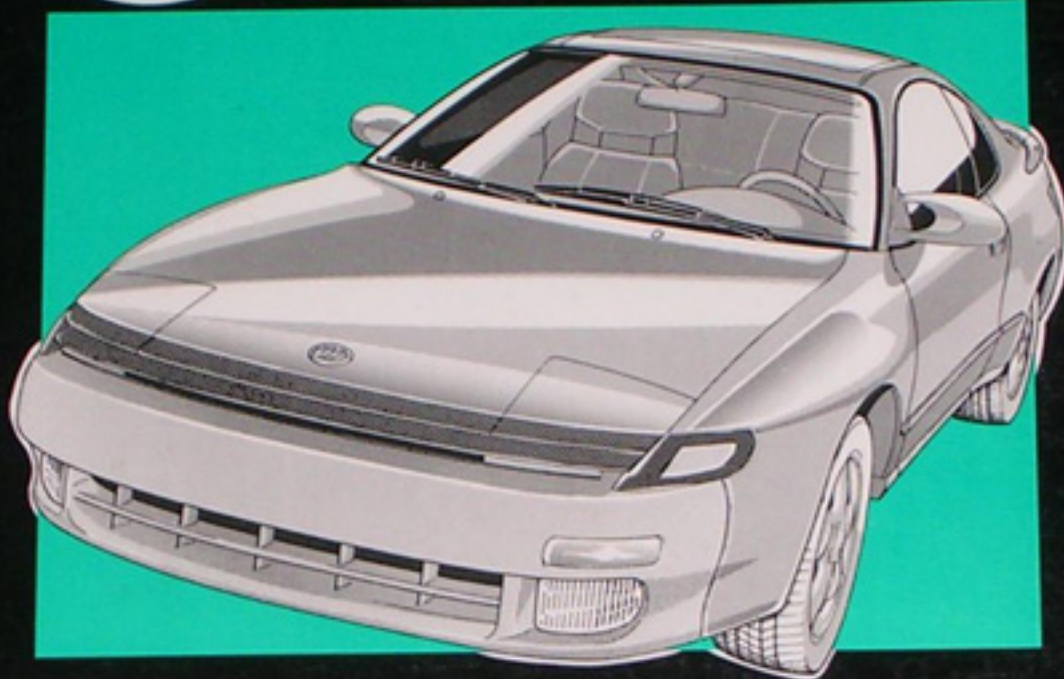


1993

 **TOYOTA**



CELLICA

REPAIR MANUAL

- ENGINE
- SPECIFICATIONS

FOR USA & CANADA
Pub. No. RM305U1

VOLUME 1

FOREWORD

This manual (Volume 1) contains maintenance and repair procedures for the engine of the 1993 CELICA.

Applicable models: AT180 series
ST184, 185 series

For repair procedures for the chassis and body, and for electrical service procedures refer to VOLUME 2 (Pub. No. RM305U2).

The manual is divided into 12 sections and 1 appendixes with a thumb index for each section at the edge of the pages.

Please note that the publications below have also been prepared as relevant service manuals to the components and systems in this vehicle.

Manual Name	Pub. No.
● 1993 Celica Electrical Wiring Diagram Manual	EWD160U
● A240L, A241E, A241H, A243L Automatic Transaxle Repair Manual	RM270U
● Celica Collision Damaged Body Repair Manual	BRM022E
● 1993 Model New Car Features	NCF092U

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

TOYOTA MOTOR CORPORATION

NOTE: The screen toned sections below are in VOLUME 2
(Pub. No. RM305U2).

INTRODUCTION	IN
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ENGINE MECHANICAL	EM
EXHAUST SYSTEM	EX
TURBOCHARGER SYSTEM	TC
EMISSION CONTROL SYSTEMS	EC
MFI AND SFI SYSTEMS	FI
COOLING SYSTEM	CO
LUBRICATION SYSTEM	LU
IGNITION SYSTEM	IG
STARTING SYSTEM	ST
CHARGING SYSTEM	CH
CLUTCH	CL
S53 MANUAL TRANSAXLE	MX
MANUAL TRANSAXLE	MT
C52 AND E150F MANUAL TRANSAXLE	AT
PROPELLER SHAFT	PR
SUSPENSION AND AXLE	SA
BRAKE SYSTEM	BR
STEERING	SR
SRS AIRBAG	AB
BODY ELECTRICAL SYSTEM	BE
BODY	BO
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SERVICE SPECIFICATIONS	A
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INTRODUCTION

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HOW TO USE THIS MANUAL

INDEX

IN003-06

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

GENERAL DESCRIPTION

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

TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

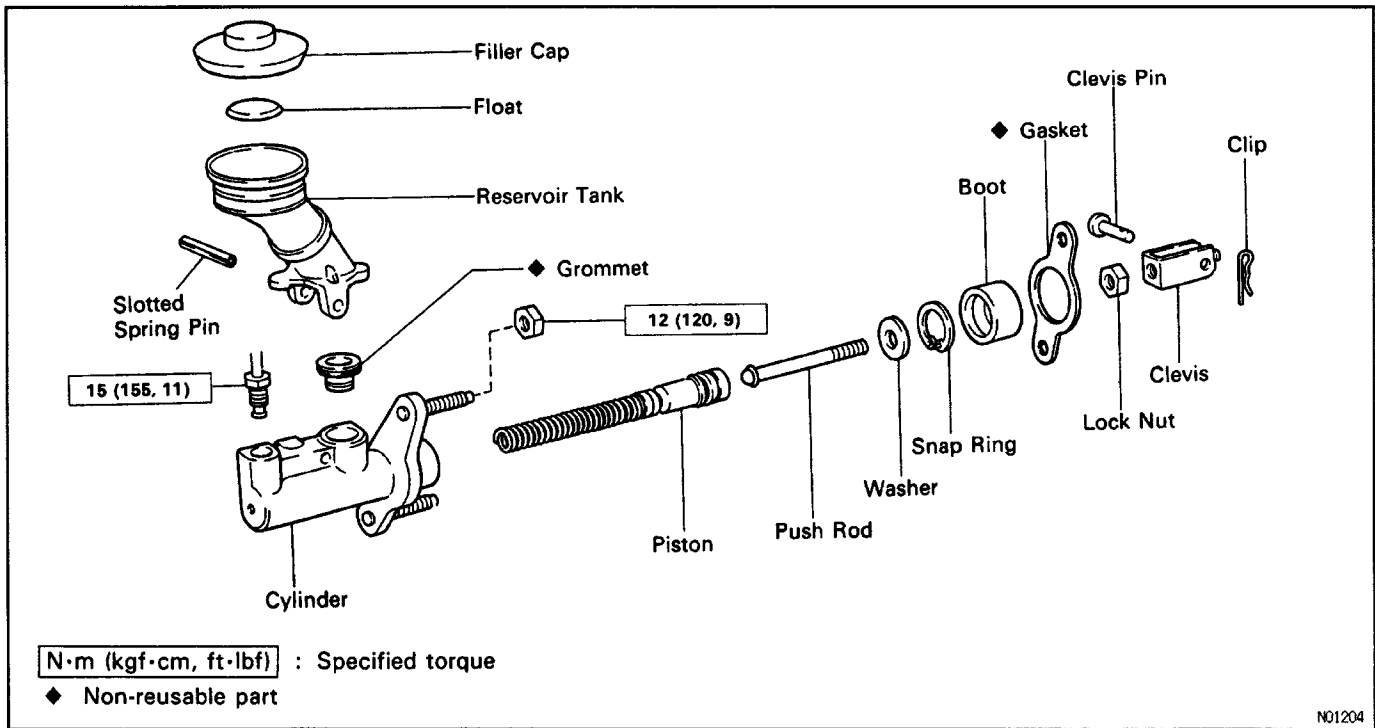
PREPARATION

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

REPAIR PROCEDURES

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

Example:



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

Example:

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

Task heading: what to do

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration.
SST 09350-30020 (09350-06120)

Set part No. *Component part No.*

Detailed text: how to do task

(b) Measure the stroke applying and releasing the compressed air (392 – 785 kPa, 4 – 8 kgf/cm² or 57 – 114 psi) as shown in the illustration.

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

Specification

Illustration: what to do and where

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

REFERENCES

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

SPECIFICATIONS

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

CAUTIONS, NOTICES, HINTS:

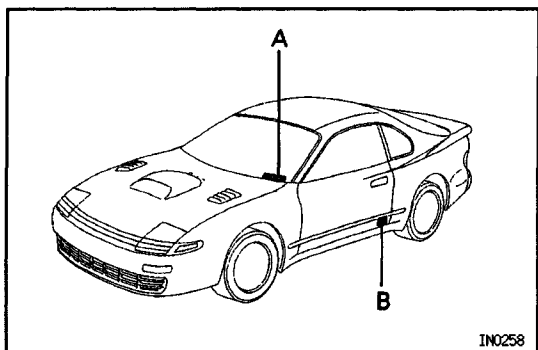
- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide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

SIS UNIT

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

Example:

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



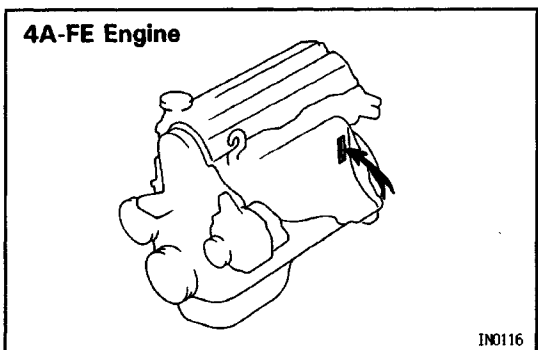
IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

IN003-01

The vehicle identification number is stamped on the vehicle identification number plate and certification label.

- A. Vehicle Identification Number Plate
- B. Certification Label

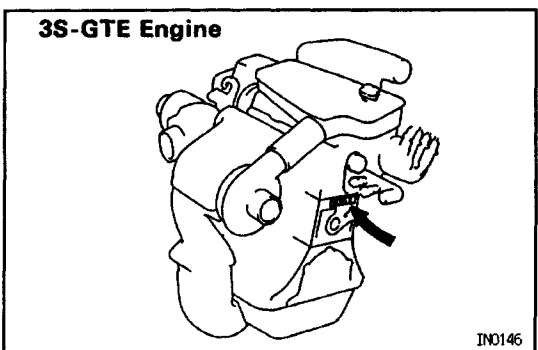


IN0116

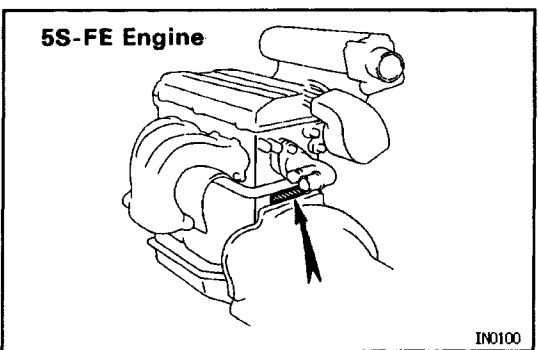
ENGINE SERIAL NUMBER

IN010-01

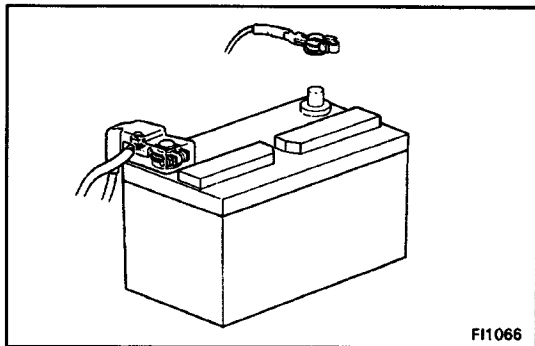
The engine serial number is stamped on the engine block as shown.



IN0146



IN0100

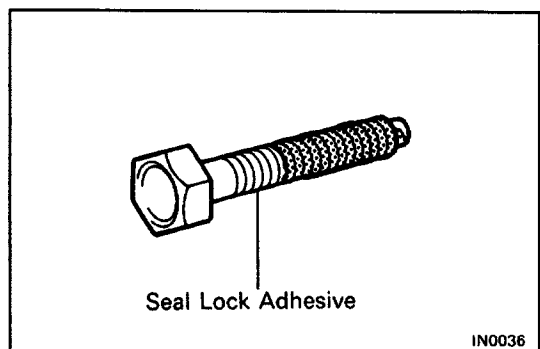


GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the 'LOCK' position and the negative (-) terminal cable is disconnected from the battery (See page AB-2).

 - (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
 - (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (-) terminal which is grounded to the vehicle body.
 - (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
 - (d) Clean the battery terminal posts and cable terminals with a clean shop rag. Do not scrape them with a file or other abrasive objects.
 - (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.
 - (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non-reusable parts
 - (a) Always replace cotter pins, gaskets, O-rings and oil seals etc. with new ones.
 - (b) Non-reusable parts are indicated in the component illustrations by the "◆" symbol.



6. Precoated parts

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

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

- (b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.
- (c) Precoated parts are indicated in the component illustrations by the "°" symbol.
When necessary, use a sealer on gaskets to prevent leaks.

8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in the preparation part at the front of each section in this manual.

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

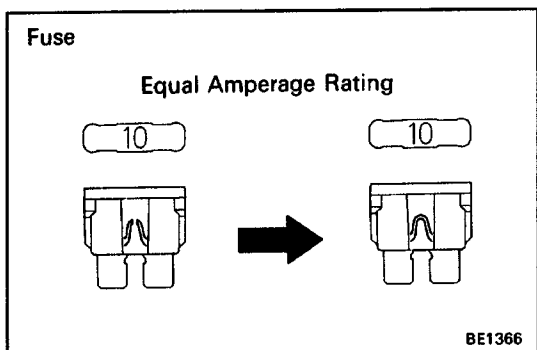
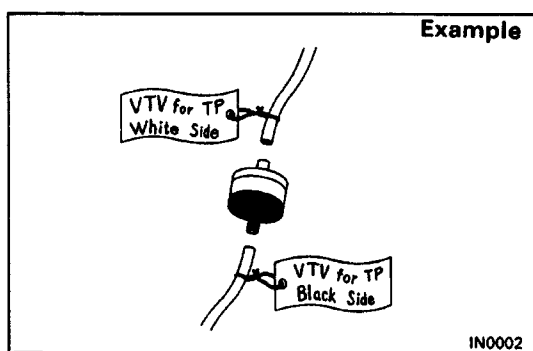
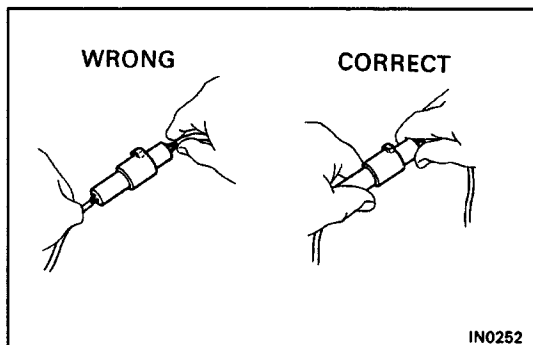
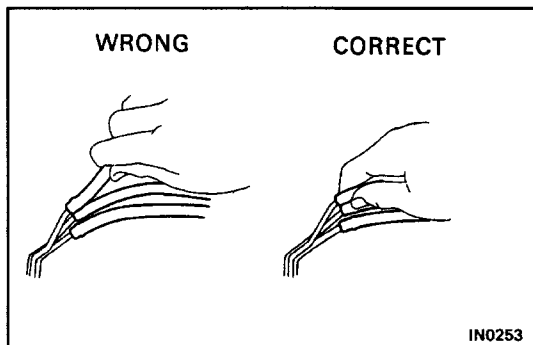


Illustration	Symbol	Part Name	Abbreviation
<p>BE5594</p>	<p>IN0365</p>	FUSE	FUSE
<p>BE5595</p>	<p>IN0366</p>	MEDIUM CURRENT FUSE	M-FUSE
<p>BE5596</p>	<p>IN0367</p>	HIGH CURRENT FUSE	H-FUSE
<p>BE5597</p>	<p>IN0367</p>	FUSIBLE LINK	FL
<p>BE5598</p>	<p>IN0368</p>	CIRCUIT BREAKER	CB

11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page [IN-24](#))
 - (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
 - (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.
12. Observe the following precautions to avoid damage to the parts:
 - (a) Do not open the cover or case of the ECU, ECM, PCM or TCM unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



- (b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
 - (c) To pull apart electrical connectors, pull on the connector itself, not the wires.
 - (d) 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.
 - (e) When steam cleaning an engine, protect the distributor, air filter, and VCV from water.
 - (f) Never use an impact wrench to remove or install temperature switches or temperature sensors.
 - (g) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
 - (h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter instead. Once the hose has been stretched, it may leak.
13. Tag hoses before disconnecting them:
 - (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
 - (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTION

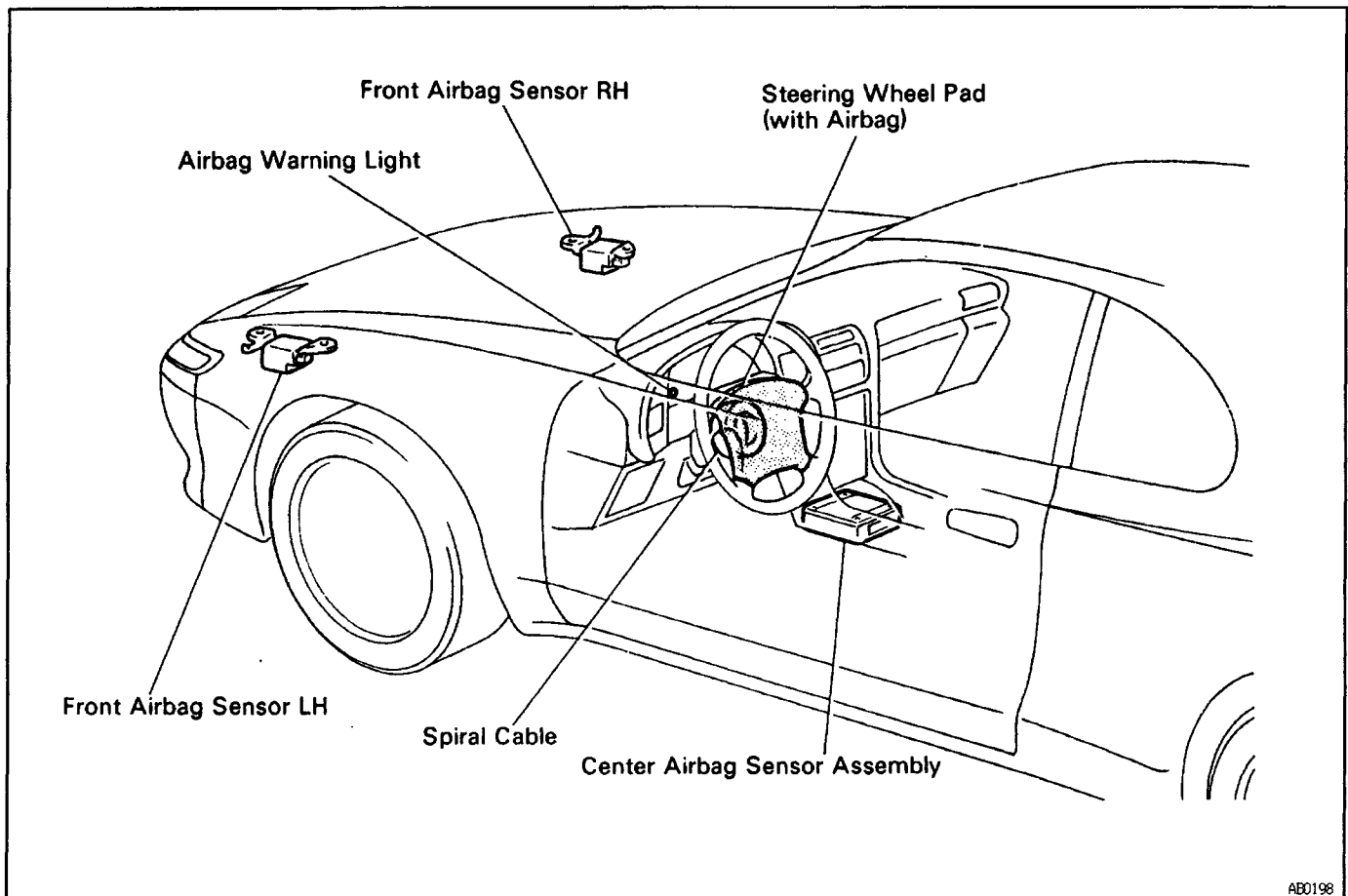
FOR VEHICLES EQUIPPED WITH SRS AIRBAG

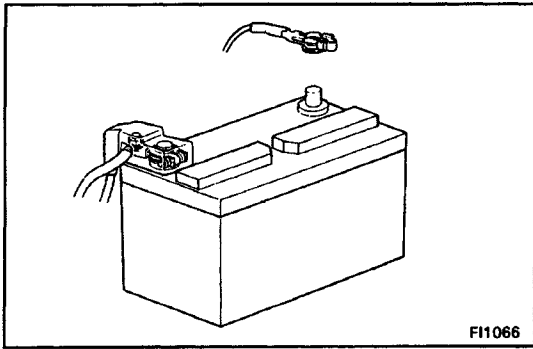
1N00E-08

The 1993 CELICA for USA specifications is equipped with an SRS (Supplemental Restraint System) airbag. Failure to carry out service operations in the correct sequence could cause the airbag system to unexpectedly deploy during servicing, possibly leading to a serious accident.

Further, if a mistake is made in servicing the airbag system, it is possible the airbag may fail to operate when required. Before performing 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.

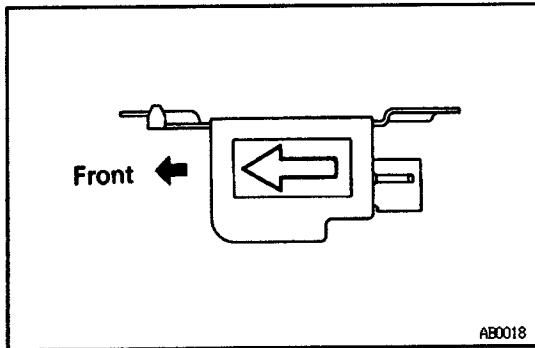
Locations of Airbag Components





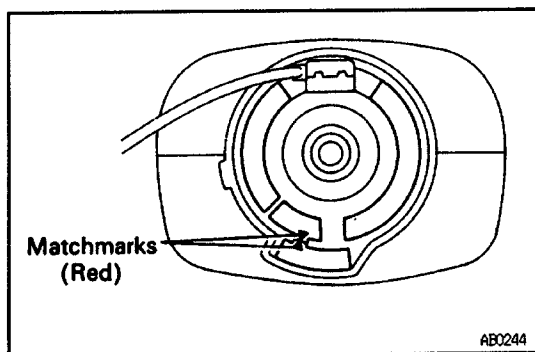
1. Malfunction symptoms of the airbag system are difficult to confirm, so the diagnostic codes become the most important source of information when troubleshooting. When troubleshooting the airbag system, always inspect the diagnostic codes before disconnecting the battery (See page [AB-24](#)).
2. **Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the LOCK position and the negative (-) terminal cable is disconnected from the battery.**
(The airbag system is equipped with a back-up power source so that if work is started within 20 seconds of disconnecting the negative (-) terminal cable of the battery, the airbag may be deployed.)
 When the negative (-) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by each memory system. Then when work is finished, reset the clock and audio systems as before.
 To avoid erasing the memory of each memory system, never use a back-up power supply from outside the vehicle.
3. Even in cases of a minor collision where the airbag does not deploy, the front airbag sensors and the steering wheel pad should be inspected (See page [AB-11](#)).
4. Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.
5. Before repairs, remove the airbag sensors if shocks are likely to be applied to the sensors during repairs.
6. The center airbag sensor assembly contains mercury. After performing replacement, do not destroy the old part. When scrapping the vehicle or replacing the center airbag sensor assembly itself, remove the center airbag sensor assembly and dispose of it as toxic waste.
7. Never disassemble and repair the front airbag sensors, center airbag sensor assembly or steering wheel pad in order to reuse it.
8. If the front airbag sensors, center airbag sensor assembly or steering wheel pad have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
9. Do not expose the front airbag sensors, center airbag sensor assembly or steering wheel pad directly to hot air or flames.
10. Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting of the electrical circuit.

11. Information labels are attached to the periphery of the airbag components. Follow the notices.
12. After work on the airbag system is completed, perform the airbag warning light check (See page AB-29).



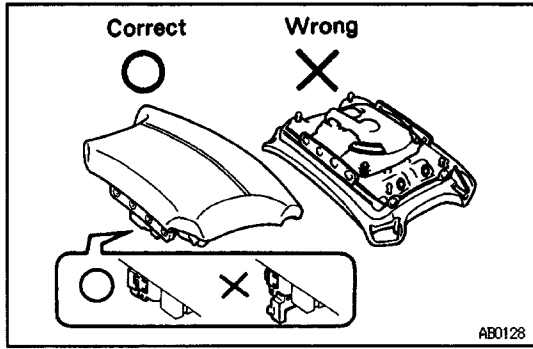
Front Airbag Sensor

1. Never reuse the front airbag sensors involved in a collision when the airbag has deployed. (Replace both left and right airbag sensors.)
2. Install the front airbag sensor with the arrow on the sensor facing toward the front of the vehicle.
3. The front airbag sensor set bolts have been anti-rust treated. When the sensor is removed, always replace the set bolts with new ones.
4. The front airbag sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector. If the connector is not securely locked, a malfunction code will be detected by the diagnosis system (See page AB-9).



Spiral Cable (in Combination Switch)

The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position; otherwise cable disconnection and other troubles may result. Refer to page AB-16 concerning correct steering wheel installation.

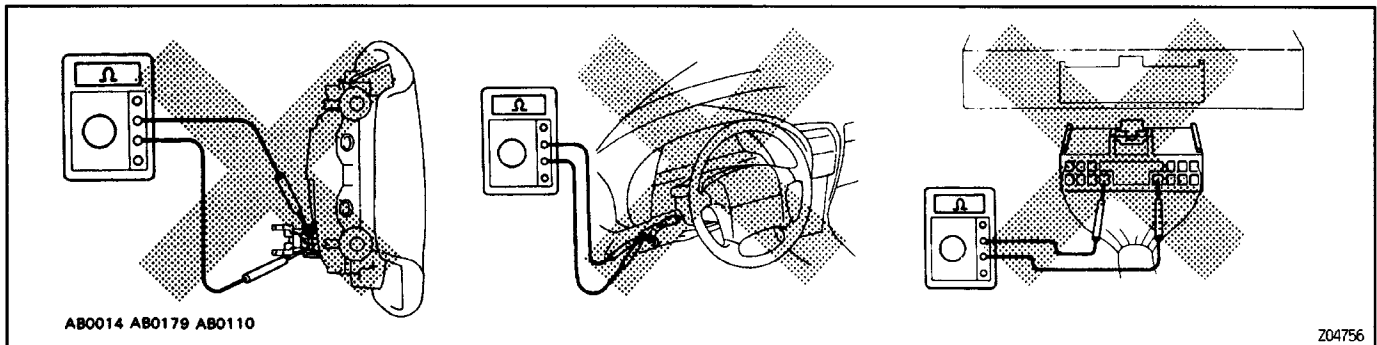


Steering Wheel Pad (with Airbag)

1. When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up.

In this case, the twin-lock type connector lock lever should be in the locked state and care should be taken to place it so the connector will not be damaged. And do not store a steering wheel pad on top of another one. (Storing the pad with its metallic surface up may lead to a serious accident if the airbag inflates for some reason.)

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



3. Grease should not be applied to the steering wheel pad and the pad should not be cleaned with detergents of any kind.
4. Store the steering wheel pad where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
5. When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the steering column near the combination switch connector before starting work.
6. When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal (See page AB-82). Perform the operation in a place away from electrical noise.

Center Airbag Sensor Assembly

The connector to the center airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connector is connected or disconnected while the center airbag sensor assembly is not mounted to the floor, it could cause undesired ignition of the airbag system.

Wire Harness and Connector

The airbag system's wire harness is integrated with the cowl wire harness assembly. The wires for the airbag wire harness are encased in a yellow corrugated tube. All the connectors for the system are also a standard yellow color. If the airbag system wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it as shown on page [AB-21](#).

FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

IN006-03

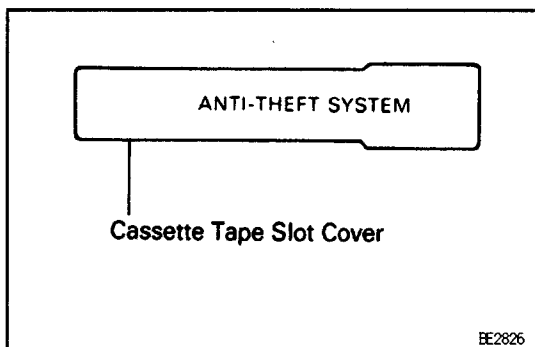
CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

- 1. Use only unleaded gasoline.**
- 2. Avoid prolonged idling.**

Avoid running the engine at idle speed for more than 20 minutes.
- 3. Avoid spark jump test.**
 - Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
 - While testing, never race the engine.
- 4. Avoid prolonged engine compression measurement.**

Engine compression tests must be done as rapidly as possible.
- 5. Do not run engine when fuel tank is nearly empty.**

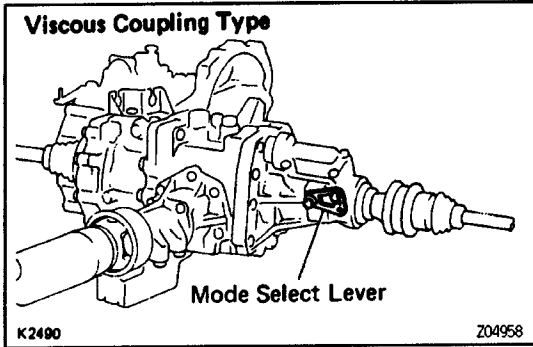
This may cause the engine to misfire and create an extra load on the converter.
- 6. Avoid coasting with ignition turned off and prolonged braking.**
- 7. Do not dispose of used catalyst along with parts contaminated with gasoline or oil.**



FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT-IN ANTI-THEFT SYSTEM

Audio System displaying the sign "ANTI – THEFT SYSTEM" shown on the left has a built-in anti-theft system which makes the audio system soundless if stolen.

If the power source for the audio system is cut even once, the anti-theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again. Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery terminals or removing the audio system the customer should be asked for the ID number so that the technician can input the ID number afterwards, or else a request made to the customer to input the ID number. For the method to input the ID number or cancel the anti-theft system, refer to the Owner's Manual.



WHEN SERVICING FULL-TIME 4WD VEHICLES

IN020-01

The full-time 4WD Celica is equipped with the viscous coupling type of center differential lock. When carrying out any kind of servicing or testing on a full-time 4WD in which the front or rear wheels are made to rotate (braking test, speedometer test, on-the-car wheel balancing, etc.), or when towing the vehicle, be sure to observe the precautions given below. If incorrect preparations or test procedures are used, the test will not be able to be successfully carried out, and may be dangerous as well. Therefore, before beginning any such servicing or test, be sure to check the following items:

- (1) Center differential lock type
- (2) Center differential mode position
- (3) Whether wheels should be touching ground or jacked up
- (4) Transmission gear position
- (5) Maximum testing vehicle speed
- (6) Maximum testing time

Also be sure to observe the following cautions:

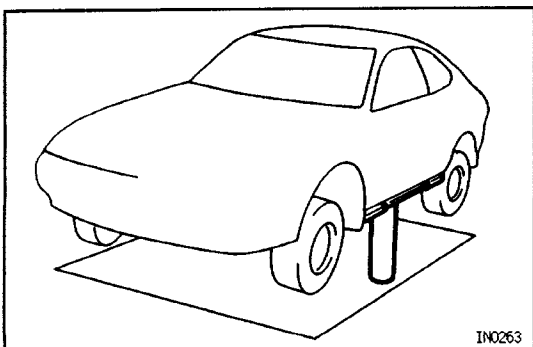
- (1) Never accelerate or decelerate the vehicle suddenly.
- (2) Observe the other cautions given for each individual test.

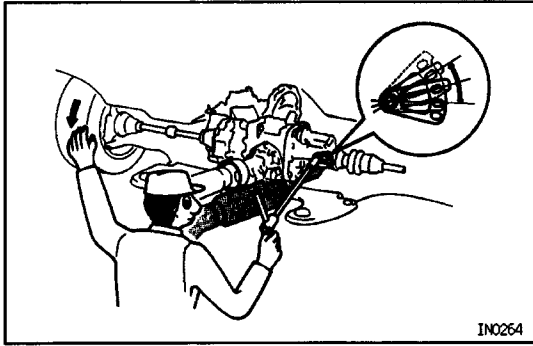
Before Beginning Test

During tests with a brake tester or chassis dynamometer, such as braking force tests or speedometer tests, if only the front or the rear wheels are to be rotated, it is necessary to set the Mode Select Lever on the transaxle to the Viscous Free Mode or to the FF Mode depending on the type of test being performed. In addition, after moving the lever to the position of the desired mode, be sure to check that the center differential's state has changed accordingly.

Moving Mode Select Lever

1. JACK UP VEHICLE



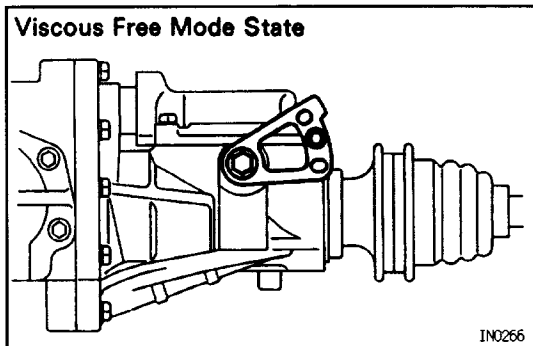
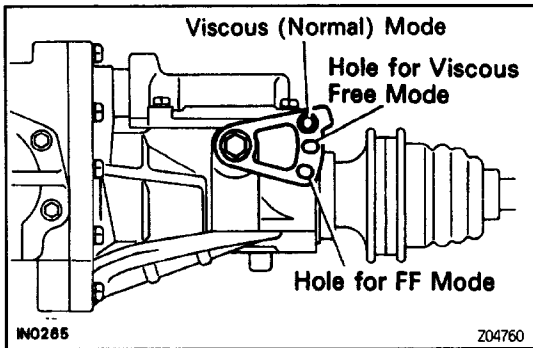


2. REMOVE MODE SELECT LEVER SET BOLT
3. MOVE MODE SELECT LEVER TO DESIRED MODE POSITION

HINT:

1. If the mode select lever cannot be moved smoothly, shift the transmission to 1st gear, then move the lever while rotating one front wheel by hand.
2. Do not use excessive force when moving the mode select lever.

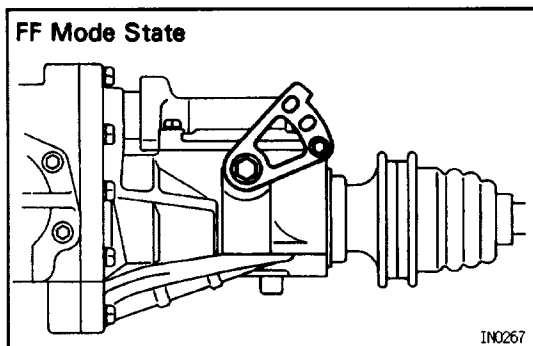
4. LOCK MODE SELECT LEVER WITH SET BOLT



5. CONFIRM MODE

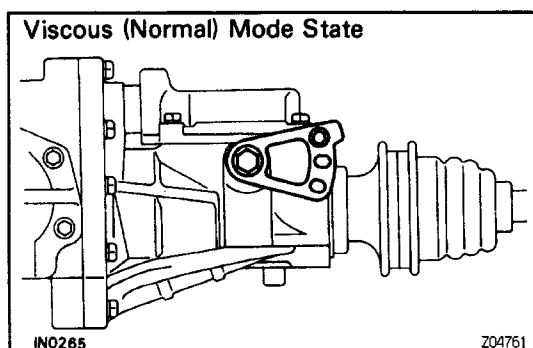
Viscous Free Mode:

Jack up one of the front wheels and check that the wheel can be rotated by hand with the transmission in neutral.



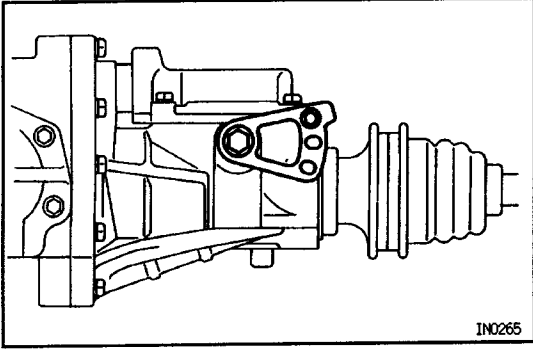
FF Mode:

Jack up one of the rear wheels and check that the wheel can be rotated by hand with the transmission in 1st gear.



Viscous (Normal) Mode:

Jack up one of the front wheels and check that the wheel resists being rotated by hand with the transmission in neutral.



6. AFTER FINISHING TEST, RETURN MODE SELECT LEVER TO "VISCOUS (NORMAL) MODE" POSITION AND INSTALL SET BOLT

NOTICE:

1. After moving the mode select lever, jack up one of the front or rear wheels and check that the wheel rotates to confirm that the mode selection has been made correctly.
2. Be sure to tighten the set bolt securely each time after moving the mode select lever.
3. Do not engage the clutch or pump the accelerator or brakes suddenly in the viscous free mode or the FF mode.
4. If either the front or the rear wheels are placed on the tester rollers in the viscous free mode, be careful not to exceed the following limits:

Maximum speed:

Speed indicated on speedometer

30 km/h (19 mph) or

Wheel speed (tester speed)

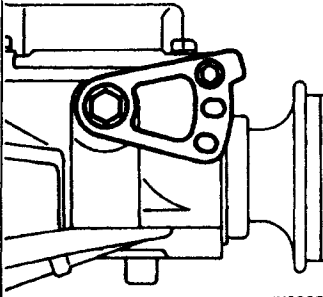
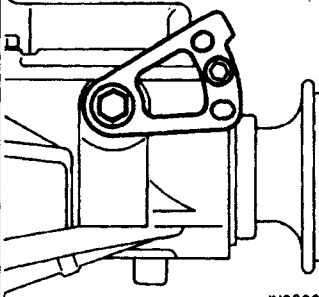
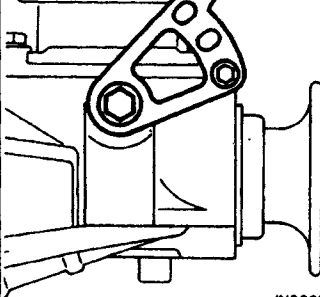
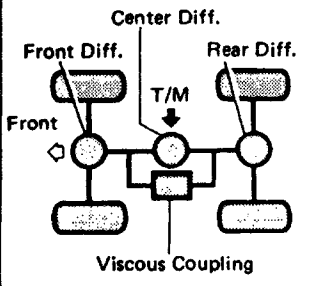
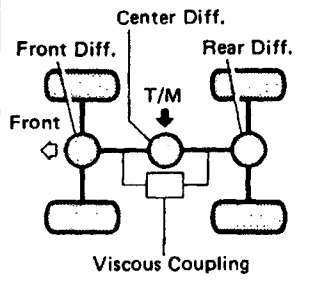
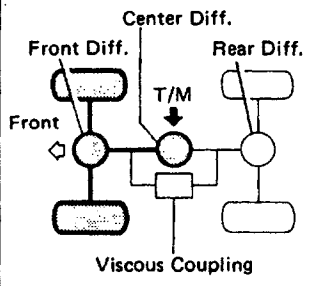
60 km/h (38 mph)

Maximum test time: 60 sec.

Note that the actual wheel speed (tester speed) is twice the speed indicated by the speedometer due to center differential operation.

5. Do not drive the vehicle in 1 st gear, 2nd gear or in reverse while in FF mode. If it is necessary to move the vehicle, drive it in 3rd, 4th or 5th gear. When desiring to back the vehicle, push it backwards manually.
6. After finishing the test, be sure to move the mode select lever back to the viscous (normal) mode and lock it securely with the set bolt.

State in Each Mode

Mode	Viscous (Normal) Mode	Viscous Free Mode	FF Mode
Mode Select Lever Position	 IN0265	 IN0266	 IN0267
State in Each Mode	 CP0052	 CP0053	 CP0054
Viscous Coupling	Operating	Not Operating	Not Operating
Center Differential	Free	Free	Locked and Separated from Rear Drive
Driving Wheel:	4WD	4WD	FWD
Conditions of Use	Normal Driving	<ul style="list-style-type: none"> • When using a brake tester 	<ul style="list-style-type: none"> • When using a chassis dynamometer • When using a combination tester
		Never use this mode during normal driving	

Braking Force Test

HINT:

1. According to the vehicle speed during the test, select one of the two test methods described below, either A or B.
2. The mode select lever position of mode select lever differs in the two test methods, A and B, so take adequate precautions.
Method A (Low Speed Test): Viscous Free Mode
Method B (High Speed Test): FF Mode

Test Method A (Low Speed Test)

Speed indicated on speedometer:

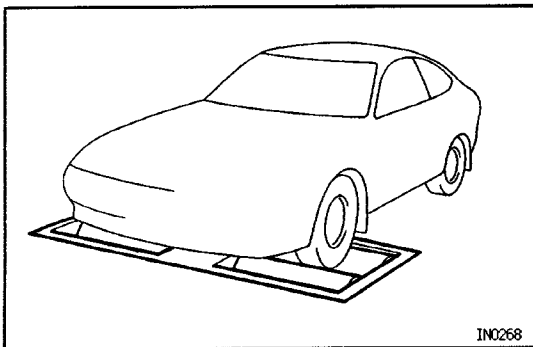
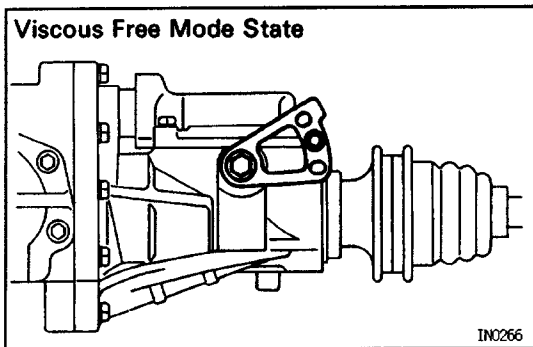
Below 30 km/h (19 mph),

Wheel speed (tester speed):

Below 60 km/h (38 mph) and

Test time:

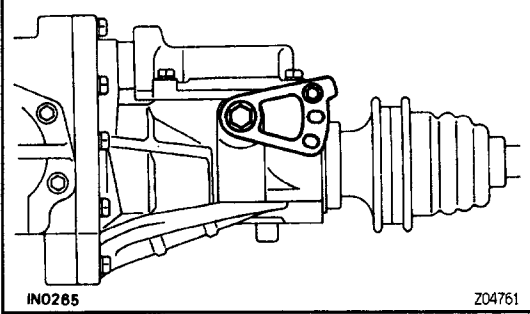
Within 60 sec.



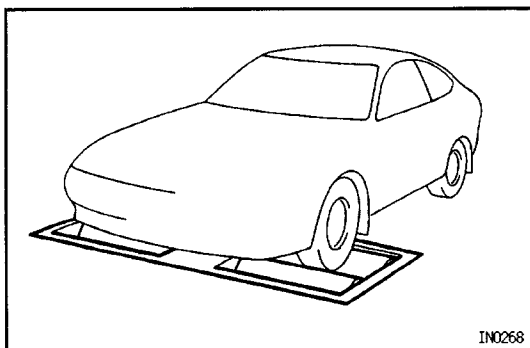
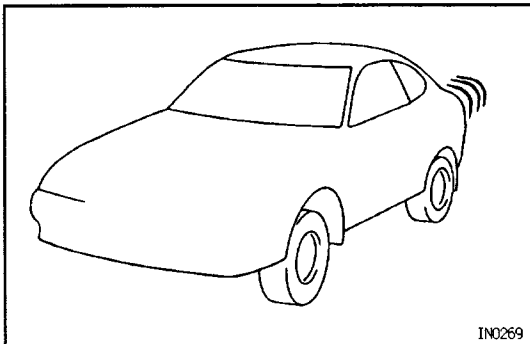
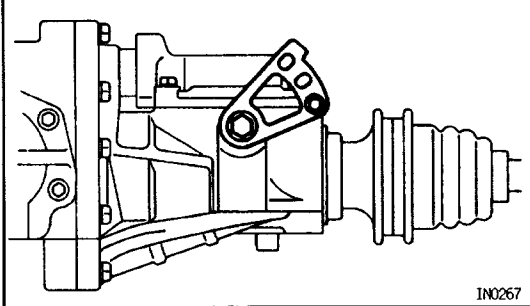
1. MOVE MODE SELECT LEVER ON TRANSAXLE TO "VISCIOUS FREE MODE" AND INSTALL SET BOLT (See page IN-15)
2. CONFIRM MODE SELECTION (See page IN-16)
3. PLACE WHEELS (EITHER FRONT OR REAR) ON TESTER ROLLERS
HINT: The actual wheel speed (tester speed) is twice the speed indicated by the speedometer due –to center differential operation, so take adequate precautions.
4. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (If equipped with it)
5. PUT TRANSMISSION IN NEUTRAL
6. OPERATE TESTER ROLLERS AND MEASURE BRAKING FORCE .

HINT: Since different types of tester are used, such as specialized brake testers and combination testers with built – in chassis dynamometer, speedometer tester, brake tester, etc., conduct the test in accordance with the instructions furnished for the tester model used.

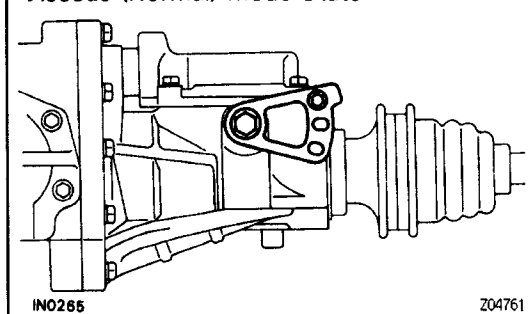
Viscous (Normal) Mode State



FF Mode State



Viscous (Normal) Mode State



- 7. AFTER FINISHING TEST, BE SURE TO MOVE MODE SELECT LEVER BACK TO "VISCIOUS (NORMAL) MODE" AND LOCK IT SECURELY WITH SET BOLT**

Test method B (High Speed Test)

[Vehicle Speed: Over 60 km/h (38 mph)]

- 1. MOVE MODE SELECT LEVER TO "FF MODE" AND INSTALL SET BOLT**
(See page IN-15)
- 2. CONFIRM MODE SELECTION**
(See page IN-16)
- 3. PLACE WHEELS (EITHER FRONT OR REAR) TO BE TESTED ON TESTER ROLLERS**

NOTICE:

1. Do not drive the vehicle in 1 st gear, 2nd gear or reverse while in the FF mode.
2. If it is necessary to move the vehicle, drive it in 3rd, 4th or 5th gear.
3. When desiring to back the vehicle, push it backwards manually.
4. Do not engage the clutch or pump the accelerator or brake pedal suddenly.

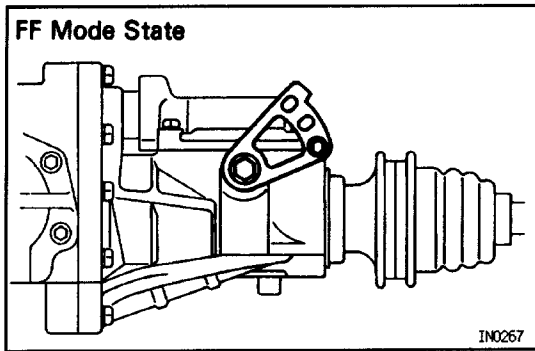
- 4. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (if equipped with it)**

- 5. PUT TRANSMISSION IN NEUTRAL**

- 6. OPERATE TESTER ROLLERS AND MEASURE BRAKING FORCE**

Tester operation differs depending on the type of tester used. Be sure to follow the procedure specified in the instructions supplied by the tester manufacturer.

- 7. AFTER FINISHING TEST, BE SURE TO MOVE MODE SELECT LEVER BACK TO "VISCIOUS (NORMAL) MODE" AND LOCK IT SECURELY WITH SET BOLT**



Speedometer Test or Other Tests (Using Speedometer Tester or Chassis Dynamometer)

1. MOVE MODE SELECT LEVER TO "FF MODE" AND INSTALL SET BOLT

(See page IN-15)

2. CONFIRM MODE SELECTION

(See page IN-16)

NOTICE:

1. Do not drive the vehicle in 1st gear, 2nd gear or reverse while in the FF mode.
2. If it is necessary to move the vehicle, drive it in 3rd, 4th or 5th gear.
3. When desiring to back the vehicle, push it backwards manually.
4. Do not engage the clutch or pump the accelerator or brake pedal suddenly.

3. PLACE FRONT WHEELS ON TESTER ROLLERS

4. CHECK REAR WHEELS

5. APPLY PARKING BRAKE

6. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (if equipped with it)

7. TEST VEHICLE

(1) Start the engine.

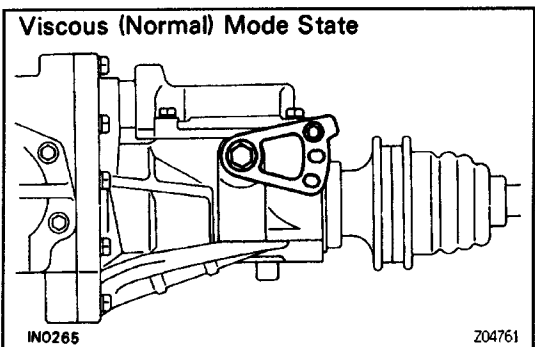
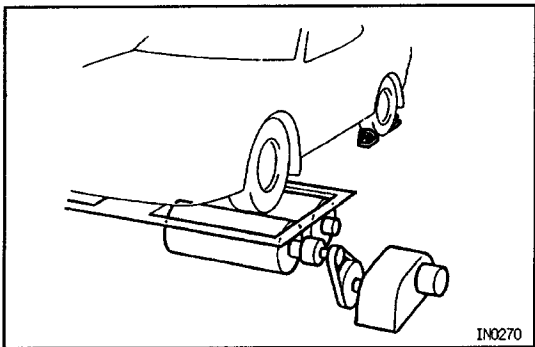
(2) Put the transmission in 3rd gear.

(3) Engage the clutch slowly, then gradually increase the speed as the test is conducted.

HINT: The test should be conducted in 3rd, 4th and 5th gears.

(4) After the test is finished, reduce the speed gradually, then stop the engine.

8. AFTER FINISHING TEST, BE SURE TO MOVE MODE SELECT LEVER BACK TO "VISCOUS (NORMAL) MODE" AND LOCK IT SECURELY WITH SET BOLT

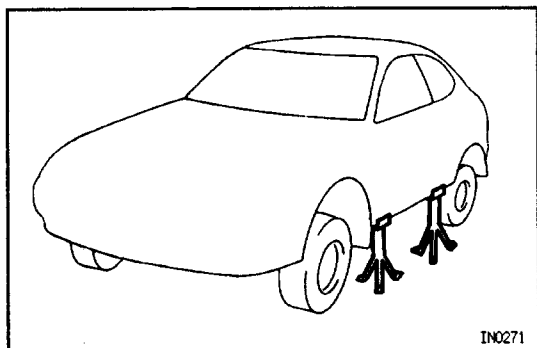


On-The-Car Wheel Balancing

NOTICE:

1. When doing on-the-car wheel balancing on a full-time 4WD vehicle, to prevent the wheels from rotating at different speeds on indifferent directions from each other (which could lead to damage to the center differential or transaxle gears), always be sure to observe the following precautions:

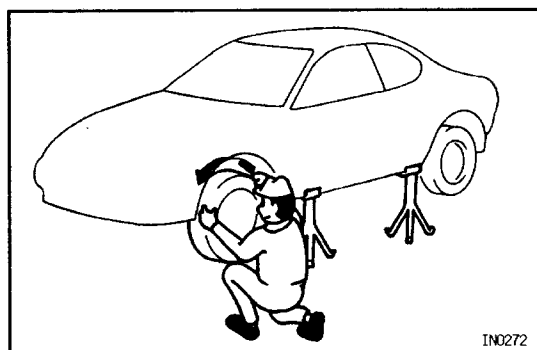
- (a) All four wheels should be jacked up, clearing the ground completely.
 - (b) The wheels should be driven with both the engine and the wheel balancer.
 - (e) The mode select lever on the transaxle of the viscous coupling type center differential should be in the viscous (normal) mode position.
 - (d) The parking brake lever should be fully released.
 - (e) None of the brakes should be allowed to drag.
2. Avoid sudden acceleration, deceleration and braking.
 3. Carry out the wheel balancing with the transmission in 3rd or 4th gear.



1. JACK UP VEHICLE SO THAT ALL FOUR WHEELS CLEAR GROUND AND CAN BE ROTATED

The wheels be rotating fast, so make sure the vehicle is firmly supported on stands.

2. RELEASE PARKING BRAKE FULLY

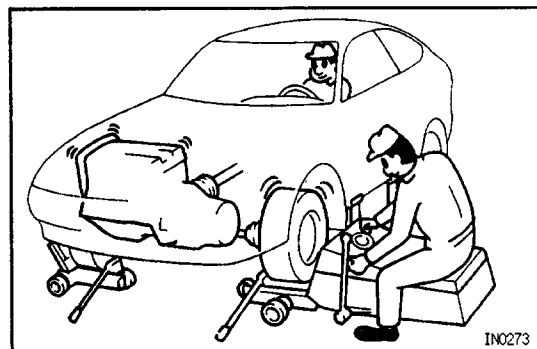


3. MAKE SURE THAT BRAKES ARE NOT DRAGGING ON ANY OF FOUR WHEELS

4. PLACE WHEEL TO BE BALANCED ON WHEEL BALANCER

Follow the procedure specified by the wheel balancer-manufacturer.

5. START ENGINE



6. PUT TRANSMISSION IN 3RD OR 4TH GEAR

7. ENGAGE CLUTCH SLOWLY, THEN GRADUALLY INCREASE SPEED TO TEST SPEED

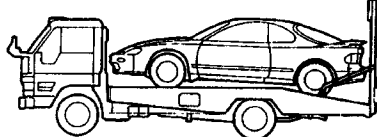
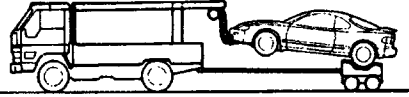
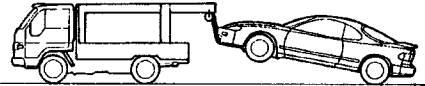
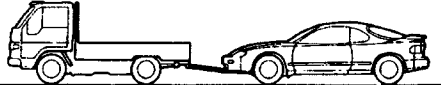
8. ROTATE WHEELS USING BOTH ENGINE'S DRIVING FORCE AND DRIVING FORCE OF WHEEL BALANCER AND CHECK WHEEL BALANCE

HINT: When doing this, be careful of the other wheels which will rotate at the same time.

WHEN TOWING FULL-TIME 4WD VEHICLES

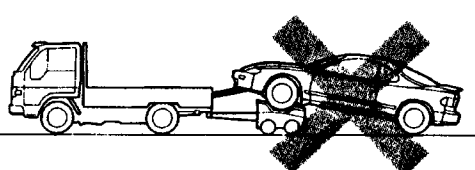
W00V-01

1. Use one of the methods shown below to tow the vehicle.
2. When there is trouble with the chassis and drive train, use method (1) (flat bed truck) or method (2) (sling type tow truck with dollies)
3. Recommended Methods: No. (1), (2), (3)
- Emergency Method: No. (4)

Type of Center Differential Towing Method	Viscous Coupling Type		
	Parking Brake	T/M Shift Lever Position	Viscous Coupling
① Flat Bed Truck  <small>IN0274</small>	Applied	1st Gear	Normal Driving Viscous Mode)
② Sling-Type Tow Truck with Dollies  <small>IN0275</small>			(No Special Operation Necessary)
③ Sling-Type Tow Truck (Front wheels must be able to rotate freely)  <small>IN0276</small>	Released	Neutral	↑
④ Towing with a Rope  <small>IN0277</small>	Released	Neutral	↑

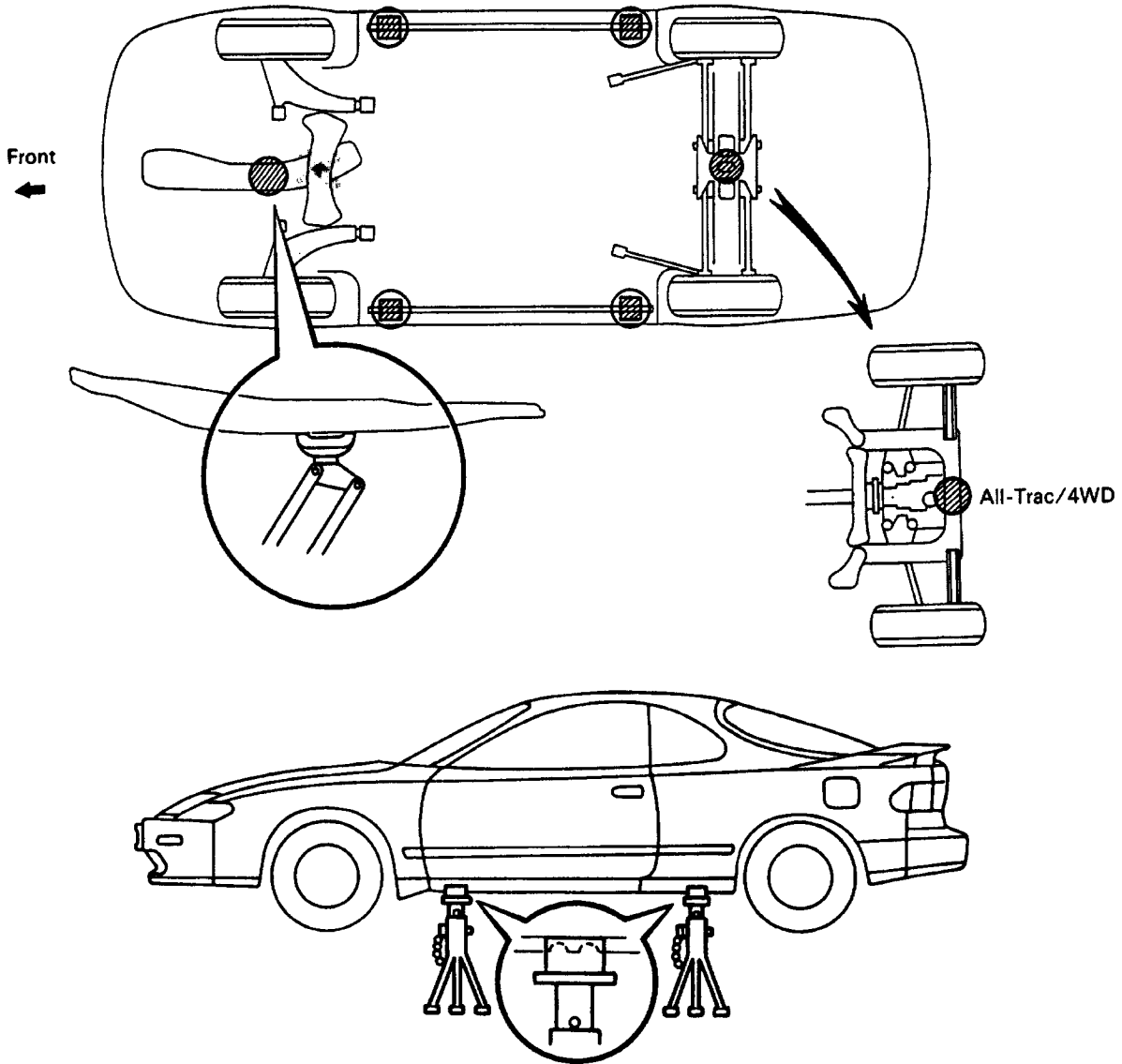
HINT: Do not use any towing method other than those shown above.


For example, the towing method shown below is dangerous, so do not use it.

 <small>IN0278</small>	<p>During towing with this towing method, there is a danger of the drivetrain heating up and causing breakdown, or of the front wheels flying off the dolly.</p>
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VEHICLE LIFT AND SUPPORT LOCATIONS

IN007-01



JACK POSITION  _____
 Front Center of engine mounting center member
 Rear Jack up support of rear subframe

NOTICE: Place the jack only in the positions indicated above. Never place the jack in the position marked "X" as this will bend the cross-member and damage the vehicle.

PANTOGRAPH JACK POSITION  _____
SUPPORT POSITION
 Safety stand and swing arm type lift 

ABBREVIATIONS USED IN THIS MANUAL

IN01D-0A

ABS	Anti -Lock Brake System
ALR	Automatic Locking Retractor
A/T	Automatic Transaxle
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid
BTDC	Before Top Dead Center
Calif.	California
CB	Circuit Breaker
CD	Compact Disc
DP	Dash Pot
ECU	Electronic Control Unit
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EX	Exhaust (Manifold, Valve)
Ex.	Except
FIPG	Formed in Place Gasket
FL	Fusible Link
Fr	Front
IG	Ignition
IN	Intake (Manifold, Valve)
J/B	Junction Block
LED	Light Emitting Diode
LH	Left - Hand
Max.	Maximum
Min.	Minimum
MP	Multipurpose
M/T	Manual Transaxle
O/D, OO	Overdrive
O/S	Oversize
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PS	Power Steering
RH	Right-Hand
Rr	Rear
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch

TCCS	Toyota Computer Controlled System
TDC	Top Dead Center
TEMP.	Temperature
T/M	Transmission
T-VIS	Toyota –Variable Induction System
U/D	Underdrive
U/S	Undersize
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
W/O	Without
2WD	Two Wheel Drive Vehicles (4x2)
4WD	Four Wheel Drive Vehicles (4x4)

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
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	—
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	—
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	—
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	—
CTOX	Continuous Trap Oxidizer	—
CTP	Closed Throttle Position	—
D FI	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: Toyota Diagnosis Communication Link (TDCL) 3: OBDII 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)
EG R	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
G EN	Generator	Alternator
GND	Ground	Ground (GND)
H02S	Heated Oxygen Sensor	Heated Oxygen Sensor (H02S)








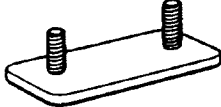


IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect Injection
IFS	Inertia Fuel–Shutoff	–
SC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold 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 Light
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non–Volatile Random Access Memory	–
O ₂ S	Oxygen Sensor	Oxygen Sensor, Ot Sensor (OtS)
OBD	On –Board Diagnostic	On–Board Diagnostic (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Converter (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	–
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SP L	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
S RT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter
TCM	Transmission Control Module	Transmission ECU (Electronic Control Unit)
TP	Throttle Position	Throttle Position
TR	Transmission Range	–

TVV	Thermal Vacuum Valve	Bimetal Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three-Way Catalytic Converter	Three-Way Catalyst (TWC) CC _{RO}
TWC+OC	Three-Way + Oxidation Catalytic Converter	CCR + CCo
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor (Reed Switch Type)
WOT	Wide Open Throttle	Full Throttle
WU-OC	Warm Up Oxidation Catalytic Converter	-
WU-TWC	Warm Up Three-Way Catalytic Converter	Manifold Converter
3GR	Third Gear	-
4GR	Fourth Gear	-

STANDARD BOLT TORQUE SPECIFICATIONS

IM008-01

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 <p>Bolt head No.</p> <p>4- 5- 6- 7- 8- 9- 10- 11-</p>	<p>4T 5T 6T 7T 8T 9T 10T 11T</p>	Stud bolt	 <p>No mark</p>	4T
	 <p>No mark</p>	4T			
Hexagon flange bolt w/ washer hexagon bolt	 <p>No mark</p>	4T	Welded bolt	 <p>Grooved</p>	6T
Hexagon head bolt	 <p>Two protruding lines</p>	5T			
Hexagon flange bolt w/ washer hexagon bolt	 <p>Two protruding lines</p>	6T	Welded bolt		4T
Hexagon head bolt	 <p>Three protruding lines</p>	7T			
Hexagon head bolt	 <p>Four protruding lines</p>	8T			

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.–1bf	6	60	52 in.–1bf
	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.–1bf	7.5	75	65 in.–1bf
	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.–1bf	9	90	78 in.–1bf
	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

MAINTENANCE

	Page
MAINTENANCE SCHEDULE	MA-2
MAINTENANCE OPERATIONS	MA-4
GENERAL MAINTENANCE	MA-17

MA

GENERAL NOTES:

- The maintenance schedule for the vehicle consists of separate A and B schedules which are applicable depending on the conditions the vehicle is used in. Confirm the vehicle's usage conditions, select the appropriate schedule and service the vehicle accordingly.
- Every service item in the periodic maintenance list must be performed.
- Next to the columns of periods in the schedule, reference pages have been added for easy access to service data and procedures necessary for each operation.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance list occurs first, the odometer reading (miles or km) or the time interval (months).
- Maintenance services after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

MAINTENANCE SCHEDULE

SCHEDULE A

Maintenance operations: A = Check and adjust if necessary
 R = Replace, change or lubricate
 I = Inspect and correct or replace if necessary

CONDITIONS:

- Towing a trailer, using a camper or car top carrier.
- Repeated short trips less than 5 miles (8 km) and outside temperature remains below freezing.
- Extensive idling and/or speed driving for a long distance such as police, taxi or door-to-door delivery use.
- Operating on dusty, rough, muddy or salt spread roads.

System	Service interval (Odometer reading or months whichever comes first)	Maintenance services beyond 60,000 miles (96,000 km) should continue to be performed at intervals shown for each maintenance schedule.																	See page (item No.)				
		Miles x 1,000	3.75	7.5	11.25	15	18.75	22.5	26.25	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60		Months			
ENGINE	Maintenance items	km x 1,000	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96					
	Timing belt																		R	-	MA-4 (item 1)		
	Valve clearance																			A	A: Every 72 months	MA-7 (item 12)	
	Drive belt																				I: First period, 60,000 miles (96,000 km) or 72 months. I: After that every 7,500 miles (12,000 km) or 12 months.	MA-4 (item 2)	
	Engine oil* MaintenanceE	3S-GTE engine																			R: Every 2,500 miles (4,000 km) or 3 months	MA-6 (item 6)	
		Others		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R: Every 6 months	MA-6 (item 6)
	Engine oil filter*	3S-GTE engine																			R: Every 5,000 miles (8,000 km) or 6 months	MA-6 (item 6)	
	Others		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R: Every 6 months	MA-6 (item 6)	
FUEL	Engine coolant																				R: First period, 45,000 miles (72,000 km) or 36 months. R: After that every 30,000 mile (48,000 km) or 24 months	MA-7 (item 7)	
	Exhaust pipes and mounts																			I	I: Every 24 months	MA-8 (item 11)	
IGNITION	Idle speed	4A-FE engine																			A: Adjust at first 7,500 miles (12,000 km) or 12 months, and at 15,000 miles (24,000 km) or 24 months. Then adjust every 15,000 miles (24,000 km) or 24 months.	MA-8 (item 13)	
	Air Filter (2)-,	3S-GTE engine																			I: Every 5,000 miles (8,000 km) or 6 months R: Every 30,000 miles (48,000 km) or 36 months	MA-5 (item 3,4)	
		Others		I	I	I	I	I	I	R	I	I	I	I	I	I	I	I	R	I	I: Every 6 months R: Every 36 months	MA-8 (item 10)	
EVAP	Fuel lines and connections																			I	I: Every 36 months	MA-7 (item 9)	
	Fuel tank capasket																			R	R: Every 72 months	MA-5 (item 5)	
BRAKES	Spark plug	4A-FE engine *,																		R	R: Every 36 months	MA-5 (item 5)	
		Others																		R	R: Every 72 months	MA-7 (item 8)	
CHASSIS	Charcoal canister																			I	I: Every 72 months	MA-10 (item 16)	
	Brake linings and drums (d)																				I: Every 12 months	MA-10 (item 15)	
	Brake pads and discs Front and rear																				I: Every 12 months	MA-9 (item 14)	
	Brake line pipes and hoses																				I: Every 24 months	MA-11 (item 17)	
	Steering linkage																				I: Every 12 months	MA-11 (item 18)	
	SRS airbag,																				I: First period, 10 years. I: After that every 2 years.	MA-12 (item 20)	
	Drive shaft boots																				I: Every 12 months	MA-12 (item 21)	
Ball joints and dust covers																				I: Every 12 months	MA-13 (item 22, 23)		
Manual transaxle, automatic transaxle, transfer and differential																				R	R: Every 24 months	MA-12 (item 19)	
Steering gear housing oil																				I	I: Every 24 months	MA-15 (item 24)	
Bolts and nuts on chassis and bod																				I	I: Every 12 months		

*and ' marks indicate maintenance which is part of the warranty conditions for the Emission Control System. The warranty period is in accordance with the owner's guide or the warranty booklet.

(* California specification vehicles

': Other specification vehicles)

(1) Applicable to vehicles operated under conditions of extensive idling and/or low speed driving for a long distance such as police, taxi or door-to-door delivery use.

(2) Applicable when operating mainly on dusty road. If not, apply SCHEDULE B.

(3) Includes inspection of fuel tank band and vapor vent system.

(4) Also applicable to lining drum for parking brake.

(5) Check for leakage.

(6) Check for oil leaks from steering gear housing.

(7) Applicable only when operating mainly on rough, muddy roads. The applicable parts are listed below. For other usage conditions, refer to SCHEDULE B.

- Front and rear suspension member to cross body
- Strut bar bracket to body bolts
- Bolts for seat installation

SCHEDULE B

CONDITIONS: Conditions other than those listed for SCHEDULE A.

System	Service interval (Odometer reading in months, whichever comes first)	Maintenance service beyond 60,000 miles (96,000 km) should continue to be performed at the same intervals shown for each maintenance schedule.										See page (item No.)		
		Miles x 1,000	7.5	15	22.5	30	37.5	45	52.5	60	Months			
	Maintenance items	km x 1,000	12	24	36	48	60	72	84	96				
ENGINE	Valve clearance									A	A: Every 72 months	MA-8 (item 12)		
	Drive belt		I: First period, 60,000 miles (96,000 km) or 72 months. I: After that every 7,500 miles (12,000 km) or 12 months.										MA-4 (item 2)	
	Engine oil*	3S-GTE engine		R: Every 5,000 miles (8,000 km) or 6 months.										MA-6 (item 6)
		Others	R	R	R	R	R	R	R	R	R	R	R: Every 12 months	
	Engine oil filter [†]	3S-GTE engine		R: Every 10,000 miles (16,000 km) or 12 months.										MA-6 (item 6)
		Others	R	R	R	R	R	R	R	R	R	R	R: Every 12 months	
Engine coolant			R: First period, 45,000 miles (72,000 km) or 36 months. R: After that every 30,000 miles (48,000 km) or 24 months.										MA-7 (item 7)	
Exhaust pipes and mountings					I					I	I: Every 36 months	MA-8 (item 11)		
FUEL	Idle speed	4A-FE engine	A: Adjust at first 7,500 miles (12,000 km) or 12 months, and at 15,000 miles (24,000 km) or 24 months. Then adjust every 15,000 miles (24,000 km) or 24 months.										MA-8 (item 13)	
	Air filter [†]					R					R	R: Every 36 months	MA-5 (item 4)	
	Fuel lines and connections					I					I	I: Every 36 months	MA-8 (item 10)	
	Fuel tank cap gasket										R	R: Every 72 months	MA-7 (item 9)	
IGNITION	Spark plugs	4A-FE engine ^{††}				R					R	R: Every 36 months	MA-5 (item 5)	
		Others									R	R: Every 72 months		
EVAP	Charcoal canister										I	I: Every 72 months	MA-7 (item 8)	
BRAKES	Brake linings and drums (2)			I		I		I			I	I: Every 24 months	MA-10 (item 16)	
	Brake pads and discs (Front and rear)			I		I		I			I	I: Every 24 months	MA-10 (item 15)	
	Brake line pipes and hoses			I		I		I			I	I: Every 24 months	MA-9 (item 14)	
CHASSIS	Steering linkage			I		I		I			I	I: Every 24 months	MA-11 (item 17)	
	SRS airbag		I: First period, 10 years. I: After that every 2 years.										MA-11 (item 18)	
	Drive shaft boots			I		I		I			I	I: Every 24 months	MA-12 (item 20)	
	Ball joints and dust covers			I		I		I			I	I: Every 24 months	MA-12 (item 21)	
	Manual transaxle, automatic transaxle and differential (3)			I		I		I			I	I: Every 24 months	MA-13 (item 22)	
	Steering gear housing oil			I		I		I			I	I: Every 24 months	MA-12 (item 19)	
	Bolts and nuts on chassis and body (5)			I		I		I			I	I: Every 24 months	MA-15 (item 24)	

* ad * marks conditions for the Emission Control System. The warranty period is in accordance with the owner's guide or the warranty booklet .

i*: California specification vehicles *: Other specification vehicles)

1 Includes inspection of fuel tank band and vapor vent system.

2 Also applicable to lining drum for parking brake.

3 Check for leakage.

4 Check for oil leaks from steering gear housing.

5 The applicable parts are listed below.

- Front and rear suspension member to cross body
- Strut bar bracket to body bolt

MAINTENANCE OPERATIONS

ENGINE

Cold Engine Operations

1. REPLACE TIMING BELT

(a) Remove the timing belt.

4A-FE (See pages EM-33 to 37)

3S-GTE (See pages EM-46 to 51)

5S-FE (See pages EM-67 to 72)

(b) Install the timing belt.

4A-FE (See pages EM-40 to 45)

3S-GTE (See pages EM-55 to 61)

5S-FE (See pages EM-75 to 80)

2. INSPECT DRIVE BELT

(a) Visually check the drive belt for excessive wear, frayed cords etc.

If necessary, replace the drive belt.

HINT: Cracks on the rib side of a drive belt are considered acceptable. If the drive belt has chunks missing from the ribs, it should be replaced.

(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:

Nippondenso BTG-20 (95506-00020)

Borroughs No. BT-33-73F

Drive belt tension:

(4A-FE)

Alternator	New belt 160 + 20 lbf
	Used belt 130 + 20 lbf
PS pump	New belt 125 ±25 lbf
	Used belt 80 ±20 lbf
A/C compressor	New belt 160 + 20 lbf
	Used belt 100 + 20 lbf

(3S-GTE and 5S-FE):

Alternator (3S-GTE)

w/ A/C	New belt 175 f 5 lbf
	Used belt 115 + 20 lbf
w/o A/C	New belt 150 ±25 lbf
	Used belt 130 + 25 lbf

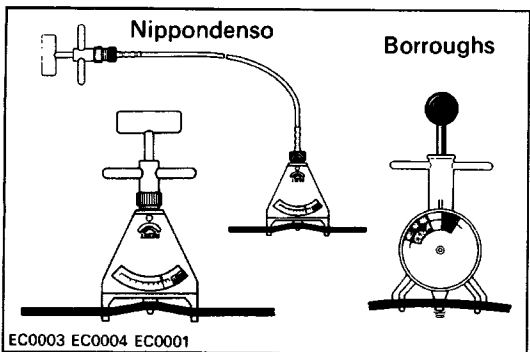
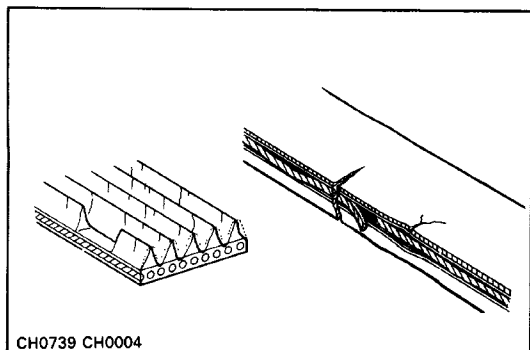
Alternator (5S-FE)

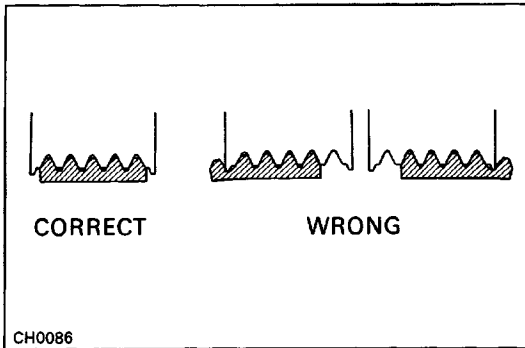
w/ A/C	New belt 175 ±5 lbf
	Used belt 130 ±10 lbf
w/o A/C	New belt 125 + 25 lbf
	Used belt 95 + 20 lbf

PS pump

New belt 125 + 25 lbf
Used belt 80 ±20 lbf

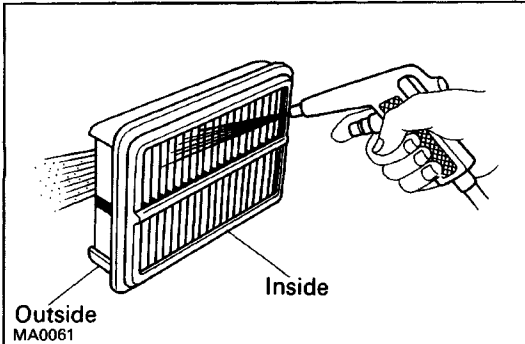
If necessary, adjust the drive belt tension.





HINT:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.



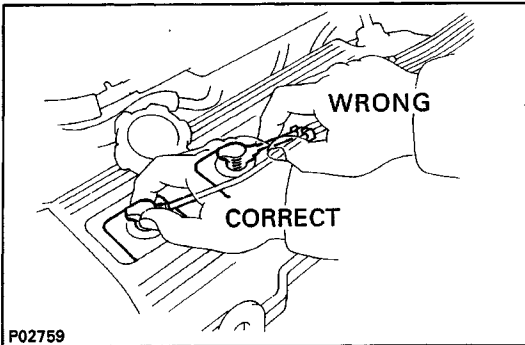
3. INSPECT AIR FILTER

- (a) Visually check that the element is not excessively damaged or oily.
If necessary, replace the element.
- (b) Clean the element with compressed air.
First blow from the inside thoroughly, then blow off the outside of the element.

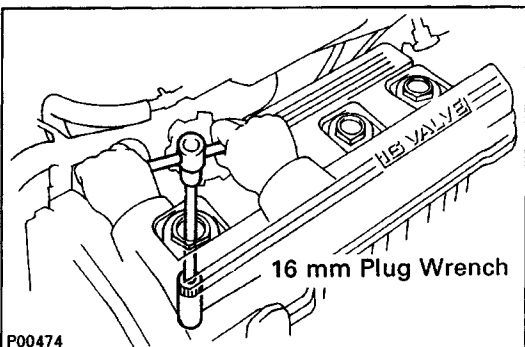
4. REPLACE AIR FILTER

Replace the element with a new one.

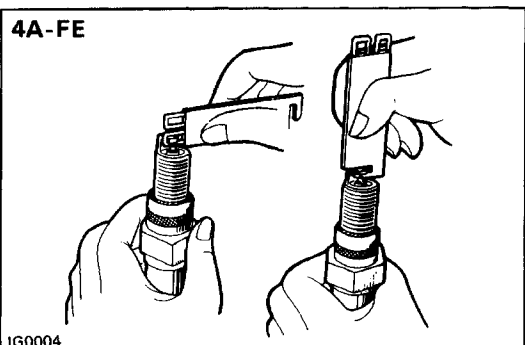
5. REPLACE SPARK PLUGS



- (a) (3S-GTE)
Remove the intercooler.
(See pages [TC-9](#) and 10)
- (b) Disconnect the spark plug cords at the rubber boot.
DO NOT pull on the cords.



- (c) Using a 16 mm plug wrench, remove the spark plugs.



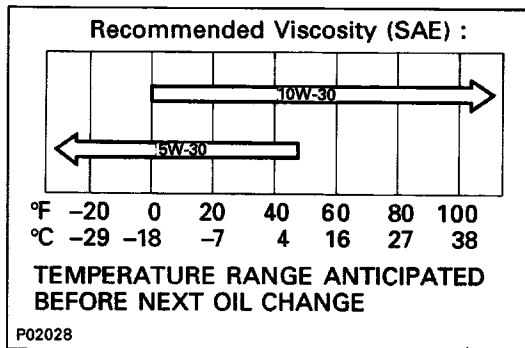
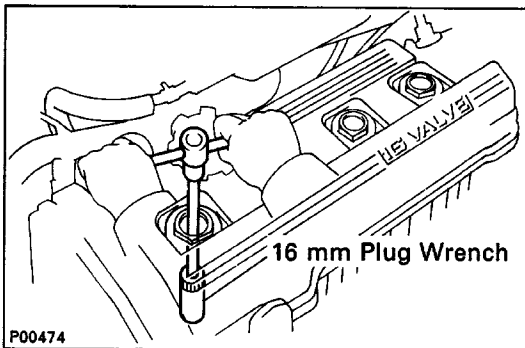
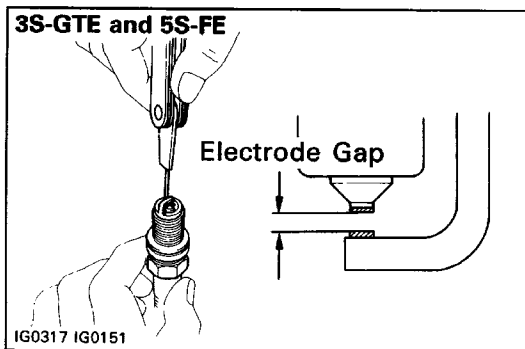
- (d) (4A-FE)

Adjust the electrode gap of new spark plugs.

Correct electrode gap: 0.8 mm (0.031 in.)

Recommended spark plugs: ND Q16R-U

NGK BCPRSEY



(e) (3S-GTE and 5S-FE)

Check the electrode gap of new spark plugs.

Correct electrode gap:

3S-GTE 0.8 mm (0.031 in.)

5S-FE 1.1 mm (0.043 in.)

Recommended spark plugs:

3S-GTE ND PK20R8

NGK BKR6EP8

5S-FE ND PK20R17

NGK BKR6EP-11

HINT: If adjusting the gap of a new plug, bend only the base of the ground electrode.

(f) Using a 16 mm plug wrench, reinstall the spark plugs.

Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

(g) Reconnect the spark plug cords.

(h) (3S-GTE)

Reinstall the intercooler. (See page [TC-17](#))

6. REPLACE ENGINE OIL AND OIL FILTER

(See page [LU-7](#))

Oil grade: API grade SG, multigrade and fuel-efficient oil

Recommended viscosity: Refer to illustration

Drain and refill capacity:

(4A-FE)

w/ Oil filter change

3.2 liters (3.3 US qts, 2.8 Imp. qts)

w/o Oil filter change

3.0 liters (3.1 US qts, 3.4 Imp. qts)

(3S-GTE)

w/ Oil filter change

3.9 liters (4.1 US qts, 3.4 Imp. qts)

w/o Oil filter change

3.6 liters (3.8 US qts, 3.2 Imp. qts)

(5S-FE w/ Oil cooler)

w/ Oil filter change

4.2 liters (4.4 US qts, 3.7 Imp. qts)

w/o Oil filter change

3.8 liters (4.0 US qts, 3.3 Imp. qts)

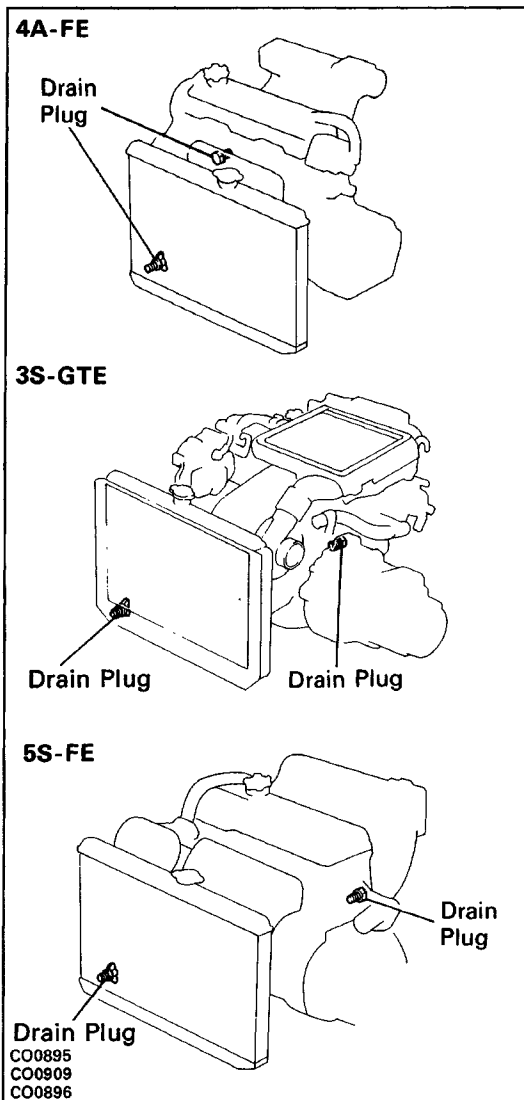
(5S-FE w/o Oil cooler)

w/ Oil filter change

4.1 liters (4.3 US qts, 3.6 Imp. qts)

w/o Oil filter change

3.7 liters (3.9 US qts, 3.3 Imp. qts)



7. REPLACE ENGINE COOLANT

(See page [CO-6](#))

HINT:

- Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturer's instructions.
- Using coolant which includes more than 50% ethylene-glycol (but not more than 70%) is recommended.

NOTICE:

- Do not use alcohol type coolant.
- The coolant should be mixed with demineralized water or distilled water

Coolant capacity (w/ Heater):

(4A-FE)

M/T 5.2 liters (5.5 US qts, 4.6 Imp. qts)

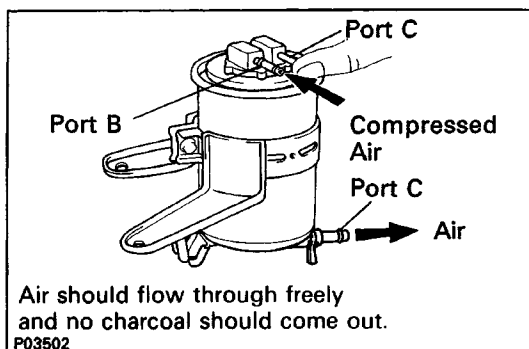
A/T 5.6 liters (5.9 US qts, 4.9 Imp. qts)

(3S-GTE) 6.5 liters (6.9 US qts, 5.7 Imp. qts)

(5S-FE)

M/T 6.2 liters (6.6 US qts, 5.5 Imp. qts)

A/T 6.1 liters (6.4 US qts, 5.4 Imp. qts)



8. INSPECT CHARCOAL CANISTER

- Disconnect the hoses from the charcoal canister. Label hoses for correct installation.
- Plug port C with your finger, and blow compressed air (294 kPa (3 kgf/cm², 43 psi)) through port B (fuel tank side).

- Check that the air comes out of the bottom of port A without resistance.

- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTICE: Do not attempt to wash the charcoal.

- Reconnect the hoses to the charcoal canister.

9. REPLACE GASKET IN FUEL TANK CAP

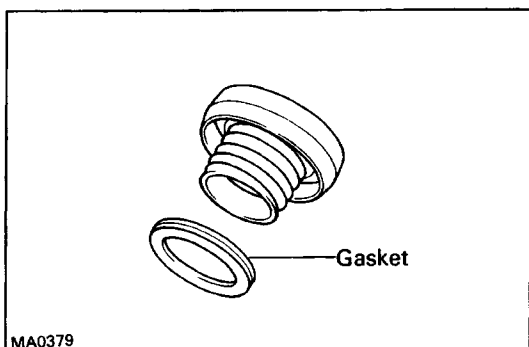
- Remove the old gasket from the tank cap.

NOTICE: Do not damage the tank cap.

- Install a new gasket by hand.

- Check the cap for damage or cracks.

- Reinstall the cap and check the torque limiter.



10. INSPECT FUEL LINES AND CONNECTIONS

Visually check the fuel lines for cracks, leakage, loose connections, deformation or tank band looseness.

11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually check the pipes, hangers and connections for severe corrosion, leaks or damage.

12. ADJUST VALVE CLEARANCE

4A-FE (See page EM-13)

3S-GTE (See page EM-17)

5S-FE (See page EM-22)

Valve clearance (Cold):

4A-FE Intake 0.15 – 0.25 mm

(0.006 – 0.010 in.)

Exhaust 0.20 – 0.30 mm

(0.008 – 0.012 in.)

3S-GTE Intake 0.15 – 0.25 mm

(0.006 – 0.010 in.)

Exhaust 0.28 – 0.38 mm

(0.011 – 0.015 in.)

5S-FE Intake 0.19 – 0.29 mm

(0.007 – 0.011 in.)

Exhaust 0.28 – 0.38 mm

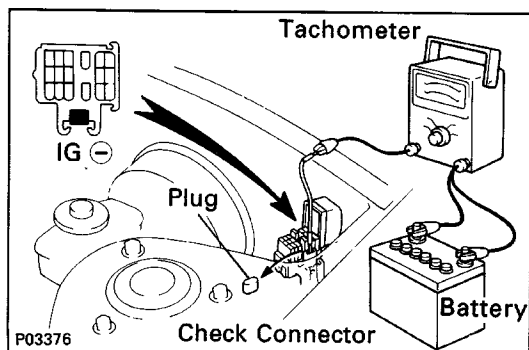
(0.011 – 0.015 in.)

Hot Engine Operations**13. (4A-FE)****ADJUST IDLE SPEED****(a) Preparation**

- Engine at normal operating temperature
- Air cleaner installed
- All pipes and hoses of air induction system connected
- All vacuum lines connected

HINT: All vacuum hoses for EGR systems, etc. should be properly connected.

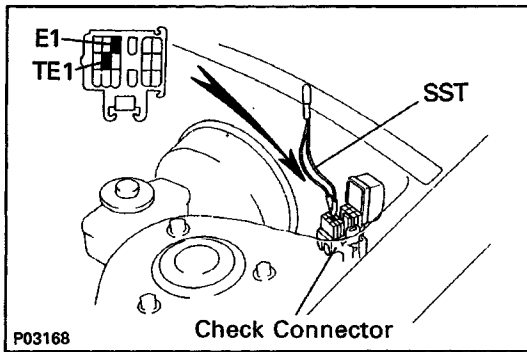
- EFI system wiring connector fully plugged
- All accessories switched OFF
- Transmission in neutral position

**(b) Connect a tachometer to the engine.**

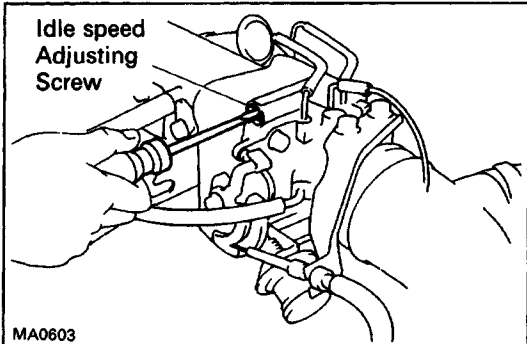
Connect the test probe of a tachometer to terminal IG (-) of the check connector.

NOTICE:

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



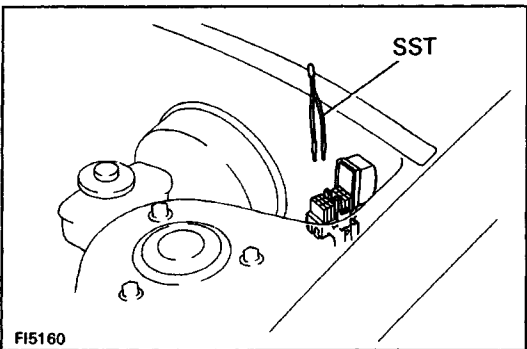
- (c) Race the engine at 2,500 rpm for approx. 2 minutes.
 (d) Using SST, connect terminals TE1 and E1 of the check connector.
 SST 09843-18020



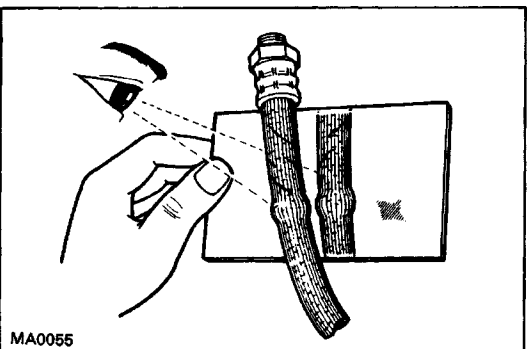
- (e) Adjust the idle speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle speed: 800 rpm (w/ Cooling fan OFF)

HINT: Make adjustments with the engine cooling fan OFF.



- (f) Remove the SST from the check connector.
 SST 09843-18020

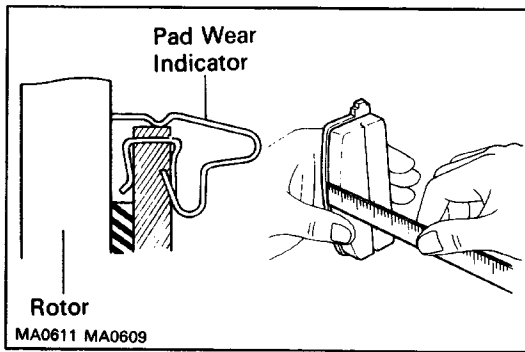


BRAKES

14. INSPECT BRAKE LINE PIPES AND HOSES

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

- (a) Check all brake lines and hoses for:
- Damage
 - Wear
 - Deformation
 - Cracks
 - Corrosion
 - Leaks
 - Bends
 - Twists
- (b) Check all clamps for tightness and connections for leakage.
- (c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.
- (d) Check that the lines installed in grommets pass through the center of the grommets.

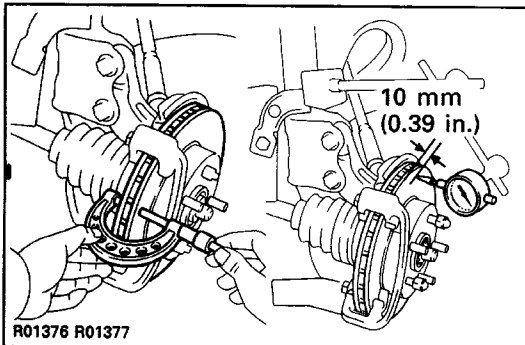


15. INSPECT BRAKE PADS AND DISCS

- (a) Check the thickness of the disc brake pads and check for irregular wear.

Minimum pad thickness: 1.0 mm (0.039 in.)

HINT: If a squealing or scraping noise comes from the brake during driving, check the pad wear indicator to see if it is contacting the disc rotor. If so, the disc pad should be replaced.



- (b) Check the disc for wear or runout.

Minimum disc thickness:

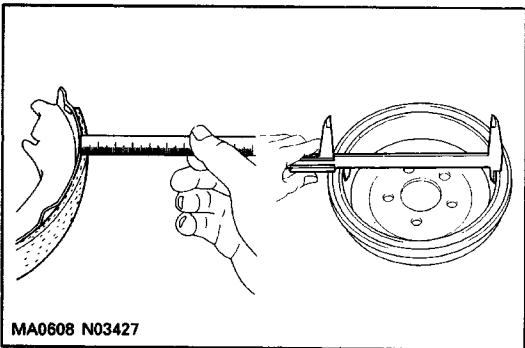
Front 23.0 mm (0.906 in.)

Rear 9.0 mm (0.354 in.)

Maximum disc runout:

Front 0.07 mm (0.0028 in.)

Rear 0.15 mm (0.0059 in.)



16. INSPECT BRAKE LININGS AND DRUMS

- (a) Check the lining-to-drum contact condition and lining wear.

Minimum lining thickness: 1.0 mm (0.039 in.)

- (b) Check the brake drums for scoring or wear.

Maximum drum inside diameter:

Drum brake 201.0 mm (7.913 in.)

Disc brake 171.0 mm (6.732 in.)

- (c) Clean the brake parts with a damp cloth.

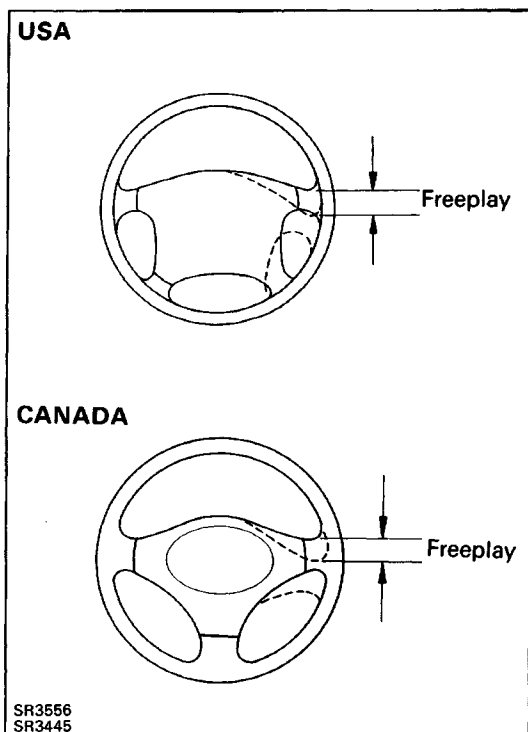
NOTICE: Do not use compressed air to clean the brake parts.

- (d) (Disc Brake)

Settle the parking brake shoes and drum. When performing the road test in item 27, do the following:

- Drive the vehicle at approx. 50 km/h (30 mph) on a safe, level and dry road.
- With the parking brake release lever pushed in, pull on the lever with 88 N (9 kgf, 20 lbf) of force.
- Drive the vehicle for approx. 400 m (1 /4 mile) in this position.
- Repeat this procedure 2 or 3 times.
- Check parking lever travel.

If necessary, adjust the parking brake.



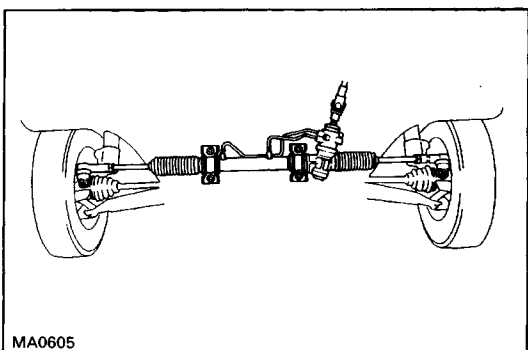
CHASSIS

17. INSPECT STEERING LINKAGE

(a) Check the steering wheel freeplay.

Maximum steering wheel freeplay: 30 mm (1.18 in.)

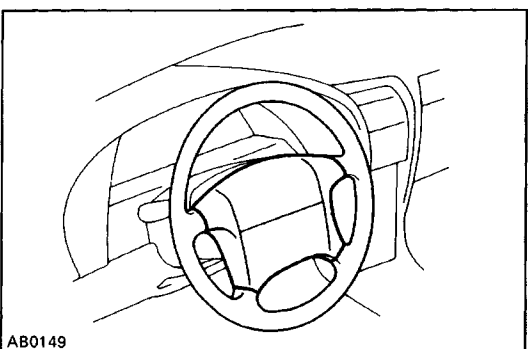
With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.



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

Check that:

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



18. INSPECT SRS AIRBAG

Visually check the steering wheel pad (airbag and inflator) .

- Use the diagnosis check to check if there are abnormalities.
- Check that there are no cuts, cracks or noticeable color changes on the surface of the steering wheel pad or in the center groove of the pad.
- Remove the steering wheel pad from the vehicle and check the wiring and steering wheel for damage and corrosion due to rusting, etc.

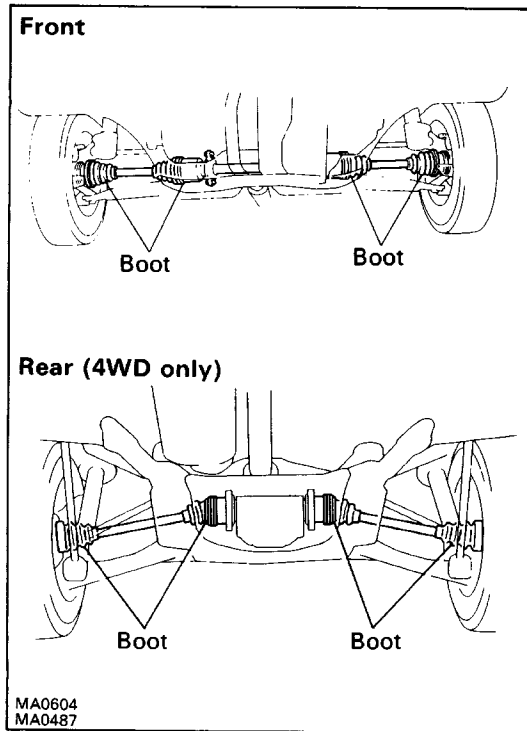
If necessary, replace the pad.

CAUTION:

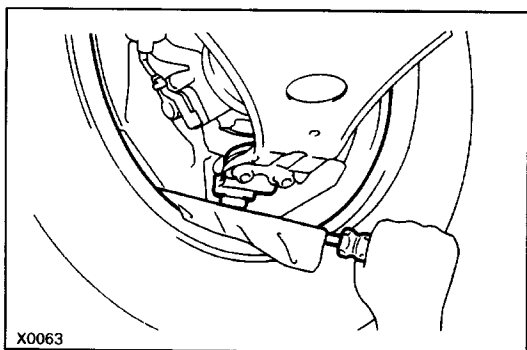
- **For removal and replacement of the steering wheel pad, see Steering Wheel Pad and Spiral Cable on AB section and be sure to perform the operation in the correct order.**
- **Before disposing of the steering wheel pad, the airbag must first be deployed by using SST (see Disposal of Steering Wheel Pad on AB section).**

19. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear box for oil leakage.

**20. INSPECT DRIVE SHAFT BOOTS**

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

**21. INSPECT BALL JOINTS AND DUST COVERS**

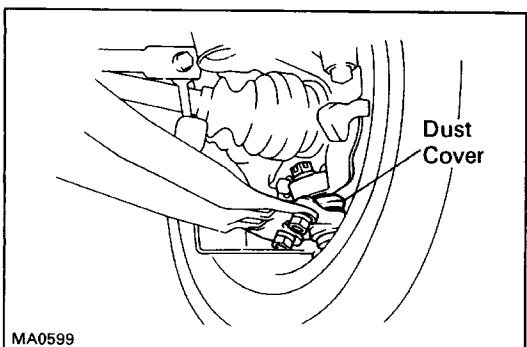
(a) Inspect the ball joints for excessive looseness.

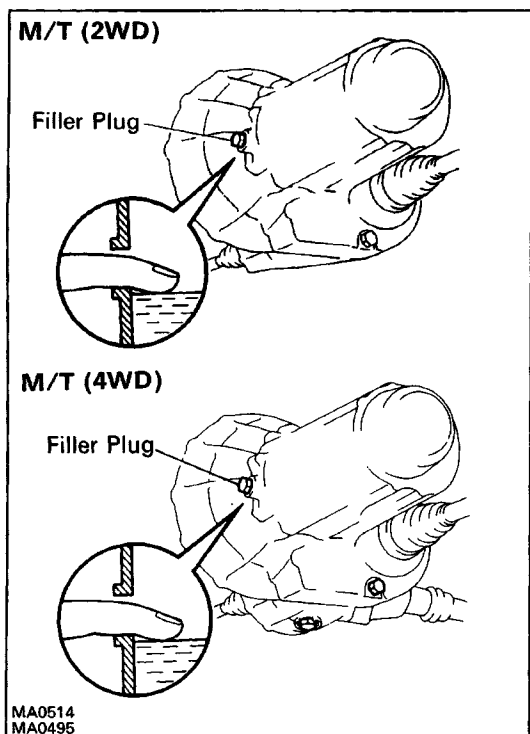
- Jack up the front of the vehicle and place wooden blocks with a height of 180 – 200 mm (7.09 – 7.87 in.) under the front tires.
- Lower the jack until there is about half a load on the front coil springs. Place stands under the vehicle for safety.
- Check that the front wheels are in a straight forward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

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

If there is play, replace the ball joint.

(b) Check the dust cover for damage.





22. CHECK TRANSAXLE FLUID

A. (M/T)

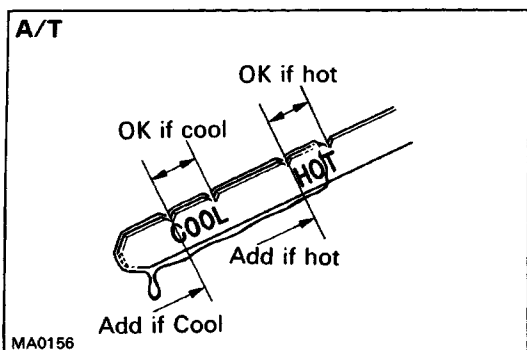
Check manual transaxle fluid

- (a) Remove the LH engine under cover.
- (b) Visually check the transaxle for fluid leakage.
If leakage is found, check for the cause and repair.
- (c) Remove the filler plug and feel inside the hole with your finger. Check that the fluid comes to within 5 mm (0.20 in.) of the bottom edge of the filler hole.
If the level is low, add oil fluid until it begins to run out of the filler hole.

Transaxle fluid: 2WD See item 23 (A)

4WD See item 23 (B)

- (d) Reinstall the filler plug securely.
- (e) Reinstall the LH engine under cover.



B. (A/T)

Check automatic transaxle fluid

- (a) Remove the LH engine under cover.
- (b) Visually check the transaxle for fluid leakage.
If leakage is found, check for the cause and repair.
- (c) Check the fluid level.
If the level is low, add fluid.

Transmission fluid: See item 23 (C)

- (d) Reinstall the LH engine under cover.

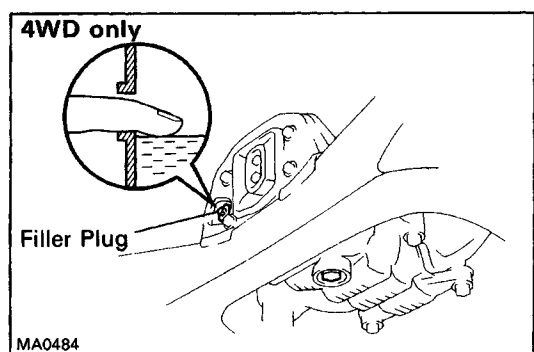
C. (4WD only)

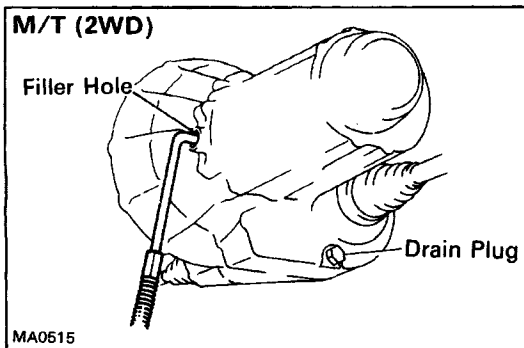
Check rear differential oil

- (a) Visually check the differential for oil leakage.
If leakage is found, check for the cause and repair.
- (b) Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the filler hole.
If the level is low, add oil until it begins to run out of the filler hole.

Transaxle oil: See item 23 (D)

- (c) Reinstall the filler plug securely.





23. REPLACE TRANSAXLE FLUID

A. (M/T (2WD))

Replace transaxle fluid

- Remove the LH engine under cover.
- Remove the filler and drain plugs, and drain the fluid.
- Reinstall the drain plug securely.
- Add new fluid until it begins to run out of the filler hole.

Recommended transaxle oil:

Oil grade API GL-3

Viscosity SAE 75W-90

Capacity: 2.6 liters (2.7 US qts, 2.3 Imp. qts)

In case the above oil grade is unavailable, use type A or B.

Type A:

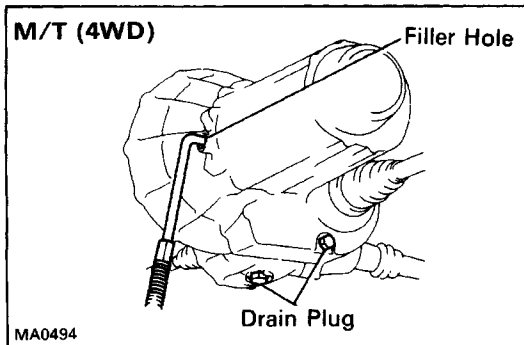
Oil grade API GL-4

Viscosity SAE 75W-90

Type B:

Oil grade API GL-5

Viscosity SAE 75W-90



- Reinstall the filler plug securely.
- Reinstall the LH engine under cover.

B. (M/T (4WD))

Replace transaxle oil (Incl. transfer oil)

- Remove the LH engine under cover.
- Remove the filler and drain plugs, and drain the oil.
- Reinstall the drain plugs securely.
- Add new oil until it begins to run out of the filler hole.

Transaxle oil: Transaxle oil E50 (08885-80206) or equivalent

Recommended transaxle oil:

Oil grade API GL-5

Viscosity SAE 75W-90 or 80W-90

Above -18°C (0°F) SAE 90

Below -18°C (0°F) SAE 80W

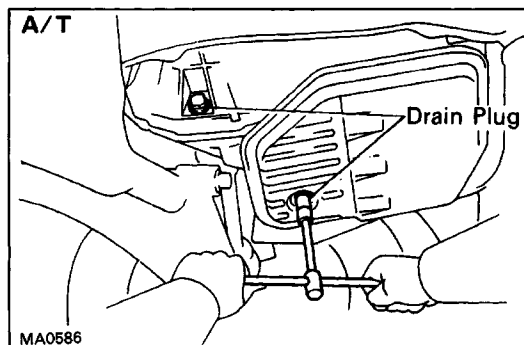
Capacity: 5.2 liters (5.5 US qts, 4.6 Imp. qts)

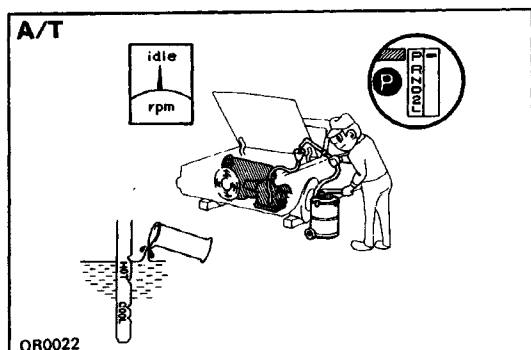
- Reinstall the filler plug securely.
- Reinstall the LH engine under cover.

C. (A/T)

Replace transaxle fluid

- Remove the LH engine under cover.
- Remove the drain plugs, and drain the fluid.
- Reinstall the drain plugs securely.





(d) With the engine OFF, add new fluid through the dipstick tube.

Transaxle fluid: ATF DEXRON[®] II

Drain and refill capacity:

3.3 liters (3.5 US qts, 2.9 Imp. qts)

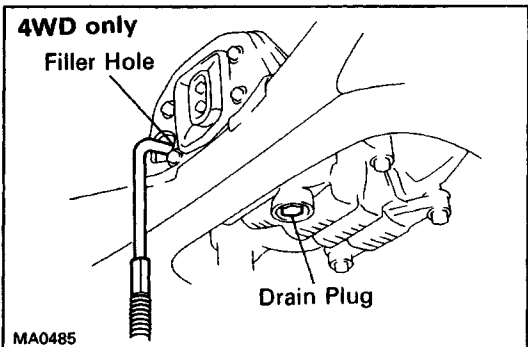
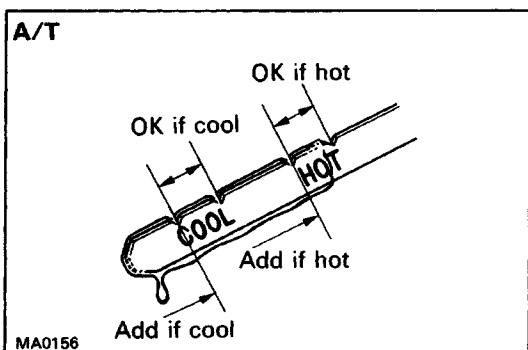
(e) Start the engine and shift the selector into all positions from "P" through "L", and then shift into "P".

(f) With the engine idling, check the fluid level. Add fluid up to the "COOL" level on the dipstick.

NOTICE: Do not overfill.

(g) Recheck the fluid level with the normal temperature (70 – 80°C (158 – 176°F)) and add as necessary.

(h) Reinstall the LH engine under cover.



D. (4WD only)

Replace rear differential oil

- Remove the filler and drain plugs, and drain the oil.
- Reinstall the drain plugs securely.
- Add new oil until it begins to run out of the filler hole.

Rear differential oil:

Oil grade API GL-5 hypo[®]d gear oil

Viscosity Above -18°C (0°F) SAE 90

Below -18°C (0°F) SAE 80W-90 or 80W

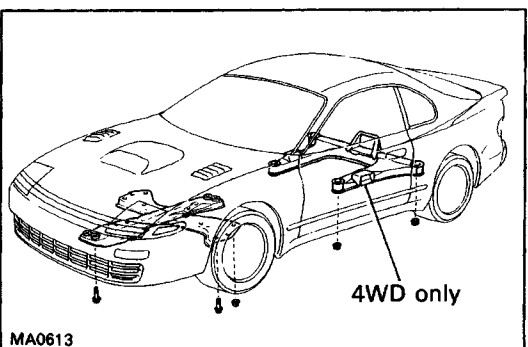
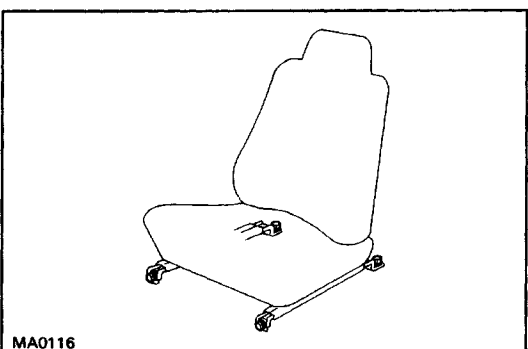
Capacity: 1.1 liters (1.2 US qts, 1.0 Imp. qts)

(d) Reinstall the filler plug securely.

24. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Front seat mounting bolts
Torque: 37 N-m (375 kgf-cm, 27 ft-lbf)
- Engine mounting center member-to-body mounting bolts
Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)
- Front suspension lower crossmember-to-body mounting bolts
Torque: 152 N-m (1,550 kgf-cm, 112 ft-lbf)
- (4WD only)
Rear suspension lower crossmember-to-body mounting bolts
Torque: 159 N-m (9,620 kgf-cm, 117 ft-lbf)



25. BODY INSPECTION

- (a) Check the body exterior for dents, scratches and rust.
- (b) Check the underbody for rust and damage.

26. ROAD TEST

- (a) Check the engine and chassis for abnormal noises.
- (b) Check that the vehicle does not wander or pull to one side.
- (c) Check that the brakes work properly and do not drag.
- (d) Perform setting down of the parking brake shoes and drum. (See page [MA-1 0](#))

27. FINAL INSPECTION

- (a) Check the operation of the body parts:
 - Hood
 - Auxiliary catch operates properly
 - Hood locks securely when closed
 - Front and rear doors
 - Door locks operate properly
 - Doors close properly
 - Luggage compartment door and back door
 - Door lock operates properly
 - Seats
 - Seat adjusts easily and locks securely in any position
 - Front seat back locks securely in any position
 - Folding-down rear seat backs lock securely
- (b) Be sure to deliver a clean car. Especially check:
 - Steering wheel
 - Shift lever knob
 - All switch knobs
 - Door handles
 - Seats

GENERAL MAINTENANCE

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

OUTSIDE VEHICLE

1. TIRES

- (a) Check the pressure with a gauge. Adjust if necessary.
- (b) Check for cuts, damage of excessive wear.

2. WHEEL NUTS

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

3. TIRE ROTATION

It is recommended that tires be rotated every 7,500 miles (12,000 km).

4. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean. Replace if necessary.

5. FLUID LEAKS

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

6. DOORS AND ENGINE HOOD

- (a) Check that all doors including the trunk lid and back door operate smoothly, and that all latches lock securely.
- (b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. LIGHTS

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

8. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

9. HORN

Check that it is working.

10. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

11. WINDSHIELD WIPER AND WASHER

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

12. WINDSHIELD DEFROSTER

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

13. REAR VIEW MIRROR

Check that it is mounted securely.

14. SUN VISORS

Check that they move freely and are mounted securely.

15. STEERING WHEEL

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

16. SEATS

- (a) Check that all front seat controls such as seat adjuster, seatback recliner, etc. operate smoothly.
- (b) Check that all latches lock securely in any position.
- (c) Check that the locks hold securely in any latched position.
- (d) Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position.
- (e) For folding-down rear backs, check that the latches lock securely.

17. SEAT BELTS

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

18. ACCELERATOR PEDAL

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

19. CLUTCH PEDAL (See Check and Adjustment of Clutch Pedal in CL section)

Check the pedal for smooth operation.

Check that the pedal has the proper freeplay.

20. BRAKE PEDAL (See Checks and Adjustments in BR section)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper reserve distance and freeplay.

(c) Check the brake booster function.

21. BRAKES

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

22. PARKING BRAKE (See Check and Adjustment of Parking Brake in BR section)

(a) Check that the lever has the proper travel.

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

23. AUTOMATIC TRANSMISSION "PARK" MECHANISM

(a) Check the lock release button of the selector lever for proper and smooth operation.

(b) On a safe incline, check that the vehicle is held securely with the selector lever in the "P" position and all brakes released.

UNDER HOOD**24. WINDSHIELD WASHER FLUID**

Check that there is sufficient fluid in the tank.

25. ENGINE COOLANT LEVEL

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

26. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.

(b) Check the hoses for cracks, kinks, rot or loose connections.

27. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If level is low, add distilled water only.

28. BRAKE AND CLUTCH FLUID LEVELS

(a) Check that the brake fluid level is near the upper level line on the see-through reservoir.

(b) Check that the clutch fluid level is within ± 5 mm (0.20 in.) of the reservoir hem.

29. ENGINE DRIVE BELTS

Check all drive belts for fraying, cranks, wear or oiliness.

30. ENGINE OIL LEVEL

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

31. POWER STEERING FLUID LEVEL

Check the level on the dipstick.

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

32. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.

(b) With the engine idling and the parking brake applied, shift the selector into all positions from "P" to "L", and then shift into "P".

(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re-insert the dipstick and check that the fluid level is in the HOT range.

(d) Perform this check with the fluid at normal driving temperature (70 – 80°C (158 – 176°F)).

HINT: Wait about 30 minutes before checking the fluid level after extended driving at high speeds in hot weather, driving in heavy traffic or with a trailer.

33. EXHAUST SYSTEM

Visually inspect for cracks, holes or loose supports.

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

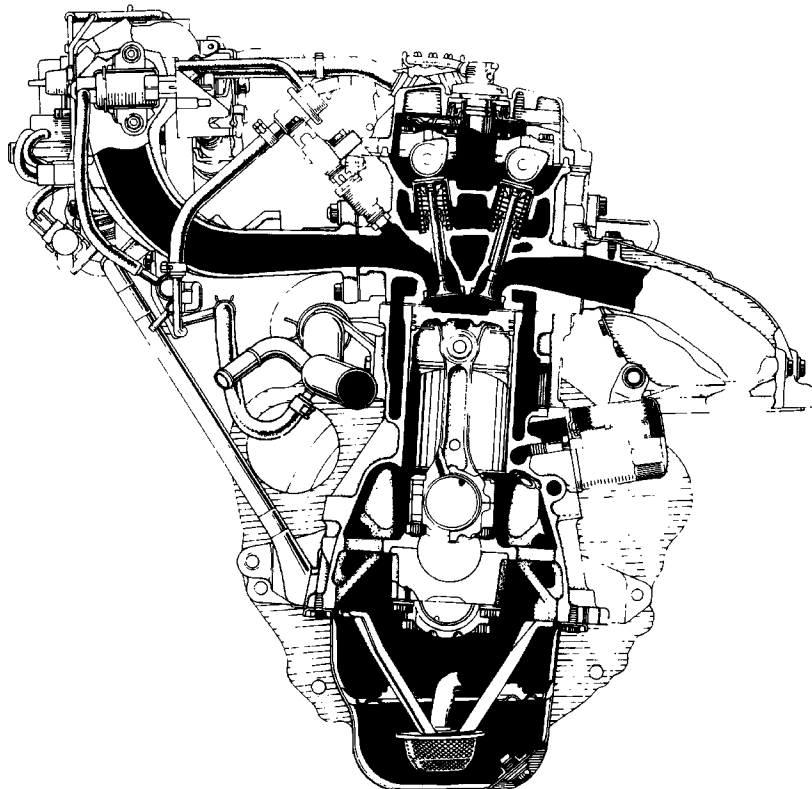
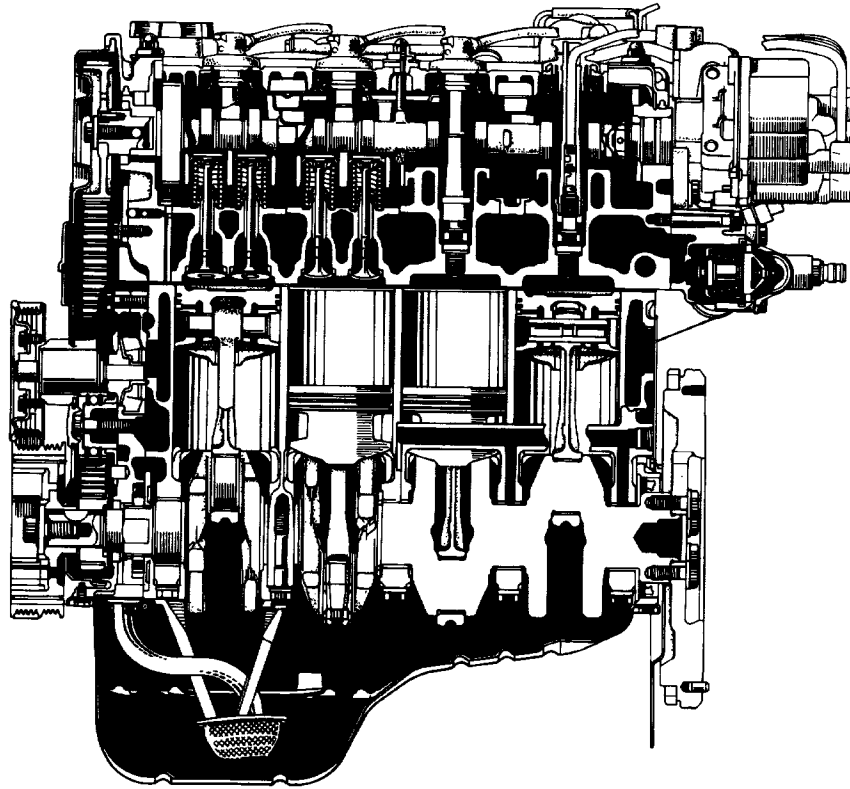
ENGINE MECHANICAL

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CYLINDER BLOCK (3S-GTE)	EM-223
CYLINDER BLOCK (5S-FE)	EM-268

EM

DESCRIPTION (4A-FE)

The 4A-FE engine is an in-line, 4-cylinder, 1.6 liter DOHC 16-valve engine.



The 4A-FE engine is an in-line, 4-cylinder engine with the cylinders numbered 1 – 2 – 3 – 4 from the front. The crankshaft is supported by 5 bearings inside the crankcase. These bearings are made of aluminum alloy.

The crankshaft is integrated with 8 weights for balance. Oil holes are placed in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.

The ignition order is 1 – 3 – 4 – 2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent-roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

The intake manifold has 4 independent long ports and utilizes the inertial supercharging effect to improve engine torque at low and medium speeds.

Exhaust and intake valves are equipped with irregular pitch springs made of special valve spring carbon steel which are capable of functioning no matter what the engine speed.

The exhaust camshaft is driven by a timing belt, and a gear on the exhaust camshaft engages with a gear on the intake camshaft to drive it. The cam journal is supported at 5 places between the valve lifters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journals and gears is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of an outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.

The resin timing belt cover is made of 3 pieces. A service hole is provided in the No. 1 belt cover for adjusting the timing belt tension.

Pistons are made of high temperature-resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.

Piston pins are the semi-floating type, with the pins fastened to the connecting rods by pressure fittings, allowing the pistons and pins to float.

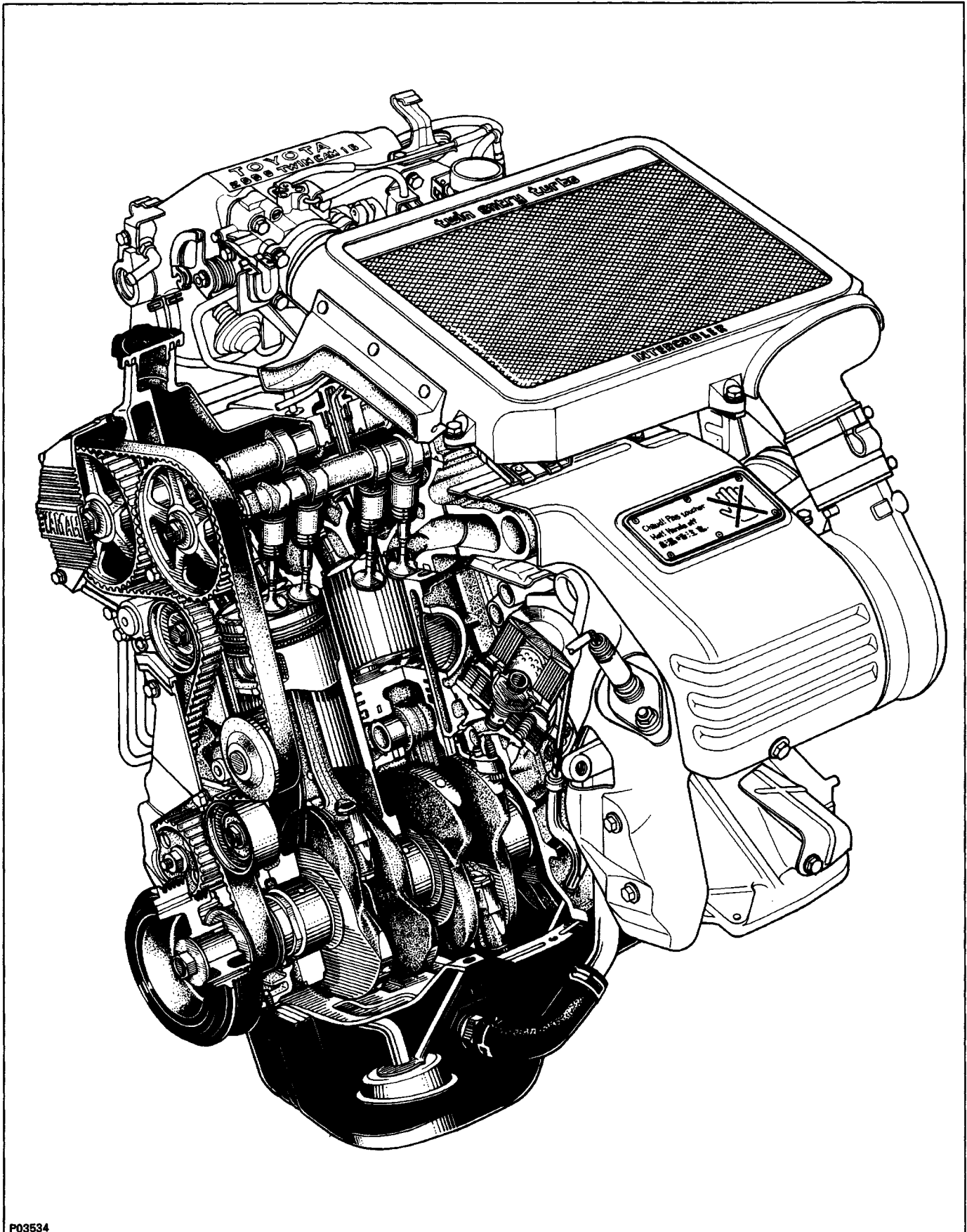
The No. 1 compression ring is made of stainless steel and the No. 2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No. 1 and No. 2 work to prevent gas leakage from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chambers.

The cylinder block is made of cast iron. It has 4 cylinders which are approximately twice the length of the piston stroke. The top of each cylinder is closed off by the cylinder head and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is stopped suddenly and the oil shifts away from the oil pump suction pipe.

DESCRIPTION (3S-GTE)

The 3S-GTE engine is an in-line, 4-cylinder, 2.0 liter DOHC 16-valve engine.



The 3S-GTE engine is an in-line, 4-cylinder engine with the cylinders numbered 1 – 2 – 3 – 4 from the front. The crankshaft is supported by 5 bearings inside the crankcase. These bearings are made of aluminum alloy.

The crankshaft is integrated with 8 weights for balance. Oil holes are placed in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.

The ignition order is 1 – 3 – 4 – 2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent-roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

The intake manifold has 8 independent long ports and utilizes the inertial supercharging effect to improve engine torque at low and medium speeds.

Both the intake camshaft and the exhaust camshaft are driven by a single timing belt. The cam journal is supported at 5 places between the valve lifters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journals and cams is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of an outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.

Pistons are made of high temperature-resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.

Piston pins are the full-floating type, with the pins fastened to neither the piston boss nor the connecting rods. Instead, snap rings are fitted on both ends of the pins, preventing the pins from falling out.

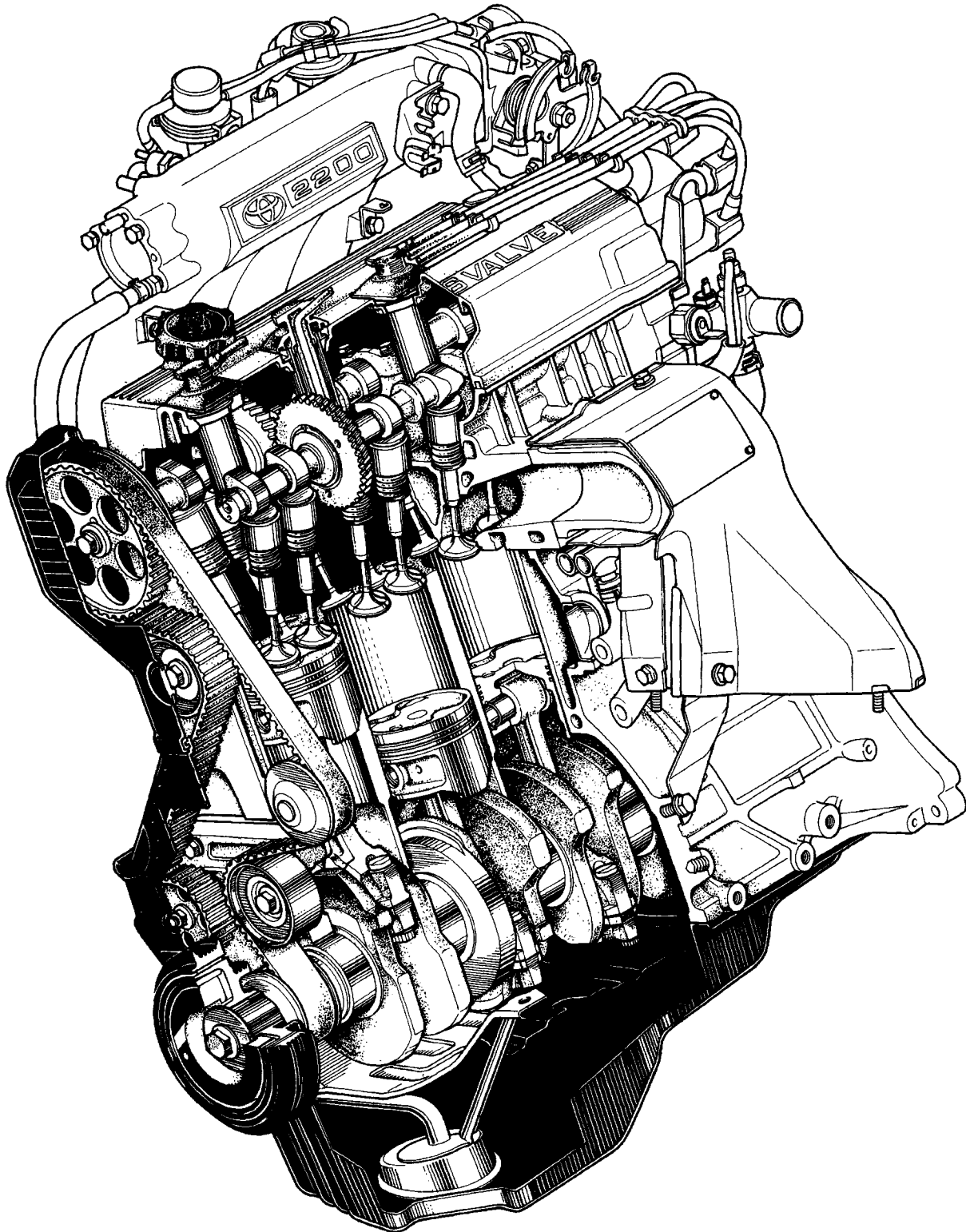
The No.1 compression ring is made of steel and the No.2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No.1 and No.2 work to prevent gas leakage from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chambers.

The cylinder block is made of cast iron. It has 4 cylinders which are approximately twice the length of the piston stroke. The top of each cylinder is closed off: by the cylinder head and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. This dividing plate also prevents the oil from making waves when the vehicle is stopped suddenly and the oil shifts away from the oil pump suction pipe.

DESCRIPTION (5S-FE)

The 5S-FE engine is an in-line, 4-cylinder, 2.2 liter DOHC 16-valve engine.



The 5S-FE engine is an in-line, 4-cylinder engine with the cylinders numbered 1 – 2 – 3 – 4 from the front. The crankshaft is supported by 5 bearings inside the crankcase. These bearings are made of aluminum alloy.

The crankshaft is integrated with 8 weights for balance. Oil holes are placed in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.

The ignition order is "1 – 3 – 4 – 2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent-roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

The intake manifold has 4 independent long ports and utilizes the inertial supercharging effect to improve engine torque at low and medium speeds.

Exhaust and intake valves are equipped with irregular pitch springs made of special valve spring carbon steel which are capable of functioning no matter what the engine speed.

The intake camshaft is driven by a timing belt, and a gear on the intake camshaft engages with a gear on the exhaust camshaft to drive it. The cam journal is supported at 5 places between the valve lifters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journals and gears is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of an outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.

Pistons are made of high temperature-resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.

Piston pins are the full-floating type, with the pins fastened to neither the piston boss nor the connecting rods. Instead, snap rings are fitted on both ends of the pins, preventing the pins from falling out.

The No.1 compression ring is made of steel and the No.2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No.1 and No.2 work to prevent gas leakage from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chambers.

The cylinder block is made of cast iron. It has 4 cylinders which are approximately twice the length of the piston stroke. The top of each cylinder is closed off by the cylinder head and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to, cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. This dividing plate also prevents the oil from making waves when the vehicle is stopped suddenly and the oil shifts away from the oil pump suction pipe.

TROUBLESHOOTING ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty Incorrect ignition timing	Troubleshoot cooling system Reset timing	CO-5 IG-25, 29, 37

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ hard to start (cranks OK)	No fuel supply to injector: <ul style="list-style-type: none"> • No fuel in tank • Fuel pump not working • Fuel filter clogged • Fuel line clogged or leaking EFI system problems Ignition problems: <ul style="list-style-type: none"> • Ignition coil • Igniter • Distributor Spark plug faulty High-tension cords disconnected or broken Vacuum leaks: <ul style="list-style-type: none"> • PCV line • EGR line • Intake manifold • T-VIS valve (3S-GTE) • Throttle body • ISC valve (3S-GTE and 5S-FE) • Brake booster line Air suction between air flow meter and throttle body (3S-GTE) Low compression	Troubleshoot EFI system Repair as necessary Perform spark test Inspect plugs Inspect cords Repair as necessary Repair as necessary Check compression	FI-13 IG-6,10,15 IG-7, 11, 16 IG-7, 11, 16 EM-31

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plug faulty High-tension cord faulty Ignition problems: <ul style="list-style-type: none"> • Ignition coil • Igniter • Distributor Incorrect ignition timing Vacuum leaks: <ul style="list-style-type: none"> • PCV line • EGR line • Intake manifold 	Inspect plugs Inspect cords Inspect coil Inspect igniter Inspect distributor Reset timing Repair as necessary	IG-7, 11, 16 IG-7,11,16 IG-8, 13, 17 IG-9, 14, 19 IG-9, 13, 18 IG-25, 29, 37

ROUGH IDLING (Cont'd)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (Cont'd)	Vacuum leaks (cont'd): <ul style="list-style-type: none"> • T-VIS valve (3S-GTE) • Throttle body • ISC valve (5S-FE and 3S-GTE) • Brake booster line Air suction between air flow meter and throttle body (3S-GTE) Incorrect idle speed Incorrect valve clearance EFI system problems Engine overheats Low compression	Check ISC system (3S-GTE and 5S-FE) Adjust idle speed (4A-FE) Adjust valve clearance Repair as necessary Check cooling system Check compression	FI-208, 211 MA-8 EM-13,17,22 CO-5 EM-31

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/poor acceleration	Spark plug faulty High-tension cord faulty Vacuum leaks: <ul style="list-style-type: none"> • PCV line • EGR line • Intake manifold • T-VIS valve (3S-GTE) • Throttle body • ISC valve (3S-GTE and 5S-FE) • Brake booster line Air suction between air flow meter and throttle body (3S-GTE) Incorrect ignition timing Incorrect valve clearance Fuel system clogged Air cleaner clogged EFI system problems Emission control system problems: (cold engine) <ul style="list-style-type: none"> • EGR system always on Engine overheats Low compression	Inspect plugs Inspect cords Repair as necessary Repair as necessary Reset timing Adjust valve clearance Check fuel system Check air cleaner Repair as necessary Check EGR system Check cooling system Check compression	IG-7, 11, 16 IG-7, 11, 16 IG-25, 29, 37 EM-13,17,22 MA-5 EC-9, 22, 38 CO-5 EM-31

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine diesels (runs after ignition switch is turned off)	EFI system problems Incorrect ignition timing EGR system faulty	Repair as necessary Reset timing Check EGR system	IG-25 , 29, 37 EC-9 , 22, 38

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	
Muffler explosion (after fire) all the time	Air cleaner clogged EFI system problems Incorrect ignition timing	Check air cleaner Repair as necessary Reset timing	MA-5 IG-25 , 29, 37
Engine backfires	EFI system problems Vacuum leaks: <ul style="list-style-type: none"> • PCV line • EGR line • Intake manifold • T-VIS valve (3S-GTE) • Throttle body • ISC valve (3S-GTE and 5S-FE) • Brake booster line Air suction between air flow meter and throttle body (3S-GTE) Insufficient fuel flow Incorrect ignition timing Incorrect valve clearance Carbon deposits in combustion chambers	Repair as necessary Check hoses and repair as necessary Repair as necessary Troubleshoot fuel system Reset timing Adjust valve clearance Inspect cylinder head	FI-13 IG-25 , 29, 37 EM-13 , 17, 22 EM-92 , 127, 161

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak PCV line clogged Piston ring worn or damaged	Repair as necessary Check PCV system Check rings	EM-204 , 244, 289
	Valve stem and guide bushing worn	Check valves and guide bushing	EM-94 , 129, 163
	Valve stem oil seal worn	Check seals	

EXCESSIVE FUEL CONSUMPTION

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak Air cleaner clogged Incorrect ignition timing ER system problems: <ul style="list-style-type: none"> • Injector faulty • Deceleration fuel cut system faulty Idle speed too high Spark plug faulty EG R system always on Low compression Tires improperly inflated Clutch slips Brakes drag	Repair as necessary Check air cleaner Reset timing Repair as necessary Check ISC system (3S-GTE and 5S-FE) Adjust idle speed (4A-FE) Inspect plugs Check EGR system Check compression Inflate tires to proper pressure Troubleshoot clutch Troubleshoot brakes	MA-5 IG-25, 29, 37 FI-208, 211 MA-8 IG-7, 11, 16 EC-9, 22, 38 EM-31

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed Incorrect ignition timing Vacuum leaks: <ul style="list-style-type: none"> • PCV line • EGR line • Intake manifold • T-VIS valve (3S-GTE) • Throttle body • ISC valve (3S-GTE and 5S-FE) • Brake booster line EFI system problems	Check ISC system (3S-GTE and 5S-FE) Adjust idle Speed (4A-FE) Reset timing Repair as necessary Repair as necessary	FI-208, 211 MA-8 IG-25, 29, 37

ENGINE TUNE-UP

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page [CO-5](#))

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page [LU-5](#))

INSPECTION OF BATTERY

(See steps 1 and 2 on page [CH-2](#))

Standard specific gravity:

1.25 – 1.27 when fully charged at 20°C (68°F)

INSPECTION OF AIR FILTER

(See step 3 on page [MA-5](#))

INSPECTION OF HIGH-TENSION CORDS

(See page [IG-7](#), 11 or 16)

Maximum resistance: 25 k Ω per cord

INSPECTION OF SPARK PLUGS (Conventional Type only (4A-FE))

(See page [IG-7](#))

Correct electrode gap: 0.8 mm (0.031 in.)

Recommended spark plugs: ND Q16R-U

NGK BCPRSEY

INSPECTION OF ALTERNATOR DRIVE BELT

(See step 3 on page [CH-3](#))

Drive belt tension:

4A-FE		New belt 160 \pm 20 lbf
		Used belt 130 \pm 20 lbf
3S-GTE	w/ A/C	New belt 165 \pm 10 lbf
		Used belt 84 \pm 15 lbf
	w/o	A/C New belt 150 \pm 25 lbf
		Used belt 130 \pm 25 lbf
5S-FE	w/ A/C	New belt 165 \pm 10 lbf
		Used belt 110 \pm 10 lbf
	w/o A/C	New belt 125 \pm 25 lbf
		Used belt 95 \pm 20 lbf

INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE (4A-FE)

HINT: Inspect and adjust the valve clearance when the engine is cold.

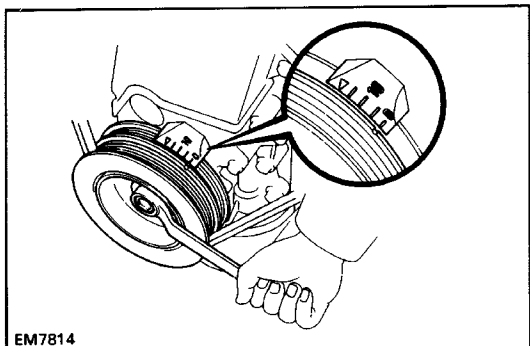
1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

2. REMOVE CYLINDER HEAD COVER

(See steps 18 and 24 on pages EM-85 and 87)

3. SET NO.1 CYLINDER TO TDC/COMPRESSION

- Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.
 - Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.
- If not, turn the crankshaft one revolution (360°) and align the mark as above.



EM7814

4. INSPECT VALVE CLEARANCE

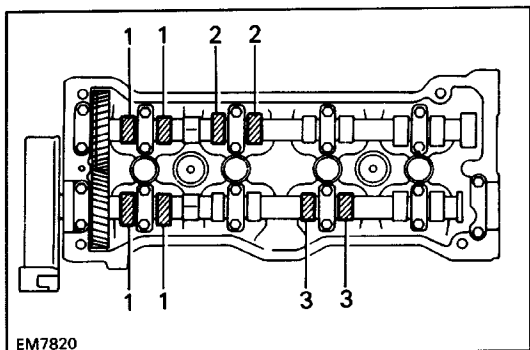
- Check only the valves indicated.
 - Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
 - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

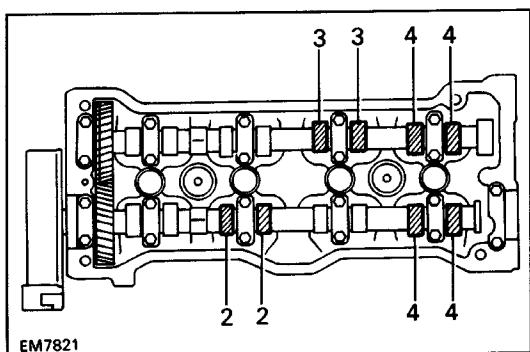
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust 0.20 – 0.30 mm (0.008 – 0.012 in.)

- Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure in step 3)
- Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



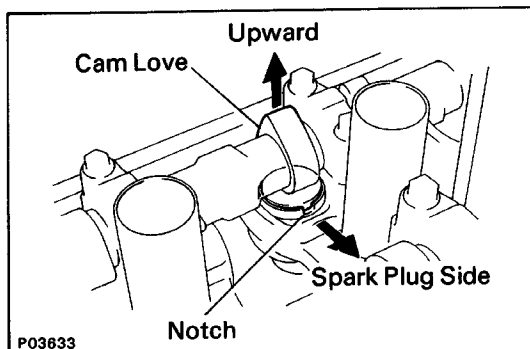
EM7820



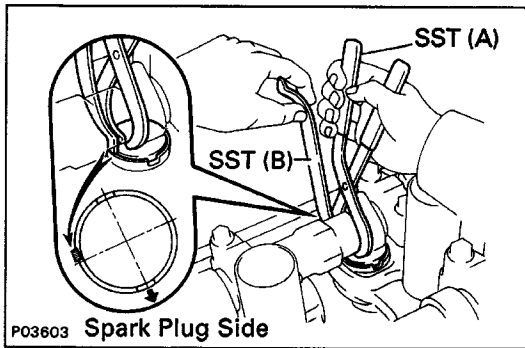
EM7821

5. ADJUST VALVE CLEARANCE

- Remove the adjusting shim.
 - Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
 - Position the notch of the valve lifter facing the spark plug side.



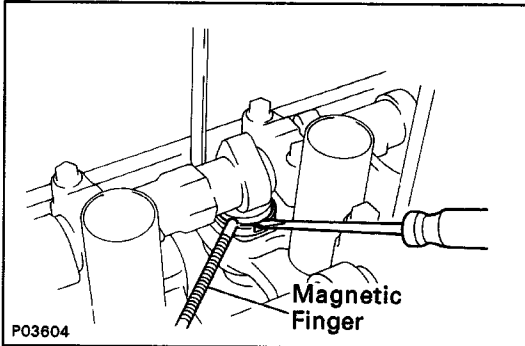
P03633



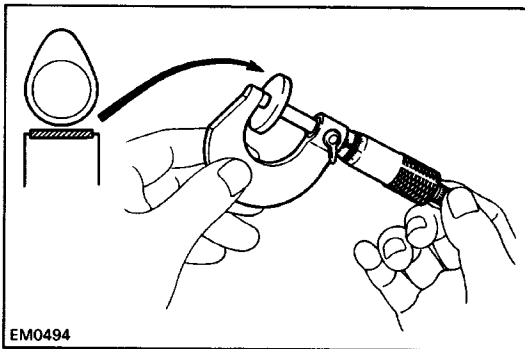
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

HINT: Apply SST (B) on the side marked with "7", at the position shown in the illustration.



- Remove the adjusting shim with small screwdriver and magnetic finger.



(b) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
 - Calculate the thickness of a new shim so that the valve clearance comes within specified value.
- T Thickness of used shim
 A Measured valve clearance
 N Thickness of new shim

Intake $N = T + (A - 0.20 \text{ mm (0.008 in.)})$

Exhaust $N = T + (A - 0.25 \text{ mm (0.010 in.)})$

- Select a new shim with a thickness as close as possible to the calculated value.

HINT: Shims are available in seventeen 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.

- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (B).

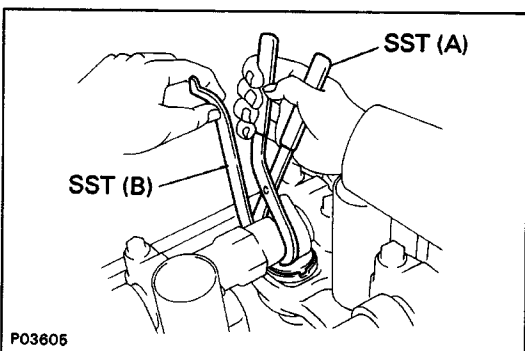
SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

(d) Recheck the valve clearance.

6. REINSTALL CYLINDER HEAD COVER

(See steps 11 and 17 on pages [EM-109](#) and 111)

7. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS



INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE (3S-GTE)

HINT: Inspect and adjust the valve clearance when the engine is cold.

1. REMOVE INTERCOOLER

(See steps 13 to 15 on pages TC-9 and 10)

2. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

3. REMOVE EGR VACUUM MODULATOR AND VSV

(See step 20 on page EM-121)

4. REMOVE EGR VALVE AND PIPE

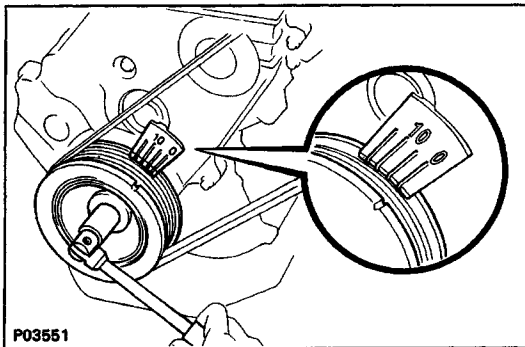
(See step 21 on page EM-121)

5. REMOVE THROTTLE BODY

(See steps 2, 3, 5 to 8, 10 and 11 on pages FI-194 and 195)

6. REMOVE CYLINDER HEAD COVER

(See step 33 on page EM-124)

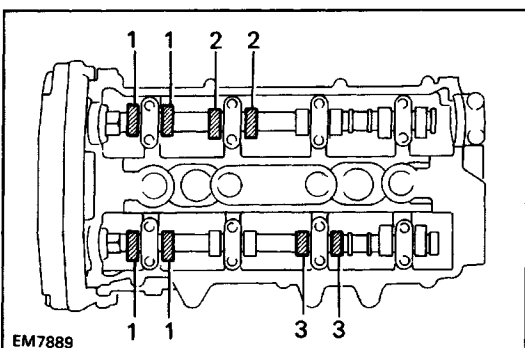


7. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.

(b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on No.4 are tight.

If not, turn the crankshaft one revolution (360°) and align the mark as above.



8. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
- Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)

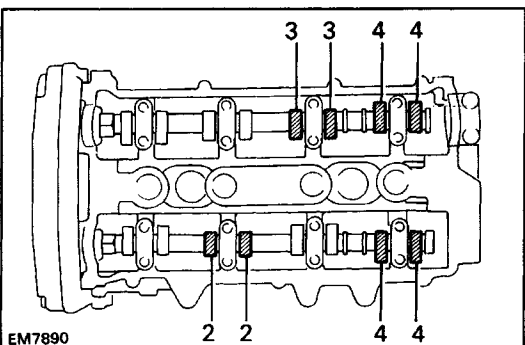
Exhaust 0.28 – 0.38 mm (0.071 – 0.015 in.)

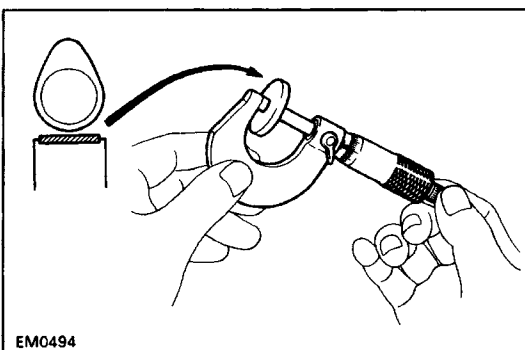
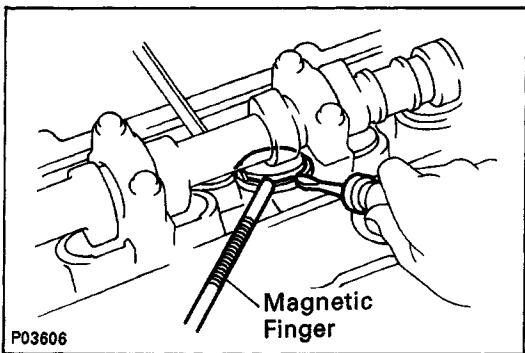
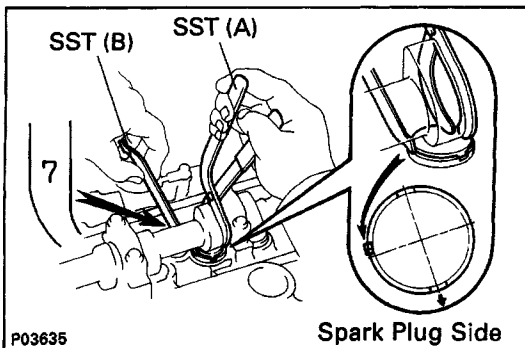
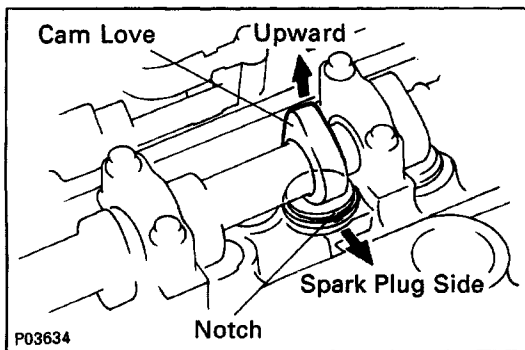
(b) Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure in step 7)

(c) Check only the valves indicated as shown.

Measure the valve clearance.

(See procedure in step (a))





9. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Position the notch of the valve lifter facing the spark plug side.

- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))
 HINT: Apply SST (B) at a slight angle on the side marked with "7", at the position shown in the illustration.

- Remove the adjusting shim with small screwdriver and magnetic finger.

(b) Determine the replacement adjusting shim size by following the Formula or Charts:

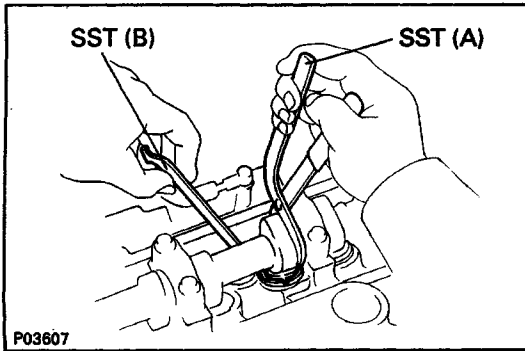
- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within the specified value.
 T Thickness of used shim
 A Measured valve clearance
 N Thickness of new shim

$$\text{Intake } N = T + (A - 0.20 \text{ mm (0.008 in.)})$$

$$\text{Exhaust } N = T + (A - 0.33 \text{ mm (0.013 in.)})$$

- Select a new shim with a thickness as close as possible to the calculated value.

HINT: Shims are available in seventeen 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.
- Place a new adjusting shim on the valve lifter.
 - Using SST (A), press down the valve lifter and remove SST (B).
SST 09248-55020 (09248-05011 (A), 09248-05021 (B))
- (d) Recheck the valve clearance.

10. REINSTALL CYLINDER HEAD COVER

(See step 7 on pages [EM-143](#) and 144)

11. REINSTALL THROTTLE BODY

(See steps 2, 3, 5 to 8, 10 and 11 on pages [FI-197](#) and 198)

12. REINSTALL EGR VALVE AND PIPE

(See step 19 on page [EM-145](#))

13. REINSTALL EGR VACUUM MODULATOR AND VSV

(See step 20 on page [EM-146](#))

14. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

15. REINSTALL INTERCOOLER

(See steps 11 to 13 on page [TC-17](#))

Adjusting Shim Selection Chart (Intake)

Main shim selection chart table with columns for installed shim thickness, measured clearance, and shim thickness in mm and inches. Includes a sub-table for Shim No. and Thickness.

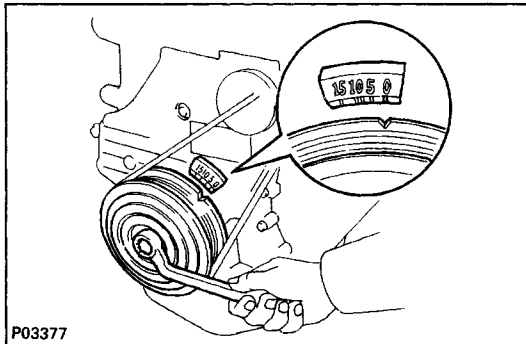
HINT: New shims have the thickness in millimeters imprinted on the face.

Intake valve clearance (Cold): 0.15 - 0.25 mm (0.006 - 0.010 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. 12 shim.

INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE (5S-FE)

HINT: Inspect and adjust the valve clearance when the engine is cold.

1. REMOVE ACCELERATOR BRACKET
2. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS
3. DISCONNECT ENGINE WIRE PROTECTOR BETWEEN CYLINDER HEAD COVER AND NO.3 TIMING BELT COVER
4. REMOVE CYLINDER HEAD COVER
(See step 33 on page EM-156)
5. SET NO.1 CYLINDER TO TDC/COMPRESSION



P0337

- (a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.
 - (b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.
- If not, turn the crankshaft one revolution (360°) and align the mark as above.

6. INSPECT VALVE CLEARANCE

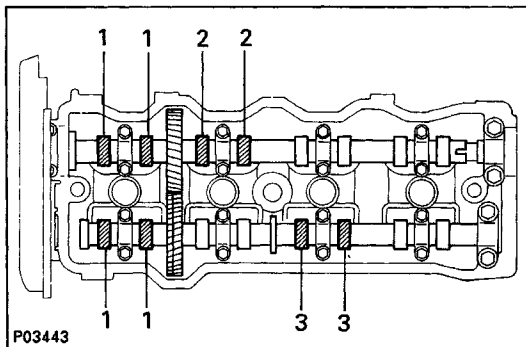
- (a) Check only the valves indicated.
 - Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
 - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

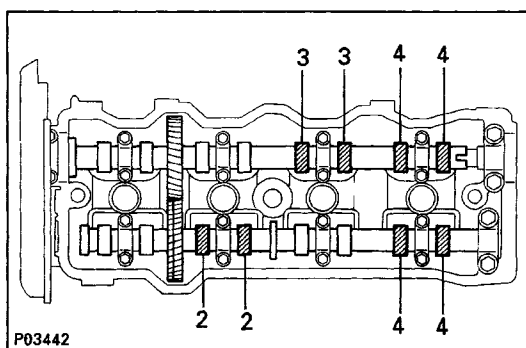
Intake 0.19 – 0.29 mm (0.007 – 0.011 in.)

Exhaust 0.28 – 0.38 mm (0.011 – 0.015 in.)

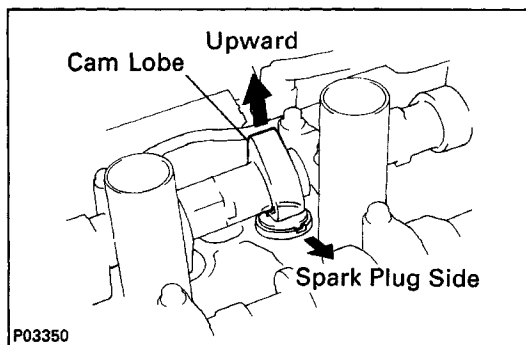
- (b) Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure in step 3)
- (c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



P03443



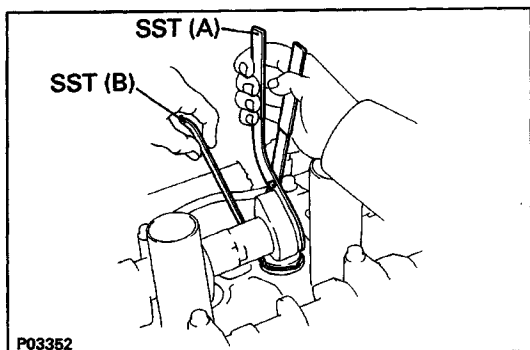
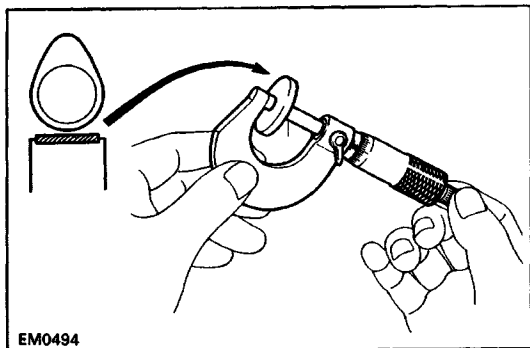
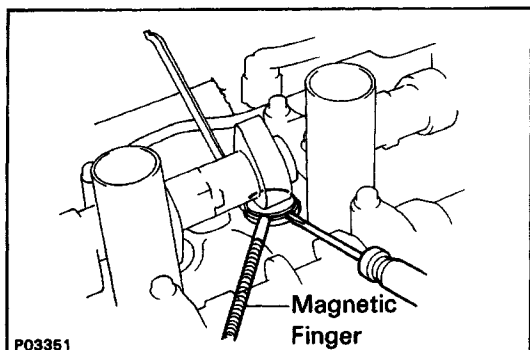
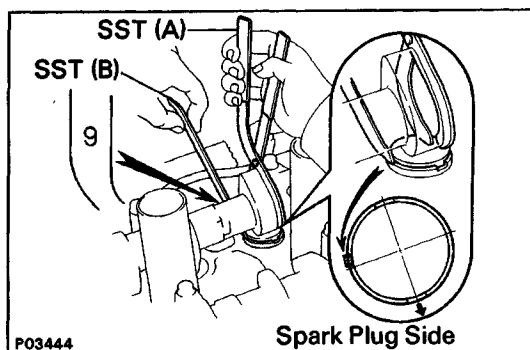
P03442



P03350

7. ADJUST VALVE CLEARANCE

- (a) Remove the adjusting shim.
 - Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward. Position the notch of the valve lifter facing the spark plug side.



- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

HINT: Apply SST (B) at a slight angle on the side marked with "9", at the position shown in the illustration.

- Remove the adjusting shim with small screwdriver and magnetic finger.

(b) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
 - Calculate the thickness of a new shim so that the valve clearance comes within specified value.
- T Thickness of used shim
 A Measured valve clearance
 N Thickness of new shim

Intake N = T + (A - 0.24 mm (0.009 in.))

Exhaust N = T + (A - 0.33 mm (0.013 in.))

- Select a new shim with a thickness as close as possible to the calculated value.

HINT: Shims are available in seventeen 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.

- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (13).

SST 09248-55020 (09248-05011 (A), 09248-05021 (B))

(d) Recheck the valve clearance.

8. REINSTALL CYLINDER HEAD COVER

(See step 8 on page EM-178)

9. INSTALL ENGINE WIRE PROTECTOR BETWEEN CYLINDER HEAD COVER AND NO.3 TIMING BELT COVER

10. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

11. INSTALL ACCELERATOR BRACKET

Installed shim thickness mm (in.)	Measured clearance mm (in.)																			
2.500 (0.0984)																				
2.520 (0.0992)																				
2.540 (0.1000)																				
2.550 (0.1004)																				
2.560 (0.1008)																				
2.580 (0.1016)																				
2.600 (0.1024)																				
2.620 (0.1031)																				
2.640 (0.1039)																				
2.650 (0.1043)																				
2.660 (0.1047)																				
2.670 (0.1051)																				
2.680 (0.1055)																				
2.690 (0.1059)																				
2.700 (0.1063)																				
2.710 (0.1067)																				
2.720 (0.1071)																				
2.730 (0.1075)																				
2.740 (0.1079)																				
2.750 (0.1083)																				
2.760 (0.1087)																				
2.770 (0.1091)																				
2.780 (0.1094)																				
2.790 (0.1098)																				
2.800 (0.1102)																				
2.810 (0.1106)																				
2.820 (0.1110)																				
2.830 (0.1114)																				
2.840 (0.1118)																				
2.850 (0.1122)																				
2.860 (0.1126)																				
2.870 (0.1130)																				
2.880 (0.1134)																				
2.890 (0.1138)																				
2.900 (0.1142)																				
2.910 (0.1146)																				
2.920 (0.1150)																				
2.930 (0.1154)																				
2.940 (0.1157)																				
2.950 (0.1161)																				
2.960 (0.1165)																				
2.970 (0.1169)																				
2.980 (0.1173)																				
2.990 (0.1177)																				
3.000 (0.1181)																				
3.010 (0.1185)																				
3.020 (0.1189)																				
3.030 (0.1193)																				
3.040 (0.1197)																				
3.050 (0.1201)																				
3.060 (0.1205)																				
3.080 (0.1213)																				
3.100 (0.1220)																				
3.120 (0.1228)																				
3.140 (0.1236)																				
3.150 (0.1240)																				
3.160 (0.1244)																				
3.180 (0.1252)																				
3.200 (0.1260)																				
3.220 (0.1268)																				
3.240 (0.1276)																				
3.250 (0.1280)																				
3.260 (0.1283)																				
3.280 (0.1291)																				
3.300 (0.1299)																				

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

P03440

Intake valve clearance (Cold):

0.19 – 0.29 mm (0.007 – 0.011 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. 11 shim.

HINT: New shims have the thickness in millimeters imprinted on the face.

INSPECTION AND ADJUSTMENT OF IGNITION TIMING

4A-FE (See page [IG-25](#))

3S-GTE (See page [IG-29](#))

5S-FE (See page [IG-37](#))

Ignition timing:

10° BTDC @ idle

(w/ Terminals TE1 and E1 connected)

INSPECTION AND ADJUSTMENT OF IDLE SPEED (4A-FE)

(See page [MA-8](#))

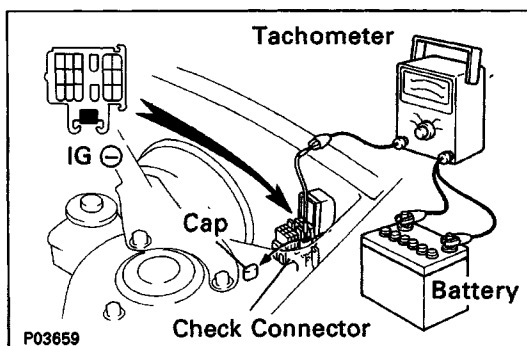
Idle speed: 800 rpm

INSPECTION OF IDLE SPEED (5S-FE and 3S-GTE)

HINT (5S-FE): Disconnecting the battery will cause the idling speed data in the ISC to be returned to the initial idling speed, causing the idling speed to rise above 750 rpm. Should this happen, either carry out a driving test, including stop-go several times at a speed above 10 km/h (6 mph), or start the engine, idle for 30 seconds and then turn the engine off repeatedly. By doing this, idle data will be stored in the ISC and the idle rpm will be at specified value.

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
 - (b) Air cleaner installed
 - (c) All pipes and hoses of air induction system connected
 - (d) All vacuum lines connected
- HINT: All vacuum hoses for EGR systems, etc. should be properly connected.
- (e) EFI system wiring connectors fully plugged
 - (f) All operating accessories switched OFF
 - (g) Transmission in neutral position

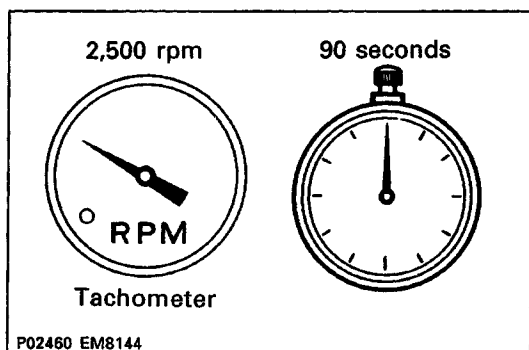


2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (-) of the check connector.

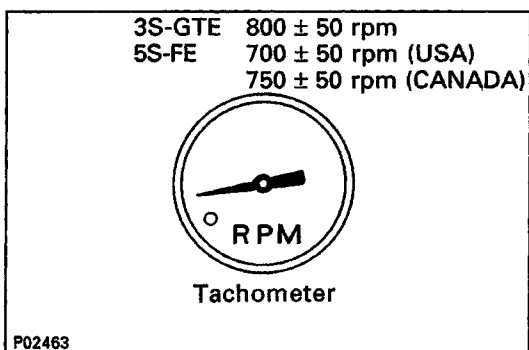
NOTICE:

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



3. INSPECT IDLE SPEED

(a) Race the engine at 2,500 rpm for approx. 90 seconds.



(b) Check the idle speed.

Idle speed:

3S-GTE	800 ± 50 rpm
5S-FE	700 ± 50 rpm USA
	750 ± 50 rpm CANADA

If the idle speed is not as specified, check the ISC system.

4. DISCONNECT TACHOMETER

TOYOTA–VARIABLE INDUCTION SYSTEM (T–VIS)

INSPECTION OF T–VIS

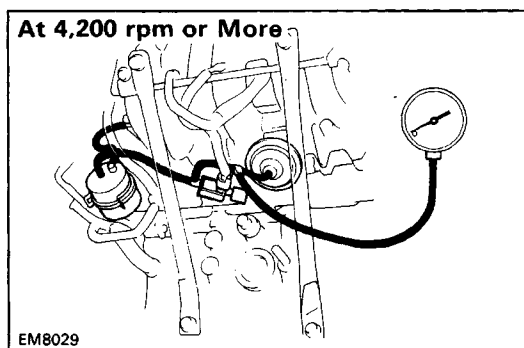
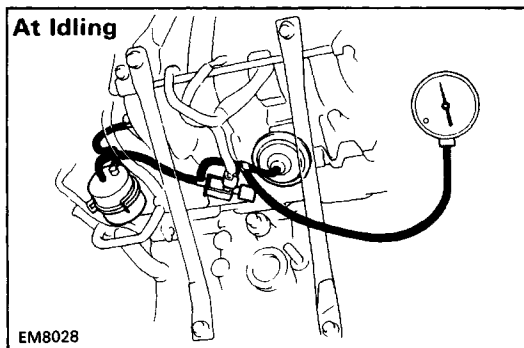
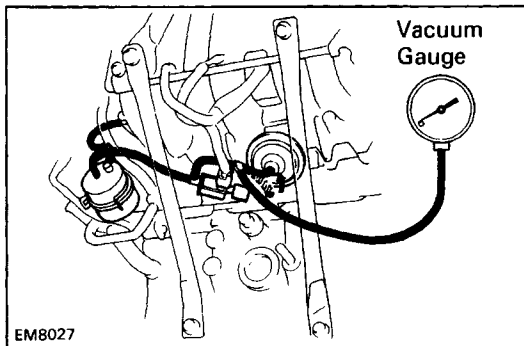
1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CONNECT TACHOMETER (See page EM-26)

3. CONNECT VACUUM GAUGE

Using a 3–way connector, connect the vacuum gauge to the hose between the VSV and actuator.



4. INSPECT T–VIS OPERATION

(a) Check that the vacuum gauge indicates vacuum at idling.

(b) Check that the vacuum gauge indicates zero at 4,200 rpm or more.

HINT: If regular unleaded gasoline is used, the vacuum gauge also indicates zero below 4,200 rpm.

IDLE AND OR 2500 RPM CO HC CHECK

HINT: This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

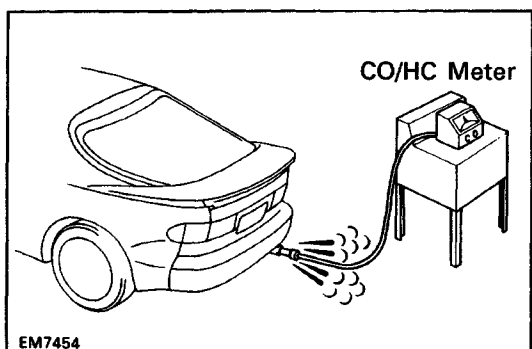
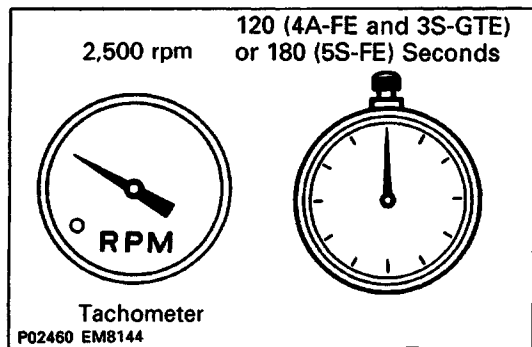
- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected

HINT: All vacuum hoses for EGR systems, etc. should be properly connected.

- (f) EFI system wiring connectors fully plugged
- (g) Ignition timing set correctly
- (h) Transmission in neutral position
- (i) Tachometer and CO/HC meter calibrated by hand.

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 120 (4A-FE AND 3S-GTE) OR 180 (5S-FE) SECONDS



4. INSERT CO/HC METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm 0.3 ft) DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

Complete the measuring within three minutes.

HINT: When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

(4A-FE and 3S-GTE)

If the CO/HC concentration at 2,500 rpm does not conform to regulations, try the following procedure.

Race the engine again at 2,500 rpm for approx. 1 minute and quickly repeat steps 4 and 5 above. This may correct the problem.

Troubleshooting

If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

(a) Check oxygen sensor operation.

(See page [FI-237](#))

(b) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: <ul style="list-style-type: none"> • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high-tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: <ul style="list-style-type: none"> • PCV hoses • EGR valve • Intake manifold • T-VIS valve (3S-GTE) Throttle body ISC valve (3S-GTE and 5S-FE) Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty EFI systems: <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line • Defective water temp. sensor • Defective air temp. sensor • Faulty ECU • Faulty injectors • Faulty cold start injector (3S-GTE) • Faulty throttle position sensor • Vacuum sensor (4A-FE and 5S-FE) • Air flow meter (3S-GTE)

COMPRESSION CHECK

HINT: If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. (3S-GTE)

REMOVE INTERCOOLER

(See steps 13 to 15 on pages TC-9 and 10)

3. (3S-GTE)

DISCONNECT SOLENOID RESISTOR CONNECTOR

4. (3S-GTE)

DISCONNECT COLD START INJECTOR CONNECTOR

5. DISCONNECT DISTRIBUTOR CONNECTOR(S)

6. REMOVE SPARK PLUGS

7. CHECK CYLINDER COMPRESSION PRESSURE

- Insert a compression gauge into the spark plug hole.
- Fully open the throttle.
- While cranking the engine, measure the compression pressure.

HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more. .

- Repeat steps (a) through (c) for each cylinder.

NOTICE: This measurement must be done in as short a time as possible.

Compression pressure:

4A-FE 1,320 kPa (13.5 kgf/cm², 191 psi) or more

3S-GTE 1,128 kPa (11.5 kgf/cm², 164 psi)
or more

5S-FE 1,226 kPa (12.5 kgf/cm², 178 psi)
or more

Minimum pressure:

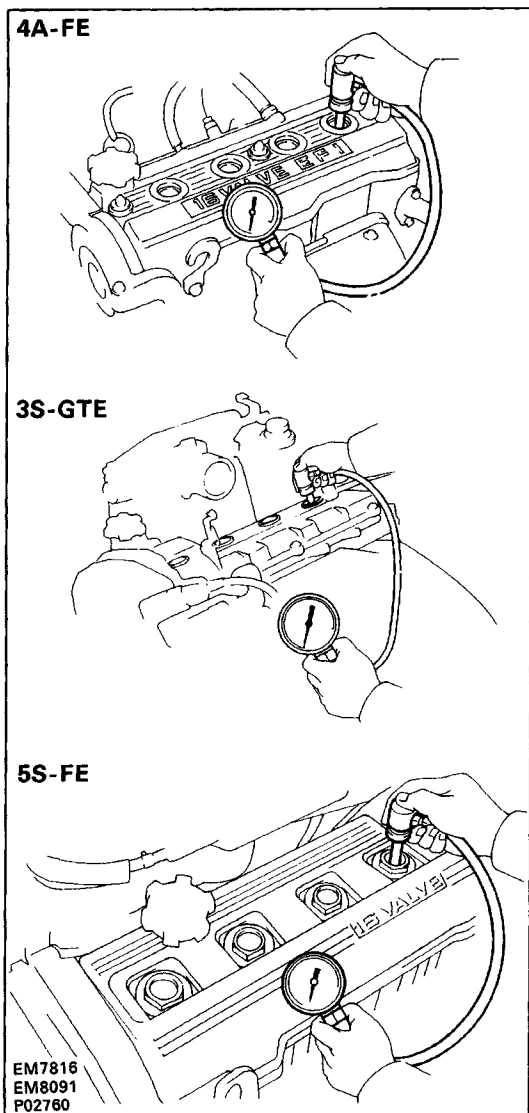
4A-FE and 5S-FE

981 kPa (10.0 kgf /cm², 142 psi)

3S-GTE 883 kPa (9.0 kgf/cm², 128 psi)

Difference between each cylinder:

98 kPa (1.0 kgf/cm², 14 psi) or less



- (e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.
- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damaged.
 - If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

8. REINSTALL SPARK PLUGS

Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

9. RECONNECT DISTRIBUTOR CONNECTOR(S)**10. (3S-GTE)**

RECONNECT COLD START INJECTOR CONNECTOR

11. (3S-GTE)

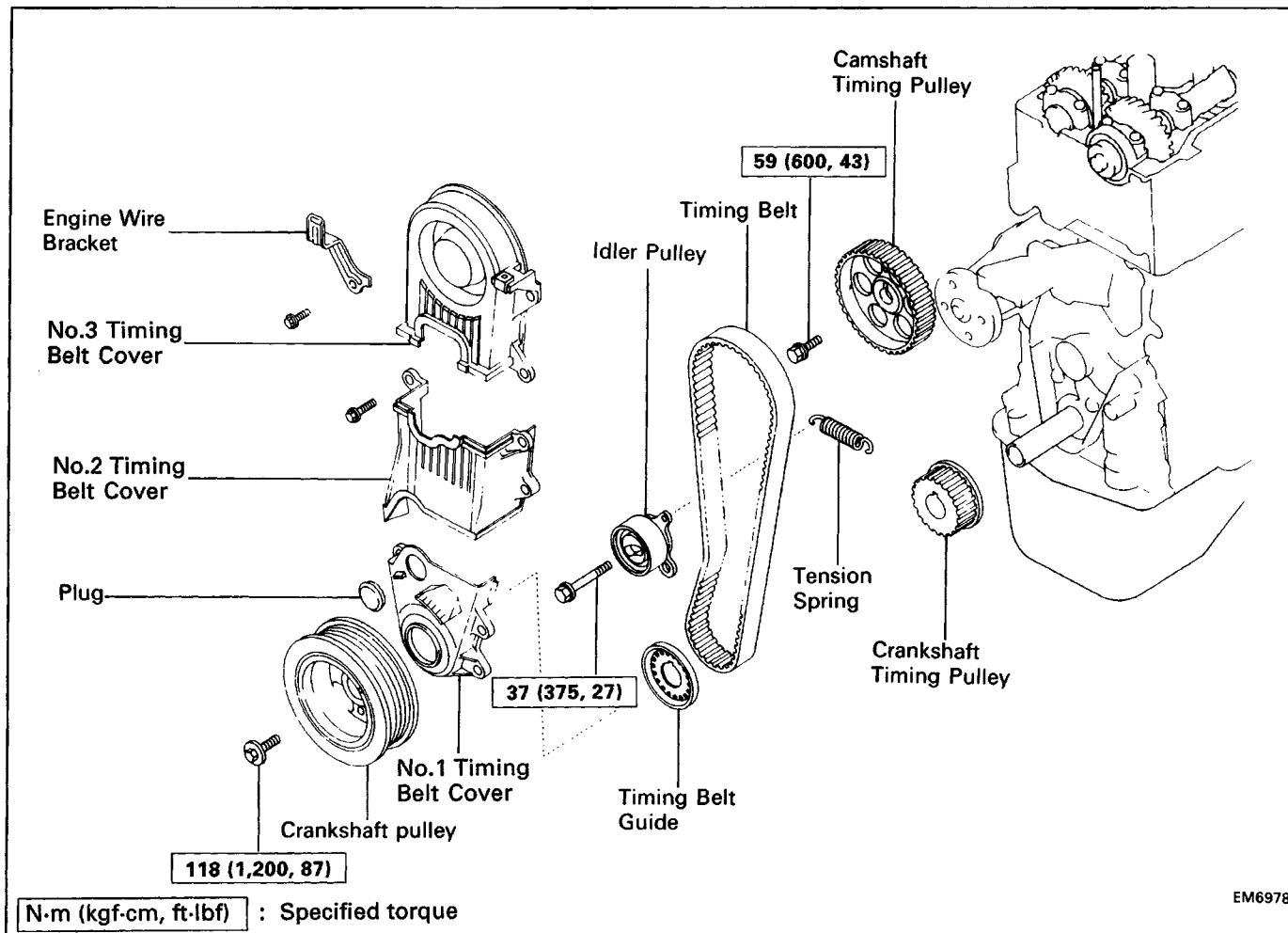
RECONNECT SOLENOID RESISTOR CONNECTOR

12. (3S-GTE)

REINSTALL INTERCOOLER

(See steps 11 to 13 on page [TC-17](#))

TIMING BELT (4A-FE) COMPONENTS



REMOVAL OF TIMING BELT

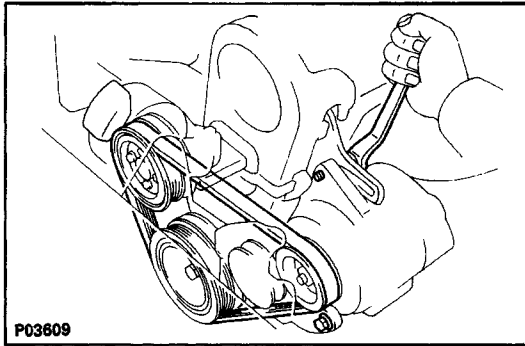
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

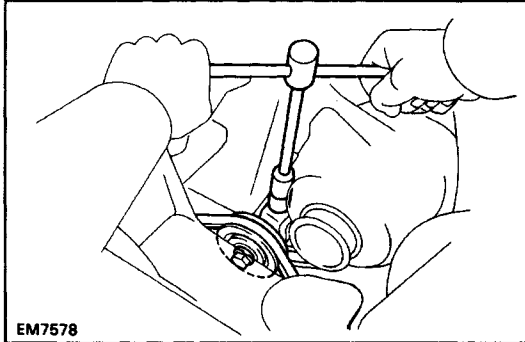
2. REMOVE RH FRONT WHEEL
3. REMOVE RH ENGINE UNDER COVER
4. REMOVE ALTERNATOR DRIVE BELT

(a) Loosen the four water pump pulley bolts.



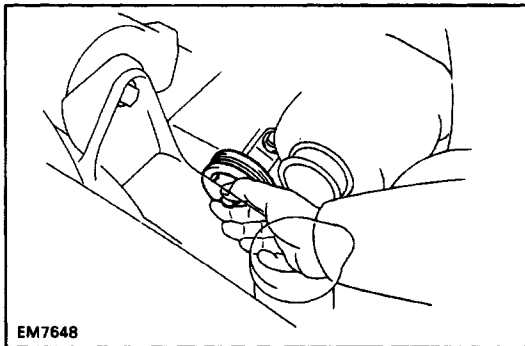


- (b) Loosen the pivot nut and adjusting bolt, and remove the drive belt.

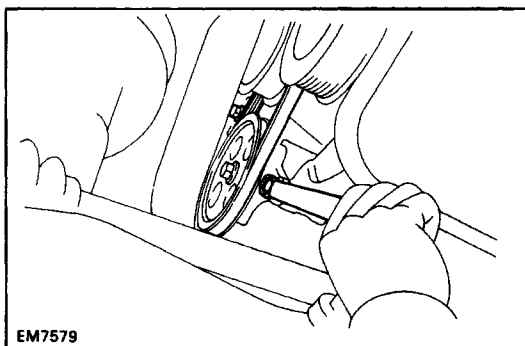


5. REMOVE A/C COMPRESSOR DRIVE BELT AND A/C IDLER PULLEY

- (a) Loosen the idler pulley mounting nut and adjusting bolt, and remove the drive belt.

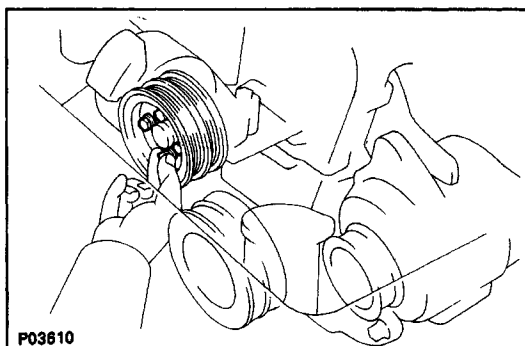


- (b) Remove the nut and idler pulley.

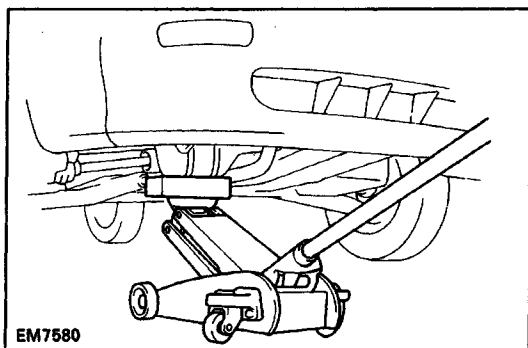


6. REMOVE PS PUMP DRIVE BELT, AND DISCONNECT WATER PUMP PULLEY FROM WATER PUMP

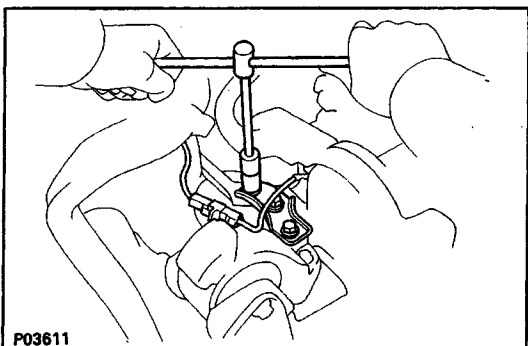
- (a) Loosen the pivot bolt and adjusting bolt, and remove the drive belt.



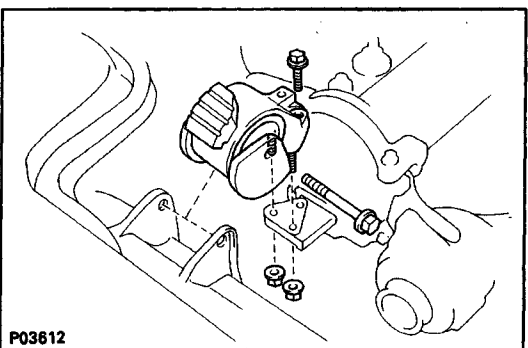
- (b) Remove the four bolts, and disconnect the water pump pulley from the water pump.

**7. SLIGHTLY JACK UP ENGINE**

Raise the engine enough to remove the weight from the engine mounting on the right side.

**8. DISCONNECT CONNECTOR FROM GROUND WIRE ON RH FENDER APRON****9. REMOVE RH ENGINE MOUNTING STAY**

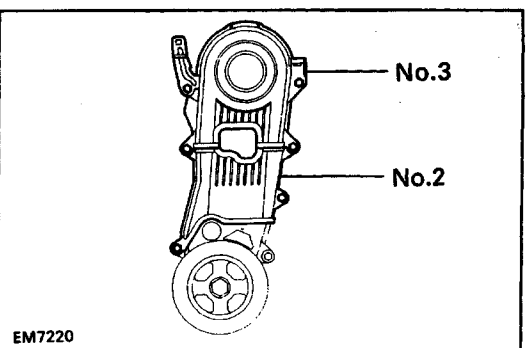
Remove the three bolts and mounting stay.

**10. REMOVE RH ENGINE MOUNTING INSULATOR**

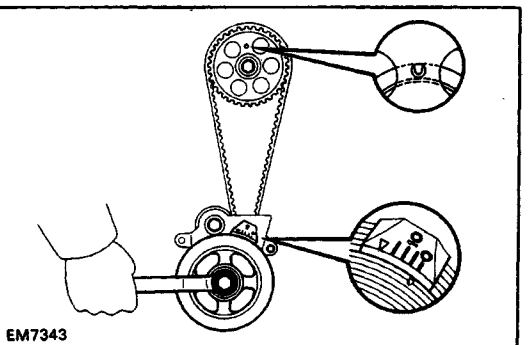
Remove the bolt, two nuts, through bolt and mounting insulator.

11. REMOVE SPARK PLUGS**12. REMOVE CYLINDER HEAD COVER**

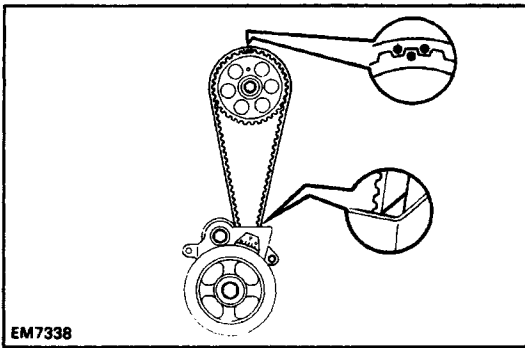
(See steps 18 and 24 on pages [EM-85](#) and 87)

**13. REMOVE NO.3 AND NO.2 TIMING BELT COVERS**

Remove the six bolts, engine wire bracket, No.3 and No.2. timing belt covers.

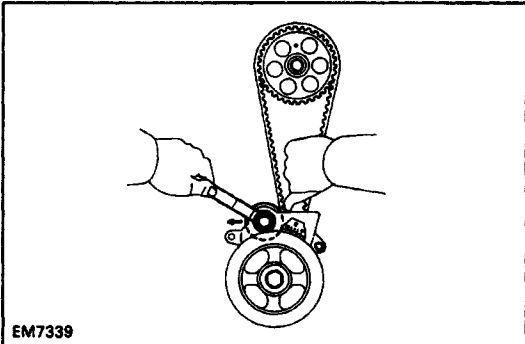
**14. SET NO.1 CYLINDER TO TDC/COMPRESSION**

- (a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.
- (b) Check that the hole of the camshaft timing pulley is aligned with the timing mark of the bearing cap. If not, turn the crankshaft one revolution (360°).

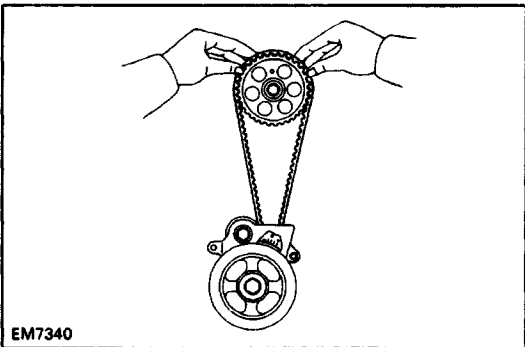


15. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY

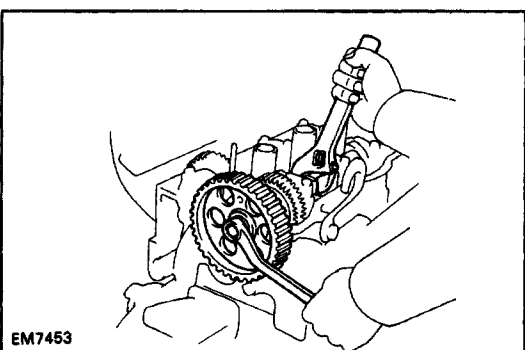
HINT (When re-using timing belt): Place the matchmarks on the timing belt and camshaft timing pulley, and matchmark on the timing belt to match the end of the No.1 timing belt cover.



- (a) Remove the grommet from the No.1 timing belt cover.
- (b) Loosen the mounting bolt of the No.1 idler pulley and push the pulley toward the left as far as it will go, and temporarily tighten it.

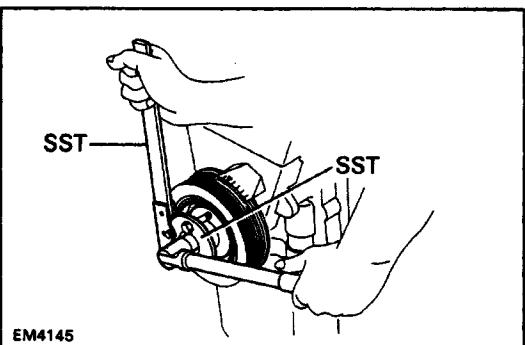


- (c) Remove the timing belt from the camshaft timing pulley.



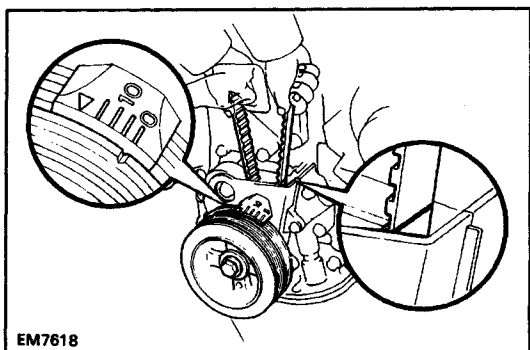
16. REMOVE CAMSHAFT TIMING PULLEY

Hold the hexagon wrench head portion of the camshaft with a wrench, and remove the bolt and timing pulley.

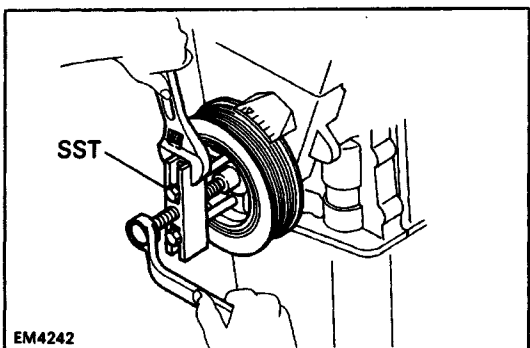


17. REMOVE CRANKSHAFT PULLEY

- (a) Using SST, remove the pulley bolt.
SST 09213-14010 and 09330-00021



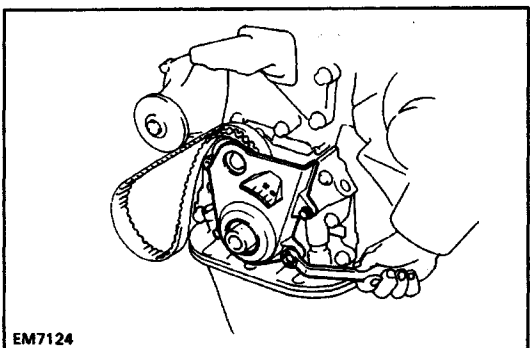
HINT (When re-using timing belt) : After loosening the crankshaft pulley bolt, check that the timing belt matchmark aligns with the end of the No.1 timing belt cover when the crankshaft pulley groove is aligned with the timing mark "o" of the No.1 timing belt cover. If the matchmark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.



(b) Using SST, remove the pulley.

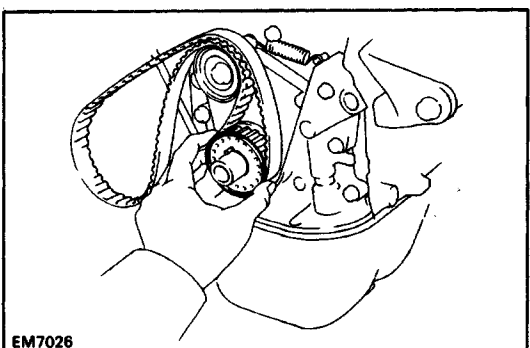
SST 09213-31021

HINT (When re-using timing belt): Remove the pulley without turning it.

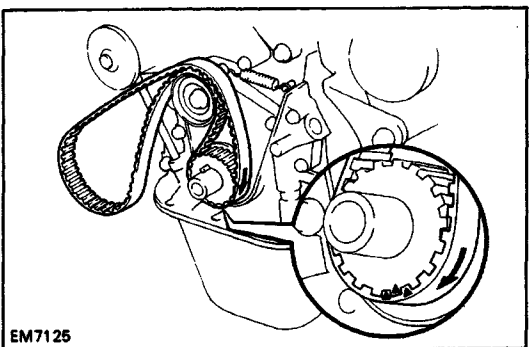


18. REMOVE NO.1 TIMING BELT COVER

Remove the three bolts and timing belt cover.

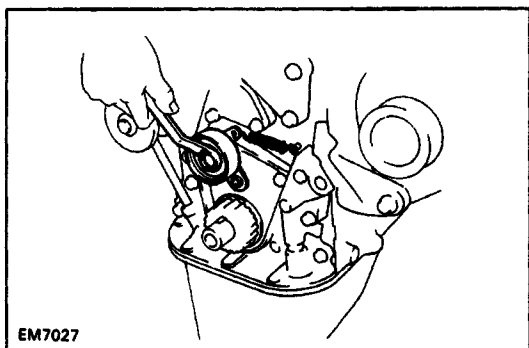


19. REMOVE TIMING BELT GUIDE



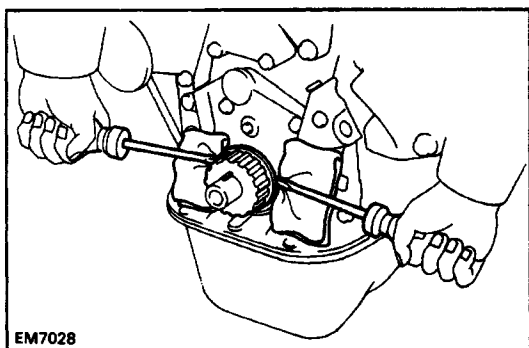
20. REMOVE TIMING BELT

HINT (When re-using timing belt): Draw a direction arrow on the timing belt (in the direction of engine revolution), and place matchmarks on the timing belt and crankshaft timing pulley.



21. REMOVE IDLER PULLEY AND TENSION SPRING

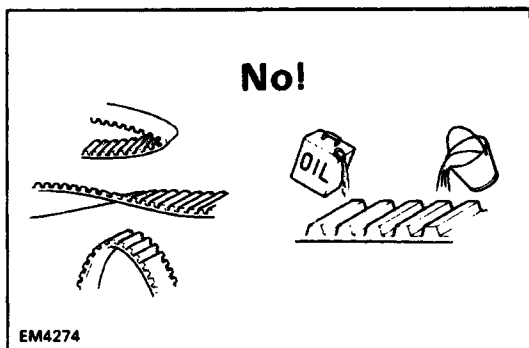
Remove the bolt, idler pulley and tension spring.



22. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use two screwdrivers.

NOTICE: Position shop rags as shown to prevent damage.



INSPECTION OF TIMING BELT COMPONENTS

1. INSPECT TIMING BELT

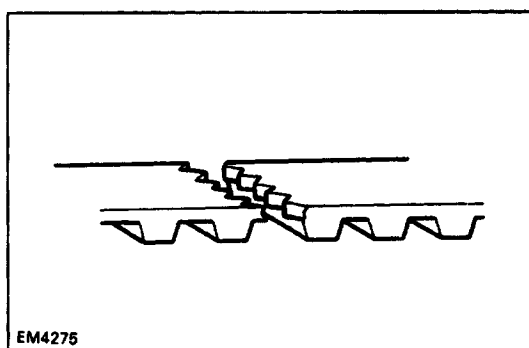
NOTICE:

- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water or steam.
- Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.

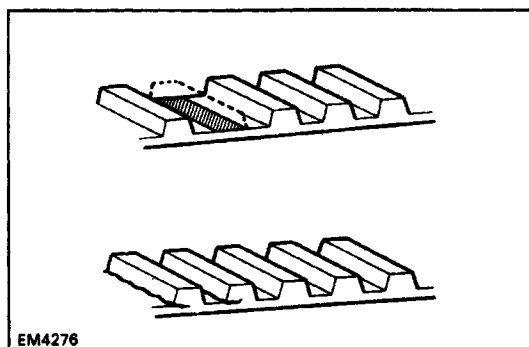
If there are any defects as shown in the illustrations, check the following points:

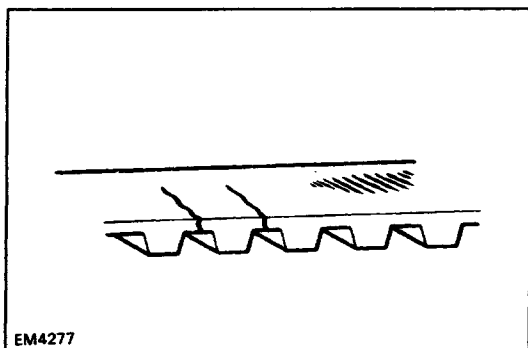
(a) Premature parting

- Check the proper installation.
- Check the timing cover gasket for damage and proper installation.

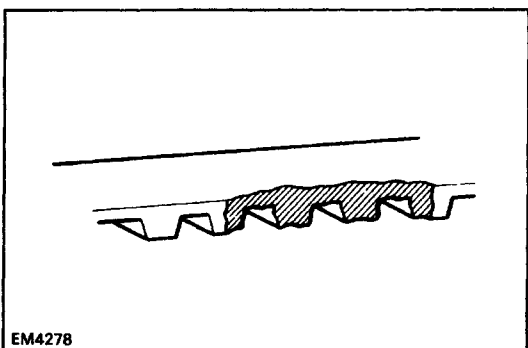


(b) If the belt teeth are cracked or damaged, check to see if either camshaft or water pump is locked.

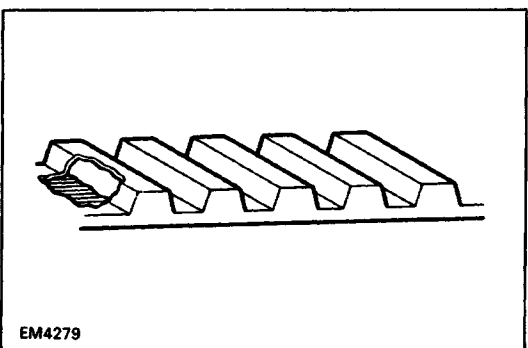




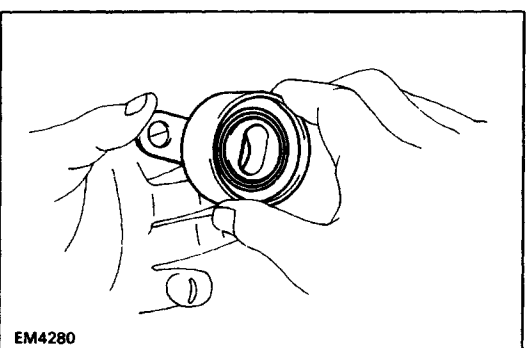
- (c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock.



- (d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.

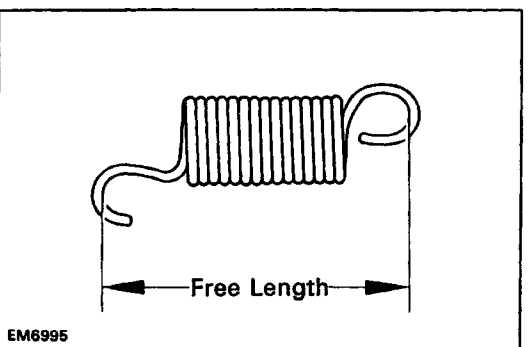


- (e) If there is noticeable wear on the belt teeth, check the timing cover for damage, correct gasket installation, and the foreign material on the pulley teeth. If necessary, replace the timing belt.



2. INSPECT IDLER PULLEY

Check that the idler pulley turns smoothly.
If necessary, replace the idler pulley.



3. INSPECT TENSION SPRING

(a) Measure the free length of tension spring.

Free length: 38.4 mm (1.512 in.)

If the free length is not as specified, replace the tension spring.

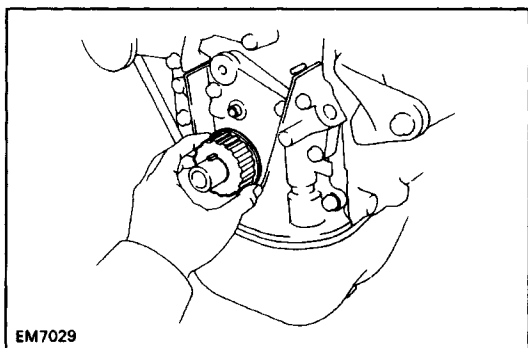
(b) Measure the tension of the tension spring at the specified installed length.

Installed tension:

35 – 39 N (3.6 – 4.0 kgf, 7.9 – 8.8 lbf)

at 50.2 mm (1.976 in.)

If the installed tension is not, as specified, replace the tension spring.

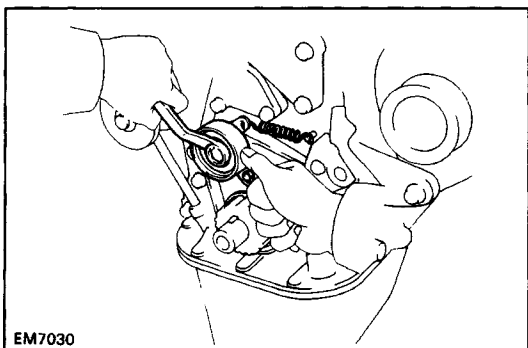


INSTALLATION OF TIMING BELT

(See page [EM-33](#))

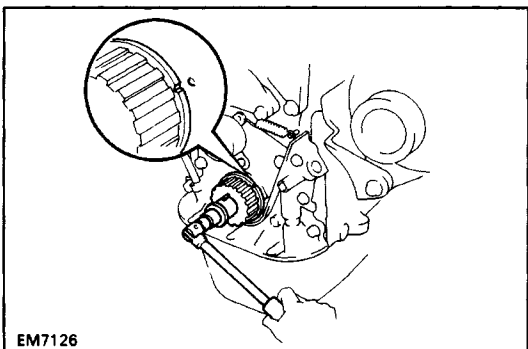
1. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the pulley set key with the key groove of the pulley.
- (b) Slide on the timing pulley, facing the flange side inward.



2. TEMPORARILY INSTALL IDLER PULLEY AND TENSION SPRING

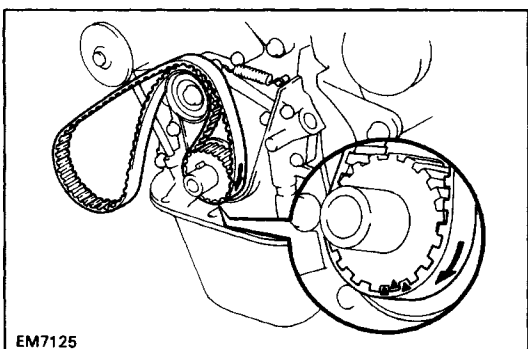
- (a) Install the idler pulley with the bolt. Do not tighten the bolt yet.
- (b) Install the tension spring.
- (c) Push the pulley toward the left as far as it will go and tighten the bolt.



3. TEMPORARILY INSTALL TIMING BELT

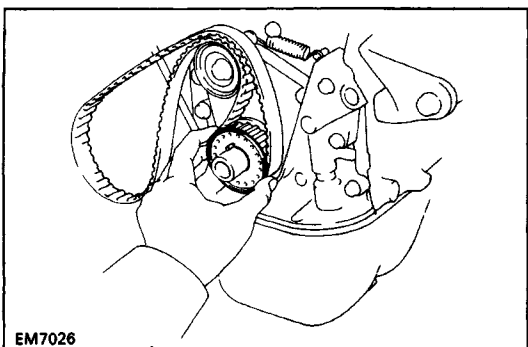
NOTICE: The engine should be cold.

- (a) Using the crankshaft pulley bolt, turn the crankshaft and align the timing marks of the crankshaft timing pulley and oil pump body.



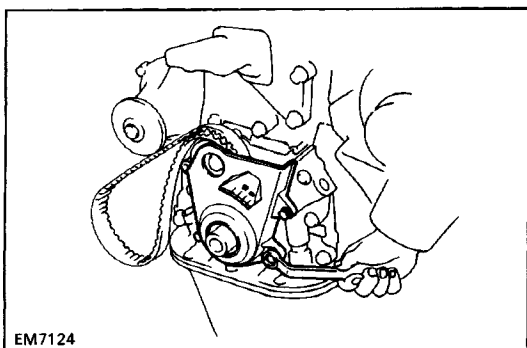
- (b) Remove any oil or water on the crankshaft timing pulley and idler pulley, and keep them clean.
- (c) Install the timing belt on the crankshaft timing pulley and idler pulley.

HINT (When re-using timing belt): Align the matchmarks of the crankshaft timing pulley and timing belt, and install the belt with the arrow pointing in the direction of engine revolution.



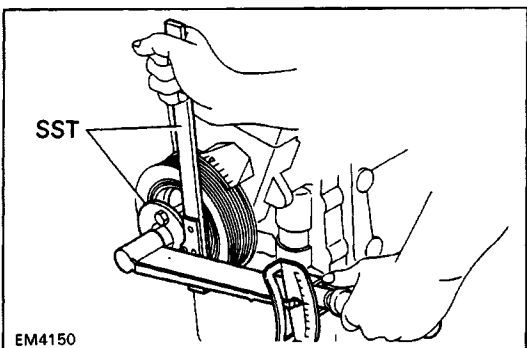
4. INSTALL TIMING BELT GUIDE

Slide on the timing belt guide, facing the cup side outward.



5. INSTALL NO.1 TIMING BELT COVER

Install the timing belt cover with the three bolts.



6. INSTALL CRANKSHAFT PULLEY

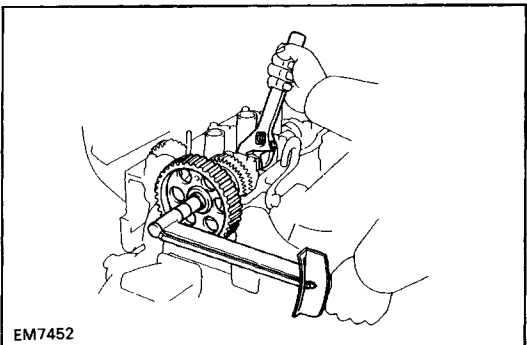
(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Temporarily install the pulley bolt.

(c) Using SST, install the pulley bolt.

SST 09213-14010 and 09330-00021

Torque: 118 N-m (7,200 kgf-cm, 87 ft-lbf)



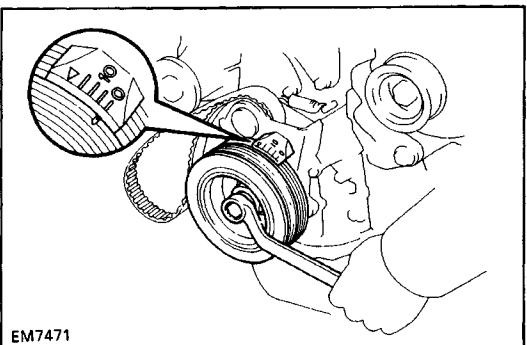
7. INSTALL CAMSHAFT TIMING PULLEY

(a) Align the camshaft knock pin with the knock pin groove of the pulley, and slide on the pulley.

(b) Temporarily install the timing pulley bolt.

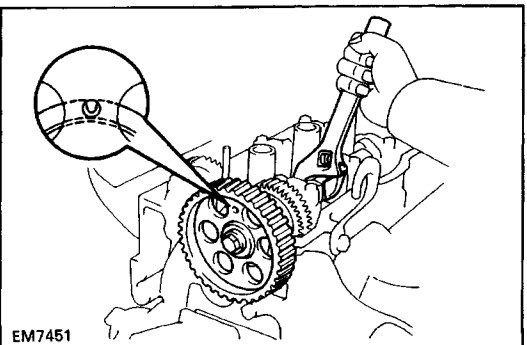
(c) Hold the hexagon wrench head portion of the camshaft with a wrench, and tighten the timing pulley bolt.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)

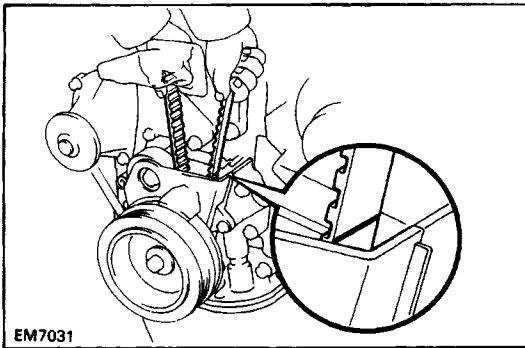


8. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with "0" timing mark of the No.1 timing belt cover.



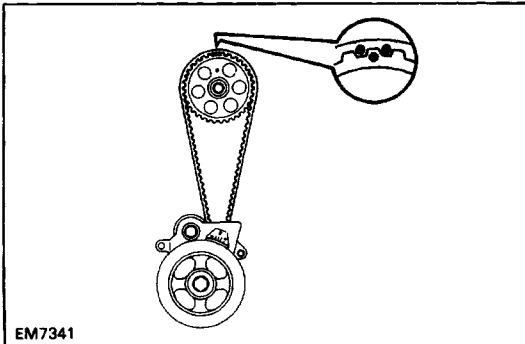
(b) Turn the hexagon wrench head portion of the camshaft, and align the hole of the camshaft timing pulley with the timing mark of the bearing cap.



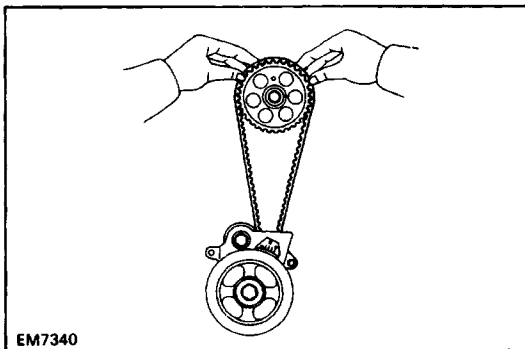
9. INSTALL TIMING BELT

HINT (When re-using timing belt):

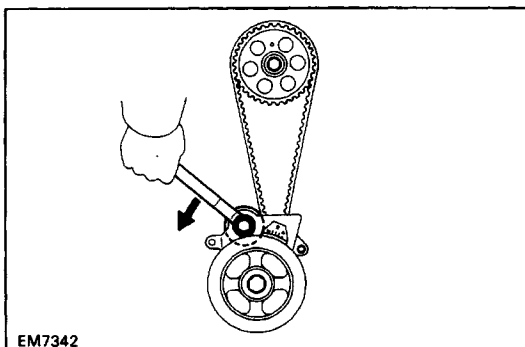
- Check that the matchmark on the timing belt matches the end of the No.1 timing belt cover. If the matchmark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.



- Align the matchmarks of the timing belt and camshaft timing pulley.

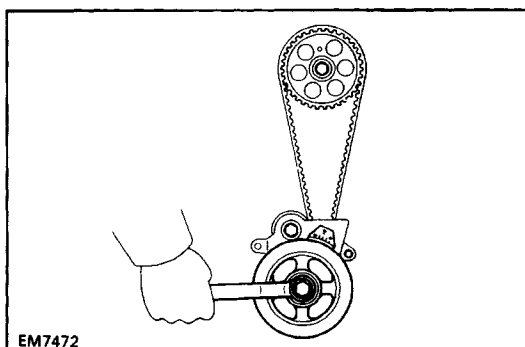


- Remove any oil or water on the camshaft timing pulley, and keep it clean.
- Install the timing belt, checking the tension between the crankshaft timing pulley and camshaft timing pulley.



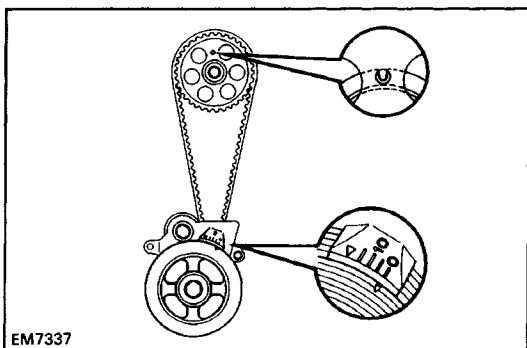
10. CHECK VALVE TIMING

- Loosen the idler pulley bolt 1/2 turn.

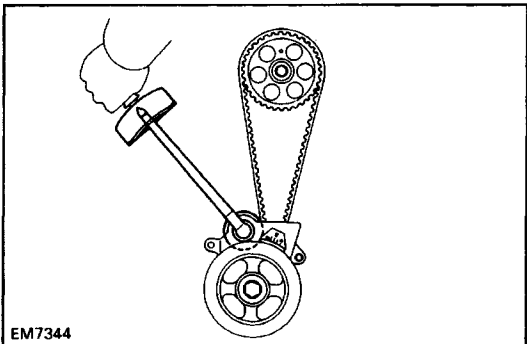


- Slowly turn the crankshaft pulley two revolutions from TDC to TDC.

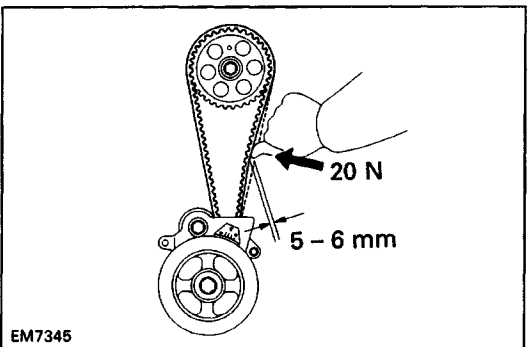
NOTICE: Always turn the crankshaft clockwise.



- (c) Check that each pulley aligns with the timing marks as shown in the illustration.
If the timing marks do not align, remove the timing belt and reinstall it.



- (d) Tighten the idler pulley bolt.
Torque: 37 N-m (375 kgf-cm, 27 ft-lbf)

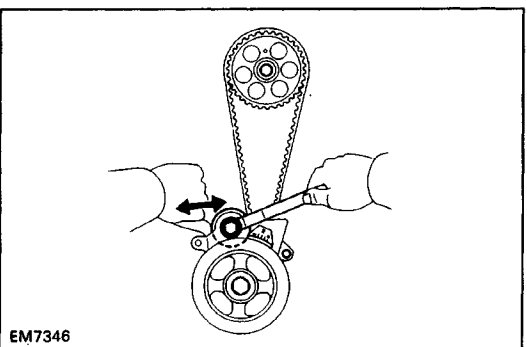


11. (REFERENCE)

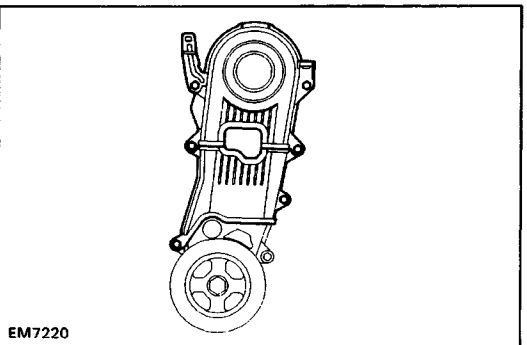
INSTALL TIMING BELT DEFLECTION

Check that there is belt tension at the position indicated in the illustration.

**Deflection: 5 – 6 mm (0.20 – 0.24 in.)
at 20 N (2 kgf, 4.4 lbf)**



If the deflection is not as specified, adjust with the idler pulley.



12. INSTALL NO.2 AND NO.3 TIMING BELT COVERS

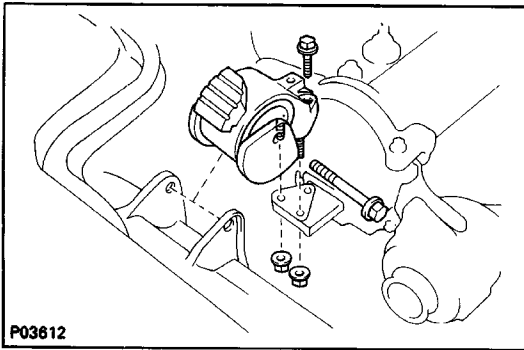
Install the No.2, No.3 timing belt covers and engine wire bracket with the six bolts.

13. INSTALL CYLINDER HEAD COVER

(See steps 11 and 17 on pages [EM-109](#) and 111)

14. INSTALL SPARK PLUGS

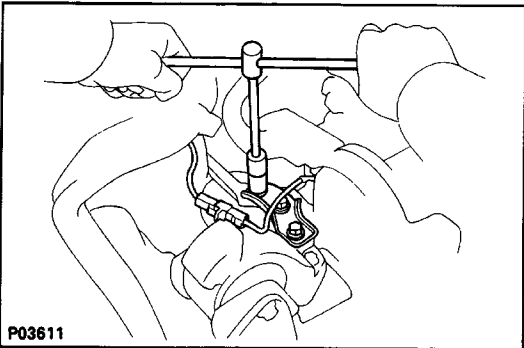
Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

**15. INSTALL RH ENGINE MOUNTING INSULATOR**

Install the mounting insulator with the through bolt, bolt and two nuts.

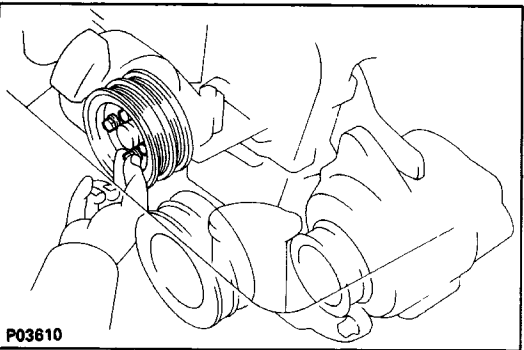
Torque:

Through bolt	87 N-m (890 kgf-cm, 64 ft-lbf)
Bolt	64 N-m (650 kgf-cm, 47 ft-lbf)
Nut	52 N-m (530 kgf-cm, 38 ft-lbf)

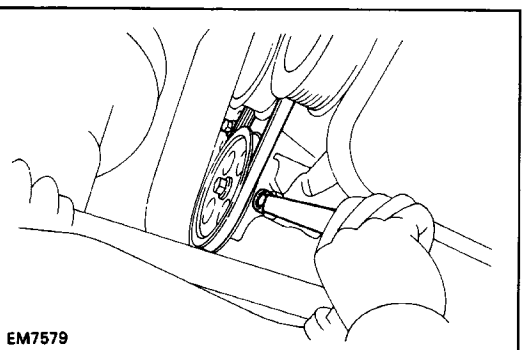
**16. INSTALL RH ENGINE MOUNTING STAY**

Install the mounting stay with the three bolts.

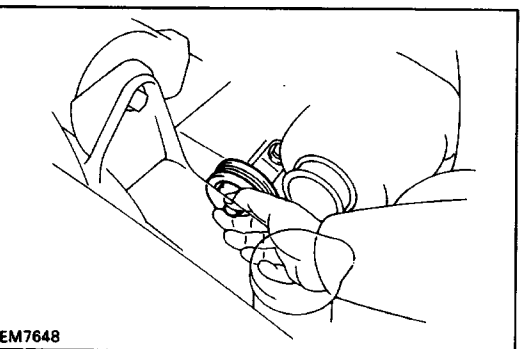
Torque: 42 N-m (430 kgf-cm, 31 ft-lbf)

17. CONNECT GROUND CONNECTOR TO GROUND WIRE ON RH FENDER APRON**18. INSTALL WATER PUMP PULLEY AND PS PUMP DRIVE BELT**

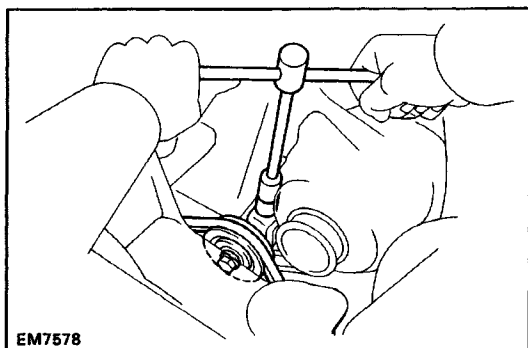
(a) Temporarily install the water pump pulley with the four bolts.



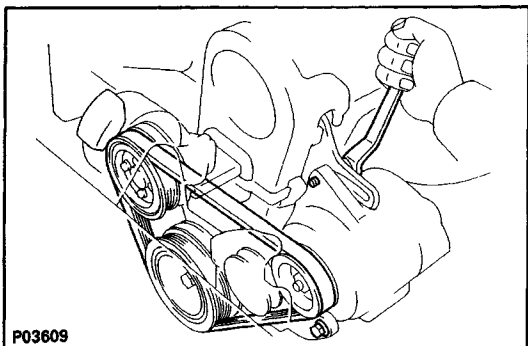
(b) Install the drive belt with the pivot bolt and adjusting bolt.

**19. INSTALL A/C IDLER PULLEY AND A/C DRIVE BELT**

(a) Temporarily install the idler pulley with the nut.



- (b) Install the drive belt with the idler pulley nut and adjusting bolt.



20. INSTALL ALTERNATOR DRIVE BELT

- (a) Install the drive belt with the pivot nut and adjusting bolt.



- (b) Tighten the four water pump pulley bolts.

21. INSTALL RH FRONT WHEEL

22. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

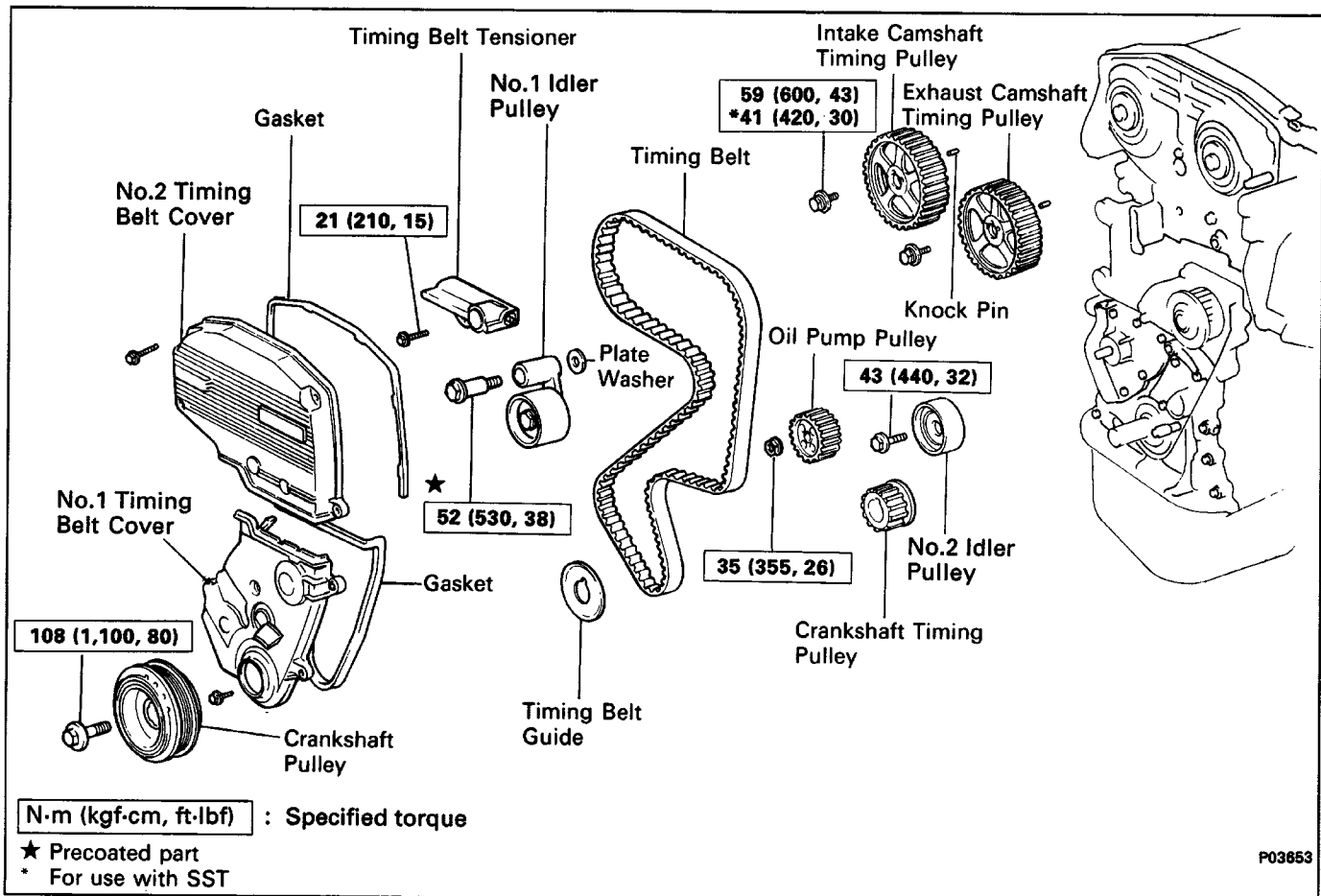
23. CHECK AND ADJUST DRIVE BELTS

Drive belt tension:

Alternator	New belt 160 ± 20 lbf
	Used belt 130 ± 20 lbf
PS pump	New belt 125 ± 25 lbf
	Used belt 80 ± 20 lbf
A/C compressor	New belt 160 ± 25 lbf
	Used belt 100 ± 20 lbf

24. INSTALL RH ENGINE UNDER COVER

TIMING BELT (3S-GTE) COMPONENTS

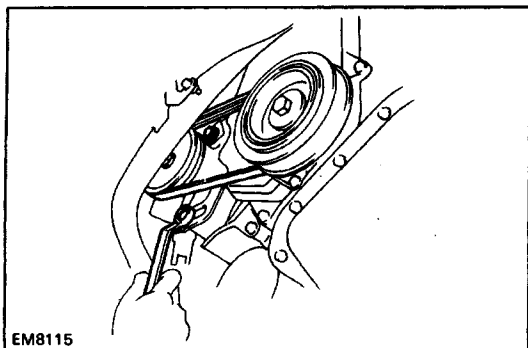


REMOVAL OF TIMING BELT

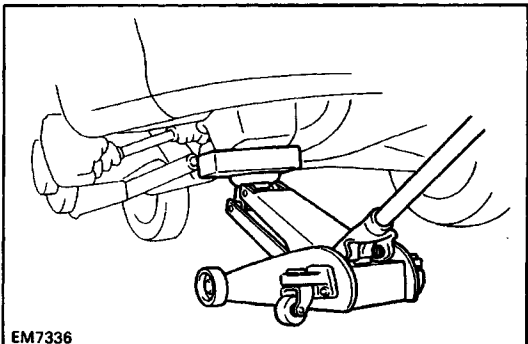
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

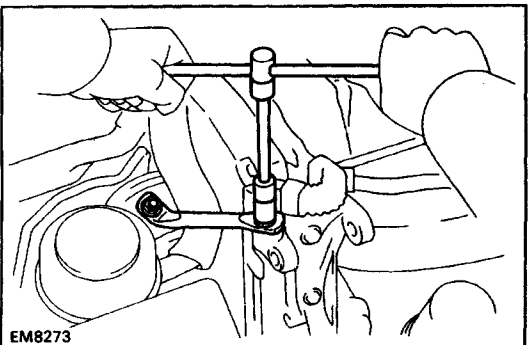
2. REMOVE RH FRONT WHEEL
3. REMOVE RH ENGINE UNDER COVER
4. REMOVE ALTERNATOR (See page [CH-7](#))
5. REMOVE INTERCOOLER
(See steps 13 to 15 on pages [TC-9](#) and 10)
6. REMOVE EGR VACUUM MODULATOR AND VSV
(See step 20 on page [EM-121](#))
7. REMOVE EGR VALVE AND PIPE
(See step 21 on page [EM-121](#))
8. REMOVE THROTTLE BODY
(See steps 2, 3, 5 to 8, 10 and 11 on pages [FI-194](#) and 195)

**9. REMOVE PS DRIVE BELT**

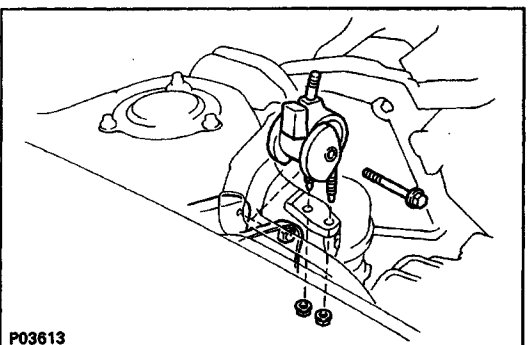
Loosen the two bolts, and remove the drive belt.

**10. SLIGHTLY JACK UP ENGINE**

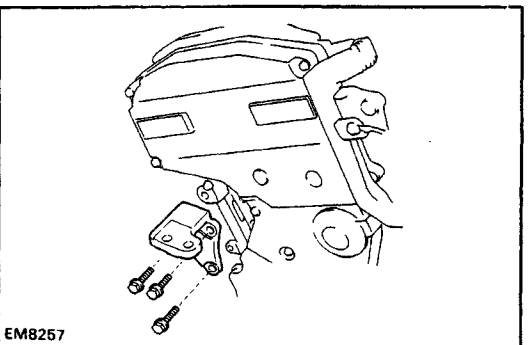
Raise the engine enough to remove the weight from the engine mounting on the right side.

**11. REMOVE RH ENGINE MOUNTING STAY**

Remove the bolt, nut and mounting stay.

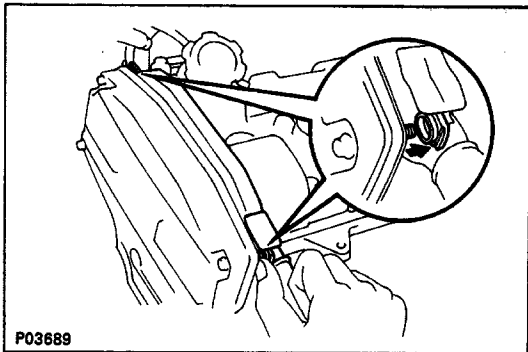
**12. REMOVE RH ENGINE MOUNTING INSULATOR**

Remove the through bolt, two nuts and mounting insulator.

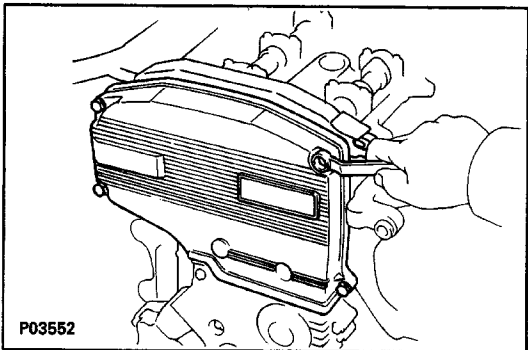
**13. REMOVE RH ENGINE MOUNTING BRACKET**

Remove the three bolts and mounting bracket.

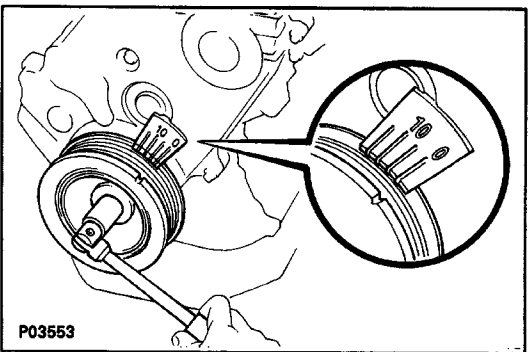
HINT: Lower the jack and perform the operation with the engine fully down.

**14. REMOVE CYLINDER HEAD COVER**

- (a) Disconnect the engine wire protector between the cylinder head cover and No.3 timing belt cover.
- (b) Remove the cylinder head cover.
(See step 33 on page [EM-124](#))

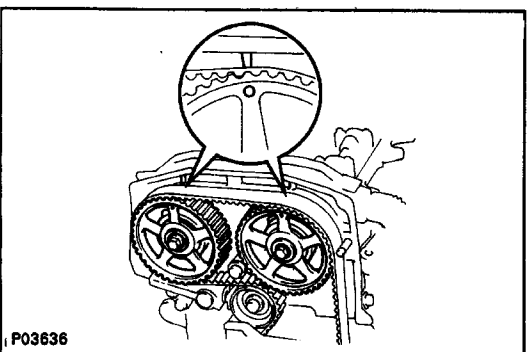
15. REMOVE SPARK PLUGS**16. REMOVE NO.2 TIMING BELT COVER**

Remove the five screws, timing belt cover and gasket.

**17. SET NO.1 CYLINDER TO TDC/COMPRESSION**

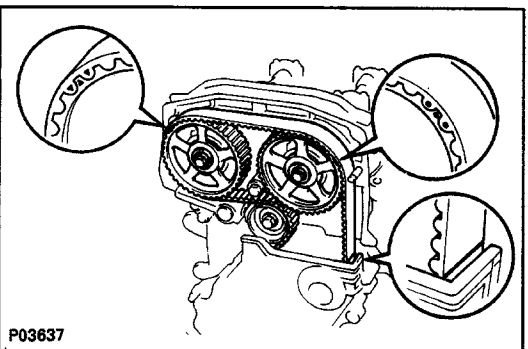
- (a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.

NOTICE: Always turn the crankshaft clockwise.



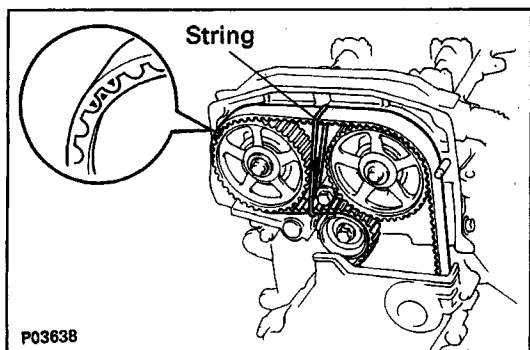
- (b) Check that the timing marks of the camshaft timing pulleys are aligned with the timing marks of the No.3 timing belt cover.

If not, turn the crankshaft one revolution (360°).

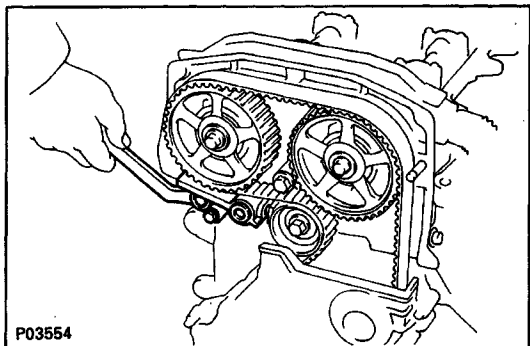
**18. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS**

HINT:

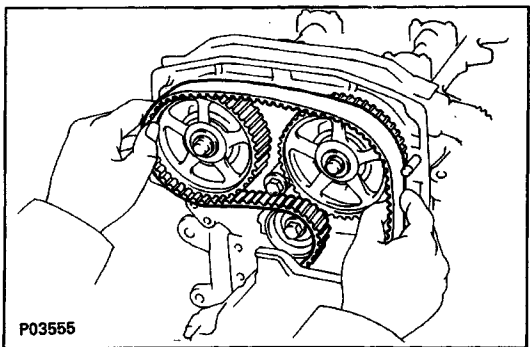
- (Re-using timing belt)
Place matchmarks on the timing belt and camshaft timing pulleys, and place a matchmark on the timing belt to match the end of the No.1 timing belt cover.



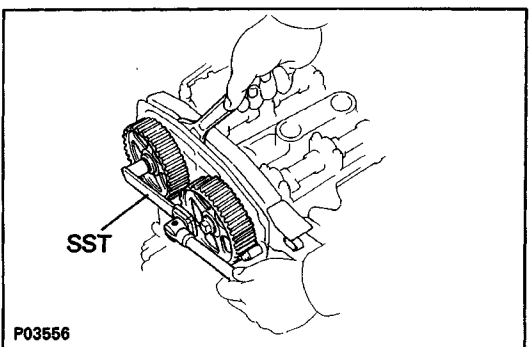
- (When replacing timing belt tensioner only)
To avoid meshing of the timing belt and timing pulley, secure one with a string. And place the matchmarks on the timing belt and RH camshaft timing pulley.



- (a) Remove the two bolts and timing belt tensioner.



- (b) Remove the timing belt from the camshaft timing pulley.



19. REMOVE CAMSHAFT TIMING PULLEYS

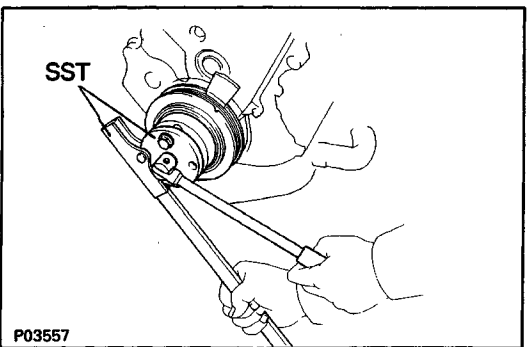
- (a) Hold the hexagon wrench head portion of the camshaft with a wrench, and remove the pulley mounting bolts.

HINT (Intake camshaft timing pulley): Use SST.

SST 09249-63010

- (b) Remove the camshaft pulleys and pins.

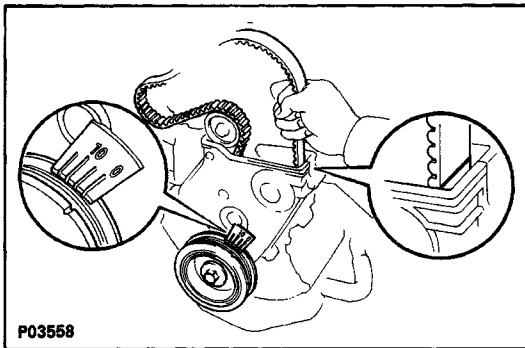
HINT: Arrange the intake and exhaust timing pulleys.



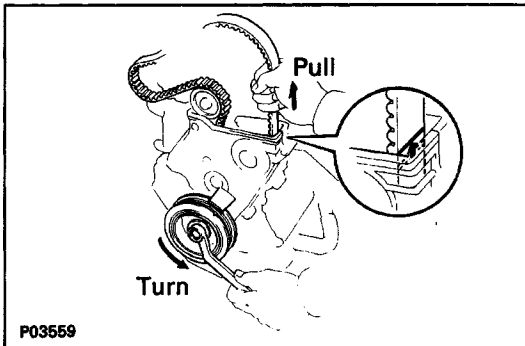
20. REMOVE CRANKSHAFT PULLEY

- (a) Using SST, remove the pulley bolt.

SST 09213-54015 (90119-08216) and 09330-00021

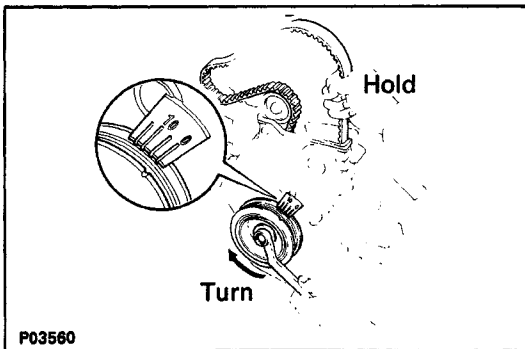


HINT (When re-using timing belt): After loosening the crankshaft pulley bolt, check that the timing belt matchmark aligns with the end of the No.1 timing belt cover when the crankshaft pulley groove is aligned with the timing mark "0" of the No.1 timing belt cover. If the matchmark does not align, align as follows:

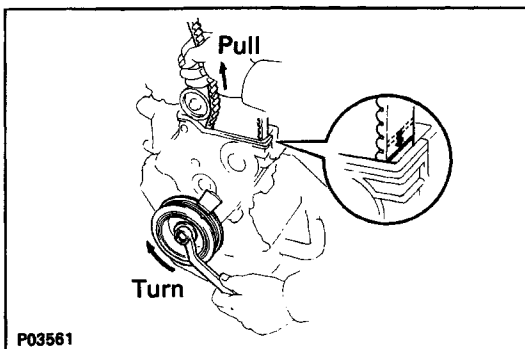


(When matchmark is out of alignment clockwise)

- Align the matchmark by pulling the timing belt up on the water pump pulley side while turning the crankshaft pulley counterclockwise.

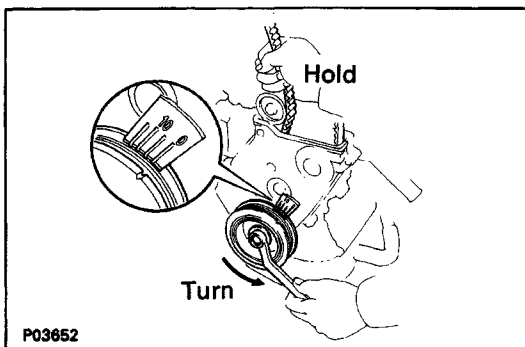


- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley clockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.

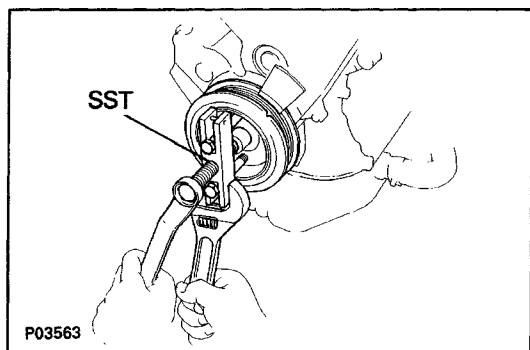


(When matchmark is out of alignment counterclockwise)

- Align the matchmark by pulling the timing belt up on the No.1 idler pulley side while turning the crankshaft pulley clockwise.



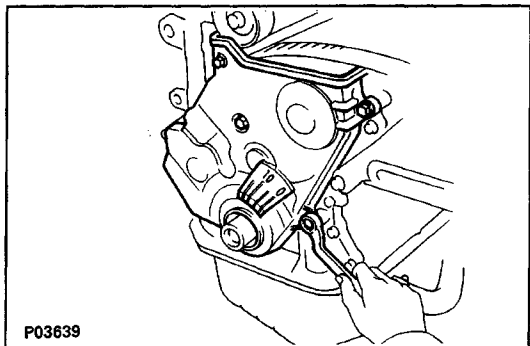
- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley counterclockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.



(b) Using SST, remove the pulley.

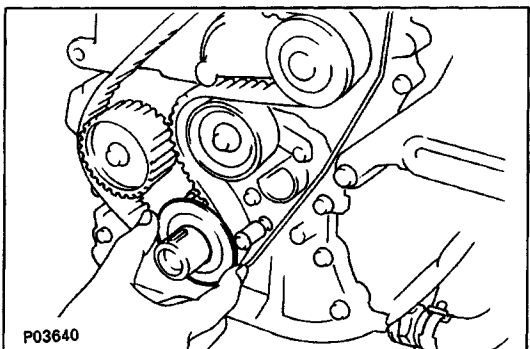
SST 09213-31021

HINT (When re-using timing belt): Remove the pulley without turning it.

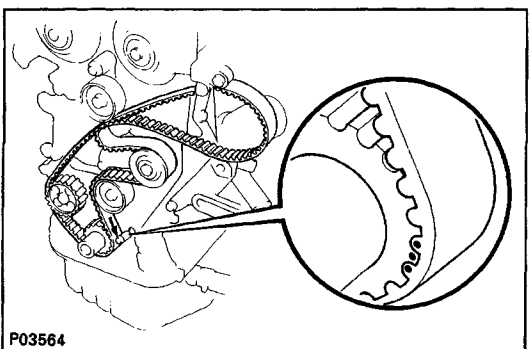


21. REMOVE NO.1 TIMING BELT COVER

Remove the six bolts, timing belt cover and gasket.

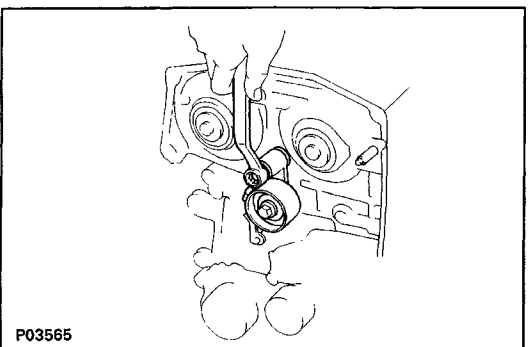


22. REMOVE TIMING BELT GUIDE



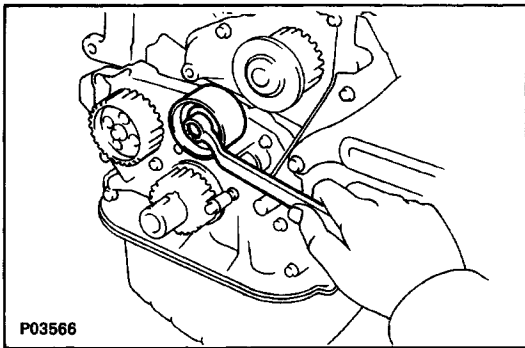
23. REMOVE TIMING BELT

HINT (When re-using timing belt): Draw a direction arrow on the timing belt (in the direction of engine revolution), and place matchmarks on the timing belt and crankshaft timing pulley.

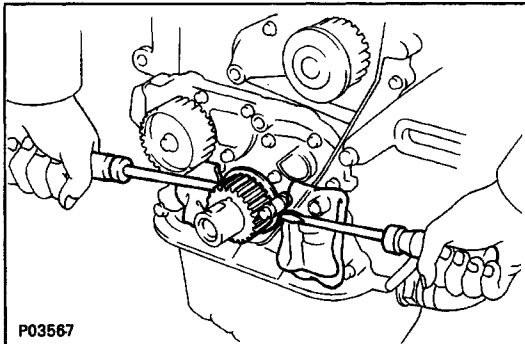


24. REMOVE NO.1 IDLER PULLEY

Remove the pivot bolt, pulley and plate washer.

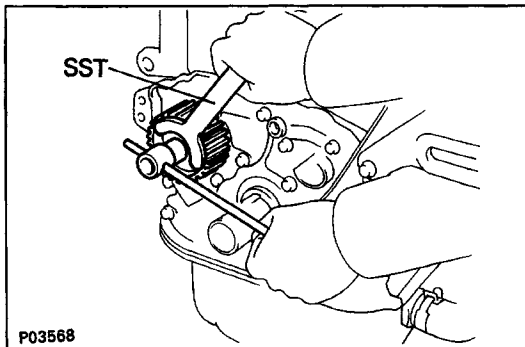
**25. REMOVE NO.2 IDLER PULLEY**

Remove the bolt and pulley.

**26. REMOVE CRANKSHAFT TIMING PULLEY**

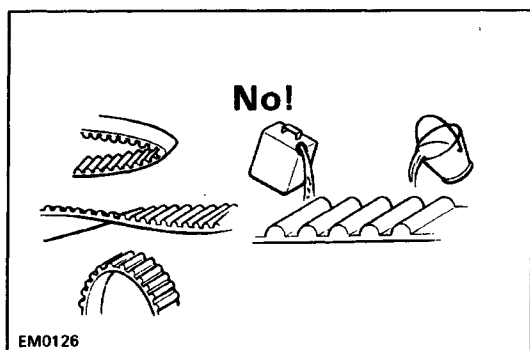
If the pulley cannot be removed by hand, use two screwdrivers.

HINT: Position shop rags as shown to prevent damage.

**27. REMOVE OIL PUMP PULLEY**

Using SST, remove the nut and pulley.

SST 09616-30011



INSPECTION OF TIMING BELT COMPONENTS

1. INSPECT TIMING BELT

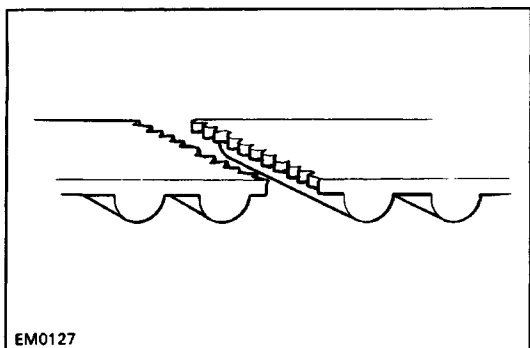
NOTICE:

- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water or steam.
- Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.

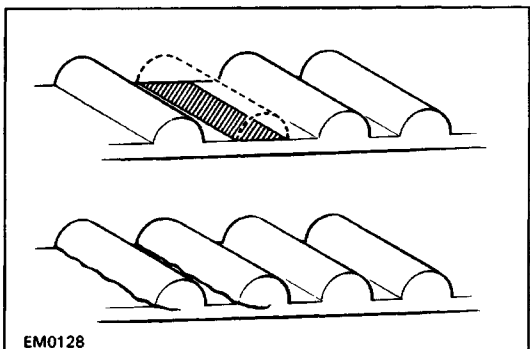
If there are any defects as shown in the illustrations, check the following points:

(a) Premature parting

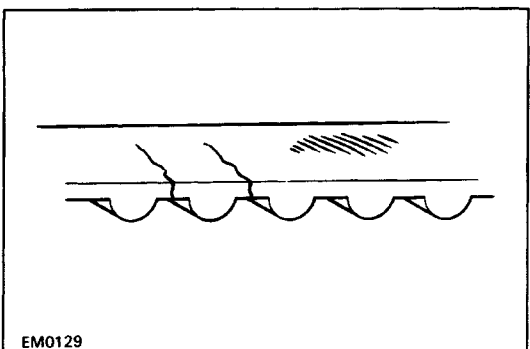
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.



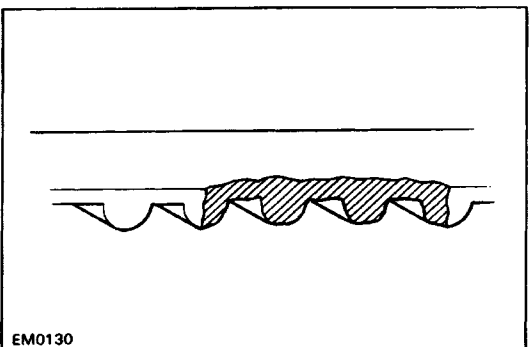
- (b) If the belt teeth are cracked or damaged, check to see if either the camshaft or water pump is locked.

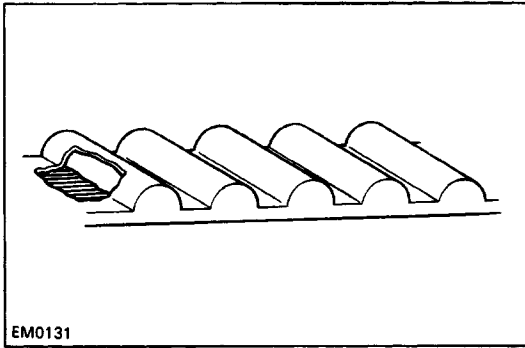


- (c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock.

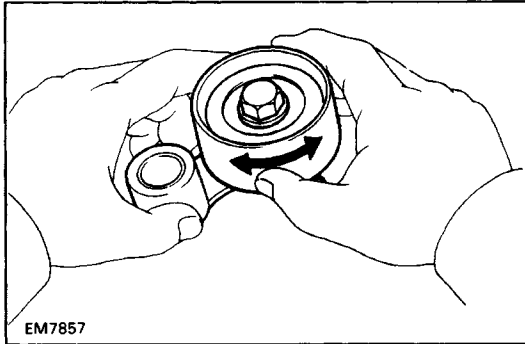


- (d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.



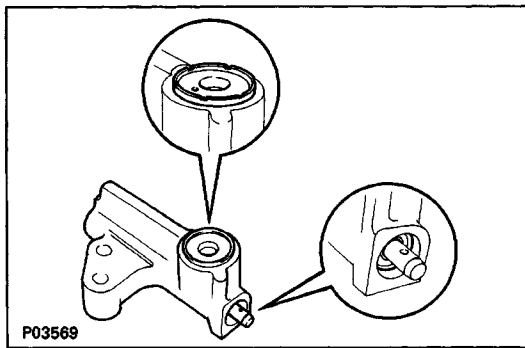


- (e) If there is noticeable wear on the belt teeth, check the timing cover for damage, correct gasket installation and the foreign material on the pulley teeth. If necessary, replace the timing belt.



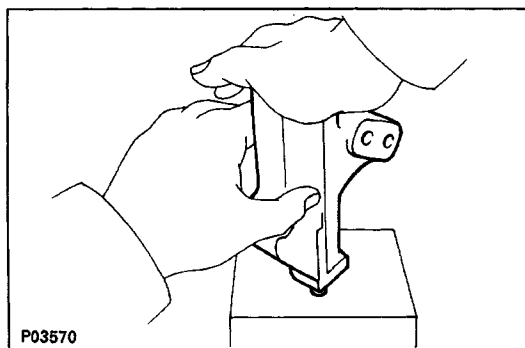
2. INSPECT IDLER PULLEYS

- Check that the idler pulley turns smoothly. If necessary, replace the idler pulley.

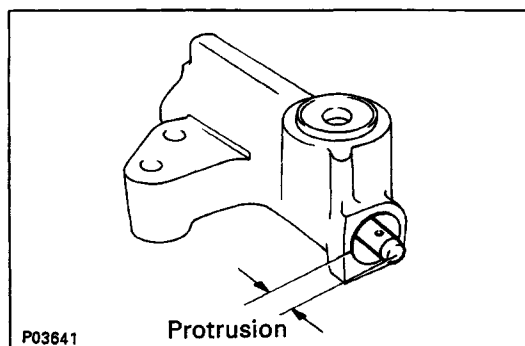


3. INSPECT TIMING BELT TENSIONER

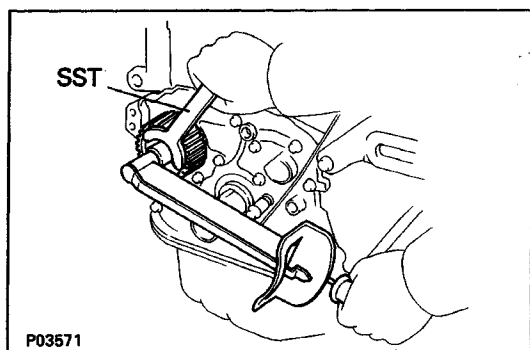
- (a) Visually check tensioner for oil leakage.
HINT: If there is only a small trace of oil on the seal of the push rod, the tensioner is all right. If leakage is found, replace the tensioner.



- (b) Hold the tensioner with both hands, and push the push rod strongly against the floor or wall to check that it doesn't move. If the push rod moves, replace the tensioner.



- (c) Measure the protrusion of the push rod from the housing end.
Protrusion: 8.5 – 9.5 mm (0.335 – 0.374 in.)
 If the protrusion is not as specified, replace the tensioner.



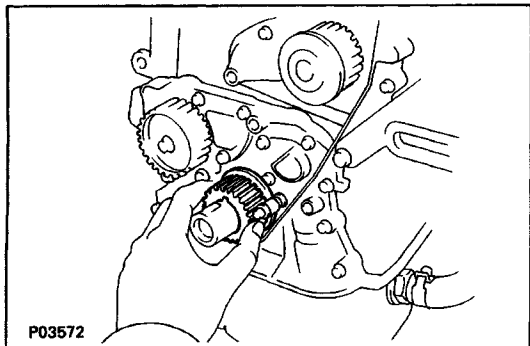
INSTALLATION OF TIMING BELT

(See page EM-46)

1. INSTALL OIL PUMP PULLEY

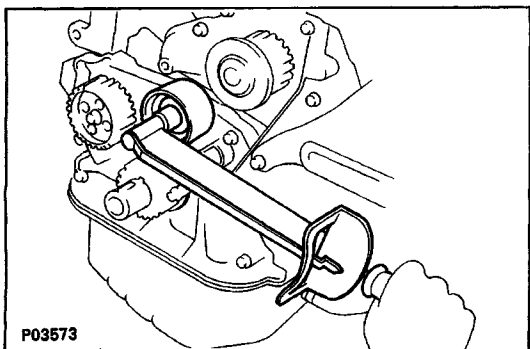
- (a) Align the cutouts of the pulley and shaft, and slide the pulley.
- (b) Using SST, install the nut.
SST 09616-30011

Torque: 35 N-m (355 kgf-cm, 26 ft-lbf)



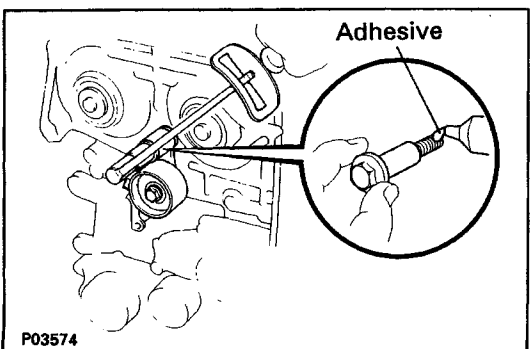
2. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the pulley set key with the key groove of the pulley.
- (b) Slide on the timing pulley facing the flange side inward.



3. INSTALL NO.2 IDLER PULLEY

- (a) Install the pulley with the bolt.
Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)
- (b) Check that the idler pulley moves smoothly.



4. INSTALL NO.1 IDLER PULLEY

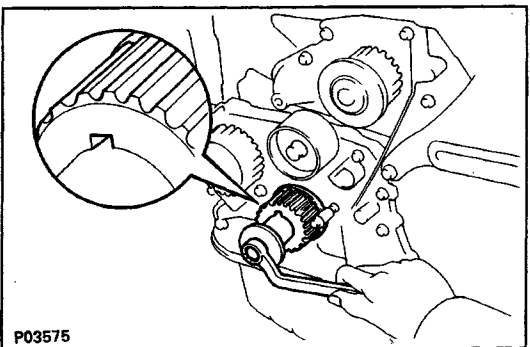
- (a) Apply adhesive to two or three threads of the pivot bolt.

Adhesive: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

- (b) Install the plate washer and pulley with the pivot bolt.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

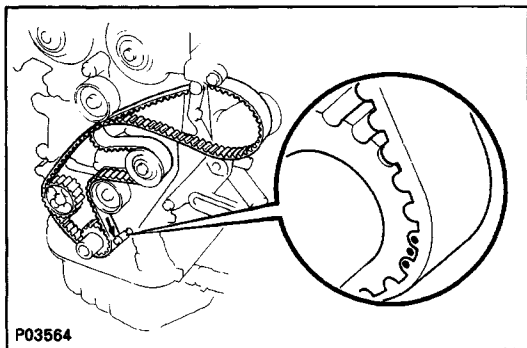
- (c) Check that the pulley bracket moves smoothly.



5. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

- (a) Using the crankshaft pulley bolt, turn the crankshaft and face the key groove of the crankshaft timing pulley upward.



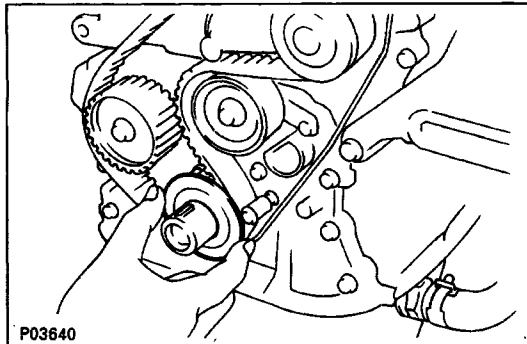
P03564

- (b) Remove any oil or water on the crankshaft pulley, oil pump pulley, water pump pulley, No.1 idler pulley and No.2 idler pulley, and keep them clean.
- (c) Install the timing belt on the crankshaft timing pulley, oil pump pulley, No.2 idler pulley, water pump pulley and No.1 idler pulley.

HINT (when re-using timing belt) : Align the matchmarks of the crankshaft timing pulley and timing belt, and install the belt with the arrow pointing in the direction of engine revolution.

6. INSTALL TIMING BELT GUIDE

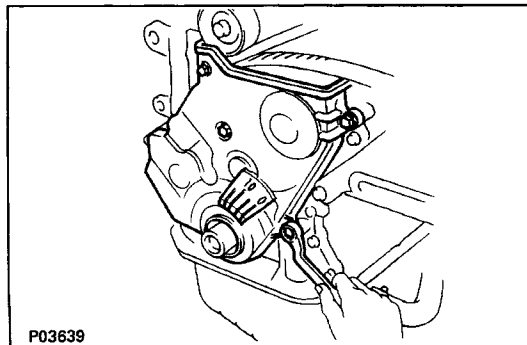
Install the guide, facing the cup side outward.



P03640

7. INSTALL NO.1 TIMING BELT COVER

- (a) Install the gasket to the timing belt cover.
- (b) Install the timing belt cover with the six bolts.



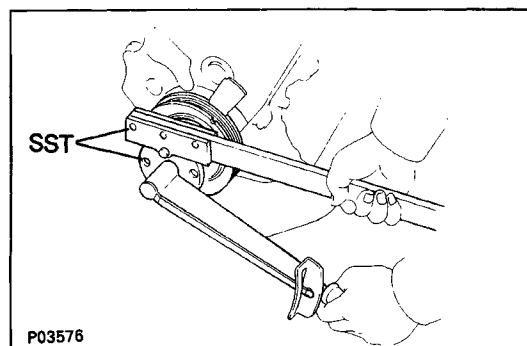
P03639

8. INSTALL CRANKSHAFT PULLEY

- (a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.
- (b) Using SST, install and torque the bolt.

SST 09213-54015 (90119-08216) and 09330-00021

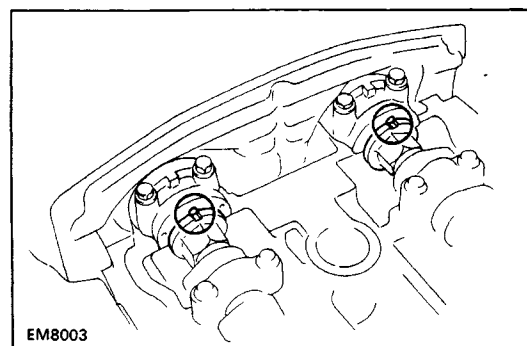
Torque: 108 N-m (1,100 kgf-cm, 80 ft-lbf)



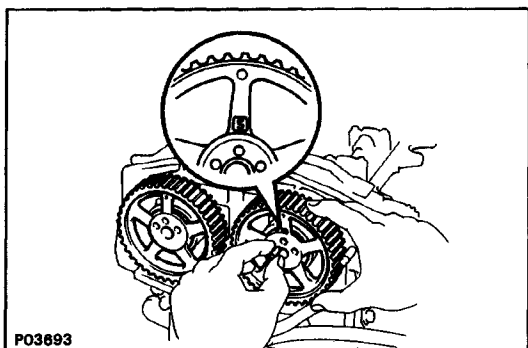
P03576

9. INSTALL CAMSHAFT TIMING PULLEYS

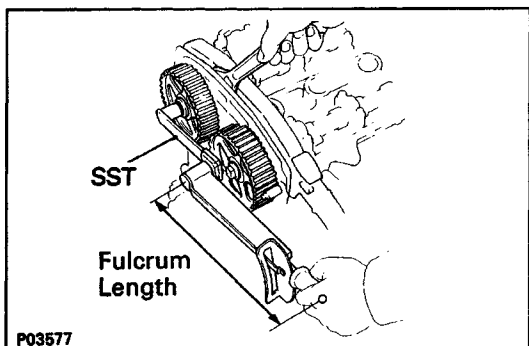
- (a) Using a wrench, turn and align the groove of the camshaft with the drilled mark of the No.1 camshaft bearing cap.



EM8003



- (b) Slide the timing pulley onto the camshaft, facing mark "S" upward.
- (c) Align the pin holes of the camshaft and timing pulley, and insert the knock pin.



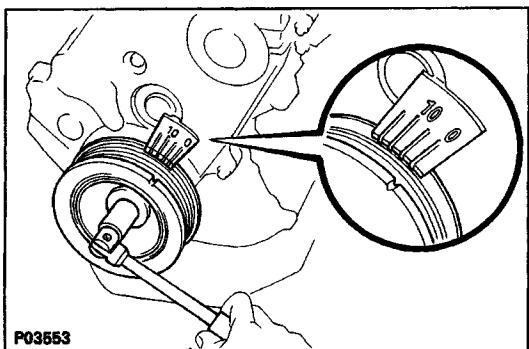
- (d) Hold the hexagon wrench head portion of the camshaft with a wrench, and tighten the bolts.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)

41 N-m (420 kgf-cm, 30 ft-lbf)

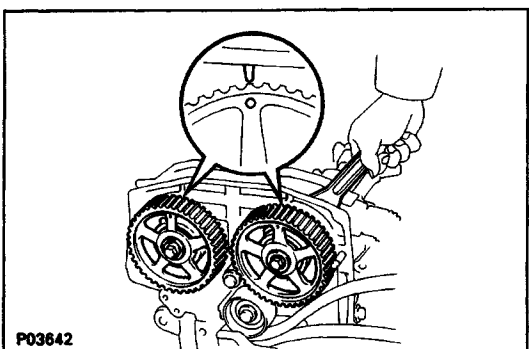
HINT (intake camshaft timing pulley):

- Use SST.
SST 09249-63010
- Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

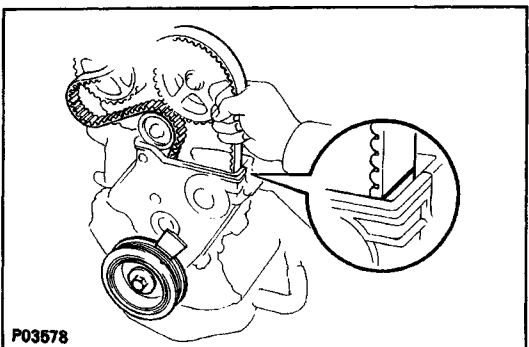


10. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley, and align its groove with timing mark "0" of the No.1 timing belt cover.



- (b) Turn the camshaft, and align the timing marks of the camshaft timing pulleys and No.3 timing belt cover.



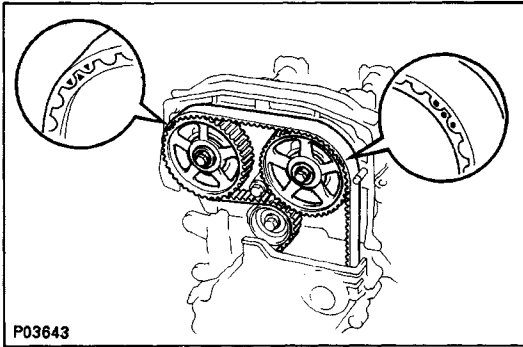
11. INSTALL TIMING BELT

HINT (When re-using timing belt):

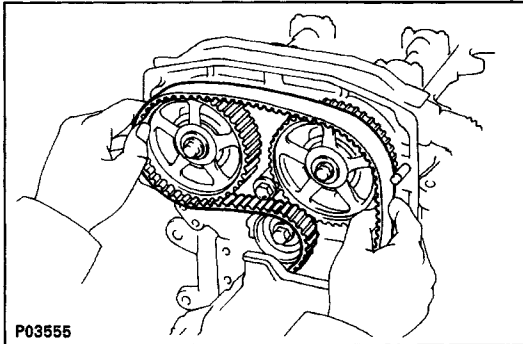
- Check that the matchmark on the timing belt matches the end of the No.1 timing belt cover.

If the matchmark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.

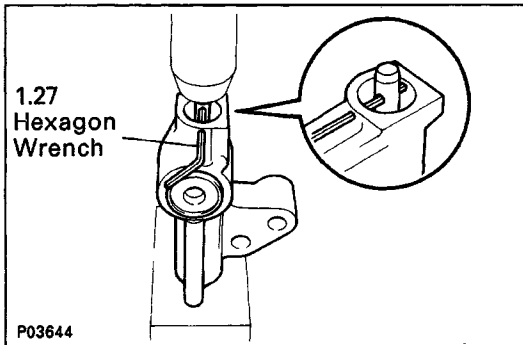
(See page [EM-50](#))



- Align the matchmarks of the timing belt and camshaft timing pulleys.

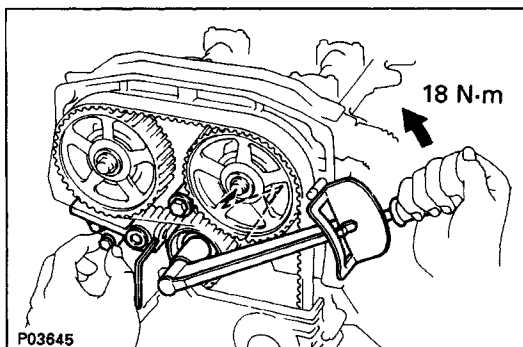


- Remove any oil or water on the camshaft timing pulley, and keep it clean.
- Install the timing belt, checking the tension between the crankshaft timing pulley and intake camshaft timing pulley.



12. SET TIMING BELT TENSIONER

- Using a press, slowly press in the push rod using 100 – 1,000 kg (220 – 2,205 lb, 981 – 9,807 N) of pressure.
- Align the holes of the push rod and housing, pass a 1.27 mm hexagon wrench through the holes to keep the setting position of the push rod.
- Release the press.

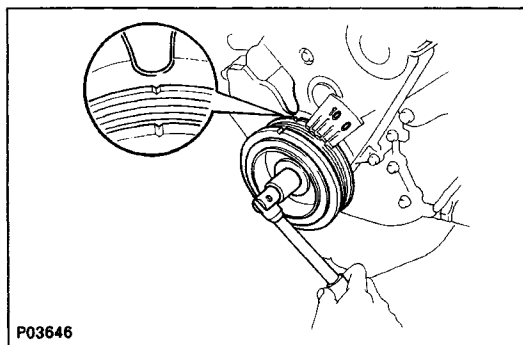


13. INSTALL TIMING BELT TENSIONER

- Turn the No.1 idler pulley bolt counterclockwise to obtain the specified torque toward the left as far as the No.1 idler pulley will go, and temporarily install the tensioner with the two bolts.

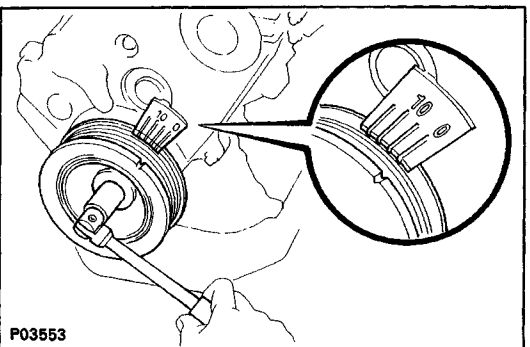
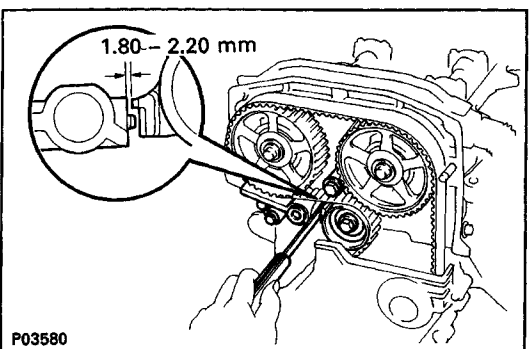
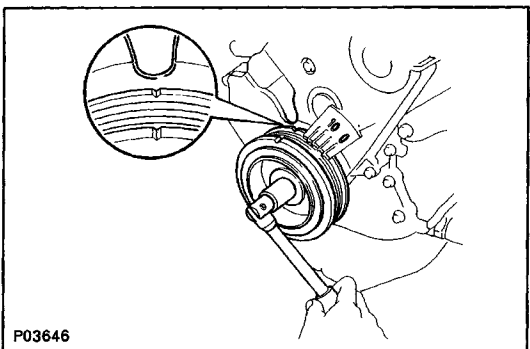
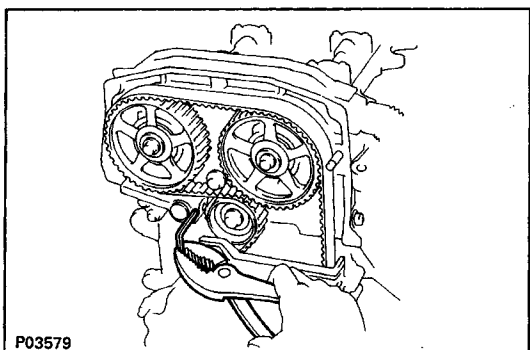
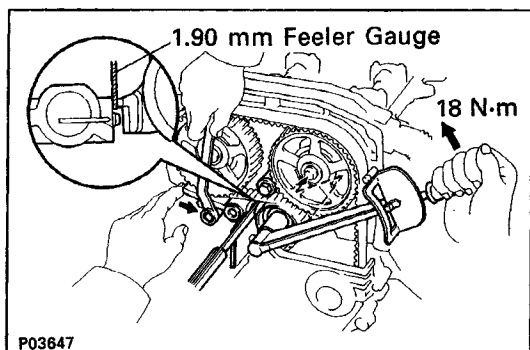
Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

NOTICE: To apply the correct torque, apply the torque wrench along the axis through the bolts of the No.1 idler pulley and exhaust camshaft timing pulley.



- Slowly turn the crankshaft pulley 5/6 revolution, and align its groove with the ATDC 60° mark of the No.1 timing belt cover.

NOTICE: Always turn the crankshaft clockwise.



- (c) Insert a 1.90 mm (0.075 in.) feeler gauge between the tensioner body and No.1 idler pulley stopper.
 (d) Turn the No.1 idler pulley bolt counterclockwise to obtain the specified torque.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

NOTICE: To apply the correct torque, apply the torque wrench along the axis through the bolts of the No.1 idler pulley and exhaust camshaft timing pulley.

- (e) While pushing the tensioner, alternately tighten the two bolts.

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

- (f) Remove the 1.90 mm (0.075 in.) feeler gauge.
 (g) Remove the 1.27 mm hexagon wrench from the tensioner.

- (h) Slowly turn the crankshaft pulley one revolution, and align its groove with the ATDC 60° mark of the No.1 timing belt cover.

NOTICE: Always turn the crankshaft clockwise.

- (i) Using a feeler gauge, check the specified clearance between the tensioner body and No.1 idler pulley stopper.

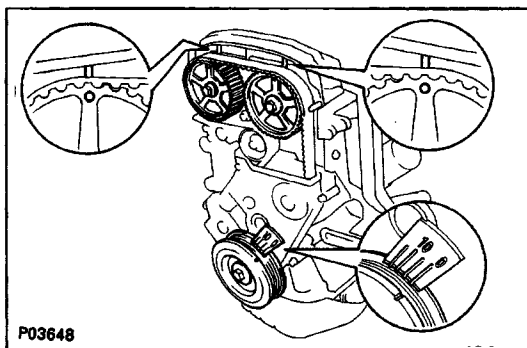
Clearance: 1.80 - 2.20 mm (0.071 - 0.087 in.)

If the clearance is not as specified, remove the tensioner and reinstall it.

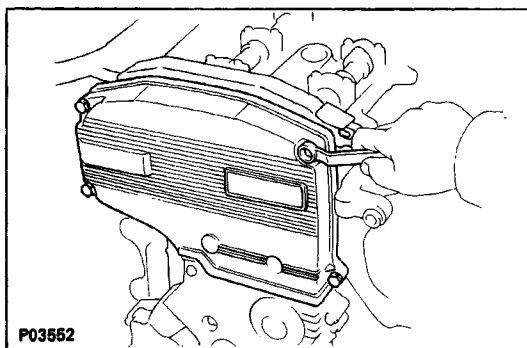
14. CHECK VALVE TIMING

- (a) Slowly turn the crankshaft pulley two revolutions from TDC to TDC.

NOTICE: Always turn the crankshaft clockwise.



- (b) Check that each pulley aligns with the timing marks as shown in the illustration.
If the marks do not align, remove the timing belt and reinstall it.



15. INSTALL NO.2 TIMING BELT COVER

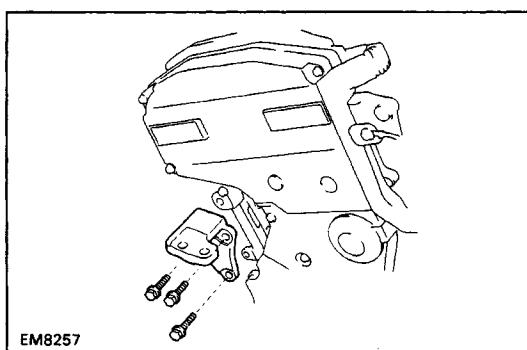
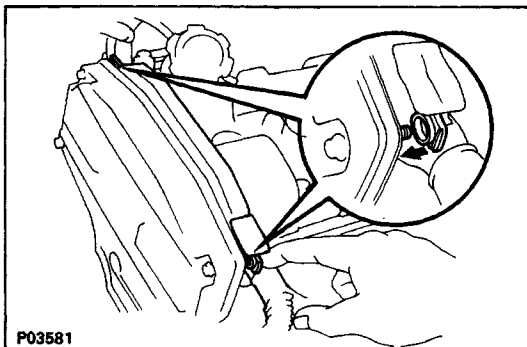
- (a) Install the gasket to the timing belt cover.
(b) Install the belt cover with the five bolts.

16. INSTALL SPARK PLUGS (See page IG-13)

Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

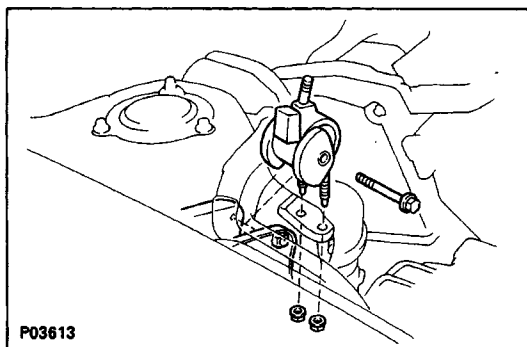
17. INSTALL CYLINDER HEAD COVER

- (a) Install the cylinder head cover.
(See step 7 on pages EM-143 and 144)
(b) Install the engine wire protector between the cylinder head cover and No.3 timing belt cover.



18. INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the three bolts.
Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)



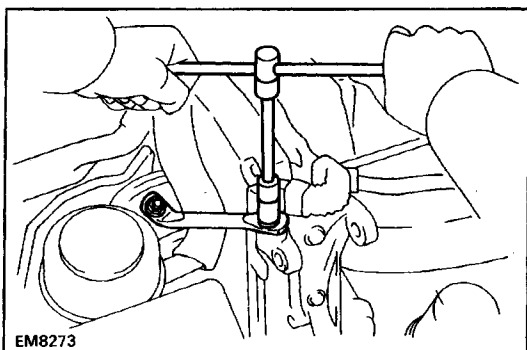
19. INSTALL RH ENGINE MOUNTING INSULATOR

Install the mounting insulator with the through bolt and two nuts.

Torque:

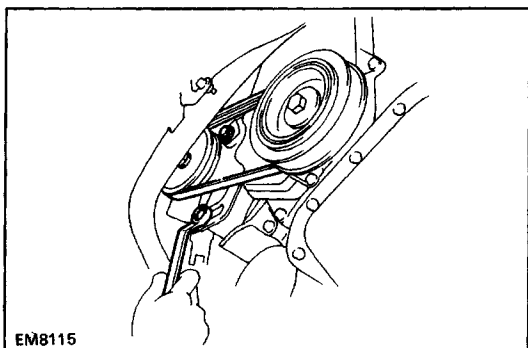
Nut 52 N-m (530 kgf-cm, 38 ft-lbf)

Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

**20. INSTALL RH ENGINE MOUNTING STAY**

Install the mounting stay with the bolt and nut.

Torque: 73 N-m (740 kgf-cm, 54 ft-lbf)

**21. INSTALL PS DRIVE BELT**

Install the drive belt with the pivot bolt and adjusting bolt.

22. INSTALL THROTTLE BODY

(See steps 2, 3, 5 to 8, 10 and 11 on pages [FI-197](#) and [198](#))

23. INSTALL EGR VALVE AND PIPE

(See step 19 on page [EM-145](#))

24. INSTALL EGR VACUUM MODULATOR AND VSV

(See step 20 on page [EM-146](#))

25. INSTALL INTERCOOLER

(See steps 11 to 13 on page [TC-17](#))

26. INSTALL ALTERNATOR (See page [CH-23](#))**27. INSTALL RH ENGINE UNDER COVER****28. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY****29. CHECK AND ADJUST DRIVE BELTS**

(a) Adjust the alternator drive belt.

Drive belt tension:

w/ A/C	New belt	165 ± 10 lbf
	Used belt	84 ± 15 lbf
w/o A/C	New belt	150 ± 25 lbf
	Used belt	130 ± 20 lbf

(b) Adjust the PS drive belt.

Drive belt tension:	New belt	125 ± 25 lbf
	Used belt	80 ± 20 lbf

30. INSTALL RH FRONT WHEEL

ADJUSTMENT OF VALVE TIMING

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE RH FRONT WHEEL

3. REMOVE RH ENGINE UNDER COVER

4. REMOVE ALTERNATOR (See page CH-7)

5. REMOVE INTERCOOLER

(See steps 13 to 15 on pages TC-9 and 10)

6. REMOVE SPARK PLUGS

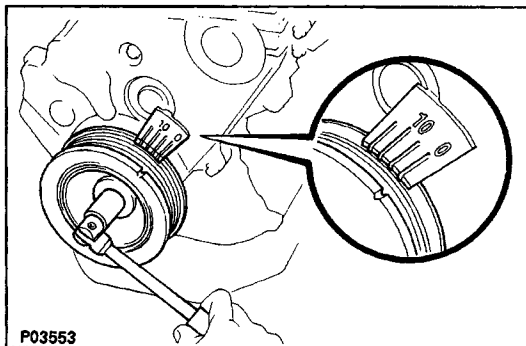
7. REMOVE NO.2 TIMING BELT COVER

(See step 16 on page EM-48)

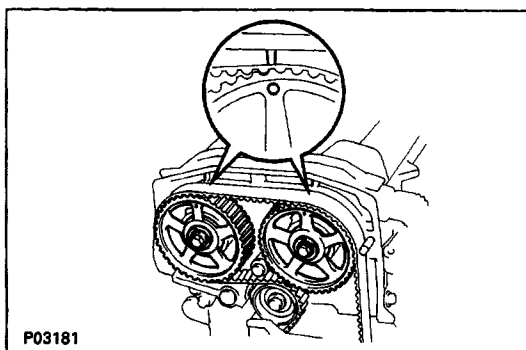
8. CHECK CAMSHAFT TIMING PULLEY MARKS

(a) Turn the crankshaft pulley, and align its groove with timing mark "0" of the No.1 timing belt cover.

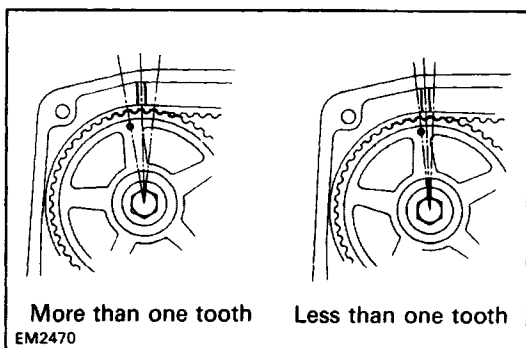
NOTICE: Always turn the crankshaft clockwise.

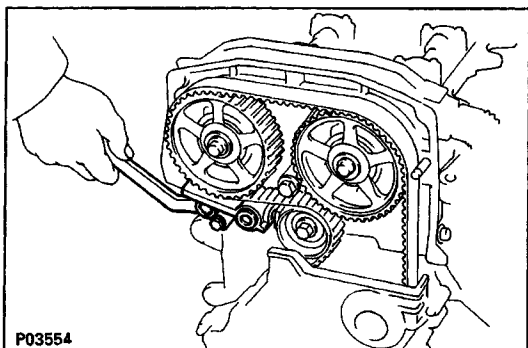


(b) Check that the timing marks of the camshaft timing pulleys are aligned with the timing mark of the No.3 timing belt cover.

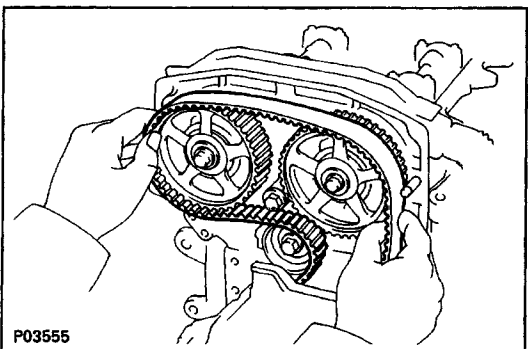


- If there is more than one timing pulley tooth between the timing marks, realign the timing marks in accordance with step 13.
- If the timing marks are aligned or the difference is less than one timing pulley tooth, proceed to step 14.

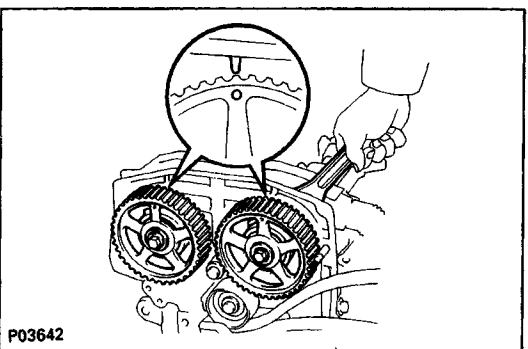


9. REMOVE EGR VACUUM MODULATOR AND VSV(See step 20 on page [EM-121](#))**10. REMOVE EGR VALVE AND PIPE**(See step 21 on page [EM-121](#))**11. REMOVE THROTTLE BODY**(See steps 2, 3, 5 to 8, 10 and 11 on pages [FI-194](#) and 195)**12. REMOVE CYLINDER HEAD COVER**(See step 33 on page. [EM-124](#))**13. ADJUST CAMSHAFT TIMING PULLEY TIMING MARKS**

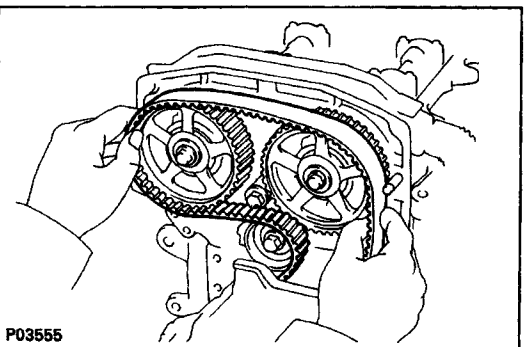
(a) Remove the two bolts and timing belt tensioner.



(b) Remove the timing belt from the camshaft timing pulleys.

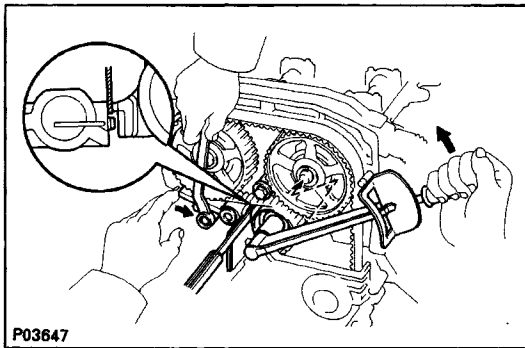


(c) Rotate the camshaft with a wrench and align the alignment marks of the camshaft timing pulley and No.3 timing belt cover.

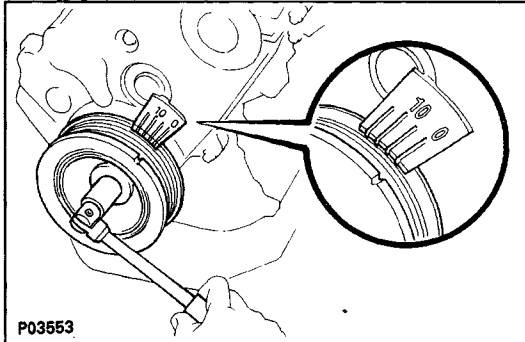


(d) Reinstall the timing belt, checking the tension between the crankshaft timing pulley and intake camshaft timing pulley.

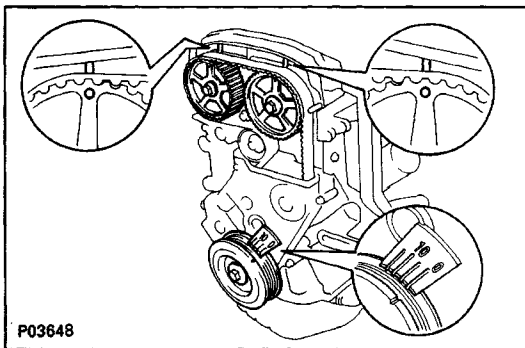
NOTICE: Install the timing belt when the engine is cold.



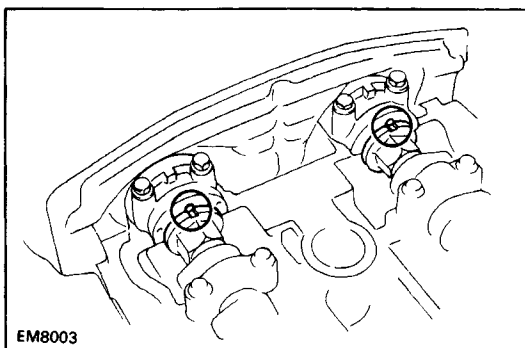
- (e) Install the timing belt tensioner with the two bolts.
 (See steps 12 and 13 on page [EM-58](#))
Torque: 21 N-m (210 kgf-cm, 15 ft-lbf)



- (f) Turn the crankshaft pulley two revolutions from TDC to TDC.
NOTICE: Always turn the crankshaft clockwise.



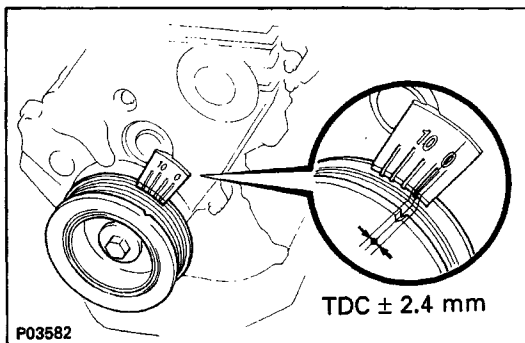
- (g) Check that each pulley aligns with the timing marks as shown in the illustration.



14. CHECK VALVE TIMING

- (a) Using a wrench, turn and align the groove of the camshaft with the drilled mark of the No.1 camshaft bearing cap.

NOTICE: Always turn the crankshaft clockwise.

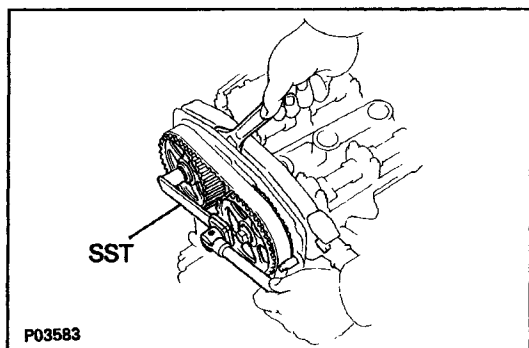


- (b) Next make a note of the crankshaft pulley angle on the No.1 timing belt cover.

HINT: Perform this check separately for the intake and exhaust sides.

If the crankshaft pulley movement is within ± 2.4 mm (0.094 in.) of TDC, it is correct.

If it is greater than 2.4 mm (0.094 in.), go back to step 11.



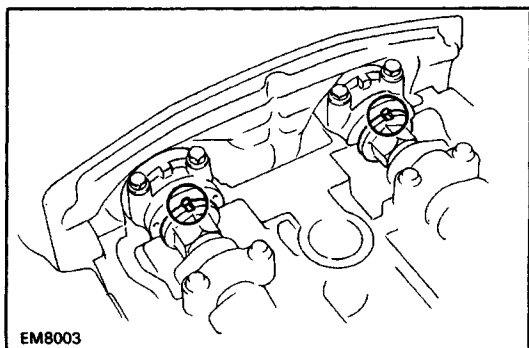
15. ADJUST VALVE TIMING

- (a) Hold the hexagon wrench head portion of the camshaft with a wrench, and remove the two camshaft timing pulley bolts.

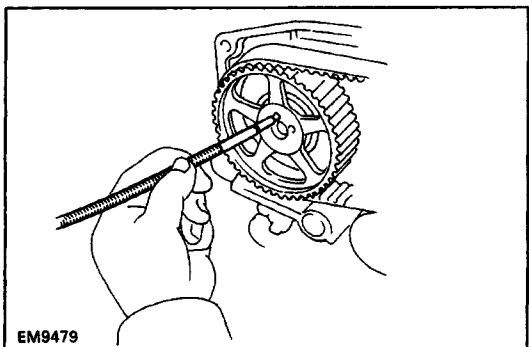
HINT (Intake camshaft timing pulley): Use SST.

SST 09249-63010

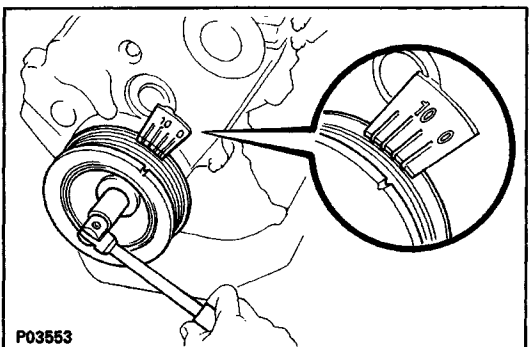
NOTICE: Do not make use of the timing belt tension when loosening the pulley bolts.



- (b) Check that the camshaft grooves are aligned with the drilled mark of the No.1 camshaft bearing cap.

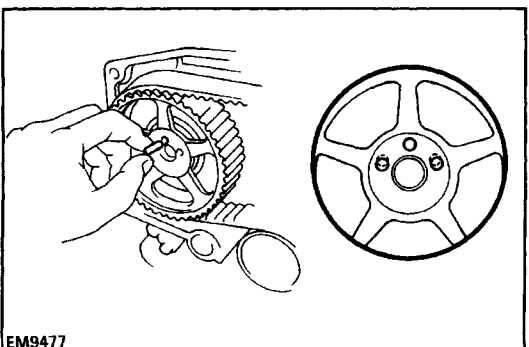


- (c) Using a magnetic finger, remove the knock pin from the pin hole of the camshaft timing pulley.



- (d) Turn the crankshaft pulley, and align its groove with timing mark "0" of the No.1 timing belt cover.

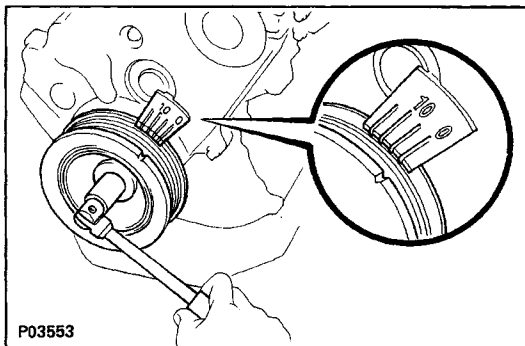
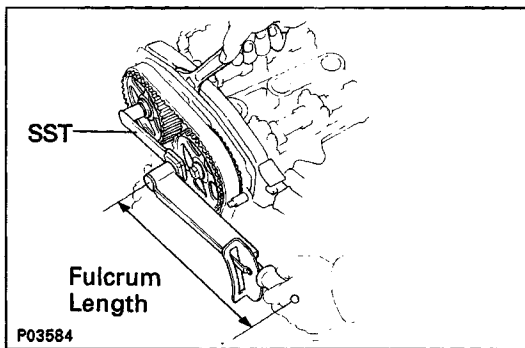
NOTICE: Always turn the crankshaft clockwise.



- (e) Select one overlapped hole of the camshaft and timing pulley, and insert the match pin into it.

HINT:

- If there is not an overlapped hole, rotate the crankshaft a little and insert the pin into the nearly overlapped hole.
- By changing the pin hole to the next one, the crankshaft pulley angle can be adjusted by approx. 2°.
- By changing the pin hole to the next two, the crankshaft pulley angle can be adjusted by approx. 5°.



(f) Hold the hexagon wrench head portion of the camshaft with a wrench, and install the pulley bolt.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)

41 N-m (420 kgf-cm, 30 ft-lbf) for SST

HINT (Intake camshaft timing pulley):

- Use SST.
SST 09249-63010
- Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

NOTICE: Do not make use of the timing belt tension when tightening the bolt.

(g) Turn the crankshaft clockwise two revolutions from TDC to TDC.

(h) Recheck the valve timing.

(See step 14 on page [EM-64](#))

16. REINSTALL NO.2 TIMING BELT COVER

(See step 15 on page [EM-60](#))

17. REINSTALL SPARK PLUGS (See page [IG-13](#))

Torque: 180 kg-cm (13 ft-lb, 18 N-m)

18. REINSTALL CYLINDER HEAD COVER

(See step 7 on pages [EM-143](#) and 144)

19. REINSTALL THROTTLE BODY

(See steps 2, 3, 5 to 8, 10 and 11 on pages [FI-197](#) and 198)

20. REINSTALL EGR VALVE AND PIPE

(See step 19 on page [EM-145](#))

21. REINSTALL EGR VACUUM MODULATOR AND VSV

(See step 20 on page [EM-146](#))

22. REINSTALL INTERCOOLER

(See steps 11 to 13 on page [TC-17](#))

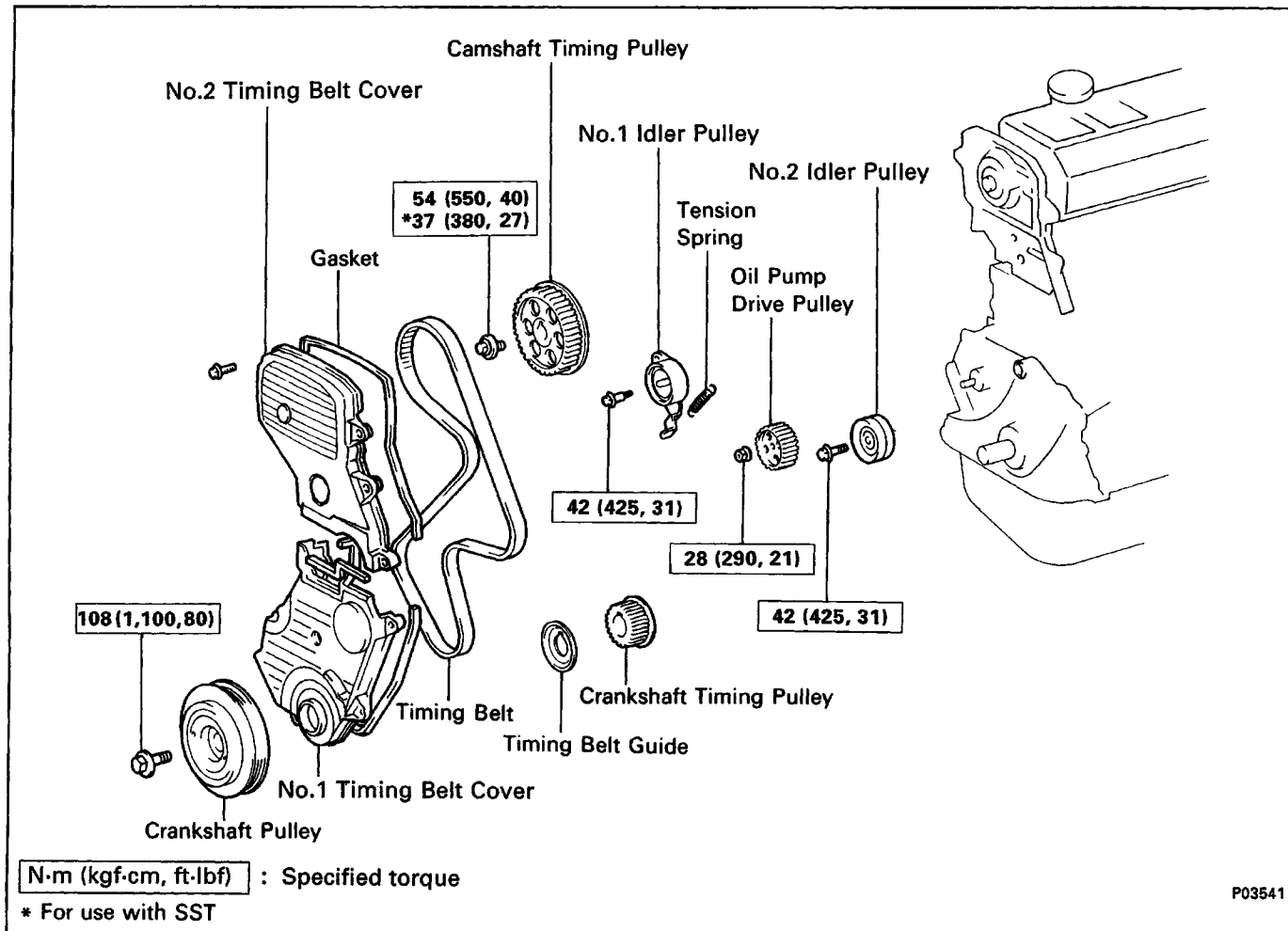
23. REINSTALL ALTERNATOR (See page [CH-23](#))

24. REINSTALL RH ENGINE UNDER COVER

25. REINSTALL RH FRONT WHEEL

26. RECONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

TIMING BELT (5S-FE) COMPONENTS

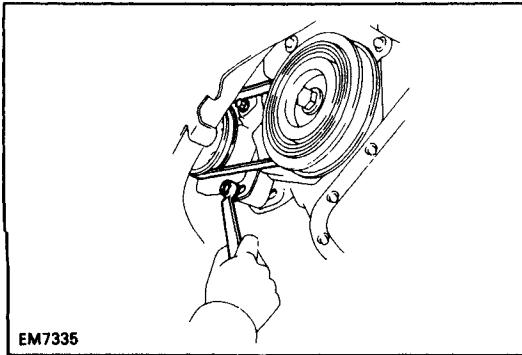


REMOVAL OF TIMING BELT

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

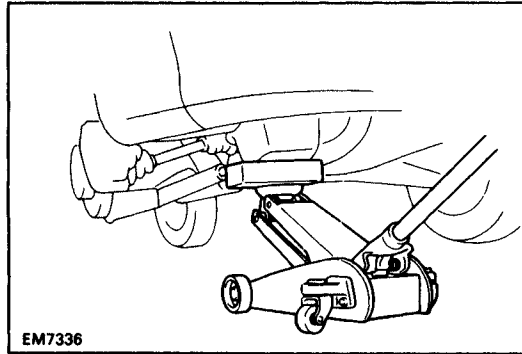
2. REMOVE RH FRONT WHEEL
3. REMOVE RH ENGINE UNDER COVER
4. (w/ CRUISE CONTROL SYSTEM (w/o ABS))
REMOVE CRUISE CONTROL ACTUATOR
(See page 11 on page [EM-270](#))
5. REMOVE ALTERNATOR (See page [CH-9](#))



EM7335

6. REMOVE PS DRIVE BELT

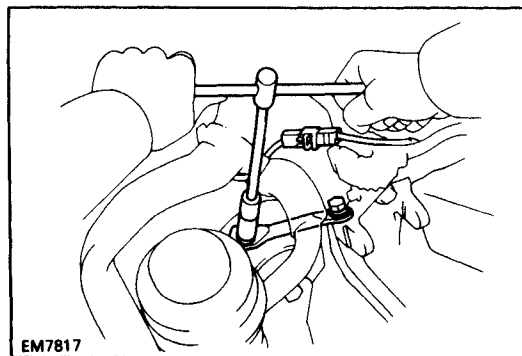
Loosen the two bolts, and remove the drive belt.



EM7336

7. SLIGHTLY JACK UP ENGINE

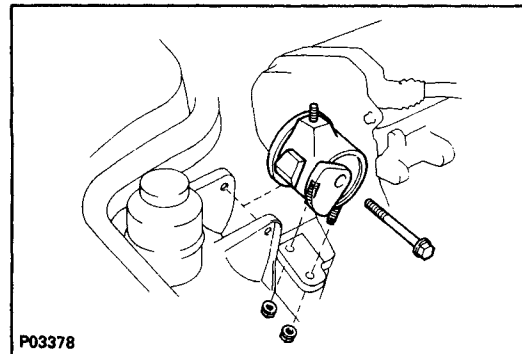
Raise the engine enough to remove the weight from the engine mounting on the right side.



EM7817

8. DISCONNECT CONNECTOR FROM GROUND WIRE ON RH FENDER APRON**9. REMOVE RH ENGINE MOUNTING STAY**

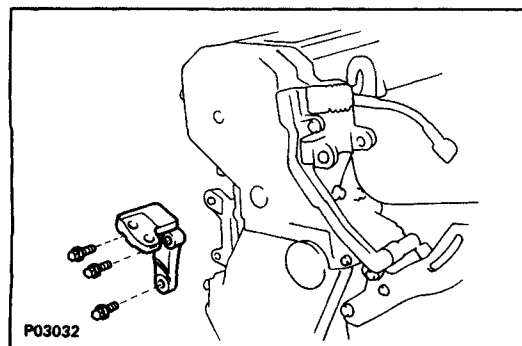
Remove the bolt, nut and mounting stay.

10. DISCONNECT PS RESERVOIR TANK FROM BRACKET

P03378

11. REMOVE RH ENGINE MOUNTING INSULATOR

Remove the through bolt, two nuts and mounting insulator.



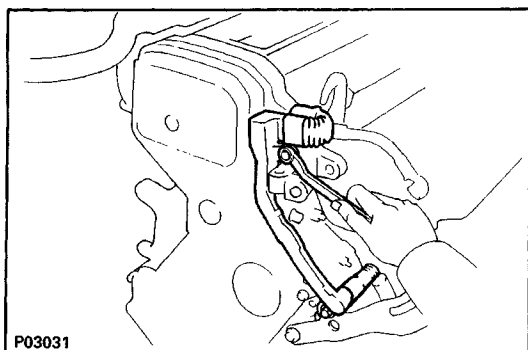
P03032

12. REMOVE RH ENGINE MOUNTING BRACKET

Remove the three bolts and mounting bracket.

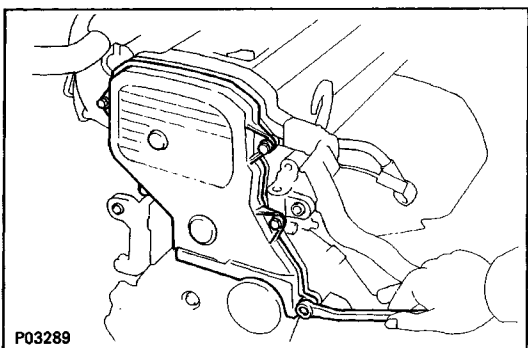
HINT: Lower the jack and perform the operation with the engine fully down.

13. REMOVE SPARK PLUGS



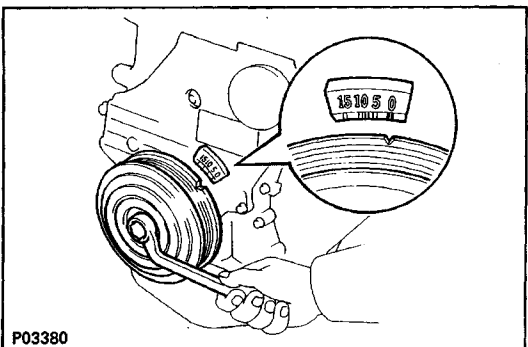
14. DISCONNECT ENGINE WIRE FROM ALTERNATOR BRACKET AND ADJUSTING BAR

Remove the two bolts, and disconnect the engine wire from the alternator bracket and adjusting bar.



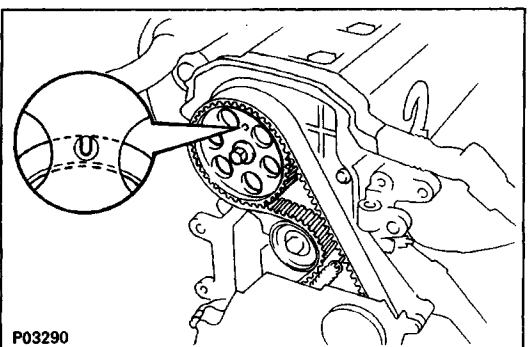
15. REMOVE NO.2 TIMING BELT COVER

Remove the five bolts, timing belt cover and two gas-kets.

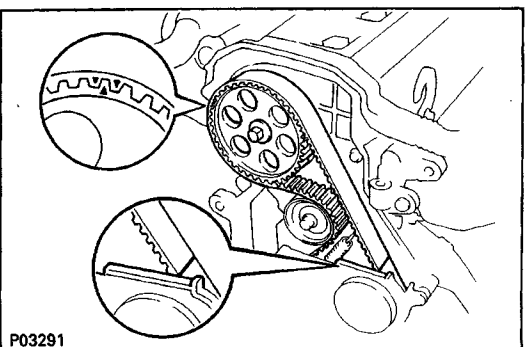


16. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.

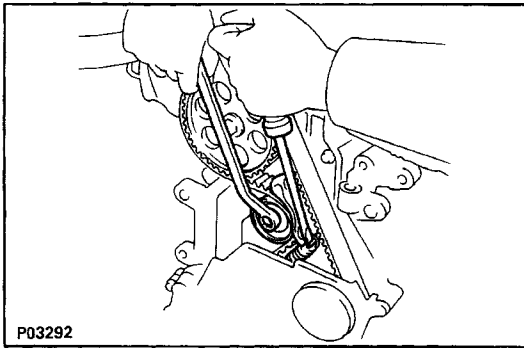


(b) Check that the hole of the camshaft timing pulley is aligned with the timing mark of the bearing cap. If not, turn the crankshaft one revolution (360°).

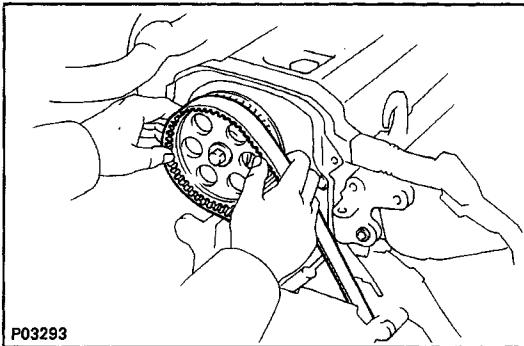


17. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY

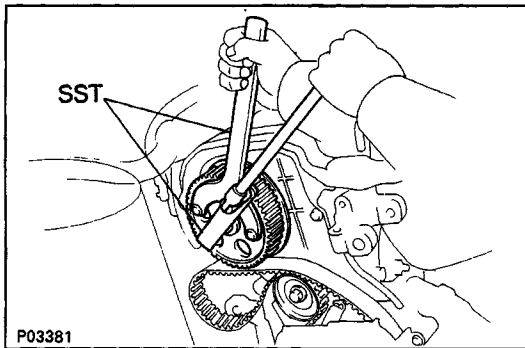
HINT (When re-using timing belt): Place the matchmarks on the timing belt and camshaft timing pulley, and place matchmark on timing belt to match the end of the No.1 timing belt cover.



- (a) Loosen the mounting bolt of the No.1 idler pulley and shift the pulley toward the left as far as it will go, and temporarily tighten it.



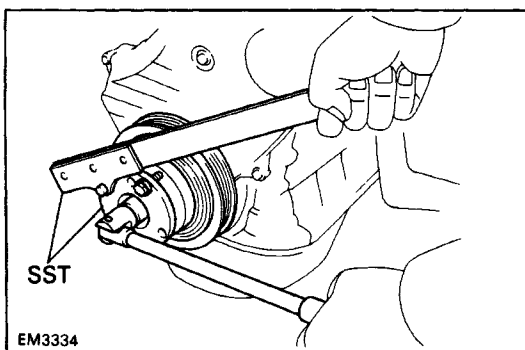
- (b) Remove the timing belt from the camshaft timing pulley.



18. REMOVE CAMSHAFT TIMING PULLEY

Using SST, remove the bolt, plate washer and timing pulley.

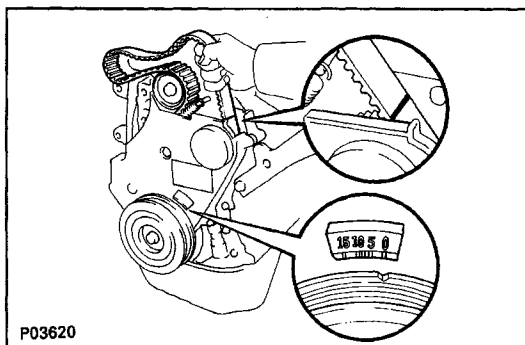
SST 09249-63010 and 09278-54012



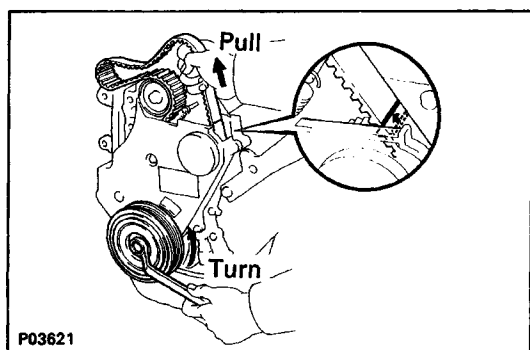
19. REMOVE CRANKSHAFT PULLEY

- (a) Using SST, remove the pulley bolt.

SST 09213-54015 (09214-00030) and 09330-00021

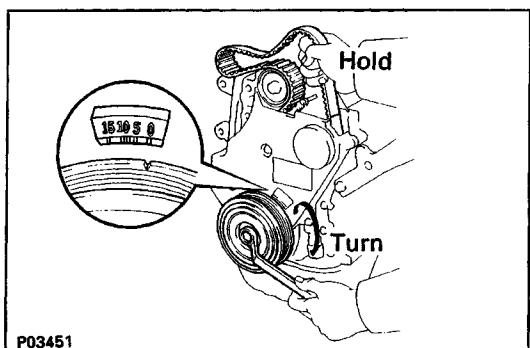


HINT (When re-using timing belt): After loosening the crankshaft pulley bolt, check that the timing belt matchmark aligns with the end of the No.1 timing belt cover when the crankshaft pulley groove is aligned with the timing mark "0" of the No.1 timing belt cover. If the matchmark does not align, align as follows:

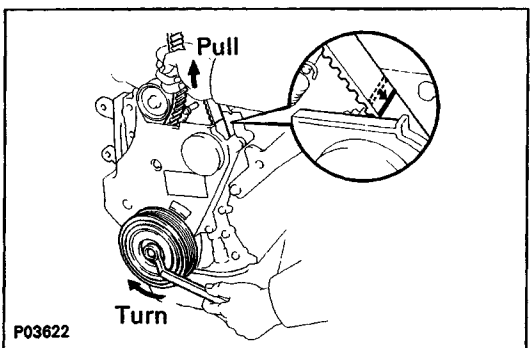


(When matchmark is out of alignment on clockwise)

- Align the matchmark by pulling the timing belt up on the water pump pulley side while turning the crankshaft pulley counterclockwise.

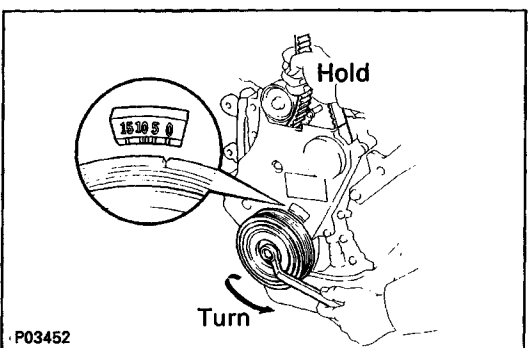


- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley clockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.

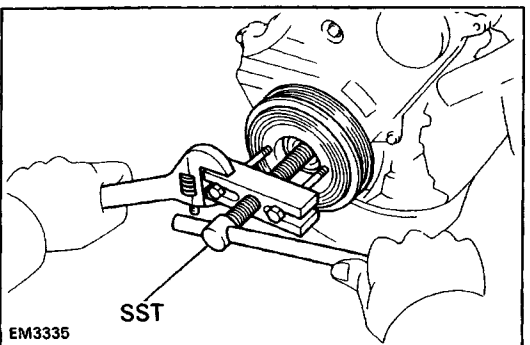


(When matchmark is out of alignment on counter-clockwise)

- Align the matchmark by pulling the timing belt up on the No.1 idler pulley side while turning the crankshaft pulley clockwise.



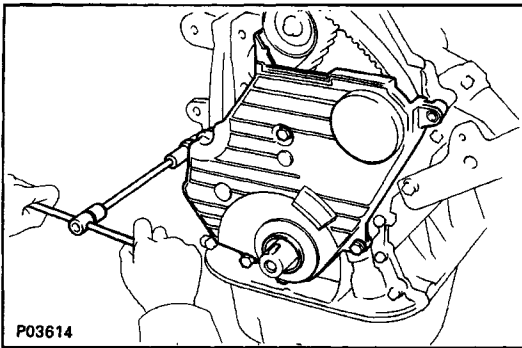
- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley counterclockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.



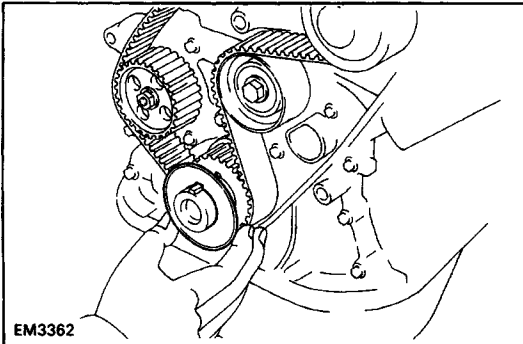
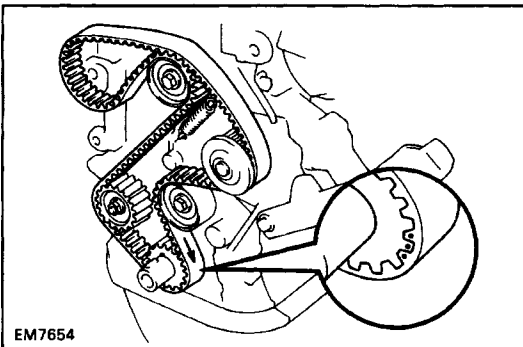
(b) Using SST, remove the pulley.

SST 09213-60017 (09213-00020, 09213-00030, 09213-00050)

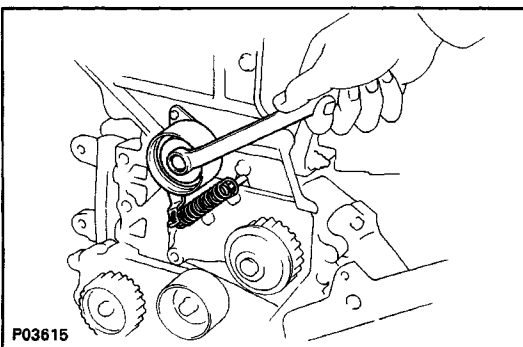
HINT (When re-using timing belt): Remove the pulley without turning it.

**20. REMOVE NO.1 TIMING BELT COVER**

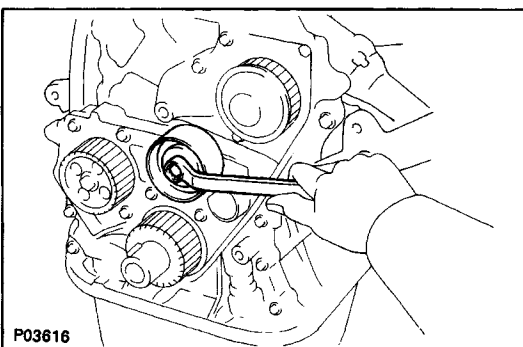
Remove the four bolts, timing belt cover and gasket.

**21. REMOVE TIMING BELT GUIDE****22. REMOVE TIMING BELT**

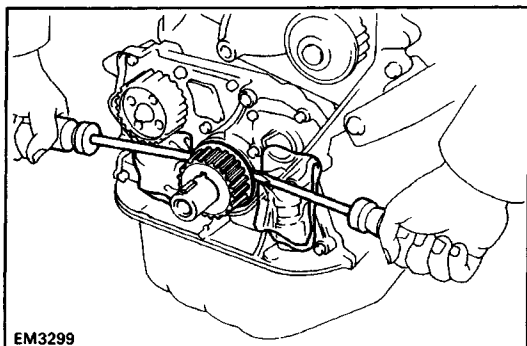
HINT (When re-using timing belt): Draw a direction arrow on the timing belt (in the direction of engine revolution), and place matchmarks on the timing belt and crankshaft timing pulley.

**23. REMOVE NO.1 IDLER PULLEY AND TENSION SPRING**

Remove the bolt, pulley and tension spring.

**24. REMOVE NO.2 IDLER PULLEY**

Remove the bolt and pulley.

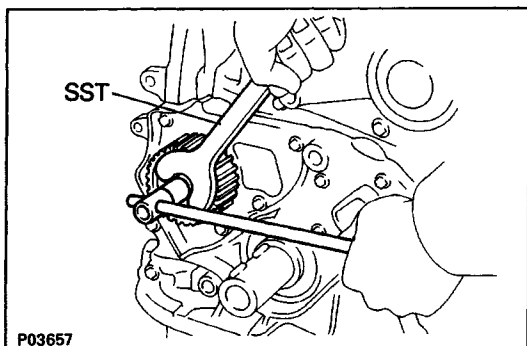


EM3299

25. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use two screwdrivers.

HINT: Position shop rags as shown to prevent damage.

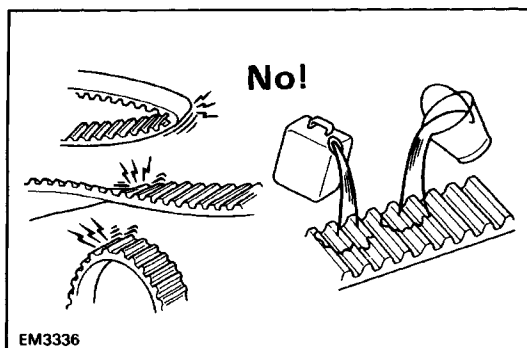


P03657

26. REMOVE OIL PUMP PULLEY

Using SST, remove the nut and pulley.

SST 09616-30011



EM3336

INSPECTION OF TIMING BELT COMPONENTS

1. INSPECT TIMING BELT

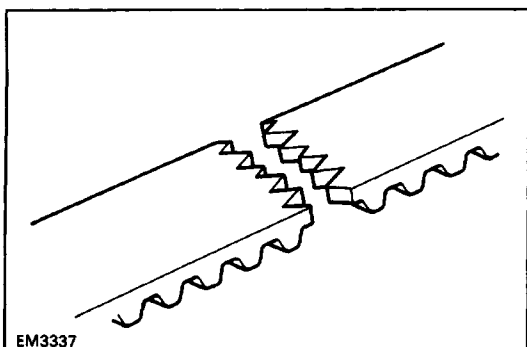
NOTICE:

- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water or steam.
- Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.

If there are any defects as shown in the illustrations, check the following points:

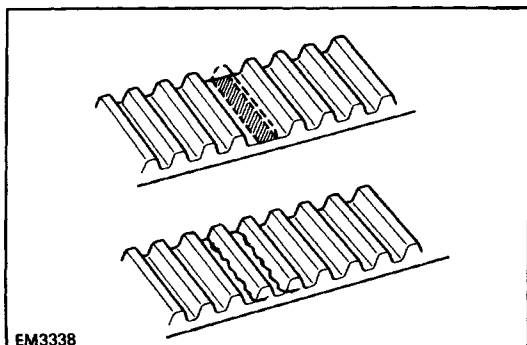
(a) Premature parting

- Check the proper installation.
- Check the timing cover gasket for damage and proper installation.

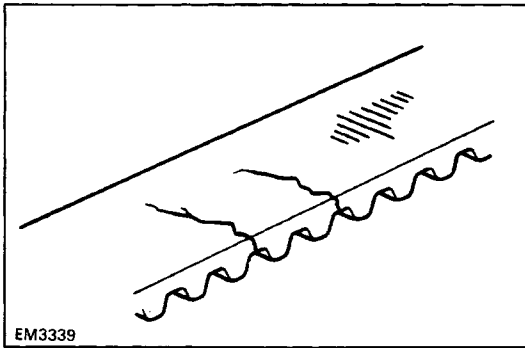


EM3337

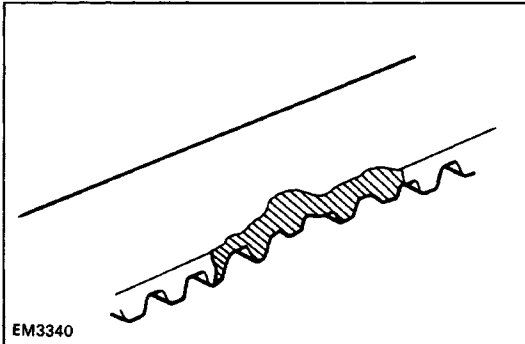
(b) If the belt teeth are cracked or damaged, check to see if either camshaft or water pump is locked.



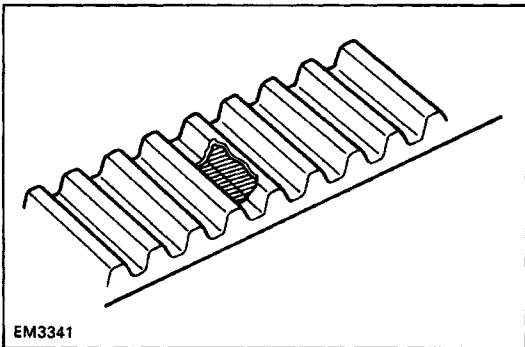
EM3338



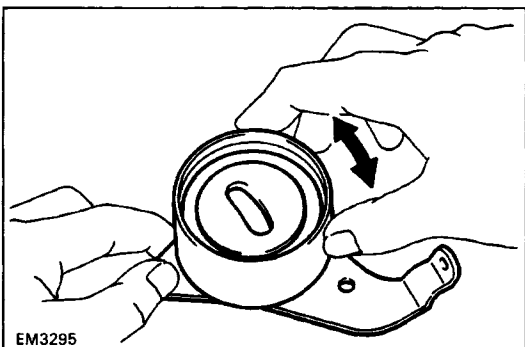
- (c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock.



- (d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.

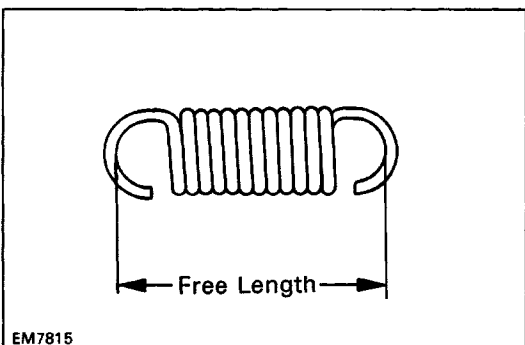


- (e) If there is noticeable wear on the belt teeth, check the timing cover for damage, correct gasket installation, and the foreign material on the pulley teeth. If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

Check that the idler pulley turns smoothly.



3. INSPECT TENSION SPRING

- (a) Measure the free length of tension spring.

Free length: 46.0 mm (1.811 in.)

If the free length is not as specified, replace the tension spring.

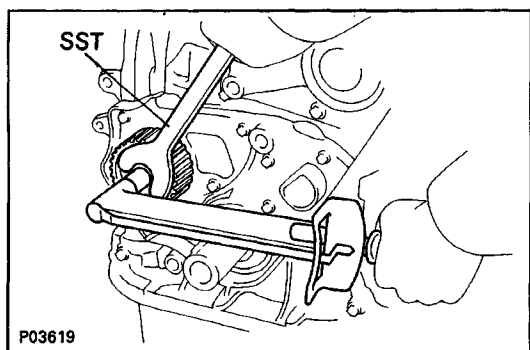
- (b) Measure the tension of the tension spring at the specified installed length.

Installed tension:

32 – 37 N (3.25 – 3.75 kgf, 7.2 – 8.3 lbf)

at 50.5 mm (1.988 in.)

If the installed tension is not as specified, replace the tension spring.



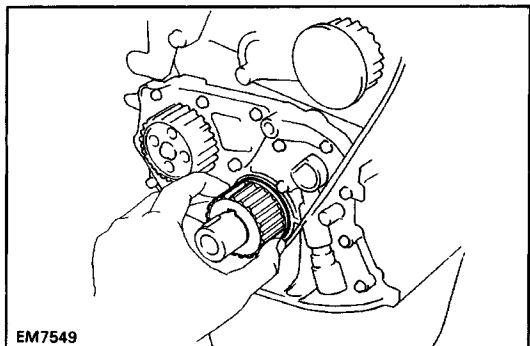
INSTALLATION OF TIMING BELT

(See page EM-67)

1. INSTALL OIL PUMP PULLEY

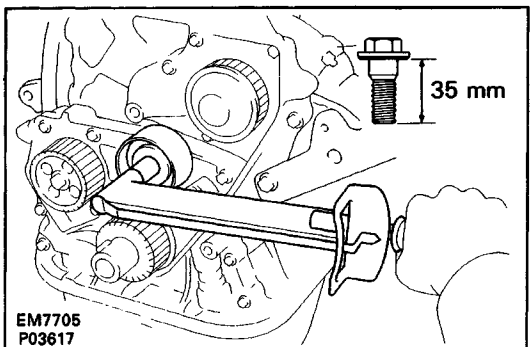
- (a) Align the cutouts of the pulley and shaft, and slide on the pulley.
- (b) Using SST, install the nut.
SST 09616-30011

Torque: 28 N-m (290 kgf-cm, 21 ft-lbf)



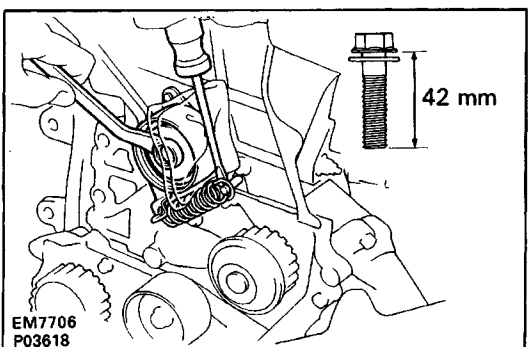
2. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the timing pulley set key with the key groove of the pulley.
- (b) Slide on the timing pulley, facing the flange side inward.



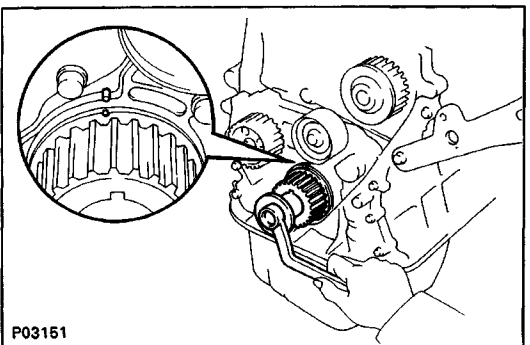
3. INSTALL NO.2 IDLER PULLEY

- (a) Install the pulley with the bolt.
Torque: 42 N-m (425 kgf-cm, 31 ft-lbf)
- HINT: Use bolt 35 mm (1.38 in.) in length.
- (b) Check that the idler pulley moves smoothly.



4. TEMPORARILY INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

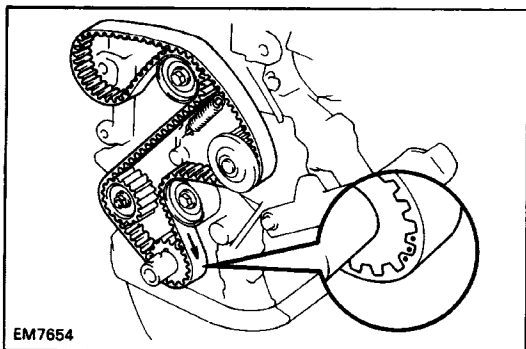
- (a) Install the pulley with the bolt. Do not tighten the bolt yet.
HINT: Use bolt 42 mm (1.65 in.) in length.
- (b) Install the tension spring.
- (c) Pry the pulley toward the left as far as it will go and tighten the bolt.
- (d) Check that the idler pulley moves smoothly.



5. TEMPORARILY INSTALL TIMING BELT

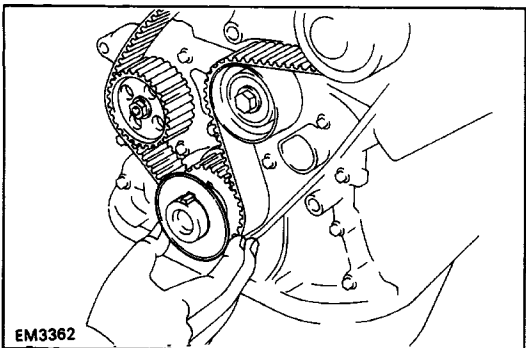
NOTICE: The engine should be cold.

- (a) Using the crankshaft pulley bolt, turn the crankshaft and align the timing marks of the crankshaft timing pulley and oil pump body.



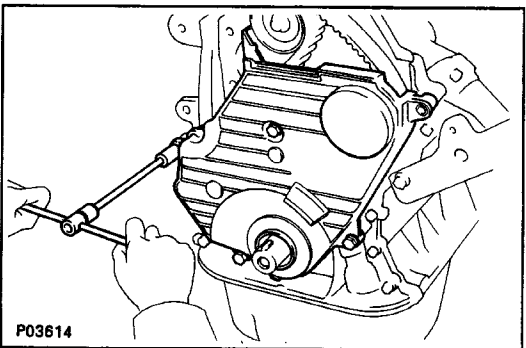
- (b) Remove any oil or water on the crankshaft pulley, oil pump pulley, water pump pulley, No.1 idler pulley, No.2 idler pulley, and keep them clean.
- (c) Install the timing belt on the crankshaft timing pulley, oil pump pulley, No.1 idler pulley, water pump pulley and No.2 idler pulley.

HINT (When re-using timing belt): Align the points marked during removal, and install the belt with the arrow pointing in the direction of engine revolution.



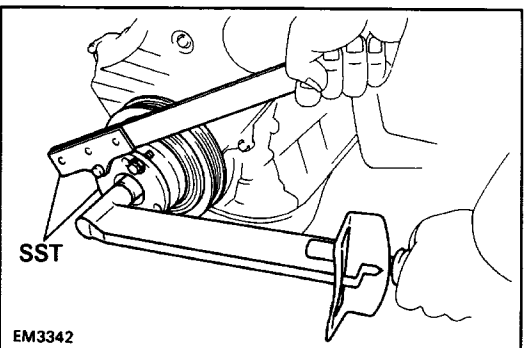
6. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.



7. INSTALL NO.1 TIMING BELT COVER

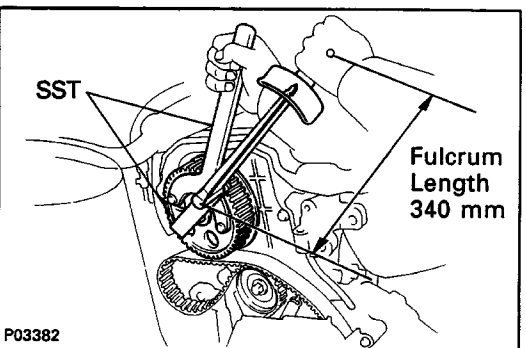
- (a) Install the gasket to the timing belt cover.
- (b) Install the timing belt cover with the four bolts.



8. INSTALL CRANKSHAFT PULLEY

- (a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.
- (b) Using SST, install the pulley bolt.
SST 09213-54015 (09214-00030) and 09330-00021

Torque: 108 N-m (1,100 kgf-cm, 80 ft-lbf)



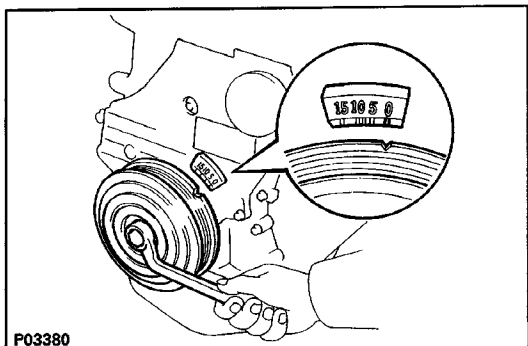
9. INSTALL CAMSHAFT TIMING PULLEY

- (a) Align the camshaft knock pin with the knock pin groove of the pulley, and slide on the timing pulley.
- (b) Using SST, install the plate washer and bolt.
SST 09249-63010 and 09278-54012

Torque: 54 N-m (550 kgf-cm, 40 ft-lbf)

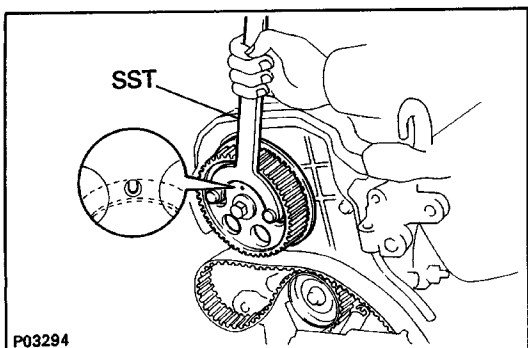
37 N-m (380 kgf-cm, 27 ft-lbf) for SST

HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.)



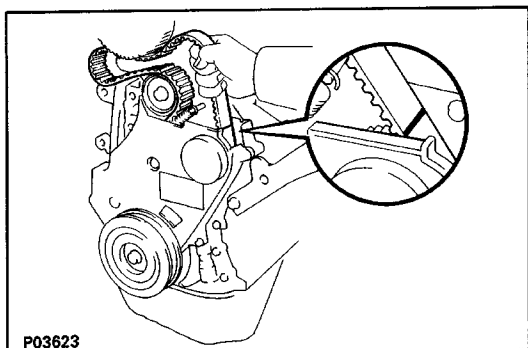
10. SET NO.1 CYLINDER-TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley, and align its groove with timing mark "0" of the No.1 timing belt cover.



- (b) Using SST, turn the camshaft, and align the hole of the camshaft timing pulley with the timing mark of the bearing cap.

SST 09278-54012



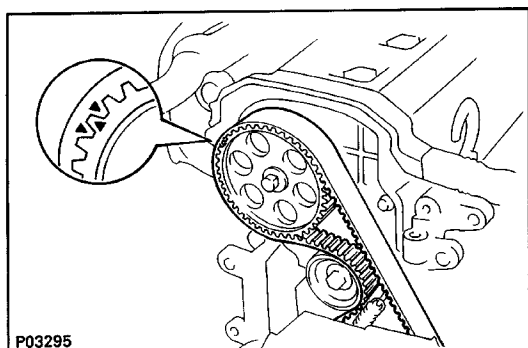
11. INSTALL TIMING BELT

HINT (When re-using timing belt):

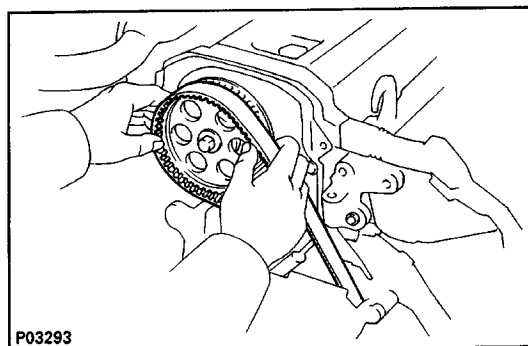
- Check that the matchmark on the timing belt matches the end of the No.1 timing belt cover.

If the matchmark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.

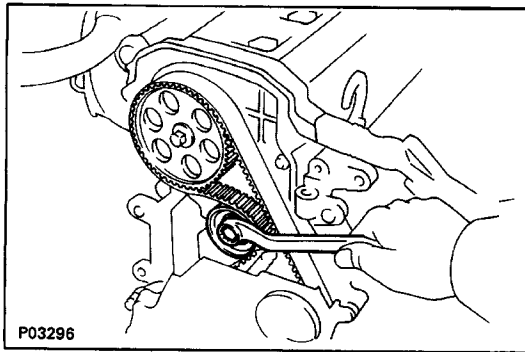
(See page [EM-71](#))



- Align the matchmarks of the timing belt and camshaft timing pulley.

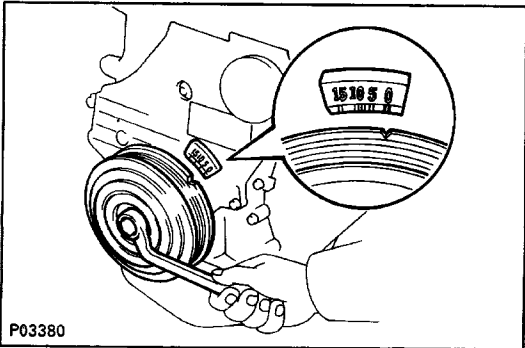


- (a) Remove any oil or water on the camshaft timing pulley, and keep it clean.
- (b) Install the timing belt, and checking the tension between the crankshaft timing pulley and camshaft timing pulley.



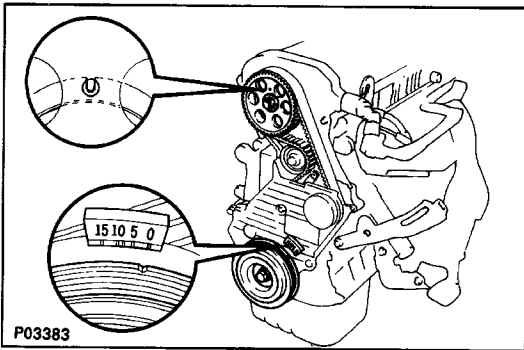
12. CHECK VALVE TIMING

(a) Loosen the No.1 idler pulley bolt 1/2 turn.

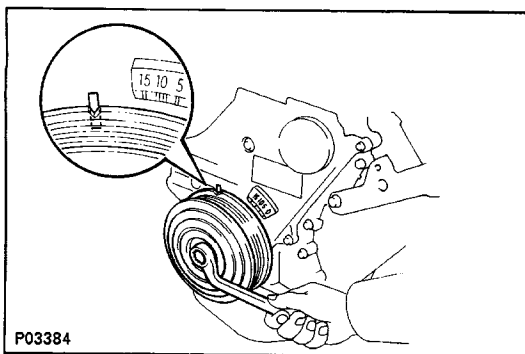


(b) Slowly turn the crankshaft pulley two revolutions from TDC to TDC.

NOTICE: Always turn the crankshaft clockwise.

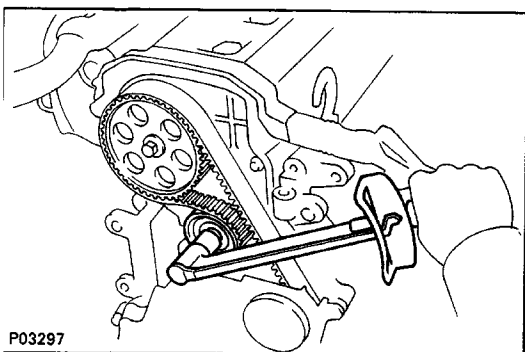


(c) Check that each pulley aligns with the timing marks as shown in the illustration.
If the timing marks do not align, remove the timing belt and reinstall it.



(d) Slowly turn the crankshaft pulley 1 7/8 revolutions, and align its groove with the mark at BTDC 45° (for No.1 cylinder) of the No.1 timing belt cover.

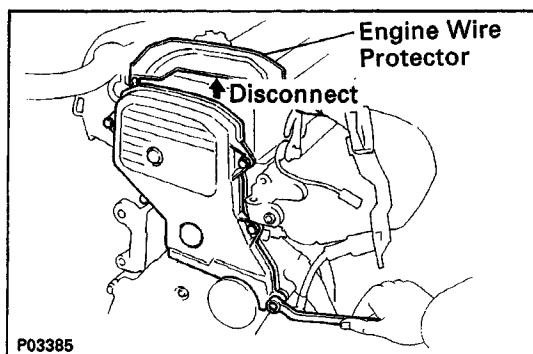
NOTICE: Always turn the crankshaft clockwise.



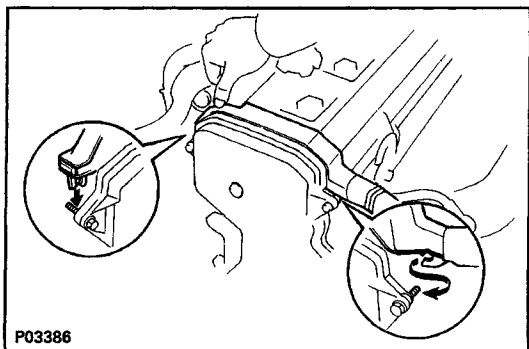
(e) Torque the mounting bolt of the No.1 idler pulley.

Torque: 42 N-m (425 kgf-cm, 31 ft-lbf)

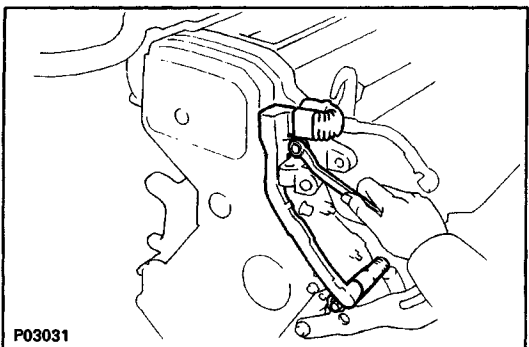
(f) Recheck the valve timing.

**13. INSTALL NO.2 TIMING BELT COVER**

- (a) Disconnect the engine Wire protector between the No.3 timing belt cover and cylinder head cover.
- (b) Install the two gaskets to the No.1 and No.2 belt covers.
- (c) Install the belt cover with the five bolts.



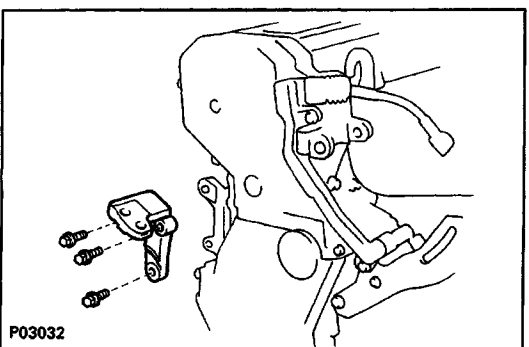
- (d) Install the two clamps of the engine wire protector to each bolt.

**14. INSTALL ENGINE WIRE TO ALTERNATOR BRACKET AND ADJUSTING BAR**

Install the engine wire with the two bolts.

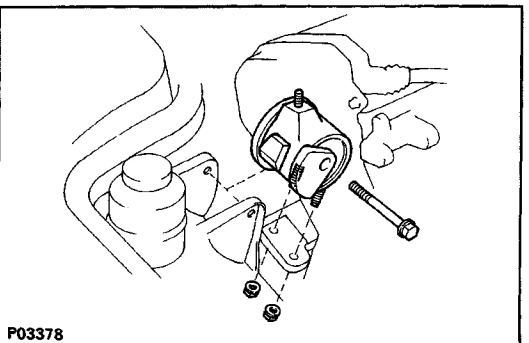
15. INSTALL SPARK PLUGS

Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

**16. INSTALL RH ENGINE MOUNTING BRACKET**

Install the bracket with the three bolts.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

**17. INSTALL RH ENGINE MOUNTING INSULATOR**

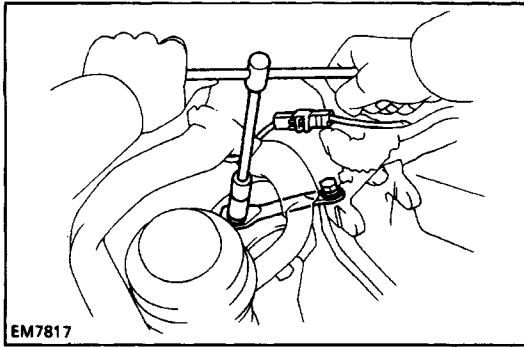
Install the mounting insulator with the through bolt and two nuts.

Torque:

Nut 52 N-m (530 kgf-cm, 38 ft-lbf)

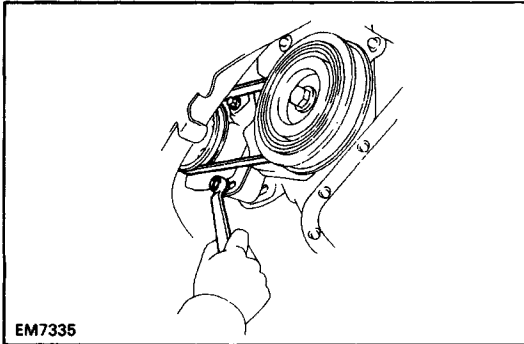
Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

18. INSTALL PS RESERVOIR TANK TO BRACKET

**19. INSTALL RH ENGINE MOUNTING STAY**

Install the mounting stay with the bolt and nut.

Torque: 73 N-m (740 kgf-cm, 54 ft-lbf)

20. CONNECT GROUND CONNECTOR TO GROUND WIRE ON RH FENDER APRON**21. INSTALL PS DRIVE BELT**

Install the drive belt with the pivot bolt and adjusting bolt.

22. INSTALL ALTERNATOR (See page [CH-25](#))**23. (w/ CRUISE CONTROL SYSTEM (w/o ABS)**

INSTALL CRUISE CONTROL ACTUATOR

(See step 33 on page [EM-309](#))

24. INSTALL RH FRONT WHEEL**25. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY****26. CHECK AND ADJUST DRIVE BELTS**

Adjust the drive belts.

Drive belt tension:

Alternator

w/ A/C

New belt 165 ± 10 lbf

Used belt 110 ± 10 lbf

w/o A/C

New belt 125 ± 25 lbf

Used belt 95 ± 20 lbf

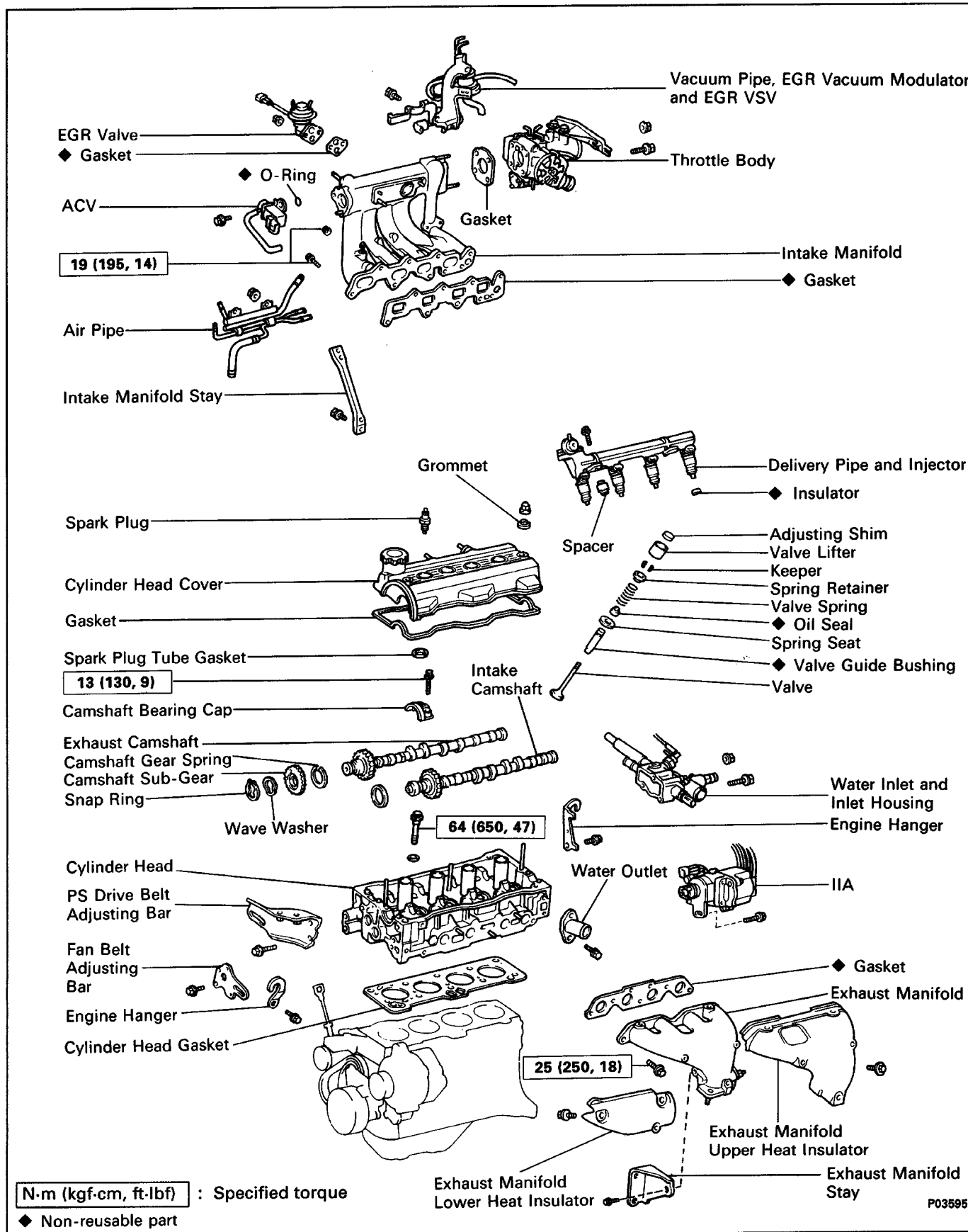
PS pump

New belt 125 ± 10 lbf

Used belt 80 ± 20 lbf

27. INSTALL RH ENGINE UNDER COVER

CYLINDER HEAD (4A-FE) COMPONENTS



REMOVAL OF CYLINDER HEAD

(See page [EM-81](#))

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page [CO-6](#))

3. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

5. REMOVE AIR CLEANER CAP AND HOSE

(See step 6 on page [EM-185](#))

6. REMOVE ENGINE UNDER COVERS

7. REMOVE SUSPENSION LOWER CROSSMEMBER

(See step 24 on page [EM-189](#))

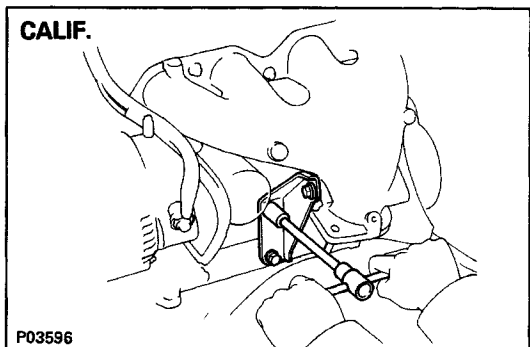
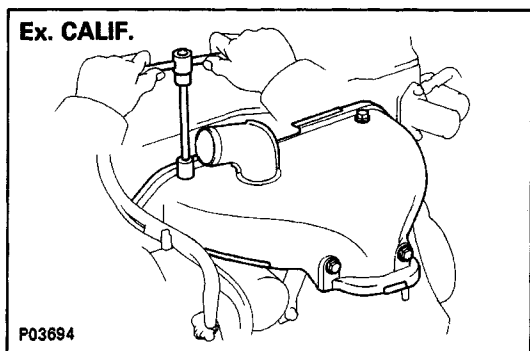
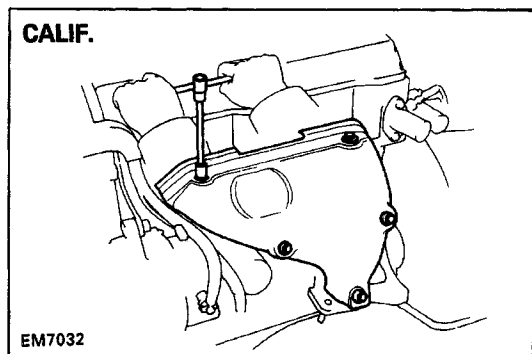
8. REMOVE FRONT EXHAUST PIPE

(See step 25 on page [EM-189](#))

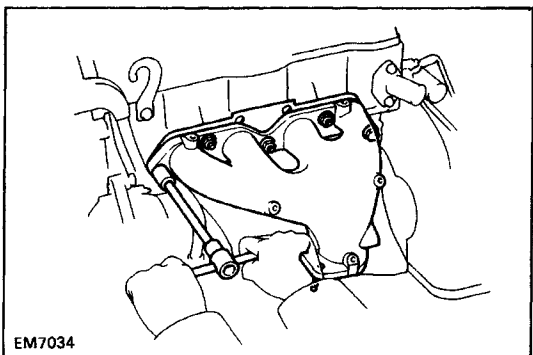
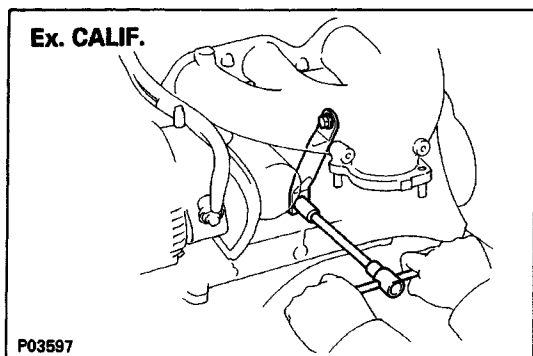
9. REMOVE DISTRIBUTOR (See page [IG-20](#))

10. REMOVE EXHAUST MANIFOLD

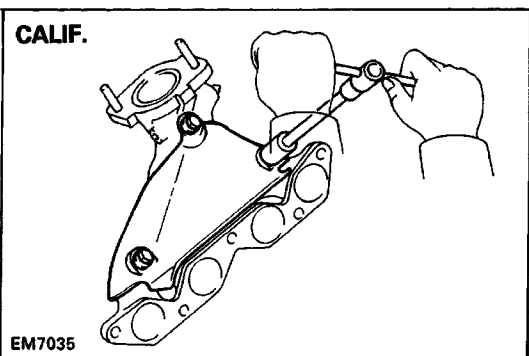
(a) Remove the five (CALIF.) or four (Ex. CALIF.) bolts and upper heat insulator.



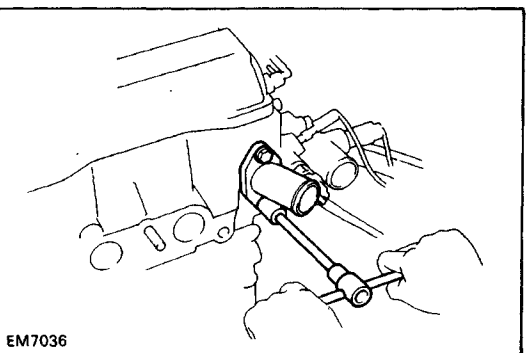
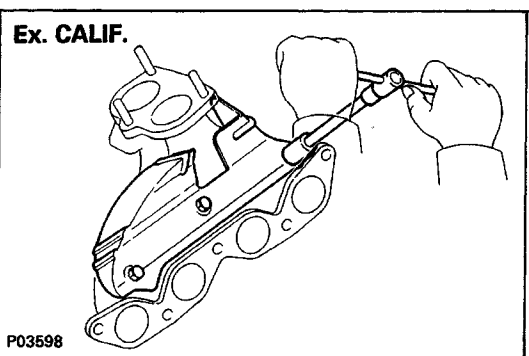
(b) Remove the three (CALIF.) or two (Ex. CALIF.) bolts and manifold stay.



(c) Remove the two bolts, three nuts, exhaust manifold and gasket.

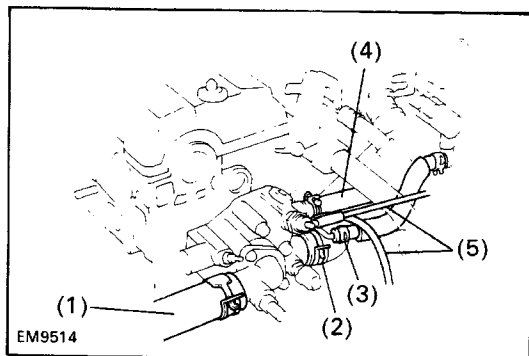


(d) Remove the three bolts and lower heat insulator from the exhaust manifold.



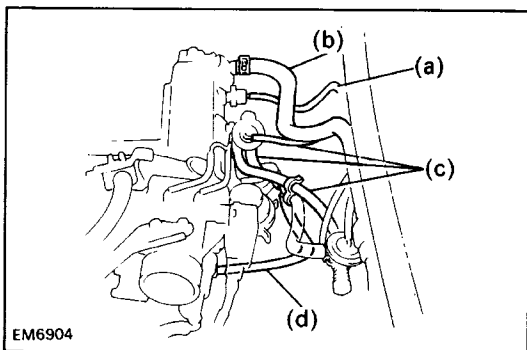
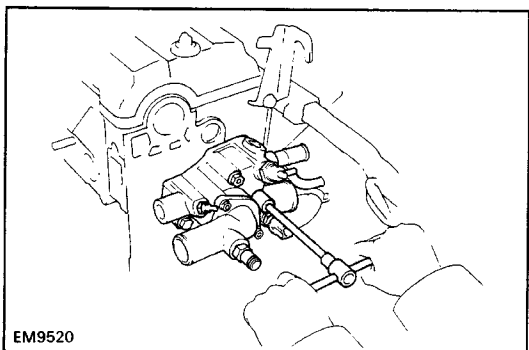
11. REMOVE WATER OUTLET

- (a) Disconnect the upper radiator hose from the water outlet.
- (b) Remove the two bolts and water outlet.



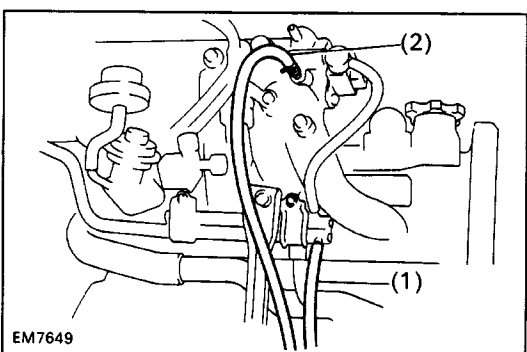
12. REMOVE WATER INLET AND INLET HOUSING

- (a) Disconnect the following connectors:
 - Water temperature sender gauge connector
 - Water temperature sensor connector
- (b) Disconnect the following hoses:
 - (1) Lower radiator hose
 - (2) Inlet pipe water hose
 - (3) Auxiliary air valve water by-pass hose
 - (4) Heater water hose
 - (5) Two EVAP BSV vacuum hoses
- (c) Remove the bolt, two nuts, the water inlet and inlet housing assembly.



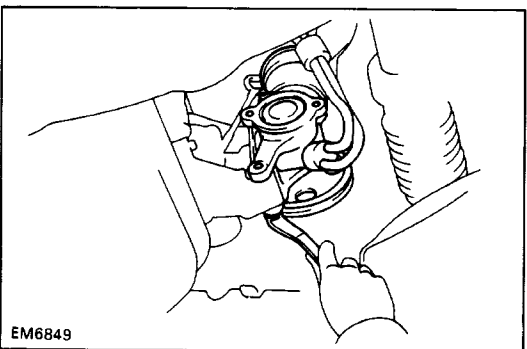
13. DISCONNECT VACUUM HOSES

- (a) Vacuum sensor hose from gas filter on intake manifold
- (b) Brake booster vacuum hose from intake manifold
- (c) Three A/C vacuum hoses from ASV on intake manifold
- (d) A/C vacuum hose from air pipe



14. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

- (a) Disconnect the following hoses:
 - (1) Air hose from air pipe
 - (2) Air hose from intake manifold
- (b) Loosen the bolt holding the PS pump to the PS pump bracket.
- (c) Remove the bolt holding the PS pump to the PS drive belt adjusting strut, and disconnect the drive belt from the PS pump pulley.
- (d) Disconnect the PS pump from the adjusting strut.

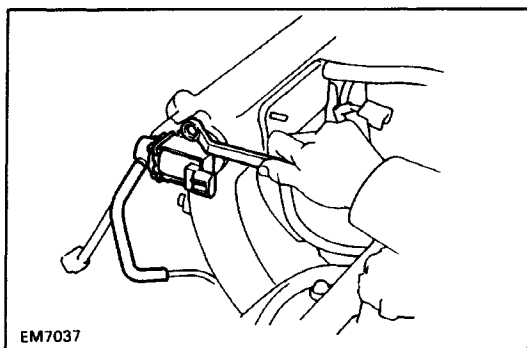


15. REMOVE THROTTLE BODY

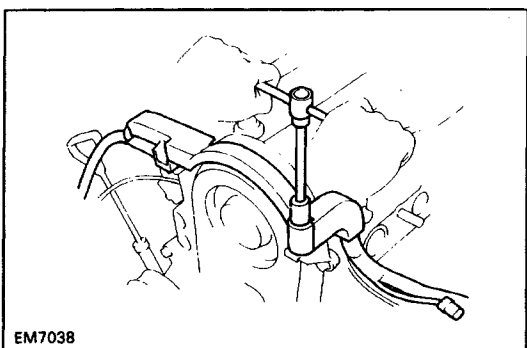
(See steps 6, 8 and 9 on pages [FI-188](#) and 189)

16. REMOVE DELIVERY PIPE AND INJECTORS

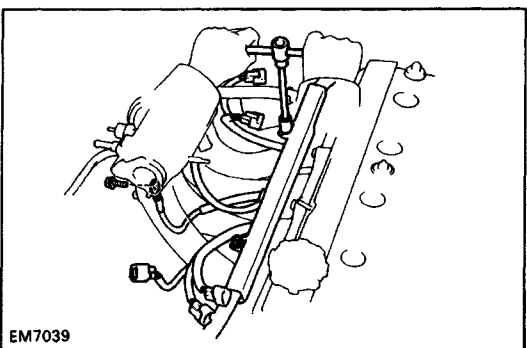
(See steps 2 to 6 on page [FI-156](#))

**17. REMOVE ACV**

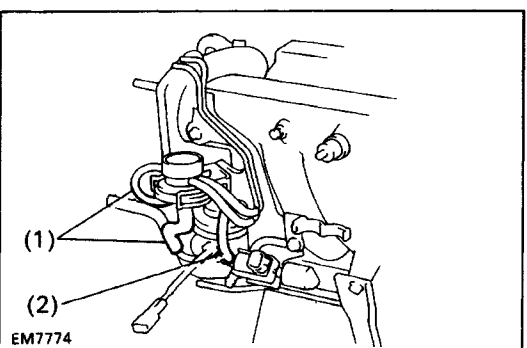
- (a) Disconnect the air hose from the air pipe.
- (b) Remove the bolt, nut and ACV.
- (c) Remove the O-ring from the ACV.

**18. DISCONNECT ENGINE WIRE FROM NO.3 TIMING BELT COVER**

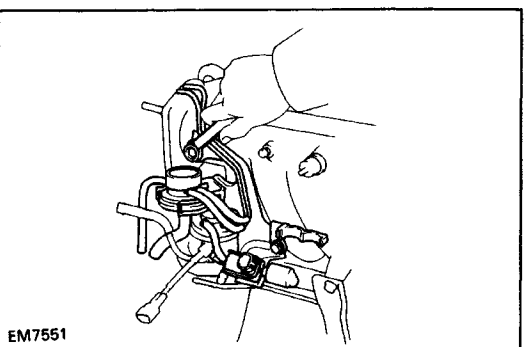
- (a) Disconnect the following connectors and wire:
 - Alternator connector
 - Alternator wire
 - Oil pressure switch connector
 - A/C compressor connector
- (b) Remove the bolt.
- (c) Disconnect the wire clamp from the wire bracket, and disconnect the engine wire from the timing belt cover.

**19. DISCONNECT ENGINE WIRE FROM INTAKE MANIFOLD**

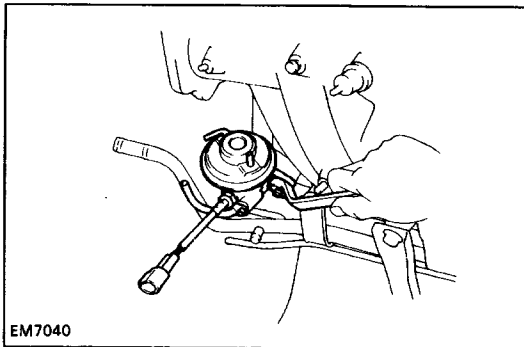
- (a) Disconnect the following connectors:
 - EGR VSV connector
 - (CALIF. only)
EGR gas temperature sensor connector
 - Vacuum sensor connector
- (b) Disconnect the wire clamp from the vacuum pipe.
- (c) Remove the three bolts, and disconnect the engine wire from the intake manifold.

**20. REMOVE VACUUM PIPE, EGR VACUUM MODULATOR AND EGR VSV**

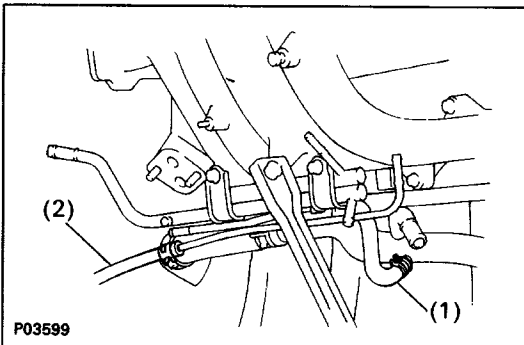
- (a) Disconnect the following hoses:
 - (1) Two vacuum hoses from EGR valve
 - (2) Vacuum hose from EGR VSV



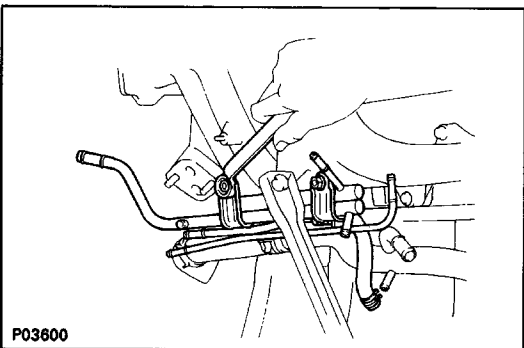
- (b) Remove the two nuts, the vacuum pipe, vacuum modulator and VSV assembly.

**21. REMOVE EGR VALVE**

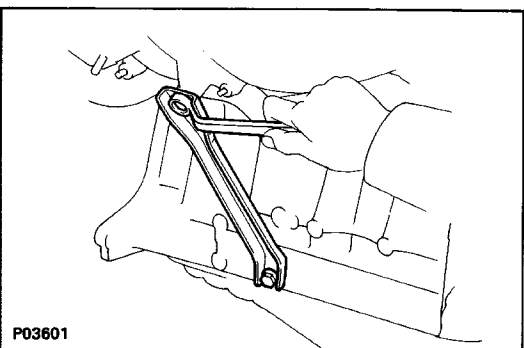
Remove the two nuts, EGR valve and gasket.

**22. REMOVE AIR PIPE**

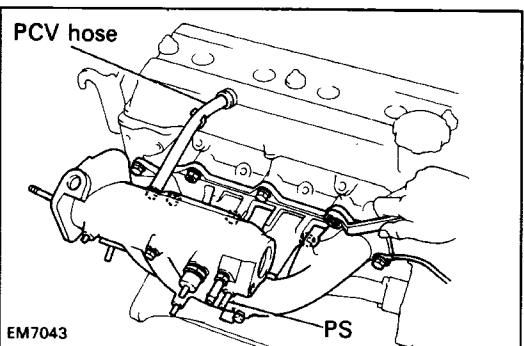
- (a) Disconnect the following hoses:
- (1) Water inlet pipe hose
 - (2) Fuel return hose (from fuel filter)



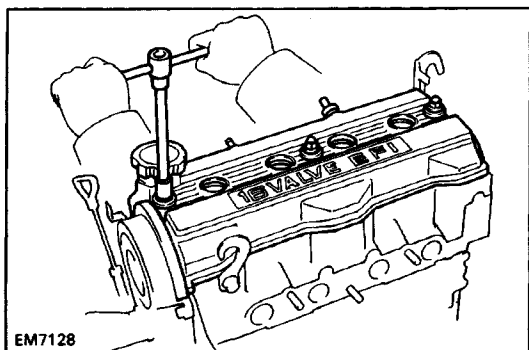
- (b) Remove the two nuts and air pipe.

**23. REMOVE INTAKE MANIFOLD**

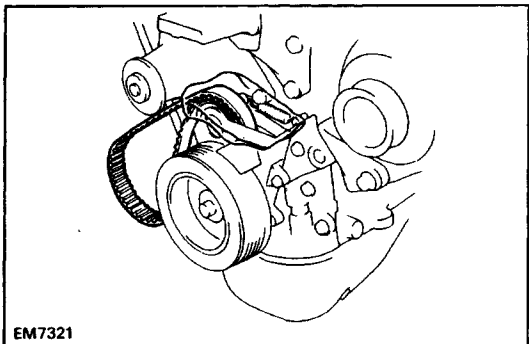
- (a) Remove the two bolts and manifold stay.



- (b) Disconnect the PCV hose from the PCV valve on the cylinder head.
- (c) Remove the seven bolts, two nuts, intake manifold and gasket.

**24. REMOVE CYLINDER HEAD COVER**

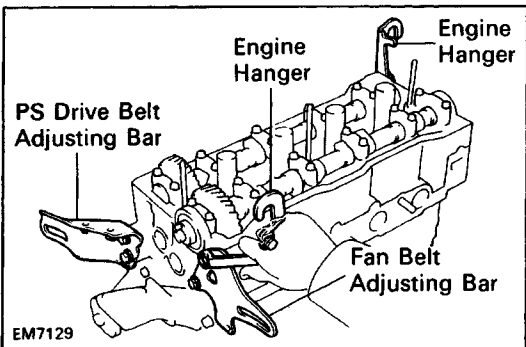
Remove the three cap nuts, grommets, head cover and gasket.

**25. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEY**

(See steps 2 and 4 to 15 on pages [EM-33](#) to 36)

NOTICE:

- Support the timing belt, so the meshing of the crankshaft timing pulley and timing belt does not shift.
- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come into contact with oil, water or dust.

**26. REMOVE CAMSHAFT TIMING PULLEY**
(See step 16 on page [EM-36](#))**27. REMOVE FAN BELT ADJUSTING BAR**

Remove the two bolts and adjusting bar.

28. REMOVE ENGINE HANGERS

Remove the bolt and engine hanger. Remove the two engine hangers.

29. REMOVE PS DRIVE BELT ADJUSTING STRUT

Remove the two bolts and adjusting strut.

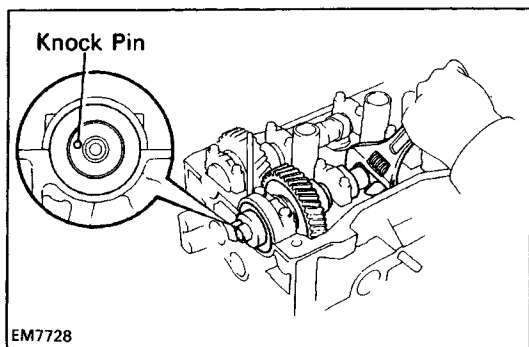
30. REMOVE CAMSHAFTS

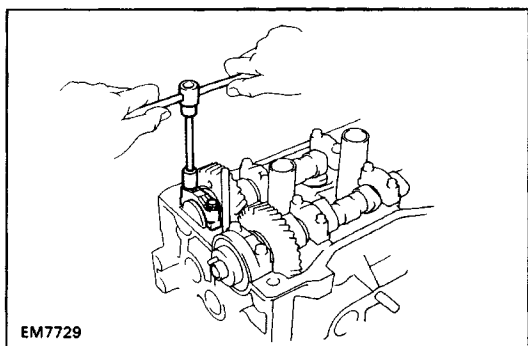
NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

A. Remove intake camshaft

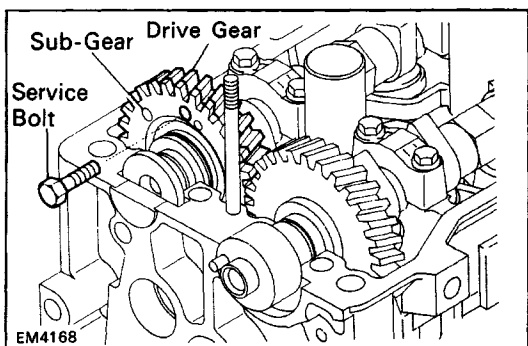
(a) Set the intake camshaft so the knock pin is slightly above the top of the cylinder head.

HINT: The above angle allows the No.1 and No.3 cylinder cam lobes of the intake camshaft to push their valve lifters evenly.





(b) Remove the two bolts and front bearing cap.



(c) Secure the intake camshaft sub-gear to the drive gear with a service bolt.

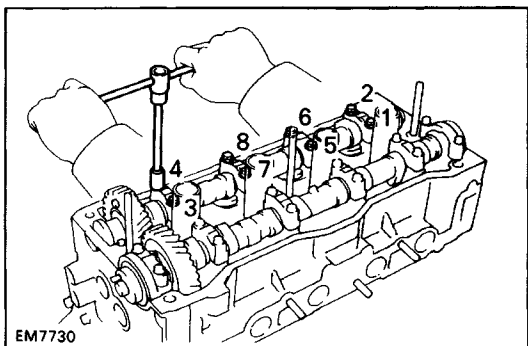
Recommended service bolt:

Thread diameter 6 mm

Thread pitch 1.0 mm

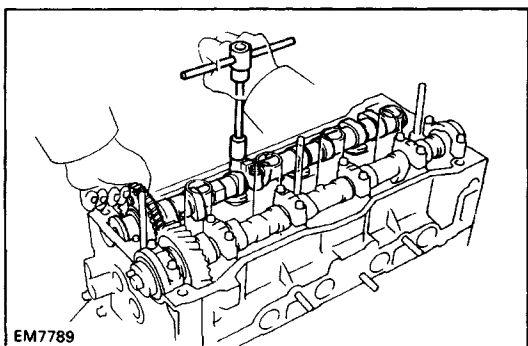
Bolt length 16 – 20 mm (0.63 – 0.79 in.)

HINT: When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



(d) Uniformly loosen and remove the eight bearing cap bolts in several passes in the sequence shown.

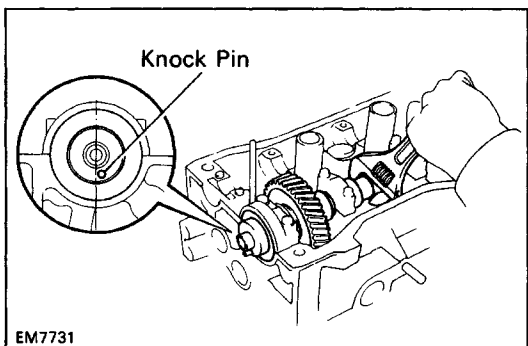
(e) Remove the four bearing caps and camshaft.



HINT: If the camshaft is not being lifted out straight and level, reinstall the bearing cap with the two bolts.

Then alternately loosen and remove the bearing cap bolts with the camshaft gear pulled up.

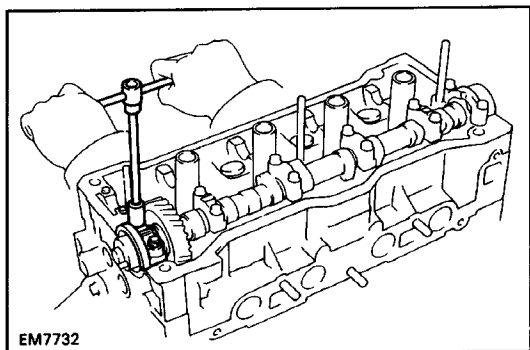
NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.



B. Remove exhaust camshaft

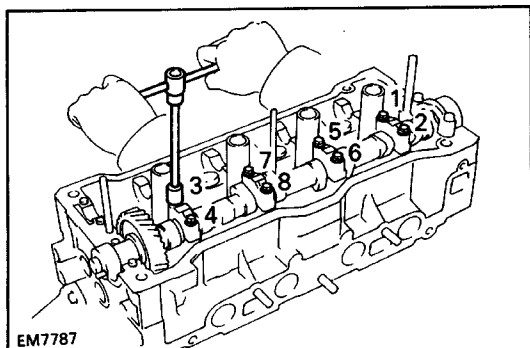
(a) Set the intake camshaft so the knock pin is located slightly counterclockwise from the vertical axis of the camshaft.

HINT: The above angle allows the No. 1 and No. 3 cylinder cam lobes of exhaust camshaft to push their valve lifters evenly.

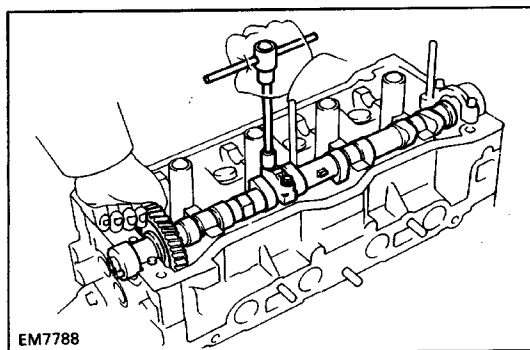


- (b) Remove the two bolts, front bearing cap and oil seal.

NOTICE: If the front bearing cap is not removable by hand, do not try to remove by force but leave as it is without bolts.



- (c) Uniformly loosen and remove the eight bearing cap bolts in several passes in the sequence shown.
 (d) Remove the four bearing caps and camshaft.



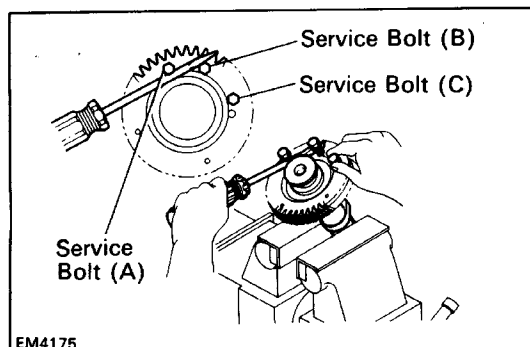
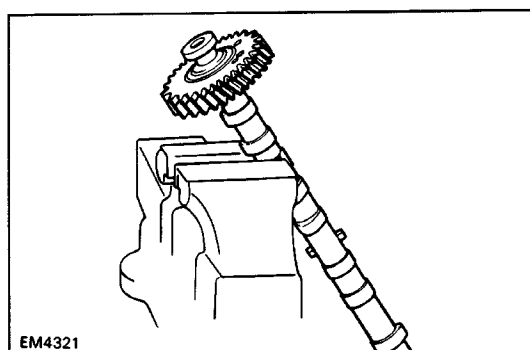
- HINT:** If the camshaft is not being lifted out straight and level, reinstall the No.3 bearing cap with the two bolts. Then alternately loosen and remove the two bearing cap bolts with the camshaft gear pulled up.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

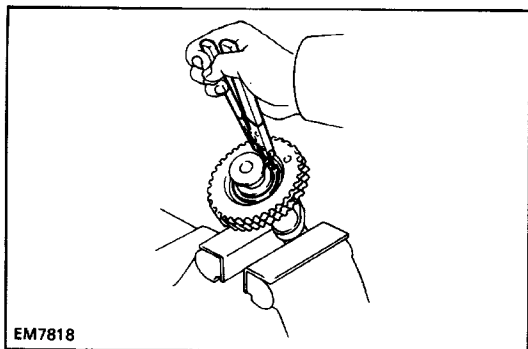
31. DISASSEMBLE EXHAUST CAMSHAFT

- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

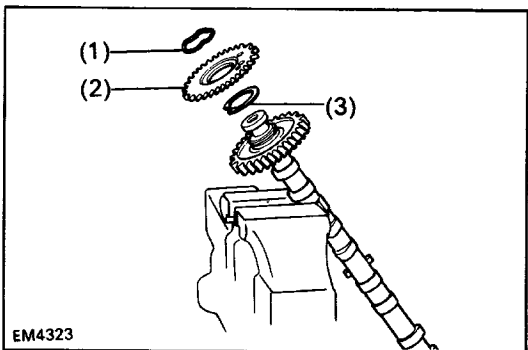
NOTICE: Be careful not to damage the camshaft.



- (b) Insert service bolts (A) and (B) into the service holes of the camshaft sub-gear.
 (c) Using a screwdriver, turn the sub-gear clockwise, and remove the service bolt (C).
NOTICE: Be careful not to damage the camshaft.



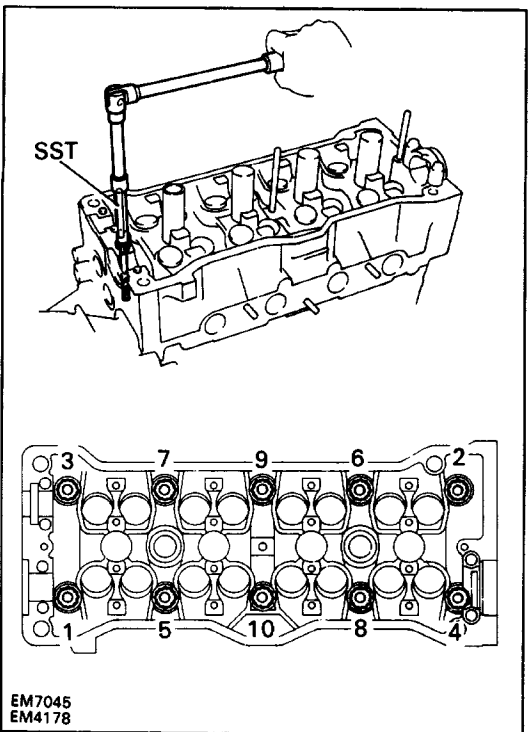
(d) Using snap ring pliers, remove the snap ring.



(e) Remove the following parts:

- (1) Wave washer
- (2) Camshaft sub-gear
- (3) Camshaft gear spring

32. REMOVE SEMI-CIRCULAR PLUG



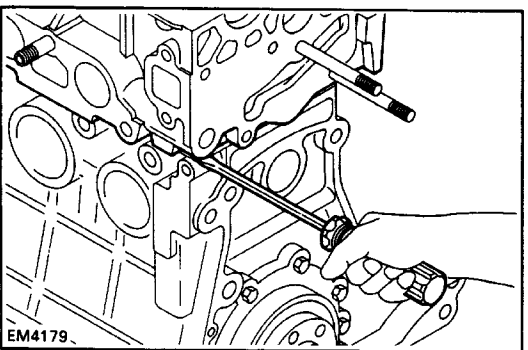
33. REMOVE CYLINDER HEAD

(a) Using SST, uniformly loosen and remove the ten cylinder head bolts in several passes in the sequence shown.

SST 09205-16010

NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.

(b) Remove the ten plate washers.



(c) Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.

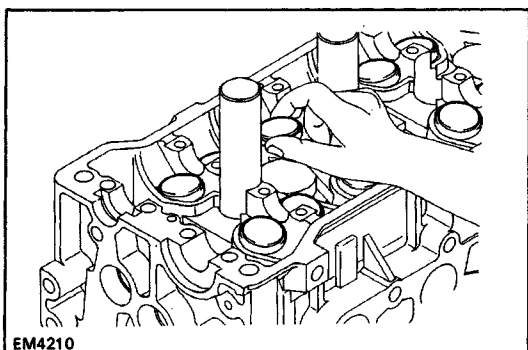
HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block saliences.

NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

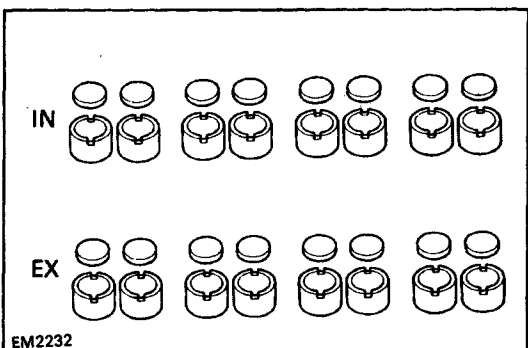
DISASSEMBLY OF CYLINDER HEAD

(See page EM-81)

1. REMOVE VALVE LIFTERS AND SHIMS



HINT: Arrange the valve lifters and shims in correct order.

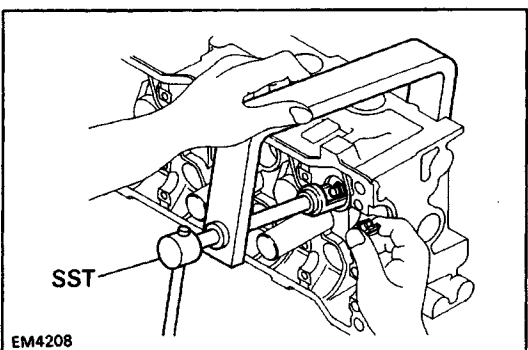


2. REMOVE VALVES

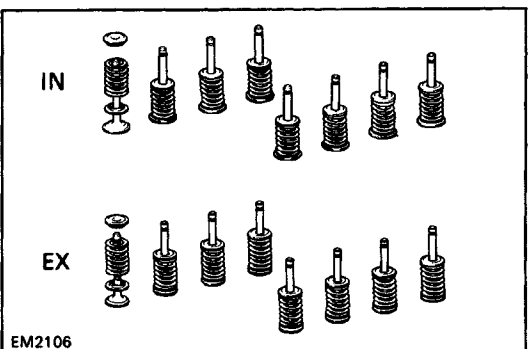
(a) Using SST, compress the valve spring and remove the two keepers.

SST 09202-70010

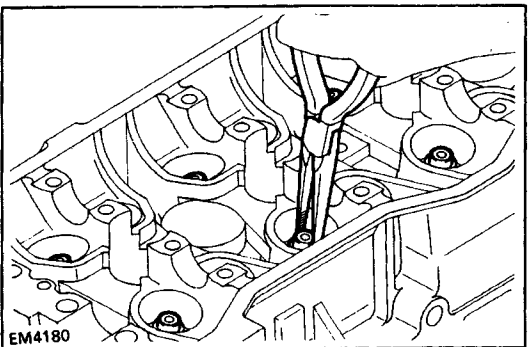
(b) Remove the spring retainer, valve spring, valve and spring seat.

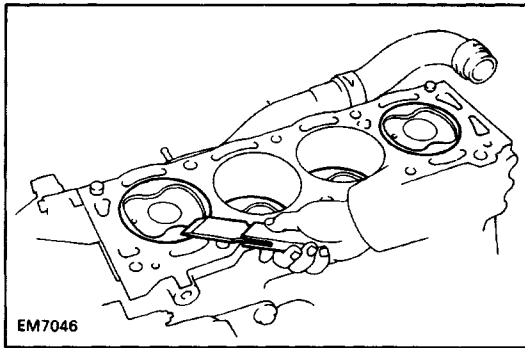


HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



(c) Using needle-nose pliers, remove the oil seal.

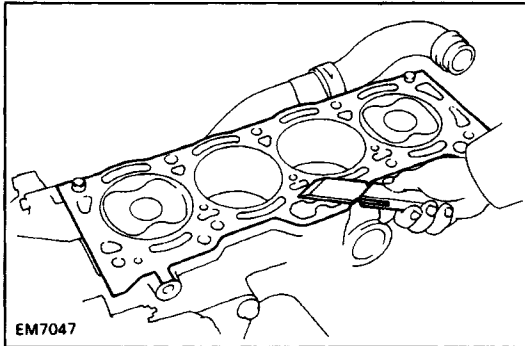




INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

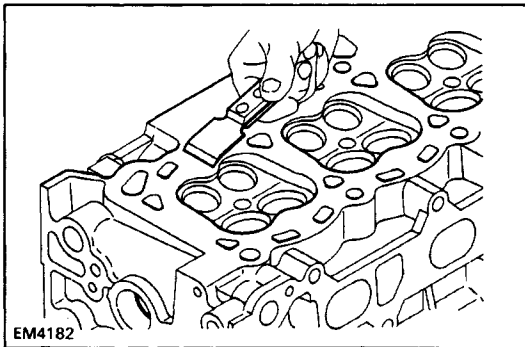
- (a) Turn the crankshaft and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surfaces.



- (b) Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder head.

- (c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high-pressure compressed air.

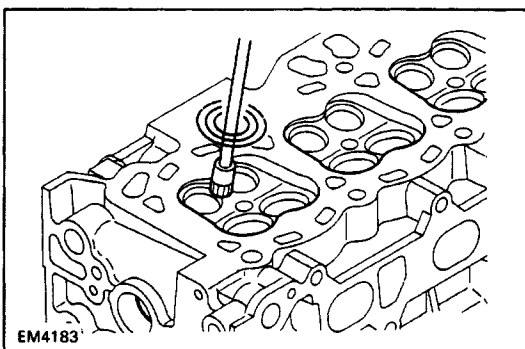


2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder block.

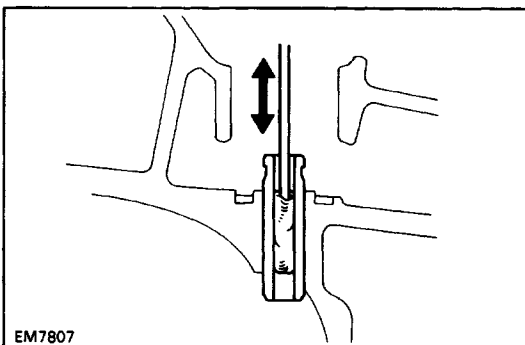
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

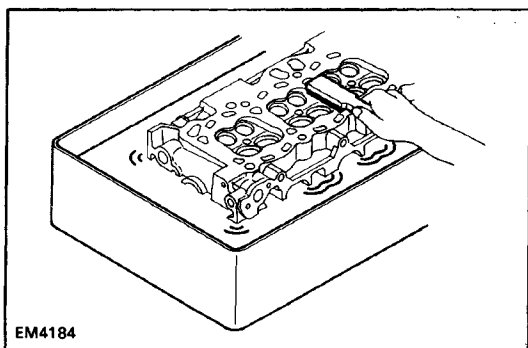
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the cylinder block contact surface.



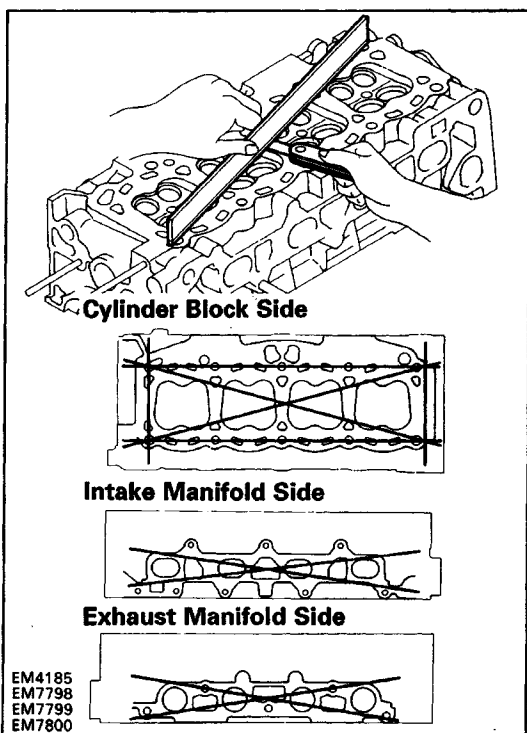
C. Clean valve guide bushings

Using a valve guide bushing brush and solvent, clean all the guide bushings.



EM4184

- D. Clean cylinder head
Using a soft brush and solvent, thoroughly clean the cylinder head.

EM4185
EM7798
EM7799
EM7800

3. INSPECT CYLINDER HEAD

A. Inspect for flatness

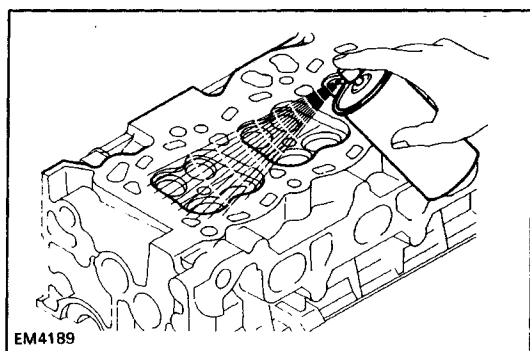
Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifolds for warpage.

Maximum warpage:

Cylinder block side 0.05 mm (0.0020 in.)

Manifold side 0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the cylinder head.

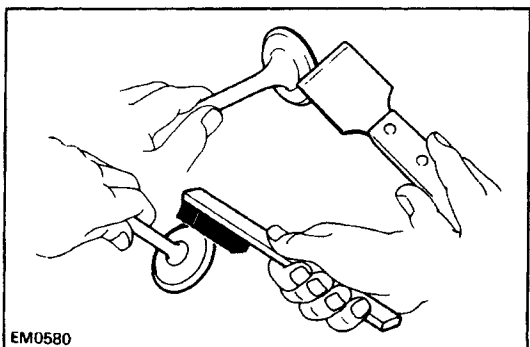


EM4189

B. Inspect for cracks

Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.

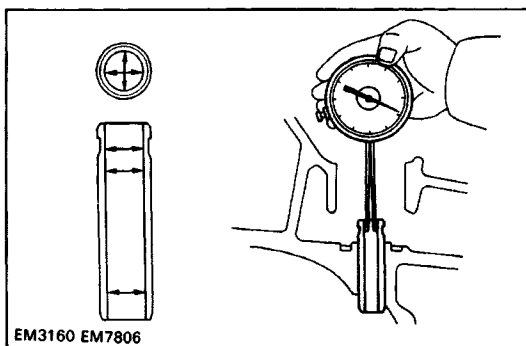
If cracked, replace the cylinder head.



EM0580

4. CLEAN VALVES

- (a) Using a gasket scraper, chip off any carbon from the valve head.
- (b) Using a wire brush, thoroughly clean the valve.

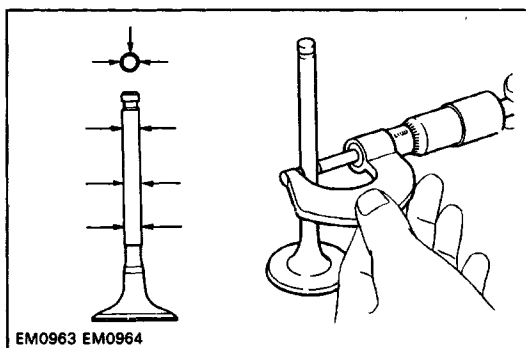


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- (a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

6.010 – 6.030 mm (0.2366 – 0.2374 in.)



- (b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

**Intake 5.970 – 5.985 mm
(0.2350 – 0.2356 in.)**

**Exhaust 5.965 – 5.980 mm
(0.2348 – 0.2354 in.)**

- (c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

**Intake 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)**

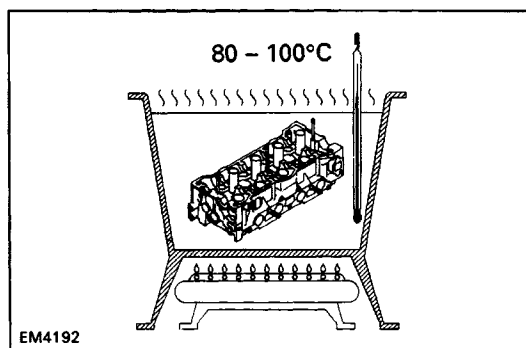
**Exhaust 0.030 – 0.065 mm
(0.0012 – 0.0026 in.)**

Maximum oil clearance:

Intake 0.08 mm (0.0031 in.)

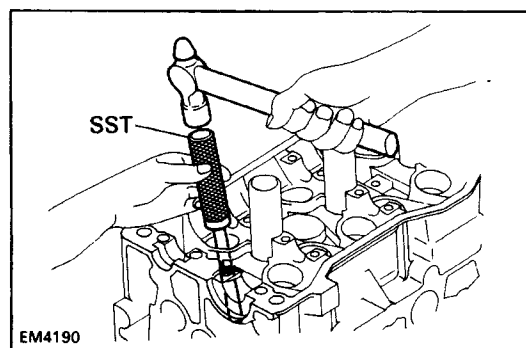
Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.



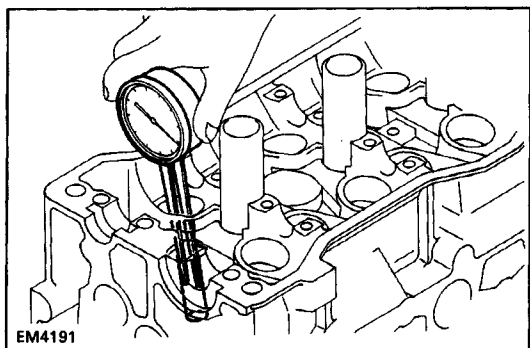
6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

- (a) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



- (b) Using SST and a hammer, tap out the guide bushing.

SST 09201-70010



- (c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

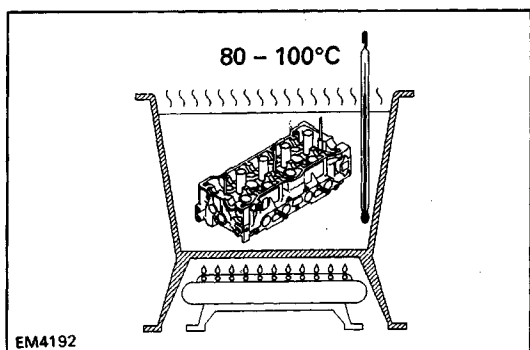
Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
11.000 – 11.027 (0.4331 – 0.4342)	Use STD
11.050 – 11.077 (0.4350 – 0.4361)	Use O/S 0.05

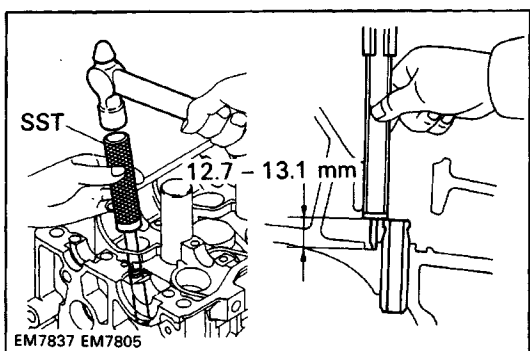
- (d) Select a new guide bushing (STD or O/S 0.05). If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to the following dimension:

11.050 – 11.077 mm (0.4350 – 0.4361 in.)

- If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.

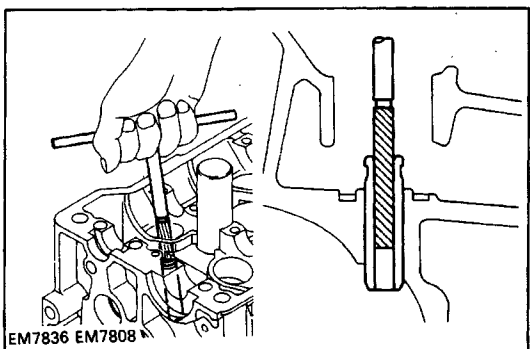


- (e) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

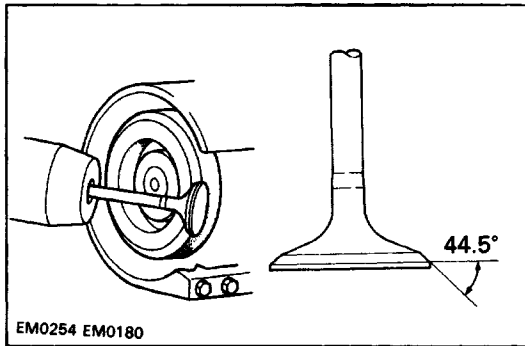


- (f) Using SST and a hammer, tap in a new guide bushing until there is 12.7 – 13.1 mm (0.500 – 0.516 in.) protruding from the cylinder head.

SST 09201-70010



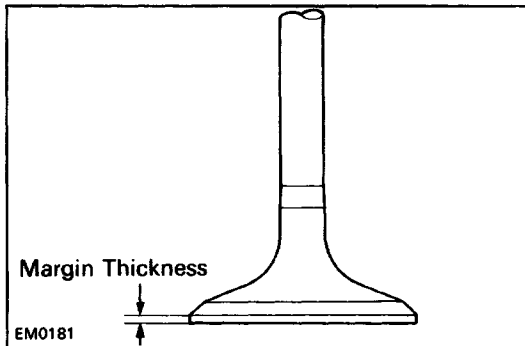
- (g) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page [EM-94](#)) between the guide bushing and valve stem.



7. INSPECT AND GRIND VALVES

- (a) Grind the valve enough to remove pits and carbon.
- (b) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°



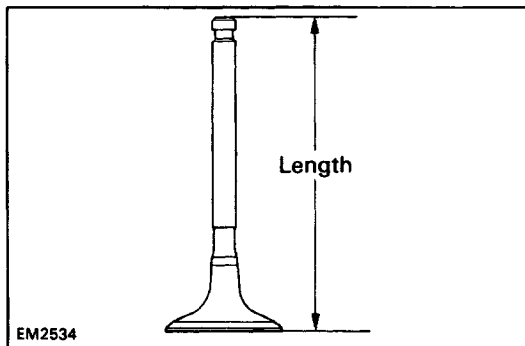
- (c) Check the valve head margin thickness.

Standard margin thickness: 0.8 – 1.2 mm

(0.031 – 0.047 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.



- (d) Check the valve overall length.

Standard overall length:

Intake 91.45 mm (3.6004 in.)

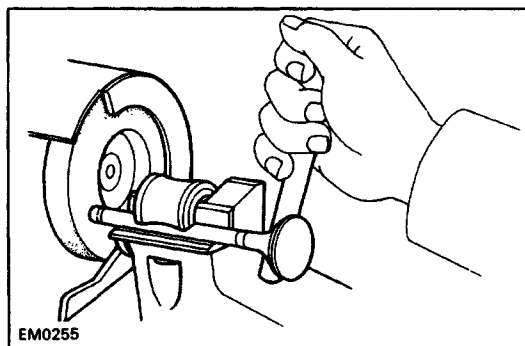
Exhaust 91.90 mm (3.6181 in.)

Minimum overall length:

Intake 90.95 mm (3.5807 in.)

Exhaust 91.40 mm (3.5984 in.)

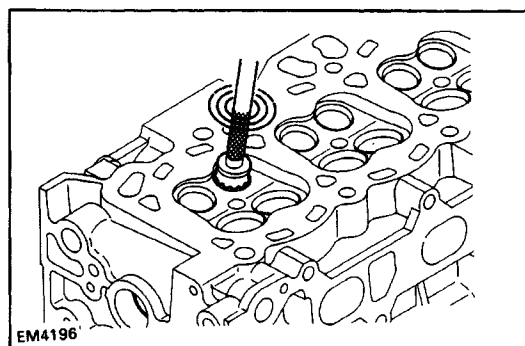
If the overall length is less than minimum, replace the valve.



- (e) Check the surface of the valve stem tip for wear.

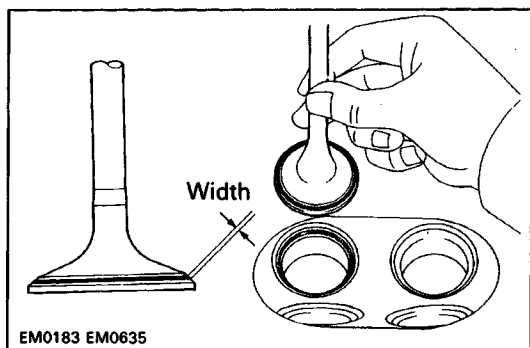
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than minimum.



8. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats.
Remove only enough metal to clean the seats.



(b) Check the valve seating position.

Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

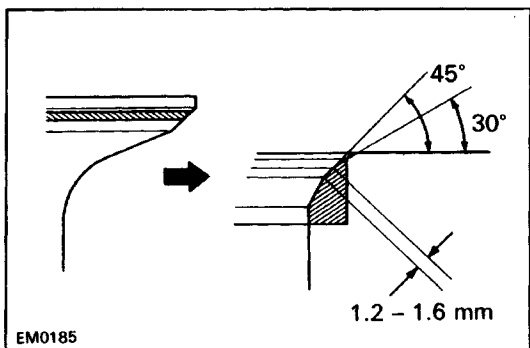
(c) Check the valve face and seat for the following:

- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

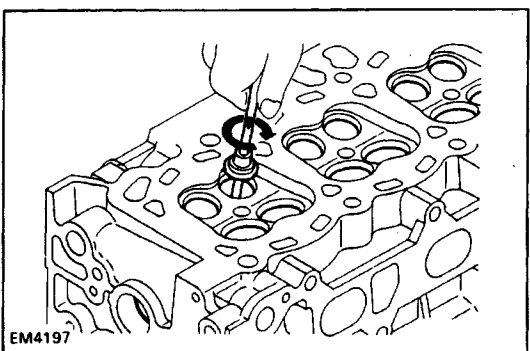
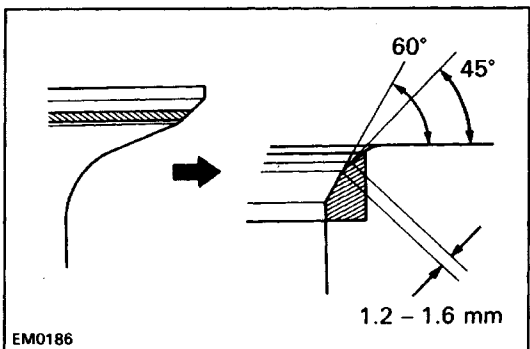
1.2 – 11.6 mm (6.047 – 0.063 in.)

If not, correct the valve seats as follows:

- (1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

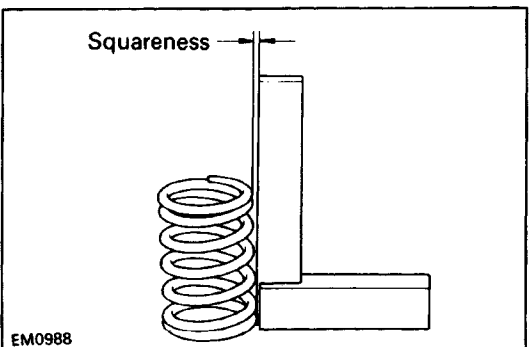


- (2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



(d) Hand-lap the valve and valve seat with an abrasive compound.

(e) After hand-lapping, clean the valve and valve seat.

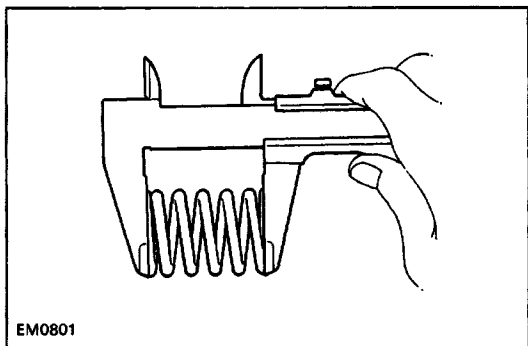


9. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness: 2.0 mm (0.079 in.)

If squareness is greater than maximum, replace the valve spring.

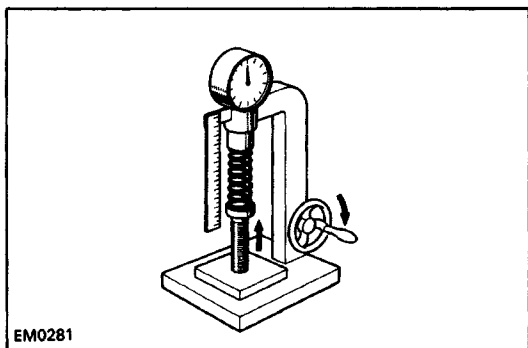


EM0801

(b) Using a vernier caliper, measure the free length of the valve spring.

Free length: 43.8 mm (1.724 in.)

If the free length is not as specified, replace the valve spring.



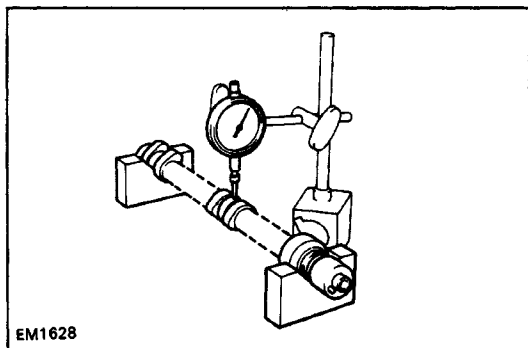
EM0281

(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

**143 – 155 N (14.6 – 15.8 kgf, 32.2 – 34.8 lbf)
at 34.7 mm (1.366 in.)**

If the installed tension is not as specified, replace the valve spring.



EM1628

10. INSPECT CAMSHAFTS AND BEARINGS

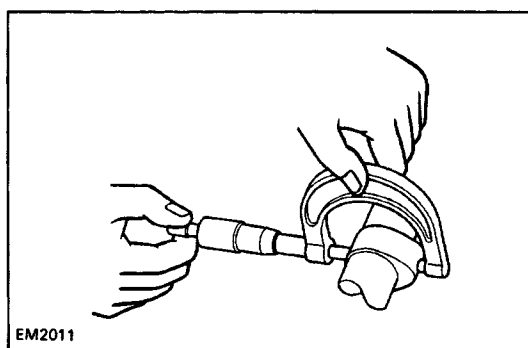
A. Inspect camshaft for runout

(a) Place the camshaft on V-blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.04 mm (0.0016 in.)

If the circle runout is greater than maximum, replace the camshaft.



EM2011

B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

**Intake 35.210 – 35.310 mm
(1.3862 – 1.3902 in.)**

**Exhaust 34.910 – 35.010 mm
(1.3744 – 1.3783 in.)**

Minimum cam lobe height:

Intake 34.81 mm (1.3705 in.)

Exhaust 34.51 mm (1.3587 in.)

If the cam lobe height is less than minimum, replace the camshaft.

C. Inspect camshaft journals

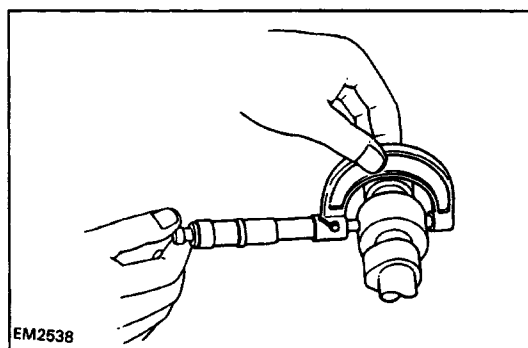
Using a micrometer, measure the journal diameter.

Journal diameter:

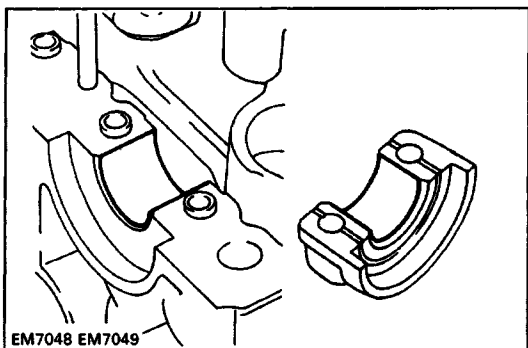
**Exhaust No.1 24.949 – 24.965 mm
(0.9822 – 0.9829 in.)**

**Others 22.949 – 22.965 mm
(0.9035 – 0.9041 in.)**

If the journal diameter is not as specified, check the oil clearance.

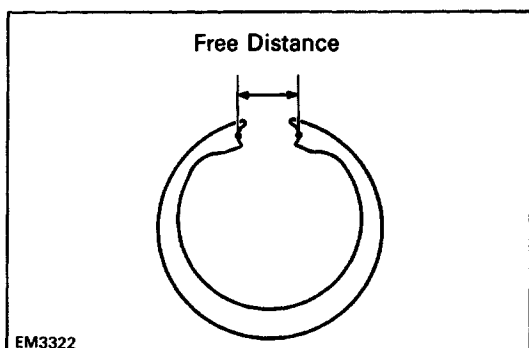


EM2538



D. Inspect camshaft bearings

Check the bearings for flaking and scoring.
If the bearings are damaged, replace the bearing caps and cylinder head as a set.

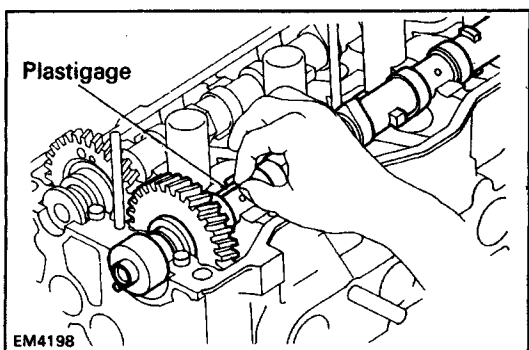


E. Inspect camshaft gear spring

Using a vernier caliper, measure the free distance between the spring ends.

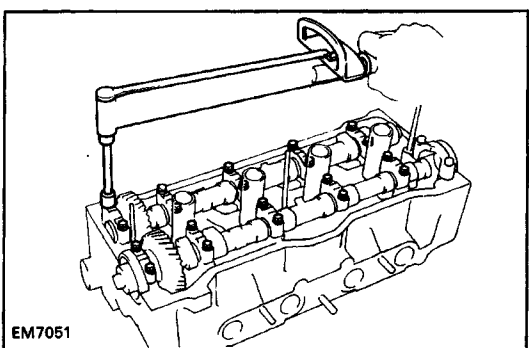
Free distance: 17.0 –17.6 mm (0.669 – 0.693 in.)

If the free distance is not as specified, replace the gear spring.



F. Inspect camshaft journal oil clearance

- (a) Clean the bearing caps and camshaft journals.
- (b) Place the camshafts on the cylinder head.
- (c) Lay a strip of Plastigage across each of the camshaft journals.

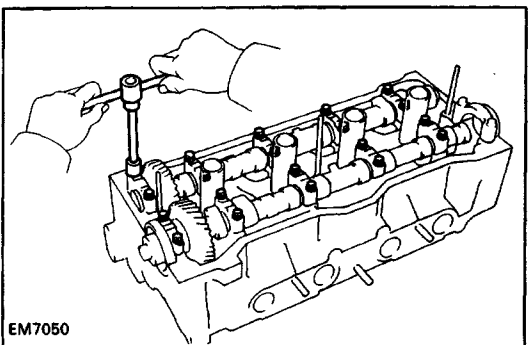


- (d) Install the bearing caps.

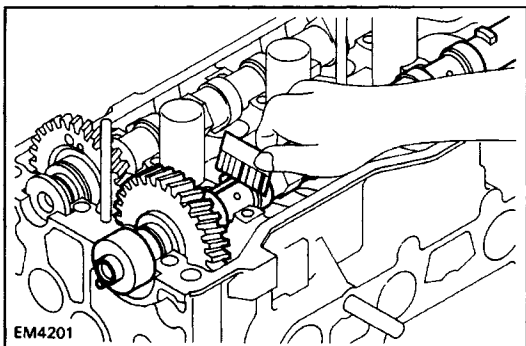
(See step 3 on pages [EM-105](#) to 107)

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

NOTICE: Do not turn the camshaft.



- (e) Remove the bearing caps.



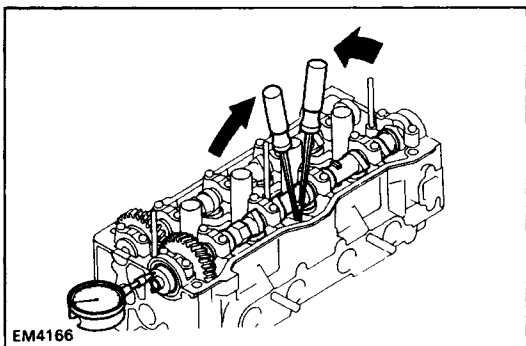
(f) Measure the Plastigage at its widest point.

**Standard oil clearance: 0.035 – 0.072 mm
(0.0014 – 0.0028 in.)**

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.



G. Inspect camshaft thrust clearance

(a) Install the camshafts.

(See step 3 on pages [EM-105](#) to 107)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

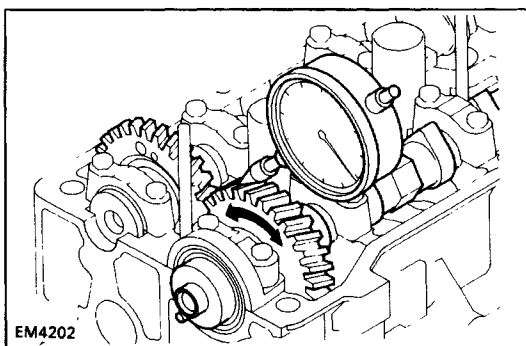
Standard thrust clearance:

Intake **0.030 – 0.085 mm
(0.0012 – 0.0033 in.)**

Exhaust **0.035 – 0.090 mm
(0.0014 – 0.0035 in.)**

Maximum thrust clearance: 0.11 mm (0.0043 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



H. Inspect camshaft gear backlash

(a) Install the camshafts without installing the exhaust camshaft sub-gear.

(See step 3 on pages [EM-105](#) to 107)

(b) Using a dial indicator, measure the backlash.

**Standard backlash: 0.020 – 0.200 mm
(0.0008 – 0.0079 in.)**

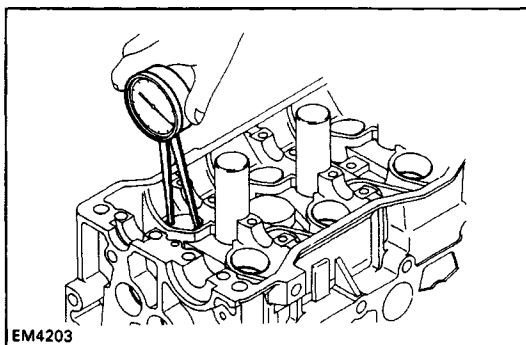
Maximum backlash: 0.30 mm (0.0188 in.)

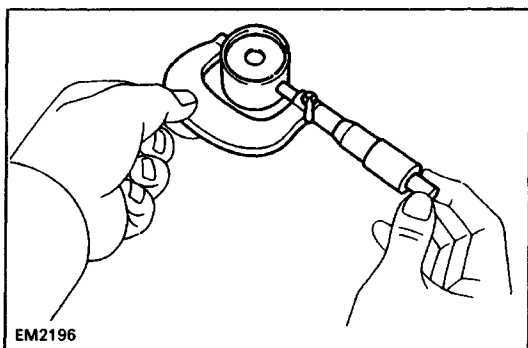
If the backlash is greater than maximum, replace the camshafts.

11. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

**Lifter bore diameter: 28.005 – 28.026 mm
(1.1026 – 1.1034 in.)**





(b) Using a micrometer, measure the lifter diameter.

Lifter diameter: 27.975 – 27.985 mm

(1.1014 – 1.1018 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

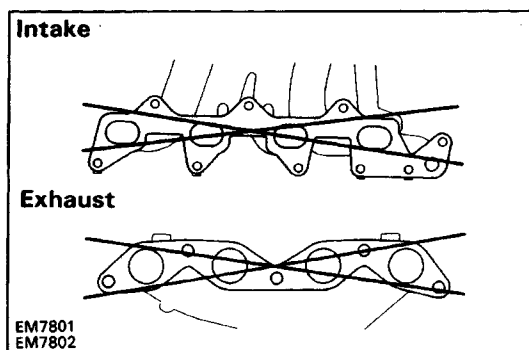
Standard oil clearance: 0.020 – 0.051 mm

(0.0008 – 0.0020 in.)

Maximum oil clearance: 0.07 mm (0.0028 in.)

If the oil clearance is greater than maximum, replace the

lifter. If necessary, replace the cylinder head.



12. INSPECT INTAKE AND EXHAUST MANIFOLDS

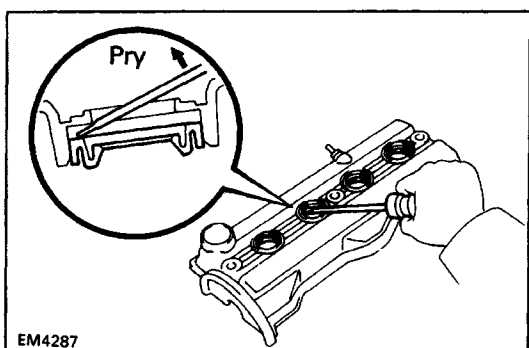
Using precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage:

Intake 0.20 mm (0.0079 in.)

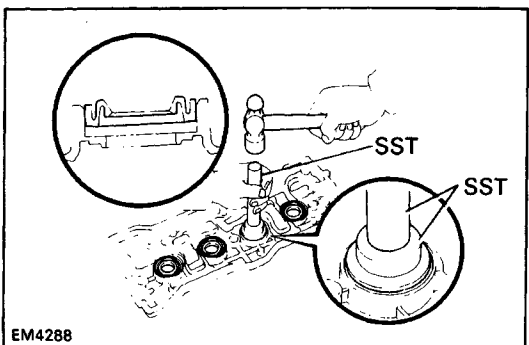
Exhaust 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold.



13. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKET

(a) Using a screwdriver, pry out the gasket.



(b) Using SST, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.

SST 09550-10012 (09552-10010, 09560-10010)

(c) Apply a light coat of IMP grease to the gasket lip.

ASSEMBLY OF CYLINDER HEAD

(See page EM-81)

HINT:

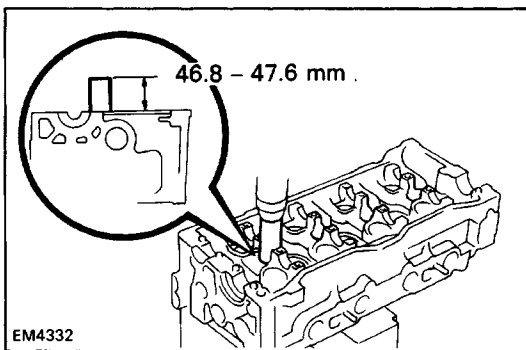
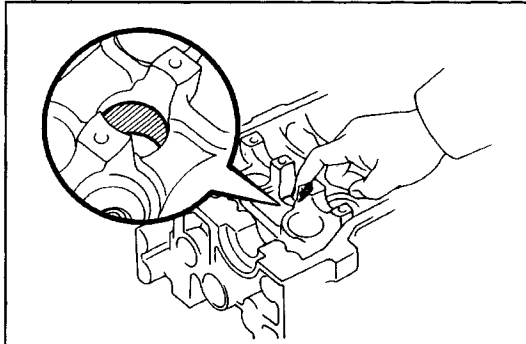
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

1. INSTALL SPARK PLUG TUBES

HINT: When using a new cylinder head, spark plug tubes must be installed.

(a) Apply adhesive to the spark plug tube hole of the cylinder head.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

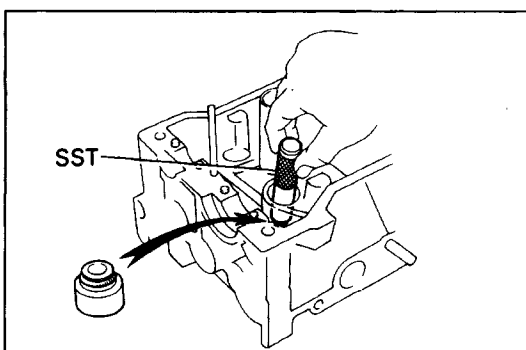


(b) Using a press, press in a new spark plug tube until there is 46.8 - 47.6 mm (1.843 - 1.874 in.) protruding from the cylinder head.

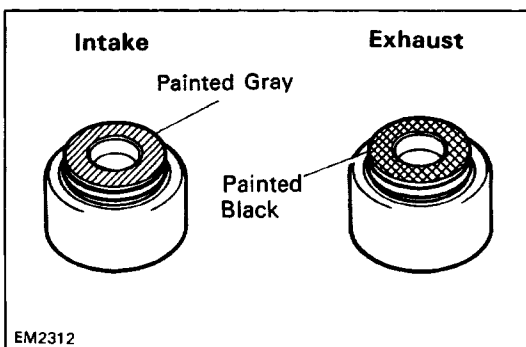
NOTICE: Avoid tapping a new spark plug tube in too far by measuring the amount of protrusion while pressing.

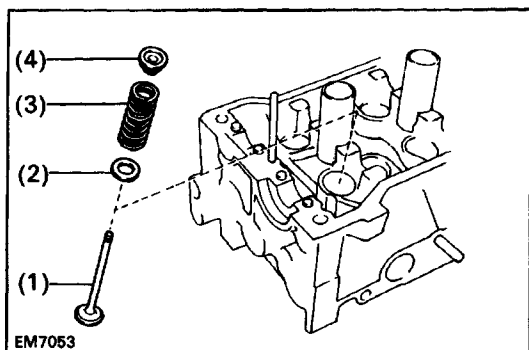
2. INSTALL VALVES

(a) Using SST, push in a new oil seal.
SST 09201-41020



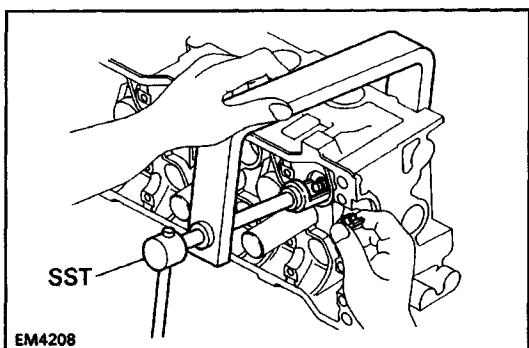
HINT: The intake valve oil seal is brown and the exhaust valve oil seal is black.





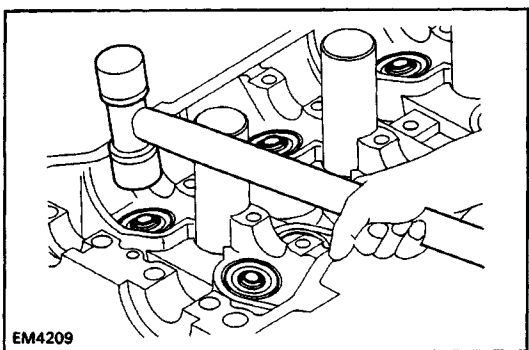
(b) Install the following parts:

- (1) Valve
- (2) Spring seat
- (3) Valve spring
- (4) Spring retainers

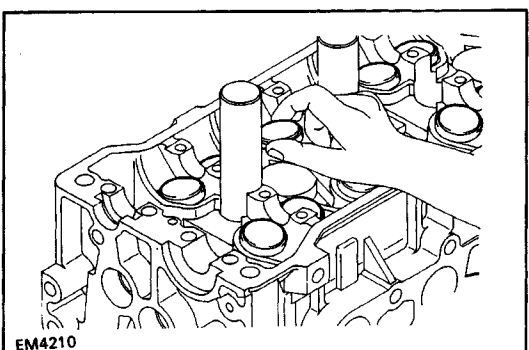


(c) Using SST, compress the valve spring and place the two keepers around the valve stem.

SST 09202-70010

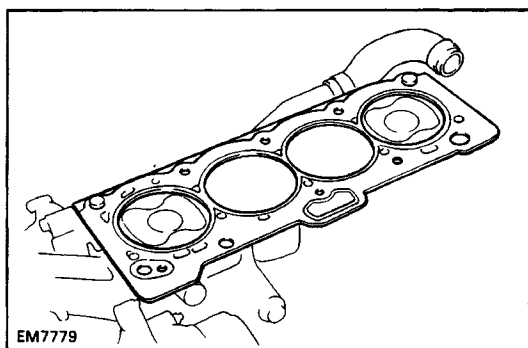


(d) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.



3. INSTALL VALVE LIFTERS AND SHIMS

- (a) Install the valve lifter and shim.
- (b) Check that the valve lifter rotates smoothly by hand.



INSTALLATION OF CYLINDER HEAD

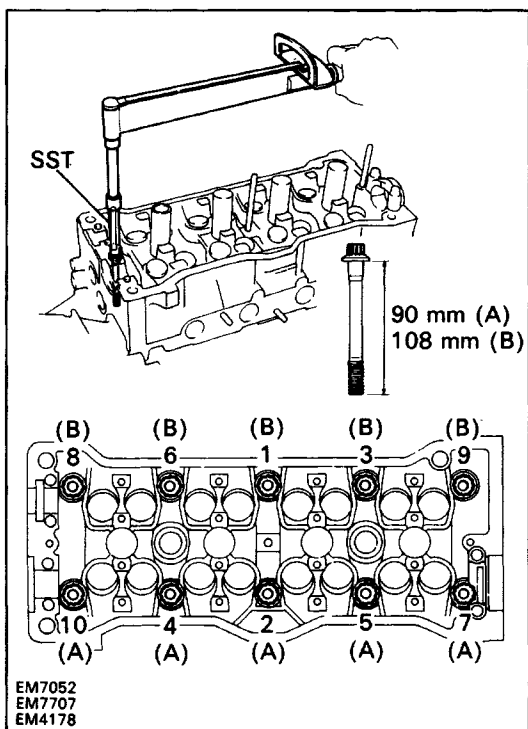
(See page EM-81)

1. INSTALL CYLINDER HEAD

- (a) Place a new cylinder head gasket in position on the cylinder block.

NOTICE: Be careful of the installation direction.

- (b) Place the cylinder head in position on the cylinder head gasket.



- (c) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (d) Install the plate washer to each cylinder head bolt.
- (e) Using SST, install and uniformly tighten the ten cylinder head bolts in several passes in the sequence shown.

SST 09205-16010

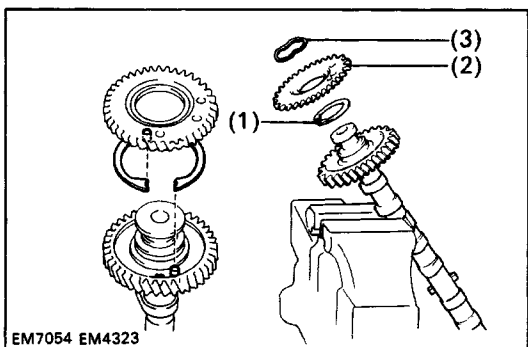
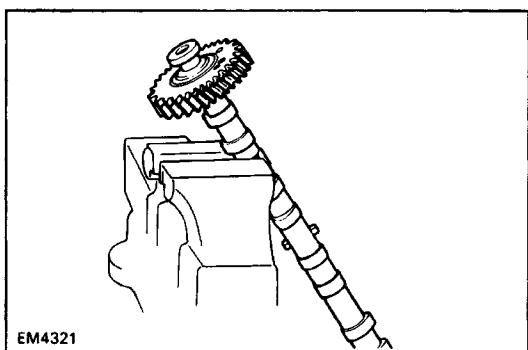
Torque: 60 N-m (610 kgf-cm, 44 ft-lbf)

HINT: Cylinder head bolts are in length of 90 mm (3.54 in.) and 108 mm (4.25 in.). Install the 90 mm (3.54 in.) bolts (A) in intake manifold side positions. Install the 108 mm (4.25 in.) bolts (B) in exhaust manifold side positions.

2. ASSEMBLE EXHAUST CAMSHAFT

- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

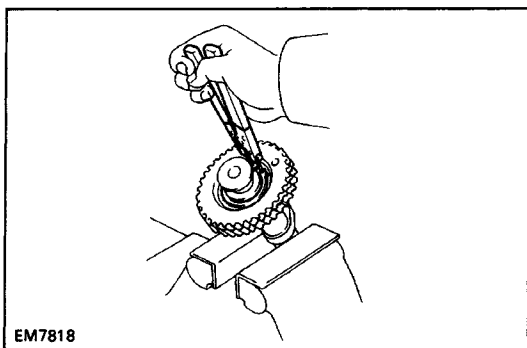
NOTICE: Be careful not to damage the camshaft.



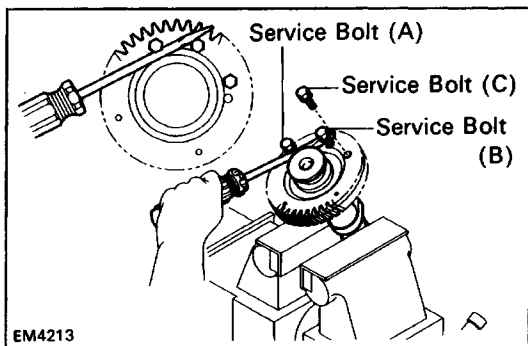
- (b) Install the following parts:

- (1) Camshaft gear spring
- (2) Camshaft sub-gear
- (3) Wave washer

HINT: Align the pins on the gears with the gear spring ends.



(c) Using snap ring pliers, install the snap ring.



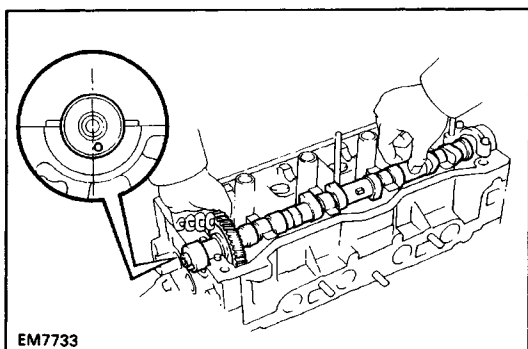
(d) Insert service bolts (A) and (13) into the service hole of the camshaft sub-gear.

(e) Using a screwdriver, align the holes of the camshaft drive gear and sub-gear by turning camshaft sub-gear clockwise, and install a service bolt (C).

NOTICE: Be careful not to damage the camshaft.

3. INSTALL CAMSHAFTS

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 portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

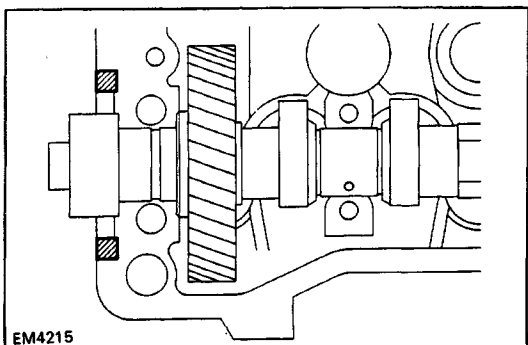


A. Install exhaust camshaft

(a) Apply MP grease to the thrust portion of the camshaft.

(b) Place the intake camshaft so the knock pin is located slightly counterclockwise from the vertical axis of the camshaft.

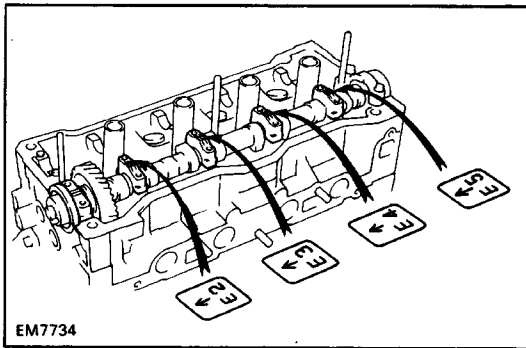
HINT: The above angle allows the No.1 and No.3 cylinder cam lobes of the exhaust camshaft to push their valve lifters evenly.



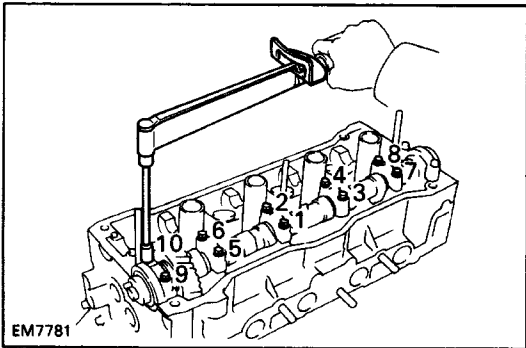
(c) Remove any old packing (FIPG) material.

(d) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent



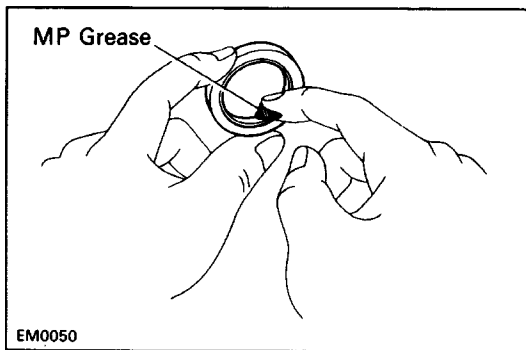
(e) Install the five bearing caps in their proper locations.



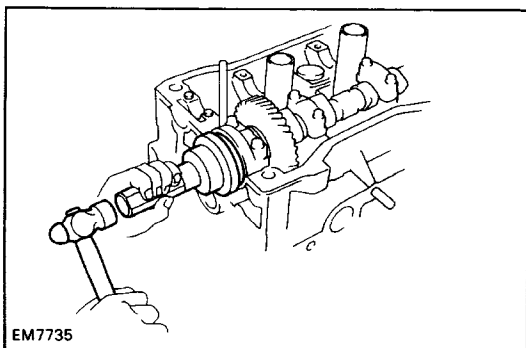
(f) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(g) Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.

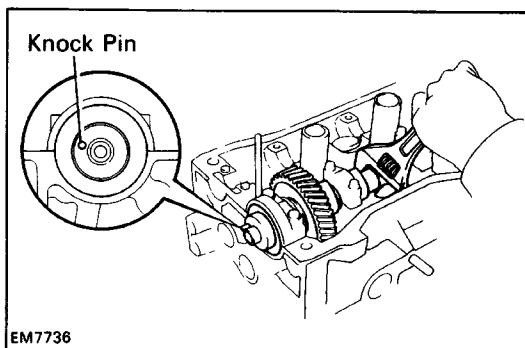
Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)



(h) Apply MP grease to a new oil seal lip.

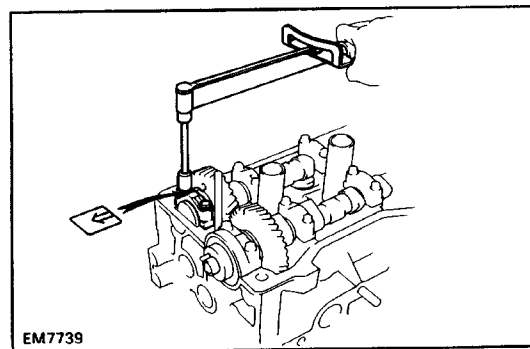
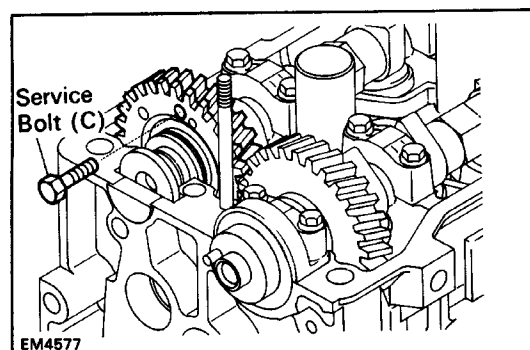
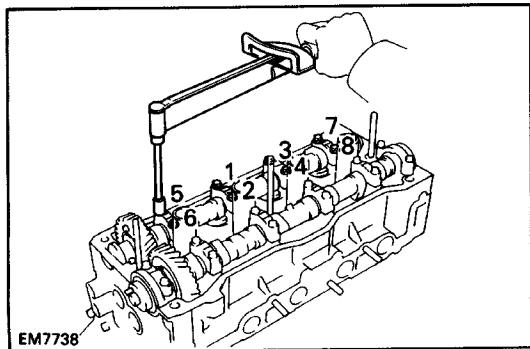
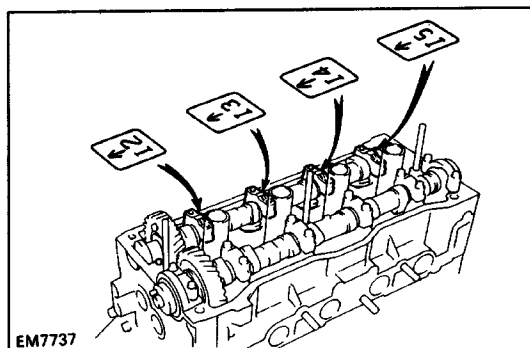
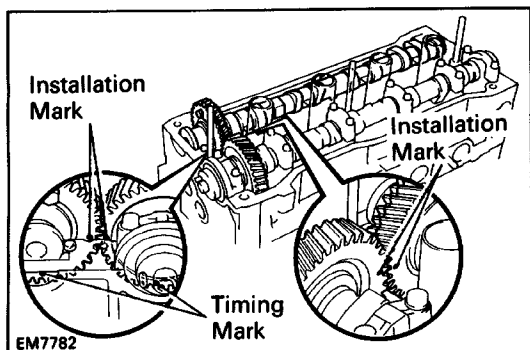


(i) Using SST, tap in the oil seal.
SST 09223-46011



B. Install intake camshaft

(a) Set the intake camshaft so the knock pin is slightly above the top of the cylinder head.



- (b) Apply MP grease to the thrust portion of the camshaft.
- (c) Engage the intake camshaft gear to the exhaust camshaft gear by matching the assembly installation marks on each gear.

NOTICE: There are also timing marks (for TDC) on each gear as shown in the illustration. Do not use these marks.

- (d) Roll down the intake camshaft onto the bearing journals while engaging gears with each other.
HINT: The above angle allows the No.1 and No.3 cylinder cam lobes of the intake camshaft to push their valve lifters evenly.
- (e) Install the four bearing caps in their proper locations.

- (f) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
- (g) Install and uniformly tighten the eight bearing cap bolts in several passes in the sequence shown.

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

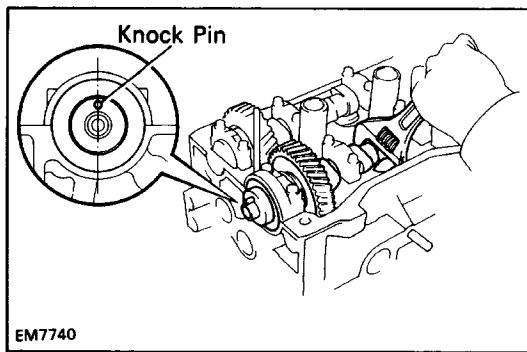
- (h) Remove the service bolt (C).

- (i) Install the No.1 bearing cap with the arrow mark facing forward.

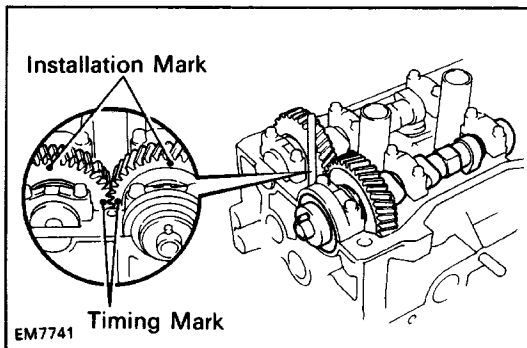
NOTICE: If the No.1 bearing cap does not fit properly, push the camshaft gear backwards by prying apart the cylinder head and camshaft gear with a screwdriver.

- (j) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
- (k) Install and alternately tighten the two bolts in several passes.

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)



- (l) Turn the exhaust camshaft clockwise, and set it with knock pin facing upward.



- (m) Check that the timing marks of the camshaft gears are aligned.

HINT: The assembly installation marks are on upside.

4. CHECK AND ADJUST VALVE CLEARANCE

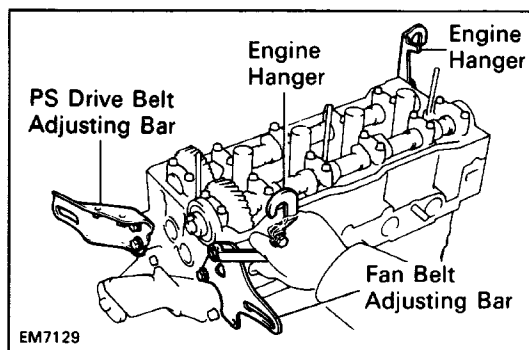
(See page [EM-13](#))

Turn the camshaft and position the cam lobe upward, and check and adjust the valve clearance.

Valve clearance (Cold):

Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust 0.20 – 0.30 mm (0.008 – 0.012 in.)



5. INSTALL PS DRIVE BELT ADJUSTING STRUT

Install the adjusting strut with the two bolts.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

6. INSTALL ENGINE HANGERS

Install the engine hanger with the bolt. Install the two engine hangers.

Torque: 27 N-m (280 kgf-cm, 20 ft-lbf)

7. INSTALL FAN BELT ADJUSTING BAR

Install the adjusting bar with the two bolts.

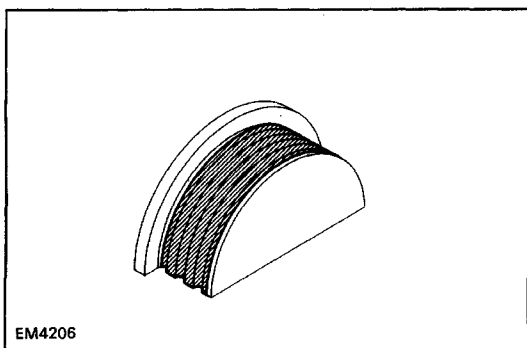
Torque: 20 N-m (200 kgf-cm, 14 ft-lbf)

8. INSTALL CAMSHAFT TIMING PULLEY

(See step 7 on page [EM-41](#))

9. INSTALL TIMING BELT

(See steps 8 to 13, 15 to 17, 19 to 22 on pages [EM-41](#) to 45)

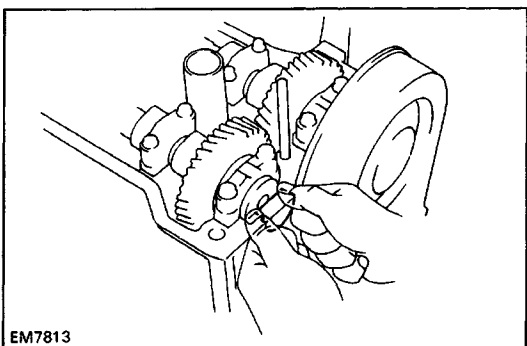


EM4206

10. INSTALL SEMI-CIRCULAR PLUG

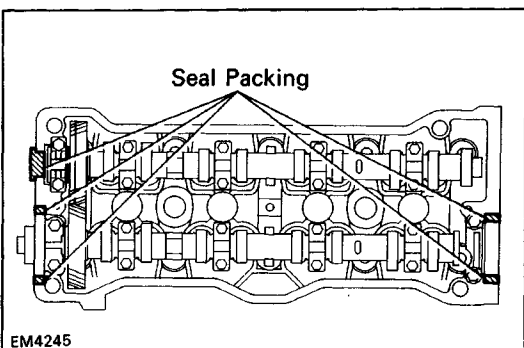
- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the circular plug.

Seal packing: Part No. 08826-00080 or equivalent



EM7813

- (c) Install the semi-circular plug to the cylinder head.

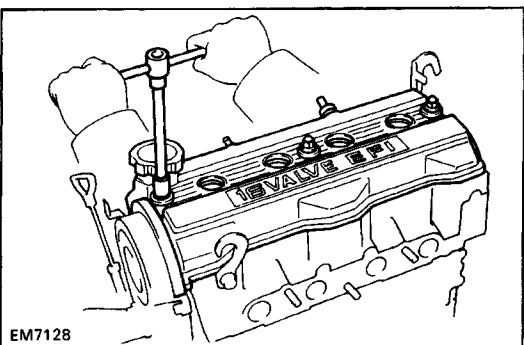


EM4245

11. INSTALL CYLINDER HEAD COVER

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head as shown in the illustration.

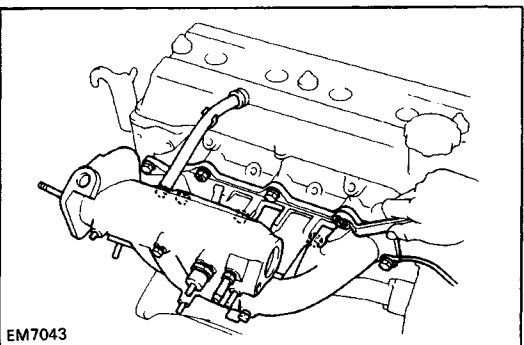
Seal packing: Part No. 08826-00080 or equivalent



EM7128

- (c) Install the gasket to the head cover.
- (d) Install the head cover with the three grommets and cap nuts. Uniformly tighten the nuts in several passes.

Torque: 7.8 N-m (80 kgf-cm, 69 in.-lbf)



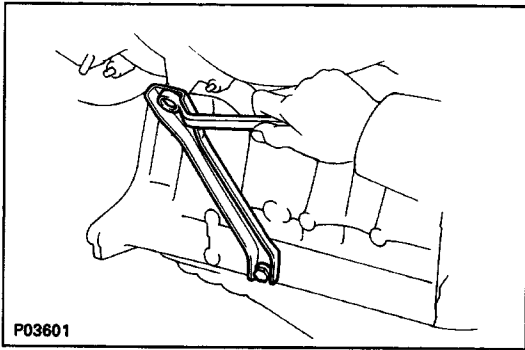
EM7043

12. INSTALL INTAKE MANIFOLD

- (a) Install a new gasket and the intake manifold with the seven bolts and two nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

- (b) Connect the PCV hose to PCV valve on the cylinder head.

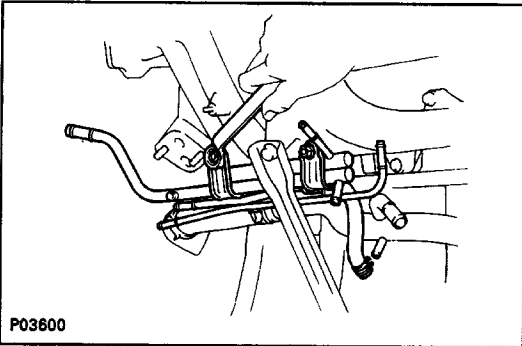


(c) Install the manifold stay with the two bolts. Alternately tighten the bolts.

Torque:

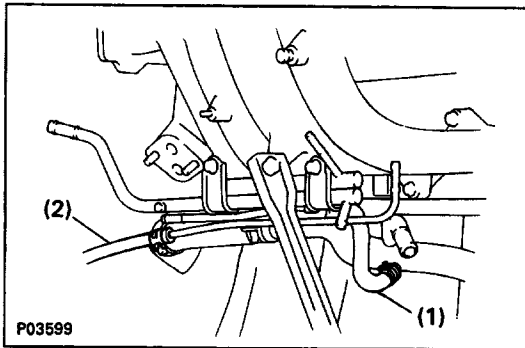
12 mm bolt head 19 N-m (195 kgf-cm, 14 ft-lbf)

14 mm bolt head 39 N-m (400 kgf-cm, 29 ft-lbf)



13. INSTALL AIR PIPE

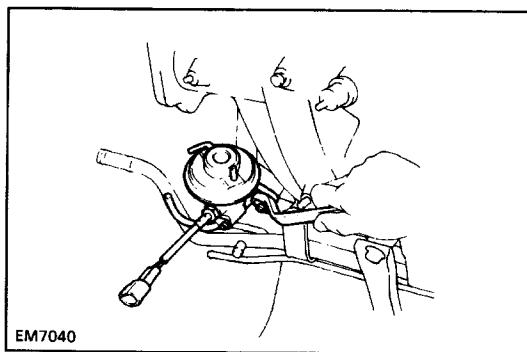
(a) Install the air pipe with the two nuts.



(b) Connect the following hoses:

(1) Water inlet pipe water by-pass hose

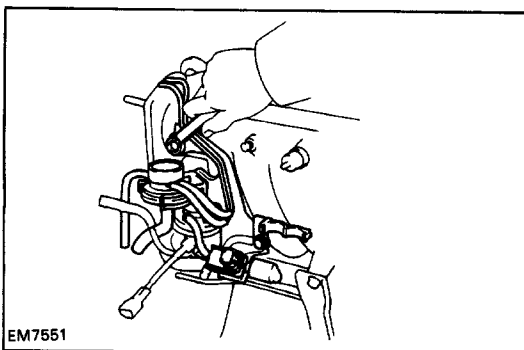
(2) Fuel return hose (from fuel filter)



14. INSTALL EGR VALVE

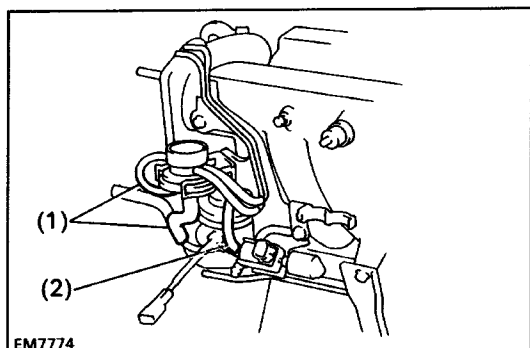
Install the EGR valve with the two nuts.

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

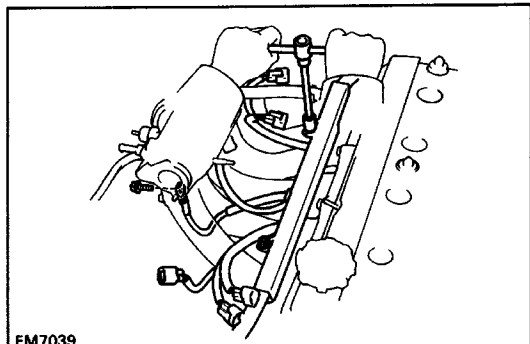


15. INSTALL VACUUM PIPE, EGR VACUUM MODULATOR AND EGR VSV

(a) Install the vacuum pipe, vacuum modulator and VSV assembly with the two nuts.

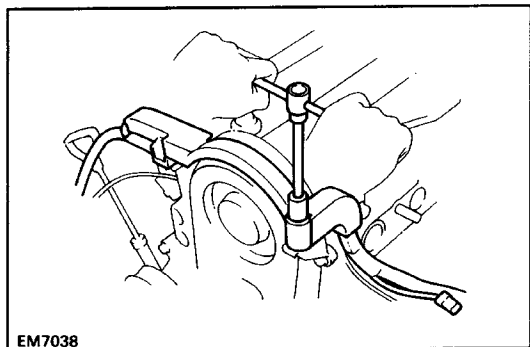


- (b) Connect the following hoses:
- (1) Two vacuum hoses (from EGR vacuum modulator) to EGR valve
 - (2) Vacuum hose (from EGR VSV) to EGR valve



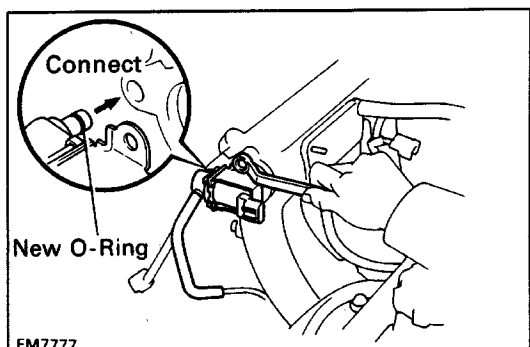
16. INSTALL ENGINE WIRE TO INTAKE MANIFOLD

- (a) Install the engine wire with the three bolts.
- (b) Install the engine wire on the engine to vacuum pipe with the wire clamp.
- (c) Connect the following connectors:
 - EGR VSV connector
 - (CALIF. only)
EGR gas temperature sensor connector
 - Vacuum sensor connector



17. INSTALL ENGINE WIRE TO No.3 TIMING BELT COVER

- (a) Install the wire clamp on the engine wire to the wire bracket.
- (b) Install the engine wire with the bolt.
- (c) Connect the following connectors and wire:
 - Alternator connector.
 - Alternator wire
 - Oil pressure switch connector
 - A/C compressor connector



18. INSTALL ACV

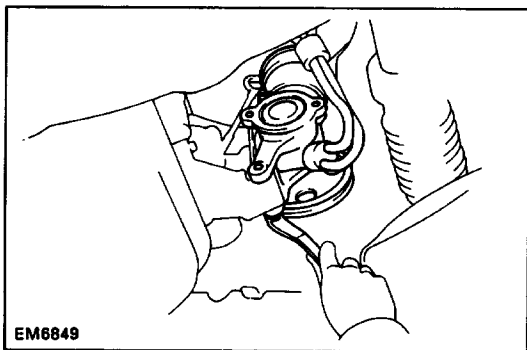
- (a) Install a new O-ring to the ACV.
 - (b) Apply soapy water to the O-ring.
 - (c) Install the ACV with the bolt and nut.
 - (d) Connect the air hose to the air pipe.
- Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)**

19. INSTALL INJECTORS AND DELIVERY PIPE

(See steps 1 to 5 on pages [FI-158](#) and [159](#))

20. INSTALL THROTTLE BODY

(See steps 2 to 5 on page [FI-191](#))

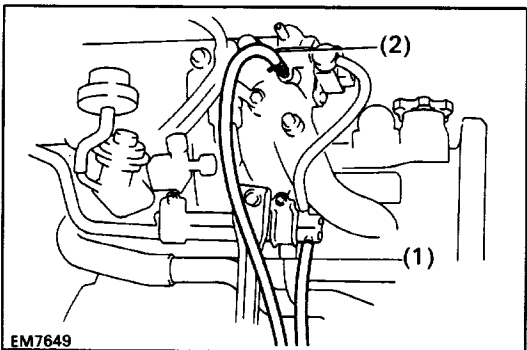


EM6849

21. INSTALL PS PUMP

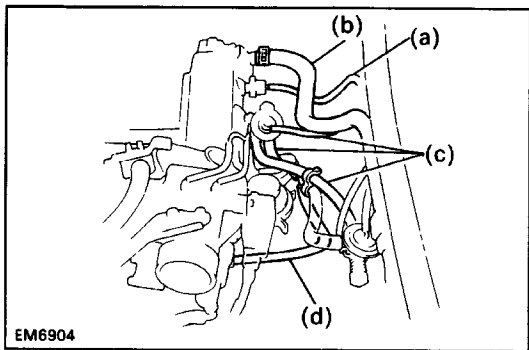
- (a) Install the PS pump and drive belt with the two bolts.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)



EM7649

- (b) Connect the following hoses:
- (1) Air hose to air pipe
 - (2) Air hose to intake manifold



EM6904

22. CONNECT VACUUM HOSES

- (a) Vacuum sensor hose to gas filter on intake manifold
- (b) Brake booster vacuum hose to intake manifold
- (c) Three A/C vacuum hoses to ASV on intake manifold
- (d) A/C vacuum hose to air pipe

23. INSTALL WATER INLET AND INLET HOUSING

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the inlet housing and cylinder head.

- Using a razor blade and gasket scraper, remove all the oil packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non-residue, clean both sealing surfaces.

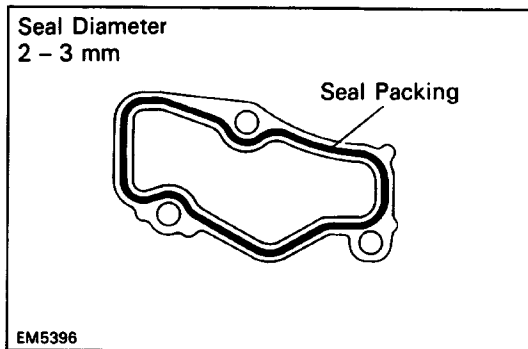
- (b) Apply seal packing to the inlet housing groove.

Seal packing: Part No. 08826-00100 or equivalent

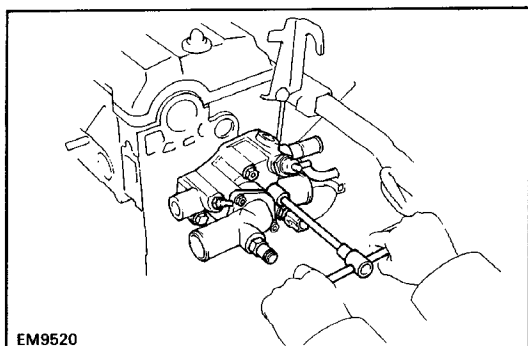
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

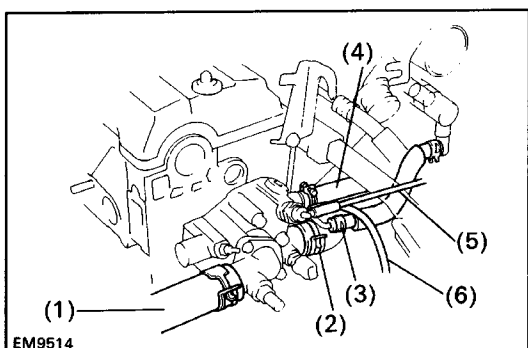


EM5396



- (c) Install the water inlet and inlet housing assembly with the bolt and two nuts.

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



- (d) Connect the following hoses: ,
- (1) Lower radiator hose
 - (2) Water inlet pipe hose
 - (3) Auxiliary air valve water by-pass hose
 - (4) Heater water hose
 - (5) EVAP BVSV vacuum hose (from port P of throttle body)
 - (6) EVAP BVSV vacuum hose (from charcoal canister)
- (e) Connect the following connectors:
- Water temperature sender gauge connector
 - Water temperature sensor connector

24. INSTALL WATER OUTLET

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water outlet and cylinder head.

- Using a razor blade and gasket scraper, remove all the oil packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non-residue, clean both sealing surfaces.

- (b) Apply seal packing to the water outlet groove.

Seal packing: Part No. 08826-00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

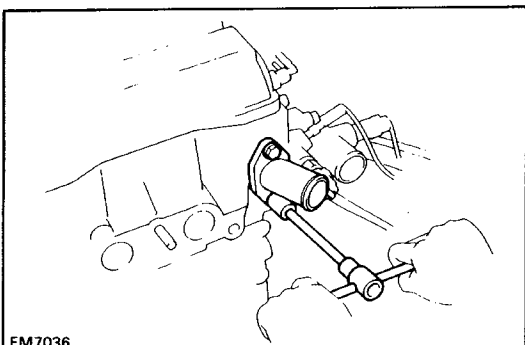
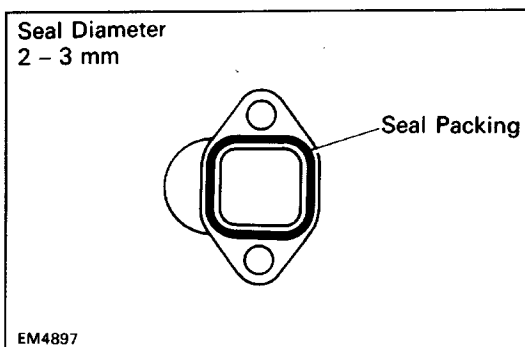
HINT: Avoid applying an excessive amount to the surface.

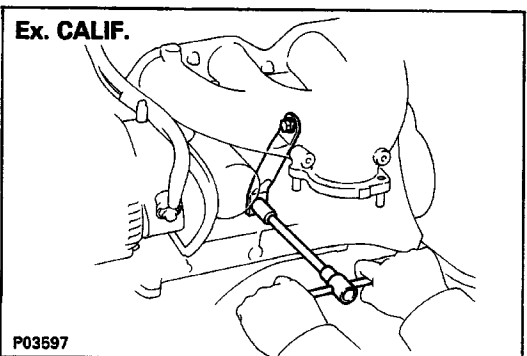
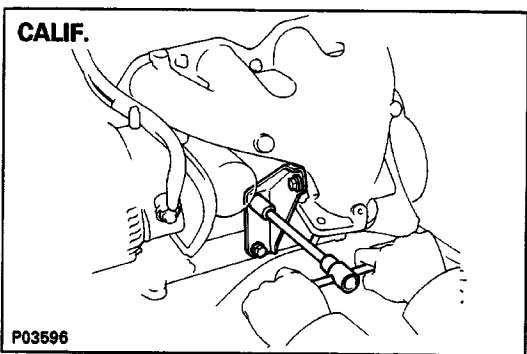
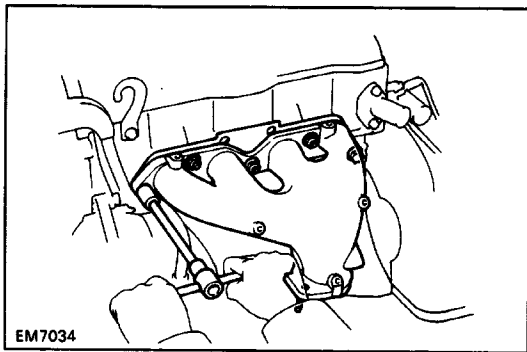
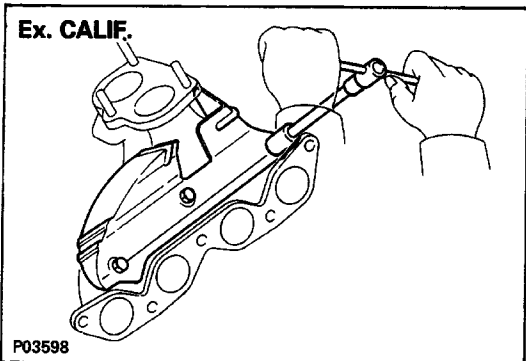
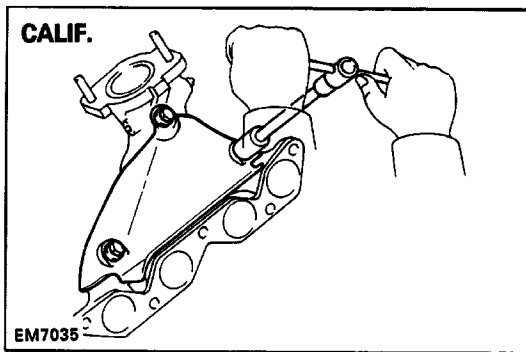
- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

- (c) Install the water outlet with the two bolts.

Torque: 15 N-m (150 kgf-cm, 11 ft-lbf)

- (d) Connect the upper radiator hose to the water outlet.





25. INSTALL EXHAUST MANIFOLD

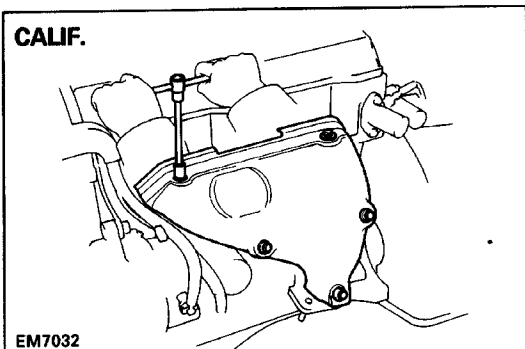
- (a) Install the lower heat insulator to the exhaust manifold with the three bolts.

- (b) Install a new gasket and the exhaust manifold with the two bolts and three new nuts. Uniformly tighten the bolts and nuts in several passes.

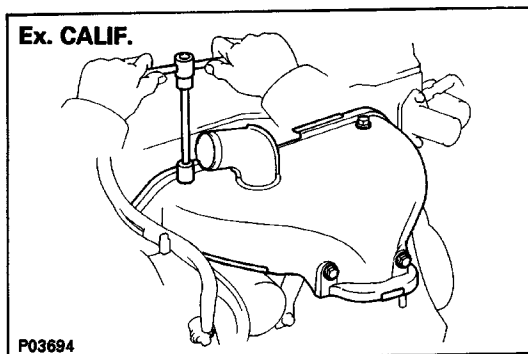
Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)

- (c) Install the manifold stay with the three (CALIF.) or two (Ex. CALIF.) bolts. Alternately tighten the bolts.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

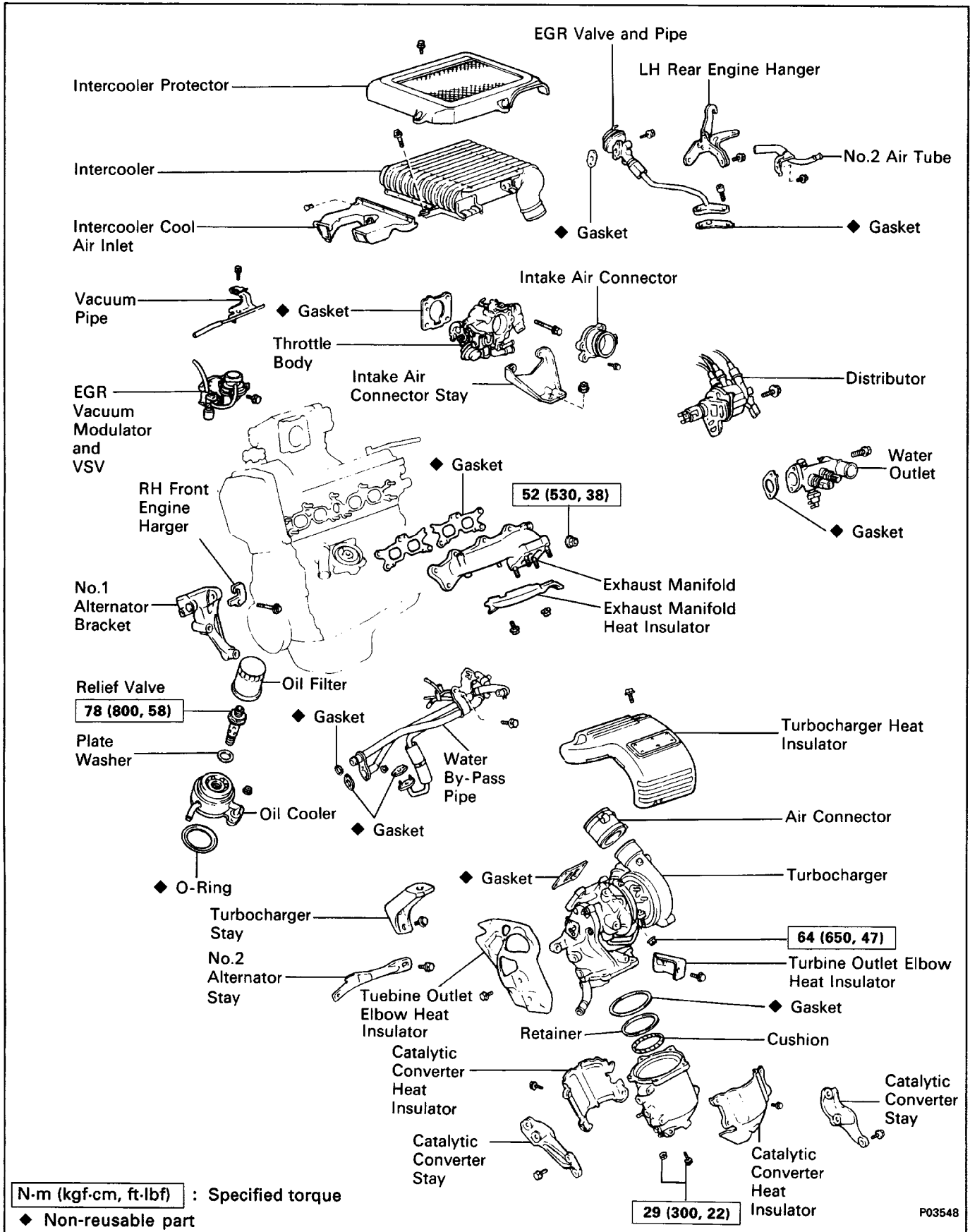


- (d) Install the upper heat insulator with the five (CALIF.) or four (Ex. CALIF.) bolts.

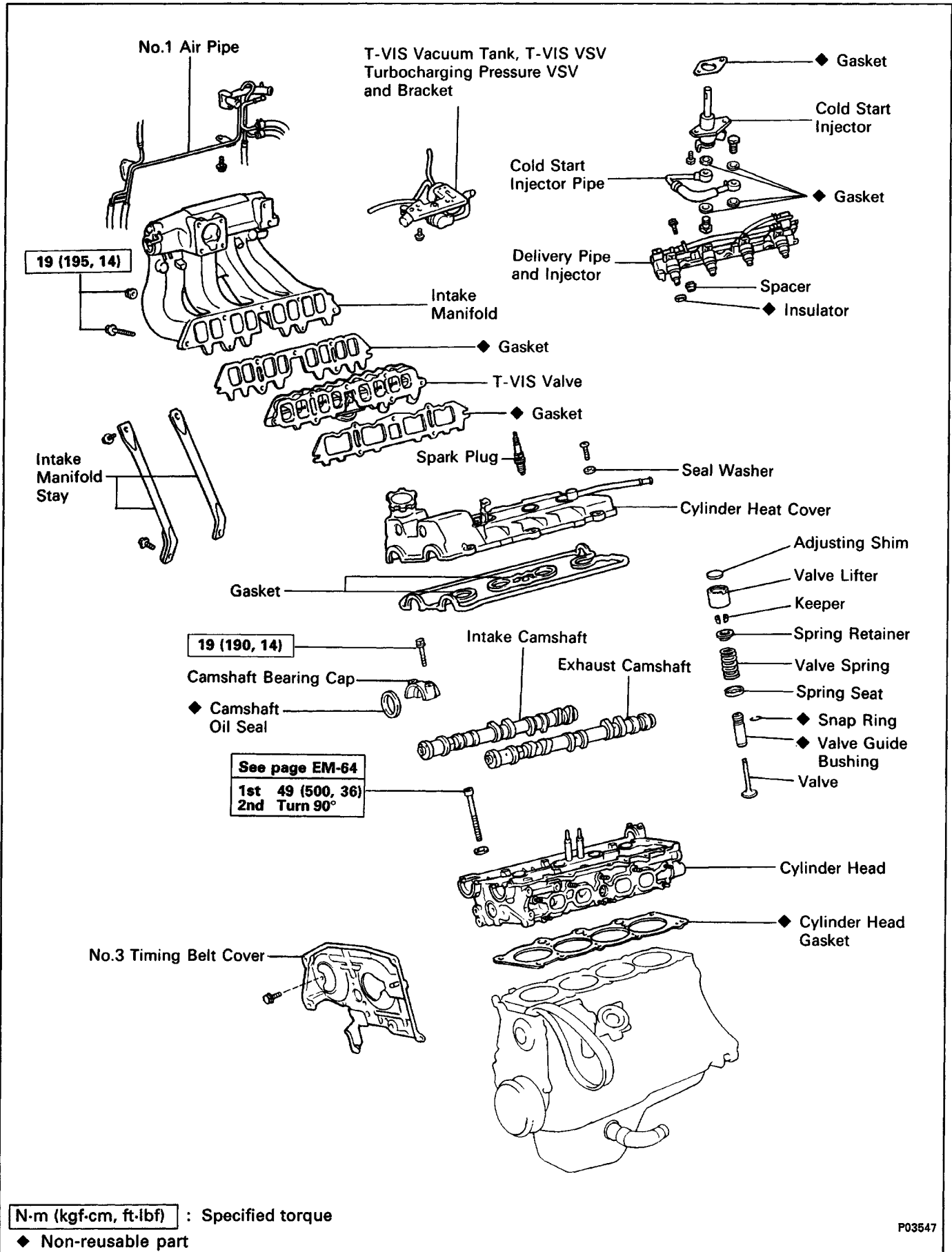


26. INSTALL DISTRIBUTOR (See page [IG-24](#))
27. INSTALL FRONT EXHAUST PIPE
(See step 17 on page [EM-217](#))
28. INSTALL SUSPENSION LOWER CROSS MEMBER
(See page 18 on page [EM-218](#))
29. INSTALL ENGINE UNDER COVERS
30. INSTALL AIR CLEANER
31. INSTALL ACCELERATOR CABLE, AND ADJUST IT
32. (A/T)
CONNECT THROTTLE CABLE, AND ADJUST IT
33. FILL WITH ENGINE COOLANT (See page [CO-6](#))
Capacity (w/ Heater):
M/T 5.2 liters (5.5 US qts, 4.6 Imp. qts)
A/T 5.6 liters (5.9 US qts, 4.9 Imp. qts)
34. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
35. START ENGINE AND CHECK FOR LEAKS
36. PERFORM ENGINE ADJUSTMENT
 - (a) Adjust the ignition timing. (See page [IG-25](#))
Ignition timing:
10° BTDC idle
(w/ Terminals TE1 and E1 connected)
 - (b) Adjust the idle speed. (See page [MA-8](#))
Idle speed: 800 rpm (w/ Cooling fan OFF)
37. PERFORM ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
38. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

CYLINDER HEAD (3S-GTE) COMPONENTS



COMPONENTS (Cont'd)



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

◆ Non-reusable part

REMOVAL OF CYLINDER HEAD

(See pages [EM-116](#) and 117)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page [CO-6](#))

3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

4. REMOVE AIR CLEANER CAP

(See step 7 on page [EM-224](#))

5. REMOVE INTERCOOLER

(See steps 13 to 15 on pages [TC-9](#) and 20)

6. REMOVE ALTERNATOR (See page [CH-7](#))

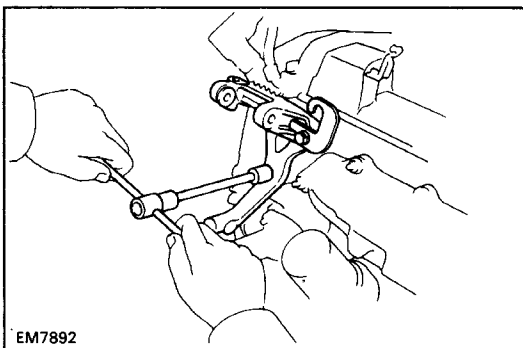
7. REMOVE ENGINE UNDER COVER

8. REMOVE SUSPENSION LOWER CROSSMEMBER

(See step 33 on page [EM-228](#))

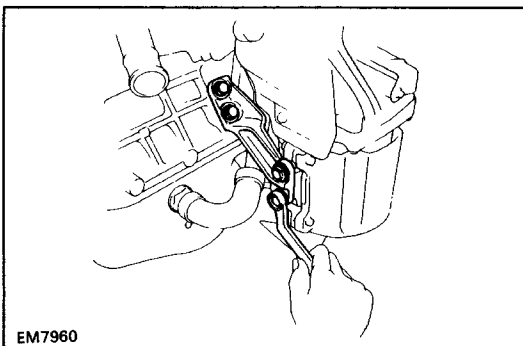
9. REMOVE FRONT EXHAUST PIPE

(See step 34 on page [EM-229](#))



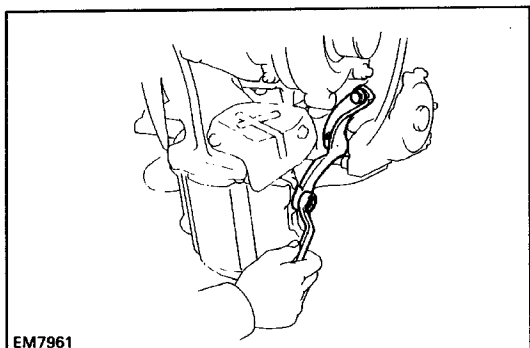
10. REMOVE RH FRONT ENGINE HANGER AND NO.1 ALTERNATOR BRACKET

Remove the three bolts, engine hanger and alternator bracket.

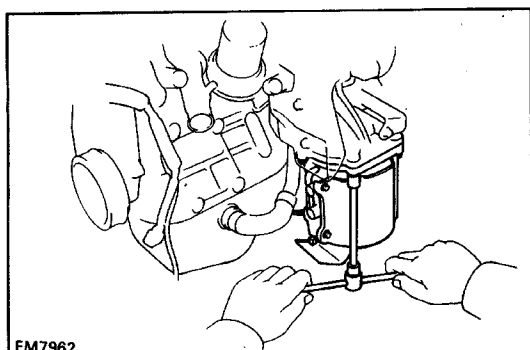


11. REMOVE CATALYTIC CONVERTER

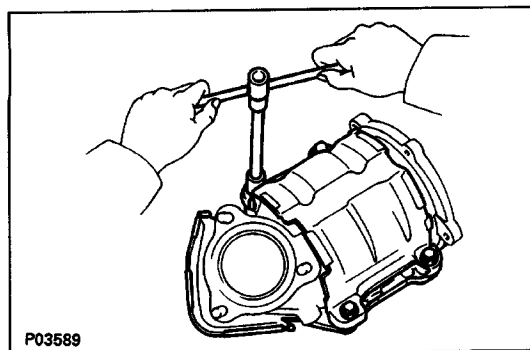
(a) Remove the four bolts and RH converter stay.



(b) Remove the three bolts and LH converter stay.



(c) Remove the three bolts, two nuts and catalytic converter. Remove the gasket, retainer and cushion.



(d) Remove the five bolts and front heat insulator.

(e) Remove the four bolts and rear heat insulator.

12. REMOVE TURBOCHARGER

(See steps 16 to 21 on pages [TC-10](#) and 11)

13. REMOVE THROTTLE BODY

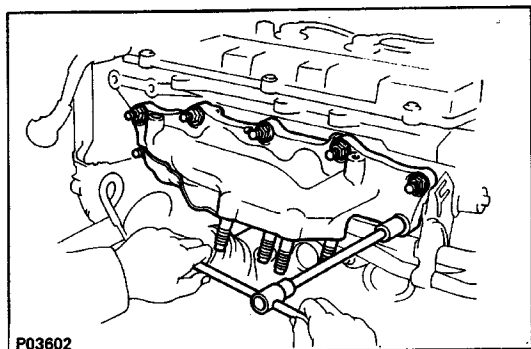
(See steps 5 to 8, 10 and 11 on pages [FI-194](#) and 195)

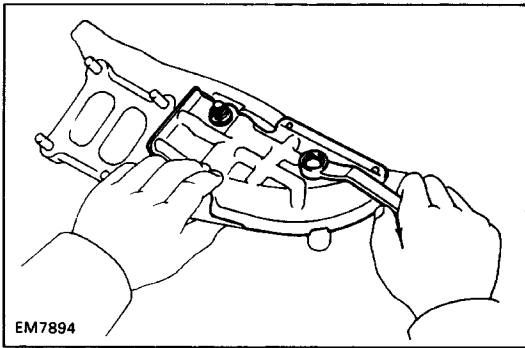
14. REMOVE COLD START INJECTOR

(See steps 2 to 4 on pages [FI-146](#) and 147)

15. REMOVE EXHAUST MANIFOLD

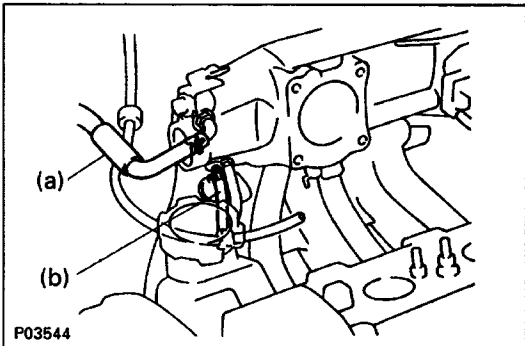
(a) Remove the nine nuts, exhaust manifold and gas ket.





(b) Remove the bolt, nut and heat insulator.

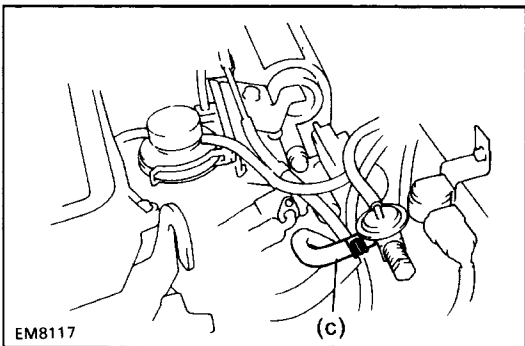
16. REMOVE DISTRIBUTOR (See page IG-26)



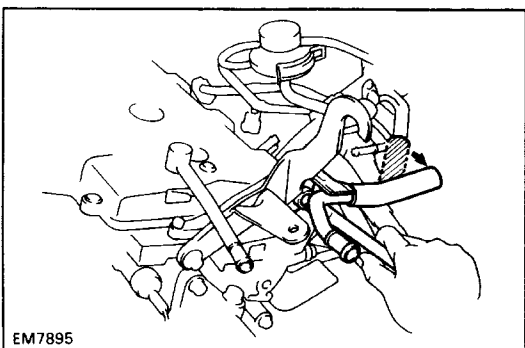
17. DISCONNECT HOSES

(a) Brake booster vacuum hose from intake manifold

(b) Turbocharging pressure sensor hose from intake manifold



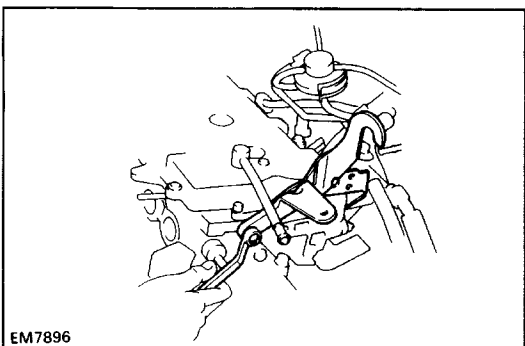
(c) A/C ASV air hose from No.1 air tube



18. REMOVE NO.2 AIR TUBE

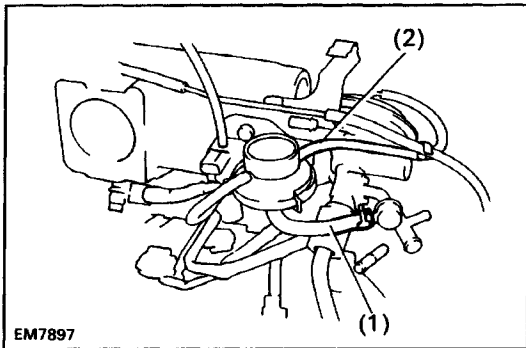
(a) Disconnect the air hose from the No.1 air tube.

(b) Remove the bolt and No.1 air tube.

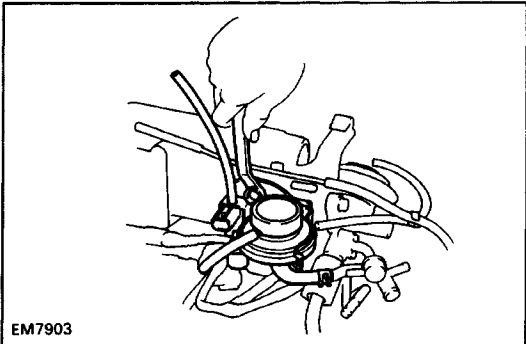


19. REMOVE LH ENGINE HANGER

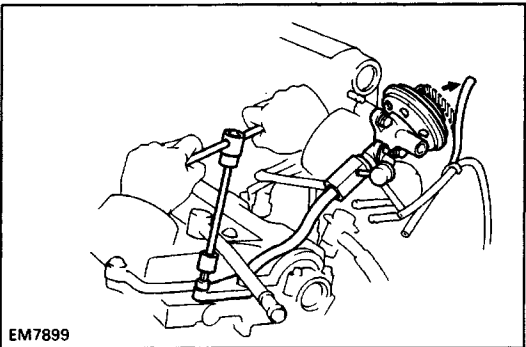
Remove the two bolts and engine hanger.

**20. REMOVE EGR VACUUM MODULATOR AND VSV**

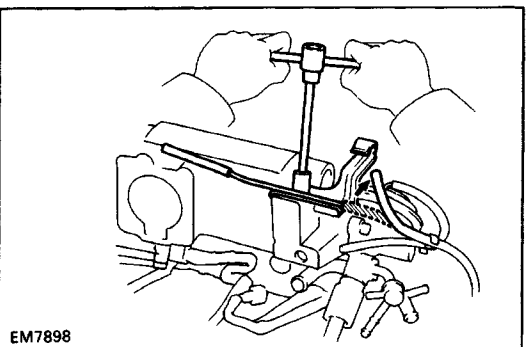
- (a) Disconnect the EGR VSV connector.
- (b) Disconnect the following hoses:
 - (1) Vacuum hose from EGR valve
 - (2) Vacuum hose from EGR vacuum modulator



- (c) Remove the bolt, vacuum modulator and VSV assembly.

**21. REMOVE EGR VALVE AND PIPE**

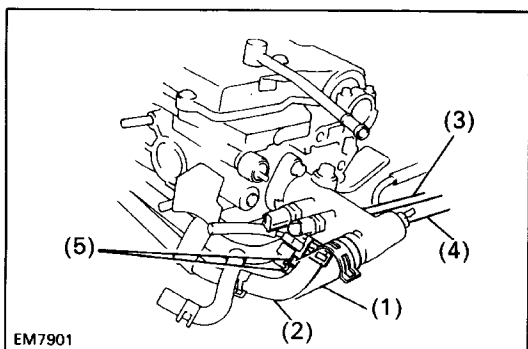
- (a) Disconnect the vacuum hose from the EGR valve.
- (b) Remove the four bolts, the EGR valve, pipe assembly and two gaskets.

**22. REMOVE VACUUM PIPE**

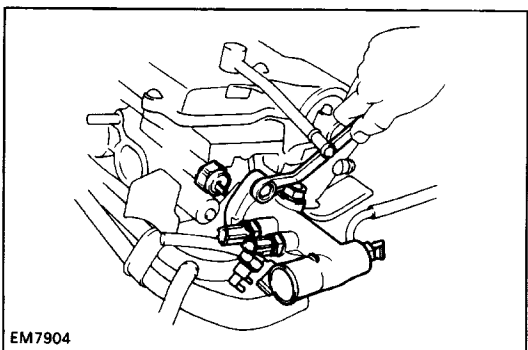
- (a) Disconnect the vacuum hose from the vacuum pipe.
- (b) Remove the bolt and vacuum pipe.

23. REMOVE WATER OUTLET

- (a) Disconnect the following connectors:
 - Water temperature sender gauge connector
 - Water temperature sensor connector
 - Cold start injector time switch connector



- (b) Disconnect the following hoses:
- (1) Upper radiator hose
 - (2) Water by-pass hose from water by-pass pipe
 - (3) Water by-pass pipe hose from ISC valve
 - (4) Heater water hose
 - (5) Two EVAP VSV vacuum hoses

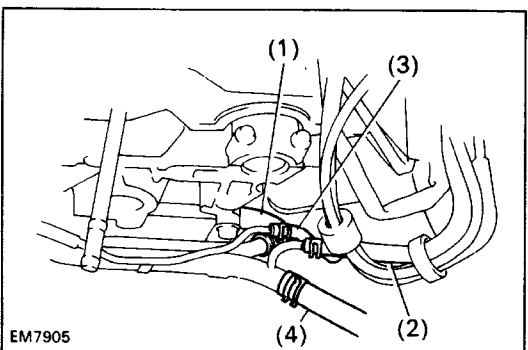


- (c) Remove the two bolts, water outlet and gasket.

24. REMOVE OIL PRESSURE SWITCH

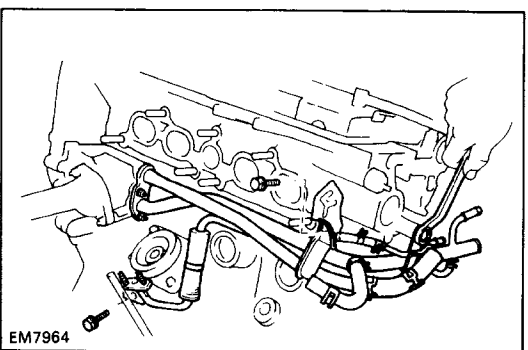
25. REMOVE OIL COOLER

(See steps 4 to 6 on pages [LU-24](#) and [25](#))

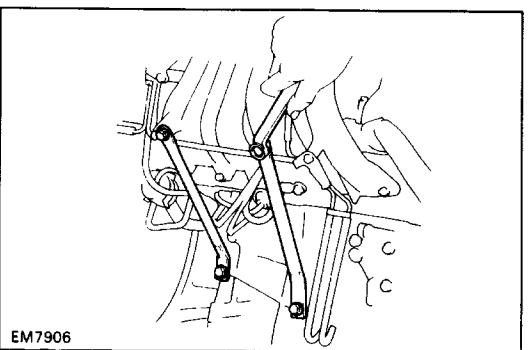


26. REMOVE WATER BY-PASS PIPE

- (a) Disconnect the following hoses:
- (1) Water by-pass hose from cylinder block
 - (2) Water by-pass hoses from No.1 air tube
 - (3) Vacuum hose from turbocharging pressure VSV
 - (4) Heater water hose

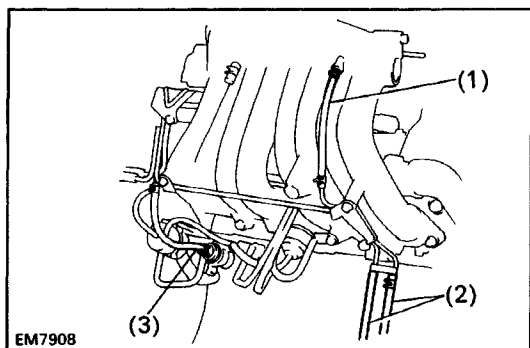


- (b) Remove the two bolts, two nuts, water by-pass pipe, gasket and O-ring.



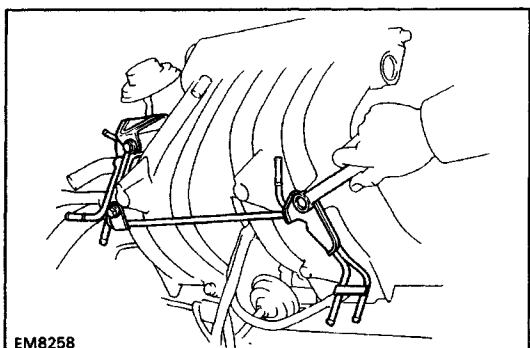
27. REMOVE INTAKE MANIFOLD STAYS

Remove the two bolts and manifold stay. Remove the two manifold stays.



28. REMOVE NO.1 AIR TUBE

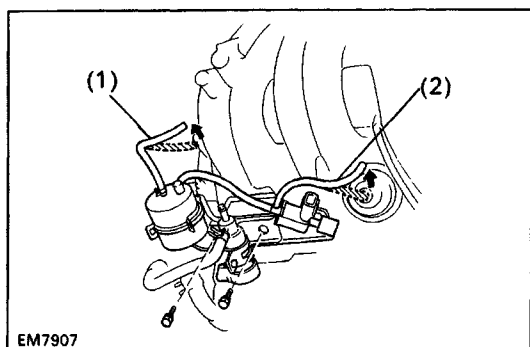
- (a) Disconnect the following hoses:
- (1) Vacuum hose from intake manifold
 - (2) Two PS vacuum hoses
 - (3) Vacuum hose from turbocharging pressure VSV



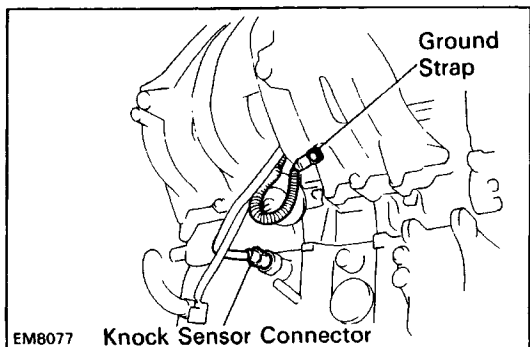
- (b) Remove the three bolts and air tube.

29. REMOVE T-VIS VACUUM TANK, T-VIS VSV, TURBOCHARGING PRESSURE VSV AND BRACKET

- (a) Disconnect the following connectors:
- T-VIS VSV connector
 - Turbocharging pressure VSV connector



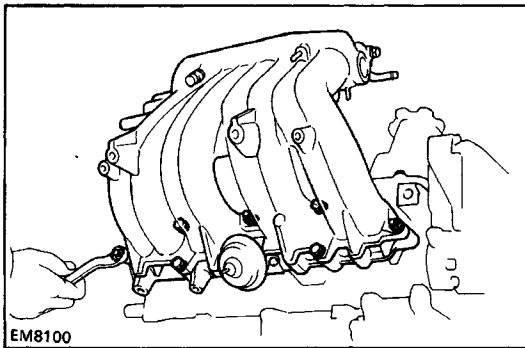
- (b) Disconnect the following hoses:
- (1) Vacuum hose (from T-VIS VSV) from T-VIS actuator
 - (2) Vacuum hose (from T-VIS vacuum tank) from intake manifold
- (c) Remove the two bolts, the T-VIS vacuum tank, T-VIS VSV, turbocharging pressure VSV and bracket assembly.



30. REMOVE INTAKE MANIFOLD AND T-VIS VALVE

- (a) Remove the bolt, and disconnect the ground strap.
- (b) Disconnect the knock sensor connector.

EM8077 Knock Sensor Connector



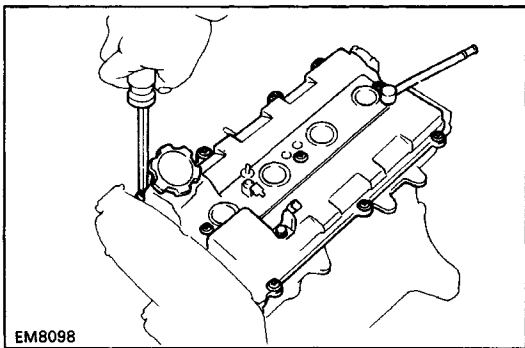
(c) Remove the four bolts, three nuts, intake manifold, T-VIS VSV and two gaskets.

31. REMOVE CHARCOAL CANISTER

(See step 20 on page [EM-226](#))

32. REMOVE DELIVERY PIPE AND INJECTORS

(See steps 8 to 14 on pages [FI-161](#) and 162)



33. REMOVE CYLINDER HEAD COVER

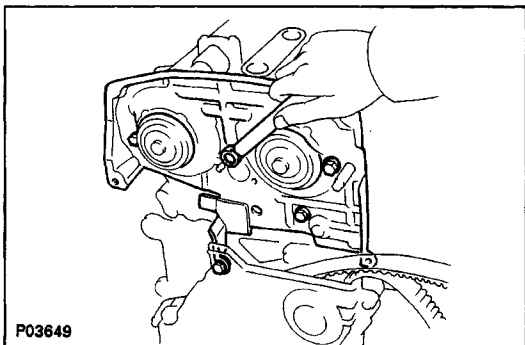
Remove the ten screws, seal washers, head cover and two gaskets.

34. REMOVE CAMSHAFT TIMING PULLEYS

(See steps 15 to 19 on pages [EM-48](#) and 49)

35. REMOVE NO.1 IDLER PULLEY

(See step 24 on page [EM-51](#))



36. REMOVE NO.3 TIMING BELT COVER

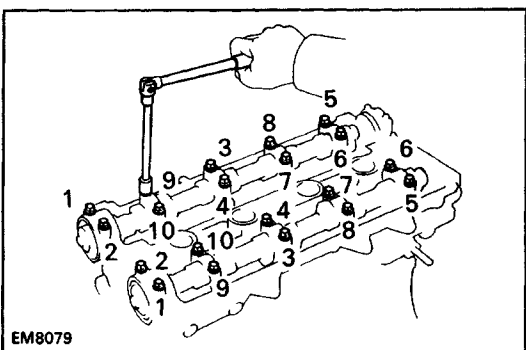
Remove the five bolts and timing belt cover.



EM8078

NOTICE:

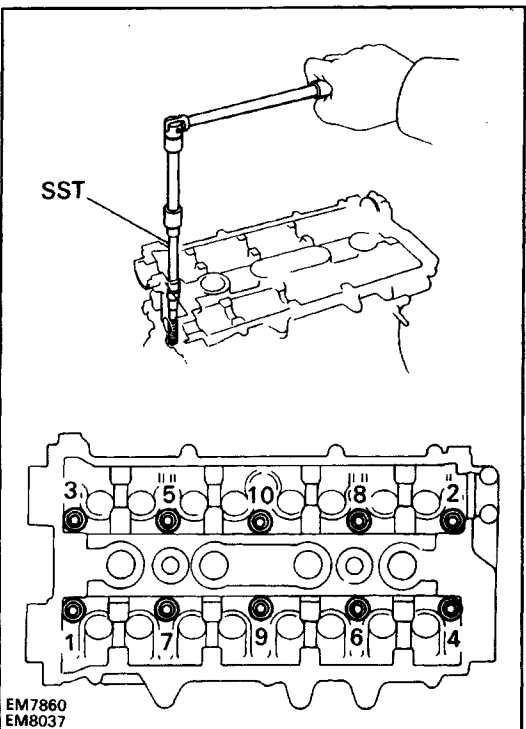
- Support the timing belt, so that the meshing of the crankshaft timing pulley and timing belt does not shift.
- Be careful not to drop anything inside the timing belt cover.
- Do not allow the timing belt to come into contact with oil, water or dust.



EM8079

37. REMOVE CAMSHAFTS

Uniformly loosen and remove the ten bearing cap bolts in several passes in the sequence shown, and remove the five bearing caps, oil seal and camshaft. Remove the intake and exhaust camshafts.

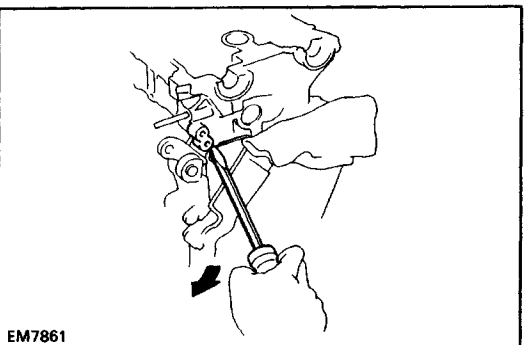
EM7860
EM8037**38. REMOVE CYLINDER HEAD**

- (a) Using SST, uniformly loosen and remove the ten cylinder head bolts in several passes in the sequence shown.

SST 09043-38100

NOTICE: Cylinder head warpage or cracking could result from removing in incorrect order.

- (b) Remove the ten plate washers.



EM7861

- (c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.

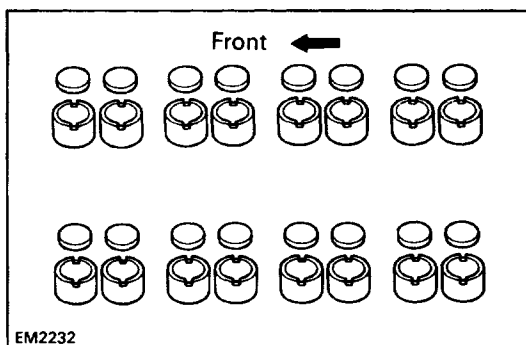
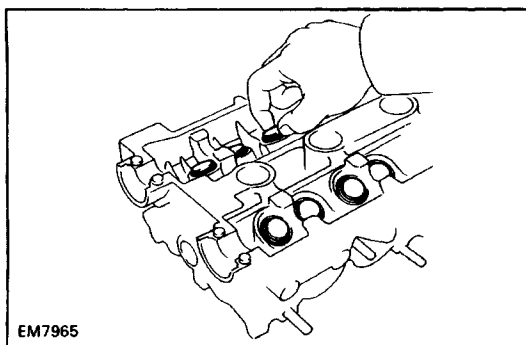
[HINT: If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

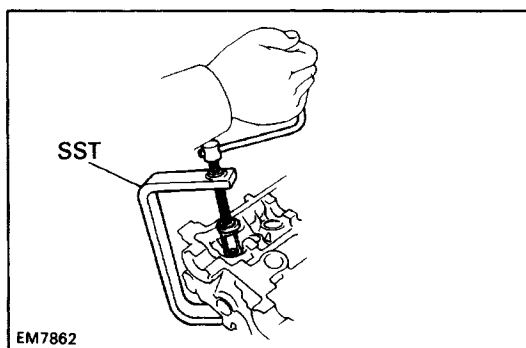
DISASSEMBLY OF CYLINDER HEAD

(See page EM-117)

1. REMOVE VALVE LIFTERS AND SHIMS



HINT: Arrange the valve lifters and shims in correct order.

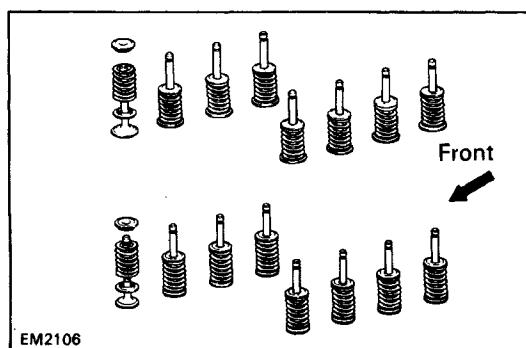


2. REMOVE VALVES

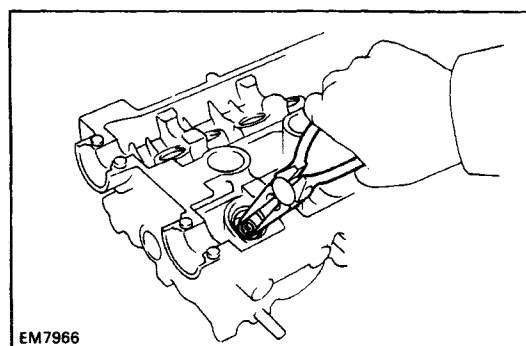
(a) Using SST, compress the valve spring and remove the two keepers.

SST 09202-70010

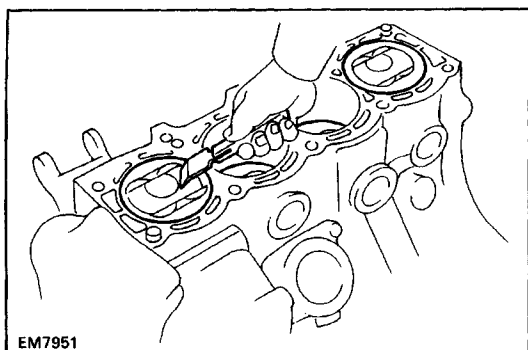
(b) Remove the spring retainer, valve spring, valve and spring seat.



HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



(c) Using needle-nose pliers, remove the oil seal.

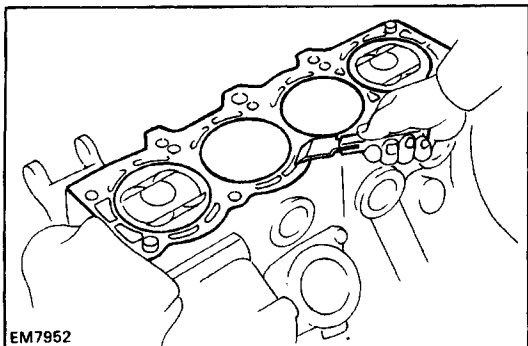


EM7951

INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.

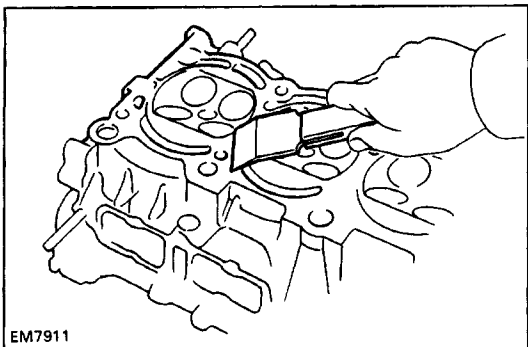


EM7952

- (b) Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder head.

- (c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high-compressed air.



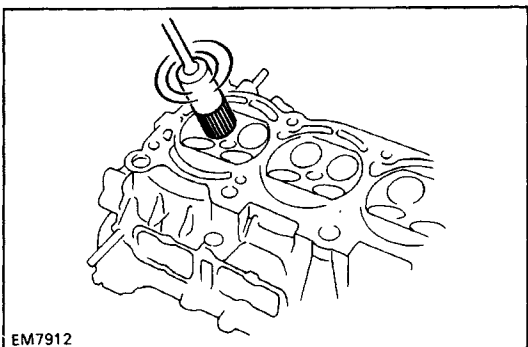
EM7911

2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder block.

NOTICE: Be careful not to scratch the cylinder block contact surface.

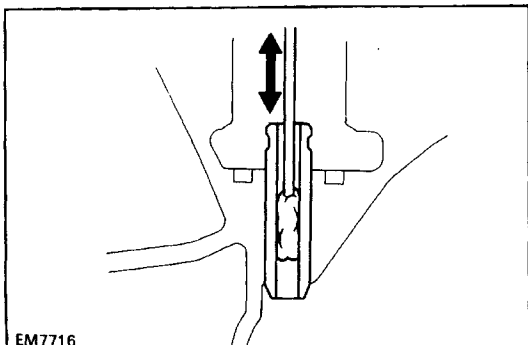


EM7912

6. Clean combustion chambers

Using a wire brush, remove all the carbon from the combustion chambers.

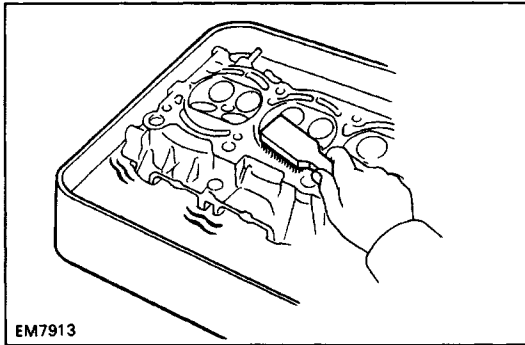
NOTICE: Be careful not to scratch the cylinder block contact surface.



EM7716

C. Clean valve guide bushings .

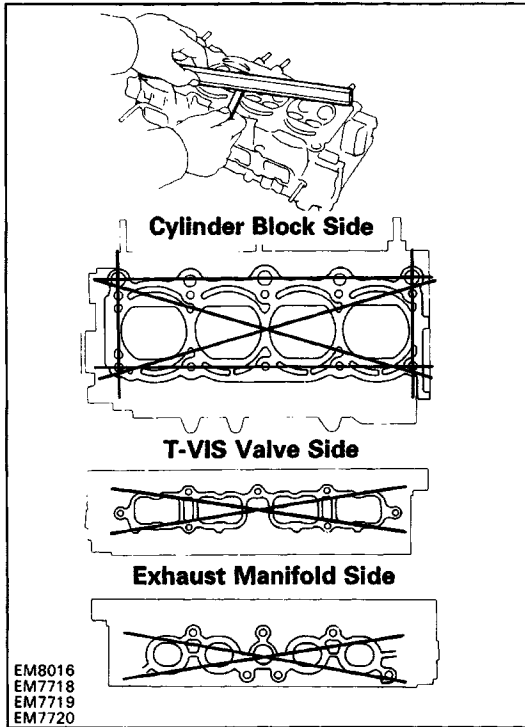
Using a valve guide bushing brush and solvent, clean all the guide bushings.



EM7913

D. Clean cylinder head

Using a soft brush and solvent, thoroughly clean the cylinder head.

EM8016
EM7718
EM7719
EM7720

3. INSPECT CYLINDER HEAD

A. Inspect for flatness

Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block, T-VIS valve and exhaust manifold for warpage.

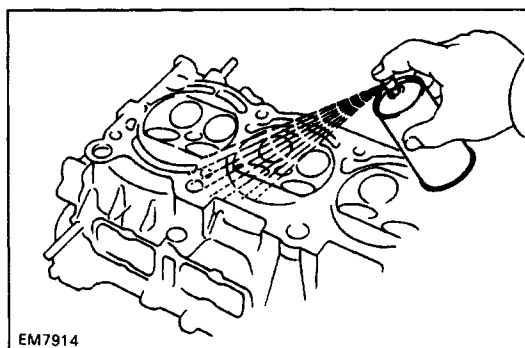
Maximum warpage:

Cylinder block side 0.20 mm (0.0079 in.)

T-VIS valve side 0.20 mm (0.0079 in.)

Exhaust manifold side 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the cylinder head.

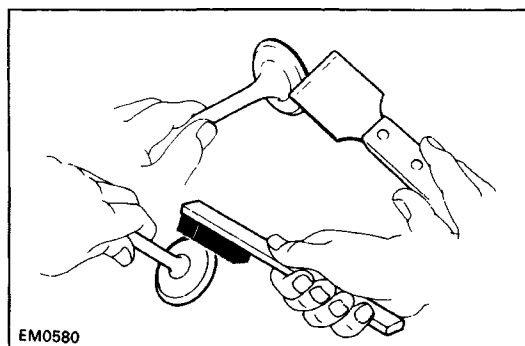


EM7914

B. Inspect for cracks

Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.

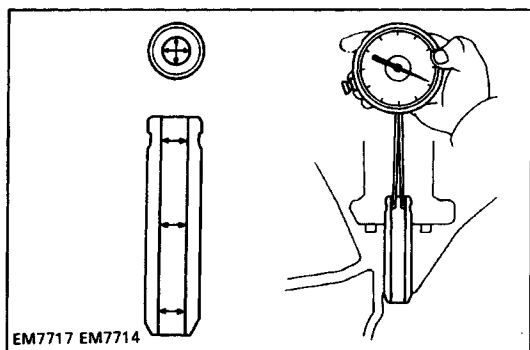


EM0580

4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

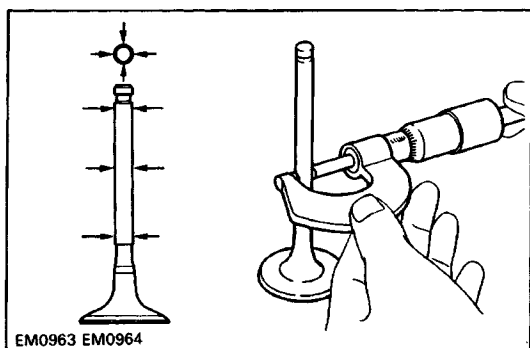
(b) Using a wire brush, thoroughly clean the valve.

5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- (a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

6.000 – 6.018 mm (0.2362 – 0.2369 in.)



- (b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

**Intake 5.960 – 5.975 mm
(0.2346 – 0.2352 in.)**

**Exhaust 5.955 – 5.970 mm
(0.2344 – 0.2350 in.)**

- (c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

**Intake 0.025 – 0.058 mm
(0.0010 – 0.0023 in.)**

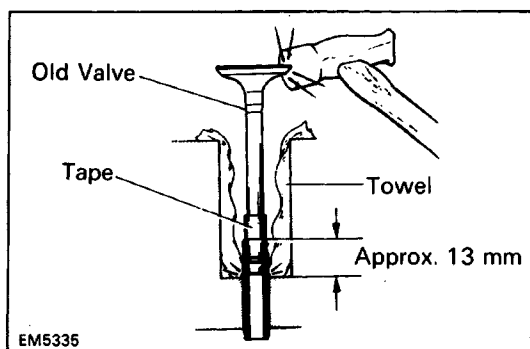
**Exhaust 0.030 – 0.063 mm
(0.0012 – 0.0025 in.)**

Maximum oil clearance:

Intake 0.08 mm (0.0031 in.)

Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.

**6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS**

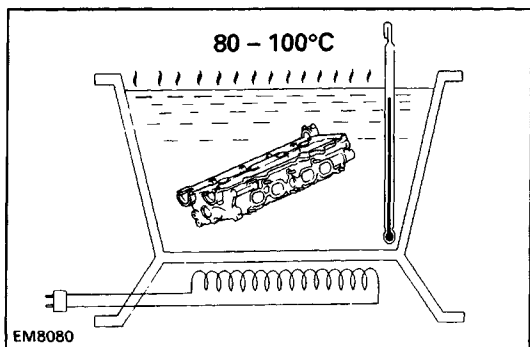
- (a) (w/ Snap Ring)

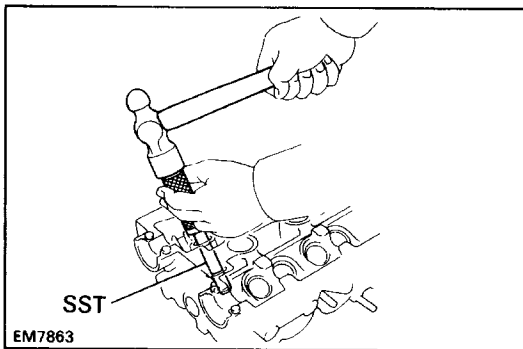
Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

HINT: Wrap the tape approx. 13 mm (0.51 in.) from the valve stem end.

NOTICE: Be careful not to damage the valve lifter hole.

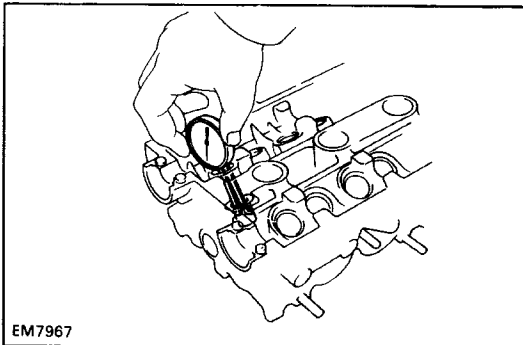
- (b) Gradually heat the cylinder head to 80– 100°C (176 – 212°F).





(c) Using SST and a hammer, tap out the guide bushing.

SST 09201-70010



(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

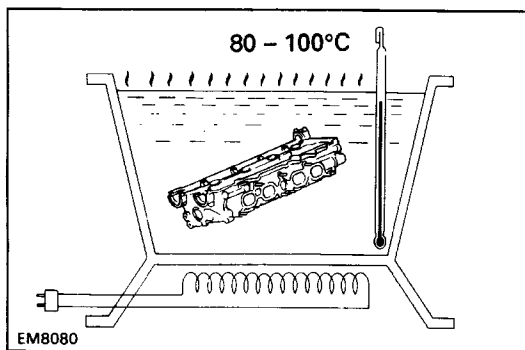
Bushing bore diameter mm* (in.)	Bushing size
10.988 - 11.006 (0.4326 - 0.4333)	Use STD
11.038 - 11.056 (0.4346 - 0.4353)	Use O/S 0.05

(e) Select a new guide bushing (STD or O/S 0.05).

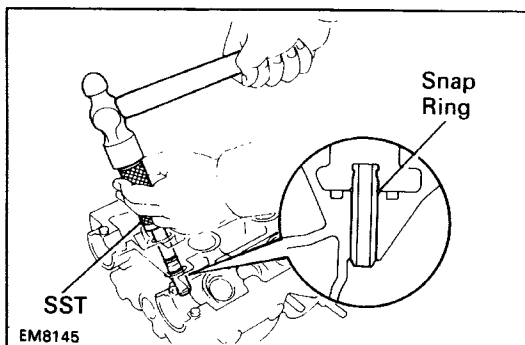
If the bushing bore diameter of the cylinder head is greater than 11.006 mm (0.4333 in.), machine the bushing bore to the following dimension:

11.038 - 11.056 mm (0.4346 - 0.4353 in.)

If the bushing bore diameter of the cylinder head is greater than 11.056 mm (0.4353 in.), replace the cylinder head.

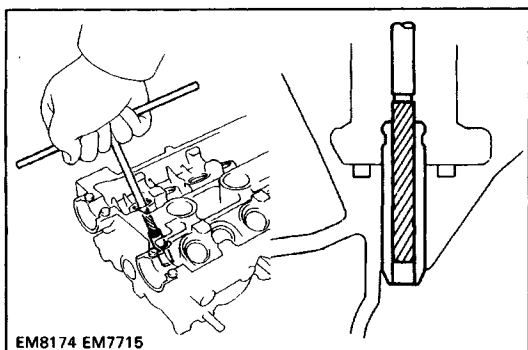


(f) Gradually heat the cylinder head to 80-100°C (176-212°F).

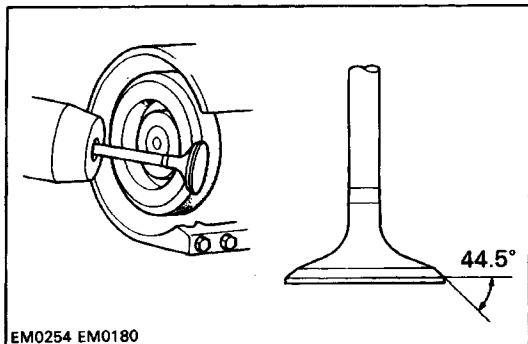


(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.

SST 09201-70010



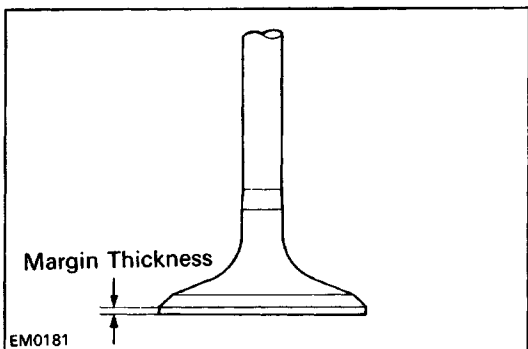
- (h) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM-129) between the guide bushing and valve stem.



7. INSPECT AND GRIND VALVES

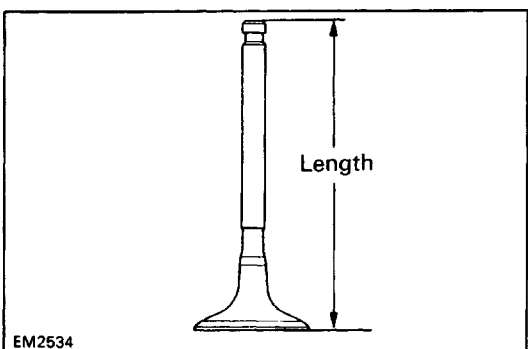
- (a) Grind the valve enough to remove pits and carbon.
 (b) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°



- (c) Check the valve head margin thickness.
Standard margin thickness: 0.8 –1.2 mm
(0.031 – 0.047 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)
 If the margin thickness is less than minimum, replace the valve.



- (d) Check the valve overall length.

Standard overall length:

Intake 100.50 mm (3.9567 in.)

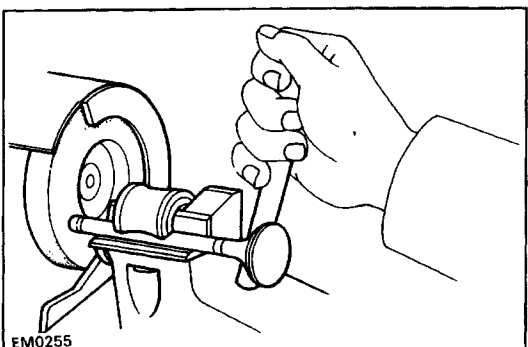
Exhaust 99.55 mm (3.9193 in.)

Minimum overall length:

Intake 99.80 mm (3.9291 in.)

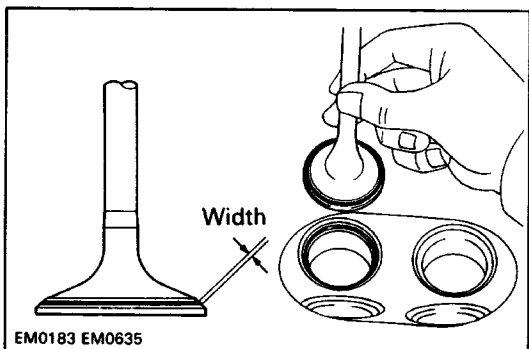
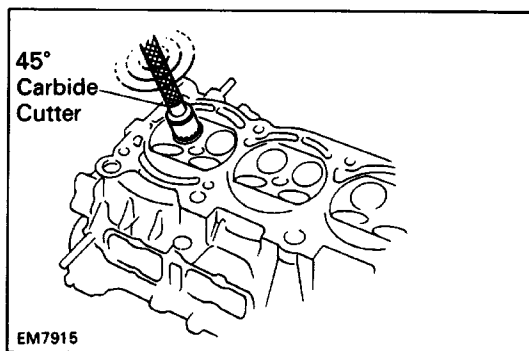
Exhaust 98.85 mm (3.8977 in.)

If the overall length is less than minimum, replace the valve.



- (e) Check the surface of the valve stem tip for wear.
 If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than minimum.

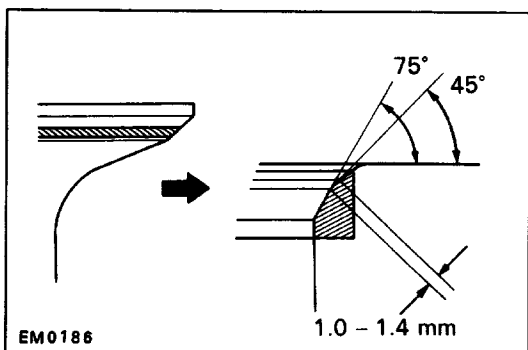
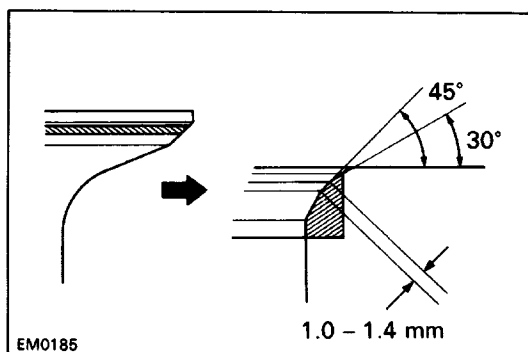


8. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats.
Remove only enough metal to clean the seats.

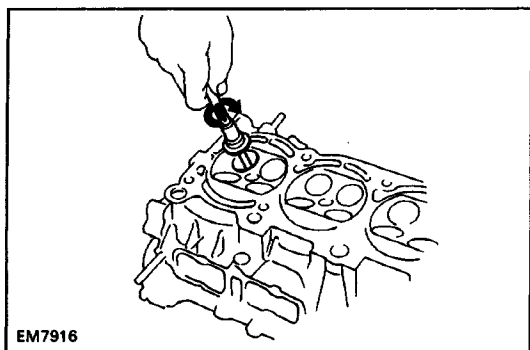
- (b) Check the valve seating position. Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

- (c) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
 - If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
 - Check that the seat contact is in the middle of the valve face with the following width:
1.0 – 1.4 mm (0.039 – 0.055 in.)



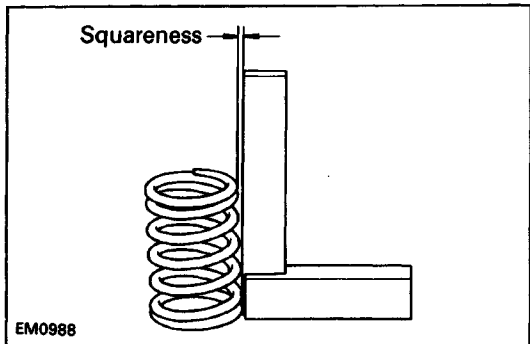
If not, correct the valve seats as follows:

- (1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.
- (2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



EM7916

- (d) Hand-lap the valve and valve seat with an abrasive compound.
- (e) After hand-lapping, clean the valve and valve seat.



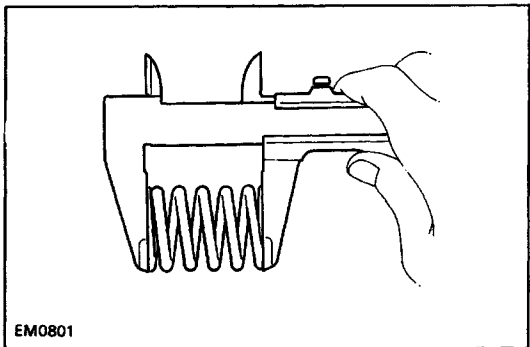
EM0988

9. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness: 2.0 mm (0.079 in.)

If the squareness is greater than maximum, replace the valve spring.

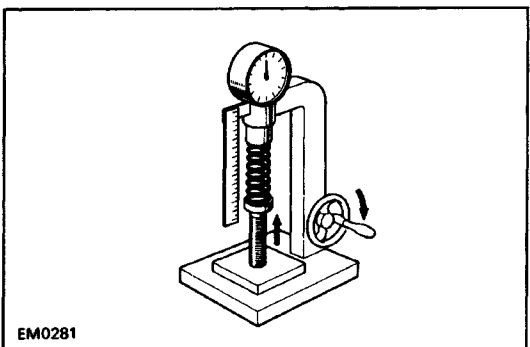


EM0801

- (b) Using a vernier caliper, measure the free length of the valve spring.

Free length: 44.43 mm (1.7492 in.)

If the free length is not as specified, replace the valve spring.



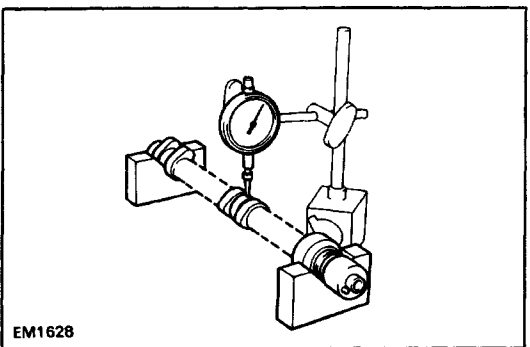
EM0281

- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

**201 – 236 N (20.5 – 24.1 kgf, 45.2 – 53.1 lbf)
at 34.4 mm (1.354 in.)**

If the installed tension is not as specified, replace the valve spring.



EM1628

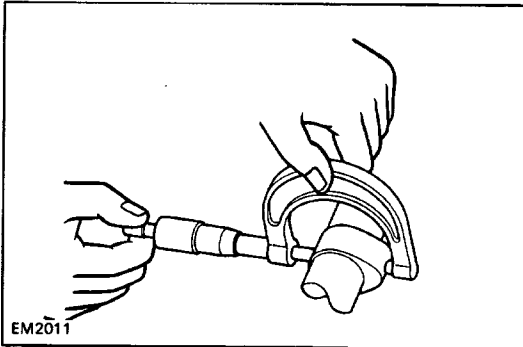
10. INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

- (a) Place the camshaft on V-blocks.
- (b) Using a dial indicator; measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft.

**B. Inspect cam lobes**

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake	41.010 – 41.110 mm (1.6146 – 1.6185 in.)
Exhaust	41.090 – 41.190 mm (1.6177 – 1.6217 in.)

Minimum cam lobe height:

Intake	39.90 mm (1.5709 in.)
Exhaust	39.98 mm (1.5740 in.)

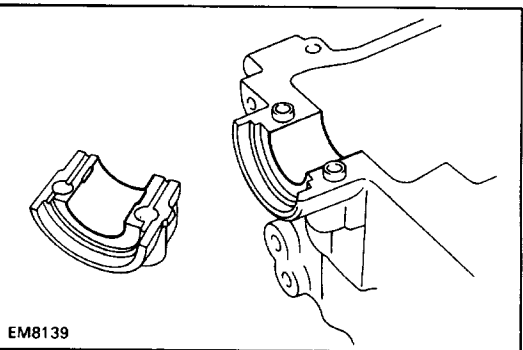
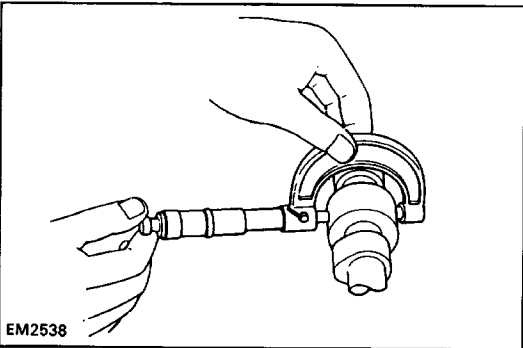
If the cam lobe height is less than minimum, replace the camshaft.

C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

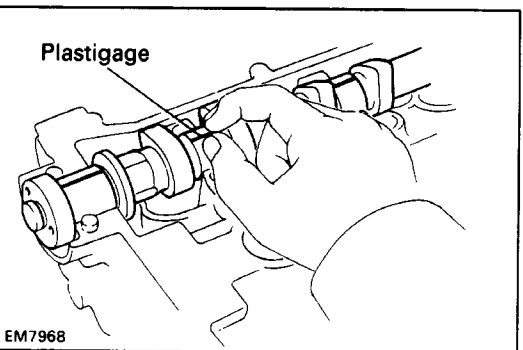
Journal diameter: 26.959 – 26.975 mm
(1.0614 – 1.0620 in)

If the journal diameter is not as specified, check the oil clearance.

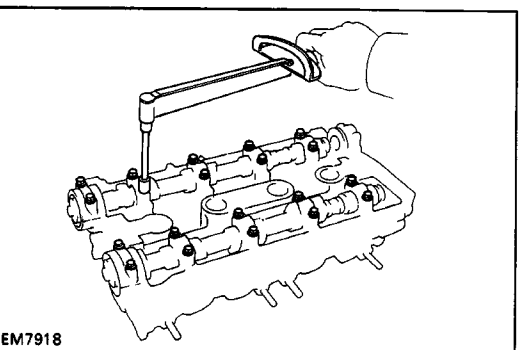
**D. Inspect camshaft bearings**

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

**E. Inspect camshaft journal oil clearance**

- Clean the bearing caps and camshaft journals.
- Place the camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journals.

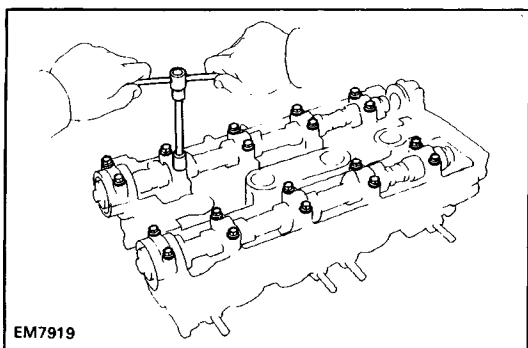


- Install the bearing caps.

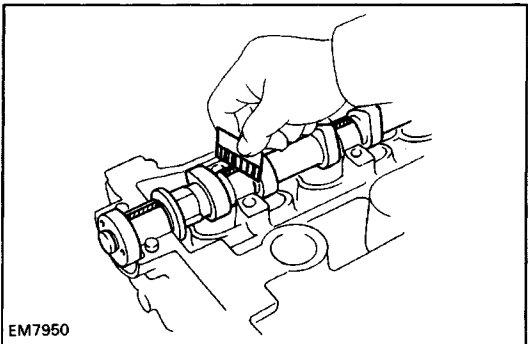
(See step 2 on page [EM-141](#))

Torque: 19 N-m (190 kgf-cm, 14 ft-lbf)

NOTICE: Do not turn the camshaft.



(e) Remove the bearing caps.



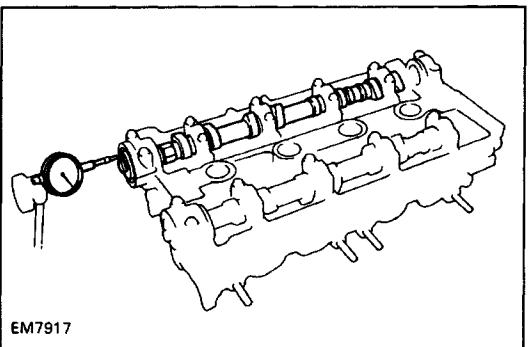
(f) Measure the Plastigage at its widest point.

Standard oil clearance: 0.025 – 0.062 mm
(0.0010 – 0.0024 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.



F. Inspect camshaft thrust clearance

(a) Install the camshafts.

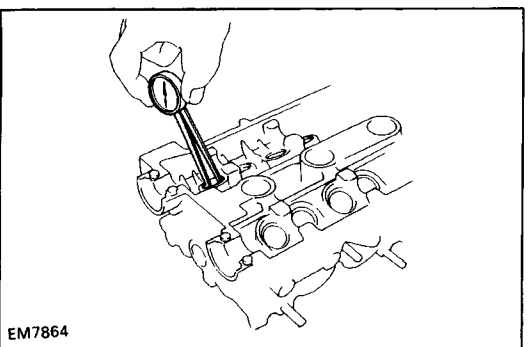
(See step 2 on page [EM-141](#))

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance: 0.120 – 0.240 mm
(0.0047 – 0.0094 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

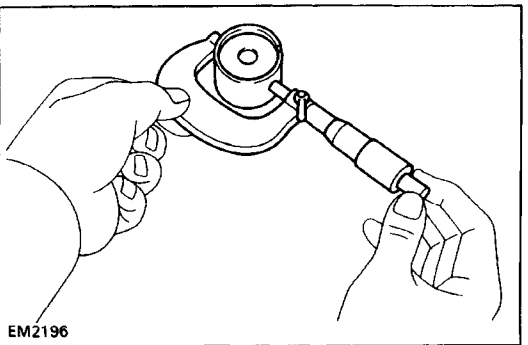
If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



11. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter: 37.000 – 31.021 mm
(1.2205 – 1.2213 in.)



(b) Using a micrometer, measure the lifter diameter.

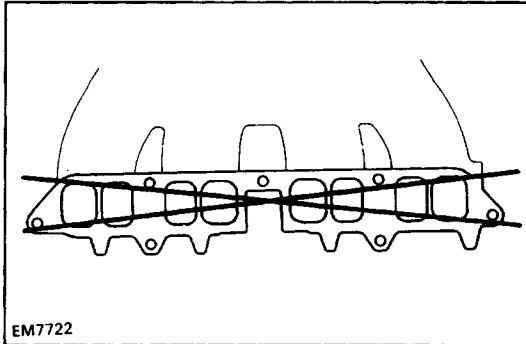
Lifter diameter: 30.975 – 30.985 mm
0.2195 – 1.2199 in.)

- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

**Standard oil clearance: 0.015 – 0.046 mm
(0.0005 – 0.0018 in.)**

Maximum oil clearance: 0.07 mm (0.0028 in.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



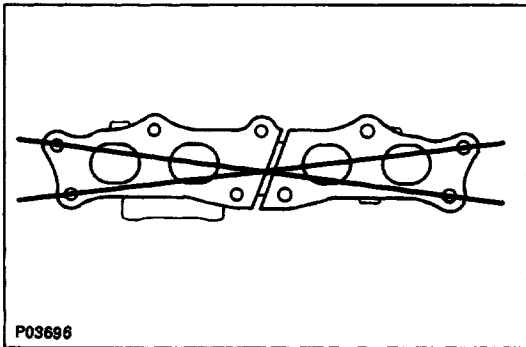
12. INSPECT MANIFOLDS

(Intake manifold)

Using precision straight edge and feeler gauge, measure the surface contacting the T-VIS valve for warpage.

Maximum warpage: 0.20 mm (0.0079 in.)

If warpage is greater than maximum, replace the intake manifold.

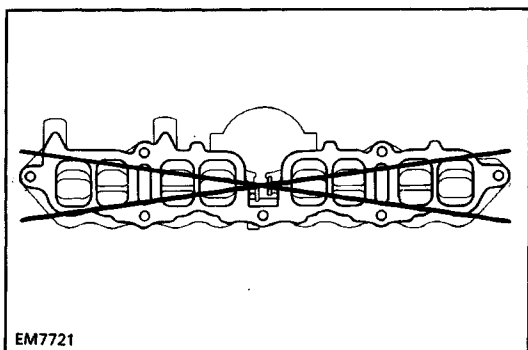


(Exhaust manifold)

Using precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.20 mm (0.0079 in.)

If warpage is greater than maximum, replace the exhaust manifold.



INSPECTION OF TOYOTA-VARIABLE INDUCTION SYSTEM (T-VIS) COMPONENTS

1. INSPECT T-VIS VALVE

A. Inspect for flatness

Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and intake manifold for warpage.

Maximum warpage: 0.20 mm (0.0079 in.)

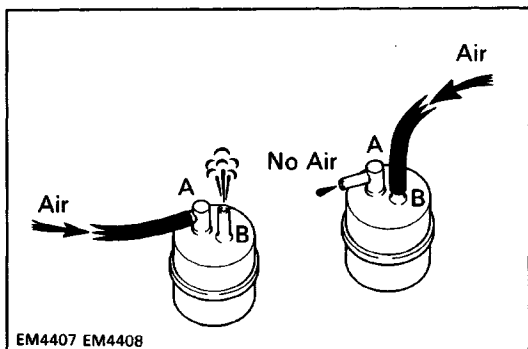
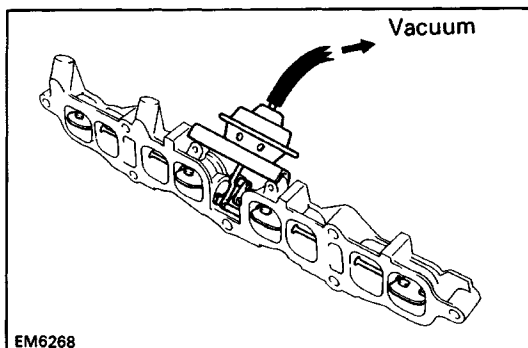
If warpage is greater than maximum, replace the T-VIS valve.

B. Inspect for operation

(a) With 53.3 kPa (400 mmHg, 15.75 in.Hg) of vacuum applied to the actuator, check that the control valve moves smoothly to the fully closed position.

(b) With the vacuum released, check that the control valve fully opens quickly.

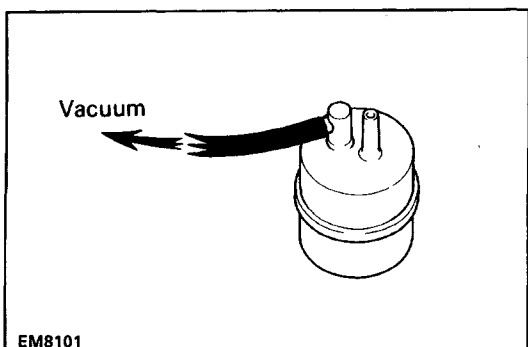
If operation is not as specified, replace the T-VIS valve.



2. INSPECT VACUUM TANK

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

(b) Check that air does not flow from ports B to A.



(c) Apply 67.7 kPa (500 mmHg, 19.69 in.Hg) of vacuum to port A, and check that there is no change in vacuum after one minute.

If operation is not as specified, replace the vacuum tank.

3. INSPECT T-VIS VSV (See page [FI-203](#))

ASSEMBLY OF CYLINDER HEAD

(See page [EM-117](#))

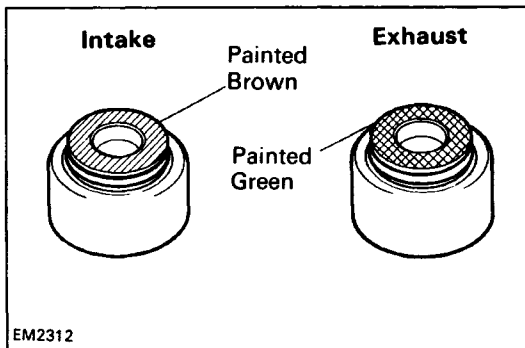
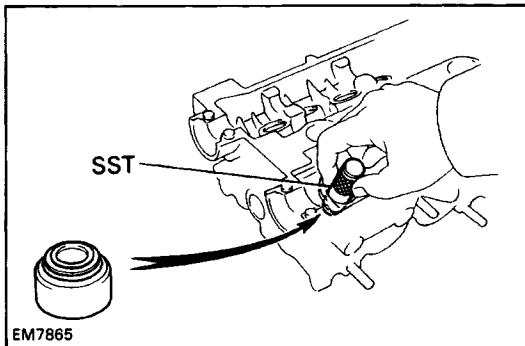
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

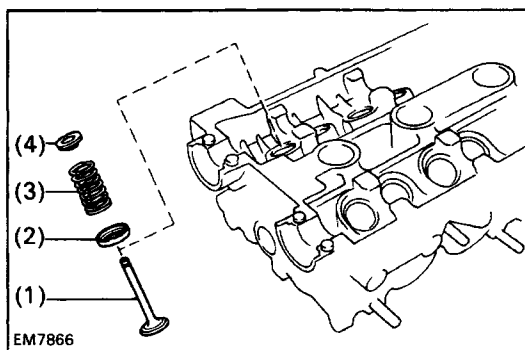
1. INSTALL VALVES

(a) Using SST, push in a new oil seal.

SST 09201-41020

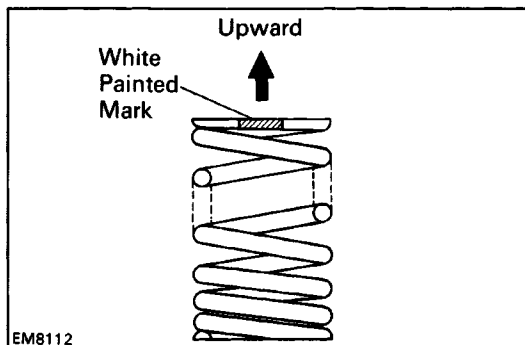


HINT: The intake valve oil seal is brown and the exhaust valve oil seal is black.

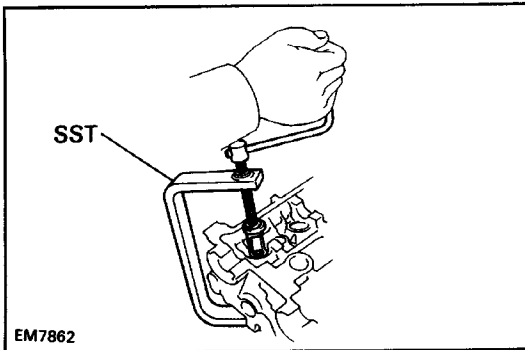


(b) Install the following parts:

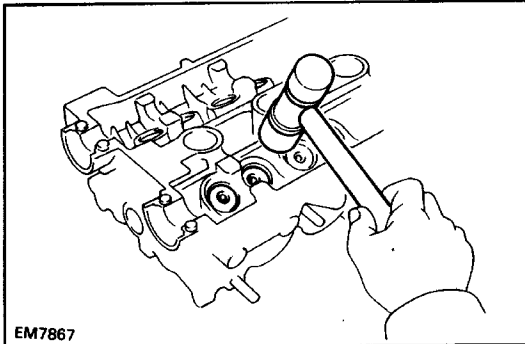
- (1) Valve
- (2) Spring seat
- (3) Valve spring
- (4) Spring retainer



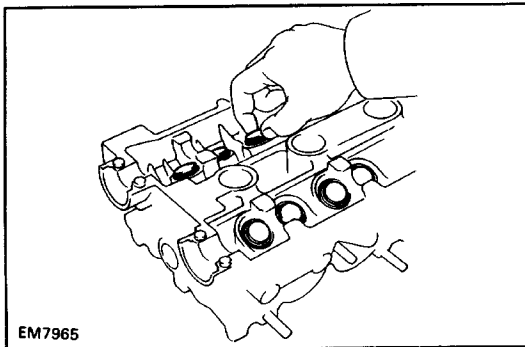
HINT: Install the valve spring, facing the white painted mark upward.



- (c) Using SST, compress the valve spring and place the two keepers around the valve stem.
SST 09202-70010

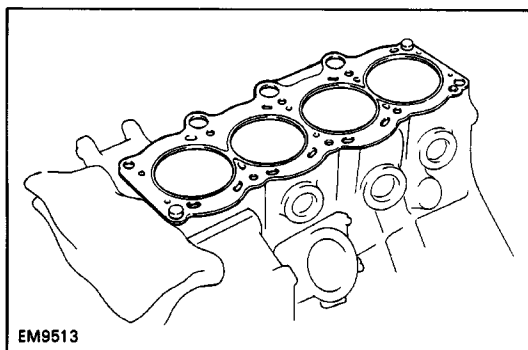


- (d) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.



2. INSTALL VALVE LIFTERS AND SHIMS

- (a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.



INSTALLATION OF CYLINDER HEAD

(See pages EM-116 and 117)

1. INSTALL CYLINDER HEAD

A. Place cylinder head on cylinder block

- (a) Place a new cylinder head gasket in position on the cylinder block.

NOTICE: Be careful of the installation direction.

- (b) Place the cylinder head in position on the cylinder head gasket.

B. Install cylinder head bolts

HINT:

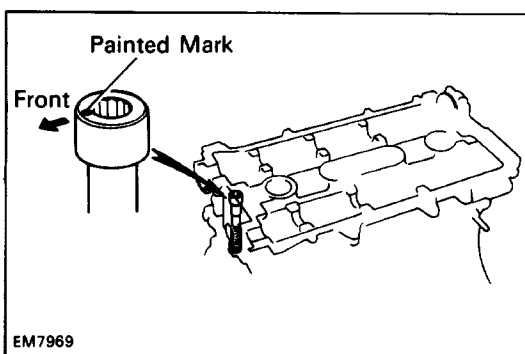
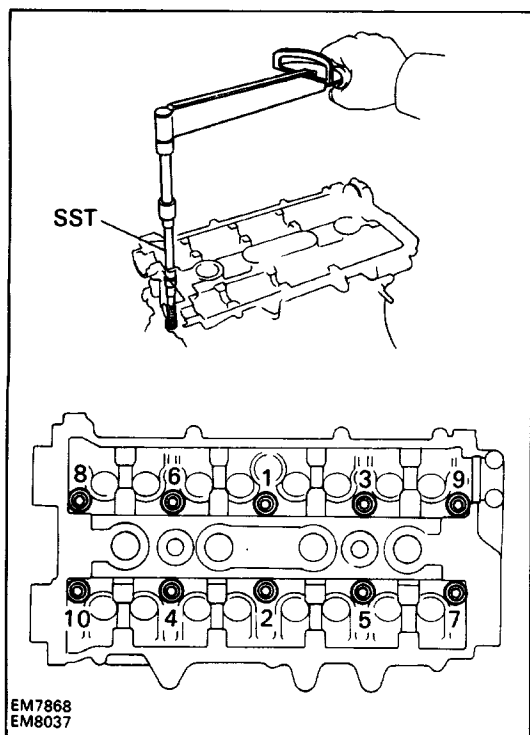
- The cylinder head bolts are tightened in two progressive steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, replace it.

- (a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (b) Install the plate washer to each cylinder head bolt.
- (c) Using SST, install and uniformly tighten the ten cylinder head bolts in several passes in the sequence shown.

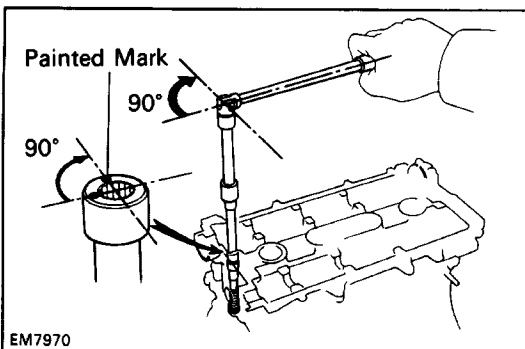
SST 09043-38100

Torque: 49 N-m (500 kgf-cm, 36 ft-lbf)

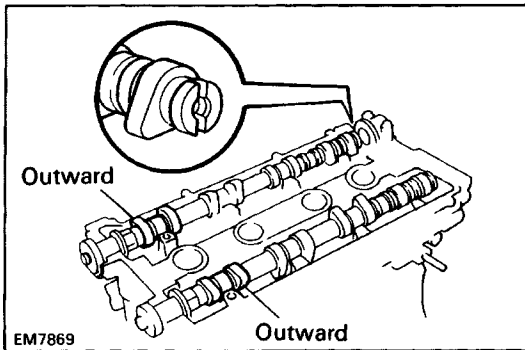
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



- (d) Mark the front of the cylinder head bolt head with paint.

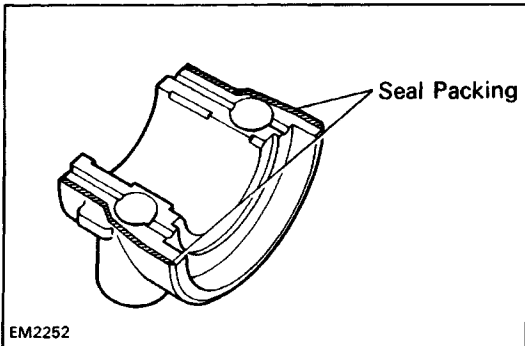


- (e) Retighten the cylinder head bolts 90° in the numerical order shown.
- (f) Check that the painted mark is now at a 90° angle to front.



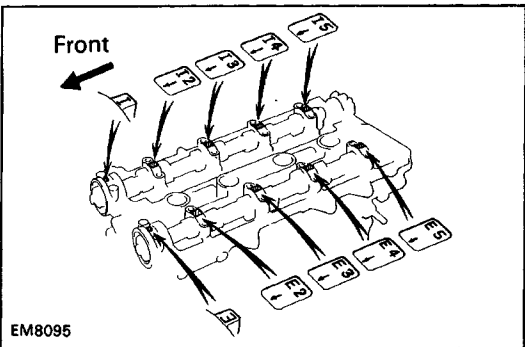
2. INSTALL CAMSHAFTS

- (a) Place the camshaft on the cylinder head with the No.1 cam lobe facing outward as shown.

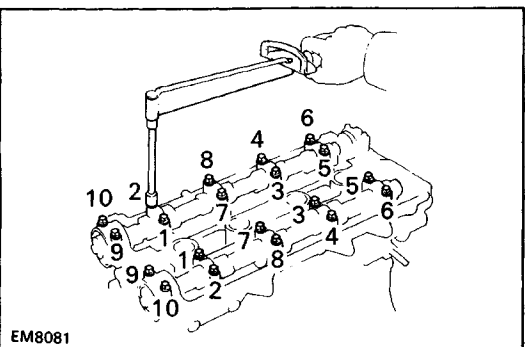


- (b) Apply seal packing to the No.1 bearing cap as shown.

Seal packing: Part No. 08826-00080 or equivalent



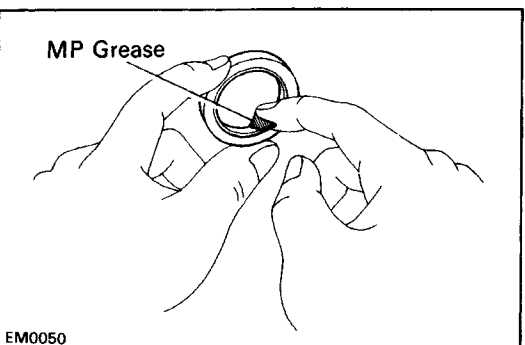
- (c) Install the bearing caps in their proper locations. HINT: Each bearing cap has a number and front mark.



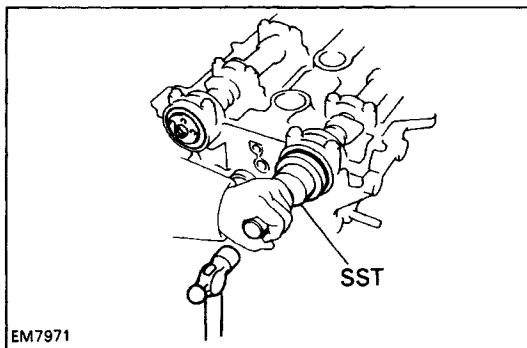
- (d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

- (e) Install and uniformly tighten the ten bearing cap bolts on one side in several passes in the sequence shown.

Torque: 19 N-m (190 kgf-cm, 14 ft-lbf)



- (f) Apply MP grease to a new oil seal lip.



(g) Using SST, tap in the two camshaft oil seals.
SST 09223-50010

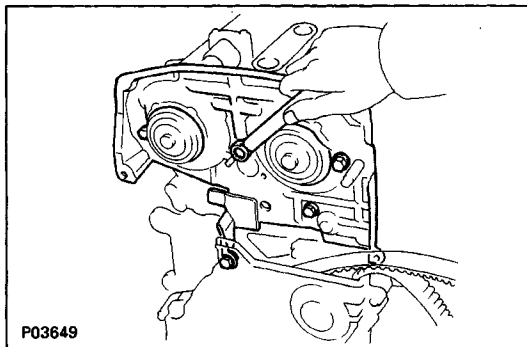
3. ADJUST VALVE CLEARANCE (See page [EM-17](#))

Turn the camshaft and position the cam lobe upward, check and adjust the valve clearance.

Valve clearance (Cold):

Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust 0.28 – 0.38 mm (0.011 – 0.015 in.)



4. INSTALL NO.3 TIMING BELT COVER

Install the No.3 belt cover with the five bolts.

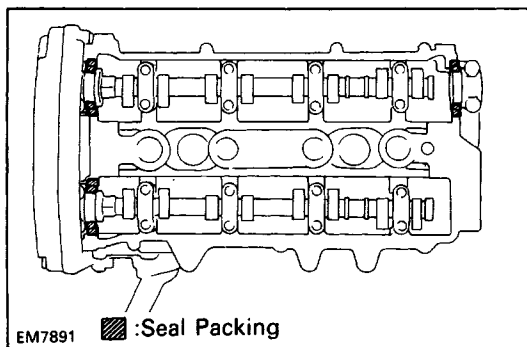
Torque: 8.8 N-m (90 kgf-cm, 78 in-lbf)

5. INSTALL NO.1 IDLER PULLEY

(See step 4 on page [EM-55](#))

6. INSTALL CAMSHAFT TIMING PULLEYS

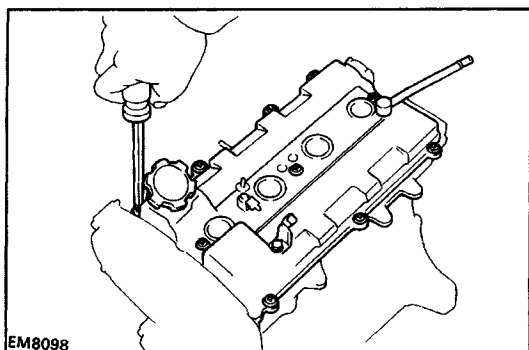
(See steps 9 to 15 on pages [EM-56](#) to 60)



7. INSTALL CYLINDER HEAD COVER

(a) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

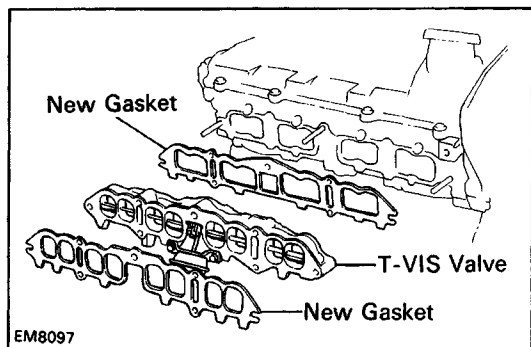


- (b) Install the two gaskets to the head cover.
- (c) Install the head cover with the twelve seal washers and screws. Uniformly tighten the screws in several passes.

Torque: 2.5 N-m (25 kgf-cm, 21 in-lbf)

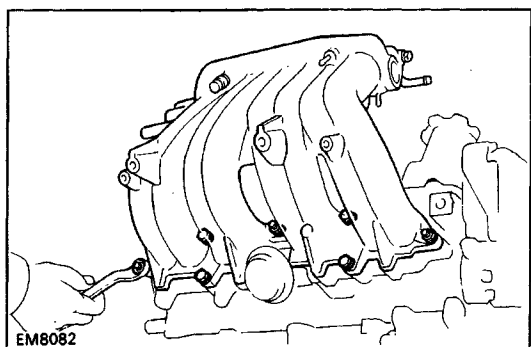
8. INSTALL DELIVERY PIPE AND INJECTORS (See steps 2 to 8 on pages [FI-166](#) to [168](#))

9. INSTALL CHARCOAL CANISTER (See step 32 on page [EM-264](#))



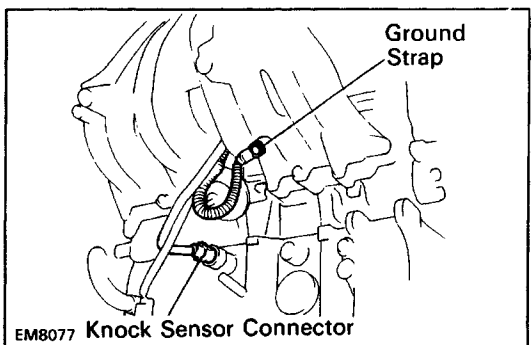
10. INSTALL T-VIS VALVE AND INTAKE MANIFOLD

- (a) Place a new gasket, the T-VIS valve and the other new gasket on the cylinder head.

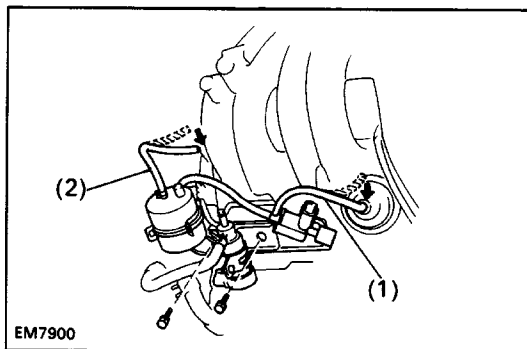


- (b) Install the intake manifold with the four bolts and three nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

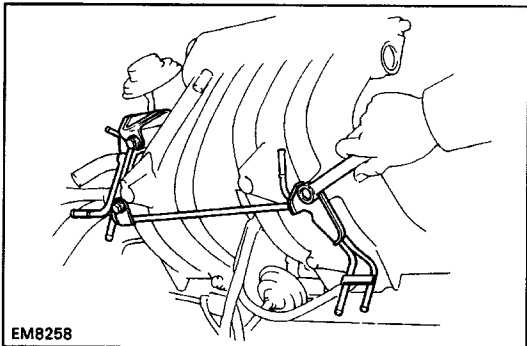


- (c) Connect the knock sensor connector.
- (d) Connect the ground strap with the bolt.



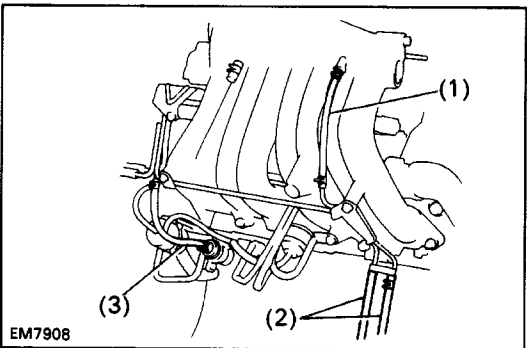
11. INSTALL T-VIS VACUUM TANK, T-VIS VSV, TURBOCHARGING PRESSURE VSV AND BRACKET

- (a) Install the T-VIS vacuum tank, T-VIS VSV, turbocharging pressure VSV and bracket assembly with the two bolts.
- (b) Connect the following hoses:
 - (1) Vacuum hose (from T-VIS VSV) to T-VIS actuator
 - (2) Vacuum hose (from T-VIS vacuum tank) to intake manifold

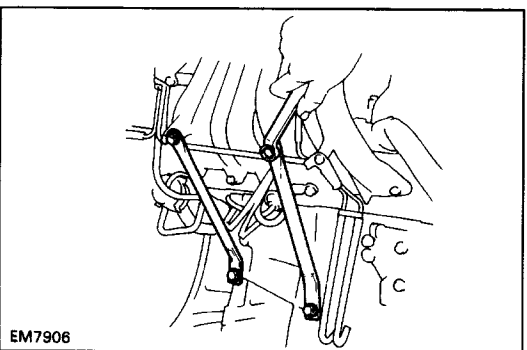


12. INSTALL NO.1 AIR TUBE

- (a) Install the air tube with the three bolts.



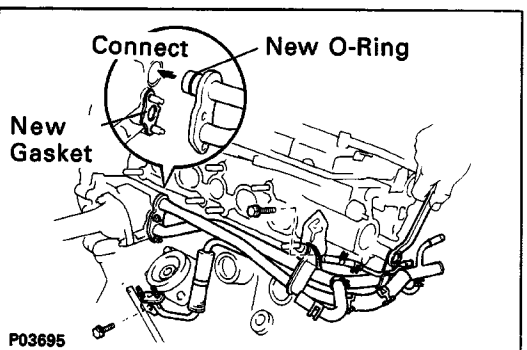
- (b) Connect the following hoses:
 - (1) Vacuum hose to intake manifold
 - (2) Two PS vacuum hoses
 - (3) Vacuum hose to turbocharging pressure VSV



13. INSTALL INTAKE MANIFOLD STAYS

Install the manifold stay with the two bolts. Alternately tighten the bolts. Install the two manifold stays.

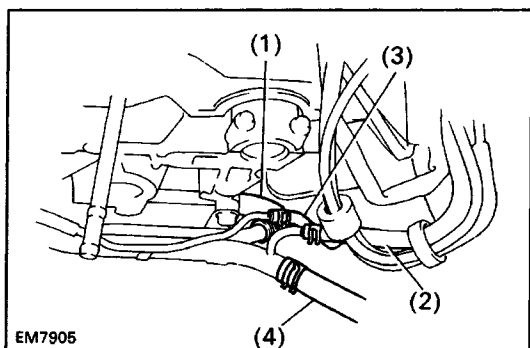
Torque: 25 N-m (260 kgf-cm, 19 ft-lbf)



14. INSTALL WATER BY-PASS PIPE

- (a) Install a new O-ring to the pipe.
- (b) Apply soapy water on the O-ring.
- (c) Install a new gasket to the water pump.
- (d) Install the water by-pass pipe with the two nuts and two bolts.

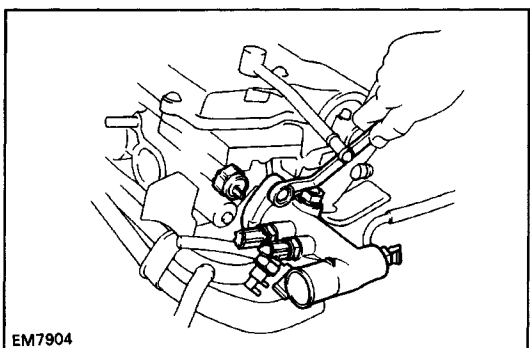
Torque: 7.8 N-m (80 kgf-cm, 69 in-lbf)



- (e) Connect the following hoses:
- (1) Water by-pass hose to cylinder block
 - (2) Water by-pass hoses to No.1 air tube
 - (3) Vacuum hose to turbocharging pressure VSV
 - (4) Heater water hose

15. INSTALL OIL COOLER

(See steps 2 to 4 on pages [LU-26](#) and [27](#))



16. INSTALL OIL PRESSURE SWITCH

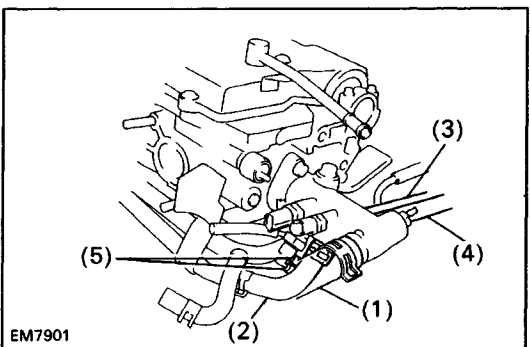
Apply adhesive to two or three threads.

Adhesive: Part No. 08833-00080, THREE BOND 1324 or equivalent

17. INSTALL WATER OUTLET

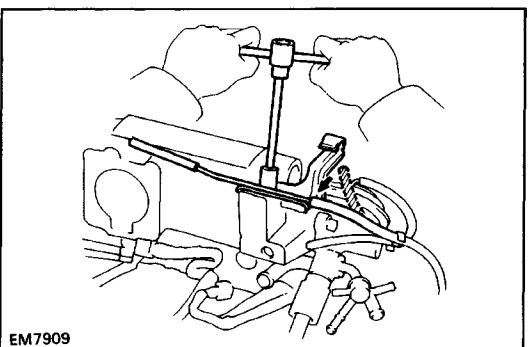
- (a) Install a new gasket and the water outlet with the two bolts.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)



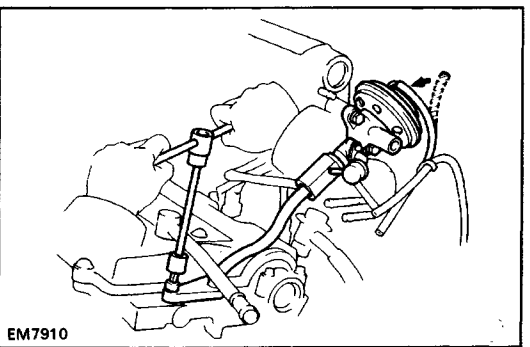
- (b) Connect the following hoses:

- (1) Upper radiator hose
- (2) Water by-pass hose to water by-pass pipe
- (3) Water by-pass pipe hose to ISC valve
- (4) Heater water hose
- (5) Two EVAP VSV vacuum hoses



18. INSTALL VACUUM PIPE

- (a) Install the vacuum pipe with the bolt.
 (b) Connect the vacuum hose to the vacuum pipe.



19. INSTALL EGR VALVE AND PIPE

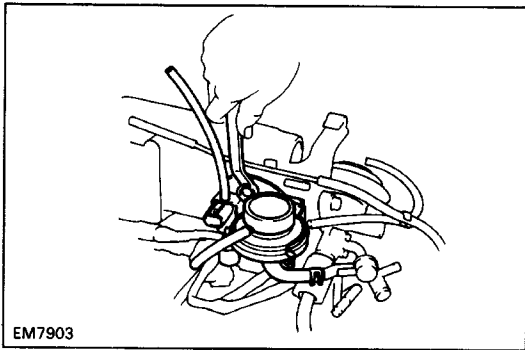
- (a) Install two new gaskets, the EGR valve and pipe assembly with the four bolts. Alternately tighten the bolts.

Torque:

To cylinder head 25 N-m (260 kgf-cm, 19 ft-lbf)

To intake manifold 19 N-m (195 kgf-cm, 14 ft-lbf)

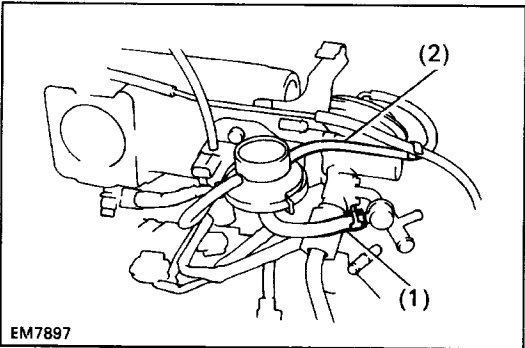
- (b) Connect the vacuum hose to the EGR valve.



EM7903

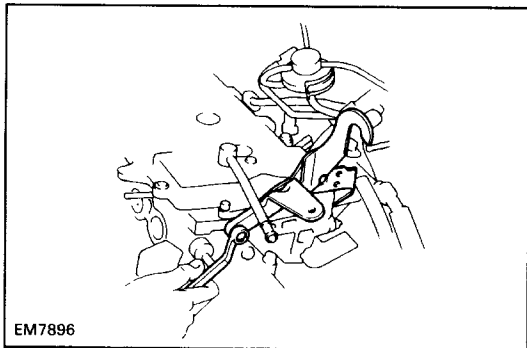
20. INSTALL EGR VACUUM MODULATOR AND VSV

- (a) Install the EGR vacuum modulator and VSV assembly with the bolt.



EM7897

- (b) Connect the following hoses:
 (1) Vacuum hose to EGR valve
 (2) Vacuum hose to EGR vacuum modulator
 (c) Connect the EGR VSV connector.



EM7896

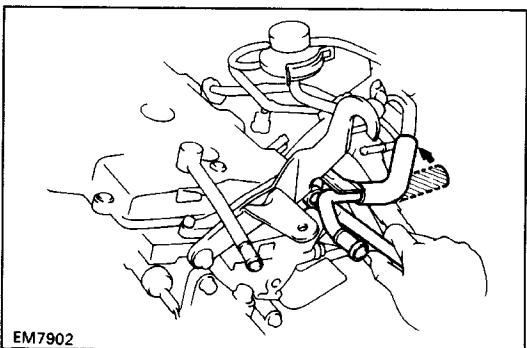
21. INSTALL LH ENGINE HANGER

Install the LH engine hanger and reservoir tank with the two bolts. Alternately tighten the bolts.

Torque:

12 mm head bolt 19 N-m (195 kgf-cm, 14 ft-lbf)

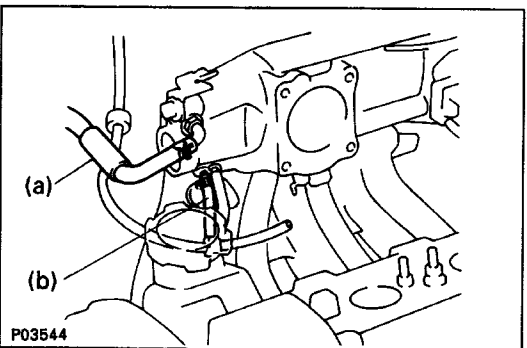
14 mm head bolt 39 N-m (400 kgf-cm, 29 ft-lbf)



EM7902

22. INSTALL NO.2 AIR TUBE

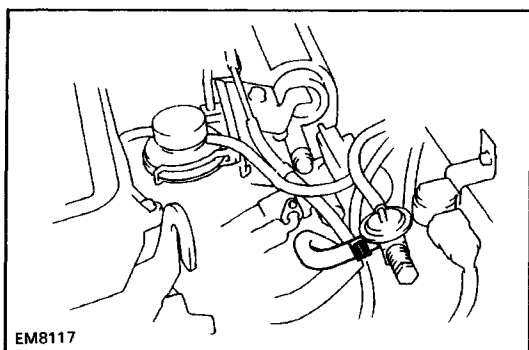
- (a) Install the air tube with the bolt.
 (b) Connect the air hose to the No.1 air tube.



P03544

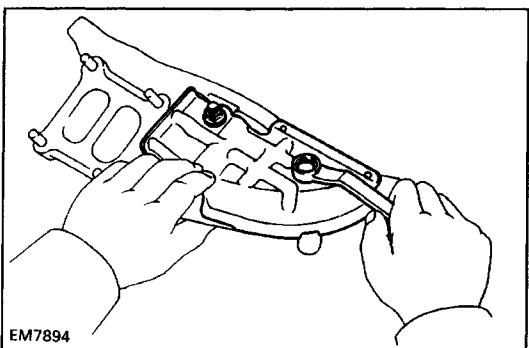
23. CONNECT HOSES

- (a) Brake booster vacuum hose to intake manifold
 (b) Turbocharging pressure sensor hose to intake manifold



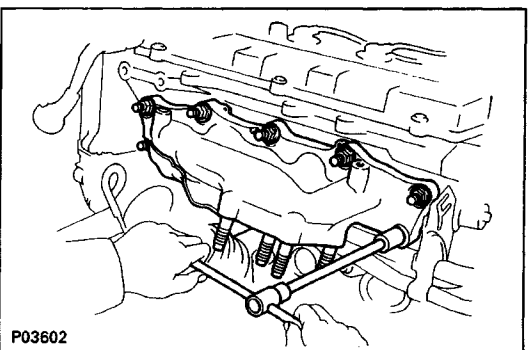
(c) A/C ASV air hose to No.1 air tube

24. INSTALL DISTRIBUTOR (See page IG-28)



25. INSTALL EXHAUST MANIFOLD

(a) Install the heat insulator with the bolt and nut.



(b) Install a new gasket and the exhaust manifold with the nine nuts. Uniformly tighten the nuts in several passes.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

26. INSTALL COLD START INJECTOR

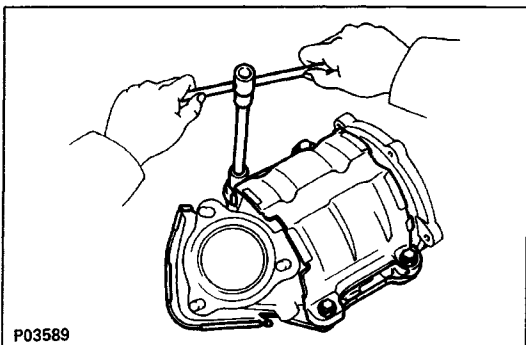
(See steps 1 to 3 on page FI-148)

27. INSTALL THROTTLE BODY

(See steps 2, 3 and 5 to 8 on pages FI-197 and 198)

28. INSTALL TURBOCHARGER

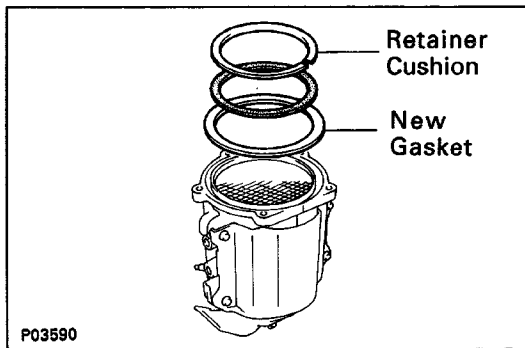
(See steps 5 to 10 on pages TC-15 to 17)



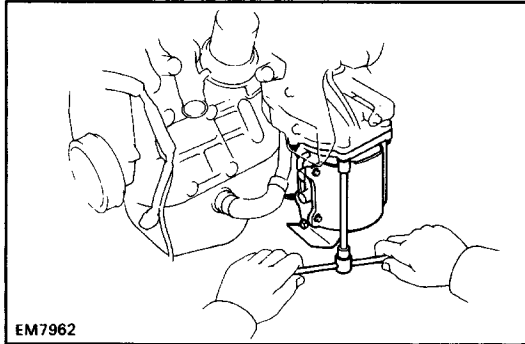
29. INSTALL CATALYTIC CONVERTER

(a) Install the front heat insulator with the five bolts.

(b) Install the rear heat insulator with the four bolts.

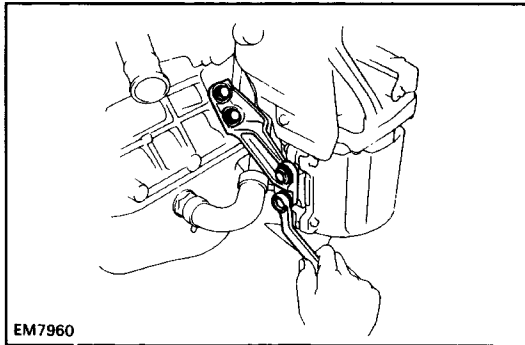


- (c) Place a new gasket, the cushion and retainer on the catalytic converter.



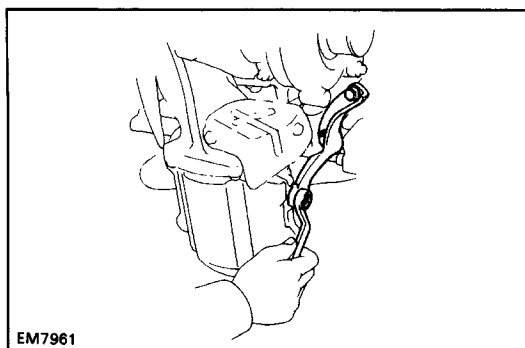
- (d) Install the catalytic converter with the three bolts and two nuts.

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



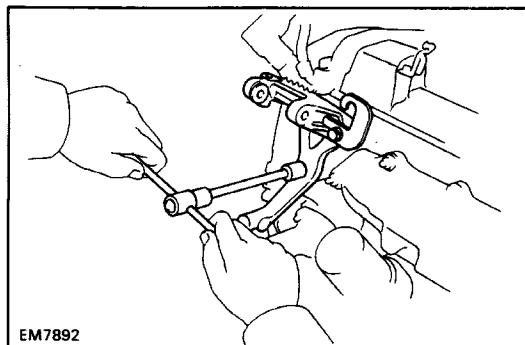
- (e) Install the RH converter stay with the four bolts. Alternately tighten the bolts.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)



- (f) Install the LH converter stay with the three bolts. Alternately tighten the bolts.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)



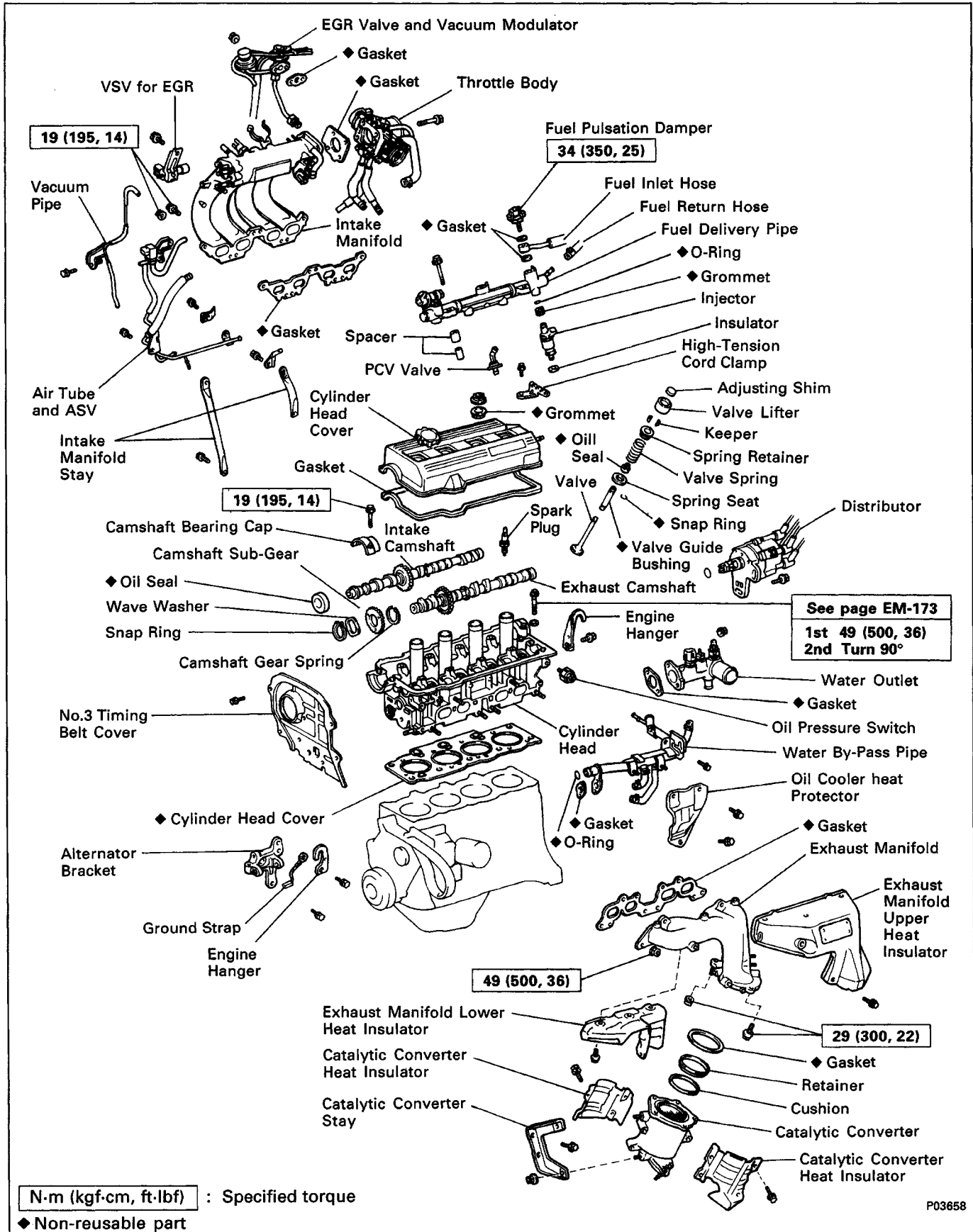
30. INSTALL NO.1 ALTERNATOR BRACKET AND RH FRONT ENGINE HANGER

Install the alternator bracket and engine hanger with the three bolts.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

31. **INSTALL FRONT EXHAUST PIPE**
(See step 18 on page [EM-261](#))
32. **INSTALL SUSPENSION LOWER CROSSMEMBER**
(See step 19 on page [EM-262](#))
33. **INSTALL ALTERNATOR** (See page [CH-23](#))
34. **INSTALL INTERCOOLER**
(See steps 11 to 13 on page [TC-17](#))
35. **INSTALL AIR CLEANER CAP**
(See step 44 on page [EM-117](#))
36. **INSTALL ACCELERATOR CABLE, AND ADJUST IT**
37. **FILL WITH ENGINE COOLANT** (See page [CO-6](#))
Capacity (w/ Heater):
6.5 liters (6.9 US qts, 5.7 Imp. qts)
38. **START ENGINE AND CHECK FOR LEAKS**
39. **ADJUST IGNITION TIMING** (See page [IG-29](#))
Ignition timing:
10° BTDC @ idle
(w/ Terminals TO and E1 connected)
40. **PERFORM ROAD TEST**
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
41. **RECHECK ENGINE COOLANT AND OIL LEVELS**

CYLINDER HEAD (5S-FE) COMPONENTS



REMOVAL OF CYLINDER HEAD

(See page [EM-150](#))

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page [CO-6](#))

3. (A/T)

.DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

5. (w/ CRUISE CONTROL SYSTEM)

REMOVE CRUISE CONTROL ACTUATOR

(See step 11 on page [EM-270](#))

6. REMOVE AIR CLEANER CAP

(See step 6 on page [EM-269](#))

7. REMOVE ALTERNATOR (See page [CH-9](#))

8. REMOVE DISTRIBUTOR (See page [IG-30](#))

9. REMOVE ENGINE UNDER COVERS

10. REMOVE SUSPENSION LOWER CROSSMEMBER

(See step 28 on page [EM-274](#))

11. REMOVE FRONT EXHAUST PIPE

(See step 29 on page [EM-274](#))

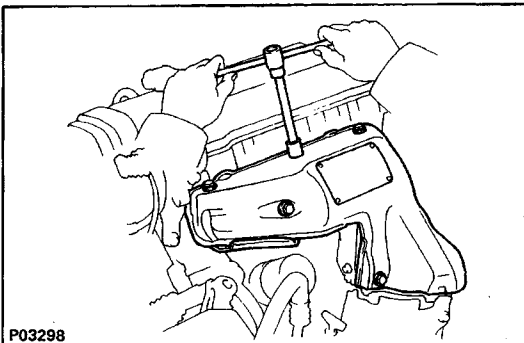
12. REMOVE OXYGEN SENSOR (MAIN)

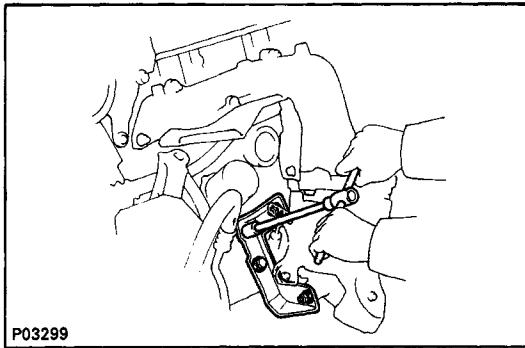
13. (CALIF. ONLY)

REMOVE SUB-OXYGEN SENSOR

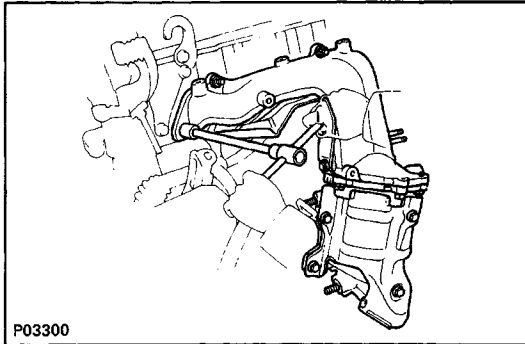
14. REMOVE EXHAUST MANIFOLD AND CATALYTIC CONVERTER ASSEMBLY

(a) Remove the six bolts and manifold upper heat insulator.

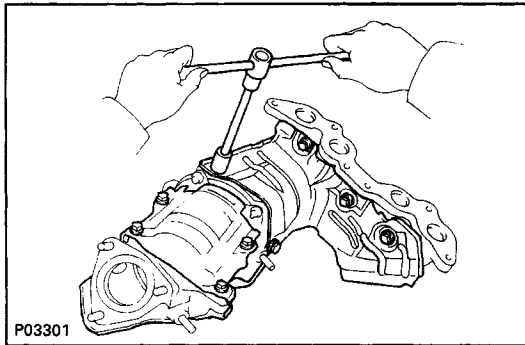




- (b) Remove the two bolts, two nuts and catalytic converter stay.

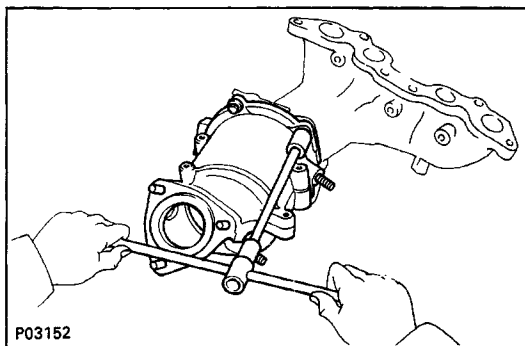


- (c) Remove the six nuts, the exhaust manifold and catalytic converter assembly.

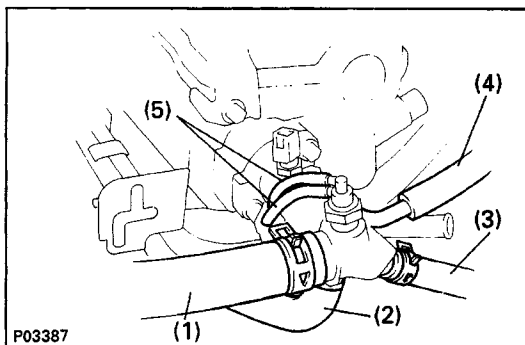


15. SEPARATE EXHAUST MANIFOLD AND CATALYTIC CONVERTER

- (a) Remove the five bolts and lower manifold heat insulator.
 (b) Remove the eight bolts and two catalytic converter heat insulator.

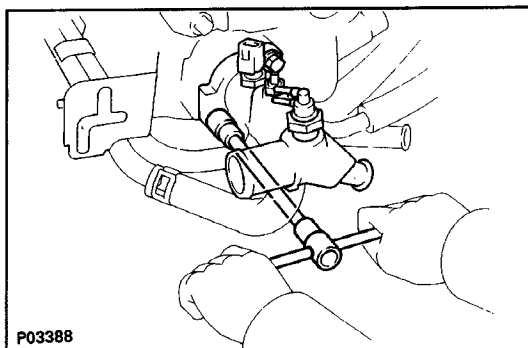


- (c) Remove the three bolts, two nuts, catalytic converter, gasket, retainer and cushion.

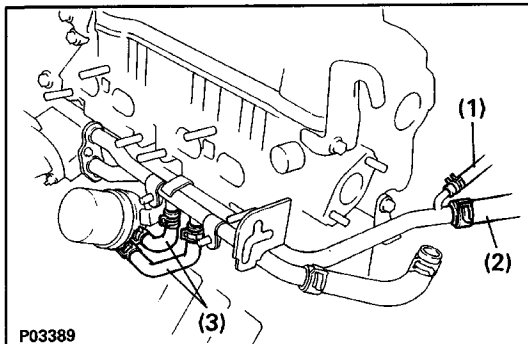


16. REMOVE WATER OUTLET

- (a) Disconnect the following connectors:
- Water temperature sender gauge connector
 - Water temperature sensor connector
- (b) Disconnect the following hoses:
- (1) Upper radiator hose
 - (2) Water by-pass pipe hose
 - (3) Heater water hose
 - (4) ISC water by-pass hose
 - (5) Two EVAP BVSV vacuum hoses

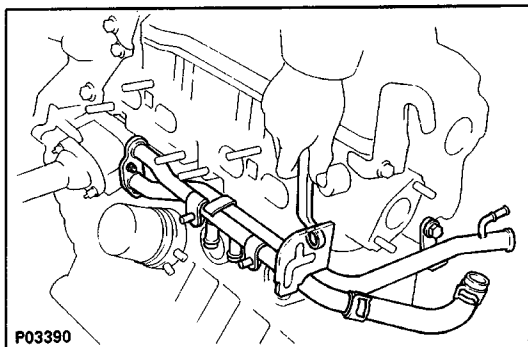


(c) Remove the two bolts, water outlet and gasket.



17. REMOVE WATER BY-PASS PIPE

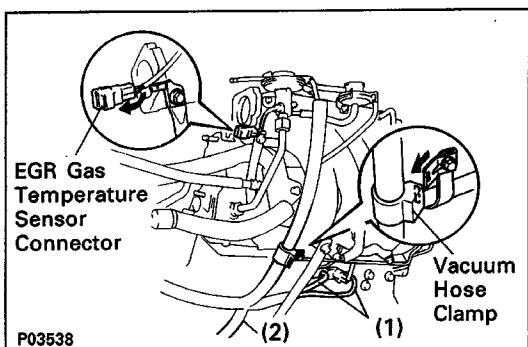
- (a) (w/ Oil Cooler)
Remove the water by-pass hose heat protector.
(See step 8 on page [LU-29](#))
- (b) Disconnect the following hoses:
- (1) ISC water by-pass hose
 - (2) Heater water hose
 - (3) (w/ Oil Cooler)
Two oil cooler water by-pass hoses



- (c) Remove the two bolts, two nuts, water by-pass pipe and gasket.
- (d) Remove the O-ring from the water by-pass hose.

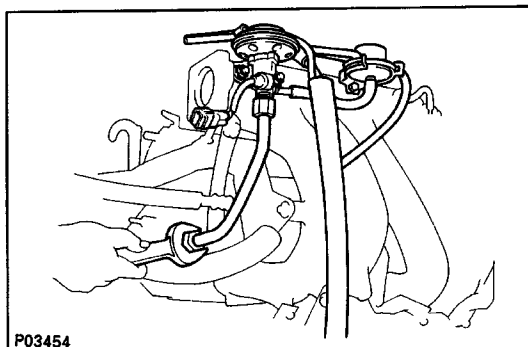
18. REMOVE THROTTLE BODY

(See steps 6 to 9 on pages [FI-201](#) and [202](#))

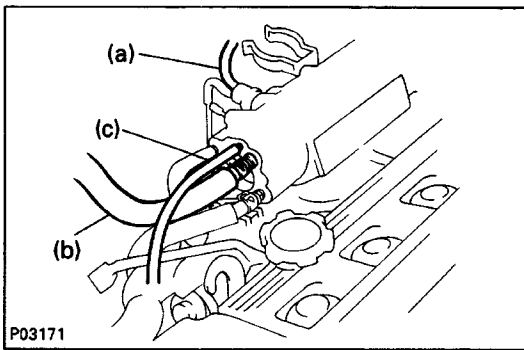


19. REMOVE EGR VALVE AND VACUUM MODULATOR

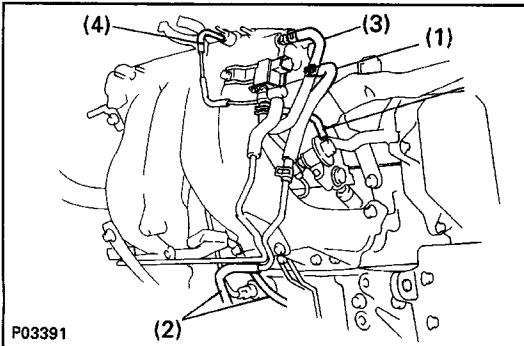
- (a) (CALIF. only)
Disconnect EGR gas temperature sensor connector, and disconnect the connector from the bracket.
- (b) Remove the following hoses:
- (1) Two vacuum hoses from EGR VSV
 - (2) Vacuum hose from charcoal canister
- (c) Disconnect the vacuum hose clamp from the bracket.



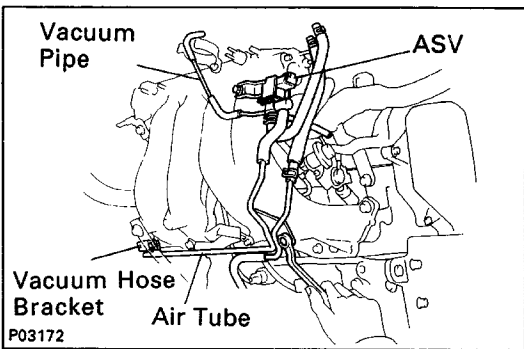
- (d) Loosen the union nut of the EGR pipe, and remove two nuts the EGR valve, vacuum modulator, vacuum hoses assembly and gasket.

**20. DISCONNECT VACUUM HOSES**

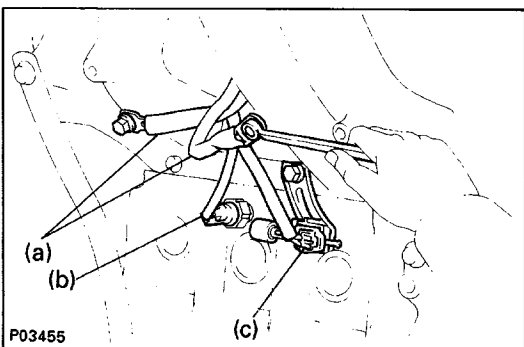
- (a) Vacuum sensor hose from gas filter
- (b) Brake booster vacuum hose from intake manifold
- (c) (w/ Cruise Control System (w/o ABS))
Actuator vacuum hose from intake manifold

**21. REMOVE AIR TUBE, ASV (FOR A/C) AND VACUUM PIPE**

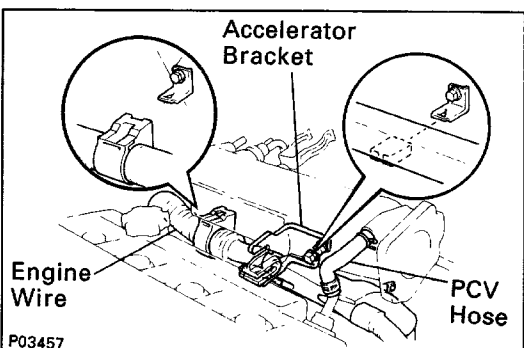
- (a) (w/ A/C)
Disconnect the ASV connector.
- (b) Disconnect the following hoses:
 - (1) PS air hose from intake manifold
 - (2) Two air hoses from air tube
 - (3) (w/ A/C)
Air- hose from intake manifold
 - (4) Vacuum hose from gas filter
 - (5) Vacuum hose from fuel pressure regulator
- (c) Remove the four bolts, vacuum hose bracket, the air tube and ASV assembly.
- (d) Remove the bolt and vacuum pipe.

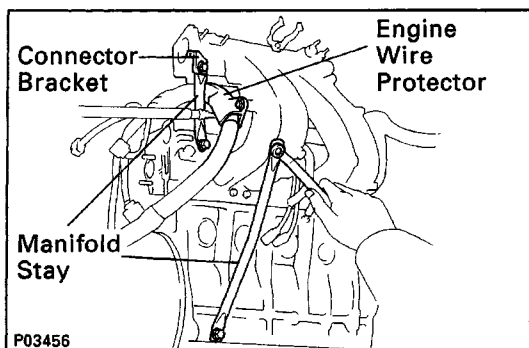
**22. DISCONNECT ENGINE WIRE GROUND STRAPS AND CONNECTORS**

- (a) Two engine ground straps from intake manifold
- (b) Knock sensor connector
- (c) VSV connector for EGR

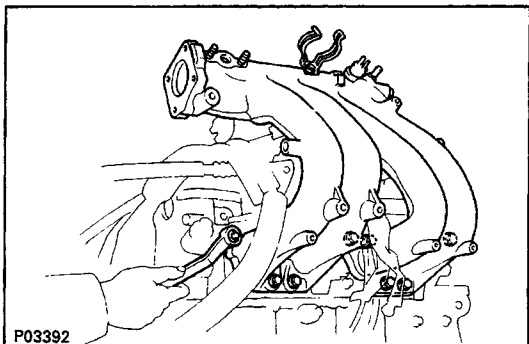
23. REMOVE VSV FOR EGR**24. REMOVE ACCELERATOR BRACKET****25. REMOVE INTAKE MANIFOLD**

- (a) Disconnect the PCV hose from the PCV valve.
- (b) Disconnect the two wire clamps from the wire brackets.





- (c) Remove the bolt, and disconnect the engine wire protector from the intake manifold.
- (d) Remove the four bolts, connector bracket (CALIF. only) and two manifold stays.



- (e) Remove the six bolts, two nuts, intake manifold and gasket.

26. REMOVE DELIVERY PIPE AND INJECTORS

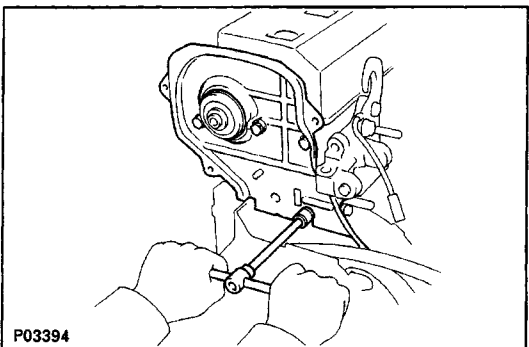
(See steps 16 and 17 on page [FI-173](#))

27. REMOVE CAMSHAFT TIMING PULLEY

(See steps 2 and 6 to 17 on pages [EM-67](#) to 70)

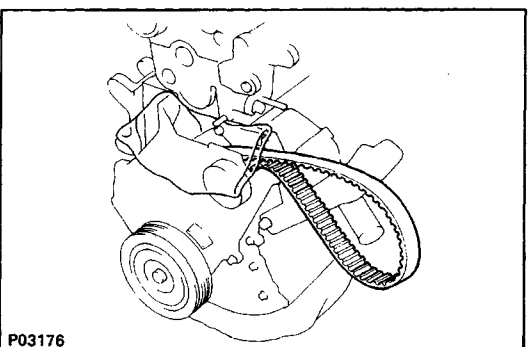
28. REMOVE NO.1 IDLER PULLEY AND TENSION SPRING

(See step 23 on page [EM-72](#))



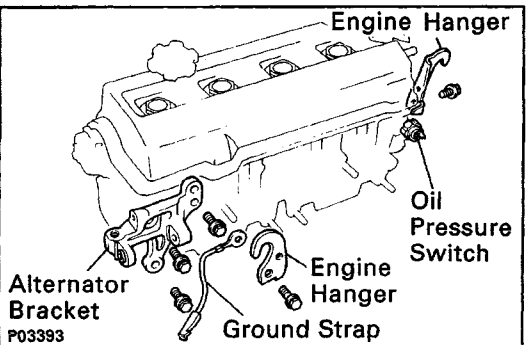
29. REMOVE NO.3 TIMING BELT COVER

Remove the four bolts and timing belt cover.



NOTICE:

- Support the timing belt, so the meshing of the crankshaft timing pulley and timing belt does not shift.
- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come into contact with oil, water or dust.



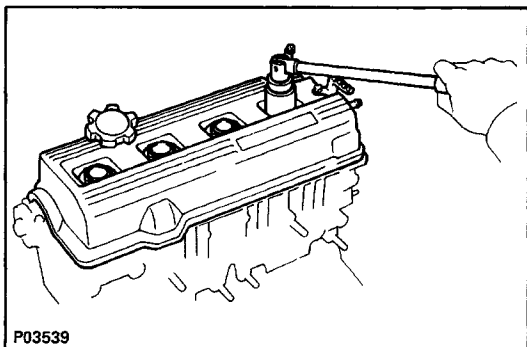
30. REMOVE ENGINE HANGERS

Remove the bolt and engine hanger. Remove the two engine hangers. Remove the ground strap.

31. REMOVE ALTERNATOR BRACKET

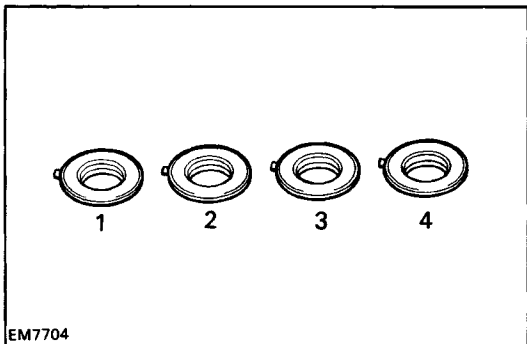
Remove the three bolts and alternator bracket.

32. REMOVE OIL PRESSURE SWITCH

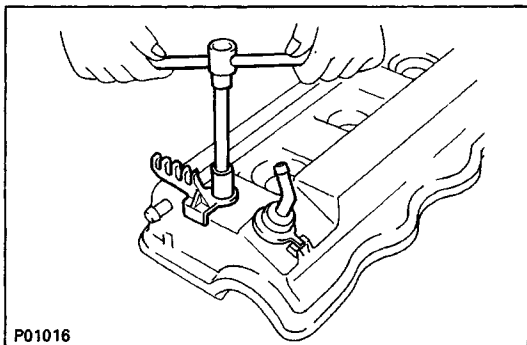


33. REMOVE CYLINDER HEAD COVER

Remove the four nuts, grommets, head cover and gasket.



HINT: Arrange the grommets in correct order, so that they can be reinstalled into their original positions. This minimizes any possibility of oil leakage due to reuse of grommets.



34. REMOVE HIGH-TENSION CORD CLAMP AND PCV VALVE FROM CYLINDER HEAD COVER

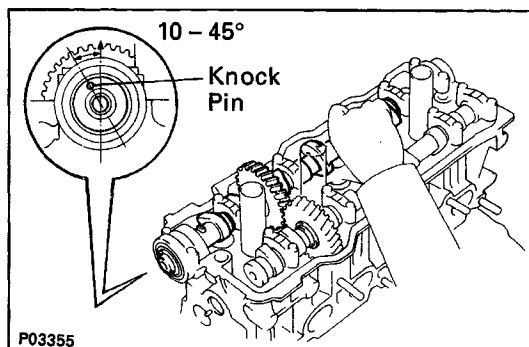
35. REMOVE CAMSHAFTS

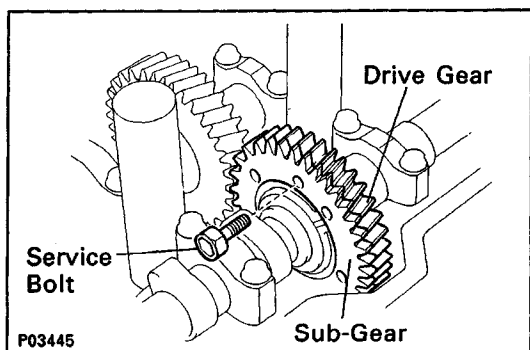
NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

A. Remove exhaust camshaft

(a) Set the knock pin of the intake camshaft at 10 –45° BTDC of camshaft angle.

HINT: The above angle allows No.2 and No.4 cylinder cam lobes of the exhaust camshaft to push their valve lifters evenly.





- (b) Secure the exhaust camshaft sub-gear to drive gear with a service bolt.

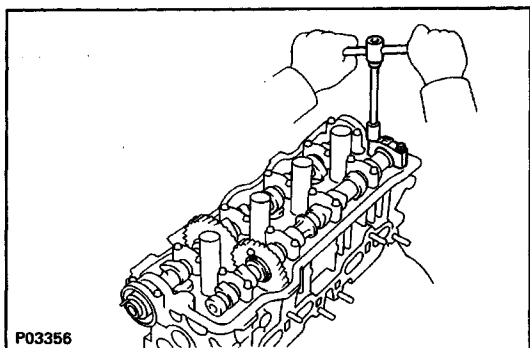
Recommended service bolt:

Thread diameter 6 mm

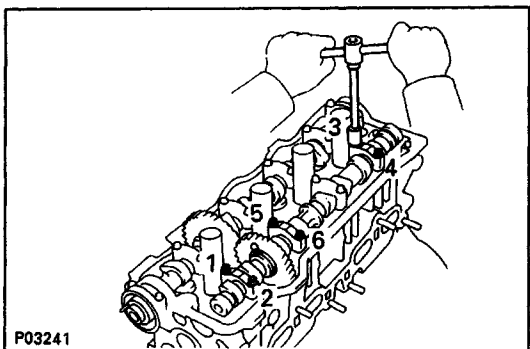
Thread pitch 1.0 mm

Bolt length 16 – 20 mm (0.63 – 0.79 in.)

HINT: When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



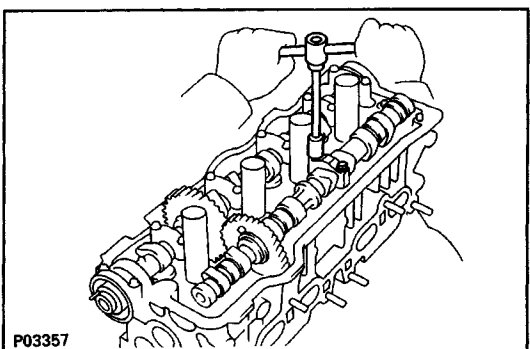
- (c) Remove the two bolts and rear bearing cap.



- (d) Uniformly loosen and remove the six bolts on the No.1, No. 2 and No.4 bearing caps in several passes in the sequence shown.

NOTICE: Do not remove the No.3 bearing cap bolts at this stage.

- (e) Remove the No.1, No.2 and No.4 bearing caps.



- (f) Alternately loosen and remove the two bolts on the No.3 bearing cap.

HINT:

- As the two No.3 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level.
- If the camshaft is not being lifted out straight and level, retighten the two No.3 bearing cap bolts. Then reverse the order of above steps from (f) to (a) and reset the knock pin of the intake camshaft at 10 – 45° BTDC, and repeat steps from (b) to (f) once again.

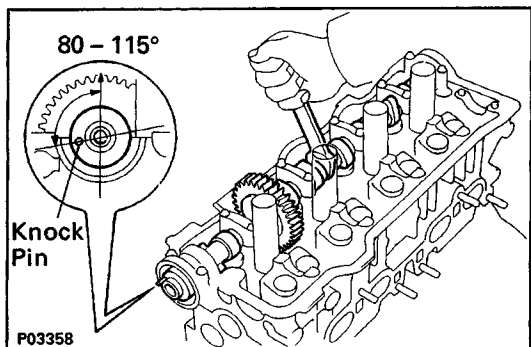
NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

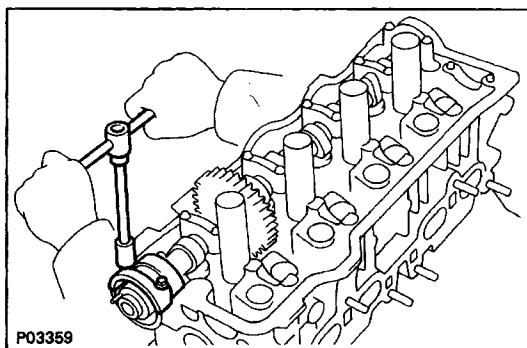
- (g) Remove the No.3 bearing cap and exhaust camshaft.

B. Remove intake camshaft

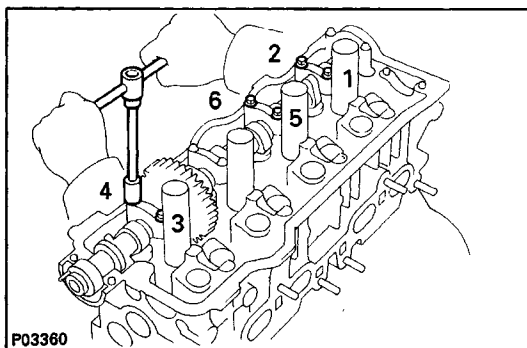
- (a) Set the knock pin of the intake camshaft at 80 – 115° BTDC of camshaft angle.

HINT: The above angle allows the No.1 and No.3 cylinder cam lobes of intake camshaft to push their valve lifters evenly.





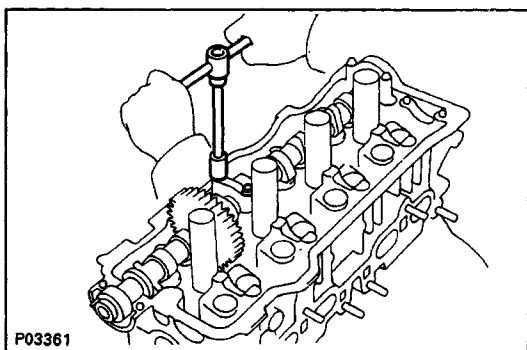
(b) Remove the two bolts, front bearing cap and oil seal.



(c) Uniformly loosen and remove the bolts on the No.1, No.3 and No.4 bearing caps in several passes in the sequence shown.

NOTICE: Do not remove the No.2 bearing cap bolts at this stage.

(d) Remove the No.1, No.3 and No.4 bearing caps.



(e) Alternately loosen and remove the two bolts on the No.2 bearing cap.

HINT:

- As the two No.2 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level, after breaking adhesion on the front bearing cap.
- If the camshaft is not being lifted out straight and level, retighten the two No.2 bearing cap bolts. Reverse the order of above steps from (e) to (a) and reset the knock pin of the intake camshaft at 80 – 115° BTDC, and repeat steps from (b) to (e) once again.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

(f) Remove the No.2 bearing cap and camshaft.

36. DISASSEMBLE EXHAUST CAMSHAFT

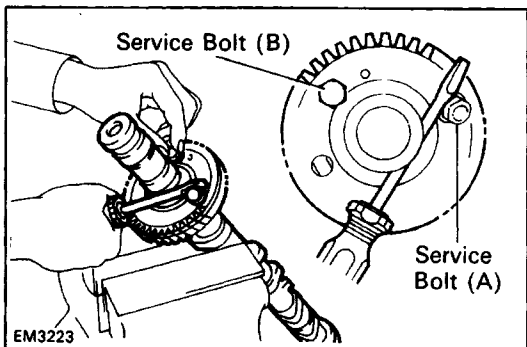
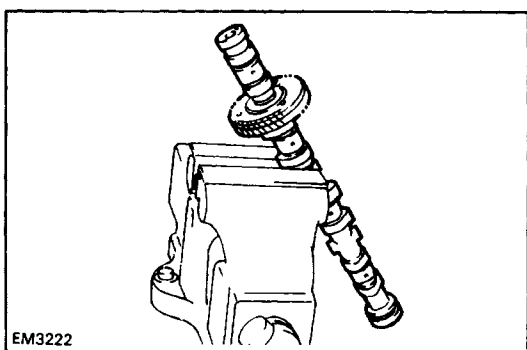
(a) Mount the hexagon wrench head portion of the camshaft in a vise.

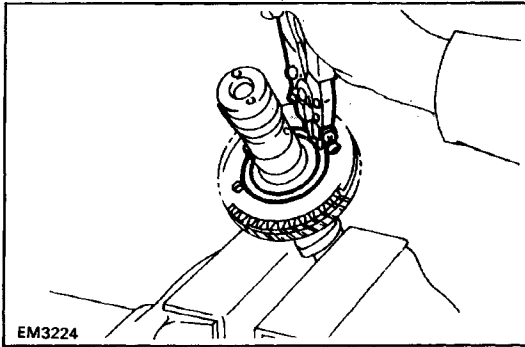
NOTICE: Be careful not to damage the camshaft.

(b) Insert a service bolt (A) into the service hole of the camshaft sub-gear.

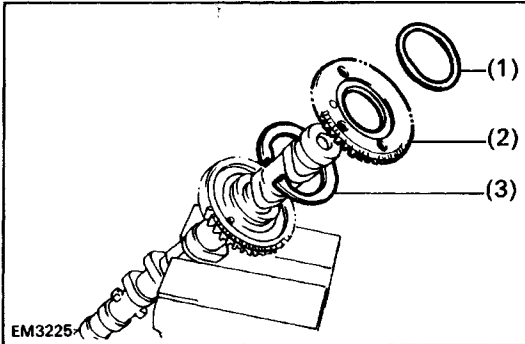
(c) Using a screwdriver, turn the sub-gear clockwise, and remove the service bolt (B).

NOTICE: Be careful not to damage the camshaft.



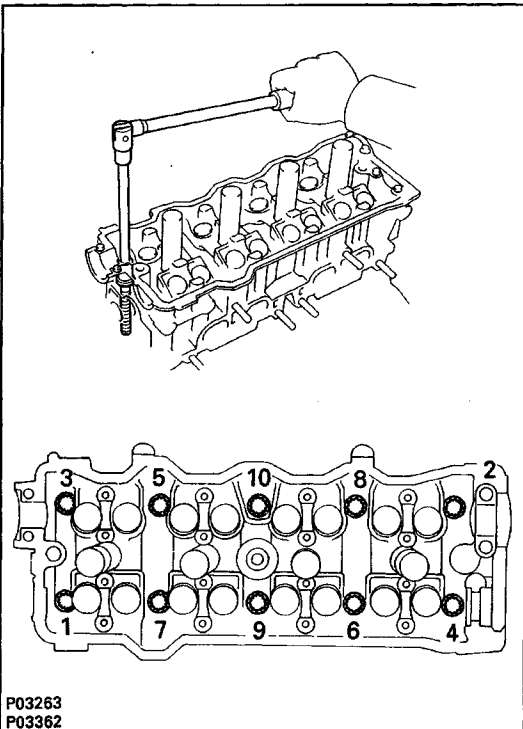


(d) Using snap ring pliers, remove the snap ring.



(e) Remove the following parts:

- (1) Wave washer
- (2) Camshaft sub-gear
- (3) Camshaft gear spring

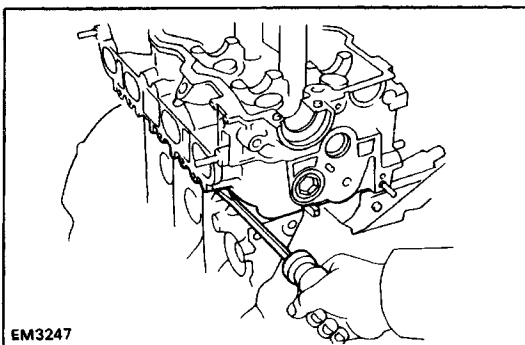


37. REMOVE CYLINDER HEAD

(a) Uniformly loosen and remove the ten cylinder head bolts in several passes in the sequence shown.

NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.

(b) Remove the ten plate washers.



(c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.

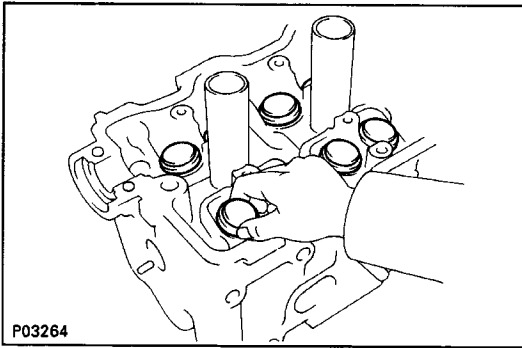
HINT: If the cylinder head is off, pry between the cylinder head and cylinder block with a screwdriver.

NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

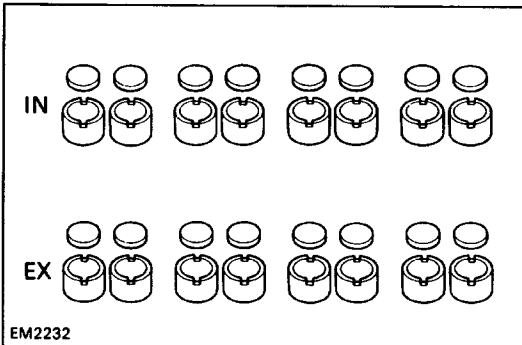
DISASSEMBLY OF CYLINDER HEAD

(See page [EM-150](#))

1. REMOVE VALVE LIFTERS AND SHIMS



HINT: Arrange the valve lifters and shims in correct order.

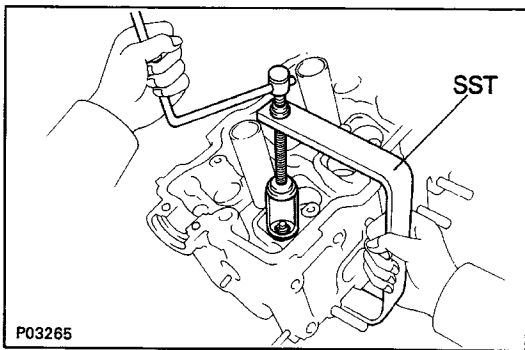


2. REMOVE VALVES

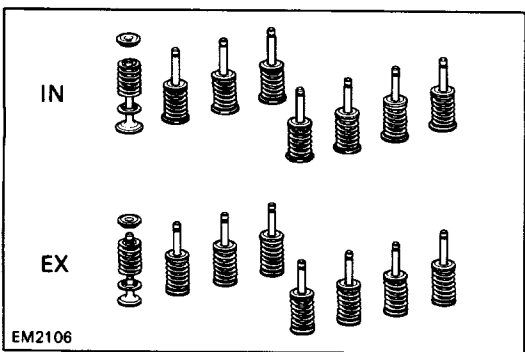
(a) Using SST, compress the valve spring and remove the two keepers.

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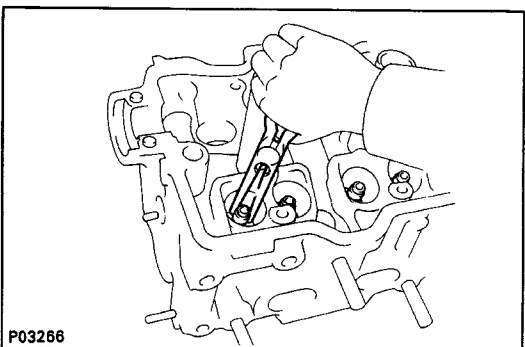
(b) Remove the spring retainer, valve spring, valve and spring seat.

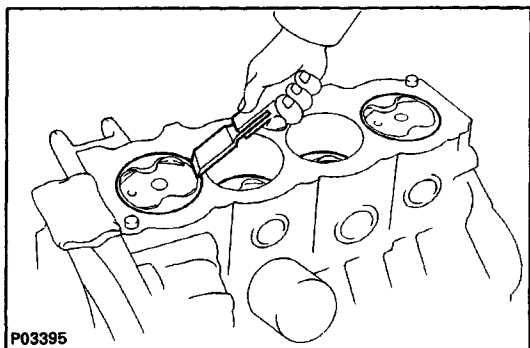


HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



(c) Using needle-nose pliers, remove the oil seal.



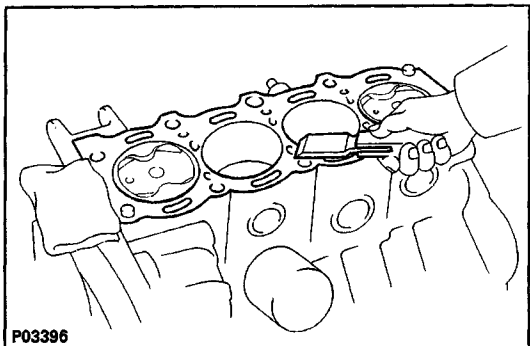


P03395

INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.

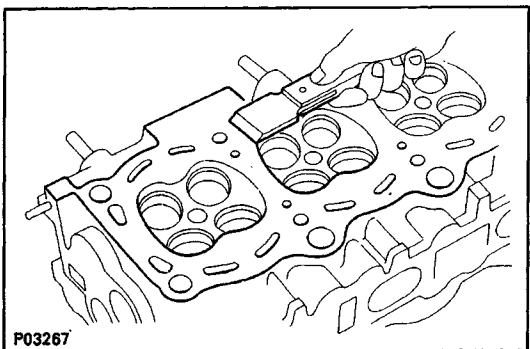


P03396

- (b) Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder head.

- (c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high-compressed air.



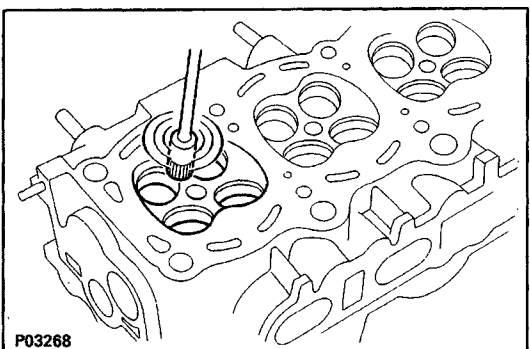
P03267

2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder block.

NOTICE: Be careful not to scratch the cylinder block contact surface.

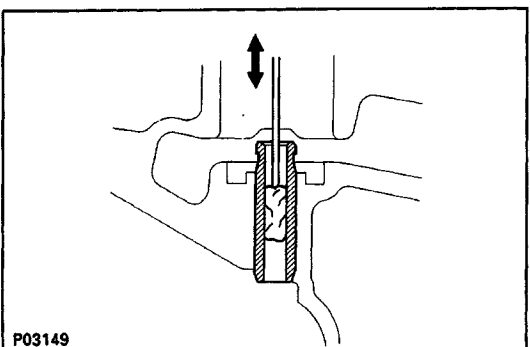


P03268

B. Clean combustion chambers

Using a wire brush, remove all the carbon from the combustion chambers.

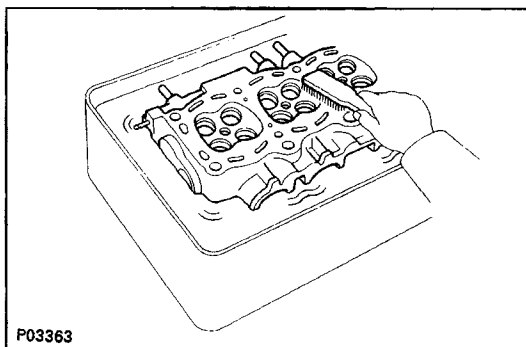
NOTICE: Be careful not to scratch the cylinder block contact surface.



P03149

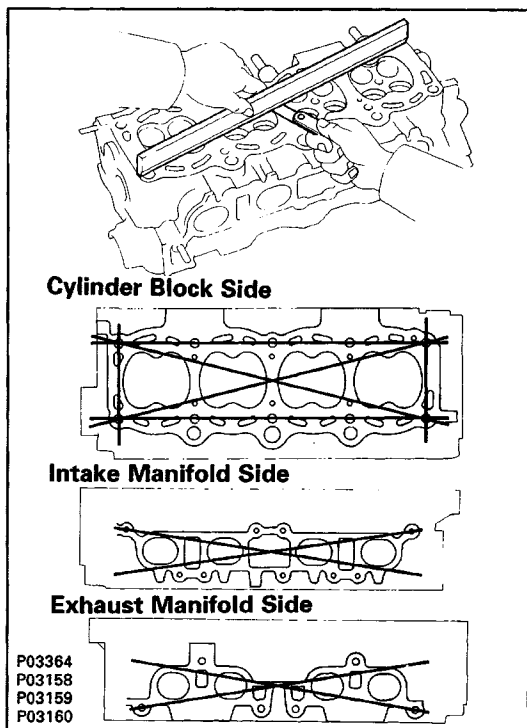
C. Clean valve guide bushings

Using a valve guide bushing brush and solvent, clean all the guide bushings.



D. Clean cylinder head

Using a soft brush and solvent, thoroughly clean the cylinder head.



3. INSPECT CYLINDER HEAD

A. Inspect for flatness

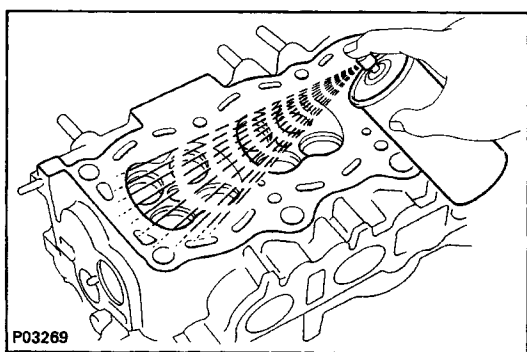
Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifold for warpage.

Maximum warpage:

Cylinder block side 0.05 mm (0.0020 in.)

Manifold side 0.08 mm (0.0031 in.)

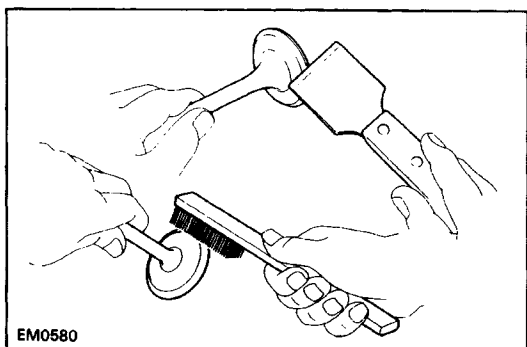
If warpage is greater than maximum, replace the cylinder head.



B. Inspect for cracks

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

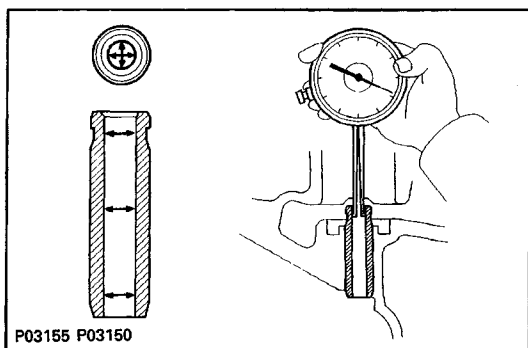
If cracked, replace the cylinder head.



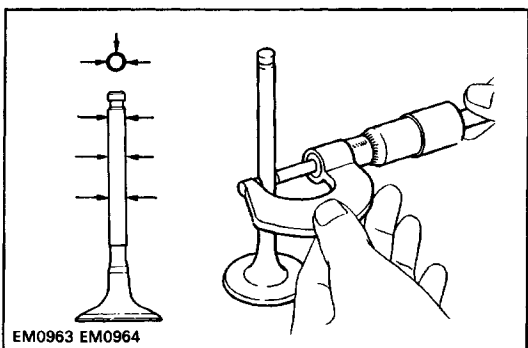
4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.



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EM0963 EM0964

5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- (a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

6.010 – 6.030 mm (0.2366 – 0.2374 in.)

- (b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

**Intake 5.970 – 5.985 mm
(0.2350 – 0.2356 in.)**

**Exhaust 5.965 – 5.980 mm
(0.2348 – 0.2354 in.)**

- (c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

**Intake 0.025 – 0.060 mm
(0–0010 – 0.0024 in.)**

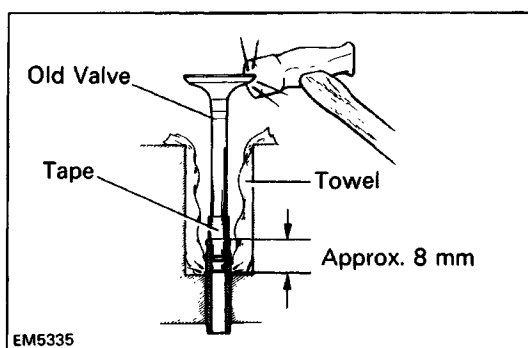
**Exhaust 0.030 – 0.065 mm
(0.0012 – 0.0026 in.)**

Maximum oil clearance:

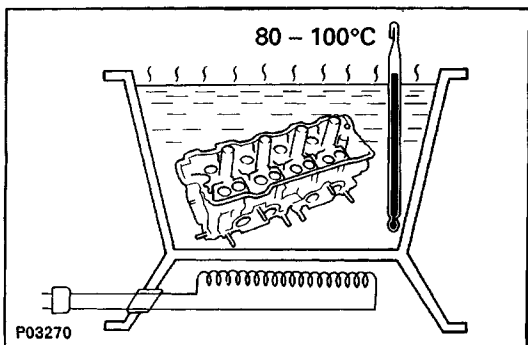
Intake 0.08 mm (0.0031 in.)

Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.



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6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

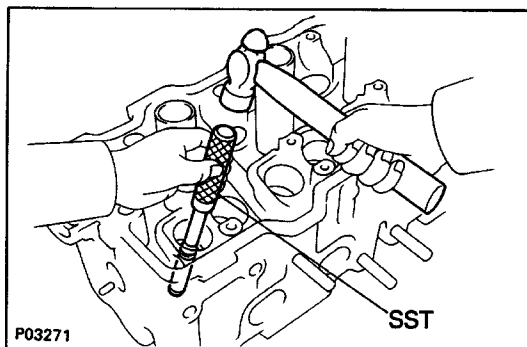
- (a) (Exhaust (w/ Snap Ring))

Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

HINT: Wrap the tape approx. 8 mm (0.31 in.) from the valve stem end.

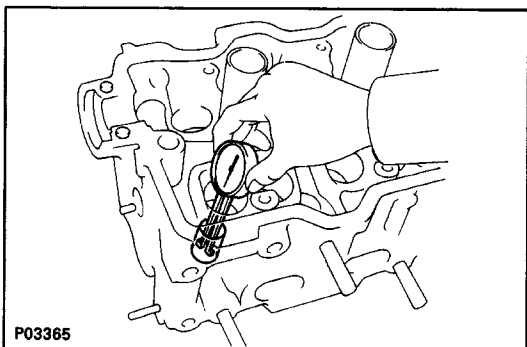
NOTICE: Be careful not to damage the valve lifter hole.

- (b) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



(c) Using SST and a hammer, tap out the guide bushing.

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(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

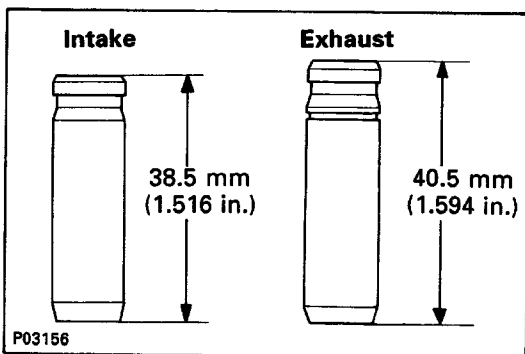
Bushing bore diameter mm (in.)	Bushing size
10.985 - 11.012 (0.4325 - 0.4335)	Use STD
11.035 - 11.062 (0.4344 - 0.4355)	Use O/S 0.05

(e) Select a new guide bushing (STD or O/S 0.05).

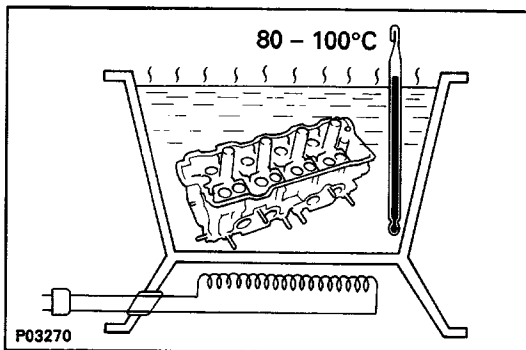
If the bushing bore diameter of the cylinder head is greater than 11.012 mm (0.4335 in.), machine the bushing bore to the following dimension:

11.035 - 11.062 mm (0.4344 - 0.4355 in.)

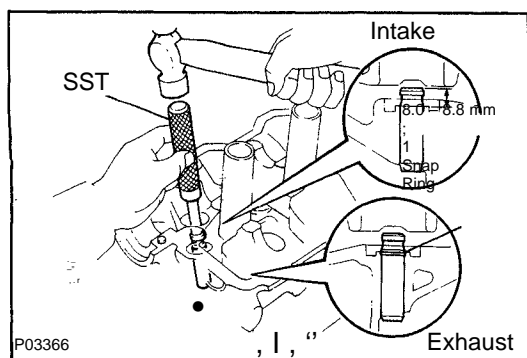
If the bushing bore diameter of the cylinder head is greater than 11.062 mm (0.4355 in.), replace the cylinder head.



HINT: Different the bushings are used for the intake and exhaust.



(f) Gradually heat the cylinder head to 80-100°C (176- 212°F).



(g) (Intake)

Using SST and a hammer, tap in a new guide bushing until there is 8.0 – 8.8 mm (0.315 – 0.346 in.) protruding from the cylinder head.

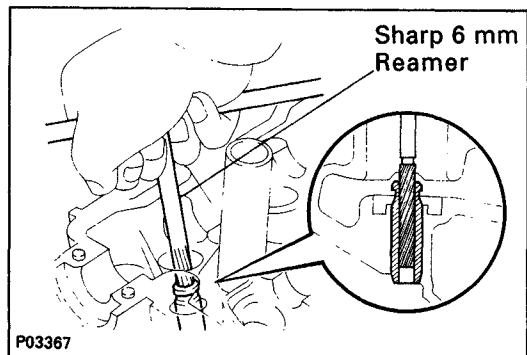
SST 09201-70010

(h) (Exhaust)

Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.

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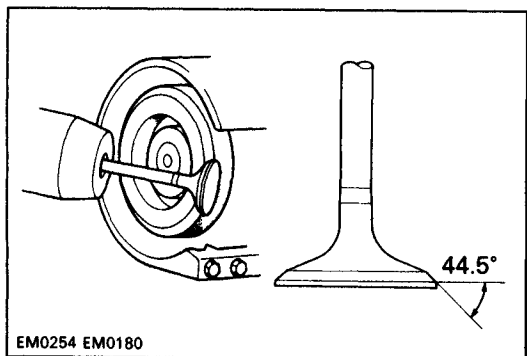
(h) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page [EM-163](#)) between the guide bushing and valve stem.



7. INSPECT AND GRIND VALVES

- Grind the valve enough to remove pits and carbon.
- Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°



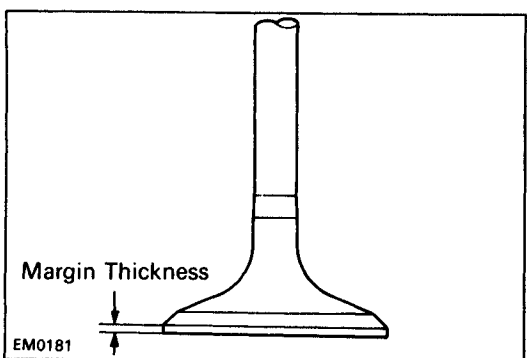
- Check the valve head margin thickness.

Standard margin thickness: 0.8 – 1.2 mm

(0.031 – 0.047 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.



- Check the valve overall length.

Standard overall length:

Intake 97.60 mm (3.8425 in.)

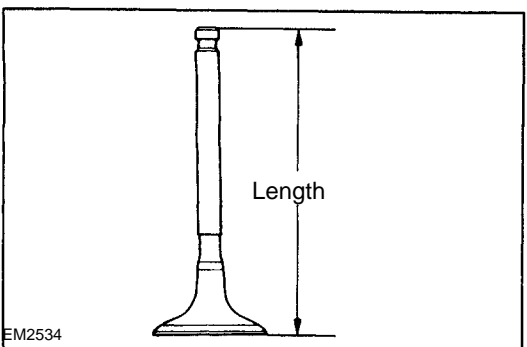
Exhaust 98.45 mm (3.8760 in.)

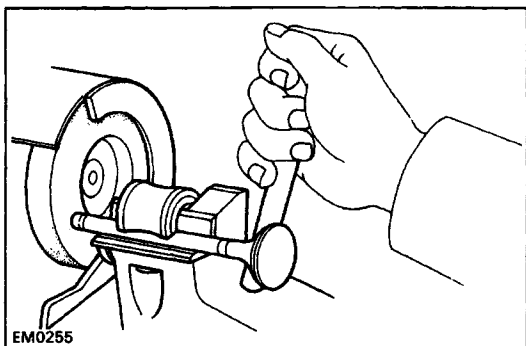
Minimum overall length:

Intake 97.1 mm (3.823 in.)

Exhaust 98.0 mm (3.858 in.)

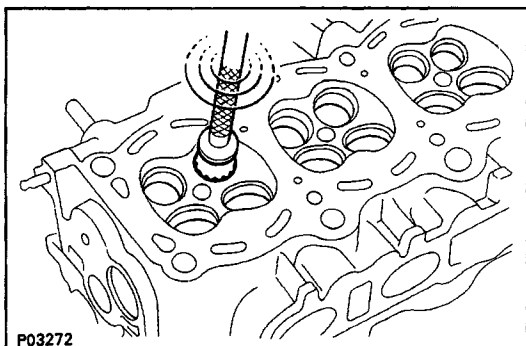
If the overall length is less than minimum, replace the valve.





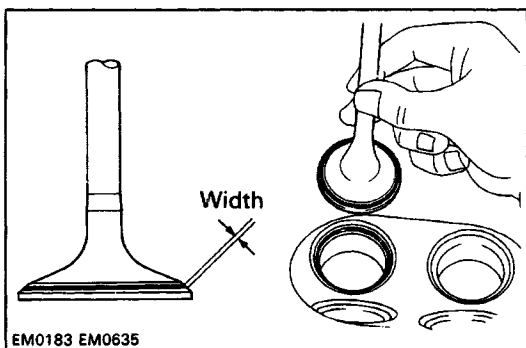
- (e) Check the surface of the valve stem tip for wear. If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than minimum.



8. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.

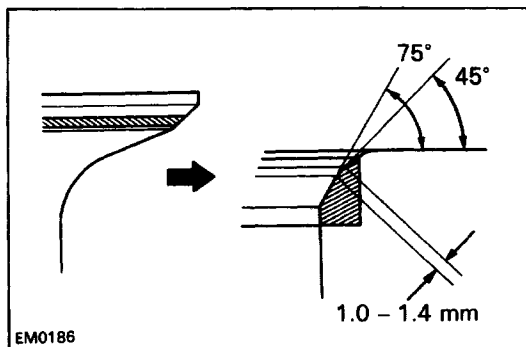
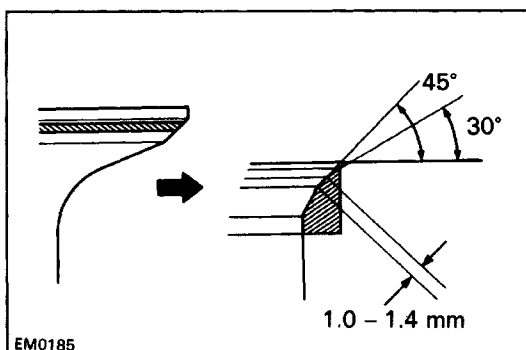


- (b) Check the valve seating position. Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.
- (c) Check the valve face and seat for the following:

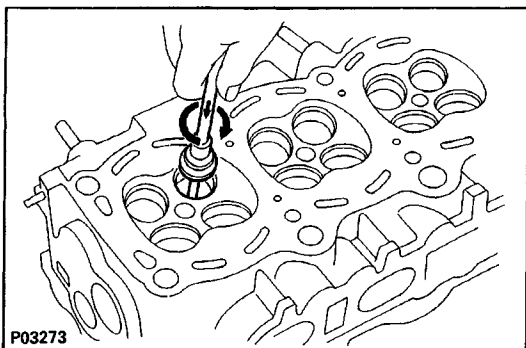
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:
1.0 – 1.4 mm (0.039 – 0.055 in.)

If not, correct the valve seats as follows:

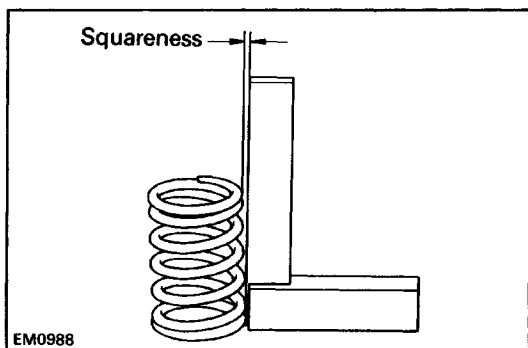
- (1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



- (2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



- (d) Hand-lap the valve and valve seat with an abrasive compound.
- (e) After hand-lapping, clean the valve and valve seat.

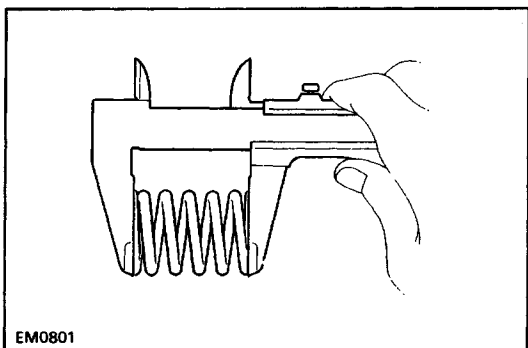


9. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness: 2.0 mm (0.079 in.)

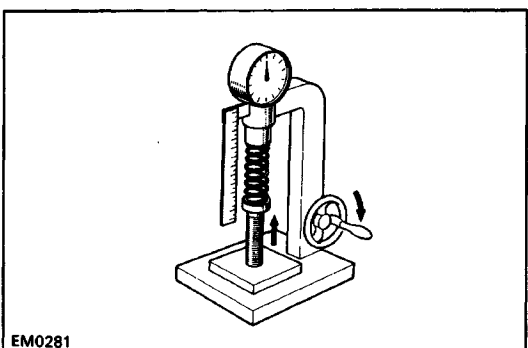
If the squareness is greater than maximum, replace the valve spring.



- (b) Using a vernier caliper, measure the free length of the valve spring.

Free length: 41.96 – 41.99 mm (1.6520 – 1.6531 in.)

If the free length is not as specified, replace the valve spring.



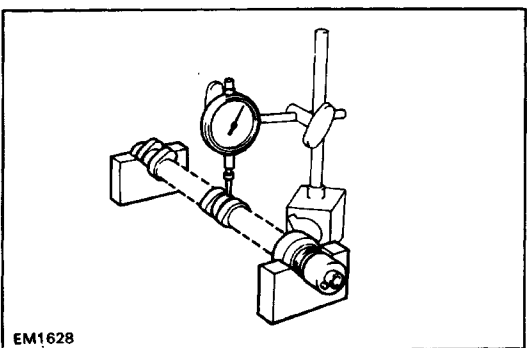
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

164 – 189 N (16.7 – 19.3 kgf, 36.8 – 42.5 lbf)

at 34.7 mm 0.366 in.)

If the installed tension is not as specified, replace the valve spring.



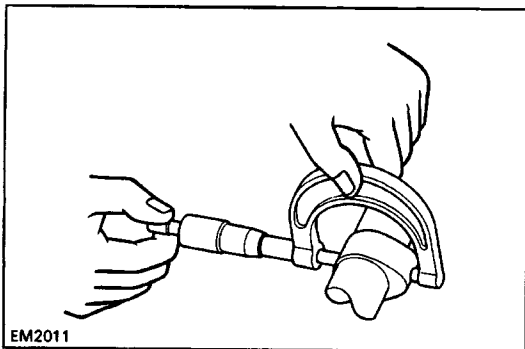
10. INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

- (a) Place the camshaft on V-blocks.
- (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.04 mm (0.0016 in.)

If the circle runout is greater than maximum, replace the camshaft.



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake 42.010 – 42.110 mm
(1.6539 – 1.6579 in.)

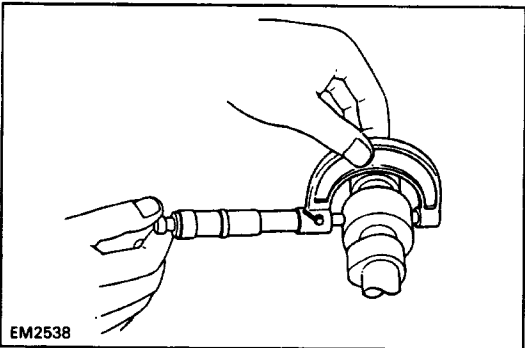
Exhaust 40.060 – 40.160 mm
(1.5772 – 1.5811 in.)

Minimum cam lobe height:

Intake 41.90 mm (1.6496 in.)

Exhaust 39.95 mm (1.5728 in.)

If the cam lobe height is less than minimum, replace the camshaft.

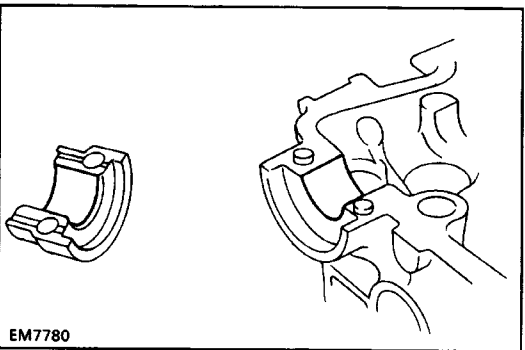


C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter: 26.959 – 26.975 mm
(1.0614 – 1.0620 in.)

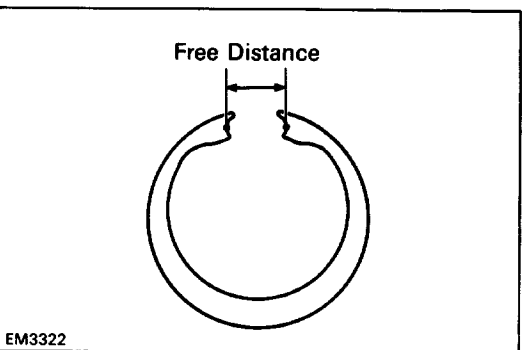
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

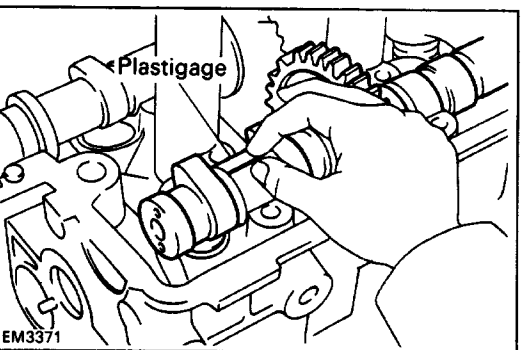


E. Inspect camshaft gear spring

Using a vernier caliper, measure the free distance between the spring ends.

Free distance: 22.5 – 22.9 mm (0.886 – 0.902 in.)

If the free distance is not as specified, replace the gear spring.

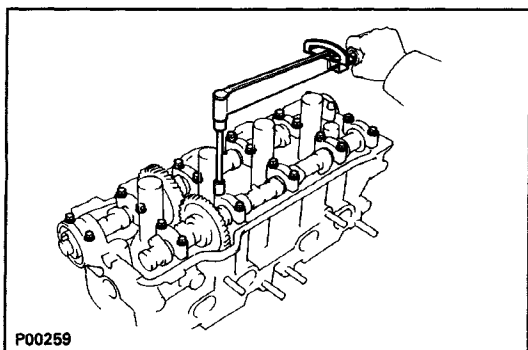


F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

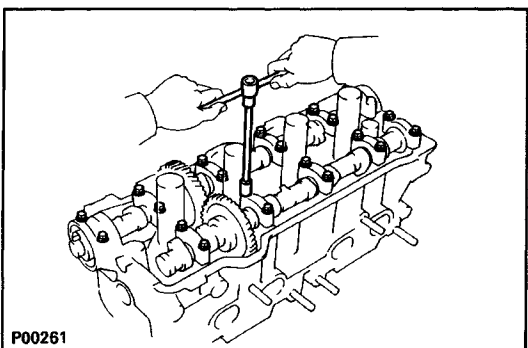


(d) Install the bearing caps.

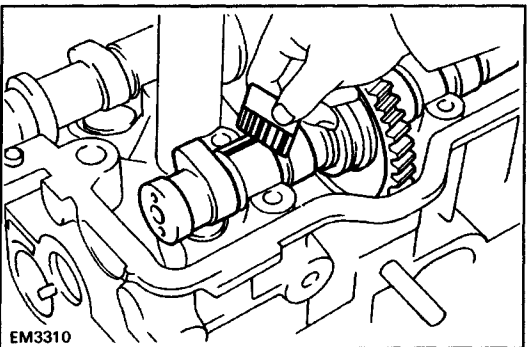
(See step 4 on pages [EM-175](#) to 177)

Torque: 19 N·m (190 kgf·cm, 94 ft·lbf)

NOTICE: Do not turn the camshaft.



(e) Remove the bearing caps.



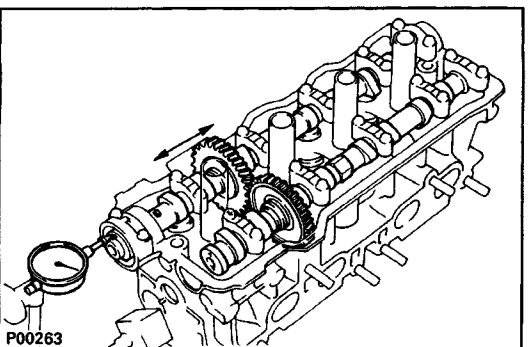
(f) Measure the Plastigage at its widest point.

**Standard oil clearance: 0.025 – 0.062 mm
(0.0010 – 0.0024 in.)**

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.



G. Inspect camshaft thrust clearance

(a) Install the camshafts.

(See step 4 on pages [EM-175](#) to 177)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:

**Intake 0.045 – 0.100 mm
(0.0018 – 0.0039 in.)**

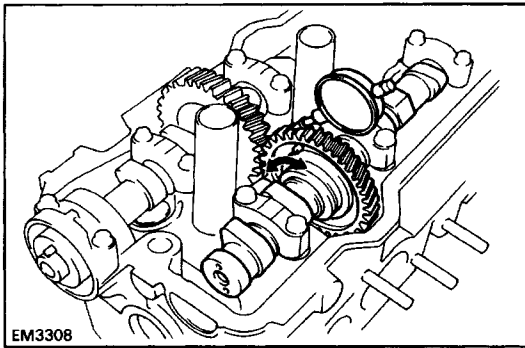
**Exhaust 0.030 – 0.085 mm
(0.0012 – 0.0033 in.)**

Maximum thrust clearance:

Intake 0.12 mm (0.0047 in.)

Exhaust 0.10 mm (0.0039 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



H. Inspect camshaft gear backlash

- (a) Install the camshafts without installing the exhaust cam sub-gear.

(See step 4 on pages EM-175 to 177)

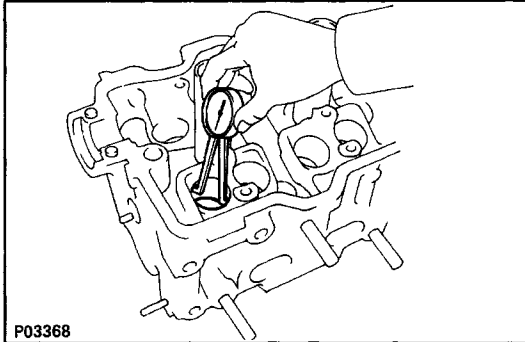
- (b) Using a dial indicator, measure the backlash.

Standard backlash: 0.020 – 0.200 mm

(0.0008 – 0.0079 in.)

Maximum backlash: 0.30 mm (0.0188 in.)

If the backlash is greater than maximum, replace the camshafts.

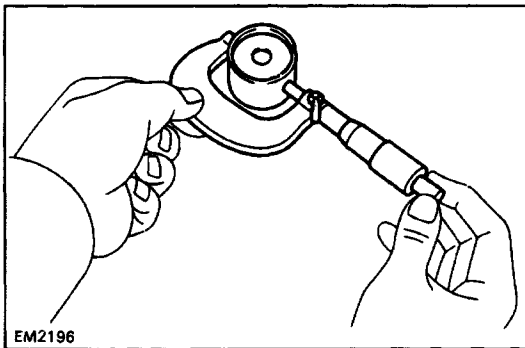


11. INSPECT VALVE LIFTERS AND LIFTER BORES

- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter: 31.000 – 31.018 mm

(1.2205 – 1.2213 in.)



- (b) Using a micrometer, measure the lifter diameter.

Lifter diameter: 30.966 – 30.976 mm

(1.2191 – 1.2195 in.)

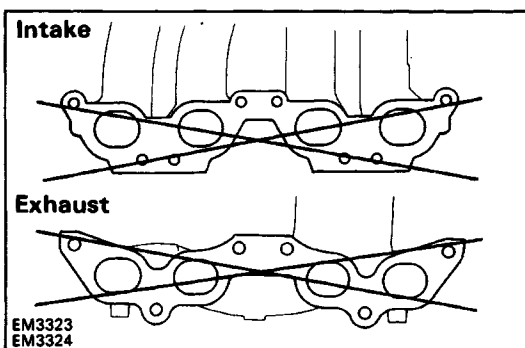
- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance: 0.024 – 0.052 mm

(0.0009 – 0.0020 in.)

Maximum oil clearance: 0.07 mm (0.0028 in.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



12. INSPECT MANIFOLDS

Using precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold.

ASSEMBLY OF CYLINDER HEAD

(See page [EM-150](#))

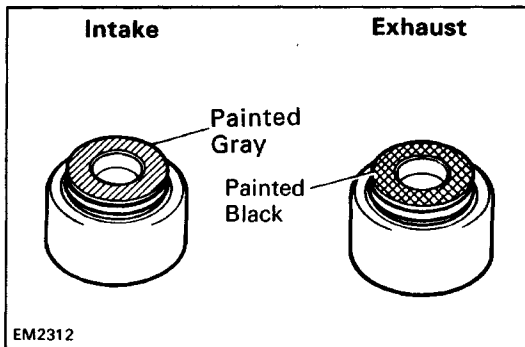
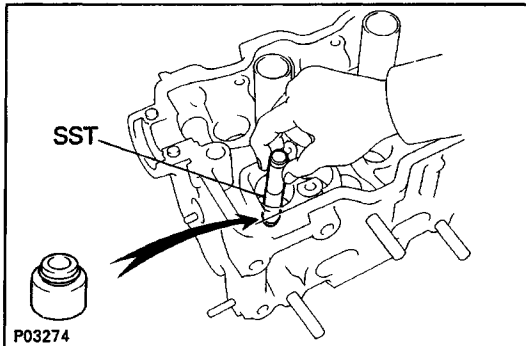
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

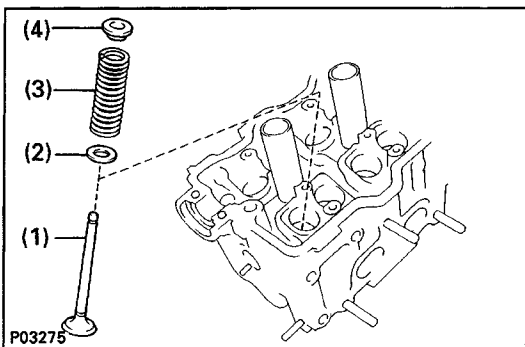
1. INSTALL VALVES

(a) Using SST, push in a new oil seal.

SST 09201-41020

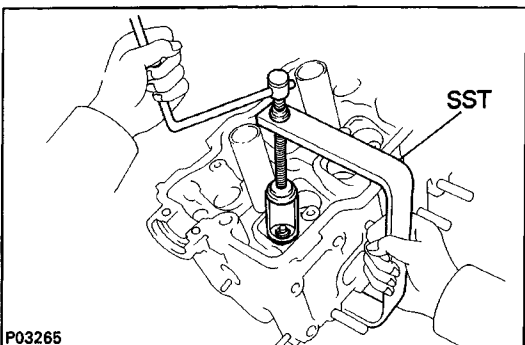


HINT: The intake valve oil seal is brown and the exhaust valve oil seal is black.



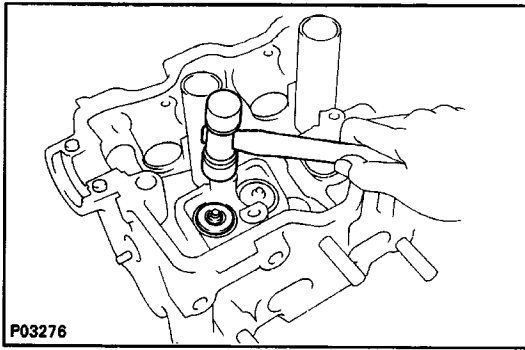
(b) Install the following parts:

- (1) Valve
- (2) Spring seat
- (3) Valve spring
- (4) Spring retainer

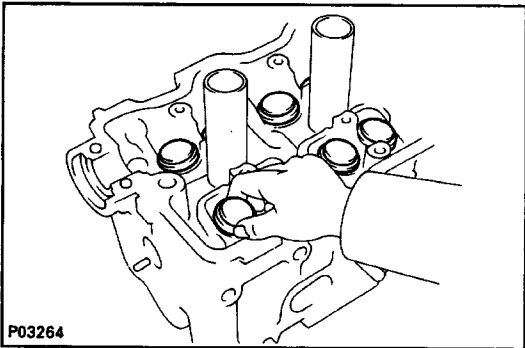


(c) Using SST, compress the valve spring and place the two keepers around the valve stem.

SST 09202-70010

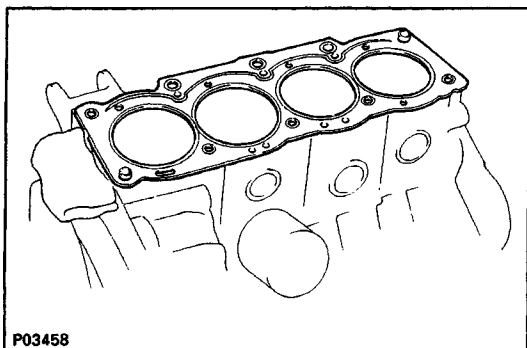


- (d) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.



2. INSTALL VALVE LIFTERS AND SHIMS

- (a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.



INSTALLATION OF CYLINDER HEAD

(See page EM-150)

1. INSTALL CYLINDER HEAD

A. Place cylinder head on cylinder block

- (a) Place a new cylinder head gasket in position on the cylinder block.

NOTICE: Be careful of the installation direction.

- (b) Place the cylinder head in position on the cylinder head gasket.

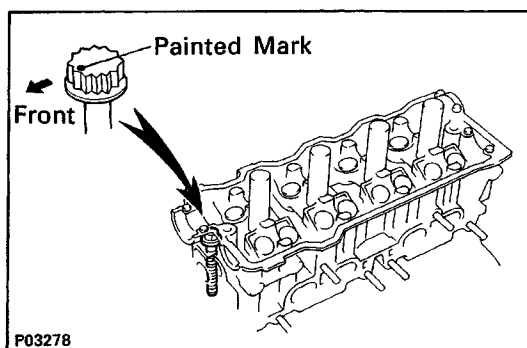
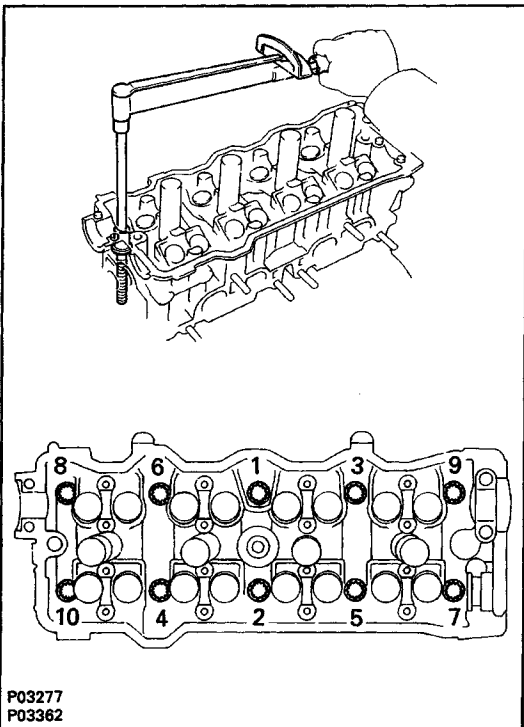
B. Install cylinder head bolts

HINT:

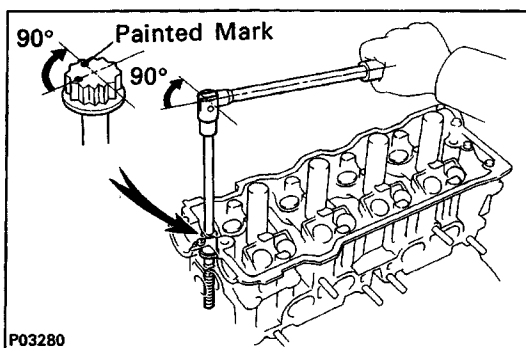
- The cylinder head bolts are tightened in two progressive steps (steps (b) and (d)).
 - If any cylinder head bolt is broken or deformed, replace it.
- (a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (b) Install the plate washer to each cylinder head bolt.
- (c) Install and uniformly tighten the ten cylinder head bolts in several passes in the sequence shown.

Torque: 49 N-m (500 kgf-cm, 36 ft-lbf)

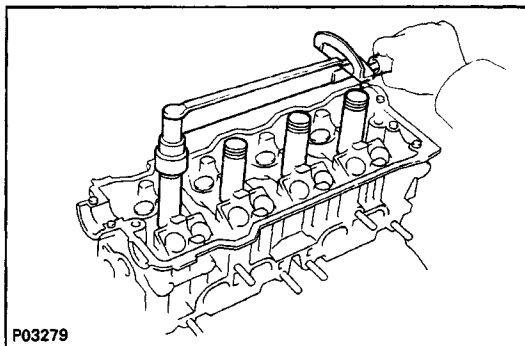
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



- (d) Mark the front of the cylinder head bolt head with paint.



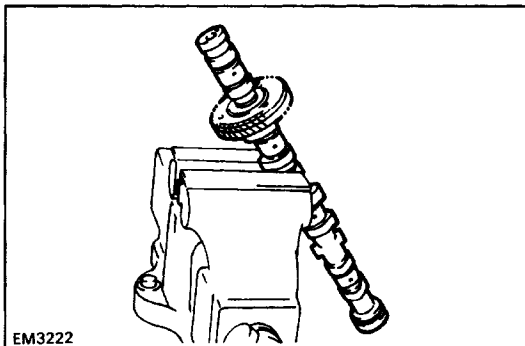
- (e) Retighten the cylinder head bolts 90° in the numerical order shown.
- (f) Check that the painted mark is now at a 90° angle to front.



2. INSTALL SPARK PLUG TUBES

- Clean the cylinder head tube holes of any residual adhesive, oil or foreign particles. Remove any oil with kerosene or gasoline.
- Screw the threads of the spark plug tube coated with adhesive into the cylinder head.
- Using the spark plug tube nut and a 30 mm socket wrench, tighten the spark plug tubes.

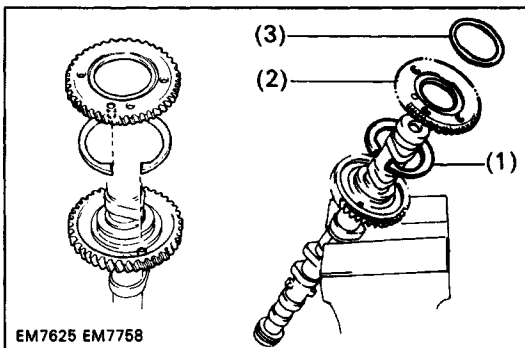
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)



3. ASSEMBLE EXHAUST CAMSHAFT

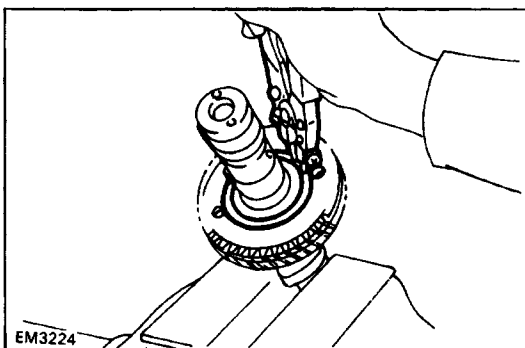
- Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE: Be careful not to damage the camshaft.

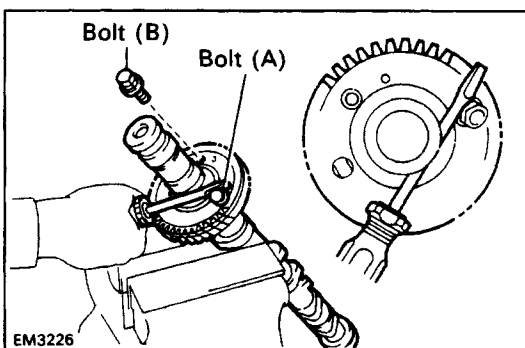


- Install the following parts:
 - Camshaft gear spring
 - Camshaft sub-gear
 - Wave washer

HINT: Align the pins on the gears with the spring ends.



- Using snap ring pliers, install the snap ring.

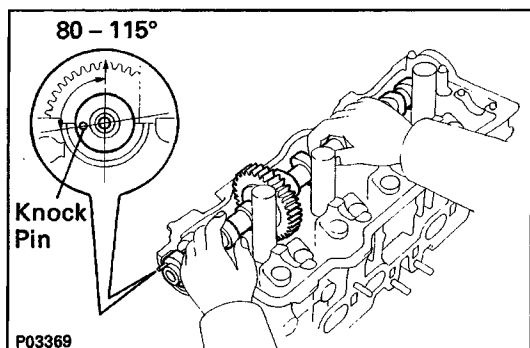


- Insert a service bolt (A) into the service hole of the camshaft sub-gear.
- Using a screwdriver, align the holes of the camshaft drive gear and sub-gear by turning camshaft sub-gear clockwise, and install a service bolt (B).

NOTICE: Be careful not to damage the camshaft.

4. INSTALL CAMSHAFTS

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 portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

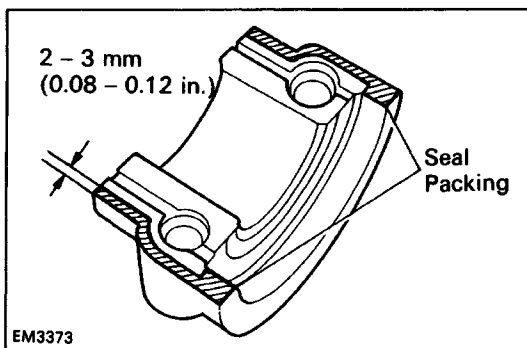


A. Install intake camshaft

(a) Apply MP grease to the thrust portion of the camshaft.

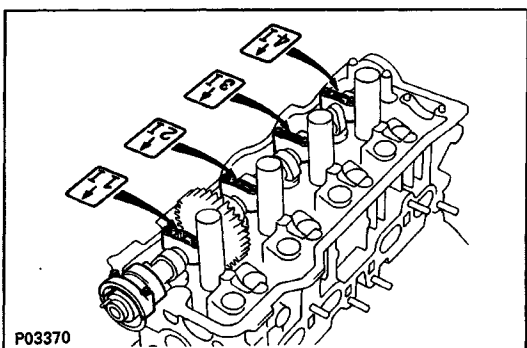
(b) Place the intake camshaft at 80 - 115° BTDC of camshaft angle on the cylinder head.

HINT: The above angle allows the No.1 and No.3 cylinder cam lobes of the intake camshaft to push their valve lifters evenly.

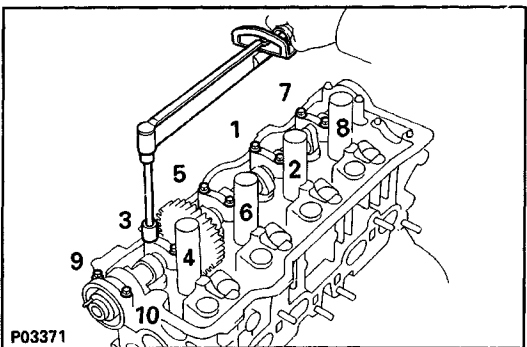


(c) Apply seal packing to the No.1 bearing cap as shown.

Seal packing: Part No. 08826-00080 or equivalent



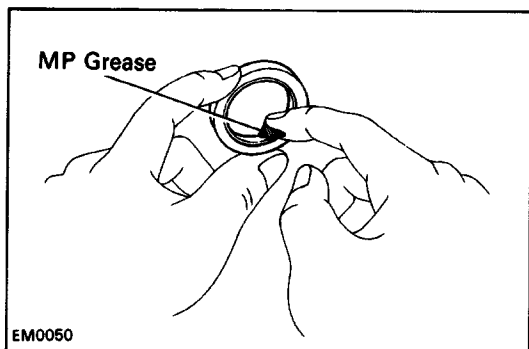
(d) Install the bearing caps in their proper locations.



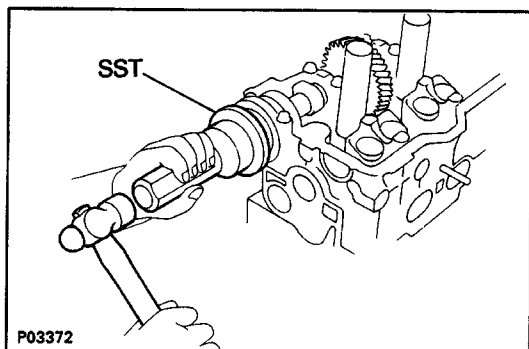
(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(f) Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.

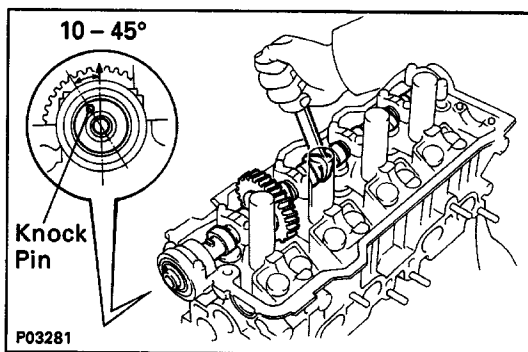
Torque: 19 N-m (190 kgf-cm, 14 ft-lbf)



(g) Apply MP grease to a new oil seal lip.



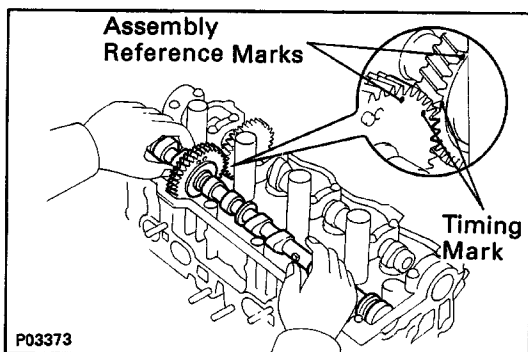
(h) Using SST, tap in the oil seal.
SST 09223-46011



B. Install exhaust camshaft

(a) Set the knock pin of the intake camshaft at 10 -45* BTDC of camshaft angle.

HINT: The above angle allows the No.2 and No.4 cylinder cam lobes of the exhaust camshaft to push their valve lifters evenly.



(b) Apply MP grease to the thrust portion of the camshaft.

(c) Engage the exhaust camshaft gear to the intake camshaft gear by matching the timing marks on each gear.

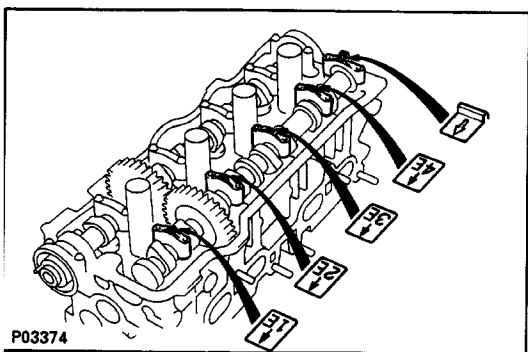
(d) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.

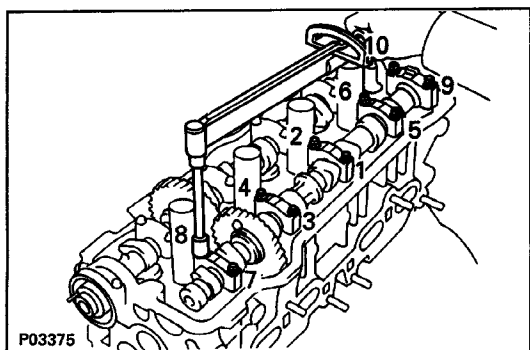
NOTICE: There are also assembly reference marks on each gear as shown in the illustration. Do not use these marks.

(e) Turn the intake camshaft clockwise or counter-clockwise little by little until the exhaust camshaft sits in the bearing journals evenly without rocking the camshaft on the bearing journals.

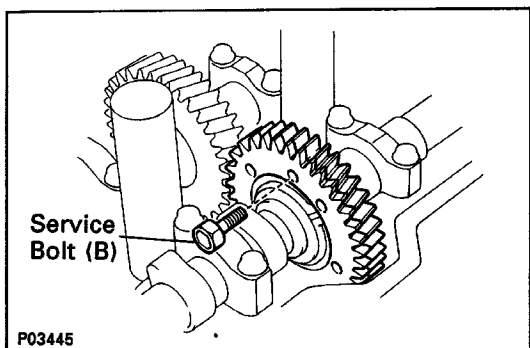
NOTICE: It is very important to replace the camshaft in the bearing journals evenly while tightening bearing caps in the subsequent steps.

(f) Install the bearing caps in their proper locations.





- (g) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
- (h) Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.
- Torque: 19 N-m (190 kgf-cm, 14 ft-lbf)**



- (i) Remove the service bolt (B).

5. CHECK AND ADJUST VALVE CLEARANCE

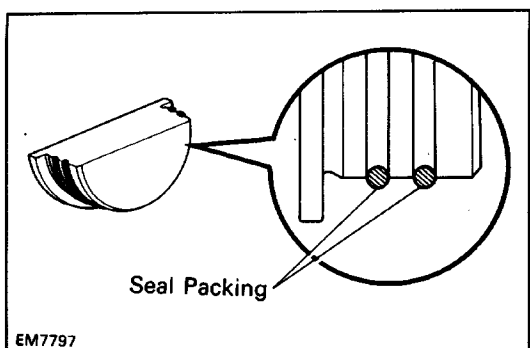
(See page [EM-22](#))

Turn the camshaft and position the cam lobe upward, and check and adjust the valve clearance.

Valve clearance (Cold):

Intake 0.19 – 0.29 mm (0.007 – 0.011 in.)

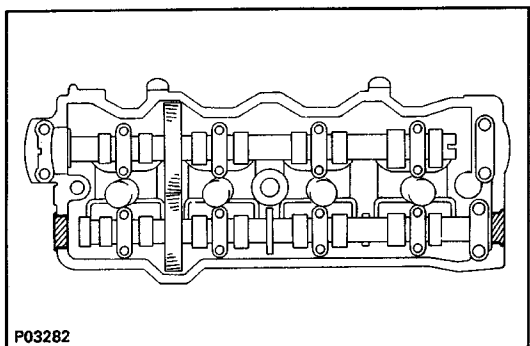
Exhaust 0.28 – 0.38 mm (0.011 – 0.015 in.)



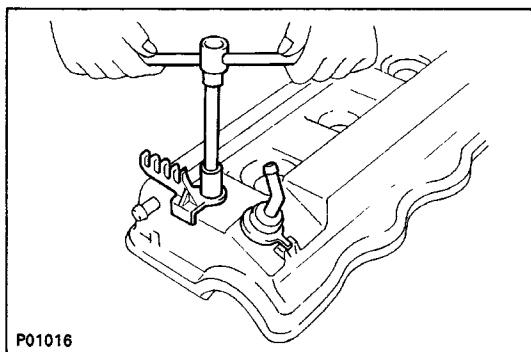
6. INSTALL SEMI-CIRCULAR PLUGS

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the semi-circular plug grooves.

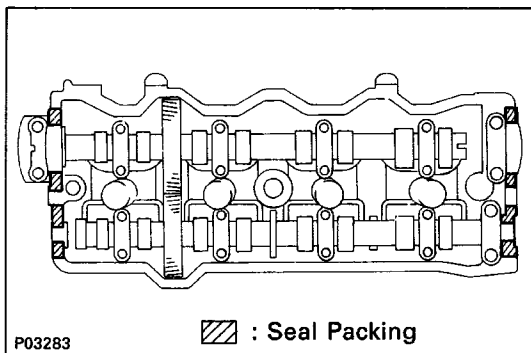
Seal packing: Part No. 08826-00080 or equivalent



- (c) Install the two semi-circular plugs to the cylinder head.



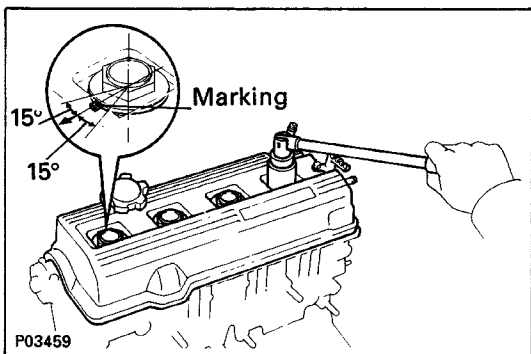
7. INSTALL HIGH-TENSION CORD CLAMP AND PCV VALVE



8. INSTALL CYLINDER HEAD COVER

- Remove any old packing (FIPG) material.
- Apply seal packing to the cylinder head as shown in the illustration.

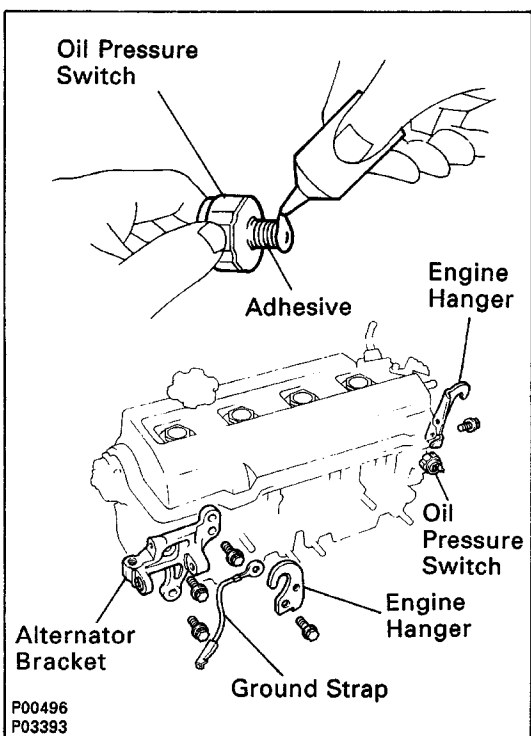
Seal packing: Part No. 08826-00080 or equivalent



- Install the gasket to the head cover.
- Install the head cover with the four grommets and nuts. Uniformly tighten the nuts in several passes.

Torque: 23 N-m (230 kgf-cm, 17 ft-lbf)

HINT: Install the grommets so that its markings are as shown in the illustration. Then install the grommet to its original position.



9. INSTALL OIL PRESSURE SWITCH

Apply adhesive to two or three threads.

Adhesive: Part No. 08833-00080, THREE BOND 1324 or equivalent

10. INSTALL ALTERNATOR BRACKET

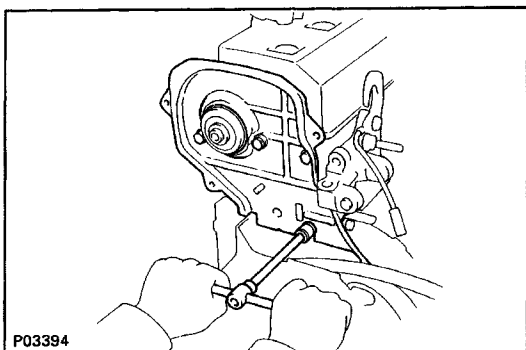
Install the alternator bracket with the three bolts.

Torque: 42 N-m (425 kgf-cm, 31 ft-lbf)

11. INSTALL ENGINE HANGERS

Install the engine hanger with the bolt. Install the two engine hangers. Install the ground strap.

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

**12. INSTALL No.3 TIMING BELT COVER**

Install the timing belt cover with the four bolts.

Torque: 7.8 N-m (80 kgf-cm, 69 in-lbf)

13. INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

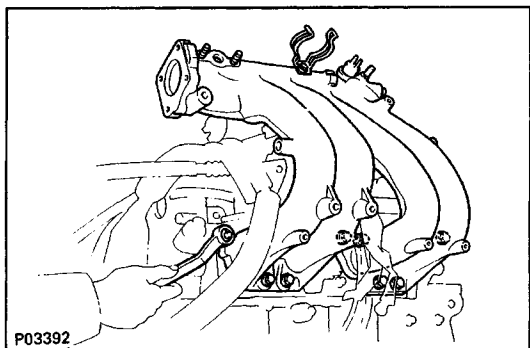
(See step 4 on page [EM-75](#))

14. INSTALL CAMSHAFT TIMING PULLEY

(See steps 9 to 21 and 24 on pages [EM-76](#) to 80)

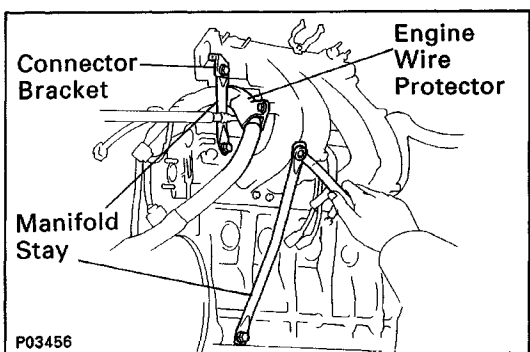
15. INSTALL INJECTOR AND DELIVERY PIPE

(See steps 1 and 2 on pages [FI-175](#) and 176)

**16. INSTALL INTAKE MANIFOLD**

(a) Install a new gasket and the intake manifold with the six bolts and two nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)



(b) Install the two manifold stays with the four bolts.

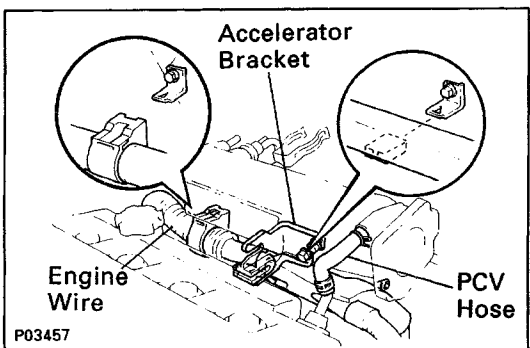
Alternately tighten the bolts. Install the connector bracket (CALIF. only).

Torque:

12 mm. head bolt 22 N-m (220 kgf-cm, 16 ft-lbf)

14 mm head bolt 42 N-m (425 kgf-cm, 31 ft-lbf)

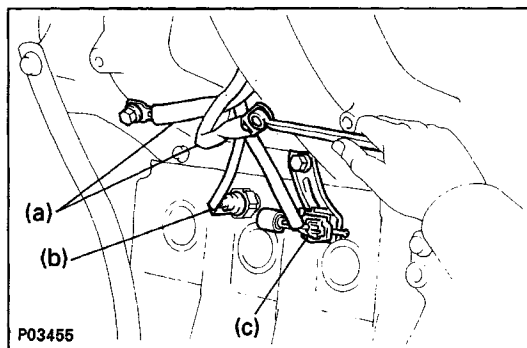
(c) Install the engine wire protector with the bolt.



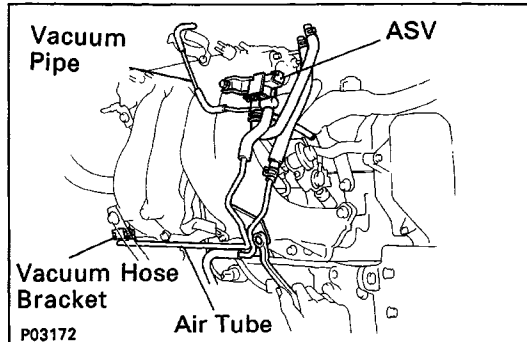
(d) Connect the two wire clamps to the wire brackets.

(e) Connect the PCV hose to the PVC valve.

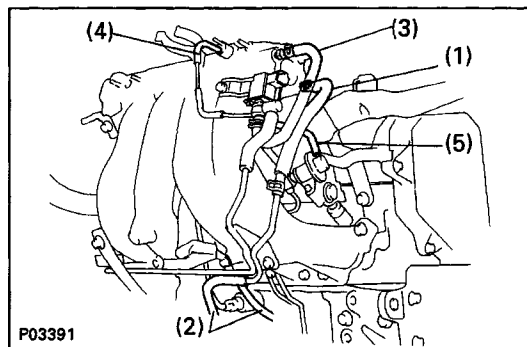
17. INSTALL ACCELERATOR BRACKET

**18. INSTALL VSV FOR EGR****19. CONNECT ENGINE WIRE GROUND STRAPS AND CONNECTORS**

- (a) Two engine ground straps to intake manifold
- (b) Knock sensor connector
- (c) VSV connector for EGR

**20. INSTALL AIR TUBE, ASV (FOR A/C) AND VACUUM PIPE**

- (a) Install the air tube, ASV assembly and the vacuum hose bracket with the four bolts.
- (b) Install the vacuum pipe with the bolt.

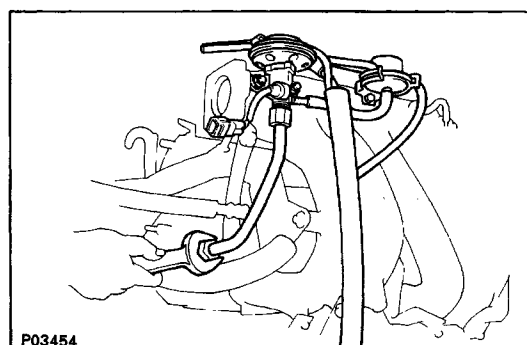
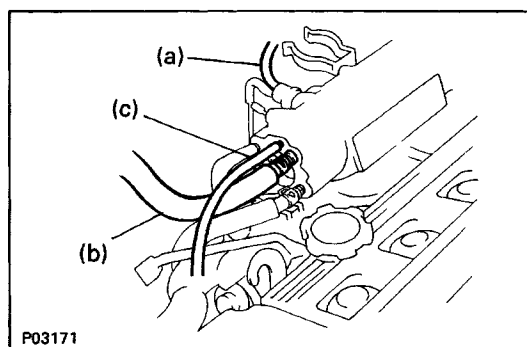


- (c) Connect the following hoses:
 - (1) PS air hose to intake manifold
 - (2) Two air hoses to air tube
 - (3) (w/ A/C)
 - Air hose to intake manifold
 - (4) Vacuum hose to gas filter
 - (5) Vacuum hose to fuel pressure regulator
- (d) (w/ A/C)

Connect the ASV connector.

21. CONNECT VACUUM HOSES

- (a) Vacuum sensor hose to gas filter
- (b) Brake booster vacuum hose to intake manifold
- (c) (w/ Cruise Control System (w/o ABS))
 - Actuator vacuum hose to intake manifold

**22. INSTALL EGR VALVE AND VACUUM MODULATOR**

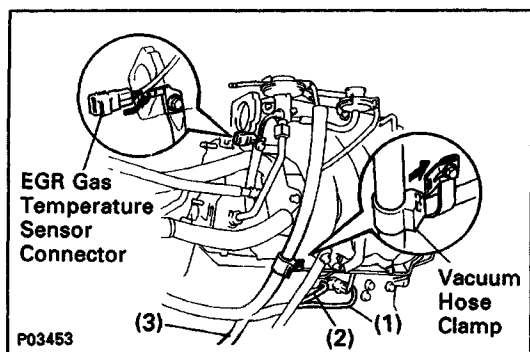
- (a) Install a new gasket and the EGR valve with the union nut and two nuts.

Torque:

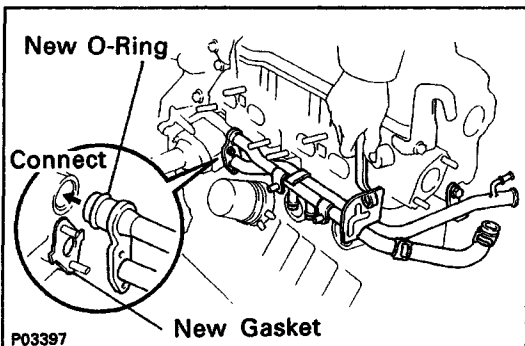
Union nut 59 N-m (600 kgf-cm, 43 ft-lbf)

Bolt 13 N-m (130 kgf-cm, 9 ft-lbf)

- (b) Install the EGR modulator- to the clamp.



- (c) Connect the following hoses:
- (1) Vacuum hose (from port Q of EGR vacuum modulator) to port G of VSV for EGR
 - (2) Vacuum hose (from EGR valve) to port E of VSV for EGR
 - (3) Vacuum hose to charcoal canister
- (d) Install the vacuum hose clamp to the bracket.
- (e) (CALIF. only)
Install the connector to the bracket. Connect the EGR gas temperature sensor connector.



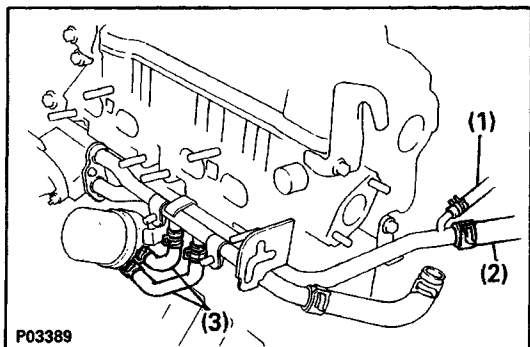
23. INSTALL THROTTLE BODY

(See steps 2 to 5 on pages [FI-204](#) and [205](#))

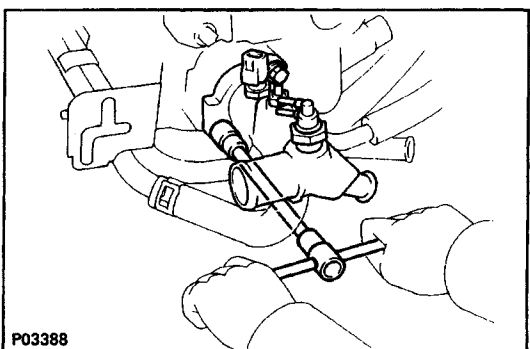
24. INSTALL WATER BY-PASS PIPE

- (a) Install a new O-ring to the by-pass pipe.
- (b) Apply soapy water on the O-ring.
- (c) Install a new gasket and the by-pass pipe with the two nuts and two bolts.

Torque(Nut): 9.3 N-m (95 kgf-cm, 82 in-lbf)



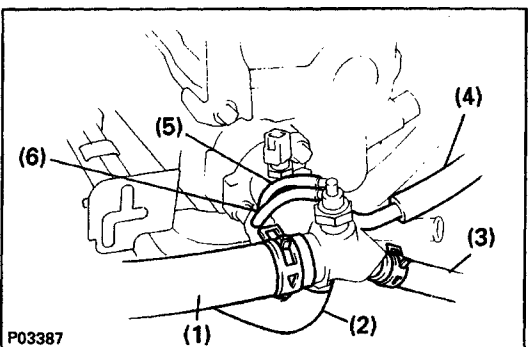
- (d) Connect the following hoses:
- (1) ISC water by-pass hose
 - (2) Heater water hose
 - (3) (w/ Oil Cooler)
Two oil cooler water by-pass hoses
- (e) (w / Oil Cooler)
Install the water by-pass hose heat protector.
(See step 3 on page [LU-30](#))



25. INSTALL WATER OUTLET

- (a) Install a new gasket and the water outlet with the two bolts.

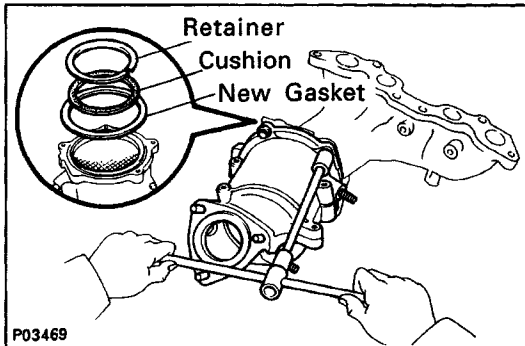
Torque: 15 N-m (150 kgf-cm, 11 ft-lbf)



- (b) Connect the following hoses:
- (1) Upper radiator hose
 - (2) Water by-pass pipe hose
 - (3) Heater water hose
 - (4) ISC water by-pass hose
 - (5) EVAP BSV vacuum hose (from port P of throttle body)
 - (6) EVAP BSV vacuum hose (from charcoal canister)

(c) Connect the following connectors:

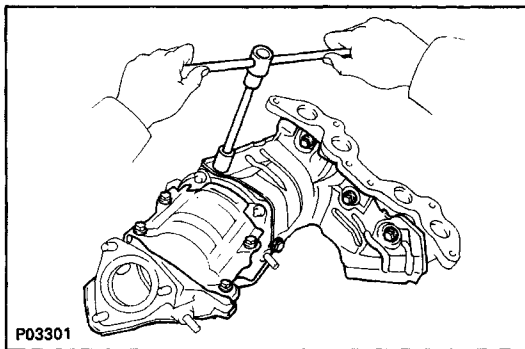
- Water temperature sender gauge connector
- Water temperature sensor connector



26. ASSEMBLE EXHAUST MANIFOLD AND CATALYTIC CONVERTER

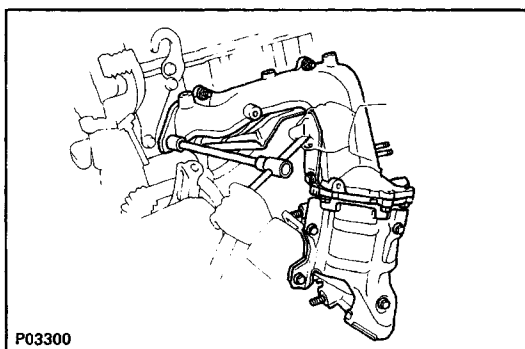
- Place the cushion, retainer and a new gasket on the catalytic converter.
- Install the catalytic converter to the exhaust manifold with the three bolts and two nuts.

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



(c) Install the lower manifold head insulator with the five bolts.

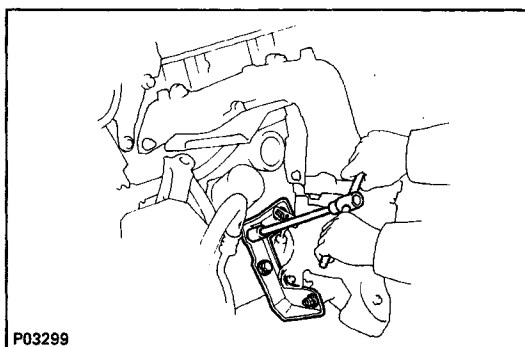
(d) Install the two catalytic converter heat insulators with the eight bolts.



27. INSTALL EXHAUST MANIFOLD AND CATALYTIC CONVERTER ASSEMBLY

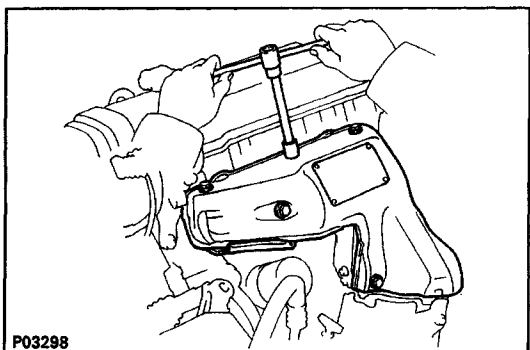
- Install a new gasket, the exhaust manifold and catalytic converter assembly with the six new nuts. Uniformly tighten the nuts in several passes.

Torque: 49 N-m (500 kgf-cm, 36 ft-lbf)



- Install the catalytic converter stay with the two bolts and two new nuts. Alternately tighten the bolts and nut.

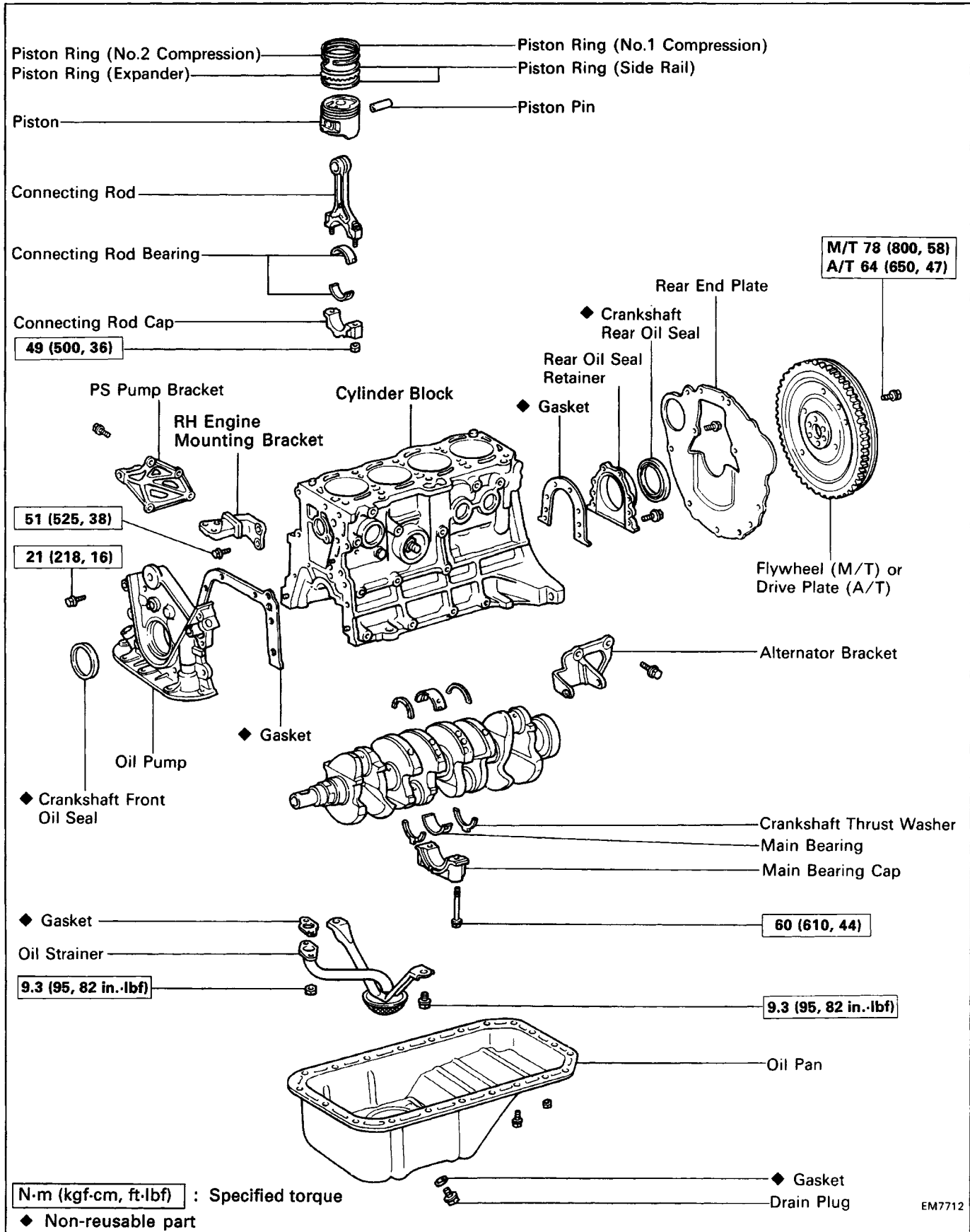
Torque: 42 N-m (425 kgf-cm, 31 ft-lbf)



- (c) Install the manifold upper heat insulator with the six bolts.

28. (CALIF. ONLY)
INSTALL SUB-OXYGEN SENSOR
29. INSTALL OXYGEN SENSOR (MAIN)
10. INSTALL FRONT EXHAUST PIPE
(See step 15 on page [EM-305](#))
31. INSTALL SUSPENSION LOWER CROSSMEMBER
(See page 16 on page [EM-306](#))
32. INSTALL ENGINE UNDER COVERS
33. INSTALL DISTRIBUTOR (See page [IG-35](#))
34. INSTALL ALTERNATOR (See page [CH-24](#))
35. INSTALL AIR CLEANER CAP AND HOSE
(See step 38 on page [EM-310](#))
36. (w/ CRUISE CONTROL SYSTEM)
INSTALL CRUISE CONTROL ACTUATOR
(See step 33 on page [EM-309](#))
37. INSTALL ACCELERATOR CABLE, AND ADJUST IT
38. (A/T)
CONNECT THROTTLE CABLE, AND ADJUST IT
39. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
40. FILL WITH ENGINE COOLANT (See page [CO-6](#))
Capacity (w/ Heater):
M/T 6.2 liters (6.6 US qts, 5.5 Imp. qts)
A/T 6.1 liters (6.4 US qts, 5.4 Imp. qts)
41. START ENGINE AND CHECK FOR LEAKS
42. ADJUST IGNITION TIMING (See page [IG-37](#))
Ignition timing:
10° BTDC, idle
(w/ Terminals TE1 and E1 connected)
43. PERFORM ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
44. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

CYLINDER BLOCK (4A-FE) COMPONENTS



REMOVAL OF ENGINE

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

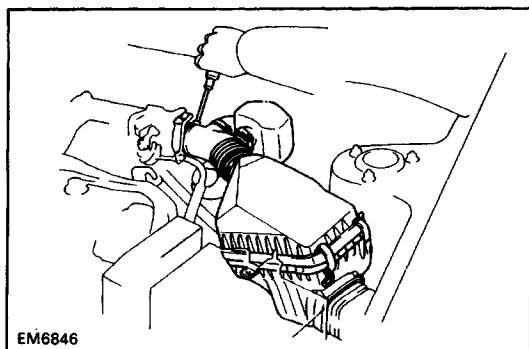
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE HOOD

3. REMOVE ENGINE UNDER COVER

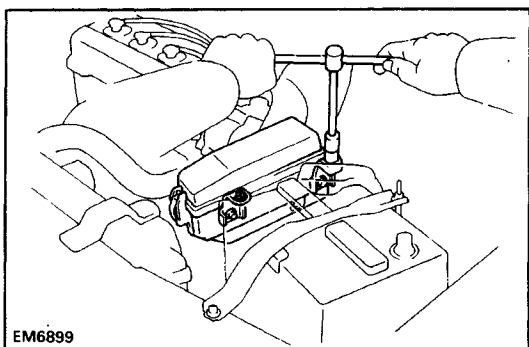
4. DRAIN ENGINE COOLANT (See page CO-6)

5. DRAIN ENGINE OIL (See page LU-7)



6. REMOVE AIR CLEANER

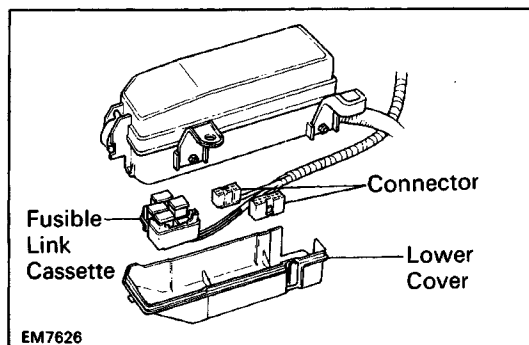
- Disconnect the intake air temperature sensor connector.
- Disconnect the accelerator cable from the bracket on the air cleaner cap.
- Disconnect the four air cleaner cap clips.
- Disconnect the air hose from the air pipe.
- Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap and element.
- Remove the three bolts and air cleaner case.

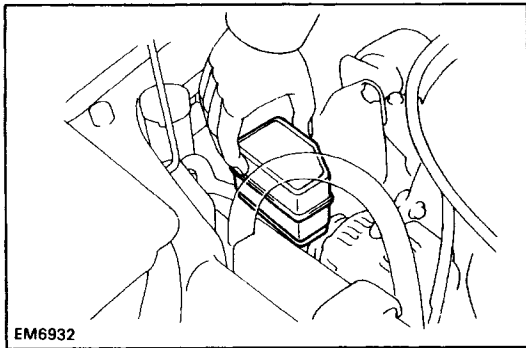


7. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

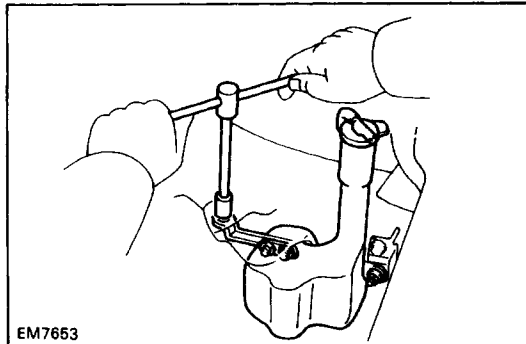
8. REMOVE ENGINE RELAY BOX, AND DISCONNECT ENGINE WIRE CONNECTORS

- Remove the two nuts, and disconnect the relay box from the battery.
- Remove the lower cover from the relay box.
- Disconnect the fusible link cassette and two connectors of the engine wire from the relay box.

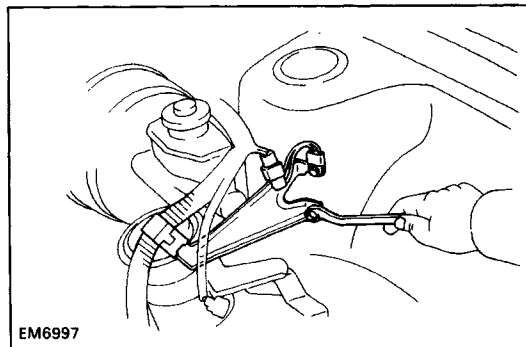




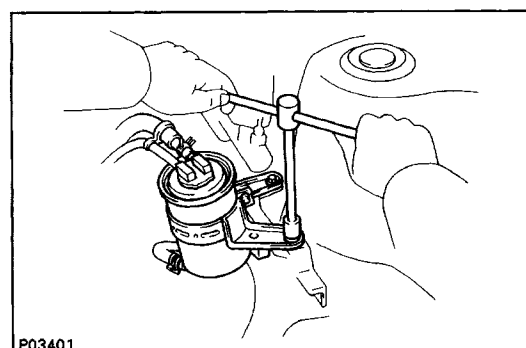
- 9. REMOVE A/C RELAY BOX FROM BRACKET**
10. REMOVE BATTERY
11. REMOVE RADIATOR (See page CO-23)



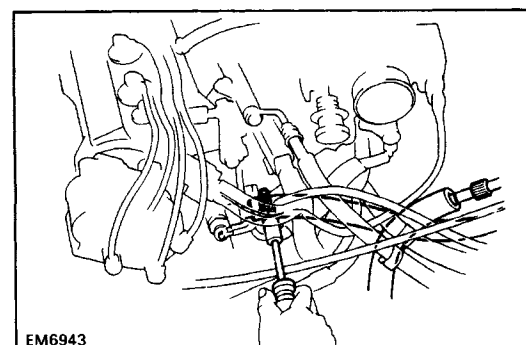
- 12. REMOVE RADIATOR RESERVOIR TANK**
 Remove the bolt, nut and reservoir tank.
13. DISCONNECT WIRES AND CONNECTORS
 (a) Check connector
 (b) Vacuum sensor connector
 (c) Ground strap from LH fender apron



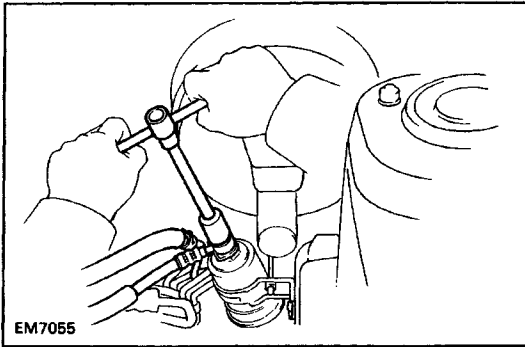
- 14. REMOVE ENGINE WIRE BRACKET**
 (a) Disconnect the wire clamp from the wire bracket.
 (b) Remove the two bolts and wire bracket. Disconnect the noise filter.



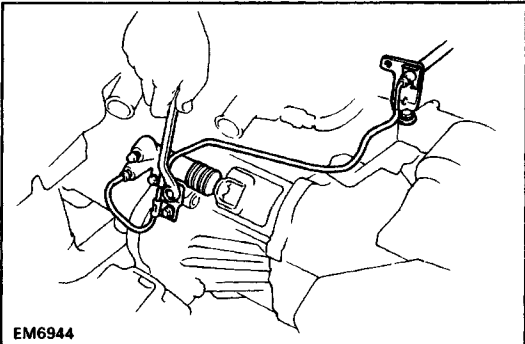
- 15. REMOVE CHARCOAL CANISTER**
 (a) Disconnect the three hoses.
 (b) Remove the two bolts and charcoal canister.



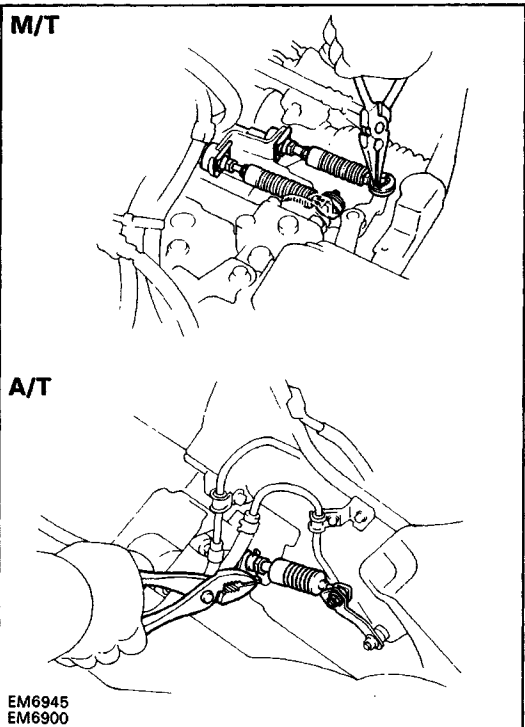
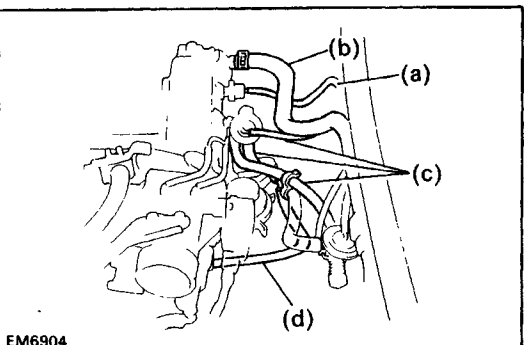
- 16. DISCONNECT HEATER HOSE FROM WATER INLET**
17. DISCONNECT SPEEDOMETER CABLE

**18. DISCONNECT FUEL HOSES**

CAUTION: Catch leaking fuel in a container.

**19. (M / T)****REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE**

Remove the three bolts, release cylinder and tube from the transaxle.

**20. DISCONNECT TRANSAXLE CONTROL CABLE(S) FROM TRANSAXLE****21. DISCONNECT VACUUM HOSES**

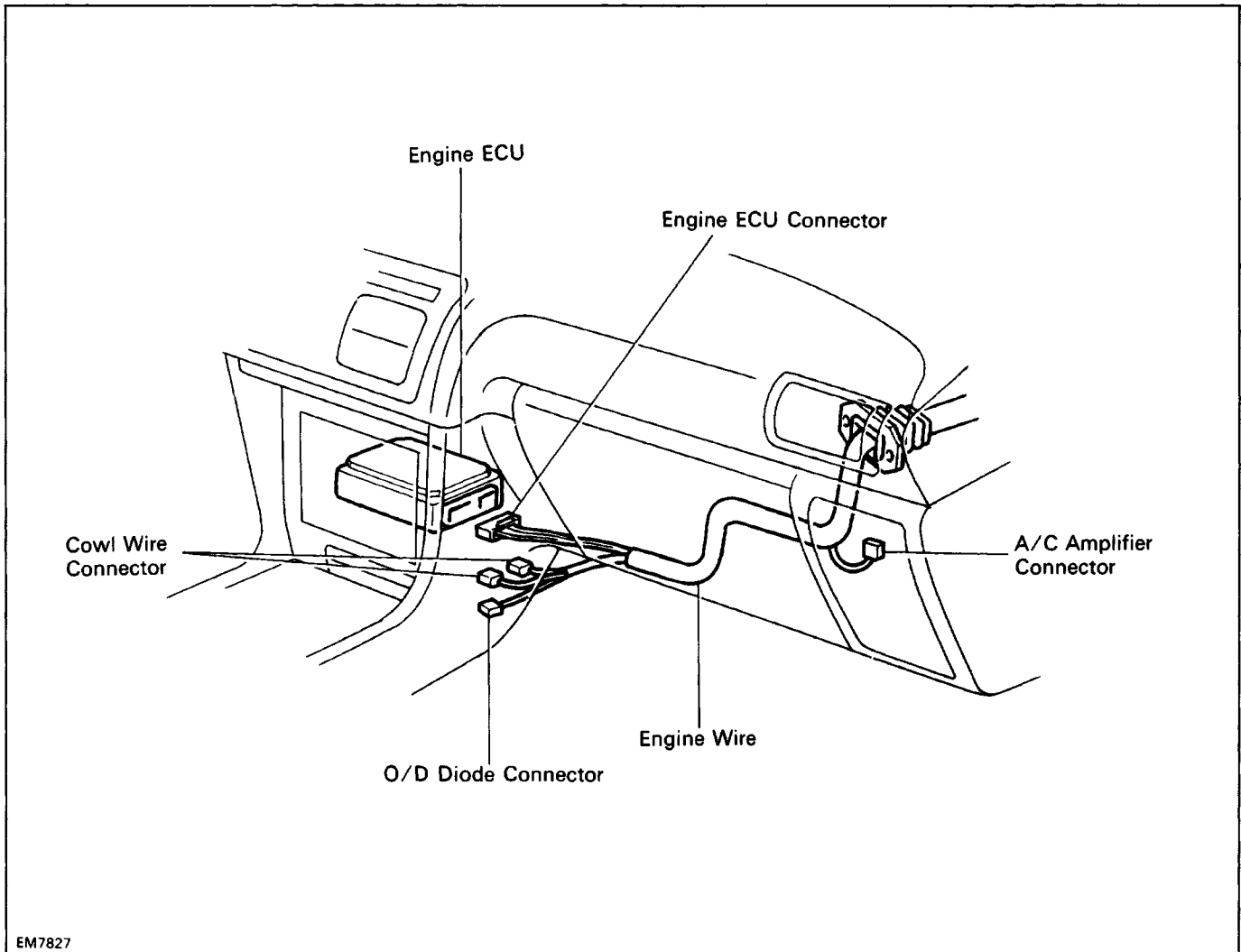
- (a) Vacuum sensor hose from gas filter on air intake chamber
- (b) Brake booster vacuum hose from air intake chamber
- (c) Three A/C vacuum hoses from ASV on air intake chamber
- (d) A/C vacuum hose from air pipe

22. DISCONNECT ENGINE WIRE

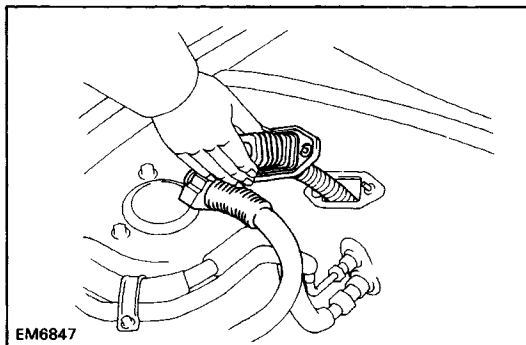
- (a) Engine wire clamp from wire bracket on RH fender apron
- (b) Two cowl wire connectors

23. DISCONNECT ENGINE WIRE FROM CABIN

- (a) Disconnect the following connectors:
 - (1) Engine ECU connector
 - (2) Two cowl wire connectors
 - (3) A/C amplifier connector
 - (4) O/D diode connector



EM7827

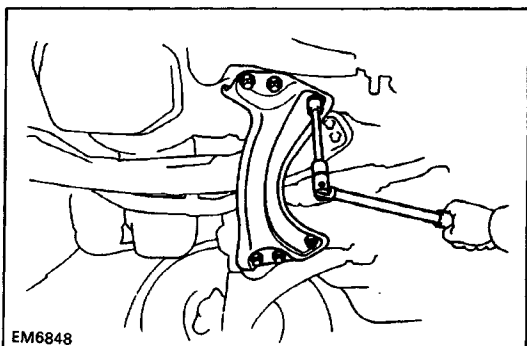


EM6847

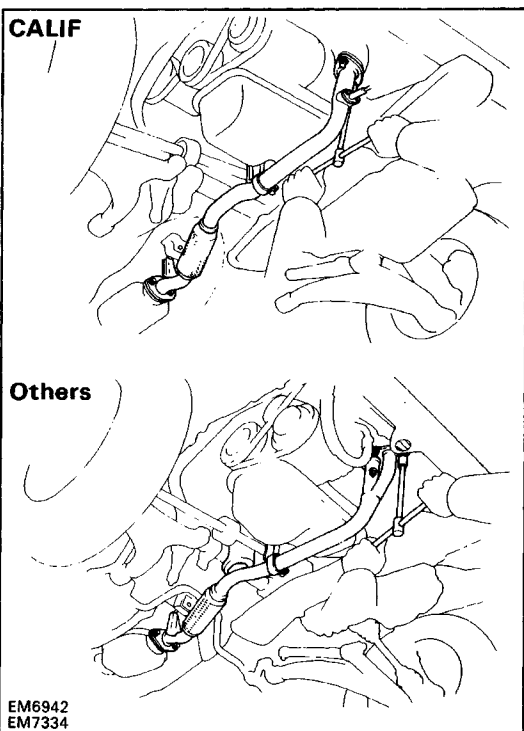
- (b) Remove the two nuts, and pull out the engine wire from the cowl panel.

24. REMOVE SUSPENSION LOWER CROSSMEMBER

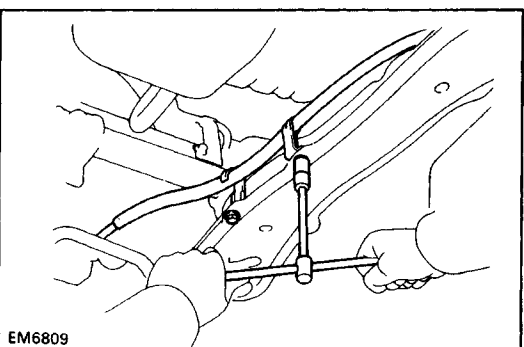
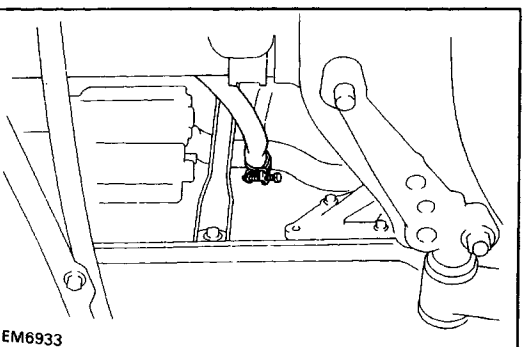
Remove the four bolts, two nuts and lower crossmember.

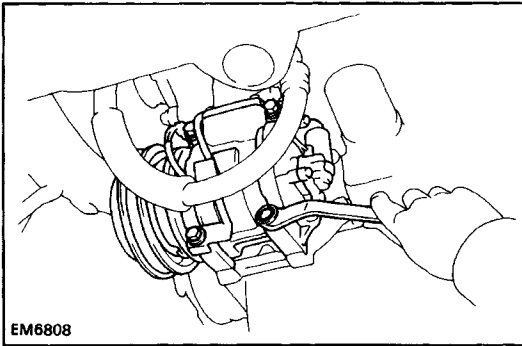
**25. REMOVE FRONT EXHAUST PIPE**

- (a) Disconnect the oxygen sensor connector.
- (b) Loosen the bolt, and disconnect the clamp from the support bracket.
- (c) Remove the two bolts and nuts holding the front exhaust pipe to the catalytic converter.
- (d) Using a 14 mm deep socket wrench, remove the two nuts (CALIF.) or three nuts (others) holding the front exhaust pipe to the catalytic converter.
- (e) Disconnect the support hook on the front exhaust pipe from the support bracket, and remove the front exhaust pipe and two (CALIF.) or three (others) gaskets.

**26. (A/T)**

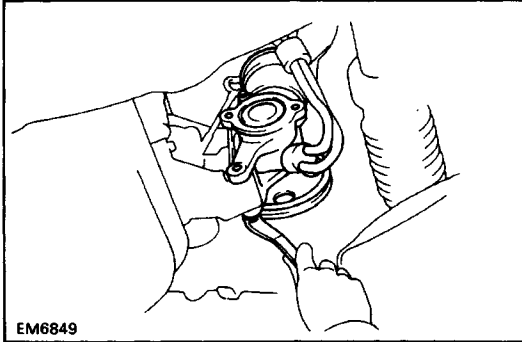
DISCONNECT TRANSAXLE CONTROL CABLE FROM ENGINE MOUNTING CENTER MEMBER

27. REMOVE DRIVE SHAFTS (See SA section)**28. DISCONNECT HEATER HOSE FROM WATER INLET PIPE**

**29. (w/ A/C)****REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES**

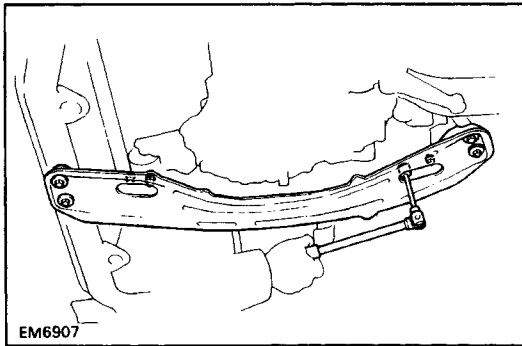
- (a) Disconnect the A/C compressor connector.
- (b) Remove the drive belt.
- (c) Remove the four bolts, and disconnect the A/C compressor.

HINT: Put aside the compressor, and suspend it to the radiator support with a string.

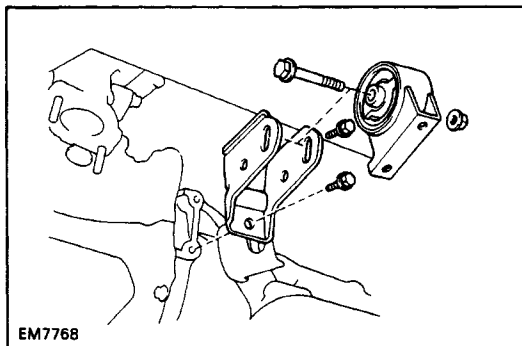
**30. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES**

- (a) Disconnect the air hose from the air pipe.
- (b) Disconnect the air hose from the intake manifold.
- (c) Remove the PS drive belt.
- (d) Remove the two bolts, and disconnect the PS pump from the engine.

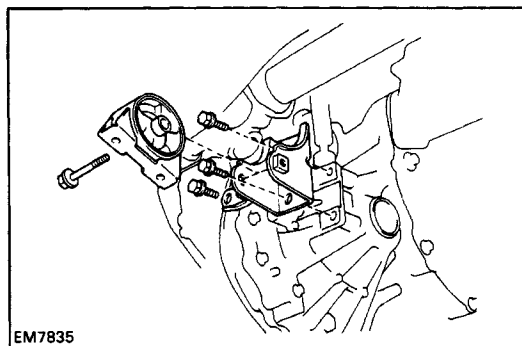
HINT: Put aside the pump and suspend it from the cowl with a string.

**31. REMOVE ENGINE MOUNTING CENTER MEMBER**

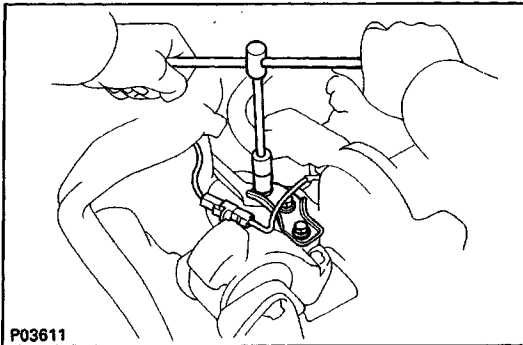
Remove the eight bolts and center member.

**32. REMOVE FRONT ENGINE MOUNTING INSULATOR AND BRACKET**

- (a) Remove the through bolt, nut and mounting insulator.
- (b) Remove the two bolts and mounting bracket.

**33. REMOVE REAR ENGINE MOUNTING INSULATOR AND BRACKET**

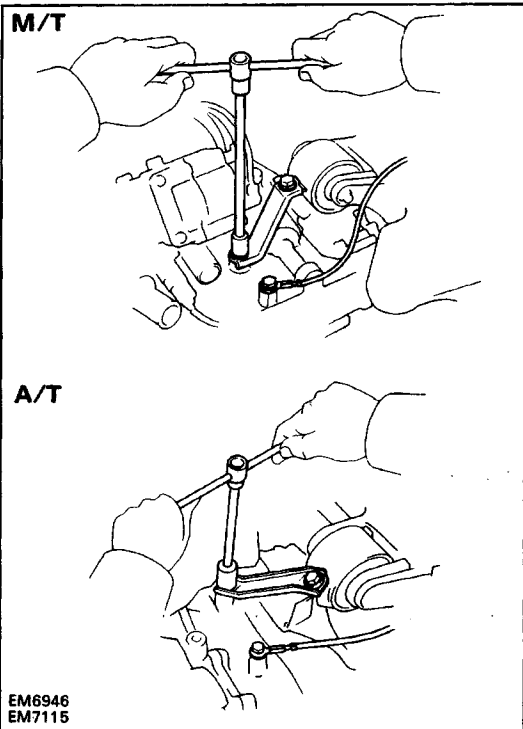
- (a) Remove the through bolt and mounting insulator.
- (b) Remove the three bolts and mounting bracket.



34. REMOVE CONNECTOR FROM GROUND WIRE ON RH FENDER APRON

35. REMOVE RH ENGINE MOUNTING STAY

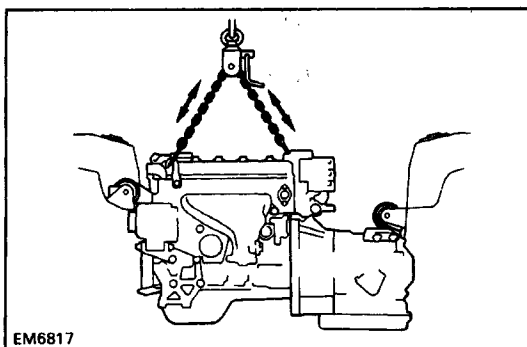
Remove the three bolts and mounting stay.



36. REMOVE LH ENGINE MOUNTING STAY

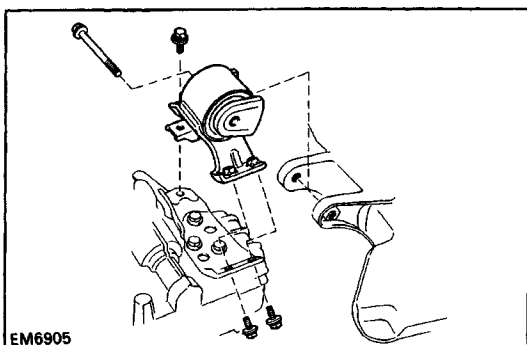
Remove the two bolts and mounting stay.

37. REMOVE GROUND STRAP FROM TRANSAXLE

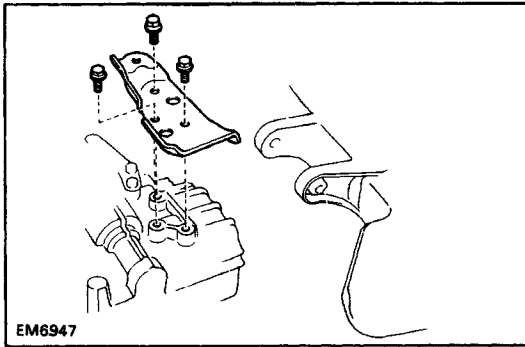


38. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE

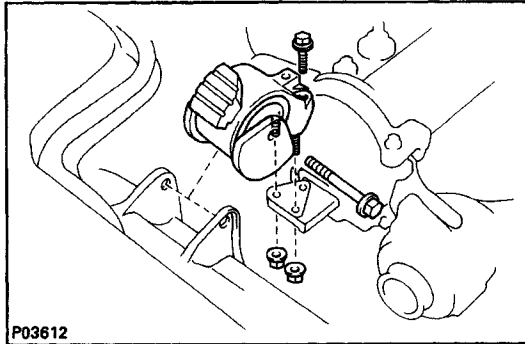
(a) Attach the engine chain hoist to the engine hangers.



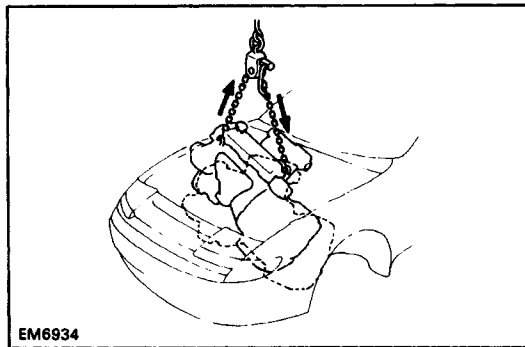
(b) Remove the through bolt, three bolts and LH mounting insulator.



(c) Remove the three bolts and LH mounting bracket.



(d) Remove the through bolt, two nuts and RH mounting insulator.



(e) Lift the engine out of the vehicle slowly and carefully.

NOTICE: Be careful not to hit the PS gear housing or neutral start switch (A/T).

(f) Make sure the engine is clear of all wiring, hoses and cables.

(g) Place the engine and transaxle assembly onto the stand.

39. REMOVE STARTER (See page [ST-3](#))

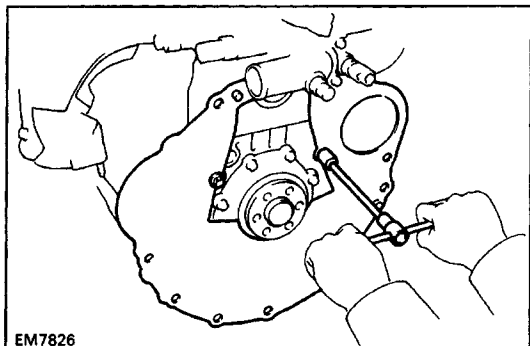
40. SEPARATE ENGINE AND TRANSAXLE

M/T (See MT section)

A/T (See AT section)

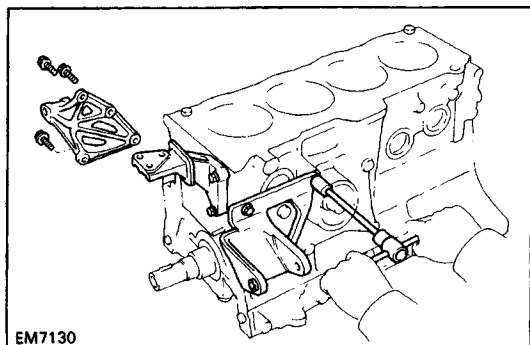
PREPARATION FOR DISASSEMBLY

1. (M/T)
REMOVE CLUTCH COVER AND DISC
2. (M/T)
REMOVE FLYWHEEL
3. (A/T)
REMOVE DRIVE PLATE



4. REMOVE REAR END PLATE
Remove the two bolts and end plate.

5. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
6. REMOVE ALTERNATOR (See page [CH-6](#))
7. REMOVE DISTRIBUTOR (See page [IG-20](#))
8. REMOVE TIMING BELT AND PULLEYS
(See pages [EM-35](#) to 38)
9. REMOVE CYLINDER HEAD (See pages [EM-82](#) to 90)
10. REMOVE WATER PUMP (See page [CO-8](#))
11. REMOVE OIL PAN AND OIL PUMP
(See pages [LU-10](#) and 11)
12. REMOVE OIL FILTER (See page [LU-7](#))



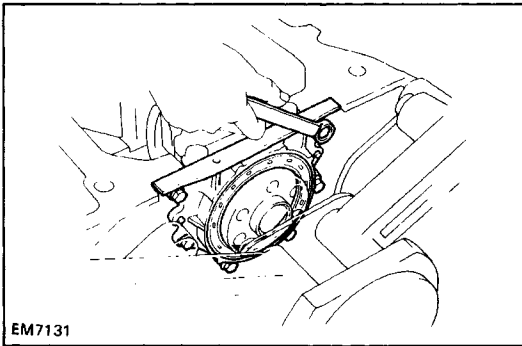
13. REMOVE ALTERNATOR BRACKET
Remove the three bolts and alternator bracket.
14. REMOVE RH ENGINE MOUNTING BRACKET
Remove the three bolts and mounting bracket.
15. REMOVE PS PUMP BRACKET
Remove the three bolts and PS pump bracket.

DISASSEMBLY OF CYLINDER BLOCK

(See page [EM-184](#))

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts, retainer and gasket.



EM7131

2. CHECK CONNECTING ROD THRUST CLEARANCE

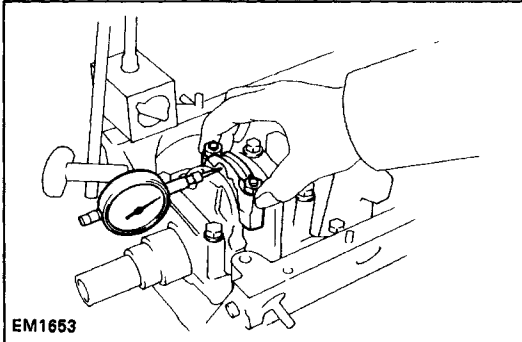
Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance: 0.150 – 0.250 mm

(0.0059 – 0.0098 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

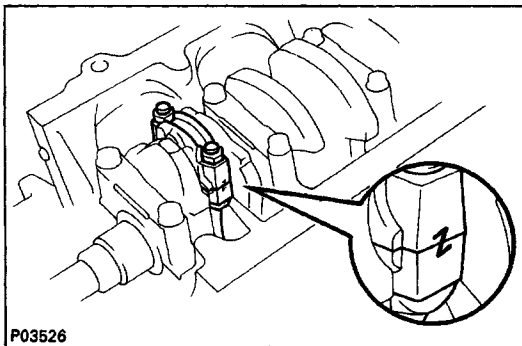
If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



EM1653

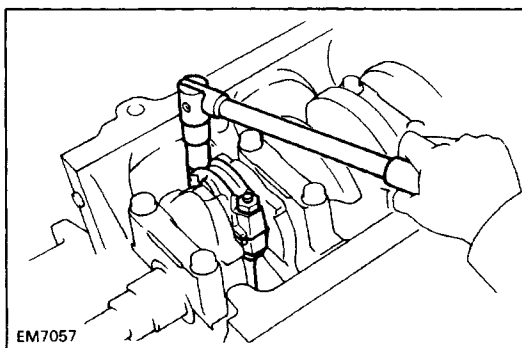
3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.



P03526

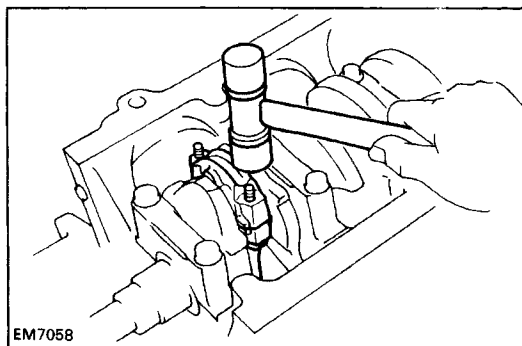
(b) Remove the connecting rod cap nuts.



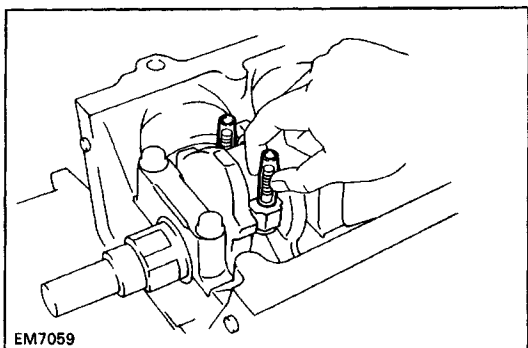
EM7057

(c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

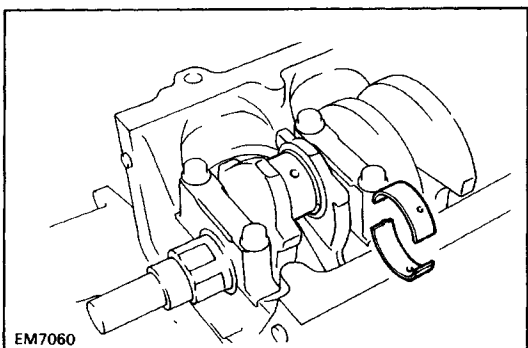
HINT: Keep the lower bearing inserted with the connecting cap.



EM7058

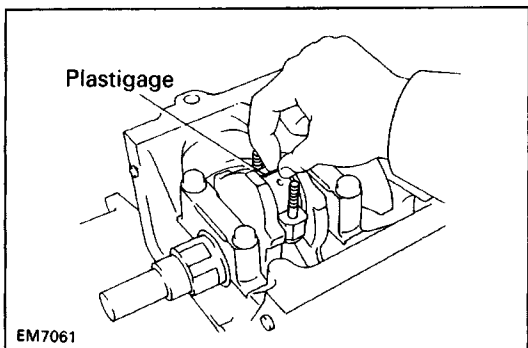


- (d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

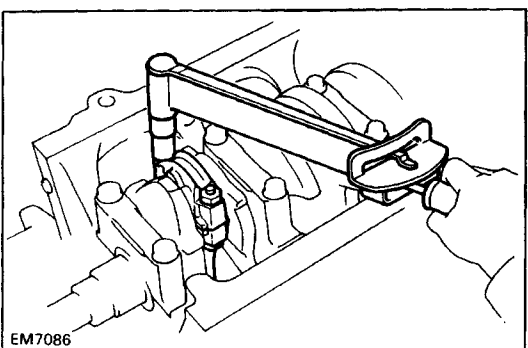


- (e) Clean the crank pin and bearing.
 (f) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



- (g) Lay a strip of Plastigage across the crank pin.

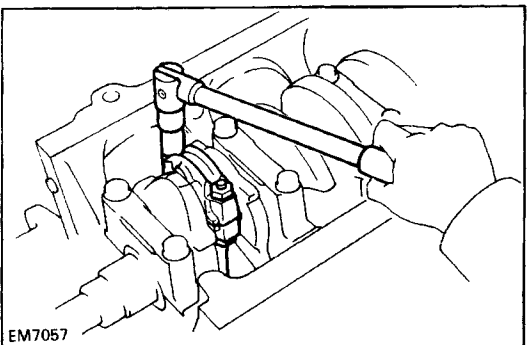


- (h) Install the connecting rod cap.

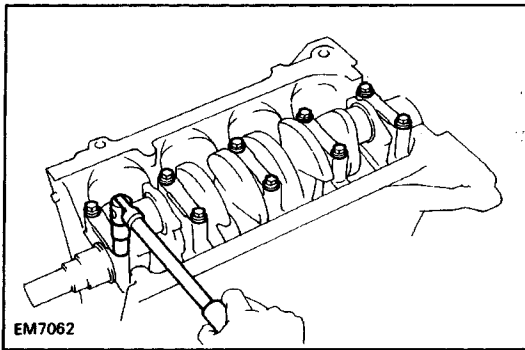
(See step 6 on page [EM-212](#))

Torque: 49 N-m (500 kgf-cm, 36 ft-lbf)

NOTICE: Do not turn the crankshaft.

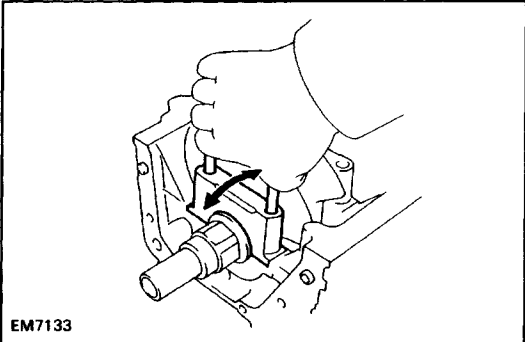


- (i) Remove the connecting rod cap.
 (See procedure (b) and (c) above)



6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

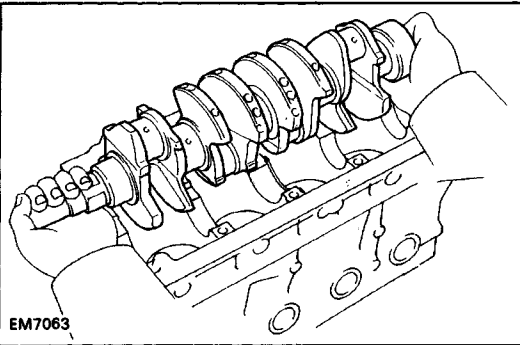
(a) Remove the main bearing cap bolts.



(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers (No.3 main bearing cap only).

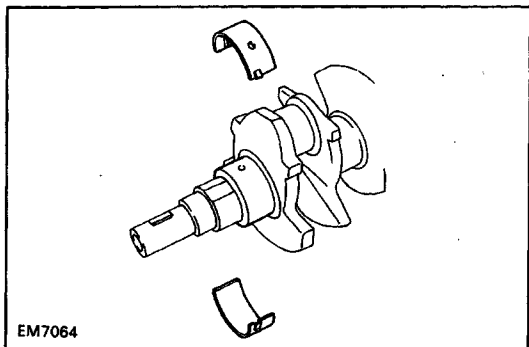
HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.



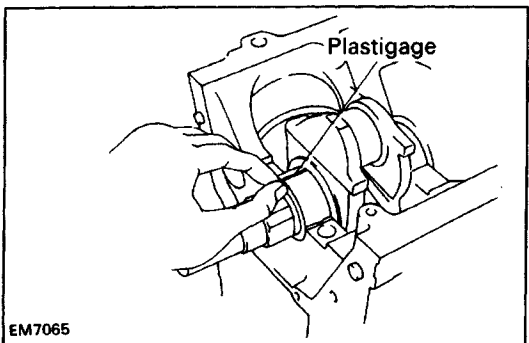
(c) Lift out the crankshaft.

HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.



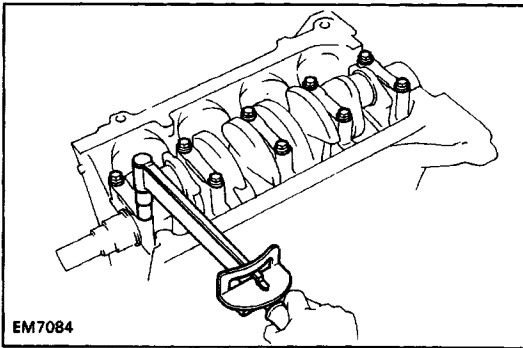
(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches. If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



(f) Place the crankshaft on the cylinder block.

(g) Lay a strip of Plastigage across each journal.

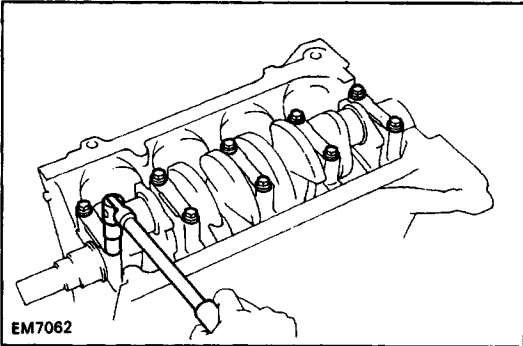


(h) Install the main bearing caps.

(See step 4 on page EM-211)

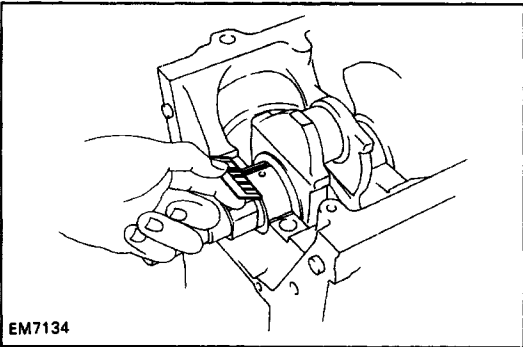
Torque: 60 N-m (610 kgf-cm, 44 ft-lbf)

NOTICE: Do not turn the crankshaft.



(i) Remove the main bearing caps.

(See procedure (a) and (b) above)



(j) Measure the Plastigage at its widest point.

Standard clearance:

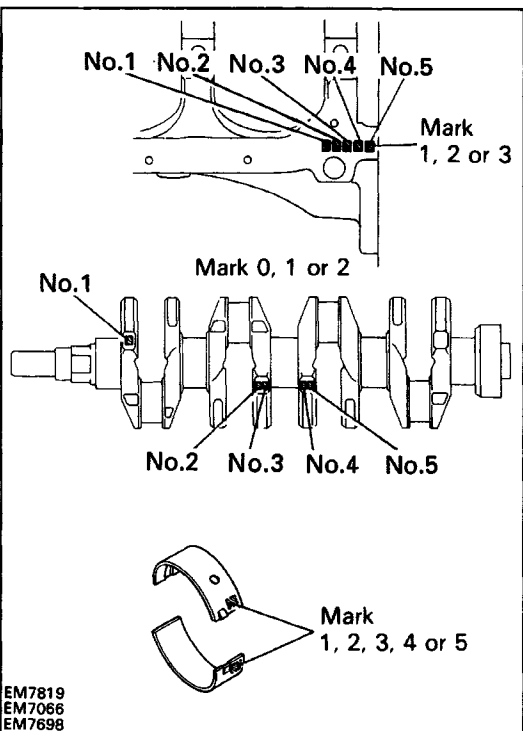
STD 0.015 – 0.033 mm
(0.0006 – 0.0013 in.)

U/S 0.25 0.018 – 0.056 mm
(0.0007 – 0.0022 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be: 0.015–0.045 mm (0.0006 – 0.0018 in.) If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

HINT: If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are five sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.



	Number marked								
	1			2			3		
Cylinder block									
Crankshaft	0	1	2	0	1	2	0	1	2
Bearing	1	2	3	2	3	4	3	4	5

**EXAMPLE: Cylinder block "2" + Crankshaft "1"
= Bearing "3"**

(Reference)**Cylinder block main journal bore diameter:**

Mark "1" 52.025 – 52.031 mm
(2.0482 – 2.0485 in.)

Mark "2" 52–031 – 52.037 mm
(2.0485 – 2.0487 in.)

Mark "3" 52.037 – 52.043 mm
(2.0487 – 2.0489 in.)

Crankshaft journal diameter:

Mark "0" 47 . 994 – 48.000 mm
(1.8895 –1.8898 in.)

Mark "1" 47.988 – 47.994 mm
(1.8893 – 1.8895 in.)

Mark "2" 47 .982 – 47.988 mm
(1.8891 –1. 8893 in.)

Standard sized bearing center wall thickness:

Mark "1" 2.002 – 2.005 mm
(0.0788 – 0.0789 in.)

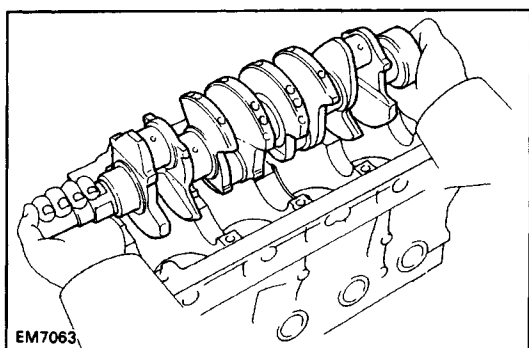
Mark "2" 2.005 – 2.008 mm
(0.0789 – 0.0791 in.)

Mark "3" 2.008 – 2.011 mm
(0.0791 – 0.0792 in.)

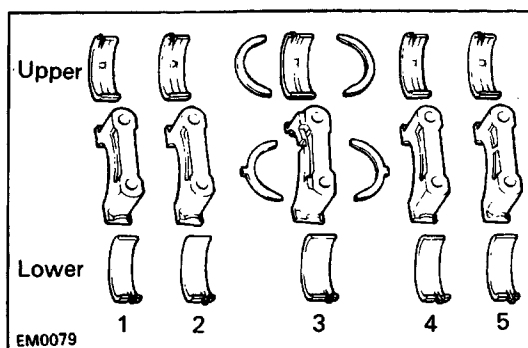
Mark "4" 2.011 – 2.014 mm
(0.0792 – 0.0793 in.)

Mark "5" 2.014 – 2.017 mm
(0.0793 – 0.0794 in.)

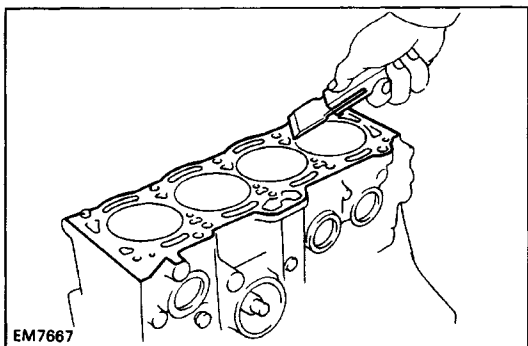
(k) Completely remove the Plastigage.

**7. REMOVE CRANKSHAFT**

- (a) Lift out the crankshaft.
- (b) Remove the upper bearings and upper thrust washers from cylinder block.



HINT: Arrange the main bearing caps, bearings and thrust washers in correct order.



EM7667

INSPECTION OF CYLINDER BLOCK

1. CLEAN CYLINDER BLOCK

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder head.

B. Clean cylinder block

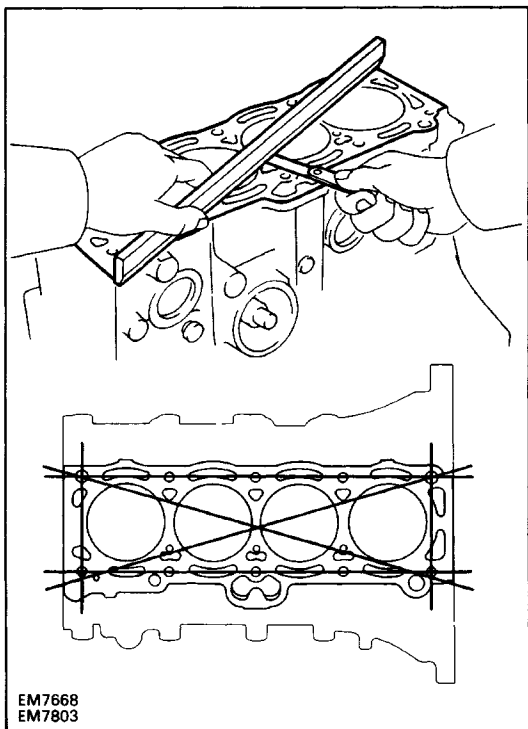
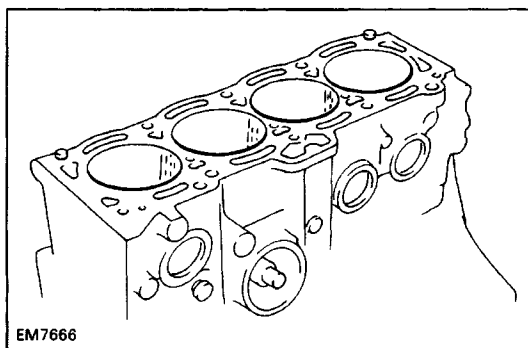
Using a soft brush and solvent, thoroughly clean the cylinder block.

2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

If warpage is greater than maximum, replace the cylinder block.

EM7668
EM7803

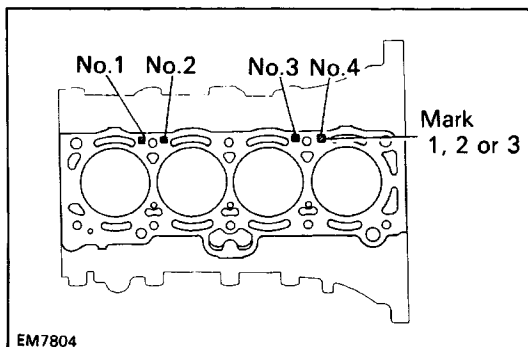
EM7666

3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the four cylinders.

If necessary, replace the cylinder block.

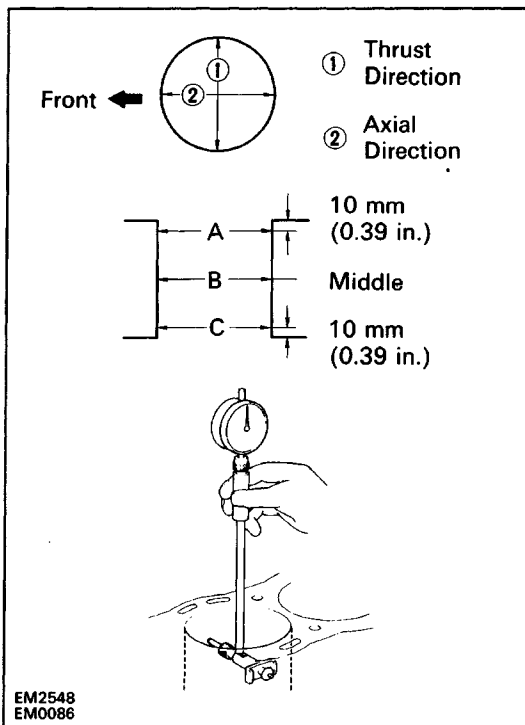


EM7804

4. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked "1", "2" and "3" accordingly.

The mark is stamped on the top of the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

STD Mark "1" 81.000 – 81.010 mm
(3.1890 – 3.1894 in.)

Mark "2" 81.010 – 81.020 mm
(3.1894 – 3.1898 in.)

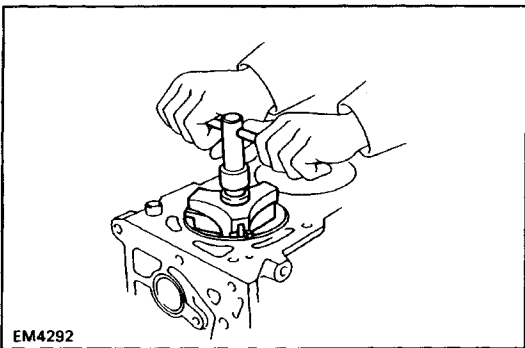
Mark "3" 81.020 – 81.030 mm
(3.1898 – 3.1902 in.)

Maximum diameter:

STD 81.23 mm (3.1980 in.)

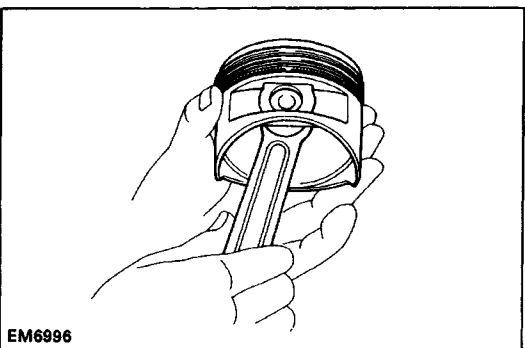
O/S 0.50 81.73 mm (3.2177 in.)

If the diameter is greater than maximum, rebore all the four cylinders. If necessary, replace the cylinder block.



5. REMOVE CYLINDER RIDGE

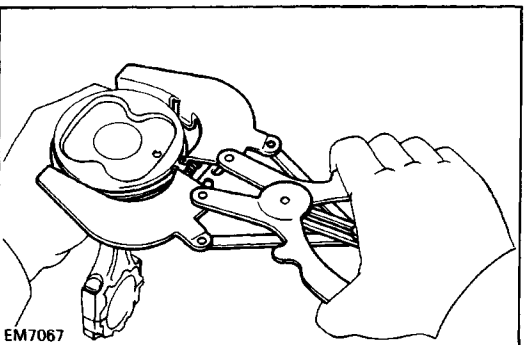
If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

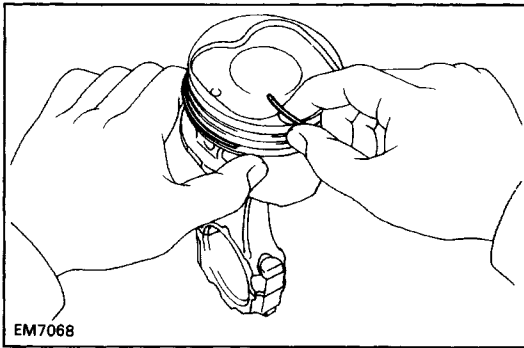
1. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.



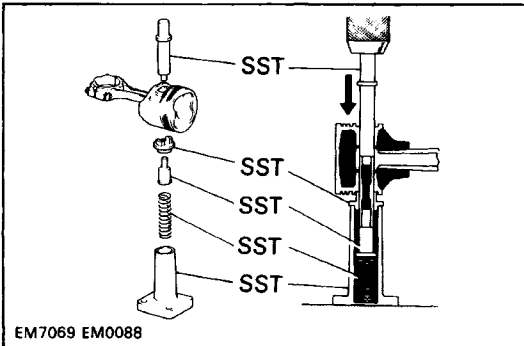
2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the two compression rings.



(b) Remove the two side rails and oil ring expander by hand.

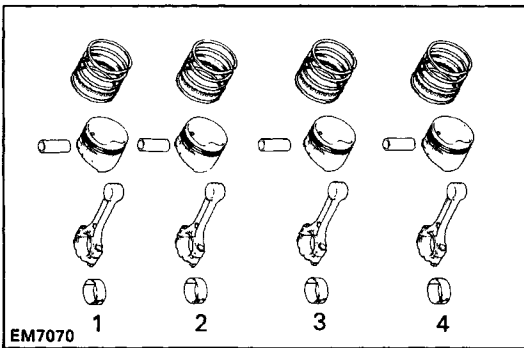
HINT: Arrange the rings in correct order only.



3. DISCONNECT CONNECTING ROD FROM PISTON

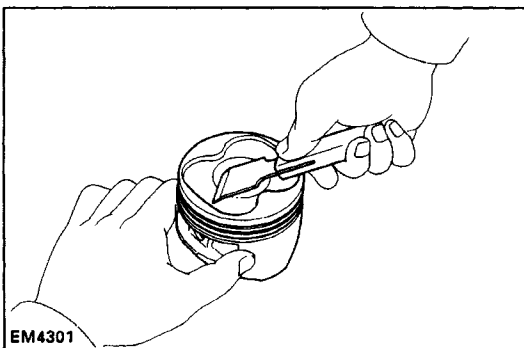
Using SST, press out the piston pin from the piston. Remove the connecting rod.

SST 09221-25024 (09221-00020, 09221-00030, 09221-00050, 09221-00130, 09221-00140)



HINT:

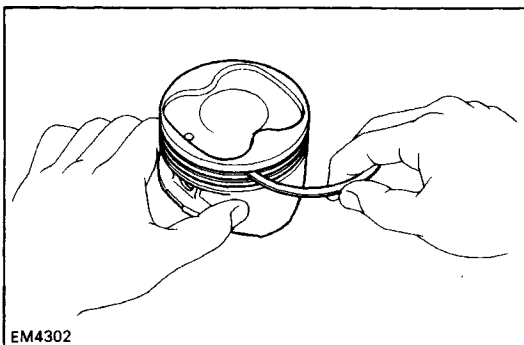
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



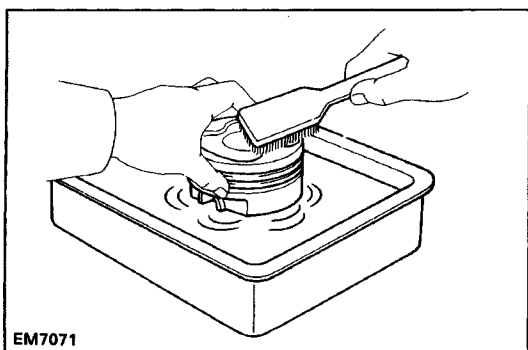
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.

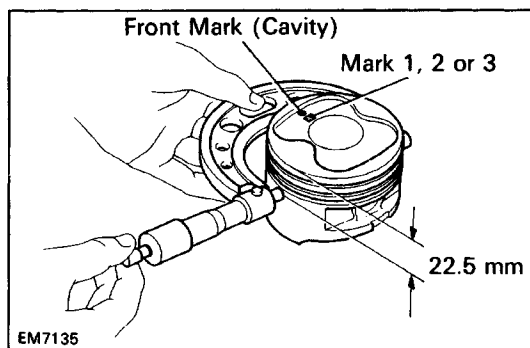


(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE: Do not use a wire brush.



2. INSPECT PISTON

A. Inspect piston oil clearance

HINT: There are three sizes of the standard piston diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the piston top.

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 22.5 mm (0.886 in.) from the piston head.

Piston diameter:

**STD Mark "1" 80-930 – 80.940 mm
(3.1862 – 3.1866 in.)**

**Mark "2" 80.940 – 80.950 mm
(3.1866 – 3.1870 in.)**

**Mark "3" 80.950 – 80.960 mm
(3.1870 – 3.1874 in.)**

**O/S 0.50 81.430 – 81.460 mm
(3.2059 – 3.2071 in.)**

(b) Measure the cylinder bore diameter in the thrust directions. (See step 4 on page [EM-201](#))

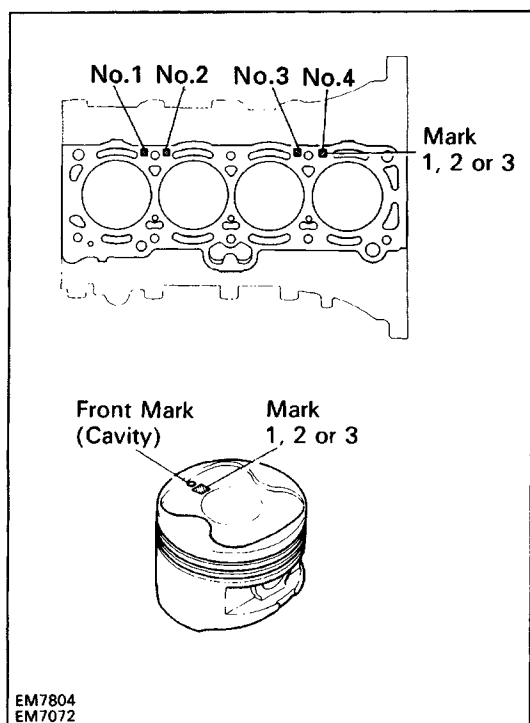
(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

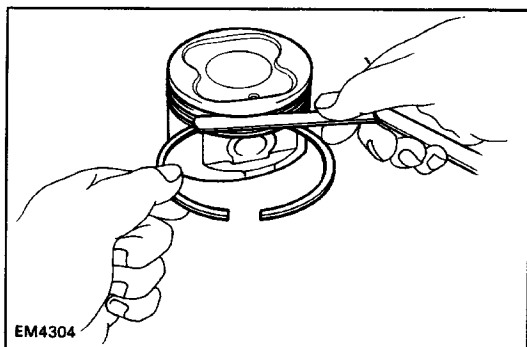
**Standard oil clearance: 0.060 – 0.080 mm
(0.0024 – 0.0031 in.)**

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace all the four pistons and rebores all the four cylinders. If necessary, replace the cylinder block.

HINT (Use new cylinder block) : Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.





B. Inspect piston ring groove clearance

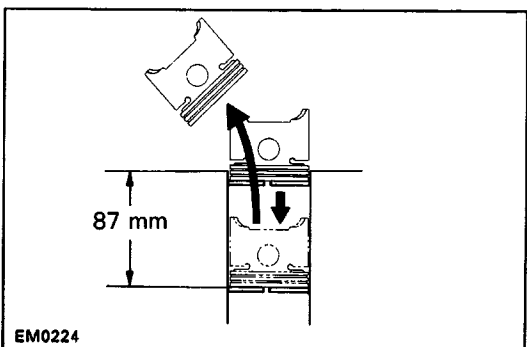
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:

No. 1 0.1040 – 0.081 mm (0.0016 – 0.0032 in.)

No. 2 0.030 – 0.070 mm (0.0012 – 0.0028 in.)

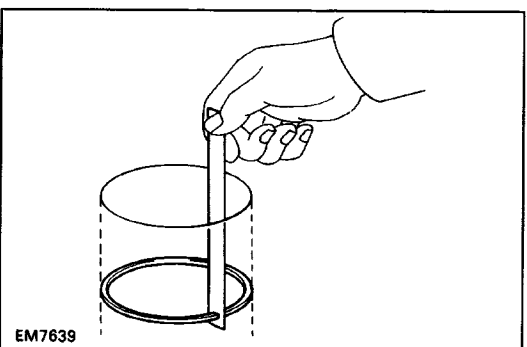
If the clearance is greater than maximum, replace the piston.



C. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 87 mm (3.43 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the end gap.

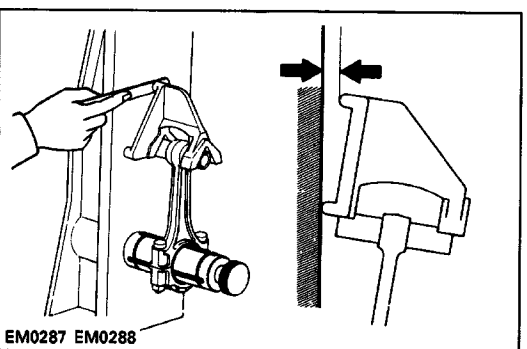
Standard end gap:

No.1	0.250 – 0.450 mm (0–0098 – 0.0177 in.)
No.2	0.150 – 0.400 mm (0.0059 – 0.0157 in.)
Oil (Side rail)	0.100 – 0.700 mm (0–0039 – 0.0276 in.)

Maximum end gap:

No.1	1.05 mm (0.0413 in.)
No.2	1.00 mm (0.0394 in.)
Oil (Side rail)	1.30 mm (0.0512 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the four cylinders or replace the cylinder block.



3. INSPECT CONNECTING ROD

Using rod aligner and feeler gauge, check the connecting rod alignment.

- Check for bending.

Maximum bending:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

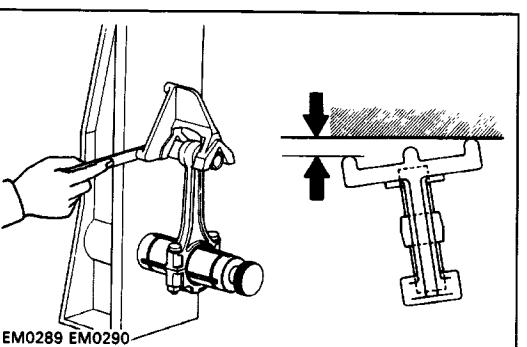
If bend is greater than maximum, replace the connecting rod and connecting rod cap as a set.

- Check for twist.

Maximum twist:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod and connecting rod cap as a set.



BORING OF CYLINDERS

HINT:

- Bore all the four cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

1. KEEP OVERSIZED PISTONS

Oversized piston diameter:

O/S 0.50 81.430 – 81.460 mm
(3.2059 – 3.2071 in.)

2. CALCULATE AMOUNT TO BORE CYLINDERS

- Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 22.5 mm (0.886 in.) from the piston head.
- Calculate the amount each cylinder is to be rebored as follows:

$$\text{Size to be rebored} = P + C - H$$

P = Piston diameter

C = Piston clearance

0.060 – 0.080 mm (0.0024 – 0.0031 in.)

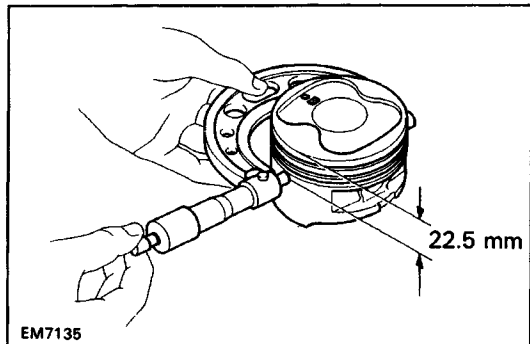
H = Allowance for honing

0.02 mm (0.0008 in.) or less

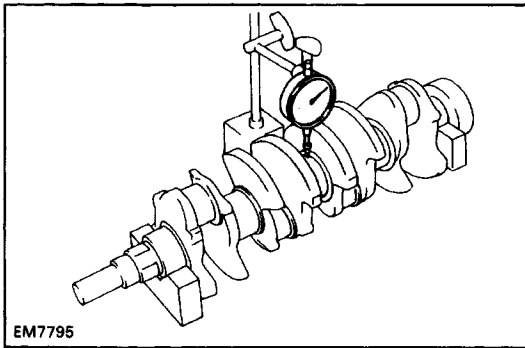
3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Maximum honing: **0.02 mm (0.0008 in.)**

NOTICE: Excess honing will destroy the finished roundness.



EM7135



EM7795

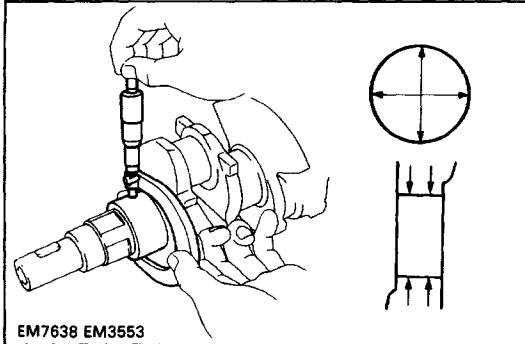
INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

- (a) Place the crankshaft on V-blocks.
- (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.



EM7638 EM3553

2. INSPECT MAIN JOURNALS AND CRANK PINS

- (a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD 47-982 – 48.000 mm
(1.8891 – 1.8898 in.)

U/S 0.25 47.745 – 47.755 mm
(1.8797 – 1.8881 in.)

Crank pin diameter:

STD 39-985 – 40.000 mm
(1.5742 – 1.5748 in.)

U/S 0.25 39.745 – 39.755 mm
(1.5648 – 1.5652 in.)

If the diameter is not as specified, check the oil clearance (See pages [EM-194](#) to 198). If necessary, grind or replace the crankshaft.

- (b) Check each main journal and crank pin for taper and out-of-round as shown.

**Maximum taper and out-of-round: 0.02 mm
(0.0008 in.)**

If the taper and out-of-round is greater than maximum, replace the crankshaft.

3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

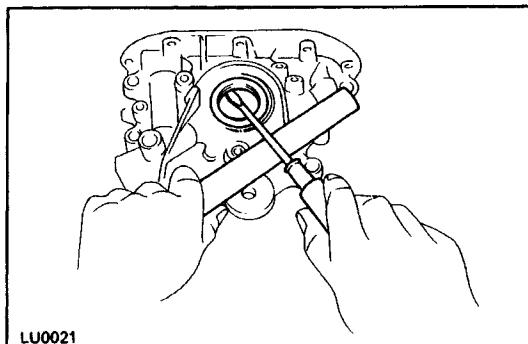
Grind and hone the main journals and/or crank pins to the finished undersized diameter.

(See procedure step 2 above).

Install new main journal and/or crank pin undersized bearings.

REPLACEMENT OF CRANKSHAFT OIL SEALS

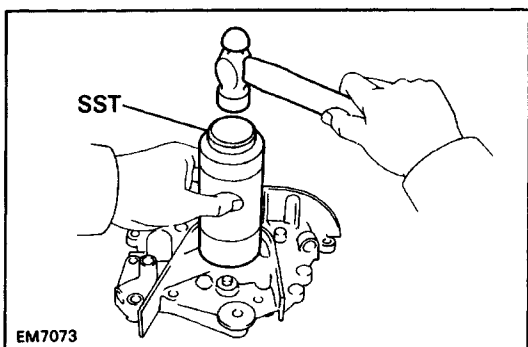
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

A. If oil pump is removed from cylinder block:

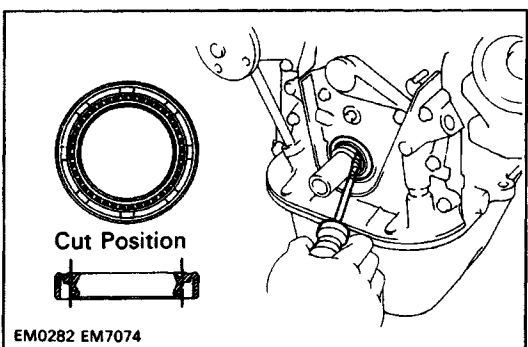
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.

SST 09309-37010

(c) Apply MP grease to the oil seal lip.



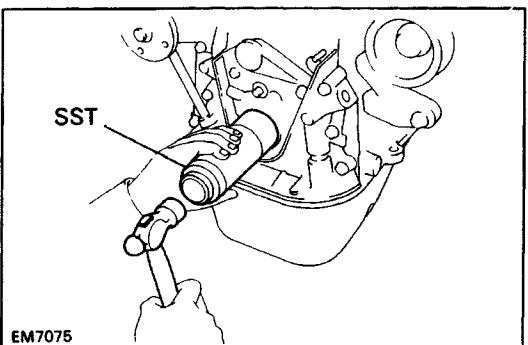
B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft.

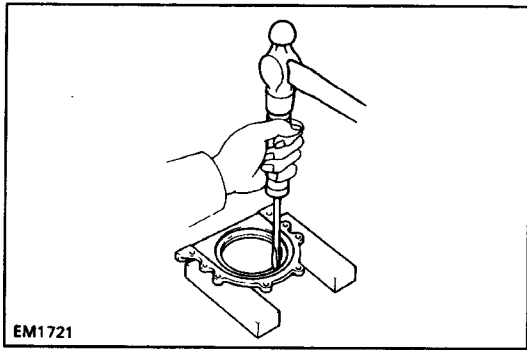
Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.

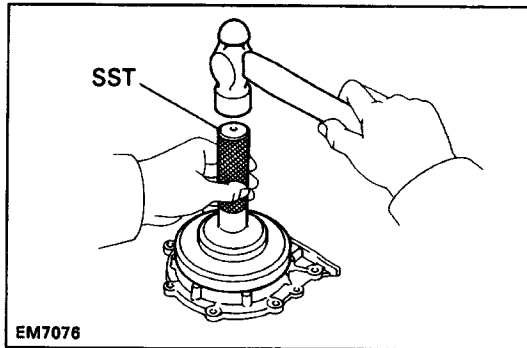
SST 09309-37010



2. REPLACE CRANKSHAFT REAR OIL SEAL

A. If rear oil seal retainer is removed from cylinder block:

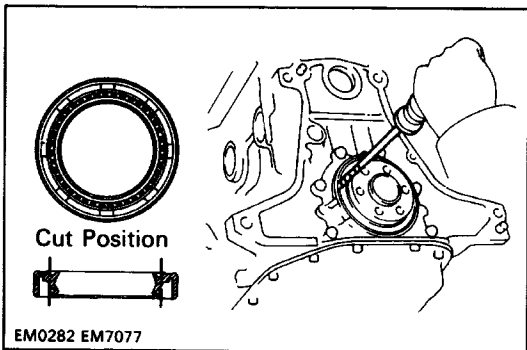
(a) Using screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.

SST 09223-41020

(c) Apply MP grease to the oil seal lip.

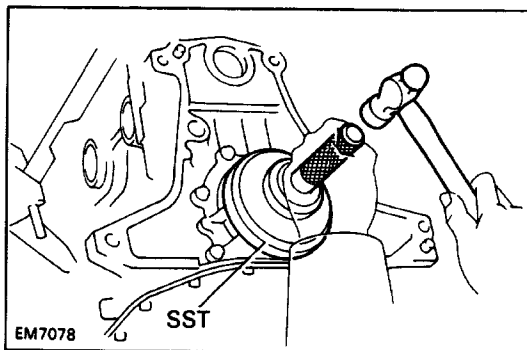


B. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

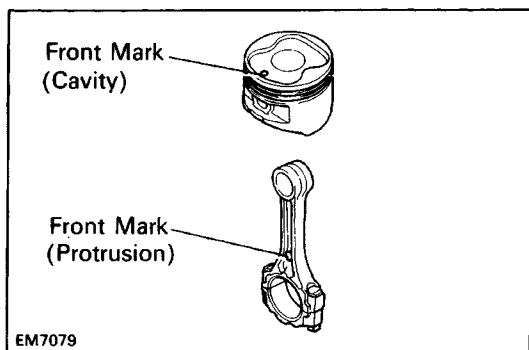
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

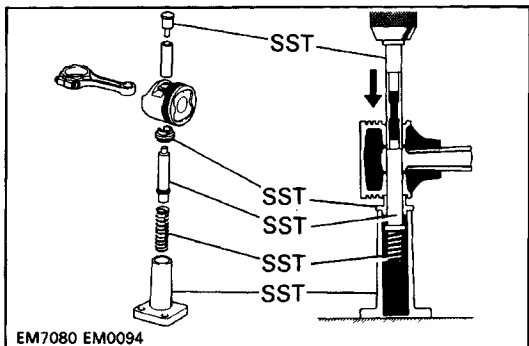
SST 09223-41020



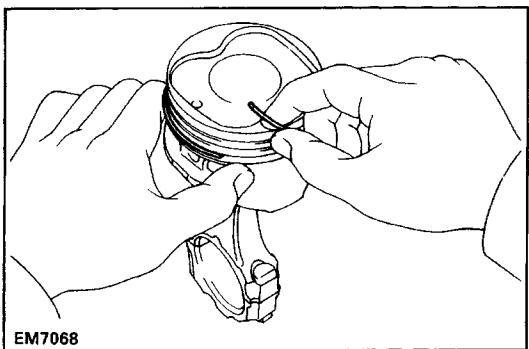
ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. ASSEMBLE PISTON AND CONNECTING ROD

- Coat the piston pin and pin holes of the piston with engine oil.
- Align the front marks of the piston and connecting rod.

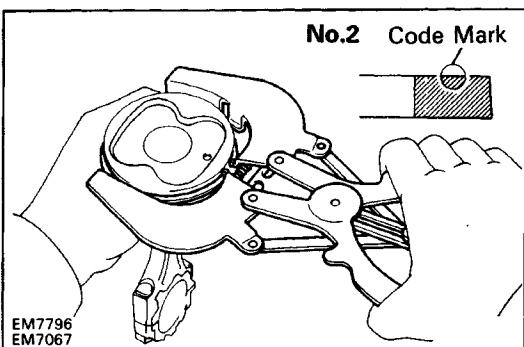


- Using SST, press in the piston pin.
SST 09221-25024 (09221-00020, 09221-00030, 09221-00050, 09221-00130, 09221-00140)



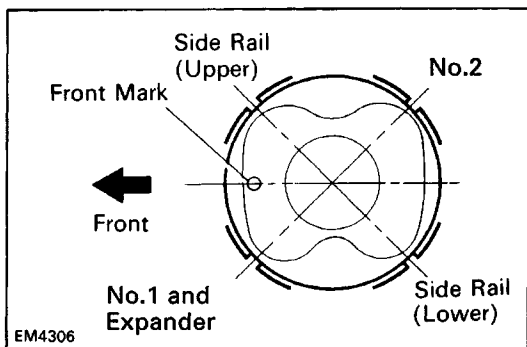
2. INSTALL PISTON RINGS

- Install the oil ring expander and two side rails by hand.



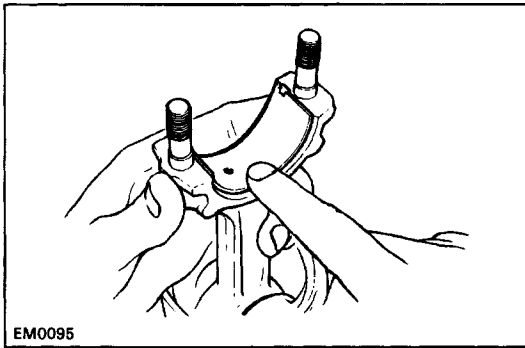
- Using a piston ring expander, install the two compression rings with the code mark facing upward (No.2 compression ring only).

Code mark (No.2 compression ring only): R or T



- Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

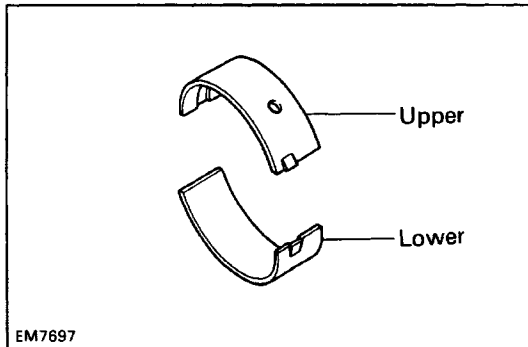
- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

ASSEMBLY OF CYLINDER BLOCK

(See page [EM-184](#))

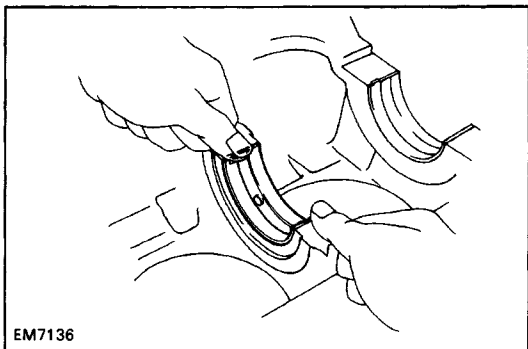
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

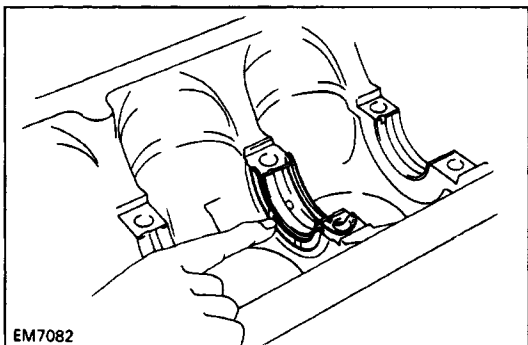


1. INSTALL MAIN BEARINGS

HINT: Upper bearings have an oil groove and oil holes; lower bearings do not.

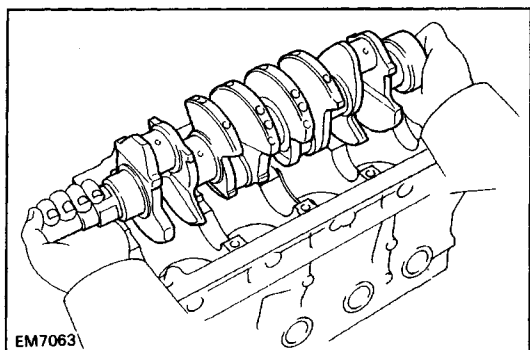


- (a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.
- (b) Install the bearings in the cylinder block and main bearing caps.

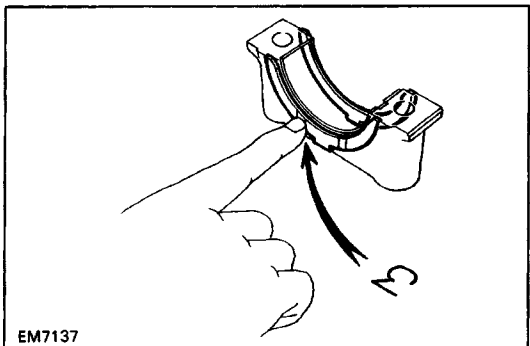


2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.3 main bearing cap position of the block with the oil grooves facing outward.

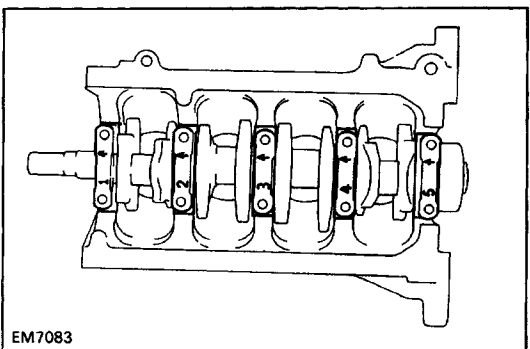


3. PLACE CRANKSHAFT ON CYLINDER BLOCK



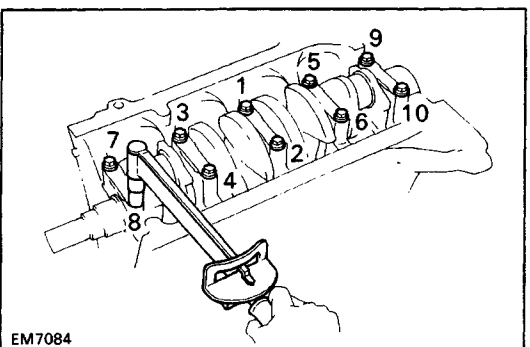
4. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

- (a) Install the thrust washers on the No.3 bearing cap with the grooves facing outward.



- (b) Install the five main bearing caps in their proper locations.

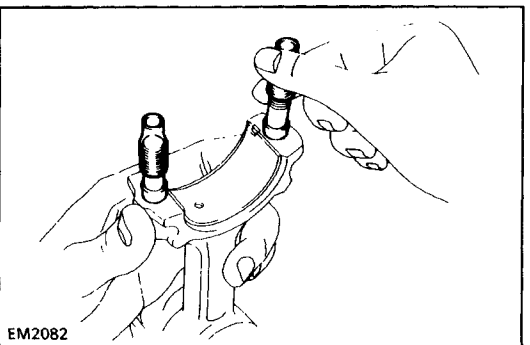
HINT: Each bearing cap has a number and front mark.



- (c) Apply a light coat of engine oil on the threads and under the heads of the main bearing caps.
 (d) Install and uniformly tighten the ten bolts of the main bearing caps in several passes in the sequence shown.

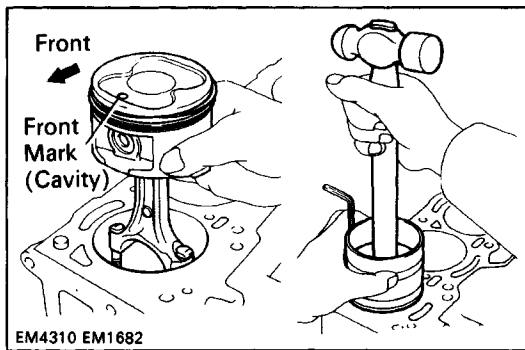
Torque: 60 N-m (610 kgf-cm, 44 ft-lbf)

- (e) Check that the crankshaft turns smoothly.
 (f) Check the crankshaft thrust clearance.
 (See step 5 on page [EM-196](#))

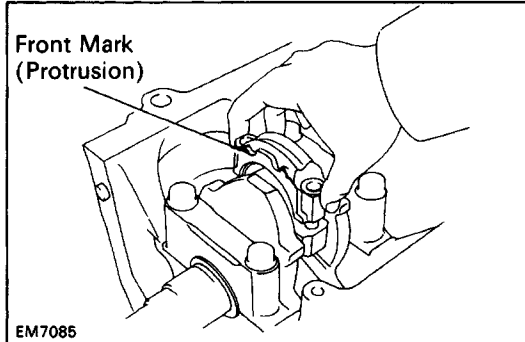


5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

- (a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

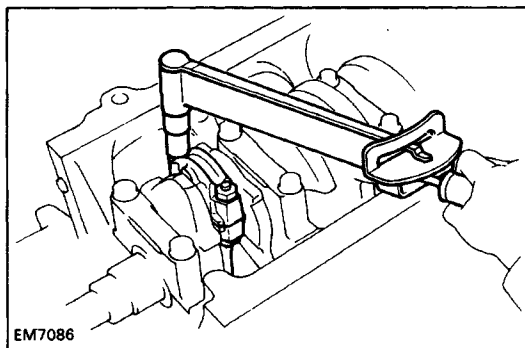


- (b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



6. INSTALL CONNECTING ROD CAPS

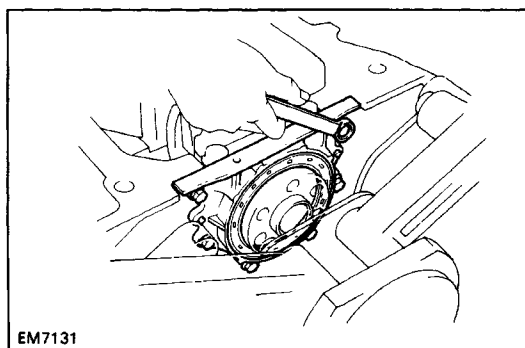
- (a) Match the numbered connecting rod cap with the connecting rod.
 (b) Install the connecting rod cap with the front mark facing forward.



- (c) Apply a light coat of engine oil on the threads and under the cap nuts.
 (d) Install and alternately tighten the connecting rod cap nuts in several passes.

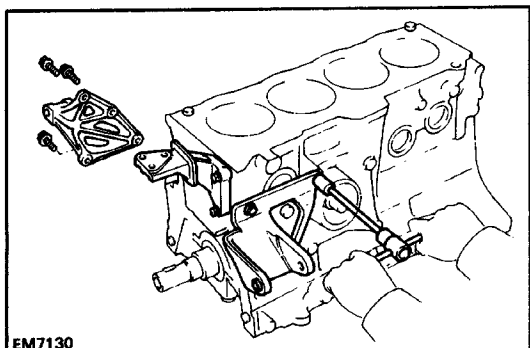
Torque: 49 N-m (500 kgf-cm, 36 ft-lbf)

- (e) Check that the crankshaft turns smoothly.
 (f) Check the connecting rod thrust clearance.
 (See step 2 on page [EM-194](#))



7. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and the retainer with the six bolts.
Torque: 9.3 N-m (95 kgf-cm, 82 in.-lbf)



POST ASSEMBLY

1. INSTALL PS PUMP BRACKET

Install the PS pump bracket with the three bolts.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

2. INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the three bolts.

Torque: 51 N-m (525 kgf-cm, 38 ft-lbf)

3. INSTALL ALTERNATOR BRACKET

Install the alternator bracket with the three bolts.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

4. INSTALL OIL FILTER (See page LU-7)

5. INSTALL OIL PUMP AND OIL PAN

(See pages LU-14 and 15)

6. INSTALL WATER PUMP (See pages CO-9 and 10)

7. INSTALL CYLINDER HEAD (See pages EM-104 to 114)

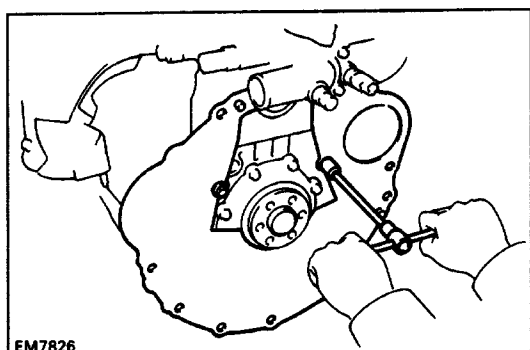
8. INSTALL PULLEYS AND TIMING BELT

(See pages EM-40 to 43)

9. INSTALL ALTERNATOR (See page CH-23)

10. INSTALL DISTRIBUTOR (See page IG-24)

11. REMOVE ENGINE STAND



12. INSTALL REAR END PLATE

Install the end plate with the two bolts.

Torque: 9.3 N-m (95 kgf-cm, 82 in-lbf)

13. (M/T)

INSTALL FLYWHEEL

(a) Install the flywheel on the crankshaft.

(b) Install and uniformly tighten the six mounting bolts in several passes in the sequence shown.

Torque: 78 N-m (800 kgf-cm, 58 ft-lbf)

14. (A/T)

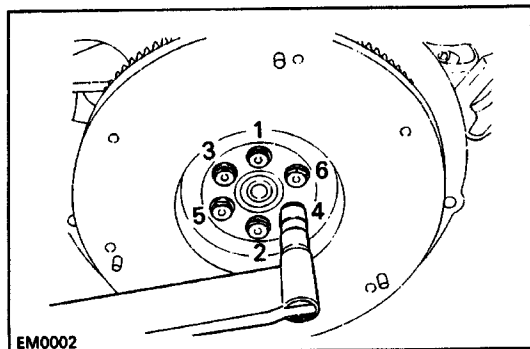
INSTALL DRIVE PLATE (See procedure in step 13)

Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)

15. (M/T)

INSTALL CLUTCH DISC AND COVER

(See CL section)



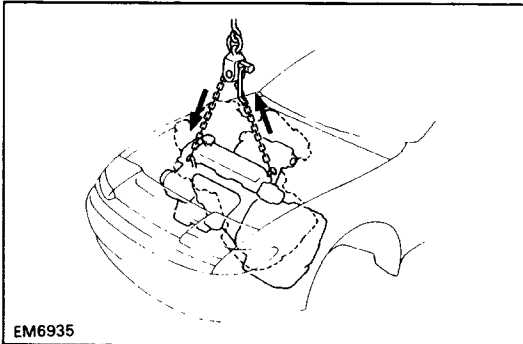
INSTALLATION OF ENGINE

1. ASSEMBLE ENGINE AND TRANSAXLE

M/T (See MT section)

A/T (See AT section)

2. INSTALL STARTER (See page [ST-22](#))



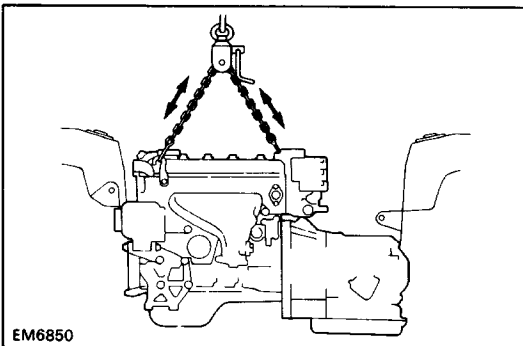
3. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

(a) Attach the engine chain hoist to the engine hangers.

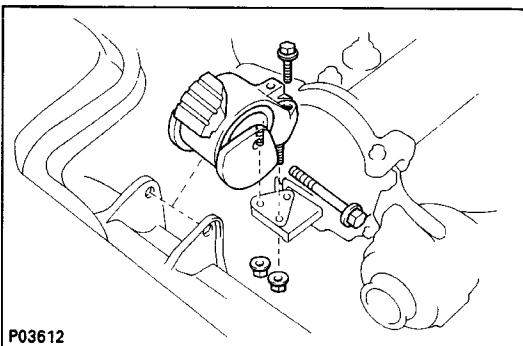
(b) Lower the engine into the engine compartment.

Tilt the transaxle downward, lower the engine and clear the LH mounting.

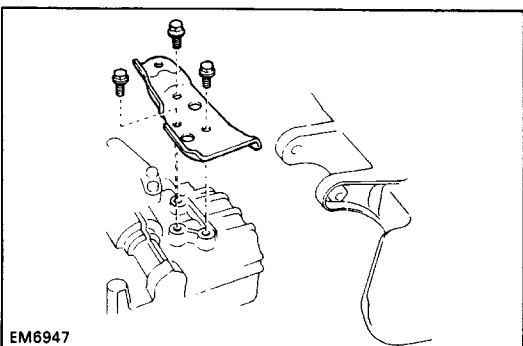
NOTICE: Be careful not to hit the PS gear housing or neutral start switch (A/T).



(c) Keep the engine level, and align RH and LH mountings with the body bracket.

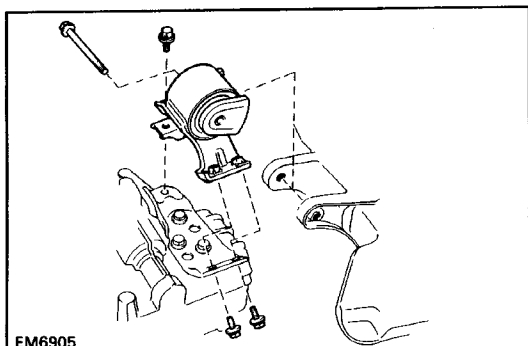


(d) Attach the RH mounting insulator to the mounting bracket and body, and temporarily install the through bolt and two nuts.



(e) Install the LH mounting bracket to the transaxle case with the three bolts.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)



- (f) Attach the LH mounting insulator to the mounting bracket and body with the through bolt and three bolts. Torque the bolts.

Torque:

Bolt 48 N-m (490 kgf-cm, 35 ft-lbf)

Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

- (g) Torque the two nuts, bolt and through bolt of the RH mounting insulator.

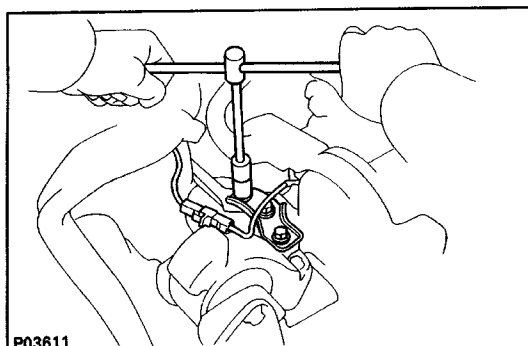
Torque:

Nut 52 N-m (530 kgf-cm, 38 ft-lbf)

Bolt 64 N-m (650 kgf-cm, 47 ft-lbf)

Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

- (h) Remove the engine chain hoist from the engine.

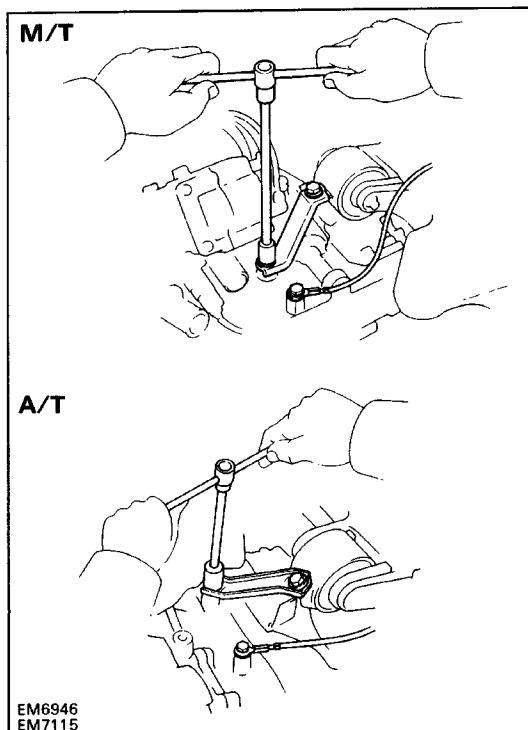


4. INSTALL RH ENGINE MOUNTING STAY

Install the mounting stay with the three bolts.

Torque: 42 N-m (430 kgf-cm, 31 ft-lbf)

5. INSTALL CONNECTOR TO GROUND WIRE ON RH FENDER APRON

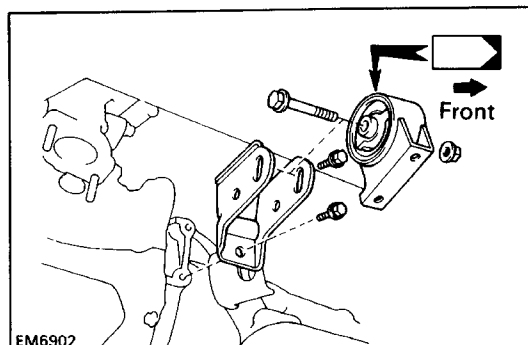


6. INSTALL LH ENGINE MOUNTING STAY

Install the mounting stay with the bolt and nut. Connect the ground strap.

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

7. CONNECT GROUND WIRE TO TRANSAXLE

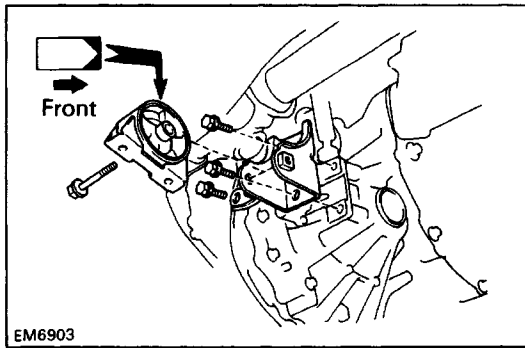


8. INSTALL FRONT ENGINE MOUNTING BRACKET AND INSULATOR

(a) Install the mounting bracket with the two bolts.

Torque: 77 N-m (790 kgf-cm, 57 ft-lbf)

(b) Temporarily install the mounting insulator with the through bolt.

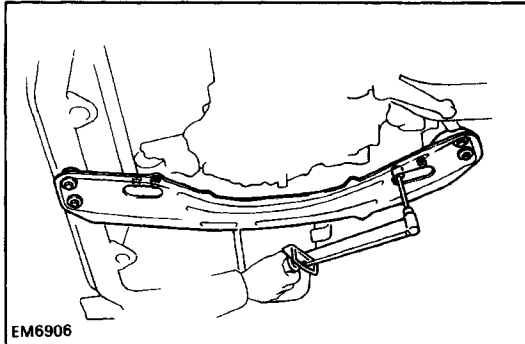


9. INSTALL REAR ENGINE MOUNTING BRACKET AND INSULATOR

(a) install the mounting bracket with the three bolts.

Torque: 77 N-m (790 kgf-cm, 57 ft-lbf)

(b) Temporarily install the mounting insulator with the through bolt.



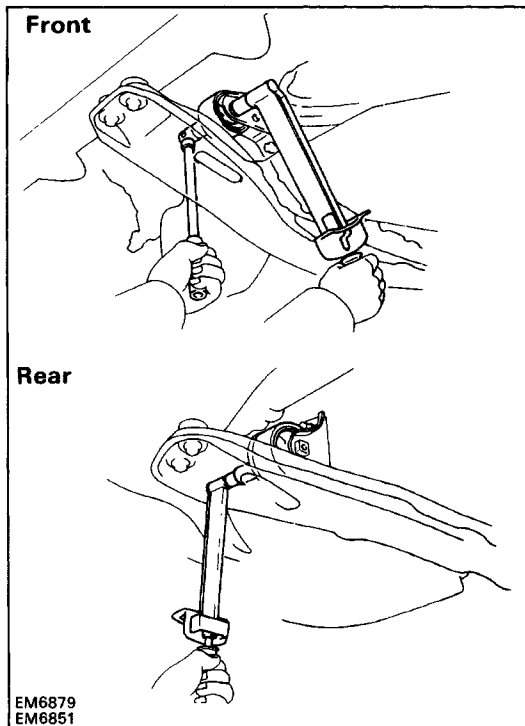
10. INSTALL ENGINE MOUNTING CENTER MEMBER

(a) Install the engine mounting center member with the four bolts.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

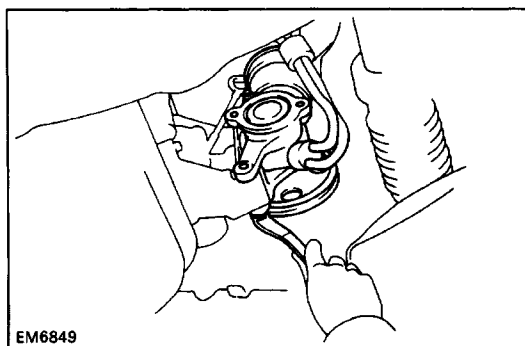
(b) Install and torque the four bolts holding the insulators to the center member.

Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)



11. TIGHTEN FRONT AND REAR ENGINE MOUNTING THROUGH BOLTS

Torque: 87 N-m 1890 kgf-cm, 64 ft-lbf)



12. INSTALL PS PUMP

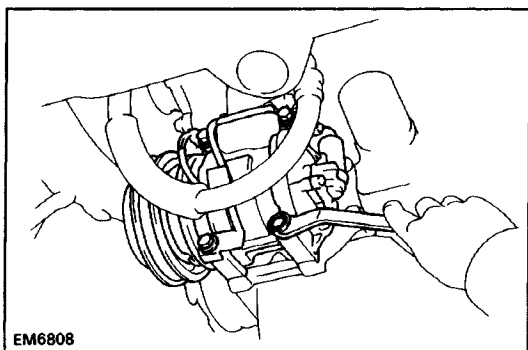
(a) Install the PS pump with the two bolts.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

(b) Install the drive belt.

(c) Connect the air hose to the air pipe.

(d) Connect the air hose to the air intake chamber.

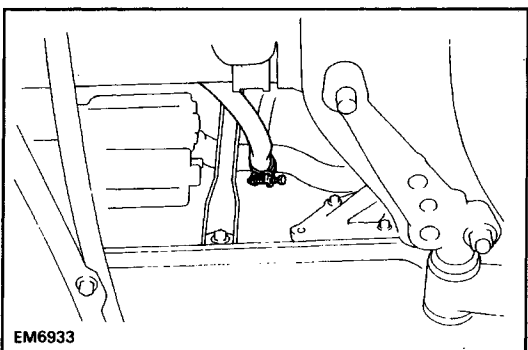
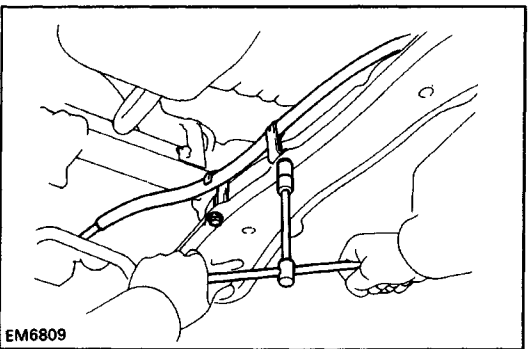
**13. (w/ A/C)****INSTALL A/C COMPRESSOR**

(a) Install the compressor with the four bolts.

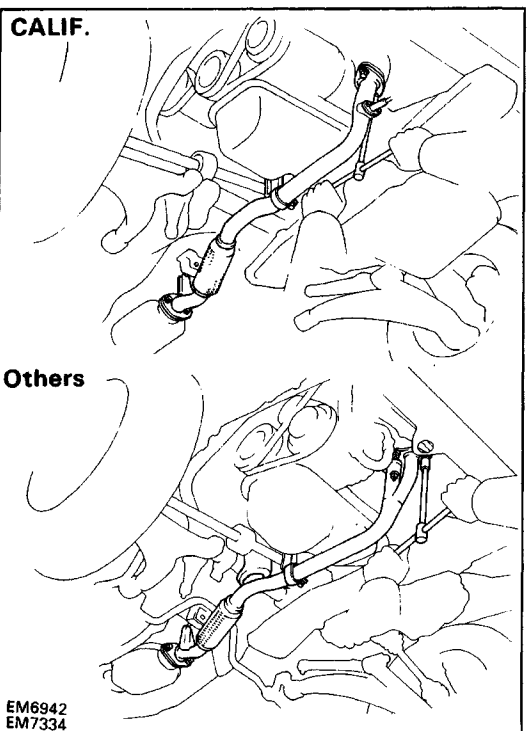
Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)

(b) Connect the two connectors.

(c) Connect the A/C compressor connector.

**14. CONNECT HEATER HOSE TO WATER INLET PIPE****15. INSTALL DRIVE SHAFTS (See SA section)****16. (A/T)****INSTALL TRANSAXLE CONTROL CABLE TO ENGINE MOUNTING CENTER MEMBER**

Install the control cable with the two clamps and bolts.

**17. INSTALL FRONT EXHAUST PIPE**

(a) Install the support hook on the front exhaust pipe to the support bracket.

(b) Place two (CALIF.) or three (others) new gaskets on the front and rear of the front exhaust pipe.

(c) Temporarily install the two bolts and new nuts holding the front exhaust pipe to the catalytic converter.

(d) Using a 14 mm deep socket wrench, install the two (CALIF.) or three (others) new nuts holding the front exhaust pipe to the exhaust manifold.

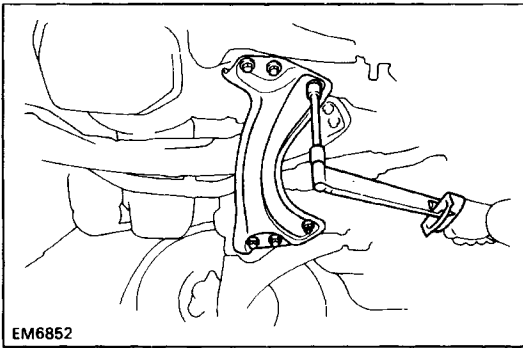
Torque: 62 N-m (630 kgf-cm, 46 ft-lbf)

(e) Tighten the two bolts and nuts holding the front exhaust pipe to the catalytic converter.

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

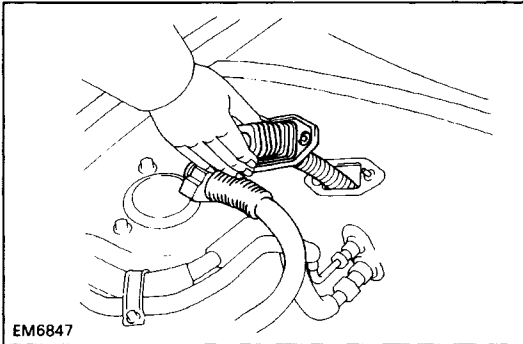
(f) Install the clamp with the bolt.

(g) Connect the oxygen sensor connector.

**18. INSTALL SUSPENSION LOWER CROSSMEMBER**

Install the lower crossmember with the four bolts and two nuts.

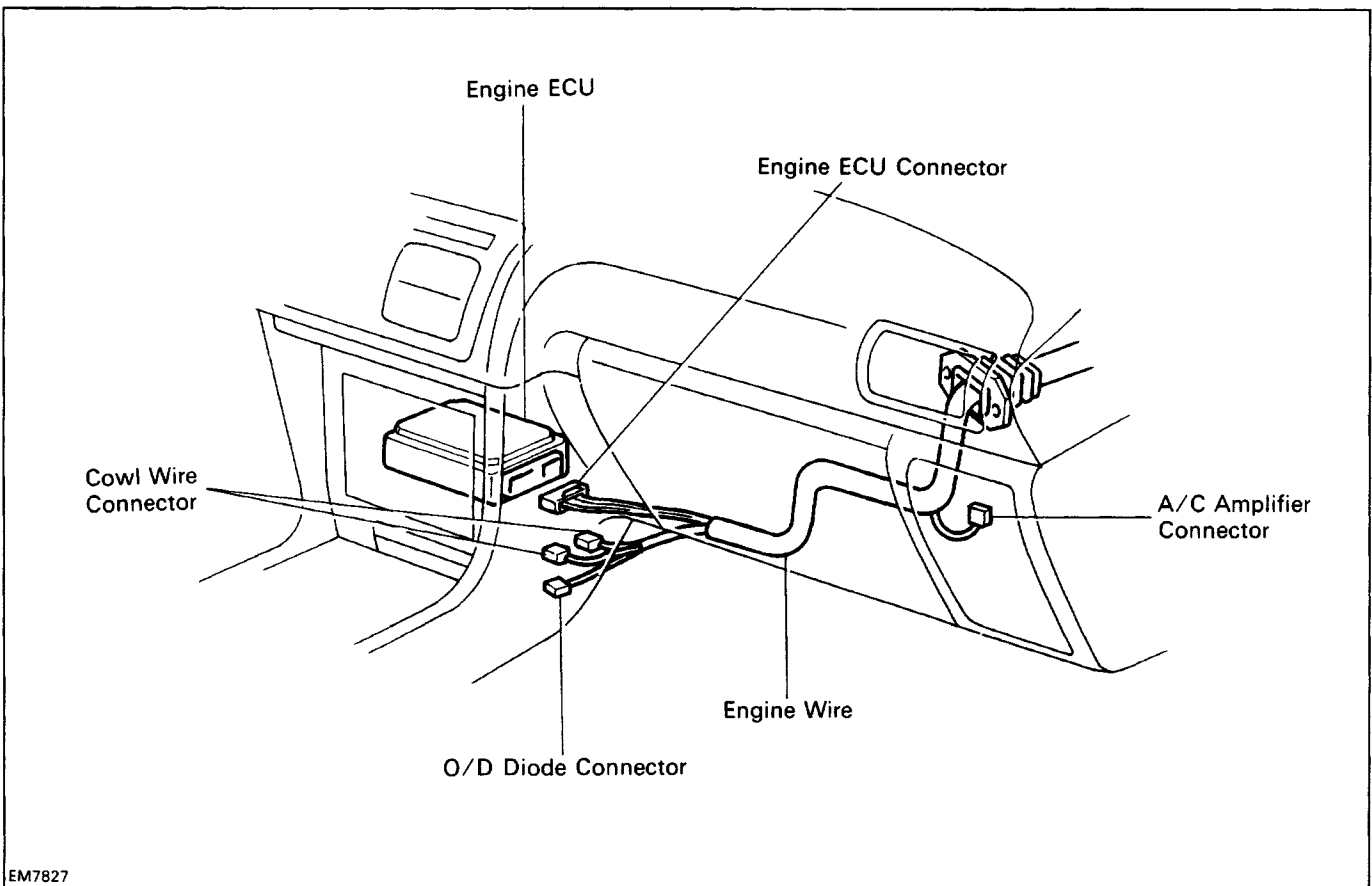
Torque: 152 N-m (1,550 kgf-cm, 112 ft-lbf)

**19. CONNECT ENGINE WIRE TO CABIN**

(a) Push in the engine wire through the cowl panel. Install the two nuts.

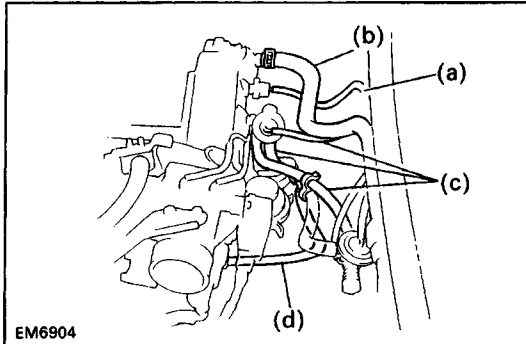
(b) Connect the following connectors:

- (1) Engine ECU connector
- (2) Two cowl wire connectors
- (3) A/C amplifier connector
- (4) O/D diode connector

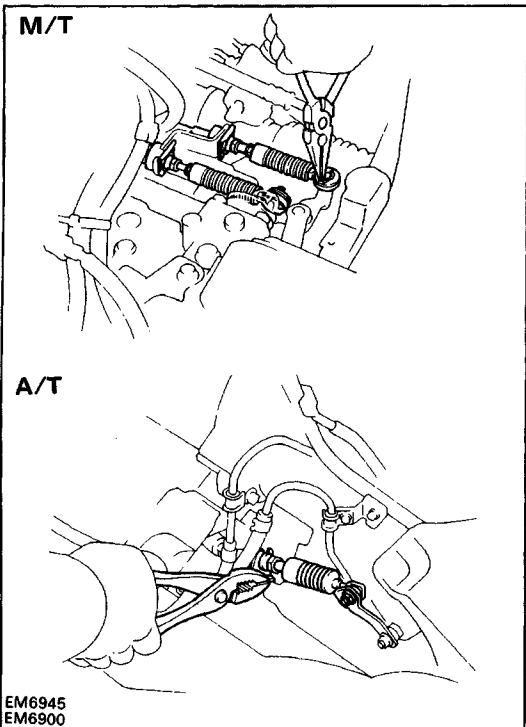
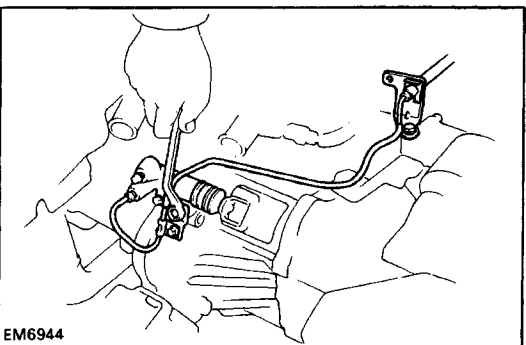


20. CONNECT ENGINE WIRE

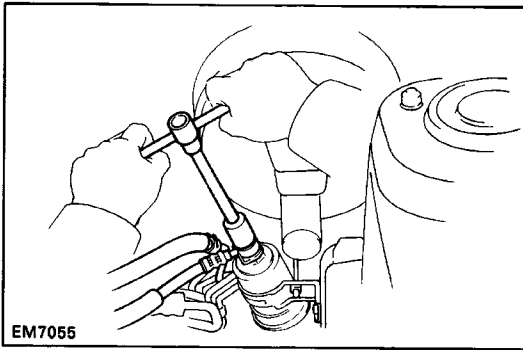
- (a) Engine wire clamp to wire bracket on RH fender apron
- (b) Two cowl wire connectors

**21. CONNECT VACUUM HOSES**

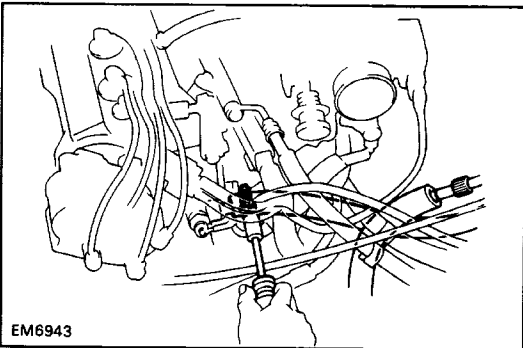
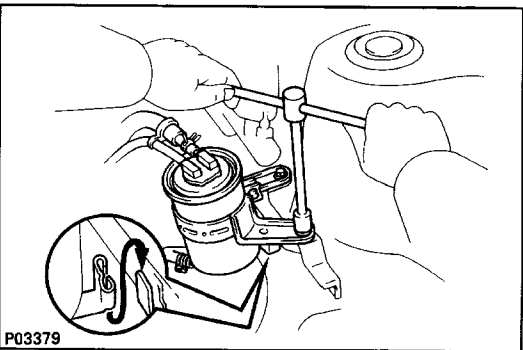
- (a) Vacuum sensor hose to gas filter on air intake chamber
- (b) Brake booster vacuum hose to air intake chamber
- (c) Three A/C idle-up vacuum hoses to ASV on air intake chamber
- (d) A/C vacuum hose to air pipe

**22. CONNECT TRANSAXLE CONTROL CABLE(S) TO TRANSAXLE****23. (M /T)****INSTALL CLUTCH RELEASE CYLINDER**

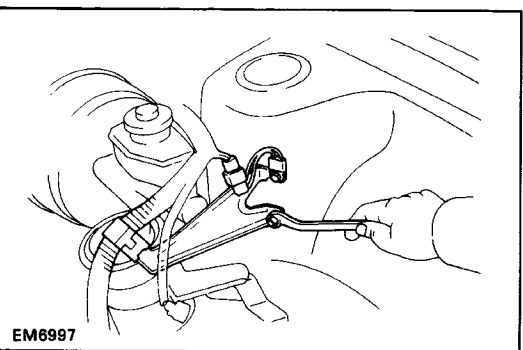
Install the release cylinder and tube with the four bolts.

**24. CONNECT FUEL HOSES**

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

**25. CONNECT SPEEDOMETER CABLE****26. CONNECT HEATER HOSE TO WATER INLET****27. INSTALL CHARCOAL CANISTER**

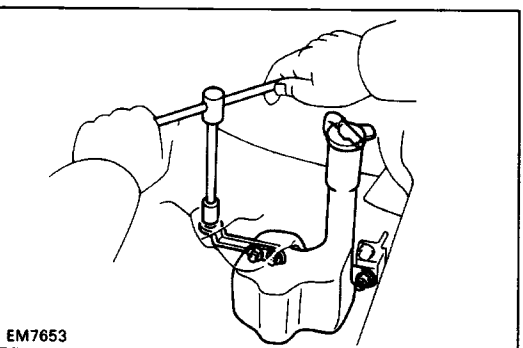
- (a) Install the charcoal canister with the two bolts.
- (b) Connect the three hoses.

**28. INSTALL ENGINE WIRE BRACKET**

- (a) Install the wire bracket with the two bolts. Install the noise filter.
- (b) Install the wire clamp to the wire bracket.

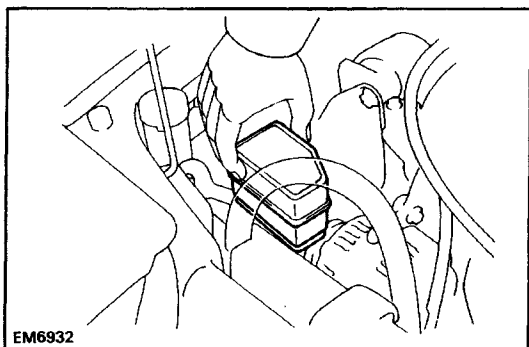
29. CONNECT WIRES AND CONNECTORS

- (a) Check connector
- (b) Vacuum sensor connector
- (c) Ground straps from LH fender apron

**30. INSTALL RADIATOR RESERVOIR TANK**

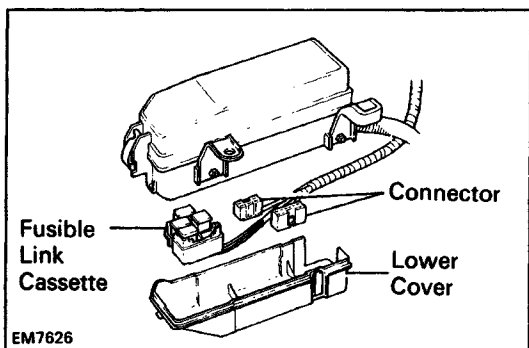
Install the reservoir tank with the two nuts.

31. INSTALL RADIATOR (See pages CO-24 and 25)**32. INSTALL BATTERY**



EM6932

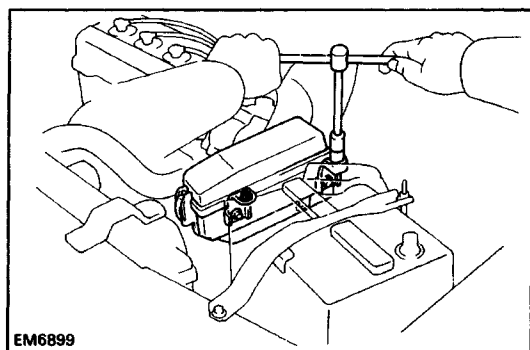
33. INSTALL A/C RELAY BOX



EM7626

34. CONNECT ENGINE WIRE, AND INSTALL ENGINE RELAY BOX

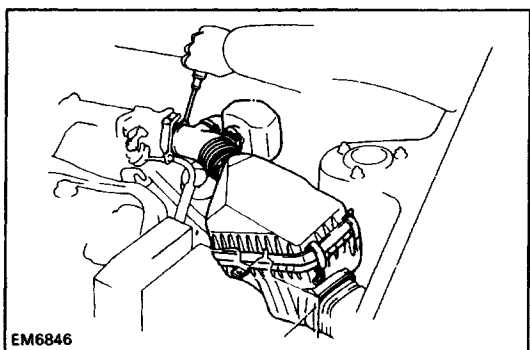
- (a) Connect the cassette and two connectors of the engine wire to the relay box.
- (b) Install the lower cover to the relay box.



EM6899

- (c) Install the relay box with the two nuts.

35. INSTALL ACCELERATOR CABLE, AND ADJUST IT



EM6846

36. INSTALL AIR CLEANER

- (a) Install the air cleaner case with the three bolts.
- (b) Install the air cleaner element.
- (c) Connect the air cleaner hose to the throttle body.
- (d) Connect the air hose to the air pipe.
- (e) Install the air cleaner cap.
- (f) Connect the intake air temperature sensor connector

37. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

38. FILL WITH ENGINE COOLANT (See page [CO-6](#))

Capacity (w/ Heater):

M/T 5.2 liters (5.5 US qts, 4.6 Imp. qts)

A/T 5.6 liters (5.9 US qts, 4.9 Imp. qts)

39. FILL WITH ENGINE OIL (See page [LU-8](#))**Capacity:****Drain and refill****w/ Oil filter– change****3.2 liters (3.3 US qts, 2.8 Imp. qts)****w/o Oil filter change****3.0 liters (3.1 US qts, 2.6 Imp. qts)****Dry fill 3.7 liters (3.9 US qts, 3.3 Imp. qts)****40. START ENGINE AND CHECK FOR LEAKS****41. PERFORM ENGINE ADJUSTMENT**

(a) Adjust the alternator drive belt.

Drive belt tension: New belt 160 ± 20 lbf**Used belt 130 ± 20 lbf**(b) Adjust the PS drive belt. (See page [SR-38](#))**Drive belt tension: New belt 125 ± 25 lbf****Used belt 80 ± 20 lbf**

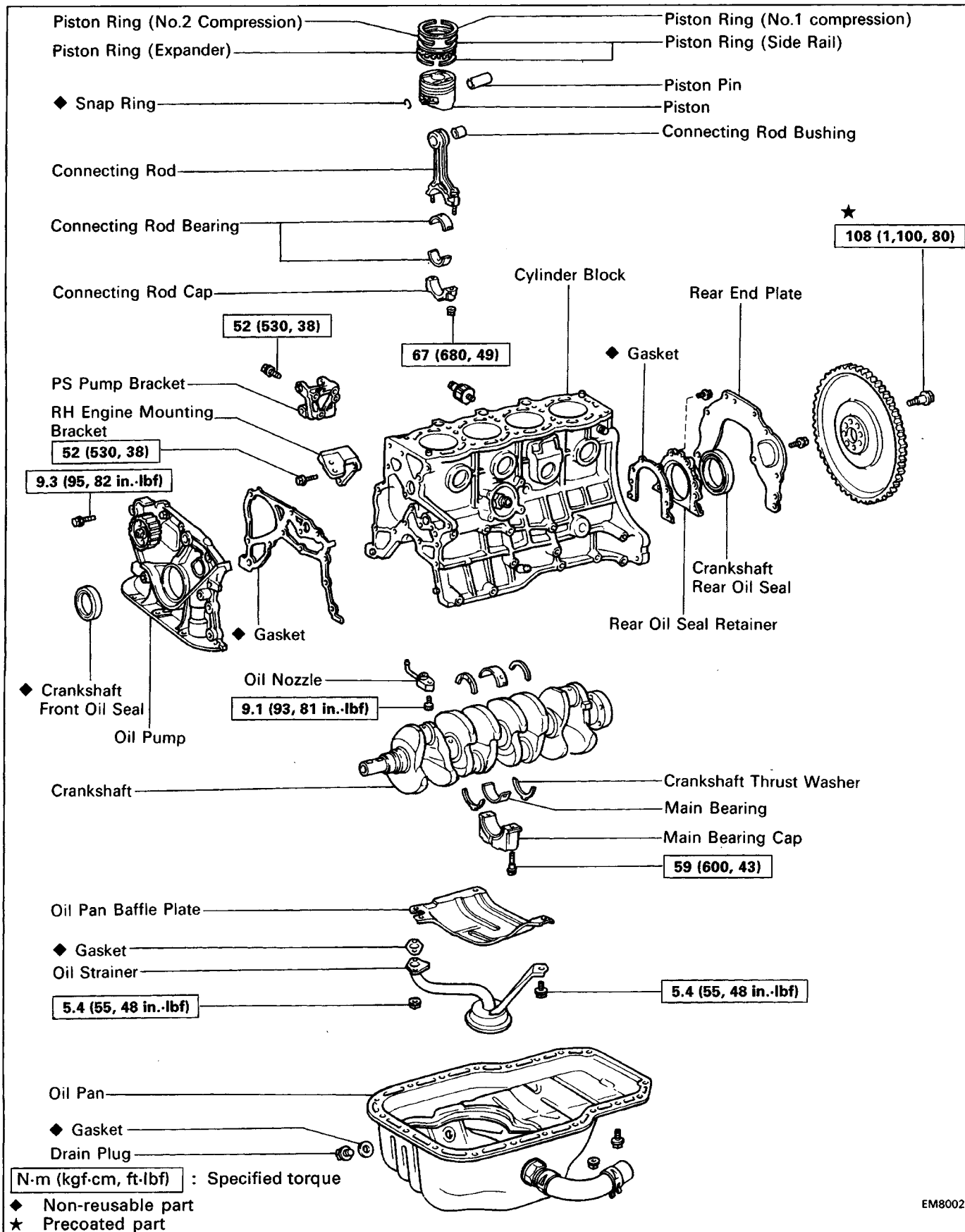
(c) Adjust the A/C drive belt.

Drive belt tension: New belt 160 ± 25 lbf**Used belt 100 ± 20 lbf**(d) Adjust the ignition timing. (See page [IG-25](#))**Ignition timing:** **10° BTDC (w/ Terminals TE1 and E1 connected)****42. INSTALL ENGINE UNDER COVERS****43. INSTALL HOOD****44. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

45. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

CYLINDER BLOCK (3S-GTE) COMPONENTS



REMOVAL OF ENGINE

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

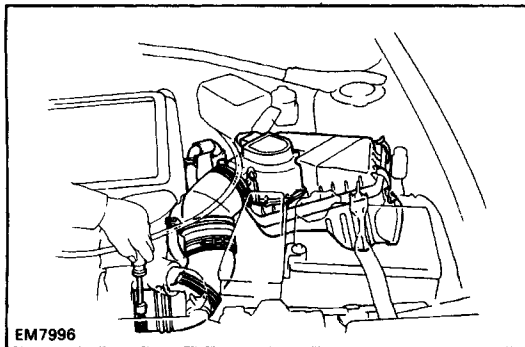
2. REMOVE HOOD

3. REMOVE ENGINE UNDER COVERS

4. DRAIN ENGINE COOLANT (See page CO-6)

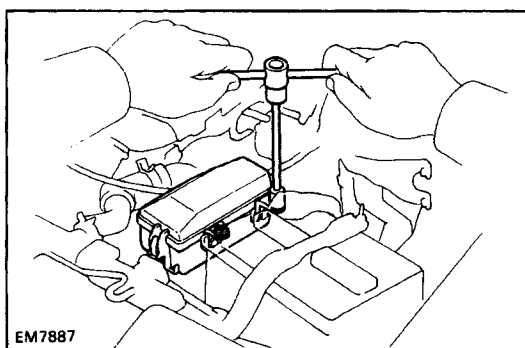
5. DRAIN ENGINE OIL (See page LU-7)

6. DRAIN TRANSAXLE OIL



7. REMOVE AIR CLEANER

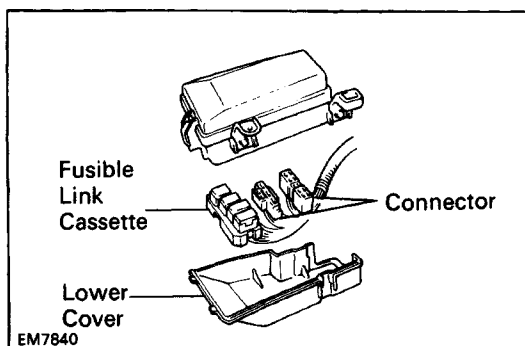
- (a) Disconnect the air flow meter connector.
- (b) Disconnect the four air cleaner cap clips.
- (c) Disconnect the following hoses:
 - (1) Air cleaner hose from turbocharger
 - (2) PCV hose from cylinder head cover
 - (3) Air hose from air tube
- (d) Remove the air cleaner cap, air flow meter assembly and element.
- (e) Remove the three bolts and air cleaner case.



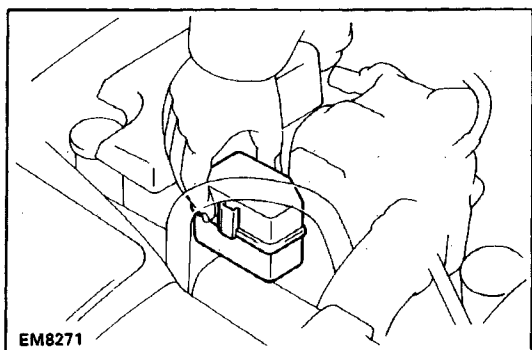
8. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

9. REMOVE ENGINE RELAY BOX, AND DISCONNECT ENGINE WIRE CONNECTORS

- (a) Remove the two nuts, and disconnect the relay box from the battery.



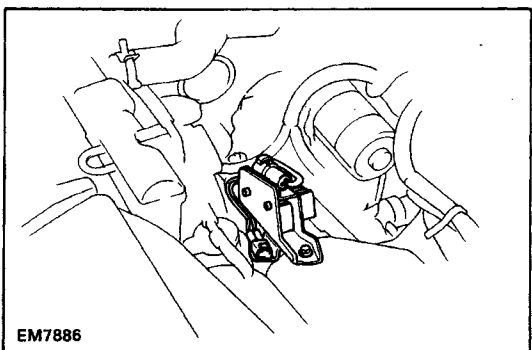
- (b) Remove the lower cover from the relay box.
- (c) Disconnect the fusible link cassette and two connectors of the engine wire from the relay box.



EM8271

10. REMOVE A/C RELAY BOX FROM BRACKET

Remove the A/C relay box from the bracket.

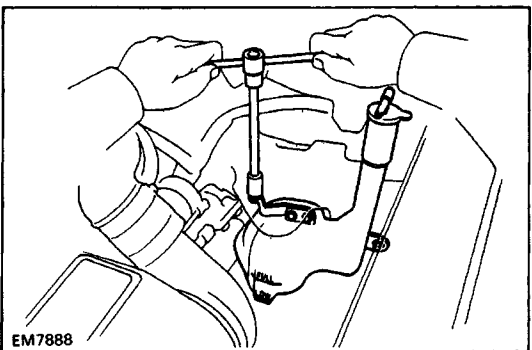
11. REMOVE BATTERY

EM7886

12. REMOVE INJECTOR SOLENOID RESISTOR AND FUEL PUMP RESISTOR'

(a) Disconnect the two connectors.

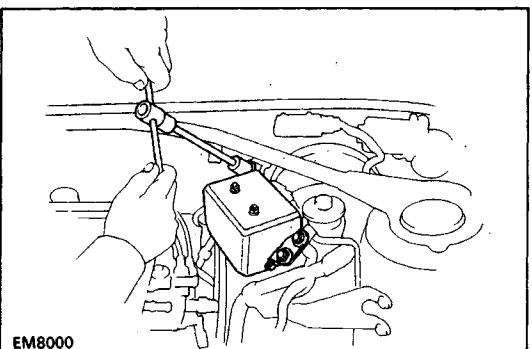
(b) Remove the bolt, the solenoid resistor and fuel pump resistor assembly.

13. REMOVE RADIATOR (See pages [CO-22](#) and [23](#))

EM7888

14. REMOVE RADIATOR RESERVOIR TANK

Remove the two nuts and reservoir tank.



EM8000

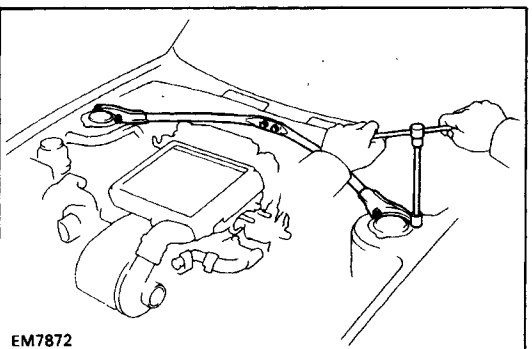
15. (w/ CRUISE CONTROL SYSTEM)**REMOVE CRUISE CONTROL ACTUATOR**

(a) Remove the two nuts and actuator cover.

(b) Remove the three bolts, and disconnect the actuator.

(c) Disconnect the actuator connector

(d) Disconnect the cable from the actuator.



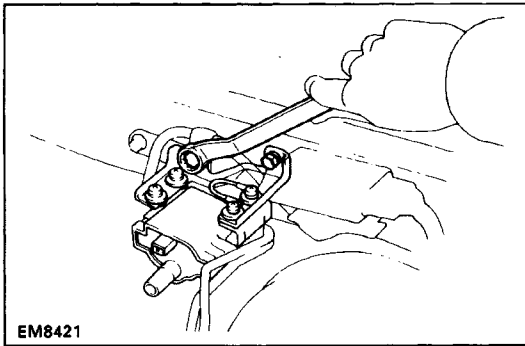
EM7872

16. REMOVE SUSPENSION UPPER BRACE

(a) Remove the two wiper arms.

(b) Remove the outside lower windshield moulding.

(c) Remove the two bolts, four nuts and upper brace.

**17. REMOVE IGNITION COIL**

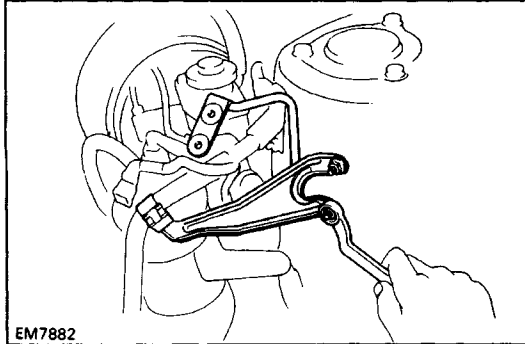
- (a) Disconnect the ignition coil connector.
- (b) Disconnect the high-tension cord.
- (c) Remove the two bolts and ignition coil.

18. DISCONNECT WIRES AND CONNECTORS

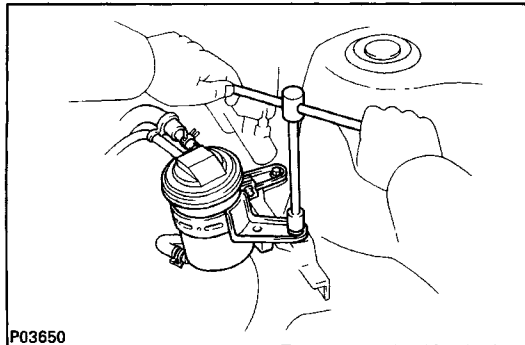
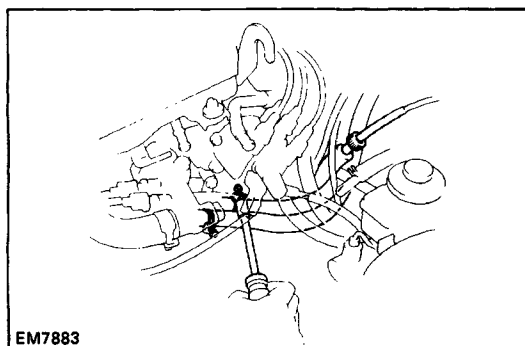
- (a) Check connector
- (b) Igniter connector
- (c) Ground strap from LH fender apron

19. REMOVE ENGINE WIRE BRACKET

- (a) Disconnect the wire clamp from the wire bracket.
- (b) Remove the two bolts and wire bracket.

**20. REMOVE CHARCOAL CANISTER**

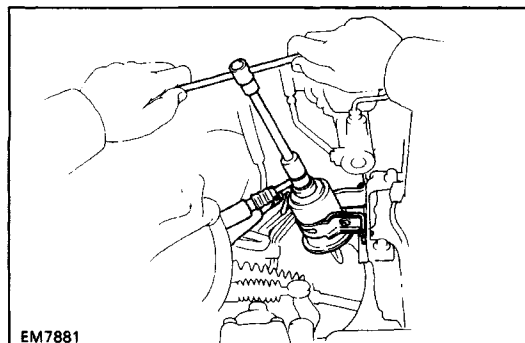
- (a) Disconnect the three hoses from the charcoal canister.
- (b) Remove the two bolts and charcoal canister.

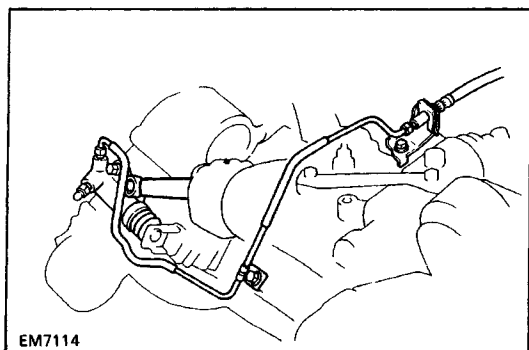
**21. DISCONNECT HEATER HOSES****22. DISCONNECT SPEEDOMETER CABLE****23. DISCONNECT FUEL HOSES**

CAUTION: Catch leaking fuel in a container.

24. DISCONNECT CONNECTORS

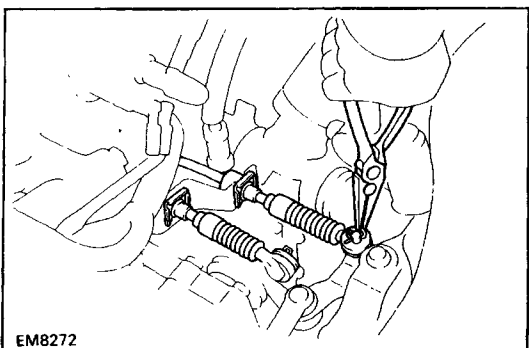
- (a) Engine room wire connector.
- (b) Noise filter connector.

25. REMOVE STARTER (See page [ST-4](#))

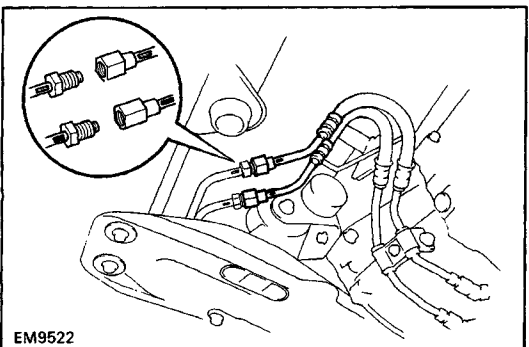


26. REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE

Remove the four bolts, release cylinder and tube from the transaxle.

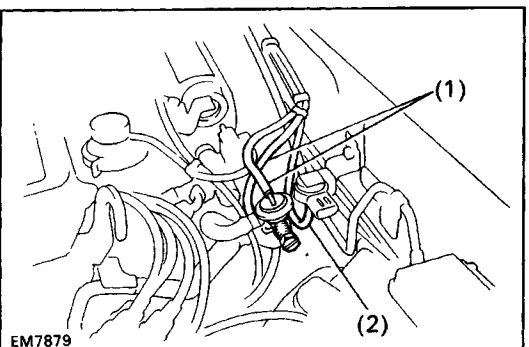


27. DISCONNECT TRANSAXLE CONTROL CABLES FROM TRANSAXLE



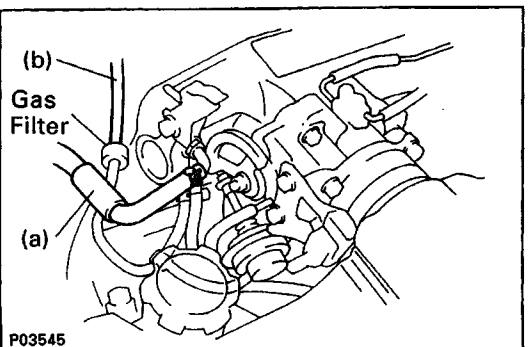
28. DISCONNECT TRANSAXLE OIL COOLER HOSES

- (a) Place matchmarks on the oil cooler hoses and tubes.
- (b) Disconnect the two oil cooler hoses from the tube.



29. DISCONNECT TURBOCHARGING PRESSURE SENSOR AND A/C ASV FROM BODY

- (a) Disconnect the turbocharging pressure sensor.
- (b) Disconnect the following hoses:
 - (1) Two vacuum hoses from A/C ASV
 - (2) Vacuum hose from turbocharging pressure sensor
- (c) Remove the bolt, and disconnect the turbocharging pressure sensor and A/C ASV from the body.



30. DISCONNECT HOSES

- (a) Brake booster vacuum hose from intake manifold
- (b) Turbocharging pressure sensor hose from gas filter

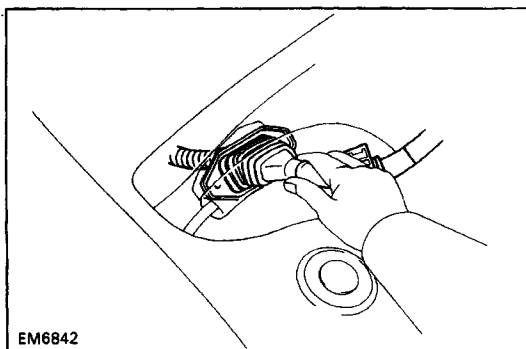
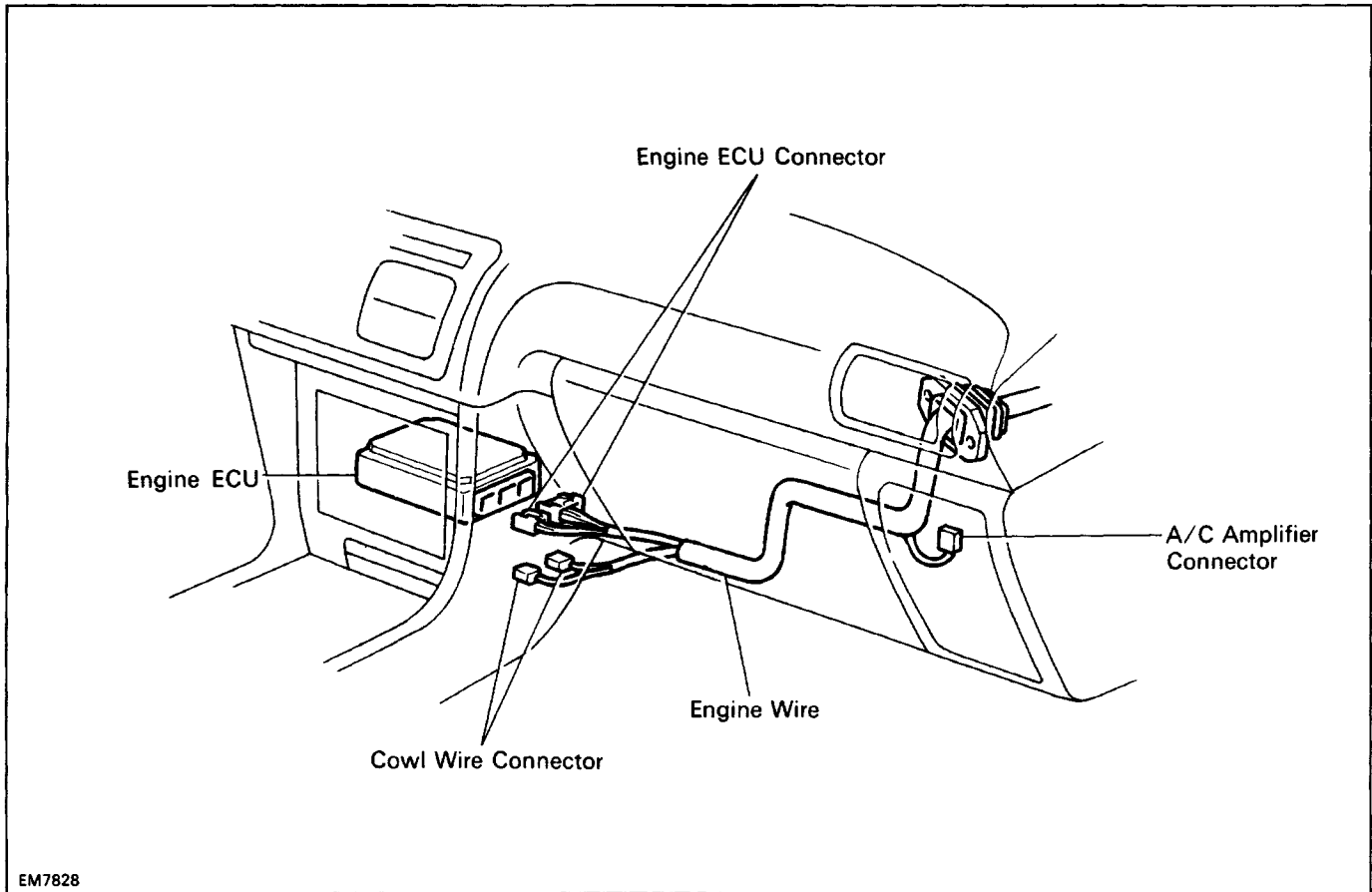
31. DISCONNECT ENGINE WIRE

- (a) Engine wire clamp from wire bracket on RH fender apron
- (b) Two cowl wire connectors

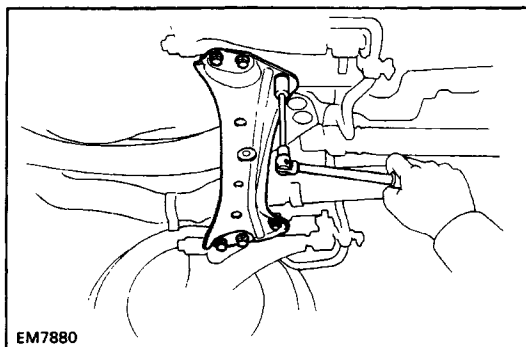
32. DISCONNECT ENGINE WIRE FROM CABIN

(a) Disconnect the following connectors:

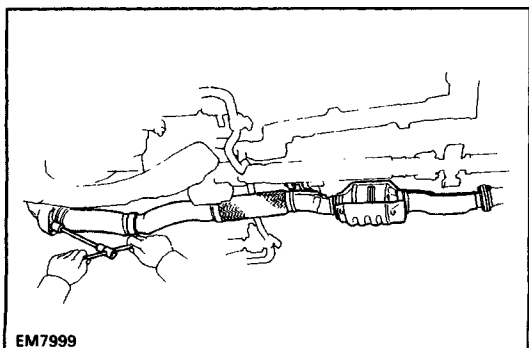
- (1) Two engine ECU connectors
- (2) Two cowl wire connectors
- (3) A/C amplifier connector



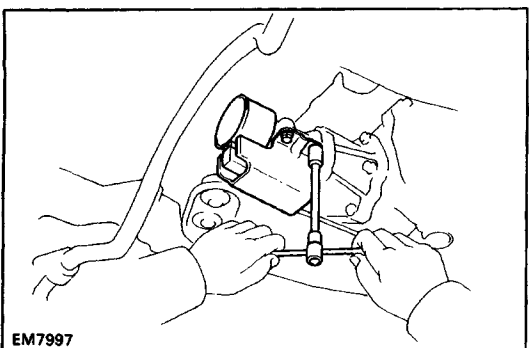
(b) Remove the two nuts, and pull out the engine wire from the cowl panel.

**33. REMOVE SUSPENSION LOWER CROSSMEMBER**

Remove the four bolts, two nuts and lower crossmember.

**34. REMOVE FRONT EXHAUST PIPE**

- (a) Loosen the bolt, and disconnect the clamp from the bracket.
- (b) Remove the two bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
- (c) Using a 14 mm deep socket wrench, remove the three nuts holding the front exhaust pipe to the catalytic converter.
- (d) Disconnect the support hook on the front exhaust pipe from the support bracket, and remove the front exhaust pipe and two gaskets.

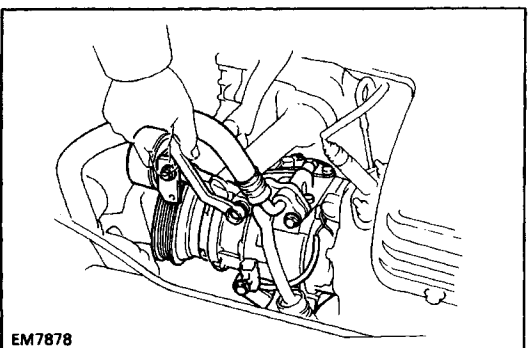
**35. REMOVE DRIVE SHAFTS (See SA section)****36. REMOVE FRONT PROPELLER SHAFT**

(See PR section)

37. REMOVE DEFLECTOR FROM TRANSFER EXTENSION HOUSING**38. REMOVE DYNAMIC DAMPER FROM TRANSFER EXTENSION HOUSING****39. REMOVE ALTERNATOR (See page CH-7)****40. REMOVE IDLER PULLEY BRACKET AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES**

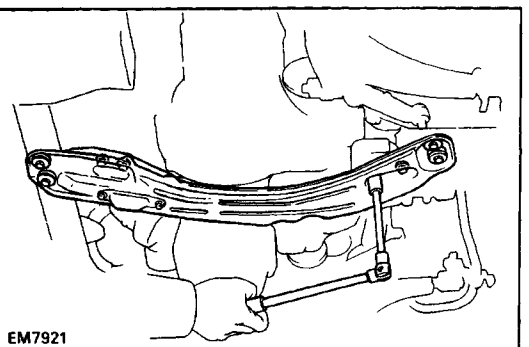
- (a) Disconnect the A/C compressor connector.
- (b) Remove the four bolts and idler pulley bracket, and disconnect the A/C compressor.

HINT: Put aside the compressor, and suspend it to the radiator support with a string.

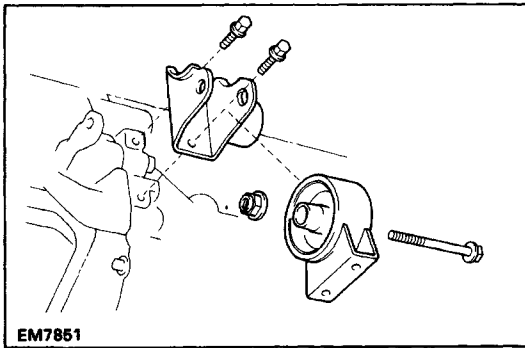
**41. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES**

- (a) Disconnect the two air hoses from the air pipe.
- (b) Remove the PS drive belt.
- (c) Remove the four bolts, and disconnect the PS pump from the engine.

HINT: Put aside the pump and suspend it to the cowl with a string.

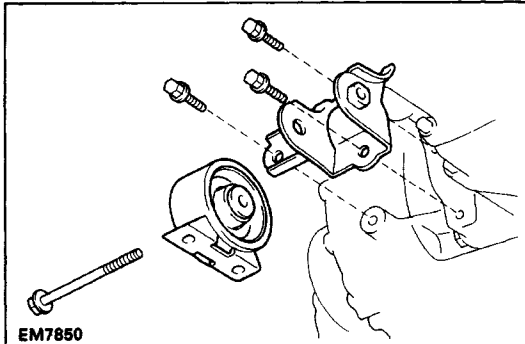
**42. REMOVE ENGINE MOUNTING CENTER MEMBER**

Remove the eight bolts and center member.



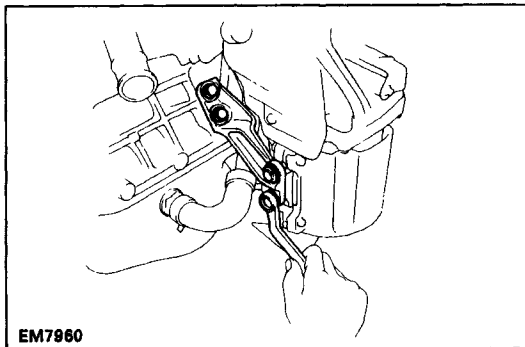
43. REMOVE FRONT ENGINE MOUNTING INSULATOR AND BRACKET

- (a) Remove the through bolt, nut and mounting insulator.
- (b) Remove the two bolts and mounting bracket.



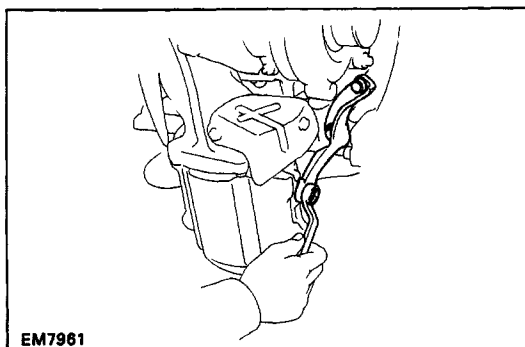
44. REMOVE REAR ENGINE MOUNTING INSULATOR AND BRACKET

- (a) Remove the through bolt and mounting insulator.
- (b) Remove the three bolts and mounting bracket.

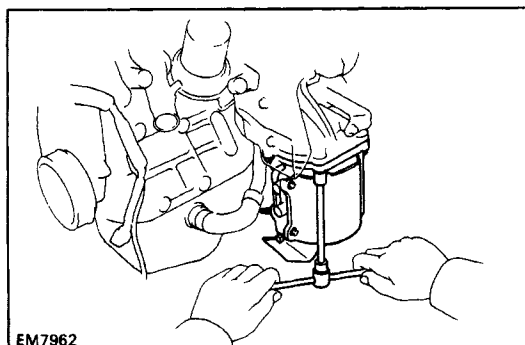


45. REMOVE CATALYTIC CONVERTER

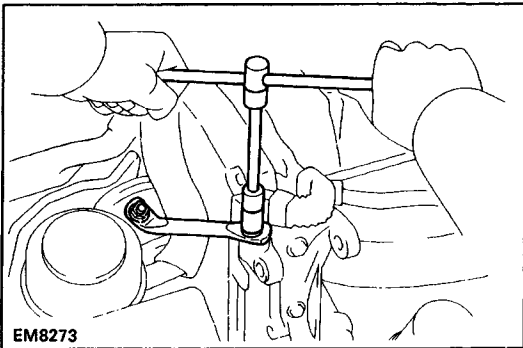
- (a) Remove the four bolts and RH converter stay.



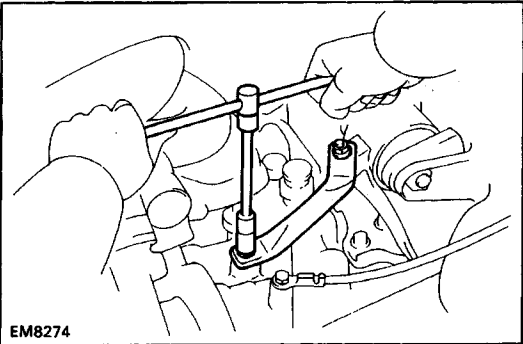
- (b) Remove the three bolts and LH converter stay.



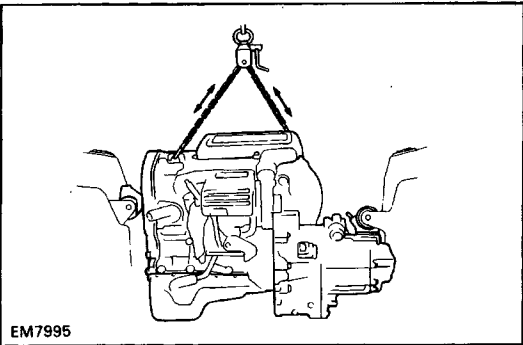
- (c) Remove the three bolts, two nuts, catalytic converter, cushion, retainer and gasket.

**46. REMOVE RH ENGINE MOUNTING STAY**

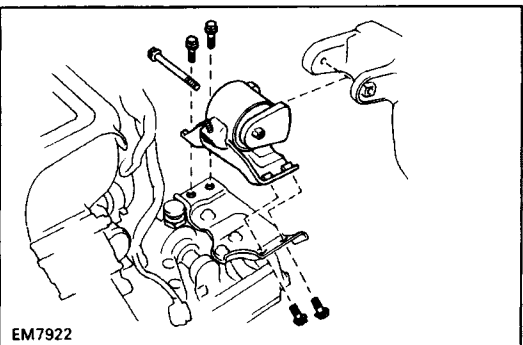
Remove the bolt, nut and mounting stay.

**47. REMOVE LH ENGINE MOUNTING STAY**

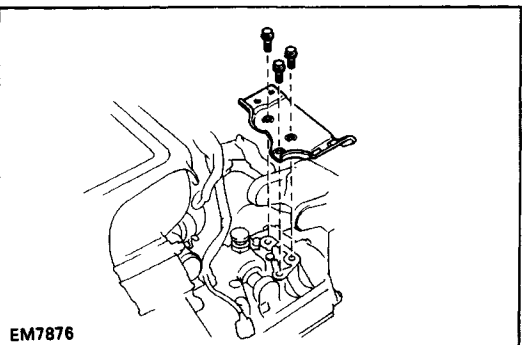
- (a) Remove the bolt, nut and mounting stay.
- (b) Remove the bolt, and disconnect the ground strap.

**48. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE**

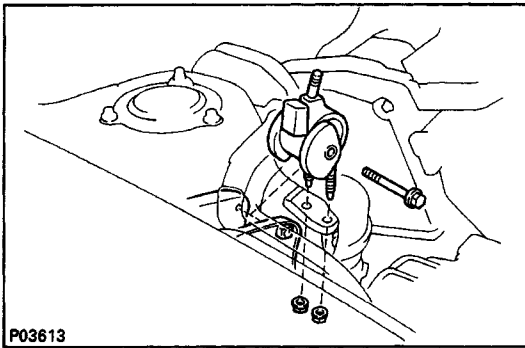
- (a) Attach the engine chain hoist to the engine hangers.



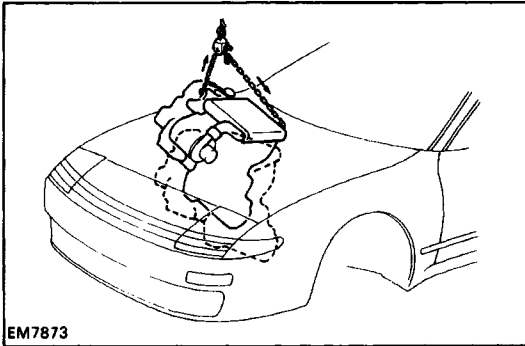
- (b) Remove the through bolt, four bolts and LH mounting insulator.



- (c) Remove the three bolts and LH mounting bracket.



- (d) Remove the through bolt, two nuts and RH mounting insulator.



- (e) Lift the engine out of the vehicle slowly and carefully.

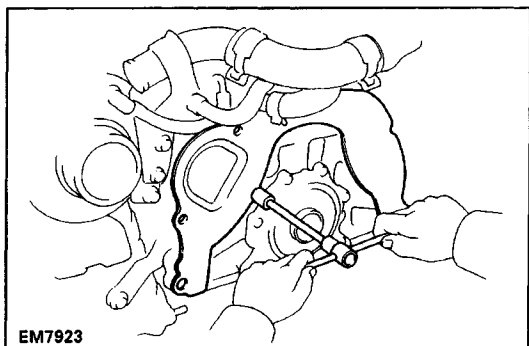
NOTICE: Be careful not to hit the PS gear housing.

- (f) Make sure the engine is clear of all wiring, hoses and cables.
- (g) Place the engine and transaxle assembly onto the stand.

49. SEPARATE ENGINE AND TRANSAXLE (See MT section)

PREPARATION FOR DISASSEMBLY

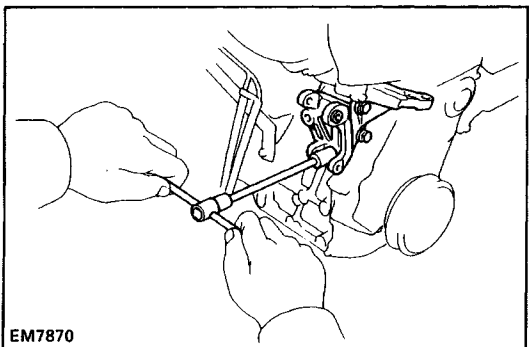
1. REMOVE CLUTCH COVER AND DISC
2. REMOVE FLYWHEEL



3. REMOVE REAR END PLATE

Remove the bolt and end plate.

4. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY



5. REMOVE RH ENGINE MOUNTING BRACKET

Remove the three bolts and mounting bracket.

6. REMOVE PS PUMP BRACKET

Remove the three bolts and PS pump bracket.

7. REMOVE TIMING BELT AND PULLEYS

(See pages [EM-48](#) to [52](#))

8. REMOVE TURBOCHARGER (See pages [TC-9](#) to [11](#))

9. REMOVE CYLINDER HEAD

(See pages [EM-118](#) to [125](#))

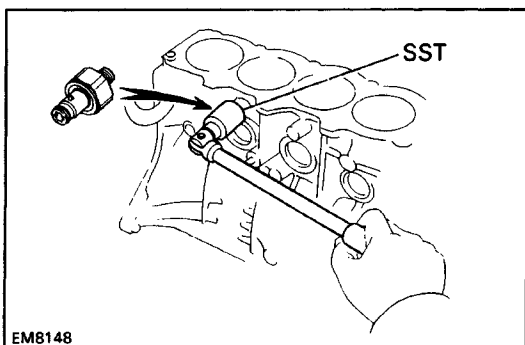
10. REMOVE WATER PUMP AND IDLER PULLEY BRACKET (See pages [CO-12](#) and [13](#))

11. REMOVE OIL PAN AND OIL PUMP

(See pages [LU-17](#) and [18](#))

12. REMOVE OIL FILTER (See page [LU-7](#))

13. REMOVE OIL COOLER (See pages [LU-24](#) and [25](#))



14. REMOVE KNOCK SENSOR

Using SST, remove the knock sensor.

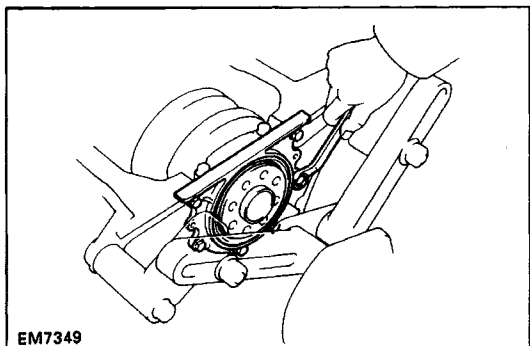
SST 09816-30010

DISASSEMBLY OF CYLINDER BLOCK

(See page EM-223)

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts, retainer and gasket.



EM7349

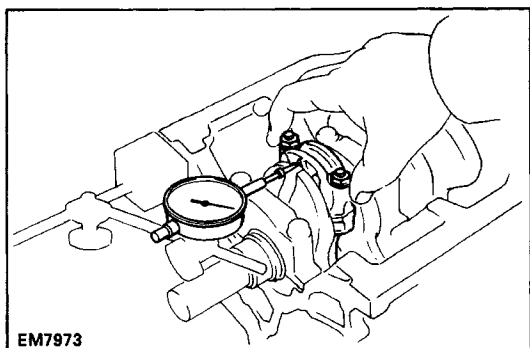
2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

**Standard thrust clearance: 0.160 – 0.312 mm
(0.0063 – 0.0123 in.)**

Maximum thrust clearance: 0.35 mm (0.0138 in.)

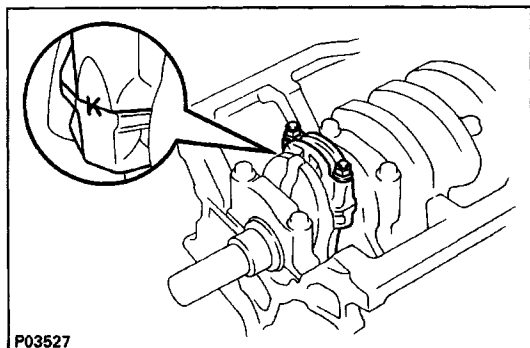
If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



EM7973

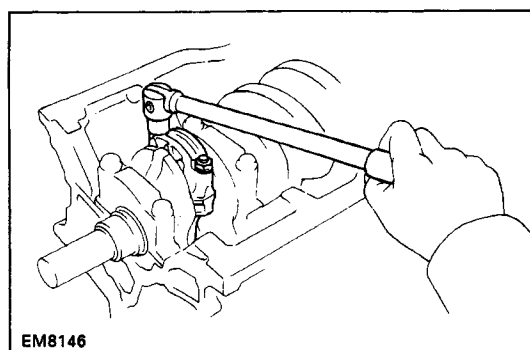
3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.



P03527

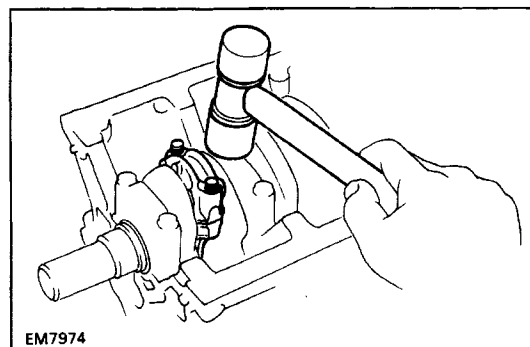
(b) Remove the connecting rod cap nuts.



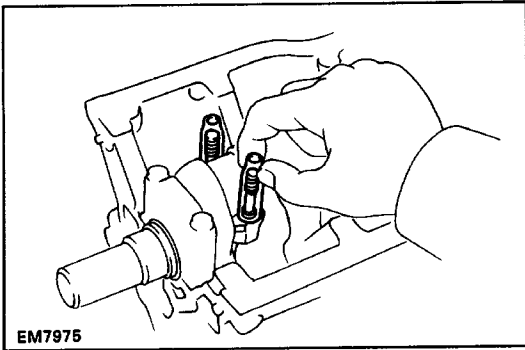
EM8146

(c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

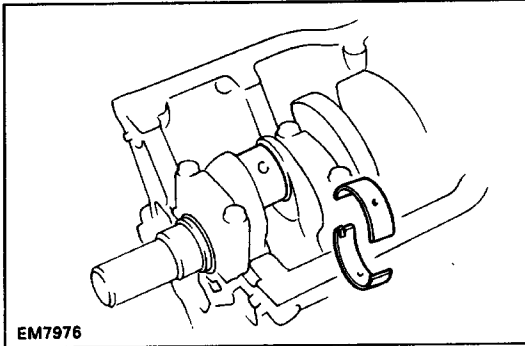
HINT: Keep the lower bearing inserted with the connecting cap.



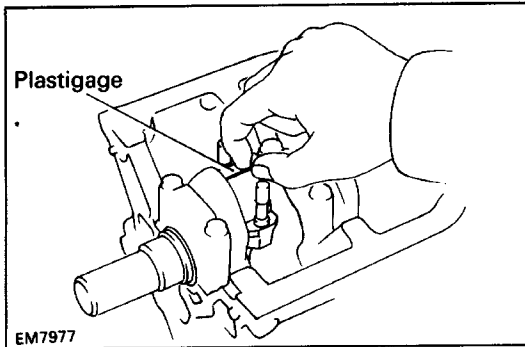
EM7974



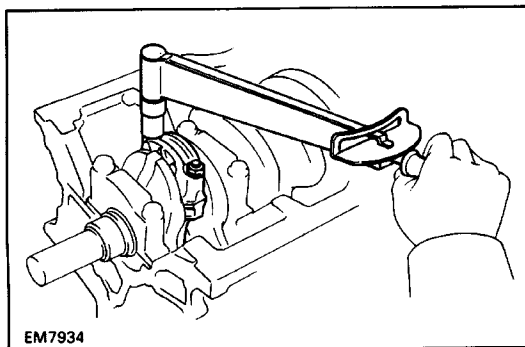
- (d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



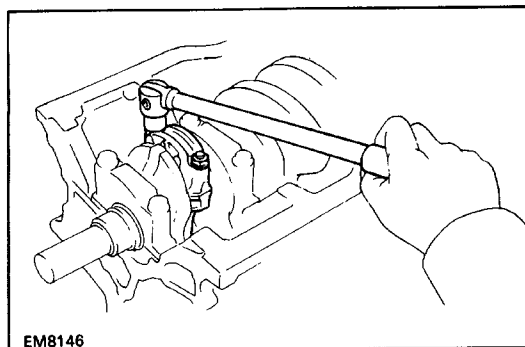
- (e) Clean the crank pin and bearing.
 (f) Check the crank pin and bearing for pitting and scratches.
 If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



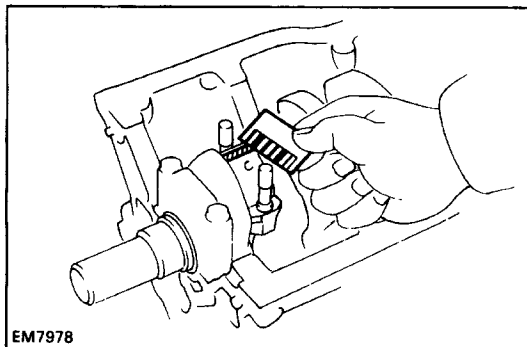
- (g) Lay a strip of Plastigage across the crank pin.



- (h) Install the connecting rod cap.
 (See step 7 on page [EM-255](#))
Torque: 67 N·m (680 kgf·cm, 49 ft·lbf)
NOTICE: Do not turn the crankshaft.



- (i) Remove the connecting rod cap.
 (See procedures (b) and (c) above)



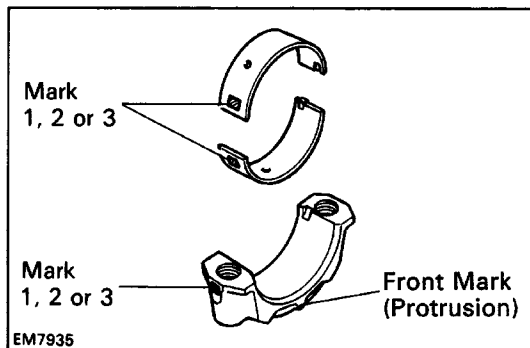
(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD	0.024 – 0.055 mm (0.0009 – 0.0022 in.)
U / S	0.023 – 0.069 mm (0.0009 – 0.0027 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.



HINT: If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked

“1” “2” and “3” accordingly.

Standard sized bearing center wall thickness:

Mark "1"	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
Mark "2"	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
Mark "3"	1.492 – 1.496 mm (0.0587 – 0.0589 in.)

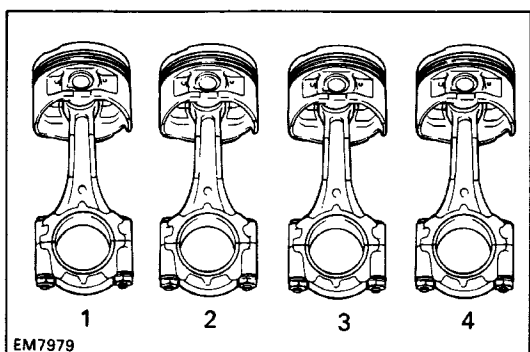
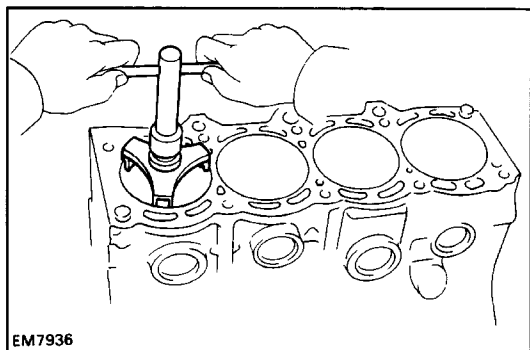
(k) Completely remove the Plastigage.

4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

- Using a ridge reamer, remove all the carbon from the top of the cylinder.
- Cover the connecting rod bolts.
(See page [EM-235](#))
- Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

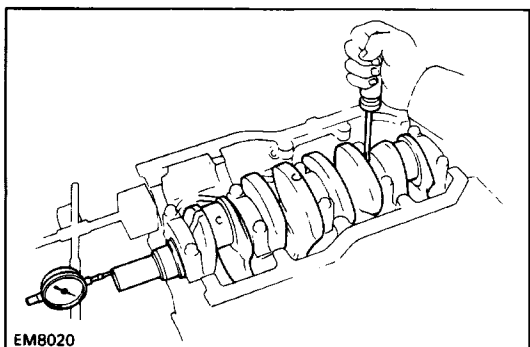
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

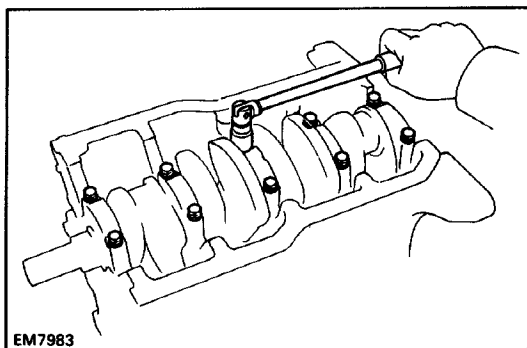
Standard thrust clearance: 0.020 – 0.220 mm
(0.0008 – 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

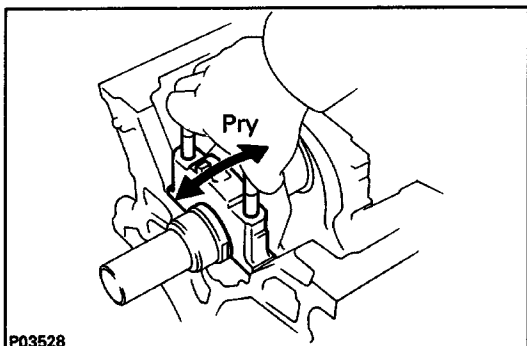
Thrust washer thickness: 2.440 – 2.490 mm
(0.0961 – 0.0980 in.)





6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

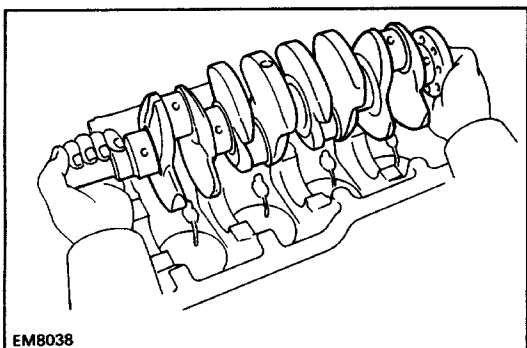
(a) Remove the main bearing cap bolts.



(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers (No.3 main bearing cap only).

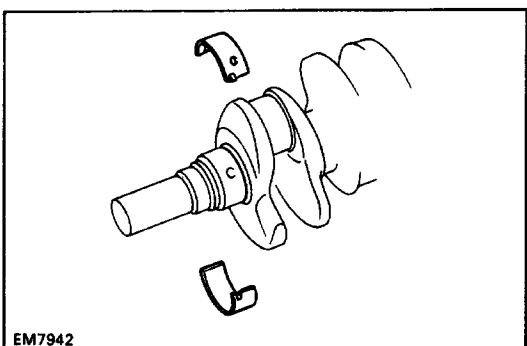
HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.



(c) Lift out the crankshaft.

HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.

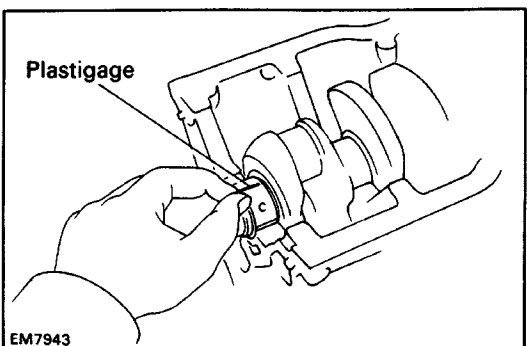


(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches.

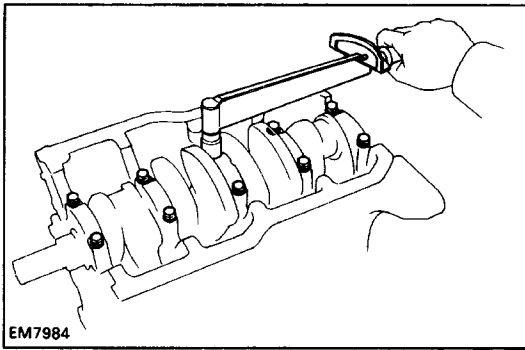
If the journal or bearing is damaged, replace the bearings.

If necessary, grind or replace the crankshaft.

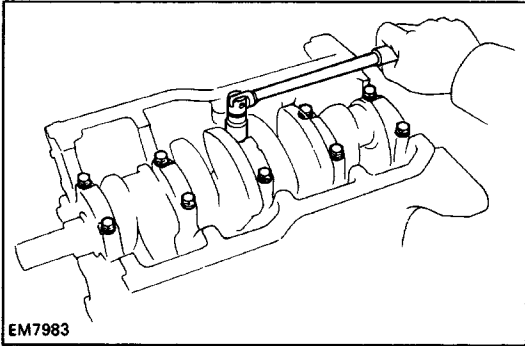


(f) Place the crankshaft on the cylinder block.

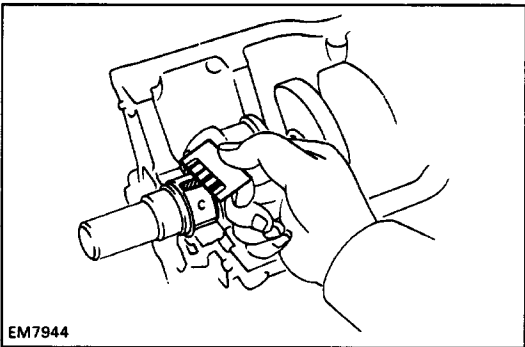
(g) Lay a strip of Plastigage across each journal.



(h) Install the main bearing caps.
 (See step 5 on page EM-254)
Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)
NOTICE: Do not turn the crankshaft.



(i) Remove the main bearing caps.
 (See procedures (a) and (b) above)



(j) Measure the Plastigage at its widest point.

Standard clearance:

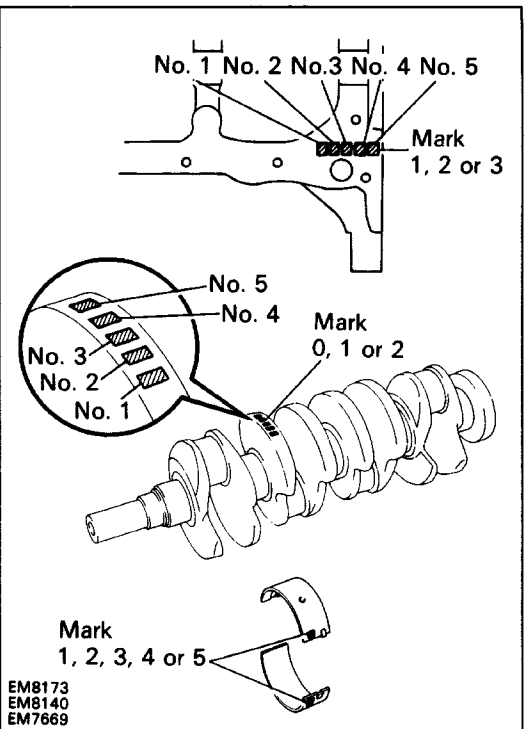
No.3	STD	0.025 – 0.044 mm (0.0010 – 0.0017 in.)
	U/S 0.25	0.021 – 0.061 mm (0.0008 – 0.0024 in.)
Others	STD	0.015 – 0.034 mm (0.0006 – 0.0013 in .)
	U/S 0.25	0.029 – 0.069 mm (0.0011 – 0.002 7 in .)

Maximum clearance: 0.08 mm (0.0031 in.)

HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be:

No.3	0.027 – 0.054 mm (0.0011 – 0.0021 in.)
Others	0.017 – 0.044 mm (0.0007 – 0.0017 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.
HINT: If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then select the bearing with the same number as the total. There are five sizes of standard bearings, marked "1," "2," "3," "4" and "5" accordingly.



Cylinder block	Number marked								
	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block "2" + Crankshaft "1" = Bearing "3"

(Reference)**Cylinder block main journal bore diameter:**

Mark "1" 59.020 – 59.026 mm
(2.3236 – 2.3239 in.)

Mark "2" 59.026 – 59.032 mm
(2.3239 – 2.3241 in.)

Mark "3" 59.032 – 59.038 mm
(2.3241 – 2.3243 in.)

Crankshaft journal diameter:

Mark "0" 54.998 – 55.003 mm
(2.1653 – 2.1655 in.)

Mark "1" 54.993 – 54.998 mm
(2.1651 – 2.1653 in.)

Mark "2" 54.988 – 54.993 mm
(2.1649 – 2.1651 in.)

Standard sized bearing center wall thickness:

No.3 Mark "1" 1.992 – 1.995 mm
(0.0784 – 0.0785 in.)

Mark "2" 1.995 – 1.998 mm
(0.0785 – 0.0787 in.)

Mark "3" 1.998 – 2.001 mm
(0.0787 – 0.0788 in.)

Mark "4" 2.001 – 2.004 mm
(0.0788 – 0.0789 in.)

Mark "5" 2.004 – 2.007 mm
(0.0789 – 0.0790 in.)

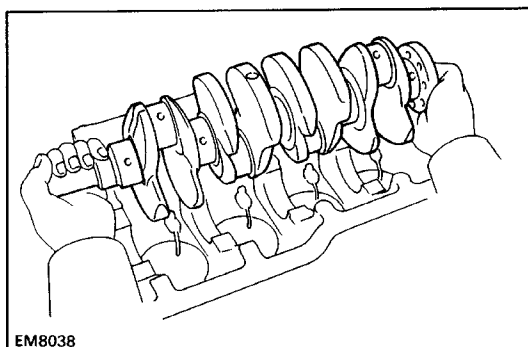
Others Mark "1" 1.997 – 2.000 mm
(0.0786 – 0.0787 in.)

Mark "2" 2.000 – 2.003 mm
(0.0787 – 0.0789 in.)

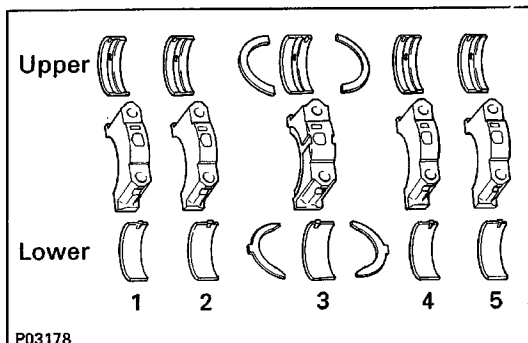
Mark "3" 2.003 – 2.006 mm
(0.0789 – 0.0790 in.)

Mark "4" 2.006 – 2.009 mm
(0.0790 – 0.0791 in.)

Mark "5" 2.009 – 2.012 mm
(0.0791 – 0.0792 in.)



EM8038



P03178

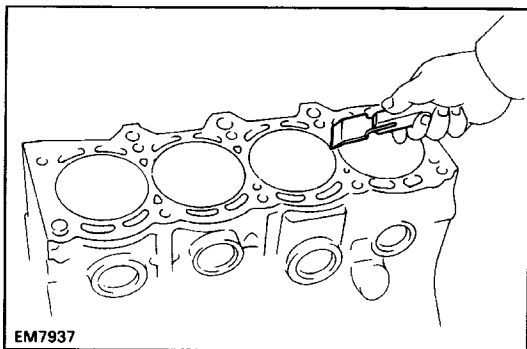
(k) Completely remove the Plastigage.

7. REMOVE CRANKSHAFT

- (a) Lift out the crankshaft.
- (b) Remove the upper bearings and upper thrust washers from the cylinder block.

HINT: Arrange the main bearing caps, bearings and thrust washers in correct order.

8. REMOVE OIL NOZZLES (See page LU-31)



INSPECTION OF CYLINDER BLOCK

1. CLEAN CYLINDER BLOCK

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the surface contacting the cylinder head.

B. Clean cylinder block

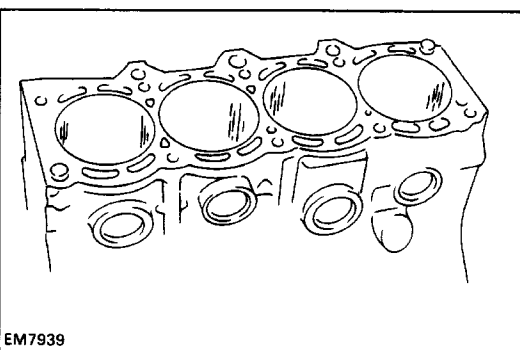
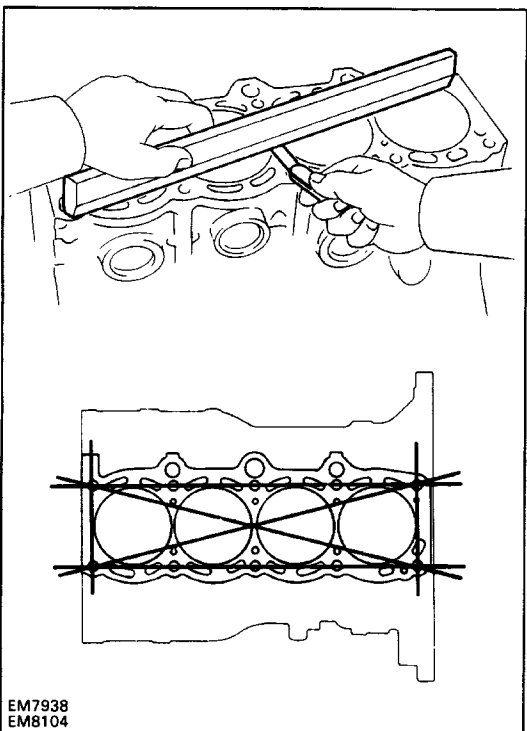
Using a soft brush and solvent, thoroughly clean the cylinder block.

2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

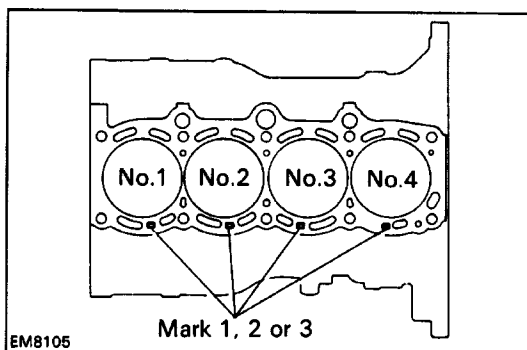
Maximum warpage: 0.05 mm (0.0020 in.)

If warpage is greater than maximum, replace the cylinder block.



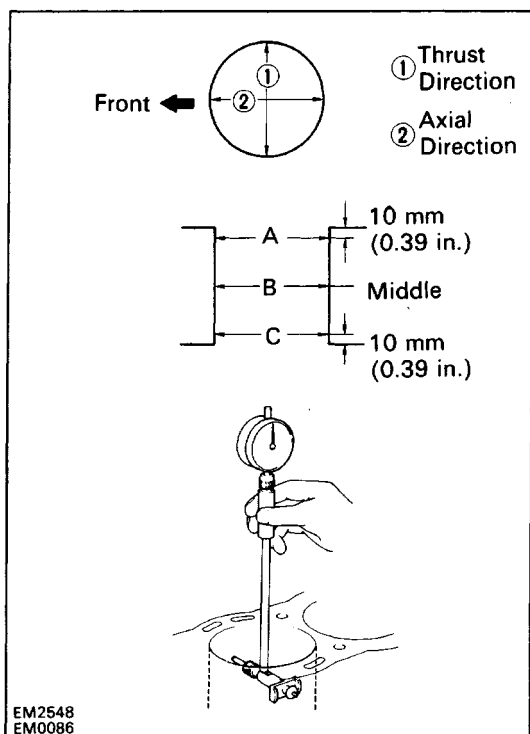
3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches. If deep scratches are present, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the top of the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

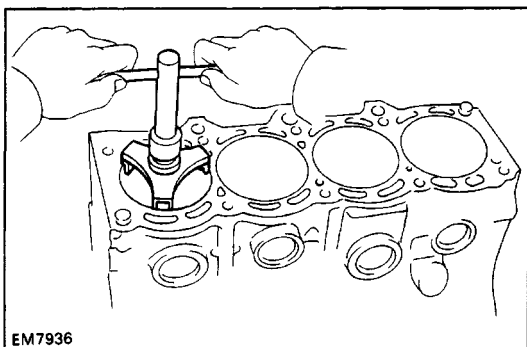
Mark 1" 86.000 – 86.010 mm
(3.3858 – 3.3862 in.)

Mark "2" 86.010 – 86.020 mm
(3.3862 – 3.3866 in.)

Mark "3" 86.020 – 86.030 mm

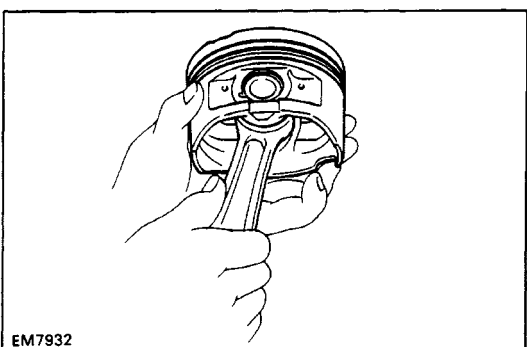
Maximum diameter: 86.23 mm (3.3949 in.)

If the diameter is greater than maximum, replace the cylinder block



5. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



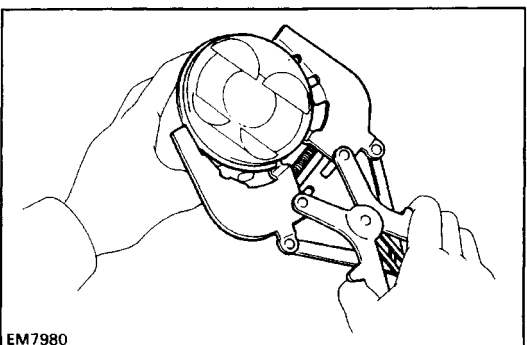
DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

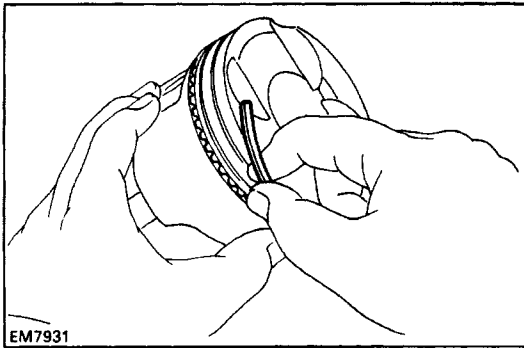
1. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.

2. REMOVE PISTON RINGS

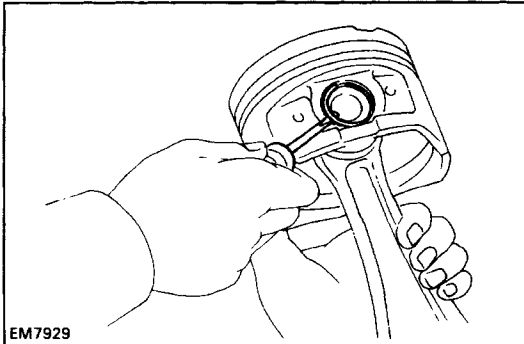
(a) Using a piston ring expander, remove the two compression rings.





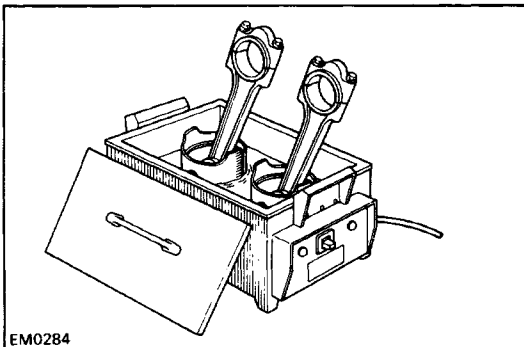
(b) Remove the two side rails and oil ring expander by hand.

HINT: Arrange the rings in correct order only.

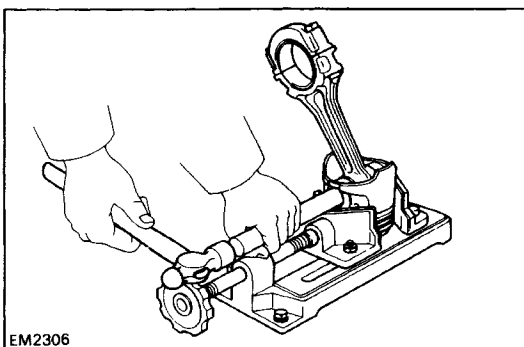


3. DISCONNECT CONNECTING ROD FROM PISTON

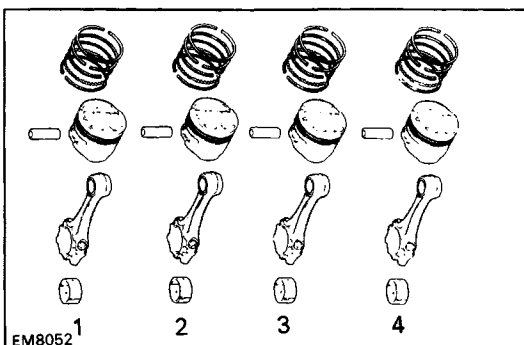
(a) Using a small screwdriver, pry out the two snap rings.



(b) Gradually heat the piston to 80 – 90°C (176 – 194°F).

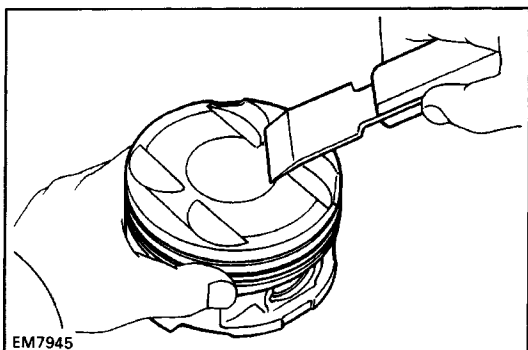


(c) Using plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.



HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

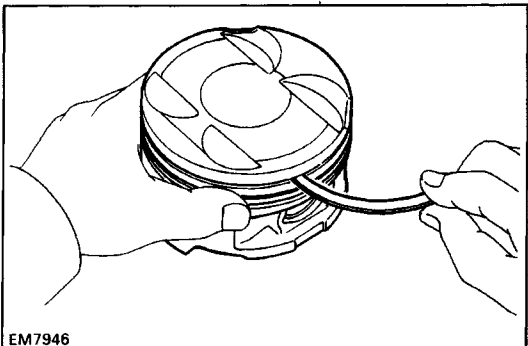


EM7945

INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

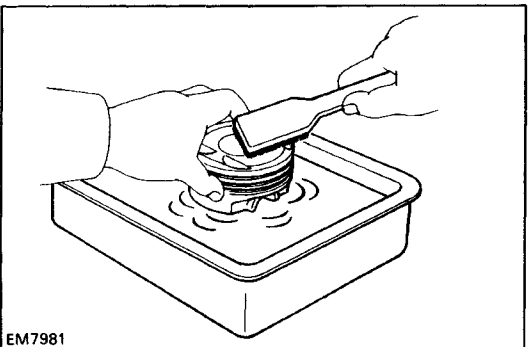
1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.



EM7946

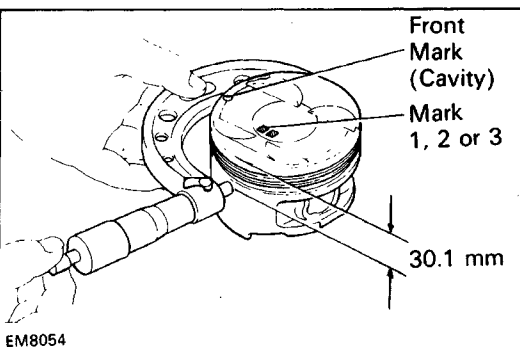
(b) Using a groove cleaner tool or broken ring, clean the piston ring grooves.



EM7981

(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE: Do not use a wire brush.



EM8054

2. INSPECT PISTON

A. Inspect piston oil clearance

HINT: There are three sizes of the standard piston diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the piston top.

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.1 mm (1.185 in.) from the piston head.

Piston diameter:

Mark "1" 85-920 - 85.930 mm
(3-3827 - 3.3831 in.)

Mark "2" 85-930 - 85.940 mm
(3-3831 - 3.3835 in.)

Mark "3" 85.940 - 85.950 mm
(3.3835 - 3.3839 in.)

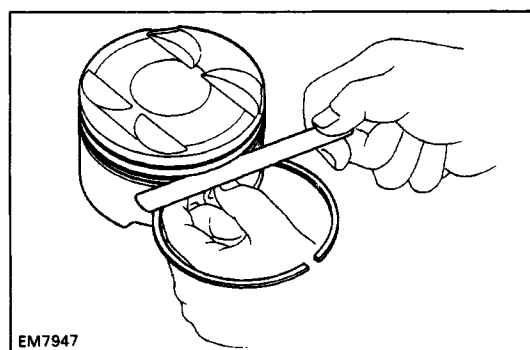
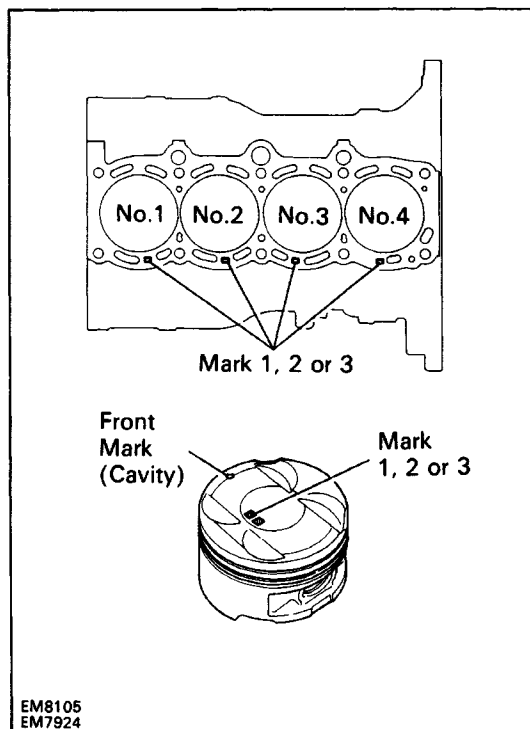
- (b) Measure the cylinder bore diameter in the thrust directions. (See step 4 on page EM-241)
- (c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

**Standard oil clearance: 0.070 – 0.090 mm
(0.0028 – 0.0035 in.)**

Maximum oil clearance: 0.110 mm (0.0043 in.)

If the oil clearance is greater than maximum, replace all the four pistons. If necessary, replace the cylinder block.

HINT (Use new cylinder block): Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.



B. Inspect piston ring groove clearance

Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:

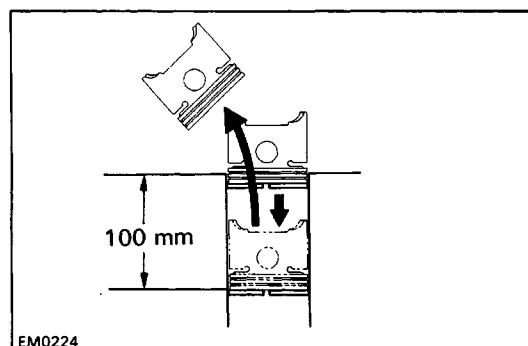
**No.1 0.040 – 0.080 mm
(0.0016 – 0.0031 in.)**

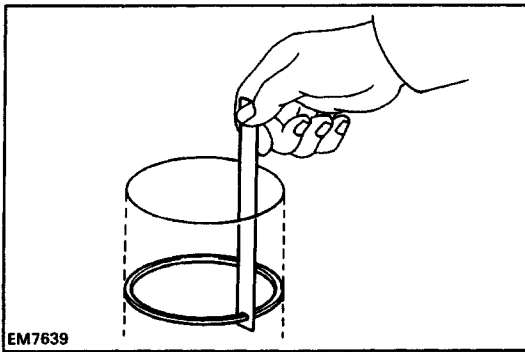
**No.2 0.030 – 0.070 mm
(0.0012 – 0.0028 in.)**

If the clearance is greater than maximum, replace the piston.

C. Inspect piston ring end gap

- (a) Insert the piston ring into the cylinder bore.
- (b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 100 mm (3.94 in.) from the top of the cylinder block.





(c) Using a feeler gauge, measure the end gap.

Standard end gap:

No.1 0.330 – 0.550 mm
(0.0130 – 0.0217 in.)

No.2 0.450 – 0.670 mm
(0.0177 – 0.0264 in.)

Oil (Side rail) 0.200 – 0.600 mm
(0.0079 – 0.0236 in.)

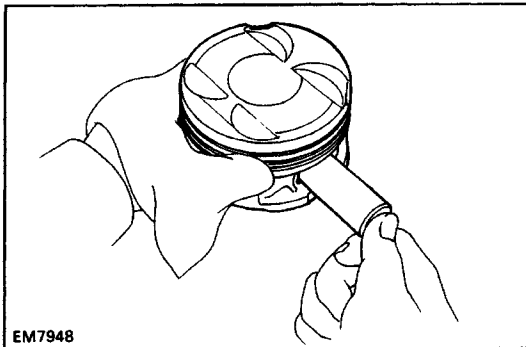
Maximum end gap:

No.1 0.85 mm (0.0335 in.)

No. 2 0.97 mm (0.0382 in.)

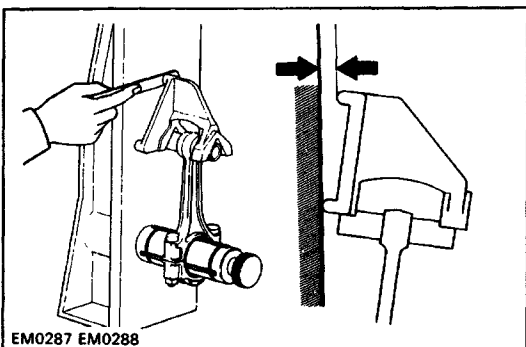
Oil (Side rail) 0.90 mm (0.0354 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



D. Inspect piston pin fit

At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



A. Inspect connecting rod alignment

Using rod aligner and feeler gauge, check the connecting rod alignment.

- Check for bending.

Maximum bending:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

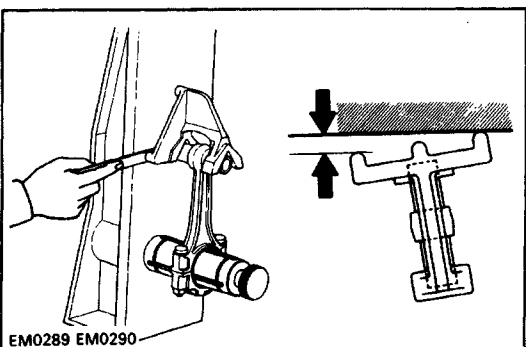
If bend is greater than maximum, replace the connecting rod assembly.

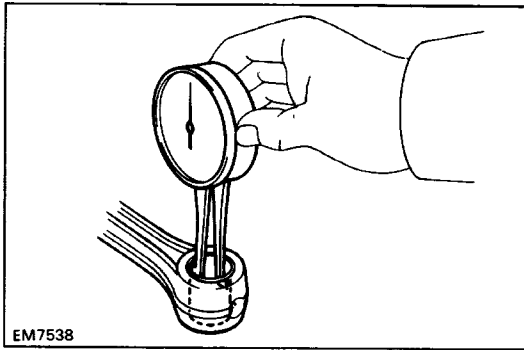
- Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.



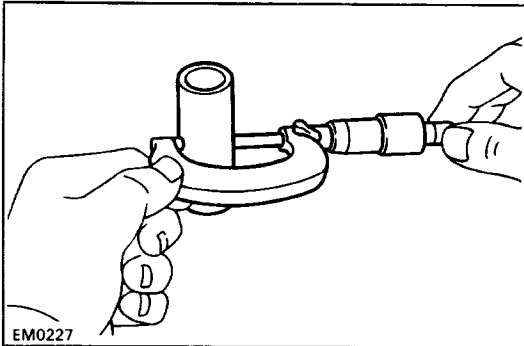


EM7538

B. Inspect piston pin oil clearance

- (a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

**Bushing inside diameter: 22.005 – 22.017 mm
(0.8663 – 0.8668 in.)**



EM0227

- (b) Using a micrometer, measure the piston pin diameter.

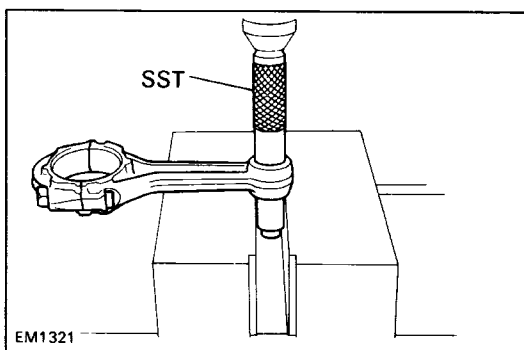
**Piston pin diameter: 21.997 – 22.009 mm
(0.8660 – 0.8665 in.)**

- (c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

**Standard oil clearance: 0.005 – 0.011 mm
(0.0002 – 0.0004 in.)**

Maximum oil clearance: 0.05 mm (0.0020 in.)

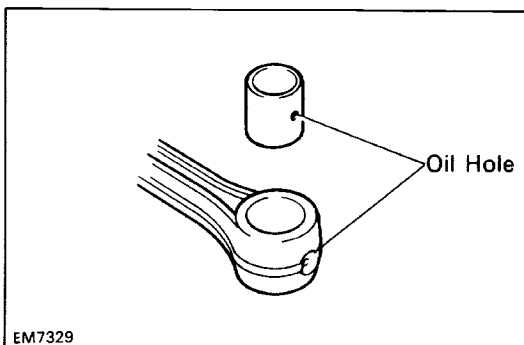
If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.



EM1321

C. If necessary, replace connecting rod bushing

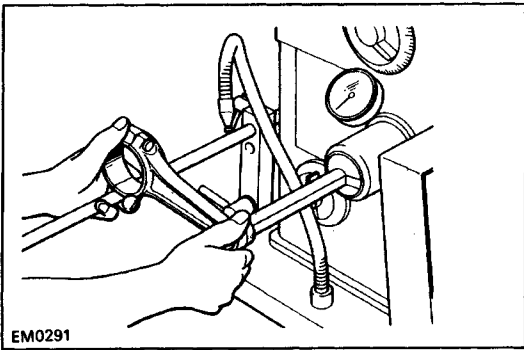
- (a) Using SST and a press, press out the bushing.
SST 09222-30010



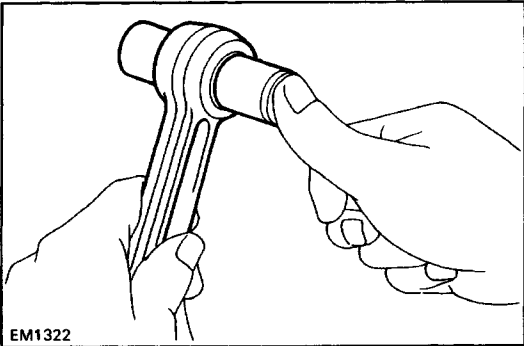
EM7329

- (b) Align the oil holes of a new bushing and the connecting rod.

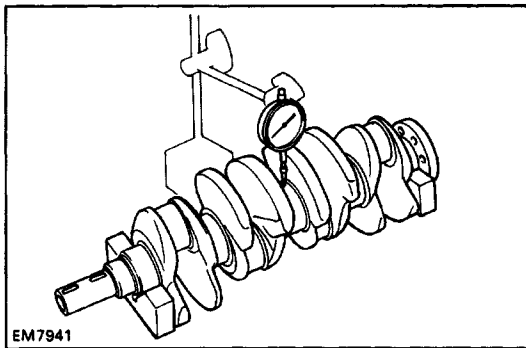
- (c) Using SST and a press, press in the bushing.
SST 09222-30010



- (d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.



- (e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



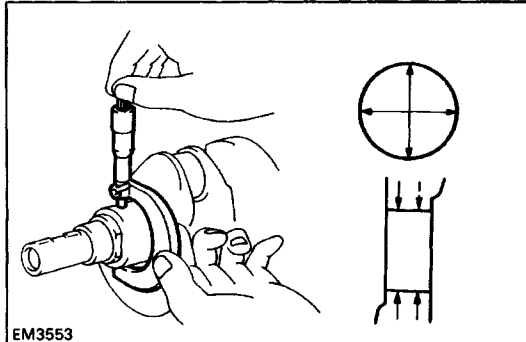
INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

- (a) Place the crankshaft on V-blocks.
- (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.



2. INSPECT MAIN JOURNALS AND CRANK PINS

- (a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD **54.988 – 55.003 mm**
 (2.1653 – 2.1655 in.)

U/S 0.25 **54.745 – 54.755 mm**
 (2.1553 – 2.1557 in.)

Crank pin diameter:

STD **47.985 – 48.000 mm**
 (1.8892 – 1.8898 in.)

U /S 0.25 **47.745 – 47.755 mm**
 (1.8797 – 1.8801 in.)

If the diameter is not as specified, check the oil clearance (See pages [EM-234](#) to 238). If necessary, grind or replace the crankshaft.

- (b) Check each main journal and crank pin for taper and out-of-round as shown.

Maximum taper and out-of-round: 0.02 mm (0.0008 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.

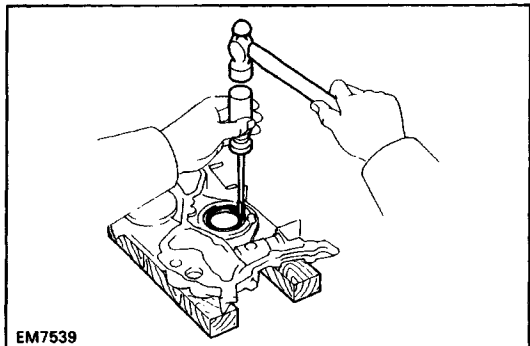
3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 2).

Install new main journal and/or crank pin undersized bearings.

REPLACEMENT OF CRANKSHAFT OIL SEALS

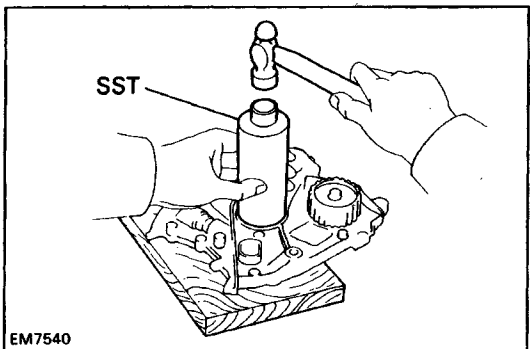
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

A. If oil pump is removed from cylinder block:

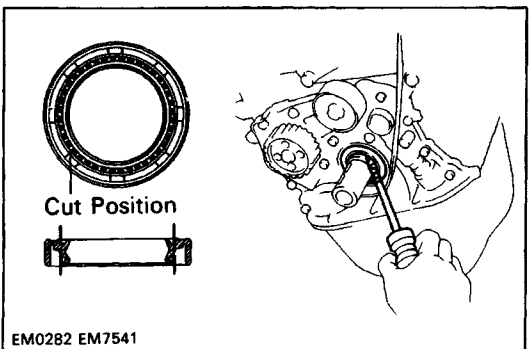
(a) Using screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.

SST 09226-10010

(c) Apply MP grease to the oil seal lip.



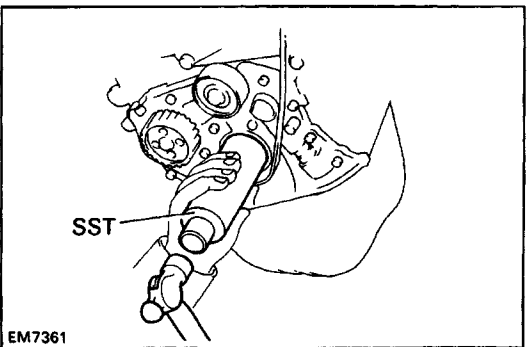
B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft.

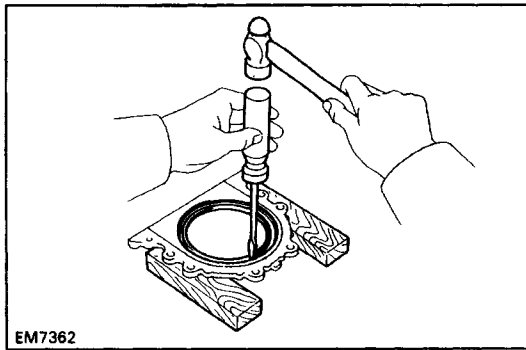
Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.

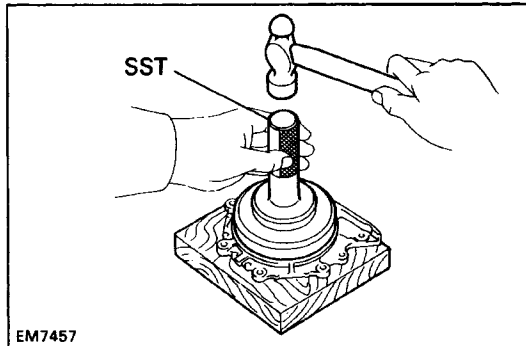
SST 09226-10010



2. REPLACE CRANKSHAFT REAR OIL SEAL

A. If rear oil seal retainer is removed from cylinder block:

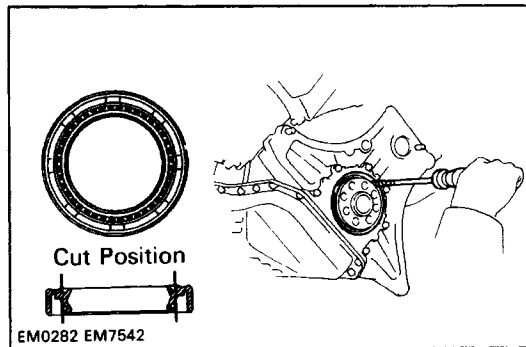
- (a) Using screwdriver and hammer, tap out the oil seal.



- (b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.

SST 09223-63010

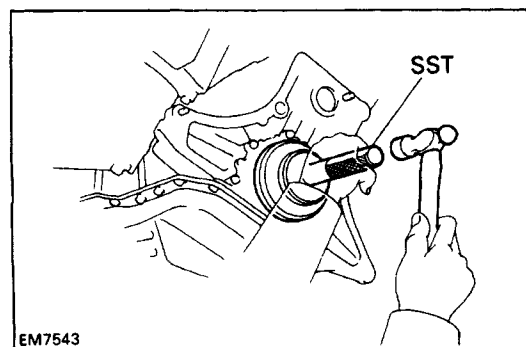
- (c) Apply MP grease to the oil seal lip.



B. If rear oil seal retainer is installed to cylinder block:

- (a) Using a knife, cut off the oil seal lip.
 (b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



- (c) Apply M P grease to a new oil seal lip.
 (d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

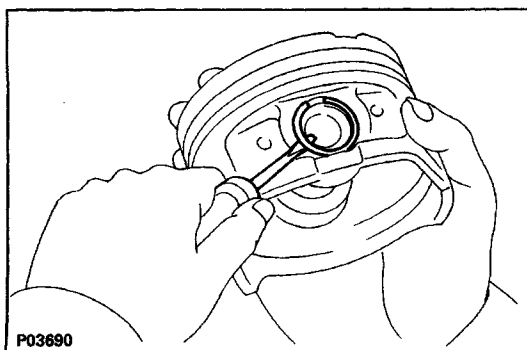
SST 09223-63010

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

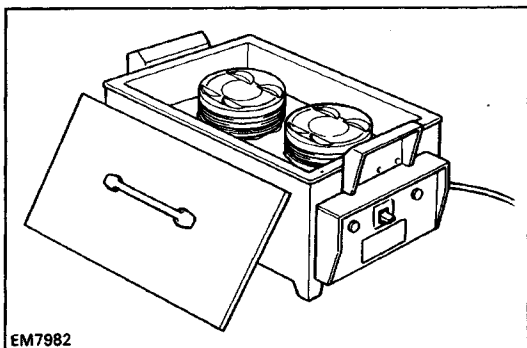
1. ASSEMBLE PISTON AND CONNECTING ROD

- (a) Using a small screwdriver, install a new snap ring on one side of the piston pin hole.

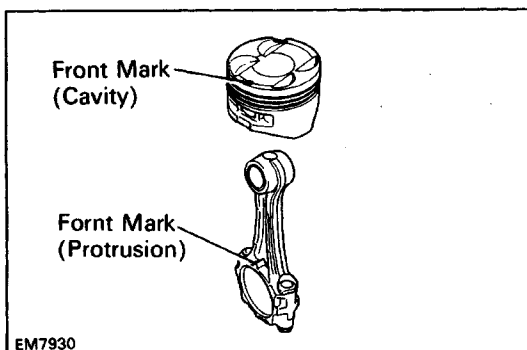
HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



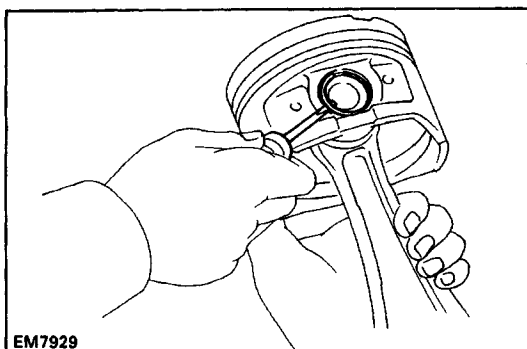
- (b) Gradually heat the piston to 80 – 90°C (176 – 194°F).



- (c) Coat the piston pin with engine oil.
 (d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

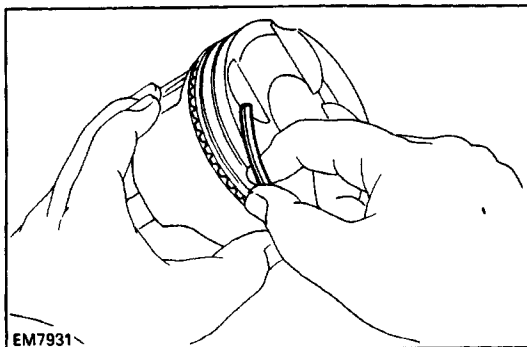


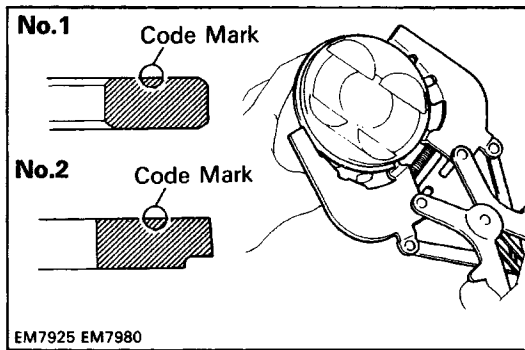
- (e) Using a small screwdriver, install a new snap ring on the other side of the piston pin hole.
 HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



2. INSTALL PISTON RINGS

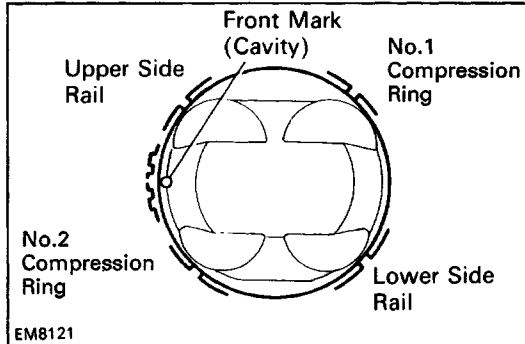
- (a) Install the oil ring expander and two side rails by hand.





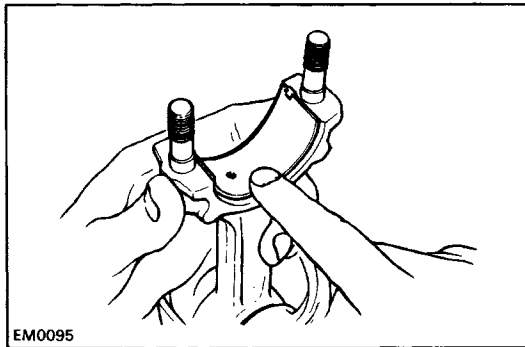
- (b) Using a piston ring expander, install the two compression rings with the code mark facing upward.

Code mark: R



- (c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

ASSEMBLY OF CYLINDER BLOCK

(See page EM-223)

HINT:

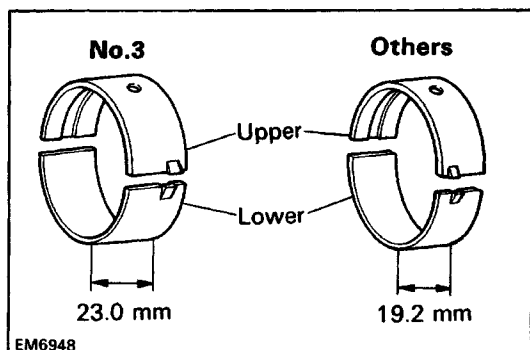
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

1. INSTALL OIL NOZZLES (See page LU-31)

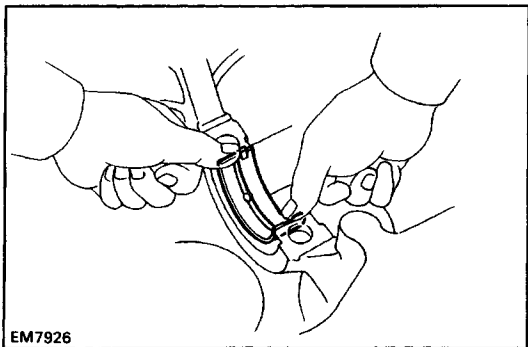
2. INSTALL MAIN BEARINGS

HINT:

- Main bearings come in widths of 19.2 mm (0.756 in.) and 23.0 mm (0.906 in.). Install the 23.0 mm (0.906 in.) bearings in the No.3 cylinder block journal position with the main bearing cap. Install the 19.2 mm (0.756 in.) bearings in the other positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.

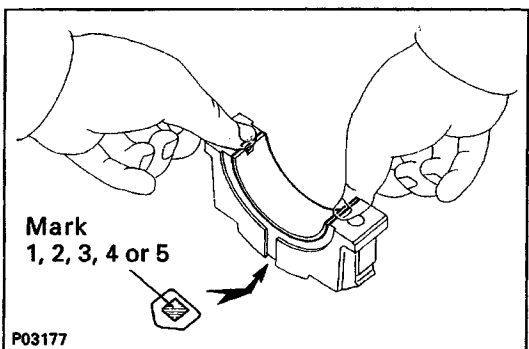


EM6948



EM7926

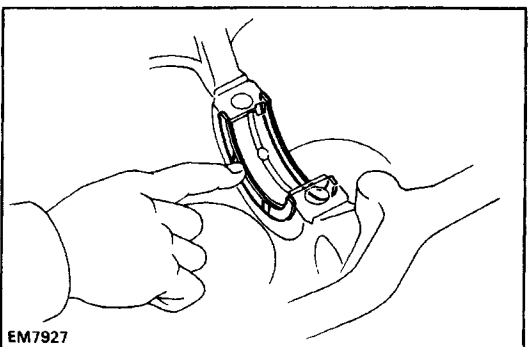
- (a) Align the bearing claw with the claw groove of the cylinder block, and push in the five upper bearings.



P03177

- (b) Align the bearing claw with the claw groove of the main bearing cap, and push in the five lower bearings.

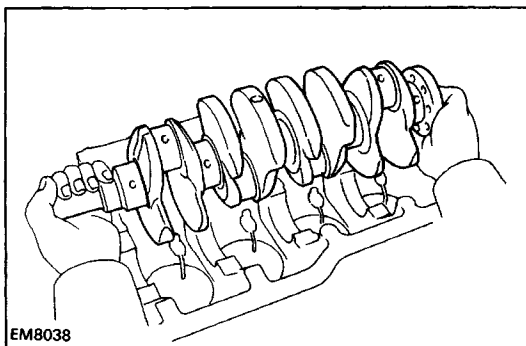
HINT: A number is marked on each main bearing cap to indicate the installation position.



EM7927

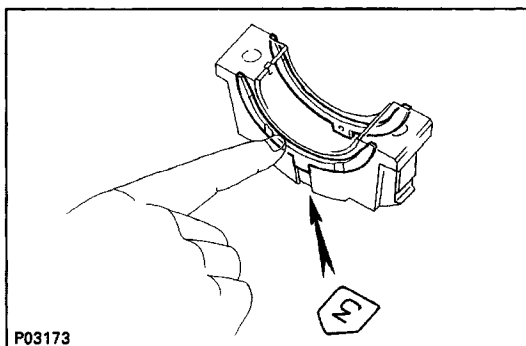
3. INSTALL UPPER THRUST WASHERS

Install the two thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.



EM8038

4. PLACE CRANKSHAFT ON CYLINDER BLOCK



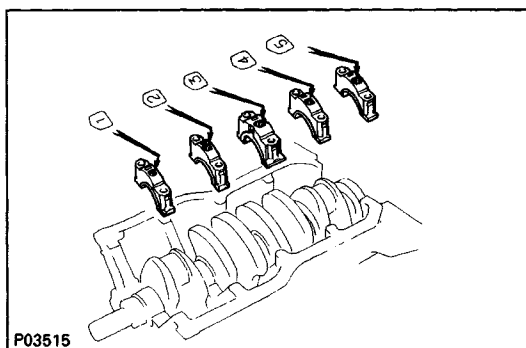
P03173

5. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

(a) Install the two thrust washers on the No.3 bearing cap with the grooves facing outward.

(b) Install the five main bearing caps in their proper locations.

HINT: Each bearing cap has a number and front mark.



P03515

(c) Apply a light coat of engine oil on the threads and under the heads of the main bearing caps.

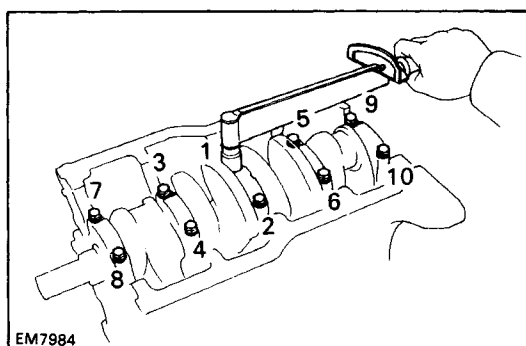
(d) Install and uniformly tighten the ten bolts of the main bearing caps in several passes in the sequence shown.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)

(e) Check that the crankshaft turns smoothly.

(f) Check the crankshaft thrust clearance.

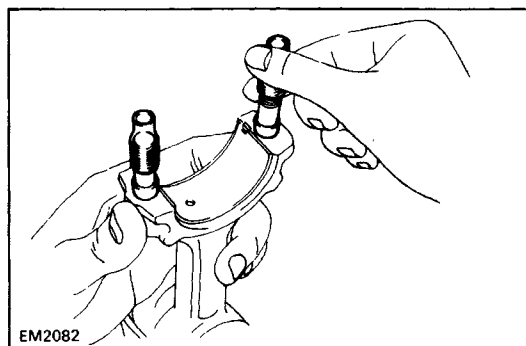
(See step 5 on page [EM-236](#))



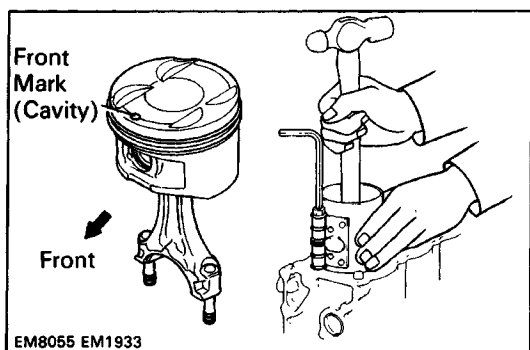
EM7984

6. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

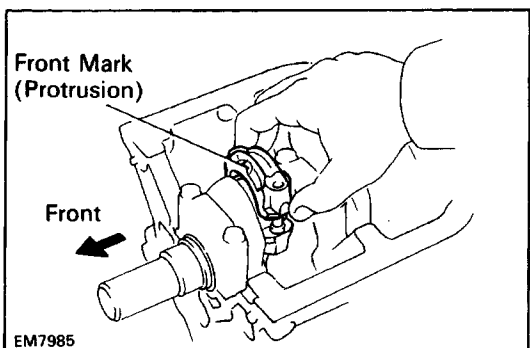
(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



EM2082

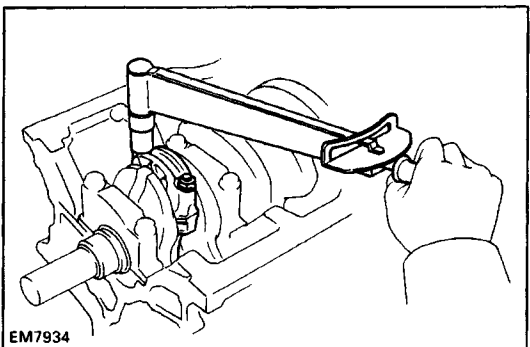


- (b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



7. INSTALL CONNECTING ROD CAPS

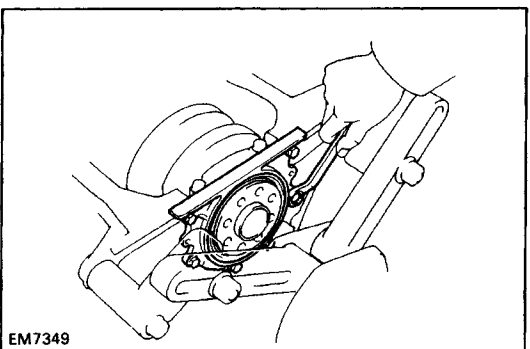
- (a) Match the numbered connecting rod cap with the connecting rod.
- (b) Install the connecting rod cap with the front mark facing forward.



- (c) Apply a light coat of engine oil on the threads and under the cap nuts.
- (d) Using SST, install and alternately tighten the cap nuts in several passes.

Torque: 67 N-m (680 kgf-cm, 49 ft-lbf)

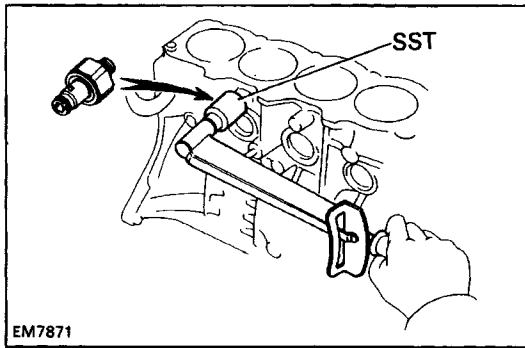
- (e) Check that the crankshaft turns smoothly.
- (f) Check the connecting rod thrust clearance.
(See step 2 on page [EM-234](#))



8. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and the retainer with the six bolts.

Torque: 9.3 N-m (95 kgf-cm, 82 in-lbf)



POST ASSEMBLY

1. INSTALL KNOCK SENSOR

Using SST, install the knock sensor.

SST 09816-30010

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

2. INSTALL OIL COOLER (See pages LU-26 and 27)

3. INSTALL OIL FILTER (See page LU-7)

4. INSTALL OIL PUMP AND OIL PAN

(See pages LU-21 to 23)

5. INSTALL WATER PUMP AND IDLER PULLEY BRACKET (See pages CO-14 and 15)

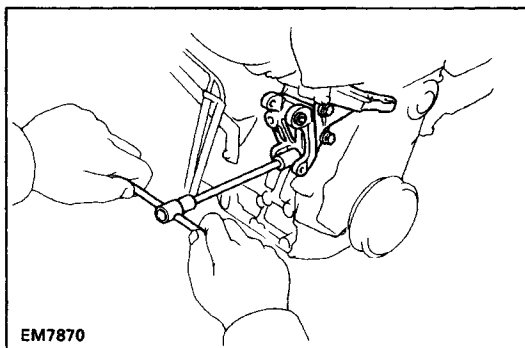
6. INSTALL CYLINDER HEAD

(See pages EM-140 to 148)

7. INSTALL TURBOCHARGER (See pages TC-15 to 17)

8. INSTALL PULLEYS AND TIMING BELT

(See pages EM-55 to 60)



9. INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the three bolts.

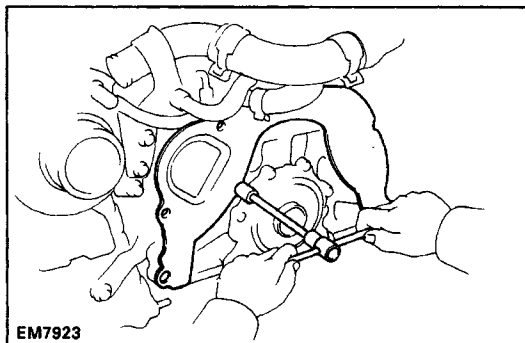
Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

10. INSTALL PS PUMP BRACKET

Install the PS pump bracket with the three bolts.

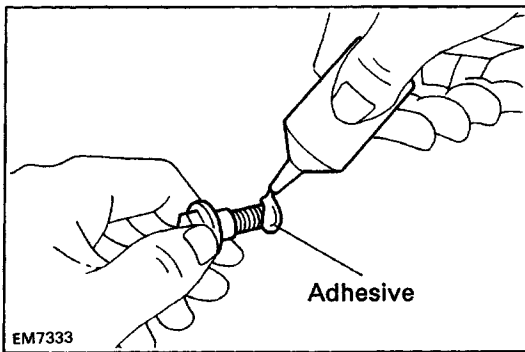
Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

11. REMOVE ENGINE STAND



12. INSTALL REAR END PLATE

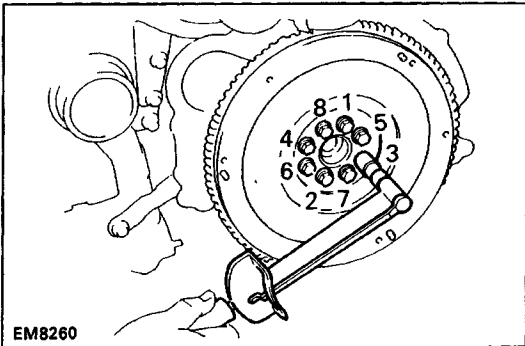
Torque: 9.3 N-m 195 kgf-cm, 82 in-lbf)



13. INSTALL FLYWHEEL

- (a) Apply adhesive to two or three threads of the mounting bolt end.

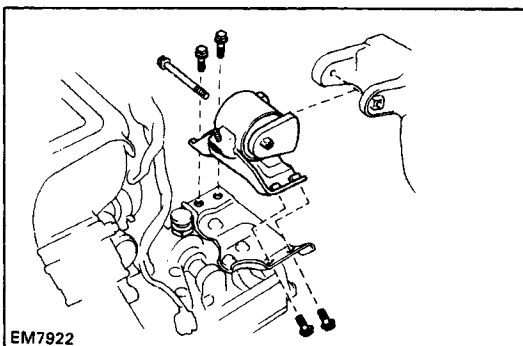
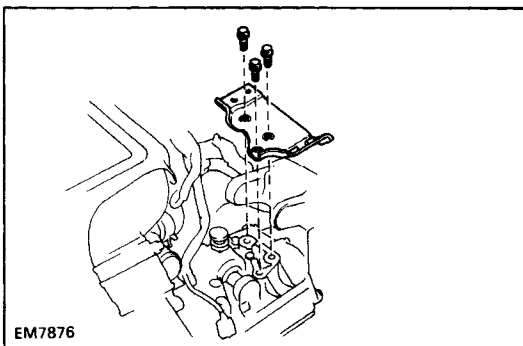
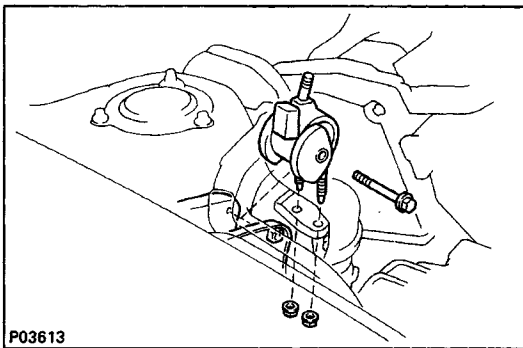
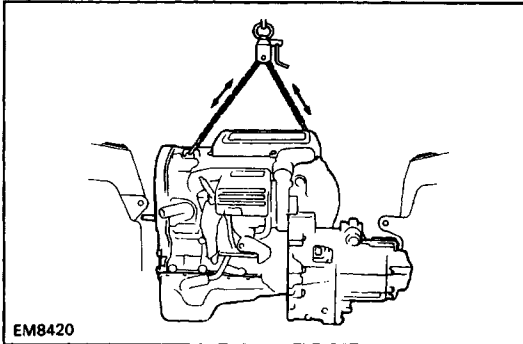
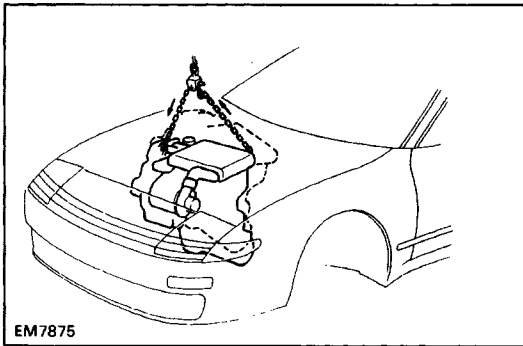
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent



- (b) Install the flywheel on the crankshaft.
(c) Install and uniformly tighten the mounting bolts in several passes in the sequence shown.

Torque: 108 N-m (1,100 kgf-cm, 80 ft-lbf)

14. INSTALL CLUTCH DISC AND COVER (See CL section)



INSTALLATION OF ENGINE

1. ASSEMBLE ENGINE AND TRANSAXLE

(See MT section)

2. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

- (a) Attach the engine chain hoist to the engine hangers.
- (b) Lower the engine into the engine compartment. Tilt the transaxle downward, lower the engine and clear the LH mounting.

NOTICE: Be careful not to hit the PS gear housing.

- (c) Keep the engine level, and align RH and LH mountings with the body bracket.

- (d) Attach the RH mounting insulator to the mounting bracket and body, and temporarily install the through bolt and two nuts.

- (e) Install the LH mounting bracket to the transaxle case with the three bolts.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

- (f) Attach the LH mounting insulator to the mounting bracket and body with the through bolt and four bolts. Tighten the bolts.

Torque:

Bolt 63 N-m (650 kgf-cm, 47 ft-lbf)

Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

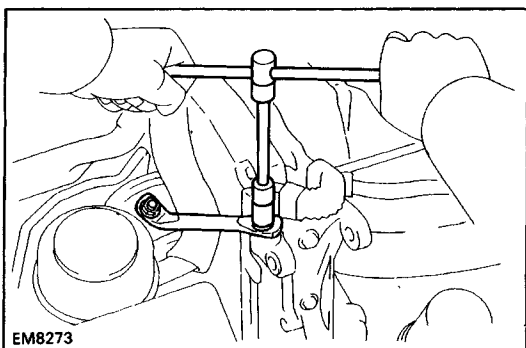
- (g) Tighten the through bolt and two nuts of the RH mounting insulator.

Torque:

Nut 52 N-m (530 kgf-cm, 38 ft-lbf)

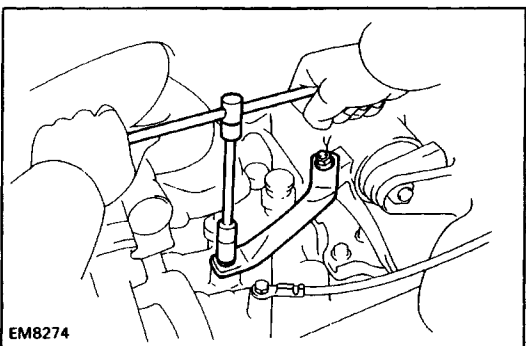
Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

- (h) Remove the engine chain hoist from the engine.

**3. INSTALL RH ENGINE MOUNTING STAY**

Install the mounting stay with the bolt and nut.

Torque: 73 N-m (740 kgf-cm, 54 ft-lbf)

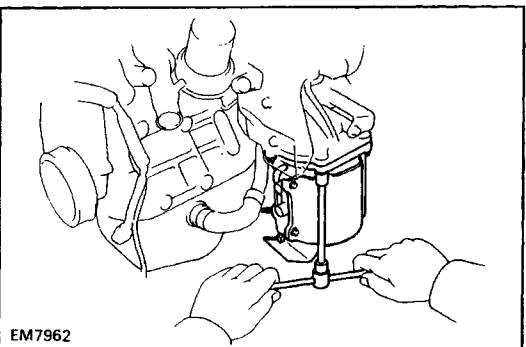
**4. INSTALL LH ENGINE MOUNTING STAY**

Install the mounting stay with the bolt and nut.

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

5. CONNECT GROUND STRAP

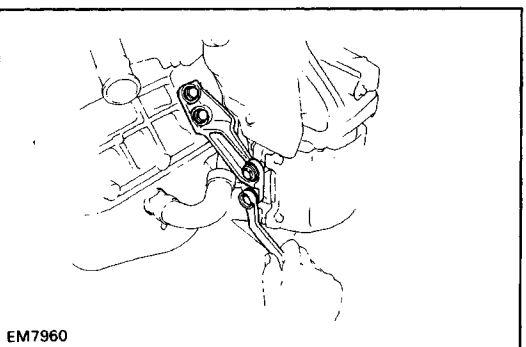
Connect the ground strap to the transaxle with the bolt.

**6. INSTALL CATALYTIC CONVERTER**

(a) Place new cushion, retainer and gasket on the catalytic converter.

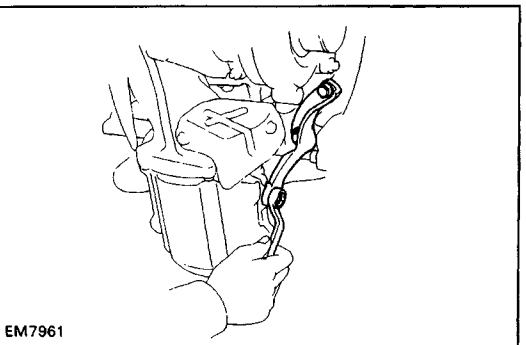
(b) Install the catalytic converter with the three bolts and two nuts.

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



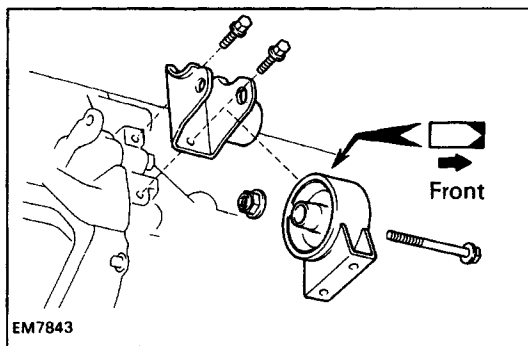
(c) Install the RH converter stay with the four bolts.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)



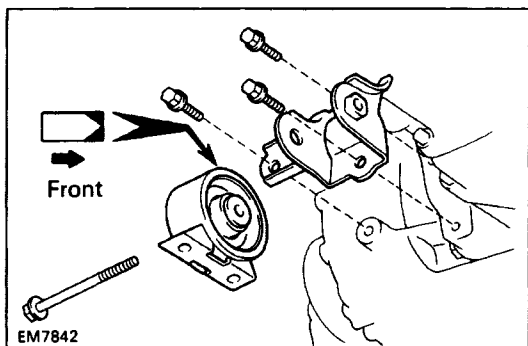
(d) Install the LH converter stay with the three bolts.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)



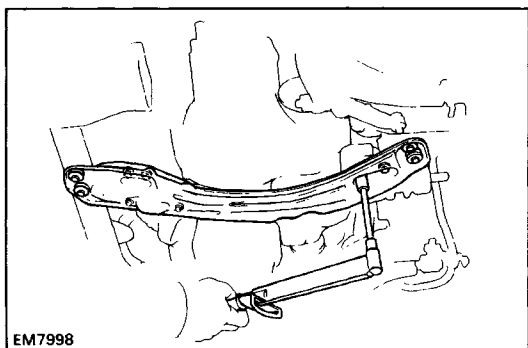
7. INSTALL FRONT ENGINE MOUNTING BRACKET AND INSULATOR

- (a) Install the mounting bracket with the two bolts.
Torque: 77 N-m (790 kgf-cm, 57 ft-lbf)
- (b) Temporarily install the mounting insulator with the through bolt and nut.



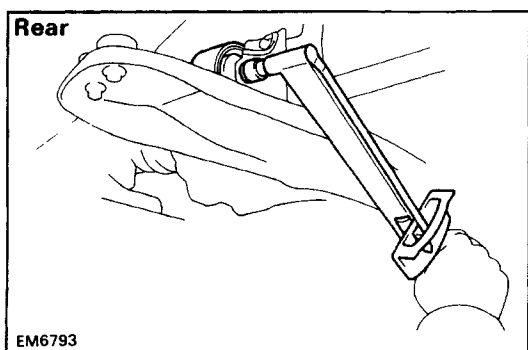
8. INSTALL REAR ENGINE MOUNTING BRACKET AND INSULATOR

- (a) Install the mounting bracket with the three bolts.
Torque: 77 N-m (790 kgf-cm, 57 ft-lbf)
- (b) Temporarily install the mounting insulator with the through bolt.



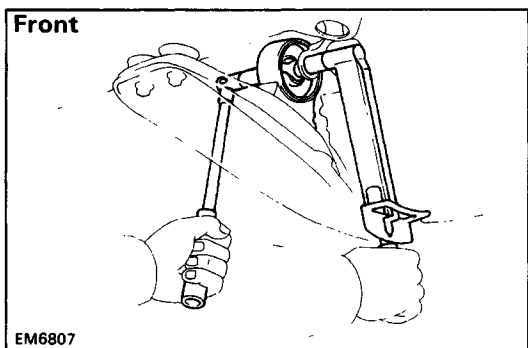
9. INSTALL ENGINE MOUNTING CENTER MEMBER

- (a) Install the engine mounting center member with the four bolts.
Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)
- (b) Install and torque the four bolts holding the insulators to the center member.
Torque: 73 N-m (740 kgf-cm, 54 ft-lbf)

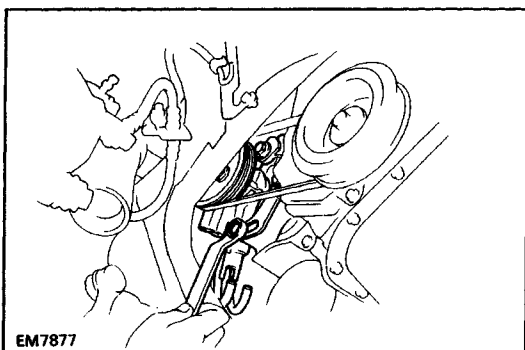


10. TIGHTEN FRONT AND REAR ENGINE MOUNTING THROUGH BOLTS

- (a) Tighten the rear through bolt.
Torque: 87 N-m (890 kgf-cm, 64 ft-lbf)



- (b) Tighten the front through bolt.
Torque: 87 N-m (890 kgf-cm, 64 ft-lbf)

**11. INSTALL PS PUMP**

(a) Install the PS pump with the four bolts.

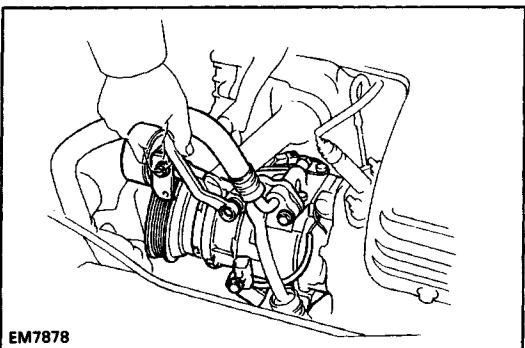
Torque:

Adjusting bolt 39 N-m (400 kgf-cm, 29 ft-lbf)

Others 43 N-m (440 kgf-cm, 32 ft-lbf)

(b) Install the drive belt.

(c) Connect the two air hoses to the air pipe.

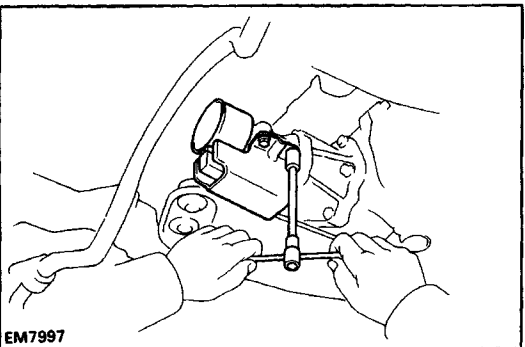
**12. INSTALL A/C COMPRESSOR AND IDLER PULLEY BRACKET**

(a) Install the compressor and idler pulley bracket with the four bolts.

Torque: 27 N-m (280 kgf-cm, 20 ft-lbf)

(b) Connect the two connectors.

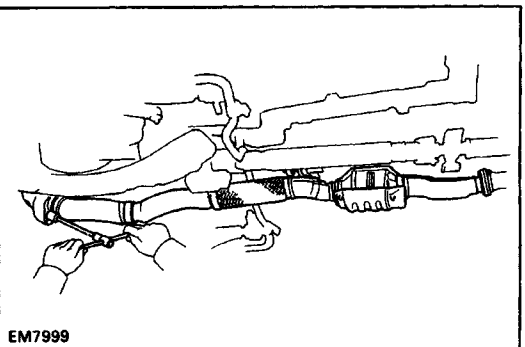
(c) Connect the A/C compressor connector.

13. INSTALL ALTERNATOR (See page CH-23)**14. INSTALL DEFLECTOR TO TRANSFER EXTENSION HOUSING****15. INSTALL DYNAMIC DAMPER TO TRANSFER EXTENSION HOUSING****16. INSTALL FRONT PROPELLER SHAFT**

(See PR section)

17. INSTALL DRIVE SHAFTS

(See SA section)

**18. INSTALL FRONT EXHAUST PIPE**

(a) Install the support hook on the front exhaust pipe to the support bracket.

(b) Place two new gaskets on the front and rear of the front exhaust pipe.

(c) Temporarily install the two bolts and new nuts holding the exhaust pipe to the center exhaust pipe.

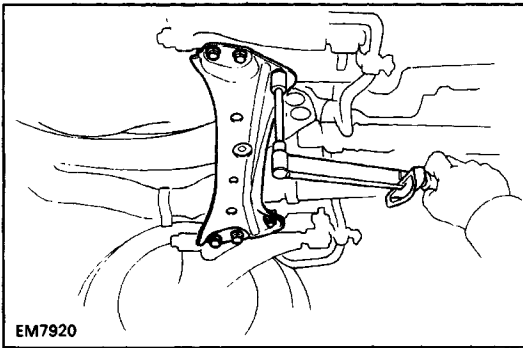
(d) Using a 14 mm deep socket wrench, install the three new nuts holding the exhaust pipe to the catalytic converter.

Torque: 62 N-m (630 kgf-cm, 46 ft-lbf)

(e) Tighten the two bolts and nuts holding the exhaust pipe to the center exhaust pipe.

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

(f) Install the clamp with the bolt.

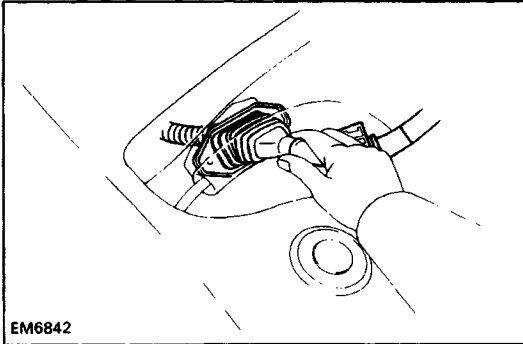


EM7920

19. INSTALL SUSPENSION LOWER CROSSMEMBER

Install the lower crossmember with the four bolts and two nuts.

Torque: 152 N-m (1,550 kgf-cm, 112 ft-lbf)



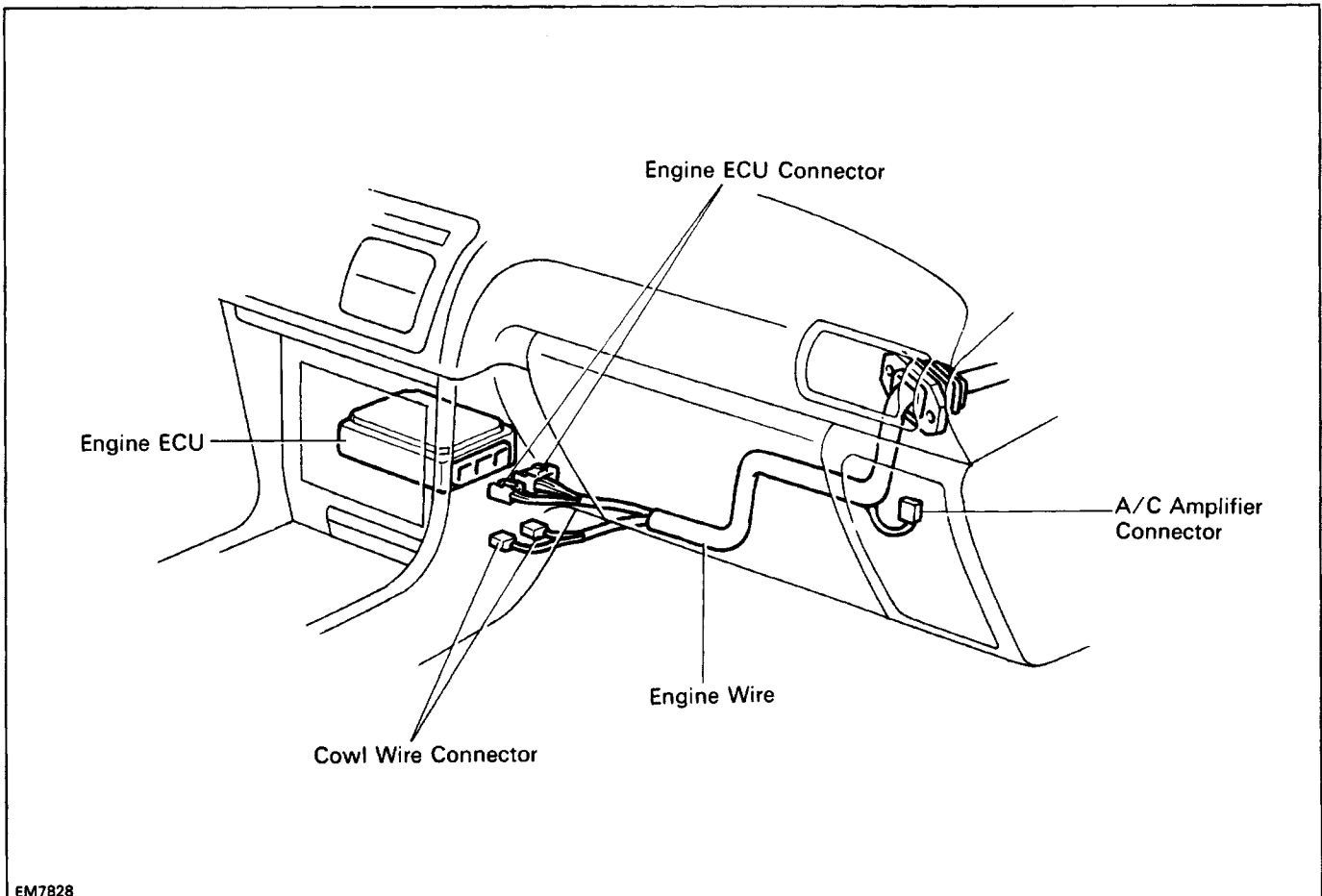
EM6842

20. CONNECT ENGINE WIRE TO CABIN

(a) Push in the engine wire through the cowl panel.
Install the two nuts.

(b) Connect the following connectors.

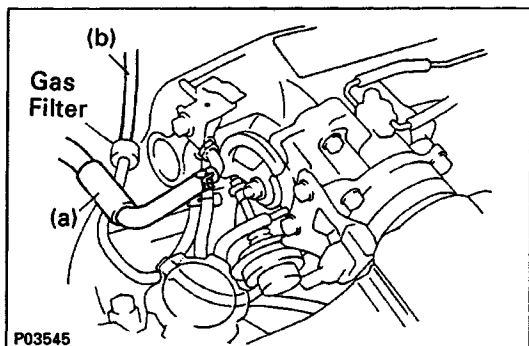
- (1) Two engine ECU connectors
- (2) Two cowl wire connectors
- (3) A/C amplifier connector



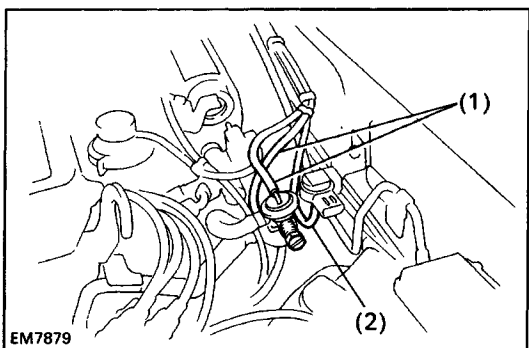
EM7828

21. CONNECT ENGINE WIRE

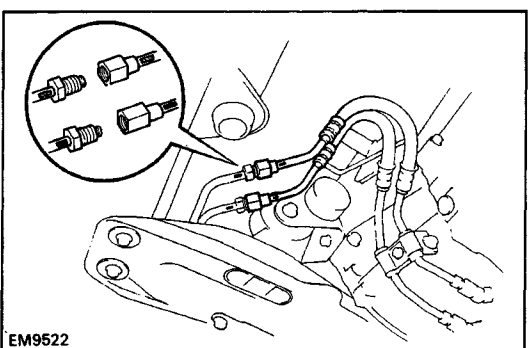
- (a) Engine wire clamp to wire bracket on RH fender apron
- (b) Two cowl wire connectors

**22. CONNECT HOSES**

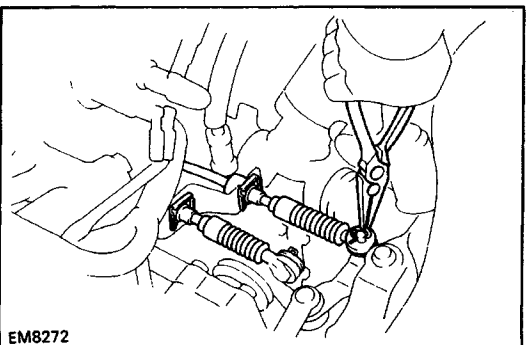
- (a) Brake booster vacuum hose from intake manifold
- (b) Turbocharging pressure sensor hose from gas filter

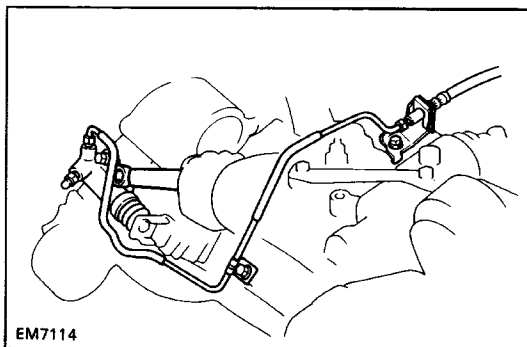
**23. INSTALL TURBOCHARGING PRESSURE SENSOR AND A/C ASV**

- (a) Install the turbocharging pressure sensor and A/C ASV with the bolt.
- (b) Connect the following hoses:
 - (1) Two vacuum hoses to ASV (from A/C ASV)
 - (2) Vacuum hose to ASV (from turbocharging pressure sensor)
- (c) Connect turbocharging pressure sensor connector.

**24. CONNECT TRANSAXLE OIL COOLER TUBE**

- (a) Align the matchmarks on the oil cooler hoses and tubes.
 - (b) Connect the two oil cooler hoses.
- Torque: 34 N-m (350 kgf-cm, 25 ft-lbf)**

**25. CONNECT TRANSAXLE CONTROL CABLES TO TRANSAXLE**



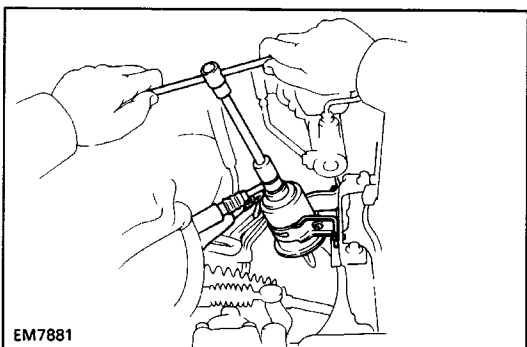
EM7114

26. INSTALL CLUTCH RELEASE CYLINDER

Install the release cylinder and tube with the four bolts.

27. INSTALL STARTER (See page ST-22)**28. CONNECT CONNECTORS**

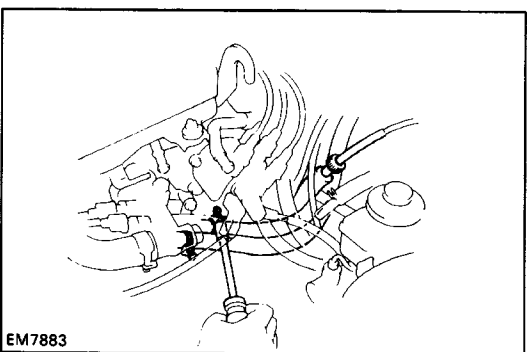
- (1) Engine room wire connector
- (2) Noise filter connector



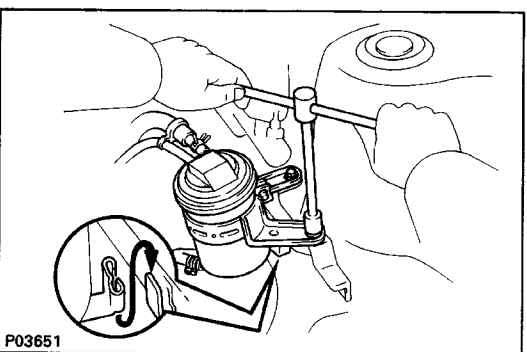
EM7881

29. CONNECT FUEL HOSES

Torque (Union bolt): 29 N-m (300 kgf-cm, 22 ft-lbf)



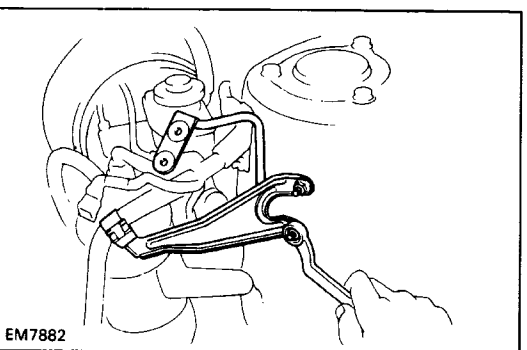
EM7883

30. CONNECT SPEEDOMETER CABLE**31. CONNECT HEATER HOSES**

P03651

32. INSTALL CHARCOAL CANISTER

- (a) Install the charcoal canister with the two bolts.
- (b) Connect the three hoses.



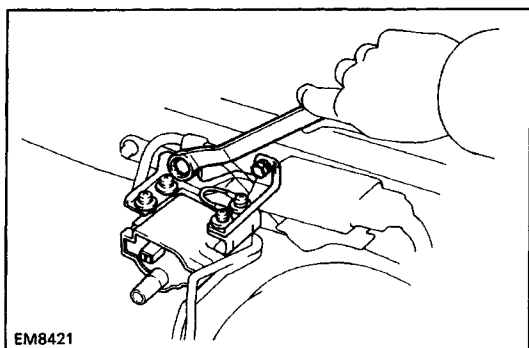
EM7882

33. INSTALL ENGINE WIRE BRACKET

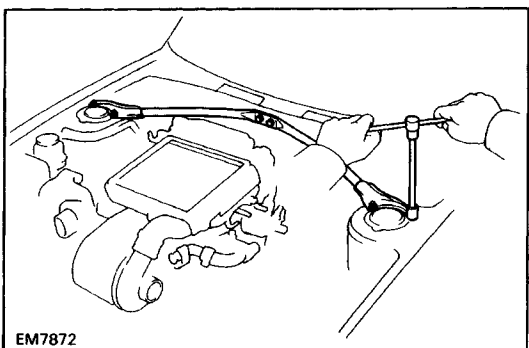
- (a) Install the wire bracket with the two bolts. Install the noise filter.
- (b) Install the wire clamp to the wire bracket.

34. CONNECT WIRES AND CONNECTORS

- (a) Check connector
- (b) Igniter connector
- (c) Ground strap from LH fender apron

**35. INSTALL IGNITION COIL**

- (a) Install the ignition coil with the two bolts.
- (b) Connect the high-tension cord.
- (c) Connect the ignition coil connector.

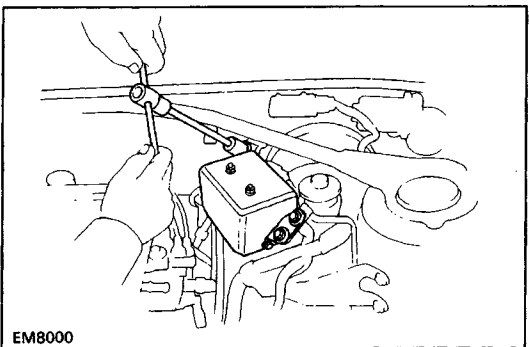
**36. INSTALL SUSPENSION UPPER BRACE**

- (a) Install the suspension upper brace with the two bolts and four bolts.

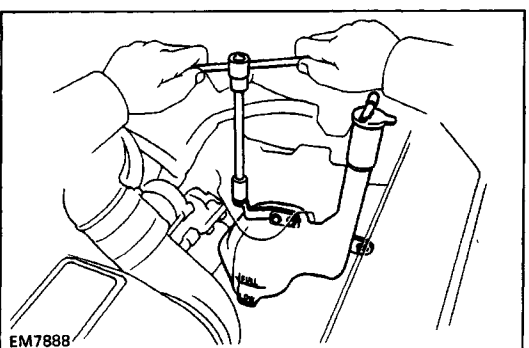
Torque: Bolt 21 N-m (210 kgf-cm, 15 ft-lbf)

Nut 64 N-m (650 kgf-cm, 47 ft-lbf)

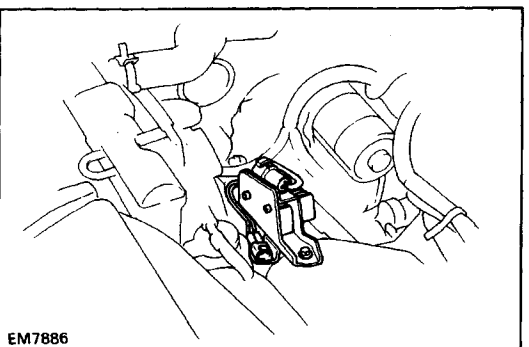
- (b) Install the outside lower windshield moulding.
- (c) Install the two wiper arms.

**37. (w/ CRUISE CONTROL SYSTEM)****INSTALL CRUISE CONTROL ACTUATOR**

- (a) Connect the cable to the actuator.
- (b) Connect the actuator connector
- (c) install the actuator with the three bolts.
- (d) Install the actuator cover with the two nuts.

**38. INSTALL RADIATOR RESERVOIR TANK**

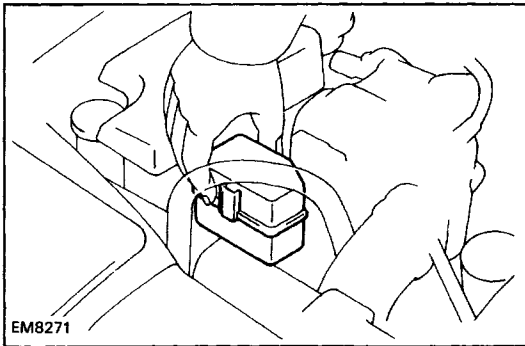
Install the reservoir tank with the two nuts.

39. INSTALL RADIATOR (See pages CO-24 and 25)**40. INSTALL INJECTOR SOLENOID RESISTOR AND FUEL PUMP RESISTOR**

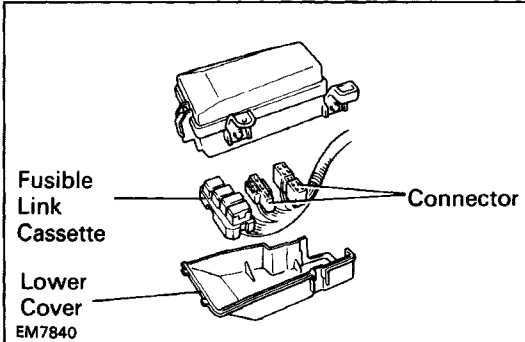
- (a) Install the solenoid resistor and fuel pump resistor with the bolt.

- (b) Connect the two connectors.

41. INSTALL BATTERY



42. INSTALL A/C RELAY BOX

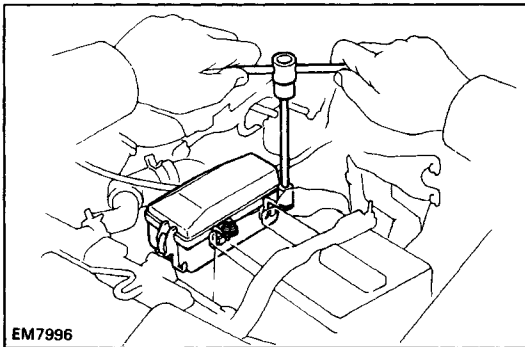


43. CONNECT ENGINE WIRE, AND INSTALL ENGINE RELAY BOX

- (a) Connect the fusible link cassette and two connectors of the engine wire to the relay box.
- (b) Install the lower cover to the relay box.

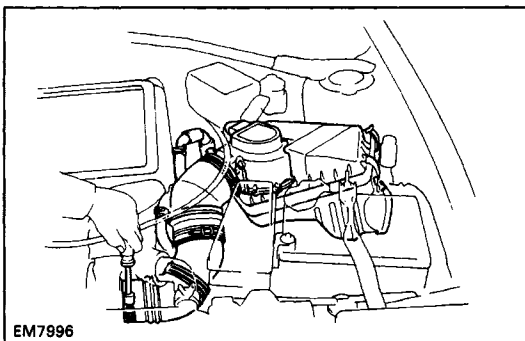
- (c) Install the relay box with the two nuts.

44. INSTALL ACCELERATOR CABLE, AND ADJUST IT



45. INSTALL AIR CLEANER

- (a) Install the air cleaner case with the three bolts.
- (b) Install the air cleaner element.
- (c) Connect the following hoses:
 - (1) Air cleaner hose to turbocharger
 - (2) PCV hose to cylinder head cover
 - (3) Air hose to air pipe
- (d) Install the air cleaner cap and air flow meter.
- (e) Connect the air flow meter connector.



46. FILL WITH TRANSAXLE OIL (See. page [MA-14](#))

Capacity: 5.2 liters (5.1 US qts, 4.6 Imp. qts)

47. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

48. FILL WITH ENGINE COOLANT (See page [CO-6](#))

Capacity (w/ Heater):

6.5 liters (6.9 US qts, 5.7 Imp. qts)

49. FILL WITH ENGINE OIL (See page LU-8)**Capacity:****Drain and refill .****w/ Oil filter change****3.9 liters (4.1 US qts, 3.4 Imp. qts)****w/o Oil filter change****3.6 liters (3.8 US qts, 3.2 Imp. qts)****Dry fill 4.3 liters (4.5 US qts, 3.8 Imp. qts)****50. START ENGINE AND CHECK FOR LEAKS****51. PERFORM ENGINE ADJUSTMENT**

(a) Adjust the alternator drive belt.

Drive belt tension:**w/ A/C New belt 165 ± 10 lbf****Used belt 84 ± 15 lbf****w/o A/C New belt 150 ± 25 lbf****Used belt 130 ± 20 lbf**

(b) Adjust the PS drive belt.

Drive belt tension: New belt 125 ± 25 lbf**Used belt 80 ± 20 lbf**

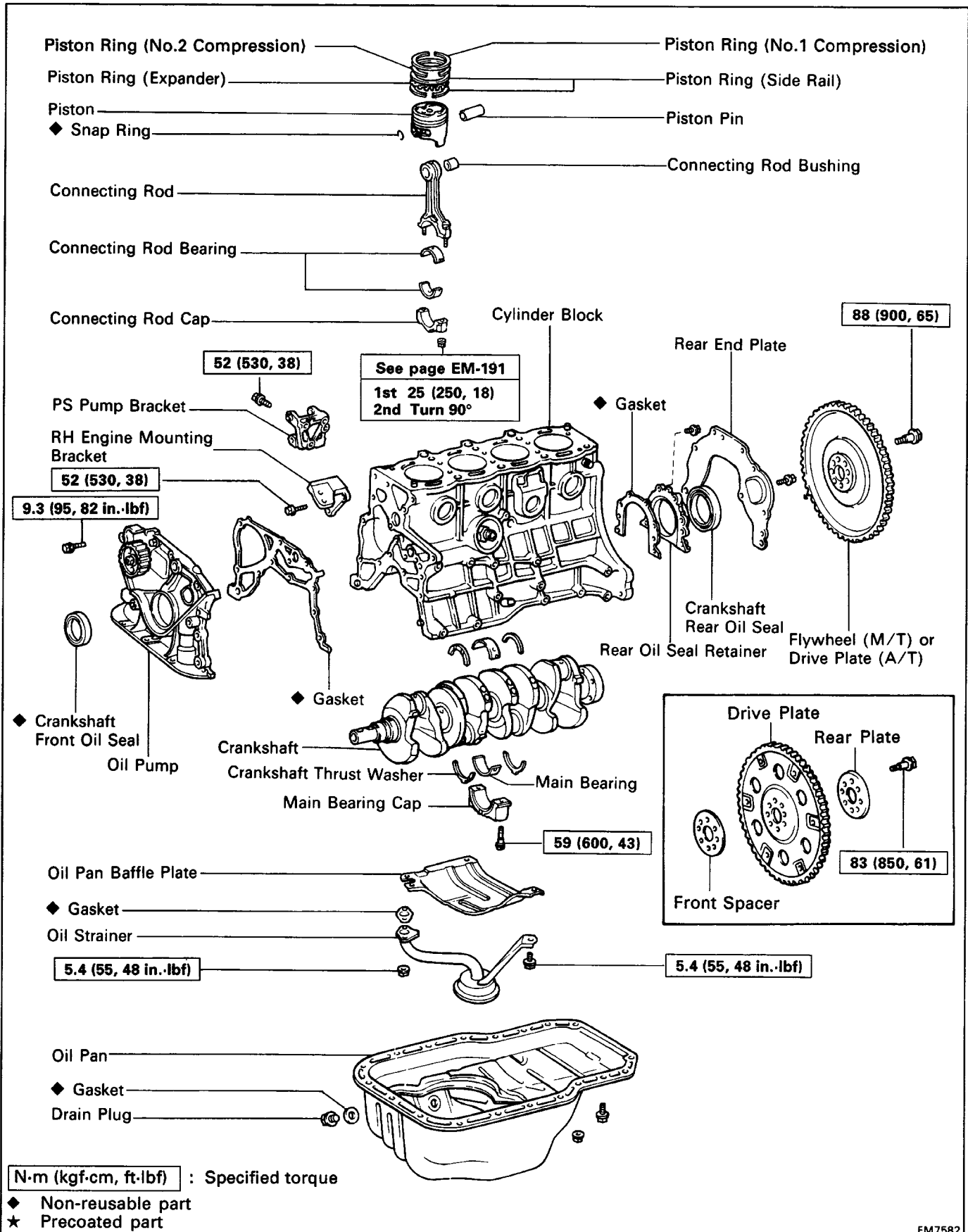
(c) Adjust the ignition timing. (See page IG-29)

Ignition timing:**10° BTDC @ idle****(w/ Terminals TO and E1 connected)****52. INSTALL ENGINE UNDER COVERS****53. INSTALL HOOD****54. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

55. RECHECK ENGINE COOLANT AND OIL LEVELS

CYLINDER BLOCK (5S-FE) COMPONENTS



REMOVAL OF ENGINE

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

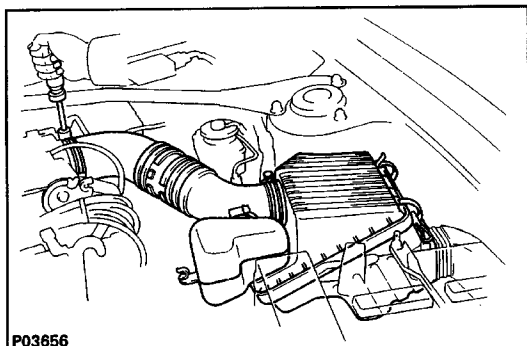
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE HOOD

3. REMOVE ENGINE UNDER COVERS

4. DRAIN ENGINE COOLANT (See page CO-6)

5. DRAIN ENGINE OIL (See page LU-7)



P03656

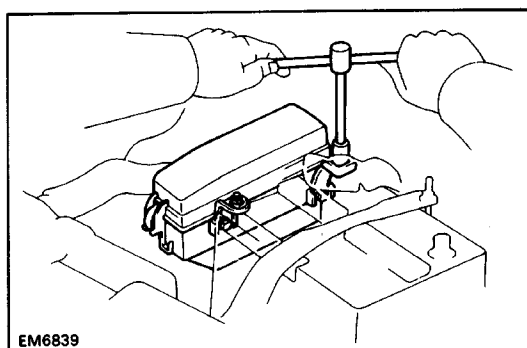
6. REMOVE AIR CLEANER

- (a) Disconnect the air intake temperature sensor connector.
- (b) Disconnect the four air cleaner cap clips.
- (c) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap and element.
- (d) Remove the three bolts and air cleaner case.

7. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

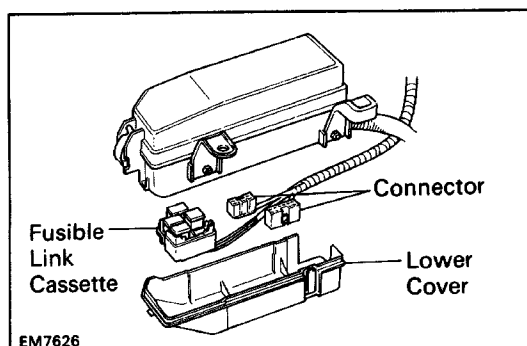
8. REMOVE ENGINE RELAY BOX, AND DISCONNECT ENGINE WIRE CONNECTORS

- (a) Remove the two nuts, and disconnect the relay box from the battery.

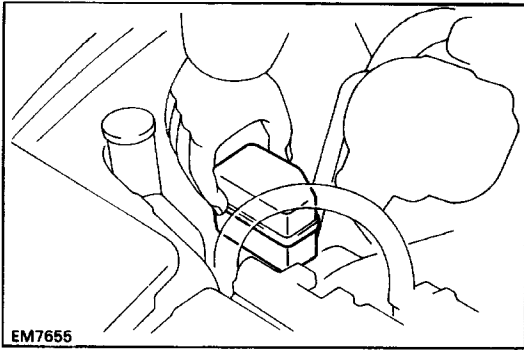


EM6839

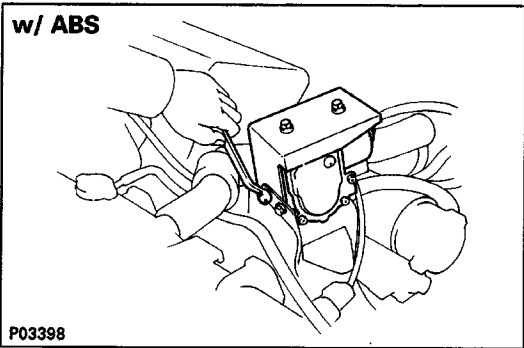
- (b) Remove the lower cover from the relay box.
- (c) Disconnect the fusible link cassette and two connectors of the engine wire from the relay box.



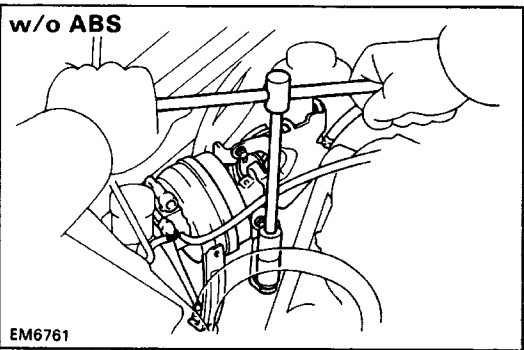
EM7626

**9. REMOVE A/C RELAY BOX FROM BRACKET**

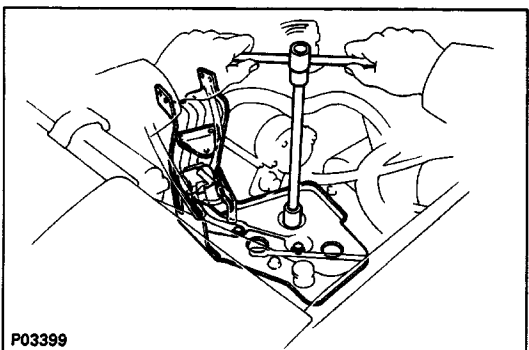
Remove the A/C relay box from the bracket.

10. REMOVE BATTERY**11. (w/ CRUISE CONTROL SYSTEM)
REMOVE CRUISE CONTROL ACTUATOR
(w/ ABS)**

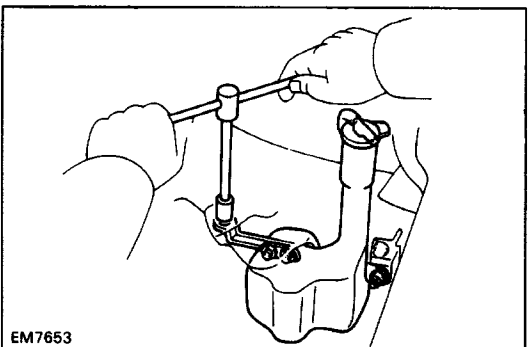
- (a) Disconnect the actuator connector.
- (b) Remove the four bolts, and disconnect the actuator from the bracket.

**(w/o ABS)**

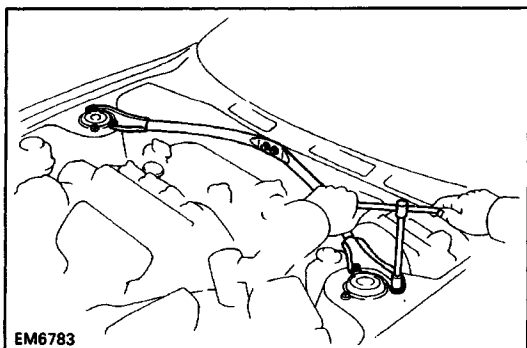
- (a) Remove the actuator cover.
- (b) Disconnect the actuator vacuum hose from the air intake chamber.
- (c) Disconnect the actuator connector
- (d) Disconnect the cable from the actuator.
- (e) Remove the three bolts and actuator.

**12. (w/ CRUISE CONTROL SYSTEM (w/ ABS))
REMOVE CRUISE CONTROL ACTUATOR BRACKET**

- (a) Remove the two bolts and nut.
- (b) Disconnect the actuator connector from the bracket.
- (c) Remove the actuator bracket.

13. REMOVE RADIATOR (See pages CO-22 and 23)**14. REMOVE RADIATOR RESERVOIR TANK**

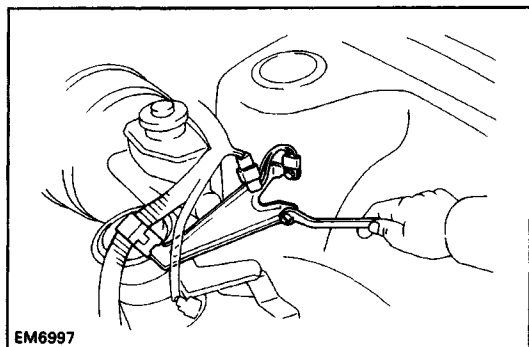
Remove the two nuts and reservoir tank.

**15. REMOVE SUSPENSION UPPER BRACE**

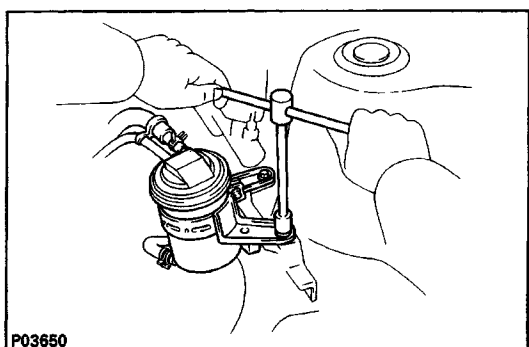
- (a) Remove the two wiper arms.
- (b) Remove outside lower windshield moulding.
- (c) Remove the two bolts, four nuts and upper brace.

16. DISCONNECT WIRES AND CONNECTORS

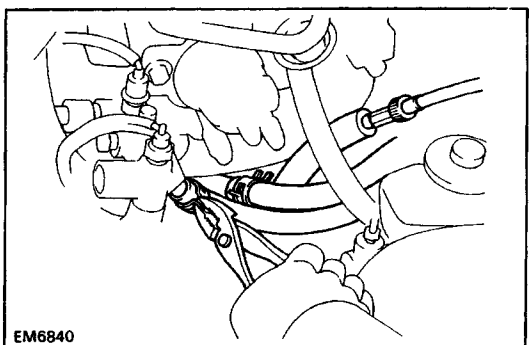
- (a) Check connector
- (b) Igniter connector
- (c) Vacuum sensor connector
- (d) Ground strap from LH fender apron

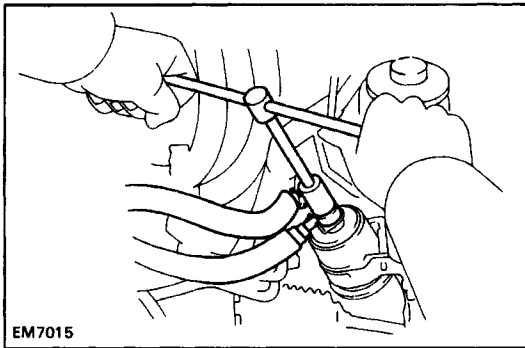
**17. REMOVE ENGINE WIRE BRACKET**

- (a) Disconnect the wire clamp from the wire bracket.
- (b) Remove the two bolts and wire bracket. Disconnect the noise filter.

**18. REMOVE CHARCOAL CANISTER**

- (a) Disconnect the three hoses from the charcoal canister.
- (b) Remove the two bolts and charcoal canister.

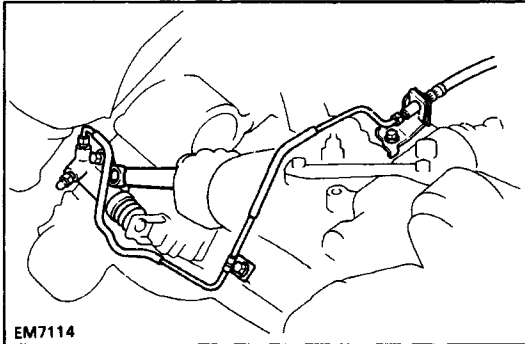
**19. DISCONNECT HEATER HOSES****20. DISCONNECT SPEEDOMETER CABLE**

**21. DISCONNECT FUEL HOSES**

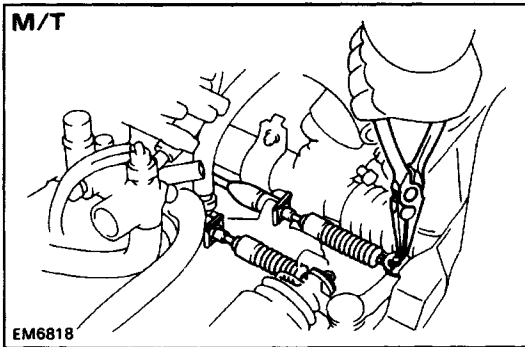
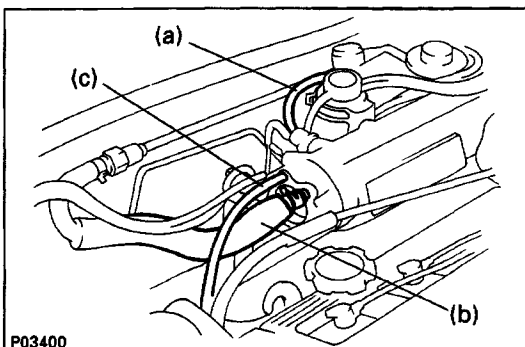
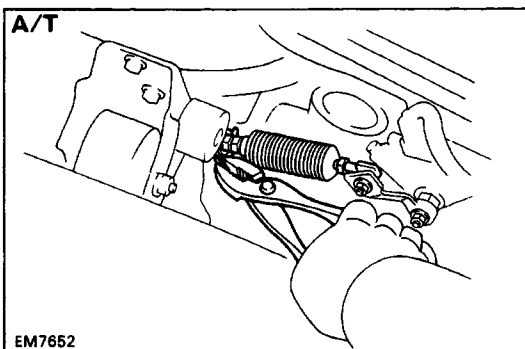
CAUTION: Catch leaking fuel in a container.

22. (M /T)

REMOVE STARTER (See page [ST-5](#))

**23. (M /T)****REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE**

Remove the four bolts, release cylinder and tube from the transaxle.

**24. DISCONNECT TRANSAXLE CONTROL CABLE(S) FROM TRANSAXLE****25. DISCONNECT VACUUM HOSES**

(a) Vacuum sensor hose from gas filter

(b) Brake booster vacuum hose from intake manifold

(c) (w/ Cruise Control System (w/o ABS))

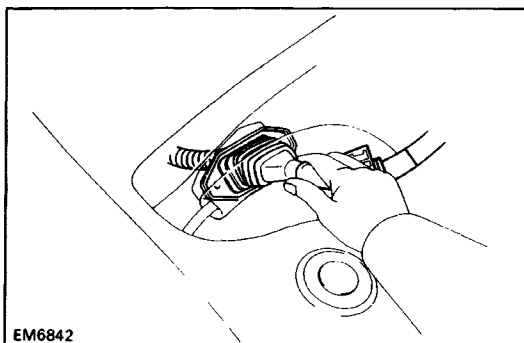
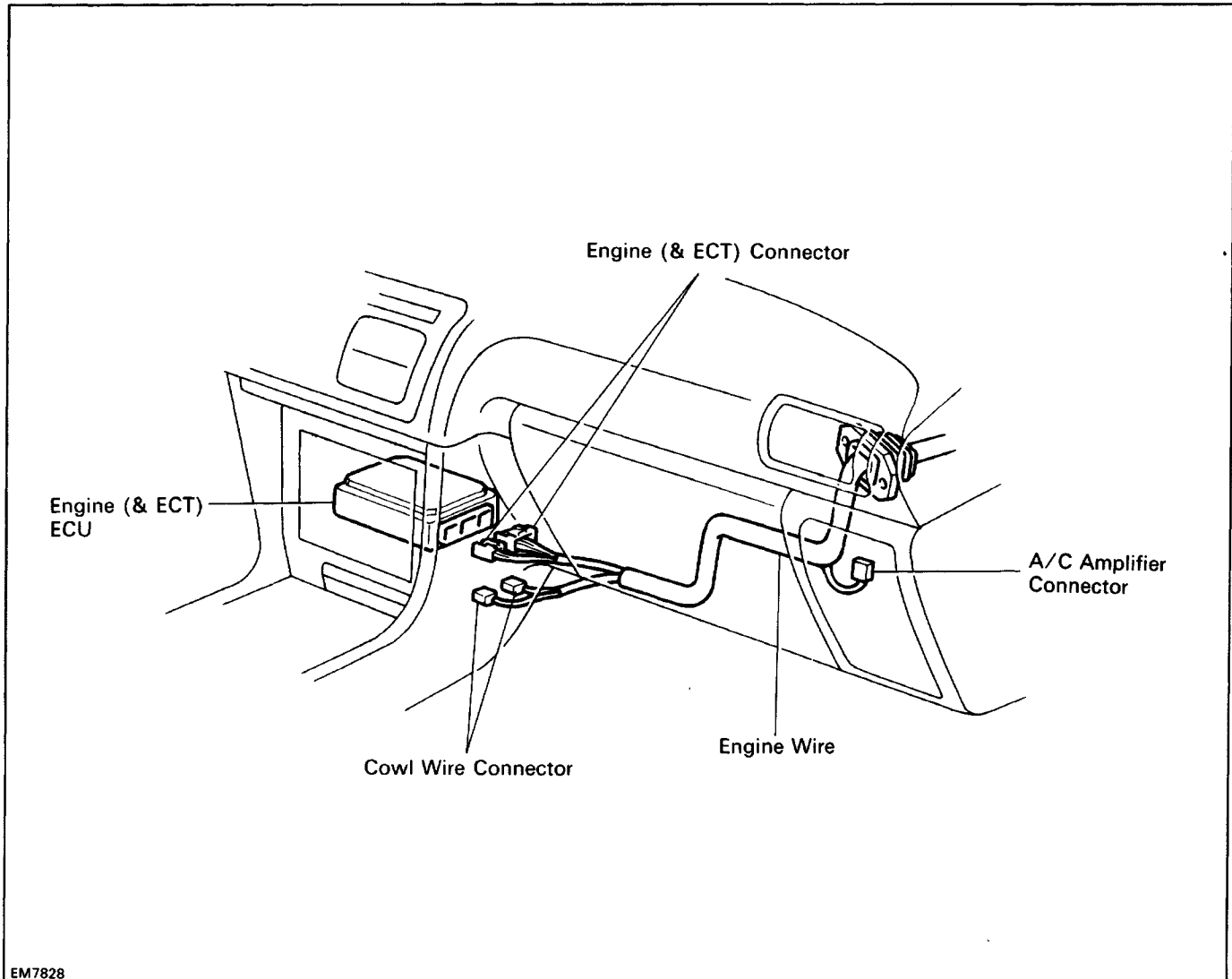
Actuator vacuum hose from intake manifold

26. DISCONNECT ENGINE WIRE

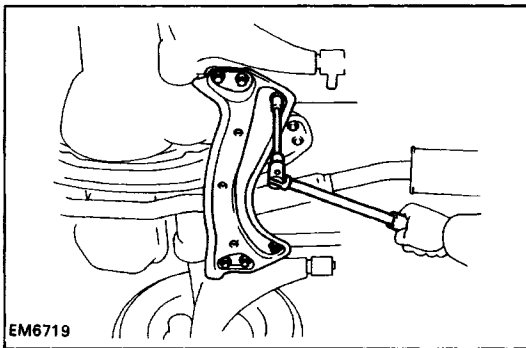
- (a) Engine wire clamp from wire bracket on RH fender apron
- (b) Two cowl wire connectors

27. DISCONNECT ENGINE WIRE FROM CABIN

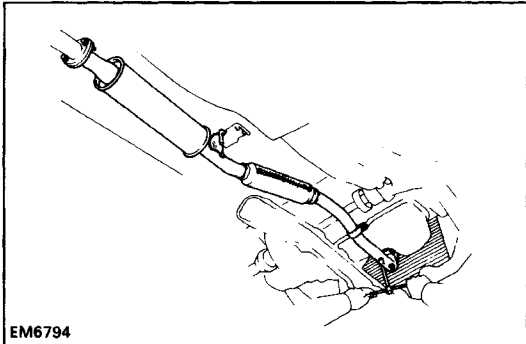
- (a) Disconnect the following connectors:
 - (1) Two engine (& ECT) ECU connectors
 - (2) Two cowl wire connectors
 - (3) A/C amplifier connector



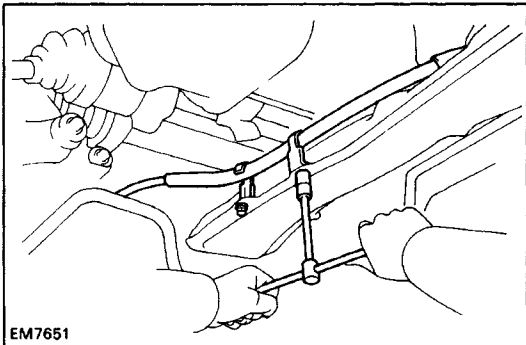
- (b) Remove the two nuts, and pull out the engine wire from the cowl panel.

**28. REMOVE SUSPENSION LOWER CROSSMEMBER**

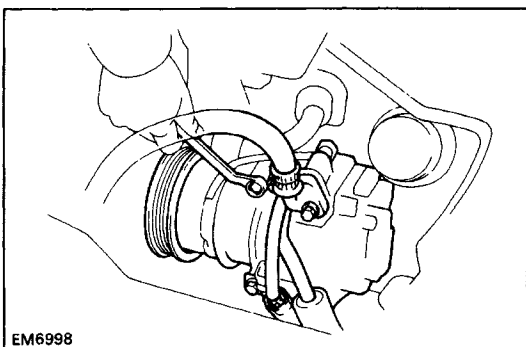
Remove the four bolts, two nuts and lower crossmember.

**29. REMOVE FRONT EXHAUST PIPE**

- (a) Loosen the bolt, and disconnect the clamp from the bracket.
- (b) Remove the two bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
- (c) Using a 14 mm deep socket wrench, remove the three nuts holding the front exhaust pipe to the catalytic converter.
- (d) Disconnect the support hook on the front exhaust pipe from the support bracket, and remove the front exhaust pipe and two gaskets.

**30. (A/T)**

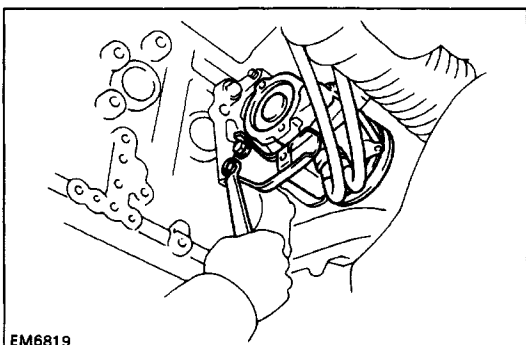
DISCONNECT TRANSAXLE CONTROL CABLE FROM ENGINE MOUNTING CENTER MEMBER

31. REMOVE DRIVE SHAFTS (See SA section)**32. (w/ A/C)**

REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

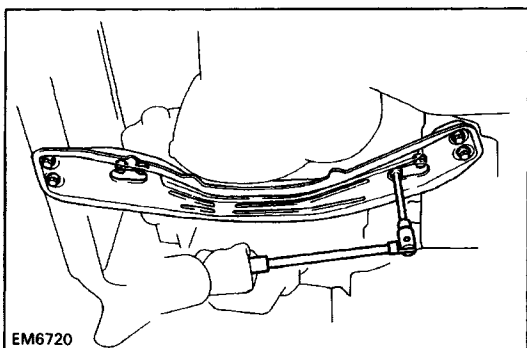
- (a) Disconnect the A/C compressor connector.
- (b) Remove the drive belt.
- (c) Remove the three bolts, and disconnect the A/C compressor.

HINT: Put aside the compressor, and suspend it to the radiator support with a string.

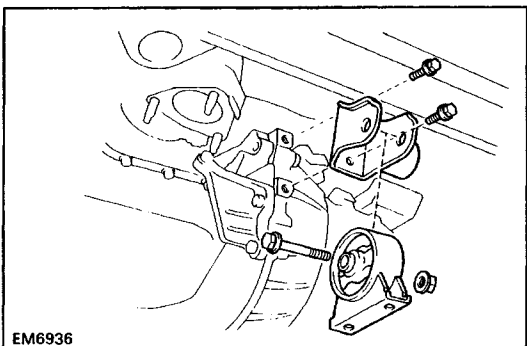
**33. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES**

- (a) Disconnect the two air hoses from the air pipe.
- (b) Remove the PS drive belt.
- (c) Remove the four bolts, and disconnect the PS pump from the engine.

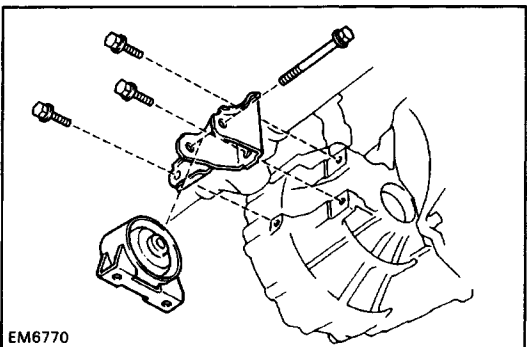
HINT: Put aside the pump and suspend it to the cowl with a string.

**34. REMOVE ENGINE MOUNTING CENTER MEMBER**

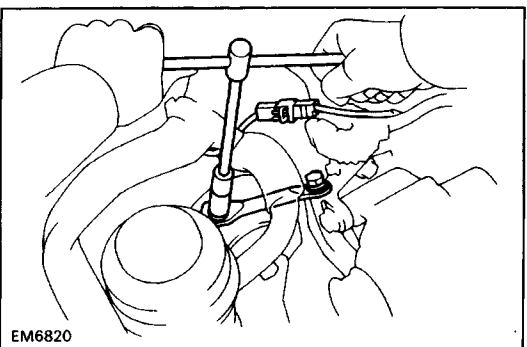
Remove the eight bolts and center member.

**35. REMOVE FRONT ENGINE MOUNTING INSULATOR AND BRACKET**

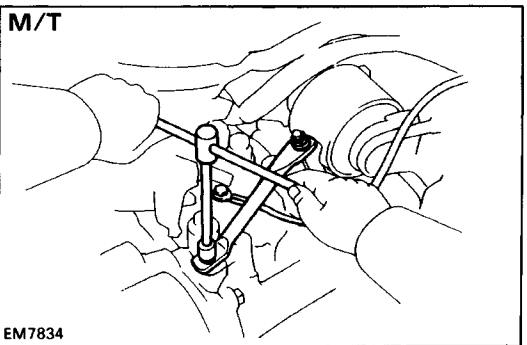
- (a) Remove the through bolt, nut and mounting insulator.
- (b) Remove the two bolts and mounting bracket.

**36. REMOVE REAR ENGINE MOUNTING INSULATOR AND BRACKET**

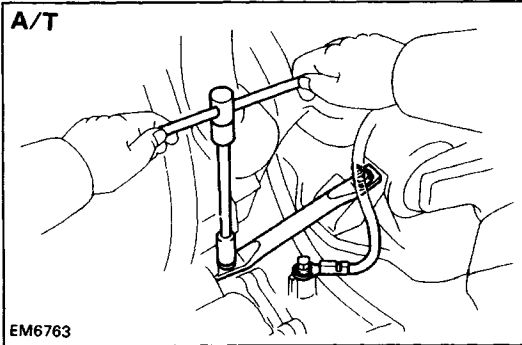
- (a) Remove the through bolt and mounting insulator.
- (b) Remove the three bolts and mounting bracket.

**37. REMOVE CONNECTOR FROM GROUND WIRE ON RH FENDER APRON****38. REMOVE RH ENGINE MOUNTING STAY**

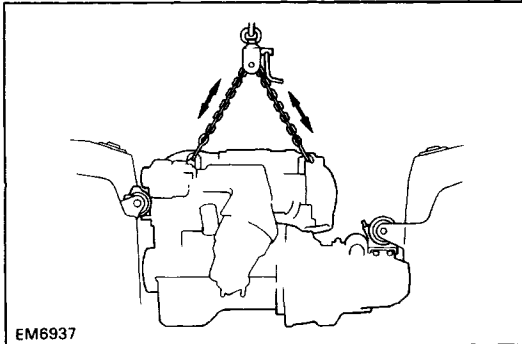
Remove the bolt, nut and mounting stay.

**39. REMOVE LH ENGINE MOUNTING STAY (M/T)**

- (a) Remove the two nuts and mounting stay.
- (b) Remove the bolt, and disconnect the ground strap.

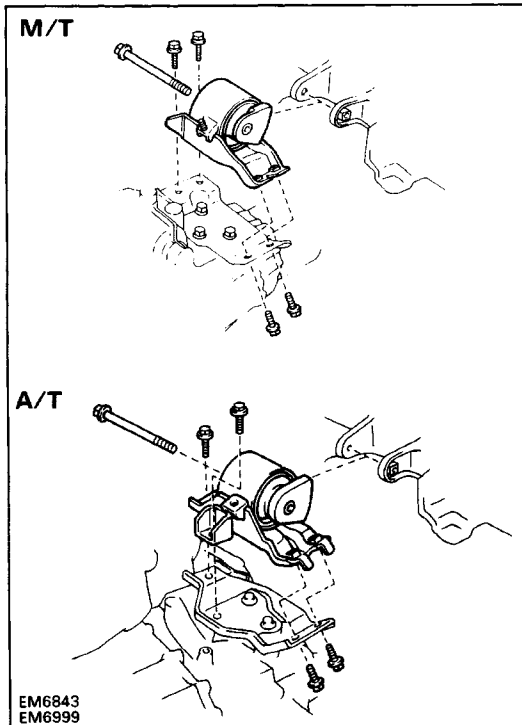
**(A/T)**

- (a) Remove the bolt, nut and mounting stay.
- (b) Remove the bolt, and disconnect the ground strap.

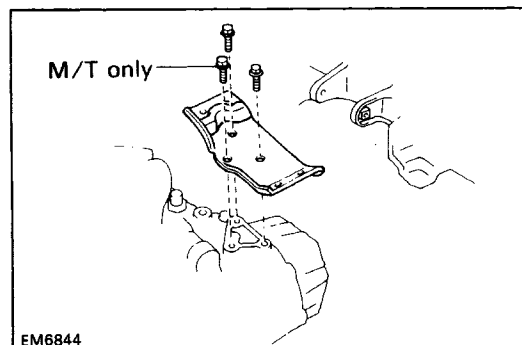


40. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE

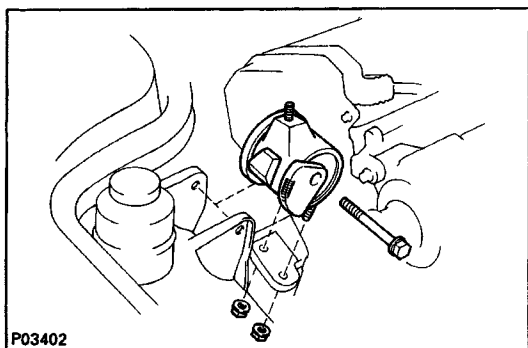
- (a) Attach the engine chain hoist to the engine hangers.



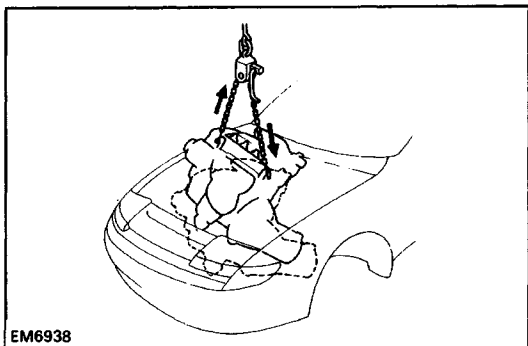
- (b) Remove the through bolt, four bolts and LH mounting insulator.



- (c) Remove the three (M/T) or two (A/T) bolts and LH mounting bracket.



- (d) Remove the through bolt, two nuts and RH mounting insulator.



- (e) Lift the engine out of the vehicle slowly and carefully.

NOTICE: Be careful not to hit the PS gear housing or neutral start switch (A/T).

- (f) Make sure the engine is clear of all wiring, hoses and cables.

- (g) Place the engine and transaxle assembly onto the stand.

41. (A/T) REMOVE STARTER (See page [ST-5](#))

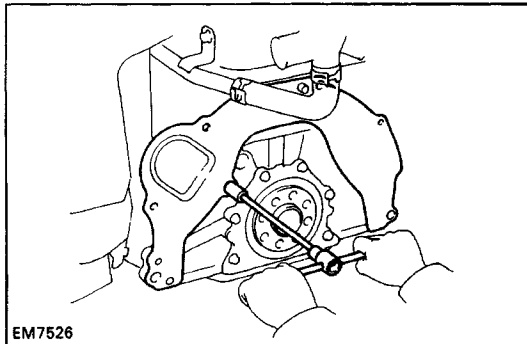
42. SEPARATE ENGINE AND TRANSAXLE

M/T (See MT section)

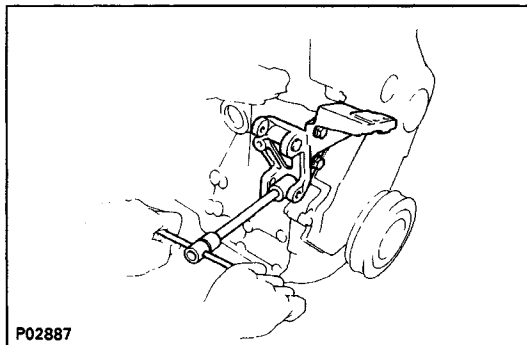
A/T (See AT section)

PREPARATION FOR DISASSEMBLY

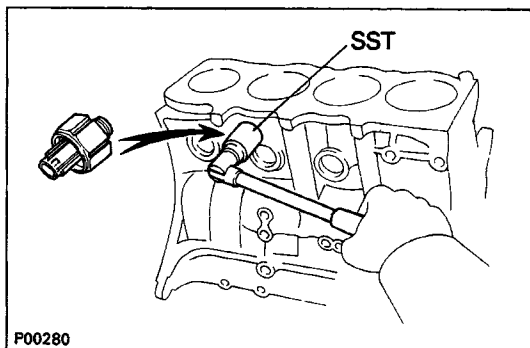
1. (M/T)
REMOVE CLUTCH COVER AND DISC
2. (M/T)
REMOVE FLYWHEEL
3. (A/T)
REMOVE DRIVE PLATE



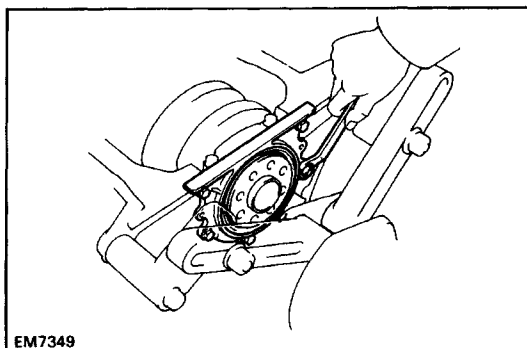
4. REMOVE REAR END PLATE
Remove the bolt and end plate.
5. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
6. REMOVE ALTERNATOR (See page CH-9)
7. REMOVE DISTRIBUTOR (See page IG-31)



8. REMOVE RH ENGINE MOUNTING BRACKET
Remove the three bolts and mounting bracket.
9. REMOVE PS PUMP BRACKET
Remove the three bolts and PS pump bracket.
10. REMOVE TIMING BELT AND PULLEYS
(See pages EM-69 to 73)
11. REMOVE CYLINDER HEAD
(See pages EM-151 to 159)
12. REMOVE WATER PUMP AND ALTERNATOR ADJUSTING BAR (See pages CO-12 and 13)
13. REMOVE OIL PAN AND OIL PUMP
(See pages LU-17 and 18)
14. REMOVE OIL FILTER (See page LU-7)
15. (w/ OIL COOLER)
REMOVE OIL COOLER (See page LU-29)



16. REMOVE KNOCK SENSOR
Using SST, remove the knock sensor.
SST 09816-30010



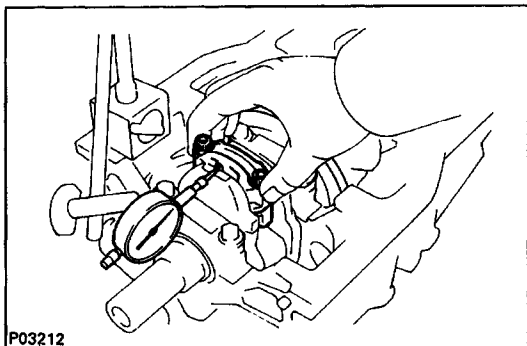
EM7349

DISASSEMBLY OF CYLINDER BLOCK

(See page EM-268)

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts, retainer and gasket.



P03212

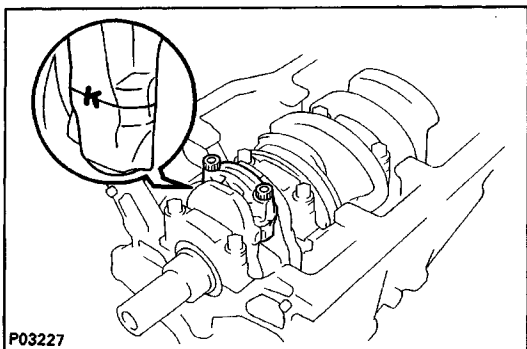
2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

**Standard thrust clearance: 0.160 – 0.312 mm
(0.0063 – 0.0123 in.)**

Maximum thrust clearance: 0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

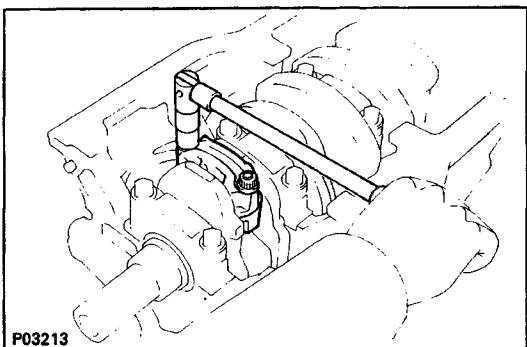


P03227

3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.

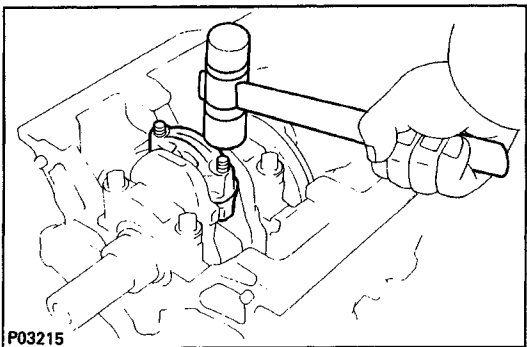
(b) Using SST, remove the connecting rod cap nuts.
SST 09011-38121



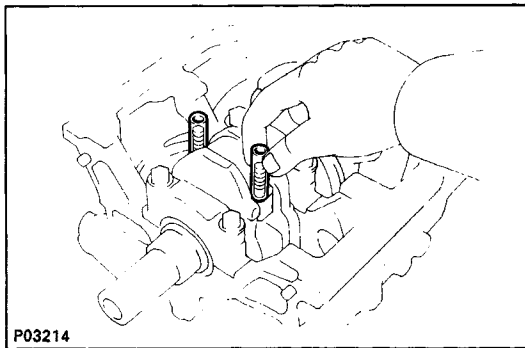
P03213

(c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

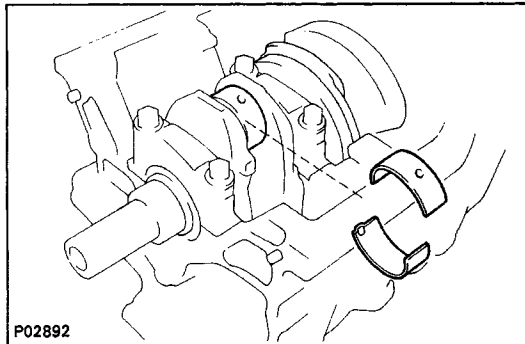
HINT: Keep the lower bearing inserted with the connecting cap.



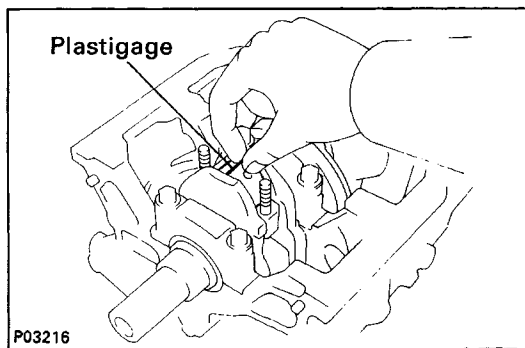
P03215



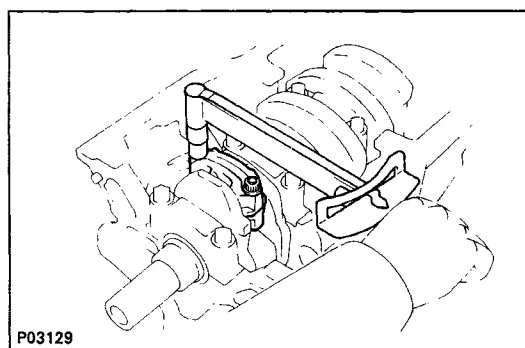
- (d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



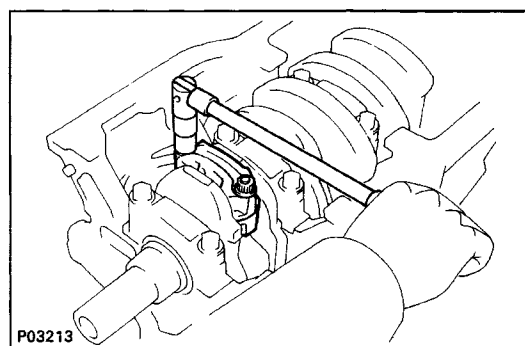
- (e) Clean the crank pin and bearing.
 (f) Check the crank pin and bearing for pitting and scratches.
 If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



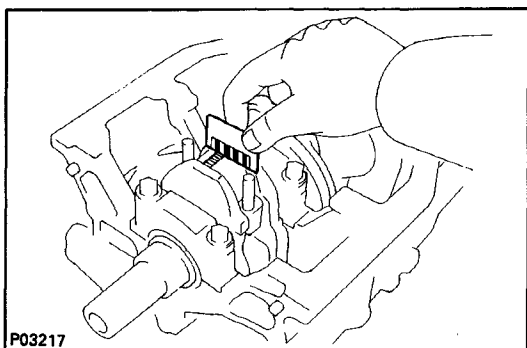
- (g) Lay a strip of Plastigage across the crank pin.



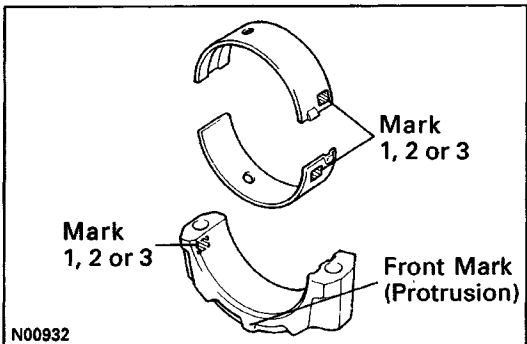
- (h) Install the connecting rod cap.
 (See step 6 on pages [EM-299](#) and 300)
Torque: 1st 25 N-m (250 kgf-cm, 18 ft-lbf)
2nd Turn 90°
NOTICE: Do not turn the crankshaft.



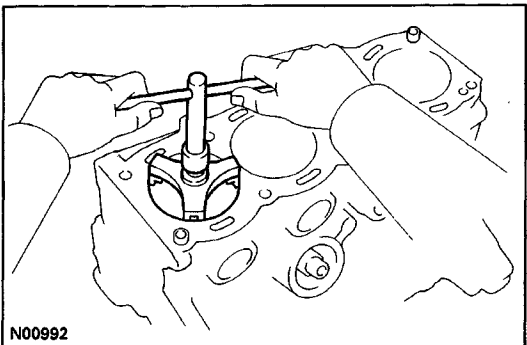
- (i) Remove the connecting rod cap.
 (See procedure (b) and (c) above)



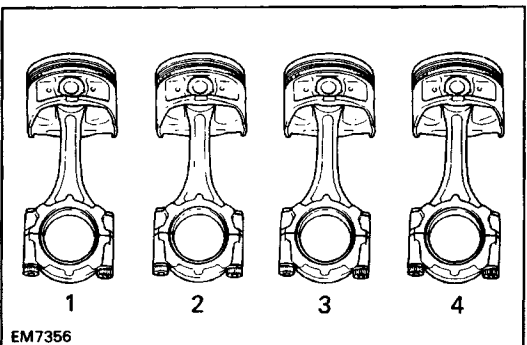
P03217



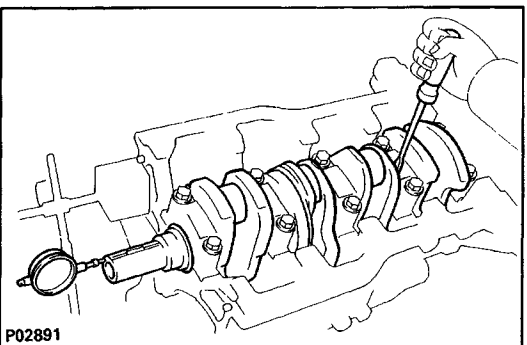
N00932



N00992



EM7356



P02891

(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD	0.024 – 0.055 mm, (0.0009 – 0.0022 in .)
U /S 0.25	0.023 – 0.069 mm (0.0009 – 0.0027 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

HINT: If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked "1", "2" and "3" accordingly.

(Reference)

Standard sized bearing center wall thickness:

Mark "1"	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
Mark "2"	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
Mark "3"	1.492 – 1.496 mm (0.0587 – 0.0589 in.)

(k) Completely remove the Plastigage.

4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

- Using a ridge reamer, remove all the carbon from the top of the cylinder.
- Cover the connecting rod bolts.
(See page [EM-280](#))
- Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.

5. CHECK CRANKSHAFT THRUST CLEARANCE

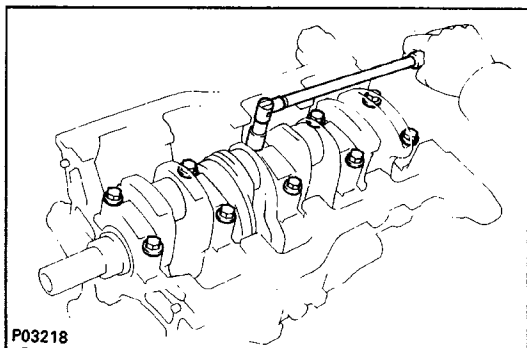
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance: 0.020 – 0.220 mm
(0.0008 – 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

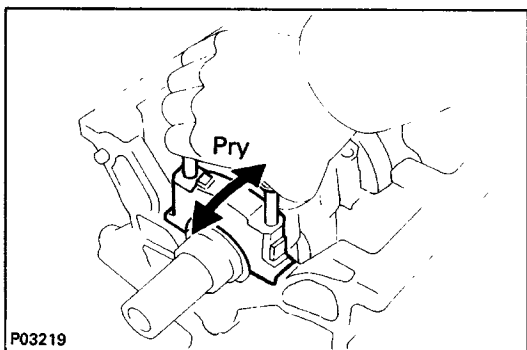
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness: 2.440 – 2.490 mm
(0.0961 – 0.0980 in.)



6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

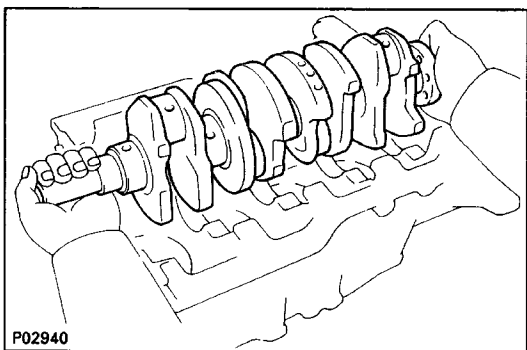
(a) Remove the main bearing cap bolts.



(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers (No.3 main bearing cap only).

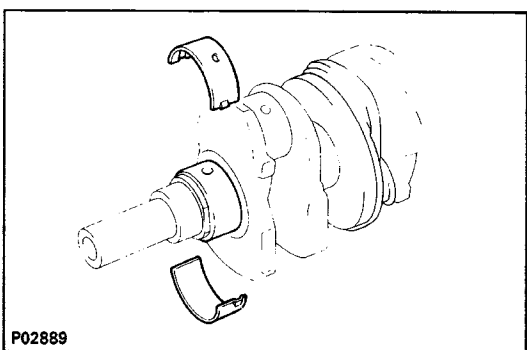
HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers— in correct order.



(c) Lift out the crankshaft.

HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.

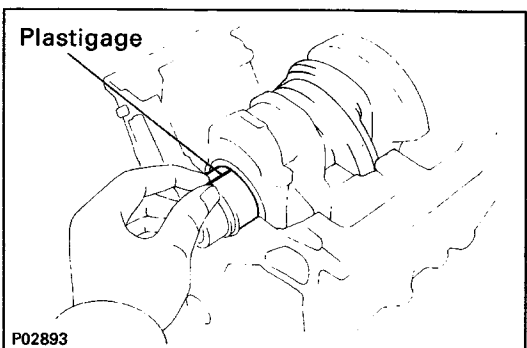


(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches.

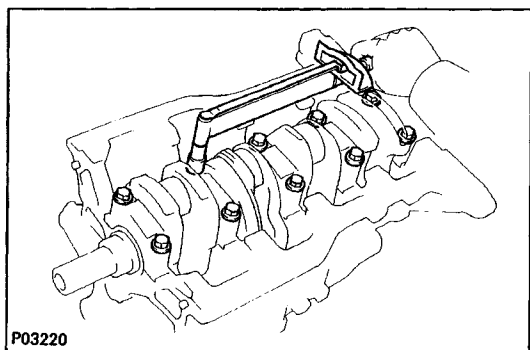
If the journal or bearing is damaged, replace the bearings.

If necessary, grind or replace the crankshaft.

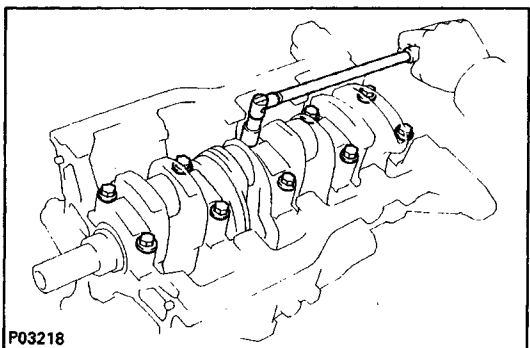


(f) Place the crankshaft on the cylinder block.

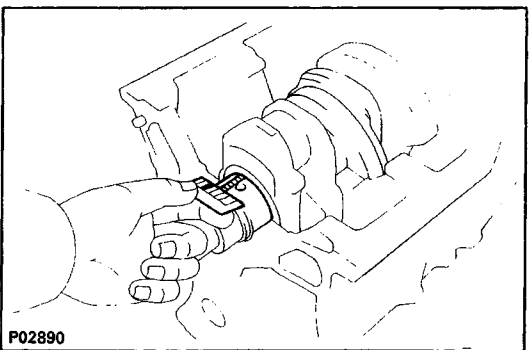
(g) Lay a strip of Plastigage across each journal.



(h) Install the main bearing caps.
 (See step 4 on page EM-298)
Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)
NOTICE: Do not turn the crankshaft.



(i) Remove the main bearing caps.
 (See procedure (a) and (b) above)



(j) Measure the Plastigage at its widest point.

Standard clearance:

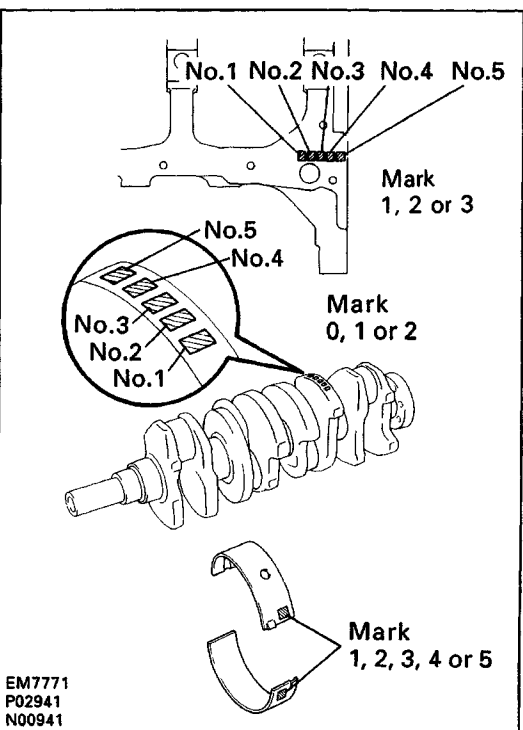
- No.3 STD 0.025 – 0.044 mm (0-0010 – 0.0017 in.)**
- U / S 0.25 0.027 – 0.067 mm (0.0011 – 0.0026 in.)**
- Others STD 0.015 – 0.034 mm (0.0006 – 0.0013 in.)**
- U / S 0.25 0.019 – 0.059 mm (0.0007 – 0.0023 in.)**

Maximum clearance: 0.08 mm (0.0031 in.)

HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be:

- No.3 0.027 – 0.054 mm (0.0011 – 0.0021 in.)**
- Others 0.017 – 0.044 mm (0.0007 – 0.0017 in.)**

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.
 HINT: If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are five sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.



	Number marked									
	1			2			3			
Cylinder block										
Crankshaft	0	1	2	0	1	2	0	1	2	
Bearing	1	2	3	2	3	4	3	4	5	

EXAMPLE: Cylinder block "2" + Crankshaft "1"
 = Bearing "3"

(Reference)**Cylinder block main journal bore diameter:**

Mark "1"	59.020 – 59.026 mm (2.3236 – 2.3239 in.)
Mark "2"	59.026 – 59.032 mm (2.3239 – 2.3241 in.)
Mark "3"	59.032 – 59.038 mm (2.3241 – 2.3243 in.)

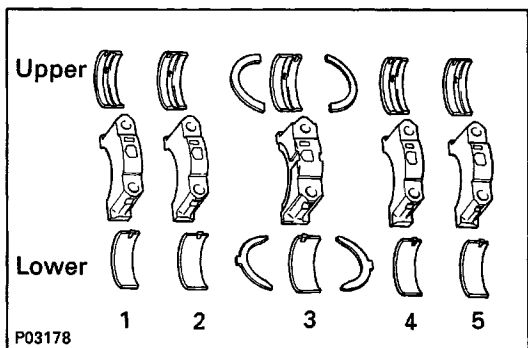
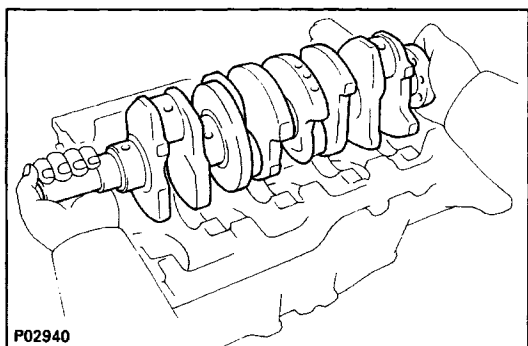
Crankshaft journal diameter:

Mark "0"	54.998 – 55.003 mm (2.1653 – 2.1655 in.)
Mark "1"	54.993 – 54.998 mm (2.1651 – 2.1653 in.)
Mark "2"	54.988 – 54.993 mm (2.1649 – 2.1651 in.)

Standard sized bearing center wall thickness:

No.3	Mark "1"	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
	Mark "2"	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
	Mark "3"	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
	Mark "4"	2.001 – 2.004 mm (0.0788 – 0.0789 in.)
	Mark "5"	2.004 – 2.007 mm (0.0789 – 0.0790 in.)

Others	Mark "1"	1.997 – 2.000 mm (0.0786 – 0.0787 in.)
	Mark "2"	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
	Mark "3"	2.003 – 2.006 mm (0.0789 – 0.0790 in.)
	Mark "4"	2.006 – 2.009 mm (0.0790 – 0.0791 in.)
	Mark "5"	2.009 – 2.012 mm (0.0791 – 0.0792 in.)

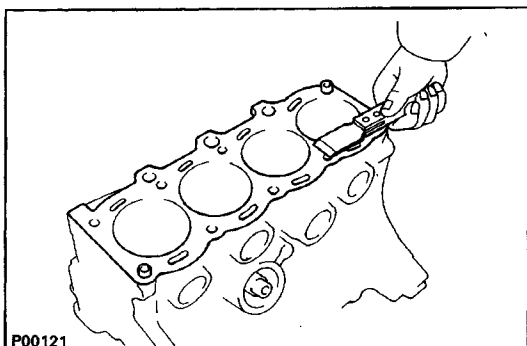


(k) Completely remove the Plastigage.

7. REMOVE CRANKSHAFT

- Lift out the crankshaft.
- Remove the upper bearings and upper thrust washers from cylinder block.

HINT: Arrange the main bearing caps, bearings and thrust washers in correct order.



INSPECTION OF CYLINDER BLOCK

1. CLEAN CYLINDER BLOCK

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the surface contacting cylinder head.

B. Clean cylinder block

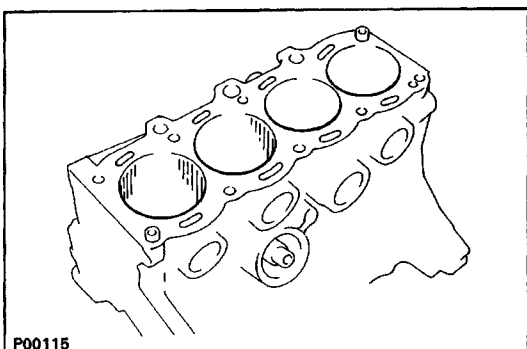
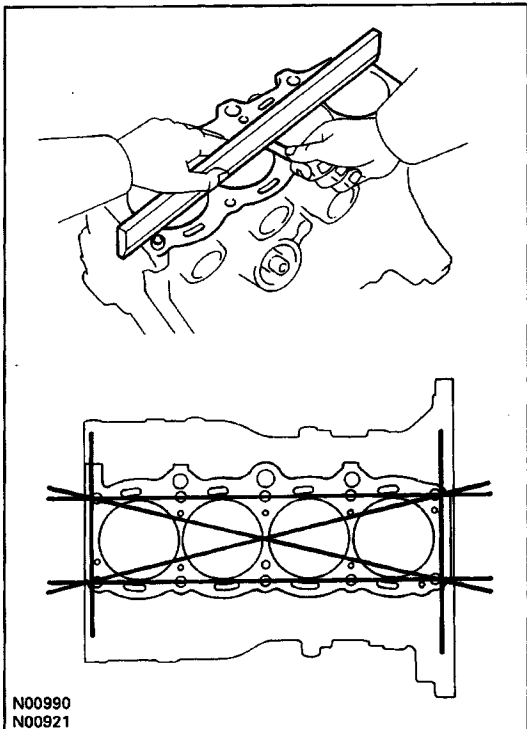
Using a soft brush and solvent, thoroughly clean the cylinder block.

2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

If warpage is greater than maximum, replace the cylinder block.

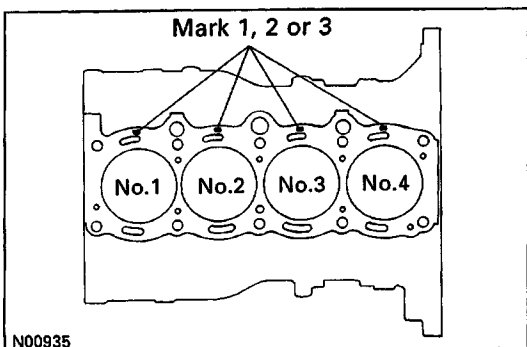


3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

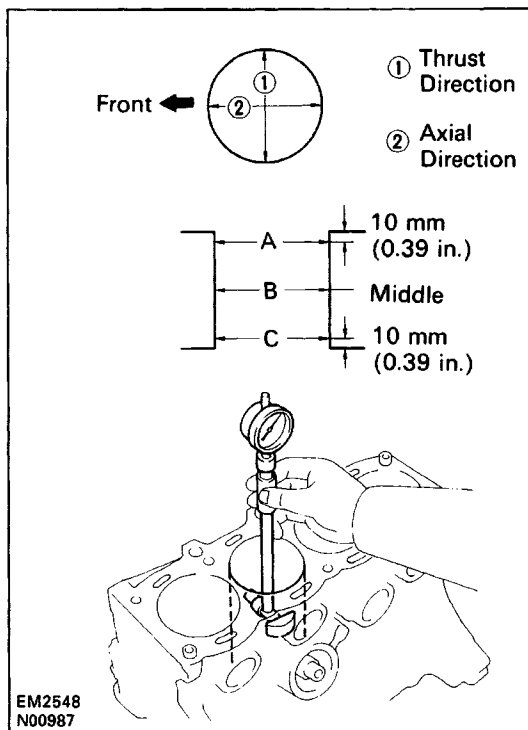
If deep scratches are present, rebore all the four cylinders.

If necessary, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the top of the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

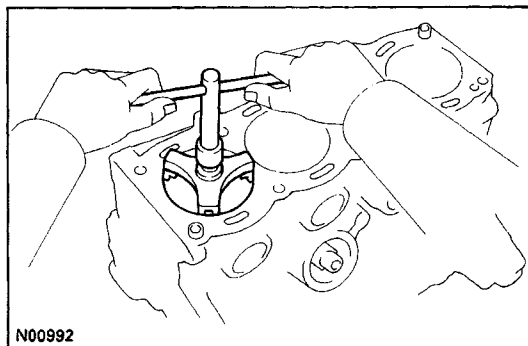
Standard diameter:

STD	Mark "1"	87.000 – 87.010 mm (3.4252 – 3.4256 in.)
	Mark "2"	87.010 – 87.020 mm (3.4256 – 3.4260 in.)
	Mark "3"	87.020 – 87.030 mm (3.4260 – 3.4264 in.)

Maximum diameter:

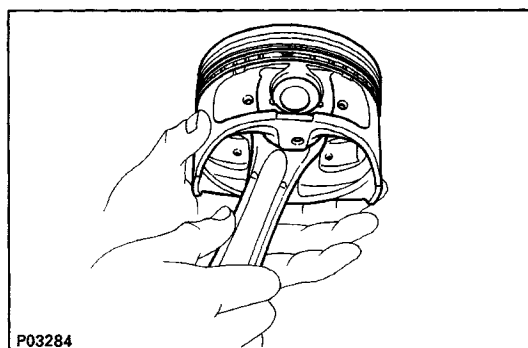
STD	87.23mm(3.4342 in.)
O/S 0.50	87.73 mm (3.4350 in.)

If the diameter is greater than maximum, rebore all the four cylinders. If necessary, replace the cylinder block.



5. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

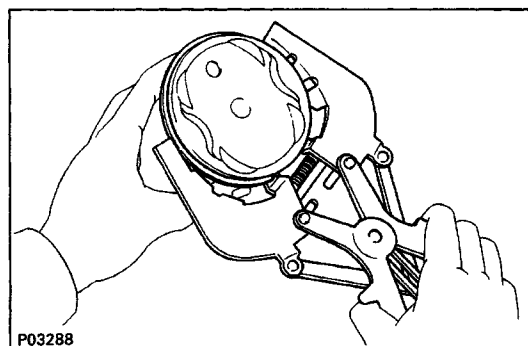
1. CHECK FIT BETWEEN PISTON AND PISTON PIN

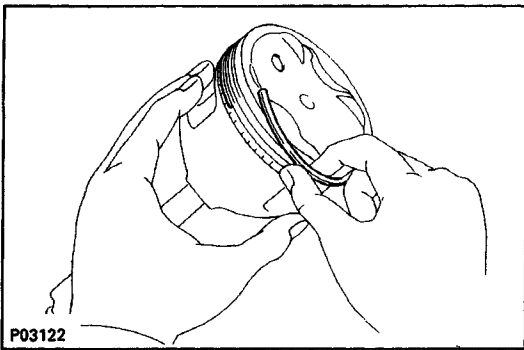
Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.

2. REMOVE PISTON RINGS

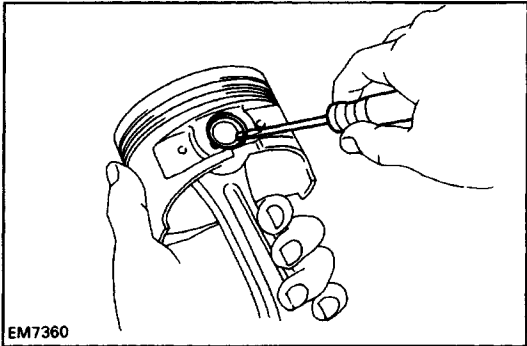
(a) Using a piston ring expander, remove the two compression rings.





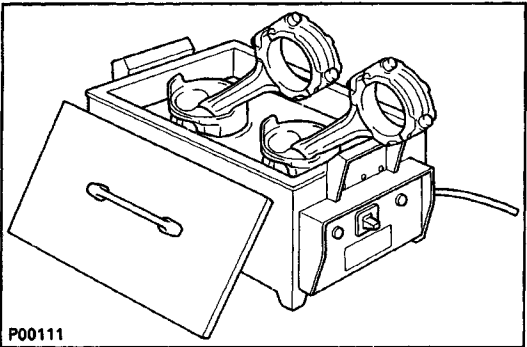
(b) Remove the two side rails and oil ring expander by hand.

HINT: Arrange the rings in correct order only.

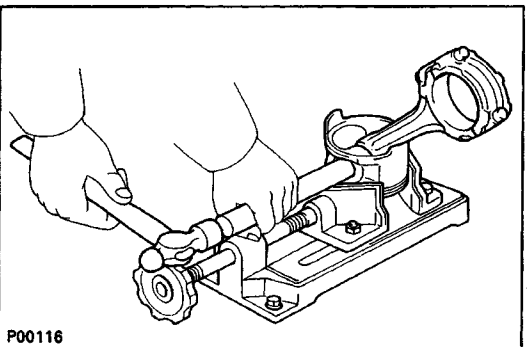


3. DISCONNECT CONNECTING ROD FROM PISTON

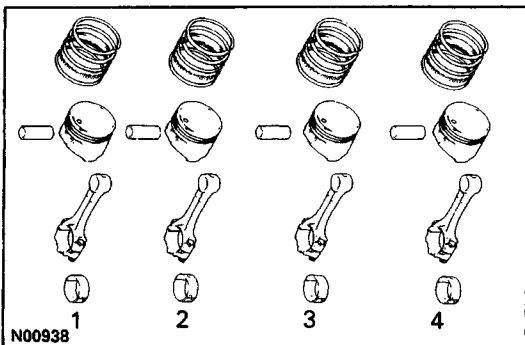
(a) Using a small screwdriver, pry out the two snap rings.



(b) Gradually heat the piston to 80 – 90°C (176 – 194°F).

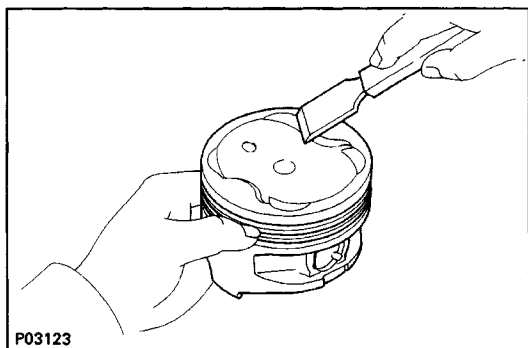


(c) Using plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod .



HINT:

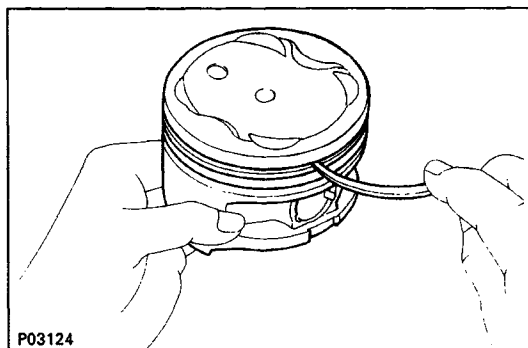
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



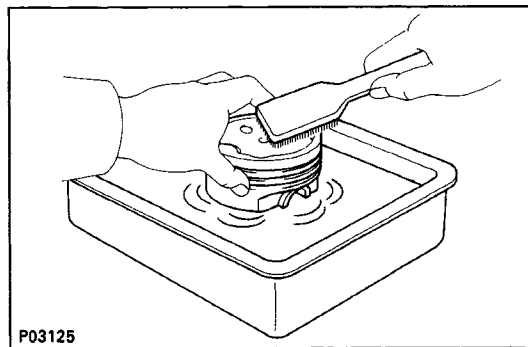
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

- (a) Using a gasket scraper, remove the carbon from the piston top.

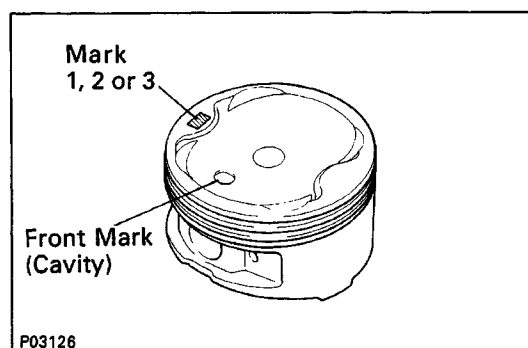


- (b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



- (c) Using solvent and a brush, thoroughly clean the piston.

NOTICE: Do not use a wire brush.



2. INSPECT PISTON

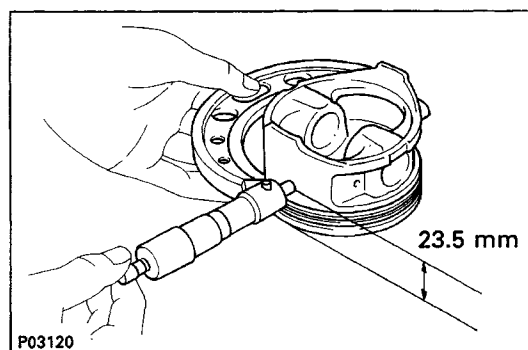
A. Inspect piston oil clearance

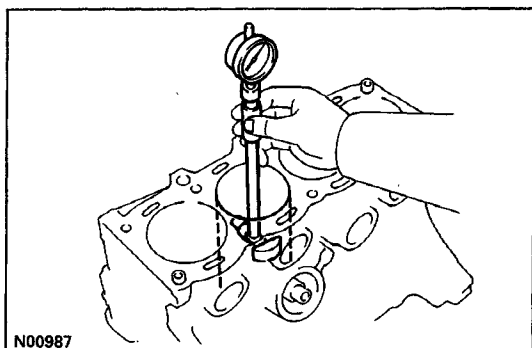
HINT: There are three sizes of the standard piston diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the piston top.

- (a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 23.5 mm (0.925 in.) from the piston head.

Piston diameter:

STD	Mark "1"	86.850 – 86.860 mm (3.4193 – 3.4197 in.)
	Mark "2"	86.860 – 86.870 mm (3.4197 – 3.4201 in.)
	Mark "3"	86.870 – 86.880 mm (3.4201 – 3.4205 in.)
O/S 0.50		87.350 – 87.380 mm (3.4390 – 3.4402 in.)





(b) Measure the cylinder bore diameter in the thrust directions.

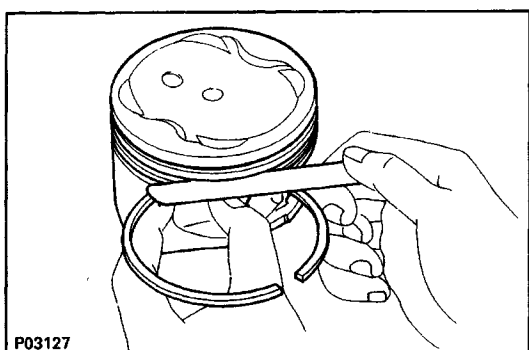
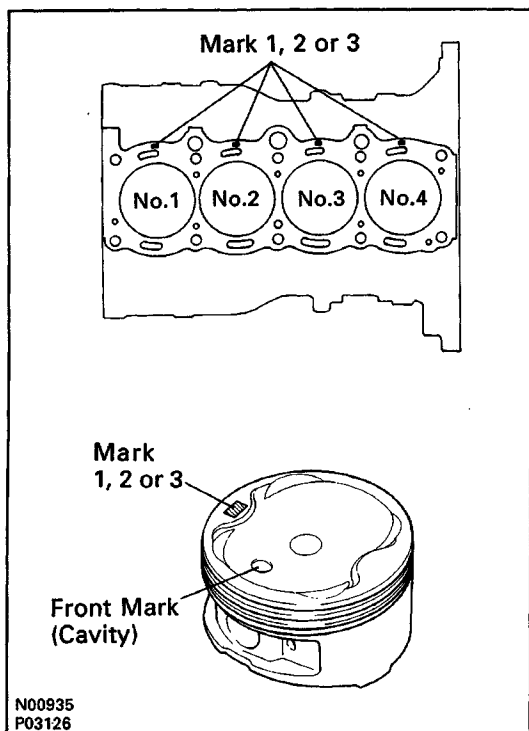
(See step 4 on page [EM-286](#))

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

**Standard oil clearance: 0.140 – 0.160 mm
(0.0055 – 0.0063 in.)**

Maximum oil clearance: 0.18 mm (0.0071 in.)

If the oil clearance is greater than maximum, replace all the four pistons and rebores all the four cylinders. If necessary, replace the cylinder block. HINT (Use new cylinder block): Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.



B. Inspect piston ring groove clearance

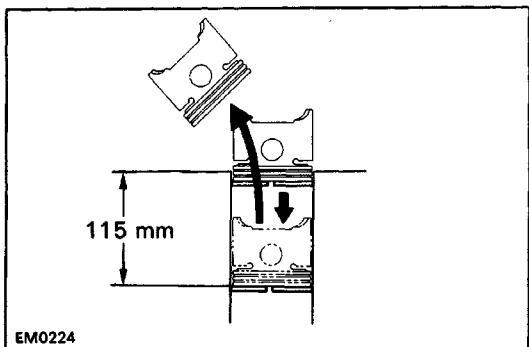
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:

No.10.040 – 0.080 mm. (0.0016 – 0.0031 in.)

No.20.030 – 0.070 mm (0.0012 – 0.0028 in.)

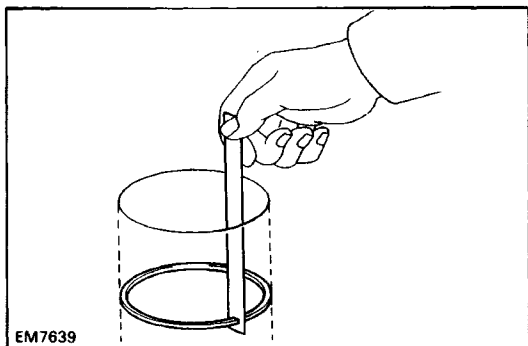
If the clearance is greater than maximum, replace the piston.



C. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 115 mm (4.53 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the end gap.

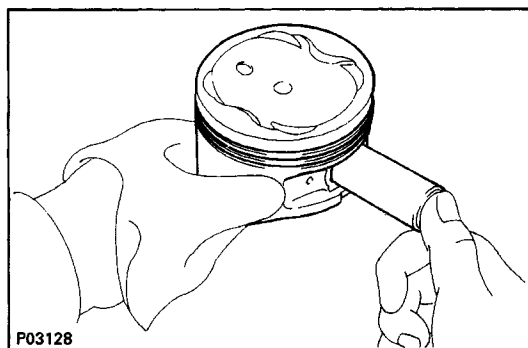
Standard end gap:

No.1	0.270 – 0.500 mm (0.0106 – 0.0197 in.)
No.2	0.350 – 0.600 mm (0.0138 – 0.0234 in .)
Oil (Side rail)	0.200 – 0.550 mm (0.0079 – 0.0217 in.)

Maximum end gap:

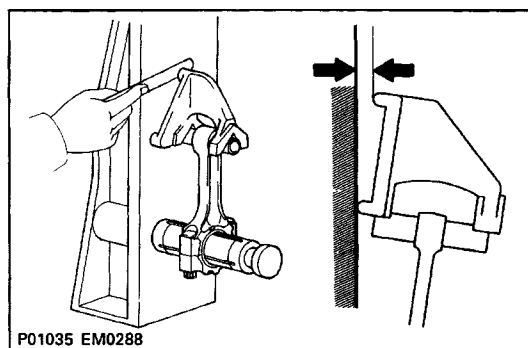
No.1	1.10 mm (0.0433 in.)
No.2	1.20 mm (0.0472 in.)
Oil (Side rail)	1.15 mm (0.0453 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the four cylinders or replace the cylinder block.



D. Inspect piston pin fit

At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

Using rod aligner and feeler gauge, check the connecting rod alignment.

- Check for bending.

Maximum bending:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

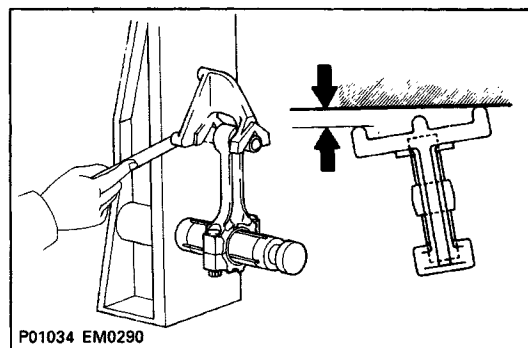
If bend is greater than maximum, replace the connecting rod assembly.

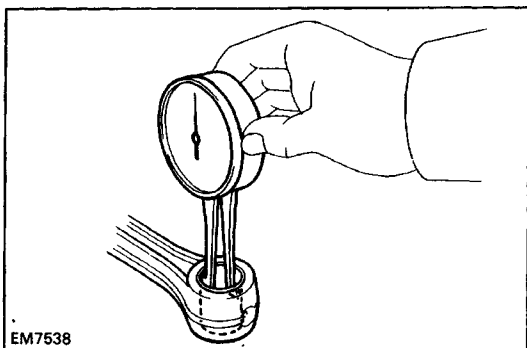
- Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.

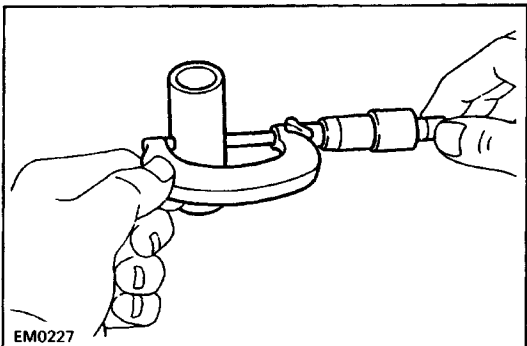




B. Inspect piston pin oil clearance

- (a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

**Bushing inside diameter: 22.005 – 22.017 mm
(0.8663 – 0.8668 in.)**



- (b) Using a micrometer, measure the piston pin diameter.

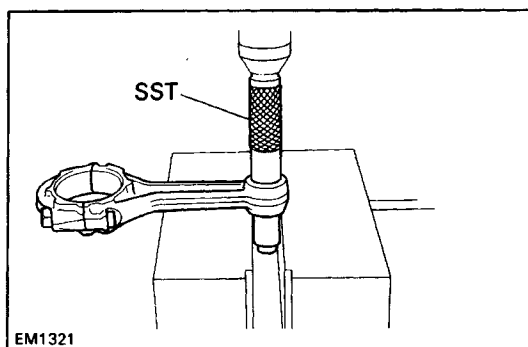
**Piston pin diameter: 21.997 – 22.009 mm
(0.8660–0.8665 in.)**

- (c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

**Standard oil clearance: 0.005 – 0.011 mm
(0.0002 – 0.0004 in.)**

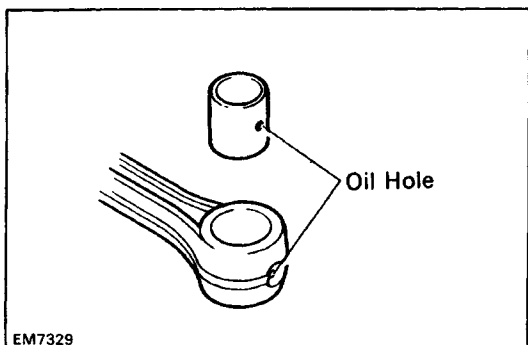
Maximum oil clearance: 0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing: If necessary, replace the piston and piston pin as a set.



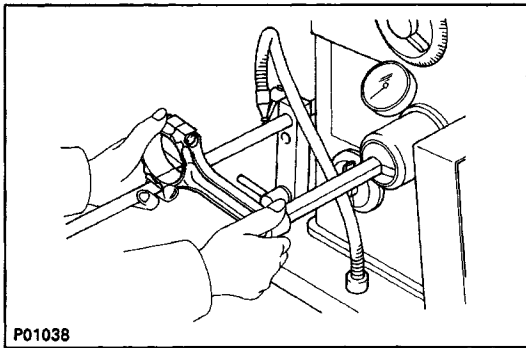
C. If necessary, replace connecting rod bushing

- (a) Using SST and a press, press out the bushing.
SST 09222-30010

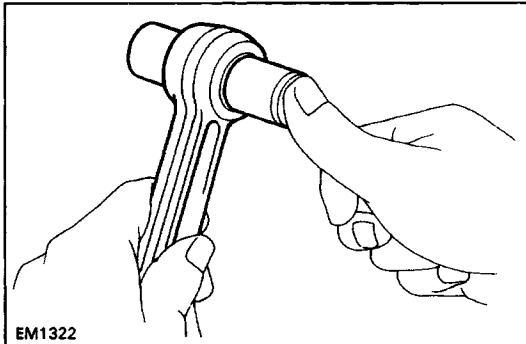


- (b) Align the oil holes of a new bushing and the connecting rod.

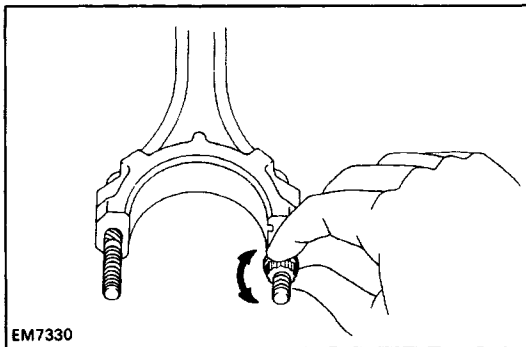
- (c) Using SST and a press, press in the bushing.
SST 09222-30010



- (d) Using a pinhole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.

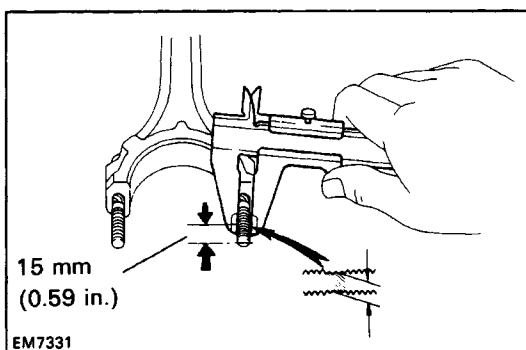


- (e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



D. Inspect connecting rod bolts

- (a) Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.



- (b) If the cap nut cannot be turned easily, measure the outside diameter of the connecting rod bolt with a vernier caliper.

**Standard diameter: 7.860 – 8.000 mm
(0.3094 – 0.3150 in.)**

Minimum diameter: 7.60 mm (0.2992 in.)

HINT: If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration. If the outside diameter is less than minimum, replace the connecting rod bolt and cap nut as a set.

BORING OF CYLINDERS

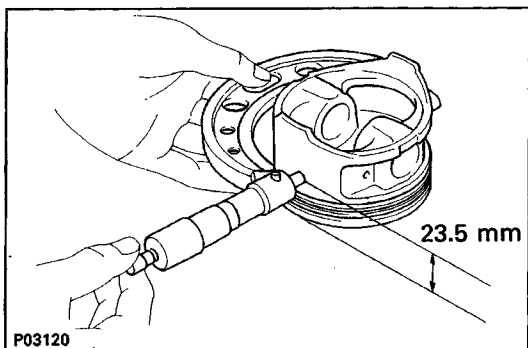
HINT:

- Bore all the four cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

1. KEEP OVERSIZED PISTONS

Oversized piston diameter:

O/S 0.50 87.350 – 87.380 mm
 (3.4390 – 3.4402 in.)



2. CALCULATE AMOUNT TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 23.5 mm (0.925 in.) from the piston head.

(b) Calculate the amount each cylinder is to be rebored as follows:

$$\text{Size to be rebored} = P + C - H$$

P = Piston diameter

C = Piston clearance

0.140 – 0.160 mm (0.0055 – 0.0063 in.)

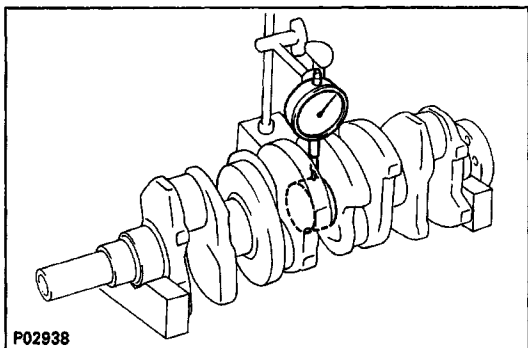
H = Allowance for honing

0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Maximum honing: 0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.



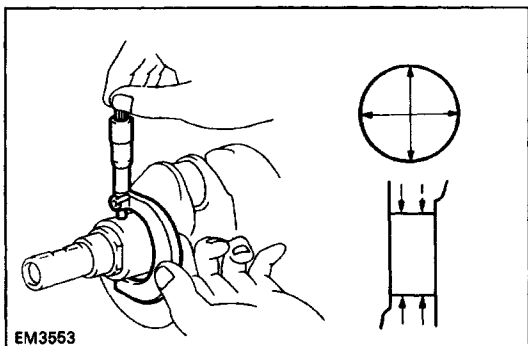
INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

- (a) Place the crankshaft on V-blocks.
- (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.



2. INSPECT MAIN JOURNALS AND CRANK PINS

- (a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD **54.998 – 55.003 mm**
 (2.1653 – 2.1655 in.)

U/S 0.25 **54.745 – 54.755 mm**
 (2.1553 – 2.1557 in.)

Crank pin diameter:

STD **51.985 – 52.000 mm**
 (2.0466 – 2.0472 in.)

U/S 0.25 **51.745 – 51.755 mm**
 (2.0372 – 2.0376 in.)

If the diameter is not as specified, check the oil clearance (See pages [EM-279](#) to 283). If necessary, grind or replace the crankshaft.

- (b) Check each main journal and crank pin for taper and out-of-round as shown.

Maximum taper and out-of-round: 0.02 mm (0.0008 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.

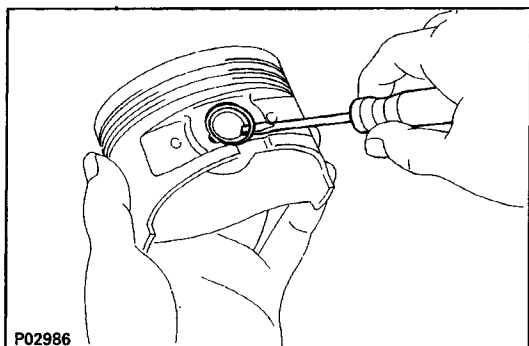
3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure in step 2).

Install new main journal and/or crank pin undersized bearings.

REPLACEMENT OF CRANKSHAFT OIL SEALS

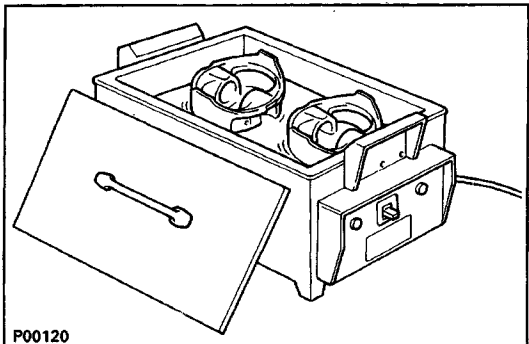
(See pages [EM-249](#) and 250)



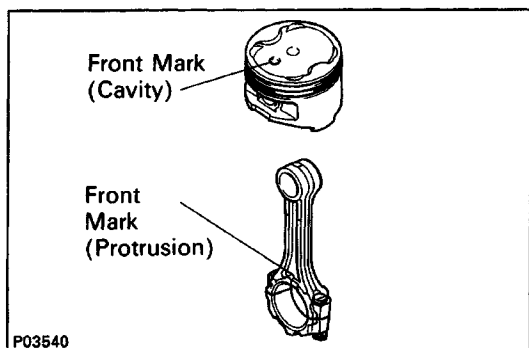
ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. ASSEMBLE PISTON AND CONNECTING ROD

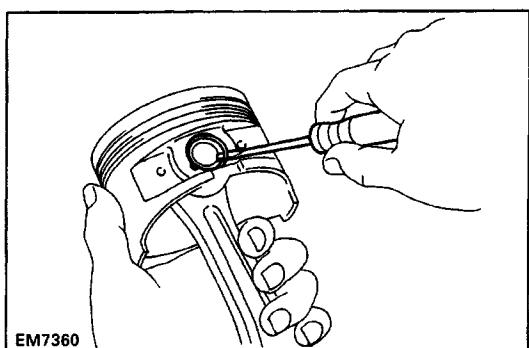
- (a) Using a small screwdriver, install a new snap ring on one side of the piston pin hole.



- (b) Gradually heat the piston to 80 – 90°C (176 – 194°F).



- (c) Coat the piston pin with engine oil.
 (d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

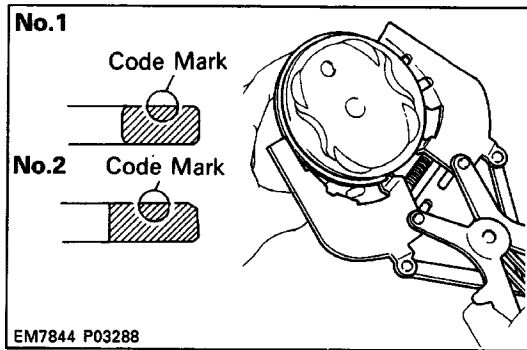


- (e) Using a small screwdriver, install a new snap ring on the other side of the piston pin hole.



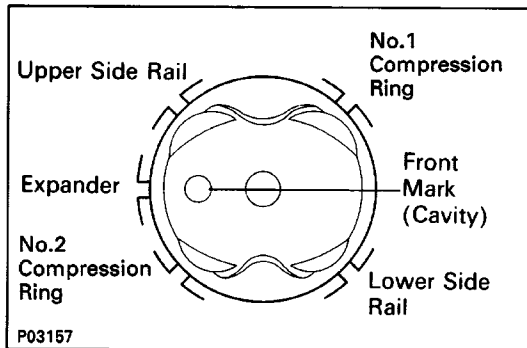
2. INSTALL PISTON RINGS

- (a) Install the oil ring expander and two side rails by hand.



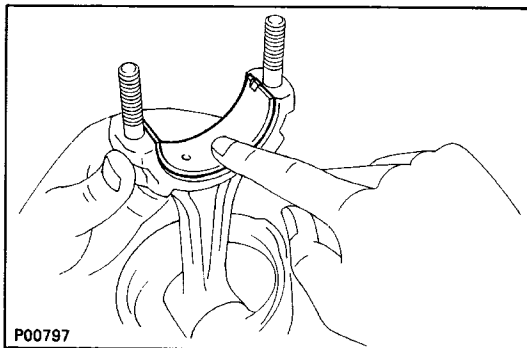
- (b) Using a piston ring expander, install the two compression rings with the code mark facing upward.

**Code mark: No.1 1N or T
No.2 2N or 2T**



- (c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

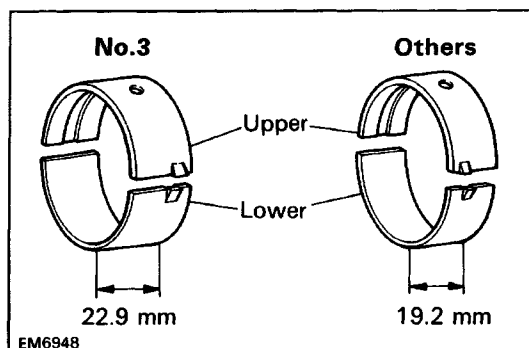
- (a) Align the bearing claw with the groove of the connecting rod or connecting cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

ASSEMBLY OF CYLINDER BLOCK

(See page EM-268)

HINT:

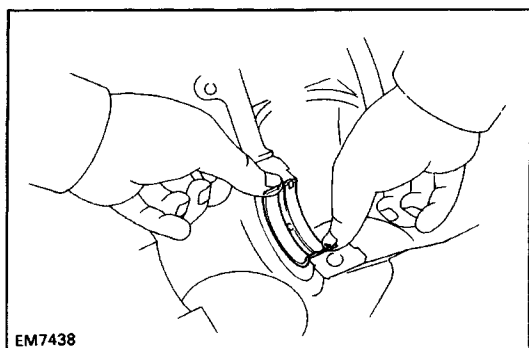
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.



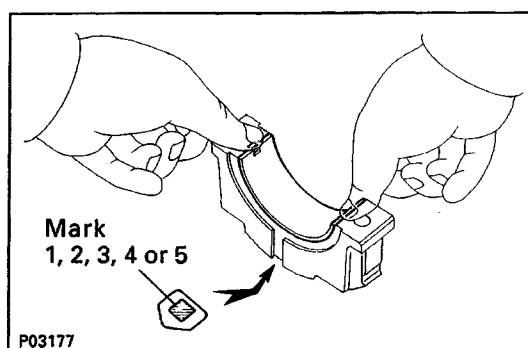
1. INSTALL MAIN BEARINGS

HINT:

- Main bearings come in widths of 19.2 mm (0.756 in.) and 22.9 mm (0.902 in.). Install the 22.9 mm (0.902 in.) bearings in the No.3 cylinder block journal position with the main bearing cap. Install the 19.2 mm (0.756 in.) bearings in the other positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.

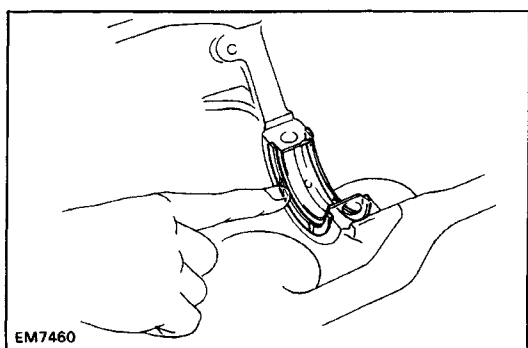


- (a) Align the bearing claw with the claw groove of the cylinder block, and push in the five upper bearings.



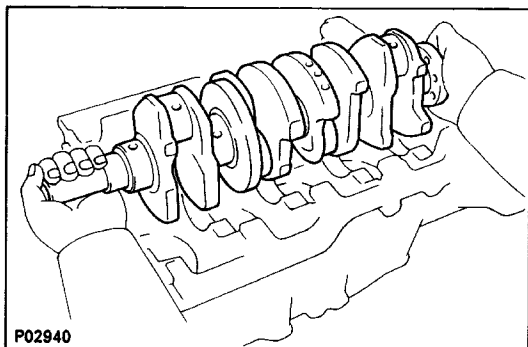
- (b) Align the bearing claw with the claw groove of the main bearing cap, and push in the five lower bearings.

HINT: A number is marked on each main bearing cap to indicate the installation position.



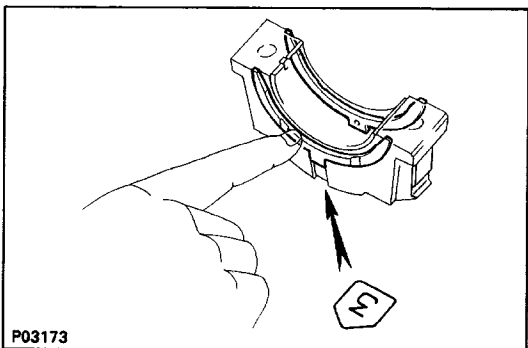
2. INSTALL UPPER THRUST WASHERS

Install the two thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.



P02940

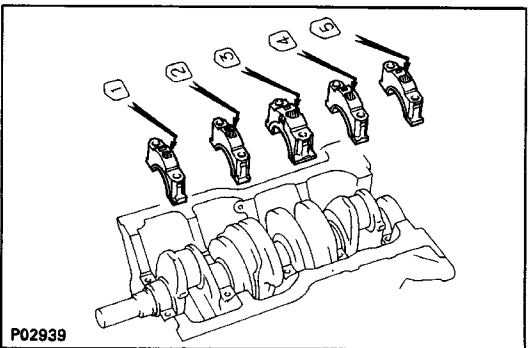
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



P03173

4. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

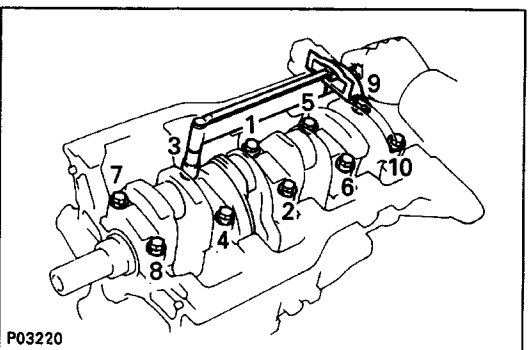
- (a) Install the two thrust washers on the No.3 bearing cap with the grooves facing outward.



P02939

- (b) Install the five main bearing caps in their proper locations.

HINT: Each bearing cap has a number and front mark.



P03220

- (c) Apply a light coat of engine oil on the threads and under the heads of the main bearing caps.

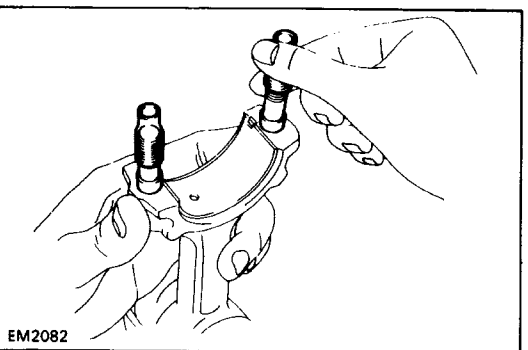
- (d) Install and uniformly tighten the ten bolts of the main bearing caps in several passes in the sequence shown.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)

- (e) Check that the crankshaft turns smoothly.

- (f) Check the crankshaft thrust clearance.

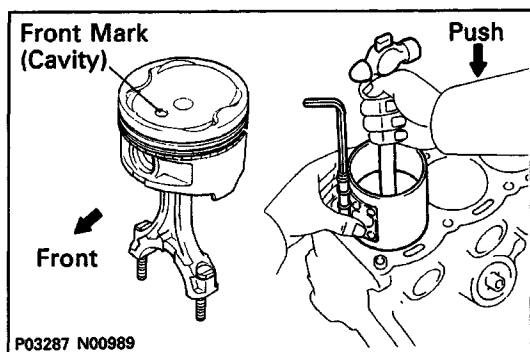
(See step 5 on page [EM-281](#))



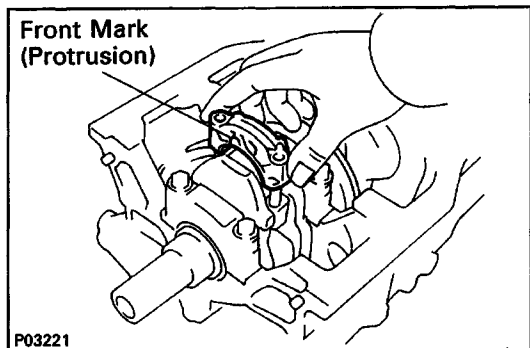
EM2082

5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

- (a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



- (b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



6. INSTALL CONNECTING ROD CAPS

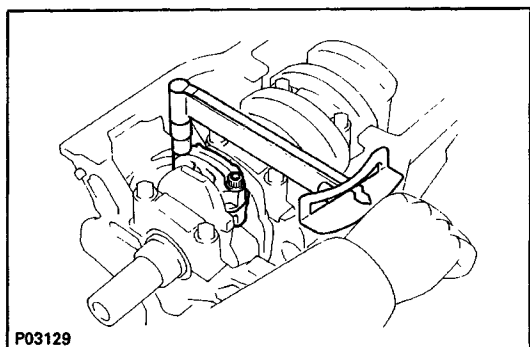
A. Place connecting rod cap on connecting rod

- Match the numbered connecting rod cap with the connecting rod.
- Install the connecting rod cap with the front mark facing forward.

B. Install connecting rod cap nuts

HINT:

- The cap nuts are tightened in two progressive steps (steps (b) and (d)).
- If any one of the connecting rod bolts is broken or deformed, replace it.

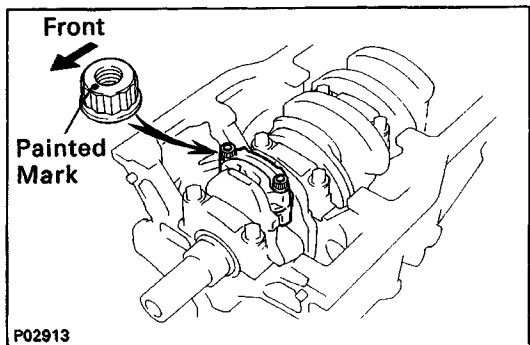


- Apply a light coat of engine oil on the threads and under the cap nuts.
- Using SST, install and alternately tighten the cap nuts in several passes.

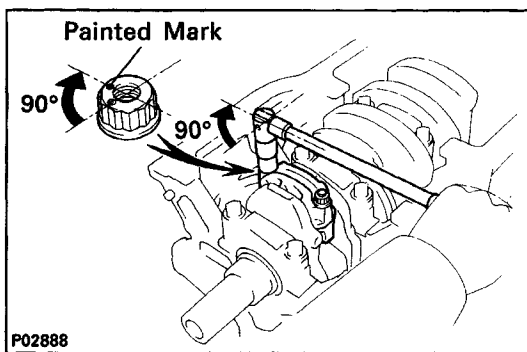
SST 09011-38121

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

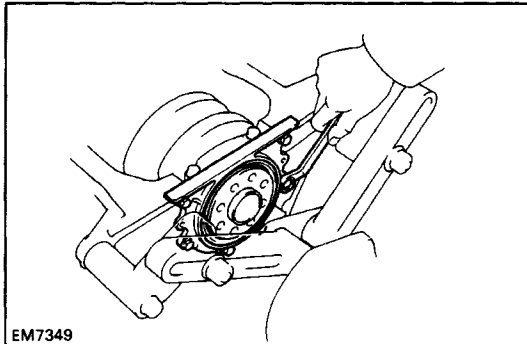
If any one of the cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set.



- Mark the front of the cap nut with the paint.

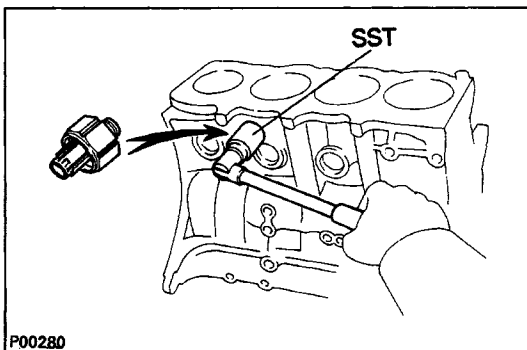


- (d) Retighten the cap nuts 90° in the numerical order shown.
- (e) Check that the painted mark is now at a 90° angle to the front.
- (f) Check that the crankshaft turns smoothly.
- (g) Check the connecting rod thrust clearance. (See step 2 on page [EM-279](#))



7. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and the retainer with the six bolts.
Torque: 9.3 N-m (95 kgf-cm, 82 in.-lbf)



POST ASSEMBLY

1. INSTALL KNOCK SENSOR

Using SST, install the knock sensor.

SST 09816-30010

Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)

2. (w/ OIL COOLER)

INSTALL OIL COOLER (See page [LU-30](#))

3. INSTALL OIL FILTER

 (See page [LU-7](#))

4. INSTALL OIL PUMP AND OIL PAN

(See pages [LU-21](#) and 22)

5. INSTALL WATER PUMP AND ALTERNATOR

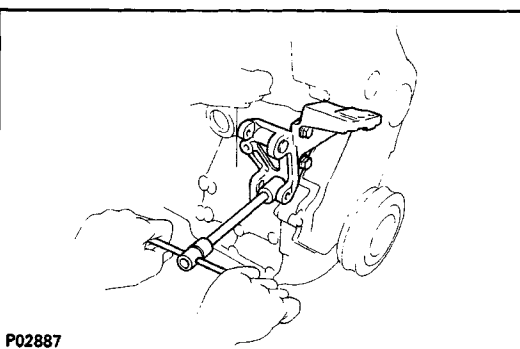
ADJUSTING BAR (See pages [CO-14](#) and 15)

6. INSTALL CYLINDER HEAD

(See pages [EM-173](#) to 182)

7. INSTALL PULLEYS AND TIMING BELT

(See pages [EM-75](#) to 79)



8. INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the three bolts.

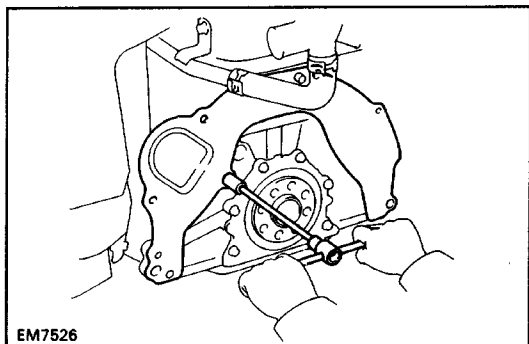
Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

9. INSTALL PS PUMP BRACKET

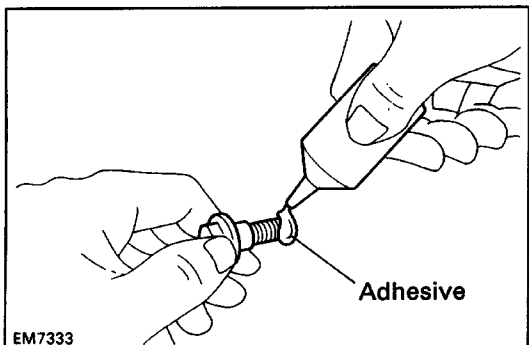
Install the PS pump bracket with the three bolts.

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

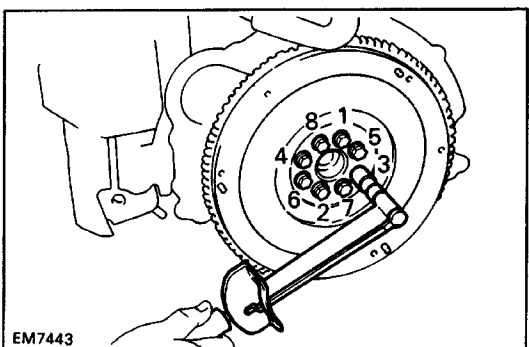
10. INSTALL ALTERNATOR (See page CH-25)
11. INSTALL DISTRIBUTOR (See page IG-35)
12. REMOVE ENGINE STAND



13. INSTALL REAR END PLATE
Torque: 9.3 N-m (95 kgf-cm, 82. in.-lbf)



14. (M/T)
INSTALL FLYWHEEL
(a) Apply adhesive to two or three threads of the mounting bolt end.
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent



- (b) Install the flywheel on the crankshaft.
- (c) Install and uniformly tighten the mounting bolts in several passes in the sequence shown.
Torque: 88 N-m (900 kgf-cm, 65 ft-lbf)

15. (A/T)
INSTALL DRIVE PLATE (See procedure in step 14)
Torque: 83 N-m (850 kgf-cm, 61 ft-lbf)
16. (M/T)
INSTALL CLUTCH DISC AND COVER
(See CL section)

INSTALLATION OF ENGINE

1. ASSEMBLE ENGINE AND TRANSAXLE

M/T (See MT section)

A/T (See AT section)

2. (A/T)

INSTALL STARTER (See page [ST-23](#))

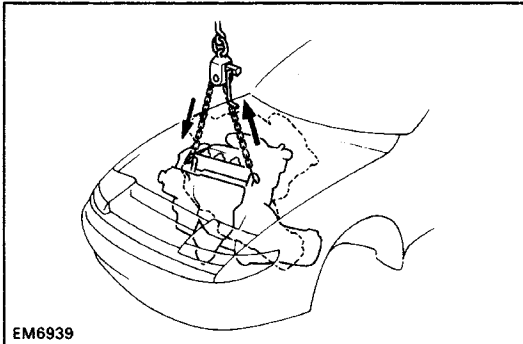
3. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

(a) Attach the engine chain hoist to the engine hangers,

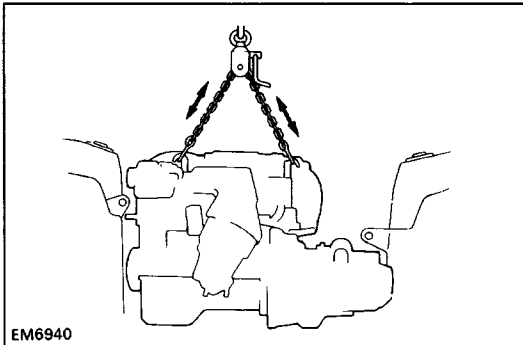
(b) Lower the engine into the engine compartment.

Tilt the transaxle downward, lower the engine and clear the LH mounting.

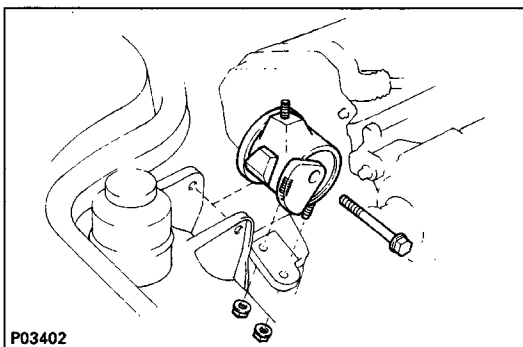
NOTICE: Be careful not to hit the PS gear housing or neutral start switch (A/T).



(c) Keep the engine level, and align RH and LH mountings with the body bracket.

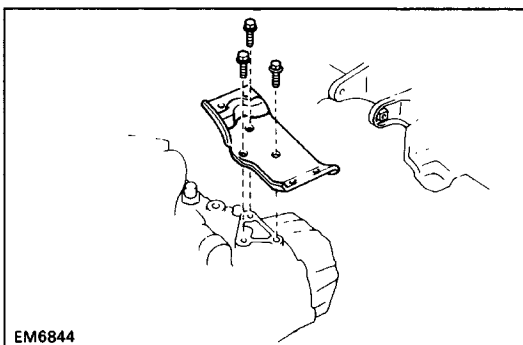


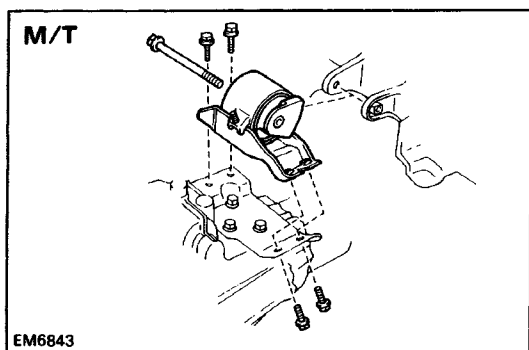
(d) Attach the RH mounting insulator to the mounting bracket and body, and temporarily install the through bolt and two nuts.



(e) Install the LH mounting bracket to the transaxle case with the three bolts.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)





- (f) Attach the LH mounting insulator to the mounting bracket and body with the through bolt and four bolts. Torque the bolts.

Torque:

Bolt 63 N-m (650 kgf-cm, 47 ft-lbf)

Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

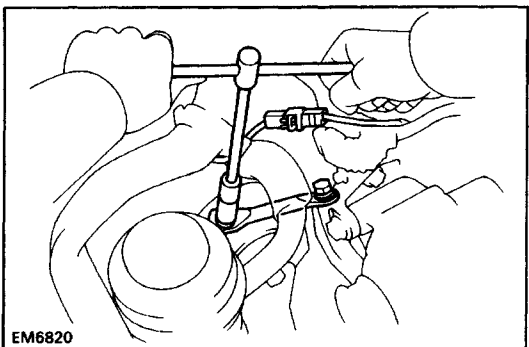
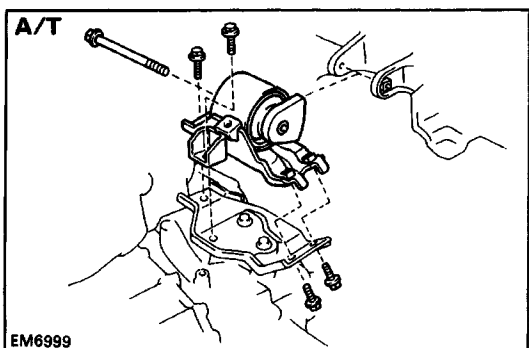
- (g) Torque the through bolt and two nuts of the RH mounting insulator.

Torque:

Nut 52 N-m (530 kgf-cm, 38 ft-lbf)

Through bolt 87 N-m (890 kgf-cm, 64 ft-lbf)

- (h) Remove the engine chain hoist from the engine.

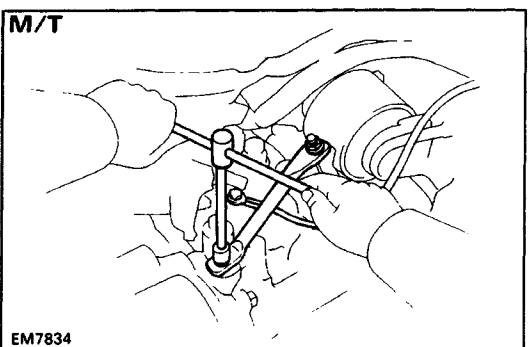


4. INSTALL RH ENGINE MOUNTING STAY

Install the mounting stay with the bolt and nut.

Torque: 73 N-m (740 kgf-cm, 54 ft-lbf)

5. CONNECT GROUND CONNECTOR TO GROUND WIRE ON RH FENDER APRON



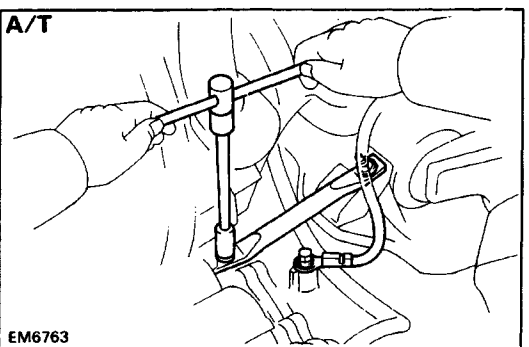
6. INSTALL LN ENGINE MOUNTING STAY

(M/T)

(a) Install the mounting stay with the two nuts.

(b) Connect the ground strap.

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

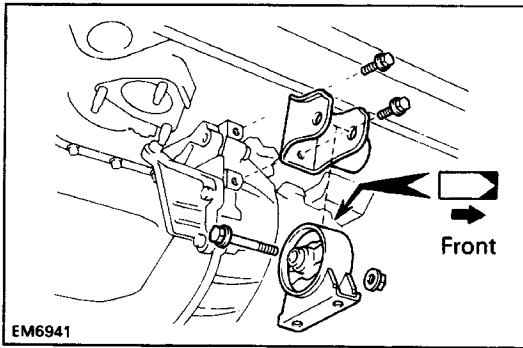


(A/T)

(a) Install the mounting stay with the bolt and nut.

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

(b) Connect the ground strap to the transaxle with the bolt.

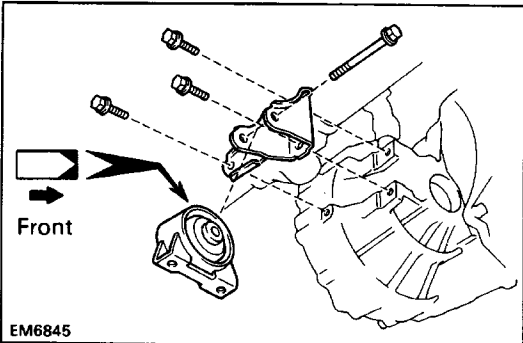


7. INSTALL FRONT ENGINE MOUNTING BRACKET AND INSULATOR

(a) Install the mounting bracket with the two bolts.

Torque: 77 N-m (790 kgf-cm, 57 ft-lbf)

(b) Temporarily install the mounting insulator with the through bolt and nut.

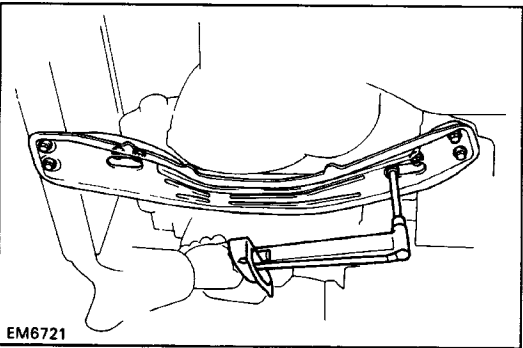


8. INSTALL REAR ENGINE MOUNTING BRACKET AND INSULATOR

(a) Install the mounting bracket with the three bolts.

Torque: 77 N-m (790 kgf-cm, 57 ft-lbf)

(b) Temporarily install the mounting insulator with the through bolt.



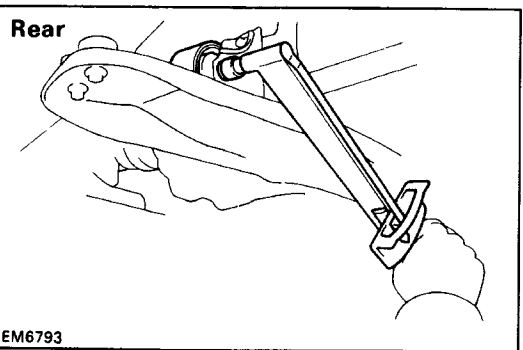
9. INSTALL ENGINE MOUNTING CENTER MEMBER

(a) Install the engine mounting center member with the four bolts.

Torque: 52 N-m (530 kgf-cm, 38 ft-lbf)

(b) Install and torque the four bolts holding the insulators to the center member.

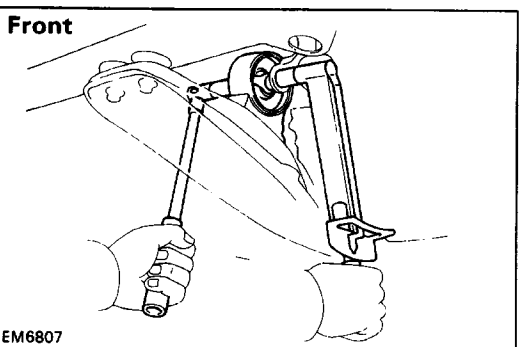
Torque: 73 N-m (740 kgf-cm, 54 ft-lbf)



10. TIGHTEN FRONT AND REAR ENGINE MOUNTING THROUGH BOLTS

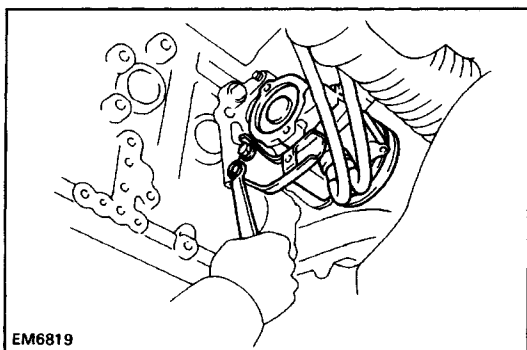
(a) Tighten the rear through bolt.

Torque: 87 N-m (890 kgf-cm, 64 ft-lbf)



(b) Tighten the front through bolt.

Torque: 87 N-m (890 kgf-cm, 64 ft-lbf)

**11. INSTALL PS PUMP**

(a) Install the PS pump with the four bolts.

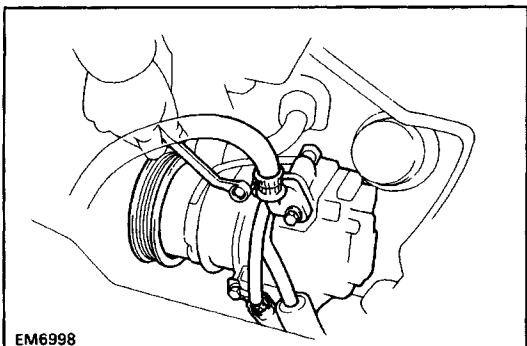
Torque:

Adjusting bolt 39 N-m (400 kgf-cm, 29 ft-lbf)

Others 43 N-m (440 kgf-cm, 32 ft-lbf)

(b) Install the drive belt.

(c) Connect the two air hoses to the air pipe.

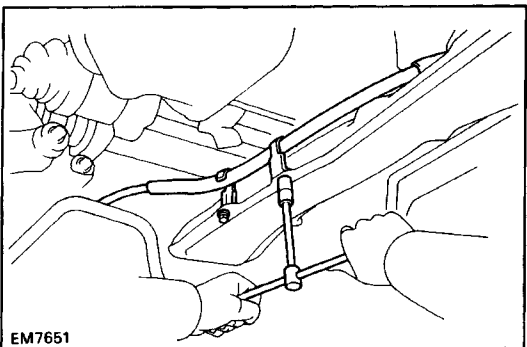
**12. (w/ A/C)****INSTALL A/C COMPRESSOR**

(a) Install the compressor with the three bolts.

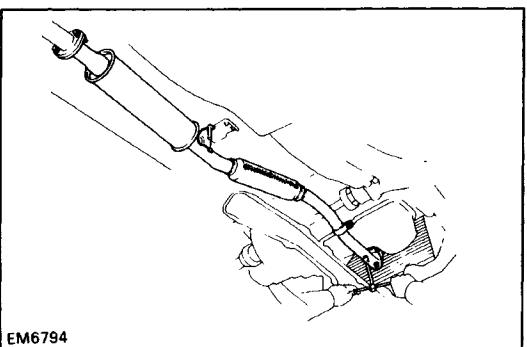
Torque: 27 N-m (280 kgfc 20 ft-lbf)

(b) Connect the two connectors.

(c) Connect the A/C compressor connector.

13. INSTALL DRIVE SHAFTS (See SA section)**14. (A/T)****INSTALL TRANSAXLE CONTROL CABLE TO ENGINE MOUNTING CENTER MEMBER**

Install the control cable with the two clamps and bolts.

**15. INSTALL FRONT EXHAUST PIPE**

(a) Install the support hook on the front exhaust pipe to the support bracket.

(b) Place two new gaskets on the front and rear of the front exhaust pipe.

(c) Temporarily install the two bolts and new nuts holding the exhaust pipe to the center exhaust pipe.

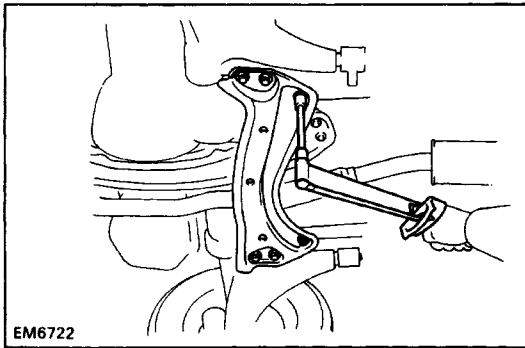
(d) Using a 14 mm deep socket wrench, install the three new nuts holding the exhaust pipe to the catalytic converter.

Torque: 62 N-m (630 kgf-cm, 46 ft-lbf)

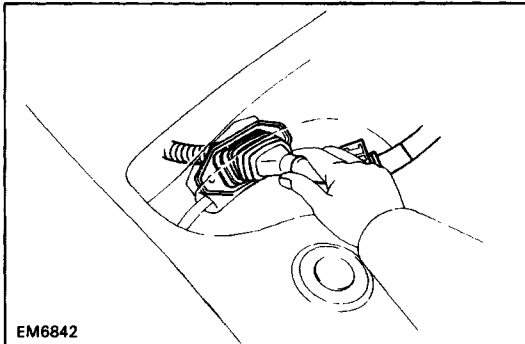
(e) Tighten the two bolts and nuts holding the exhaust pipe to the center exhaust pipe.

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

(f) Install the clamp with the bolt.

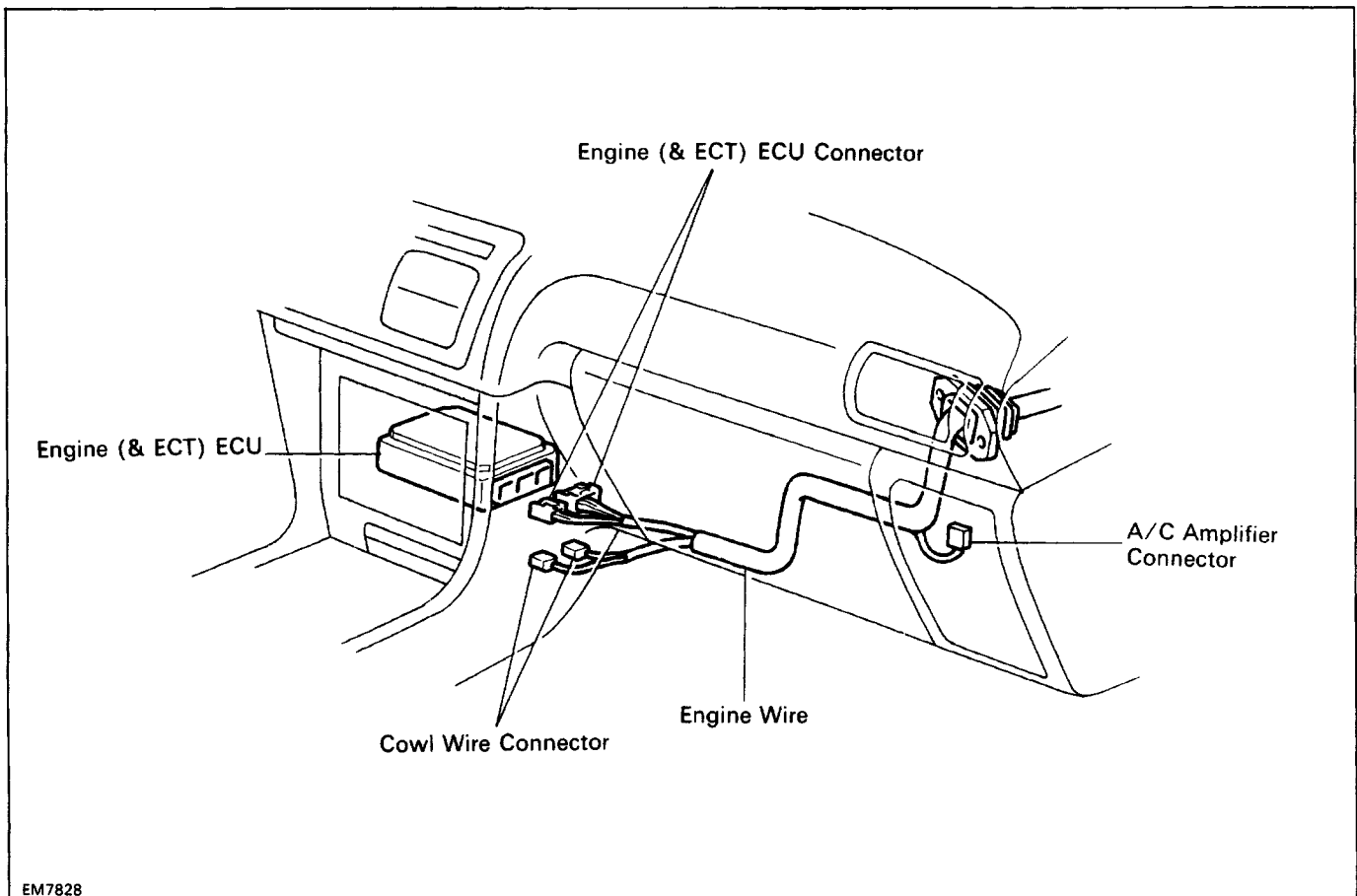


- 16. INSTALL SUSPENSION LOWER CROSSMEMBER**
 Install the lower crossmember with the four bolts and two nuts.
Torque: 152 N-m (1,554 kgf-cm, 112 ft-lbf)



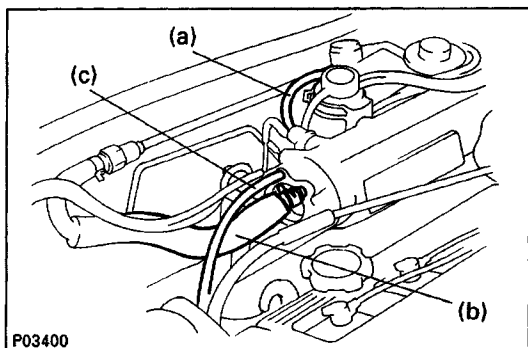
- 17. CONNECT ENGINE WIRE TO CABIN**
 (a) Push in the engine wire through the cowl panel.
 Install the two nuts.

- (b) Connect the following connectors:
 (1) Two engine (& ECT) ECU connectors
 (2) Two cowl wire connectors
 (3) A/C amplifier connector

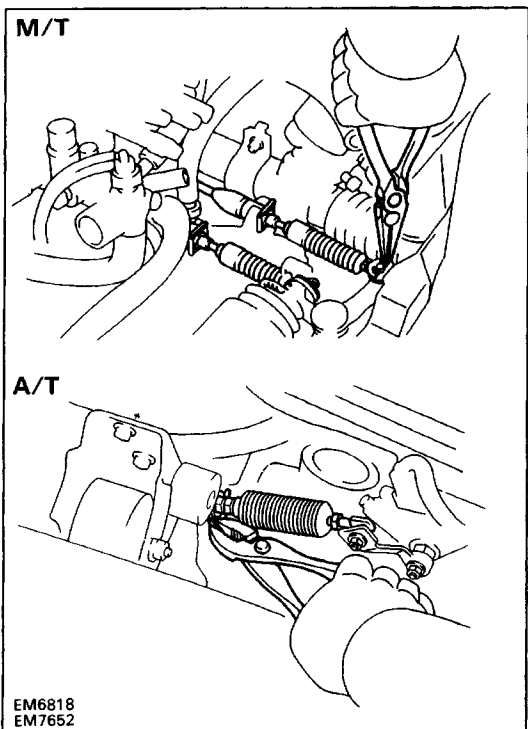
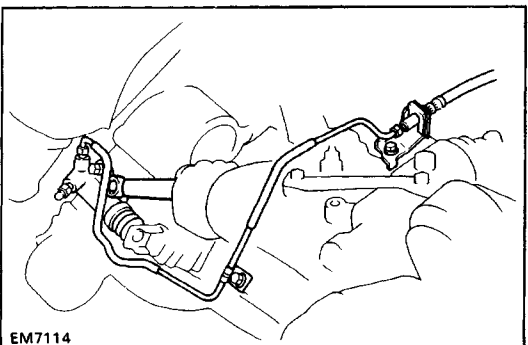


18. CONNECT ENGINE WIRE

- (a) Engine wire clamp to wire bracket on RH fender apron
- (b) Two cowl wire connectors

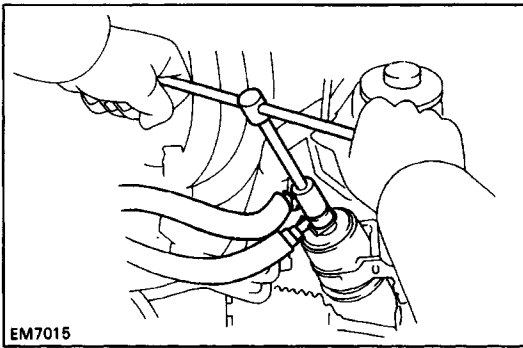
**19. CONNECT VACUUM HOSES**

- (a) Vacuum sensor hose to gas filter
- (b) Brake booster vacuum hose to intake manifold
- (c) (w/ Cruise Control System (w/o ABS))
Actuator vacuum hose to intake manifold

**20. CONNECT TRANSAXLE CONTROL CABLE(S) TO TRANSAXLE****21. (M/T)****INSTALL CLUTCH RELEASE CYLINDER**

Install the release cylinder and tube with the four bolts.

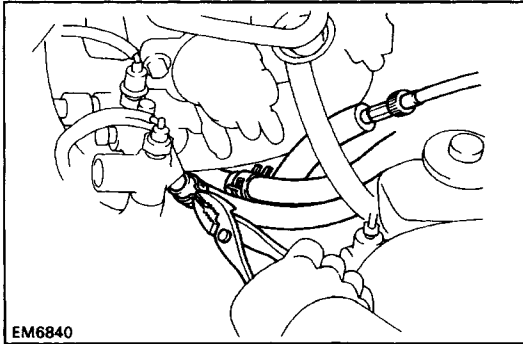
22. (M /T)**INSTALL STARTER (See page [ST-23](#))**



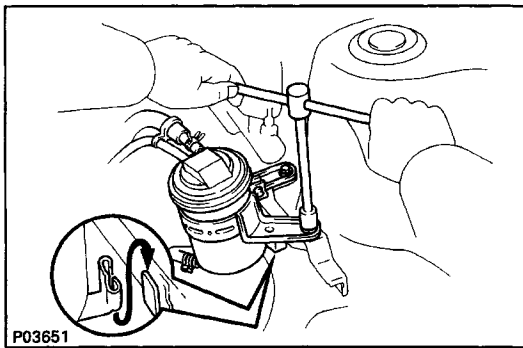
EM7015

23. CONNECT FUEL HOSES

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



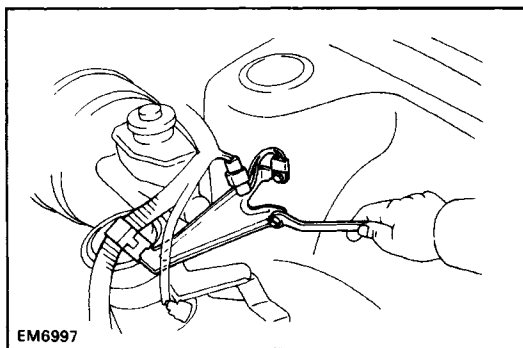
EM6840

24. CONNECT SPEEDOMETER CABLE**25. CONNECT HEATER HOSES**

P03651

26. INSTALL CHARCOAL CANISTER

- (a) Install the charcoal canister with the two bolts.
- (b) Connect the three hoses.



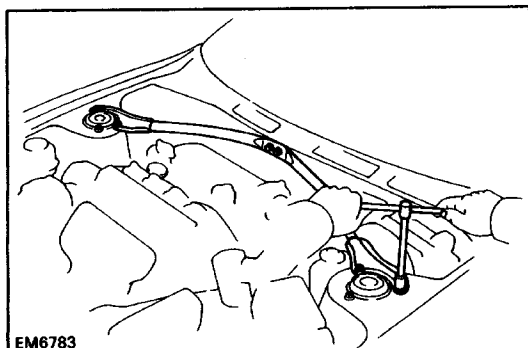
EM6997

27. INSTALL ENGINE WIRE BRACKET

- (a) Install the wire bracket with the two bolts. Install the noise filter.
- (b) Install the wire clamp to the wire bracket.

28. CONNECT WIRES AND CONNECTORS

- (a) Check connector
- (b) Igniter connector
- (c) Vacuum sensor connector
- (d) Ground straps from LH fender apron

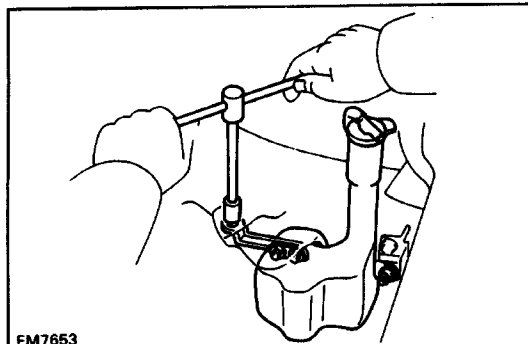
**29. INSTALL SUSPENSION UPPER BRACE**

- (a) Install the suspension upper brace with the two bolts and four nuts.

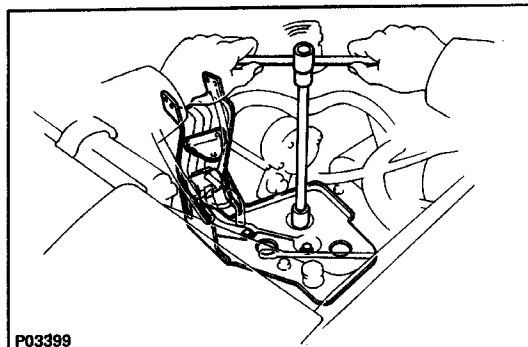
Torque: Bolt 21 N-m (210 kgf-cm, 15 ft-lbf)

Nut 64 N-m (650 kgf-cm, 47 ft-lbf)

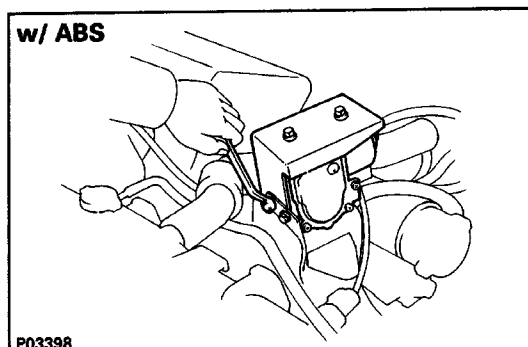
- (b) Install the outside lower windshield moulding.
 (c) Install the two wiper arms.

**30. INSTALL RADIATOR RESERVOIR TANK**

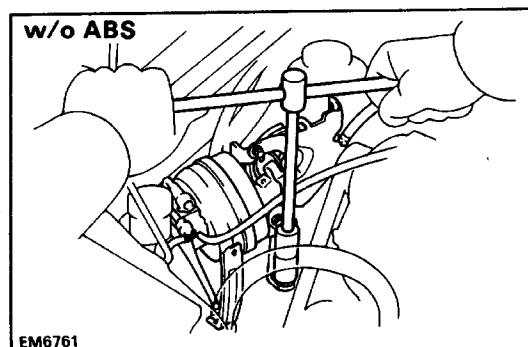
Install the reservoir tank with the two nuts.

31. INSTALL RADIATOR (See pages CO-24 and 25)**32. (w/ CRUISE CONTROL SYSTEM (w/ ABS))****INSTALL CRUISE CONTROL ACTUATOR BRACKET**

- (a) Install the actuator bracket with the two bolts and nut.
 (b) Install the actuator connector to the bracket.

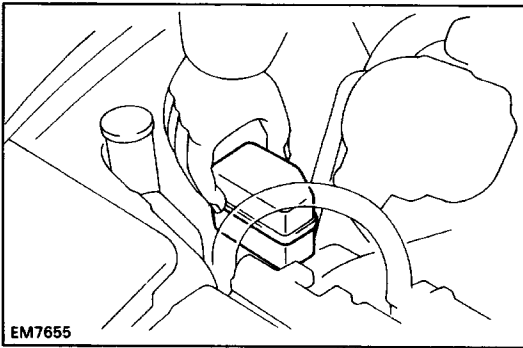
**33. (w/ CRUISE CONTROL SYSTEM)****INSTALL CRUISE CONTROL ACTUATOR (w/ ABS)**

- (a) Install the actuator with the four bolts.
 (b) Connect the actuator connector.

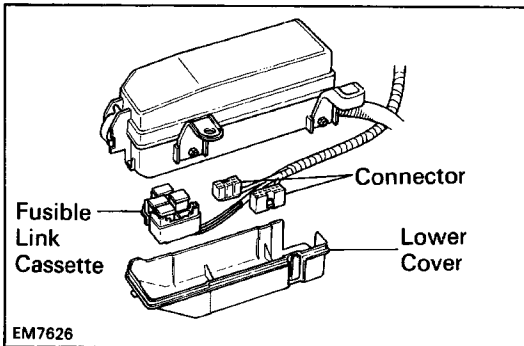
**(w/o ABS)**

- (a) Install the actuator with the three bolts.
 (b) Connect the cable to the actuator.
 (c) Connect the actuator connector.
 (d) Connect the actuator vacuum hose.
 (e) Install the actuator cover.

34. INSTALL BATTERY



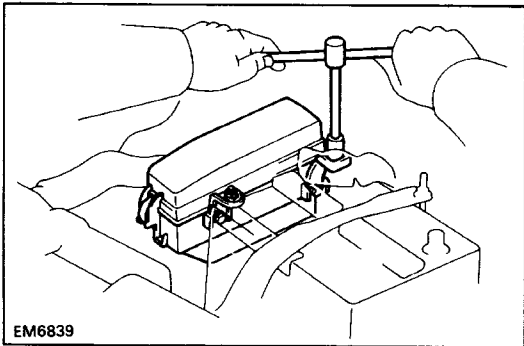
EM7655

35. INSTALL A/C RELAY BOX

EM7626

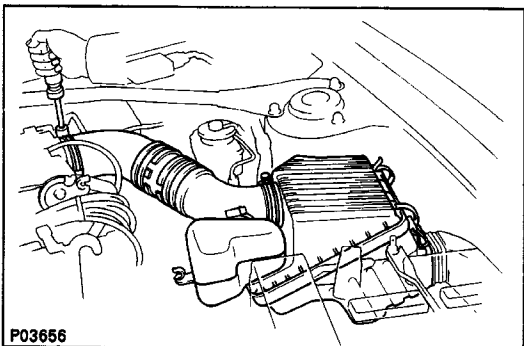
36. CONNECT ENGINE WIRE, AND INSTALL ENGINE RELAY BOX

- (a) Connect the fusible link cassette and two connectors of the engine wire to the relay box.
- (b) Install the lower cover to the relay box.



EM6839

- (c) Install the relay box with the two nuts.

37. INSTALL ACCELERATOR CABLE, AND ADJUST IT

P03656

38. INSTALL AIR CLEANER ASSEMBLY

- (a) Install the air cleaner case with the three bolts.
- (b) Install the air cleaner element.
- (c) Connect the air cleaner hose to the throttle body.
- (d) Install the air cleaner cap.
- (e) Connect the intake air temperature sensor connector.

39. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**40. FILL WITH ENGINE COOLANT (See page [CO-6](#))****Capacity (w/ Heater):**

M/T 6.2 liters (6.6 US qts, 5.5 Imp. qts)

A/T 6.1 liters (6.4 US qts, 5.4 Imp. qts)

41. FILL WITH ENGINE OIL (See page [LU-8](#))**Capacity (w/ Oil cooler):****Drain and refill****w/ Oil filter change****4.2 liters (4.4 US qts, 3.7 Imp. qts)****w/o Oil filter change****3.8 liters (4.0 US qts, 3.3 Imp. qts)****Dry fill 4.6 liters (4.9 US qts, 4.0 Imp. qts)****Capacity (w/ Oil cooler):****Drain and refill****w/ Oil filter change****4.1 liters (4.3 US qts, 3.6 Imp. qts)****w/o Oil filter change****3.7 liters (3.9 US qts, 3.3 Imp. qts)****Dry fill 4.5 liters (4.8 US qts, 4.0 Imp. qts)****42. START ENGINE AND CHECK FOR LEAKS****43. PERFORM ENGINE ADJUSTMENT**

(a) Adjust the alternator drive belt.

(See page [CH-3](#))**Drive belt tension:****w/ A/C New belt 165 ± 10 lbf****Used belt 110 ± 10 lbf****w/o A/C New belt 125 ± 25 lbf****Used belt 95 ± 20 lbf**(b) Adjust the PS drive belt. (See page [SR-38](#))**Drive belt tension: New belt 125 ± 25 lbf****Used belt 80 ± 20 lbf**(c) Adjust the ignition timing. (See page [IG-37](#))**Ignition timing:****10° BTDC @ idle****(w/ Terminals TE1 and E1 connected)****44. INSTALL ENGINE UNDER COVERS****45. INSTALL HOOD****46. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

47. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

EXHAUST SYSTEM

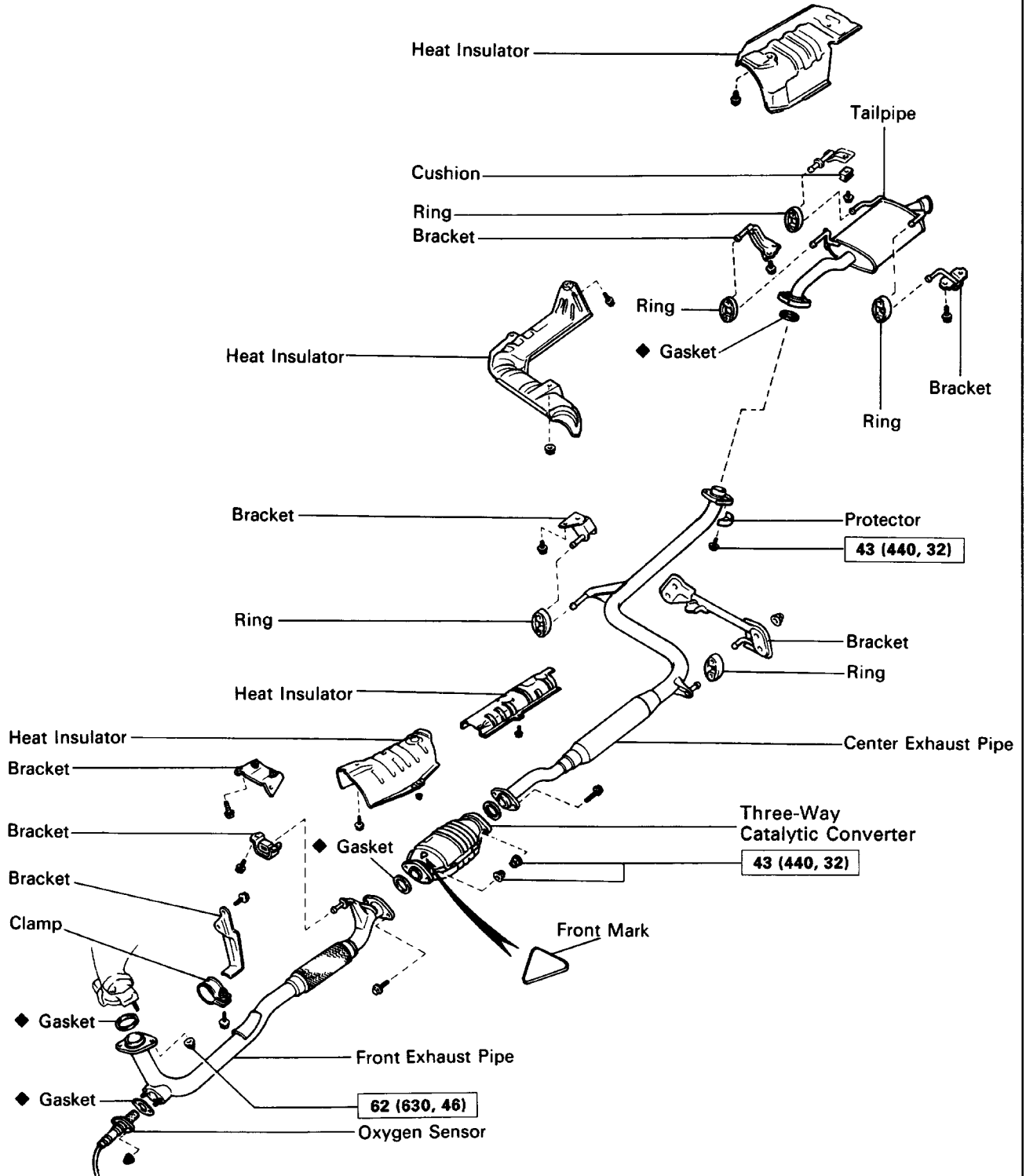
	Page
EXHAUST PIPES AND HEAT INSULATORS	EX-2



EX

EXHAUST PIPES AND HEAT INSULATORS COMPONENTS

4A-FE (CALIF.)

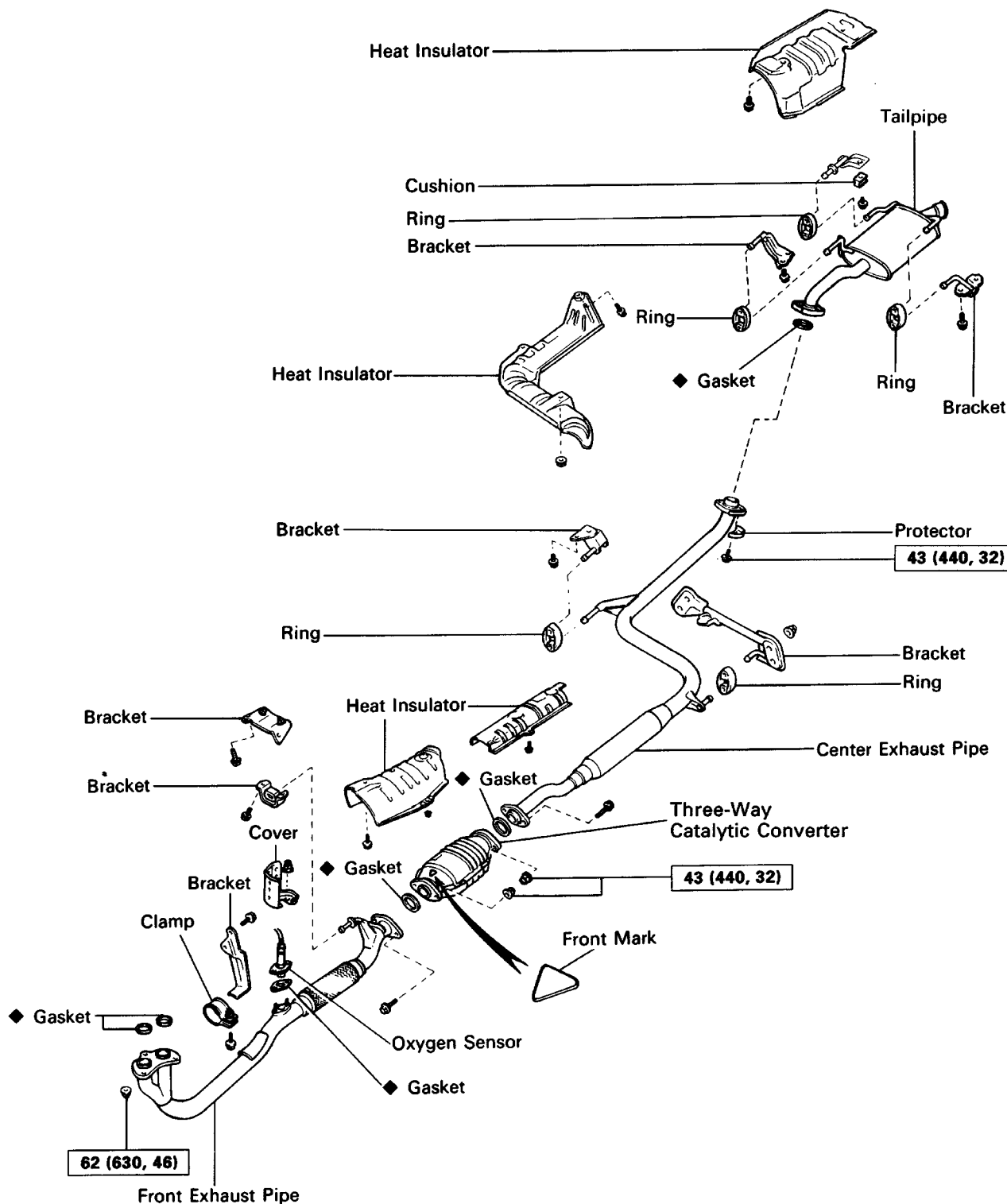


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

COMPONENTS

4A-FE (Ex. CALIF.)

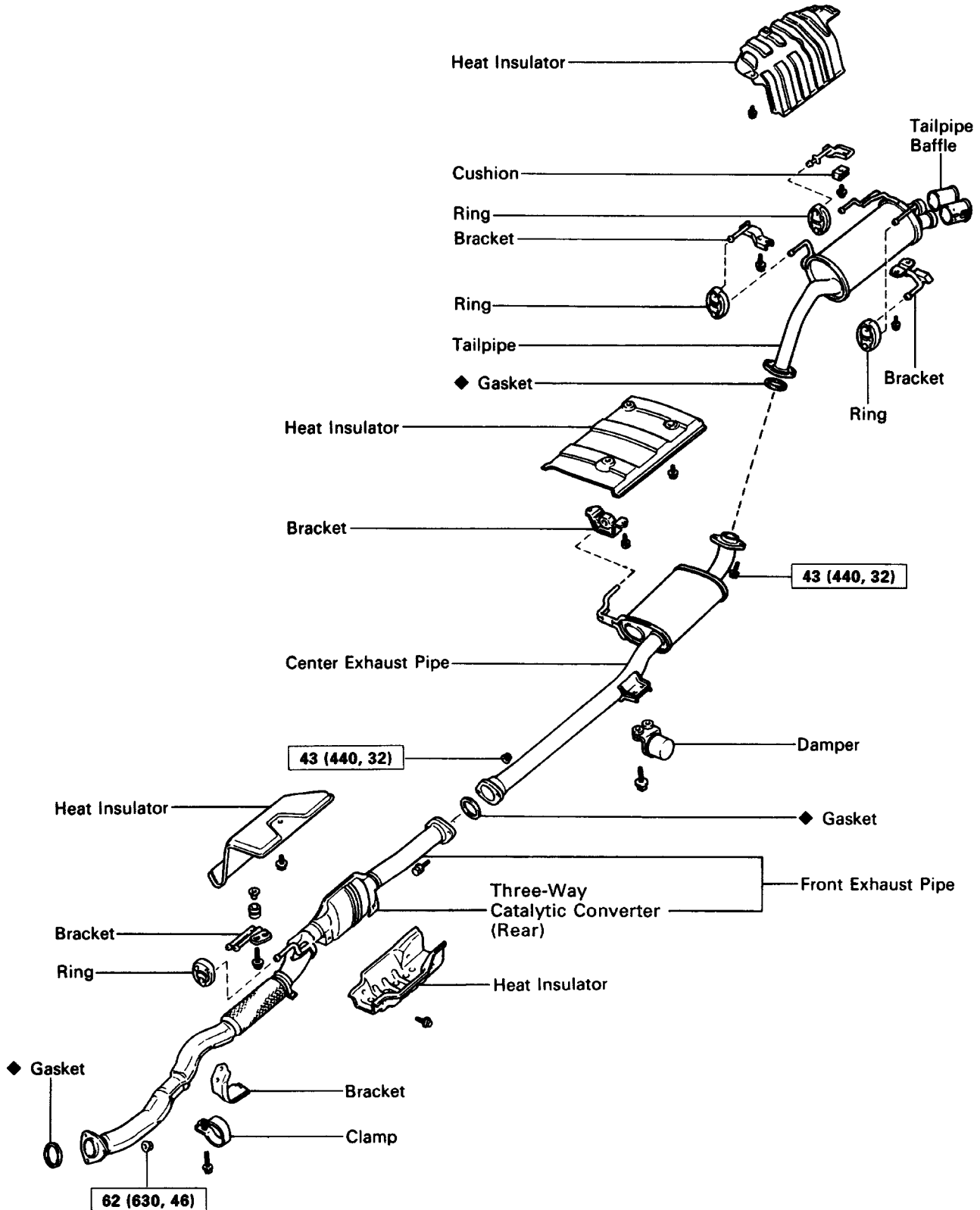


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

EXHAUST PIPES AND HEAT INSULATORS COMPONENTS

3S-GTE



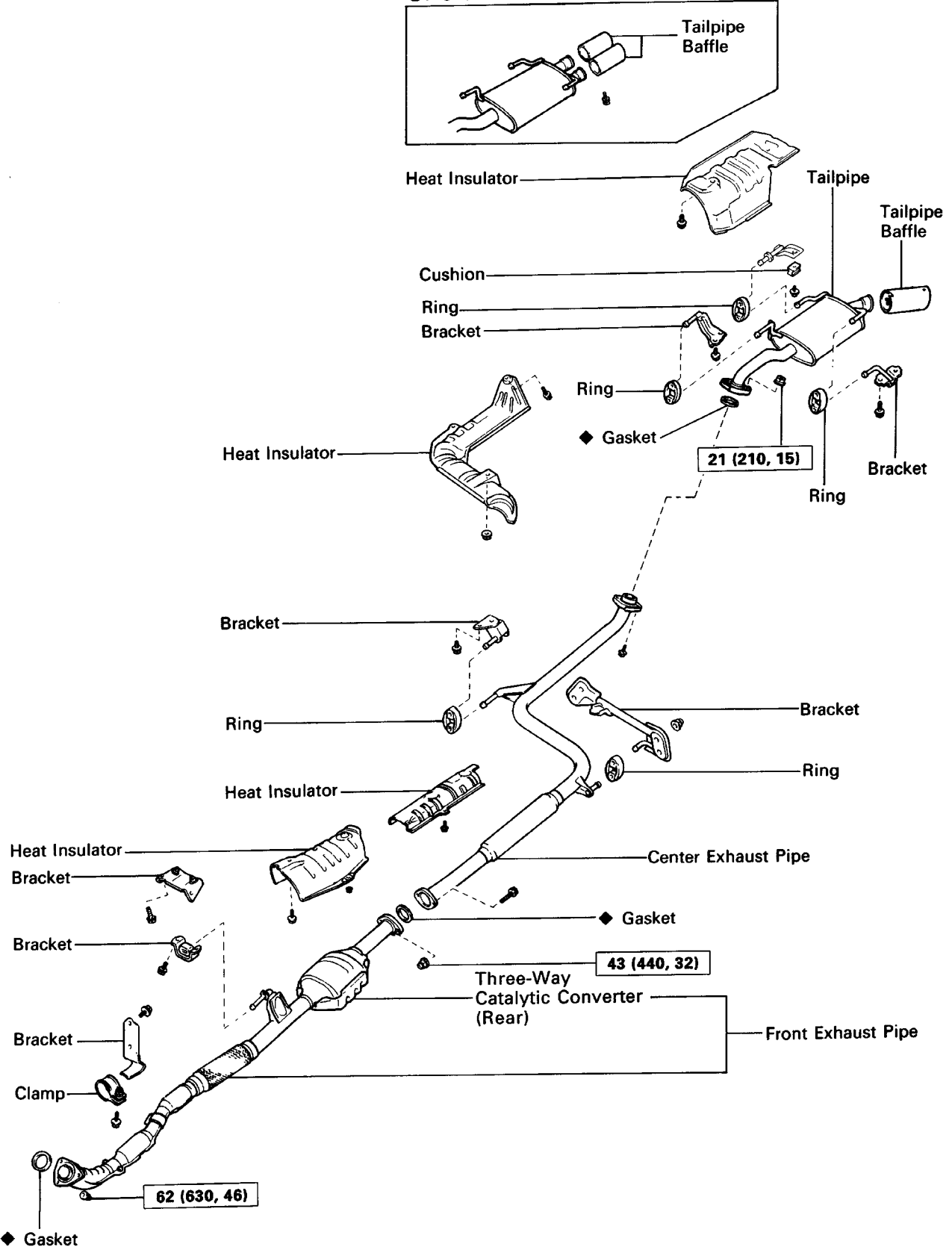
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

COMPONENTS

5S-FE (CALIF.)

GT-S Grade



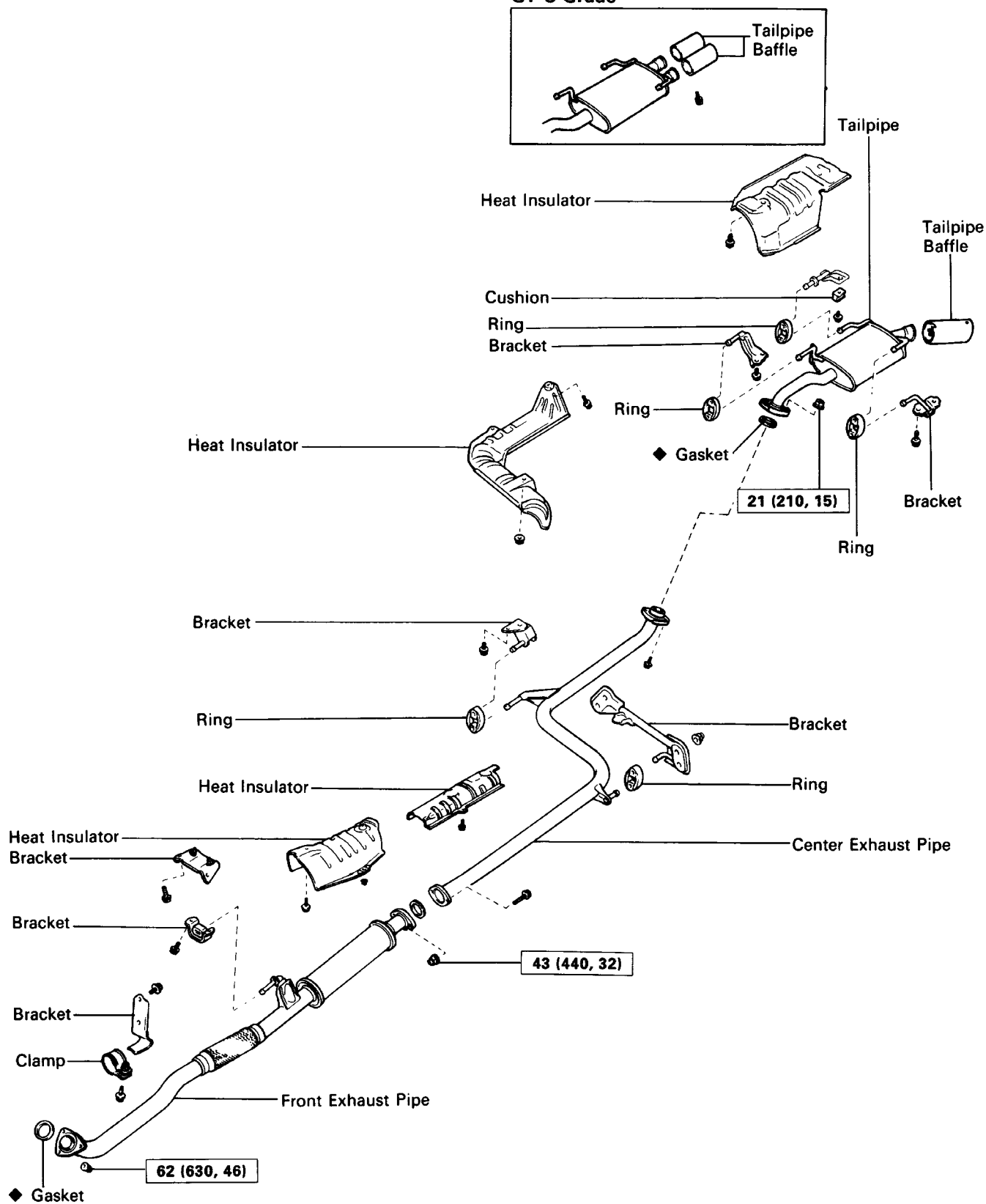
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

COMPONENTS

5S-FE (Ex. CALIF.)

GT-S Grade



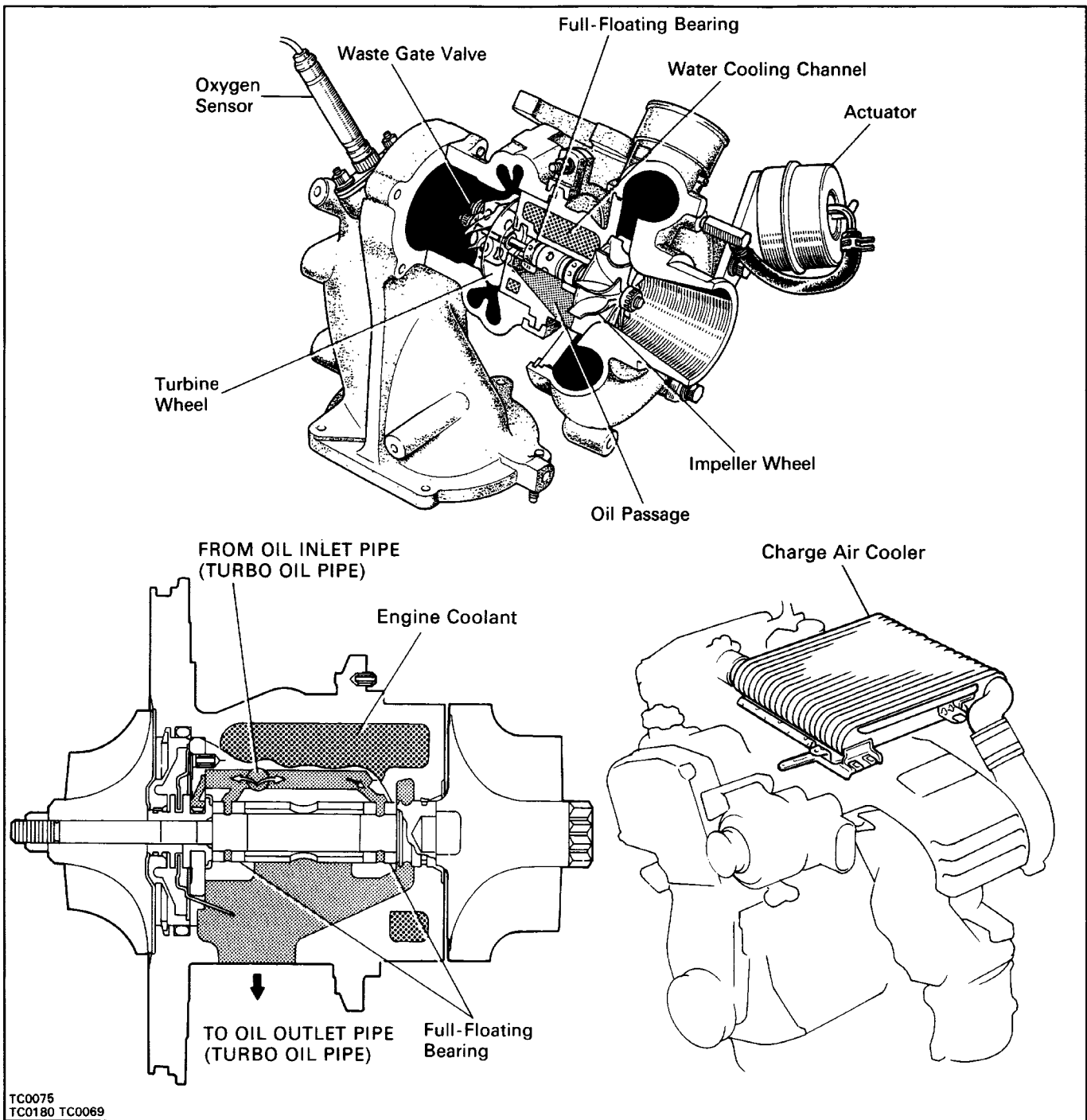
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

TURBOCHARGER

	Page
DESCRIPTION	TC-2
PRECAUTIONS	TC-4
TROUBLESHOOTING	TC-5
TURBOCHARGER	TC-7

DESCRIPTION



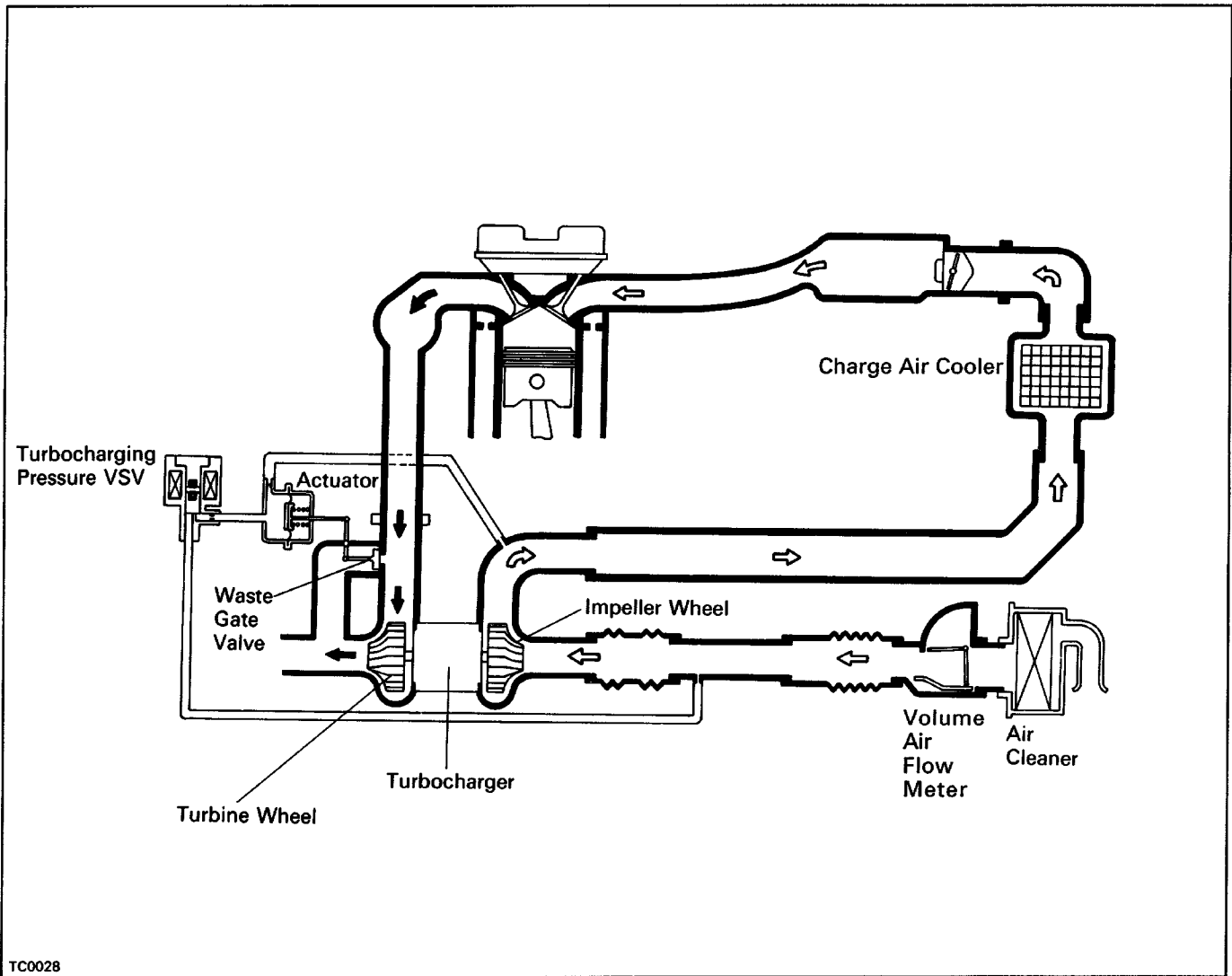
Systems which increase the amount of air sent to the engine are either turbocharger type (using exhaust gas to turn the turbine) or supercharger type (using the engine crankshaft, etc. to mechanically turn the pump, etc.). For CELICA 3S-GTE engine, the turbocharger type has been adopted.

The turbocharger is a device which increases engine output by sending a greater amount of air-fuel mixture to the engine than under normal conditions.

Engine output depends upon the volume of the air-fuel mixture ignited per unit of time.

Therefore, to increase engine output, the most effective method is to send a greater amount of air-fuel mixture into the cylinder.

In other words, by installing a special turbocharger and providing a higher air-fuel mixture than usual, engine output can be increased by increasing the average combustion pressure without increasing the engine speed.



Operation of Turbocharger

Exhaust gas acts on the turbine wheel inside the turbine housing, causing it to revolve. When the turbine wheel revolves, the impeller wheel which is located on the same shaft also revolves, compressing the intake air which has passed through the volume air flow meter from the air cleaner. When expelled from the compressor housing, the compressed air is supplied to the cylinders. When the engine speed increases, the exhaust gas volume increases and the turbine wheel revolutions increase approx. 20,000 – 110,000 rpm), thus the turbocharged air pressure grows greater and engine output increases.

Waste Gate Valve

High output is achieved by turbo-charging, but if the turbocharged air pressure becomes too high, knocking occurs and, on the contrary, a reduction in engine output is caused. If the turbocharged air pressure exceeds the prescribed air pressure, the flow of exhaust gas by-passes the turbine, controlling turbine wheel revolutions and turbocharged air pressure. This by-pass valve which controls the quantity of exhaust gas flowing to the turbine is called the waste gate valve. When the turbocharged air pressure exceeds the prescribed pressure, the actuator operates, the waste gate valve opens and part of the exhaust gas by-passes the turbine. This causes a drop in the turbine revolution rate and controls the turbocharged air within the prescribed limits.

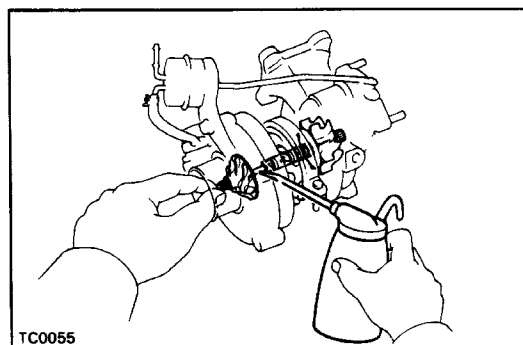
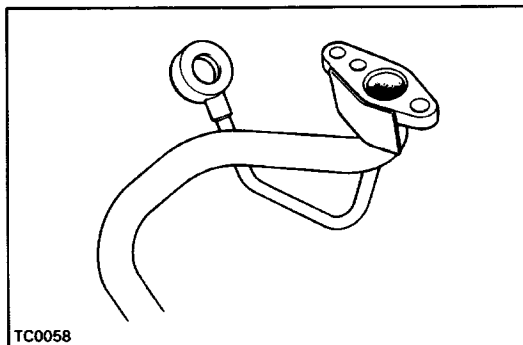
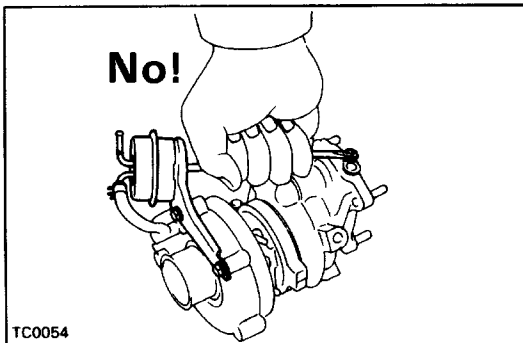
Charge Air Cooler

The charge air cooler cools the turbocharged air (intake air) put out by the turbocharger, thereby increasing the air density. As the intake air temperature decreases, the gas temperature in the combustion chambers falls and the occurrence of knocking is suppressed, giving an increase in engine output.

The Celica 3S-GTE charge air cooler is an air cooling type located at the top of the engine, utilizing the vehicle windstream to cool turbocharged air.

PRECAUTIONS

1. Do not stop the engine immediately after pulling a trailer or high speed or uphill driving. Idle the engine for 20 –120 seconds, depending on the severity of the driving condition.
2. Avoid sudden racing or acceleration immediately after starting a cold engine.
3. If the engine is running with the air cleaner removed, entry of foreign material will damage the wheels which run at extremely high speed.
4. If the turbocharger is defective and must be replaced, first check for the cause of the defect in reference to the following items and replace parts if necessary:
 - Engine oil level and quality
 - Conditions under which the turbocharger was used
 - Oil lines leading to the turbocharger



5. Use caution when removing and reinstalling the turbocharger assembly. Do not drop it or bang it against anything or grasp it by easily-deformed parts, such as the actuator or rod, when moving it.
6. Before removing the turbocharger, plug the intake and exhaust ports and oil inlet to prevent entry of dirt or other foreign material.
7. If replacing the turbocharger, check for accumulation of sludge particles in the oil pipes, and if necessary, replace the oil pipes.
8. Completely remove the gasket adhered to the lubrication oil pipe flange and turbocharger oil flange.
9. If replacing bolts or nuts, do so only with the specified new ones to guard against breakage or deformation.
10. If replacing the turbocharger, put 20 cc (1.2 cu in.) of oil into the turbocharger oil inlet and turn the impeller wheel by hand to spread oil to the bearing.
11. If overhauling or replacing the engine, cut the fuel supply after reassembly and crank the engine for 30 seconds to distribute oil throughout the engine. Then allow the engine to idle for 60 seconds.

TROUBLESHOOTING

HINT: Before troubleshooting the turbocharger, first check the engine itself. (Valve clearance, engine compression, ignition timing etc.)

INSUFFICIENT ACCELERATION, LACK OF POWER OR EXCESSIVE FUEL CONSUMPTION

(Possible Cause)	(Check Procedure and Correction Method)
<p>1. TURBOCHARGING PRESSURE TOO LOW</p>	<p>Check turbocharging pressure. (See page TC-8) Turbocharging pressure: 49 – 81 kPa (0.50 – 0.83 kgf/cm², 7.1 – 11.8 psi) If the pressure is below specification, begin diagnosis from item 2.</p>
<p>2. RESTRICTED INTAKE AIR SYSTEM</p>	<p>Check intake air system, and repair or replace parts as necessary. (See page TC-9)</p>
<p>3. LEAK IN INTAKE AIR SYSTEM</p>	<p>Check intake air system, and repair or replace parts as necessary. (See page TC-9)</p>
<p>4. RESTRICTED EXHAUST SYSTEM</p>	<p>Check exhaust system, and repair or replace parts as necessary. (See page TC-9)</p>
<p>5. LEAK IN EXHAUST SYSTEM</p>	<p>Check exhaust system, and repair or replace parts as necessary. (See page TC-9)</p>
<p>6. ERRATIC TURBOCHARGER OPERATION</p>	<p>Check rotation of impeller wheel. If it does not turn or turns with a heavy drag, replace the turbocharger assembly. Check axial and radial plays of impeller wheel. (See page TC-13) Axial play: 0.13 mm (0.0051 in.) or less Radial play: 0.18 mm (0.0071 in.) or less If not within specification, replace the turbocharger assembly.</p>

ABNORMAL NOISE

(Possible Cause)

(Check Procedure and Correction Method)

**1. TURBOCHARGER HEAT INSULATOR
RESONANCE**

Check for loose, improperly installed or deformed insulator mounting bolts, and repair or replace as necessary.

**2. EXHAUST PIPE LEAKING OR
VIBRATING**

Check for deformed exhaust pipe, loose mounting bolts or damaged gasket, and repair or replace as necessary.

**3. ERRATIC TURBOCHARGER
OPERATION**

Refer to Item 6 of INSUFFICIENT ACCELERATION, LACK OF POWER OR EXCESSIVE FUEL CONSUMPTION.

EXCESSIVE OIL CONSUMPTION OR WHITE EXHAUST

(Possible Cause)

(Check Procedure and Correction Method)

FAULTY TURBOCHARGER SEAL

Check for oil leakage in exhaust system.

- Remove the turbine elbow from the turbocharger and check for excessive carbon deposits on the turbine wheel. Excessive carbon deposits indicate a faulty turbocharger.

Check for oil leakage in intake air system.

- Check for axial and radial plays in impeller wheel, and replace the turbocharger if necessary.
(See page [TC-13](#))

Axial play: 0.13 mm (0.0051 in.) or less
Radial play: 0.18 mm (0.0071 in.) or less

NOTICE: There is some oil mist from the PCV in the blowby gas so care must be taken not to diagnose this as an oil leakage from the turbocharger.

TURBOCHARGER

ON-VEHICLE INSPECTION

1. INSPECT INTAKE AIR SYSTEM

Check for leakage or clogging between the air cleaner and turbocharger inlet and between the turbocharger outlet and cylinder head.

- Clogged air cleaner Clean or replace filter
- Hoses collapsed or deformed Repair or replace
- Leakage from connections Check each connection and repair
- Cracks in components Check and replace

2. INSPECT EXHAUST SYSTEM

Check for leakage or clogging between the cylinder head and turbocharger inlet and between the turbocharger outlet and exhaust pipe.

- Deformed components Repair or replace
- Foreign material in passages Remove
- Leakage from components Repair or replace
- Cracks in components Check and replace

3. INSPECT ACTUATOR OPERATION .

- Disconnect the actuator hose.
- Using SST (turbocharger pressure gauge), apply approx. 61 kPa (0.62 kg/cm², 88 psi) of pressure to the actuator and check that the rod moves.

If the rod does not move, replace the turbocharger assembly.

SST 09992-00241

NOTICE: Never apply more than 81 kPa (0.83 kg/cm², 11.8 psi) of pressure to the actuator.

4. CHECK TURBOCHARGING PRESSURE

- Using a 3-way connector, connect SST (turbocharger pressure gauge) to the hose between the intake manifold and turbocharging pressure sensor.

SST 09992-00241

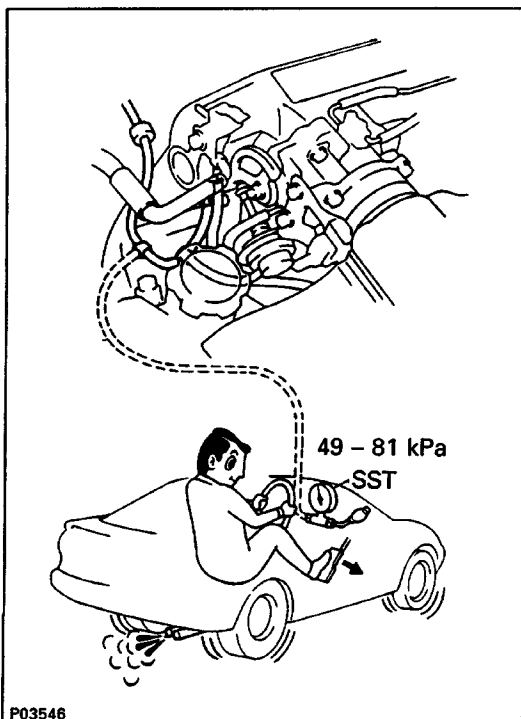
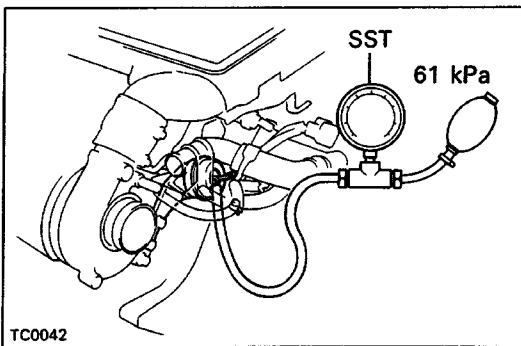
- While driving with the engine running at 2,800 rpm or more with the throttle valve fully open in the 2nd gear, check the turbocharging pressure.

Standard pressure: 49 – 81 kPa

(0.50 – 0.83 kgf/cm², 7.1 – 11.8 psi)

If the pressure is less than that specified, check the intake air and exhaust systems for leakage. If there is no leakage, replace the turbocharger assembly.

If the pressure is above specification, check if the actuator hose is disconnected or cracked. If not, replace the turbocharger assembly.



5. INSPECT IMPELLER WHEEL ROTATION

(See step 1 on page TC-13)

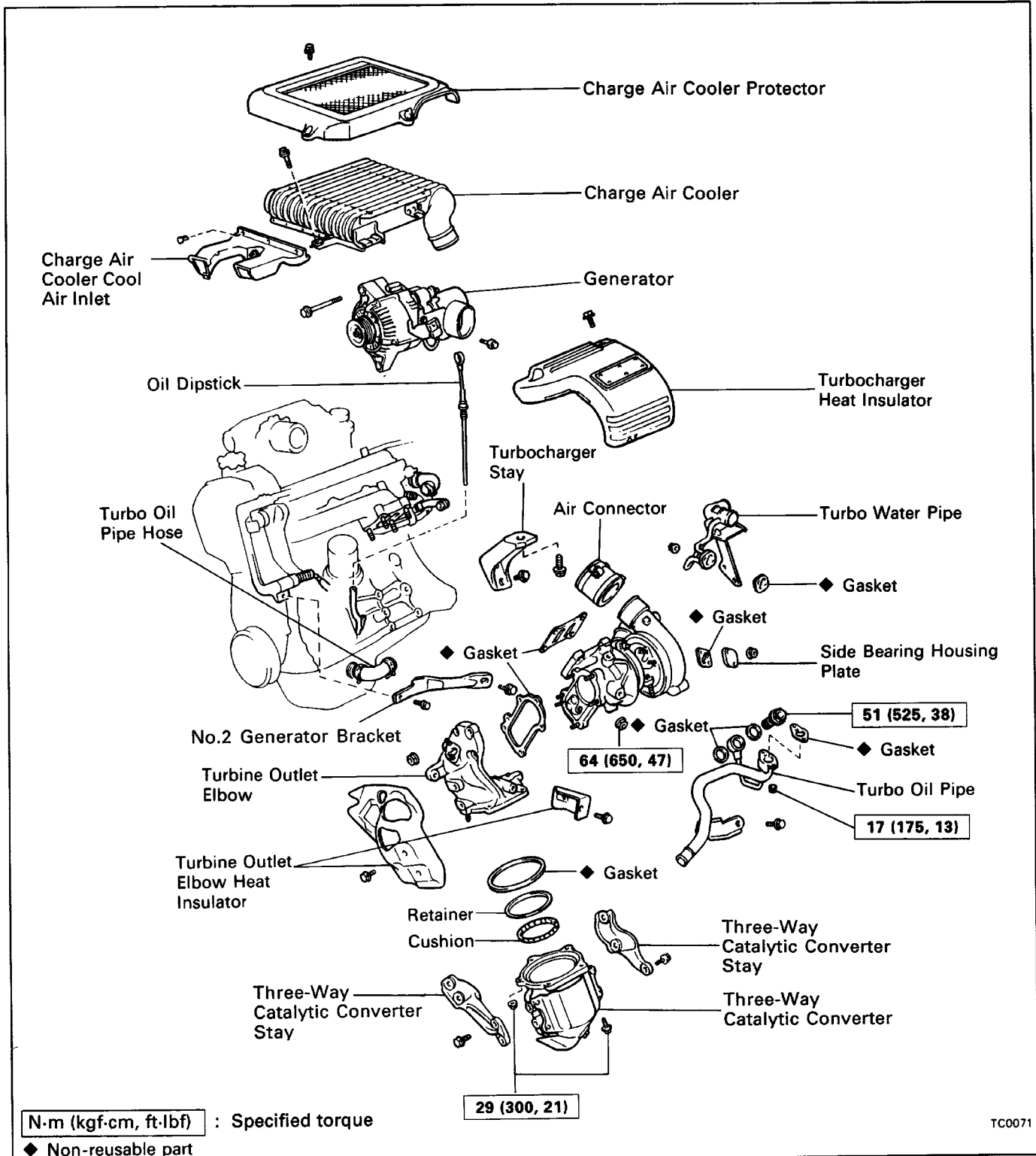
6. INSPECT TURBOCHARGING PRESSURE VSV

(See page FI-226)

7. INSPECT TURBOCHARGING PRESSURE SENSOR

(See page FI-235)

COMPONENTS



REMOVAL OF TURBOCHARGER

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE ENGINE UNDER COVERS

3. DRAIN ENGINE COOLANT (See page [CO-6](#))

4. REMOVE AIR CLEANER CAP

(See step 7 on page [EM-224](#))

5. REMOVE SUSPENSION LOWER CROSSMEMBER

(See step 33 on page [EM-228](#))

6. REMOVE FRONT EXHAUST PIPE

(See step 34 on page [EM-229](#))

7. REMOVE ENGINE MOUNTING CENTER MEMBER

(See step 42 on page [EM-229](#))

8. REMOVE FRONT MOUNTING INSULATOR AND BRACKET (See step 43 on page [EM-230](#))

9. REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE

(See step 26 on page [EM-227](#))

10. REMOVE GENERATOR (See page [CH-7](#))

11. REMOVE IDLER PULLEY BRACKET AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

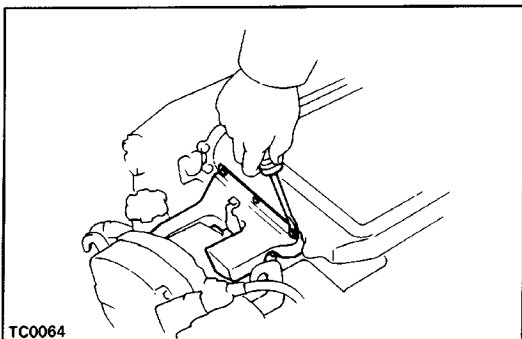
(See step 39 on page [EM-80](#))

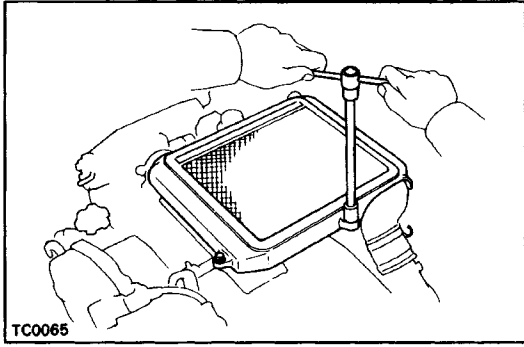
12. REMOVE THREE-WAY CATALYTIC CONVERTER

(See step 45 on page [EM-230](#))

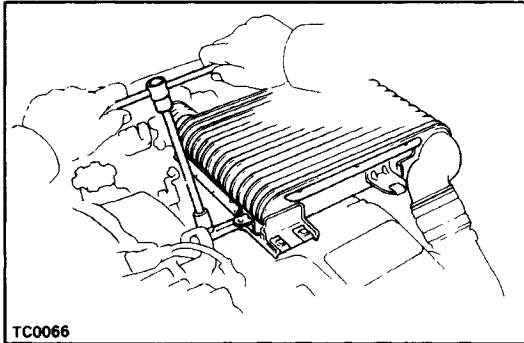
13. REMOVE CHARGE AIR COOLER COOL AIR INLET

Using a clip remover, remove the seven clips and air inlet.

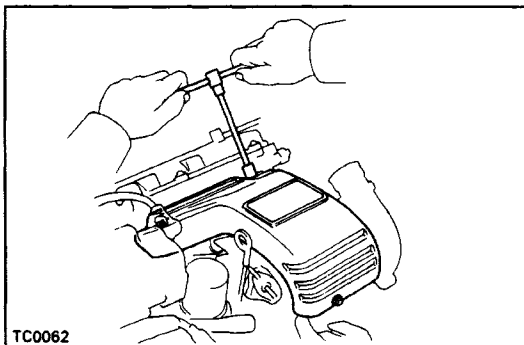


**14. REMOVE CHARGE AIR COOLER PROTECTOR**

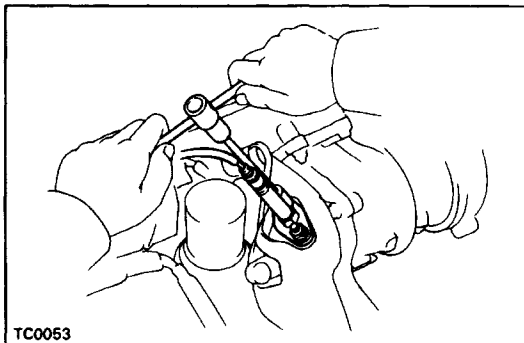
Remove the three bolts and protector.

**15. REMOVE CHARGE AIR COOLER**

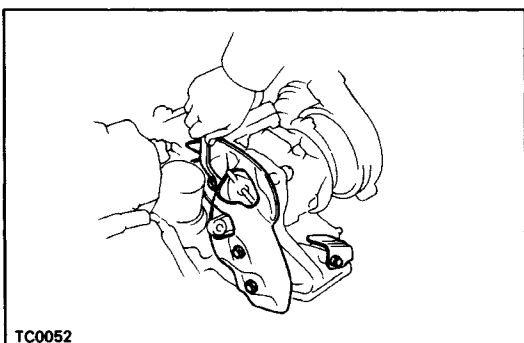
- (a) Remove the two bolts.
- (b) Disconnect the charge air cooler from the turbocharger and intake air connector, and remove the charge air cooler and air connector.

**16. REMOVE TURBOCHARGER HEAT INSULATOR**

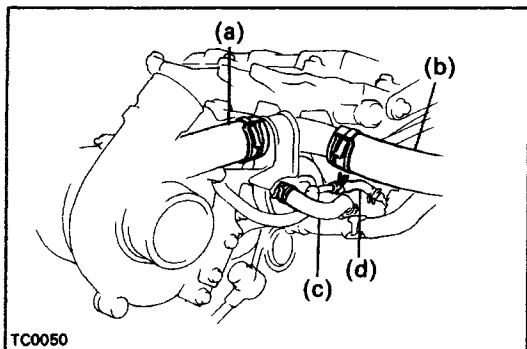
Remove the three bolts and heat insulator.

**17. REMOVE OXYGEN SENSOR**

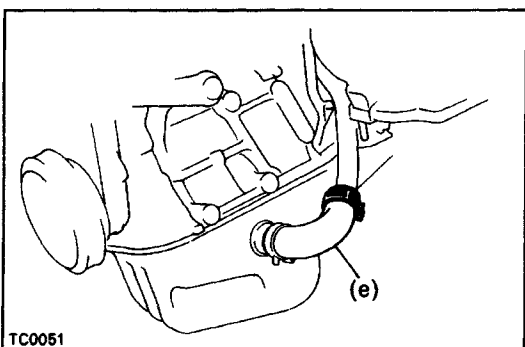
- (a) Disconnect the oxygen sensor connector.
- (b) Remove the two nuts, oxygen sensor and gasket.

**18. REMOVE HEAT INSULATORS OF TURBINE OUTLET ELBOW**

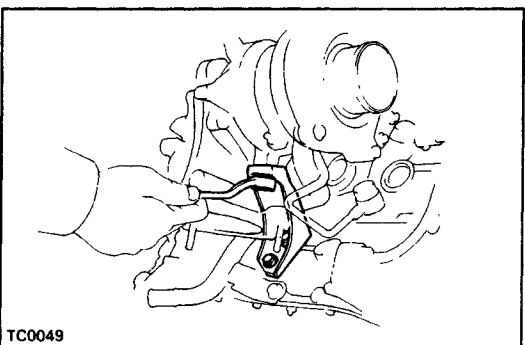
- (a) Remove the oil dipstick.
- (b) Remove the three bolts and RH heat insulator.
- (c) Remove the two bolts and LH heat insulator.

**19. DISCONNECT HOSES**

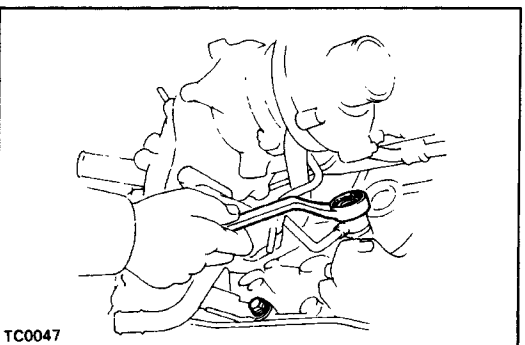
- (a) Water hose from radiator
- (b) Water hose from water inlet
- (c) Water by-pass hose from turbo water pipe
- (d) Vacuum hose from actuator



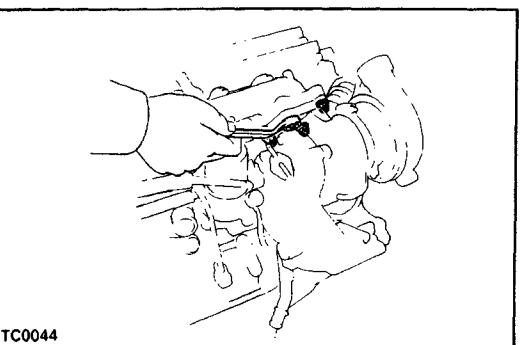
- (e) Oil hose from turbo oil pipe

**20. REMOVE TURBOCHARGER STAY**

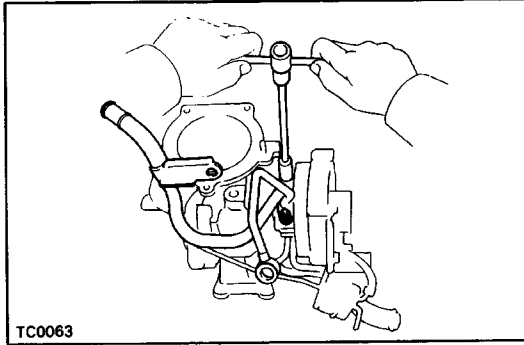
Remove the three bolts and turbocharger stay.

**21. REMOVE TURBOCHARGER**

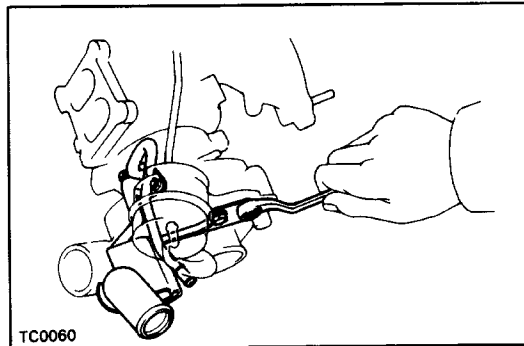
- (a) Remove the bolt and union bolt holding the No.1 turbo oil pipe to the cylinder block. Remove the two union bolt gaskets.



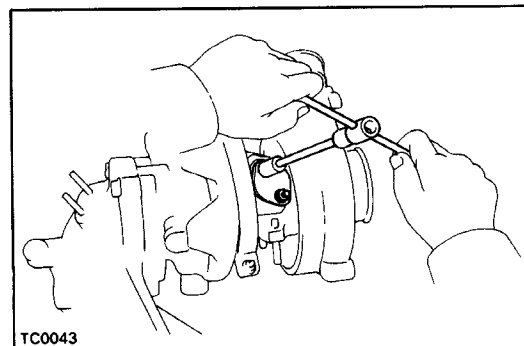
- (b) Remove the four nuts, turbocharger and gasket.

**22. REMOVE TURBO OIL PIPE**

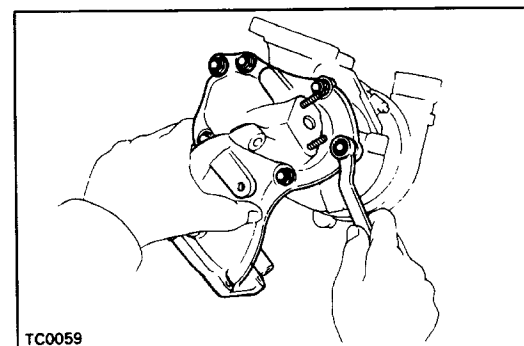
Remove the two nuts, oil pipe and gasket.

**23. REMOVE TURBO WATER PIPE**

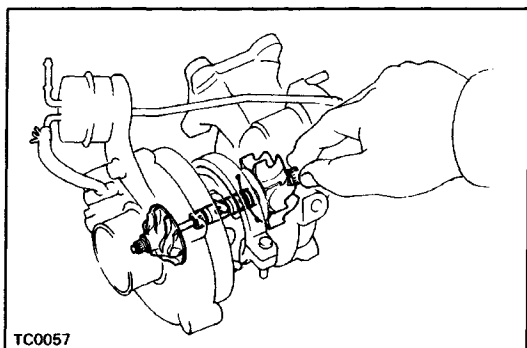
Remove the two nuts, two bolts, water pipe and gasket.

**24. REMOVE SIDE BEARING HOUSING PLATE**

Remove the two nuts, housing plate and gasket.

**25. REMOVE TURBINE OUTLET ELBOW**

Remove the six nuts, outlet elbow and gasket.

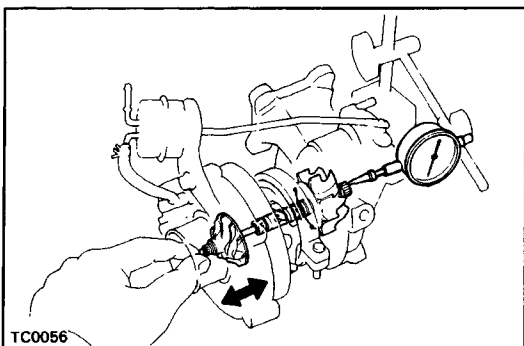


INSPECTION OF TURBOCHARGER

1. INSPECT IMPELLER WHEEL ROTATION

Grasp the edge of the turbine wheel and turn it. Check that the impeller wheel turns smoothly.

If the impeller wheel does not turn or if it turns with a drag, replace the turbocharger assembly.

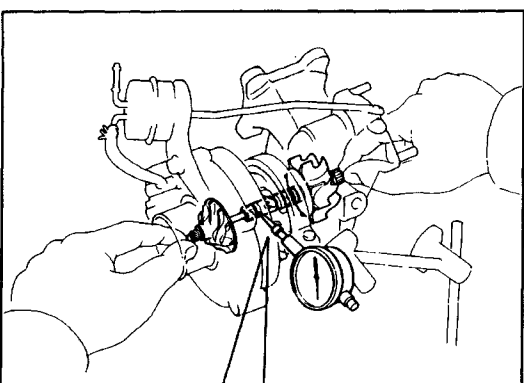


2. INSPECT AXIAL PLAY OF IMPELLER WHEEL

Insert a dial indicator into the intake side, hold the turbine wheel edge by hand, and check the axial play.

Standard clearance: 0.13 mm (0.0051 in.) or less

If the axial play is not as specified, replace the turbocharger assembly.



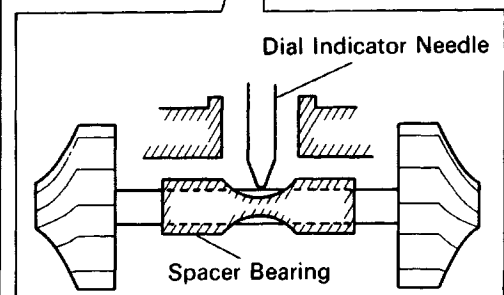
3. INSPECT RADIAL PLAY OF IMPELLER WHEEL

(a) From oil outlet hole, insert a dial indicator through the hole in the spacer bearing and set it in the center of the impeller shaft.

(b) Move the impeller shaft in a radial direction, and measure the radial play of the impeller shaft.

Standard clearance: 0.18 mm (0.0071 in.) or less

If the radial play is not as specified, replace the turbocharger assembly.

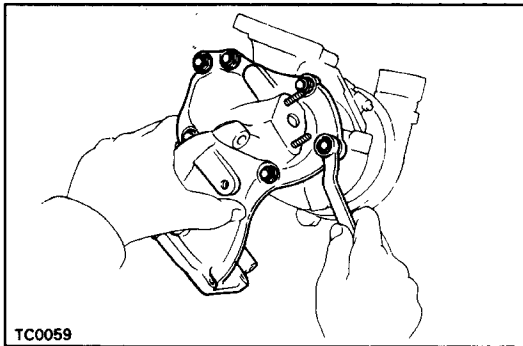


TC0061
TC0039

INSTALLATION OF TURBOCHARGER

(see page TC-8)

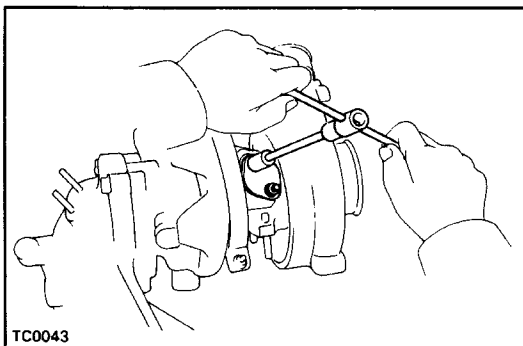
NOTICE: After replacing the turbocharger assembly, pour approx. 20 cc (1.2 cu in.) of new oil into the oil inlet and turn the impeller wheel by hand to splash oil on the bearing.



1. INSTALL TURBINE OUTLET ELBOW

Install a new gasket and the outlet elbow with the six nuts.

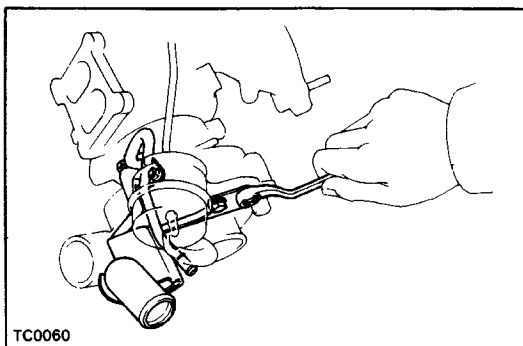
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)



2. INSTALL SIDE BEARING HOUSING PLATE

Install a new gasket and the housing plate with the two nuts.

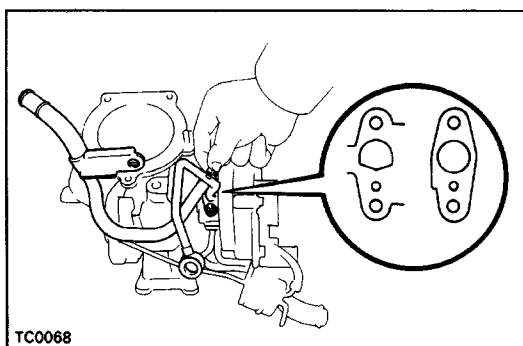
Torque: 11 N-m (120 kgf-cm, 9 ft-lbf)



3. INSTALL TURBO WATER PIPE

Install a new gasket and the water pipe with the two nuts and two bolts.

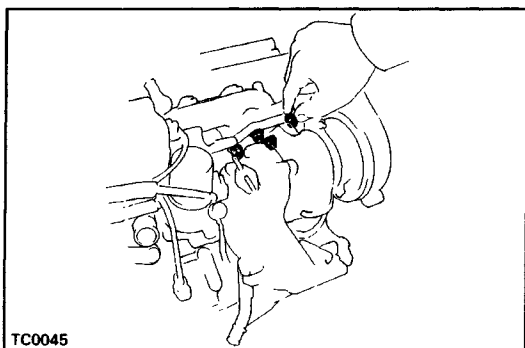
Torque: 11 N-m (120 kgf-cm, 9 ft-lbf)



4. INSTALL TURBO OIL PIPE

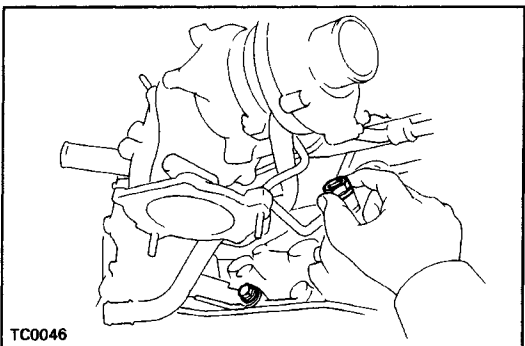
(a) Align the oil holes of a new gasket and the turbocharger housing.

(b) Install the gasket and oil pipe with the two nuts. Do not torque the nuts yet.

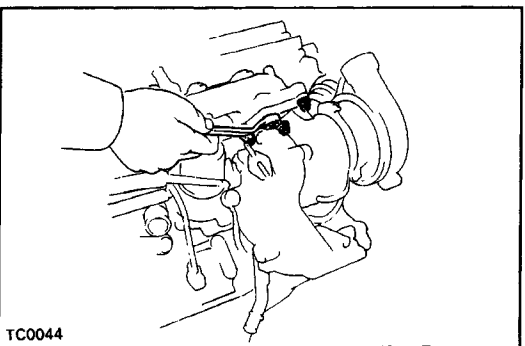


5. INSTALL TURBOCHARGER

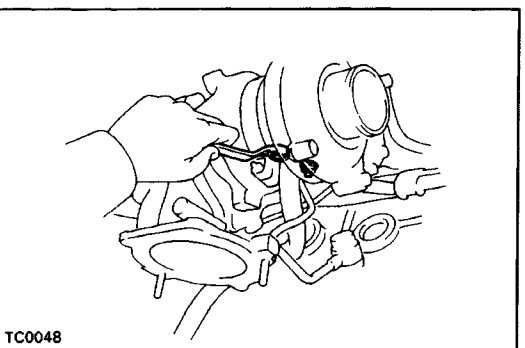
- (a) Install a new gasket and the turbocharger with the four nuts. Do not torque the nuts.



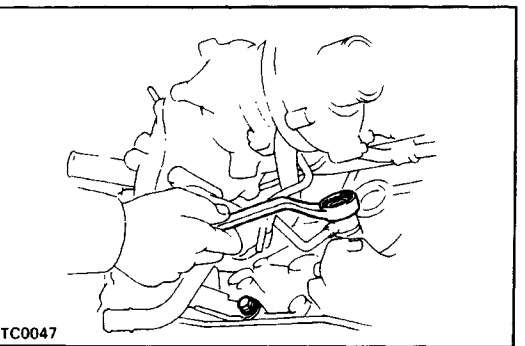
- (b) Install the oil pipe with the bolt, two new gaskets and union bolt. Do not torque the bolt and union bolt.



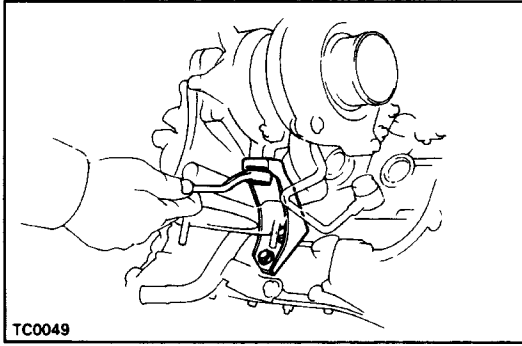
- (c) Tighten the four nuts holding the turbocharger to the exhaust manifold.
Torque: 64 N-m (650 kgf-cm, 47 ft-lbf)



- (d) Tighten the two nuts holding the oil pipe to the turbocharger.
Torque: 17 N-m (775 kgf-cm, 13 ft-lbf)



- (e) Tighten the union bolt holding the oil pipe to the cylinder block.
Torque: 51 N-m (525 kgf-cm, 38 ft-lbf)
(f) Tighten the bolt holding the bracket of the oil pipe to the cylinder block.
Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)



6. INSTALL TURBOCHARGER STAY

Install the turbocharger stay with the three bolts.

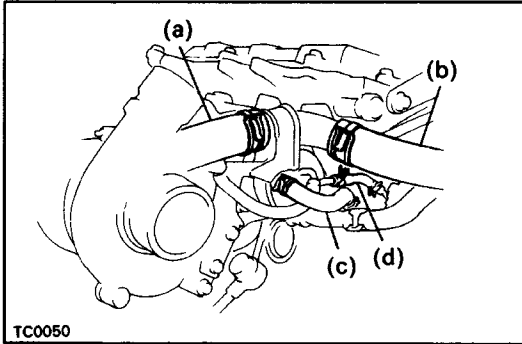
Torque:

To turbocharger

69 N-m (705 kgf-cm, 51 ft-lbf)

To cylinder block

59 N-m (600 kgf-cm, 43 ft-lbf)



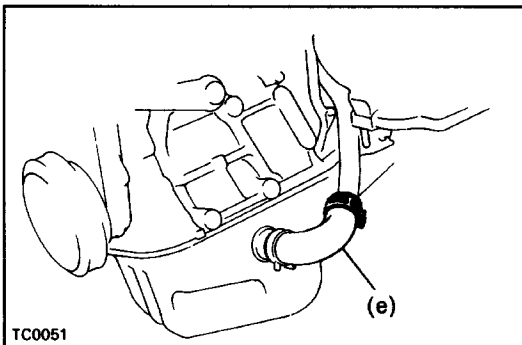
7. CONNECT HOSES

(a) Water hose from radiator

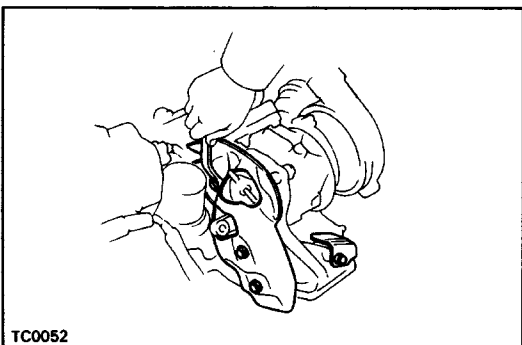
(b) Water hose from water inlet

(c) Water by-pass hose from turbo water pipe

(d) Vacuum hose from actuator



(e) Oil hose from turbo oil pipe

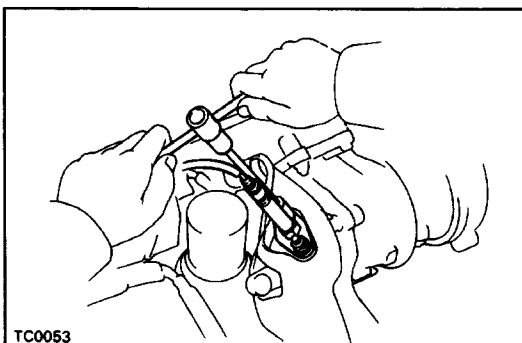


8. INSTALL HEAT INSULATORS OF TURBINE OUTLET ELBOW

(a) Install the RH heat insulator with the three bolts.

(b) Install the LH heat insulator with the two bolts.

(c) Install the oil dipstick gauge.

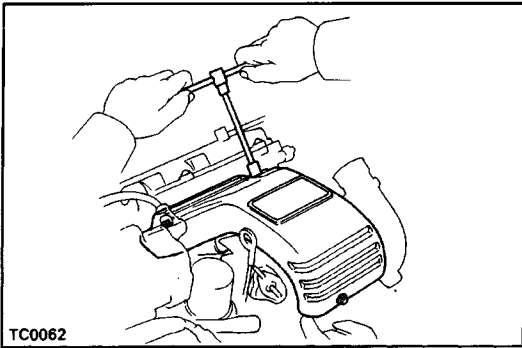


9. INSTALL OXYGEN SENSOR

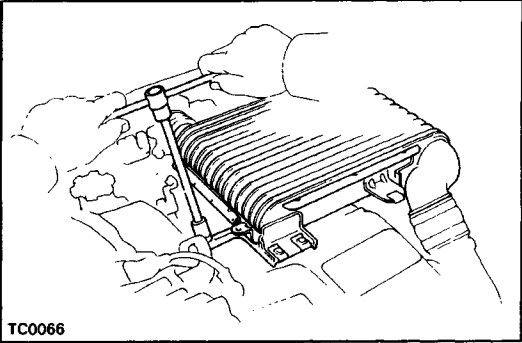
(a) Install a new gasket and the oxygen sensor with the two nuts.

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

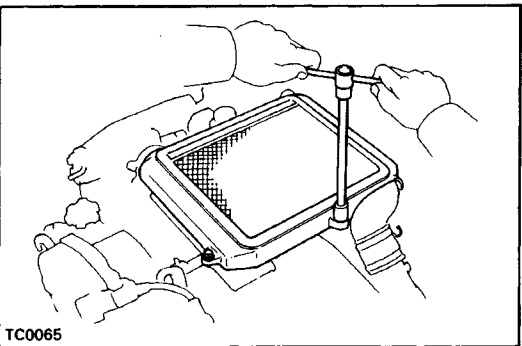
(b) Connect the oxygen sensor connector.

**10. INSTALL TURBOCHARGER HEAT INSULATOR**

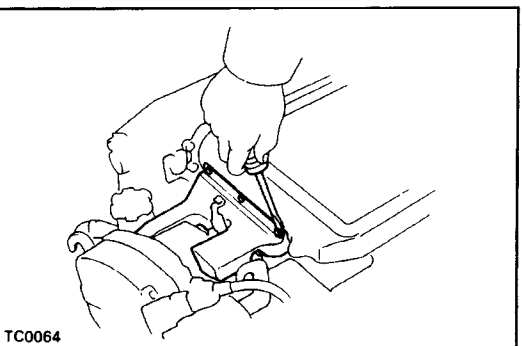
Install the heat insulator with the three bolts.

**11. INSTALL CHARGE AIR COOLER**

Connect the charge air cooler to the turbocharger and intake air connector, and install the charge air cooler with the two bolts.

**12. INSTALL CHARGE AIR COOLER PROTECTOR**

Install the protector with the three bolts.

**13. INSTALL CHARGE AIR COOLER COOL AIR INLET**

Install the cool air inlet with the seven clips.

14. INSTALL THREE-WAY CATALYTIC CONVERTER

(See step 6 on page [EM-259](#))

15. INSTALL A/C COMPRESSOR AND IDLER PULLEY BRACKET

(See step 12 on page [EM-261](#))

16. INSTALL GENERATOR

(See page [CH-23](#))

17. INSTALL CLUTCH RELEASE CYLINDER

(See step 26 on page [EM-263](#))

18. **INSTALL FRONT MOUNTING BRACKET AND INSULATOR (See step 7 on page [EM-260](#))**
19. **INSTALL ENGINE MOUNTING CENTER MEMBER (See steps 9 and 10 on page [EM-260](#))**
20. **INSTALL FRONT EXHAUST PIPE (See step 18 on page [EM-261](#))**
21. **INSTALL SUSPENSION LOWER CROSSMEMBER (See step 19 on page [EM-262](#))**
22. **INSTALL AIR CLEANER CAP (See step 45 on page [EM-266](#))**
23. **FILL ENGINE WITH COOLANT (See page [CO-6](#))**
Capacity (w/ Heater):
6.5 liters (6.9 U S qts, 5.7 Imp. qts)
24. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**
25. **START ENGINE AND CHECK FOR LEAKS**
26. **CHECK ENGINE OIL LEVEL (See page [LU-5](#))**
27. **REMOVE ENGINE UNDER COVERS**

EMISSION CONTROL SYSTEMS

	Page
(4A-FE)	
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COMPONENT LAYOUT AND SCHEMATIC DRAWING	EC-3
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM	EC-4
EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM	EC-6
EXHAUST GAS RECIRCULATION (EGR) SYSTEM	EC-9
THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM	EC-14
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EXHAUST GAS RECIRCULATION (EGR) SYSTEM	EC-38
THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM	EC-42

EC

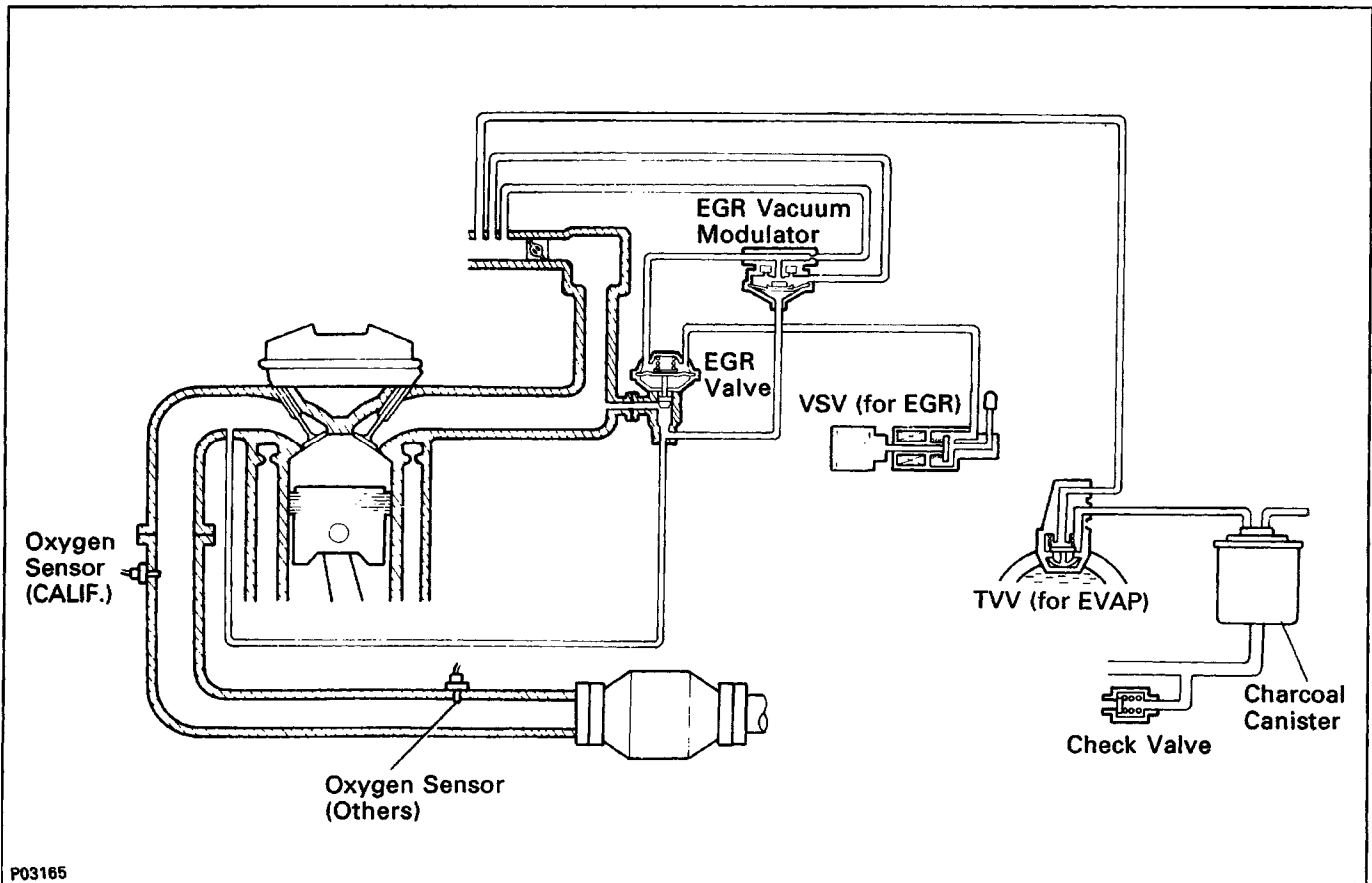
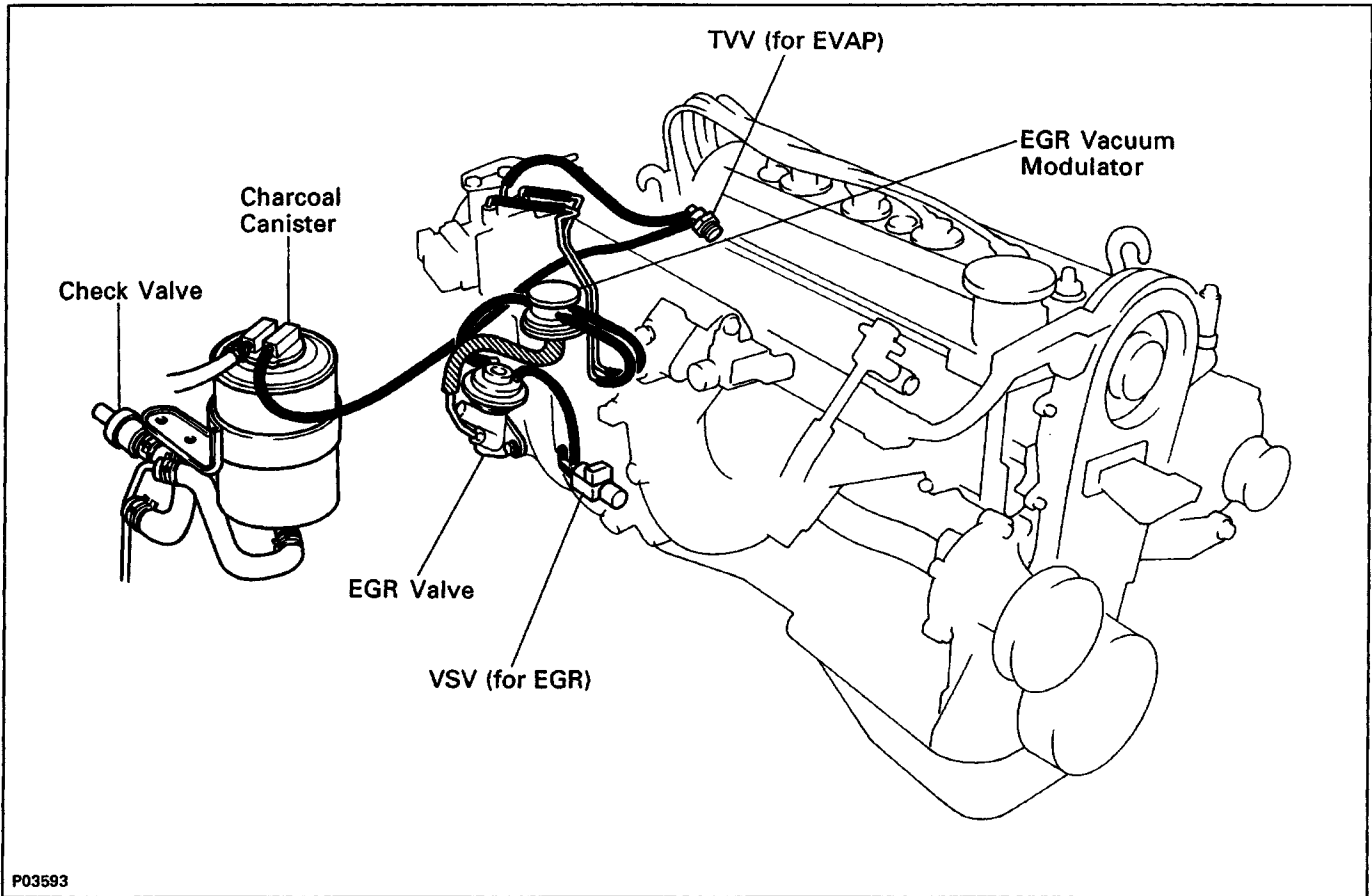
NOTE: TROUBLESHOOTING (See pages EM-8 to 11)

(4A-FE) SYSTEM PURPOSE

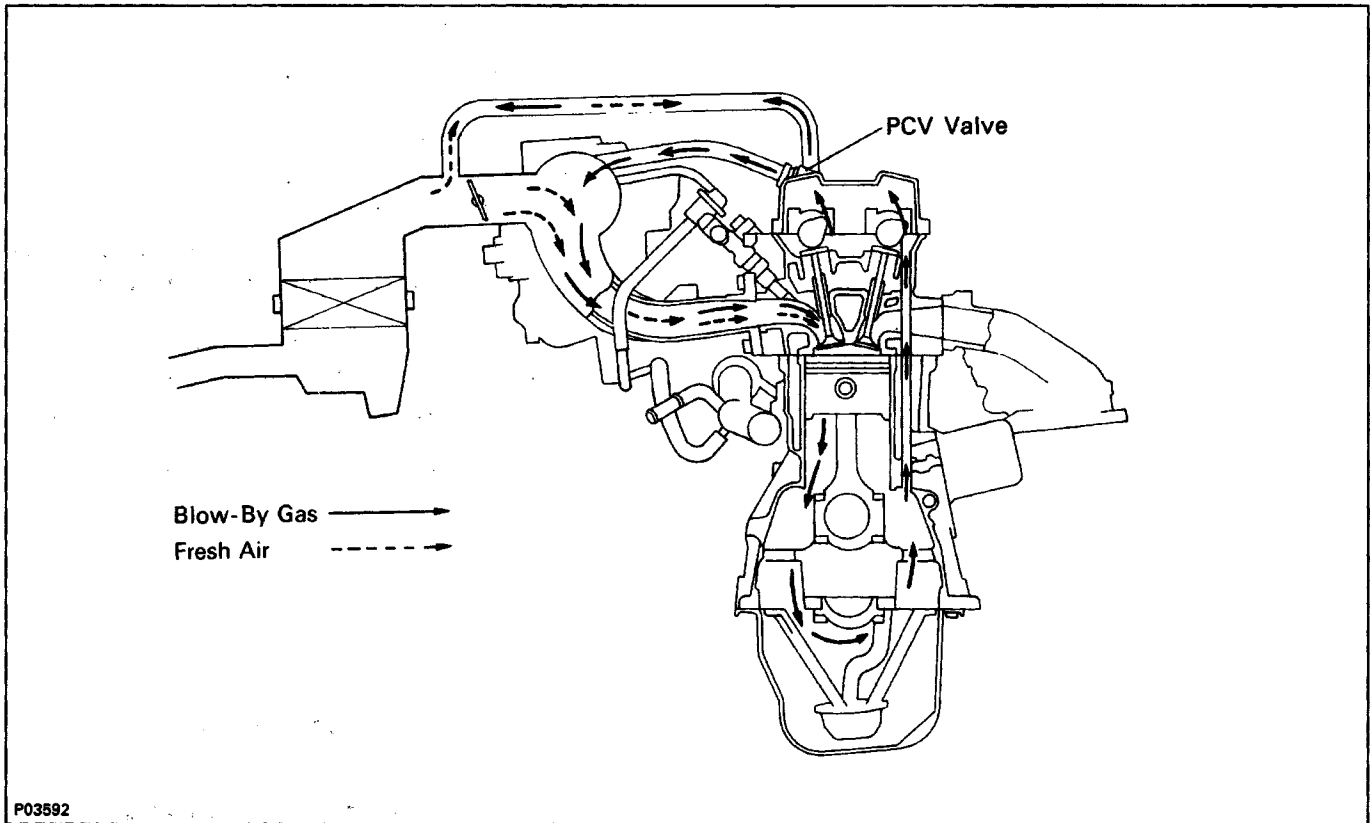
System	Abbreviation	Purpose
Positive Crankcase ventilation	PCV	Reduces blow-by gas (HC)
Evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three-way catalytic converter	TWC	Reduces CO, HC and NOx
Multiport fuel injection	MFI	Regulates all engine conditions for reduction of exhaust emissions.

Remark * For inspection and repair of the MFI system, refer to MFI section of this manual.

COMPONENT LAYOUT AND SCHEMATIC DRAWING

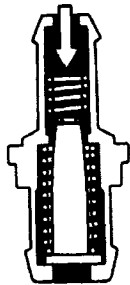


POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

Engine not Running or if Backfiring
Intake Manifold Side

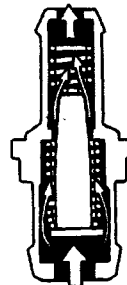


○ PCV VALVE IS CLOSED.

Cylinder Head Side

EC1001

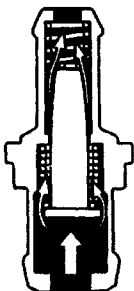
Normal Operation



- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS LARGE.

EC1002

Idling or Decelerating



- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS SMALL.

EC1003

Acceleration or High Load



- PCV VALVE IS FULLY OPEN.

EC1004

INSPECTION OF PCV VALVE

1. REMOVE PCV VALVE
2. INSTALL CLEAN HOSE TO PCV VALVE
3. INSPECT PCV VALVE OPERATION

(a) Blow air into the cylinder head side, and check that air passes through easily.

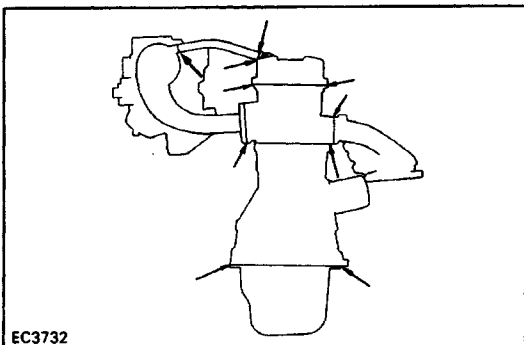
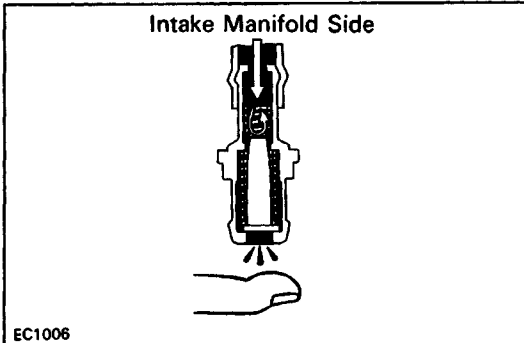
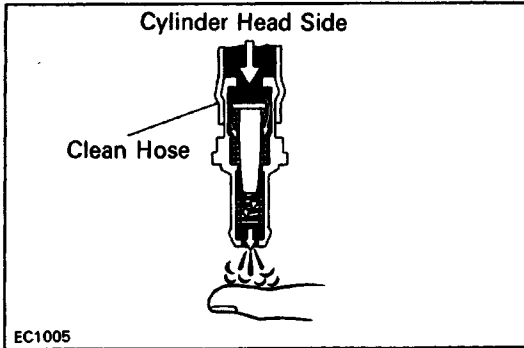
CAUTION: Do not suck air through the valve.

Petroleum substances inside the valve are harmful.

(b) Blow air into the intake manifold side, and check that air passes through with difficulty.

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

4. REMOVE CLEAN HOSE FROM PCV VALVE
5. REINSTALL PCV VALVE

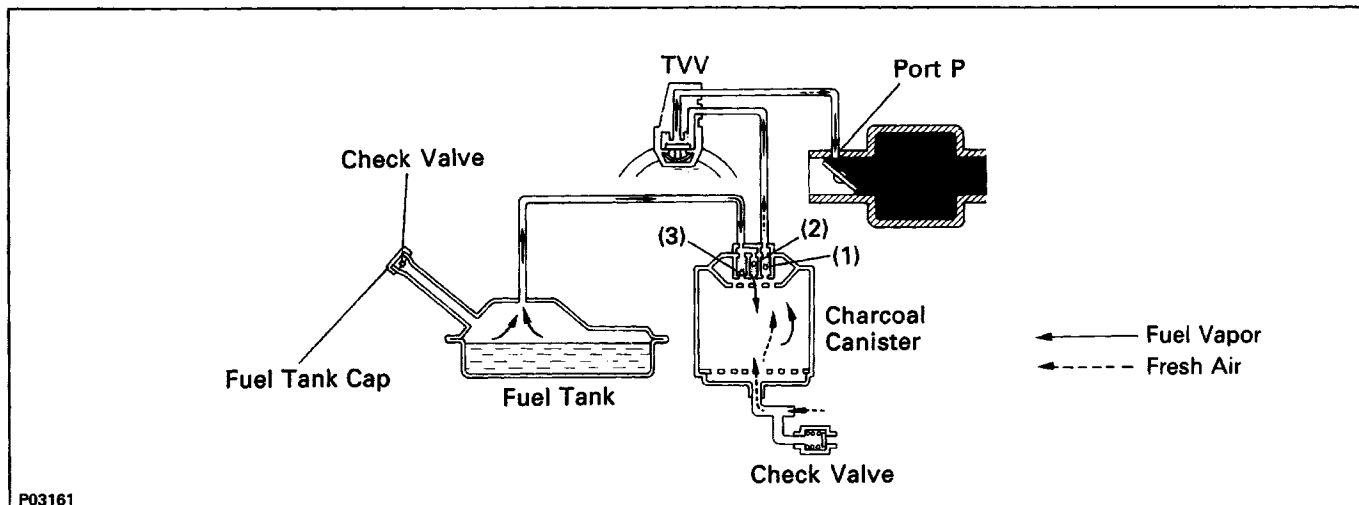


INSPECTION OF PCV HOSES AND CONNECTIONS

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.

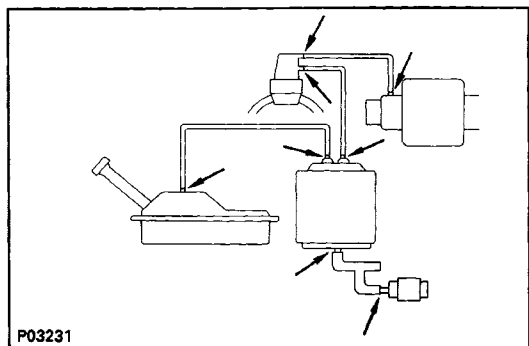
EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



P03161

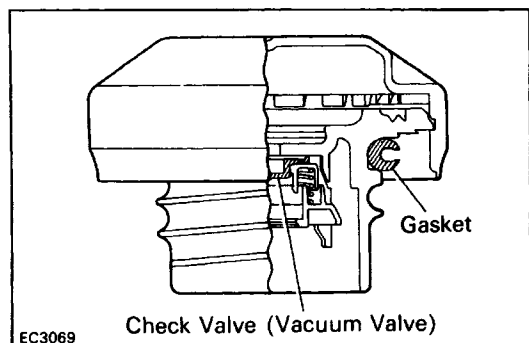
To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Engine Coolant Temp.	TVV	Throttle Valve Opening	Canister Check Valve			Check Valve in Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35°C (95°F)	CLOSED	-	-	-	-	-	HC from tank is absorbed into the canister.
Above 54°C (129°F)	OPEN	Positioned below port P	CLOSED	-	-	-	
		Positioned above port P	OPEN	-	-	-	HC from canister is led into air intake manifold.
High pressure in tank	-	-	-	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank	-	-	-	CLOSED	OPEN	OPEN	Air is led into the fuel tank.



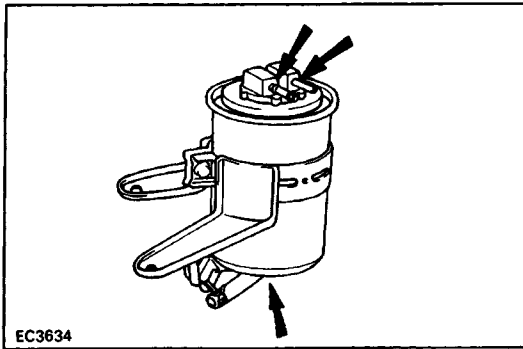
P03231

- INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP**
- 1. VISUALLY INSPECT LINES AND CONNECTIONS**
Look for loose connections, sharp bends or damage.
 - 2. VISUALLY INSPECT FUEL TANK**
Look for deformation, cracks or fuel leakage.



EC3069

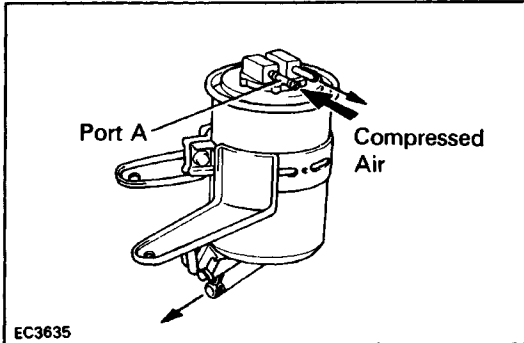
- 3. VISUALLY INSPECT FUEL TANK CAP**
Check if the cap and/or gasket are deformed or damaged.
If necessary, repair or replace the cap.



INSPECTION OF CHARCOAL CANISTER

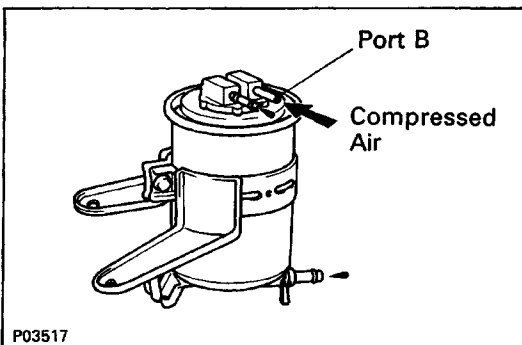
1. REMOVE CHARCOAL CANISTER
2. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.

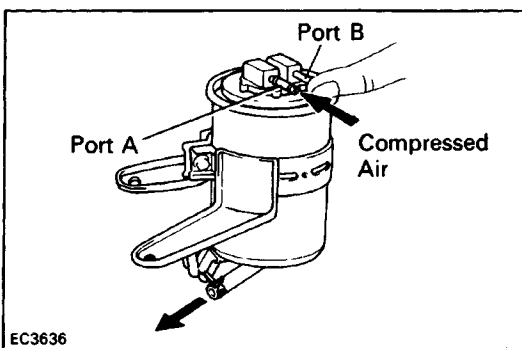


3. INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE

- (a) Using low pressure compressed air, blow into port A and check that air flows without resistance from the other ports.



- (b) Blow into port B and check that air does not flow from the other ports.
If a problem is found, replace the charcoal canister.



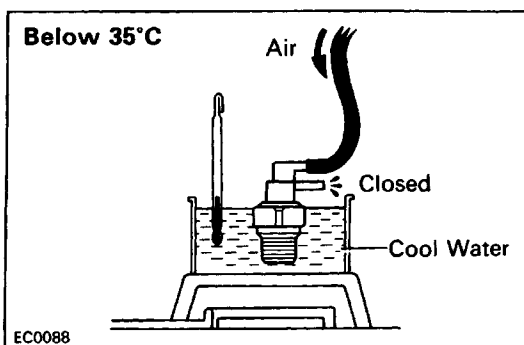
4. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 kgf/cm², 43 psi) of compressed air into port A while holding port B closed.

NOTICE:

- Do not attempt to wash the canister.
- No activated carbon should come out.

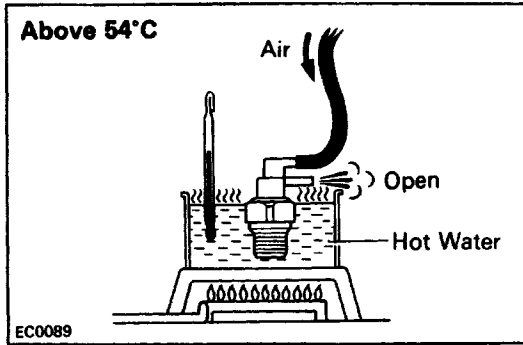
5. REINSTALL CHARCOAL CANISTER



INSPECTION OF TVV

INSPECT TVV BY BLOWING AIR INTO PIPE

- (a) Drain the coolant from the radiator into a suitable container.
- (b) Remove the TVV from the water inlet housing.
- (c) Cool the TVV to below 35°C (95°F) with cool water.
- (d) Blow air into the port and check that the TVV is closed.



- (e) Heat the TVV to above 54°C (129°F) with hot water.
- (f) Blow air into the port and check that the TVV is open. If a problem is found, replace the TVV.
- (g) Apply adhesive to two or three threads of the TVV and reinstall.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

- (h) Refill the radiator with engine coolant.

INSPECTION OF CHECK VALVE

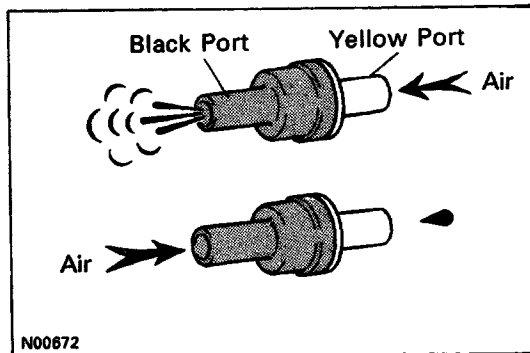
1. REMOVE CHECK VALVE

2. INSPECT CHECK VALVE

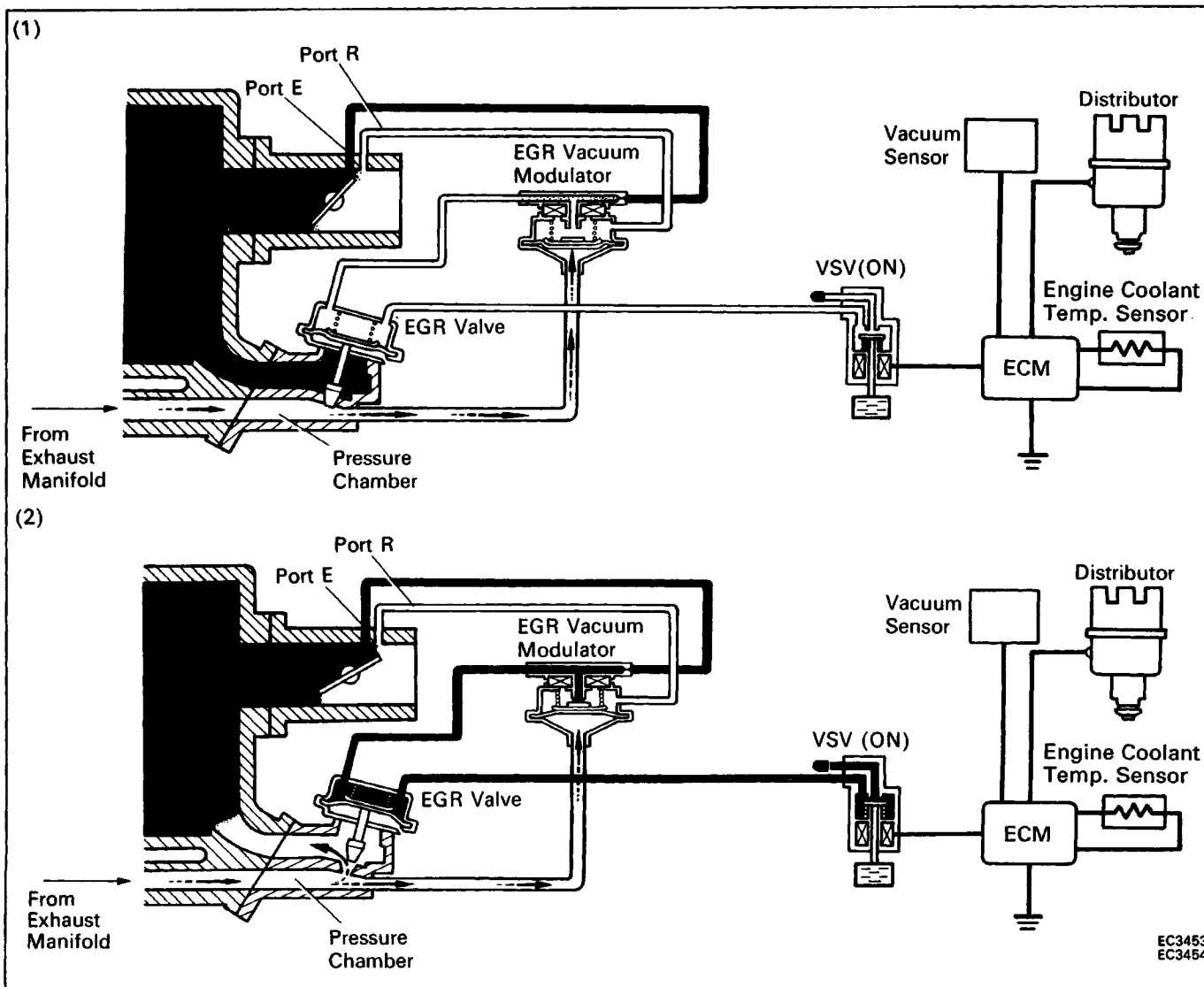
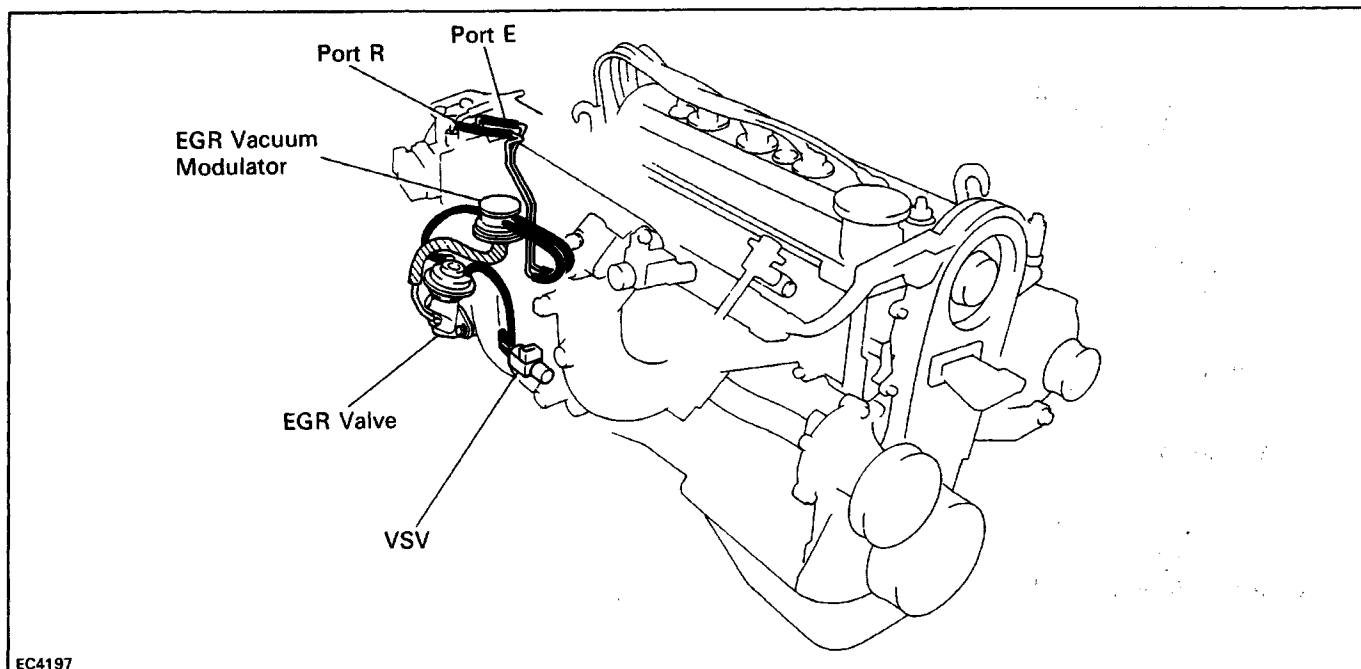
- (a) Check that air flows from the yellow port to the black port.
 - (b) Check that air does not flow from the black port to the yellow port.
- If operation is not as specified, replace the check valve.

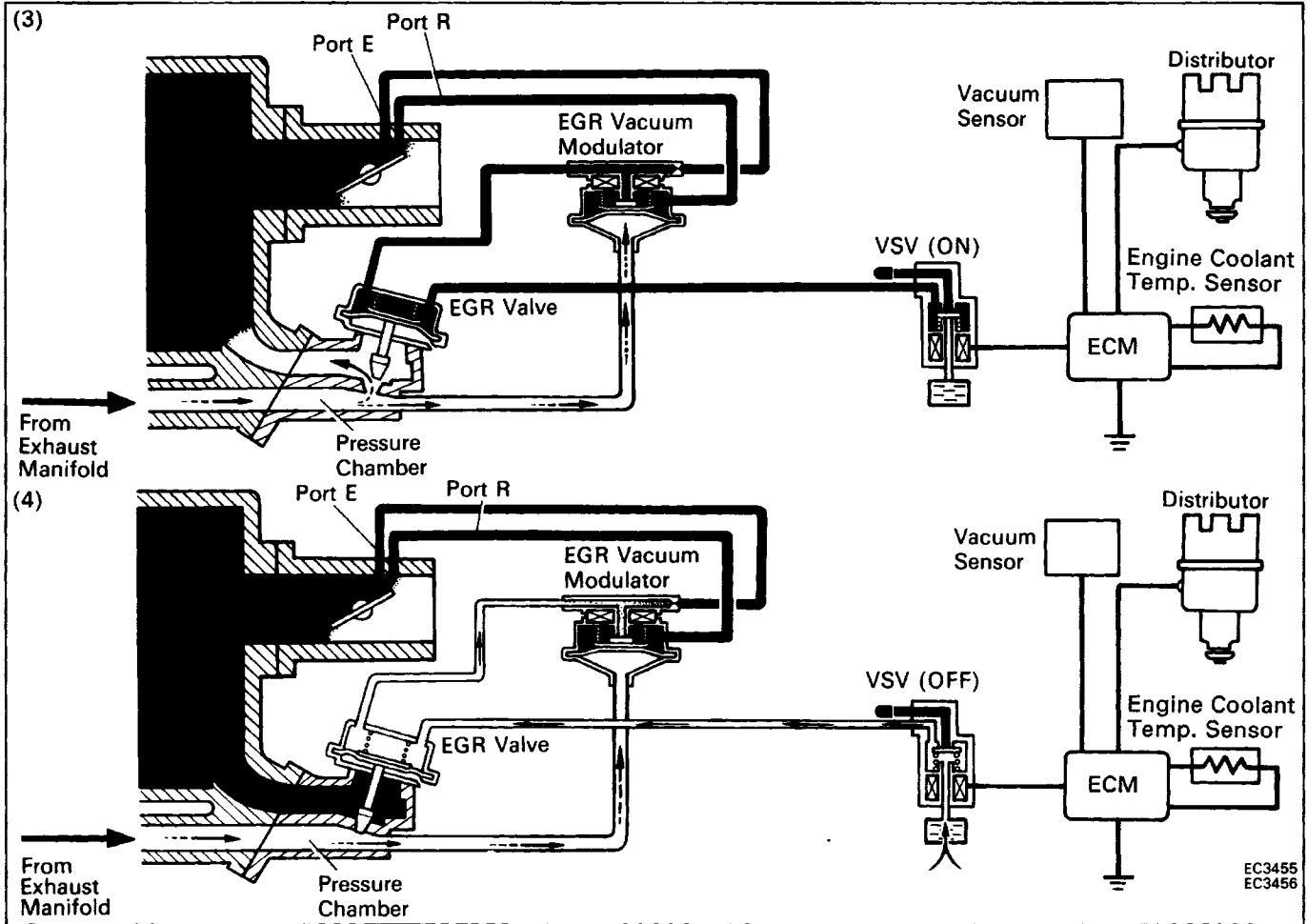
3. REINSTALL CHECK VALVE

HINT: Reinstall the check valve with the black port facing the charcoal canister side.



EXHAUST GAS RECIRCULATION (EGR) SYSTEM





EC3455
EC3456

To reduce NOx emissions, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

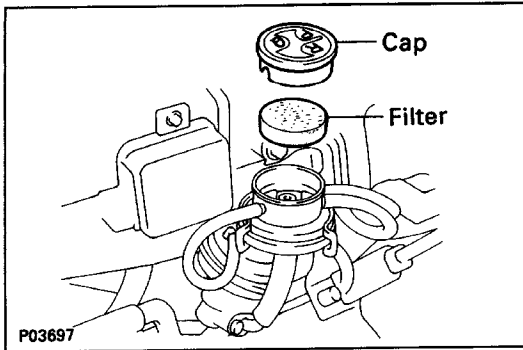
Engine Coolant Temp.	ENGINE rpm	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber	EGR Vacuum Modulator	EGR Valve	Exhaust Gas	
Below 47°C (117°F)	-	**** OFF	-	-	-	CLOSED	Not recirculated	
Above 53°C (127°F)	Above 1,100 rpm (Federal) & Below 4,000 rpm	*** ON	Positioned below port E	-	-	CLOSED	Not recirculated	
			Positioned between port E and and port R	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
				(2) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated
	Positioned above port R	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)		
Below 1,000 rpm (Federal) & Above 4,400 rpm	-	(4) OFF	-	-	-	CLOSED	Not recirculated	

Remarks: * Pressure increase → Modulator closes → EGR valve opens → Pressure drops
 ← EGR valve closes ← Modulator opens ←

** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the exhaust gas, even if the exhaust pressure is insufficiently low.

*** VSV switched ON when product of engine rpm multiplied by vacuum sensor valve exceeds a specified valve.

**** If terminals TE1 and E1 of data link connector 1 are connected, the VSV switches ON.

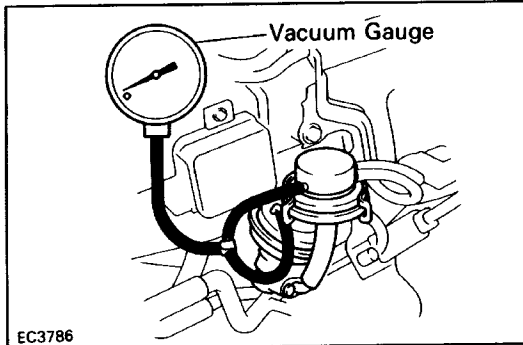


INSPECTION OF EGR SYSTEM

1. INSPECT AND CLEAN FILTERS IN EGR VACUUM MODULATOR

- (a) Check the filters for contamination or damage.
- (b) Using compressed air, clean the filters.

HINT: Install the filters with the coarser surface facing the atmospheric side (outward).

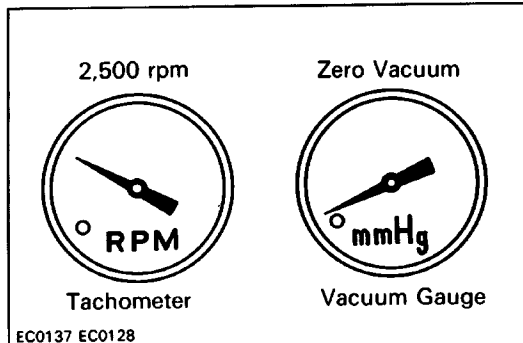


2. INSTALL VACUUM GAUGE

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum modulator.

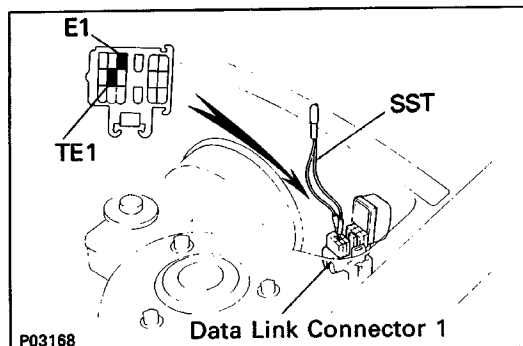
3. INSPECT SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle.



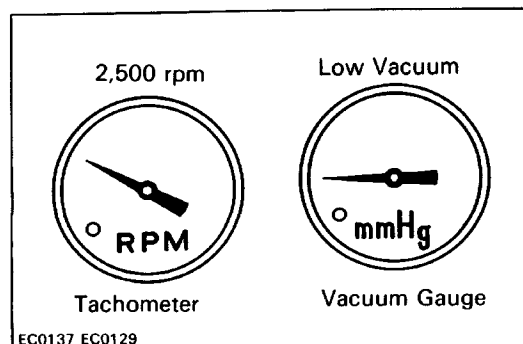
4. INSPECT VSV OPERATION

Check that the vacuum gauge indicates zero at 2,500 rpm.



5. CONNECT TERMINALS TE1 AND E1 OF DATA LINK CONNECTOR 1

Using SST, connect the terminals TE1 and E1 of the data link connector 1.

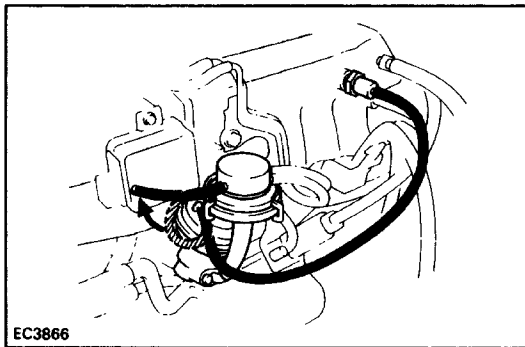


6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR

Check that the vacuum gauge indicates low vacuum at 2,500 rpm.

7. REMOVE VACUUM GAUGE

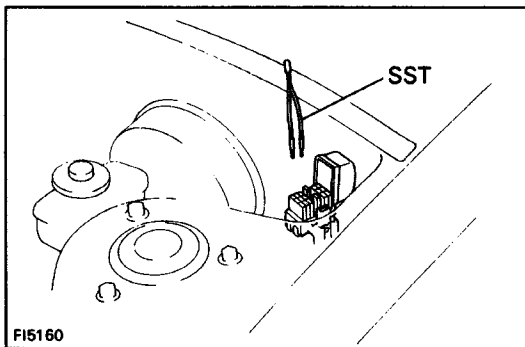
Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations.



EC3866

8. INSPECT EGR VALVE OPERATION

- (a) Apply vacuum directly to the EGR valve with the engine idling.
- (b) Check that the engine runs rough or dies.
- (c) Reconnect the vacuum hoses to the proper locations.

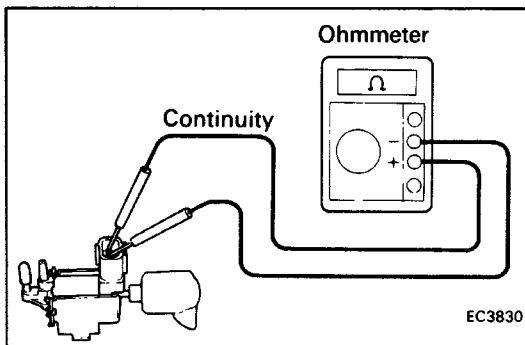


FI5160

9. REMOVE SST FROM CHECK CONNECTOR

SST 09843-18020

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART



EC3830

INSPECTION OF VSV

1. REMOVE VSV

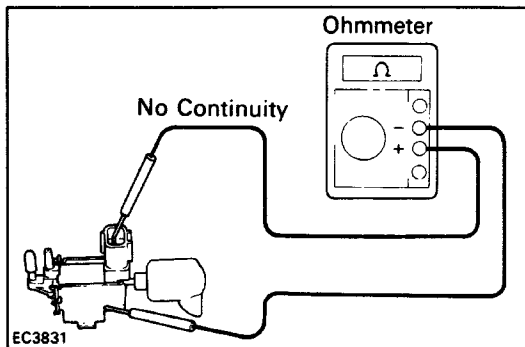
2. INSPECT VSV

A. Inspect VSV for open circuit

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

Resistance (Cold): 37 - 44

If there is no continuity, replace the VSV.

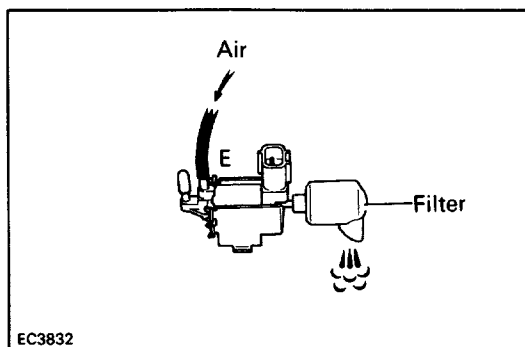


EC3831

B. Inspect VSV for ground

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

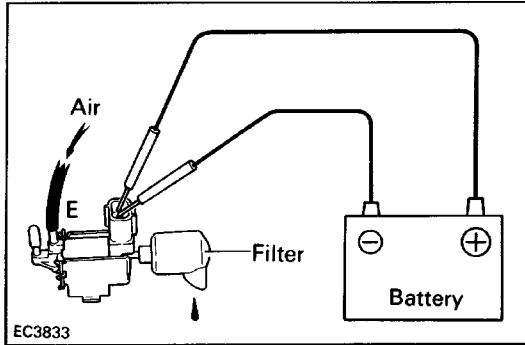
If there is continuity, replace the VSV.



EC3832

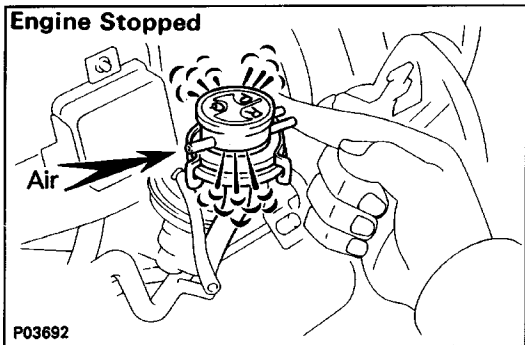
C. Inspect VSV operation

- (a) Check that air flows from port E to the filter.



- (b) Apply battery voltage across the terminals.
 - (c) Check that air does not flow from port E to the filter.
- If operation is not as specified, replace the VSV.

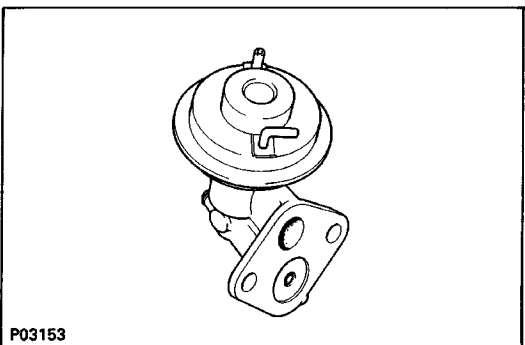
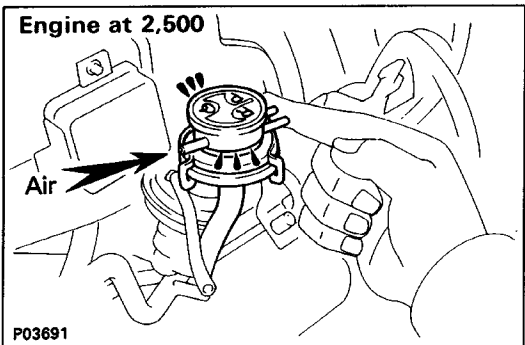
3. REINSTALL VSV



INSPECTION OF EGR VACUUM MODULATOR

INSPECT OPERATION OF EGR VACUUM MODULATOR

- (a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
- (b) Block ports P and R with your finger.
- (c) Blow air into port Q, and check that the air passes through to the air filter side freely.
- (d) Start the engine, and maintain speed at 2,500 rpm.
- (e) Repeat the above test. Check that there is a strong resistance to air flow.
- (f) Reconnect the vacuum hoses to the proper locations.



INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

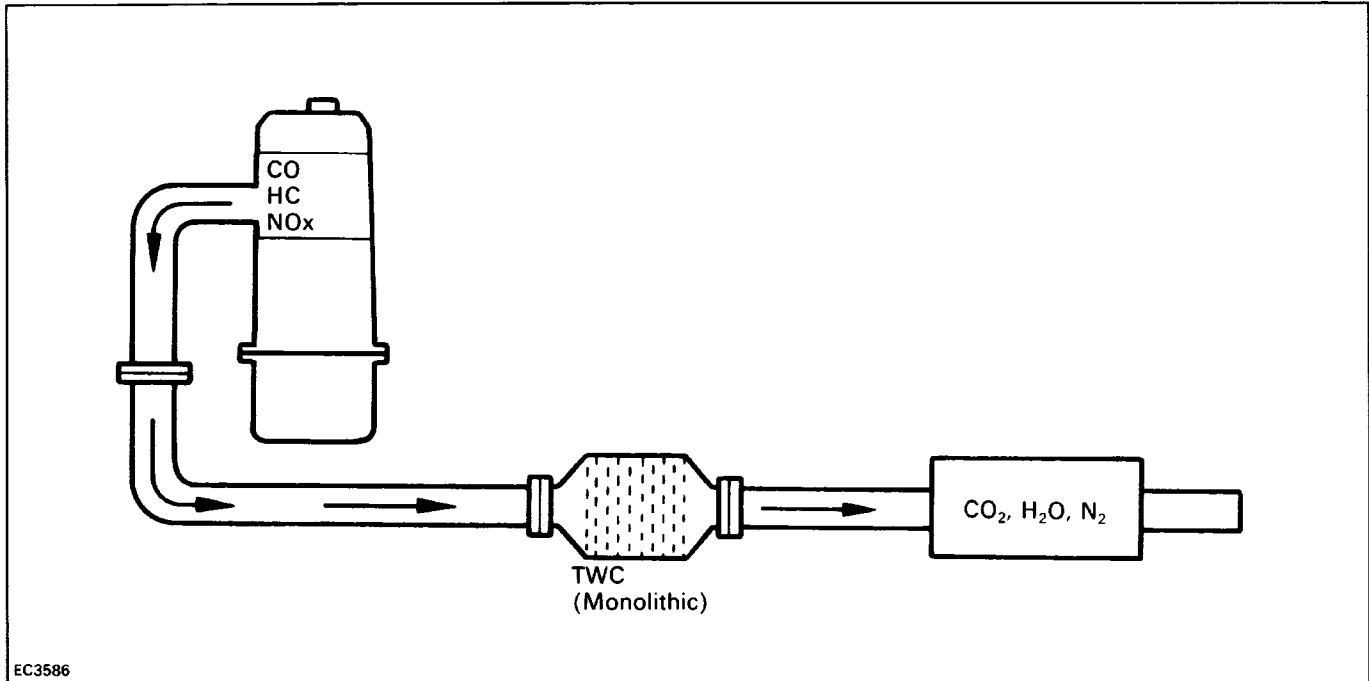
2. INSPECT EGR VALVE

Check for sticking and heavy carbon deposits. If a problem is found, replace the valve.

3. REINSTALL EGR VALVE

Install a new gasket.

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM



To reduce CO, HC and NO_x emissions, they are oxidized, and converted to carbon dioxide (CO₂), water (H₂O) and nitrogen (N₂) by the three-way catalytic converter

Exhaust Port		TWC		Exhaust Gas
CO HC NO _x	→	OXIDATION AND REDUCTION	→	CO ₂ H ₂ O N ₂

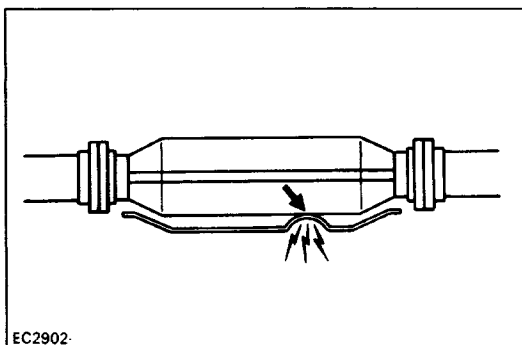
INSPECTION OF EXHAUST PIPE ASSEMBLY

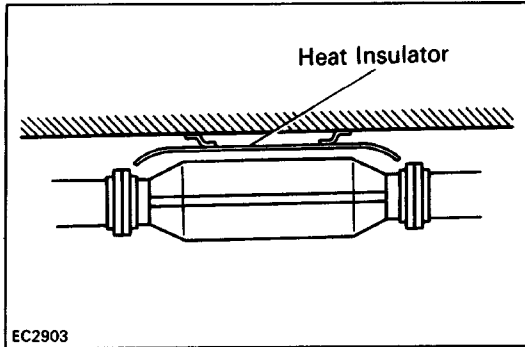
1. INSPECT CONNECTIONS FOR LOOSENESS OR DAMAGE
2. INSPECT CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

INSPECTION OF THREE-WAY CATALYTIC CONVERTER

INSPECT FOR DENTS OR DAMAGE

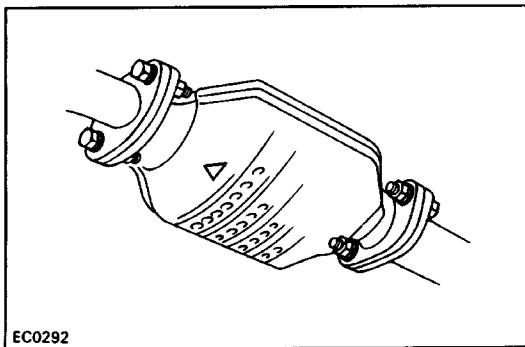
If any part of protector is damaged or dented to the extent that it contacts the three-way catalytic converter, repair or replace it.





INSPECTION OF HEAT INSULATOR

1. INSPECT HEAT INSULATOR FOR DAMAGE
2. INSPECT FOR ADEQUATE CLEARANCE BETWEEN THREE-WAY CATALYTIC CONVERTER AND HEAT INSULATOR



REPLACEMENT OF THREE-WAY CATALYTIC CONVERTER

1. REMOVE THREE-WAY CATALYTIC CONVERTER

- (a) Check that the three-way catalytic converter is cool.
- (b) Remove the four bolts and nuts holding the pipes to the three-way catalytic converter.
- (c) Remove the three-way catalytic converter and two gaskets.

2. REINSTALL THREE-WAY CATALYTIC CONVERTER

- (a) Place two new gaskets on the front and rear pipes.
- (b) Install the three-way catalytic converter with the bolts and nuts. Torque the bolts and nuts.

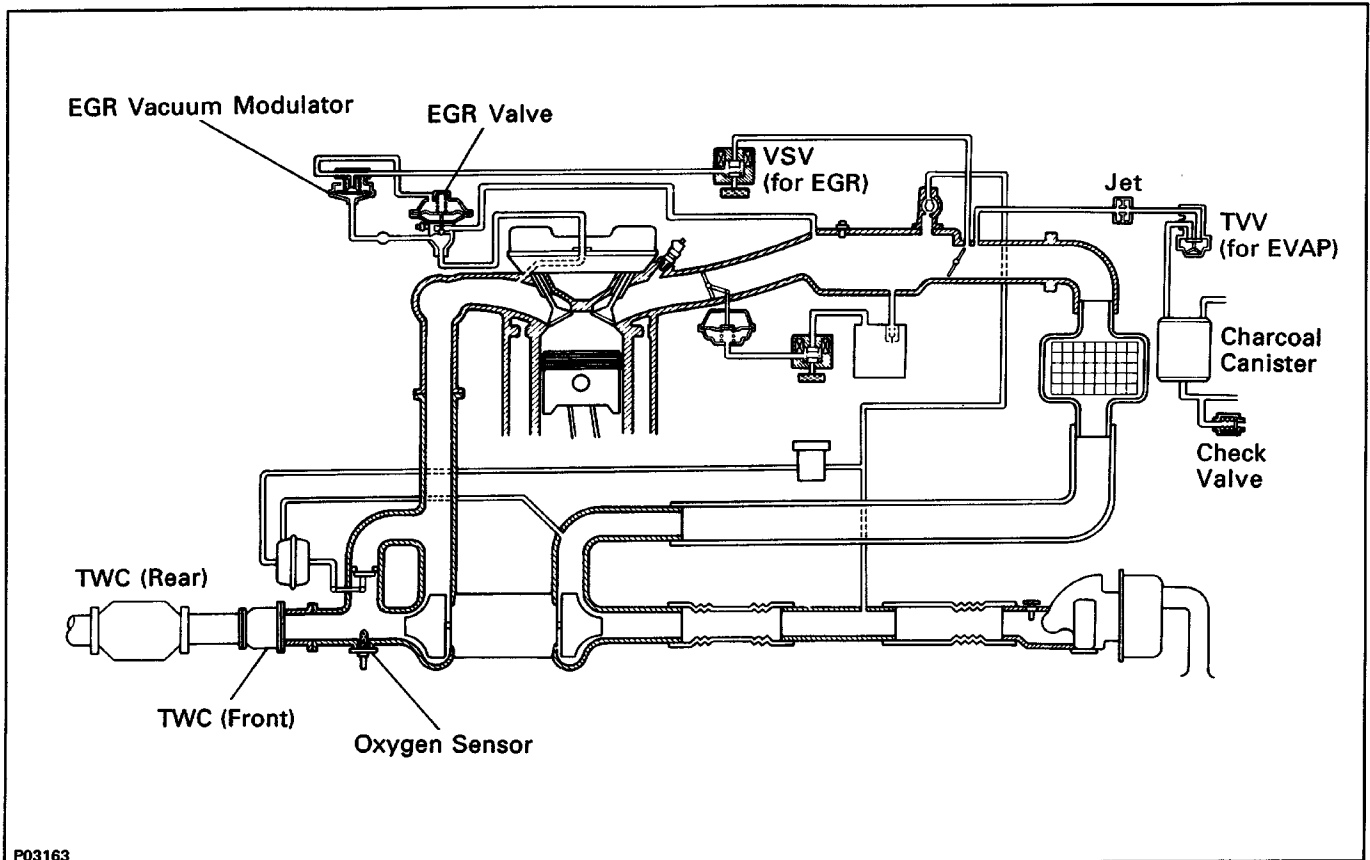
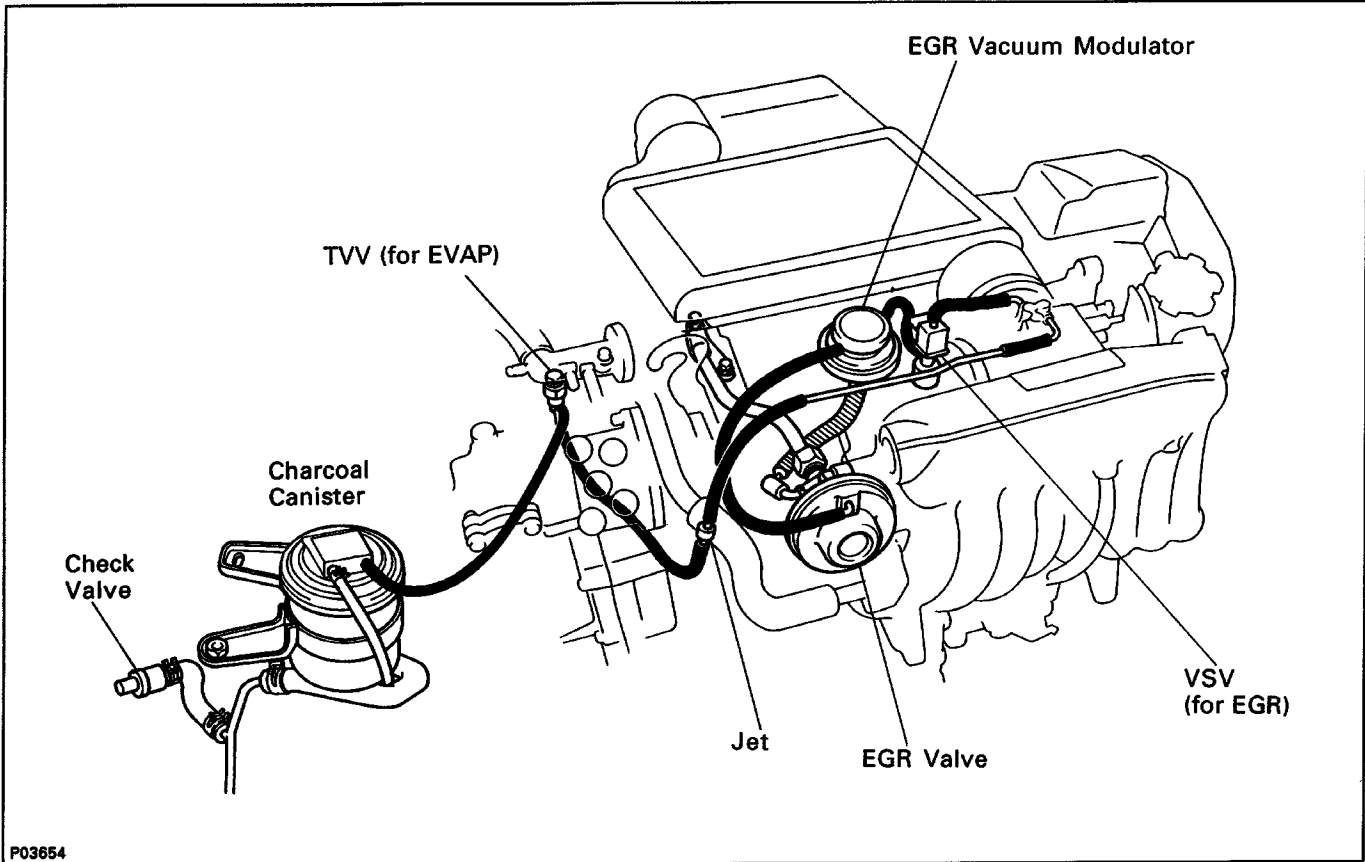
Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

(3S-GTE) SYSTEM PURPOSE

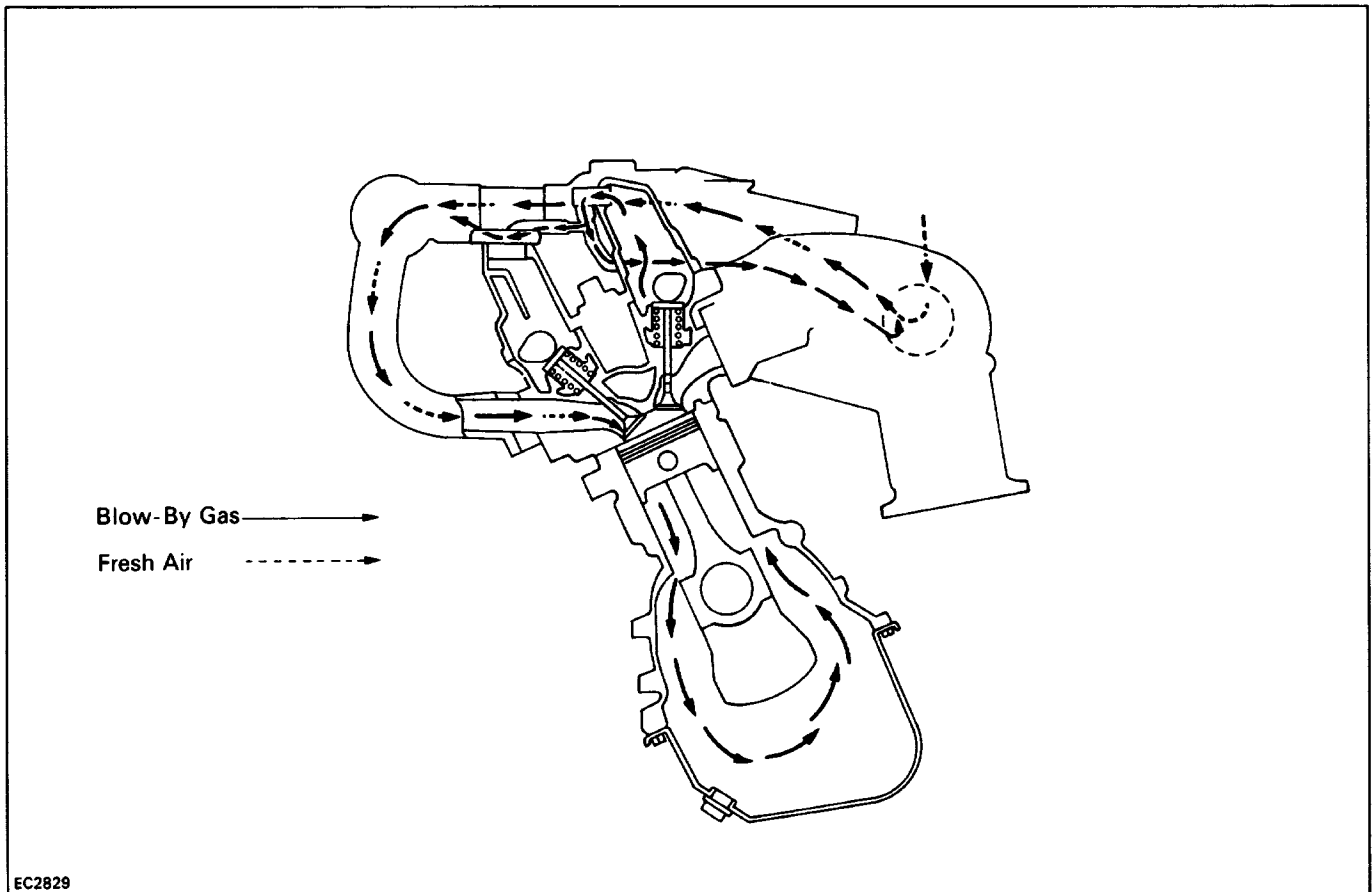
System	Abbreviation	Purpose
Positive Crankcase ventilation	PCV	Reduces blow-by gas (HC)
Evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three-way catalytic converter	TWC	Reduces CO, HC and NOx
Sequential Multiport Fuel Injection	SFI	Regulates all engine conditions for reduction of exhaust emissions.

Remark * For inspection and repair of the SFI system, refer to SFI section of this manual.

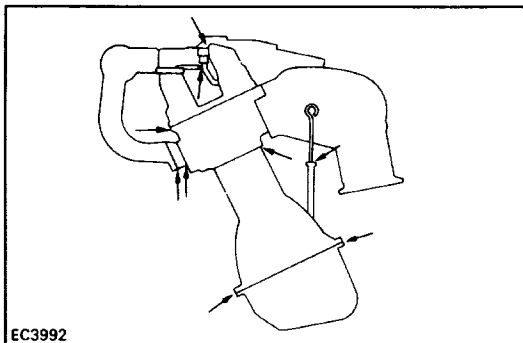
COMPONENT LAYOUT AND SCHEMATIC DRAWING



POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emissions, crankcase blow-by gas (HC) is routed to the intake manifold for combustion in the cylinders.

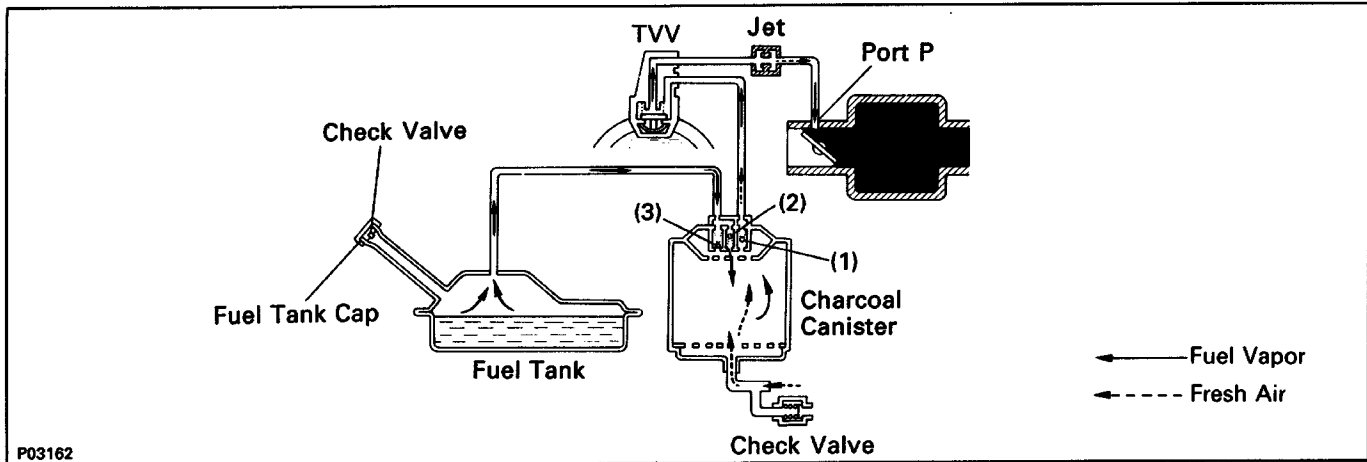


INSPECTION OF PCV HOSE AND CONNECTIONS

VISUALLY INSPECT HOSE AND CONNECTIONS

Check for cracks, leaks or damage.

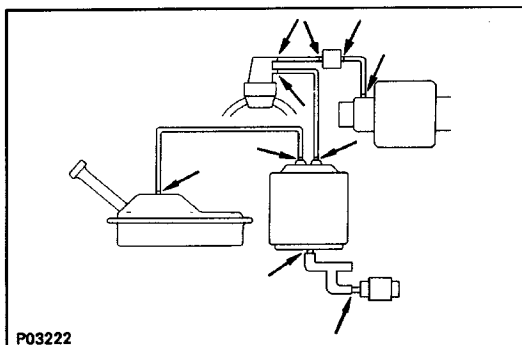
EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



P03162

To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Engine Coolant Temp.	TVV	Throttle Valve Opening	Canister Check Valve			Check valve in Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35°C (95°F)	CLOSED	-	-	-	-	-	HC from tank is absorbed into the canister.
Above 54°C (129°F)	OPEN	Positioned below port P	CLOSED	-	-	-	
		Positioned above port P	OPEN	-	-	-	H C from canister is led into air intake chamber.
High pressure in tank	-	-	-	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank	-	-	-	CLOSED	OPEN	OPEN	Air is led into the fuel tank.



P03222

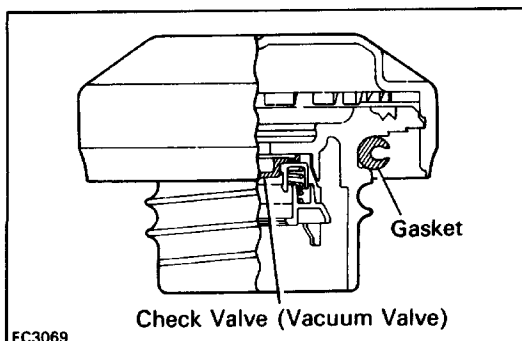
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.

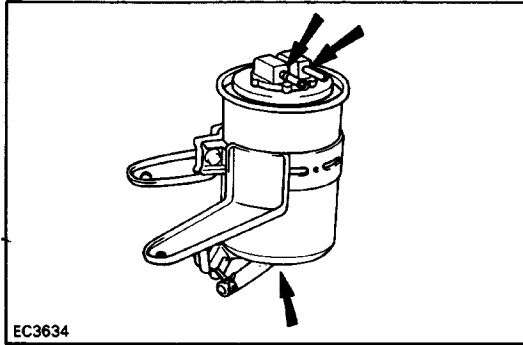


EC3069

3. VISUALLY INSPECT FUEL TANK CAP

Check if the cap and/or gasket are deformed or damaged.

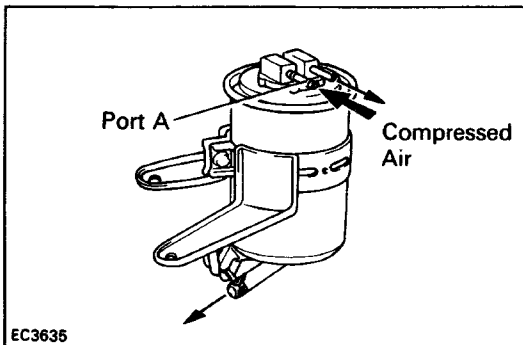
If necessary, repair or replace the cap.



INSPECTION OF CHARCOAL CANISTER

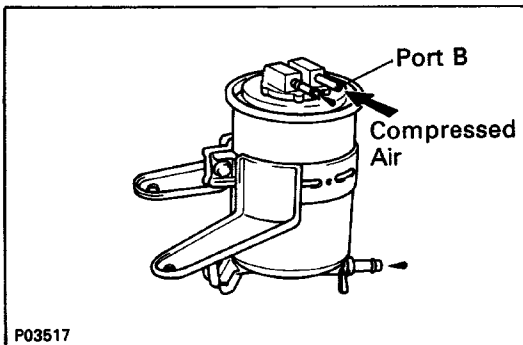
1. REMOVE CHARCOAL CANISTER
2. REMOVE CAP FROM CHARCOAL CANISTER
3. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.



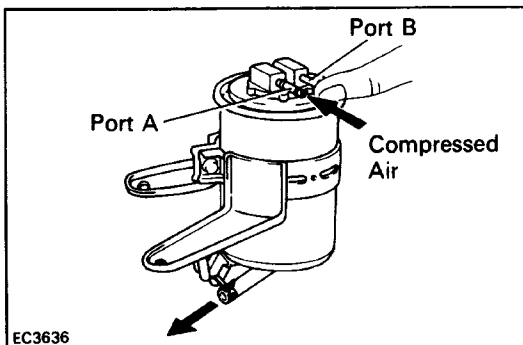
4. INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air, blow into port A and check that air flows without resistance from the other ports.



(b) Blow into port B and check that air does not flow from the other ports.

If a problem is found, replace the charcoal canister.



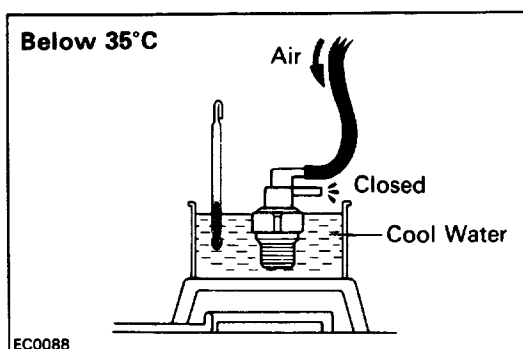
5. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 kgf/cm², 43 psi) or 1 compressed air into port A while holding port B closed.

NOTICE:

- Do not attempt to wash the canister.
- No activated carbon should come out.

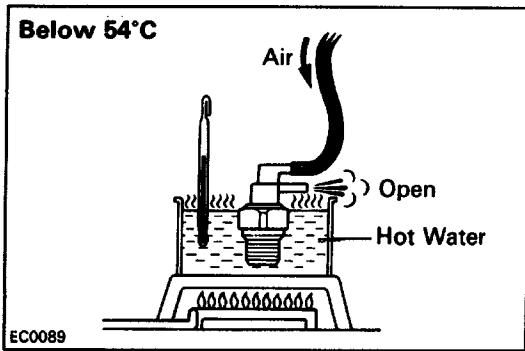
6. REINSTALL CAP TO CHARCOAL CANISTER
7. REINSTALL CHARCOAL CANISTER



INSPECTION OF TVV

INSPECT TVV BY BLOWING AIR INTO PIPE

- (a) Drain the engine coolant from the radiator into a suitable container.
- (b) Remove the TVV from the water outlet.
- (c) Cool the TVV to below 35°C (95°F) with cool water.
- (d) Blow air into the port and check that the TVV is closed.



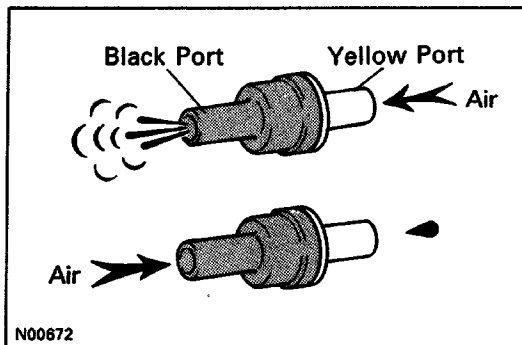
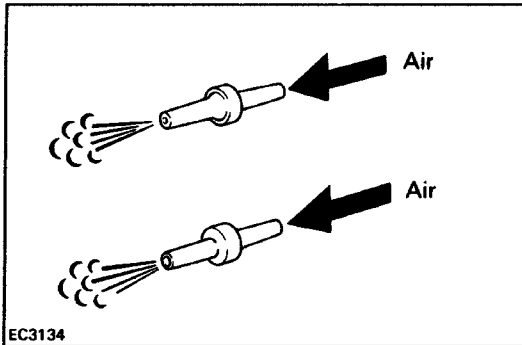
- (e) Heat the TVV to above 54°C (129°F) with hot water.
- (f) Blow air into the port and check that the TVV is open.
If a problem is found, replace the TVV.
- (g) Apply adhesive to two or three threads of the TVV, and reinstall.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

- (h) Refill the radiator with engine coolant.

INSPECTION OF JET

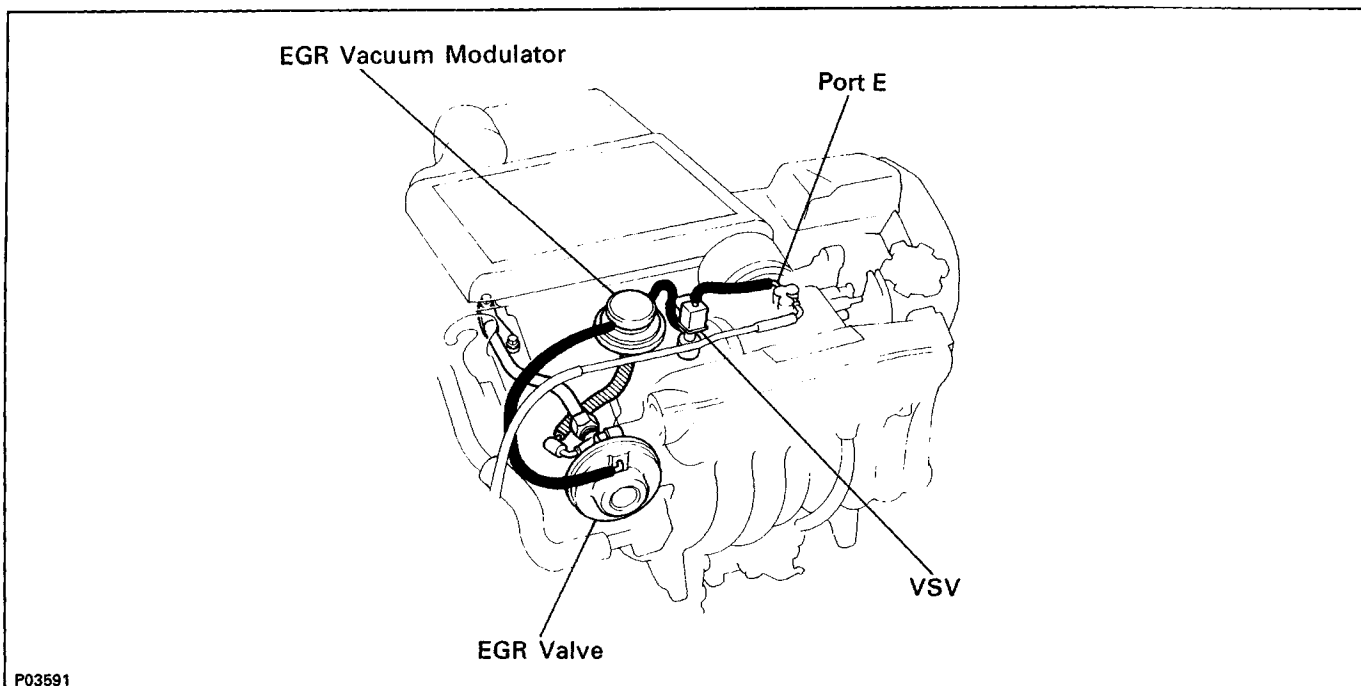
1. REMOVE JET
2. INSPECT JET BY BLOWING AIR FROM EACH SIDE
Check for stoppage.
3. REINSTALL JET



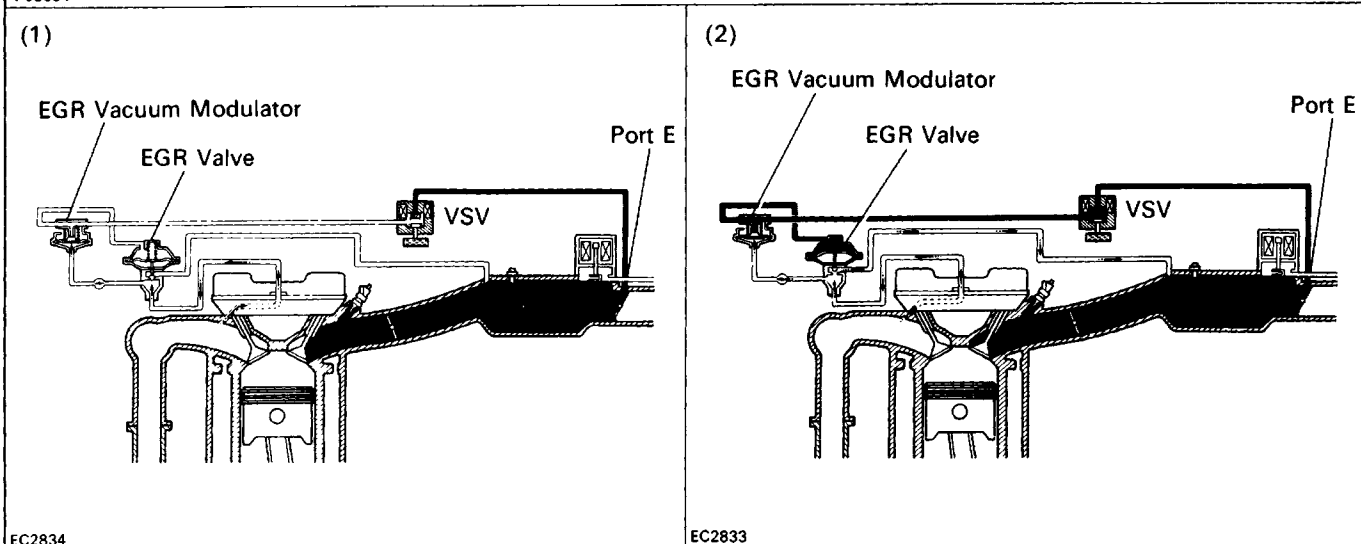
INSPECT OF CHECK VALVE

1. REMOVE CHECK VALVE
2. INSPECT CHECK VALVE
 - (a) Check that air flows from the yellow port to the black port.
 - (b) Check that air does not flow from the black port to the yellow port.
If operation is not as specified, replace the check valve.
3. REINSTALL CHECK VALVE
HINT: Reinstall the check valve with the black port facing the charcoal canister side.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM



P03591



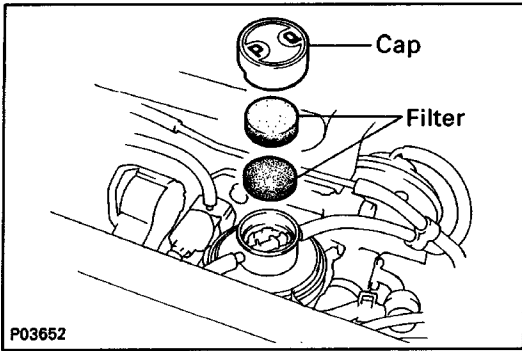
EC2834

EC2833

To reduce NOx emissions, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Engine Coolant Temp.	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 54°C (129°F)	CLOSED	-	-	-	-	CLOSED	Not recirculated
Above 60°C (140°F)	OPEN	Positioned above port E	(1)	-	-	CLOSED	Not recirculated
		Positioned below port E	(2)	•	CLOSED passage to atmosphere	OPEN	Recirculated (increase)

Remark: * When the throttle valve is positioned above port E, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.



INSPECTION OF EGR SYSTEM

1. INSPECT AND CLEAN FILTERS IN EGR VACUUM MODULATOR

- Remove the cap and two filters.
- Check the filters for contamination or damage.
- Using compressed air, clean the filters.
- Reinstall the two filters and cap.

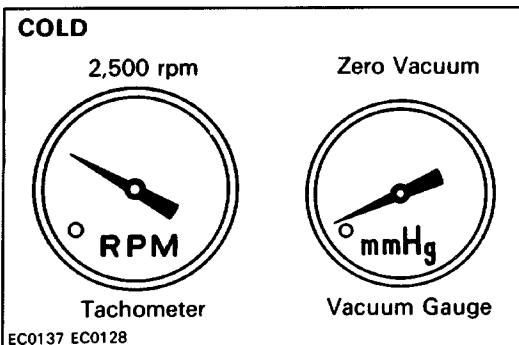
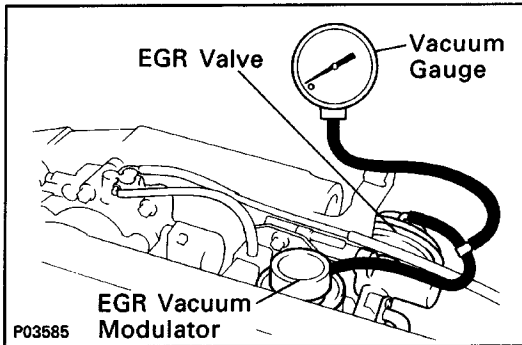
HINT: Install the filters with the coarser surface facing the atmospheric side (outward).

2. INSTALL VACUUM GAUGE

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum modulator.

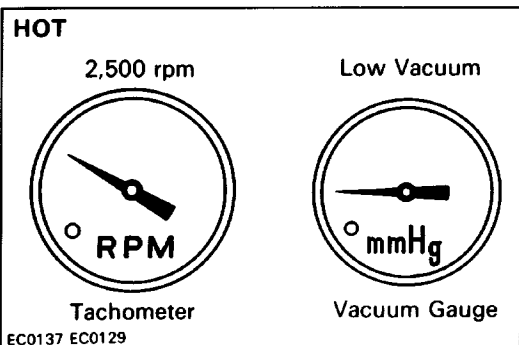
3. INSPECT SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle.



4. INSPECT VSV OPERATION WITH COLD ENGINE

- The coolant temperature should be below 54°C (129°F).
- Check that the vacuum gauge indicates zero vacuum at 2,500 rpm.

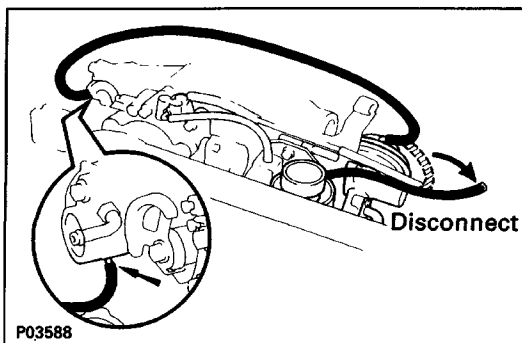


5. INSPECT VSV OPERATION WITH HOT ENGINE

- Warm up the engine.
- Check that the vacuum gauge indicates low vacuum at 2,500 rpm.

6. REMOVE VACUUM GAUGE

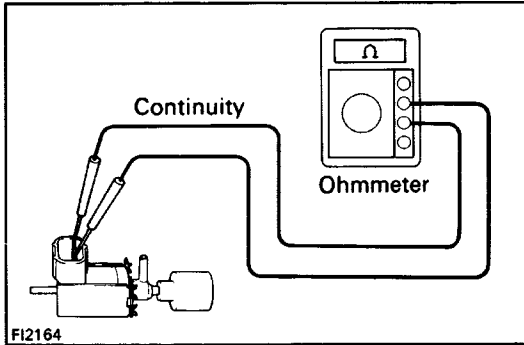
Remove the vacuum gauge, and reconnect the vacuum hoses to proper locations.



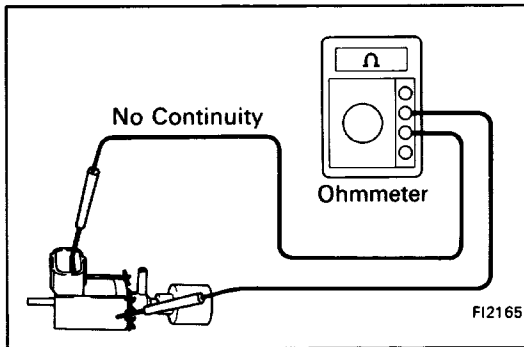
7. INSPECT EGR VALVE OPERATION

- Apply vacuum directly to the EGR valve with the engine idling.
- Check that the engine runs rough or dies.
- Reconnect the vacuum hoses to the proper locations.

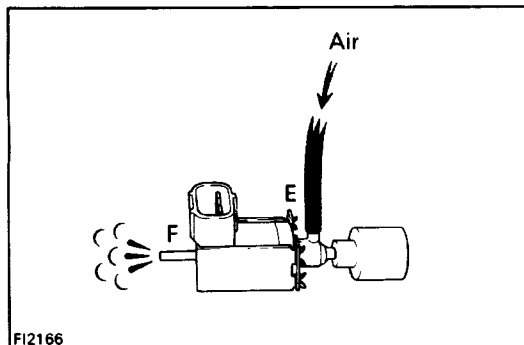
IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART



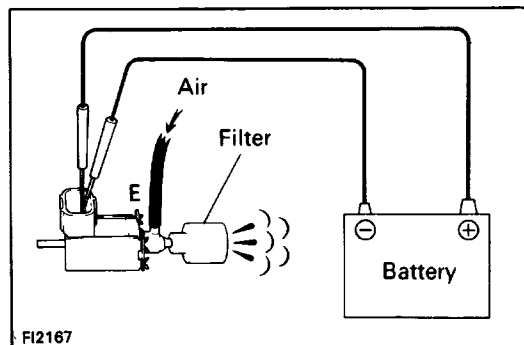
FI2164



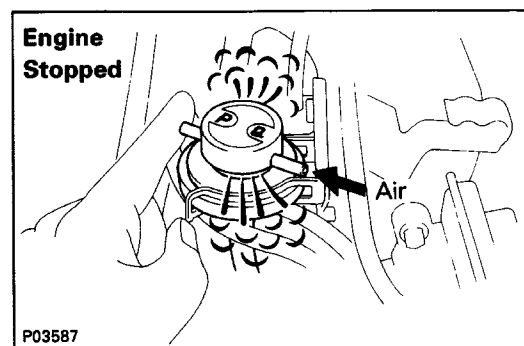
FI2165



FI2166



FI2167



P03587

INSPECTION OF VSV

1. REMOVE VSV

2. INSPECT VSV

A. Inspect VSV for open circuit

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

Resistance (Cold): 33 – 39

If there is no continuity, replace the VSV.

B. Inspect VSV for ground

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

If there is continuity, replace the VSV.

C. Inspect VSV operation

- (a) Check that air flows from ports E to F.

- (b) Apply battery voltage across the terminals.

- (c) Check that air flows from port E to the filter.

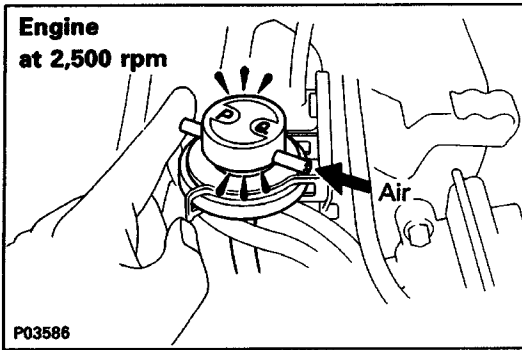
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

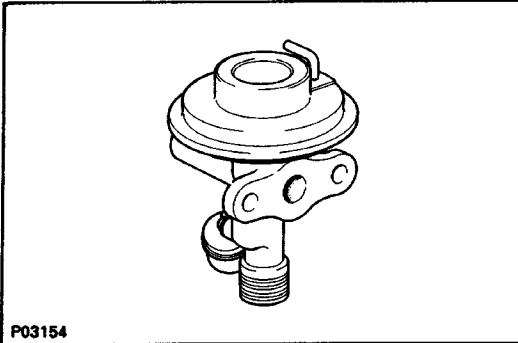
INSPECTION OF EGR VACUUM MODULATOR

INSPECT OPERATION OF EGR VACUUM MODULATOR

- (a) Disconnect the vacuum hoses from ports P and Q of the EGR vacuum modulator.
- (b) Block port one side with your finger.
- (c) Blow air into another port, and check that the air passes through to the air filter side freely.



- (d) Start the engine, and maintain speed at 2,500 rpm.
- (e) Repeat the above test. Check that there is a strong resistance to air flow.
- (f) Reconnect the vacuum hoses to the proper locations.



INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

2. INSPECT EGR VALVE

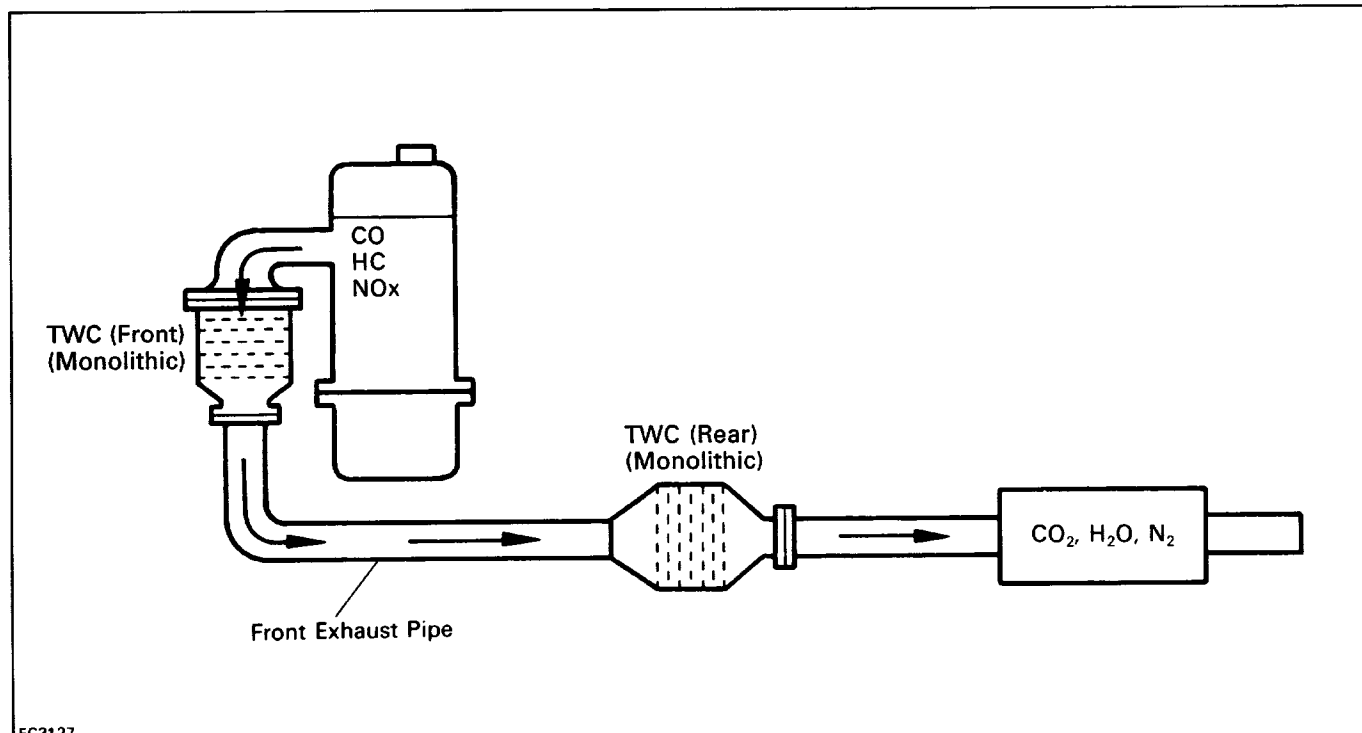
Check for sticking and heavy carbon deposits.

If a problem is found, replace the valve.

3. REINSTALL EGR VALVE

Install a new gasket.

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM



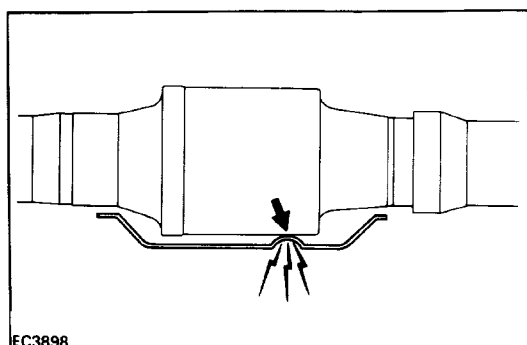
EC3127

To reduce CO, HC and NOx emissions, they are oxidized, reduced and converted to carbon dioxide (CO₂), water (H₂O) and nitrogen (N₂) by the three-way catalytic converter.

Exhaust Port		TWC (Front)		TWC (Rear)		Exhaust Gas
CO HC NOx	→	OXIDATION AND REDUCTION	→	OXIDATION AND REDUCTION	→	CO ₂ H ₂ O N ₂

INSPECTION OF EXHAUST PIPE ASSEMBLY

1. INSPECT CONNECTIONS FOR LOOSENESS OR DAMAGE
2. INSPECT CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE



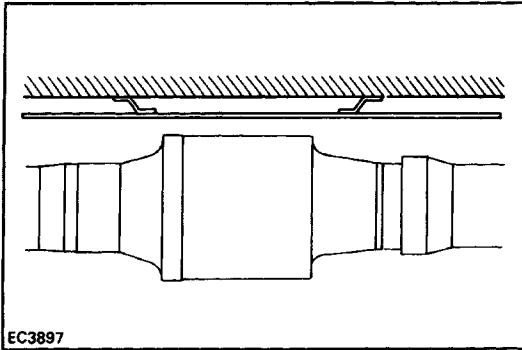
EC3898

INSPECTION OF THREE-WAY CATALYTIC CONVERTER

(Three-Way Catalytic Converter-Rear)

INSPECT FOR DENTS OR DAMAGE

If any part of protector is damaged or dented to the extent that it contacts the three-way catalytic converter, repair or replace it.



INSPECTION OF HEAT INSULATOR (Three-Way Catalytic Converter-Rear)

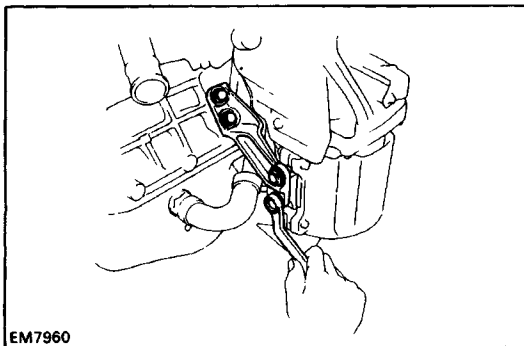
1. INSPECT HEAT INSULATOR FOR DAMAGE
2. INSPECT FOR ADEQUATE CLEARANCE BETWEEN THREE-WAY CATALYTIC CONVERTER AND HEAT INSULATOR

REPLACEMENT OF THREE-WAY CATALYTIC CONVERTER (Three-Way Catalytic Converter-Front)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

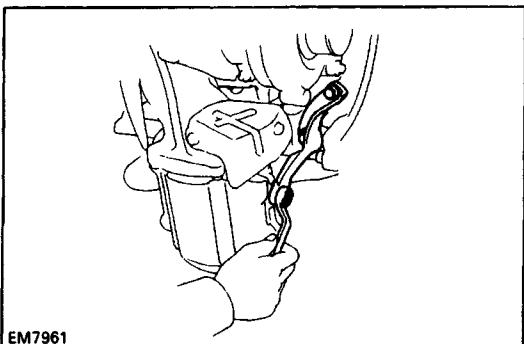
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE ENGINE UNDER COVERS
3. REMOVE FRONT EXHAUST PIPE
(See step 2 on page [EC-30](#))
4. REMOVE GENERATOR (See page [CH-7](#))
5. REMOVE IDLER PULLEY BRACKET AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
(See step 40 on page [EM-229](#))

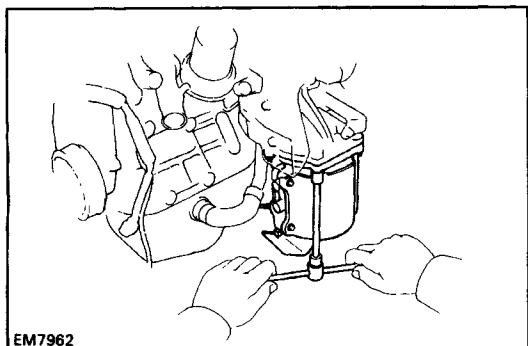


6. REMOVE THREE-WAY CATALYTIC CONVERTER (Front)

- (a) Check that the three-way catalytic converter is cool.
- (b) Remove the four bolts and RH three-way catalytic converter stay.

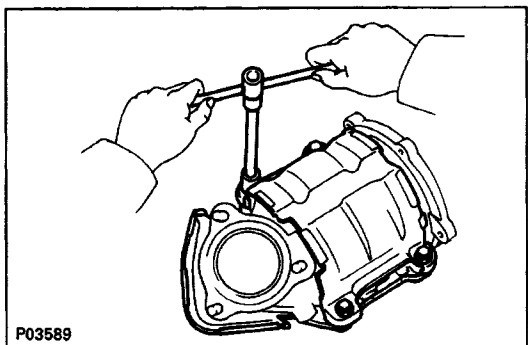


- (c) Remove the three bolts and LH three-way catalytic converter stay.



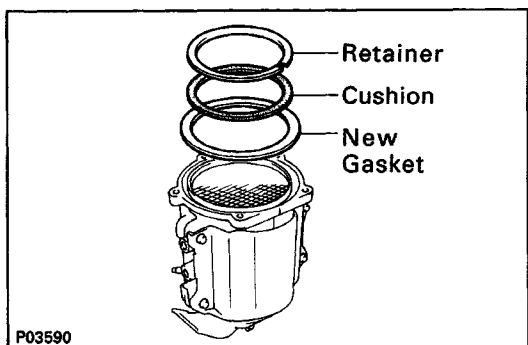
(d) Remove the three bolts, two nuts, the three-way catalytic converter, gasket, retainer and cushion.

(e) Remove the nine bolts and two heat insulators from the three-way catalytic converter.

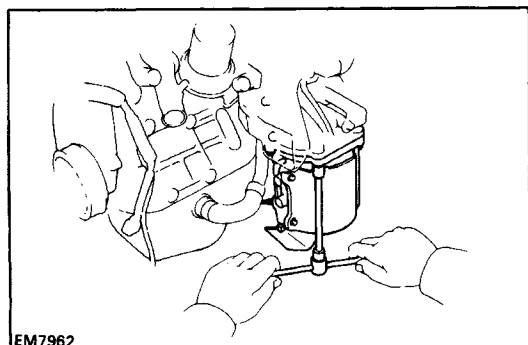


7. REINSTALL THREE-WAY CATALYTIC CONVERTER (FRONT)

(a) Install the two heat insulators to a new three-way catalytic converter with the nine bolts.

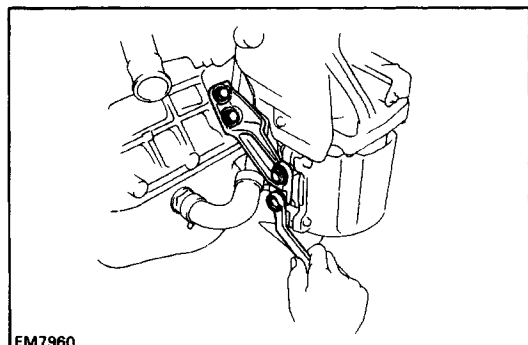


(b) Place the cushion, retainer and a new gasket on the three-way catalytic converter.



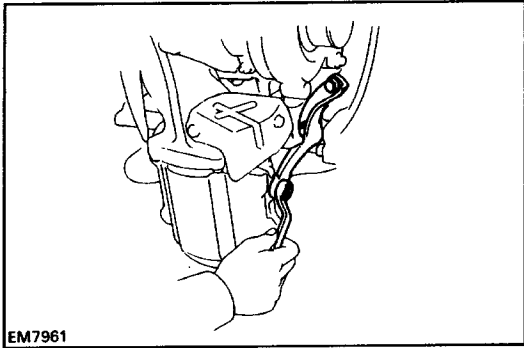
(c) Install the three-way catalytic converter with the three bolts and two new nuts.

Torque: 29 N-m (300 kgf-cm, 21 ft-lbf)



(d) Install the RH three-way catalytic converter stay with the four bolts.

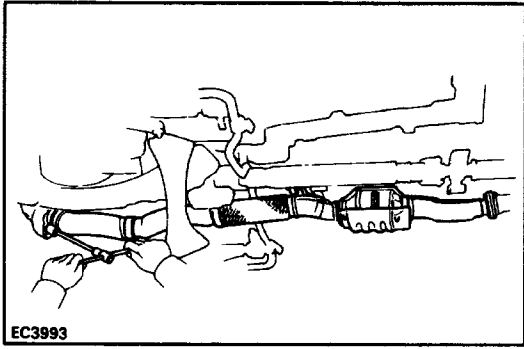
Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)



(e) Install the LH three-way catalytic converter stay with the three bolts.

Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)

8. REINSTALL IDLER PULLEY BRACKET AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
(See step 12 on page [EM-261](#))
9. REINSTALL GENERATOR (See page [CH-23](#))
10. REINSTALL FRONT EXHAUST PIPE
(See step 3 on page [EC-30](#))
11. REINSTALL ENGINE UNDER COVERS
12. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY



(Three-Way Catalytic Converter-Rear)

1. REMOVE RH ENGINE UNDER COVER

2. REMOVE FRONT EXHAUST PIPE (THREE-WAY CATALYTIC CONVERTER-REAR)

- (a) Loosen the bolt, and disconnect the clamp from the bracket.
- (b) Remove the two bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
- (c) Using a 14 mm deep socket wrench, remove the three nuts holding the front exhaust pipe to the three-way catalytic converter (front).
- (d) Disconnect the support hook on the front exhaust pipe from the support bracket, and remove the front exhaust pipe and two gaskets.

3. REINSTALL FRONT EXHAUST PIPE (THREE-WAY CATALYTIC CONVERTER-REAR)

- (a) Install the support hook on the front exhaust pipe to the support bracket
- (b) Place the two new gaskets on the front and rear of the front exhaust pipe.
- (c) Temporarily install the two bolts and two new nuts holding the front exhaust pipe to the center exhaust pipe.
- (d) Using a 14 mm deep socket wrench, install the three nuts holding the front exhaust pipe to the three-way catalytic converter (front).

Torque: 62 N-m (630 kgf-cm, 46 ft-lbf)

- (e) Tighten the two bolts and nuts holding the front exhaust pipe to the center exhaust pipe.

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

- (f) Install the clamp with the bolt.

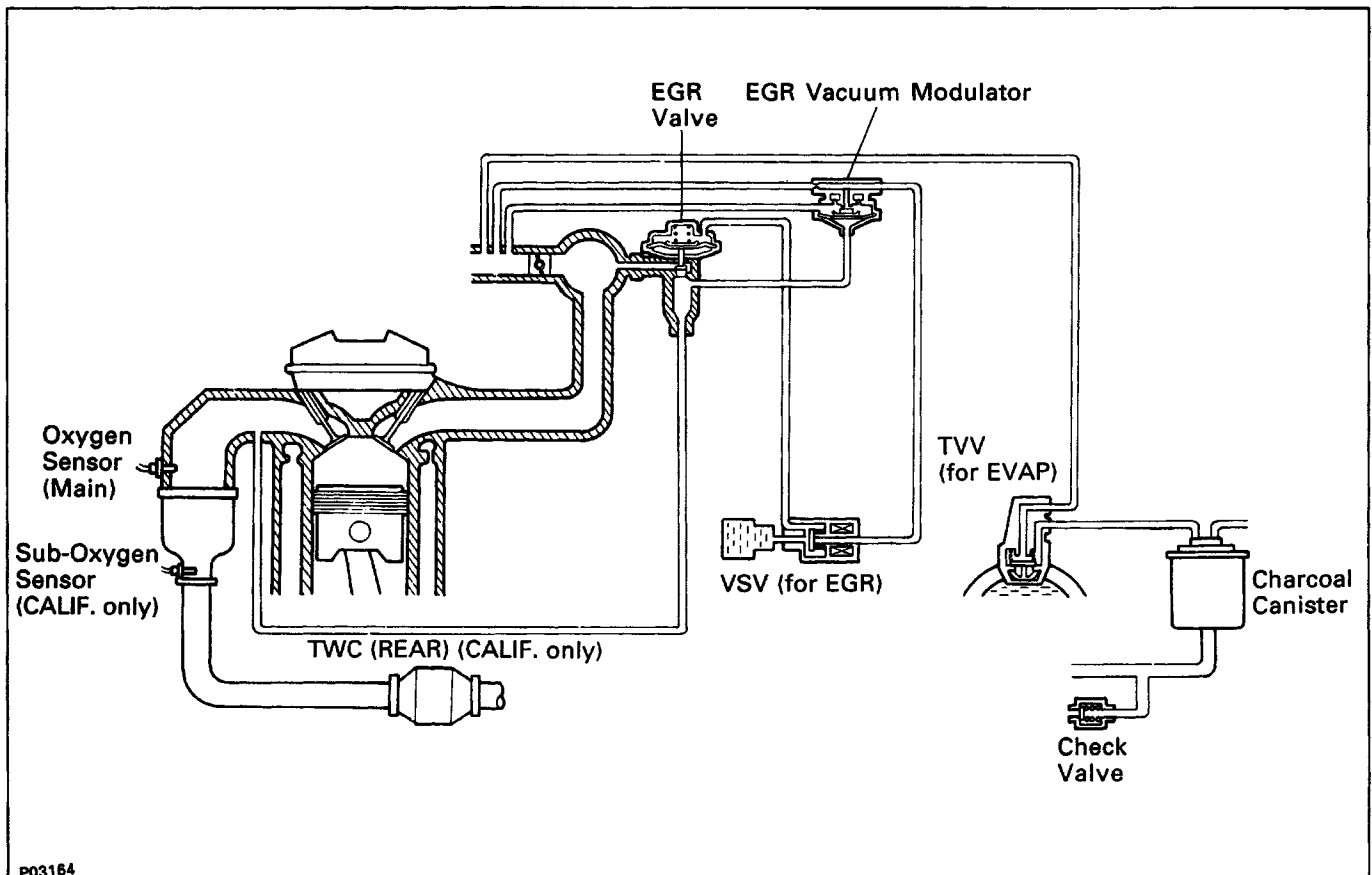
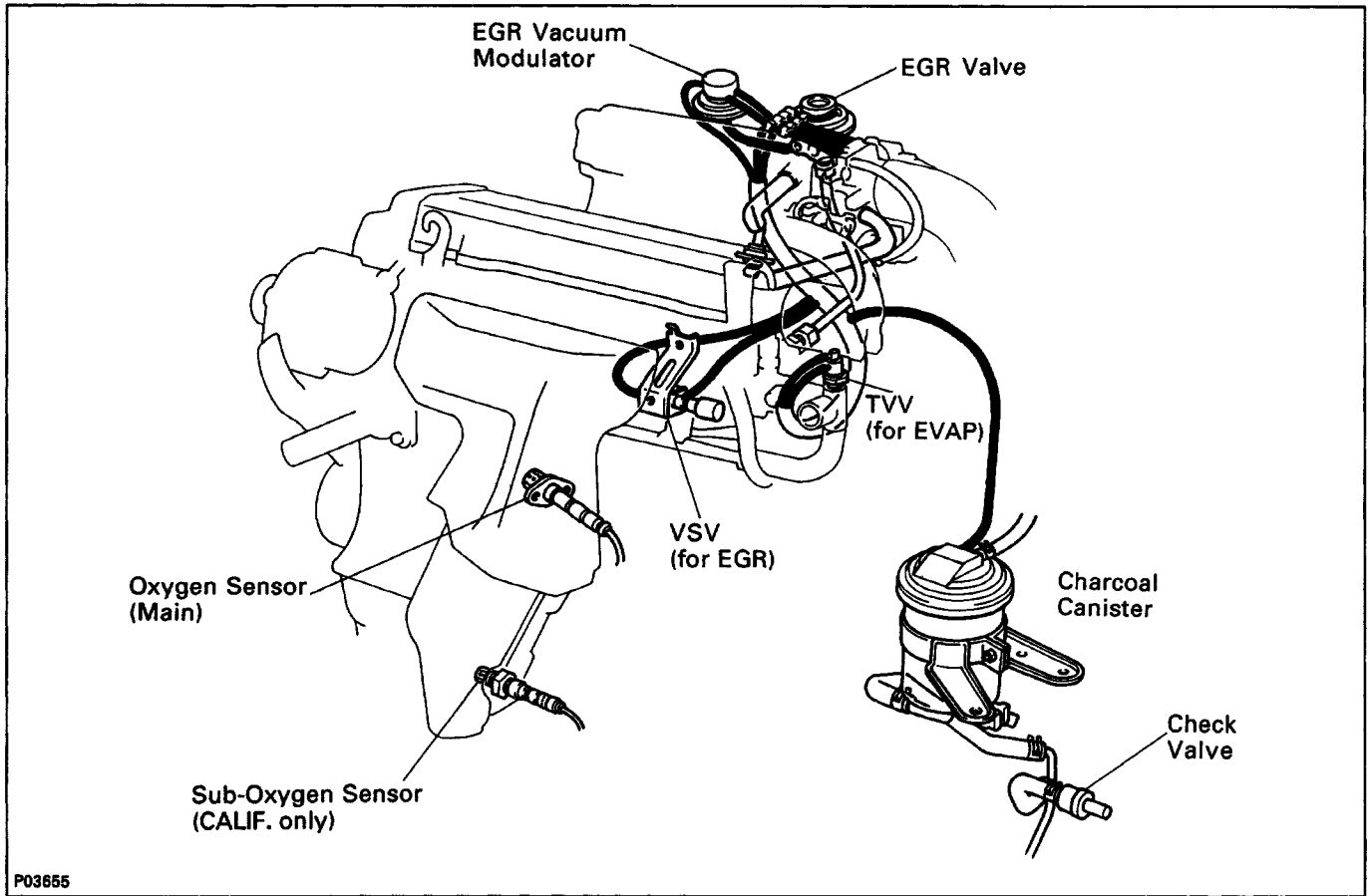
4. REINSTALL RH ENGINE UNDER COVER

(5S-FE) SYSTEM PURPOSE

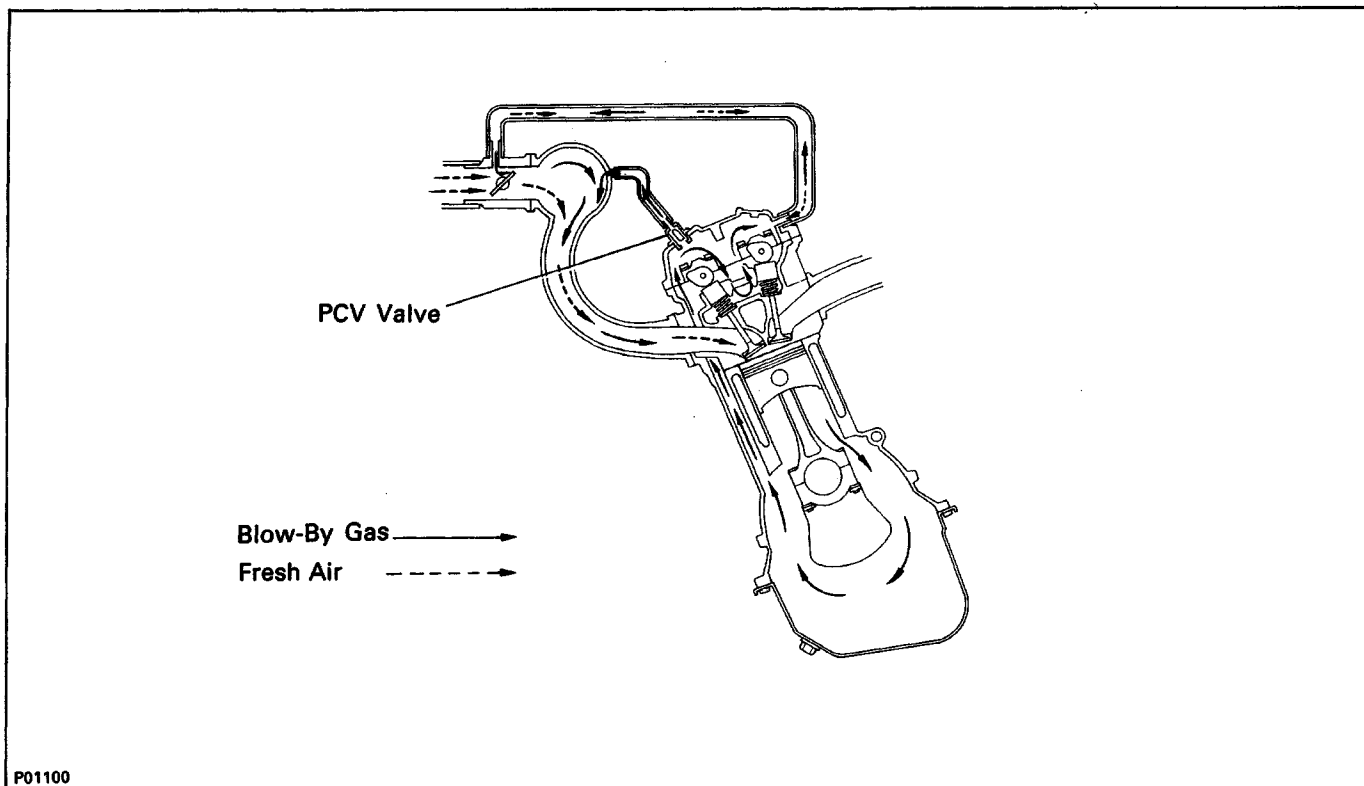
System	Abbreviation	Purpose
Positive Crankcase ventilation	PCV	Reduces blow-by gas (HC)
Evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three-way catalytic converter	TWC	Reduces CO, HC and NOx
Multiport fuel injection	MFI	Regulates all engine conditions for reduction of exhaust emissions.

Remark * For inspection and repair of the MFI system, refer to MFI section of this manual.

COMPONENT LAYOUT AND SCHEMATIC DRAWING

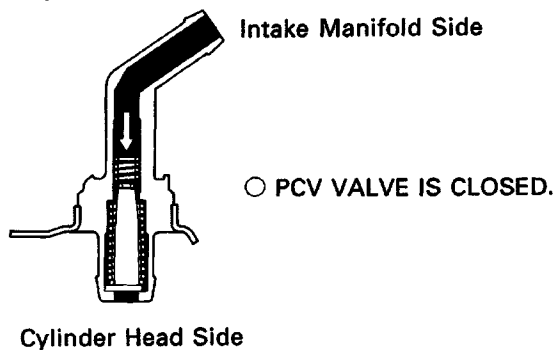


POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

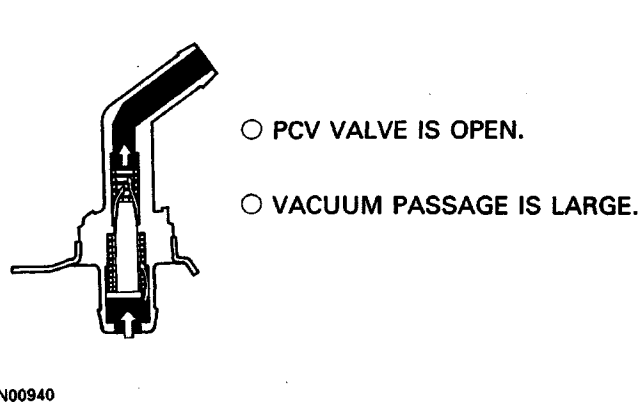


To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

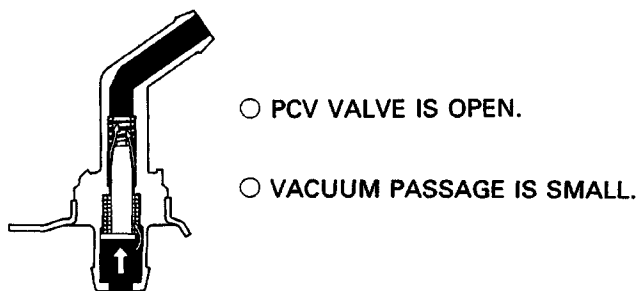
Engine not Running or if Backfiring



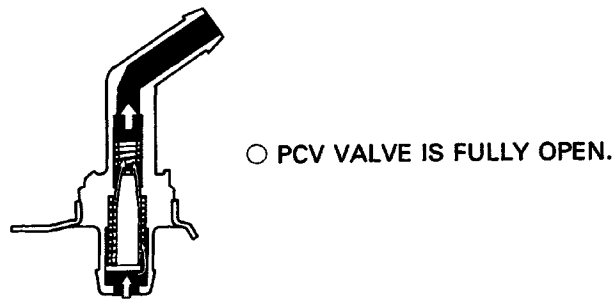
Normal Operation

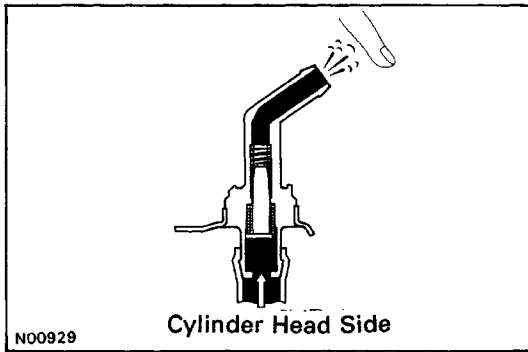


Idling or Decelerating



Acceleration or High Load





INSPECTION OF PCV VALVE

1. REMOVE PCV VALVE
2. INSTALL CLEAN HOSE TO PCV VALVE
3. INSPECT PCV VALVE OPERATION

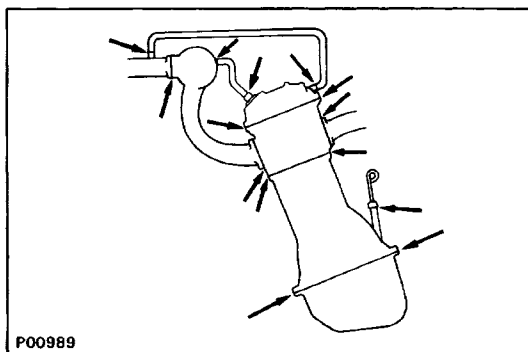
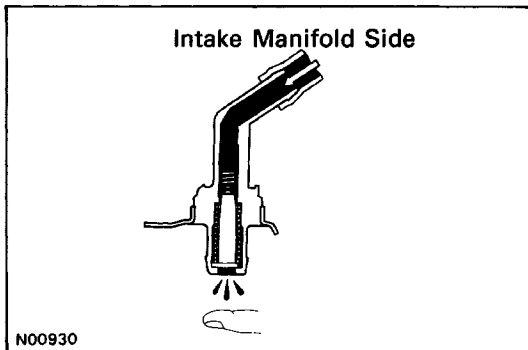
(a) Blow air into the cylinder head side, and check that air passes through easily.

CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.

(b) Blow air into the intake manifold side, and check that air passes through with difficulty.

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

4. REMOVE CLEAN HOSE FROM PCV VALVE
5. REINSTALL PCV VALVE

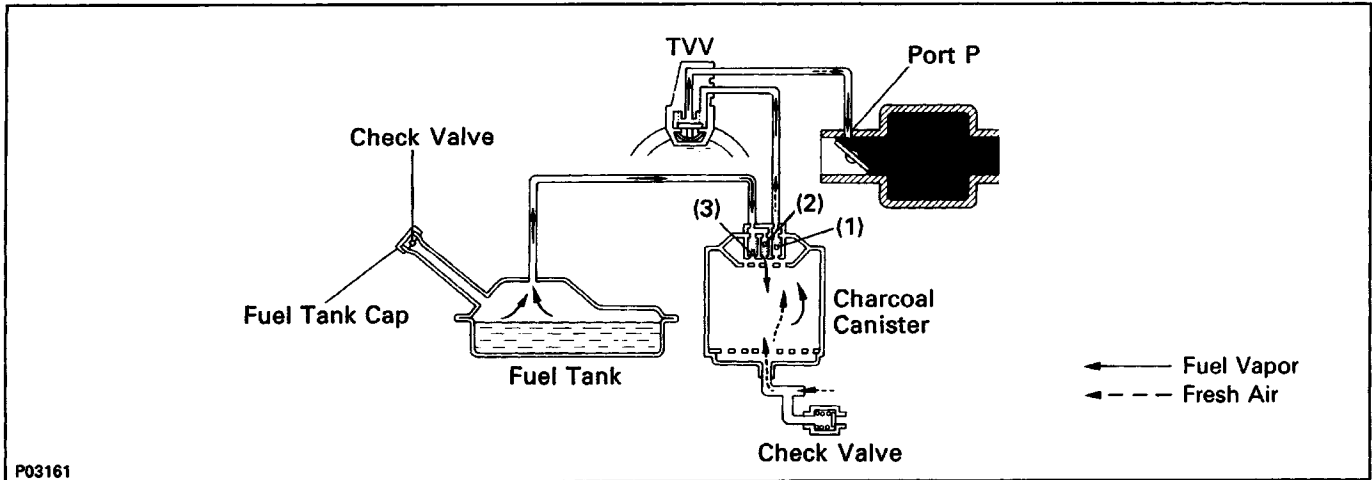


INSPECTION OF PCV HOSE AND CONNECTIONS

VISUALLY INSPECT HOSE AND CONNECTIONS

Check for cracks, leaks or damage.

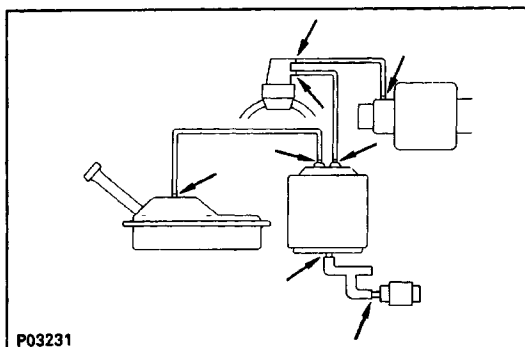
EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



P03161

To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Engine Coolant Temp.	TVV	Throttle Valve Opening	Canister Check Valve			Check Valve in Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35°C (95°F)	CLOSED	-	-	-	-	-	HC from tank is absorbed into the canister.
Above 54°C (129°F)	OPEN	Positioned below port P	CLOSED	-	-	-	
		Positioned above port P	OPEN	-	-	-	HC from canister is led into air intake chamber.
High pressure in tank	-	-	-	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank	-	-	-	CLOSED	OPEN	OPEN	Air is led into the fuel tank.



P03231

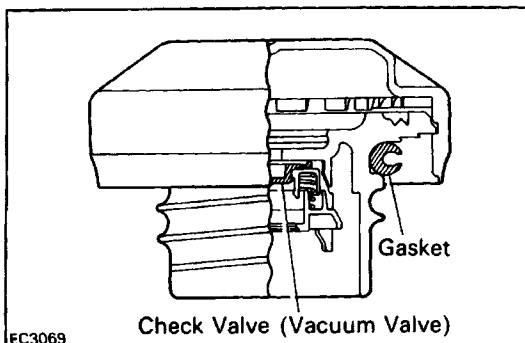
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.



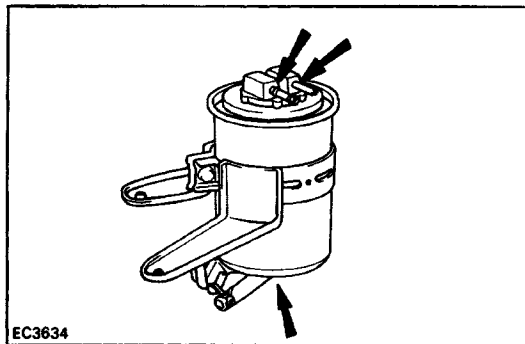
EC3069

Check Valve (Vacuum Valve)

3. VISUALLY INSPECT FUEL TANK CAP

Check if the cap and/or gasket are deformed or damaged.

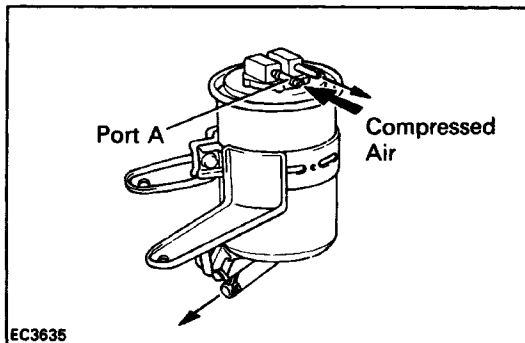
If necessary, repair or replace the cap.



INSPECTION OF CHARCOAL CANISTER

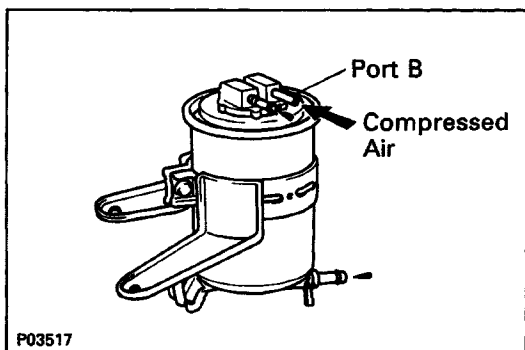
1. REMOVE CHARCOAL CANISTER
2. REMOVE CAP FROM CHARCOAL CANISTER
3. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.



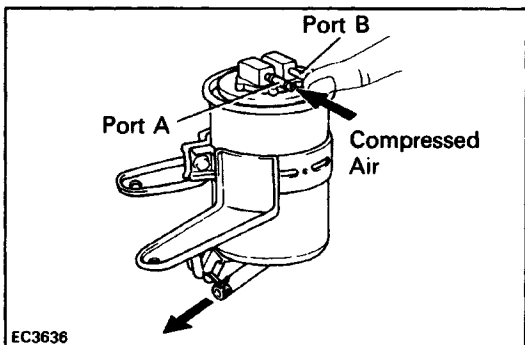
4. INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air, blow into port A and check that air flows without resistance from the other ports.



(b) Blow into port B and check that air does not flow from the other ports.

If a problem is found, replace the charcoal canister.



5. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 kgf/cm², 43 psi) of compressed air into port A while holding port B closed.

NOTICE:

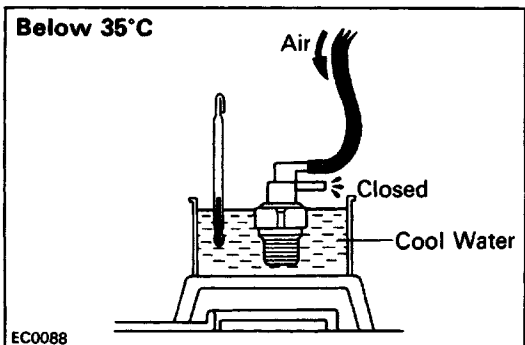
- Do not attempt to wash the canister.
- No activated carbon should come out.

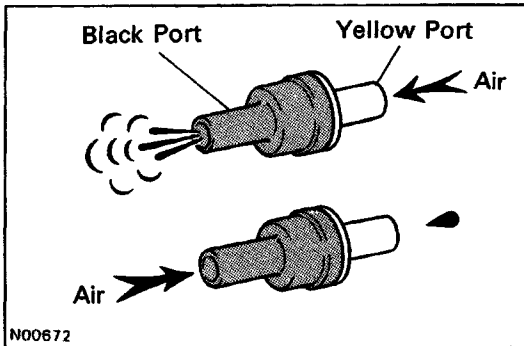
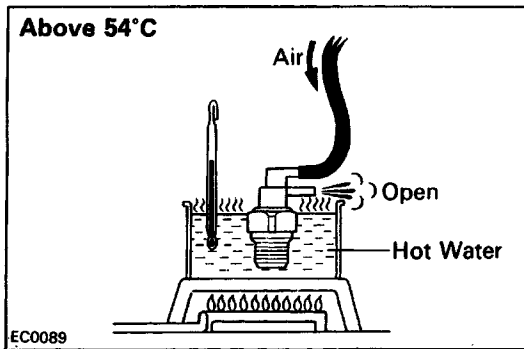
6. REINSTALL CAP TO CHARCOAL CANISTER
7. REINSTALL CHARCOAL CANISTER

INSPECTION OF TVV

INSPECT TVV BY BLOWING AIR INTO PIPE

- (a) Drain the engine coolant from the radiator into a suitable container.
- (b) Remove the TVV from the water outlet.
- (c) Cool the TVV to below 35°C (95°F) with cool water.
- (d) Blow air into the port and check that the TVV is closed.





- (e) Heat the TVV to above 54°C (129°F) with hot water.
- (f) Blow air into the port and check that the TVV is open.
If a problem is found, replace the TVV.
- (g) Apply adhesive to two or three threads the TVV, and reinstall.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

- (h) Refill the radiator with engine coolant.

INSPECTION OF CHECK VALVE

1. REMOVE CHECK VALVE

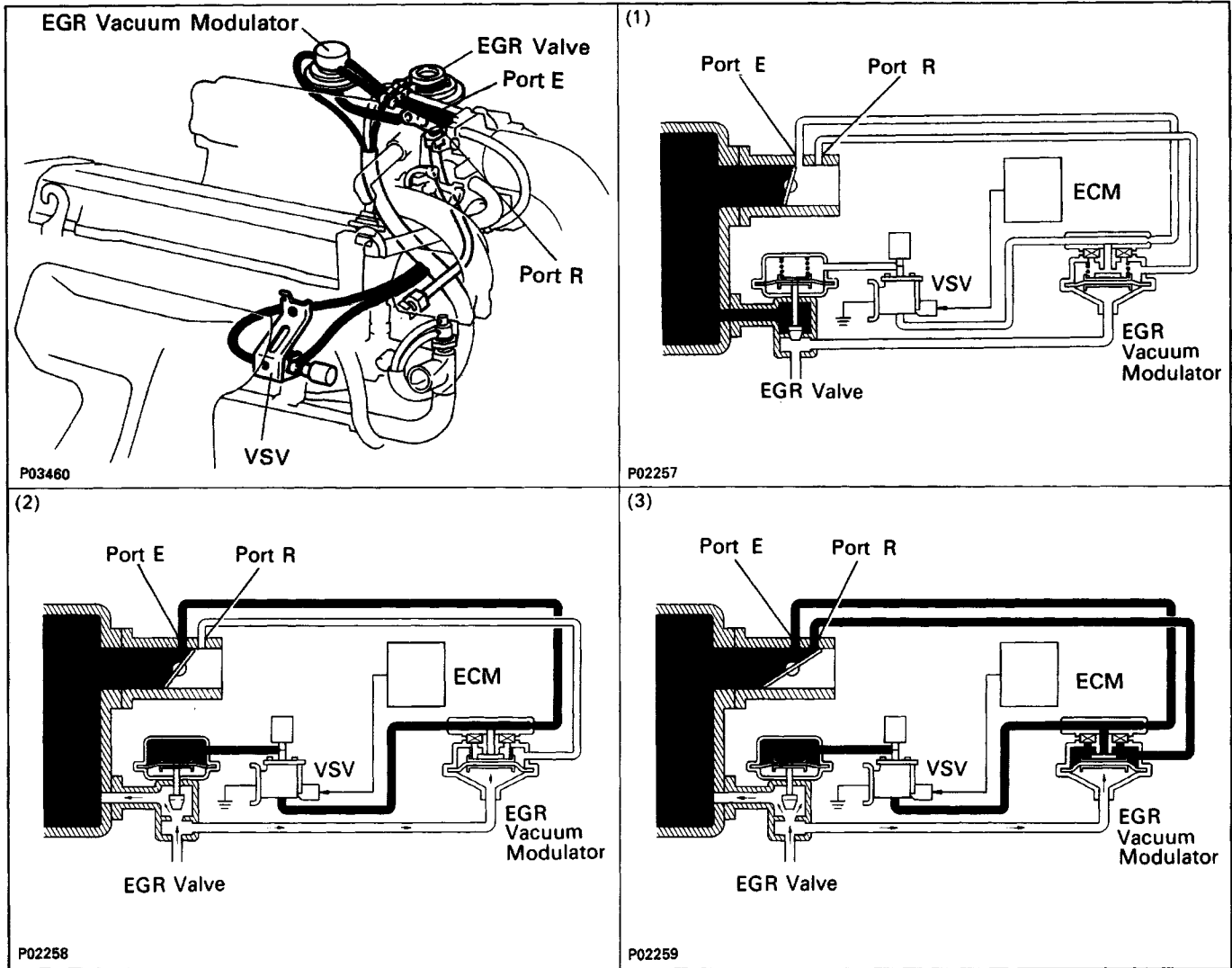
2. INSPECT CHECK VALVE

- (a) Check that air flows from the yellow port to the black port.
- (b). Check that air does not flow from the black port to the yellow port.
If operation is not as specified, replace the check valve.

3. REINSTALL CHECK VALVE

HINT: Reinstall the check valve with the black port facing the charcoal canister side.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

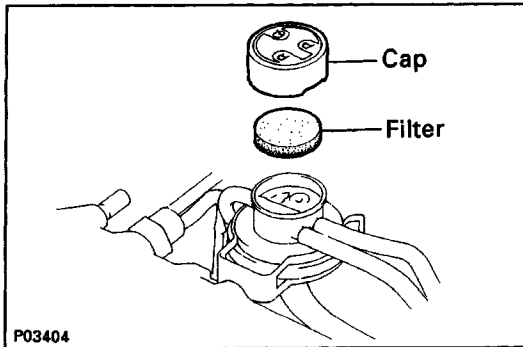


Engine Coolant Temp.	Engine RPM	PIM (ECU)	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber	EGR Vacuum Modulator	EGR Valve	Exhaust Gas	
Below 55°C (131°F)	-	-	CLOSED	-	-	-	CLOSED	Not recirculated	
Above 60°C (140°F)	Below 4,000 rpm	OFF	CLOSED	Positioned below port E	-	-	CLOSED	Not recirculated	
			CLOSED	Positioned below port E	(1)	-	CLOSED	Not recirculated	
	Above 4,000 rpm	ON	OPEN	Positioned between port E and port R	(2) HIGH	*	CLOSES passage to atmosphere	OPEN	Recirculated
			OPEN	Positioned above port R	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)
Above 4,000 rpm	Above 4,000 rpm	OFF	CLOSED	-	-	-	CLOSED	Not Recirculated	

* Pressure increases → Modulator closes → EGR valve opens → Pressure drops
 ← EGR valve closes ← Modulator opens ←

** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the exhaust gas, even if the exhaust pressure is insufficiently low.

*** If terminals TE1 and E1 of data link connector 1 are connected, the VSV switches ON.



INSPECTION OF EGR SYSTEM

1. INSPECT AND CLEAN FILTERS IN EGR VACUUM MODULATOR

- Remove the cap and filter.
- Check the filters for contamination or damage.
- Using compressed air, clean the filter.
- Reinstall the filter and cap.

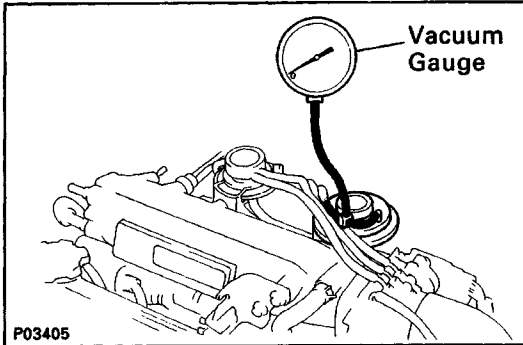
HINT: Install the filters with the coarser surface facing the atmospheric side (outward).

2. INSTALL VACUUM GAUGE

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and VSV.

3. INSPECT SEATING OF EGR VALVE

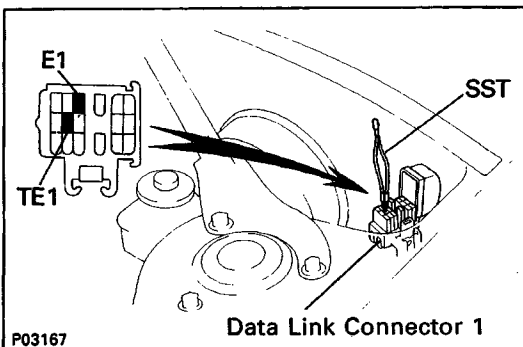
Start the engine and check that the engine starts and runs at idle.



4. CONNECT TERMINALS TE1 AND E1 OF DATA LINK CONNECTOR 1

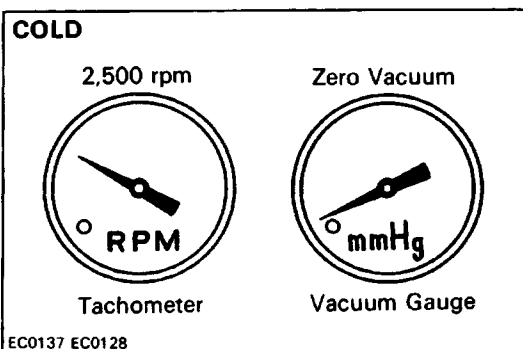
Using SST, connect terminals TE1 and E1 of the data link connector 1.

SST 09843-18020



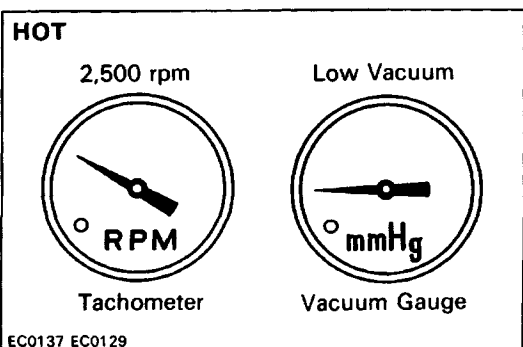
5. INSPECT VSV OPERATION WITH COLD ENGINE

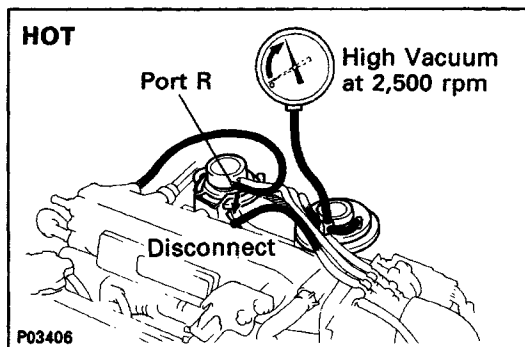
- The engine coolant temperature should be below 55°C (131°F).
- Check that the vacuum gauge indicates zero at 2,500 rpm.



6. INSPECT VSV OPERATION OF AND EGR VACUUM MODULATOR WITH HOT ENGINE

- Warm up the engine above 60°C (140°F).
- Check that the vacuum gauge indicates low vacuum at 2,500 rpm.





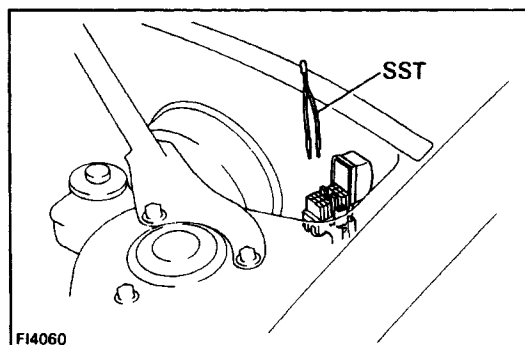
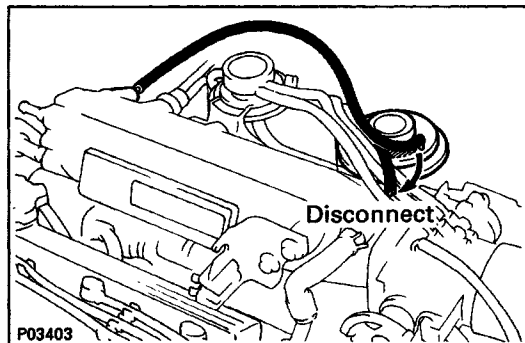
- (c) Disconnect the vacuum hose port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.
 - (d) Check that the vacuum gauge indicates high vacuum at 2,500 rpm.
- HINT: As a large amount of exhaust gas enters, the engine will misfire slightly.

7. REMOVE VACUUM GAUGE

Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations.

8. INSPECT EGR VALVE OPERATION

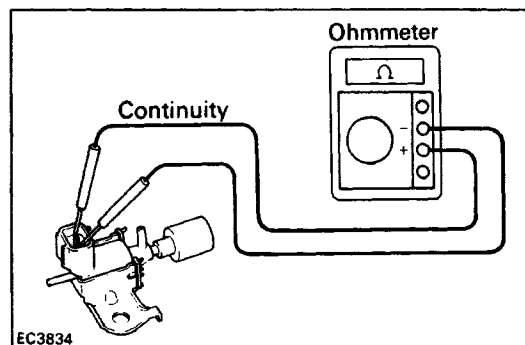
- (a) Apply vacuum directly to the EGR valve with the engine idling.
- (b) Check that the engine runs rough or dies.
- (c) Reconnect the vacuum hoses to the proper locations.



9. REMOVE SST FROM DATA LINK CONNECTOR 1

SST 09843-18020

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART



INSPECTION OF VSV

1. REMOVE VSV

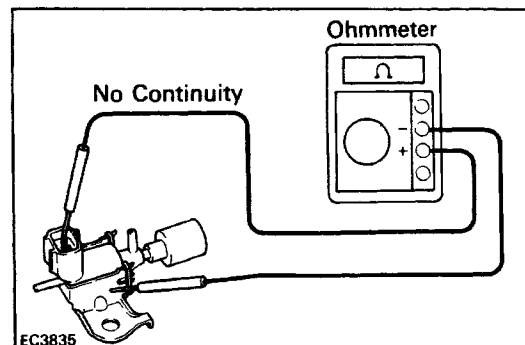
2. INSPECT VSV

A. Inspect VSV for open circuit.

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

Resistance (Cold): 33 - 39

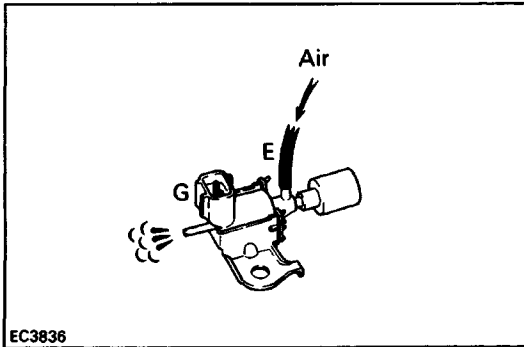
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

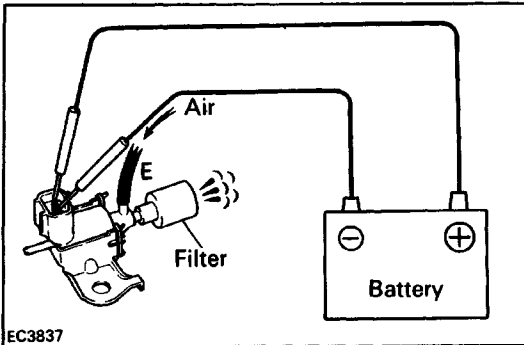
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

- (a) Check that the air flows from ports E to G.

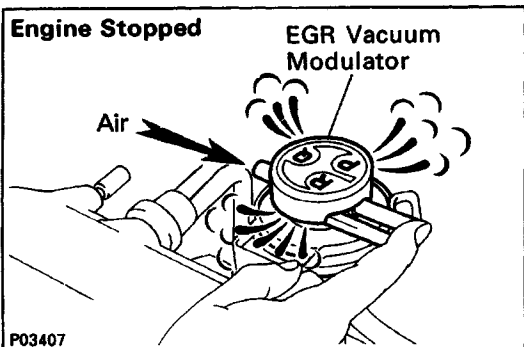


- (b) Apply battery voltage across the terminals.

- (c) Check that the air flows from port E to the filter.

If operation is not as specified, replace the VSV.

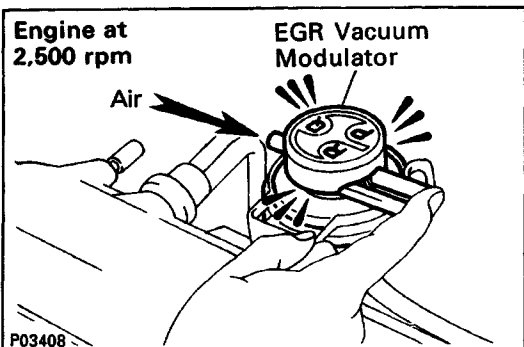
3. REINSTALL VSV



INSPECTION OF EGR VACUUM MODULATOR

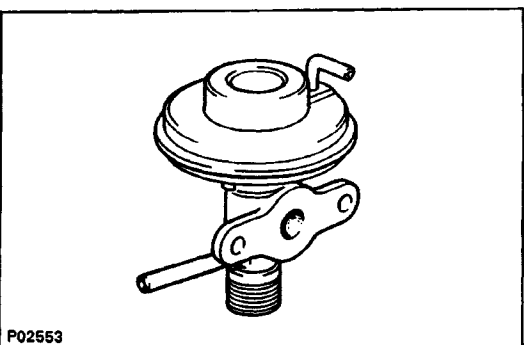
INSPECT OPERATION OF EGR VACUUM MODULATOR

- (a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
- (b) Block ports P and R with your finger.
- (c) Blow air into port Q, and check that the air passes through to the air filter side freely.
- (d) Start the engine, and maintain speed at 2,500 rpm.
- (e) Repeat the above test. Check that there is a strong resistance to air flow.



- (f) Reconnect the vacuum hoses to the proper locations.

If operation is not as specified, replace the vacuum modulator.



INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

2. INSPECT EGR VALVE

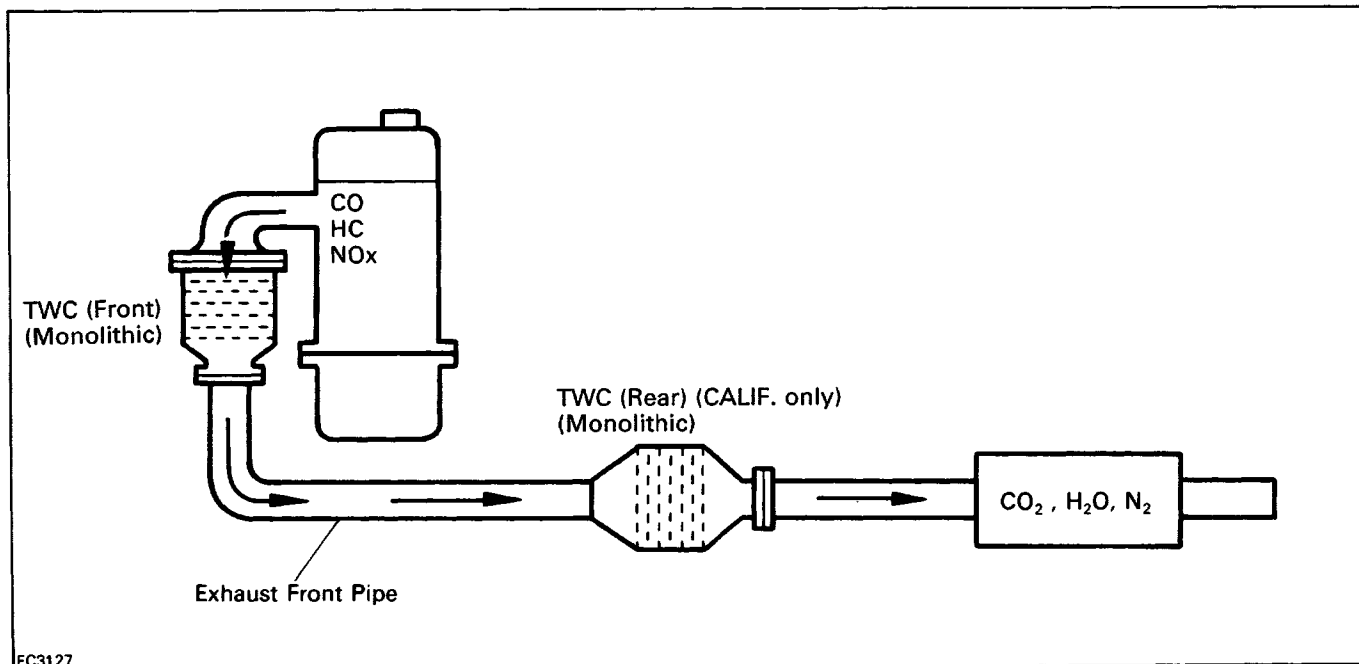
Check for sticking and heavy carbon deposits.

If a problem is found, replace the valve.

3. REINSTALL EGR VALVE

Install a new gasket.

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM



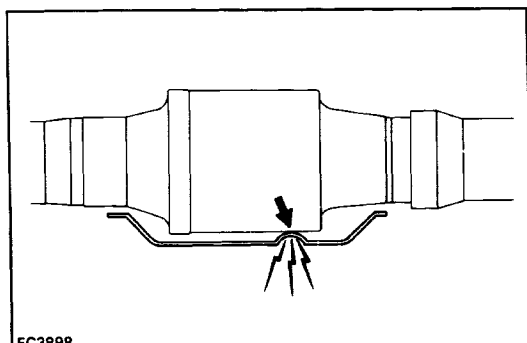
EC3127

To reduce CO, HC and NOx emissions, they are oxidized, and converted to carbon dioxide (CO₂), water (H₂O) and nitrogen (N₂) by the three-way catalytic converter

Exhaust Port		TWC (Front)		TWC (Rear) (CALIF. only)		Exhaust Gas
CO HC NOx	→	OXIDATION AND REDUCTION	→	OXIDATION AND REDUCTION	→	CO ₂ H ₂ O N ₂

INSPECTION OF EXHAUST PIPE ASSEMBLY

1. INSPECT CONNECTIONS FOR LOOSENESS OR DAMAGE
2. INSPECT CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

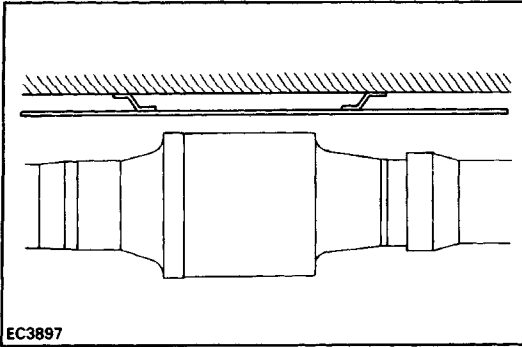


EC3898

INSPECTION OF THREE-WAY CATALYTIC CONVERTER (Three-Way Catalytic Converter-Rear (CALIF. only))

INSPECT FOR DENTS OR DAMAGE

If any part of protector is damaged or dented to the extent that it contacts the three-way catalytic converter, repair or replace it.



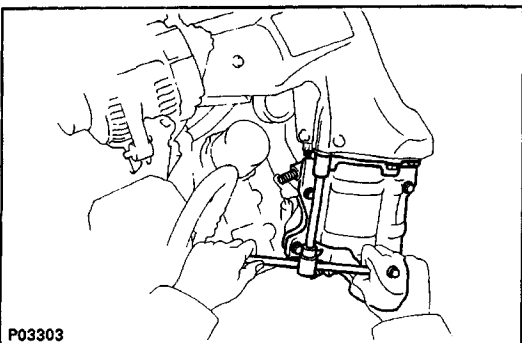
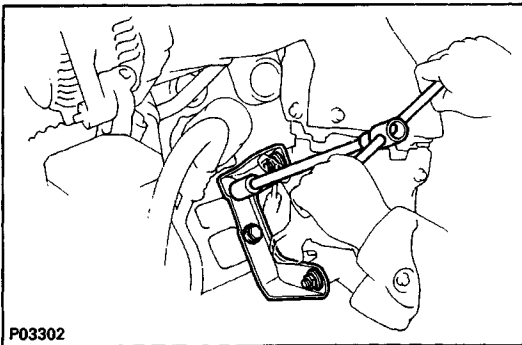
INSPECTION OF HEAT INSULATOR (Three-Way Catalytic Converter-Rear (CALIF. only))

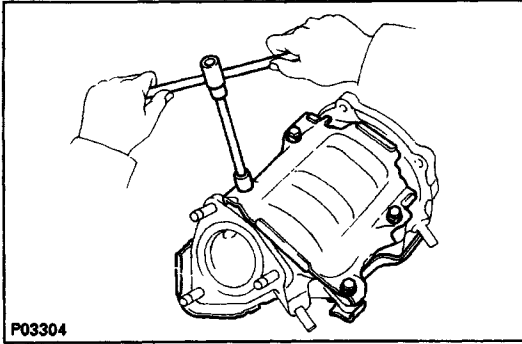
1. INSPECT HEAT INSULATOR FOR DAMAGE
2. INSPECT FOR ADEQUATE CLEARANCE BETWEEN THREE-WAY CATALYTIC CONVERTER AND HEAT INSULATOR

REPLACEMENT OF THREE-WAY CATALYTIC CONVERTER

(Three-Way Catalytic Converter (Front))

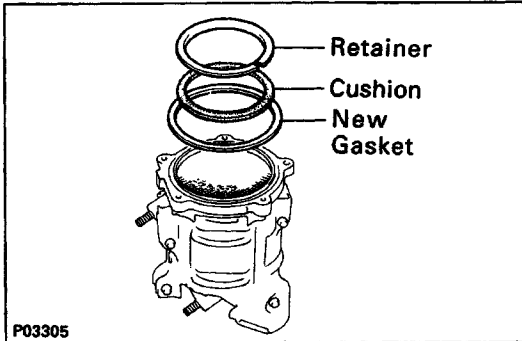
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
2. REMOVE RH ENGINE UNDER COVER
3. REMOVE FRONT EXHAUST PIPE
(See step 2 on page [EC-45](#))
4. REMOVE THREE-WAY CATALYTIC CONVERTER (FRONT)
 - (a) Check that the three-way catalytic converter is cool
 - (b) Disconnect the main oxygen sensor connector.
 - (c) (CALIF. only)
Disconnect the sub-oxygen sensor connector.
 - (d) Remove the two bolts, two nuts and three-way catalytic converter stay.
 - (e) Remove the three bolts, two nuts, three-way catalytic converter, gasket, retainer and cushion.
 - (f) Remove the eight bolts and two heat insulators from the three-way catalytic converter.



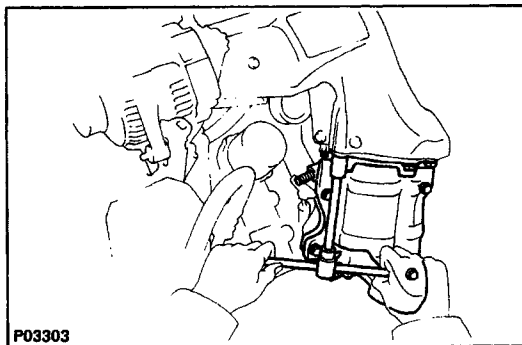


5. REINSTALL THREE-WAY CATALYTIC CONVERTER (FRONT)

- (a) Install the two heat insulators to a new three-way catalytic converter with the eight bolts.

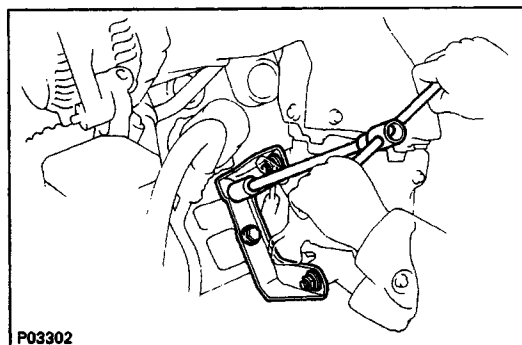


- (b) Place the cushion, retainer and a new gasket on the three-way catalytic converter.



- (c) Install the three-way catalytic converter with the three bolts and two new nuts.

Torque: 29 N-m (300 kgf-cm, 21 ft-lbf)



- (d) Install the three-way catalytic converter stay with the two bolts and two nuts.

Torque: 42 N-m (425 kgf-cm, 31 ft-lbf)

- (e) Connect the main oxygen sensor connector.

- (f) (CALIF. only)

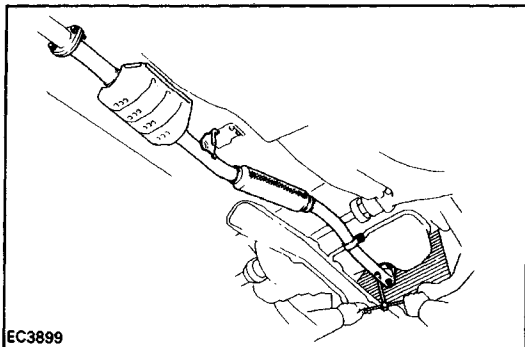
Connect the sub-oxygen sensor connector.

6. REINSTALL FRONT EXHAUST PIPE

(See step 3 on page [EC-45](#))

7. REINSTALL RH ENGINE UNDER COVER

8. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY



(Three-Way Catalytic Converter-Rear (CALIF. only))

1. REMOVE RH ENGINE UNDER COVER

2. REMOVE FRONT EXHAUST PIPE (THREE-WAY CATALYTIC CONVERTER-REAR)

- (a) Loosen the bolt, and disconnect the clamp from the bracket.
- (b) Remove the two bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
- (c) Using a 14 mm deep socket wrench, remove the three nuts holding the front exhaust pipe to the three-way catalytic converter (front).
- (d) Disconnect the support hook on the front exhaust pipe from the support bracket, and remove the front exhaust pipe and two gaskets.

3. REINSTALL FRONT EXHAUST PIPE (THREE-WAY CATALYTIC CONVERTER-REAR)

- (a) Install the support hook on the front exhaust pipe to the support bracket.
- (b) Place two new gaskets on the front and rear of the front exhaust pipe.
- (c) Temporarily install the two bolts and two new nuts holding the front exhaust pipe to the center exhaust pipe.
- (d) Using a 14 mm deep socket wrench, install the three new nuts holding the front exhaust pipe to the three-way catalytic converter (front).

Torque: 62 N-m (630 kgf-cm, 46 ft-lbf)

- (e) Tighten the two bolts and nuts holding the front exhaust pipe to the center exhaust pipe.

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

- (f) Install the clamp with the bolt.

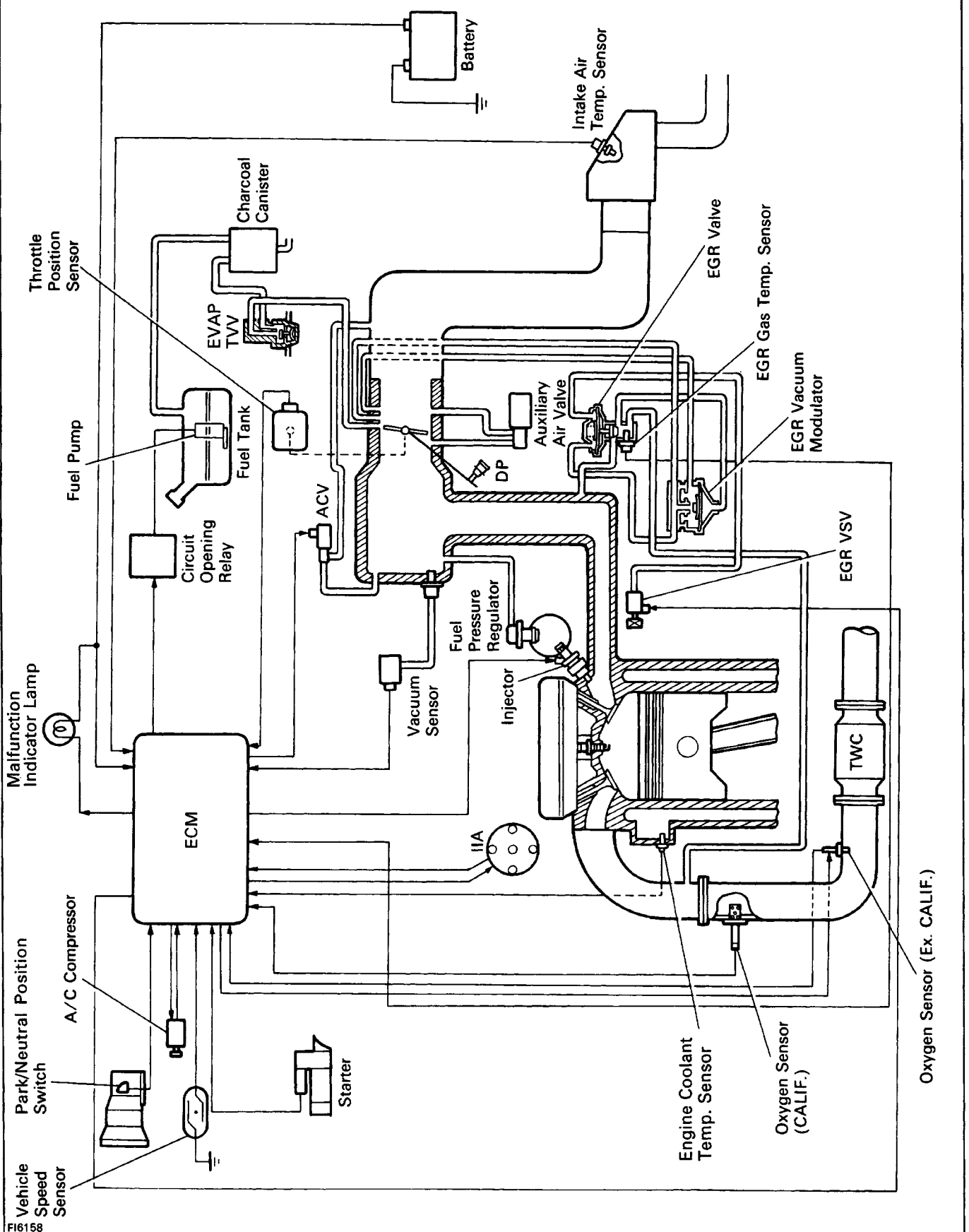
4. REINSTALL RH ENGINE UNDER COVER

MFI AND SFI SYSTEMS

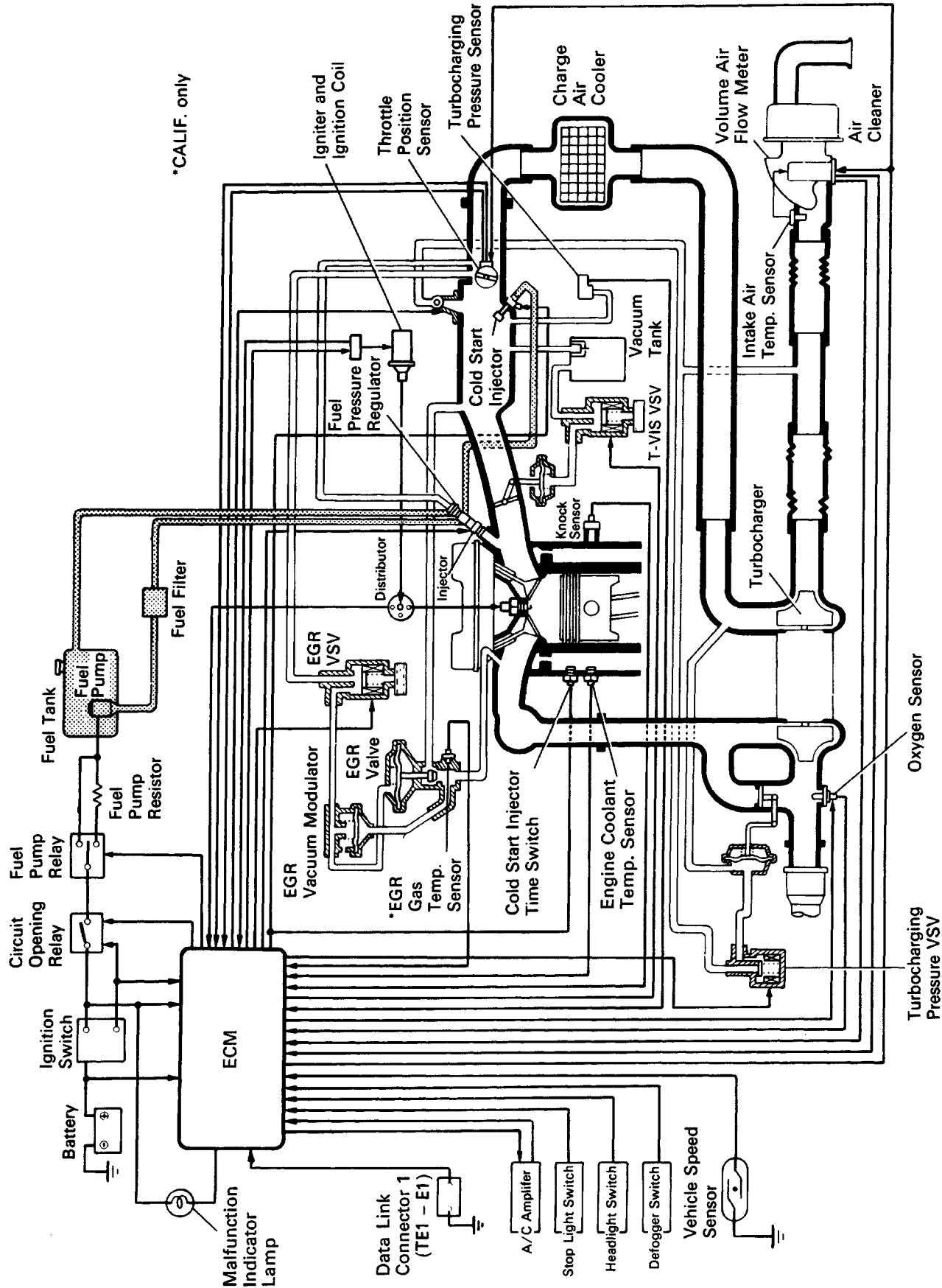
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DESCRIPTION

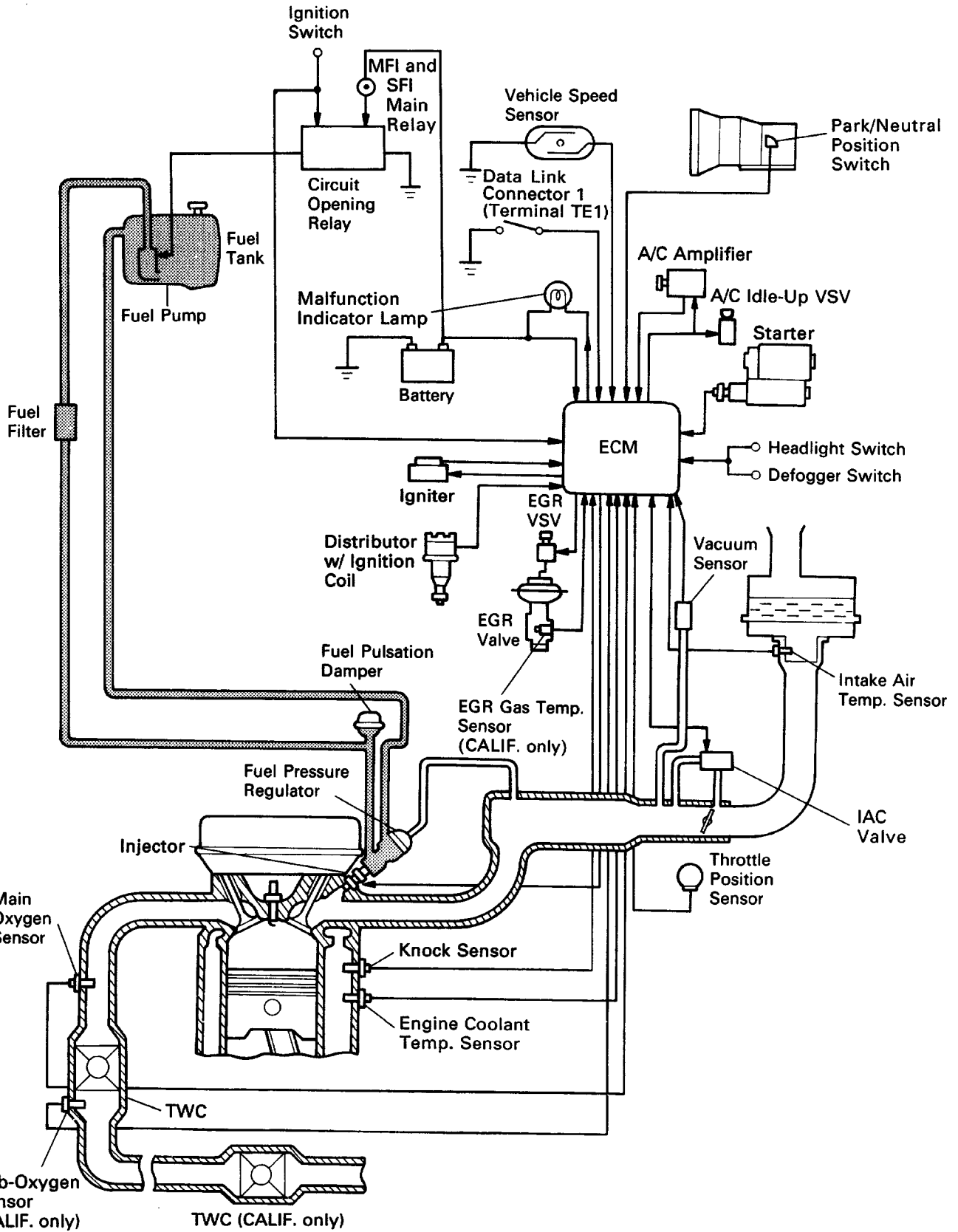
4A-FE



3S-GTE



5S-FE



The MFI and SFI systems are composed of three basic sub-systems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the MFI and SFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake port in accordance with signals from the ECM (Engine Control Module).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The CELICA 4A-FE, 3S-GTE and 5S-FE engines are equipped with a TOYOTA Computer Controlled System (TCCS) which centrally controls the MFI and SFI, ESA, IAC, diagnosis systems etc. by means of an Engine Control Module (ECM—formerly MFI and SFI computer) employing a microcomputer.

The ECM controls the following functions:

1. Multiport Fuel Injection and Sequential Multiport Fuel Injection (MFI and SFI)

The ECM receives signals from various sensors indicating changing engine operation conditions such as:

- Intake manifold pressure (4A-FE and 5S-FE)
- Intake air volume (3S-GTE)
- Intake air temperature
- Engine coolant temperature
- Engine rpm
- Throttle valve opening angle
- Exhaust oxygen content etc.

The signals are utilized by the ECM to determine the injection duration necessary for an optimum air-fuel ratio.

2. Electronic Spark Advance (ESA)

The ECM is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, engine coolant temperature, etc.), the microcomputer (ECM) triggers the spark at the precisely right instant. (See IG section)

3. Idle Air Control (IAC)

The ECM is programmed with target idling speed values to respond to different engine conditions (Engine coolant temperature, air conditioning ON/OFF (3S-GTE and 5S-FE), etc.). Sensors transmit signals to the ECM which controls the flow of air through the by-pass of the throttle valve and adjust idle speed to the target value.

4. Diagnosis

The ECM detects any malfunctions and abnormalities in the sensor network and lights a malfunction indicator lamp on the combination meter. At the same time, the trouble is identified and a diagnostic trouble code is recorded by the ECM. The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when terminals TE1 and E1 are connected. The diagnostic trouble codes are referred to the later page. (See page [FI-31](#), 44 or 50)

5. Fail-Safe Function

In the event of the sensor malfunctioning, a back-up circuit will take over to provide minimal drivability, and the malfunction indicator lamp will illuminate.

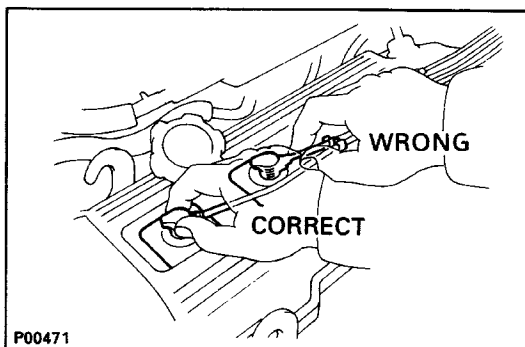
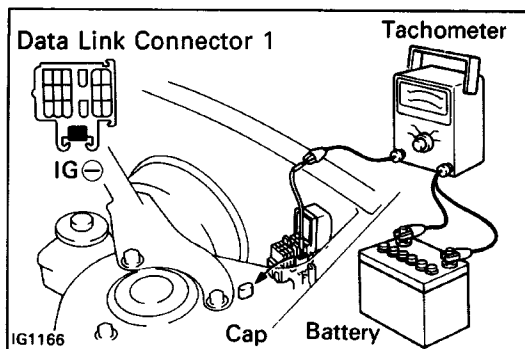
PRECAUTIONS

1. Before working on the fuel system, disconnect the cable from negative (-) terminal of the battery.
HINT: Any diagnostic trouble code retained by the computer will be erased when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.
2. Do not smoke or work near an open flame when working on the fuel system.
3. Keep gasoline away from rubber or leather parts.

INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS

1. CHECK CORRECT ENGINE TUNE-UP
(See page [EM-12](#))
2. PRECAUTIONS WHEN CONNECTING GAUGE
 - (a) Use the battery as the power source for the timing light, tachometer, etc.
 - (b) Connect the tester probe of a tachometer to the terminal IGO of the data link connector 1.



3. IN EVENT OF ENGINE MISFIRE, FOLLOWING PRECAUTIONS SHOULD BE TAKEN

- (a) Check proper connection of battery terminals, etc.
- (b) Handle high-tension cords carefully.
- (c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
- (d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR

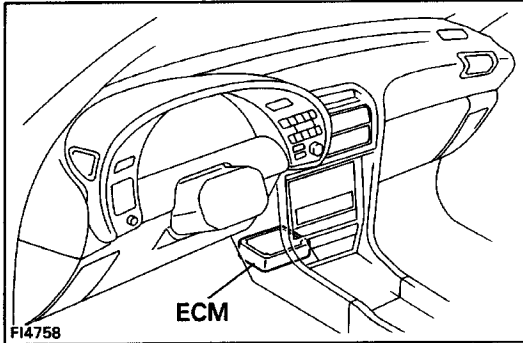
- (a) Do not allow oxygen sensor to drop or hit against an object.
- (b) Do not allow the sensor to come into contact with water.

IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

The ECM has been designed so that it will not be affected by outside interference. However, if your vehicle is equipped with a CB radio transceiver, etc. (even one with about 10 W output), it may, at times, have an effect upon ECM operation, especially if the antenna and feeder are installed nearby.

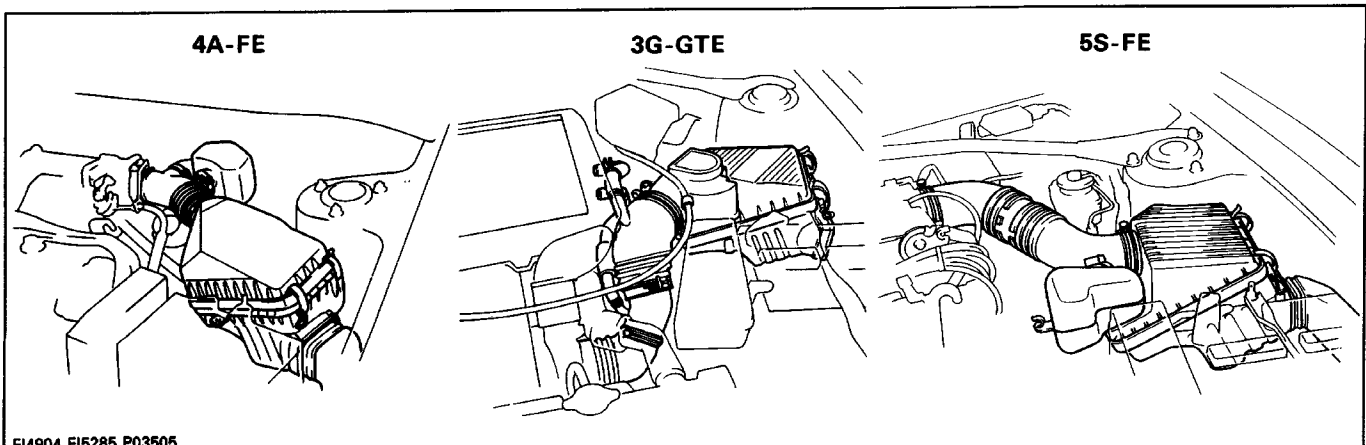
Therefore, observe the following precautions:

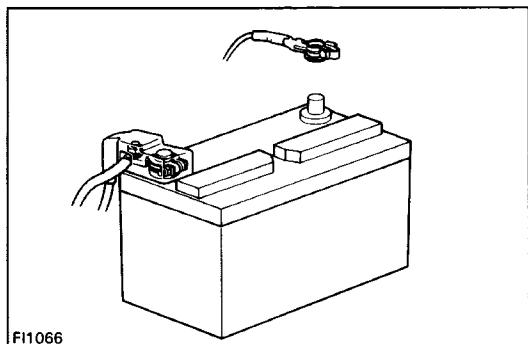
1. Install the antenna as far away as possible from the ECM.
The ECM is located under the radio so the antenna should be installed at the rear side of the vehicle.
2. Keep the antenna feeder as far away as possible from the ECM wires—at least 20 cm (7.87 in.)—and, especially, do not wind them together.
3. Check that the feeder and antenna are properly adjusted.
4. Do not equip your vehicle with a powerful mobile radio system.
5. Do not open the cover or the case of the ECM unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



AIR INDUCTION SYSTEM

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will cause air suction and cause the engine to run out of tune.





FI1066

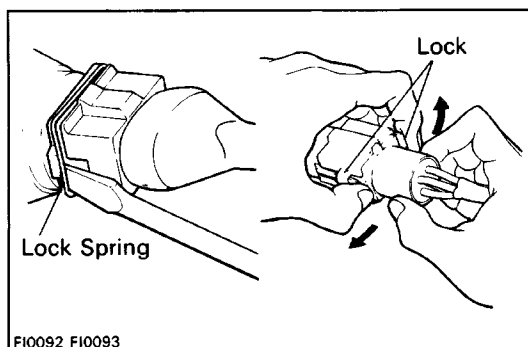
ELECTRONIC CONTROL SYSTEM

1. Before removing MFI and SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the battery terminals.

HINT: Always check the diagnostic code before disconnecting the battery terminals.

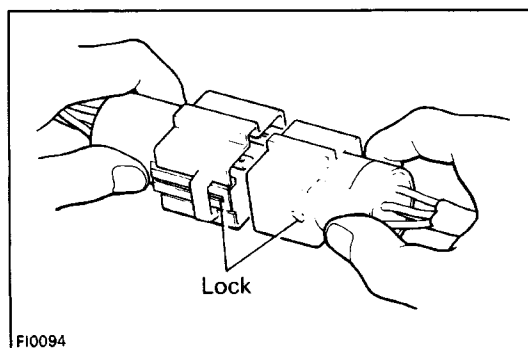
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (-) cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all MFI and SFI parts carefully, especially the ECM.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the MR and SFI parts and wiring connectors.
7. Parts should be replaced as an assembly.
8. Care is required when pulling out and inserting wiring connectors.

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



FI0092 FI0093

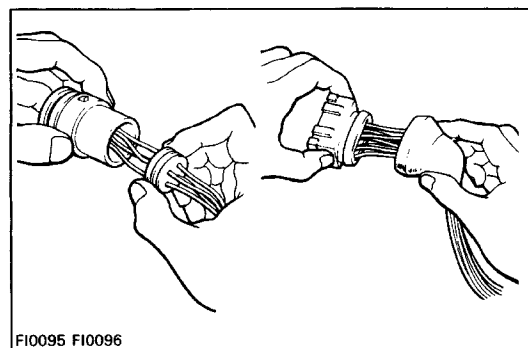
(b) Fully insert the connector and check that it is locked.



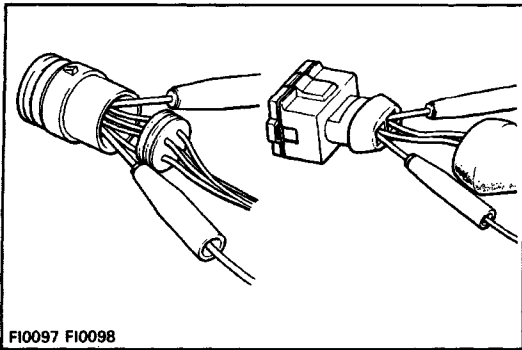
FI0094

9. When inspecting a connector with a volt/ohmmeter.

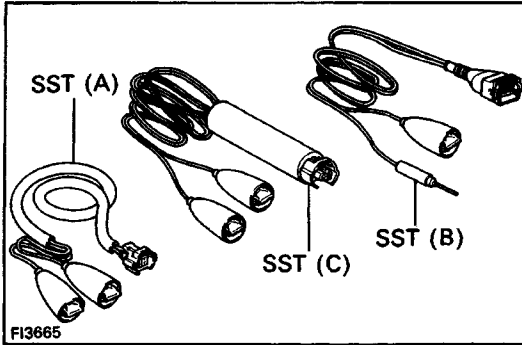
(a) Carefully take out the water-proofing rubber if it is a water-proof type connector.



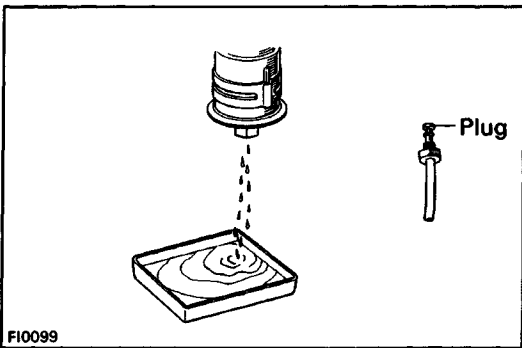
FI0095 FI0096



- (b) Insert the tester probe into the connector from wiring side when checking the continuity, amperage or voltage.
- (c) Do not apply unnecessary force to the terminal.
- (d) After checking, install the water-proofing rubber on the connector securely.

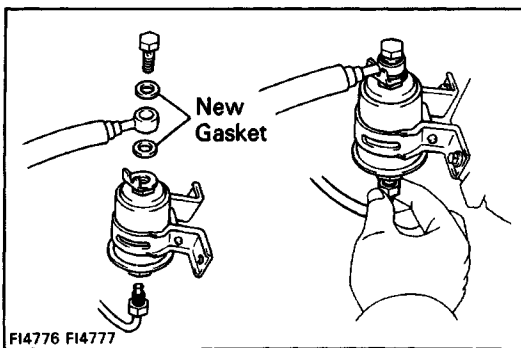


10. Use SST for inspection or test of the injector, cold start injector or its wiring connector.
 SST 09842-30070 (A) for 4A-FE and 5S-FE
 09842-30050 (B) and 09842-30060 (C)
 for 3S-GTE

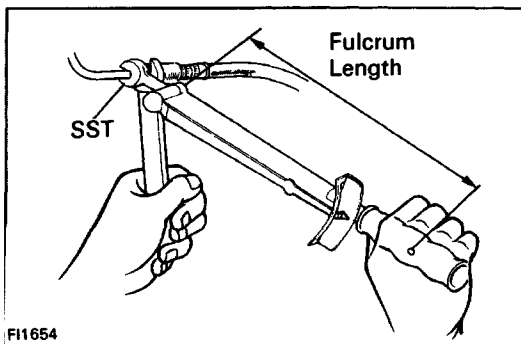


FUEL SYSTEM

1. When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the following procedures:
- (a) Put a container under the connection.
 - (b) Slowly loosen the connection.
 - (c) Disconnect the connection.
 - (d) Plug the connection with a rubber plug.



2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedures: (Union Bolt Type)
- (a) Always use a new gasket.
 - (b) Tighten the union bolt by hand.
 - (c) Tighten the union bolt to the specified torque.
Torque: 29 N-m (300 kgf-cm, 22 ft-1160)



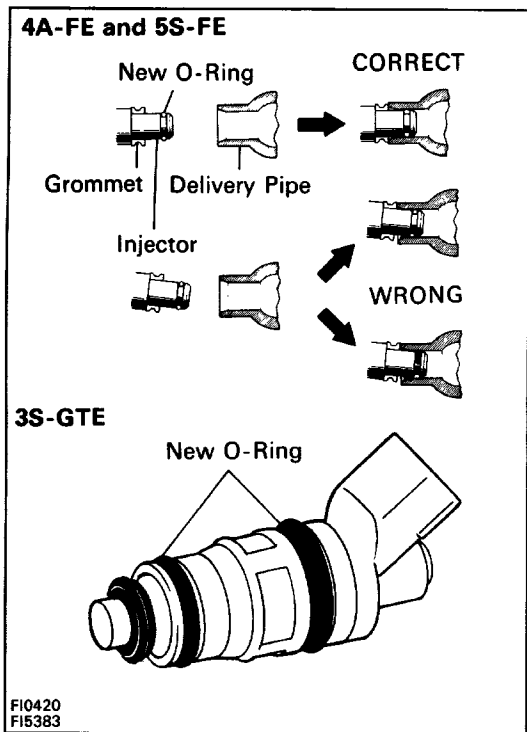
(Flare Nut Type)

- (a) Apply a light coat of engine oil to the flare nut and tighten the flare nut by hand.
- (b) Using SST, tighten the flare nut to the specified torque.

SST 09631-22020

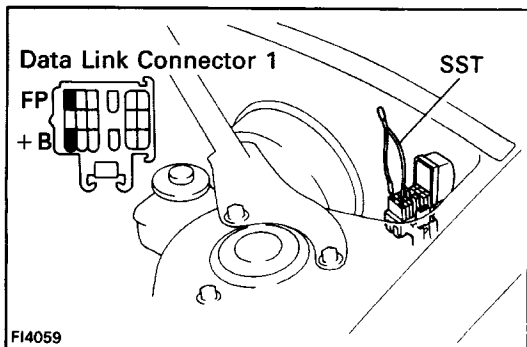
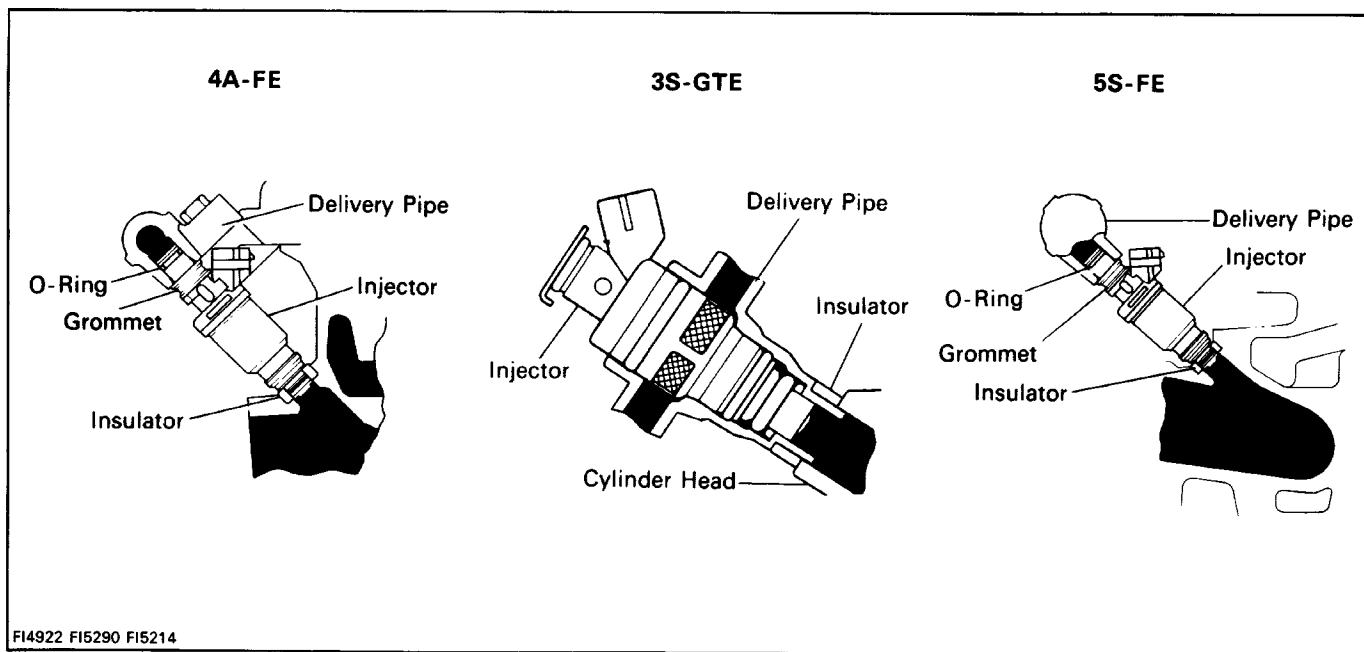
Torque: 30 N-m (310 kgf-cm, 22 ft-lbf)

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

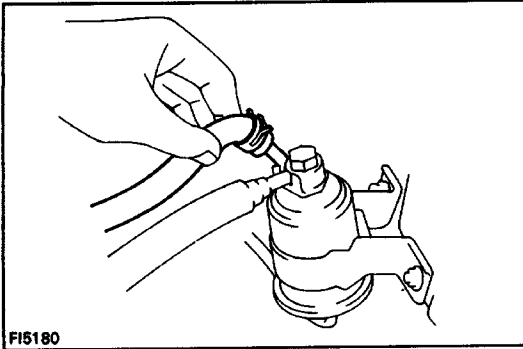


3. Observe the following precautions when removing and installing the injectors.
 - (a) Never reuse the O-ring.
 - (b) When placing a new O-ring on the injector, take care not to damage it in any way.
 - (c) Coat a new O-ring with spindle oil or gasoline before installing - never use engine, gear or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

4. Install the injector to delivery pipe and cylinder head as shown in the illustration.

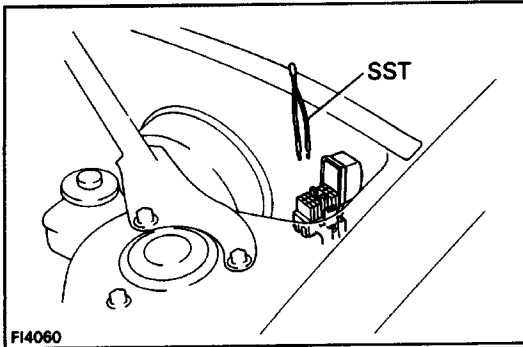


5. Check that there are no fuel leaks after performing any maintenance on the fuel system.
 - (a) Using SST, connect terminals +B and FP of the data link connector 1.
SST 09843-18020
 - (b) With engine stopped, turn the ignition switch ON.



- (c) When the fuel return hose is pinched, the pressure within high pressure line will rise to approx. 392 kPa (4 kgf/cm², 51 psi). In this state, check to see that there are no leaks from any part of the fuel system.

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



- (d) Turn the ignition switch OFF.

- (e) Remove the SST.
SST 09843-18020

TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Engine troubles are usually not caused by the MFI and SFI systems.

When troubleshooting, always first check the condition of the other systems.

(a) Electronic source

- Battery
- Fusible links
- Fuses

(b) Body ground

(c) Fuel supply

- Fuel leakage
- Fuel filter
- Fuel pump

(d) Ignition system

- Spark plugs
- High-tension cords
- Distributor
- Ignition coil
- Ignite

(e) Air induction system

- Vacuum leaks

(f) Emission control system

- PCV system
- EGR system

(g) Others

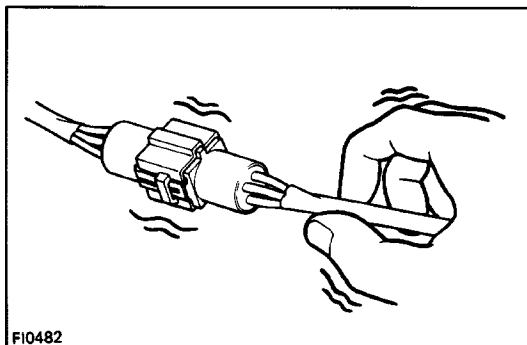
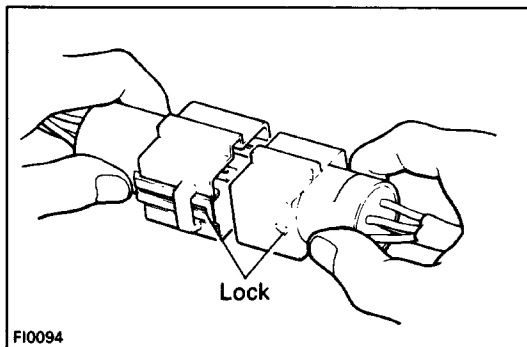
- Ignition timing (ESA system)
- Idle speed (IAC system)
- etc.

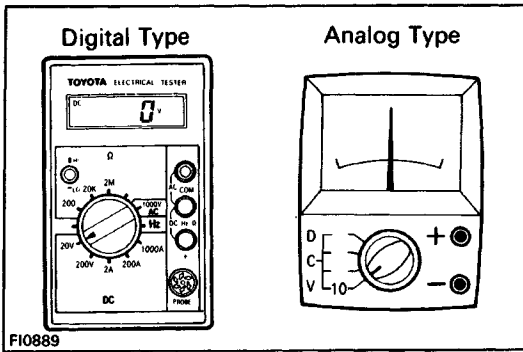
2. The most frequent cause of problems is simply a bad contact in wiring connectors. Always check that connections are secure.

When inspecting the connector, pay particular attention to the following points:

- (a) Check to see that the terminals are not bent.
- (b) Check to see that the connector is pushed in completely and locked.
- (c) Check to see that there is no signal change when the connector is slightly tapped or wiggled.

3. Troubleshoot sufficiently for other causes before replacing the ECM, as the ECM is of high quality and it is expensive.

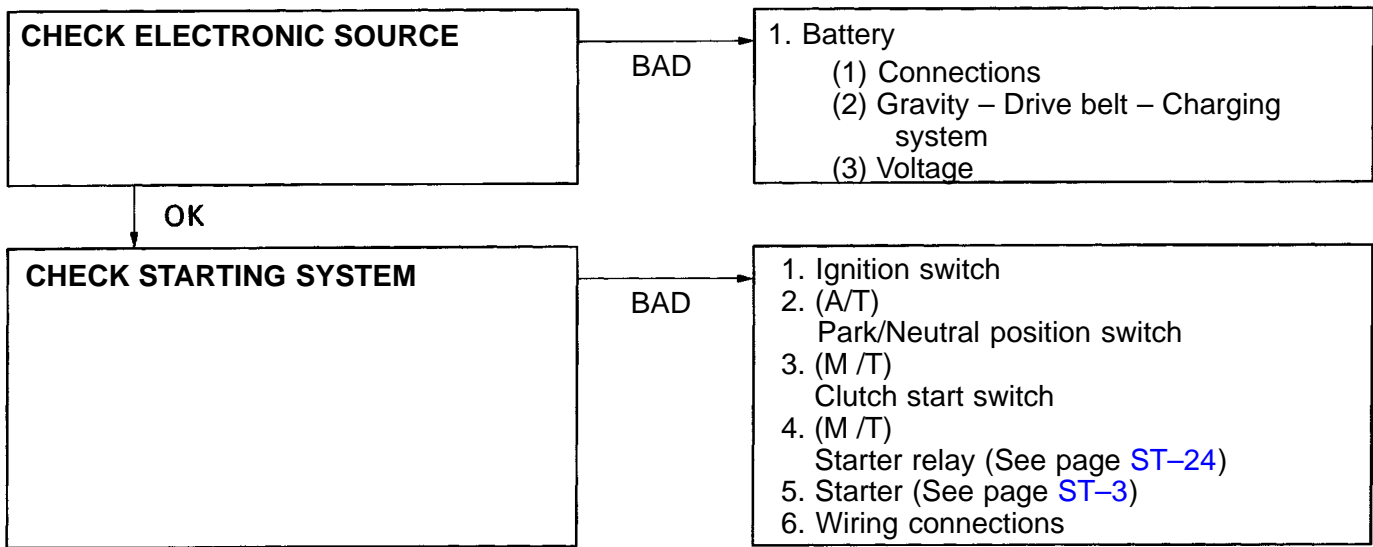




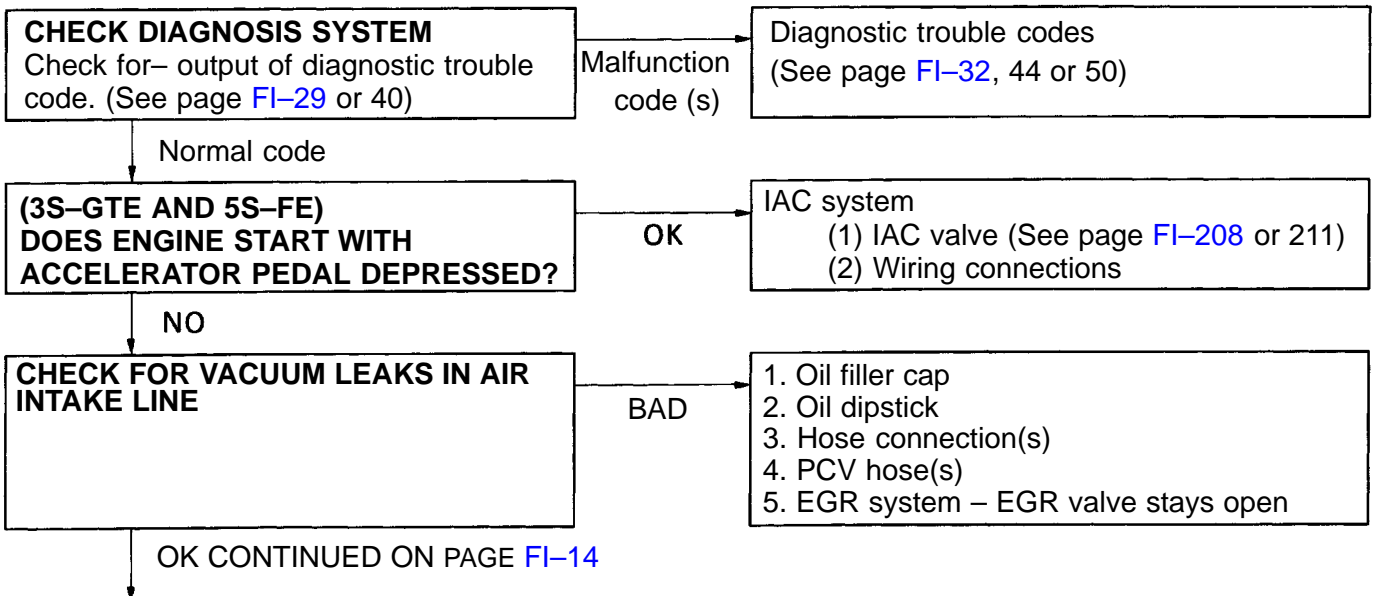
4. Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting of the electrical circuit. (See page FI-58)

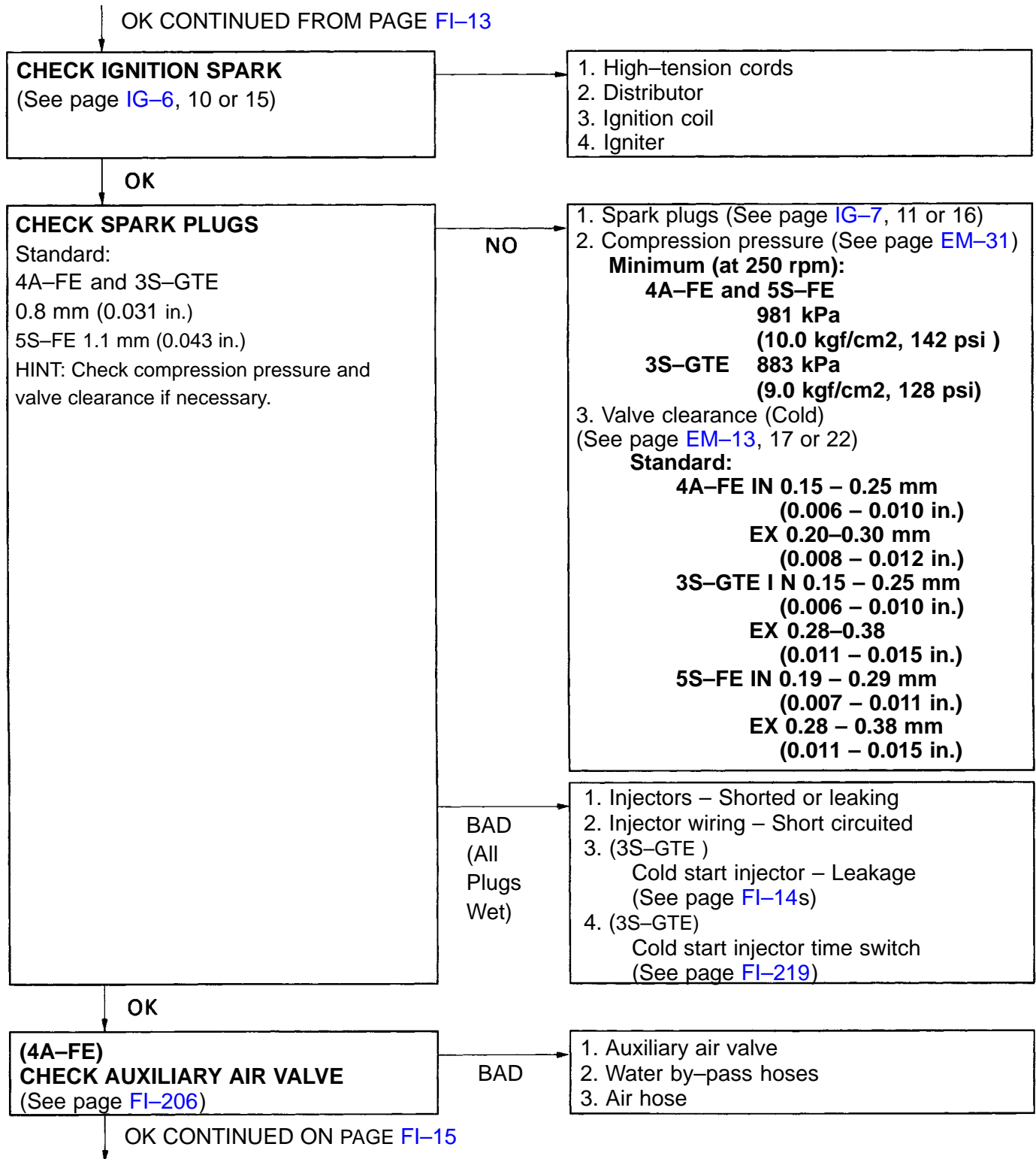
TROUBLESHOOTING PROCEDURES

SYMPTOM – DIFFICULT TO START OR NO START (ENGINE WILL NOT CRANK OR CRANKS SLOWLY)

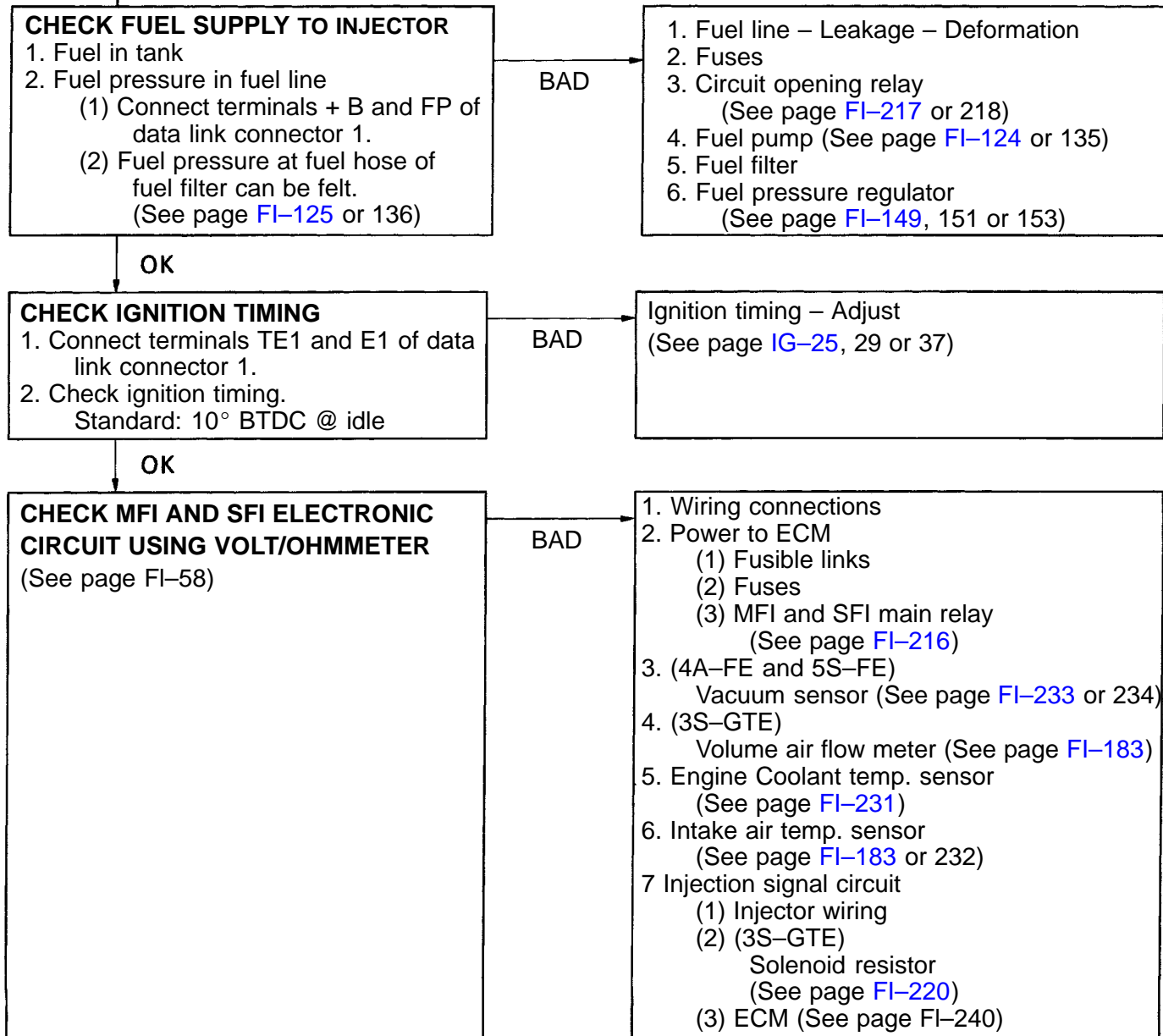


SYMPTOM – DIFFICULT TO START OR NO START (CRANKS OK)

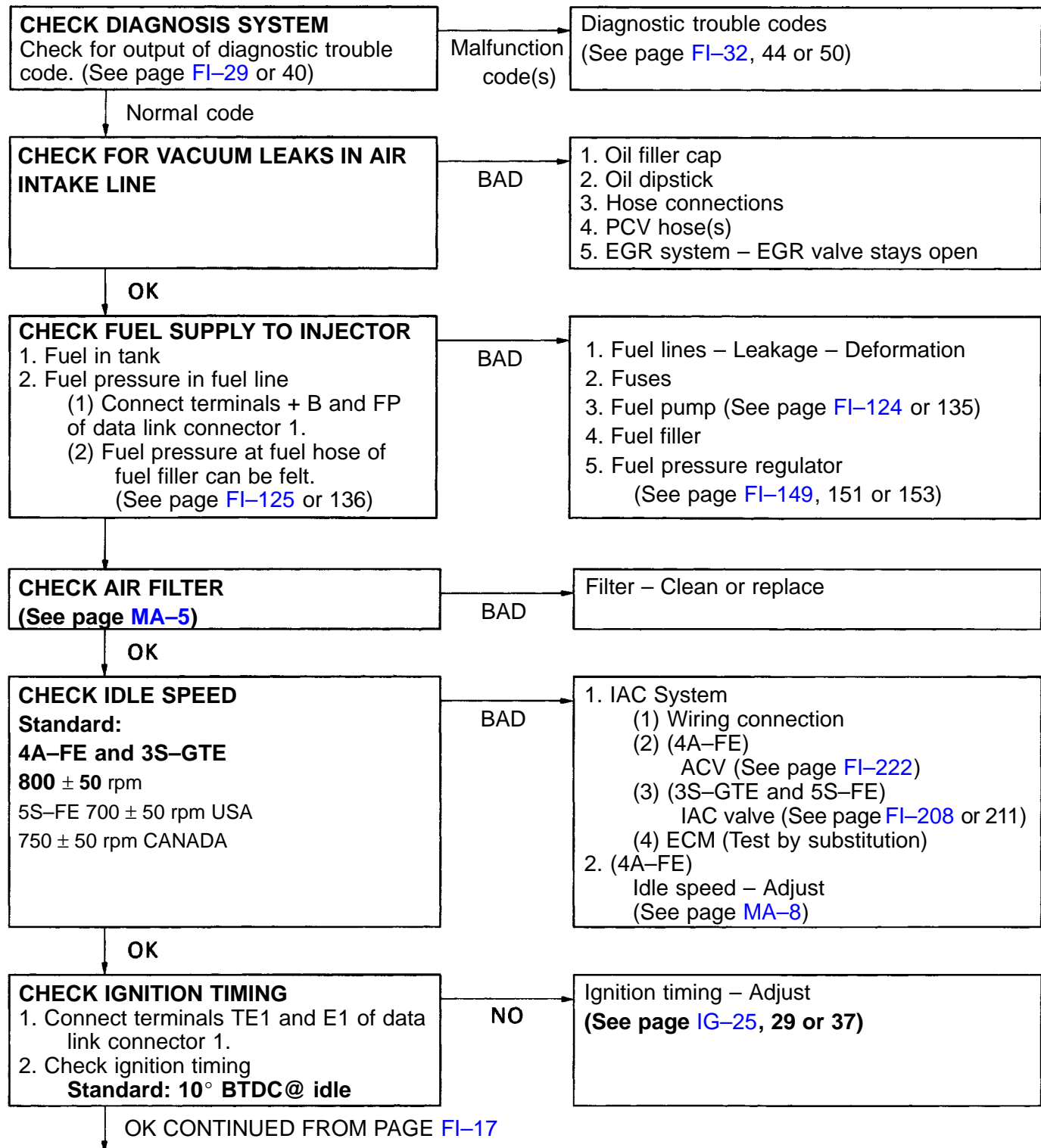




OK CONTINUED FROM PAGE FI-14



SYMPTOM – ENGINE OFTEN STALLS



OK CONTINUED ON PAGE [FI-16](#)

CHECK SPARK PLUG
Standard:
4A-FE and 3S-GTE
 0.8 mm (0.031 in.)
5S-FE 1.1 mm (0.043 in.)
 HINT: Check compression pressure and valve clearance if necessary.

NO

1. Spark plugs (See page [IG-7](#), 11 or 16)
2. Compression pressure (See page [EM-31](#))
Minimum (at 250 rpm):
4A-FE and 5S-FE
 981 kPa
 (10.0 kgf/cm², 142 psi)
3S-GTE 883 kPa
 (9.0 kgf/cm², 128 psi)
3. Valve clearance (Cold)
 (See page [EM-13](#), 17 or 22)
Standard:
4A-FE IN 0.15-0.25 mm
 (0.006 - 0.010 in.)
EX 0.20-0.30
 (0.008 - 0.012 in.)
3S-GTE IN (0.15 - 0.25 mm
 (0.006 - 0.010 in.)
EX 0.28 - 0.38 mm
 (0.011 - 0.015 in.)
5S-FE IN 0.19 - 0.29 mm
 (0.007 - 0.011 in.)
EX 0.28-0.38 mm
 (0.011 - 0.015 in.)

OK

(3S-GTE)
CHECK COLD START INJECTOR
 (See page [FI-146](#))

BAD

1. Cold start injector
 (See page [FI-146](#))
2. Cold start injector time switch
 (See page [FI-219](#))

OK CONTINUED FROM PAGE [FI-16](#)

CHECK FUEL PRESSURE
 (See page [FI-125](#), 128 or 136)

BAD

1. Fuel pump (See page [FI-124](#) or 135)
2. Fuel filter
3. Fuel pressure regulator
 (See page [FI-149](#), 151 or 153)

OK

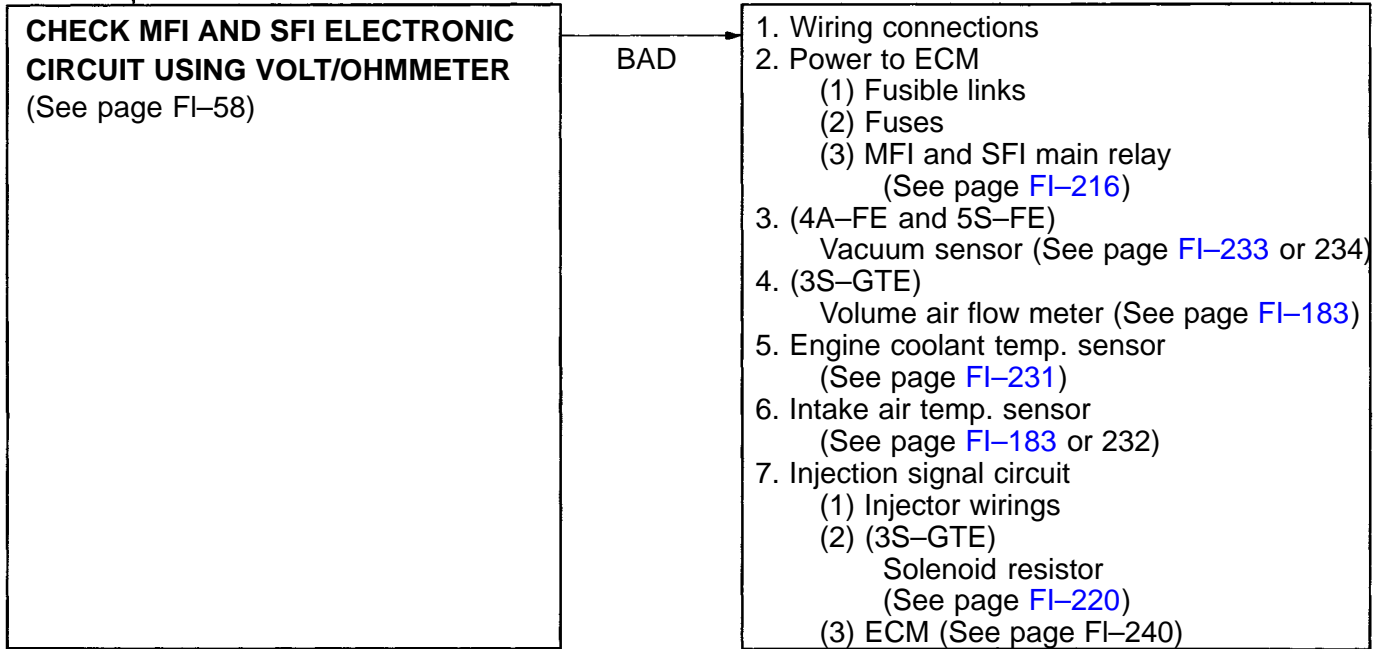
CHECK INJECTORS
 (See page [FI-155](#), 160 or 169)

BAD

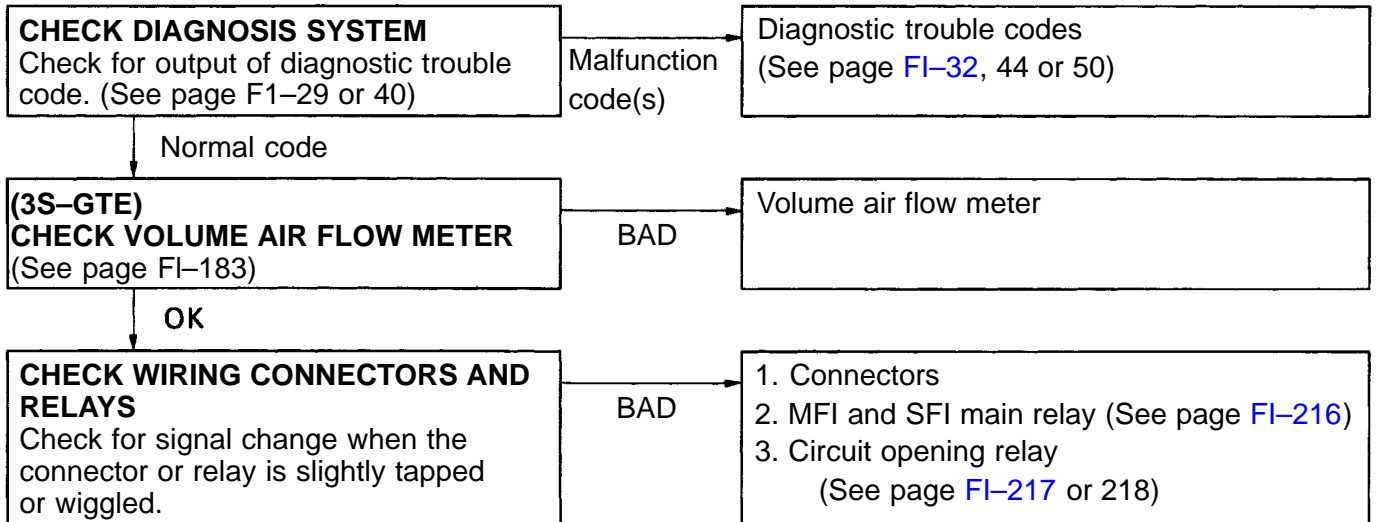
Injection condition

OK CONTINUED ON PAGE [FI-18](#)

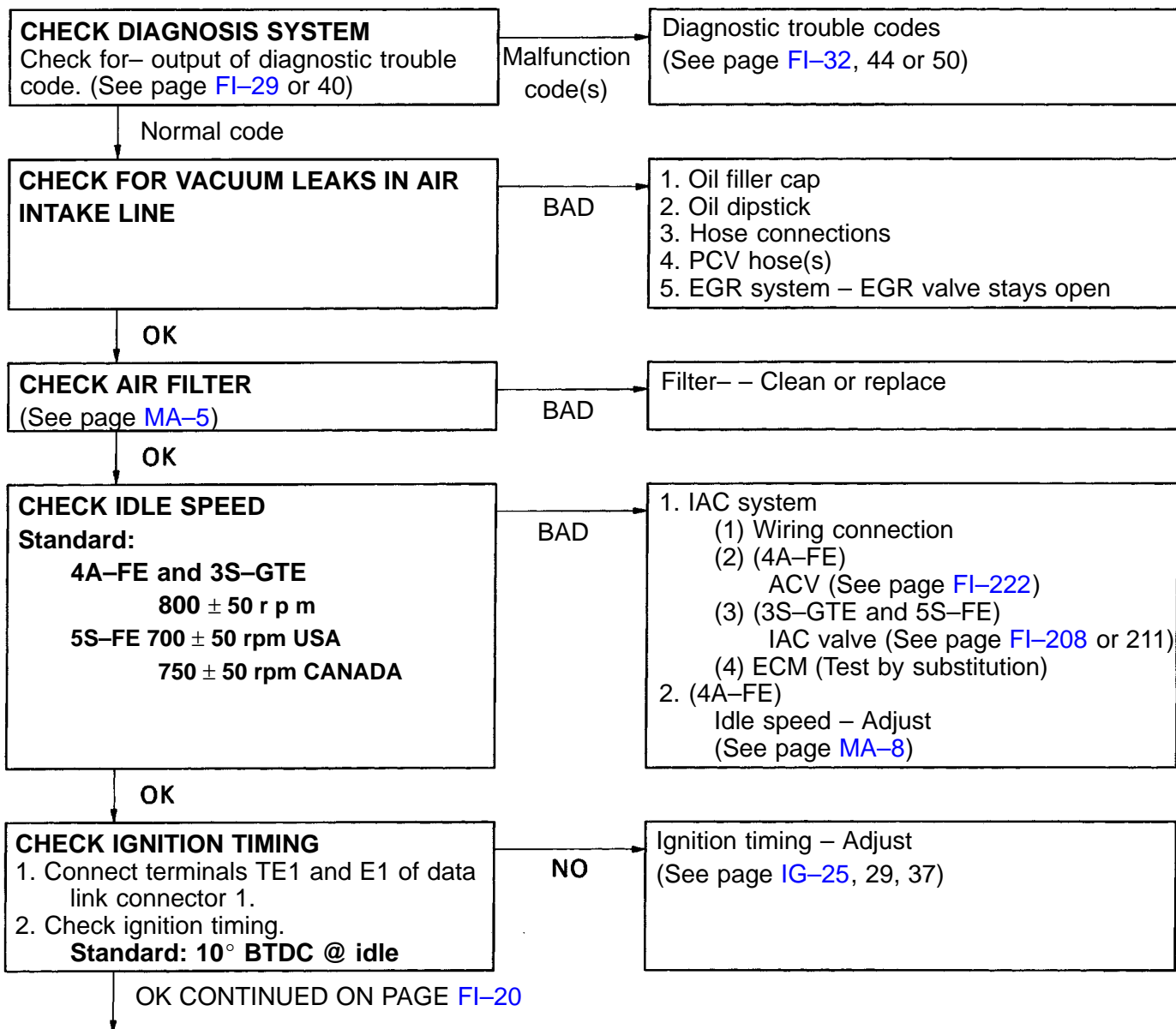
OK CONTINUED FROM PAGE FI-17



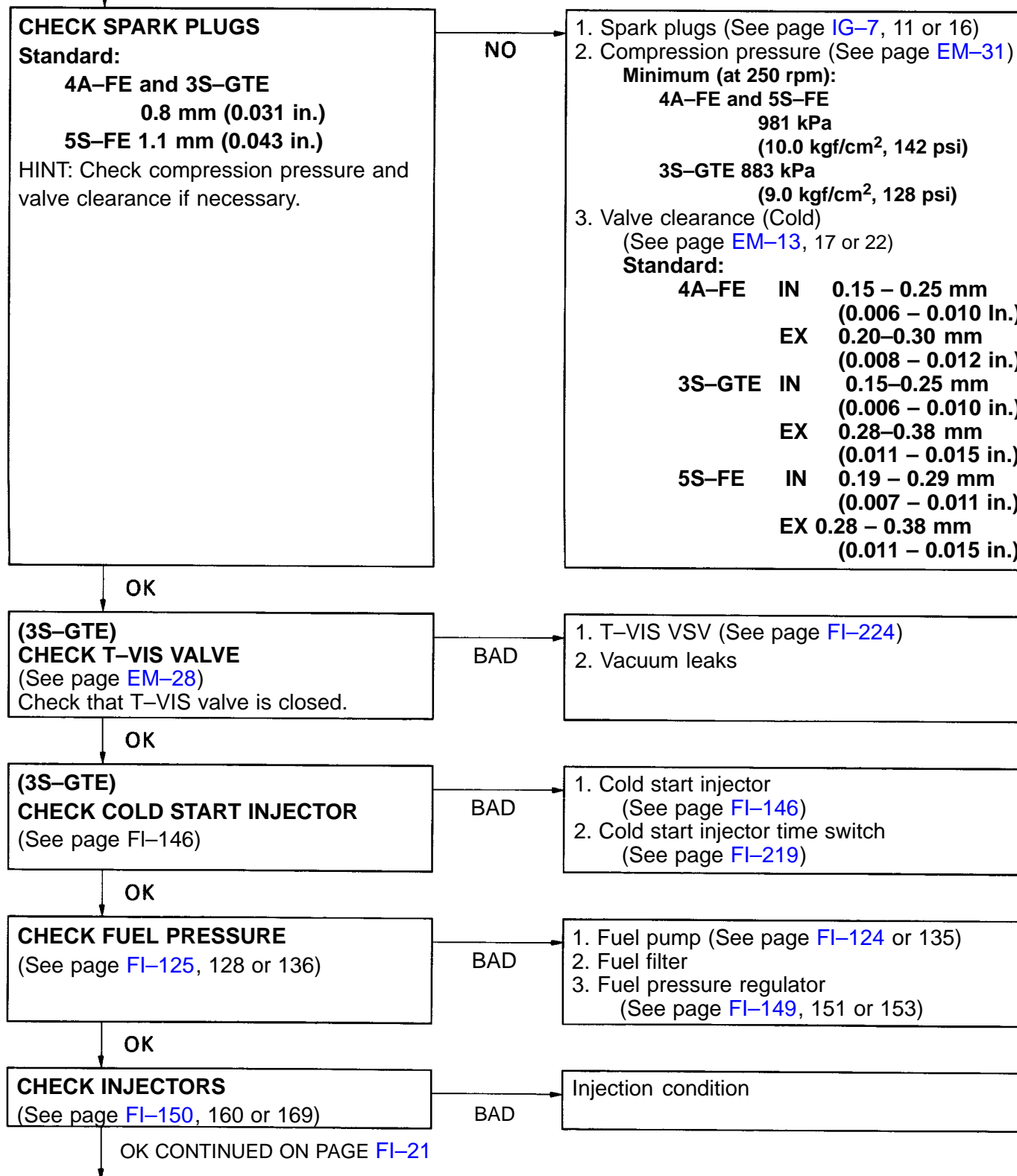
SYMPTOM – ENGINE SOMETIMES STALLS

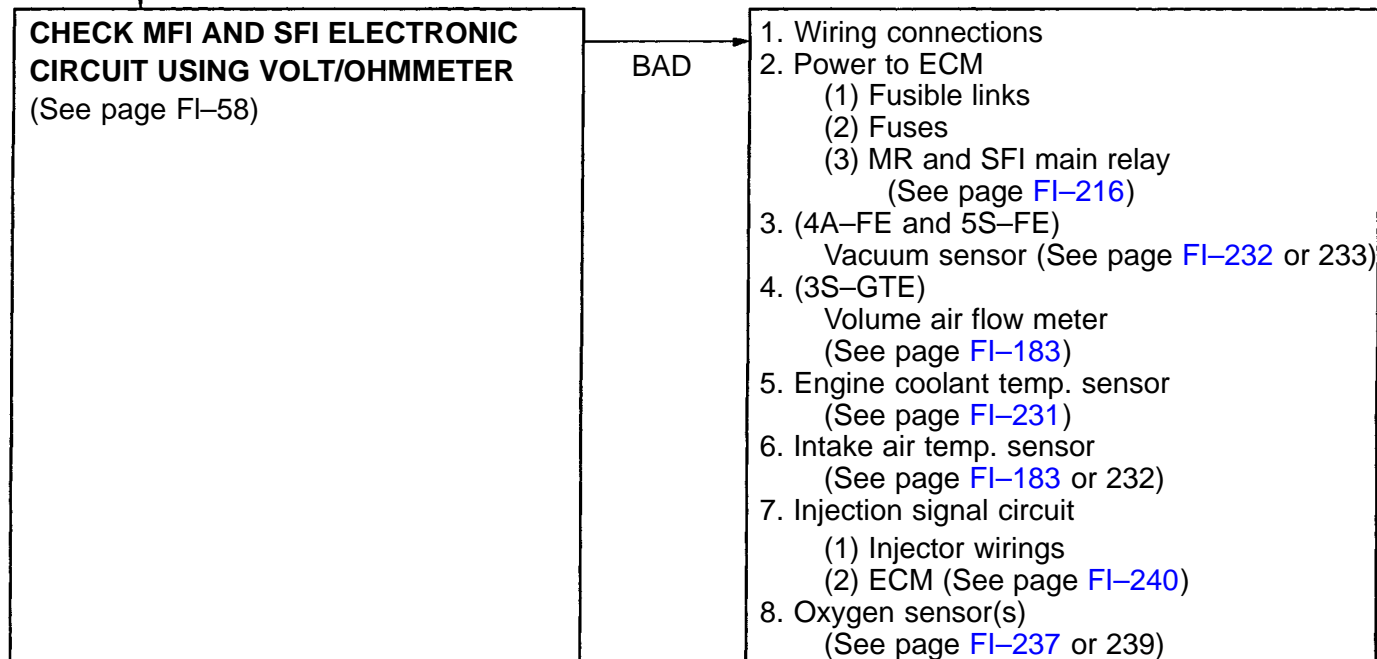


SYMPTOM – ROUGH IDLING AND/OR MISSING



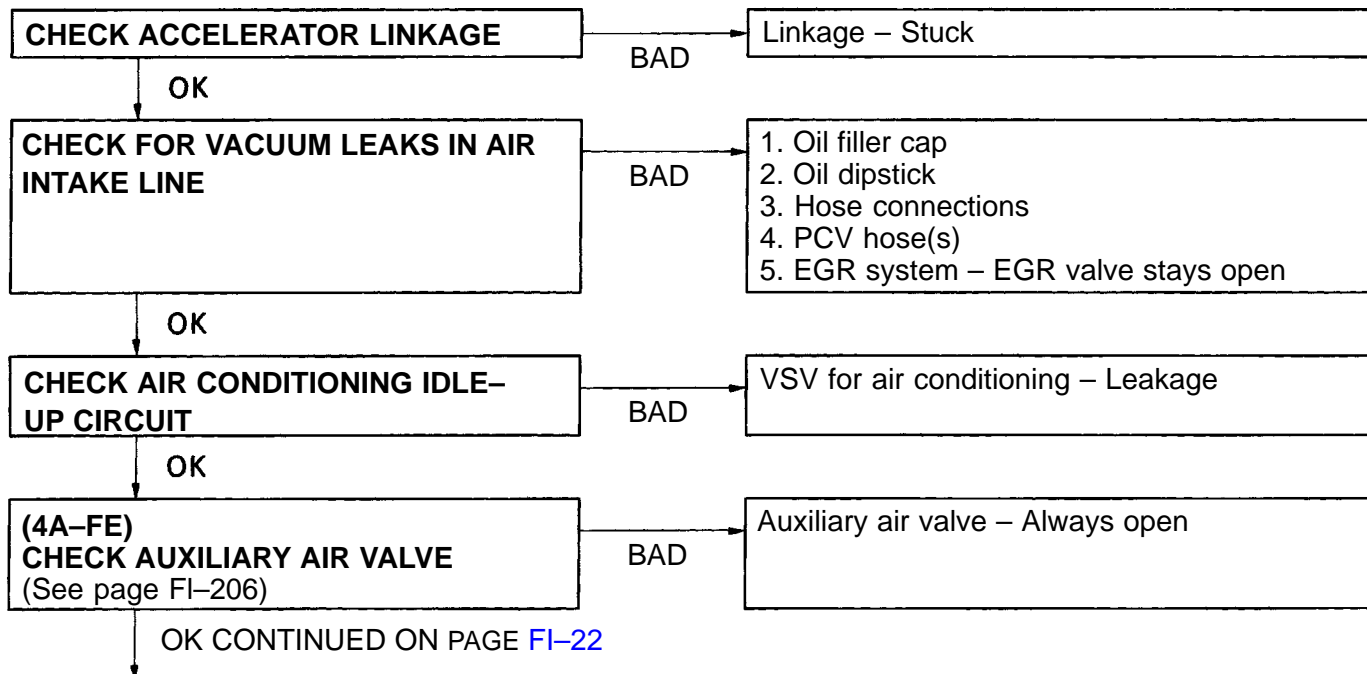
OK CONTINUED FROM PAGE FI-19

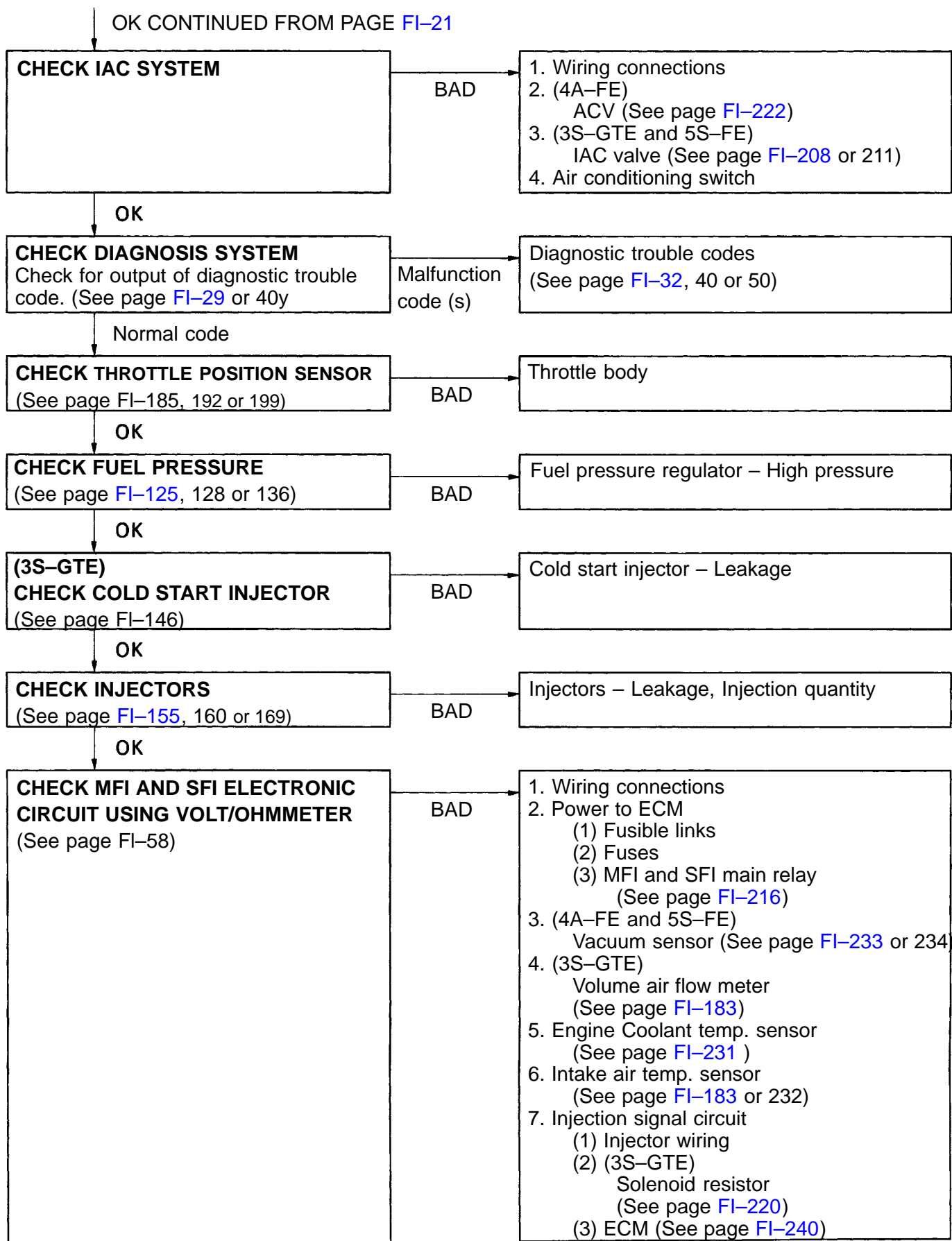


OK CONTINUED FROM PAGE [FI-20](#)

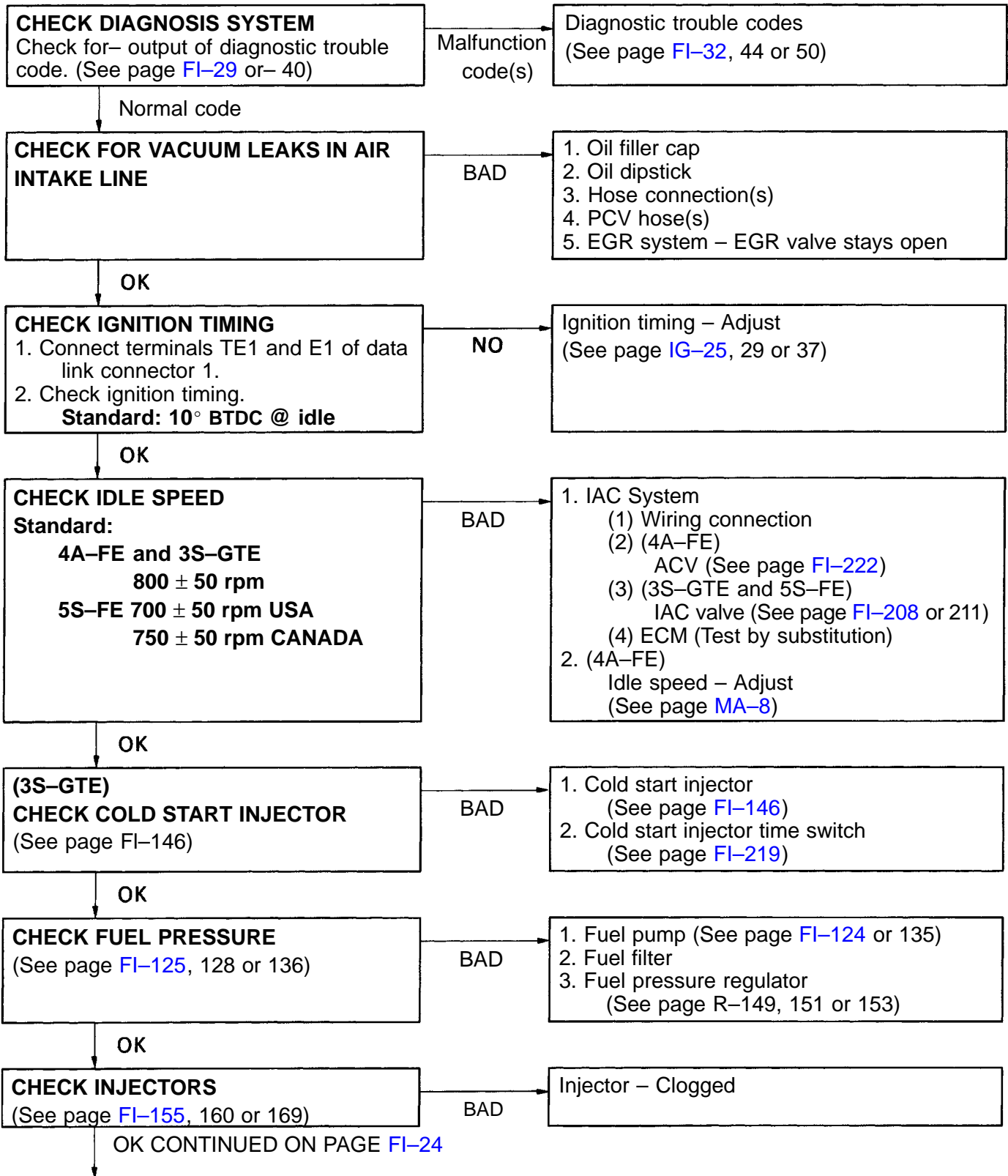
SYMPTOM – HIGH ENGINE SPEED (NO DROP)

HINT (5S-FE): Disconnecting the battery will cause the idling speed data in the IAC to be returned to the initial idling speed, causing the idling speed to rise above 700 rpm (5S-FE USA), 750 rpm (5S-FE CANADA). Should this happen, either carry out a driving test, including stop-go several times at a speed above 10 km/h, or start the engine, idle for 30 seconds and then turn the engine off repeatedly. By doing this, idle data will be stored in the IAC and the idle rpm will be at specified value.

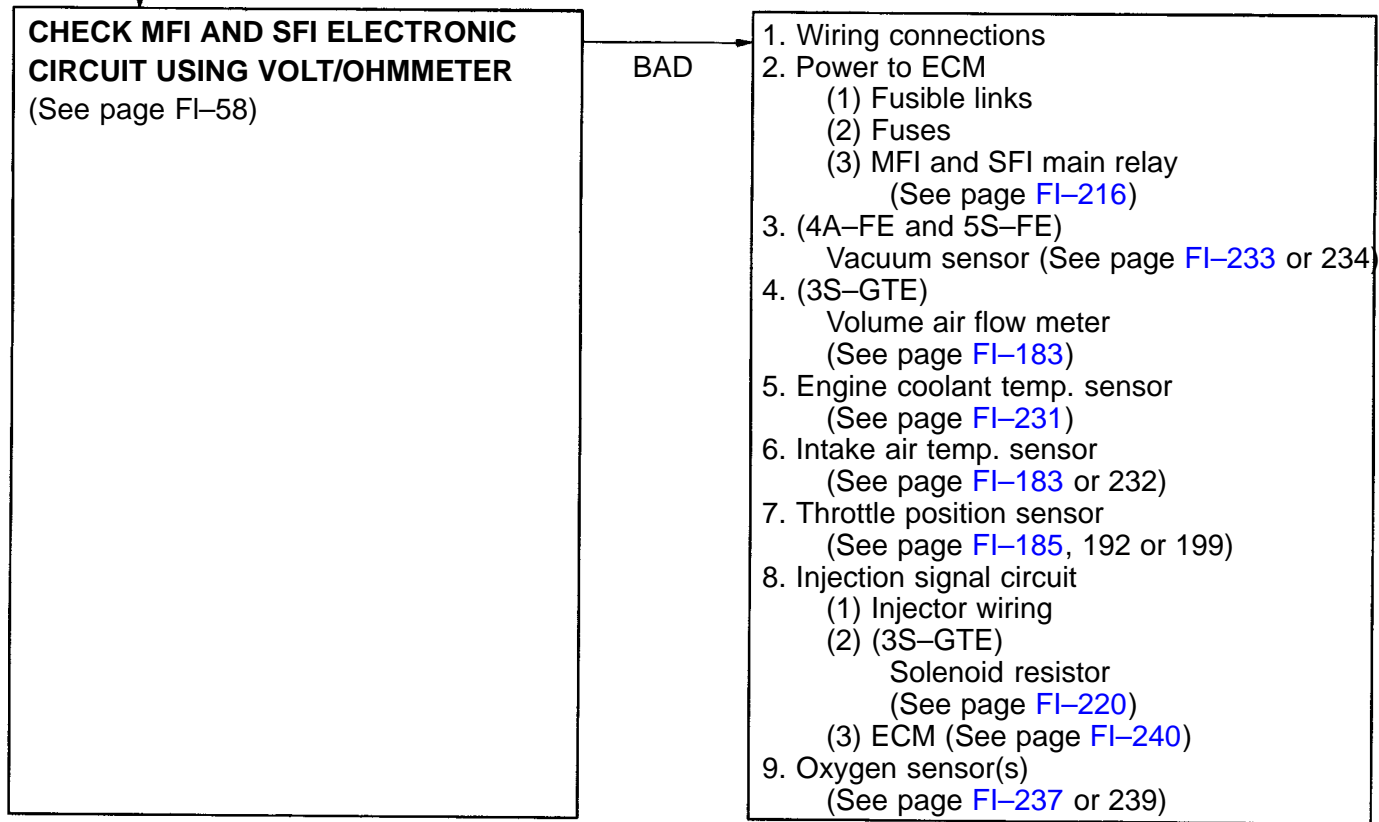




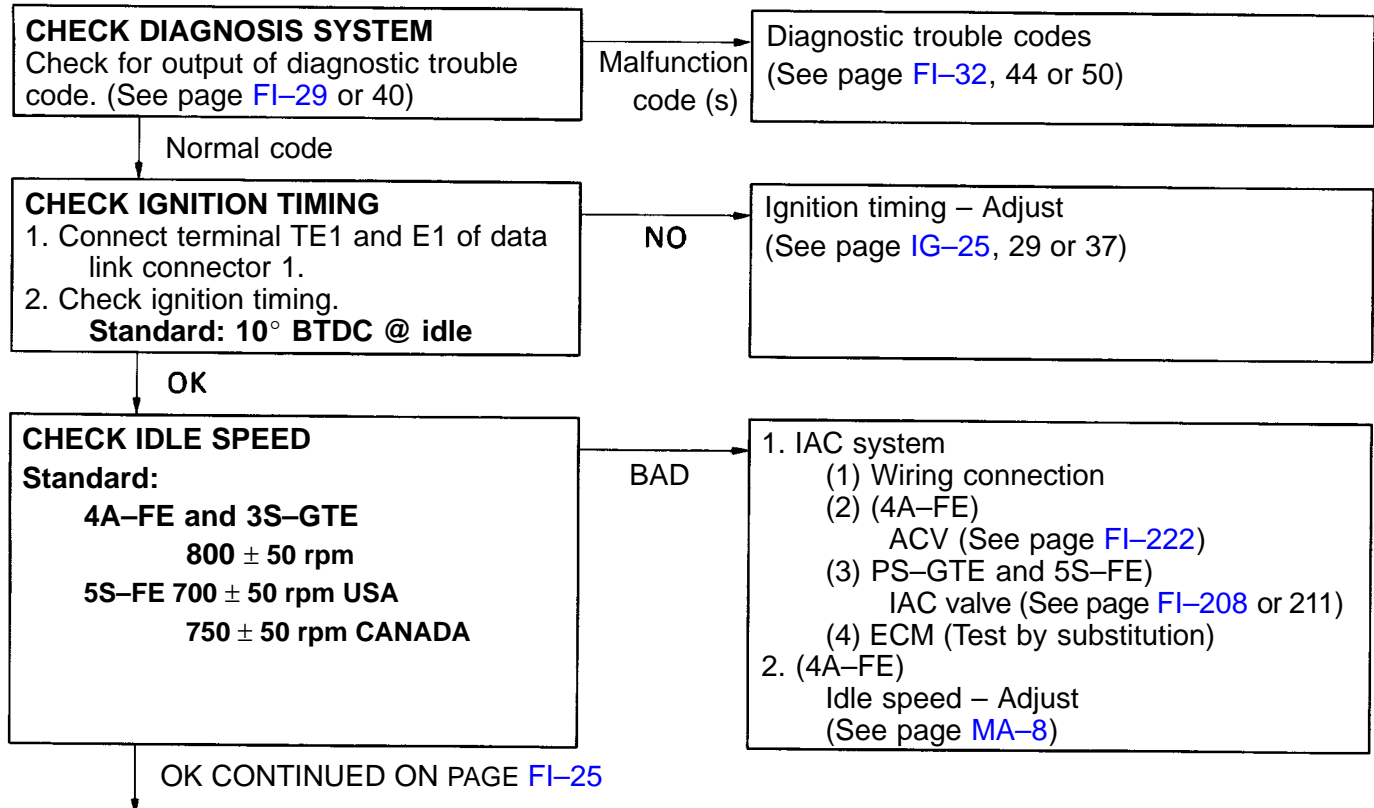
SYMPTOM – ENGINE BACKFIRES – Lean Fuel Mixture

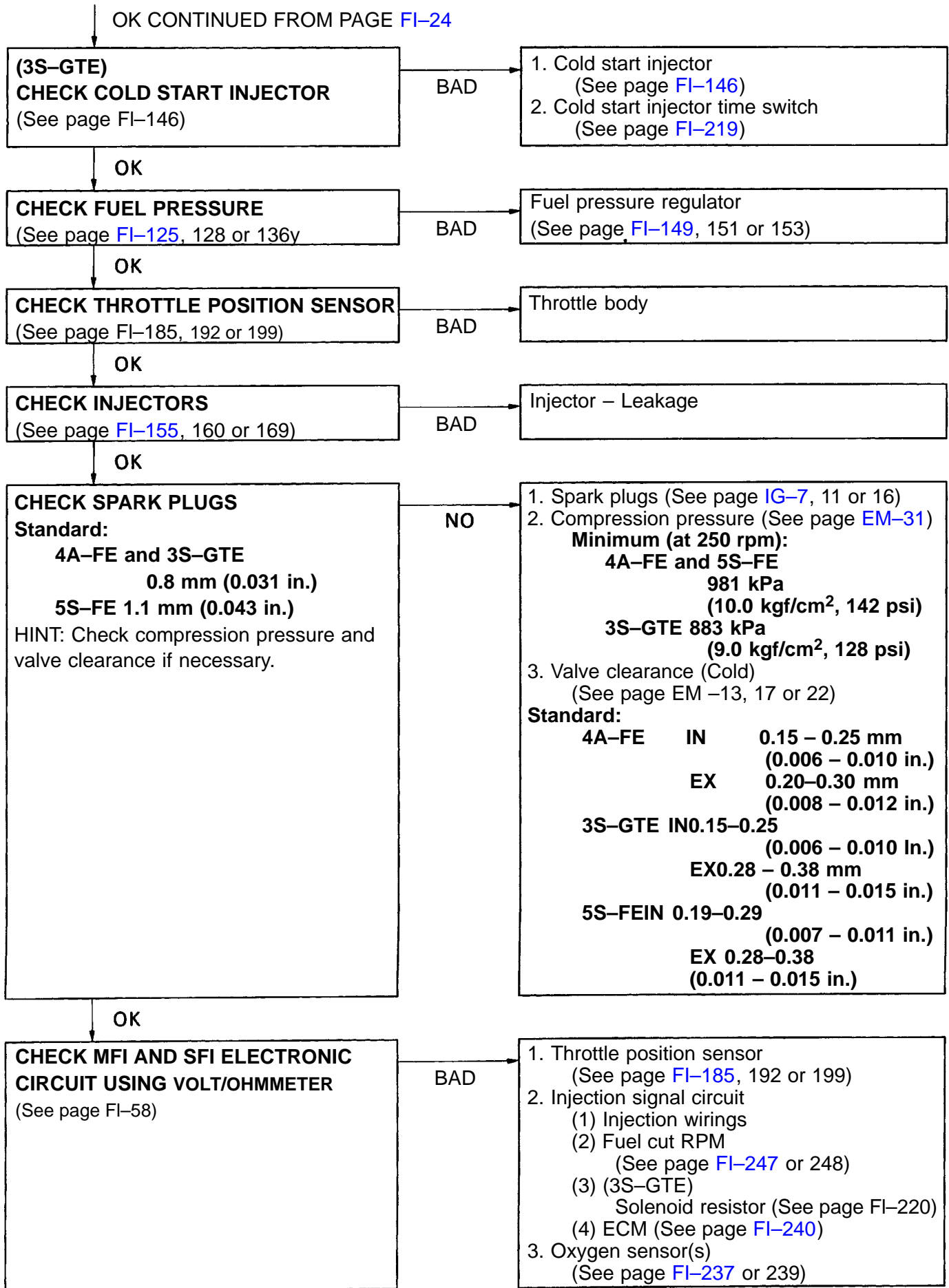


OK CONTINUED FROM PAGE [FI-23](#)

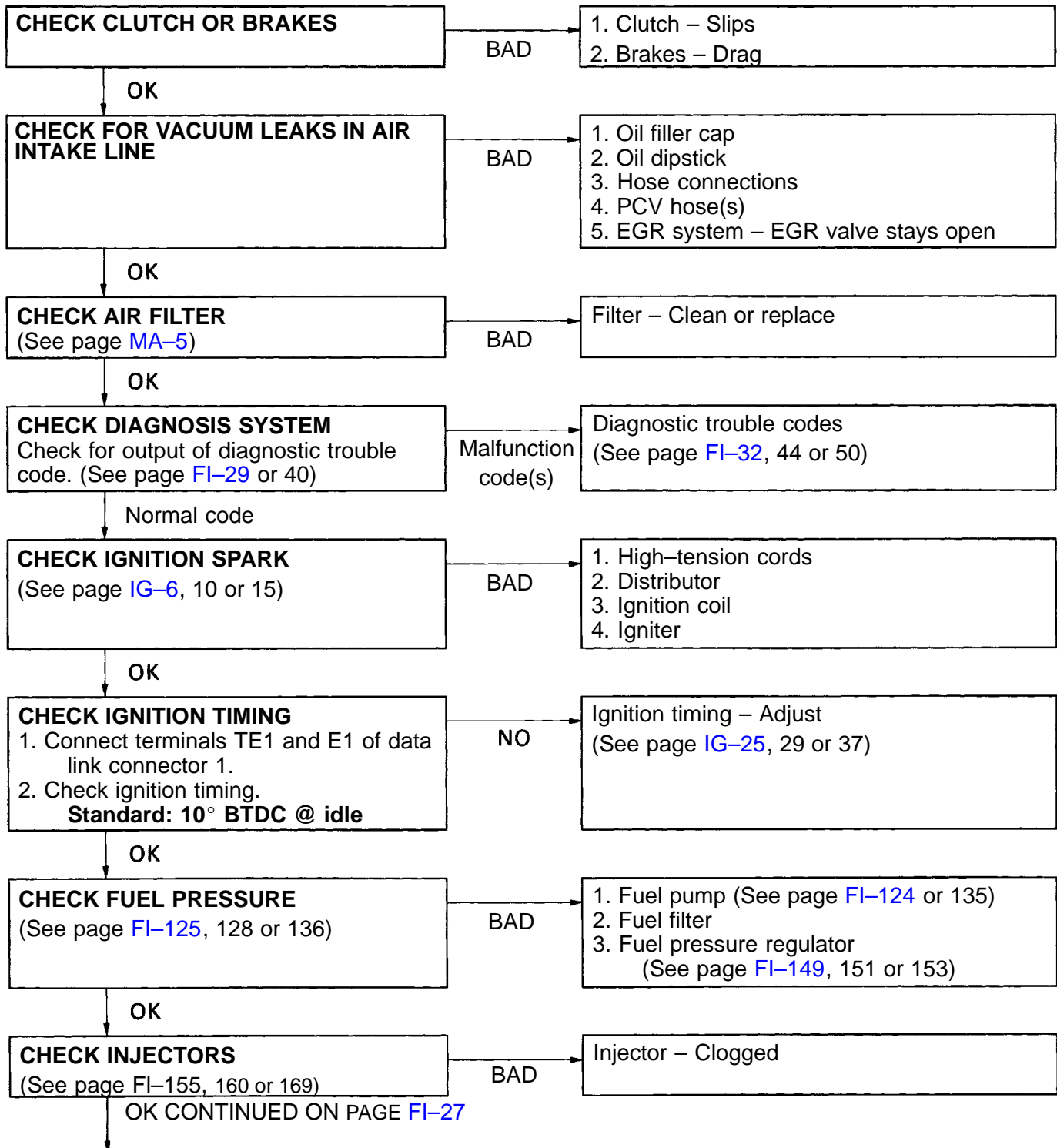


SYMPTOM – MUFFLER EXPLOSION (AFTER FIRE) – Rich Fuel Mixture Misfire





SYMPTOM – ENGINE HESITATES AND/OR POOR ACCELERATION



OK CONTINUED FROM PAGE FI-26

CHECK SPARK PLUGS

Standard:

4A-FE and 3S-GTE

0.8 mm (0.031 in.)

5S-FE 1.1 mm (0.043 in.)

HINT: Check compression pressure and valve clearance if necessary.

NO

1. Spark plugs (See page IG-7, 11 or 16)
2. Compression pressure (See page EM-31)
Minimum (at 250 rpm):
4A-FE and 5S-FE
981 kPa
(10.0 kgf/cm², 142 psi)
3S-GTE 883 kPa
(9.0 kgf/cm², 128 psi)
3. Valve clearance (Cold)
 (See page EM-13, 17 or 22)
Standard:

4A-FE	IN	0.15 - 0.25 mm (0.006 - 0.010 in.)
	EX	0.20 - 0.30 mm (0.008 - 0.012 in.)
3S-GTE	IN	0.15-0.25 (0.006 - 0.010 in.)
	EX	0.28 - 0.38 mm (0.011 - 0.015 in.)
5S-FE	IN	0.19 - 0.29 mm (0.007 - 0.011 in.)
	EX	0.28 - 0.38 mm (0.011 - 0.015 in.)

OK

**(3S-GTE)
CHECK T-VIS VALVE**

(See page EM-28)

Check if air control valve is open with engine running at 4,200 rpm or above.

BAD

1. T-V I S VSV (See page FI-224)
2. Vacuum leaks

OK

**CHECK MFI AND SFI ELECTRONIC
CIRCUIT USING VOLT/OHMMETER**

(See page FI-58)

BAD

1. Wiring connections
2. Power to ECM
 - (1) Fusible links
 - (2) Fuses
 - (3) MFI and SR main relay
(See page FI-216)
3. (4A-FE and 5S-FE)
Vacuum sensor (See page FI-233 or 234)
4. (3S-GTE)
Volume air flow meter
(See page FI-183)
5. Engine coolant temp. sensor
(See page FI-231)
6. Intake air temp. sensor
(See page FI-183 or 232)
7. Throttle position sensor
(See page FI-185, 192 or 199)
8. Injection signal circuit
 - (1) Injector wirings
 - (2) (3S-GTE)
Solenoid resistor
(See page FI-220)
 - (3) ECM (See page FI-240)

DIAGNOSIS SYSTEM (4A-FE)

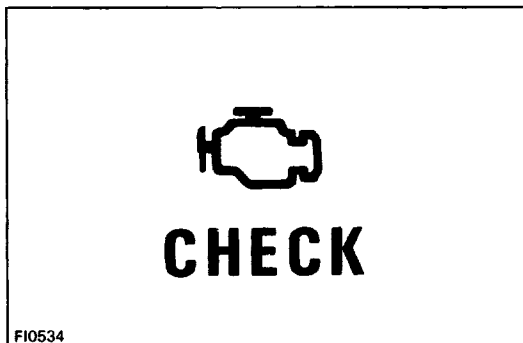
DESCRIPTION

The ECM contains a built-in, self-diagnosis system by which troubles with the engine signal network are detected and a malfunction indicator lamp on the combination meter lights up.

By analyzing various signals as shown in the later table (See page FI-32) the ECM detects system malfunctions relating to the sensors or actuator.

If a malfunction is detected, the ECM lights up the malfunction indicator lamp to inform the driver of the occurrence of a malfunction. (For some codes the light does not come on.) The light goes off automatically when the malfunction has been repaired. But the diagnostic trouble code(s) remains stored in the ECM memory (except for code No.51). The ECM stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch off.

The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when TE1 and E1 terminals on the data link connector 1 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.



MALFUNCTION INDICATOR LAMP CHECK

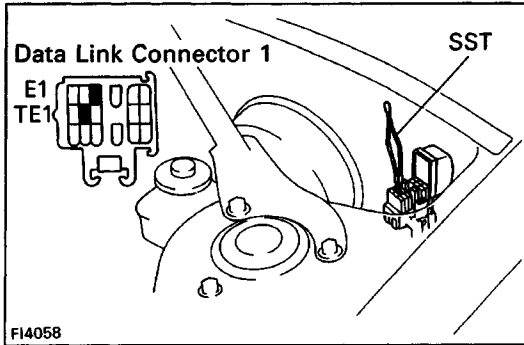
1. The malfunction indicator lamp will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the malfunction indicator lamp should go off.

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

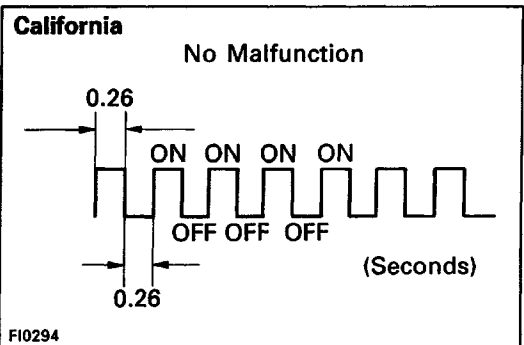
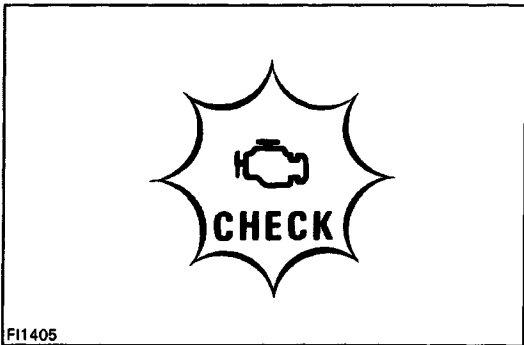
OUTPUT OF DIAGNOSTIC TROUBLE CODES

To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions
 - (a) Battery voltage 11 V or more
 - (b) Throttle valve fully closed (throttle position sensor IDL points closed)
 - (c) Transmission in neutral position
 - (d) Accessories switched OFF
 - (e) Engine at normal operating temperature
2. Turn the ignition switch ON. Do not start the engine.
3. Using SST, connect terminals TE1 and E1 of the data link connector 1.
SST 09843-18020

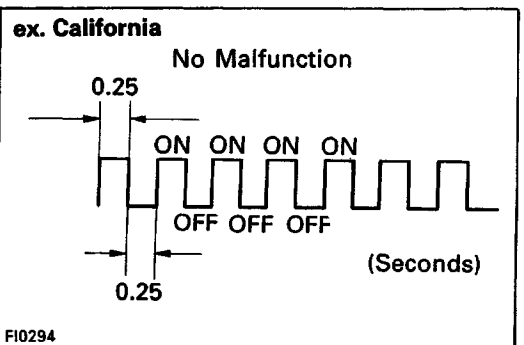


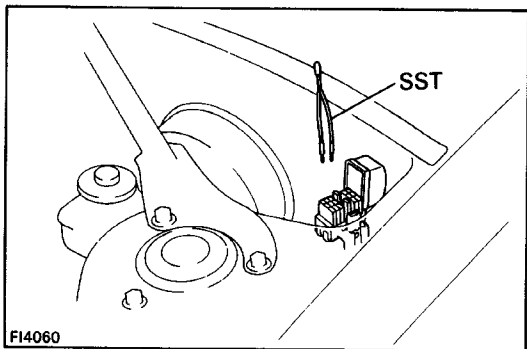
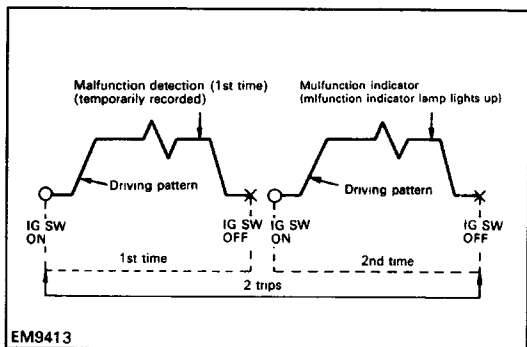
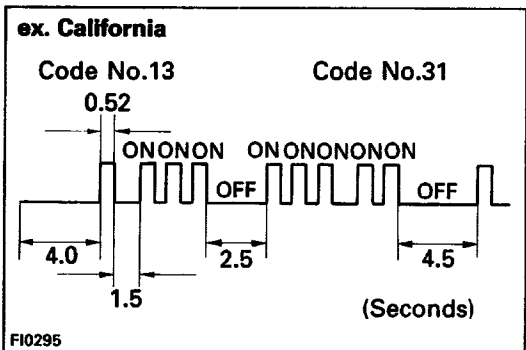
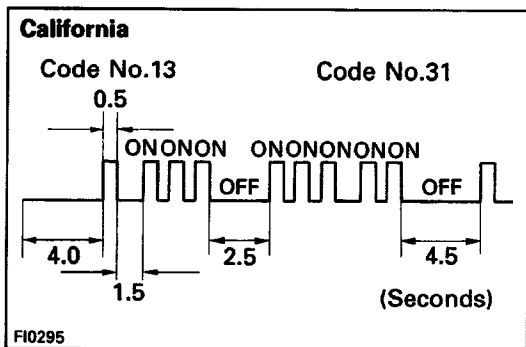
4. Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp.



Diagnostic Trouble Codes (See page [FI-32](#))

- (a) Normal System Operation (no malfunction)
 - The light will alternately blink ON and OFF approx. 2 times per second.





(b) Malfunction Code Indication

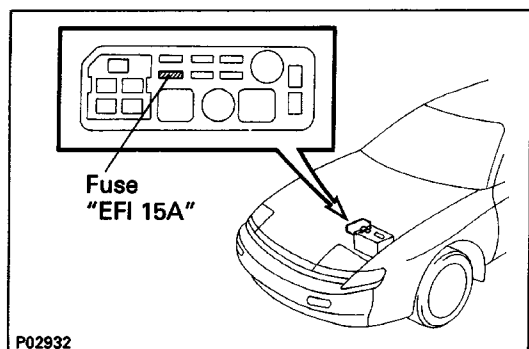
- In the event of a malfunction, the light will blink every 0.5 seconds (0.52 seconds). The first number of blinks will equal the first digit of a : digit diagnostic trouble code and, after a 1. second pause, the 2nd number of blinks will equal the 2nd. If there are two or more codes, there will be a 2.5-second pause between each.
- After all the codes have been signaled, there will be a 4.5-second pause and they will all be repeated as long as the terminals TE1 and E1 of the data link connector 1 are connected.

HINT: In the event of a number of trouble codes, indication will begin from the smaller value and continue to the larger in order.

(c) (2 trip detection logic)

Diagnostic trouble codes 21, 25, 26 and 71 use "2 trip detection logic". With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the malfunction indicator lamp to light up. The 2 trip repeats the same mode a 2nd time. (However, the ignition switch must be turned OFF between the 1st time and 2nd time).

5. After the diagnostic check, remove the SST.
SST 09843-18020



CANCELLING DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be cancelled out by removing the fuse "EFI 15A" for 60 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the battery negative H terminal, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If the diagnostic trouble code is not cancelled out, it will be retained by the ECM and appear along with a new code in the event of future trouble.
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded.

2. After cancellation, perform road test of the vehicle to check that a normal code is now read on the malfunction indicator lamp.

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








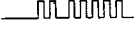
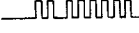
DIAGNOSIS INDICATION

1. When 2 or more codes are indicated, the lowest number (code) will appear first.
2. All detected diagnostic trouble codes, except code No. 51, will be retained in memory by the ECM from the time of detection until cancelled out.
3. Once the malfunction is cleared, the malfunction indicator lamp on the combination meter will go off but the diagnostic trouble code remain stored in ECM memory (except for code No. 51).



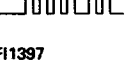
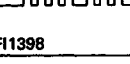


DIAGNOSTIC TROUBLE CODES

HINT:

- Parameters listed in the chart may not be exactly same as your reading due to type of the instruments or other factors.
- If a malfunction code is displayed during the diagnostic trouble code check in test mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Code No.	Number of blinks Malfunction Indicator Lamp	System	.1 Malfunction Indicator Lamp	Diagnosis	Trouble Area	*2 Memory	See Page
—	 FI1401	Normal	—	No trouble code is recorded.	—	—	—
12	 FI1389	RPM Signal	ON	No G or NE signal is input to the ECM for 2 secs. or more after STA turns ON.	<ul style="list-style-type: none"> Open or short in IIA circuit IIA Open or short in STA circuit ECM 	○	IG-4 FI-68
13	 FI1390	RPM Signal	ON	NE signal is not input to ECM for 50 msec. or more when engine speed is 1,000 rpm or more.	<ul style="list-style-type: none"> Open or short in IIA circuit IIA ECM 	○	IG-4
14	 FI1391	Ignition Signal	ON	IGF signal from igniter is not input to ECM for 4 consecutive ignition.	<ul style="list-style-type: none"> Open or short in IGF or IGT circuit from igniter to ECM Igniter ECM 	○	FI-69
21	 FI1400	Oxygen Sensor Signal	ON	At normal driving speed (below 60 mph and engine speed is above 1,900 rpm), amplitude of oxygen sensor signal (OX) is reduced to between 0.35 – 0.70 V continuously for 60 secs. or more. *6 (2 trip detection logic)	<ul style="list-style-type: none"> Oxygen or short in circuit of oxygen sensor Oxygen sensor ECM 	○	FI-72
				Open or short in heater circuit of oxygen sensor for 0.5 sec or more. (HT) (Exc.. Calif.)	<ul style="list-style-type: none"> Open or short in heater circuit of oxygen sensor Oxygen sensor heater ECM 		
22	 FI1392	Engine Coolant Temp. Sensor Signal	ON	Open or short in engine coolant temp. sensor circuit for 500 msec. or more. (THW)	<ul style="list-style-type: none"> Open or short in engine coolant temp. sensor circuit Water temp. sensor ECM 	○	FI-67
24	 FI1611	Intake Air Temp. Sensor Signal	*3 ON	Open or short in intake air temp. sensor circuit for 500 msec. or more. (THA)	<ul style="list-style-type: none"> Open or short in intake air temp. circuit Intake air temp. sensor ECM 	○	FI-66
25	 FI2562	Air-Fuel Ratio Lean Mal-function	ON	(1) Oxygen sensor output in less than 0.45 V for at least 90 secs. for Calif. or 120 secs. for others when oxygen sensor is warmed up (racing at 2,000 rpm). (only for code 25 in Calif. spec.) *4	<ul style="list-style-type: none"> Engine ground bolt loose Open in E1 circuit Open in injector circuit Fuel line pressure (Injector blockage, etc.) Open or short in oxygen sensor circuit Oxygen sensor Ignition system Engine coolant temp. sensor Vacuum sensor ECM 	○	FI-65 FI-72
				(2) When the engine speed varies by more than 50 rpm over the preceding crankshaft position period during a period of 50 secs. during idling with the engine coolant temp. 50°C (122°F) or more *6(2 trip detection logic) (1) and (2)	<ul style="list-style-type: none"> Engine ground bolt loose Open in E1 circuit Short in injector circuit Fuel line pressure (Injector leakage, etc.) Open or short in cold start injector circuit Cold start injector Open or short in oxygen sensor circuit Oxygen sensor Engine coolant temp. sensor Vacuum sensor Compression pressure ECM 		
26	 FI2563	Air-Fuel Ratio Rich Mal-function	ON			○	

DIAGNOSTIC TROUBLE CODES (Cont'd)

Code No.	Number of blinks Malfunction Indicator Lamp	System	*1 Malfunction Indicator Lamp	Diagnosis	Trouble Area	*2 Memory	See Page
31	 FI1394	Vacuum Sensor Signal	ON	Open or short detected continuously for 500 msec. or more in vacuum sensor circuit. (PIM)	<ul style="list-style-type: none"> Open or short in vacuum-sensor circuit Vacuum sensor ECM 	○	FI-64
41	 FI1396	Throttle Position Sensor Signal	*3 ON	Low PSW signal is input continuously to the ECM for 500 msec. or more at idling (IDL contact is ON).	<ul style="list-style-type: none"> Open or short in throttle-position sensor circuit Throttle position sensor ECM 	○	FI-63
42	 FI1397	Vehicle Speed Sensor Signal	OFF	SPD signal is not input to the ECM for at least 8 seconds during high load driving with engine speed between 2,600 rpm and 4,500 rpm.	<ul style="list-style-type: none"> Open or short in vehicle speed sensor circuit Vehicle speed sensor ECM 	○	—
43	 FI1398	Starter Signal	OFF	Starter signal (STA) is not input to ECM even once until engine reaches 800 rpm or more when cranking.	<ul style="list-style-type: none"> Open or short in starter signal circuit Open or short in IG SW circuit ECM 	○	FI-68
*5 71	 FI2622	EGR System Mal-function	ON	With the engine coolant temp. at 70°C (158°F) or more 50 secs. from start of EGR operation. The EGR gas temp. is less than 80°C (176°F) and the EGR gas temp. has risen less than 10°C (18°F) during the 50 secs. *6 (2 trip detection logic)	<ul style="list-style-type: none"> Open in EGR temp. sensor circuit Open in VSV circuit for EGR EGR vacuum hose disconnected, valve stuck Clogged in EGR gas passage ECM 	○	FI-73
51	 FI1399	Switch Condition Signal	OFF	Displayed when A/C is ON, IDL contact OFF or shift position in "R", "D", "2", or "1" positions with the check terminals E1 and TE1 connected.	<ul style="list-style-type: none"> A/C switch circuit Throttle position sensor IDL circuit Park/neutral position switch Accelerator pedal, cable ECM 	X	FI-63 FI-71

REMARKS:

- *1: "ON" displayed in the diagnosis mode column indicates that the Malfunction Indicator Lamp is lighted up when a malfunction is detected.
"OFF" indicates that the Malfunction Indicator Lamp does not light up during malfunction diagnosis, even if a malfunction is detected.
- *2: "0" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "X" indicates that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostic results is performed with the ignition switch ON.
- *3: The Malfunction Indicator Lamp comes on if malfunction occurs only for California specifications.
- *4: No. (2) in the diagnostic contents of codes No.25 and 26 apply to California specification vehicles only, while (1) applies to all models.
- *5: Code 71 is used only for California specifications.
- *6: "2 trip detection logic" (See page [FI-30](#).)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	21	Main Oxygen Sensor Circuit
Malfunction: Main Oxygen Sensor Deterioration		
<p>The graph illustrates the driving pattern for detecting a Main Oxygen Sensor Deterioration. The vertical axis represents Vehicle Speed, with markers at 40 mph and 50 mph. The horizontal axis represents Time. The pattern consists of two cycles. Cycle 1: (1) Idle at 0 mph. (2) Start engine. (3) Idle for 3 minutes. (4) Accelerate to 40 mph. (5) Maintain 40-50 mph for 1-2 minutes. (6) Stop engine for 3 seconds. Cycle 2: (7) Repeat steps (3), (4), and (5).</p>		
P02539		
<ol style="list-style-type: none"> (1) Disconnect the ER fuse (15 A) for 60 seconds or more, with ignition switch OFF. (2) Start the engine and warm the engine up with all accessory switches OFF. (3) After the engine is warmed up, let it idle for 3 minutes. (4) Accelerate gradually and maintain at approximately 1,500 rpm, or within the 1,300 to 1,700 rpm range. Turn the A/C on, and drive in "D" for automatic, or in case of manual transmission, upshift appropriately. Shift carefully so that the engine speed would not fall below 1,200 rpm. Depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking. (5) Maintain the vehicle speed at 40 – 50 mph. Keep the vehicle running for 1 to 2 minutes after starting acceleration. (6) After driving, stop at a safe place and turn the ignition switch OFF for 3 seconds or more. (7) Start the engine and perform steps (3), (4) and (5). 		
<p>HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (7)</p>		
<p>NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.</p>		

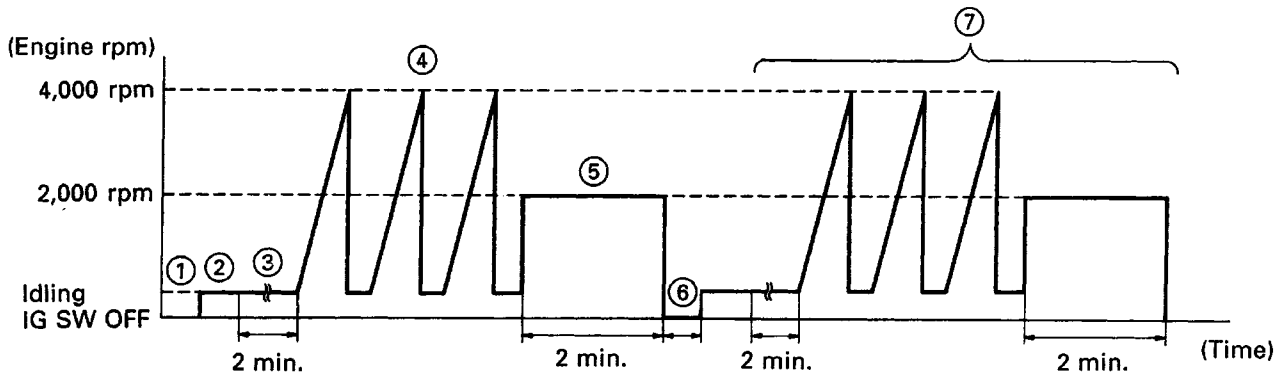
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	25	Air-Fuel Ratio Lean Malfunction
	26	Air-Fuel Ratio Rich Malfunction

Malfunction: Open or Short in Oxygen Sensor



P02492

- (1) Disconnect the EFI fuse (15 A) for 60 seconds or more, with ignition switch OFF.
- (2) Start the engine and warm the engine up.
- (3) After the engine is warmed up, let it idle for 2 minutes.
- (4) Accelerate rapidly to 4,000 rpm three times.
- (5) Maintain at 2,000 rpm for 2 minutes.
- (6) Turn the ignition switch OFF for 10 seconds.
- (7) Start the engine and repeat steps (2), (3), (4) and (5) again.

HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (7) .

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

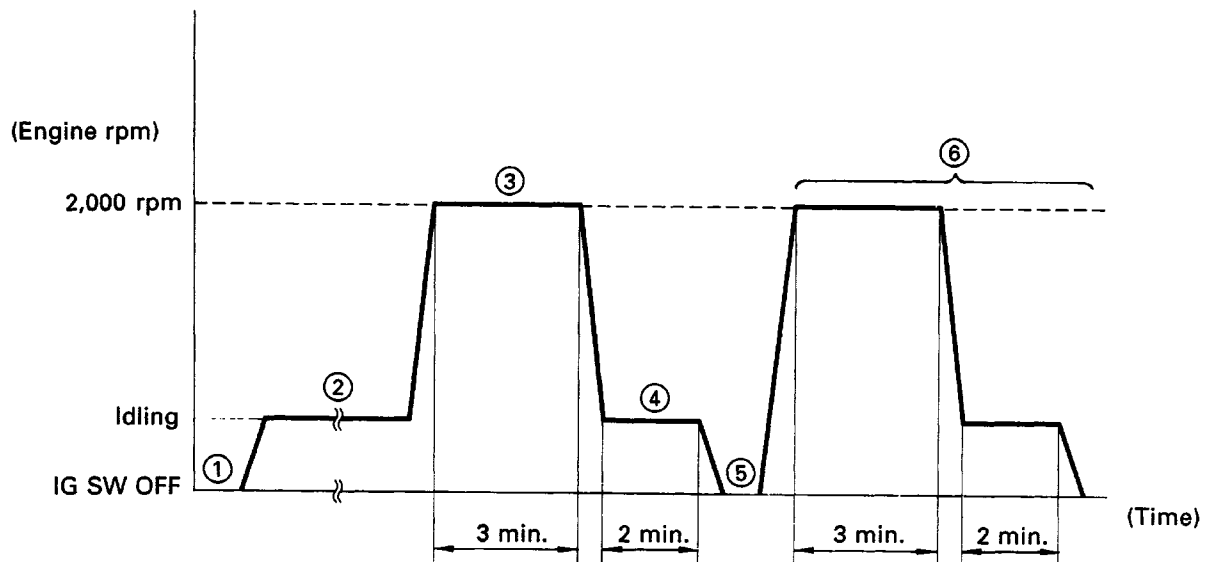
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	25	Air-Fuel Ratio Lean Malfunction (California)
	26	Air-Fuel Ratio Rich Malfunction (California)

Malfunction: Open or Short in Oxygen Sensor, Open or Short in Injector Leak, Blockage, Loose E/G Earth Bolt



P02543

- (1) Disconnect the G Battery terminal for 60 seconds or more, with ignition switch OFF.
- (2) Start the engine and warm the engine up, with all accessory switches OFF.
- (3) After the engine is warmed up, maintain at 2,000 rpm for 3 minutes.
- (4) Let it idle for 2 minutes. ("D" position for A/T)
- (5) Turn the ignition switch OFF for 3 seconds or more.
- (6) Start the engine and perform steps (3) and (4) again.

HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

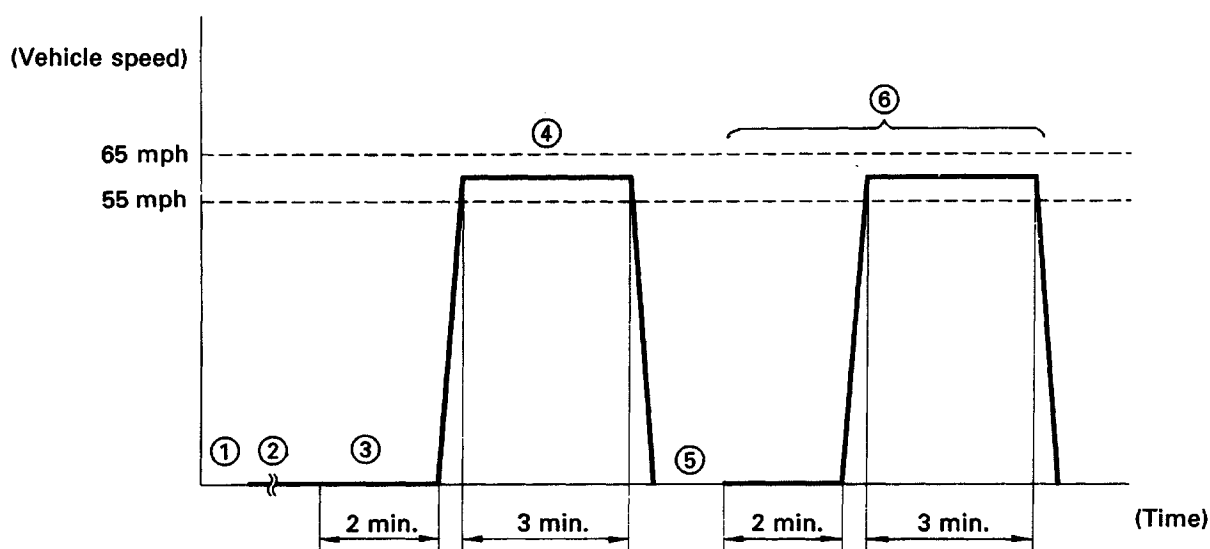
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	71	EGR System Malfunction (California)
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Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose, Valve Stuck



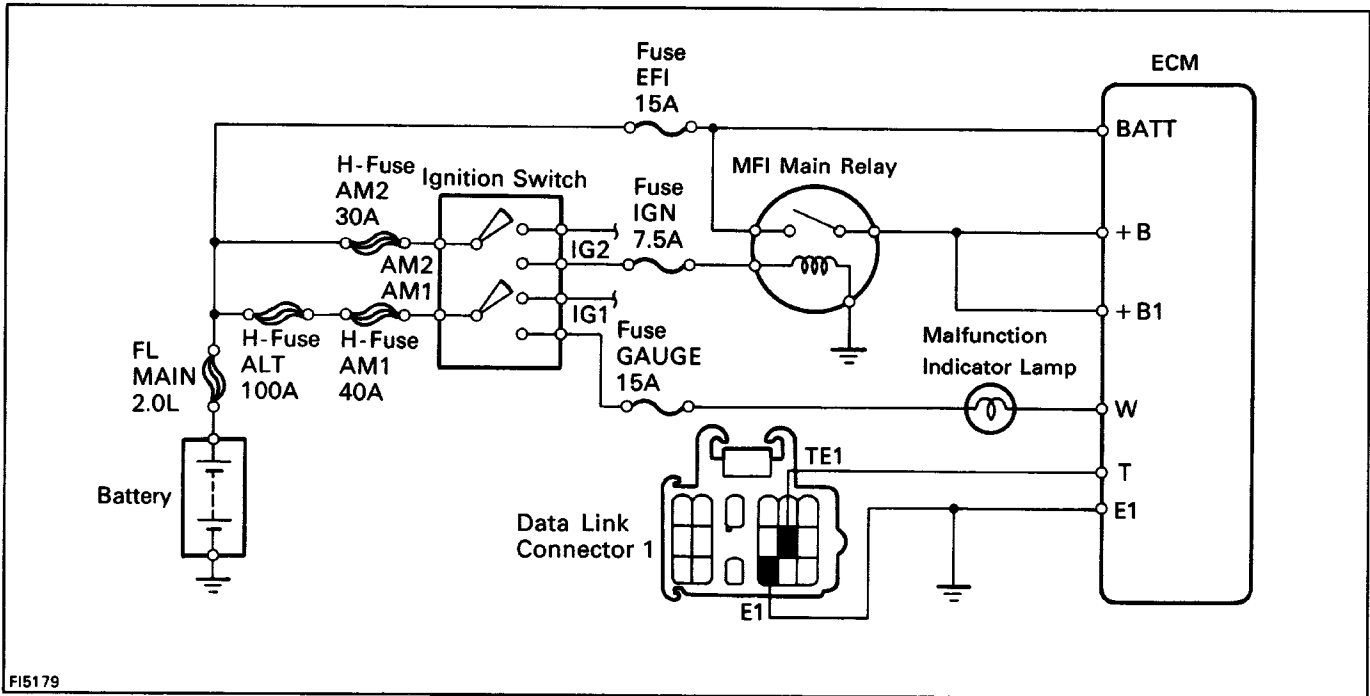
P02538

- (1) Disconnect the fuse EFI (15 A) for 60 seconds or more, with ignition switch OFF.
- (2) Start the engine and warm the engine up with all accessory switches OFF.
- (3) After the engine is warmed up, let it idle for 2 minutes.
- (4) With the transmission in 5th gear ("D" position and O/D ON for AM, drive at 55 – 65 mph for 3 minutes.
- (5) Stop at a safe place and turn the ignition switch OFF for 3 – 10 seconds.
- (6) Start the engine and perform steps (3) and (4).

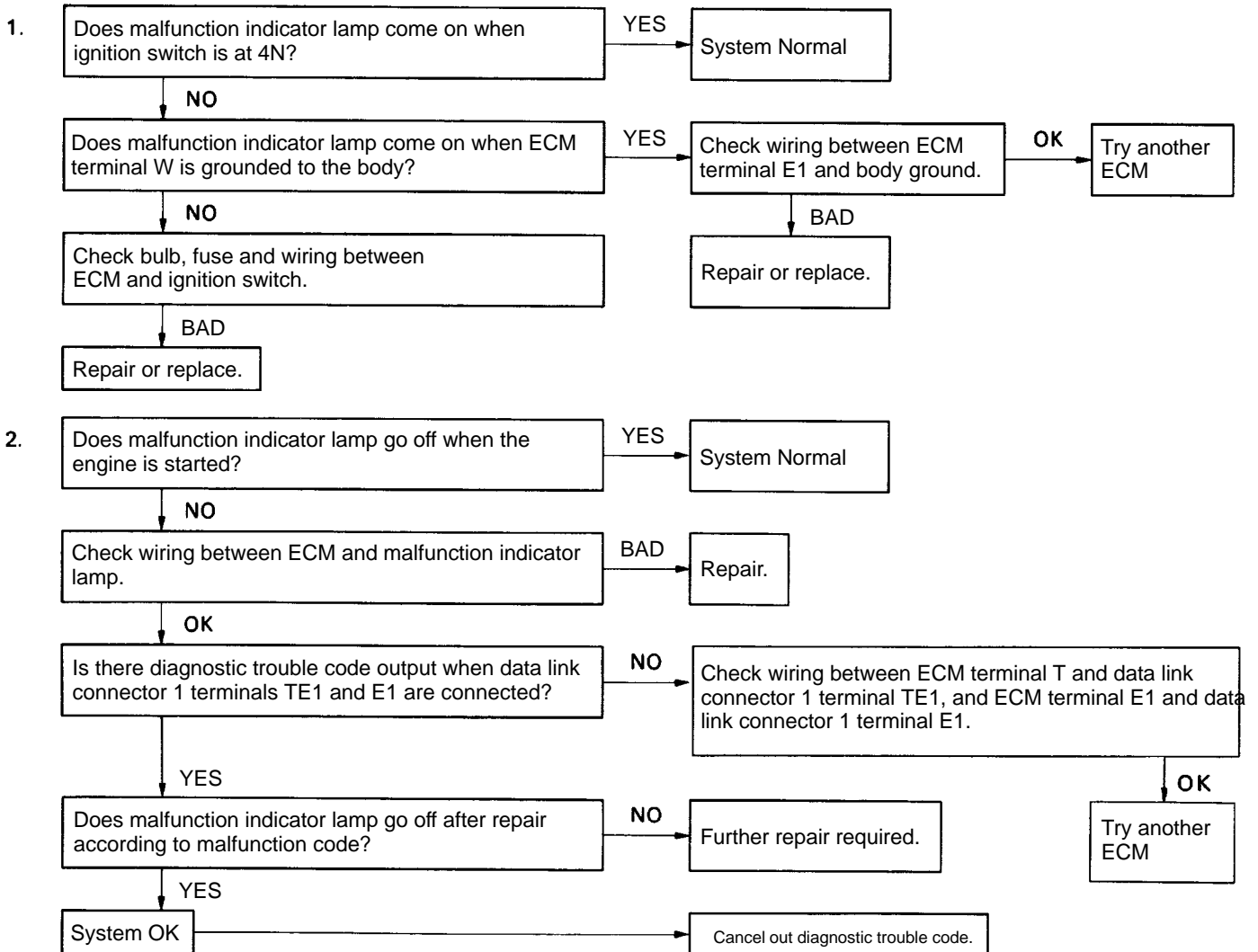
HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

INSPECTION OF DIAGNOSIS CIRCUIT



FI5179



DIAGNOSIS SYSTEM (3S–GTE and 5S–FE) DESCRIPTION

The ECM contains a built-in, self-diagnosis system by which troubles with the engine signal network are detected and a malfunction indicator lamp on the combination meter lights up.

By analyzing various signals shown in the later table (See page [FI-44](#) or 50) the ECM detects system malfunctions relating to the sensors or actuators.

The self-diagnosis system has two modes, a normal mode and a test mode.

If a malfunction is detected when in the normal mode, the ECM lights up the malfunction indicator lamp to inform the driver of the occurrence of a malfunction. (For some codes the lamp does not come on.) The lamp goes off automatically when the malfunction has been repaired. But the diagnostic trouble code(s) remains stored in the ECM memory. The ECM stores the code(s) until it is cleaned by removing the EFI fuse with the ignition switch off.

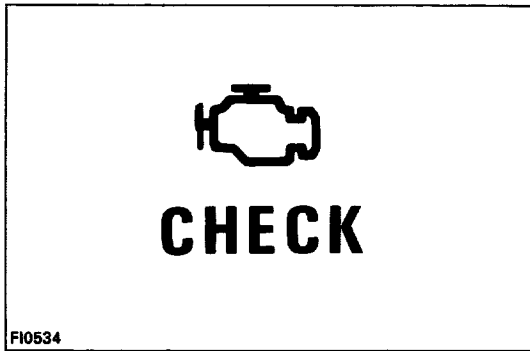
The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when TE1 and E1 terminals of the data link connector 1 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.

If a malfunction is detected when in the test mode, the ECM lights up the malfunction indicator lamp to inform the technician of the occurrence of a malfunction (except for code Nos.42, 43 and 51). In this case, TE2 and E1 terminals of the data link connector 1 should be connected as shown later. (See page [FI-42](#))

In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECM memory even when the ignition switch is off (except code Nos.42, 43 and 51).

This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the malfunction indicator lamp can be selected by connecting the TE1, TE2 and E1 terminals of the data link connector 1, as shown later.

A test mode function has been added to the functions of the self-diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self-diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page [FI-44](#) or 50)



MALFUNCTION INDICATOR LAMP CHECK

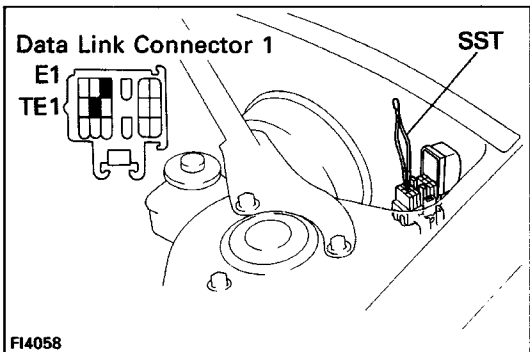
1. The malfunction indicator lamp will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the malfunction indicator lamp should go off.
If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

OUTPUT OF DIAGNOSTIC TROUBLE CODES

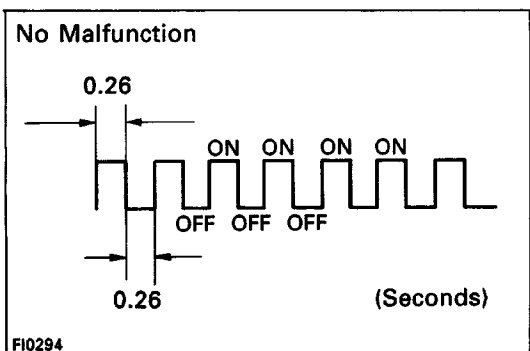
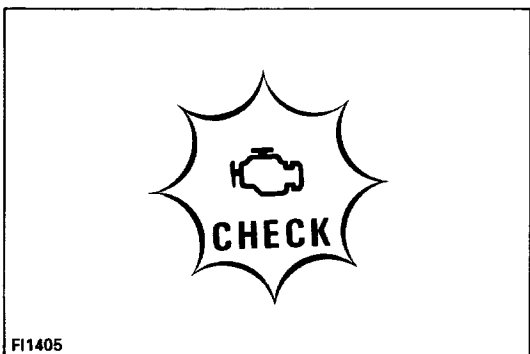
(Normal mode)

To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions
 - (a) Battery voltage 11 V or more
 - (b) Throttle valve fully closed (throttle position sensor IDL points closed)
 - (c) Transmission in neutral position
 - (d) Accessories switched OFF.
 - (e) Engine at normal operating temperature
2. Turn the ignition switch ON. Do not start the engine.
3. Using SST, connect terminals TE1 and E1 of the data link connector 1.
SST 09843-18020



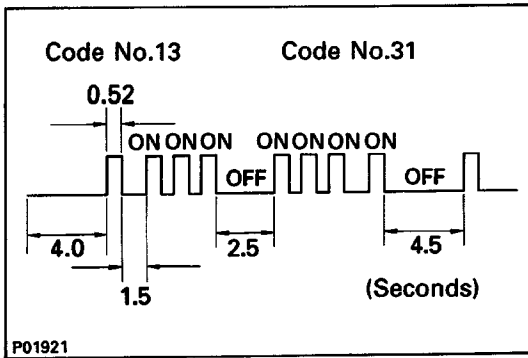
4. Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp.



Diagnostic Trouble Codes (See page [FI-44](#) or 50)

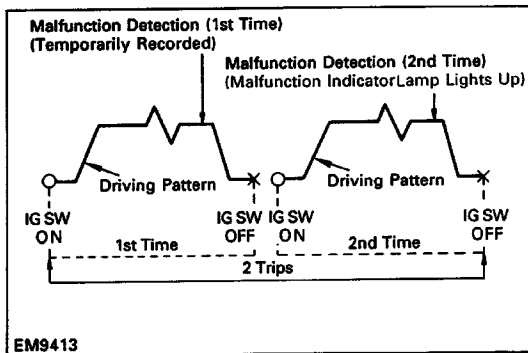
(a) Normal System Operation (no malfunction)

- The lamp will alternately blink ON and OFF at 0.26-second intervals.



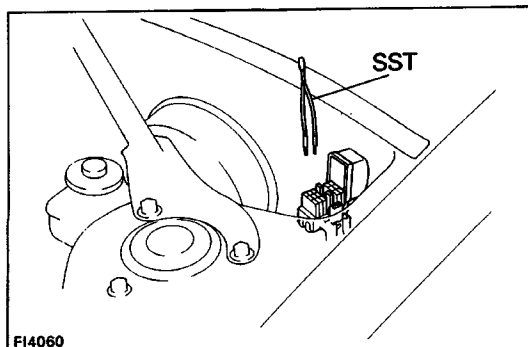
(b) Malfunction Code Indication

- In the event of a malfunction, the light will blink every 0.5 seconds. The first number of blinks will equal the first digit of a 2-digit diagnostic trouble code and, after a 1.5-second pause, the 2nd number of blinks will equal the 2nd. If there are two or more codes, there will be a 2.5-second pause between each code.
- After all the codes have been output, there will be a 4.5-second pause and they will all be repeated as long as the terminals TE1 and E1 of the data link connector 1 are connected.
HINT: In the event of a number of trouble codes, indication will begin from the smaller value and continue to the larger.



(c) (2 Trip Detection Logic)

Diagnostic trouble codes 25, 26, 27 and 71 use "2 trip detection logic". With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the Malfunction Indicator Lamp to light up. The 2 trip repeats the same mode a 2nd time. (However, the ignition switch must be turned OFF between the 1st time and 2nd time.) In the Test Mode, the Malfunction Indicator Lamp lights up the 1st time a malfunction is detected.



5. After the diagnostic check, remove the SST.
SST 09843-18020

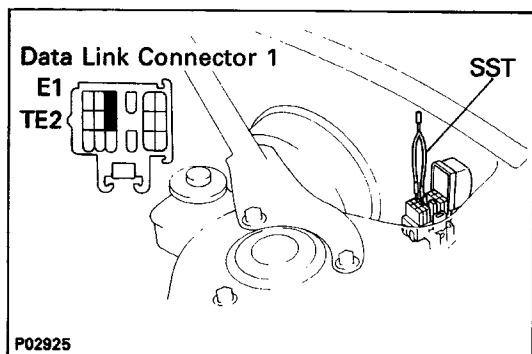
(Test mode)**HINT:**

- Compared to the normal mode, the test mode has high sensing ability to detect malfunctions.
- It can also detect malfunctions in the starter signal circuit, air conditioning signal and park/neutral position switch signal.
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

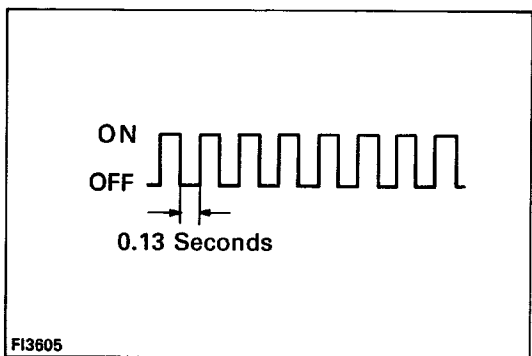
To obtain an output of diagnostic trouble code, proceed as follows:

1. Initial conditions

- (a) Battery voltage 11 volts or more
- (b) Throttle valve fully closed (throttle position sensor IDL points closed)
- (c) Transmission in neutral position
- (d) Accessories switched OFF

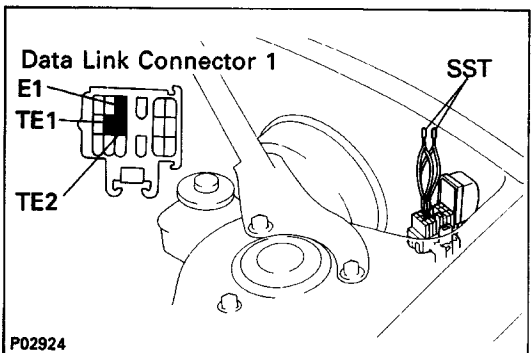


2. First, using SST, connect terminals TE2 and E1 of the data link connector 1, then turn the ignition switch on to begin the diagnosis in the test mode.
SST 09843-18020



HINT: To confirm that the test mode is operating, check that the malfunction indicator lamp flashes when the ignition switch is turned ON.

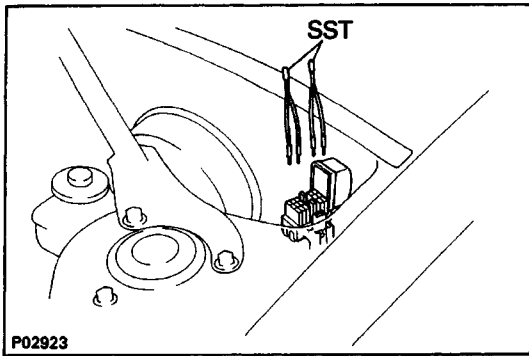
3. Start the engine and drive the vehicle at a speed of 10 km/h (6 mph) or higher.
4. Simulate the conditions of the malfunction described by the customer.



5. Using SST, connect terminals TE1 and E1 of the data link connector 1.

SST 09843-18020

6. Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp.
(See page [FI-40](#))

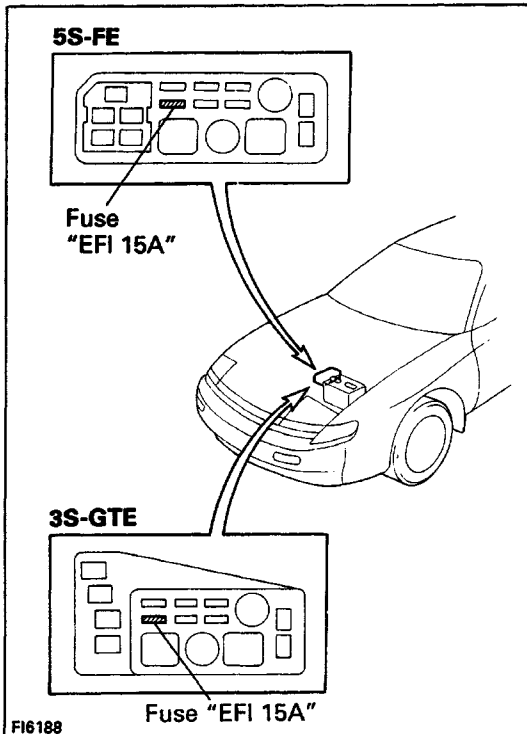


7. After the diagnostic check, remove SST.

SST 09843-18020

HINT:

- The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned on.
- The starter signal and vehicle speed signal will be diagnosed by the ECM as malfunctions, and code Nos.42, and 43 will be output, if the operation in 3 above is not performed.



CANCELLING DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be cancelled out by removing the fuse "EFI 15A" for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the battery negative (-) terminal, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If the diagnostic trouble code is not cancelled out, it will be retained by the ECM and appear along with a new code in the event of future trouble.
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded.

2. After cancellation, perform road test of the vehicle to check that a normal code is now read on the malfunction indicator lamp.

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








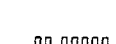

DIAGNOSIS INDICATION

1. When 2 or more codes are indicated, the lowest number (code) will appear first.
2. All detected diagnostic trouble codes, except code No.51 and No.53, will be retained in memory by the ECM from the time of detection until cancelled out.
3. Once the malfunction is cleared, the malfunction indicator lamp on the combination meter will go off but the diagnostic trouble code(s) remain stored in ECM memory (except for codes No.43, No.51 and No.53).

DIAGNOSTIC TROUBLE CODES (3S-GTE)

HINT:

- If a malfunction is detected during the diagnostic trouble code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of blinks Malfunction Indicator Lamp	System	*1 Malfunction Indicator Lamp		Diagnosis	Trouble Area	Memory	See Page
			Normal Mode	Test Mode				
—	 FI1401	Normal	—	—	No trouble code is recorded.	—	—	—
12	 FI1606	RPM Signal	ON	N.A.	<ul style="list-style-type: none"> • No G1, G2 or NE signal is input to the ECM for 2 secs. or more after STA turns ON. • Open in G - circuit. 	<ul style="list-style-type: none"> • Open or short in NE, G circuit • Distributor • Open or short in STA circuit • ECM 	○	1G-4 FI-84
13	 FI1607	RPM Signal	ON	ON	NE signal is not input to ECM for 0.1 sec. or more when engine speed is 1,000 rpm or more.	<ul style="list-style-type: none"> • Open or short in NE circuit • Distributor • ECM 	○	1G-4
14	 FI1608	Ignition Signal	ON	N.A.	IG signal from igniter is not input to ECM for 8 - 11 consecutive ignition.	<ul style="list-style-type: none"> • Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM 	○	FI-85
21	 FI1609	Oxygen Sensor Signal	ON	N.A.	Open or short in heater circuit of oxygen sensor for 0.5 sec. or more. (HT)	<ul style="list-style-type: none"> • Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • ECM 	○	FI-90
				ON	At normal driving speed (below 60 mph and engine speed is above 1,500 rpm), amplitude of oxygen sensor signal (OX1) is reduced to between 0.35 - 0.70 V continuously for 60 secs. or more. *6 (2 trip detection logic) (Exc. Calif.)	<ul style="list-style-type: none"> • Open or short in oxygen sensor circuit • Oxygen sensor • ECM 		
22	 FI1610	Engine Coolant Temp. Sensor Signal	ON	ON	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more. (THW)	<ul style="list-style-type: none"> • Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM 	○	FI-83
24	 FI1611	Intake Air Temp. Sensor Signal	*3 ON	ON	Open or short in intake air temp. sensor circuit for 0.5 sec. or more. (THA)	<ul style="list-style-type: none"> • Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM 	○	FI-82
25	 FI2562	Air-Fuel Ratio Lean Mal-function	ON	ON	(1) Oxygen sensor output in less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 1,500 rpm). (only for code 25) *4	<ul style="list-style-type: none"> • Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (Injector blockage, etc.) • Open or short in oxygen sensor circuit • Oxygen sensor • Ignition system • Engine coolant temp. sensor • Volume air flow meter (air intake) • ECM 	○	FI-81 FI-90
				ON	(2) When the oxygen sensor signal oscillates beyond 0.45 V more than 15 times within a 4 sec, period at idle and at engine coolant temperature of 60°C (140°F) or above. *4 (3) When the air-fuel compensation value fluctuates more than 20% from the ECM set range within an 80 sec. period, at engine coolant temperature of 60°C (140°F) or above. *6 (2 trip detection logic) (1) - (3)	<ul style="list-style-type: none"> • Engine ground bolt loose • Open in E1 circuit • Short in injector circuit • Fuel line pressure (Injector leakage, etc.) • Open or short in cold start injector circuit • Cold start injector • Open or short in oxygen sensor circuit • Oxygen sensor • Volume air flow meter • Compression pressure • ECM 		
26	 FI2563	Air-Fuel Ratio Rich Mal-function	ON	ON	(1) Oxygen sensor output in less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 1,500 rpm). (only for code 25) *4 (2) When the oxygen sensor signal oscillates beyond 0.45 V more than 15 times within a 4 sec, period at idle and at engine coolant temperature of 60°C (140°F) or above. *4 (3) When the air-fuel compensation value fluctuates more than 20% from the ECM set range within an 80 sec. period, at engine coolant temperature of 60°C (140°F) or above. *6 (2 trip detection logic) (1) - (3)	<ul style="list-style-type: none"> • Engine ground bolt loose • Open in E1 circuit • Short in injector circuit • Fuel line pressure (Injector leakage, etc.) • Open or short in cold start injector circuit • Cold start injector • Open or short in oxygen sensor circuit • Oxygen sensor • Volume air flow meter • Compression pressure • ECM 	○	FI-81 FI-90

DIAGNOSTIC TROUBLE CODES (3S-GTE) (Cont'd)

Code No.	Number of blinks Malfunction Indicator Lamp	System	.1 Malfunction Indicator Lamp		Diagnosis	Trouble Area	*2 Memory	See Page
			Normal Mode	Test Mode				
31	FI1612	Volume Air Flow Meter Signal	ON	ON	At idling, open or short detected continuously for 0.5 sec. or more in volume air flow meter circuit. • Open - VC • Short - VC-E2	• Open or short in volume air flow meter circuit	○	FI-80
32	FI1613	Volume Air Flow Meter Signal	ON	ON	Open or short detected continuously for 0.5 sec. or more in volume air flow meter circuit. • Open - E2 • Short - VS-VC	• Volume air flow meter • ECM	○	FI-80
34	BE3933	Turbo-charging Pressure Signal	ON	N.A.	Abnormal over charge during high load driving.	• Open or short in turbocharging pressure sensor circuit • Turbocharging pressure sensor	○	-
35	BE3933	Turbo-charging Pressure sensor Signal	ON	ON	Open or short detected continuously for 0.5 sec. or more in turbocharging pressure sensor signal circuit. (PIM)	• Turbocharger • ECM	○	F • -88
41	FI1614	Throttle Position Sensor Signal	*3 ON	ON	Open or short detected in throttle position sensor signal (VTA) for 0.5 sec. or more. IDL contact is ON and VTA output exceeds 1.5 V.	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	FI-78
42	FI1615	Vehicle Speed Sensor Signal	OFF	OFF	SPD signal is not input to the ECM for at least 8 seconds during high load driving with engine speed between 2,500 rpm and 5,000 rpm	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	-
43	FI1616	Starter Signal	N.A.	OFF	Starter signal (STA) is not input to ECM even once until engine reaches 800 rpm or more when cranking.	• Open or short in starter signal circuit • Open or short in IG SW or main relay circuit • ECM	X	FI-84
52	FI1618	Knock Sensor Signal	ON	N.A.	With engine speed between 1,600 rpm and 7,200 rpm, signal from knock sensor is not input to ECM for 2 revolutions (KNK)	• Open or short in knock sensor circuit • Knock sensor (looseness, etc.) • ECM	○	-
53	FI1619	Knock Control Signal	ON	N.A.	Engine speed is between 700 rpm and 7,200 rpm and ECM (for knock control) malfunction is detected.	• ECM	X	-
71	FI2622	EGR System Mal-function	ON	ON	120 secs. from start of EGR operation, EGR gas temp. is less than 80°C OWN with coolant temp. 80°C (176°F) or more. *6 (2 trip detection logic)	• Open in EGR gas temp. sensor circuit • Open in VSV circuit for EGR • EGR vacuum hose disconnected, valve stuck • Clogged in EGR gas passage • ECM	○	FI-91
51	FI1617	Switch Condition Signal	N.A.	OFF	Displayed when A/C is ON or IDL contact OFF with the check terminals E1 and TE1 connected.	• A/C switch circuit • Throttle position sensor IOL circuit • Accelerator pedal, cable • ECM	X	FI-78

REMARKS:

*1: "ON" displayed in the diagnosis mode column indicates that the Malfunction Indicator Lamp is lighted up when a malfunction is detected.

"OFF" indicates that the "CHECK" does not light up during malfunction diagnosis, even if a malfunction is detected.

"N.A." indicates that the item is not included in malfunction diagnosis.

*2: "0" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "X" indicates

that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs.

Accordingly, output of diagnostic results is performed with the ignition switch ON.

*3: The Malfunction indicator lamp comes on if malfunction occurs only for California specifications.

*4: No. (2) and (3) in the diagnostic contents of codes No.25 and 26 apply to California specification vehicles only, while (1) applies to all models.

*5: Code 71 is used only for California specifications.

*6: "2 trip detection logic" (See page FI-40)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (3S-GTE)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	21	Oxygen Sensor Circuit
Malfunction: Deterioration of Oxygen Sensor		
<p>P01713</p> <ol style="list-style-type: none"> (1) Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF. (2) Initiate test mode: Connect terminals TE2 and E1 of data link connector 1 with ignition switch OFF. (3) Start the engine and warm the engine up with all accessory switches OFF. (4) After the engine is warmed up, let it idle for 3 minutes. (5) Accelerate gradually and maintain at approximately 1,500 rpm, or within the 1,300 to 1,700 rpm range. Turn the A/C on, and drive in "D" for automatic, or in case of manual transmission, upshift appropriately. Shift carefully so that the engine speed would not fall below 1,200 rpm. Depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking. (6) Maintain the vehicle speed at 40 – 50 mph. Keep the vehicle running for 1 – 2 minutes after starting acceleration. <p>HINT: If any malfunction is detected, the malfunction indicator lamp will light up during step (6).</p> <p>NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.</p>		

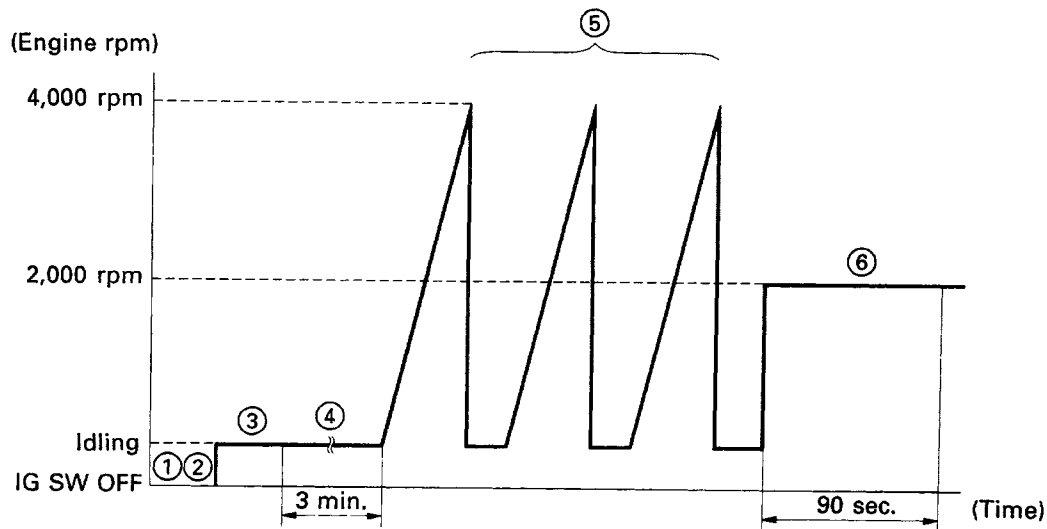
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (3S-GTE) (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	25	Air-Fuel Ratio Lean Malfunction
	26	Air-Fuel Ratio Rich Malfunction

Malfunction: Open or Short in Main Oxygen Sensor



P02491

- ① Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF.
- ② Initial test mode: Connect terminal TE2 and E1 of data link connector 1 with ignition switch OFF.
- ③ Start the engine and warm the engine up, with all accessory switches OFF.
- ④ After the engine is warmed up, let it idle for 3 minutes.
- ⑤ Accelerate rapidly to 4,000 rpm three times.
- ⑥ Maintain at 2,000 rpm for 90 seconds.

HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

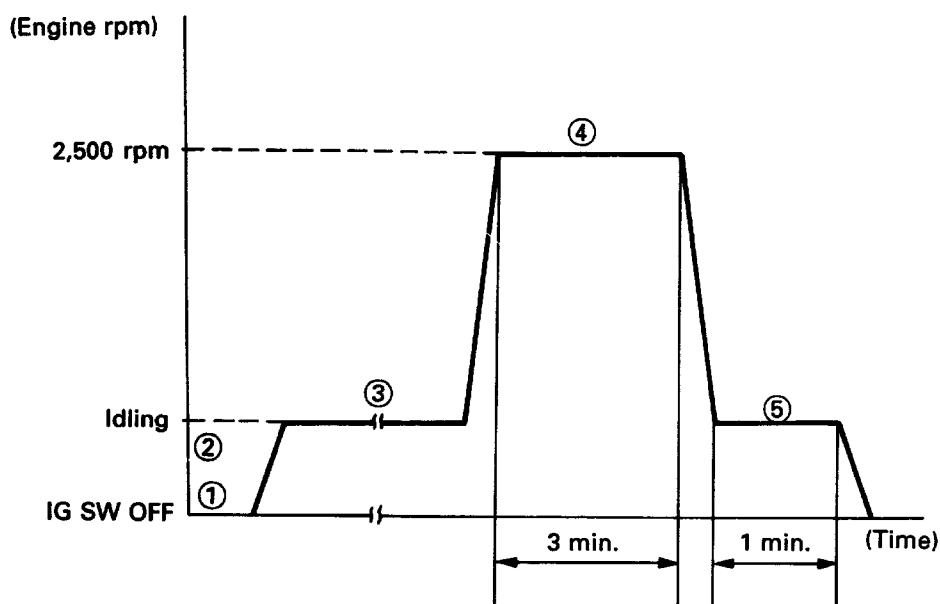
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (3S-GTE) (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	25	Air-Fuel Ratio Lean Malfunction (California)
	26	Air-Fuel Ratio Rich Malfunction (California)

Malfunction: open or Short in Injector Leak, Blockage, Loose Engine Earth Bolt



P01711

HINT: When start this test, coolant temp. is 35°C (95°F) or less and A/C switch OFF.
Before this test, check the feedback voltage for oxygen sensor.

- (1) Disconnect the ER fuse (15 A) for 10 seconds or more, with ignition switch OFF.
- (2) Initiate test mode: Connect terminals TE2 and E1 of check connector with ignition switch OFF.
- (3) Start the engine and warm the engine up.
- (4) After the engine is warmed up, maintain at 2,500 rpm for 3 minutes.
- (5) Let it idle for 1 minute.

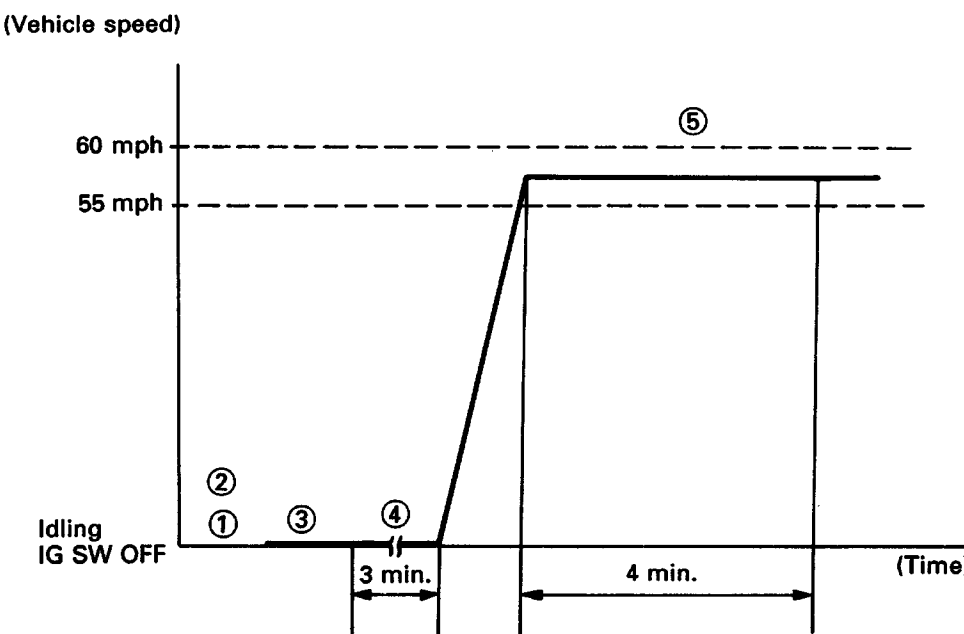
HINT: If any malfunction is detected, the malfunction indicator lamp will light up during step (5).

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (3S-GTE) (Cont'd)

Purpose of the driving pattern.





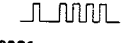





- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	71	EGR System Malfunction (California)
<p>Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose, Valve Stuck</p> <p>(Vehicle speed)</p>  <p>P01712</p> <p>HINT: When start this test, engine coolant temp. is 35°C (95°F) or less and A/C switch OFF.</p> <ol style="list-style-type: none"> (1) Disconnect the fuse EFI (15 A) for 10 seconds or more, with ignition switch OFF. (2) Initiate test mode: Connect terminals TE2 and E1 of data link connector 1 with ignition switch OFF. (3) Start engine and warm engine up. (4) After engine is warmed up, let it idle for 2 minutes. (5) With the A/C switch OFF and transmission in 5th gear, drive at 55 – 60 mph for 4 minutes. <p>HINT: If any malfunction is detected, the malfunction indicator lamp will light up during step (5).</p> <p>NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.</p>		









DIAGNOSTIC TROUBLE CODES (5S-FE)

HINT:

- If a malfunction is detected during the diagnostic trouble code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of blinks Malfunction Indicator Lamp	System	Malfunction Indicator Lamp		Diagnosis	Trouble Area	*2 Memory	See Page
			Normal Mode	Test Mode				
—	 FI1401	Normal	—	—	No trouble code is recorded. code is recorded.	—	—	—
12	 FI1806	RPM Signal	ON	N.A.	(1) No NE signal is input to ECM for 2 secs. or more after STA turns ON. (2) No G signal is input to ECM for 3 secs. or more between 600 – 4,000 rpm.	<ul style="list-style-type: none"> • Open or short in NE, G circuit • Distributor • Open or short in STA circuit • ECM 	○	IG-4 FI-102 FI-1 IS
13	 FI1607	RPM Signal	ON	ON	(1) NE signal is not input to ECM for 0.3 secs. or more when engine speed is 1,500 rpm or more. (2) No G signal is input ECM for 4 NE signal. (Test mode only)	<ul style="list-style-type: none"> • Open or short in NE circuit • Distributor • ECM 	○	IG-4
14	 FI1608	Ignition Signal	ON	N.A.	IG signal from igniter is not input to ECM for 4 – 5 consecutive ignition	<ul style="list-style-type: none"> • Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM 	○	FI-103 FI-119
16 (AT only)	 BE3931	Electronic Controlled Transmission Control Signal	ON	N.A.	Normal signal is not output from ECM CPU.	<ul style="list-style-type: none"> • ECM 	○	—
21	 FI1609	Main Oxygen Sensor Signal	ON	N.A.	At normal driving speed (below 60 mph and engine speed is above 1,500 rpm), amplitude of oxygen sensor signal (OX) is reduced to between 0.35 – 0.70 V continuously for 60 secs. or more.	<ul style="list-style-type: none"> • Open or short in oxygen sensor circuit • Oxygen sensor • ECM 	○	FI-106 FI-122
22	 FI1610	Engine Coolant Temp. Sensor Signal	ON	ON	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more. (THW)	<ul style="list-style-type: none"> • Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM 	○	FI-101 FI-117
24	 FI1611	Intake Air Temp. Sensor Signal	x3 ON	ON	Open or short in intake air temp. sensor circuit for 0.5 sec. or more. (THA)	<ul style="list-style-type: none"> • Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM 	○	FI-100 FI-116
25	 FI2562	Air-Fuel Ratio Lean Malfunction	ON	ON	(1) Oxygen sensor output is less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 2,000 rpm). – only for code 25 (2) When the engine speed varies by more than 20 rpm over the preceding crankshaft position period during a period of 20 seconds during idling with the engine coolant temp. 60°C (140°F) or more. *6 (2 trip detection logic) (1) and (2)	<ul style="list-style-type: none"> • Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (Injector blockage, etc.) • Open or short in oxygen sensor circuit • Oxygen sensor • Ignition system • Engine coolant temp. sensor • Vacuum sensor • ECM 	○	FI-99 FI-106 FI-115 FI-122
26*	 FI2563	Air-Fuel Ratio Rich Malfunction	ON	ON	(1) Oxygen sensor output is less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 2,000 rpm). – only for code 25 (2) When the engine speed varies by more than 20 rpm over the preceding crankshaft position period during a period of 20 seconds during idling with the engine coolant temp. 60°C (140°F) or more. *6 (2 trip detection logic) (1) and (2)	<ul style="list-style-type: none"> • Engine ground bolt loose • Open in E1 circuit • Short in injector circuit • Fuel line pressure (Injector leakage, etc.) • Open or short in cold start injector circuit • Cold start injector • Open or short in oxygen sensor circuit • Oxygen sensor • Engine coolant temp. sensor • Vacuum sensor • Compression pressure • ECM 	○	FI-99 FI-106 FI-115 FI-122

DIAGNOSTIC TROUBLE CODES (5S-FE) (Cont'd)

Code No.	Number of blinks Malfunction Indicator Lamp	System	Malfunction Indicator Lamp		Diagnosis	Trouble Area	w2 Memory	See page
			Normal Mode	Test Mode				
27*4	 FI3294	Sub-Oxygen Sensor Signal	ON	ON	When sub-oxygen sensor is warmed up and full acceleration continued for 2 seconds, output of main oxygen sensor is 0.45 V or more (rich) and output of sub-oxygen sensor is 0.45 V or less (lean). (OX2) *5 (2 trip detection logic)	<ul style="list-style-type: none"> Short or open in sub-oxygen sensor circuit Sub-oxygen sensor ECM 	○	FI-106 FI-122
31	 FI1612	Vacuum Sensor Signal	ON	ON	Open or short detected continuously for 0.5 sec. or more in vacuum sensor circuit (PIM)	<ul style="list-style-type: none"> Open or short in vacuum sensor circuit Vacuum sensor ECM 	○	FI-98 FI-114
41	 FI1614	Throttle Position Sensor Signal	ON*3	ON	Open or short detected continuously for 0.5 sec. or more in throttle sensor (VTA) circuit.	<ul style="list-style-type: none"> Open or short in throttle position sensor circuit Throttle position sensor ECM 	○	FI-96 FI-112
42	 FI1615	Vehicle Speed Sensor Signal	OFF	OFF	(Mfr) SPD signal is not input to ECM for at least 8 seconds during high load driving with engine speed between 3,100 rpm and 5,000 rpm. (AIT) PNP OFF and engine speed 3,100 rpm or more	<ul style="list-style-type: none"> Open or short in vehicle speed sensor circuit Vehicle speed sensor ECM 	○	—
43	 FI1616	Starter Signal	N.A.	OFF	No starter signal is not input to ECM even once after ignition.	<ul style="list-style-type: none"> Open or short in starter signal circuit Open or short in IG SW or main relay circuit ECM 	X	FI-102 FI-118
52	 FI1618	Knock Sensor Signal	ON	N.A.	In area of knock control signal from knock sensor is not input to ECM for 6 revolutions. (KNK)	<ul style="list-style-type: none"> Open or short in knock sensor circuit Knock sensor (looseness, etc.) ECM 	○	—
71 *4	 FI2622	EGR System Malfunction	ON	ON	50 seconds from start of EGR operation, EGR gas temp. is less than 70°C with engine coolant temp. 80°C (176°) or more.	<ul style="list-style-type: none"> Open in EGR gas temp sensor circuit Open in VSV circuit for EGR EGR vacuum hose disconnected, valve stuck Clogged in EGR gas passage ECM 	○	FI-1 o7 FI-123
51	 FI1617	Switch Condition Signal	N.A.	OFF	Displayed when A/C is ON IDI contact OFF or shift position in "R", "D", "2", or N1" positions with the check terminals EI and TE1 connected.	<ul style="list-style-type: none"> A/C switch circuit Throttle position sensor IDL circuit Neutral start switch circuit Accelerator pedal, cable ECM 	X	FI-96 FI-122

REMARKS:

"ON" displayed in the diagnosis trouble mode column indicates that the Malfunction Indicator Lamp is lighted up when a malfunction is detected. "OFF" indicates that the Malfunction Indicator Lamp does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

*2: "0" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "X" indicates that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the ignition switch ON.

*3: The Malfunction Indicator Lamp comes on if malfunction occurs only for California specifications.

*4: Code 26, 27 and 71 is used only for California specifications.

*5: "2 trip detection logic" (See page FI-40.)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (5S-FE)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	21	Main Oxygen Sensor Circuit
<p>Malfunction: Deterioration of Oxygen Sensor</p> <div> <p>The graph illustrates the driving pattern for detecting a Main Oxygen Sensor Circuit malfunction. The vertical axis represents vehicle speed in miles per hour (mph), with marked levels at 40 mph and 50 mph. The horizontal axis represents time. The sequence of events is as follows: (1) Ignition switch is turned OFF. (2) The engine is started and idles. (3) The engine is warmed up. (4) The engine idles for a 3-minute period. (5) The vehicle is accelerated to a steady speed of approximately 40-50 mph. (6) The vehicle maintains this speed for 1-2 minutes.</p> </div> <p>P01713</p> <ol style="list-style-type: none"> <li>(1) Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF. <li>(2) Initiate test mode: Connect terminals TE2 and E1 of data link connector 1 with ignition switch OFF. <li>(3) Start the engine and warm the engine up with all accessory switches OFF. <li>(4) After the engine is warmed up, let it idle for 3 minutes. <li>(5) Accelerate gradually and maintain at approximately 1,500 rpm, or within the 1,300 to 1,700 rpm range. Turn the A/C on, and drive in "D" for automatic, or in case of manual transmission, upshift appropriately. Shift carefully so that the engine speed would not fall below 1,200 rpm. Depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking. <li>(6) Maintain the vehicle speed at 40 – 50 mph. Keep the vehicle running for 1 – 2 minutes after starting acceleration. <p>HINT: If any malfunction is detected, the malfunction indicator lamp will light up during step (6).</p> <p>NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.</p>		

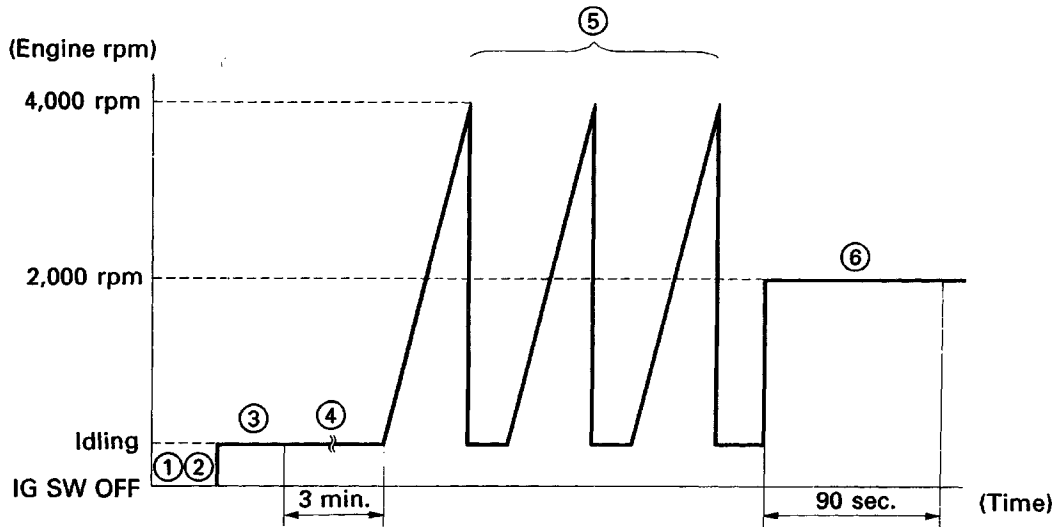
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (5S-FE) (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	25	Air-Fuel Ratio Lean Malfunction
	26	Air-Fuel Ratio Rich Malfunction

Malfunction: Open or Short in Main Oxygen Sensor



P02491

- (1) Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF.
- (2) Initial test mode: Connect terminals TE2 and E1 of data link connector 1 with ignition switch OFF.
- (3) Start the engine and warm the engine up, with all accessory switches OFF.
- (4) After the engine is warmed up, let it idle for 3 minutes.
- (5) Accelerate rapidly to 4,000 rpm three times.
- (6) Maintain at 2,000 rpm for 90 seconds.

HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

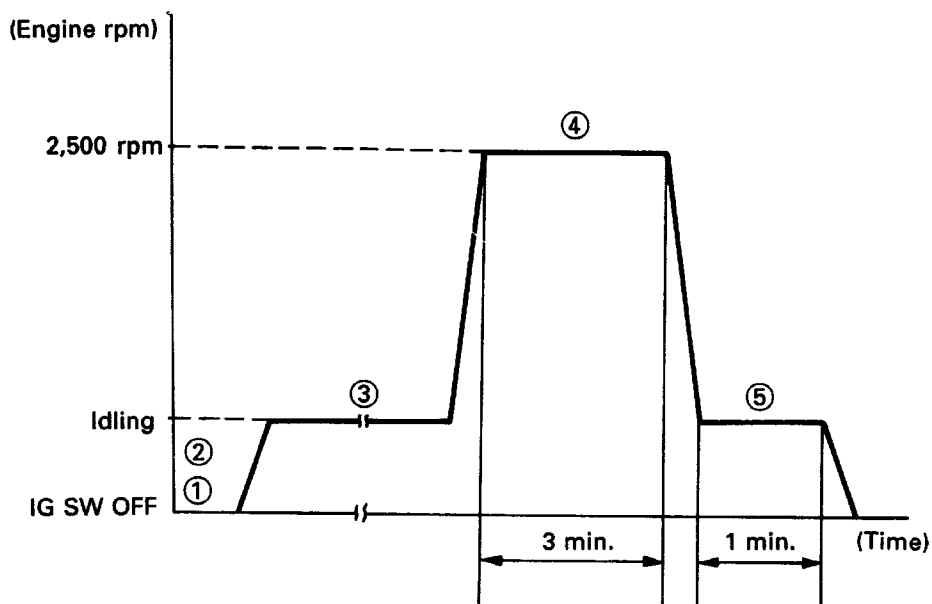
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (5S-FE) (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	25	Air-Fuel Ratio Lean Malfunction (California)
	26	Air-Fuel Ratio Rich Malfunction (California)

Malfunction: Open or Short in Oxygen Sensor, Open or Short in Injector Leak, Blockage, Loose Engine Earth Bolt



P01711

HINT: Before this test, check the feedback voltage for oxygen sensor.

- (1) Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF.
- (2) Initiate test mode: Connect terminals TE2 and E1 of data link connector 1 with ignition switch OFF.
- (3) Start the engine and warm the engine up.
- (4) After the engine is warmed up, maintain at 2,500 rpm for 3 minutes.
- (5) Let it idle for 1 minute.

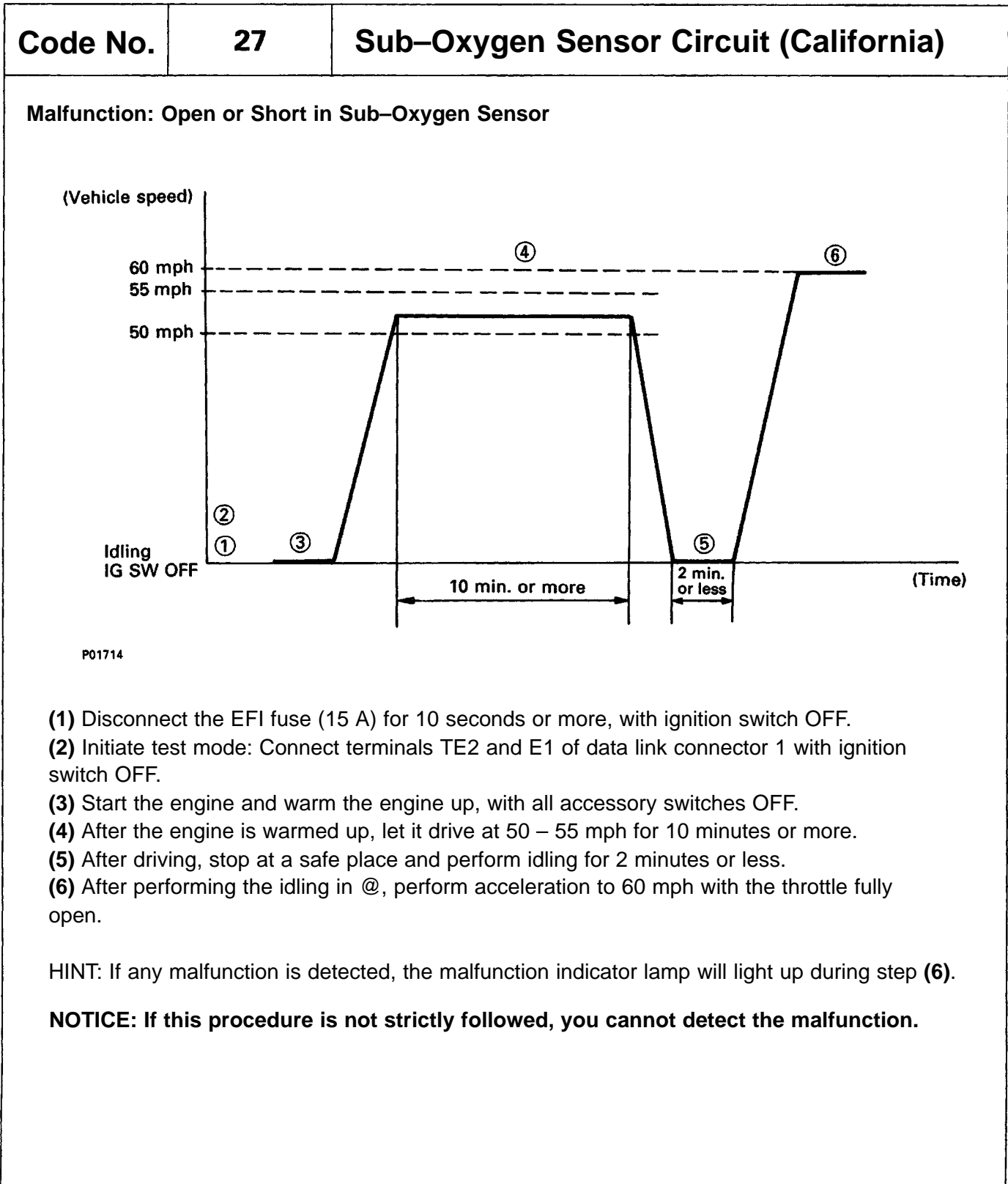
HINT: If any malfunction is detected, the malfunction indicator lamp will light up during step 0.

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (5S-FE) (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.



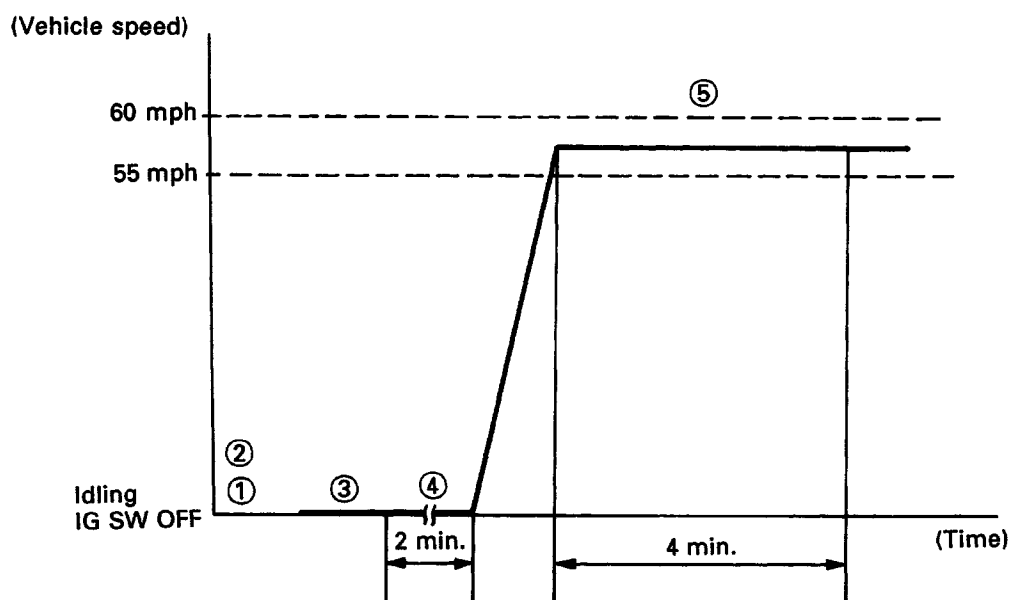
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (5S-FE) (Cont'd)

Purpose of the driving pattern.

- (a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
- (b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	71	EGR System Malfunction (California)
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Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose, Valve Stuck



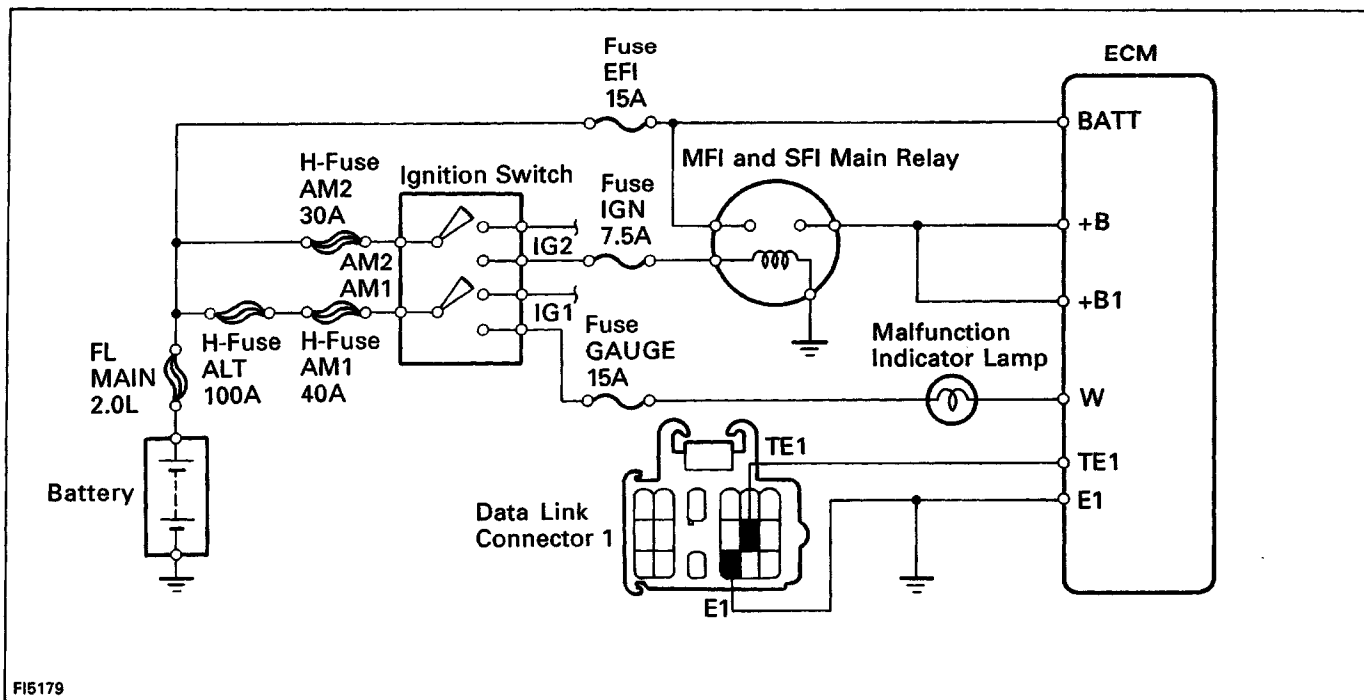
P01712

- (1) Disconnect the fuse EFI (15 A) for 10 seconds or more, with ignition switch OFF.
- (2) Initiate test mode: Connect terminals TE2 and E1 of data link connector 1 with ignition switch OFF.
- (3) Start engine and warm engine up.
- (4) After engine is warmed up, let it idle for 3 minutes.
- (5) With the A/C switch OFF and transmission in 5th gear ("D" position for AM, drive at 55 – 60 mph for 4 minutes.

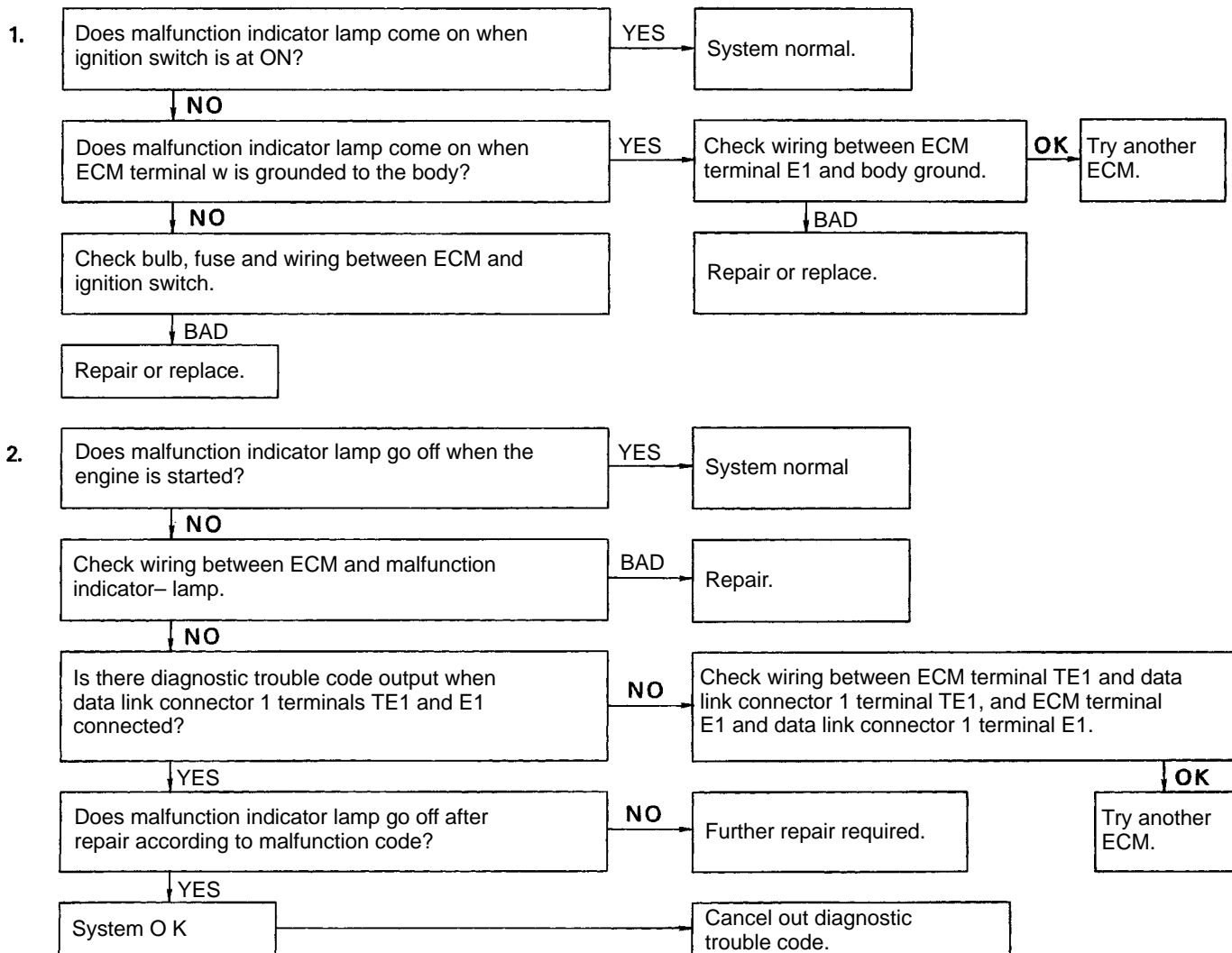
HINT: If any malfunction is detected, the malfunction indicator lamp will light up during step (5).

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

INSPECTION OF DIAGNOSIS CIRCUIT



FI5179

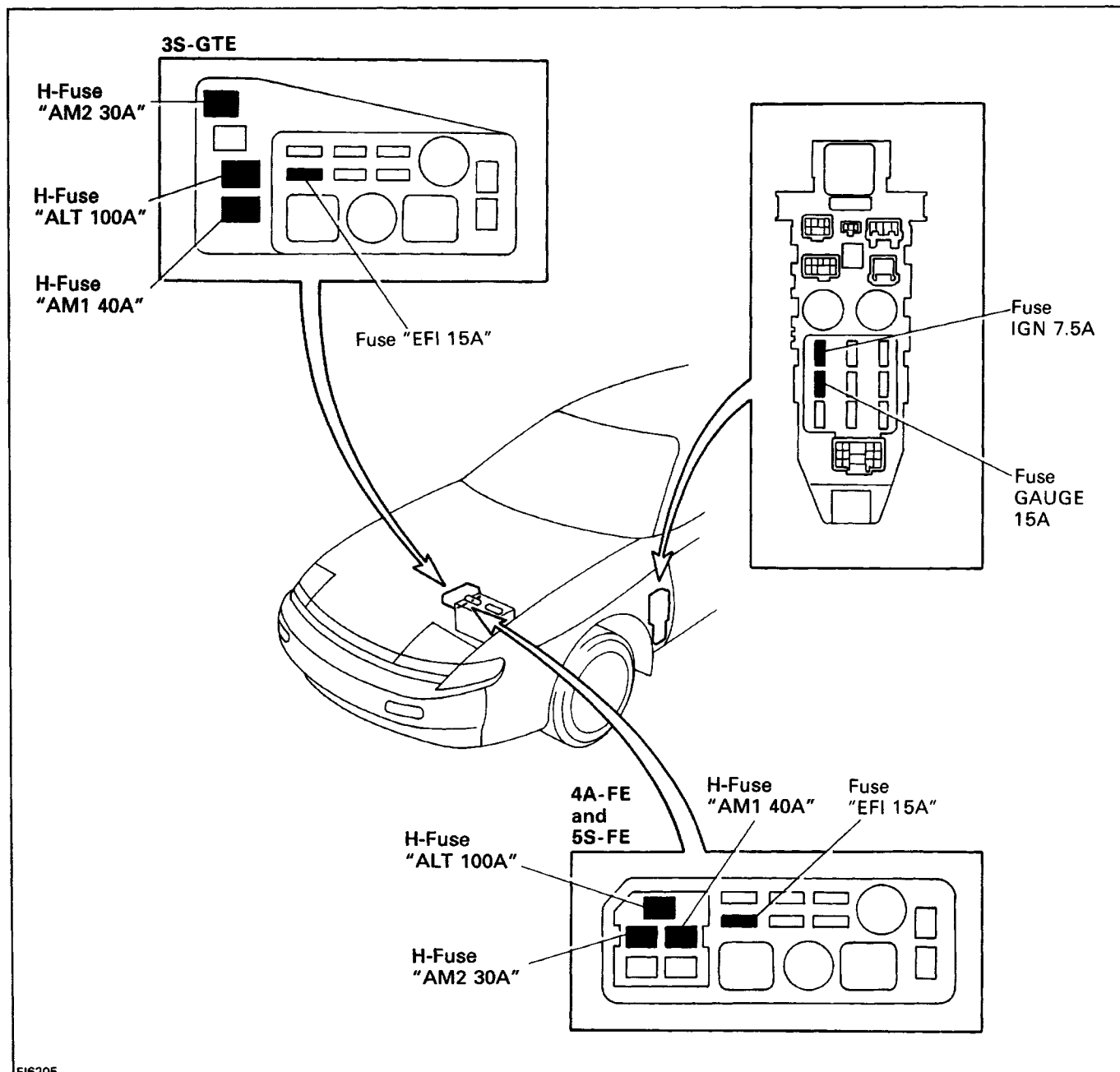


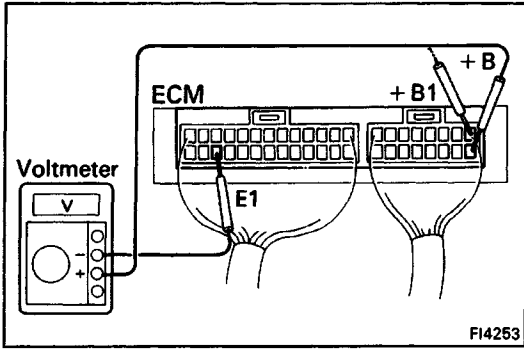
TROUBLESHOOTING WITH VOLT/OHMMETER

HINT:

- The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat. However, troubleshooting should be performed while referring to the inspection methods described in this manual.
- Before beginning inspection, it is best to first make a simple check of the fuses, fusible links and the condition of the connectors.
- The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit within the computer.
- If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECM is faulty and should be replaced.

LOCATION OF FUSES AND FUSIBLE LINKS





MFI SYSTEM CHECK PROCEDURE (4A-FE)

HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position.

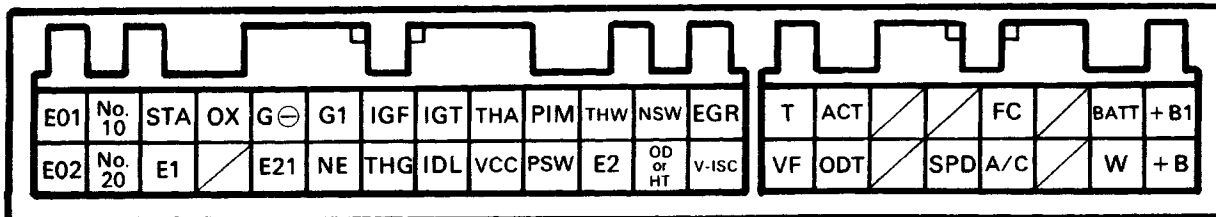
Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of Engine ECM (4A-FE)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	IGT	IGNITER	ACT	A/C AMPLIFIER
E02	POWER GROUND	IDL	THROTTLE POSITION SENSOR	*2ODT	O/D SOLENOID
No.10	INJECTOR	THA	INTAKE AIR TEMP. SENSOR		-
No.20	INJECTOR	VCC	VACUUM SENSOR		
STA	STARTER SWITCH	PIM	VACUUM SENSOR		
E1	ENGINE GROUND	PSW	THROTTLE POSITION SENSOR	SPD	SPEED SENSOR
OX	OXYGEN SENSOR	THW	ENGINE COOLANT TEMP. SENSOR	FC	CIRCUIT OPENING RELAY
	-	E2	SENSOR GROUND	A/C	A/C COMPRESSOR
G⊖	DISTRIBUTOR GROUND	N SW	PARK/NEUTRAL POSITION SWITCH		-
E21	SENSOR GROUND	*1 OD *2 H T	O/D SOLENOID OXYGEN SENSOR HEATER		
G1	DISTRIBUTOR	EGR	EGR VSV	BATT	BATTERY
NE	DISTRIBUTOR	V-ISC	ACV VSV	W	MALFUNCTION INDICATOR LAMP
IGF	IGNITER	T	DATA LINK CONNECTOR 1	+B1	MFI MAIN RELAY
" THG	EGR GAS TEMP. SENSOR	VF	DATA LINK CONNECTOR 1	B	MFI MAIN RELAY

ECM Terminals

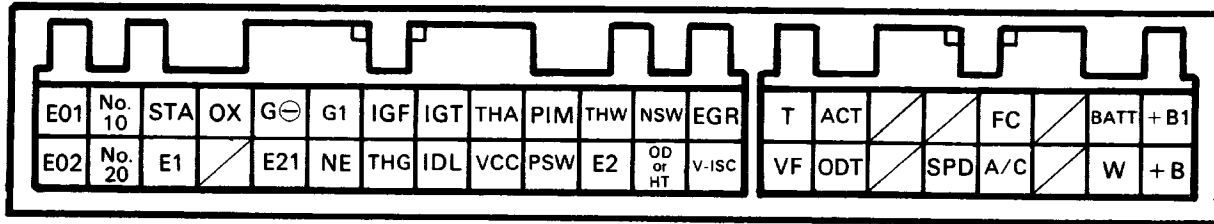
*1 CALIF. only
*2 Ex. CALIF.



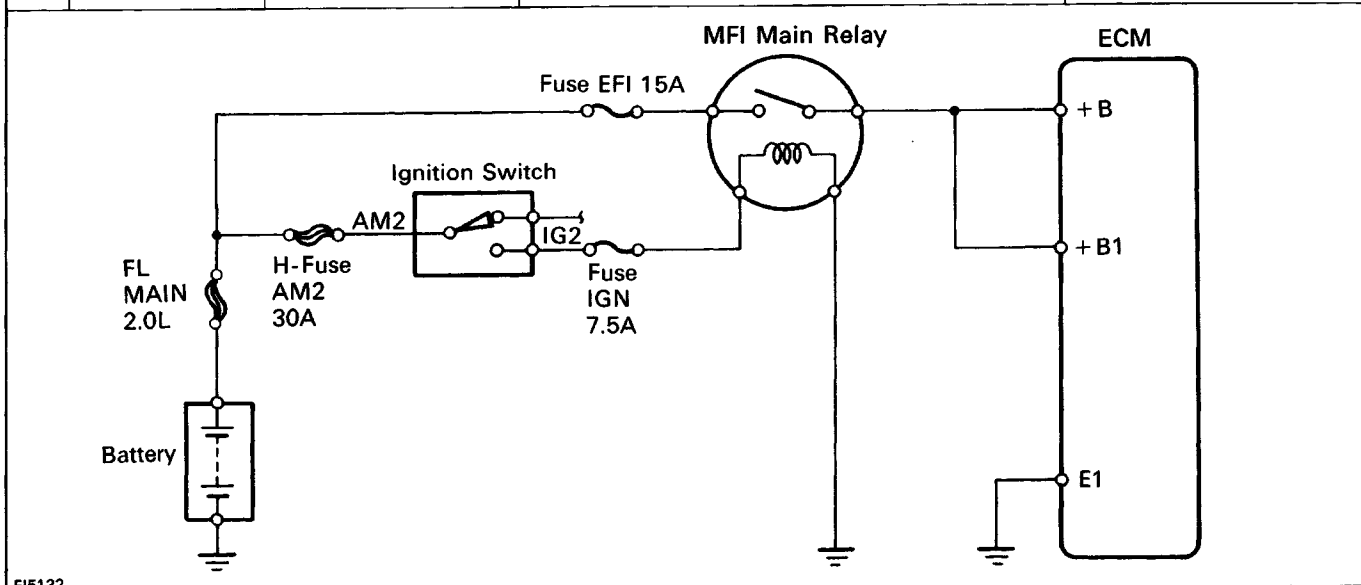
Voltage at ECM Wiring Connectors (4A-FE) (4A-FE)

No.	Terminals	Condition		STD voltage (V)	See page
1	+B-E1 + B1	IG SW ON		10-14	FI-61
2	BATT - E 1	-		10-14	FI-62
3	IDL - E2	IG SW ON	Throttle valve open	10-14	FI-63
	PSW - E2		Throttle valve fully closed	10-14	
4	PIM - E2	IG SW ON		3.3-3.9	FI-64
	VCC - E2			4.5-5.5	
5	No. 10 E01 No. 20 E02				
6	THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1-3	FI-66
7	THW - E2		Engine coolant temp. 80°C (176°F)	2.0-2.8	FI-67
8	STA - E1	Cranking		6-14	FI-68
9	IGT - E1	Cranking or idling		0.7-1.0	FI-69
10	W - E1	No trouble (malfunction indicator lamp off) and engine running		10-14	FI-70
11	A/C - E1	IG SW ON	Air conditioning ON	8-14	FI-71

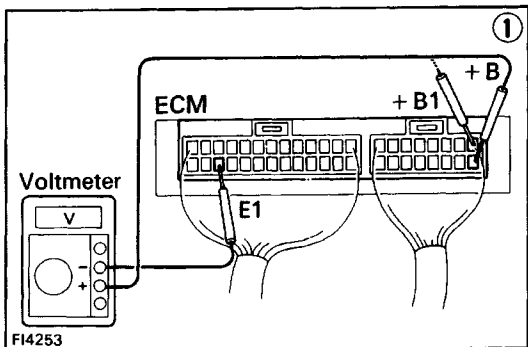
ECM Terminals



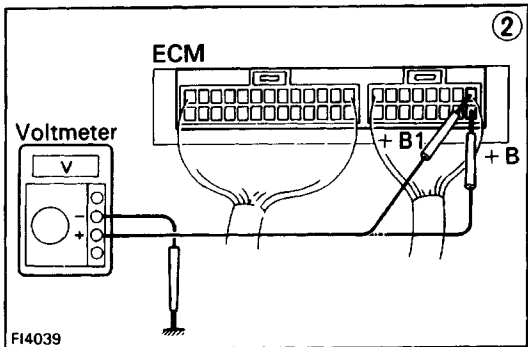
No.	Terminals	Trouble	Condition	STD voltage
1	+B-E1 + B1	No voltage	IG SW ON	10 - 14 V



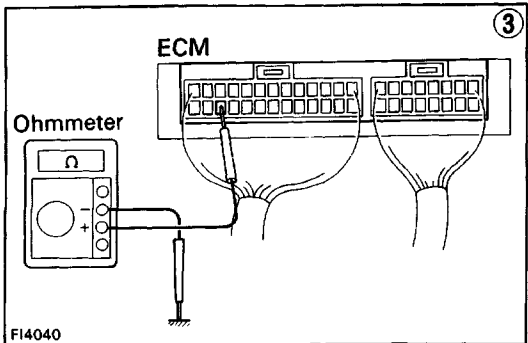
FI5132



FI4253



FI4039



FI4040

(1) There is no voltage between ECM terminals + B or + B1 and E1. (IG SW ON)

(2) Check that there is voltage between ECM terminal +B or +B1 and body ground. (IG SW ON)

NO → Check fuses, H-fuse, fusible link and ignition switch.
 OK → (3) Check wiring between ECM terminal E1 and body ground.

(3) Check wiring between ECM terminal E1 and body ground.

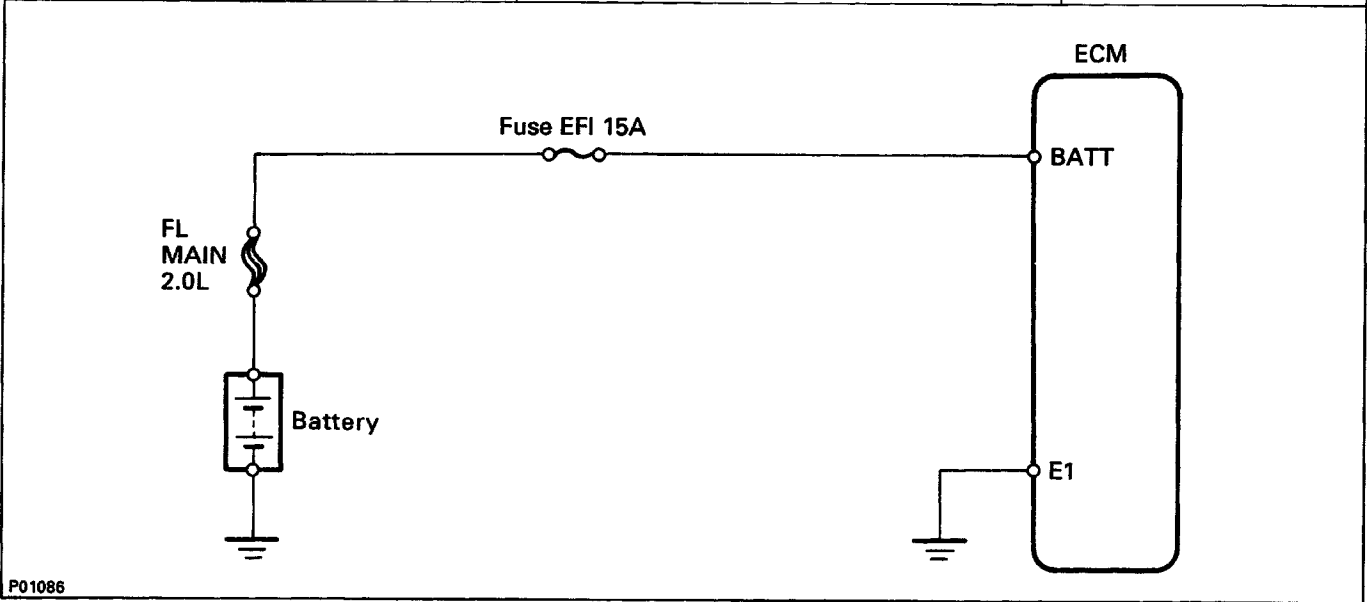
OK → Try another ECM.
 BAD → Repair or replace.

Check fuses, H-fuse, fusible link and ignition switch.
 BAD → Repair or replace.

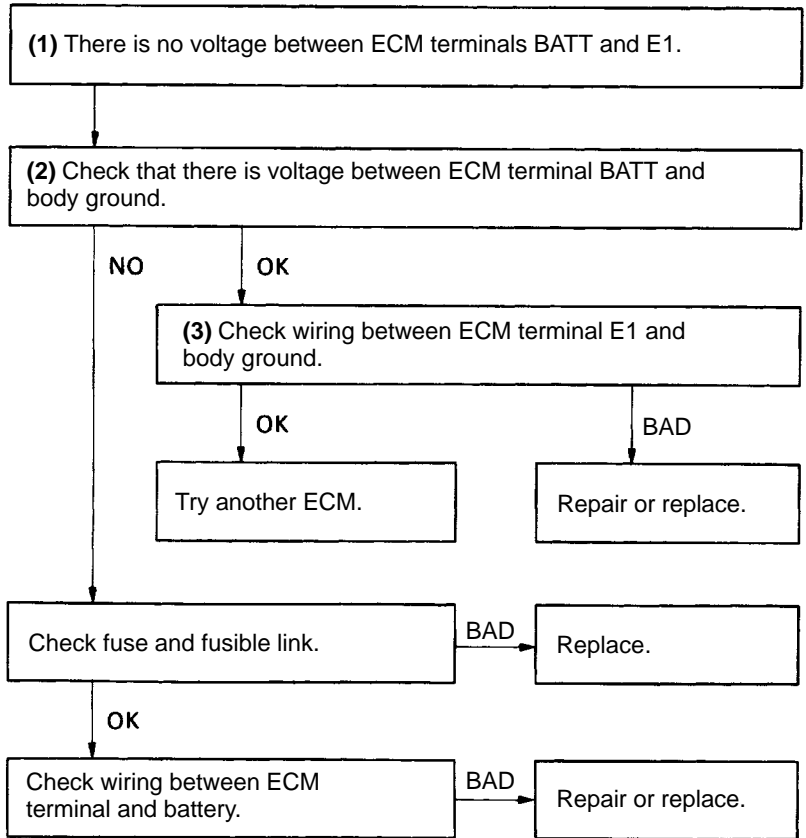
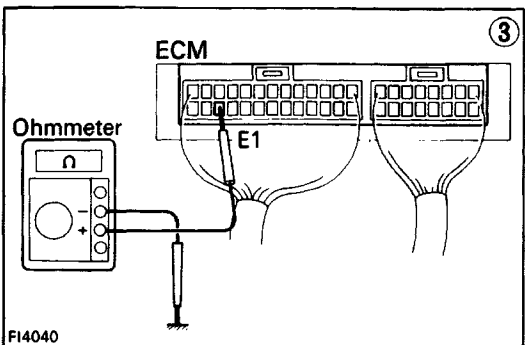
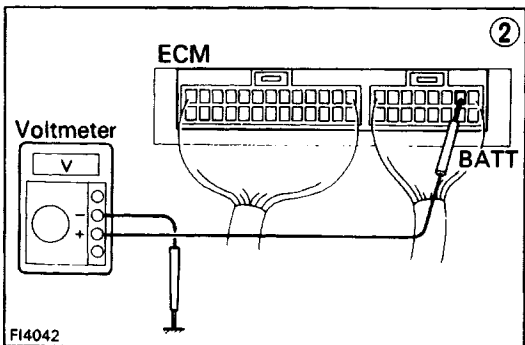
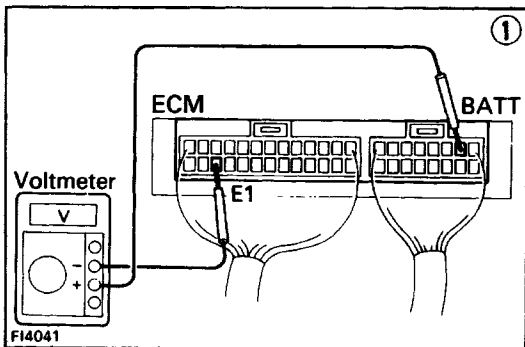
Check MFI main relay. (See page FI-216)
 BAD → Replace.

Check wiring between MFI main relay and battery.
 BAD → Repair or replace.

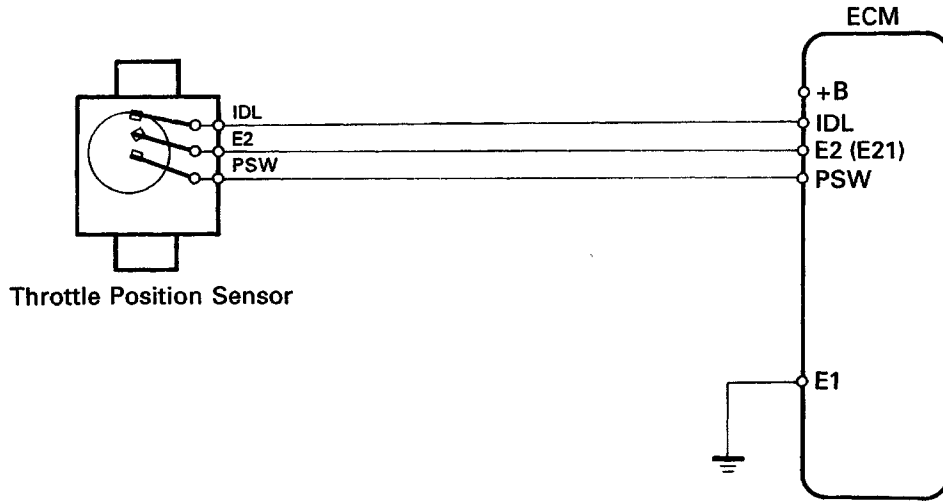
No.	Terminals	Trouble	Condition	STD voltage
2	+B +B1	No voltage	-	10 - 14 V



P01086

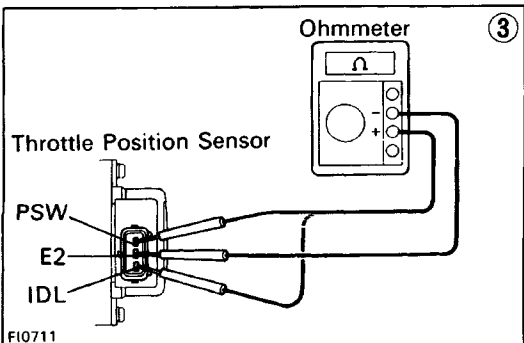
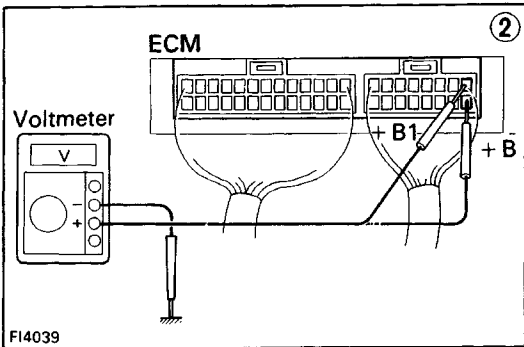
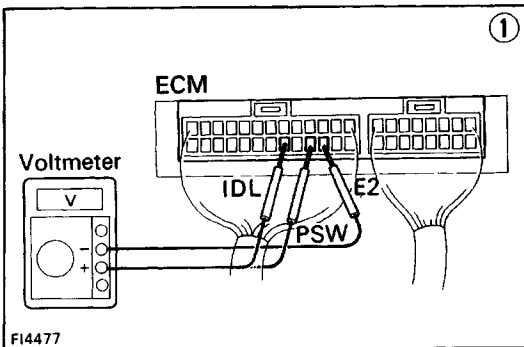


No.	Terminals	Trouble	Condition	STD voltage	
3	IDL - E2	No voltage	IG SW ON	Throttle valve open	10 - 14 V
	PSW - E2			Throttle valve fully closed	10 - 14 V



P02927

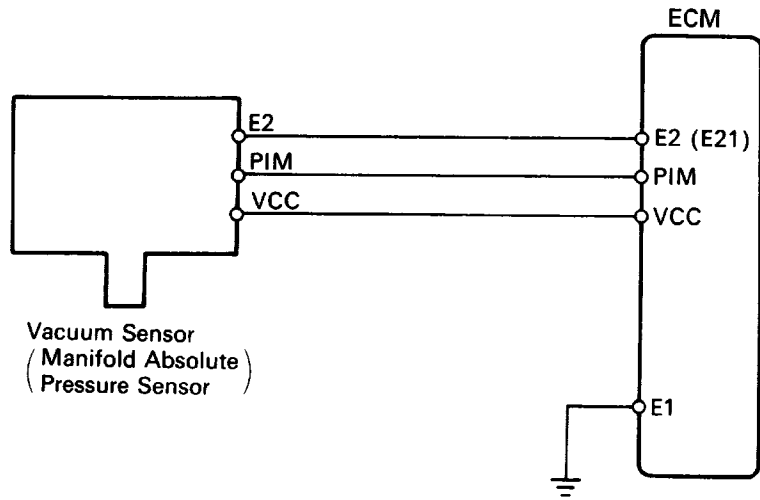
• IDL-E2, PSW-E2



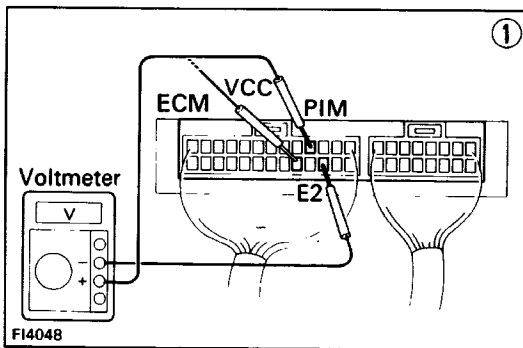
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    graph TD
      A["(1) There is no voltage between ECM terminals IDL or PSW and E2. (IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal +B or +B1 and body ground. (IG SW ON)"]
      B -- NO --> C["Refer to No.1. 1See page FI-61 j"]
      B -- OK --> D["Check wiring between ECM terminal E1 and body ground."]
      D -- OK --> E["Try another ECM."]
      D -- BAD --> F["Repair or replace."]
      C -- BAD --> G["Repair or replace."]
      C -- OK --> H["(3) Check throttle position sensor.(See page FI-185)"]
      H -- BAD --> I["Replace or repair throttle position sensor."]
      H -- OK --> J["Check wiring between ECM and throttle position sensor."]
      J -- OK --> K["Try another ECM."]
  
```

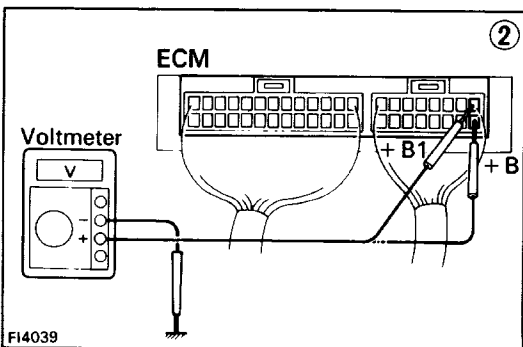
No.	Terminals	Trouble	Condition	STD voltage
4	PIM - E2	No voltage	IG SW ON	3.3 - 3.9 V
	VCC-E2			4.5 - 5.5 V



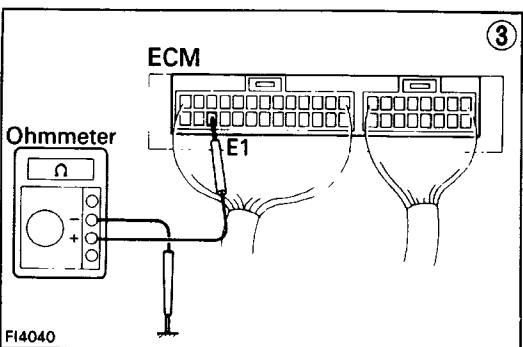
FI1226



FI4048

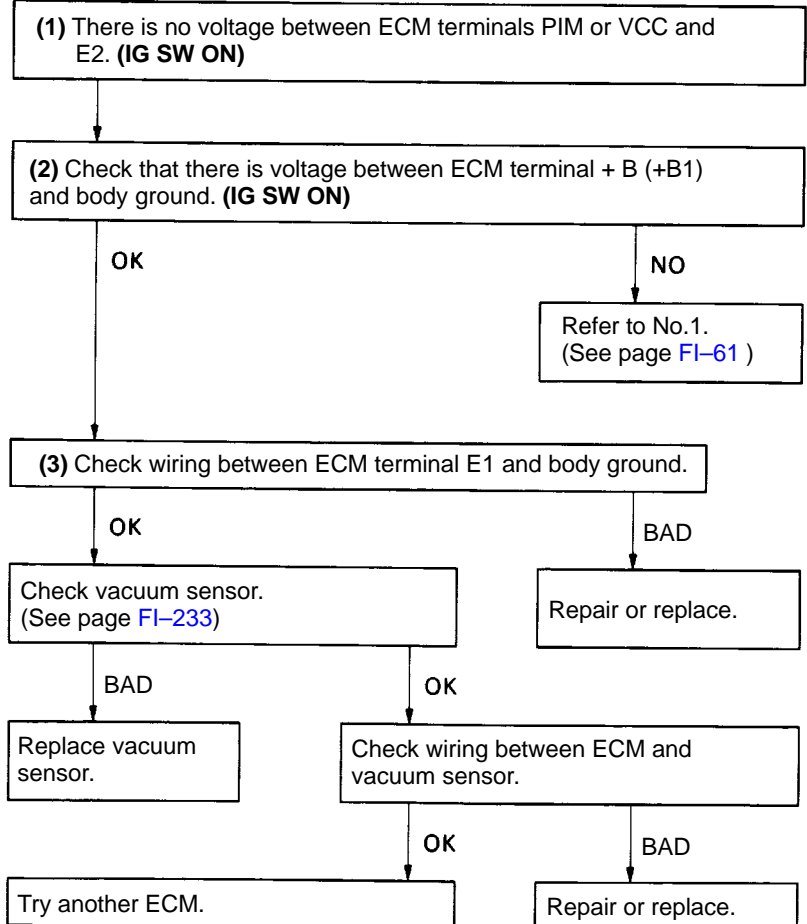


FI4039

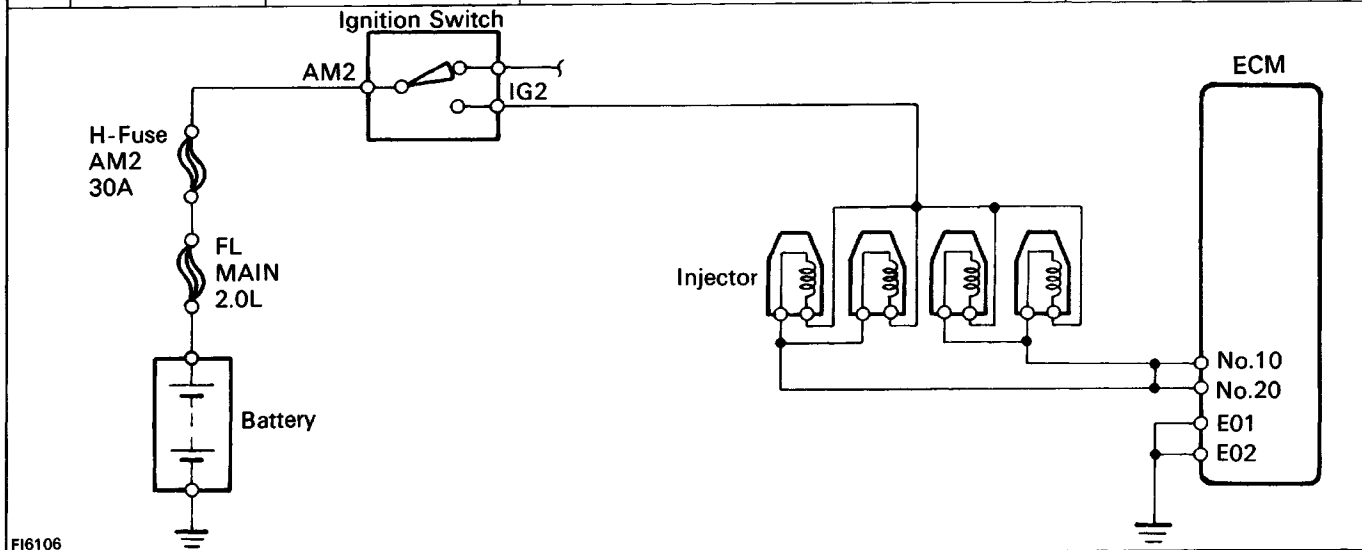


FI4040

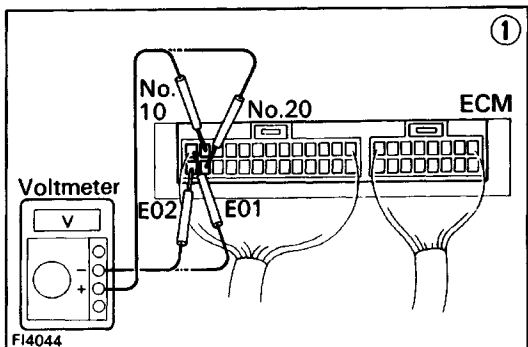
• PIM - E2, VCC - E2



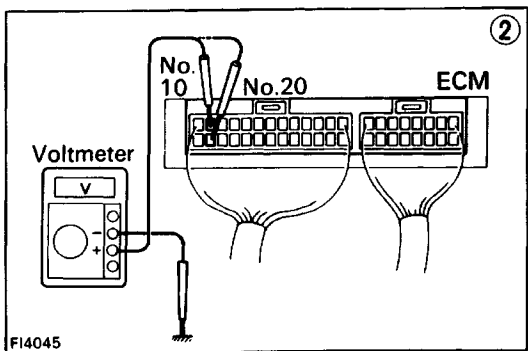
No.	Terminals	Trouble	Condition	STD voltage
5	No.10 - E01 No.20 - E02	No voltage	IG SW ON	10 - 14 V



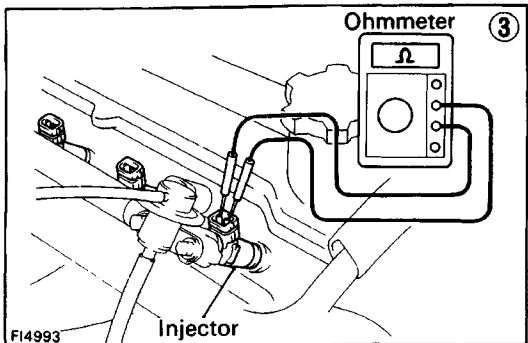
FI6106



FI4044



FI4045

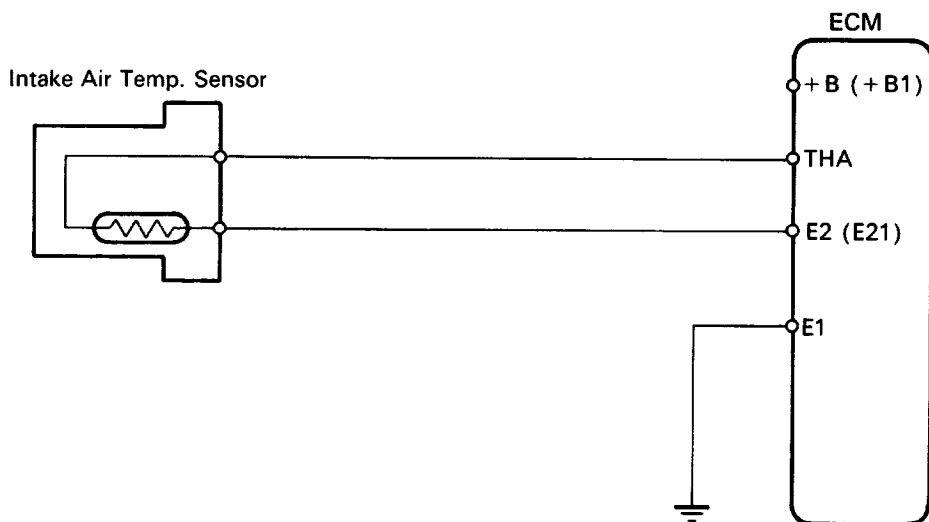


FI4993

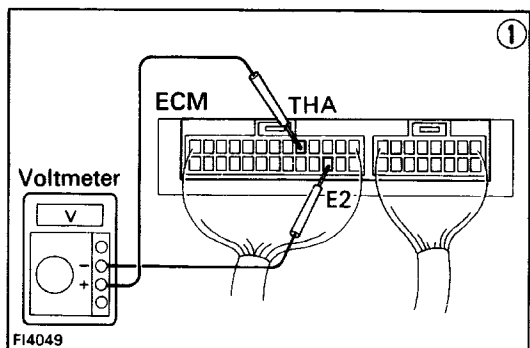
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    graph TD
      Step1["(1) There is no voltage between ECM terminals No.10 and / or No.20 and E01 and / or E02. (IG SW ON)"]
      Step2["(2) Check that there is voltage between ECM terminal No.10 and / or No. 20 and body ground."]
      Step3["(3) Check resistance of each injector. STD resistance. Approx. 13.8Ω"]
      
      Step1 --> Step2
      Step2 -- NO --> Fuse["Check H-fuse, fusible link and ignition switch."]
      Step2 -- OK --> Step3
      
      Fuse -- BAD --> FuseFix["Repair or replace."]
      Fuse -- OK --> Step3
      
      Step3 -- BAD --> InjectorFix["Replace injector."]
      Step3 -- OK --> Wiring["Check wiring between ECM terminal No-10 and / or No.20 and battery."]
      
      Wiring -- BAD --> WiringFix["Repair or replace."]
      Wiring -- OK --> End[" "]
      
      Step2 --> E01["Check wiring between ECM terminal E01 and I or E02 and body ground."]
      E01 -- OK --> TryECM["Try another ECM."]
      E01 -- BAD --> E01Fix["Repair or replace."]
  
```

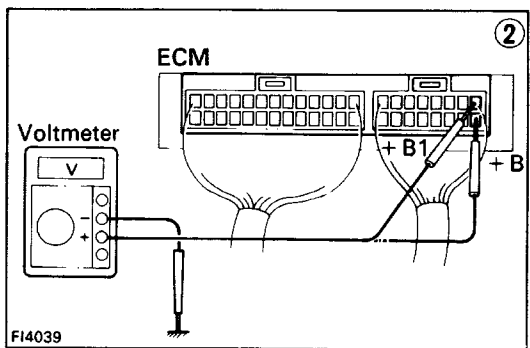
No.	Terminals	Trouble	Condition		STD voltage
6	THA-E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	1 - 3 V



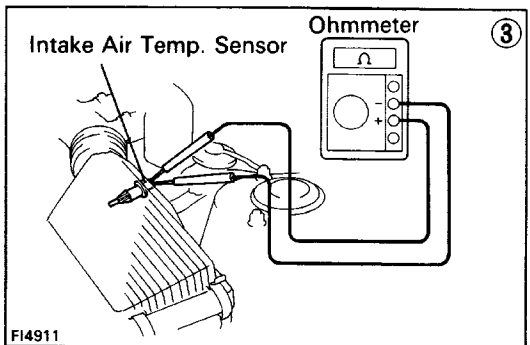
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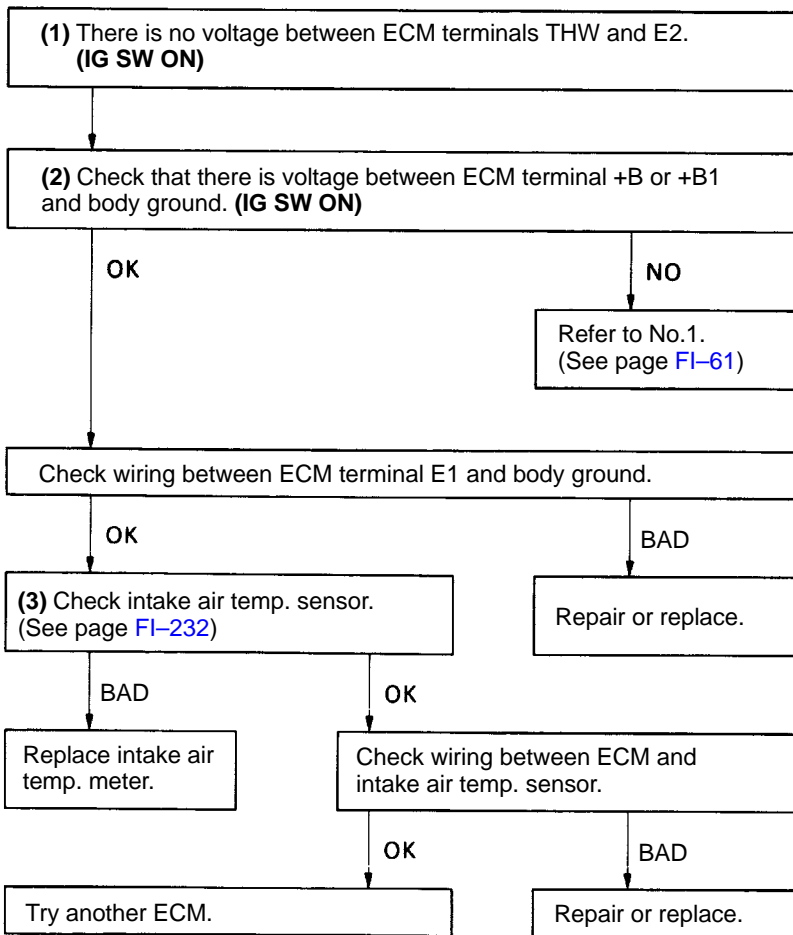
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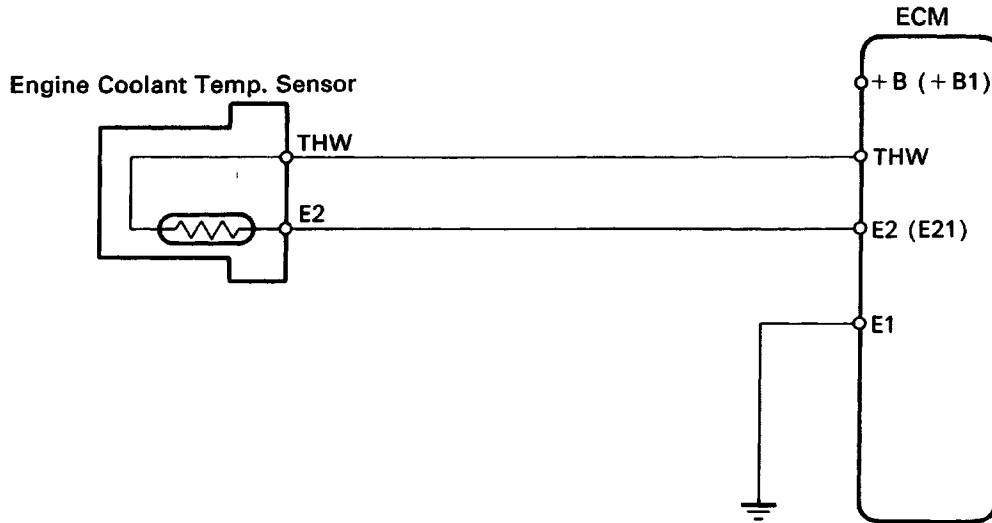
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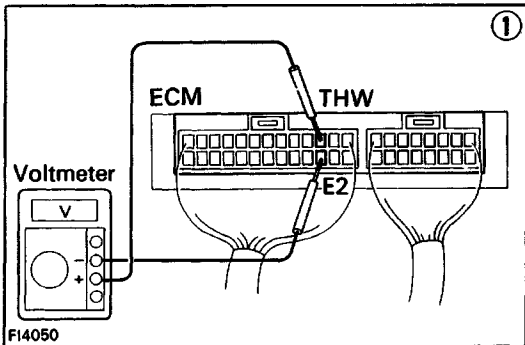
FI4911



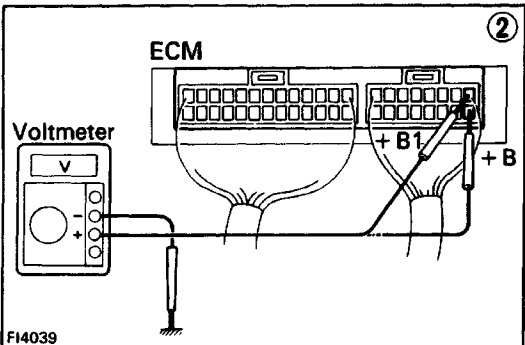
No.	Terminals	Trouble	Condition		STD voltage
7	THW- E2	No voltage	IG SW ON	Engine coolant temperature 80°C (176°F)	0.1 - 1.0 V



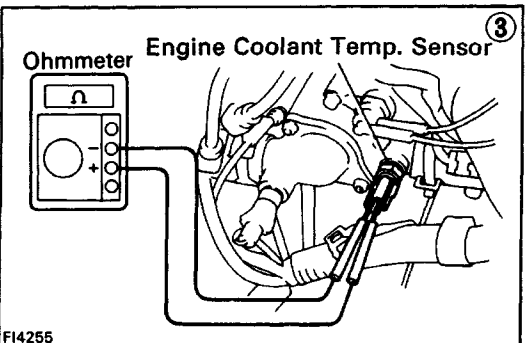
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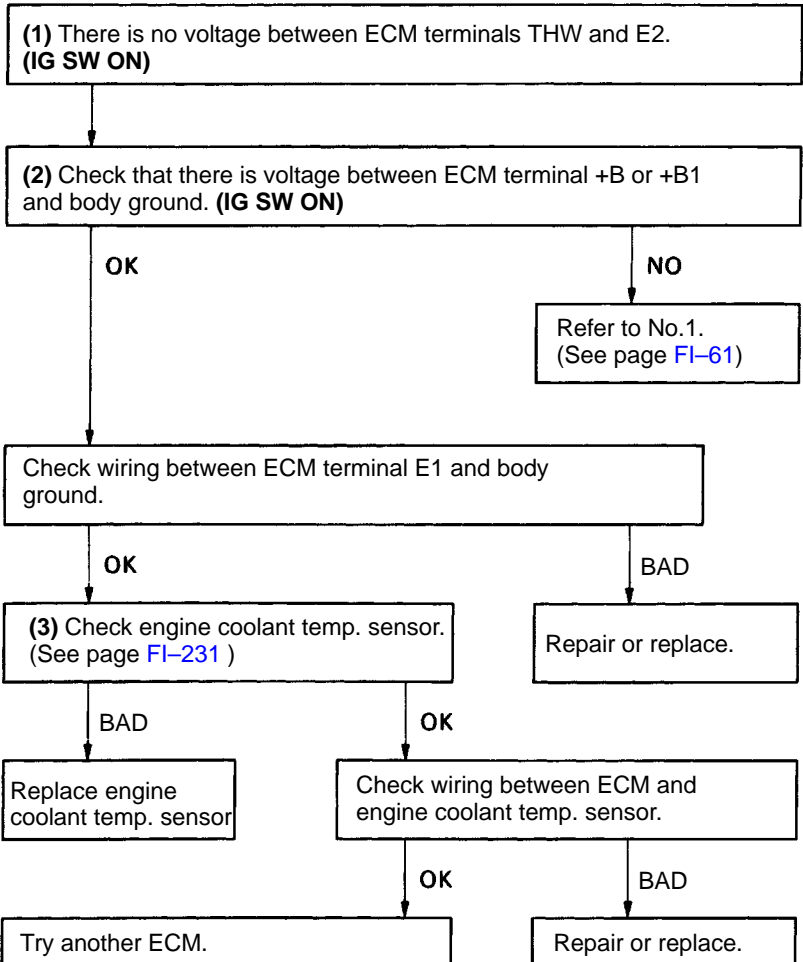
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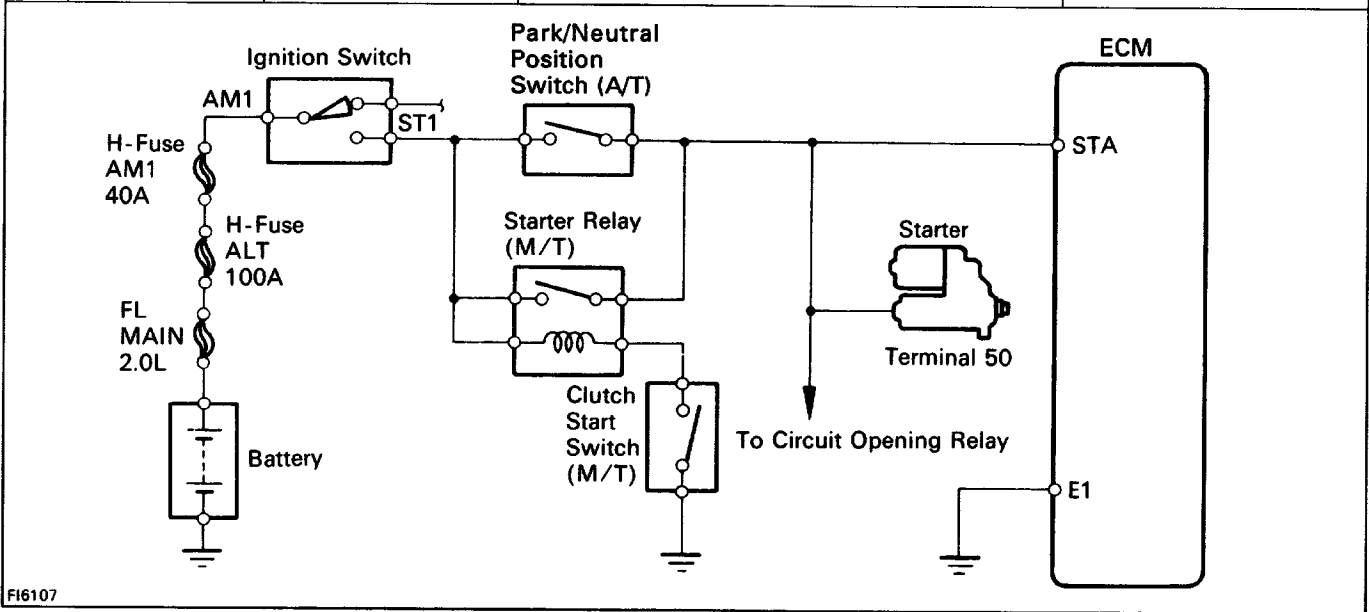
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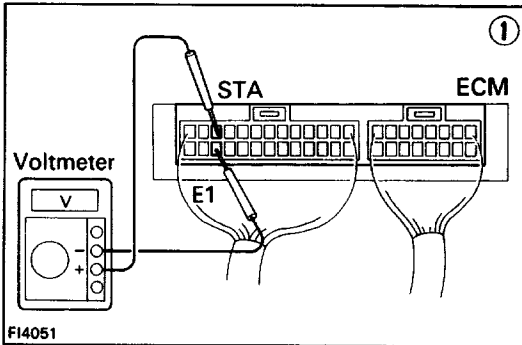
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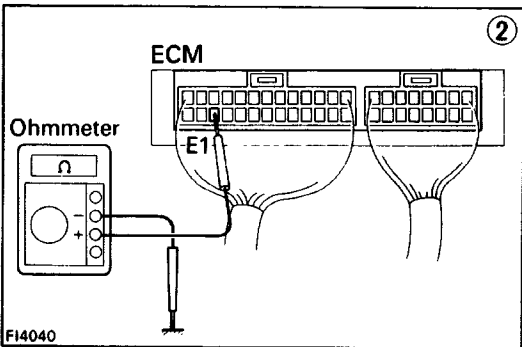
No.	Terminals	Trouble	Condition	STD voltage
8	STA - E1	No voltage	Cranking	6 - 14V



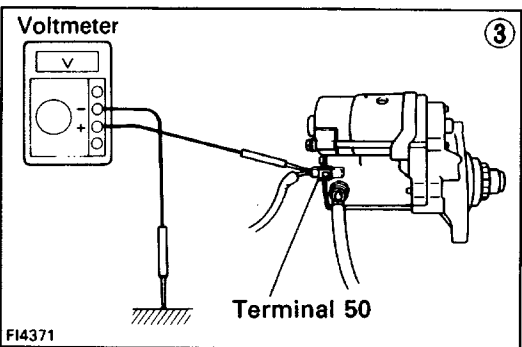
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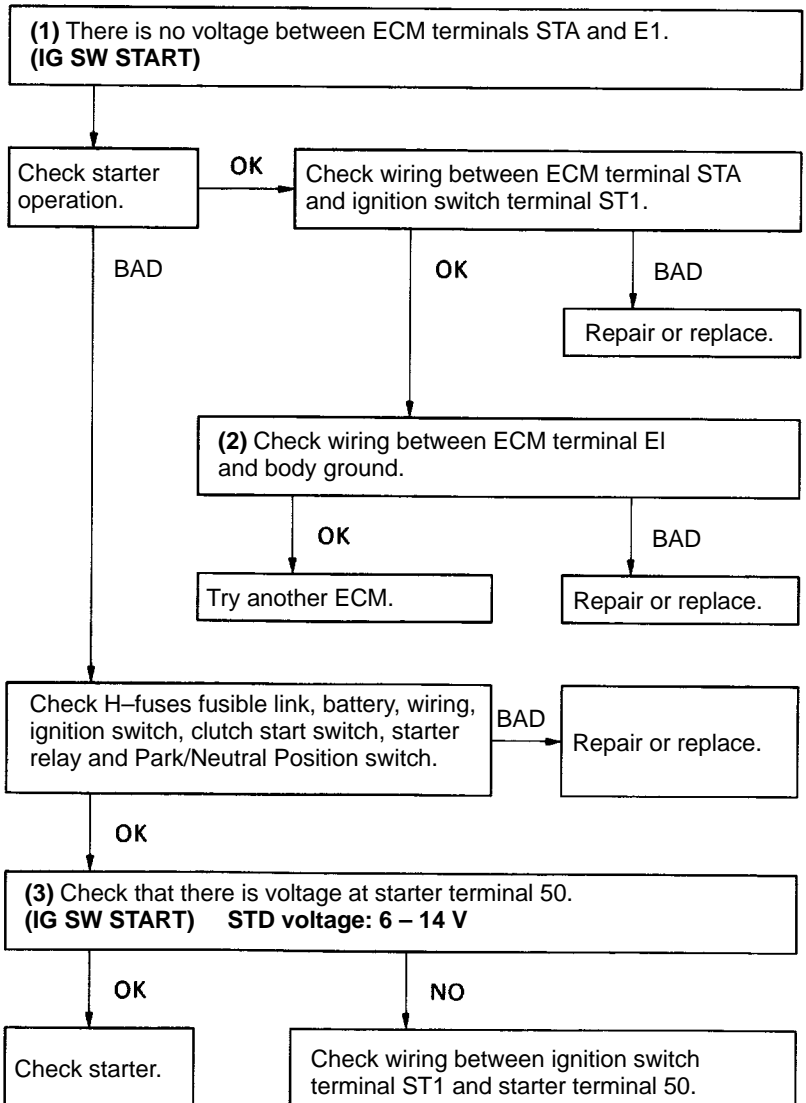
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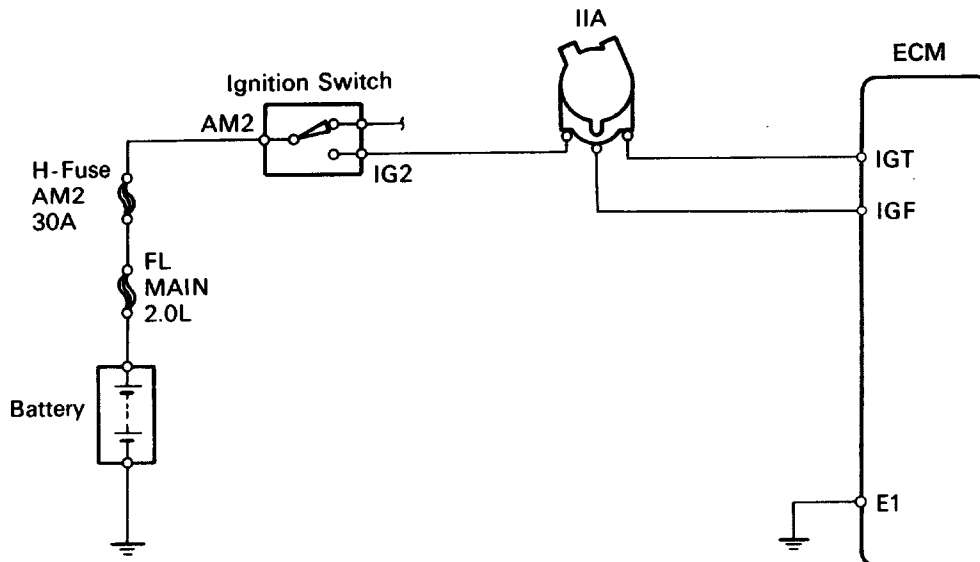
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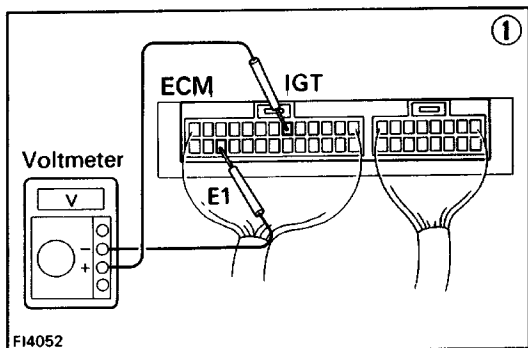
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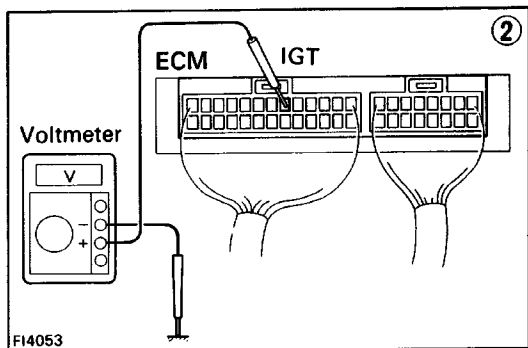
No.	Terminals	Trouble	Condition	STD voltage
9	IGT - E1	No voltage	Idling	0.7 - 1.0 V



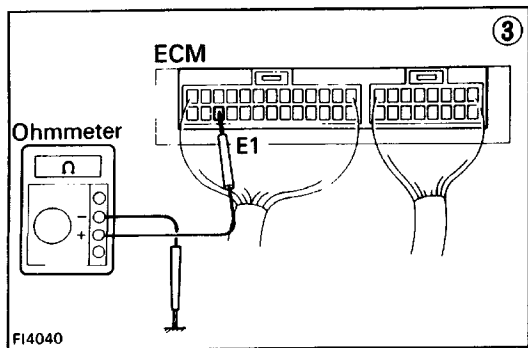
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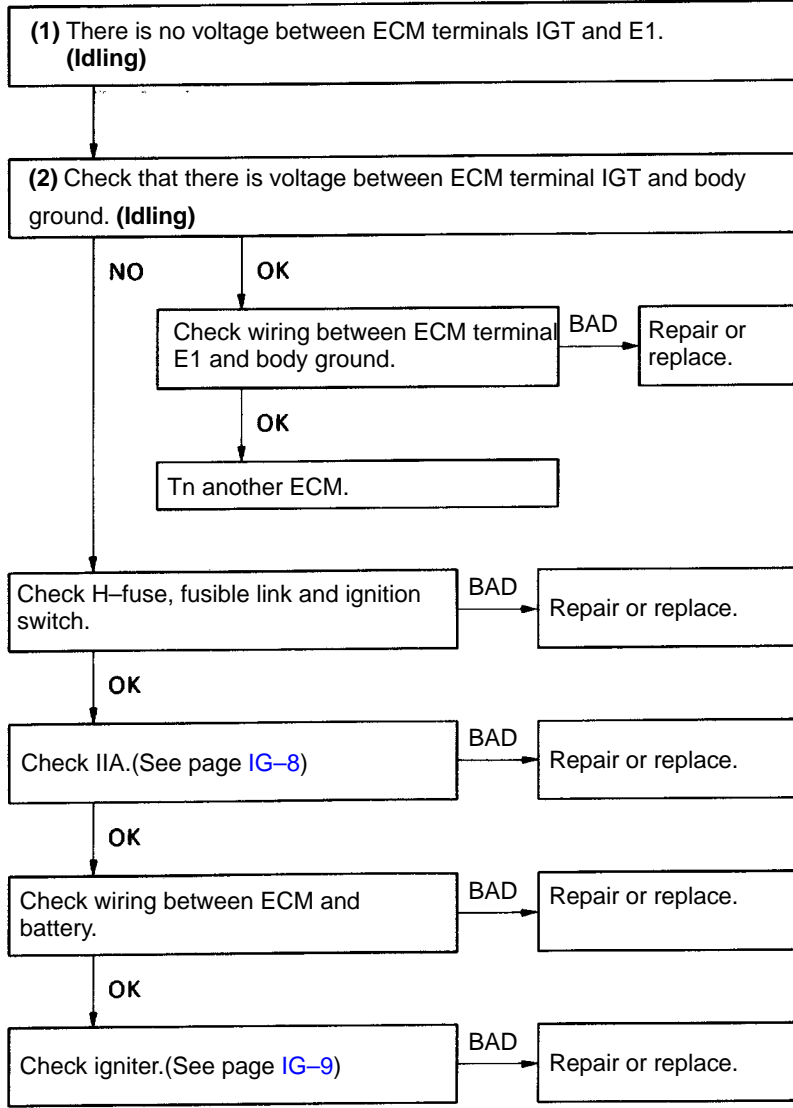
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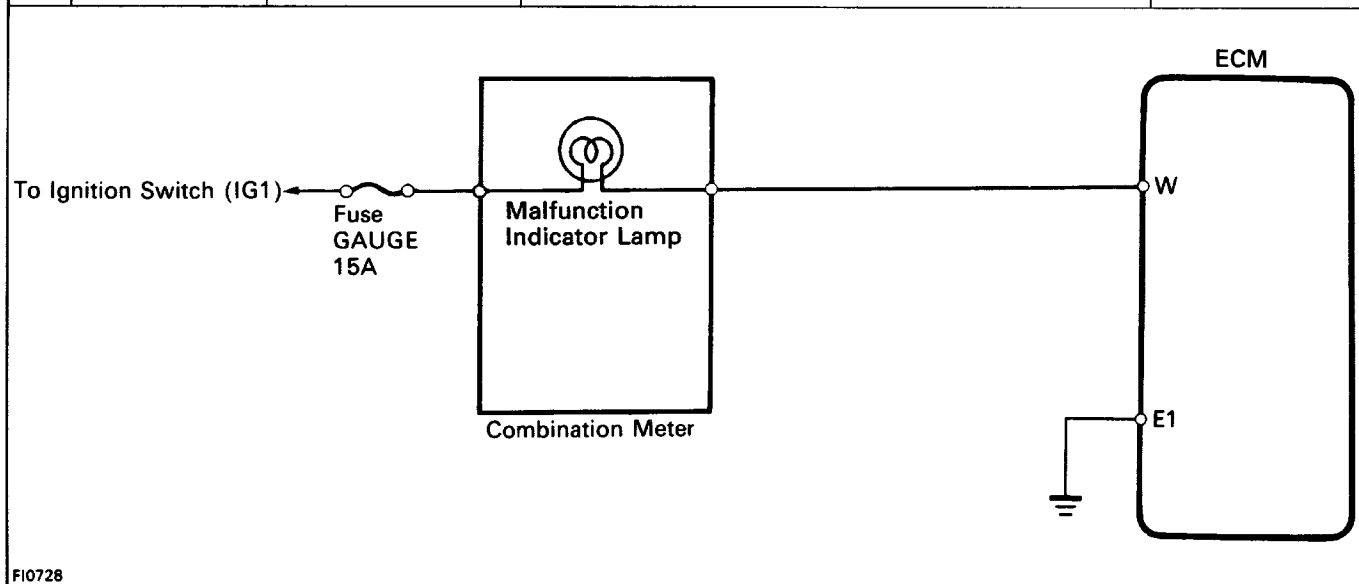
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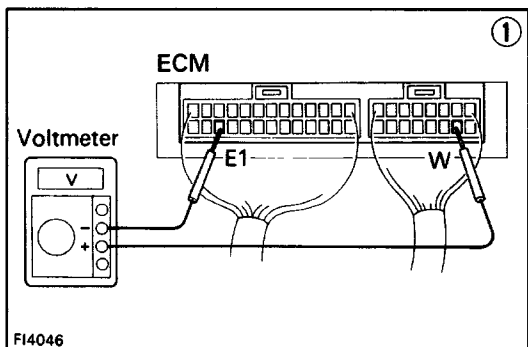
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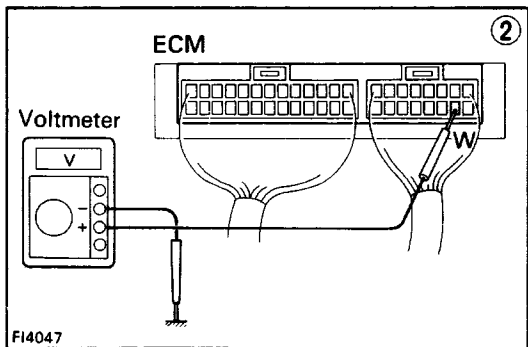
No.	Terminals	Trouble	Condition	STD voltage
10	W - E1	No voltage	No trouble (malfunction indicator lamp off) and engine running	10 - 14 V



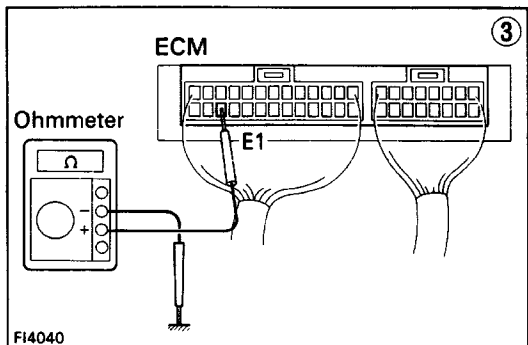
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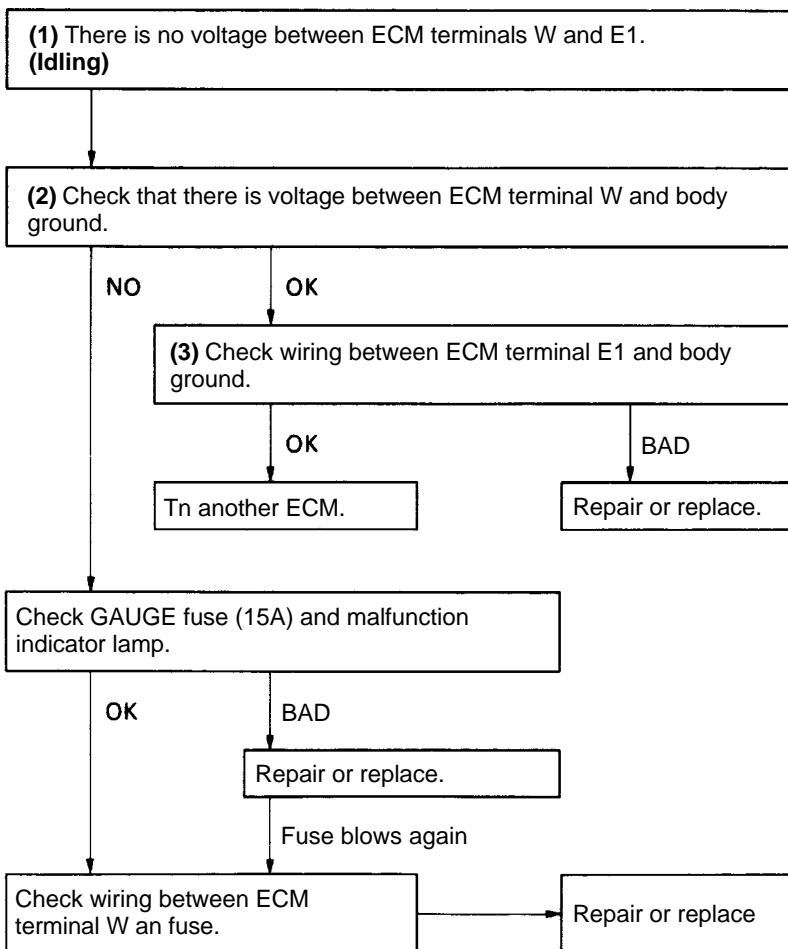
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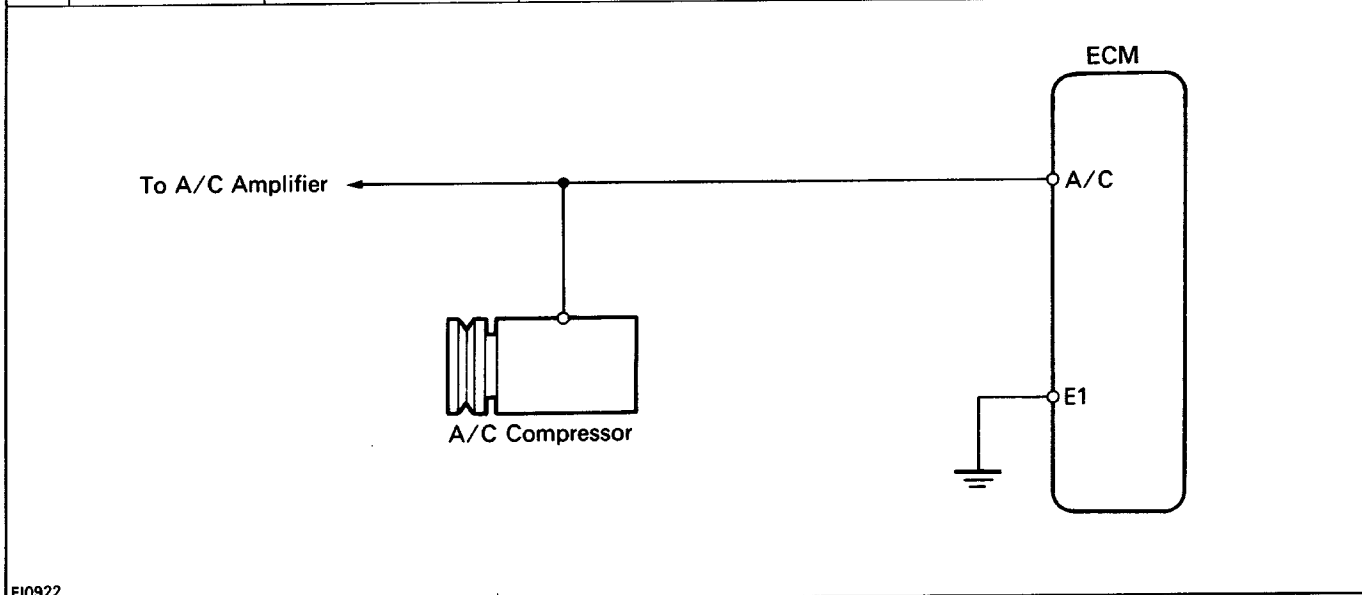
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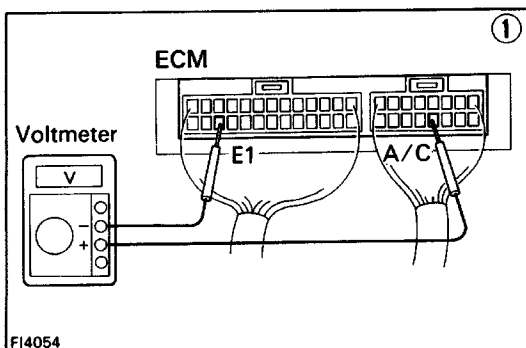
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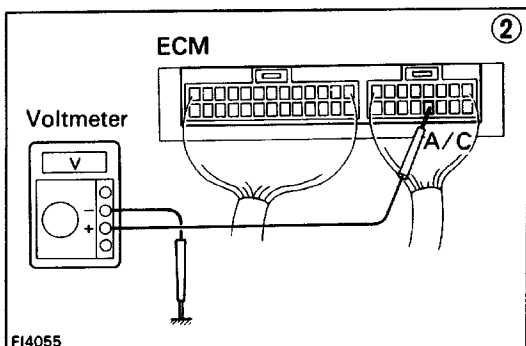
No.	Terminals	Trouble	Condition	STD voltage
11	A/C - E 1	No voltage	Air conditioning ON	8-14 V



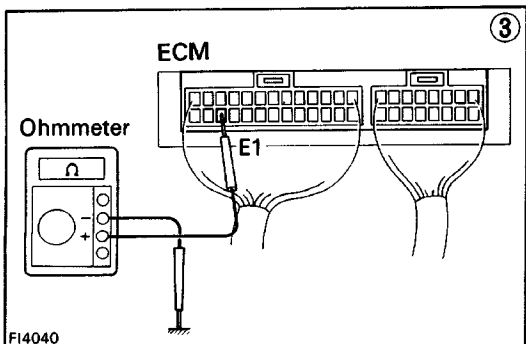
FI0922



FI4054



FI4055

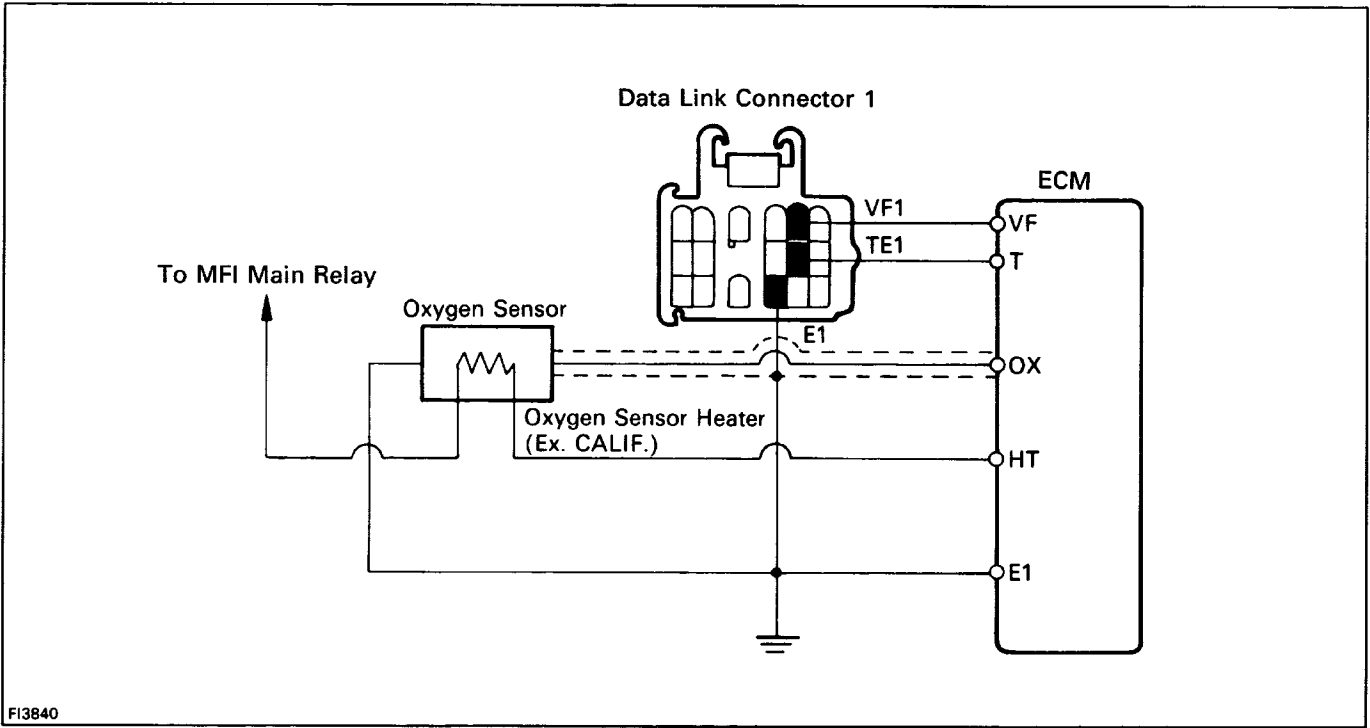


FI4040

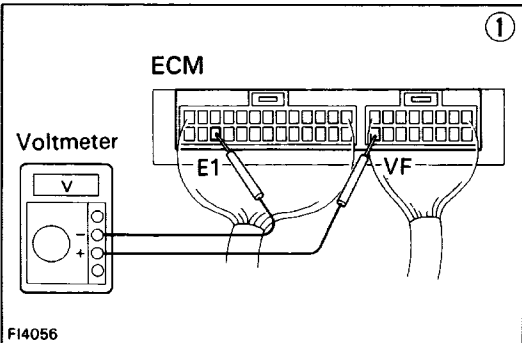
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    graph TD
      Step1["(1) There is no voltage between ECM terminals A/C and E1.  
(Air conditioning on)"]
      Step2["(2) Check that there is voltage between ECM terminal A/C and body ground."]
      Step3["(3) Check wiring between ECM terminal E1 and body ground."]
      CheckComp["Check compressor running."]
      CheckAmp["Check wiring between ECM terminal A/C and amplifier."]
      CheckAmpGnd["Check that there is voltage between amplifier terminal and body ground."]
      CheckWiring["Check wiring between amplifier and ECM or compressor."]
      TryECM["Try another ECM."]
      RepairECM["Repair or replace."]
      RepairAmp["Repair or replace."]
      RepairWiring["Repair or replace."]

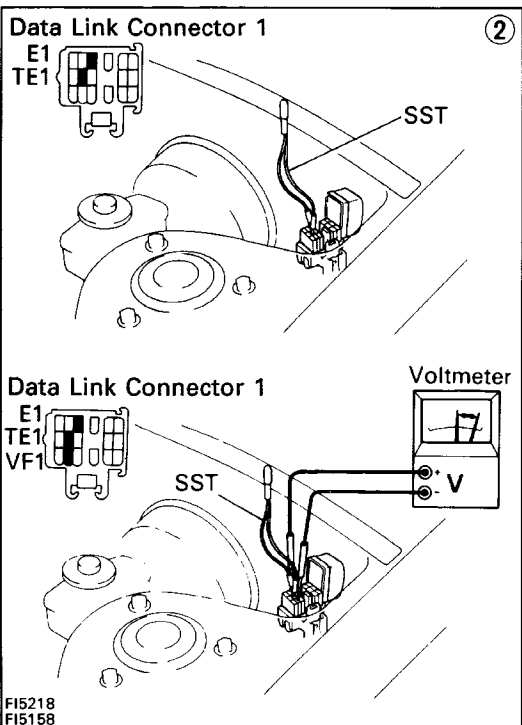
      Step1 --> Step2
      Step2 -- NO --> CheckComp
      Step2 -- OK --> Step3
      Step3 -- OK --> TryECM
      Step3 -- BAD --> RepairECM
      CheckComp -- OK --> CheckAmp
      CheckComp -- BAD --> CheckAmpGnd
      CheckAmp -- OK --> CheckWiring
      CheckAmp -- BAD --> RepairAmp
      CheckAmpGnd -- BAD --> RepairAmp
      CheckWiring -- BAD --> RepairWiring
      CheckWiring -- OK --> RepairWiring
  
```



FI3840



FI4056

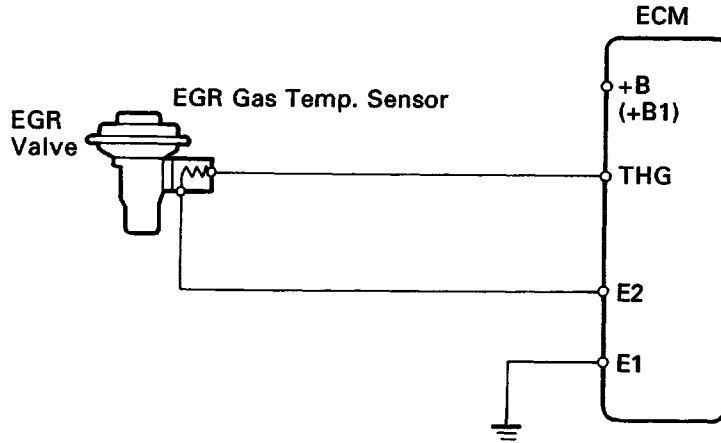


FI5218
FI5158

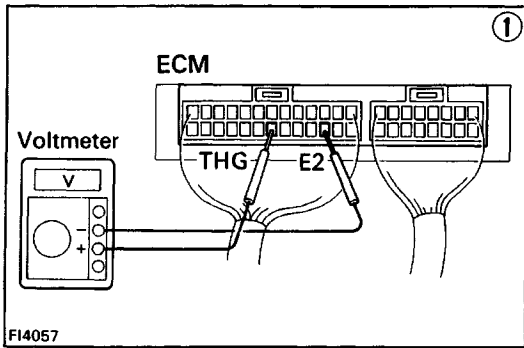
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    graph TD
      A["(1) There is no voltage between ECM terminals VF and E1."] --> B["Check that there is voltage between ECM terminal VF and body ground."]
      B -- NO --> C["Is air leaking into air induction system?"]
      B -- OK --> D["Check wiring between ECM terminal E1 and body ground."]
      D -- OK --> E["Try another- ECM."]
      D -- BAD --> F["Repair or replace."]
      C -- YES --> G["Repair air leak."]
      C -- NO --> H["Check spark plugs. (See page IG-7)"]
      H -- BAD --> I["Repair or replace."]
      H -- OK --> J["Check IIA and ignition system. (See page IG-4)"]
      J -- BAD --> K["Repair or replace."]
      J -- OK --> L["Check fuel pressure. (See page FI-125)"]
      L -- BAD --> M["Repair or replace."]
      L -- OK --> N["Check injectors. (See page FI-155)"]
      N -- BAD --> O["Repair or replace."]
      N -- OK --> P["Check vacuum sensor. (See page FI-233)"]
      P -- BAD --> Q["Repair or replace."]
      P -- OK --> R["(2) Check operation of oxygen sensor. (See page FI-237)"]
      R -- OK --> S["System Normal"]
      R -- BAD --> T["Check wiring between oxygen sensor and ECM."]
      T -- BAD --> U["Repair wiring."]
      T -- OK --> V["Replace oxygen sensor."]
    
```

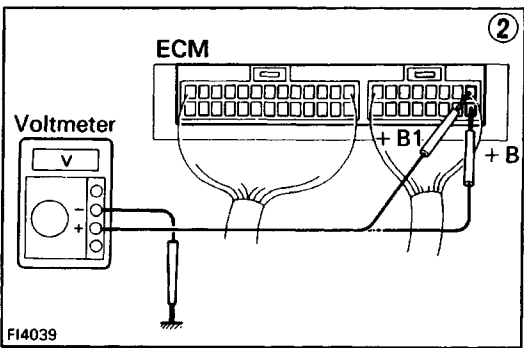
CALIF. only



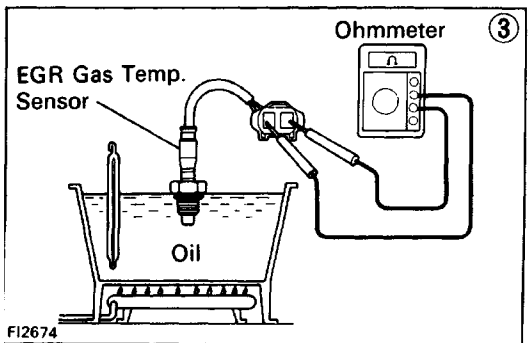
FI2680



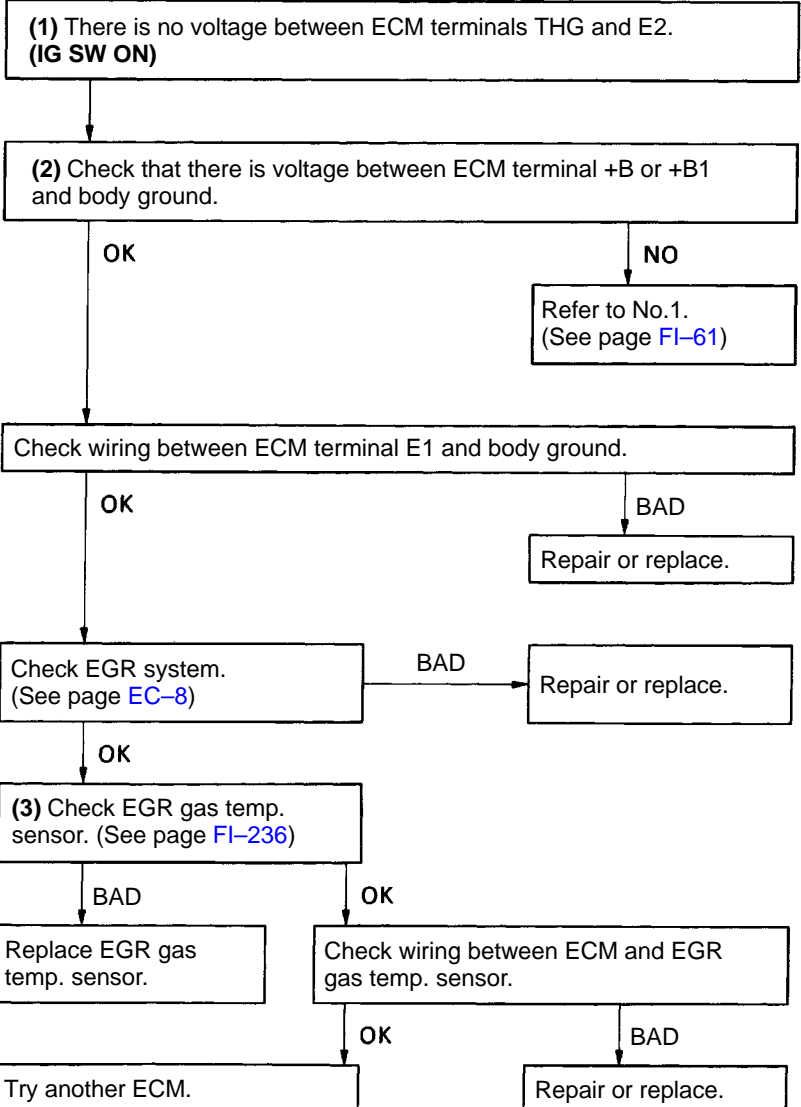
FI4057

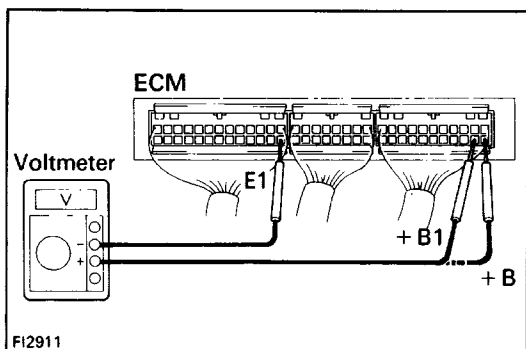


FI4039



FI2674





SFI SYSTEM CHECK PROCEDURE (3S-GTE)

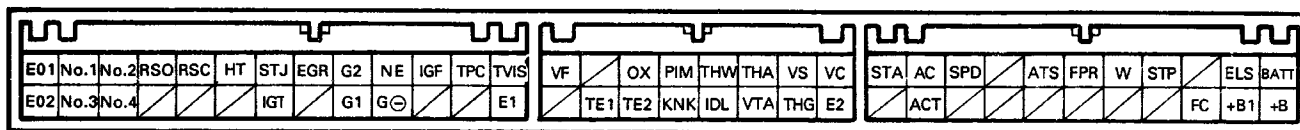
HINT:

- Perform all voltage measurements with the connectors disconnected.
 - Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position.
- Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECM (3S-GTE)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	TPC	TURBOCHARGING PRESSURE VSV	AC	A/C MAGNET SWITCH
E ₂	POWER GROUND		—	ACT	A/C AMPLIFIER
No.1	INJECTOR (No.1)	T-VIS	T-VIS VSV	SPD	SPEED SENSOR
No.3	INJECTOR (No.3)	E1	ENGINE GROUND		—
No.2	INJECTOR (No.2)	VF	DATA LINK CONNECTOR 1		—
No.4	INJECTOR (No.4)		—		—
RSO	IAC VALVE		—	ATS	A/C AMPLIFIER
	—	TE1	DATA LINK CONNECTOR 1		—
RSC	IAC VALVE	OX	OXYGEN SENSOR	FPR	FUEL PUMP RELAY
	—	TE2	DATA LINK CONNECTOR 1		—
HT	OXYGEN SENSOR HEATER	PI M	TURBOCHARGING PRESSURE SENSOR	W	MALFUNCTION INDICATOR LAMP
	—	KNK	KNOCK SENSOR		—
STJ	COLD START INJECTOR	THW	ENGINE COOLANT TEMP. SENSOR	STP	STOP LIGHT SWITCH
IGT	IGNITER	IDL	THROTTLE POSITION SENSOR		—
EGR	EGR VSV	THA	AIR TEMP. SENSOR		—
	—	VTA	THROTTLE POSITION SENSOR	FC	CIRCUIT OPENING RELAY
G2	DISTRIBUTOR	VS	VOLUME AIR FLOW METER	E LS	HEADLIGHT DEFOGGER
G1	DISTRIBUTOR	*THG	EGR GAS TEMP. SENSOR	+B I	SFI MAIN RELAY
NE	DISTRIBUTOR	VC	SENSOR POWER SOURCE	BATT	BATTERY
G ⊖	DISTRIBUTOR	E2	SENSOR GROUND	+B	SFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH	*CALIF. only	
	—		—		

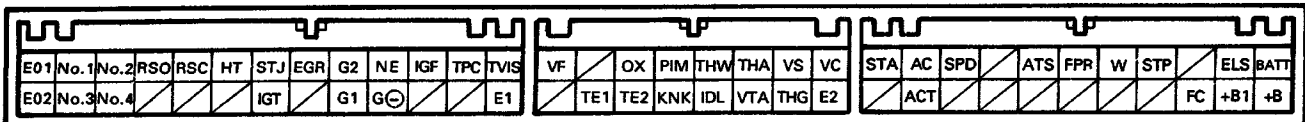
ECM Terminals



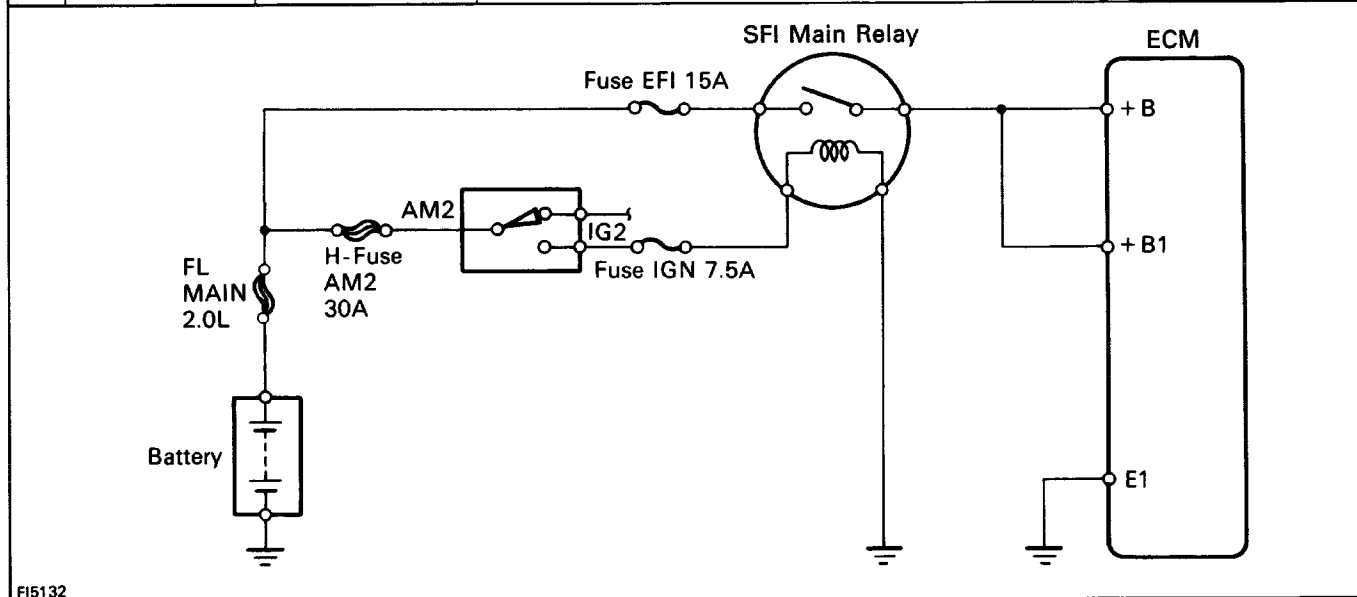
Voltage at ECM Wiring Connectors (3S-GTE)

No.	Terminals	Condition	STD voltage (V)	See page	
1	+ B - E1 + B1	IG SW ON	10-14	FI-7s	
2	BATT - E1	-	10-14	FI-77	
3	ID L - E2	IG SW ON	Throttle valve open	4.5-5.5	FI-7 s
	VC - E2		-	4.5-5.5	
	VTA - E 2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.1 -1.0	
			Throttle valve fully open	3.2-4.2	
4	VC - E2	IG SW ON	-	4.5-5.5	FI-80
	VS - E2		Measuring plate fully closed	3.7-4.3	
			Measuring plate fully open	0.2-0.5	
			Idling	1.6-4.1	
	3,000 rpm		1.0-2.0		
5	No.1 No.2 E01 No.3 E02 No.4	IG SW ON	10-14	FI-81	
6	THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1 -3	FI-82
7	TH W - E2		Engine coolant temp. 80°C (176°F)	0.1 -1.1	FI-83
8	STA - E 1	Cranking		6-14	FI-84
9	IGT - E1	Cranking or idling		0.8-1.2	FI-85
10	RSC - E1 RSO	IG SW ON	ECM connectors disconnected	8-14	FI-85
11	W -E1	No trouble (malfunction indicator lamp off) and engine running		10-14	F1-87
12	PIM - E2	IG SW ON		2.5-4.5	FI-88
	VC - E2			4.5-5.5	
13	AC - E 1	IG SW ON	Air conditioning ON	8-14	FI-89

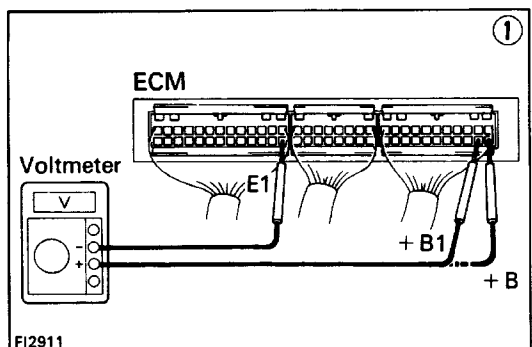
ECM Terminals



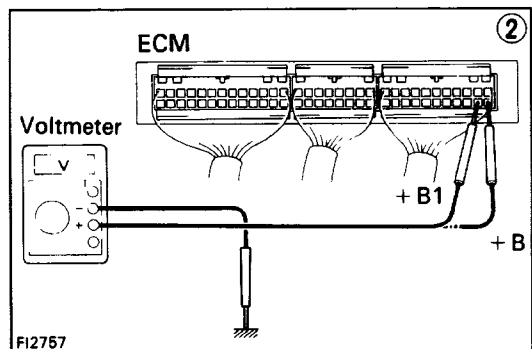
No.	Terminals	Trouble	Condition	STD voltage
1	+ B _ E1 + B1	No voltage	IG SW ON	10 - 14 V



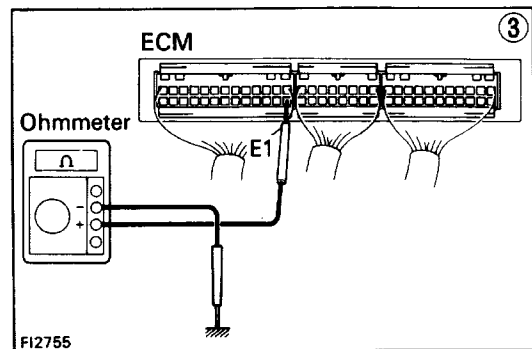
FI5132



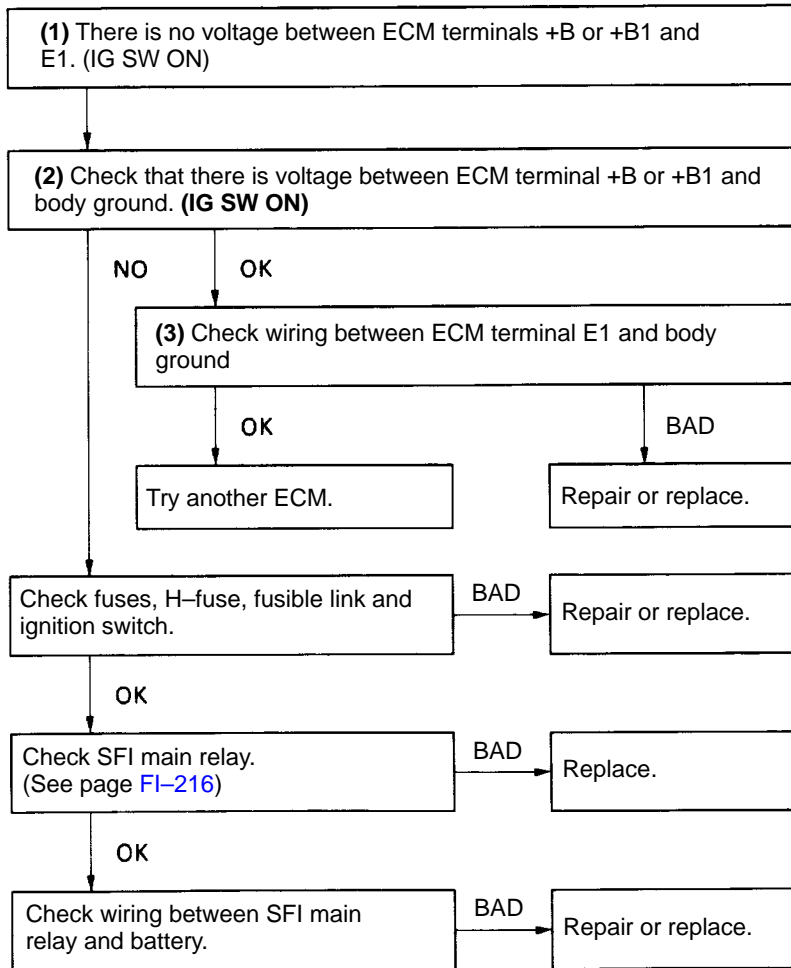
FI2911



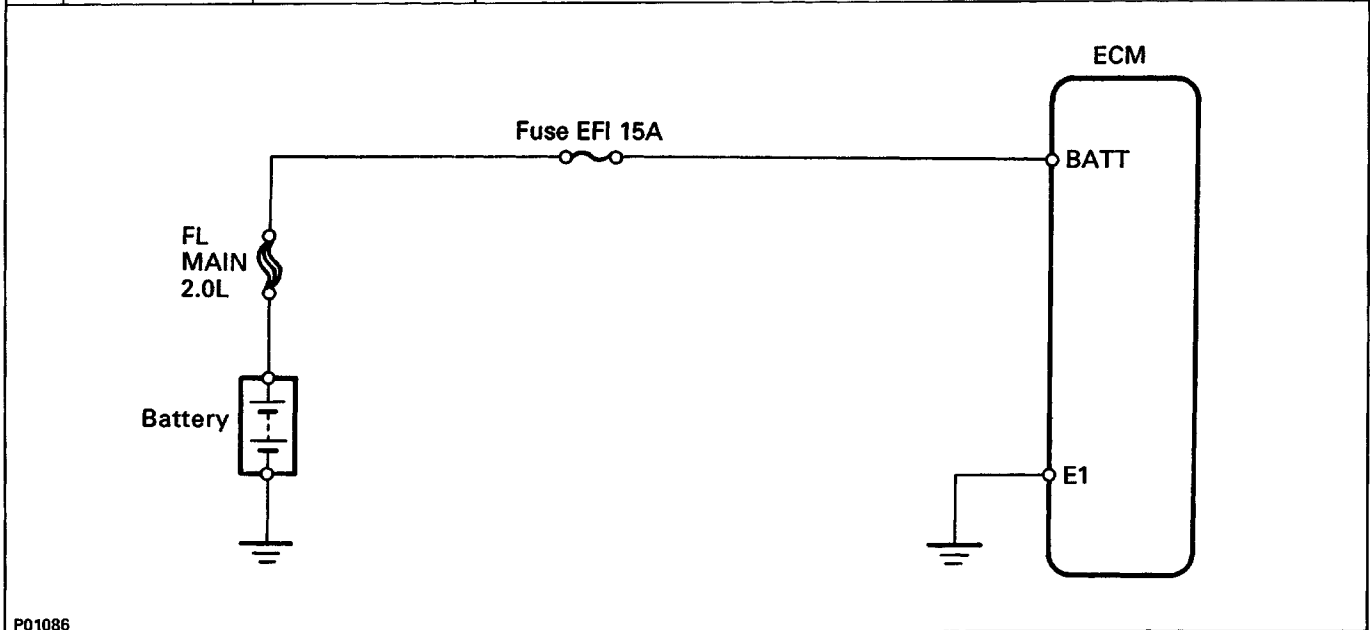
FI2757



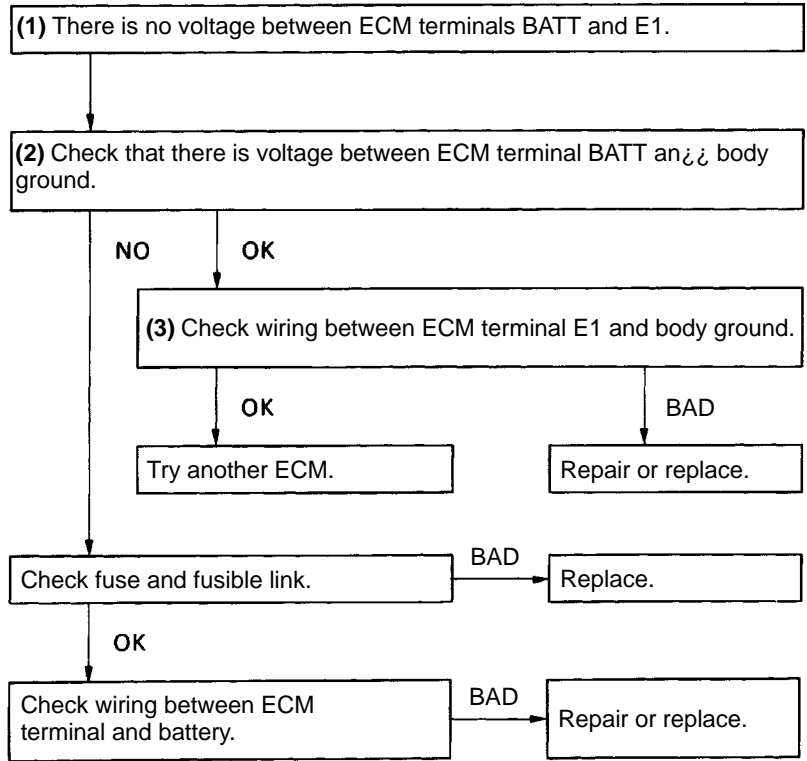
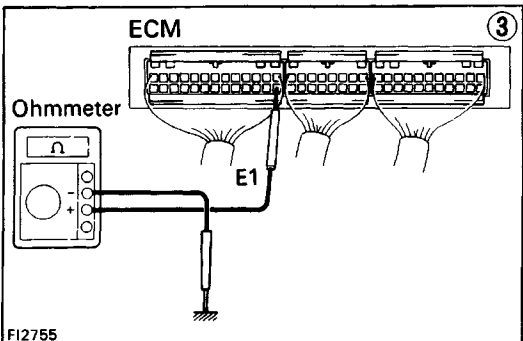
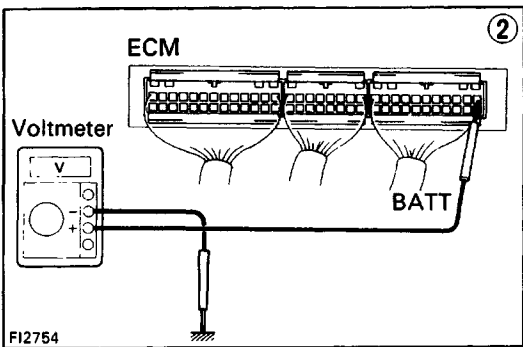
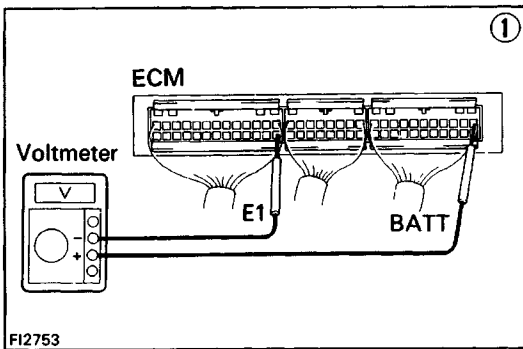
FI2755



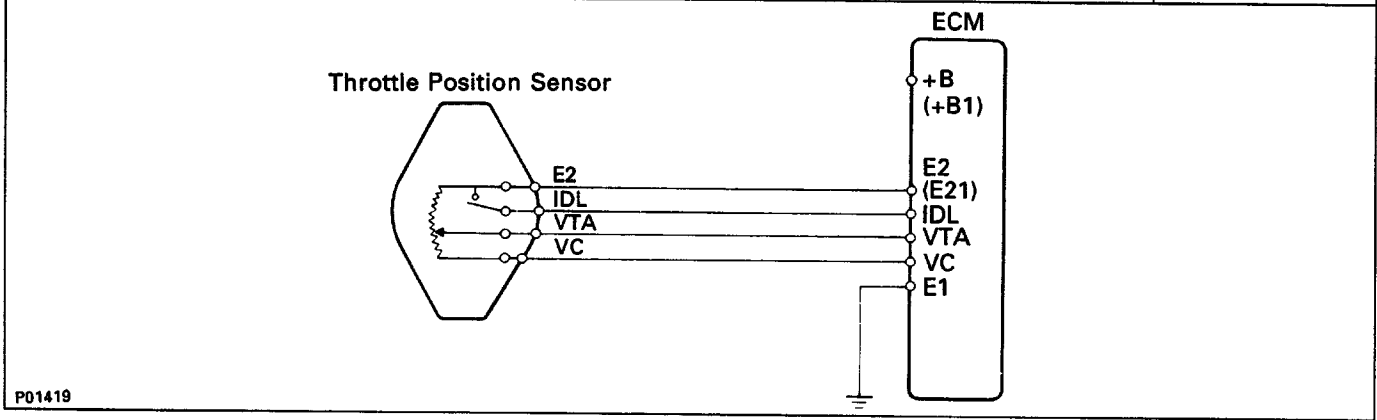
No.	Terminals	Trouble	Condition	STD voltage
2	BATT - E1	No voltage	-	10 - 14 V



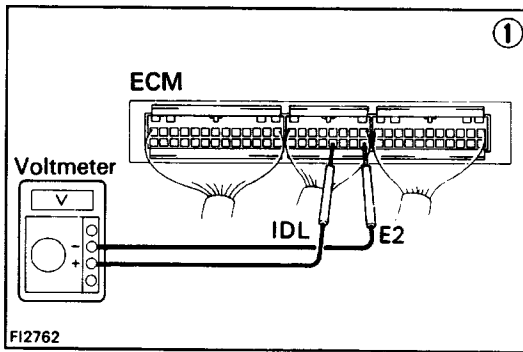
P01086



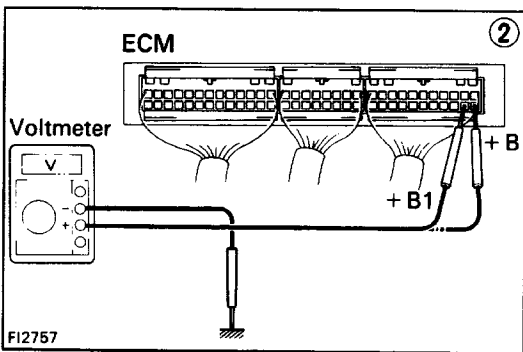
No.	Terminals	Trouble	Condition	STD voltage	
3	IDL - E2	No voltage	IG SW ON	Throttle valve open	4.5 - 5.5 V
	VC - E2			4.5 - 5.5 V	
	VTA - E2			Throttle valve fully closed (Throttle opener must be cancelled first)	0.1 - 1.0 V
				Throttle valve fully open	3.2 - 4.2 V



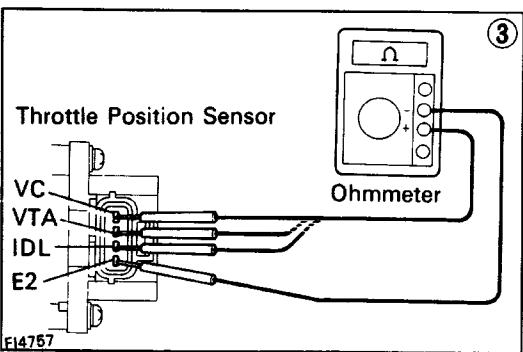
P01419



FI2762



FI2757

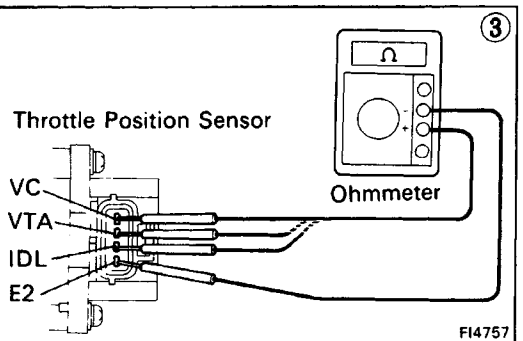
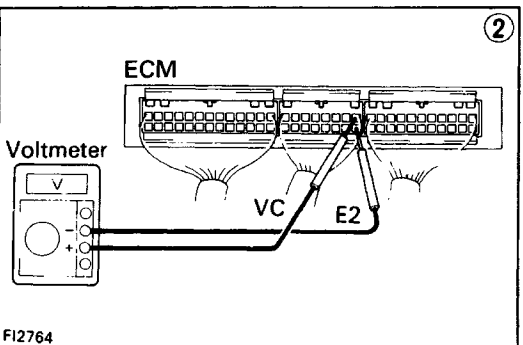
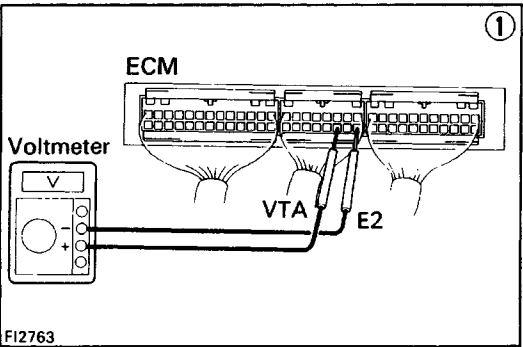
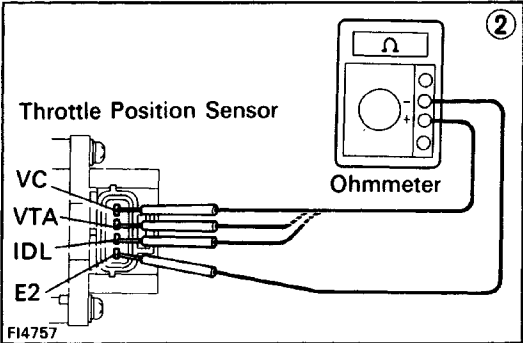
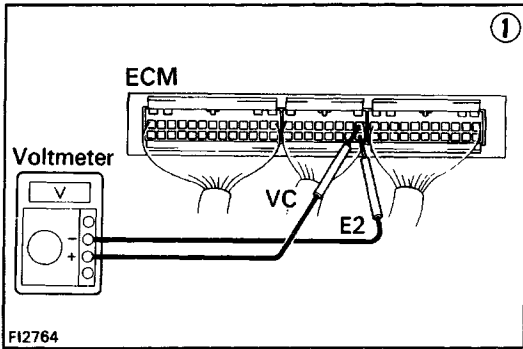


FI4757

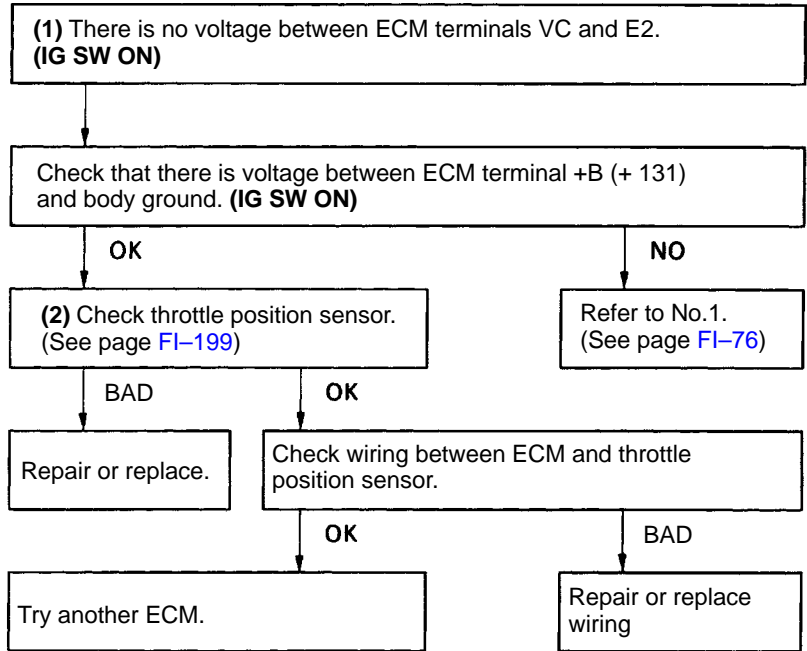
• IDL - E2

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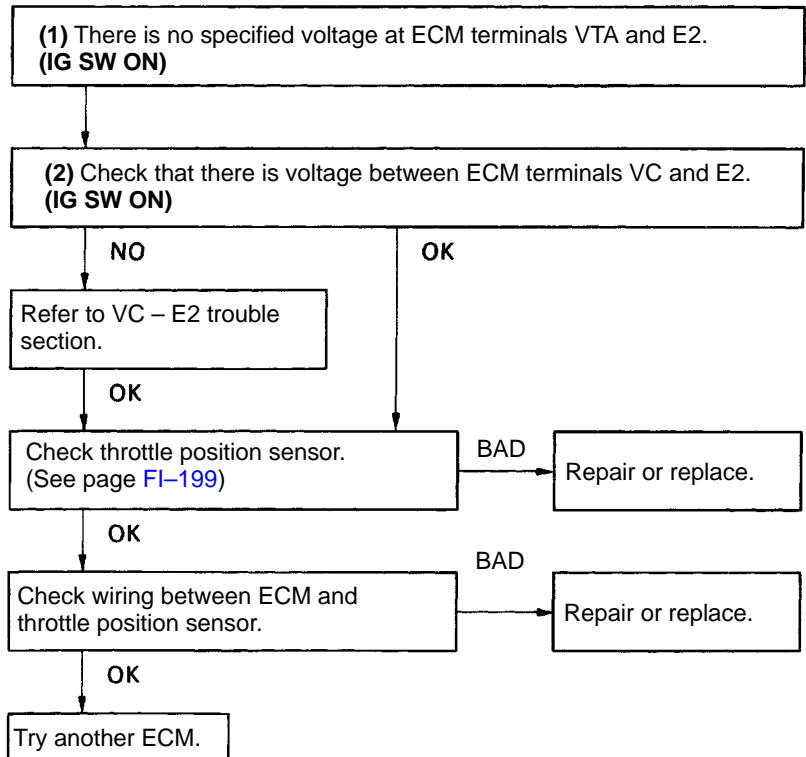
    graph TD
      A["(1) There is no voltage between ECM terminals IDL and E2.  
(IG SW ON) (Throttle valve open)"] --> B["(2) Check that there is voltage between ECM terminal + B (+ 131)  
and body ground. (IG SW ON)"]
      B -- NO --> C["Refer to No.1.  
(See page FI-76)"]
      B -- OK --> D["Check wiring between ECM terminal E1 and body ground."]
      D -- OK --> E["Try another ECM."]
      D -- BAD --> F["Repair or replace."]
      C -- BAD --> F
      C -- OK --> G["(3) Check throttle position sensor.  
(See page FI-199)"]
      G -- BAD --> H["Repair or replace  
throttle position sensor."]
      G -- OK --> I["Check wiring between ECM and  
throttle position sensor."]
      I -- OK --> J["Try another ECM."]
      I -- BAD --> F
  
```



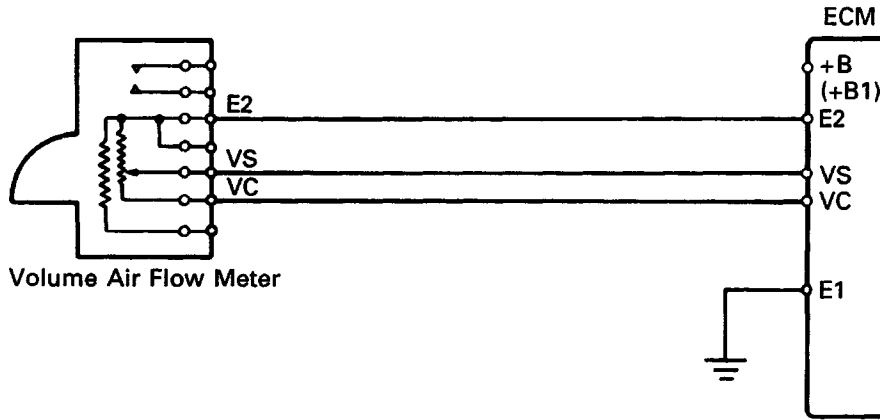
• VC - E2



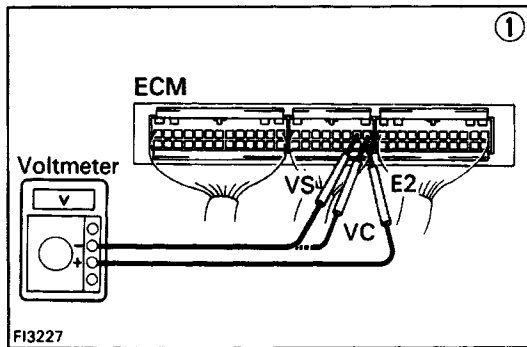
• VTA - E2



No.	Terminals	Trouble	Condition	STD voltage	
4	VC - E2	No voltage	IG SW ON	-	4.5 - 5.5 V
	VS - E2			Measuring plate fully closed	3.7 - 4.3 V
				Measuring plate fully open	0.2 - 0.5 V
	VS - E2		Idle	1.6 - 4.1 V	
			3,000 rpm	1.0 - 2.0 V	



FI6032



FI3227

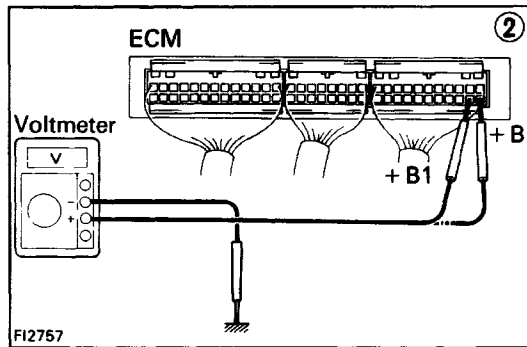
(1) There is no specified voltage at ECM terminals VC or VS and E2. (IG SW ON)

(2) Check that there is voltage between ECM terminal +B (+B1) and body ground. (IG SW ON)

OK

NO

Refer to No.1. (See page FI-76)



FI2757

Check wiring between ECM terminal E1 and body ground.

OK

BAD

(3) Check volume air flow meter. (See page FI-183)

Repair or replace.

BAD

OK

Repair or replace volume air flow meter.

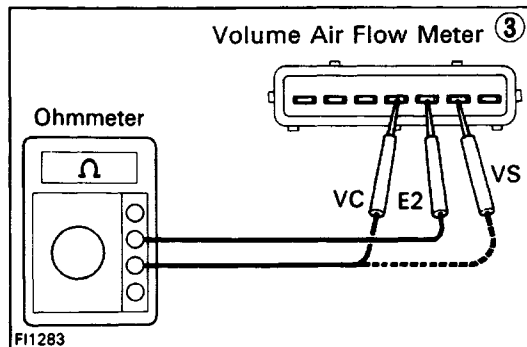
Check wiring between ECM and volume air flow meter.

OK

BAD

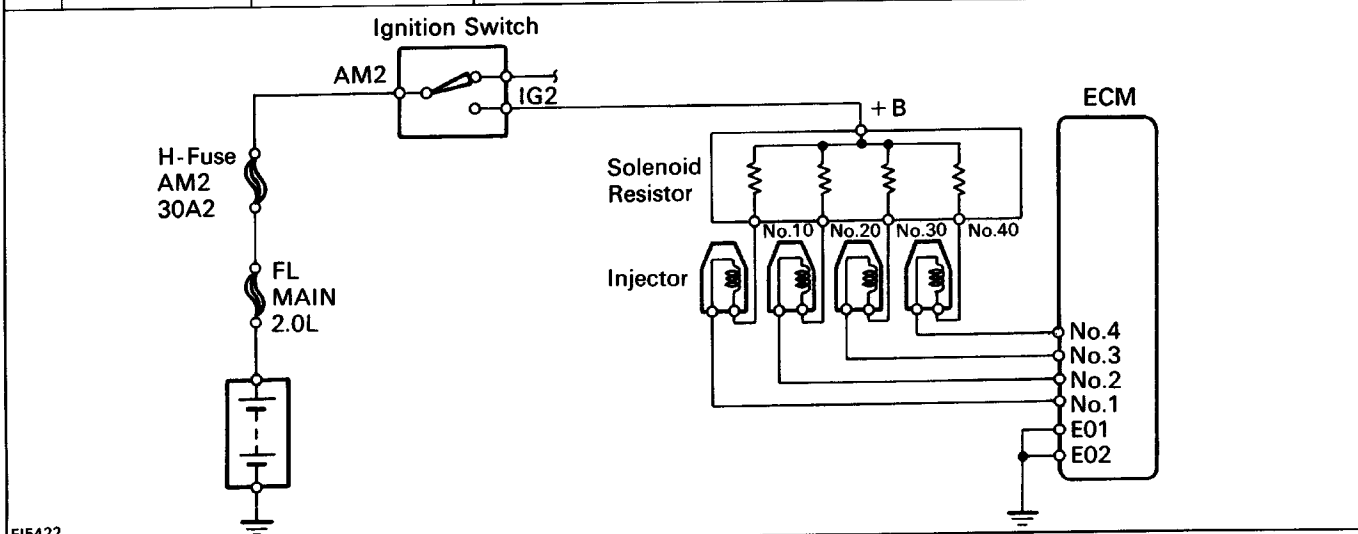
Try another ECM.

Repair or replace.

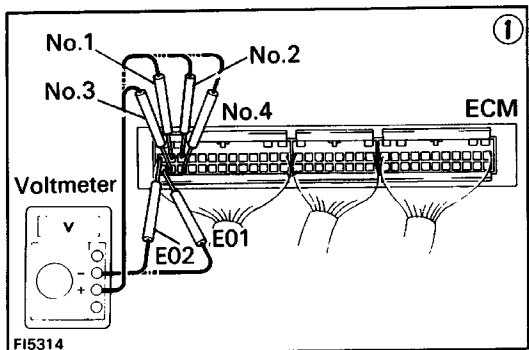


FI1283

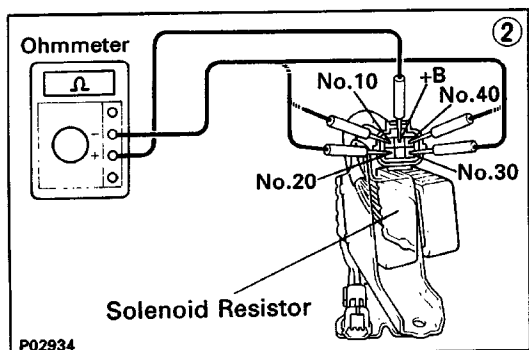
No.	Terminals	Trouble	Condition	STD voltage
5	No. 1 No. 2 - E01 No. 3 - E02 No. 4	No voltage	IG SW ON	10-14V



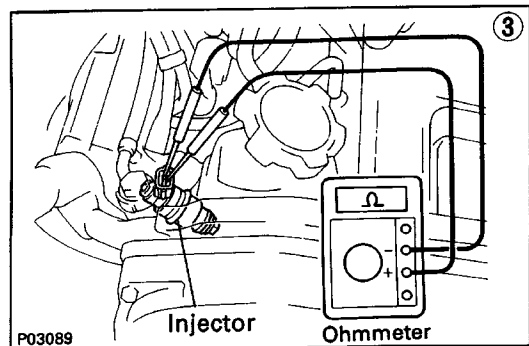
FI5422



FI5314



P02934

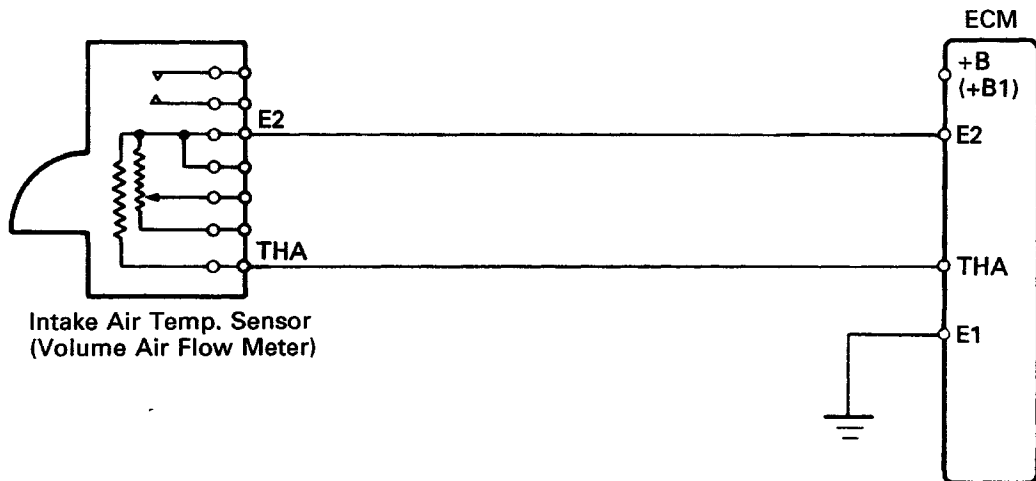


P03089

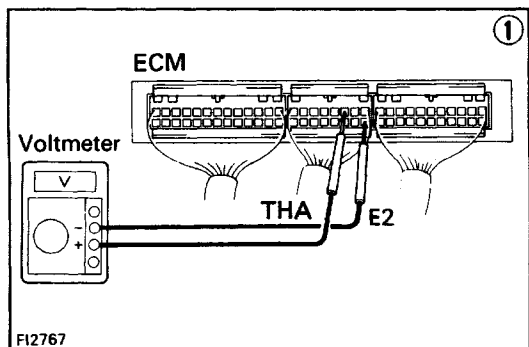
```

    graph TD
      A["(1) There is no voltage between ECM terminals No.1, No-2, No.3 and/ or No.4 and E01 and/ or E02. (IG SW ON)"] --> B["Check that there is specified voltage between solenoid resistor terminal +B and body ground. STD voltage: 10 - 14V"]
      B -- OK --> C["(2) Check resistance between +B of solenoid resistor and each other terminal. STD resistance: 4 - 6 Ω"]
      B -- NO --> D["Check H-fuse, fusible link, wiring and ignition switch. BAD -> Repair or replace."]
      C -- OK --> E["(3) Check resistance of each injector. STD resistance: 2 - 4 Ω"]
      C -- NO --> F["Replace resistor."]
      E -- OK --> G["Check wiring between ECM and resistor"]
      E -- BAD --> H["Replace injector."]
      G -- BAD --> I["Repair or replace wiring"]
      G -- OK --> J["Try another ECM."]
    
```

No.	Terminals	Trouble	Condition		STD voltage
6	THA - E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	1-3 V



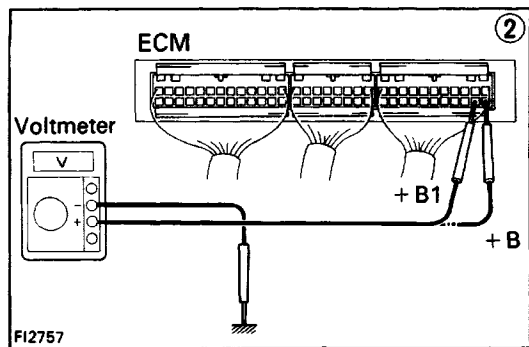
FI6030



FI2767

(1) There is no voltage between ECM terminals THA and E2. (IG SW ON)

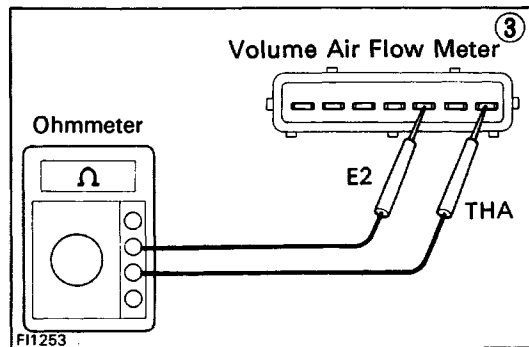
(2) Check that there is voltage between ECM terminal +B (+B1) and body ground. (IG SW ON)



FI2757

Check wiring between ECM terminal E1 and body ground.

(3) Check intake air temp. sensor (See page FI-183)



FI1253

OK

Check wiring between ECM terminal E1 and body ground.

OK

Replace volume air flow meter-

Try another ECM.

NO

Refer to No.1. (See page FI-76)

BAD

Repair or replace.

OK

Check wiring between ECM and intake air temp. sensor.

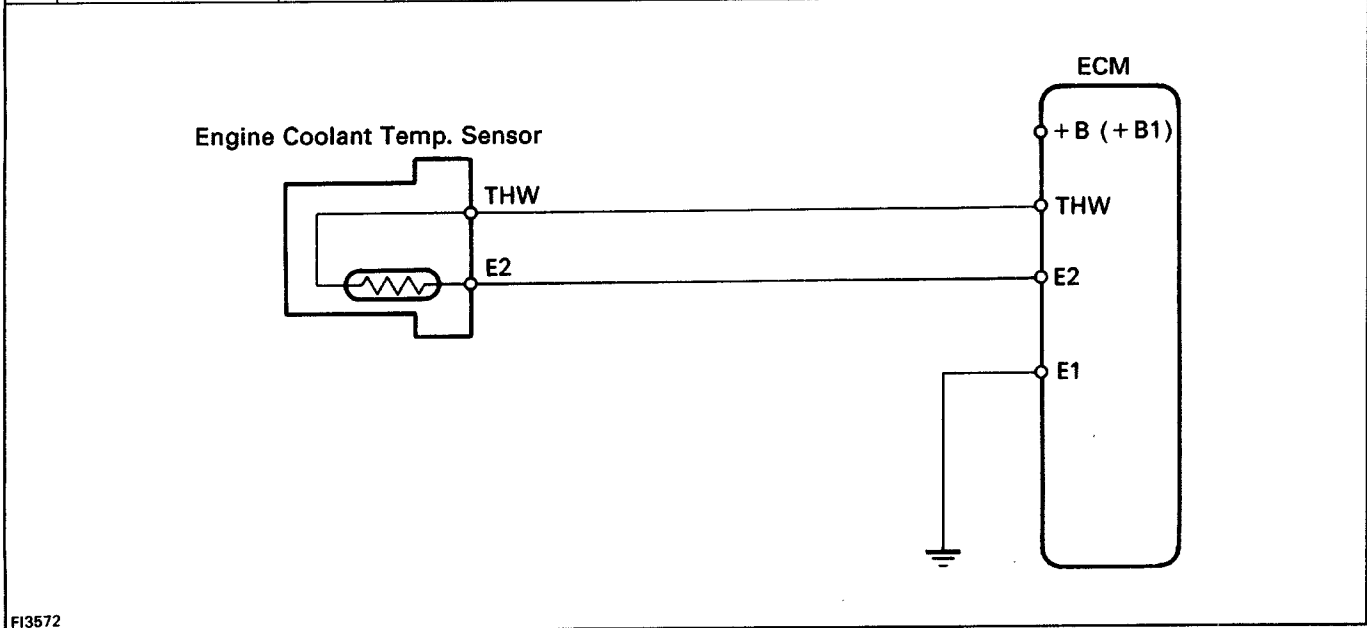
OK

Try another ECM.

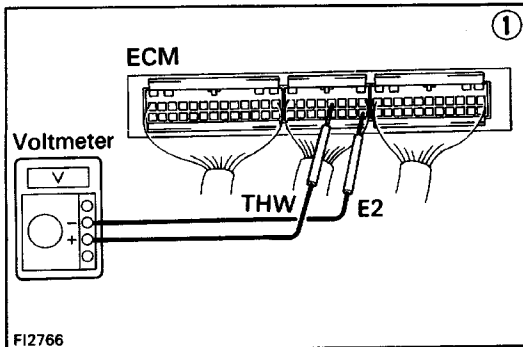
BAD

Repair or replace.

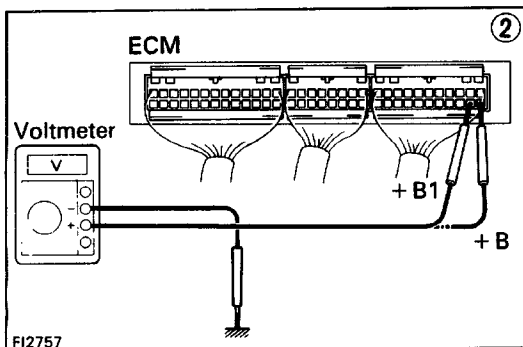
No.	Terminals	Trouble	Condition		STD voltage
7	THW - E2	No voltage	IG SW ON	Engine coolant temperature 80°C (176°F)	0.1 - 1.1 V



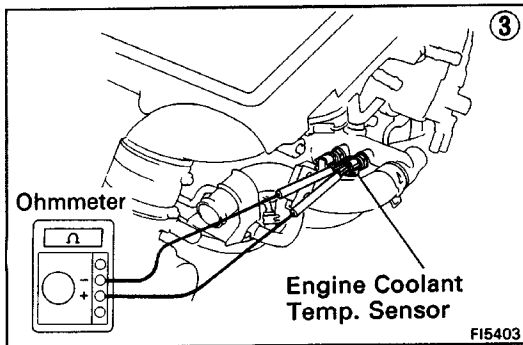
FI3572



FI2766



FI2757

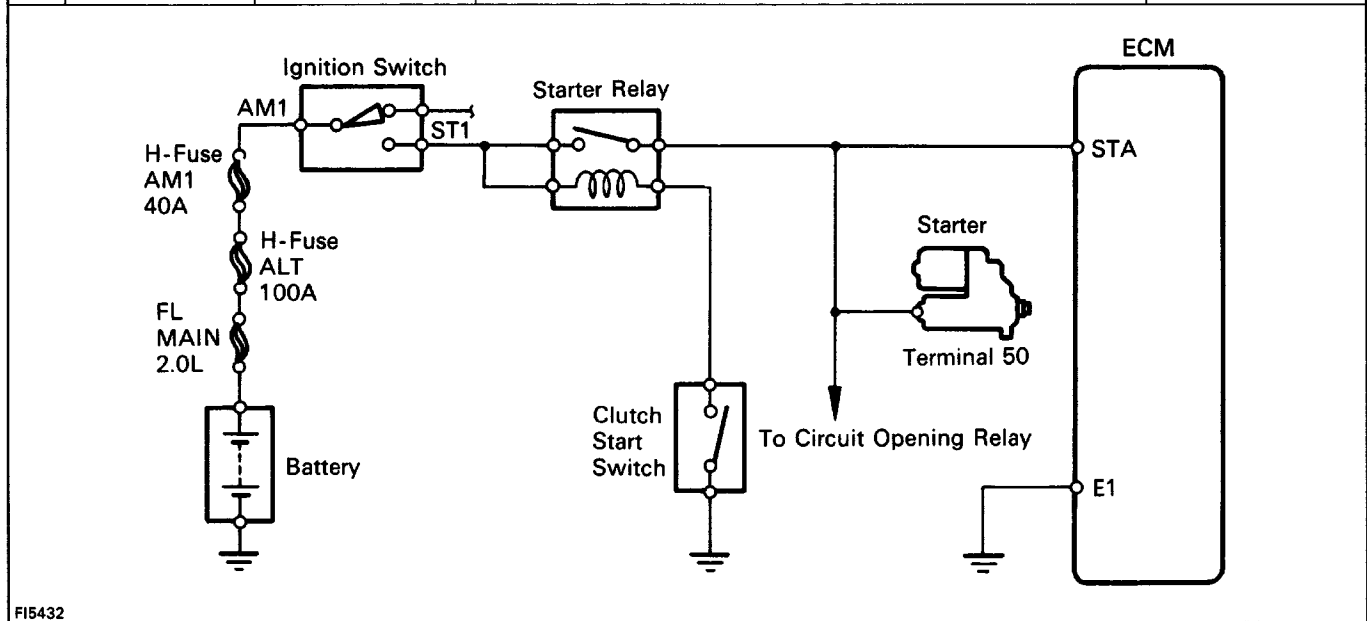


FI5403

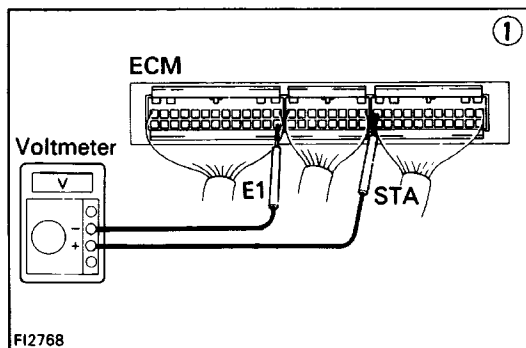
```

    graph TD
      A["(1) There is no voltage between ECM terminals THW and E2  
(IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal + B 1+ B1 and  
body ground.(IG SW ON)"]
      B -- OK --> C["Check wiring between ECM terminal E1 and body ground."]
      B -- NO --> D["Refer to No1.  
(See page FI-76)"]
      C -- OK --> E["Check engine coolant temp.  
sensor. (See page FI-231)"]
      C -- BAD --> F["Repair or replace."]
      E -- BAD --> G["Replace engine  
coolant temp.  
sensor."]
      E -- OK --> H["Check wiring between ECM and  
engine coolant temp. sensor."]
      H -- OK --> I["Try another ECM."]
      H -- BAD --> J["Repair or replace."]
    
```

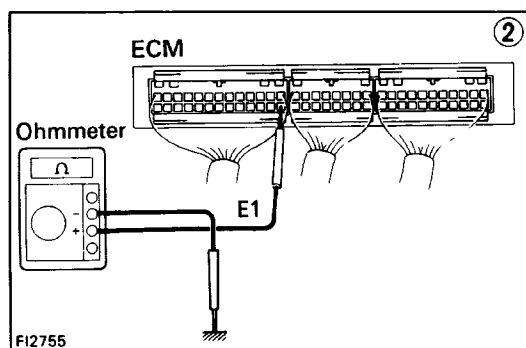
No.	Terminals	Trouble	Condition	STD voltage
8	STA - E1	No voltage	Cranking	6-14V



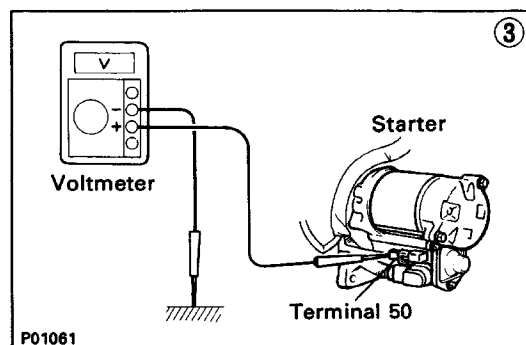
FI5432



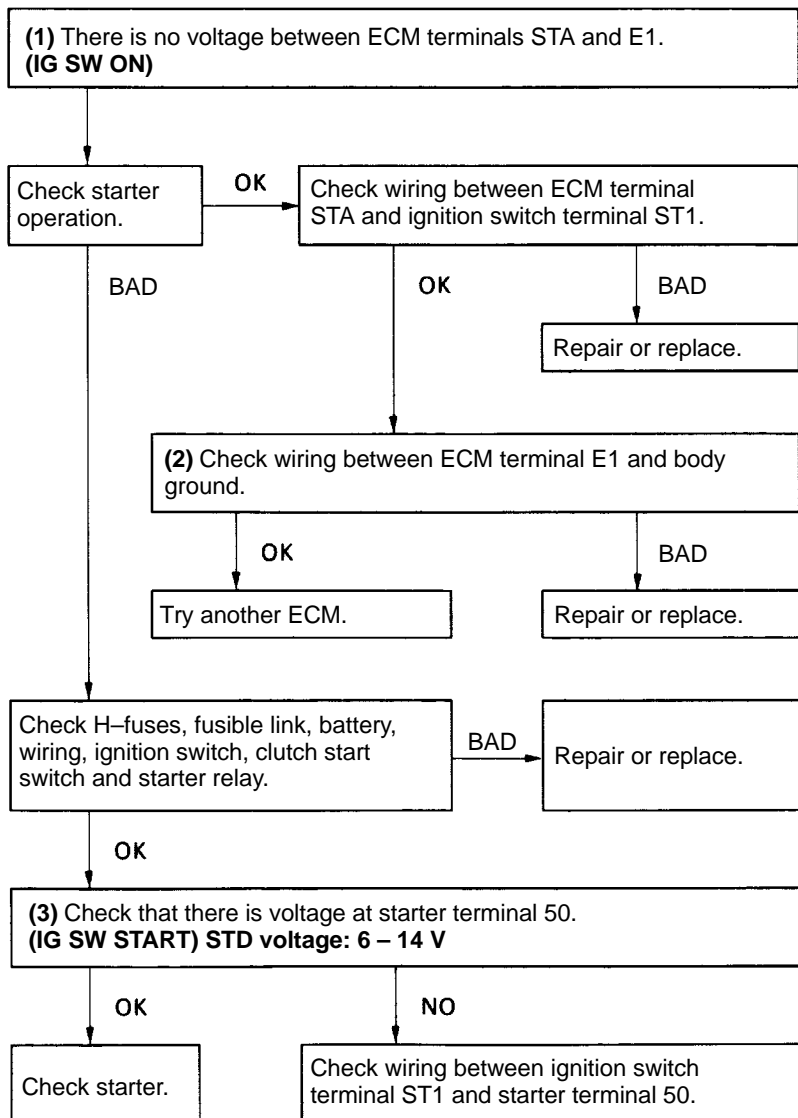
FI2768



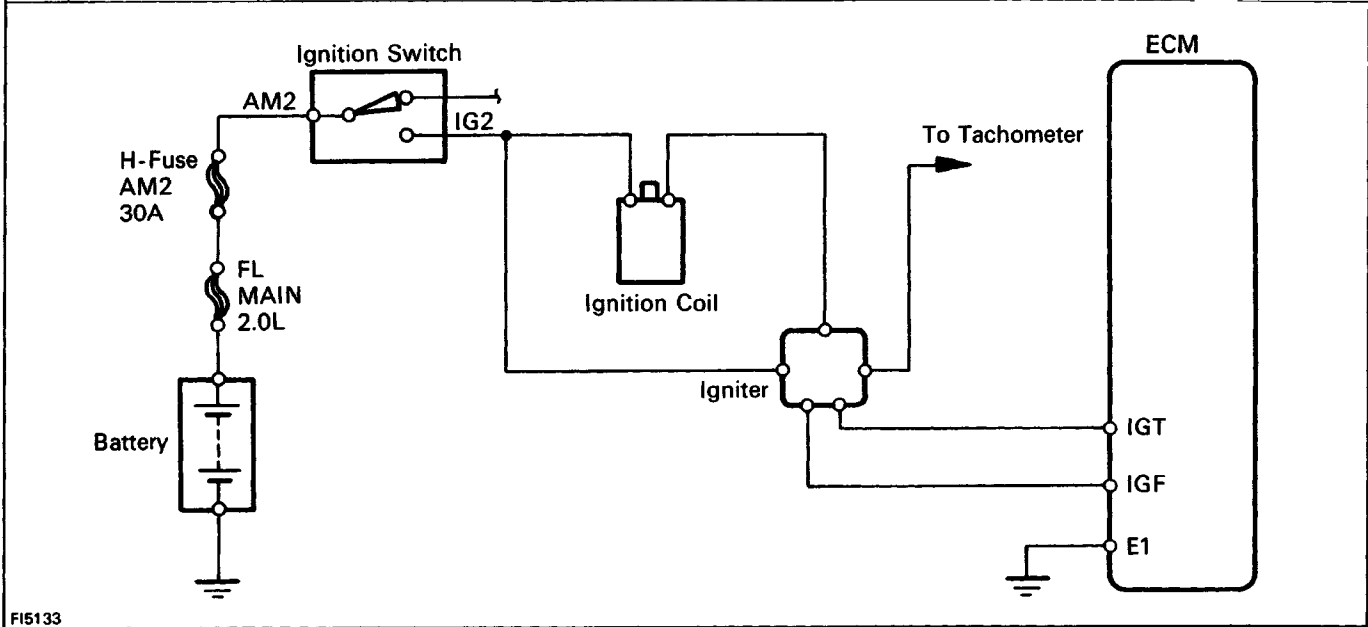
FI2755



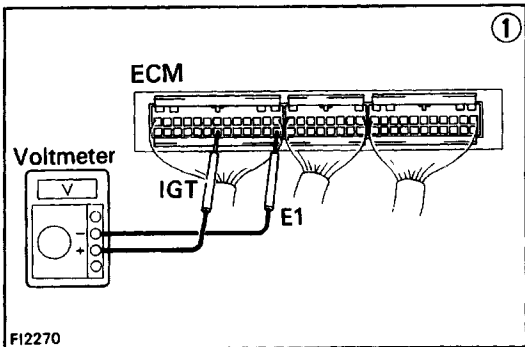
P01061



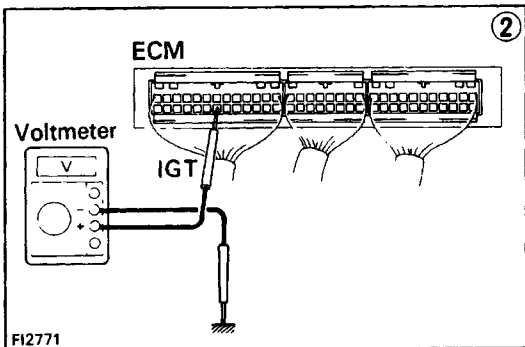
No.	Terminals	Trouble	Condition	STD voltage
9	IGT - E1	No voltage	Idling	0.8 - 1.2 V



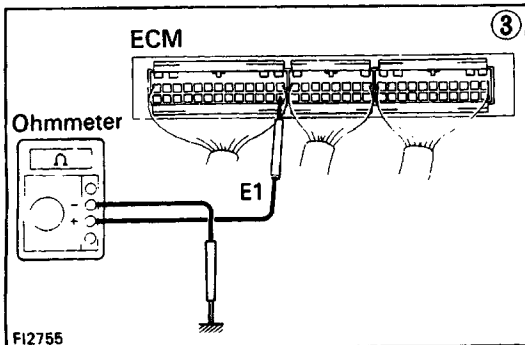
FI5133



FI2270



FI2771

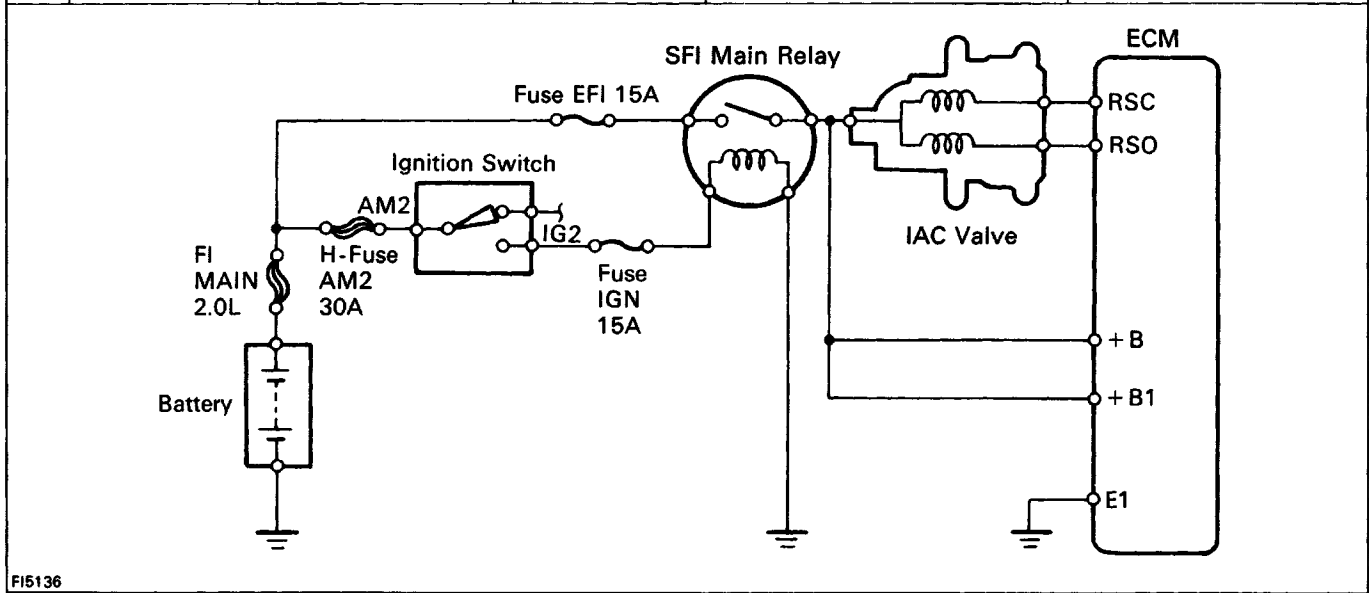


FI2755

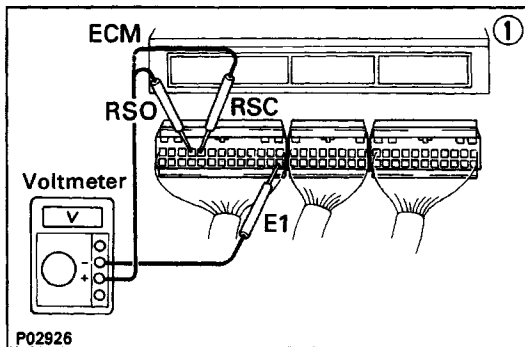
```

    graph TD
      A["(1) There is no voltage between ECM terminals IGT and E1. (idling)"] --> B["(2) Check that there is voltage between ECM terminal IGT and body ground. (idling)"]
      B -- NO --> C["Check H-fuse, fusible link and ignition switch."]
      B -- OK --> D["(3) Check wiring between ECM terminal E1 and body ground."]
      D -- BAD --> E["Repair or Replace."]
      D -- OK --> F["Try another ECM"]
      C -- BAD --> E
      C -- OK --> G["Check distributor. (See page IG-14)"]
      G -- BAD --> E
      G -- OK --> H["Check wiring between ECM and battery."]
      H -- BAD --> E
      H -- OK --> I["Check igniter. (See page IG-14)"]
      I -- BAD --> E
      I -- OK --> End[" "]
  
```

No.	Terminals	Trouble	Condition		STD voltage
10	RSC RSO - E1	No voltage	IG SW ON	Engine ECM connectors disconnected	8 - 14 V



FI5136



P02926

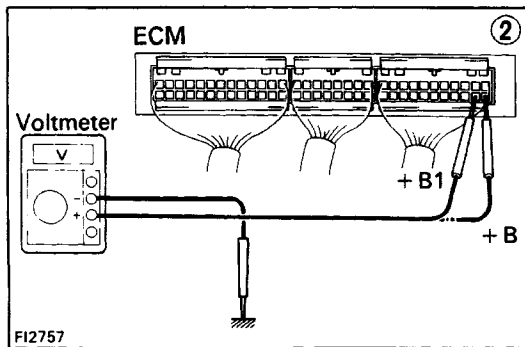
(1) There is no voltage between ECM terminals RSC or RSO and E1. (IG SW ON)

(2) Check that there is voltage between ECM terminal + B (+B1) and body ground. (IG SW ON)

OK

NO

Refer to No.1.
(See page FI-76)



FI2757

(3) Check resistance between IAC valve terminals + B and RSC or RSO. STD resistance: 19.3 - 22.3Ω

BAD

Replace IAC valve.

OK

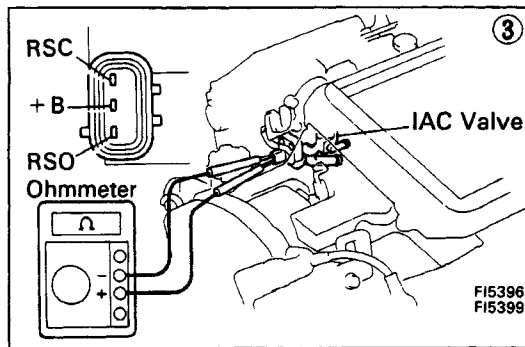
Check wiring between ECM and IAC valve.

BAD

Repair or replace wiring.

OK

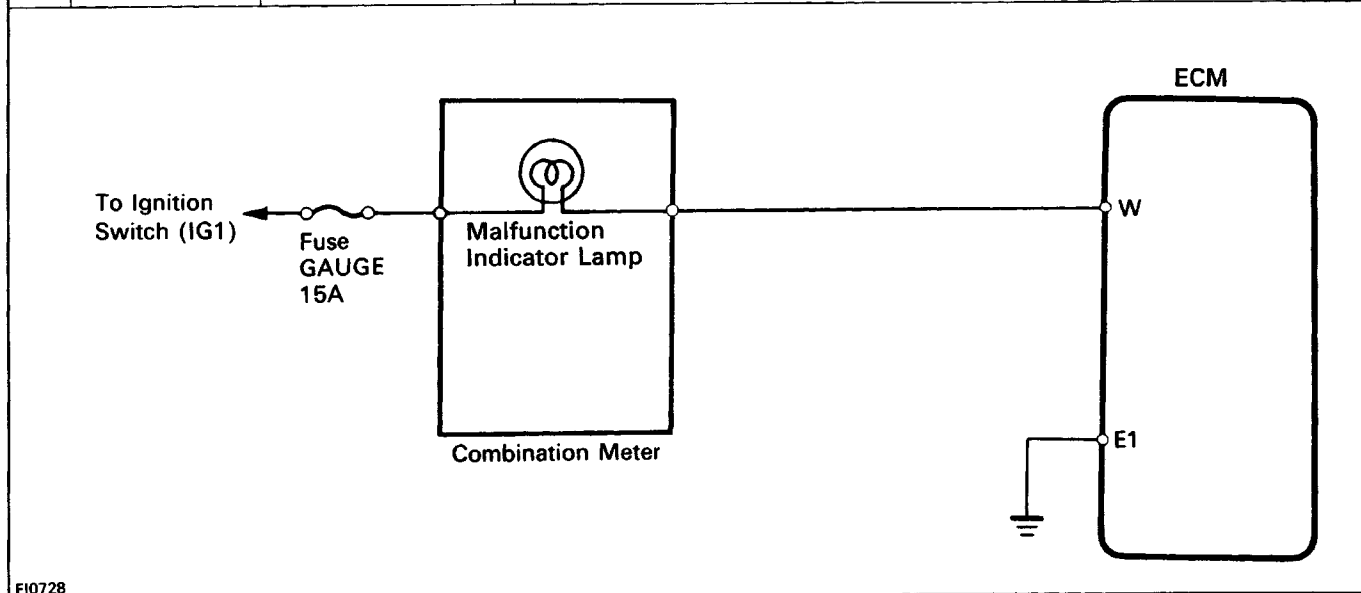
Try another ECM.



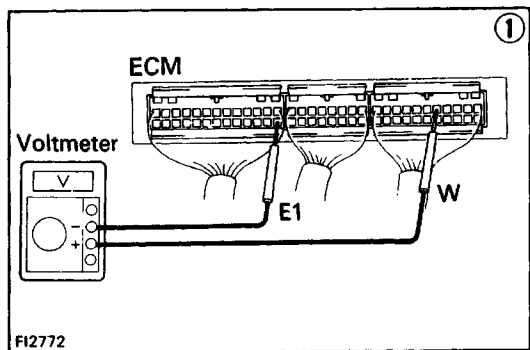
FI5396

FI5399

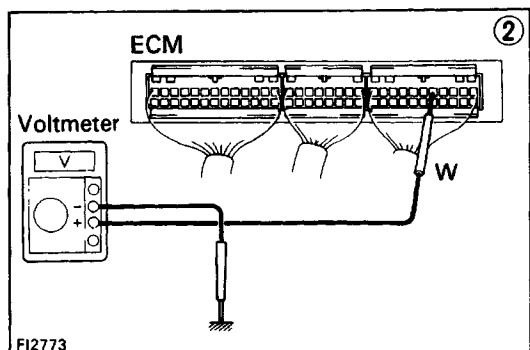
No.	Terminals	Trouble	Condition	STD voltage
11	W - E1	No voltage	No trouble (malfunction indicator lamp off) and engine running.	10-14V



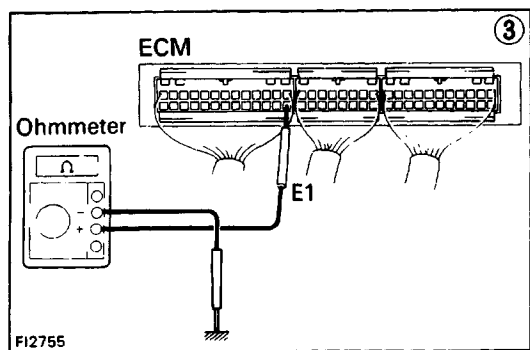
FI0728



FI2772



FI2773

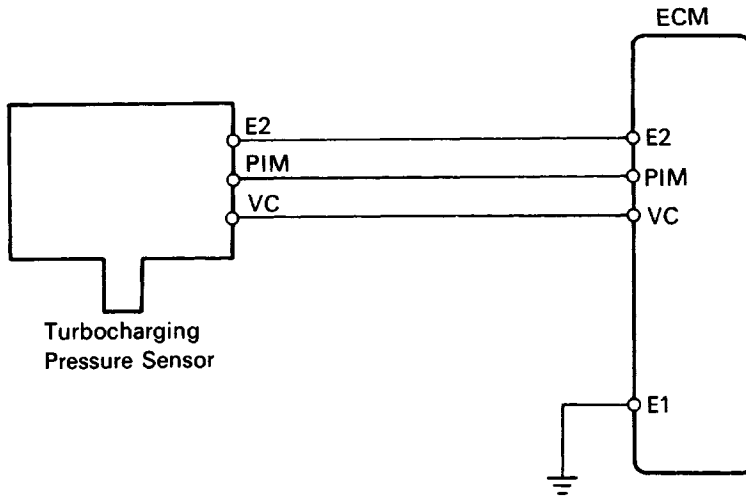


FI2755

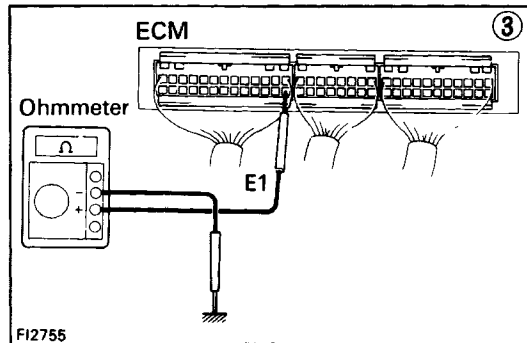
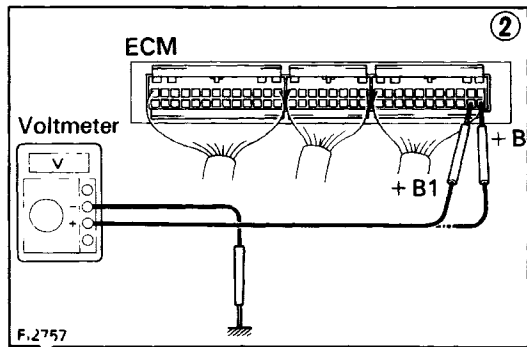
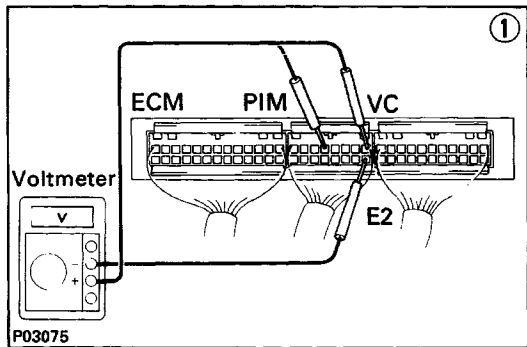
```

    graph TD
      A["(1) There is no voltage between ECM terminals W and E1. (Idling)"] --> B["(2) Check that there is voltage between ECM terminal W and body ground."]
      B -- NO --> C["Check GAUGE fuse (15A) and malfunction indicator lamp."]
      B -- OK --> D["(3) Check wiring between ECM terminal E1 and body ground."]
      D -- OK --> E["Try another ECM"]
      D -- BAD --> F["Repair or replace."]
      C -- OK --> G["Check wiring between ECM terminal W and fuse."]
      C -- BAD --> H["Repair or replace."]
      G -- Fuse blows again --> H
      G -- BAD --> I["Repair or replace."]
  
```

No.	Terminals	Trouble	Condition	STD voltage
12	PIM-E2	No voltage	IG SW ON	2.5 - 4.5 V
	VC - E2			4.5 - 5.5 V



FI1226

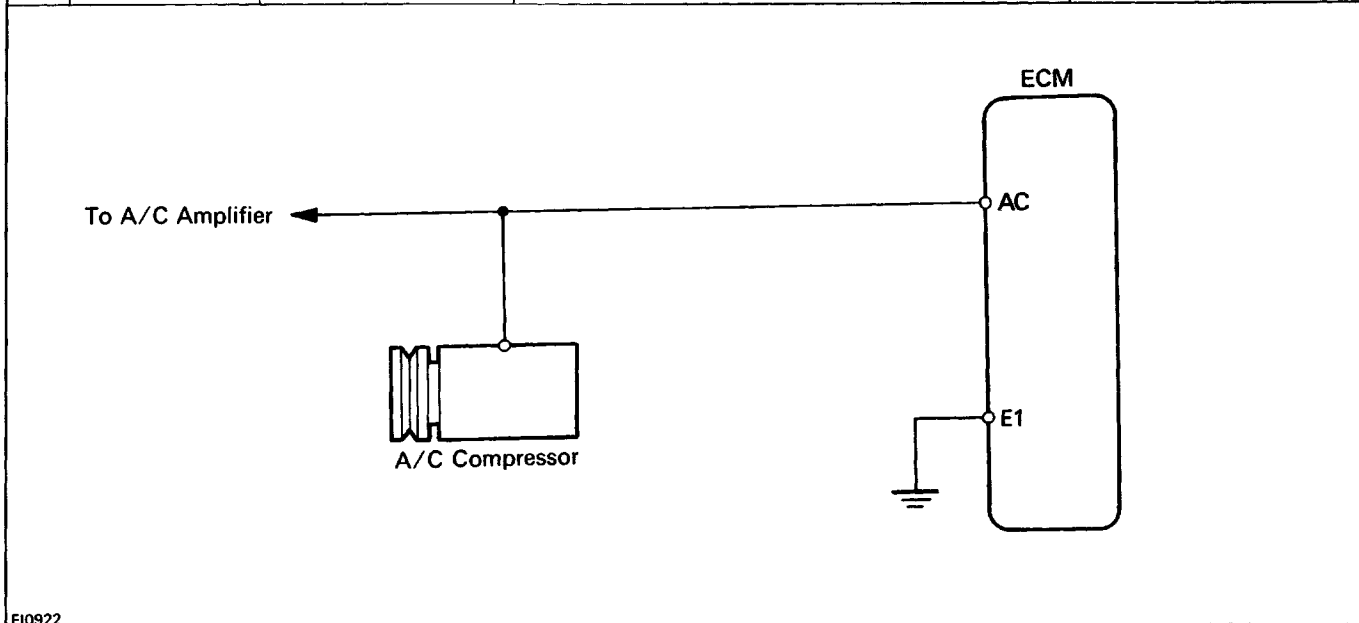


• PIM-E2, VC-E2

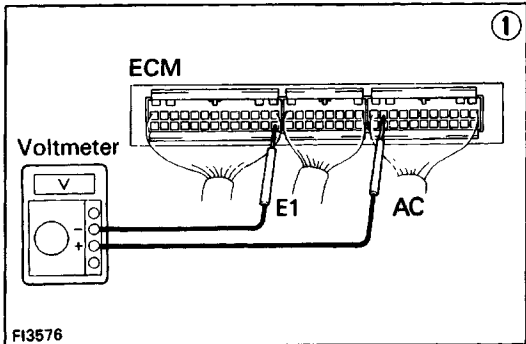
```

    graph TD
      A["(1) There is no voltage between ECM terminals PIM or VC and E2. (IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal + B or + 131 and body ground. (IG SW ON)"]
      B -- NO --> C["Refer to No-1 . (See page FI-76)"]
      B -- OK --> D["(3) Check wiring between ECM terminal E1 and body ground."]
      D -- BAD --> E["Repair or replace."]
      D -- OK --> F["Check turbocharging pressure sensor. (See page FI-235)"]
      F -- BAD --> G["Replace turbocharging pressure sensor."]
      F -- OK --> H["Check wiring between ECM and turbocharging pressure sensor."]
      H -- BAD --> E
      H -- OK --> I["Try another ECM."]
      I --> E
  
```

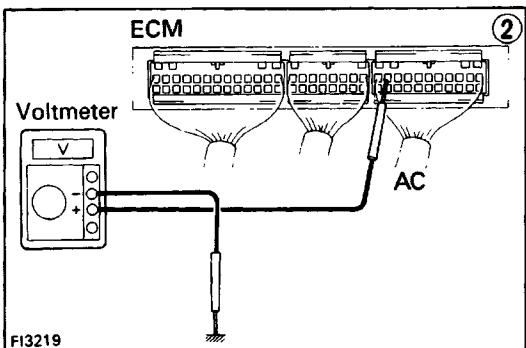
No.	Terminal	Trouble	Condition	STD voltage
13	AC - E1	No voltage	Air conditioning ON	8 - 14V



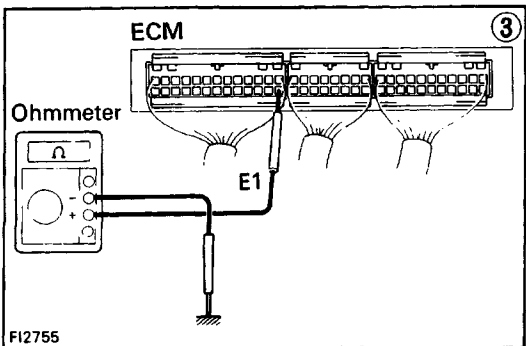
FI0922



FI3576



FI3219

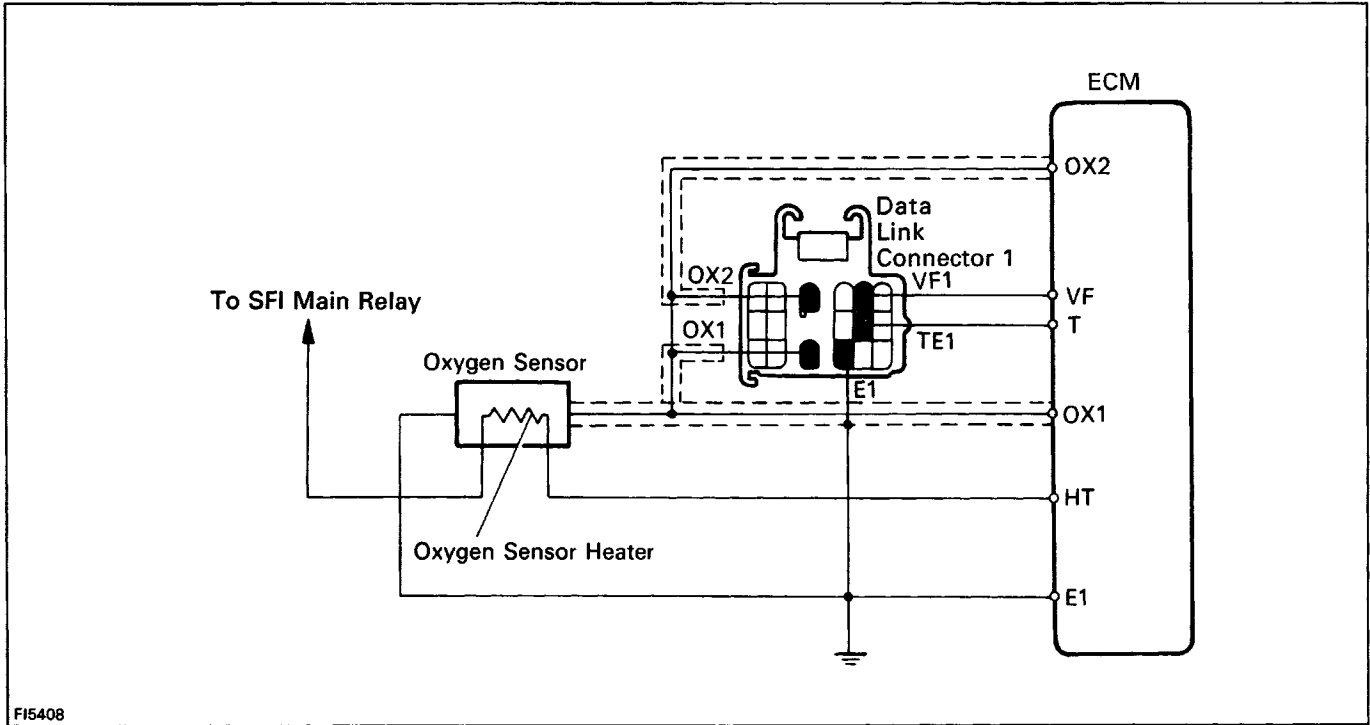


FI2755

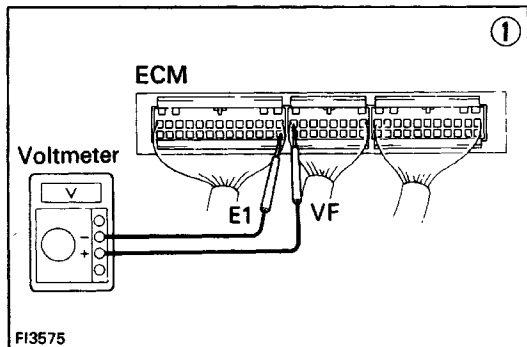
```

    graph TD
      Step1["(1) There is no voltage between ECM terminals AC and E1.  
(Air conditioning ON)"]
      Step2["(2) Check that there is voltage between ECM terminal AC and  
body ground."]
      Step3["(3) Check wiring between ECM terminal E1 and body  
ground."]
      Step4["Check compressor running."]
      Step5["Check wiring between ECM  
terminal AC and  
amplifier."]
      Step6["Check that there is voltage between  
amplifier terminal and body ground."]
      Step7["Check wiring between amplified  
and ECM or compressor."]
      Step8["Tn another ECM."]
      Step9["Repair or replace."]
      Step10["Repair or replace."]
      Step11["Repair or replace."]
      Step12["Repair or replace."]

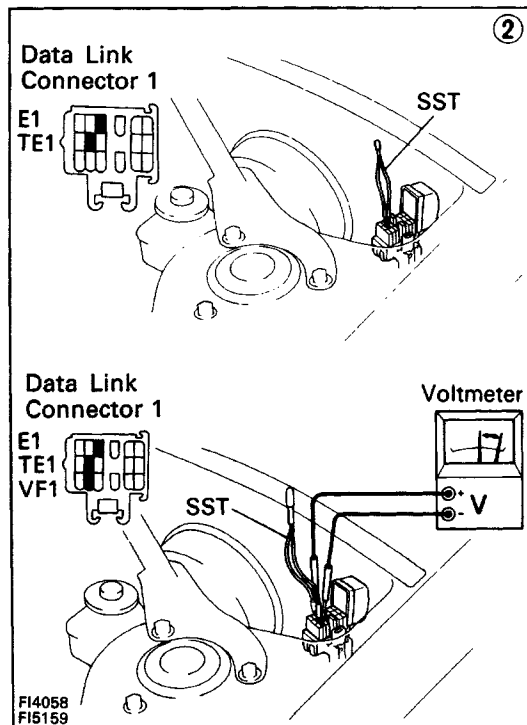
      Step1 --> Step2
      Step2 -- NO --> Step4
      Step2 -- OK --> Step3
      Step3 -- OK --> Step8
      Step3 -- BAD --> Step9
      Step4 -- OK --> Step5
      Step4 -- BAD --> Step6
      Step5 -- OK --> Step11
      Step5 -- BAD --> Step10
      Step6 -- OK --> Step11
      Step6 -- BAD --> Step10
      Step7 -- OK --> Step11
      Step7 -- BAD --> Step10
  
```



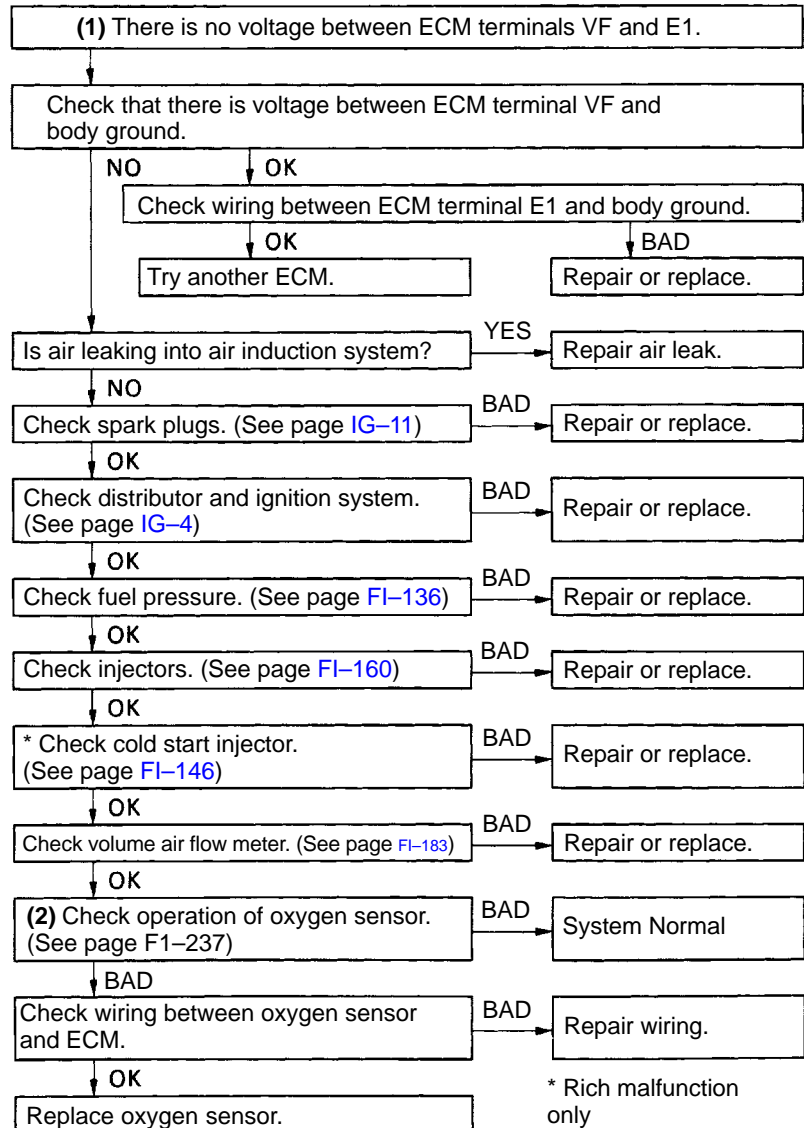
F15408



F13575

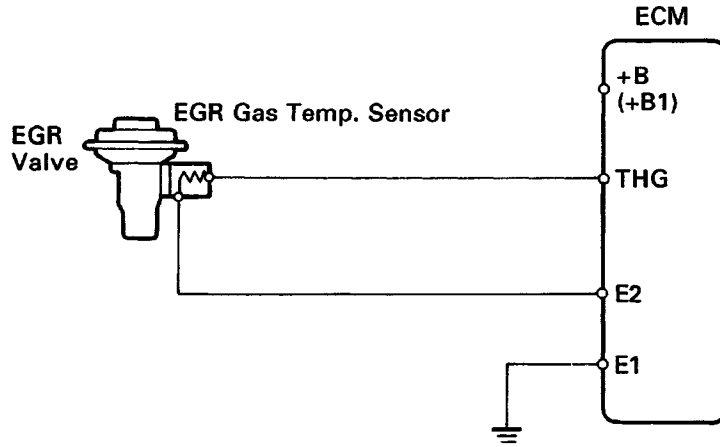


F14058
F15159

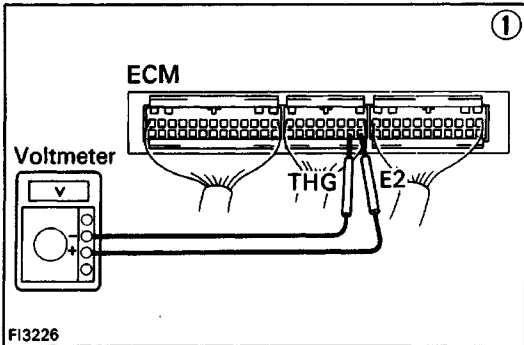


* Rich malfunction only

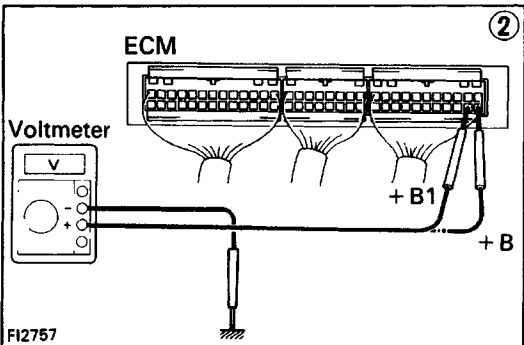
CALIF. only



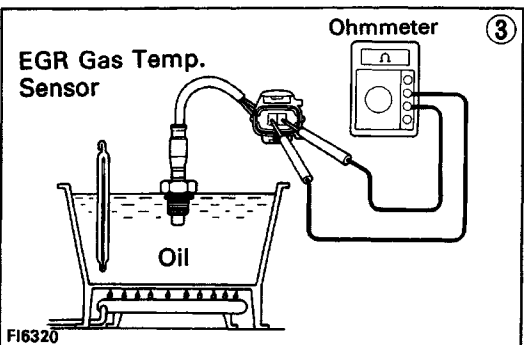
FI2680



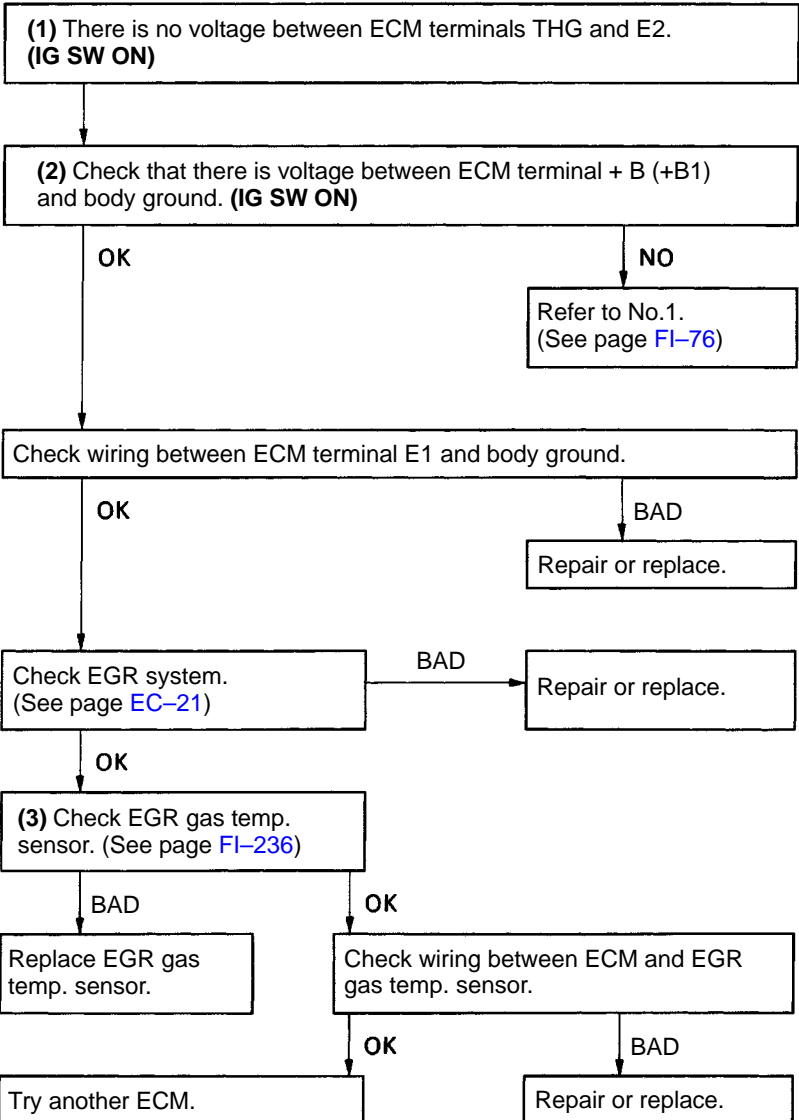
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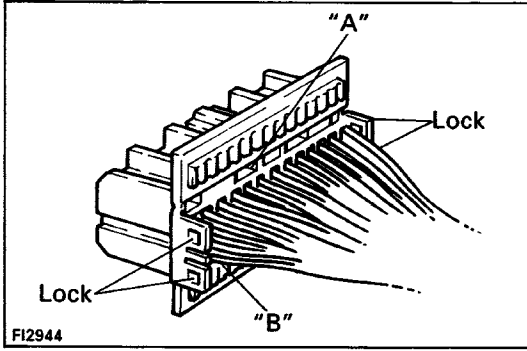


FI2757



FI6320





MFI SYSTEMS CHECK PROCEDURE

(5S-FE MIT)

PREPARATION

- (a) Disconnect the connectors from the ECM.
- (b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.

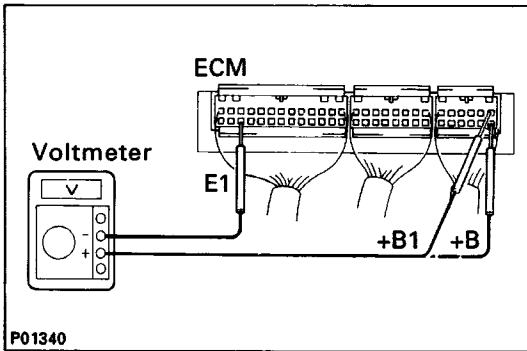
NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

- (c) Reconnect the connectors to the ECM.

HINT:

- Perform all voltage measurements with the connectors disconnected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in the "ON" position.

Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each at each terminal of the wiring connectors.

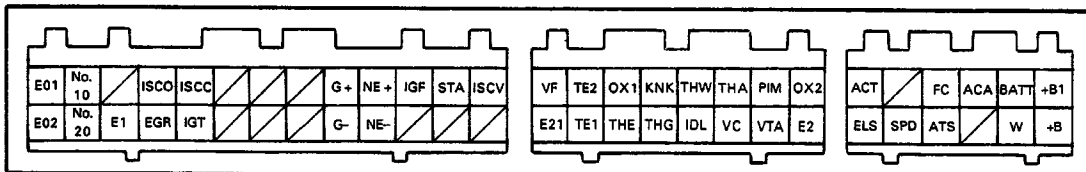


Terminals of ECM (5S-FE M/T)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	N E+	DISTRIBUTOR	THA	AIR TEMP. SENSOR
E02	POWER GROUND	NE-	DISTRIBUTOR	VC	VACUUM SENSOR THROTTLE POSITION SENSOR
No.10	INJECTOR	IGF	IGNITER	PIM	VACUUM SENSOR
No.20	INJECTOR		—	VTA	THROTTLE POSITION SENSOR
	—	STA	STARTER RELAY	*OX2	SUB-OXYGEN SENSOR
E1	ENGINE GROUND		—	E2	SENSOR GROUND
ISCO	ISV VALVE	SCV	A/C IDLE-UP VSV	ACT	A/C AMPLIFIER
EGR	EGR VSV		—	ELS	HEAD LIGHT AND DEFOGGER
ISCC	ISV VALVE	VF	DATA LINK CONNECTOR 1		—
IGT	IGNITER	E21	SENSOR GROUND	SPD	SPEED SENSOR
	—	TE2	DATA LINK CONNECTOR 1	FC	CIRCUIT OPENING RELAY
	—	TE 1	DATA LINK CONNECTOR 1	ATS	A/C AMPLIFIER
	—	ox i	MAIN OXYGEN SENSOR	ACA	A/C AMPLIFIER
	—	THE	EVAPORATOR TEMP. SENSOR		—
	—	KNK	KNOCK SENSOR	BATT	BATTERY
	—	*THG	EGR GAS TEMP. SENSOR	W	MALFUNCTION INDICATOR LAMP
G +	DISTRIBUTOR	THW	ENGINE COOLANT TEMP. SENSOR	+B1	MFI MAIN RELAY
G -	DISTRIBUTOR	IDL	THROTTLE POSITION SENSOR	+B	MFI MAIN RELAY

ECM Terminals

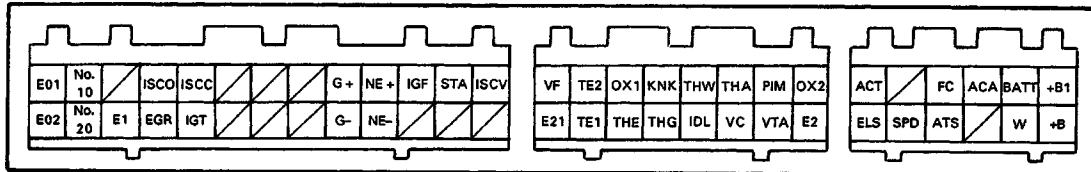
* Calif. only

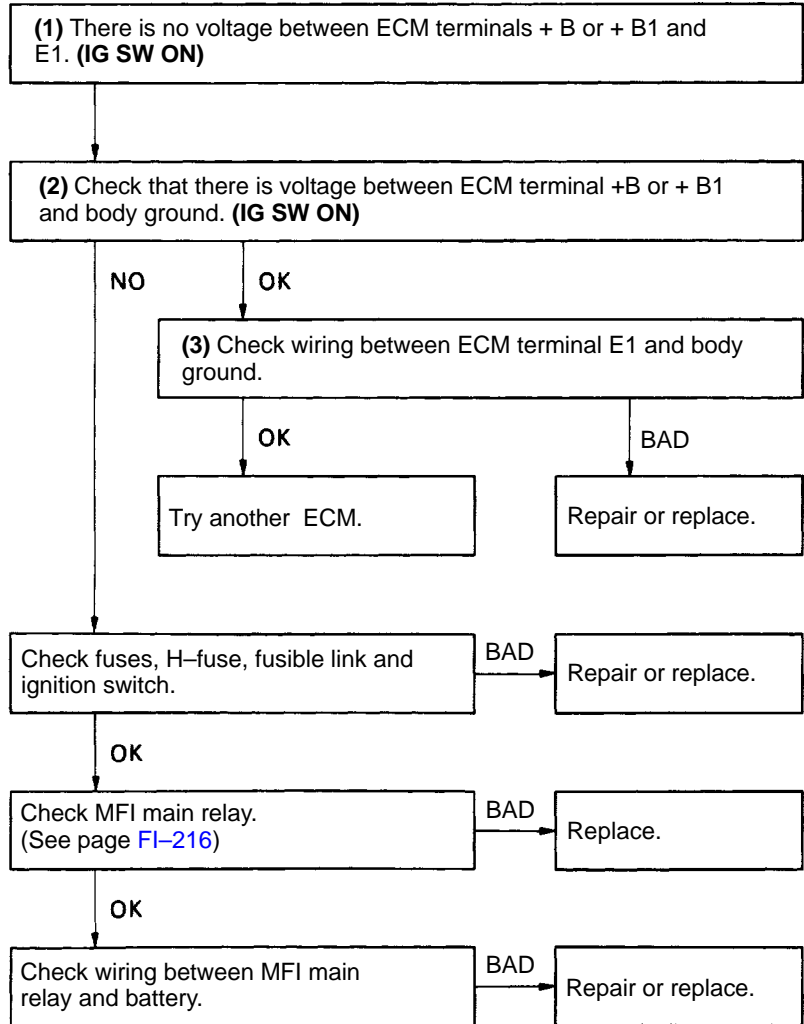
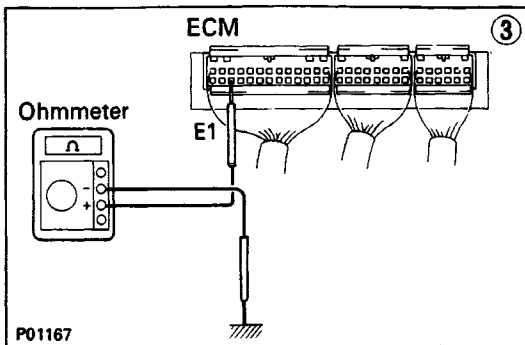
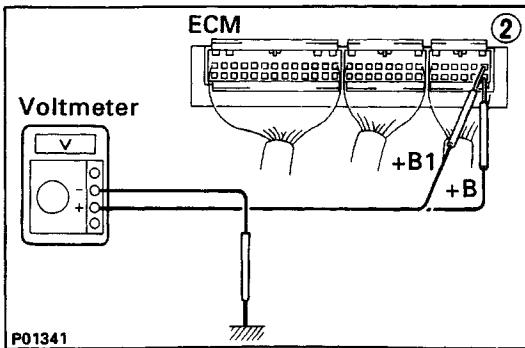
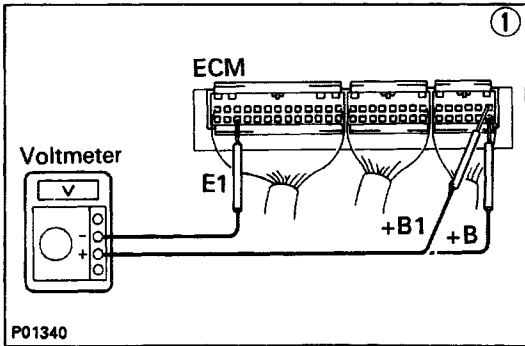
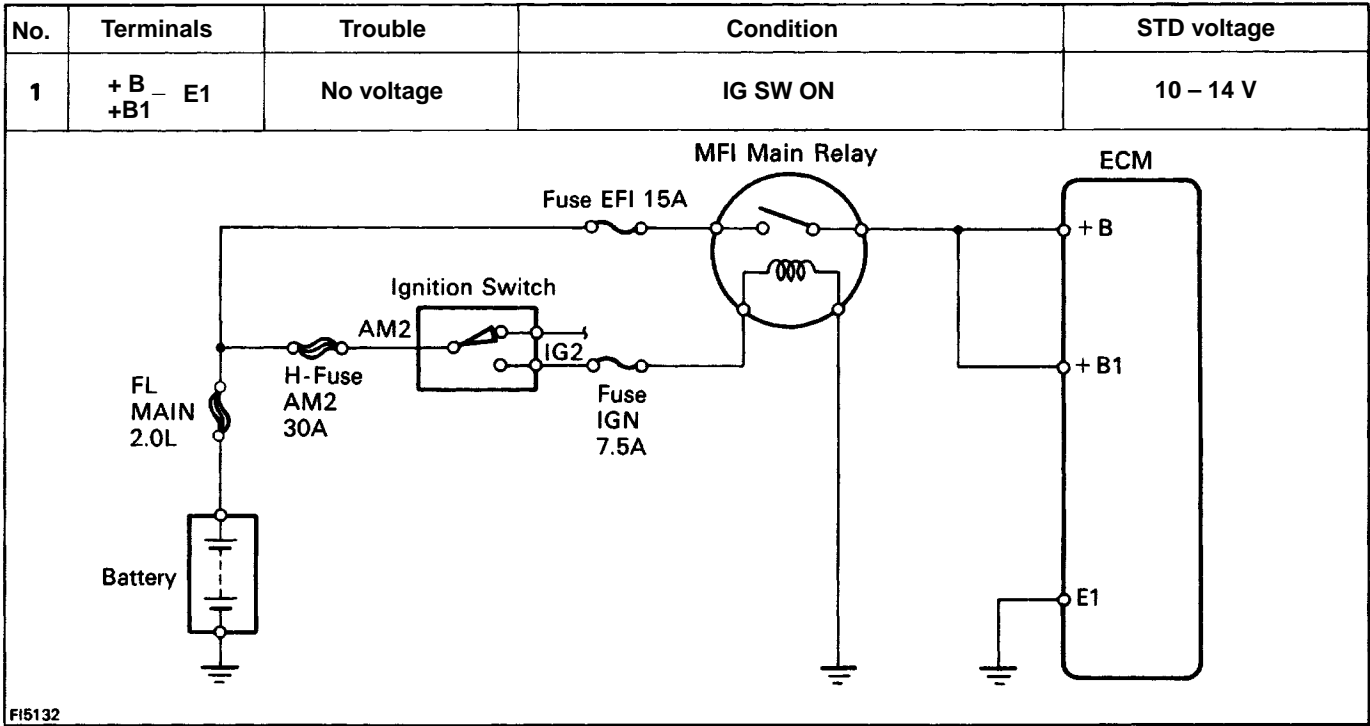


**Voltage at ECM Wiring Connectors
(5S-FE M/T)**

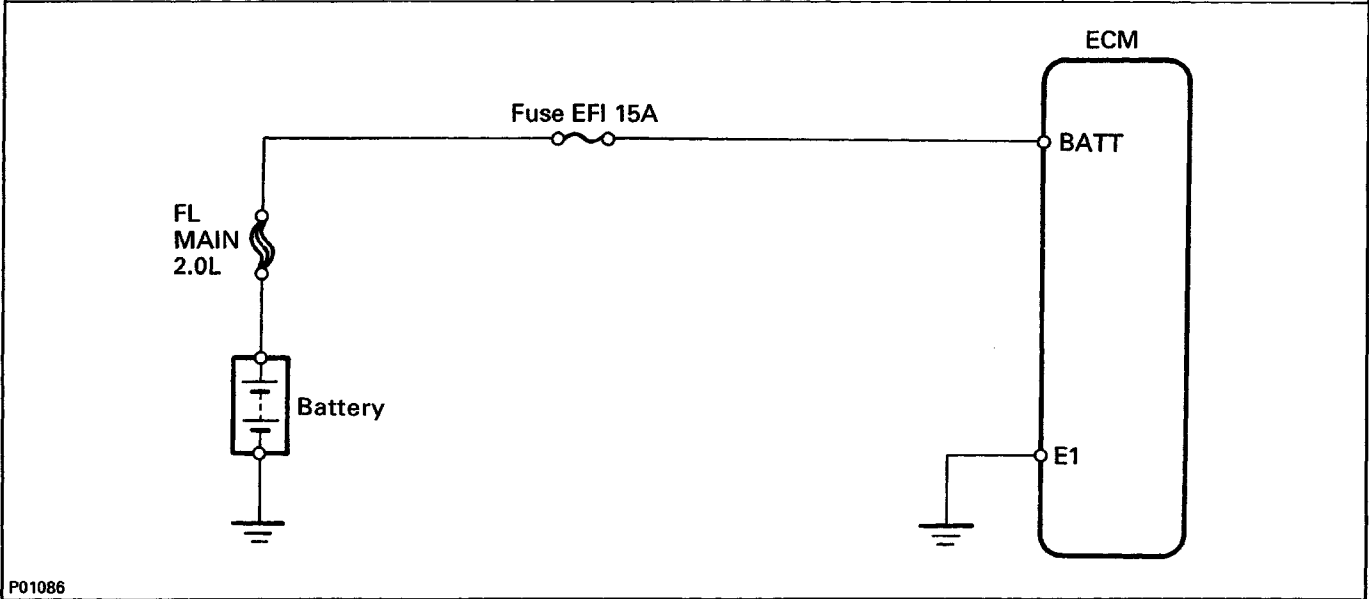
No.	Terminals	Condition		STD voltage (V)	See page
1	+B _ E 1 +B1	IG SW ON		10-14	FI-94
2	BATT - E1			10-14	FI-95
3	IDL - E2	• G SW ON	Throttle valve open	8-14	FI-96
	VC - E2			4.5-5.5	
	VTA - E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.8-1.2	
			Throttle valve fully open	3.2-4.2	
4	PIM-E2	IG SW ON		3.3-3.9	FI-98
	VC- E2			4.5-5.5	
5	No.10 _ E01 No.20 E02				
6	THA - E2	IG SW ON	Intake air temp. 20°C (168°F)	1.9-2.9	FI-100
7	THW - E2		Engine coolant temp. 80°C (176°F)	0.1-1.1	FI-101
8	STA - E 1	Cranking		6-14	FI-102
9	IGT- E1	Cranking or idling		0.8-1.2	FI-103
10	ISCC - E1 ISCO	IG SW ON	ECM connectors disconnected	8-14	FI-104
11	W-E1	No trouble (malfunction indicator lamp off) and engine running		10-14	FI-105

ECM Terminals

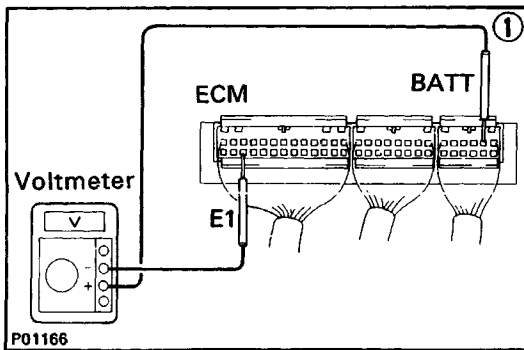




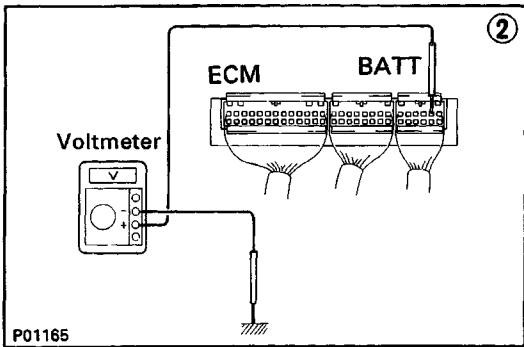
No.	Terminals	Trouble	Condition	STD voltage
2	BATT - E1	No voltage	-	10 - 14 V



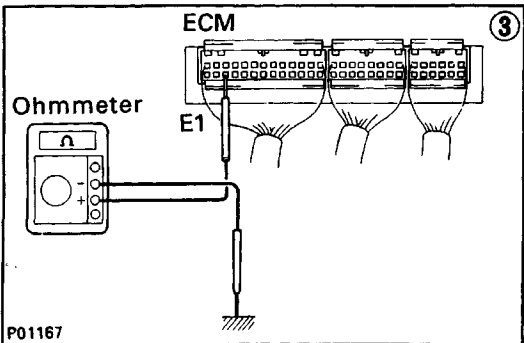
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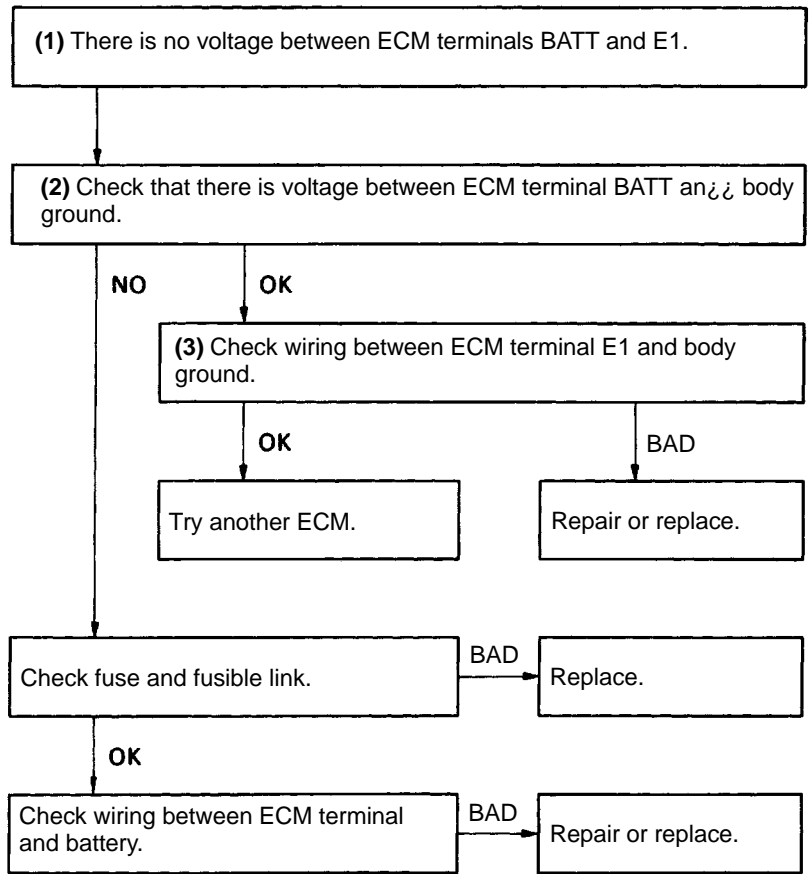
P01166



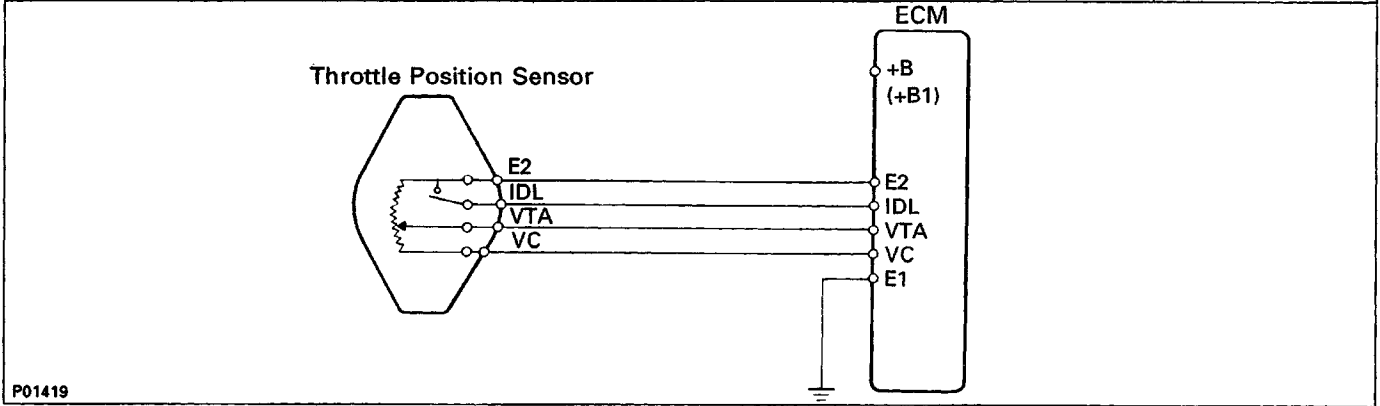
P01165



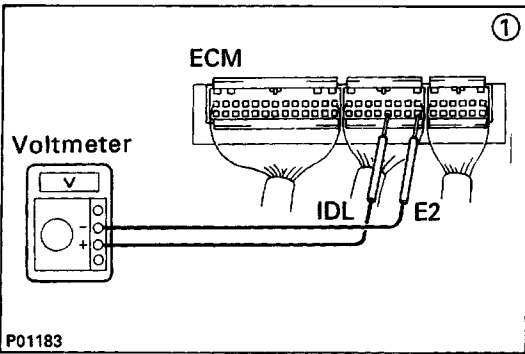
P01167



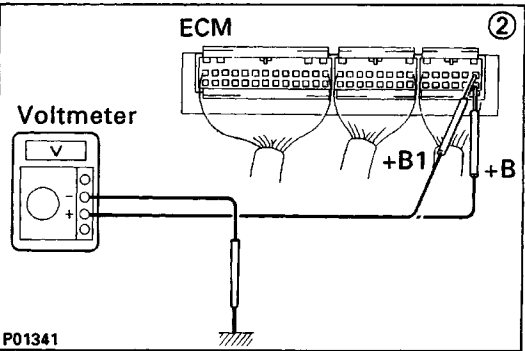
No.	Terminals	Trouble	Condition	STD voltage	
3	IDL - E2	No voltage	IG SW ON	Throttle valve open	s-14v
	VC - E2				4.5 - 5.5 V
	VTA - E2			Throttle valve fully closed (Throttle opener must be cancelled first)	0.8 - 1.2 V
				Throttle valve fully open	3.2 - 4.2 V



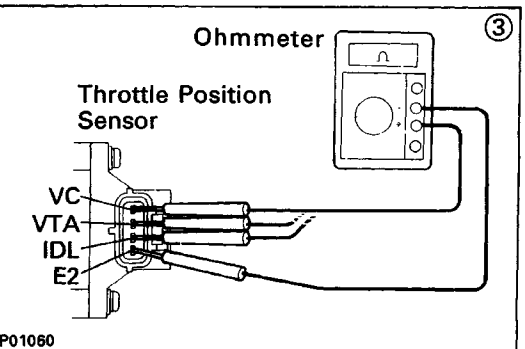
P01419



P01183

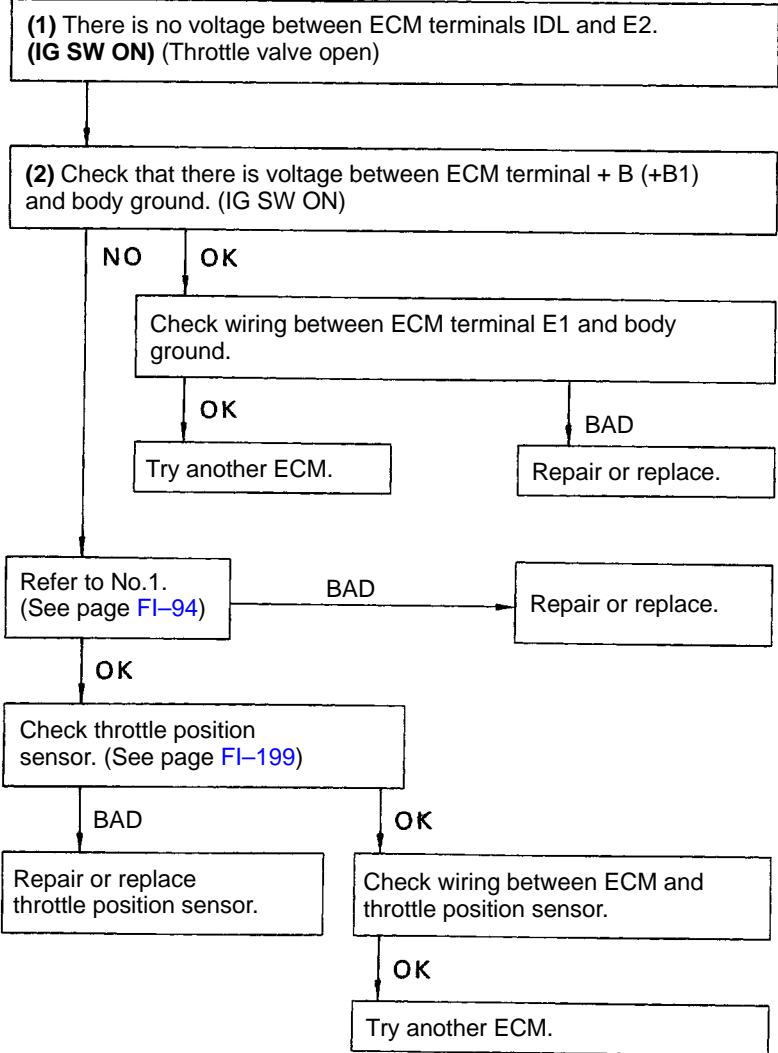


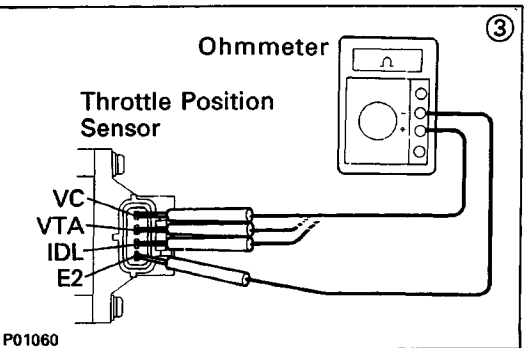
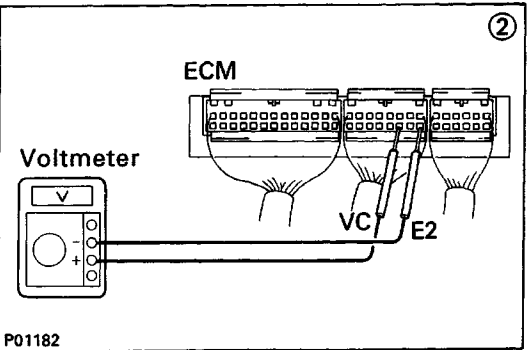
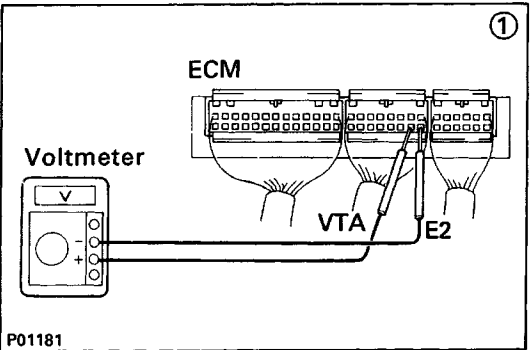
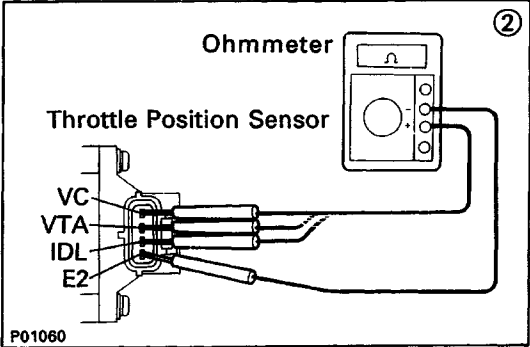
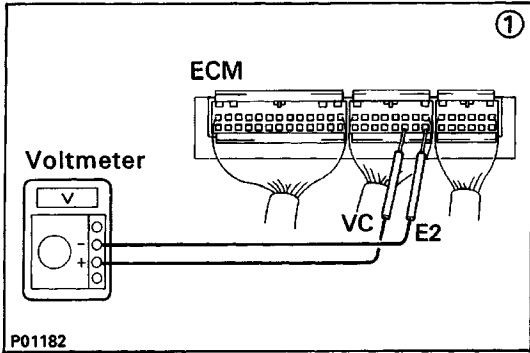
P01341



P01060

• 1DL - E2





• VC-E2

```

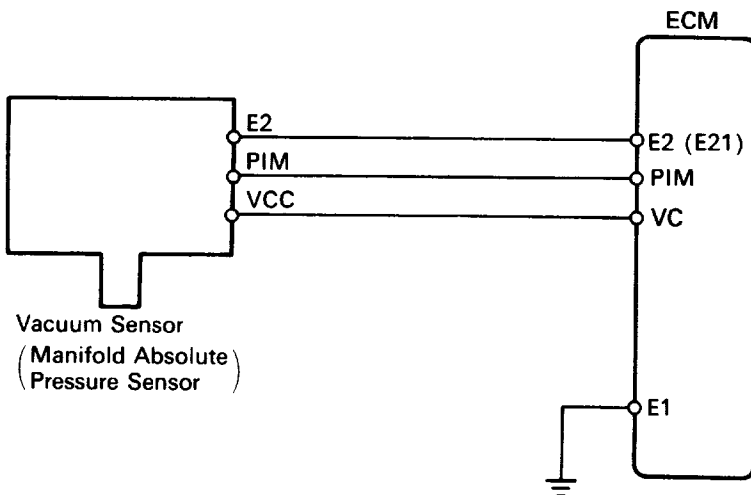
    graph TD
      A["(1) There is no voltage between ECM terminals VC and E2. (IG SW ON)"] --> B["Check that there is voltage between ECM terminal + B (+B1) and body ground. (IG SW ON)"]
      B -- OK --> C["Check throttle position sensor. (See page FI-199)"]
      B -- NO --> D["Refer to No.1. (See page FI-94)"]
      C -- BAD --> E["Repair or replace."]
      C -- OK --> F["Check wiring between ECM and throttle position sensor."]
      F -- OK --> G["Try another ECM."]
      F -- BAD --> H["Repair or replace wiring."]
    
```

• VTA - E2

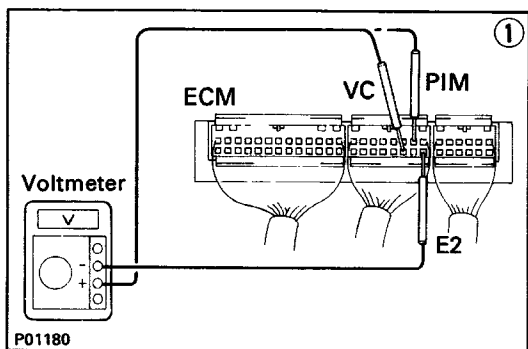
```

    graph TD
      A["(1) There is no specified voltage at ECM terminals VTA and E2. (IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminals VC and E2. (IG SW ON)"]
      B -- NO --> C["Refer to VC - E2 trouble section."]
      B -- OK --> D["(3) Check throttle position sensor. (See page FI-199)"]
      D -- BAD --> E["Repair or replace."]
      D -- OK --> F["Check wiring between ECM and throttle position sensor."]
      F -- BAD --> G["Repair or replace."]
      F -- OK --> H["Try another ECM."]
    
```

No.	Terminals	Trouble	Condition	STD voltage
4	PIM - E2	No voltage	IG SW ON	3.3 - 3.9 V
	VC - E2			4.5 - 5.5 V



FI1226



• PIM - E2, VC - E2

(1) There is no voltage between ECM terminals PIM or VC and E2. (IG SW ON)

(2) Check that there is voltage between ECM terminal + B (+B1) and body ground. (IG SW ON)

OK

NO

Refer to No.1. (See page FI-94)

(3) Check wiring between ECM terminal E1 and body ground.

OK

BAD

Check vacuum sensor. (See page FI-234)

Repair or replace.

BAD

OK

Replace vacuum sensor.

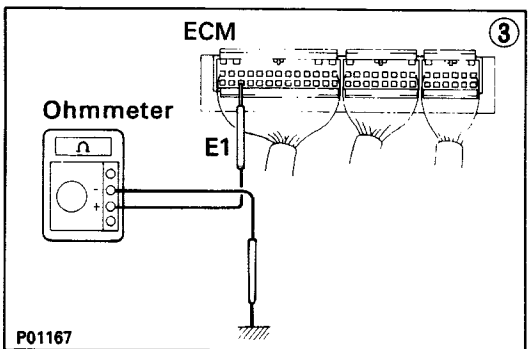
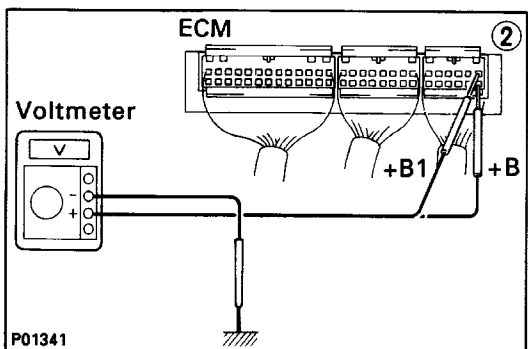
Check wiring between ECM and vacuum sensor.

OK

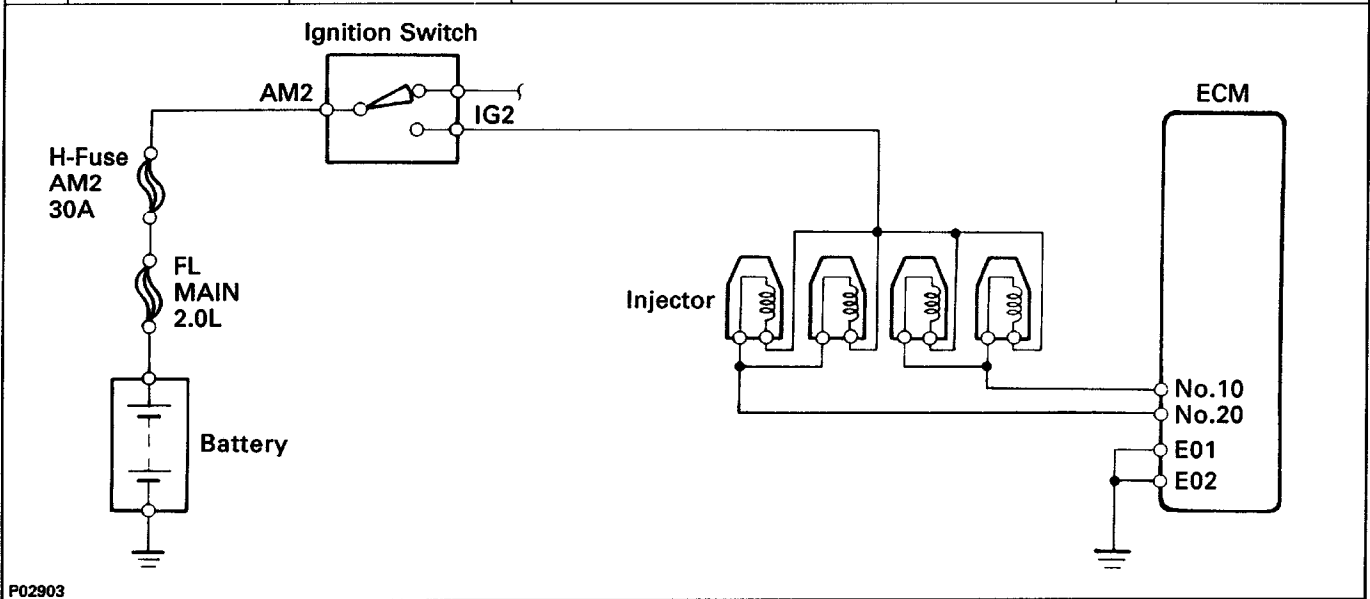
BAD

Try another ECM.

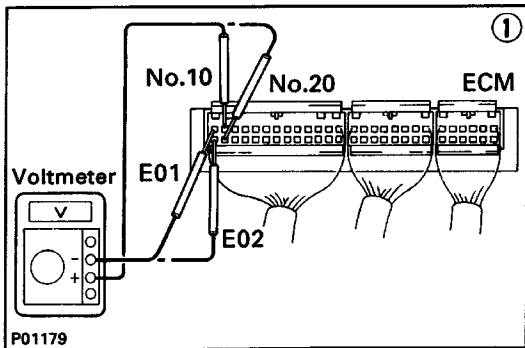
Repair or replace.



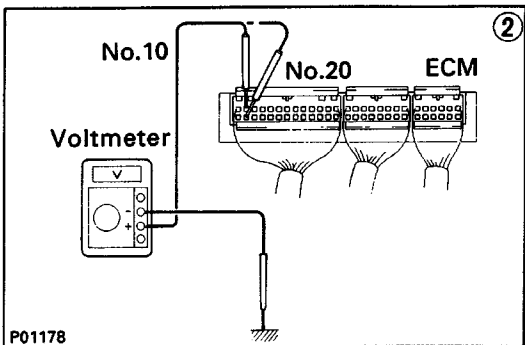
No.	Terminals	Trouble	Condition	STD voltage
5	No. 10 - E01 No. 20 - E02	No voltage	IG SW ON	10 - 14 V



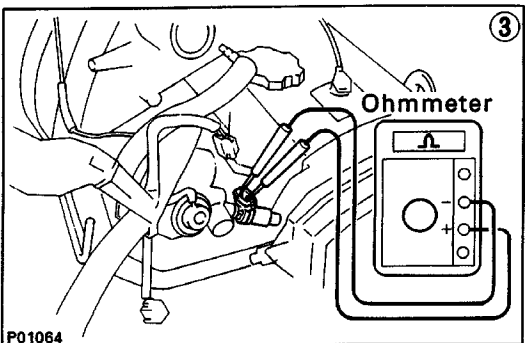
P02903



P01179



P01178

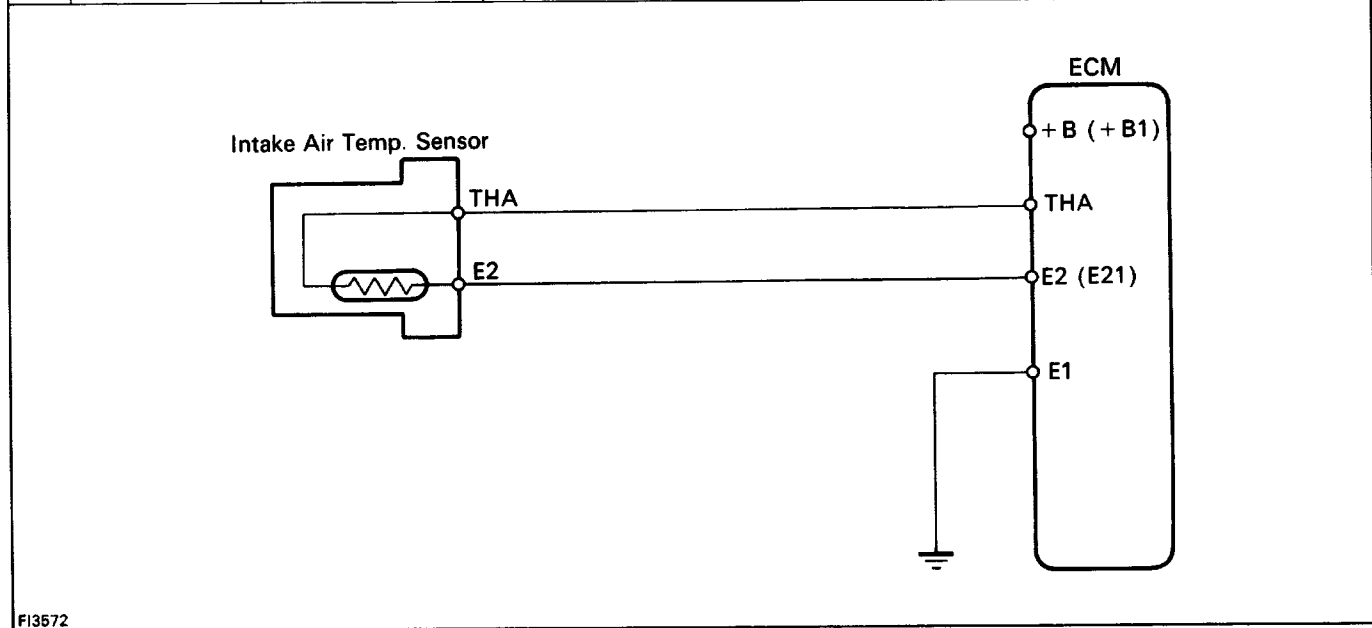


P01064

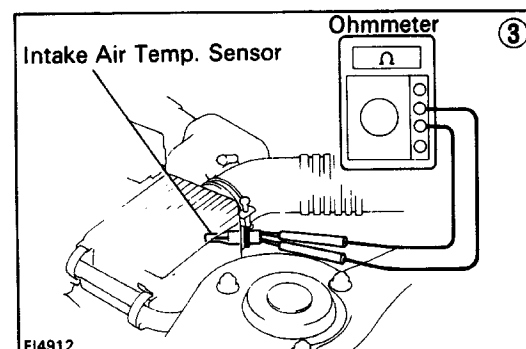
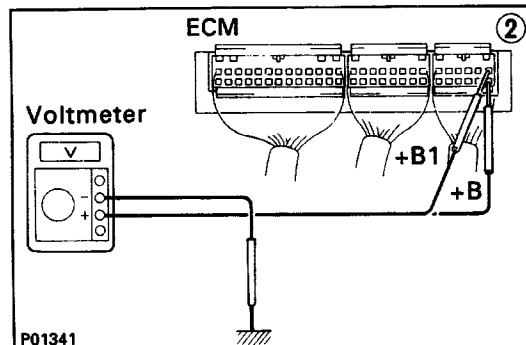
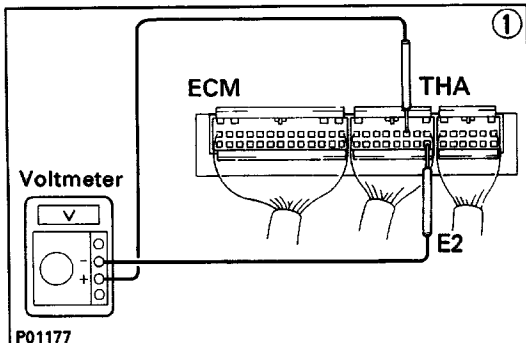
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    graph TD
      A["(1) There is no voltage between ECM terminals No.10 and / or No.20 and E01 and / or E02. (IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal No.10 and / or No. 20 and body ground."]
      B -- NO --> C["Check H-fuse, fusible link and ignition switch."]
      B -- OK --> D["Check wiring between ECM terminal E01 and / or E02 and body ground."]
      D -- OK --> E["Try another ECM."]
      D -- BAD --> F["Repair or replace."]
      C -- BAD --> F
      C -- OK --> G["(3) Check resistance of each injector. STD resistance: Approx. 13.8 Ω"]
      G -- OK --> H["Check wiring between ECM terminal No.10 and / or No.20 and battery."]
      G -- BAD --> I["Replace injector."]
      H -- BAD --> F
      H -- OK --> End[" "]
  
```

No.	Terminals	Trouble	Condition		STD voltage
			IG SW ON	Intake air temperature 20°C (68°F)	
6	THA - E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	1.9 - 2.9 V



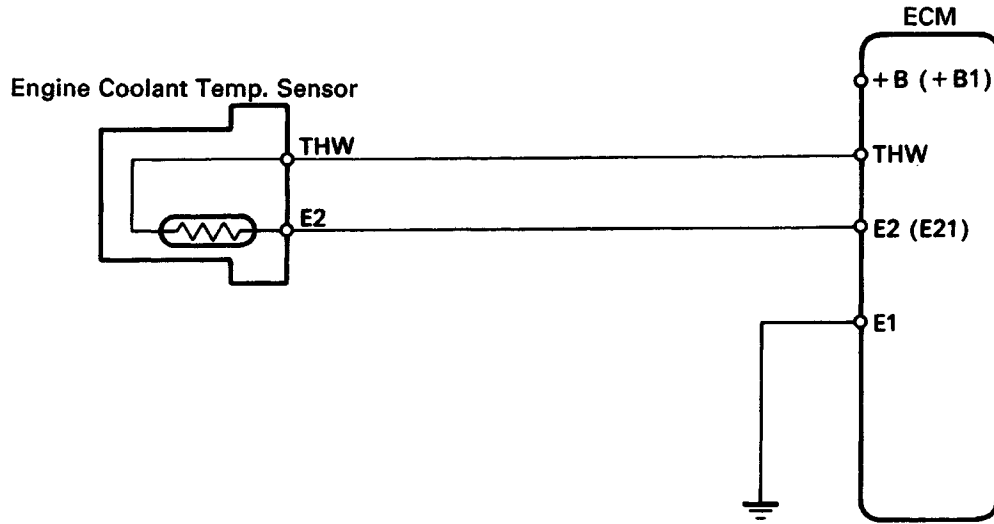
FI3572



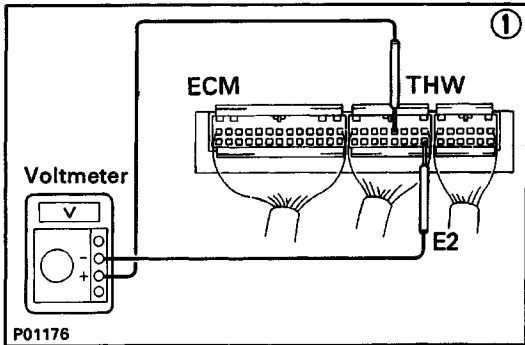
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    graph TD
      A["(1) There is no voltage between ECM terminals THA and E2.  
(IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal +B or +B1  
and body ground. (IG SW ON)"]
      B -- NO --> C["Refer to No.1.  
(See page FI-94)"]
      B -- OK --> D["Check wiring between ECM terminal E1 and body ground."]
      D -- BAD --> E["Repair or replace."]
      D -- OK --> F["Check intake air temp. sensor.  
(See page FI-232)"]
      F -- BAD --> G["Replace air temp. sensor."]
      F -- OK --> H["Check wiring between ECM and air temp. sensor."]
      H -- BAD --> I["Repair or replace."]
      H -- OK --> J["Try another ECM."]
    
```

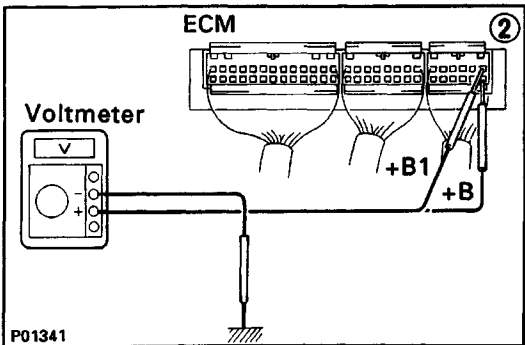

No.	Terminals	Trouble	Condition		STD voltage
7	THW - E2	No voltage	IG SW ON	Engine coolant temperature 80°C (176°F)	0.1 - 1.1 V



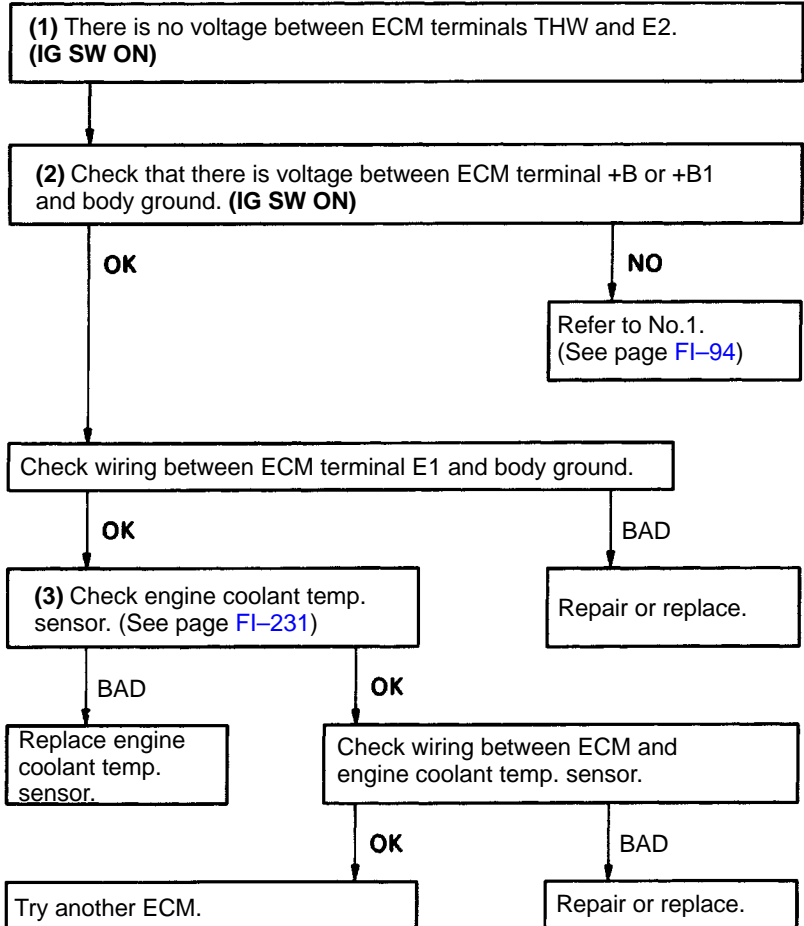
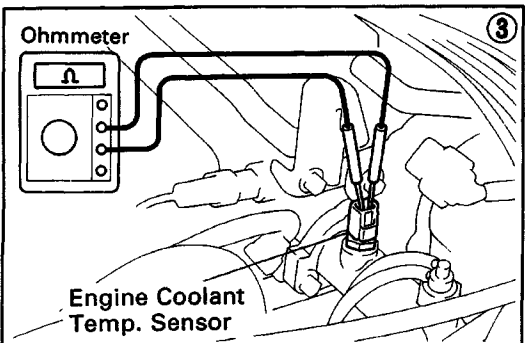
FI3572



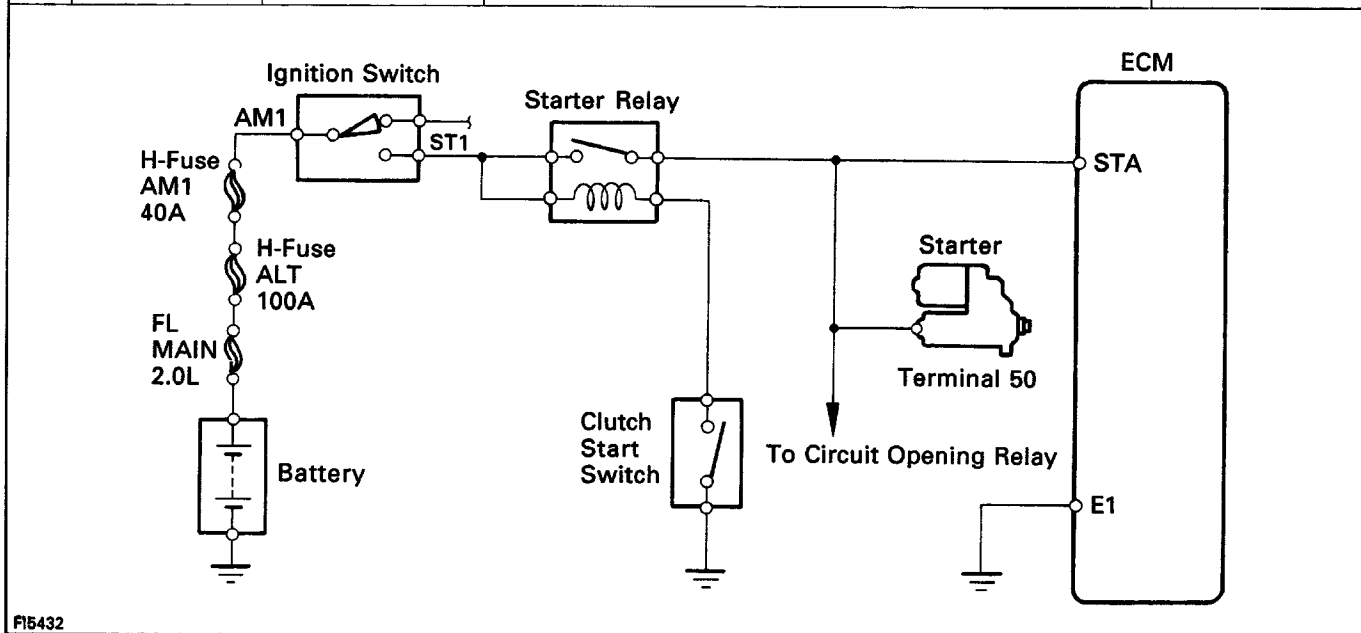
P01176



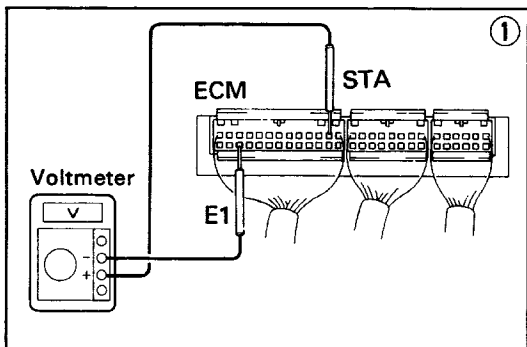
P01341



No.	Terminals	Trouble	Condition	STD voltage
8	STA - E1	No voltage	Cranking	6 - 14 V

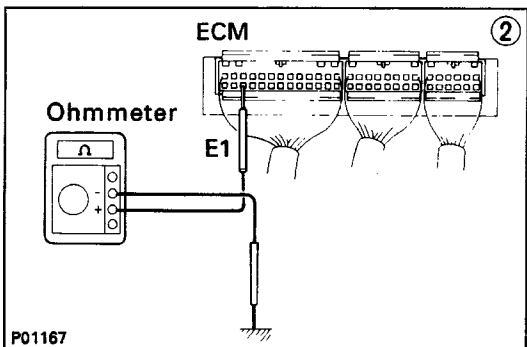


FI5432



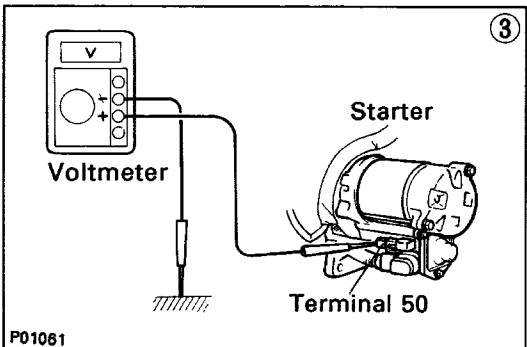
(1) There is no voltage between ECM terminals STA and E1.
(IG SW START)

Check starter operation.
 OK → Check wiring between ECM terminal STA and ignition switch terminal ST1.
 BAD → Repair or replace.



(2) Check wiring between ECM terminal E1 and body ground.
 OK → Try another ECM.
 BAD → Repair or replace.

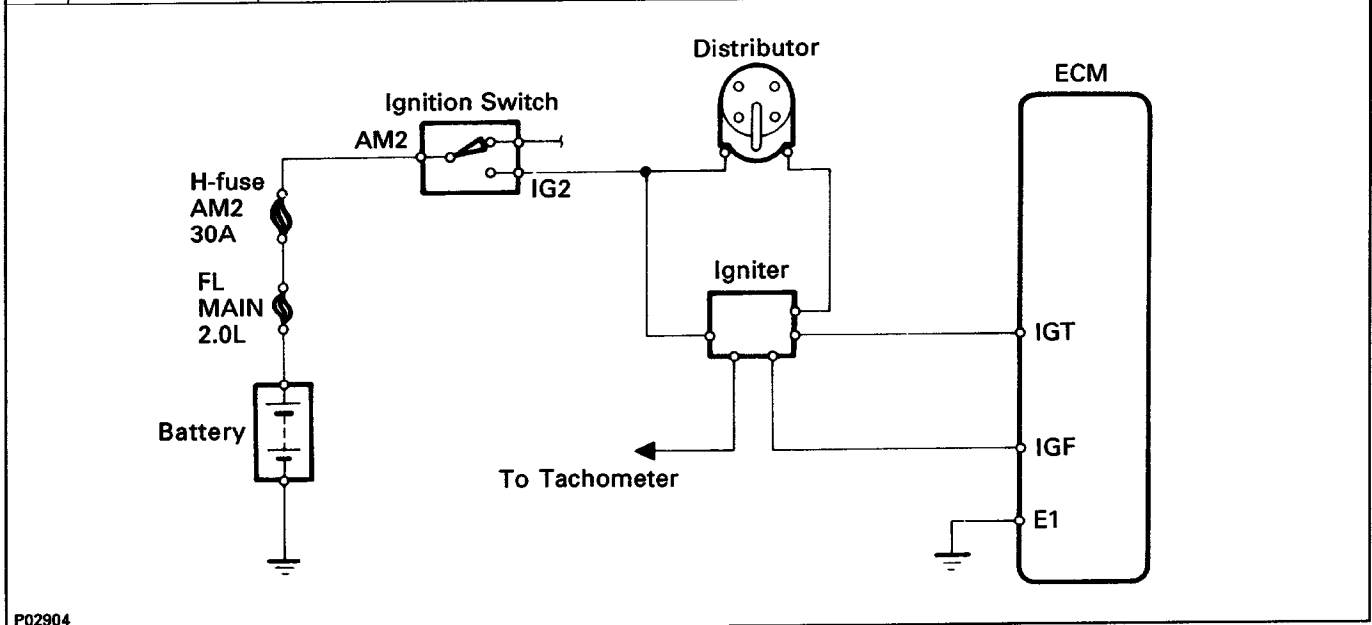
Check H-fuse, fusible link, battery, wiring, ignition switch, clutch start switch and starter relay.
 BAD → Repair or replace.
 OK → (3) Check that there is voltage at starter terminal 50. (IG SW START) STD voltage: 6 - 14 V



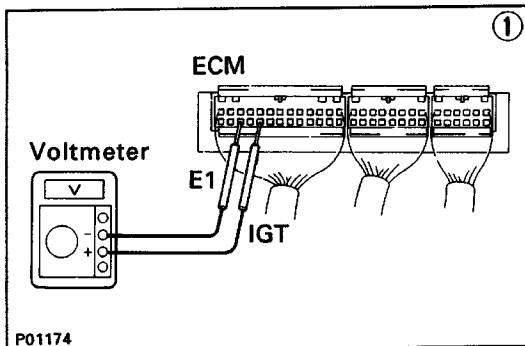
(3) Check that there is voltage at starter terminal 50. (IG SW START) STD voltage: 6 - 14 V
 OK → Check starter.
 NO → Check wiring between ignition switch terminal ST1 and starter terminal 50.

FD1061

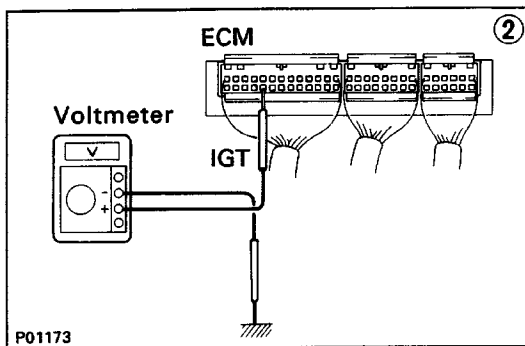
No.	Terminals	Trouble	Condition	STD voltage
9	IGT - E1	No voltage	Idling	0.8 - 1.2 V



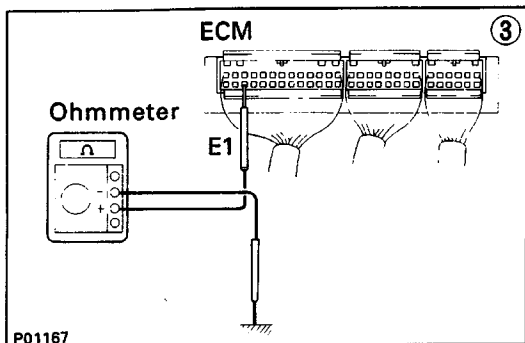
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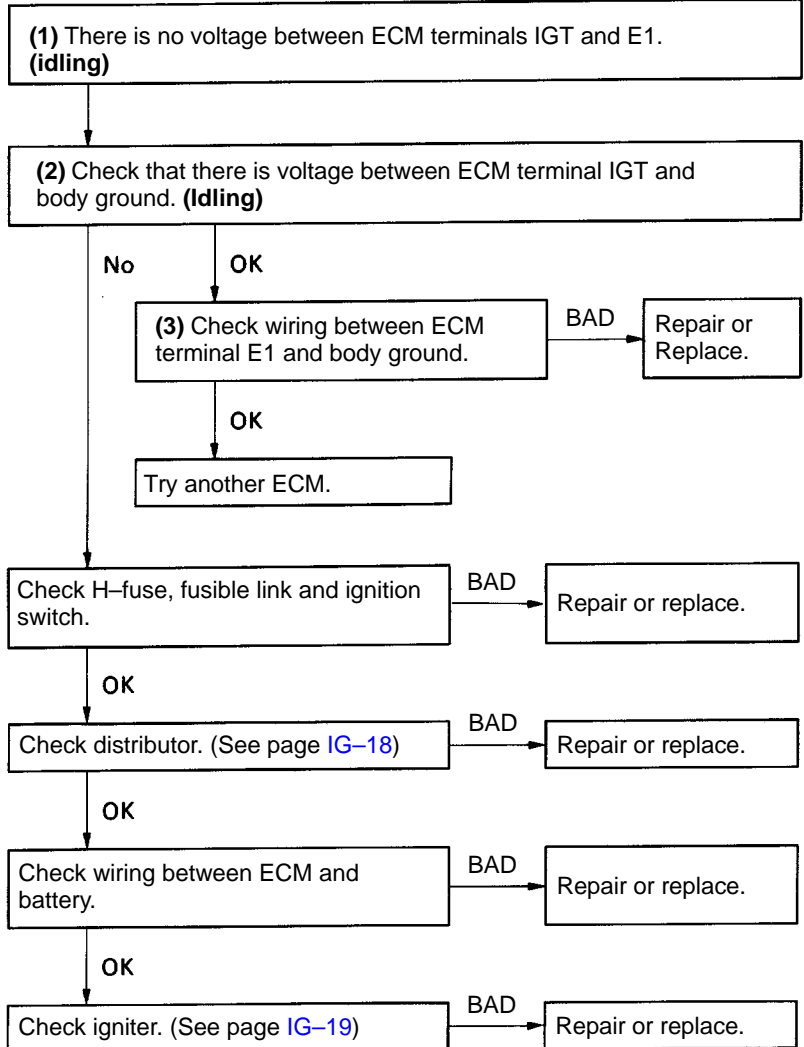
P01174

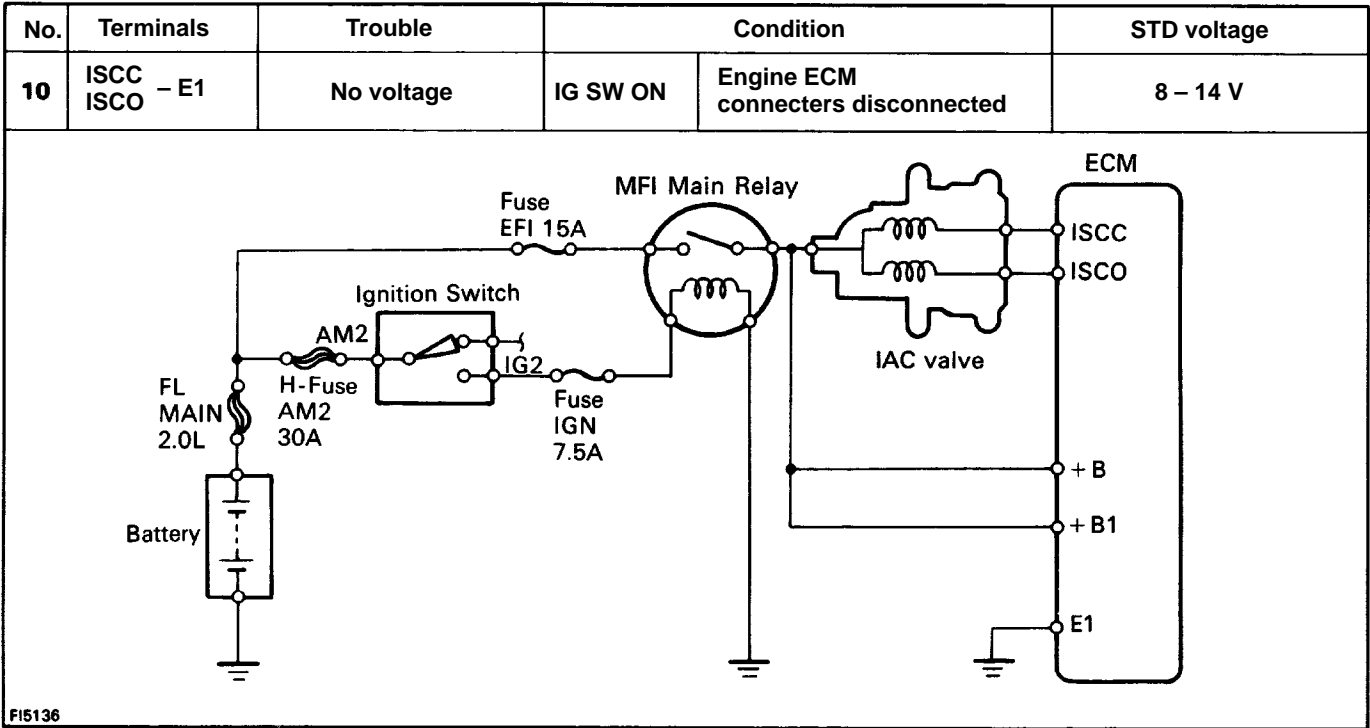


P01173

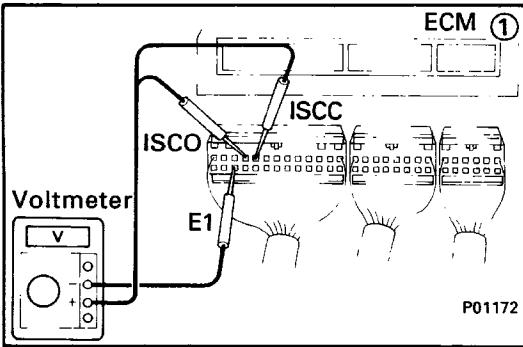


P01167





FI5136



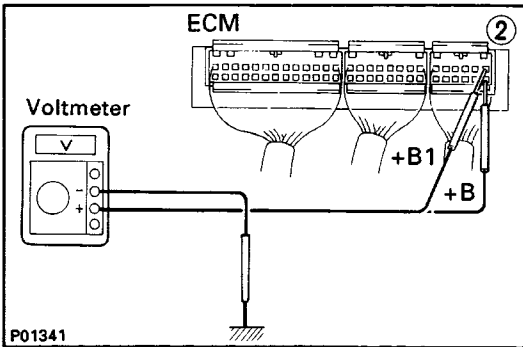
(1) There is no voltage between ECM terminals ISCC or ISCO and E1. (IG SW ON)

(2) Check that there is voltage between ECM terminal +B or +B1 and body ground. (IG SW ON)

OK

NO

Refer to No.1. (See page FI-94)



(3) Check resistance between IAC valve terminals +B and ISCC or ISCO. STD resistance: Approx. 19.3 - 22.3Ω

BAD

Replace IAC valve.

OK

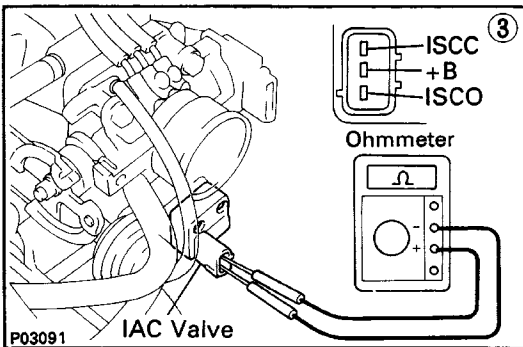
Check wiring between ECM and IAC valve.

BAD

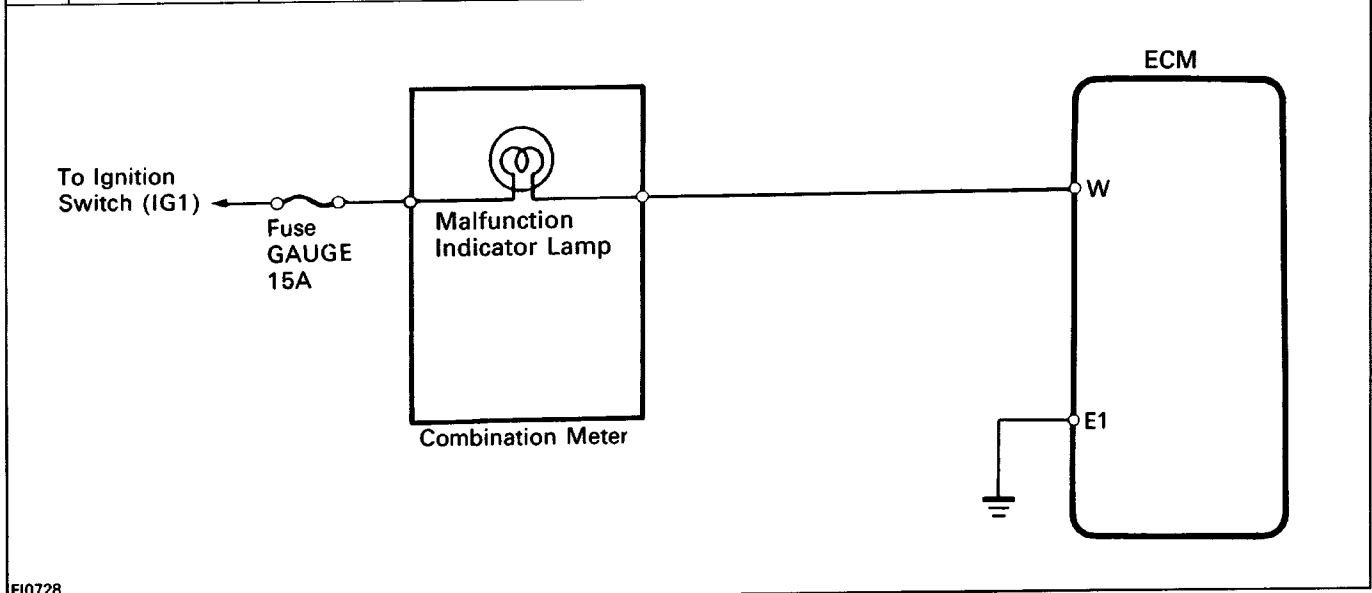
Repair or replace wiring.

OK

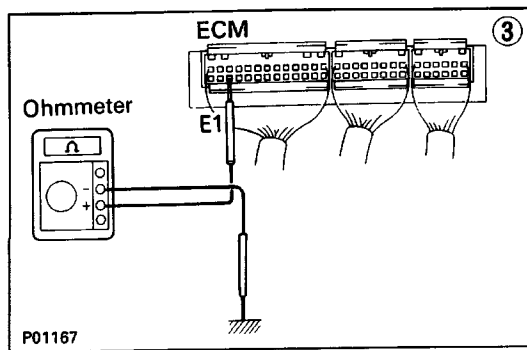
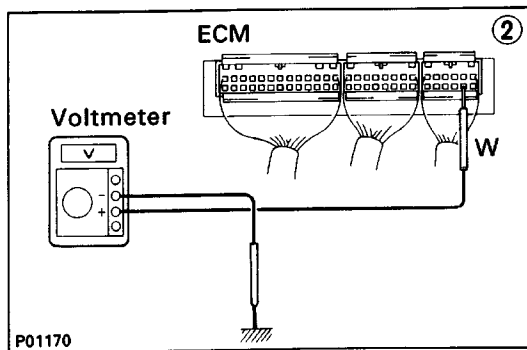
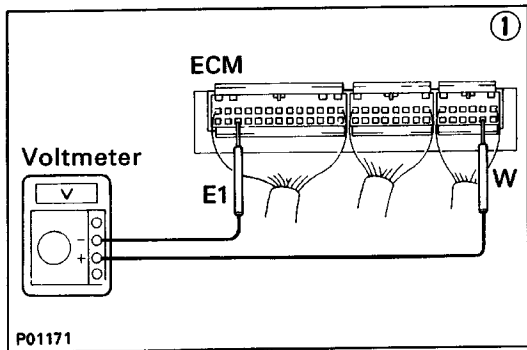
Try another ECM.



No.	Terminals	Trouble	Condition	STD voltage
11	1AI - E 1	No voltage	No trouble (malfunction indicator lamp off) and engine running.	10 - 14 V

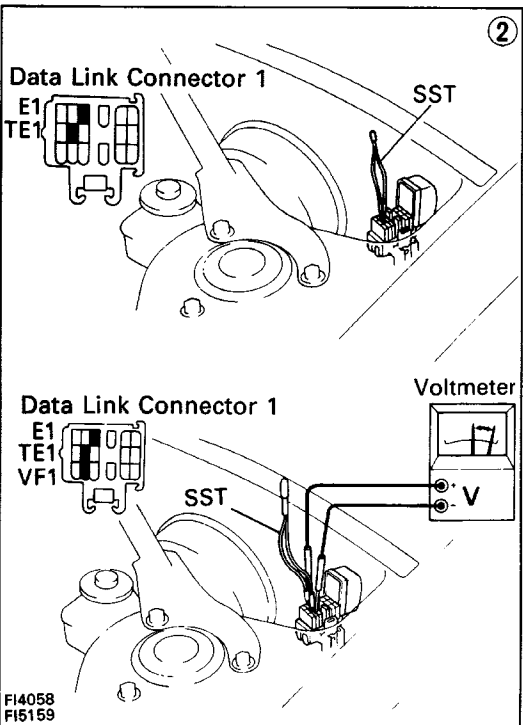
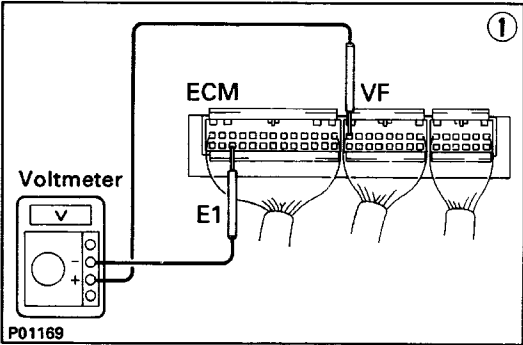
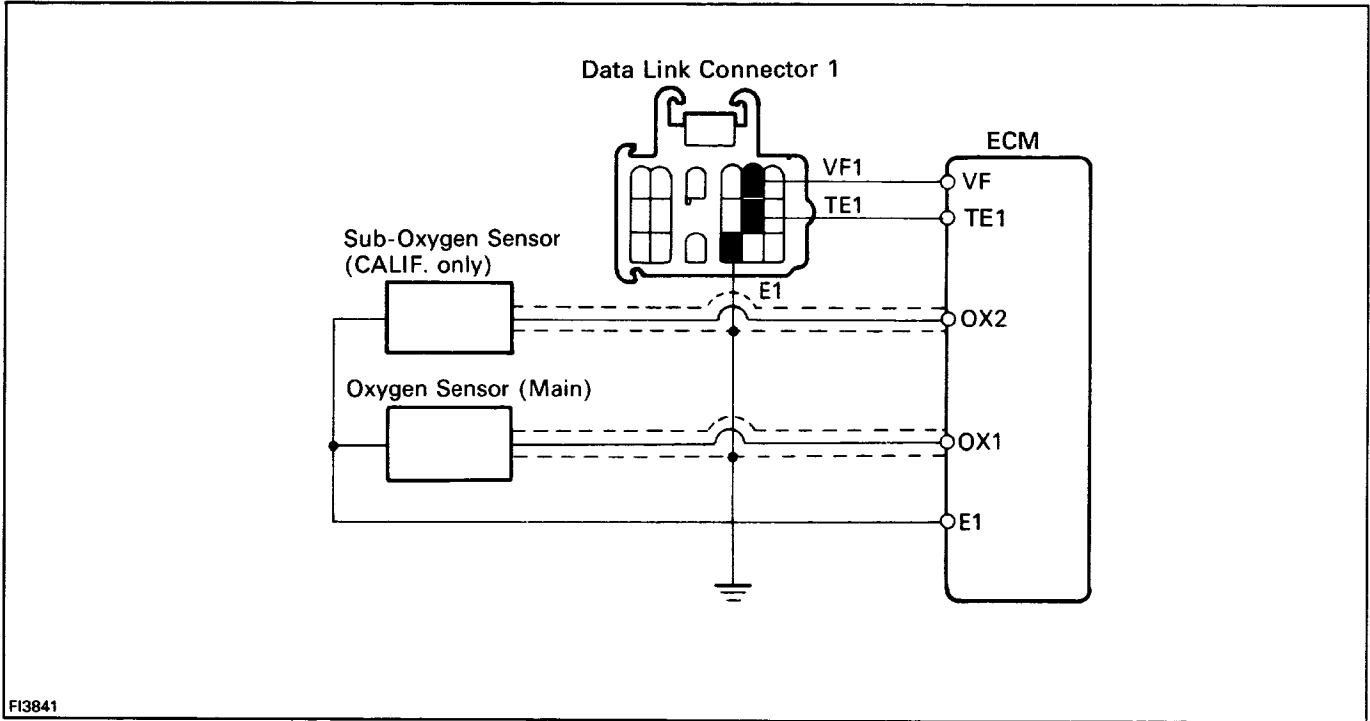


FI0728



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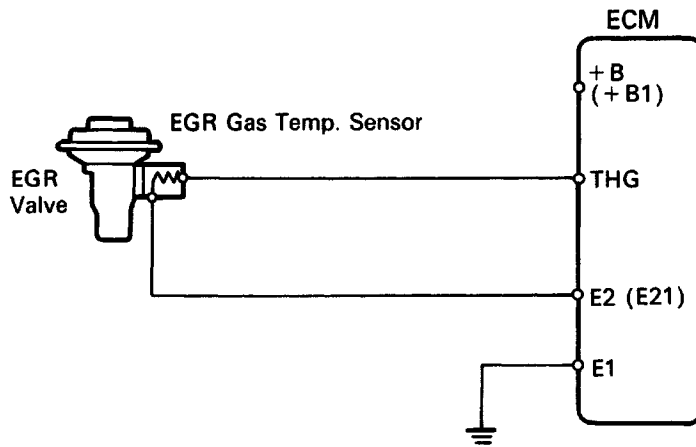
    graph TD
      A["(1) There is no voltage between ECM terminals W and E1. (Idling)"] --> B["(2) Check that there is voltage between ECM terminal W and body ground."]
      B -- NO --> C["(3) Check wiring between ECM terminal E1 and body ground"]
      B -- OK --> D["Check GAUGE fuse (15A) and malfunction indicator lamp."]
      C -- OK --> E["Try another ECM."]
      C -- BAD --> F["Repair or replace."]
      D -- OK --> G["Check wiring between ECM terminal W and fuse."]
      D -- BAD --> H["Repair or replace."]
      G -- Fuse blows again --> I["Repair or replace."]
      G -- BAD --> I
      H --> I
      F --> I
  
```



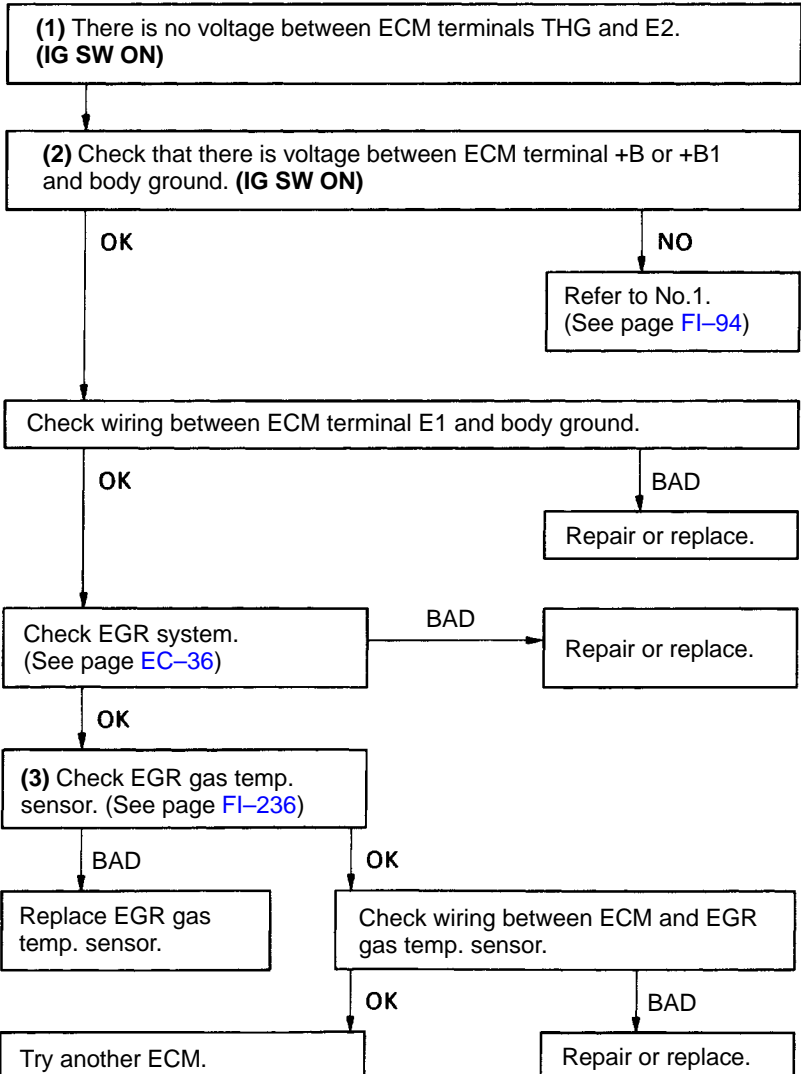
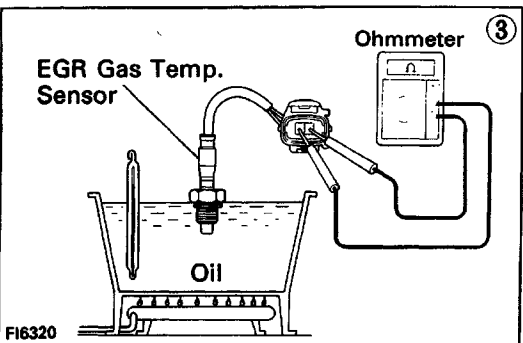
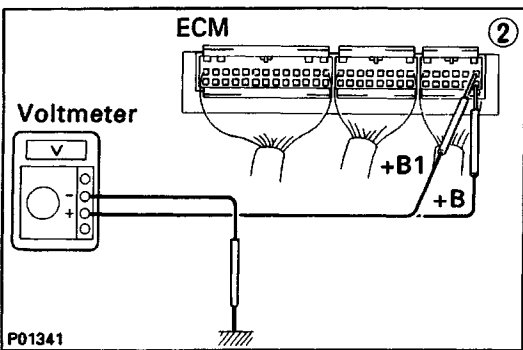
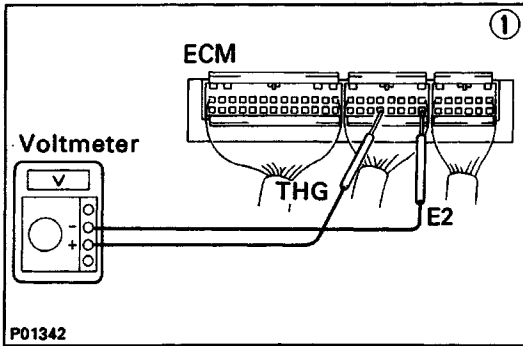
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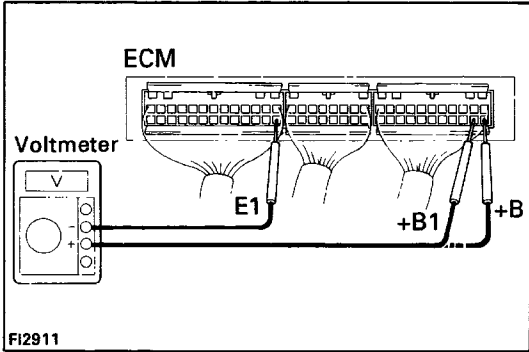
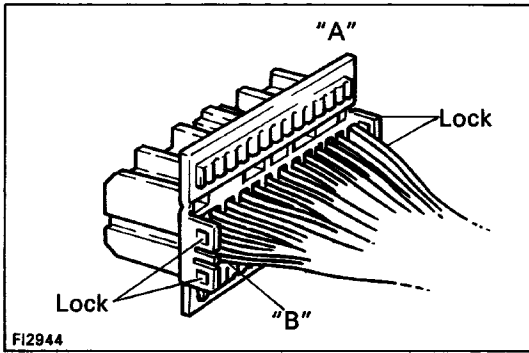
    graph TD
      A["(1) There is no voltage between ECM terminals VF and E1."] --> B["Check that there is voltage between ECM terminal VF and body ground."]
      B -- NO --> C["Check wiring between ECM terminal E1 and body ground."]
      B -- OK --> D["Is air leaking into air induction system?"]
      C -- OK --> D
      C -- BAD --> E["Repair or replace."]
      D -- YES --> F["Repair or replace."]
      D -- NO --> G["Check spark plugs. (See page IG-16)"]
      G -- BAD --> H["Repair or replace."]
      G -- OK --> I["Check distributor and ignition system. (See page IG-4)"]
      I -- BAD --> H
      I -- OK --> J["Check fuel pressure. (See page FI-128)"]
      J -- BAD --> H
      J -- OK --> K["Check injectors. (See page FI-169)"]
      K -- BAD --> H
      K -- OK --> L["Check vacuum sensor (See page FI-234)"]
      L -- BAD --> H
      L -- OK --> M["(2) Check operation of oxygen sensors. (See pages FI-237 and 239)"]
      M -- OK --> N["System Normal"]
      M -- BAD --> O["Check wiring between oxygen sensor and ECM."]
      O -- BAD --> P["Repair wiring."]
      O -- OK --> Q["Replace oxygen sensors."]
    
```

CALIF. only



FI2680





MFI SYSTEM CHECK PROCEDURE (5S-FE A/T) PREPARATION

- (a) Disconnect the connectors from the ECM.
- (b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.

NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

- (c) Reconnect the connectors to the ECM.

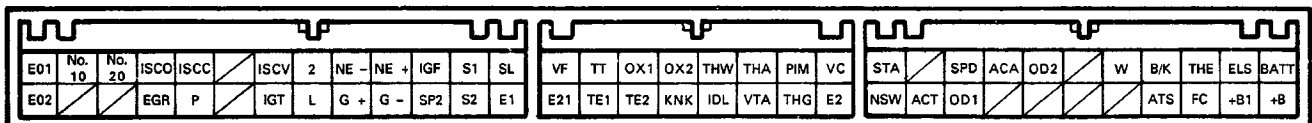
HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in the "ON" position. Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECM (5S-FE A/T)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	S1	SOLENOID	/	—
E02	POWER GROUND	S2	SOLENOID	ACT	A/C AMPLIFIER
No.10	INJECTOR	SL	SOLENOID	SP1	SPEED SENSOR
/	—	E1	ENGINE GROUND	OD1	OD OFF SWITCH
No.20	INJECTOR	VF	DATA LINK CONNECTOR 1	ACA	A/C AMPLIFIER
/	—	E21	SENSOR GROUND	/	—
ISCO	IAC VALVE	TT	DATA LINK CONNECTOR 1	OD2	OD MAIN SWITCH
EGR	EGR VSV	TE1	DATA LINK CONNECTOR 1	/	—
ISCC	IAC VALVE	OX1	OXYGEN SENSOR	/	—
P	PATTERN SELECT SWITCH	TE2	DATA LINK CONNECTOR 1	/	—
/	—	*OX2	SUB-OXYGEN SENSOR	W	MALFUNCTION INDICATOR LAMP
/	—	KNK	KNOCK SENSOR	/	—
ISCV	A/C IDLE-UP VSV	THW	ENGINE COOLANT TEMP. SENSOR	BIK	STOP LIGHT SWITCH
IGT	IGNITER	IDL	THROTTLE POSITION SENSOR	ATS	A/C AMPLIFIER
2	PARK/NEUTRAL POSITION SWITCH	THA	AIR TEMP. SENSOR	THE	EVAPORATOR TEMP. SENSOR
L	PARK/NEUTRAL POSITION SWITCH	VTA	THROTTLE POSITION SENSOR	FC	CIRCUIT OPENING RELAY
NE -	DISTRIBUTOR	PI M	VACUUM SENSOR	ELS	HEADLIGHT RELAY DEFOGGER RELAY
G +	DISTRIBUTOR	*THG	EGR GAS TEMP. SENSOR	+B	MFI MAIN RELAY
NE +	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR	BA^	BATTERY
G -	DISTRIBUTOR	E2	SENSOR GROUND	+B I	MFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH	*Calif. only	
SP2	SPEED SENSOR	N SW	PARK/NEUTRAL POSITION SWITCH		

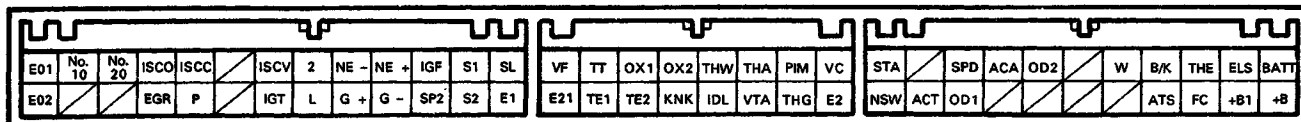
ECM Terminals



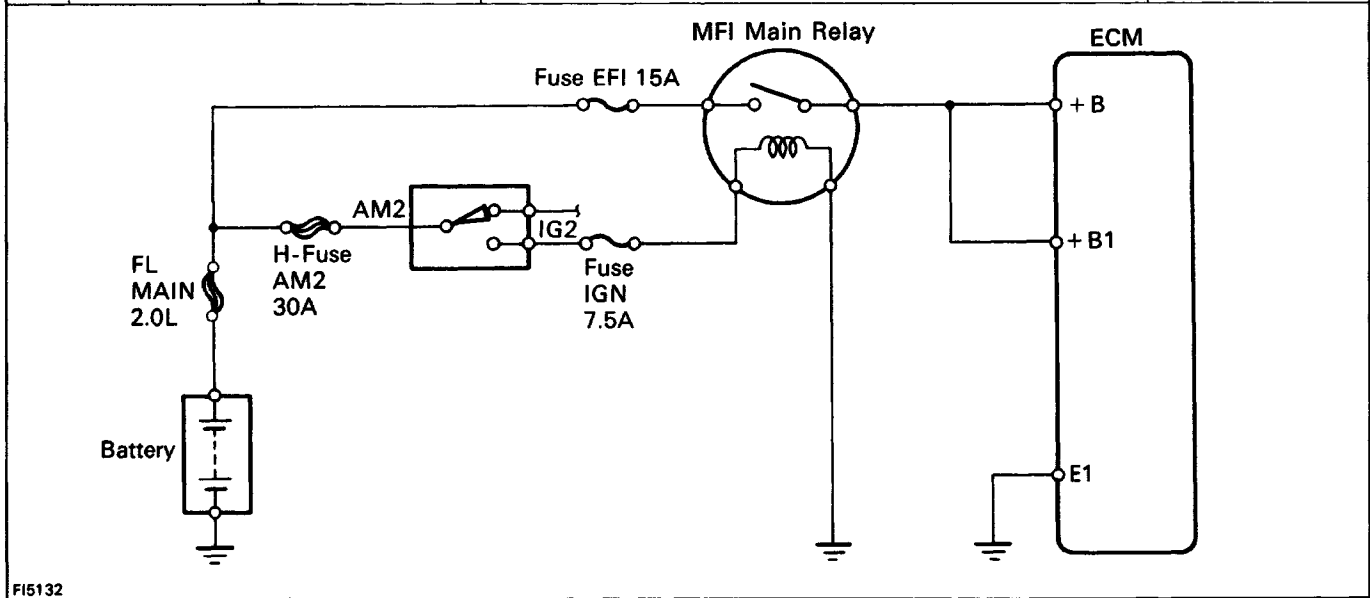
Voltage at ECM Wiring Connectors (5S-EE A/T)

No.	Terminals	Condition		STD voltage (V)	See page
1	+B-E1 + B1	IG SW ON		10-14	FI-110
2	BATT - E 1	—		10-14	F-111
3	IDL - E2	IG SW ON	Throttle valve open	8-14	F-112
	VC - E2		—	4.5-5.5	
	VTA - E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.8-1.2	
			Throttle valve fully open	3.2-4.2	
4	PIM - E2	IG SW ON		3.3-3.9	FI-114
	VC - E2		4.5-5.5		
5	No. 10 E01 - No. 20 E02			10-14	FI-115
6	THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1.9-2.9	FI-116
7	THW - E2		Engine coolant temp. 80°C (176°F)	0.1 -1.1	FI-117
8	STA - E 1	Cranking		6-14	FO-118
9	IGT - E1	Cranking or idling		0.8-1.2	FI-119
10	ISCC - EI ISCO	IG SW ON	ECM connectors disconnected	8-14	FI-120
11	W - E1	No trouble (malfunction indicator lamp off) and engine running		10-14	FI-121

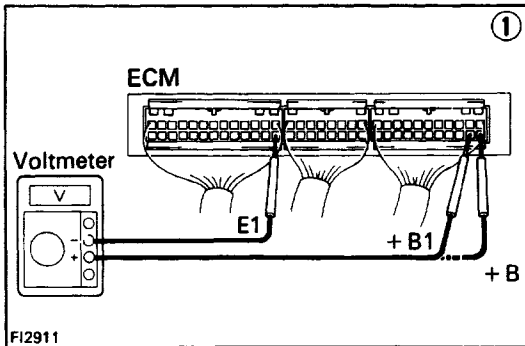
ECM Terminals



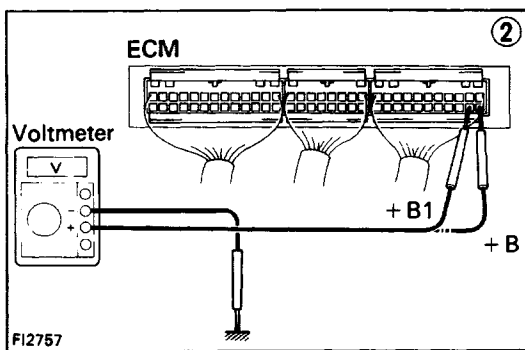
No.	Terminals	Trouble	Condition	STD voltage
1	+B + B1 - E1	No voltage	IG SW ON	10 - 14 V



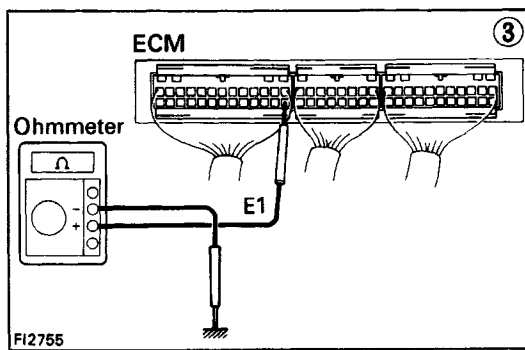
FI5132



FI2911



FI2757

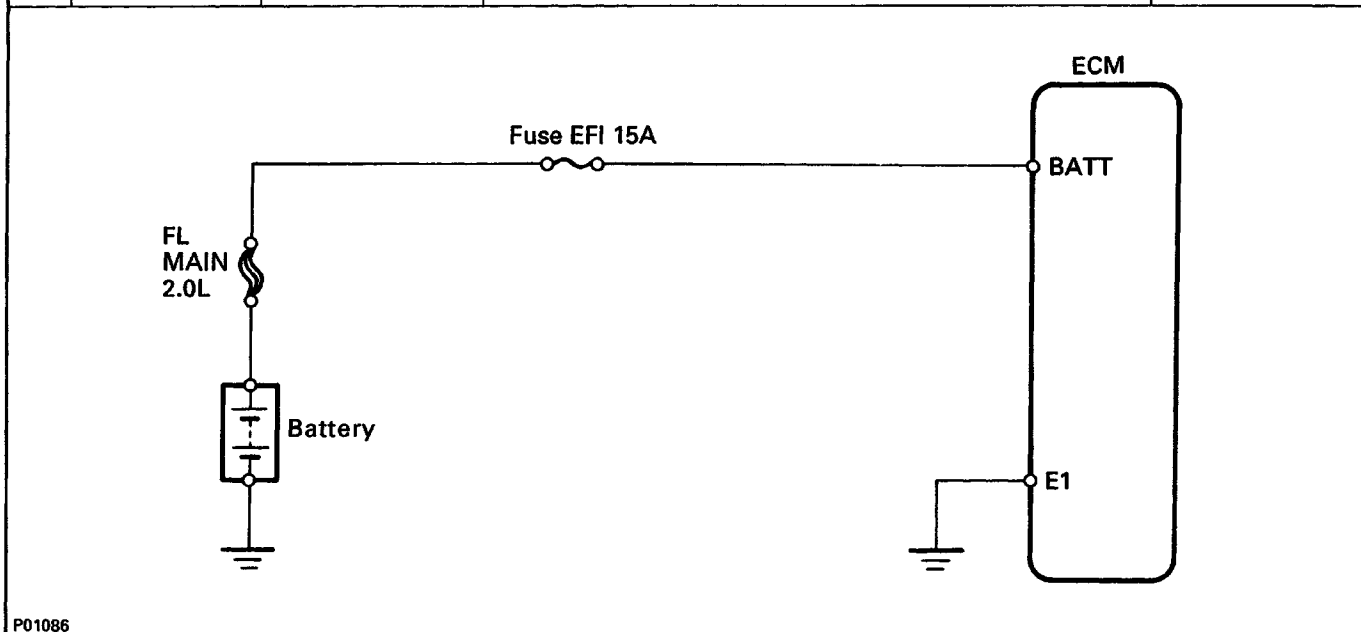


FI2755

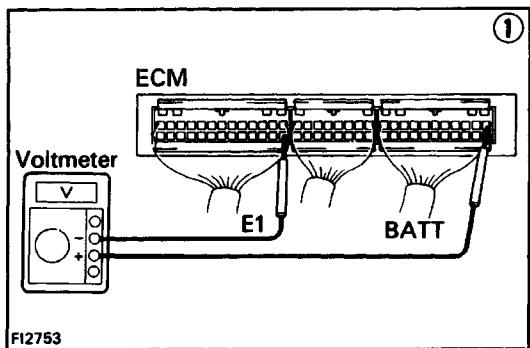
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    graph TD
      A["(1) There is no voltage between ECM terminals +B or +B1 and E1.(IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal +B or +B1 and body ground. (IG SW ON)"]
      B -- NO --> C["(3) Check wiring between ECM terminal E1 and body ground."]
      B -- OK --> D["Check fuses, H-fuse, fusible link and ignition switch."]
      C -- OK --> D
      C -- BAD --> E["Repair or replace."]
      D -- BAD --> E
      D -- OK --> F["Check MFI main relay. (See page FI-216)"]
      F -- BAD --> G["Replace."]
      F -- OK --> H["Check wiring between MFI main relay and battery."]
      H -- BAD --> E
      H -- OK --> I["OK"]
  
```

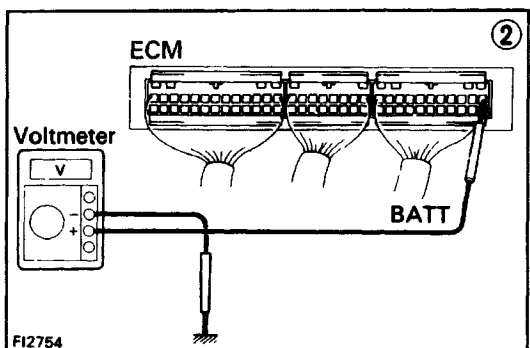
No.	Terminals	Trouble	Condition	STD voltage
2	BATT - E1	No voltage	-	10 - 14V



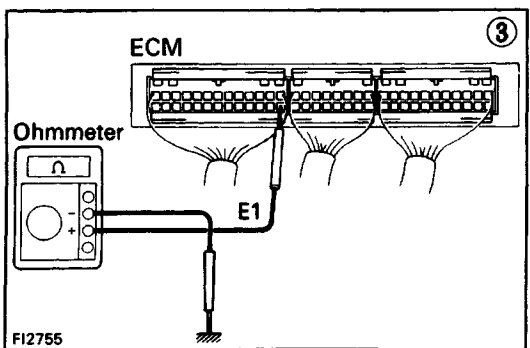
P01086



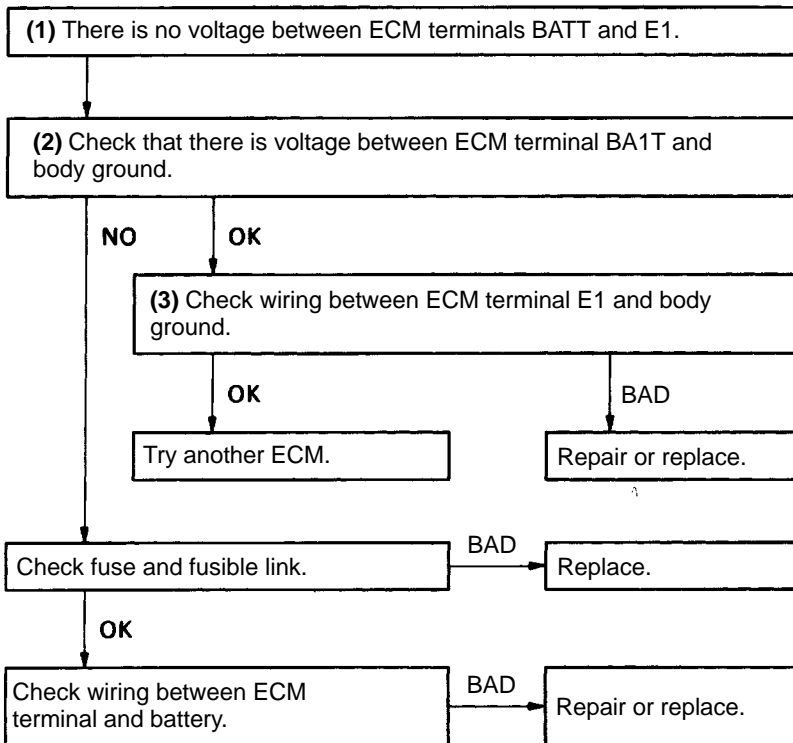
FI2753



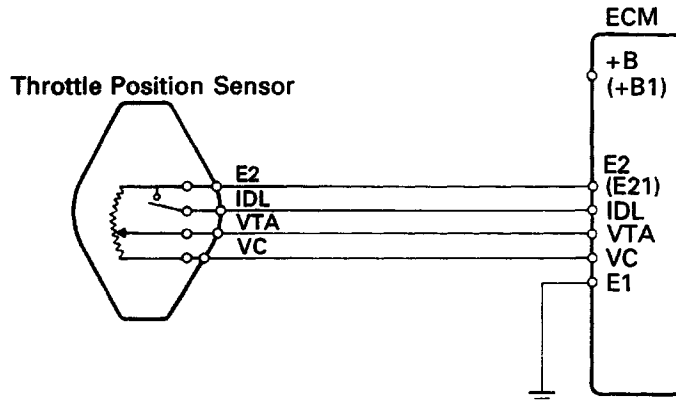
FI2754



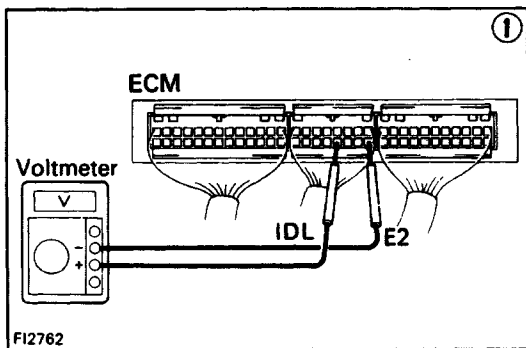
FI2755



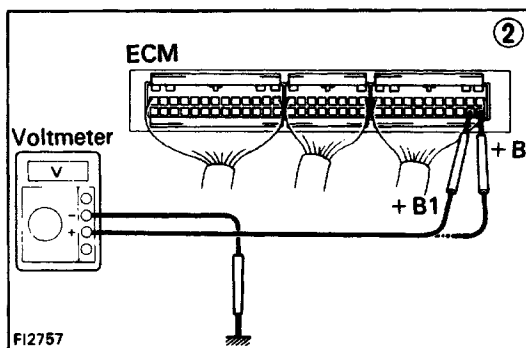
No.	Terminals	Trouble	Condition	STD voltage	
3	IDL - E2	No voltage	IG SW ON	Throttle valve open	8 - 14V
	VC - E2			-	4.5 - 5.5 V
	VTA - E2			Throttle valve fully closed (Throttle opener must be cancelled first)	0.8 - 1.2 V
				Throttle valve fully open	3.2 - 4.2 V



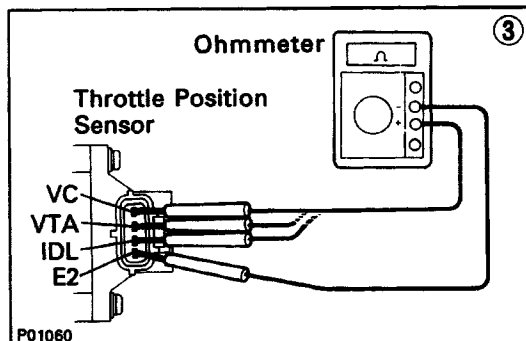
P01419



FI2762

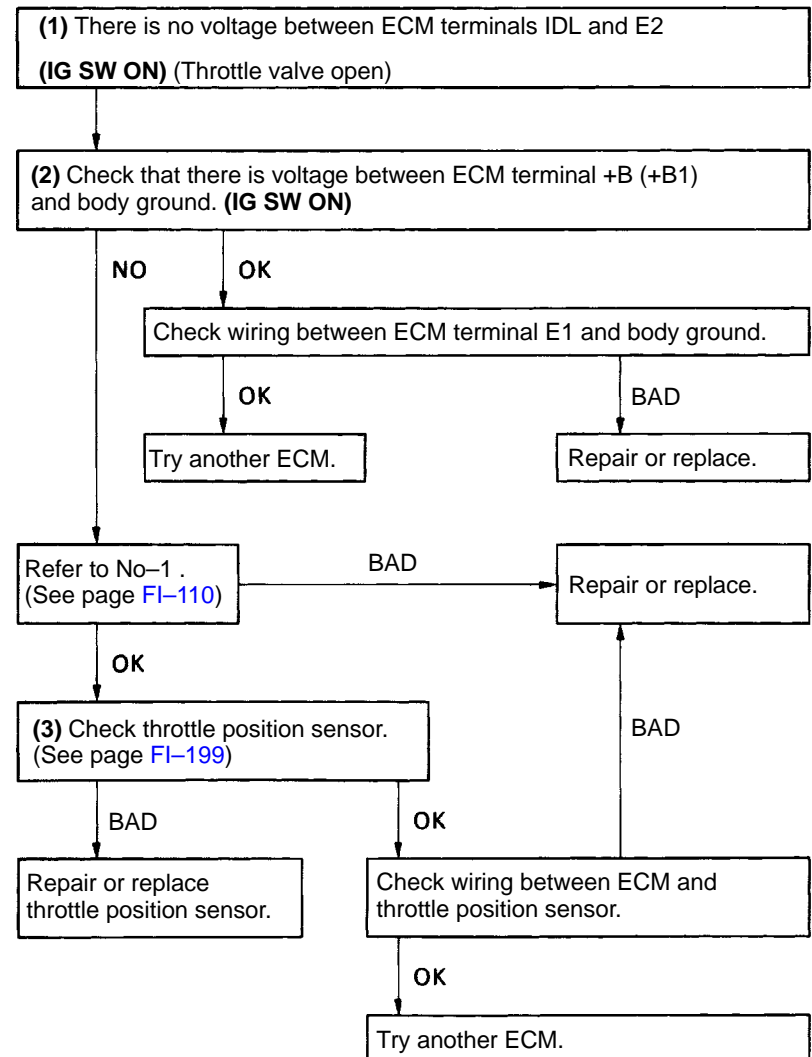


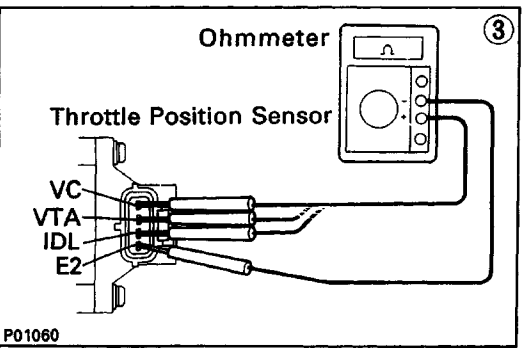
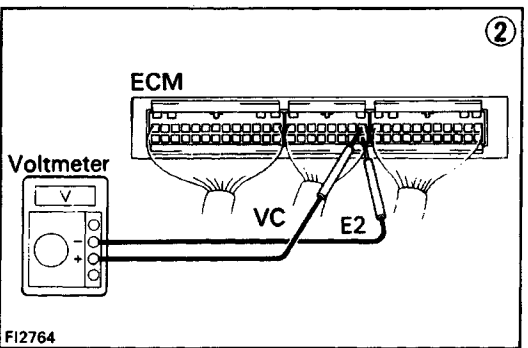
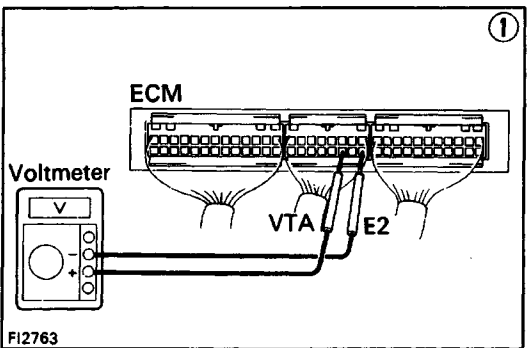
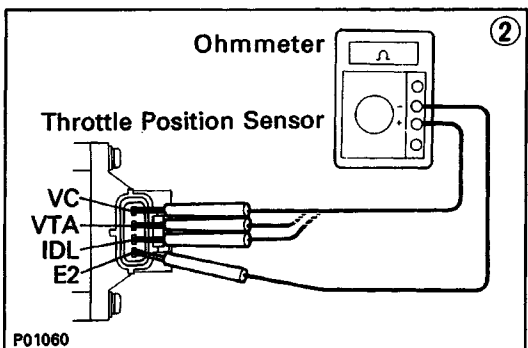
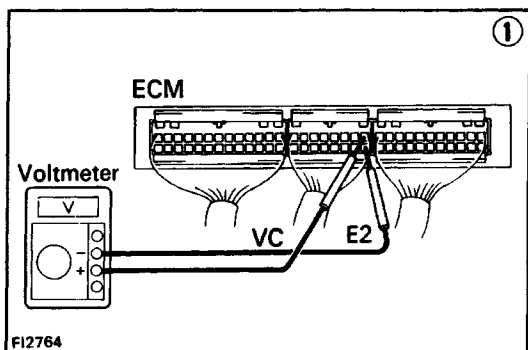
FI2757



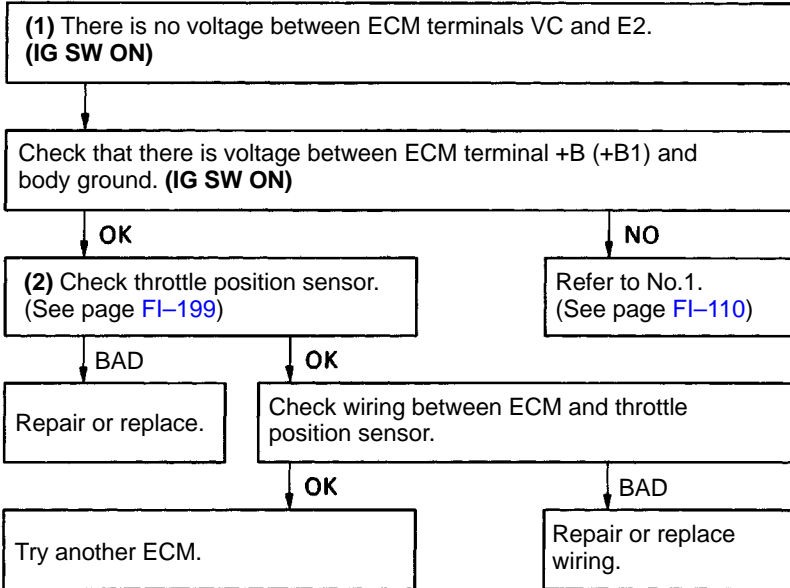
P01060

• IDL - E2

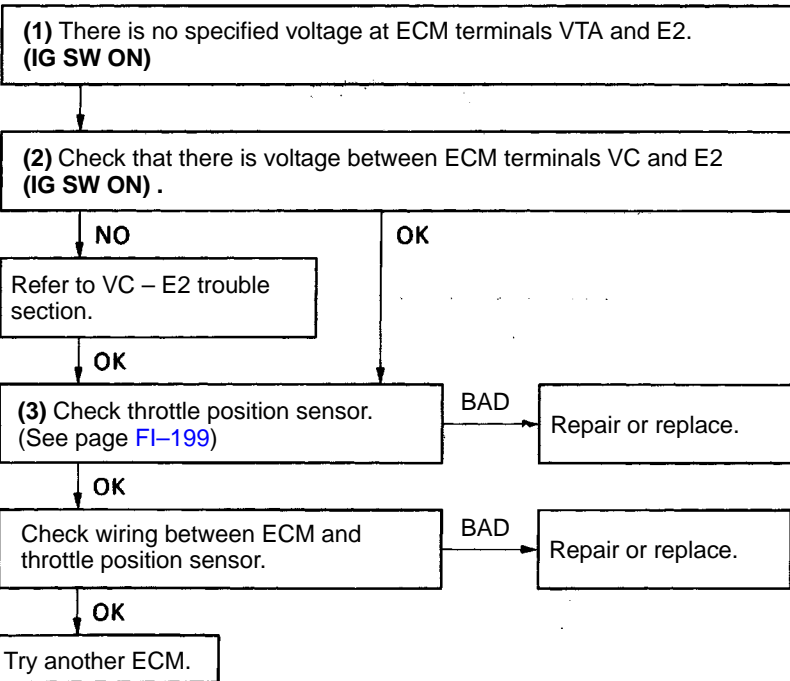




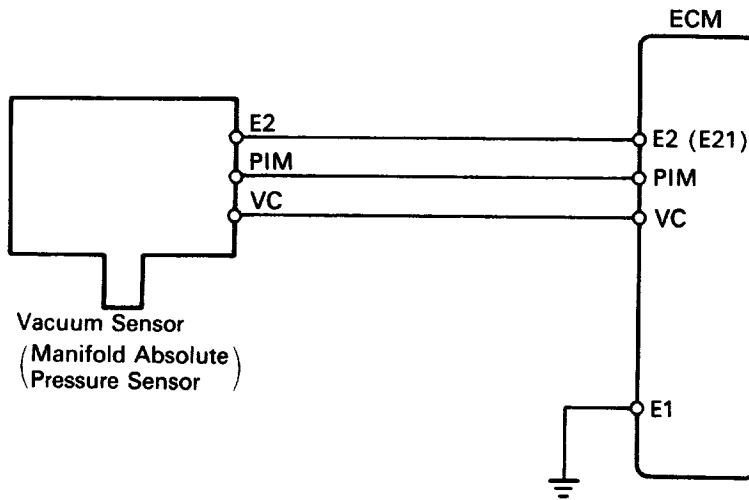
• VC-E2



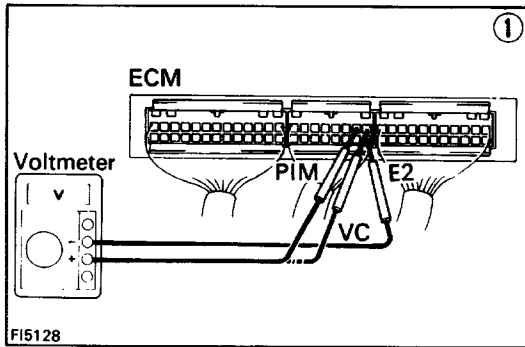
• VTA - E2



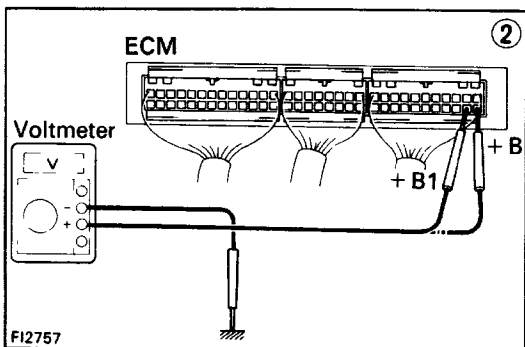
No.	Terminals	Trouble	Condition	STD voltage
4	PIM - E2	No voltage	IG SW ON	3.3 - 3.9 V
	VC - E2			4.5 - 5.5 V



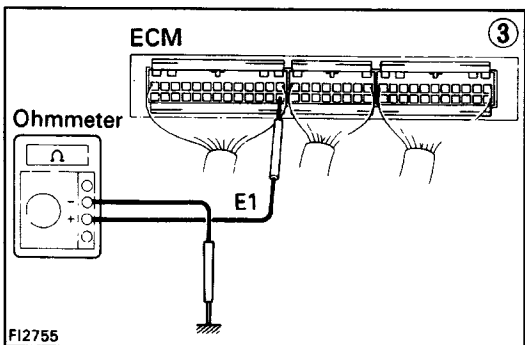
FI1226



FI5128



FI2757



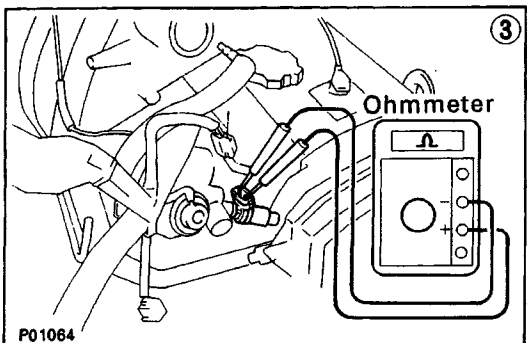
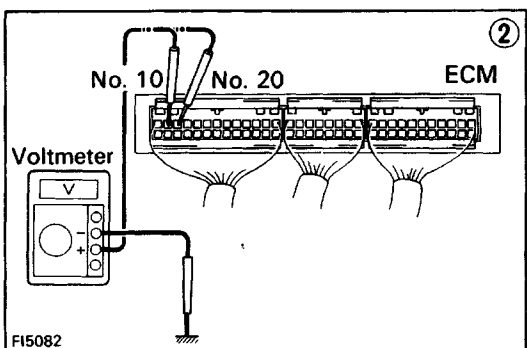
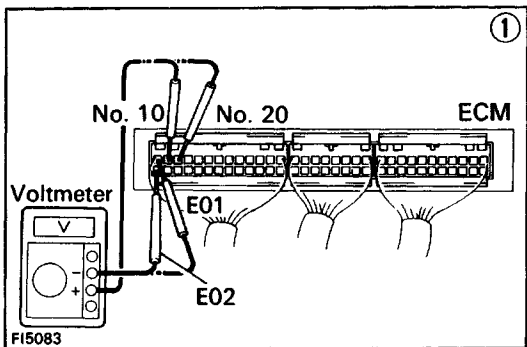
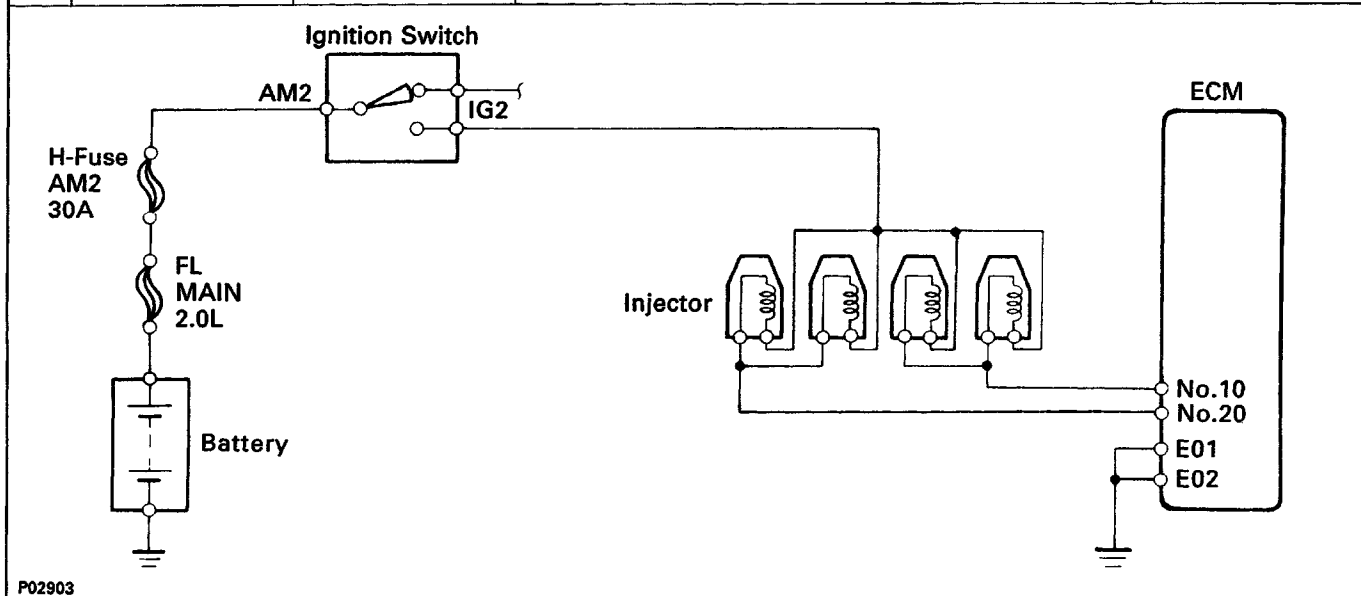
FI2755

• PIM - E2, VC - E2

```

    graph TD
      A["(1) There is no voltage between ECM terminals PIM or VC and E2. (IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal +B (+B1) and body ground. (IG SW ON)"]
      B -- NO --> C["Refer to No.1. (See page FI-110)"]
      B -- OK --> D["(3) Check wiring between ECM terminal E1 and body ground."]
      D -- BAD --> E["Repair or replace."]
      D -- OK --> F["Check vacuum sensor. (See page FI-234)"]
      F -- BAD --> G["Replace vacuum sensor."]
      F -- OK --> H["Check wiring between ECM and vacuum sensor."]
      H -- BAD --> E
      H -- OK --> I["Try another ECM."]
    
```

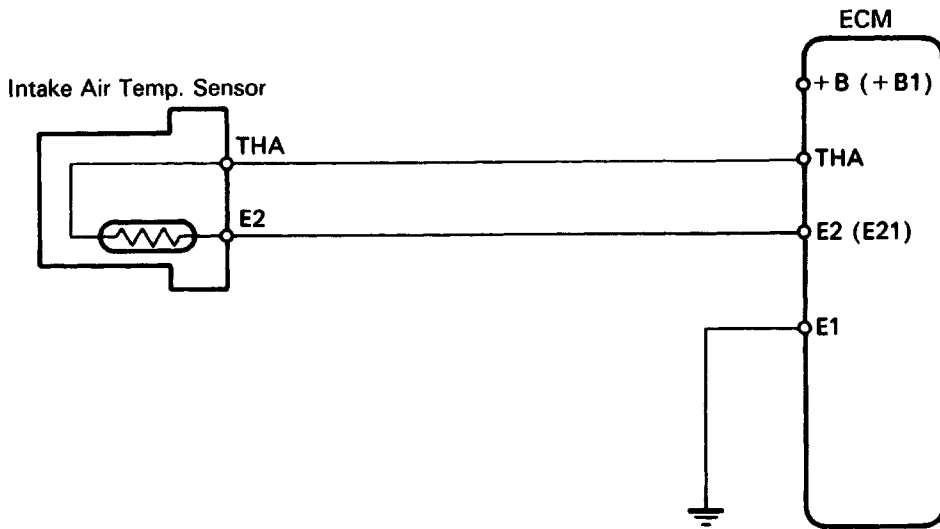
No.	Terminals	Trouble	Condition	STD voltage
5	No.10 - E01 No.20 - E02	No voltage	IG SW ON	10 - 14 V



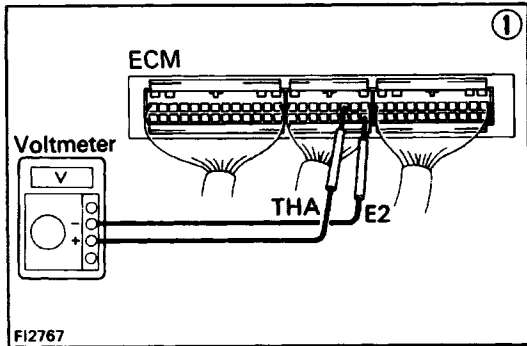
```

    graph TD
      Step1["(1) There is no voltage between ECM terminals No.10 and/or No.20 and E01 and/or E02. (IG SW ON)"]
      Step2["(2) Check that there is voltage between ECM terminal No.10 and/or No.20 and body ground."]
      Step3["(3) Check resistance of each injector. STD resistance: Approx. 13.8 Ω"]
      
      Step1 --> Step2
      
      Step2 -- NO --> Fuse["Check H-fuse, fusible link and ignition switch."]
      Step2 -- OK --> Step3
      
      Fuse -- BAD --> FuseFix["Repair or replace."]
      Fuse -- OK --> Step3
      
      Step3 -- OK --> InjectFix["Replace injector."]
      Step3 -- BAD --> Wiring["Check wiring between ECM terminal No.10 and/or No.20 and battery."]
      Wiring -- BAD --> WiringFix["Repair or replace."]
      Wiring -- OK --> InjectFix
  
```

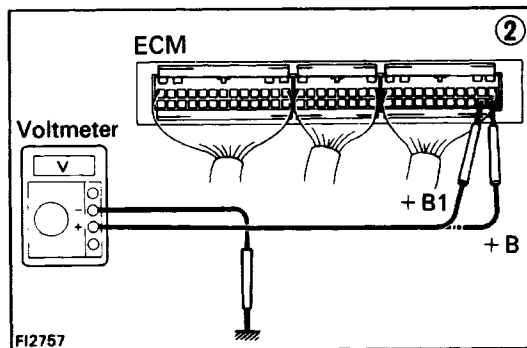
No.	Terminals	Trouble	Condition		STD voltage
			IG SW ON	Intake air temperature 20°C (68°F)	
6	THA - E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	1.9 - 2.9 V



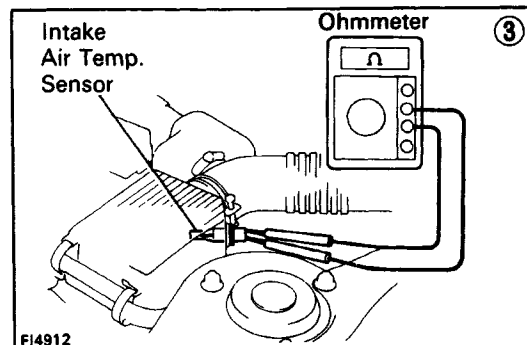
FI3572



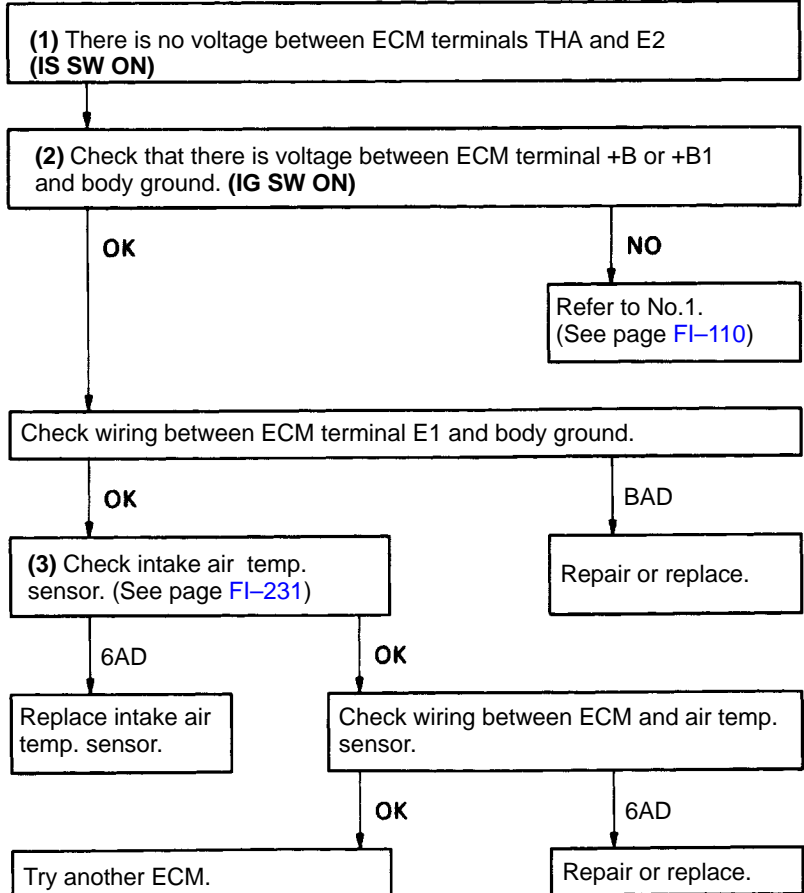
FI2767



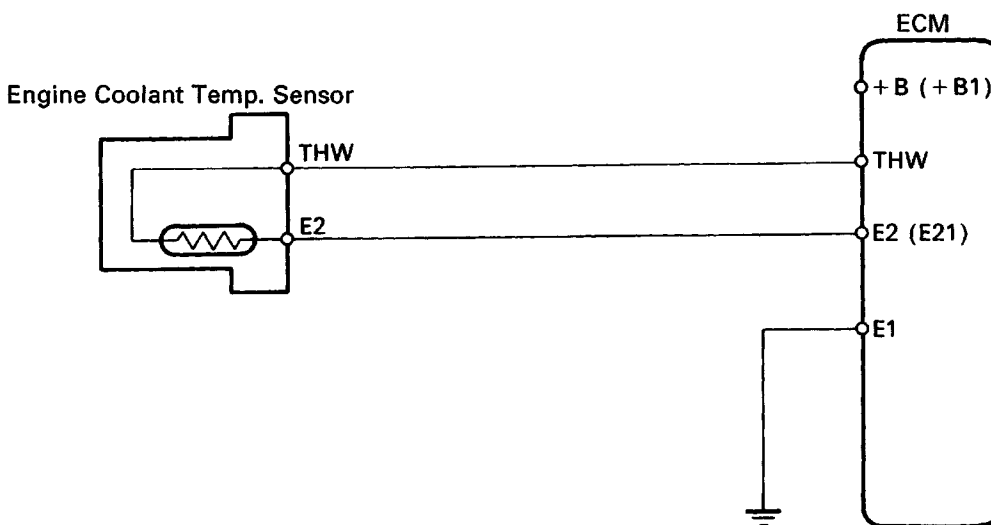
FI2757



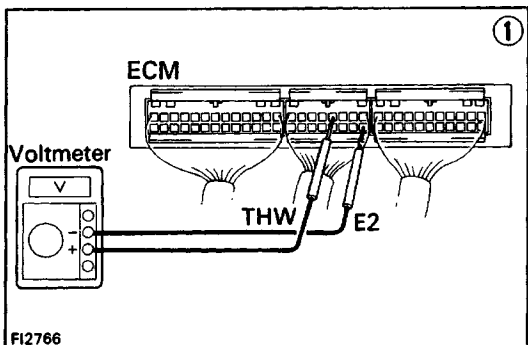
FI4912



No.	Terminals	Trouble	Condition		STD voltage
			IG SW ON	Engine coolant temperature 80°C (176°F)	
7	THW - E2	No voltage	IG SW ON	Engine coolant temperature 80°C (176°F)	0.1 - 1.1 V



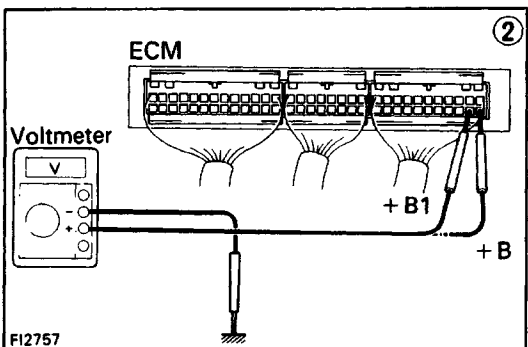
FI357



FI2766

(1) There is no voltage between ECM terminals THW and E2. (IG SW ON)

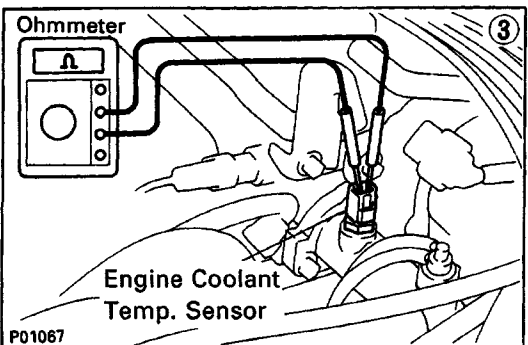
(2) Check that there is voltage between ECM terminal +B or +B1 and body ground. (IG SW ON)



FI2757

Check wiring between ECM terminal E1 and body ground.

(3) Check engine coolant temp. sensor. (See page FI-231)



P01067

BAD
Replace engine coolant temp. sensor.

Try another ECM.

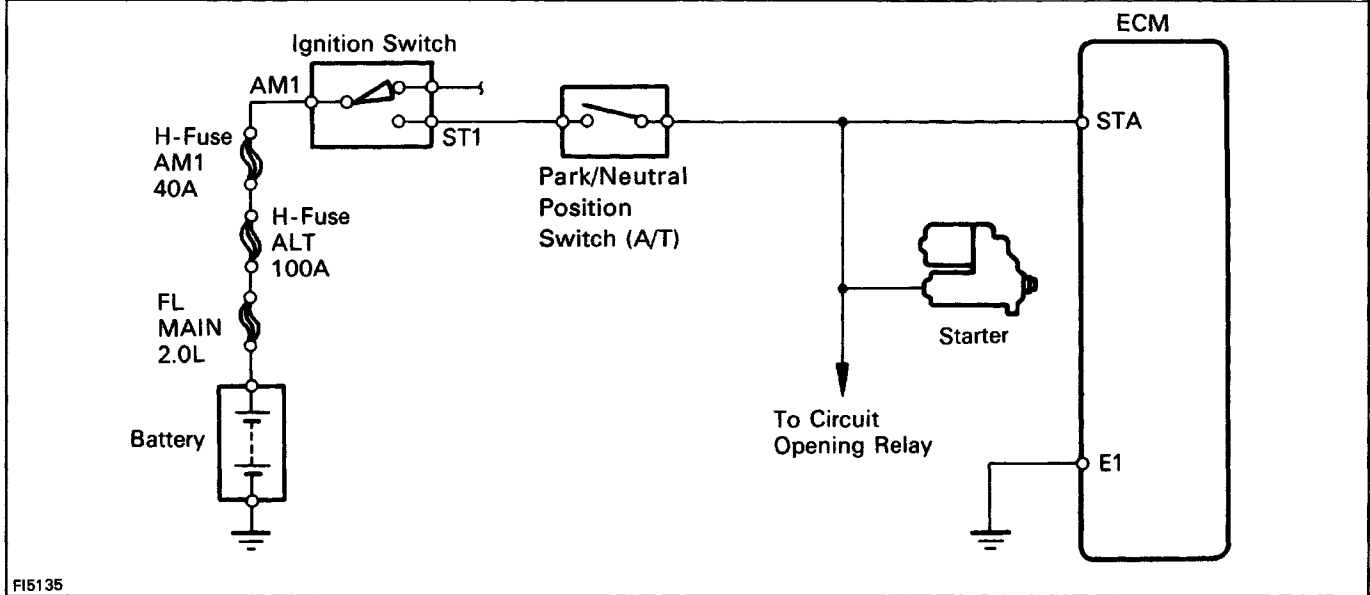
Check wiring between ECM and water temp. sensor.

BAD
Repair or replace.

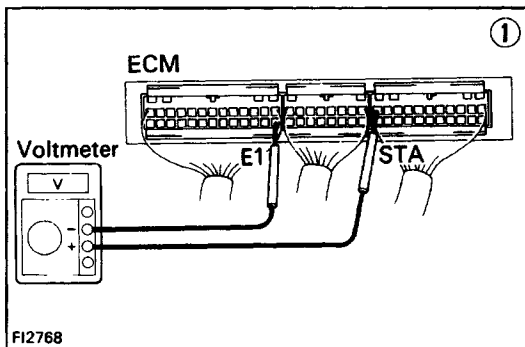
NO
Refer to No.1 (See page FI-110)

BAD
Repair or replace.

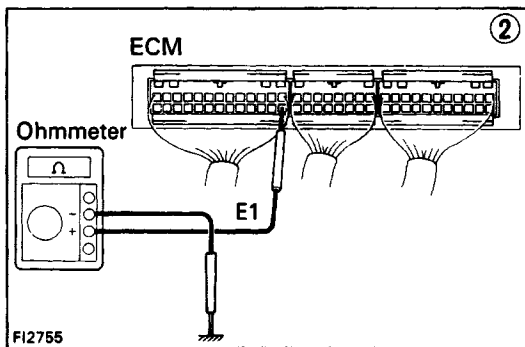
No.	Terminals	Trouble	Condition	STD voltage
8	STA - E1	No voltage	Cranking	6 - 14 V



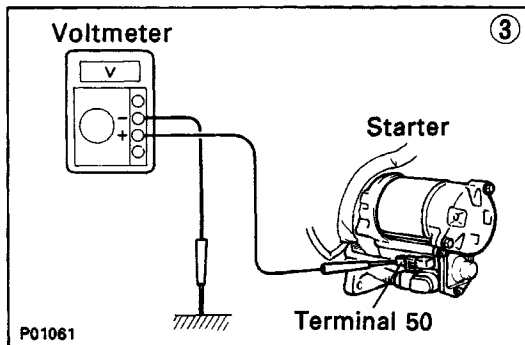
FI5135



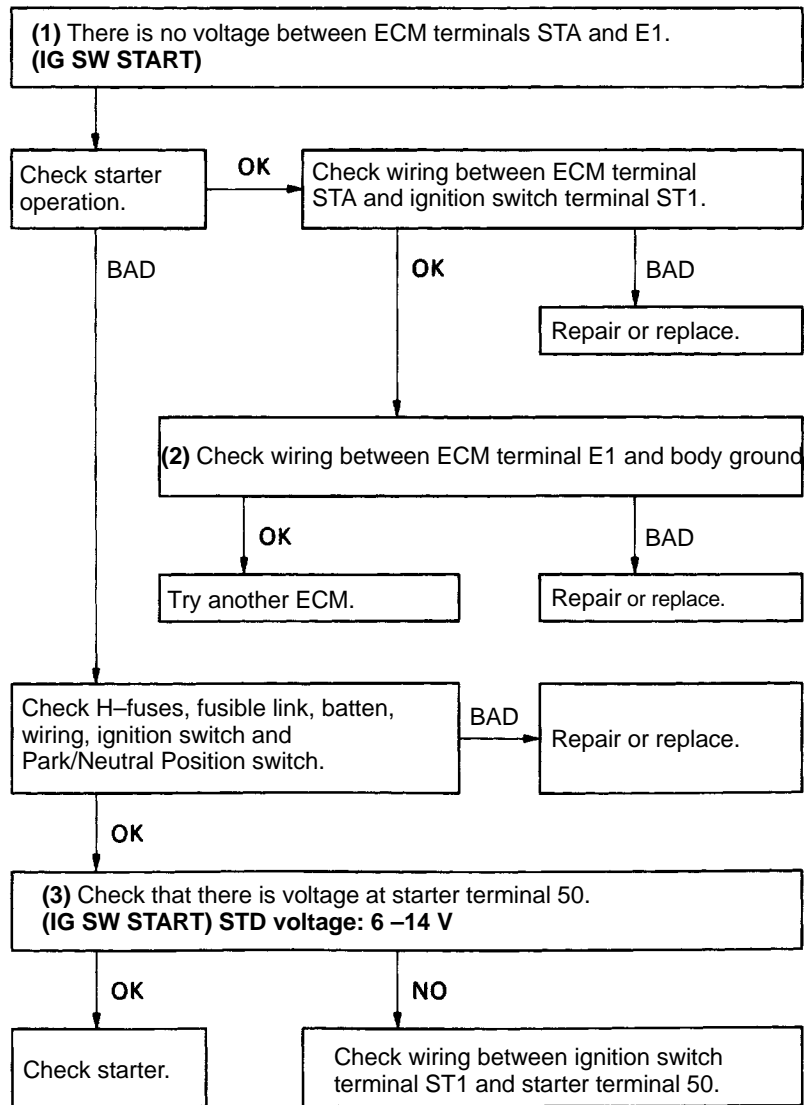
FI2768



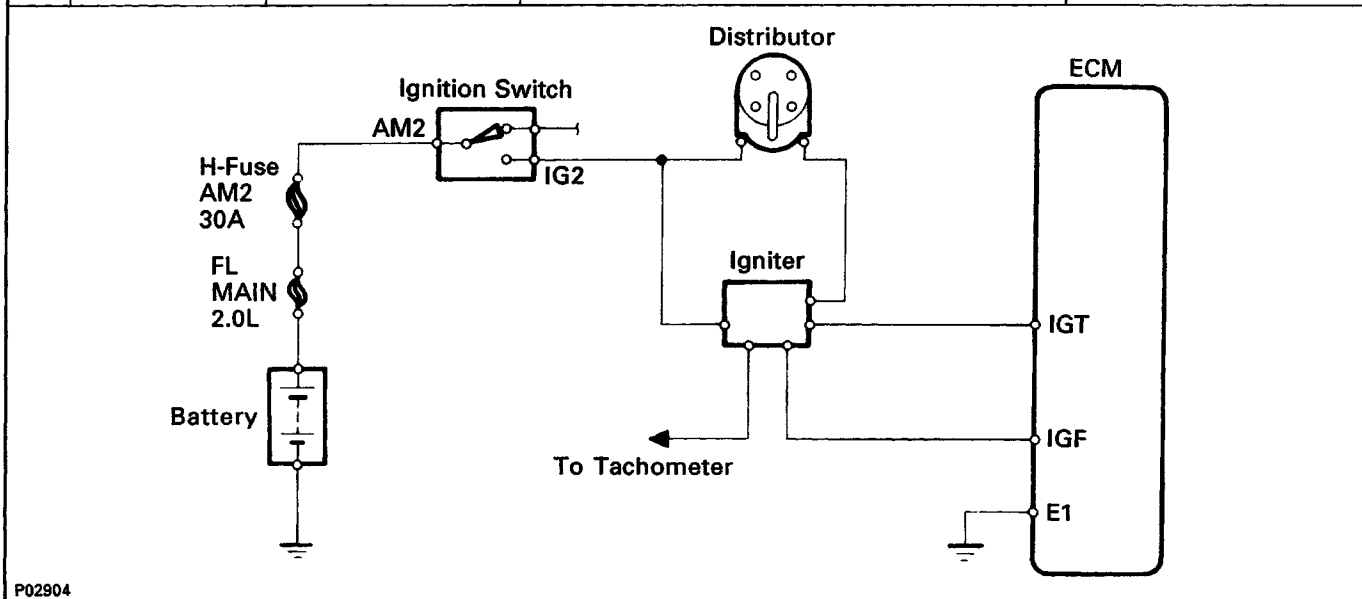
FI2755



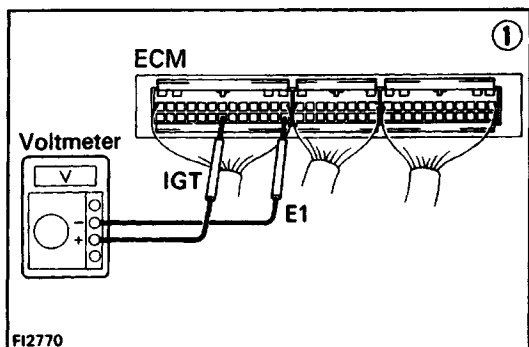
P01061



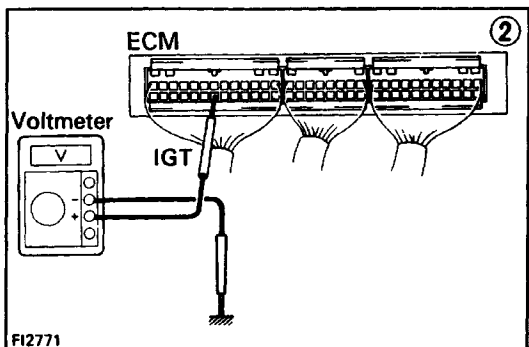
No..	Terminals	Trouble	Condition	STD voltage
9	IGT - E1	No voltage	Idling	0.8 - 1.2 V



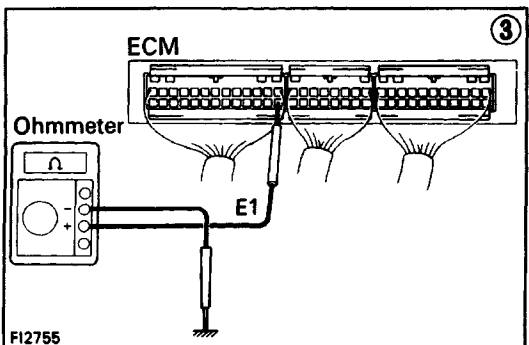
P02904



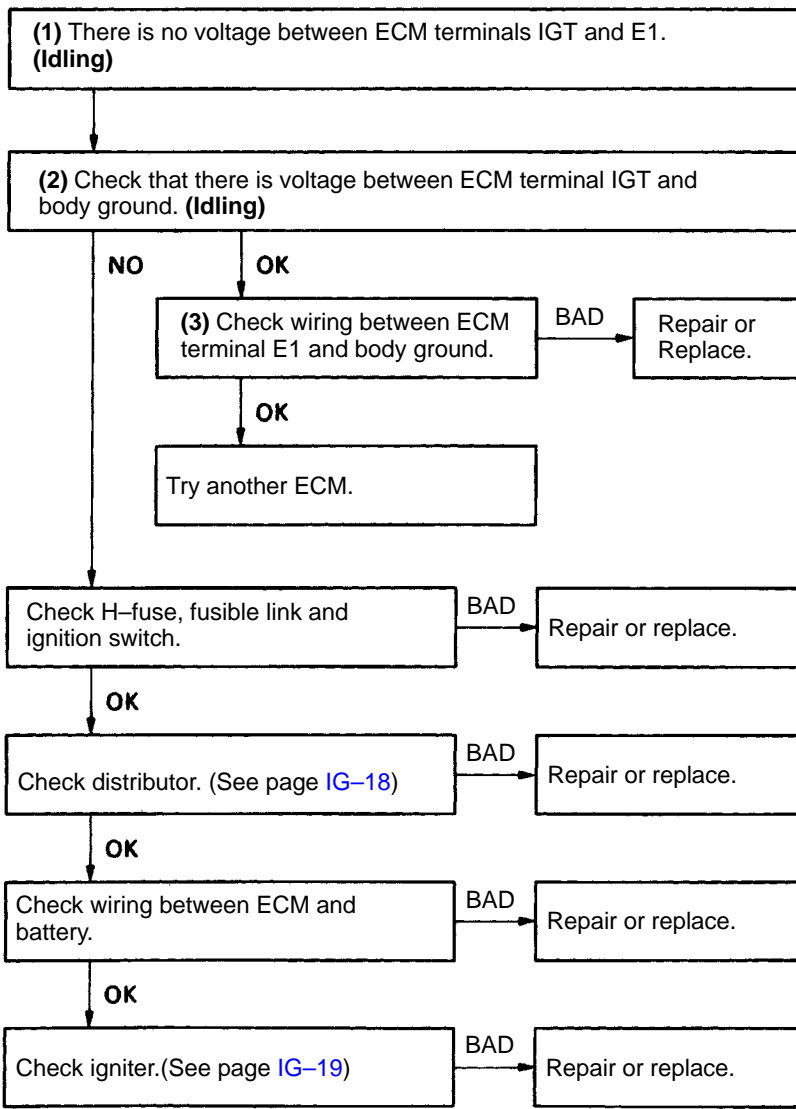
FI2770



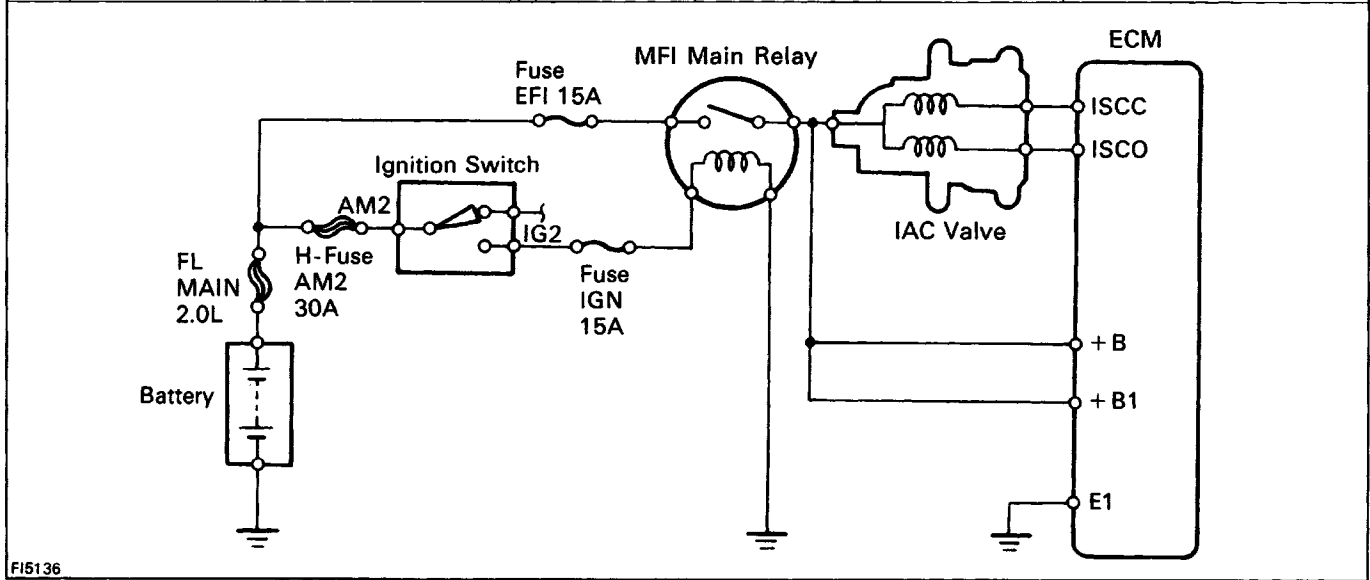
FI2771



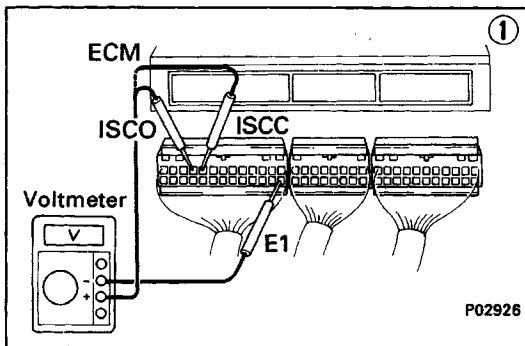
FI2755



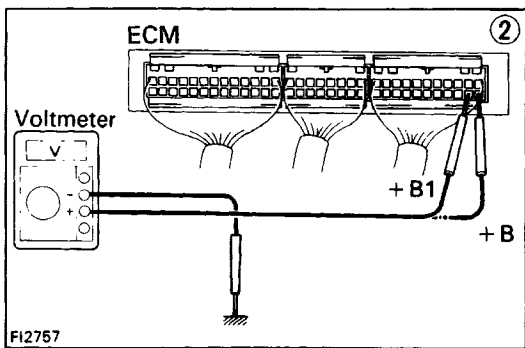
No.	Terminals	Trouble	Condition		STD voltage
10	ISCC - E1 ISCO	No voltage	IG SW ON	ECM connectors disconnected	8 - 14 V



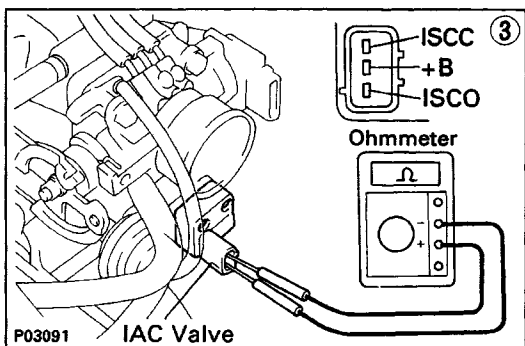
FI5136



P02926



FI2757

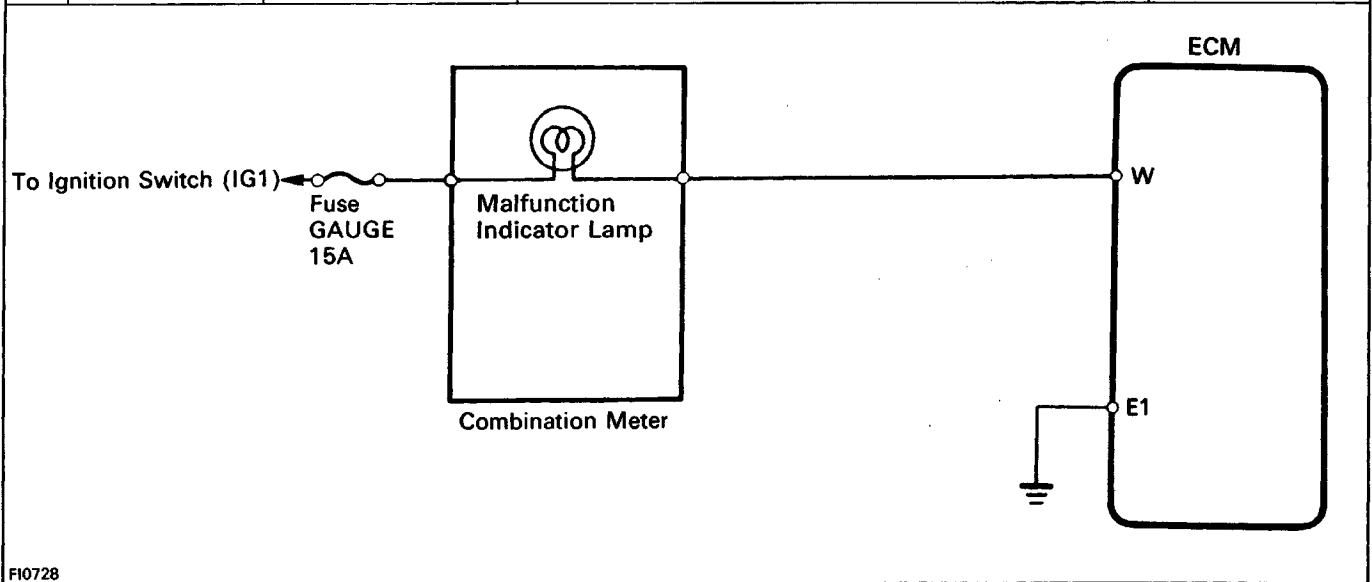


P03091

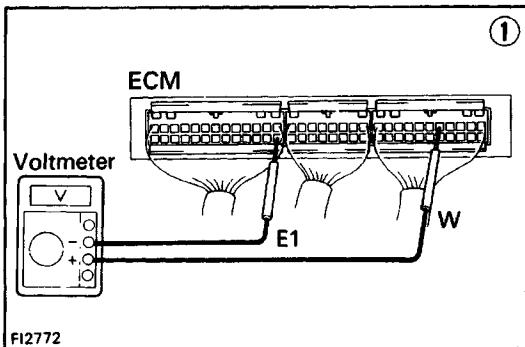
```

    graph TD
      A["(1) There is no voltage between ECM terminals ISCC or ISCO and E1.  
(IG SW ON)"] --> B["(2) Check that there is voltage between ECM terminal +B or +B1  
and body ground. (IG SW ON)"]
      B -- NO --> C["Refer to No.1.  
(See page FI-110)"]
      B -- OK --> D["(3) Check resistance between IAC valve terminals +B and ISCC or ISCO.  
STD resistance: 19.3 - 22.3Ω"]
      D -- BAD --> E["Replace IAC valve."]
      D -- OK --> F["Check wiring between ECM and IAC valve."]
      F -- BAD --> G["Repair or replace wiring."]
      F -- OK --> H["Try another ECM."]
    
```

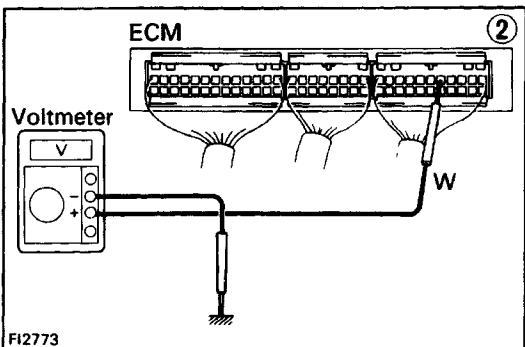
No.	terminals	Trouble	Condition	STD voltage
11	W - E1	No voltage	No trouble (Malfunction indicator lamp off) and engine running.	10 - 14 V



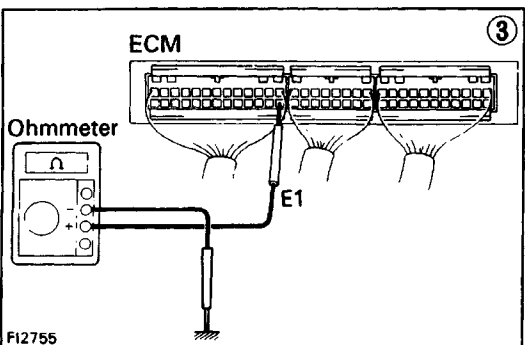
FI0728



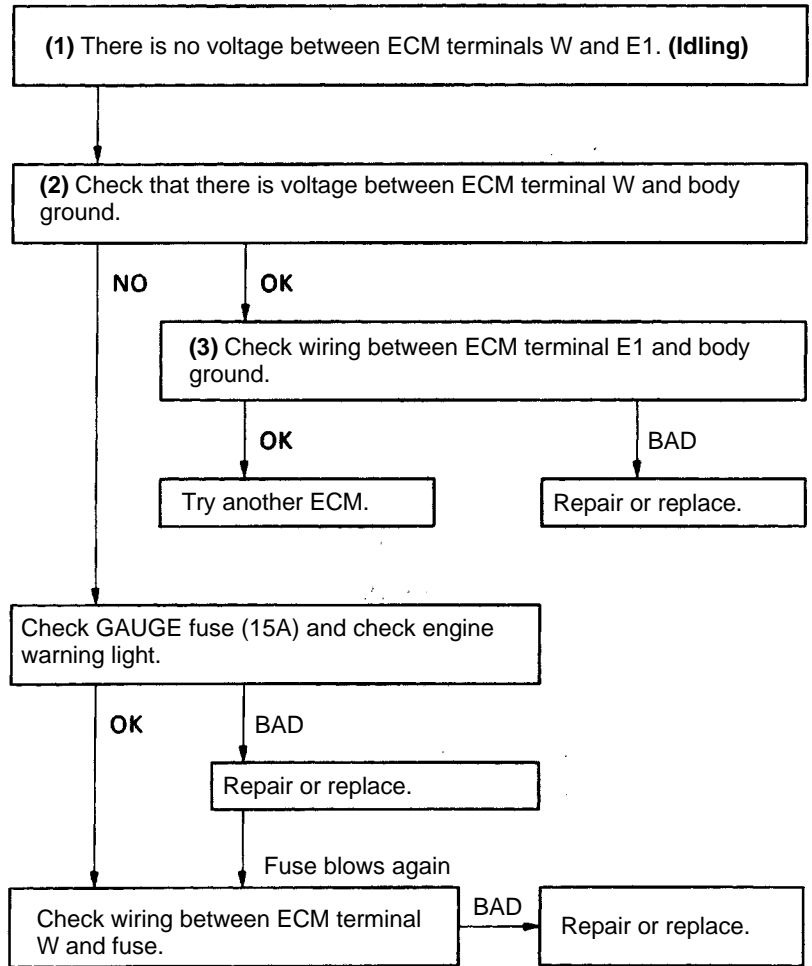
FI2772

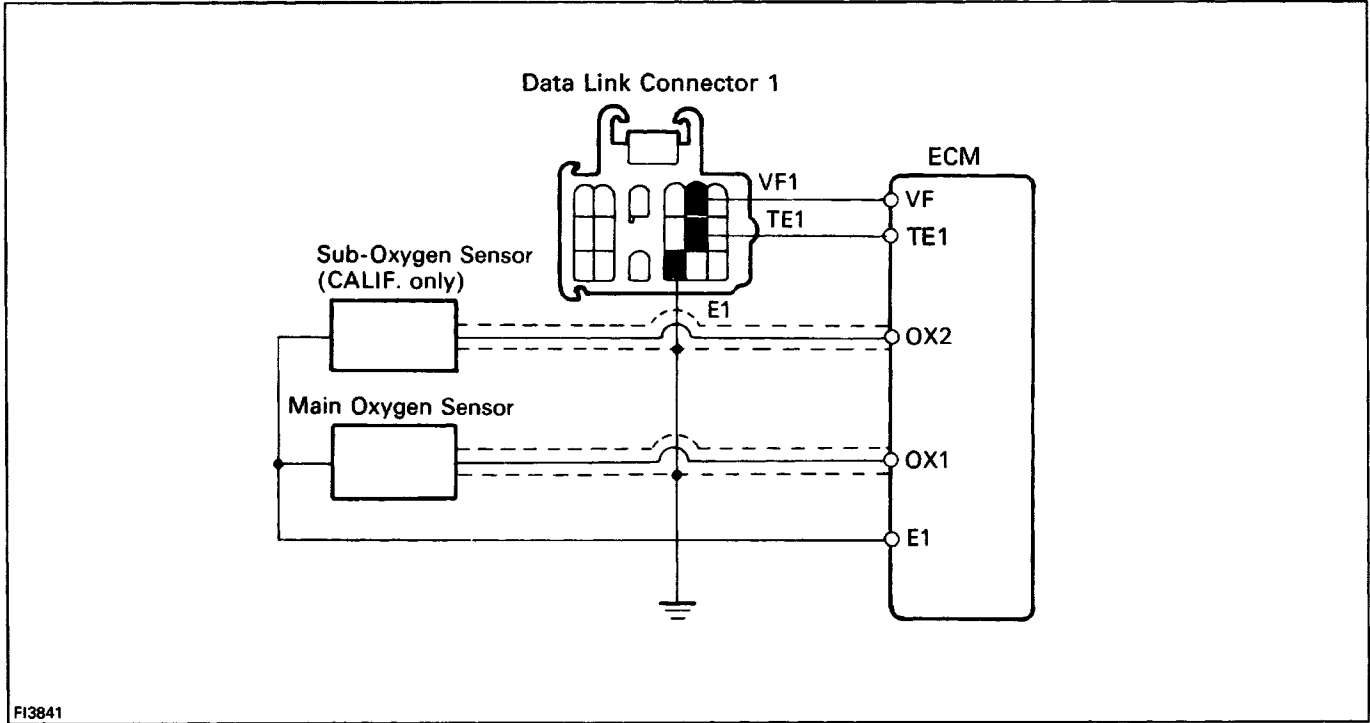


FI2773

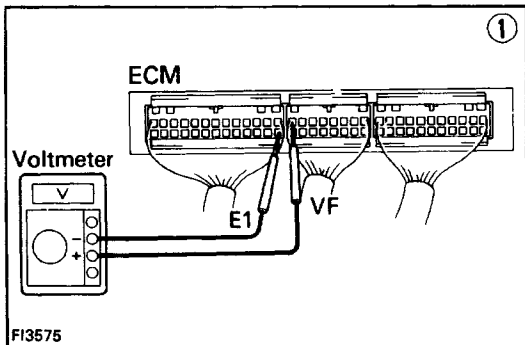


FI2755

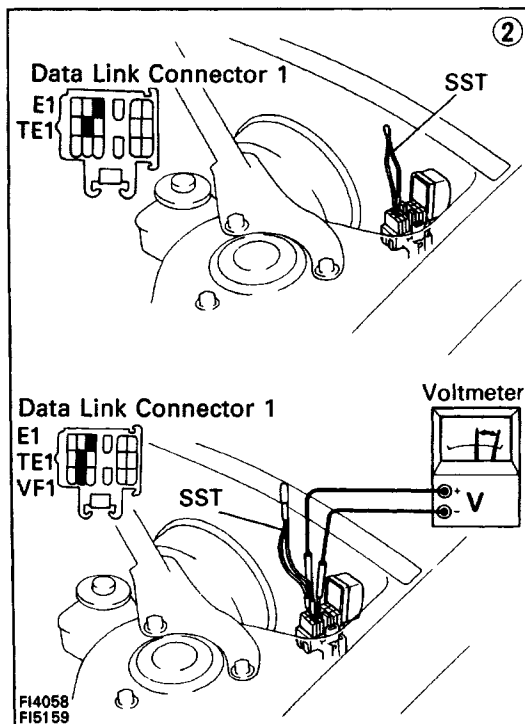




FI3841



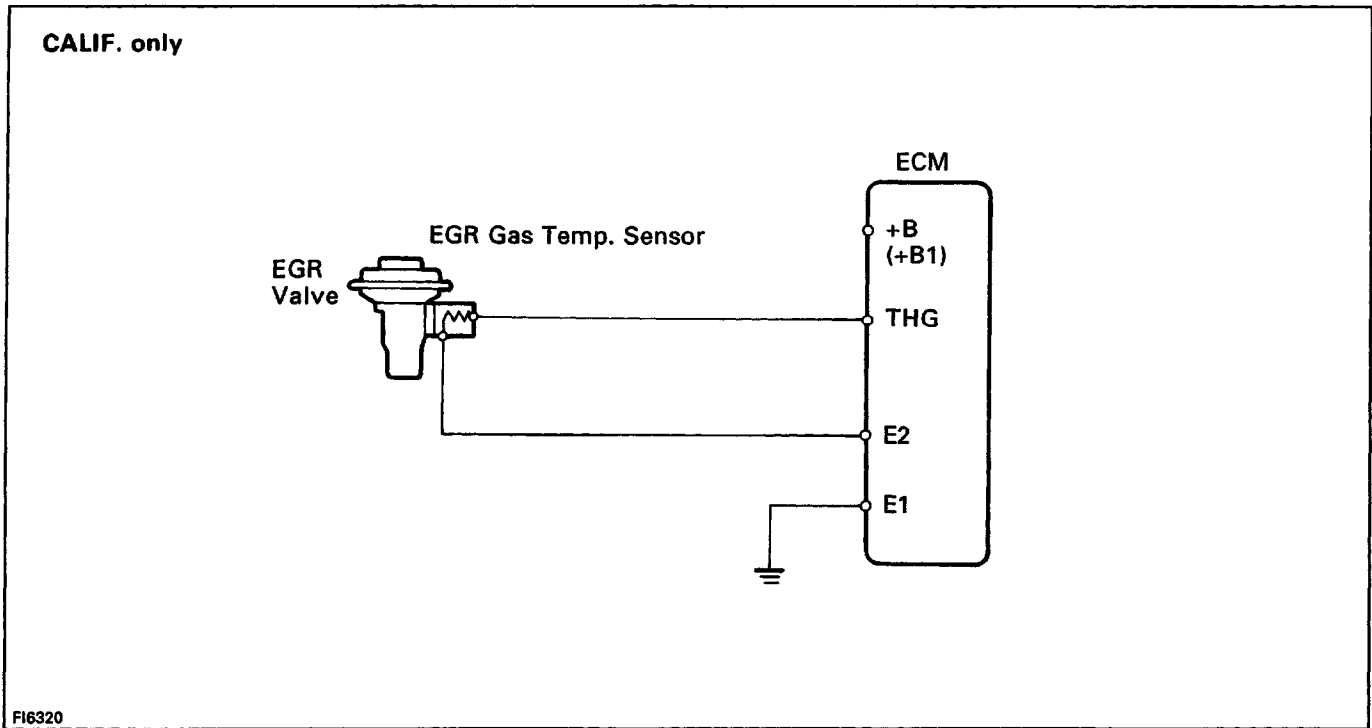
FI3575



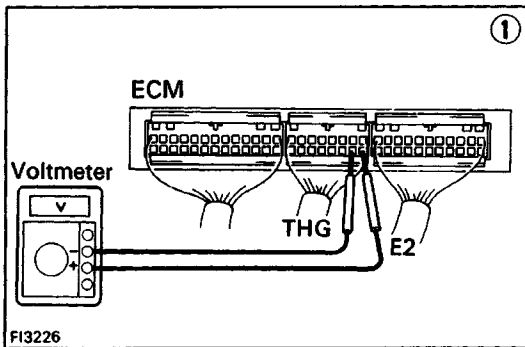
FI4058
FI5159

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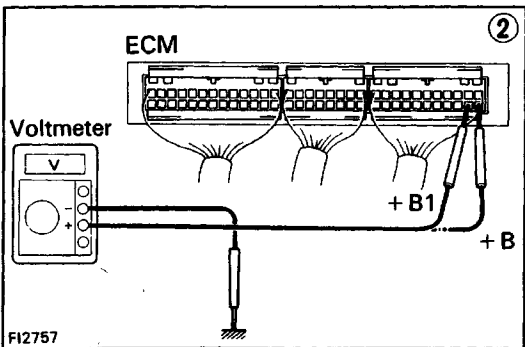
    graph TD
      A["(1) There is no voltage between ECM terminals VF and E1."] --> B["Check that there is voltage between ECM terminal VF and body ground."]
      B -- NO --> C["Check wiring between ECM terminal E1 and body ground."]
      B -- OK --> D["Is air leaking into air induction system?"]
      C -- OK --> D
      C -- BAD --> E["Repair or replace."]
      D -- YES --> F["Repair air leak."]
      D -- NO --> G["Check spark plugs. (See page IG -16)"]
      G -- BAD --> H["Repair or replace."]
      G -- OK --> I["Check distributor and ignition system. (See page IG-4)"]
      I -- BAD --> J["Repair or replace."]
      I -- OK --> K["Check fuel pressure. (See page FI-128)"]
      K -- BAD --> L["Repair or replace."]
      K -- OK --> M["Check injectors. (See page FI-169)"]
      M -- BAD --> N["Repair or replace."]
      M -- OK --> O["Check vacuum sensor. (See page FI-234)"]
      O -- BAD --> P["Repair or replace."]
      O -- OK --> Q["(2) Check operation of oxygen sensors. (See pages FI-237 and 239)"]
      Q -- BAD --> R["System Normal"]
      Q -- OK --> S["Check wiring between oxygen sensor and ECM."]
      S -- BAD --> T["Repair wiring."]
      S -- OK --> U["Replace oxygen sensors."]
    
```



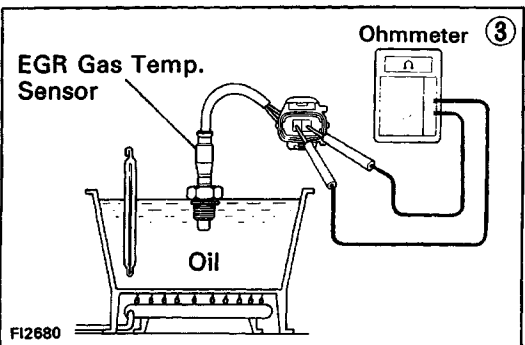
FI6320



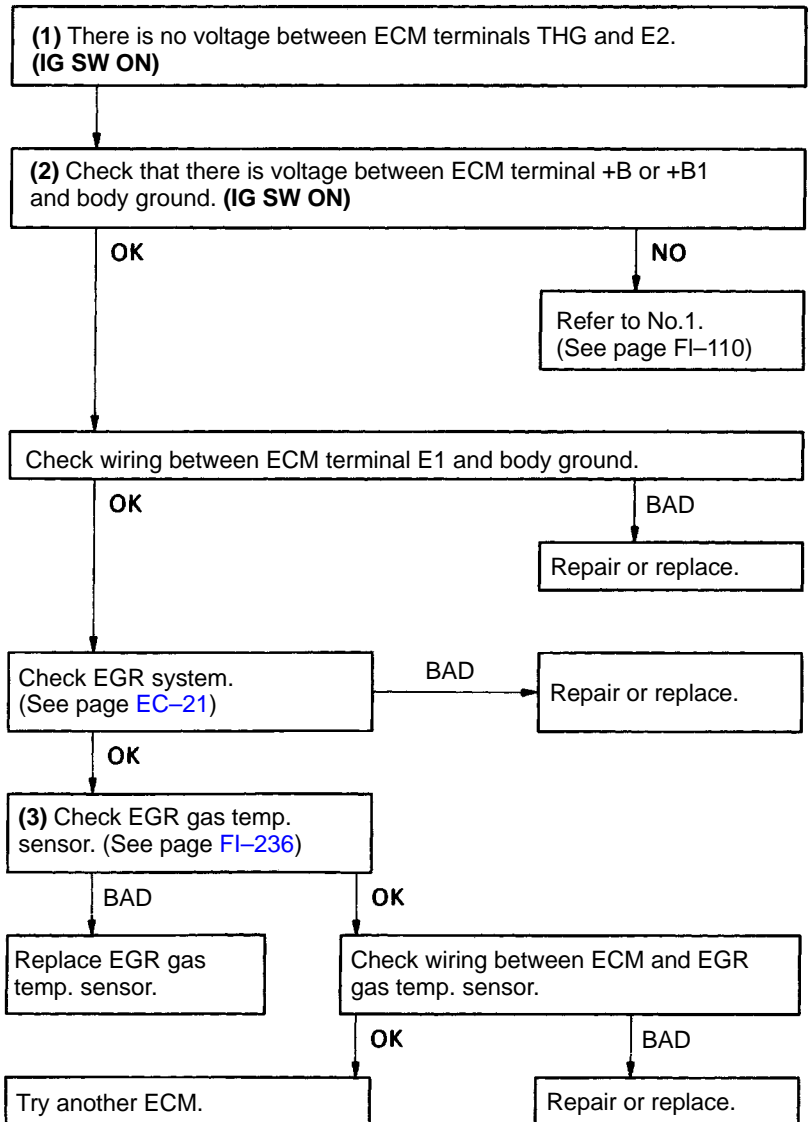
FI3226



FI2757

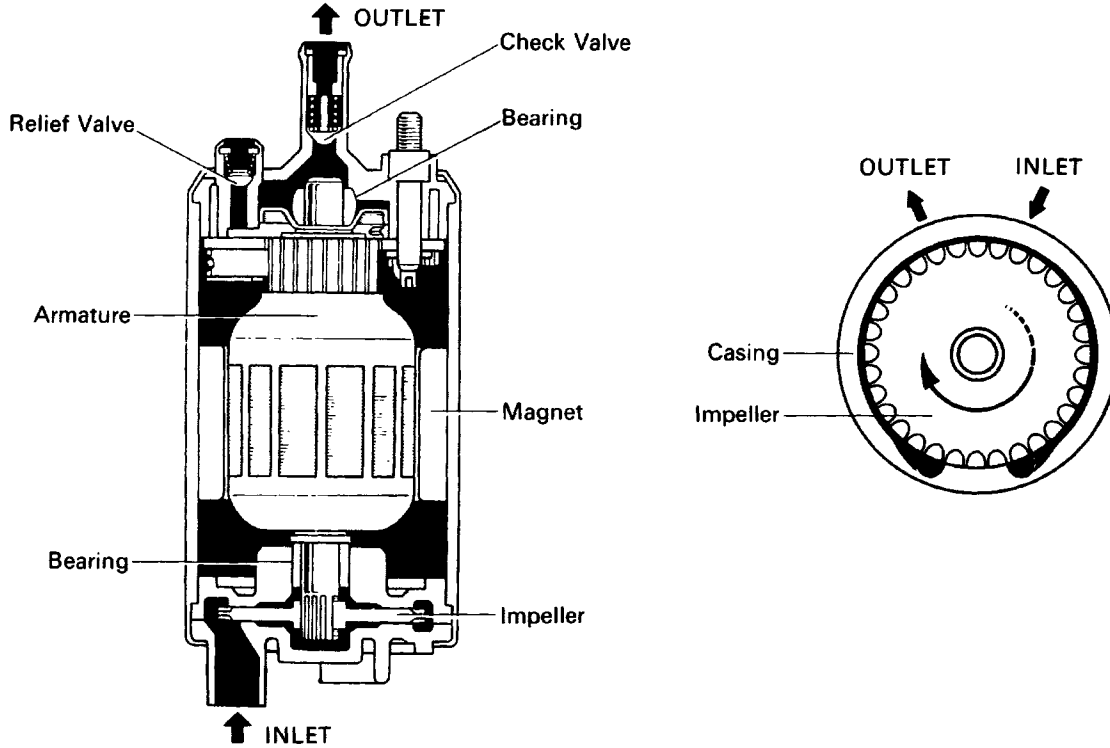


FI2680

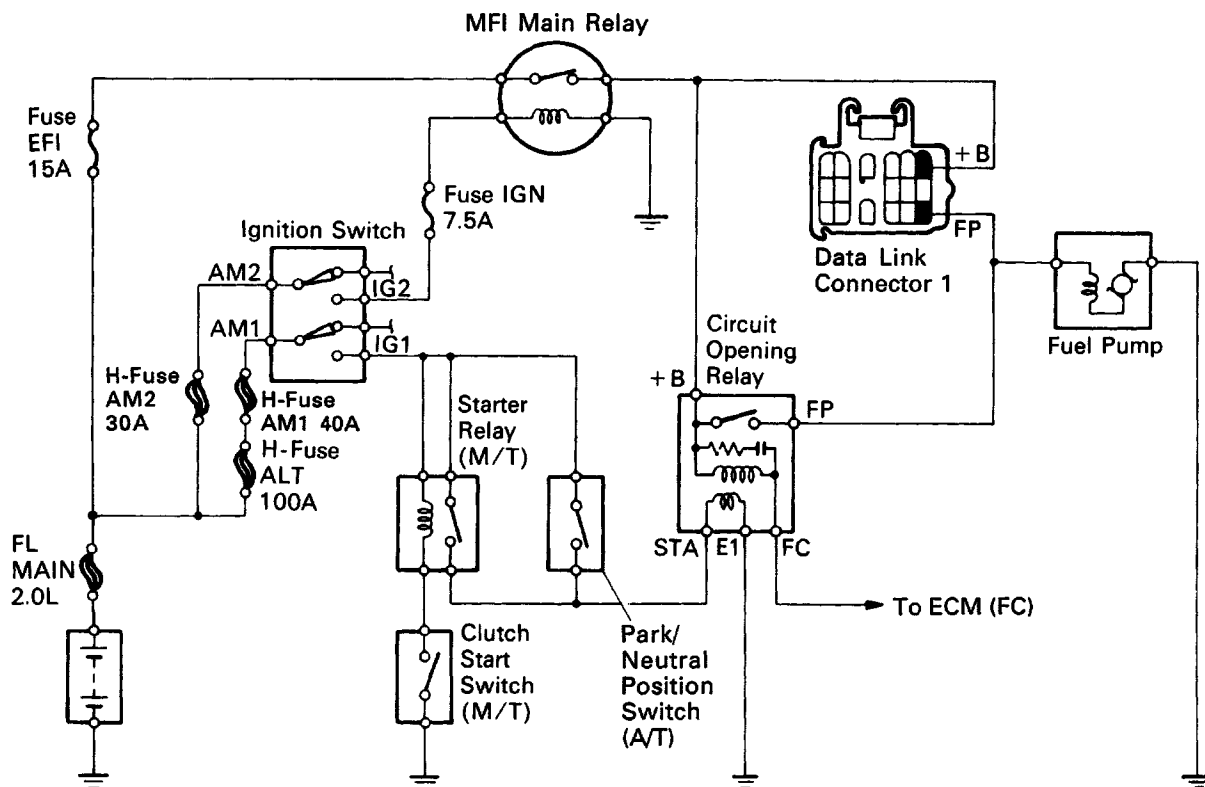


FUEL SYSTEM

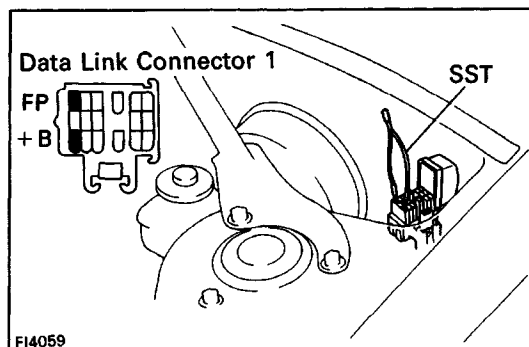
Fuel Pump (4A-FE and 5S-FE)



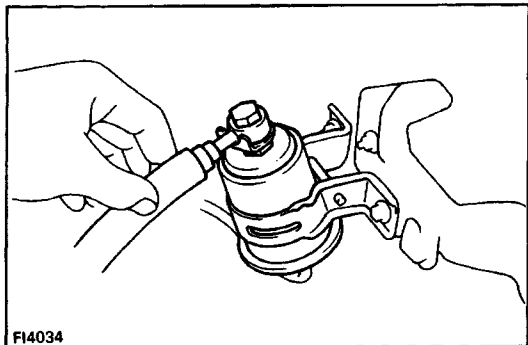
FI0530 FI1479



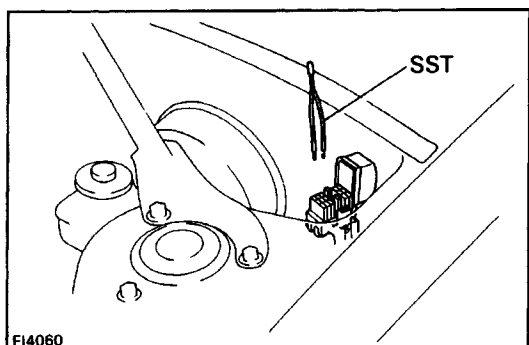
FI5137



FI4059



FI4034



FI4060

ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

(a) Using SST, connect terminals +B and FP of the data link connector 1.

SST 09843-18020

(b) Turn the ignition switch ON.

NOTICE: Do not start the engine.

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

HINT: At this time, you will hear fuel return noise.

(d) Remove SST.

SST 09843-18020

(e) Turn the ignition switch OFF.

If there is no pressure, check the following parts:

- Fusible link
- Fuse (AM2 30A)
- Fuses (EFI 15A, IGN 7.5A)
- MFI main relay
- Fuel pump
- Wiring connections

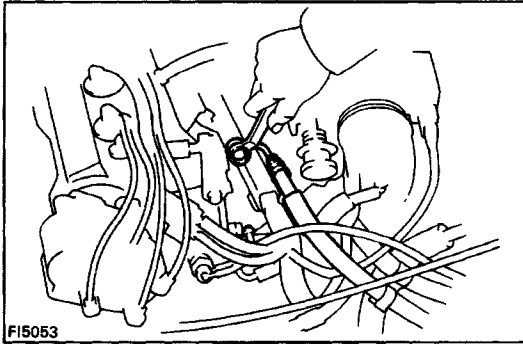
2. (4A-FE)

CHECK FUEL PRESSURE

(a) Check that the battery voltage is above 12 volts.

(b) Disconnect the cable from the negative (-) terminal of the battery.

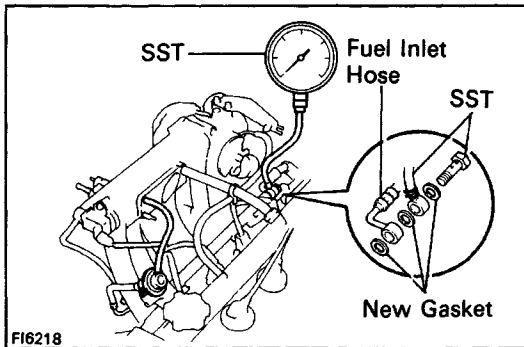
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.



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

HINT:

- Put a suitable container or shop towel under the cold start injector pipe.
- Slowly loosen the union bolt.



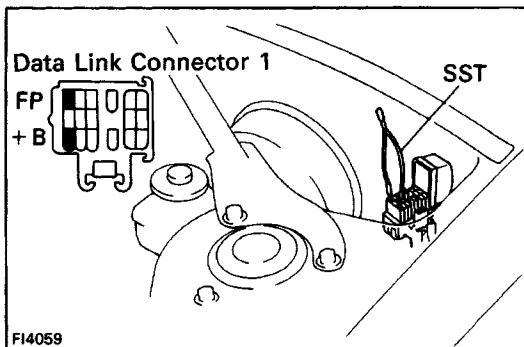
(d) Install the fuel inlet hose and SST (pressure gauge) to the delivery pipe with three new gaskets and SST

(union bolt).

SST 09268-45012

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

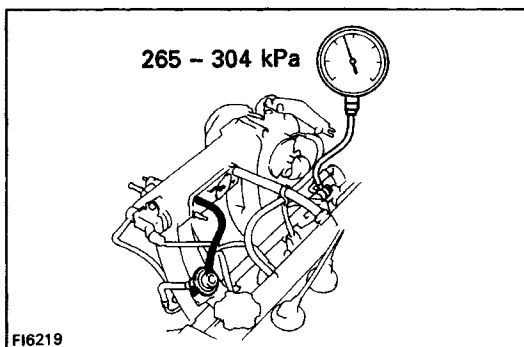
(e) Wipe off any splattered gasoline.



(f) Using SST, connect terminals +B and FP of the data link connector 1.

SST 09843-18020

(g) Reconnect the battery negative (-) cable.



(h) Turn the ignition switch ON.

(i) Measure the fuel pressure.

Fuel pressure: 265 - 304 kPa

(2.7 - 3.1 kgf/cm², 38 - 44 psi)

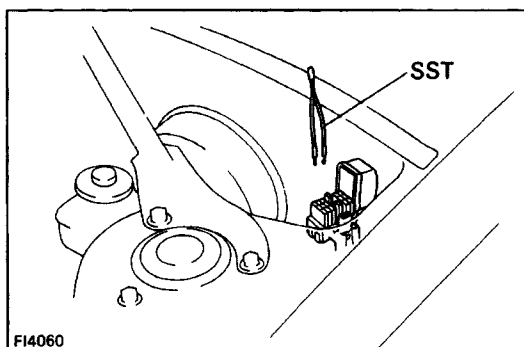
If pressure is high, replace the fuel pressure regulator.

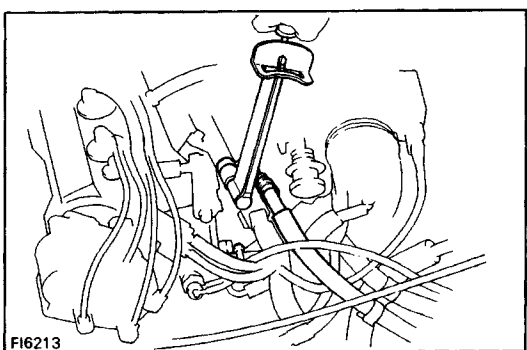
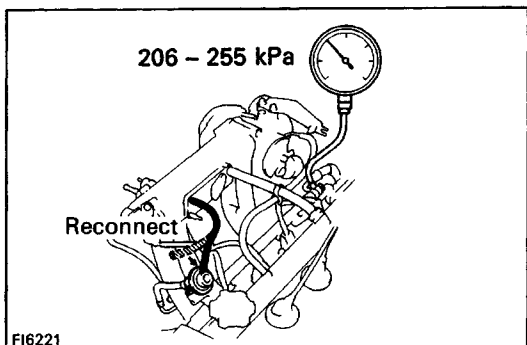
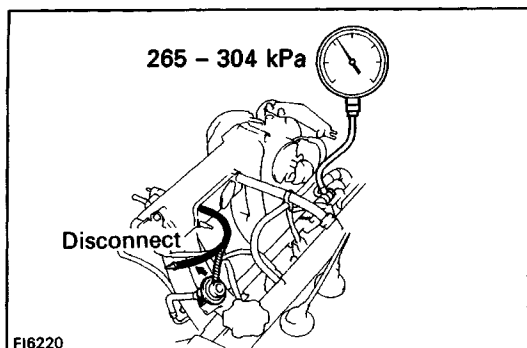
If pressure is low, check the following parts:

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

(j) Remove SST.

SST 09843-18020





- (k) Start the engine.
- (l) Disconnect the vacuum sensing hose from the fuel pressure regulator.
- (m) Measure the fuel pressure at idle.

Fuel pressure: 265 - 304 kPa
(2.7 - 3.1 kgf/cm², 38 - 44 psi)

- (n) Reconnect the vacuum sensing hose to the fuel pressure regulator, and plug the hose end.
- (o) Measure the fuel pressure at idle.
- Fuel pressure: 206 - 255 kPa**
(2.1 - 2.6 kgf/cm², 31 - 37 psi)
- If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.
- (p) Stop the engine. Check that the fuel pressure remains 147 kPa (1.5 kgf/cm², 21 psi) or more for 5 minutes after the engine is turned off.
- If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.
- (q) After checking fuel pressure, disconnect the battery negative (-) cable and carefully remove the SST to prevent gasoline from splashing.
- SST 09268-45012

- (r) Reconnect the fuel inlet hose to delivery pipe with two new gaskets and the union bolt.
- Torque: 29 N-m (300 kgf-cm, 29 ft-lbf)**

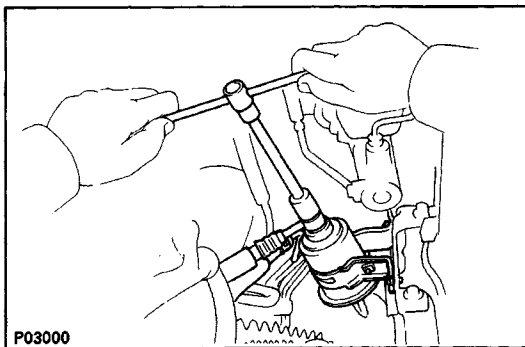
- (s) Reconnect the cable to the negative (-) terminal of the battery.
- (t) Check for fuel leakage. (See page [FI-10](#))

3. (5S-FE)

CHECK FUEL PRESSURE

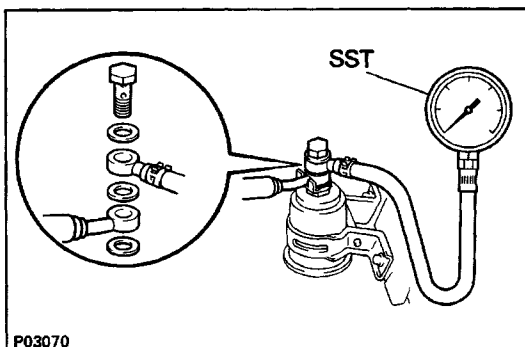
- (a) Check that the battery voltage is above 12 volts.
- (b) Disconnect the cable from the negative (-) terminal of the battery.

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.



- (c) Put a suitable container- or shop towel under the fuel filter.
- (d) Remove the union bolt and two gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.

HINT: Slowly loosen the union bolt.

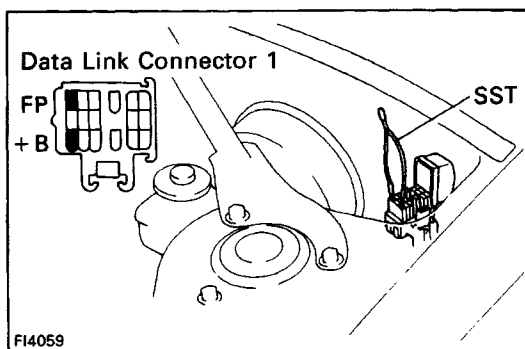


- (e) Install the fuel inlet hose and SST (pressure gauge) to the fuel filter outlet with three new gaskets and the union bolt.

SST 09268-45012

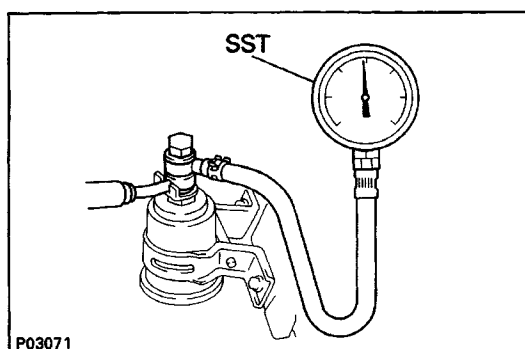
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)

- (f) Wipe off any splattered gasoline.
Reconnect the battery negative (-) cable.



- (h) Using SST, connect terminals +B and FP of the data link connector 1.

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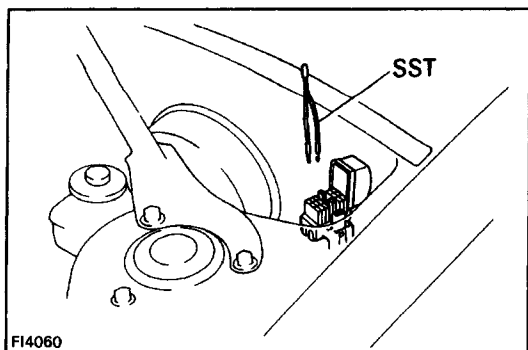
- (i) Turn the ignition switch ON.
- (j) Measure the fuel pressure.

Fuel pressure: 265 - 304 kPa

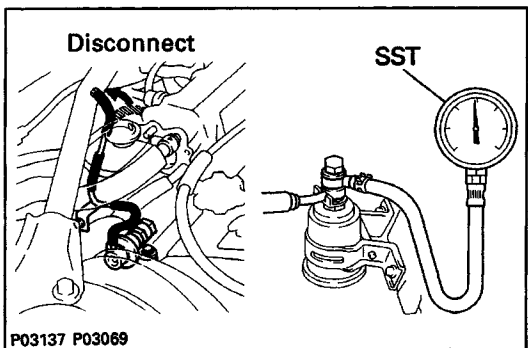
(2.7 - 3.1 kgf/cm², 38 - 44 psi)

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

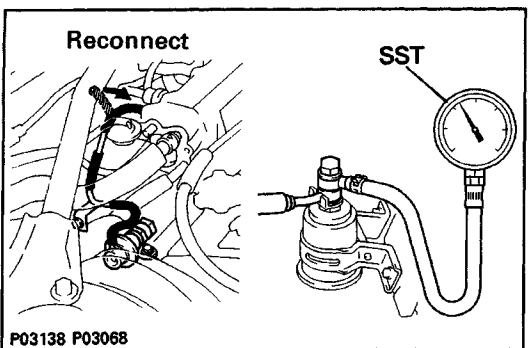
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator



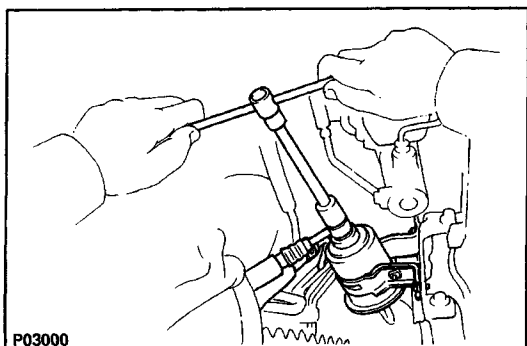
- (k) Remove SST.
SST 09843-18020



- (l) Start the engine.
(m) Disconnect the vacuum sensing hose from the air intake chamber and plug the air intake chamber outlet.
(n) Measure the fuel pressure at idle.
Fuel pressure: 265 – 304 kPa
(2.7 – 3.1 kgf/cm², 38 – 44 psi)



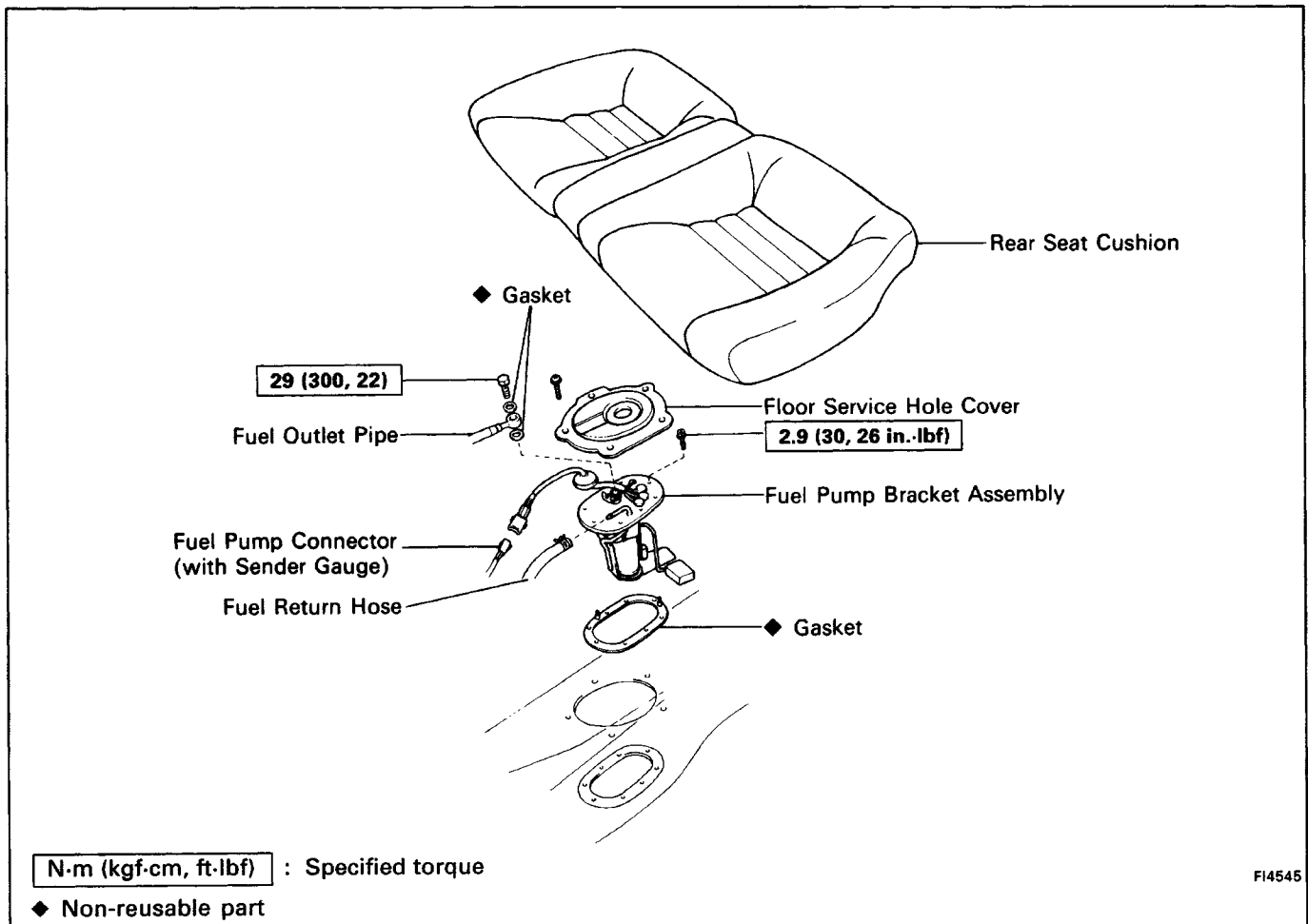
- (o) Reconnect the vacuum sensing hose to the air intake chamber.
(p) Measure the fuel pressure at idle.
Fuel pressure: 206 – 255 kPa
(2.1 – 2.6 kgf/cm², 31 – 37 psi)
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.
(q) Stop the engine. Check that the fuel pressure remains 147 kPa (1.5 kgf/cm², 21 psi) or more for 5 minutes after the engine is turned off.
If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.
(r) After checking fuel pressure, disconnect the battery negative (-) cable and carefully remove the SST to prevent gasoline from splashing.
SST 09268-45012



- (s) Connect the fuel inlet hose with two new gaskets and the union bolt.
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)
(t) Reconnect the cable to the negative H terminal of the battery.
(u) Check for fuel leaks. (See page [FI-10](#))

REMOVAL OF FUEL PUMP

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



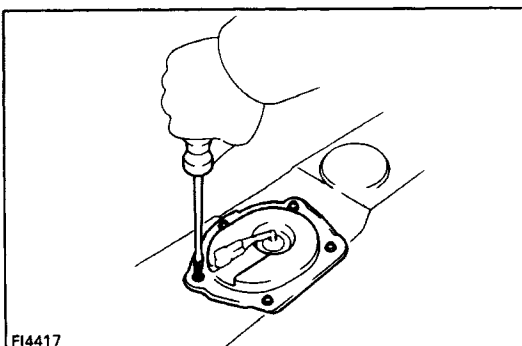
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

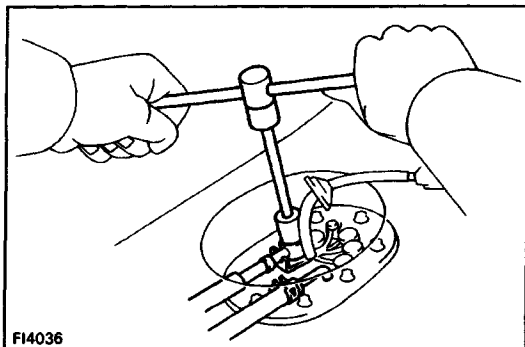
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE REAR SEAT CUSHION

3. REMOVE FLOOR SERVICE HOLE COVER

- Disconnect the fuel pump (with fuel sender gauge) connector.
- Remove the five screws and service hole cover.

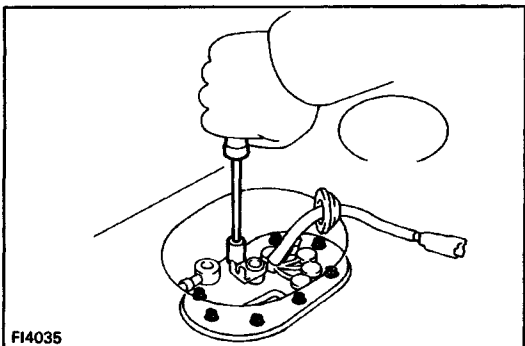




4. DISCONNECT FUEL PIPE AND HOSE FROM FUEL PUMP BRACKET

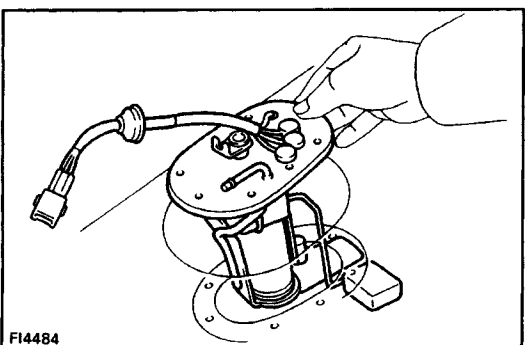
CAUTION: Remove the fuel filter cap to prevent the fuel from flowing out.

- (a) Remove the union bolt and two gaskets, and disconnect the outlet pipe from the pump bracket.
- (b) Disconnect the return hose from the pump bracket.



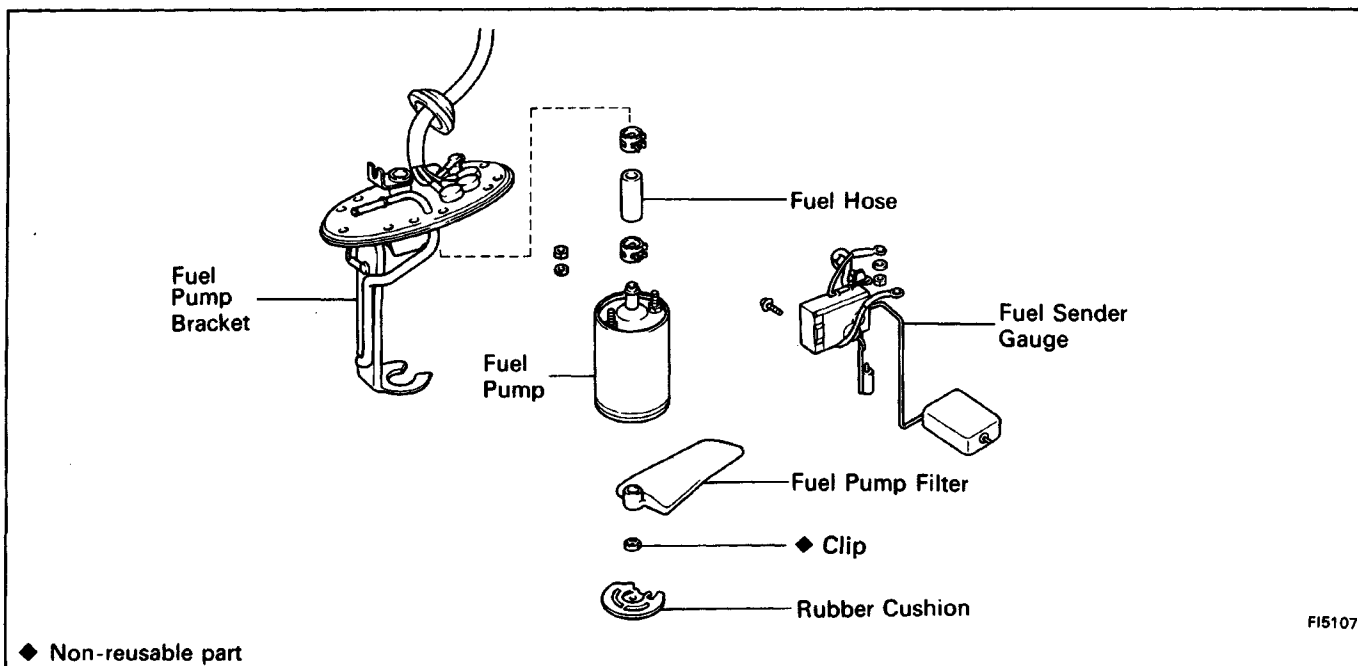
5. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK

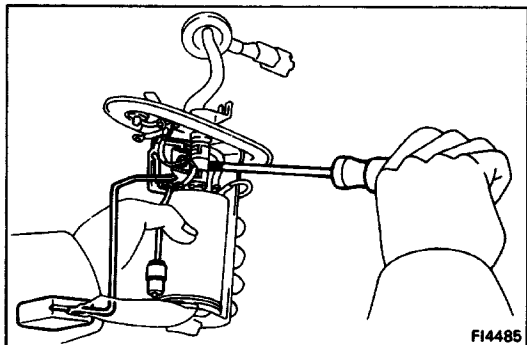
- (a) Remove the eight bolts.



- (b) Pull out the pump bracket assembly.
- (c) Remove the gasket from the pump bracket.

COMPONENTS



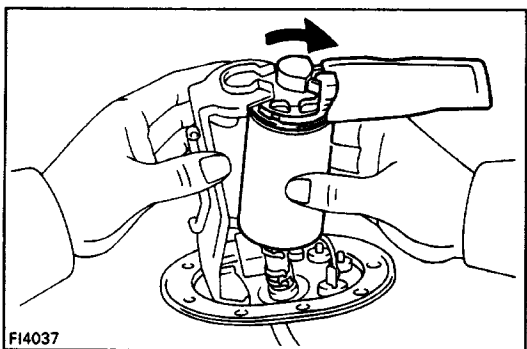


DISASSEMBLY OF FUEL PUMP

(See page [FI-131](#))

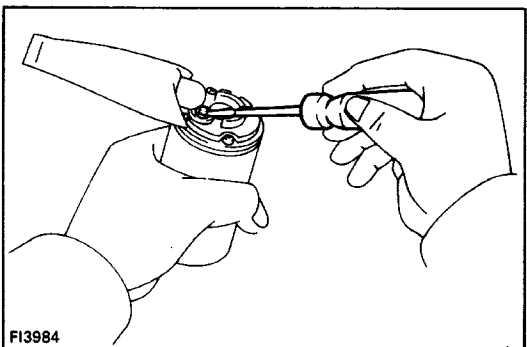
1. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

- (a) Remove the nut and spring washer, and disconnect the lead wire from the pump bracket. Disconnect the three lead wires.
- (b) Remove the two screws and sender gauge.



2. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

- (a) Remove the nut and spring washers, and disconnect the lead wire from the fuel pump. Disconnect the two lead wires.
- (b) Pull out the lower side of the fuel pump from the pump bracket.
- (c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.
- (d) Remove the rubber cushion from the fuel pump.



3. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

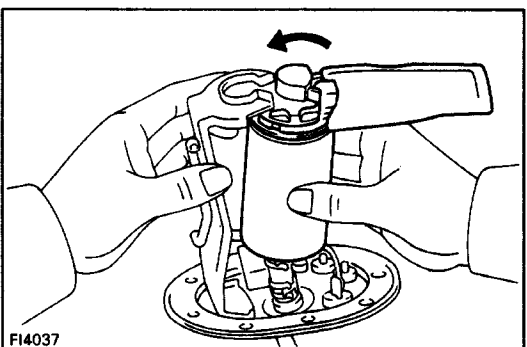
- (a) Using a small screwdriver, remove the clip.
- (b) Pull out the pump filter.

ASSEMBLY OF FUEL PUMP

(See page [FI-131](#))

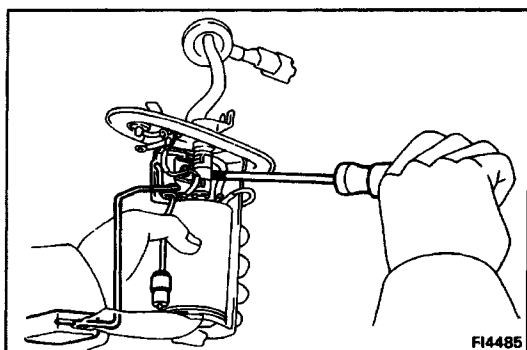
1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

Install the pump filter with a new clip.



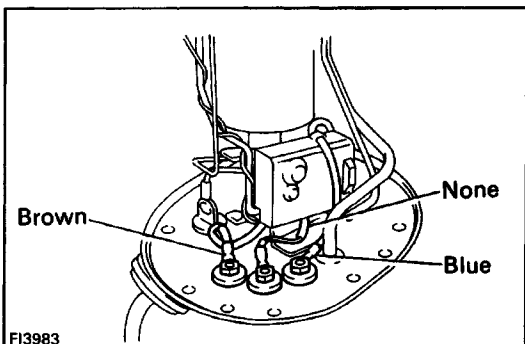
2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

- (a) Install the rubber cushion to the fuel pump.
- (b) Connect the fuel hose to the outlet port of the fuel pump.
- (c) Connect the lead wire to the fuel pump with the spring washer and nut. Connect the two lead wires.
- (d) Install the fuel pump by pushing the lower side of the fuel pump.

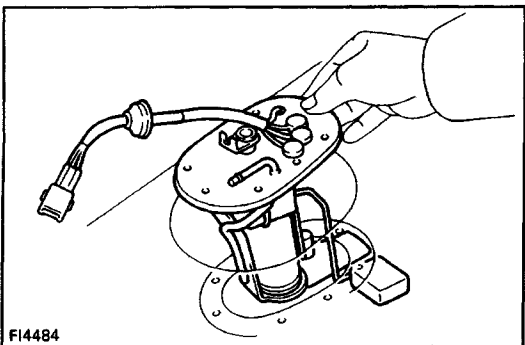


3. INSTALL FUEL SENDER GAUGE TO FUEL PUMP BRACKET

(a) Install the sender gauge with the two screws.



(b) Connect the lead wire to the pump bracket with the spring washer and nut. Connect the three lead wires as shown.

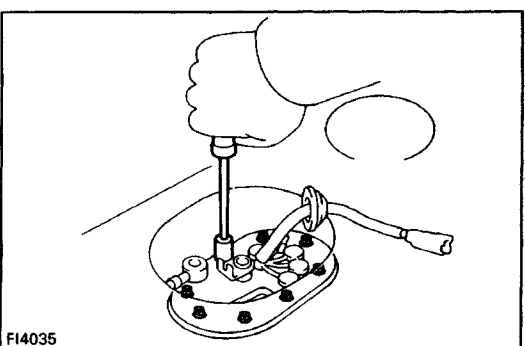


INSTALLATION OF FUEL PUMP

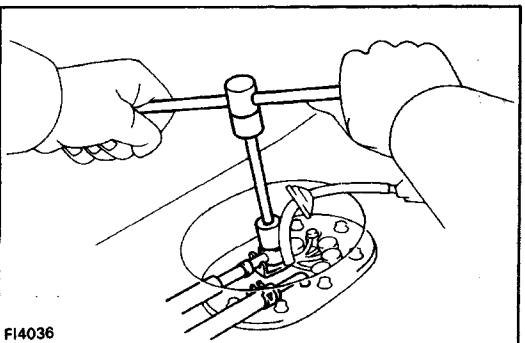
(See page [FI-130](#))

1. INSTALL FUEL PUMP BRACKET ASSEMBLY TO FUEL TANK

- (a) Install a new gasket to the pump bracket.
- (b) Insert the pump bracket assembly into the fuel tank.



(c) Install the pump bracket with the eight bolts.
Torque: 2.9 N-m (30 kgf-cm, 26 in.-lbf)



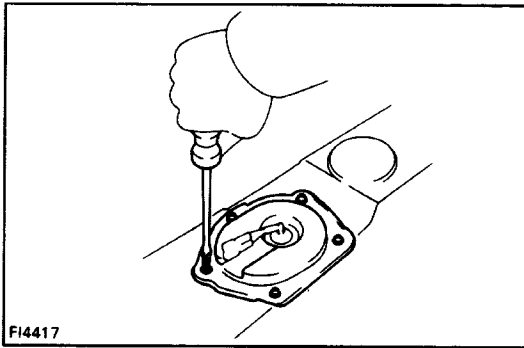
2. CONNECT FUEL PIPE AND HOSE TO FUEL PUMP BRACKET

(a) Connect the outlet pipe to the pump bracket with two new gaskets and the union bolt.

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

(b) Connect the return hose to the pump bracket.

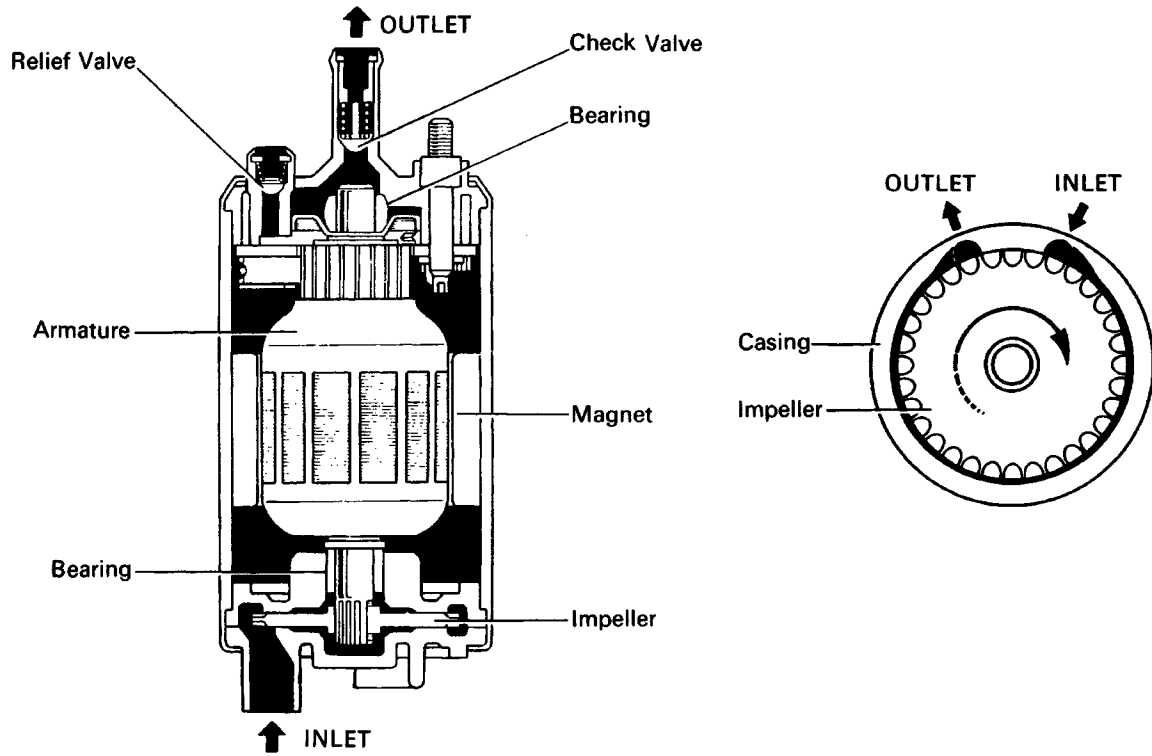
3. CHECK FOR FUEL LEAKAGE (See page [FI-10](#))

**4. INSTALL FLOOR SERVICE HOLE COVER**

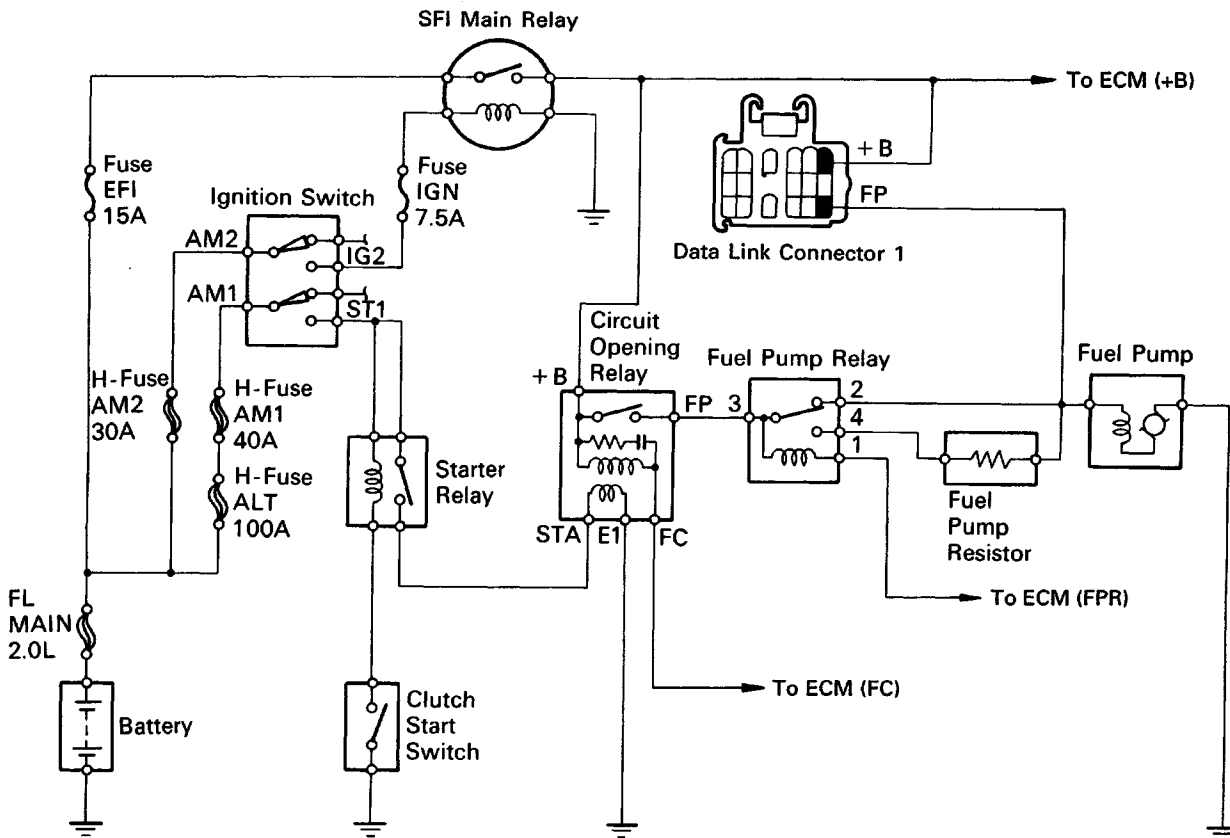
- (a) Install the service hole cover with the five screws.
- (b) Connect the fuel pump (with fuel sender gauge) connector.

5. INSTALL REAR SEAT CUSHION**6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

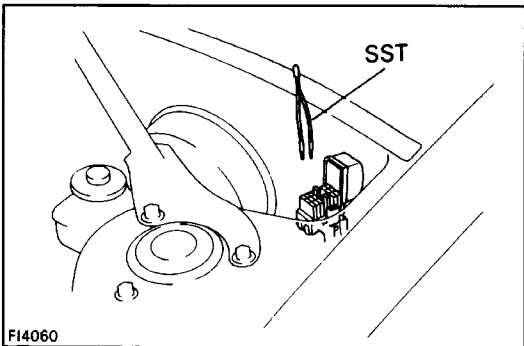
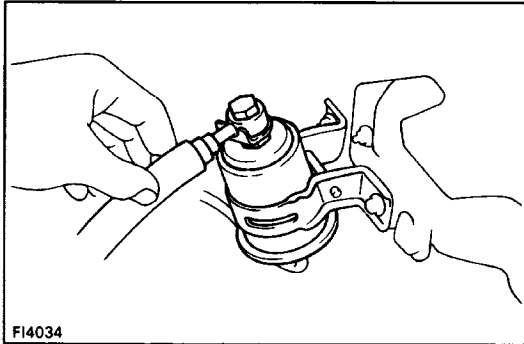
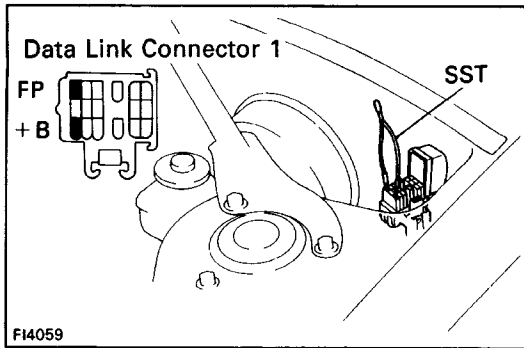
Fuel Pump (3S-GTE)



FI0530 FI1479



FI5423



ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

(a) Using SST, connect terminals +B and FP of the data link connector 1.

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(b) Turn the ignition switch ON.

NOTICE: Do not start the engine.

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

HINT: At this time, you will hear fuel return noise.

(d) Turn the ignition switch OFF.

(e) Remove SST.

SST 09843-18020

If there is no pressure, check the following parts:

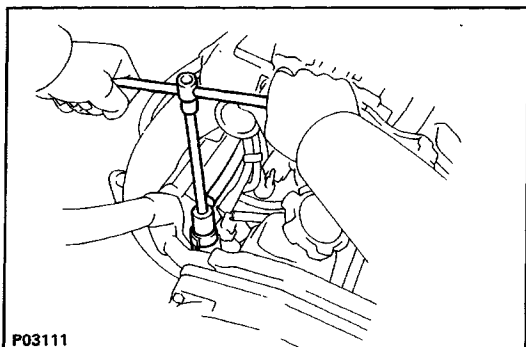
- Fusible link
- H-fuse (AM2 30A)
- Fuses (EFI 15A, IGN 7.5A)
- SFI main relay
- Fuel pump
- Wiring connections

2. CHECK FUEL PRESSURE

(a) Check that the battery voltage is above 12 volts.

(b) Disconnect the cable from the negative (-) terminal of the battery.

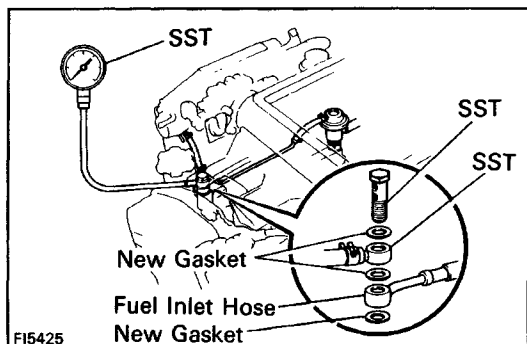
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.



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

HINT:

- Put a suitable container or shop towel under the cold start injector pipe.
- Slowly loosen the union bolt.

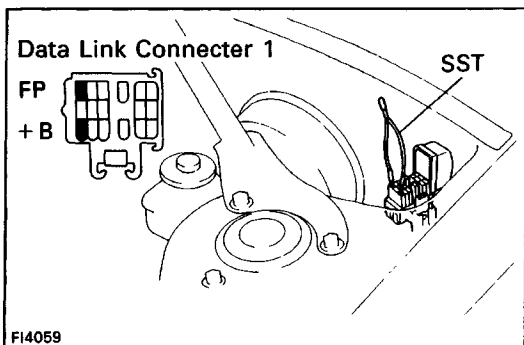


(d) Install the fuel inlet hose and SST (pressure gauge) to the delivery pipe with three new gaskets and SST (union bolt).

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

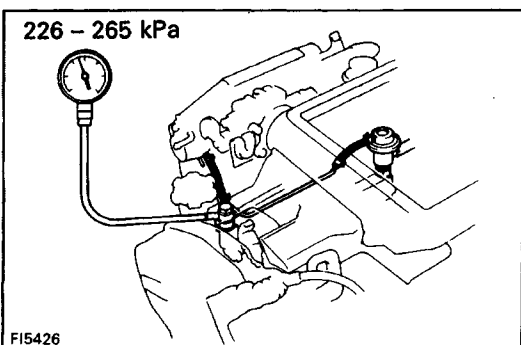
(e) Wipe off any splattered gasoline.



(f) Using SST, connect terminals +B and FP of the data link connector 1.

SST 09843-18020

(g) Reconnect the battery negative (-) cable.



(h) Turn the ignition switch ON.

(i) Measure the fuel pressure.

Fuel pressure: 226 - 265 kPa

(2.3 - 2.7 kgf/cm², 33 - 38 psi)

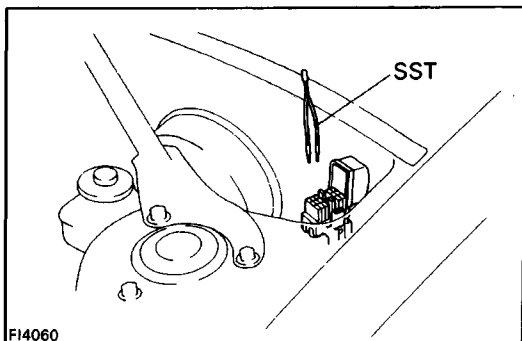
If pressure is high, replace the fuel pressure regulator.

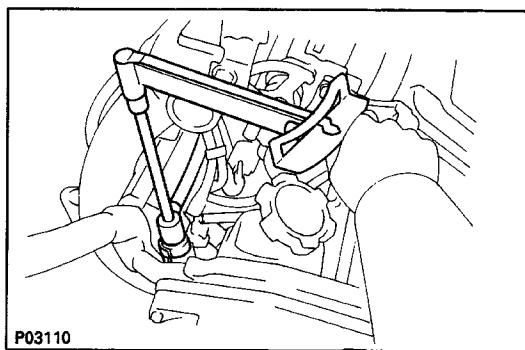
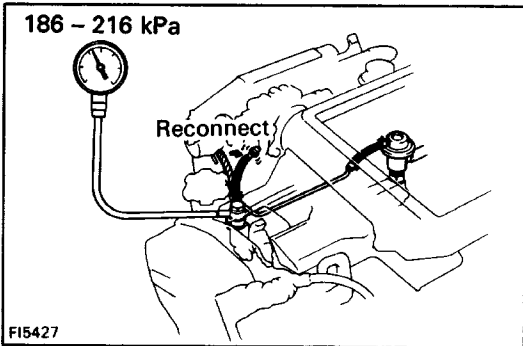
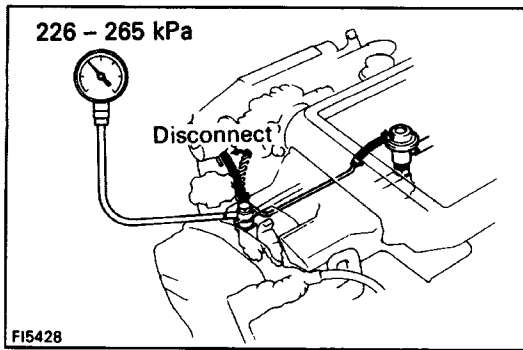
If pressure is low, check the following parts:

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

(j) Remove SST.

SST 09843-18020





- (k) Start the engine.
- (l) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.
- (m) Measure the fuel pressure at idle.

Fuel pressure: 226 - 265 kPa

(2.3 - 2.7 kgf/cm², 33 - 38 psi)

- (n) Reconnect the vacuum sensing hose to the fuel pressure regulator and plug the hose end.
- (o) Measure the fuel pressure at idle.

Fuel pressure: 186 - 216 kPa

(1.9 - 2.2 kgf/cm², 27 - 31 psi)

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

- (p) Stop the engine. Check that the fuel pressure remains 147 kPa (1.5 kgf/cm², 21 psi) or more for 5 minutes after the engine is turned off.

If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.

- (q) After checking fuel pressure, disconnect the battery negative (-) cable and carefully remove the SST to prevent gasoline from splashing.
SST 09268-45012

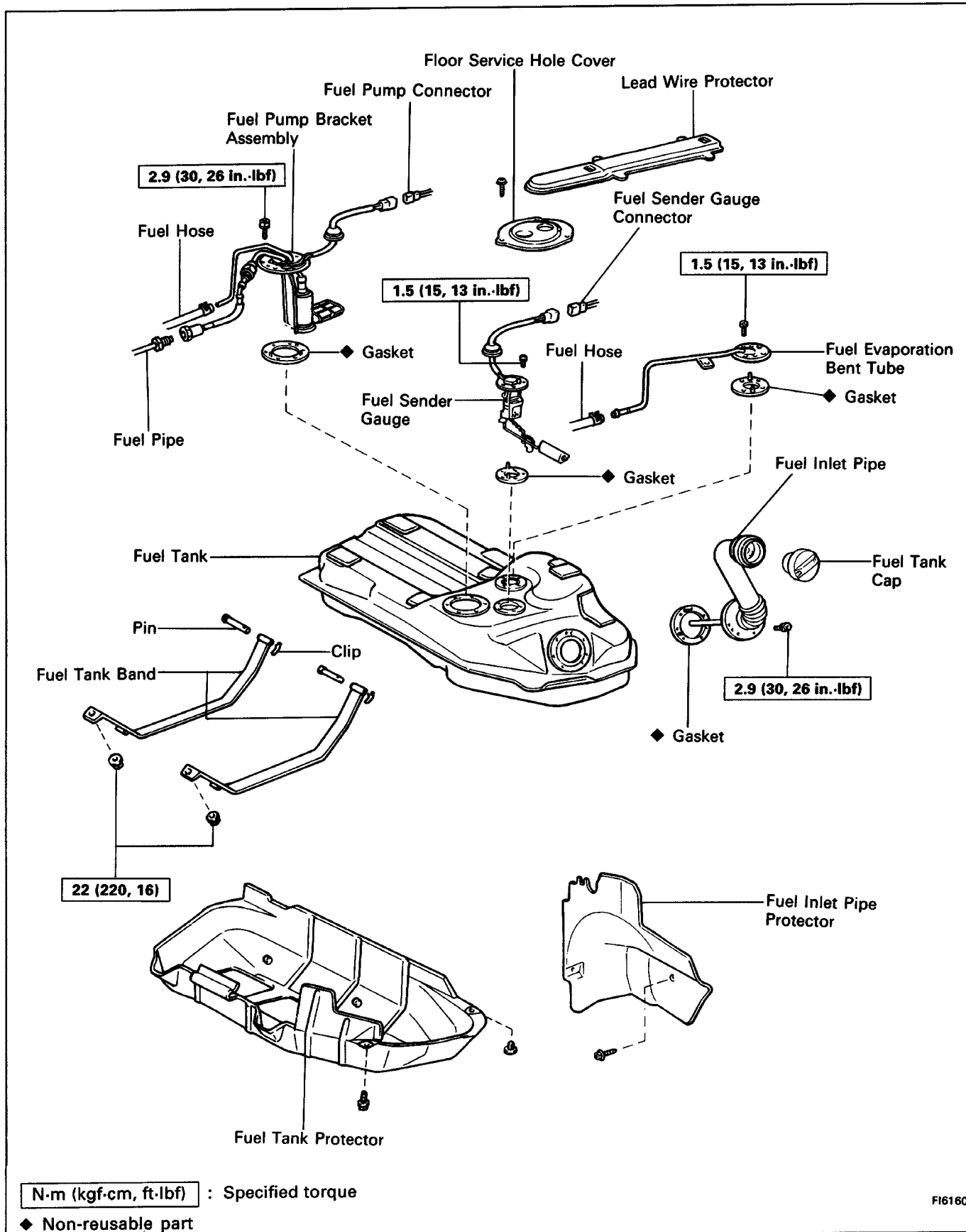
- (r) Reconnect the fuel inlet hose with two new gaskets and the union bolt.

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

- (s) Reconnect the cable to the negative (-) terminal of the battery.
- (t) Check for fuel leakage. (See page FI -10)

REMOVAL OF FUEL PUMP

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

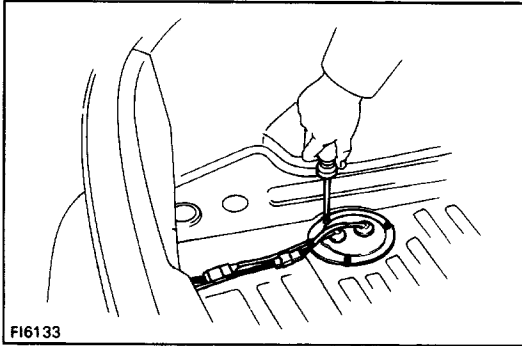


1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE FLOOR SERVICE HOLE COVER

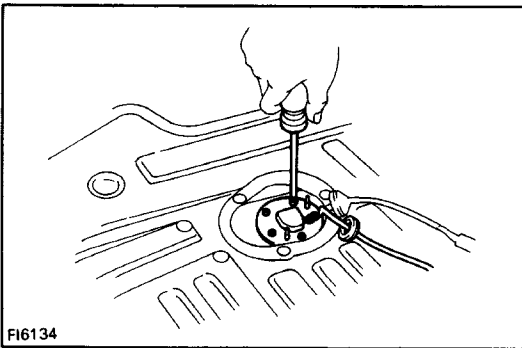
- (a) Remove the lead wire protector.
- (b) Disconnect the fuel pump and fuel sender gauge connectors.
- (c) Remove the three screws and service hole cover.



FI6133

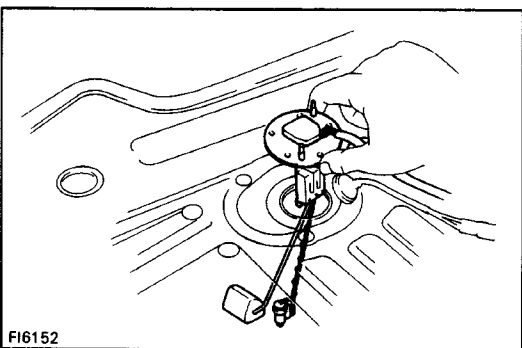
3. DRAW OUT FUEL FROM FUEL TANK

- (a) Remove the five screws and fuel sender gauge.
- (b) Remove the gasket from the fuel sender gauge.
- (c) Draw out the fuel from the fuel tank.



FI6134

- (d) Install a new gasket to the fuel sender gauge.
- (e) Insert the sender gauge into the fuel tank.

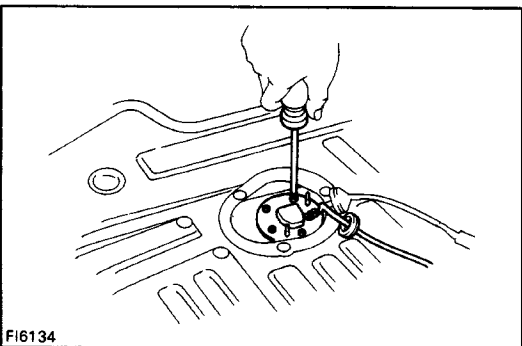


FI6152

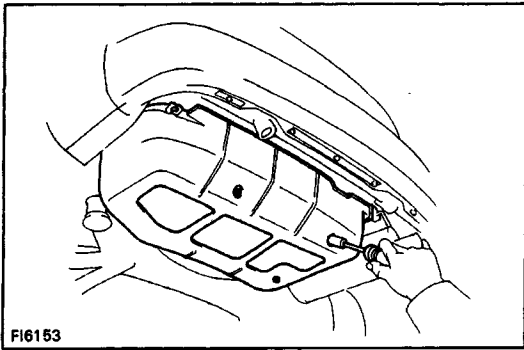
- (f) Reinstall the fuel sender gauge with the five screws.

Torque: 1.5 N-m (15 kgf-cm, 73 in.-lbf)

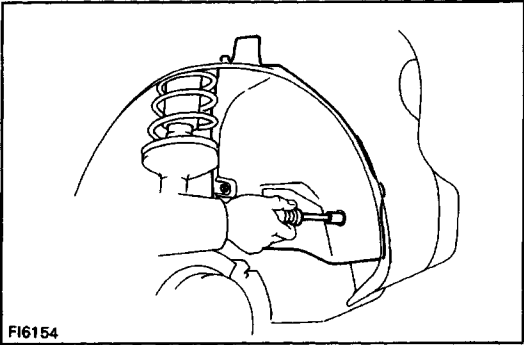
4. REMOVE LH REAR WHEEL



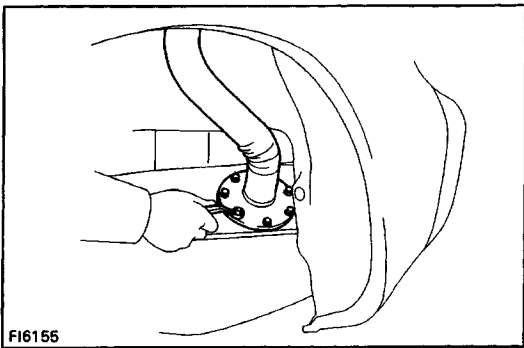
FI6134

**5. REMOVE FUEL TANK PROTECTOR**

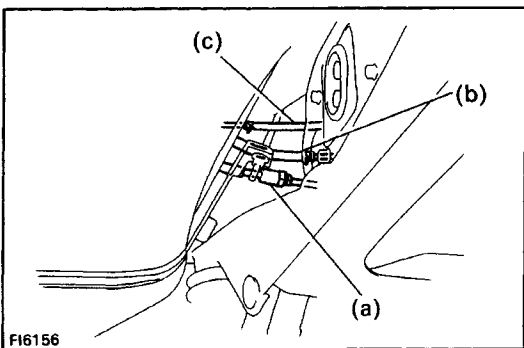
Remove the clip, six bolts and tank protector.

**6. REMOVE FUEL INLET PIPE PROTECTOR**

Remove the two screws and pipe protector.

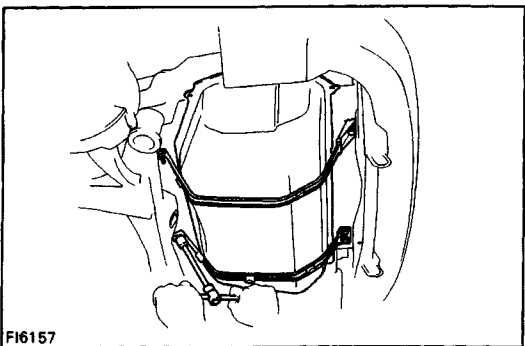
**7. DISCONNECT FUEL INLET PIPE FROM FUEL TANK**

- (a) Remove the seven bolts, and disconnect the inlet pipe.
- (b) Remove the gasket from the inlet pipe.

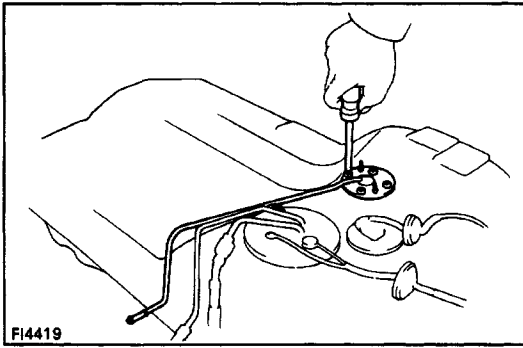
**8. DISCONNECT FUEL HOSES**

CAUTION: Remove the fuel filter cap to prevent the fuel from flowing out.

- (a) Fuel outlet hose
- (b) Fuel return hose
- (c) Fuel evaporation bent hose

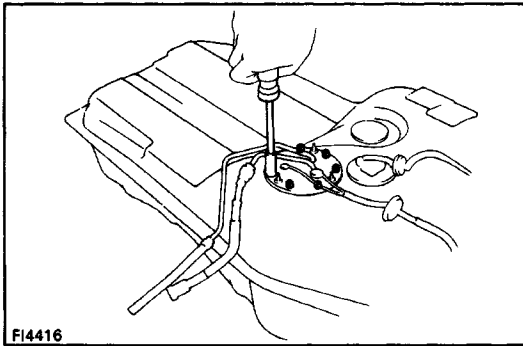
**9. REMOVE FUEL TANK**

- (a) Support the fuel tank with a jack.
- (b) Remove the nut, clip, pin and fuel tank bands. Remove the two tank bands.
- (c) Remove the fuel tank.



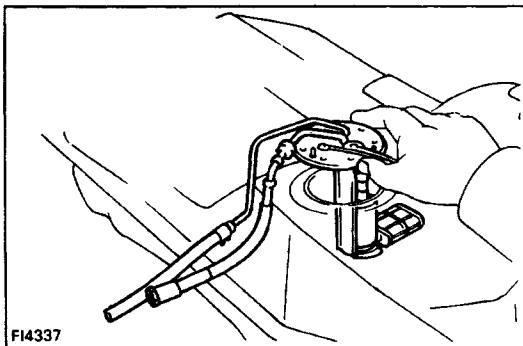
10. REMOVE FUEL EVAPORATION BENT TUBE

- (a) Remove the bolt holding the bent tube to the fuel pump bracket.
- (b) Remove the four screws, bent tube and gasket.



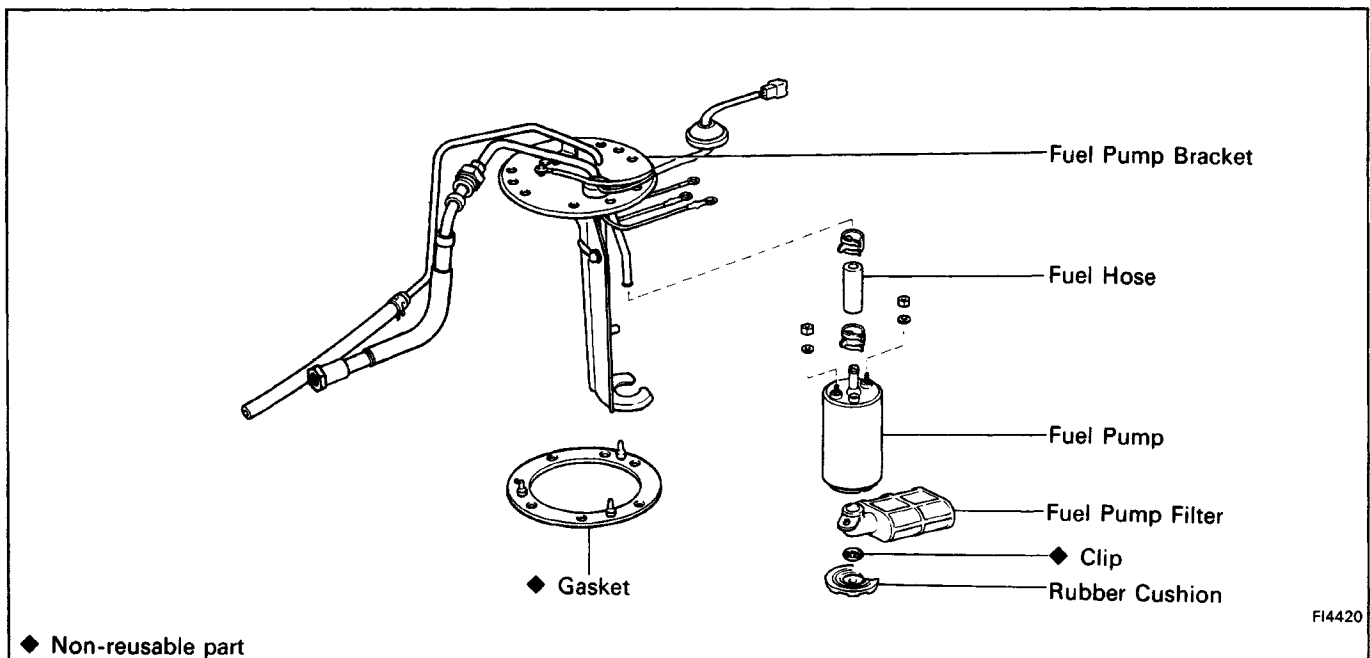
11. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK

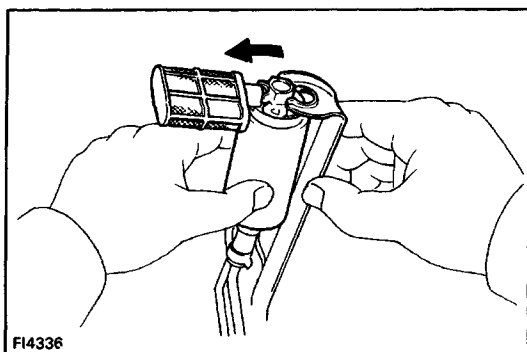
- (a) Remove the six bolts.



- (b) Pull out the pump bracket assembly.
- (c) Remove the gasket from the pump bracket.

COMPONENTS





DISASSEMBLY OF FUEL PUMP

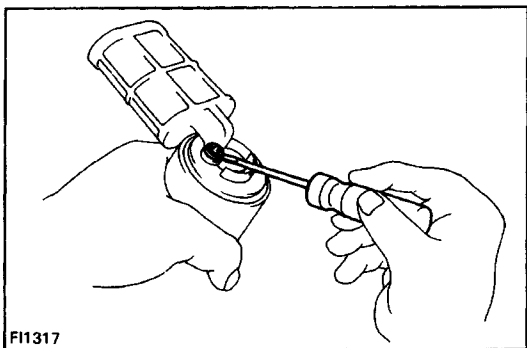
(See page [FI-142](#))

1. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

- (a) Pull out the lower side of the fuel pump from the pump bracket.
- (b) Remove the rubber cushion from the fuel pump.
- (c) Remove the nut and spring washer, and disconnect the lead wire from the fuel pump. Disconnect the three lead wires.
- (d) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.

2. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

- (a) Using a small screwdriver, remove the clip.
- (b) Pull out the pump filter.



ASSEMBLY OF FUEL PUMP

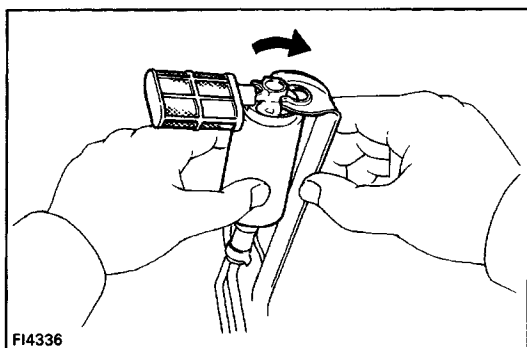
(See page [FI-142](#))

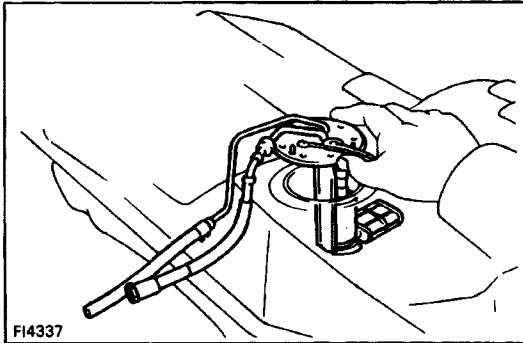
1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

install the pump filter with a new clip.

2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

- (a) Connect the fuel hose to the outlet port of the fuel pump.
- (b) Connect the lead wire to the fuel pump with the spring washer and nut. Connect the two lead wires.
- (c) Install the rubber cushion to the fuel pump.
- (d) Install the fuel pump by pushing the lower side of the fuel pump.





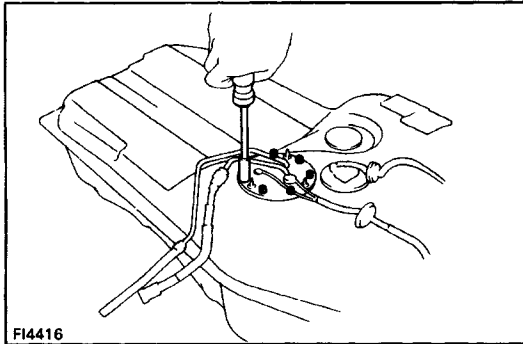
FI4337

INSTALLATION OF FUEL PUMP

(See page [FI-139](#))

1. INSTALL FUEL PUMP BRACKET ASSEMBLY TO FUEL TANK

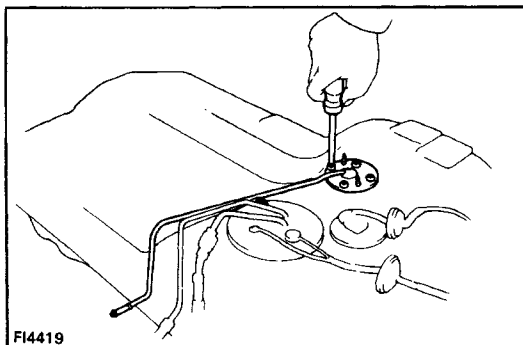
- (a) Install a new gasket to the pump bracket.
- (b) Insert the pump bracket assembly into the fuel tank.



FI4416

- (c) Install the pump bracket with the six bolts.

Torque: 2.9 N-m (30 kgf-cm, 26 in.lbf)



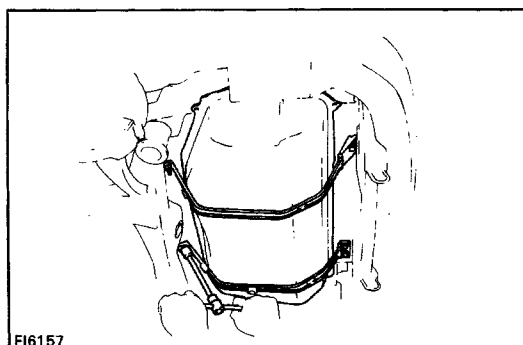
FI4419

2. INSTALL FUEL EVAPORATION BENT TUBE

- (a) Install a new gasket to the bent tube.
- (b) Install the bent tube with the four screws.
- (c) Install the bolt holding the bent tube to the fuel pump bracket.

Torque: 1.5 N-m (15 kgf-cm, 13 in.-lbf)

Torque: 2.9 N-m (30 kgf-cm, 26 in.-lbf)

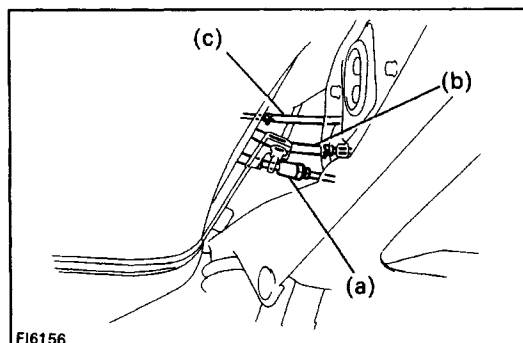


FI6157

3. INSTALL FUEL TANK

- (a) Attach the fuel tank to the body.
- (b) Install the fuel tank band with the pin, clip and nut. Install the two tank bands.

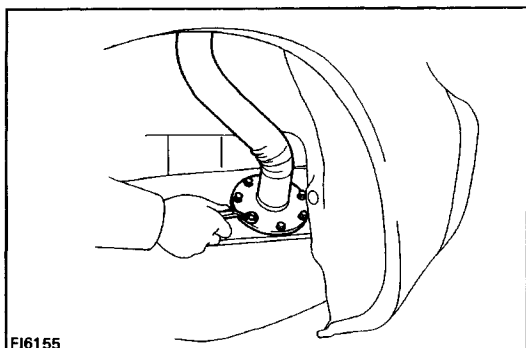
Torque: 22 N-m (220 kgf-cm, 16 ft-lbf)



FI6156

4. CONNECT FUEL HOSES

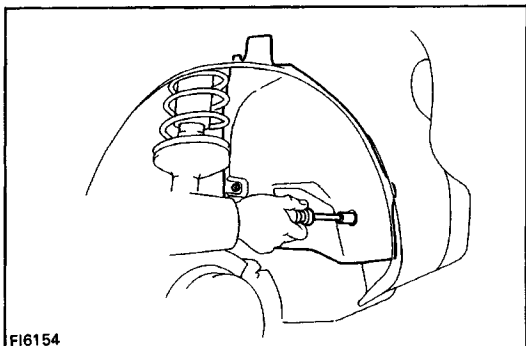
- (a) Fuel outlet hose
Torque (See page [FI-9](#)):
30 N-m (310 kgf-cm, 22 ft-lbf)
- (b) Fuel return hose
- (c) Fuel evaporation bent hose



FI6155

5. INSTALL FUEL INLET PIPE

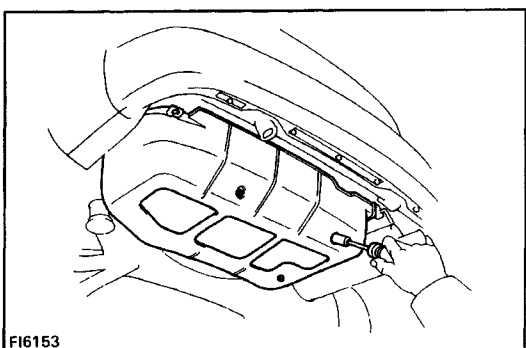
- (a) Install a new gasket to the inlet pipe.
 - (b) Install the inlet pipe with the seven bolts.
- Torque: 2.9 N-m (30 kgf-cm, 26 in-lbf)**



FI6154

6. INSTALL FUEL INLET PIPE PROTECTOR

- (a) Attach the pipe protector to the body.
- (b) Install the pipe protector with the two screws.

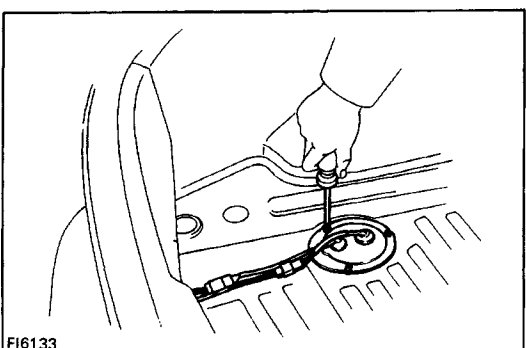


FI6153

7. INSTALL FUEL TANK PROTECTOR

- (a) Attach the tank protector to the body.
- (b) Install the tank protector with the clip and six bolts.

8. INSTALL LH REAR WHEEL



FI6133

9. INSTALL FLOOR SERVICE HOLE COVER

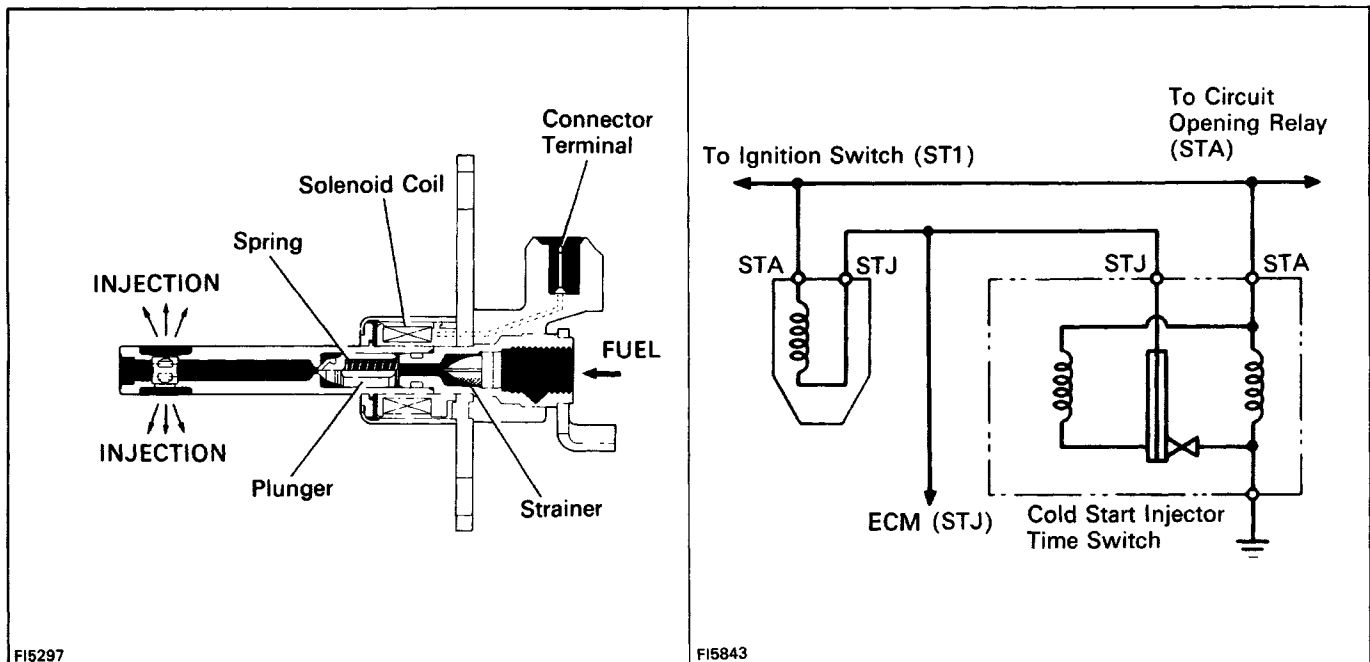
- (a) Run the lead wires of the fuel pump and sender gauge through the holes in the service hole cover.
- (b) Install the service hole cover with the three screws.
- (c) Install the lead wire protector.

10. FILL WITH FUEL

11. CHECK FOR FUEL LEAKAGE (See page [FI-10](#))

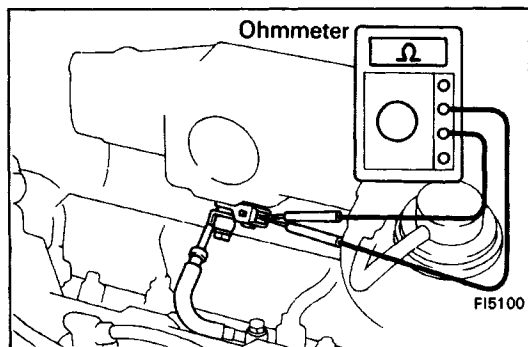
12. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Cold Start Injector (3S-GTE)



FI5297

FI5843



ON-VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

- Remove the throttle body.
(See steps 1 to 8, 10 and 11 on pages [FI-194](#) and [195](#))
- Disconnect the cold start injector connector.
- Using an ohmmeter, measure the resistance between the terminals.

Resistance: 2 - 4

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

- Reconnect the cold start injector connector.
- Reinstall the throttle body.

(See steps 2, 3 and 5 to 12 on pages [FI-197](#) and [198](#))

REMOVAL OF COLD START INJECTOR

1. REMOVE THROTTLE BODY

(See steps 1 to 8, 10 and 11 on pages [FI-173](#) and [174](#))

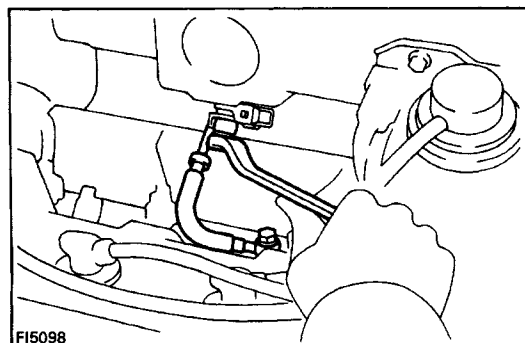
2. DISCONNECT COLD START INJECTOR CONNECTOR

3. REMOVE COLD START INJECTOR PIPE

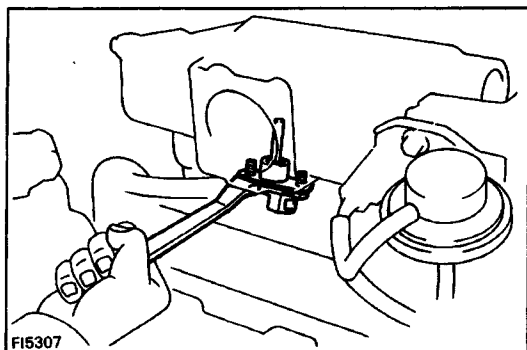
Remove the two union bolts and four gaskets and injector pipe.

HINT:

- Put a suitable container or shop towel under the injector pipe.
- Slowly loosen the union bolt.

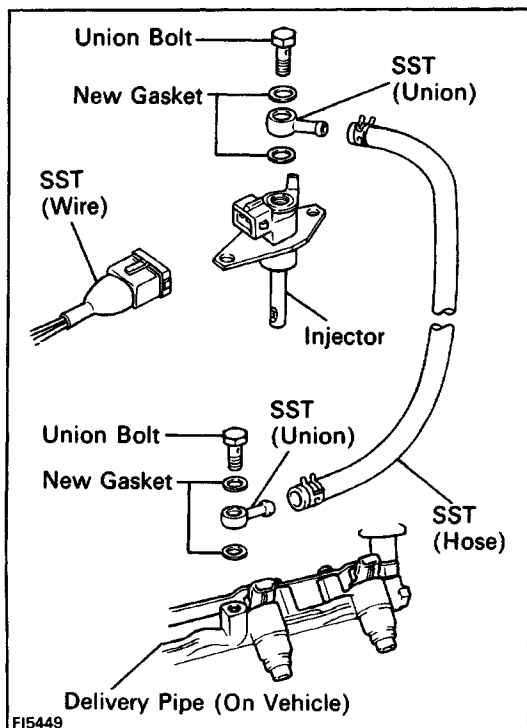


FI5098



4. REMOVE COLD START INJECTOR

Remove the two bolts, cold start injector and gasket.



INSPECTION OF COLD START INJECTOR

1. INSPECT INJECTION OF COLD START INJECTOR

CAUTION: Keep injector clear of sparks during the test.

(a) Install SST (two unions) to the injector and delivery pipe with four new gaskets and the union bolts.

SST 09268-41045 (09268-41080)

Torque: 12 N-m (125 kgf-cm, 9 ft-lbf)

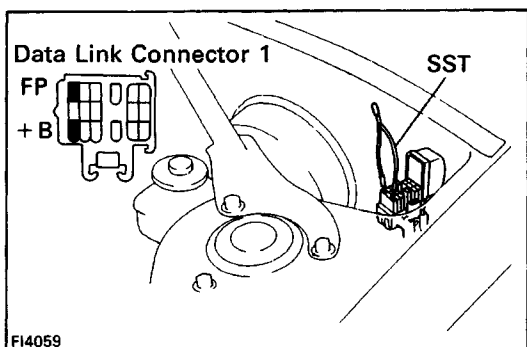
(b) Connect SST (hose) to the unions.

SST 09268-41045

(c) Connect SST (wire) to the injector.

SST 09842-30050

(d) Put a container under the injector.



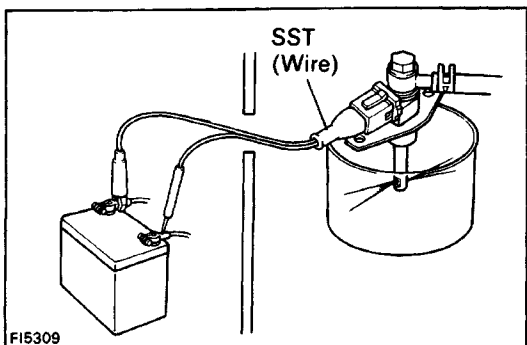
(e) Using SST, connect terminals +B and FP of the data link connector 1.

SST 09843-18020

(f) Reconnect the battery negative (-) cable.

(g) Turn the ignition switch ON.

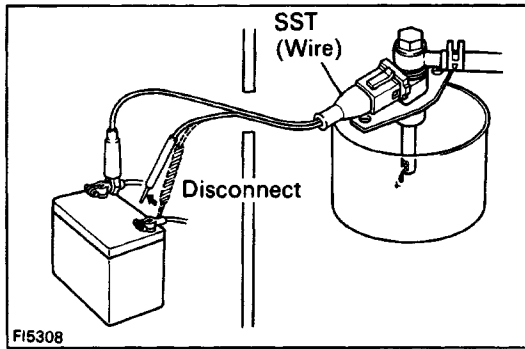
NOTICE: Do not start the engine.



(h) Connect the test probes of the SST (wire) to the battery, and check that the fuel spray is as shown.

SST 09842-30050

NOTICE: Perform this check within the shortest possible time.



2. INSPECT LEAKAGE

- (a) In the condition above, disconnect the test probes of SST (wire) from the battery and check for fuel leakage from the injector.

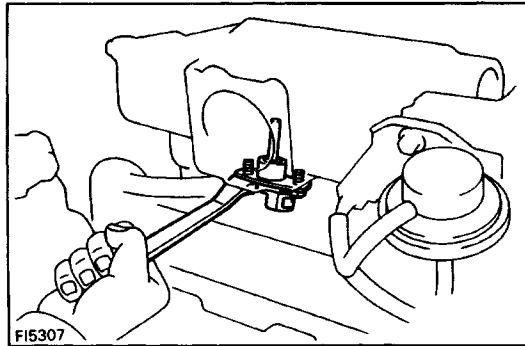
SST 09842-30050

Fuel drop: One drop or less per minute

- (b) Disconnect the battery negative (-) cable.

- (c) Remove SST.

SST 09268-41045, 09842-30050 and 09843-18020

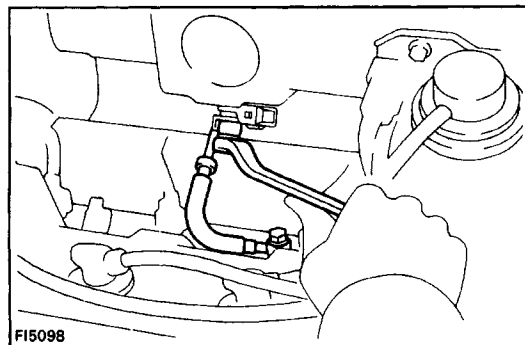


INSTALLATION OF COLD START INJECTOR

1. INSTALL COLD START INJECTOR

Install a new gasket and the injector with the two bolts.

Torque: 5.9 N-m (60 kgf-cm, 52 in.-lbf)



2. INSTALL COLD START INJECTOR PIPE

Install the injector pipe with four new gaskets and the two union bolts.

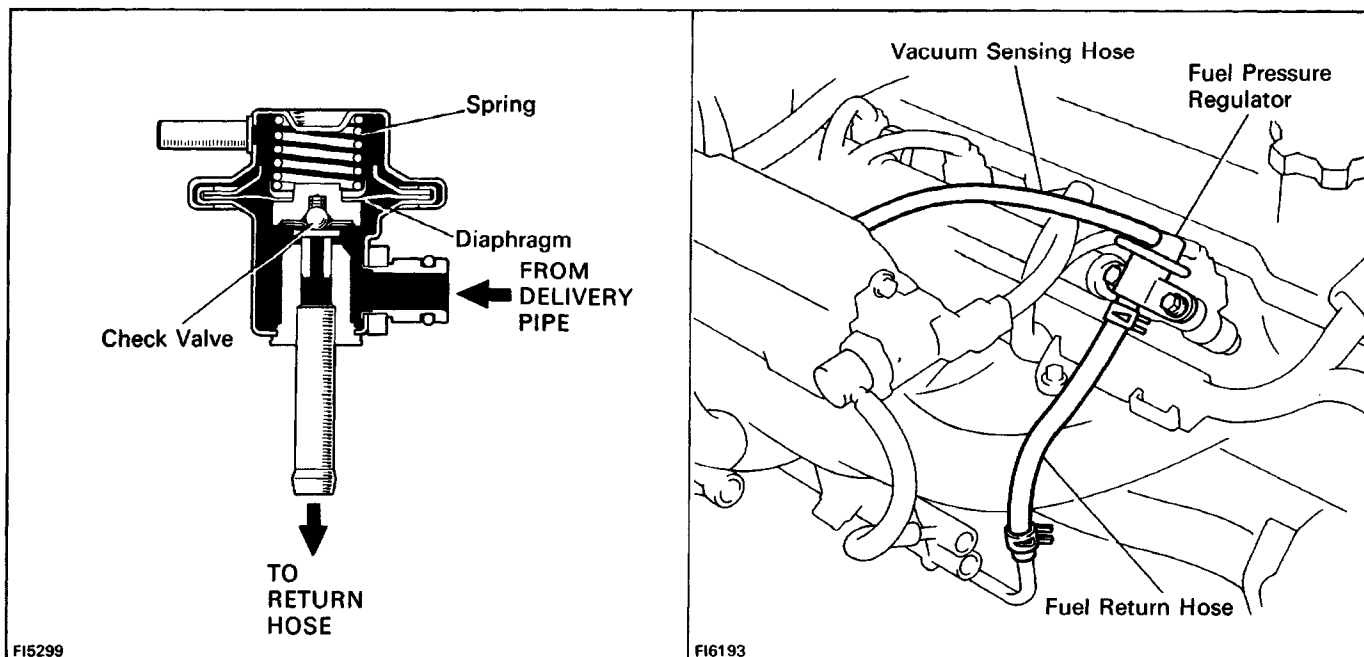
Torque: 12 N-m (125 kgf-cm, 9 ft-lbf)

3. CONNECT COLD START INJECTOR CONNECTOR

4. INSTALL THROTTLE BODY

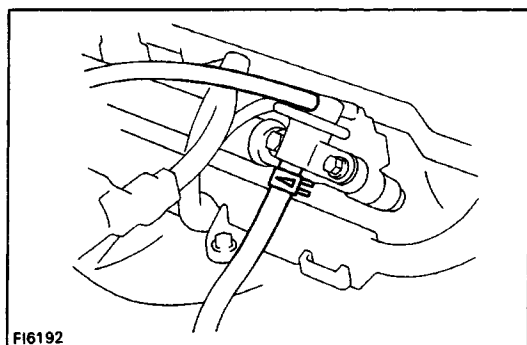
(See steps 2, 3 and 5 to 12 on pages [FI-197](#) and 198)

Fuel Pressure Regulator (4A-FE)



ON-VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page [FI-125](#))



REMOVAL OF FUEL PRESSURE REGULATOR

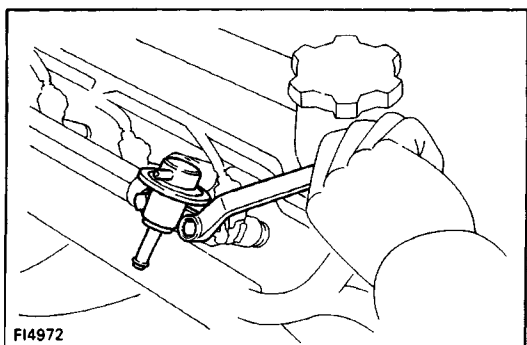
1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR
2. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR

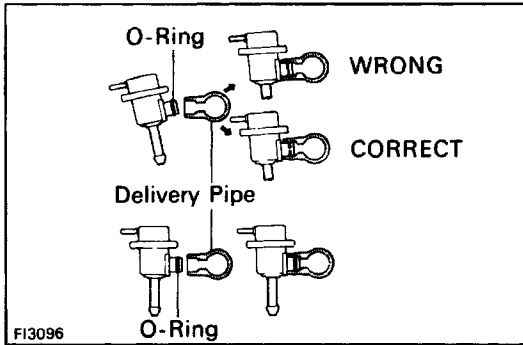
HINT:

- Put a suitable container or shop towel under the pressure regulator.
- Slowly loosen the union bolt.

3. REMOVE FUEL PRESSURE REGULATOR

- (a) Remove the two bolts, and pull out the pressure regulator.
- (b) Remove the O-ring from the pressure regulator.

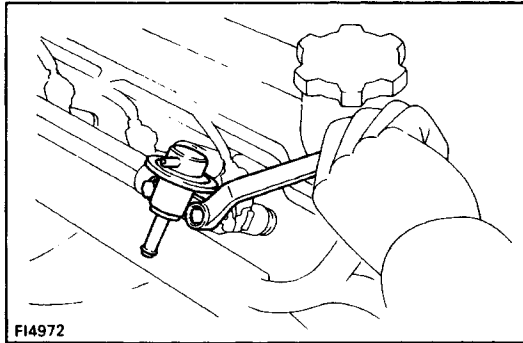




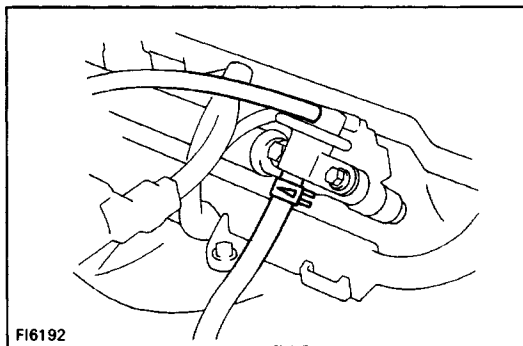
INSTALLATION OF FUEL PRESSURE REGULATOR

1. INSTALL FUEL PRESSURE REGULATOR

- (a) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.



- (b) Install the pressure regulator with the two bolts.
Torque: 9.3 N-m (95 kgf-cm, 82 in.-lbf)

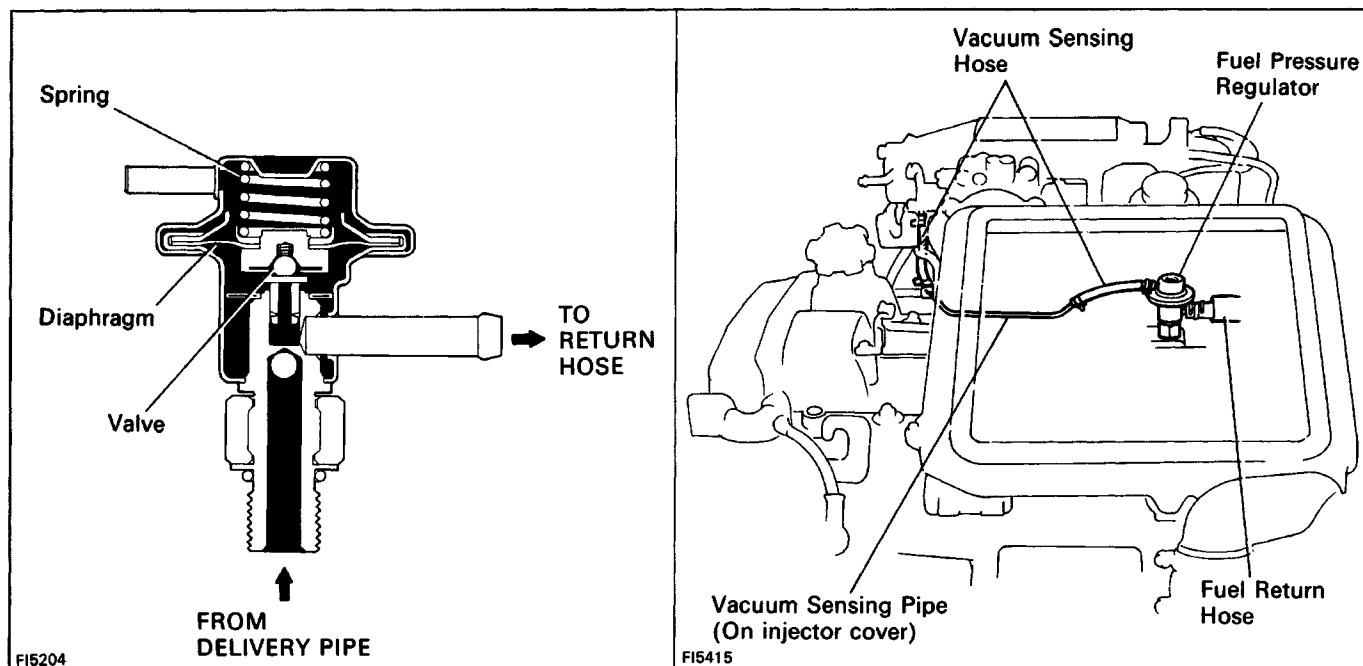


2. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR

3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR

4. CHECK FOR FUEL LEAKAGE (See page [FI-10](#))

Fuel Pressure Regulator (3S-GTE)



ON-VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page [FI-136](#))

REMOVAL OF FUEL PRESSURE REGULATOR

1. REMOVE THROTTLE BODY

(See steps 1 to 8, 10 and 11 on pages [FI-194](#) and 195)

2. REMOVE INJECTORS, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY

(See steps 1 to 14 on pages [FI-161](#) and 162)

3. REMOVE FUEL INLET HOSE FROM DELIVERY PIPE

(See step 15 on page [FI-162](#))

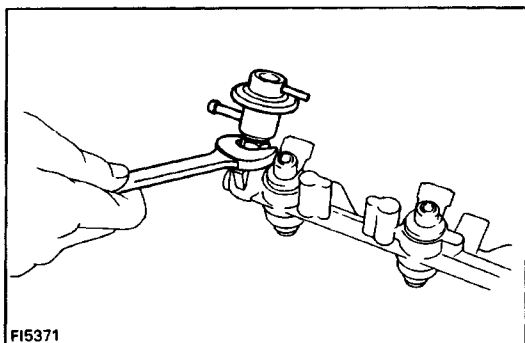
4. REMOVE INJECTOR COVER FROM DELIVERY PIPE

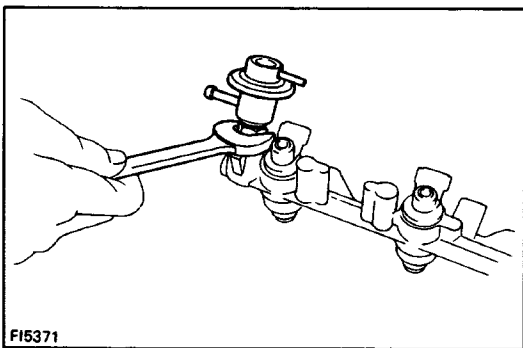
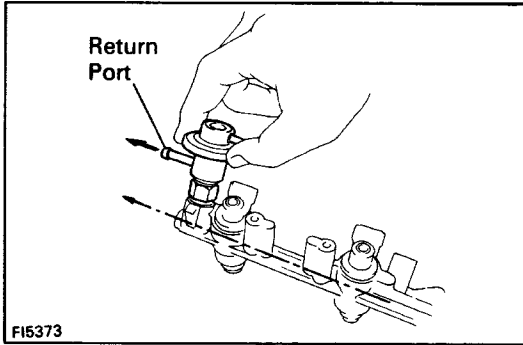
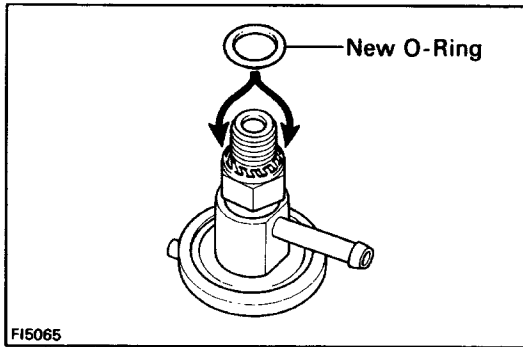
(See step 1 on page [FI-164](#))

5. REMOVE FUEL PRESSURE REGULATOR

(a) Loosen the lock nut, and remove the pressure regulator.

(b) Remove the O-ring from the pressure regulator.





INSTALLATION OF FUEL PRESSURE REGULATOR

1. INSTALL FUEL PRESSURE REGULATOR

- (a) Fully loosen the lock nut on the pressure regulator.
- (b) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.

- (c) Completely thrust the pressure regulator into the delivery pipe by hand.
- (d) Turn the pressure regulator counterclockwise until the fuel return port faces in the direction indicated in the illustration.

- (e) Tighten the lock nut.
Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)

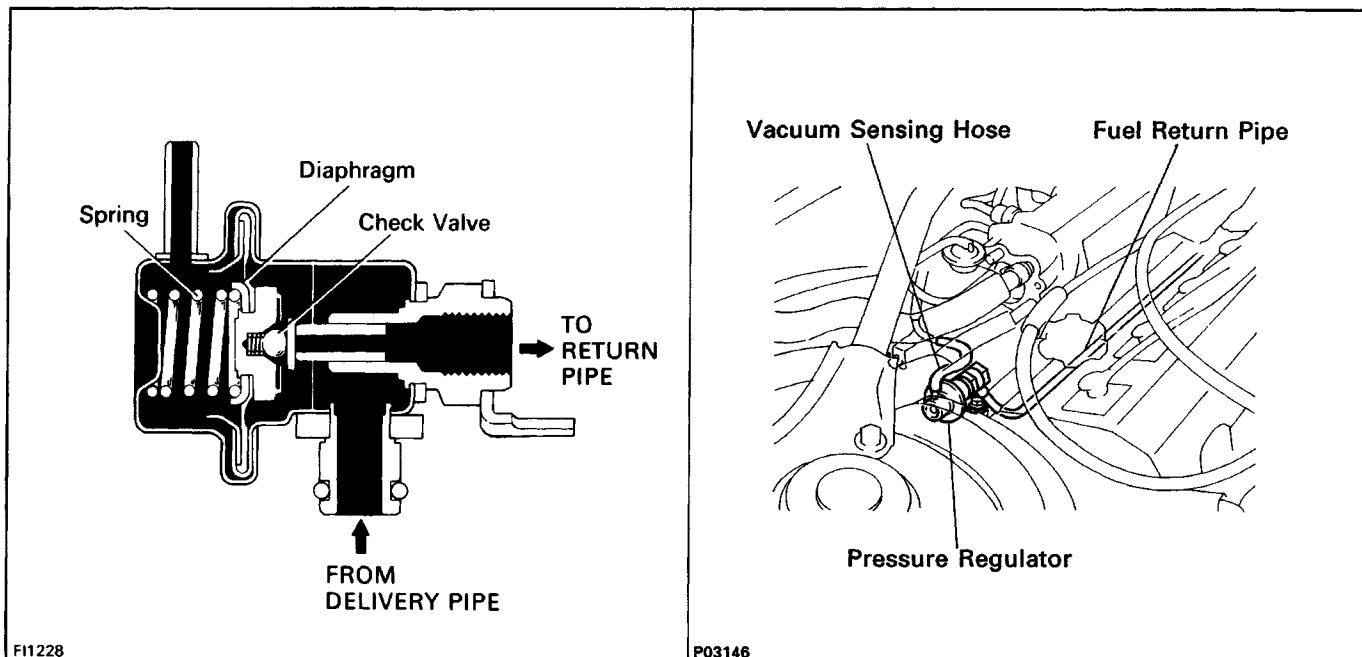
2. INSTALL INJECTOR COVER TO DELIVERY PIPE (See step 4 on page [FI-165](#))

3. INSTALL FUEL INLET HOSE TO DELIVERY PIPE (See step 1 on page [FI-166](#))

4. INSTALL INJECTORS, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY (See steps 2 to 14 on pages [FI-166](#) and 167)

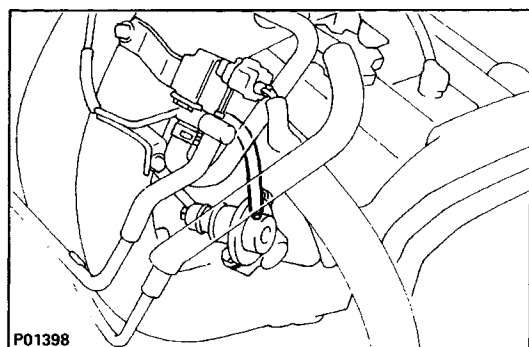
5. INSTALL THROTTLE BODY (See steps 2, 3 and 5 to 12 on pages [FI-197](#) and 198)

Fuel Pressure Regulator (5S-FE)



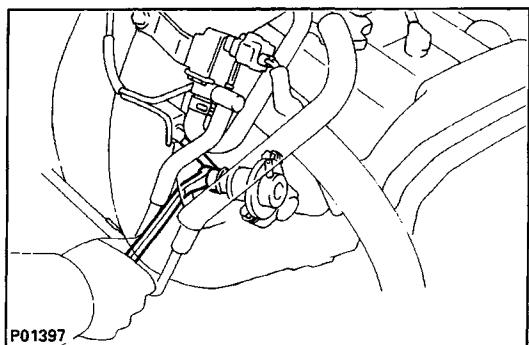
ON-VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page [FI-128](#))



REMOVAL OF FUEL PRESSURE REGULATOR

1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

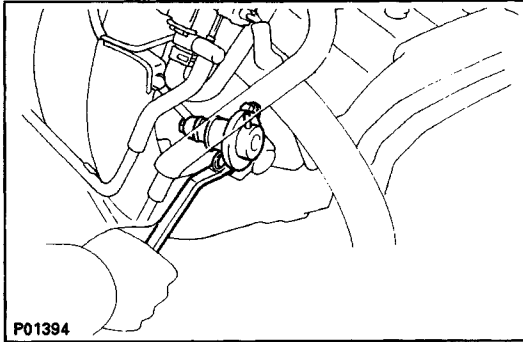


2. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR

Remove the union bolt and two gaskets, and disconnect the return pipe from the pressure regulator.

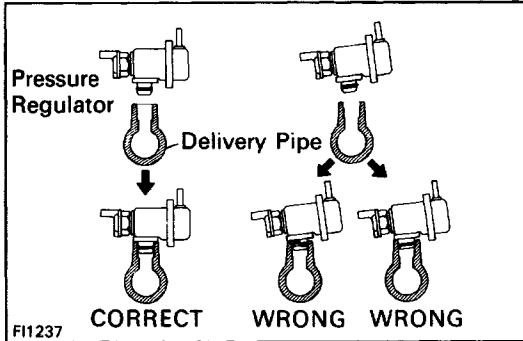
HINT:

- Put a suitable container or shop towel under the pressure regulator.
- Slowly loosen the union bolt.



3. REMOVE FUEL PRESSURE REGULATOR

- (a) Remove the two bolts, and pull out the pressure regulator.
- (b) Remove the O-ring from the pressure regulator.

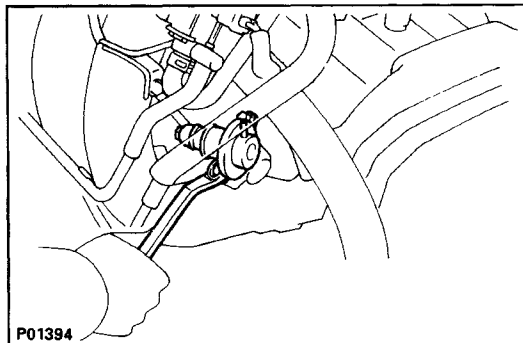


INSTALLATION OF FUEL PRESSURE REGULATOR

1. INSTALL FUEL PRESSURE REGULATOR

- (a) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.

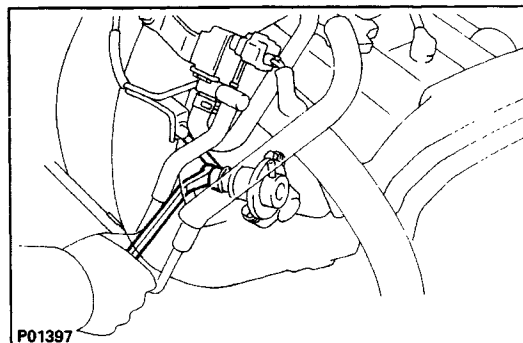
- (b) Install the pressure regulator with the two bolts.
Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)



2. CONNECT FUEL RETURN PIPE TO FUEL PRESSURE REGULATOR

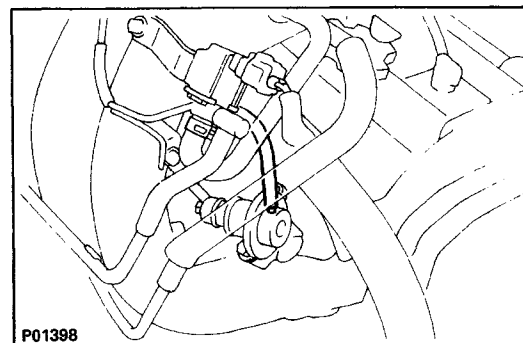
Install the return pipe with new two gaskets and the union bolt.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

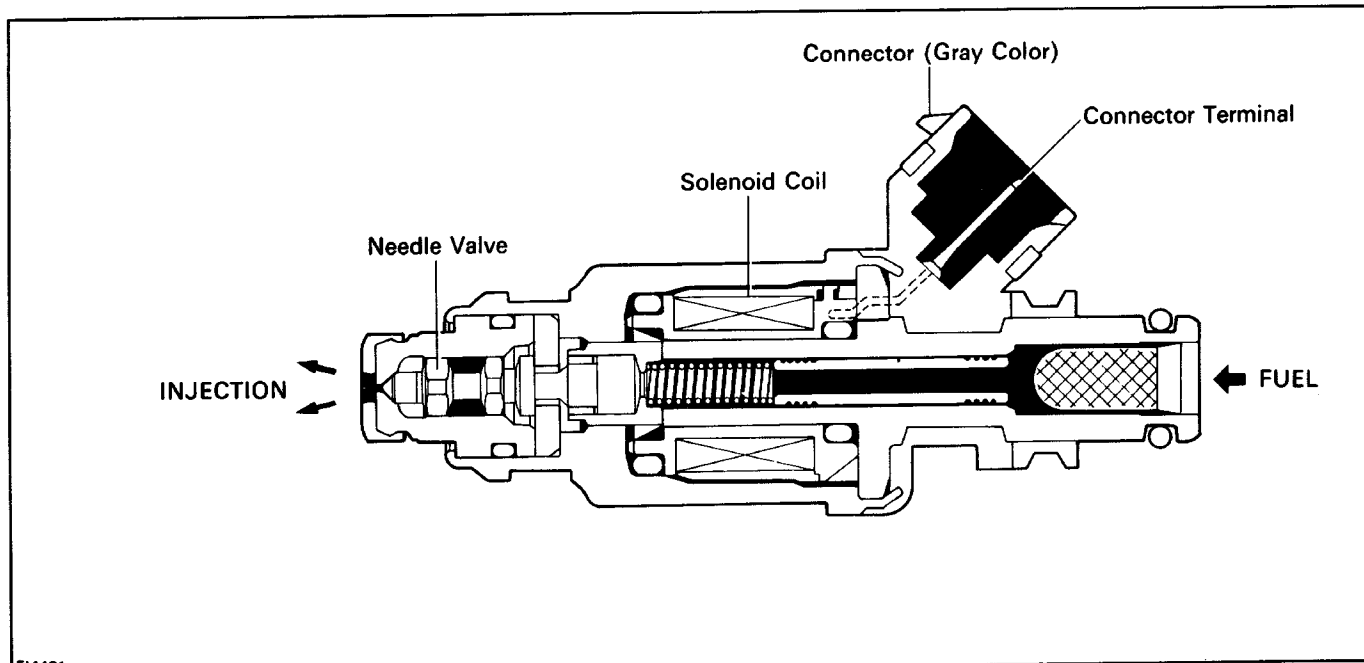


3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR

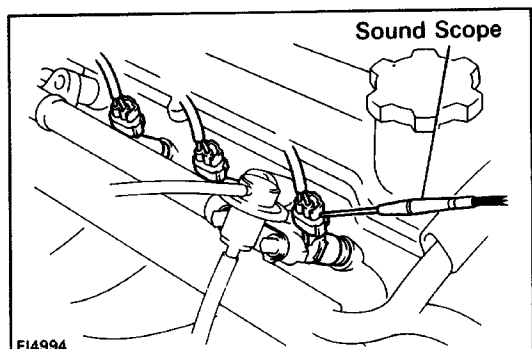
4. CHECK FOR FUEL LEAKAGE (See page [FI-10](#))



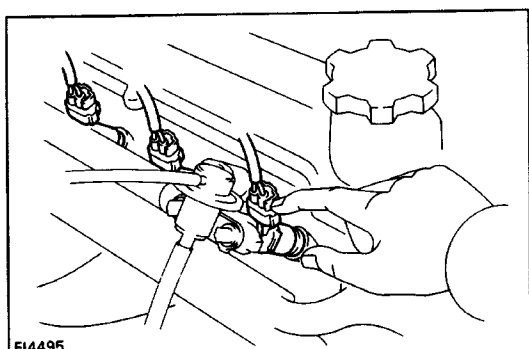
Injectors (4A-FE)



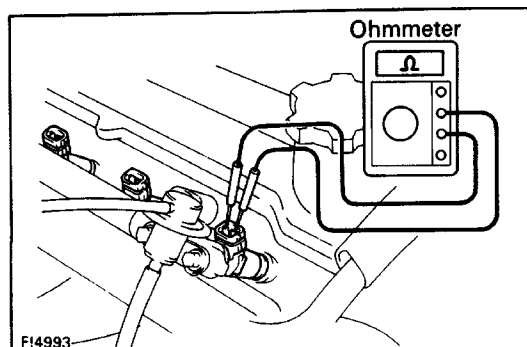
FI4481



FI4994



FI4495



FI4993

ON-VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

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

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

If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.

2. INSPECT INJECTOR RESISTANCE

- (a) Disconnect the injector connector.
- (b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: Approx. 13.8

- If the resistance is not as specified, replace the injector
- (e) Reconnect the injector connector.

REMOVAL OF INJECTORS

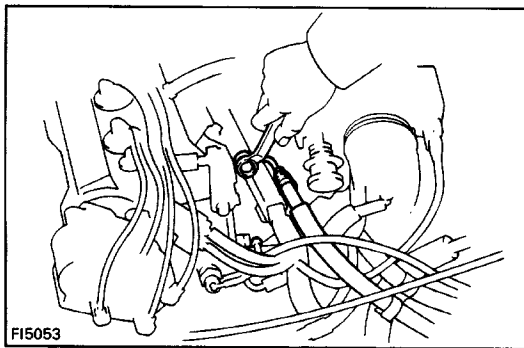
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

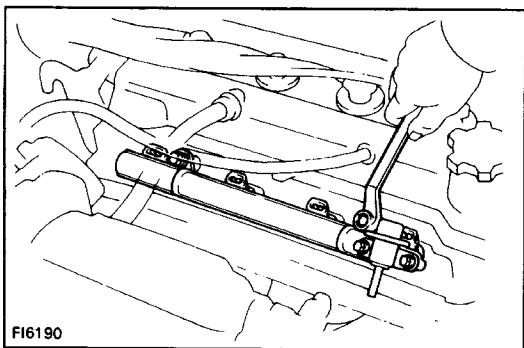
3. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR

4. DISCONNECT INJECTOR CONNECTORS



5. DISCONNECT FUEL INLET HOSE FROM DELIVERY PIPE

Remove the union bolt and two gaskets, and disconnect the inlet hose from the delivery pipe.



6. REMOVE DELIVERY PIPE AND INJECTORS

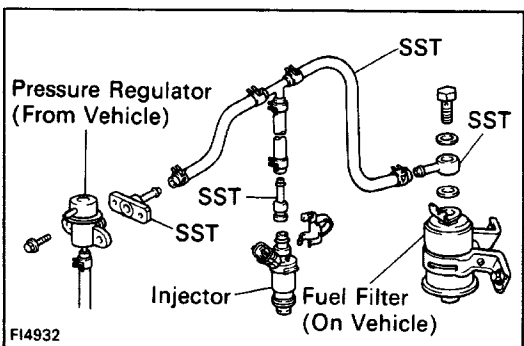
(a) Remove the two bolts and delivery pipe together with the four injectors.

NOTICE: Be careful not to drop the injectors when removing the delivery pipe.

(b) Remove the four insulators and two spacers from the cylinder head.

(c) Pull out the four injectors from the delivery pipe.

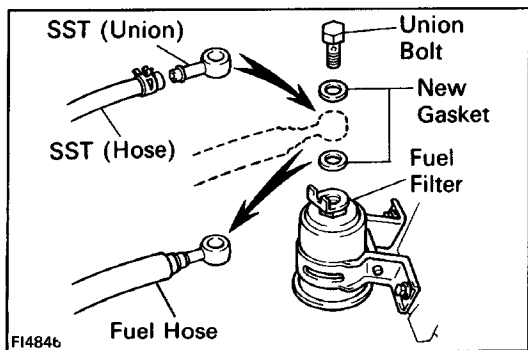
(d) Remove the O-ring and grommet from each injector.



INSPECTION OF INJECTORS

1. INSPECT INJECTOR INJECTION

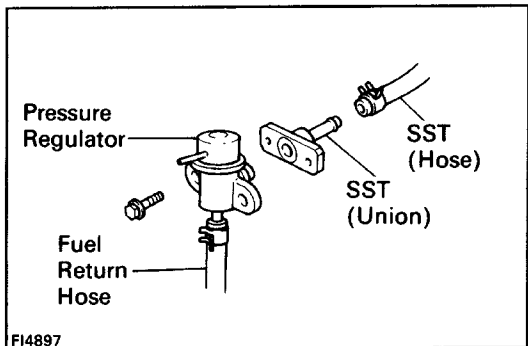
CAUTION: Keep injector clear of sparks during the test.



- (a) Disconnect the fuel hose from the fuel filter outlet.
- (b) Connect SST (union and hose) to the fuel filter outlet with two new gaskets and the union bolt.
SST 09268-41045 (90405-09015)

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

HINT: Use the vehicle's fuel filter.

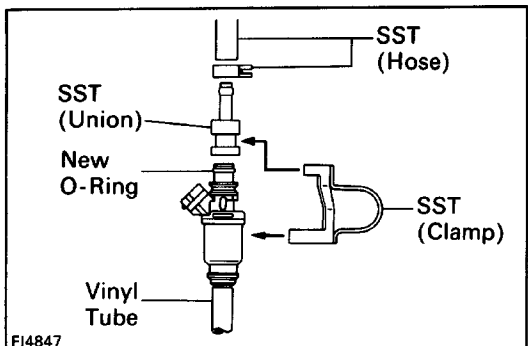


- (c) Remove the pressure regulator from the delivery pipe, and connect the fuel return hose to the pressure regulator.

- (d) Install a new O-ring to the pressure regulator.
- (e) Connect the SST (hose) to the pressure regulator with SST (union) and the two bolts.

SST 09268-41045 (09268-41090)

Torque: 9.3 N-m (95 kgf-cm, 82 in.lbf)



- (f) Install the grommet and a new O-ring to the injector.

- (g) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp), SST 09268-41045

- (h) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

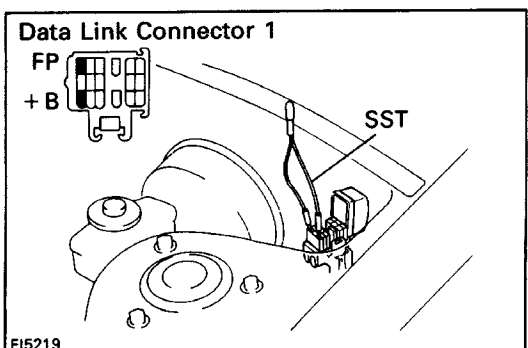
- (i) Using SST, connect terminals +B and FP of the data link connector 1.

SST 09843-18020

- (j) Reconnect the battery negative (-) cable.

- (k) Turn the ignition switch ON.

NOTICE: Do not start the engine.



- (l) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.

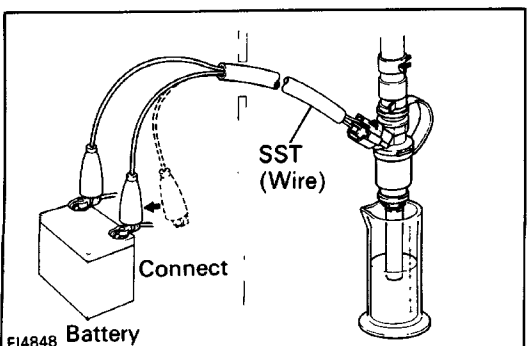
SST 09842-30070

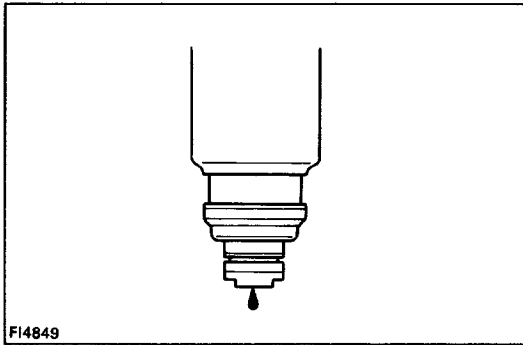
Volume: 40 - 50 cm³ (2.4 - 3.1 cu in.) per 50 sec.

Difference between each injector:

5 cm³ (0.3 cu in.) or less

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





2. INSPECT LEAKAGE

- (a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.

SST 09842-30070

Fuel drop: One drop or less per minute

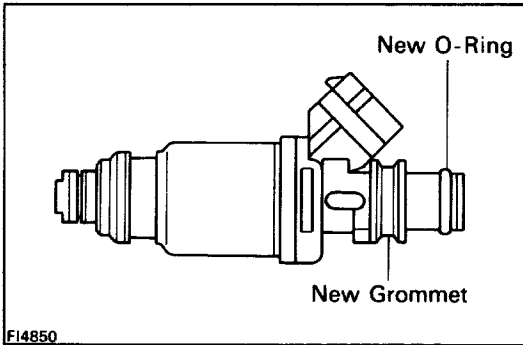
- (b) Disconnect the battery negative (-) cable.
 (c) Remove SST.

SST 09268-41045 and 09843-18020

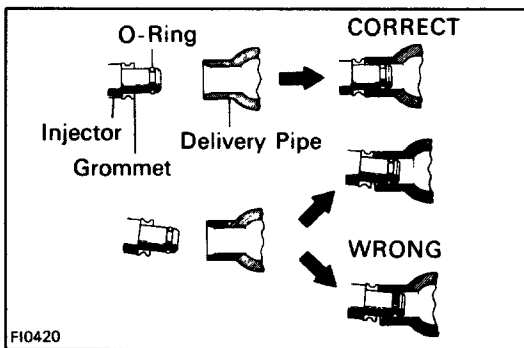
INSTALLATION OF INJECTORS

1. INSTALL INJECTORS AND DELIVERY PIPE

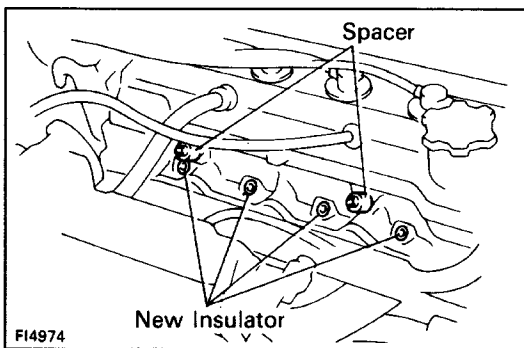
- (a) Install a new grommet to the injector.
 (b) Apply a light coat of gasoline to a new O-ring and install it to the injector.



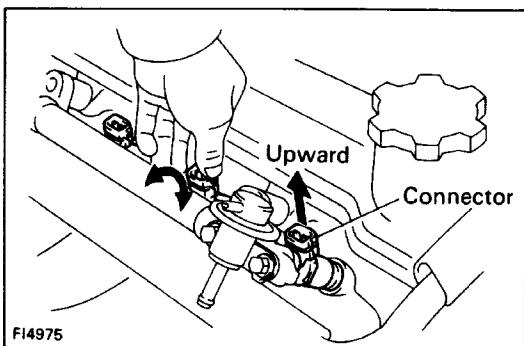
- (c) While turning the injector left and right, install it to the delivery pipes. Install the four injectors.

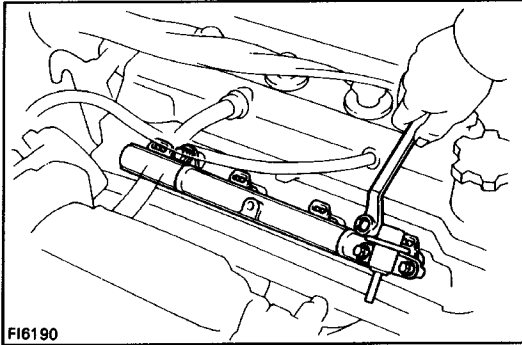


- (d) Place four new insulators and the two spacers in position on the cylinder head.



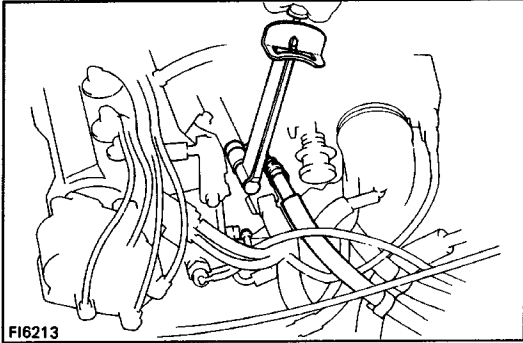
- (e) Place the four injectors together with the delivery pipe in position on the cylinder head.
 (f) Check that the injectors rotate smoothly.
 HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-rings.
 (g) Position the injector connector upward.





(h) Install the two bolts.

Torque: 15 N-m (950 kgf-cm, 11 ft-lbf)



2. CONNECT FUEL INLET HOSE TO DELIVERY PIPE

Connect the inlet hose with two new gaskets and the union bolt.

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

3. CONNECT INJECTOR CONNECTORS

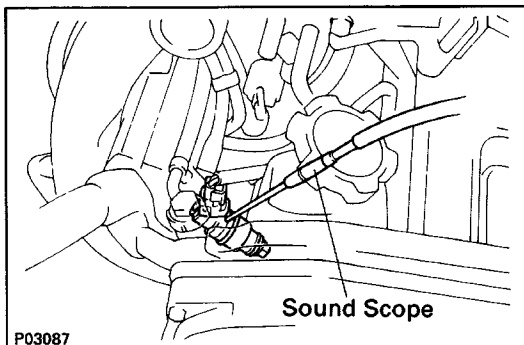
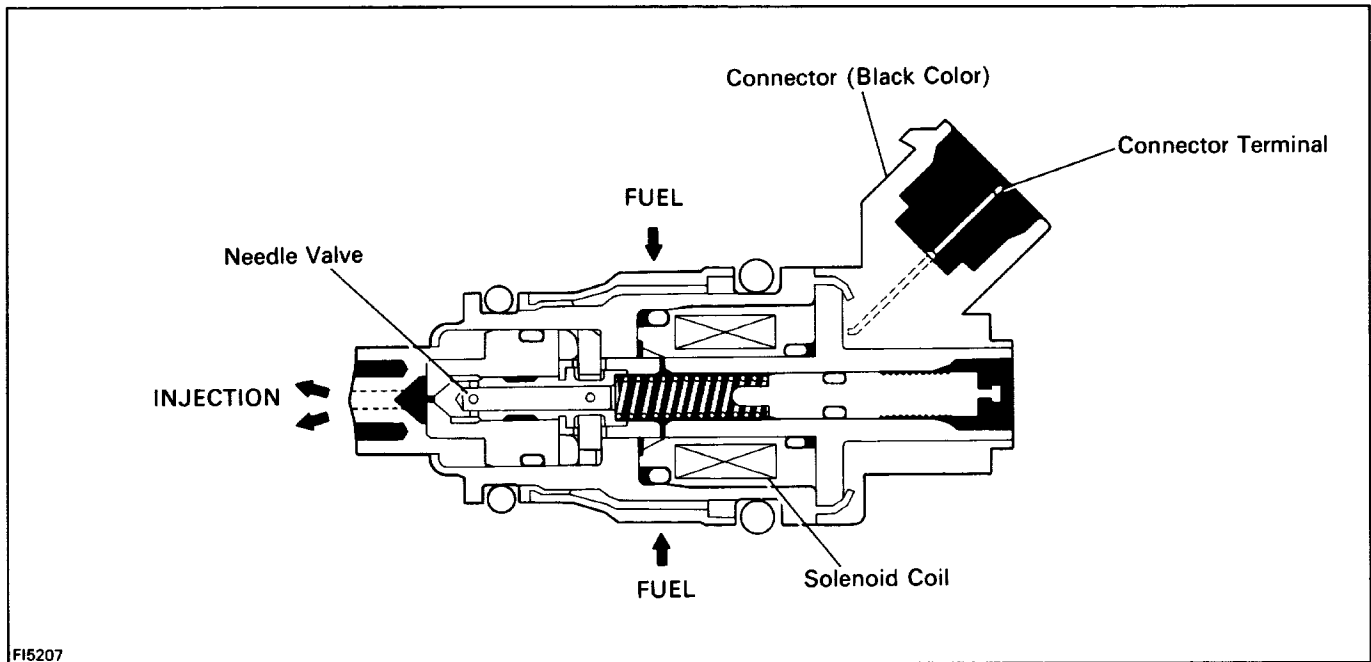
4. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR

5. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. CHECK FOR FUEL LEAKAGE (See page [FI-10](#))

Injectors (3S-GTE)

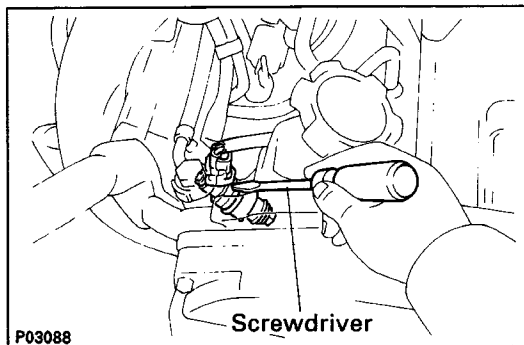


ON-VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

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



- (b) If you have no sound scope, you can check the injector transmission operation with a screwdriver. If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.

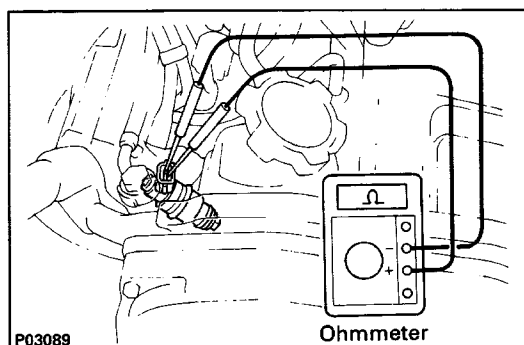
2. INSPECT INJECTOR RESISTANCE

- (a) Remove the throttle body.
(See steps 1 to 8, 10 and 11 on pages [FI-194](#) and [195](#))
- (b) Disconnect the injector connector.
- (c) Using an ohmmeter, measure the resistance between the terminals.

Resistance: 2 - 4

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

- (d) Reconnect the injector connector.
- (e) Reinstall the throttle body.
(See steps 2, 3 and 5 to 12 on pages [FI-197](#) and [198](#))



REMOVAL OF INJECTORS

1. REMOVE THROTTLE BODY

(See steps 1 to 8, 10 and 11 on pages FI-194 and 195)

2. REMOVE AIR CLEANER

(See step 7 on page EM-224)

3. REMOVE CHARCOAL CANISTER

(See step 20 on page EM-226)

4. REMOVE EGR VSV AND VACUUM MODULATOR

(See step 20 on page EM-121)

5. REMOVE EGR VALVE AND PIPE

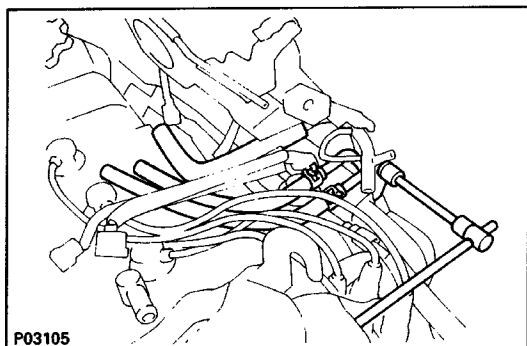
(See step 21 on page EM-121)

6. REMOVE COLD START INJECTOR PIPE

(See step 3 on page FI-146)

7. REMOVE COLD START INJECTOR

(See step 4 on page FI-147)

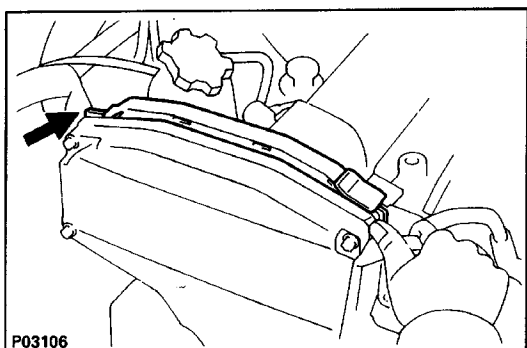


8. REMOVE AIR HOSE

9. DISCONNECT WATER BY-PASS PIPE WITH HOSES

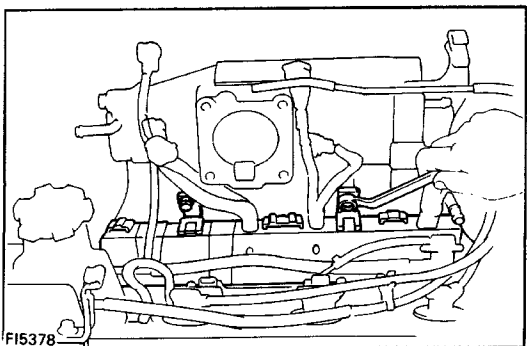
Remove the bolt and disconnect the water by-pass pipe with hoses.

10. DISCONNECT INJECTOR CONNECTORS

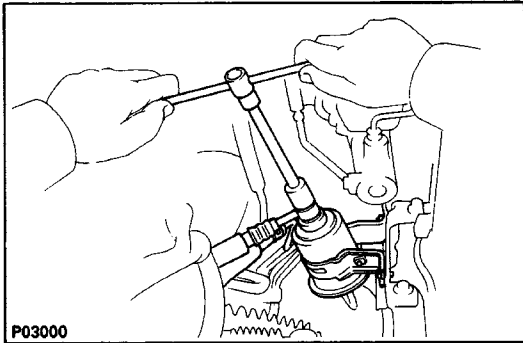


11. DISCONNECT ENGINE WIRE

(a) Disconnect the two wire clamps from the mounting bolts of the No.2 timing belt cover.

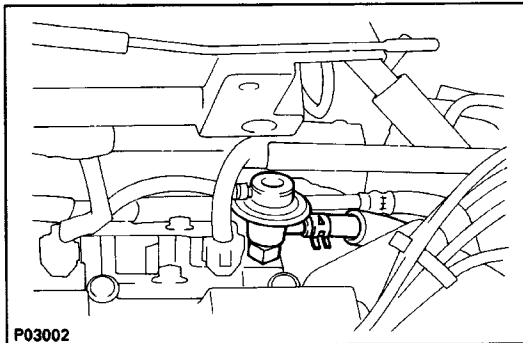


(b) Disconnect the two wire clamps from the wire brackets on the intake manifold.

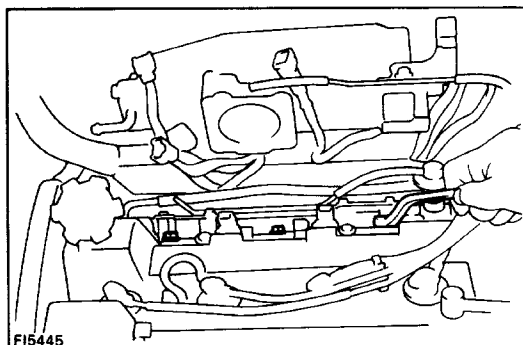


12. DISCONNECT FUEL INLET HOSE FROM FUEL FILTER

Remove the union bolt and two gaskets, and disconnect the inlet hose.

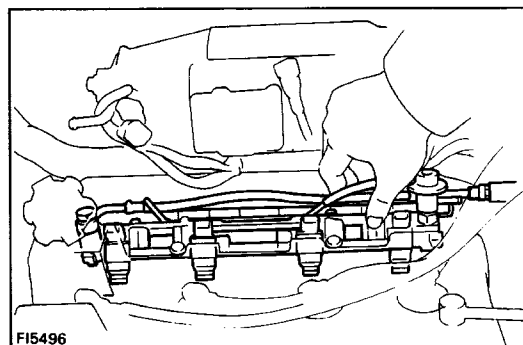


13. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR



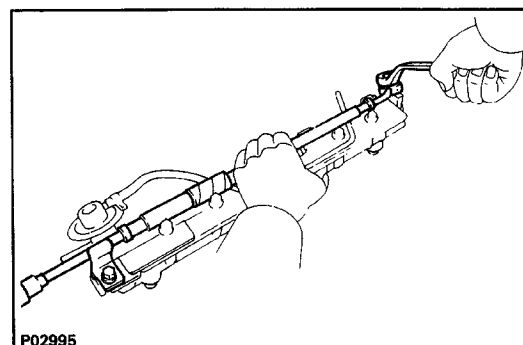
14. REMOVE INJECTOR, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY

(a) Remove the three bolts holding the delivery pipe to the cylinder head.



(b) Remove the delivery pipe assembly.

(c) Remove the four insulators and three spacers.



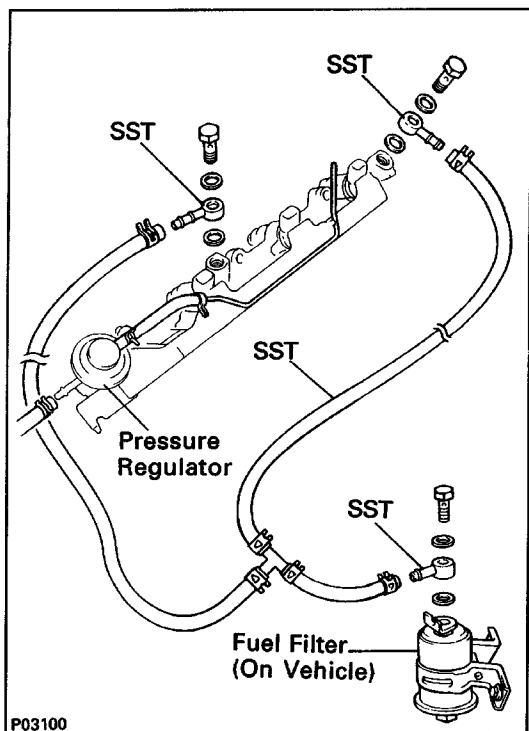
15. REMOVE FUEL INLET HOSE FROM DELIVERY PIPE

Remove the bolt, union bolt, two gaskets and inlet hose.

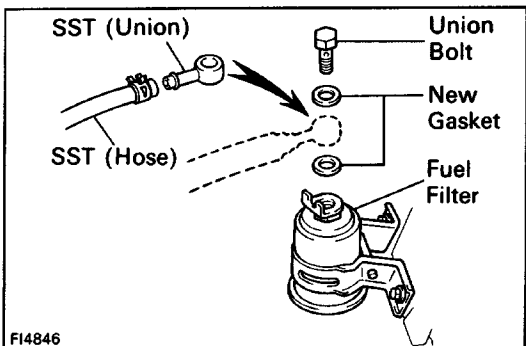
INSPECTION OF INJECTORS

1. INSPECT INJECTOR INJECTION

CAUTION: Keep injector clear of sparks during the test.



P03100



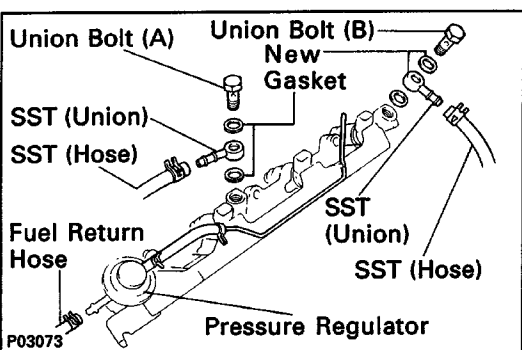
FI4846

(a) Connect SST (union and hose) to the fuel filter outlet with two new gaskets and the union bolt.

SST 09268-41045 (90405-09015)

Torque: 29 N-m (300 kgf-cm, 22 ft-116)

HINT: Use the vehicle's fuel filter.



P03073

(b) Connect the fuel return hose to the fuel outlet of the pressure regulator on the delivery pipe.

(c) Connect SST (union and hose) to the delivery pipe with four new gaskets and the two union bolts (A and B).

SST 09268-41045 (09268-41080, 90405-09015)

Torque:

A 12 N-m (125 kgf-cm, 9 ft-lbf)

B 29 N-m (300 kgf-cm, 22 ft-lbf)

(d) Put the injector into the graduated cylinder.

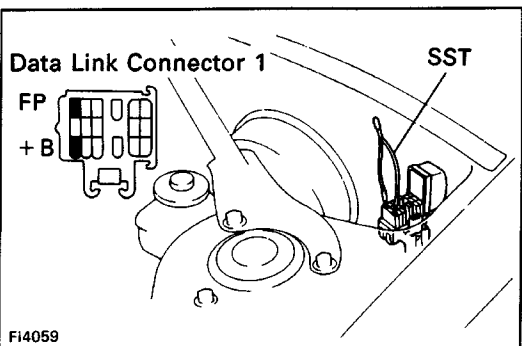
(e) Using SST, connect terminals +B and FP of the data link connector 1.

SST 09843-18020

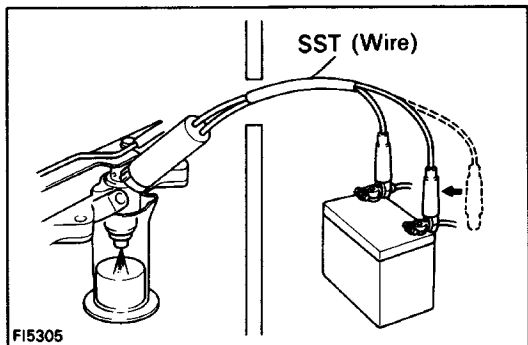
(f) Reconnect the battery negative (-) cable.

(g) Turn the ignition switch ON.

NOTICE: Do not start the engine.



FI4059



(h) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.

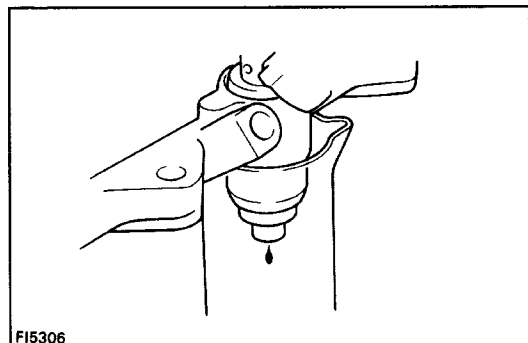
SST 09842-30060

Volume: 95 – 120 cm³ (5.8 – 7.3 cu in.) per 50 sec.

Difference between each injector:

5 cm³ (0.3 cu in.) or less

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



2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check for fuel leakage from the injector.

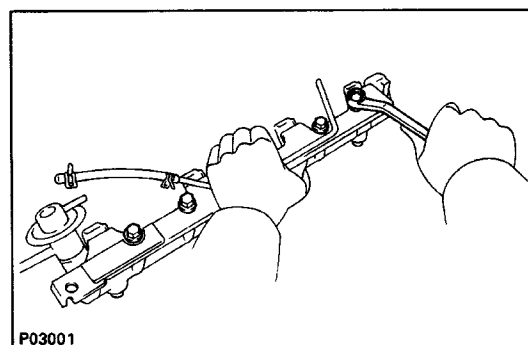
SST 09842-30060

Fuel drop: One drop or less per minute

(b) Disconnect the battery negative (-) cable.

(c) Remove SST.

SST 09268-41045 and 09843-18020



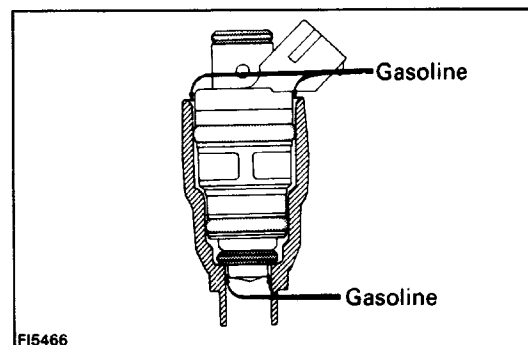
REPLACEMENT OF INJECTORS

1. REMOVE INJECTOR COVER

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

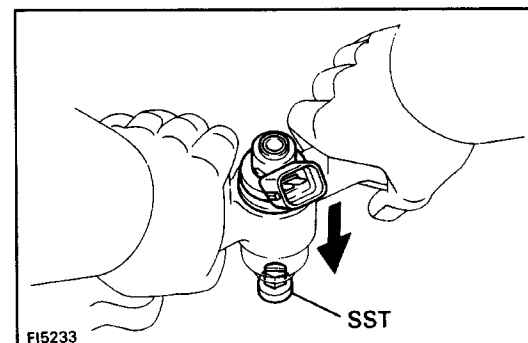
(b) Remove the four bolts and injector cover.

(c) Remove the four insulators from the injectors.



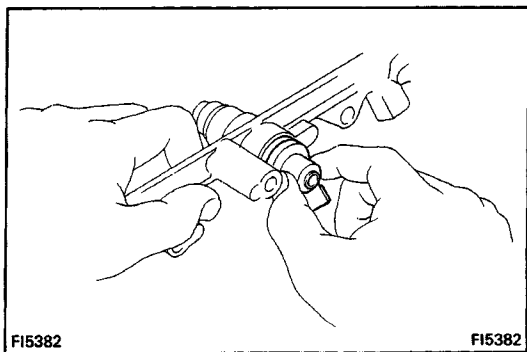
2. REMOVE INJECTORS

(a) Apply gasoline between the delivery pipe and injectors.

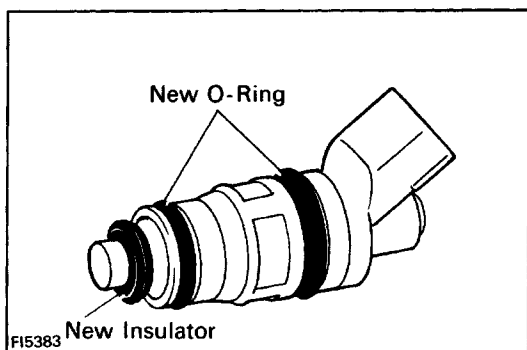


(b) Using SST, lift up the injector.

SST 09268-74010

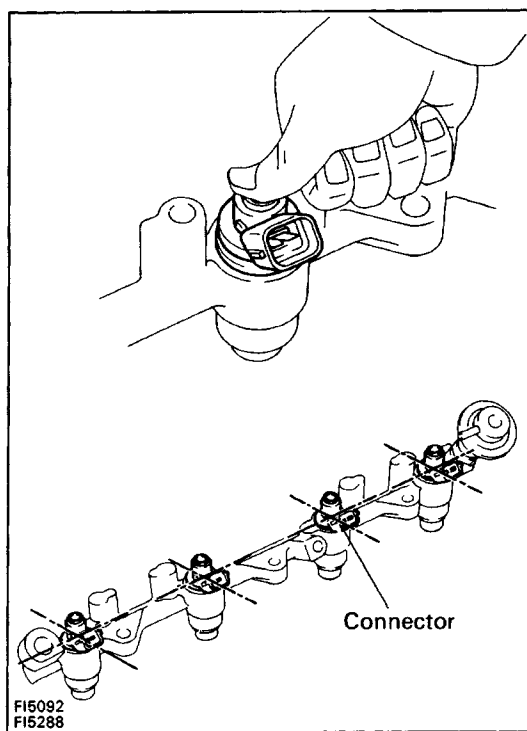


- (c) Pull out the four injectors from the delivery pipe.
- (d) Remove the insulator and two O-rings from each injector.

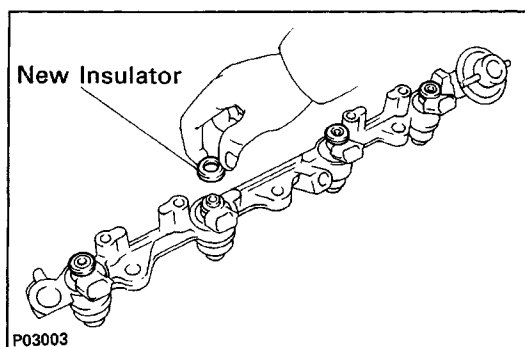


3. INSTALL INJECTORS

- (a) Apply a light coat of gasoline to two new O-rings, and install them to the injector.
- (b) Install new insulator and two O-rings to each injector.

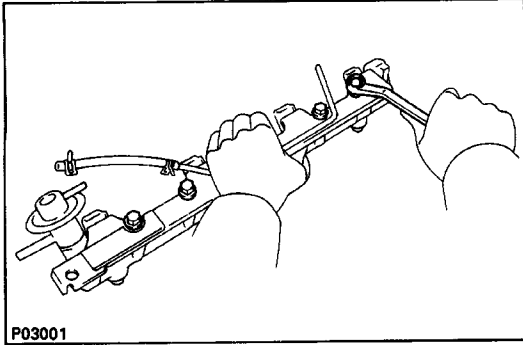


- (c) Push in the four injectors so that the injector connectors are positioned as shown in the illustration.



4. INSTALL INJECTOR COVER

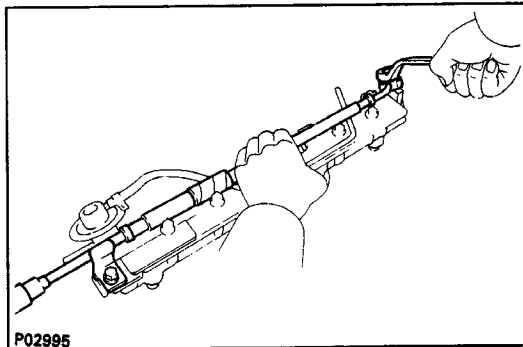
- (a) Place a new insulator on each injector.



(b) Install the injector cover with the four bolts.

Torque: 7.8 N-m (80 kgf-cm, 69 in.-lbf)

(c) Connect the vacuum sensing hose to the pressure regulator.



INSTALLATION OF INJECTORS

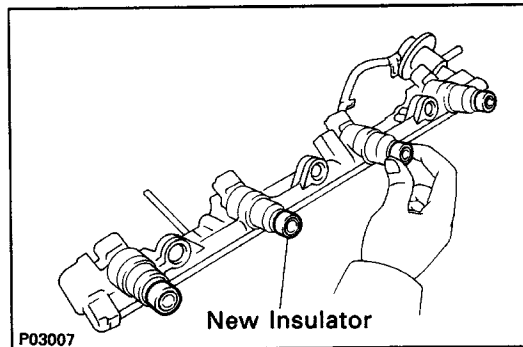
1. INSTALL FUEL INLET HOSE TO DELIVERY PIPE

Install the inlet hose with the bolt, two new gaskets and union bolt.

Torque:

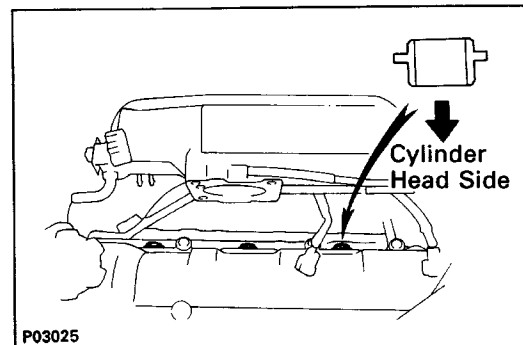
Bolt 7.8 N-m (80 kgf-cm, 69 in.-lbf)

Union bolt 29 N-m (300 kgf-cm, 22 ft-lbf)

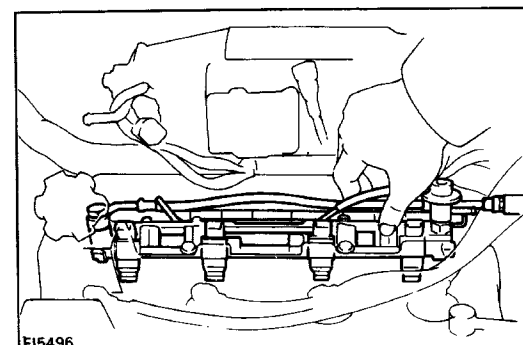


2. INSTALL INJECTORS, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY

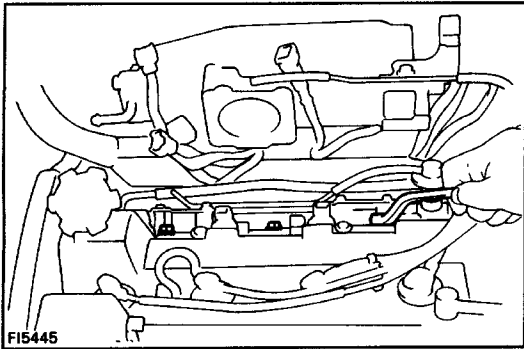
(a) Install a new insulator to each injector.



(b) Place the three spacers in position on the cylinder head.

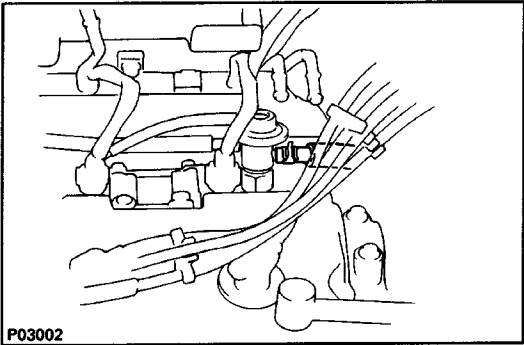


(c) Place the delivery pipe in position on the cylinder head.

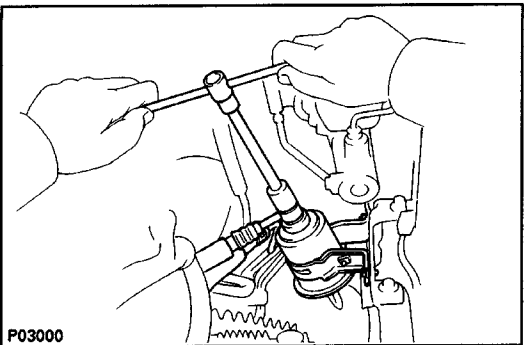


(d) Install the three bolts.

Torque: 19 N-m (195 kgf-cm, 14 ft.lbf)



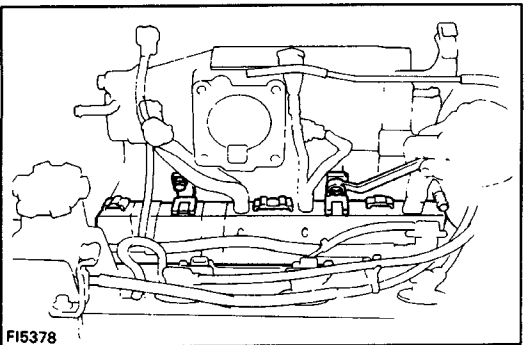
3. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR



4. CONNECT FUEL INLET HOSE TO FUEL FILTER

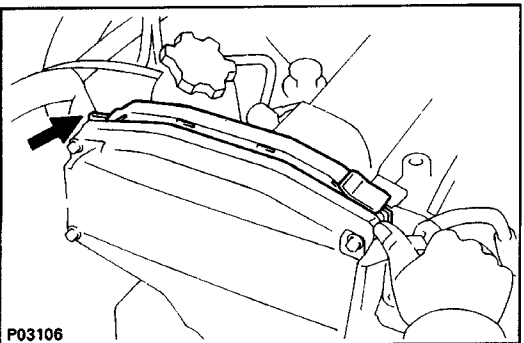
Install the inlet hose with two new gaskets and the union bolt.

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

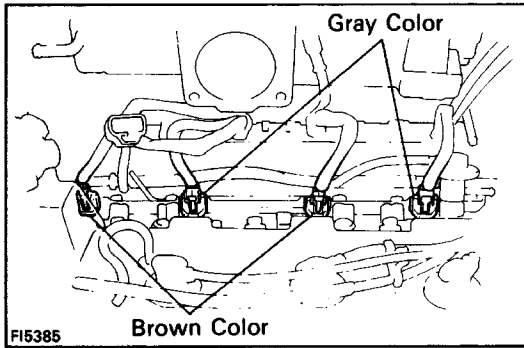


5. INSTALL ENGINE WIRE

(a) install the two wire clamps to the wire brackets on the intake manifold.



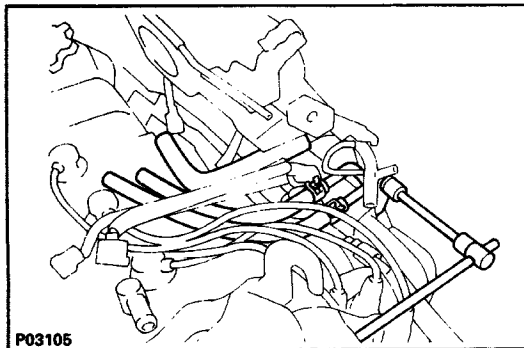
(b) Install the two wire clamps to the mounting bolts of the No.2 timing belt cover.



6. CONNECT INJECTOR CONNECTORS

Connect the injector connectors as shown in the illustration.

HINT: No.1 and No.3 injector connectors are brown.
No. 2 and No.4 injector connectors are gray.



7. CONNECT WATER BY-PASS PIPE WITH HOSES

Install the water by-pass pipe with hoses with the bolt.

8. INSTALL AIR HOSE

9. INSTALL COLD START INJECTOR

(See step 1 on page FI-148)

10. INSTALL COLD START INJECTOR PIPE

(See step 2 on page FI-148)

11. INSTALL EGR VALVE AND PIPE

(See step 19 on page EM-145)

12. INSTALL EGR VSV AND VACUUM MODULATOR

(See step 20 on page EM-146)

13. INSTALL CHARCOAL CANISTER

(See step 32 on page EM-264)

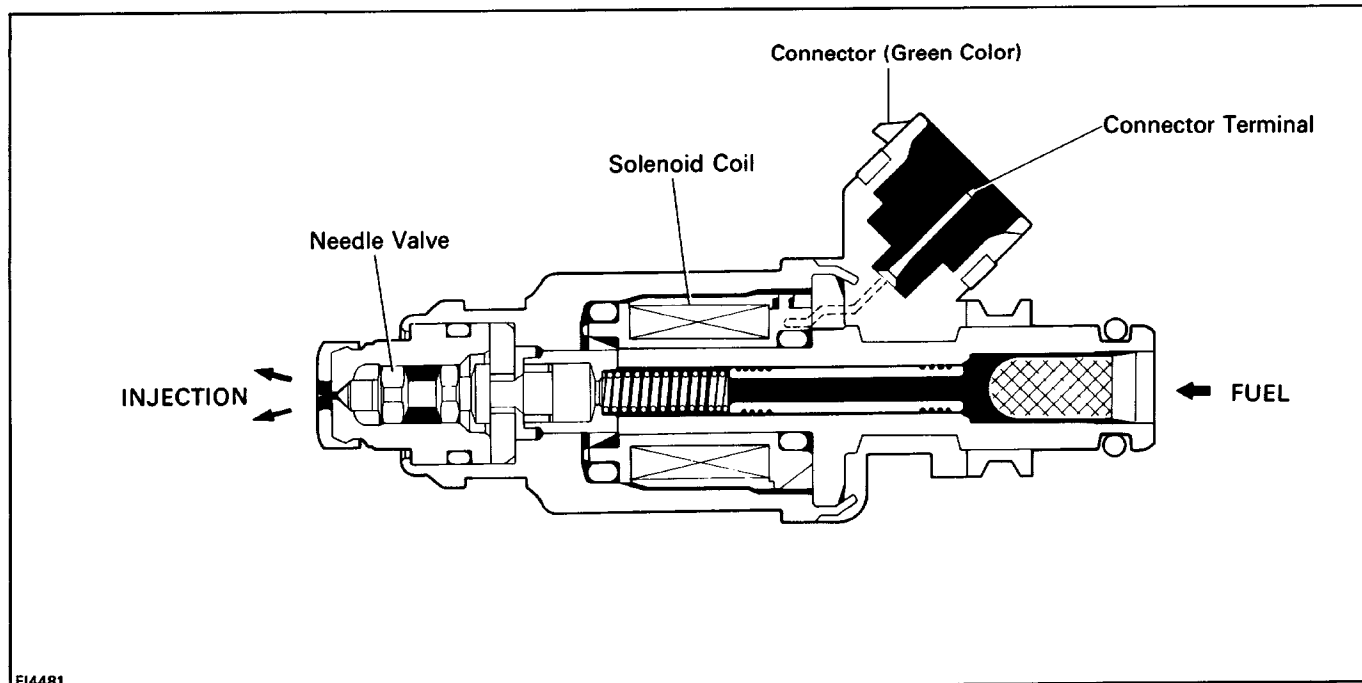
14. INSTALL AIR CLEANER

(See step 45 on page EM-266)

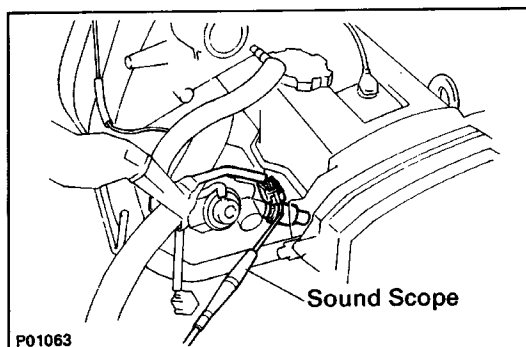
15. INSTALL THROTTLE BODY

(See steps 2, 3 and 5 to 12 on pages FI-197 and 198)

Injectors (5S-FE)



FI4481

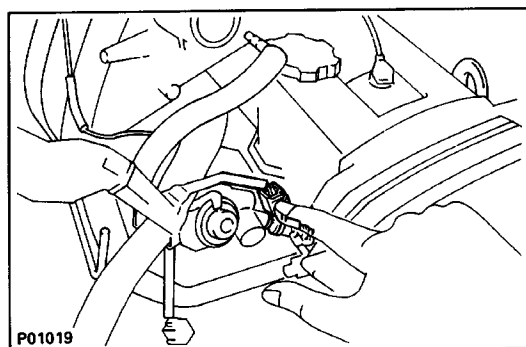


ON-VEHICLE INSPECTION

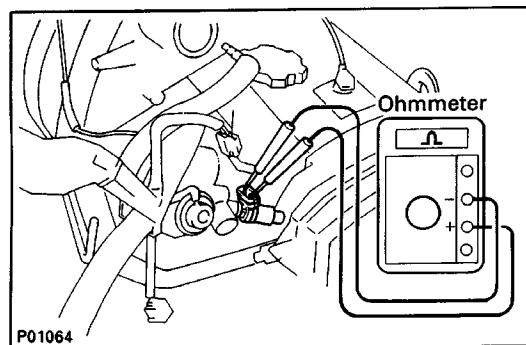
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

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



- (b) If you have no sound scope, you can check the injector transmission operation with your finger. If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.



2. INSPECT INJECTOR RESISTANCE

- (a) Disconnect the injector connector.
 (b) Using an ohmmeter, measure the resistor between the terminals.

Resistance: Approx. 13.8

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

- (c) Reconnect the injector connector.

REMOVAL OF INJECTORS**1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT**3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY****4. (AIT)**

DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

5. REMOVE AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

- (a) Disconnect the air intake temperature sensor connector.
- (b) Disconnect the cruise control actuator cable from the clamp on the resonator.
- (c) Loosen the air cleaner hose clamp bolt.
- (d) Disconnect the four air cleaner cap clips.
- (e) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.

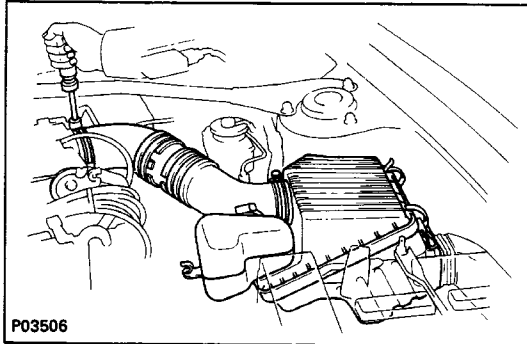
6. REMOVE THROTTLE BODY

- (a) Disconnect throttle position sensor connector.
- (b) Disconnect IAC valve connector.

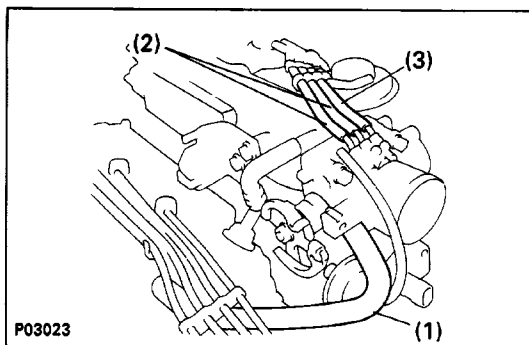
(c) Disconnect the following hoses from the throttle body:

- (1) PCV hose
- (2) Two vacuum hoses from EGR vacuum modulator
- (3) Vacuum hose from EVAP VSV

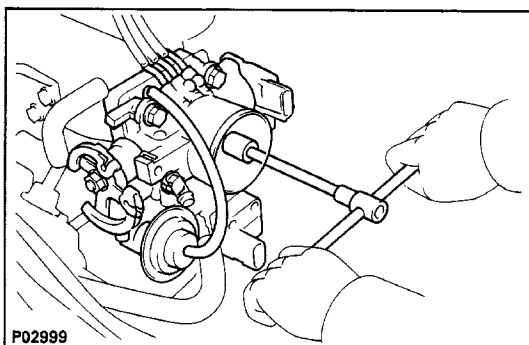
(d) Remove the four throttle body mounting bolts.



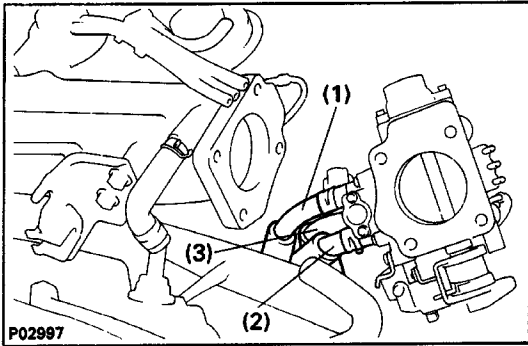
P03506



P03023

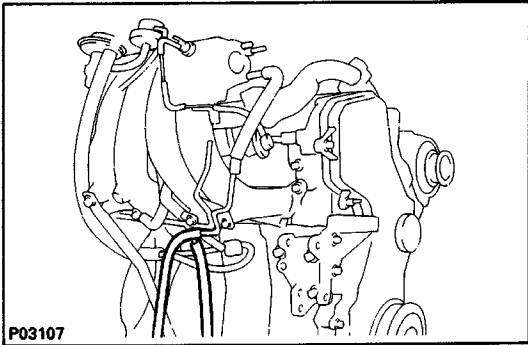


P02999

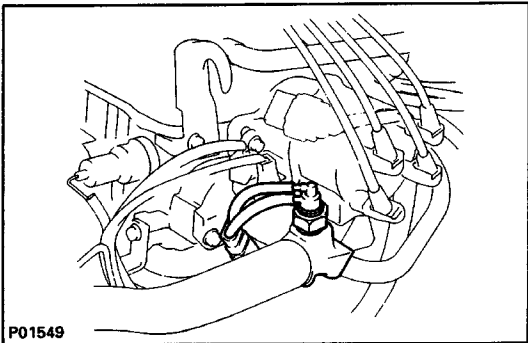


(e) Disconnect the hoses from the throttle body, and remove the throttle body.

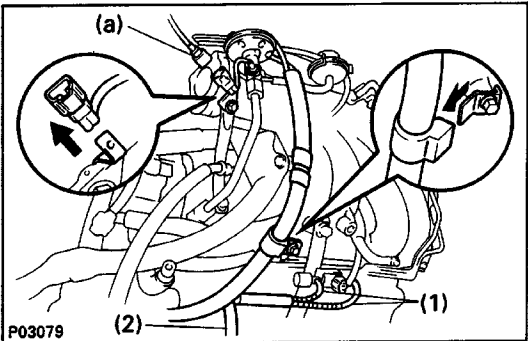
- (1) Water by-pass hose from water outlet
- (2) Water by-pass hose from water by-pass pipe
- (3) Air hose from air tube



7. DISCONNECT PS VACUUM HOSES

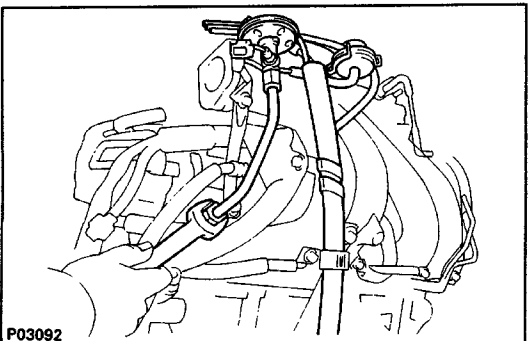


8. DISCONNECT VACUUM HOSES FROM EVAP TVV

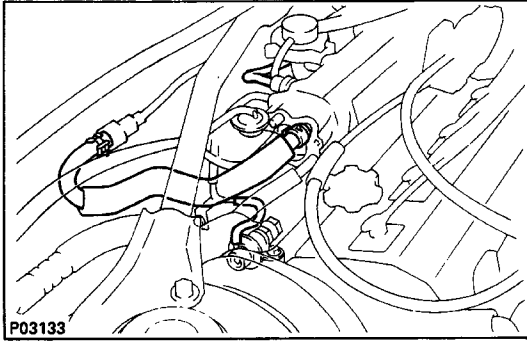


9. REMOVE EGR VALVE AND VACUUM MODULATOR

- (a) (Calif. only)
Disconnect EGR gas temperature sensor connector.
- (b) Remove the following hoses:
 - (1) Two vacuum hoses from EGR VSV
 - (2) Vacuum hose from charcoal canister
- (c) Disconnect the vacuum hose clamp.



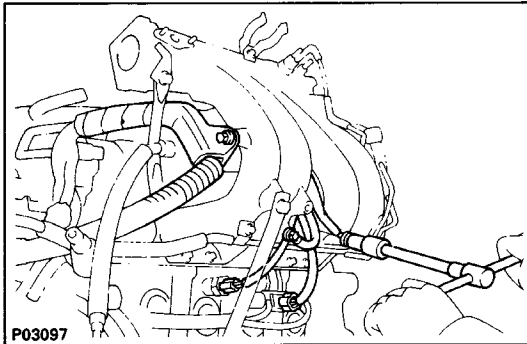
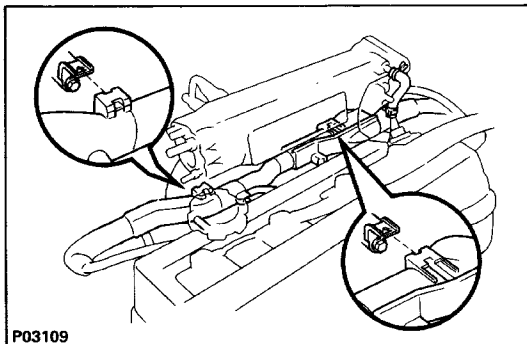
- (d) Loosen the union nut of the EGR pipe, and remove two nuts, the EGR valve, vacuum modulator, vacuum hoses assembly and gasket.

**10. DISCONNECT VACUUM HOSES**

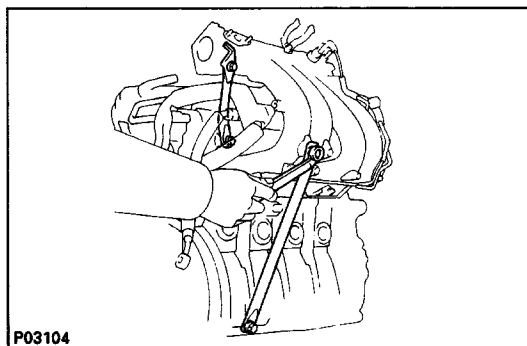
- (a) Vacuum sensor hose from air intake chamber
- (b) Brake booster vacuum hose from air intake chamber
- (c) Vacuum sensing hose

11. (w/ A/C)

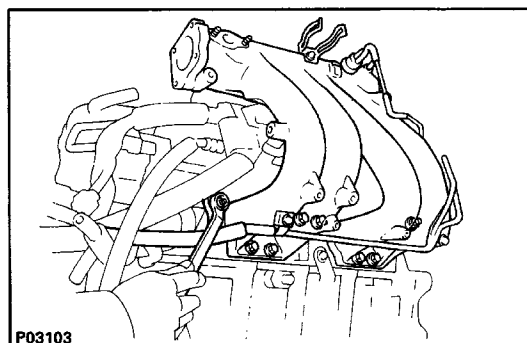
DISCONNECT A/C MAGNET SWITCH VSV CONNECTOR

**12. DISCONNECT ENGINE WIRE GROUND STRAPS FROM INTAKE MANIFOLD****13. DISCONNECT KNOCK SENSOR AND EGR VSV CONNECTORS****14. REMOVE BOLT AND WIRE CLAMP, AND DISCONNECT ENGINE WIRE HARNESS****15. REMOVE INTAKE MANIFOLD**

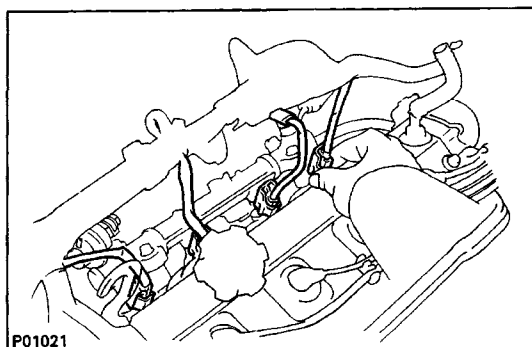
- (a) Disconnect the two wire clamps from the wire brackets on the intake manifold.



- (b) Remove the four bolts, wire bracket (Calif. only), No.1 air intake chamber and manifold stays.

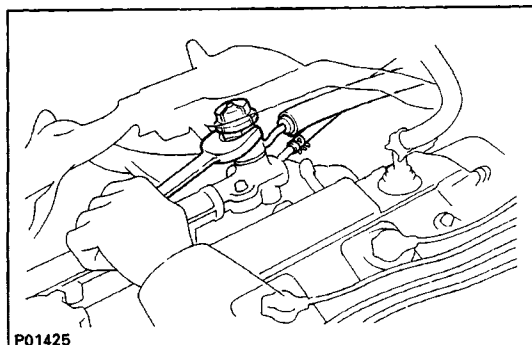


- (c) Remove the six bolts, two nuts, intake manifold and gasket.



P01021

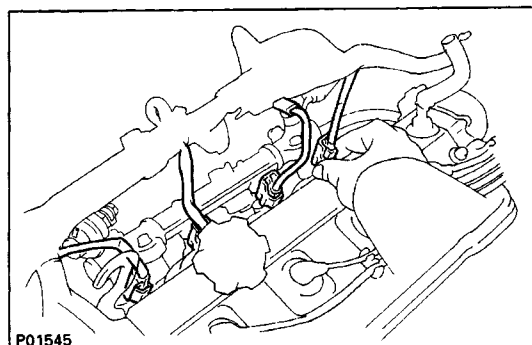
16. DISCONNECT INJECTOR CONNECTORS



P01425

17. REMOVE DELIVERY PIPE AND INJECTORS

- (a) Loosen the pulsation damper, and disconnect the fuel inlet pipe.
- (b) Disconnect the fuel return hose.

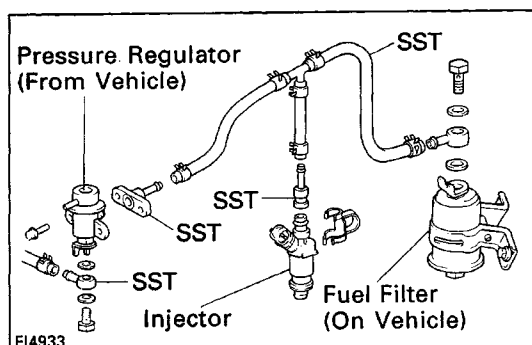


P01545

- (c) Remove the two bolts and delivery pipe together with the four injectors.

NOTICE: Be careful not to drop the injectors when removing the delivery pipe.

- (d) Remove the four insulators and two spacers from the cylinder head.
- (e) Pull out the four injectors from the delivery pipe.
- (f) Remove the O-ring and grommet from each injector.

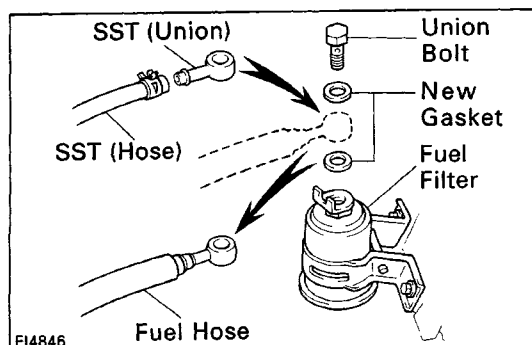


FI4933

INSPECTION OF INJECTORS

1. INSPECT INJECTOR INJECTION

CAUTION: Keep injector clear of sparks during the test.



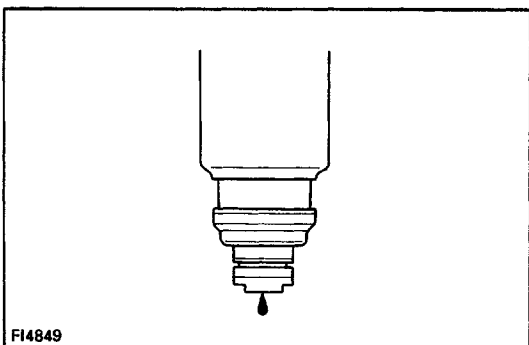
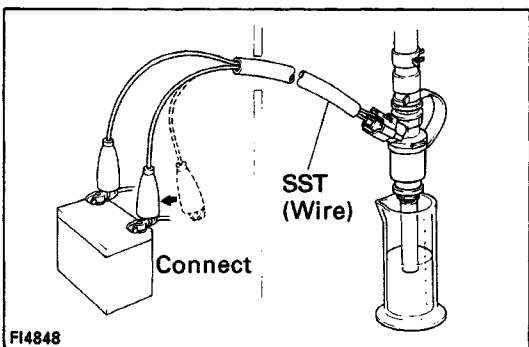
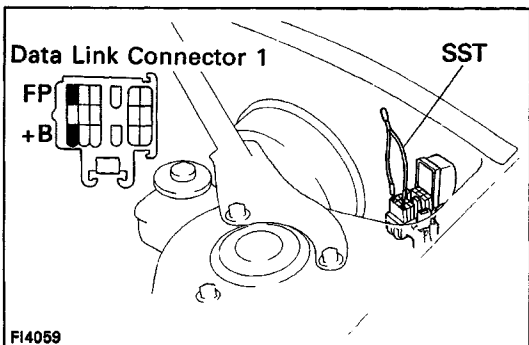
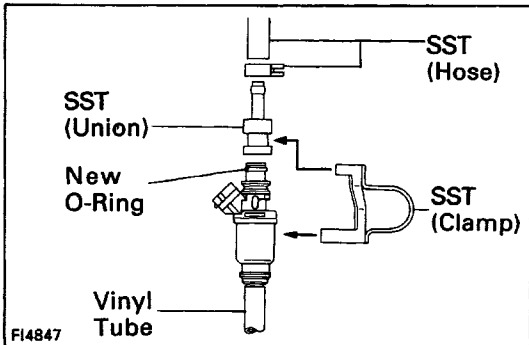
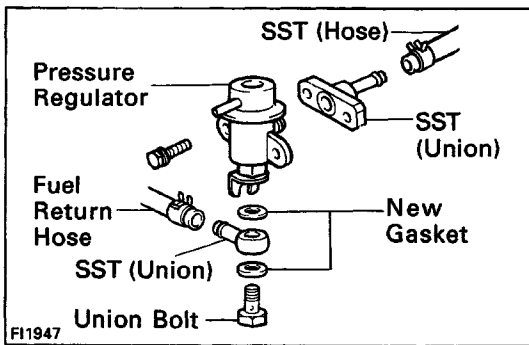
FI4846

- (a) Disconnect the fuel hose from the fuel filter outlet.
- (b) Connect SST (union and hose) to the fuel filter outlet with two new gaskets and the union bolt.

SST 09s268-41045 (90405-09015)

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

HINT: Use the vehicle's fuel filter.



- (c) Install a new O-ring to the fuel inlet of pressure regulator.
- (d) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the two bolts.

SST 09268-41045 (09268-41090)

Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)

- (e) Connect the fuel return hose to the fuel outlet of the pressure regulator with SST (union), two new gaskets and union bolt.

SST 09268-41045 (09268-41080)

Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

- (f) Install the grommet and a new O-ring to the injector.

- (g) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).

SST 09268-41045

- (h) Put the injector into the graduated cylinder.

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

- (i) Using SST, connect terminals +B and FP of the data link connector 1.

SST 09843-18020

- (j) Reconnect the battery negative (-) cable.

- (k) Turn the ignition switch ON.

NOTICE: Do not start the engine.

- (l) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.

SST 09842-30070

Volume: 49 – 59 cm³ (3.0 – 3.6 cu in.) per 15 sec.

Difference between each injector:

5 cm³ (0.3 cu in.) or less

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

2. INSPECT LEAKAGE

- (a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.

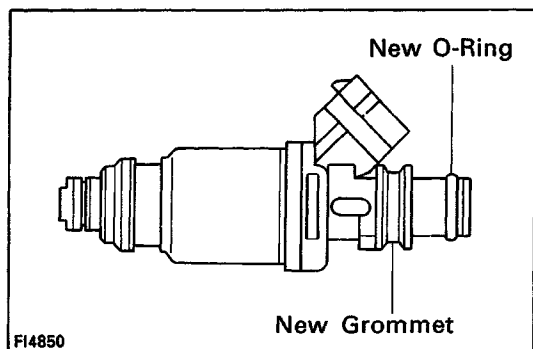
SST 09842-30070

Fuel drop: One drop or less per minute

- (b) Disconnect the battery negative H cable.

- (c) Remove SST.

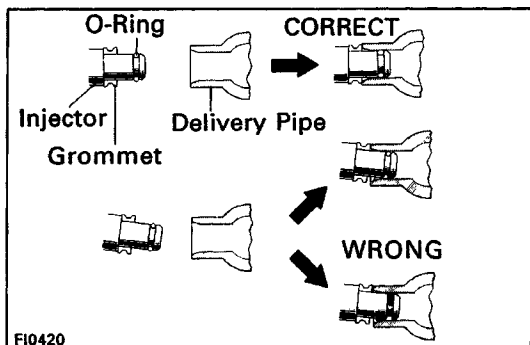
SST 09268-41045 and 09843-18020



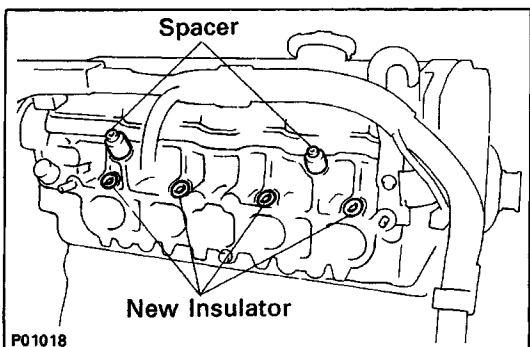
INSTALLATION OF INJECTORS

1. INSTALL INJECTORS AND DELIVERY PIPE

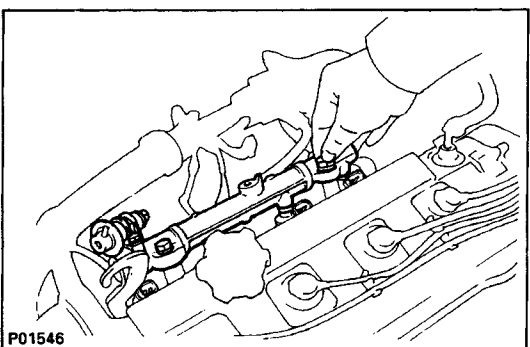
- (a) Install a new grommet to the injector.
- (b) Apply a light coat of gasoline to a new O-ring and install it to the injector.



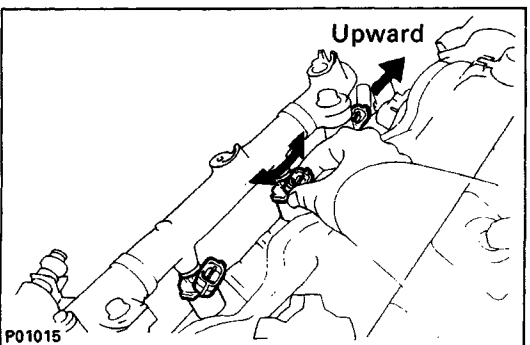
- (c) While turning the injector left and right, install it to the delivery pipes. Install the four injectors.



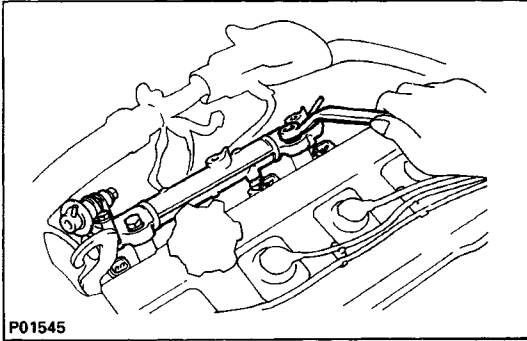
- (d) Place four new insulators and the two spacers in position on the cylinder head.



- (e) Place the four injectors together with the delivery pipe in position on the cylinder head.
- (f) Temporarily install the two bolts holding the delivery pipe to the cylinder head.

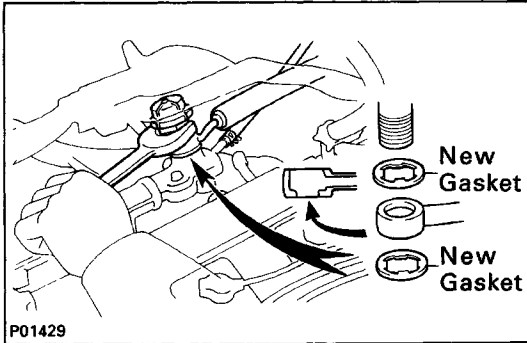


- (g) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-rings.
- (h) Position the injector-connector upward.



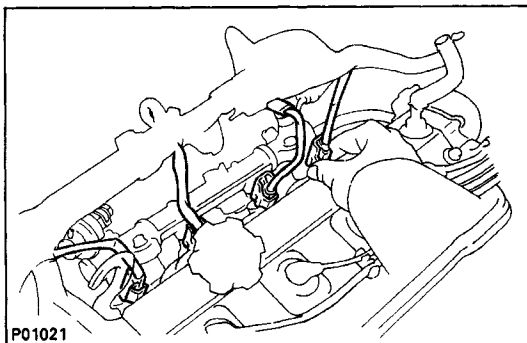
- (l) Tighten the two bolts holding the delivery pipe to the cylinder head.

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

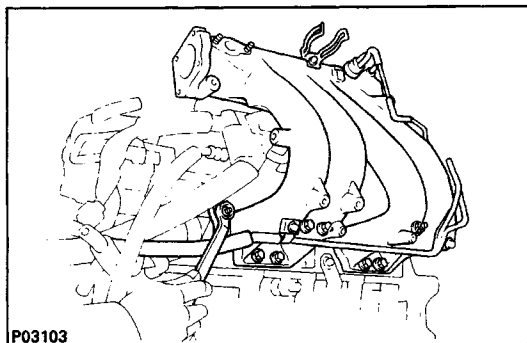


- (j) Connect the fuel return hose.
 (k) Connect the fuel inlet pipe to the delivery pipe with two new gaskets and the pulsation damper.

Torque: 34 N-m (350 kgf-cm, 25 ft-lbf)



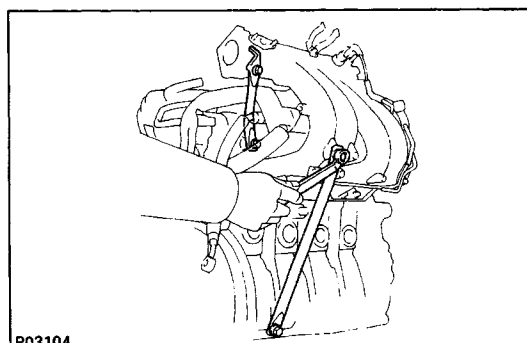
2. CONNECT INJECTOR CONNECTORS



3. INSTALL INTAKE MANIFOLD

- (a) Install a new gasket and the intake manifold with the six bolts and two nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 19 N-m (195 kgf-cm, 14 ft.-ibf)

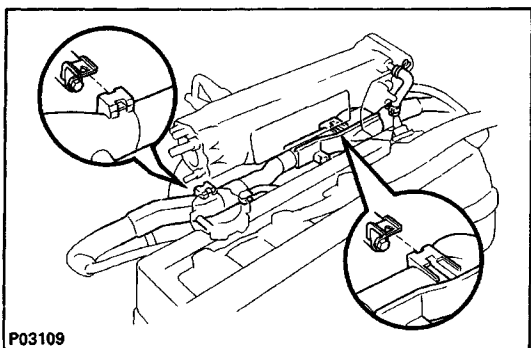


- (b) Install the No.1 air intake chamber and manifold stays, wire bracket (Calif. only) with the four bolts.

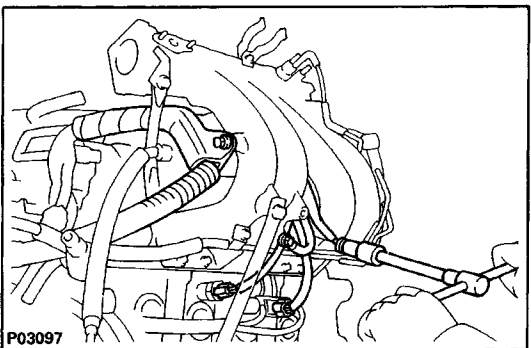
Torque:

14 mm head bolt 42 N-m (425 kgf-cm, 31 ft-lbf)

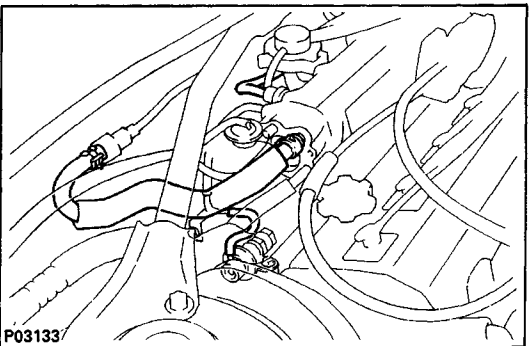
12 mm head bolt 22 N-m (220 kgf-cm, 16 ft-lbf)



(c) Connect the two wire clamps to the wire brackets on the intake manifold.

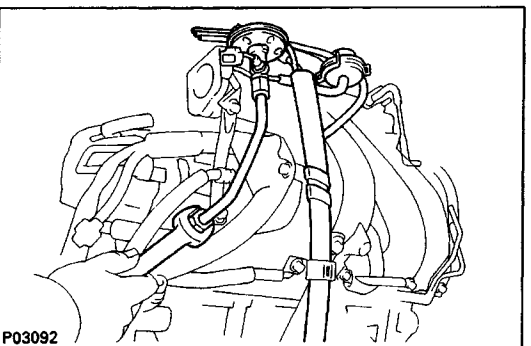


4. CONNECT ENGINE WIRE HARNESS WITH WIRE CLAMP AND BOLT
5. CONNECT KNOCK SENSOR AND EGR VSV CONNECTORS
6. CONNECT TWO ENGINE WIRE GROUND STRAP TO INTAKE MANIFOLD



7. (w/ A/C)
CONNECT A/C MAGNET SWITCH VSV CONNECTOR
8. CONNECT VACUUM HOSES

- (a) Vacuum sensor hose to air intake chamber.
- (b) Brake booster vacuum hose to air intake chamber.
- (c) Vacuum sensing hose.



9. INSTALL EGR VALVE AND VACUUM MODULATOR

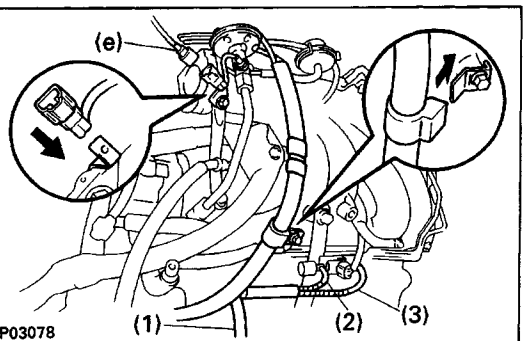
- (a) Install a new gasket and the EGR valve with the union nut and two nuts.

Torque:

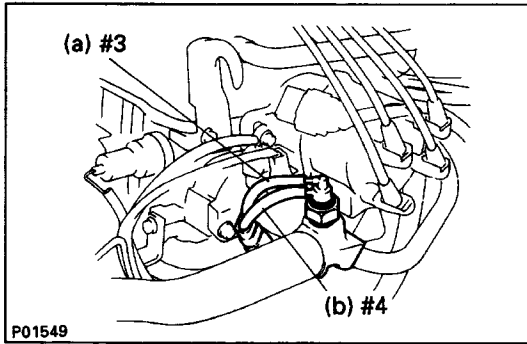
Union nut 59 N-m (600 kgf-cm, 43 ft-lbf)

Nut 13 N-m (130 kgf-cm, 9 ft-lbf)

- (b) Install the EGR modulator to the clamp.



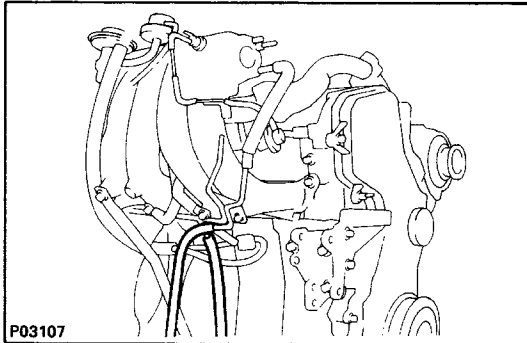
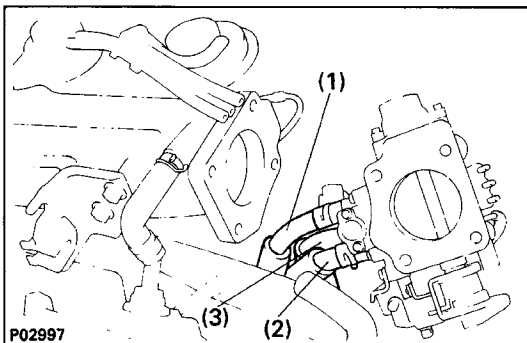
- (c) Connect the vacuum hose clamp.
- (d) Connect the following hoses:
 - (1) Vacuum hose to charcoal canister
 - (2) Vacuum hose (from EGR valve) to E port of EGR VSV
 - (3) Vacuum hose (from Q port EGR vacuum modulator) to G port of EGR VSV
- (e) (Calif. only)
Connect the EGR gas temperature sensor connector.

**10. CONNECT TWO VACUUM HOSES TO EVAP TVV**

(a) To P port of throttle body

(b) To charcoal canister

HINT: Hose Nos. are indicated in the illustration.

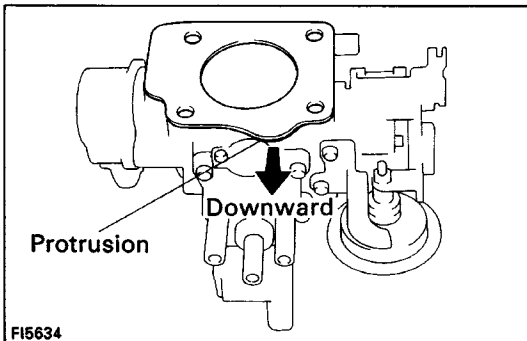
**11. CONNECT TWO PS VACUUM HOSES****12. INSTALL THROTTLE BODY**

(a) Connect the following hoses to the throttle body:

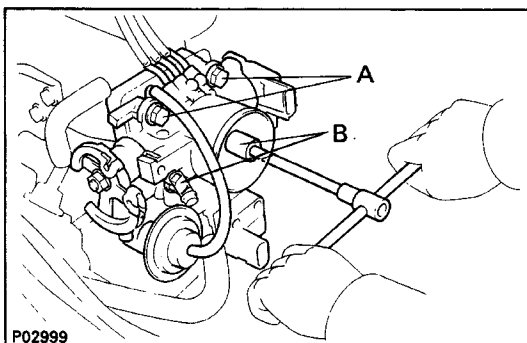
(1) Water by-pass hose to water outlet

(2) Water by-pass hose to water by-pass pipe

(3) Air hose to air tube



(b) Place a new gasket on the throttle body, facing the protrusion downward.



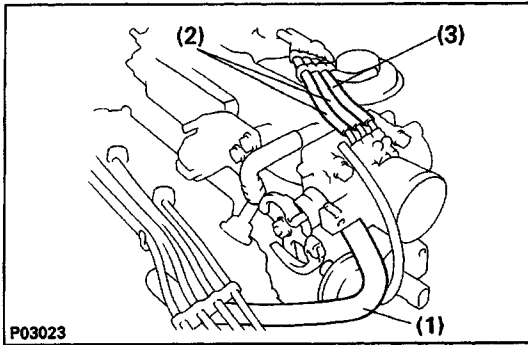
(c) Install the throttle body with the four bolts.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

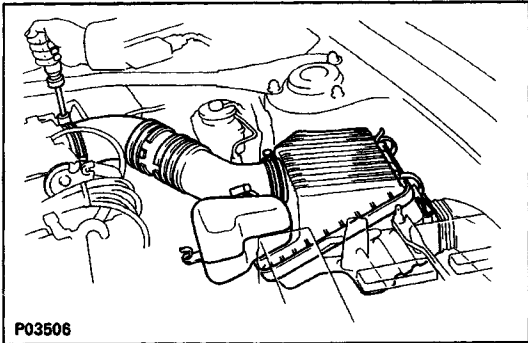
HINT: Each bolt is indicated in the illustration.

Bolt length: A 45 mm (1.77 in.)

B 55 mm (2.17 in.)



- (d) Connect the following hoses to the throttle body:
 - (1) PCV hose
 - (2) Two vacuum hoses to EGR vacuum modulator
 - (3) Vacuum hose to EGR VSV
- (e) Connect the IAC valve connector.
- (f) Connect the throttle position sensor connector.



13. INSTALL AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

- (a) Connect the air cleaner hose to the throttle body.
- (b) Install the air cleaner cap together with the resonator and air cleaner hose.
- (c) Connect the air intake temperature sensor connector.
- (d) Connect the cruise control actuator cable to the clamp on the resonator.

14. (AIT)

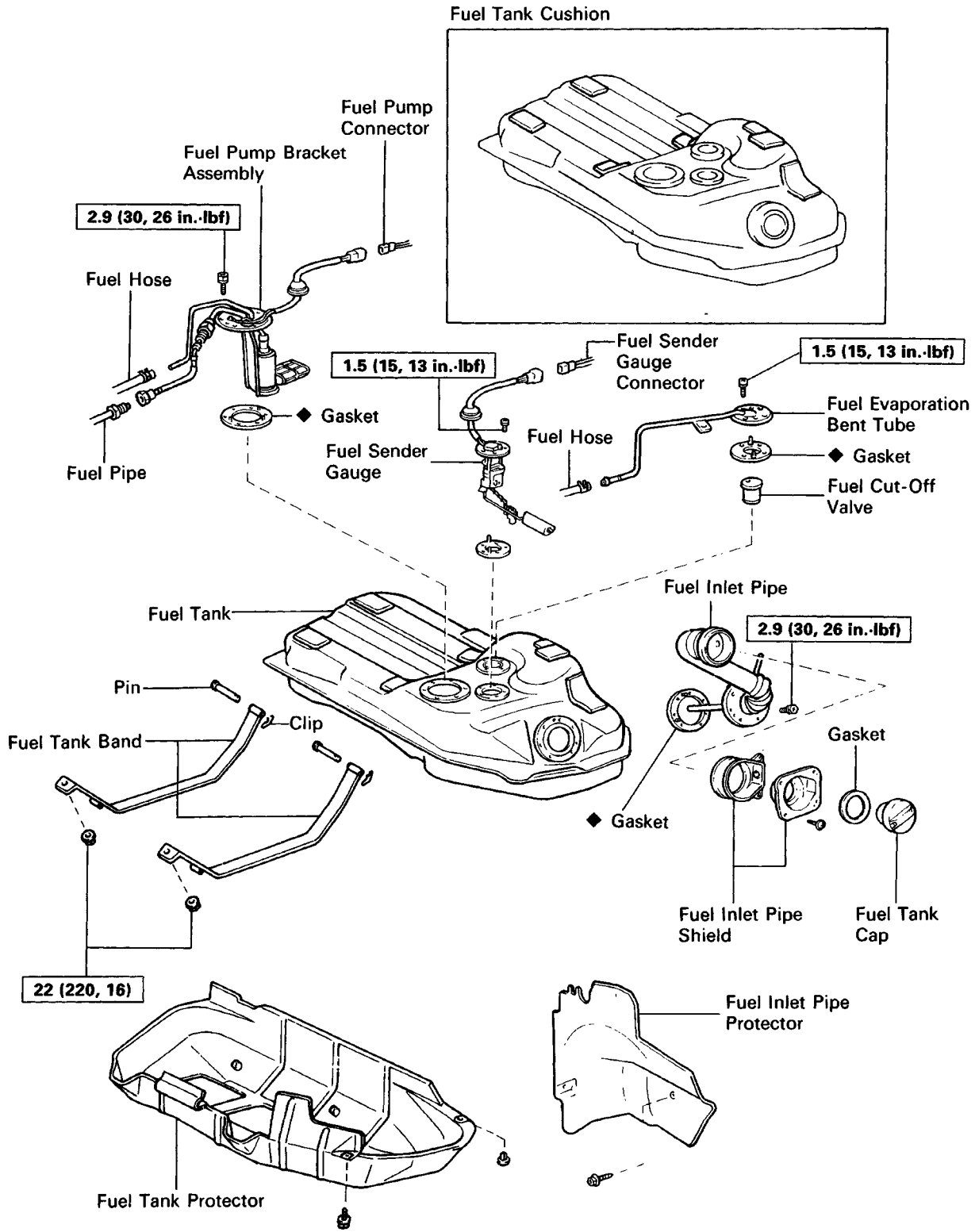
CONNECT THROTTLE CABLE, AND ADJUST IT

15. CONNECT ACCELERATOR CABLE, AND ADJUST IT

16. FILL WITH ENGINE COOLANT (See page [CO-6](#))

17. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

COMPONENTS (3S-GTE)



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

◆ Non-reusable part

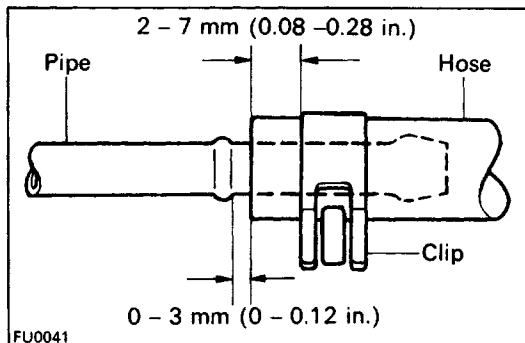
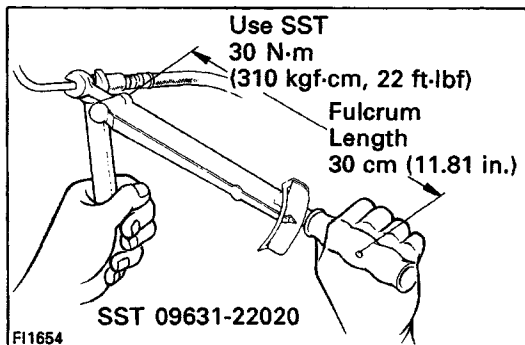
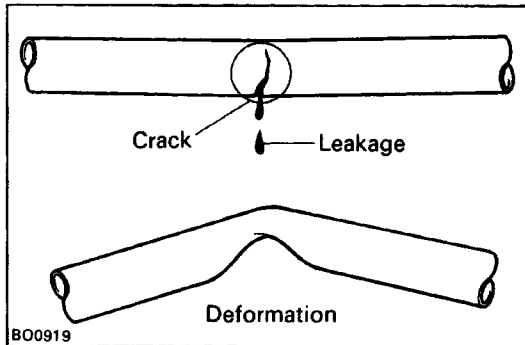
PRECAUTIONS

1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.

INSPECT FUEL LINES AND CONNECTIONS

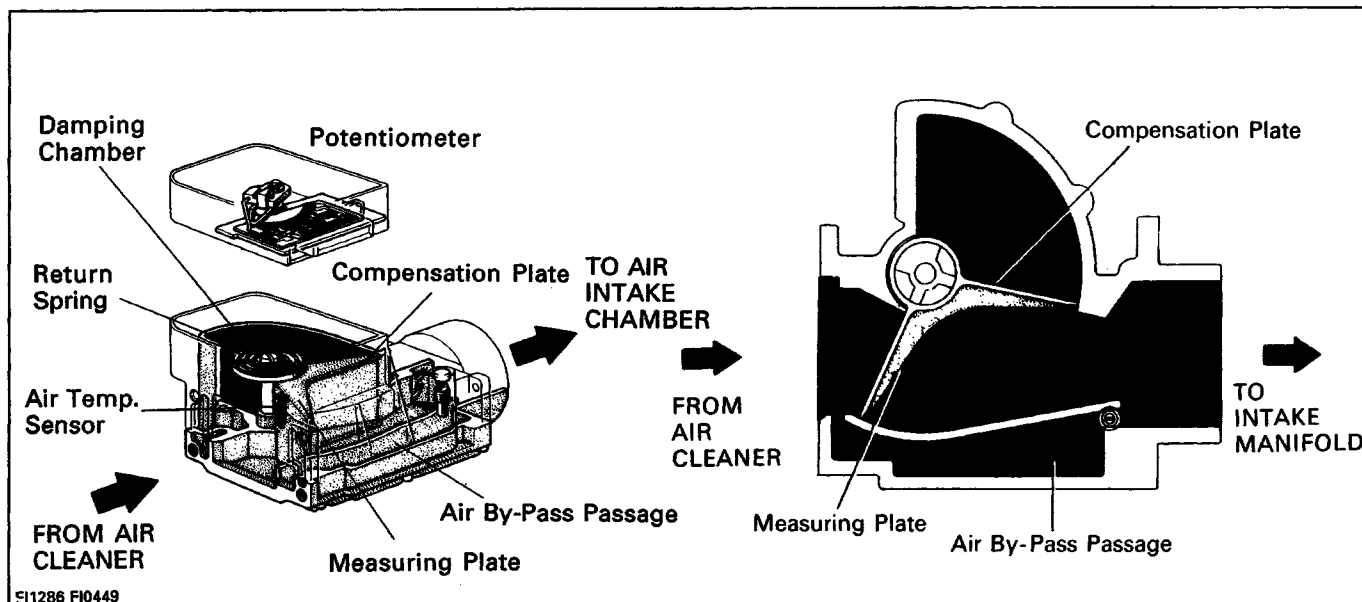
- (a) Check the fuel lines for cracks or leakage, and all connections for deformation.
- (b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
- (c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
- (d) Check the filler neck for damage or fuel leakage.
- (e) Hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the parts as necessary.

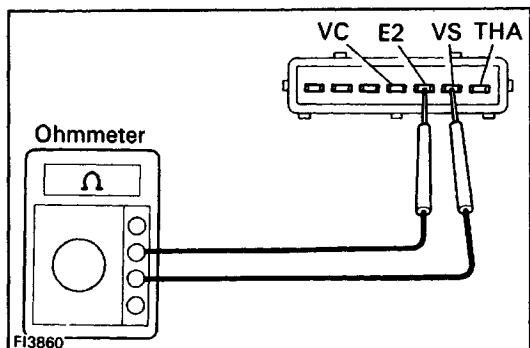


AIR INDUCTION SYSTEM

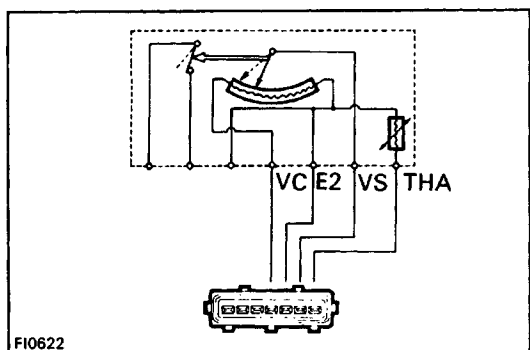
Volume Air Flow Meter (3S-GTE)



FI1286 FI0449



FI3860



FI0622

ON-VEHICLE INSPECTION

INSPECT RESISTANCE OF VOLUME AIR FLOW METER

- Disconnect the volume air flow meter connector.
- Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance	Temperature
VS - E2	200 - 600Ω	-
VC - E2	200 - 400Ω	-
THA - E2	10 - 20 kΩ 4 - 7 kΩ 2 - 3kΩ 0.9 - 1.3 kΩ 0.4 - 0.7 kΩ	-20°C (-4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F)

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

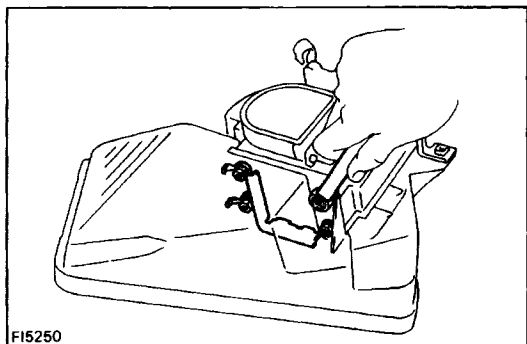
- Reconnect the volume air flow meter connector.

REMOVAL OF VOLUME AIR FLOW METER

- DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

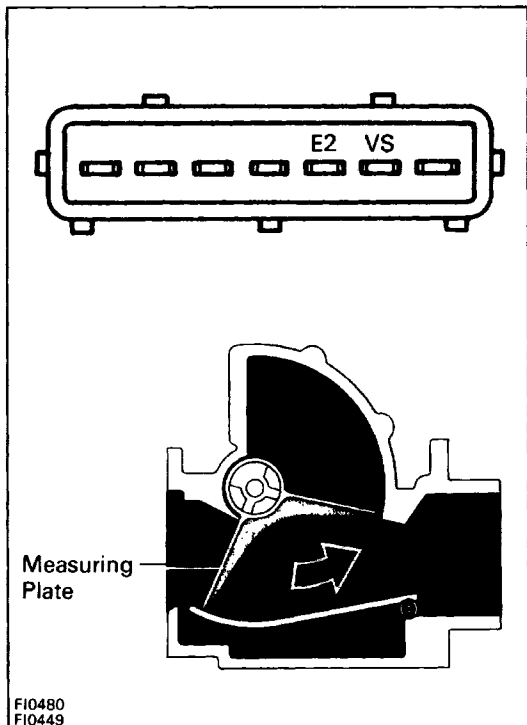
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

- DISCONNECT VOLUME AIR FLOW METER CONNECTOR



FI5250

3. DISCONNECT AIR CLEANER HOSE FROM VOLUME AIR FLOW METER
4. REMOVE AIR CLEANER CAP AND VOLUME AIR FLOW METER ASSEMBLY
5. REMOVE VOLUME AIR FLOW METER FROM AIR CLEANER CAP
 - (a) Pry off the lock plates.
 - (b) Remove the bolt, four nuts, volume air flow meter and gasket.

FI0480
FI0449

INSPECTION OF VOLUME AIR FLOW METER

INSPECT VOLUME AIR FLOW METER

Using an ohmmeter, measure the resistance between terminals VS and E2 by moving the measuring plate.

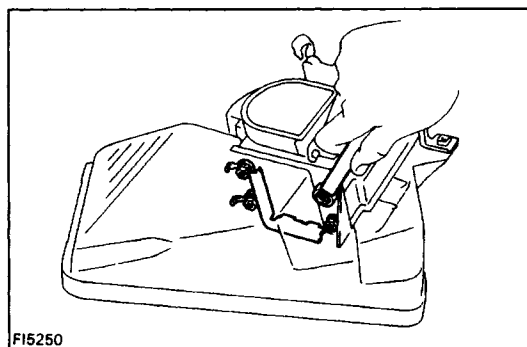
Resistance: 200 – 600 at fully closed
20 –1,200 at fully open

HINT: Resistance will change in a wave pattern as the measuring plate slowly opens.

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

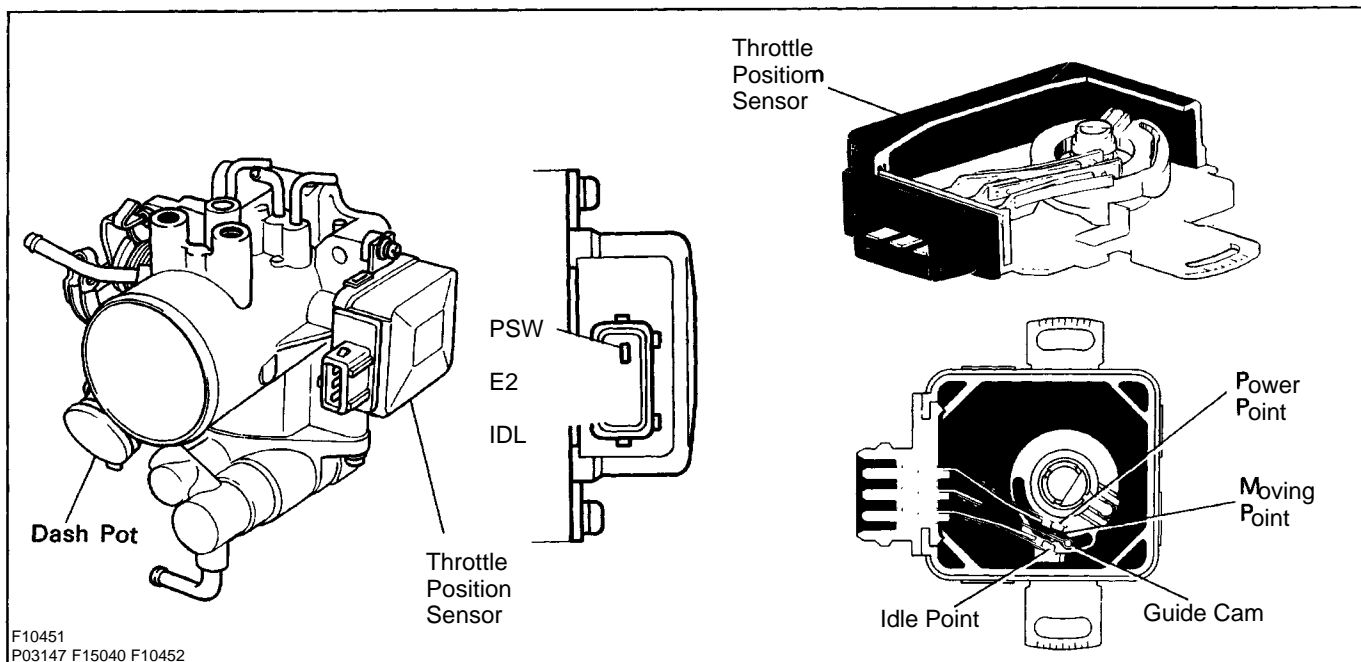
INSTALLATION OF VOLUME AIR FLOW METER

1. INSTALL VOLUME AIR FLOW METER TO AIR CLEANER CAP
 - (a) Install a new gasket and the volume air flow meter with the bolt, two lock and plates and four nuts.
 - (b) Pry the lock plates.
2. INSTALL AIR CLEANER CAP AND VOLUME AIR FLOW METER ASSEMBLY
3. CONNECT AIR CLEANER HOSE TO VOLUME AIR FLOW METER
4. CONNECT VOLUME AIR FLOW METER CONNECTOR
5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY



FI5250

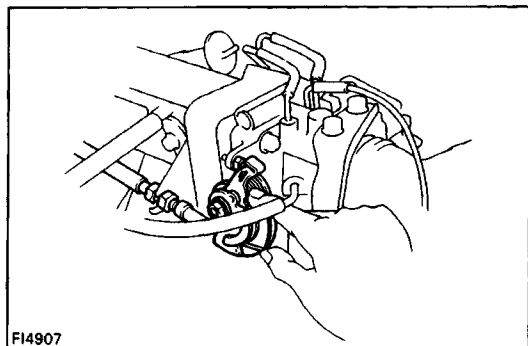
Throttle Body (4A-FE)



ON-VEHICLE INSPECTION

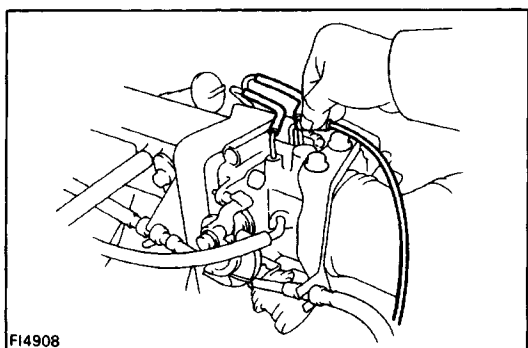
1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

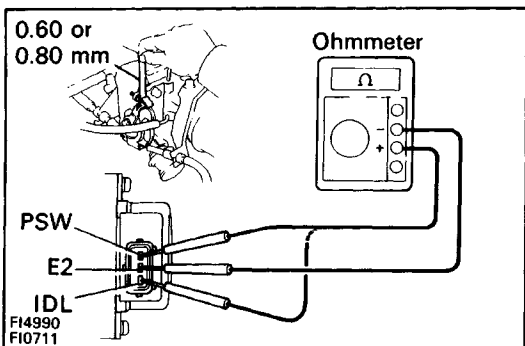
- Start the engine.
- Check the vacuum with your finger.



Port name	At idle	Other than idle
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum

2. INSPECT THROTTLE POSITION SENSOR

- (a) Disconnect the sensor connector.
- (b) Insert a thickness gauge between the throttle stop screw and stop lever.
- (c) Using an ohmmeter, measure the resistance between each terminal.



Clearance between lever and stop screw	Continuity between terminals	
	IDL - E2	PSW - E2
0.60 mm (0.024 in.)	Continuity	No continuity
0.80 mm (0.031 in.)	No continuity	No continuity
Throttle valve fully open	No continuity	Continuity

(d) Reconnect the sensor connector.

3. INSPECT AND ADJUST DASH POT (DP)

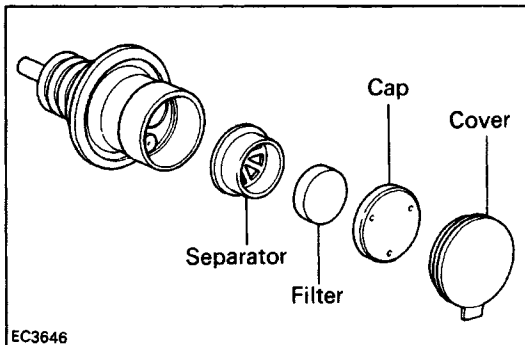
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed: 800 ± 50 rpm

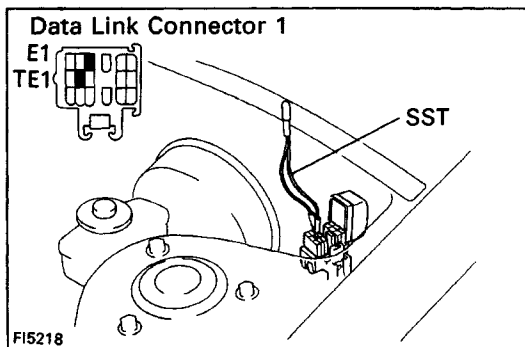
C. Remove cover, cap, filter and separator from DP



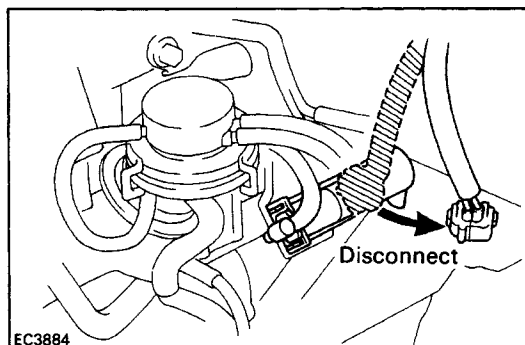
D. Check and adjust DIP setting speed

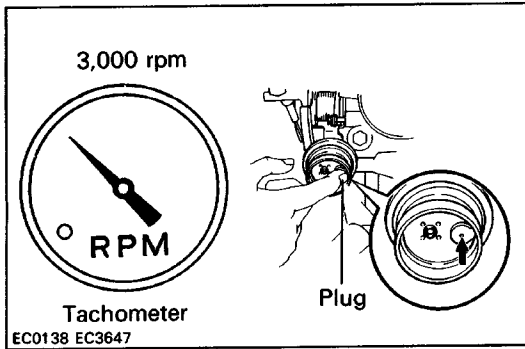
(a) Using SST, connect the terminals TE1 and E1 of the data link connector 1.

SST 09843-18020

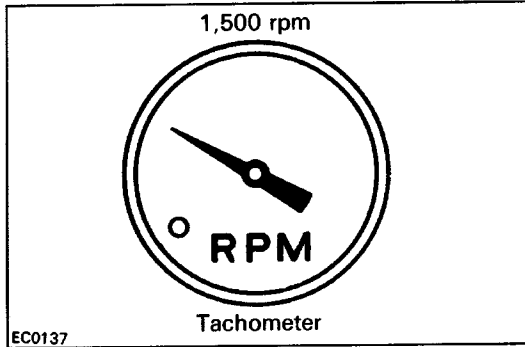


(b) Disconnect the EGR VSV connector.

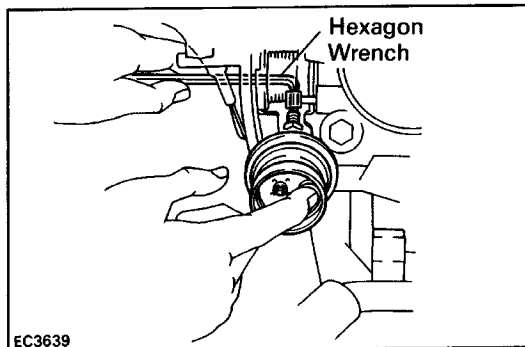




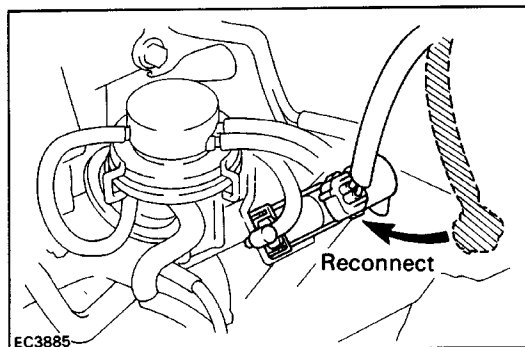
- (c) Maintain the engine at 3,000 rpm.
- (d) Plug the VTV hole with your finger.



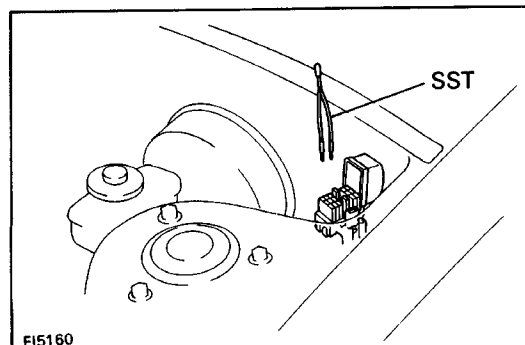
- (e) Release the throttle valve.
 - (f) Check that the DP is set.
- DP setting speed (w/ Cooling fan OFF):**
M/T 1,800 rpm
A/T 2,200 rpm



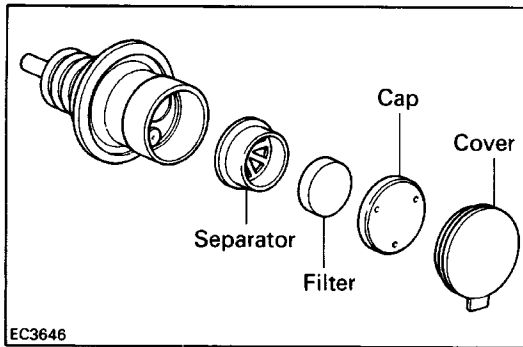
- (g) Using a hexagon wrench, adjust the DP setting speed by turning the DP adjusting screw.
- (h) Repeat steps from (c) to (e), and recheck the DP setting speed.



- (i) Reconnect the EGR VSV connector.



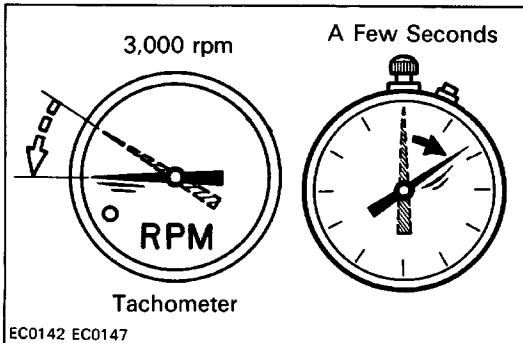
- (j) Remove the SST.
 SST 09843-18020



E. Reinstall DP separator, filter, cap and cover

HINT:

- Install the filter with the coarser surface facing the atmospheric side (outward).
- Install the cover with ventilate holes below.



F. Check VTV operation

Race the engine at 3,000 rpm for a few seconds, release the throttle valve and check that the engine returns to idle in a few seconds.

REMOVAL OF THROTTLE BODY

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page CO-6)

3. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

5. REMOVE AIR CLEANER CAP AND AIR CLEANER HOSE (See step 6 on page EM-185)

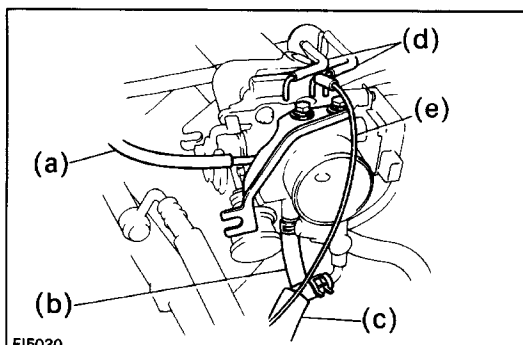
6. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

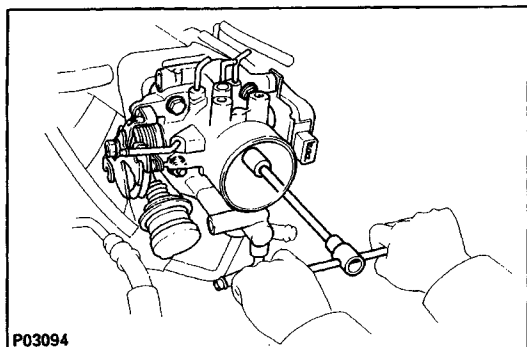
7. REMOVE ACCELERATOR BRACKET FROM THROTTLE BODY

Remove the two bolts and bracket.

8. DISCONNECT HOSES FROM THROTTLE BODY

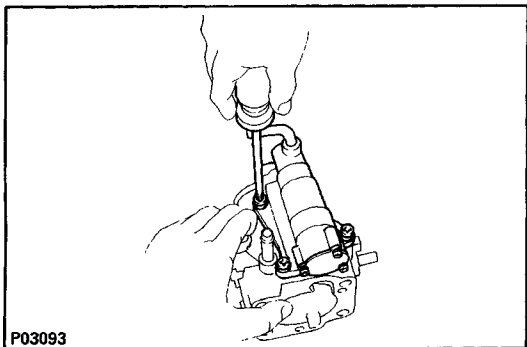
- (a) PCV hose
- (b) Water by-pass hose from air pipe
- (c) Water by-pass hose from water inlet housing
- (d) Two vacuum hoses from vacuum pipe
- (e) Vacuum hose from EVAP VSV





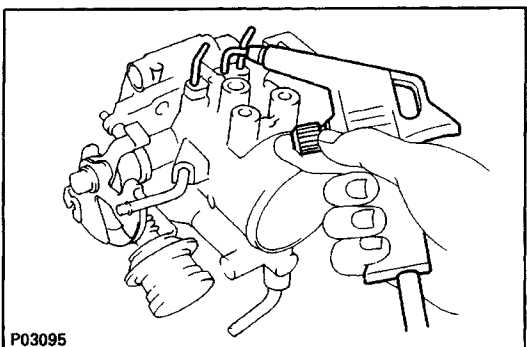
9. REMOVE THROTTLE BODY

Remove the two bolts, two nuts, throttle body and gas-ket.



10. IF NECESSARY, REMOVE AUXILIARY AIR VALVE

Remove the four screws, air valve, gasket and O-ring.

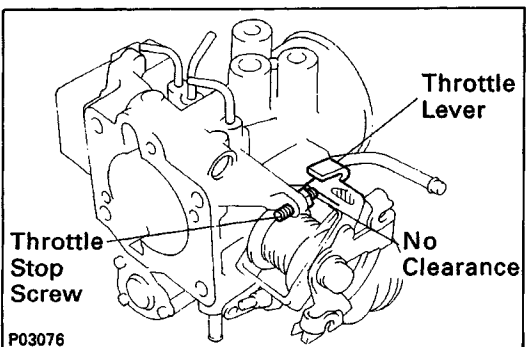


INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

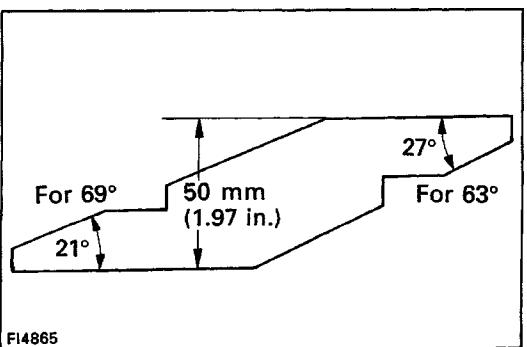
- (a) Using a soft brush and carburetor cleaner, clean the cast parts.
- (b) Using compressed air, clean all the passages and apertures.

NOTICE: To prevent deterioration, do not clean the throttle position sensor and DP.



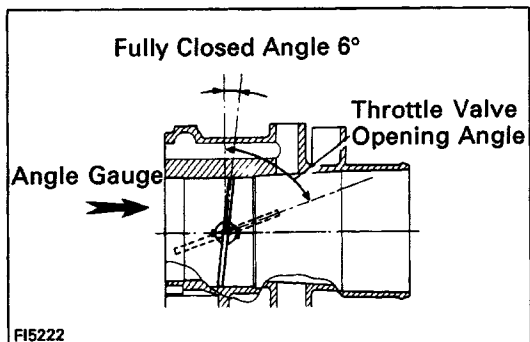
2. INSPECT THROTTLE VALVE

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

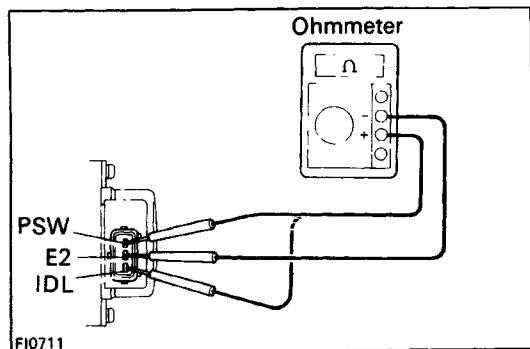


3. INSPECT THROTTLE POSITION SENSOR

- (a) Make an angle gauge as shown in the illustration.

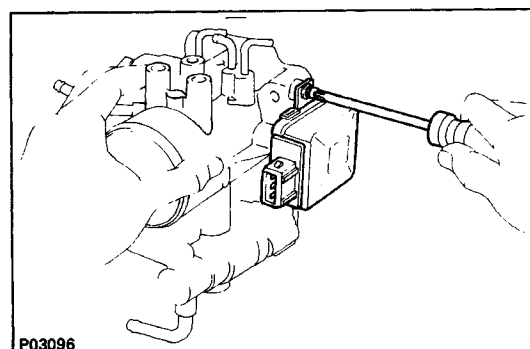


(b) Set the throttle valve opening angle to 63° or 69° from the vertical position (incl. throttle valve fully closed angle 6°).



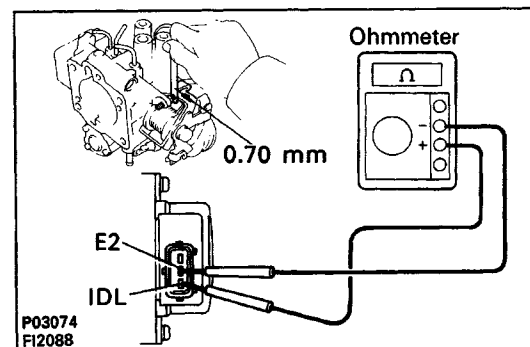
(c) Using an ohmmeter, check the continuity between each terminal.

Throttle valve opening angle	Continuity	
	IDL - E2	PSW - E2
63° from vertical	No continuity	No continuity
69° from vertical	No continuity	Continuity
Less than 7.5° from vertical	Continuity	No continuity

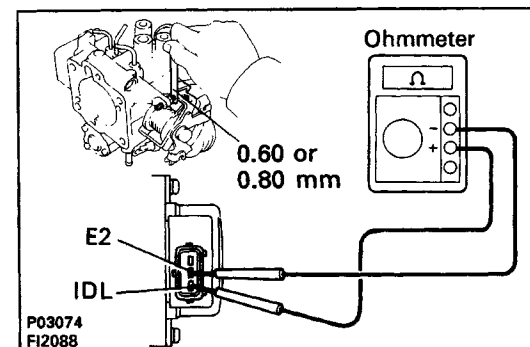


4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the two set screws of the sensor.

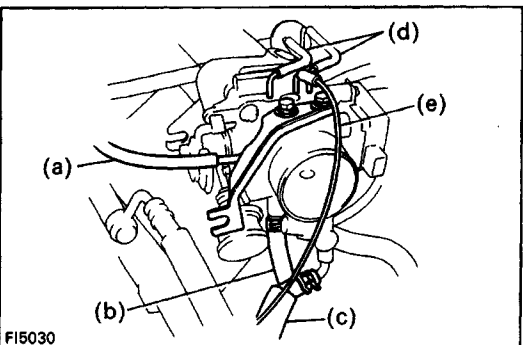
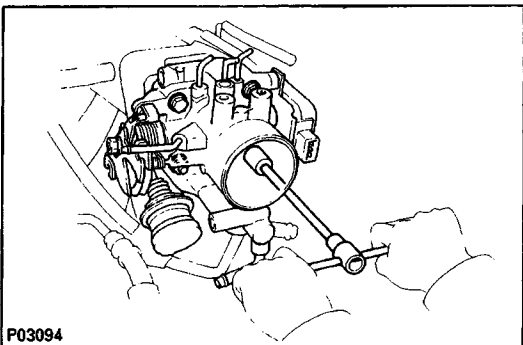
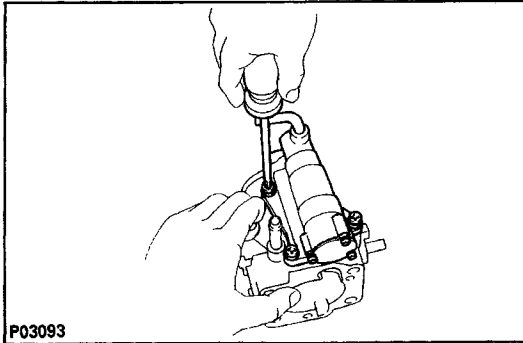
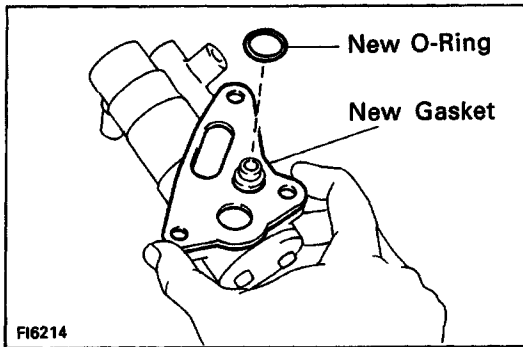


- (b) Insert a 0.70 mm (0.028 in.) thickness gauge, between the throttle stop screw and stop lever.
- (c) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.
- (d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two set screws.



(e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL - E2)
0.60 mm (0.024 in.)	Continuity
0.80 mm (0.031 in.)	No continuity



INSTALLATION OF THROTTLE BODY

1. INSTALL AUXILIARY AIR VALVE

(a) Place a new gasket and O-ring on the auxiliary air valve.

(b) Install the air valve with the three screws.

2. INSTALL THROTTLE BODY

Install a new gasket and the throttle body with the two bolts and two nuts.

Torque: 22 N-m (220 kgf-cm, 16 ft-lbf)

3. CONNECT HOSES TO THROTTLE BODY

- (a) PCV hose
- (b) Water by-pass hose to air pipe
- (c) Water by-pass hose to water inlet housing
- (d) Two vacuum hoses to vacuum pipe
- (e) Vacuum hose to EVAP VSV

4. INSTALL ACCELERATOR BRACKET TO THROTTLE BODY

Install the bracket with the two bolts.

5. CONNECT THROTTLE POSITION SENSOR CONNECTOR

6. INSTALL AIR CLEANER CAP AND AIR CLEANER HOSE

(See step 36 on page [EM-221](#))

7. CONNECT ACCELERATOR CABLE, AND ADJUST IT

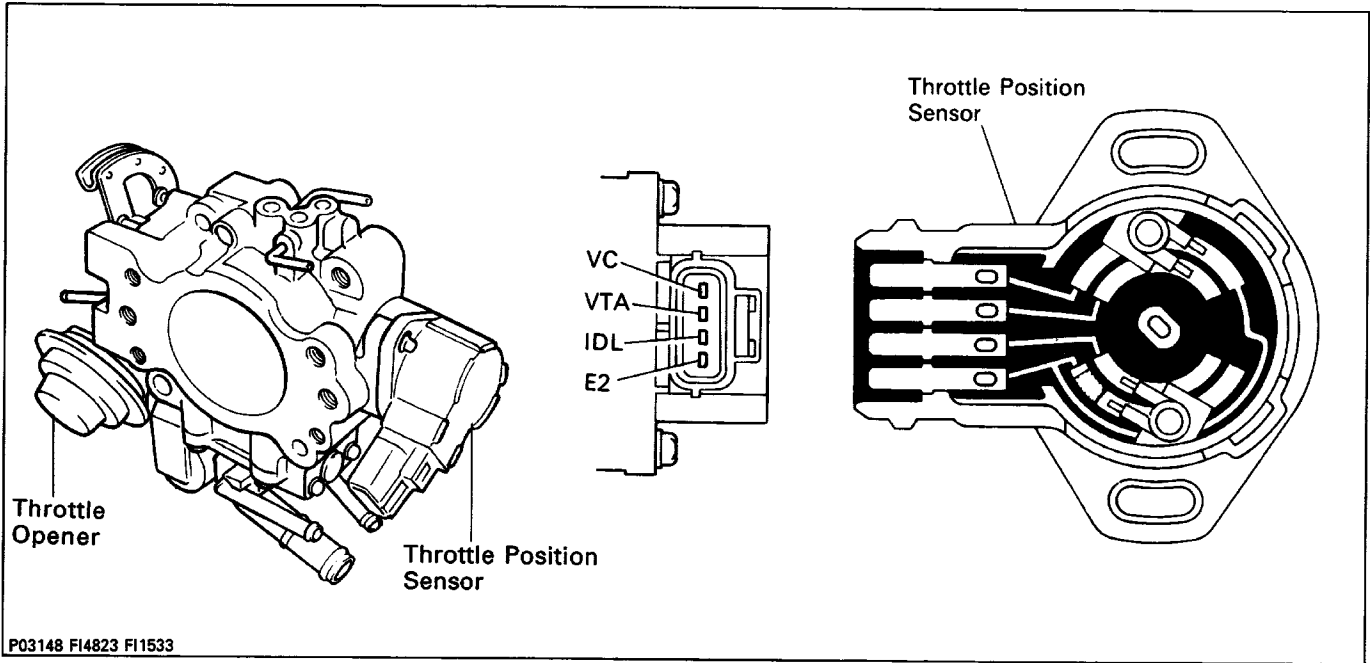
8. (A/T)

CONNECT THROTTLE CABLE, AND ADJUST IT

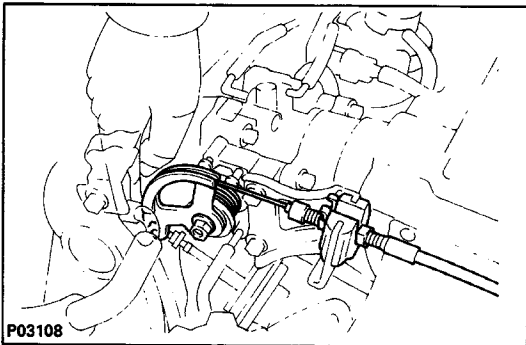
9. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

10. FILL WITH ENGINE COOLANT (See page [CO-6](#))

Throttle Body (3S-GTE)



P03148 FI4823 FI1533

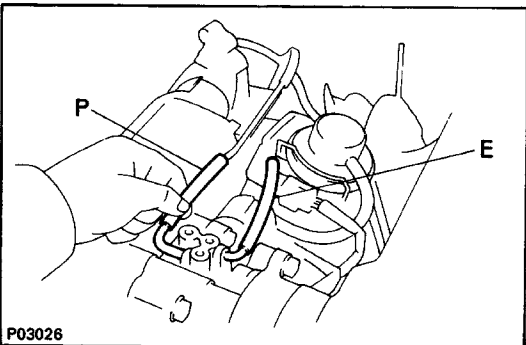


P03108

ON-VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.

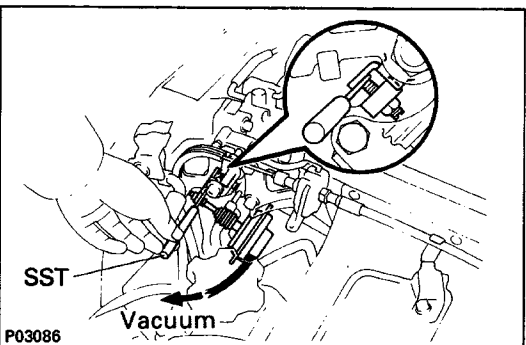


P03026

(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

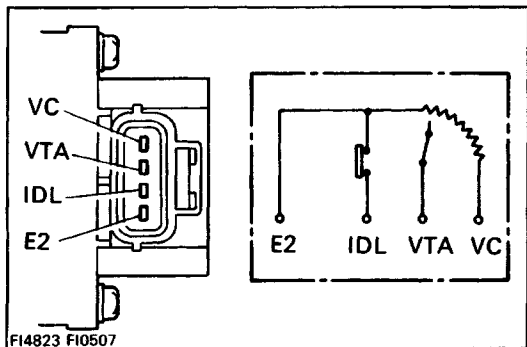
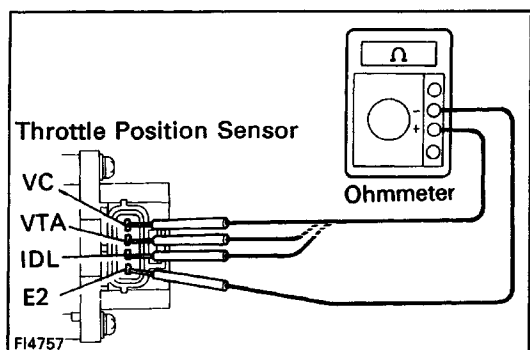
Port No.	At idle	Other than idle
E	No vacuum	Vacuum
P	No vacuum	Vacuum



P03086

2. INSPECT THROTTLE POSITION SENSOR

- Apply vacuum to the throttle opener.
- Disconnect the sensor connector.
- Insert SST between the throttle stop screw and stop lever.
SST 09240-00020



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

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA - E2	0.47 - 6.1 kΩ
0.50 mm (0.020 in.)	IDL - E2	2.3 kΩ or less
0.70 mm (0.028 in.)	IDL - E2	Infinity
Throttle valve fully open	VTA - E2	3.1 - 12.1 kΩ
-	VC - E2	3.9 - 9.0 kΩ

(e) Reconnect the sensor connector.

3. INSPECT THROTTLE OPENER

A. Warm up engine

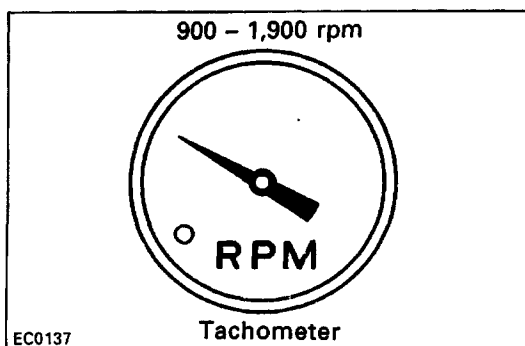
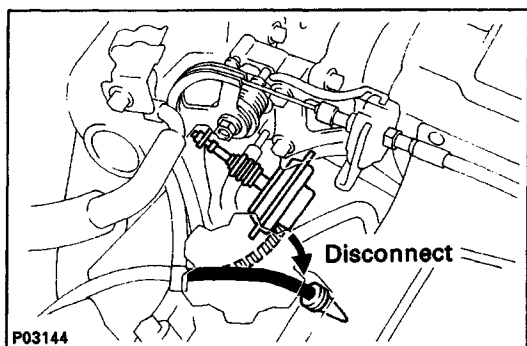
Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed: 800 ± 50 rpm

C. Check throttle opener setting speed

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.



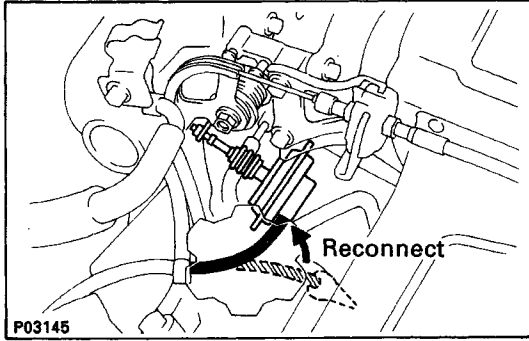
(b) Check the throttle opener setting speed.

Throttle opener setting speed:

900 - 1,900 rpm

If the throttle opener setting is not as specified, replace the throttle body.

(c) Stop the engine.



- (d) Reconnect the vacuum hose to the throttle opener.
- (e) Start the engine and check that the idle rpm returns to the correct speed.

REMOVAL OF THROTTLE BODY

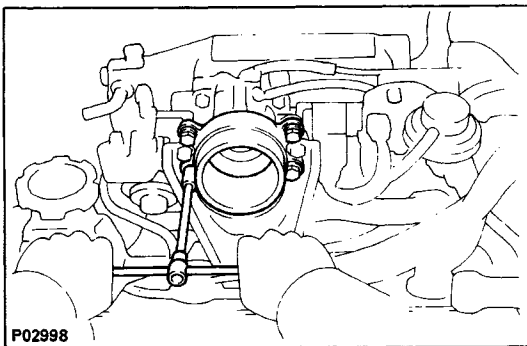
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page CO-6)

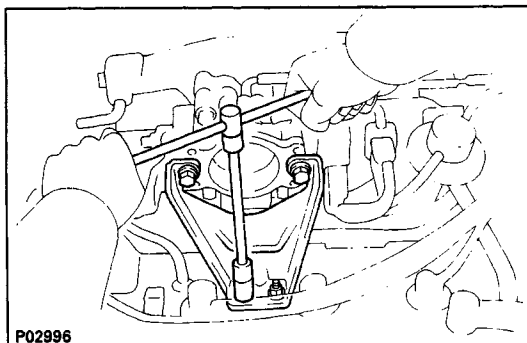
3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

4. REMOVE CHARGE AIR COOLER (See steps 13 to 15 on pages TC-9 and 10)



5. REMOVE INTAKE AIR CONNECTOR

Remove the four bolts and air connector.

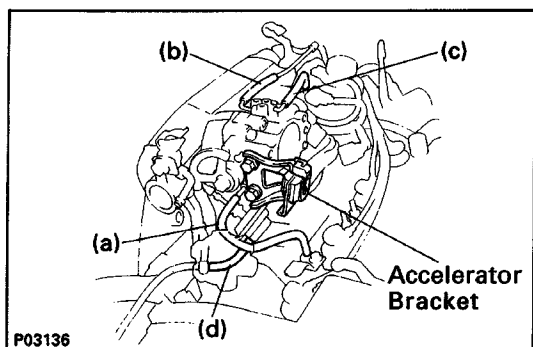


6. REMOVE INTAKE AIR CONNECTOR STAY

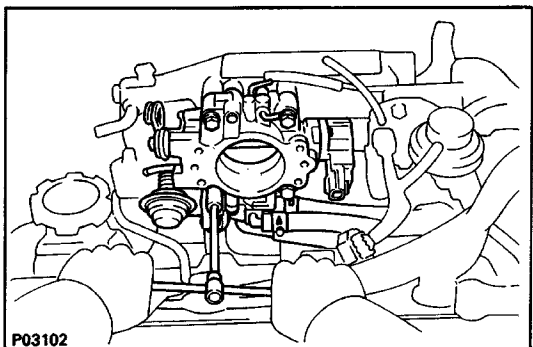
Remove the two bolts, two nuts and air-connector stay.

7. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

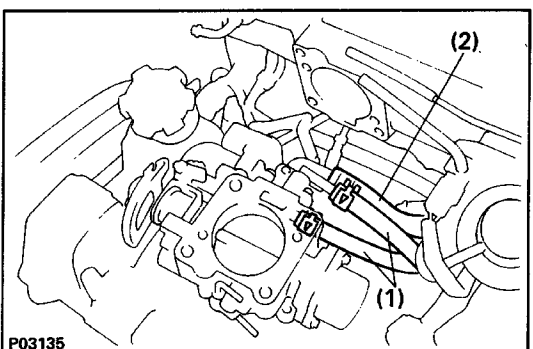
8. DISCONNECT IAC VALVE CONNECTOR

**9. REMOVE ACCELERATOR BRACKET****10. DISCONNECT HOSES FROM THROTTLE BODY**

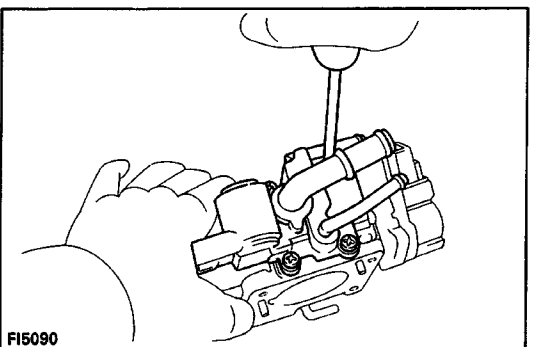
- (a) PCV hose from cylinder head cover
- (b) Vacuum hose (from throttle body P port) from vacuum pipe
- (c) Vacuum hose (from throttle body E port) from EGR VSV
- (d) Vacuum hose from throttle opener

**11. REMOVE THROTTLE BODY**

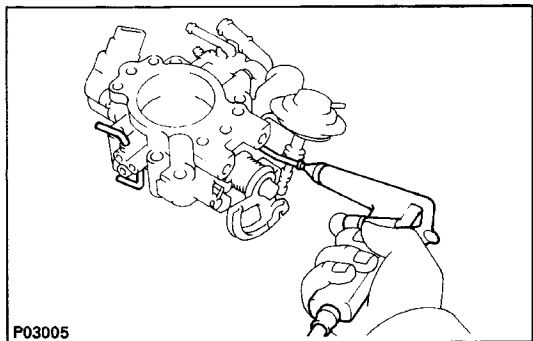
- (a) Remove the four bolts, throttle body and gasket.



- (b) Disconnect the hoses from the throttle body, and remove the throttle body.
 - (1) Two water by-pass hoses from No.1 air tube
 - (2) Air hose from No.1 air tube

**12. IF NECESSARY, REMOVE IAC VALVE FROM THROTTLE BODY**

Remove the four screws, IAC valve and gasket.

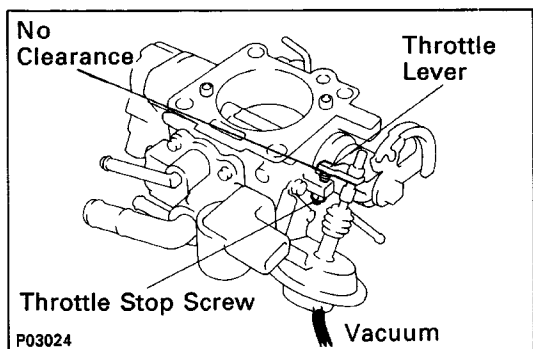


INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

- (a) Using a soft brush and carburetor cleaner, clean the cast parts.
- (b) Using compressed air, clean all the passages and apertures.

NOTICE: To prevent deterioration, do not clean the throttle position sensor.

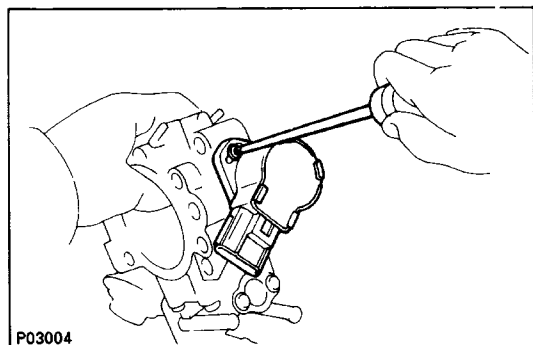


2. INSPECT THROTTLE VALVE

- (a) Apply vacuum to the throttle opener.
- (b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

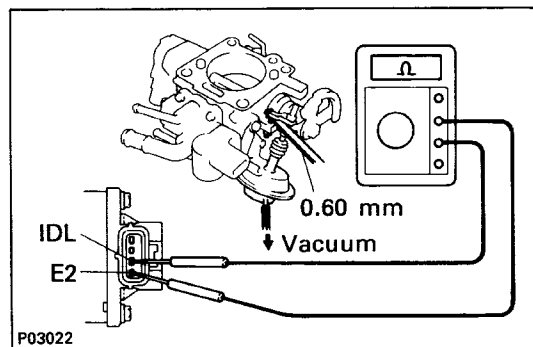
3. INSPECT THROTTLE POSITION SENSOR

(See step 2 on page FI-192)



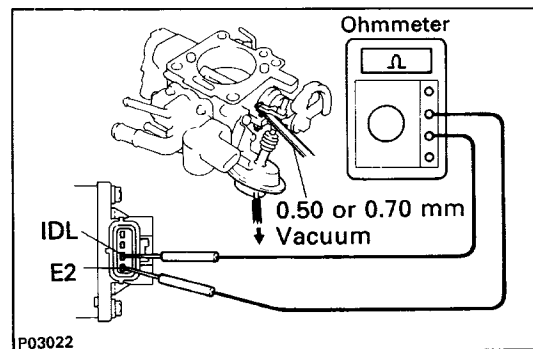
4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

- (a) Loosen the two set screws of the sensor.

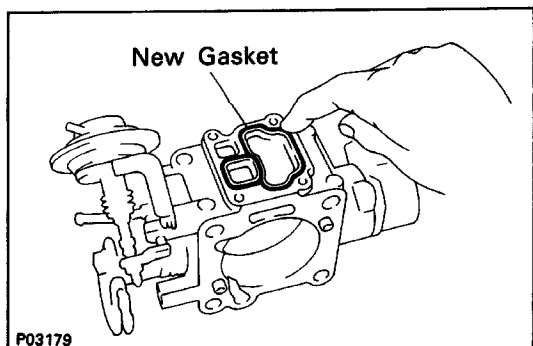


- (b) Apply vacuum to the throttle opener.
- (e) Insert a 0.60 mm (0.024 in.) thickness gauge, between the throttle stop screw and stop lever.
- (d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.
- (e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two set screws.

- (f) Recheck the continuity between terminals IDL and E2.



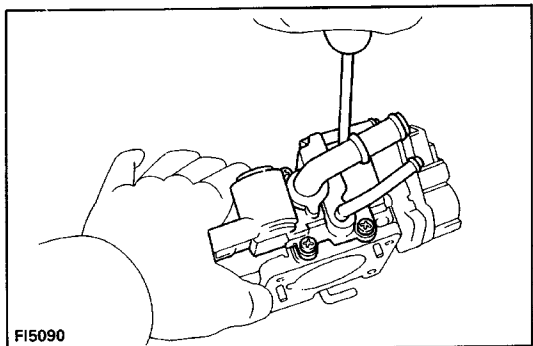
Clearance between lever and stop screw	Continuity (IDL - E2)
0.50 mm (0.020 in.)	Continuity
0.70 mm (0.028 in.)	No continuity



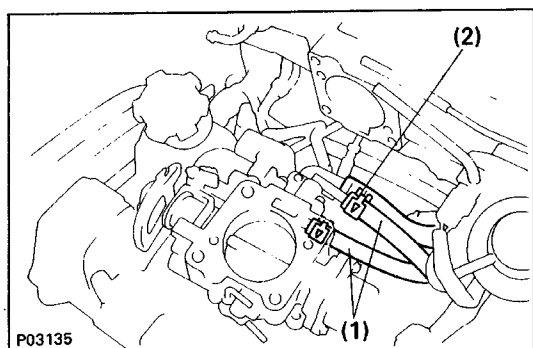
INSTALLATION OF THROTTLE BODY

1. INSTALL IAC VALVE TO THROTTLE BODY

(a) Place a new gasket on the throttle body.



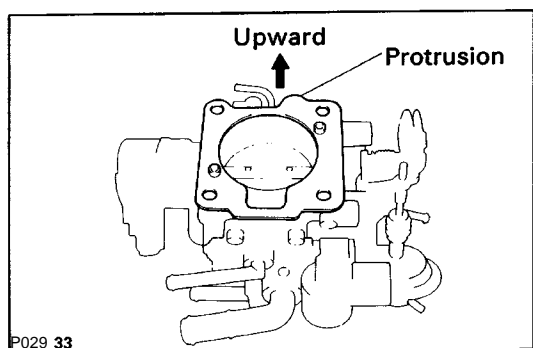
(b) Install the IAC valve with the four screws.



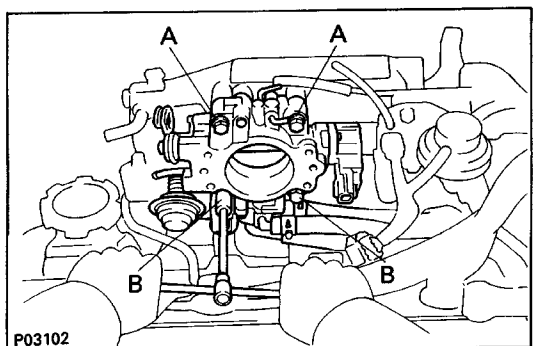
2. INSTALL THROTTLE BODY

(a) Connect the following hoses to the throttle body:

- (1) Two water by-pass hoses to No.1 air tube
- (2) Air hose to No.1 air tube



(b) Place a new gasket on the throttle body, facing the protrusion upward.



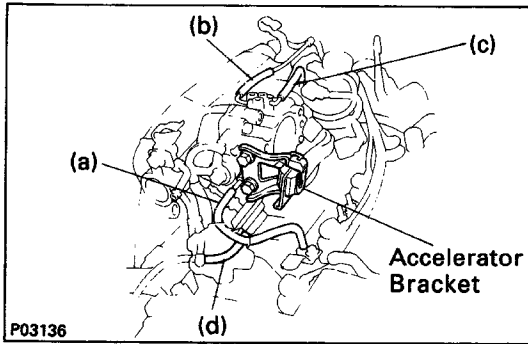
(c) Install the throttle body with the four bolts.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

HINT: Each bolt is indicated in the illustration.

Bolt length: A 45 mm (1.77 in.)

B 70 mm (2.76 in.)



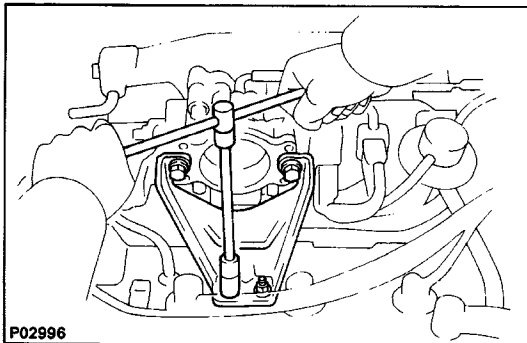
3. CONNECT HOSES TO THROTTLE BODY

- (a) PCV hose to cylinder head cover
- (b) Vacuum hose (from throttle body P port) to vacuum pipe
- (c) Vacuum hose (from throttle body E port) to EGR VSV
- (d) Vacuum hose from throttle opener

4. INSTALL ACCELERATOR BRACKET

5. CONNECT IAC VALVE CONNECTOR

6. CONNECT THROTTLE POSITION SENSOR CONNECTOR



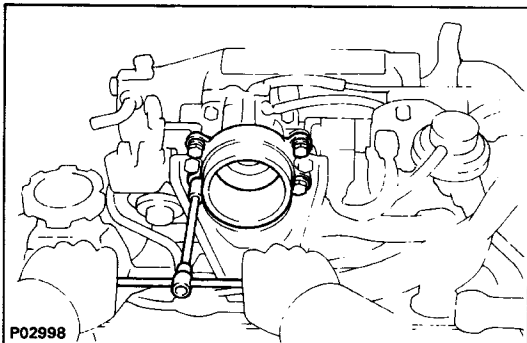
7. INSTALL INTAKE AIR CONNECTOR STAY

Install the air connector stay with the two bolts and two nuts.

Torque:

Bolt 19 N-m (195 kgf-cm, 14 ft-lbf)

Nut 7.8 N-m (80 kgf-cm, 69 in.-lbf)



8. INSTALL INTAKE AIR CONNECTOR

Install the air connector with the four bolts.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

9. INSTALL CHARGE AIR COOLER

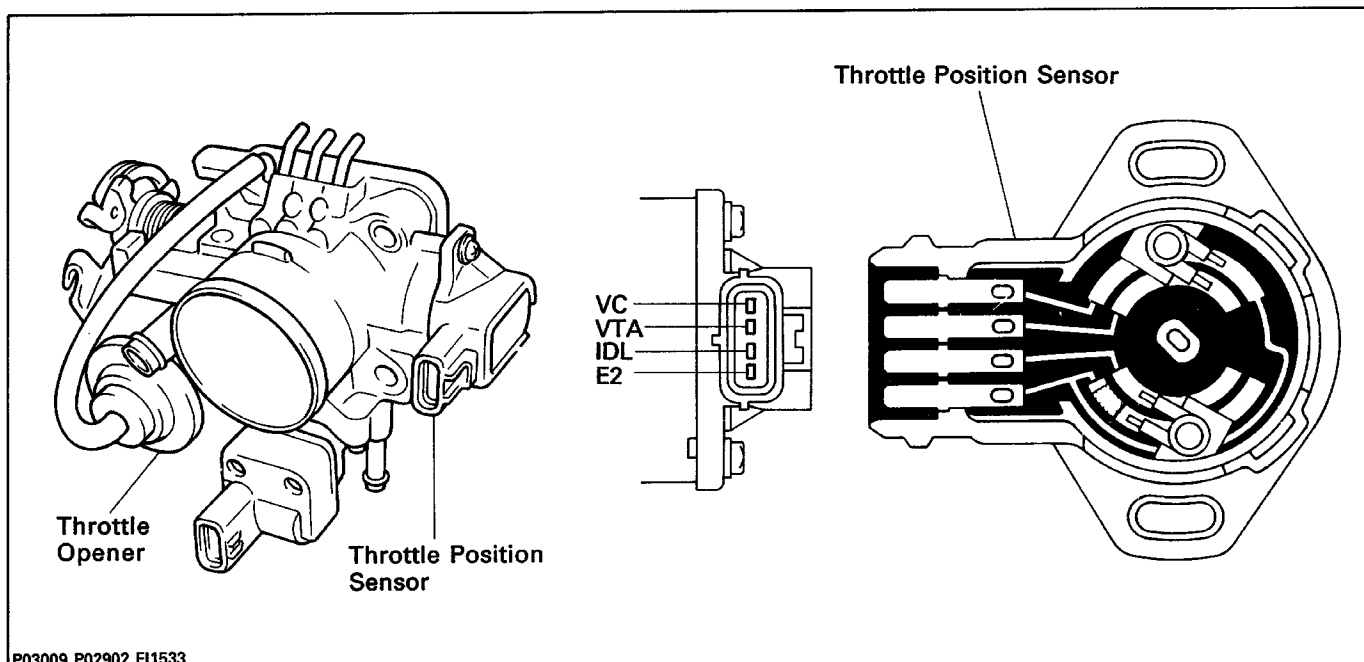
(See steps 11 to 13 on page [TC-17](#))

10. CONNECT ACCELERATOR CABLE, AND ADJUST IT

11. FILL WITH ENGINE COOLANT (See page [CO-6](#))

12. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Throttle Body (5S-FE)

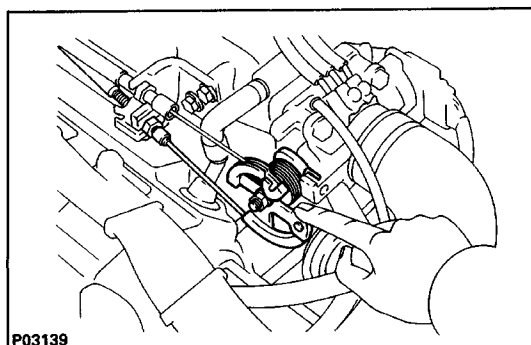


P03009 P02902 F11533

ON-VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

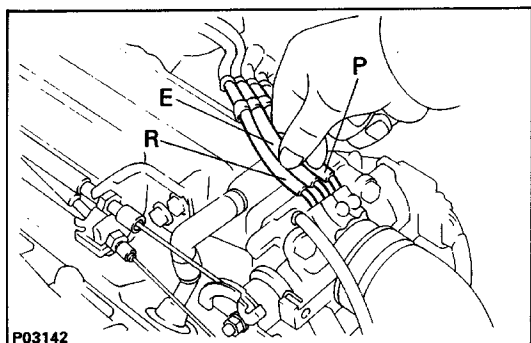
(a) Check that the throttle linkage moves smoothly.



P03139

(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

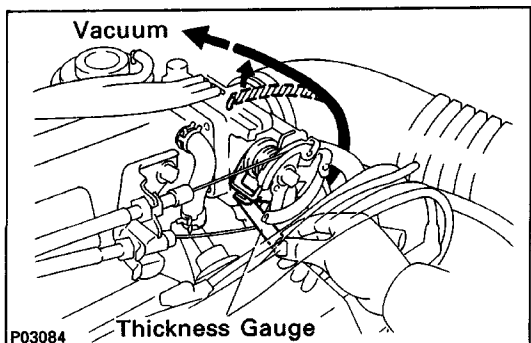


P03142

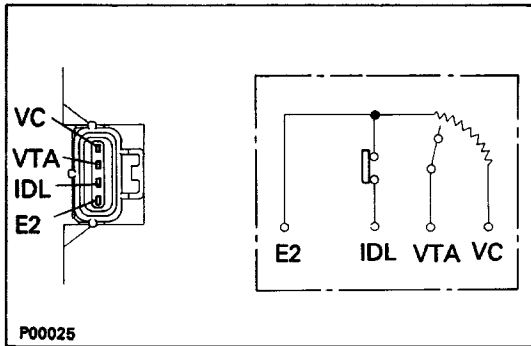
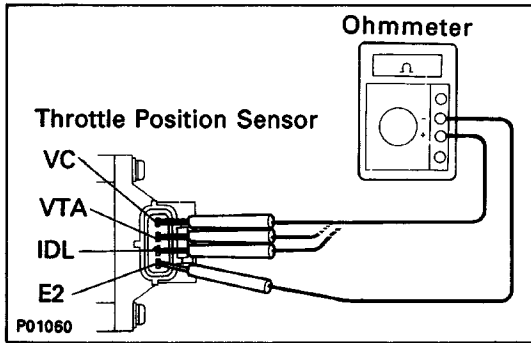
Port name	At idle	Other than idle
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	No vacuum

2. INSPECT THROTTLE POSITION SENSOR

- Apply vacuum to the throttle opener.
- Disconnect the sensor connector.
- Insert a thickness gauge between the throttle stop screw and stop lever.



P03084



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

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA - E2	0.2 - 5.7 kΩ
0.50 mm (0.020 in.)	IDL - E2	2.3 kΩ or less
0.70 mm (0.028 in.)	IDL - E2	Infinity
Throttle valve fully open	VTA - E2	2.0 - 10.2 kΩ
-	VC - E2	2.5 - 5.9 kΩ

(e) Reconnect the sensor connector.

3. INSPECT AND ADJUST THROTTLE OPENER

A. Warm up engine

Allow the engine to warm up to normal operating temperature.

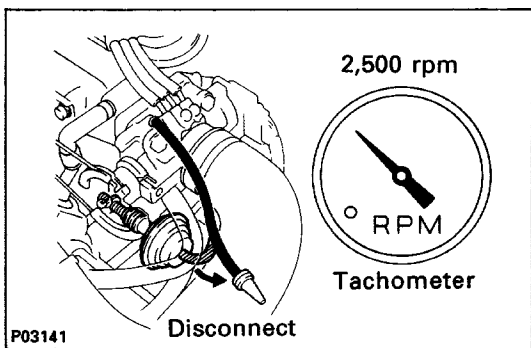
B. Check idle speed

Idle speed: **700 ± 50 rpm USA**

750 ± 50 rpm CANADA

C. Check and adjust throttle opener setting speed

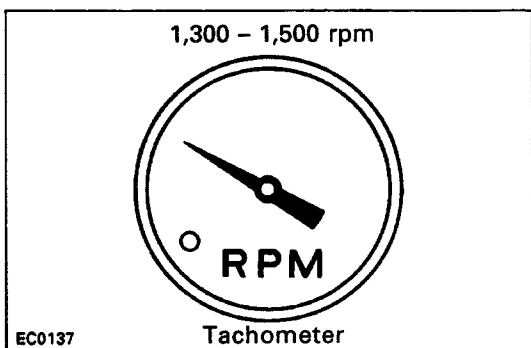
- Disconnect the vacuum hose from the throttle opener, and plug the hose end.
- Maintain the engine at 2,500 rpm.

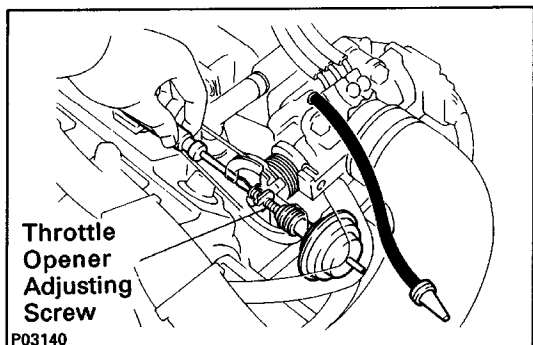


- Release the throttle valve.
- Check that the throttle opener is set.

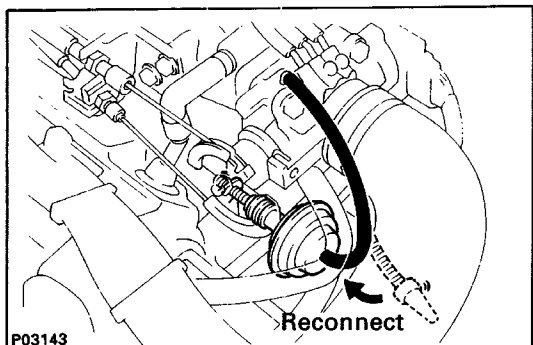
Throttle opener setting speed:

1,300-1,500 rpm (w/ Cooling fan OFF)





- (e) Adjust the throttle opener setting speed by turning the throttle opener adjusting screw.



- (f) Reconnect the vacuum hose to the throttle opener.

REMOVAL OF THROTTLE BODY

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page CO-6)

3. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

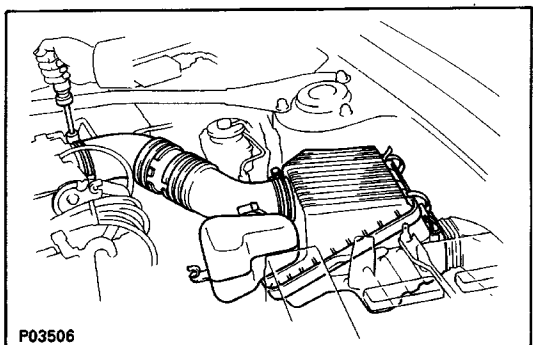
4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

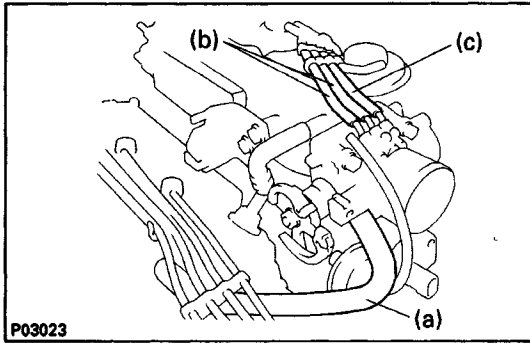
5. REMOVE AIR CLEANER CAP AND AIR CLEANER HOSE

- Disconnect the air intake temperature sensor connector.
- Disconnect the cruise control actuator cable from the clamp on the resonator.
- Loosen the air cleaner hose clamp bolt.
- Disconnect the four air cleaner cap clips.
- Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.

6. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

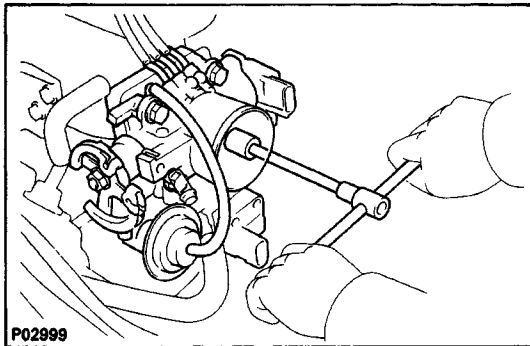
7. DISCONNECT IAC VALVE CONNECTOR





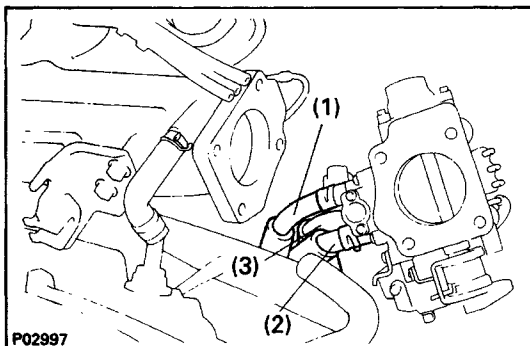
8. DISCONNECT HOSES FROM THROTTLE BODY

- (a) PCV hose
- (b) Two vacuum hoses from EGR vacuum modulator
- (c) Vacuum hoses from EVAP VSV

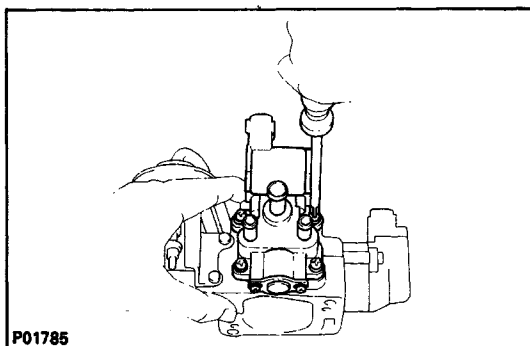


9. REMOVE THROTTLE BODY

- (a) Remove the four bolts, throttle body and gasket.



- (b) Disconnect the hoses from the throttle body, and remove the throttle body.
 - (1) Water by-pass hose from water outlet
 - (2) Water by-pass hose from water by-pass pipe
 - (3) Air- hose from air tube



10. IF NECESSARY, REMOVE IAC VALVE FROM THROTTLE BODY

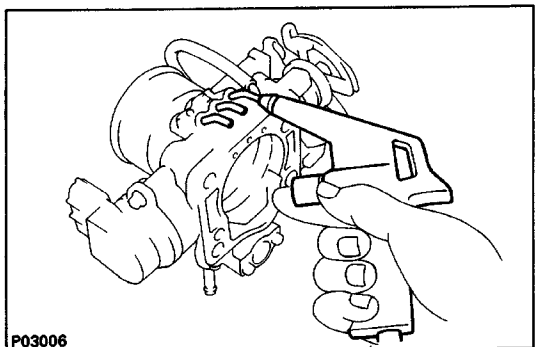
Remove the four screws, IAC valve and gasket.

INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

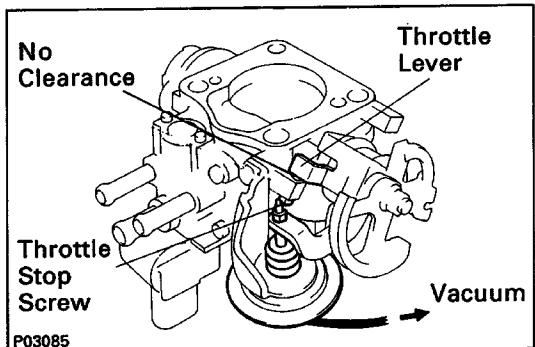
- (a) Using a soft brush and carburetor cleaner, clean the cast parts.
- (b) Using compressed air, clean all the passages and apertures.

NOTICE: To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE VALVE

- (a) Apply vacuum to the throttle opener.
- (b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

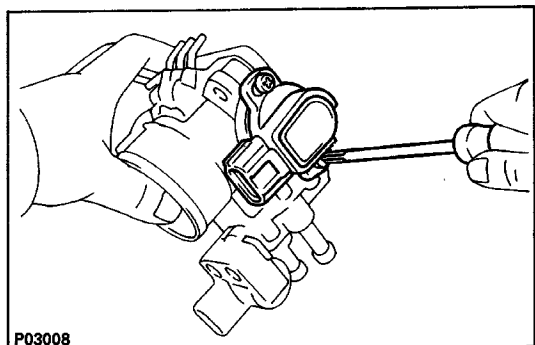


3. INSPECT THROTTLE POSITION SENSOR

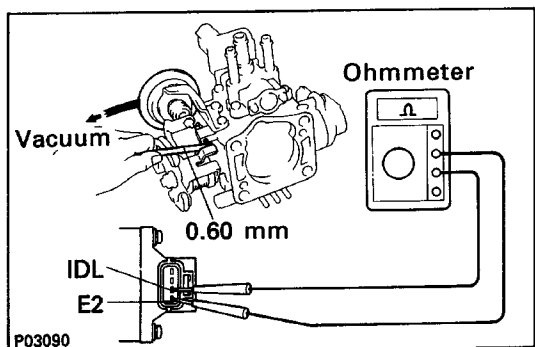
(See step 2 on page FI-199)

4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

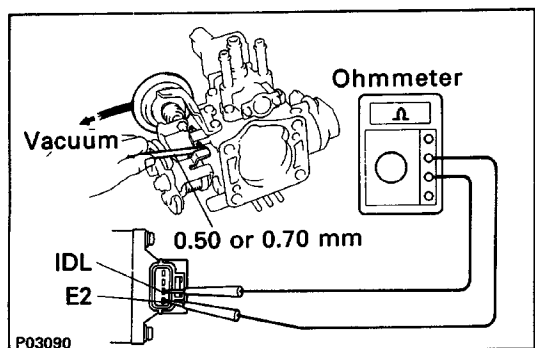
- (a) Loosen the two set screws of the sensor.



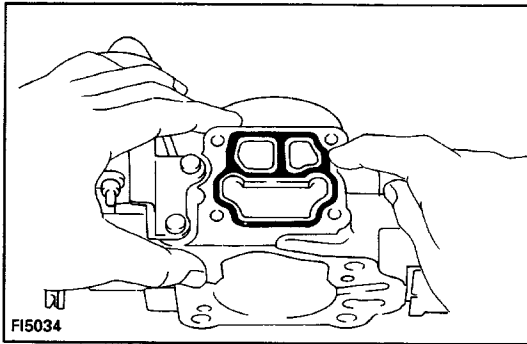
- (b) Apply vacuum to the throttle opener.
- (c) Insert a 0.60 mm (0.024 in.) thickness gauge, between the throttle stop screw and stop lever.
- (d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.
- (e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two set screws.



- (f) Recheck the continuity between terminals IDL and E2.



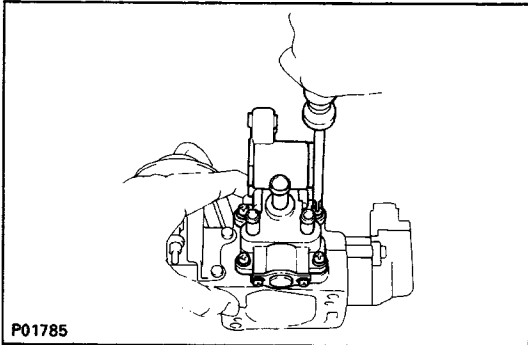
Clearance between lever and stop screw	Continuity (IDL - E2)
0.50 mm (0.020 in.)	Continuity
0.70 mm (0.028 in.)	No continuity



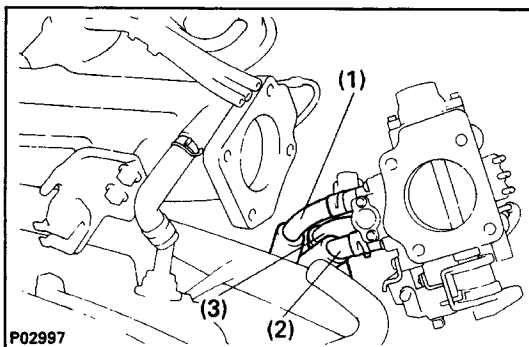
INSTALLATION OF THROTTLE BODY

1. INSTALL IAC VALVE TO THROTTLE BODY

(a) Place a new gasket on the throttle body.



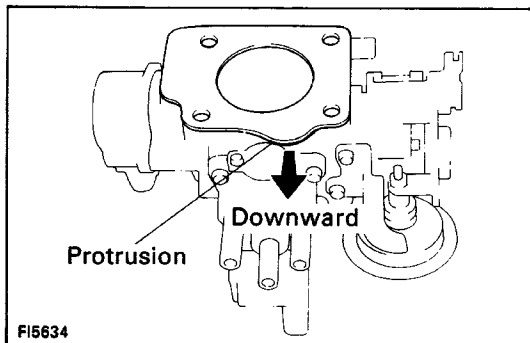
(b) Install the IAC valve with the four screws.



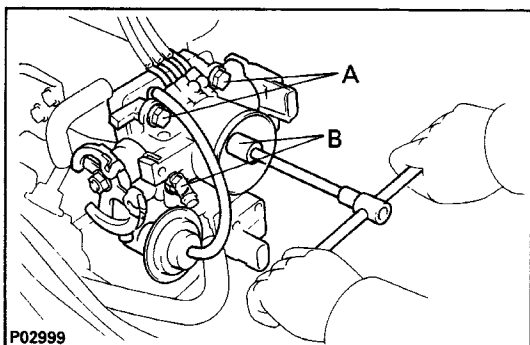
2. INSTALL THROTTLE BODY

(a) Connect the following hoses to the throttle body:

- (1) Water by-pass hose to water outlet
- (2) Water by-pass hose to water by-pass pipe
- (3) Air hose to air tube



(b) Place a new gasket on the throttle body, facing the protrusion downward.



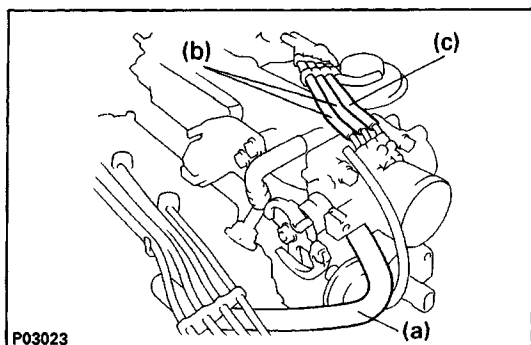
(c) Install the throttle body with the four bolts.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

HINT: Each bolt is indicated in the illustration.

Bolt length: A 45 mm (1.77 in.)

B 55 mm (2.17 in.)

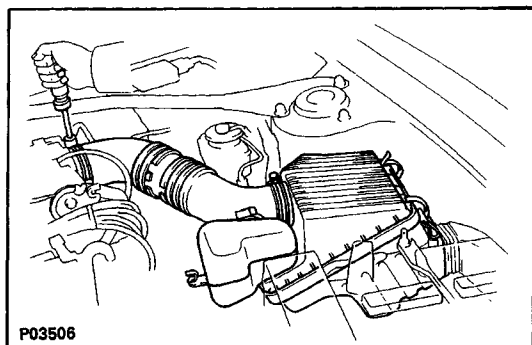


3. CONNECT HOSES TO THROTTLE BODY

- (a) PCV hose
- (b) Two vacuum hoses to EGR vacuum modulator
- (c) Vacuum hose to EGR VSV

4. CONNECT IAC VALVE CONNECTOR

5. CONNECT THROTTLE POSITION SENSOR CONNECTOR



6. INSTALL AIR CLEANER CAP AND AIR CLEANER HOSE

- (a) Connect the air- cleaner hose to the throttle body.
- (b) Install the air cleaner cap together with the resonator and air cleaner hose.
- (c) Connect the air intake temperature sensor connector.
- (d) Connect the cruise control actuator cable to the clamp on the resonator.

7. CONNECT ACCELERATOR CABLE, AND ADJUST IT

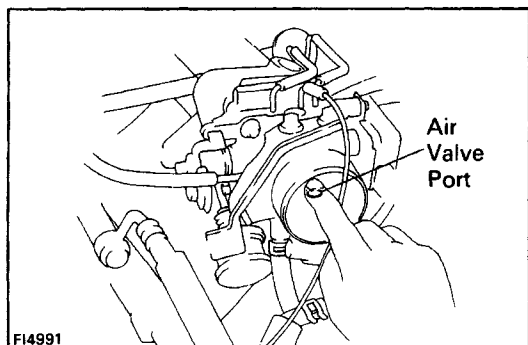
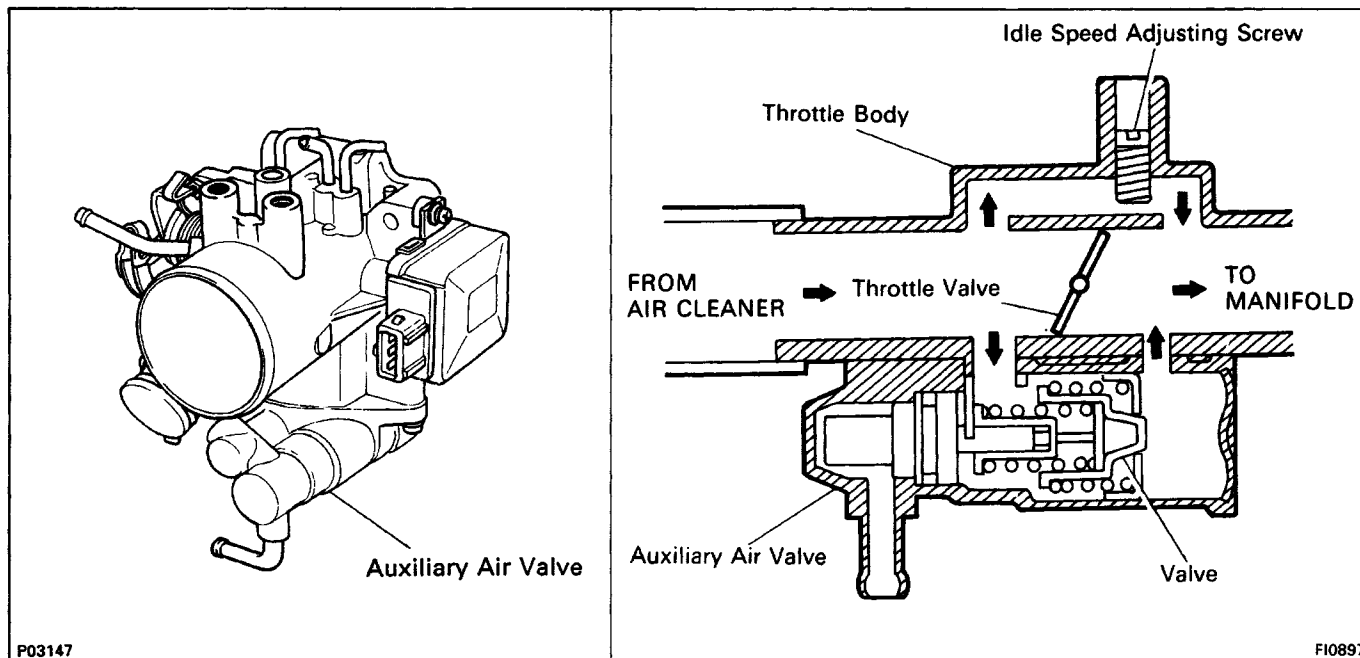
8. (A/T)

CONNECT THROTTLE CABLE, AND ADJUST IT

9. FILL WITH ENGINE COOLANT (See page CO-6)

10. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Auxiliary Air Valve (4A-FE)



ON-VEHICLE INSPECTION

1. DISCONNECT AIR CLEANER HOSE FROM THROTTLE BODY

2. INSPECT AIR VALVE OPERATION

Check the engine RPM by closing the air valve port on the throttle body.

At low temp. (Engine coolant temp.: below 80°C (176°F))

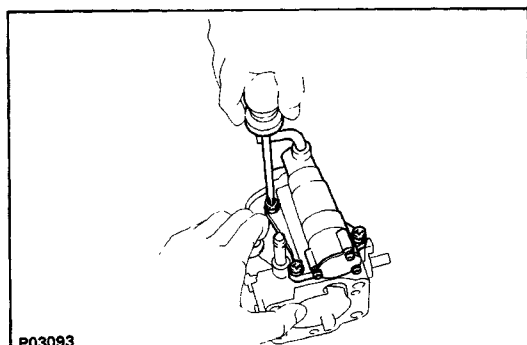
- When the air valve port is closed, the engine RPM should drop.

After warm up

- When the air valve port is closed, engine RPM should not drop more than 50 rpm.

If operation is not as specified, replace the auxiliary air valve.

3. RECONNECT AIR CLEANER HOSE TO THROTTLE BODY



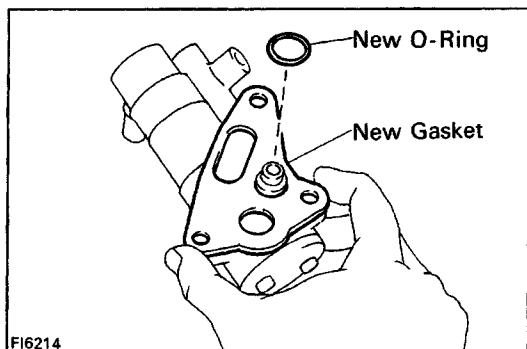
REMOVAL OF AUXILIARY AIR VALVE

1. REMOVE THROTTLE BODY

(See steps 1 to 9 on pages [FI-188](#) and 189)

2. REMOVE AUXILIARY AIR VALVE FROM THROTTLE BODY

Remove the four screws, air valve, gasket and O-ring.

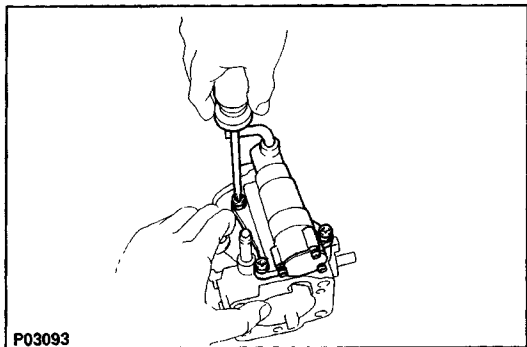


INSTALLATION OF AUXILIARY AIR VALVE

1. INSTALL AUXILIARY AIR VALVE

(a) Place a new gasket and O-ring on the auxiliary air valve.

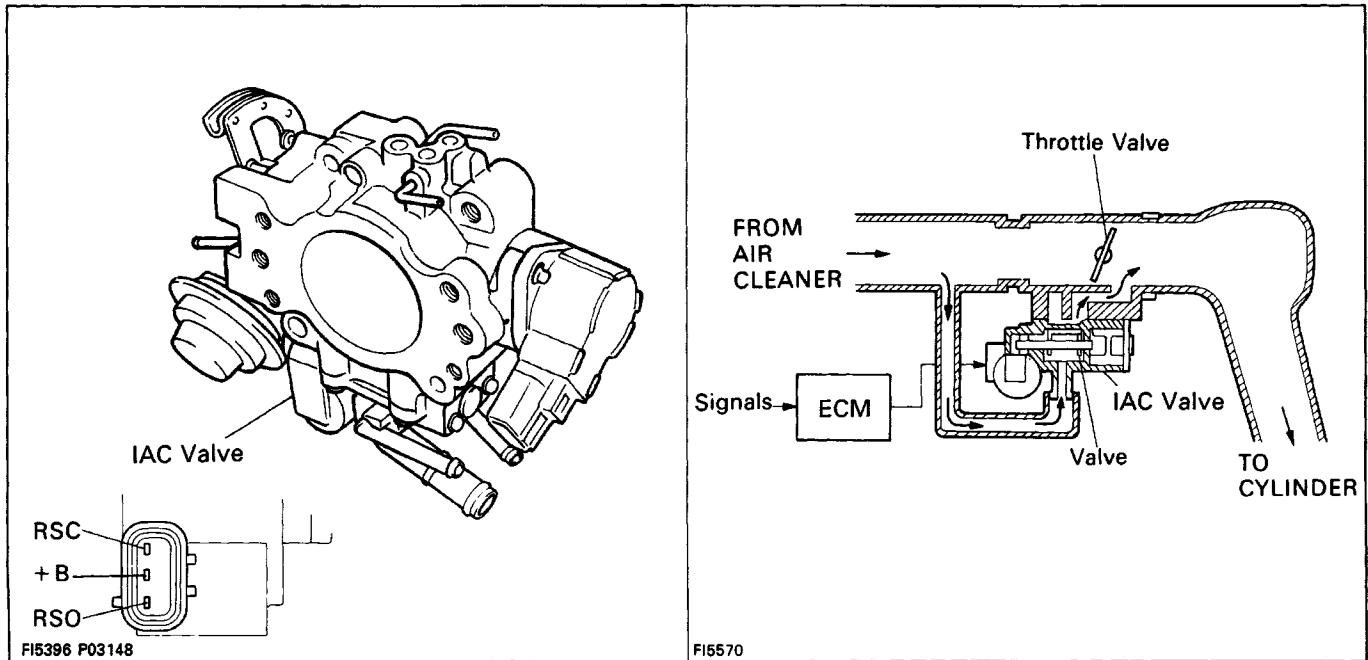
(b) Install the air valve with the three screws.



2. INSTALL THROTTLE BODY

(See steps 2 to 10 on page [FI-191](#))

Idle Air Control (IAC) Valve (3S-GTE)

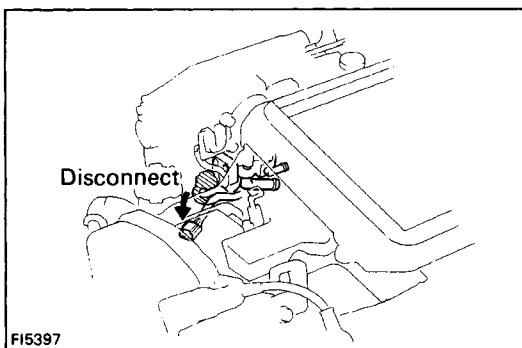


ON-VEHICLE INSPECTION

1. INSPECT IAC VALVE OPERATION

(a) Initial conditions:

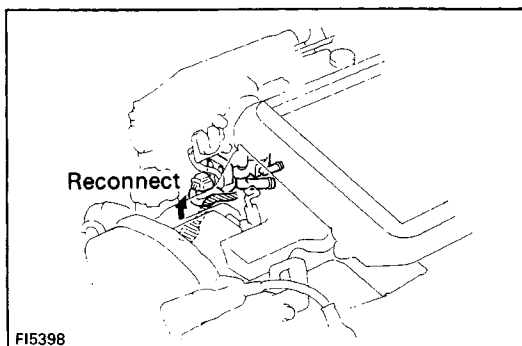
- Engine at normal operating temperature
- Idle speed set correctly



(b) Disconnect the IAC valve connector.

(c) Check the engine rpm.

Engine rpm: 1,000 rpm or more

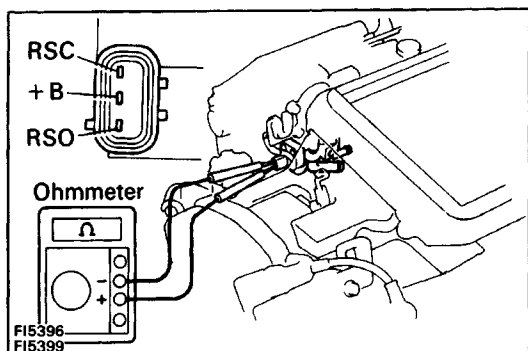


(d) Reconnect the IAC valve connector.

(e) Check that they return to the idle speed.

Idle speed: 800 + 50 rpm

If the rpm operation is not as specified, check the IAC valve, wiring and ECM.



2. INSPECT IAC VALVE RESISTANCE

- (a) Disconnect the IAC valve connector.
- (b) Using an ohmmeter, measure the resistance between terminal + B and other terminals (RSC, RSO).

Resistance: 19.3 – 22.3

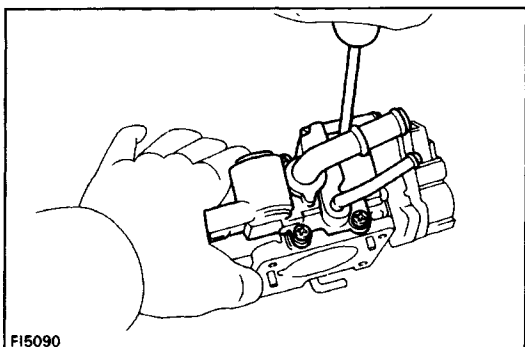
If resistance is not as specified, replace the IAC valve.

- (c) Reconnect the IAC valve connector.

REMOVAL OF IAC VALVE

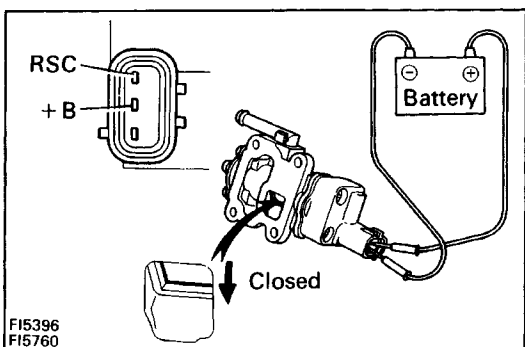
1. REMOVE THROTTLE BODY

(See steps 1 to 11 on pages [FI-194](#) and [195](#))



2. REMOVE IAC VALVE

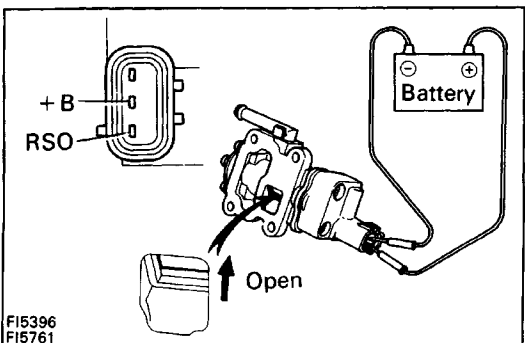
Remove the four screws, IAC valve and gasket.



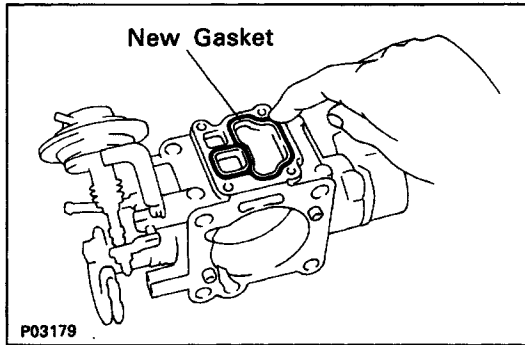
INSPECTION OF IAC VALVE

INSPECT IAC VALVE OPERATION

- (a) Connect the positive (+) lead from the battery to terminal + B and negative (-) lead to terminal RSC, and check that the valve is closed.



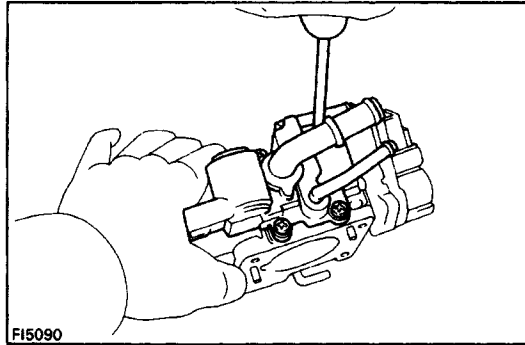
- (b) Connect the positive (+) lead from the battery to terminal + B and negative (-) lead to terminal RSO, and check that the valve is open.



INSTALLATION OF IAC VALVE

1. INSTALL IAC VALVE

(a) Place a new gasket on the throttle body.

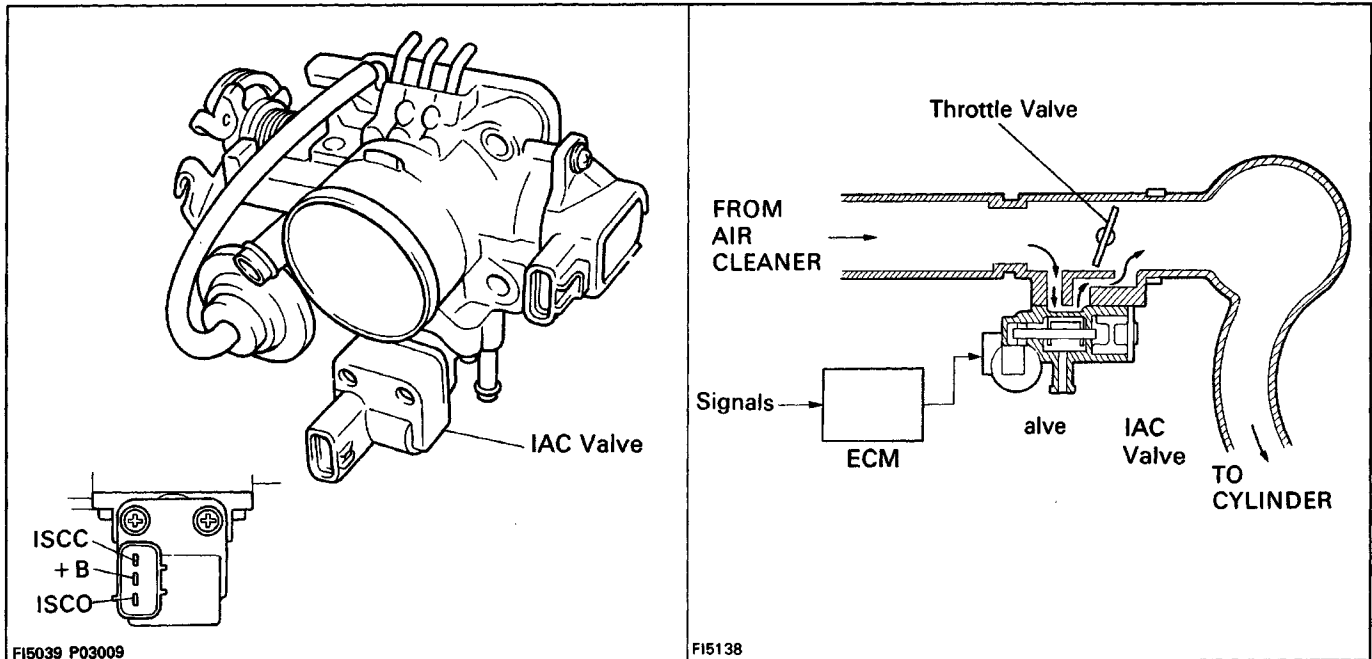


(b) Install the IAC valve with the four screws.

2. INSTALL THROTTLE BODY

(See steps 2 to 12 on pages [FI-197](#) and [198](#))

Idle Air Control (IAC) Valve (5S-FE)

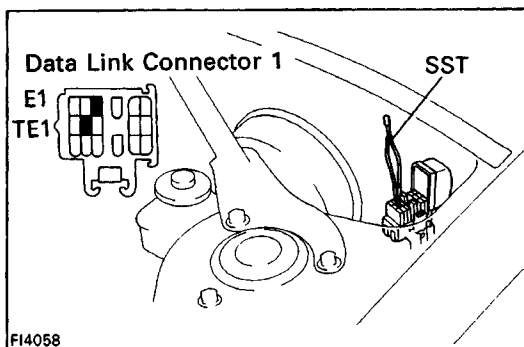


ON-VEHICLE INSPECTION

1. INSPECT IAC VALVE OPERATION

(a) Initial conditions:

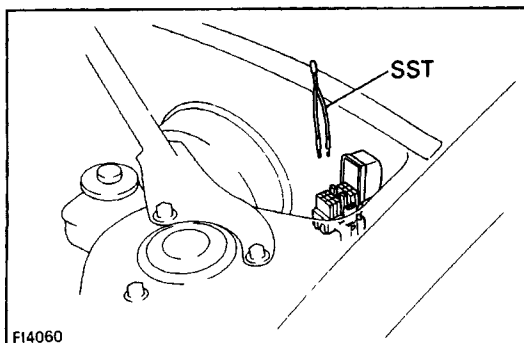
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position



(b) Using SST, connect terminals TE1 and E1 of the data link connector 1.

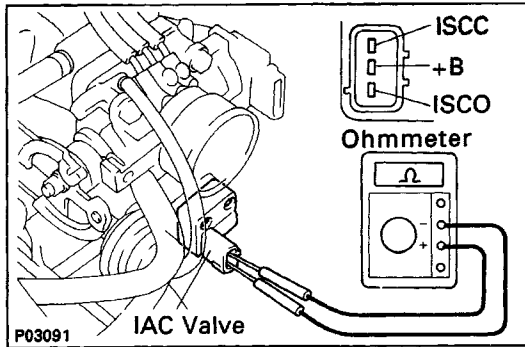
SST 09843-18020

(c) After engine rpm are kept at 900 – 1,300 rpm for 5 seconds, check that they return to idle speed. If the rpm operation is not as specified, check the IAC valve, wiring and ECM.



(d) Remove SST.

SST 09843-18020



2. INSPECT IAC VALVE RESISTANCE

- (a) Disconnect the IAC valve connector.
- (b) Using an ohmmeter, measure the resistance between terminal + B and other terminals (ISCC, ISCO).

Resistance: 19.3 – 22.3

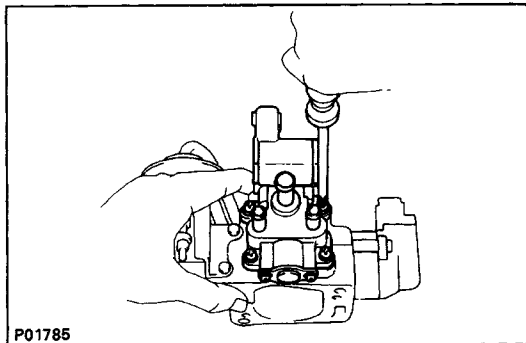
If resistance is not as specified, replace the IAC valve.

- (e) Reconnect the IAC valve connector.

REMOVAL OF IAC VALVE

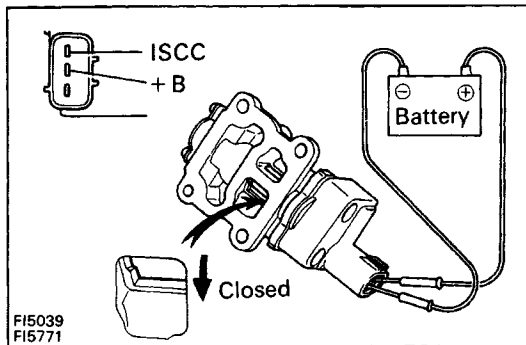
1. REMOVE THROTTLE BODY

(See steps 1 to 9 on pages [FI-201](#) and [202](#))



2. REMOVE IAC VALVE

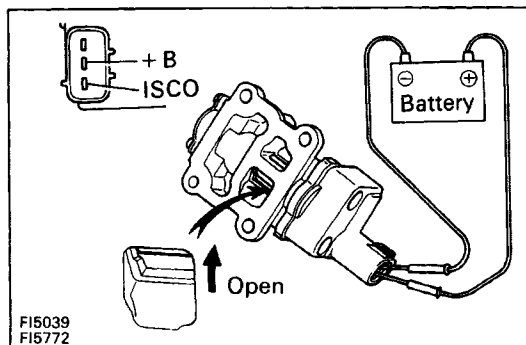
Remove the four screws, IAC valve and gasket.



INSPECTION OF IAC VALVE

INSPECT IAC VALVE OPERATION

- (a) Connect the positive (+) lead from the battery to terminal + B and negative (-) lead to terminal ISCC, and check that the valve is closed.

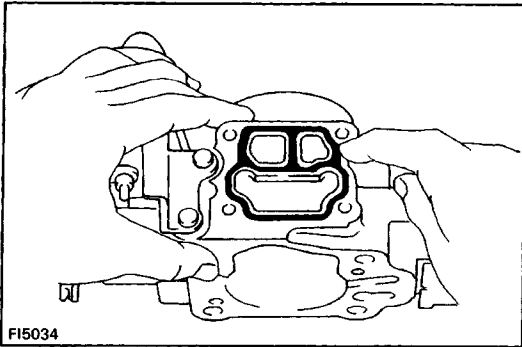


- (b) Connect the positive (+) lead from the battery to terminal + B and negative (-) lead to terminal ISCO, and check that the valve is open.

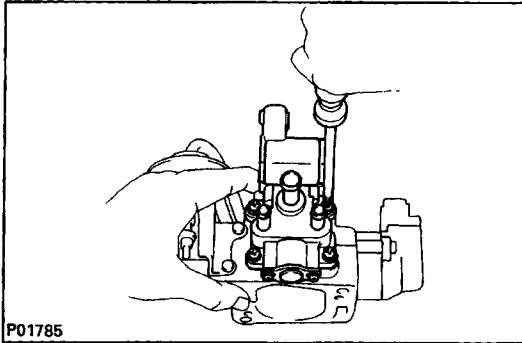
INSTALLATION OF IAC VALVE

9. INSTALL IAC VALVE

(a) Place a new gasket on the throttle body.



(b) Install the IAC valve with the four screws.



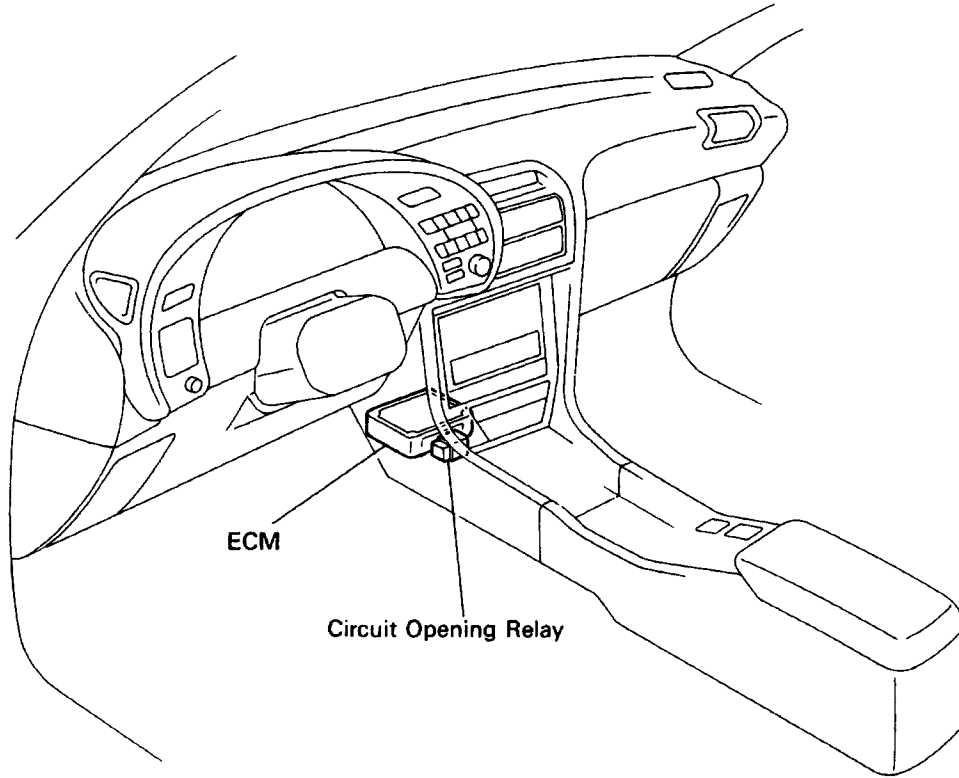
2. INSTALL THROTTLE BODY

(See steps 2 to 10 on pages [FI-204](#) and 205)

ELECTRONIC CONTROL SYSTEM

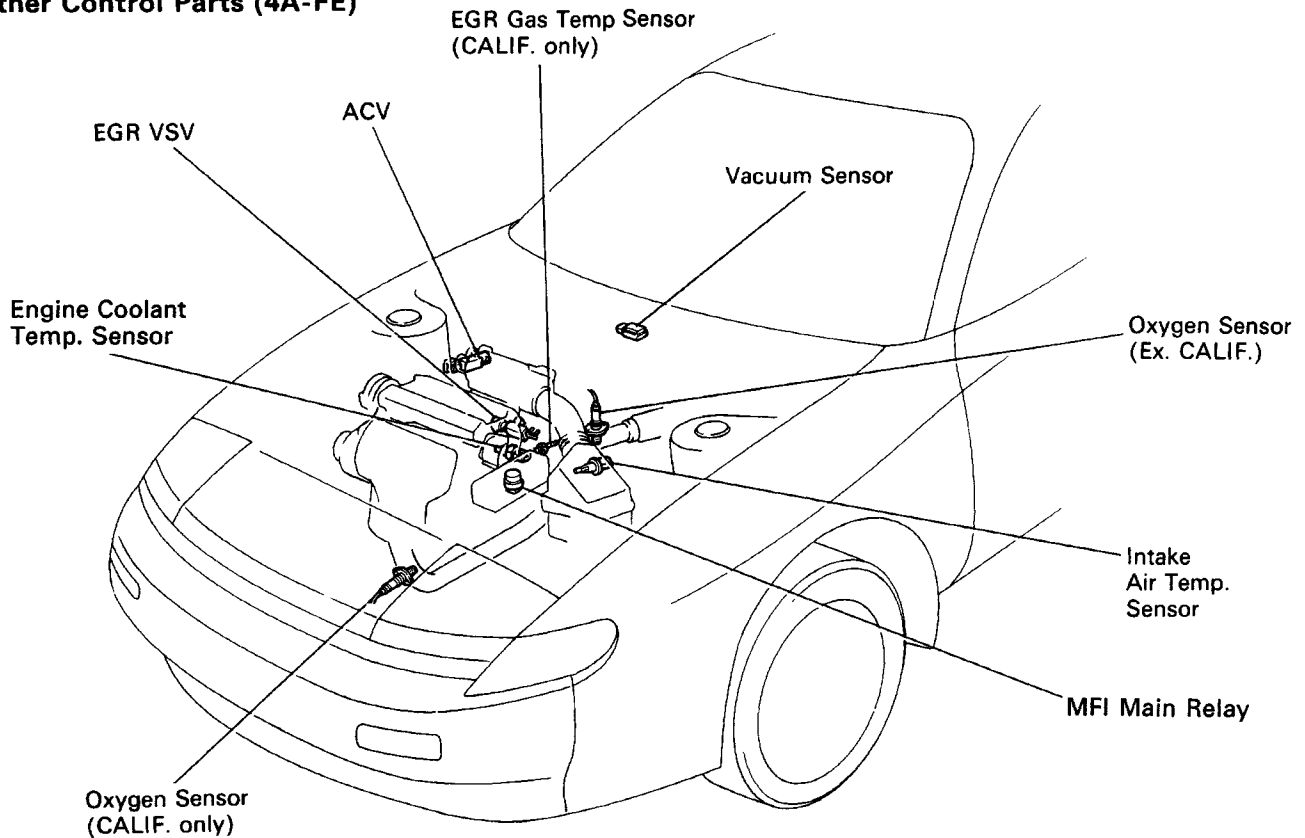
Location of Electronic Control Parts

ECM and Circuit Opening Relay



FI5450

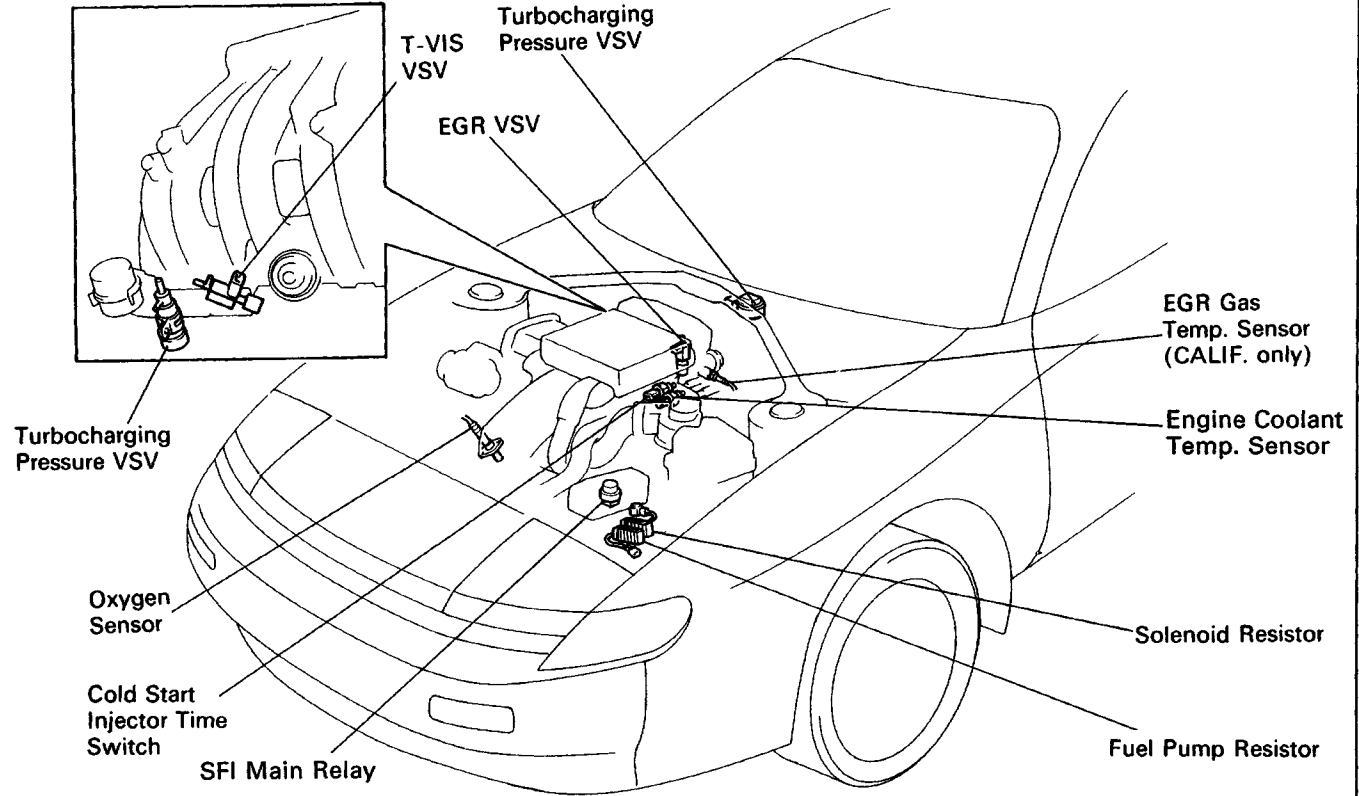
Other Control Parts (4A-FE)



FI6189

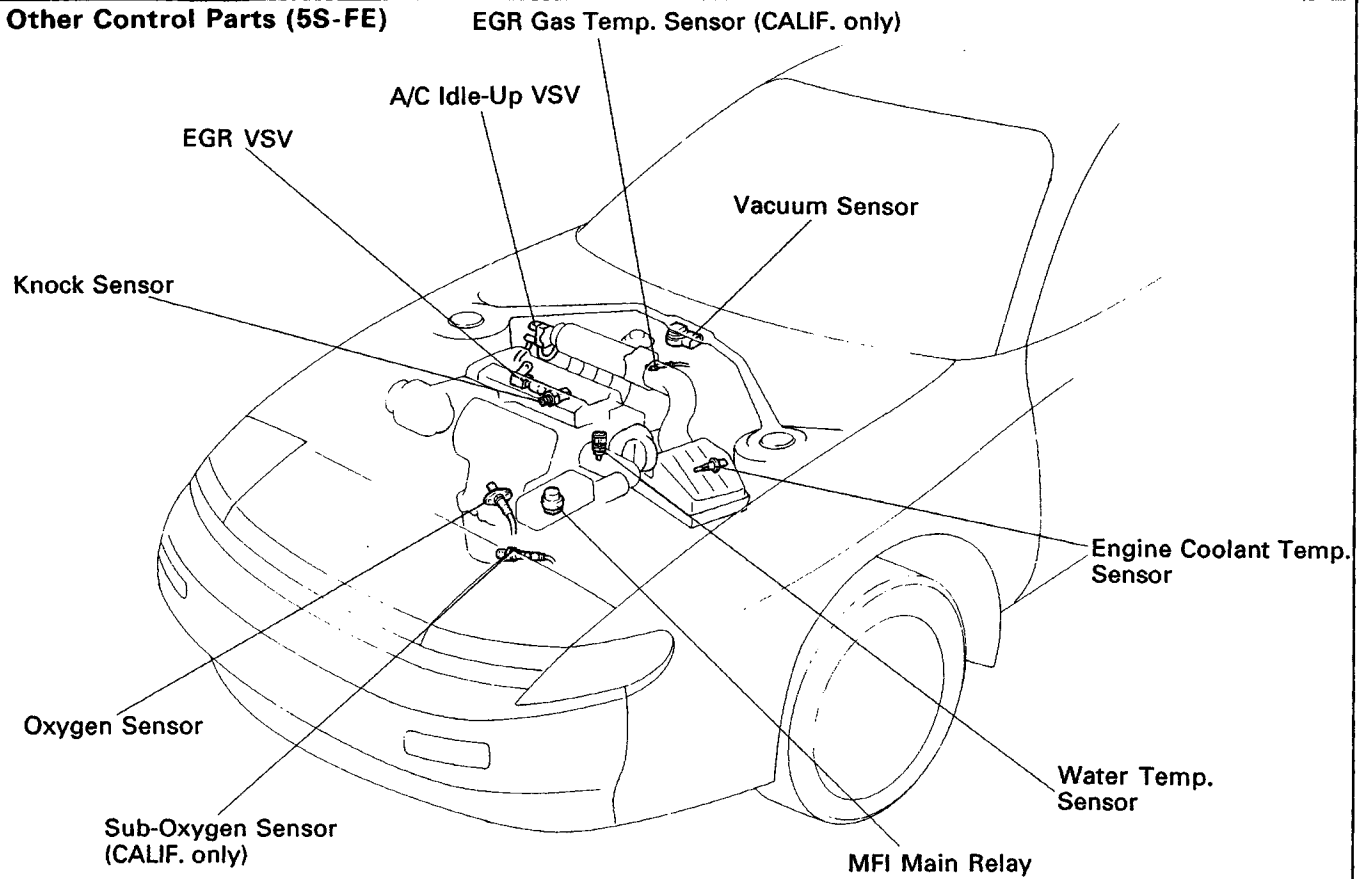
Location of Electronic Control Parts (Cont'd)

Other Control Parts (3S-GTE)



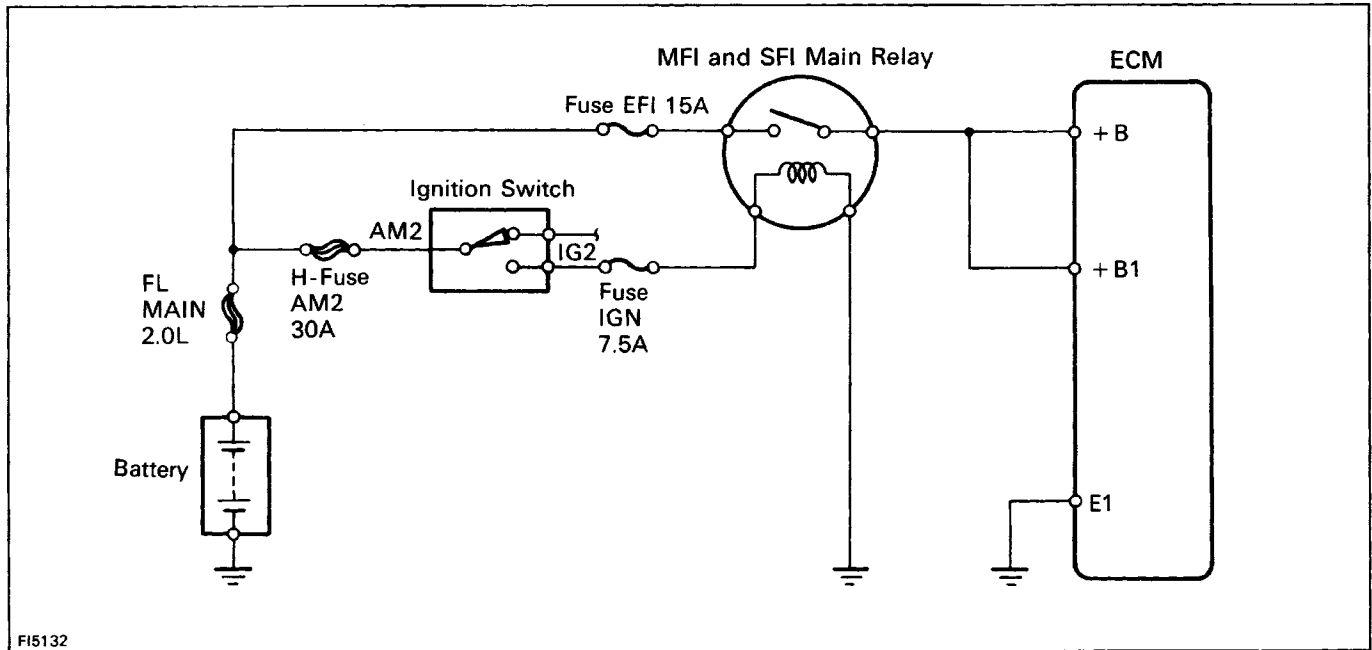
P03180

Other Control Parts (5S-FE)

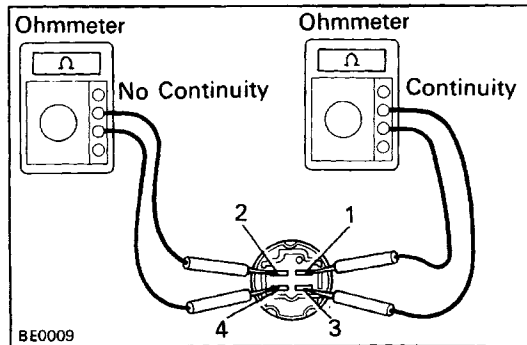


P03019

MFI and SFI Main Relay



FI5132



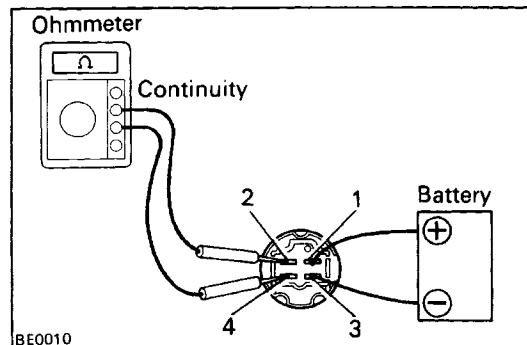
BE0009

INSPECTION OF MFI AND SFI MAIN RELAY

1. INSPECT RELAY CONTINUITY

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.
- (b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



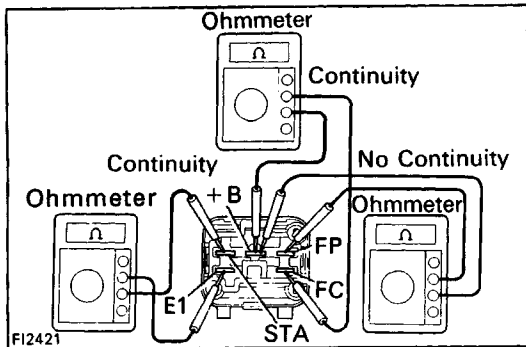
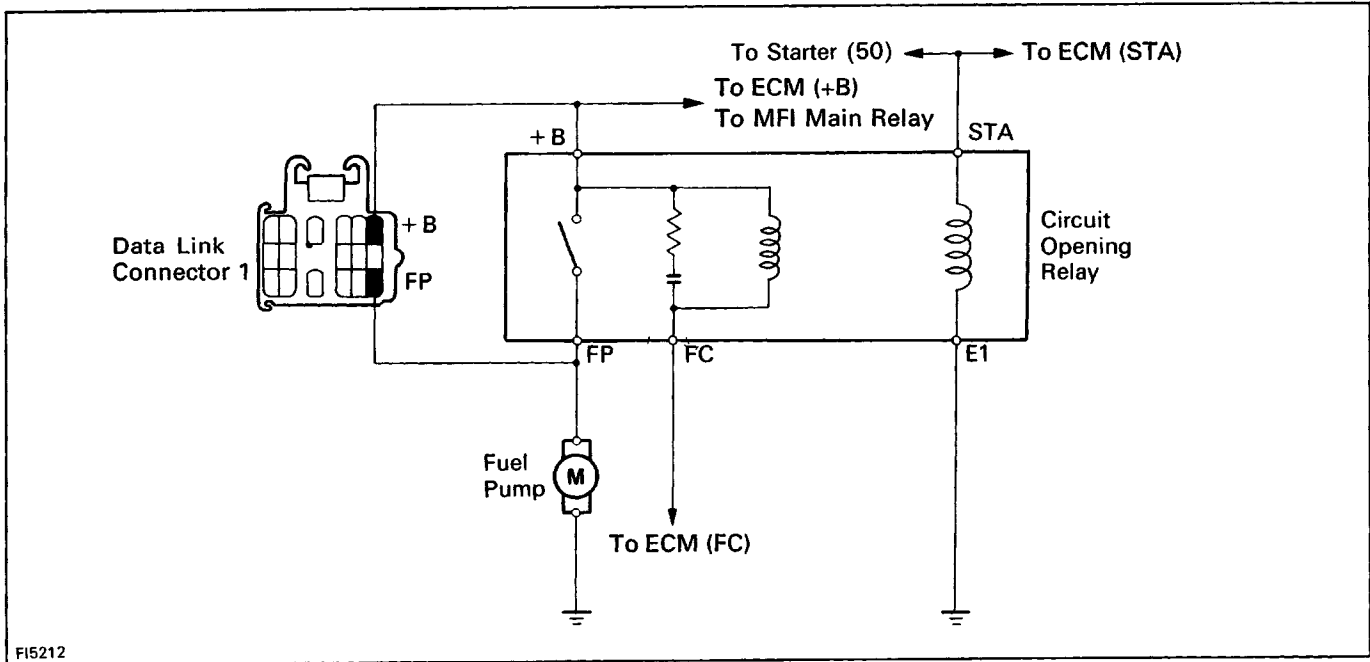
BE0010

2. INSPECT RELAY OPERATION

- (a) Apply battery voltage across terminals 1 and 3.
- (b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

Circuit Opening Relay (4A-FE and 5S-FE)

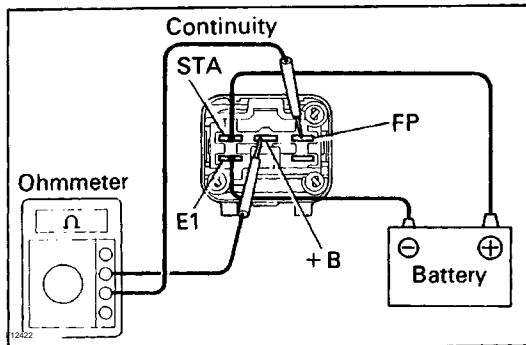


INSPECTION OF CIRCUIT OPENING RELAY

1. INSPECT RELAY CONTINUITY

- Using an ohmmeter, check that there is continuity between terminals STA and E1.
- Check that there is continuity between terminals + B and FC.
- Check that there is no continuity between terminals + B and FP.

If continuity is not as specified, replace the relay.

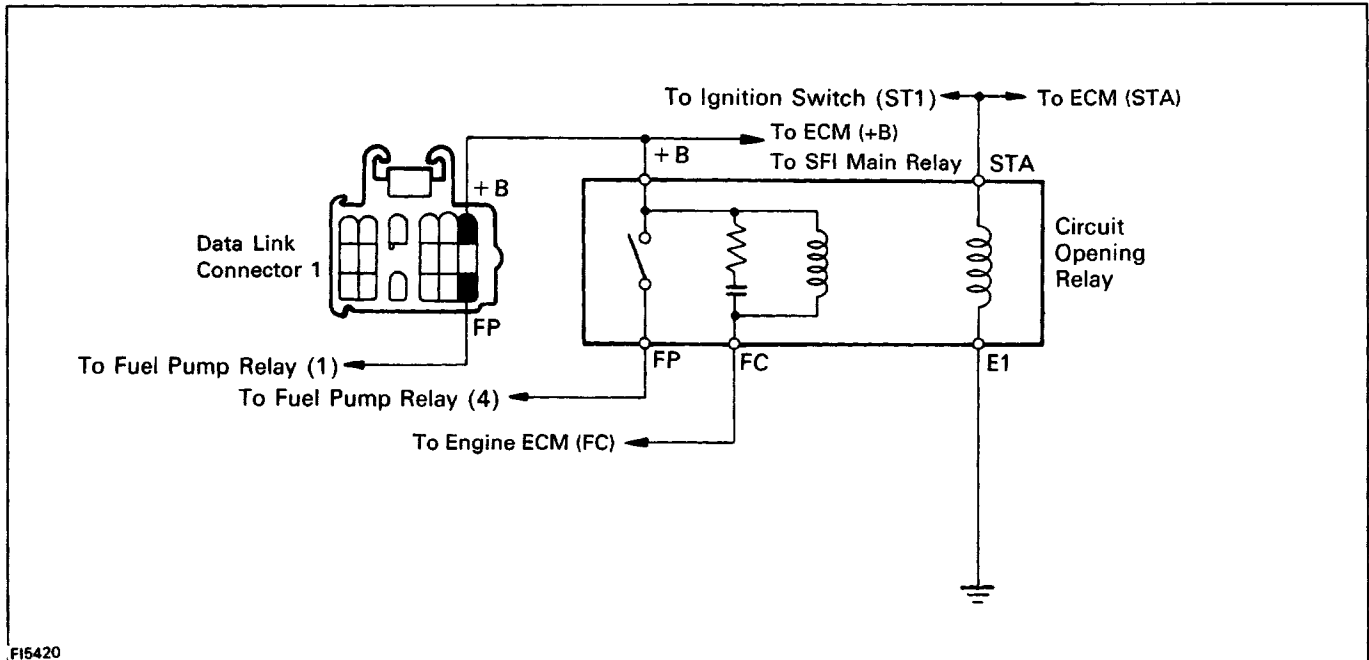


2. INSPECT RELAY OPERATION

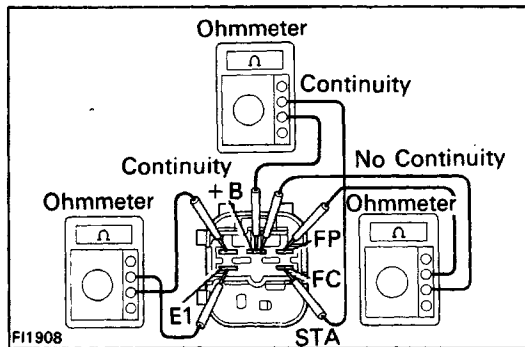
- Apply battery voltage across terminals STA and E1.
- Using an ohmmeter, check that there is continuity between terminals + B and FP.

If operation is not as specified, replace the relay.

Circuit Opening Relay (3S-GTE)



FI5420



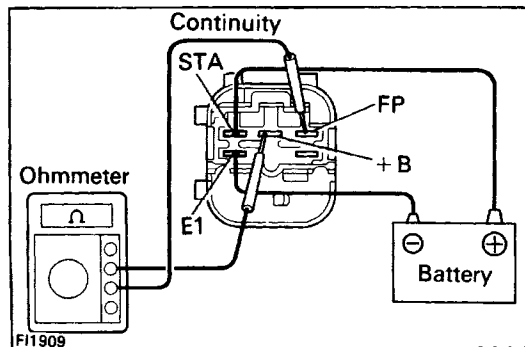
FI1908

INSPECTION OF CIRCUIT OPENING RELAY

1. INSPECT RELAY CONTINUITY

- (a) Using an ohmmeter, check that there is continuity between terminals STA and E1.
- (b) Check that there is continuity between terminals + B and FC.
- (c) Check that there is no continuity between terminals + B and FP.

If continuity is not as specified, replace the relay.

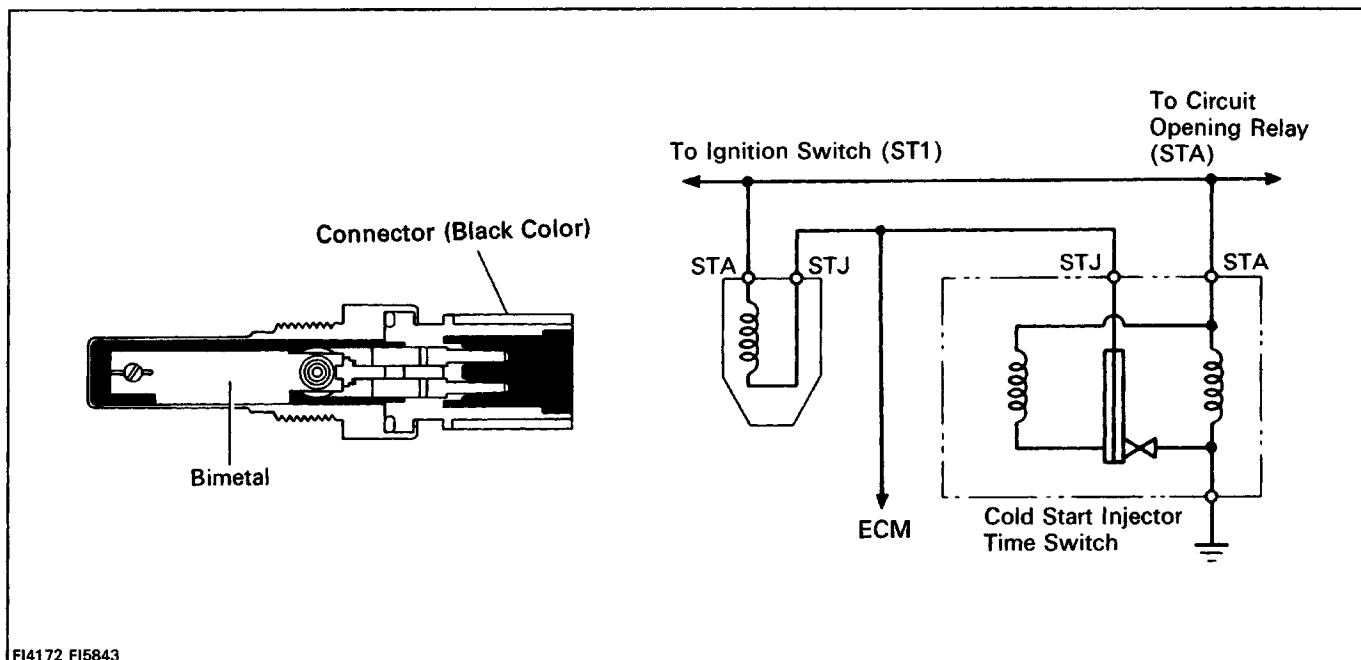


FI1909

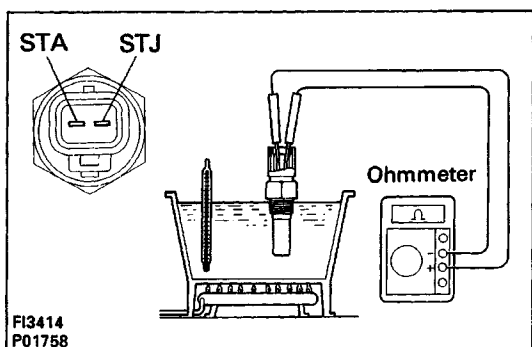
2. INSPECT RELAY OPERATION

- (a) Apply battery voltage across terminals STA and E1.
 - (b) Using an ohmmeter, check that there is continuity between terminals + B and FP.
- If operation is not as specified, replace the relay.

Cold Start Injector Time Switch (3S-GTE)



FI4172 FI5843



FI3414
P01758

INSPECTION OF COLD START INJECTOR TIME SWITCH

INSPECT RESISTANCE OF COLD START INJECTOR TIME SWITCH

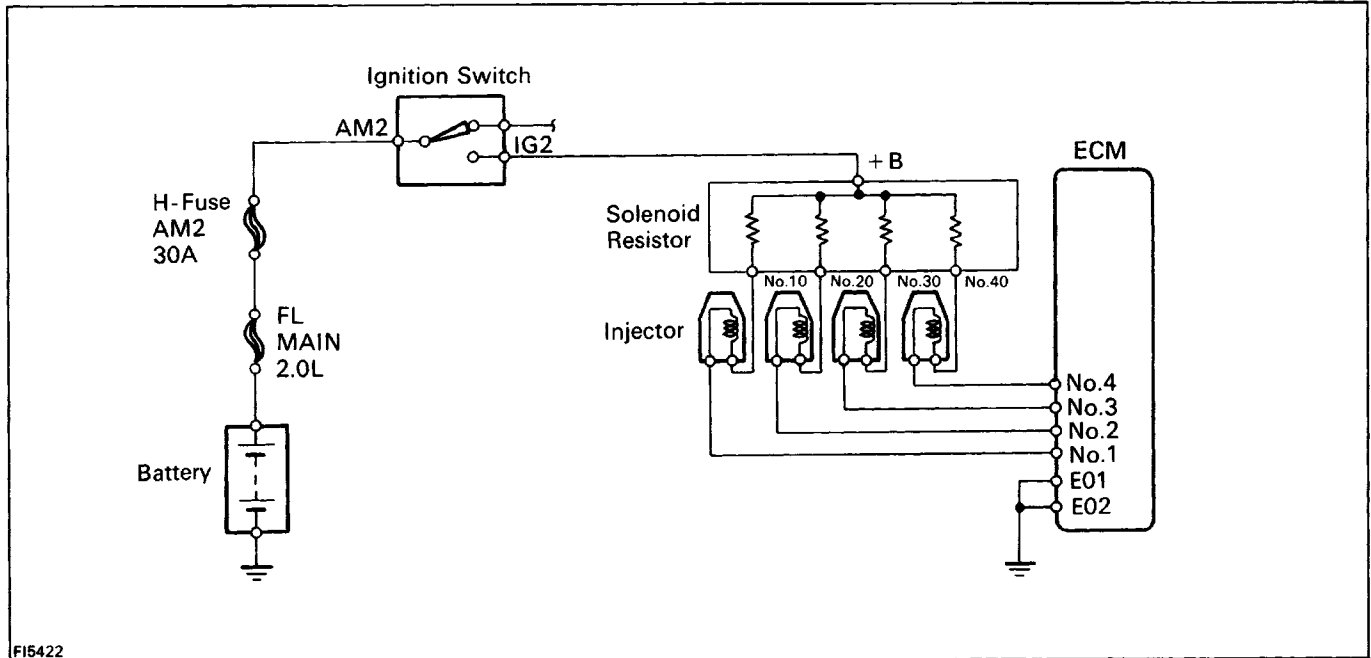
Using an ohmmeter, measure the resistance between each terminal.

Resistance:

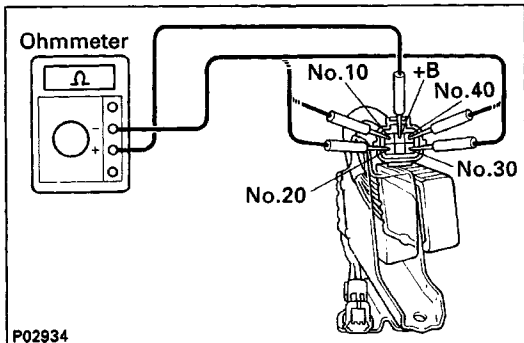
STA - STJ	30 - 50	below 10°C (50°F)
	70 - 90	above 25°C (77°F)
STA - Ground	30-90	

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

Solenoid Resistor (3S-GTE)



FI5422



P02934

INSPECTION OF SOLENOID RESISTOR

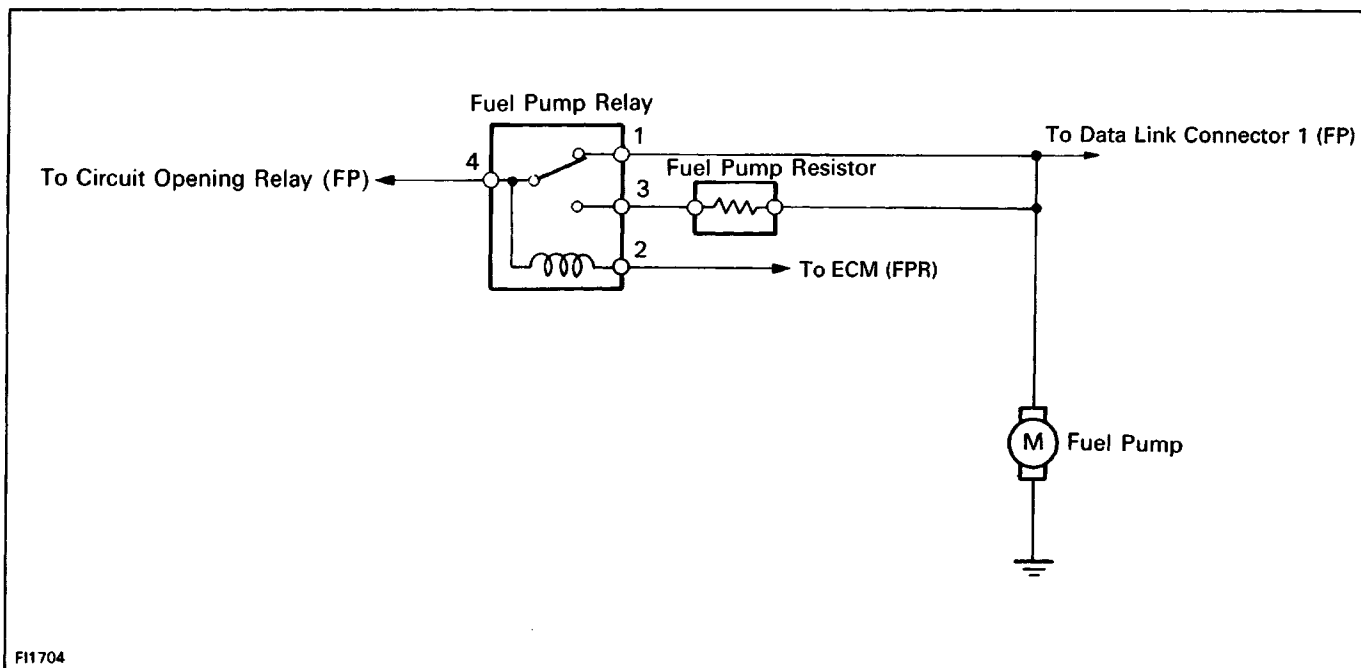
INSPECT SOLENOID RESISTOR

Using an ohmmeter, measure the resistance between terminal + B and other terminals.

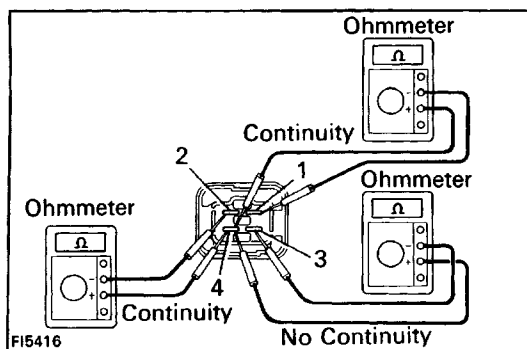
Resistance: 4 - 6

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

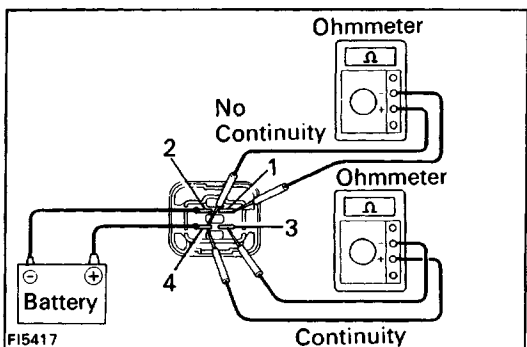
Fuel Pump Relay and Resistor (3S-GTE)



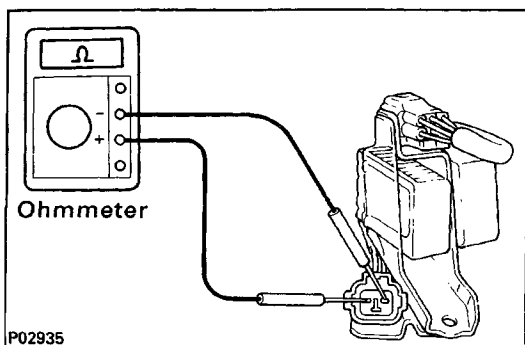
FI1704



FI5416



FI5417



P02935

INSPECTION OF FUEL PUMP RELAY AND RESISTOR

1. INSPECT FUEL PUMP RELAY

A. Inspect relay continuity

- Using an ohmmeter, check that there is continuity between terminals 2 and 4.
- Check that there is continuity between terminals 1 and 4.
- Check that there is no continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.

B. Inspect relay operation

- Apply battery voltage across terminals 2 and 4.
- Using an ohmmeter, check that there is no continuity between terminals 1 and 4.
- Check that there is continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.

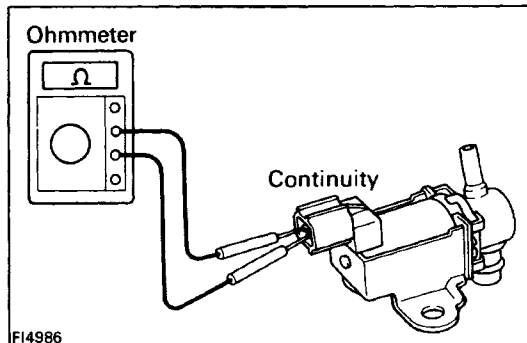
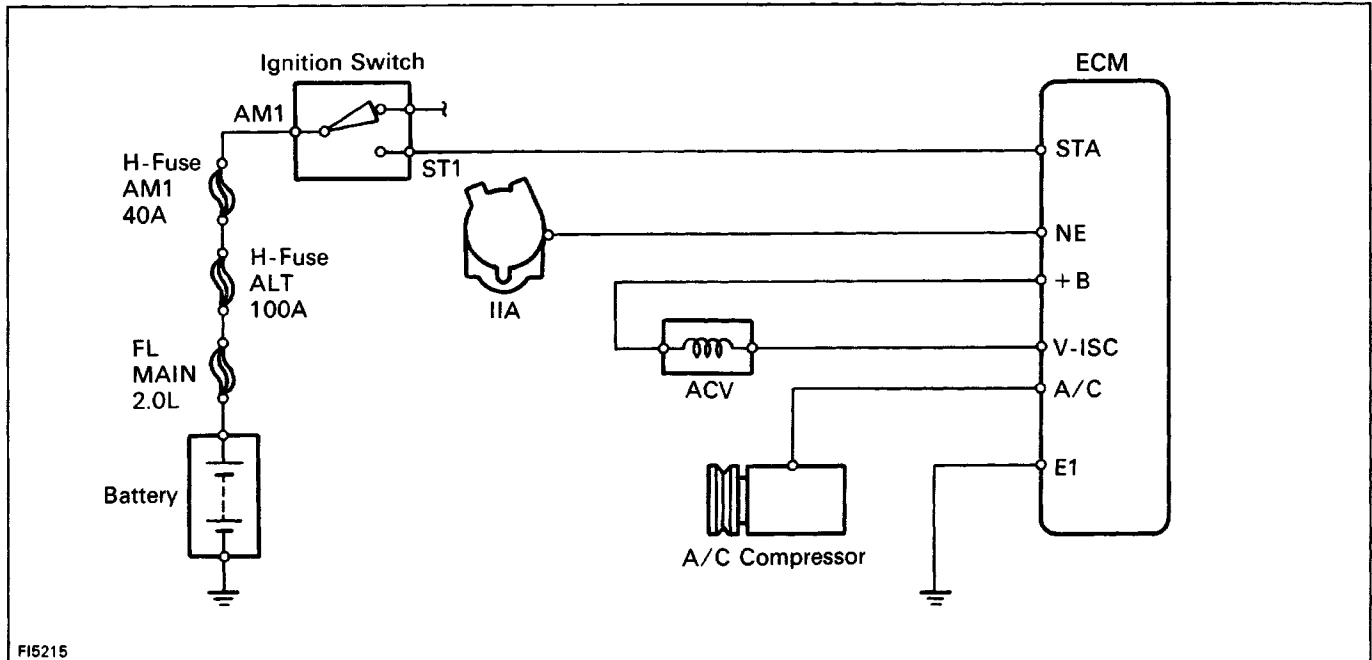
2. INSPECT FUEL PUMP RESISTOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Approx. 0.73

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

Air Control Valve (ACV) (4A-FE)



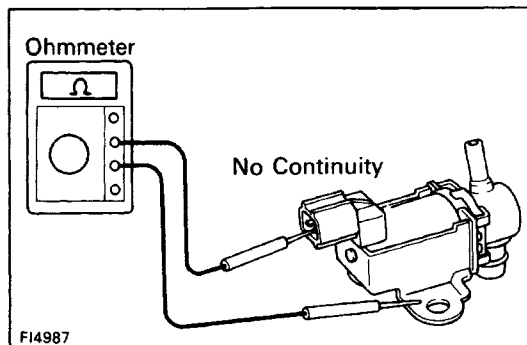
INSPECTION OF ACV

1. INSPECT ACV FOR OPEN CIRCUIT

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

Resistance (Cold): 27 – 33

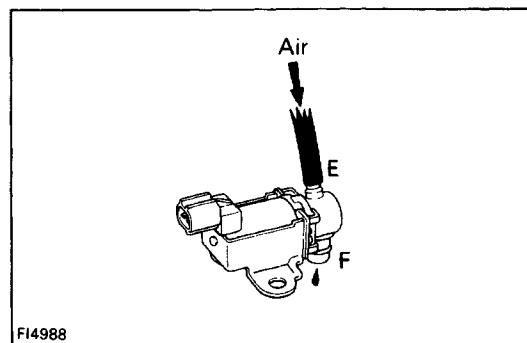
If there is no continuity, replace the ACV.



2. INSPECT ACV FOR GROUND

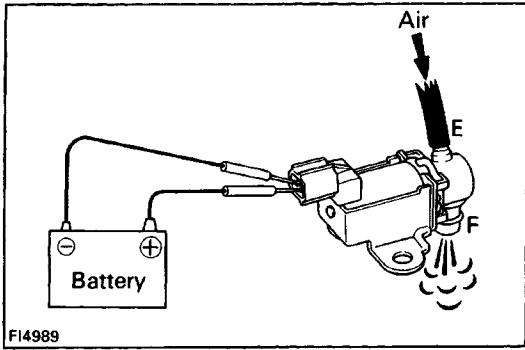
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the ACV.



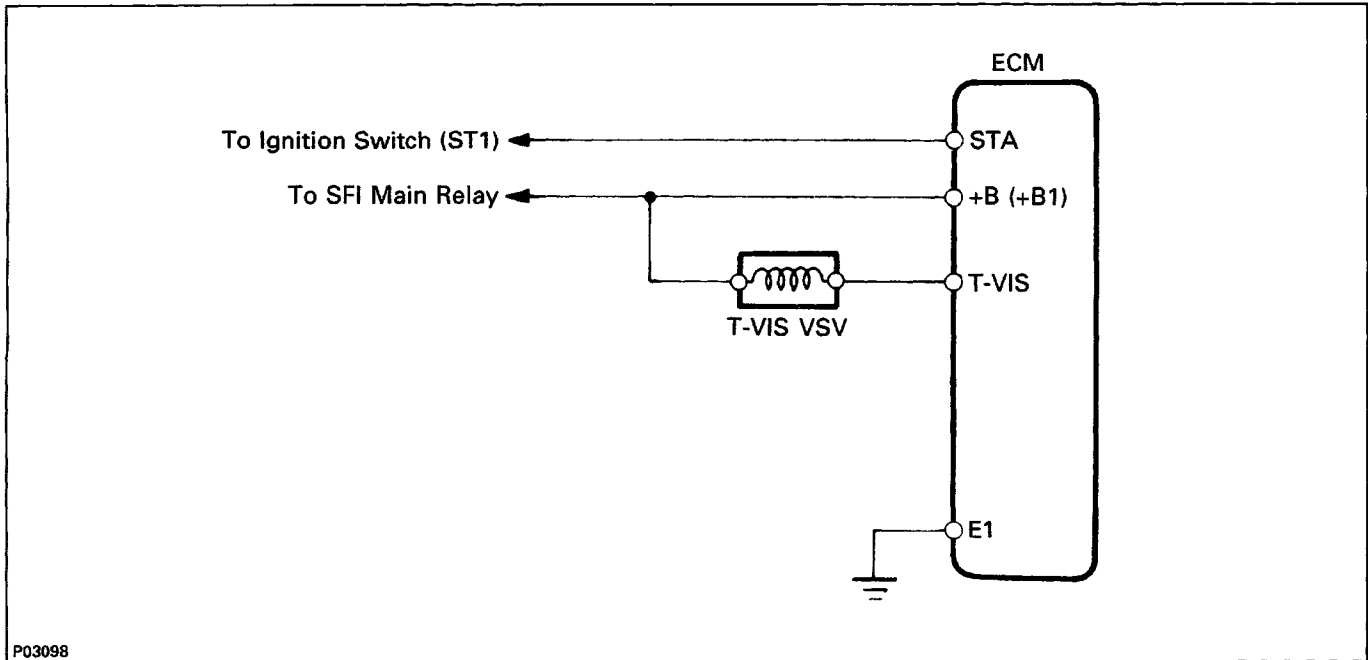
3. INSPECT ACV OPERATION

- (a) Check that the air does not flow from port E to port F.

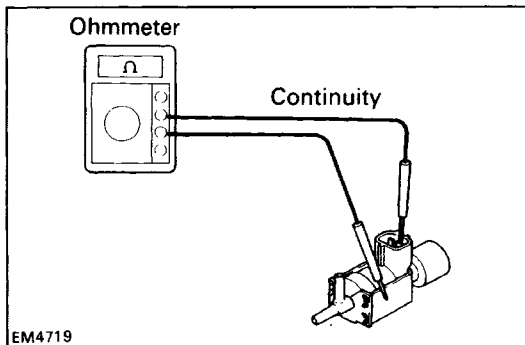


- (b) Apply battery voltage across the terminals.
- (c) Check that the air flows from port E to port F.
If operation is not as specified, replace the ACV.

T-VIS VSV (3S-GTE)



P03098



EM4719

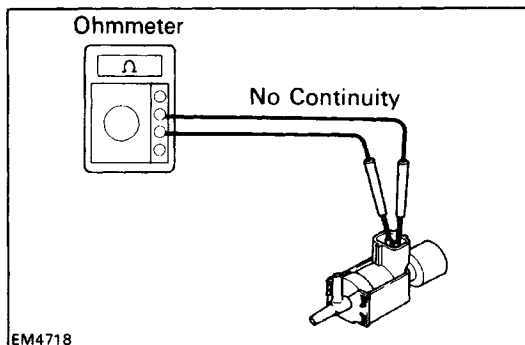
INSPECTION OF T-VIS VSV

1. INSPECT VSV FOR OPEN CIRCUIT

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

Resistance (Cold): 33 – 39

If there is no continuity, replace the VSV.

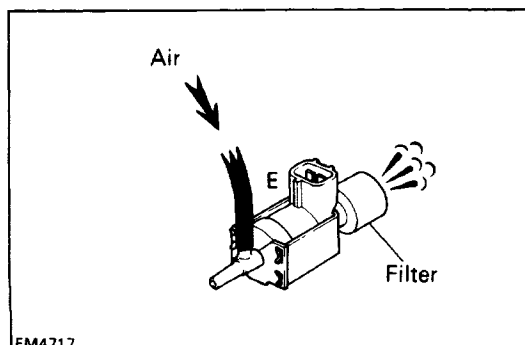


EM4718

2. INSPECT VSV FOR GROUND

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

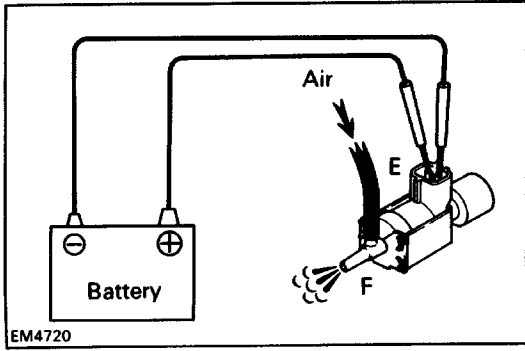
If there is continuity, replace the VSV.



EM4717

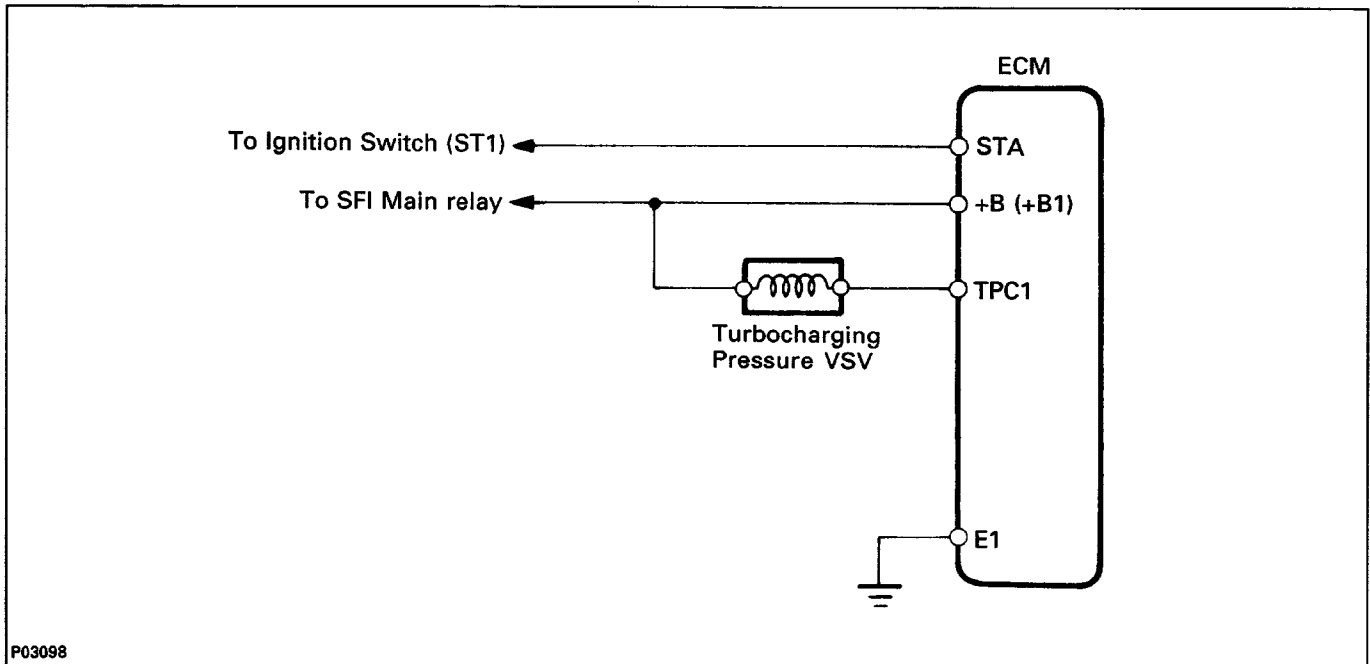
3. INSPECT VSV OPERATION

(a) Check that the air flows from port E to the filter.

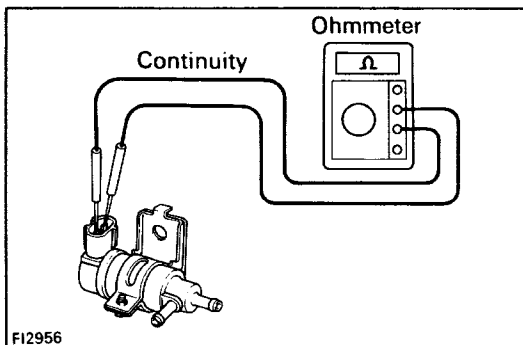


- (b) Apply battery voltage across the terminals.
- (c) Check that the air flows from port E to port F.
If operation is not as specified, replace the VSV.

Turbocharging Pressure VSV (3S-GTE)



P03098



FI2956

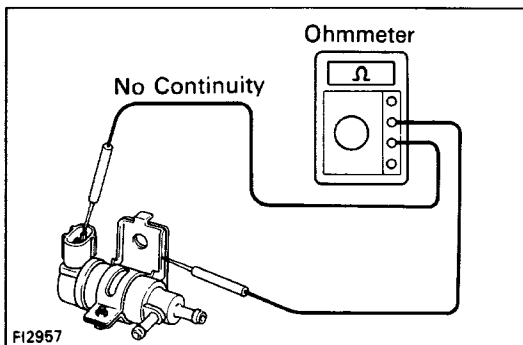
INSPECTION OF TURBOCHARGING PRESSURE VSV

1. INSPECT VSV FOR OPEN CIRCUIT

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

Resistance (Cold): 24 – 30

If there is no continuity, replace the VSV.

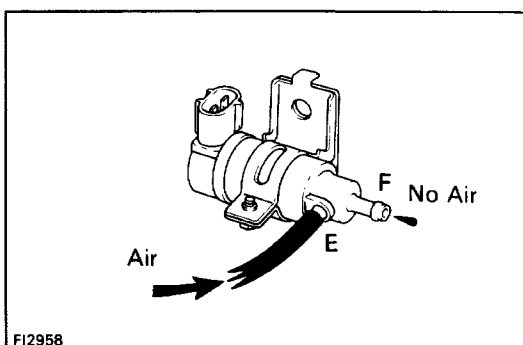


FI2957

2. INSPECT VSV FOR GROUND

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

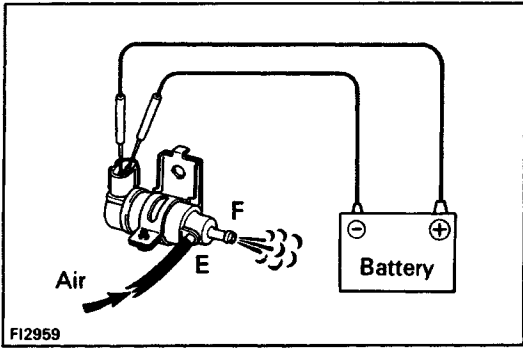
If there is continuity, replace the VSV.



FI2958

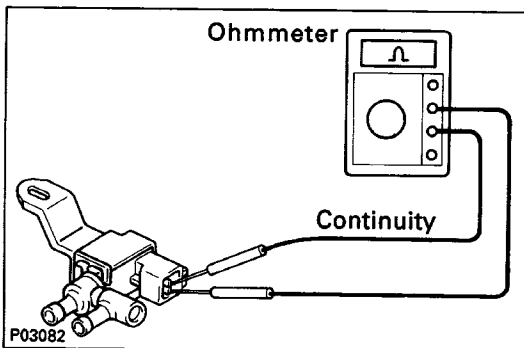
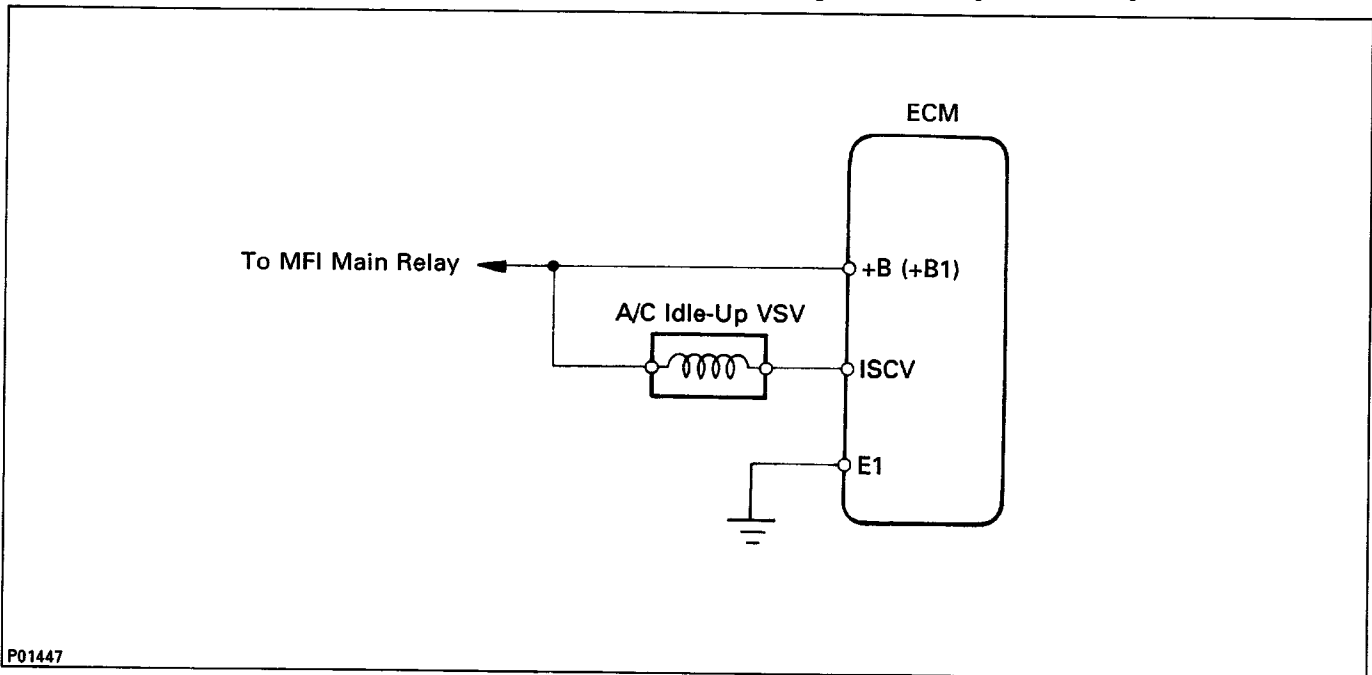
3. INSPECT VSV OPERATION

- (a) Check that the air does not flow from port E to port F.



- (b) Apply battery voltage across the terminals.
- (c) Check that the air flows from port E to port F.
If operation is not as specified, replace the VSV.

A/C Idle-Up VSV (5S-FE)



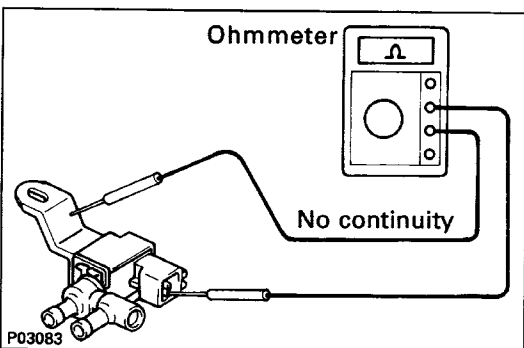
INSPECTION OF A/C IDLE-UP VSV

1. INSPECT VSV FOR OPEN CIRCUIT

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

Resistance (Cold): 30 - 34

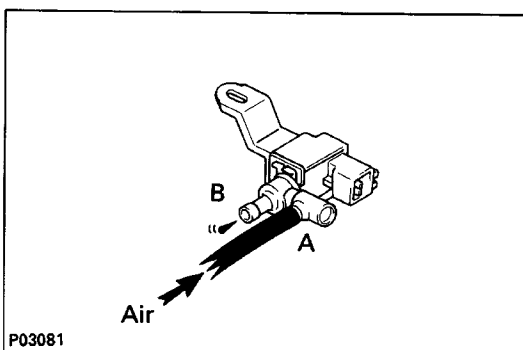
If there is no continuity, replace the VSV.



2. INSPECT VSV FOR GROUND

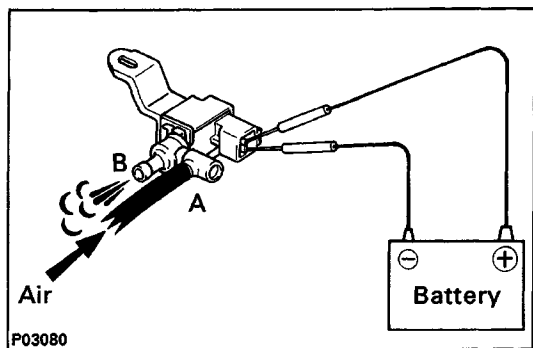
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



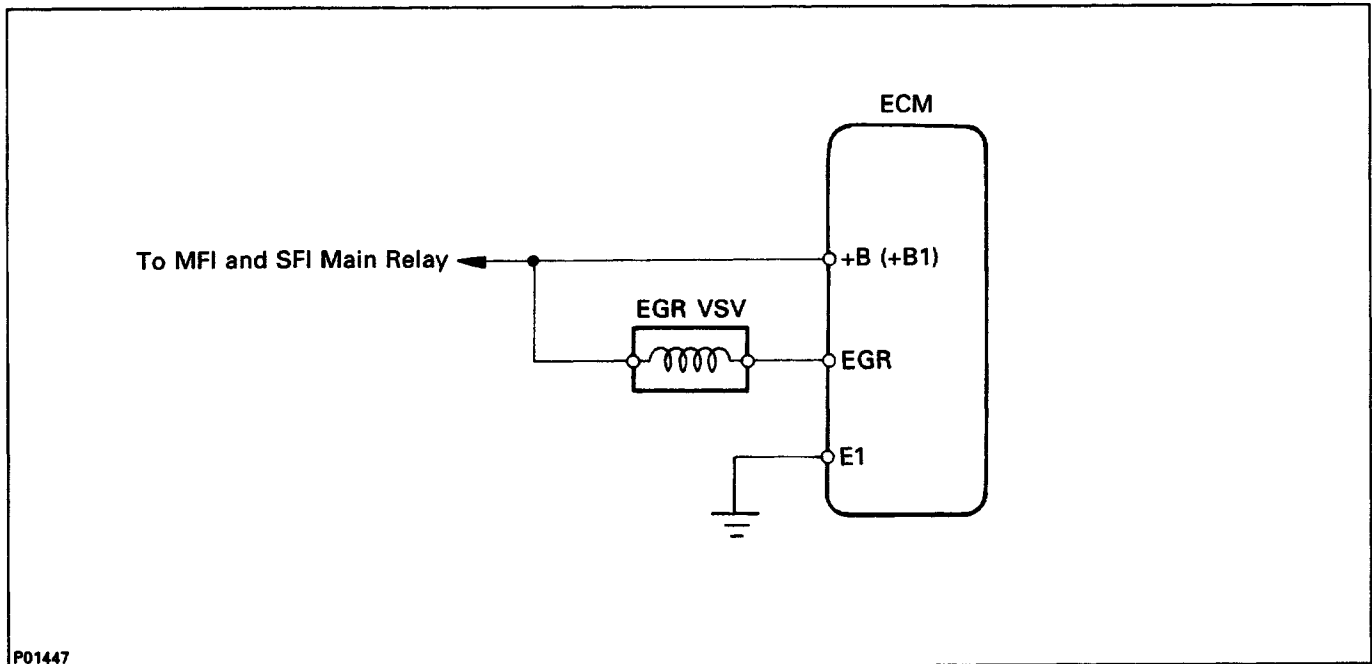
3. INSPECT VSV OPERATION

- (a) Check that the air does not flow from port A to port B.



- (b) Apply battery voltage across the terminals.
- (c) Check that the air- flows from port A to port B.
If operation is not as specified, replace the VSV.

EGR VSV



P01447

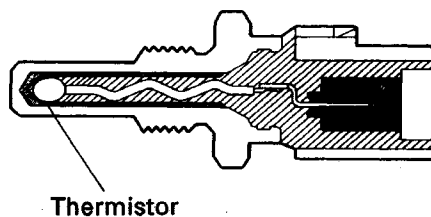
INSPECTION OF EGR VSV

4A-FE (See page [EC-11](#))

3S-GTE (See page [EC-23](#))

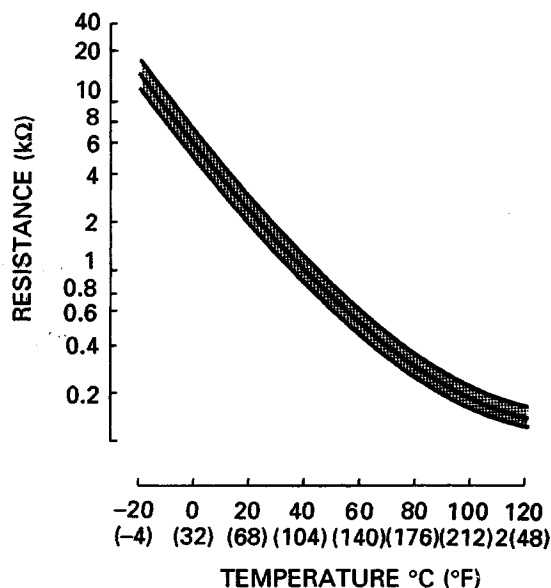
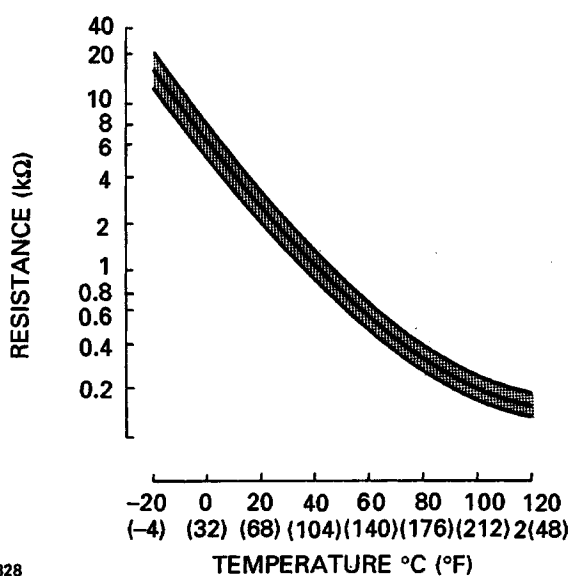
5S-FE (See page [EC-38](#))

Engine Coolant Temperature Sensor

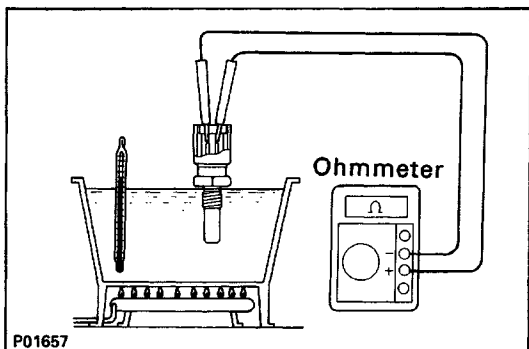


4A-FE

3S-GTE and 5S-FE



FI3828
P03525 P03524



P01657

INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR

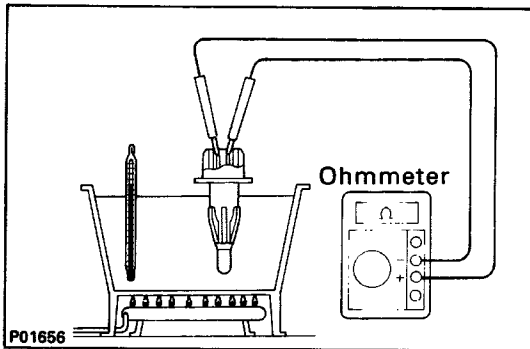
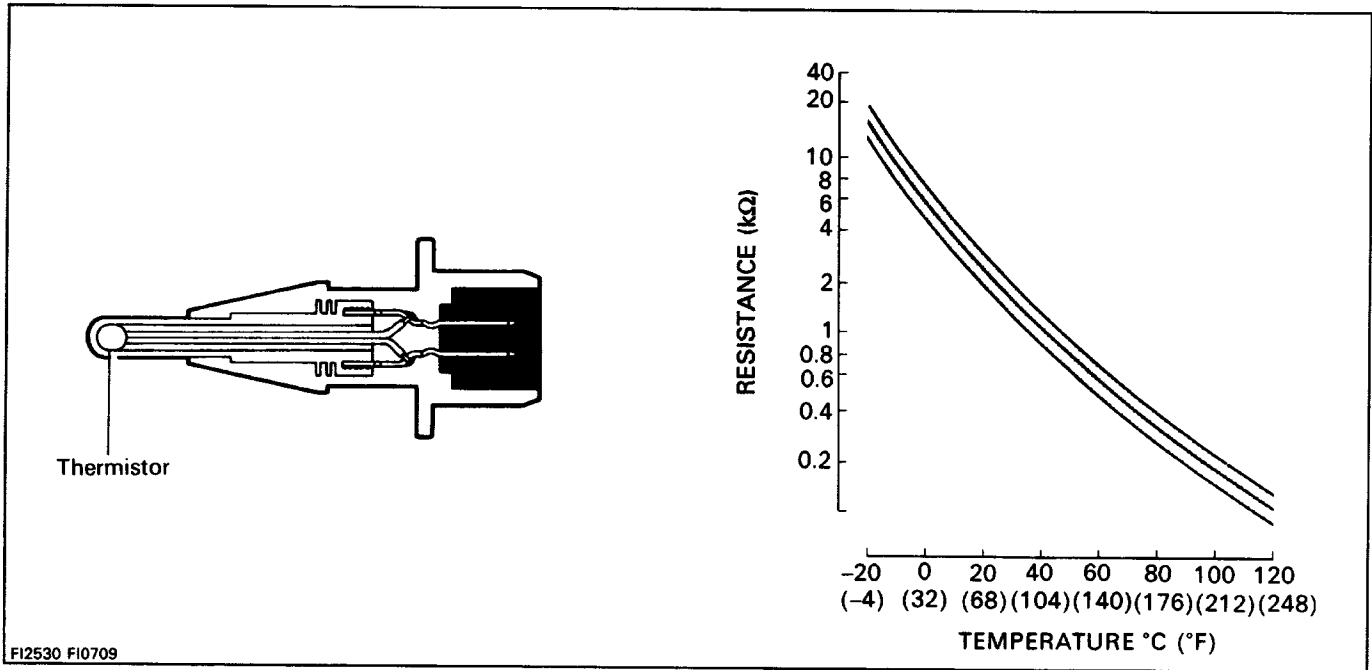
INSPECT RESISTANCE OF ENGINE COOLANT TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the chart above

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

Intake Air Temperature Sensor (4A-FE and 5S-FE)



INSPECTION OF INTAKE AIR TEMPERATURE SENSOR

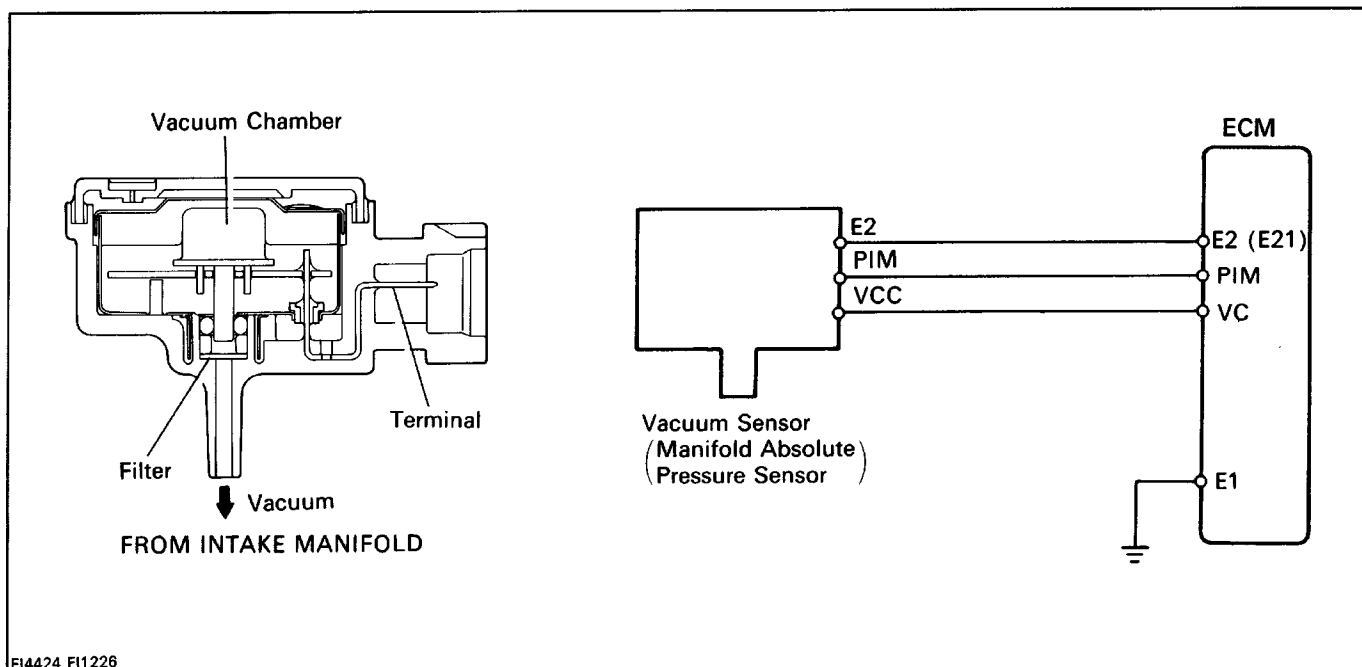
INSPECT RESISTANCE OF INTAKE AIR TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

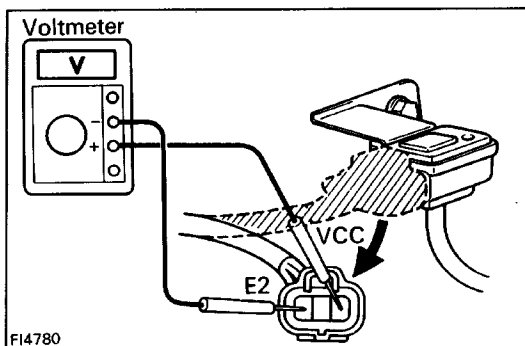
Resistance: Refer to the chart above

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

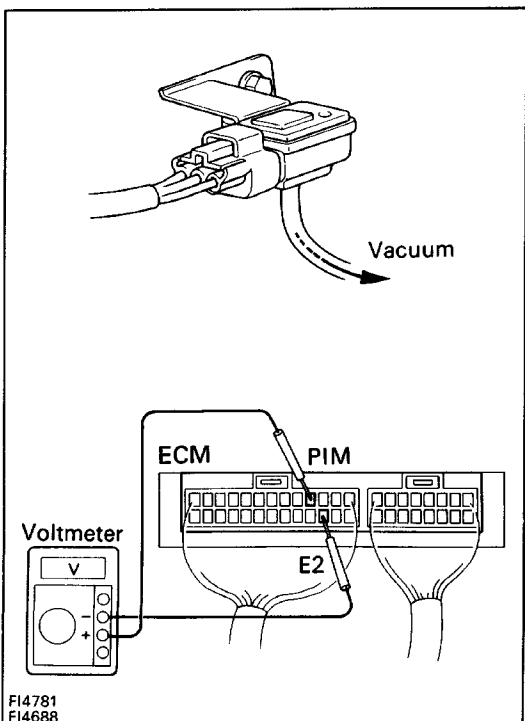
Vacuum Sensor (Manifold Absolute Pressure Sensor) (4A-FE)



FI4424 FI1226



FI4780



FI4781 FI4688

INSPECTION OF VACUUM SENSOR

1. INSPECT POWER SOURCE VOLTAGE OF VACUUM SENSOR

- (a) Disconnect the vacuum sensor connector.
- (b) Turn the ignition switch ON.
- (c) Using a voltmeter, measure the voltage between connector terminals VCC and E2 of the wiring harness side.

Voltage: 4.5 – 5.5 V

- (d) Reconnect the vacuum sensor connector.

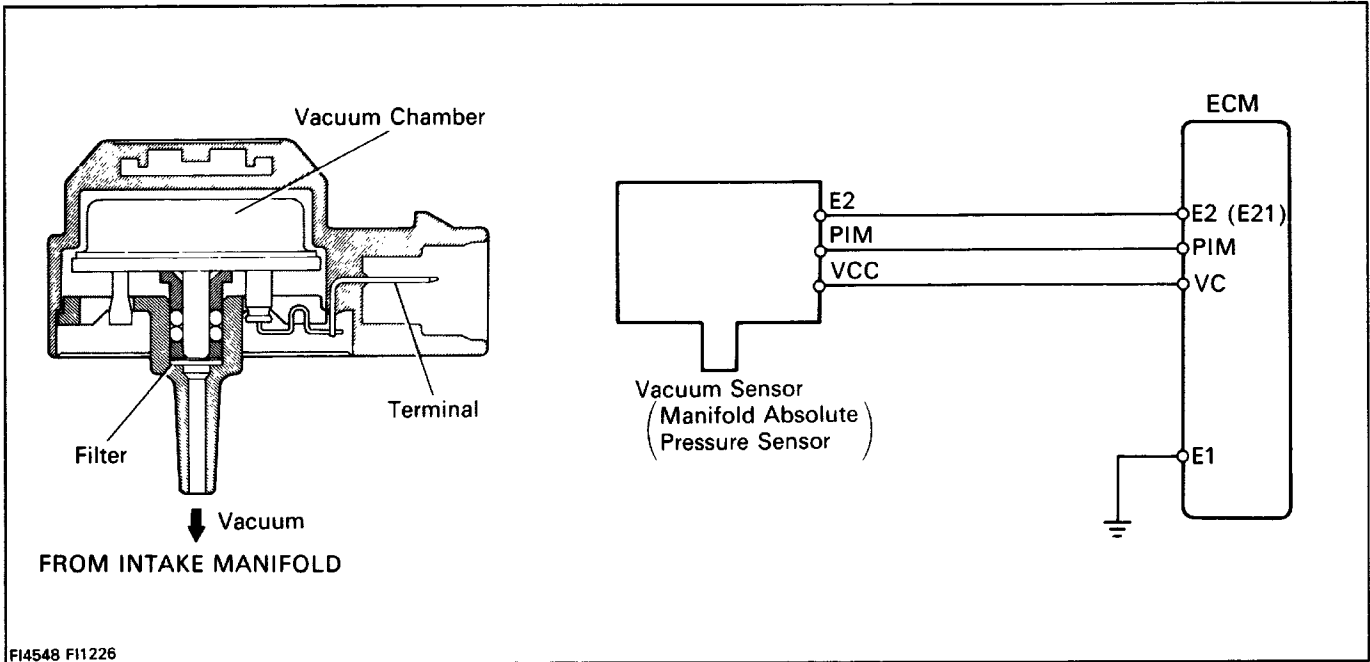
2. INSPECT POWER OUTPUT OF VACUUM SENSOR

- (a) Turn the ignition switch ON.
- (b) Disconnect the vacuum hose of the intake manifold (chamber) side.
- (c) Connect a voltmeter to terminals PIM and E2 of the ECM, and measure and record the output voltage under ambient atmospheric pressure.
- (d) Apply vacuum to the vacuum sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 66.7 kPa (500 mmHg, 19.69 in.Hg).
- (e) Measure voltage drop from step (c) above for each segment.

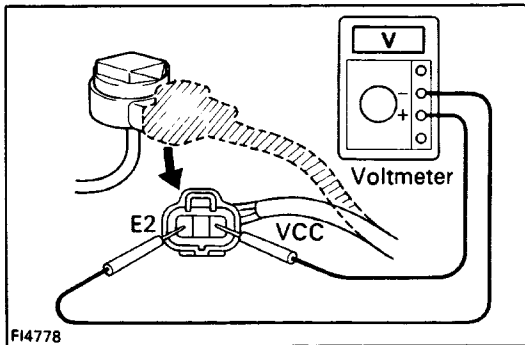
Voltage drop:

Applied Vacuum kPa (mmHg in.Hg)	13.3 (100 3.94)	26.7 (200 7.87)	40.0 (300 11.81)	53.5 (400 15.75)	66.7 (500 19.69)
Voltage drop (V)	0.3–0.5	0.7–0.9	1.1–1.3	1.5–1.7	1.9–2.1

Vacuum Sensor (Manifold Absolute Pressure Sensor) (5S-FE)



FI4548 FI1226



FI4778

INSPECTION OF VACUUM SENSOR

1. INSPECT POWER SOURCE VOLTAGE OF VACUUM SENSOR

- (a) Disconnect the vacuum sensor connector.
- (b) Turn the ignition switch ON.
- (c) Using a voltmeter, measure the voltage between connector terminals VCC and E2 of the wiring harness side.

Voltage: 4.5 – 5.5 V

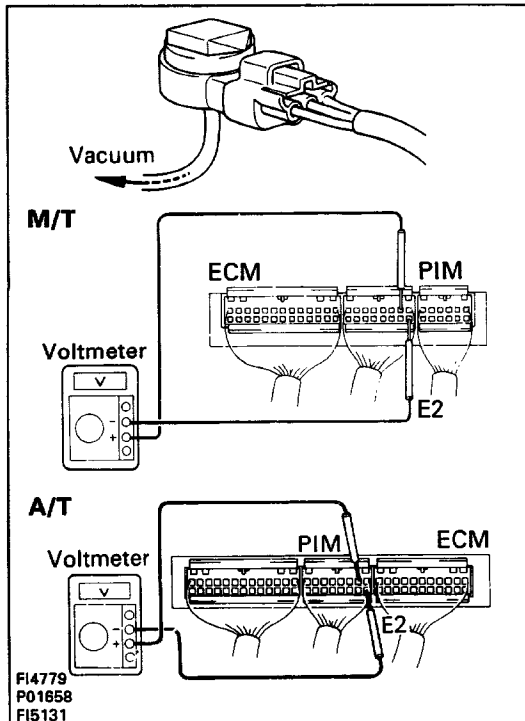
- (d) Reconnect the vacuum sensor connector.

2. INSPECT POWER OUTPUT OF VACUUM SENSOR

- (a) Turn the ignition switch ON.
- (b) Disconnect the vacuum hose of the intake manifold (chamber) side.
- (c) Connect a voltmeter to terminals PIM and E2 of the ECM, and measure and record the output voltage under ambient atmospheric pressure.
- (d) Apply vacuum to the vacuum sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 66.7 kPa (500 mmHg, 19.69 in.Hg).
- (e) Measure voltage drop from step (c) above for each segment.

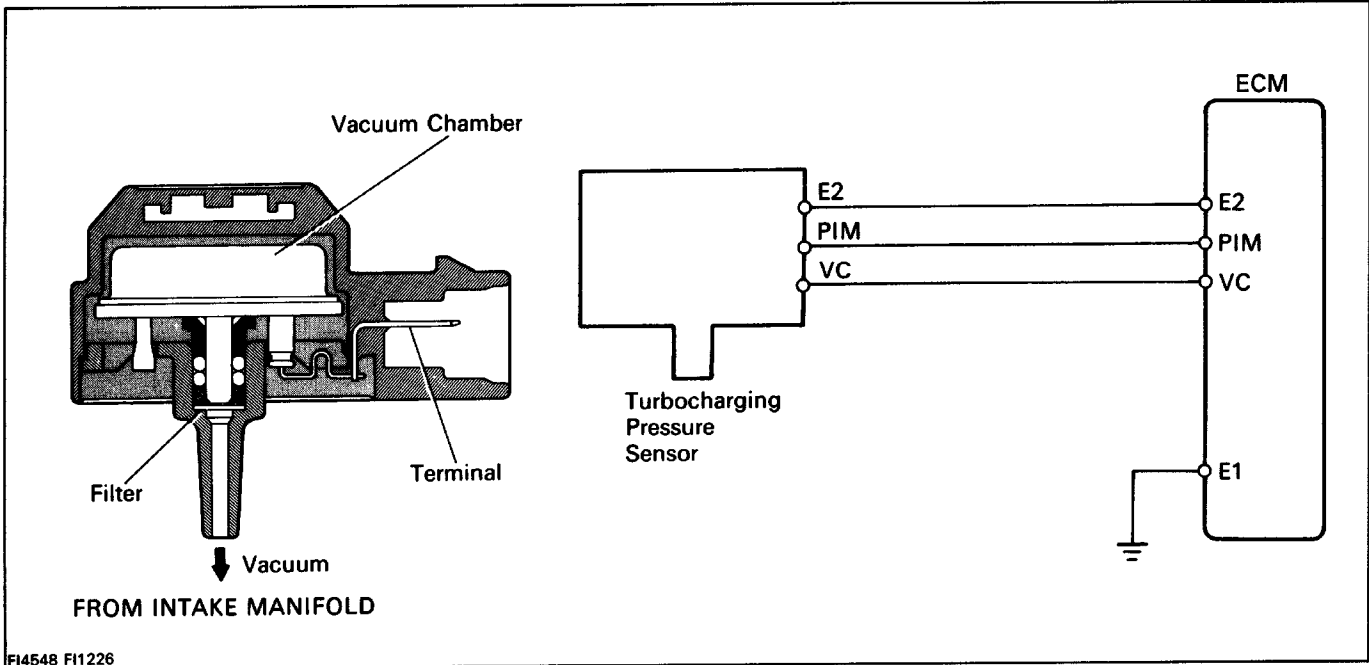
Voltage drop:

Applied Vacuum kPa	13.3	26.7	40.0	53.5	66.7
mmHg	(100)	(200)	(300)	(400)	(500)
in.Hg	(3.94)	(7.87)	(11.81)	(15.75)	(19.69)
Voltage drop (V)	0.3–0.5	0.7–0.9	1.1–1.3	1.5–1.7	1.9–2.1



FI4779
 P01658
 FI5131

Turbocharging Pressure Sensor (3S-GTE)



FI4548 FI1226

INSPECTION OF TURBOCHARGING PRESSURE SENSOR

1. INSPECT POWER SOURCE VOLTAGE OF TURBOCHARGING PRESSURE SENSOR

- Disconnect the pressure sensor connector.
- Turn the ignition switch ON.
- Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.

Voltage: 4.5 – 5.5 V

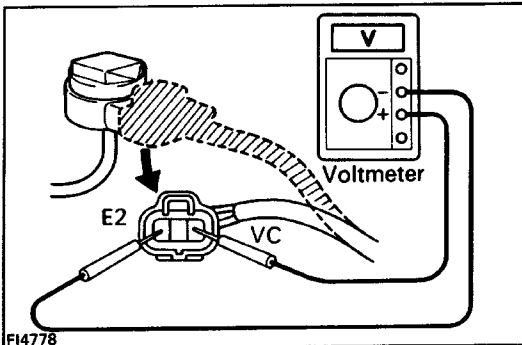
- Reconnect the pressure sensor connector.

2. INSPECT POWER OUTPUT OF TURBOCHARGING PRESSURE SENSOR

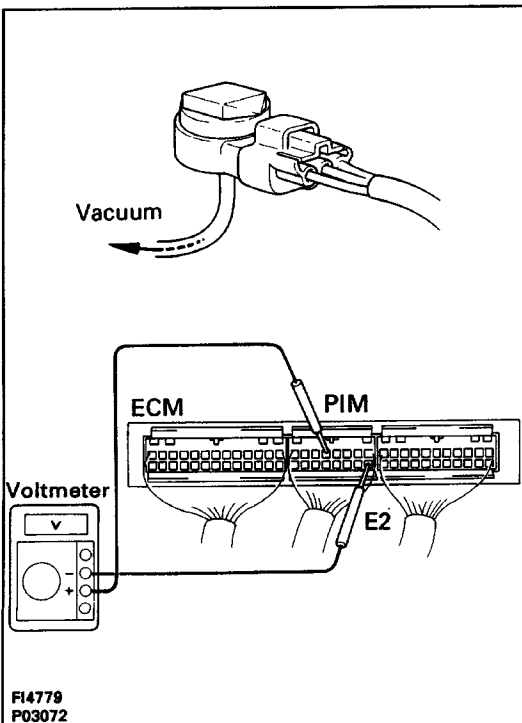
- Turn the ignition switch ON.
- Disconnect the vacuum hose of the intake manifold (chamber) side.
- Connect a voltmeter to terminals PIM and E2 of the ECM, and measure and record the output voltage under ambient atmospheric pressure.
- Apply vacuum to the pressure sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 66.7 kPa (500 mmHg, 19.69 in.Hg).
- Measure voltage drop from step (c) above for each segment.

Voltage drop:

Applied Vacuum kPa	13.3	26.7	40.0	53.5	66.7
(mmHg in.Hg)	(100 3.94)	(200 7.87)	(300 11.81)	(400 15.75)	(500 19.69)
Voltage drop (V)	0.15–0.35	0.4–0.6	0.65–0.85	0.9–1.1	1.15–1.35

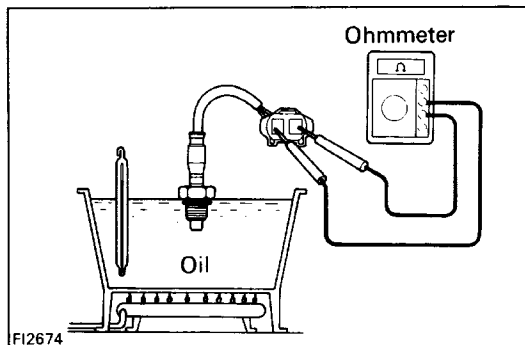
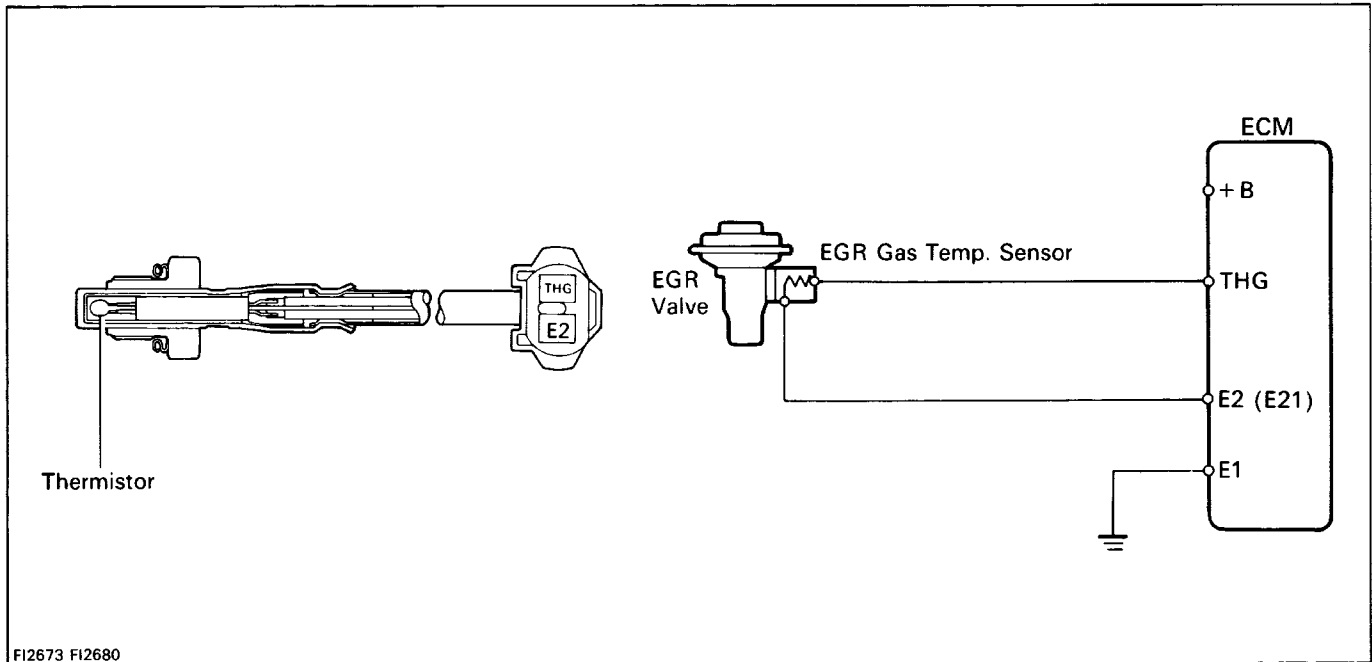


FI4778



FI4779 P03072

EGR Gas Temperature Sensor (CALIF. only)



INSPECTION OF EGR GAS TEMPERATURE SENSOR

INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

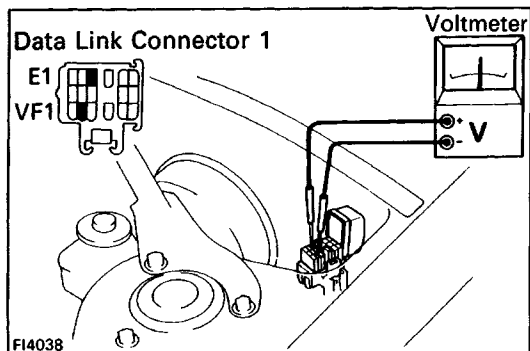
Resistance:

69 – 89 k at 50°C (112°F)

11 – 15 k at 100°C (212°F)

2 – 4 k at 150°C (302°F)

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



Oxygen Sensor (Main)

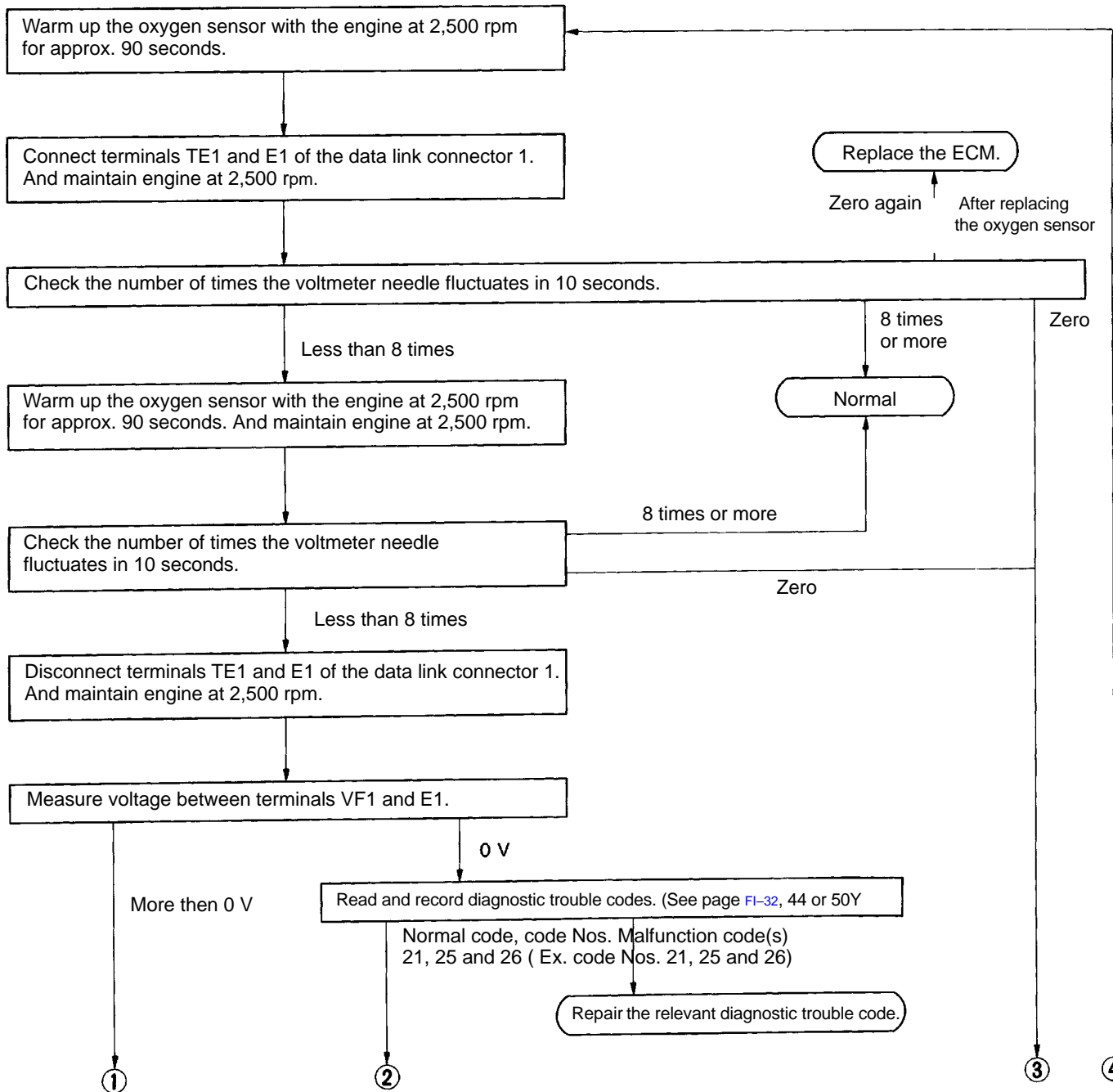
INSPECTION OF OXYGEN SENSOR

1. WARM UP ENGINE

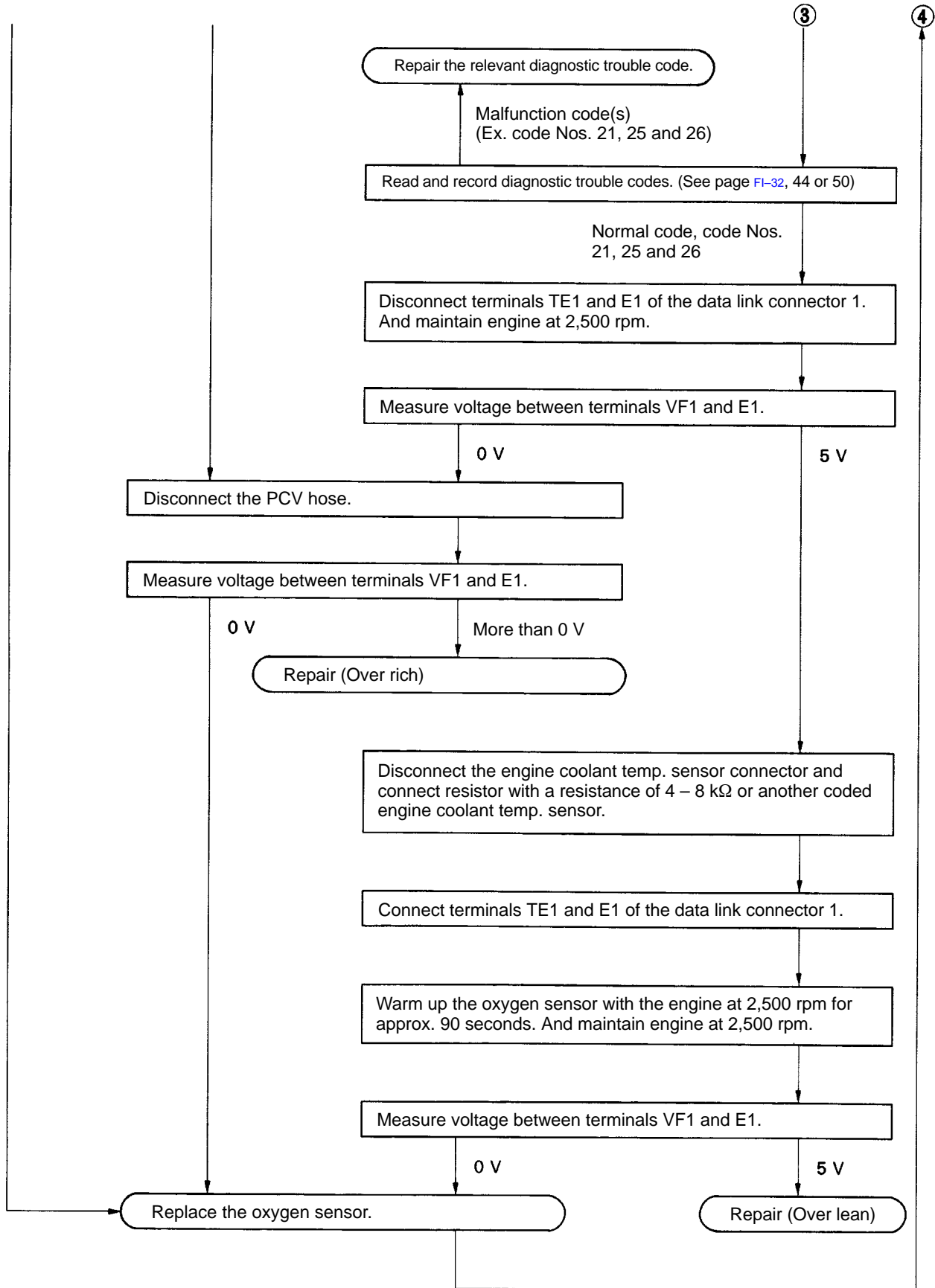
Allow the engine to warm up to normal operating temperature.

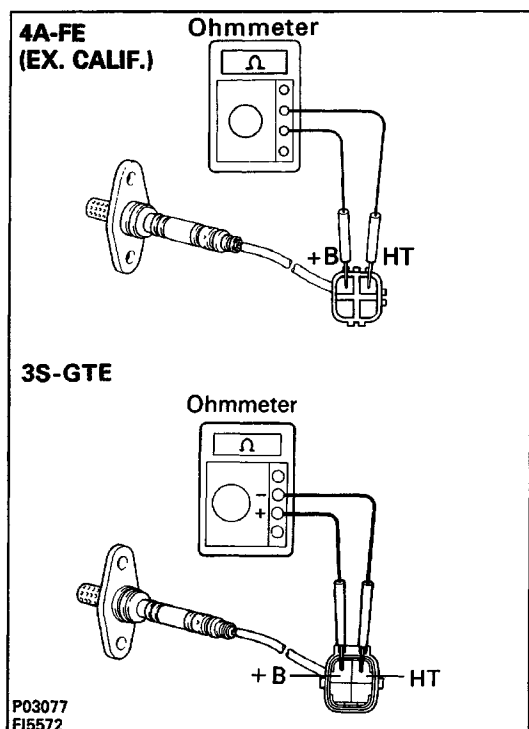
2. INSPECT FEEDBACK VOLTAGE

Connect the positive (+) probe of a voltmeter to terminal VF1 of the data link connector, and negative (-) probe to terminal E1. Perform the test as follows:



CONTINUED FROM PAGE FI-237





3. (4A-FE (Ex. CALIF.) AND 3S-GTE)

INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance (Cold): 5.1 – 6.3 k at 20°C (68°F)

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

Sub-Oxygen Sensor (5S-FE CALIF. only)

INSPECTION OF SUB-OXYGEN SENSOR

INSPECT SUB-OXYGEN SENSOR

HINT: Inspect it only when code No.27 is displayed.

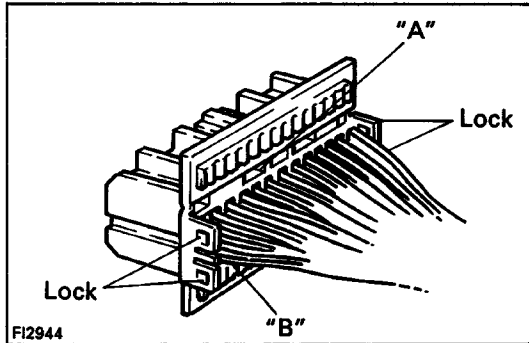
- (a) Cancel diagnostic trouble code. (See page [FI-43](#))
- (b) Warm up the engine until it reaches normal operating temperature.
- (c) (M/T)
 - Drive for 5 minutes or more between 80 km/h (50 mph) and 100 km/h in 4th or 5th gear.
- (A/T)
 - Drive for 5 minutes or more between 80 km/h (50 mph) and 100 km/h (62 mph) in "D" position.
- (d) Following the conditions in step (c), press fully on the accelerator pedal for 2 seconds or more.
 - HINT: Do not exceed 100 km/h (62 mph), or diagnostic trouble code will be cancelled.
- (e) Stop the vehicle and turn the ignition switch OFF.
- (f) Carry out steps (b), (c) and (d) again to test acceleration.

If code No. 27 appears again, check the sub-oxygen sensor circuit. If the circuit is normal, replace the sub-oxygen sensor.

Electronic Control Module (ECM)

INSPECTION OF ECM

HINT: The MR and SFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECM.



FI2944

1. PREPARATION

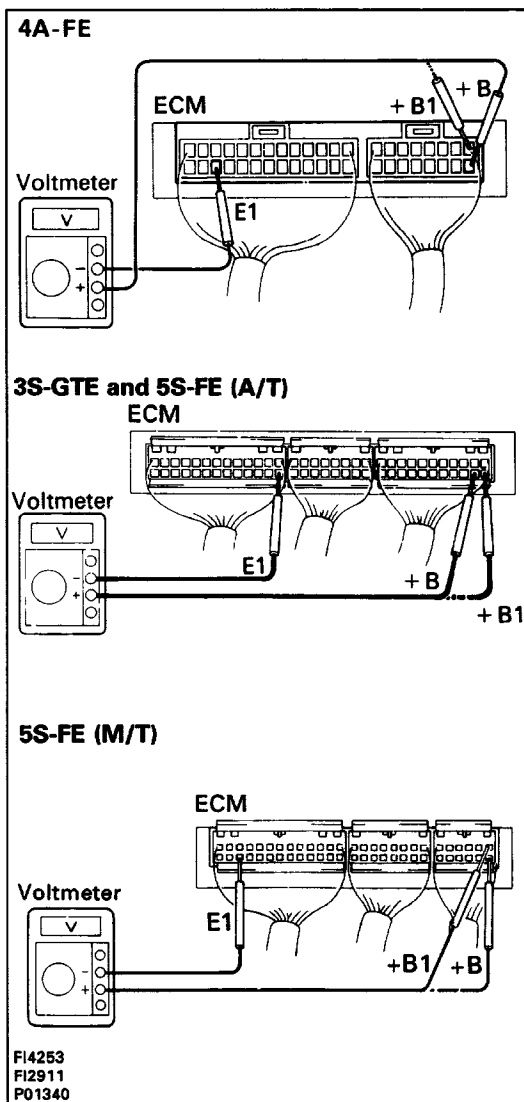
- (a) Disconnect the connectors from the ECM.
- (b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.

NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

2. INSPECT VOLTAGE OF ECM

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
 - Measure the voltage at each terminal.
- HINT:
- Perform all voltage measurements with the connectors connected.
 - Verify that the battery voltage is 11 V or more when the ignition switch is ON.

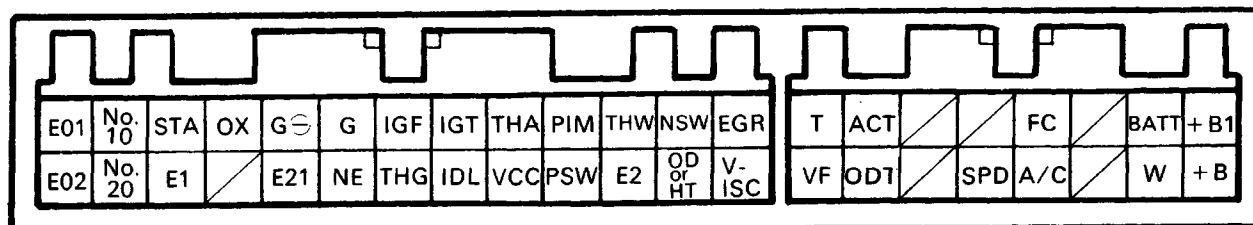


FI4253
FI2911
P01340

Voltage at ECM Wiring Connectors (4A-FE)

Terminals	Condition		STD voltage (V)
+B + B1 - E1	IG SW ON		10-14
BATT - E 1	-		10-14
IDL - E2	IG SW ON	Throttle valve open	10-14
PSW - E2		Throttle valve fully closed	10-14
PIM-E2	IG SW ON		3.3-3.9
VCC - E2			4.5-5.5
No.10 E01 No.20 E02			10-14
THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1-3
THW - E2		Engine coolant temp. 80°C (176°F)	0.1-1.0
STA - E1	Cranking		6-14
IGT - E1	Cranking or idling		0.7-1.0
W - E1	No trouble (Malfunction indicator- lamp off) and engine running		10-14
A/C - E1	IG SW ON	Air conditioning ON	8-14
ACT - E1		Heater blower SW ON	4-6
T - E1		Data link connector 1 TE1 - E1 not connected	10-14
		Data link connector 1 TE1 - E1 connected	0.5 or less
NSW - E1		Park/Neutral position switch P or N position	0-2
		Ex. park/neutral position switch P or N position	6-14
V-ISC - E1	Cranking for ten seconds after starting		10-14

ECM Terminals

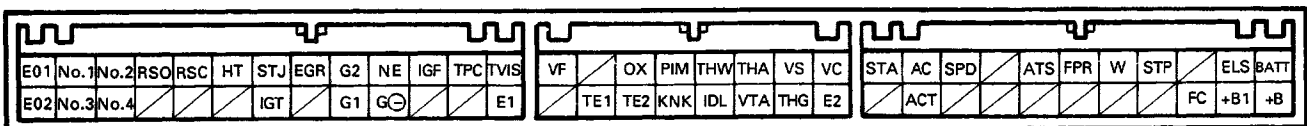


Voltage at ECM Wiring Connectors (3S-GTE)

Terminals	Condition		STD voltage (V)
+B - E1 + B1	IG SW ON		10-14
BATT - E 1	-		10-14
IDL - E2	IG SW ON	Throttle valve open	4.5-5.5
VTA - E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.1 -1.0
		Throttle valve fully open	3.2-4.2
VC - E2		-	4.5-5.5
VS - E2		Measuring plate fully closed	3.7-4.3
		Measuring plate fully open	0.2-0.5
	Idling	1.6-4.1	
	3,000 rpm	1.0-2.0	
No. 1 No. 2 _ E01 No. 3 E02 No. 4	IG SW ON		10-14
THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1 -3
THW - E2		Engine coolant temp. 80°C (176°F)	0.1 -1.1
STA - E1	Cranking		6-14
IGT - E1	Cranking or idling		0.8-1.2
RSC_ E1 RSO	IG SW ON	ECM connectors disconnected	8-14
W-EI	No trouble (malfunction indicator lamp off) and engine running		10-14
PIM - E2	IG SW ON		2.5-4.5
AC -E1	IG SW ON	Air conditioning ON	8-14
*1 TVIS - E1		Throttle valve fully closed	2.0 or less
		Throttle valve open	10-14
*2 TVIS - E1	Idling	2.0 or less	
	4,200 rpm or more	10-14	
TE1 - E1	IG SW ON	Data link connector 1 TE1 - E1 not connected	10-14
		Data link connector 1 TE1 - E1 connected	0.5 or less

ECM Terminals

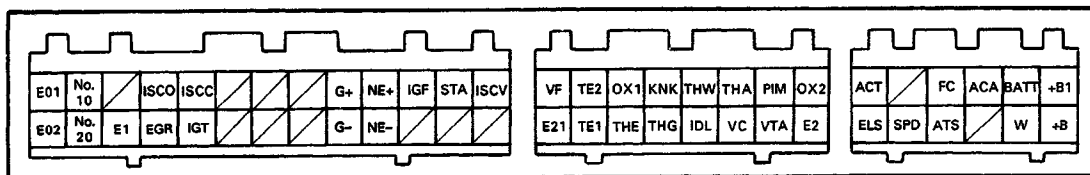
*1 w/ Regular Unleaded Gasoline *2 w/ Premium Unleaded Gasoline



Voltage at ECM Wiring Connectors (5S-FE)

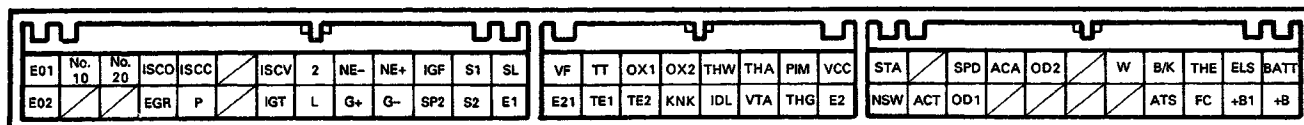
Terminals	Condition		STD voltage (V)
+B + B1 - E1	IG SW ON		10-14
BATT - E1	-		10-14
IDL - E2	IG SW ON	Throttle valve open	8-14
VTA - E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.8 - 1.2
		Throttle valve fully open	3.2 - 4.2
PIM-E2	IG SW ON		3.3 - 3.9
VC - E2			4.5 - 5.5
No. 10 E01 No. 20 E02			10 - 14
THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1.9 - 2.9
THW - E2		Engine coolant temp. 80°C (176°F)	0.1 - 1.1
STA - E1	Cranking		6 - 14
IGT - E1	Cranking or idling		0.8 - 1.2
ISCC - E1 ISCO	IGSWON	ECM connectors disconnected	8 - 14
W-EI	No trouble (malfunction indicator lamp off) and engine running		10 - 14
A/C - E1	IG SW ON	Air conditioning ON	8 - 14
ACT - E1		Air conditioning ON	4.5 - 5.5
ACA - E1		Air conditioning ON	2 or less
TE1 - E1		Data link connector 1 TE1 - E1 not connected	10-14
		Data link connector 1 TE1 - E1 connected	1 or less
NSW - E1		Park/Neutral position switch P or N position	0 - 2
	Ex. park/neutral position switch P or N position	6 - 14	
B/ K - E1	Stop light SW ON (Brake pedal depressed)		10 - 14

ECM Terminals

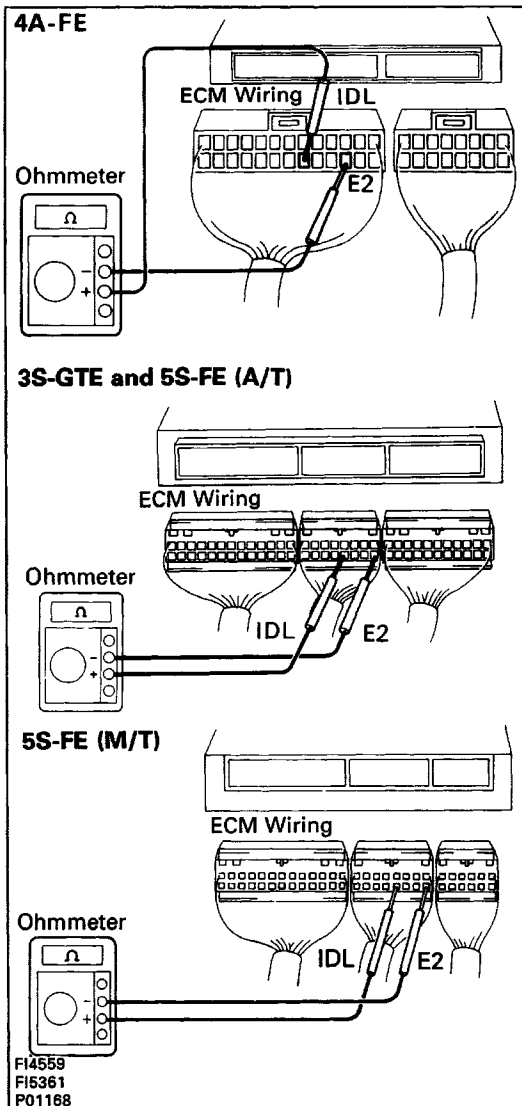


P01821

ECM Terminals



FI2796



2. INSPECT RESISTANCE OF ECM

NOTICE:

- Do not touch the ECM terminals.
- The tester probe should be inserted into the wiring connector from the wiring side.

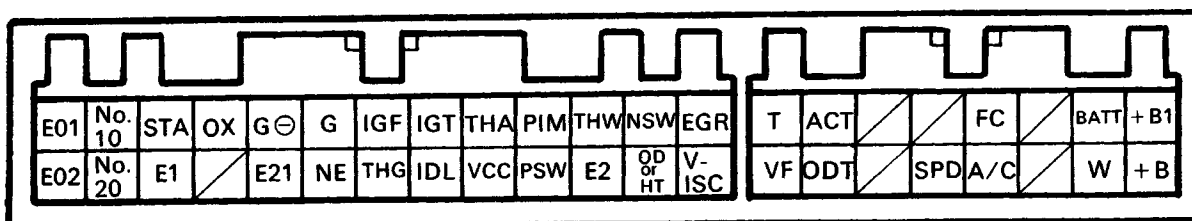
Check the resistance between each terminal of the wiring connectors.

- Disconnect the connectors from the ECM.
- Measure the resistance at each terminal.

Resistance of ECM Wiring Connector (4A-FE)

Terminals	Condition	STD resistance (Ω)
IDL - E2	Throttle valve open	Infinity
	Throttle valve fully closed	0
PSW - E2	Throttle valve fully open	0
	Throttle valve fully closed	Infinity
THA - E2	Intake air temperature 20°C (68°F)	2,000 - 3,000
THW - E2	Engine coolant temperature 80°C (176°F)	200-400
G1 NE - G(-)	Cold	185-265

ECM Terminals

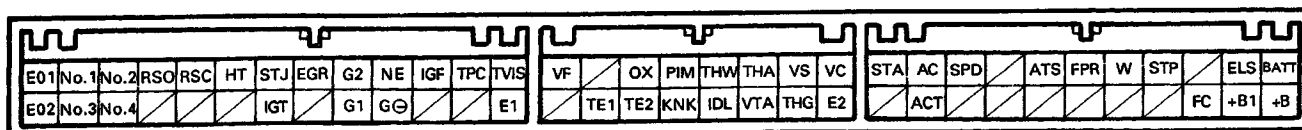


FI4266

Resistance of ECM Wiring Connectors (3S-GTE)

Terminals	Condition	STD resistance (Ω)
IDL - E2	Throttle valve open	Infinity
	Throttle valve fully closed	2,300 or less
VTA - E2	Throttle valve fully open	3,100 - 12,100
	Throttle valve fully closed	470-6,100
VC - E2	-	3,900 - 9,000
VS - E2	Measuring plate fully closed	200-600
	Measuring plate fully open	20-1,200
THA - E2	Intake air temp. 20°C (68°F)	2,000 - 3,000
THW - E2	Engine coolant temp. 80°C (176°F)	200-400
G1 G2 - G(-)	Cold	125-190
NE - G(-)	Cold	155-240
RSC + B RSO + B1	-	19.3-22.3

ECM Terminals

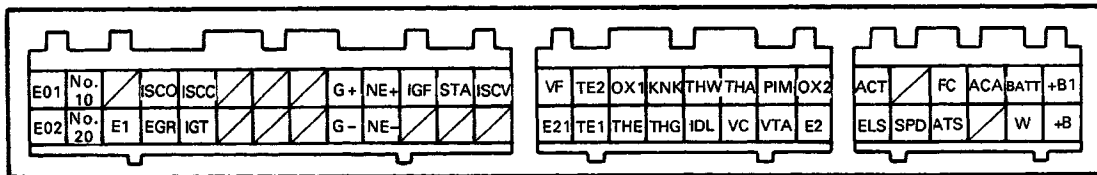


FI2796

Resistance of ECM Wiring Connectors (5S-FE)

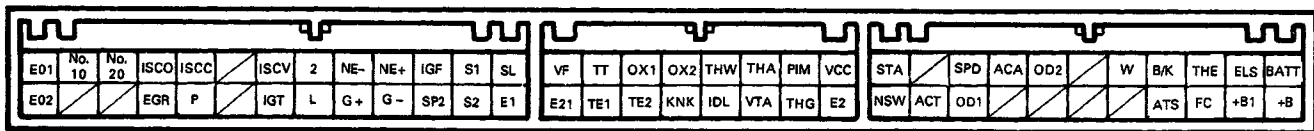
Terminals	Condition	STD resistance (Ω)
IDL - E2	Throttle valve open	Infinity
	Throttle valve fully closed (Throttle opener must be cancelled first)	2,300 or less
VTA - E2	Throttle valve fully open	2,000 - 10,200
	Throttle valve fully closed (Throttle opener must be cancelled first)	200-5,700
VC - E2	—	2,500 - 5,900
THA - E2	Intake air temp. 20°C (68°F)	2,000 - 3,000
THW - E2	Engine coolant temp. 80°C (176°F)	200-400
G+ - G-	Cold	185-265
NE+ - NE-	Cold	370-530
ISCC _ + B ISCO +B I	—	19.3-22.3

ECM Terminals



P01821

ECM Terminals



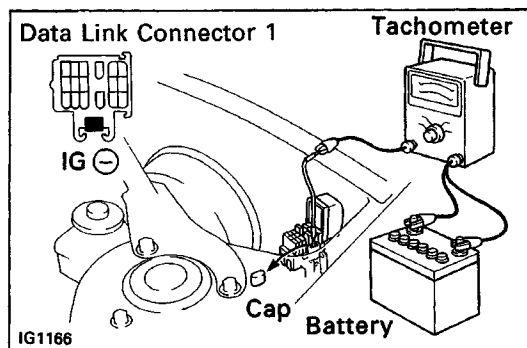
FI2796

Fuel Cut RPM (4A-FE)

INSPECTION OF FUEL CUT RPM

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (-) of the data link connector 1.

NOTICE:

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

3. INSPECT FUEL CUT RPM

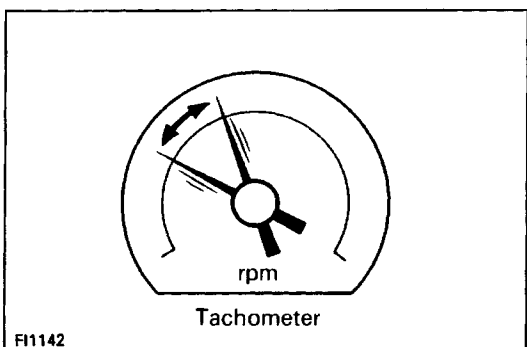
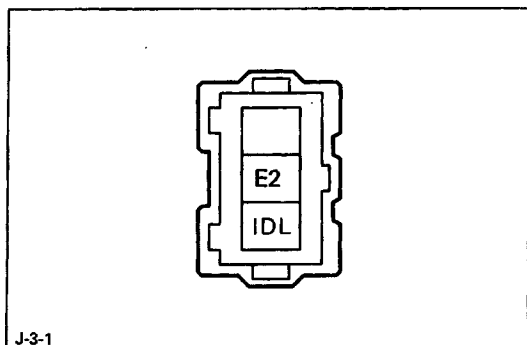
- Disconnect the connector from the throttle position sensor.
- Connect terminals IDL and E2 of the wiring connector.
- Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

NOTE:

- The vehicle should be stopped.
- Measure with the A/C OFF.

Fuel cut rpm: 2,300 rpm

Fuel return rpm: 1,700 rpm



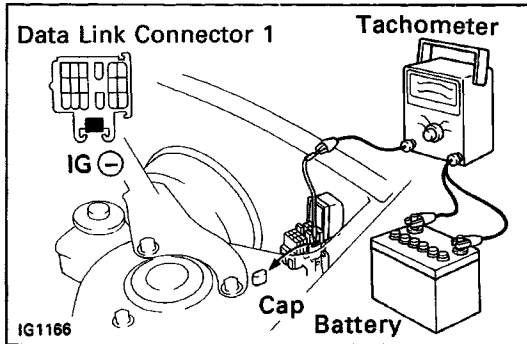
4. DISCONNECT TACHOMETER

Fuel Cut RPM (3S-GTE and 5S-FE)

INSPECTION OF FUEL CUT RPM

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TACHOMETER TO ENGINE

Connect the test probe of a tachometer to terminal IG (-) of the data link connector 1.

NOTICE:

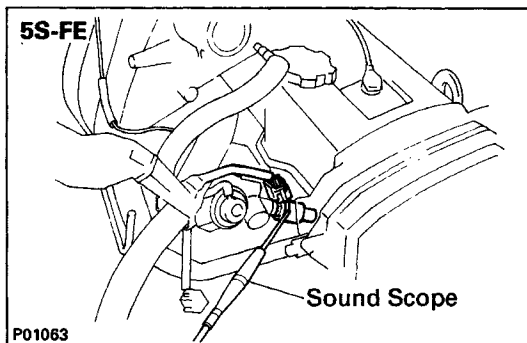
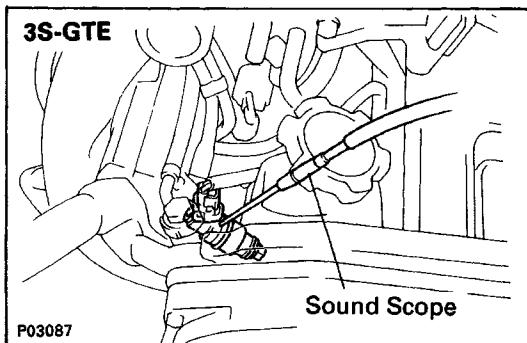
- **NEVER** allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.

3. INSPECT FUEL CUT RPM

- Increase the engine speed to at least 2,500 rpm.
- Use a sound scope to check for injector operating noise.
- Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT: Measure with the A/C OFF.

Fuel return rpm: 3S-GTE 1,600 rpm
5S-FE 1,500 rpm



4. DISCONNECT TACHOMETER

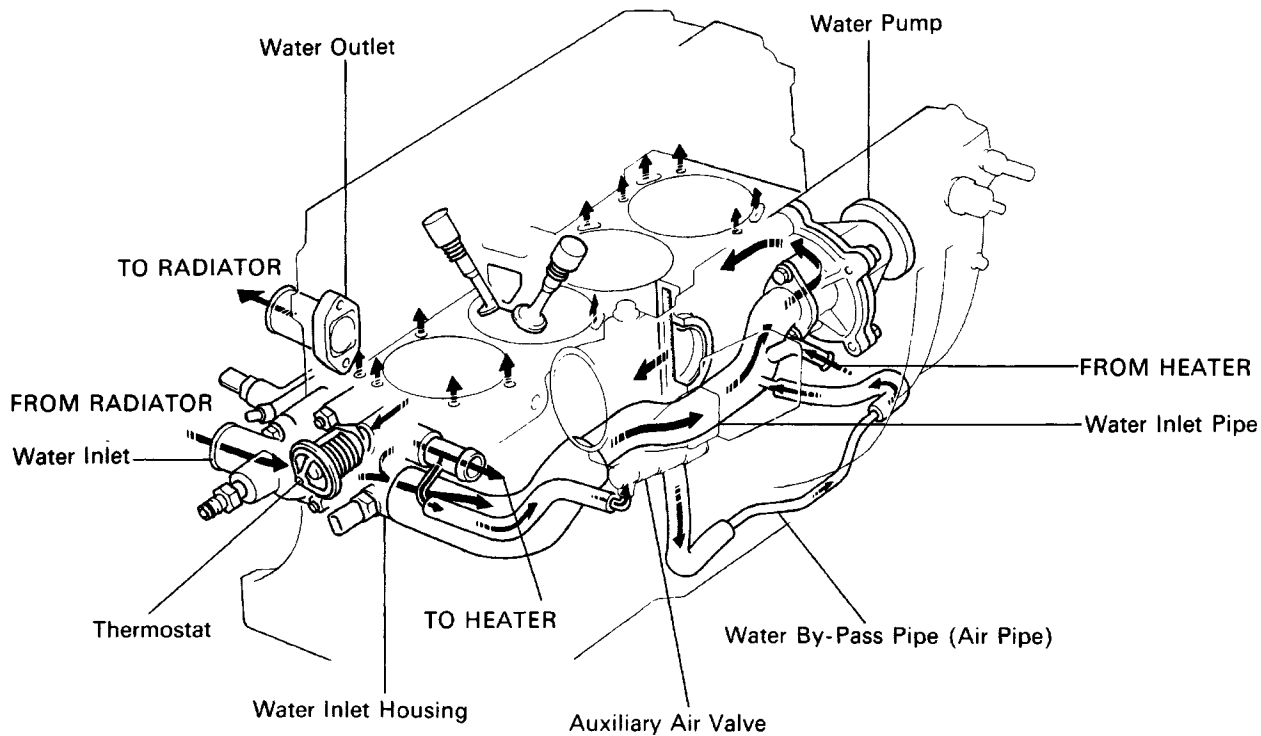
COOLING SYSTEM

	Page
DESCRIPTION	CO-2
TROUBLESHOOTING	CO-5
CHECK AND REPLACEMENT OF ENGINE COOLANT	CO-5
WATER PUMP (4A-FE)	CO-7
WATER PUMP (3S-GTE and 5S-FE)	CO-11
THERMOSTAT	CO-17
RADIATOR	CO-20
ELECTRIC COOLING FAN	CO-26

DESCRIPTION

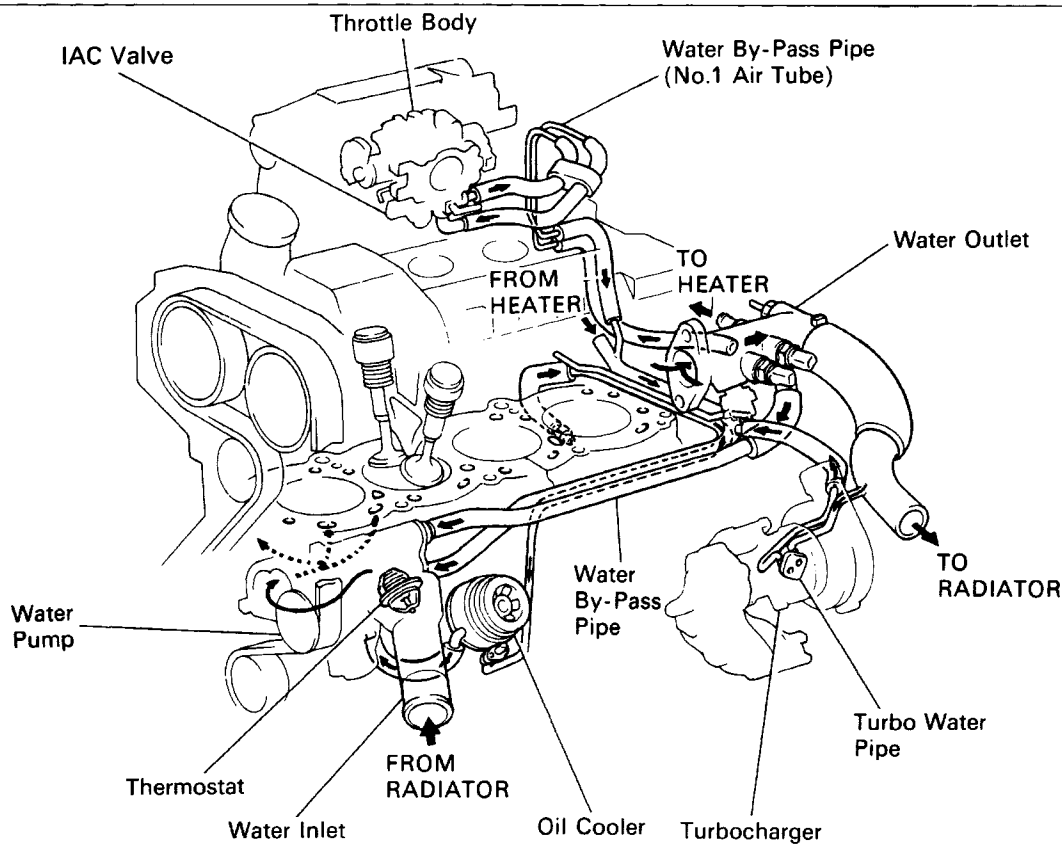
This engine utilizes a pressurized forced circulation cooling system which includes a thermostat equipped with a by-pass valve mounted on the inlet side.

4A-FE



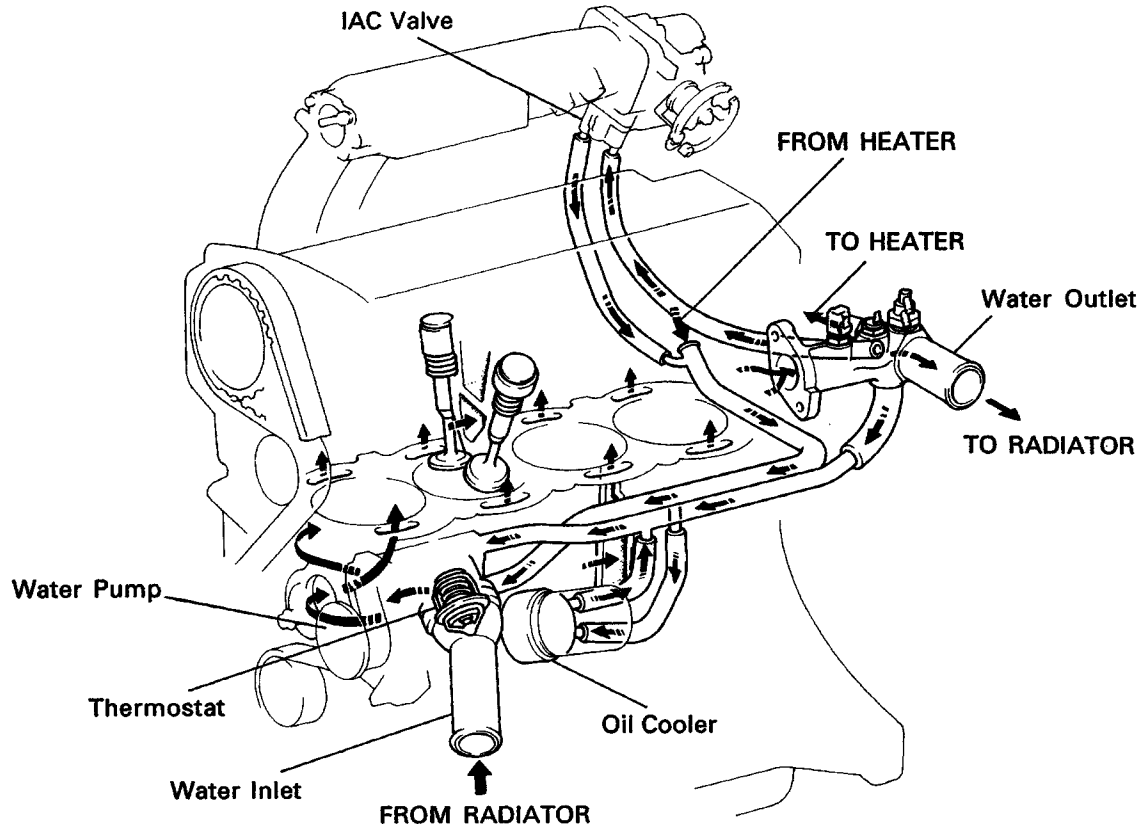
P03311

3S-GTE



CO0912

5S-FE



P03030

The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, electric fan, hoses and other components.

Coolant which is heated in the water jacket is pumped to the radiator, through which an electric fan blows air to cool the coolant as it passes through. Coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine.

The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes. It is designed to provide adequate cooling of the cylinders and combustion chambers which become heated during engine operation.

RADIATOR

The radiator performs the function of cooling the coolant which has passed through the water jacket and become hot, and it is mounted in the front of the vehicle. The radiator consists of an upper tank and lower tank, and a core which connects the two tanks. The upper tank contains the inlet for coolant from the water jacket and the filler inlet. It also has a hose attached through which excess coolant or steam can flow. The lower tank has an outlet and drain cock for the coolant. The core contains many tubes through which coolant flows from the upper tank to the lower tank as well as to cooling fins which radiate heat away from the coolant in the tubes. The air sucked through the radiator by the electric fan, as well as the wind generated by the vehicle's travel, passes through the radiator, cooling the coolant. Models with automatic transmission include an automatic transmission fluid cooler built into the lower tank of the radiator. A fan with an electric motor is mounted behind the radiator to assist the flow of air through the radiator. The fan operates when the engine coolant temperature becomes high in order to prevent it from becoming too high.

RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the coolant from boiling even when the engine coolant temperature exceeds 100°C (212°F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. The relief valve opens and lets steam escape through the overflow pipe when the pressure generated inside the cooling system exceeds the limit (engine coolant temperature: 110 – 120°C (230 – 248°F), pressure; 58.8 – 103.0 kPa (0.6 – 1.05 kgf/cm², 8.5 – 14.9 psi)). The vacuum valve opens to alleviate the vacuum which develops in the cooling system after the engine is stopped and the engine coolant temperature drops. The valve's opening allows the coolant in the reservoir tank to return to the cooling system.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. The coolant in the reservoir tank returns to the radiator when the engine coolant temperature drops, thus keeping the radiator full at all times and avoiding needless coolant loss. Check the reservoir tank level to learn if the coolant needs to be replenished.

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the cylinder block and driven by a generator belt (4A-FE) or timing belt (3S-GTE and 5S-FE).

THERMOSTAT

The thermostat has a wax type by-pass valve and is mounted in the water inlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the engine coolant temperature. This valve closes when the engine coolant temperature drops, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. The valve opens when the engine coolant temperature has risen, allowing the circulation of coolant. Wax inside the thermostat expands when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax cools, its contraction causes the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 82°C (180°F).

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Dirt, leaves or insects in radiator or condenser Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage Thermostat faulty Incorrect ignition timing Electric cooling system faulty Radiator hose plugged or rotten Water pump faulty Radiator plugged or cap faulty Cylinder head or block cracked or water passage clogged	Clean radiator or condenser Repair as necessary	CO-20
		Check thermostat Reset timing	CO-17 IG-24, 29 37 CO-27
		Inspect electric cooling system Replace hose Replace water pump Check radiator and cap Repair as necessary	CO-7, 11 CO-20

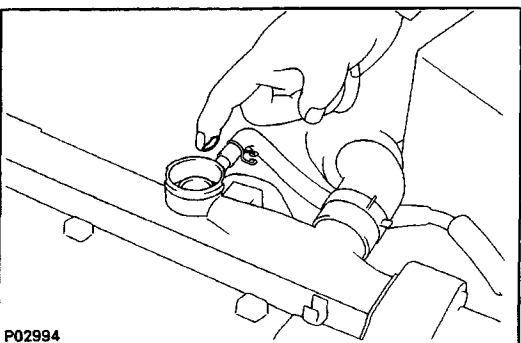
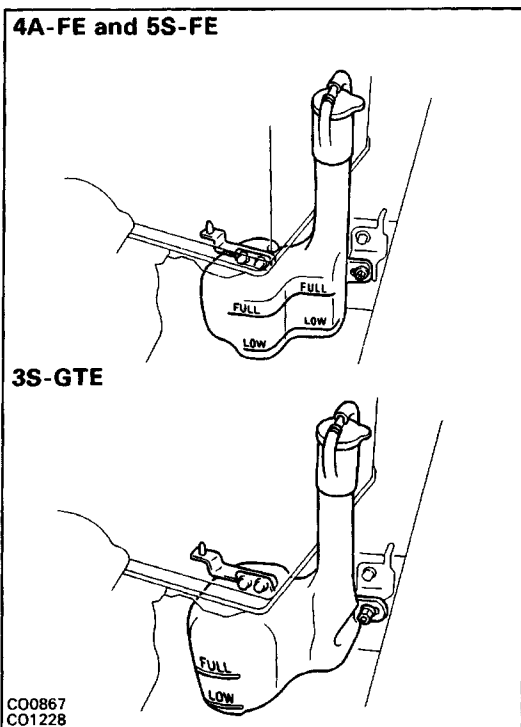
HINT: Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

CHECK AND REPLACEMENT OF ENGINE COOLANT

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The coolant level should be between the "LOW" and "FULL" lines.

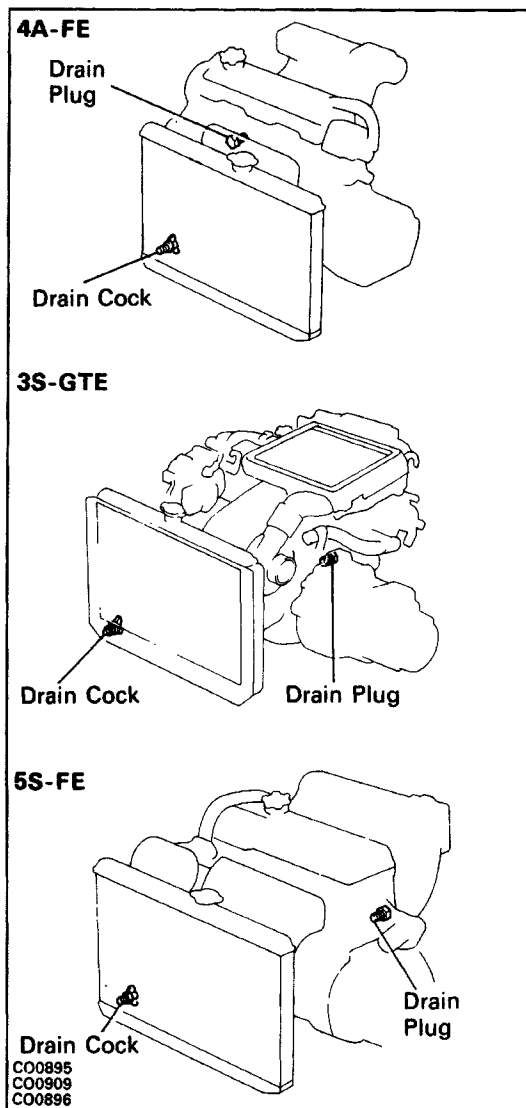
If low, check for leaks and add coolant up to the "FULL" line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.



3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) Drain the coolant from the radiator drain cock and engine drain plug.

LOCATION (Engine drain plug):

4A-FE In the cylinder block on the front right side.

3S-GTE and 5S-FE In the cylinder block on the rear left side.

(c) Close the drain cock and plug.

Torque (Engine drain plug):

4A-FE 34 N-m (350 kgf-cm, 25 ft-lbf)

3S-GTE and 5S-FE 25 N-m (250 kgf-cm, 18 ft-lbf)

(d) Slowly fill the system with coolant.

- Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturer's directions.
- Using coolant which includes more than 50% ethylene-glycol (but not more than 70%) is recommended.

NOTICE:

- Do not use alcohol type coolant.
- The coolant should be mixed with demineralized water or distilled water.

Capacity (w/ Heater):

4A-FE M/T 5.2 liters (5.5 US qts, 4.6 Imp. qts)

A/T 5.6 liters (5.9 US qts, 4.9 Imp. qts)

3S-GTE 6.5 liters (6.9 US qts, 5.7 Imp. qts)

5S-FE M/T 6.2 liters (6.6 US qts, 5.5 Imp. qts)

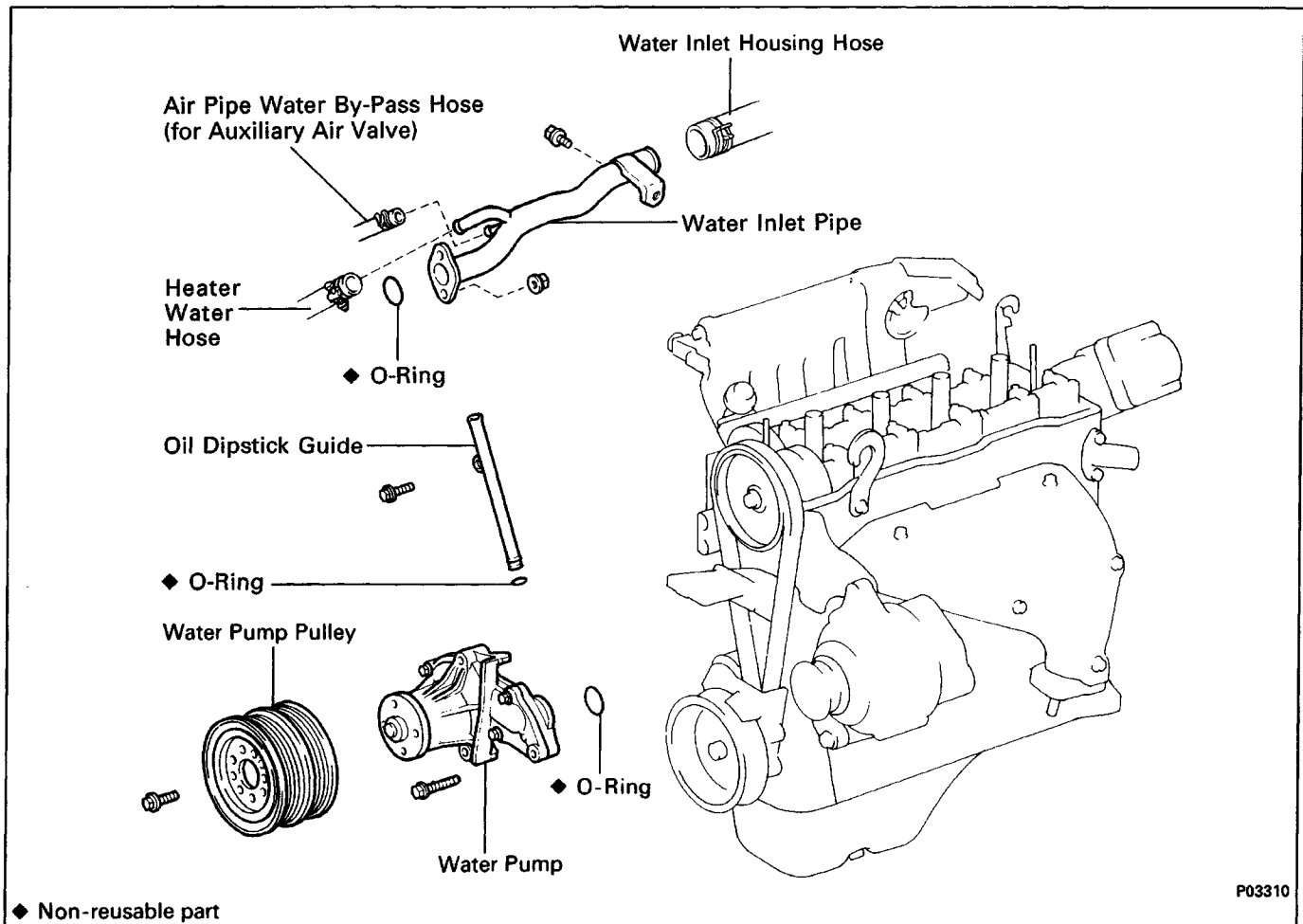
A/T 6.1 liters (6.4 US qts, 5.4 Imp. qts)

(e) Reinstall the radiator cap.

(f) Warm up the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.

WATER PUMP (4A-FE) COMPONENTS

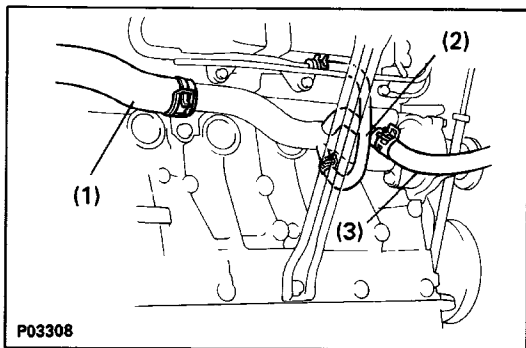


REMOVAL OF WATER PUMP

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

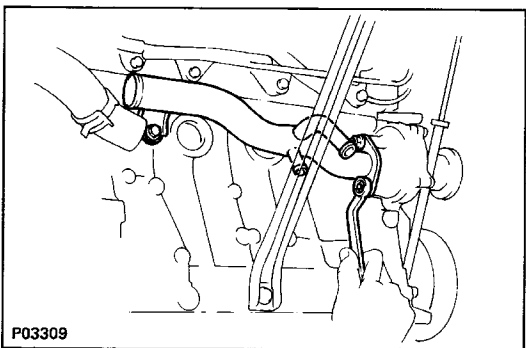
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page [CO-6](#))
3. REMOVE NO.3 AND NO.2 TIMING BELT COVERS (See steps 2 to 13 on pages [EM-33](#) to 35)
4. REMOVE PS DRIVE BELT ADJUSTING STRUT (See step 29 on page [EM-87](#))

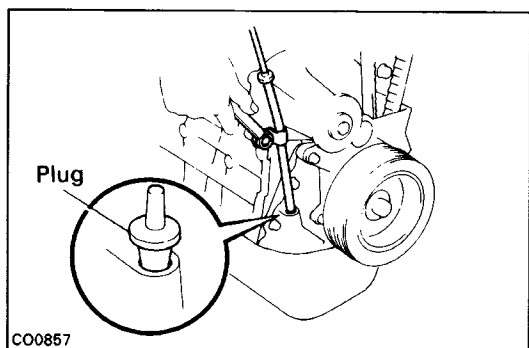


5. REMOVE WATER INLET PIPE

- (a) Disconnect the following hoses:
- (1) Water inlet housing hose
 - (2) Heater water hose
 - (3) Air pipe water by-pass hose

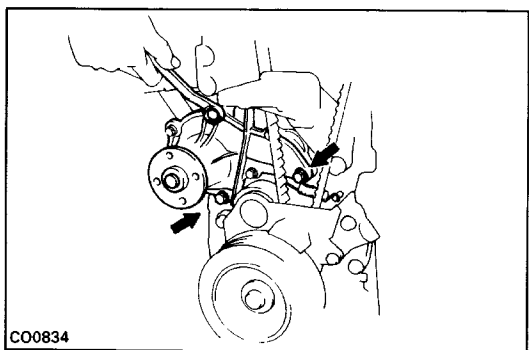


- (b) Remove the bolt, two nuts, inlet pipe and O-ring.



6. REMOVE OIL DIPSTICK AND DIPSTICK GUIDE

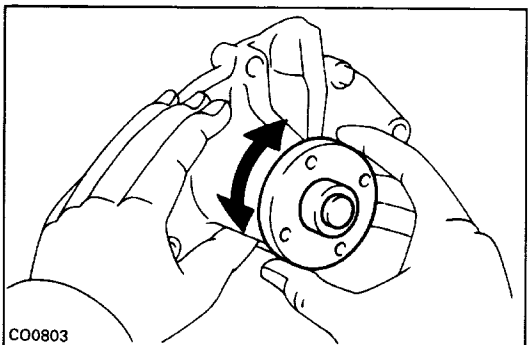
- (a) Remove the dipstick.
 (b) Remove the bolt, and pull out the dipstick guide.
 Plug the guide installation hole of the oil pump.
 (c) Remove the O-ring from the dipstick guide.



7. REMOVE WATER PUMP

- (a) Remove the three bolts holding the water pump to the cylinder block.
 (b) Remove the water pump together with the pulley.
 Remove the O-ring.

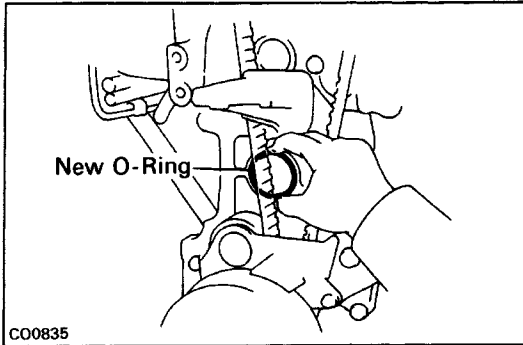
NOTICE: Be careful not to get coolant on the timing belt.



INSPECTION OF WATER PUMP

INSPECT WATER PUMP

Turn the pulley and check that the water pump bearing moves smoothly and quietly.

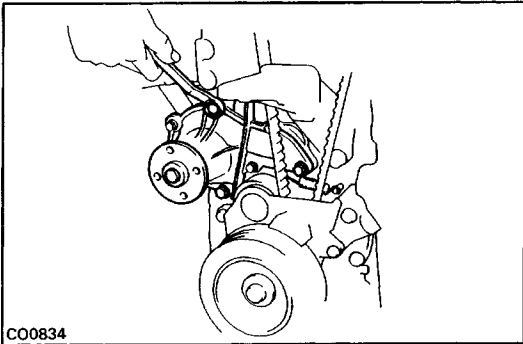


INSTALLATION OF WATER PUMP

(See page [CO-7](#))

1. INSTALL WATER PUMP

- (a) Place a new O-ring in position on the cylinder block.

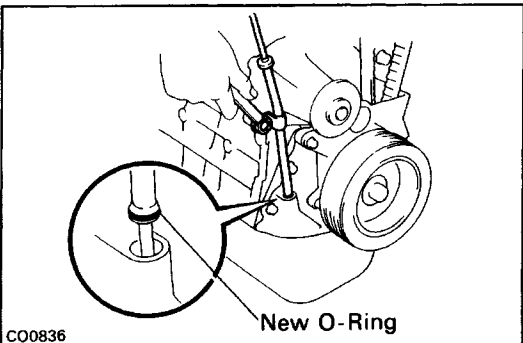


- (b) Place the pulley on the water pump, and place the water pump together with the pulley on the cylinder block.

HINT: If the pulley is not placed on the water pump first, the pump cannot be installed later.

- (c) Install the water pump with the three bolts.

Torque: 15 N-m (150 kgf-cm, 11 ft-lbf)



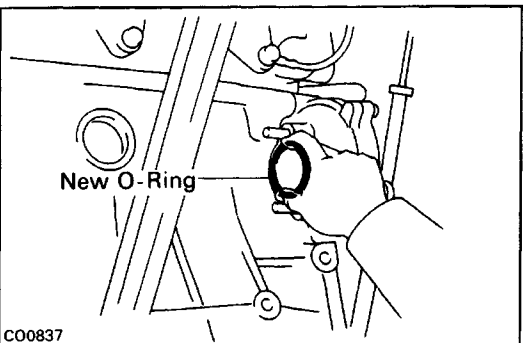
2. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK

- (a) Install a new O-ring to the dipstick guide.

- (b) Apply soapy water to the O-ring.

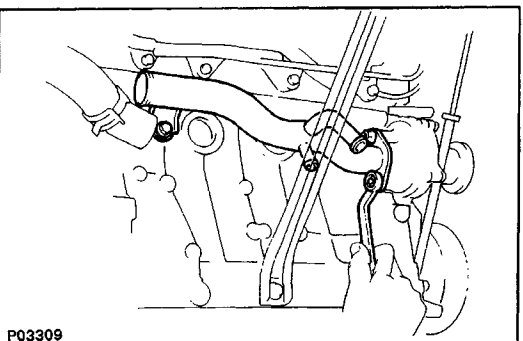
- (c) Push in the dipstick guide, and install it with the bolt.

Torque: 9.3 N-m (95 kgf-cm, 82in.-lbf)



3. INSTALL WATER INLET PIPE

- (a) Place a new O-ring in position on the water pump.



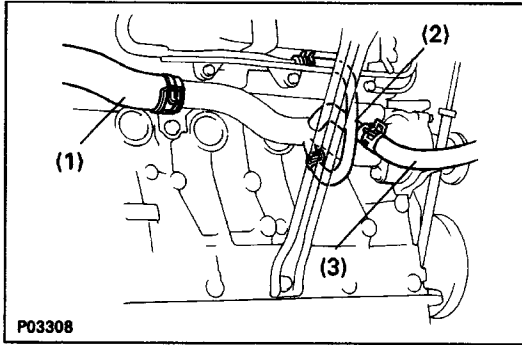
- (b) Temporarily install water pump with the two nuts and bolt.

- (c) Tighten the two nuts.

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

- (d) Tighten the bolt.

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)



(e) Connect the following hoses:

- (1) Water inlet housing hose
- (2) Heater water by-pass hose
- (3) Air pipe water by-pass hose

4. INSTALL PS DRIVE BELT ADJUSTING STRUT

(See step 5 on page [EM-108](#))

5. INSTALL NO.3 AND NO.2 TIMING BELT COVERS

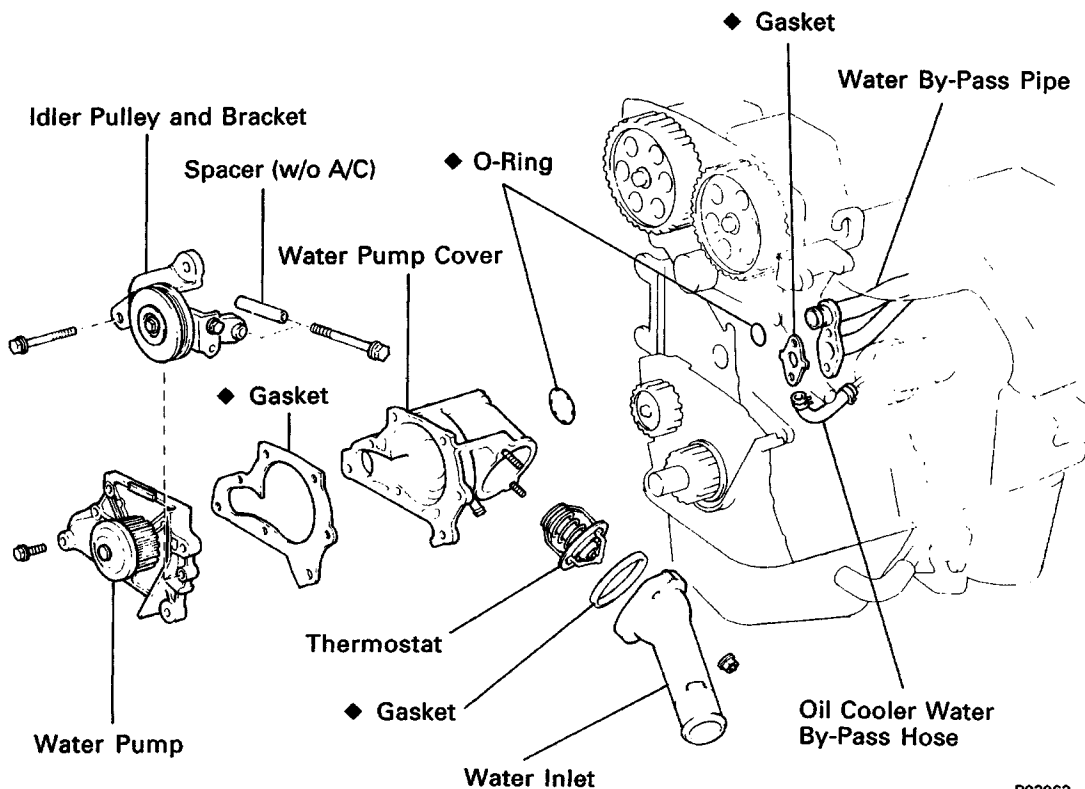
(See steps 12 to 24 on pages [EM-43](#) to 45)

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. FILL WITH ENGINE COOLANT (See page [CO-6](#))

WATER PUMP (3S-GTE and 5S-FE) COMPONENTS

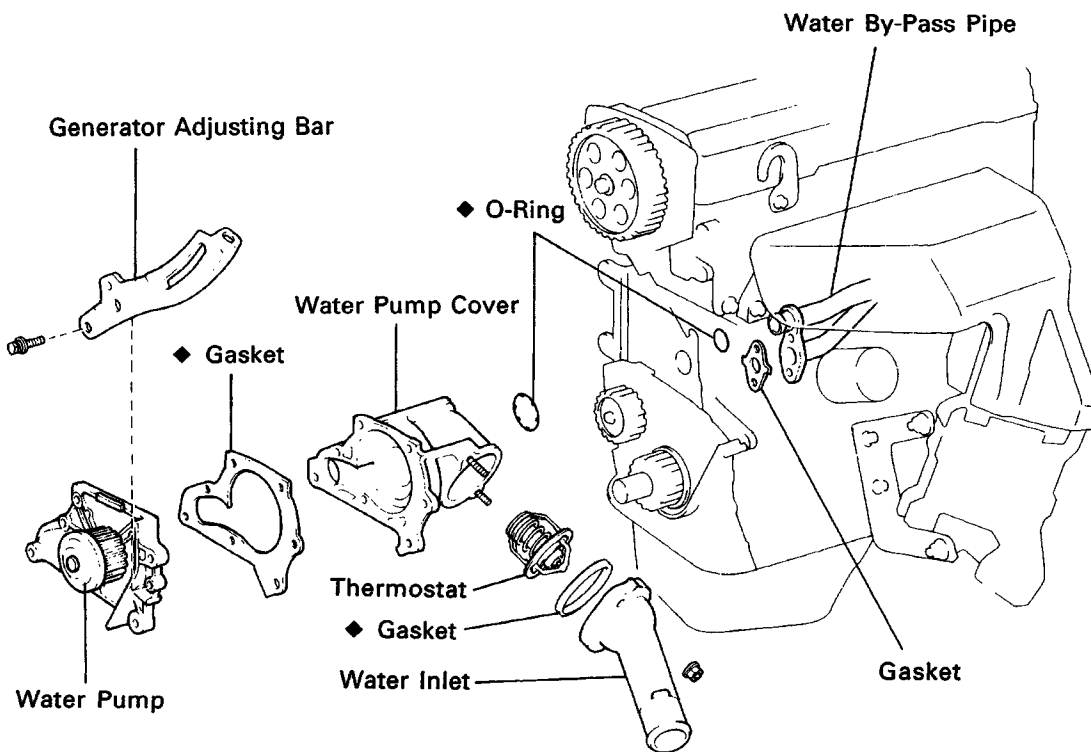
3S-GTE



P03063

◆ Non-reusable part

5S-FE



P03067

◆ Non-reusable part

REMOVAL OF WATER PUMP

(See page [CO-11](#))

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page [CO-6](#))

3. REMOVE TIMING BELT

3S-GTE (See steps 2 to 18 and 20 to 23 on pages EM-46 to 51)

5S-FE (See steps 2 to 17 and 19 to 22 on pages EM-67 to 72)

4. (3S-GTE)

REMOVE NO.2 IDLER PULLEY

(See step 25 on page [EM-52](#))

5. (5S-FE)

REMOVE IDLER PULLEYS

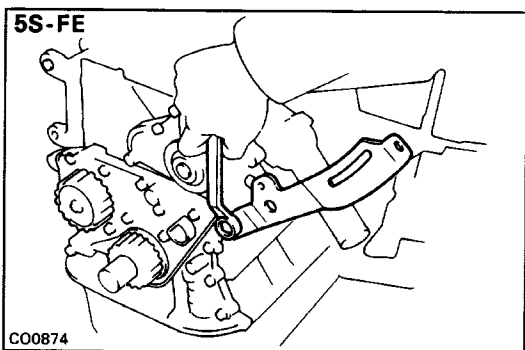
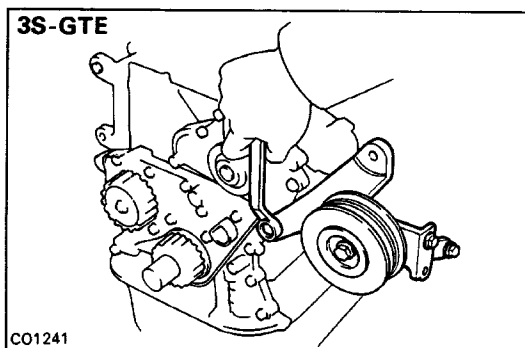
(See steps 23 to 24 on page [EM-72](#))

6. DISCONNECT LOWER RADIATOR HOSE FROM WATER INLET

7. (3S-GTE)

REMOVE IDLER PULLEY AND BRACKET

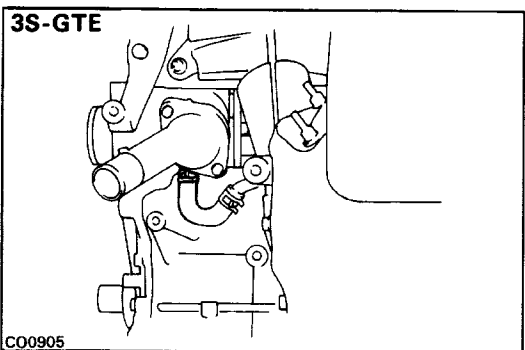
Remove the two bolts, pulley, bracket and spacer (w/o, A/C).



8. (5S-FE)

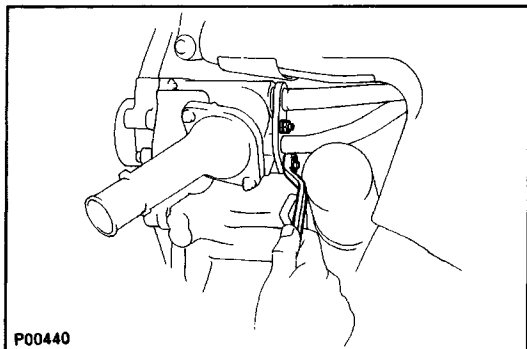
REMOVE GENERATOR BELT ADJUSTING BAR

Remove the bolt and adjusting bar.



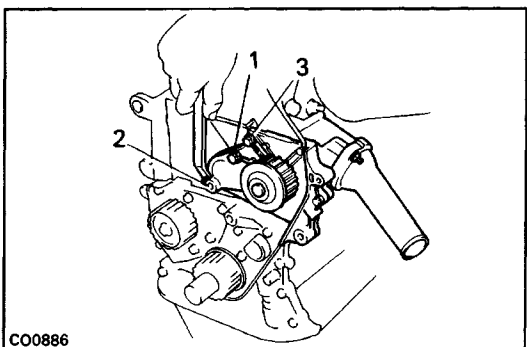
9. (3S-GTE)

DISCONNECT OIL COOLER WATER BY-PASS HOSE



10. REMOVE WATER PUMP AND WATER PUMP COVER ASSEMBLY

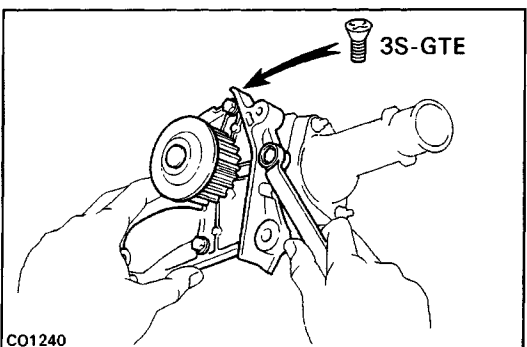
(a) Remove the two nuts holding the pump to the water by-pass pipe.



(b) Remove the three bolts in the sequence shown.

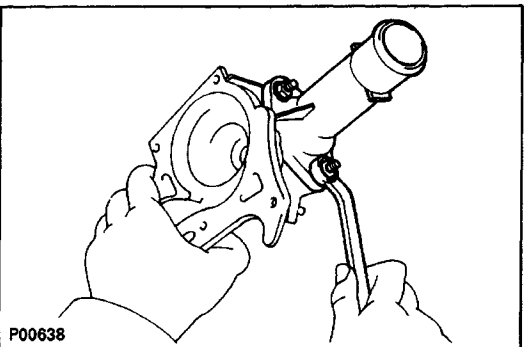
(c) Pull out the water pump together with the water pump cover.

(d) Remove the gasket and two O-rings from the water pump and water by-pass pipe.



11. SEPARATE WATER PUMP AND WATER PUMP COVER

Remove the three bolts, water pump and gasket from the water pump cover.

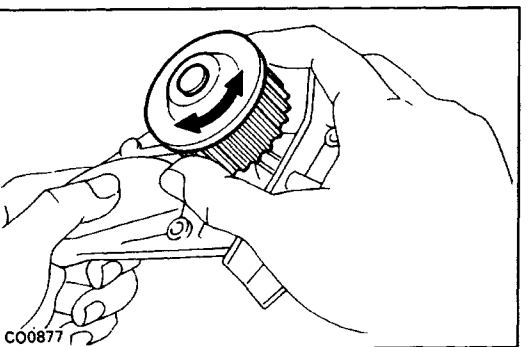


12. REMOVE WATER INLET AND THERMOSTAT FROM WATER PUMP COVER

(a) Remove the two nuts and water inlet from the water pump.

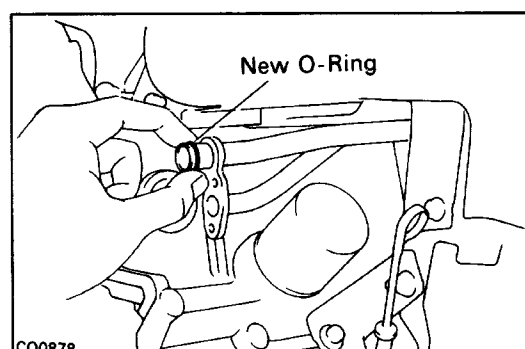
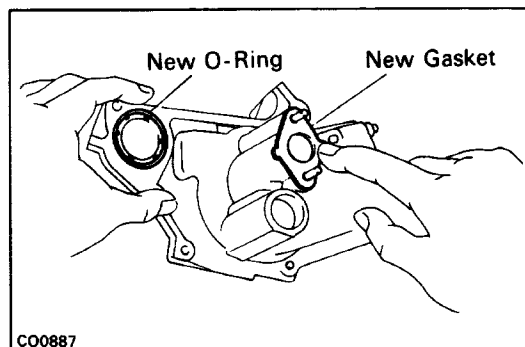
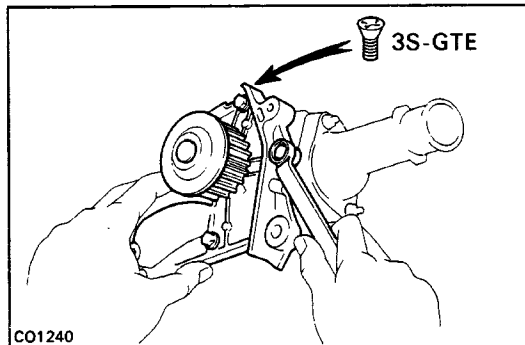
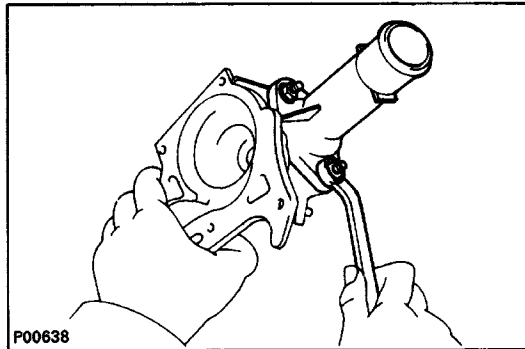
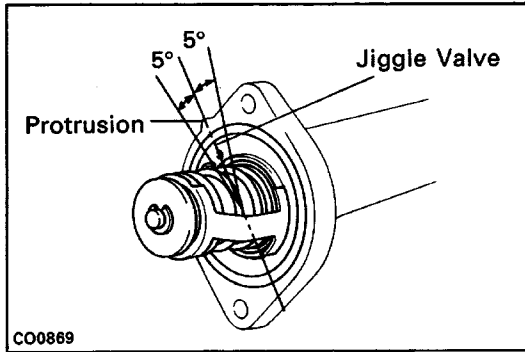
(b) Remove the thermostat.

(c) Remove the gasket from the thermostat.



INSPECTION OF WATER PUMP INSPECT WATER PUMP

Turn the pulley and check that the water pump bearing moves smoothly and quietly.



INSTALLATION OF WATER PUMP

(See page [CO-11](#))

1. INSTALL THERMOSTAT AND WATER INLET TO WATER PUMP COVER

- (a) Install a new gasket to the thermostat.
- (b) Align the jiggle valve of the thermostat with the upper side of the stud bolt, and insert the thermostat in the water pump.
HINT: The jiggle valve may be set within 5° of either side of the prescribed position.

- (c) Install the water inlet with the two nuts.

Torque:

3S-GTE 7.8 N-m (80 kgf-cm, 69 in.-lbf)

5S-FE 9.3 N-m (95 kgf-cm, 82 in.-lbf)

2. ASSEMBLE WATER PUMP AND WATER PUMP COVER

Install a new gasket and the water pump to the pump cover with the three bolts.

Torque:

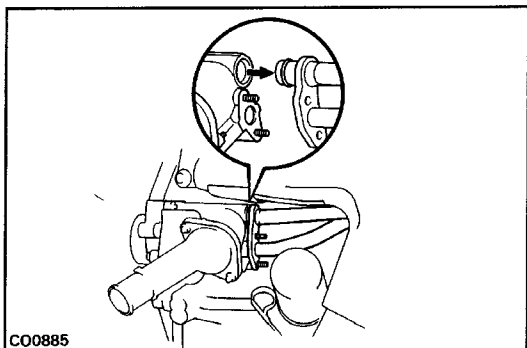
3S-GTE 9.3 N-m (95 kgf-cm, 82 in.-lbf)

5S-FE 8.8 N-m (90 kgf-cm, 78 in.-lbf)

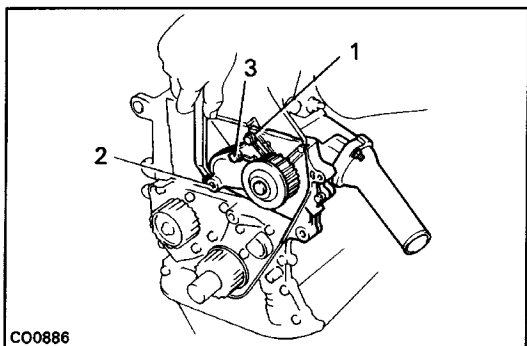
3. INSTALL WATER PUMP AND WATER PUMP COVER ASSEMBLY

- (a) Install new O-ring and gasket to the water pump cover.

- (b) Install a new O-ring to the water by-pass pipe.



- (c) Apply soapy water to the O-ring on the water by-pass pipe.
- (d) Connect the pump cover to the water by-pass pipe.
Do not install the nuts yet.

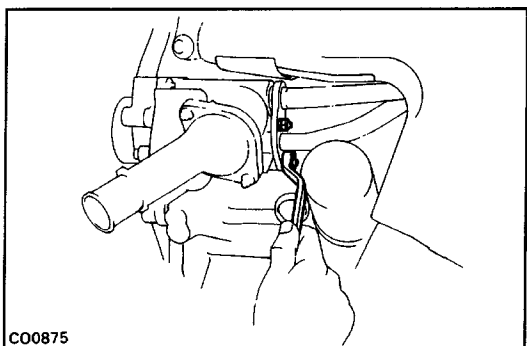


- (e) Install the water pump with the three bolts. Tighten the bolts in the sequence shown.

Torque:

3S-GTE 7.8 N-m (80 kgf-cm, 69 MAW)

5S-FE 8.8 N-m (90 kgf-cm, 78 MAW)

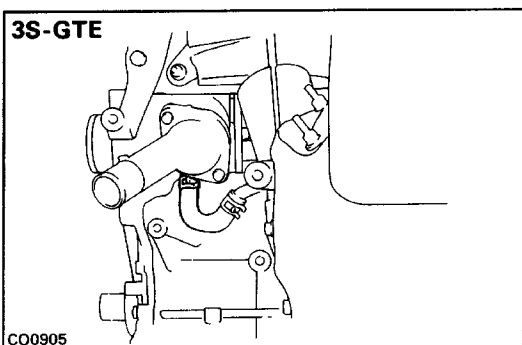


- (f) Install the two nuts holding the water pump cover to the water by-pass pipe.

Torque:

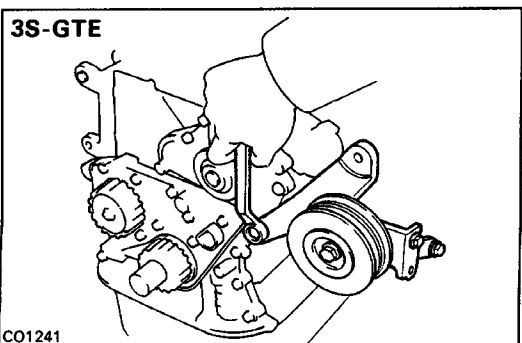
3S-GTE 12 N-m (120 kgf-cm, 9 ft-lbf)

5S-FE 9.3 N-m (95 kgf-cm, 82 MAW)



4. (3S-GTE)

CONNECT OIL COOLER WATER BY-PASS HOSE

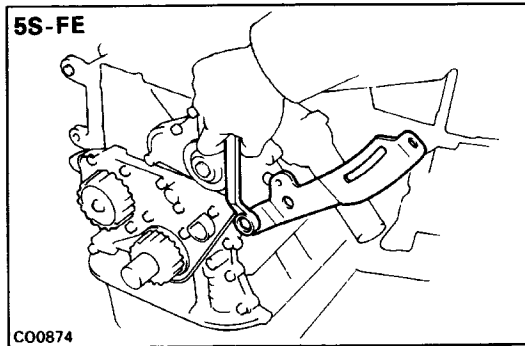


5. (3S-GTE)

INSTALL IDLER PULLEY AND BRACKET

Install the pulley and bracket with the spacer (w/o A/C) and two bolts.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)

**6. (5S-FE)****INSTALL GENERATOR BELT ADJUSTING BAR**

Temporarily install the adjusting bar with the bolt.

7. CONNECT LOWER RADIATOR HOSE TO WATER**INLET****8. (3S-GTE)****INSTALL NO.2 IDLER PULLEY**

(See step 3 on page [EM-55](#))

9. (5S-FE)**INSTALL IDLER PULLEYS**

(See steps 3 and 4 on page [EM-75](#))

10. INSTALL TIMING BELT

3S-GTE (See steps 5 to 8 and 10 to 30 on pages [EM-55](#) to 61)

5S-FE (See steps 5 to 8 and 10 to 27 on pages [EM-75](#) to 80)

11. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**12. FILL WITH ENGINE COOLANT (See page [CO-6](#))**

THERMOSTAT

REMOVAL OF THERMOSTAT (4A-FE)

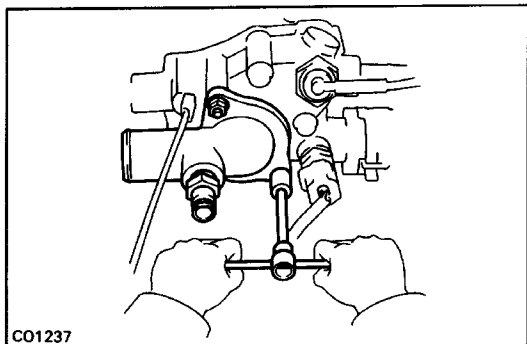
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page CO-6)

3. DISCONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR

4. DISCONNECT LOWER RADIATOR HOSE



CO1237

5. REMOVE WATER INLET AND THERMOSTAT

- (a) Remove the two nuts and water inlet from the water pump.
- (b) Remove the thermostat.
- (c) Remove the gasket from the thermostat.

REMOVAL OF THERMOSTAT (3S-GTE and 5S-FE)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page CO-6)

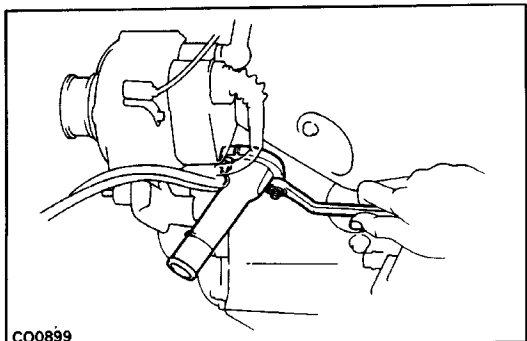
3. (3S-GTE)

REMOVE GENERATOR (See page CH-7)

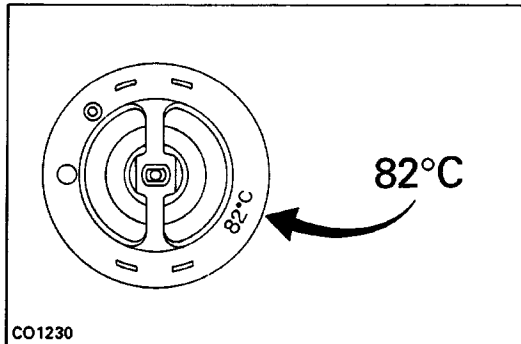
4. DISCONNECT LOWER RADIATOR HOSE

5. REMOVE WATER INLET AND THERMOSTAT

- (a) Remove the two nuts and water inlet from the water pump.
- (b) Remove the thermostat.
- (c) Remove the gasket from the thermostat.



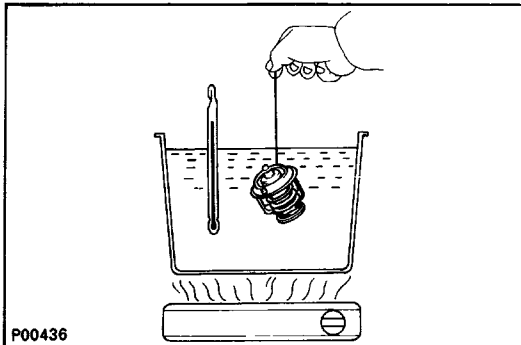
CO0899



INSPECTION OF THERMOSTAT

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.



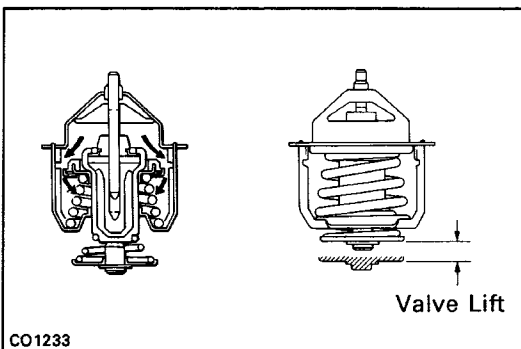
(a) Immerse the thermostat in water and gradually heat the water—.

(b) Check the valve opening temperature.

Valve opening temperature:

80 – 84°C (176 – 183°F)

If the valve opening temperature is not as specified, replace the thermostat.



(c) Check the valve lift.

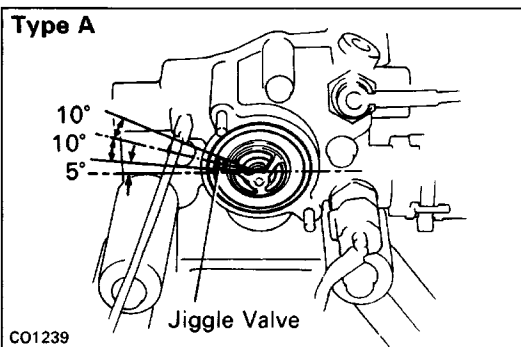
Valve lift:

8 mm (0.31 in.) or more at 95°C (203°F)

If the valve lift is less than specification, replace the thermostat.

(d) Check that the valve spring is tight when the thermostat is fully closed.

If necessary, replace the thermostat.



INSTALLATION OF THERMOSTAT (4A-FE)

1. PLACE THERMOSTAT IN WATER PUMP

(a) Install a new gasket to the thermostat.

(b) (Type A)

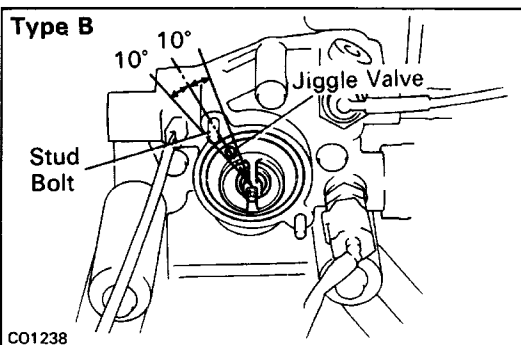
Set the jiggle valve of the thermostat in angle position, and insert the thermostat in the water inlet housing.

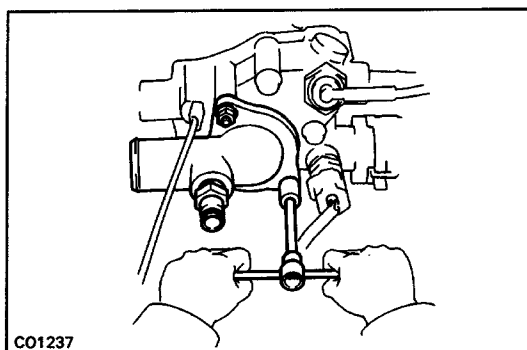
HINT: The jiggle valve may be set within 10° of either side of the prescribed position.

(b) (Type B)

Align the jiggle valve of the thermostat with the upper side of the stud bolt, and insert the thermostat in the water pump.

HINT: The jiggle valve may be set within 10° of either side of the prescribed position.





2. INSTALL WATER INLET

Install the water inlet with the two nuts.

Torque: 9.3 N-m (95 kgf-cm, 82in.-lbf)

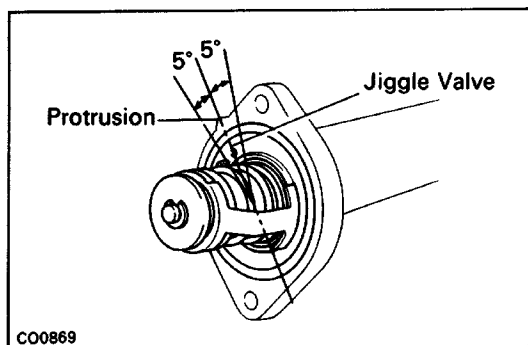
3. CONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR

4. CONNECT LOWER RADIATOR HOSE

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

6. FILL WITH ENGINE COOLANT (See page CO-6)

7. START ENGINE AND CHECK FOR LEAKS



INSTALLATION OF THERMOSTAT (3S-GTE and 5S-FE)

1. PLACE THERMOSTAT IN WATER PUMP

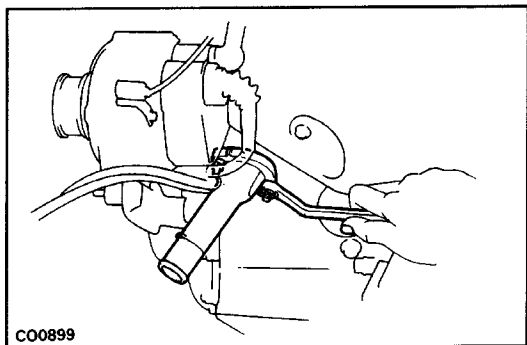
- Install a new gasket to the thermostat.
- Align the jiggle valve of the thermostat with the upper side of the stud bolt, and insert the thermostat in the water pump.

HINT: The jiggle valve may be set within 5° of either side of the prescribed position.

2. INSTALL WATER INLET

Install the water inlet with the two nuts.

Torque: 8.8 N-m (90 kgf-cm, 78 in.-lbf)



3. (3S-GTE)

INSTALL GENERATOR (See page CH-23)

4. CONNECT LOWER RADIATOR HOSE

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

6. FILL WITH ENGINE COOLANT (See page CO-6)

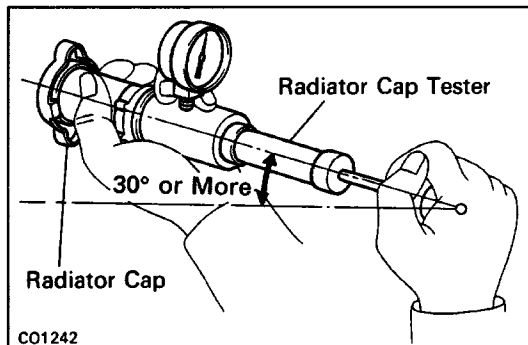
7. START ENGINE AND CHECK FOR LEAKS

RADIATOR

CLEANING OF RADIATOR

Using water or a steam cleaner, remove any mud and dirt from the radiator core.

CAUTION: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure is 2,942 – 3,432 kPa (30 – 35 kgf/cm², 427 – 498 psi), keep a distance of at least 40 – 50 cm (15.75 – 19.69 in.) between the radiator core and cleaner nozzle.



INSPECTION OF RADIATOR

1. INSPECT RADIATOR CAP

NOTICE: When performing steps (a) and (b) below, keep the radiator pump tester at an angle of over 30° above the horizontal.

- (a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the relief valve.

Pump speed: 1 push/3 seconds or more

NOTICE: Push the pump at a constant speed.

If air is not coming from the relief valve, replace the radiator cap.

- (b) Pump the tester several times and measure the relief valve opening pressure.

Pump speed:

1st time 1 push/1 second or less

2nd time or more Any speed

Standard opening pressure:

74 – 103 kPa

(0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)

Minimum opening pressure:

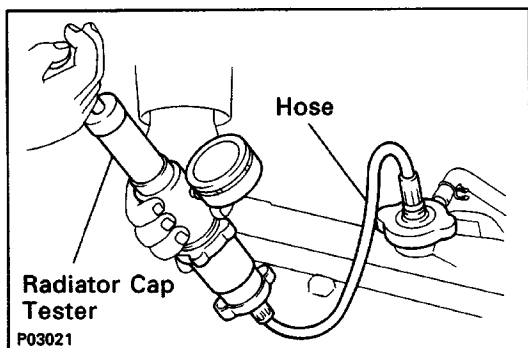
59 kPa (0.6 kgf/cm², 8.5 psi)

If the opening pressure is less than minimum, replace the radiator cap.

2. INSPECT COOLING SYSTEM FOR LEAKS

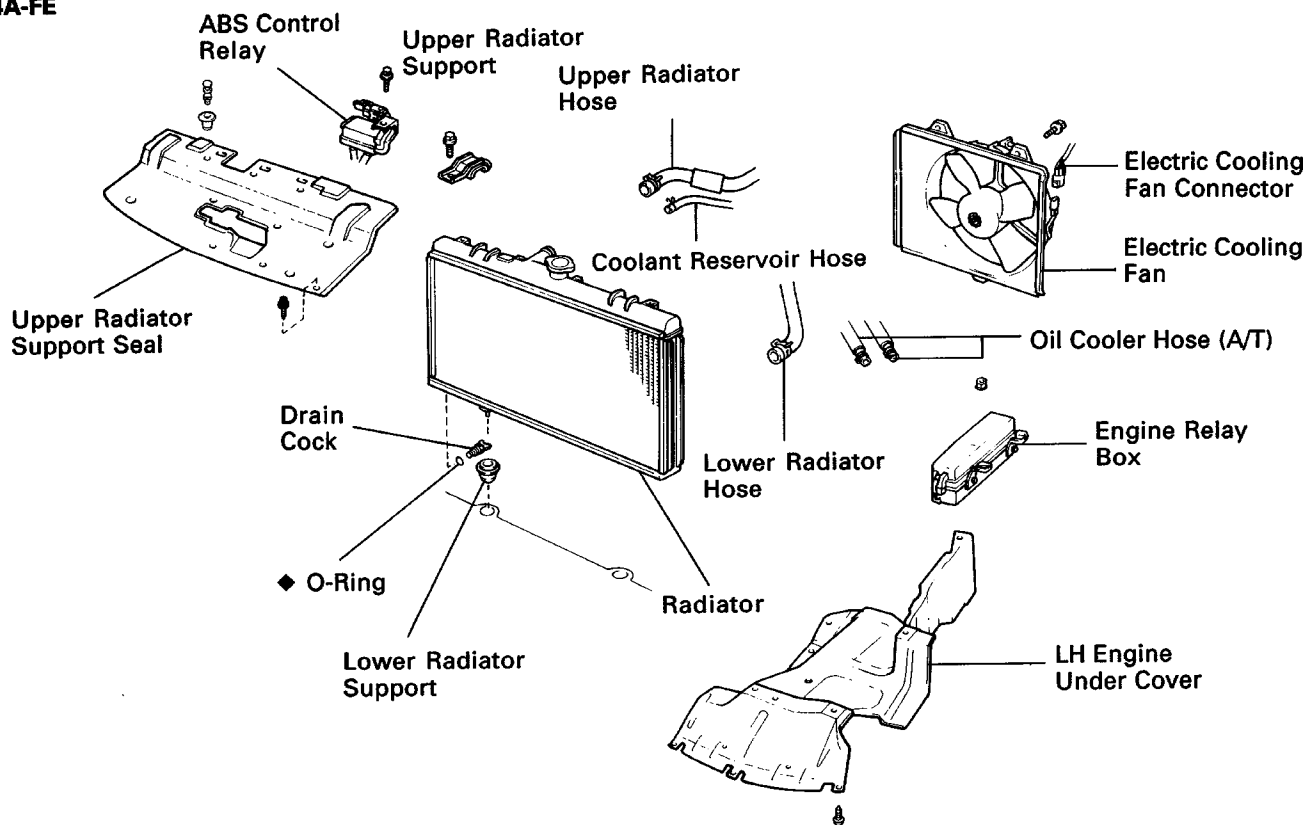
- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Warm up the engine.
- (c) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.



REMOVAL OF RADIATOR

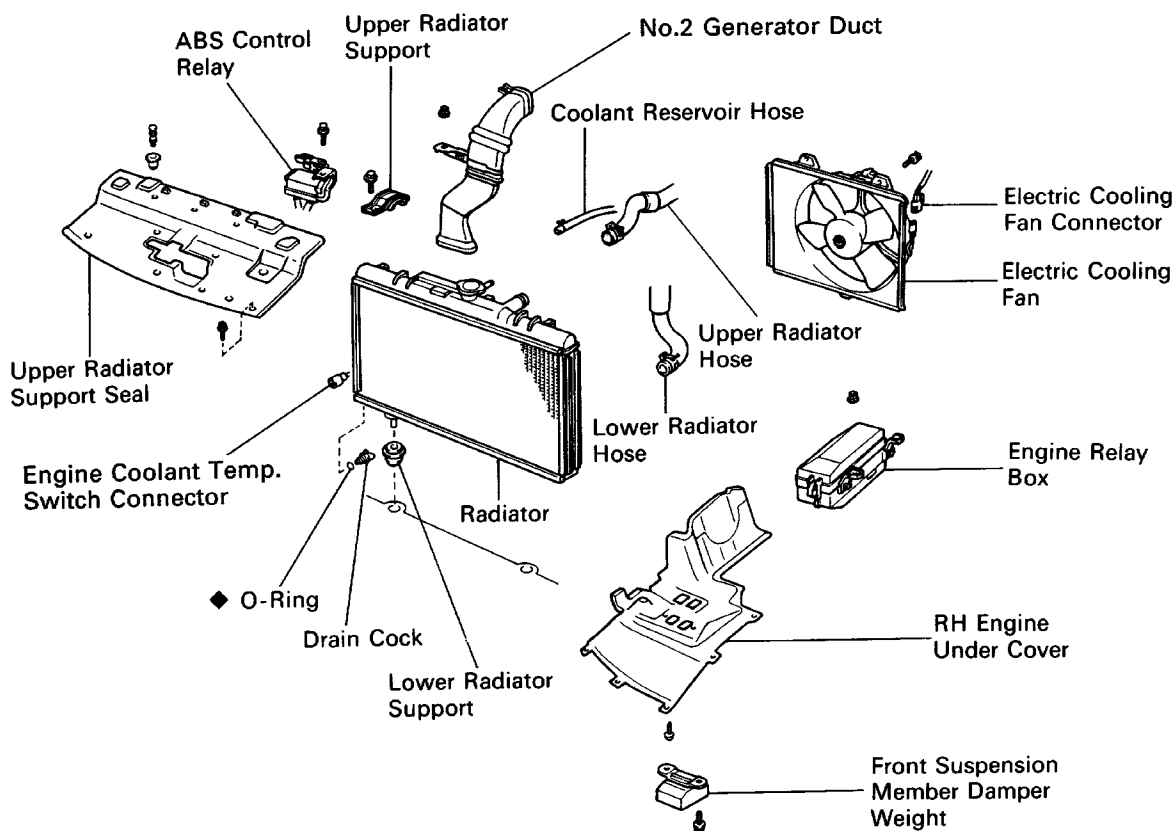
4A-FE



P03027

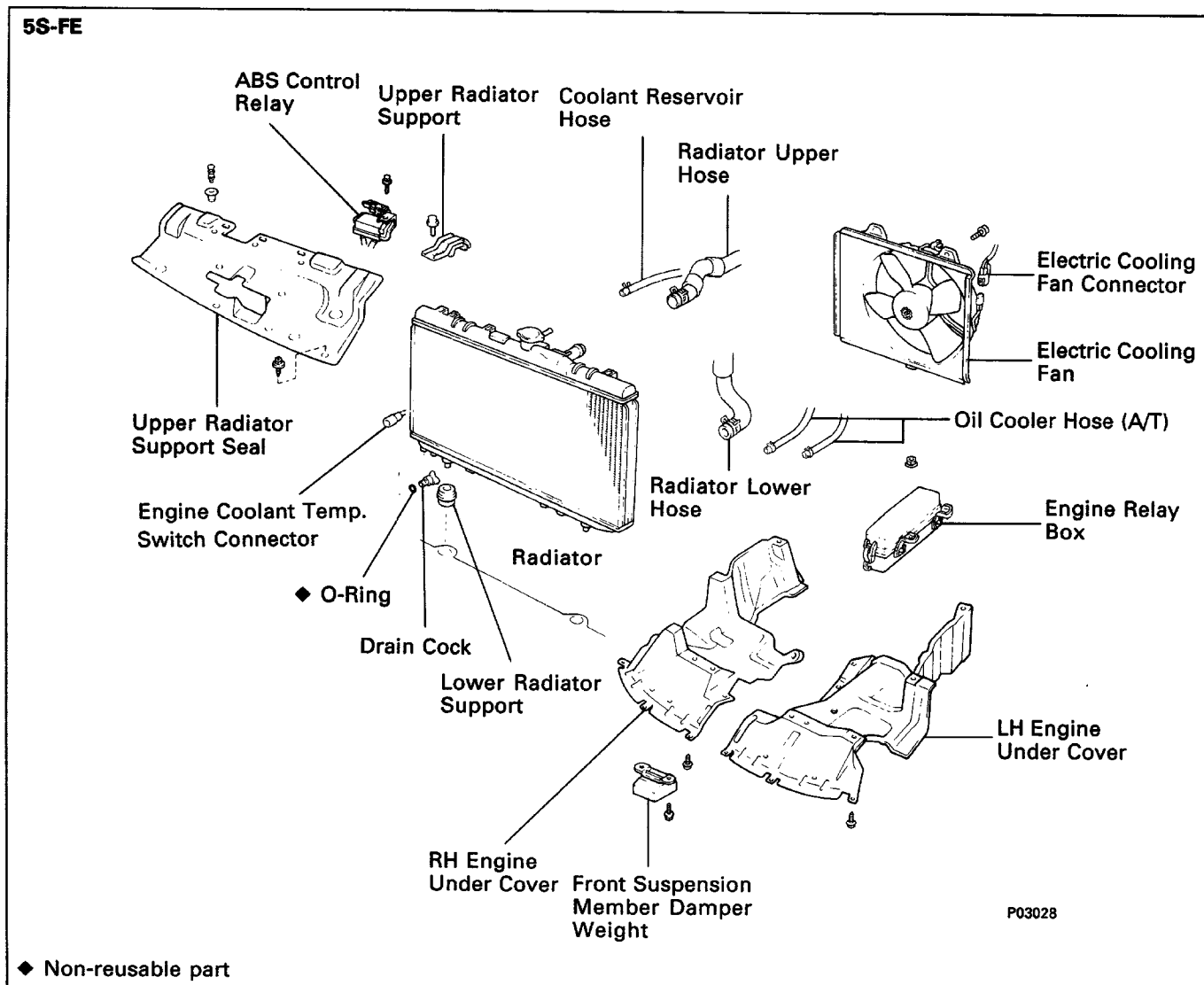
◆ Non-reusable part

3S-GTE



C01244

◆ Non-reusable part



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. (4A-FE)

REMOVE LH ENGINE UNDER COVER

3. (3S-GTE AND 5S-FE (M/T))

REMOVE RH ENGINE UNDER COVER

4. (5S-FE (A/T))

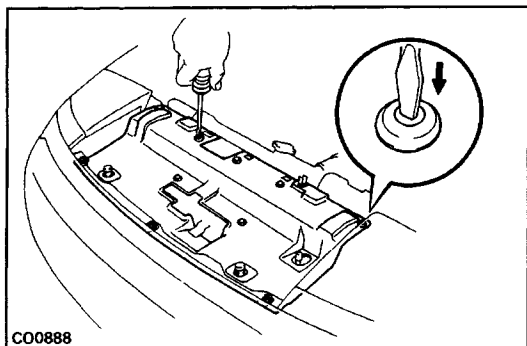
REMOVE RH AND LH ENGINE UNDER COVERS

5. DRAIN ENGINE COOLANT (See page [CO-6](#))

6. (3S-GTE AND 5S-FE)

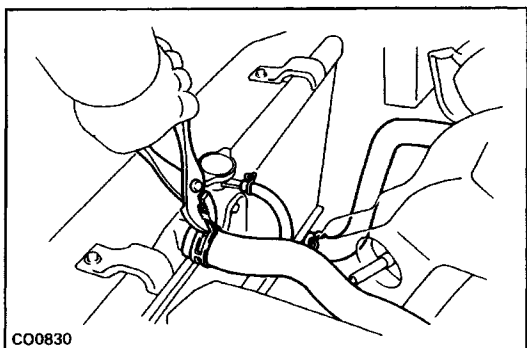
DISCONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR

7. (w/ ABS)
DISCONNECT ABS CONTROL RELAY FROM RADIATOR
8. (3S-GTE)
REMOVE NO.2 GENERATOR DUCT
9. DISCONNECT ENGINE RELAY BOX FROM BATTERY



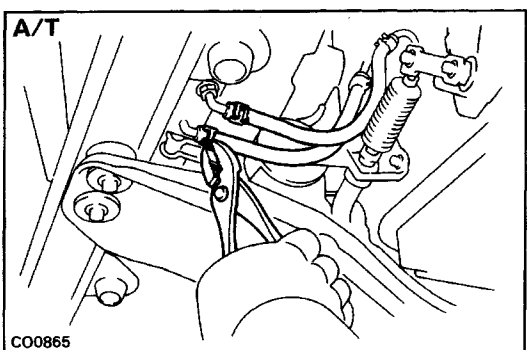
CO0888

10. REMOVE UPPER RADIATOR SUPPORT SEAL
Remove the seven clips, three screws and support seal.
11. DISCONNECT ELECTRIC COOLING FAN CONNECTOR



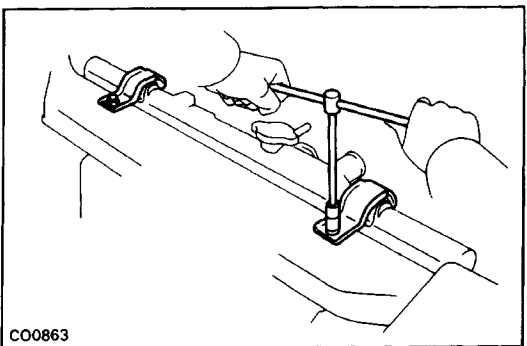
CO0830

12. DISCONNECT COOLANT RESERVOIR HOSE
13. DISCONNECT RADIATOR HOSES



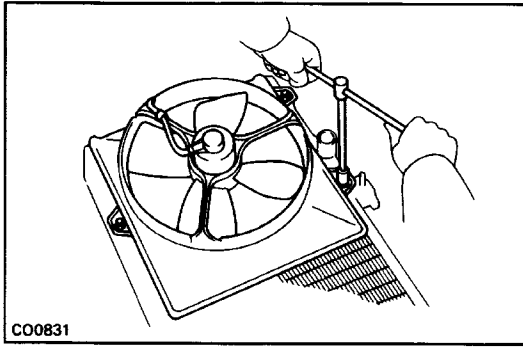
CO0865

14. (A/T)
DISCONNECT OIL COOLER HOSES



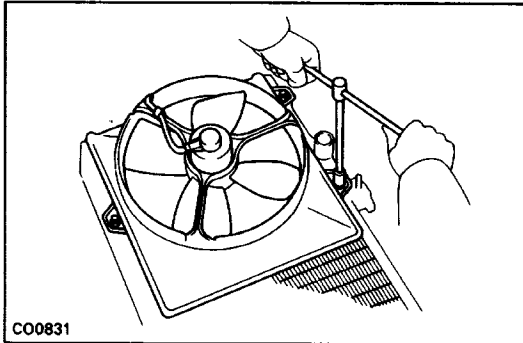
CO0863

15. REMOVE RADIATOR AND ELECTRIC COOLING FAN
 - (a) Remove the two bolts and two upper supports.
 - (b) Lift out the radiator.
 - (c) Remove the two lower radiator supports.



16. REMOVE ELECTRIC COOLING FAN FROM RADIATOR

Remove the three bolts and cooling fan.

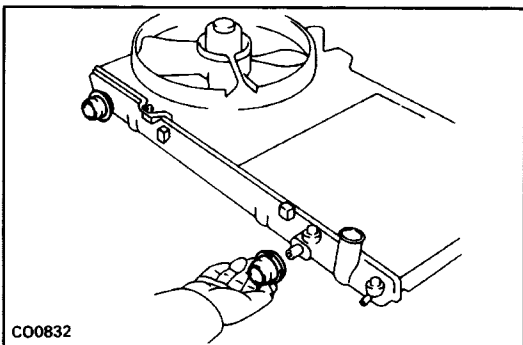


INSTALLATION OF RADIATOR

(See page [CO-21](#) or 22)

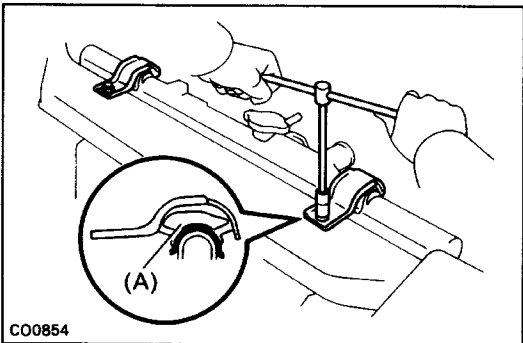
1. INSTALL ELECTRIC COOLING FAN TO RADIATOR

Install the cooling fan with the three bolts.



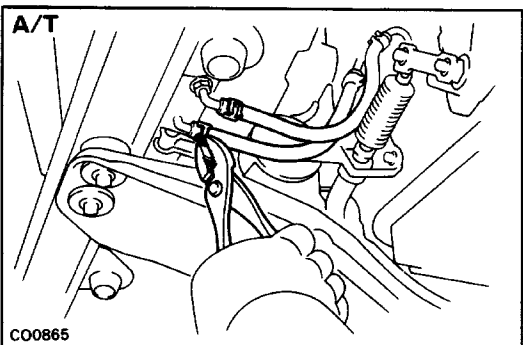
2. INSTALL RADIATOR

(a) Place the two lower radiator supports in position on the body.



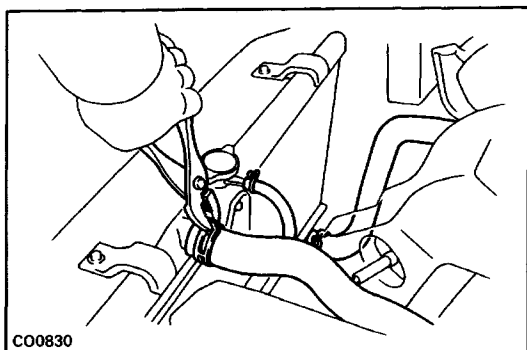
(b) Place the radiator in position, and install the two upper supports with the two bolts.

HINT: After installation, check that the rubber cushion (A) of the supports are not depressed.

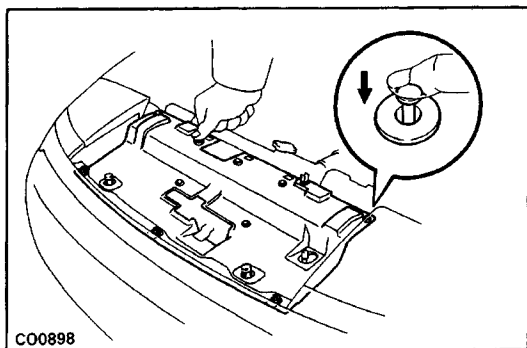


3. (A/T)

CONNECT OIL COOLER HOSES



4. CONNECT RADIATOR HOSES
5. CONNECT COOLANT RESERVOIR HOSE
6. CONNECT ELECTRIC COOLING FAN CONNECTOR

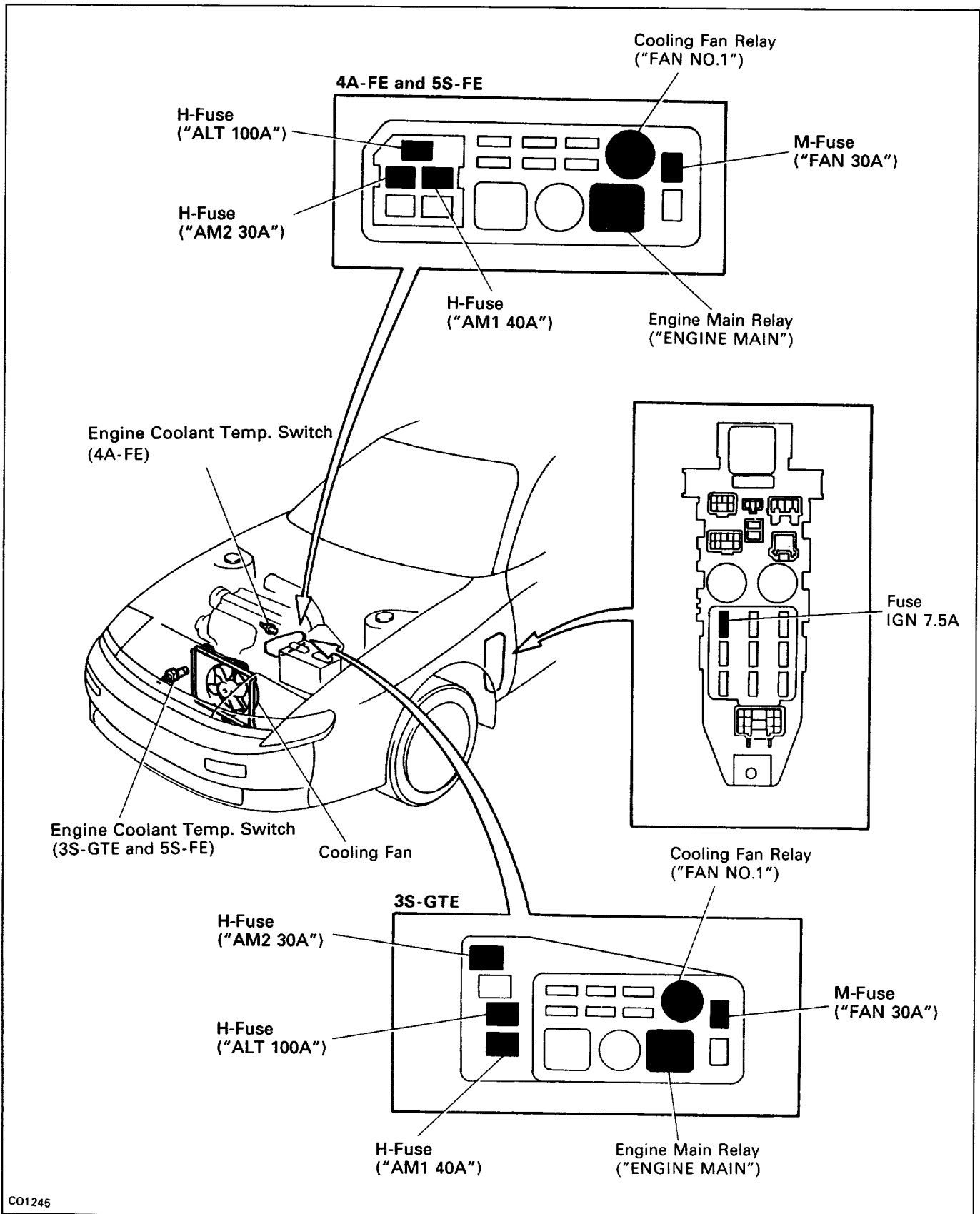


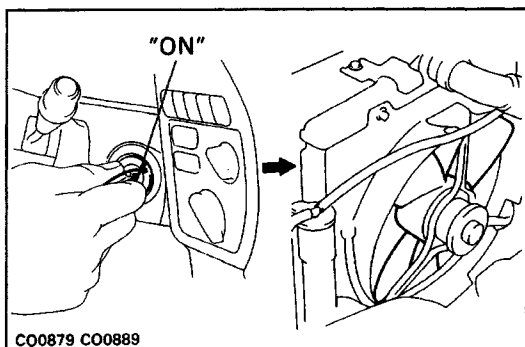
7. INSTALL UPPER RADIATOR SUPPORT SEAL
Install the support seal with the seven clips and three screws.

8. INSTALL ENGINE RELAY BOX
9. (3S-GTE)
INSTALL NO.2 GENERATOR AIR DUCT
10. (w/ ABS)
INSTALL ABS CONTROL RELAY
11. (3S-GTE AND 5S-FE)
CONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR
12. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
13. FILL WITH ENGINE COOLANT (See page [CO-6](#))
14. START ENGINE AND CHECK FOR LEAKS
15. (A/T)
CHECK AUTOMATIC TRANSMISSION (A/T) FLUID LEVEL (See page [MA-13](#))
NOTICE: Do not overfill.
16. (4A-FE)
INSTALL LH ENGINE UNDER COVER
17. (3S-GTE AND 5S-FE (M/T))
INSTALL RH ENGINE UNDER COVER
18. (5S-FE (A/T))
INSTALL RH AND LH ENGINE UNDER COVERS

ELECTRIC COOLING FANS

LOCATION OF ELECTRIC COOLING FAN COMPONENTS





CO0879 CO0889

ON-VEHICLE INSPECTION

Low Temperature (Below 83°C (181°F))

1. TURN IGNITION SWITCH "ON"

Check that the cooling fan stops.

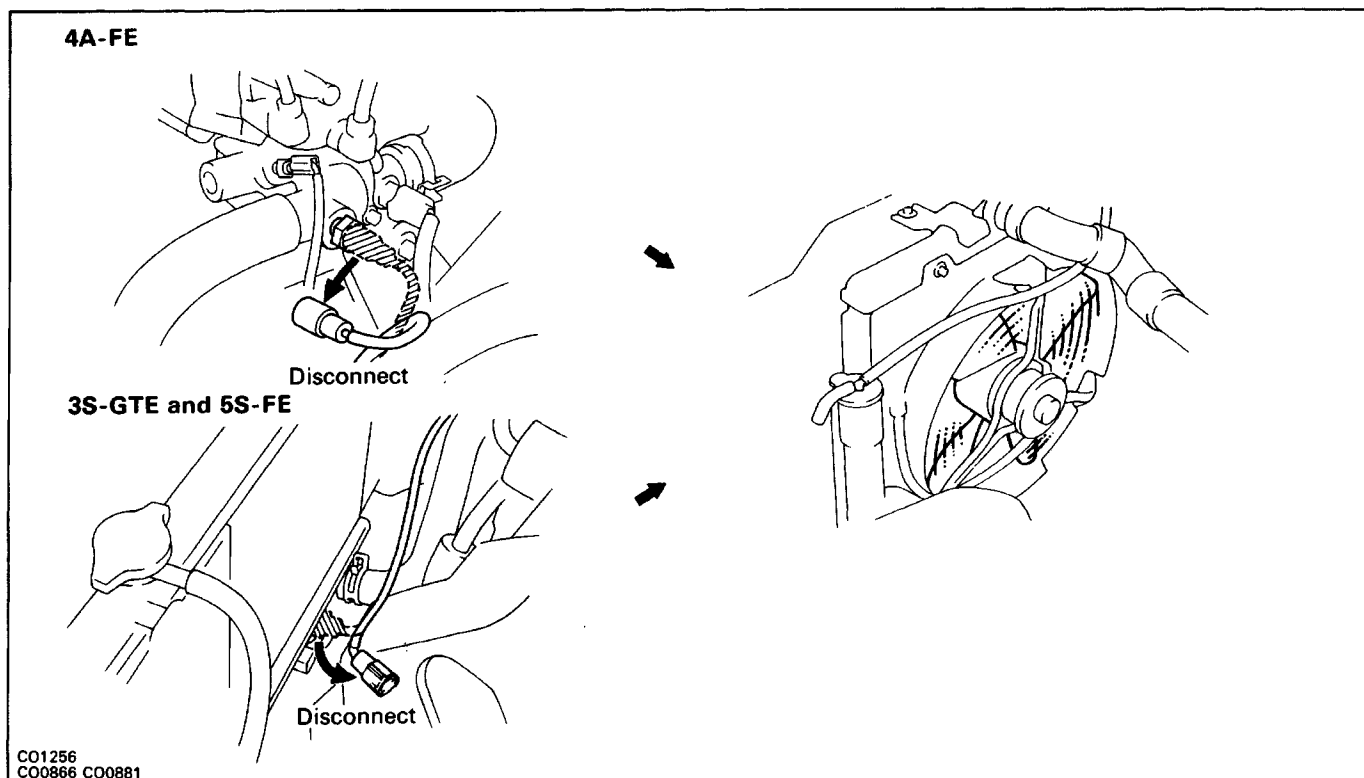
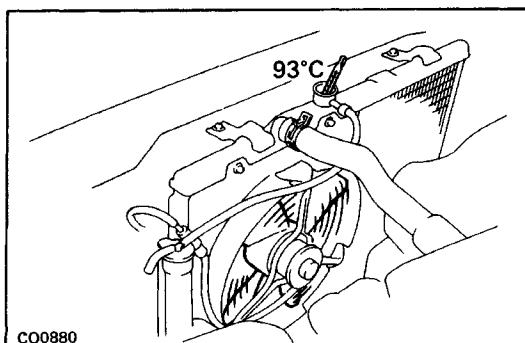
If not, check the cooling fan relay and engine coolant temperature switch, and check for a separated connector or severed wire between the cooling fan relay and engine coolant temperature switch.

2. DISCONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR

Check that the cooling fan rotates.

If not, check the cooling fan relay, cooling fan, engine main relay and fuse, and check for a short circuit between the cooling fan relay and engine coolant temperature switch.

3. CONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR

CO1256
CO0866 CO0881

CO0880

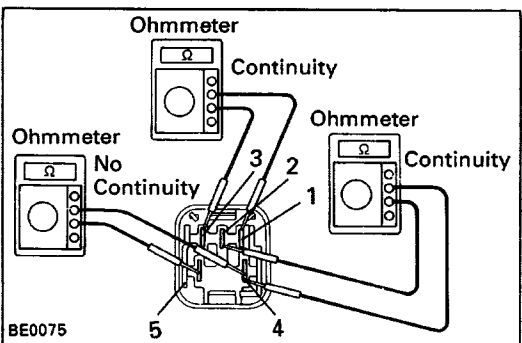
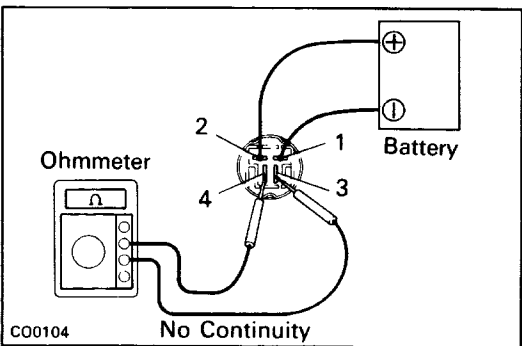
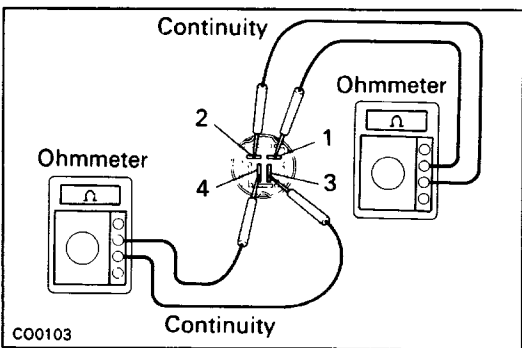
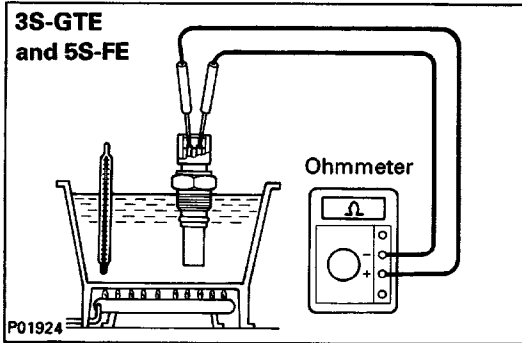
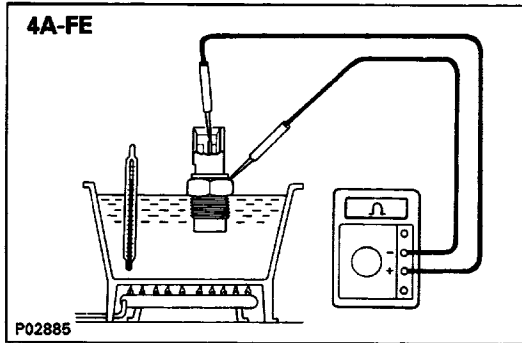
High Temperature (Above 93°C (199°F))

4. START ENGINE

(a) Raise engine coolant temperature to above 93°C (199°F).

(b) Check that the cooling fan rotates.

If not, replace the engine coolant temperature switch.



INSPECTION OF ELECTRIC COOLING FAN COMPONENTS

1. INSPECT ENGINE COOLANT TEMPERATURE SWITCH (4A-FE)

- Using an ohmmeter, check that there is no continuity between the terminal and switch body when the engine coolant temperature is above 93°C (199°F).
- Using an ohmmeter, check that there is continuity between the terminal and switch body when the engine coolant temperature is below 83°C (181°F). If continuity is not as specified, replace the switch.

(3S-GTE and 5S-FE)

- Using an ohmmeter, check that there is no continuity between the terminals when the engine coolant temperature is above 93°C (199°F).
- Using an ohmmeter, check that there is continuity between the terminals when the engine coolant temperature is below 83°C (181°F).

If continuity is not as specified, replace the switch.

2. INSPECT COOLING FAN RELAY ("FAN NO.1")

A. Inspect relay continuity

- Using an ohmmeter, check that there is continuity between terminals 1 and 2.
 - Check that there is continuity between terminals 3 and 4.
- If continuity is not as specified, replace the relay.

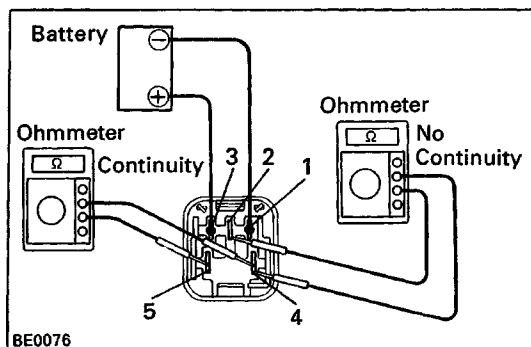
B. Inspect relay operation

- Apply battery positive voltage across terminals 1 and 2.
 - Using an ohmmeter, check that there is no continuity between terminals 3 and 4.
- If operation is not as specified, replace the relay.

3. INSPECT ENGINE MAIN RELAY ("ENGINE MAIN")

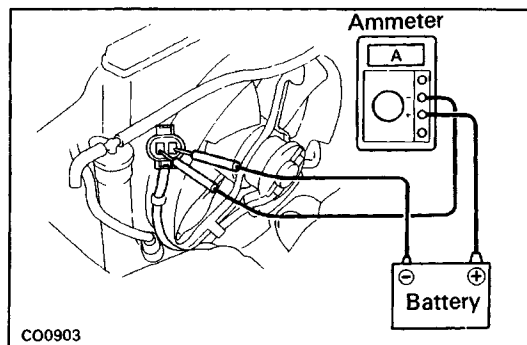
A. Inspect relay continuity

- Using an ohmmeter, check that there is continuity between terminals 1 and 3.
 - Check that there is continuity between terminals 2 and 4.
 - Check that there is no continuity between terminals 4 and 5.
- If continuity is not as specified, replace the relay.



6. Inspect relay operation

- (a) Apply battery positive voltage across terminals 1 and 3.
 - (b) Using an ohmmeter, check that there is no continuity between terminals 2 and 4.
 - (c) Check that there is continuity between terminals 4 and 5.
- If operation is not as specified, replace the relay.



4. INSPECT COOLING FAN

- (a) Connect battery and ammeter to the cooling fan connector.
- (b) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

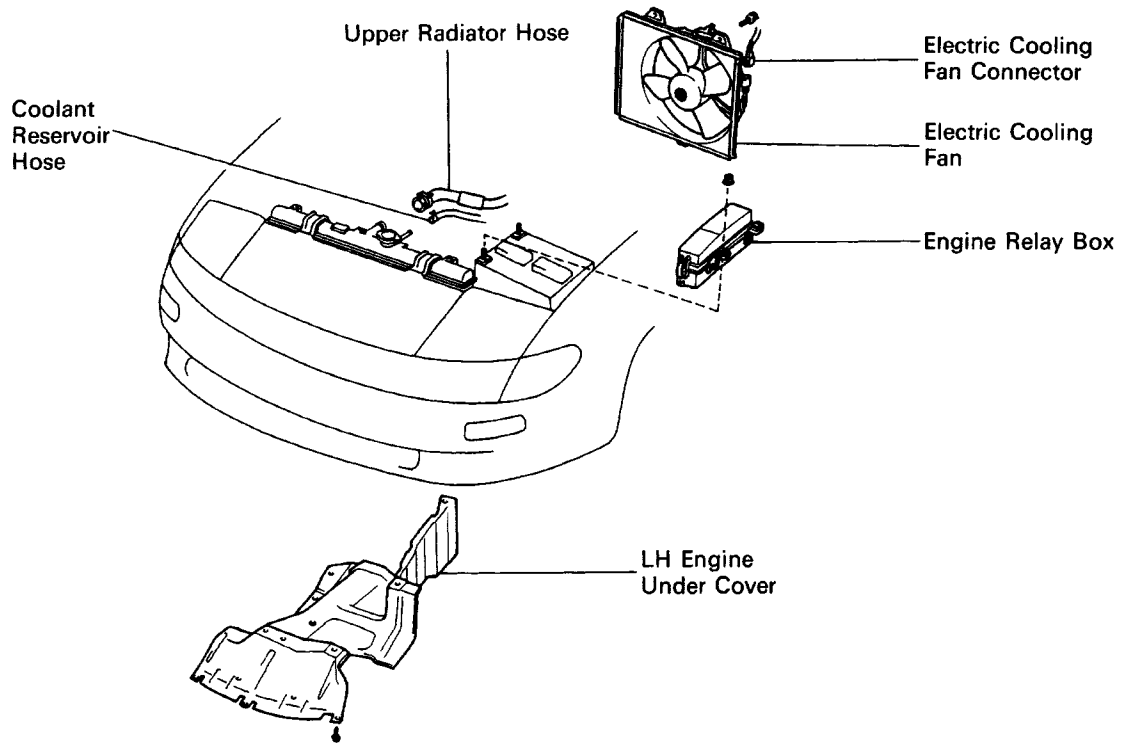
Standard amperage:

4A-FE and 5S-FE 5.8 – 7.4 A

3S-GTE 8.8–10.8 A

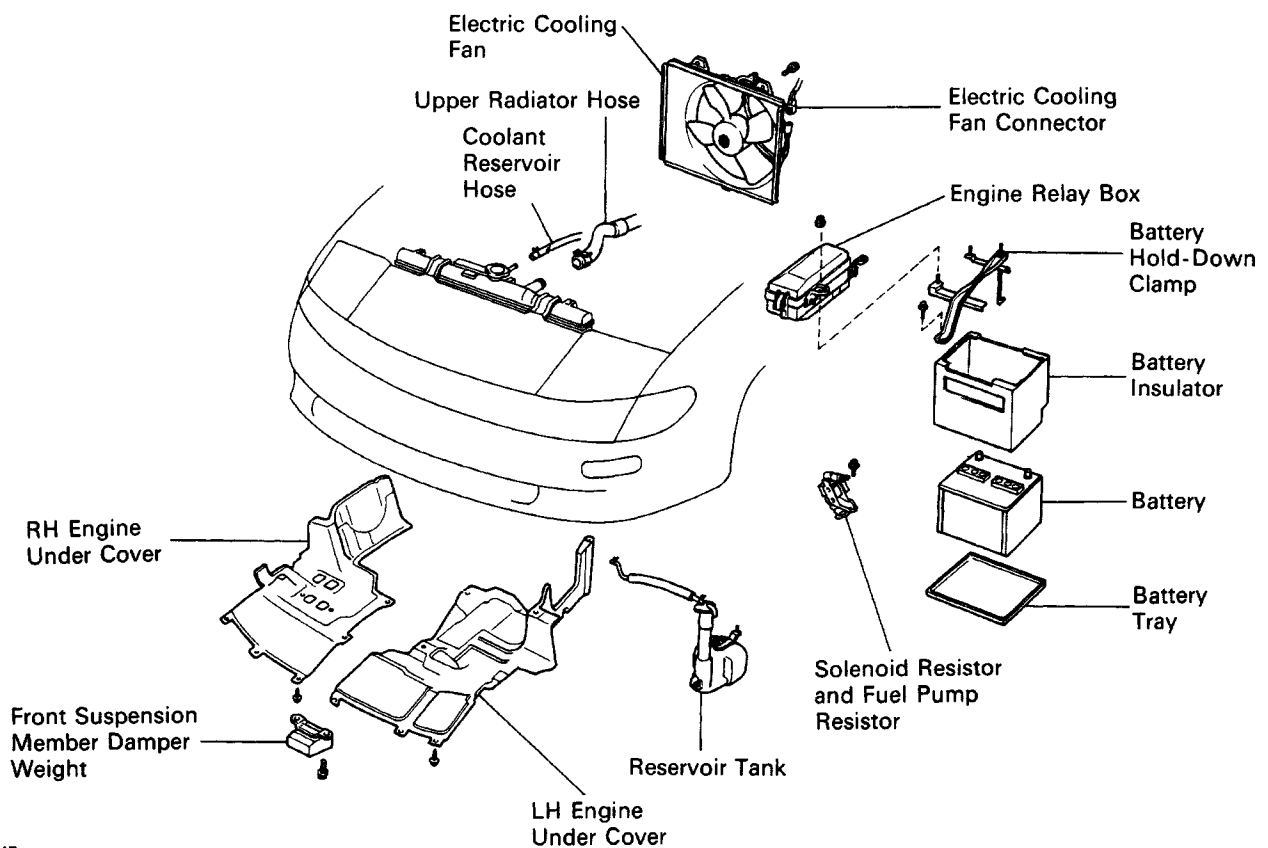
REMOVAL OF ELECTRIC COOLING FAN

4A-FE



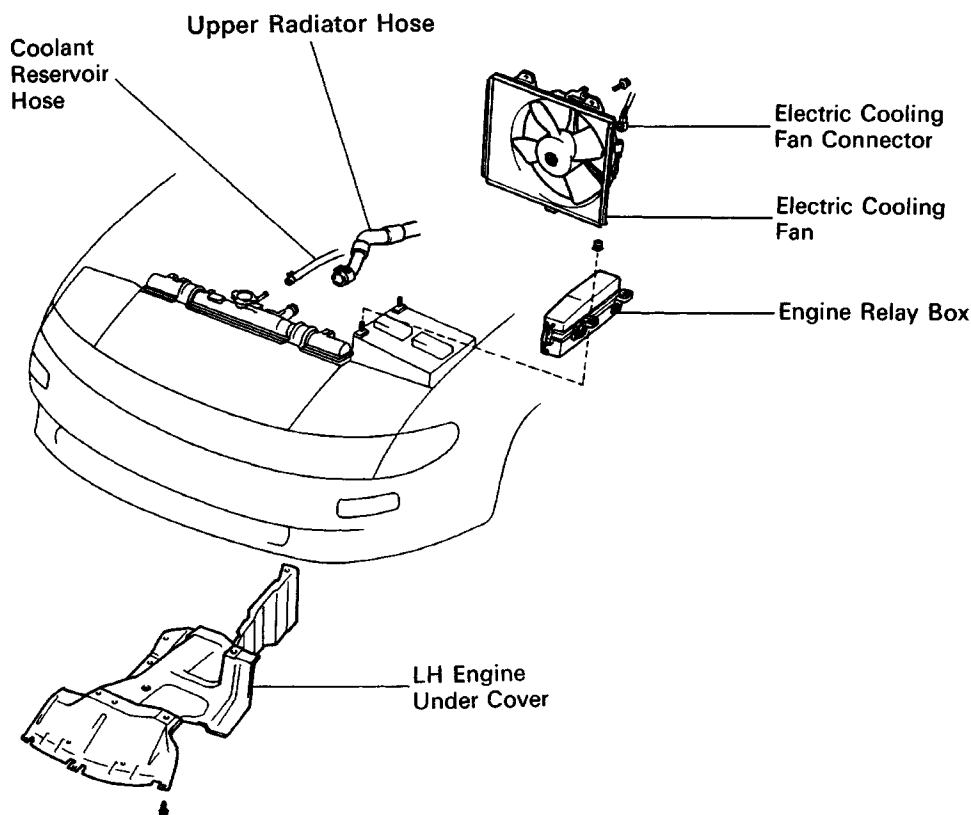
CO1246

3S-GTE



CO1247

5S-FE



C00883

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. (4A-FE AND 5S-FE)

REMOVE LH ENGINE UNDER COVER

3. (3S-GTE)

REMOVE RH AND LH ENGINE UNDER COVERS

4. DRAIN ENGINE COOLANT (See page CO-6)

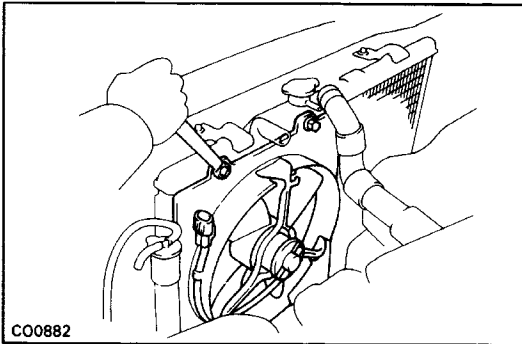
5. DISCONNECT ENGINE RELAY BOX FROM BATTERY

6. (3S-GTE)

REMOVE BATTERY

7. (3S-GTE)

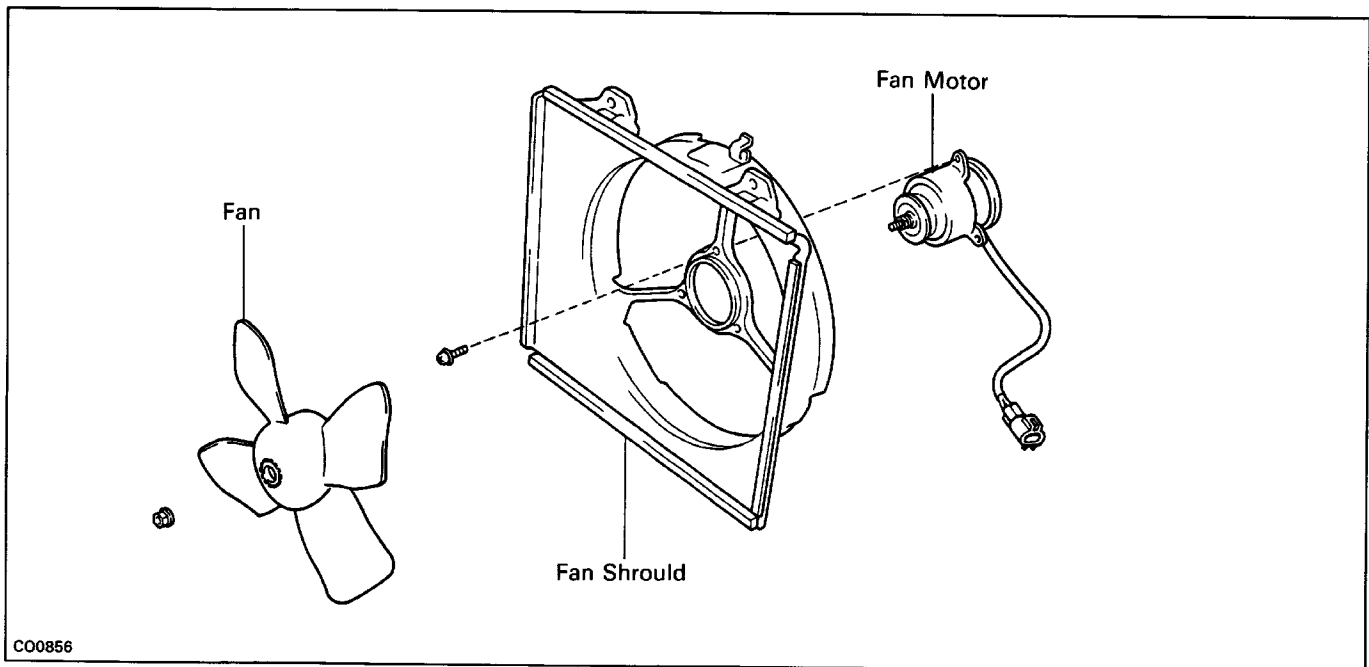
REMOVE SOLENOID RESISTOR AND FUEL PUMP RESISTOR

8. (3S-GTE)**REMOVE RESERVOIR TANK****9. (4A-FE AND 5S-FE)****DISCONNECT COOLANT RESERVOIR HOSE FROM RADIATOR****10. DISCONNECT UPPER RADIATOR HOSE FROM RADIATOR**

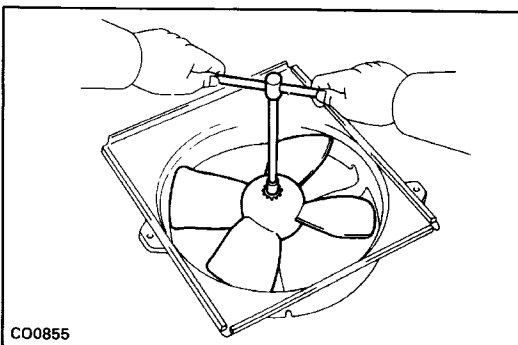
CO0882

11. REMOVE ELECTRIC COOLING FAN

- (a) Disconnect the cooling fan connector.
- (b) Remove the three bolts and cooling fan.

COMPONENTS

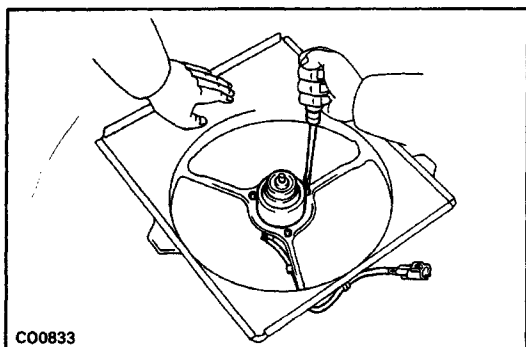
CO0856



CO0855

DISASSEMBLY OF ELECTRIC COOLING FAN**1. REMOVE FAN**

Remove the nut and fan.



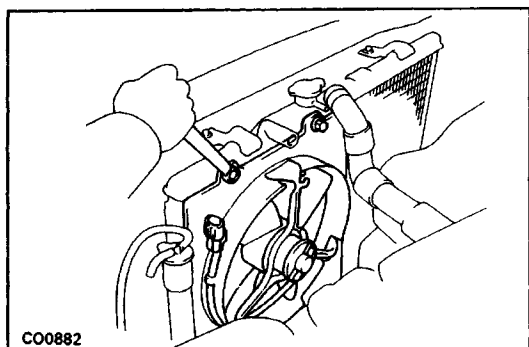
2. REMOVE FAN MOTOR

Remove the three screws and fan motor.

ASSEMBLY OF ELECTRIC COOLING FAN

(See page [CO-32](#))

1. INSTALL FAN MOTOR
2. INSTALL FAN



INSTALLATION OF ELECTRIC COOLING FAN

(See page [CO-30](#) or 31)

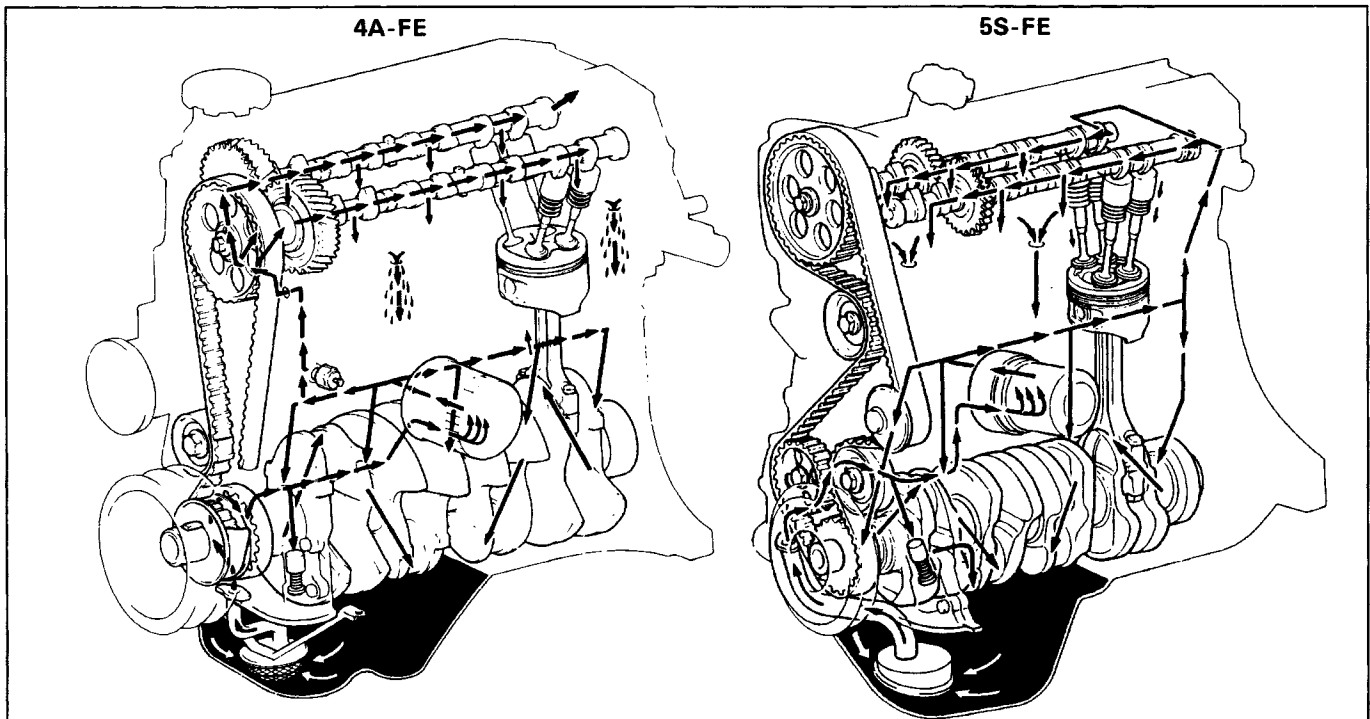
1. INSTALL ELECTRIC COOLING FAN
 - (a) Install the cooling fan with the three bolts.
 - (b) Connect the cooling fan connector.
2. CONNECT UPPER RADIATOR HOSE TO RADIATOR
3. (4A-FE AND 5S-FE)
CONNECT COOLANT RESERVOIR HOSE TO RADIATOR
4. (3S-GTE)
INSTALL RESERVOIR TANK
5. (3S-GTE)
INSTALL SOLENOID RESISTOR AND FUEL PUMP RESISTOR
6. (3S-GTE)
INSTALL BATTERY
7. INSTALL ENGINE RELAY BOX FROM BATTERY
8. FILL WITH ENGINE COOLANT (See page [CO-6](#))
9. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
10. START ENGINE AND CHECK FOR LEAKS
11. (3S-GTE)
INSTALL RH AND LH ENGINE UNDER COVERS
12. (4A-FE AND 5S-FE)
INSTALL LH ENGINE UNDER COVER

LUBRICATION SYSTEM

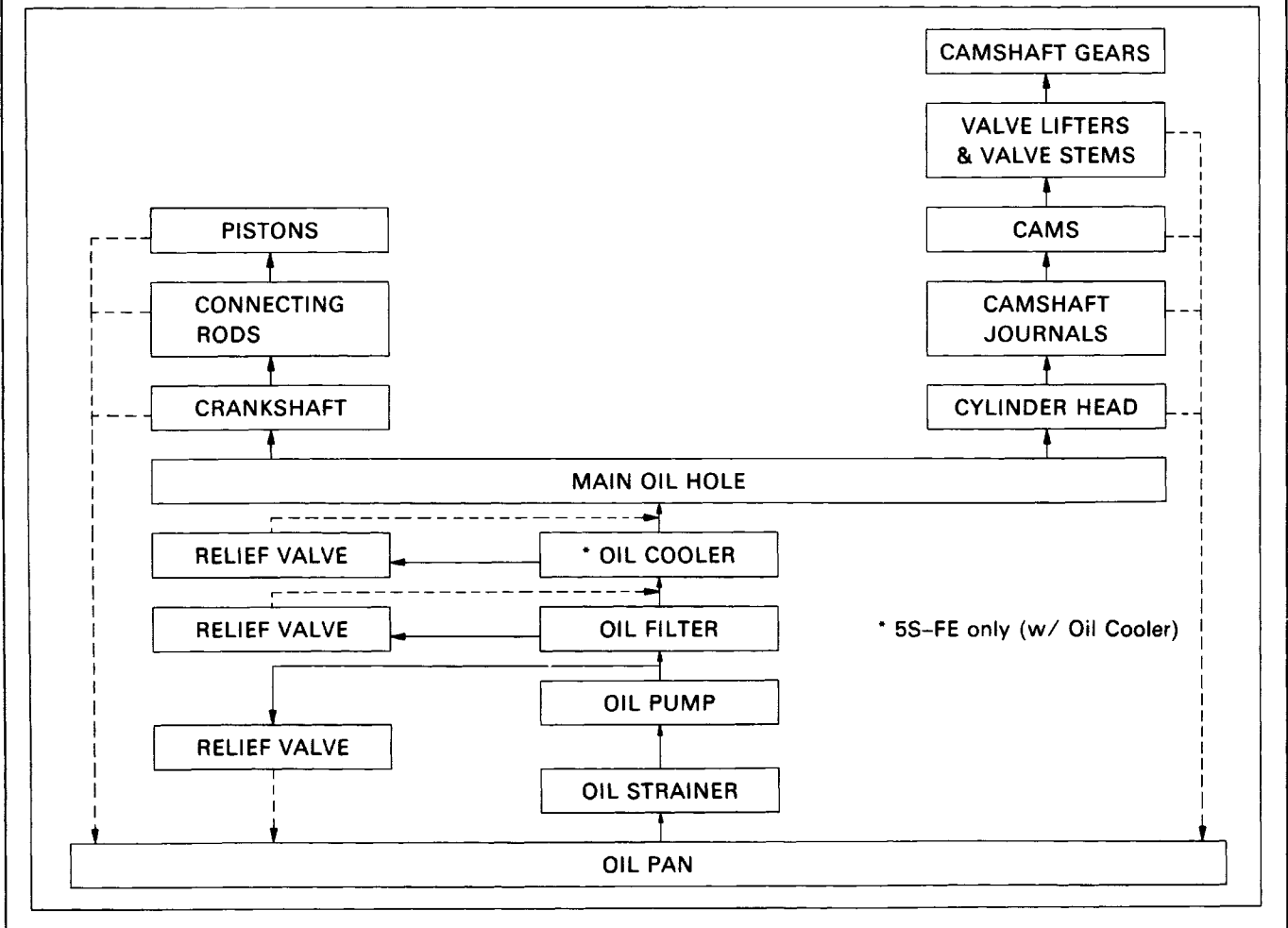
	Page
DESCRIPTION	LU-2
TROUBLESHOOTING	LU-4
OIL PRESSURE CHECK	LU-5
REPLACEMENT OF ENGINE OIL AND OIL FILTER	LU-7
OIL PUMP (4A-FE)	LU-9
OIL PUMP (3S-GTE and 5S-FE)	LU-16
OIL COOLER (3S-GTE)	LU-24
OIL COOLER (5S-FE)	LU-28
OIL NOZZLES (3S-GTE)	LU-31

DESCRIPTION

A fully pressurized, fully filtered lubrication system has been adopted for this engine.



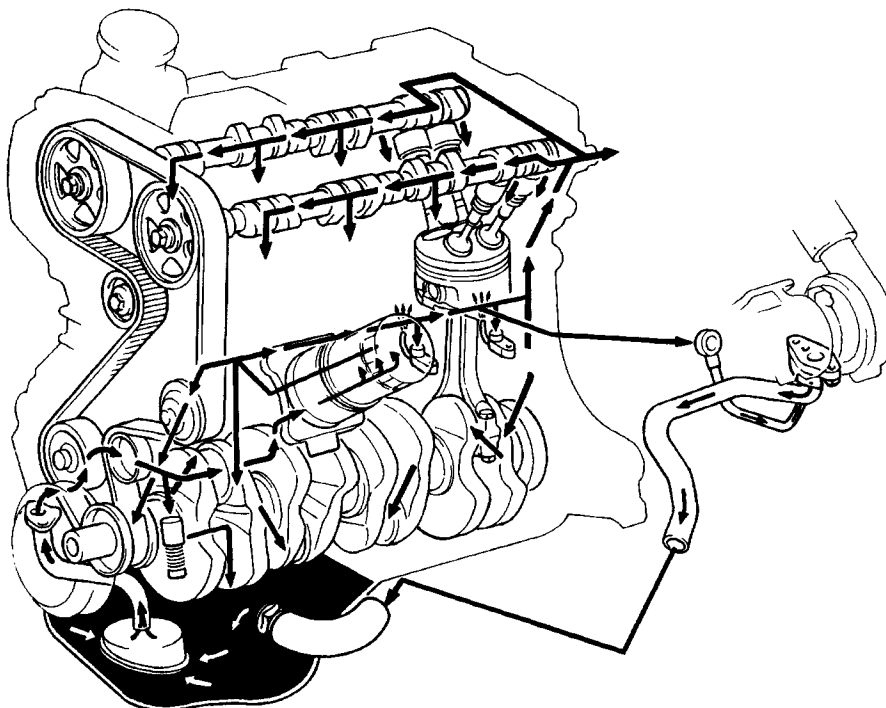
LU0908 LU0910



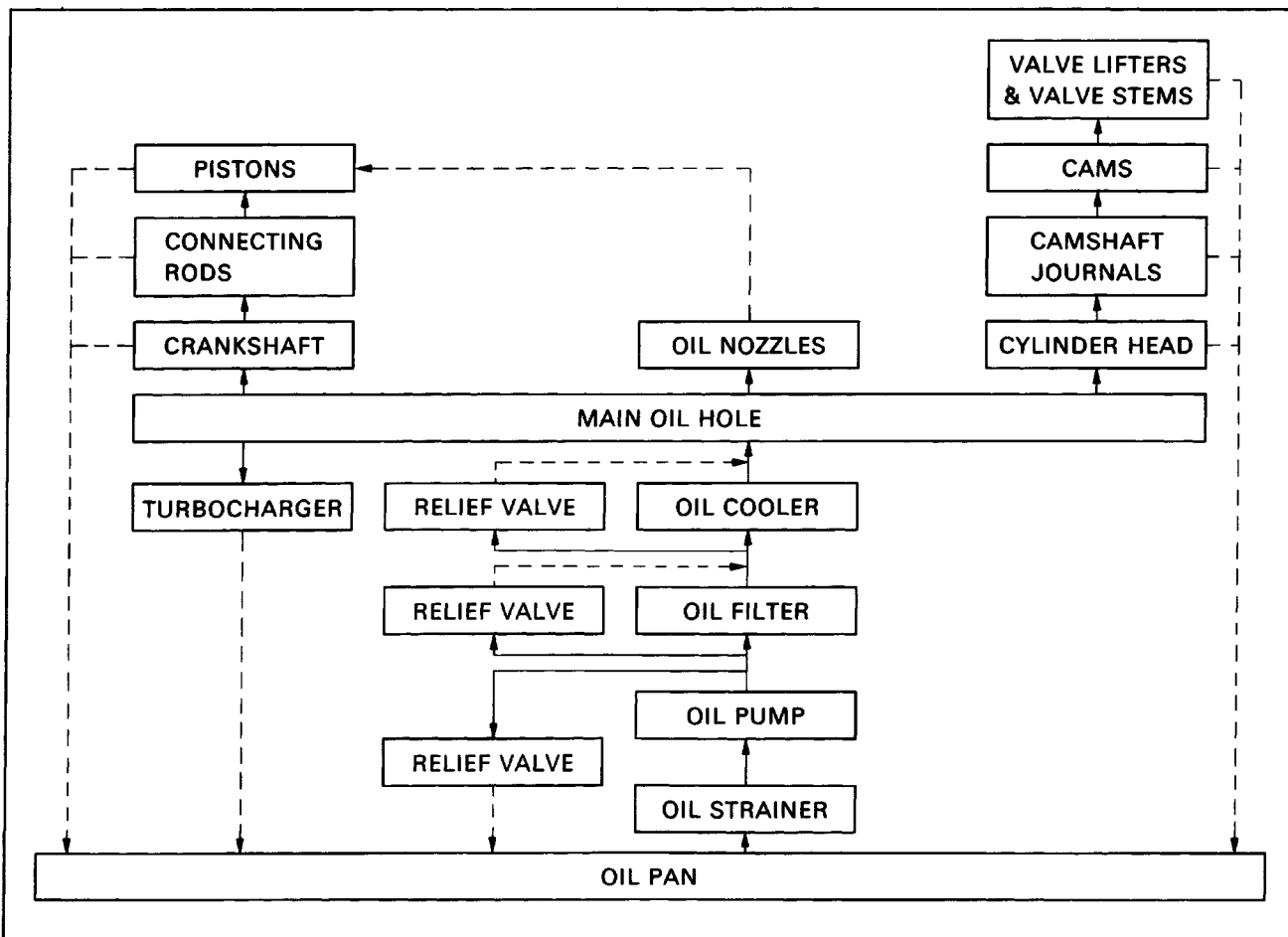
DESCRIPTION

A fully pressurized, fully filtered lubrication system has been adopted for this engine.

3S-GTE



LU0932



A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the center left side of the cylinder block is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and feeds it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil pump to remove impurities. The oil pump itself is a trochoid type pump, inside of which is a drive rotor and a driven rotor. When the drive rotor rotates, the driven rotor rotates in the same direction, and since the axis of the driven rotor shaft is different from the center of the driver rotor, the space between the two rotors is changed as they rotate. Oil is drawn in when the space widens and is discharged when the space becomes narrow.

OIL PRESSURE REGULATIONS (RELIEF VALVE)

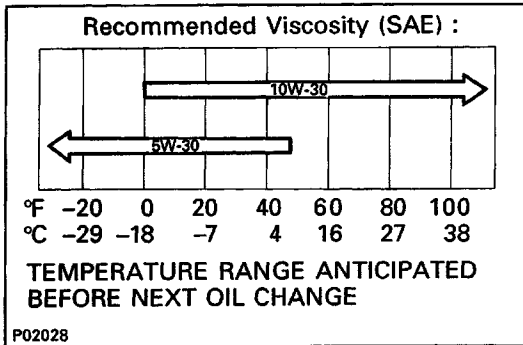
At high engine speed, the engine oil supplied by the pump exceeds the capacity of the engine to utilize it. For that reason, the oil pressure regulator works to prevent an oversupply of oil. During normal oil supply, a coil spring and valve keep the by-pass closed, but when too much oil is being fed, the pressure becomes extremely high, overpowering the force of the spring and opening the valves. This allows the excess oil to flow through the valve and return to the oil pan.

OIL FILTER

The oil filter is a full flow type filter with a relief valve built into the paper filter element. Particles of metal from wear, airborne dirt, carbon and other impurities can get into the oil during use and could cause accelerated wear or seizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element. A relief valve is also included ahead of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve by-passes the oil filter and flows directly into the main oil hole in the engine.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked Oil seal faulty Gasket faulty	Repair as necessary Replace oil seal Replace gasket	EM-207, 249, 294 LU-20
Low oil pressure	Oil leakage Relief valve faulty Oil pump faulty Engine oil poor quality Crankshaft bearing faulty Connecting rod bearing faulty Oil filler clogged	Repair as necessary Repair relief valve Repair oil pump Replace engine oil Replace bearing Replace bearing Replace oil filler	LU-9, 17 LU-9, 17 LU-7 EM-1 85, 224, 269 E M -185, 224, 269 LU-7
High oil pressure	Relief valve faulty	Repair relief valve	LU-9, 17



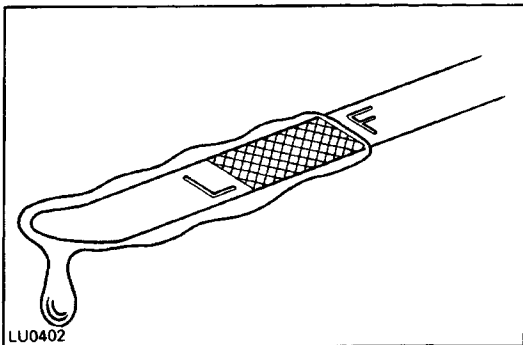
OIL PRESSURE CHECK

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is poor, replace the oil.

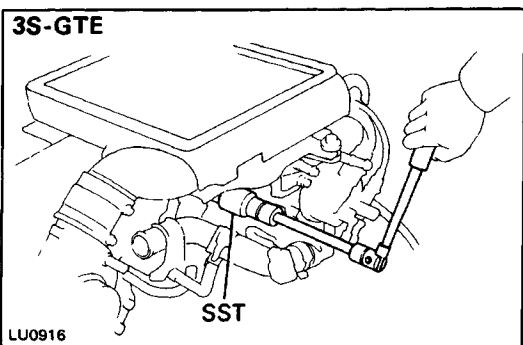
Oil grade: API grade SG multigrade and fuel-efficient engine oil. Recommended viscosity is as shown.



2. CHECK ENGINE OIL LEVEL

The oil level should be between the "L" and "F" marks on the dipstick.

If low, check for leakage and add oil up to "F" mark.



3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

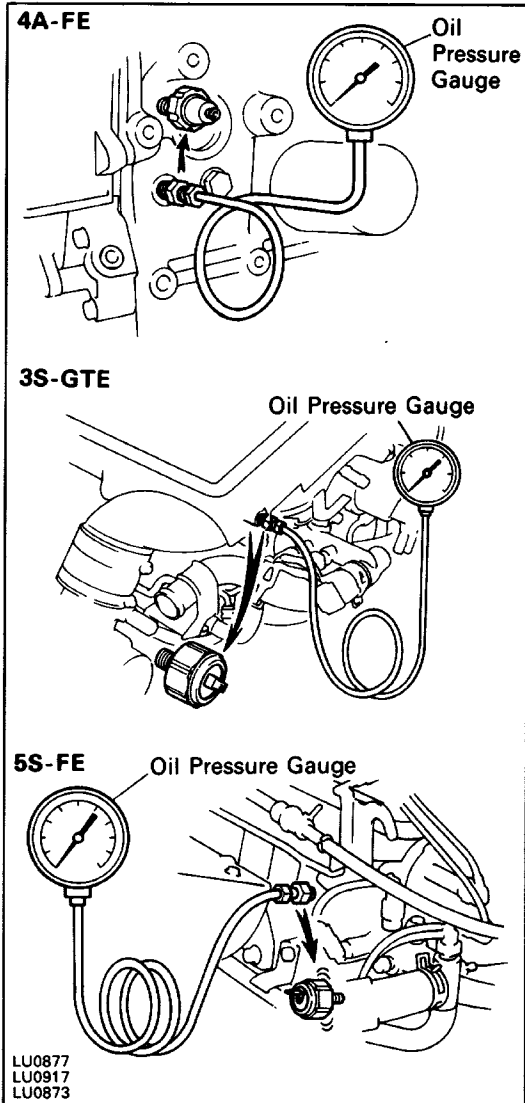
(a) (4A-FE)

Remove the generator and bracket.

(b) Remove the oil pressure switch.

HINT (3S-GTE): Use SST.

SST 09816-30010



(c) Install an oil pressure gauge.

(d) (4A-FE)

Install the bracket and generator.

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

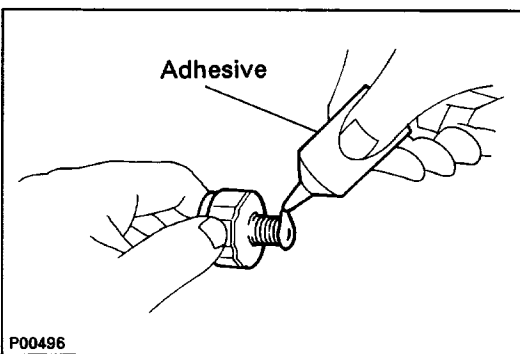
Oil pressure:

At idle 29 kPa (0.3 kgf/cm², 4.3 psi)

or more

At 3,000 rpm 245 – 490 kPa

(2.5 – 5.0 kgf/cm², 36 – 71 psi)



6. REINSTALL OIL PRESSURE SWITCH

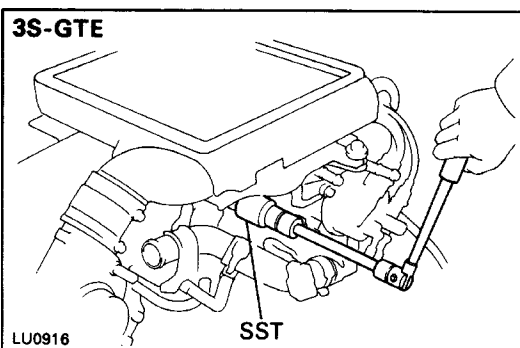
(a) (4A-FE)

Remove the generator and bracket.

(b) Remove the oil pressure gauge.

(c) Apply adhesive to two or three threads of the oil pressure switch.

Adhesive: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



(d) Reinstall the oil pressure switch.

HINT (3S-GTE): Use SST.

SST 09816-30010

(e) (4A-FE)

Reinstall the bracket and generator.

7. START ENGINE AND CHECK FOR LEAKS

REPLACEMENT OF ENGINE OIL AND OIL FILTER

CAUTION:

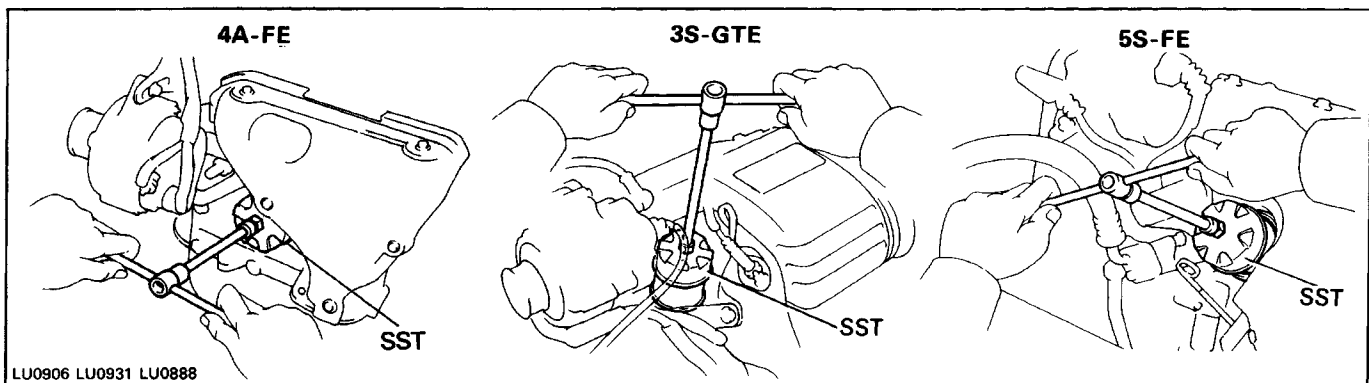
- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Care should be taken, therefore, when changing engine, oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.

1. DRAIN ENGINE OIL

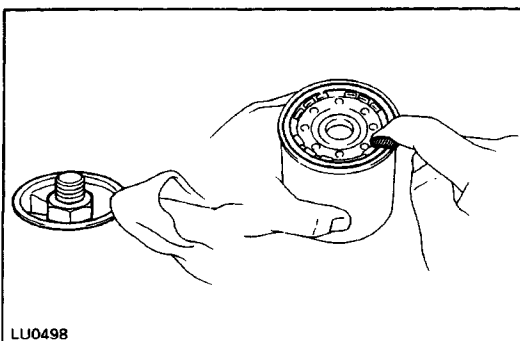
- Remove the oil filler cap.
- Remove the oil drain plug, and drain the oil into a container.

2. REPLACE OIL FILTER

- (3S-GTE)
Remove the generator ducts.
(See steps 2, 4 and 10 on pages [CH-7](#) and 8)
- Using SST, remove the oil filter.
SST 09228-06500

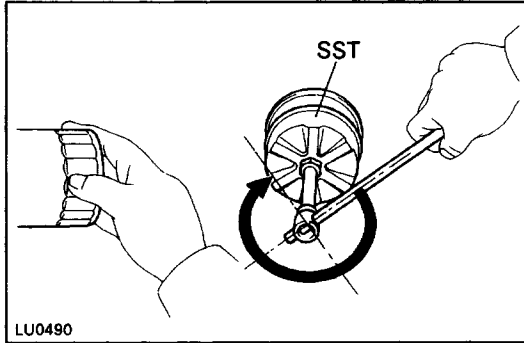


LU0906 LU0931 LU0888



LU0498

- Clean the oil filter contact surface on the filter mounting.
- Lubricate the filter rubber gasket with engine oil.



- (e) Tighten the oil filter by hand until the rubber gasket contacts the seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the oil filter.

SST 09228-06500

- (f) (3S-GTE)

Reinstall the generator ducts.

(See steps 1, 7 and 9 on pages [CH-23](#) and 24)

3. FILL WITH ENGINE OIL

- (a) Clean and install the oil drain plug with a new gasket.

Torque:

4A-FE 34 N-m (350 kgf-cm, 25 ft-lbf)

3S-GTE and 5S-FE 39 N-m (400 kgf-cm, 29 ft-lbf)

- (b) Fill with new engine oil.

Oil grade: See page [LU-5](#)

Capacity:

(4A-FE)

Drain and refill

w/ Oil filter change

3.2 liters (3.3 US qts, 2.8 Imp. qts)

w/o Oil filter change

3.0 liters (3.1 US qts, 2.6 Imp. qts)

Dry fill 3.7 liters (3.9 US qts, 3.3 Imp. qts)

(3S-GTE)

Drain and refill

w/ Oil filter change

3.9 liters (4.1 US qts, 3.4 Imp. qts)

w/o Oil filter change

3.6 liters (3.8 US qts, 3.2 Imp. qts)

Dry fill 4.3 liters (4.5 US qts, 3.8 Imp. qts)

(5S-FE (w/ Oil cooler))

Drain and refill

w/ Oil filter change

4.2 liters (4.4 US qts, 3.7 Imp. qts)

w/o Oil filter change

3.8 liters (4.0 US qts, 3.3 Imp. qts)

Dry fill 4.6 liters (4.9 US qts, 4.0 Imp. qts)

(5S-FE (w/o Oil cooler))

Drain and refill

w/ Oil filter change

4.1 liters (4.3 US qts, 3.6 Imp. qts)

w/o Oil filter change

3.7 liters (3.9 US qts, 3.3 Imp. qts)

Dry fill 4.5 liters (4.8 US qts, 4.0 Imp. qts)

- (c) Reinstall the oil filler cap.

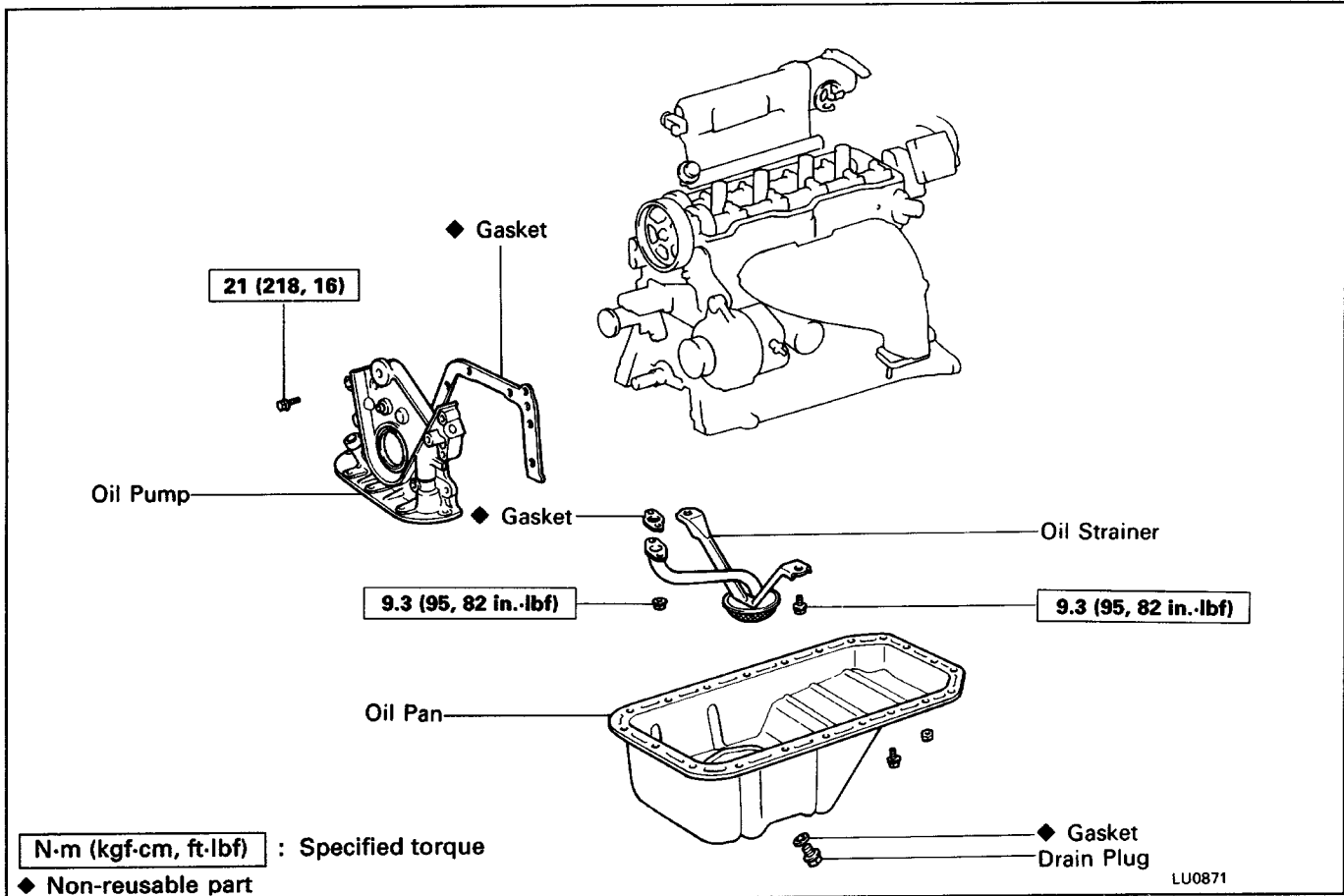
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL (See page [LU-5](#))

OIL PUMP (4A-FE)

REMOVAL OF OIL PUMP

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE HOOD

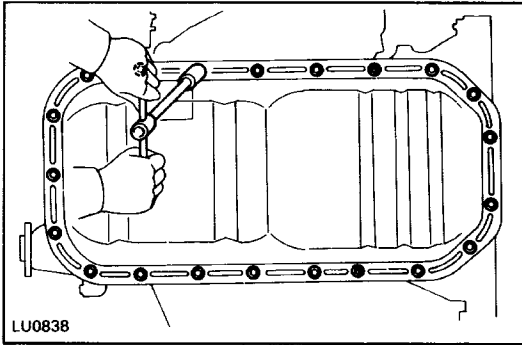
3. REMOVE ENGINE UNDER COVERS

4. DRAIN ENGINE OIL (See page LU-7)

5. REMOVE SUSPENSION LOWER CROSSMEMBER (See step 24 on page EM-189)

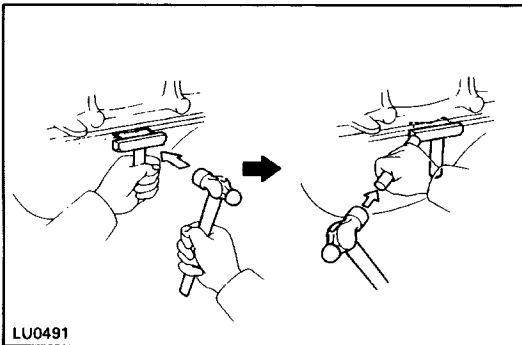
6. REMOVE FRONT EXHAUST PIPE (See step 25 on page EM-189)

7. REMOVE ENGINE MOUNTING CENTER MEMBER (See step 31 on page EM-190)



8. REMOVE OIL PAN

- (a) Remove the nineteen bolts and two nuts.

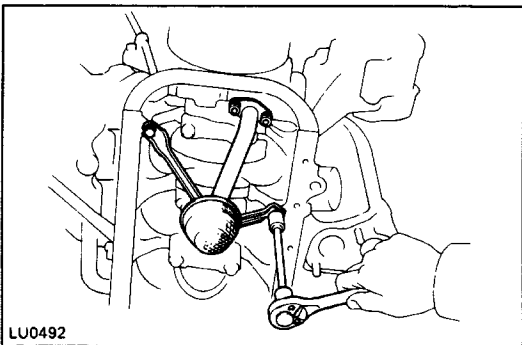


- (b) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and remove the oil pan.

SST 09032-00100

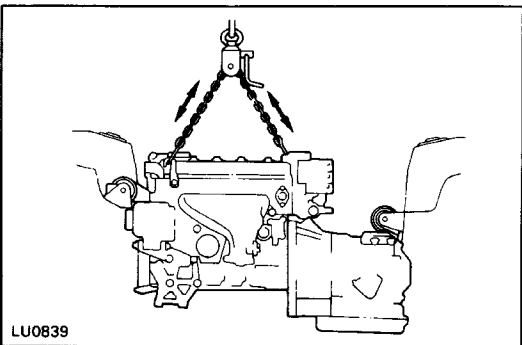
NOTICE:

- Do not use SST for the oil pump body side and rear oil seal retainer.
- Be careful not to damage the oil pan flange.



9. REMOVE OIL STRAINER

Remove the two bolts, two nuts, oil strainer and gasket.

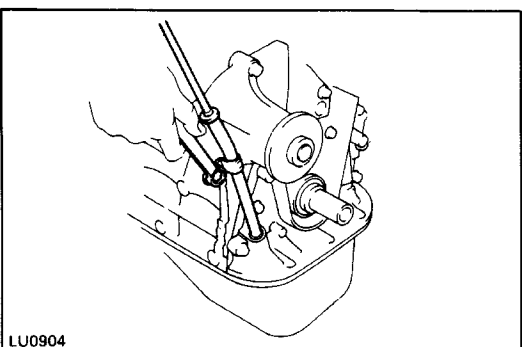


10. SUSPEND ENGINE WITH ENGINE CHAIN HOIST

11. REMOVE TIMING BELT

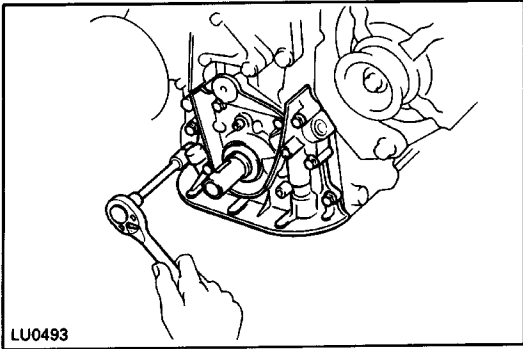
(See steps 2 to 15 and 17 to 20 on pages [EM-33](#) to 37)

12. REMOVE IDLER PULLEY AND CRANKSHAFT TIMING PULLEY (See steps 21 and 22 on page [EM-38](#))



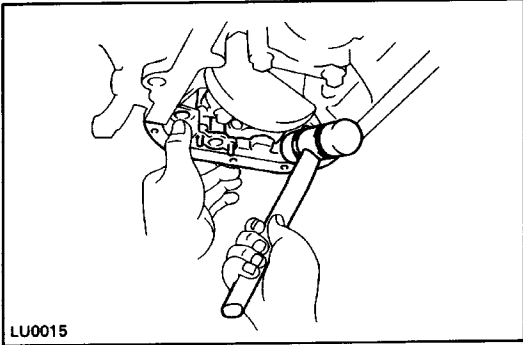
13. REMOVE OIL DIPSTICK AND DIPSTICK GUIDE

- (a) Remove the dipstick.
 (b) Remove the bolt, and pull out the dipstick guide.
 (c) Remove the O-ring from the dipstick guide.



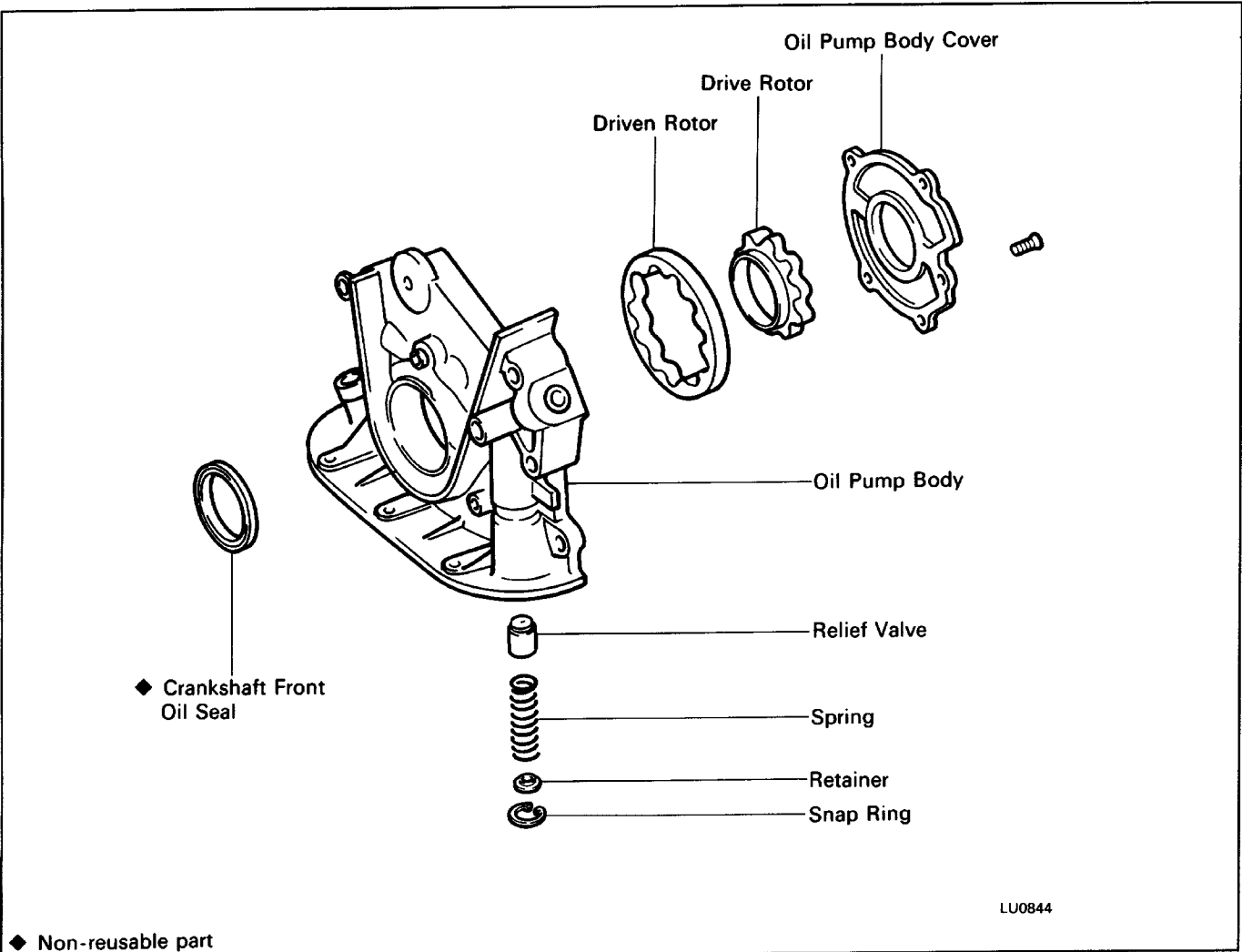
14. REMOVE OIL PUMP

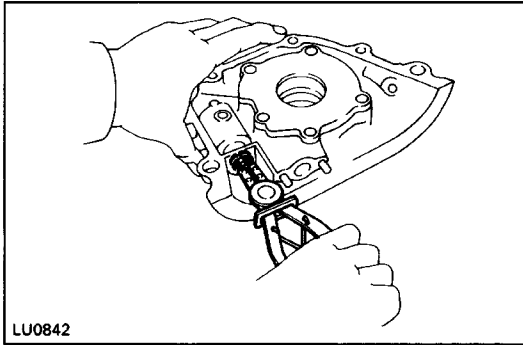
(a) Remove the seven bolts.



(b) Using a plastic-faced hammer, remove the oil pump by carefully tapping the oil pump body.

COMPONENTS





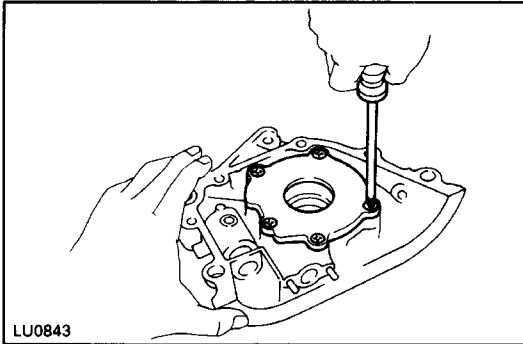
LU0842

DISASSEMBLY OF OIL PUMP

(See page [LU-11](#))

1. REMOVE RELIEF VALVE

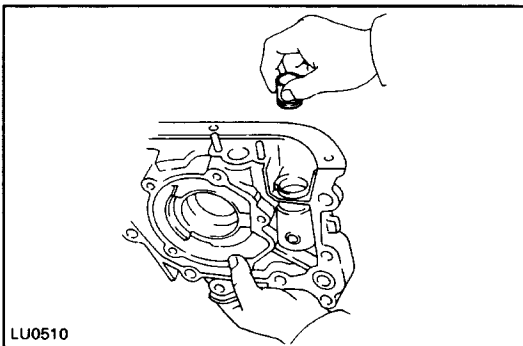
- (a) Using snap ring pliers, remove the snap ring.
- (b) Remove the retainer, spring and relief valve.



LU0843

2. REMOVE DRIVE AND DRIVEN ROTORS

Remove the five screws, pump body cover, the drive and driven rotors.

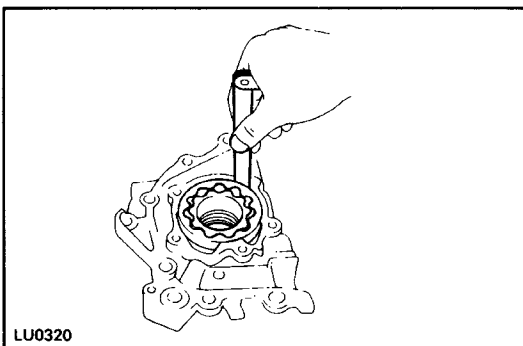


LU0510

INSPECTION OF OIL PUMP

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight. If it doesn't, replace the relief valve. If necessary, replace the oil pump assembly.



LU0320

2. INSPECT DRIVE AND DRIVEN ROTORS

A. Inspect rotor body clearance

Using a thickness gauge, measure the clearance between the driven rotor and pump body.

Standard body clearance: 0.080 – 0.180 mm (0.0031 – 0.0071 in.)

Maximum body clearance: 0.20 mm (0.0079 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

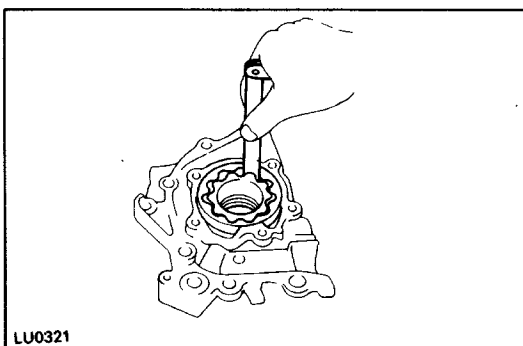
B. Inspect rotor tip clearance

Using a thickness gauge, measure the clearance between the drive and driven rotor tips.

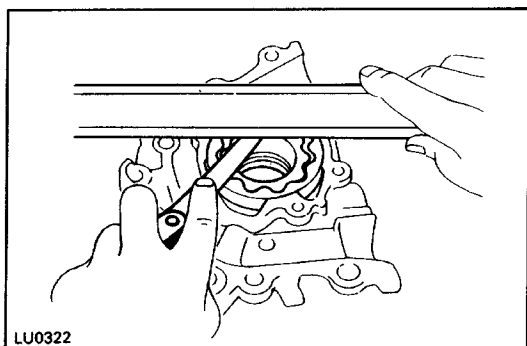
Standard tip clearance: 0.025 – 0.085 mm (0.0010 – 0.0033 in.)

Maximum tip clearance: 0.35 mm (0.0138 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.



LU0321



C. Inspect rotor side clearance

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

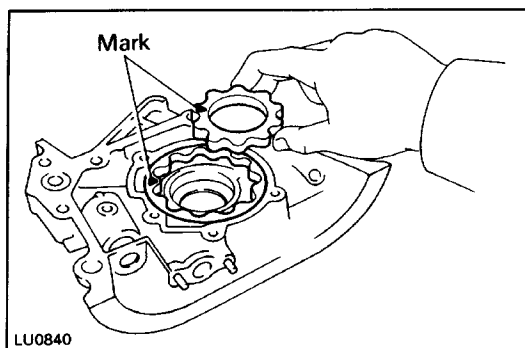
**Standard side clearance: 0.025 – 0.085 mm
(0.0010 – 0.0033 in.)**

Maximum side clearance: 0.10 mm (0.0039 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

(See page [EM-207](#))

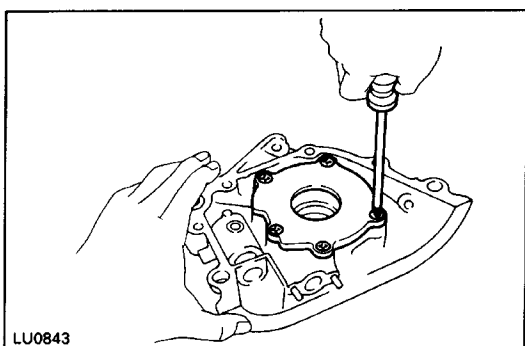


ASSEMBLY OF OIL PUMP

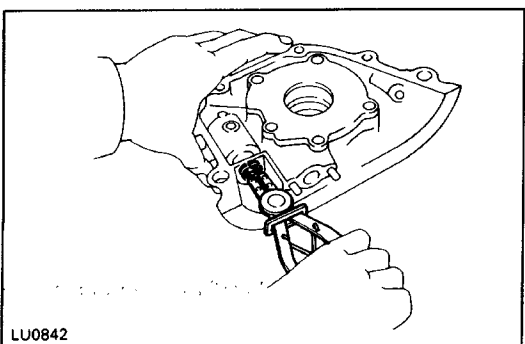
(See page [LU-11](#))

1. INSTALL DRIVE AND DRIVEN ROTORS

- (a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.

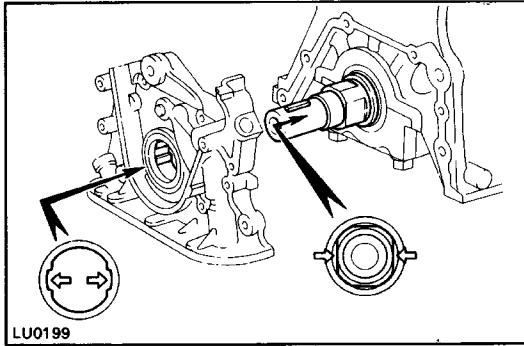


- (b) Install the pump body cover with the five screws.
Torque: 10 N-m (105 kgf-cm, 8 ft-lbf)



2. INSTALL RELIEF VALVE

- (a) Insert the relief valve, spring and retainer into the pump body hole.
(b) Using snap ring pliers, install the snap ring.

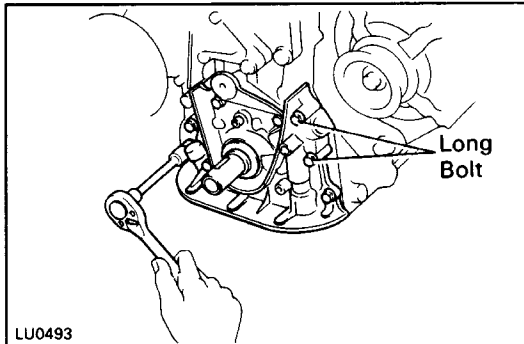


INSTALLATION OF OIL PUMP

(See page [LU-9](#))

1. INSTALL OIL PUMP

- Place a new gasket in position on the cylinder block.
- Engage the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft, and slide the oil pump.



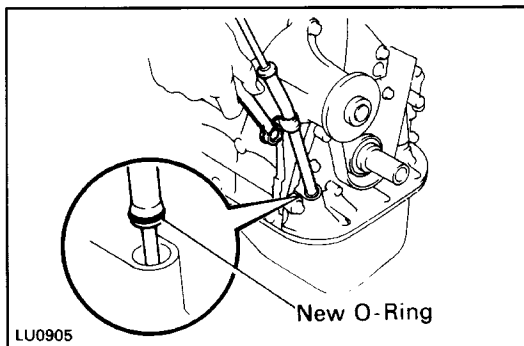
- Install the oil pump with the seven bolts.

Torque: 21 N-m (218 kgf-cm, 16 ft-lbf)

HINT: Each bolt length is indicated in the illustration.

Bolt length: Long bolt 35 mm (1.38 in.)

Others 25 mm (0.98 in.)



2. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK

- Install a new O-ring to the dipstick guide.
- Apply soapy water to the O-ring.
- Push in the dipstick guide, and install it with the bolt.

Torque: 9.3 N-m (95 kgf-cm, 82 in.-lbf)

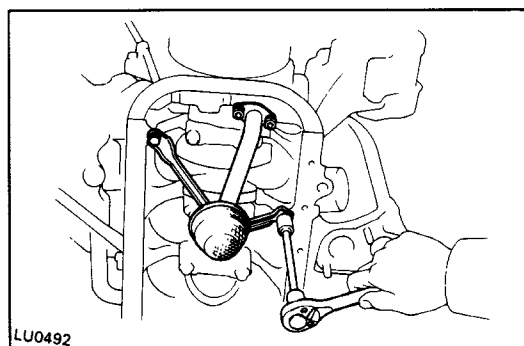
- Install the dipstick.

3. INSTALL CRANKSHAFT TIMING PULLEY AND IDLER PULLEY (See steps 1 and 2 on page [EM-40](#))

4. INSTALL TIMING BELT

(See steps 3 to 6 and 8 to 21 on pages [EM-40](#) to 45)

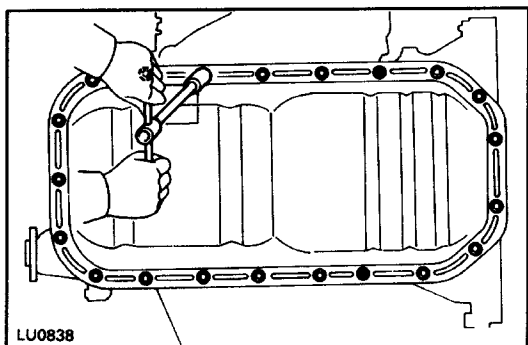
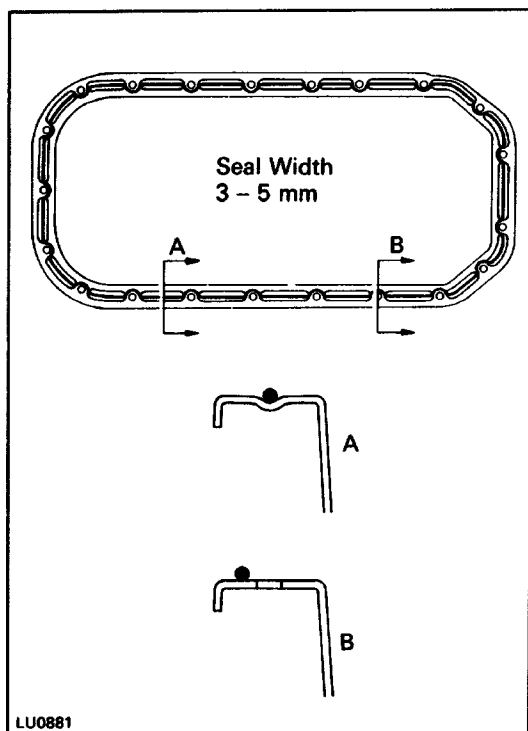
5. REMOVE ENGINE CHAIN HOIST FROM ENGINE



6. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the two bolts and two nuts.

Torque: 9.3 N-m (95 kgf-cm, 82 in.-lbf)



7. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non-residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the oil pan as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 3 - 5 mm (0.12 - 0.20 in.) opening.
- HINT: Avoid applying an excessive amount to the surface. Be particularly careful near oil passages.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
 - Immediately remove nozzle from the tube and re-install cap.

(c) Install the oil pan with the nineteen bolts and two nuts.

Torque: 4.9 N-m (50 kgf-cm, 43in.-lbf)

8. INSTALL ENGINE MOUNTING CENTER MEMBER

(See step 10 on page [EM-216](#))

9. INSTALL FRONT EXHAUST PIPE

(See step 17 on page [EM-217](#))

10. INSTALL SUSPENSION LOWER CROSSMEMBER

(See step 18 on page [EM-218](#))

11. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

12. FILL WITH ENGINE OIL (See page [LU-8](#))

13. START ENGINE AND CHECK FOR LEAKS

14. RECHECK ENGINE OIL LEVEL (See page [LU-5](#))

15. INSTALL HOOD

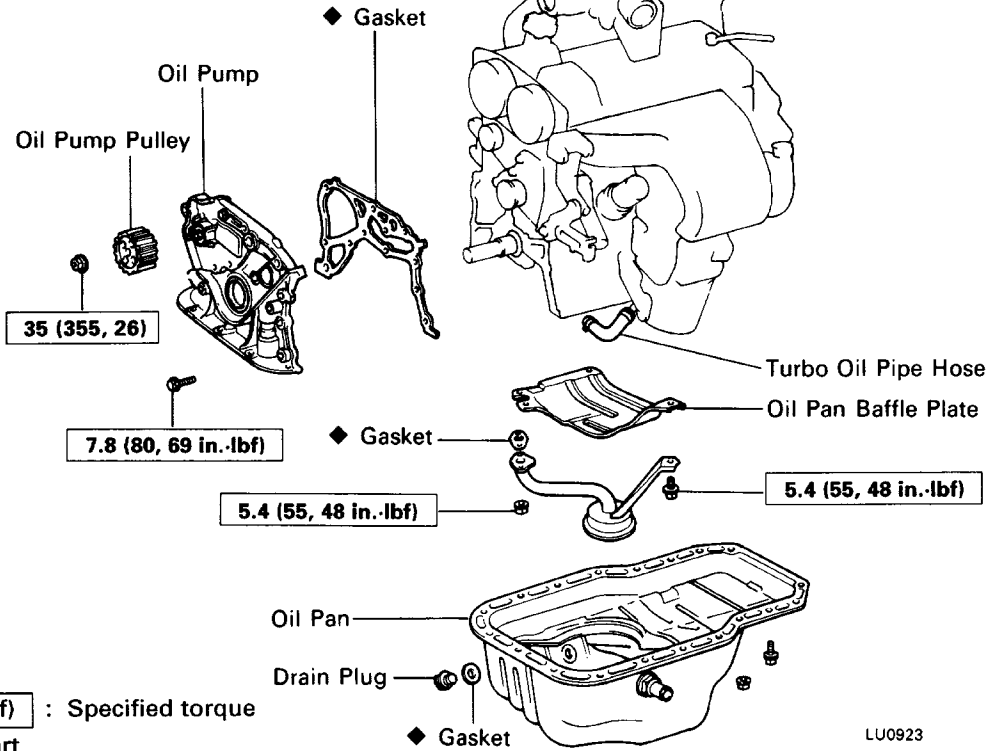
16. INSTALL ENGINE UNDER COVERS

OIL PUMP (3S-GTE and 5S-FE)

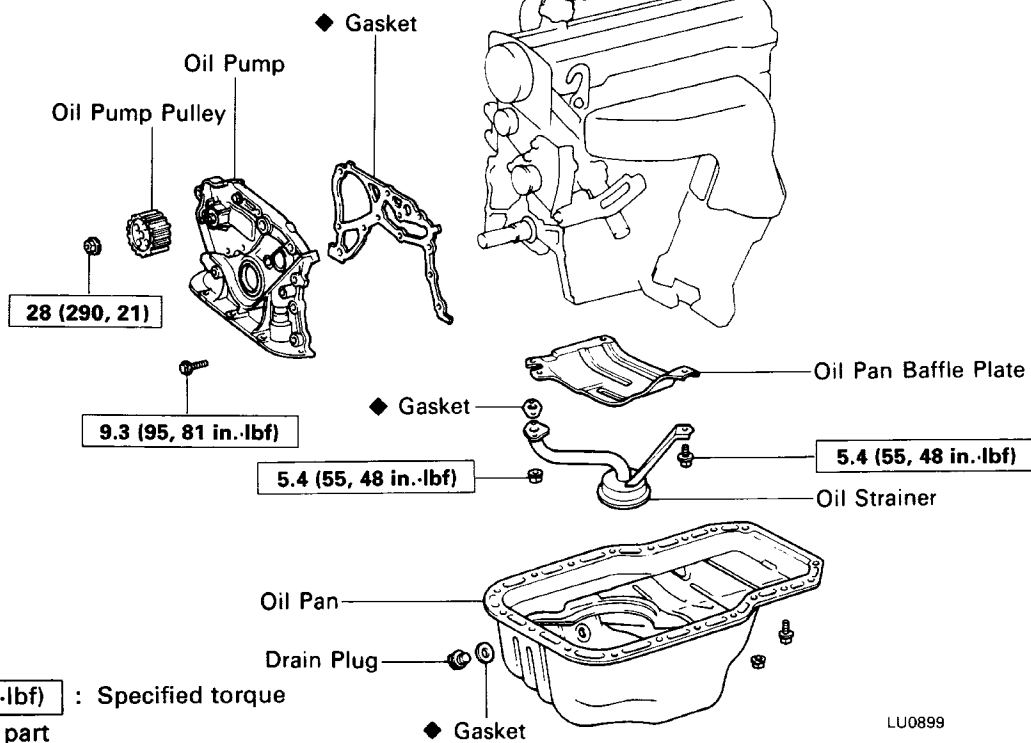
REMOVAL OF OIL PUMP

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

3S-GTE



5S-FE



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE HOOD

3. REMOVE ENGINE UNDER COVERS

4. DRAIN ENGINE OIL (See page LU-7)

5. REMOVE SUSPENSION LOWER CROSSMEMBER

3S-GTE (See step 33 on page EM-228)

5S-FE (See step 28 on page EM-274)

6. REMOVE FRONT EXHAUST PIPE

3S-GTE (See step 34 on page EM-229)

5S-FE (See step 29 on page EM-274)

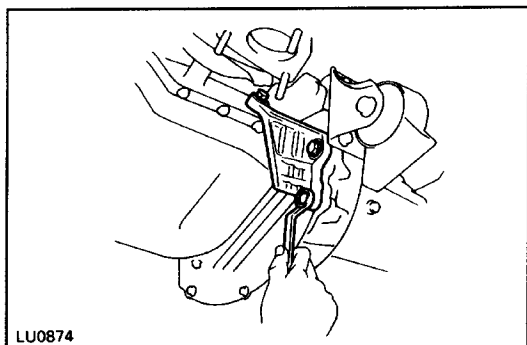
7. REMOVE ENGINE MOUNTING CENTER MEMBER

3S-GTE (See step 42 on page EM-229)

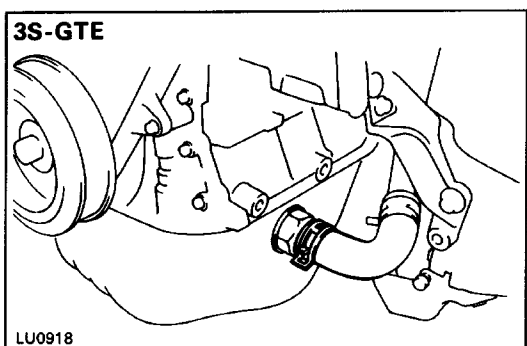
5S-FE (See step 34 on page EM-275)

8. REMOVE STIFFENER PLATE

Remove the three bolts and stiffener plate.



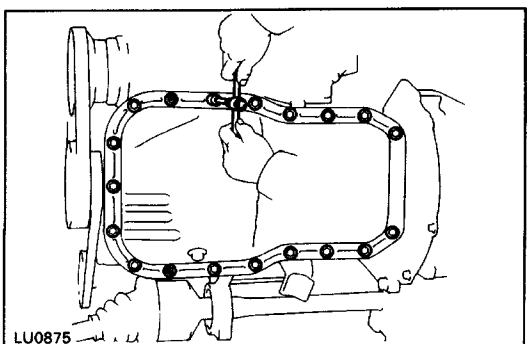
LU0874



LU0918

9. (3S-GTE)

DISCONNECT TURBO OIL PIPE HOSE FROM OIL-PAN

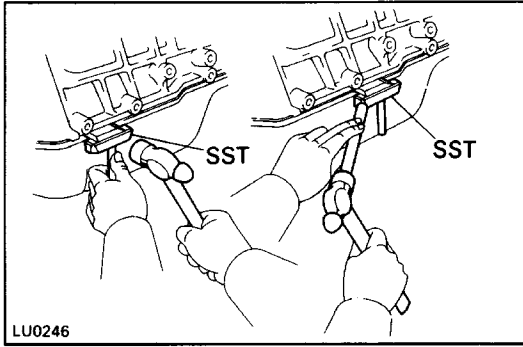


LU0875

10. REMOVE OIL PAN

(a) Remove the dipstick.

(b) Remove the seventeen bolts and two nuts.

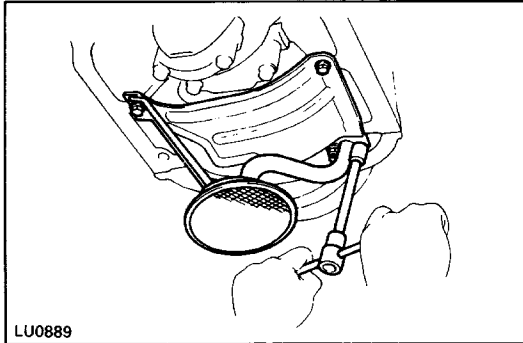


- (c) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and remove the oil pan.

SST 09032-00100

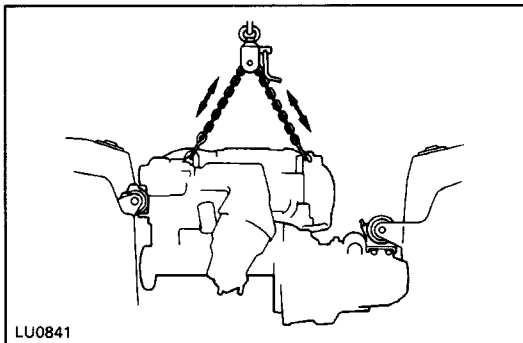
NOTICE:

- Do not use SST for the oil pump body side and rear oil seal retainer.
- Be careful not to damage the oil pan flange.



11. REMOVE OIL STRAINER AND Baffle PLATE

Remove the two bolts, two nuts, oil strainer, baffle plate and gasket.



12. SUSPEND ENGINE WITH ENGINE CHAIN HOIST

13. REMOVE TIMING BELT

3S-GTE (See steps 2 to 18 and 20 to 23 on pages EM-46 to 51)

5S-FE (See steps 2 to 17 and 19 to 22 on pages EM-67 to 72)

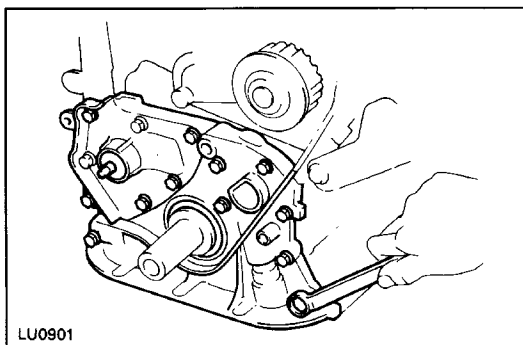
14. REMOVE NO.2 IDLER PULLEY, CRANKSHAFT TIMING PULLEY AND OIL PUMP PULLEY

3S-GTE (See steps 25 to 27 on page [EM-52](#))

5S-FE (See steps 24 to 26 on pages [EM-72](#) and 73)

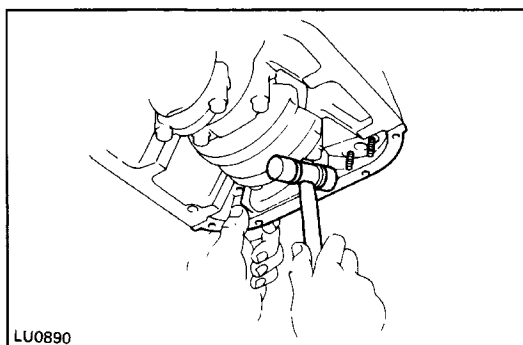
15. REMOVE OIL PUMP

- (a) Remove the twelve bolts.

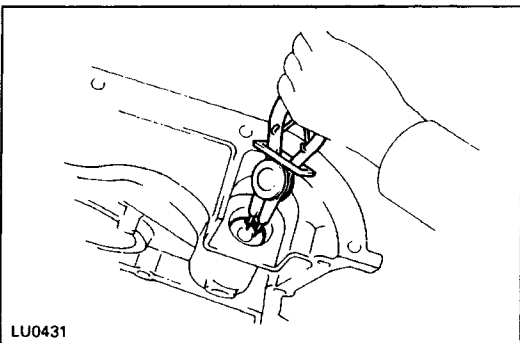
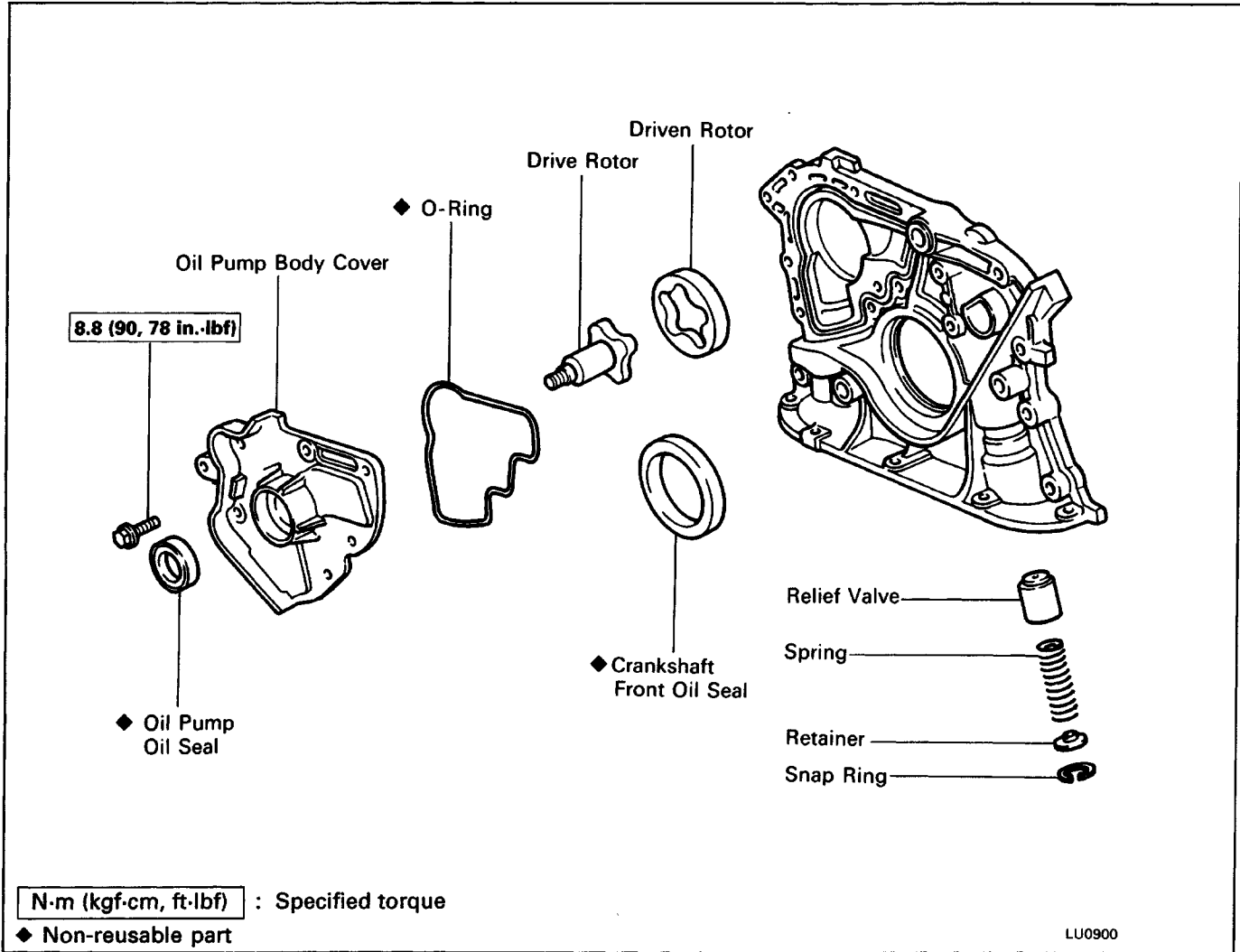


- (b) Using a plastic-faced hammer, remove the oil pump by carefully tapping the oil pump body.

(c) Remove the gasket.



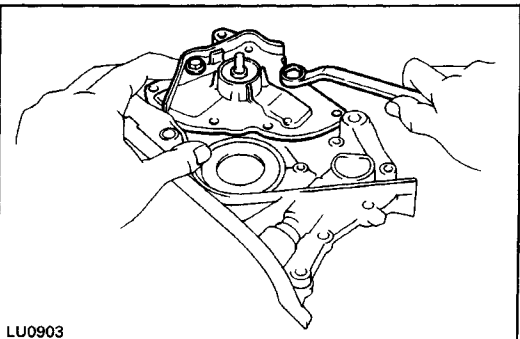
COMPONENTS



DISASSEMBLY OF OIL PUMP

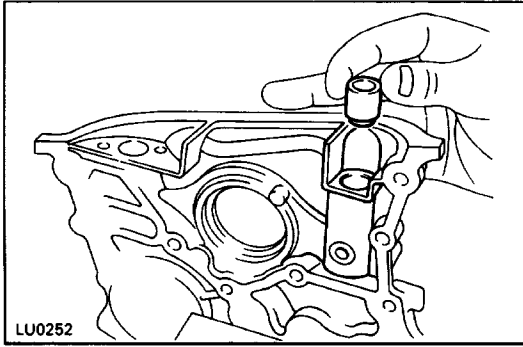
1. REMOVE RELIEF VALVE

- (a) Using snap ring pliers, remove the snap ring.
- (b) Remove the retainer, spring and relief valve.



2. REMOVE DRIVE AND DRIVEN ROTORS

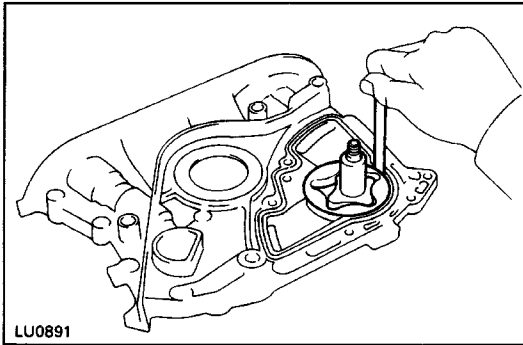
Remove the two bolts, pump body cover, O-ring, the drive and driven rotors.



INSPECTION OF OIL PUMP

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight. If it doesn't, replace the relief valve. If necessary, replace the oil pump assembly.



2. INSPECT DRIVE AND DRIVEN ROTORS

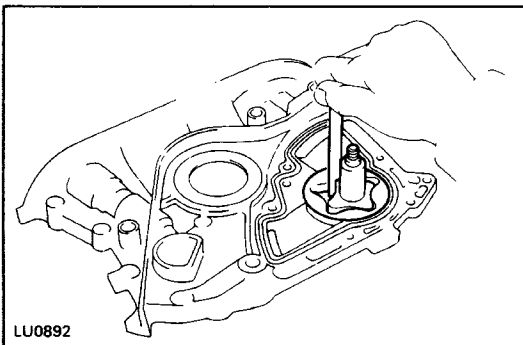
A. Inspect rotor body clearance

Using a thickness gauge, measure the clearance between the driven rotor and body.

**Standard body clearance: 0.100 – 0.160 mm
(0.0039 – 0.0063 in.)**

Maximum body clearance: 0.20 mm (0.0079 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



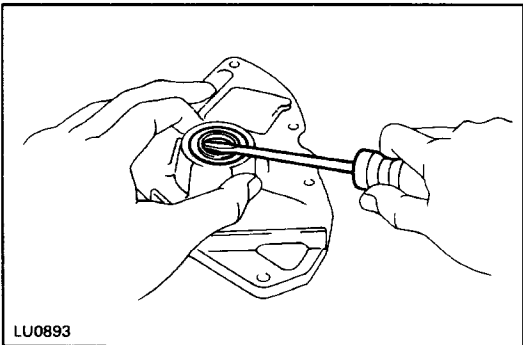
B. Inspect rotor tip clearance

Using a thickness gauge, measure the clearance between the drive and driven rotor tips.

**Standard tip clearance: 0.040 – 0.160 mm
(0.0016 – 0.0063 in.)**

Maximum tip clearance: 0.20 mm (0.0079 in.)

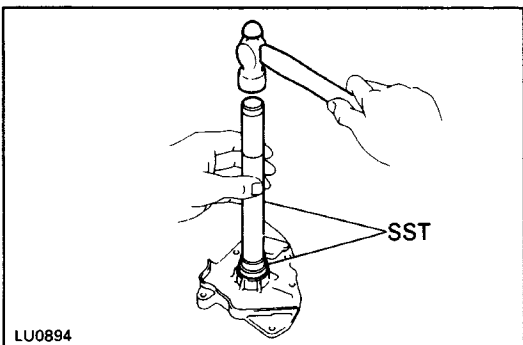
If the tip clearance is greater than maximum, replace the rotors as a set.



REPLACEMENT OF OIL PUMP OIL SEAL

1. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.



2. INSTALL OIL SEAL

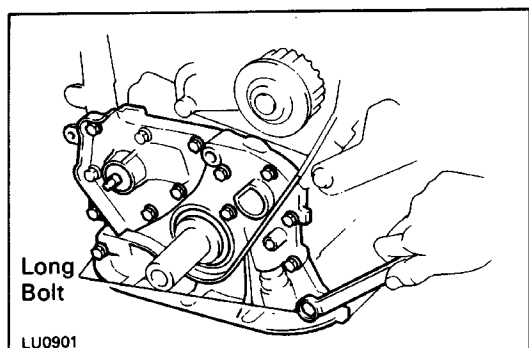
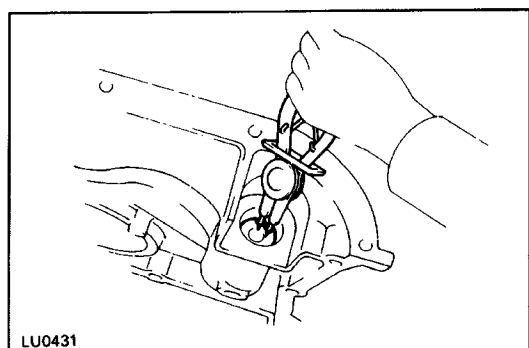
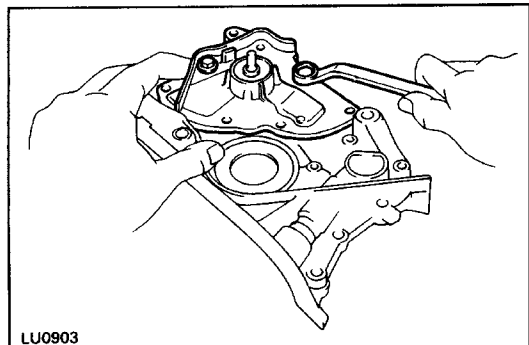
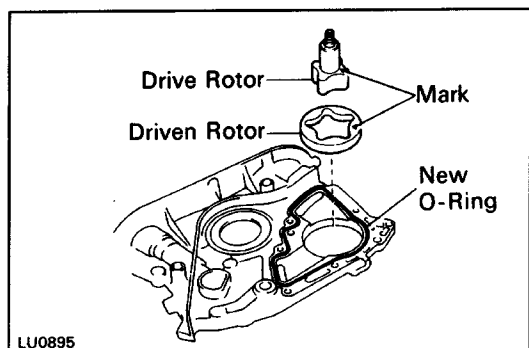
(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump cover edge.

SST 09620-30010 (09627-30010, 09631-00020)

(b) Apply MP grease to the oil seal lip.

REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

(See page [EM-249](#))



ASSEMBLY OF OIL PUMP

(See page [LU-19](#))

1. INSTALL DRIVE AND DRIVEN ROTORS

- (a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.

- (b) Install the pump body cover with the two bolts.
Torque: 8.8 N-m (90 kgf-cm, 78 in-lbf)

2. INSTALL RELIEF VALVE

- (a) Insert the relief valve, spring and retainer into the pump body hole.
- (b) Using snap ring pliers, install the snap ring.

INSTALLATION OF OIL PUMP

(See page [LU-16](#))

1. INSTALL OIL PUMP

Install a new gasket and the oil pump with the twelve bolts.

Torque: 3S-GTE 7.8 N-m (80 kgf-cm, 69in-lbf)

5S-FE 8.8 N-m (90 kgf-cm, 78in.-lbf)

HINT: Each bolt length is indicated in the illustration.

Bolt length: Long bolt 35 mm (1.38 in.)

Others 25 mm (0.98 in.)

2. INSTALL OIL PUMP PULLEY, CRANKSHAFT TIMING PULLEY AND NO.2 IDLER PULLEY

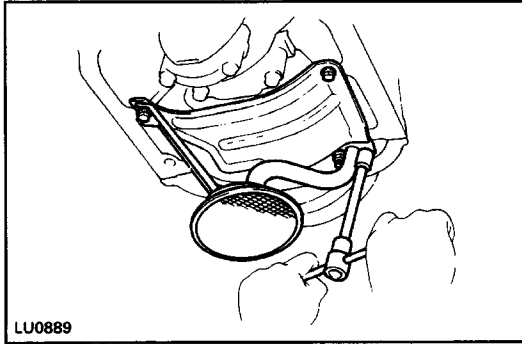
3S-GTE (See steps 1 to 3 on page [EM-55](#))

5S-FE (See steps 1 to 3 on page [EM-75](#))

3. INSTALL TIMING BELT

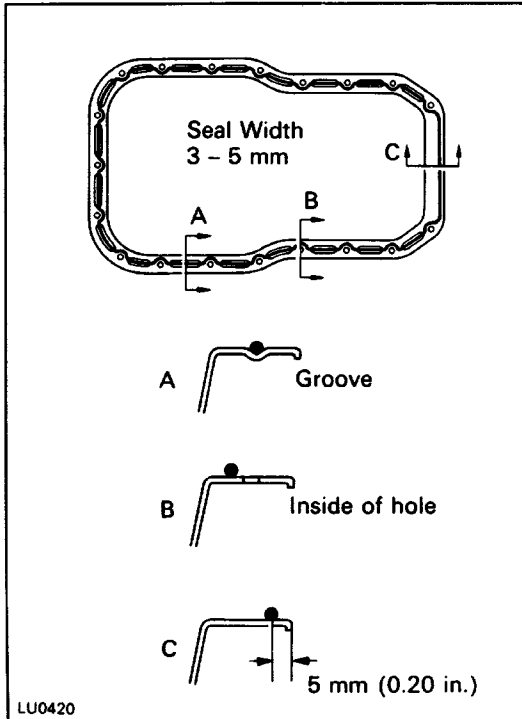
3S-GTE (See steps 5 to 8, 10 to 26 and 30 on pages [EM-55](#) to 61)

5S-FE (See steps 5 to 8 and 10 to 24 on pages [EM-75](#) to 80)

**4. REMOVE ENGINE CHAIN HOIST FROM ENGINE****5. INSTALL Baffle Plate and Oil Strainer**

Install a new gasket, the baffle plate and the oil strainer with the two bolts and two nuts.

Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)

**6. INSTALL OIL PAN**

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan and cylinder block.

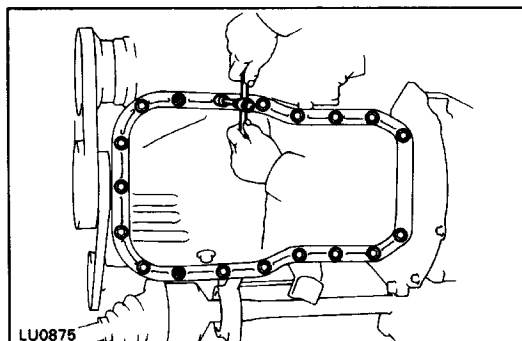
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non-residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the oil pan as shown in the illustration.

Seal packing: Part No.08826-00080 or equivalent

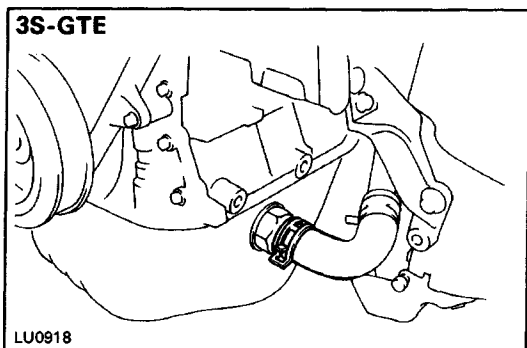
- Install a nozzle that has been cut to a 3 – 5 mm (0.12 – 0.20 in.) opening.
- HINT: Avoid applying an excessive amount to the surface. Be particularly careful near oil passages.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and re-install cap.



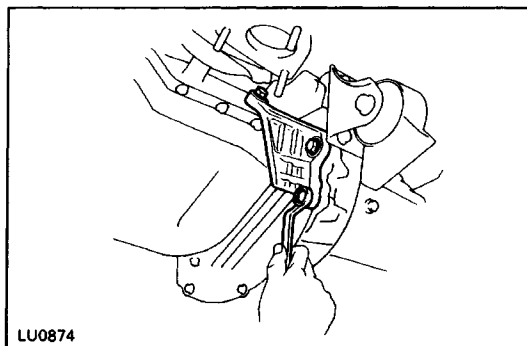
(c) Install the oil pan with the seventeen bolts and four nuts.

Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)

(d) Install the dipstick.



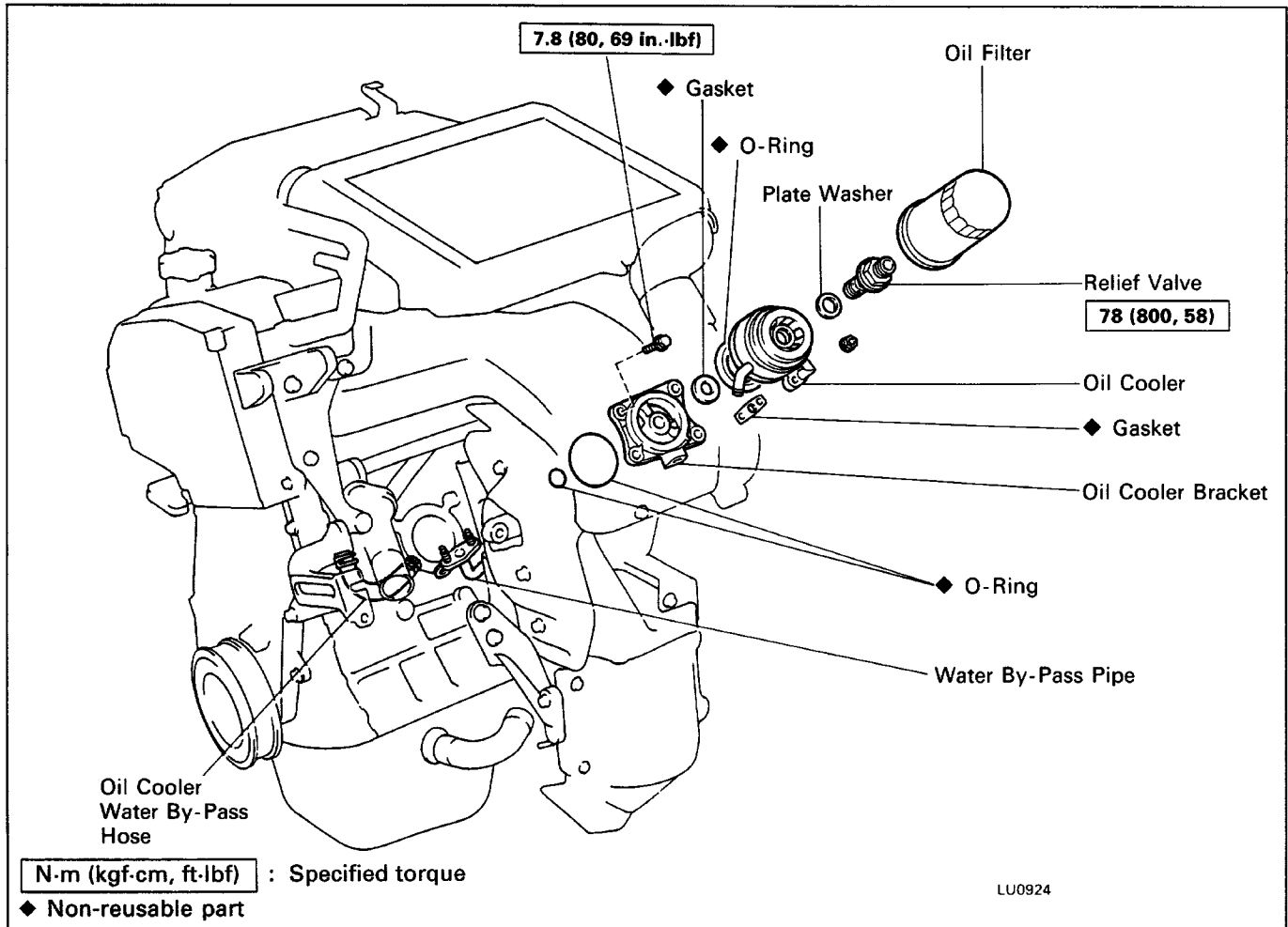
- 7. (3S-GTE)**
CONNECT TURBO OIL PIPE HOSE TO OIL PAN



- 8. INSTALL STIFFENER PLATE**
Install the stiffener plate with the three bolts.
Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)

- 9. INSTALL ENGINE MOUNTING CENTER MEMBER**
3S-GTE (See step 9 on page [EM-260](#))
5S-FE (See step 9 on page [EM-304](#))
- 10. INSTALL FRONT EXHAUST PIPE**
3S-GTE (See step 18 on page [EM-261](#))
5S-FE (See step 15 on page [EM-305](#))
- 11. INSTALL SUSPENSION LOWER CROSSMEMBER**
3S-GTE (See step 19 on page [EM-262](#))
5S-FE (See step 16 on page [EM-306](#))
- 12. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**
- 13. FILL WITH ENGINE OIL** (See page [LU-8](#))
- 14. START ENGINE AND CHECK FOR LEAKS**
- 15. RECHECK ENGINE OIL LEVEL** (See page [LU-5](#))
- 16. INSTALL HOOD**
- 17. INSTALL ENGINE UNDER COVERS**

OIL COOLER (3S-GTE) COMPONENTS



REMOVAL OF OIL COOLER

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

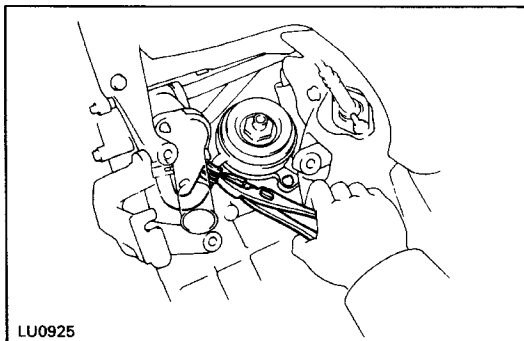
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page [CO-6](#))

3. REMOVE GENERATOR (See page [CH-7](#))

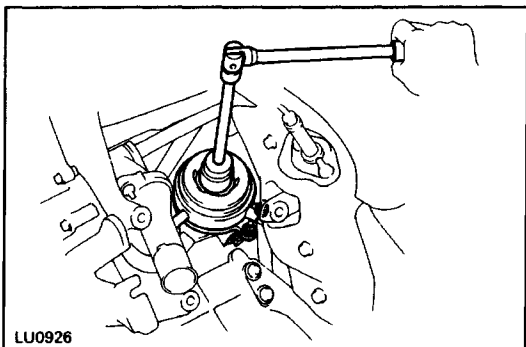
4. REMOVE OIL FILTER (See page [LU-7](#))

5. DISCONNECT WATER BY-PASS HOSE FROM OIL COOLER

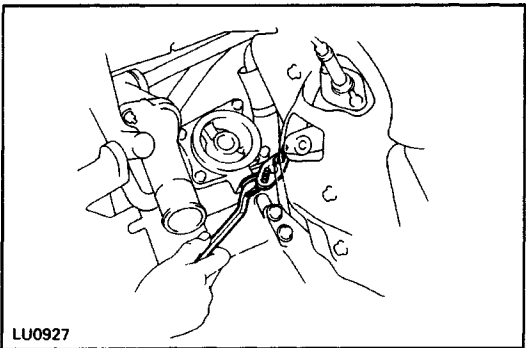


6. REMOVE OIL COOLER

- (a) Remove the relief valve and plate washer.
- (b) Remove the two nuts, oil cooler and two gaskets.
- (c) Remove the O-ring from the oil cooler.

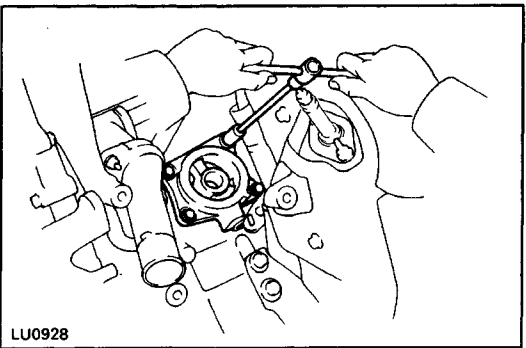


LU0926



LU0927

- (d) Remove the bolt, and disconnect the water by-pass pipe from the oil cooler bracket.



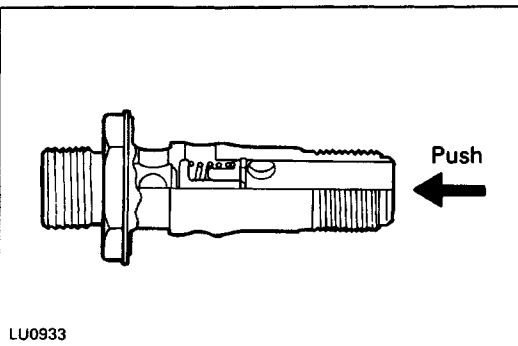
LU0928

7. REMOVE OIL COOLER BRACKET

- (a) Remove the four bolts and oil cooler bracket.
- (b) Remove the two O-rings from the oil cooler.

INSPECTION OF OIL COOLER**1. INSPECT RELIEF VALVE**

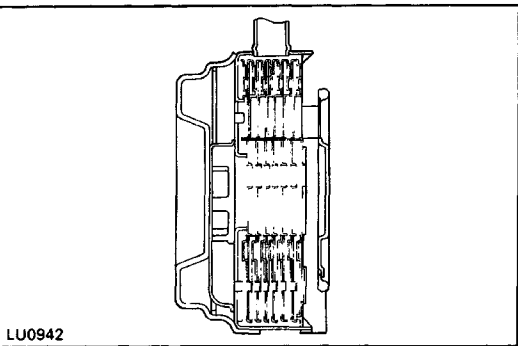
Push the valve with a wooden stick to check if it is stuck. If stuck, replace the relief valve.



LU0933

2. INSPECT OIL COOLER

Check the oil cooler for damage or clogging. If necessary, replace the oil cooler.



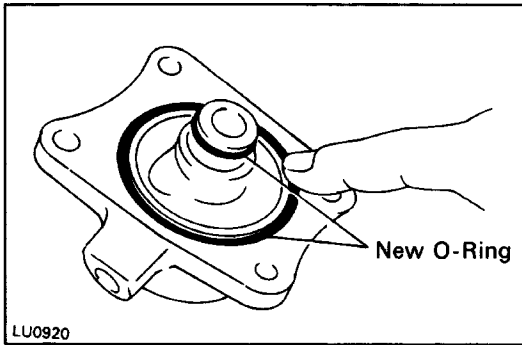
LU0942

INSTALLATION OF OIL COOLER

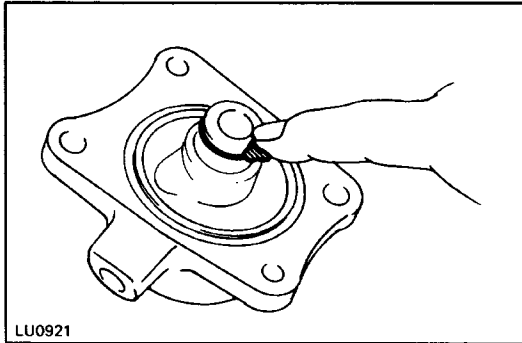
(See page [LU-24](#))

1. INSTALL OIL COOLER BRACKET

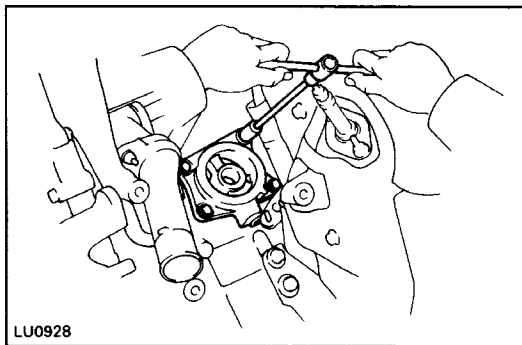
(a) Install two new O-rings to the oil cooler bracket.



(b) Apply a light coat of engine oil on the small O-ring.

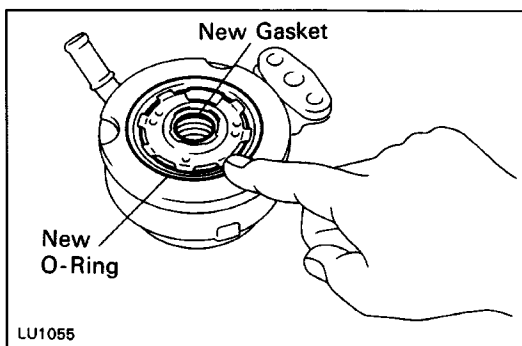


(c) Install the oil cooler bracket with the four bolts.
Torque: 7.8 N-m (80 kgf-cm, 69 in.-lbf)

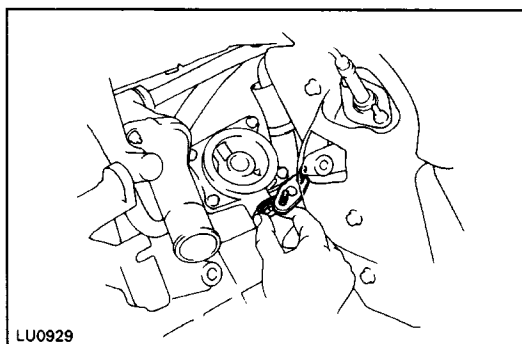


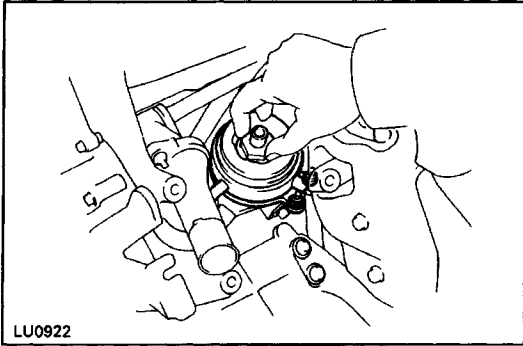
2. INSTALL OIL COOLER

(a) Install new O-ring and gasket to the oil cooler.

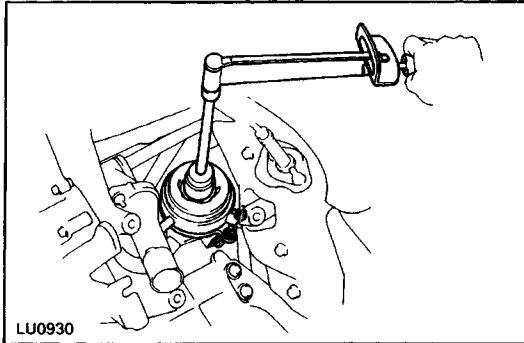


(b) Temporarily install the water by-pass pipe with the bolt.

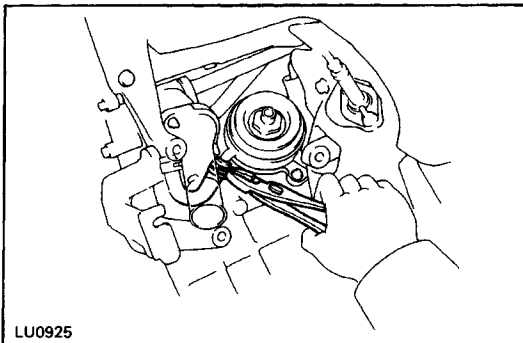




- (c) Apply a light coat of engine oil on the threads and under the head of the relief valve.
- (d) Temporarily install two new gaskets and the oil cooler with the plate washer, relief valve and two nuts.



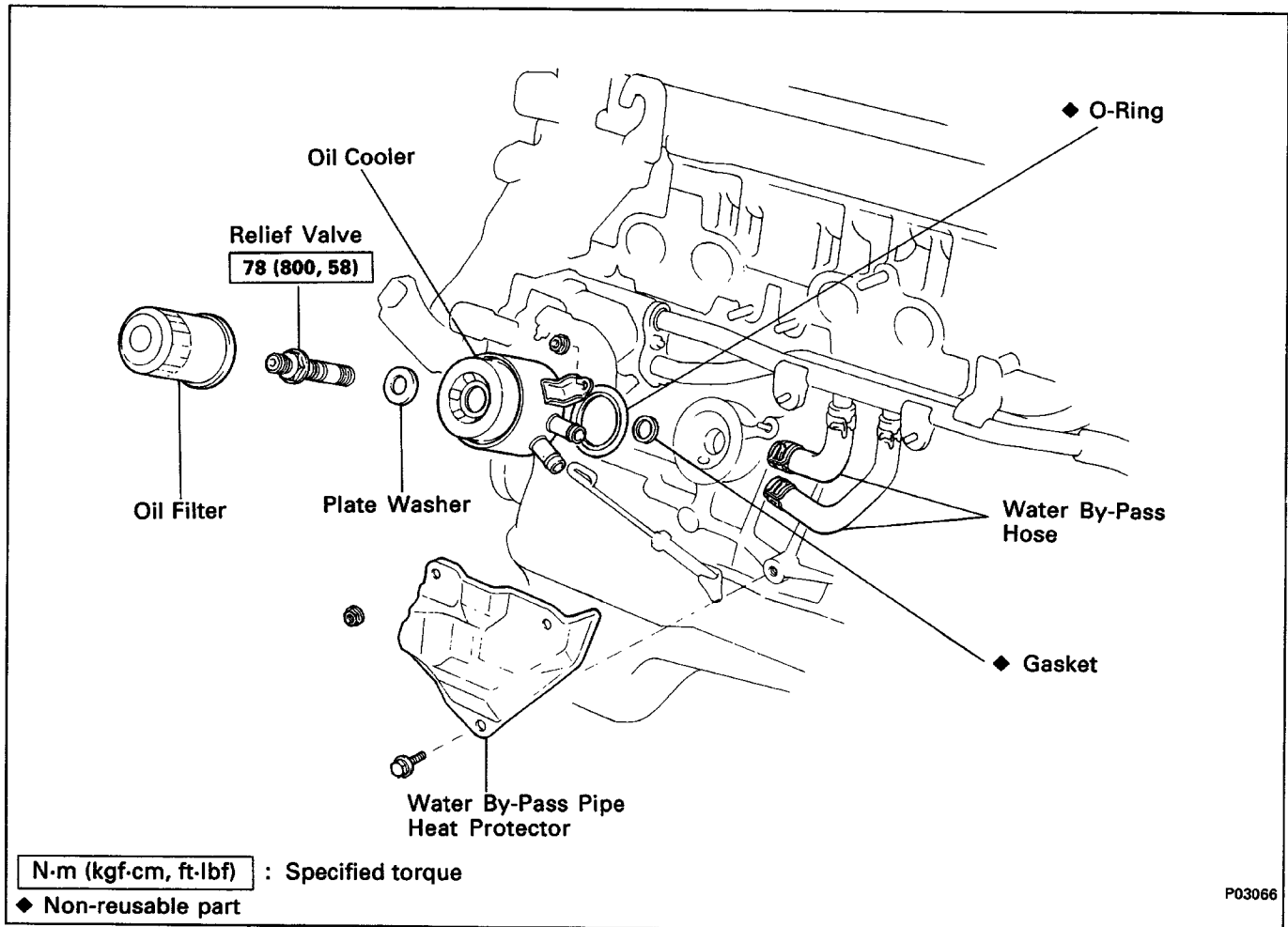
- (e) Tighten the relief valve.
Torque: 78 N-m (800 kgf-cm, 58 ft-lbf)
- (f) Tighten the two nuts holding the oil cooler to the water by-pass pipe..
Torque: 12 N-m (120 kgf-cm, 9 ft-lbf)
- (g) Tighten the bolt holding the water by-pass pipe to oil cooler bracket.
Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)



3. CONNECT WATER BY-PASS HOSE TO OIL COOLER

- 4. INSTALL OIL FILTER (See page [LU-7](#))
- 5. INSTALL GENERATOR (See page [CH-23](#))
- 6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
- 7. FILL WITH ENGINE COOLANT (See page [CO-6](#))
- 8. START ENGINE AND CHECK FOR LEAKS
- 9. CHECK ENGINE OIL LEVEL (See page [LU-5](#))

OIL COOLER (5S-FE) COMPONENTS



REMOVAL OF OIL COOLER

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE RH ENGINE UNDER COVER

3. DRAIN ENGINE COOLANT (See page [CO-6](#))

4. REMOVE FRONT EXHAUST PIPE

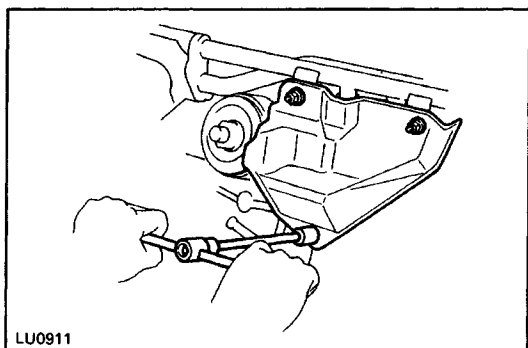
(See step 30 on page [EM-274](#))

5. REMOVE GENERATOR (See page [CH-9](#))

6. REMOVE EXHAUST MANIFOLD AND THREE-WAY CATALYTIC CONVERTER ASSEMBLY

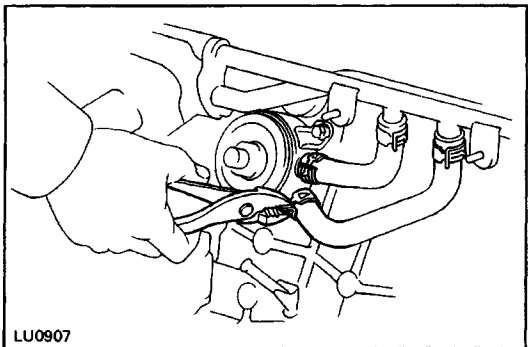
(See step 14 on pages [EM-151](#) and 152)

7. REMOVE OIL FILTER (See page [LU-7](#))



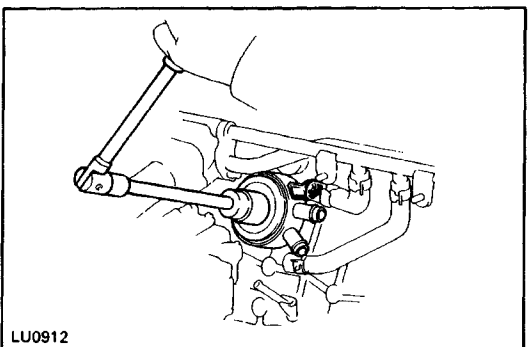
8. REMOVE WATER BY-PASS HOSE HEAT PROTECTOR

Remove the bolt, two nuts and heat protector.



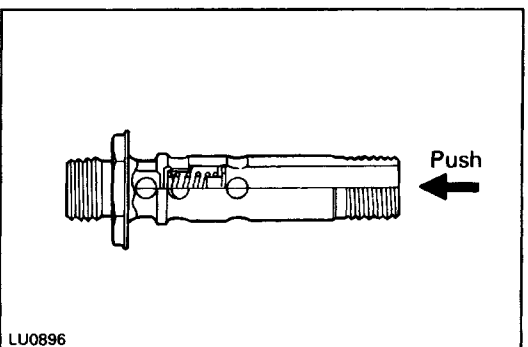
9. DISCONNECT WATER BY-PASS HOSES FROM OIL COOLER

Disconnect the two water by-pass hoses.



10. REMOVE OIL COOLER

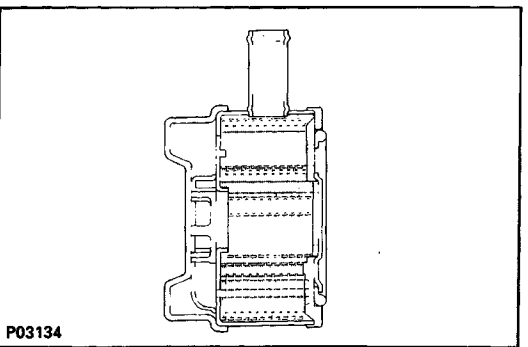
- (a) Remove the relief valve and plate washer.
- (b) Remove the nut and oil cooler.
- (c) Remove the O-ring and gasket from the oil cooler.



INSPECTION OF OIL COOLER

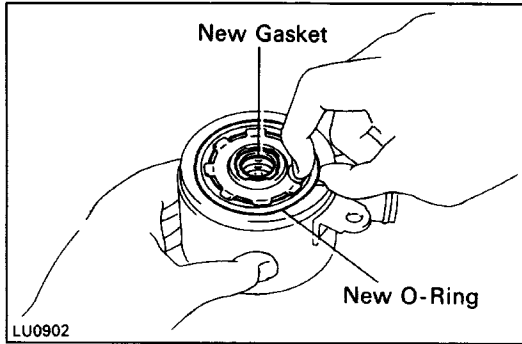
1. INSPECT RELIEF VALVE

Push the valve with a wooden stick to check if it is stuck. If stuck, replace the relief valve.



2. INSPECT OIL COOLER

Check the oil cooler for damage or clogging. If necessary, replace the oil cooler.

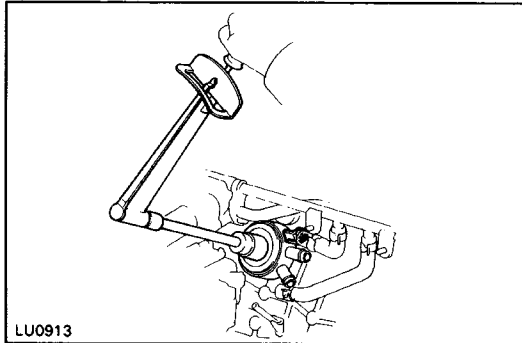


INSTALLATION OF OIL COOLER

(See page [LU-28](#))

1. INSTALL OIL COOLER

(a) Install new O-ring and gasket to the oil cooler.



(b) Apply a light coat of engine oil on the threads and under the head of the relief valve.

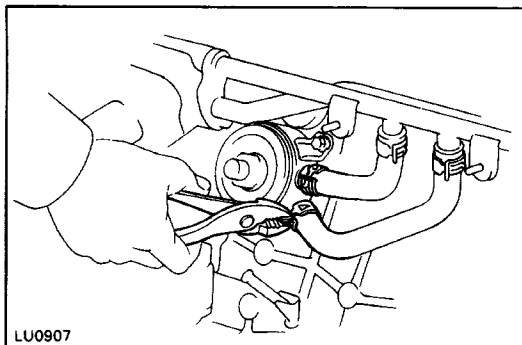
(c) Temporarily install the oil cooler with the nut.

(d) Install the plate washer and relief valve.

Torque: 800 kg-cm (58 ft-lb, 78 N-m)

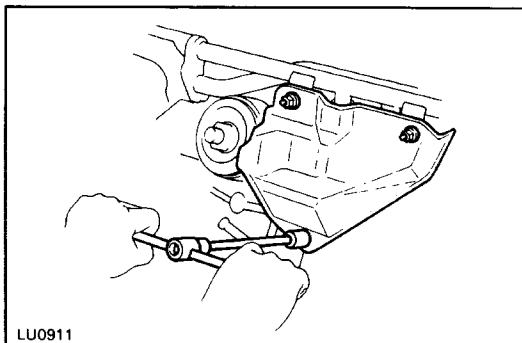
(e) Tighten the nut.

Torque: 80 kg-cm (69 in.-lb, 7.8 N-m)



2. CONNECT WATER BY-PASS HOSES

Connect the two water by-pass hoses.



3. INSTALL WATER BY-PASS HOSE HEAT PROTECTOR

Install the heat protector with the bolt and two nuts.

4. INSTALL OIL FILTER (See page [LU-7](#))

5. INSTALL EXHAUST MANIFOLD AND CATALYTIC CONVERTER ASSEMBLY

(See step 27 on page [EM-182](#))

6. INSTALL GENERATOR (See page [CH-25](#))

7. INSTALL FRONT EXHAUST PIPE

(See step 15 on page [EM-305](#))

8. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

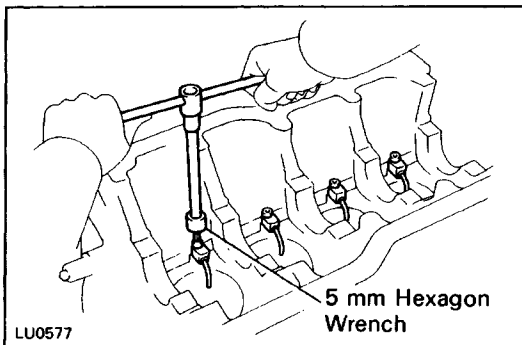
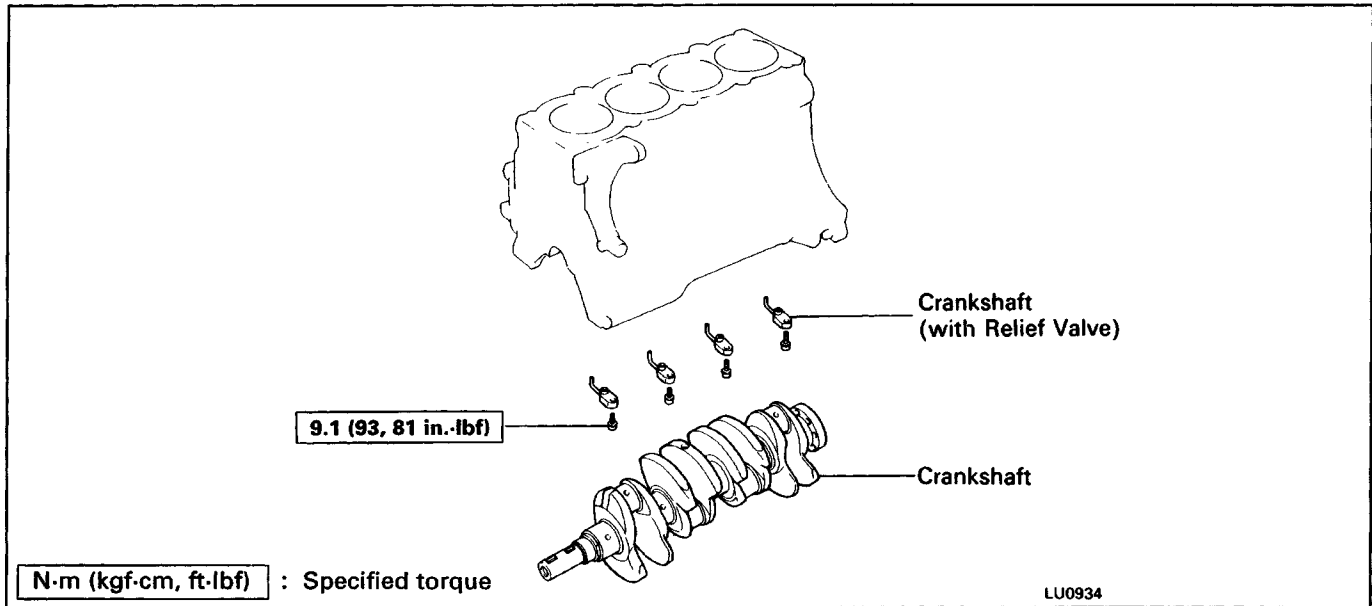
9. FILL WITH ENGINE COOLANT (See page [CO-6](#))

10. START ENGINE AND CHECK FOR LEAKS

11. CHECK ENGINE OIL LEVEL (See page [LU-5](#))

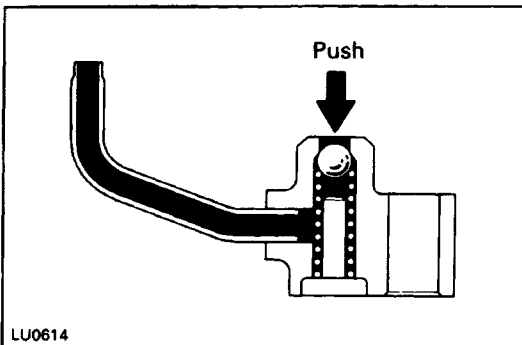
12. INSTALL RH ENGINE UNDER COVER

OIL NOZZLES (3S-GTE) COMPONENTS



REMOVAL OF OIL NOZZLES

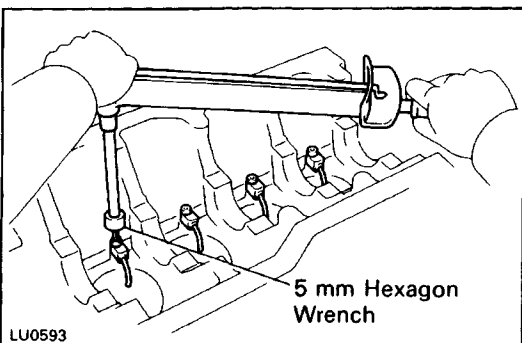
1. REMOVE CRANKSHAFT (See pages [EM-224](#) to 239)
2. REMOVE OIL NOZZLES (WITH RELIEF VALVES)
Using a 5 mm hexagon wrench, remove the bolt and oil nozzle. Remove the four oil nozzles.



INSPECTION OF OIL NOZZLES

INSPECT RELIEF VALVES (OIL NOZZLES)

Push the valve with a wooden stick to check if it is stuck. If stuck, replace the relief valve.

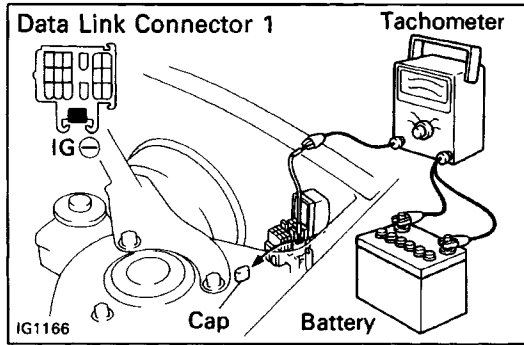


INSTALLATION OF OIL NOZZLES

1. INSTALL OIL NOZZLES (WITH RELIEF VALVES)
Using a 5 mm hexagon wrench, install the oil nozzle with the bolt. Install the four oil nozzles.
Torque: 9.1 N·m (93 kgf·cm, 81 in.-lbf)
2. REMOVE CRANKSHAFT (See pages [EM-253](#) to 267)

IGNITION SYSTEM

	Page
PRECAUTIONS	IG-2
TROUBLESHOOTING	IG-3
IGNITION SYSTEM CIRCUIT	IG-4
ON-VEHICLE INSPECTION (4A-FE)	IG-6
ON-VEHICLE INSPECTION (3S-GTE)	IG-10
ON-VEHICLE INSPECTION (5S-FE)	IG-15
INTEGRATED IGNITION ASSEMBLY (IIA) (4A-FE)	IG-20
DISTRIBUTOR (3S-GTE)	IG-26
DISTRIBUTOR (5S-FE)	IG-30



PRECAUTIONS

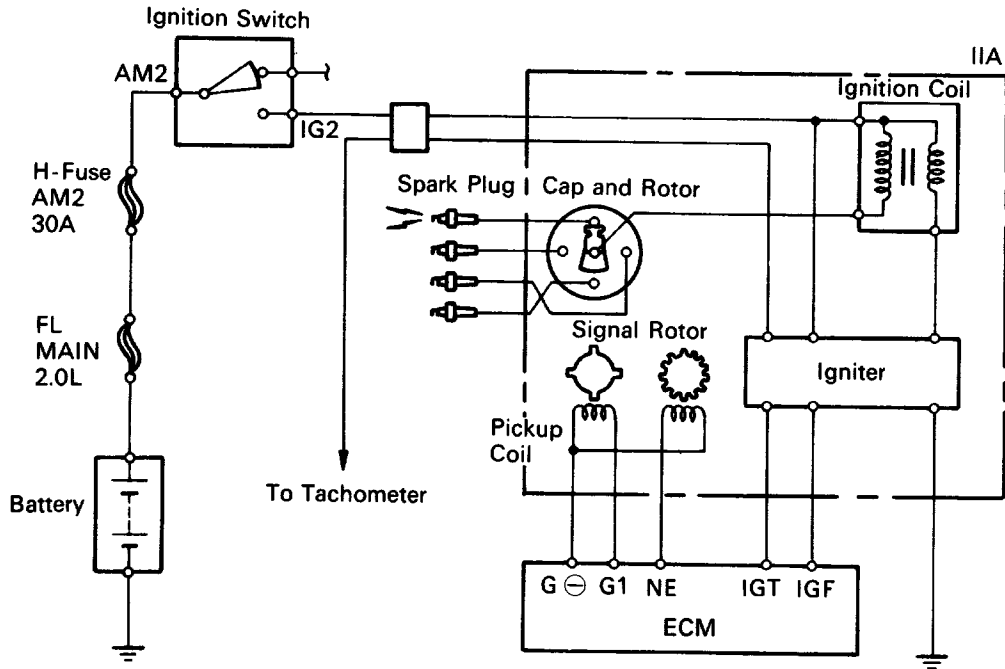
1. Do not leave the ignition switch on for more than 10 minutes if the engine will not start.
2. With a tachometer connected to the system, connect the test probe of the tachometer to terminal IG (-) of the data link connector 1.
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.
4. NEVER allow the tachometer terminal to touch ground as this could damage the igniter and/or ignition coil.
5. Do not disconnect the battery when the engine is running.
6. Check that the igniter is properly grounded to the body.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ hard to start (cranks ok)	Incorrect ignition timing Ignition problems <ul style="list-style-type: none"> • Ignition coil • Igniter • Distributor • High-tension cords Ignition wiring disconnected or broken	Reset timing Inspect coil Inspect igniter Inspect distributor Inspect high-tension cords Inspect wiring	IG-25, 29, 37 IG-8, 13, 17 IG-9, 14, 19 IG-9, 13, 19 IG-7, 11, 16
Rough idle or stalls	Spark plug faulty Ignition wiring faulty Incorrect ignition timing Ignition problems <ul style="list-style-type: none"> • Ignition coil • Igniter • Distributor • High-tension cords 	Inspect plugs Inspect wiring Reset timing Inspect coil Inspect igniter Inspect distributor Inspect high-tension cords	IG-7, 11, 16 IG-25, 29, 37 IG-8, 13, 17 IG-9, 14, 19 IG-9, 13, 19 IG-7, 11, 16
Engine hesitates/ poor acceleration	Spark plug faulty Ignition wiring faulty Incorrect ignition timing	Inspect plugs Inspect wiring Reset timing	IG-7, 11, 16 IG-25, 29, 37
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	IG-25, 29, 37
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG-25, 29, 37
Engine backfires	Incorrect ignition timing	Reset timing	IG-25, 29, 37
Poor gasoline mileage	Spark plug faulty Incorrect ignition timing	Inspect plugs Reset timing	IG-7, 11, 16 IG-25, 29, 37
Engine overheats	Incorrect ignition timing	Reset timing	IG-25, 29, 37

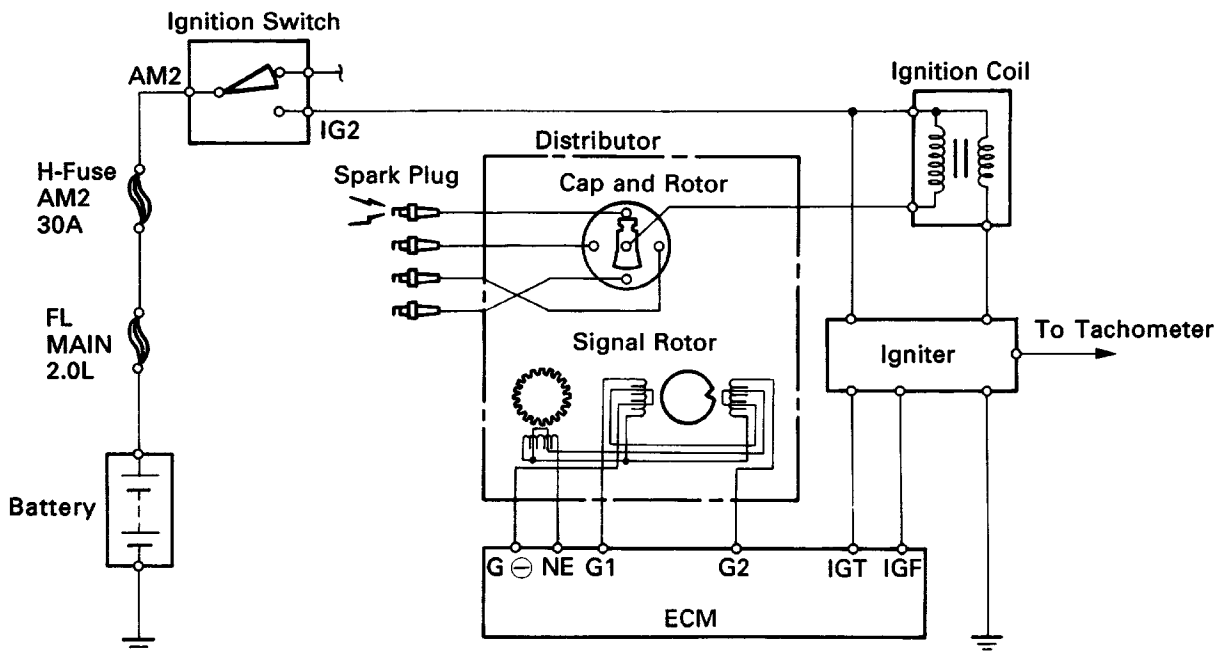
IGNITION SYSTEM CIRCUIT

4A-FE

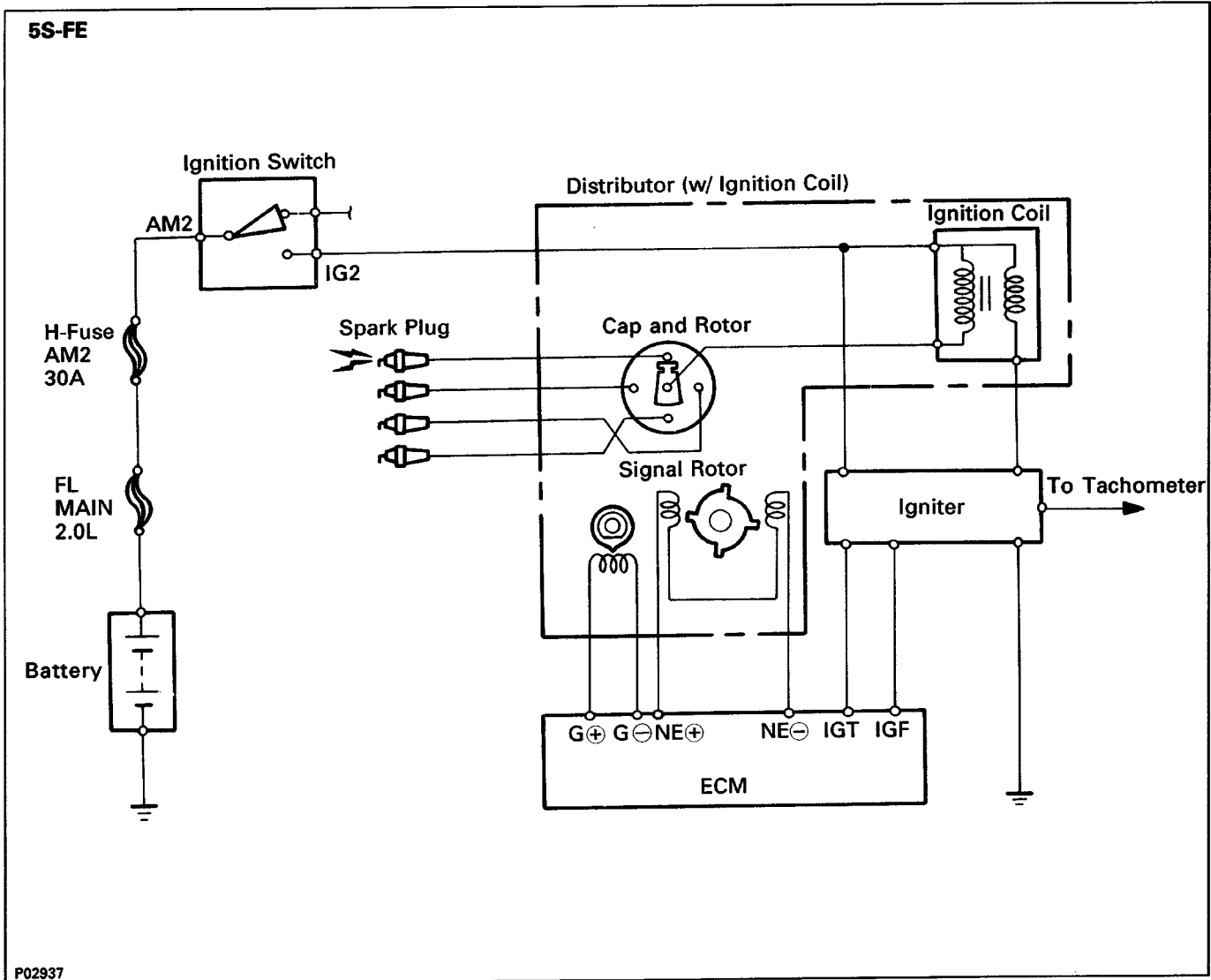


IG1310

3S-GTE



P02936



P02937

ELECTRONIC SPARK ADVANCE (ESA)

The ECM is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, engine coolant temperature, etc.) the microcomputer (ECM) triggers the spark at precisely the right instant.

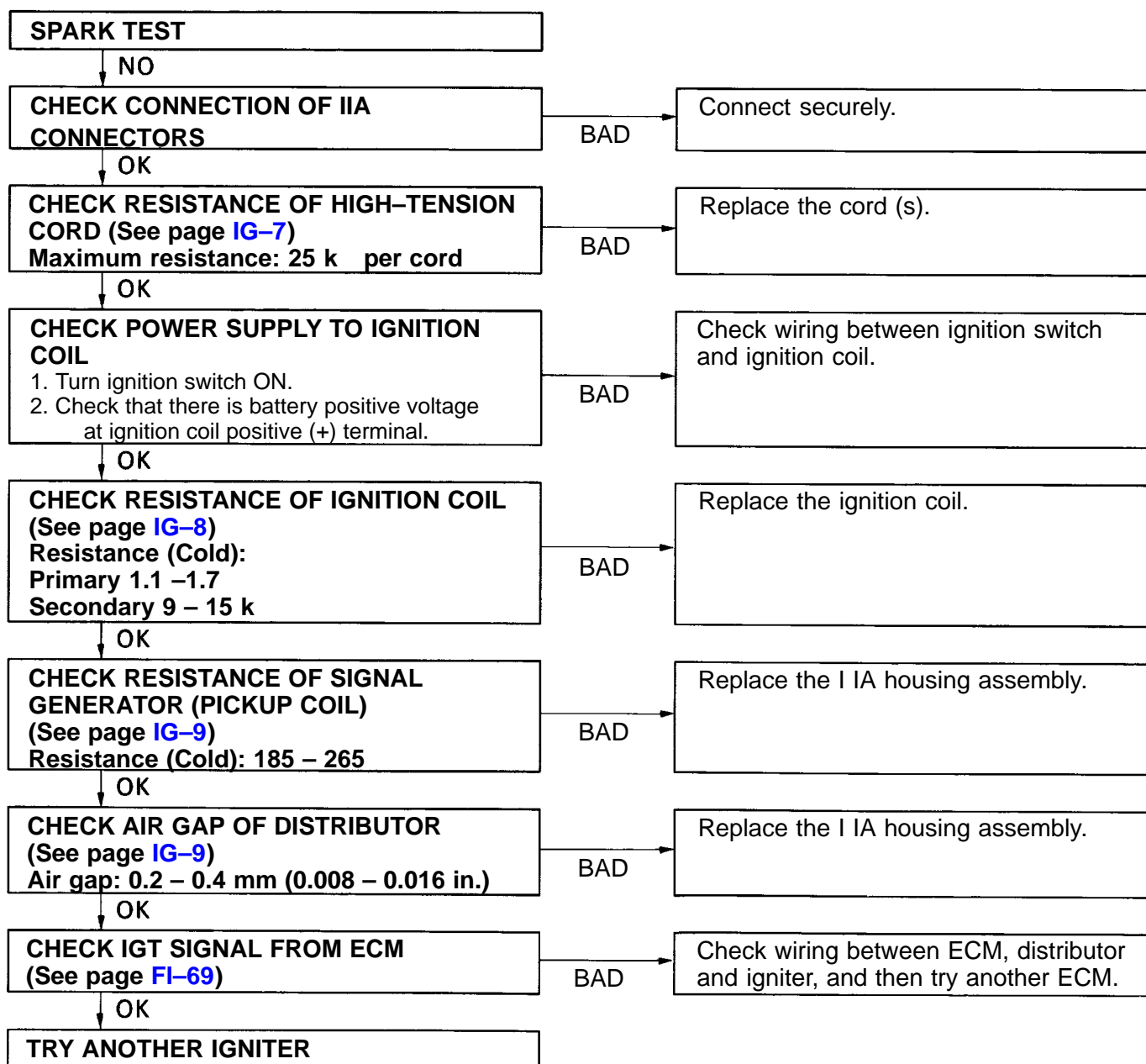
ON-VEHICLE INSPECTION (4A-FE)

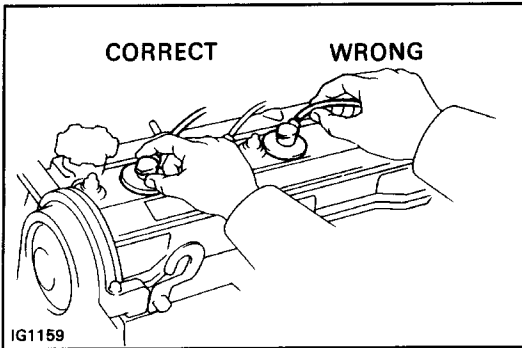
SPARK TEST

CHECK THAT SPARK OCCURS

- Disconnect the high-tension cords from the spark plugs. (See page IG-7)
 - Remove the spark plugs. (See page IG-7)
 - Install the spark plugs to the each high-tension cord.
 - Ground the spark plug.
 - Check if spark occurs while engine is being cranked.
- HINT: To minimize the amount of fuel injected into cylinders during this test, crank the engine for no more than 1 - 2 seconds at a time.

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





INSPECTION OF HIGH-TENSION CORDS

1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

Disconnect the high-tension cords at the rubber boot. DO NOT pull on the cords.

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

2. REMOVE IIA CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS

3. INSPECT HIGH-TENSION CORD RESISTANCE

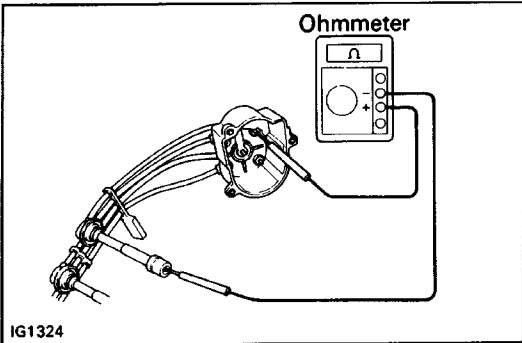
Using an ohmmeter: measure the resistance without disconnecting the IIA cap.

Maximum resistance: 25 k per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high-tension cord and/or IIA cap.

4. REINSTALL IIA CAP

5. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

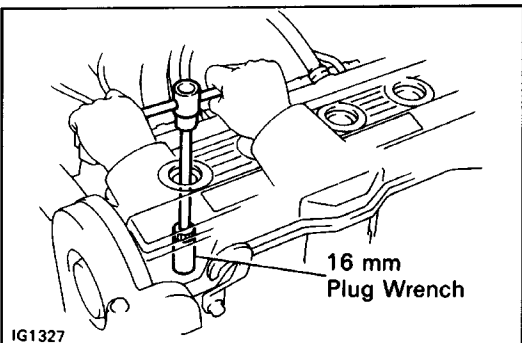


INSPECTION OF SPARK PLUGS

1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

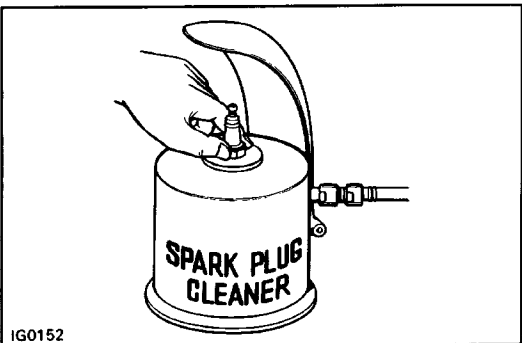
2. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



3. CLEAN SPARK PLUGS

Using spark plug cleaner or wire brush, clean the spark plug.

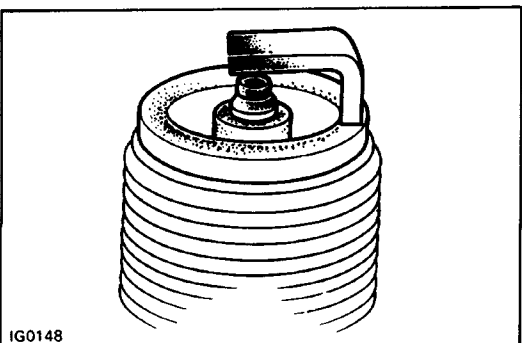


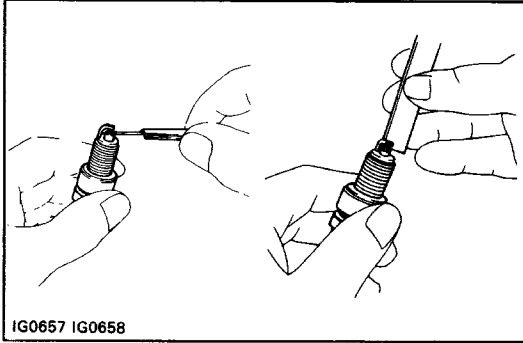
4. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the spark plug.

**Recommended spark plug: ND Q16R-U
NGK BCPR5EY**

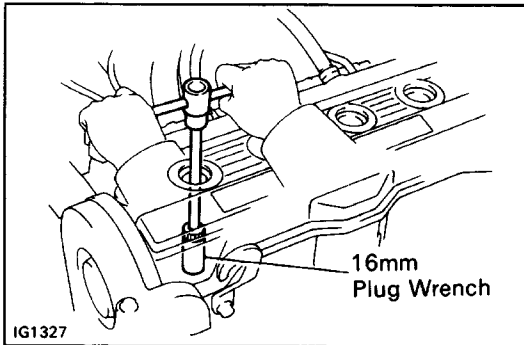




5. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the correct electrode gap.

Correct electrode gap: 0.8 mm (0.31 in.)



6. INSTALL SPARK PLUGS

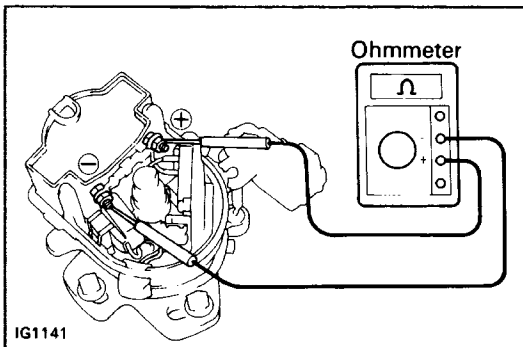
Using a 16 mm plug wrench, install the spark plug.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

7. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

INSPECTION OF IIA

1. DISCONNECT IIA CONNECTORS
2. REMOVE IIA CAP
3. REMOVE DISTRIBUTOR ROTOR
4. REMOVE IGNITION COIL AND IGNITER DUST COVERS



Ignition Coil

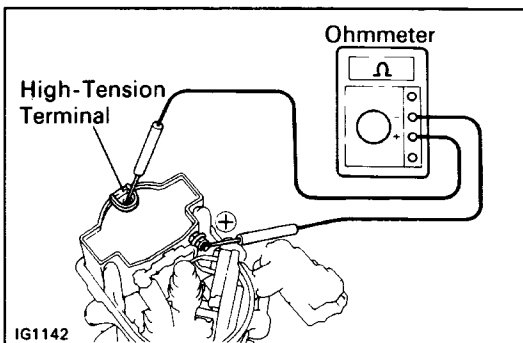
5. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and negative (-) terminals.

Primary coil resistance (Cold):

1.1 ~ 1.7 at -10 ~ +400C (14 ~ 1040F)

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



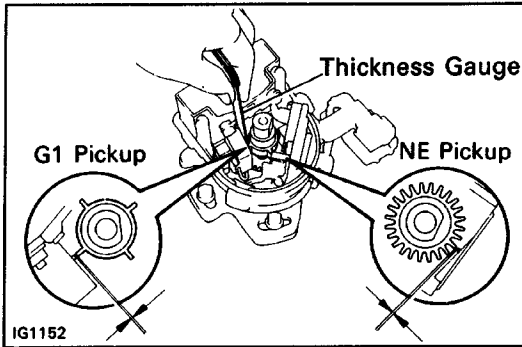
6. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and high-tension terminals.

Secondary coil resistance (Cold):

9 ~ 15 k at -10 ~ +400C (14 ~ 104°F)

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



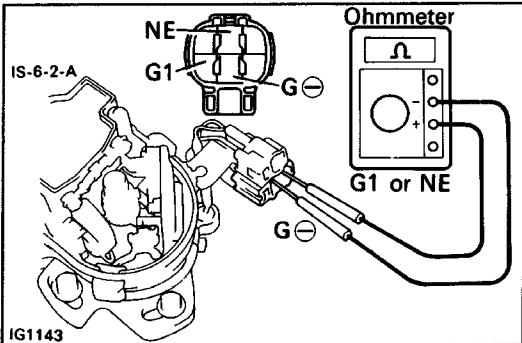
Distributor

7. INSPECT AIR GAP

Using a thickness gauge, measure the gap between the signal rotor and pickup coil projection.

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

If the air gap is not as specified, replace the IIA housing assembly.



8. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals (G1 and GE(-), NE and G(-)).

Pickup coil resistance (Cold):

185 – 265 Ω at -10 – +40°C (14 – 104°F)

If the resistance is not as specified, replace the IIA housing assembly.

9. REINSTALL IGNITION COIL AND IGNITER DUST COVERS

10. REINSTALL DISTRIBUTOR ROTOR

11. REINSTALL IIA CAP

12. RECONNECT IIA CONNECTORS

Igniter

(See procedure Spark Test on page [IG-6](#))

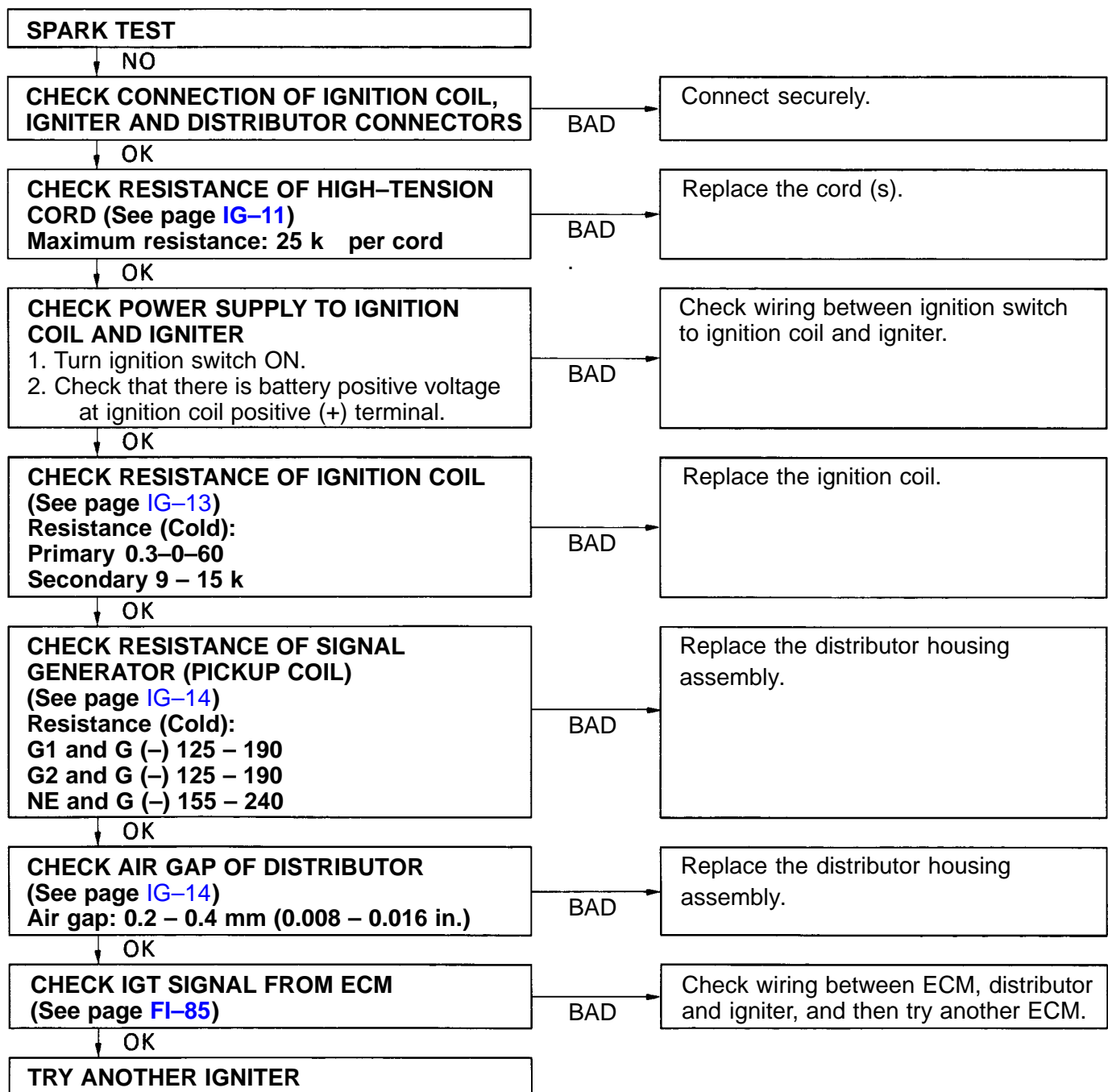
ON-VEHICLE INSPECTION (3S-GTE)

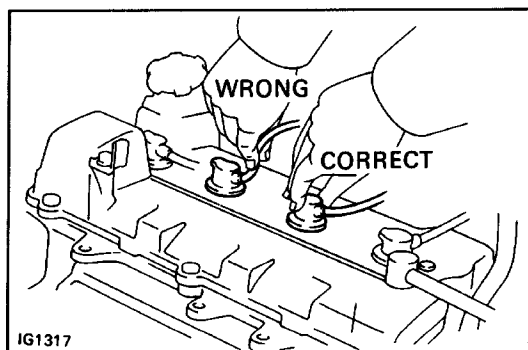
SPARK TEST

CHECK THAT SPARK OCCURS

- Disconnect the high-tension cord from the distributor.
(See page IG-11)
- Hold the end about 12.5 mm (0.50 in.) from the body of car.
- Check if spark occurs while engine is being cranked.
HINT: To minimize the amount of fuel injected into the cylinders during this test, crank the engine for no more than 1 - 2 seconds at a time.

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





INSPECTION OF HIGH-TENSION CORDS

1. REMOVE CHARGE AIR COOLER

(See steps 13 to 15 on pages [TC-9](#) and 10)

2. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

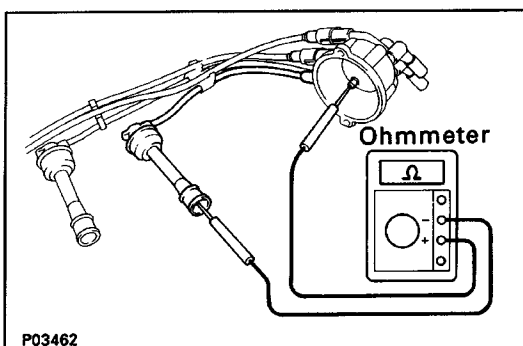
Disconnect the high-tension cords at the rubber boot.

DO NOT pull on the cords.

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

3. DISCONNECT HIGH-TENSION CORD FROM IGNITION COIL

4. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS



5. INSPECT HIGH-TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance without disconnecting the distributor cap.

Maximum resistance: 25 k Ω per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high-tension cord and/or distributor cap.

6. REINSTALL DISTRIBUTOR CAP

7. RECONNECT HIGH-TENSION CORD TO IGNITION COIL

8. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

9. REINSTALL CHARGE AIR COOLER

(See steps 11 to 15 on page [TC-17](#))

INSPECTION OF SPARK PLUGS

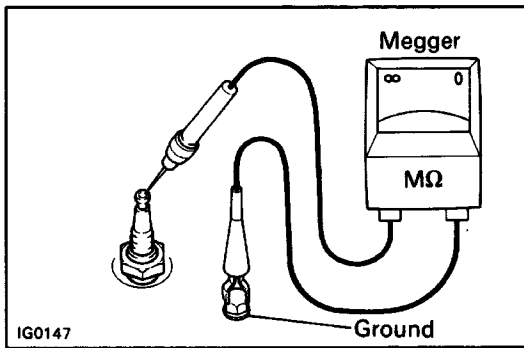
NOTICE:

- Never use a wire brush for cleaning.
- Never attempt to adjust the electrode gap on used spark plug.
- Spark plug should be replaced every 100,000 km (60,000 miles).

1. REMOVE CHARGE AIR COOLER

(See steps 13 to 15 on pages [TC-9](#) and 10)

2. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS



3. INSPECT ELECTRODE

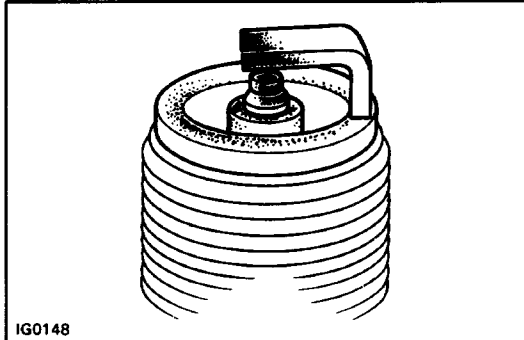
Using a megger (insulation resistance meter), measure the insulation resistance.

Standard correct insulation resistance:

10 M or more

If the resistance is less than specified, proceed to step 4.

HINT: If a megger is not available, the following simple method of inspection provides fairly accurate results.



(Simple Method)

(a) Quickly race the engine to 4,000 rpm five times.

(b) Remove the spark plug. (See step 4)

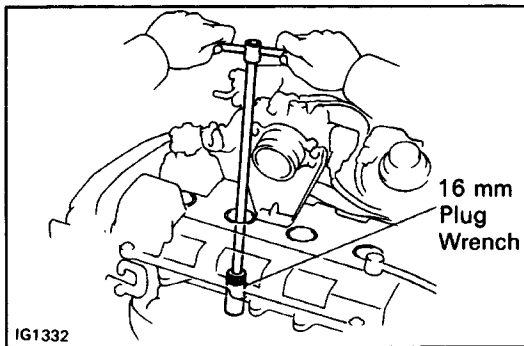
(c) Visually check the spark plug.

If the electrode is dry ... Okay

If the electrode is wet ... Proceed to step 5

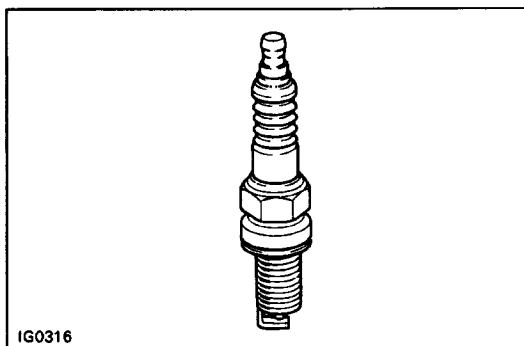
(d) Reinstall the spark plug.

(See step 8 on page [IG-13](#))



4. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



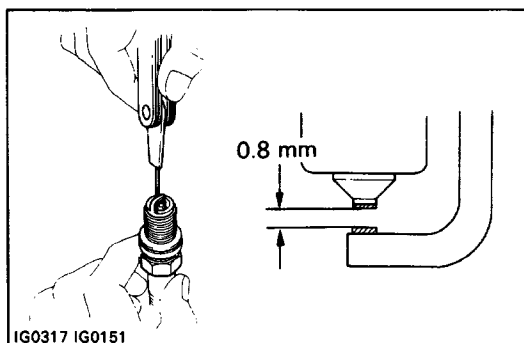
5. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug: ND PK20R8

NGK BKR6EP8



6. INSPECT ELECTRODE CAP

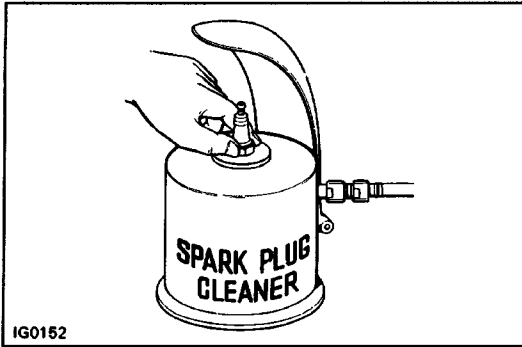
Maximum electrode gap: 1.0 mm (0.39 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap of new spark plug:

0.8 mm (0.31 in.)

NOTICE: If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



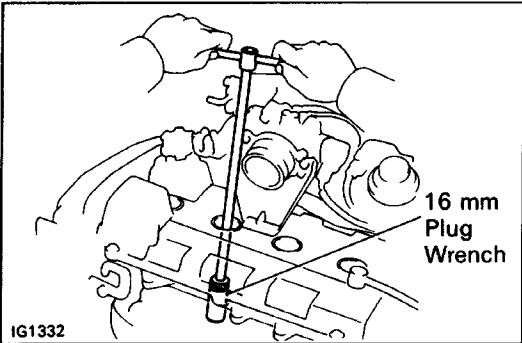
7. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

Air pressure: Below 588 kPa (6 kgf/cm², 85 psi)

Duration: 20 seconds or less

HINT: If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



8. INSTALL SPARK PLUGS

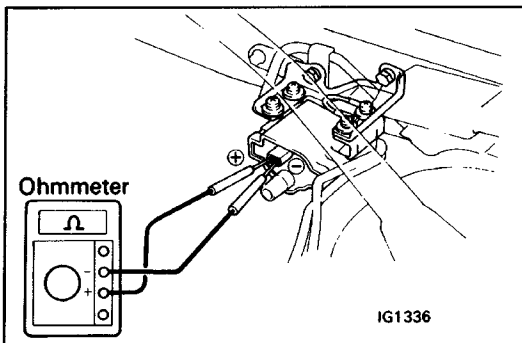
Using a 16 mm plug wrench, install the spark plug.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

9. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

10. REINSTALL CHARGE AIR COOLER

(See steps 11 to 13 on page [TC-17](#))



INSPECTION OF IGNITION COIL

1. DISCONNECT IGNITION COIL CONNECTOR

2. DISCONNECT HIGH-TENSION CORD

3. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and negative (-) terminals.

Primary coil resistance (Cold):

0.3 ~ 0.6 Ω at -10 ~ +40°C (14 ~ 104°F)

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

4. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and high-tension terminals.

Secondary coil resistance (Cold):

9 ~ 15 kΩ at -10 ~ +40°C (14 ~ 104°F)

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

5. RECONNECT HIGH-TENSION CORD

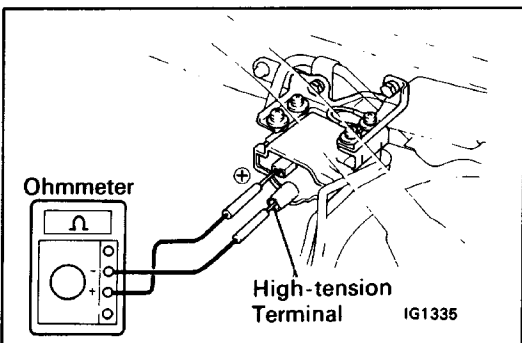
6. RECONNECT IGNITION COIL CONNECTOR

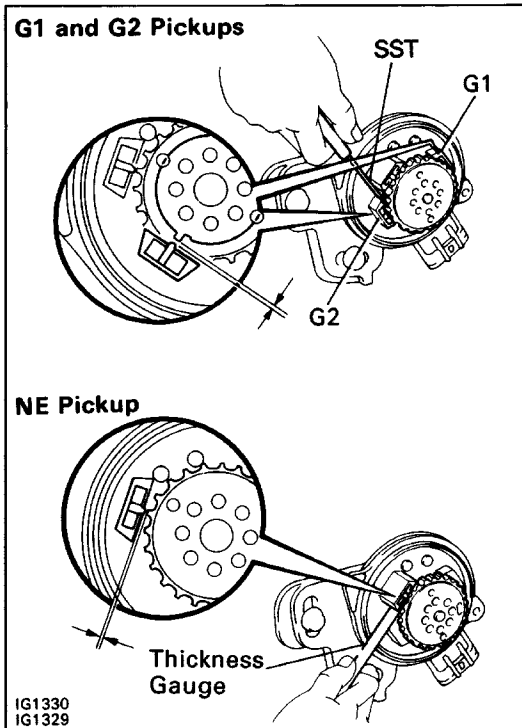
INSPECTION OF DISTRIBUTOR

1. DISCONNECT DISTRIBUTOR CONNECTOR

2. REMOVE DISTRIBUTOR CAP

3. REMOVE ROTOR





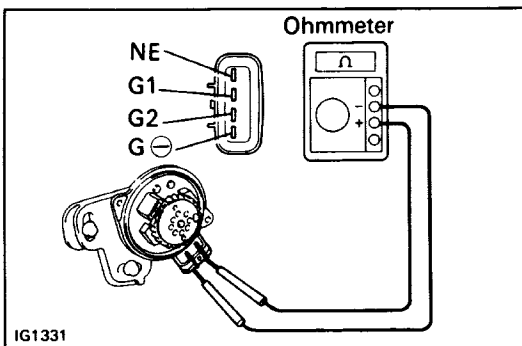
4. INSPECT AIR GAP

Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the air gap between the signal rotor and pickup coil projection.

SST 09240-00020 for G1 and G2 pickups

Air gap: 0.2 - 0.4 mm (0.008 - 0.016 in.)

If the air gap is not as specified, replace the distributor housing assembly.



5. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Pickup coil resistance (Cold):

G1 and G (-)

125 ~ 190 at -10 ~ +40°C (14 ~ 104°F)

G2 and G (-)

125 ~ 190 at -10 ~ +40°C (14 ~ 104°F)

NE and G (-)

155 ~ 240 at -10 ~ +40°C (14 ~ 104°F)

If the resistance is not as specified, replace the distributor housing assembly.

6. REINSTALL ROTOR

7. REINSTALL DISTRIBUTOR CAP

8. RECONNECT DISTRIBUTOR CONNECTOR

INSPECTION OF IGNITER

(See procedure Spark Test on page [IG-10](#))

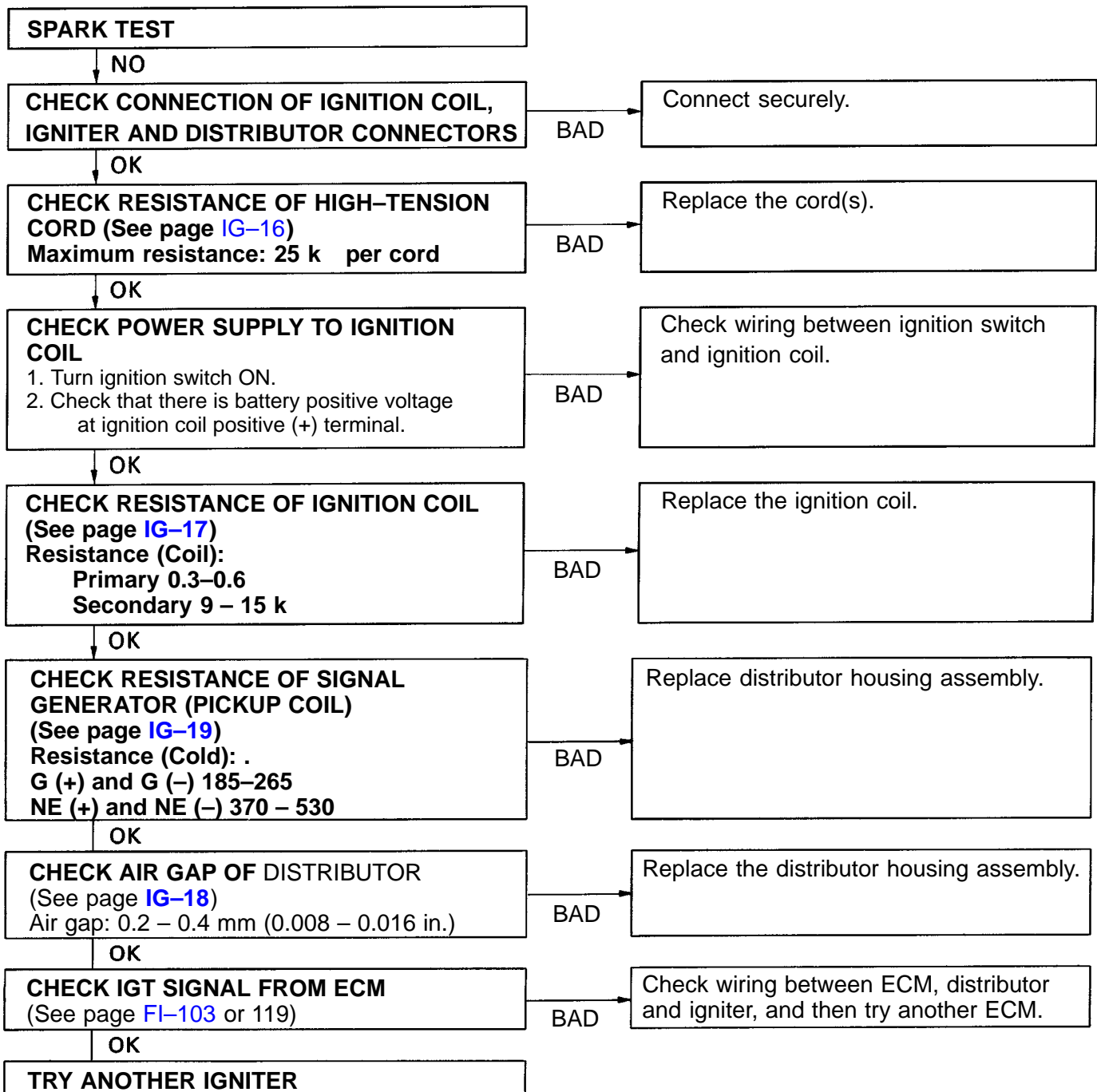
ON-VEHICLE INSPECTION (5S-FE)

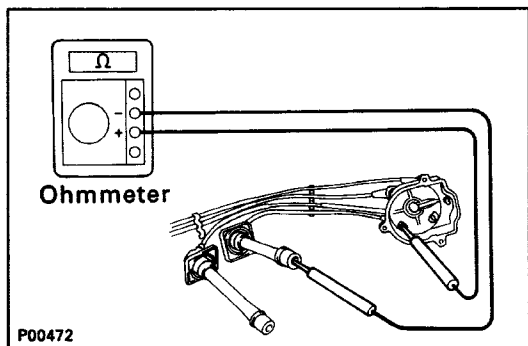
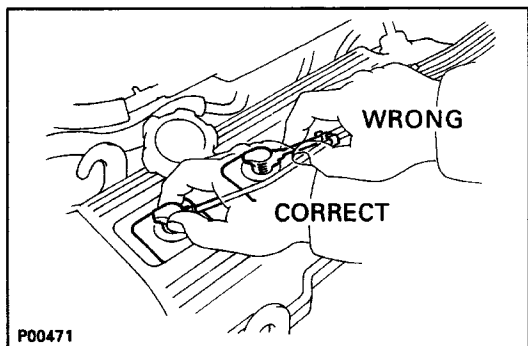
SPARK TEST

CHECK THAT SPARK OCCURS

- (a) Disconnect the high-tension cord from the distributor.
(See page IG-16)
- (b) Hold the end about 12.5 mm (0.50 in.) from the body of car.
- (e) Check if spark occurs while engine is being cranked.
HINT: To minimize the amount of fuel injected into the cylinders during this test, crank the engine for no more than 1 – 2 seconds at a time.

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





INSPECTION OF HIGH-TENSION CORDS

1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

Disconnect the high-tension cords at the rubber boot.
DO NOT pull on the cords.

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

2. DISCONNECT HIGH-TENSION CORD FROM IGNITION COIL (See step 3 on pages IG-30 and 31)

3. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS

4. INSPECT HIGH-TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance without disconnecting the distributor cap.

Maximum resistance: 25 k Ω per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high-tension cord and/or distributor cap.

5. REINSTALL DISTRIBUTOR CAP

6. RECONNECT HIGH-TENSION CORD TO IGNITION COIL (See step 3 on pages IG-32 and 33)

7. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

INSPECTION OF SPARK PLUGS

NOTICE:

- Never use a wire brush for cleaning.
- Never attempt to adjust the electrode gap on used spark plug.
- Spark plug should be replaced every 100,000 km (60,000 miles).

1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

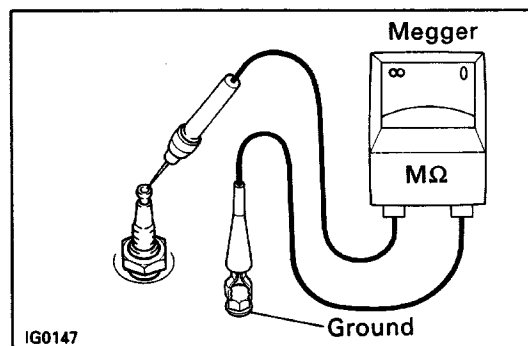
2. INSPECT ELECTRODE

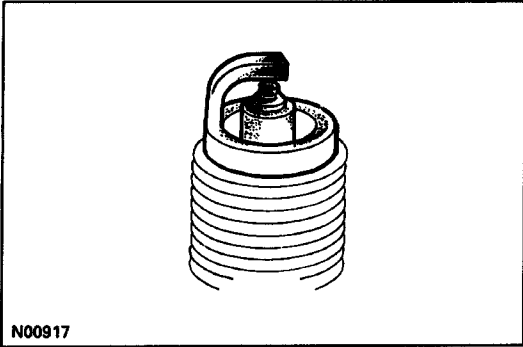
Using a megger (insulation resistance meter), measure the insulation resistance.

**Standard correct insulation resistance:
10 M Ω or more**

If the resistance is less than specified, proceed to step 4.

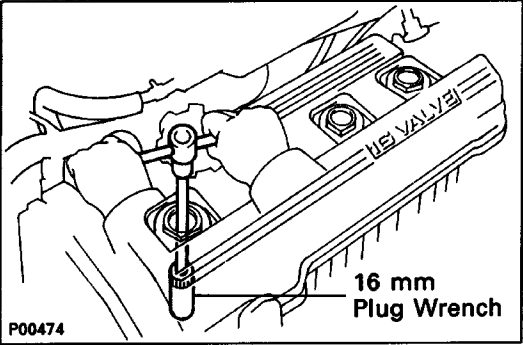
HINT: If a megger is not available, the following simple method of inspection provides fairly accurate results.





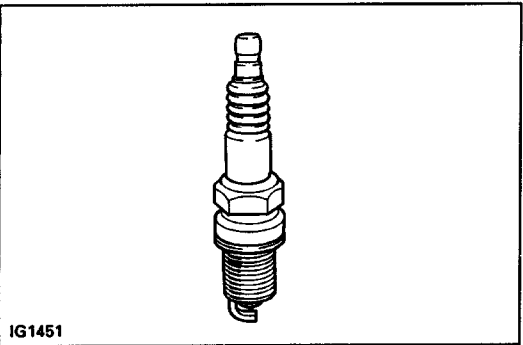
(Simple Method)

- (a) Quickly race the engine to 4,000 rpm five times.
- (b) Remove the spark plug. (See step 3)
- (c) Visually check the spark plug.
If the electrode is dry ... Okay
If the electrode is wet ... Proceed to step 4
- (d) Reinstall the spark plug.
(See step 7 on page IG-18)



3. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.

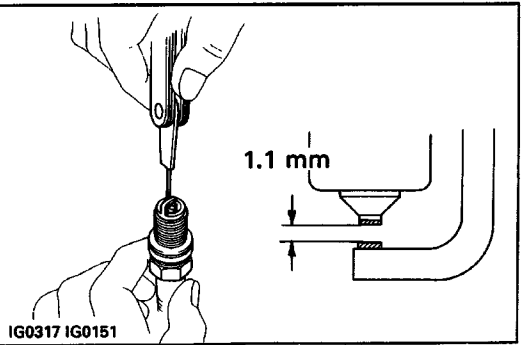


4. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

**Recommended spark plug: ND PK20R11
NGK BKR6EP-11**



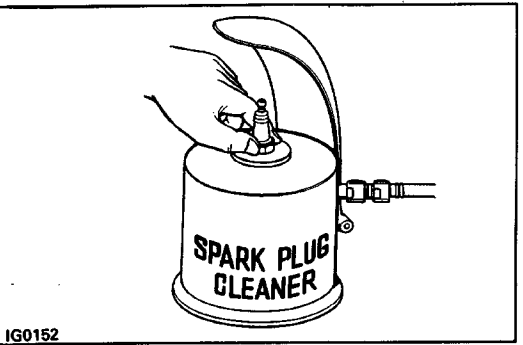
5. INSPECT ELECTRODE GAP

Maximum electrode gap: 1.3 mm (0.051 in.)

If the gap is greater than maximum, replace the spark plug.

**Correct electrode gap of new spark plug:
1.1 mm (0.043 in.)**

NOTICE: If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



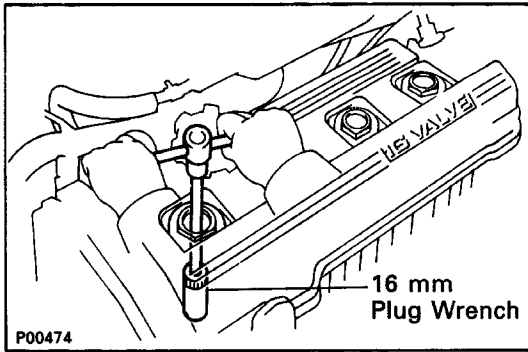
6. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

Air pressure: Below 588 kPa (6 kgf/cm², 85 psi)

Duration: 20 seconds or less

**HINT: If there are traces of oil, remove it with gaso-
line before using the spark plug cleaner.**



7. INSTALL SPARK PLUGS

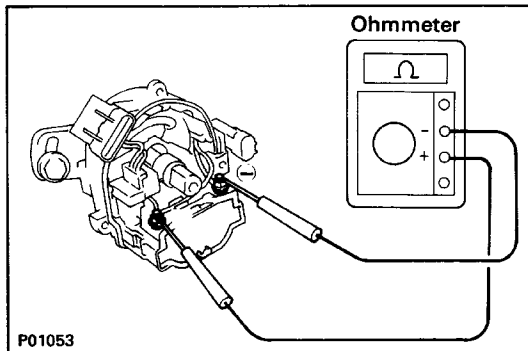
Using a 16 mm plug wrench, install the spark plug.

Torque: 18 N-m (180 kgf-cm, 13 ft-lbf)

8. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

INSPECTION OF DISTRIBUTOR

1. DISCONNECT DISTRIBUTOR CONNECTORS
2. DISCONNECT DISTRIBUTOR CAP
3. REMOVE ROTOR
4. REMOVE IGNITION COIL DUST COVER



Ignition Coil

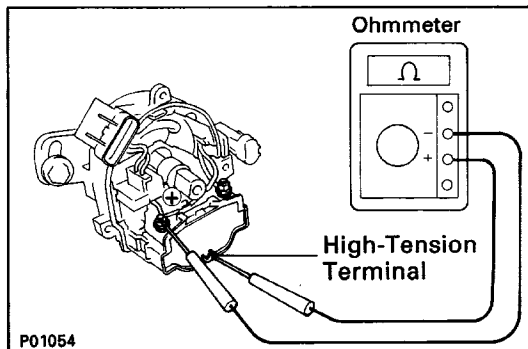
5. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and negative (-) terminals.

Primary coil resistance (Cold):

0.3 ~ 0.6 at -10 ~ +40°C (14 ~ 104°F)

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



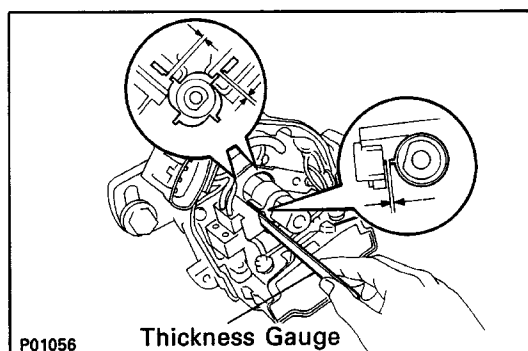
6. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and high-tension terminals.

Secondary coil resistance (Cold):

9 ~ 15 k at -10 ~ +40°C (14 ~ 104°F)

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



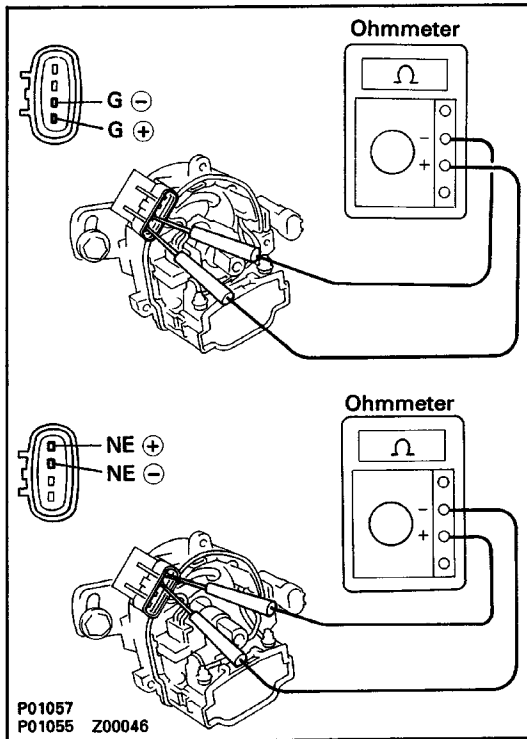
Distributor

7. INSPECT AIR GAP

Using a thickness gauge, measure the air gap between the signal rotor and pickup coil projection.

Air gap: 0.2 - 0.4 mm (0.008 - 0.016 in.)

If the air gap is not as specified, replace the distributor housing assembly.



8. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals (G (+) and G (-) , NE (+) and NE (-)).

Pickup coil resistance (Cold):

G (+) and G (-)

185 ~ 265 at -10 ~ +40°C (14 ~ 104°F)

NE (+) and NE (-)

370 ~ 530 at -10 ~ +40°C (14 ~ 104°F)

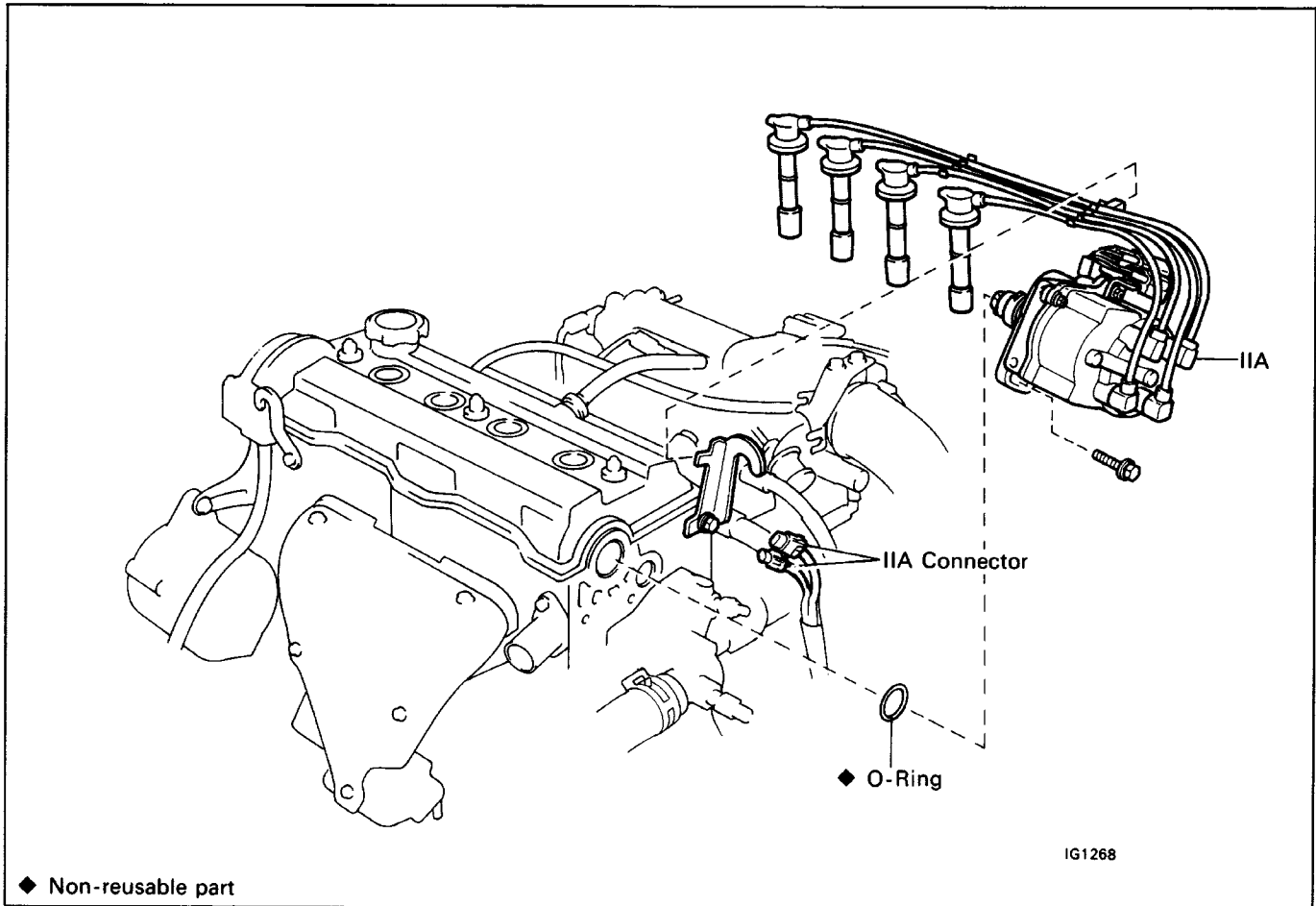
If the resistance is not as specified, replace the distributor housing assembly.

9. REINSTALL IGNITION COIL DUST COVER
10. REINSTALL ROTOR
11. REINSTALL DISTRIBUTOR CAP
12. RECONNECT DISTRIBUTOR CONNECTORS

INSPECTION OF IGNITER

(See Spark Test procedure on page [IG-15](#))

INTEGRATED IGNITION ASSEMBLY (IIA) (4A-FE) REMOVAL OF IIA



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

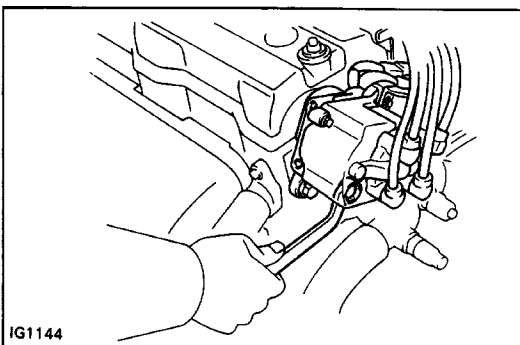
2. DISCONNECT IIA CONNECTORS

3. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

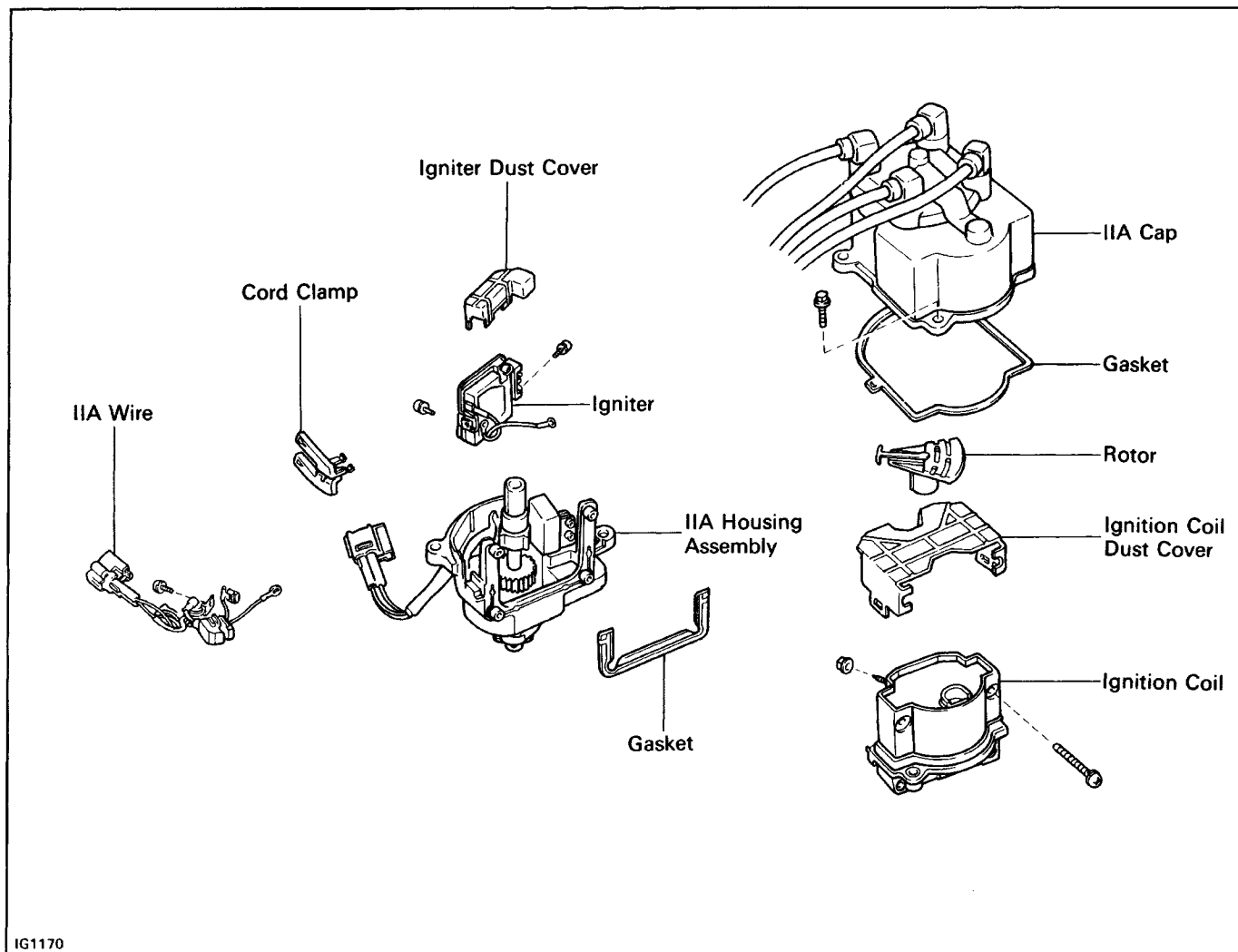
- Disconnect the cord clamp from the engine hanger.
- Disconnect the four high-tension cords from the spark plugs. (See page [IG-7](#))

4. REMOVE IIA

- Remove the two hold-down bolts, and pull out the IIA.
- Remove the O-ring from the IIA housing.



COMPONENTS



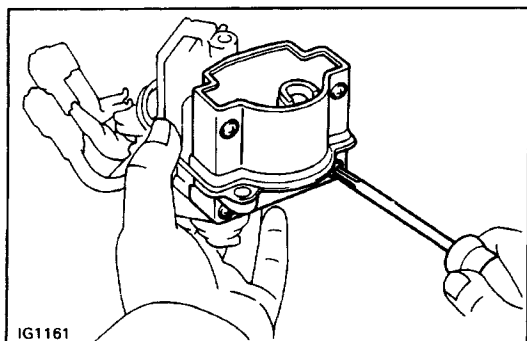
IG1170

DISASSEMBLY OF IIA

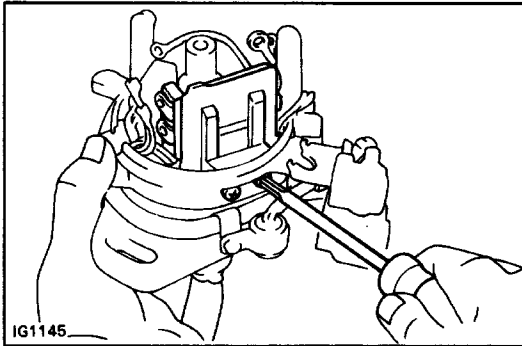
1. REMOVE IIA CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS
2. REMOVE ROTOR
3. REMOVE IGNITION COIL DUST COVER
4. REMOVE IGNITER DUST COVER

5. REMOVE IGNITION COIL

- (a) Remove the two nuts, and disconnect the three wires from the ignition coil terminals.
- (b) Remove the four screws, ignition coil and gasket.

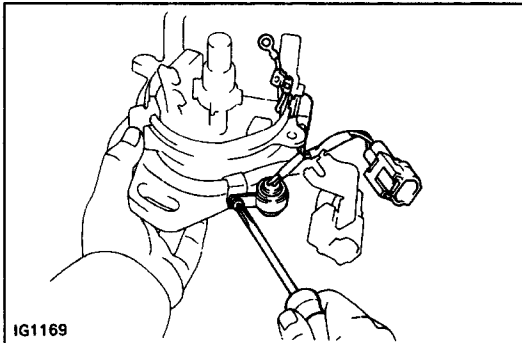


IG1161



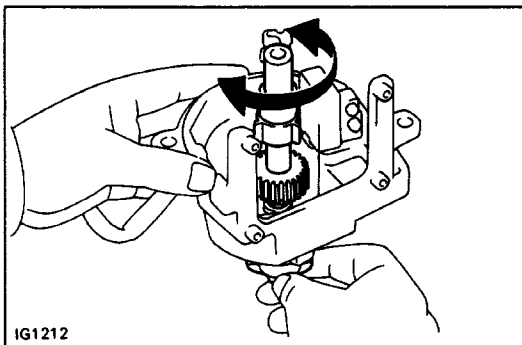
6. REMOVE IGNITER

- (a) Remove the two nuts, and disconnect the three wires from the ignite terminals.
- (b) Remove the two screws and igniter.



7. REMOVE IIA WIRE

- (a) Disconnect the connector from the cord clamp.
- (b) Disconnect the wire grommet from the IIA housing.
- (c) Remove the screw and IIA wire.

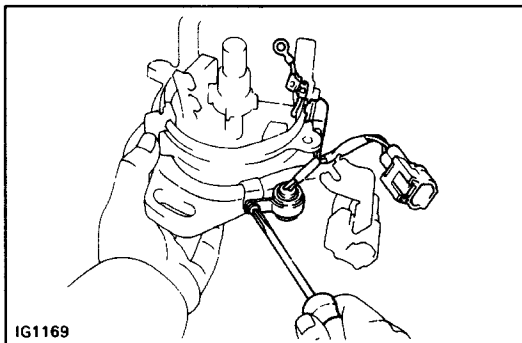


INSPECTION OF IIA

INSPECT GOVERNOR SHAFT

Turn the governor shaft and check that it is not rough or worn.

If it feels rough or worn, replace the IIA housing assembly.

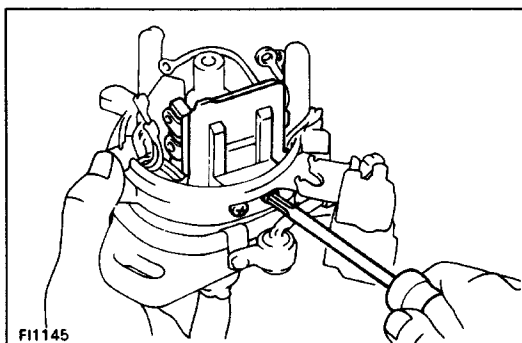


ASSEMBLY OF IIA

(See page [IG-21](#))

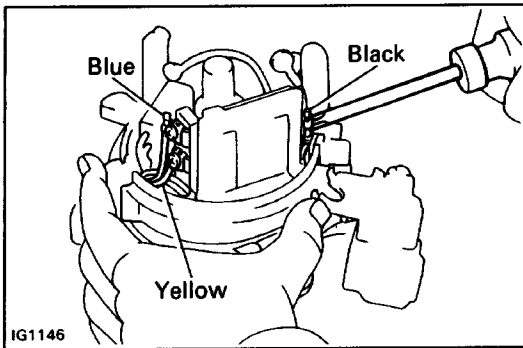
1. INSTALL IIA WIRE

- (a) Fit the wire grommet to the IIA housing.
- (b) Install the IIA wire with the screw.
- (c) Install the connector to the cord clamp.

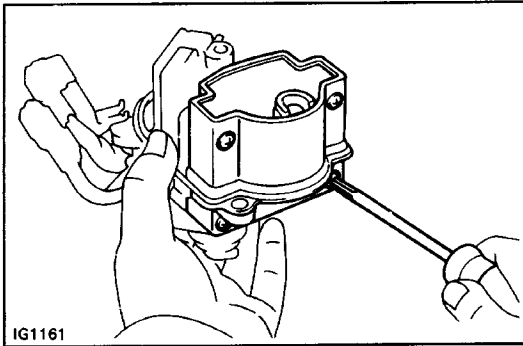


2. INSTALL IGNITER

- (a) Install the igniter with the two screws.

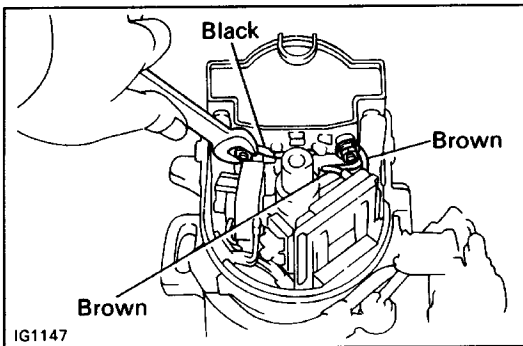


- (b) Connect the three wires to the igniter terminals with the three screws.

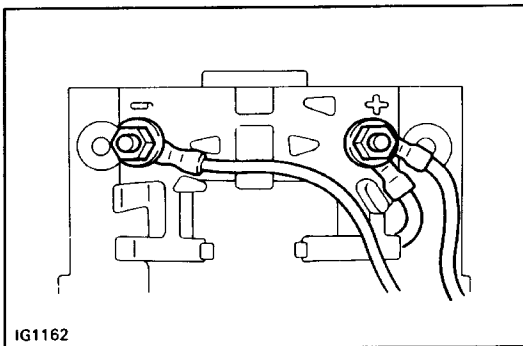


3. INSTALL IGNITION COIL

- (a) Install the gasket and ignition coil with the four screws.



- (b) Connect the three wires to the ignition coil terminals with the two nuts.



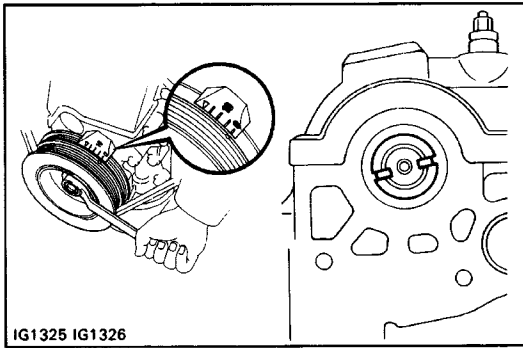
NOTICE:

- When connecting the wires to the ignition coil, insert both properly into their grooves found on the side of the ignition coil.
- Be sure the wires do not contact with signal rotor or IIA housing.

4. INSTALL IGNITION COIL DUST COVER

5. INSTALL ROTOR

6. INSTALL IIA CAP AND HIGH-TENSION CORDS

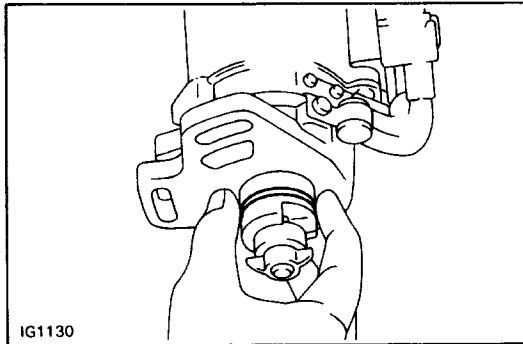


INSTALLATION OF IIA

(See page IG-20)

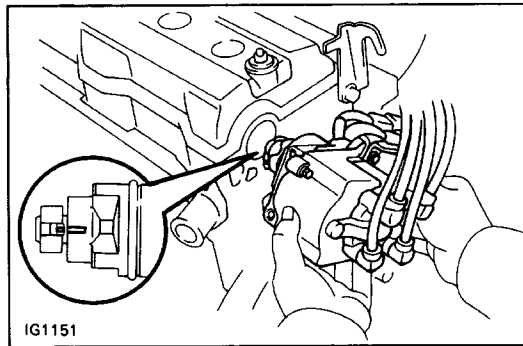
1. SET NO.1 CYLINDER TO TDC/COMPRESSION

Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown in the illustration.



2. INSTALL IIA

- (a) Install a new O-ring to the housing.
- (b) Apply a light coat of engine oil on the O-ring.



- (c) Align the cutout of the coupling with the line of the housing.
- (d) Insert the IIA, aligning the center of the flange with that of bolt hole on the cylinder head.
- (e) Lightly tighten the two hold-down bolts.

3. CONNECT HIGH-TENSION CORDS TO SPARK PLUGS

Firing order: 1 - 3 - 4 - 2

4. CONNECT IIA CONNECTORS

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

6. WARM UP ENGINE

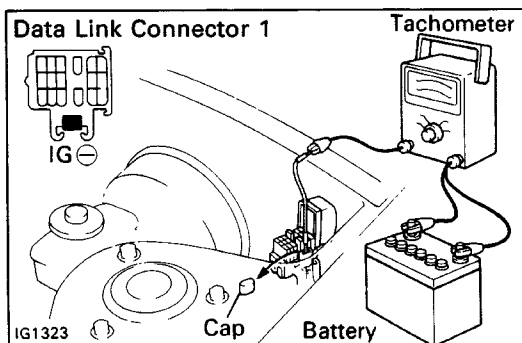
Allow the engine to warm up to normal operating temperature.

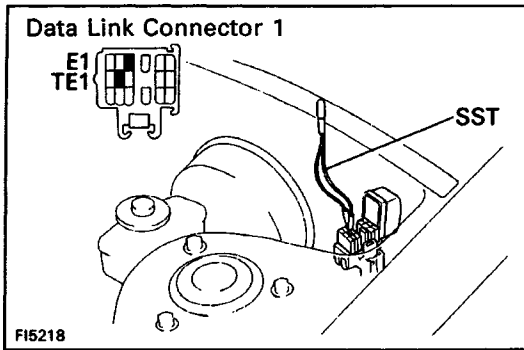
7. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG₂₂ of the data link connector 1.

NOTICE:

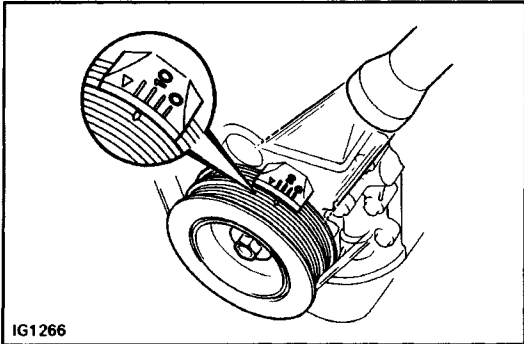
- NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.





8. ADJUST IGNITION TIMING

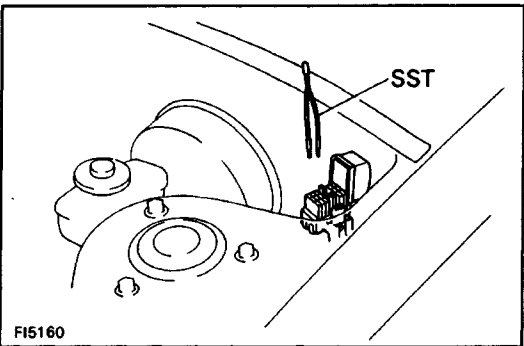
- (a) Using SST, connect terminals TE1 and E1 of the data link connector 1.
SST 09843-18020



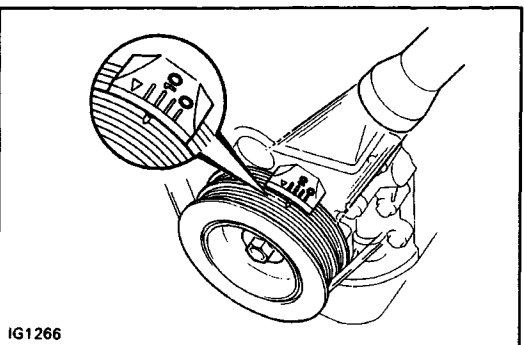
- (b) Using a timing light, check the ignition timing.
Ignition timing: 10° BTDC @ idle
(Transmission in neutral range)

- (c) Loosen the two hold-down bolts, and adjust by turning the IIA.
(d) Tighten the hold-down bolts, and recheck the ignition timing.

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



- (e) Remove the SST.
SST 09843-18020



9. FURTHER CHECK IGNITION TIMING

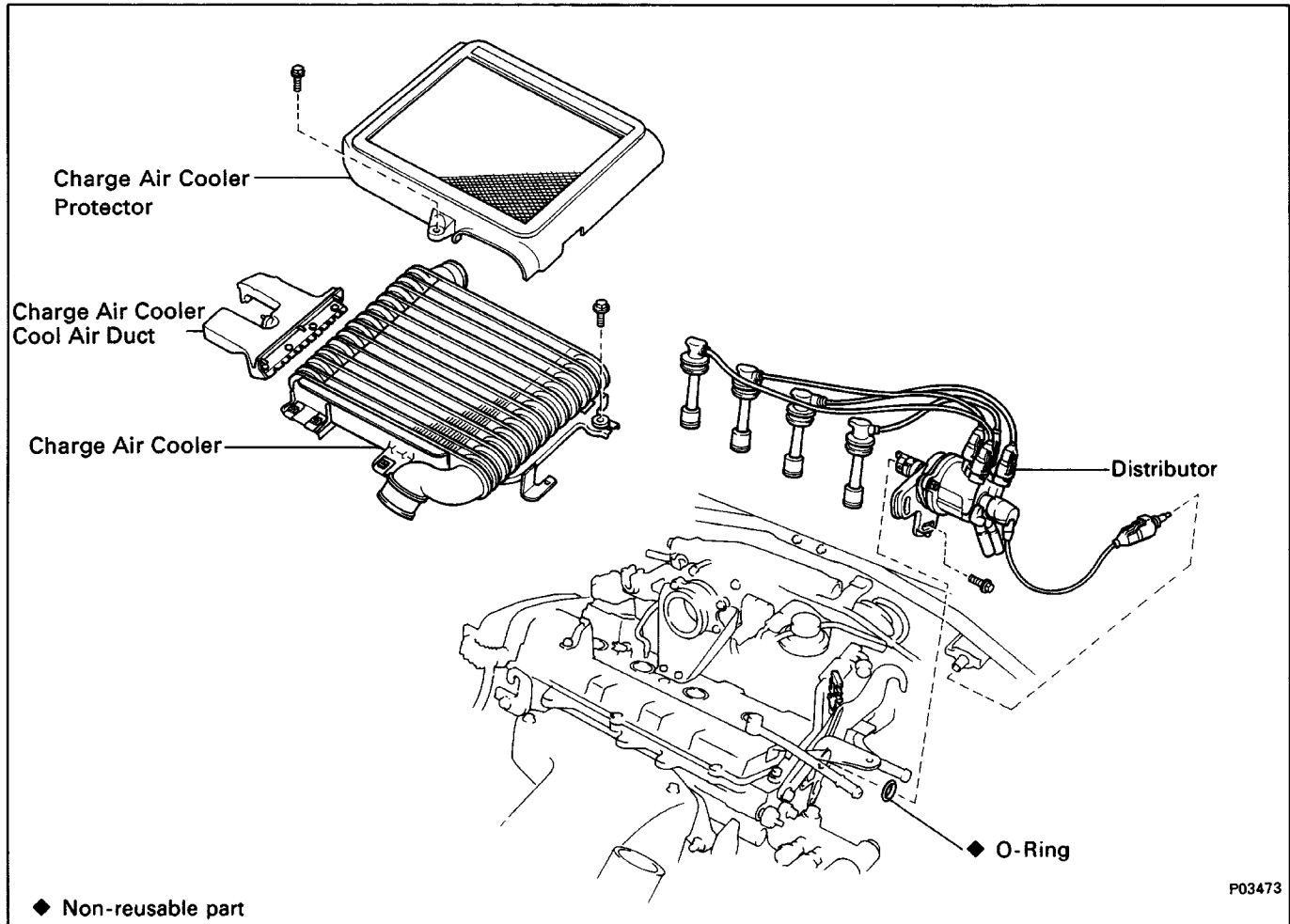
Ignition timing: 0 – 20° BTDC @ idle
(Transmission in neutral range)

HINT: The timing mark moves in a range between 0° and 20°.

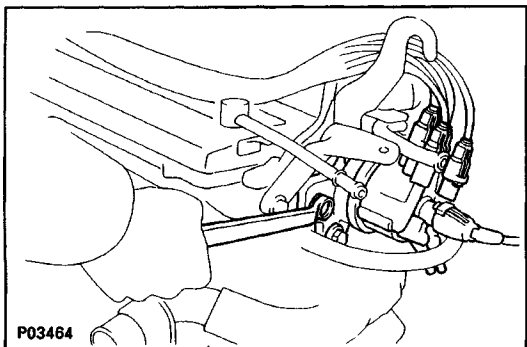
10. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

DISTRIBUTOR

REMOVAL OF DISTRIBUTOR



1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
2. **REMOVE CHARGE AIR COOLER**
 (See steps 13 to 15 on pages [TC-9](#) and 10)
3. **DISCONNECT DISTRIBUTOR CONNECTOR**
4. **DISCONNECT HIGH-TENSION CORD FROM IGNITION COIL**
5. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**
 - (a) Disconnect the four high-tension cords from the cord clamp.
 - (b) Disconnect the four high-tension cords from the spark plugs. (See page [IG-11](#))

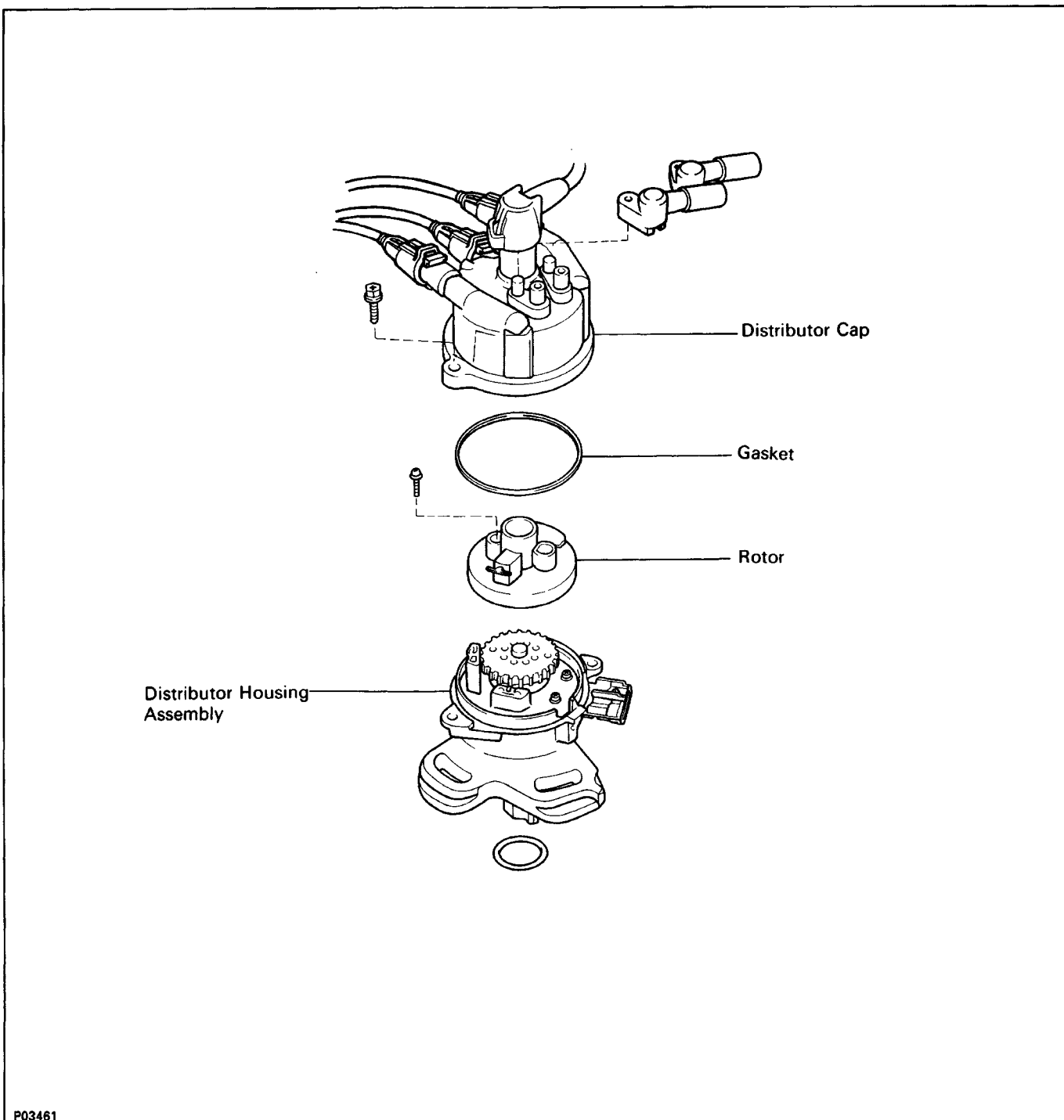


P03464

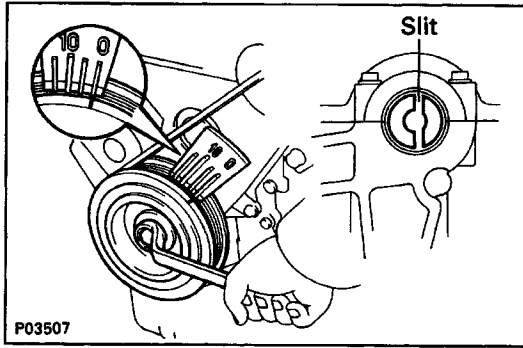
6. REMOVE DISTRIBUTOR

- (a) Remove the two hold-down bolts, and pull out the distributor.
- (b) Remove the O-ring from the distributor housing.

COMPONENTS



P03461

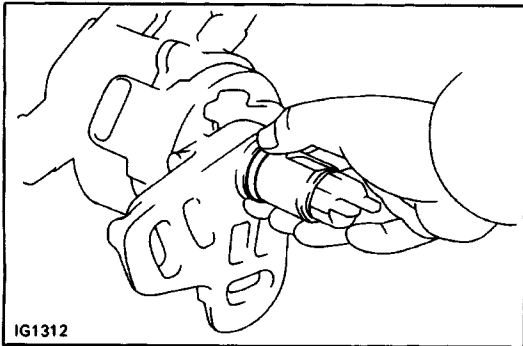


INSTALLATION OF DISTRIBUTOR

(See page [IG-26](#))

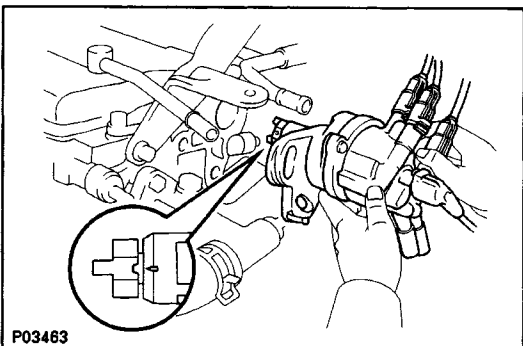
1. SET NO.1 CYLINDER TO TDC/COMPRESSION

Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown.



2. INSTALL DISTRIBUTOR

- (a) Install a new O-ring to the housing.
- (b) Apply a light coat of engine oil on the O-ring.



- (c) Align the cutout portion of the coupling with the groove of the housing.
- (d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head.
- (e) Lightly tighten the two hold-down bolts.

3. CONNECT HIGH-TENSION CORD TO IGNITION COIL

4. CONNECT HIGH-TENSION CORDS TO SPARK PLUGS

- (a) Connect the four high-tension cords to the spark plugs.

Firing order: 1 - 3 - 4 - 2

- (b) Install the four high-tension cords to the cord clamp.

5. CONNECT DISTRIBUTOR CONNECTOR

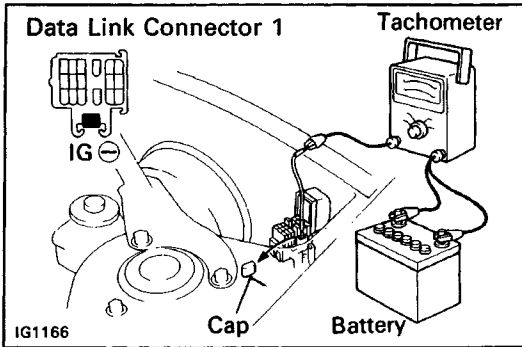
6. INSTALL CHARGE AIR COOLER

(See steps 11 to 15 on page [TC-17](#))

7. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

8. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

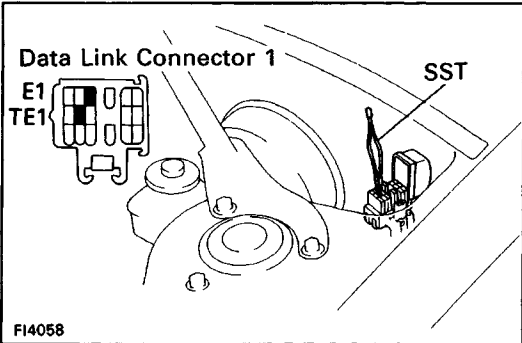


9. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IGO of the data link connector 1.

NOTICE:

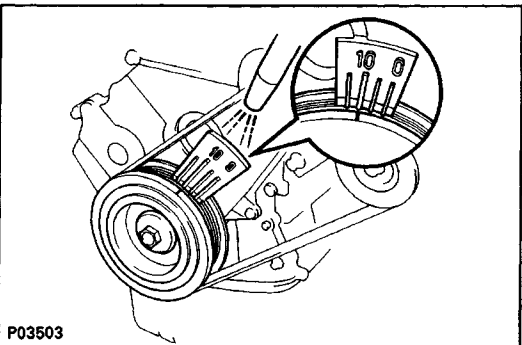
- **NEVER** allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.



10. ADJUST IGNITION, TIMING

(a) Using SST, connect terminals TE1 and E1 of the data link connector 1.

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(b) Using a timing light, check the ignition timing.

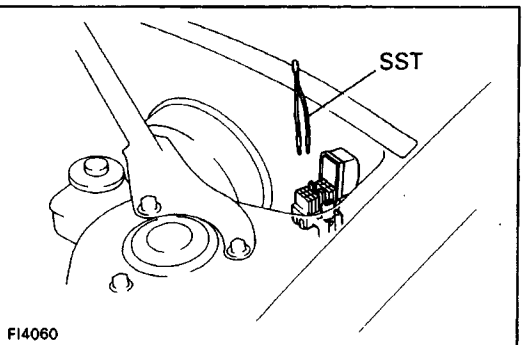
Ignition timing: 10° BTDC @ idle

(Transmission in neutral position)

(c) Loosen the two hold-down bolts, and adjust by turning the distributor.

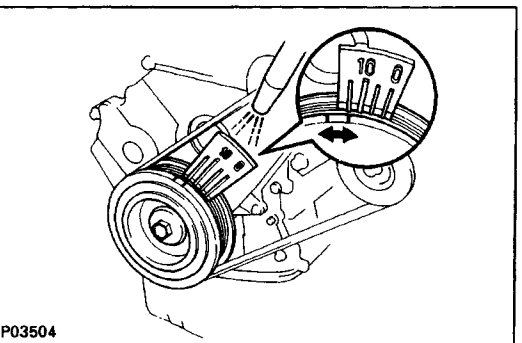
(d) Tighten the two hold-down bolts, and recheck the ignition timing.

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)



(e) Remove the SST.

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11. FURTHER CHECK IGNITION TIMING

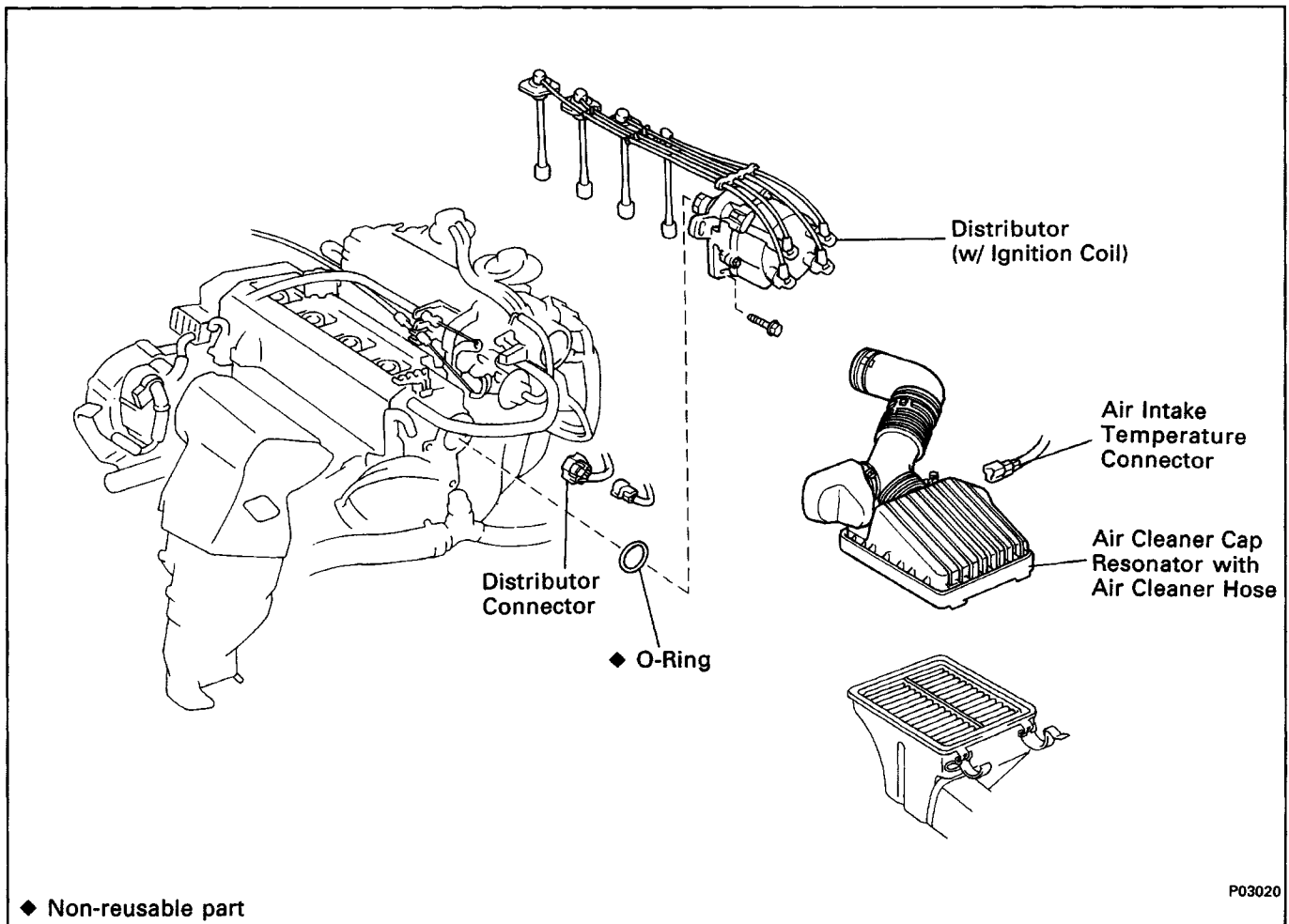
Ignition timing: 12 – 21° BTDC @ idle

(Transmission in neutral position)

HINT: The timing mark moves in a range between 12° and 21°.

12. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

DISTRIBUTOR (5S-FE) REMOVAL OF DISTRIBUTOR

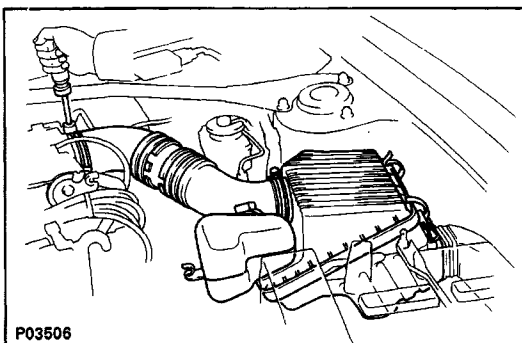


1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

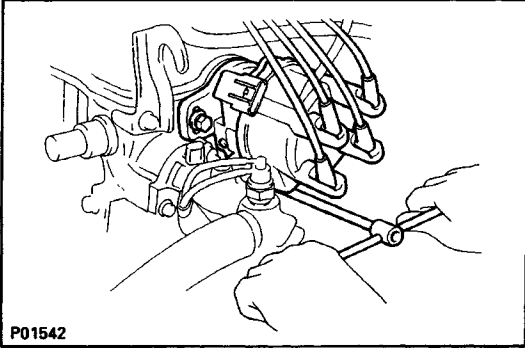
2. REMOVE AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

- Disconnect the air intake temperature sensor connector.
- Disconnect the cruise control actuator cable from the clamp on the resonator.
- Loosen the air cleaner hose clamp bolt.
- Disconnect the four air cleaner cap clips.
- Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.



3. DISCONNECT DISTRIBUTOR CONNECTORS**4. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**

- (a) Disconnect the four high-tension cords from the spark plugs.
- (b) Disconnect the high-tension cords from the clamp on the cylinder head cover.

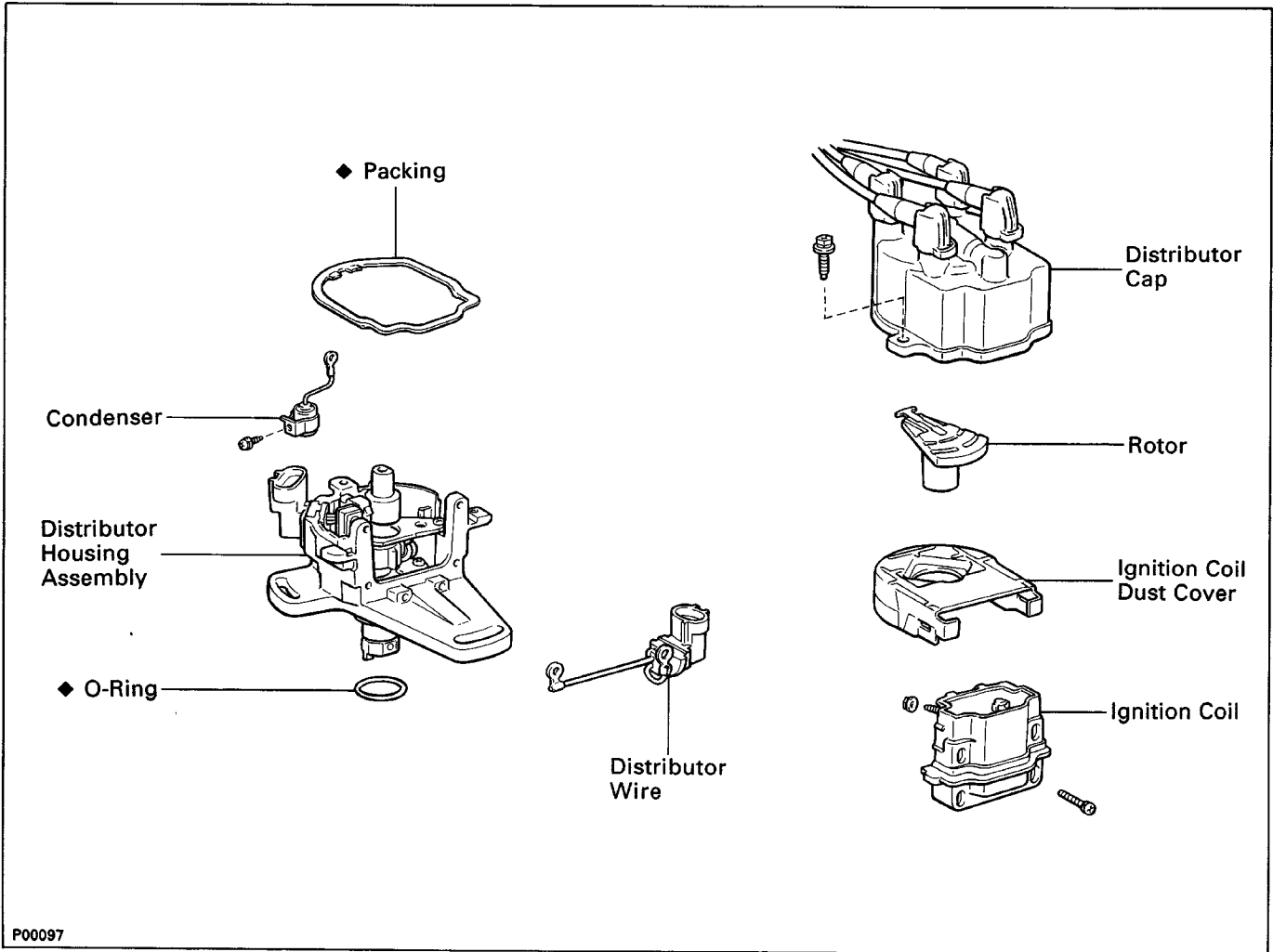


P01542

5. REMOVE DISTRIBUTOR

- (a) Remove the two hold-down bolts, and pull out the distributor.
- (b) Remove the O-ring from the distributor housing.

COMPONENTS

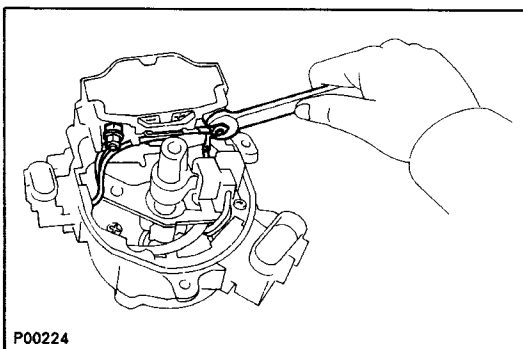


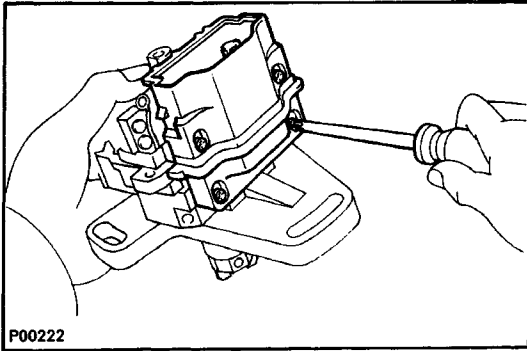
DISASSEMBLY OF DISTRIBUTOR

1. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS
2. REMOVE ROTOR
3. REMOVE IGNITION COIL DUST COVER

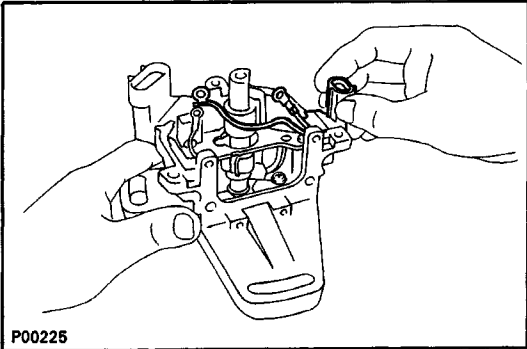
4. REMOVE IGNITION COIL

- (a) Remove the two nuts, and disconnect the three wires from the ignition coil terminals.



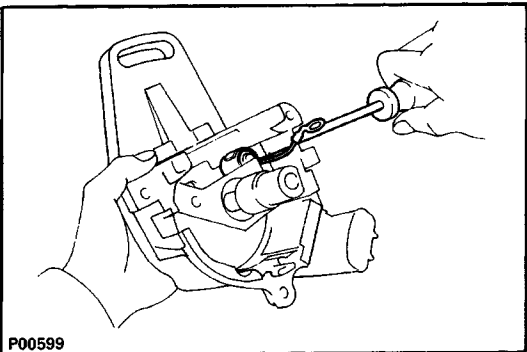


(b) Remove the four screws and ignition coil.



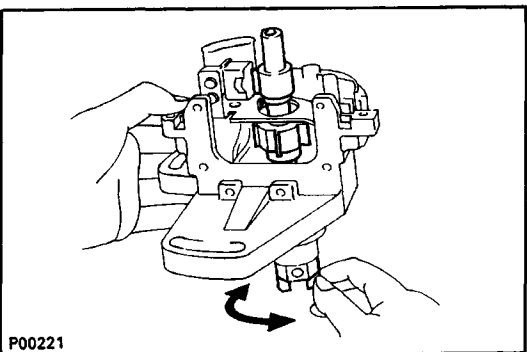
5. REMOVE DISTRIBUTOR WIRE

Remove the distributor wire from the distributor housing.



6. REMOVE CONDENSER

Remove the screw and condenser.



DISTRIBUTOR INSPECTION

INSPECT SHAFT

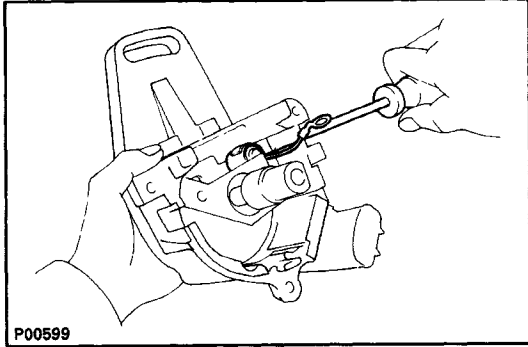
Turn the shaft and check that it is not rough or worn. If it feels rough or worn, replace the distributor housing assembly.

DISTRIBUTOR ASSEMBLY

(See page IG-32)

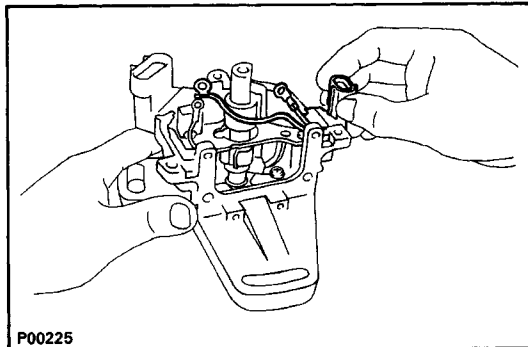
1. INSTALL CONDENSER

Install the condenser with the screw.



2. INSTALL DISTRIBUTOR WIRE

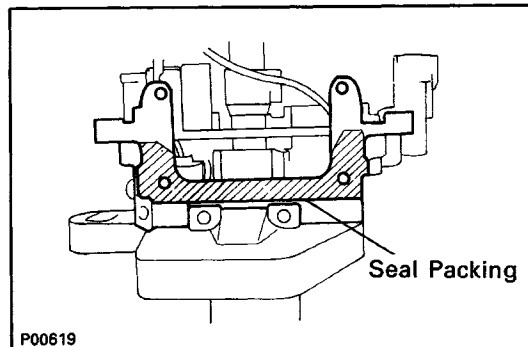
Install the grommet of the wire to the distributor housing.



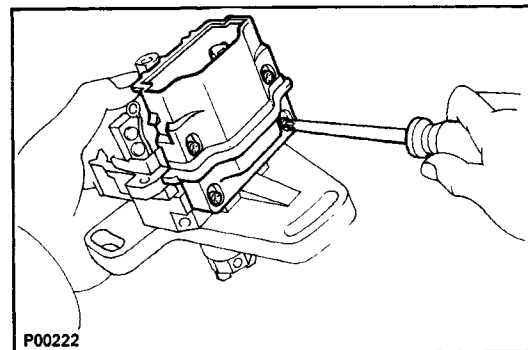
3. INSTALL IGNITION COIL

- (a) Remove any oil packing (FIPG) material.
- (b) Apply seal packing to the ignition coil installing surface of the housing as shown in the illustration.

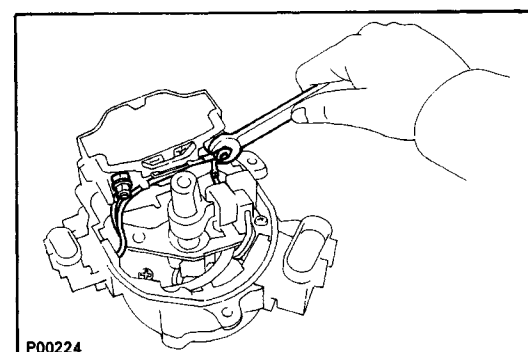
Seal packing: Part No. 08826-00080 or equivalent

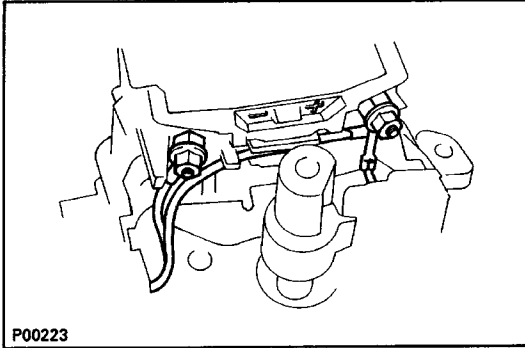


- (c) Install the ignition coil with the four screws.



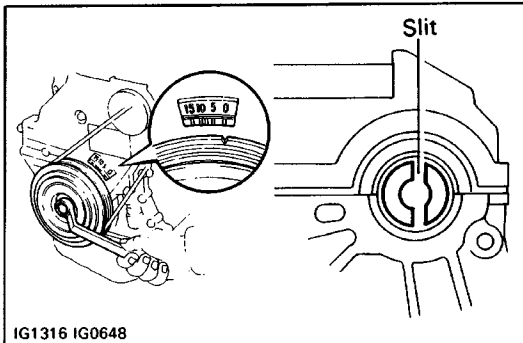
- (d) Connect the three wires to the ignition coil terminals with the two nuts.



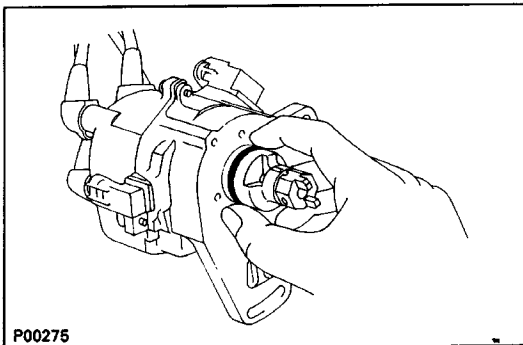
**NOTICE:**

- When connecting the wires to the ignition coil, insert both properly into their grooves found on the side of the ignition coil.
- Be sure the wires do not contact with signal rotor or distributor housing.

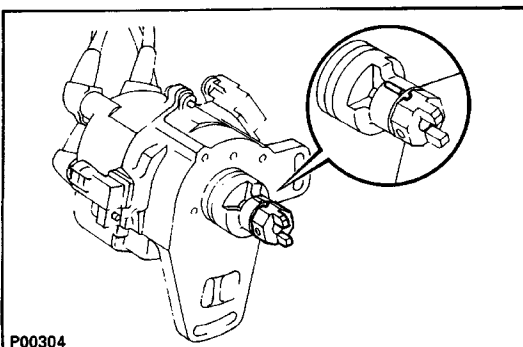
4. INSTALL IGNITION COIL DUST COVER
5. INSTALL ROTOR
6. INSTALL DISTRIBUTOR CAP AND HIGH-TENSION CORDS

**INSTALLATION OF DISTRIBUTOR**(See page [IG-30](#))**1. SET NO.1 CYLINDER TO TDC/COMPRESSION**

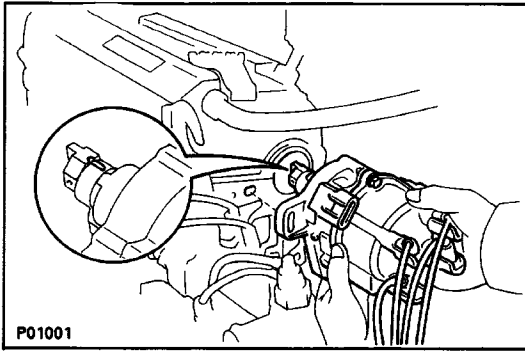
Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown.

**2. INSTALL DISTRIBUTOR**

- (a) Install a new O-ring to the housing.
- (b) Apply a light coat of engine oil on the O-ring.



- (c) Align the cutout portion of the coupling with the groove of the housing.

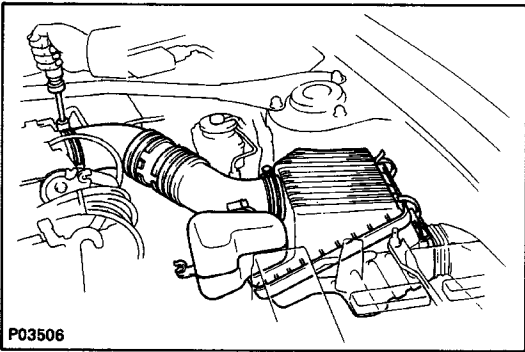


- (d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head.
- (e) Lightly tighten the hold-down bolts.
- (f) Install the high-tension cord clamp to the rear engine hanger.

3. CONNECT HIGH-TENSION CORDS TO SPARK PLUGS

Firing order: 1 - 3 - 4 - 2

4. CONNECT DISTRIBUTOR CONNECTORS



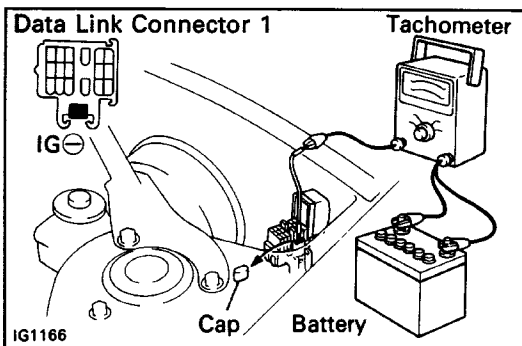
5. INSTALL AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

- (a) Connect the air cleaner hose to the throttle body.
- (b) Install the air cleaner cap together with the resonator and air cleaner hose.
- (c) Connect the air intake temperature sensor connector.
- (d) Connect the cruise control actuator cable to the clamp on the resonator.

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

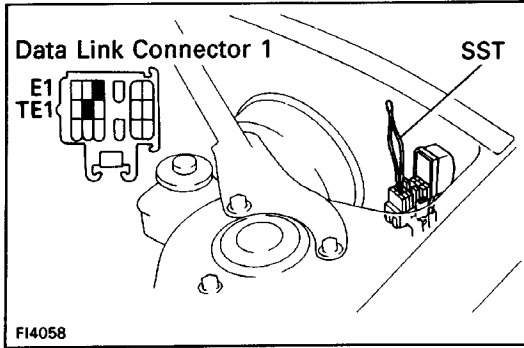


8. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (-) of the data link connector 1.

NOTICE:

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

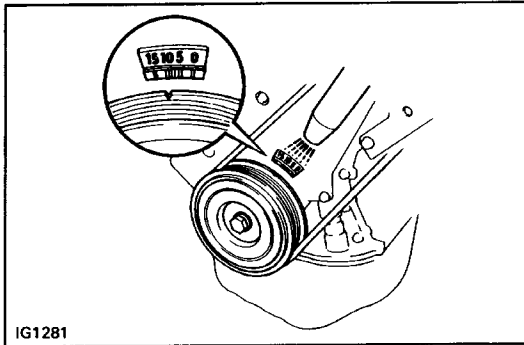


9. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the data link connector 1.

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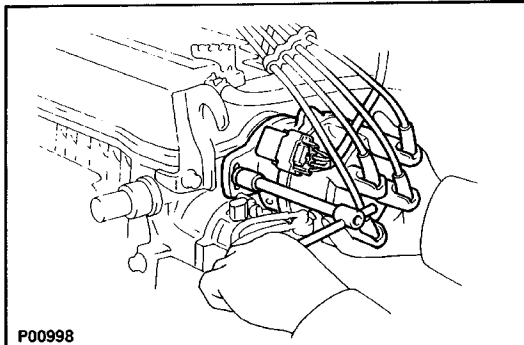
HINT: After engine rpm are kept at 1,000 – 1,300 rpm for 5 seconds, check that they return to idle speed.



(b) Using a timing light, check the ignition timing.

Ignition timing: 10° BTDC @ idle

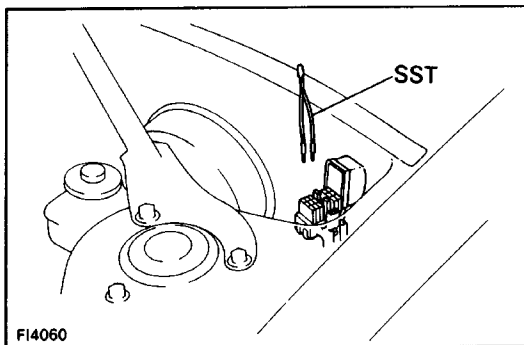
(Transmission in neutral position)



(c) Loosen the hold-down bolts, and adjust by turning the distributor.

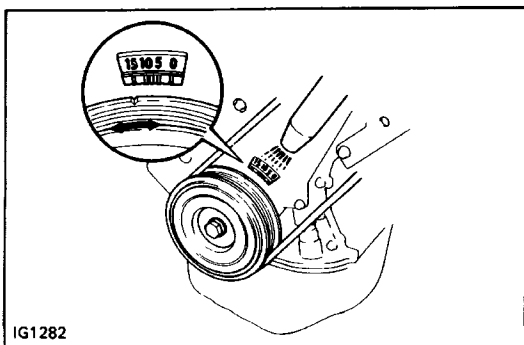
(d) Tighten the hold-down bolts, and recheck the ignition timing.

Torque: 19 N-m (195 kgf-cm, 14 ft-lbf)



(e) Remove the SST.

SST 09843-18020



10. FURTHER CHECK IGNITION TIMING

Ignition timing: 13 – 22° BTDC @ idle

(Transmission in neutral position)

HINT: The timing mark moves in a position between 13° and 22°.

11. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

STARTING SYSTEM

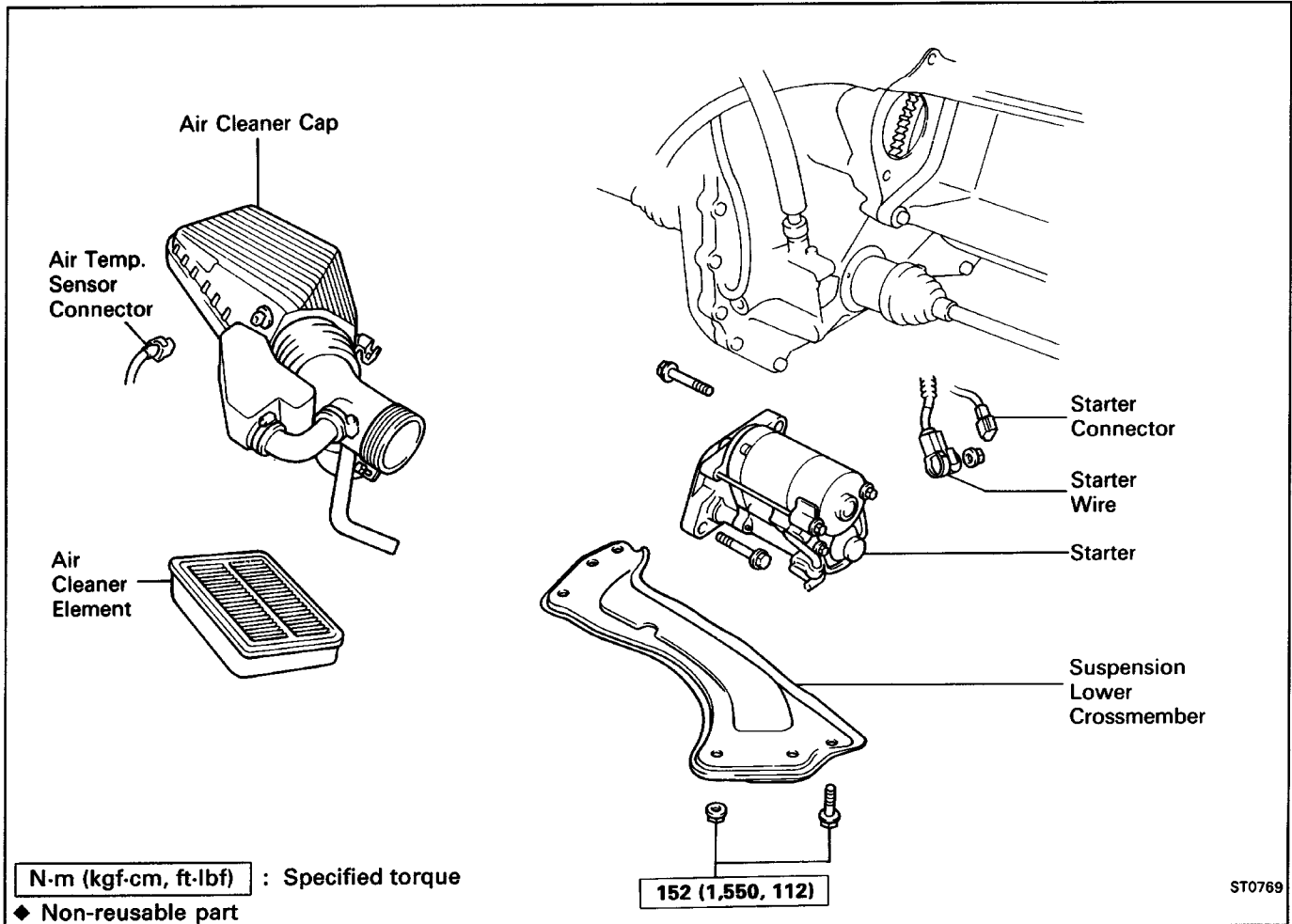
	Page
TROUBLESHOOTING	ST-2
STARTER	ST-3
STARTER RELAY (M/T only)	ST-24
CLUTCH STARTER SWITCH (M/T only)	ST-24

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low Battery cables loose, corroded or worn Clutch start switch faulty (M/T) Neutral start switch faulty (A/T) Starter relay faulty (M/T) Fusible link blown Starter faulty Ignition switch faulty	Check battery specific gravity Check or replace battery Repair or replace cables Adjust or replace clutch start switch Adjust or repair switch Replace starter relay Replace fusible link Repair starter Replace ignition switch	CH-2 CL-5 ST-8
Engine cranks slowly	Battery charge low Battery cables loose, corroded or worn Starter faulty	Check battery specific gravity Charge or replace battery Repair or replace cables Repair starter	CH-2 ST-8
Starter keeps running	Starter faulty Ignition switch faulty Short in wiring	Repair starter Replace ignition switch Repair wiring	ST-8
Starter spins – engine will not crank	Pinion gear teeth broken or starter faulty Flywheel teeth broken	Repair starter Replace flywheel	ST-8

STARTER

REMOVAL OF STARTER (4A-FE)



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE SUSPENSION LOWER CROSSMEMBER

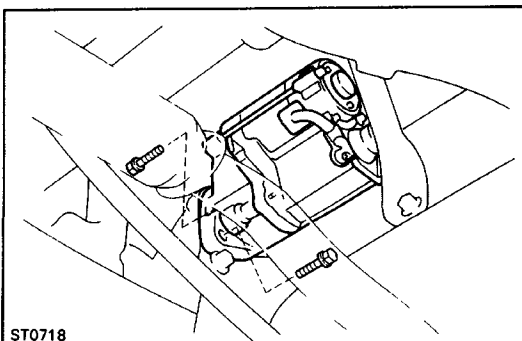
(See step 24 on page [EM-189](#))

3. REMOVE AIR CLEANER CAP

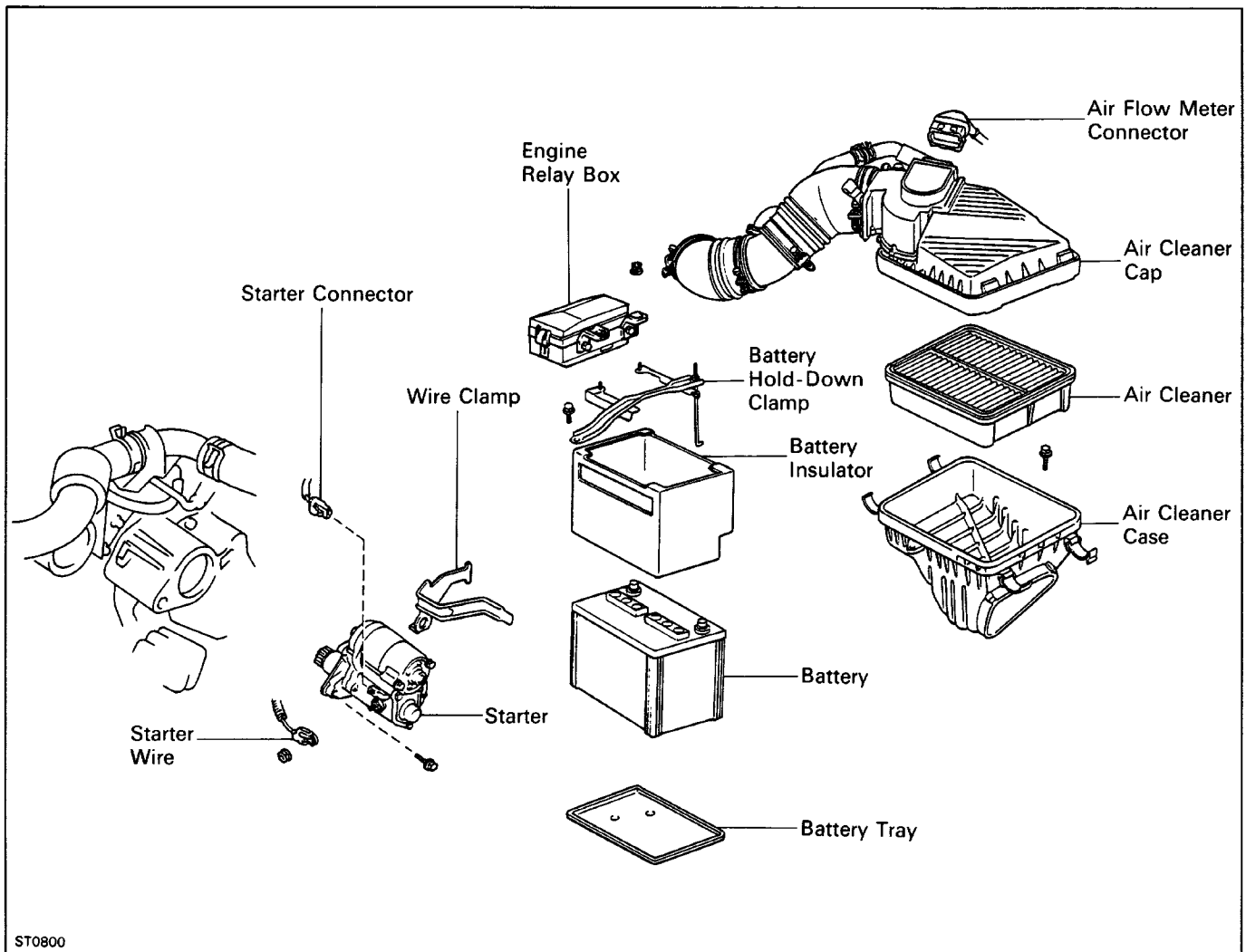
(See step 6 on page [EM-185](#))

4. REMOVE STARTER

- (a) Remove the two bolts holding the starter to the transaxle.
- (b) Disconnect the starter connector.
- (e) Remove the nut, and disconnect the starter wire. Remove the starter.



REMOVAL OF STARTER (3S-GTE)



ST0800

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE AIR CLEANER

(See step 7 on page [EM-224](#))

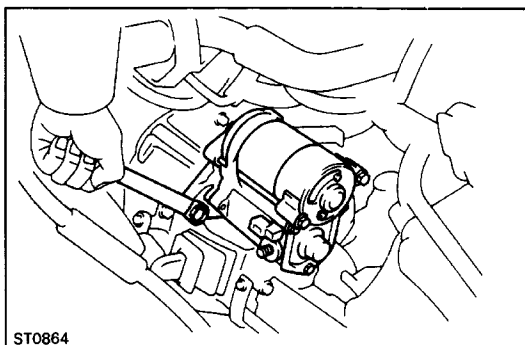
3. REMOVE ENGINE RELAY BOX

(See step 9 on page [EM-224](#))

4. REMOVE BATTERY

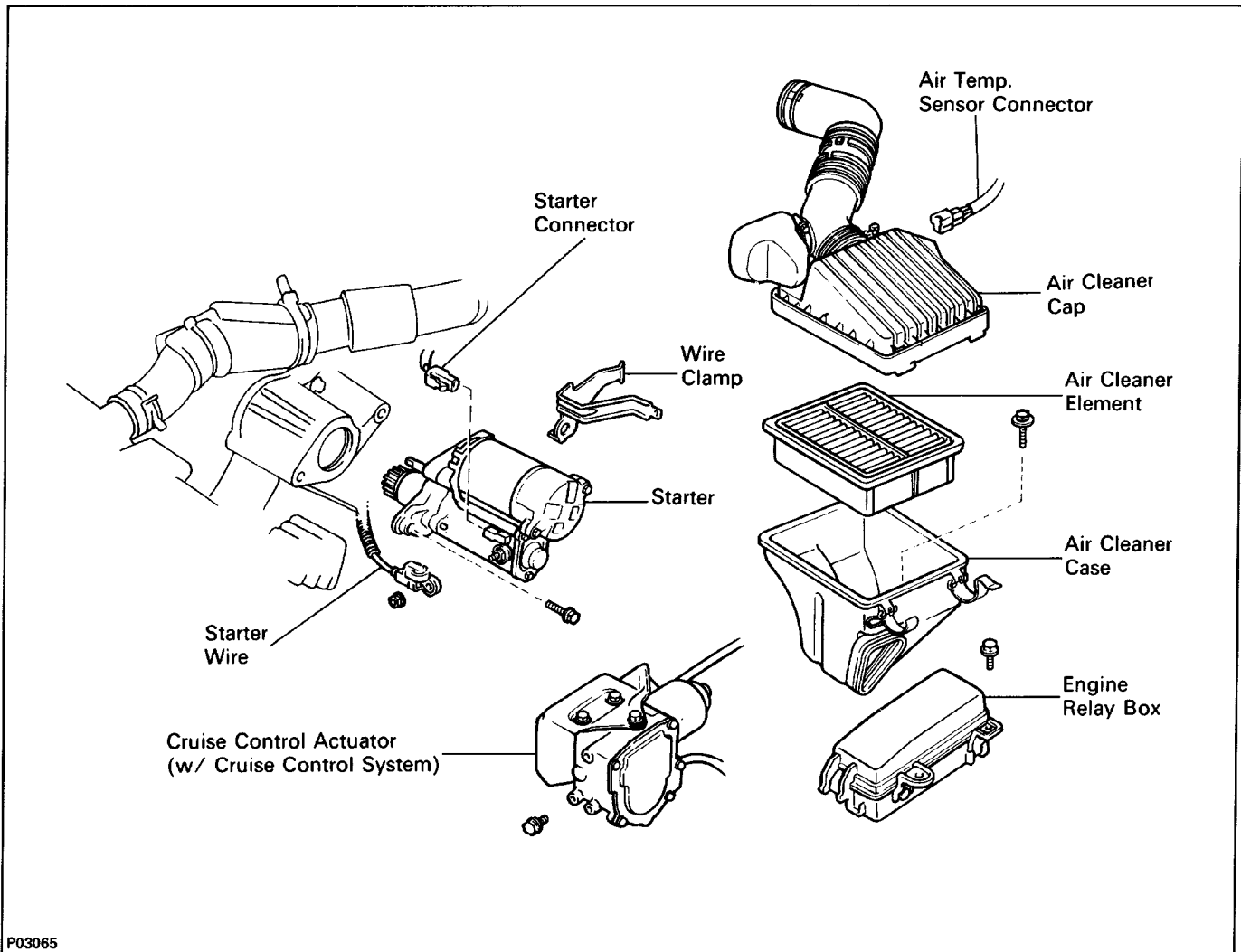
5. REMOVE STARTER

- Disconnect the starter connector.
- Remove the nut, and disconnect the starter wire.
- Remove the two bolts, wire clamp and starter.



ST0864

REMOVAL OF STARTER (5S-FE)



P03065

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE AIR CLEANER

(See step 6 on page [EM-269](#))

3. REMOVE ENGINE RELAY BOX

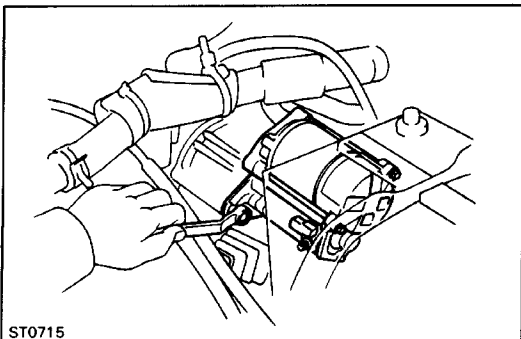
(See step 8 on page [EM-269](#))

4. (w/ CRUISE CONTROL SYSTEM (w/ ABS)) REMOVE CRUISE CONTROL ACTUATOR

(See step 10 on page [EM-270](#))

5. REMOVE STARTER

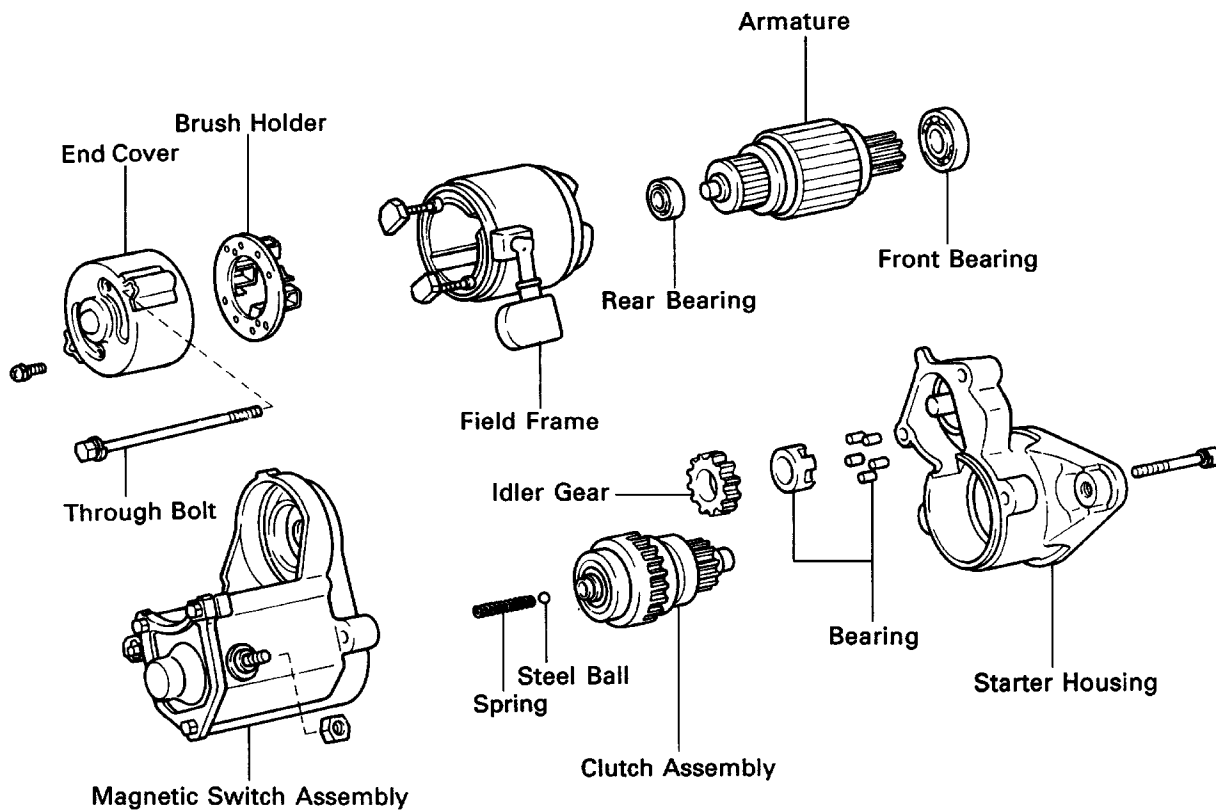
- Disconnect the starter connector.
- Remove the nut, and disconnect the starter wire.
- Remove the two bolts, wire clamp and starter.



ST0715

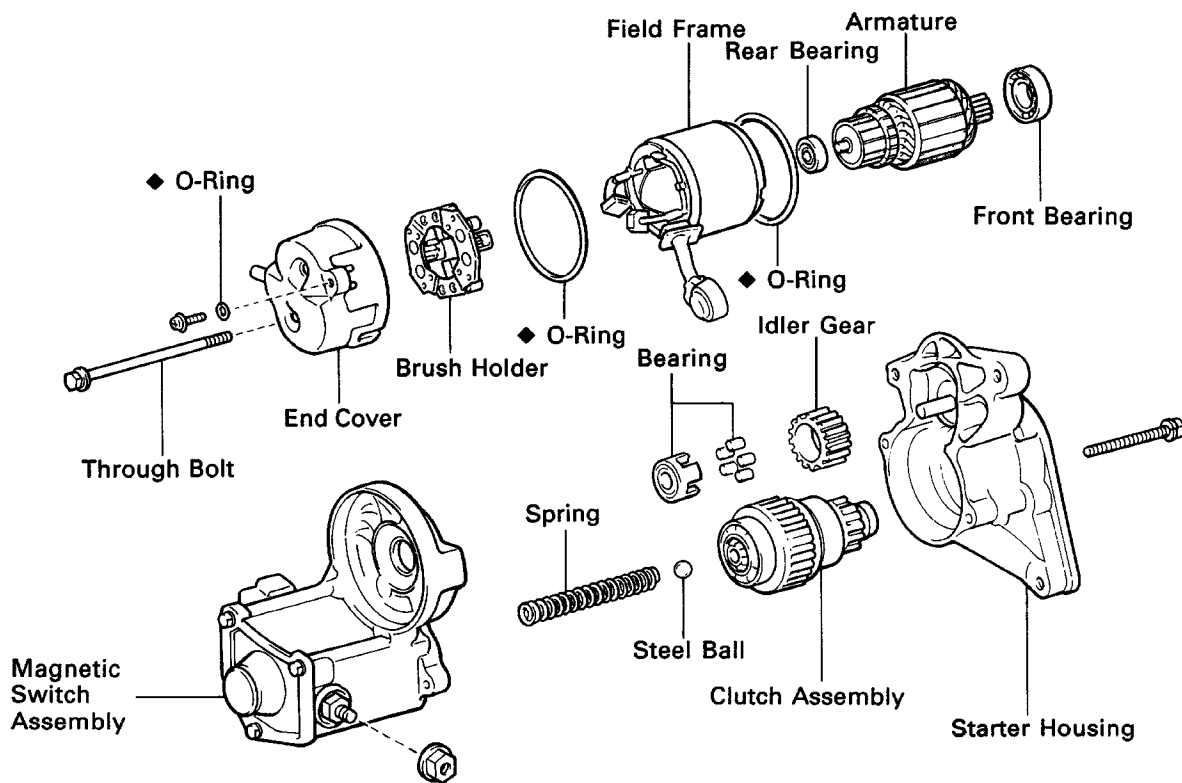
COMPONENTS

4A-FE (1.0 kW Type)



P02900

4A-FE (1.4 kW Type)

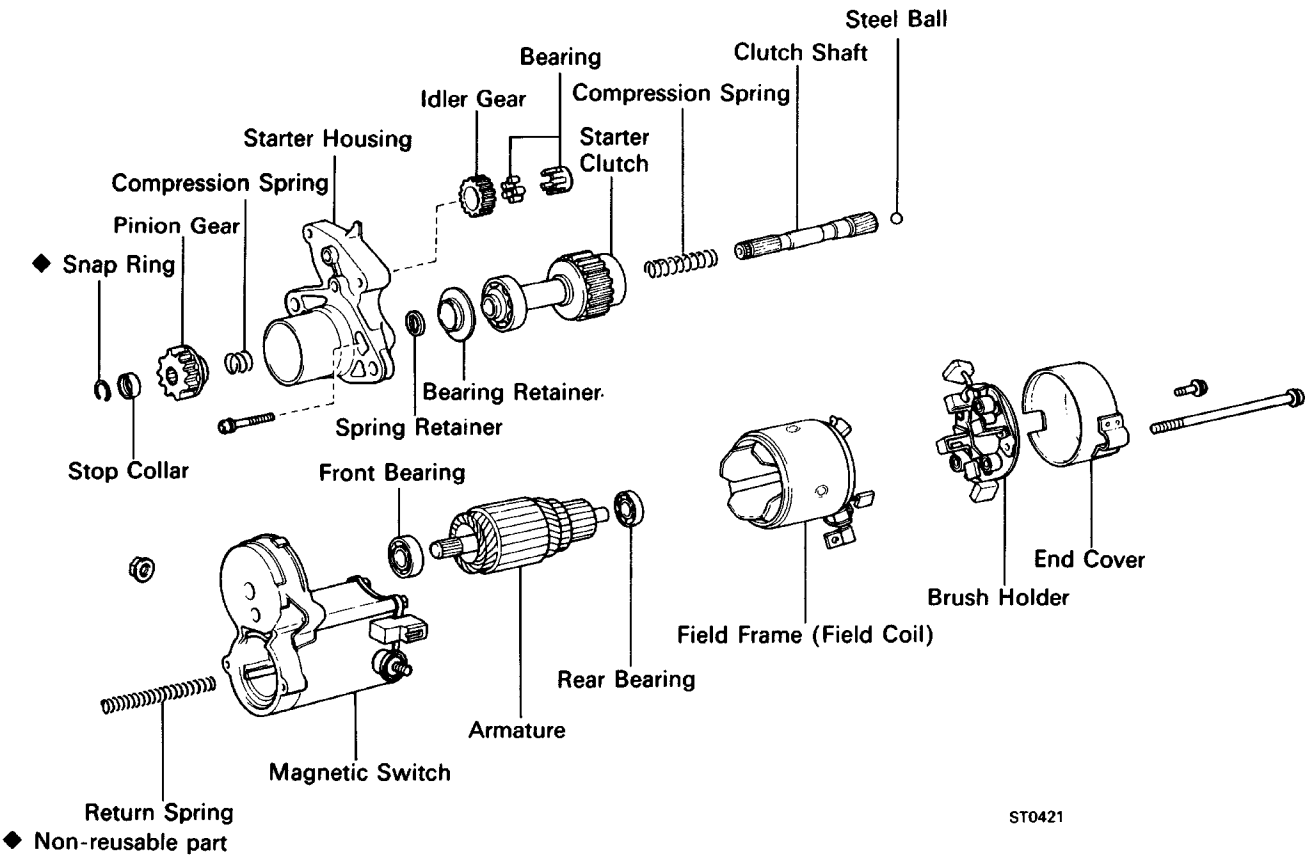


◆ Non-reusable part

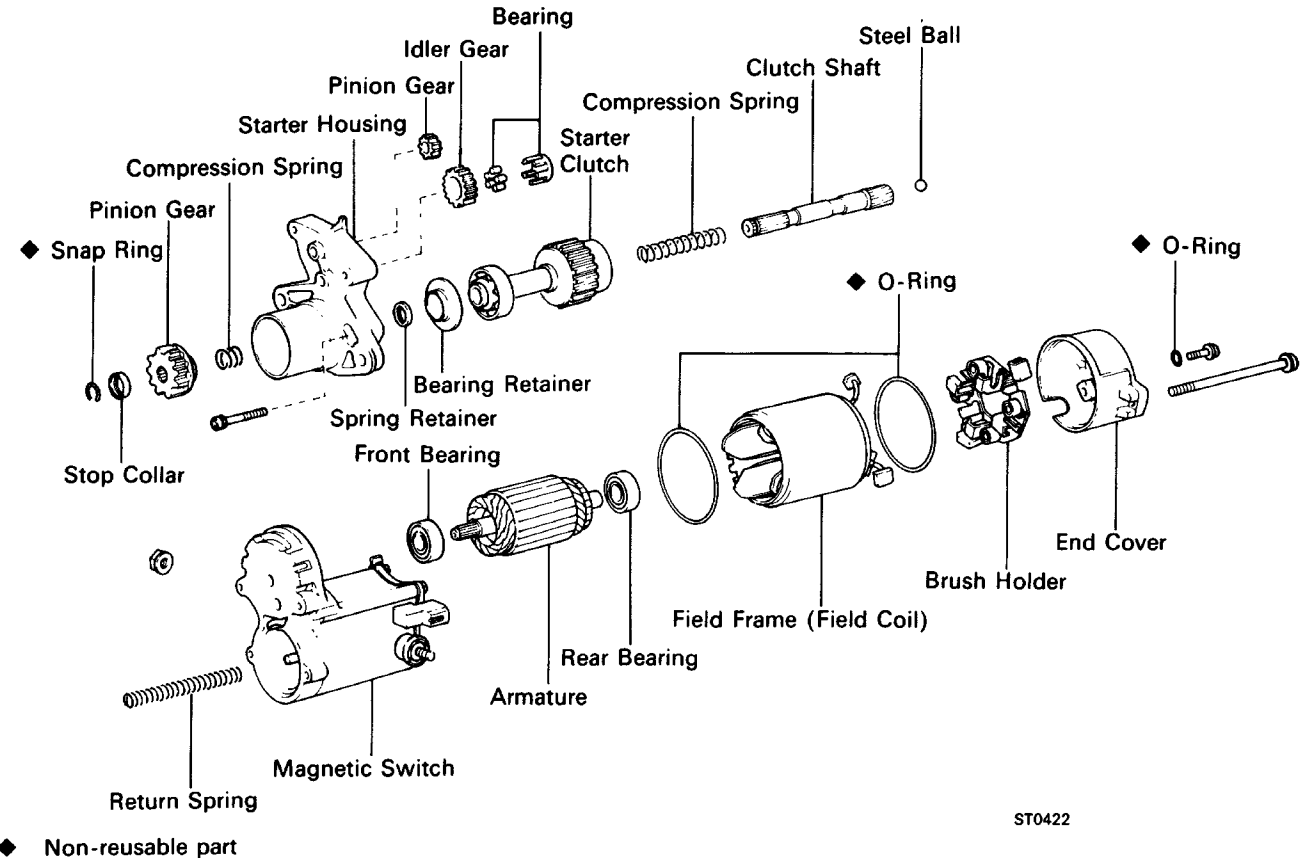
P02899

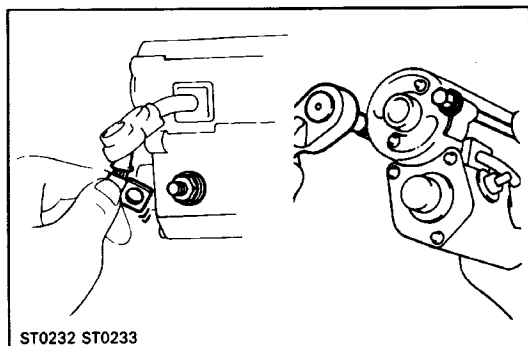
COMPONENTS (Cont'd)

3S-GTE (1.0 kW Type)



3S-GTE (1.6 kW Type) and 5S-FE





DISASSEMBLY OF STARTER

4A-FE (See page ST-6)

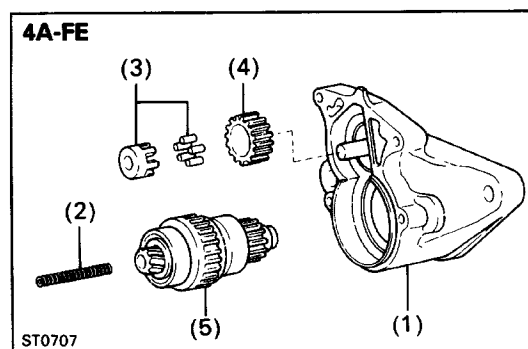
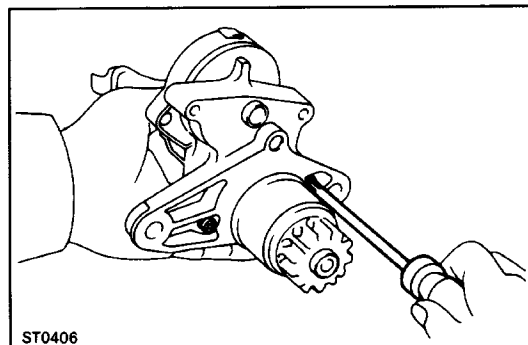
3S-GTE and 5S-FE (See page ST-7)

1. REMOVE FIELD FRAME AND ARMATURE

- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.
- (b) Remove the two through bolts, and pull out the field frame together with the armature.
- (c) (1.4 kW and 1.6 kW Types)
Remove the O-ring from the field frame.

2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEARS

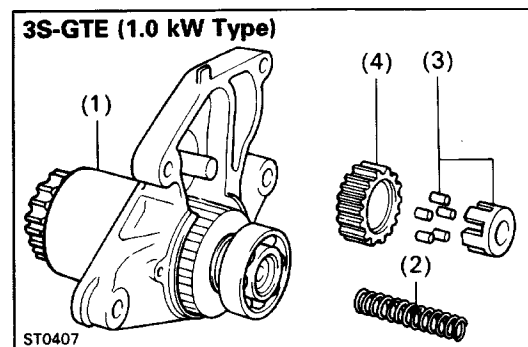
- (a) Remove the two screws.



- (b) Remove the following parts from the magnetic switch:

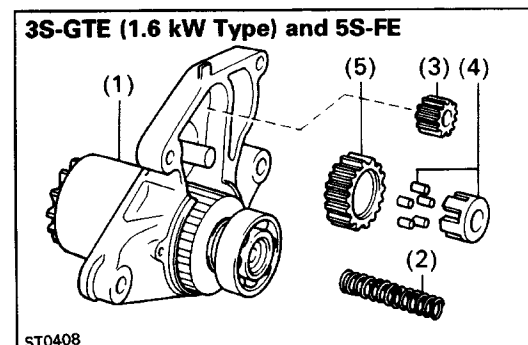
(4A-FE)

- (1) Starter housing
- (2) Return spring
- (3) Bearing
- (4) Idler gear
- (5) Clutch assembly



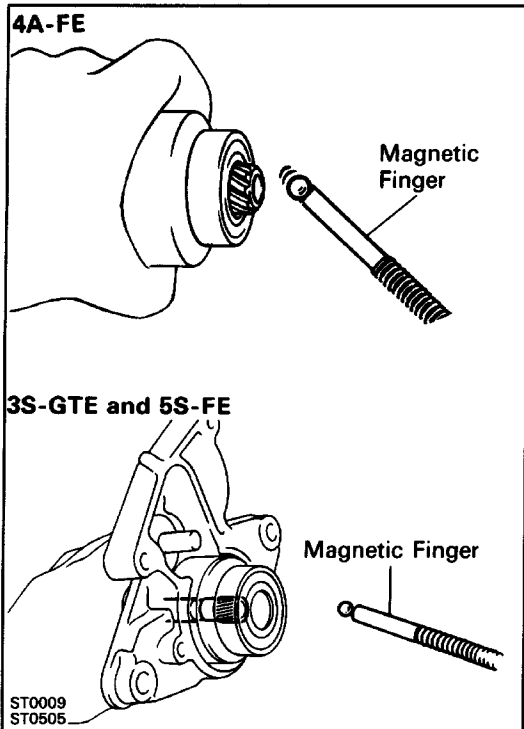
(3S-GTE (1.0 kW Type))

- (1) Starter housing and clutch assembly
- (2) Return spring
- (3) Bearing
- (4) Idler gear



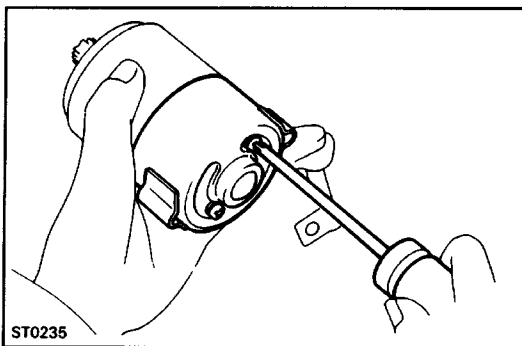
(3S-GTE (1.6 kW Type) and 5S-FE)

- (1) Starter housing and clutch assembly
- (2) Return spring
- (3) Pinion gear
- (4) Bearing
- (5) Idler gear



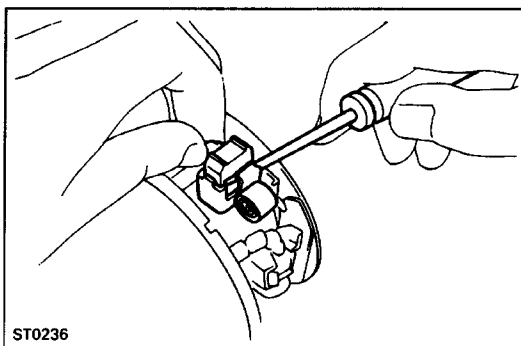
3. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.



4. REMOVE BRUSH HOLDER

- (a) Remove the two screws, two O-rings (1.4 kW and 1.6 kW types) and end cover from the field frame.
- (b) (1.4 kW and 1.6 kW Types)
Remove the O-ring from the field frame.



- (c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes, and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME

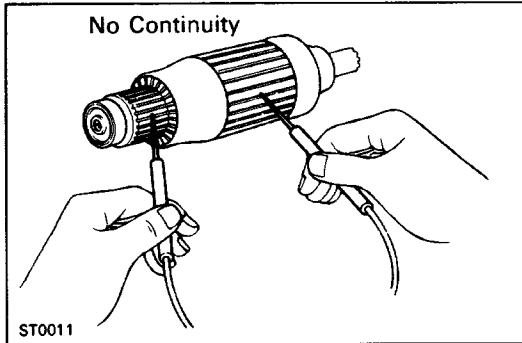
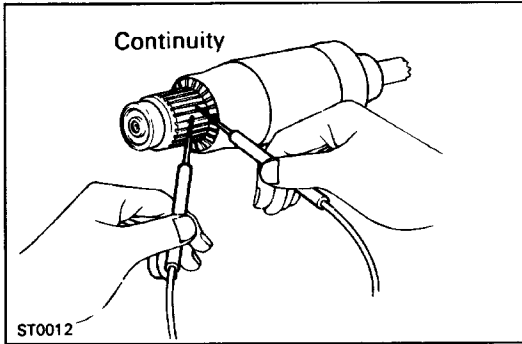
INSPECTION AND REPAIR OF STARTER

Armature Coil

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity, replace the armature.



2. INSPECT COMMUTATOR FOR GROUND

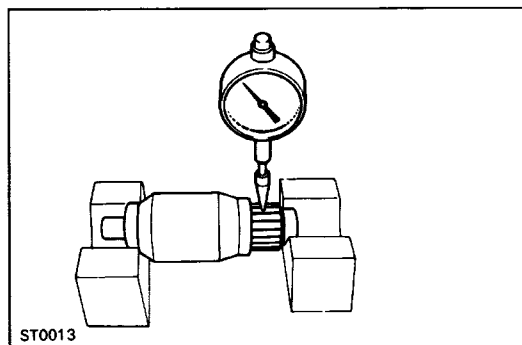
Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACE

If the surface is dirty or burnt, correct with sandpaper (No.400) or on a lathe.



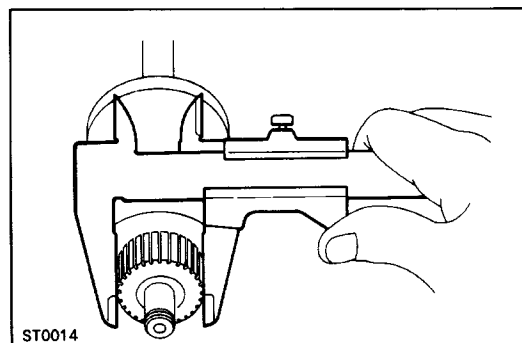
2. INSPECT COMMUTATOR FOR RUNOUT

(a) Place the commutator on V-blocks.

(b) Using a dial indicator, measure the circle runout.

Maximum circle runout: 0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.



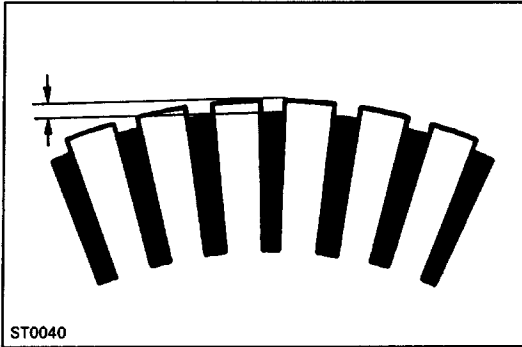
3. INSPECT COMMUTATOR DIAMETER

Using a vernier caliper, measure the diameter.

Standard diameter: 30.0 mm (1.181 in.)

Minimum diameter: 29.0 mm (1.142 in.)

If the diameter is less than minimum, replace the armature.



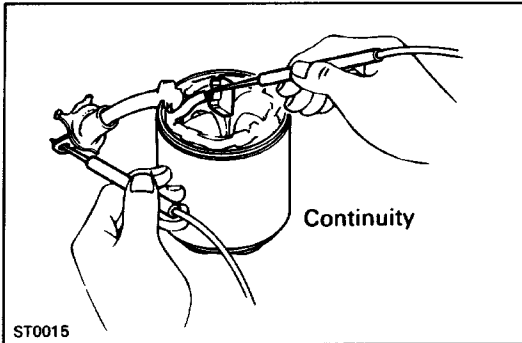
4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth: 0.6 mm (0.024 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

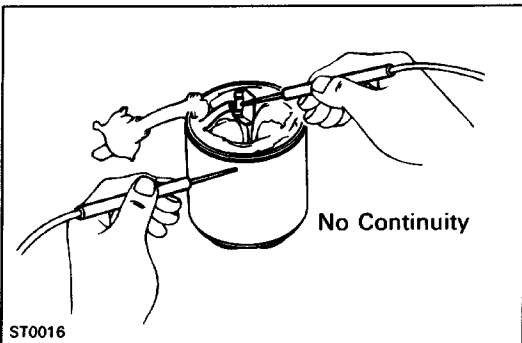


Field Coil (Field Frame)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

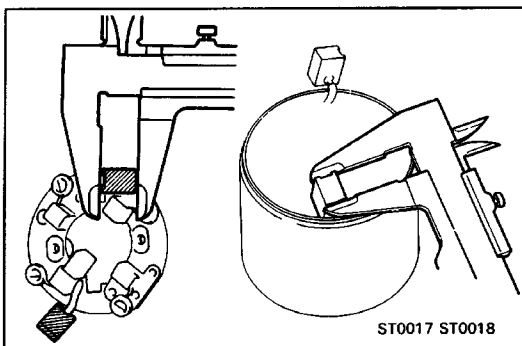
If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, replace the field frame.



Brushes

INSPECT BRUSH LENGTH

Using a vernier caliper, measure the brush length.

Standard length:

1.0 kW type 13.5 mm (0.531 in.)

1.4 kW and 1.6 kW types 15.5 mm (0.610 in.)

Minimum length:

1.0 kW type 8.5 mm (0.335 in.)

1.4 kW and 1.6 kW types 10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.

Brush Springs

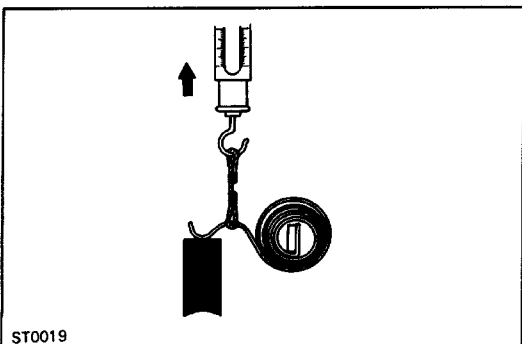
INSPECT BRUSH SPRING LOAD

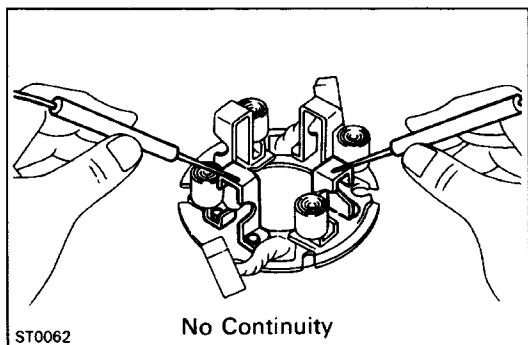
Take the pull scale reading the instant the brush spring separates from the brush.

Standard installed load:

18–24 N (1.79–2.41 kgf, 3.9–5.3 lbf)

If the installed load is not as specified, replace the brush springs.





Brush Holder

INSPECT BRUSH HOLDER INSULATION

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders. If there is continuity, repair or replace the brush holder.

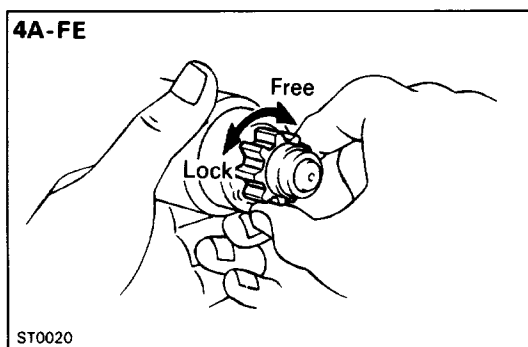
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and the clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

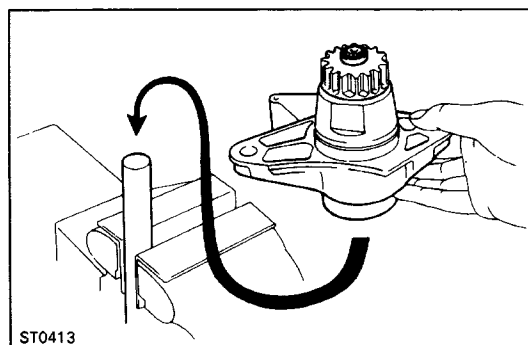
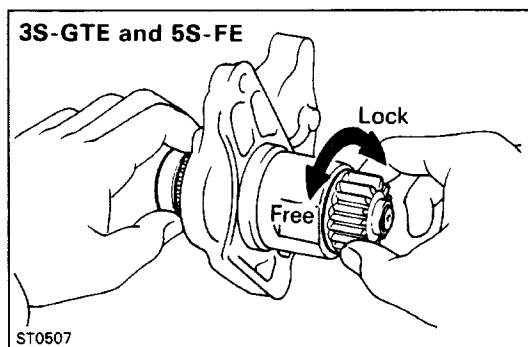
If damaged, also check the flywheel ring gear for wear or damage.



2. INSPECT CLUTCH PINION GEAR

Rotate the pinion gear clockwise (4A-FE) or counterclockwise (3S-GTE and 5S-FE) and check that it turns freely. Try to rotate the pinion gear counterclockwise (4A-FE) or clockwise (3S-GTE and 5S-FE) and check that it locks.

If necessary, replace the clutch assembly.

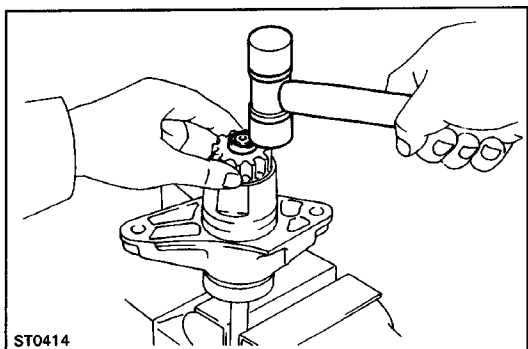


3. (3S-GTE AND 5S-FE)

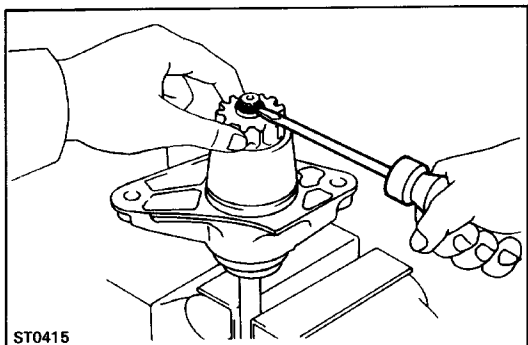
IF NECESSARY, REPLACE CLUTCH ASSEMBLY

A. Disassemble starter housing and clutch assembly

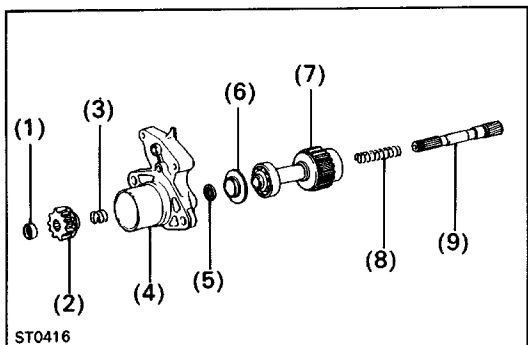
- (a) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.



- (b) Push down the pinion gear.
- (c) Using a plastic-faced hammer, tap down the stop collar.



- (d) Using a screwdriver, pry out the snap ring.



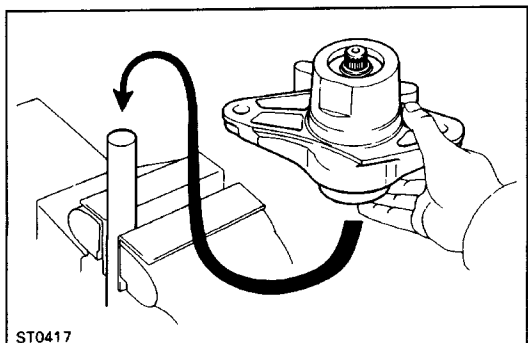
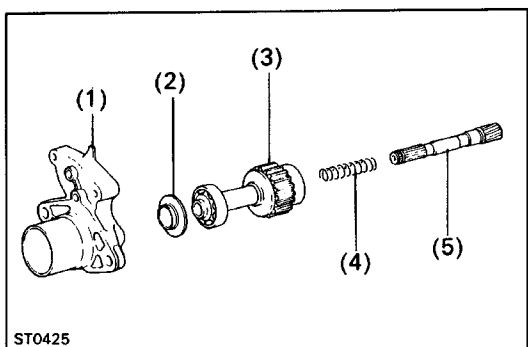
- (e) Disassemble the following parts:

- (1) Stop collar
- (2) Pinion gear
- (3) Compression spring
- (4) Starter housing
- (5) Spring retainer
- (6) Bearing retainer
- (7) Starter clutch
- (8) Compression spring
- (9) Clutch shaft

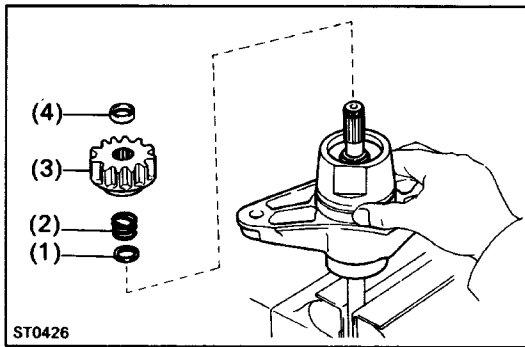
B. Assemble starter housing and clutch assembly

- (a) Assemble the following parts:

- (1) Starter housing
- (2) Bearing retainer
- (3) Starter clutch
- (4) Compression spring
- (5) Clutch shaft

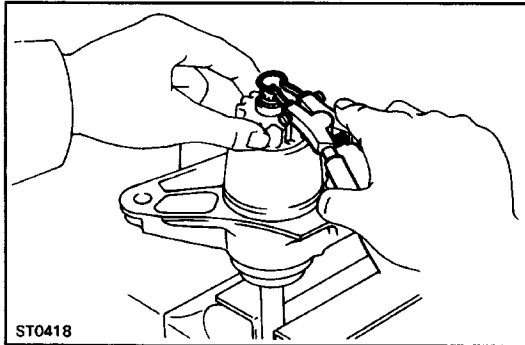


- (b) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.



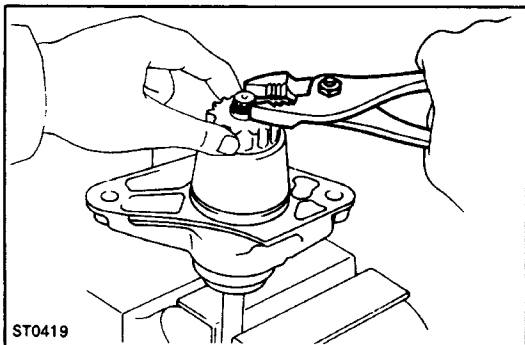
(c) Push down the starter housing, and install the following parts:

- (1) Spring retainer
- (2) Compression spring
- (3) Pinion gear
- (4) Stop collar



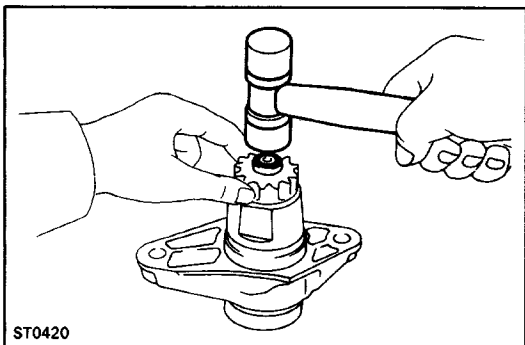
(d) Push down the pinion gear.

(e) Using snap ring pliers, install a new snap ring.



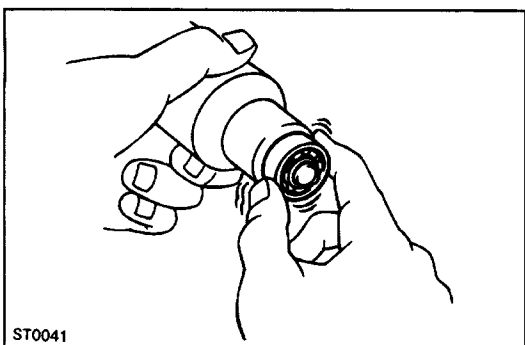
(f) Using pliers, compress the snap ring.

(g) Check that the snap ring fits correctly.



(h) Remove the starter housing and clutch assembly from the brass bar.

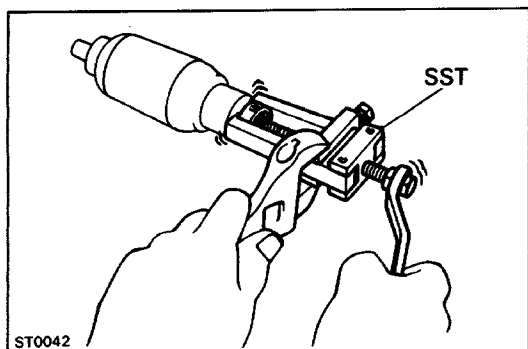
(i) Using a plastic-faced hammer, tap the clutch shaft and install the stop collar onto the snap ring.



Bearings

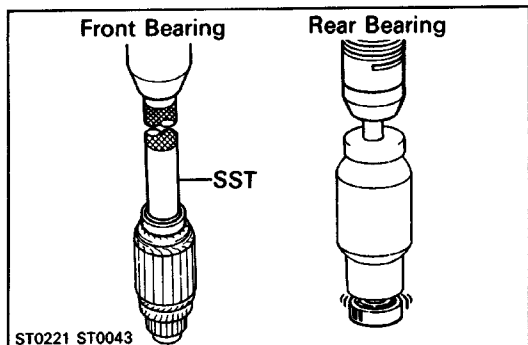
1. INSPECT BEARINGS

Turn each bearing by hand while applying inward force. If resistance is felt or the bearing sticks, replace the bearing.

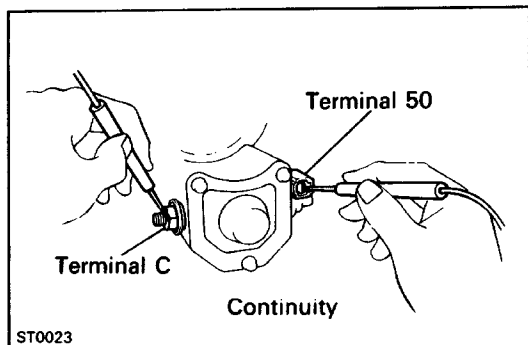


2. IF NECESSARY, REPLACE BEARINGS

- (a) Using SST, remove the bearing.
SST 09286-46011



- (b) Using SST and a press, press in a new front bearing.
SST 09285-76010 for 1.0 kW type
09820-00030 for 1.4 kW type
09201-41020 for 1.6 kW type
- (c) Using a press, press in a new rear bearing.

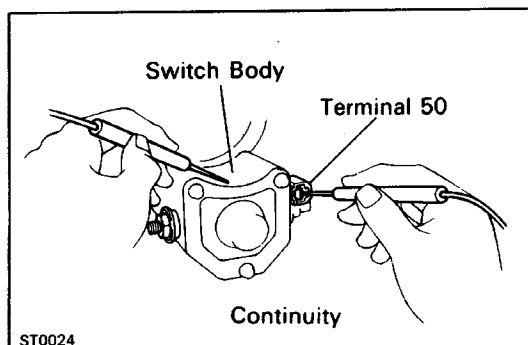


Magnetic Switch (4A-FE)

1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.

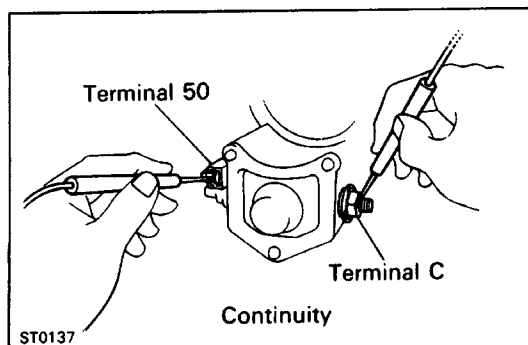
If there is no continuity, replace the magnetic switch.



2. PERFORM HOLD-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.

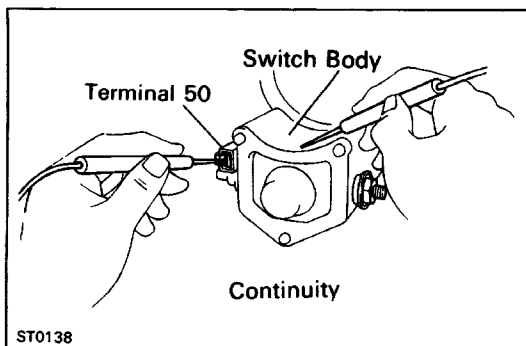


Magnetic Switch (3S-GTE and 5S-FE)

1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.

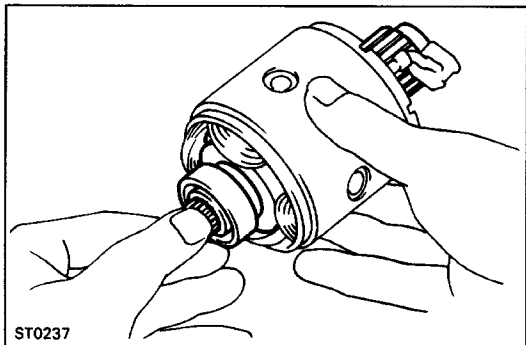
If there is no continuity, replace the magnetic switch.



2. PERFORM HOLD-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.



ASSEMBLY OF STARTER

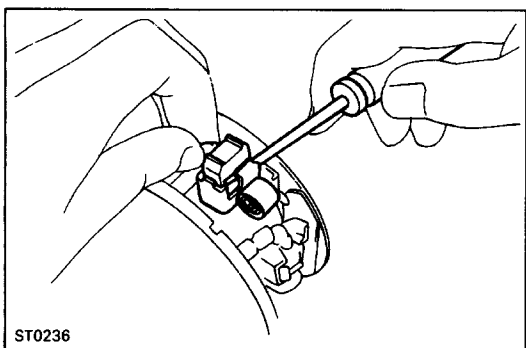
4A-FE (See page [ST-6](#))

3S-GTE and 5S-FE (See page [ST-7](#))

HINT: Use high-temperature grease to lubricate the bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

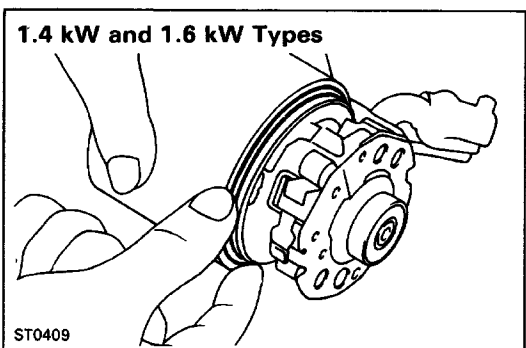
Apply grease to the armature bearings, and insert the armature into the field frame.



2. INSTALL BRUSH HOLDER

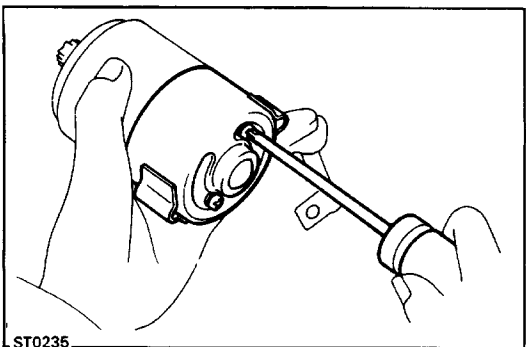
- (a) Place the brush holder in position on the armature.
- (b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the four brushes.

NOTICE: Check that the positive (+) lead wires are not grounded.

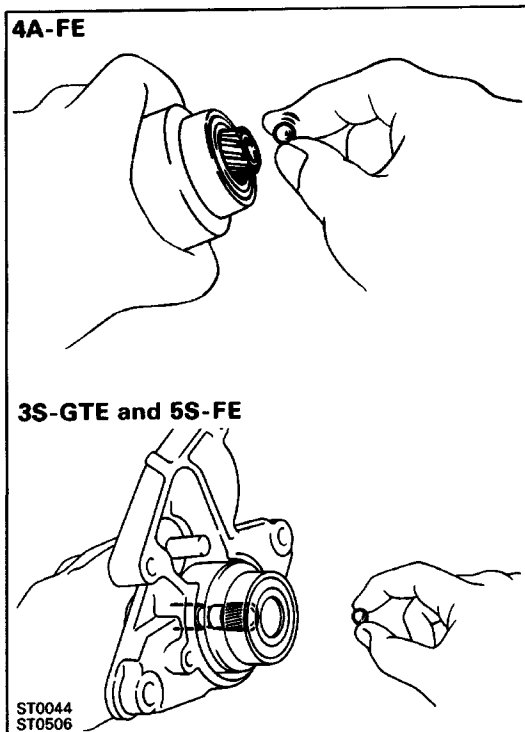


- (c) (1.4 kW and 1.6 kW Types)

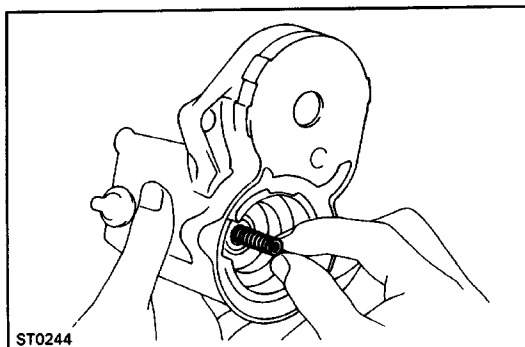
Place a new O-ring in position on the field frame.



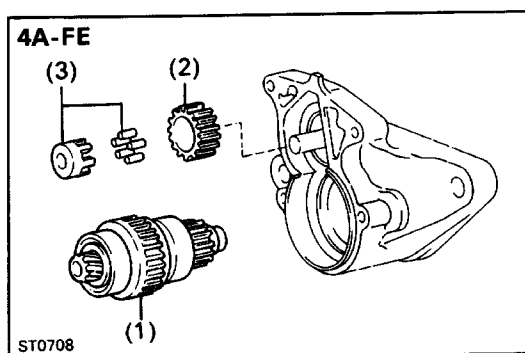
- (d) Install the end cover with two new O-rings (1.4 kW and 1.6 kW types) and the two screws.

**3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE**

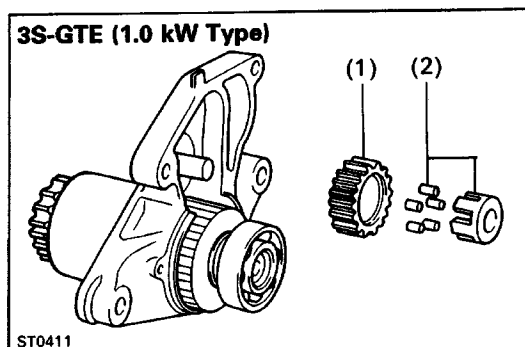
- (a) Apply grease to the steel ball.
- (b) insert the steel ball into the clutch shaft hole.

**4. INSTALL CLUTCH ASSEMBLY (4A-FE) AND GEARS**

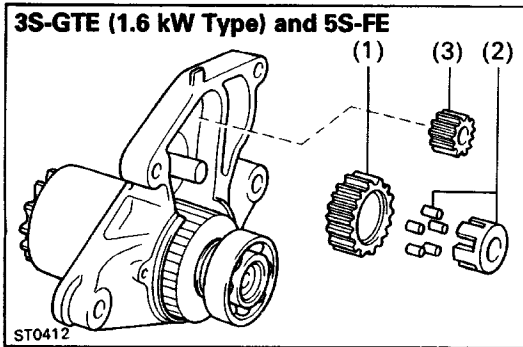
- (a) Apply grease to the return- spring.
- (b) Insert the return spring into the magnetic switch hole.



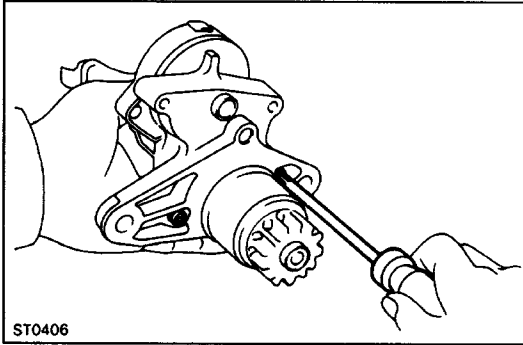
- (c) Place the following parts in position on the starter housing:
(4A-FE)
- (1) Clutch assembly
- (2) Idler gear
- (3) Bearing



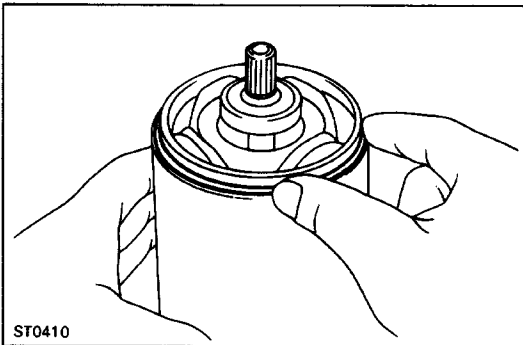
- (3S-GTE (1.0 kW Type))
- (1) Idler gear
- (2) Bearing



- (3S-GTE (1.6 kW Type) and 5S-FE)
- (1) Idler gear
 - (2) Bearing
 - (3) Pinion gear



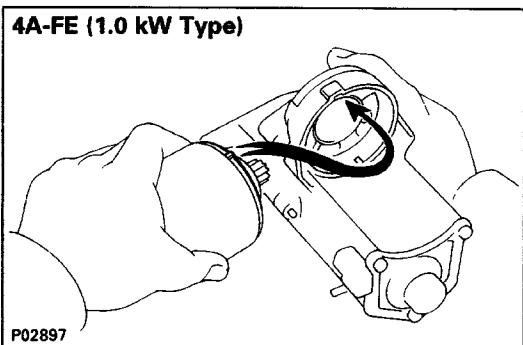
- (d) Assemble the starter housing and magnetic switch with the two screws.



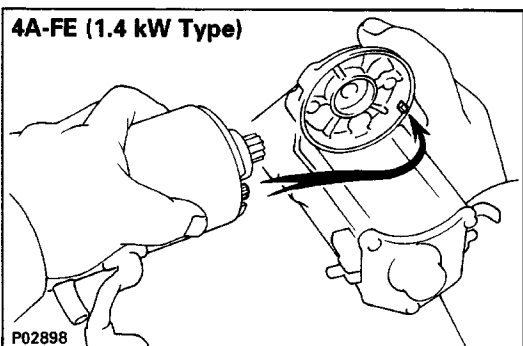
5. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY

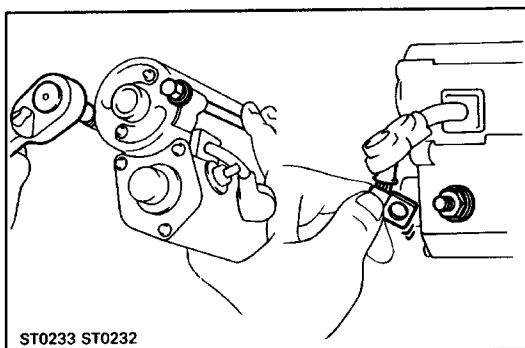
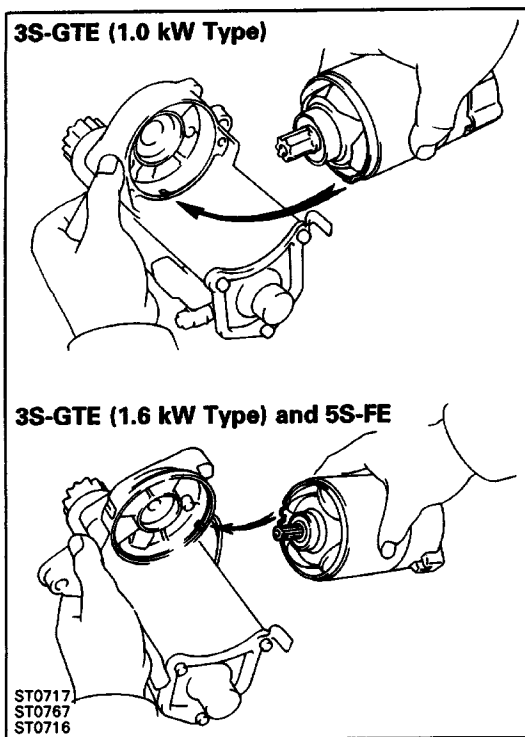
- (a) (1.4 kW and 1.6 kW Types)

Place a new O-ring in position on the field frame.

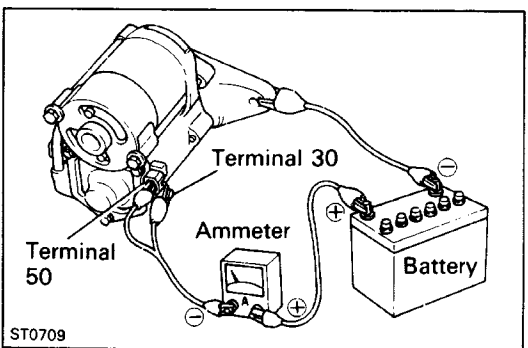
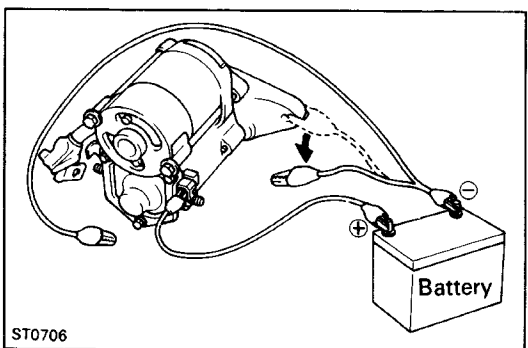
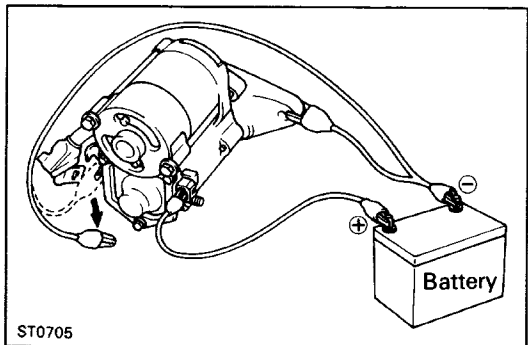
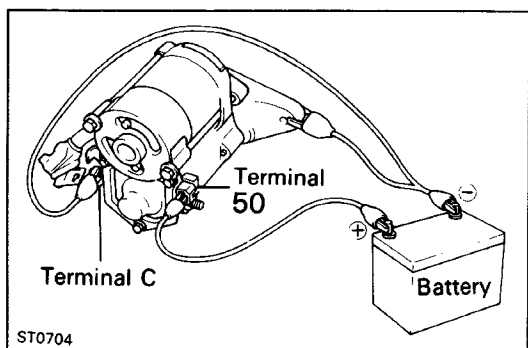


- (b) Align the protrusion of the field frame with the cutout of the magnetic switch.





- (c) Install the field frame and armature assembly with the two through bolts.
- (d) Connect the lead wire to terminal C, and install the nut.



PERFORMANCE TEST OF STARTER (4A-FE)

NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL-IN TEST

- Disconnect the field coil lead wire from terminal C.
- Connect battery to the magnetic switch as shown.
Check that the pinion gear moves outward.
If the pinion gear does not move, replace the magnetic switch.

2. PERFORM HOLD-IN TEST

While connected as above with the pinion gear out, disconnect the negative (-) lead from terminal C. Check that the pinion gear remains out.
If the pinion gear returns inward, replace the magnetic switch.

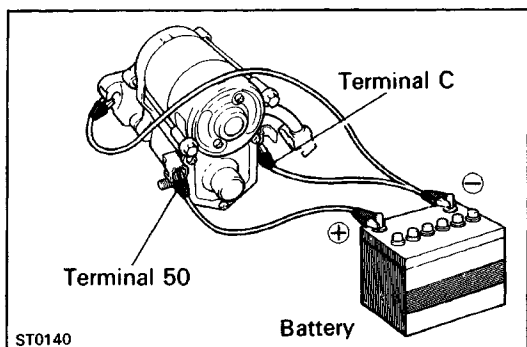
3. INSPECT PLUNGER RETURN

Disconnect the negative (+) lead from the switch body. Check that the pinion gear returns inward.
If the pinion gear does not return, replace the magnetic switch.

4. PERFORM NO-LOAD PERFORMANCE TEST

- Connect battery and ammeter to the starter as shown.
- Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check the reading on the ammeter.

Standard amperage: 90 A or less at 11.5 V



PERFORMANCE TEST OF STARTER (3S-GTE and 5S-FE)

NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL-IN TEST

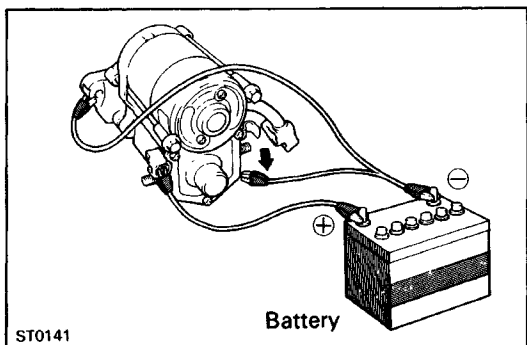
- Disconnect the field coil lead wire from terminal C.
- Connect battery to the magnetic switch as shown. Check that the pinion gear moves outward.

If the pinion gear does not move, replace the magnetic switch.

2. PERFORM HOLD-IN TEST

While connected as above with the pinion gear out, disconnect the negative (-) lead from terminal C. Check that the pinion gear remains out.

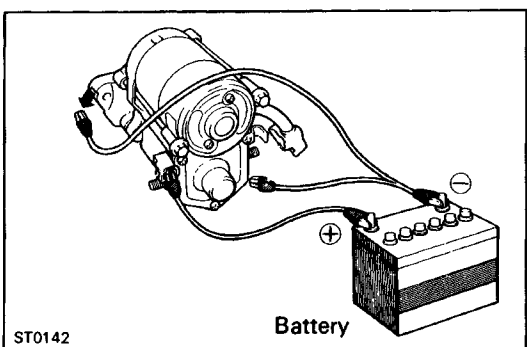
If the pinion gear returns inward, replace the magnetic switch.



3. INSPECT PLUNGER RETURN

Disconnect the negative (+) lead from the switch body. Check that the pinion gear returns inward.

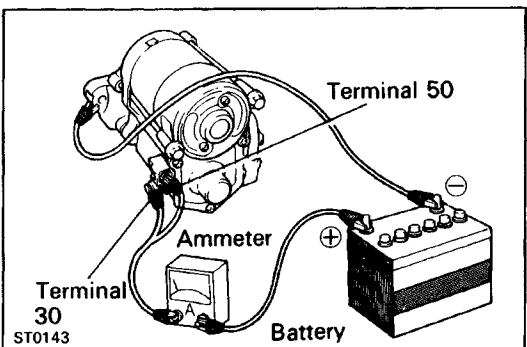
If the pinion gear does not return, replace the magnetic switch.

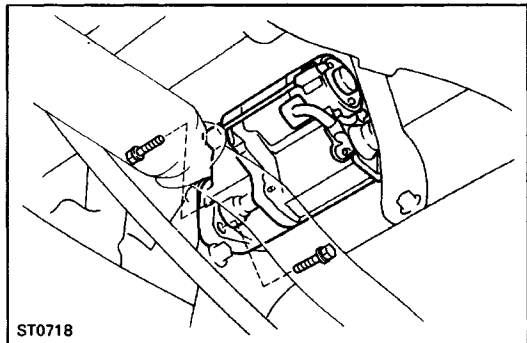


4. PERFORM NO-LOAD PERFORMANCE TEST

- Connect battery and ammeter to the starter as shown.
- Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check the reading on the ammeter.

Standard amperage: 90 A or less at 11.5 V





INSTALLATION OF STARTER (4A-FE)

(See page [ST-3](#))

1. INSTALL STARTER

- (a) Connect the starter wire with the nut.
 - (b) Connect the starter connector.
 - (c) Install the starter with the two bolts.
- Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

2. INSTALL AIR CLEANER CAP

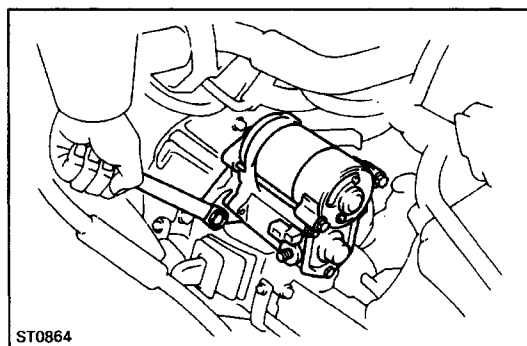
(See step 36 on page [EM-221](#))

3. INSTALL SUSPENSION LOWER CROSSMEMBER

(See step 18 on page [EM-218](#))

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK THAT ENGINE STARTS



INSTALLATION OF STARTER (3S-GTE)

(See page [ST-4](#))

1. INSTALL STARTER

- (a) Install the starter with the two bolts.
- Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)
- (b) Connect the starter wire with the nut.
 - (c) Connect the starter connector.

2. INSTALL CRUISE CONTROL ACTUATOR

3. INSTALL ENGINE RELAY BOX

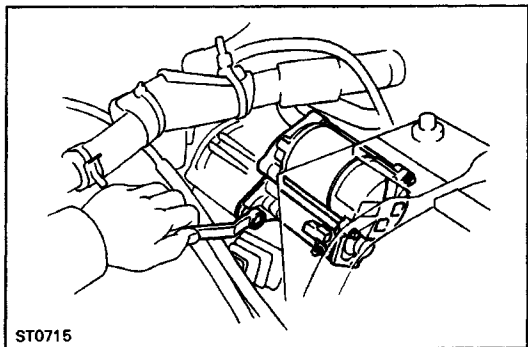
(See step 44 on page [EM-266](#))

4. INSTALL AIR CLEANER

(See step 45 on page [EM-266](#))

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

6. CHECK THAT ENGINE STARTS



INSTALLATION OF STARTER (5S-FE)

(See page [ST-5](#))

1. INSTALL STARTER

- (a) Install the starter with the two bolts.
Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)
- (b) Connect the starter wire with the nut.
- (c) Connect the starter connector.

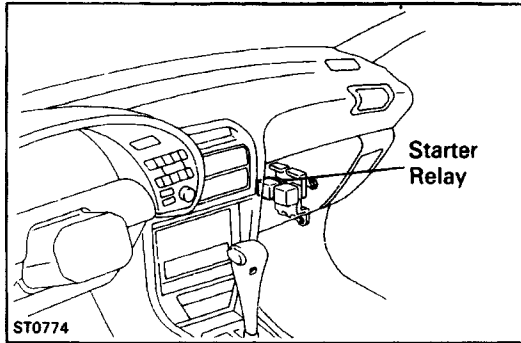
2. (w/ CRUISE CONTROL SYSTEM (w/ ABS)) INSTALL CRUISE CONTROL ACTUATOR (See step 35 on page [EM-309](#))

3. INSTALL ENGINE RELAY BOX (See step 37 on page [EM-310](#))

4. INSTALL AIR CLEANER (See step 39 on page [EM-310](#))

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

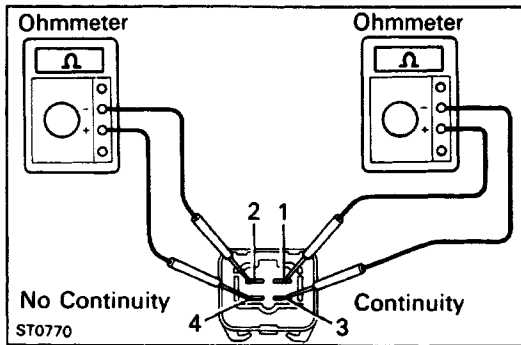
6. CHECK THAT ENGINE STARTS



STARTER RELAY (M/T only)

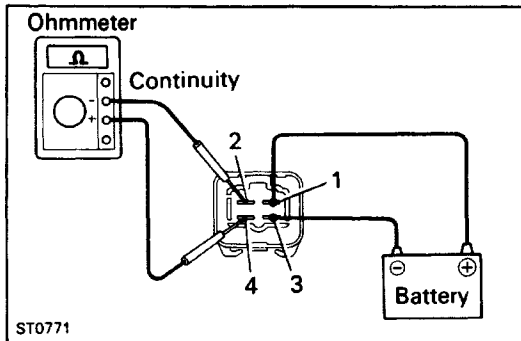
INSPECTION OF STARTER RELAY

LOCATION: In the right kick panel.



1. INSPECT RELAY CONTINUITY

- (a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.
 - (b) Check that there is no continuity between terminals 2 and 4.
- If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

- (a) Apply battery voltage across terminals 1 and 3.
 - (b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.
- If operation is not as specified, replace the relay.

CLUTCH START SWITCH (M/T only)

(See page [CL-5](#))

CHARGING SYSTEM

	Page
PRECAUTIONS	CH-2
TROUBLESHOOTING	CH-2
ON-VEHICLE INSPECTION	CH-2
GENERATOR	CH-6

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery when the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition ON and engine not running	Fuse blown Light burned out Wiring connections loose IC regulator faulty	Check "IGN" fuses Replace light Tighten loose connections Replace IC regulator	CH-12
Discharge warning light does not go off with engine running (battery requires frequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown IC regulator or generator faulty Wiring faulty	Adjust or replace drive belt Repair or replace cables Check "ECU-IG" fuse Replace fusible link Check charging system Repair wiring	CH-3 CH-4

ON-VEHICLE INSPECTION

1. INSPECT BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

(a) Check the specific gravity of each cell.

Standard specific gravity:

1.25 – 1.27 when fully charged at 20°C(68°F)

If not within specification, charge the battery.

(b) Check the electrolyte level of each cell.

If insufficient, refill with distilled (or purified) water.

2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible links and fuses for continuity.

Fusible link: MAIN 2.0L

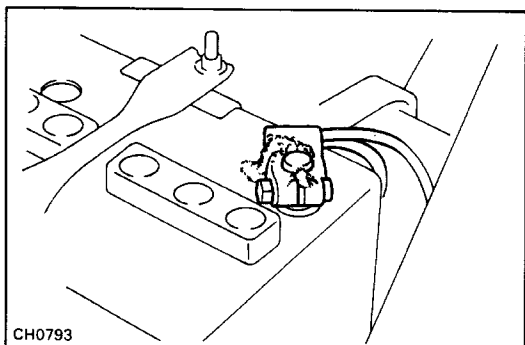
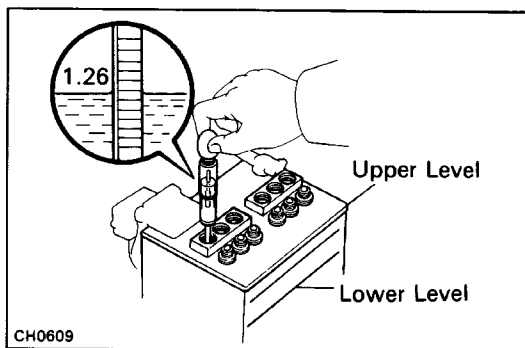
H-fuse: ALT 100A

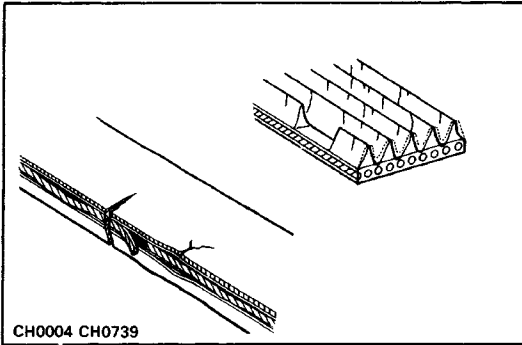
AM1 40A

AM2 30A

Fuse: ECU-IG 15A

IGN 7.5A





3. INSPECT DRIVE BELT

(a) Visually check the drive belt for excessive wear, frayed cords etc.

If necessary, replace the drive belt.

HINT: Cracks on rib side of a drive belt are considered acceptable. If the drive belt has chunks missing from the ribs, it should be replaced.

(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:

Nippondenso BTG-20 (95506-00020)

Borroughs No. BT-33-73F

Drive belt tension:

4A-FE		New belt 160 ± 20 lbf
		Used belt 130 ± 20 lbf
3S-GTE	w/ A/C	New belt 165 ± 10 lbf
	w/o A/C	Used belt 115 ± 20 lbf
		New belt 150 ± 25 lbf
		Used belt 130 ± 25 lbf
5S-FE	w/ A/C	New belt 165 ± 10 lbf
	w/o A/C	New belt 125 ± 25 lbf
		Used belt 95 ± 20 lbf

If the belt tension is not as specified, adjust it.

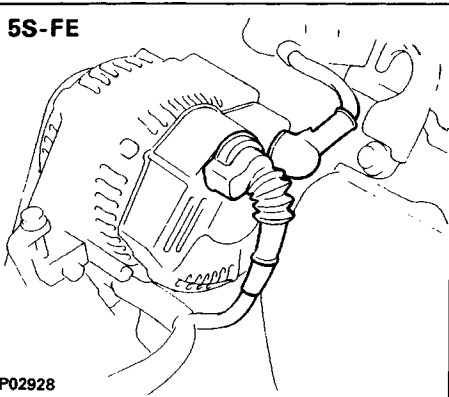
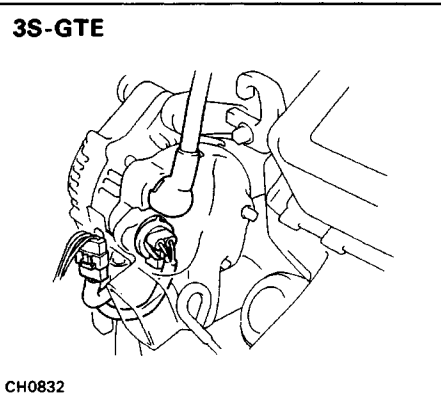
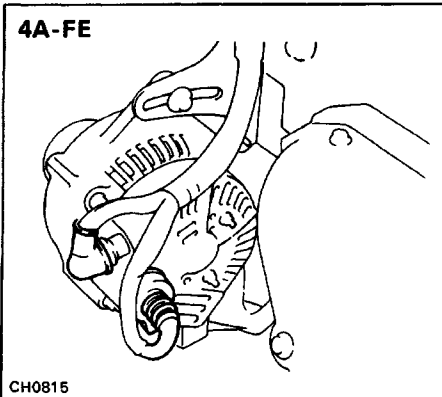
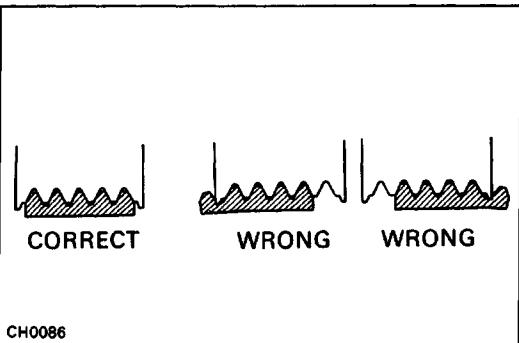
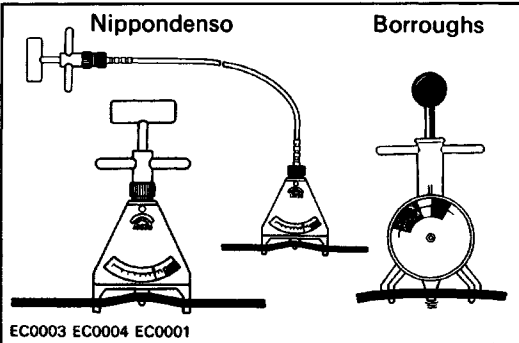
HINT:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

4. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the generator while the engine is running.



5. INSPECT CHARGE WARNING LIGHT CIRCUIT

- Turn the ignition switch ON. Check that the charge warning light is lit.
- Start the engine. Check that the light goes off.
If the light does not go off as specified, troubleshoot the charge light circuit.

6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/generator tester is available, connect the tester to the charging circuit as per manufacturer's instructions.

- If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:
 - Disconnect the wire from terminal B of the generator and connect it to the negative probe of the ammeter.
 - Connect the positive (+) probe of the ammeter to terminal B of the generator.
 - Connect the positive (+) probe of the voltmeter to terminal B of the generator.
 - Ground the negative (-) probe of the voltmeter.
- Check the charging circuit as follows:
With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

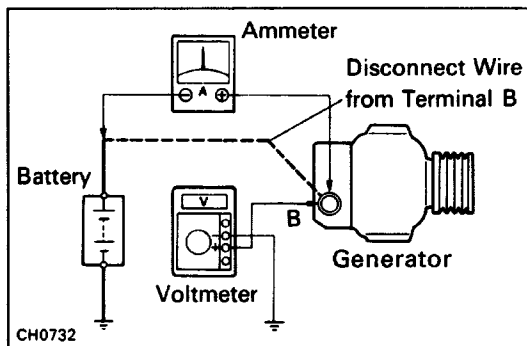
Standard voltage: 13.9 – 15.1 V at 25°C (77°F)

13.5 – 14.3 V at 115°C (239°F)

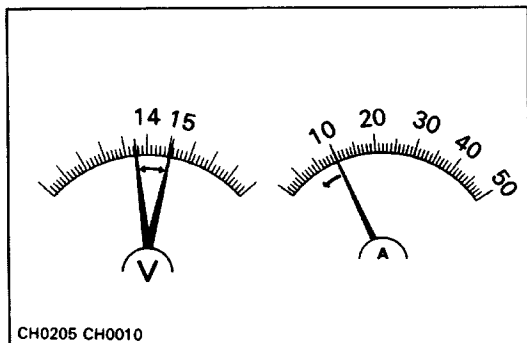
If the voltmeter reading is greater than standard voltage, replace the IC regulator.

If the voltmeter reading is less than standard voltage, check the IC regulator and generator as follows:

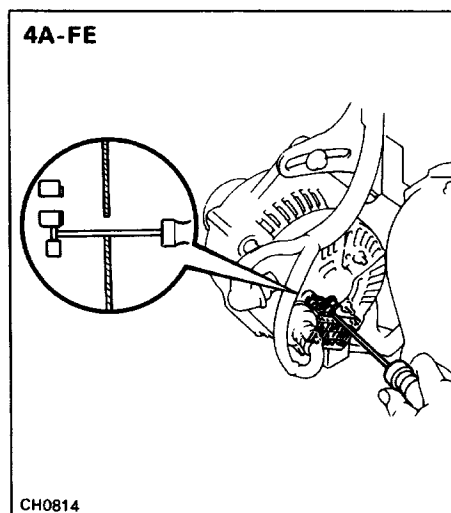
- With terminal F grounded, start the engine and check the voltmeter reading of terminal B.



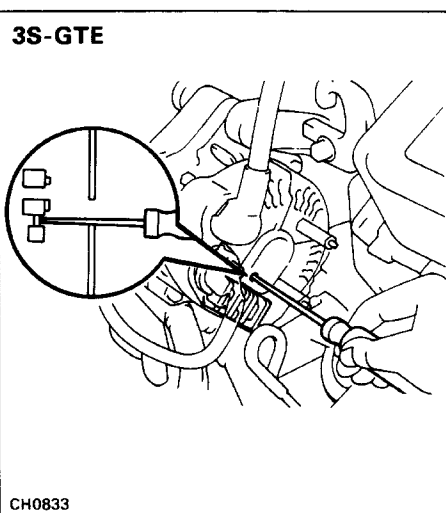
CH0732



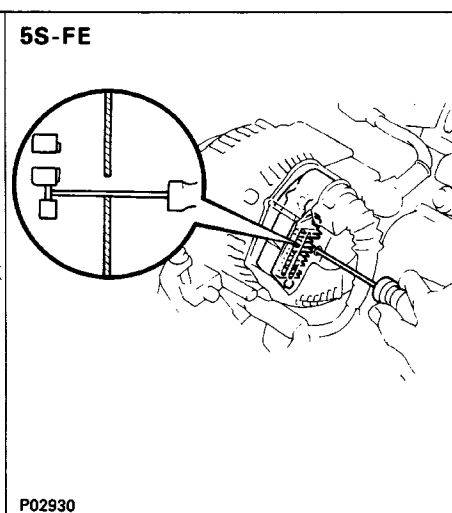
CH0205 CH0010



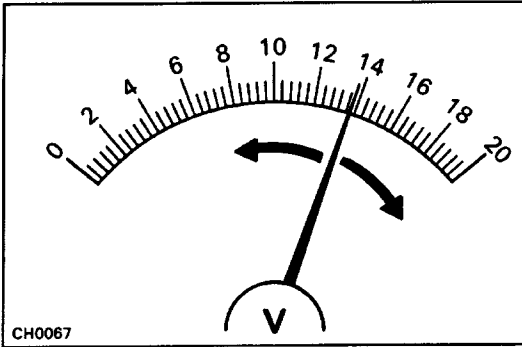
CH0814



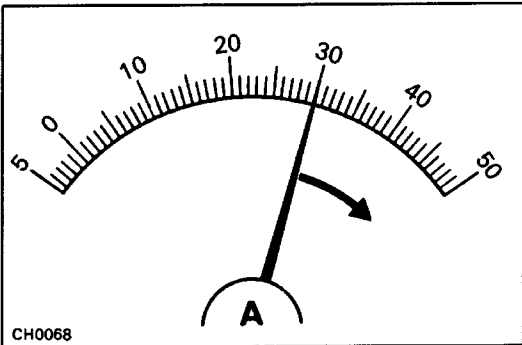
CH0833



P02930



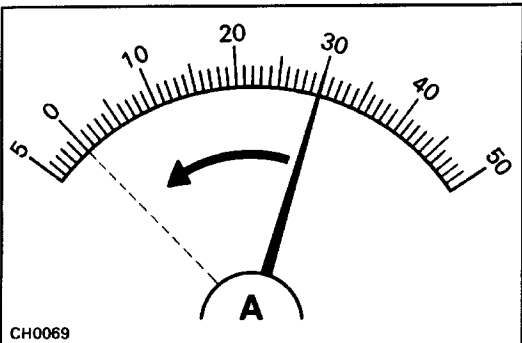
- If the voltmeter reading is greater than standard voltage, replace the IC regulator.
- If the voltmeter reading is less than standard voltage, check the generator.



7. INSPECT CHARGING CIRCUIT WITH LOAD

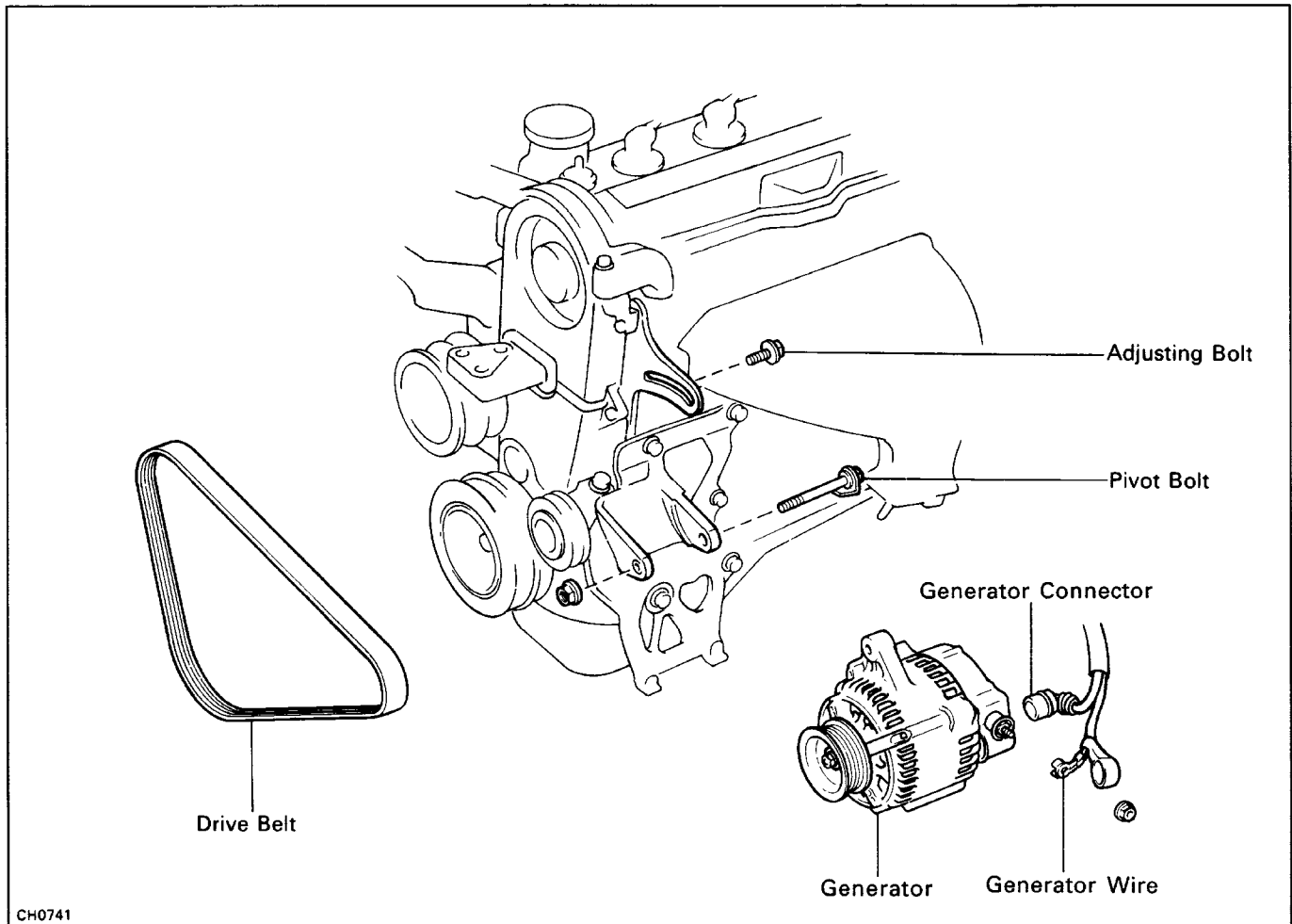
- With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI".
- Check the reading on the ammeter.

Standard amperage: 30 A or more

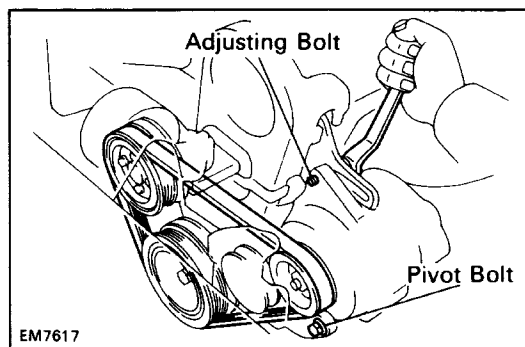


If the ammeter reading is less than the standard amperage, repair the generator. (See page [CH-12](#))
 HINT: With the battery fully charged, the indication will sometimes be less than standard amperage.

GENERATOR REMOVAL OF GENERATOR (4A-FE)



CH0741



EM7617

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

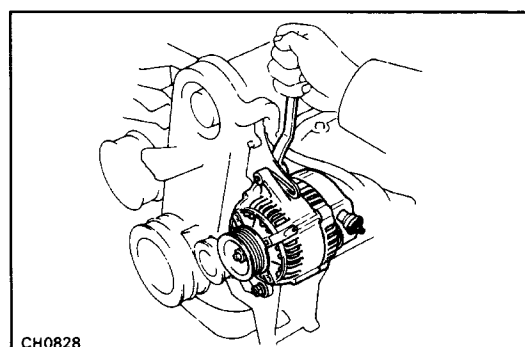
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE DRIVE BELT

Loosen the pivot nut and adjusting bolt, and remove the drive belt.

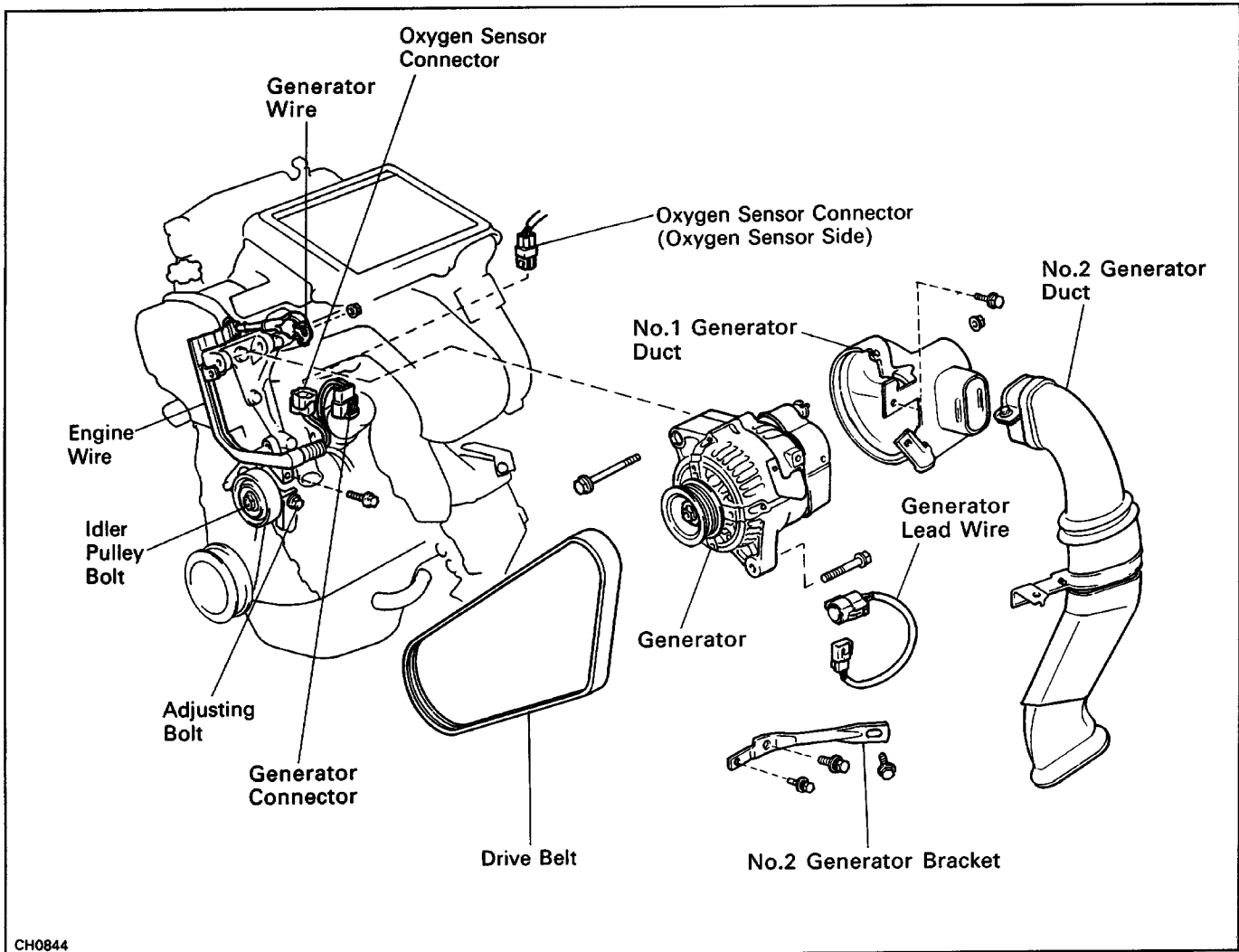
3. REMOVE GENERATOR

- (a) Disconnect the generator connector.
- (b) Remove the nut, and disconnect the generator wire.
- (c) Remove the pivot nut, bolt, adjusting bolt and generator.



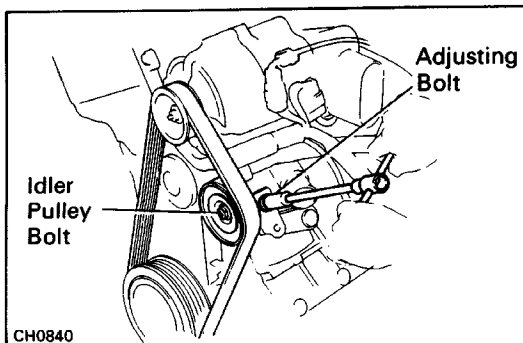
CH0828

REMOVAL OF GENERATOR (3S-GTE)



CH0844

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
2. DISCONNECT ABS CONTROL RELAY FROM RADIATOR
3. DISCONNECT A/C RELAY BOX FROM BRACKET
4. REMOVE NO.2 GENERATOR DUCT
5. REMOVE DRIVE BELT
 - (a) Loosen the idler pulley bolt.
 - (b) Loosen the adjusting bolt, and remove the drive belt.



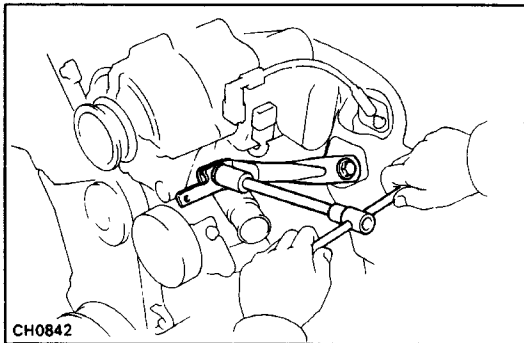
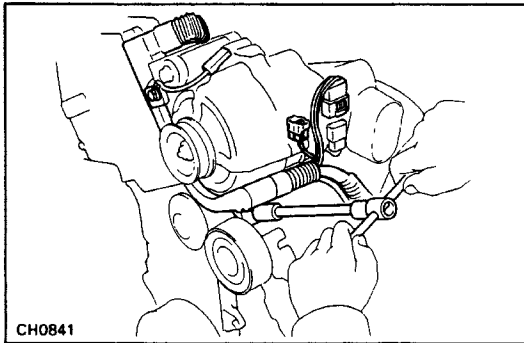
CH0840

6. DISCONNECT ENGINE WIRE

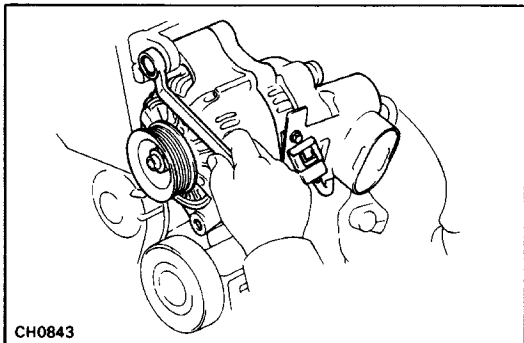
(a) Disconnect the following connectors and wires:

- Generator connector from lead wire
- Generator wire
- A/C compressor connector
- Engine coolant temperature switch connector
- Oxygen sensor wire clamp from No.1 generator duct
- Oxygen sensor connector
- Oxygen sensor connector (wiring harness side) from No.1 generator duct

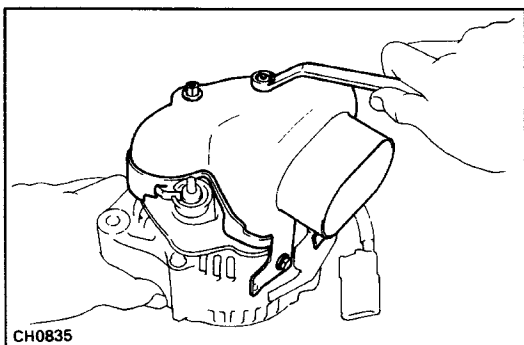
(b) Remove the two bolts, and disconnect the ground strap and engine wire from the brackets.

**7. REMOVE NO.2 GENERATOR BRACKET**

Remove the two bolts and generator bracket.

8. REMOVE ABS ACTUATOR COVER**9. REMOVE GENERATOR**

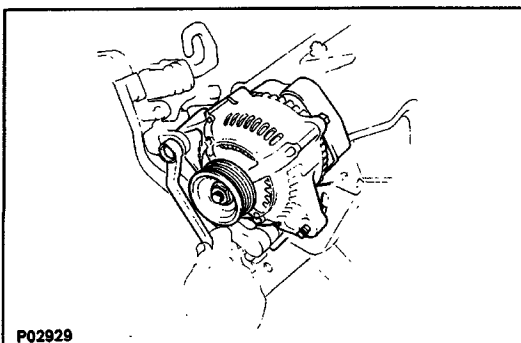
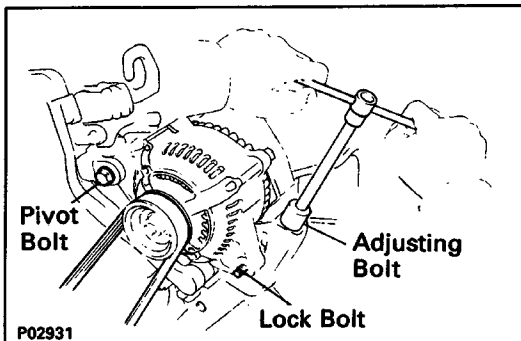
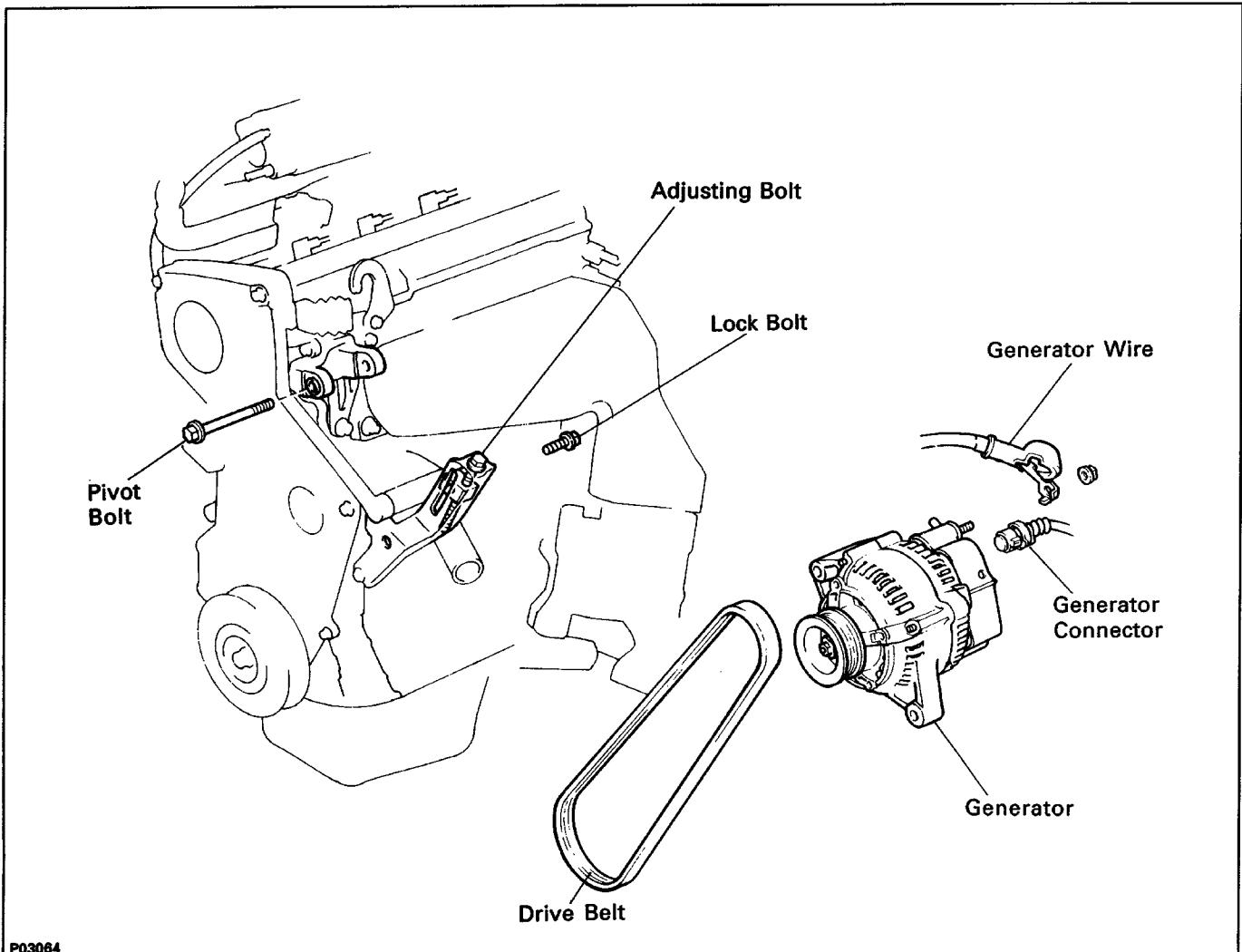
Remove the two bolts and generator.

**10. REMOVE NO.1 GENERATOR DUCT**

(a) Remove the two nuts and generator duct.

(b) Remove the generator lead wire.

REMOVAL OF GENERATOR (5S-FE)



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE DRIVE BELT

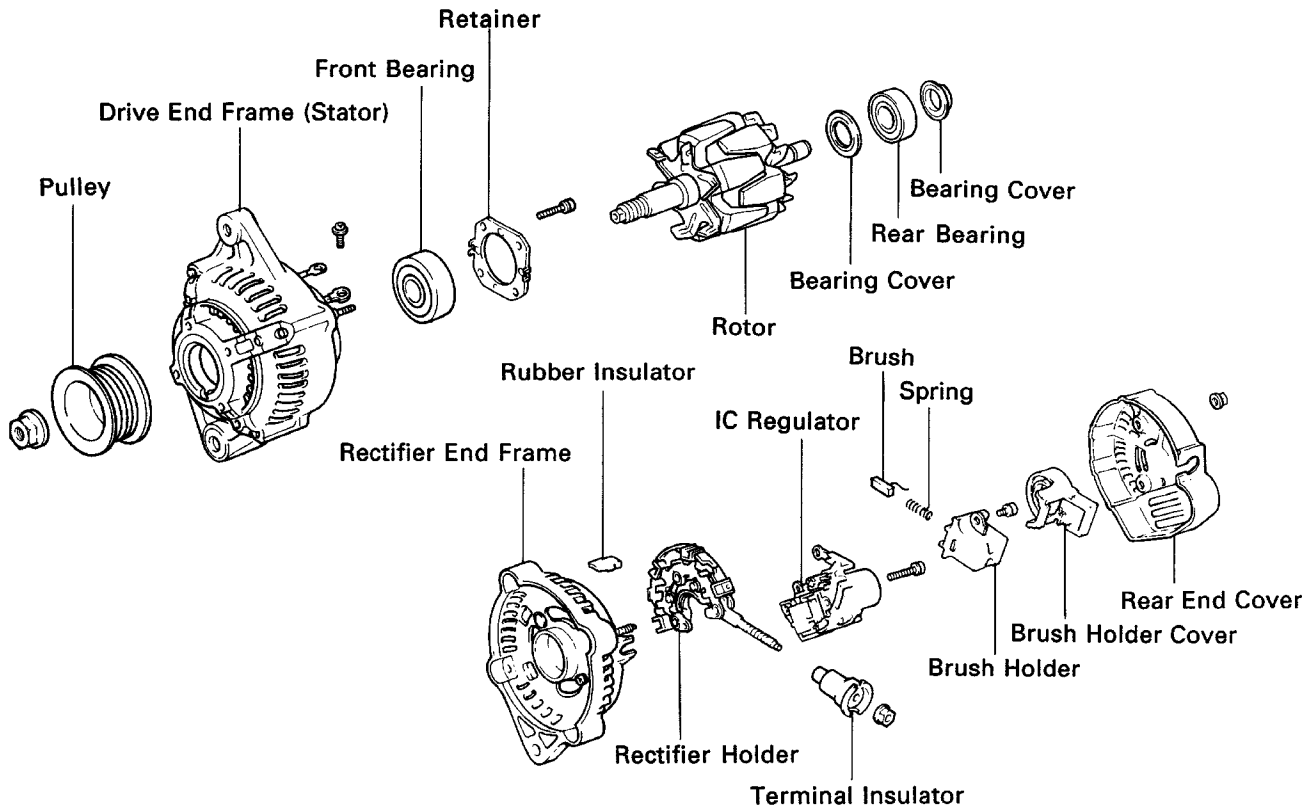
- Loosen the pivot bolt and adjusting lock bolt.
- Loosen the adjusting bolt, and remove the drive belt.

3. REMOVE GENERATOR

- Disconnect the generator connector.
- Remove the nut, and disconnect the generator wire.
- Remove the pivot bolt, adjusting lock bolt and generator.

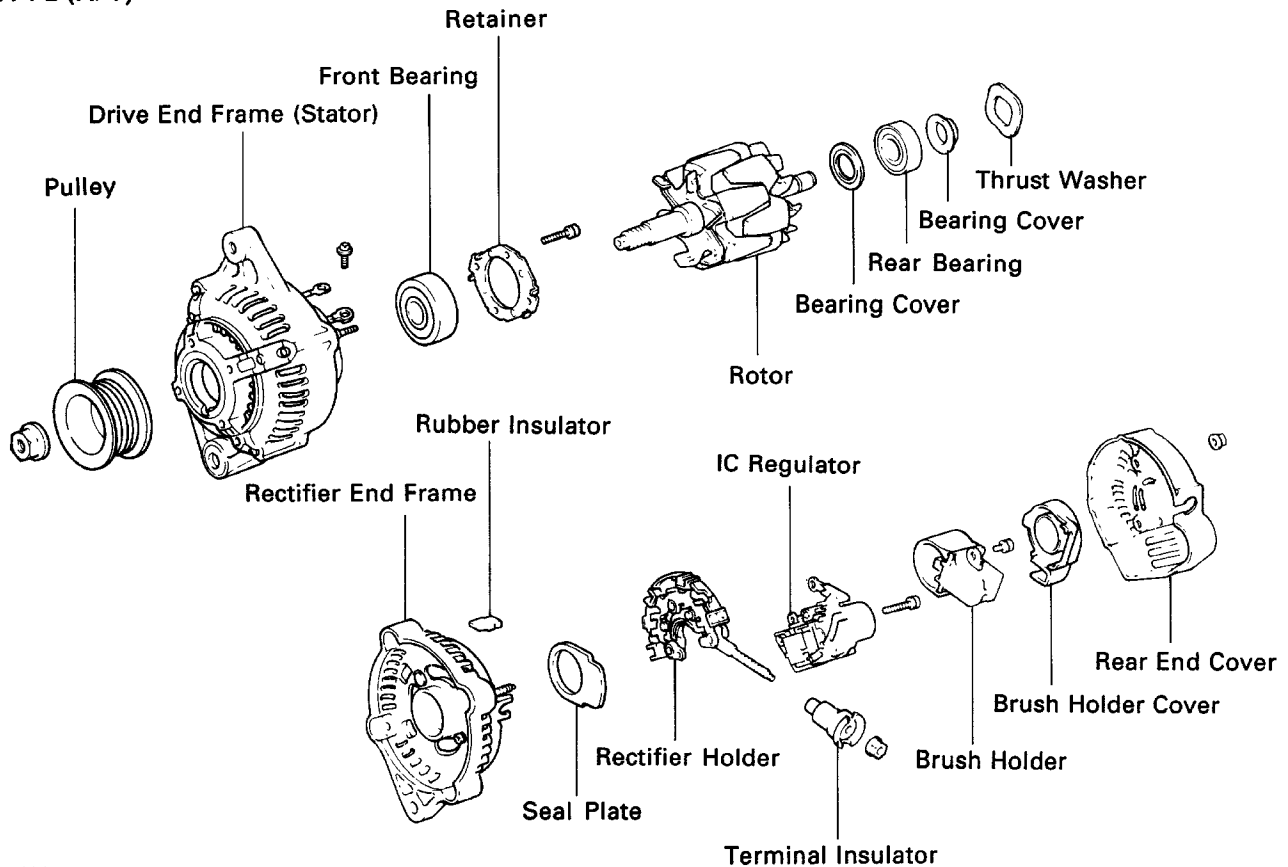
COMPONENTS

4A-FE (M/T)



P02906

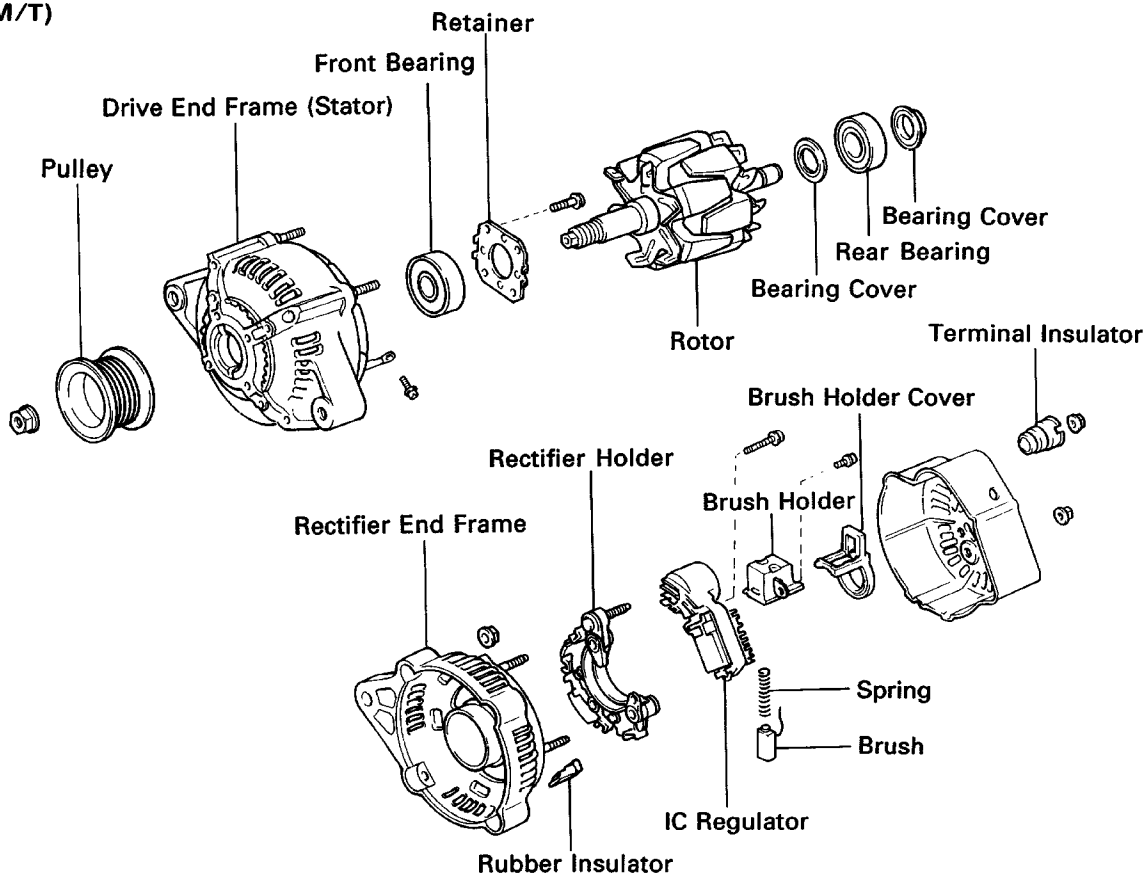
4A-FE (A/T)



P02905

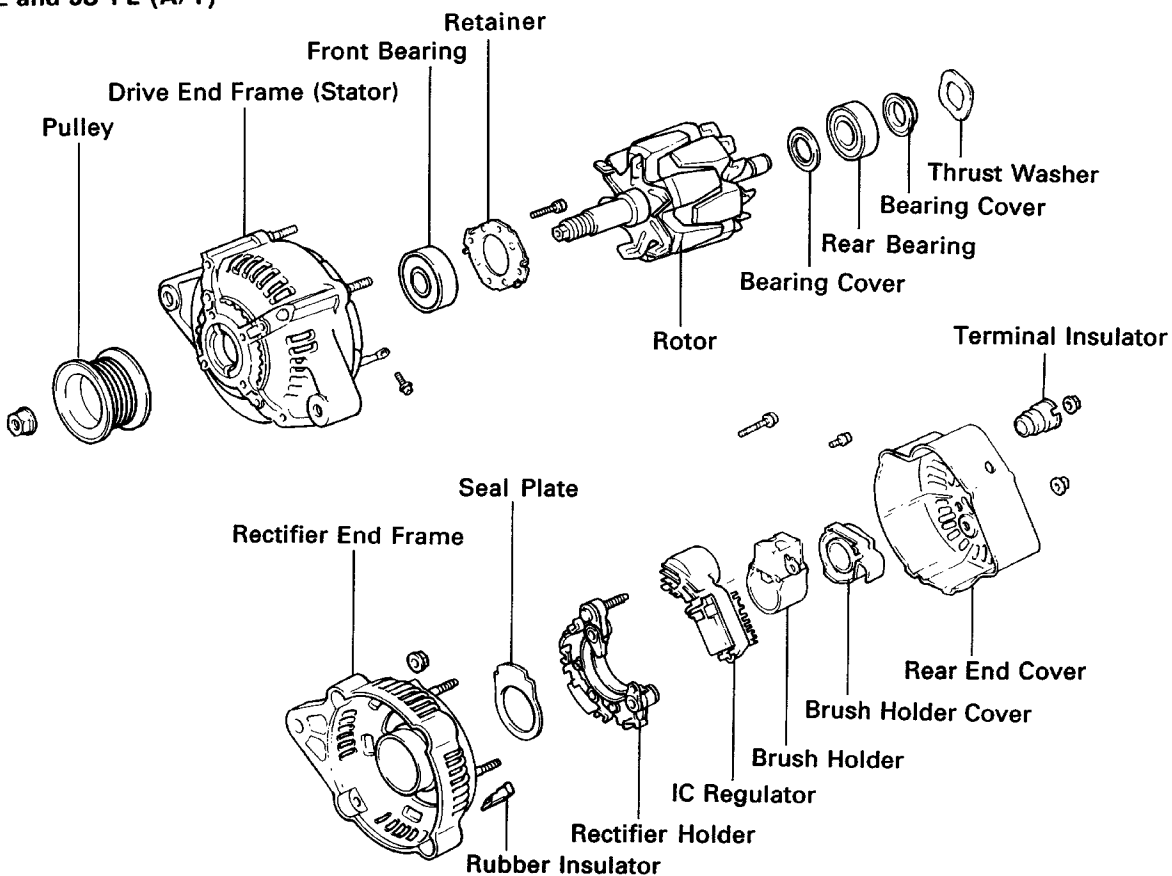
COMPONENTS (Cont'd)

5S-FE (M/T)



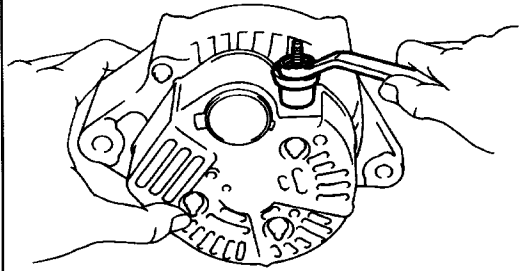
P02907

3S-GTE and 5S-FE (A/T)

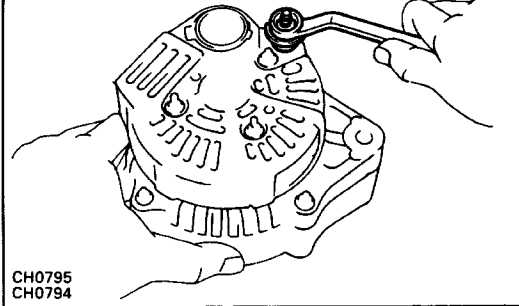
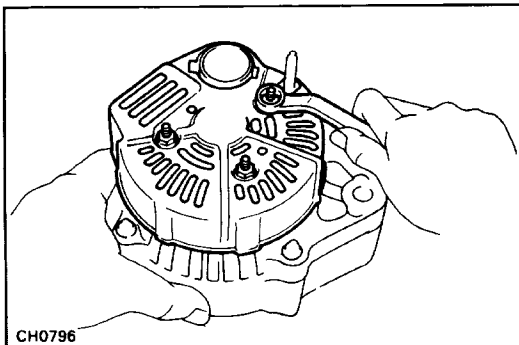


P02908

4A-FE

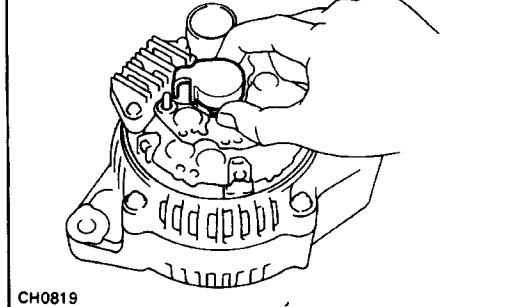


3S-GTE and 5S-FE

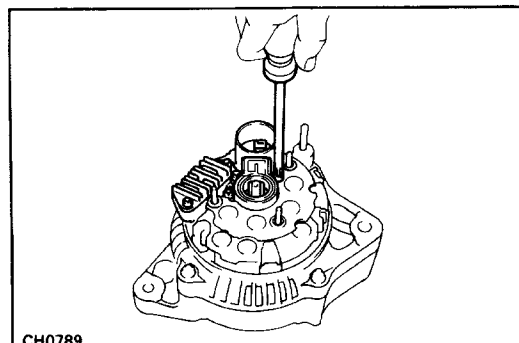
CH0795
CH0794

CH0796

M/T (3S-GTE) and A/T



CH0819



CH0789

DISASSEMBLY OF GENERATOR

4A-FE (See page [CH-10](#))3S-GTE and 5S-FE (See page [CH-11](#))

1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

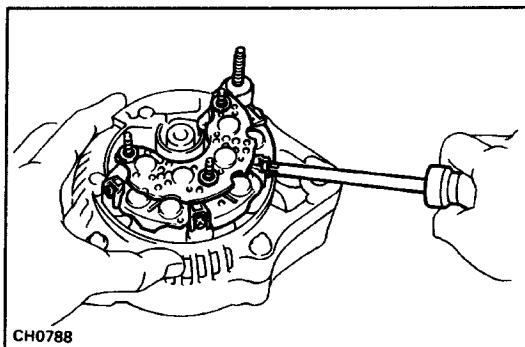
(b) Remove the three nuts and end cover.

2. REMOVE BRUSH HOLDER AND IC REGULATOR

(a) (M/T (3S-GTE) and A/T)

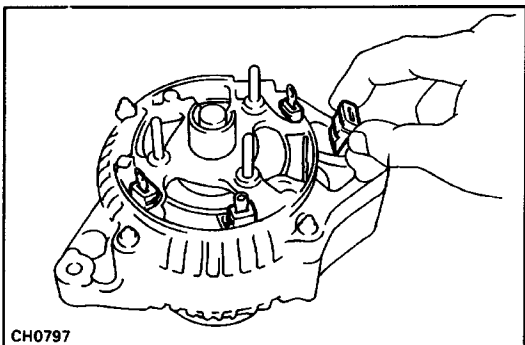
Remove the brush holder cover from the brush holder.

(b) Remove the five screws, brush holder and IC regulator.

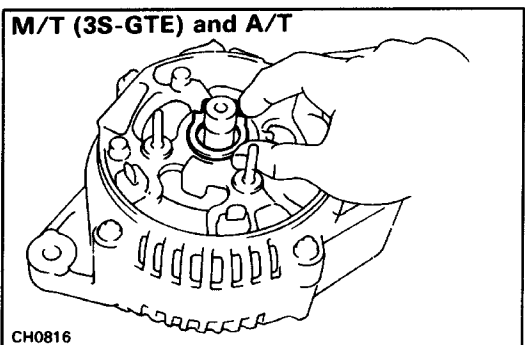


3. REMOVE RECTIFIER HOLDER

(a) Remove the four screws and rectifier holder.

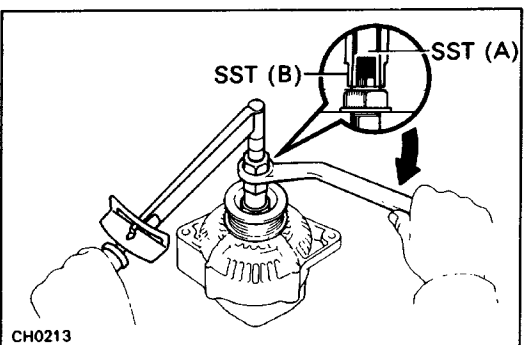


(b) Remove the four rubber insulators.



(c) (M/T (3S-GTE) and A/T)

Remove the seal plate.



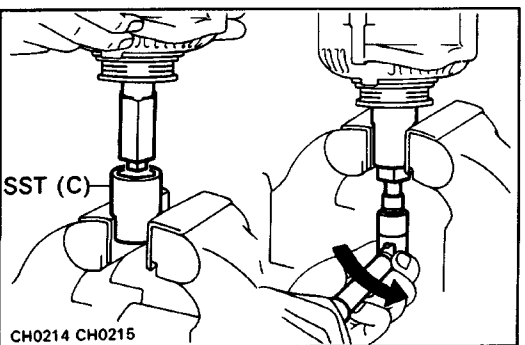
4. REMOVE PULLEY

(a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820-63010

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

(b) Check that SST (A) is secured to the rotor shaft.



(c) As shown in the illustration, mount SST (C) in a vise, and install the generator to SST (C).

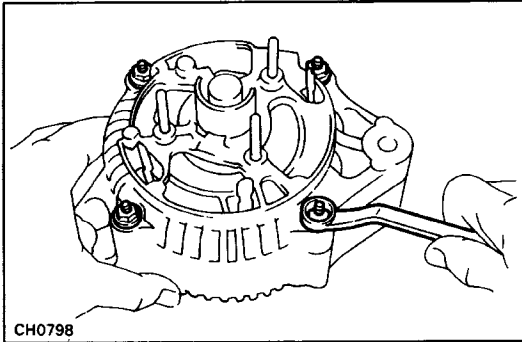
(d) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

(e) Remove the generator from SST (C).

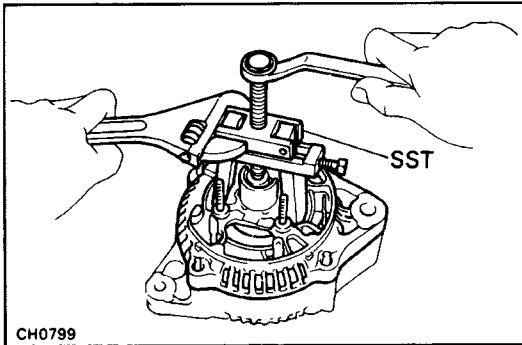
(f) Turn SST (B) and remove SST (A and B).

(g) Remove the pulley nut and pulley.

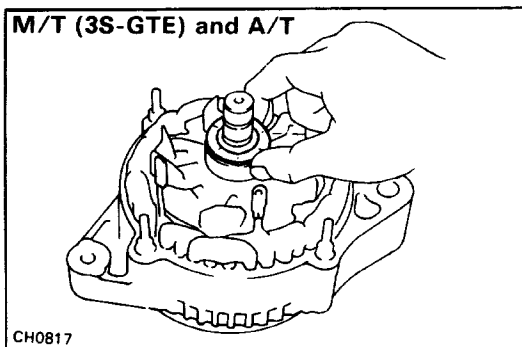


5. REMOVE RECTIFIER END FRAME

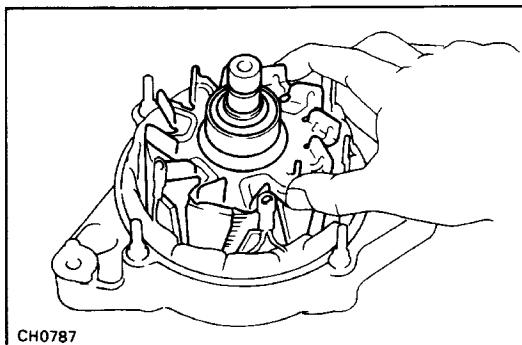
(a) Remove the four nuts.



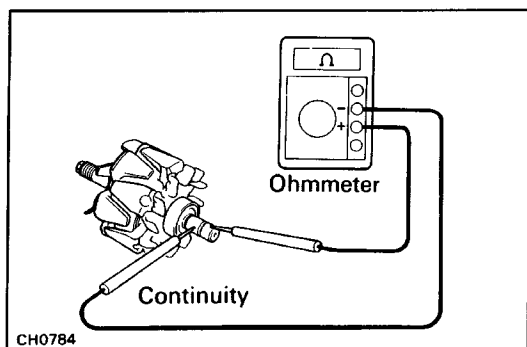
(b) Using SST, remove the rectifier end frame.
SST 09286-46011



(c) (M/T (3S-GTE) and A/T)
Remove the thrust washer.



6. REMOVE ROTOR FROM DRIVE END FRAME



CH0784

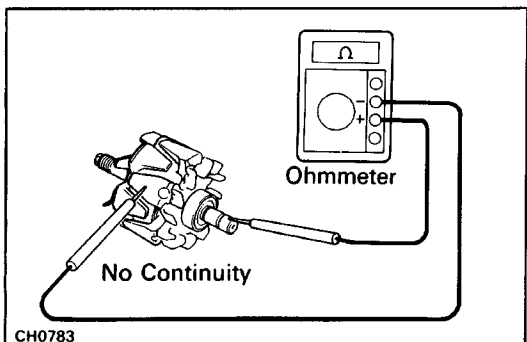
INSPECTION AND REPAIR OF GENERATOR Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance (Cold): 2.8 – 3.0

If there is no continuity, replace the rotor.

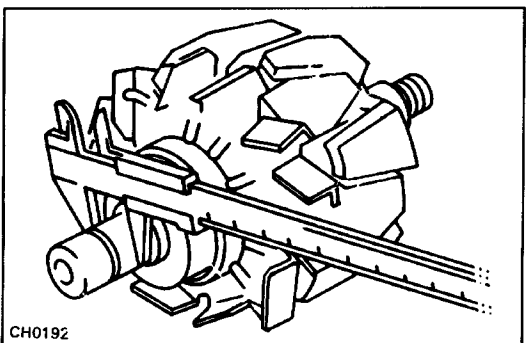


CH0783

2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.



CH0192

3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

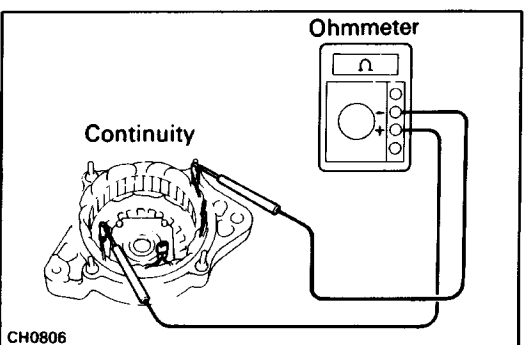
(b) Using a vernier caliper, measure the slip ring diameter.

Standard diameter: 14.2 – 14.4 mm

(0.559 – 0.567 in.)

Minimum diameter: 12.8 mm (0.504 in.)

If the diameter is less than minimum, replace the rotor.



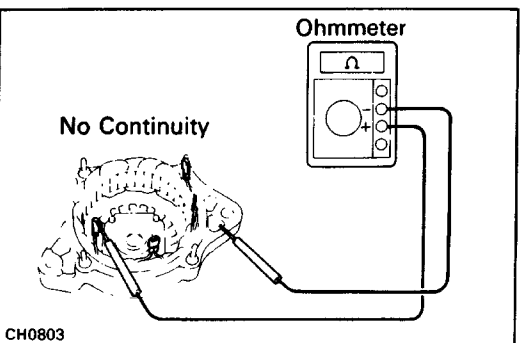
CH0806

Stator (Drive End Frame)

1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

If there is no continuity, replace the drive end frame assembly.

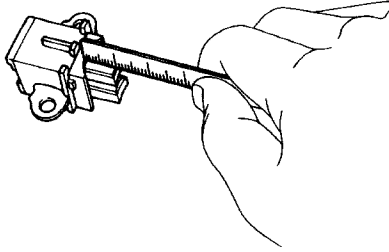
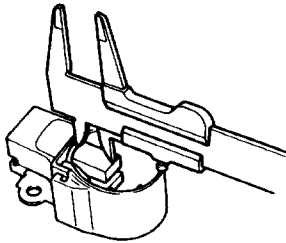


CH0803

2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

If there is continuity, replace the drive end frame assembly.

M/T (4A-FE and 5S-FE)**M/T (3S-GTE) and A/T**CH0247
CH0722

Brushes

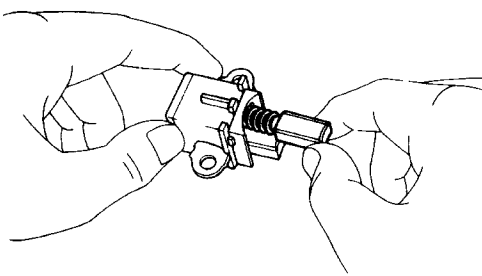
1. INSPECT EXPOSED BRUSH LENGTH

Using a vernier caliper or scale, measure the exposed brush length.

Standard exposed length: 10.5 mm (0.413 in.)

Minimum exposed length: 1.5 mm (0.059 in.)

If the exposed length is less than minimum, replace the brushes (M/T (4A-FE and 5S-FE)) or brushes and brush holder assembly (M/T (3S-GTE) and A/T).

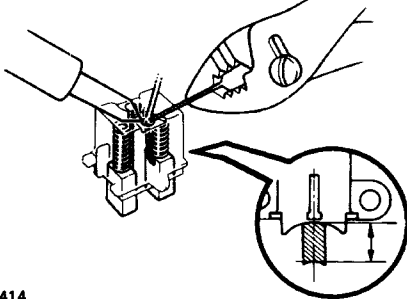
M/T (4A-FE and 5S-FE)

CH0248

2. (M/T (4A-FE AND 5S-FE))

IF NECESSARY, REPLACE BRUSHES

- (a) Unsolder and remove the brush and spring.
- (b) Run the wire of a new brush through the spring and the hole in the brush holder, and insert the spring and brush into the brush holder.

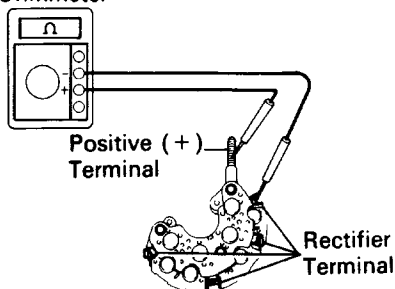
M/T (4A-FE and 5S-FE)

CH0414

- (c) Solder the brush wire to the brush holder at specified exposed length.

Exposed length: 10.5 mm (0.413 in.)

- (d) Check that the brush moves smoothly in the brush holder.
- (e) Cut off the excess wire.
- (f) Apply insulation paint to the soldered area.

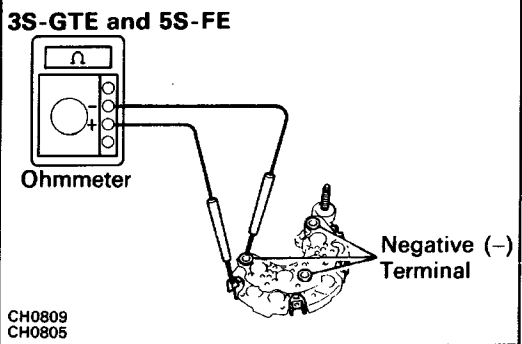
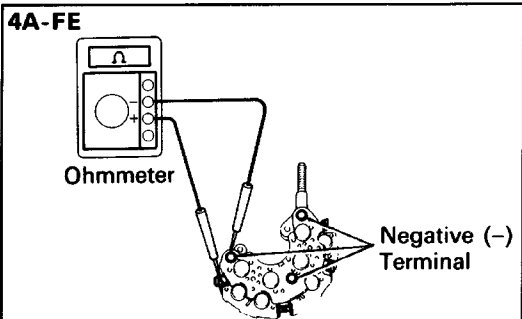
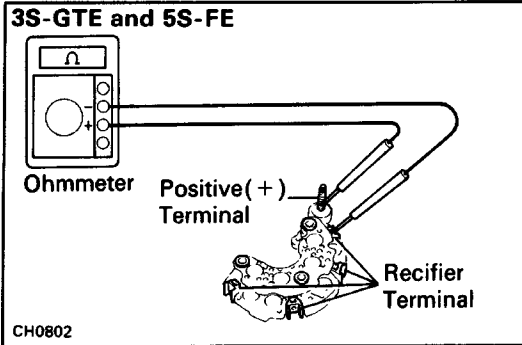
4A-FE Ohmmeter

CH0808

Rectifiers (Rectifier Holder)

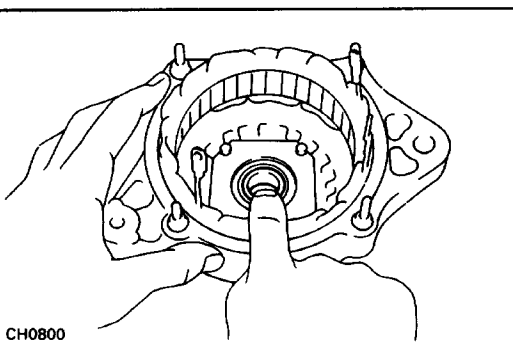
1. INSPECT POSITIVE RECTIFIER

- (a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.
- (b) Reverse the polarity of the tester probes and repeat step (a).
- (c) Check that one shows continuity and the other shows no continuity.
If continuity is not as specified, replace the rectifier holder.



2. INSPECT NEGATIVE RECTIFIER

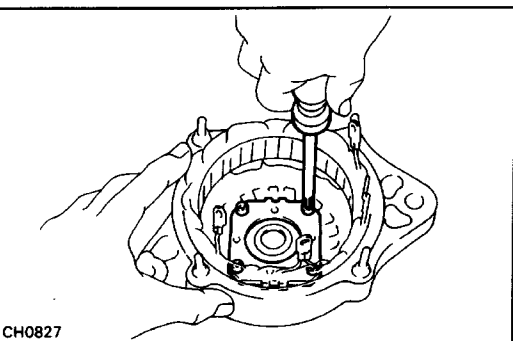
- Using an ohmmeter, connect one tester probe to each negative (-) terminal and the other to each rectifier terminal.
- Reverse the polarity of the tester probes and repeat step (a).
- Check that one shows continuity and the other shows no continuity.
If continuity is not as specified, replace the rectifier holder.



Bearings

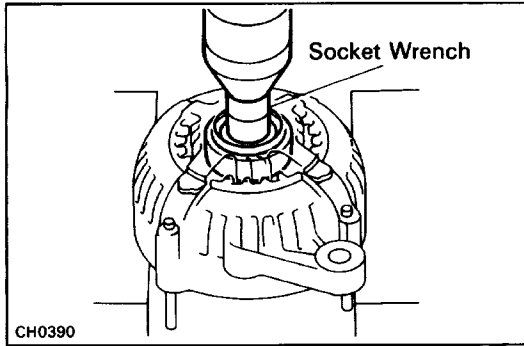
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

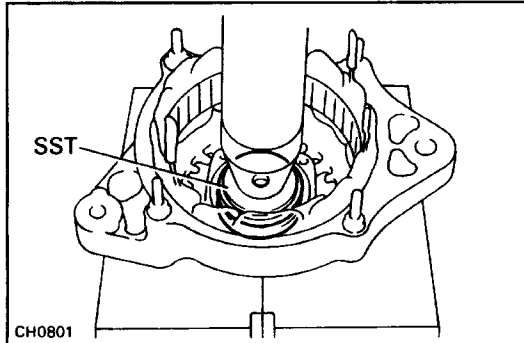


2. IF NECESSARY, REPLACE FRONT BEARING

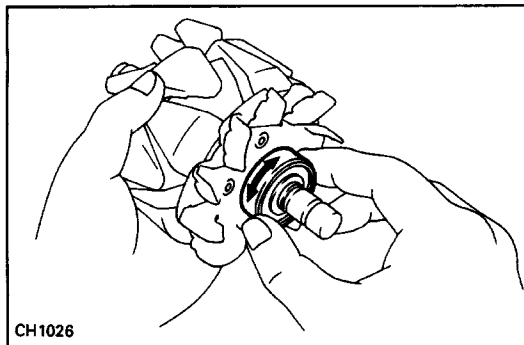
- Remove the four screws, bearing retainer and bearing.



- (b) Using socket wrench and press, press out the bearing.

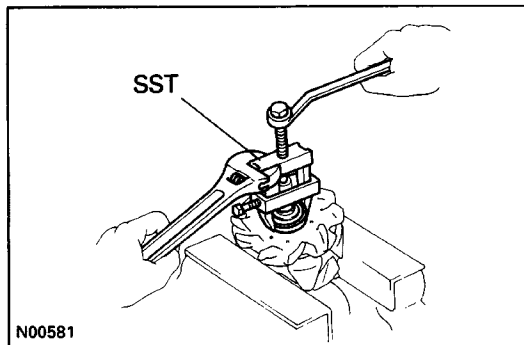


- (c) Using SST and a press, press in a new bearing.
SST 09608-20012 (09608-00030)
(d) Install the bearing retainer with the four screws.



3. INSPECT REAR BEARING

Check that the bearing is not rough or worn.

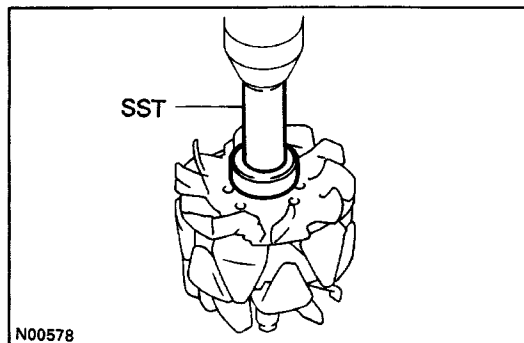


4. IF NECESSARY, REPLACE REAR BEARING

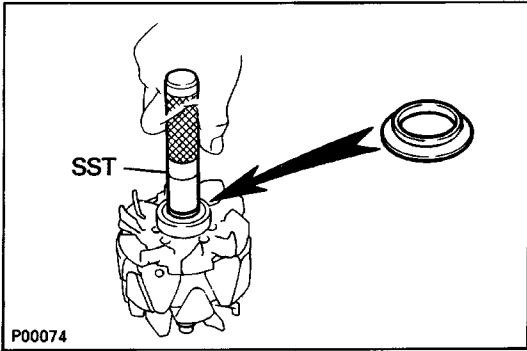
- (a) Using SST, remove the bearing covers and bearing.
SST 09820-00021

NOTICE: Be careful not to damage the fan.

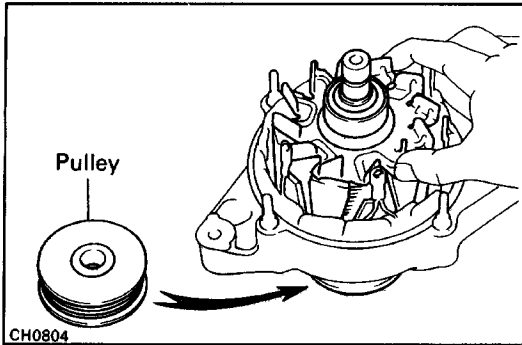
- (b) Place the bearing cover on the rotor.



- (c) Using SST and a press, press in a new bearing.
SST 09820-00030



(d) Using SST, push in the bearing cover.
SST 09285-76010



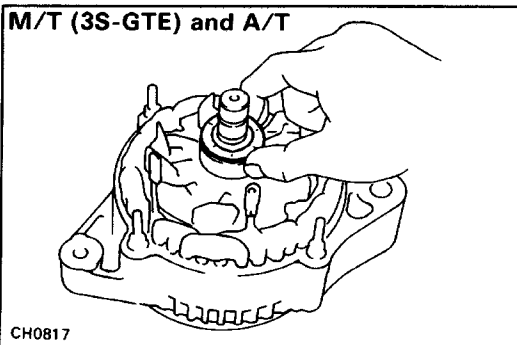
ASSEMBLY OF GENERATOR

4A-FE (See page EM-10)

3S-GTE and 5S-FE (See page EM-11)

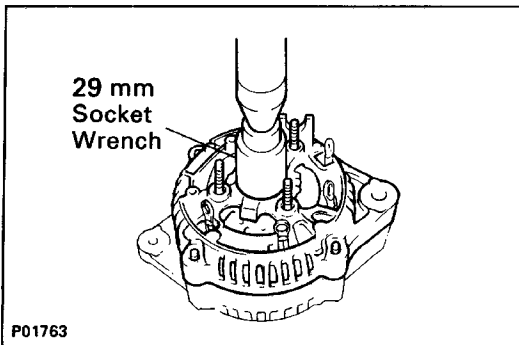
1. INSTALL ROTOR TO RECTIFIER END FRAME

- (a) Place the rectifier end frame on the pulley.
- (b) Install the rotor to the rectifier end frame.

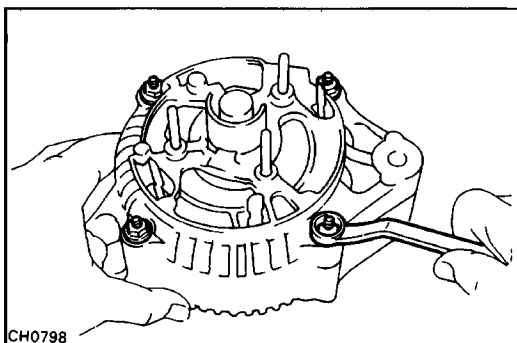


2. INSTALL RECTIFIER END FRAME

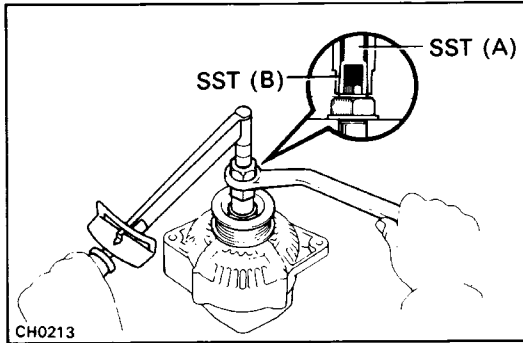
- (a) (M/T (3S-GTE) and A/T)
Place the thrust washer on the rotor.



- (b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.



- (c) Install the four nuts.

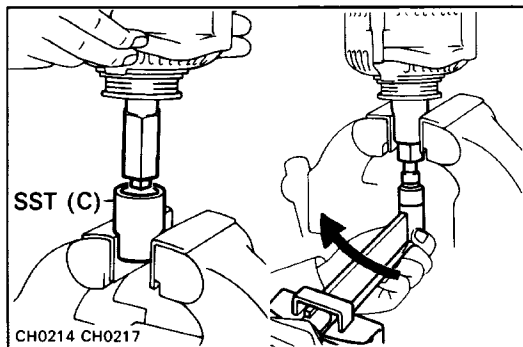


3. INSTALL PULLEY

- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
- (b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820-63010

Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)

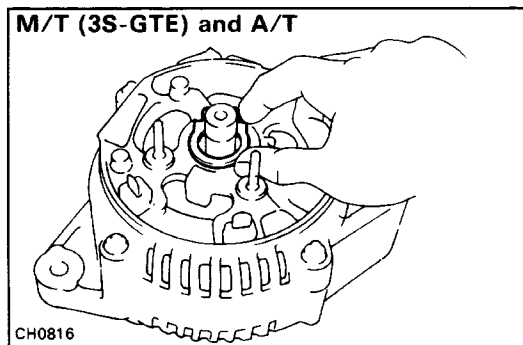
- (c) Check that SST (A) is secured to the pulley shaft.



- (d) As shown in the illustration mount SST (C) in a vise, and install the generator to SST (C).
- (e) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.

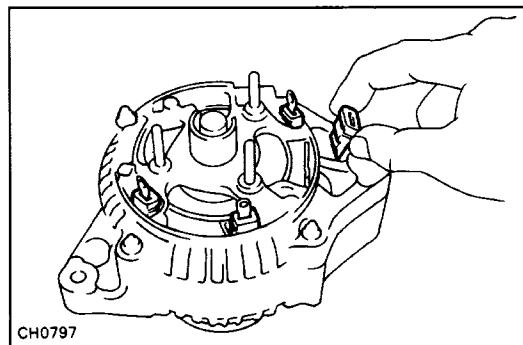
Torque: 110 N-m (1,125 kgf-cm, 81 ft-lbf)

- (f) Remove the generator from SST (C).
- (g) Turn SST (B) and remove SST (A and B).

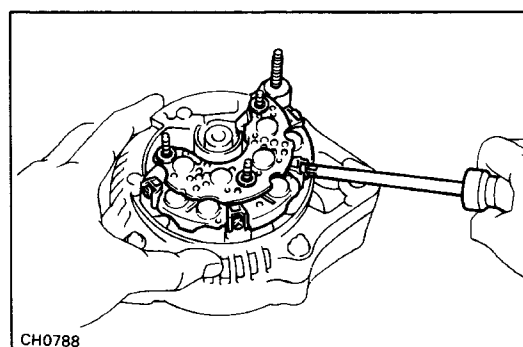


4. INSTALL RECTIFIER HOLDER

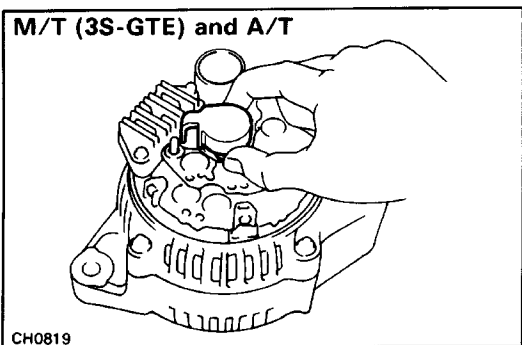
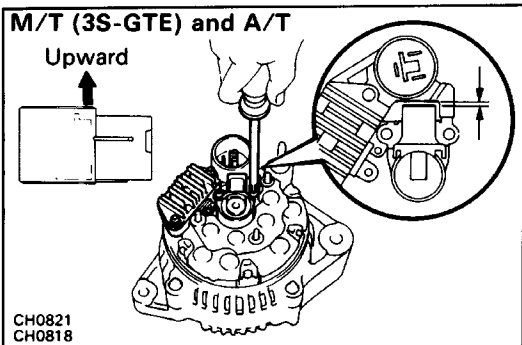
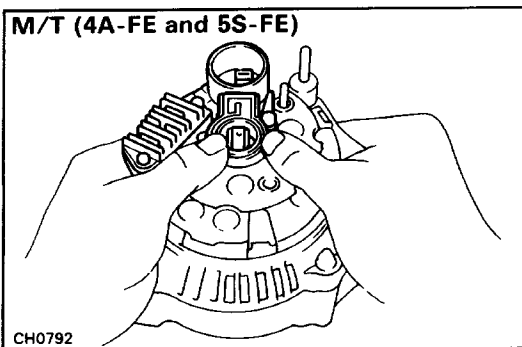
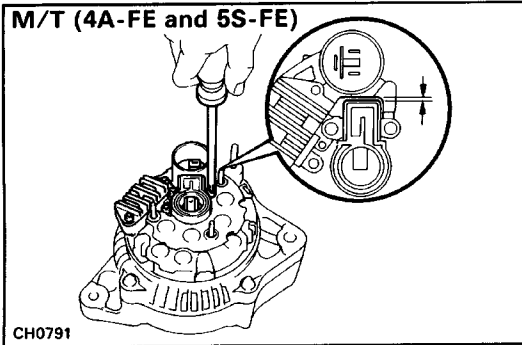
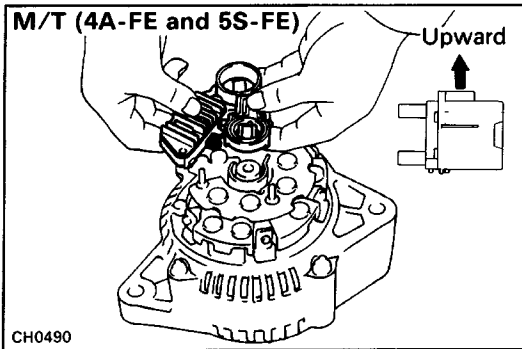
- (a) (M/T (3S-GTE) and A/T)
Place the seal plate on the rectifier end frame.



- (b) Install the four rubber insulators on the lead wires.



- (c) Install the rectifier holder with the four screws.



5. INSTALL IC REGULATOR AND BRUSH HOLDER (M/T (4A-FE and 5S-FE))

(a) Install the brush holder cover to the brush holder.

NOTICE: Be careful of the holder installation direction.

(b) Place the IC regulator together with the brush holder horizontally on the rectifier end frame.

(c) Install the five screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and connector.

(d) Fit the brush holder cover.

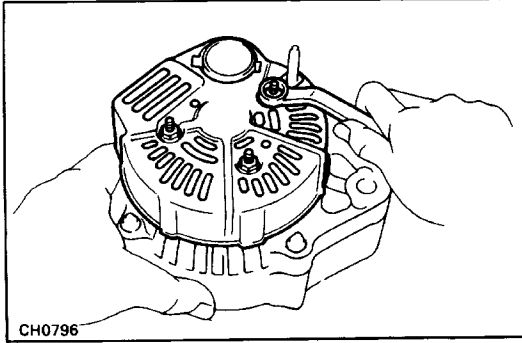
(M/T (3S-GTE) and A/T)

(a) Place the IC regulator and brush holder on the rectifier end frame.

NOTICE: Be careful of the holder installation direction.

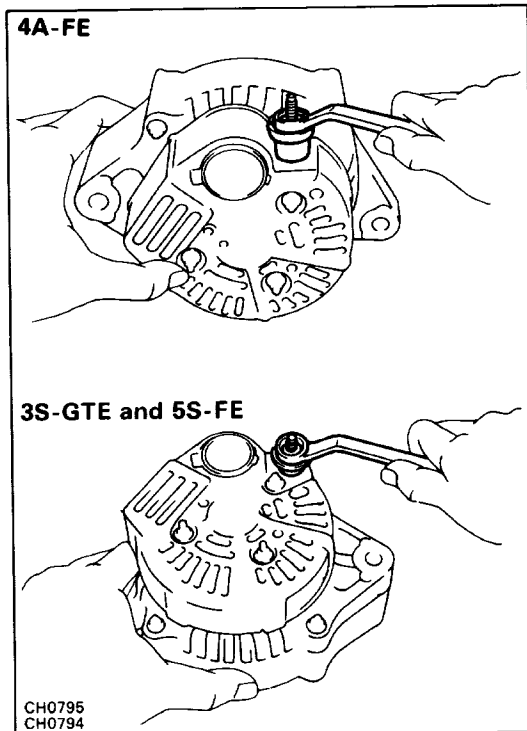
(b) Install the five screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and connector.

(c) Place the brush holder cover on the brush holder.

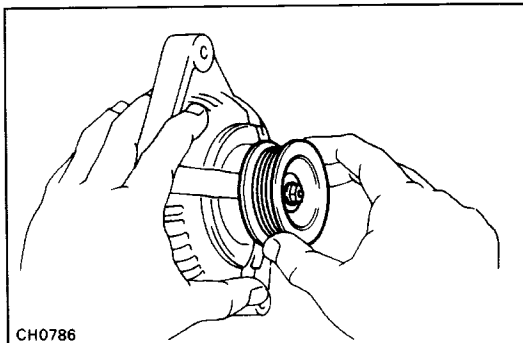


6. INSTALL REAR END COVER

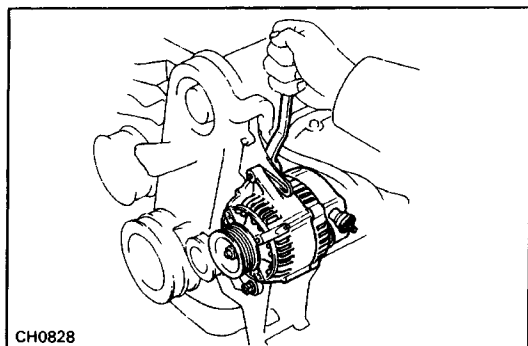
(a) Install the end cover with the three nuts.



(b) Install the terminal insulator with the nut.



7. CHECK THAT ROTOR ROTATES SMOOTHLY



CH0828

INSTALLATION OF GENERATOR (4A-FE)

(See page [CH-6](#))

1. INSTALL GENERATOR

- (a) Mount the generator on the generator brackets with the pivot bolt, nut and adjusting bolt. Do not tighten the bolt and nut yet.
- (b) Connect the generator connector.
- (c) Connect the generator wire with the nut.

2. INSTALL DRIVE BELT

Adjust the drive belt tension.

(See step 3 on page [CH-3](#))

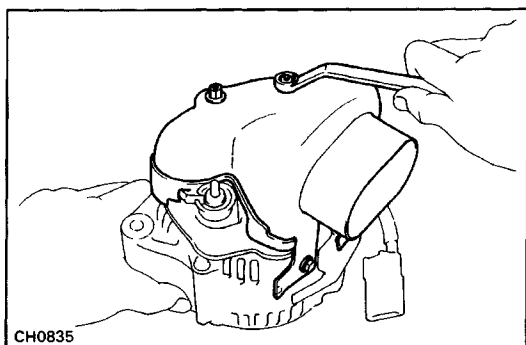
Drive belt tension: New belt 160 ± 20 lbf

Used belt 130 ± 20 lbf

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

4. PERFORM ON-VEHICLE INSPECTION

(See steps 5 to 7 on pages [CH-4](#) to 5)



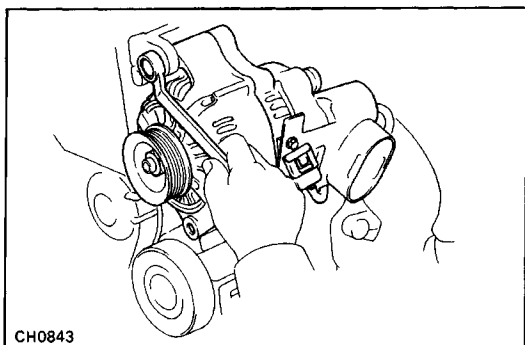
CH0835

INSTALLATION OF GENERATOR (3S-GTE)

(See page [CH-7](#))

1. INSTALL NO.7 GENERATOR DUCT

- (a) Install the generator lead wire.
- (b) Remove the generator duct with the two nuts.



CH0843

2. INSTALL GENERATOR

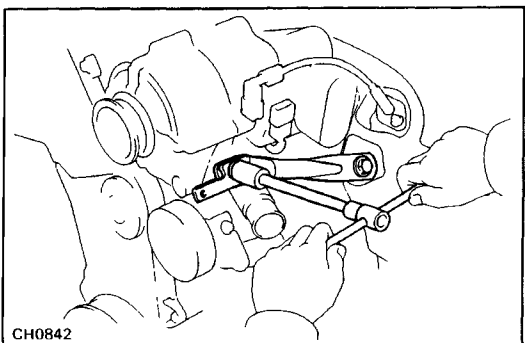
Install the generator with the two bolts.

Torque:

12 mm head bolt $19 \text{ N}\cdot\text{m}$ ($195 \text{ kgf}\cdot\text{cm}$, $14 \text{ ft}\cdot\text{lbf}$)

14 mm head bolt $52 \text{ N}\cdot\text{m}$ ($530 \text{ kgf}\cdot\text{cm}$, $38 \text{ ft}\cdot\text{lbf}$)

3. INSTALL ABS ACTUATOR COVER



CH0842

4. INSTALL NO.2 GENERATOR BRACKET

Install the generator bracket with the two bolts.

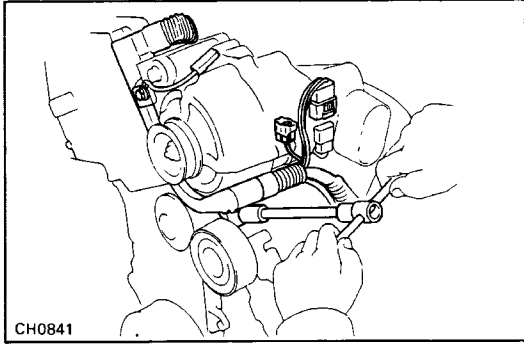
Torque:

To turbine outlet elbow

$43 \text{ N}\cdot\text{m}$ ($440 \text{ kgf}\cdot\text{cm}$, $32 \text{ ft}\cdot\text{lbf}$)

To No.1 generator bracket

$39 \text{ N}\cdot\text{m}$ ($400 \text{ kgf}\cdot\text{cm}$, $29 \text{ ft}\cdot\text{lbf}$)



5. INSTALL ENGINE WIRE

- (a) Install the engine wire and ground strap with the two bolts.
- (b) Connect the following connectors and wires:
 - Generator connector from lead wire
 - Generator wire
 - A/C compressor connector
 - Engine coolant temperature switch connector
 - Oxygen sensor wire clamp from No.1 generator duct
 - Oxygen sensor connector
 - Oxygen sensor connector (wiring harness side) from No.1 generator duct

6. INSTALL DRIVE BELT

Adjust the drive belt tension.

(See step 3 on page [CH-2](#))

Drive belt tension:

w/ A/C	New belt 165 ± 10 lbf
	Used belt 115 ± 20 lbf
w/o A/C	New belt 150 ± 25 lbf
	Used belt 130 ± 25 lbf

7. INSTALL A/C RELAY BOX TO BRACKET

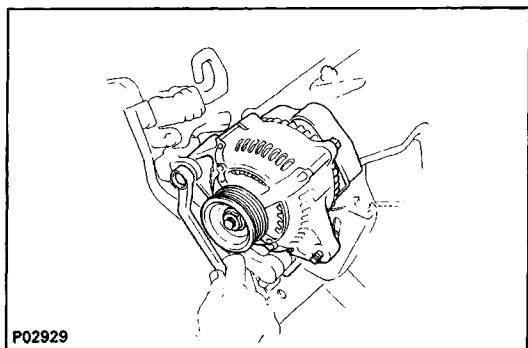
8. INSTALL ABS CONTROL RELAY TO RADIATOR

9. INSTALL NO.2 GENERATOR DUCT

10. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

11. PERFORM ON-VEHICLE INSPECTION

(See steps 5 to 7 on pages [CH-4](#) and 5)



INSTALLATION OF GENERATOR (5S-FE)

(See page [CH-9](#))

1. INSTALL GENERATOR

- (a) Mount the generator on the generator brackets with the pivot bolt and adjusting lock bolt. Do not tighten the bolts yet.
- (b) Connect the generator connector.
- (c) Connect the generator wire with the nut.

2. INSTALL DRIVE BELT

Adjust the drive belt tension.

(See step 3 on page [CH-3](#))

Drive belt tension:

w/ A/C	New belt 165 ± 10 lbf
	Used belt 110 ± 10 lbf
w/o A/C	New belt 125 ± 25 lbf
	Used belt 95 ± 20 lbf

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

4. PERFORM ON-VEHICLE INSPECTION

(See steps 5 to 7 on pages [CH-4](#) to 5)

SERVICE SPECIFICATIONS

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MAINTENANCE

Engine

Drive belt tension						
Alternator	4A-FE		New belt.	160 ± 20 lbf		
			Used belt	130 ± 20 lbf		
	3S-GTE	w/ A/C	New belt	165 ± 10 lbf		
		w/o A/C	Used belt	84 ± 15 lbf		
	5S-FE	w/ A/C	New belt	150 ± 25 lbf		
		w/o A/C	Used belt	130 ± 25 lbf		
	PS pump	w/ A/C	New belt	165 ± 10 lbf		
			Used belt	110 ± 10 lbf		
		w/o A/C	New belt	125 ± 25 lbf		
			Used belt	95 ± 20 lbf		
A/C compressor (4A-FE)		New belt	125 ± 25 lbf			
		Used belt	80 ± 20 lbf			
		Used belt	160 ± 25 lbf			
		Used belt	100 ± 20 lbf			
Engine coolant capacity (w/ Heater)						
4A-FE		M /T	5.2 liters	5.5 U S qts	4.6 Imp. qts	
		A/T	5.6 liters	5.9 U S qts	4.9 Imp. qts	
3S-GTE			6.5 liters	6.9 US qts	5.7 Imp. qts	
5S-FE		M /T	6.2 liters	6.6 US qts	5.5 Imp. qts	
		A/T	6.1 liters	6.4 U S qts	5.4 Imp. qts	
Engine oil capacity (Drain and refill)						
4A-FE		w/ Oil filter change	3.2 liters	3.3 US qts	2.8 Imp. qts	
		w/o Oil filter change	3.0 liters	3.1 U S qts	3.4 Imp. qts	
3S-GTE		w/ Oil filter change	3.9 liters	4.1 U S qts	3.4 Imp. qts	
5S-FE	w/ Oil cooler	w/o Oil filter change	3.6 liters	3.8 US qts	3.2 Imp. qts	
		w/ Oil filter change	4.2 liters	4.4 U S qts	3.7 Imp. qts	
	w/o Oil cooler	w/o Oil filter change	3.8 liters	4.0 U S qts	3.3 Imp. qts	
		w/ Oil filter change	4.1 liters	4.3 US qts	3.6 Imp. qts	
		w/o Oil filter change	3.7 liters	3.9 U S qts	3.3 Imp. qts	
Spark plug						
Type	4A-FE		ND	Q16R-U		
			NGK	BCPR5EY		
	3S-GTE		ND	PK20R8		
5S-FE			NGK	BKR6EP8		
			ND	PK20R11		
Gap	4A-FE and 3S-GTE		NGK	BKP6EP-11	0.031 in.	
	5S-FE			0.8 mm	0.043 in.	
				1.1 mm		
Firing order						
Valve clearance	4A-FE	Intake	1 - 3 - 4 - 2		0.006-0.010 in.	
		Exhaust			0.008-0.012 in.	
	3S-GTE	Intake	0.15 - 0.25 mm			0.006 - 0.010 in.
		Exhaust	0.20 - 0.30 m m			0.011 - 0.015 in.
	5S-FE	Intake	0.15 - 0.25 m m			0.007 - 0.011 in.
		Exhaust	0.28 - 0.38 m m			0.011 - 0.015 in.
Idle speed (4A-FE)						
		Intake	0.19 - 0.29 m m			
		Exhaust	0.28 - 0.38 mm			
			800 rpm			

Chassis

Brake pads and disc					
Pad thickness		Limit	1.0 mm	0.039 in.	
Disc thickness	Limit	Front	23.0 mm	0.906 in.	
		Rear	9.0 mm	0.354	
Disc runout	Limit	Front	0.07 mm	in.	
		Rear	0.15 mm	0.0028 in.	
Brake linings and drums					
Lining thickness		Limit	1.0 mm	0.039 in.	
Drum inside diameter	Limit	Drum brake	201.0 mm	7.913 in.	
		Disc brake	171.0 mm	6.732 in.	
Front axle and suspension					
Ball joint vertical play		Limit	0 mm	0 in.	
Steering wheel play			30 mm	1.18 in.	
Torque specifications					
Front seat mounting bolts			37 N-m	375 kgf-cm	27 ft-lbf
Engine mounting center member-to-body mounting bolts			73 N-m	740 kgf-cm	54 ft-lbf
Front suspension lower crossmember-to-body mounting bolts			152 N-m	1,550 kgf-cm	112 ft-lbf
Rear suspension lower crossmember-to-body mounting bolts			159 N-m	1,620 kgf-cm	117 ft-lbf

ENGINE MECHANICAL (4A–FE)

Specifications

Intake manifold vacuum	at idle speed		60 kPa	450 mmHg	17.7 in.Hg
Compression pressure	at 250 rpm	STD	1,320 kPa (13.5 kgf/cm ² , 191 psi) or more		
	Difference of pressure between each cylinder	Limit	981 kPa 10.0 kgf/cm ² , 142 psi 98 kPa (1.0 kgf/cm ² , 14 psi) or less		
Idler pulley tension spring	Free length		38.4 mm	1.512 in.	
	Installed load at 51.9 mm (2.043 in.)		35 – 39 N	3.6 – 4.0 kgf 7.9 – 8.8 lbf	
Cylinder head	Warpage Cylinder block side	Limit	0.05 mm	0.020 in.	
	Manifold side	Limit	0.10 mm	0.039 in.	
	Valve seat Refacing angle		30°, 45°, 60°		
	Contacting angle		45°		
	Contacting width		1.2 – 1.6 mm	0.047 – 0.063 in.	
Valve guide bushing	Inside diameter		6.010 – 6.030 mm		0.2366 – 0.2374 in.
	Outside diameter (for repair part)	STD	11.048 – 11.059 mm		0.4350 – 0.4354 in.
		O/S 0.05	11.098 – 11.109 mm		0.4369 – 0.4374 in.

Specifications (Cont'd)

Valve	Valve overall length	STD	Intake	91.45 mm	3.6004 in.
			Exhaust	91.90 mm	3.6181 in.
	Valve face angle	Limit	Intake	90.95 mm	3.5807 in.
			Exhaust	91.40 mm	3.5984 in.
	Stem diameter			44.5°	
	Stem oil clearance	STD	Intake	5.970 – 5.985 mm	0.2350 – 0.2356 in.
			Exhaust	5.965 – 5.980 mm	0.2348 – 0.2354 in.
		Limit	Intake	0.025 – 0.060 mm	0.0010 – 0.0024 in.
			Exhaust	0.030 – 0.065 mm	0.0012 – 0.0026 in.
	Margin thickness	Limit	Intake	0.08 mm	0.0031 in.
Exhaust			0.10 mm	0.0039 in.	
STD		Intake	0.8 – 1.2 mm	0.031 – 0.047 in.	
		Limit	Exhaust	0.5 mm	0.020 in.
Valve spring	Squareness		Limit	2.0 mm 0.079 in.	
	Free length			43.8 mm 1.774 in.	
	Installed tension at 34.7 mm (1.366 in.)			143 – 155 N (14.6 – 15.8 kgf, 32.2 – 34.8 lbf)	
Valve lifter	Lifter diameter			27.975 – 27.985 mm	1.1014 – 1.1018 in.
	Lifter bore diameter			28.005 – 28.026 mm	1.1026 – 1.1034 in.
	Oil clearance		STD	0.020 – 0.051 mm	0.0008 – 0.0020 in.
			Limit	0.07 mm	0.0028 in.
Manifold	Warpage	Limit	Intake	0.20 mm	0.0079 in.
			Exhaust	0.30 mm	0.0118 in.
Camshaft and gear	Thrust clearance	STD	Intake	0.030 – 0.085 mm	0.0012 – 0.0033 in.
			Exhaust	0.035 – 0.090 mm	0.0014 – 0.0035 in.
	Journal oil clearance	Limit		0.11 mm	0.0043 in.
			STD	0.035 – 0.072 mm	0.0014 – 0.0028 in.
	Journal diameter	Limit		0.10 mm	0.0039 in.
			Exhaust No.1	24.949 – 24.965 mm	0.9822 – 0.9829 in.
	Circle runout	Others		22.949 – 22.965 mm	0.9035 – 0.9041 in.
			Limit	0.04 mm	0.0016 in.
	Cam lobe height	STD	Intake	35.210 – 35.310 mm	1.3862 – 1.3902 in.
			Exhaust	34.910 – 35.010 mm	1.3744 – 1.3783 in.
	Camshaft gear backlash	Limit	Intake	34.81 mm	1.3705 in.
			Exhaust	34.51 mm	1.3587 in.
Camshaft gear spring end free distance	STD		0.020 – 0.200 mm	0.0008 – 0.0079 in.	
		Limit	0.30 mm	0.0188 in.	
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm	0.0020 in.
	Cylinder bore diameter	STD	Mark 1	81.000 – 81.010 mm	3.1890 – 3.1894 in.
			Mark 2	81.010 – 81.020 mm	3.1894 – 3.1898 in.
			Mark 3	81.020 – 81.030 mm	3.1898 – 3.1902 in.
	Limit	STD	81.23 mm	3.1980 in.	
		O/S 0.50	81.73 mm	3.2177 in.	

Specifications (Cont'd)

Piston and piston ring	Piston diameter	STD	Mark 1	80.930 – 80.940 mm	3.1862 – 3.1866 in.
			Mark 2	80.940 – 80.950 mm	3.1866 – 3.1870 in.
			Mark 3	80.950 – 80.960 mm	3.1870 – 3.1874 in.
		0/S 0.50		81.430 – 81.460 mm	3.2059 – 3.2071 in.
	Piston oil clearance	STD		0.060 – 0.080 mm	0.0024 – 0.0031 in.
		Limit		0.10 mm	0.0039 in.
	Piston ring groove clearance	No.1		0.040 – 0.081 mm	0.0016 – 0.0032 in.
		No.2		0.030 – 0.070 mm	0.0012 – 0.0028 in.
	Piston ring end gap	STD	No.1	0.250 – 0.450 mm	0.0098 – 0.0177 in.
			No.2	0.150 – 0.400 mm	0.0059 – 0.0157 in.
			Oil	0.100 – 0.700 mm	0.0039 – 0.0276 in.
		Limit	No.1	1.05 mm	0.0413 in.
		No.2	1.00 mm	0.0394 in.	
		Oil	1.30 mm	0.0512 in.	
Connecting rod	Thrust clearance	STD		0.150 – 0.250 mm	0.0059 – 0.0098 in.
		Limit		0.30 mm	0.0118 in.
	Connecting rod bearing center wall thickness	STD	Mark 1	1.486 – 1.490 mm	0.0585 – 0.0587 in.
			Mark 2	1.490 – 1.494 mm	0.0587 – 0.0588 in.
			Mark 3	1.494 – 1.498 mm	0.0588 – 0.0590 in.
	Connecting rod oil clearance	STD	STD	0.020 – 0.051 mm	0.0008 – 0.0020 in.
			U/S 0.25	0.019–0.065 mm	0.0007 – 0.0026 in.
		Limit		0.08 mm	0.0031 in.
			Rod bending Limit per 100 mm (3.94 in.)	0.05 mm	0.0020 in.
			Rod twist Limit per 100 mm (3.94 in.)	0.05 mm	0.0020 in.
Crankshaft	Thrust clearance			0.020 – 0.220 mm	0.0008 – 0.0087 in.
		Limit		0.30 mm	0.0118 in.
	Thrust washer thickness			2.440 – 2.490 mm	0.0961 – 0.0980 in.
	Main journal oil clearance	STD	STD	0.015–0.033 mm	0.0006 – 0.0013 in.
			U/S 0.25	0.018 – 0.056 mm	0.0007 – 0.0022 in.
		Limit		0.10 mm	0.0039 in.
	Main journal diameter	STD		47.982 – 48.000 mm	1.8891 – 1.8898 in.
		U/S 0.25		47.745 – 47.755 mm	1.8797 – 1.8881 in.
	Main bearing center wall thickness	STD	Mark 1	2.002 – 2.005 mm	0.0788 – 0.0789 in.
			Mark 2	2.005 – 2.008 mm	0.0789 – 0.0791 in.
			Mark 3	2.008 – 2.011 mm	0.0791 – 0.0792 in.
			Mark 4	2.011 – 2.014 mm	0.0792 – 0.0793 in.
			Mark 5	2.014 – 2.017 mm	0.0793 – 0.0794 in.
	Crank pin diameter	STD		39.985 – 40.000 mm	1.5742 – 1.5748 in.
		U/S 0.25		39.745 – 39.755 mm	1.5648 – 1.5652 in.
Circle runout	Limit		0.06 mm	0.0024 in.	
Main journal taper and out-of-round	Limit		0.02 mm	0.0008 in.	
Crank pin taper and out-of-round	Limit		0.02 mm	0.0008 in.	

Torque Specifications

Part tightened	N·m	kgf-cm	ft-lbf
Crankshaft pulley x Crankshaft	118	1,200	87
Camshaft timing pulley x Camshaft	59	600	43
Idler pulley x Cylinder block	37	375	27
Cylinder head x Cylinder block	60	610	44
Camshaft bearing cap x Cylinder head	13	130	9
PS drive belt adjusting strut x Cylinder head	39	400	29
Engine hanger x Cylinder head	27	280	20
Fan belt adjusting bar x Cylinder head	20	200	14
Cylinder head cover x Cylinder head	7.8	80	69 in.-lbf
Intake manifold x Cylinder head	19	195	14
Intake manifold stay x Intake manifold	19	195	14
Intake manifold stay x Cylinder block	39	400	29
EGR valve x Intake manifold	13	130	9
ACV x Intake manifold	13	130	9
Water inlet housing x Cylinder head	20	200	14
Water outlet x Cylinder head	15	150	11
Exhaust manifold x Cylinder head	25	250	18
Exhaust manifold stay x Exhaust manifold	39	400	29
Exhaust manifold stay x Cylinder block	39	400	29
Main bearing cap x Cylinder block	60	610	44
Connecting rod cap x Connecting rod	49	500	36
Rear oil seal retainer x Cylinder block	9.3	95	82 in.-lbf
PS pump bracket x Cylinder block	19	195	14
RH engine mounting bracket x Cylinder block	51	525	38
Alternator bracket x Cylinder block	39	400	29
Rear end plate x Cylinder block	9.3	95	82 in.-lbf
Flywheel (M/T) x Crankshaft	78	800	58
Drive plate (A/T) x Crankshaft	64	650	47
LH engine mounting bracket x Transaxle	52	530	38
LH engine mounting insulator x LH mounting bracket	48	490	35
LH engine mounting insulator x Body	87	890	64
R H engine mounting insulator x R H mounting bracket	52	530	38
	Nut		
	Bolt		
	52	530	38
	64	650	47
RH engine mounting insulator x Body	87	890	64
R H engine mounting stay x R H mounting insulator	42	430	31
RH engine mounting stay x PS drive belt adjusting strut	42	430	31
LH engine mounting stay x Transaxle	21	210	15
LH engine mounting stay x LH mounting insulator	21	210	15
Front engine mounting bracket x Transaxle	77	790	57
Rear engine mounting bracket x Transaxle	77	790	57
Engine mounting center member x Body	52	530	38
Engine mounting center member x Front mounting insulator	64	650	47
Engine mounting center member x Rear mounting insulator	64	650	47
Front engine mounting bracket x Front mounting insulator	87	890	64
Rear engine mounting bracket x Rear mounting insulator	87	890	64

Torque Specifications (Cont'd)

Part tightened	N-m	kgf-cm	ft-lbf
PS pump x Bracket	39	400	29
A/C compressor x Bracket	25	250	18
Suspension lower crossmember x Body	152	1,550	112

ENGINE MECHANICAL (3S-GTE)

Specifications

Idle speed				800 ± 50 rpm
Intake manifold vacuum	at idle speed			60 kPa 450 mmHg 17.7 in.Hg
Compression	at 250 rpm	STD Limit		1,128 kPa (11.5 kgf/cm ² , 164 psi) or more 883 kPa 9.0 kgf/cm ² 128 psi 98 kPa (1.0 kgf/cm ² , 14 psi) or less
	Difference of pressure between each cylinder			
Timing belt tensioner	Protrusion			8.5 – 9.5 m m 0.335 – 0.374 in.
Cylinder head	warpage	Cylinder block side	Limit	0.20 mm 0.0079 in.
		Intake manifold side	Limit	0.20 mm 0.0079 in.
		Exhaust manifold side	Limit	0.30 mm 0.0118 in.
	Valve seat	Refacing angle		30°, 45°, 75°
		Contacting angle		45°
	Contacting width			1.0 – 1.4 mm 0.039 – 0.055 in.
Valve guide bushing	Inside diameter			6.000 – 6.018 mm 0.2362 – 0.2369 in.
	Outside diameter (for repair part)	STD		11.030 – 11.041 mm 0.4343 – 0.4347 in.
		O/S 0.05		11.080 – 11.091 mm 0.4362 – 0.4367 in.
Valve	Valve overall length	STD	Intake	100.50 m m 3.9567 in.
			Exhaust	99.55 mm 3.9193 in.
		Limit	Intake	99.80 m m 3.9291 in.
			Exhaust	98.85 mm 3.8917 in.
	Valve face angle			44.5°
	Stem diameter		Intake	5.960 – 5.975 mm 0.2346 – 0.2352 in.
			Exhaust	5.955 – 5.970 mm 0.2344 – 0.2350 in.
	Stem oil clearance	STD	Intake	0.025 – 0.058 mm 0.0010 – 0.0023 in.
			Exhaust	0.030 – 0.063 mm 0.0012 – 0.0025 in.
		Limit	Intake	0.08 mm 0.0031 in.
Exhaust			0.10 mm 0.0039 in.	
Margin thickness	STD		0.8 – 1.2 mm 0.031 – 0.047 in.	
	Limit		0.5 mm 0.020 in.	
Valve spring	Squareness	Limit		2.0 mm 0.079 in.
	Free length			44.43 mm 1.7492 in.
	Installed tension at 34.4 mm (1.354 in.)			201 – 236 N (20.5 – 24.1 kgf, 45.2 – 53.1 lbf)

Specifications (Cont'd)

Valve lifter	Lifter diameter Lifter bore diameter Oil clearance	STD Limit	30.975 – 30.985 mm 1.2195 – 1.2199 in. 31.000 – 31.021 mm 1.2205 – 1.2213 in. 0.015 – 0.046 mm 0.0006 – 0.0018 in. 0.07 mm 0.0028 in.
Manifold	Warpage	Limit	0.20 mm 0.0079 in.
Camshaft	Thrust clearance Journal oil clearance Journal diameter Circle runout Cam lobe height	STD Limit STD Limit STD Limit	0.120 – 0.240 mm 0.0047 – 0.0094 in. 0.30 mm 0.0118 in. 0.025 – 0.062 mm 0.0010 – 0.0024 in. 0.08 mm 0.0031 in. 26.959 – 26.975 mm 1.0614 – 1.0620 in. 0.06 mm 0.0024 in. 41.010–41.110mm 1.6146–1.6185 in. 41.090 – 41.190 mm 1.6177 –1.6217 in. 39.90 mm 1.5709 in. 39.98 mm 1.5740 in.
T-VIS valve	Warpage	Limit	0.20 mm 0.0079 in.
Cylinder block	Cylinder head surface warpage Cylinder bore diameter	Limit STD	0.05 mm 0.0020 in. 86.000 – 86.010 mm 3.3858 – 3.3862 in. 86.010 – 86.020 mm 3.3862 – 3.3866 in. 86.020 – 86.030 mm 3.3866 – 3.3870 in. 86.23 mm 3.3949 in.
Piston and piston ring	Piston diameter Piston oil clearance Piston ring groove clearance Piston ring end gap	Mark 1 Mark 2 Mark 3 STD Limit No.1 No.2 STD No.1 No.2 Oil Limit No.1 No.2 Oil	85.920 – 85.930 mm 3.3827 – 3.3831 in. 85.930 – 85.940 mm 3.3831 – 3.3835 in. 85.940 – 85.950 mm 3.3835 – 3.3839 in. 0.070 – 0.090 mm 0.0028 – 0.0035 in. 0.110 mm 0.0043 in. 0.040 – 0.080 mm 0.0016 – 0.0031 in. 0.030 – 0.070 mm 0.0012 – 0.0028 in. 0.330 – 0.550 mm 0.0130 – 0.0217 in. 0.450 – 0.670 mm 0.0177 – 0.0264 in. 0.200 – 0.600 mm 0.0079 – 0.0236 in. 0.85 mm 0.0335 in. 0.97 mm 0.0382 in. 0.90 mm 0.0354 in.
Connecting rod	Thrust clearance Limit Connecting rod bearing center wall thickness Connecting rod oil clearance Rod bending Limit per 100 mm (3.94 in.) Rod twist Limit per 100 mm (3.94 in.)	STD Limit STD STD Limit	0.160 – 0.312 mm 0.0063 – 0.0123 in. 0.35 mm 0.0138 in. 1.484 – 1.488 mm 0.0584 – 0.0586 in. 1.488 – 1.492 mm 0.0586 – 0.0587 in. 1.492 – 1.496 mm 0.0587 – 0.0589 in. 0.024 – 0.055 mm 0.0009 – 0.0022 in. 0.023 – 0.069 mm 0.0009 – 0.0027 in. 0.08 mm 0.0031 in. 0.05 mm 0.0020 in. 0.15 mm 0.0059 in.

Specifications (Cont'd)

Connecting rod (cont'd)	Bushing inside diameter		22.005 – 22.017 mm	0.8663 – 0.8668 in.
	Piston pin diameter		21.997 – 22.009 mm	0.8660 – 0.8665 in.
	Piston pin oil clearance	STD	0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit	0.05 mm	0.0020 in.
Crankshaft	Thrust clearance	STD	0.020 – 0.220 mm	0.0008 – 0.0087 in.
		Limit	0.30 mm	0.0118 in.
	Thrust washer thickness		2.440 – 2.490 mm	0.0961 – 0.0980 in.
	Main journal oil clearance			
	STD	No-3 STD	0.025 – 0.044 mm	0.0010 – 0.0017 in.
		U/S 0.25	0.021 – 0.061 mm	0.0008 – 0.0024 in.
		Others STD	0.015 – 0.034 mm	0.0006 – 0.0013 in.
		U/S 0.25	0.029 – 0.069 mm	0.0011 – 0.0027 in.
	Limit		0.08 mm	0.0031 in.
	Main journal diameter	STD	54.988 – 55.003 mm	2.1653 – 2.1655 in.
		U/S 0.25	54.745 – 54.755 mm	2.1553 – 2.1557 in.
	Main bearing center wall thickness			
		STD No.3		
		Mark 1	1.992 – 1.995 mm	0.0784 – 0.0785 in.
		Mark 2	1.995 – 1.998 mm	0.0785 – 0.0787 in.
		Mark 3	1.998 – 2.001 mm	0.0787 – 0.0788 in.
		Mark 4	2.001 – 2.004 mm	0.0788 – 0.0789 in.
		Mark 5	2.004 – 2.007 mm	0.0789 – 0.0790 in.
		Others		
		Mark 1	1.997 – 2.000 mm	0.0786 – 0.0787 in.
	Mark 2	2.000 – 2.003 mm	0.0787 – 0.0789 in.	
	Mark 3	2.003 – 2.006 mm	0.0789 – 0.0790 in.	
	Mark 4	2.006 – 2.009 mm	0.0790 – 0.0791 in.	
	Mark 5	2.009 – 2.012 mm	0.0791 – 0.0792 in.	
Crank pin diameter	STD	47.985 – 48.000 mm	1.8892 – 1.8898 in.	
	U/S 0.25	47.745 – 47.755 mm	1.8797 – 1.8801 in.	
	Limit	0.06 mm	0.0024 in.	
Circle runout	Limit	0.02 mm	0.0008 in.	
Main journal taper and out-of-round	Limit	0.02 mm	0.0008 in.	
Crank pin taper and out-of-round	Limit	0.02 mm	0.0008 in.	

Torque Specifications

Part tightened		N·m	kgf-cm	ft-lbf
Oil pump pulley x Oil pump drive shaft		35	355	26
No.2 idler pulley x Cylinder block		43	440	32
No.1 idler pulley bracket x Cylinder head		52	530	38
Crankshaft pulley x Crankshaft		108	1,100	80
Camshaft timing pulley x Camshaft		59	600	43
Timing belt tensioner x Cylinder head	For SST	41	420	30
Cylinder head x Cylinder block	1st	21	210	15
	2nd	49	500	36
Camshaft bearing cap x Cylinder head	Turn 90°	19	190	14
No.3 timing belt cover x Cylinder head		8.8	90	78 in.-lbf

Torque Specifications (Cont'd)

Part tightened	N·m	kgf-cm	ft-lbf	
Cylinder head cover x Cylinder head	2.5	25	21 in-lbf	
Intake manifold x Cylinder head	19	195	14	
Intake manifold stay x Intake manifold	25	260	19	
Intake manifold stay x Cylinder block	25	260	19	
Water by-pass pipe x Water pump cover	7.8	80	69 in-lbf	
Water outlet x Cylinder head	39	400	29	
EGR valve x Intake manifold	19	195	14	
EGR pipe x Cylinder head	25	260	19	
LH engine hanger x Cylinder head	12 mm head bolt	19	195	14
	14 mm head bolt	39	400	29
Exhaust manifold x Cylinder head	52	530	38	
Catalytic converter x Turbine outlet elbow	29	300	22	
Catalytic converter stay x Catalytic converter	59	600	43	
No.1 alternator bracket x Cylinder head	39	400	29	
Main bearing cap x Cylinder block	59	600	43	
Connecting rod cap x Connecting rod	67	680	49	
Rear oil seal retainer x Cylinder block	9.3	95	82 in-lbf	
Knock sensor x Cylinder block	44	450	33	
RH engine mounting bracket x Cylinder block	52	530	38	
PS pump bracket x Cylinder block	43	440	32	
Rear end plate x Cylinder block	9.3	95	82 in-lbf	
Flywheel x Crankshaft	108	1,100	80	
LH engine mounting bracket x Transaxle	52	530	38	
LH engine mounting insulator x LH mounting bracket	63	650	47	
LH engine mounting insulator x Body	87	890	64	
RH engine mounting insulator x RH mounting bracket	52	530	38	
RH engine mounting insulator x Body	87	890	64	
RH engine mounting stay x RH mounting insulator	73	740	54	
RH engine mounting stay x No.1 alternator bracket	73	740	54	
LH engine mounting stay x LH mounting insulator	21	210	15	
LH engine mounting stay x Transaxle	21	210	15	
Front engine mounting bracket x Transaxle	77	790	57	
Rear engine mounting bracket x Transaxle	77	790	57	
Engine mounting center member x Body	52	530	38	
Engine mounting center member x Front mounting insulator	73	740	54	
Engine mounting center member x Rear mounting insulator	73	740	54	
Front engine mounting insulator x Front mounting insulator	87	890	64	
Rear engine mounting insulator x Rear mounting insulator	87	890	64	
PS pump x PS pump bracket	Adjusting bolt	39	400	29
	Others	43	440	32
A/C compressor x Cylinder block	27	280	20	
Suspension lower crossmember x Body	152	1,550	112	
Transaxle oil cooler tube x Oil cooler hose	34	350	25	
Suspension upper brace x Body	Bolt	21	210	15
	Nut	64	650	47

ENGINE MECHANICAL (5S–FE)

Specifications

Idle speed		USA CANADA	700 ± 50 rpm 750 ± 50 rpm	
Intake manifold vacuum	at idle speed		60 kPa 450 mmHg 17.7 in.Hg	
Compression pressure	at 250 rpm Difference of pressure between each cylinder	STD Limit	1,226 kPa (12.5 kgf/cm ² , 178 psi) or more 981 kPa 10.0 kgf/cm ² 142 psi 98 kPa (1.0 kgf/cm ² , 14 psi) or less	
Idler pulley tension spring	Free length at 51.9 mm (2.043 in.) Installed load		46.0 mm 1.811 in. 32–37 N 3.25–3.75 kgf 7.2–8.3 lbf	
Cylinder head	Warpage Cylinder block side Manifold side Valve seat Refacing angle Contacting angle Contacting width	Limit Limit	0.05 mm 0.020 in. 0.08 mm 0.031 in. 30°, 45°, 75° 45° 1.0 – 1.4 mm 0.039 – 0.055 in.	
Valve guide bushing	Inside diameter Outside diameter (for repair part)	STD O/S 0.05	6.010 – 6.030 mm 0.2366 – 0.2374 in. 11.033 – 11.044 mm 0.4344 – 0.4348 in. 11.083 – 11.094 mm 0.4363 – 0.4368 in.	
Valve	Valve overall length Valve face angle Stem diameter Stem oil clearance Margin thickness	STD Limit STD Limit	Intake Exhaust Intake Exhaust Intake Exhaust Intake Exhaust Intake Exhaust STD Limit	97.60 m m 3.8425 in. 98.45 m m 3.8760 in. 97.1 mm 3.823 in . 98.0 mm 3.858 in. 44.5° 5.970 – 5.985 mm 0.2350 – 0.2356 in. 5.965 – 5.980 mm 0.2348 – 0.2354 in. 0.025 – 0.060 mm 0.0010 – 0.0024 in. 0.030 – 0.065 mm 0.0012 – 0.0026 in. 0.08 mm 0.0031 in. 0.10 mm 0.0039 in. 0.8 – 1.2 mm 0.031 – 0.047 in. 0.5 mm 0.020 in.
Valve spring	Squareness Free length Installed tension at 34.7 mm (1.366 in.)	Limit	2.0 mm 0.079 in. 41.96 – 41.99 mm 1.6520 1.6520 – 1.6531 in. 164 – 189 N 0 6.7 – 19.3 kgf, 36.8 – 42.5 lbf)	
Valve lifter	Lifter diameter Lifter bore diameter Oil clearance	STD Limit	30.966 – 30.976 mm 1.2191 – 1.2195 in. 31.000 – 31.018 mm 1.2205 – 1.2213 in. 0.024 – 0.052 mm 0.0009 – 0.0020 in. 0.07 mm 0.0028 in.	
Manifold	Warpage	Limit	0.30 mm 0.0118 in.	

Specifications (Cont'd)

Camshaft	Thrust clearance	STD	Intake	0.045 – 0.100 mm 0.0018 – 0.0039 in.
			Exhaust	0.030 – 0.085 mm 0.0012 – 0.0033 in.
	Journal oil clearance	Limit	Intake	0.12 mm
			Exhaust	0.0047 in.
	Journal diameter	STD		0.10 mm 0.0039 in.
		Limit		0.025 – 0.062 mm 0.0010 – 0.0024 in.
	Circle runout Limit			0.10 mm 0.0039 in.
				26.959 – 26.975 mm 1.0614 – 1.0620 in.
	Cam lobe height STD Intake			0.04 mm 0.0016 in.
				42.010 – 42.110 mm 1.6539 – 1.6579 in.
	Exhaust			40.060 – 40.160 mm 1.5772 – 1.5811 in.
			41.90 mm 1.6496 in.	
Camshaft gear backlash STD			39.95 mm 1.5728 in.	
	Limit		0.020 – 0.200 mm 0.0008 – 0.0079 in.	
Camshaft gear spring end free distance			0.30 mm 0.0188 in.	
			22.5 – 22.9 mm 0.886 – 0.902 in.	
Cylinder block	Cylinder head surface warpage	Limit		0.05 mm 0.0020 in.
	Cylinder bore diameter STD	Mark 1		87.000 – 87.010 mm 3.4252 – 3.4256 in.
		Mark 2		87.010 – 87.020 mm 3.4256 – 3.4260 in.
		Mark 3		87.020 – 87.030 mm 3.4260 – 3.4264 in.
Limit	STD		87.23 mm 3.4342 in.	
	O/S 0.50		87.73 mm 3.4350 in.	
Piston and piston ring	Piston diameter	STD	Mark 1	86.850 – 86.860 mm 3.4193 – 3.4197 in.
			Mark 2	86.860 – 86.870 mm 3.4197 – 3.4201 in.
			Mark 3	86.870 – 86.880 mm 3.4201 – 3.4205 in.
	Piston oil clearance	O/S 0.50		87.350 – 87.380 mm 3.4390 – 3.4402 in.
		STD		0.140 – 0.160 mm 0.0055 – 0.0063 in.
	Piston ring groove clearance	Limit		0.18 mm 0.0071 in.
			No.1	0.040 – 0.080 mm 0.0016 – 0.0031 in.
	Piston ring end gap		No.2	0.030 – 0.070 mm 0.0012 – 0.0028 in.
		STD	No.1	0.270–0.500 mm 0.0106–0.0197 in.
	Limit		No.2	0.350 – 0.600 mm 0.0138 – 0.0234 in.
			Oil	0.200 – 0.550 mm 0.0079 – 0.0217 in.
		No.1	1.10 mm 0.0433 in.	
Connecting rod	Thrust clearance STD			0.160 – 0.312 mm 0.0063 – 0.0123 in.
		Limit		0.35 mm 0.0138 in.
	Connecting rod bearing center wall thickness	STD	Mark 1	1.484 – 1.488 mm 0.0584 – 0.0586 in.
			Mark 2	1.488 – 1.492 mm 0.0586 – 0.0587 in.
			Mark 3	1.492 – 1.496 mm 0.0587 – 0.0589 in.
	Connecting rod oil clearance	STD	STD	0.024 – 0.055 mm 0.0009 – 0.0022 in.
		Limit	U/S 0.25	0.023 – 0.069 mm 0.0009 – 0.0027 in.
	Rod bending Limit per 100 mm (3.94 in.)			0.08 mm 0.0031 in.
				0.05 mm 0.0020 in.
	Rod twist Limit per 100 mm (3.94 in.)			0.15 mm 0.0059 in.
			22.005 – 22.017 mm 0.8663 – 0.8668 in.	
Bushing inside diameter				

Specifications (Cont'd)

Connecting rod (cont'd)	Piston pin diameter			21.997 – 22.009 mm	0.8660 – 0.8665 in.	
	Piston pin oil clearance	STD		0.005 – 0.011 mm	0.0002 – 0.0004 in.	
	Limit			0.05 mm	0.0020 in.	
	Connecting rod bolt outside diameter	STD		7.860 – 8.000 mm	0.3094 – 0.3150 in.	
		Limit		7.60 mm	0.2992 in.	
Crankshaft	Thrust clearance	STD		0.020 – 0.220 mm	0.0008 –	
		Limit		0.30 mm	0.0087 in.	
	Thrust washer thickness			2.440 – 2.490 mm	0.0118 in.	
	Main journal oil clearance				0.0961 – 0.0980 in.	
		STD	No. 3	STD	0.025 – 0.044 mm	0.0010 – 0.0017 in.
				U/S 0.25	0.027 – 0.067 mm	0.0011 – 0.0026 in.
			Others	STD	0.015–0.034 mm	0.0006 – 0.0013 in.
				U/S 0.25	0.019 – 0.059 mm	0.0007 – 0.0023 in.
	Limit			0.08 mm	0.0031 in.	
	Main journal diameter	STD		54.988 – 55.003 mm	2.1653 – 2.1655 in.	
				U/S 0.25	54.745 – 54.755 mm	2.1553 – 2.1557 in.
	Main bearing center wall thickness	STD	No.3	Mark 1	1.992 – 1.995 mm	0.0784 – 0.0785 in.
				Mark 2	1.995 – 1.998 mm	0.0785 – 0.0787 in.
				Mark 3	1.998 – 2.001 m m	0.0787 – 0.0788 in.
				Mark 4	2.001 – 2.004 m m	0.0788 – 0.0789 in.
				Mark 5	2.004 – 2.007 m m	0.0789 – 0.0790 in.
			Others	Mark 1	1.997 – 2.000 mm	0.0786 – 0.0787 in.
				Mark 2	2.000 – 2.003 m m	0.0787 – 0.0789 in.
				Mark 3	2.003 – 2.006 mm	0.0789 – 0.0790 in.
				Mark 4	2.006 – 2.009 mm	0.0790 – 0.0791 in.
			Mark 5	2.009–2.012 mm	0.0791 – 0.0792 in.	
Crank pin diameter	STD			51.985 – 52.000 mm	2.0466 – 2.0472 in.	
			U/S 0.25	51.745 – 51.755 mm	2.0372 – 2.0376 in.	
Circle runout	Limit			0.06 mm	0.0024 in.	
Main journal taper and out-of-round	Limit			0.02 mm	0.0008 in.	
Crank pin taper and out-of-round	Limit			0.02 mm	0.0008 in.	

Torque Specifications

Part tightened		N·m	kgf-cm	ft-lbf
Oil pump pulley x Oil pump drive shaft		28	290	21
No.2 idler pulley x Cylinder block		42	425	31
Crankshaft pulley x Crankshaft		108	1,100	80
Camshaft timing pulley x Camshaft		54	550	40
	For SST	37	380	27
No.1 idler pulley x Cylinder head		42	425	31
Cylinder head x Cylinder block	1st	49	500	36
	2nd	Turn 90°		
Spark plug tube x Cylinder head		39	400	29
Camshaft bearing cap x Cylinder head		19	190	14

Torque Specifications (Cont'd)

Part tightened		N·m	kgf-cm	ft-lbf
Cylinder head cover x Cylinder head		23	230	17
Alternator bracket x Cylinder head		42	425	31
Engine hanger x Cylinder head		25	250	18
No.3 timing belt cover x Cylinder head		7.8	80	fig in.-lbf
Intake manifold x Cylinder head		19	195	14
Intake manifold stay x Intake manifold		19	195	14
Intake manifold stay x Cylinder block		42	425	31
EGR valve x Intake manifold		13	130	9
EGR pipe x Cylinder head		59	600	43
Water by-pass pipe x Water pump cover		9.3	95	82 in.-lbf
Water outlet x Cylinder head		15	150	11
Catalytic converter x Exhaust manifold		29	300	22
Exhaust manifold x Cylinder head		49	500	36
Catalytic converter stay x Catalytic converter		42	425	31
Catalytic converter stay x Cylinder block		42	425	31
Main bearing cap x Cylinder block		59	600	43
Connecting rod cap x Connecting rod	1st	25	250	18
	2nd	Turn 90°		
Rear oil seal retainer x Cylinder block		9.3	95	82 in.-lbf
Knock sensor x Cylinder block		37	380	27
Rear end plate x Cylinder block		9.3	95	82 in.-lbf
Flywheel x Crankshaft (M/T)		88	900	65
Drive plate x Crankshaft (A/T)		83	850	61
R H engine mounting bracket x Cylinder block		52	530	38
PS pump bracket x Cylinder head		43	440	32
LH engine mounting bracket x Transaxle		52	530	38
LH engine mounting insulator x Body		87	890	64
LH engine mounting insulator x LH mounting bracket		63	650	47
RH engine mounting insulator x Body		87	890	64
RH engine mounting insulator x RH mounting bracket		52	530	38
R H engine mounting stay x R H mounting insulator		73	740	54
RH engine mounting stay x Alternator bracket		73	740	54
LH engine mounting stay x Transaxle		21	210	15
LH engine mounting stay x LH mounting insulator		21	210	15
Front engine mounting bracket x Transaxle		77	790	57
Rear engine mounting bracket x Transaxle		77	790	57
Engine mounting center member x Body		52	530	38
Engine mounting center member x Front mounting insulator		73	740	54
Engine mounting center member x Rear mounting insulator		73	740	54
Front engine mounting bracket x Front mounting bracket		87	890	64
Rear engine mounting bracket x Rear mounting insulator		87	890	64
PS pump x PS pump bracket	Adjusting bolt	39	400	29
	Others	43	440	32
A/C compressor x Cylinder block		27	280	20
Suspension lower crossmember x Body		152	1,550	112
Suspension upper brace x Body	Bolt	21	210	15
	Nut	64	650	47

EXHAUST SYSTEM

Part tightened	N-m	kgf-cm	ft-lbf
Front exhaust pipe x Exhaust manifold (4A–FE)	62	630	46
Front exhaust pipe x Catalytic converter (4A–FE)	43	440	32
Front exhaust pipe x Catalytic converter (3S–GTE and 5S–FE)	62	630	46
Center exhaust pipe x Catalytic converter (4A–FE)	43	440	32
Front exhaust pipe x Center exhaust pipe (3S–GTE and 5S–FE)	43	440	32
Center exhaust pipe x Tailpipe (4A–FE and 3S–GTE)	43	440	32
Center exhaust pipe x Tailpipe (5S–FE)	21	210	15

TURBOCHARGER SYSTEM

Specifications

Turbocharger	Turbocharging pressure	49 – 81 kPa (0.50 – 0.83 kgf/cm ² , 7.1 – 11.8 psi)
	Impeller wheel axial play	0.13 mm (0.0051 in.) or less
	Impeller wheel radial play	0.18 mm (0.0071 in.) or less

Torque Specifications

Part tightened		N-m	kgf-cm	ft-lbf
Turbine outlet elbow x Turbocharger		64	650	47
Side bearing housing plate x Turbocharger		11	120	9
Turbo water pipe x Turbocharger		11	120	9
Turbocharger x Exhaust manifold		64	650	47
Turbo oil pipe x Turbocharger		17	175	13
Turbo oil pipe x Cylinder block	Bolt	43	440	32
	Union bolt	51	525	38
Turbocharger stay x Turbocharger		69	705	51
Turbocharger stay x Cylinder block		59	600	43
Oxygen sensor x Turbine outlet elbow		44	450	33

MFI AND SFI SYSTEMS (4A–FE)

Specifications

Fuel pressure regulator	Fuel pressure at no vacuum	2655 – 304 kPa (2.7 – 3.1 kgf/cm ² , 38 – 44 psi)
Injector	Resistance Injection volume Difference between each injector Fuel leakage	Approx. 13.8 kΩ 40 – 50 cm ³ (2.4 – 3.1 cu in.)/15 sec. 5 cm ³ (0.31 cu in.) or less One drop or less per minute
Throttle body	Throttle body fully closed angle	6°

Specifications (Cont'd)

Throttle position sensor	Throttle opening angle (from vertical)	Clearance between stop screw and lever	IDL - E2	PSW - E2
	—	0.60 mm 0.024 in.	Continuity	No continuity
	—	0.80 mm 0.032 in.	No continuity	No continuity
	Throttle valve fully open	—	No continuity	Continuity
	63°	—	No continuity	No continuity
69°	—	No continuity	Continuity	
7.5° or less	—	Continuity	No continuity	
Dash pot	Setting speed	M/T Afr	1,800 rpm 2,200 rpm	
ACV valve	Resistance	27-33Ω		
EGR VSV	Resistance	33-39Ω		
Water temp. sensor-	Resistance	at -20°C (-4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10-20 kΩ 4-7 kΩ 2-3 kΩ 0.9 - 1.3 kΩ 0.4 - 0.7 kΩ 0.2 - 0.4 kΩ	
Intake air temp. sensor	Resistance	at -20°C (-4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10-20 kΩ 4-7 kΩ 2-3 kΩ 0.9 - 1.3 kΩ 0.4 - 0.7 kΩ 0.2 - 0.4 kΩ	
EGR gas temp. sensor (CALIF. only)	Resistance	at 500C (112°F) at 1001C 1212°F) at 1501C (302°F)	69 - 89 Ω 11-15kΩ 2-4 kΩ	
Oxygen sensor heater (Ex. CALIF.)	Resistance	5.1 -6.3Ω		
ECU	HINT:			
	<ul style="list-style-type: none"> Perform all voltage and resistance measurements with the ECU connected. Verify that the battery voltage is 11 V or above with the ignition switch ON. 			
	Voltage			
	Terminals	Condition		STD voltage (V)
	+B _ E1 +B1	IG SW ON		10-14
	BATT - E1			10-14
	IDL - E2	IG SW ON	Throttle valve open	10-14
	PSW - E2		Throttle valve fully closed	10-14
	PIM - E2	IG SW ON		3.3-3.9
VCC - E2	4.5-5.5			

Specifications (Cont'd)

ECU (cont'd)	Voltage (cont'd)		
	Terminals	Condition	STD voltage (V)
No.10 _ E01 No. 20 E02	IG SW ON		10-14
THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1-3
THW - E2		Coolant temp. 80°C (176°F)	0.1 - 1.0
STA - E1	Cranking		6-14
IGT - E1	Cranking or idling		0.7-1.0
V11 - E1	No trouble ("CHECK" engine warning light on) and engine running		10-14
A/C - E i	IG SW ON	Air conditioning ON	8-14
ACT - E 1		Air conditioning ON	4-6
T - E1 .		Check connector TE1 - E1 not connected	10-14
		Check connector TE1 - E1 connected	0.5 or less
NSW - E1		Neutral start switch P or N range	0-2
		Ex. neutral start switch P or N range	6-14
V-ISC - E1	Cranking for ten seconds after starting		10-14
Resistance			
Terminals	Condition		STD resistance (Ω)
IDL - E2	Throttle valve fully open		Infinity
	Throttle valve fully closed		0
PSW - E2	Throttle valve fully open		0
	Throttle valve fully closed		Infinity
THA - E2	Intake air temp. 20°C (68°F)		2,000 - 3,000
THW - E2	Coolant temp. 80°C (176°F)		200-400
G1 _ G (-)	Cold		185-265
Fuel cut	w/ Vehicle speed 0 km/h and coolant and coolant temp. 80°C (176°F) Fuel cut rpm Fuel return rpm		2,300 rpm 1,700 rpm

Torque Specifications

Part tightened		N·m	kgf-cm	ft-lbf
Fuel line	Union bolt type	29	300	22
	Flare nut type	30	310	22
Fuel pump bracket x Fuel tank		2.9	30	26 in.-lbf
Fuel inlet pipe x Fuel tank		2.9	30	26 in.-lbf
Fuel evaporation vent tube x Fuel tank		1.5	15	13 in.-lbf
Fuel breather tube x Fuel tank		1.5	15	13 in.-lbf
Fuel tank band x Body		39	400	29
Fuel pressure regulator x Delivery pipe		9.3	95	82 in.-lbf
Delivery pipe x Cylinder head		15	150	11
Throttle body x Intake manifold		22	220	16

MFI AND SFI SYSTEMS (3S-GTE)

Specifications

Fuel pressure regulator	Fuel pressure at no vacuum	226 – 265 kPa (2.3 – 2.7 kgf/cm ² , 33 – 38 psi)		
Cold start injector	Resistance	2–4Ω		
	Fuel leakage	One drop or less per minute		
Injector	Resistance	2–4Ω		
	Injection volume	95–120 cm ³ (5.8 – 7.3 cu in.) per 15 sec.		
	Difference between each injector	5 cm ³ (0.3 cu in.) or less		
	Fuel leakage	One drop or less per minute		
Air flow meter	Resistance VS – E2	200 – 600 Ω (Measuring plate fully closed)		
		20 – 1,200 Ω (Measuring plate fully open)		
	VC-E2 THA – E2	at –20°C (–4°F)	200 – 400 Ω	
		at 0°C (32°F)	10,– 20,kΩ	
		at 20°C (68°F)	4–7 kΩ	
		at 40°C (104°F)	2–3 Ω	
		at 60°C (140°F)	0.9 – 1.3 kΩ	
	0.4 – 0.7 Ω			
Throttle position sensor	Clearance between stop screw and lever		Between terminals	Resistance
	0 mm	0 in.	VTA – E 2	0.47 – 6.1 kΩ
	0.50 mm	0.020 in.	IDL – E2	2.3 kΩ or less
	0.70 mm	0.028 in.	IDL – E2	Infinity
	Throttle valve fully open		VTA – E 2	3.1 – 12.1 kΩ
	—	VC-E2	3.9 – 9.0 kΩ	
Throttle opener	Setting speed		900 – 1,900 rpm	
ISC valve	Resistance +B – RSC or RSO		19.3 – 22.3 Ω	

Specifications (Cont'd)

Cold start injector time switch	Resistance STA – STJ STA – Ground	below 10°C (50°F) above 25°C (77°F)	30 – 50Ω 70 – 90Ω 30 – 90Ω	
Solenoid resistor	Resistance +B – No.10, No.20, No.30 or No.40		4 – 6Ω	
Fuel pump resistor	Resistance		Approx. 0.73Ω	
T-VIS VSV	Resistance		33–39 Ω	
Turbocharging pressure VSV	Resistance		24 – 30 Ω	
EGR VSV	Resistance		33 – 39Ω	
Water temp. sensor	Resistance	at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10–20 kΩ 4–7 kΩ 2 – 7 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ	
EGR gas temp. sensor (CALIF. only)	Resistance	at 500C (112°F) at 100°C (212°F) at 150°C (302°F)	69 – 89 kΩ 11–15kΩ 2–4 kΩ	
Oxygen sensor heater	Resistance		5.1 – 6.3 Ω	
ECU	HINT:			
	<ul style="list-style-type: none"> Perform all voltage and resistance measurements with the ECU connected. Verify that the battery voltage is 11 V or above with the ignition switch ON. 			
	Voltage			
	Terminals	Condition	STD voltage (V)	
	+ B _ E1 +B 1	IG SW ON	10–14	
	BATT – E1		10–14	
	IDL – E2	IG SW ON	Throttle valve open	4.5–5.5
	VTA – E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.1 – 1.0
			Throttle valve fully open	3.2–4.2
	VC – E2			4.5–5.5
VS – e2	Measuring plate fully closed		3.7–4.3	
	Measuring plate fully open		0.2–0.5	
	Idling	1.6 – 4.1		
	3,000 rpm	1.0–2.0		

Specifications (Cont'd)

ECU (cont'd)	Voltage (cont'd)		
	Terminals	Condition	STD voltage (V)
No.1 No.2 _ E01 No.3 E02 No.4	IG SW ON		10-14
THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1-3
THW - E2		Coolant temp. 80°C (176°F)	0.1-1.1
STA - E1	Cranking		6-14
IGT - E1	Cranking or idling		0.8-1.2
RSC _ RSO	IG SW ON	Engine ECU connectors disconnected	8-14
W - E1	No trouble ("CHECK" engine warning light off) and engine running		10-14
PIM - E2	IG SW ON		2.5-4.5
AC - E1	IG SW ON	Air conditioning ON	8-14
ACT - E1		Air conditioning ON	4-6
w/ Regular unleaded gasoline TVIS - E1		Throttle valve fully closed	2.0 or less
		Throttle valve open	10-14
w/ Premium unleaded gasoline TVIS - E1	Idling		2.0 or less
	4,200 rpm or more		10-14
TE1 - E1	IG SW ON	Check connector TE1 - E1 not connected	10-14
		Check connector TE1 - E1 connected	0.5 or less
Resistance			
Terminals	Condition		STD resistance (Ω)
IDL - E2	Throttle valve fully open		Infinity
	Throttle valve fully closed		2,300 or less
VTA - E2	Throttle valve fully open		3,100 - 12,100
	Throttle valve fully closed		470-6,100
VC - E2	—		390-9,000
VS - e2	Measuring plate fully closed		200-600
	Measuring plate fully open		20-1,200
THA - E2	Intake air temp. 20°C (68°F)		2,000 - 3,000
THW - E2	Coolant temp. 80°C (176°F)		200-400

Specifications (Cont'd)

ECU (cont'd)	Resistance (cont'd)		
	Terminals	Condition	STD resistance (Ω)
	G1 _ G2 G (-)	Cold	125–190
	NE – G (-)	Cold	155–240
	RSC _ +B RSO +B1		19.3–22.3
	Fuel cut	Fuel return rpm	1,600 rpm

Torque Specifications

Part tightened	N-m	kgf-cm	ft-lbf
Fuel line	29	300	22
	30	310	22
Fuel pump x Fuel tank	2.9	30	26 in.-lbf
Fuel sender gauge x Fuel tank	1.5	15	13 in.-lbf
Fuel evaporator bent tube x Fuel tank	1.5	15	13 in.-lbf
Fuel inlet pipe x Fuel tank	2.9	30	26 in.-lbf
Fuel tank band x Body	22	220	16
Cold start injector x Intake manifold	5.9	60	52 in.-lbf
Cold start injector pipe x Cold start injector	12	125	9
Cold start injector pipe x Delivery pipe	12	125	9
Fuel pressure regulator x Delivery pipe	29	300	22
Injector cover x Delivery pipe	7.8	80	69 in.-lbf
Fuel inlet hose x Delivery pipe	7.8	80	69 in.-lbf
	29	300	22
Delivery pipe x Cylinder head	19	195	14
Fuel inlet hose x Fuel filter	29	300	22
Throttle body x Intake manifold	19	195	14
Intake air connector stay x Throttle body	19	195	14
Intake air connector stay x Cylinder head	7.8	80	69 in.-lbf
Intake air connector x Throttle body	19	195	14

MFI AND SFI SYSTEMS (5S-FE)

Specifications

Fuel pressure regulator	Fuel pressure at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm ² , 38 – 44 psi)	
Injector	Resistance Injection volume Difference between each injector Fuel leakage	Approx. 13.8 kΩ 49 – 59 cm ³ (3.0 – 3.6 cu in.)/15 sec. 5 cm ³ (0.31 cu in.) or– less One drop or less per minute	
Throttle position sensor	Clearance between stop screw and lever	Between terminals	Resistance
	0 mm 0 in. 0.50 mm 0.020 in. 0.70 mm 0.028 in. Throttle valve fully open —	VTA – E2 IDL–E2 IDL – E2 VTA – E2 VC–E2	0.2 – 5.7 kΩ 2.3 kΩ or less Infinity 2.0 – 10.2 kΩ 2.5 – 5.9 kΩ
Throttle opener	Setting speed	1,300 – 1,500 rpm	
ISC valve	Resistance +B – ISCC or– ISCO	19.3 – 22.3Ω	
A/C idle–up VSV	Resistance	30 – 34Ω	
EGR VSV	Resistance	33–3992	
Water temp. sensor	Resistance at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10–20 kΩ 4–7 kΩ 2–3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ	
Intake air temp. sensor	Resistance at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10–20 kΩ 4–7 kΩ 2–3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ	
EGR gas temp. sensor (CALIF. only)	Resistance at 50°C (112°F) at 100°C (212°F) at 1500C (3020F)	69 – 89 kΩ 11–15kΩ 2–4 kΩ	
ECU	HINT: <ul style="list-style-type: none"> Perform all voltage and resistance measurements with the ECU connected. Verify that the battery voltage is 11 V or above with the ignition switch ON. 		
	Voltage		
	Terminals	Condition	STD voltage (V)
	+B – E1 +B1	IG SW ON	10–14

Specifications (Cont'd)

ECU (cont'd)		Voltage (cont'd)	
Terminals	Condition		STD voltage (V)
BATT - E1			10-14
IDL - E2	IG SW ON	Throttle valve open	8-14
VTA - E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.8-1.2
		Throttle valve fully open	3.2-4.2
PIM - E2	IG SW ON		3.3-3.9
VC - E2			4.5-5.5
No.10 _ E01 No. 20 E02			10-14
THA - E2	IG SW ON	Intake air temp. 20°C (68°F)	1.9-2.9
THW - E2		Coolant temp. 80°C (176°F)	0.1-1.1
STA - E1	Cranking		6-14
IGT - E1	Cranking or idling		0.8-1.2
ISCC _ E1 ISCO	IG SW ON	Engine (& ECT) ECU connectors disconnected	8-14
W - E1	No trouble ("CHECK" engine warning light off) and engine running		10-14
A/C - E 1	IG SW ON	Air conditioning ON	8-14
ACT - E1		Air conditioning ON	4.5-5.5
ACA - E1		Air conditioning ON	2 or less
TE1 - E1		Check connector TE1 - E1 not connected	10-14
NSW - E1		Check connector TE1 - E1 connected	1 or less
		Neutral start switch P or N range	0 - 2
		Ex. neutral start switch P or- N range	6-14
B/K - E1	Stop light SW ON (Brake pedal depressed)		10-14
Resistance			
Terminals	Condition		STD resistance (Ω)
IDL - E2	Throttle valve fully open		Infinity
	Throttle valve fully closed (Throttle opener must be cancelled first)		2,300 or- less
VTA - E2	Throttle valve fully open		2,000 - 10,200
	Throttle valve fully closed (Throttle opener must be cancelled first)		200-5,700

Specifications (Cont'd)

ECU (cont'd)	Resistance (cont'd)		
	Terminals	Condition	STD resistance (Ω)
	VC – E2		2,500 – 5,900
	THA – E2	Intake air temp. 20°C (68°F)	2,000 – 3,000
	THW – E2	Coolant temp. 80°C (176°F)	200–400
	G + – G –	Cold	185–265
	NE + – NE –	Cold	370–530
	ISCC _ +B ISCO +B I		19.3–22.3
Fuel cut	Fuel return rpm		1,500 rpm

Torque Specifications

Part tightened		N·m	kgf-cm	ft-lbf
Fuel line	Union bolt type	29	300	22
	Flare nut type	30	310	22
Fuel pump bracket x Fuel tank		2.9	30	26 in.-lbf
Fuel inlet pipe x Fuel tank		2.9	30	26 in.-lbf
Fuel evaporation bent tube x Fuel tank		1.5	15	13 in.-lbf
Fuel sender gauge x Fuel tank		1.5	15	13 in.-lbf
Fuel breather gauge x Fuel tank		1.5	15	13 in.-lbf
Fuel tank band x Body		39	400	29
Cold start injector x Intake manifold		9.3	95	82 in.-lbf
Cold start injector pipe x Cold start injector		18	180	13
Cold start injector pipe x Delivery pipe		19	195	14
Fuel pressure regulator x Delivery pipe		5.4	55	48 in.-lbf
Fuel return pipe x Fuel pressure regulator		18	180	13
Delivery pipe x Cylinder head		13	130	9
Fuel pulsation damper x Delivery pipe		34	350	25
Throttle body x Intake manifold		19	195	14

COOLING SYSTEM

Specifications

Engine coolant capacity		See page A-2
Radiator cap	Relief valve opening pressure STD	74 – 103 kPa (0.75 – 1.05 kgf/cm ² , 10.7 – 14.9 psi)
	Limit	59 kPa 0.6 kgf/cm ² 8.5 psi
Thermostat	Valve opening temperature	80 – 84°C 176 –183°E
	Valve lift at 95°C (203°F)	8 mm (0.31 in.) or more

Torque Specifications (4A-FE)

Part tightened	N·m	kgf-cm	ft-lbf
Engine block x Drain plug	34	350	25
Water pump x Cylinder block	15	150	11
Water inlet pipe x Water pump	20	200	14
Water inlet pipe x Cylinder block	13	130	9
Water inlet x Water inlet housing	9.3	95	82 in.-lbf

torque Specifications (3S-GTE and 5S-FE)

Part tightened	N-m	kgf-cm	ft-lbf
Engine block x Drain plug	25	250	18
Water pump x Water pump cover	3S-GTE	9.3	95
	5S-FE	8.8	90
Water pump x Cylinder block	3S-GTE	7.8	80
	5S-FE	9.3	95
Water by-pass pipe x Water pump cover	3S-GTE	12	120
	5S-FE	9.3	95
Idler pulley bracket x Cylinder block (3S-GTE)	19	195	14
Idler pulley bracket x Alternator bracket (3S-GTE)	19	195	14
Water inlet x Water pump	3S-GTE	7.8	80
	5S-FE	9.3	95

LUBRICATION SYSTEM

Specifications

Engine oil capacity		See page A-29	
Oil pressure	at idle at 3,000 rpm	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more 245 – 490 kPa (2.5 – 5.0 kgf/cm ² , 36 – 71 psi)	
Oil pump (4A-FE)	Body clearance	STD Limit	0.080 – 0.180 m m 0.0031 – 0.0071 in. 0.20 m m 0.0079 i n.
	Tip clearance	STD Limit	0.025 – 0.085 m m 0.0010 – 0.0033 in. 0.35 m m 0.0138 in.
	Side clearance	STD Limit	0.025 – 0.085 m m 0.0010 – 0.0033 in. 0.10 mm 0.0039 in.
Oil pump (3S-GTE and 5S-FE)	Body clearance	STD	0.100–0.160 mm 0.0039 – 0.0063 in.
	Tip clearance	Limit	0.20 m m 0.0079 in.
		STD Limit	0.040 – 0.160 m m 0.0016 – 0.0063 in. 0.20 m m 0.0079 i n.

Torque Specifications (4A-FE)

Part tightened	N- m	kgf-cm	ft-lbf
Engine pan x Drain plug	34	350	25
Oil pump x Cylinder block	21	218	16
Oil strainer x Cylinder block	9.3	95	82 in.-lbf
Oil strainer x Oil pump	9.3	95	82 in.-lbf
Oil pan x Cylinder block	4.9	55	43 in.-lbf
Oil pan x Oil pump	4.9	55	43 in.-lbf
Oil pan x Rear oil seal retainer	4.9	50	43 in.-lbf
Oil dipstick guide x Water pump	9.3	95	82 in.-lbf

Torque Specifications (3S-GTE and 5S-FE)

Part tightened		N·m	kgf·cm	ft·lbf
Engine pan x Drain plug		39	400	29
Oil pump body cover x Oil pump body		8.8	90	78 in.-lbf
Oil pump x Cylinder block	3S-GTE	7.8	80	69 in.-lbf
	5S-FE	9.3	95	82 in.-lbf
Oil strainer x Cylinder block		5.4	55	48 in.-lbf
Oil strainer x Oil pump		5.4	55	48 in.-lbf
Oil pan x Cylinder block		5.4	55	48 in.-lbf
Oil pan x Oil pump		5.4	55	48 in.-lbf
Stiffener plate x Cylinder block		37	380	27
Stiffener plate x Transaxle case		37	380	27
Oil cooler bracket x Cylinder block (3S-GTE)		7.8	80	69 in.-lbf
Oil cooler x Oil cooler bracket (3S-GTE)		78	800	58
Water by-pass pipe x Oil cooler (3S-GTE)		12	120	9
Water by-pass pipe x Oil cooler bracket (3S-GTE)		18	180	13
Oil cooler x Cylinder block (5S-FE)	Relief valve	78	800	58
	Nut	7.8	80	69 in.-lbf
Oil nozzle x Cylinder block		9.1	93	81 in.-lbf

IGNITION SYSTEM

Ignition timing		10° BTDC @ idle (w/ Terminals TE1 and E1 connected)
Firing order		1-3-4-2
Spark plug		See page A-2
High-tension cord	Resistance	25 kΩ per cord
Ignition coil	Primary coil resistance (Cold) 4A-FE 3S-GTE and 5S-FE Secondary coil resistance (Cold)	1.1-1.7 Ω 0.3-0.6 Ω 9-15Ω
Distributor	Air gap Signal generator (pickup coil) resistance (Cold) 4A-FE 3S-GTE G1 - G (-) G2 - G (-) NE -G (-) 5S-FE G (+)- G (-) NE (+) - NE (-)	0.2 - 0.4 m m 0.008-0.016 in. 185 - 265 Ω 125 - 190 Ω 125 - 190 Ω 155 - 240 Ω 185 - 265 Ω 370 - 530 Ω

STARTING SYSTEM

Starter	Rated voltage and output power		12 V 1.0 kW	12V1.4kW, 12V1.6 kW	
	No-load characteristic	Current	90 A or less at 11.5 V	←	
		rpm	3,000 rpm or more	3.500 rpm or more	
	Brush length	STD	13.5 mm 0.531 in.	15.5 mm 0.610 in.	
		Limit	8.5 mm 0.335 in.	10.0 mm 0.394 in.	
	Commutator	Outer diameter	STD	30.0 mm 1.181 in.	←
			Limit	29.0 mm 1.142 in.	←
	Undercut depth	STD	0.6 mm 0.024 in.	←	
		Limit	0.2 mm 0.008 in.	←	
	Circle runout	Limit	0.05 mm 0.0020 in.	←	
Spring installed load		18-24 N (1.79 - 2.41 kgf, 3.9-5.3 lbf)	←		

CHARGING SYSTEM

Drive belt tension		See page A-2	
Battery specific gravity when fully charged at 20°C (68°F)		1.25-1.27	
Alternator	Rated output	12 V-70 A, 12V-80 A	
	Rotor coil resistance	2.8-3.092	
	Slip ring diameter	STD	14.2 - 14.4 mm 0.559 - 0.567 in.
		Limit	12.8 mm 0.504 in.
	Brush exposed length	STD	10.5 mm 0.413 in.
Limit		1.5 mm 0.059 in.	
Alternator regulator	Regulating voltage	at 25°C (77°F)	13.9 - 15.1 V
		at 115°C (239°F)	13.5 - 14.3 V

LUBRICANT

Item		Capacity			Classification
		Liters	US qts	Imp. qts	
Manual transaxle oil	C52	2.6	2.7	2.3	API GL-4 or GL-5 SAE 75W-90
	E150F	5.2	5.5	4.6	API GL-5 Viscosity: Above -18°C (0°F) SAE90 Below -18°C (0°F) SAE80W
Automatic transaxle fluid					ATF DEXRON® II
A241 E	Dry fill	8.0	8.5	7.0	
	Drain and refill	3.3	3.5	2.9	
A243L	Dry fill	7.7	8.1	6.8	
	Drain and refill	3.3	3.5	2.9	
Differential oil		1.1	1.2	1.0	API GL-5 Hypoid gear oil Viscosity: Above -18°C (0°F) SAE 90 Below -18°C (0°F) SAE80W-90
Power steering fluid	Total	0.8	0.85	0.70	ATF DEXRON® II
Brake fluid		—			SAE J1703 or FMVSS No. 116 DOT3

LUBRICANT

Item			Capacity			Classification
			Liters	U S qts	Imp. qts	
Engine oil	4A-FE	Dry fill	3.7	3.9	3.3	API grade SG, multigrade fuel-efficient and recommended viscosity oil
		Drain and refill				
		w/ Oil filter change	3.2	3.3	2.8	
		w/o Oil filter change	3.0	3.1	2.6	
	3S-GTE	Dry fill	4.3	4.5	3.8	
		Drain and refill				
		w/ Oil filter change	3.9	4.1	3.4	
		w/o Oil filter change	3.6	3.8	3.2	
	5S-FE (w/ Oil cooler)	Dry fill	4.6	4.9	4.0	
		Drain and refill				
		w/ Oil filter change	4.2	4.4	3.7	
		w/o Oil filter change	3.8	4.0	3.3	
5S-FE (w/o Oil cooler)	Dry fill	4.5	4.8	4.0		
	Drain and refill					
	w/ Oil filter change	4.1	4.3	3.5		
	w/o Oil filter change	3.7	3.9	3.3		

STEERING

Specifications

Steering	Steering wheel freeplay	30 mm (1.18 in.) or less
Steering column	Pawl stopper (Tilt steering column) Mark 1 or A 2 or B 3 or C 4 or D 5 or E 6 or F 7 or G (Auto tilt away steering column) Mark 1 or A 2 or B 3 or C 4 or D 5 or E 6 or F 7 or G Collar (Auto tilt away steering column)	12.68 – 12.74 mm 0.4992 – 0.5016 in. 12.61 – 12.67 mm 0.4965 – 0.4988 in. 12.54 – 12.60 mm 0.4937 – 0.4961 in. 12.47–12.53 mm 0.4909 – 0.4933 in. 12.40 – 12.46 m m 0.4882 – 0.4906 in. 12.33 – 12.39 mm 0.4854 – 0.4878 in. 12.26 – 12.32 mm 0.4827 – 0.4850 in. 12.68 – 12.74 mm 0.4992 – 0.5016 in. 12.61 – 12.67 mm 0.4965 – 0.4988 in. 12.54 – 12.60 mm 0.4937 – 0.4961 in. 12.47 – 12.53 mm 0.4909 – 0.4933 in. 12.40 – 12.46 mm 0.4882 – 0.4906 in. 12.33 – 12.39 mm 0.4854 – 0.4878 in. 12.26 – 12.32 mm 0.4827 – 0.4850 in. 12.75 – 12.85 mm 0.5020 – 0.5059 in. 12.55 – 12.65 mm 0.4941 – 0.4980 in. 12.35 – 12.45 mm 0.4862 – 0.4902 in. 12.15 – 12.25 mm 0.4783 – 0.4823 in. 11.95 – 12.05 mm 0.4705 – 0.4744 in. 11.75 – 11.85 mm 0.4610 – 0.4665 in. 11.55 – 11.65 mm 0.4547 – 0.4587 in. 11.25 – 11.35 mm 0.4429 – 0.4468 in.
Power steering (On-vehicle inspection)	Drive belt tension New belt Used belt Maximum rise of oil level Oil pressure at Idle speed (4A-FE engine) (5S-FE engine) (3S-GTE engine)	441 ± 667 N 45 – 68 kgf 100 – 150 lbf 265 ± 441 N 27 – 45 kgf 60 – 100 lbf Below 5 mm 10.20 in.) 6,865 kPa (70 kgf/cm ² , 996 psi) 7,355 kPa (75 kgf/cm ² , 1,068 psi) 7,845 kPa (80 kgf/cm ² , 1,138 psi)
	Steering effort USA CANADA	39 N 4 kgf 8.8 lbf 6.9 N –m 70 kgf–cm 61 in.–lbf

Specifications (Cont'd)

(Power steering pump)	Rotor shaft bushing oil clearance STD		0.01 – 0.03 mm	0.0004 – 0.0012 in.
	Maximum		0.07 mm.	0.0028 in.
	Vane plate to rotor groove clearance		0.03 mm	0.0012 in.
	Vane plate Minimum height		8.0 mm	0.315 in.
	Minimum thickness		1.77 mm	0.0697 in.
	Minimum length		14.97 mm	0.5894 in.
	Vane plate length Rotor and cam ring mark	None		
		1		
		2		
		3	14.996 – 14.998 mm	0.59039 – 0.59047 in.
	4	14.994 – 14.996 mm	0.59032 – 0.59039 in.	
Flow control valve spring length	STD Minimum		14.992 – 14.994 mm	0.59024 – 0.59032 in.
			14.990 – 14.992 mm	0.59016 – 0.59024 in.
			14.988 – 14.990 mm	0.59008 – 0.59016 in.
			38 mm	1.49 in.
Pump rotating torque		36 mm	1.42 in.	
		0.3 N-m (2.8 kgf-cm, 2.4 in.-lbf) or less		
(Gear housing)	Steering rack runout	Maximum	0.3 mm	0.012 in.
	Bearing preload (turning)		0.4 – 0.6 N-m (4.5 – 6.5 kgf-cm, 3.9 – 5.6 in.-lbf)	
	Total preload (turning)		0.9 – 1.2 N-m (9 – 12 kgf-cm, 7.8 – 10.4 in.-lbf)	

Torque Specifications

Steering column (Non-tilt steering column)	Part tightened		N-m	kgf-cm	ft-lbf
		Main shaft x Intermediate shaft		35	360
(Tilt steering column)	Tilt lever assembly installation bolt		2.9	30	26 in.-lbf
	Tilt pawl set nut		5.9	60	52 in.-lbf
	Tilt lever retainer set nut		15	150	11
	Compression spring bushing bolt		7.8	80	69 in.-lbf
	Main shaft x Intermediate shaft		35	360	26
(Auto tilt away steering column)	Tilt memory bolt		6.4	65	56 in.-lbf
	Tilt lever bracket installation bolt		2.9	30	26 in.-lbf
	Tilt lever retainer set nut		14 mm	15	11
			8 mm	2.9	30
	No. 2 tilt memory plate set nut		14 mm	15	11
			10 mm	5.9	80
	Compression spring bushing bolt		7.8	360	69 in.-lbf
Main shaft x Intermediate shaft		35		26	
(Removal and installation)	Main shaft x Steering wheel		35	360	26
	Steering wheel pad (w/ airbag)		7.4	75	65 in.-lbf
	Column tube x Body		25	260	19
	Column tube attachment x Brake pedal bracket		12	120	9
	Universal joint		35	360	26

Torque Specifications (Cont'd)

Power steering (Power steering pump)	Part tightened	N-m	kgf-cm	ft. lbf
	Pressure port union x Front housing	69	700	51
	Air control valve x Pump housing	36	370	27
	Drive pulley nut	43	440	32
	Reservoir tank x Housing (4A-FE)	13	130	9
	12 mm	41	420	30
	14 mm	69	700	51
	Union bolt (4A-FE)	13	130	9
	Union bolt (4A-FE)	13	525	38
	Suction port union x Pump housing (5S-FE)	51	400	29
	Pressure tube joint bolt	39	440	32
	PS pump x Bracket (4A-FE)	43	400	29
	PS pump x Bracket (5S-FE, 3S-GTE) Upper	39	370	27
	Lower	36	550	36
	Pressure tube union nut (5S-FE, 3S-GTE)	49	1,550	152
	Tie rod end x Knuckle arm	152	740	29
	Lower crossmember R H and LH sides	39		
	Center			
(Gear housing)	Control valve housing x Rack housing	31	315	23
	Bearing guide lock nut	56	570	41
	Rack guide spring cap lock nut	56	570	41
	Rack x Rack end	72	730	53
	Turn pressure tube x Gear housing	20	200	14
	Tie rod end lock nut	56	570	41
	Gear housing x Body	59	600	43
	Gear housing x Return line	44	450	33
	Gear housing x Pressure line	44	450	33
	Center member x Body	52	530	38
	Tie rod end x Knuckle arm	49	500	36
	Control valve shaft x Universal joint	35	360	26
	Lower crossmember	152	1,550	112
	Tube clamp set bolt	13	130	9
	Engine x Engine mounting	77	790	57
	Engine mounting x Center member			
	4A-FE			
	5S-FE, 3S-GTE			
	Lower crossmember R H and LH sides	64	650	47
	Center	73	740	54
	Engine mounting x Insulator	152	1,550	112
	Exhaust front pipe x Manifold	39	400	29
	Exhaust front pipe x Center pipe	87	890	64
	Propeller shaft x Intermediate shaft	62	630	46
	Stabilizer bar x Link	43	440	32
	Stabilizer bar bracket	74	750	54
		35	360	26
		18	180	13