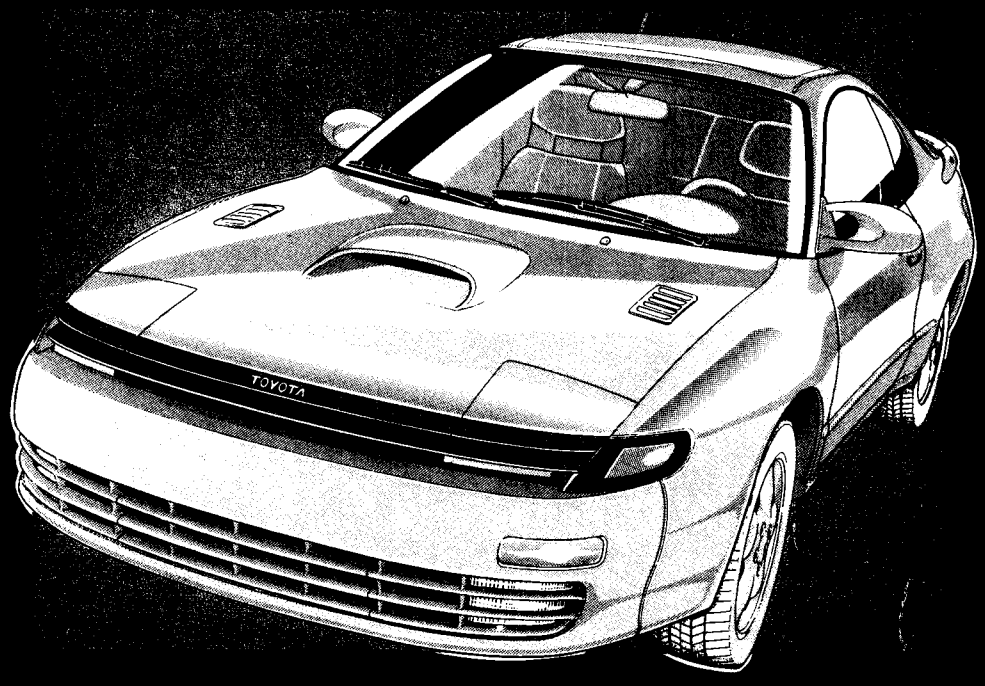
1990

TOYOTA



REPAIR MANUAL

- ENGINE
- CHASSIS
- BODY
- ELECTRICAL
- SPECIFICATIONS

FOR USA & CANADA
Pub. No. RM176U

1990 TOYOTA CELICA ALL-TRAC/4WD REPAIR MANUAL

NOTE: The following screen toning letters sections refer to the 1990 CELICA REPAIR MANUAL (Pub. No. RM149U).

INTRODUCTION

HOW TO USE THIS MANUAL

To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

An **INDEX** is provided on the first page of each section to guide you to the item to be repaired.

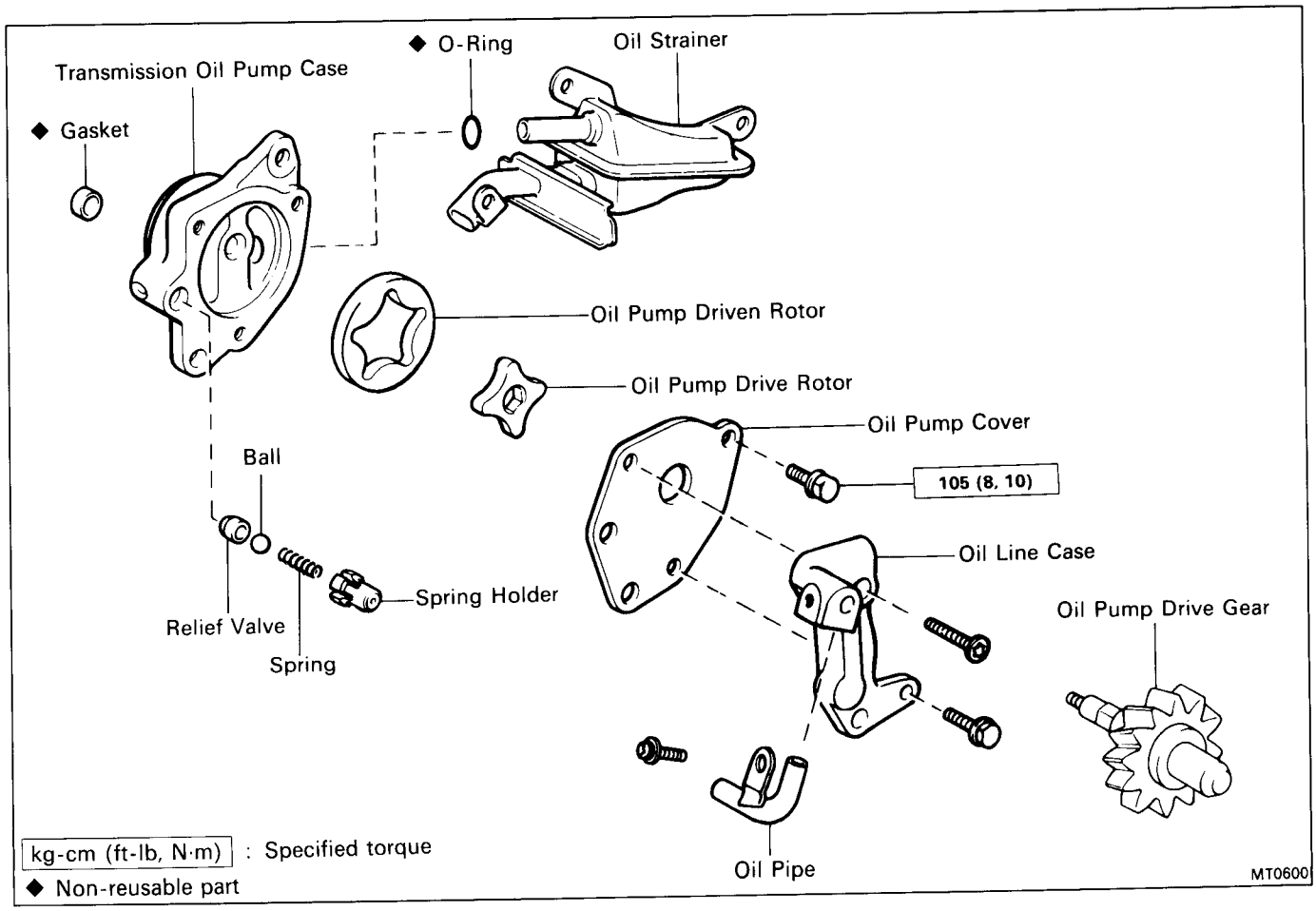
At the beginning of each section, **PRECAUTIONS** are given that pertain to *all* repair operations contained in that section. *Read these precautions before starting any repair task.*

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The repair for each possible cause is referenced in the remedy column to quickly lead you to the solution.

REPAIR PROCEDURES

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

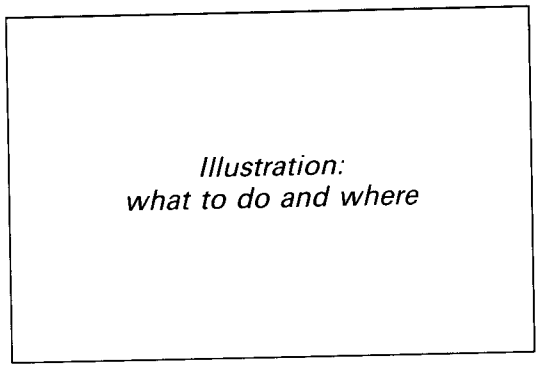
Example:



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

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

Example:



Task heading: What to do

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

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

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 (4 – 8 kg/cm², 57 – 114 psi or 392 – 785 kPa) as shown in the figure.

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

Specification

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

REFERENCES

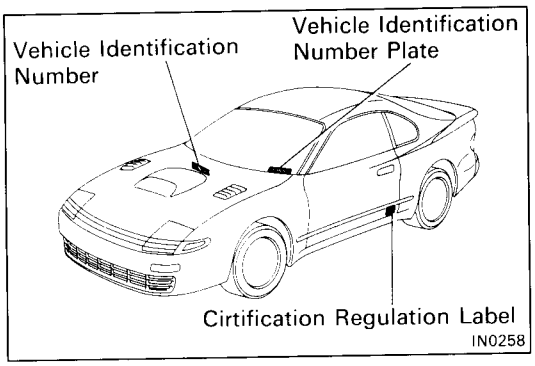
References have been kept to a minimum. However, when they are required you are given the page to refer to.

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 in Appendix A, for quick reference.

CAUTIONS, NOTICES, HINTS:

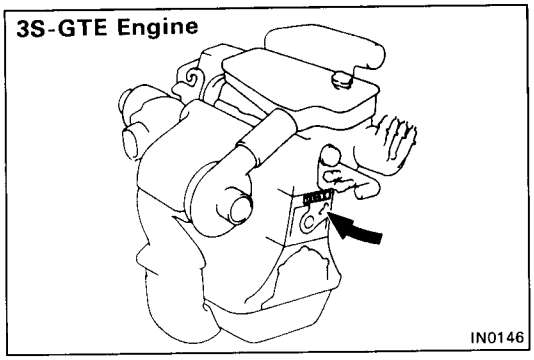
- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damaged to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide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



IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the cowl panel of the engine compartment. This number is also stamped on top of the instrument panel and the driver's door panel.

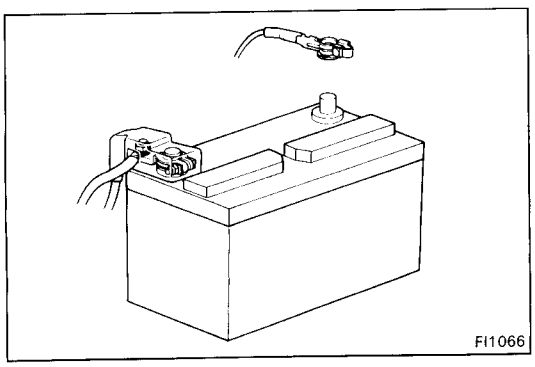


ENGINE SERIAL NUMBER

The engine serial number is stamped on the rear of the cylinder block.

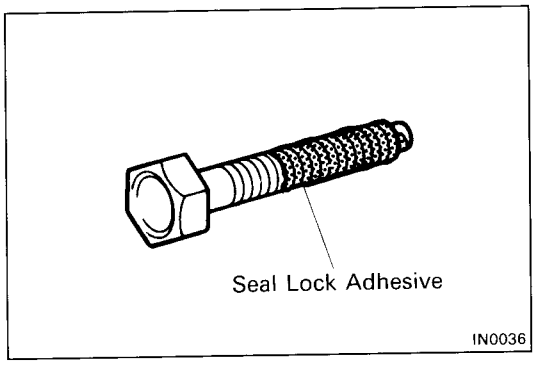
GENERAL REPAIR INSTRUCTIONS

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:
   (a) **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 Pub.No.RM149U, page AB-2).**
   (b) Before performing electrical work, disconnect the negative cable from the battery terminal.
   (c) 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.
   (d) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
   (e) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive object.
   (f) 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.
   (g) 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.



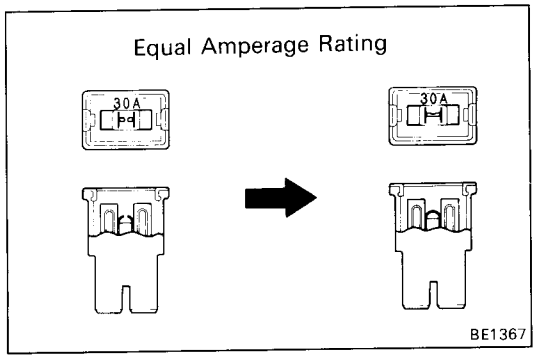
6. Precoated parts

   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) Recoating of precoated parts
      (1) Clean off the old adhesive from the bolt, nut or threads.
      (2) Dry with compressed air.
      (3) Apply the specified seal lock adhesive to the bolt or nut threads.
   (c) Precoated parts are indicated in the component illustrations by the "★" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.

8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

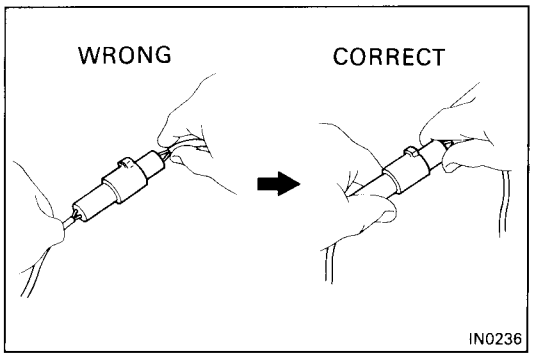
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the back of this manual.

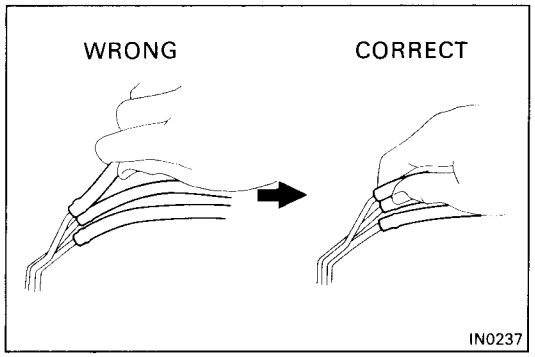


10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

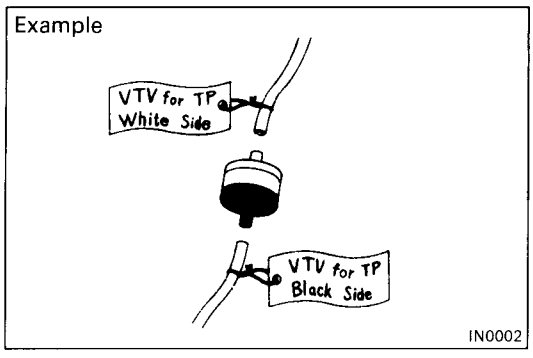
11. Care must be taken when jacking up an supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN-21).
   (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
   (b) 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 unless absolutely necessary.**
    (If the IC terminals are touched, the IC may be destroyed by static electricity.)
    (b) To pull apart electrical connectors, pull on the connector itself, not the wires.





    (c) 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.
    (d) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
    (e) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (f) When steam cleaning an engine, protect the distributor, coil, air filter and VCV from water.
    (g) Never use an impact wrench to remove or install temperature switches or temperature sensors.
    (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.

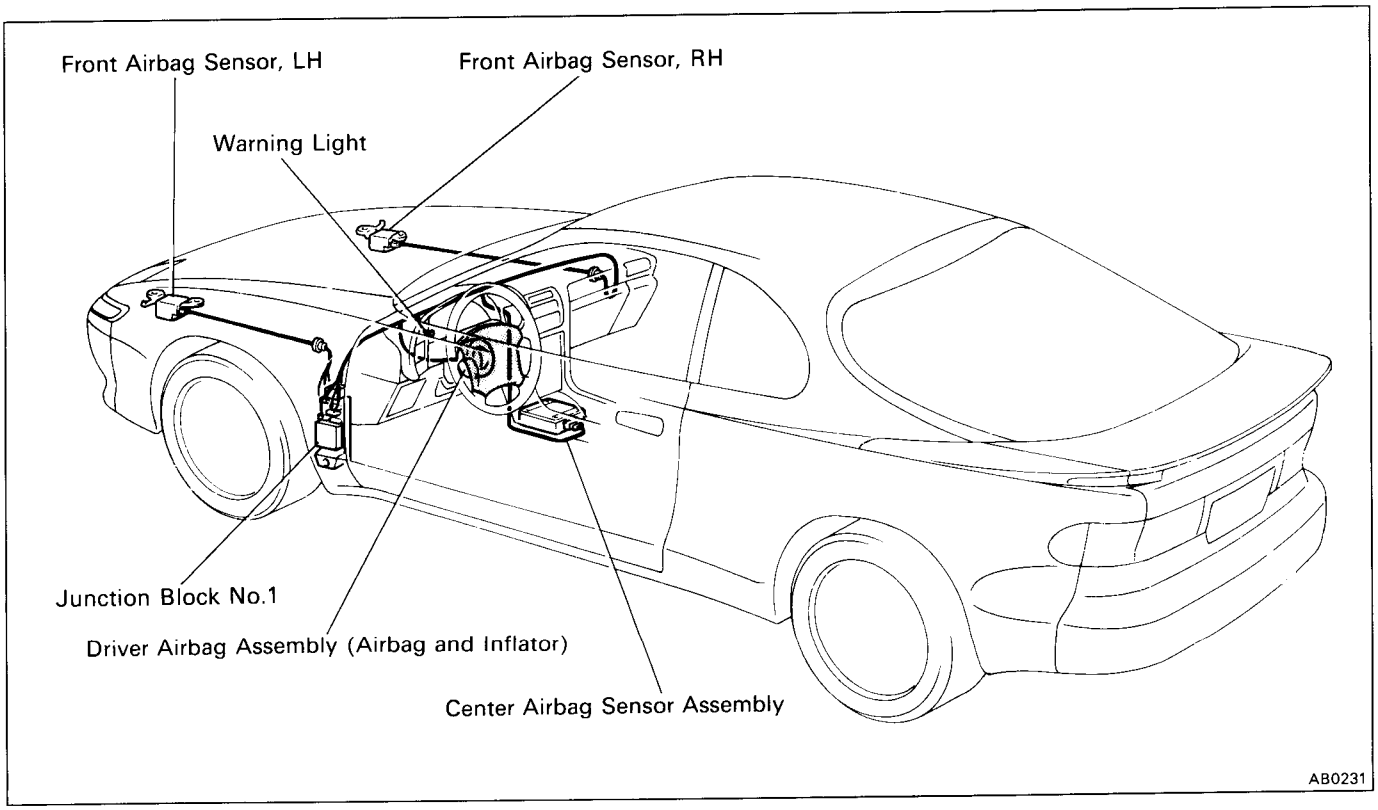


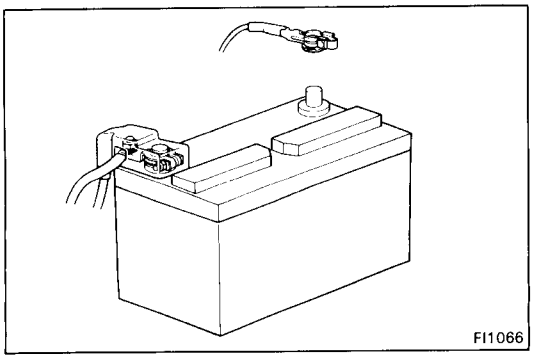
13. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTIONS FOR VEHICLES EQUIPPED WITH SRS AIRBAG

The 1990 CELICA All-Trac/4WD 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

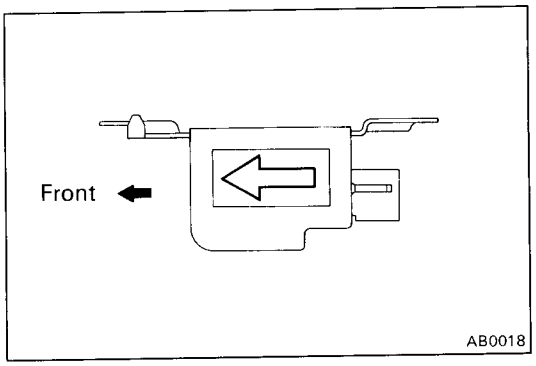




1. Malfunction symptoms of the airbag system are difficult to confirm, so the diagnostic codes become the most important source of information when troubleshooting. When troubleshooting the airbag system, always inspect the diagnostic codes before disconnecting the battery (See Pub.No.RM149U, page AB-24).
2. **Work must be started after approx. 20 seconds or loner 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.)

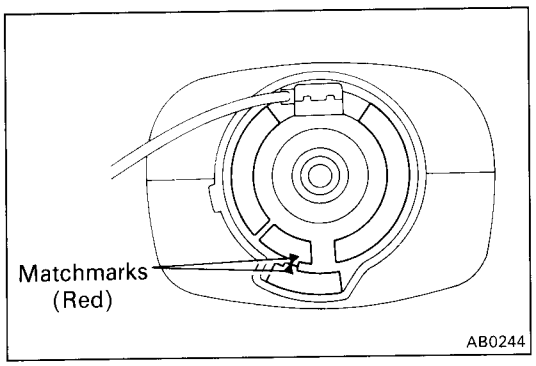
When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by each memory system. Then when work is finished, reset the clock and audio systems as before.
To avoid erasing 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 Pub.No.RM149U, 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 kΩ/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 Pub.No.RM149U, page AB-29).



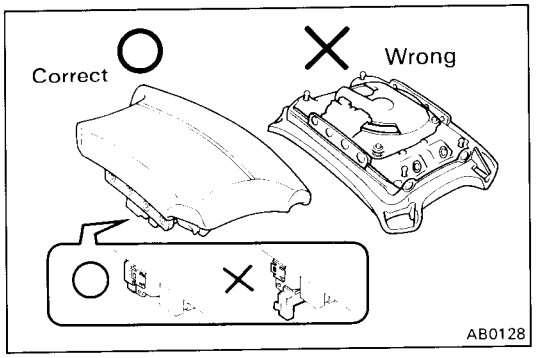
FRONT AIRBAG SENSOR

1. Never reuse the front airbag sensors involved in a collision when the airbag has deployed. (Replace both the 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 Pub.No. RM149U, page AB-9).



SPIRAL CABLE (IN COMBINATION SWITCH)

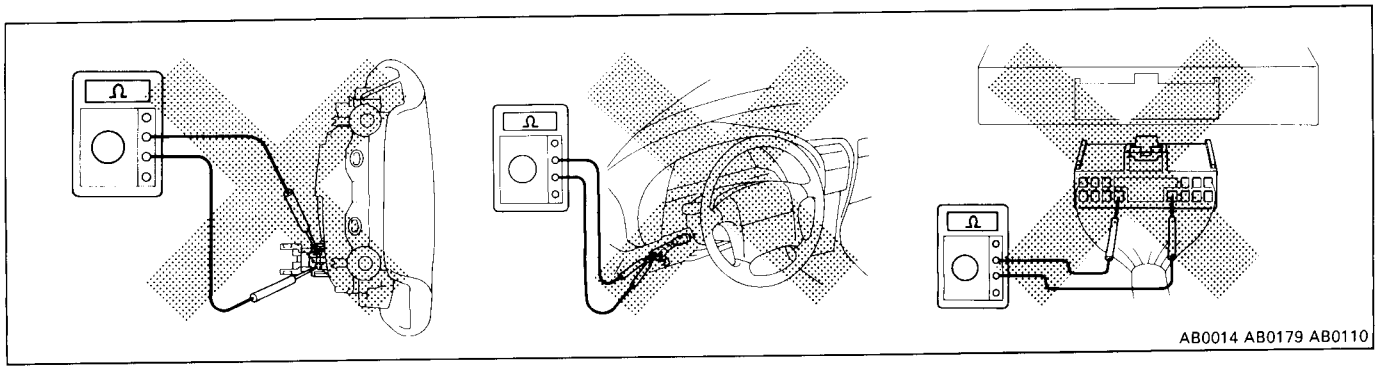
The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position; otherwise cable disconnection and other troubles may result. Refer to Pub.No.RM149U, page AB-16 of this manual concerning correct steering wheel installation.



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 90°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 Pub.No.RM149U, 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 undersired 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 Pub.No.RM149U, on page AB-21.

PRECAUTIONS FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

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.

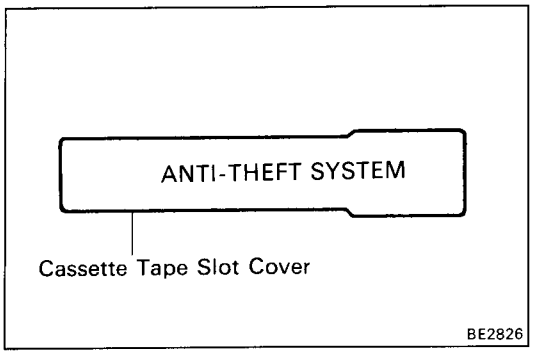
1. **Use only unleaded gasoline.**
2. **Avoid prolonged idling.**

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

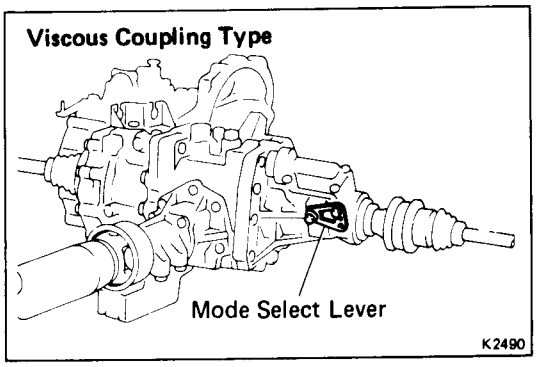
   Engine compression tests must be made as rapidly as possible.
5. **Do not run engine when fuel tank is nearly empty.**

   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.**

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



Audio Systems 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.



PRECAUTIONS WHEN SERVICING FULL-TIME 4WD VEHICLES

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 belows. 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:

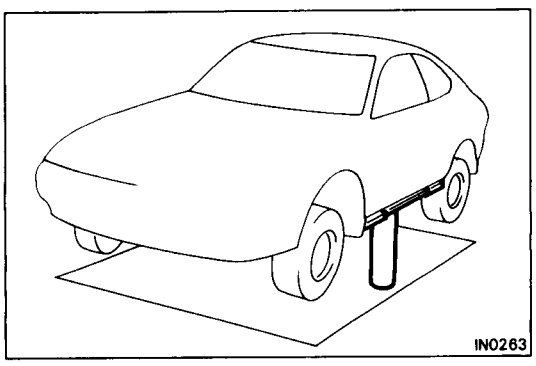
(1) Center differential lock type
(2) Center differential mode position
(3) Whether wheels should be touching ground or jacked up
(4) Transmission gear position
(5) Maximum testing vehicle speed
(6) Maximum testing time

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

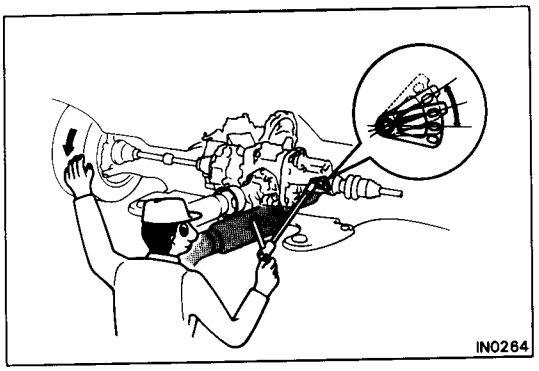
BEFORE BEGINNING TEST

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 perform. 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

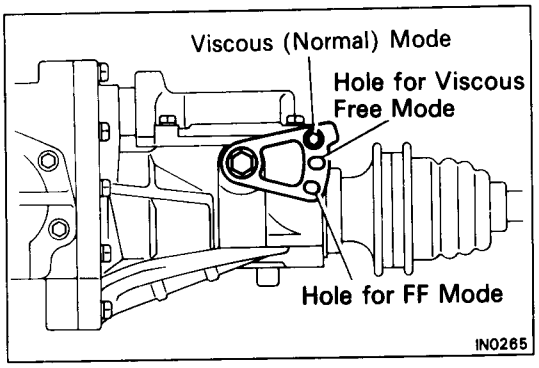

IN0264

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.



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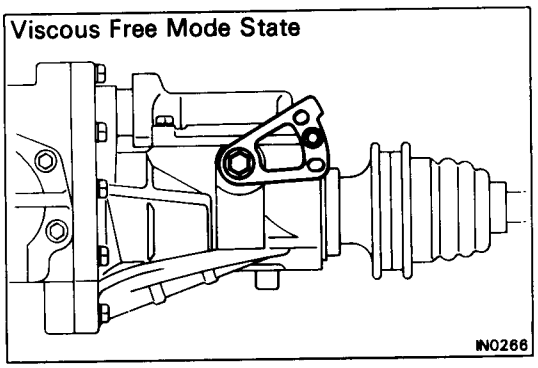
4. LOCK MODE SELECT LEVER WITH SET BOLT

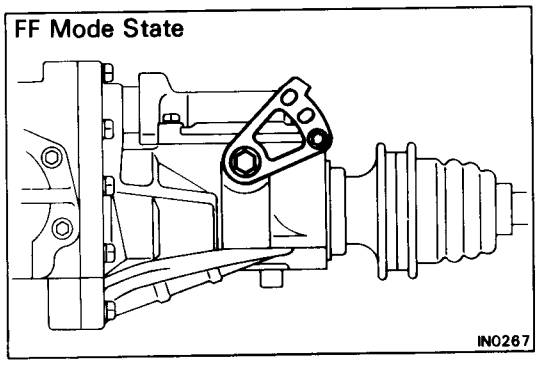


IN0266

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.



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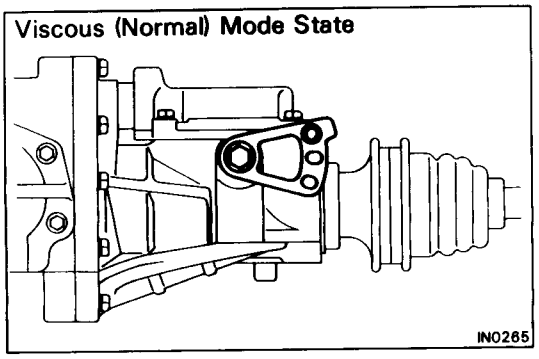
FF Mode:

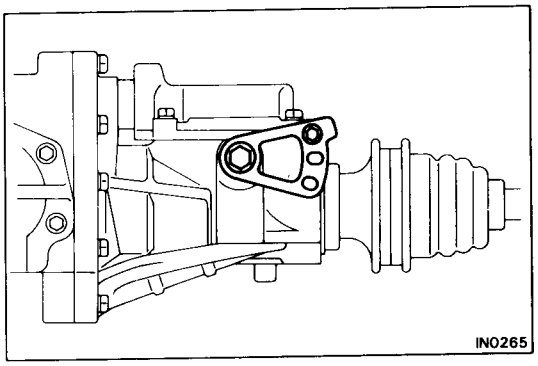
Jack up one of the rear wheels and check that the wheel can be rotated by hand with the transmission in 1st gear.



IN0265

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:

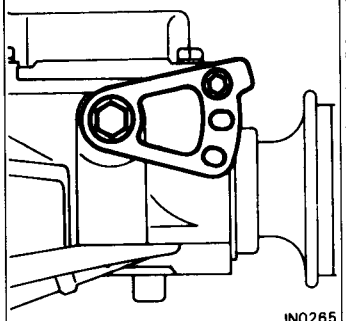
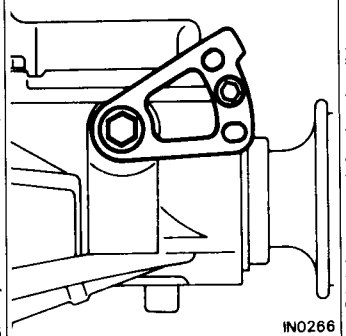
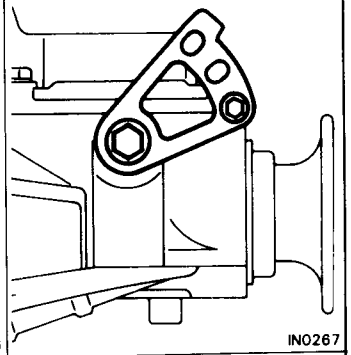
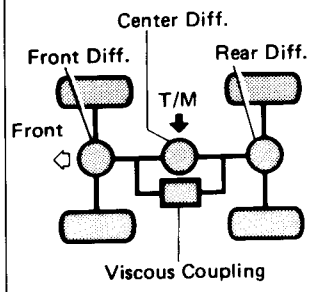
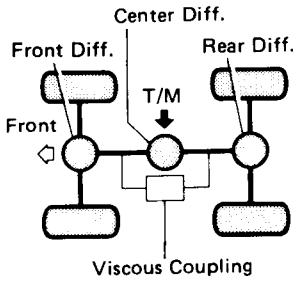
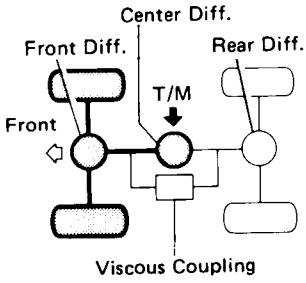
   Maximum speed:
   Speed indicated on speedometer
   Wheel speed (tester speed) 19 mph (30 km/h) or 38 mph (60 km/h)
   Maximum test time: 60 sec.

   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 1st 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 Wheels	4WD	4WD	FWD
Conditions of Use	Normal Driving	• When using a brake tester Never use this mode during normal driving	• 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.

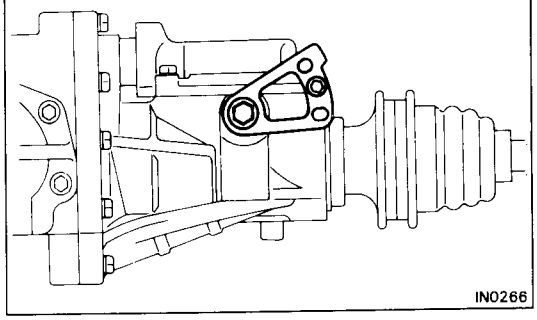
   Method A (Low Speed Test) : Viscous Free Mode

   Method B (High Speed Test) : FF Mode

TEST METHOD A (Low Speed Test)

Speed indicated on speedometer: Below 19 mph (30 km/h),
Wheel speed (tester speed): Below 38 mph (60 km/h) and
Test time: Within 60 sec.

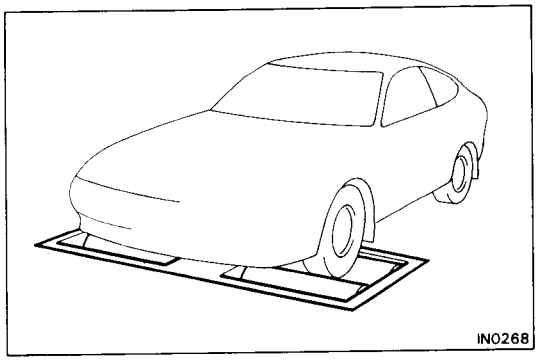
Viscous Free Mode State



IN0266

1. **MOVE MODE SELECT LEVER ON TRANSAXLE TO "VISCOUS FREE MODE" AND INSTALL SET BOLT (See page IN-12)**
2. **CONFIRM MODE SELECTION (See page IN-13)**
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.

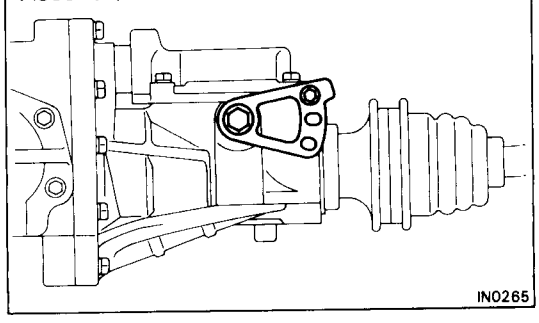


IN0268

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.

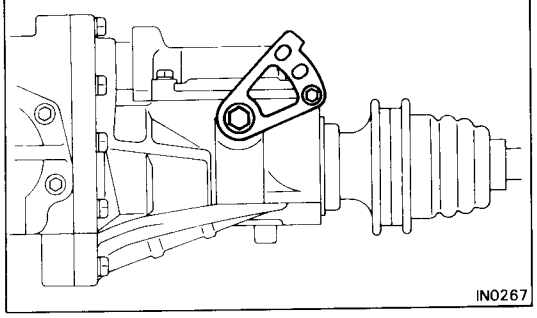
Viscous (Normal) Mode State



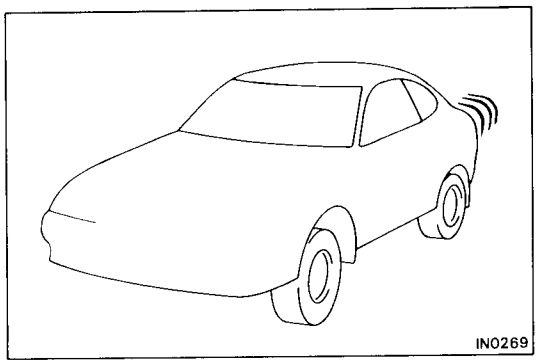
IN0265

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

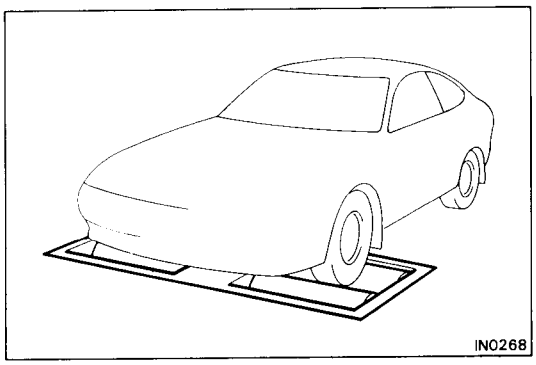
FF Mode State



IN0267

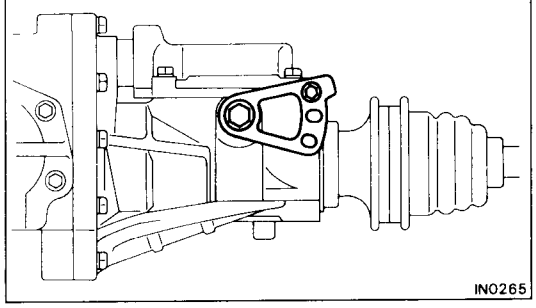


IN0269



IN0268

Viscous (Normal) Mode State



IN0265

TEST METHOD B (High Speed Test)

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

1. MOVE MODE SELECT LEVER TO "FF MODE" AND INSTALL SET BOLT
(See page IN-12)

2. CONFIRM MODE SELECTION
(See page IN-13)

3. PLACE WHEELS (EITHER FRONT OR REAR) TO BE TESTED ON TESTER ROLLERS

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.

4. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (If equipped with it)

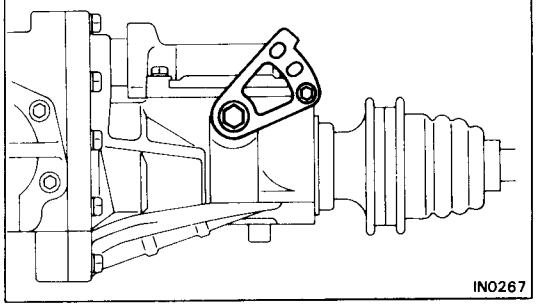
5. PUT TRANSMISSION IN NEUTRAL

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 "VISCOUS (NORMAL) MODE" AND LOCK IT SECURELY WITH SET BOLT

FF Mode State



IN0267

SPEEDOMETER TEST OR OTHER TESTS

(Using Speedometer Tester or Chassis Dynamometer)

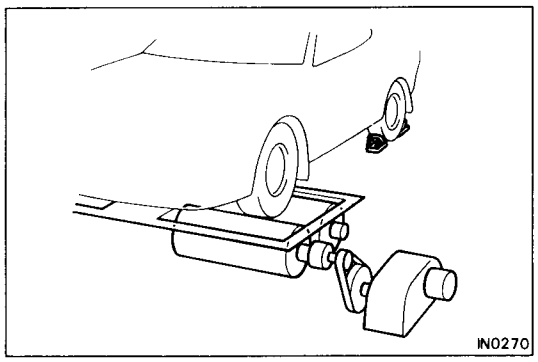
1. MOVE MODE SELECT LEVER TO "FF MODE" AND INSTALL SET BOLT
(See page IN-12)

2. CONFIRM MODE SELECTION
(See page IN-13)

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



IN0270

4. CHOCK REAR WHEELS

5. APPLY PARKING BRAKE

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

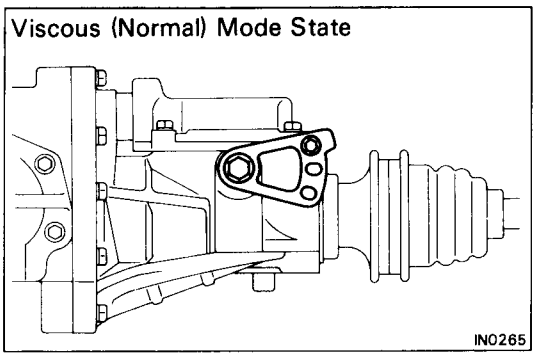
7. TEST VEHICLE
   (1) Start the engine.
   (2) Put the transmission in 3rd gear.
   (3) Engage the clutch slowly, then gradually increase the speed as the test is conducted.

   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

Viscous (Normal) Mode State

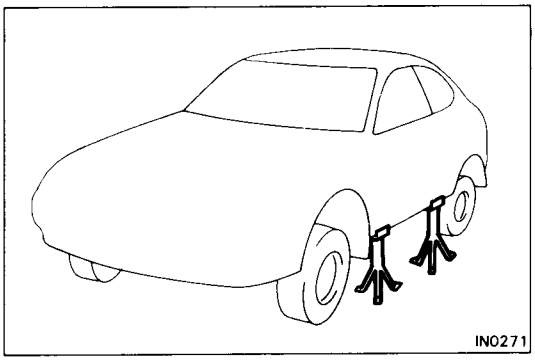


IN0265

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 be driven with both the engine and the wheel balancer.
   (c) 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.

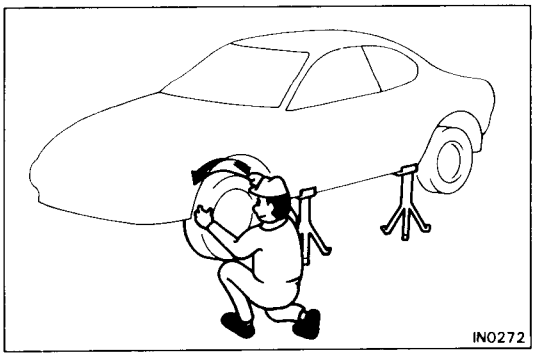


1. JACK UP VEHICLE SO THAT ALL FOUR WHEELS CLEAR GROUND AND CAN BE ROTATED

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

2. RELEASE PARKING BRAKE FULLY

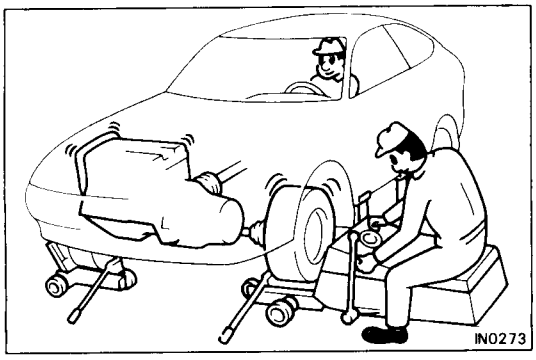
3. MAKE SURE THAT BRAKES ARE NOT DRAGGING ON ANY OF FOUR WHEELS



4. PLACE WHEEL TO BE BALANCED ON WHEEL BALANCER

   Follow the precedure specified by the wheel balancer manufacturer.

5. START ENGINE



6. PUT TRANSMISSION IN 3RD OR 4TH GEAR

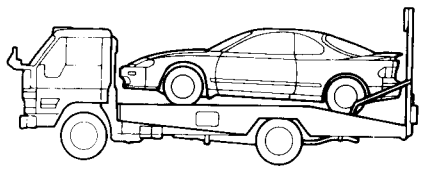
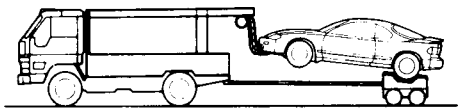
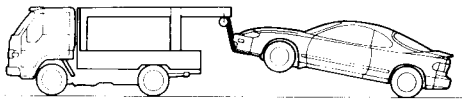
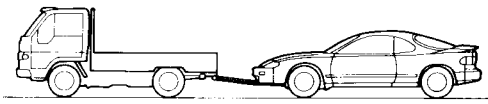
7. ENGAGE CLUTCH SLOWLY, THEN GRADUALLY INCREASE SPEED TO TEST SPEED

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

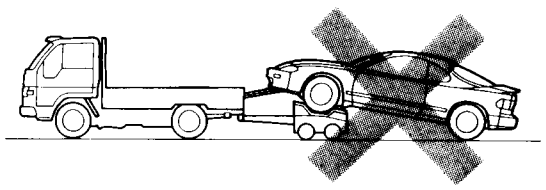
   HINT: When doing this be careful of the other wheels, which will rotate at the same time.

PRECAUTIONS WHEN TOWING FULL-TIME 4WD VEHICLES

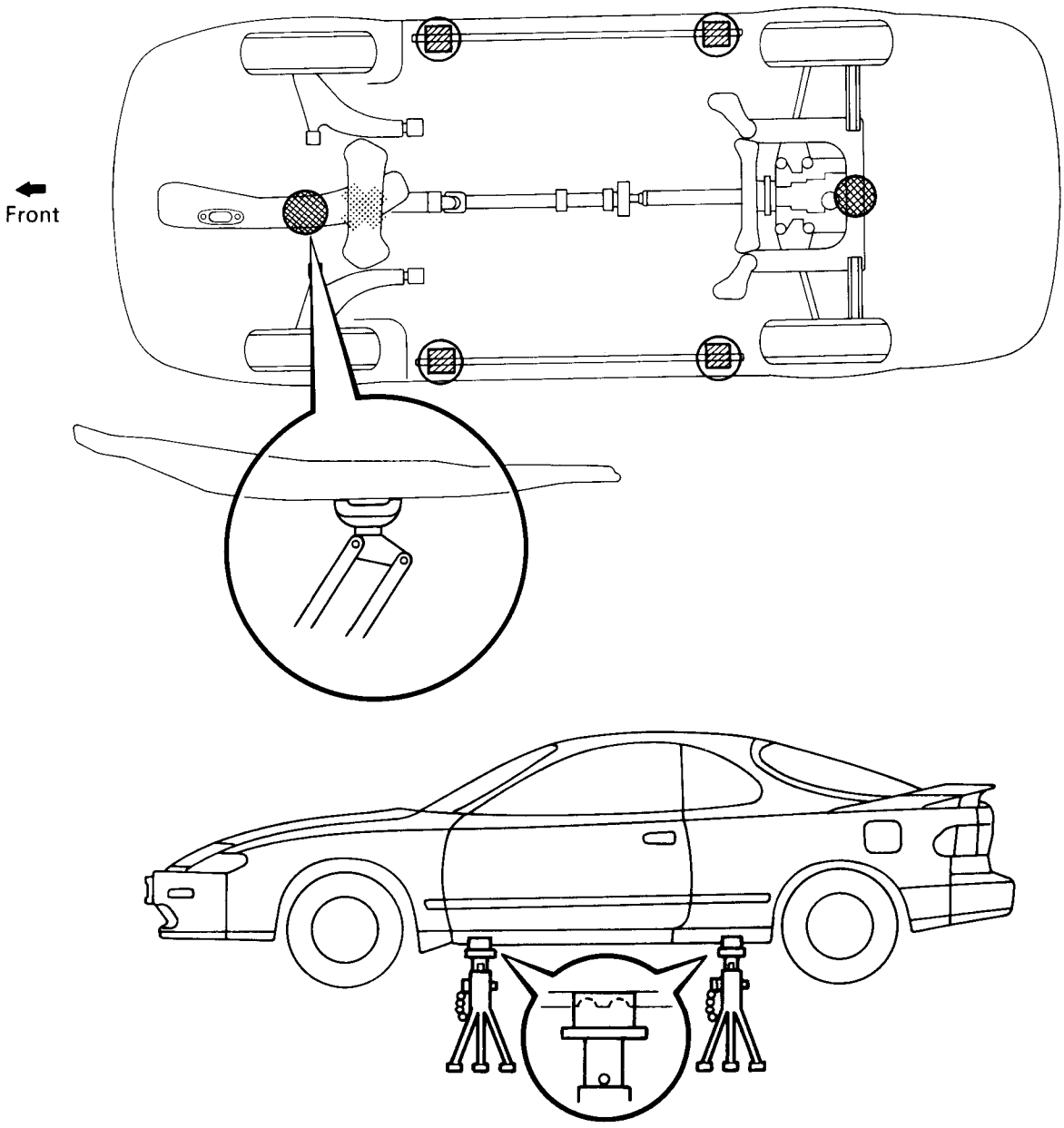
1. Use one of the methods shown below to tow the vehicle.
2. When there is trouble with the chassis and drive train, use method ① (flat bed truck) or method ② (sling type two truck with dollies)
3. Recommended Methods: No. ①, ② or ③
   Emergency Method : No. ④

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

 IN0278	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.

VEHICLE LIFT AND SUPPORT LOCATIONS



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

IN0290
IN0259

ABBREVIATIONS USED IN THIS MANUAL

ABS	Anti-Lock Brake System
A/C	Air Conditioner
Approx.	Approximately
ASV	Air Suction Valve
ATDC	After Top Dead Center
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
CB	Circuit Breaker
ECU	Electronic Control Unit
EFI	Electronic Fuel Injection
EGR	Exhaust Gas Recirculation
ESA	Electronic Spark Advance
EVAP	Evaporative (Emission Control)
EX	Exhaust (manifold, valve)
Ex.	Except
FL	Fusible Link
FR, Fr	Front
IN	Intake (manifold, valve)
IG	Ignition
ISC	Idle Speed Control
LH	Left-Hand
Min.	Minimum
MP	Multipurpose
M/T, MTM	Manual Transaxle
O/S	Oversize
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PS	Power Steering
RH	Right-Hand
Rr	Rear
SRS	Supplemental Restraint System
SOL.	Solenoid
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch
TCCS	TOYOTA Computer Controlled System
TDC	Top Dead Center
T/M	Transmission
T-VIS	Toyota-Variable Induction System
TWC	Three-Way Catalyst
U/S	Undersize
VSV	Vacuum Switching Valve
w/	With
w/o	Without
2WD	Two Wheel Drive Vehicles (4 x 2)
4WD	Four Wheel Drive Vehicles (4 x 4)

MAINTENANCE

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

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 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 of less than 5 miles (8 km) and outside temperatures remains below freezing.
- Extensive idling and/or low speed driving for long distances 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 items	Maintenance service beyond 60,000 (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	
	km x 1,000	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96		
ENGINE	Timing belt (1)																R	–	MA-4 (item 1)
	Valve clearance																A	A: Every 72 months	MA-6 (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 *	R: Every 2,500 miles (4,000 km) or 3 months.																	MA-5 (item 6)
	Engine oil filter *	R: Every 5,000 miles (8,000 km) or 6 months.																	MA-5 (item 6)
	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-6 (item 7)
	Exhaust pipes and mountings				I				I				I				I	I; Every 24 months	MA-6 (item 11)
FUEL	Air filter (2) *	I: Every 5,000 miles (8,000 km) or 6 months. R: Every 30,000 miles (48,000 km) or 36 months.																	MA-4 (item 3,4)
	Fuel lines and connection (3)								I								I	I: Every 36 months	MA-6 (item 10)
	Fuel tank cap gasket																R	I: Every 72 months	MA-6 (item 9)
IGNITION	Spark plug																R	R: Every 72 months	MA-5 (item 5)
EVAP	Charcoal canister																I	I: Every 72 months	MA-6 (item 8)
BRAKES	Brake linings and drums (4)		I		I		I		I		I		I		I		I	I: Every 12 months	MA-8 (item 15)
	Brake pads and discs (Front and rear)		I		I		I		I		I		I		I		I	I: Every 12 months	MA-7 (item 14)
	Brake line pipes and hoses				I				I				I				I	I: Every 24 months	MA-7 (item 13)
CHASSIS	Steering linkage		I		I		I		I		I		I		I		I	I: Every 12 months	MA-8 (item 16)
	SRS airbag	I: First period, 10 years. I: After every 2 years.																	MA-9 (item 17)
	Drive shaft boots		I		I		I		I		I		I		I		I	I: Every 12 months	MA-9 (item 20)
	Manual transaxle, transfer and differential				R				R				R				R	R: Every 24 months	MA-10 (item 21, 22)
	Steering gear housing oil (5)				I				I				I				I	I: Every 24 months	MA-9 (item 18)
	Bolts and nuts on chassis and body (6)		I		I		I		I		I		I		I		I	I: Every 12 months	MA-11 (item 23)

★ mark indicates 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. (★: CALIF. only)

(1) Applicable to vehicles operated under conditions of extensive idling and/or low speed driving for a long distances 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 oil leaks from steering gear housing.

(6) 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.
- Bolts for sheet installation

SCHEDULE B

CONDITIONS: Conditions other than those listed in SCHEDULE A

System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items	Maintenance service beyond 60,000 (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	
	km x 1,000	12	24	36	48	60	72	84	96		
ENGINE	Valve clearance								A	A: Every 72 months	MA-6 (item 12)
	Drive belt	I: First period, 60,000 miles (96,000 km or 72 months. I: After that every 7,5000 miles (12,000 km) or 12 months.									MA-4 (item 2)
	Engine oil *	R: Every 5,000 miles (8,000 km) or 6 months.									MA-5 (item 6)
	Engine oil filter *	R: Every 10,000 miles (16,000 km) or 12 months.									MA-5 (item 6)
	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-6 (item 7)
	Exhaust pipes and mountings				I				I	I: Every 36 months	MA-6 (item 11)
FUEL	Air filter *				R				R	R: Every 36 months	MA-4 (item 4)
	Fuel lines and connections (1)				I				I	I: Every 36 months	MA-6 (item 10)
	Fuel tank cap gasket								R	R: Every 72 months	MA-6 (item 9)
IGNITION	Spark plugs								R	R: Every 72 months	MA-5 (item 5)
EVAP	Charcoal canister								I	I: Every 72 months	MA-6 (item 8)
BRAKES	Brake linings and drums (2)		I		I		I		I	I: Every 24 months	MA-8 (item 15)
	Brake pads and discs (Front and rear)		I		I		I		I	I: Every 24 months	MA-7 (item 14)
	Brake line pipes and hoses		I		I		I		I	I: Every 24 months	MA-7 (item 13)
CHASSIS	Steering linkage		I		I		I		I	I: Every 24 months	MA-8 (item 16)
	SRS airbag	I: First period, 10 years. I: After that every 2 years.									MA-9 (item 17)
	Drive shaft boots		I		I		I		I	I: Every 24 months	MA-9 (item 19)
	Ball joints and dust covers		I		I		I		I	I: Every 24 months	MA-10 (item 20)
	Manual transaxle, transfer and differential (3)		I		I		I		I	I: Every 24 months	MA-10 (item 21)
	Steering gear housing oil (4)		I		I		I		I	I: Every 24 months	MA-9 (item 18)
	Bolts and nuts on chassis and body (5)		I		I		I		I	I: Every 24 months	MA-11 (item 23)

★ mark indicates 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. (★: CALIF. only)

(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.
- Bolts for sheet installation

MAINTENANCE OPERATIONS

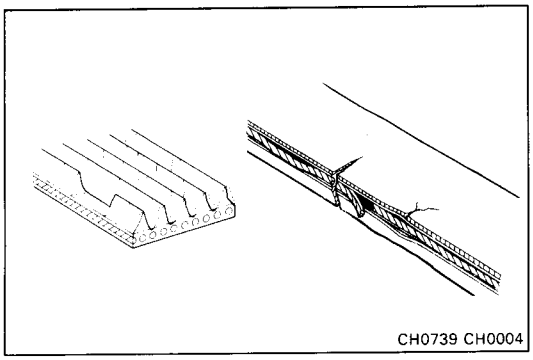
ENGINE

Cold Engine Operations

1. REPLACE TIMING BELT

(a) Remove the timing belt.
(See pages EM-19 to 24)

(b) Install the timing belt.
(See pages EM-28 to 34)



2. INSPECT DRIVE BELT

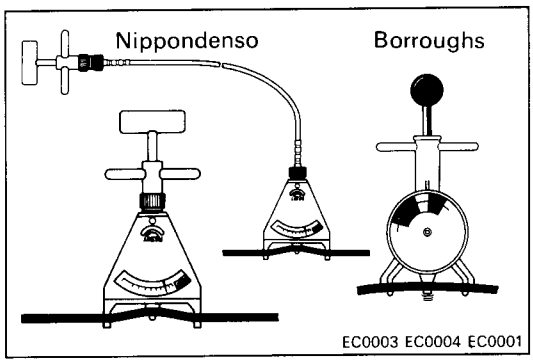
(a) Visually check the drive belt for excessive wear, frayed cords etc.

If necessary, replace the drive belt.

HINT: Cracks on the ribbed 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



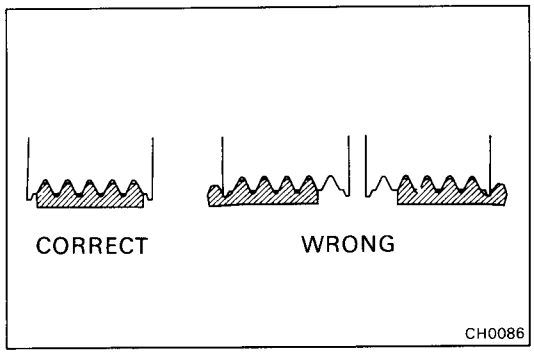
Drive belt tension:

Alternator		
w/ A/C	**New belt**	**175 ± 5 lb**
	Used belt	**115 ± 20 lb**
w/o A/C	**New belt**	**150 ± 25 lb**
	Used belt	**130 ± 25 lb**
PS pump	**New belt**	**125 ± 25 lb**
	Used belt	**80 ± 20 lb**

If necessary, adjust the drive belt tension.

HINT:

- "New belt" refers to a belt which has been used 5 minutes or less 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.



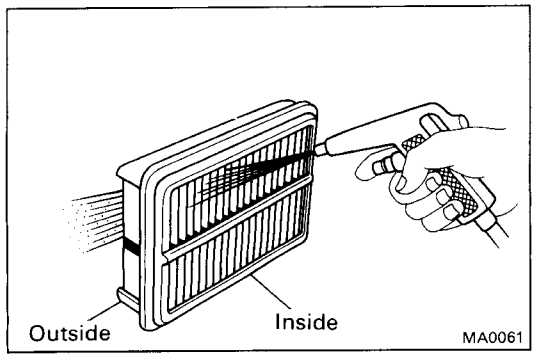
3. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively damaged or oily.

If necessary, replace the air cleaner element.

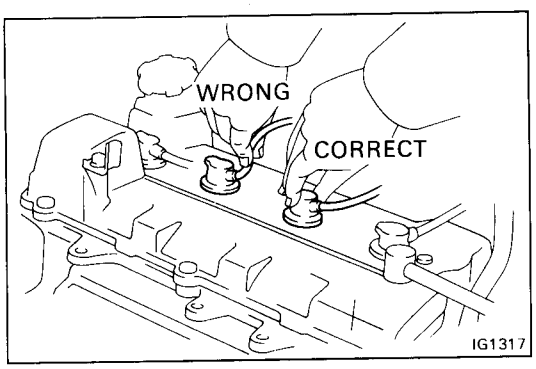
(b) Clean the element with compressed air.

First blow from the inside thoroughly, then blow off the outside of the element.



4. REPLACE AIR FILTER

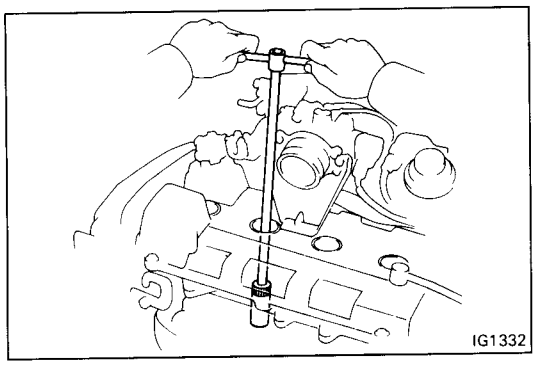
Replace the air cleaner element with a new one.



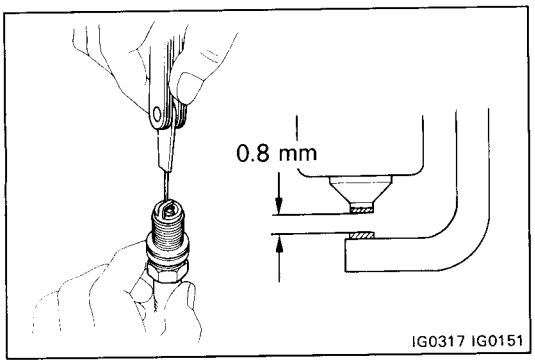
5. REPLACE SPARK PLUGS

(a) 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.

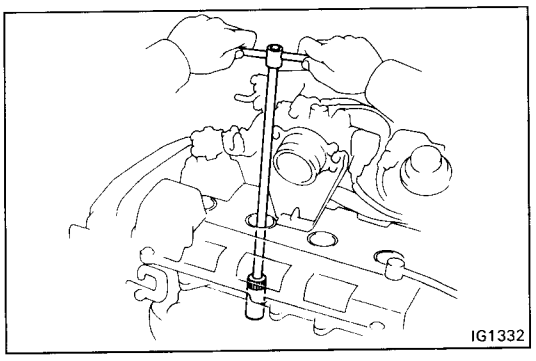


(d) Check the electrode gap of new spark plugs.

Correct electrode gap: **0.8 mm (0.031 in.)**

Recommended spark plugs: **ND PK20R8**
NGK BKR6EP8

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

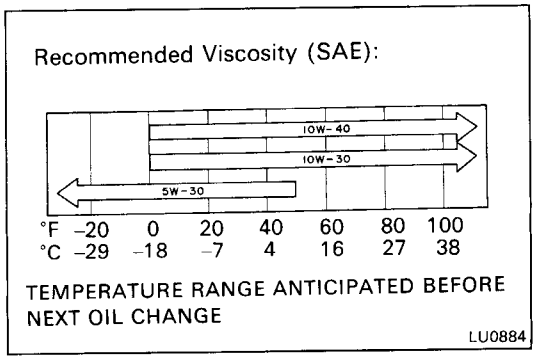


(e) Using a 16 mm plug wrench, install the spark plugs.

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

(f) Connect the spark plug cords.

(g) Install the intercooler. (See page TC-17)



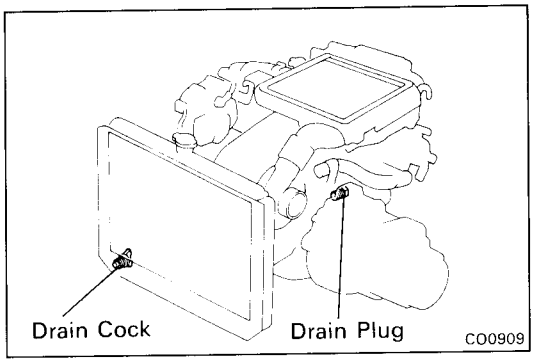
6. REPLACE ENGINE OIL AND OIL FILTER (See page LU-5)

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

Drain and refill capacity:

w/ Oil filter change
3.9 liters (3.7 US qts, 3.4 Imp. qts)

w/o Oil filter change
3.6 liters (3.8 US qts, 3.2 Imp. qts)



7. **REPLACE ENGINE COOLANT**
(See page CO-4)

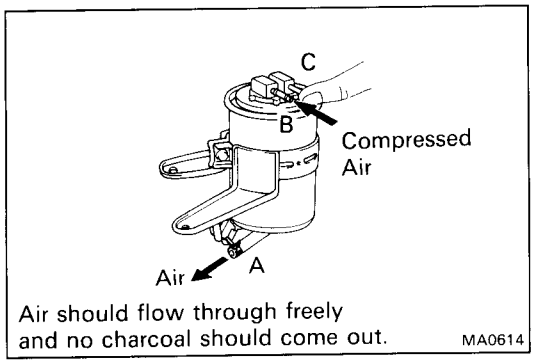
HINT:

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

NOTICE:

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

Coolant capacity (w/ Heater):
6.4 liters (6.8 US qts, 5.6 Imp. qts)



8. **INSPECT CHARCOAL CANISTER**

(a) Disconnect the hoses from the charcoal canister. Label hoses for correct installation.

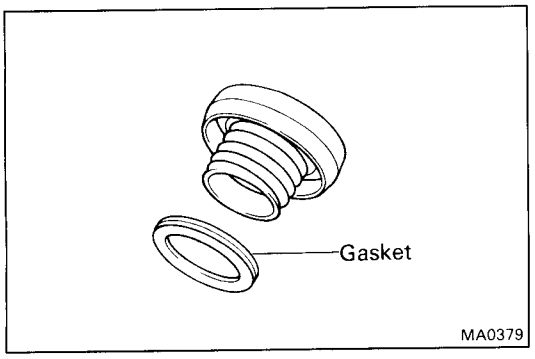
(b) Plug port C with your finger, and blow compressed air (3 kg/cm^2, 43 psi or 294 kPa) through port B (fuel tank side).

- Check that air comes out of the bottom 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.

(c) Connect the hoses to the charcoal canister.



9. **REPLACE GASKET IN FUEL TANK CAP**

(a) Remove the old gasket from the tank cap.

NOTICE: Do not damage the tank cap.

(b) Install a new gasket by hand.

(c) Check the cap for damage or cracks.

(d) Install the cap and check the torque limiter.

10. **INSPECT FUEL LINES AND CONNECTIONS**

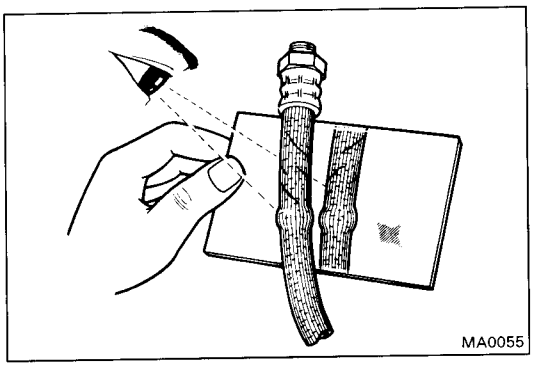
Visually check the fuel lines for cracks, leakage, loose connections, deformation or tank band looseness.

11. **INSPECT EXHAUST PIPES AND MOUNTINGS**

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

12. **ADJUST VALVE CLEARANCE (See page EM-15)**

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.)



BRAKES

13. 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.

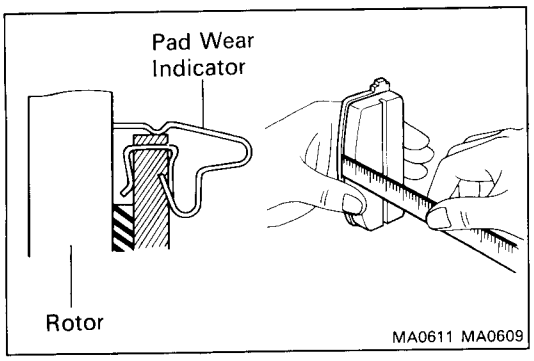
(a) Check all brake lines and hoses for:

- 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.

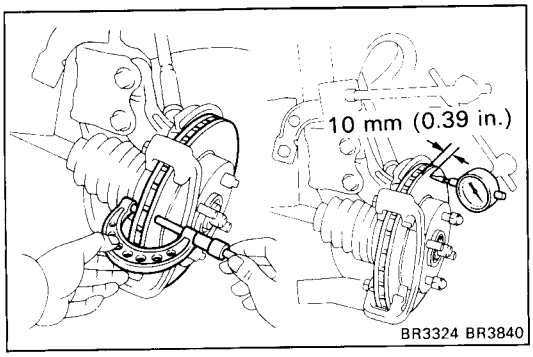


14. INSPECT BRAKE PADS AND DISCS

(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.



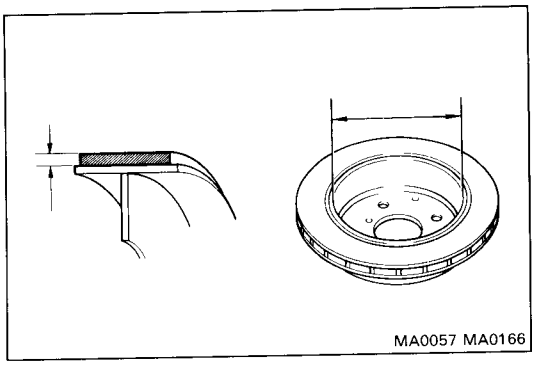
(b) Check the disc for wear or runout.

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.)**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15. 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: 171.0 mm (6.732 in.)

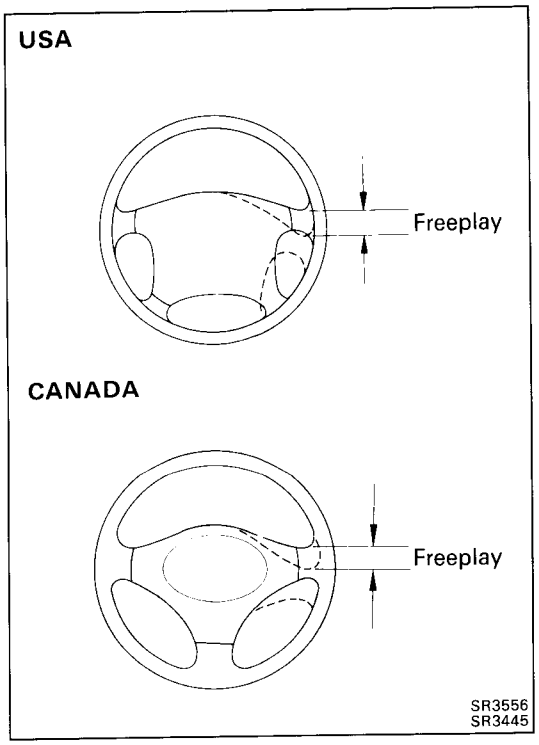
(c) Clean the brake parts with a damp cloth.

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

(d) Settle the parking brake shoes and drum. When performing the road test in item 25, 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 9 kg (20 lb, 88 N) 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.



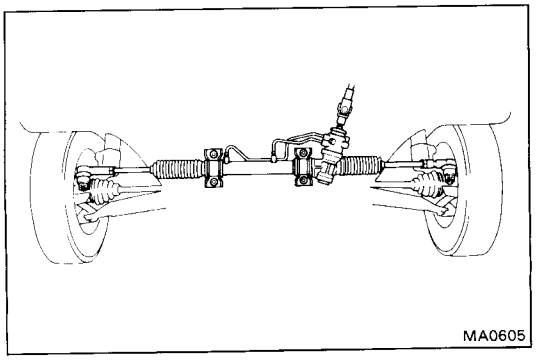
CHASSIS

16. 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.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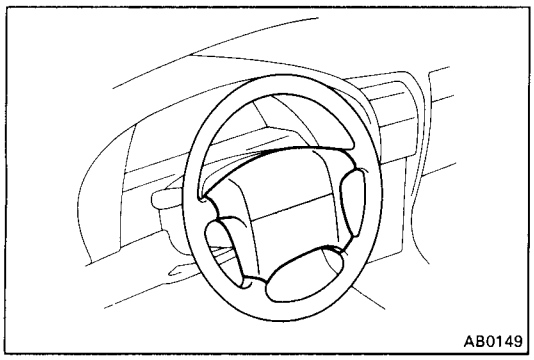
(b) Check the steering linkage for looseness or damage.

Check that:

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



17. INSPECT SRS AIRBAG

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

- 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:

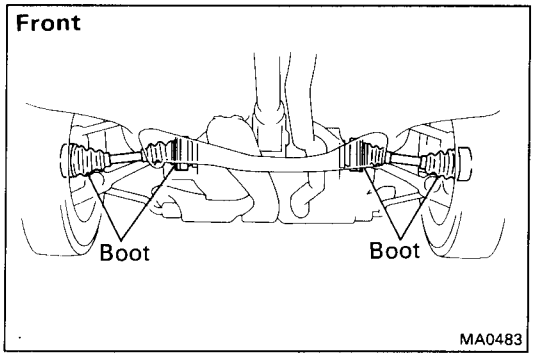
- **For removal and replacement of the steering wheel pad, see Pub. No. RM149U on page AB-15 and be sure to perform the operation in the correct order.**
- **Before disposing of the steering wheel pad, the airbag must first be deployed by using an SST (see Pub. No. RM149U on page AB-82).**

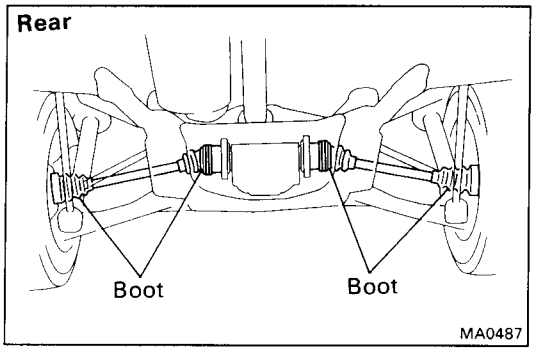
18. INSPECT STEERING GEAR HOUSING OIL

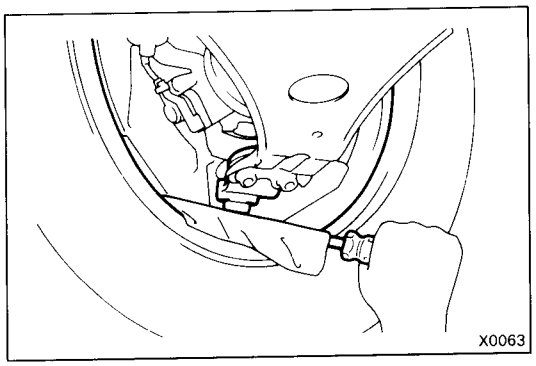
Check the steering gear box for oil leakage.

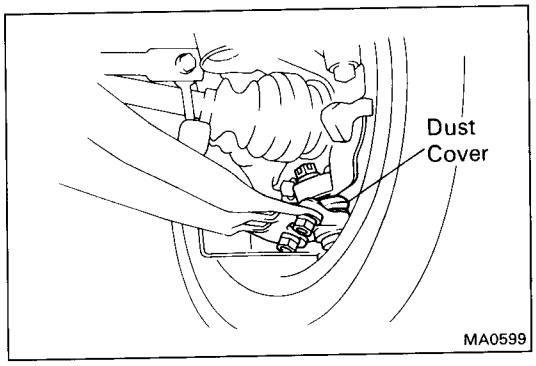
19. INSPECT DRIVE SHAFT BOOTS

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









20. INSPECT BALL JOINTS AND DUST COVERS

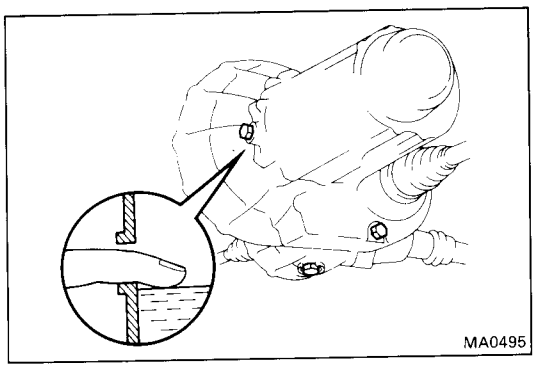
(a) Inspect the ball joints for excessive looseness.

- 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.



21. CHECK TRANSAXLE OIL AND REAR DIFFERENTIAL OIL

A. Check manual transaxle oil

(a) Remove the LH engine under cover.

(b) Visually check the transaxle for oil leakage.

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

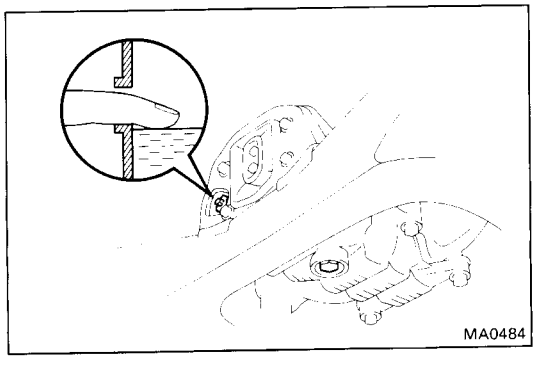
(c) Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the filler hole.

If the level is low, add oil until it begins to run out the filler hole.

Transaxle oil: See item 22 (A)

(d) Reinstall the filler plug securely.

(e) Reinstall the LH engine under cover.



B. Check rear differential oil

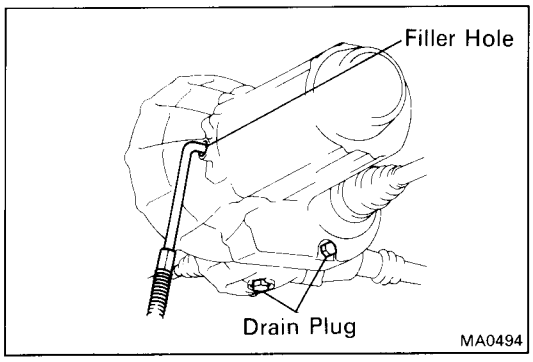
(a) Visually check the differential for oil leakage.
If leakage is found, check for the cause and repair.

(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 the filler hole.

Differential oil: See item 22 (B)

(c) Reinstall the filler plug securely.



22. REPLACE TRANSAXLE OIL AND REAR DIFFERENTIAL OIL

A. Replace transaxle oil (Incl. transfer oil)

(a) Remove the LH engine under cover.

(b) Remove the filler and drain plugs, and drain the oil.

(c) Reinstall the drain plugs securely.

(d) Add new oil until it begins to run out of the filler hole.

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

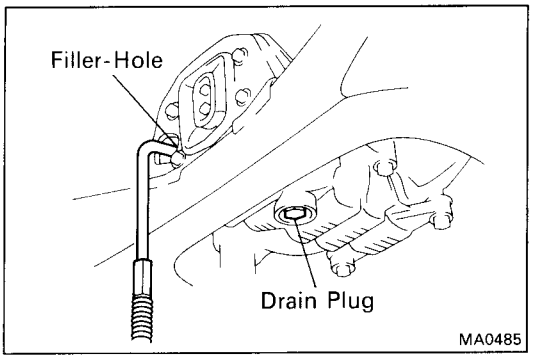
Recommended transaxle oil:

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)**

(e) Reinstall the filler plug securely.

(f) Reinstall the engine under cover.



B. Replace rear differential oil

(a) Remove the filler and drain plugs, and drain the oil.

(b) Reinstall the drain plugs securely.

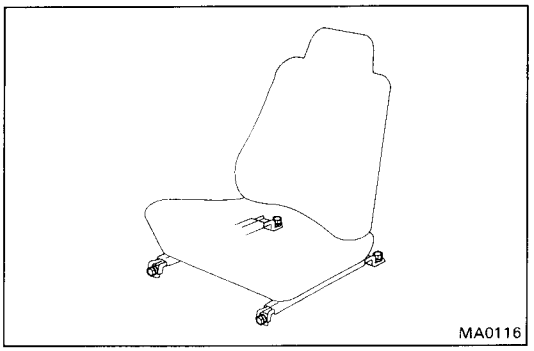
(c) Add new oil until it begins to run out of the filler hole.

Rear differential oil:

Oil grade	**API GL-5 hypoid gear oil**
Viscosity	**Above – 18°C (0°F) SAE 90**
	Below – 18°C (0°F) SAE 80W-90

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

(d) Reinstall the filler plug securely.

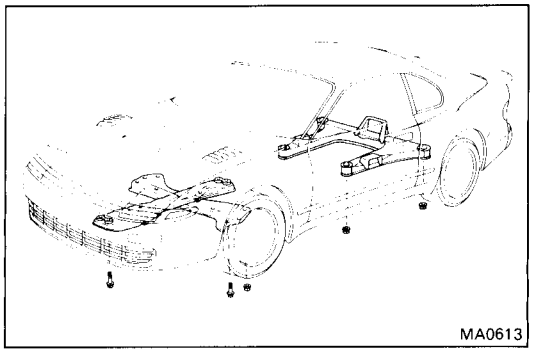


23. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Front seats mount bolts

Torque: 375 kg-cm (27 ft-lb, 37 N·m)



- Engine mounting center member-to-body mount bolts

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

- Front suspension lower crossmember-to-body mount bolts

Torque: 1,550 kg-cm (112 ft-lb, 152 N·m)

- Rear suspension lower crossmember-to-body mount bolts

Torque: 1,280 kg-cm (93 ft-lb, 126 N·m)

24. BODY INSPECTION

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

(b) Check the underbody for rust and damage.

25. 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-8)

26. 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 closes 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
  Fold-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 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, these 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 follow:

OUTSIDE VEHICLE

1. **TIRES**
   (a) Check the pressure with a gauge, Adjust if necessary.
   (b) Check for cuts, damage or excessive wear.

2. **WHEEL NUTS**
   When checking the tires, check the nuts for looseness or 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 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 fold-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

Check the pedal for smooth operation.

Check that the pedal has the proper freeplay.

20. BRAKE PEDAL

(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

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

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

UNDER HOOD

23. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

24. ENGINE COOLANT LEVEL

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

25. RADIATOR AND HOSES

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

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

26. 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 low, add distilled.

27. 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.

28. ENGINE DRIVE BELTS

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

29. ENGINE OIL LEVEL

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

30. 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.

31. EXHAUST SYSTEM

Visually inspect for cranks, 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.

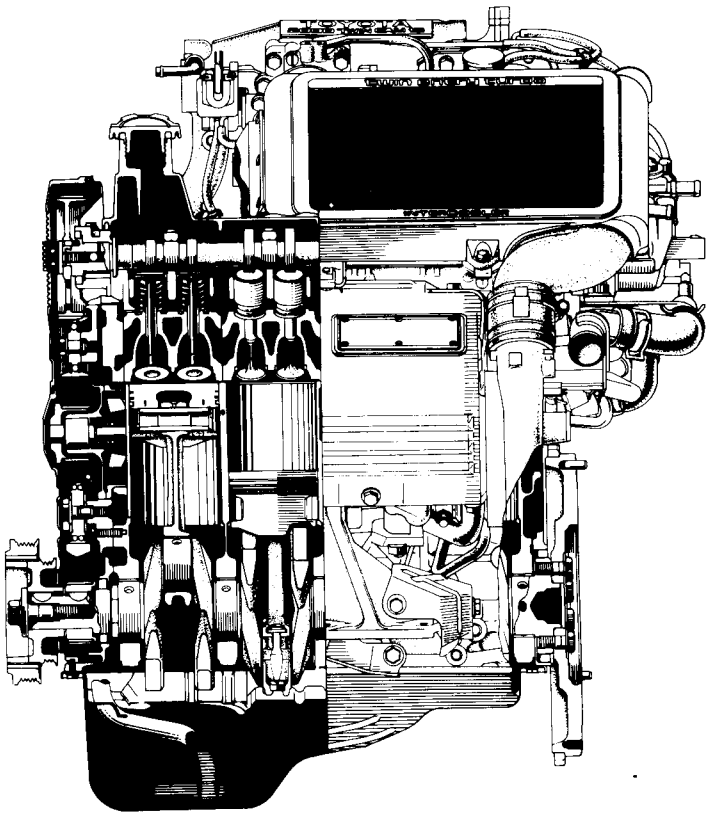
ENGINE MECHANICAL

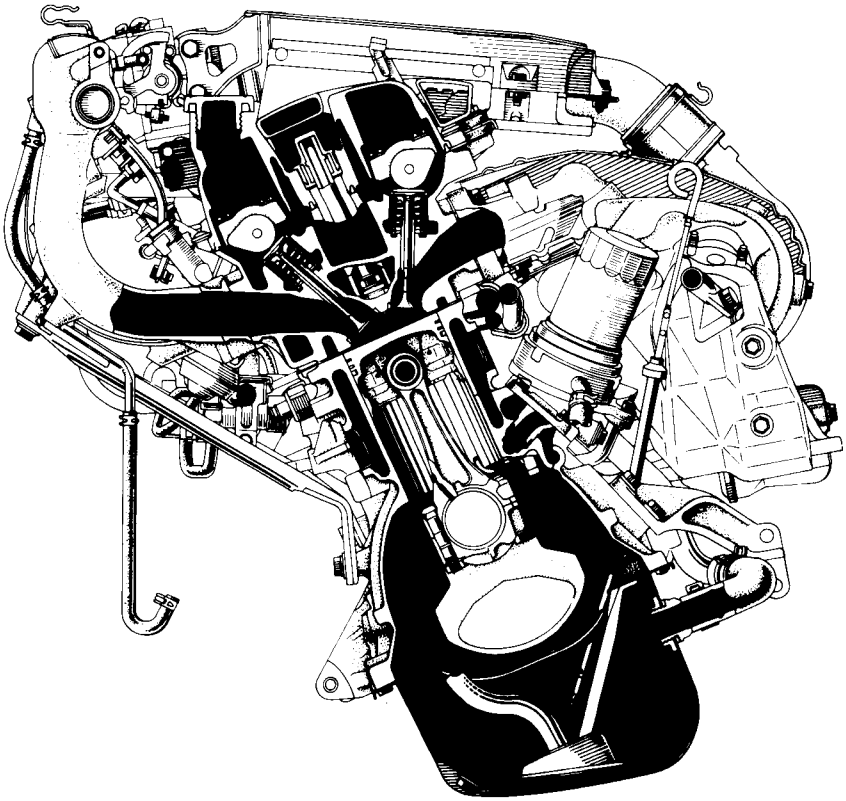
REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

DESCRIPTION

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





EM7884
EM7885

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 firing 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 super-charging 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 thus shifting the oil shifts away from the oil pump suction pipe.

TROUBLESHOOTING

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	*CO-4
	Incorrect ignition timing	Reset timing	IG-13

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 ● No fuel in tank ● Fuel pump not working ● Fuel filter clogged ● Fuel line clogged or leaking	Troubleshoot EFI system	FI-10
	EFI system problems	Repair as necessary	
	Ignition problems ● Ignition coil ● Igniter ● Distributor	Perform spark test	IG-5
	Spark plug faulty	Inspect plugs	IG-6
	High-tension cords disconnected or broken	Inspect cords	IG-6
	Vacuum leaks ● PCV line ● EGR line ● Intake manifold ● T-VIS valve ● Throttle body ● ISC valve ● Brake booster line	Repair as necessary	
	Air suction between air flow meter and throttle body	Repair as necessary	
	Low compression	Check compression	EM-17

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plug faulty	Inspect plugs	IG-6
	High-tension cord faulty	Inspect cords	IG-6
	Ignition problems		
	● Ignition coil	Inspect coil	IG-8
	● Igniter	Inspect igniter	IG-9
	● Distributor	Inspect distributor	IG-8
	Incorrect ignition timing	Reset timing	IG-13
	Vacuum leaks ● PCV line ● EGR line ● Intake manifold	Repair as necessary	

* See Pub. No. RM149U.

ROUGH IDLING (Cont'd)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (Cont'd)	● T-VIS valve ● Throttle body ● ISC valve ● Brake booster line		
	Air suction between air flow meter and throttle body		
	Incorrect idle speed	Check ISC system	FI-76
	Incorrect valve clearance	Adjust valve clearance	EM-9
	EFI system problems	Repair as necessary	
	Engine overheats	Check cooling system	*CO-4
	Low compression	Check compression	EM-17

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ poor acceleration	Spark plug faulty	Inspect plugs	IG-6
	High-tension cord faulty	Inspect cords	IG-6
	Vacuum leaks ● PCV line ● EGR line ● Intake manifold ● T-VIS valve ● Throttle body ● ISC valve ● Brake booster line	Repair as necessary	
	Air suction between air flow meter and throttle body	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-13
	Incorrect valve clearance	Adjust valve clearance	EM-9
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air cleaner	MA-4
	EFI system problems	Repair as necessary	
	Emission control system problem (cold engine) ● EGR system always on	Check EGR system	EC-8
	Engine overheats	Check cooling system	*CO-4
	Low compression	Check compression	EM-17

* See Pub. No. RM149U.

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine diesels (runs after ignition switch is turned off)	EFI system problems	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-13
	EGR system faulty	Check EGR system	EC-8

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	Check air cleaner	MA-4
	EFI system problems	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-13
Engine backfires	EFI system problems	Repair as necessary	
	Vacuum leak ● PCV line ● EGR line ● Intake manifold ● T-VIS valve ● Throttle body ● ISC valve ● Brake booster line	Check hoses and repair as necessary	
	Air suction between air flow meter and throttle body	Repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	FI-10
	Incorrect ignition timing	Reset timing	IG-13
	Incorrect valve clearance	Adjust valve clearance	EM-9
	Carbon deposits in combustion chambers	Inspect cylinder head	EM-51

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	
	Piston ring worn or damaged	Check rings	EM-95
	Valve stem and guide bushing worn	Check valves and guide bushing	EM-53
	Valve stem oil seal worn	Check seals	

EXCESSIVE FUEL CONSUMPTION

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air cleaner	MA-4
	Incorrect ignition timing	Reset timing	IG-13
	EFI system problems ● Injector faulty ● Deceleration fuel cut system faulty	Repair as necessary	
	Idle speed too high	Check ISC system	FI-76
	Spark plug faulty	Inspect plugs	IG-6
	EGR system always on	Check EGR system	EC-8
	Low compression	Check compression	EM-17
	Tires improperly inflated	Inflate tires to proper pressure	
	Clutch slips	Troubleshoot clutch	
	Brakes drag	Troubleshoot brakes	

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed	Check ISC system	FI-76
	Incorrect ignition timing	Reset timing	IG-13
	Vacuum leaks ● PCV line ● EGR line ● Intake manifold ● T-VIS valve ● Throttle body ● ISC valve ● Brake booster line	Repair as necessary	
	EFI system problems	Repair as necessary	

ENGINE TUNE-UP

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page CO-4)

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page LU-4)

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 page MA-4)

INSPECTION OF HIGH-TENSION CORDS

(See page IG-6)

Maximum resistance: 25 kΩ per cord

INSPECTION AND ADJUSTMENT OF ALTERNATOR DRIVE BELT

(See step 3 on page CH-3)

Drive belt tension:

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

INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE

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)

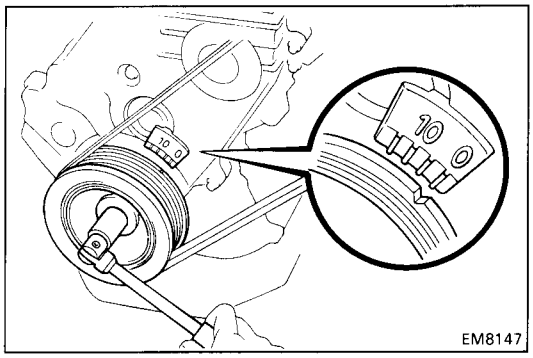
2. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**

3. **REMOVE EGR VACUUM MODULATOR AND VSV**
(See step 20 on page EM-45)

4. **REMOVE EGR VALVE AND PIPE**
(See step 21 on page EM-45)

5. **REMOVE THROTTLE BODY**
(See steps 5 to 8 and 9 to 11 on pages FI-72 and 73)

6. **REMOVE CYLINDER HEAD COVER**
(See step 34 on page EM-48)

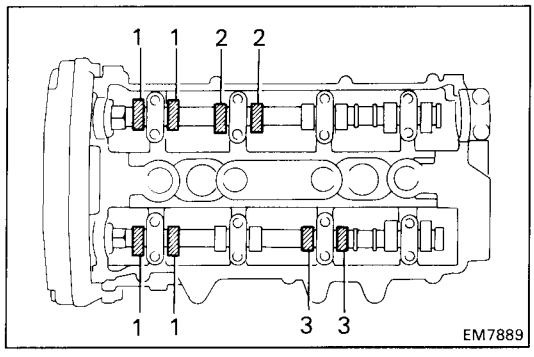


7. **SET NO.1 CYLINDER TO TDC/COMPRESSION**

(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.



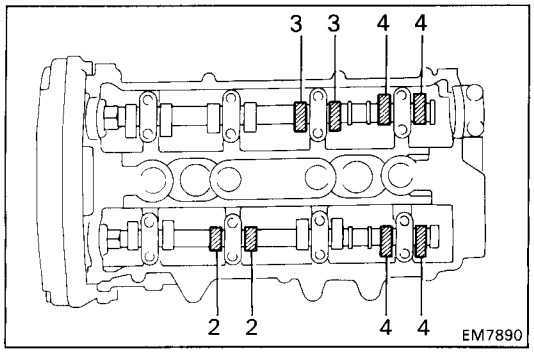
8. **INSPECT VALVE CLEARANCE**

(a) Check only those valves indicated.

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

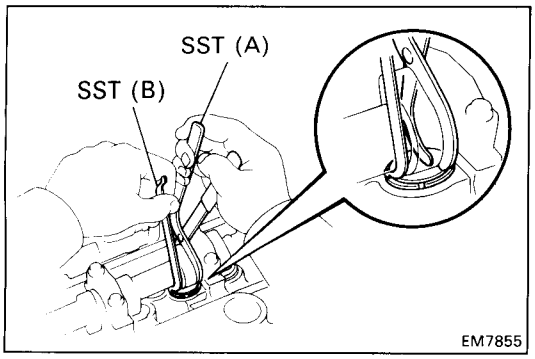
Valve clearance (Cold):

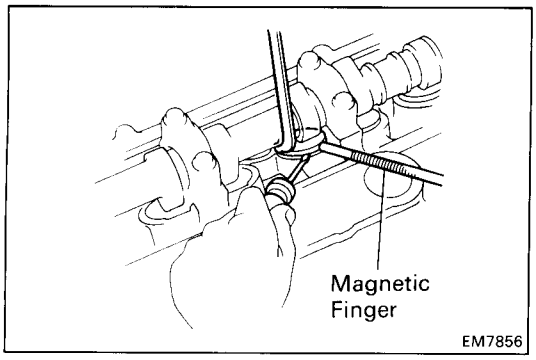
Intake	**0.15 – 0.25 mm (0.006 – 0.010 in.)**
Exhaust	**0.20 – 0.30 mm (0.008 – 0.012 in.)**

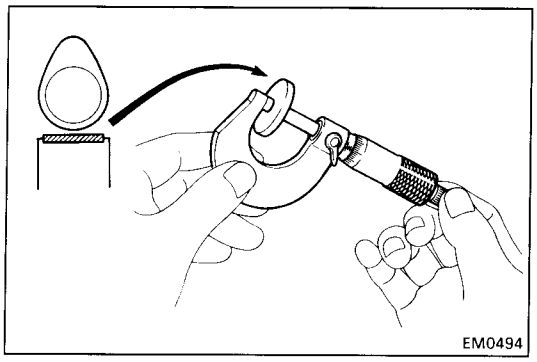


(b) Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure step 7)

(c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure 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.
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

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HINT: Before pressing down the valve lifter, position its notch toward the spark plug side.

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

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

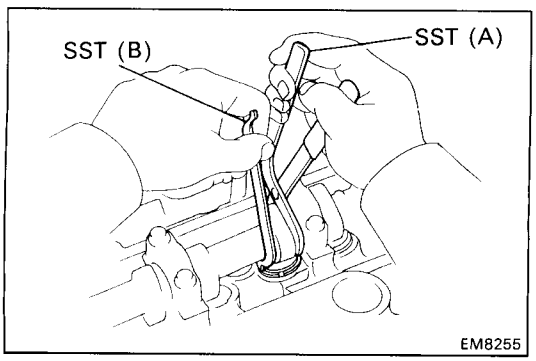
- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

T ..... Thickness of used shim
A ..... Measured valve clearance
N ..... Thickness of new shim

Intake **N = T + (A – 0.20 mm (0.008 in.))**
Exhaust **N = T + (A – 0.25 mm (0.010 in.))**

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

HINT: Shims are available in twenty-seven sizes in increments of 0.05 mm (0.0020 in.), from 2.00 mm (0.0787 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).

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(d) Recheck the valve clearance.

10. REINSTALL CYLINDER HEAD COVER
(See step 7 on pages EM-66 and 67)

11. REINSTALL THROTTLE BODY
(See steps 2, 3 and 4 to 8 on pages FI-74 and 75)

12. REINSTALL EGR VALVE AND PIPE
(See step 20 on page EM-69)

13. REINSTALL EGR VACUUM MODULATOR AND VSV
(See step 21 on page EM-70)

14. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

15. REINSTALL INTERCOOLER
(See steps 11 to 13 on page TC-17)

Adjusting Shim Selection Using Chart

INTAKE

Measured clearance (mm)	Installed shim thickness (mm)																																																			
	2.000	2.025	2.050	2.075	2.100	2.125	2.150	2.175	2.200	2.225	2.250	2.275	2.300	2.325	2.350	2.375	2.400	2.425	2.450	2.475	2.500	2.525	2.550	2.575	2.600	2.625	2.650	2.675	2.700	2.725	2.750	2.775	2.800	2.825	2.850	2.875	2.900	2.925	2.950	2.975	3.000	3.025	3.050	3.075	3.100	3.125	3.150	3.175	3.200	3.225	3.250	3.275	3.300
0.000 – 0.025							02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46
0.026 – 0.050						02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48
0.051 – 0.075					02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48
0.076 – 0.100				02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50
0.101 – 0.125			02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50
0.126 – 0.149		02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52
0.150 – 0.250																																																					
0.251 – 0.275	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54	
0.276 – 0.300	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54		
0.301 – 0.325	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54			
0.326 – 0.350	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54				
0.351 – 0.375	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54					
0.376 – 0.400	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54						
0.401 – 0.425	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54							
0.426 – 0.450	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54								
0.451 – 0.475	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54									
0.476 – 0.500	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54										
0.501 – 0.525	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54											
0.526 – 0.550	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54												
0.551 – 0.575	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54													
0.576 – 0.600	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54														
0.601 – 0.625	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54															
0.626 – 0.650	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																
0.651 – 0.675	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																	
0.676 – 0.700	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																		
0.701 – 0.725	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																			
0.726 – 0.750	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																				
0.751 – 0.775	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																					
0.776 – 0.800	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																						
0.801 – 0.825	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																							
0.826 – 0.850	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																								
0.851 – 0.875	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																									
0.876 – 0.900	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																										
0.901 – 0.925	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																											
0.926 – 0.950	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																												
0.951 – 0.975	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																													
0.976 – 1.000	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																														
1.001 – 1.025	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																															
1.026 – 1.050	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																
1.051 – 1.075	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																	
1.076 – 1.100	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																		
1.101 – 1.125	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																			
1.126 – 1.150	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																				
1.151 – 1.175	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																					
1.176 – 1.200	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																						
1.201 – 1.225	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																							
1.226 – 1.250	44	44	46	46	48	48	50	50	52	52	54	54	54																																								
1.251 – 1.275	44	46	46	48	48	50	50	52	52	54	54	54																																									
1.276 – 1.300	46	46	48	48	50	50	52	52	54	54	54																																										
1.301 – 1.325	46	48	48	50	50	52	52	54	54	54																																											
1.326 – 1.350	48	48	50	50	52	52	54	54	54																																												
1.351 – 1.375	48	50	50	52	52	54	54	54																																													
1.376 – 1.400	50	50	52	52	54	54	54																																														
1.401 – 1.425	50	52	52	54	54	54																																															
1.426 – 1.450	52	52	54	54	54																																																
1.451 – 1.475	52	54	54	54																																																	
1.476 – 1.500	54	54	54																																																		
1.501 – 1.525	54	54																																																			
1.526 – 1.550	54																																																				

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.00 (0.0787)	30	2.70 (0.1063)
04	2.05 (0.0807)	32	2.75 (0.1083)
06	2.10 (0.0827)	34	2.80 (0.1102)
08	2.15 (0.0846)	36	2.85 (0.1122)
10	2.20 (0.0866)	38	2.90 (0.1142)
12	2.25 (0.0886)	40	2.95 (0.1161)
14	2.30 (0.0906)	42	3.00 (0.1181)
16	2.35 (0.0925)	44	3.05 (0.1201)
18	2.40 (0.0945)	46	3.10 (0.1220)
20	2.45 (0.0965)	48	3.15 (0.1240)
22	2.50 (0.0984)	50	3.20 (0.1260)
24	2.55 (0.1004)	52	3.25 (0.1280)
26	2.60 (0.1024)	54	3.30 (0.1299)
28	2.65 (0.1043)		

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 No.44 shim.

Adjusting Shim Selection Using Chart

EXHAUST

Installed shim thickness (mm)

Measured clearance (mm)	2.000	2.025	2.050	2.075	2.100	2.125	2.150	2.175	2.200	2.225	2.250	2.275	2.300	2.325	2.350	2.375	2.400	2.425	2.450	2.475	2.500	2.525	2.550	2.575	2.600	2.625	2.650	2.675	2.700	2.725	2.750	2.775	2.800	2.825	2.850	2.875	2.900	2.925	2.950	2.975	3.000	3.025	3.050	3.075	3.100	3.125	3.150	3.175	3.200	3.225	3.250	3.275	3.300
0.000 – 0.025									02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44
0.026 – 0.050								02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46
0.051 – 0.075							02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46
0.076 – 0.100						02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48
0.101 – 0.125					02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48
0.126 – 0.150				02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50
0.151 – 0.175			02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50
0.176 – 0.199		02	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52
0.200 – 0.300																																																					
0.301 – 0.325	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54	
0.326 – 0.350	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54		
0.351 – 0.375	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54			
0.376 – 0.400	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54				
0.401 – 0.425	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54					
0.426 – 0.450	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54						
0.451 – 0.475	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54							
0.476 – 0.500	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54								
0.501 – 0.525	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54									
0.526 – 0.550	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54										
0.551 – 0.575	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54											
0.576 – 0.600	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54												
0.601 – 0.625	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	54	54	54													
0.626 – 0.650	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54														
0.651 – 0.675	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54															
0.676 – 0.700	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																
0.701 – 0.725	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																	
0.726 – 0.750	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																		
0.751 – 0.775	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																			
0.776 – 0.800	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																				
0.801 – 0.825	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																					
0.826 – 0.850	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																						
0.851 – 0.875	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																							
0.876 – 0.900	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																								
0.901 – 0.925	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																									
0.926 – 0.950	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																										
0.951 – 0.975	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																											
0.976 – 1.000	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																												
1.001 – 1.025	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																													
1.026 – 1.050	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																														
1.051 – 1.075	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																															
1.076 – 1.100	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																
1.101 – 1.125	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																	
1.126 – 1.150	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																		
1.151 – 1.175	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																			
1.176 – 1.200	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																				
1.201 – 1.225	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																					
1.226 – 1.250	42	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																						
1.251 – 1.275	42	44	44	46	46	48	48	50	50	52	52	54	54	54																																							
1.276 – 1.300	44	44	46	46	48	48	50	50	52	52	54	54	54																																								
1.301 – 1.325	44	46	46	48	48	50	50	52	52	54	54	54																																									
1.326 – 1.350	46	46	48	48	50	50	52	52	54	54	54																																										
1.351 – 1.375	46	48	48	50	50	52	52	54	54	54																																											
1.376 – 1.400	48	48	50	50	52	52	54	54	54																																												
1.401 – 1.425	48	50	50	52	52	54	54	54																																													
1.426 – 1.450	50	50	52	52	54	54	54																																														
1.451 – 1.475	50	52	52	54	54	54																																															
1.476 – 1.500	52	52	54	54	54																																																
1.501 – 1.525	52	54	54	54																																																	
1.526 – 1.550	54	54	54																																																		
1.551 – 1.575	54	54																																																			
1.576 – 1.600	54																																																				

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.00 (0.0787)	30	2.70 (0.1063)
04	2.05 (0.0807)	32	2.75 (0.1083)
06	2.10 (0.0827)	34	2.80 (0.1102)
08	2.15 (0.0846)	36	2.85 (0.1122)
10	2.20 (0.0866)	38	2.90 (0.1142)
12	2.25 (0.0886)	40	2.95 (0.1161)
14	2.30 (0.0906)	42	3.00 (0.1181)
16	2.35 (0.0925)	44	3.05 (0.1201)
18	2.40 (0.0945)	46	3.10 (0.1220)
20	2.45 (0.0965)	48	3.15 (0.1240)
22	2.50 (0.0984)	50	3.20 (0.1260)
24	2.55 (0.1004)	52	3.25 (0.1280)
26	2.60 (0.1024)	54	3.30 (0.1299)
28	2.65 (0.1043)		

Exhaust valve clearance (Cold):
0.20 – 0.30 mm (0.008 – 0.012 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No.42 shim.

INSPECTION AND ADJUSTMENT OF IGNITION TIMING

(See page IG-13)

Ignition timing:
14 – 19° BTDC @ idle
(w/ Terminals TE1 and E1 connected)

INSPECTION OF IDLE SPEED

Idle speed: 800 ± 50 rpm

TOYOTA-VARIABLE INDUCTION SYSTEM (T-VIS)

INSPECTION OF T-VIS

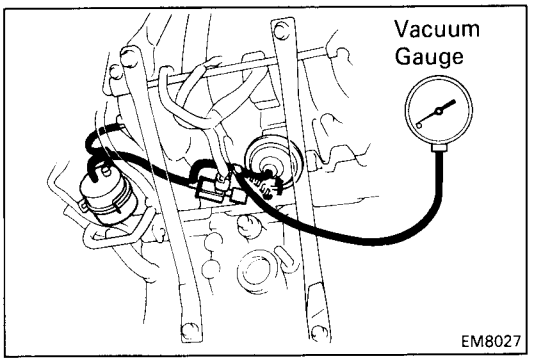
1. **WARM UP AND STOP ENGINE**

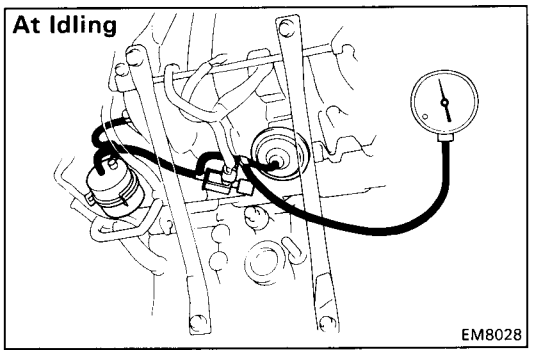
   Allow the engine to warm up to normal operating temperature.

2. **CONNECT TACHOMETER (See page IG-12)**

3. **CONNECT VACUUM GAUGE**

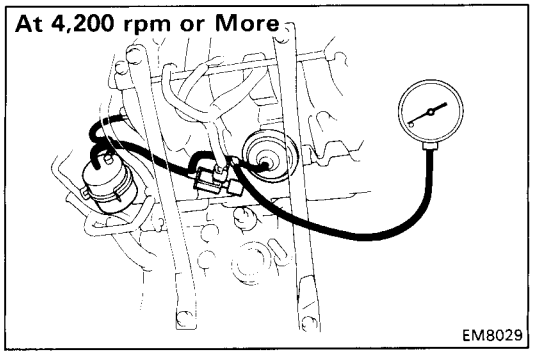
   Using a 3-way connector, connect the vacuum gauge to the hose between the VSV and actuator.





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 2,500 RPM HC/CO CONCENTRATION CHECK METHOD

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

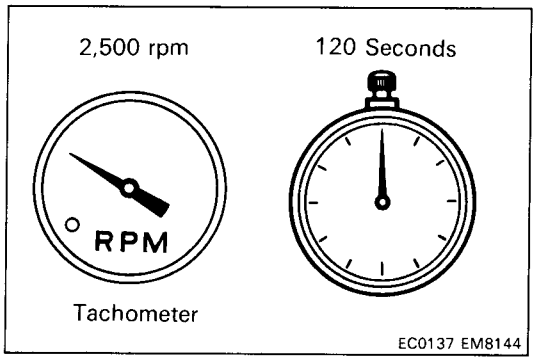
HINT: All vacuum hoses for EGR systems, etc. should be properly connected.

(f) EFI system wiring connectors fully plugged

(g) Ignition timing set correctly

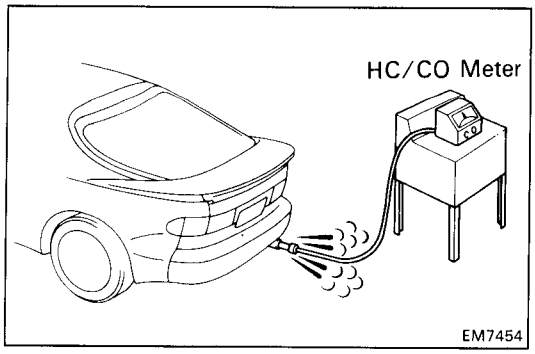
(h) Transmission in neutral range

(i) Tachometer and HC/CO meter calibrated and at hand.



2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 120 SECONDS



4. INSERT HC/CO METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm (1.3 ft)

5. CHECK HC/CO 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 regulations.

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

(a) Check oxygen sensor operation.
(See page FI-92)

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

HC	CO	Problems	Causes
High	Normal	Rough idle	1. Faulty ignition: ● 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
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: ● PCV hose ● EGR valve ● Intake manifold ● T-VIS valve ● Throttle body ● ISC valve ● Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty EFI systems ● Faulty pressure regulator ● Clogged fuel return line ● Defective water temp. sensor ● Defective air temp. sensor ● Faulty ECU ● Faulty injector ● Faulty cold start injector ● Faulty throttle position sensor ● Air flow meter

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.

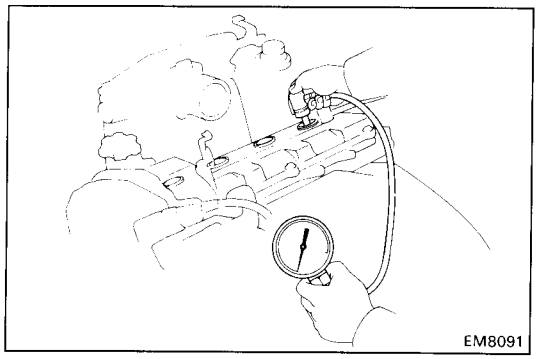
2. **REMOVE INTERCOOLER**
   (See steps 13 to 15 on pages TC-9 and 10)

3. **DISCONNECT SOLENOID RESISTOR CONNECTOR**

4. **DISCONNECT COLD START INJECTOR CONNECTOR**

5. **DISCONNECT DISTRIBUTOR CONNECTOR**

6. **REMOVE SPARK PLUGS (See page IG-7)**



7. **CHECK CYLINDER COMPRESSION PRESSURE**

   (a) Insert a compression gauge into the spark plug hole.

   (b) Fully open the throttle.

   (c) While cranking the engine, measure the compression pressure.

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

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

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

   Compression pressure:
   11.5 kg/cm² (164 psi, 1,128 kPa) or more

   Minimum pressure:
   9.0 kg/cm² (128 psi, 883 kPa)

   Difference between each cylinder:
   1.0 kg/cm² (14 psi, 98 kPa) or less

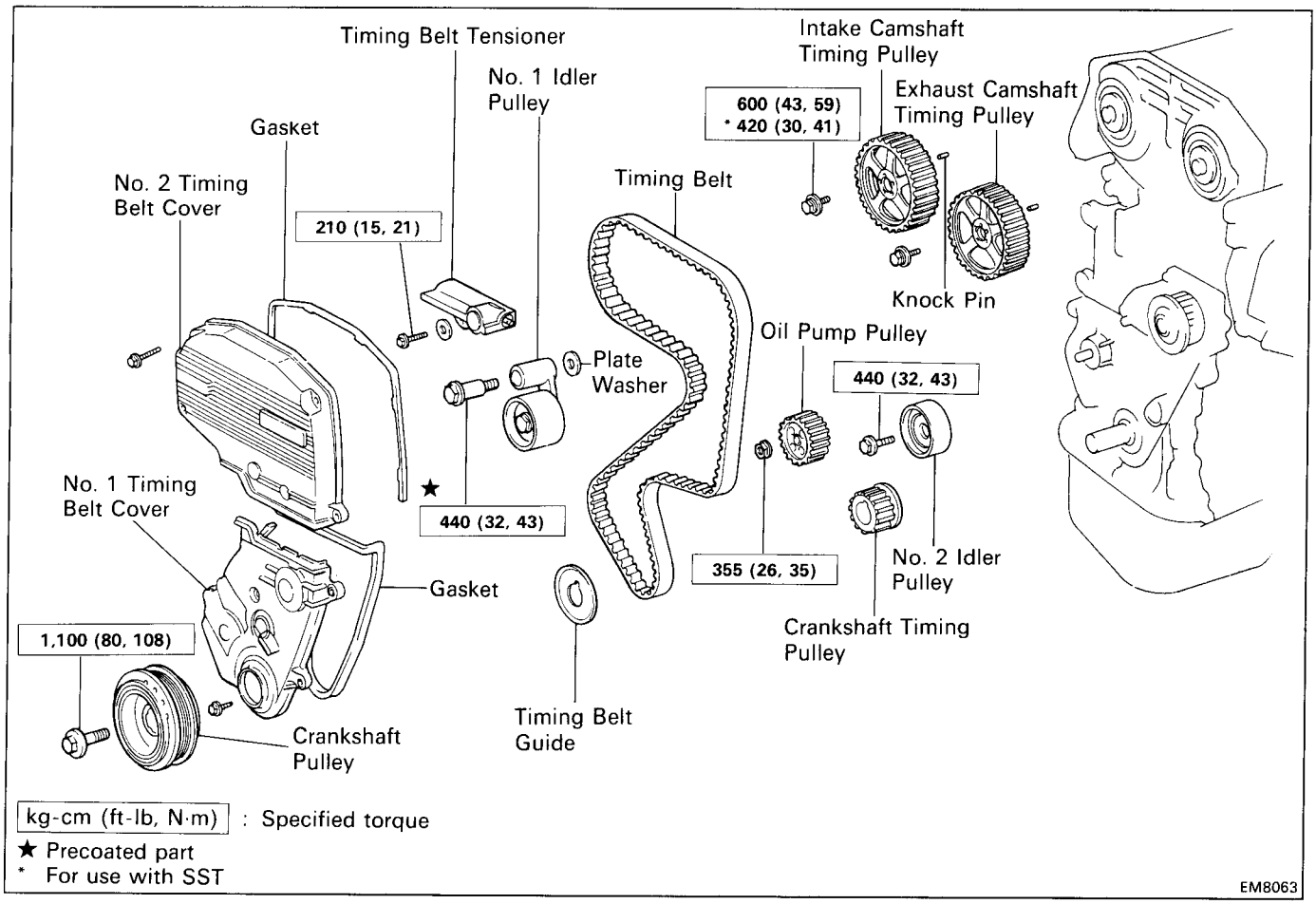
   (e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

   - 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 (See page IG-8)
   Torque: 180 kg-cm (13 ft-lb, 18 N·m)
9. RECONNECT DISTRIBUTOR CONNECTOR
10. RECONNECT COLD START INJECTOR CONNECTOR
11. RECONNECT SOLENOID RESISTOR CONNECTOR
12. REINSTALL INTERCOOLER
    (See steps 11 to 13 on page TC-17)

TIMING BELT

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

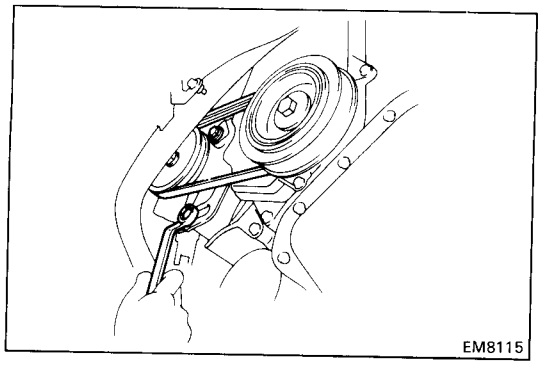
4. REMOVE ALTERNATOR
   (See steps 2 to 6 on page CH-5 and 6)

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-45)

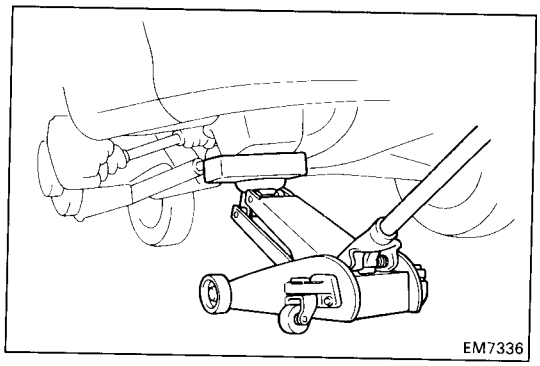
7. REMOVE EGR VALVE AND PIPE
   (See step 21 on page EM-45)

8. REMOVE THROTTLE BODY
   (See steps 5 to 8, 10 and 11 on pages FI-72 and 73)



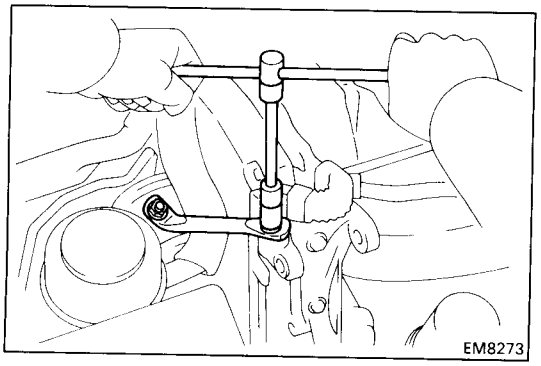
9. REMOVE PS DRIVE BELT

Loosen the two bolts, and remove the drive belt.



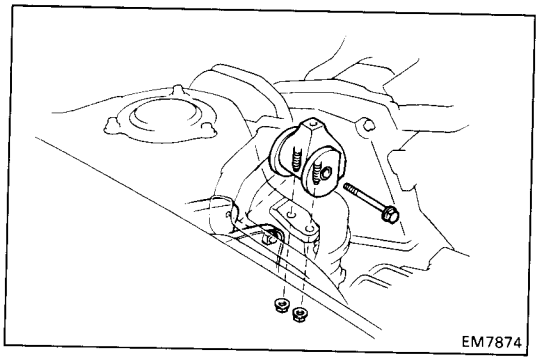
10. SLIGHTLY JACK UP ENGINE

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



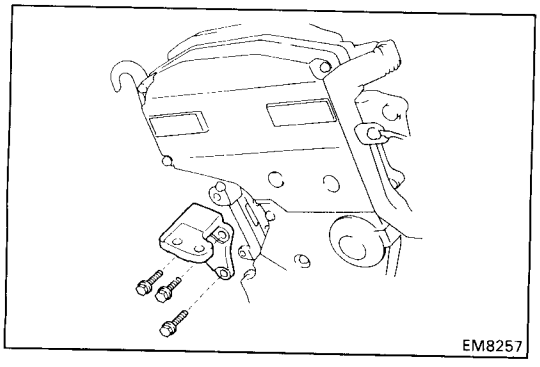
11. REMOVE RH ENGINE MOUNTING STAY

Remove the bolt, nut and mounting stay.



12. REMOVE RH ENGINE MOUNTING INSULATOR

Remove the through bolt, two nuts and mounting insulator.



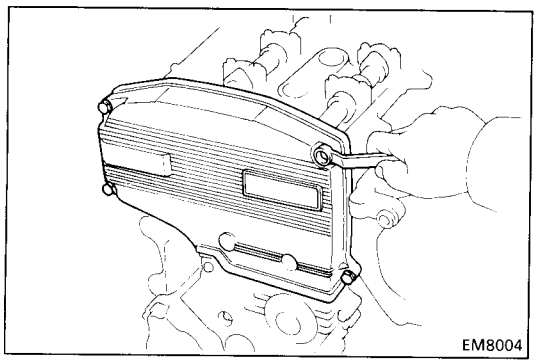
13. REMOVE RH ENGINE MOUNTING BRACKET

Remove the three bolts and mounting bracket.

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

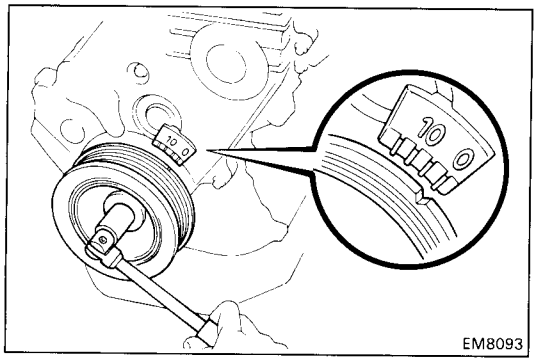
14. **REMOVE CYLINDER HEAD COVER**
(See step 34 on page EM-48)

15. **REMOVE SPARK PLUGS (See page IG-7)**



16. **REMOVE NO.2 TIMING BELT COVER**

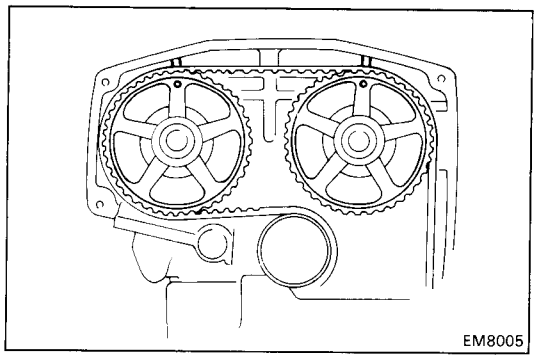
Remove the five screws, timing belt cover and gasket.



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

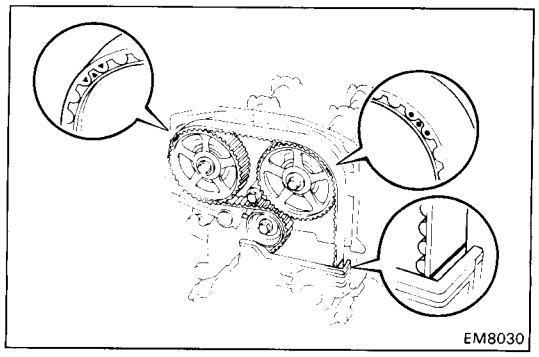
(a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.

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.

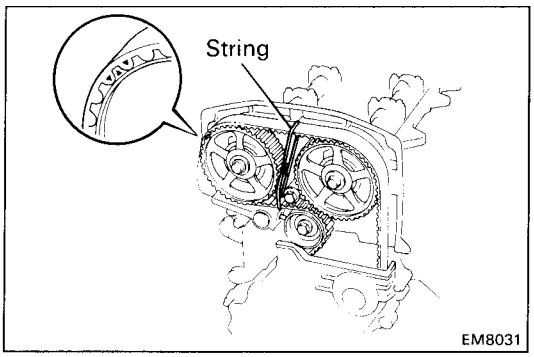
If not, turn the crankshaft one revolution (360°).



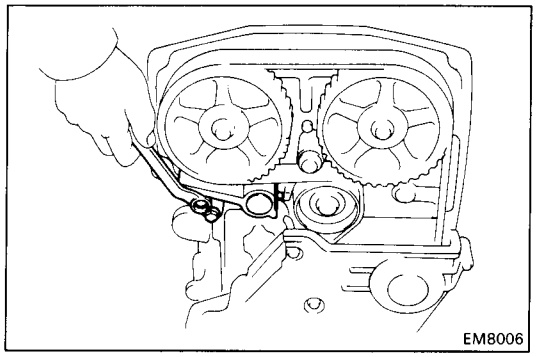
18. **REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS**

HINT:

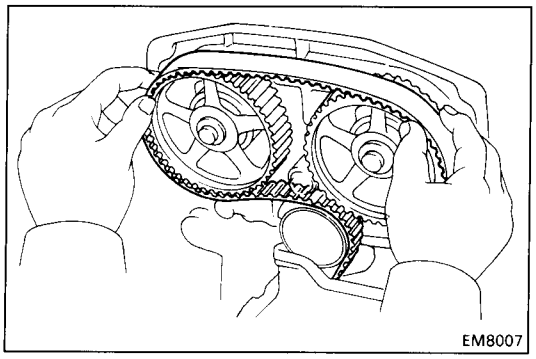
- (Re-using timing belt)
  Place matchmarks on the timing belt and camshaft timing pulleys, and place a matchmark on the timing belt to match the end of the No1 timing belt cover.



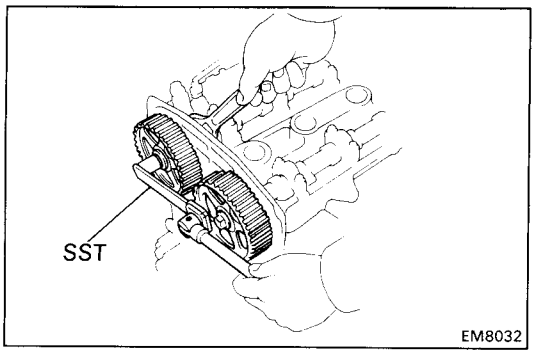
- (When replacing timing belt tensioner only)
  To avoid meshing of the timing belt and timing pulley, secure one with a string. And place the matchmarks on the timing belt and RH camshaft timing pulley.



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



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



19. REMOVE CAMSHAFT TIMING PULLEYS

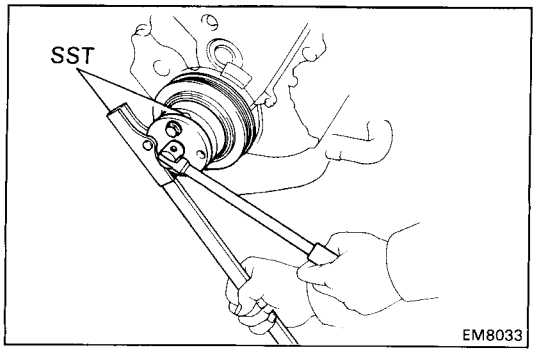
(a) Hold the hexagonal wrench head portion of the camshaft with a wrench, and remove the pulley mount bolts.

HINT (Intake camshaft timing pulley): Use SST.

SST 09249-63010

(b) Remove the camshaft pulleys and pins.

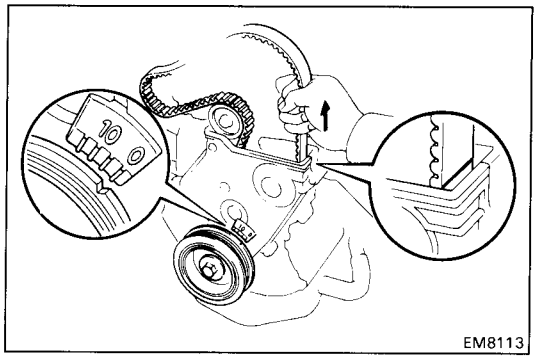
HINT: Arrange the intake and exhaust timing pulleys.



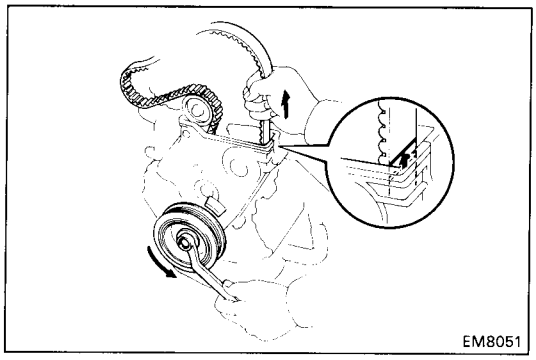
20. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt.

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

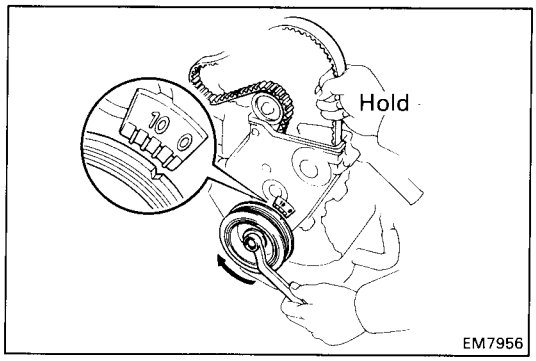


HINT (When re-using timing belt): After loosening the crankshaft pulley bolt, check that the timing belt matchmark aligns with the end of the No.1 timing belt cover when the crankshaft pulley groove is aligned with the timing mark "0" of the No.1 timing belt cover. If the matchmark does not align, align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

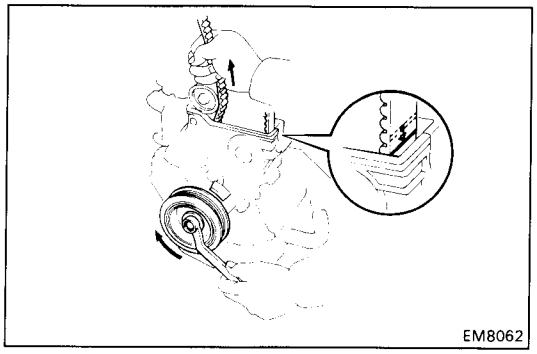


(When matchmark is out of alignment clockwise)

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

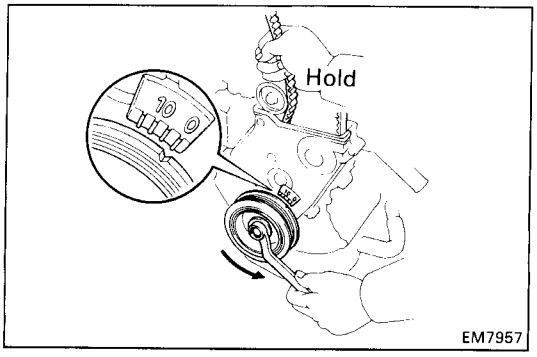


- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley clockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.

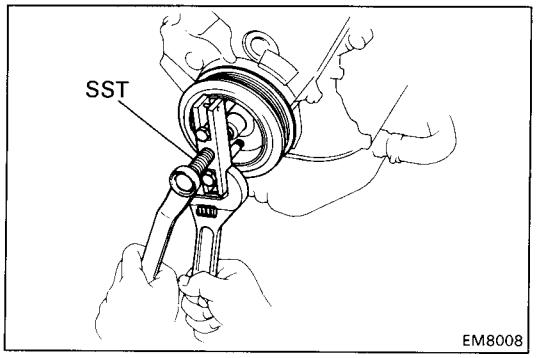


(When matchmark is out of alignment counterclockwise)

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



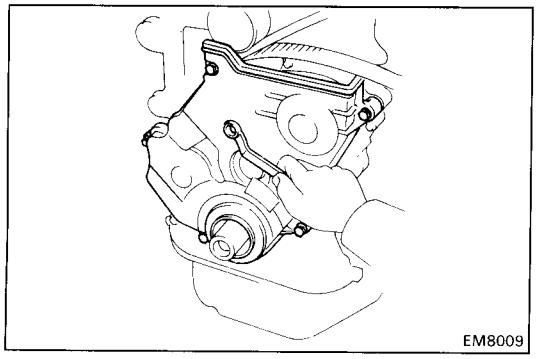
- After aligning the matchmark, hold the timing belt. And turn the crankshaft pulley counterclockwise, and align its groove with timing mark "0" of the No.1 timing belt cover.



(b) Using SST, remove the pulley.

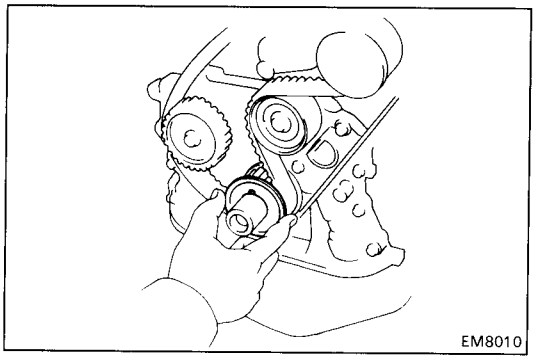
SST 09213-31021

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

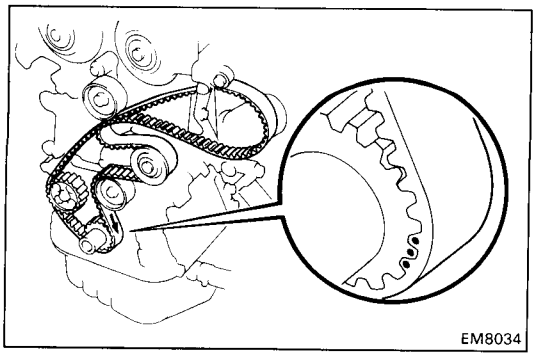


21. REMOVE NO.1 TIMING BELT COVER

Remove the six bolts, timing belt cover and gasket.

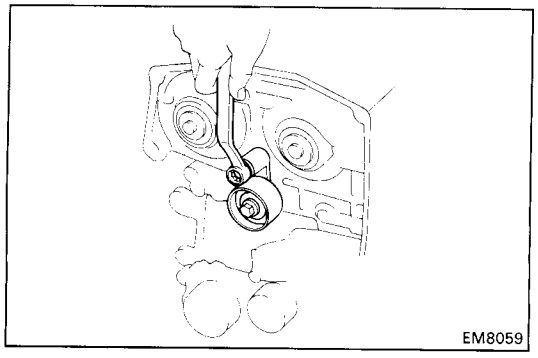


22. REMOVE TIMING BELT GUIDE



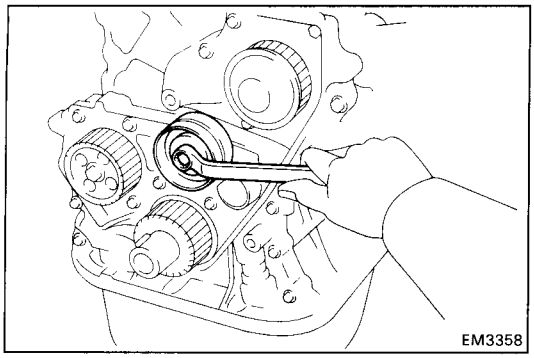
23. REMOVE TIMING BELT

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.



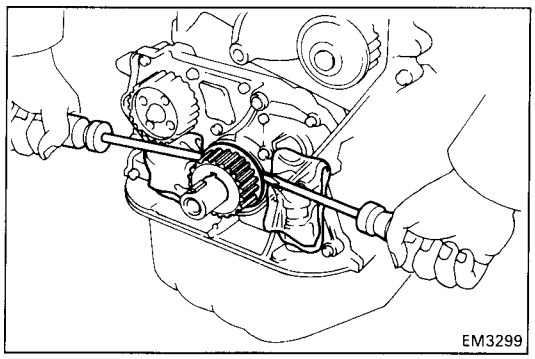
24. REMOVE NO.1 IDLER PULLEY

Remove the pivot bolt, pulley and plate washer.



25. REMOVE NO.2 IDLER PULLEY

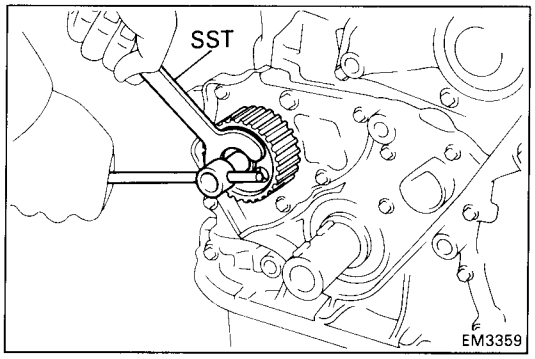
Remove the bolt and pulley.



26. REMOVE CRANKSHAFT TIMING PULLEY

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

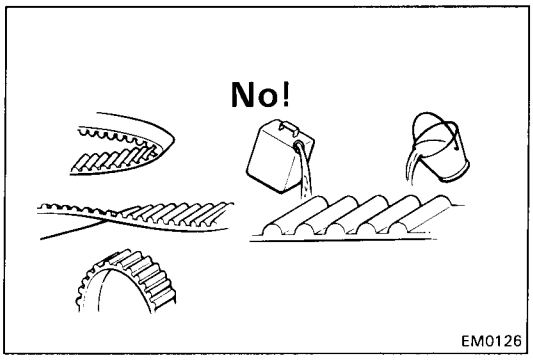
HINT: Position shop rags as shown to prevent damage.

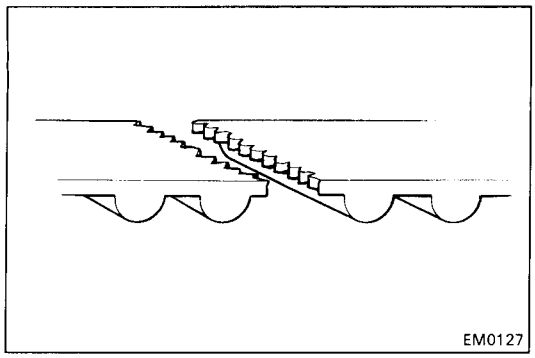


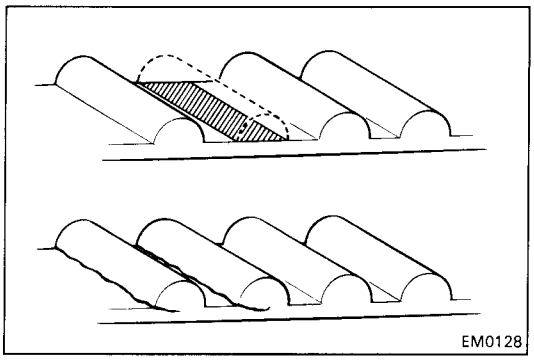
27. REMOVE OIL PUMP PULLEY

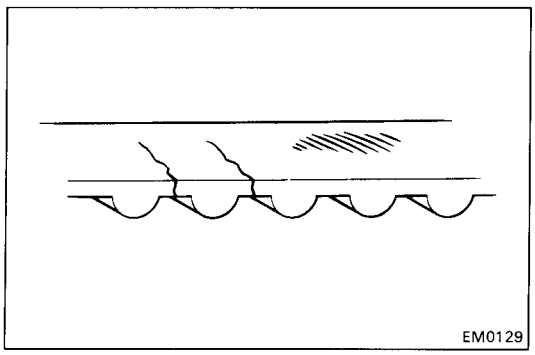
Using SST, remove the nut and pulley.

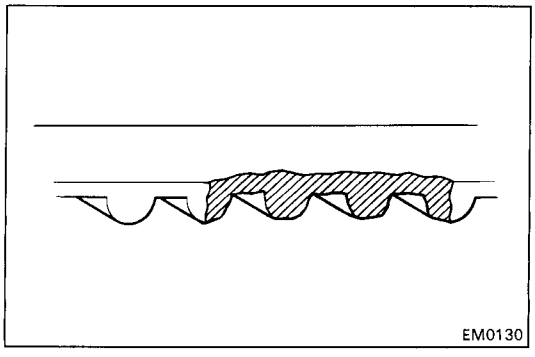
SST 09616-30011











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 mount bolt of the camshaft timing pulley.**

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

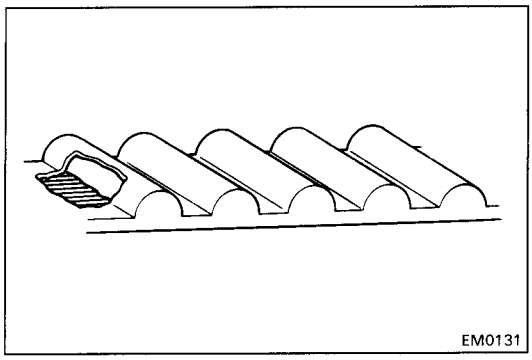
(a) Premature parting

- 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.

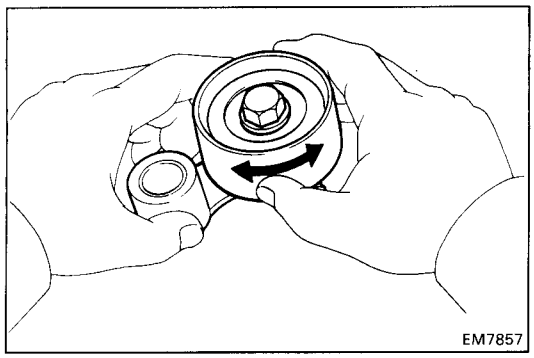
(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock.

(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.

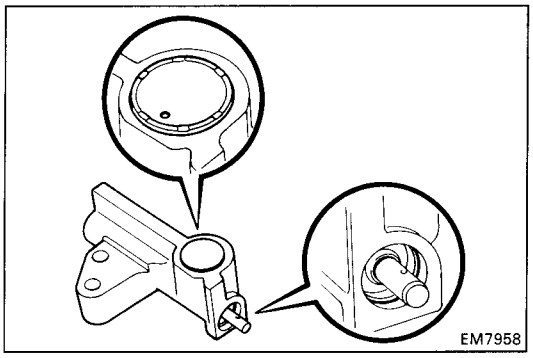
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

Check the turning smoothness of the idler pulley.

If necessary, replace the idler pulley.

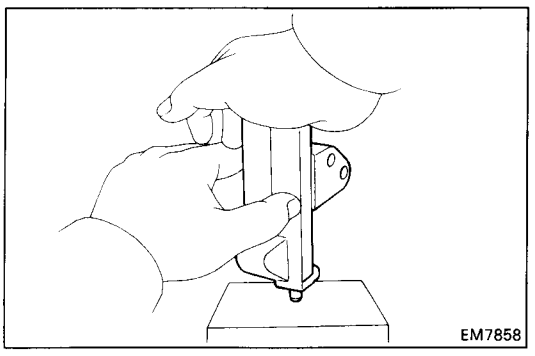


3. INSPECT TIMING BELT TENSIONER

(a) Visually check tensioner for oil leakage.

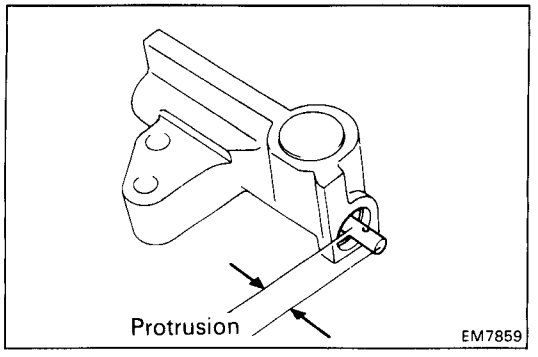
HINT: If there is only a small trace of oil on the seal of the push rod, the tensioner is all right.

If leakage is found, replace the tensioner.



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

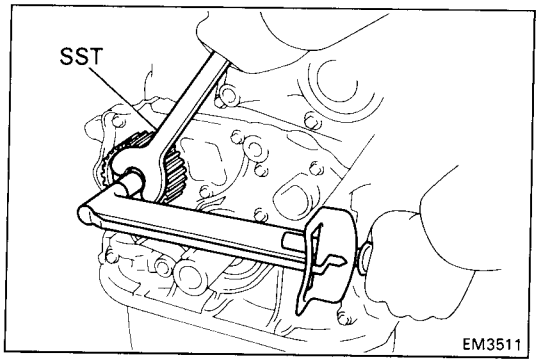
If the push rod moves, replace the tensioner.



(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-19)

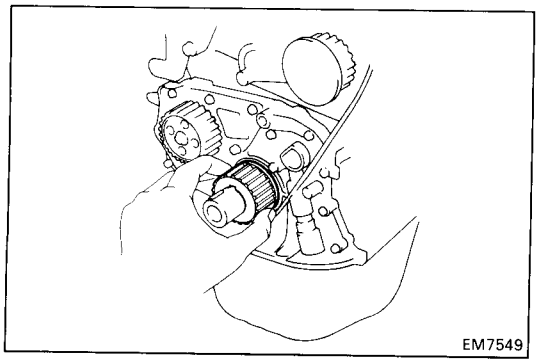
1. INSTALL OIL PUMP PULLEY

(a) Align the cutouts of the pulley and shaft, and slide the pulley.

(b) Using SST, install the nut.

SST 09616-30011

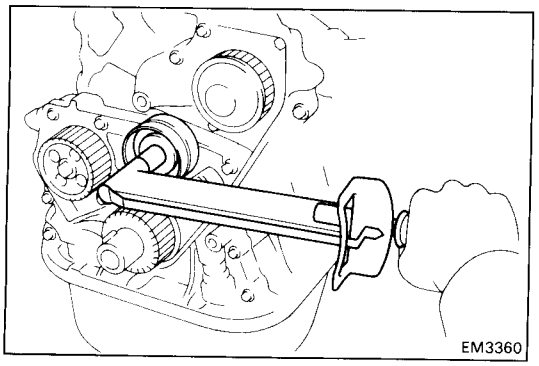
Torque: 355 kg-cm (26 ft-lb, 35 N·m)



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.

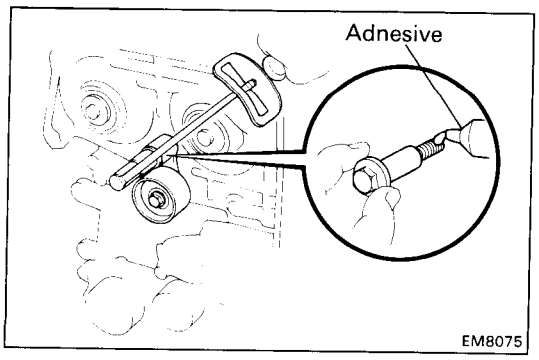


3. INSTALL NO.2 IDLER PULLEY

(a) Install the pulley with the bolt.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)

(b) Check that the idler pulley moves smoothly.



4. INSTALL NO.1 IDLER PULLEY

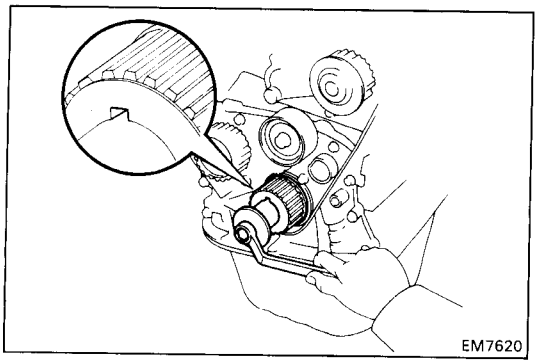
(a) Apply adhesive to two or three threads of the pivot bolt.

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

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

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

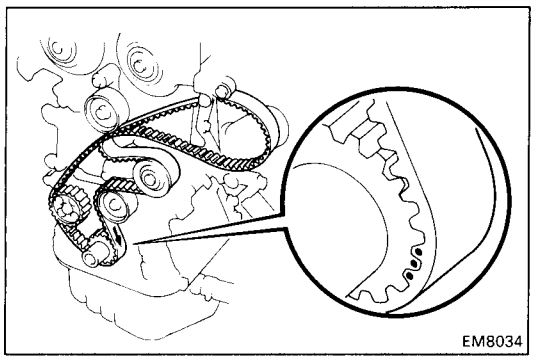
(c) Check that the pulley bracket moves smoothly.



5. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

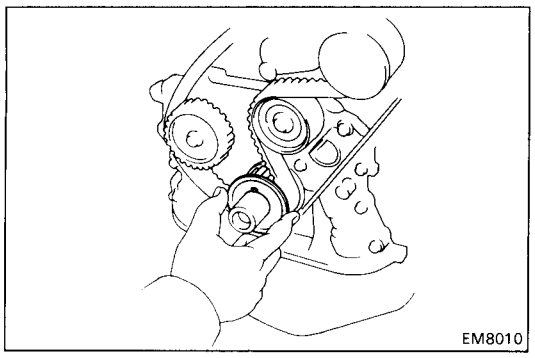
(a) Using the crankshaft pulley bolt, turn the crankshaft and position the key groove of the crankshaft timing pulley upward.



(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.

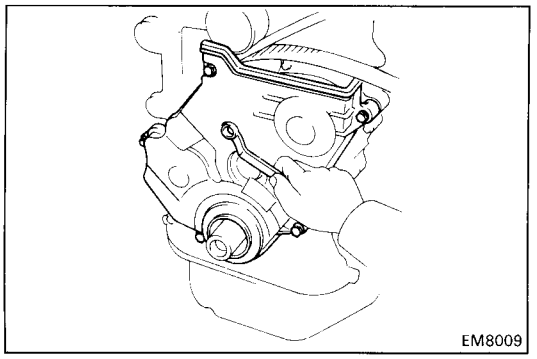
(c) Install the timing belt on the crankshaft timing pulley, oil pump pulley, No.2 idler pulley, water pump pulley and No.1 idler pulley.

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

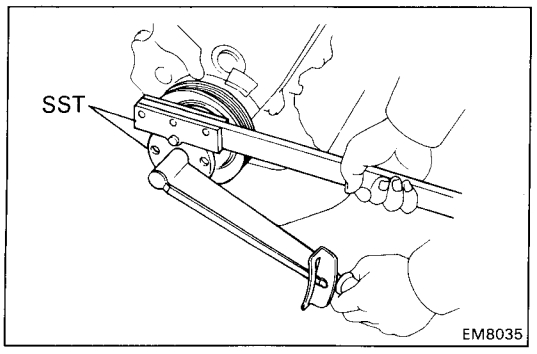
Install the guide, facing the cup side outward.



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.



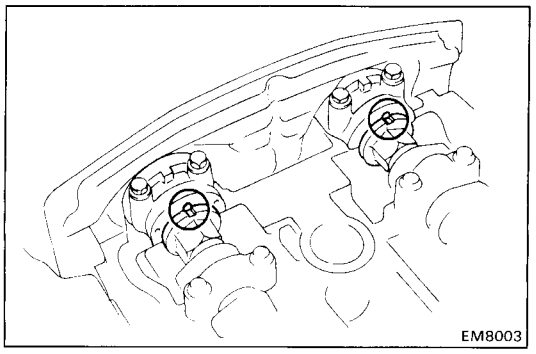
8. INSTALL CRANKSHAFT PULLEY

(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.

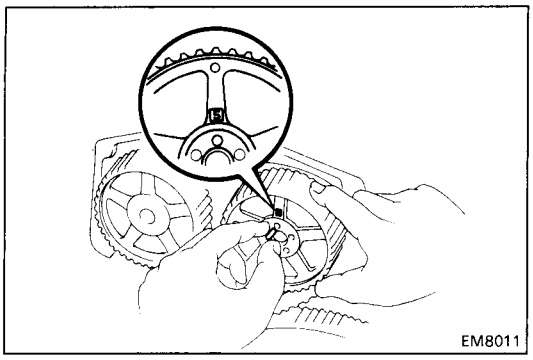
SST 09213-54015 (90119-08216) and 09330-00021

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)



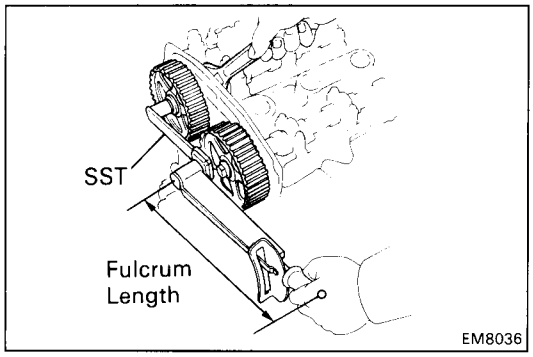
9. INSTALL CAMSHAFT TIMING PULLEYS

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



(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.



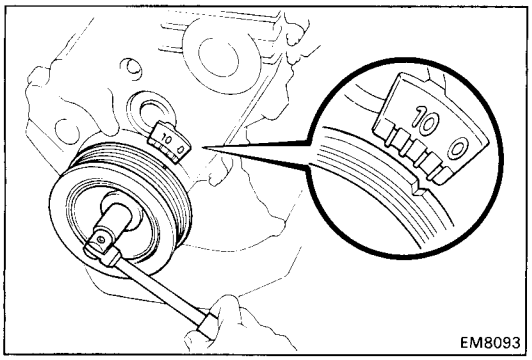
(d) Hold the hexagonal wrench head portion of the camshaft with a wrench, and tighten the bolts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)
420 kg-cm (30 ft-lb, 41 N·m) for SST

HINT (Intake camshaft timing pulley):
- Use SST.

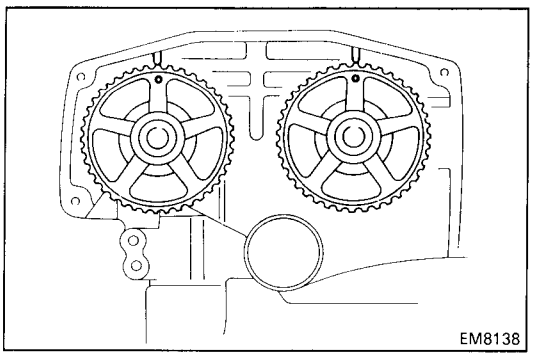
SST 09249-63010

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

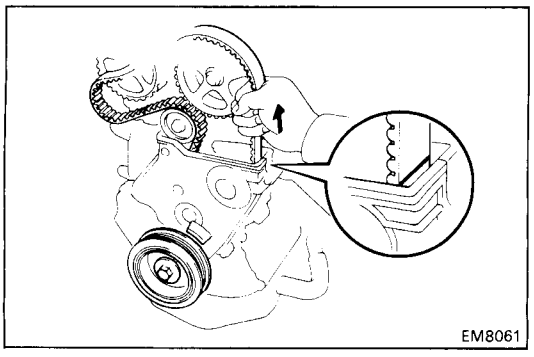


10. SET NO.1 CYLINDER TO TDC/COMPRESSION

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



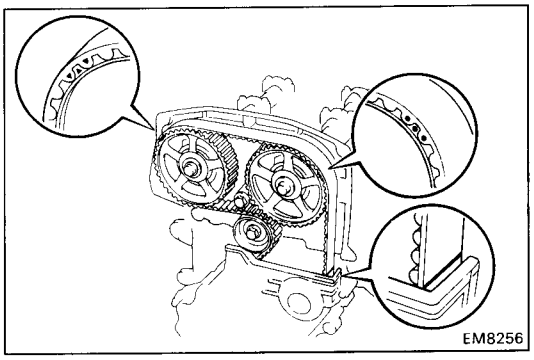
(b) Turn the camshaft, and align the timing marks of the camshaft timing pulleys and No.3 timing belt cover.



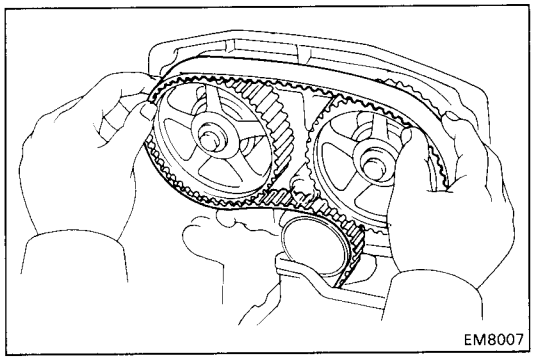
11. INSTALL TIMING BELT

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-23)

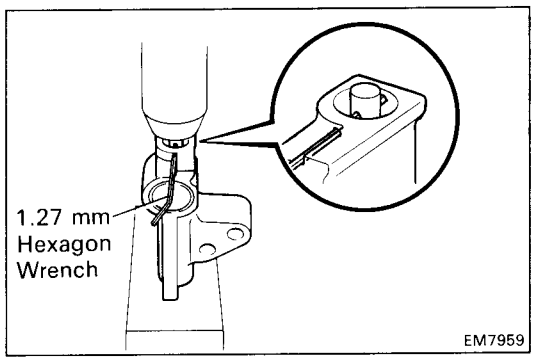


- Align the matchmarks of the timing belt and camshaft timing pulleys.



(a) Remove any oil or water on the camshaft timing pulley, and keep it clean.

(b) Install the timing belt, checking the tension between the crankshaft timing pulley and intake camshaft timing pulley.

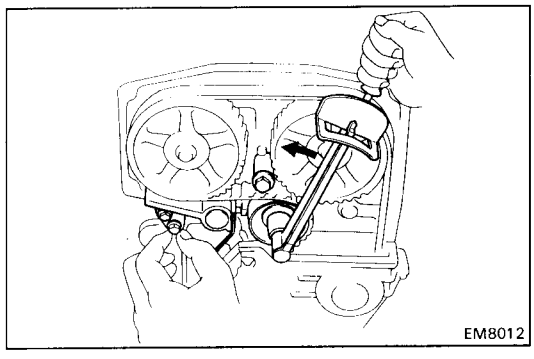


12. SET TIMING BELT TENSIONER

(a) Using a press, slowly press in the push rod using 100 – 1,000 kg (220 – 2,205 lb, 981 – 9,807 N) of pressure.

(b) 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.

(c) Release the press.

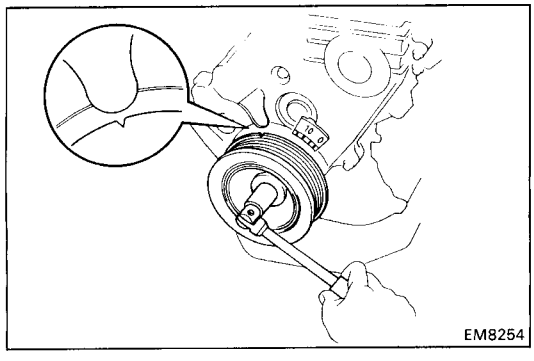


13. INSTALL TIMING BELT TENSIONER

(a) Turn the No.1 idler pulley bolt counterclockwise 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.

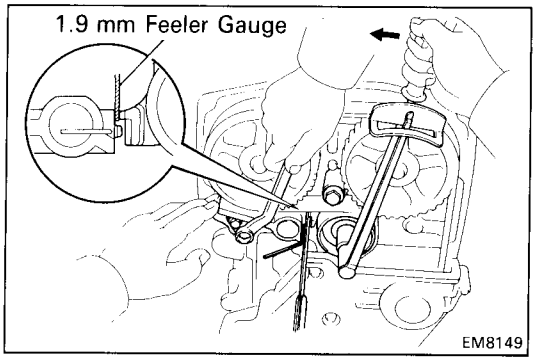
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

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.



(b) 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.



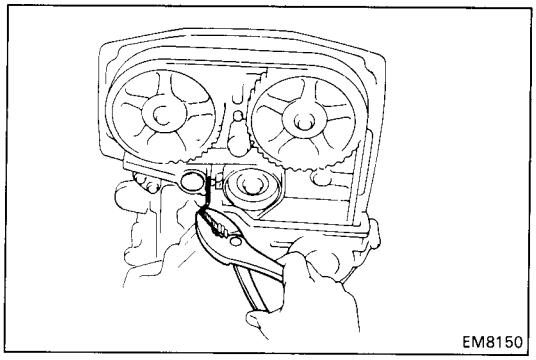
(c) Insert a 1.90 mm (0.075 in.) feeler gauge between the tensioner body and No.1 idler pulley stopper.

(d) Turn the No.1 idler pulley bolt counterclockwise to obtain the specified torque.

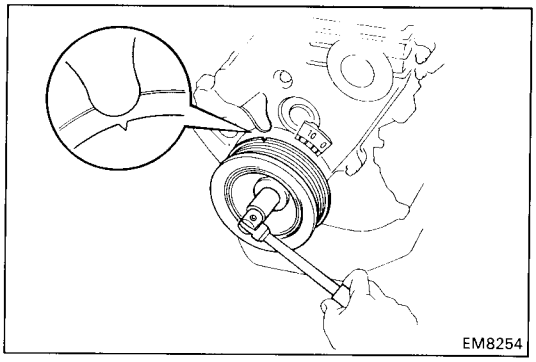
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

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

Torque: 210 kg-cm (15 ft-lb, 21 N·m)

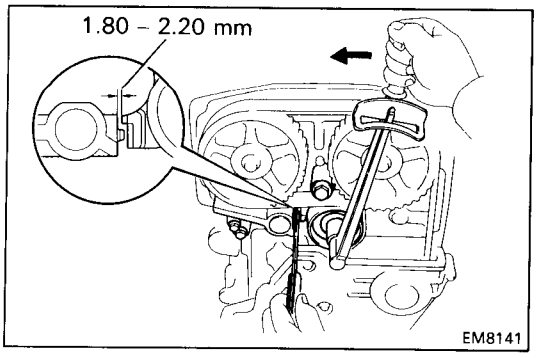


(f) Remove the 1.27 mm hexagon wrench from the tensioner.



(g) 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.



(h) Turn the No.1 idler pulley bolt counterclockwise obtain the specified torque.

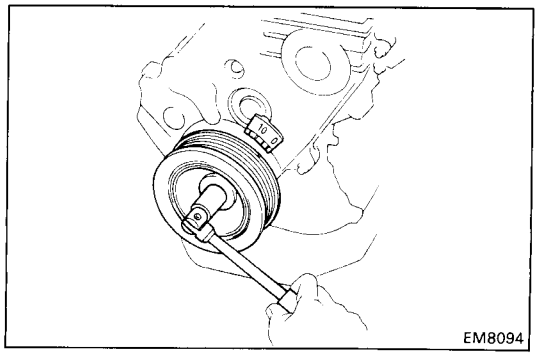
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

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.

(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.)

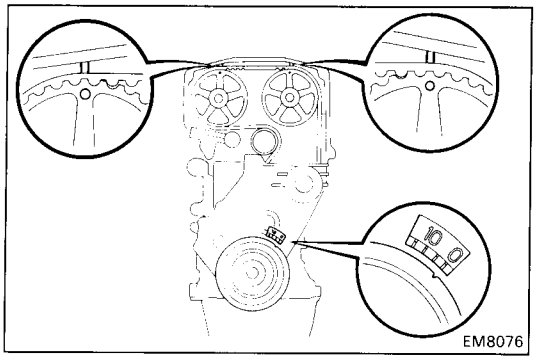
If the clearance is not as specified, remove the tensioner and reinstall it.



14. CHECK VALVE TIMING

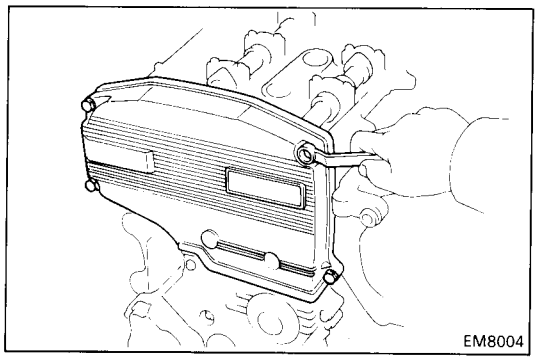
(a) Slowly turn the crankshaft pulley two revolutions from TDC to TDC.

NOTICE: Always turn the crankshaft clockwise.



(b) Check that each pulley aligns with the timing marks as shown in the figure.

If the marks do not align, remove the timing belt and reinstall it.



15. INSTALL NO.2 TIMING BELT COVER

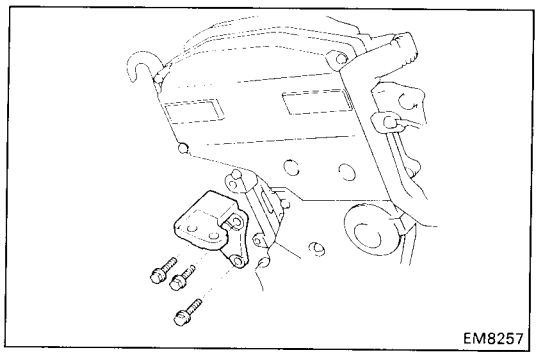
(a) Install the gasket to the timing belt cover.

(b) Install the belt cover with the five bolts.

16. INSTALL SPARK PLUGS (See page IG-8)

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

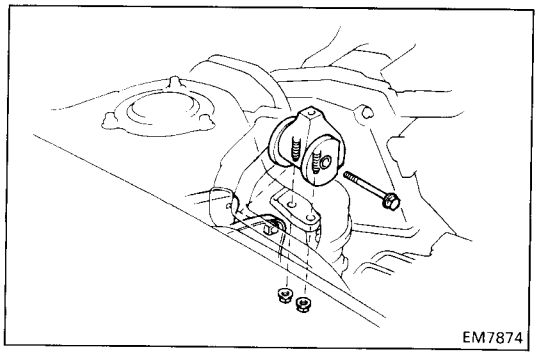
17. INSTALL CYLINDER HEAD COVER (See step 7 on pages EM-66 and 67)



18. INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the three bolts.

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

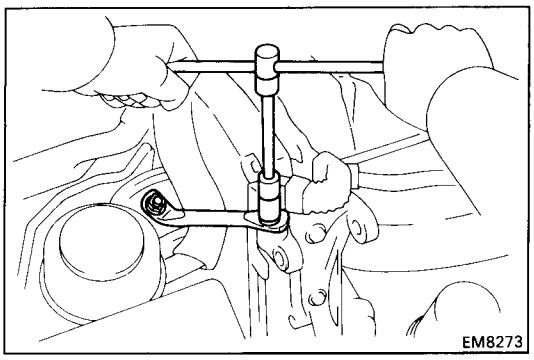


19. INSTALL RH ENGINE MOUNTING INSULATOR

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

Torque:

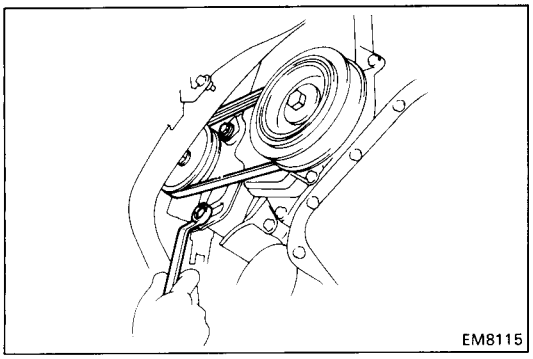
Nut	**530 kg-cm (38 ft-lb, 52 N·m)**
Through bolt	**890 kg-cm (64 ft-lb, 87 N·m)**



20. **INSTALL RH ENGINE MOUNTING STAY**

Install the mounting stay with the bolt and nut.

Torque: 740 kg-cm (54 ft-lb, 73 N·m)



21. **INSTALL PS DRIVE BELT**

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

22. **INSTALL THROTTLE BODY**
(See steps 2, 3 and 5 to 8 on pages FI-74 and 75)

23. **INSTALL EGR VALVE AND PIPE**
(See step 20 on page EM-69)

24. **INSTALL EGR VACUUM MODULATOR AND VSV**
(See step 21 on page EM-70)

25. **INSTALL INTERCOOLER**
(See steps 11 to 13 on page TC-17)

26. **INSTALL ALTERNATOR**
(See steps 2 to 6 pages CH-7)

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.
(See page CH-2)

Drive belt tension:

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

(b) Adjust the PS drive belt.

Drive belt tension:	**New belt**	**125 ± 25 lb**
	Used belt	**80 ± 20 lb**

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**

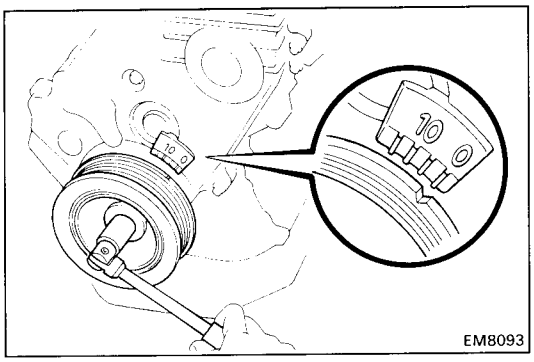
3. **REMOVE RH ENGINE UNDER COVER**

4. **REMOVE ALTERNATOR**
   (See steps 2 to 6 on page CH-5 and 6)

5. **REMOVE INTERCOOLER**
   (See steps 13 to 15 on pages TC-9 and 10)

6. **REMOVE SPARK PLUGS (See page IG-7)**

7. **REMOVE NO.2 TIMING BELT COVER**
   (See step 16 on page EM-21)

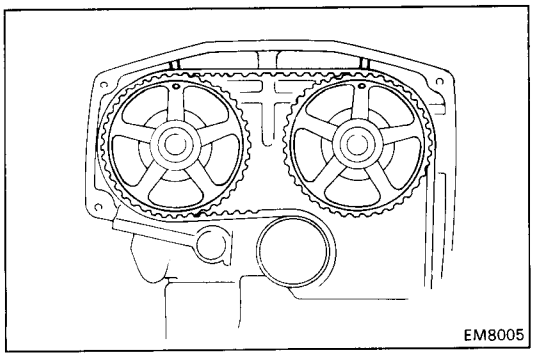


EM8093

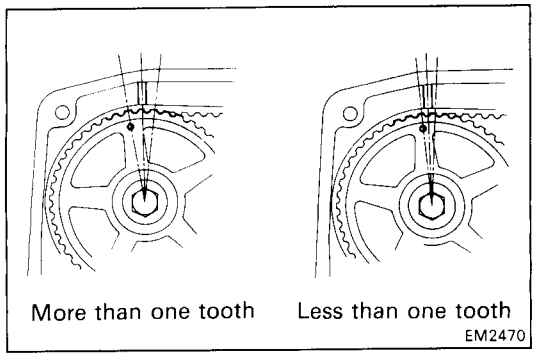
8. **CHECK CAMSHAFT TIMING PULLEY MARKS**

   (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.


EM8005

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


More than one tooth Less than one tooth
EM2470

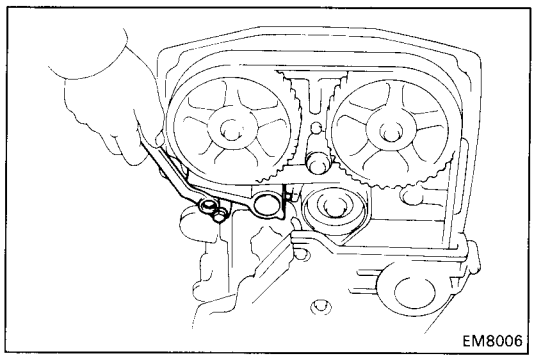
- If there is more than one timing pulley tooth between the timing marks, realign the timing marks in accordance with step 13.
- If the timing marks are aligned or the difference is less than one timing pulley tooth, proceed to step 14.

9. **REMOVE EGR VACUUM MODULATOR AND VSV**
(See step 20 on page EM-45)

10. **REMOVE EGR VALVE AND PIPE**
(See step 21 on page EM-45)

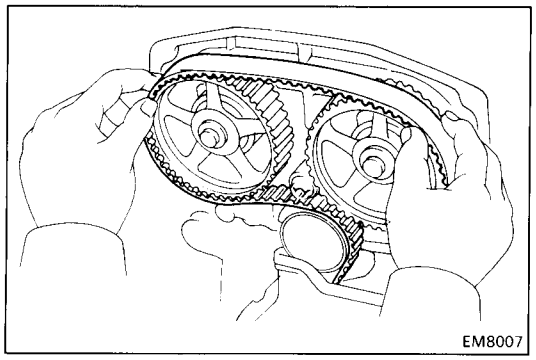
11. **REMOVE THROTTLE BODY**
(See steps 5 to 8 and 9 to 11 on pages FI-72 and 73)

12. **REMOVE CYLINDER HEAD COVER**
(See step 34 on page EM-48)

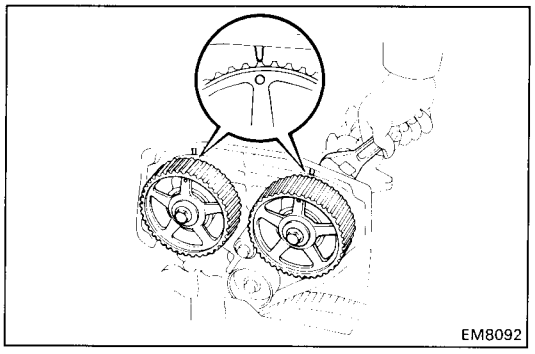

EM8006

13. **ADJUST CAMSHAFT TIMING PULLEY TIMING MARKS**

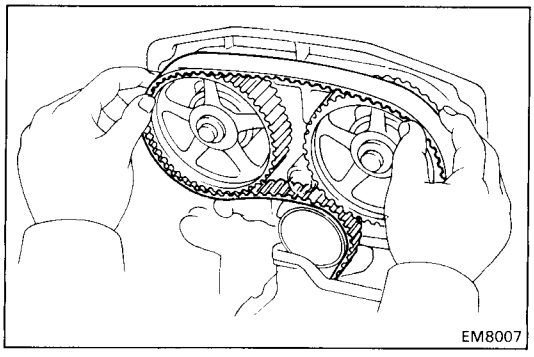
(a) Remove the two bolts and timing belt tensioner.


EM8007

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

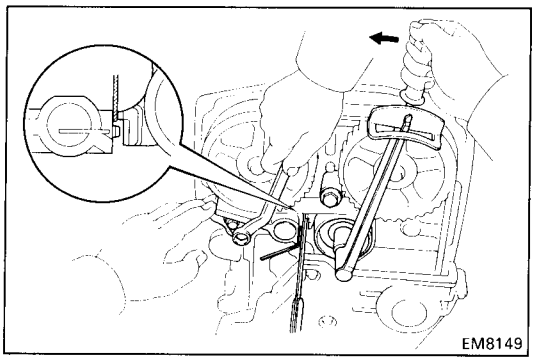

EM8092

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


EM8007

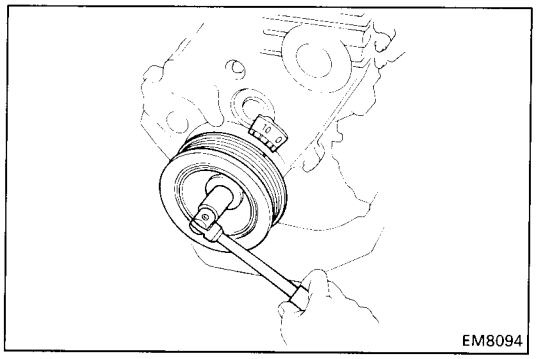
(d) Reinstall the timing belt, checking the tension between the crankshaft timing pulley and intake camshaft timing pulley.

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



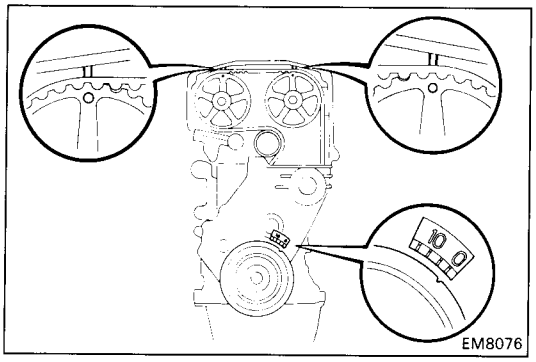
(e) Install the timing belt tensioner with the two bolts. (See steps 12 and 13 on page EM-31)

Torque: 210 kg-cm (15 ft-lb, 21 N·m)

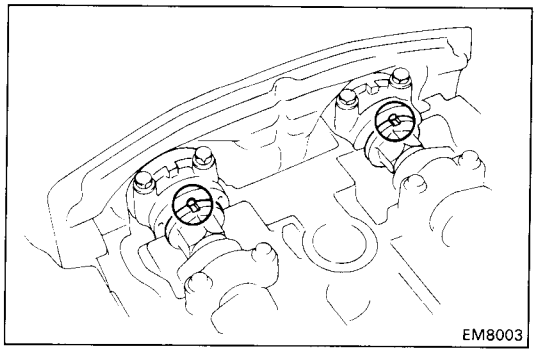


(f) Turn the crankshaft pulley two revolutions from TDC to TDC.

NOTICE: Always turn the crankshaft clockwise.



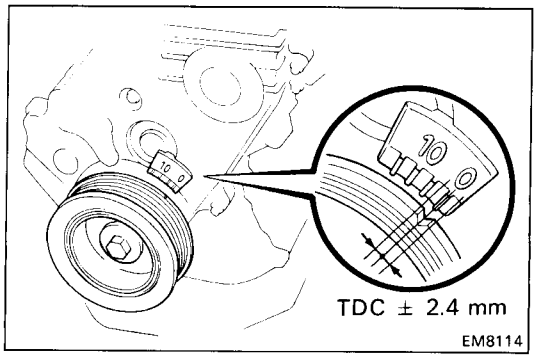
(g) Check that each pulley aligns with the timing marks as shown in the figure.



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.

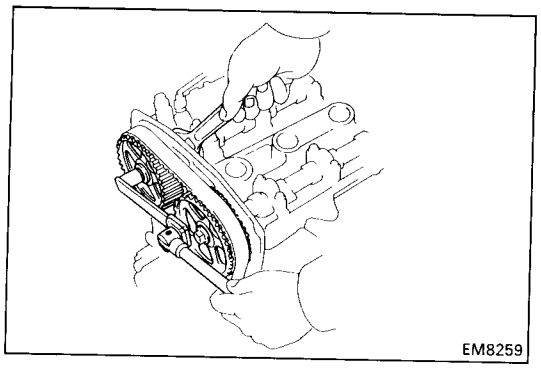


(b) Next make a note of the crankshaft pulley angle on the No.1 timing belt cover.

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.



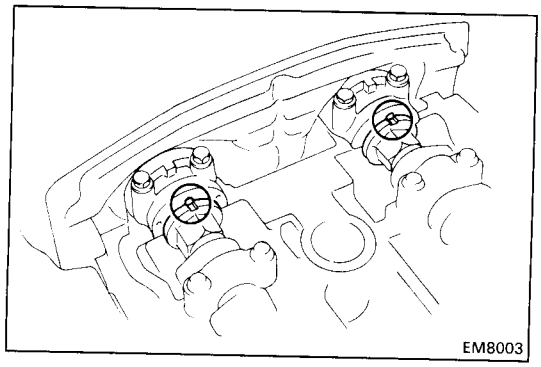
15. ADJUST VALVE TIMING

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

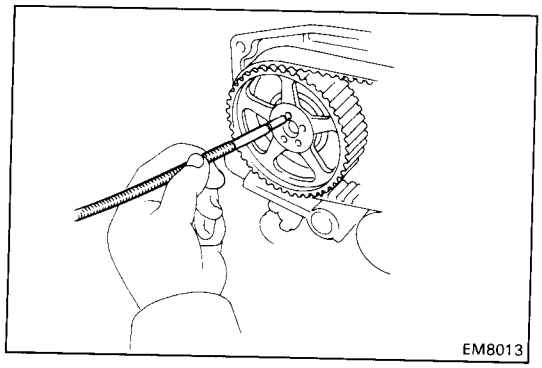
HINT (Intake camshaft timing pulley): Use SST.

SST 09249-63010

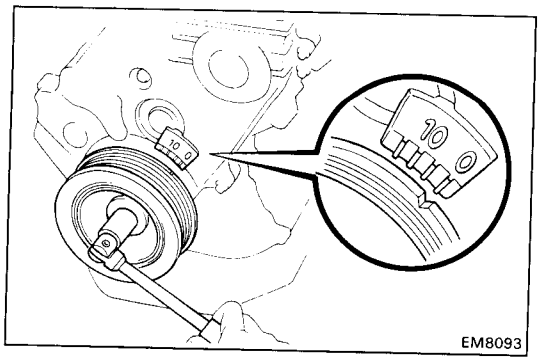
NOTICE: Do not make use of the timing belt tension when loosening the pulley bolts.



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

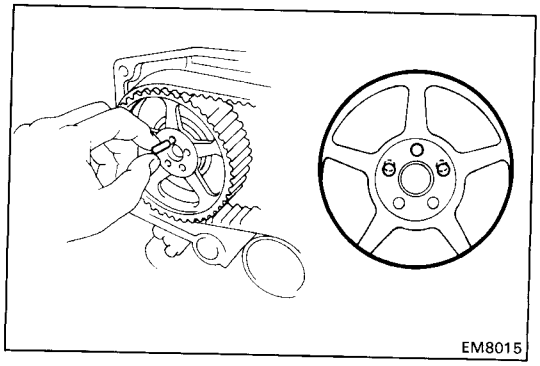


(c) Using a magnetic finger, remove the knock pin from the pin hole of the camshaft timing pulley.



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

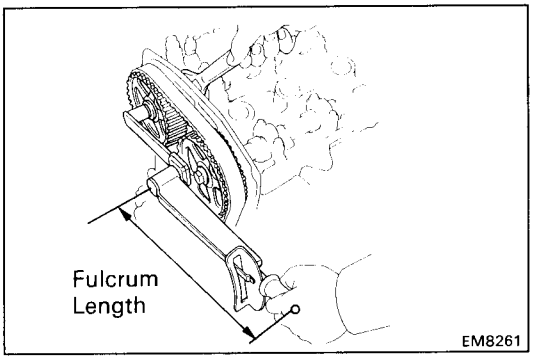
NOTICE: Always turn the crankshaft clockwise.

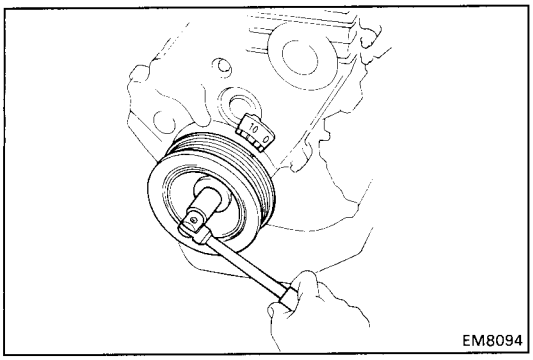


(e) Select one overlapped hole of the camshaft and timing pulley, and insert the match pin into it.

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 hexagonal wrench head portion of the camshaft with a wrench, and install the pulley bolt.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)
420 kg-cm (30 ft-lb, 41 N·m) 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-37)

16. **REINSTALL NO.2 TIMING BELT COVER**
(See step on 15 page EM-32)

17. **REINSTALL SPARK PLUGS (See page IG-8)**
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

18. **REINSTALL CYLINDER HEAD COVER**
(See step 7 on pages EM-66 and 67)

19. **REINSTALL THROTTLE BODY**
(See steps 2, 3 and 5 to 8 on pages FI-74 and 75)

20. **REINSTALL EGR VALVE AND PIPE**
(See step 20 on page EM-69)

21. **REINSTALL EGR VACUUM MODULATOR AND VSV**
(See step 21 on page EM-70)

22. **REINSTALL INTERCOOLER**
(See steps 11 to 13 on page TC-17)

23. **REINSTALL ALTERNATOR**
(See steps 2 to 5 on page CH-7)

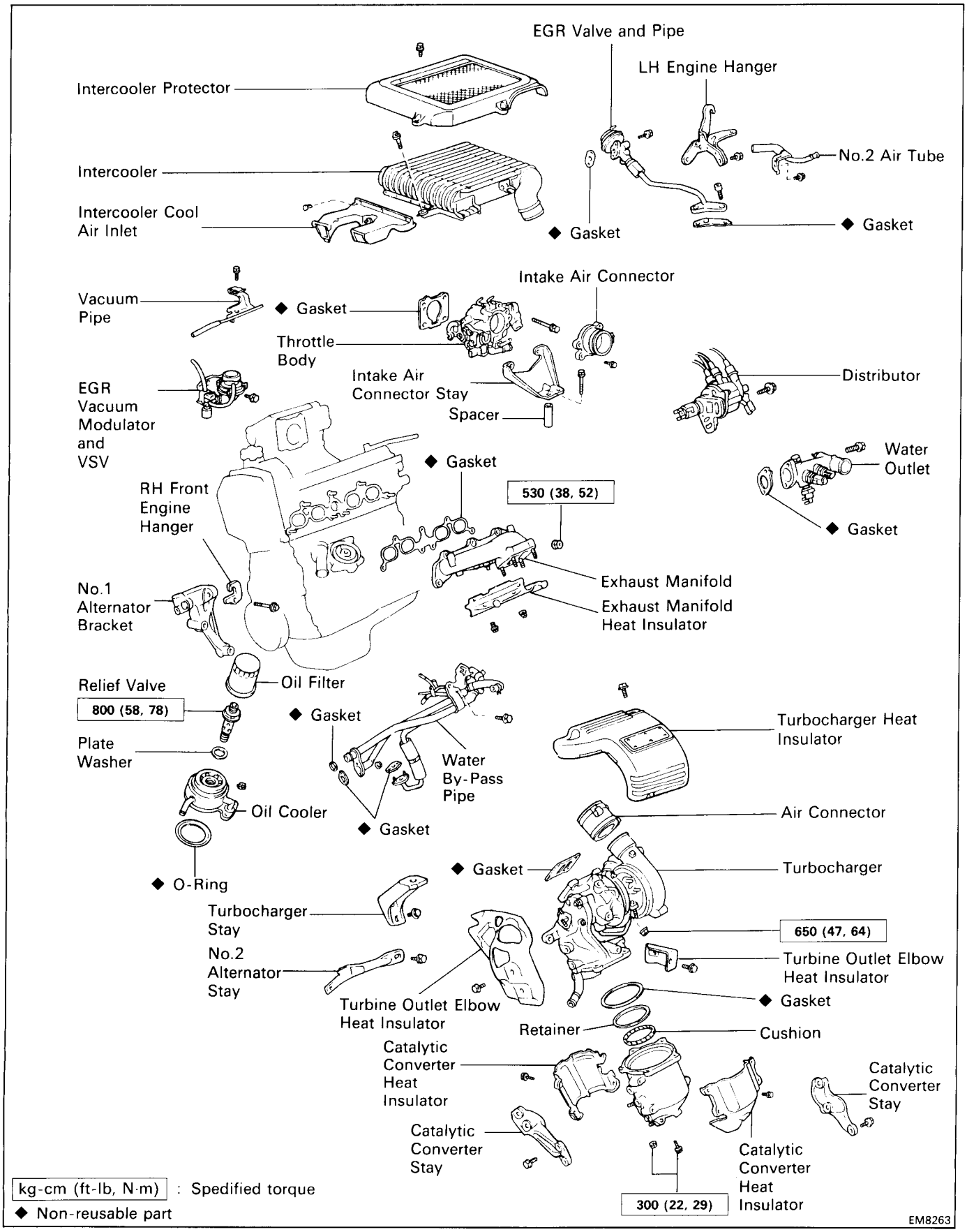
24. **REINSTALL RH ENGINE UNDER COVER**

25. **REINSTALL RH FRONT WHEEL**

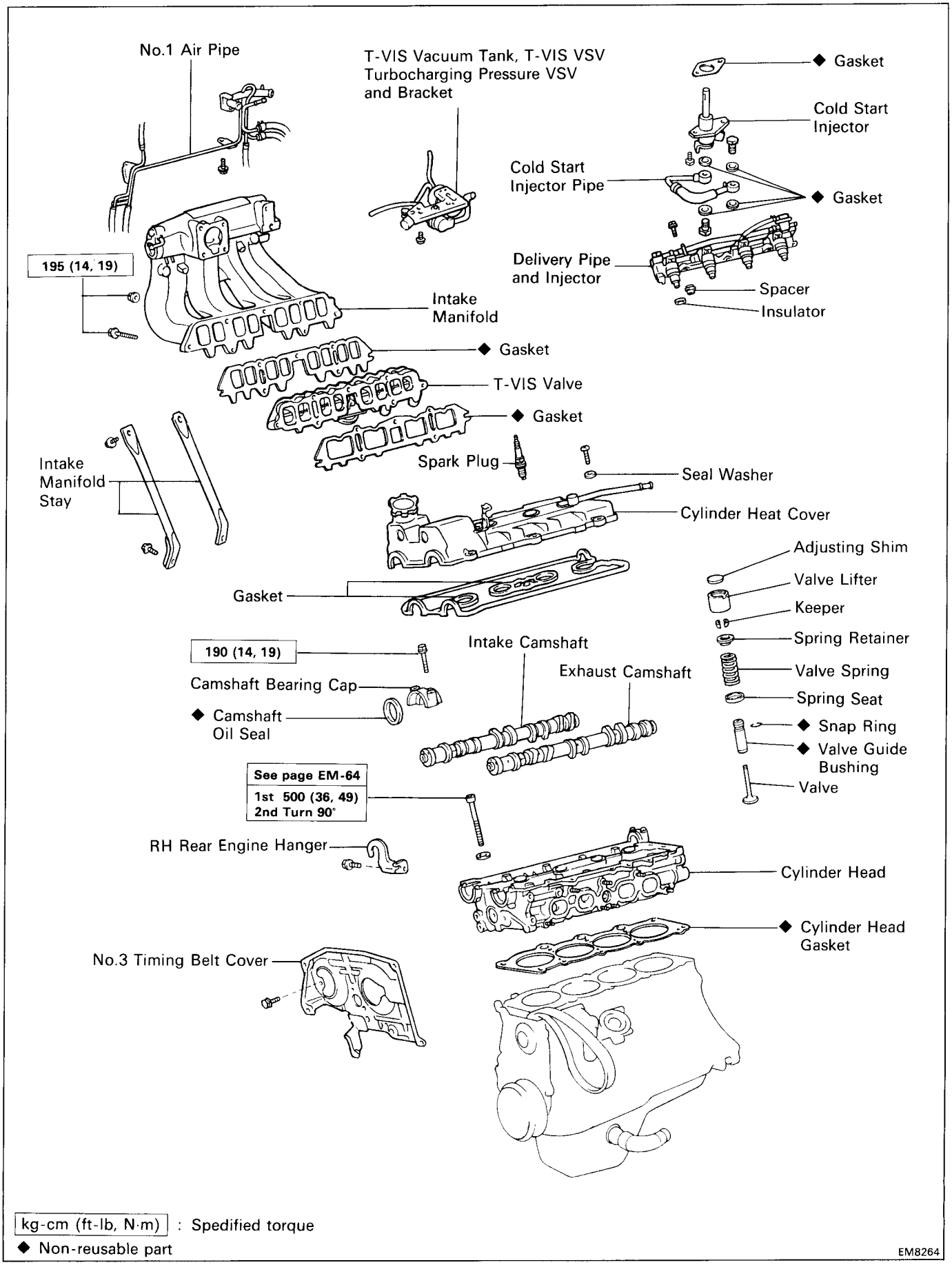
26. **RECONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

CYLINDER HEAD

COMPONENTS



COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Spedified torque

◆ Non-reusable part

EM8264

REMOVAL OF CYLINDER HEAD

(See pages EM-40 and 41)

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-4)

3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

4. REMOVE AIR CLEANER CAP
   (See step 7 on page EM-75)

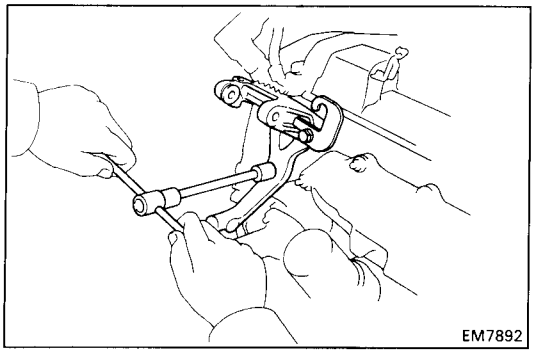
5. REMOVE INTERCOOLER
   (See steps 13 to 15 on pages TC-9 and 20)

6. REMOVE ALTERNATOR
   (See steps 2 to 6 on pages CH-5 and 6)

7. REMOVE ENGINE UNDER COVER

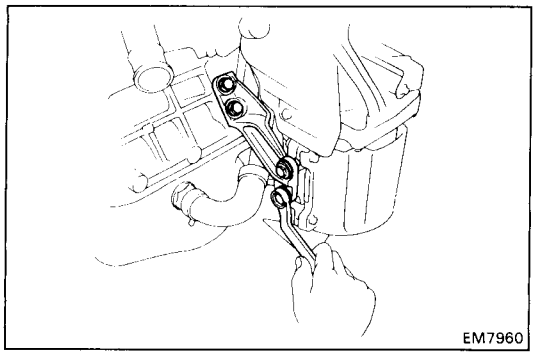
8. REMOVE SUSPENSION LOWER CROSSMEMBER
   (See step 32 on page EM-79)

9. REMOVE FRONT EXHAUST PIPE
   (See step 33 on page EM-80)



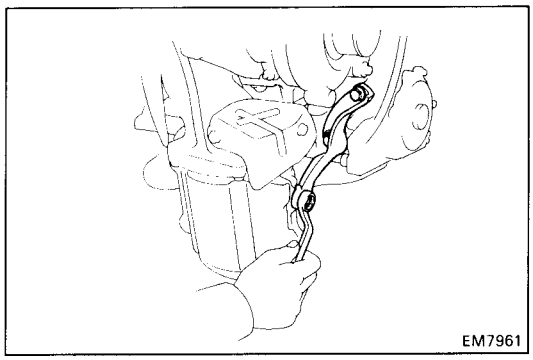
10. REMOVE RH FRONT ENGINE HANGER AND NO.1 ALTERNATOR BRACKET

    Remove the three bolts, engine hanger and alternator bracket.

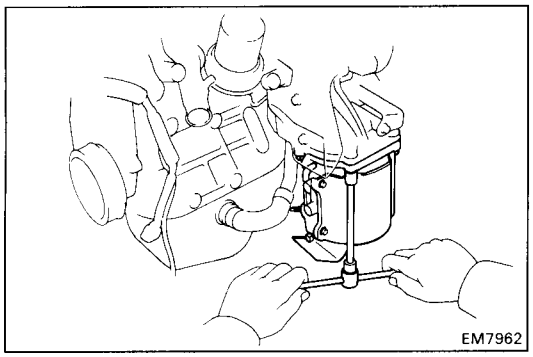


11. REMOVE CATALYTIC CONVERTER

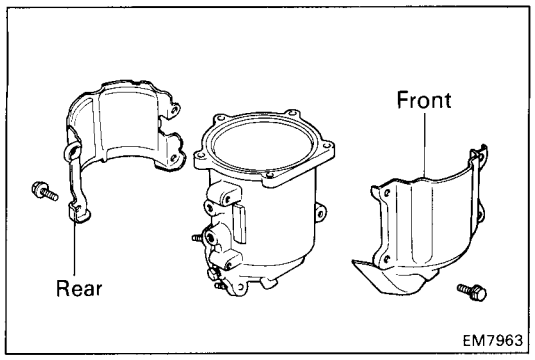
    (a) Remove the four bolts and RH converter stay.



(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.



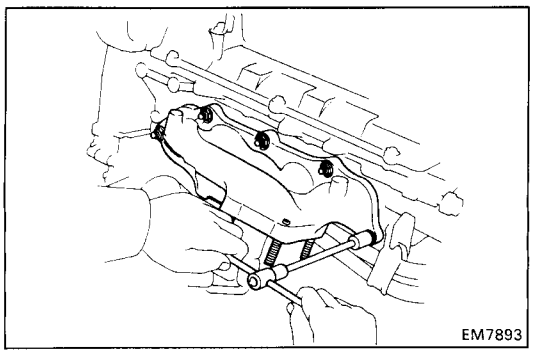
(d) Remove the five bolts and front heat insulator.

(e) Remove the four bolts and rear heat insulator.

12. REMOVE TURBOCHARGER
(See steps 16 to 21 on page TC-10 and 11)

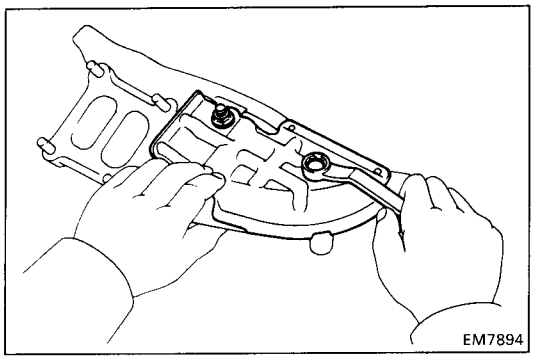
13. REMOVE THROTTLE BODY
(See steps 5 to 8 and 10 on page FI-72)

14. REMOVE COLD START INJECTOR
(See steps 2 to 4 on pages FI-53 and 54)



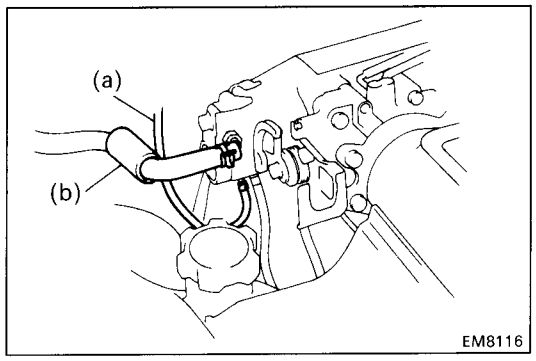
15. REMOVE EXHAUST MANIFOLD

(a) Remove the seven nuts, exhaust manifold and gasket.



(b) Remove the bolt, nut and heat insulator.

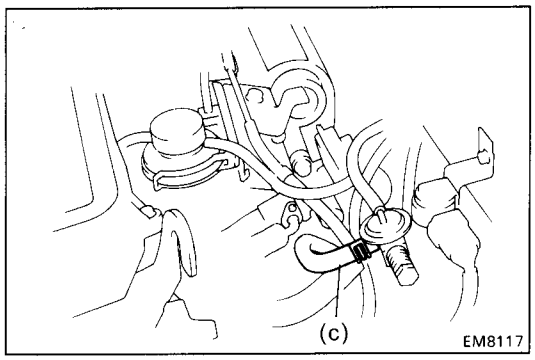
16. REMOVE DISTRIBUTOR (See page IG-10)



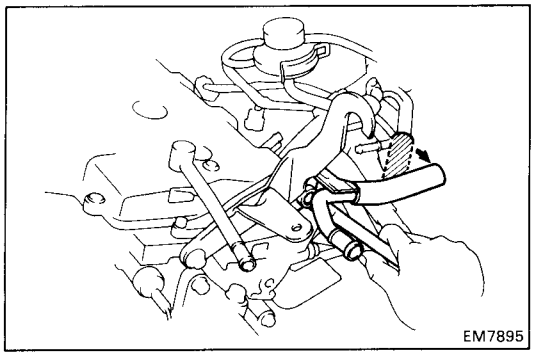
17. DISCONNECT HOSES

(a) Brake booster vacuum hose from intake manifold.

(b) Turbocharging pressure sensor hose from intake manifold.



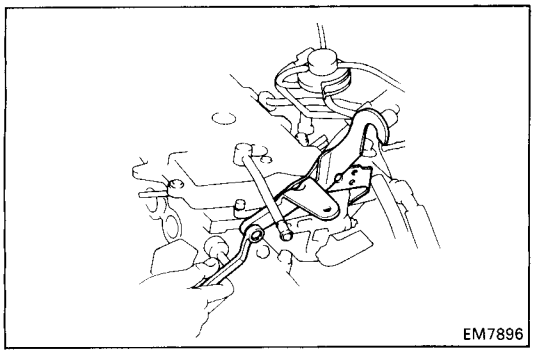
(c) A/C ASV air hose from No.1 air tube.



18. REMOVE NO.2 AIR TUBE

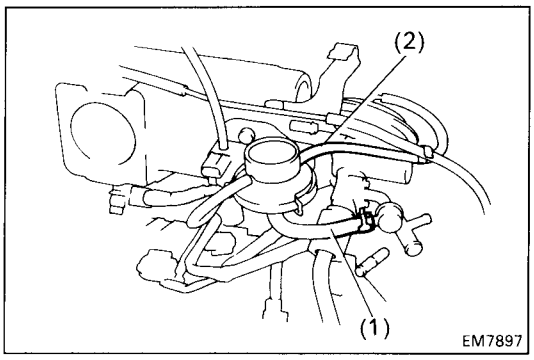
(a) Disconnect the air hose from the No.1 air tube.

(b) Remove the bolt and No.1 air tube.



19. REMOVE LH ENGINE HANGER

Remove the two bolts and engine hanger.



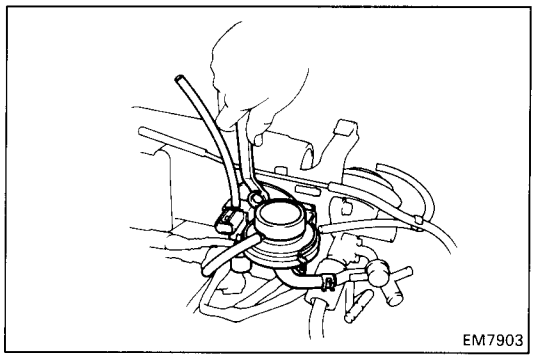
20. REMOVE EGR VACUUM MODULATOR AND VSV

(a) Disconnect the EGR VSV connector.

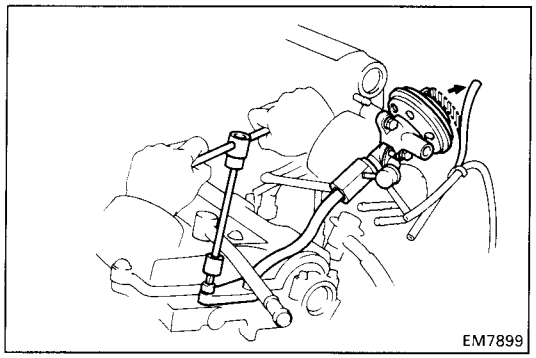
(b) Disconnect the following hoses:

(1) Vacuum hose from EGR valve

(2) Vacuum hose from EGR vacuum modulator



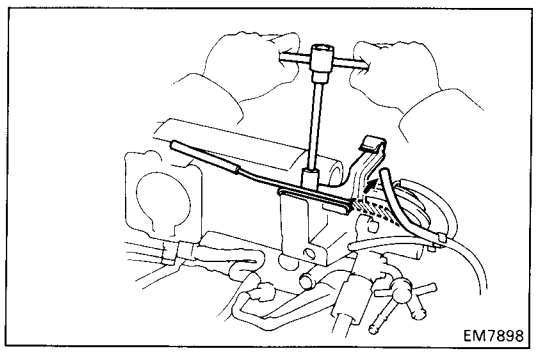
(c) Remove the bolt, vacuum modulator and VSV assembly.



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

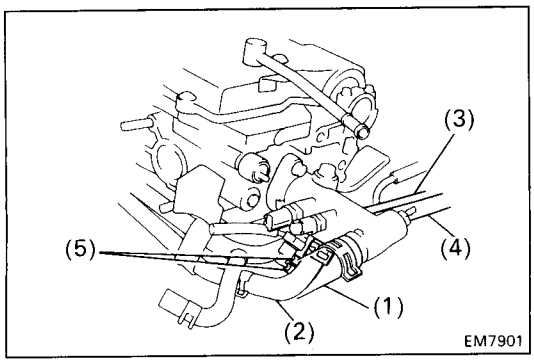
(a) Disconnect the vacuum hose from the vacuum pipe.

(b) Remove the bolt and vacuum pipe.

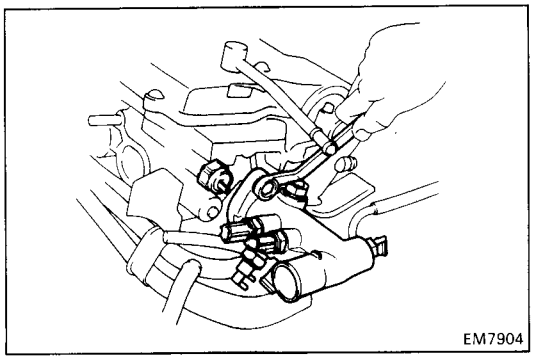
23. REMOVE WATER OUTLET

(a) Disconnect the following connectors:

- Water temperature sender gauge connector
- Water temperature sensor
- Cold start injector time switch connector



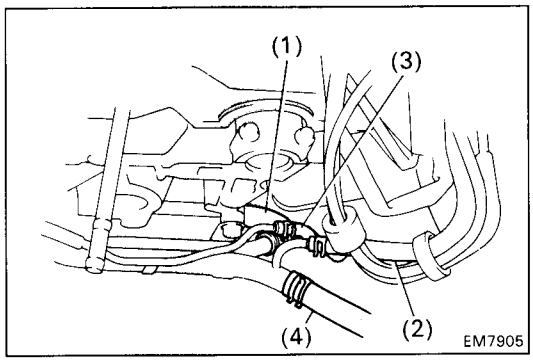
(b) Disconnect the following hoses:
(1) Upper radiator hose
(2) Water by-pass hose from water by-pass pipe
(3) Water by-pass pipe hose from ISC valve
(4) Heater water hose
(5) Two EVAP VSV vacuum hoses



(c) Remove the two bolts, water outlet and gasket.

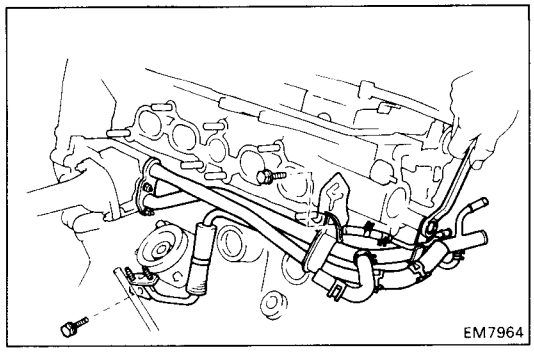
24. REMOVE OIL PRESSURE SWITCH

25. REMOVE OIL COOLER
(See steps 3 to 6 on pages LU-10 and 11)

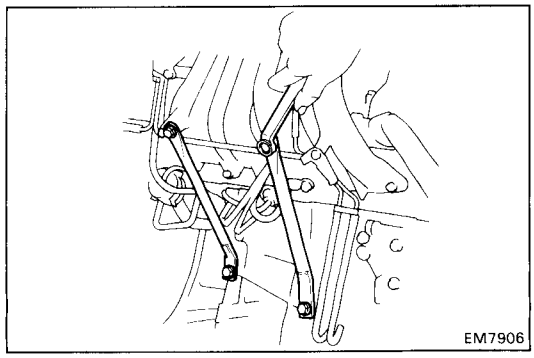


26. REMOVE WATER BY-PASS PIPE

(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

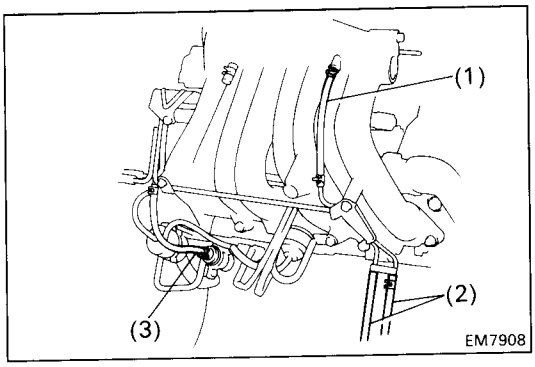


(b) Remove the two bolts, two nuts, water by-pass pipe, gasket and O-ring.



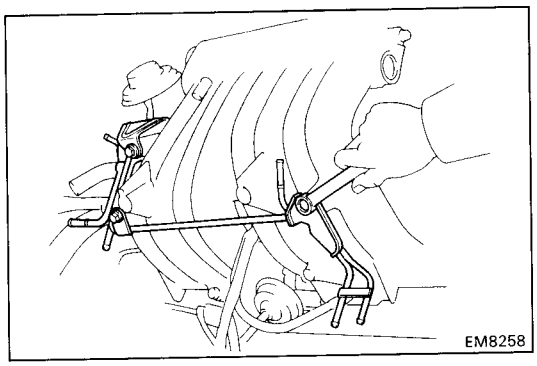
27. REMOVE INTAKE MANIFOLD STAYS

Remove the two bolts and manifold stay. Remove the two manifold stays.



28. REMOVE NO.1 AIR TUBE

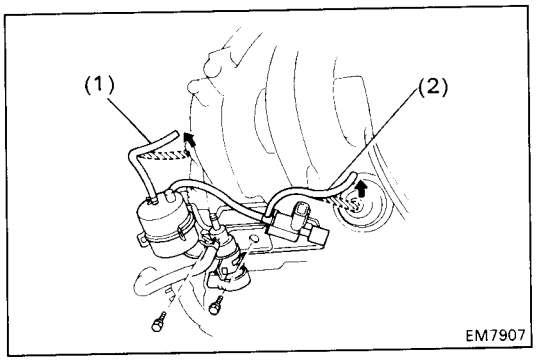
(a) Disconnect the following hoses:
(1) Vacuum hose from intake manifold
(2) Two PS vacuum hoses
(3) Vacuum hose from turbocharging pressure VSV



(b) Remove the three bolts and air tube.

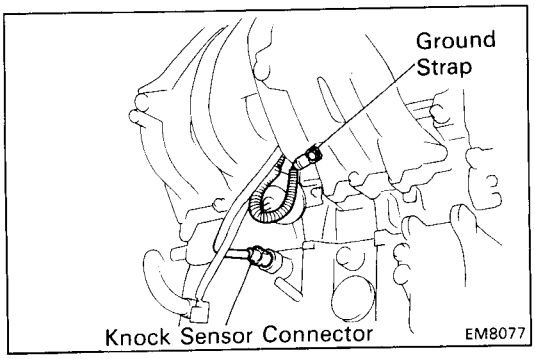
29. REMOVE T-VIS VACUUM TANK, T-VIS VSV, TURBOCHARGING PRESSURE VSV AND BRACKET

(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

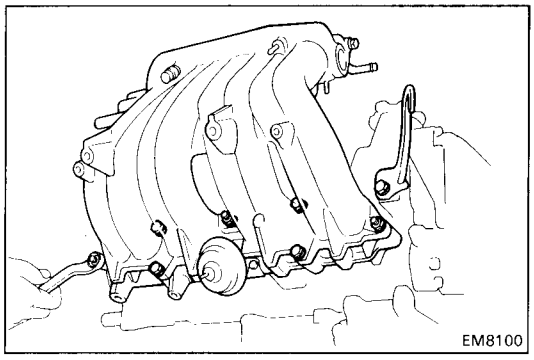
(c) Remove the two bolts, the T-VIS vacuum tank, T-VIS VSV, turbocharging pressure VSV and bracket assembly.



30. REMOVE INTAKE MANIFOLD AND T-VIS VALVE

(a) Remove the bolt, and disconnect the ground strap.

(b) Disconnect the knock sensor connector.

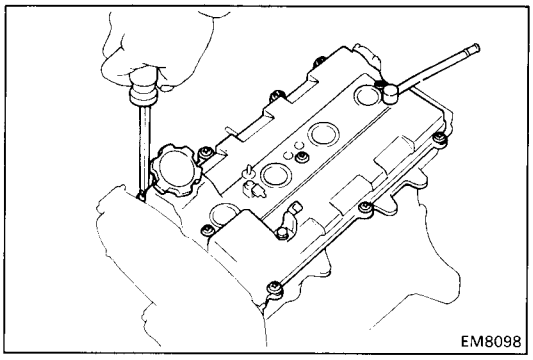


(c) Remove the four bolts, three nuts, intake manifold, T-VIS VSV and two gaskets.

31. **REMOVE RH REAR ENGINE HANGER**
Remove the bolt and engine hanger.

32. **REMOVE CHARCOAL CANISTER**
(See step 20 on page EM-77)

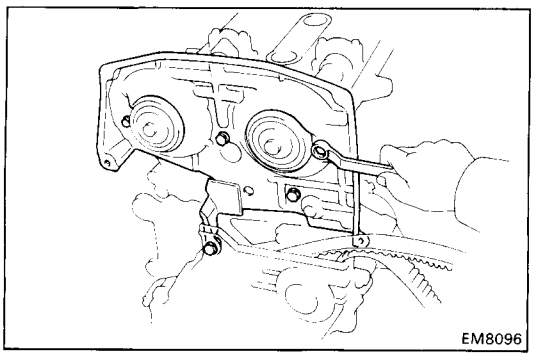
33. **REMOVE DELIVERY PIPE AND INJECTORS**
(See steps 8 to 13 on pages FI-59 and 60)



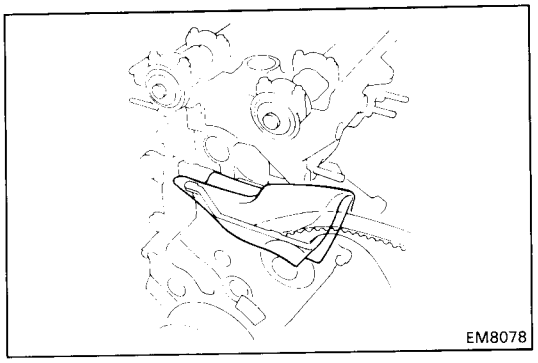
34. **REMOVE CYLINDER HEAD COVER**
Remove the ten screws, seal washers, head cover and two gaskets.

35. **REMOVE CAMSHAFT TIMING PULLEYS**
(See steps 15 to 19 on pages EM-21 and 22)

36. **REMOVE NO.1 IDLER PULLEY**
(See step 24 on page EM-24)

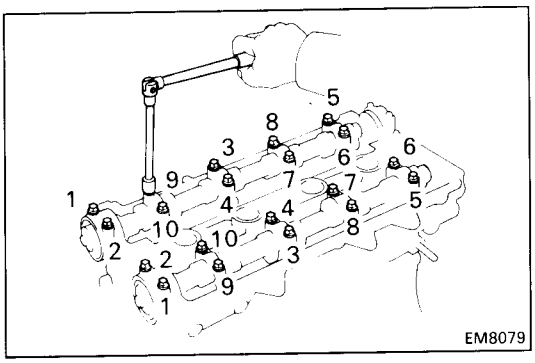


37. **REMOVE NO.3 TIMING BELT COVER**
Remove the five bolts and timing belt cover.



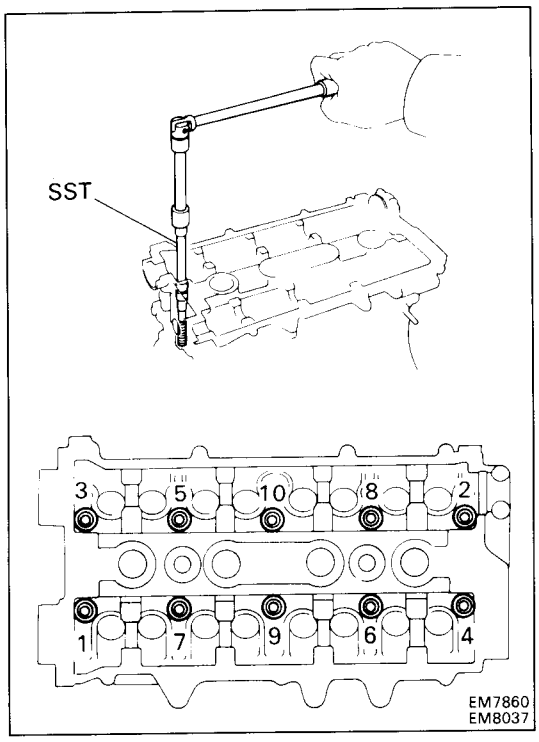
NOTICE:

- **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.**



38. 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.

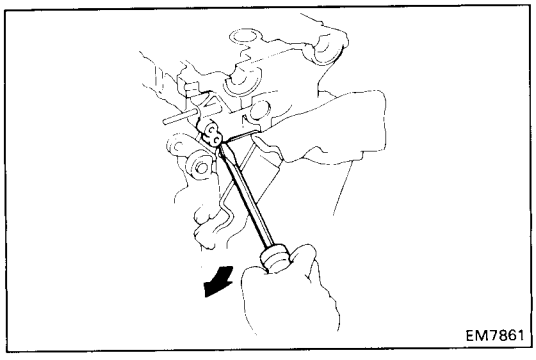


39. REMOVE CYLINDER HEAD

(a) Using SST, uniformly loosen and remove the ten cylinder head bolts in several passes in the sequence shown.

SST 09043-38100

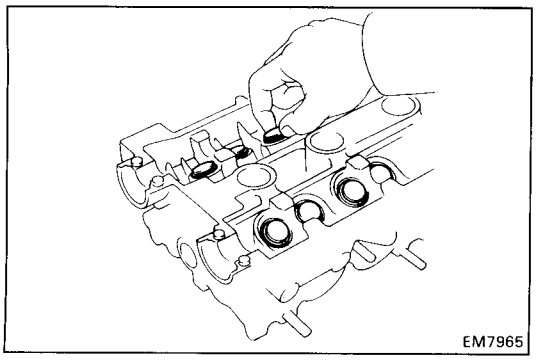
NOTICE: Cylinder head warpage or cracking could result from removing in incorrect order.



(b) 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.

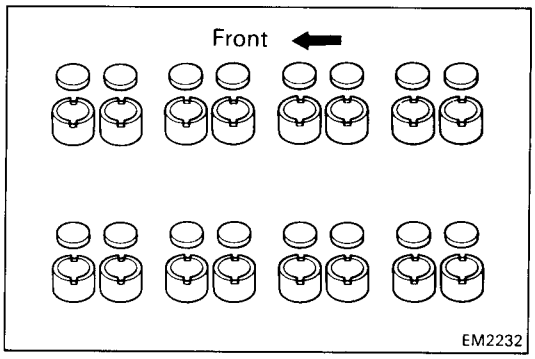
NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.



DISASSEMBLY OF CYLINDER HEAD

(See pages EM-40 and 41)

1. REMOVE VALVE LIFTERS AND SHIMS



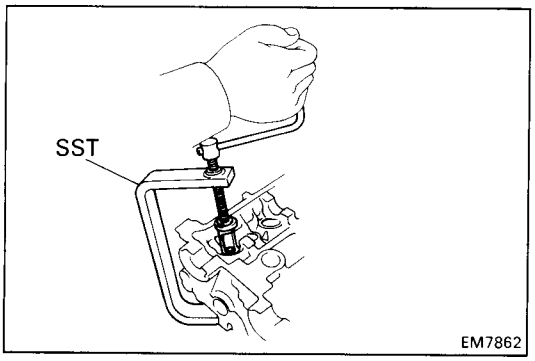
HINT: Arrange the valve lifters and shims in correct order.

2. REMOVE VALVES

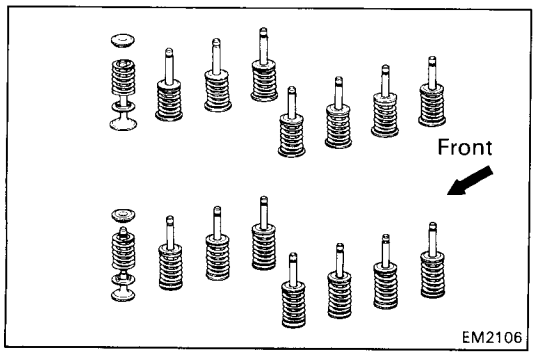
(a) Using SST, compress the valve spring and remove the two keepers.

SST 09202-70010

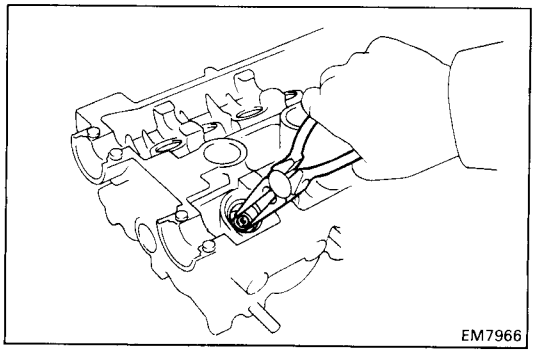
(b) Remove the spring retainer, valve spring, valve and spring seat.

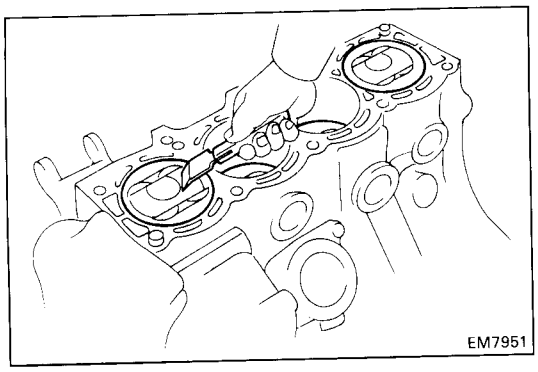


HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



(c) Using needle-nose pliers, remove the oil seal.

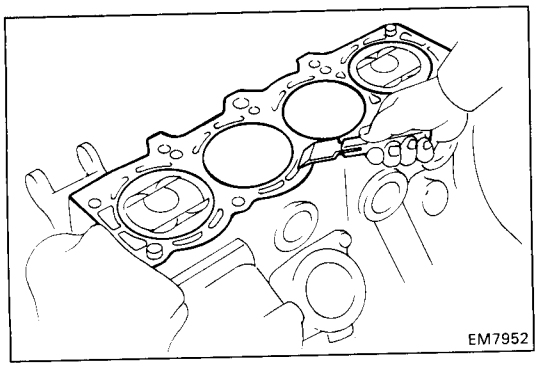




INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

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 surface.



(b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

(c) Using compressed air, blow carbon and oil from the bolt holes.

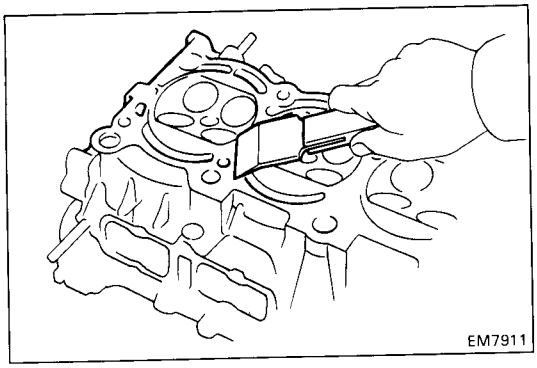
CAUTION: Protect your eyes when using high-compressed air.

2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the cylinder block surface.

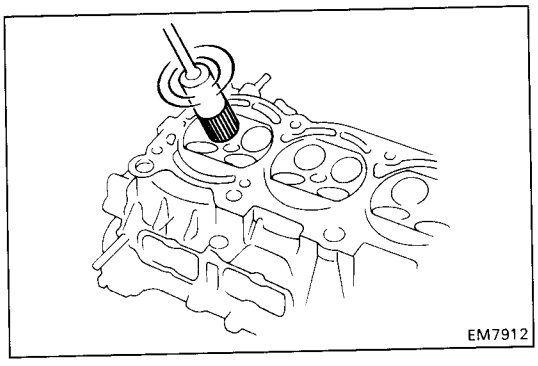
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

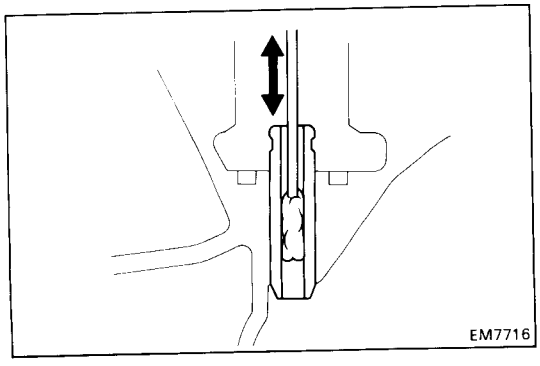
Using a wire brush, remove all the carbon from the combustion chambers.

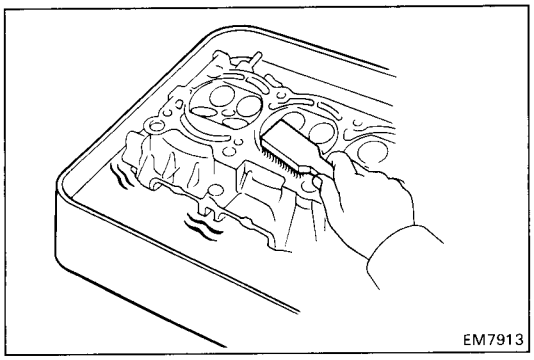
NOTICE: Be careful not to scratch the cylinder block contact surface.



C. Clean valve guide bushings

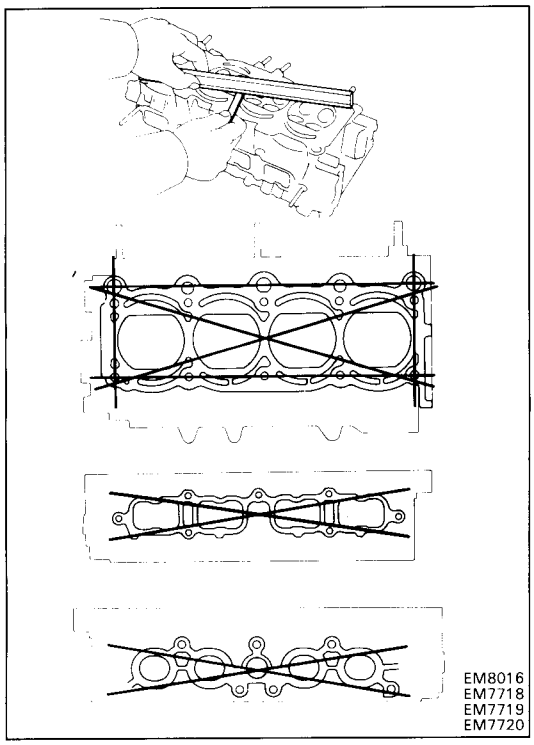
Using a valve guide bushing brush and solvent, clean all the guide bushings.




EM7913

D. Clean cylinder head

Using a soft brush and solvent, thoroughly clean the cylinder head.


EM8016
EM7718
EM7719
EM7720

3. INSPECT CYLINDER HEAD

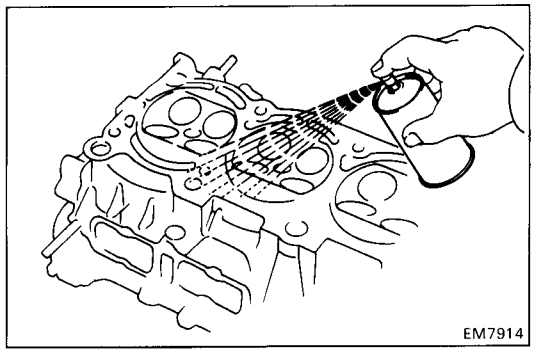
A. Inspect for flatness

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.)**

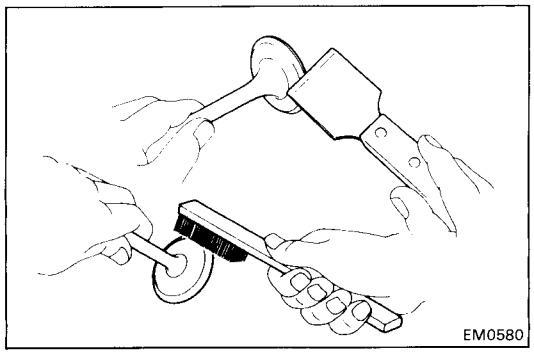
If warpage is greater than maximum, replace the cylinder head.


EM7914

B. Inspect for cracks

Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.

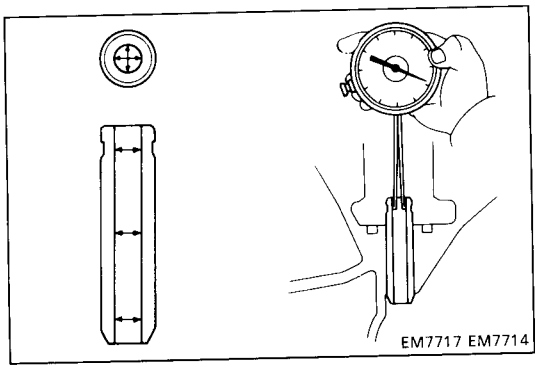
If cracked, replace the cylinder head.


EM0580

4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

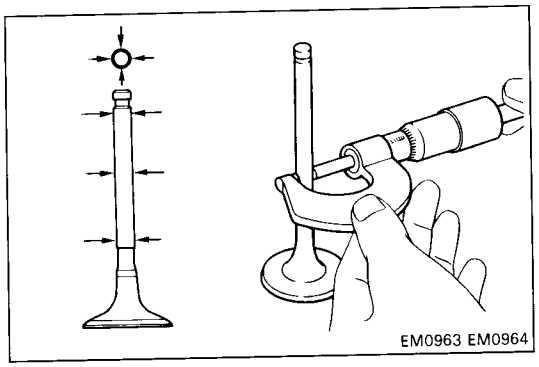
(b) Using a wire brush, thoroughly clean the valve.



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.

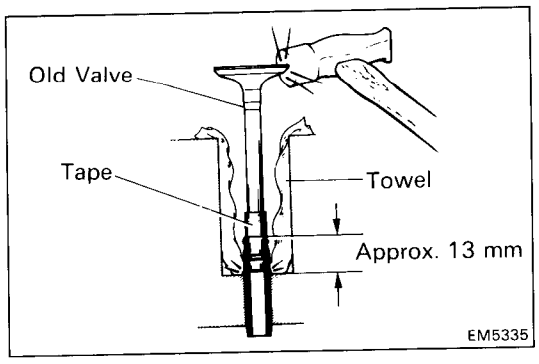
Standard oil clearance:

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.

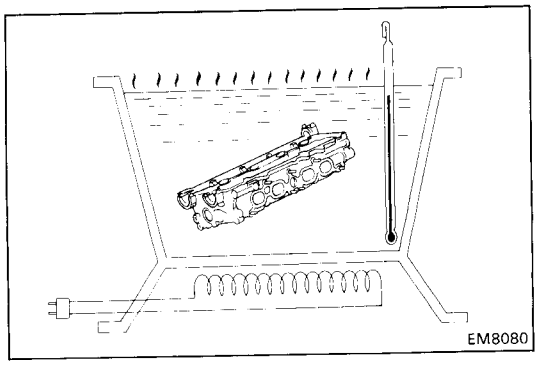


6. **IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS**

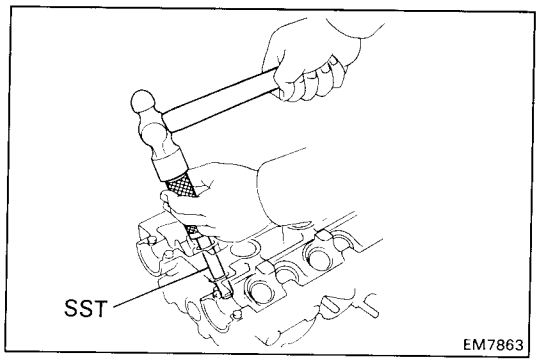
(a) (w/ Snap Ring)
Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

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.

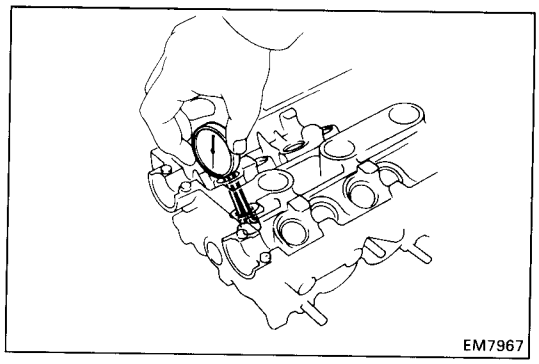


(b) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



(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

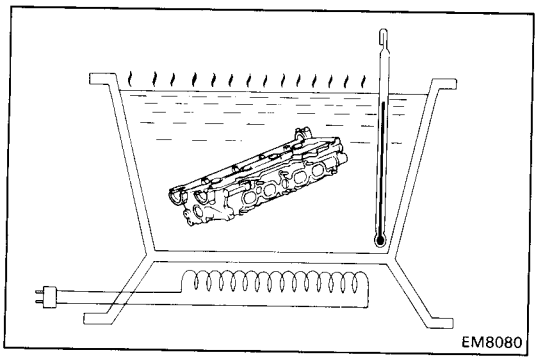
Bushing bore diameter mm (in.)	Bushing size
10.988 – 11.006 (0.4326 – 0.4333)	Use STD
11.038 – 11.056 (0.4346 – 0.4353)	Use O/S 0.05

(e) Select a new guide bushing (STD size or O/S 0.05).

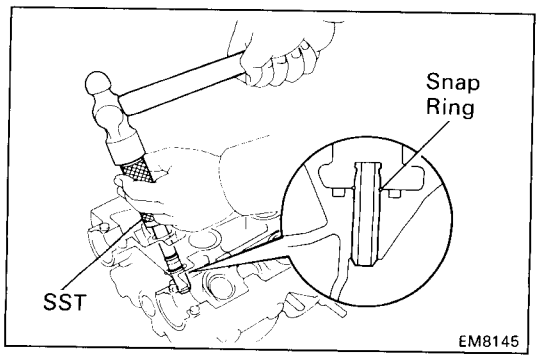
If the bushing bore diameter of the cylinder head is greater than 11.006 mm (0.4333 in.), machine the bushing bore to the following dimension:

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.

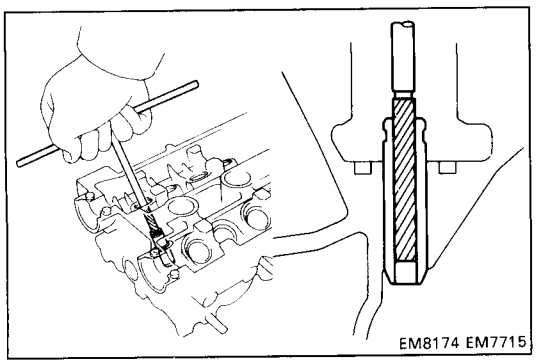


(f) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

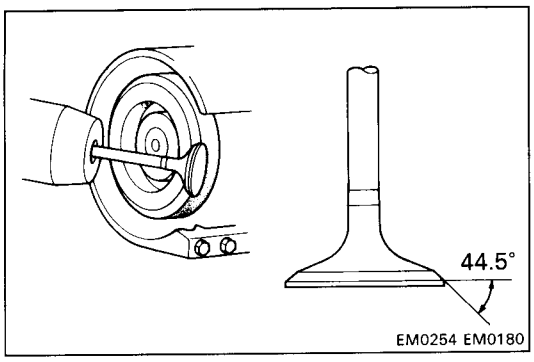


(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.

SST 09201-70010



(h) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM-53) between the guide bushing and valve stem.

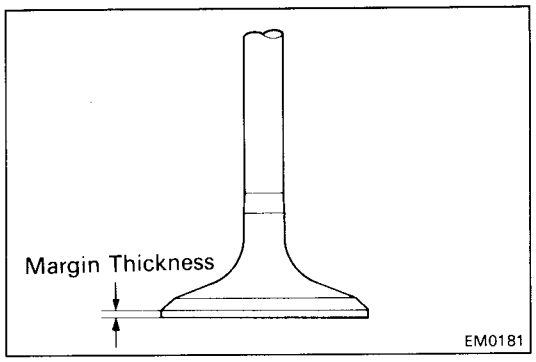


7. INSPECT AND GRIND VALVES

(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°

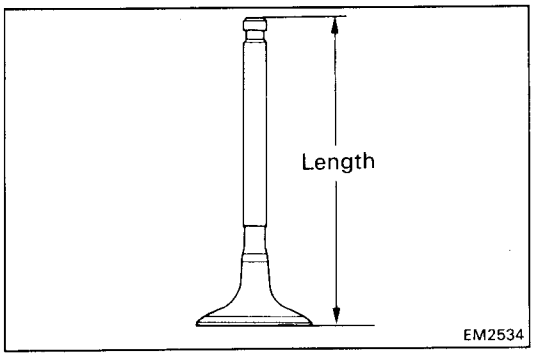


(c) Check the valve head margin thickness.

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.

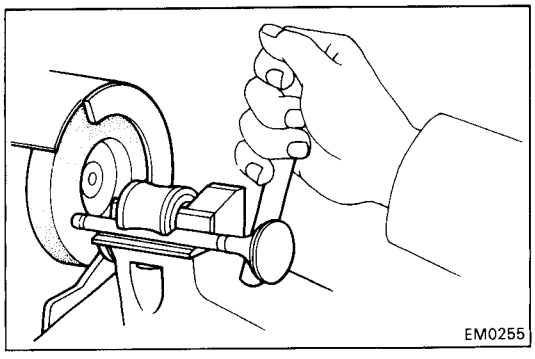


(d) Check the valve overall length.

Standard overall length:
Intake 105.50 mm (4.1535 in.)
Exhaust 99.55 mm (3.9193 in.)

Minimum overall length:
Intake 104.80 mm (4.1260 in.)
Exhaust 98.85 mm (3.8917 in.)

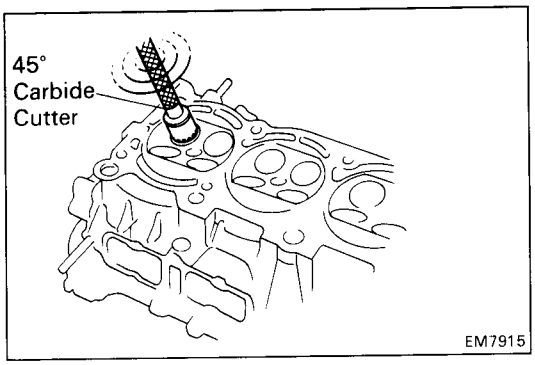
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.

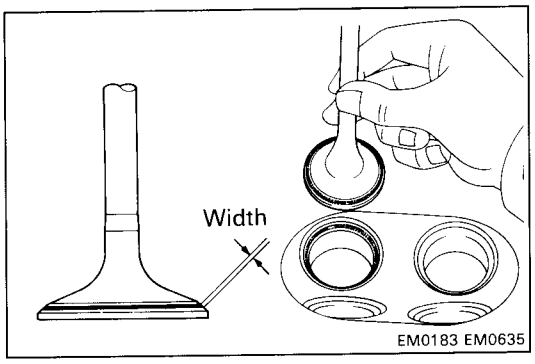
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than the 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.

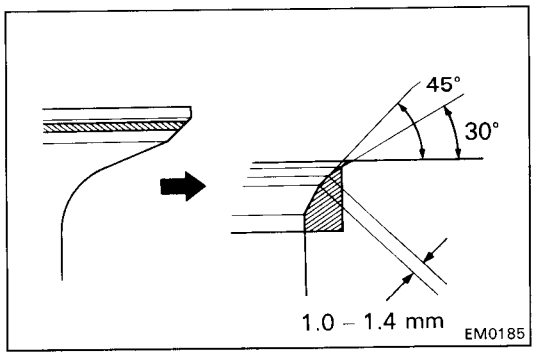


(b) Check the valve seating position.
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

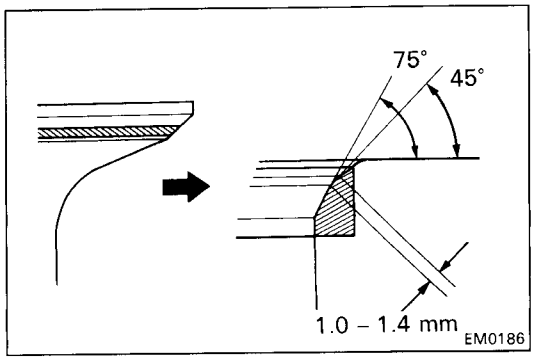
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

1.0 – 1.4 mm (0.039 – 0.055 in.)

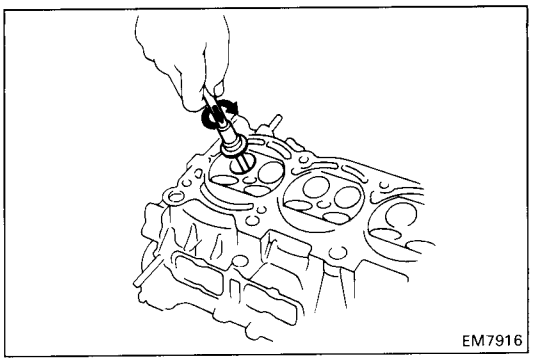


If not, correct the valve seats as follows:

(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

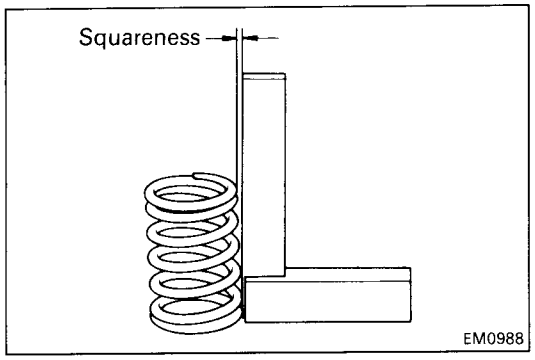


(2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



(d) Hand-lap the valve and valve seat with an abrasive compound.

(e) After hand-lapping, clean the valve and valve seat.

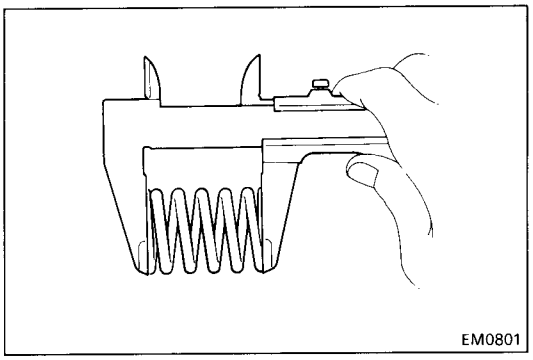


9. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness: 2.0 mm (0.079 in.)

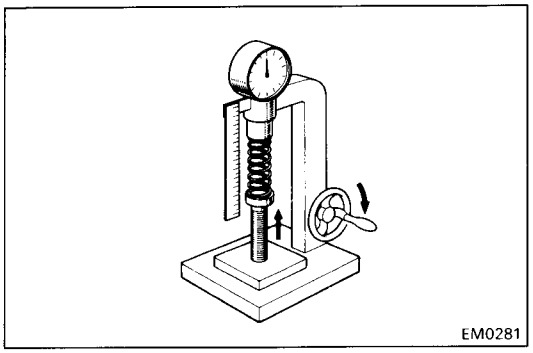
If the squareness is greater than maximum, replace the valve spring.



(b) Using a vernier caliper, measure the free length of the valve spring.

Free length: 44.43 mm (1.7492 in.)

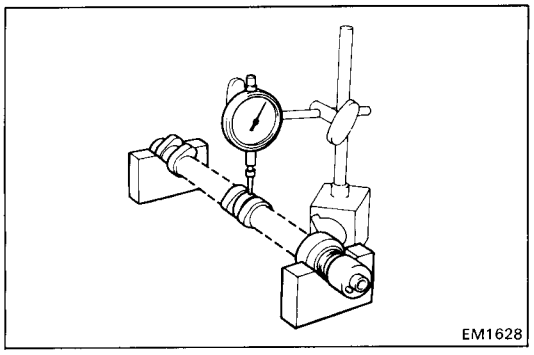
If the free length is not as specified, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:
20.5 – 24.1 kg (45.2 – 53.1 lb, 201 – 236 N)
at 34.4 mm (1.354 in.)

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



10. INSPECT CAMSHAFTS AND BEARINGS

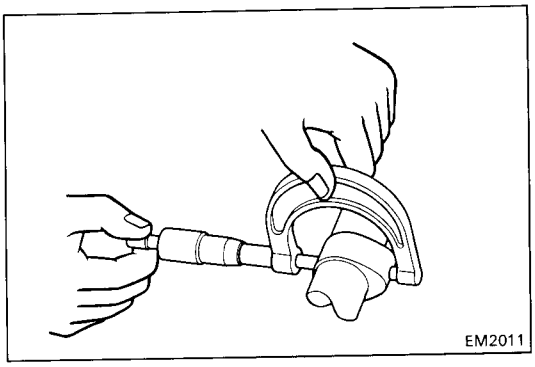
A. Inspect camshaft for runout

(a) Place the camshaft on V-blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft.



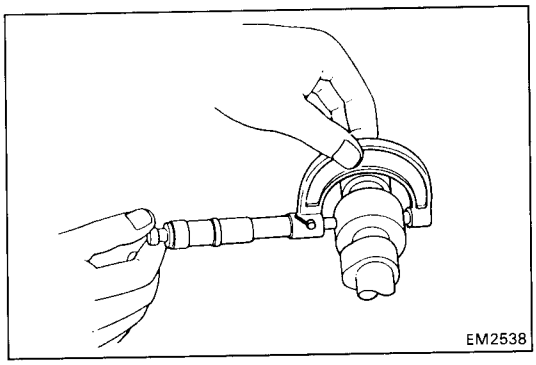
B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height: 41.010 – 41.110 mm (1.6146 – 1.6185 in.)

Minimum cam lobe height: 39.90 mm (1.5709 in.)

If the cam lobe height is greater than minimum, replace the camshaft.

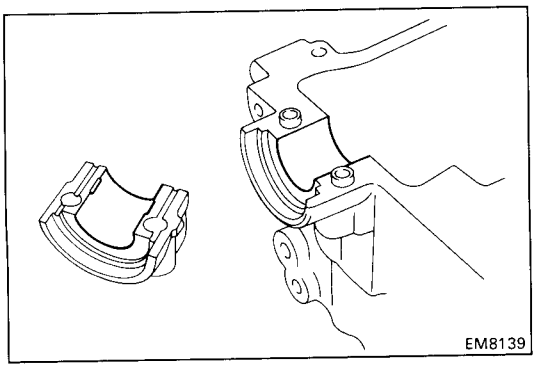


C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter: 26.959 – 26.975 mm (1.0614 – 1.0620 in.)

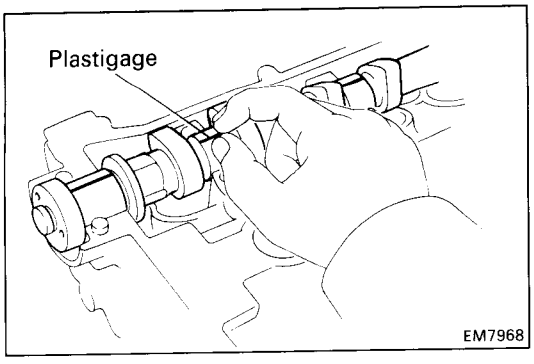
If the journal diameter is not as specified, check the oil clearance.



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.

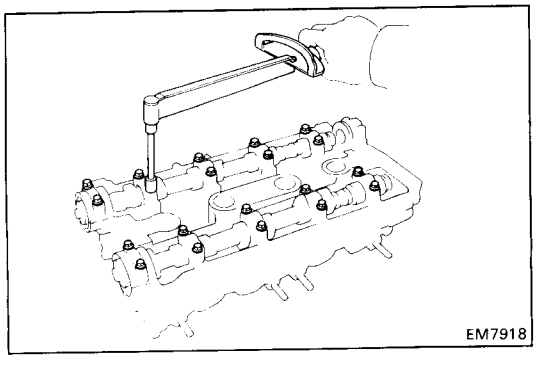


E. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

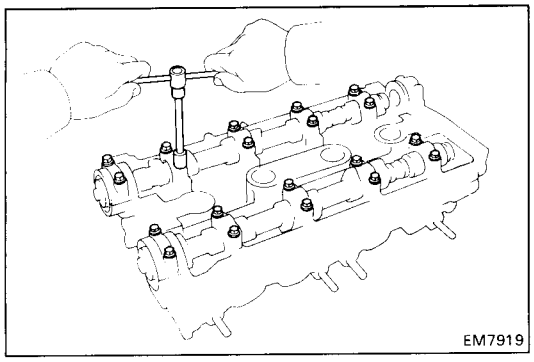
(c) Lay a strip of Plastigage across each of the camshaft journals.



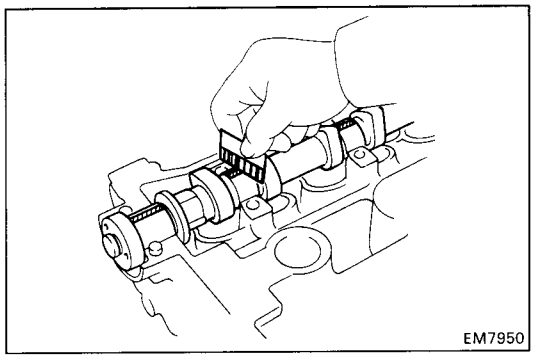
(d) Install the bearing caps.
(See step 2 on page EM-65)

Torque: 190 kg-cm (14 ft-lb, 19 N·m)

NOTICE: Do not turn the camshaft.


EM7919

(e) Remove the bearing caps.


EM7950

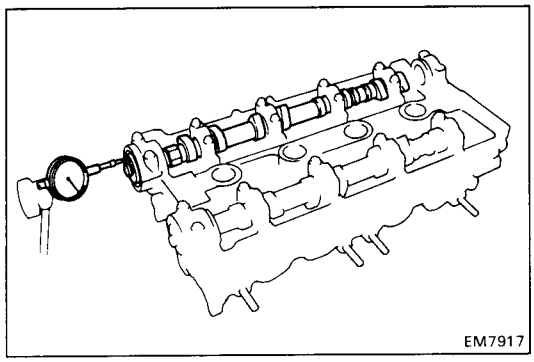
(f) Measure the Plastigage at its widest point.

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.


EM7917

F. Inspect camshaft thrust clearance

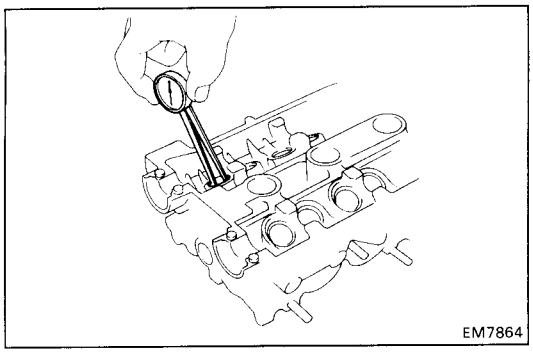
(a) Install the camshafts.
(See step 2 on page EM-65)

(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.)

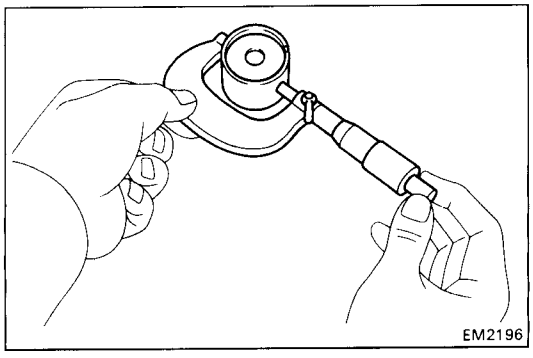
If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.


EM7864

11. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter: 28.000 – 28.021 mm (1.1024 – 1.1032 in.)


EM2196

(b) Using a micrometer, measure the lifter diameter.

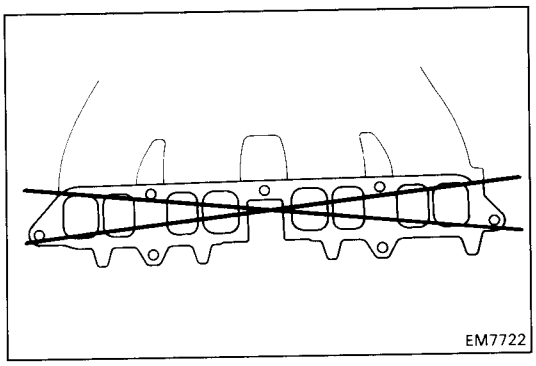
Lifter diameter: 27.975 – 27.985 mm (1.1014 – 1.1018 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance: 0.015 – 0.046 mm (0.0006 – 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.


EM7722

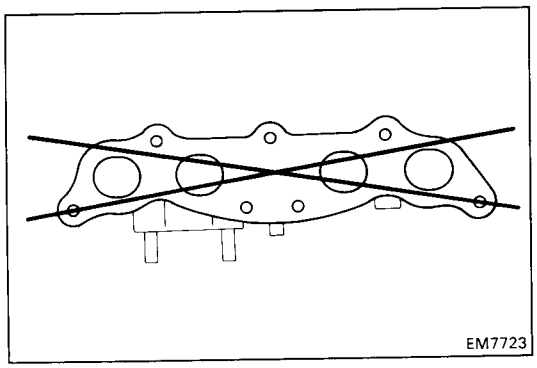
12. INSPECT INTAKE AND EXHAUST MANIFOLDS

(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.

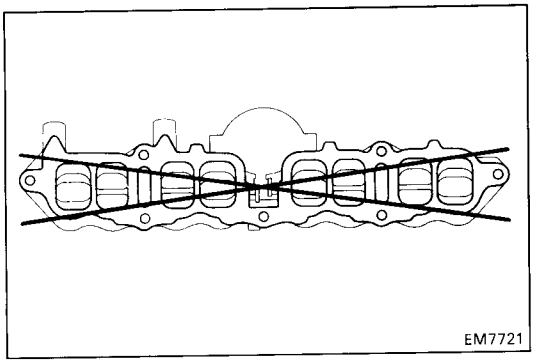

EM7723

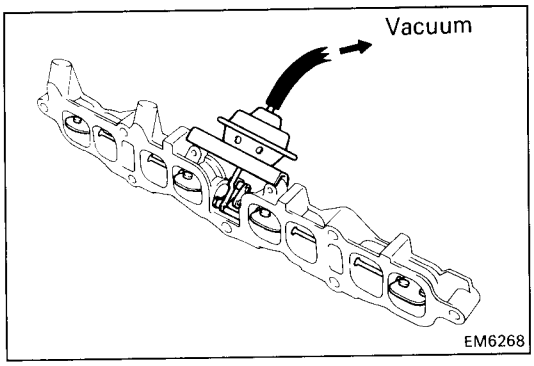
(Exhaust manifold)

Using precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

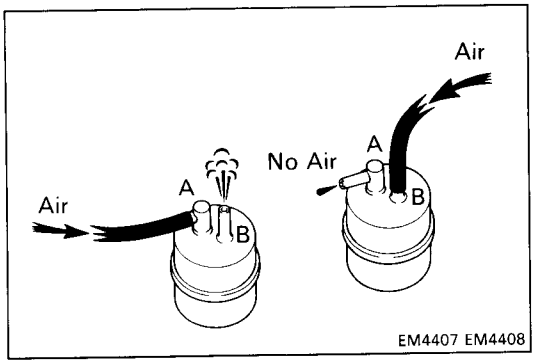
Maximum warpage: 0.20 mm (0.0079 in.)

If warpage is greater than maximum, replace the exhaust manifold.

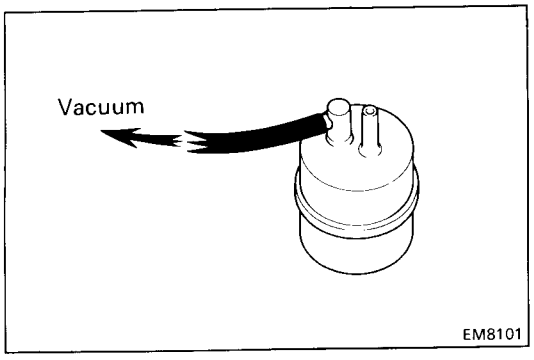

EM7721



EM6268



EM4407 EM4408



EM8101

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 400 mmhg (15.75 in.Hg, 53.3 kPa) 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 500 mmHg (19.69 ib.Hg, 66.7 kPa) of vacuum to port A, and check that there is no change in vacuum after one minuite.

If operation is not as specified, replace the vacuum tank.

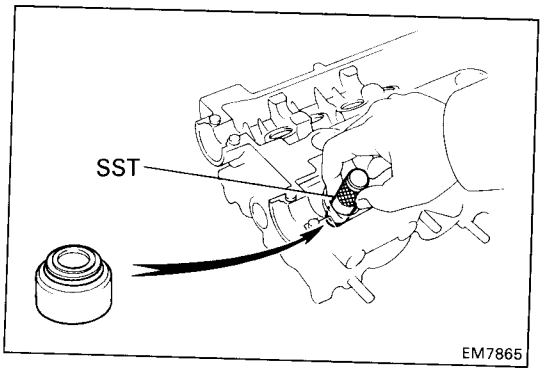
3. INSPECT T-VIS VSV (See page FI-85)

ASSEMBLY OF CYLINDER HEAD

(See pages EM-40 and 41)

HINT:

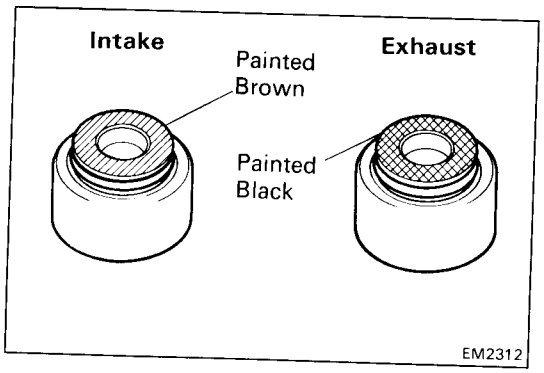
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



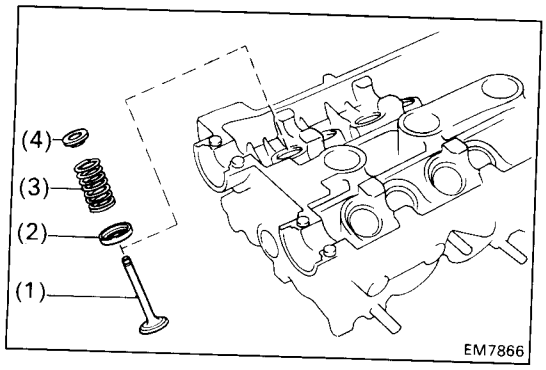
1. INSTALL VALVES

(a) Using SST, push in a new oil seal.

SST 09201-41020

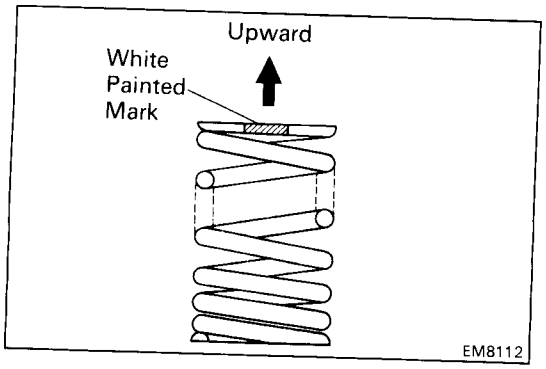


HINT: The intake valve oil seal is brown and the exhaust valve oil seal is black.

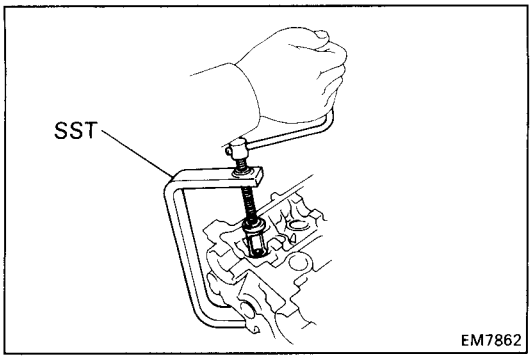


(b) Install the following parts:

(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer

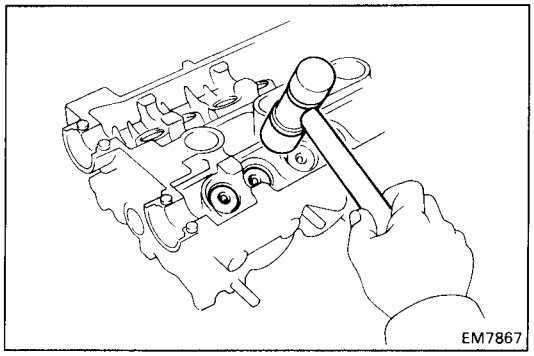


HINT: Install the valve spring, facing the white painted mark upward.

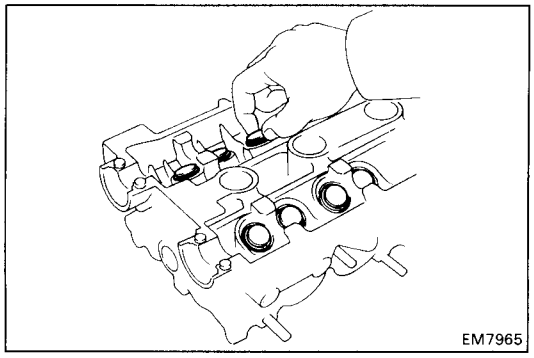


(c) Using SST, compress the valve spring and place the two keepers around the valve stem.

SST 09202-70010



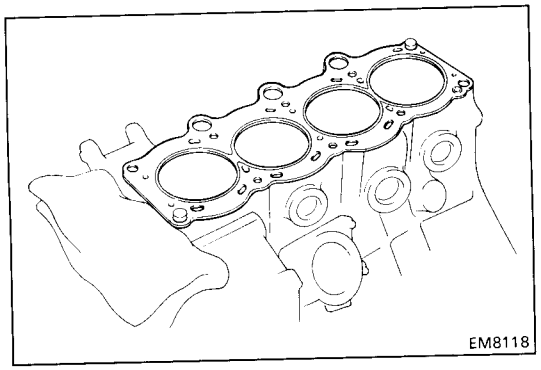
(d) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.



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-40 and 41)

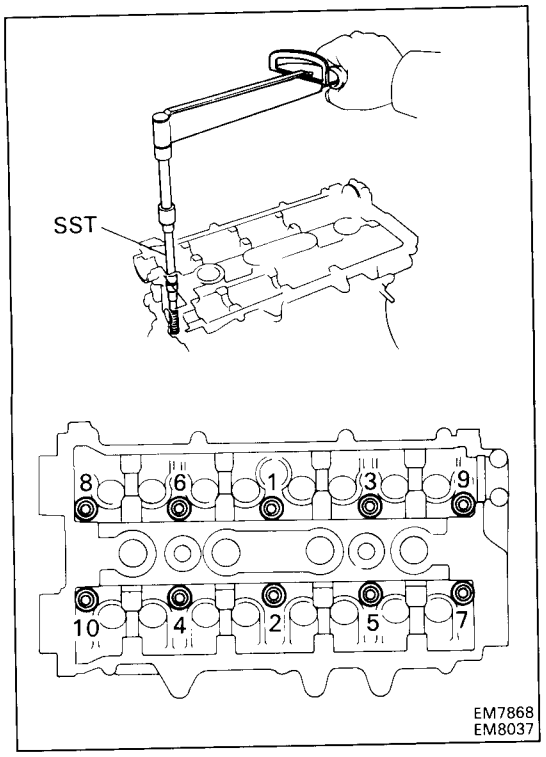
1. INSTALL CYLINDER HEAD

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.

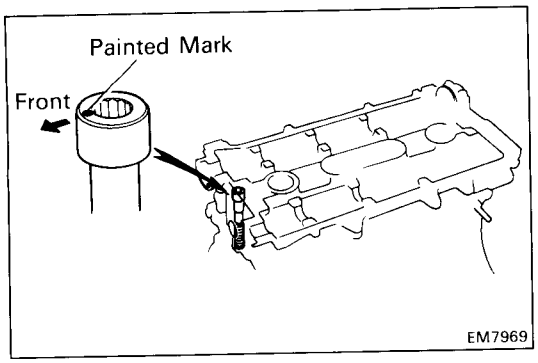
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using SST, install and uniformly tighten the ten cylinder head bolts in several passes in the sequence shown.

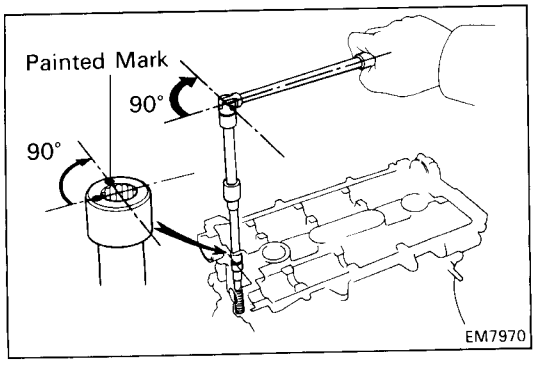
SST 09043-38100

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

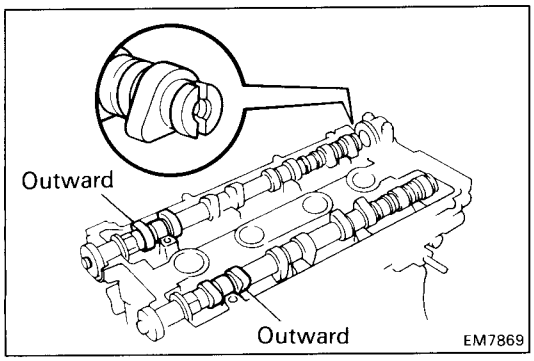


(c) Mark the front of the cylinder head bolt head with paint.



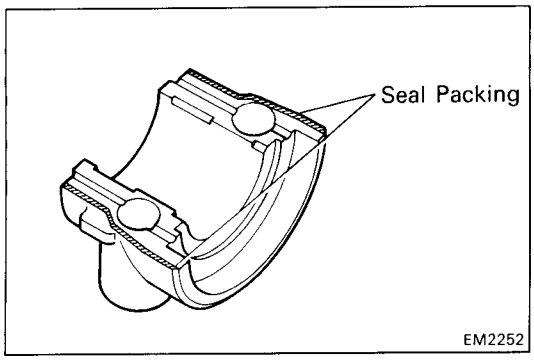
(d) Retighten the cylinder head bolts 90° in the numerical order shown.

(e) Check that the painted mark is now at a 90° angle to front.



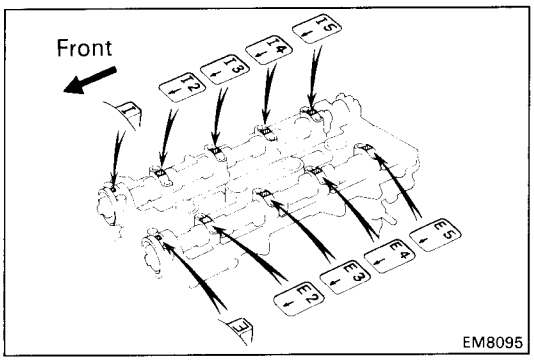
2. INSTALL CAMSHAFTS

(a) Place the camshaft on the cylinder head with the No.1 cam lobe facing outward as shown.



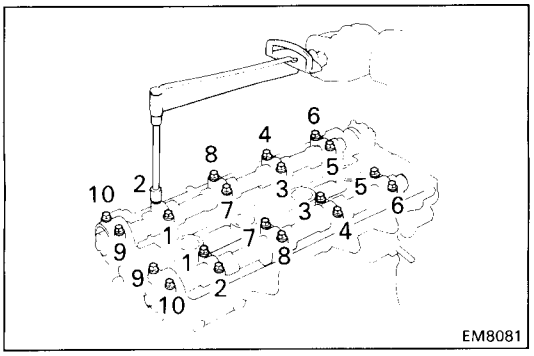
(b) Apply seal packing to the No.1 bearing cap as shown.

Seal packing: Part No. 08826-00080 or equivalent



(c) Install the bearing caps in their proper locations.

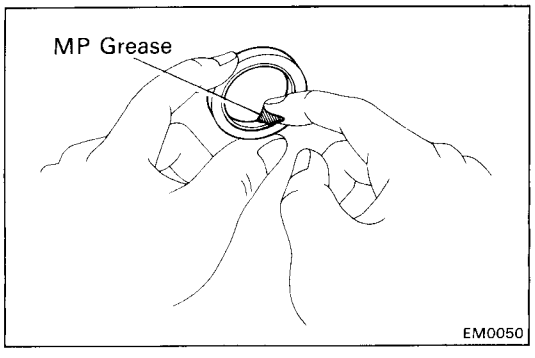
HINT: Each bearing cap has a number and front mark.



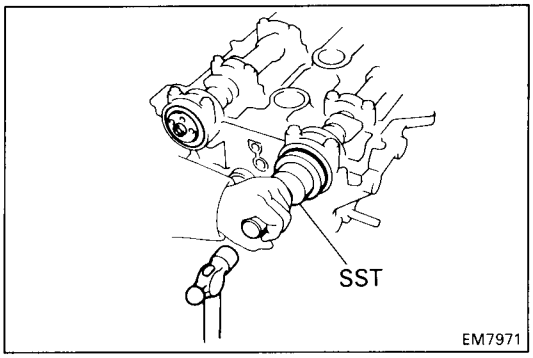
(d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(e) Install and uniformly tighten the ten bearing cap bolts on one side in several passes in the sequence shown.

Torque: 190 kg-cm (14 ft-lb, 19 N·m)



(f) Apply MP grease to a new oil seal lip.

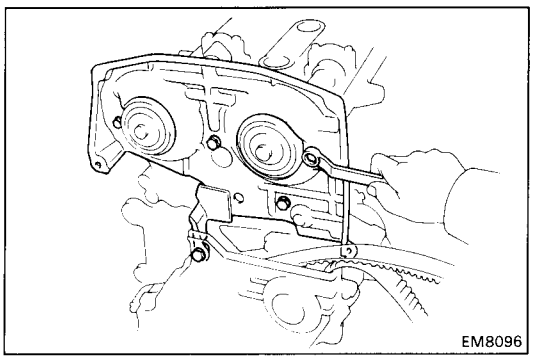


(g) Using SST, tap in the two camshaft oil seals.
SST 09223-50010

3. **ADJUST VALVE CLEARANCE (See page EM-9)**

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 0.20 – 0.30 mm (0.008 – 0.012 in.)



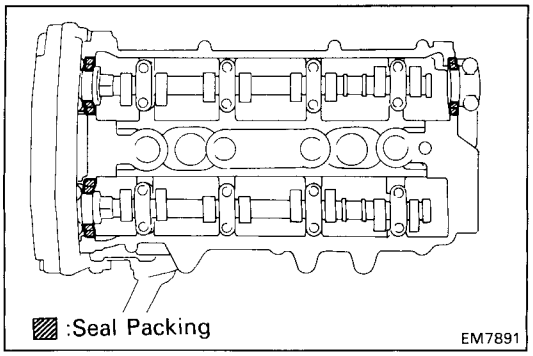
4. **INSTALL NO.3 TIMING BELT COVER**

Install the No.3 belt cover with the five bolts.

Torque: 90 kg-cm (78 in.-lb, 8.8 N)

5. **INSTALL NO.1 IDLER PULLEY**
(See step 4 on page EM-28)

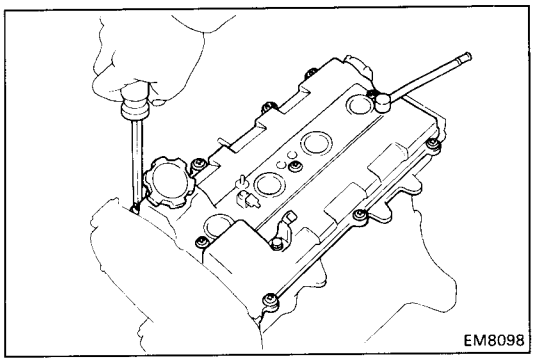
6. **INSTALL CAMSHAFT TIMING PULLEYS**
(See steps 9 to 15 on pages EM-30 to 33)



7. **INSTALL CYLINDER HEAD COVER**

(a) Apply seal packing to the cylinder head as shown in the figure.

Seal packing: Part No. 08826-00080 or equivalent



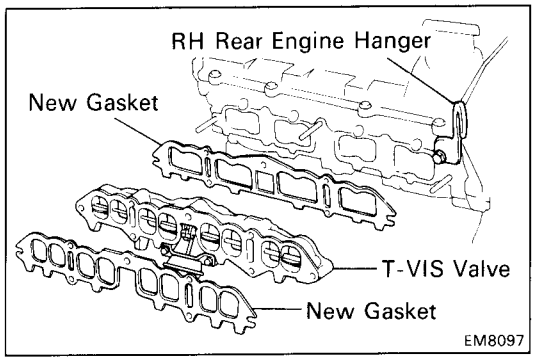
(b) Install the two gaskets to the head cover.

(c) Install the head cover with the twelve seal washers and screws. Uniformly tighten the screws in several passes.

Torque: 25 kg-cm (21 in.-lb, 2.5 N)

8. **INSTALL DELIVERY PIPE AND INJECTORS**
(See steps 2 to 7 on pages FI-64 to 66)

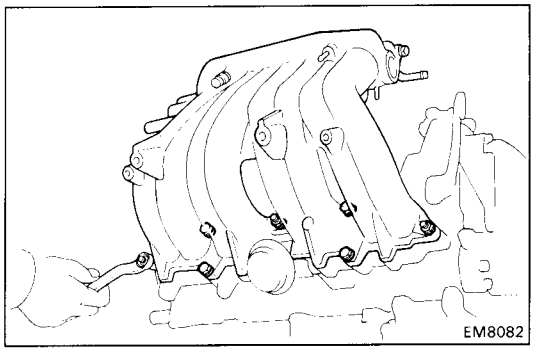
9. **INSTALL CHARCOAL CANISTER**
(See step 31 on page EM-115)



10. **INSTALL RH REAR ENGINE HANGER**
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

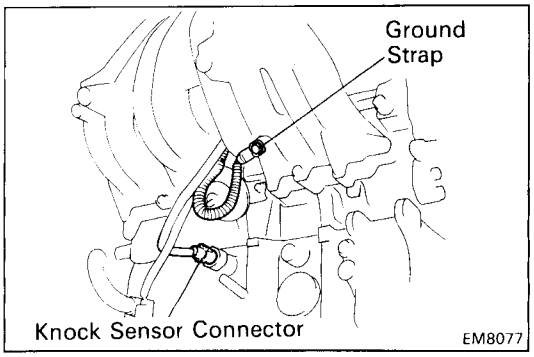
11. **INSTALL T-VIS VALVE AND INTAKE MANIFOLD**

(a) Place a new gasket, the T-VIS valve and the other new gasket on the cylinder head.



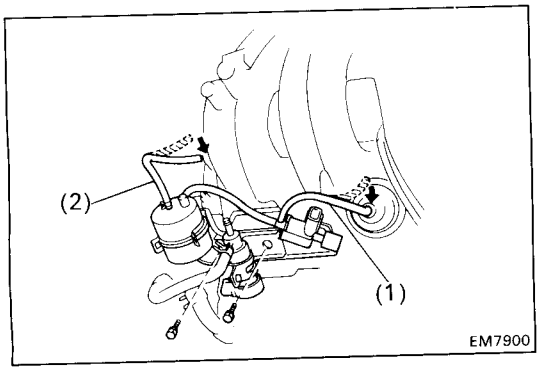
(b) Install the intake manifold with the four bolts and three nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



(c) Connect the knock sensor connector.

(d) Connect the ground strap with the bolt.



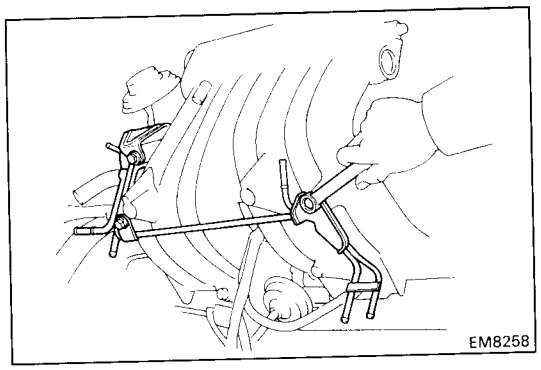
12. INSTALL T-VIS VACUUM TANK, T-VIS VSV, TURBOCHARGING PRESSURE VSV AND BRACKET

(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:

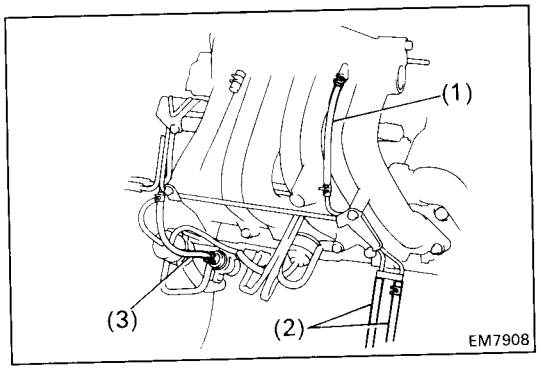
(1) Vacuum hose (from T-VIS VSV) from T-VIS actuator

(2) Vacuum hose (from T-VIS vacuum tank) from intake manifold



13. INSTALL NO.1 AIR TUBE

(a) Install the air tube with the three bolts.

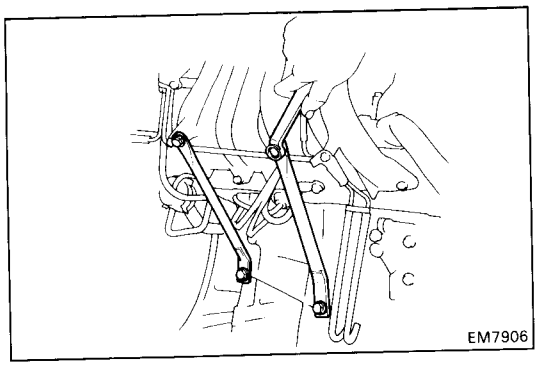


(b) Connect the following hoses:

(1) Vacuum hose to intake manifold

(2) Two PS vacuum hoses

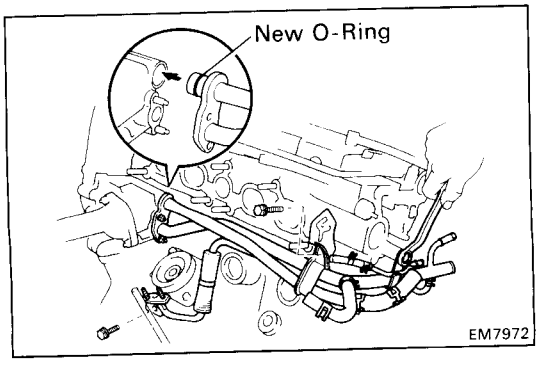
(3) Vacuum hose to turbocharging pressure VSV



14. INSTALL INTAKE MANIFOLD STAYS

Install the manifold stay with the two bolts. Install the two manifold stays.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)



15. INSTALL WATER BY-PASS PIPE

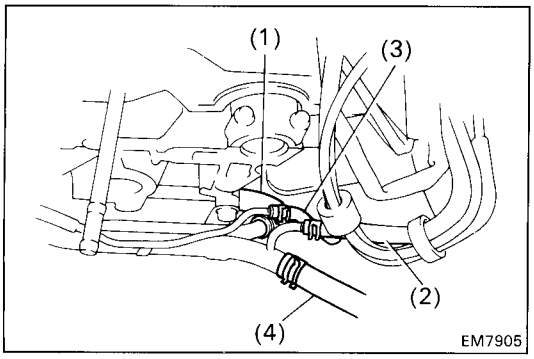
(a) Install a new O-ring to the pipe.

(b) Apply soapy water on the O-ring.

(c) Install a new gasket to the water pump.

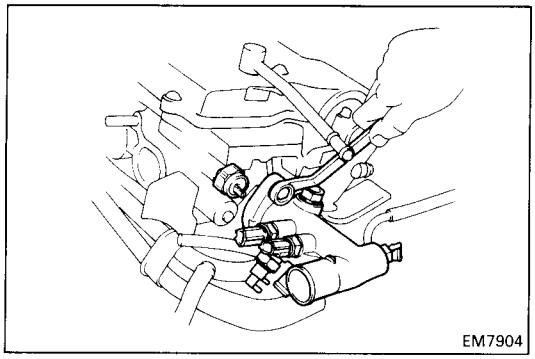
(d) Install the water by-pass pipe with the two nuts and two bolts.

Torque (Nuts): 80 kg-cm (69 in.-lb, 7.8 N·m)



(e) Connect the following hoses:
(1) Water by-pas 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

16. INSTALL OIL COOLER
(See steps 2 to 4 on pages LU-12 and 13)



17. INSTALL OIL PRESSURE SWITCH

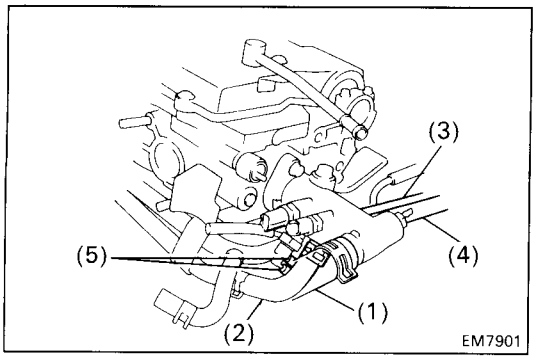
Apply adhesive to two or three threads.

Adhesive: Part No. 08833-00080, THREE BOND 1324 or equivalent

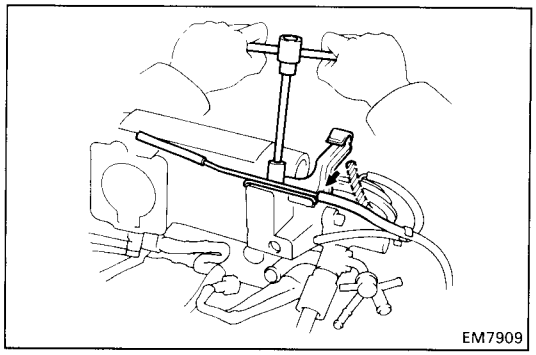
18. INSTALL WATER OUTLET

(a) Install a new gasket and the water outlet with the two bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

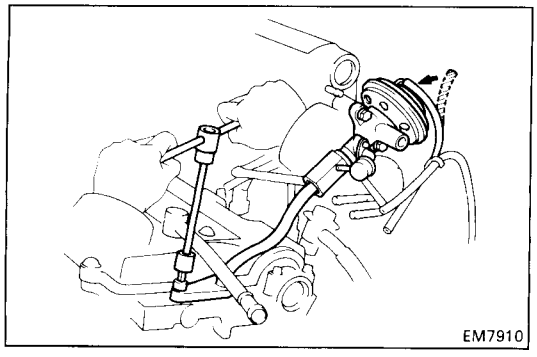


(b) Connect the following hoses:
(1) Upper radiator hose
(2) Water by-pass hose to water by-pass pipe
(3) Water by-pass pipe hose to ISC valve
(4) Heater water hose
(5) Two EVAP VSV vacuum hoses



19. INSTALL VACUUM PIPE

(a) Install the vacuum pipe with the bolt.
(b) Connect the vacuum hose to the vacuum pipe.

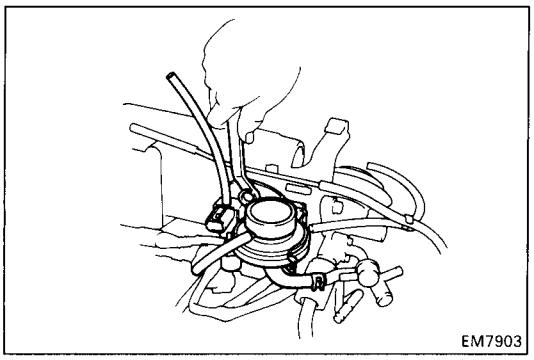


20. INSTALL EGR VALVE AND PIPE

(a) Install two new gaskets, the EGR valve and pipe assembly with the four bolts.

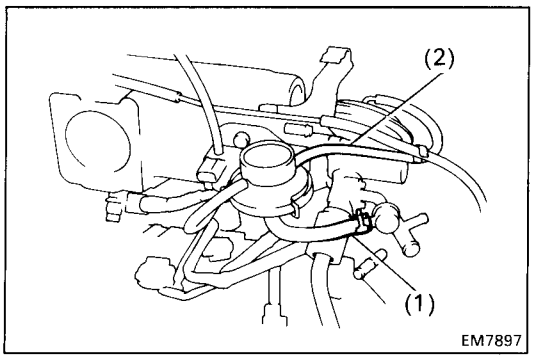
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

(b) Connect the vacuum hose to the EGR valve.



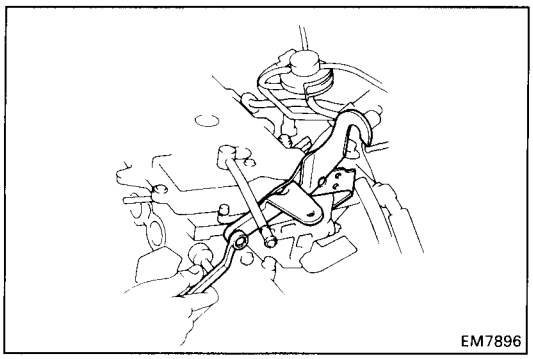
21. INSTALL EGR VACUUM MODULATOR AND VSV

(a) Install the EGR vacuum modulator and VSV assembly with the bolt.



(b) Connect the following hoses:
(1) Vacuum hose to EGR valve
(2) Vacuum hose to EGR vacuum modulator

(c) Connect the EGR VSV connector.

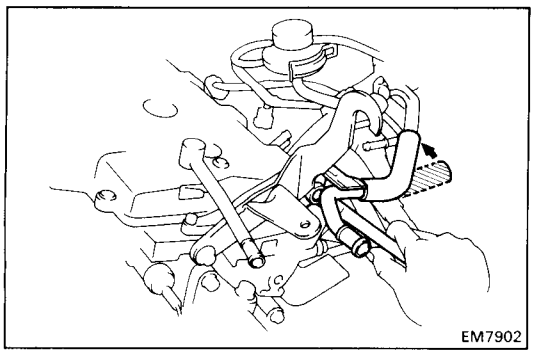


22. INSTALL LH ENGINE HANGER

Install the LH engine hanger and reservoir tank with the two bolts.

Torque:

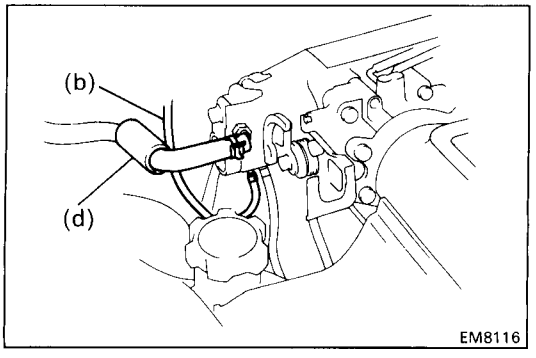
12 mm head bolt	**130 kg-cm (9 ft-lb, 13 N·m)**
14 mm head bolt	**195 kg-cm (14 ft-lb, 19 N·m)**



23. INSTALL NO.2 AIR TUBE

(a) Install the air tube with the bolt.

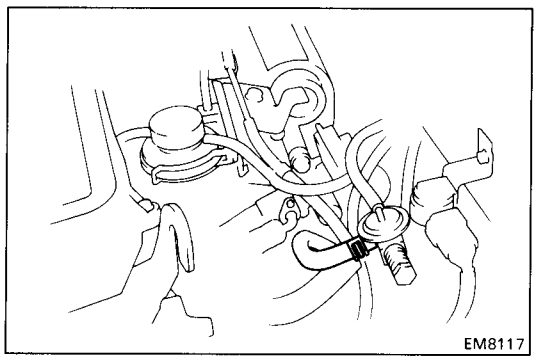
(b) Connect the air hose to the No.1 air tube.



24. CONNECT HOSES

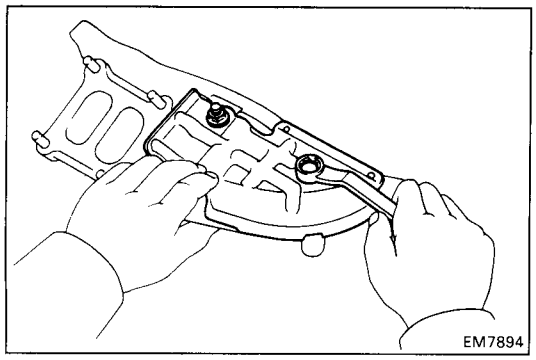
(a) Brake booster vacuum hose to intake manifold.

(b) Turbocharging pressure sensor hose to intake manifold.

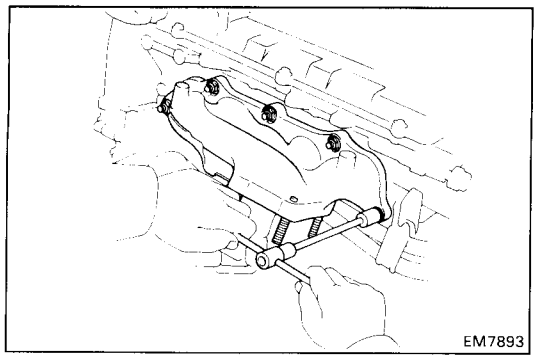

EM8117

(c) A/C ASV air hose to No.1 air tube.

25. **INSTALL DISTRIBUTOR**
(See steps 1 to 5 on page IG-12)


EM7894

26. **INSTALL EXHAUST MANIFOLD**
(a) Install the heat insulator with the bolt and nut.


EM7893

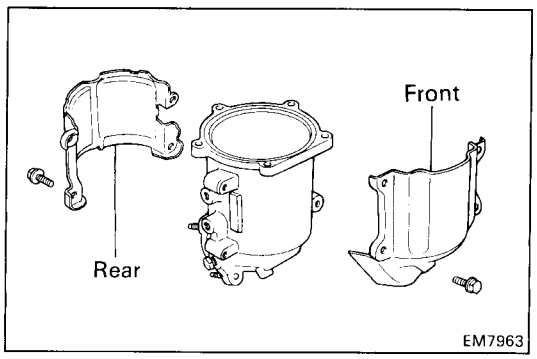
(b) Install a new gasket and the exhaust manifold with the seven nuts. Uniformly tighten the nuts in several passes.

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

27. **INSTALL COLD START INJECTOR**
(See steps 1 to 3 on page FI-55)

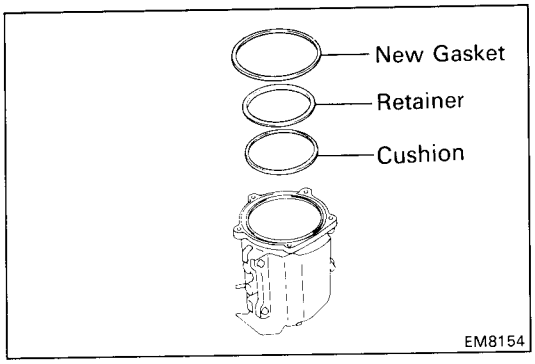
28. **INSTALL THROTTLE BODY**
(See steps 2, 3 and 4 to 8 on pages FI-74 and 75)

29. **INSTALL TURBOCHARGER**
(See steps 5 to 10 on pages TC-15 to 17)

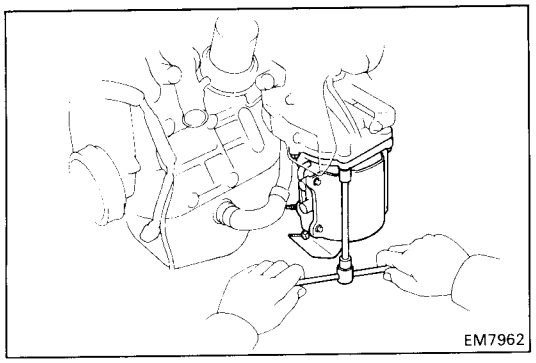


EM7963

30. **INSTALL CATALYTIC CONVERTER**
(a) Install the front heat insulator with the five bolts.
(b) Install the rear heat insulator with the four bolts.

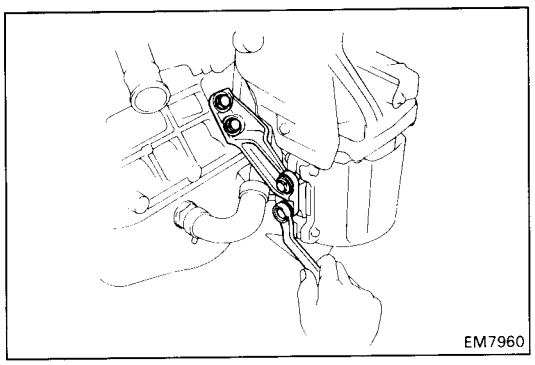


(c) Place the cushion, retainer and a new gasket on the catalytic converter.



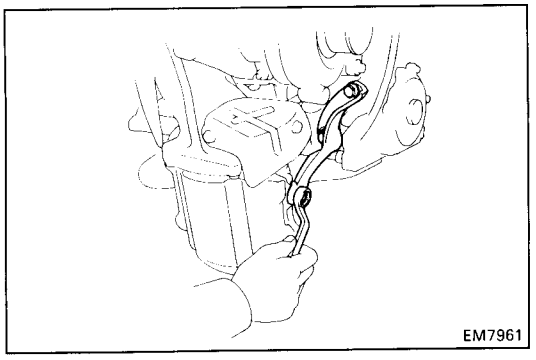
(d) Install the catalytic converter with the three bolts and two nuts.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



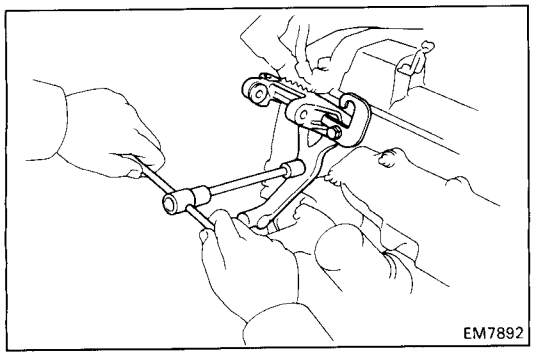
(e) Install the RH converter stay with the four bolts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)



(f) Install the LH converter stay with the three bolts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)



31. INSTALL NO.1 ALTERNATOR BRACKET AND RH FRONT ENGINE HANGER

Install the alternator bracket and engine hanger with the three bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

32. INSTALL FRONT EXHAUST PIPE
(See step 18 on page EM-112)

33. INSTALL SUSPENSION LOWER CROSSMEMBER
(See step 19 on page EM-113)

34. INSTALL ALTERNATOR
(See steps 2 to 5 on pages CH-6 and 7)

35. INSTALL INTERCOOLER
(See steps 11 to 13 on page TC-17)

36. INSTALL AIR CLEANER CAP
(See step 44 on pages EM-117)

37. INSTALL ACCELERATOR CABLE, AND ADJUST IT

38. FILL WITH ENGINE COOLANT (See page CO-4)

Capacity (w/ Heater):
6.4 liters (6.8 US qts, 5.6 Imp. qts)

39. START ENGINE AND CHECK FOR LEAKS

40. ADJUST IGNITION TIMING
(See steps 8 to 11 on pages IG-12 and 13)

Ignition timing:
10° BTDC @ idle
(w/ Terminals TE1 and E1 connected)

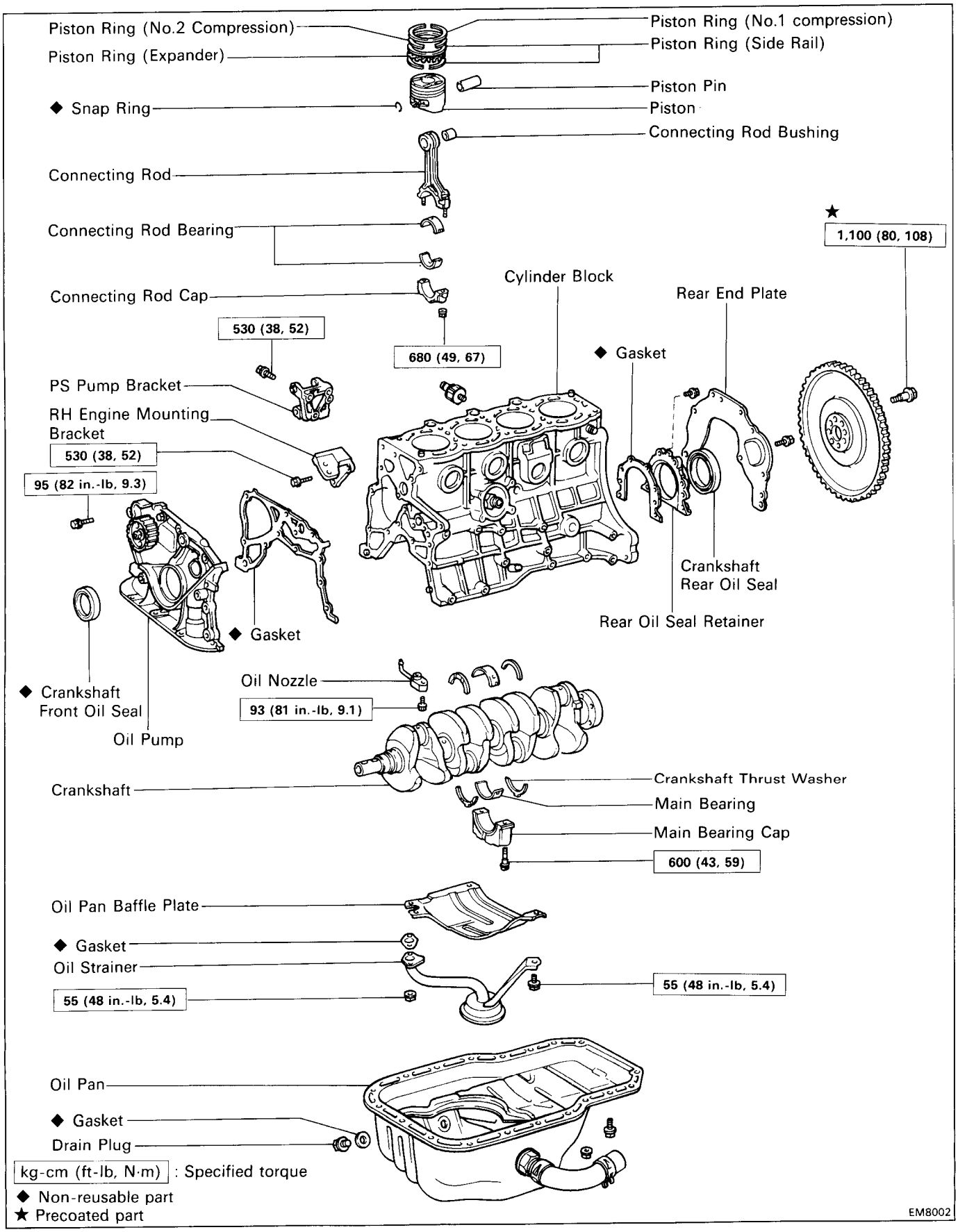
41. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

42. RECHECK ENGINE COOLANT AND OIL LEVELS

CYLINDER BLOCK

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.

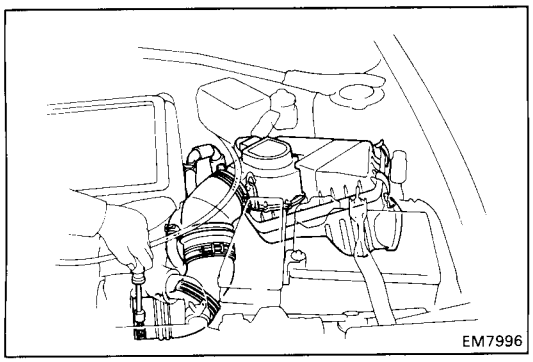
2. **REMOVE HOOD**

3. **REMOVE ENGINE UNDER COVERS**

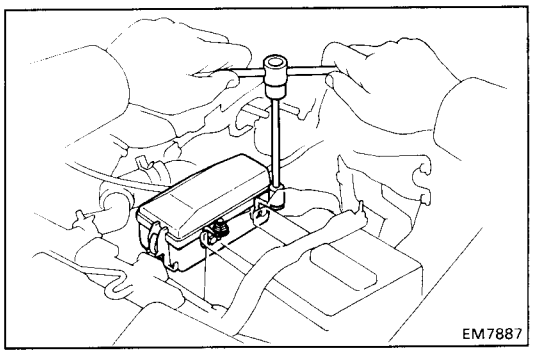
4. **DRAIN ENGINE COOLANT (See page CO-4)**

5. **DRAIN ENGINE OIL (See page LU-5)**

6. **DRAIN TRANSAXLE OIL**

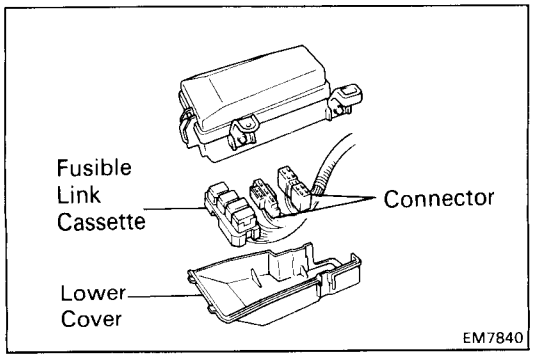

EM7996

7. **REMOVE AIR CLEANER ASSEMBLY**
   (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.


EM7887

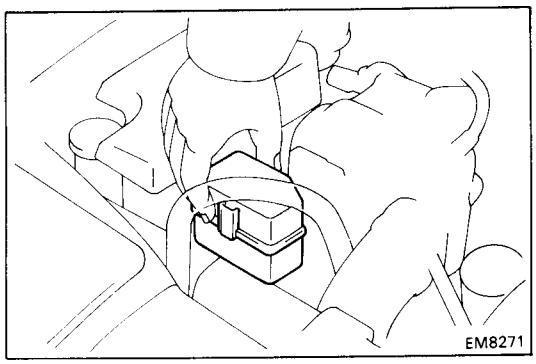
8. **DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY**

9. **REMOVE ENGINE RELAY BOX, AND DISCONNECT ENGINE WIRE CONNECTORS**
   (a) Remove the two nuts, and disconnect the relay box from the battery.



EM7840

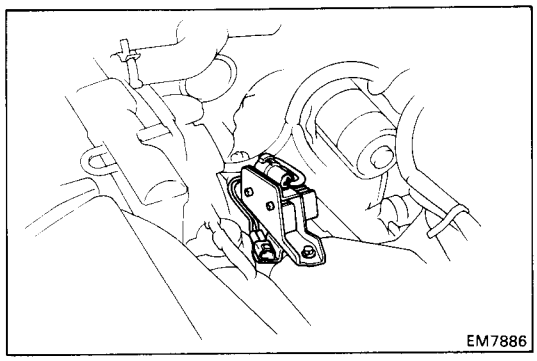
   (b) Remove the lower cover from the relay box.
   (c) Disconnect the fusible link cassette and two connectors of the engine wire from the relay box.



10. REMOVE A/C RELAY BOX FROM BRACKET

Remove the A/C relay box from the bracket.

11. REMOVE BATTERY

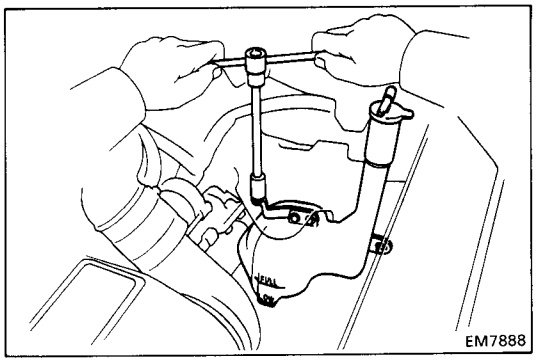


12. REMOVE INJECTOR SOLENOID RESISTOR AND FUEL PUMP RESISTOR

(a) Disconnect the two connectors.

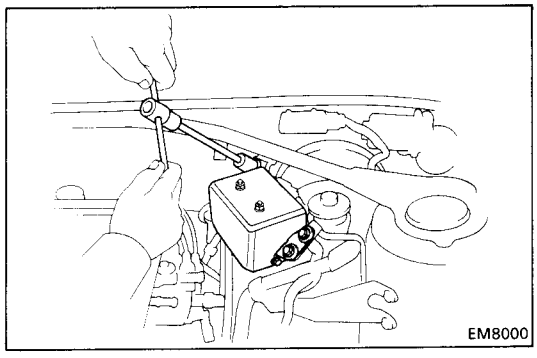
(b) Remove the bolt, the solenoid resistor and fuel pump resistor assembly.

13. REMOVE RADIATOR



14. REMOVE RADIATOR RESERVOIR TANK

Remove the two nuts and reservoir tank.



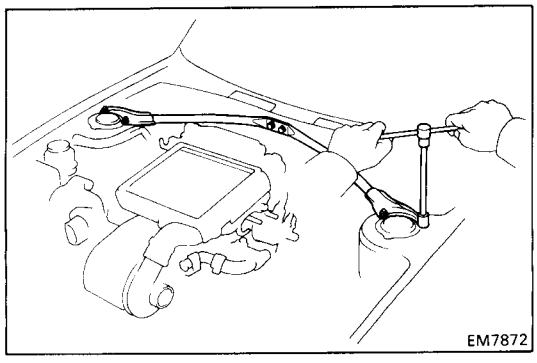
15. (w/ CRUISE CONTROL SYSTEM) REMOVE CRUISE CONTROL ACTUATOR

(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.

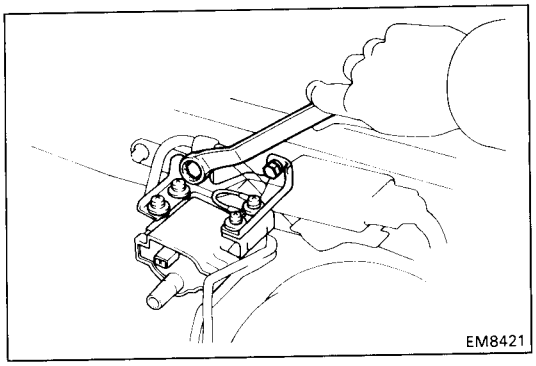


16. REMOVE SUSPENSION UPPER BRACE

(a) Remove the two wiper arms.

(b) Remove the outside lower windshield moulding.

(c) Remove the two bolts, four nuts and upper brace.

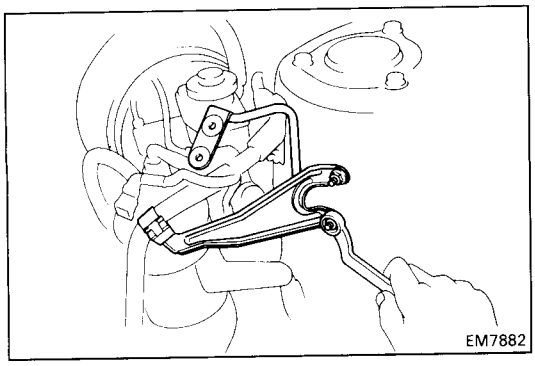


17. REMOVE IGNITION COIL

(a) Disconnect the ignition coil connector.
(b) Disconnect the high-tension cord.
(c) Remove the two bolts and ignition coil.

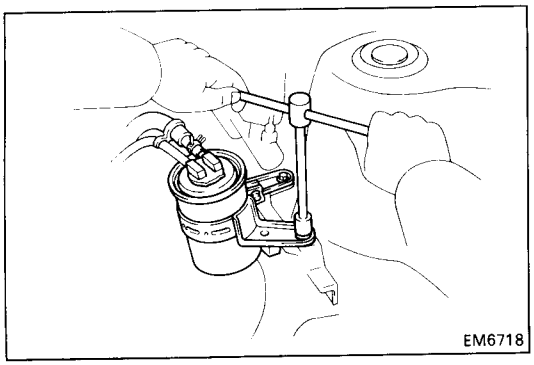
18. DISCONNECT WIRES AND CONNECTORS

(a) Check connector.
(b) Igniter connector.
(c) Ground strap from LH fender apron.



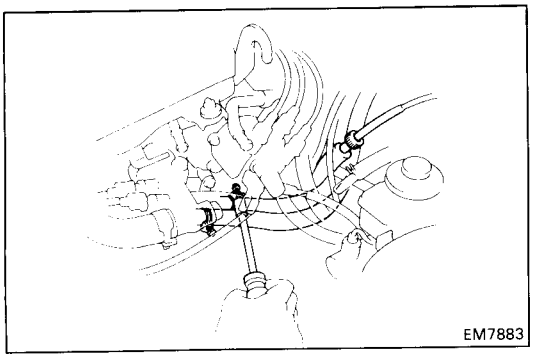
19. REMOVE ENGINE WIRE BRACKET

(a) Disconnect the wire clamp from the wire bracket.
(b) Remove the two bolts and wire bracket.



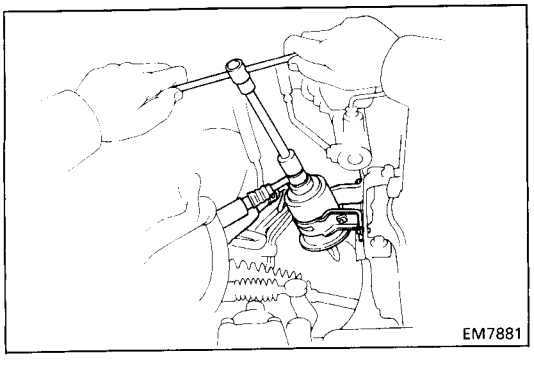
20. REMOVE CHARCOAL CANISTER

(a) Disconnect the two vacuum hoses from the charcoal canister.
(b) Remove the two bolts and charcoal canister.



21. DISCONNECT HEATER HOSES

22. DISCONNECT SPEEDOMETER CABLE



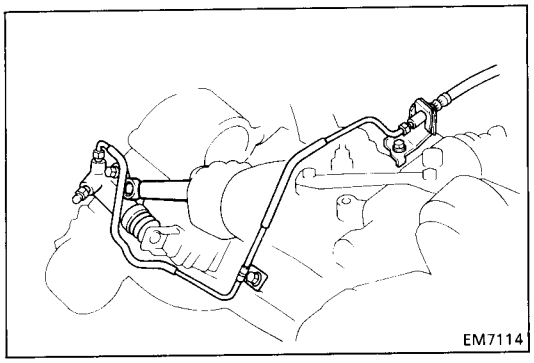
23. DISCONNECT FUEL HOSES

CAUTION: Catch leaking fuel in a container.

24. DISCONNECT CONNECTORS

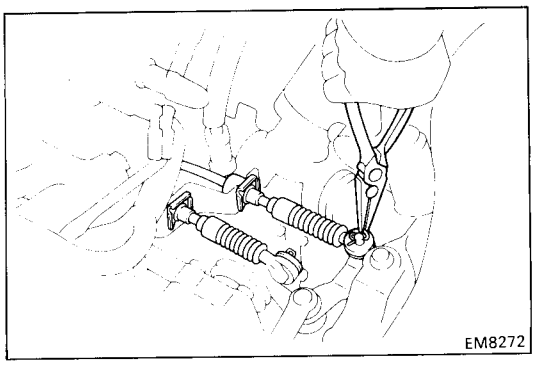
(a) Engine room wire connector.
(b) Noise filter connector.

25. REMOVE STARTER (See page ST-2)

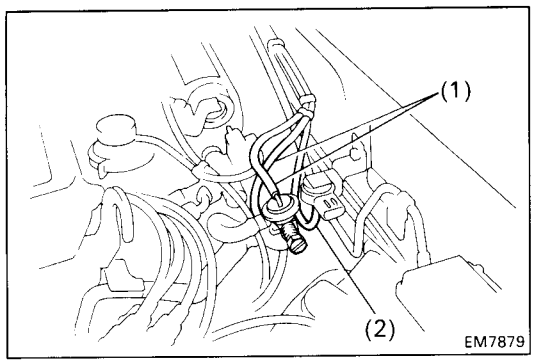


26. REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE

Remove the four bolts, release cylinder and tube from the transaxle.



27. DISCONNECT TRANSAXLE CONTROL CABLES FROM TRANSAXLE



28. DISCONNECT TURBOCHARGING PRESSURE SENSOR AND A/C ASV FROM BODY

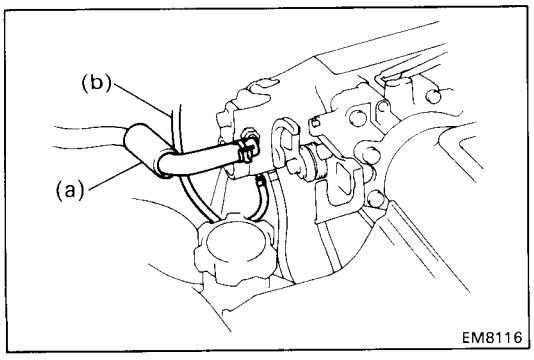
(a) Disconnect the turbocharging pressure sensor.

(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.



29. DISCONNECT HOSES

(a) Brake booster vacuum hose from intake manifold.

(b) Turbocharging pressure sensor hose from intake manifold.

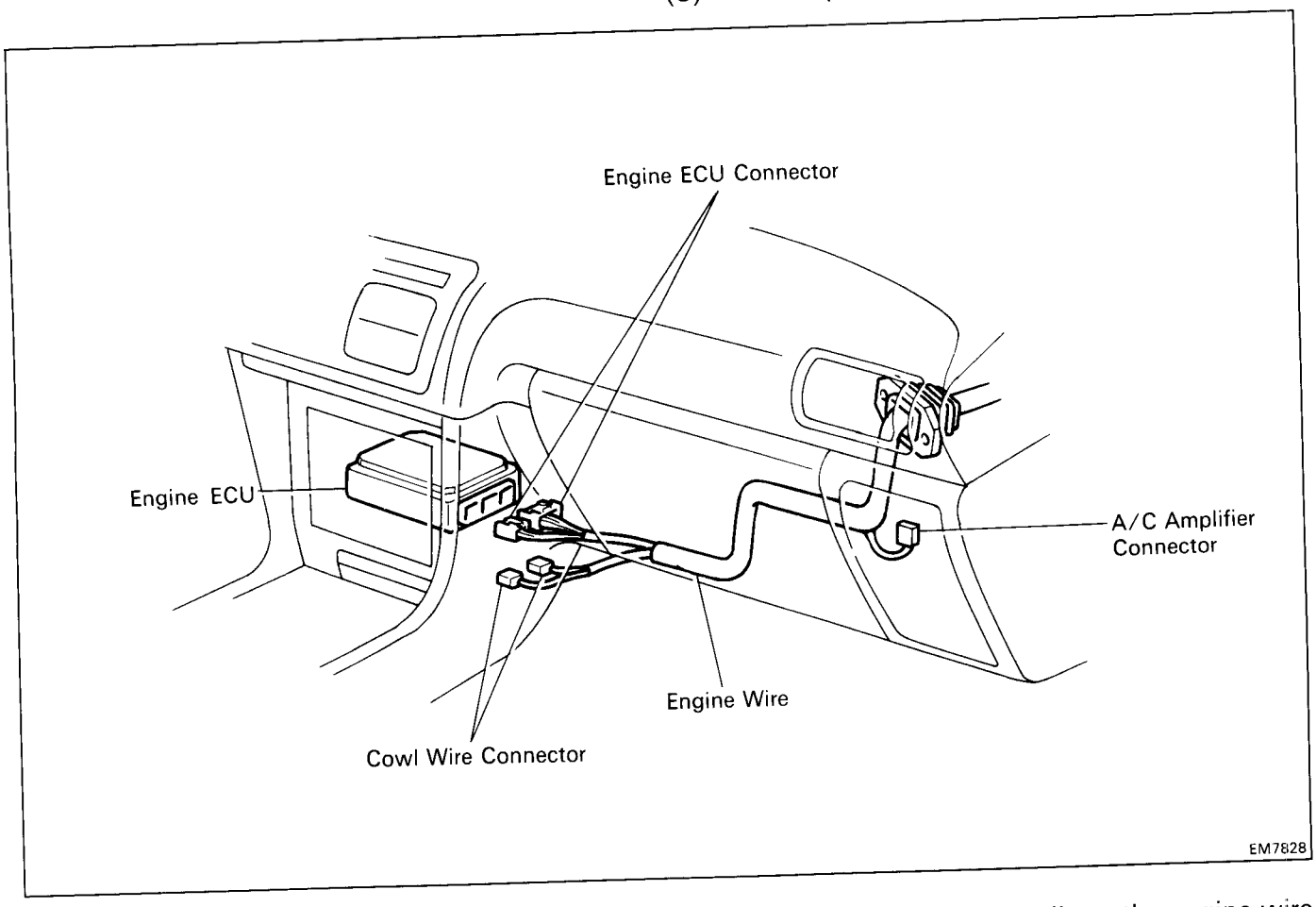
30. DISCONNECT ENGINE WIRE

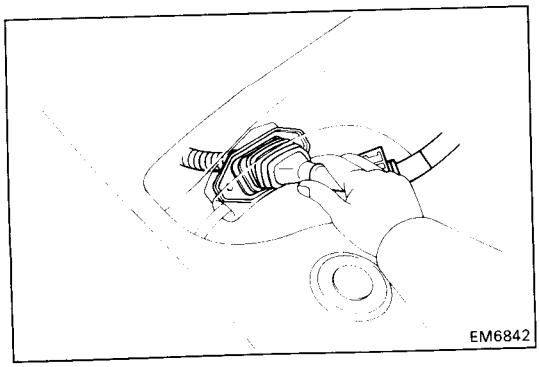
(a) Engine wire clamp from wire bracket on RH fender apron.

(b) Two cowl wire connectors.

31. 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

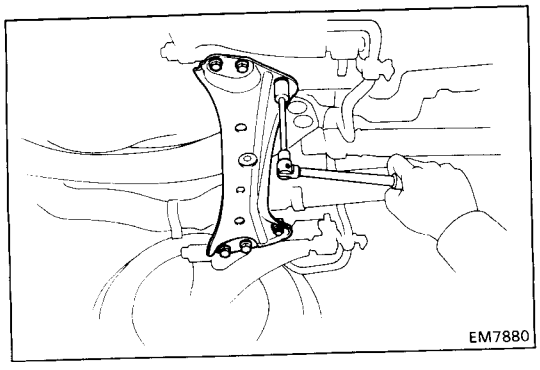


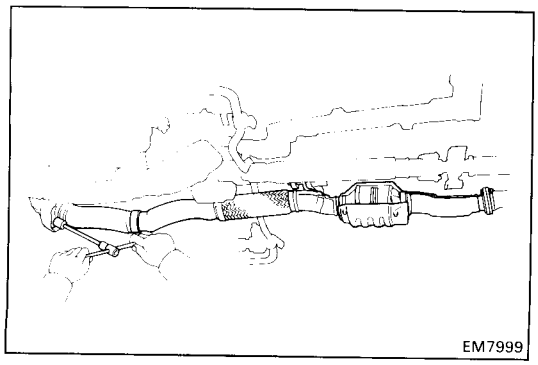


(b) Remove the two nuts, and pull out the engine wire from the cowl panel.

32. REMOVE SUSPENSION LOWER CROSSMEMBER

Remove the four bolts, two nuts and lower crossmember.




EM7999

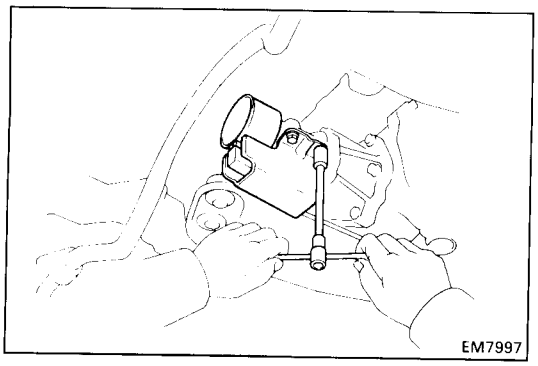
33. REMOVE FRONT EXHAUST PIPE

(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.

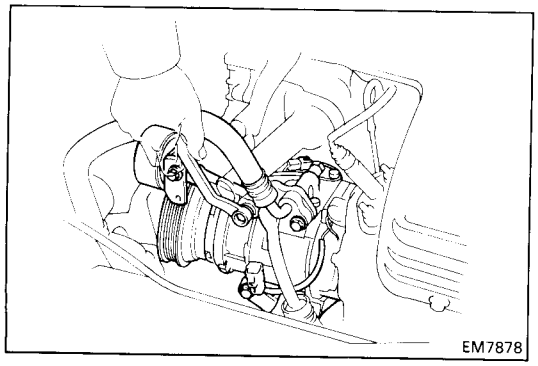

EM7997

34. REMOVE DRIVE SHAFTS (See page SA-7)

35. REMOVE FRONT PROPELLER SHAFT (See page PR-3)

36. REMOVE DEFLECTOR FROM TRANSFER EXTENSION HOUSING

37. REMOVE DYNAMIC DAMPER FROM TRANSFER EXTENSION HOUSING


EM7878

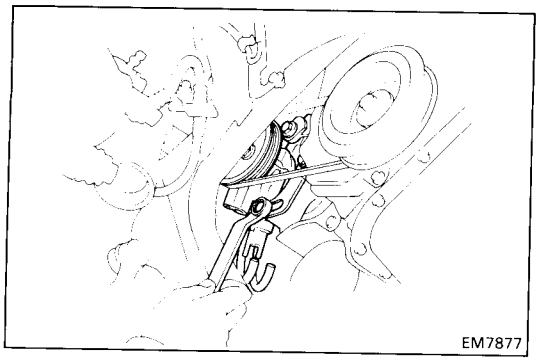
38. REMOVE ALTERNATOR (See pages CH-5 and 6)

39. 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.


EM7877

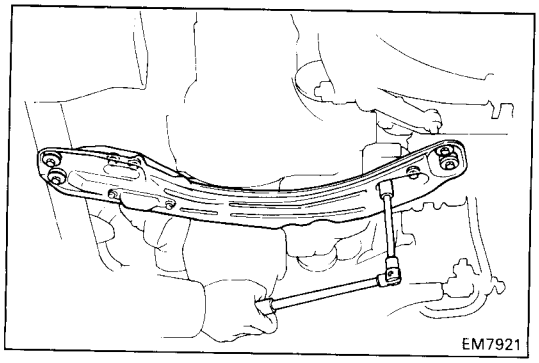
40. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

(a) Disconnect the two air hoses from the air pipe.

(b) Remove the PS drive belt.

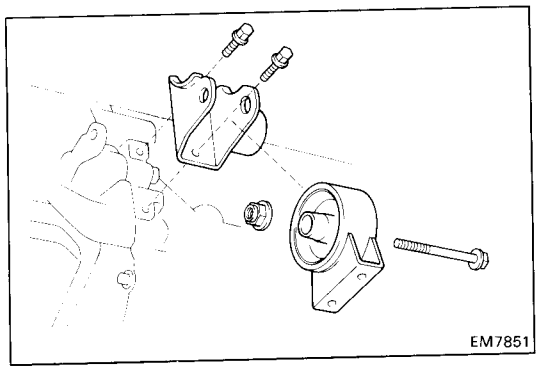
(c) Remove the four bolts, and disconnect the PS pump from the engine.

HINT: Put aside the pump and suspend it to the cowl with a string.


EM7921

41. REMOVE ENGINE MOUNTING CENTER MEMBER

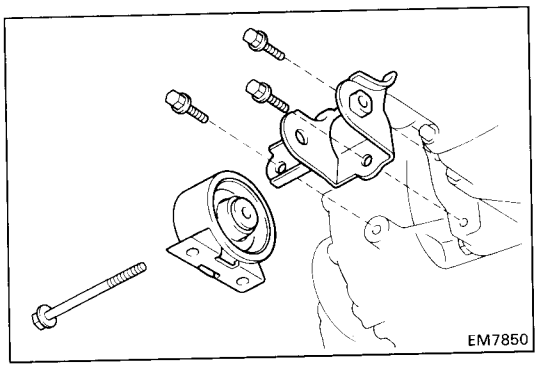
Remove the eight bolts and center member.



42. REMOVE FRONT ENGINE MOUNTING INSULATOR AND BRACKET

(a) Remove the through bolt, nut and mounting insulator.

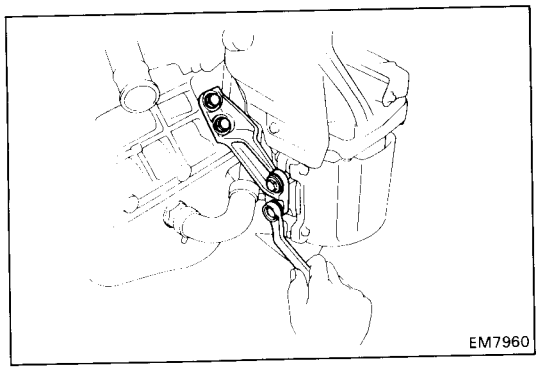
(b) Remove the two bolts and mounting bracket.



43. REMOVE REAR ENGINE MOUNTING INSULATOR AND BRACKET

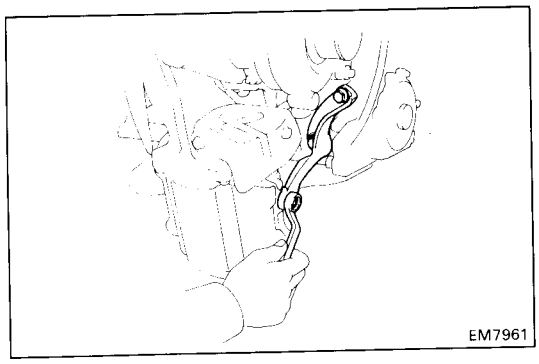
(a) Remove the through bolt and mounting insulator.

(b) Remove the three bolts and mounting bracket.

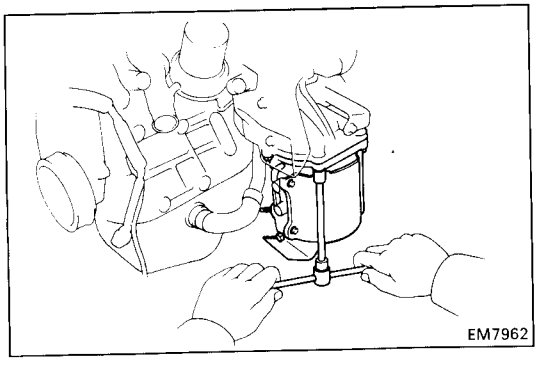


44. REMOVE CATALYTIC CONVERTER

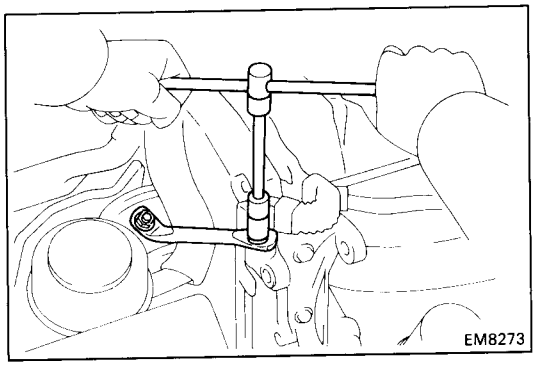
(a) Remove the four bolts and RH converter stay.



(b) Remove the three bolts and LH converter stay.

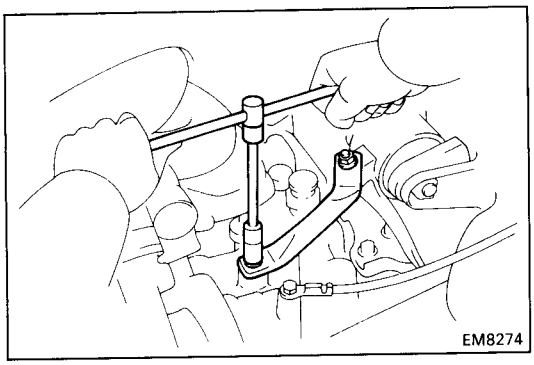


(c) Remove the three bolts, two nuts, catalytic converter, cushion, retainer and gasket.



45. REMOVE RH ENGINE MOUNTING STAY

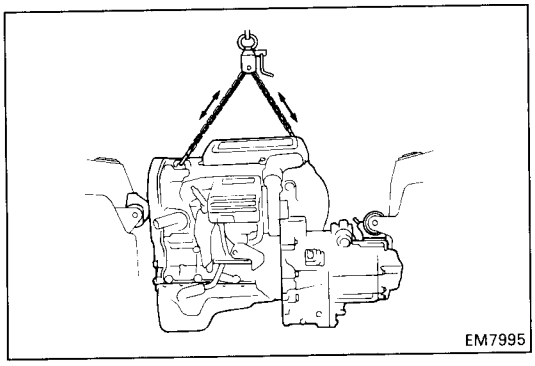
Remove the bolt, nut and mounting stay.



46. REMOVE LH ENGINE MOUNTING STAY

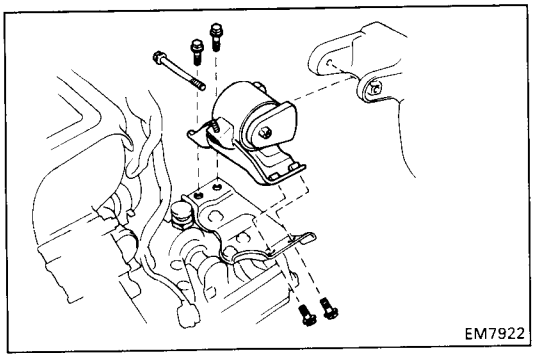
(a) Remove the bolt, nut and mounting stay.

(b) Remove the bolt, and disconnect the ground strap.

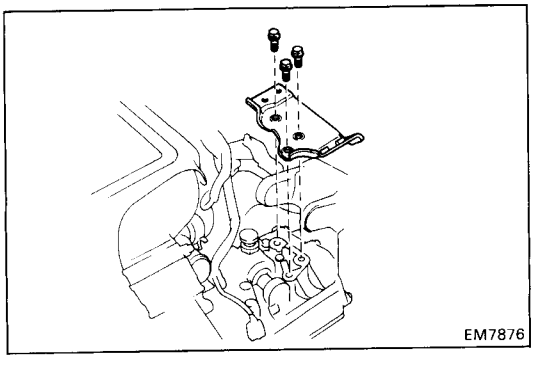


47. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE

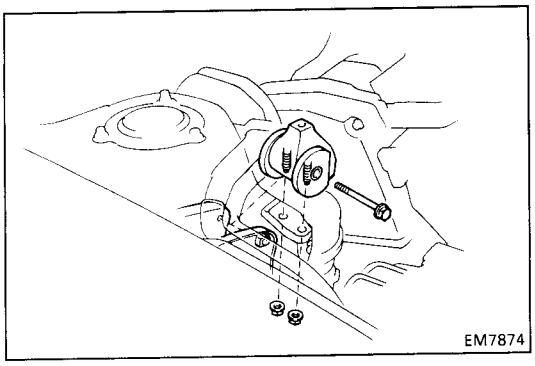
(a) Attach the engine chain hoist to the engine hangers.



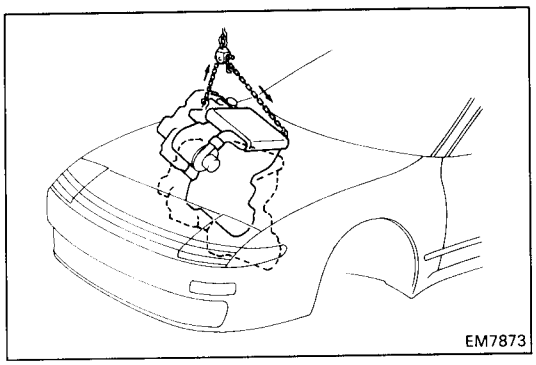
(b) Remove the through bolt, four bolts and LH mounting insulator.



(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.

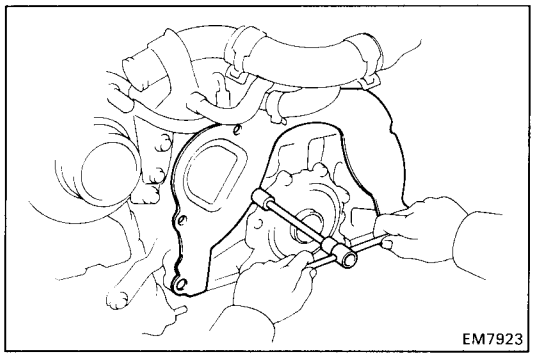
(f) Make sure the engine is clear of all wiring, hoses and cables.

(g) Place the engine and transaxle assembly onto the stand.

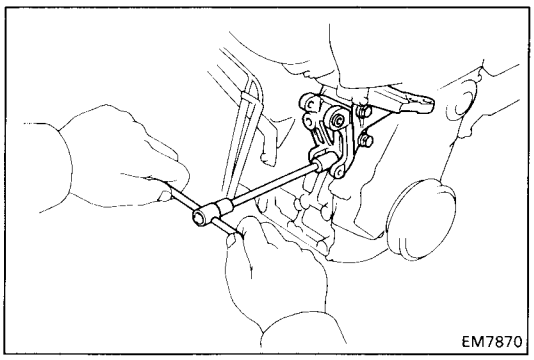
48. SEPARATE ENGINE AND TRANSAXLE
(See page MT-6)

PREPARATION FOR DISASSEMBLY

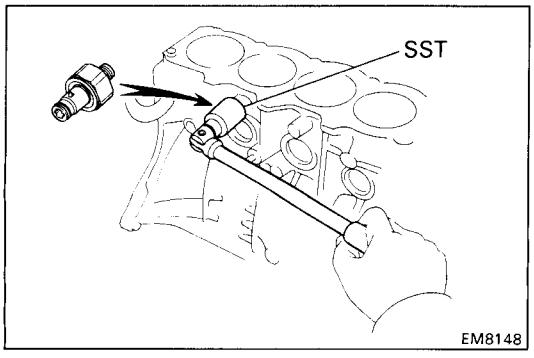
1. **REMOVE CLUTCH COVER AND DISC**
2. **REMOVE FLYWHEEL**



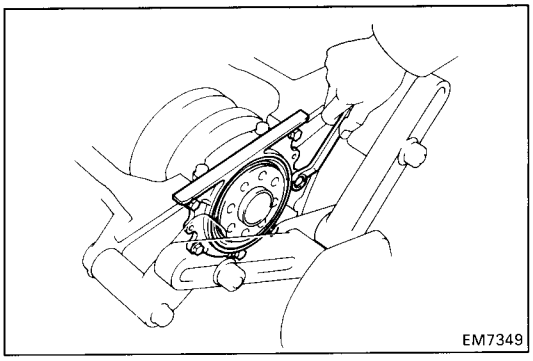
3. **REMOVE REAR END PLATE**
   Remove the bolt and end plate.
4. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**



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-19 to 25)**
8. **REMOVE CYLINDER HEAD (See pages EM-42 to 49)**
9. **REMOVE WATER PUMP AND IDLER PULLEY BRACKET (See pages CO-5 and 6)**
10. **REMOVE OIL PAN AND OIL PUMP (See page LU-8)**
11. **REMOVE OIL FILTER (See page LU-5)**
12. **REMOVE OIL COOLER (See page LU-11)**



13. **REMOVE KNOCK SENSOR**
    Using SST, remove the knock sensor.
    SST 09816-30010

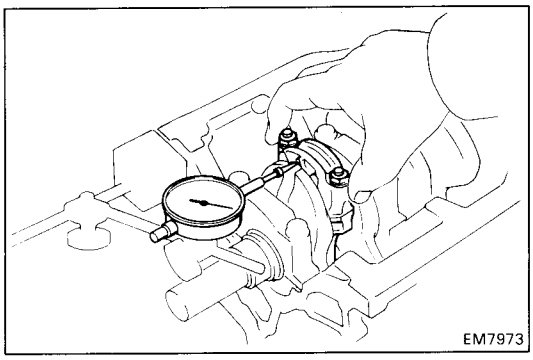


DISASSEMBLY OF CYLINDER BLOCK

(See page EM-74)

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts, retainer and gasket.



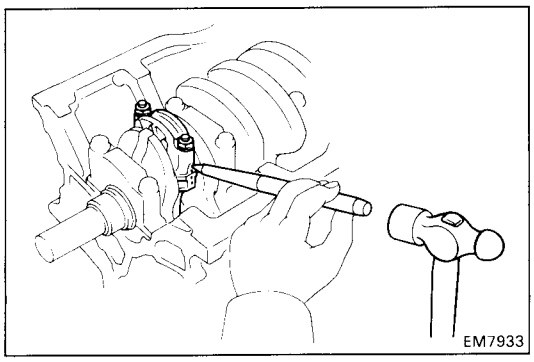
2. CHECK CONNECTING ROD THRUST CLEARANCE

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.)**

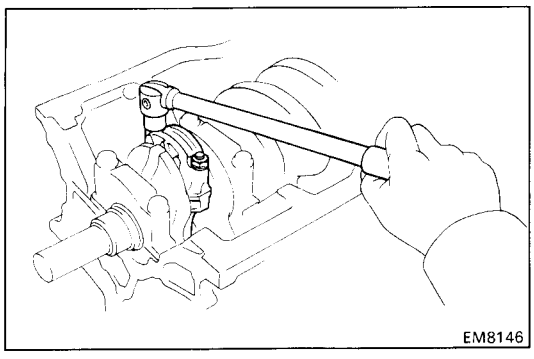
Maximum thrust clearance: **0.35 mm (0.0138 in.)**

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

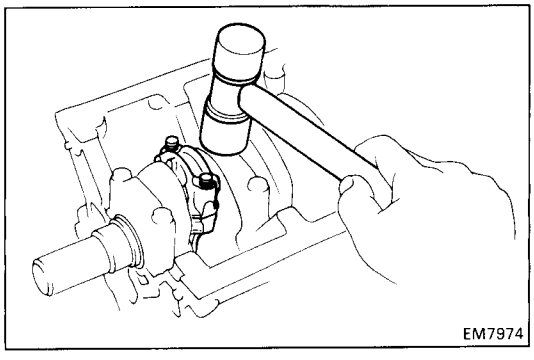


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Using a punch or numbering stamp, place the matchmarks on the connecting rod and cap to ensure correct reassembly.

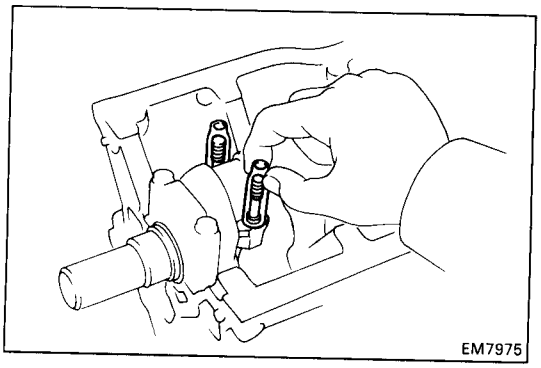


(b) Remove the connecting rod cap nuts.

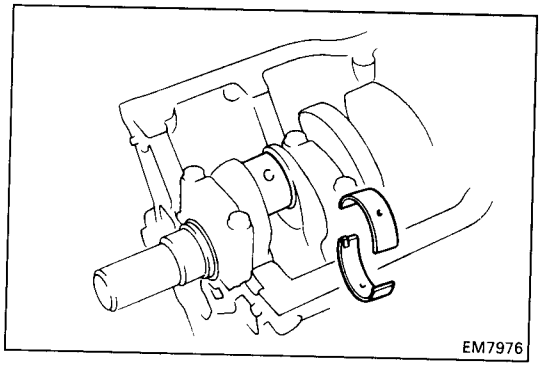


(c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

HINT: Keep the lower bearing inserted with the connecting cap.



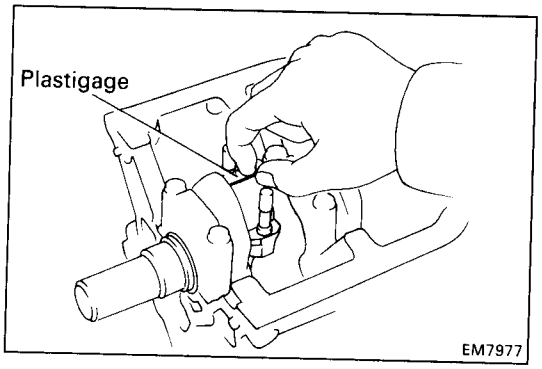
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



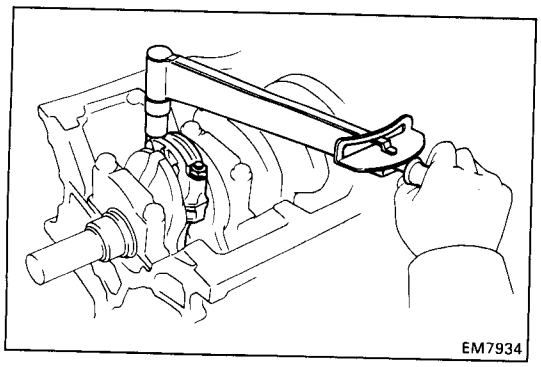
(e) Clean the crank pin and bearing.

(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.



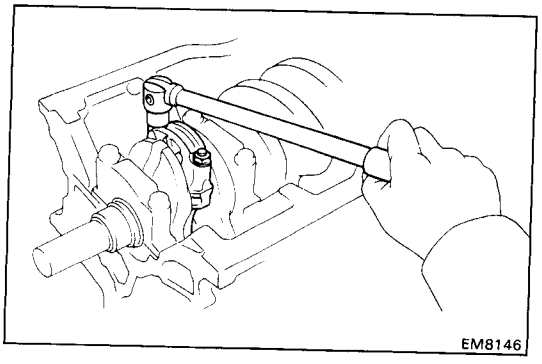
(g) Lay a strip of Plastigage across the crank pin.



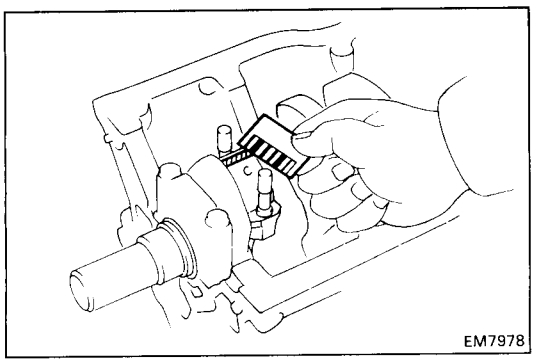
(h) Install the connecting rod cap.
(See step 7 on page EM-106)

Torque: 680 kg-cm (49 ft-lb, 67 N·m)

NOTICE: Do not turn the crankshaft.



(i) Remove the connecting rod cap.
(See procedures (b) and (c) above)



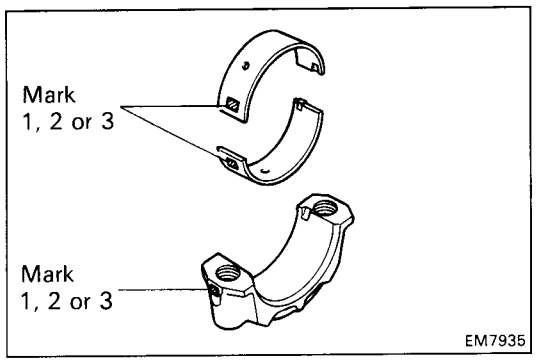
(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD	**0.024 – 0.055 mm (0.0009 – 0.0022 in.)**
U/S 0.25	**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.

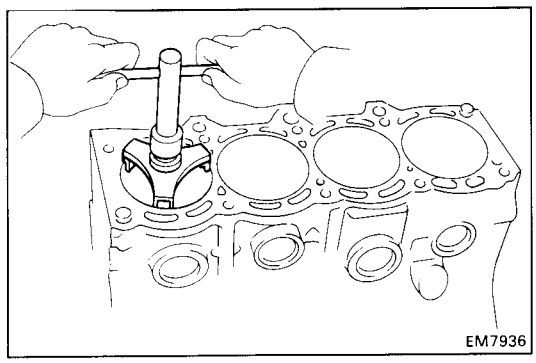


HINT: If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked "1", "2" and "3" accordingly.

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.

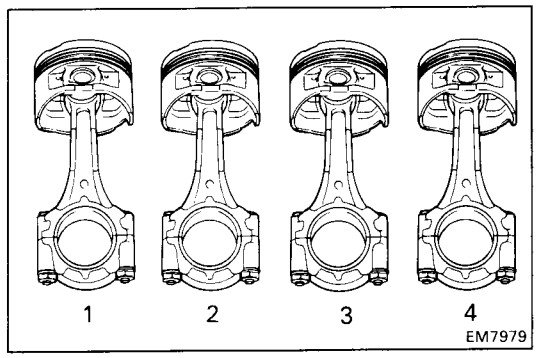


4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

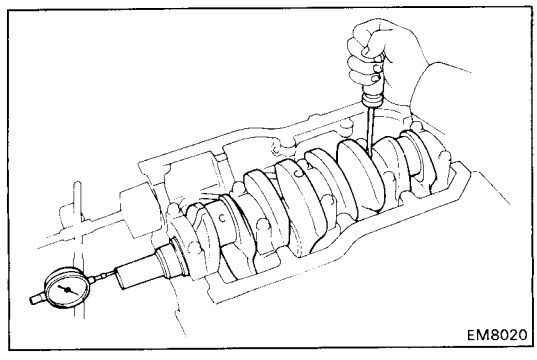
(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Cover the connecting rod bolts.
(See page EM-86)

(c) 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

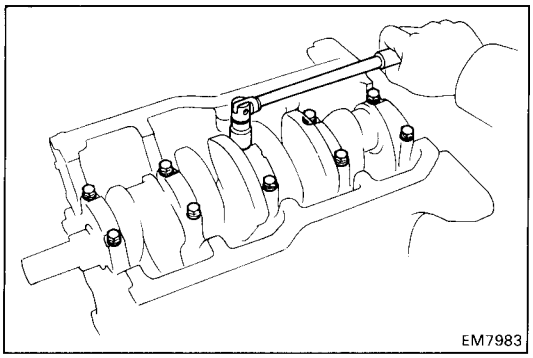
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance: 0.020 – 0.220 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

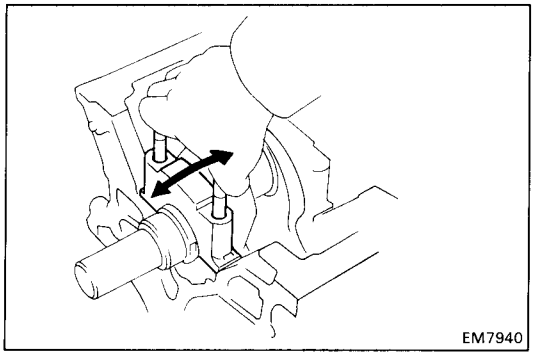
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness: 2.440 – 2.490 mm (0.0961 – 0.0980 in.)



6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

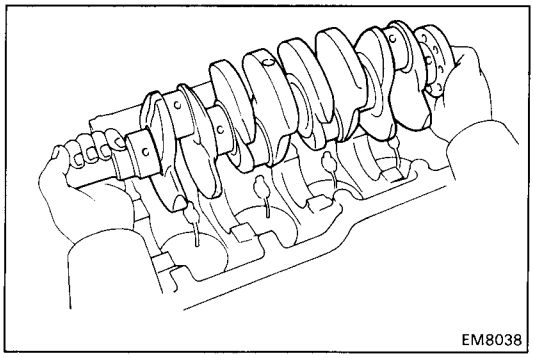
(a) Remove the main bearing cap bolts.



(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).

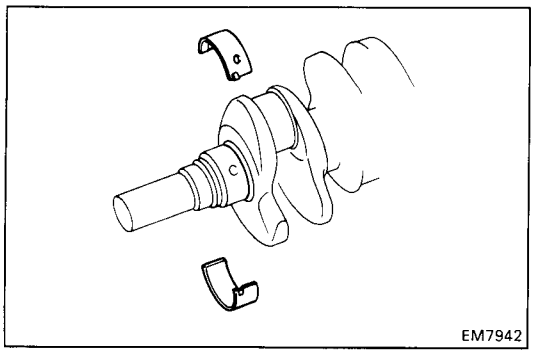
HINT:

- 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.

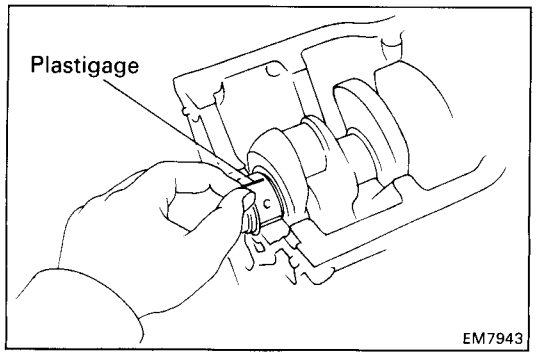
HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.



(d) Clean each main journal and bearing.

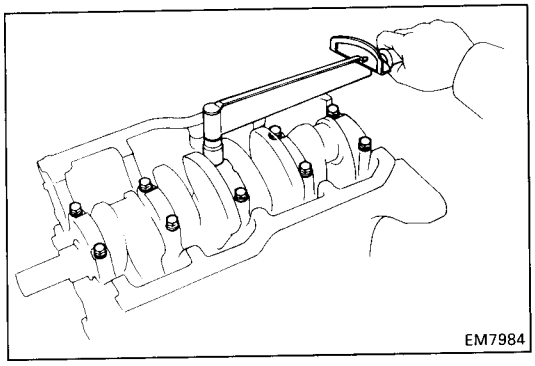
(e) Check each main journal and bearing for pitting and scratches.

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.

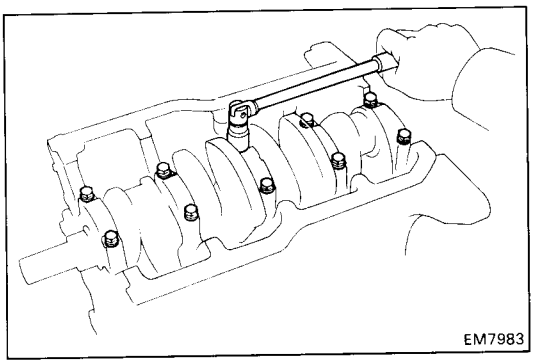
(g) Lay a strip of Plastigage across each journal.



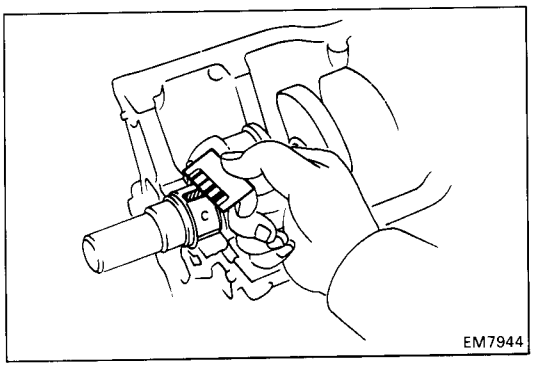
(h) Install the main bearing caps.
(See step 5 on page EM-105)

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

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 – 0.0027 in.)**

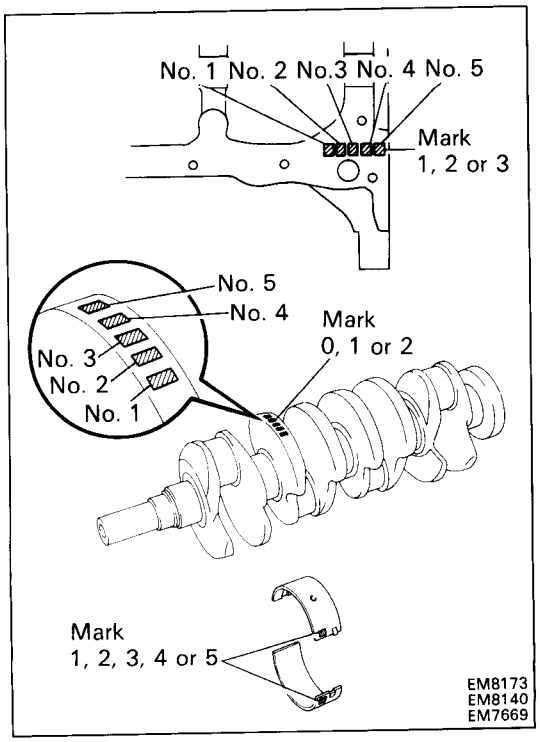
Maximum clearance: 0.08 mm (0.0031 in.)

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.



	Number marked								
Cylinder block	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Bearing	1	2	3	1	2	3	1	2	3

EXAMPLE: Cylinder block "2" + Crankshaft "1" = Bearing "3"

(Reference)

Cylinder block main journal bore diameter:

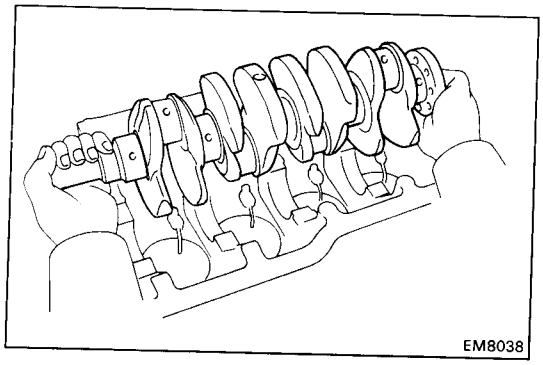
Mark "1"	59.020 – 59.026 mm (2.3236 – 2.3239 in.)
Mark "2"	59.026 – 59.032 mm (2.3239 – 2.3241 in.)
Mark "3"	59.032 – 59.038 mm (2.3241 – 2.3243 in.)

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.)

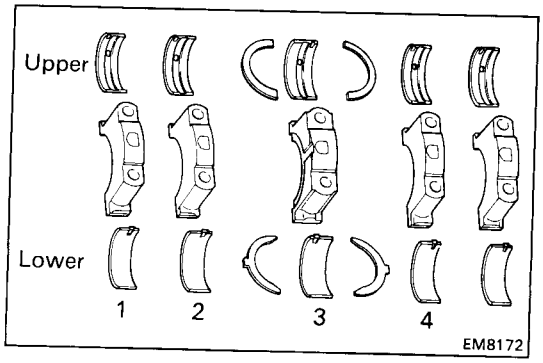


(k) Completely remove the Plastigage.

7. **REMOVE CRANKSHAFT**

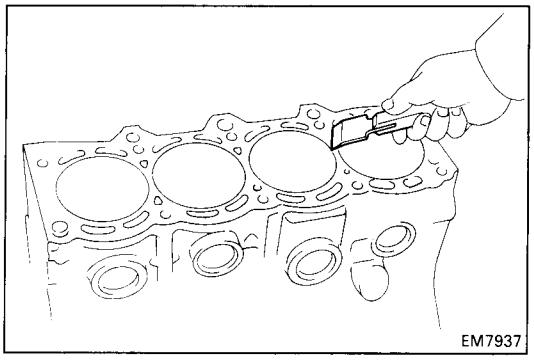
(a) Lift out the crankshaft.

(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-14)**



INSPECTION OF CYLINDER BLOCK

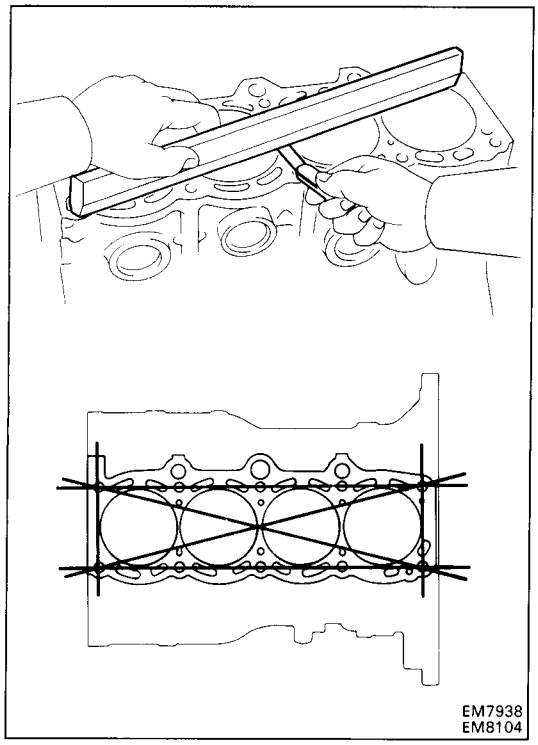
1. CLEAN CYLINDER BLOCK

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

B. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block.

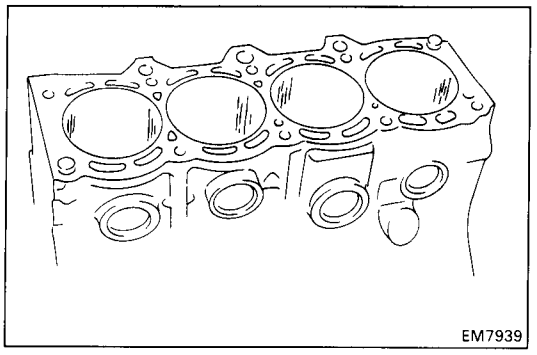


2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

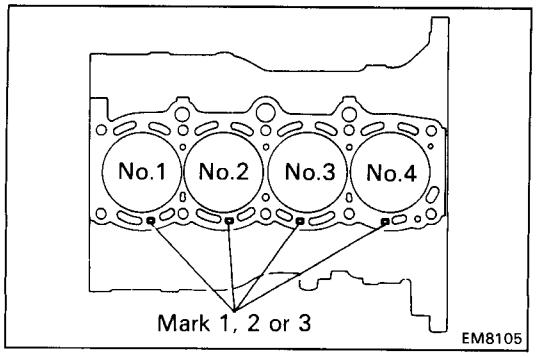
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

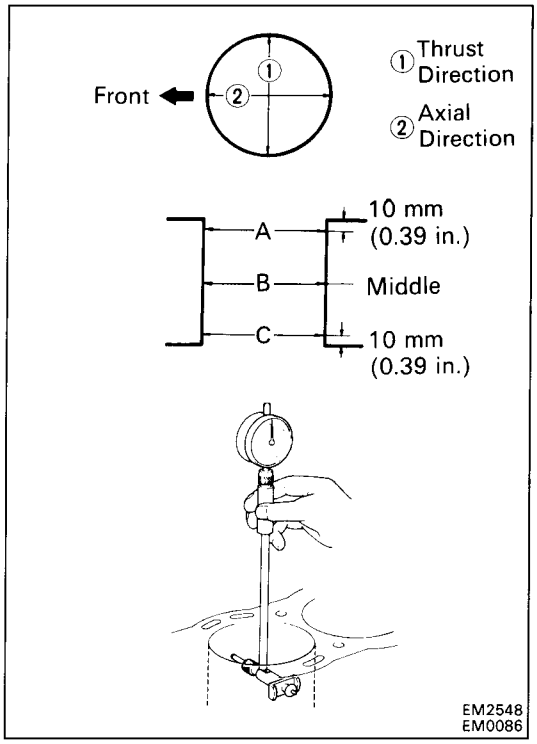
Visually check the cylinder for vertical scratches.

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.



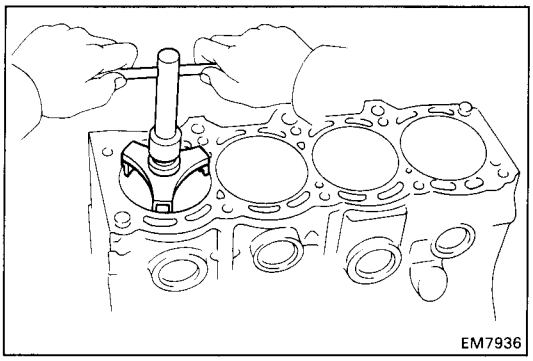
Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust axial directions.

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 (3.3866 – 3.3870 in.)**

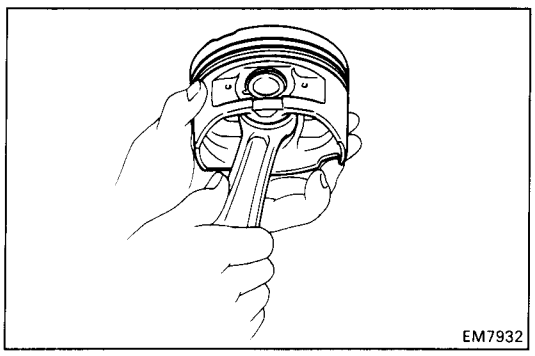
Maximum diameter: 86.23 mm (3.3949 in.)

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.

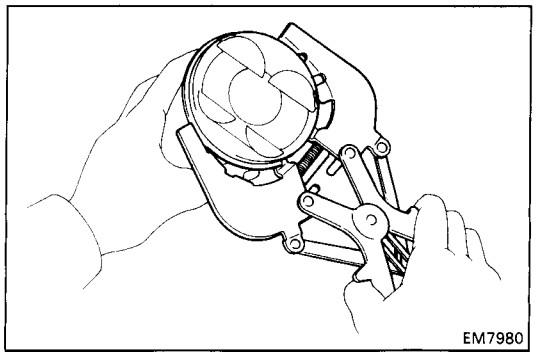


DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CHECK FIT BETWEEN PISTON AND PISTON PIN

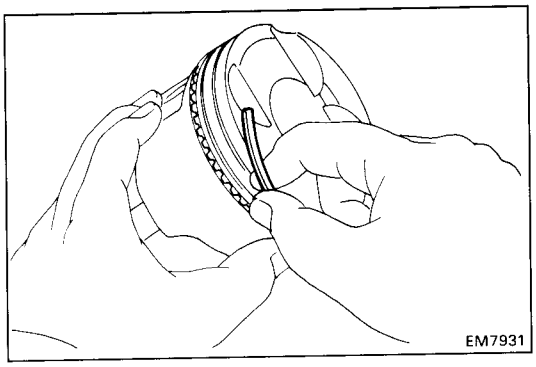
Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.



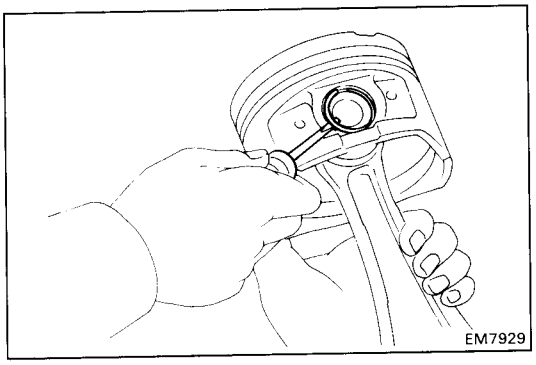
2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the two compression rings.



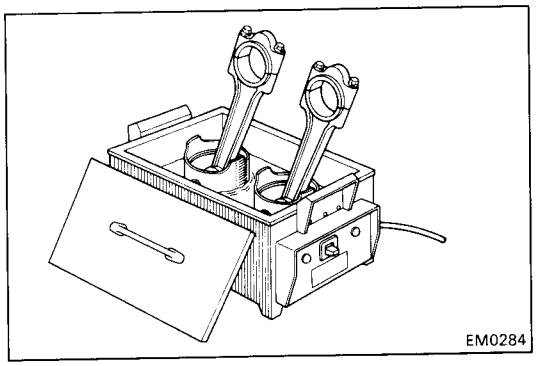
(b) Remove the two side rails and oil ring expander by hand.

HINT: Arrange the rings in correct order only.

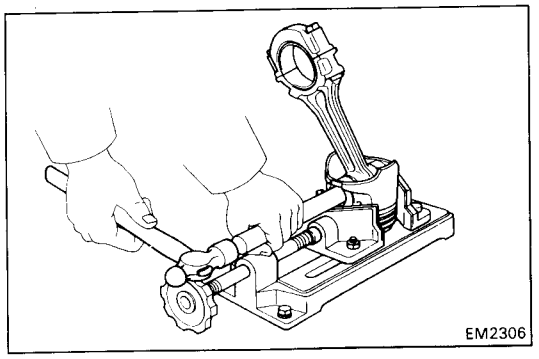


3. **DISCONNECT CONNECTING ROD FROM PISTON**

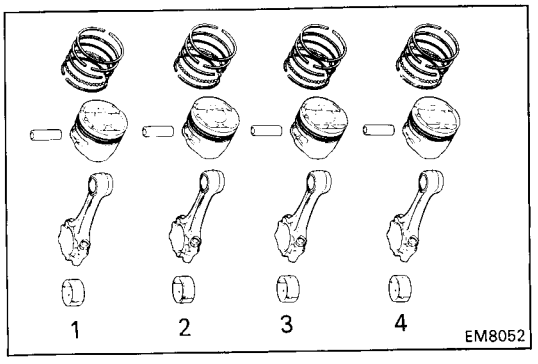
(a) Using a small screwdriver, pry out the two snap rings.



(b) Gradually heat the piston to 80 – 90°C (176 – 194°F).

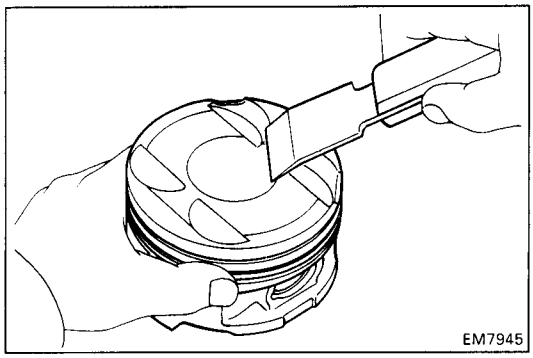


(c) Using plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.



HINT:

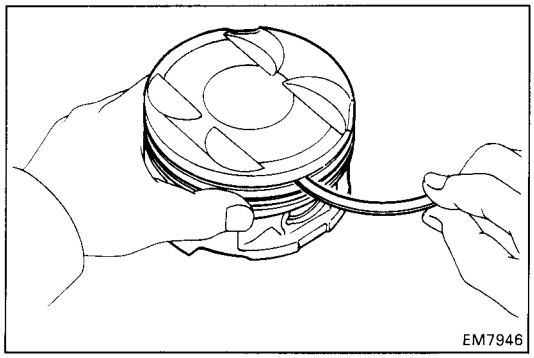
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.


EM7945

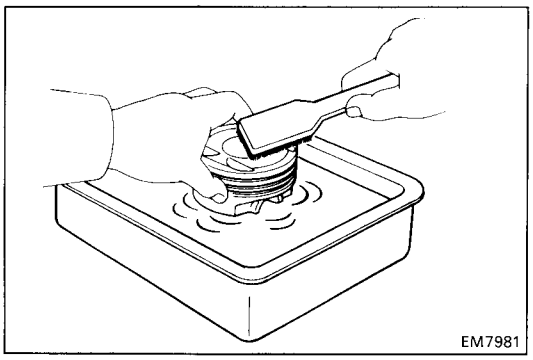
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.

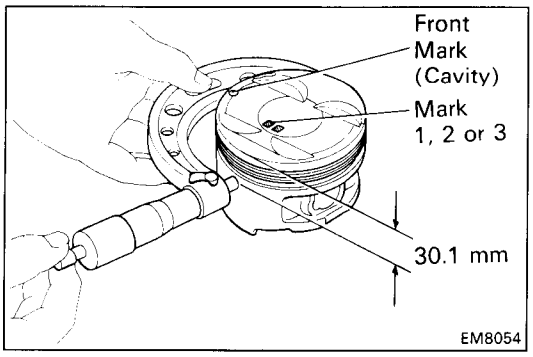

EM7946

(b) Using a groove cleaner 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-92)

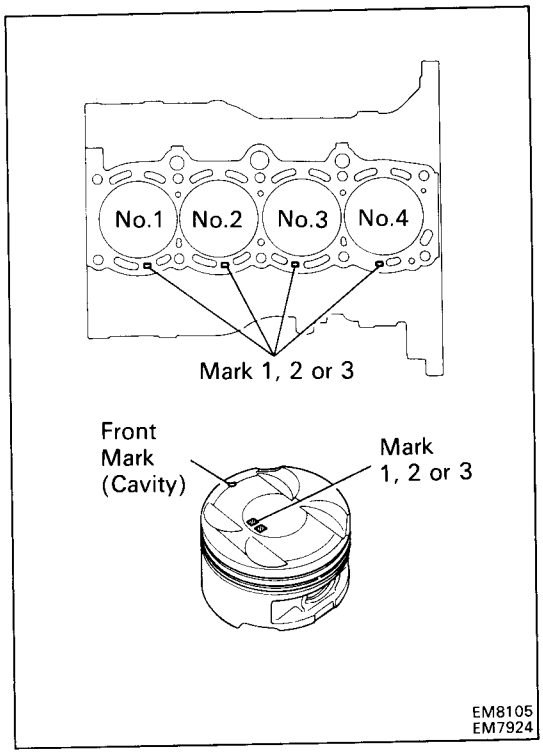
(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

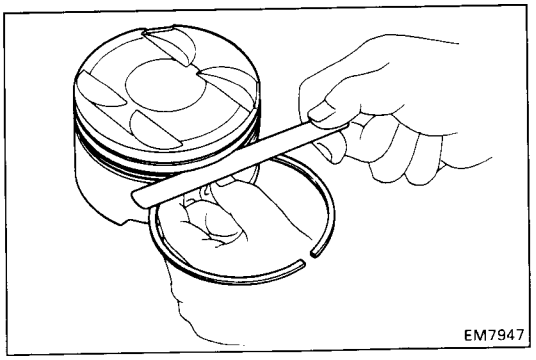
Standard oil clearance: **0.070 – 0.090 mm (0.0028 – 0.0035 in.)**

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

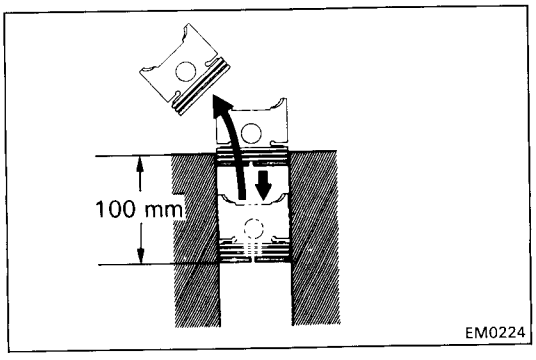
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

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.)

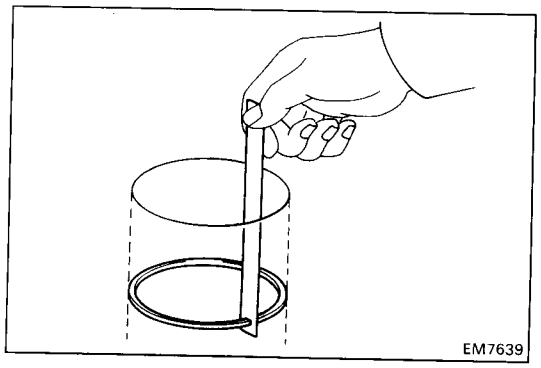
If the clearance is greater than maximum, replace the piston.



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.

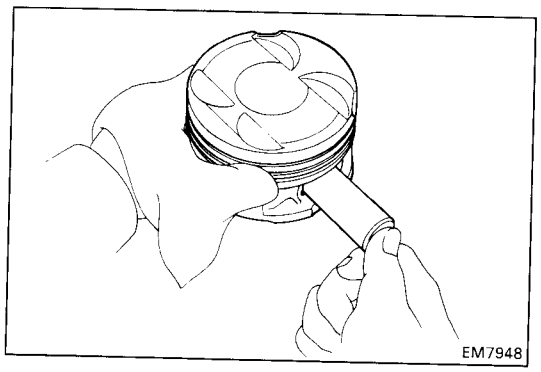
Standard end gap:

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:

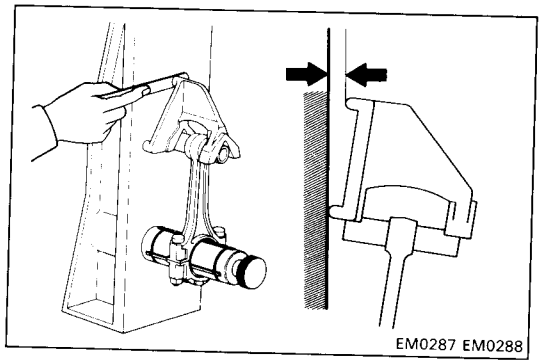
No.1	**0.85 mm (0.0335 in.)**
No.2	**0.97 mm (0.0382 in.)**
Oil (Side rail)	**0.90 mm (0.0354 in.)**

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.



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

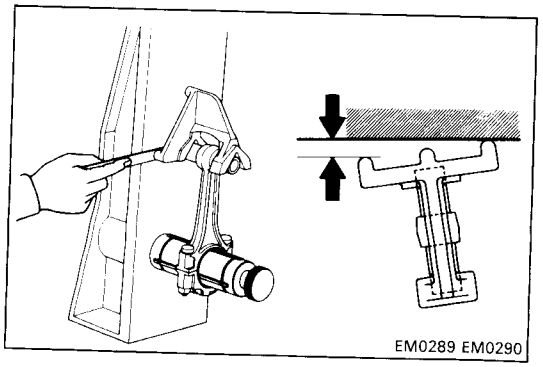
Using rod aligner and feeler gauge, check the connecting rod alignment.

- 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.

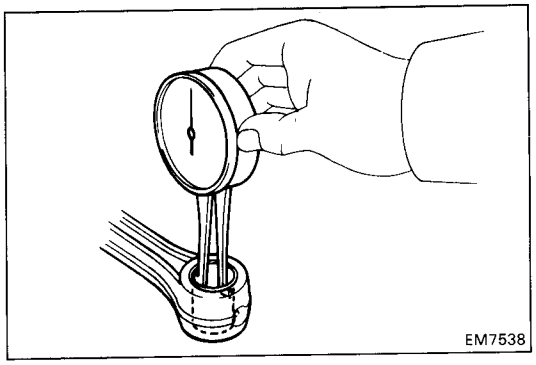


- Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

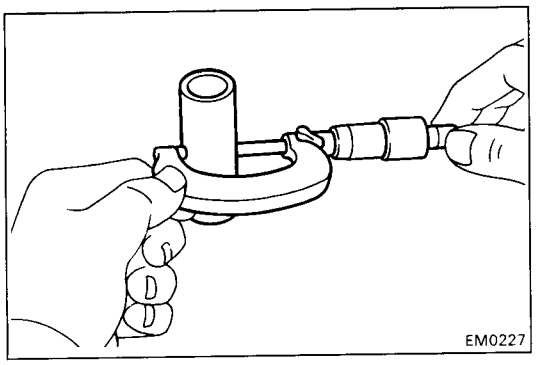
If twist is greater than maximum, replace the connecting rod assembly.



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.

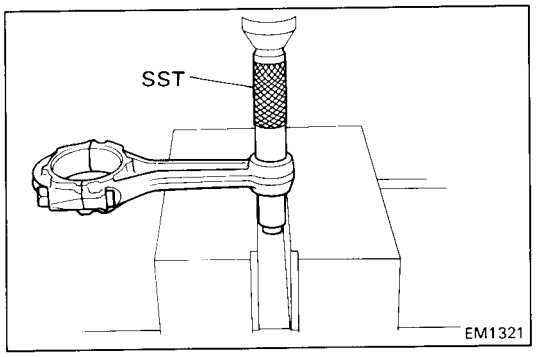
Piston pin diameter: 21.997 – 22.009 mm (0.8660 – 0.8665 in.)

(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.)

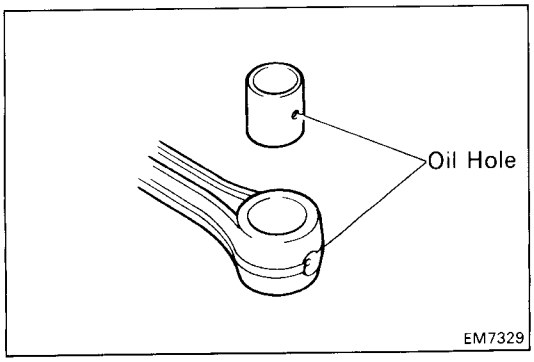
If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.



C. If necessary, replace connecting rod bushing

(a) Using SST and a press, press out the bushing.

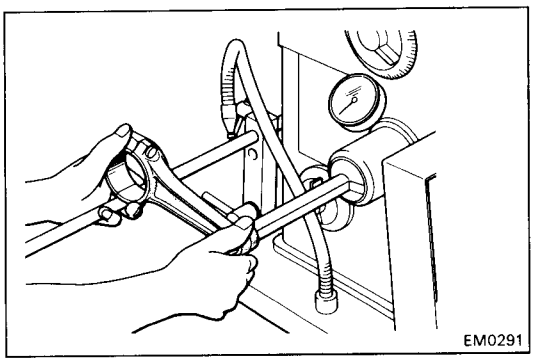
SST 09222-30010



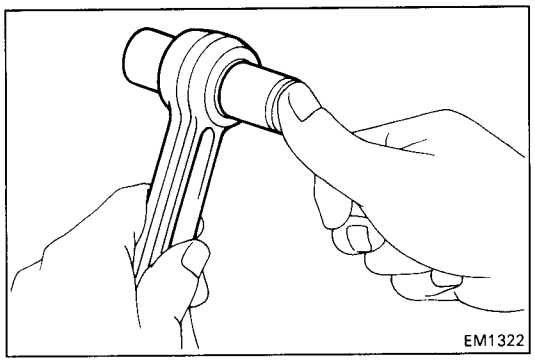
(b) Align the oil holes of a new bushing and the connecting rod.

(c) Using SST and a press, press in the bushing.

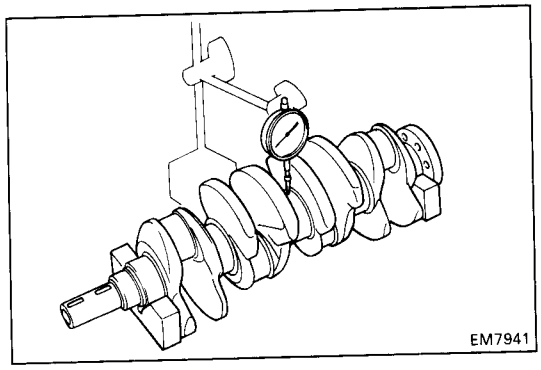
SST 09222-30010

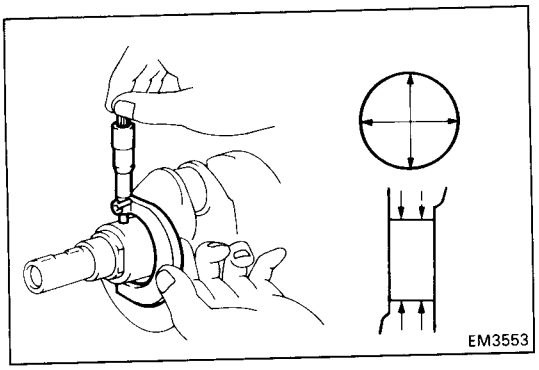


(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.



(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.


EM7941


EM3553

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 size	**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 size	**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-85 to 89). 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.

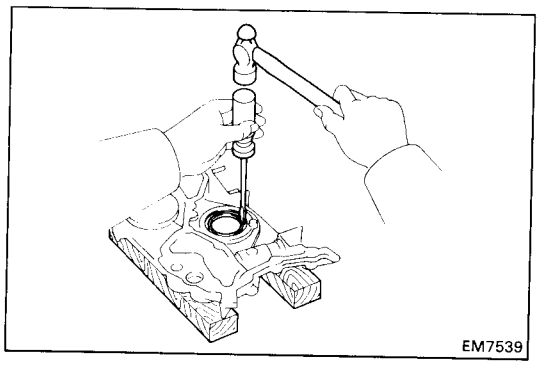
3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

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

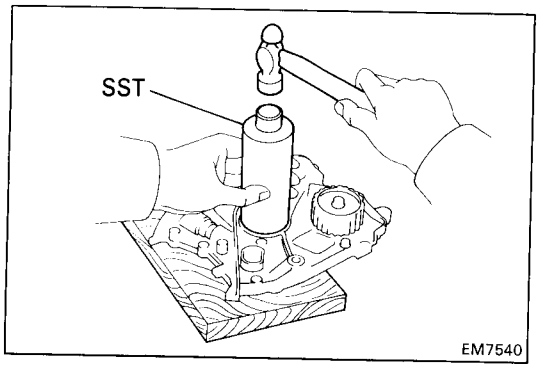
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



1. **REPLACE CRANKSHAFT FRONT OIL SEAL**

A. **If oil pump is removed from cylinder block:**

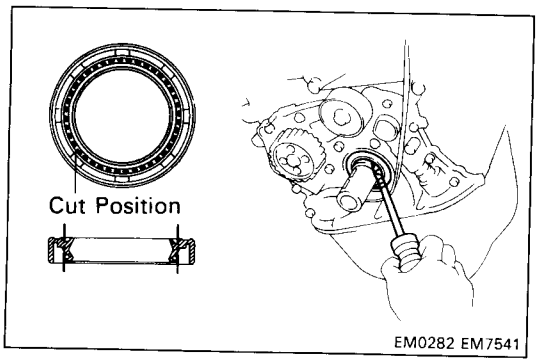
(a) Using a screwdriver and hammer, tap out the oil seal.



(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.

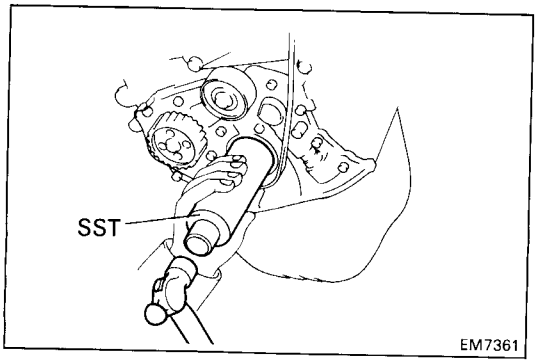


B. **If oil pump is installed to the cylinder block:**

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

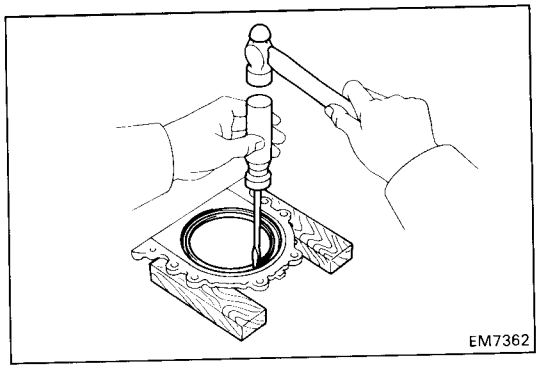
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(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.

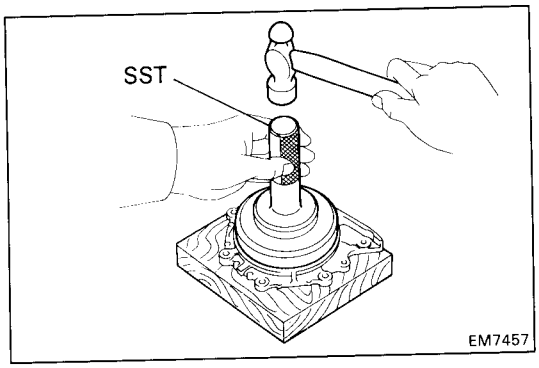
SST 09226-10010



2. REPLACE CRANKSHAFT REAR OIL SEAL

A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.

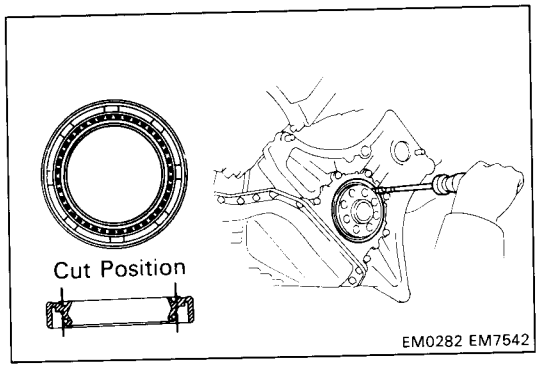


(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.

SST 09223-63010

(c) Apply MP grease to the oil seal lip.

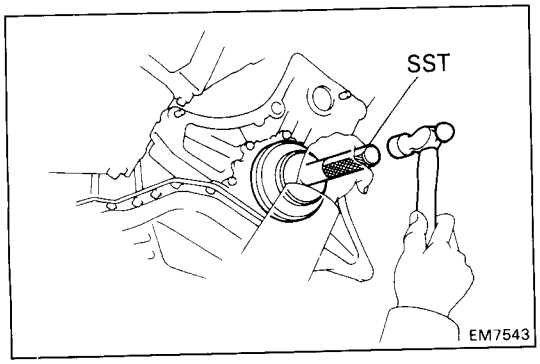
B. If rear oil seal retainer is installed to cylinder block:



(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

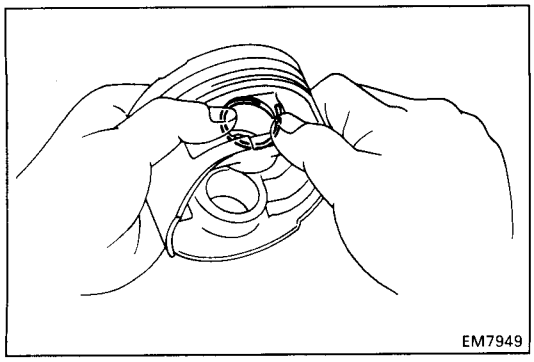
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply 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 09223-63010

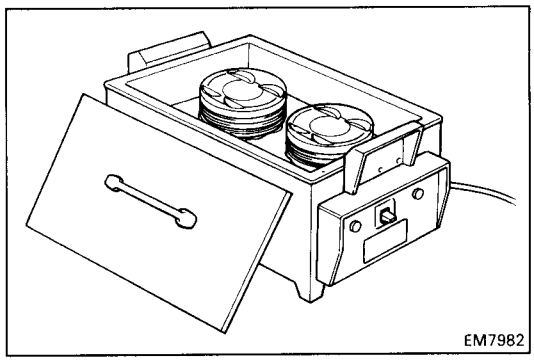

EM7949

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

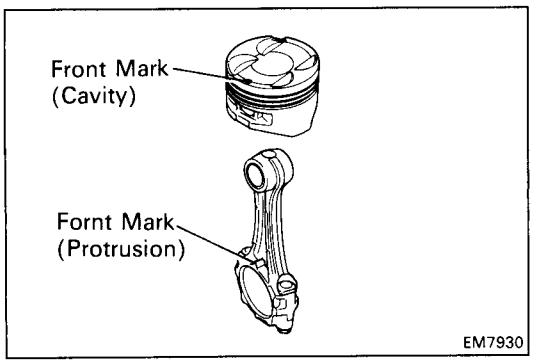
1. ASSEMBLE PISTON AND CONNECTING ROD

(a) 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.


EM7982

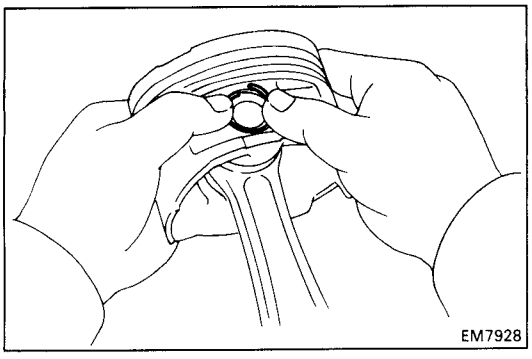
(b) Gradually heat the piston to 80 – 90°C (176 – 194°F).



EM7930

(c) Coat the piston pin with engine oil.

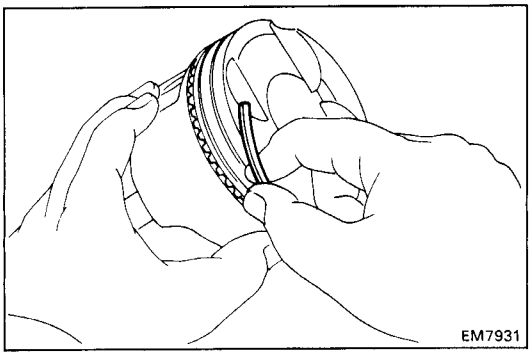
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.


EM7928

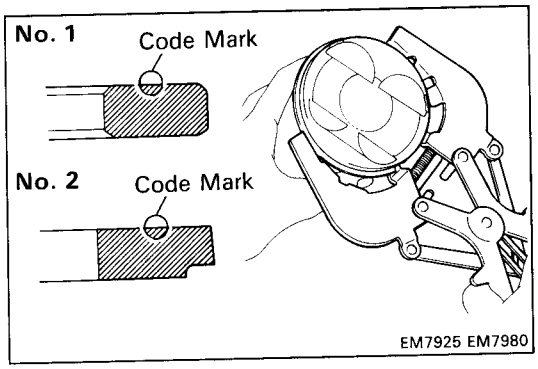
(e) Install a new snap ring on the other side of the piston pin hole.

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

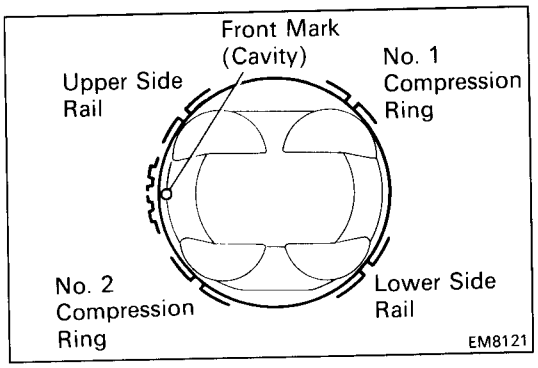

EM7931

(a) Install the oil ring expander and two side rails by hand.



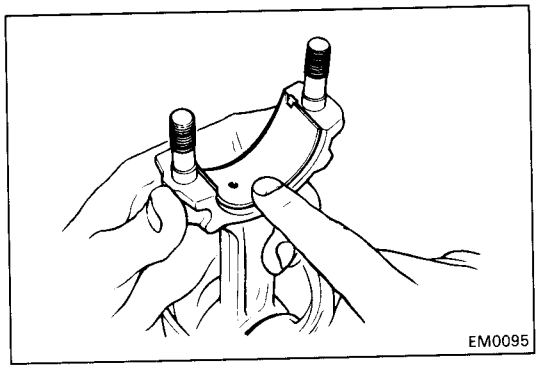
(b) Using a piston ring expander, install the two compression rings with the code mark facing upward.

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-74)

HINT:

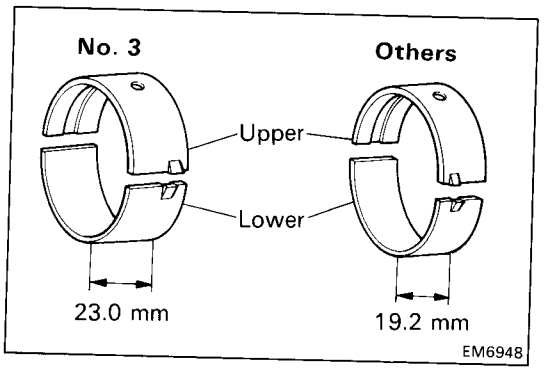
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

1. **INSTALL OIL NOZZLES (See page LU-14)**

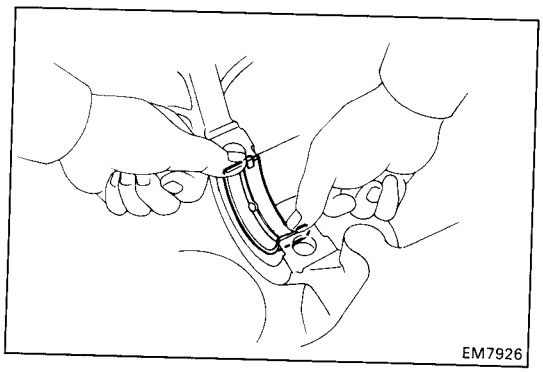
2. **INSTALL MAIN BEARINGS**

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.

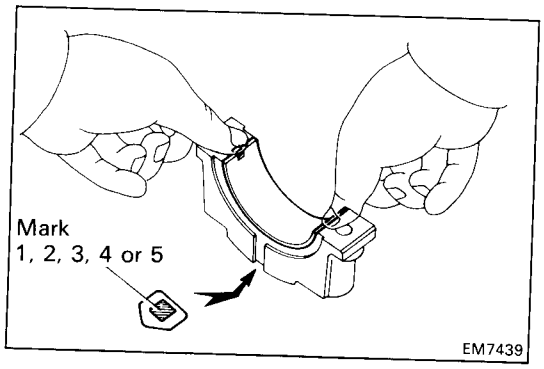


(a) Align the bearing claw with the claw groove of the cylinder block, and push in the five upper bearings.



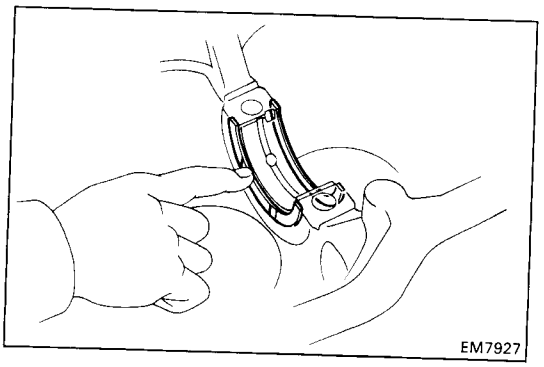
(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the five lower bearings.

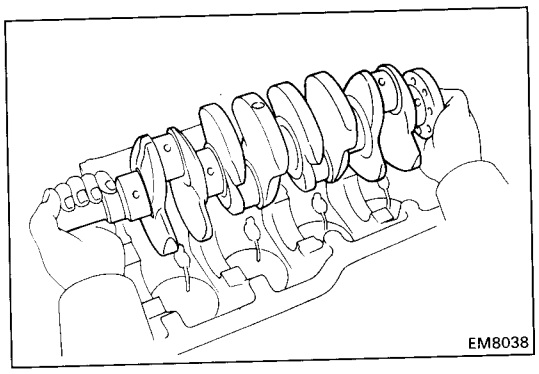
HINT: A number is marked on each main bearing cap to indicate the installation position.



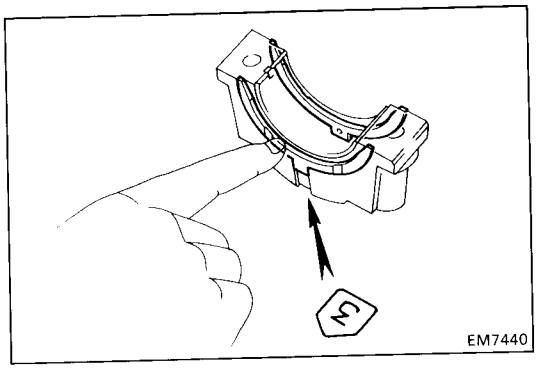
3. **INSTALL UPPER THRUST WASHERS**

Install the two thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.



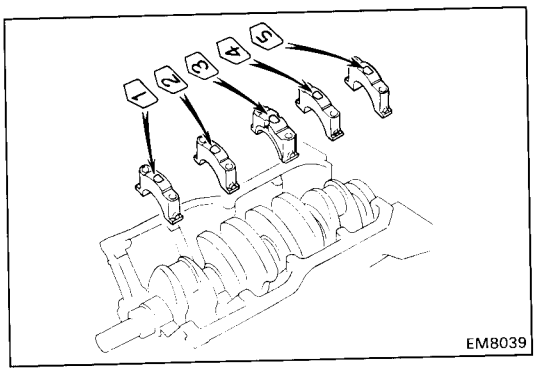


4. PLACE CRANKSHAFT ON CYLINDER BLOCK



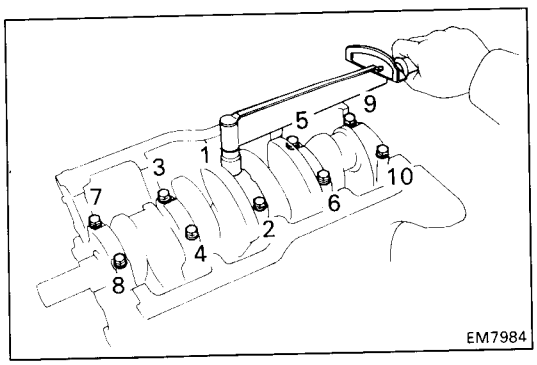
5. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

(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.



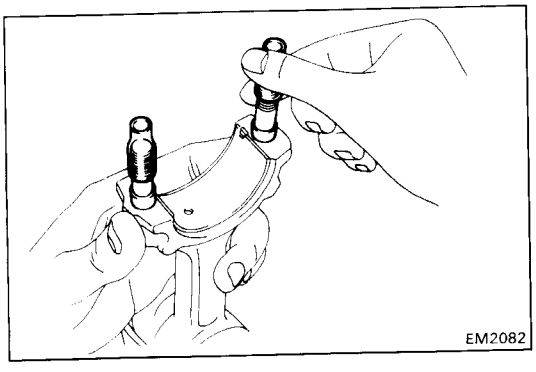
(c) Apply a light coat of engine oil on the threads and under the heads of the main bearing caps.

(d) Install and uniformly tighten the ten bolts of the main bearing caps in several passes in the sequence shown.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

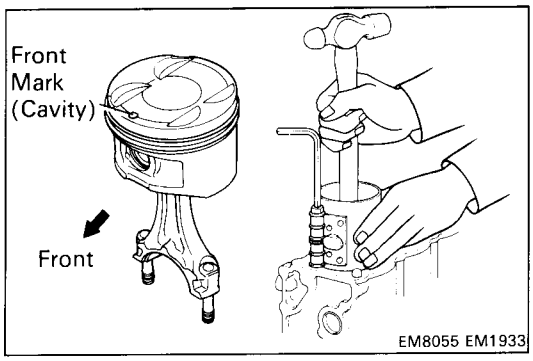
(e) Check that the crankshaft turns smoothly.

(f) Check the crankshaft thrust clearance.
(See step 5 on page EM-87)

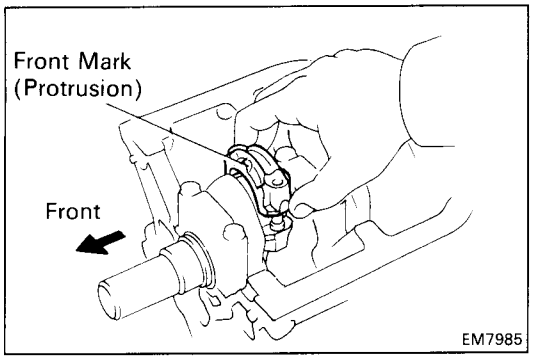


6. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



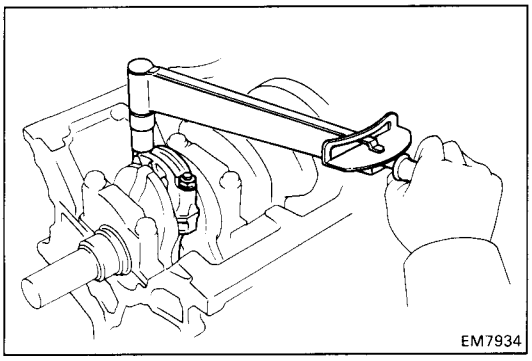
(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



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.



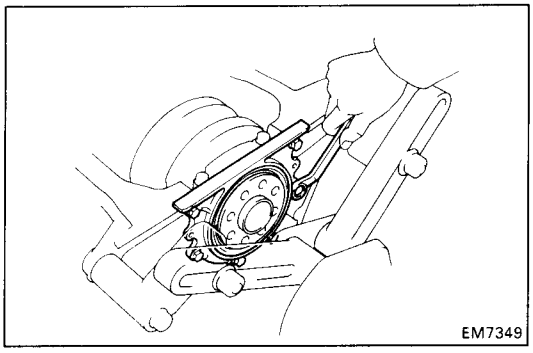
(c) Apply a light coat of engine oil on the threads and under the cap nuts.

(d) Using SST, install and alternately tighten the cap nuts in several passes.

Torque: 680 kg-cm (49 ft-lb, 67 N·m)

(e) Check that the crankshaft turns smoothly.

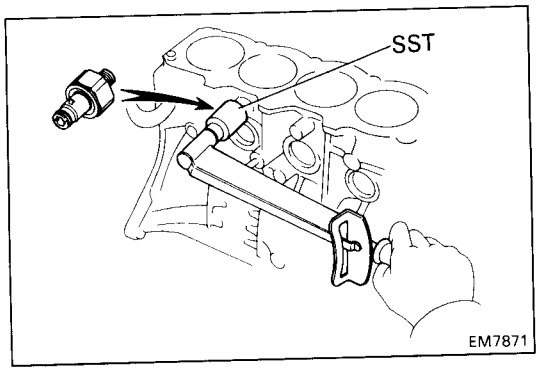
(f) Check the connecting rod thrust clearance.
(See step 2 on page EM-85)



8. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and the retainer with the six bolts.

Torque: 95 kg-cm (82 in.-lb, 9.3 N·m)



POST ASSEMBLY

1. **INSTALL KNOCK SENSOR**
   Using SST, install the knock sensor.
   SST 09816-30010
   Torque: 450 kg-cm (33 ft-lb, 44 N·m)

2. **INSTALL OIL COOLER (See pages LU-12 and 13)**

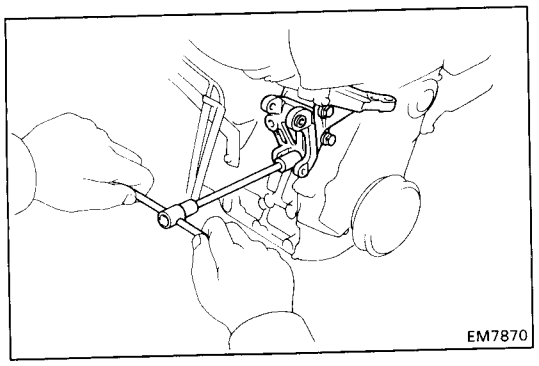
3. **INSTALL OIL FILTER (See page LU-5)**

4. **INSTALL OIL PUMP AND OIL PAN (See page LU-9)**

5. **INSTALL WATER PUMP AND IDLER PULLEY BRACKET (See pages CO-6 and 7)**

6. **INSTALL CYLINDER HEAD (See pages EM-64 to 72)**

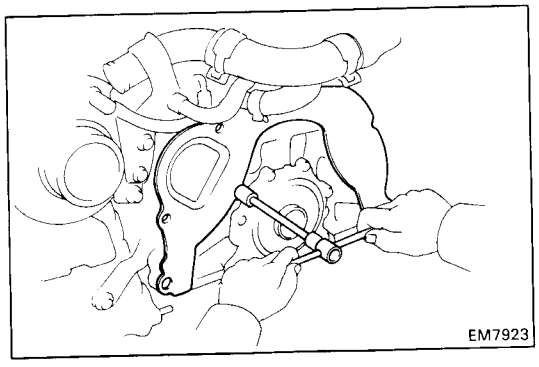
7. **INSTALL PULLEYS AND TIMING BELT (See pages EM-28 to 32)**



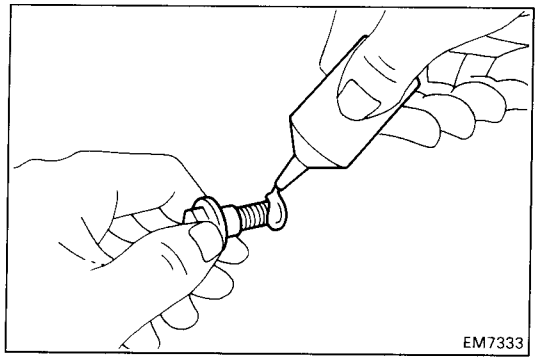
8. **INSTALL RH ENGINE MOUNTING BRACKET**
   Install the mounting bracket with the three bolts.
   Torque: 530 kg-cm (38 ft-lb, 52 N·m)

9. **INSTALL PS PUMP BRACKET**
   Install the PS pump bracket with the three bolts.
   Torque: 440 kg-cm (32 ft-lb, 43 N·m)

10. **REMOVE ENGINE STAND**



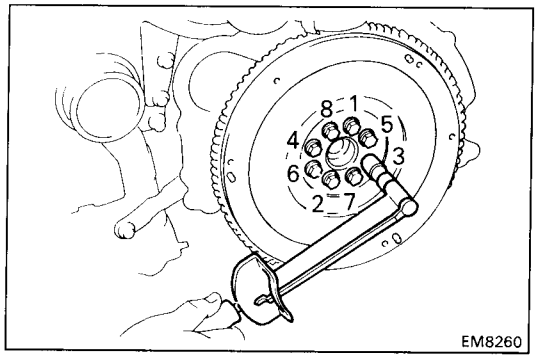
11. **INSTALL REAR END PLATE**
    Torque: 95 kg-cm (82 ft-lb, 9.3 N·m)



12. INSTALL FLYWHEEL

(a) Apply adhesive to two or three threads of the mount bolt end.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

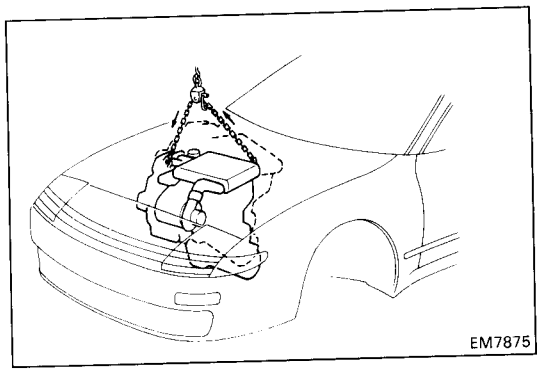


(b) Install the flywheel on the crankshaft.

(c) Install and uniformly tighten the mount bolts in several passes in the sequence shown.

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)

13. INSTALL CLUTCH DISC AND COVER



INSTALLATION OF ENGINE

1. **ASSEMBLE ENGINE AND TRANSAXLE**
(See page MT-6)

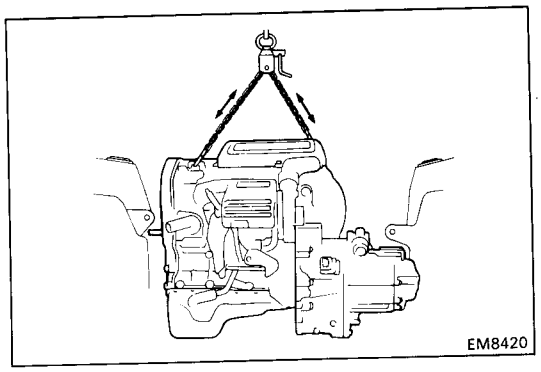
2. **INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE**

(a) Attach the engine chain hoist to the engine hangers.

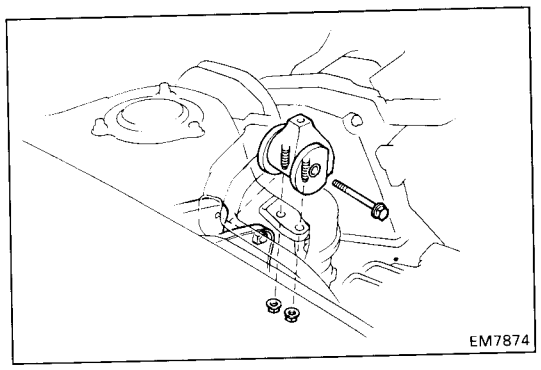
(b) Lower the engine into the engine compartment. Tilt the transaxle downward, lower the engine and clear the LH mounting.

NOTICE: Be carefui not to hit the PS gear housing.

(c) Keep the engine level, and align RH and LH mountings with the body bracket.

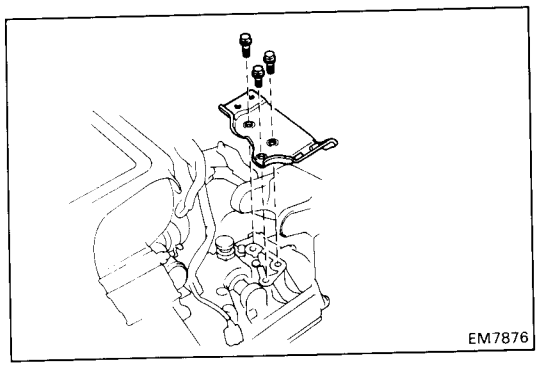


(d) Attach the RH mounting insulator to the mounting bracket and body, and temporarily install the through bolt and two nuts.



(e) Install the LH mounting bracket to the transaxle case with the three bolts.

Torque: 530 kg-cm (38 ft-lb, 52 N·m)



(f) Attach the LH mounting insulator to the mounting bracket and body with the through bolt and four bolts. Tighten the bolts.

Torque:

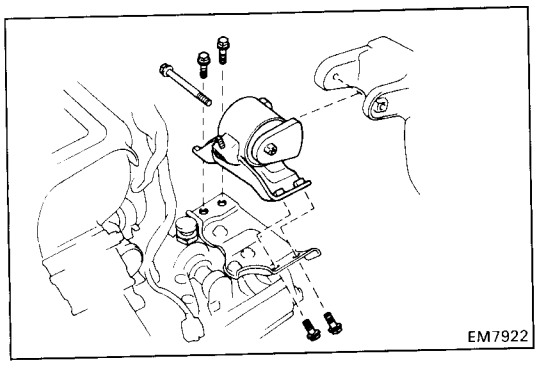
Bolt	**650 kg-cm (47 ft-lb, 63 N·m)**
Through bolt	**890 kg-cm (64 ft-lb, 87 N·m)**

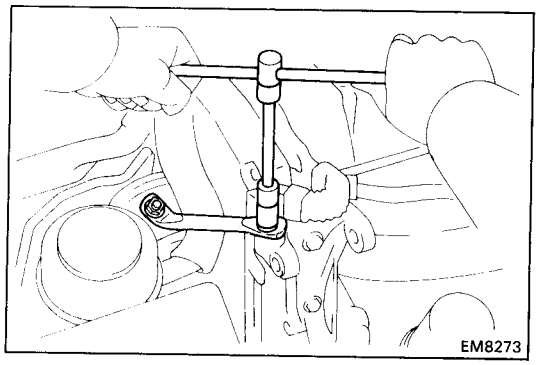
(g) Tighten the through bolt and two nuts of the RH mounting insulator.

Torque:

Nut	**530 kg-cm (38 ft-lb, 52 N·m)**
Through bolt	**890 kg-cm (64 ft-lb, 87 N·m)**

(h) Remove the engine chain hoist from the engine.

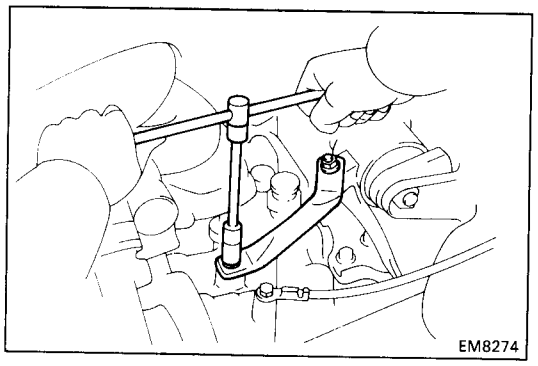




3. **INSTALL RH ENGINE MOUNTING STAY**

Install the mounting stay with the bolt and nut.

Torque: 740 kg-cm (54 ft-lb, 73 N·m)



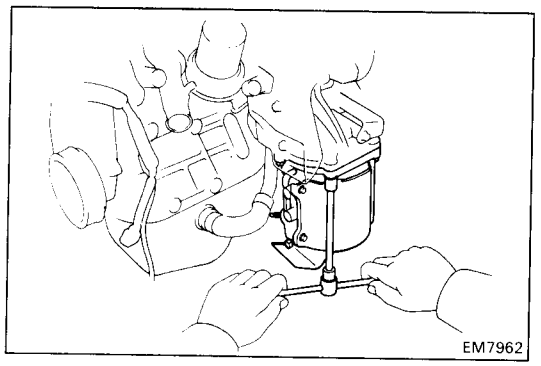
4. **INSTALL LH ENGINE MOUNTING STAY**

Install the mounting stay with the bolt and nut.

Torque: 210 kg-cm (15 ft-lb, 21 N·m)

5. **CONNECT GROUND STRAP**

Connect the ground strap to the transaxle with the bolt.

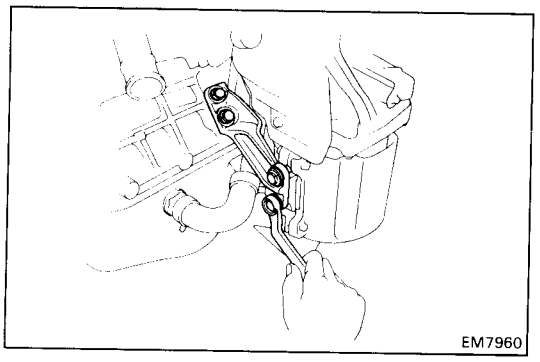


6. **INSTALL CATALYTIC CONVERTER**

(a) Place new cushion, retainer and gasket on the catalytic converter.

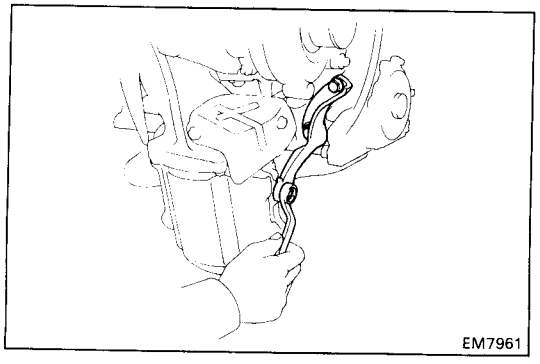
(b) Install the catalytic converter with the three bolts and two nuts.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



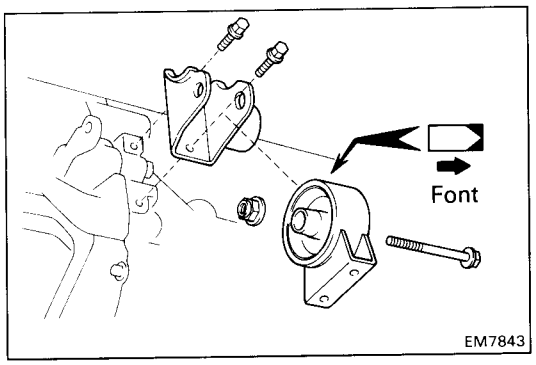
(c) Install the RH converter stay with the four bolts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)



(d) Install the LH converter stay with the three bolts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

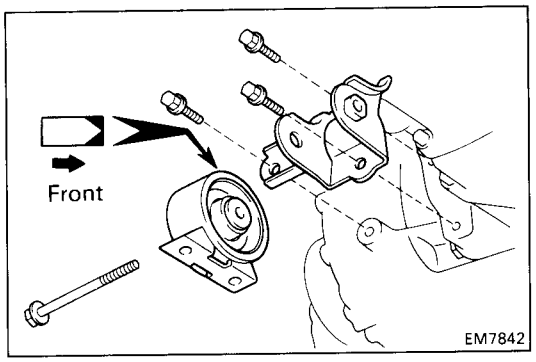


7. **INSTALL FRONT ENGINE MOUNTING BRACKET AND INSULATOR**

(a) Install the mounting bracket with the two bolts.

Torque: 790 kg-cm (57 ft-lb, 77 N·m)

(b) Temporarily install the mounting insulator with the through bolt and nut.

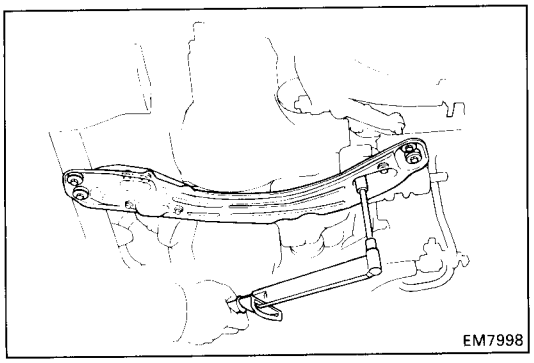


8. **INSTALL REAR ENGINE MOUNTING BRACKET AND INSULATOR**

(a) Install the mounting bracket with the three bolts.

Torque: 790 kg-cm (57 ft-lb, 77 N·m)

(b) Temporarily install the mounting insulator with the through bolt.



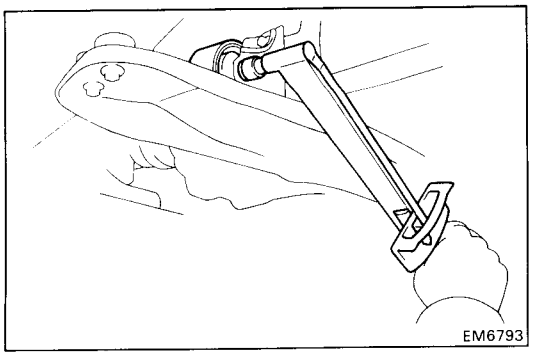
9. **INSTALL ENGINE MOUNTING CENTER MEMBER**

(a) Install the engine mounting center member with the four bolts.

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

(b) Install and torque the four bolts holding the insulators to the center member.

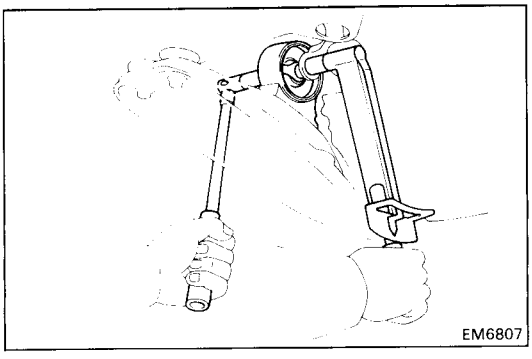
Torque: 740 kg-cm (54 ft-lb, 73 N·m)



10. **TIGHTEN FRONT AND REAR ENGINE MOUNTING THROUGH BOLTS**

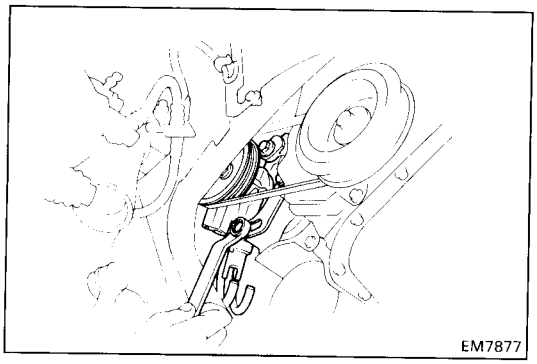
(a) Tighten the rear through bolt.

Torque: 890 kg-cm (64 ft-lb, 87 N·m)



(b) Tighten the front through bolt.

Torque: 890 kg-cm (64 ft-lb, 87 N·m)


EM7877

11. **INSTALL PS PUMP**

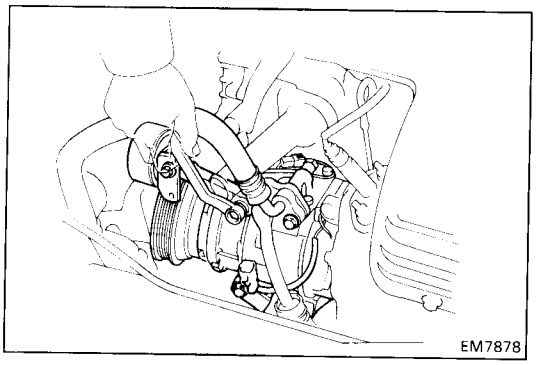
(a) Install the PS pump with the four bolts.

Torque:

Adjusting bolt	**400 kg-cm (29 ft-lb, 39 N·m)**
Others	**440 kg-cm (32 ft-lb, 43 N·m)**

(b) Install the drive belt.

(c) Connect the two air hoses to the air pipe.


EM7878

12. **INSTALL A/C COMPRESSOR AND IDLER PULLEY BRACKET**

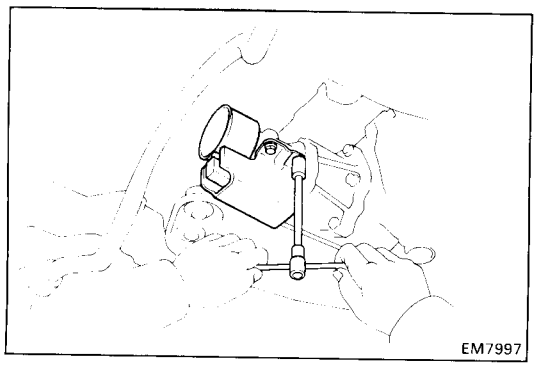
(a) Install the compressor and idler pulley bracket with the four bolts.

Torque: 280 kg-cm (20 ft-lb, 27 N·m)

(b) Connect the two connectors.

(c) Connect the A/C compressor connector.

13. **INSTALL ALTERNATOR (See page CH-7)**

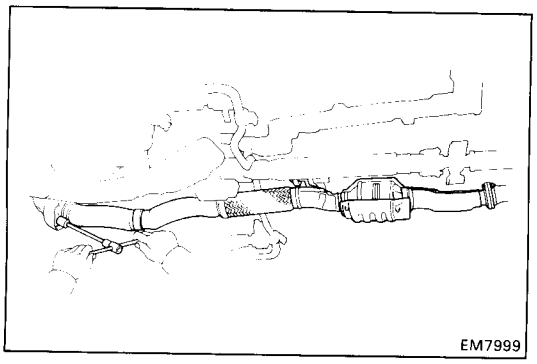

EM7997

14. **INSTALL DEFLECTOR TO TRANSFER EXTENSION HOUSING**

15. **INSTALL DYNAMIC DAMPER TO TRANSFER EXTENSION HOUSING**

16. **INSTALL FRONT PROPELLER SHAFT (See page PR-3)**

17. **INSTALL DRIVE SHAFTS (See page SA-7)**


EM7999

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.

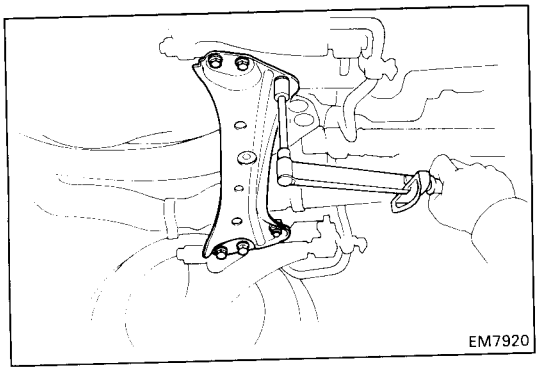
(d) Using a 14 mm deep socket wrench, install the three new nuts holding the exhaust pipe to the catalytic converter.

Torque: 630 kg-cm (46 ft-lb, 62 N·m)

(e) Tighten the two bolts and nuts holding the exhaust pipe to the center exhaust pipe.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)

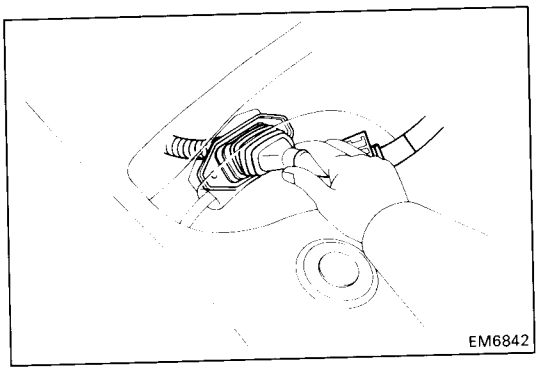
(f) Install the clamp with the bolt.



19. INSTALL SUSPENSION LOWER CROSSMEMBER

Install the lower crossmember with the four bolts and two nuts.

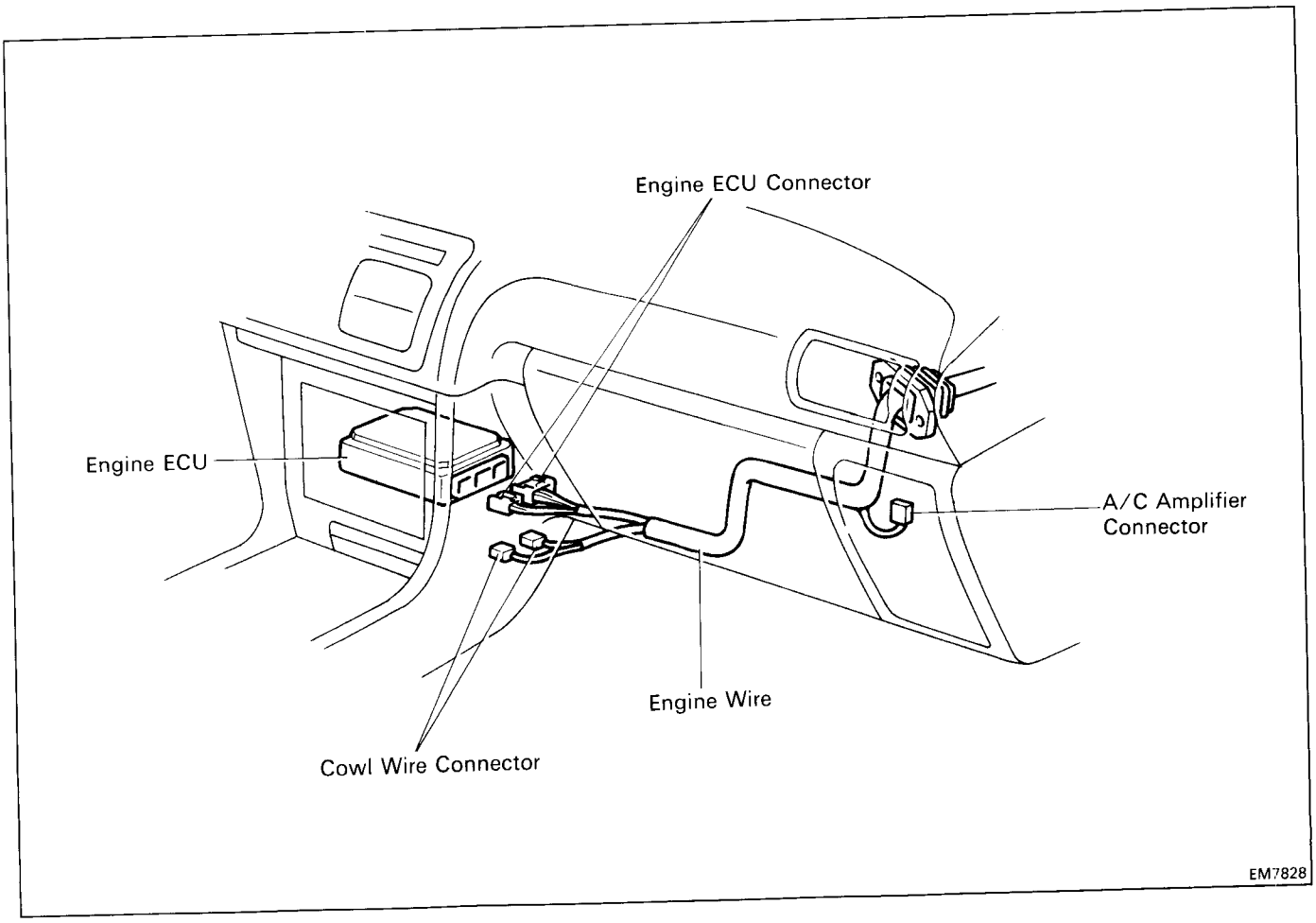
Torque: 1,550 kg-cm (112 ft-lb, 152 N·m)



20. CONNECT ENGINE WIRE TO CABIN

(a) Push in the engine wire through the cowl panel. Install the two nuts.

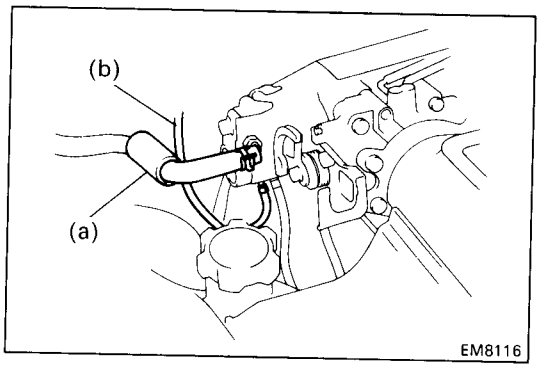
(b) Connect the following connectors.
- (1) Two engine ECU connectors
- (2) Two cowl wire connectors
- (3) A/C amplifier connector



21. CONNECT ENGINE WIRE

(a) Engine wire clamp to wire bracket on RH fender apron

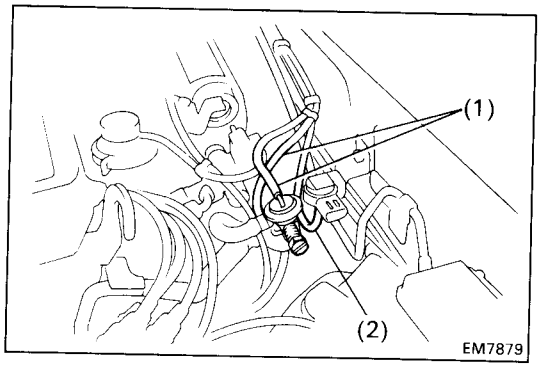
(b) Two cowl wire connectors



22. CONNECT HOSES

(a) Brake booster vacuum hose from intake manifold

(b) Turbocharging pressure sensor hose from intake manifold



23. INSTALL TURBOCHARGING PRESSURE SENSOR AND A/C ASV

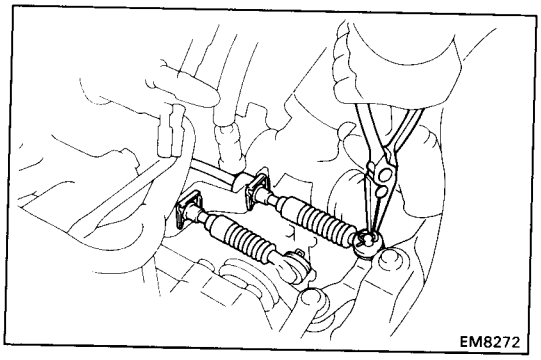
(a) Install the turbocharging pressure sensor and A/C ASV with the bolt.

(b) Connect the following hoses:

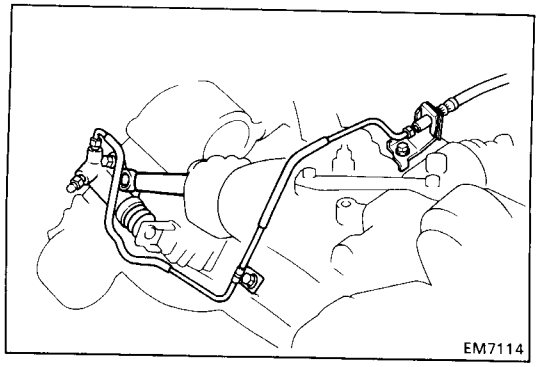
(1) Two vacuum hoses to ASV from A/C ASV

(2) Vacuum hose to ASV from turbocharging pressure sensor

(c) Connect turbocharging pressure sensor connector.



24. CONNECT TRANSAXLE CONTROL CABLES TO TRANSAXLE



25. INSTALL CLUTCH RELEASE CYLINDER

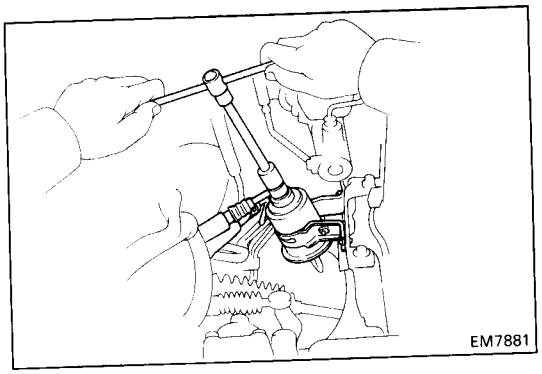
Install the release cylinder and tube with the four bolts.

26. INSTALL STARTER (See page ST-3)

27. CONNECT CONNECTORS

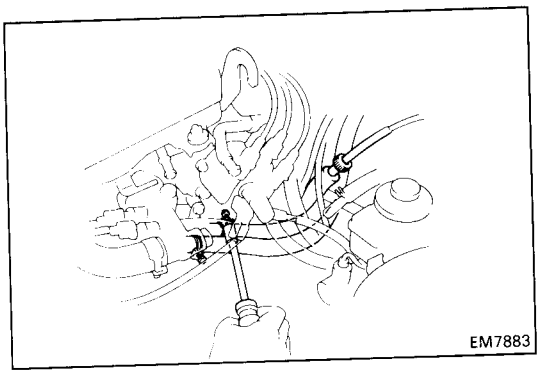
(1) Engine room wire connector

(2) Noise filter connector



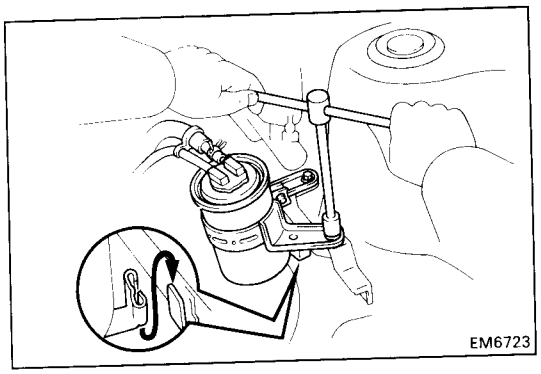
28. **CONNECT FUEL HOSES**

Torque (Union bolt): 300 kg-cm (22 ft-lb, 29 N·m)



29. **CONNECT SPEEDOMETER CABLE**

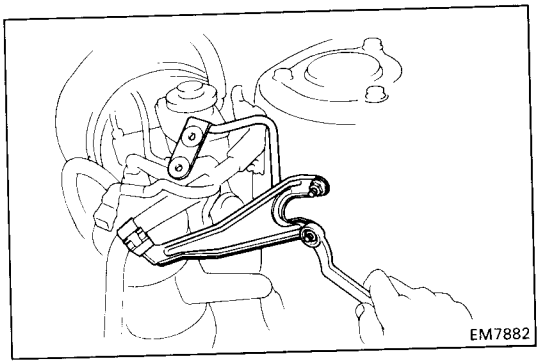
30. **CONNECT HEATER HOSES**



31. **INSTALL CHARCOAL CANISTER**

(a) Install the charcoal canister with the two bolts.

(b) Connect the two vacuum hoses.



32. **INSTALL ENGINE WIRE BRACKET**

(a) Install the wire bracket with the two bolts. Install the noise filter.

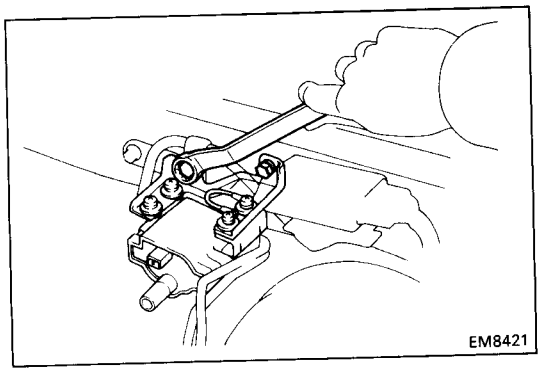
(b) Install the wire clamp to the wire bracket.

33. **CONNECT WIRES AND CONNECTORS**

(a) Check connector

(b) Igniter connector

(c) Ground strap from LH fender apron

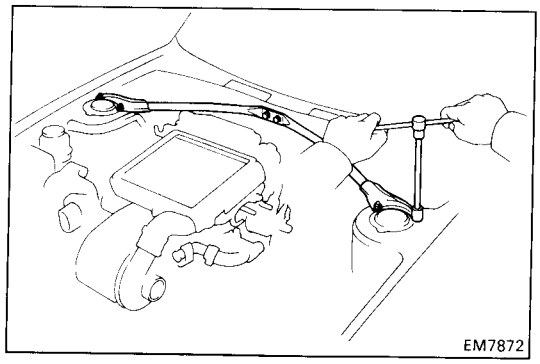


34. **INSTALL IGNITION COIL**

(a) Install the ignition coil with the two bolts.

(b) Connect the high-tension cord.

(c) Connect the ignition coil connector.



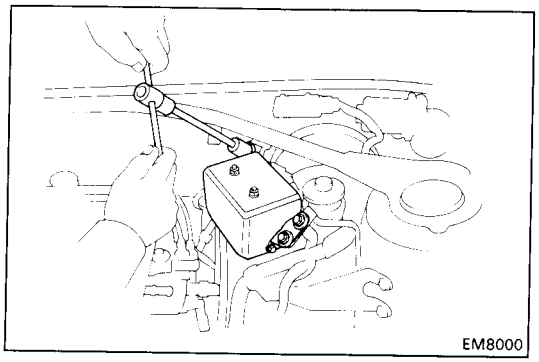
35. INSTALL SUSPENSION UPPER BRACE

(a) Install the suspension upper brace with the two bolts and four bolts.

Torque: Bolt 210 kg-cm (15 ft-lb, 21 N·m)
Nut 650 kg-cm (47 ft-lb, 64 N·m)

(b) Install the outside lower windshield moulding.

(c) Install the two wiper arms.



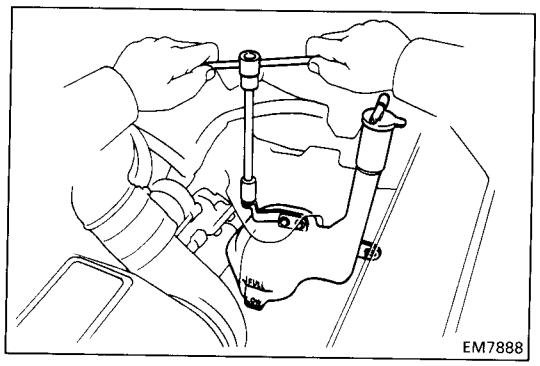
36. (w/ CRUISE CONTROL SYSTEM) INSTALL CRUISE CONTROL ACTUATOR

(a) Connect the cable to the actuator.

(b) Connect the actuator connector

(c) Install the actuator with the three bolts.

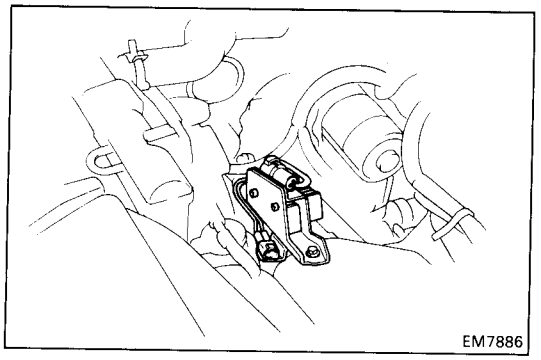
(d) Install the actuator cover with the two nuts.



37. INSTALL RADIATOR RESERVOIR TANK

Install the reservoir tank with the two nuts.

38. INSTALL RADIATOR

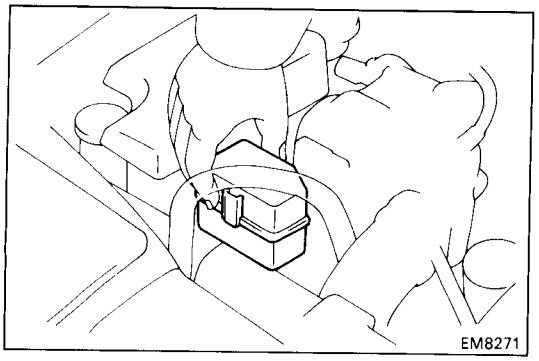


39. INSTALL INJECTOR SOLENOID RESISTOR AND FUEL PUMP RESISTOR

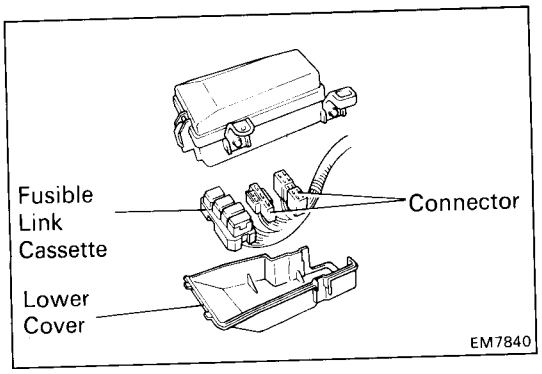
(a) Install the solenoid resistor and fuel pump resistor with the bolt.

(b) Connect the two connectors.

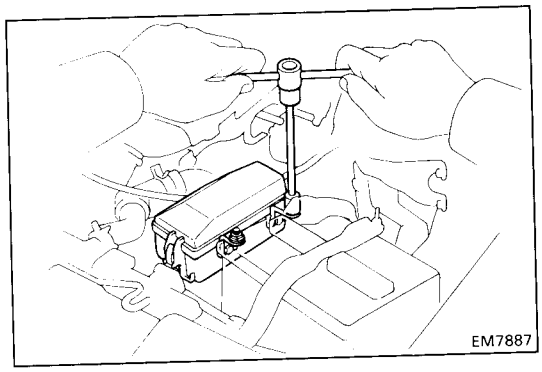
40. INSTALL BATTERY



41. INSTALL A/C RELAY BOX

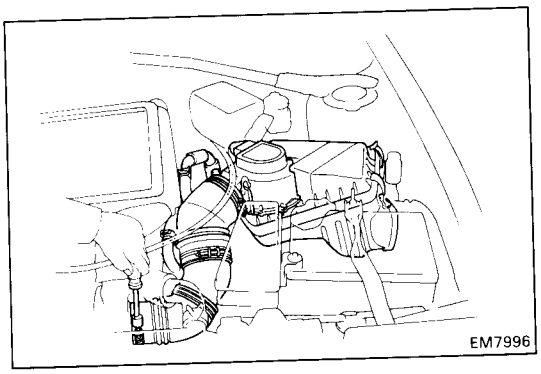


42. **CONNECT ENGINE WIRE, AND INSTALL ENGINE RELAY BOX**
   (a) Connect the fusible link cassette and two connectors of the engine wire to the relay box.
   (b) Install the lower cover to the relay box.



   (c) Install the relay box with the two nuts.

43. **INSTALL ACCELERATOR CABLE, AND ADJUST IT**



44. **INSTALL AIR CLEANER ASSEMBLY**
   (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.

45. **FILL WITH TRANSAXLE OIL (See page MA-11)**
   Capacity: 4.8 liters (5.1 US qts, 4.2 Imp. qts)

46. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

47. **FILL WITH ENGINE COOLANT (See page CO-4)**
   Capacity (w/ Heater):
   6.4 liters (6.8 US qts, 5.6 Imp. qts)

48. **FILL WITH ENGINE OIL (See page LU-6)**
   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)

49. START ENGINE AND CHECK FOR LEAKS

50. PERFORM ENGINE ADJUSTMENT

(a) Adjust the alternator drive belt.
(See page CH-2)

Drive belt tension:

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

(b) Adjust the PS drive belt.

Drive belt tension:	**New belt**	**125 ± 25 lb**
	Used belt	**80 ± 20 lb**

(c) Adjust the ignition timing.
(See steps 8 to 11 on pages IG-12 and 13)

Ignition timing:
10° BTDC @ idle
(w/ Terminals TE1 and E1 connected)

51. INSTALL ENGINE UNDER COVERS

52. INSTALL HOOD

53. PERFORM ROAD TEST

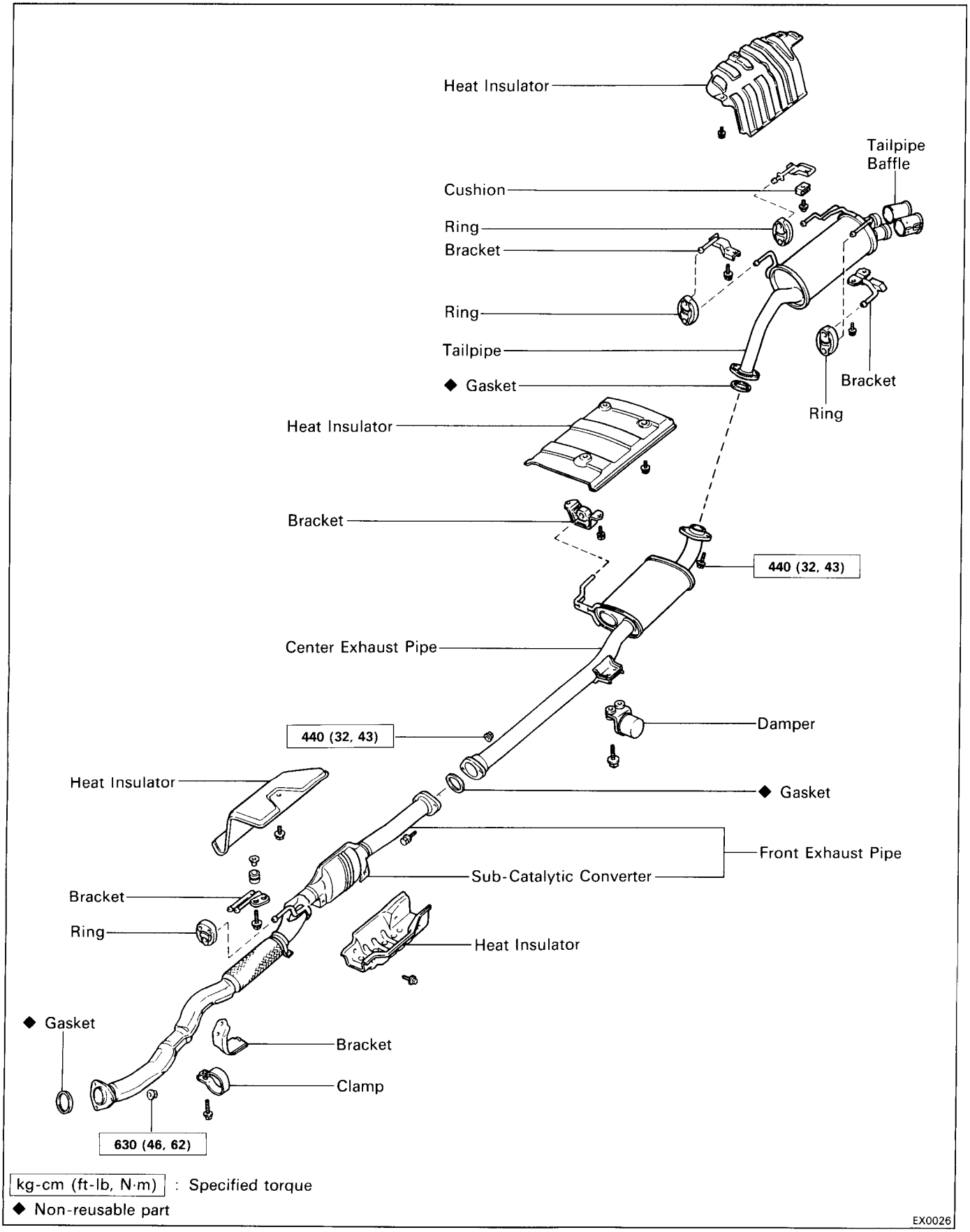
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

54. RECHECK ENGINE COOLANT AND OIL LEVELS

EXHAUST SYSTEM

EXHAUST PIPES AND HEAT INSULATORS

COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

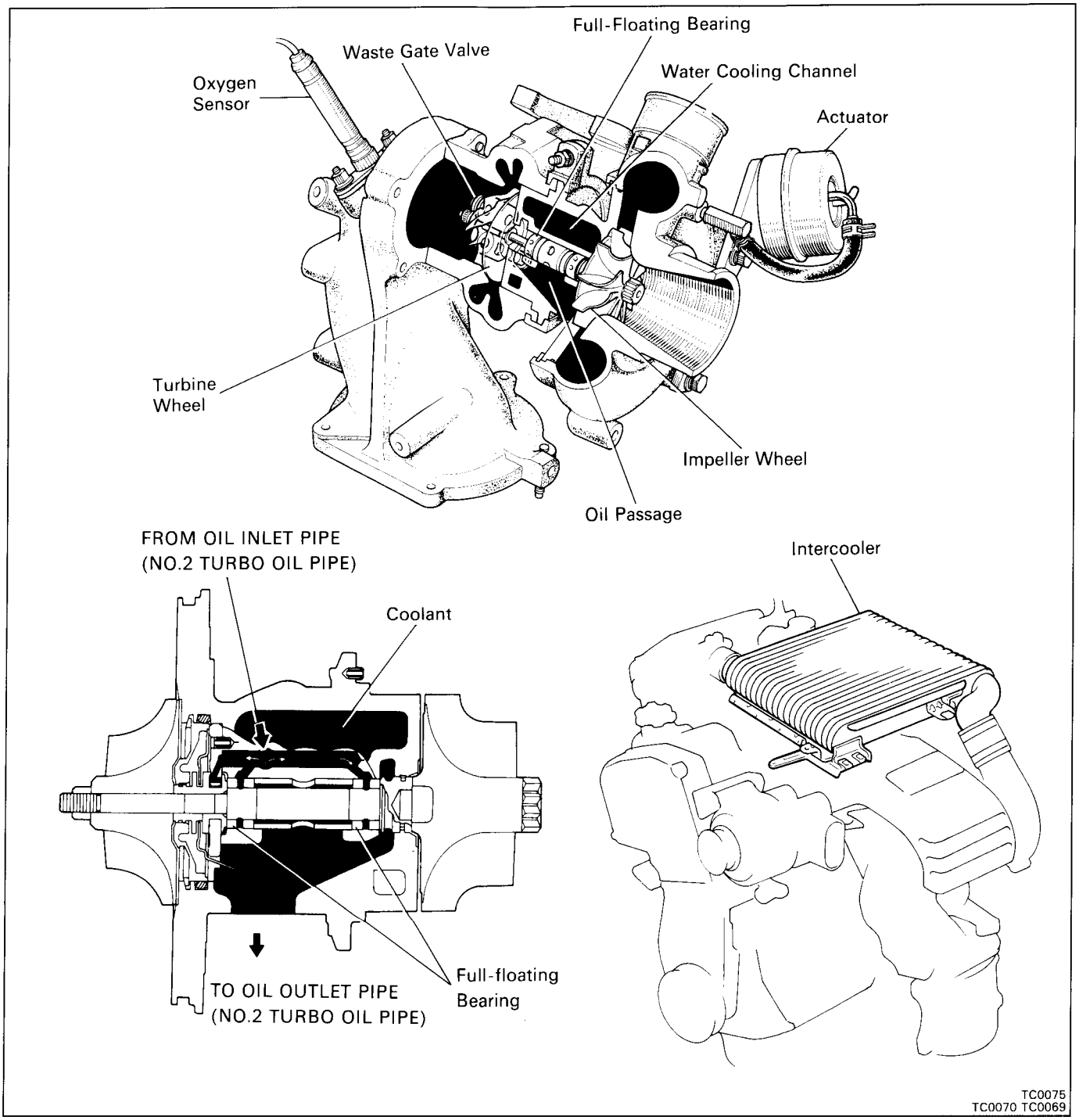
◆ Non-reusable part

EX0026

TURBOCHARGER

TC

DISCRIPTION

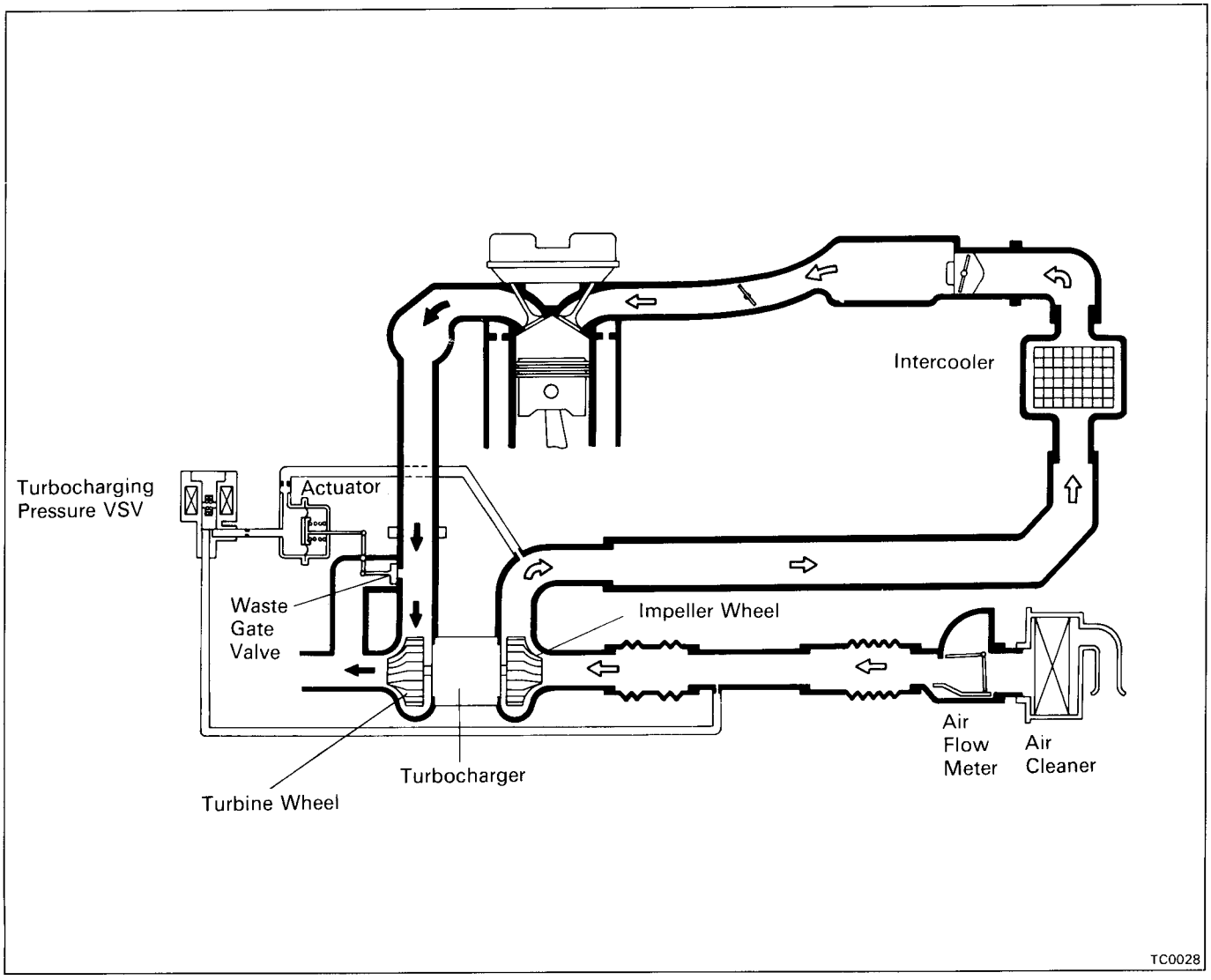


Systems which increase the amount of air sent to the engine are either turbocharger type (using exhaust gas to turn the turbine) or supercharger type (using the engine crankshaft, etc. to mechanically turn the pump, etc.). For CELICA 3S-GTE engine, the turbocharger type has been adopted.

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 trubine 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 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.

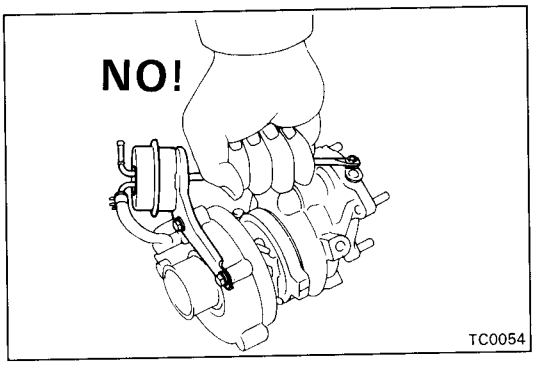
Intercooler

The intercooler 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 chamber falls and the occurrence of knocking is suppressed, giving an increase in engine output.

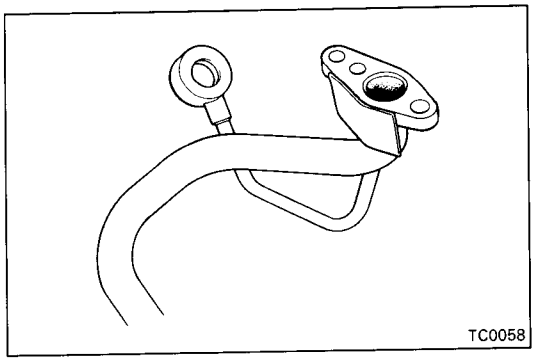
The Celica 3S-GTE intercooler is an air cooling type located at the top of the engine, utilizing the vehicle windstream to cool turbocharged air.

PRECAUTIONS

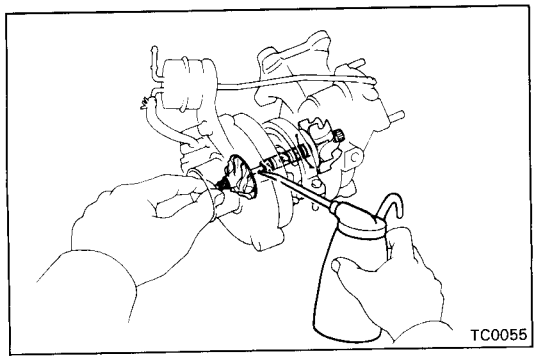
1. Do not stop the engine immediately after pulling a trailer or high speed or uphill driving. Idle the engine for 20 – 120 seconds, depending on the severity of the driving condition.
2. Avoid sudden racing or acceleration immediately after starting a cold engine.
3. If the engine is running with the air cleaner removed, entry of foreign material entering 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)
1. TURBOCHARGING PRESSURE TOO LOW	Check turbocharging pressure. (See page TC-8) **Turbocharging pressure:** **0.50 – 0.83 kg/cm^2** **(7.1 – 11.8 psi, 49 – 81 kPa)** If the pressure is below specification, begin diagnosis from item 2.
2. RESTRICTED INTAKE AIR SYSTEM	Check intake air system, and repair or replace parts as necessary. (See page TC-9)
3. LEAK IN INTAKE AIR SYSTEM	Check intake air system, and repair or replace parts as necessary. (See page TC-9)
4. RESTRICTED EXHAUST SYSTEM	Check exhaust system, and repair or replace parts as necessary. (See page TC-9)
5. LEAK IN EXHAUST SYSTEM	Check exhaust system, and repair or replace parts as necessary. (See page TC-9)
6. ERRATIC TURBOCHARGER OPERATION	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.

ABNORMAL NOISE

(Possible Cause)	(Check Procedure and Correction Method)
1. TURBOCHARGING HEAT INSULATOR RESONNANCE	Check for loose, improperly installed or deformed insulator mount bolts, and repair or replace as necessary.
2. EXHAUST PIPE LEAKING OR VIBRATING	Check for deformed exhaust pipe, loose mount 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 OF TURBOCHARGER

1. INSPECT INTAKE AIR SYSTEM

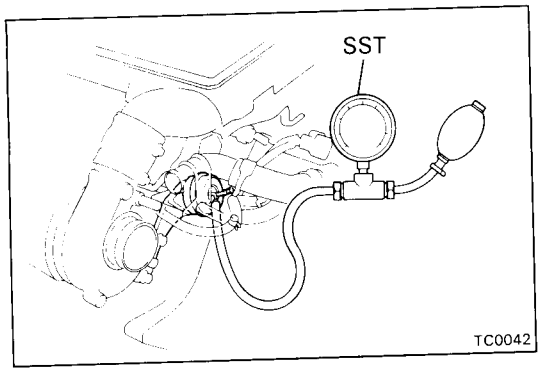
Check for leakage or clogging between the air cleaner and turbocharger inlet and between the turbocharger outlet and cylinder head.

- Clogged air cleaner ..... Clean or replace element
- 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

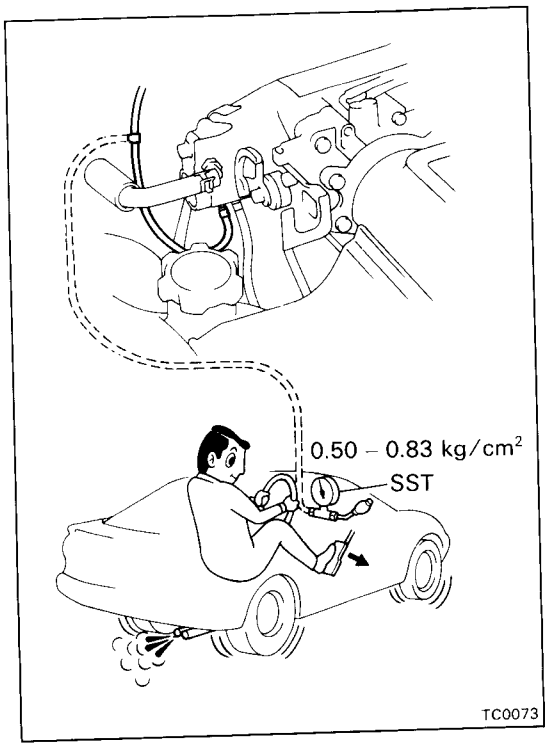
(a) Disconnect the actuator hose.

(b) Using SST (turbocharger pressure gauge), apply approx. 0.62 kg/cm^2 (8.8 psi, 61 kpa) 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 0.83 kg/cm^2 (11.8 psi, 81 kPa) of pressure to the actuator.



4. CHECK TURBOCHARGING PRESSURE

(a) Using a 3-way connector, connect SST (turbocharger pressure gauge) to the hose between the intake manifold and turbocharging pressure sensor.

SST 09992-00241

(b) 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: 0.50 – 0.83 kg/cm^2 (7.1 – 11.8 psi, 49 – 81 kPa)

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.

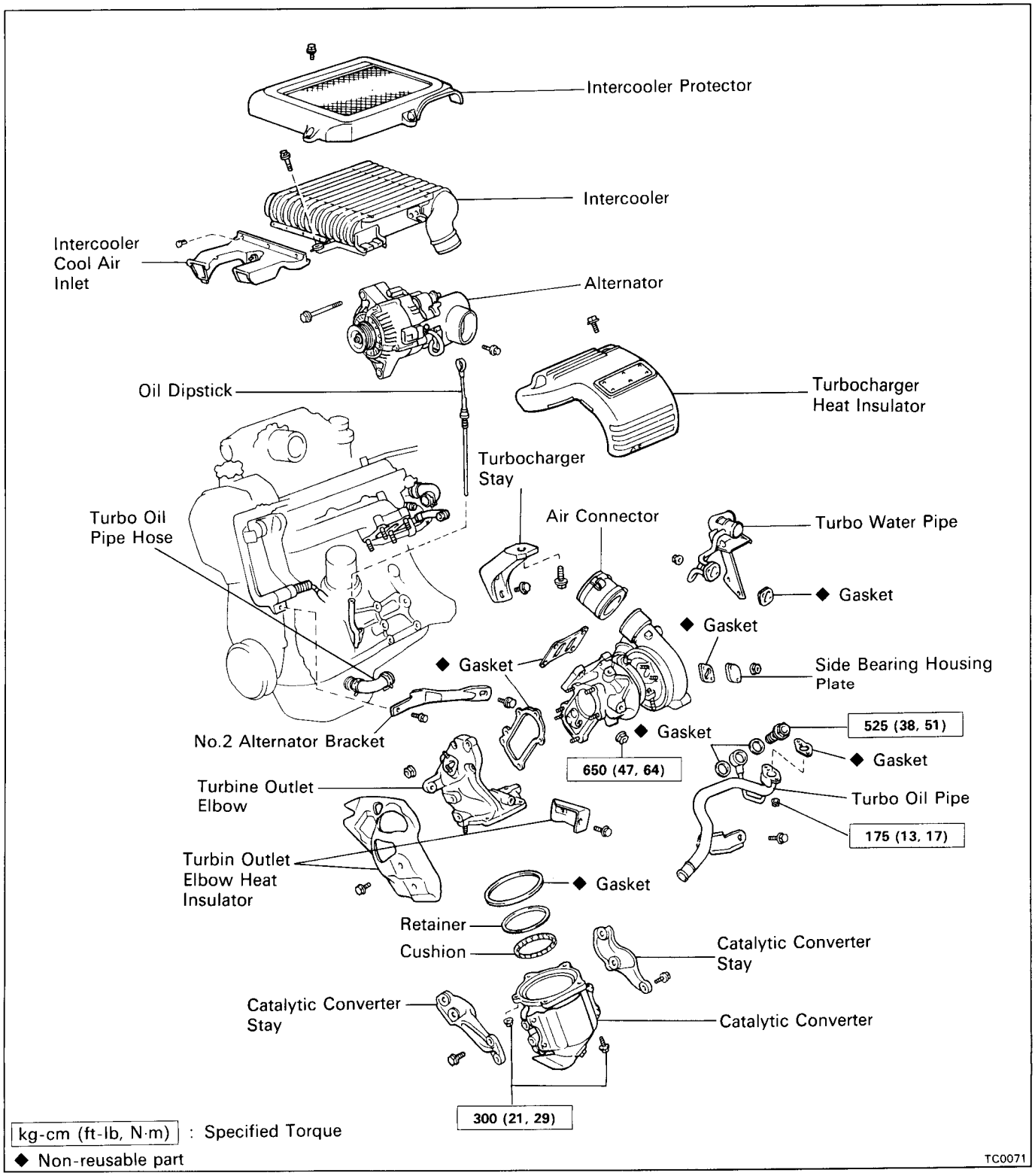
If the pressure is above specification, check if the actuator hose is disconnected or cracked. If not, replace the turbocharger assembly.

5. **INSPECT IMPELLER WHEEL ROTATION**
(See step 1 on page TC-13)

6. **INSPECT TURBOCHARGING PRESSURE VSV**
(See page FI-87)

7. **INSPECT TURBOCHARGING PRESSURE SENSOR**
(See page FI-89)

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-4)

4. REMOVE AIR CLEANER CAP
   (See step 7 on page EM-75)

5. REMOVE SUSPENSION LOWER CROSSMEMBER
   (See step 32 on page EM-79)

6. REMOVE FRONT EXHAUST PIPE
   (See step 33 on page EM-80)

7. REMOVE ENGINE MOUNTING CENTER MEMBER
   (See step 41 on page EM-80)

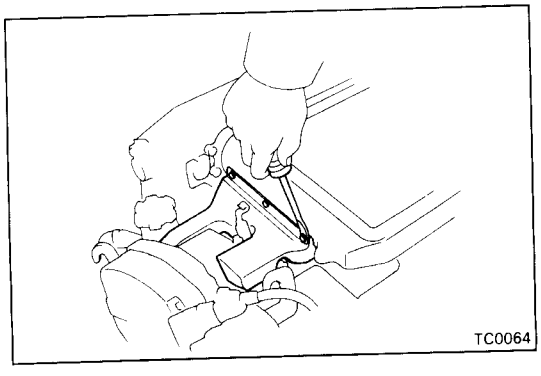
8. REMOVE FRONT MOUNTING INSULATOR AND BRACKET
   (See step 42 on page EM-81)

9. REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE
   (See step 26 on page EM-78)

10. REMOVE ALTERNATOR
    (See steps 2 to 6 on pages CH-5 and 6)

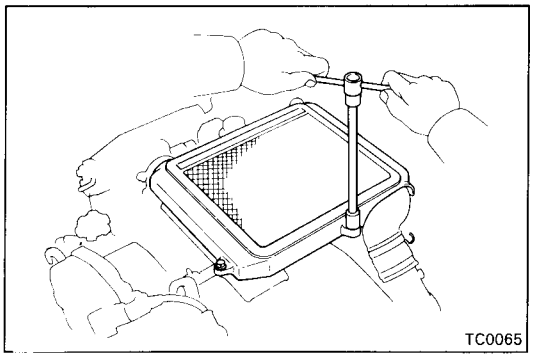
11. REMOVE IDLER PULLEY BRACKET AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
    (See step 39 on page EM-80)

12. REMOVE CATALYTIC CONVERTER
    (See step 11 on pages EM-42 and 43)



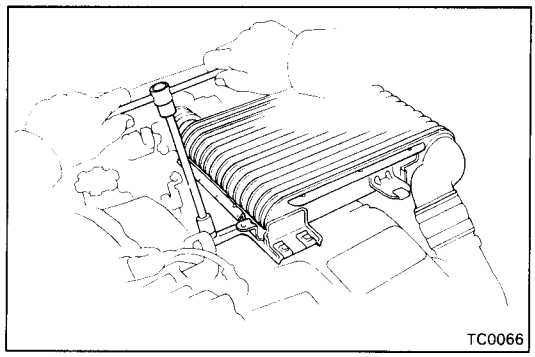
13. REMOVE INTERCOOLER COOL AIR INLET

    Using a clip remover, remove the seven clips and air inlet.



14. REMOVE INTERCOOLER PROTECTOR

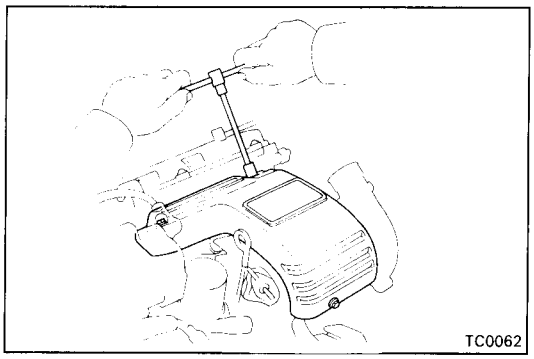
Remove the three bolts and protector.



15. REMOVE INTERCOOLER

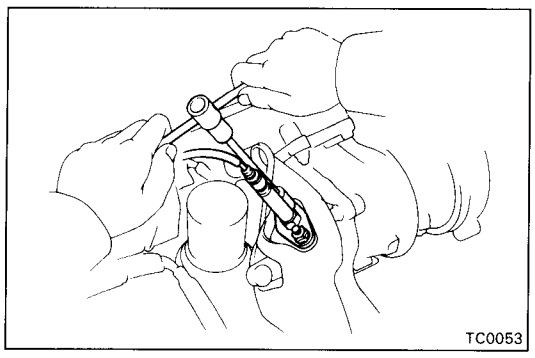
(a) Remove the two bolts.

(b) Disconnect the intercooler from the turbocharger and intake air connector, and remove the intercooler and air connector.



16. REMOVE TURBOCHARGER HEAT INSULATOR

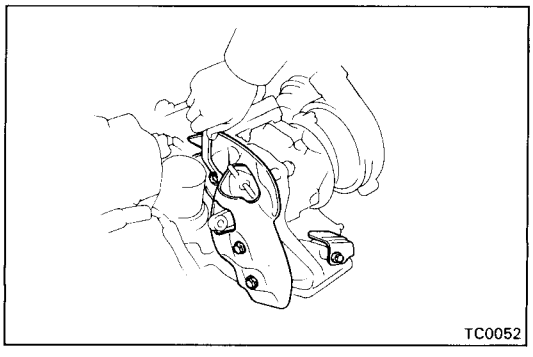
Remove the three bolts and heat insulator.



17. REMOVE OXYGEN SENSOR

(a) Disconnect the oxygen sensor connector.

(b) Remove the two nuts, oxygen sensor and gasket.

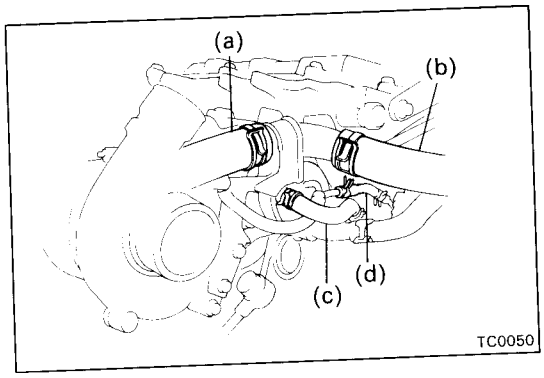


18. REMOVE HEAT INSULATORS OF TURBINE OUTLET ELBOW

(a) Remove the oil dipstick.

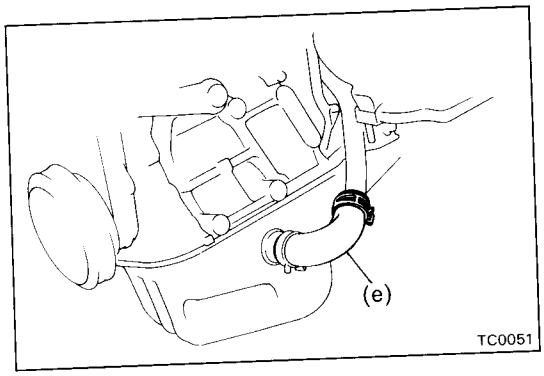
(b) Remove the three bolts and RH heat insulator.

(c) Remove the two bolts and LH heat insulator.

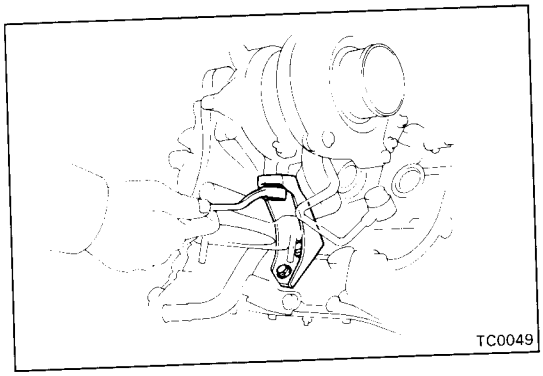


19. DISCONNECT HOSES

(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

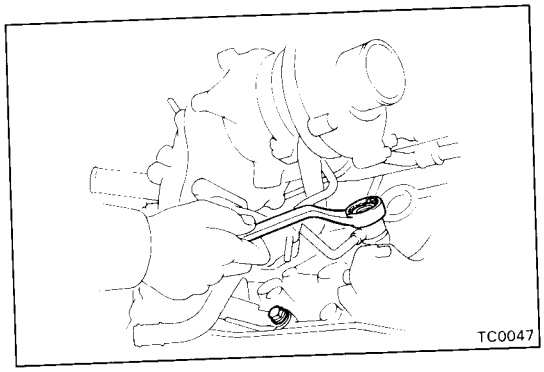


(e) Oil hose from turbo oil pipe



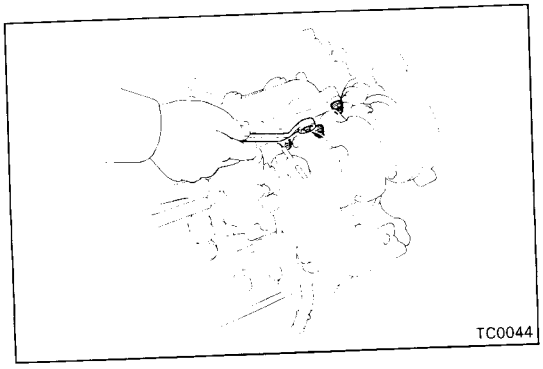
20. REMOVE TURBOCHARGER STAY

Remove the three bolts and turbocharger stay.

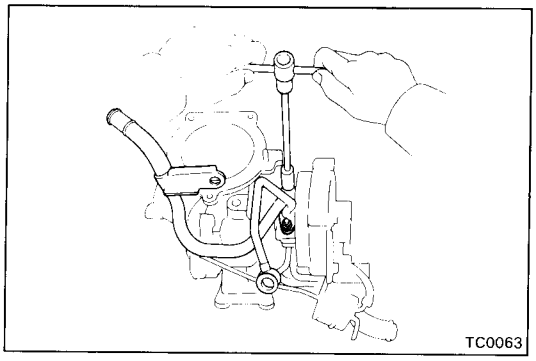


21. REMOVE TURBOCHARGER

(a) Remove the bolt and union bolt holding the No.1 turbo oil pipe to the cylinder block. Remove the two union bolt gaskets.

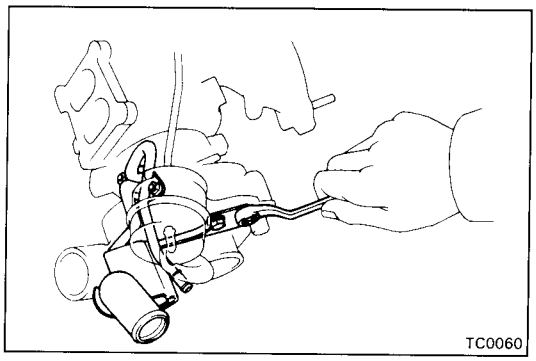


(b) Remove the four nuts, turbocharger and gasket.



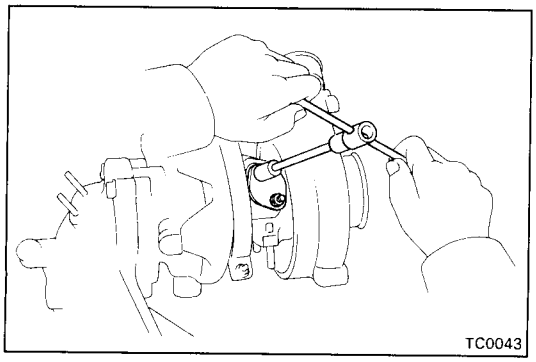
22. REMOVE TURBO OIL PIPE

Remove the two nuts, oil pipe and gasket.



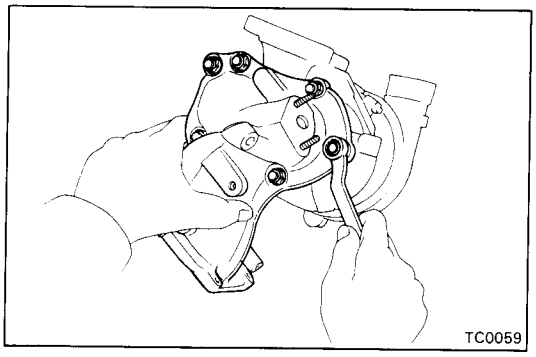
23. REMOVE TURBO WATER PIPE

Remove the two nuts, two bolts, water pipe and gasket.



24. REMOVE SIDE BEARING HOUSING PLATE

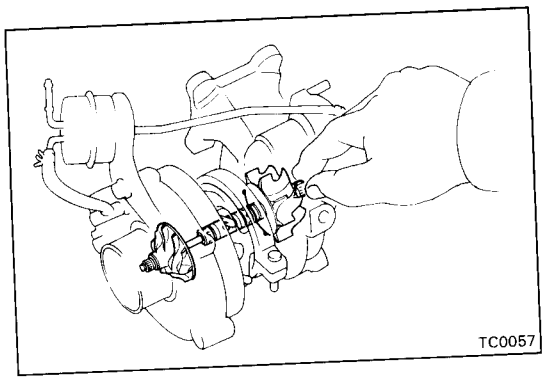
Remove the two nuts, housing plate and gasket.



25. REMOVE TURBINE OUTLET ELBOW

Remove the six nuts, outlet elbow and gasket.

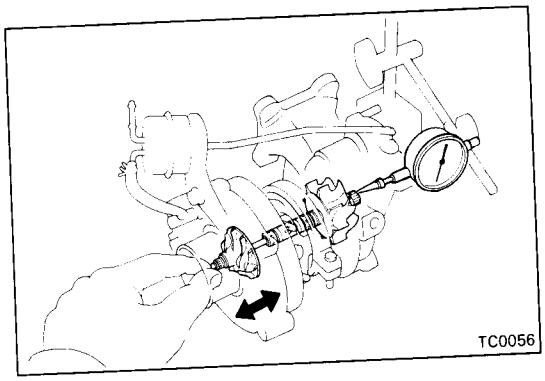
INSPECTION OF TURBOCHARGER



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.

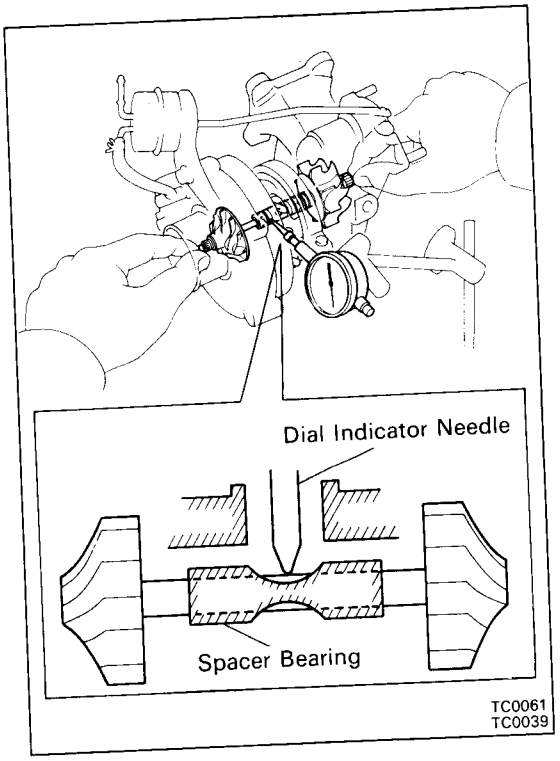


2. INSPECT AXIAL PLAY OF IMPELLER WHEEL

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 directio, and measure the radial play of the impeller shaft.

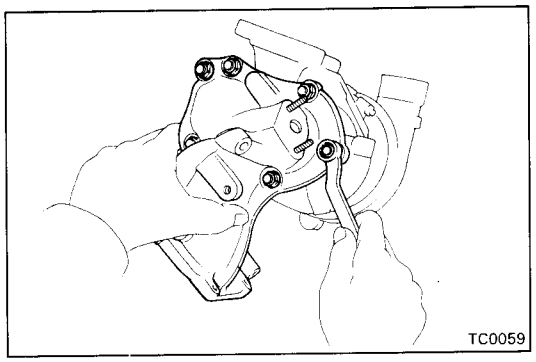
Standard clearance: 0.18 mm (0.0071 in.) or less

If the radial play is not as specified, replace the turbocharger assembly.

INSTALLATION OF TURBOCHARGER

(See page TC-8)

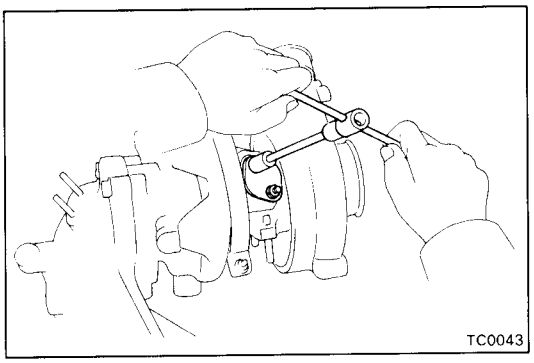
NOTICE: After replacing the turbocharger assembly, pour approx. 20 cc (1.2 cu in.) of new oil into the oil inlet and turn the impeller wheel by hand to splash oil on the bearing.



1. **INSTALL TURBINE OUTLET ELBOW**

   Install a new gasket and the outlet elbow with the six nuts.

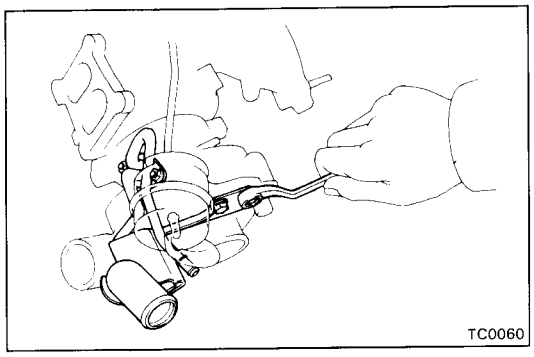
   Torque: 650 kg-cm (47 ft-lb, 64 N·m)



2. **INSTALL SIDE BEARING HOUSING PLATE**

   Install a new gasket and the housing plate with the two nuts.

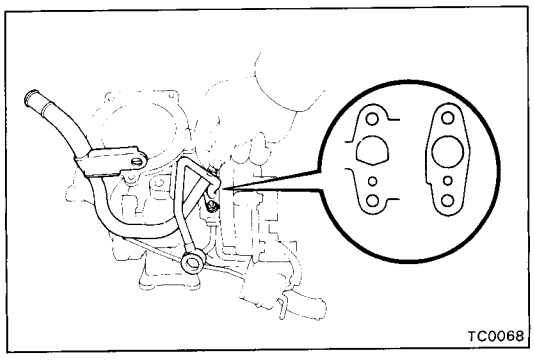
   Torque: 120 kg-cm (9 ft-lb, 11 N·m)



3. **INSTALL TURBO WATER PIPE**

   Install a new gasket and the water pipe with the two nuts and two bolts.

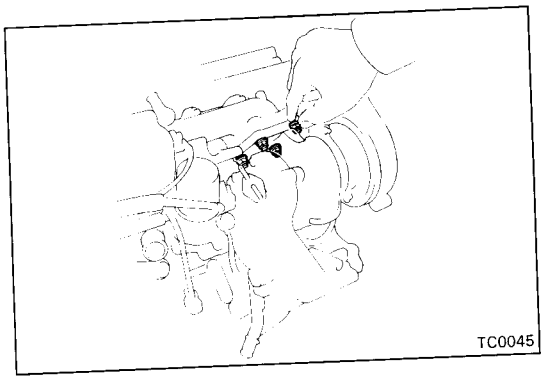
   Torque: 120 kg-cm (9 ft-lb, 11 N·m)



4. **INSTALL TURBO OIL PIPE**

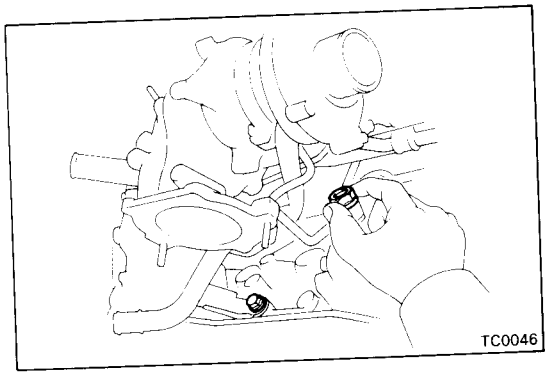
   (a) Align the oil holes of a new gasket and the turbocharger housing.

   (b) Install the gasket and oil pipe with the two nuts. Do not torque the nuts yet.

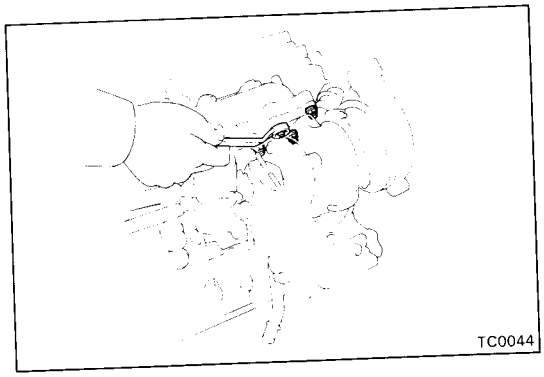


5. **INSTALL TURBOCHARGER**

(a) Install a new gasket and the turbocharger with the four nuts. Do not torque the nuts.

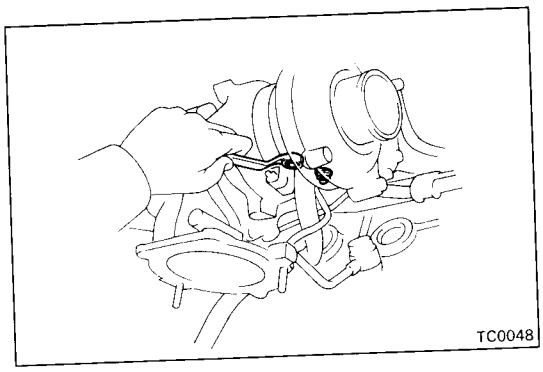


(b) Install the oil pipe with the bolt, two new gaskets and union bolt. Do not torque the bolt and union bolt.



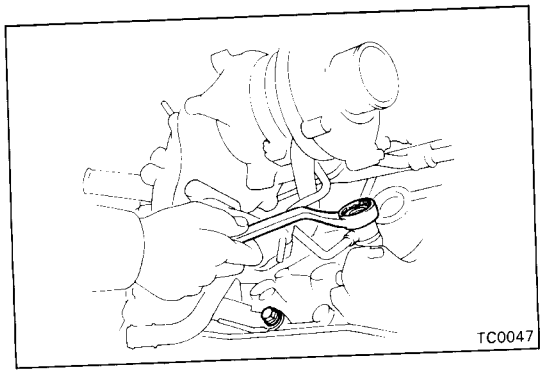
(c) Tighten the four nuts holding the turbocharger to the exhaust manifold.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)



(d) Tighten the two nuts holding the oil pipe to the turbocharger.

Torque: 175 kg-cm (13 ft-lb, 17 N·m)

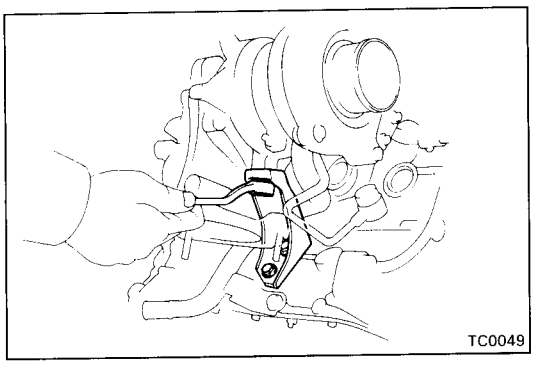


(e) Tighten the union bolt holding the oil pipe to the cylinder block.

Torque: 525 kg-cm (38 ft-lb, 51 N·m)

(f) Tighten the bolt holding the bracket of the oil pipe to the cylinder block.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)

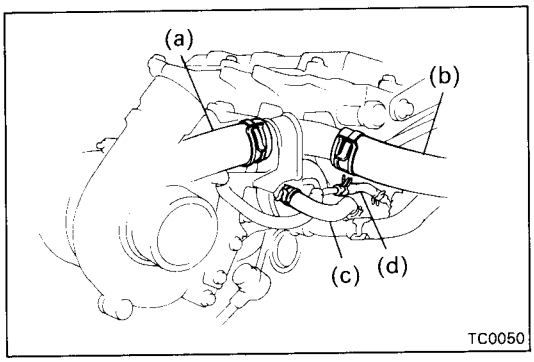


6. **INSTALL TURBOCHARGER STAY**

Install the turbocharger stay with the three bolts.

Torque:

To turbocharger	**705 kg-cm (51 ft-lb, 69 N·m)**
To cylinder block	**600 kg-cm (43 ft-lb, 59 N·m)**



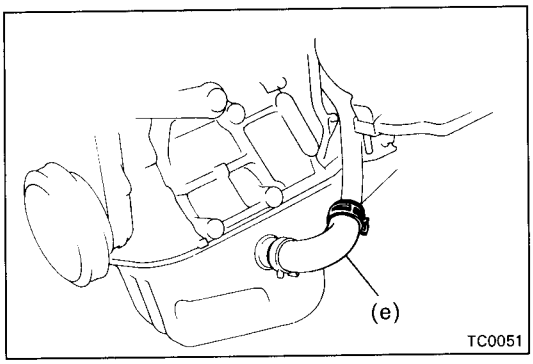
7. **CONNECT HOSES**

(a) Water hose from radiator

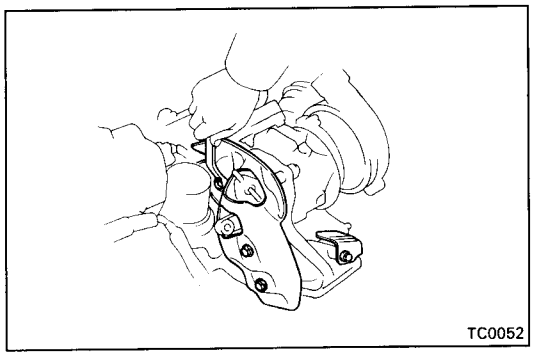
(b) Water hose from water inlet

(c) Water by-pass hose from turbo water pipe

(d) Vacuum hose from actuator



(e) Oil hose from turbo oil pipe

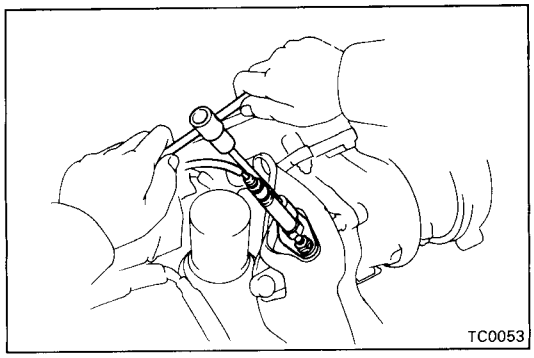


8. **INSTALL HEAT INSULATORS OF TURBINE OUTLET ELBOW**

(a) Install the RH heat insulator with the three bolt.

(b) Install the LH heat insulator with the two bolt.

(c) Install the oil dipstick gauge.

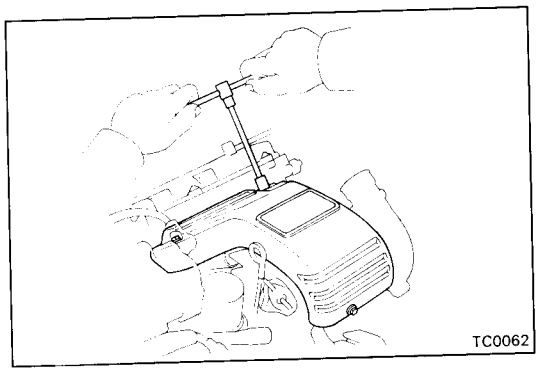


9. **INSTALL OXYGEN SENSOR**

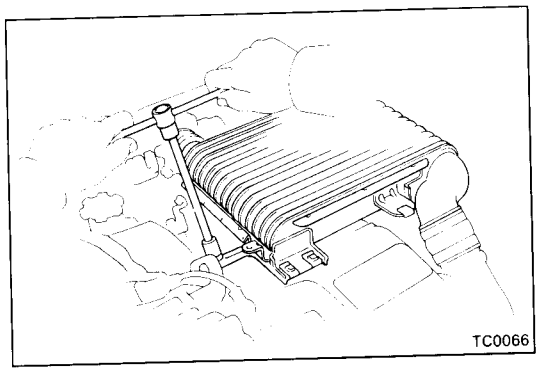
(a) Install a new gasket and the oxygen sensor with the two nuts.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

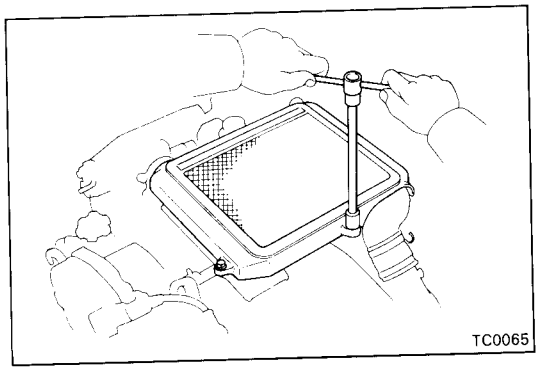
(b) Connect the oxygen sensor connector.



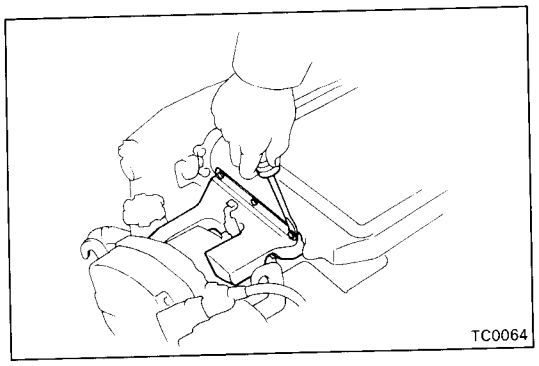
10. **INSTALL TURBOCHARGER HEAT INSULATOR**
Install the heat insulator with the three bolt.



11. **INSTALL INTERCOOLER**
Connect the intercooler to the turbocharger and intake air connector, and install the intercooler with the two bolts.



12. **INSTALL INTERCOOLER PROTECTOR**
Install the protector with the three bolt.



13. **INSTALL INTERCOOLER COOL AIR INLET**
Install the cool air inlet with the seven clips.

14. **INSTALL CATALYTIC CONVERTER**
(See step 30 on page EM-72)

15. **INSTALL A/C COMPRESSOR AND IDLER PULLEY BRACKET**
(See step 12 on page EM-112)

16. **INSTALL ALTERNATOR**
(See steps 2 to 6 on pages CH-6 and 7)

17. **INSTALL CLUTCH RELEASE CYLINDER**
(See step 25 on page EM-114)

18. INSTALL FRONT MOUNTING BRACKET AND NSULATOR
(See step 7 on page EM-111)

19. INSTALL ENGINE MOUNTING CENTER MEMBER
(See steps 9 and 10 on page EM-111)

20. INSTALL FRONT EXHAUST PIPE
(See step 18 on page EM-112)

21. INSTALL SUSPENSION LOWER CROSSMEMBER
(See step 19 on page EM-113)

22. INSTALL AIR CLEANER CAP
(See step 44 on page EM-117)

23. FILL ENGINE WITH COOLANT (See page CO-4)
Capacity (w/ Heater):
6.4 liters (6.8 US qts, 5.6 Imp. qts)

24. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

25. START ENGINE AND CHECK FOR LEAKS

26. CHECK ENGINE OIL LEVEL

27. REMOVE ENGINE UNDER COVERS

EMISSION CONTROL SYSTEMS

NOTE: TROUBLESHOOTING (See pages EM-4 to 7)

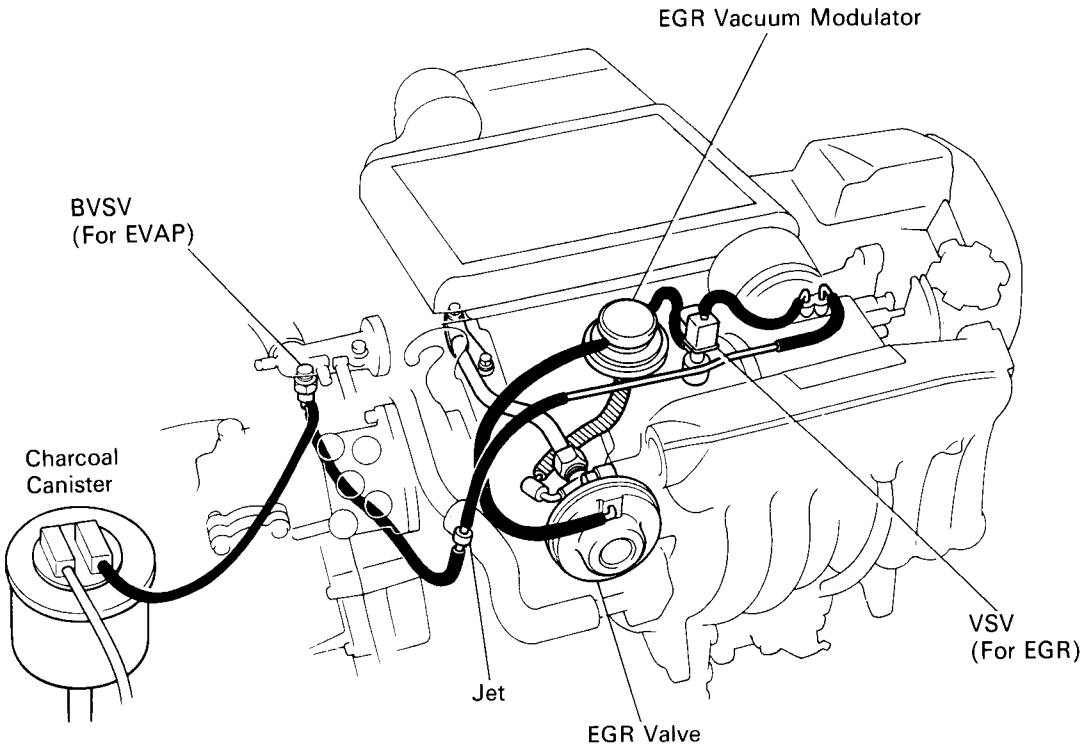
EC

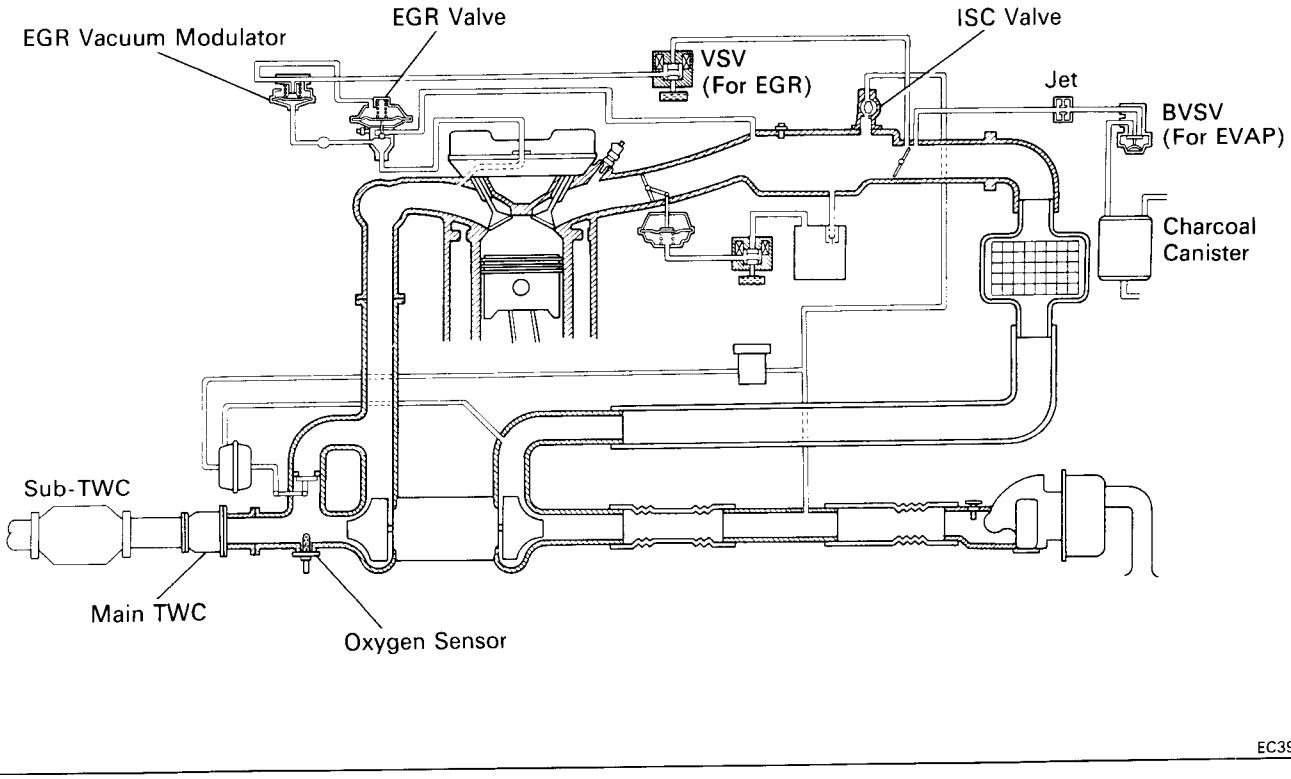
SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive Crankcase ventilation	PCV	Reduces blow-by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three-way catalyst	TWC	Reduces HC, CO and NOx
Electronic fuel injection*	EFI	Regulates all engine conditions for reduction of exhaust emissions.

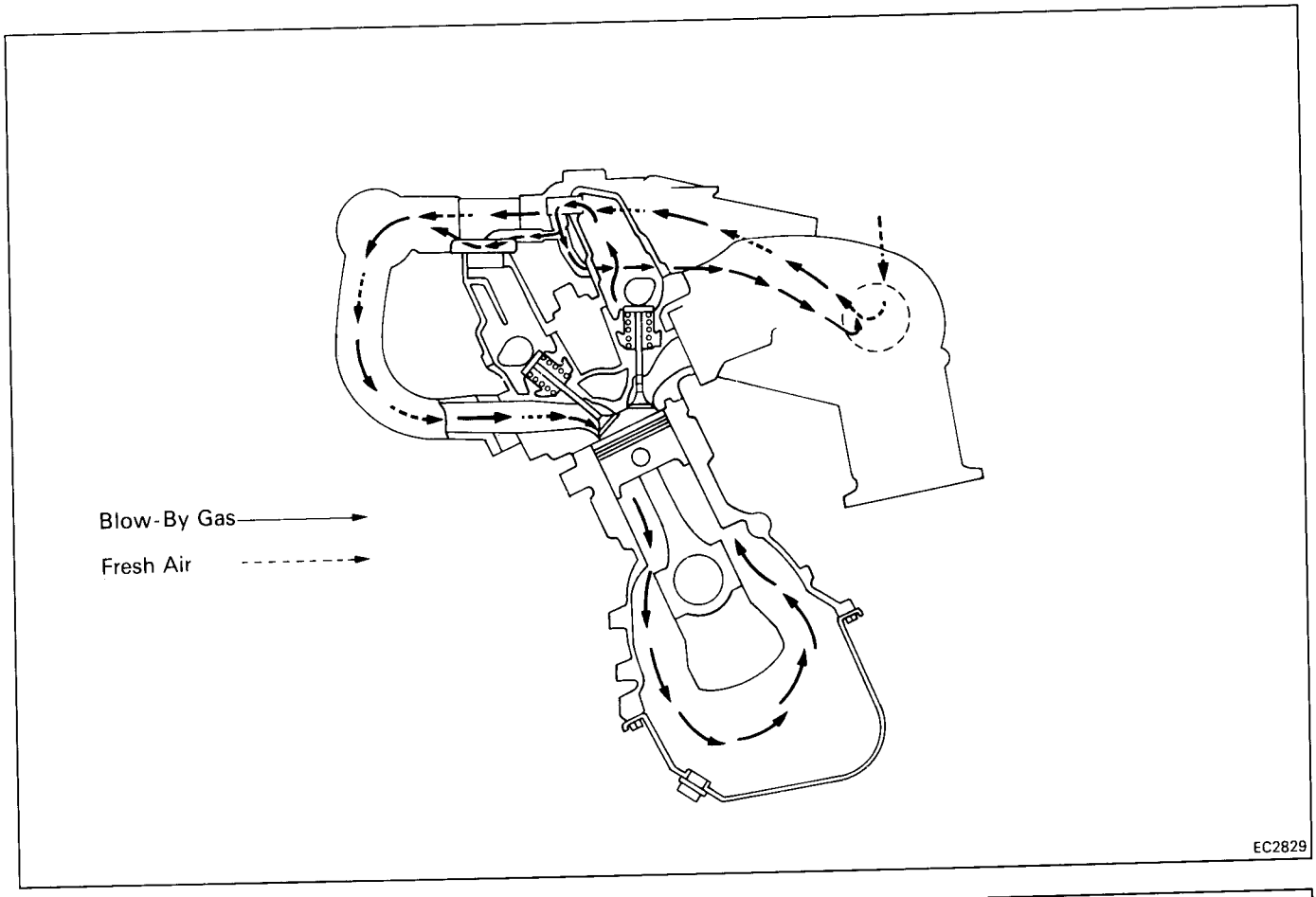
Remarks * For inspection and repair of the EFI system, refer to EFI section of this manual.

COMPONENT LAYOUT AND SCHEMATIC DRAWING

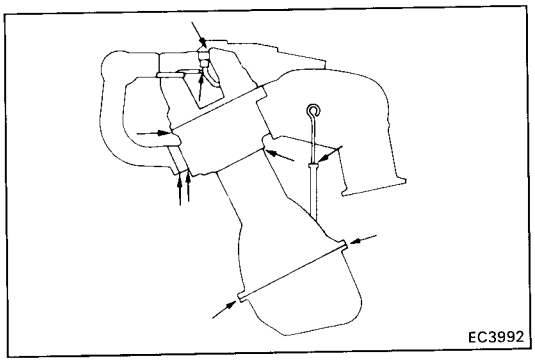




POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emissions, crankcase blow-by gas (HC) is routed to the intake manifold for combustion in the cylinders.

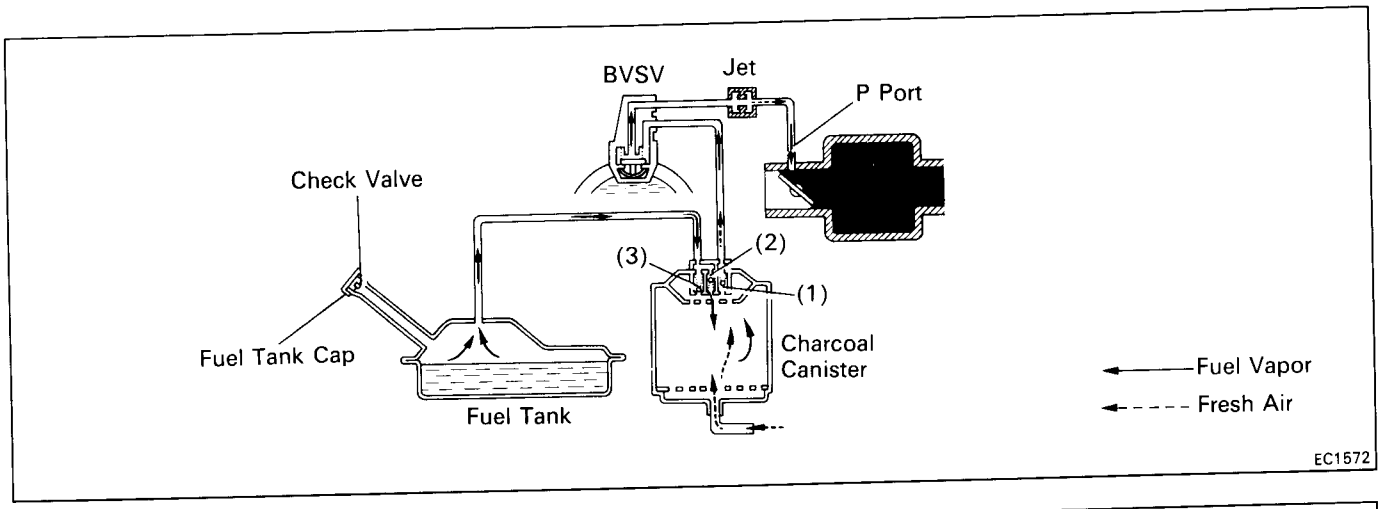


INSPECTION OF PCV HOSE AND CONNECTIONS

VISUALLY INSPECT HOSE AND CONNECTIONS

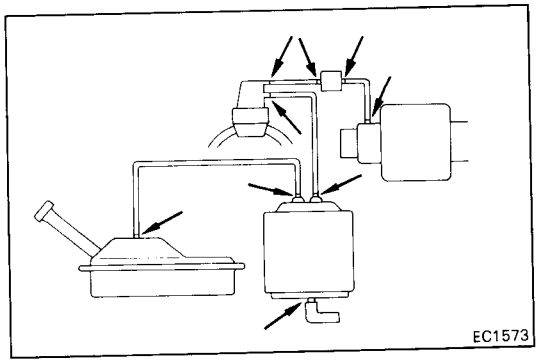
Check for cracks, leaks or damage.

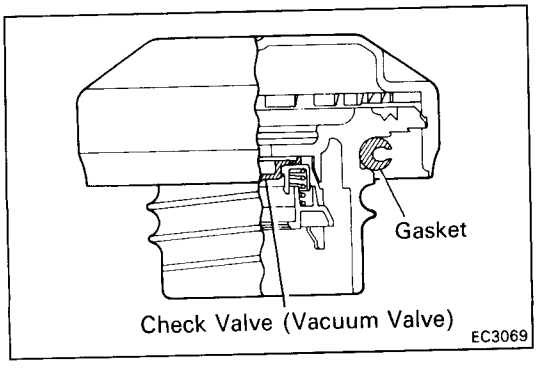
FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



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.

Coolant Temp.	BVSV	Throttle Valve Opening	Canister Check Valve (1)	Canister Check Valve (2)	Canister Check Valve (3)	Check valve in Cap	Evaporated Fuel (HC)
Below 35°C (95°F)	CLOSED	–	–	–	–	–	HC from tank is absorbed into the canister.
Above 54°C (129°F)	OPEN	Positioned below P port	CLOSED	–	–	–	
		Positioned above P port	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.



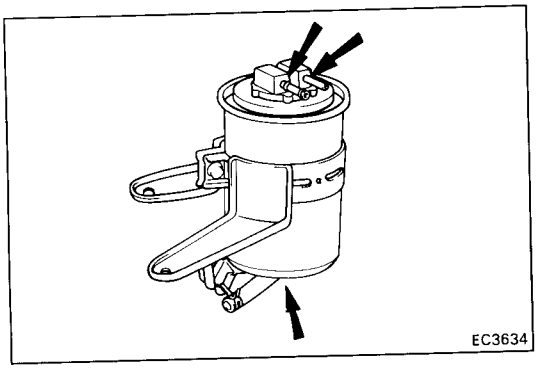


INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

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.

3. **VISUALLY INSPECT FUEL TANK CAP**
   Check if the cap and/or gasket are deformed or damaged.
   If necessary, repair or replace the cap.

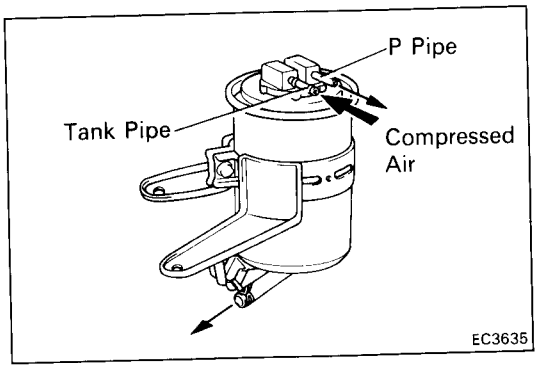


INSPECTION OF CHARCOAL CANISTER

1. **REMOVE CHARCOAL CANISTER**

2. **VISUALLY INSPECT CHARCOAL CANISTER**

   Look for cracks or damage.

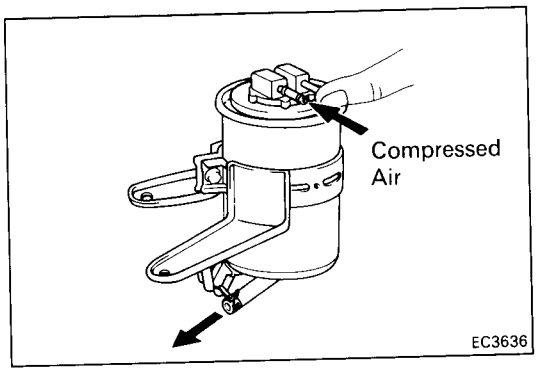


3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

   (a) Using low pressure compressed air, blow into the tank port and check that air flows without resistance from the other ports.

   (b) Blow into the P port and check that air does not flow from the other ports.

   If a problem is found, replace the charcoal canister.

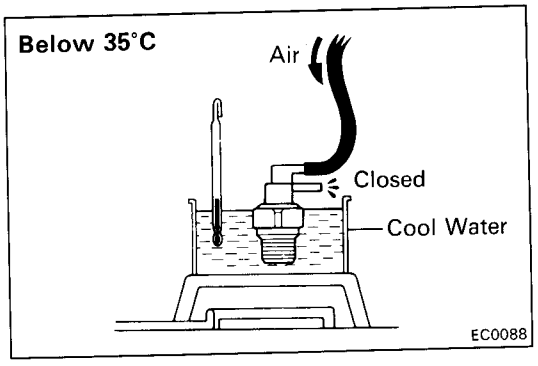


4. **CLEAN FILTER IN CANISTER**

   Clean the filter by blowing 3 kg/cm^2 (43 psi, 294 kPa) of compressed air into the tank port while holding the other upper canister port closed.

   NOTICE:
   - **Do not attempt to wash the canister.**
   - **No activated carbon should come out.**

5. **REINSTALL CHARCOAL CANISTER**



INSPECTION OF BVSV

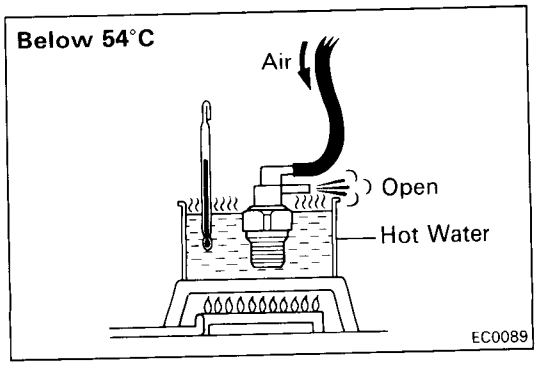
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV from the water outlet.

(c) Cool the BVSV to below 35°C (95°F) with cool water.

(d) Blow air into a pipe and check that the BVSV is closed.



(e) Heat the BVSV to above 54°C (129°F) with hot water.

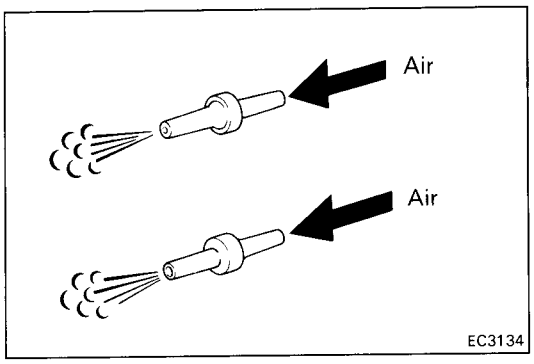
(f) Blow air into a pipe and check that the BVSV is open.

If a problem is found, replace the BVSV.

(g) Apply adhesive to two or three threads of the BVSV, and reinstall.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

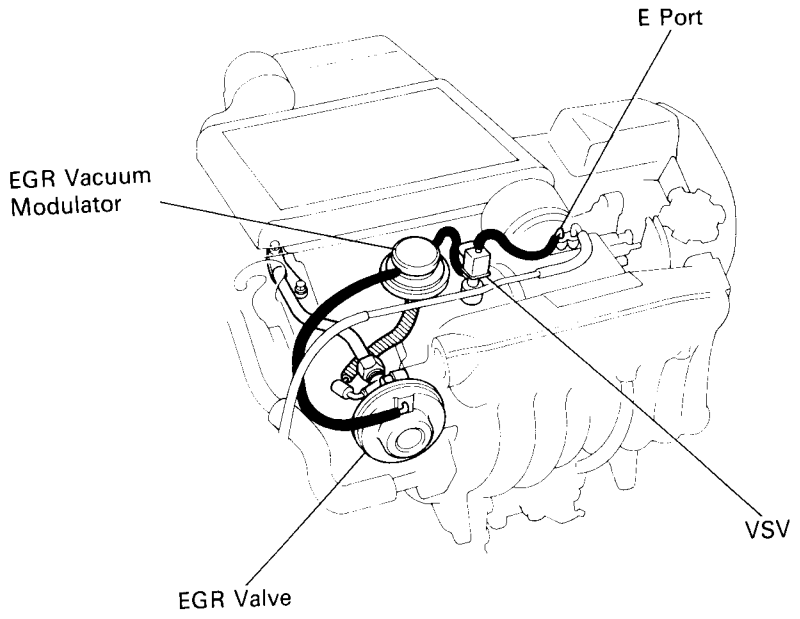
(h) Refill the radiator with coolant.



INSPECTION OF JET

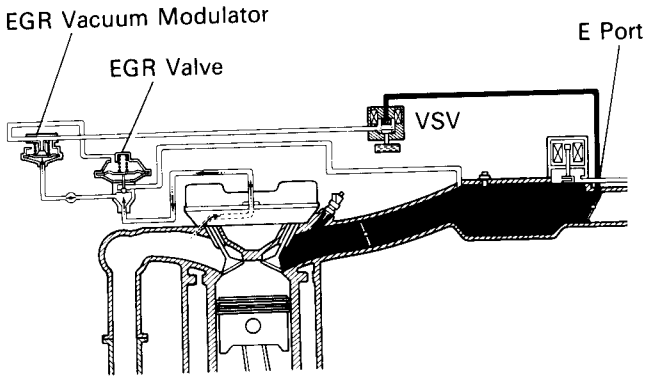
1. **INSPECT JET BY BLOWING AIR FROM EACH SIDE**
   Check for stoppage.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM



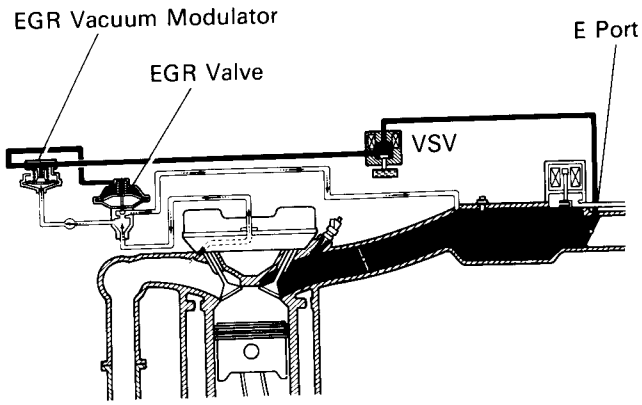
EC3994

(1)



EC2834

(2)

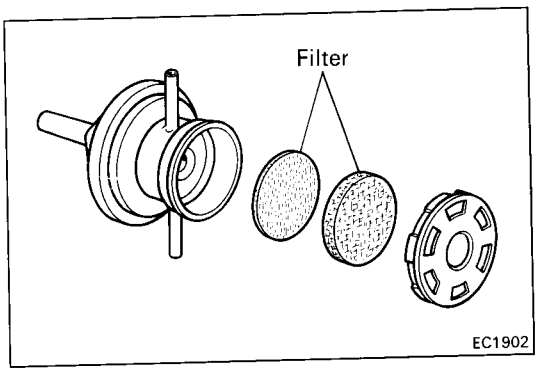


EC2833

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.

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 E port	(1)	–	–	CLOSED	Not recirculated
		Positioned below E port	(2)	*	CLOSED passage to atmosphere	OPEN	Recirculated (increase)

Remarks: * When the throttle valve is positioned above the E port, 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.



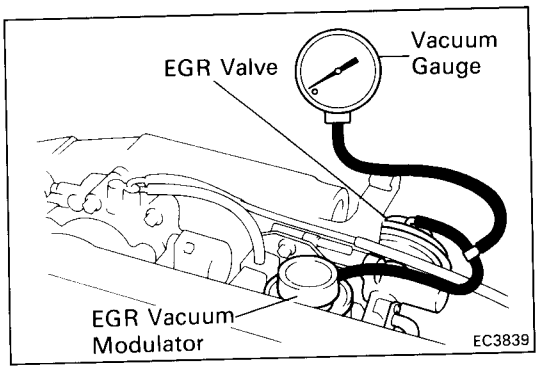
INSPECTION OF EGR SYSTEM

1. CHECK 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).

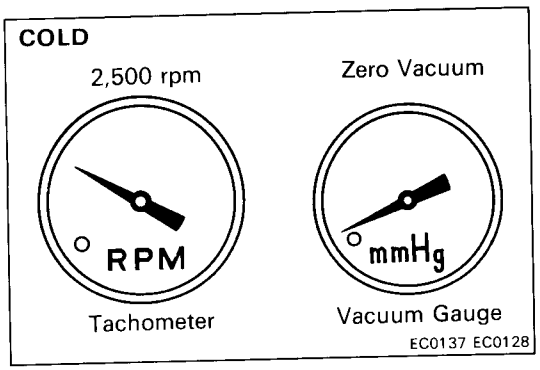


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum modulator.

3. CHECK SEATING OF EGR VALVE

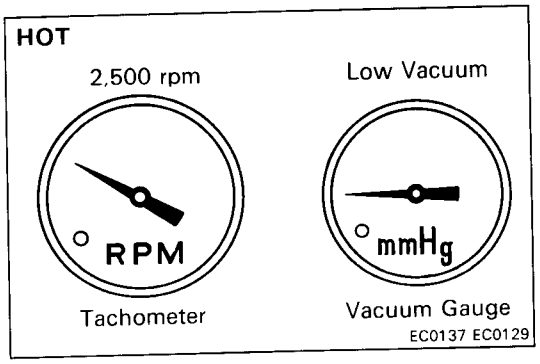
Start the engine and check that the engine starts and runs at idle.



4. CHECK VSV WITH COLD ENGINE

(a) The coolant temperature should be below 54°C (129°F).

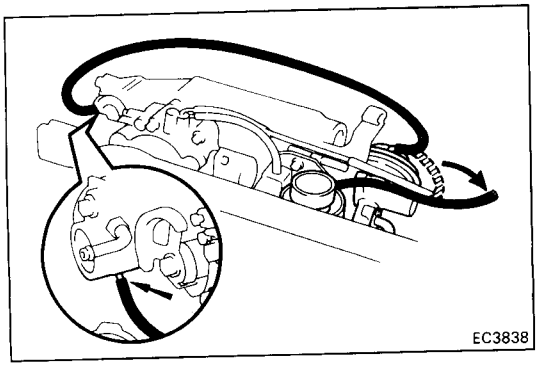
(b) Check that the vacuum gauge indicates zero vacuum at 2,500 rpm.



5. CHECK VSV WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm.



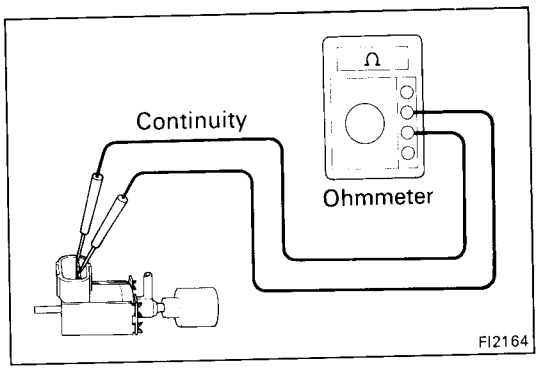
6. CHECK EGR VALVE

(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.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART



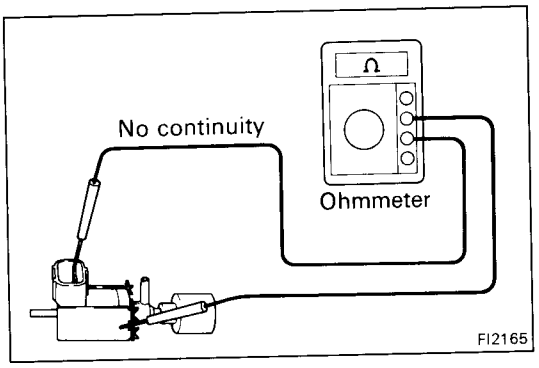
INSPECTION OF VSV

1. CHECK VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is conitnuity between the terminals.

Resistance (Cold): 33 – 39 Ω

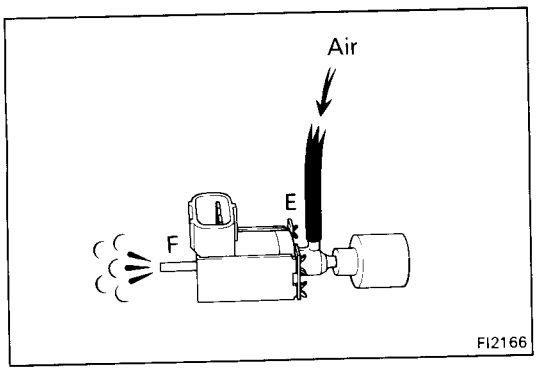
If there is no continuity, replace the VSV.



2. CHECK VSV FOR GROUND

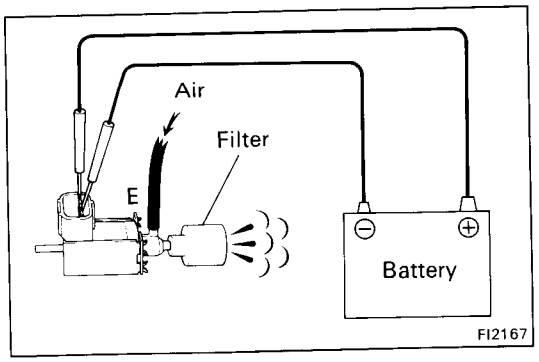
Using an ohmmeter, check that there is no conitnuity between each terminal and the body.

If there is continuity, replace the VSV.



3. CHECK VSV OPERATION

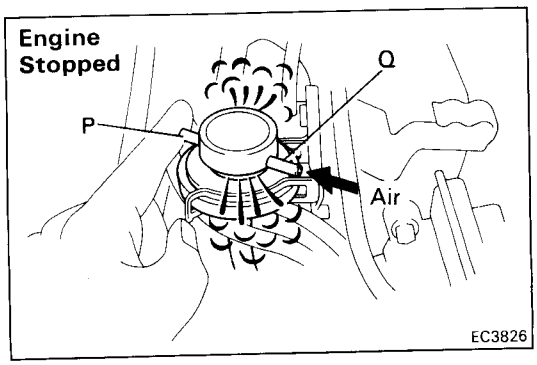
(a) Check that air flows from ports E to F.



(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.



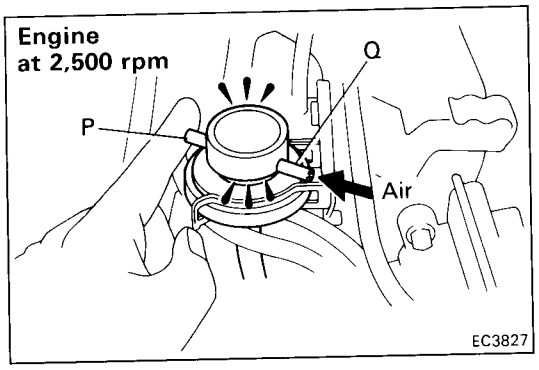
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(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**

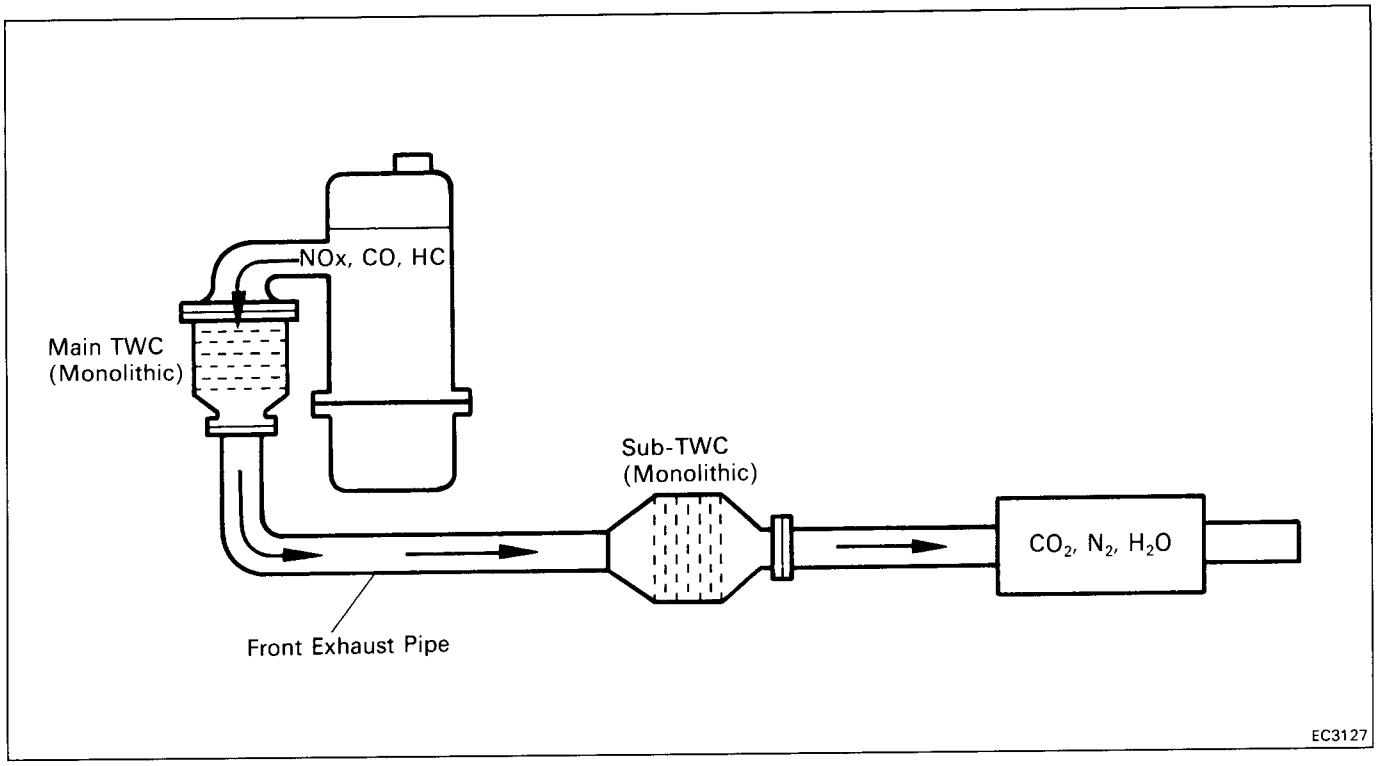
   Check for sticking and heavy carbon deposits.

   If a problem is found, replace the valve.

2. **REINSTALL EGR VALVE**

   Install a new gasket.

THREE-WAY CATALYST (TWC) SYSTEM

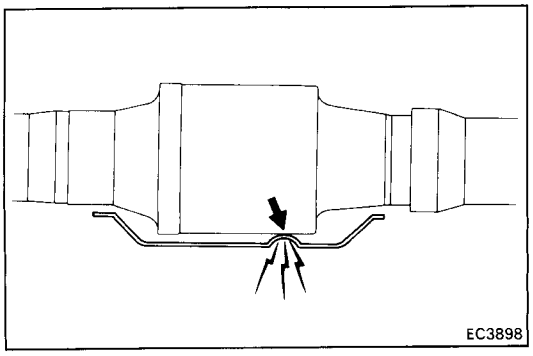


To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		Main TWC		Sub-TWC		Exhaust Gas
HC, CO AND NOx	→	OXIDATION AND REDUCTION	→	OXIDATION AND REDUCTION	→	CO_2 H_2O N_2

INSPECTION OF EXHAUST PIPE ASSEMBLY

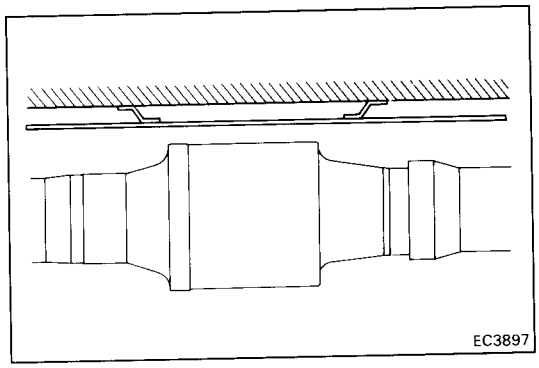
1. **CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE**
2. **CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE**



INSPECTION OF CATALYTIC CONVERTER (Sub-Catalytic Converter)

CHECK FOR DENTS OR DAMAGE

If any part of protector is damaged or dented to the extent that it contacts the converter, repair or replace it.


EC3897

INSPECTION OF HEAT INSULATOR (Sub-Catalytic Converter)

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

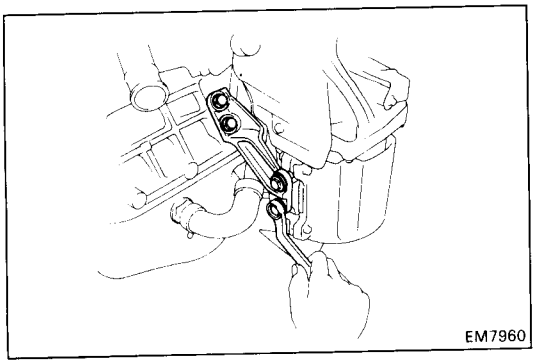
REPLACEMENT OF CATALYTIC CONVERTER

(Main Catalytic Converter)

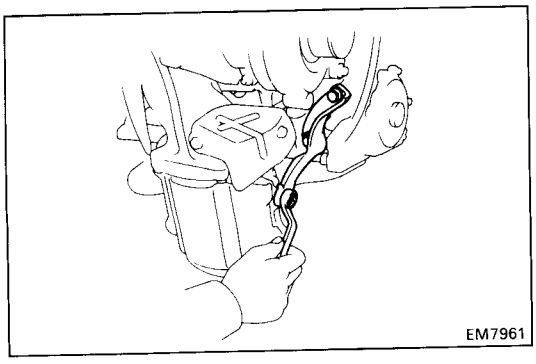
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

   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.

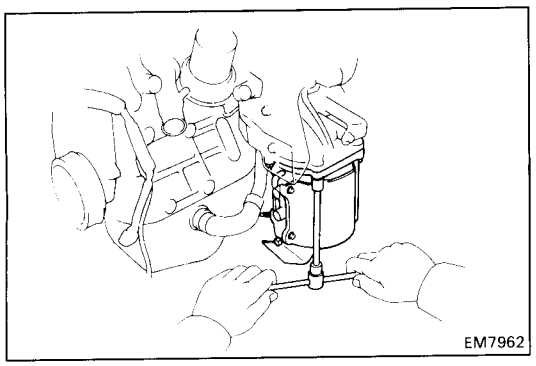
2. REMOVE ENGINE UNDER COVERS
3. REMOVE FRONT EXHAUST PIPE
   (See step 2 on page EC-16)
4. REMOVE ALTERNATOR
   (See steps 2 to 6 on pages CH-5 and 6)
5. REMOVE IDLER PULLEY BRACKET AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
   (See step 39 on page EM-80)


EM7960

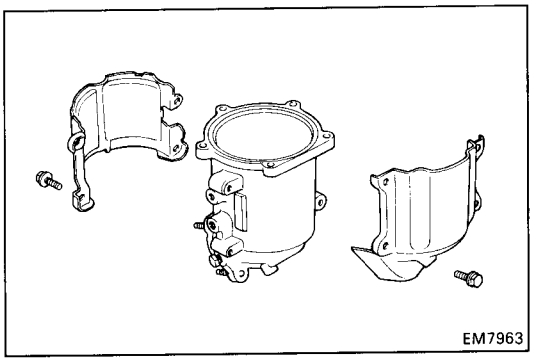
6. REMOVE MAIN CATALYTIC CONVERTER
   (a) Check that the converter is cool.
   (b) Remove the four bolts and RH converter stay.


EM7961

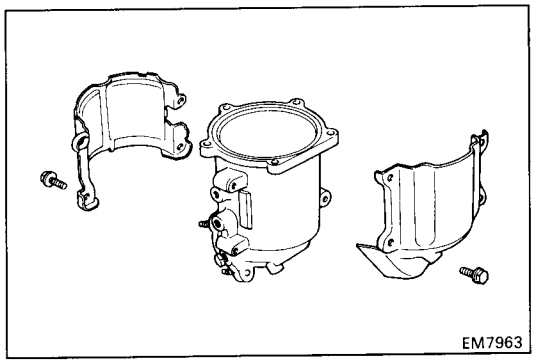
   (c) Remove the three bolts and LH converter stay.



(d) Remove the three bolts, two nuts, converter, gasket, retainer and cushion.

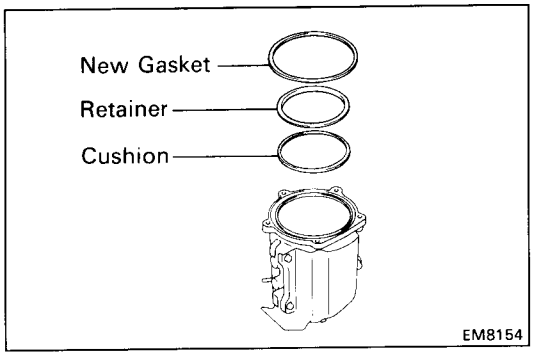


(e) Remove the nine bolts and two heat insulator from the converter.

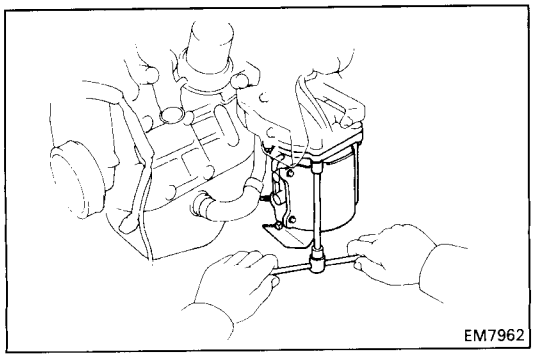


7. REINSTALL MAIN CATALYTIC CONVERTER

(a) Install the two heat insulators to a new converter with the nine bolts.

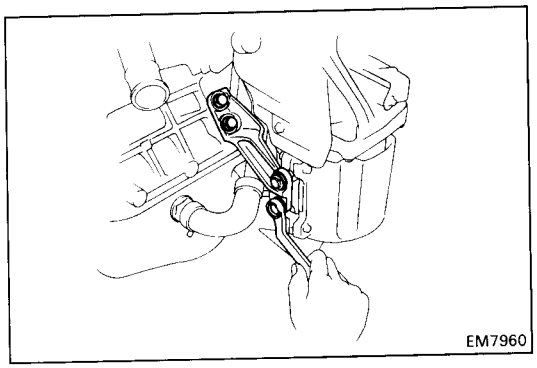


(b) Place the cushion, retainer and a new gasket on the converter.



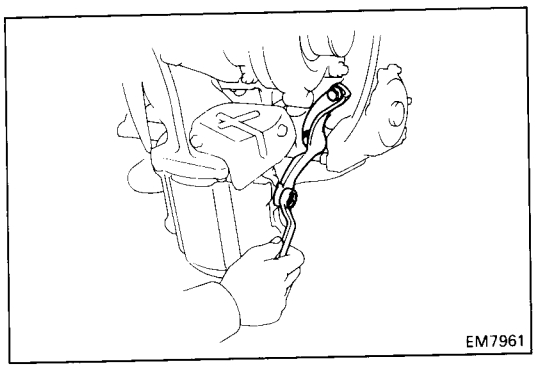
(c) Install the converter with the three bolts and two new nuts.

Torque: 300 kg-cm (21 ft-lb, 29 N·m)



(d) Install the RH converter stay with the four bolts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)



(e) Install the LH converter stay with the three bolts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

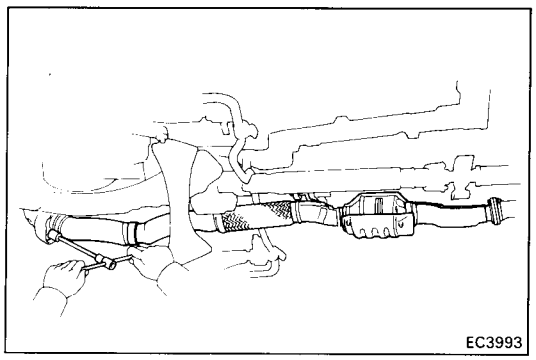
8. **REINSTALL IDLER PULLEY BRACKET AND A/C COMPRESSOR WITHOUT DISCONNECTING HOSES**
   (See step 12 on page EM-112)

9. **REINSTALL ALTERNATOR**
   (See steps 2 to 6 on page CH-7)

10. **REINSTALL FRONT EXHAUST PIPE**
    (See step 3 on page EC-16)

11. **REINSTALL ENGINE UNDER COVERS**

12. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**


EC3993

(Sub-Catalytic Converter)

1. **REMOVE RH ENGINE UNDER COVER**
2. **REMOVE FRONT EXHAUST PIPE (SUB-CATALYTIC CONVERTER)**
   (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 main 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.
3. **REINSTALL FRONT EXHAUST PIPE (SUB-CATALYTIC CONVERTER)**
   (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 main catalytic converter.

   Torque: 630 kg-cm (46 ft-lb, 62 N·m)

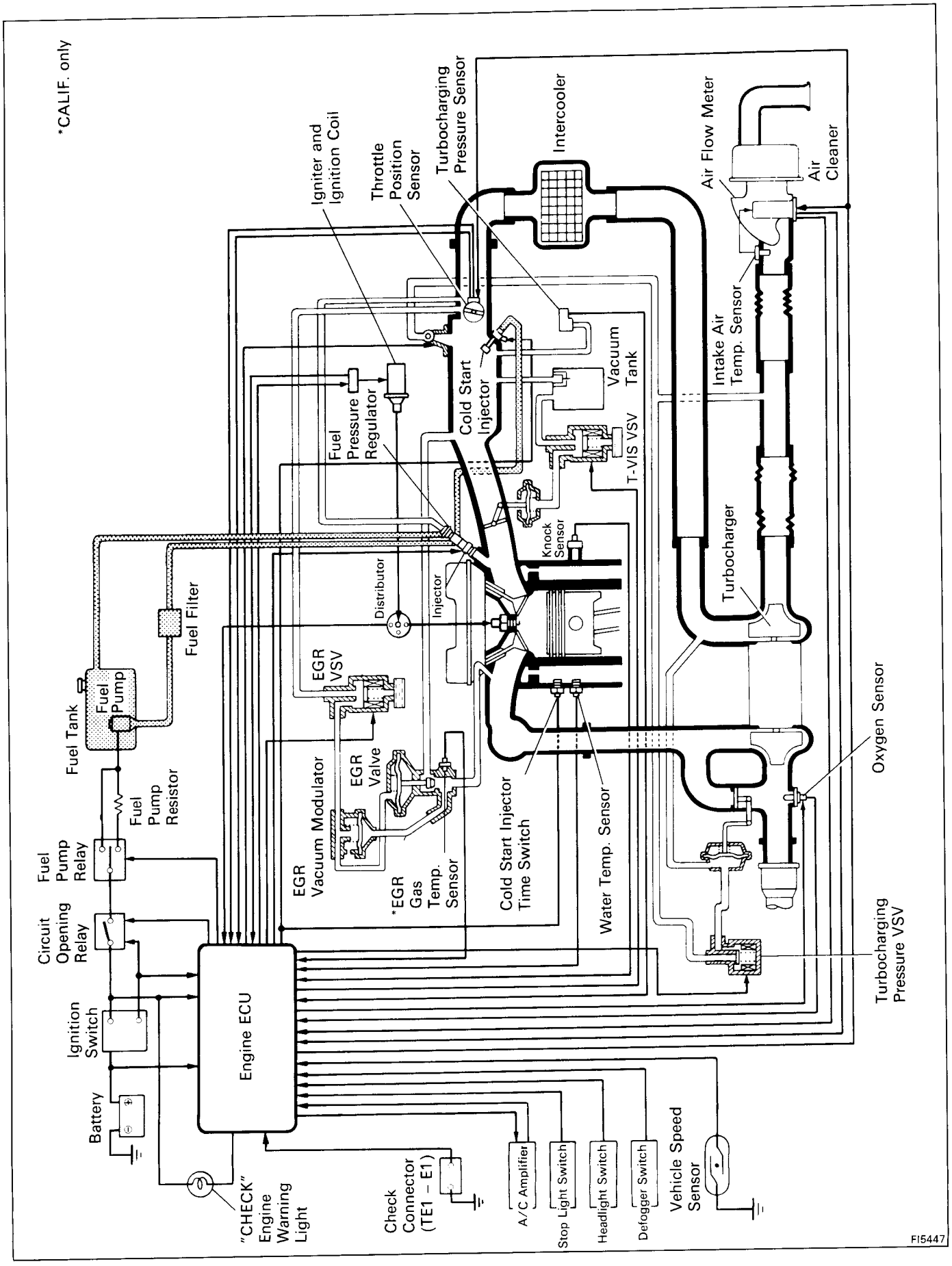
   (e) Tighten the two bolts and nuts holding the front exhaust pipe to the center exhaust pipe.

   Torque: 440 kg-cm (32 ft-lb, 43 N·m)

   (f) Install the clamp with the bolt.
4. **REINSTALL RH ENGINE UNDER COVER**

EFI SYSTEM

SYSTEM DESCRIPTION



The EFI system is composed of three basic sub-systems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the EFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake port in accordance with signals from the ECU (Electronic Control Unit).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The celica 3S-GTE engine is equipped with a which centrally controls the EFI, ESA, ISC, Diagnosis systems etc. by means of an Electronic Control Unit (ECU-formerly EFI computer) employing a microcomputer.

The ECU controls the following functions:

1. Electronic Fuel Injection (EFI)

   The ECU receives signals from various sensors indicating changing engine operation conditions such as:

   Intake air volume
   Intake air temperature
   Coolant temperature
   Engine rpm
   Acceleration/deceleration
   Exhaust oxygen content etc.

   The signals are utilized by the ECU to determine the injection duration necessary for an optimum air-fuel ratio.

2. Electronic Spark Advance (ESA)

   The ECU 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, coolant temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant. (See IG section)

3. Idle Speed Control (ISC)

   The ECU is programmed with target idling speed values to respond to different engine conditions (coolant temperature, air conditioner ON/OFF, etc.). Sensors transmit signals to the ECU 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 ECU detects any malfunctions and abnormalities in the sensor network and lights a "CHECK" engine warning light on the instrument panel. At the same time, the trouble is identified and a diagnostic code is recorded by the ECU. The diagnostic code can be read by the number of blinks of the "CHECK" engine warning light when terminals TE1 and E1 are connected.The diagnostic codes are referecl to the later page. (See page FI-24)

5. Fail-safe Function

   In the event of the sensor malfunctioning, a back-up circuit will take over to provide minimal drivability, and the "CHECK" engine warning light will illuminate.

PRECAUTIONS

1. **Before working on the fuel system, disconnect the cable from negative (–) terminal of the battery.**

   HINT: Any diagnostic 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.**

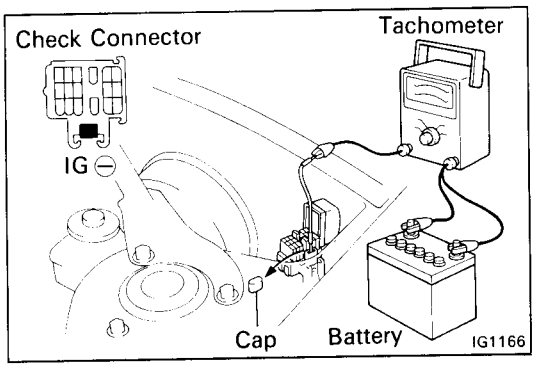
3. **Keep gasoline away from rubber or leather parts.**

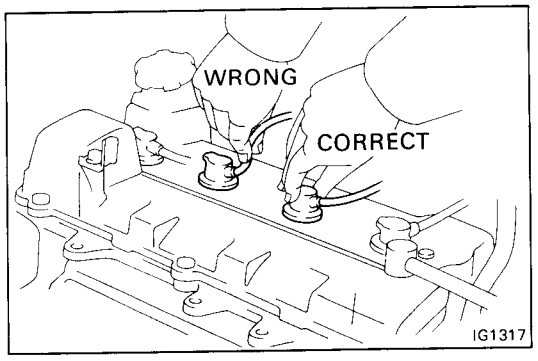
INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS

1. **CHECK CORRECT ENGINE TUNE-UP**
   (See page EM-8)

2. **PRECAUTIONS WHEN CONNECTING GAUGE**
   (a) Use the battery as the power source for the timing light, tachometer, etc.
   (b) Connect the test probe of a tachometer to the terminal IG⊖ of the check connector.



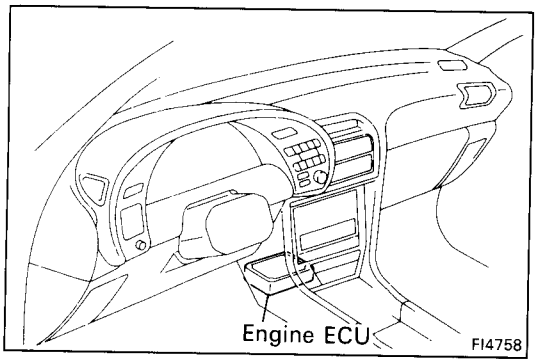


3. **IN EVENT OF ENGINE MISFIRE FOLLOWING PRECAUTIONS SHOULD BE TAKEN**
   (a) Check proper connection of battery terminals, etc.
   (b) Handle high-tension cords carefully.
   (c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
   (d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

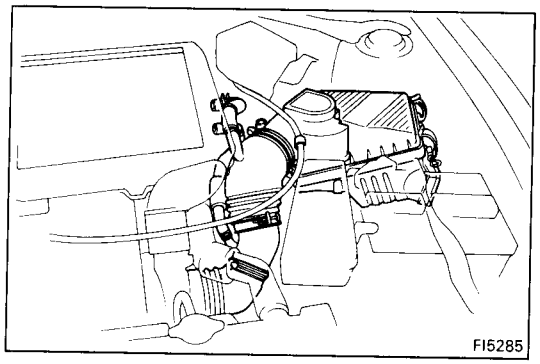
4. **PRECAUTIONS WHEN HANDLING OXYGEN SENSOR**
   (a) Do not allow oxygen sensor to drop or hit against an object.
   (b) Do not allow the sensor to come into contact with water.

IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

The ECU 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 ECU operation, especially if the antenna and feeder are installed nearby. Therefore, observe the following precautions:

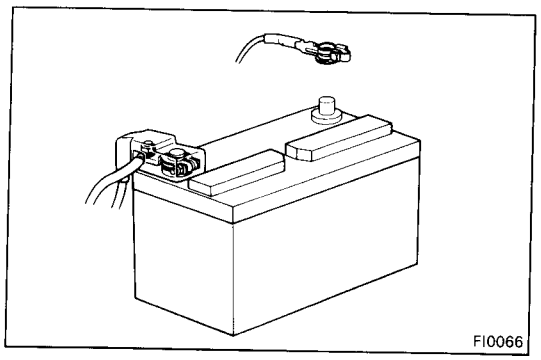


1. Install the antenna as far away as possible from the ECU. The ECU is located under the radio so the antenna should be installed at the rear side of the vehicle.
2. Keep the antenna feeder as far away as possible from the ECU wires – at least 20 cm (7.87 in.) – and, especially, do not wind them together.
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 ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



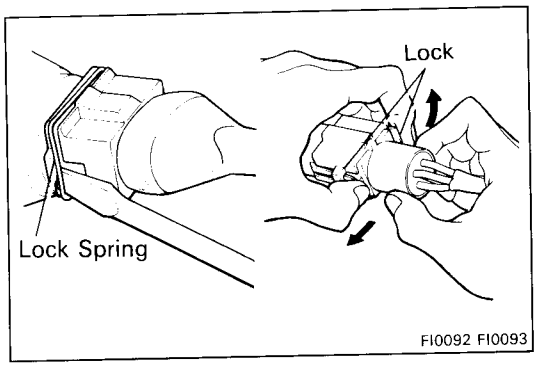
AIR INDUCTION SYSTEM

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.



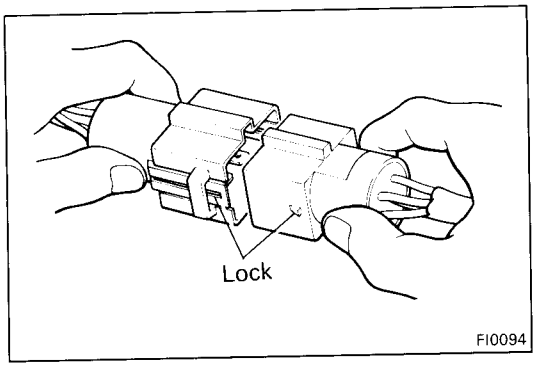
ELECTRONIC CONTROL SYSTEM

1. Before removing EFI 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 EFI parts carefully, especially the ECU.
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 ECU 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 EFI parts and wiring connectors.

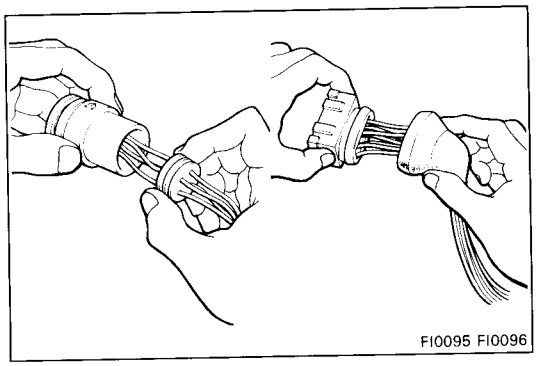


7. Parts should be replaced as an assembly.

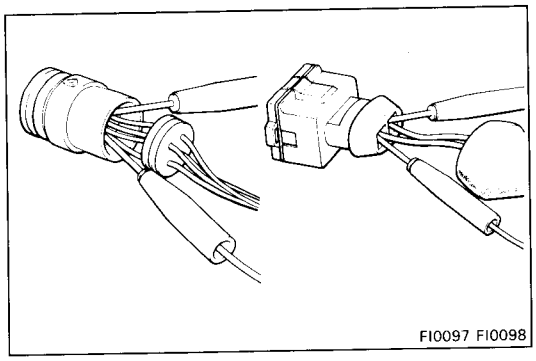
8. Care is required when pulling out and inserting wiring connectors.
   (a) Release the lock and pull out the connector, pulling on the connectors.



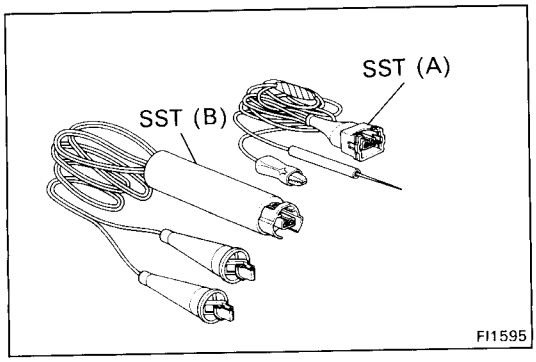
   (b) Fully insert the connector and check that it is locked.



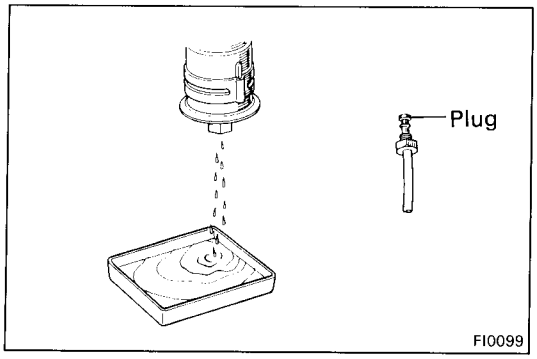
9. When inspecting a connector with a volt/ohmmeter.
   (a) Carefully take out the water-proofing rubber if it is a water-proof type connector.



   (b) Insert the test 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.

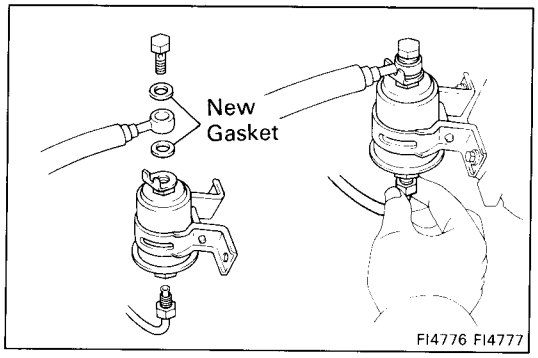


10. Use SST for inspection or test of the injector, cold start injector or its wiring connector.
    SST 09842-30050 (A) and 09842-30060 (B)

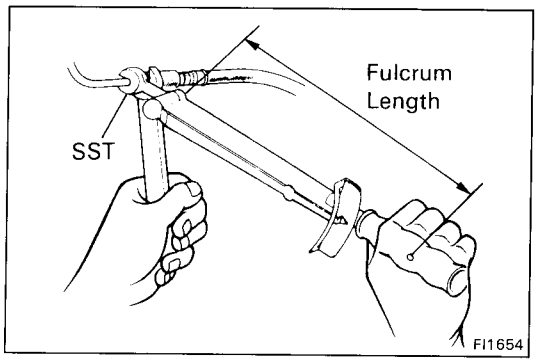


FUEL SYSTEM

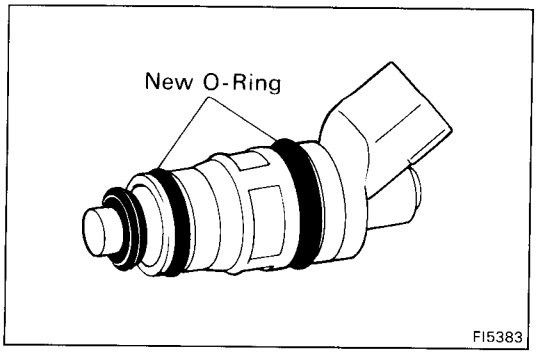
1. When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the following procedure:
   (a) Put a container under the connection.
   (b) Slowly loosen the connection.
   (c) Disconnect the connection.
   (d) Plug the connection with a rubber plug.



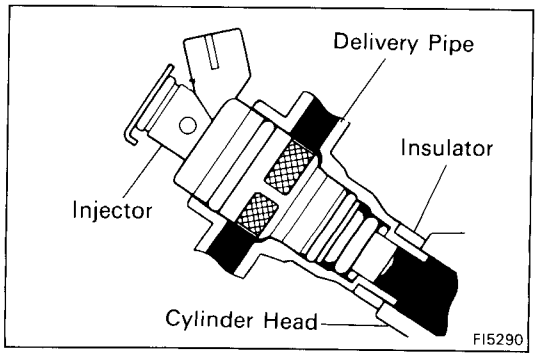
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedures:
   (Union Bolt Type)
   (a) Always use a new gasket.
   (b) Tighten the union bolt by hand.
   (c) Tighten the union bolt to the specified torque.
   Torque: 300 kg-cm (22 ft-lb, 29 N·m)



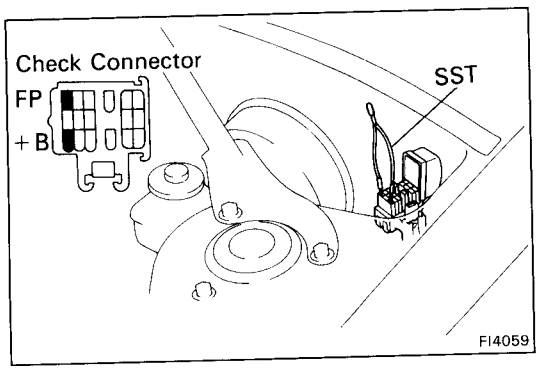
   (Flare Nut Type)
   (a) Apply a light coat of engine oil to the flare nut and tighten the flare nut by hand.
   (b) Using SST, tighten the flare nut to the specified torque.
   SST 09631-22020
   Torque: 310 kg-cm (22 ft-lb, 30 N·m)
   HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).



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 figure.



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 check connector.

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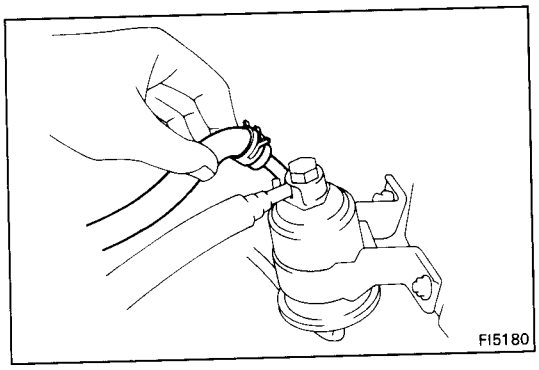
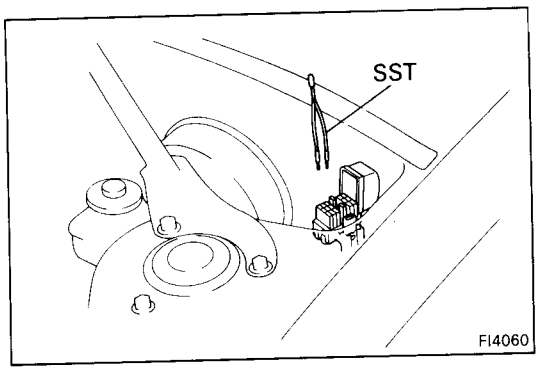
(b) With engine stopped, turn the ignition switch ON.



(c) When the fuel return hose is pinched, the pressure within high pressure line will rise to approx. 4 kg/cm^2 (57 psi, 392 kPa). 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.

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TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Engine troubles are usually not caused by the EFI system. When troubleshooting, always first check the condition of the other systems.
   (a) Electronic source
      - Battery
      - Fusible links
      - Fuses

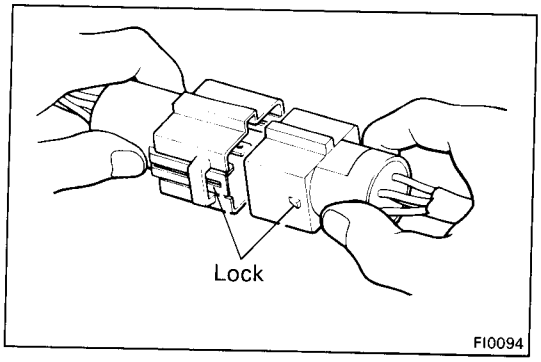
   (b) Body ground
   (c) Fuel supply
      - Fuel leakage
      - Fuel filter
      - Fuel pump

   (d) Ignition system
      - Spark plugs
      - High-tension cords
      - Distributor
      - Ignition coil
      - Igniter

   (e) Air induction system
      - Vacuum leaks

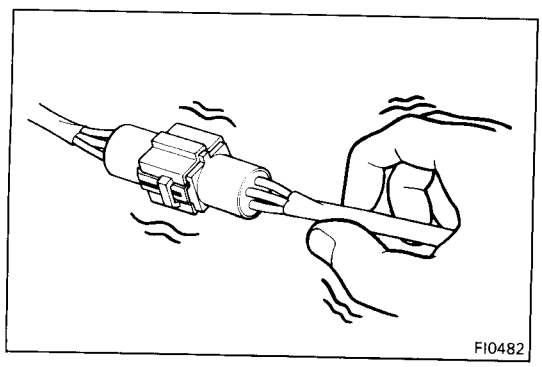
   (f) Emission control system
      - PCV system
      - EGR system

   (g) Others
      - Ignition timing (ESA system)
      - Idle speed (ISC system)
      - etc.

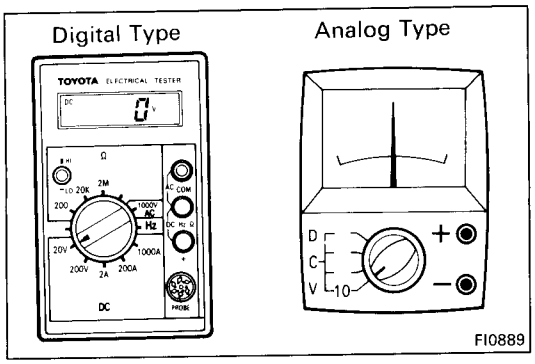


2. The most frequent cause of problems is simply a bad contact in wiring connectors. Always check that connections are secure.

   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 ECU, as the ECU 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-27)

TROUBLESHOOTING PROCEDURES

SYMPTOM – DIFFICULT TO START OF NO START (ENGINE WILL NOT CRANK OR CRANKS SLOWLY)

CHECK ELECTRONIC SOURCE → BAD →
1. Battery
   (1) Connections
   (2) Gravity – Drive belt – Charging system
   (3) Voltage
2. Fusible links

OK ↓

CHECK STARTING SYSTEM → BAD →
1. Ignition switch
2. Clutch start switch
3. Starter relay
4. Starter
5. Wiring connection

SYMPTOM – DIFFICULT TO START OR NO START (CRANKS OK)

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code. (See page FI-21)
→ Malfunction code(s) → Diagnostic code(s) (See page FI-24)

Normal code ↓

DOES ENGINE START WITH ACCELERATOR PEDAL DEPRESSED? → OK →
ISC system
   (1) ISC Valve (See page FI-76)
   (2) Wiring connection

NO ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE → BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connection(s)
4. PCV hose(s)
5. EGR system – EGR valve stays open

OK ↓

CHECK IGNITION SPARK
(See page IG-5) → BAD →
1. High-tension cords
2. Distributor
3. Ignition coil
4. Igniter

OK ↓ CONTINUED ON PAGE FI-11

OK CONTINUED FROM PAGE FI-10

CHECK SPARK PLUGS
Standard: 0.8 mm (0.031 in.)
HINT: Check compression pressure and valve clearance if necessary.

NO →
1. Spark plugs
2. Compression pressure
   Minimum: 9.0 kg/cm² (128 psi, 883 kPa) at 250 rpm
3. Valve clearance (Cold)
   Standard: IN 0.15 – 0.25 mm (0.006 – 0.010 in.)
   EX 0.20 – 0.30 mm (0.008 – 0.012 in.)

BAD (All Plugs WET) →
1. Injector(s) – Shorted or leaking
2. Injector wiring – Short circuited
3. Cold start injector – leakage (See page FI-53)
4. Cold start injector time switch (See page FI-82)

OK

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel in tank
2. Fuel pressure in fuel line
   (1) Connect terminals +B and FP of the check connector.
   (2) Feel pressure at fuel hose of fuel filter. (See page FI-47)

BAD →
1. Fuel lines – Leakage – Deformation
2. Fuses
3. Circuit opening relay (See page FI-80)
4. Fuel pump (See page FI-46)
5. Fuel filter
6. Fuel pressure regulator (See page FI-56)

OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
   Standard: 10° BTDC @ idle

NO → Ignition timing – Adjust (See page IG-13)

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI-27)

BAD →
1. Wiring connections
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI-79)
3. Air flow meter (See page FI-69)
4. Water temp. sensor (See page FI-83)
5. Air temp. sensor (See page FI-69)
6. Injection signal circuit
   (1) Injector wiring
   (2) Solenoid resistor (See page FI-81)
   (3) ECU (See page FI-95)

SYMPTOM – ENGINE OFTEN STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-21)

→ Malfunction code(s) → Diagnostic code(s) (See page FI-24)

↓ Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

→ BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system – EGR valve stays open

↓ OK

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel tank
2. Fuel pressure in fuel line
   (1) Connect terminals +B and EP of the check connector.
   (2) Feel pressure at fuel hose of fuel filter. (See page FI-47)

→ BAD →
1. Fuel line – Leakage – Deformation
2. Fuses
3. Circuit opening relay (See page FI-80)
4. Fuel pump (See page FI-46)
5. Fuel filter
6. Fuel pressure regulator (See page FI-56)

↓ OK

CHECK AIR FILTER ELEMENT

→ BAD → Element – Clean or replace

↓ OK

CHECK IDLE SPEED
Standard: 800 ± 50 rpm

→ BAD →
1. Wiring connections
2. ISC valve (See page FI-76)
3. ECU (Test by substitution)

↓ OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
   Standard: 10° BTDC @ idle

→ NO → Ignition system

↓ OK

CHECK SPARK PLUGS
Standard: 0.8 mm (0.031 in.)
HINT: Check compression pressure and valve clearance if necessary

→ NO →
1. Spark plugs
2. Compression pressure
   Minimum: 9.0 kg/cm² (128 psi, 883 kPa) at 250 rpm
3. Valve Clearance (Cold)
   Standard: IN 0.15 – 0.25 mm (0.006 – 0.010 in.)
   EX 0.20 – 0.30 mm (0.008 – 0.012 in.)

↓ OK

CONTINUED ON PAGE FI-13

OK CONTINUED FROM PAGE FI-12

CHECK COLD START INJECTOR
(See page FI-53)
→ BAD
1. Cold start injector (See page FI-53)
2. Cold start injector time switch (See page FI-82)

OK

RECHECK FUEL PRESSURE
(See page FI-47)
→ BAD
1. Fuel pump (See page FI-46)
2. Fuel filter
3. Fuel pressure regulator (See page FI-56)

OK

CHECK INJECTORS
(See page FI-58)
→ BAD
Injection condition

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI-27)
→ BAD
1. Wiring connections
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI-79)
3. Air flow meter (See page FI-69)
4. Water temp. sensor (See page FI-83)
5. Air temp. sensor (See page FI-69)
6. Injection signal circuit
   (1) Injector wiring
   (2) Solenoid resistor (See page FI-81)
   (3) ECU (See page FI-95)

SYMPTOM – ENGINE SOMETIMES STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-21)
→ Malfunction code(s)
Diagnostic code(s)
(See page FI-24)

Normal code

CHECK AIR FLOW METER
(See page FI-69)
→ BAD
Air flow meter

OK

CHECK WIRING CONNECTORS AND RELAYS
Check for signal change when the connector or relay is slightly tapped or wiggled.
→ BAD
1. Connector(s)
2. EFI main relay (See page FI-79)
3. Circuit opening relay (See page FI-80)

SYMPTOM – ROUGH IDLING AND/OR MISSING

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code
(See page FI-21)

→ Malfunction code(s) → Diagnostic code(s) (See page FI-24)

↓ Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

→ BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connection(s)
4. PCV hose(s)
5. EGR system – EGR valve stays open

↓ OK

CHECK AIR FILTER

→ BAD → Element – Clean or replace

↓ OK

CHECK IDLE SPEED
Standard: 800 ± 50 rpm

→ NO →
1. Wiring connections
2. ISC valve (See page FI-76)
3. ECU (Test by substitution)

↓ OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
   Standard: 10° BTDC @ idle

→ NO → Ignition system

↓ OK

CHECK SPARK PLUGS
Standard: 0.8 mm (0.031 in.)
HINT: Check compression pressure and valve clearance if necessary.

→ BAD →
1. Spark plugs and high-tension cords
2. Compression pressure
   Minimum: 9.0 kg/cm² (128 psi, 883 kPa) at 250 rpm
3. Valve clearance (Cold)
   Standard: IN 0.15 – 0.25 mm (0.006 – 0.010 in.)
   EX 0.20 – 0.30 mm (0.008 – 0.012 in.)

↓ OK

CHECK T-VIS VALVE
Check that the T-VIS valve is closed.

→ BAD →
1. T-VIS VSV (See page FI-85)
2. Vacuum leaks

↓ OK

CHECK COLD START INJECTOR
(See page FI-53)

→ BAD →
1. Cold start injector (See page FI-53)
2. Cold start injector time switch. (See page FI-82)

↓ OK CONTINUED ON PAGE FI-15

OK CONTINUED FROM PAGE FI-14

CHECK FUEL PRESSURE
(See page FI-47)

BAD →
1. Fuel pump (See page FI-46)
2. Fuel filter
3. Fuel pressure regulator (See page FI-56)

OK

CHECK INJECTORS
(See page FI-58)

BAD → Injection condition

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI-27)

BAD →
1. Wiring connections
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI-79)
3. Air flow meter (See page FI-69)
4. Water temp. sensor (See page FI-83)
5. Air temp. sensor (See page FI-69)
6. Injection signal circuit
   (1) Injector wiring
   (2) Solenoid resistor (See page FI-81)
   (3) ECU (See page FI-95)
7. Oxygen sensor (See page FI-92)

SYMPTOM – HIGH ENGINE SPEED (NO DROP)

CHECK ACCELERATOR LINKAGE

BAD → Linkage – Stuck

OK

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system – EGR valve stays open

OK

CHECK AIR CONDITIONER IDLE-UP CIRCUIT

BAD → Air valve for air conditioner – Leakage

OK

CHECK ISC SYSTEM

BAD →
1. Wiring connections
2. ISC valve (See page FI-76)
3. Air conditioner switch

OK

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-21)

Malfunction code → Diagnostic code(s) (See page FI-24)

Normal code CONDINUED ON PAGE FI-16

OK CONTINUED FROM PAGE FI-15

CHECK THROTTLE POSITION SENSOR (See page FI-71) → BAD → Throttle body

OK

CHECK FUEL PRESSURE (See page FI-47) → BAD → Fuel pressure regulator – High pressure

OK CONTINUED FROM PAGE FI-9

CHECK COLD START INJECTOR (See page FI-53) → BAD → Cold start injector – Linkage

OK

CHECK INJECTORS (See page FI-58) → BAD → Injectors – Leakage, Injection quantity

OK

CHECK ENGINE EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER (See page FI-27) → BAD →

1. Wiring connections
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI-79)
3. Air flow meter (See page FI-69)
4. Water temp. sensor (See page FI-83)
5. Air temp. sensor (See page FI-69)
6. Injection signal circuit
   (1) Injector wiring
   (2) Solenoid resistor (See page FI-81)
   (3) ECU (See page FI-95)

SYMPTOM – ENGINE BACKFIRES-Lean Fuel Mixture

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code. (See page FI-21) → Malfunction code(s) → Diagnostic code(s) (See page FI-24)

Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE → BAD →

1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hose(s)
5. EGR system – EGR valve stays open

OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
   Standard: 10° BTDC @ idle

→ NO → Ignition timing – Adjust (See page IG-13)

OK CONTINUED ON PAGE FI-17

OK CONTINUED FROM PAGE FI-16

CHECK IDLE SPEED
Standard: 800 ± 50 rpm
→ NO →
1. Wiring connections
2. ISV valve (See page FI-76)
3. ECU (Test by substitution)

OK

CHECK COLD START INJECTOR
(See page FI-53)
→ BAD →
1. Cold start injector (See page FI-53)
2. Cold start injector time switch (See page FI-82)

OK

CHECK FUEL PRESSURE
(See page FI-47)
→ BAD →
1. Fuel pump (See page FI-46)
2. Fuel filter
3. Fuel pressure regulator (See page FI-56)

OK

CHECK INJECTORS
(See page FI-58)
→ BAD →
Injectors – Clogged

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI-27)
→ BAD →
1. Wiring connection
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI-79)
3. Air flow meter (See page FI-69)
4. Water temp. sensor (See page FI-83)
5. Air temp. sensor (See page FI-69)
6. Throttle position sensor (See page FI-71)
7. Injection signal circuit
   (1) Injector wiring
   (2) Fuel cut RPM (See page FI-98)
   (3) Solenoid resistor (See page FI-81)
   (4) ECU (See page FI-95)
8. Oxygen sensor (See page FI-92)

SYMPTOM – MUFFLE EXPLOSION (AFTER FIRE)-Rich Fuel Mixture-Misfire

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-21)
→ Malfunction code(s) →
Diagnostic code(s) (See page FI-24)

Normal code

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
   Standard: 10° BTDC @ idle
→ BAD →
Ignition timing – Adjust (See page IG-13)

OK CONTINUED ON PAGE FI-18

OK CONTINUED FROM PAGE FI-17

CHECK IDLE SPEED
Standard: 800 ± 50 rpm

NO →
1. Wiring connections
2. ISC valve (See page FI-76)
3. ECU (Test by substitution)

OK

CHECK COLD START INJECTOR
(See page FI-53)

BAD →
1. Cold start injector (See page FI-53)
2. Cold start injector time switch (See page FI-82)

OK

CHECK FUEL PRESSURE
(See page FI-47)

BAD → Fuel pressure regulator (See page FI-56)

OK

CHECK THROTTLE POSITION SENSOR
(See page FI-71)

BAD → Throttle body

OK

CHECK INJECTORS
(See page FI-58)

BAD → Injectors – Leakage

OK

CHECK SPARK PLUGS
Standard: 0.8 mm (0.031 in.)
HINT: Check compression pressure and valve clearance if necessary.

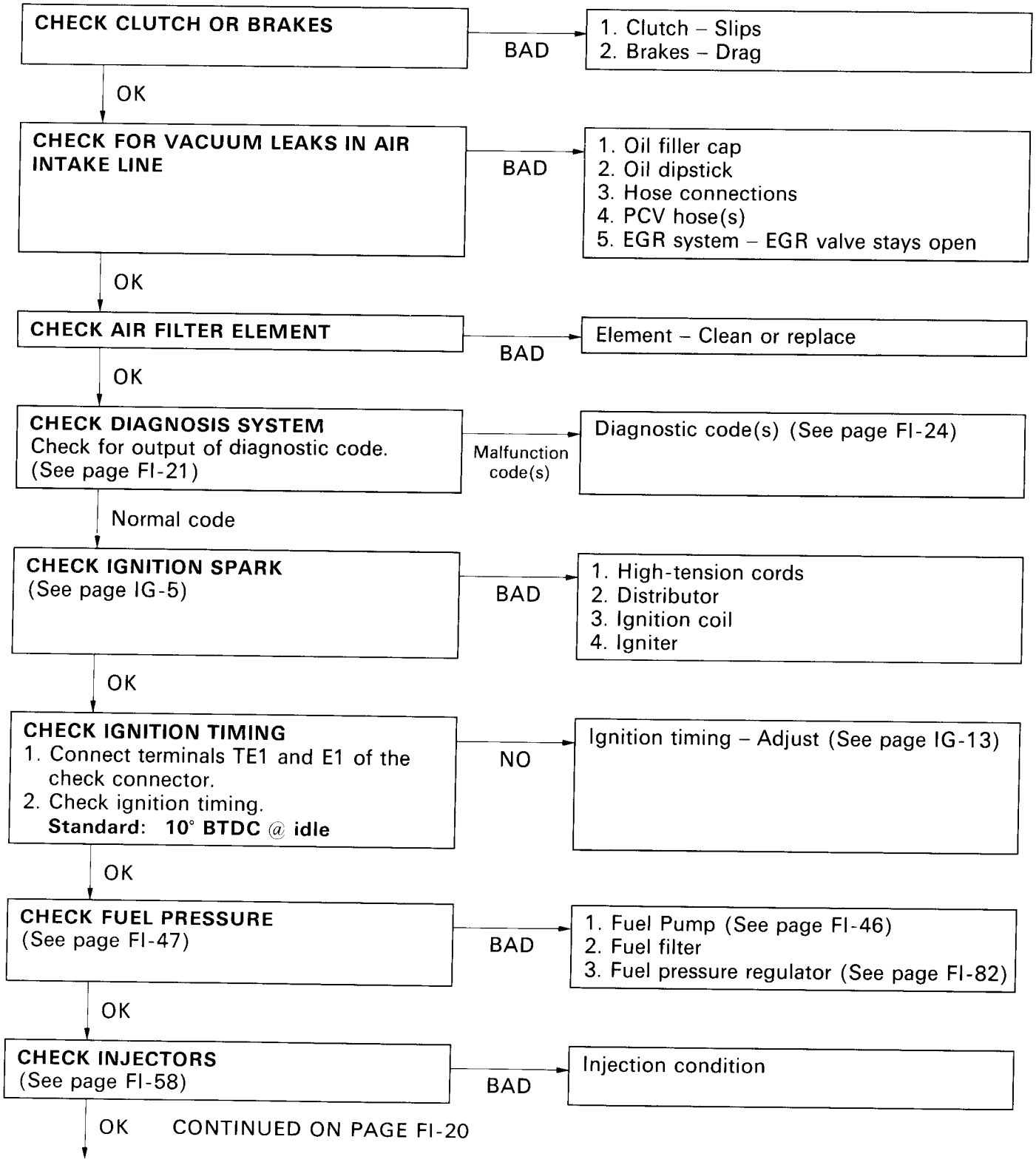
NO →
1. Spark plugs
2. Compression pressure
   Minimum: 9.0 kg/cm² (128 psi, 883 kPa) at 250 rpm
3. Valve clearance (Cold)
   Standard: IN 0.15 – 0.25 mm (0.006 – 0.010 in.)
   EX 0.20 – 0.30 mm (0.008 – 0.012 in.)

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI-27)

BAD →
1. Throttle position sensor (See page FI-71)
2. Injection signal circuit
   (1) Injector wiring
   (2) Fuel cut RPM (See page FI-98)
   (3) Solenoid resistor (See page FI-81)
   (4) ECU (See page FI-95)
3. Oxygen sensor (See page FI-92)

SYMPTOM – ENGINE HESITATES AND/OR POOR ACCELERATION



OK CONTINUED FROM PAGE FI-19

CHECK SPARK PLUGS
Standard: 0.8 mm (0.031 in.)
HINT: Check compression pressure and valve clearance if necessary.

NO →
1. Spark plugs
2. Compression pressure
   Minimum: 9.0 kg/cm² (128 psi, 883 kPa) at 250 rpm
3. Valve clearance (Cold)
   Standard: IN 0.15 – 0.25 mm (0.06 – 0.010 in.)
   EX 0.20 – 0.30 mm (0.008 – 0.012 in.)

OK

CHECK T-VIS VALVE
Check if T-VIS valve is open with engine running at 4,200 rpm or above.

BAD →
1. T-VIS VSV (See page FI-85)
2. Vacuum leaks

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI-27)

BAD →
1. Wiring connections
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI-79)
3. Air flow meter (See page FI-69)
4. Water temp. sensor (See page FI-83)
5. Air temp. sensor (See page FI-69)
6. Throttle position sensor (See page FI-71)
7. Injection signal circuit
   (1) Injector wiring
   (2) Solenoid resistor (See page FI-81)
   (3) ECU (See page FI-95)

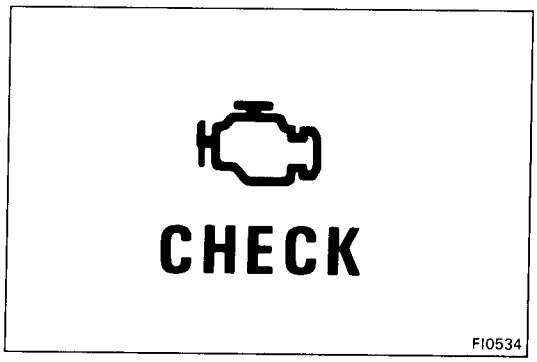
DIAGNOSIS SYSTEM

DESCRIPTION

The ECU contains a built-in, self-diagnosis system which detects troubles within the engine signal network and then a warning on the "CHECK" engine warning light on the instrument panel flashes.

By analyzing various signals shown in the table (See page 24) the ECU detects system malfunctions which are related to the various operating parameter sensors or actuator. The ECU stores the failure code associated with the detected failure until the diagnosis system is cleared by removing the EFI fuse with the ignition switch OFF.

THE "CHECK" engine warning light on the instrument panel informs the driver that a malfunction has been detected. The light goes off automatically when the malfunction has been cleared.



"CHECK" ENGINE WARNING LIGHT CHECK

1. The "CHECK" engine warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the "CHECK" engine warning light should go off.

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

OUTPUT OF DIAGNOSTIC CODES

To obtain an output of diagnostic codes, proceed as follow:

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 check connector.

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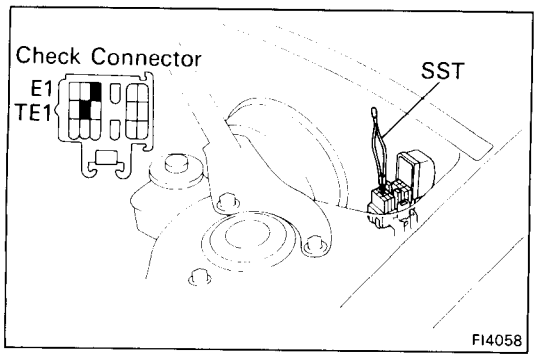
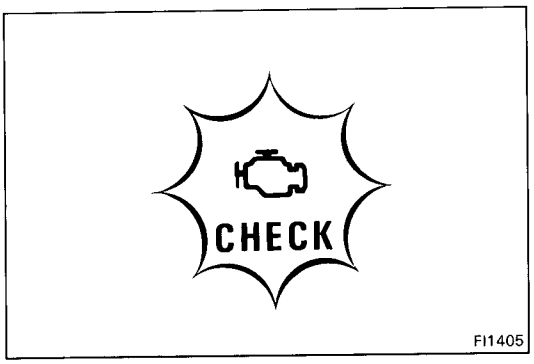
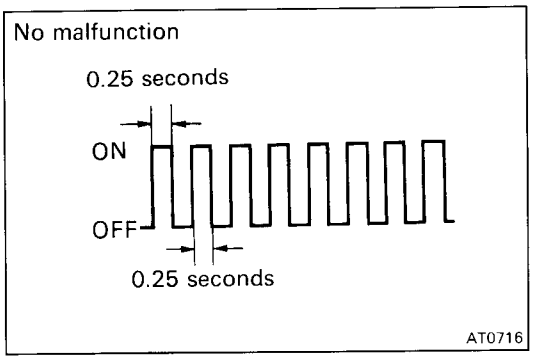


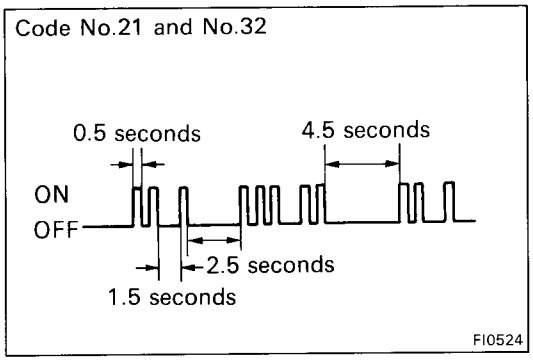


4. Read the diagnostic code as indicated by the number of flashes of the "CHECK" engine warning light.



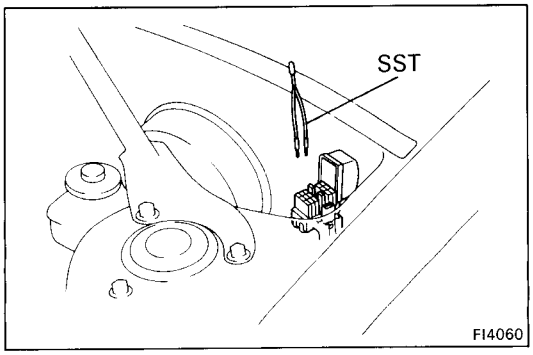
Diagnostic Codes (See page FI-24)

(a) Normal System Operation (no malfunction)
- The light will alternately blink ON and OFF 2 times per second.

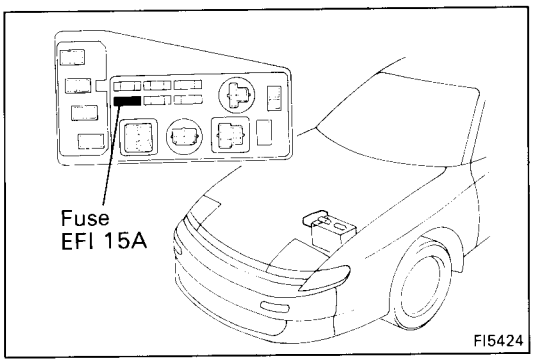


(b) Malfunction Code Indication
- In the event of a malfunction, the light will blink every 0.5 seconds. The first number of blinks will equal the first digit of a 2-digit diagnostic code and, after a 1.5 second pause, the 2nd number of blinks will equal the 2nd. If there are two or more codes, there will be a 2.5 second pause between each.
- 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 check connector are connected.

HINT: In the event of a number of trouble codes, indication will begin from the smaller value and continue in order to the larger.



5. After the diagnostic check, remove the SST.
SST 09843-18020



CANCELLING DIAGNOSTIC CODE

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the EFI fuse (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 code is not cancelled out, it will be retained by the ECU 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 code has been recorded.

2. After cancellation, perform road test of the vehicle to check that a normal code is now read on the "CHECK" engine warning light.

   If the same diagnostic 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.

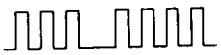
2. All detected diagnostic codes, except codes No.51 and No.53, will be retained in memory by the ECU from the time of detection until cancelled out.

3. Once the malfunction is cleared, the "CHECK" engine warning light on the instrument panel will go off but the diagnostic code(s) remain stored in ECU memory (except for codes No.51 and No.53).

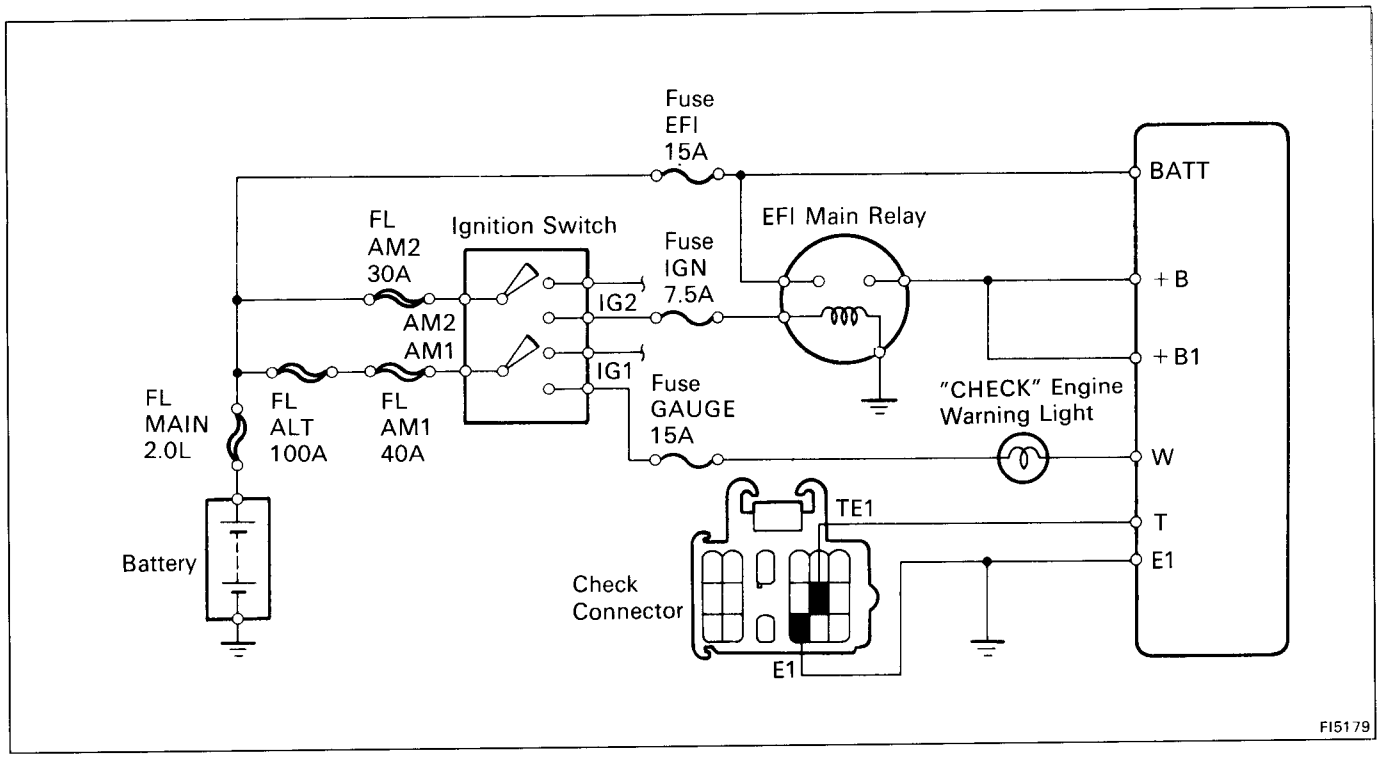
DIAGNOSTIC CODES

Code No.	Number of Engine blinks	System	Diagnosis	Trouble area	See page
–	 ON OFF FI1401	Normal	This appears when none of the other codes are identified.	–	–
12	 FI1389	RPM Signal	No NE or G signal to ECU within 2 seconds after engine has been cranked.	● Distributor circuit ● Distributor ● Starter signal circuit ● ECU	IG-4
13	 FI1390	RPM Signal	No NE signal to ECU when engine speed is above 1,000 rpm.	● Distributor circuit ● Distributor ● ECU	–
14	 FI1391	Ignition Signal	No IGF signal to ECU 8 – 11 times in succession.	● Igniter and ignition coil circuit ● Igniter and ignition coil ● ECU	FI-39
21	 FI1400	Oxygen Sensor Signal	During air-fuel ratio feedback correction, voltage output from the oxygen sensor does not exceed a set value on the lean side and the rich side continuously for a certain period.	● Oxygen sensor circuit ● Oxygen sensor ● ECU	FI-64
		Oxygen Sensor Heater Circuit	Open or short circuit in oxygen sensor heater.	● Oxygen sensor heater circuit ● Oxygen sensor heater ● ECU	FI-44
22	 FI1392	Water Temp. Sensor Signal	Open or short circuit in water temp. sensor signal (THW).	● Water temp. sensor circuit ● Water temp. sensor ● ECU	FI-37
24	 FI1611	Intake Air Temp. Sensor Signal	Open or short circuit in intake air temp. sensor signal (THA).	● Intake air temp. sensor circuit ● Intake air temp. sensor ● ECU	FI-36
25	 FI2562	Air-fuel Ratio Lean Malfunction	(1) (CALIF. only) When air-fuel ratio feedback correction value or adaptive control value continued at the upper (lean) or lower (rich) limit renewed for a certain period of time. (2) (CALIF. only) When air-fuel ratio feedback correction value or adaptive control value feedback frequency is abnormally high during feedback condition. (3) Open or short circuit in oxygen sensor signal.	● Injector circuit ● Injector ● Oxygen sensor circuit ● ECU ● Fuel line pressure ● Air flow meter ● Air intake system ● Ignition system	–
26	 FI2563	Air-fuel Ration Rich Malfunction		● Injector circuit ● Injector ● Fuel line pressure ● Cold start injector ● Air flow meter ● ECU	–
31	 FI1394	Air Flow Meter Signal	Open circuit in VC signal or short circuit between VS and E2 when idle contacts are closed.	● Air flow meter circuit ● Air flow meter ● ECU	FI-34
32	 FI1395	Air Flow Meter Signal	Open circuit in E2 or short circuit between VC and VS.	● Air flow meter circuit ● Air flow meter ● ECU	FI-34

DIAGNOSTIC CODES (Cont'd)

Code No.	Number of Engine blinks	System	Diagnosis	Trouble area	See page
34	 FI3047	Turbocharging Pressure Signal	Excessive turbocharging pressure.	● Turbocharger ● Turbocharging pressure sensor circuit ● Turbocharging pressure sensor ● ECU	–
35	 FI3048	Turbocharging Pressure Sensor Signal	Open or short circuit in turbocharging sensor pressure sensor signal (PIM).	● Turbocharging pressure sensor circuit ● Turbocharging pressure sensor ● ECU	FI-42
41	 FI1396	Throttle Position Sensor Signal	Open or short circuit in throttle position sensor signal (VTA).	● Throttle position sensor circuit ● Throttle position sensor ● ECU	FI-32
42	 FI1397	Vehicle Speed Sensor Signal	No SPD signal for 8 seconds when engine speed is between 2,500 rpm and 5,000 rpm and coolant temp. is below 80 °C (176 °F) except when racing the engine.	● Vehicle speed sensor circuit ● Vehicle speed sensor ● ECU	–
43	 FI1398	Starter Signal	No STA signal to ECU unit when engine speed reaches 800 rpm with vehicle not moving.	● Ignition switch circuit ● Ignition switch ● ECU	FI-38
52	 FI1618	Knock Sensor Signal	Open or short circuit in knock sensor signal (KNK).	● Knock sensor circuit ● Knock sensor ● ECU	–
53	 FI1619	Knock Control Signal in ECU	Knock control in ECU faulty	● ECU	–
71	 FI2622	EGR Malfunction (CALIF. only)	EGR gas temp. below predetermined level during EGR control.	● EGR system (EGR valve, EGR hose etc.) ● EGR gas temp. sensor circuit ● EGR gas temp. sensor ● EGR control VSV ● EGR control VSV circuit ● ECU	FI-45
51	 FI1399	Switch Signal	No IDL signal or A/C signal to ECU, with the check terminals TE1 and E1 shorted.	● A/C switch circuit ● A/C amplifier ● Throttle position sensor circuit ● Throttle position sensor ● Accelerator pedal and cable ● ECU	–

INSPECTION OF DIAGNOSIS CIRCUIT



1.

Does "CHECK" engine warning light come on when ignition switch is at ON?
- YES → System Normal
- NO → Does "CHECK" engine warning light come on when ECU terminal W is grounded to the body?
  - YES → Check wiring between ECU terminal E1 and body ground.
    - OK → Try another ECU.
    - BAD → Repair or replace.
  - NO → Check bulb, fuse and wiring between ECU and ignition switch.
    - BAD → Repair or replace.

2.

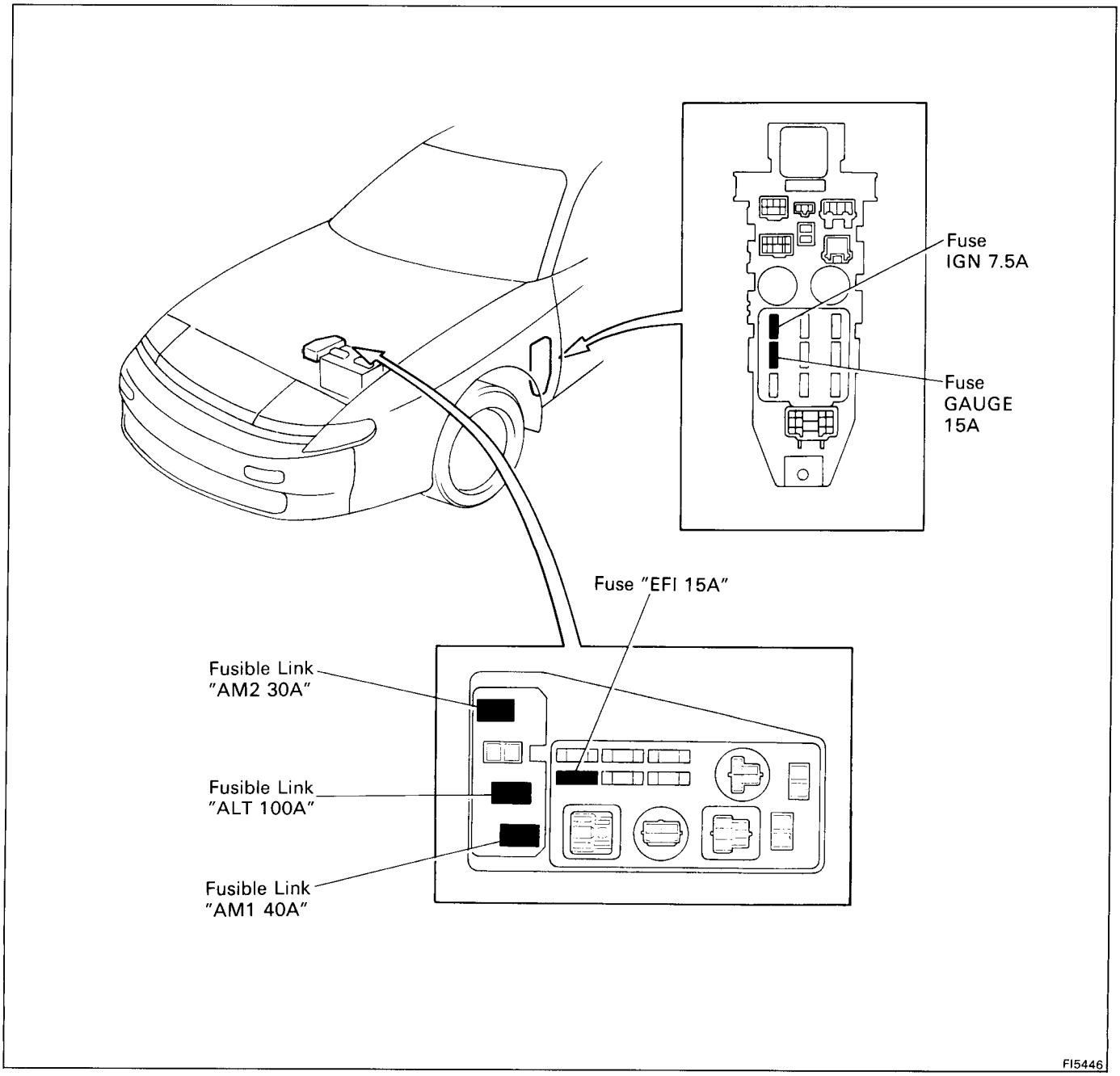
Does "CHECK" engine warning light go off when the engine is started?
- YES → System Normal
- NO → Check wiring between ECU and "CHECK" engine warning light.
  - BAD → Repair.
  - OK → Is there diagnostic code output when check connector terminals TE1 and E1 are connected?
    - NO → Try another ECU.
    - YES → Does "CHECK" engine warning light go out after repair according to malfunction code?
      - NO → Further repair required.
      - YES → System OK → Cancel out diagnostic code.

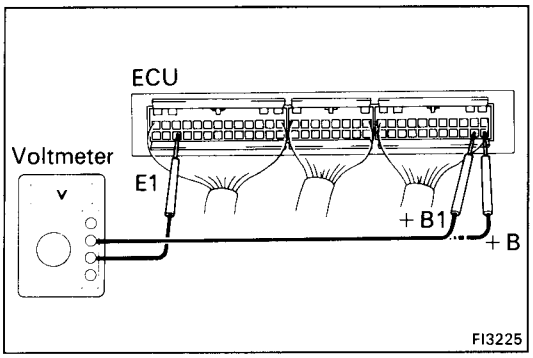
TROUBLESHOOTING WITH VOLT/ OHMMETER

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 in a components outside the computer or a short 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 ECU is faulty and should be replaced.

LOCATION OF FUSES AND FUSIBLE LINKS





EFI SYSTEM CHECK PROCEDURE

HINT:

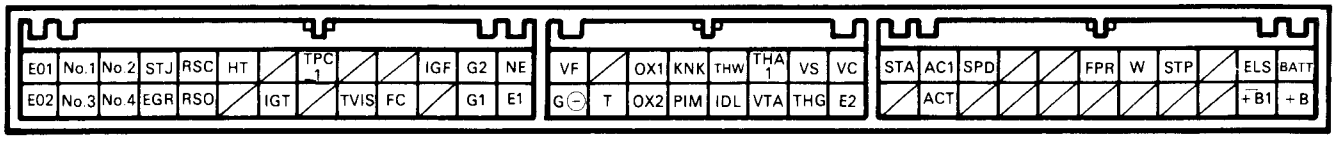
- Perform all voltage measurements with the connectors disconnected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position.

Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECU

Symbol	Terminal	Symbol	Terminal	Symbol	Terminal
E01	POWER GROUND	G2	DISTRIBUTOR	AC1	A/C MAGNET SWITCH
E02	POWER GROUND	G1	DISTRIBUTOR	ACT	A/C AMPLIFIER
No.1	INJECTOR (No.1)	NE	DISTRIBUTOR	SPD	SPEED SENSOR
No.3	INJECTOR (No.3)	E1	ENGINE GROUND		–
No.2	INJECTOR (No.2)	VF	CHECK CONNECTOR		–
No.4	INJECTOR (No.4)	G⊖	DISTRIBUTOR		–
STJ	COLD START INJECTOR		–		–
EGR	EGR VSV	T	CHECK CONNECTOR		–
RSC	ISC VALVE	OX1	OXYGEN SENSOR	FPR	FUEL PUMP RELAY
RSO	ISC VALVE	OX2	CHECK CONNECTOR		–
HT	OXYGEN SENSOR HEATER	KNK	KNOCK SENSOR	W	WARNING LIGHT
	–	PIM	TURBOCHARGING PRESSURE SENSOR		–
	–	THW	WATER TEMP. SENSOR	STP	STOP LIGHT SWITCH
IGT	IGNITER	IDL	THROTTLE POSITION SENSOR		–
TPC1	TURBOCHARGING PRESSURE VSV	THA1	AIR TEMP. SENSOR		–
	–	VTA	THROTTLE POSITION SENSOR		–
	–	VS	AIR FLOW METER	ELS	HEADLIGHT DEFOGGER
T-VIS	T-VIS VSV	*THG	EGR GAS TEMP. SENSOR	+B1	EFI MAIN RELAY
	–	VC	SENSOR POWER SOURCE	BATT	BATTERY
FC	CIRCUIT OPENING RELAY	E2	SENSOR GROUND	+B	EFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH		* CALIF. only
	–		–		

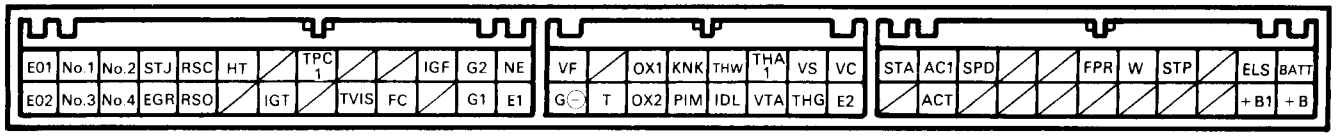
Engine ECU Terminals



Voltage at ECU Wiring Connectors

No.	Terminals	Condition		STD voltage (V)	See page
1	+B, +B1 – E1	IG SW ON		10 – 14	FI-30
2	BATT – E1	–		10 – 14	FI-31
3	IDL – E2	IG SW ON	Throttle valve open	4.5 – 5.5	FI-32
	VC – E2		–	4.5 – 5.5	
	VTA – E2		Throttle valve open	0.1 – 1.0	
			Throttle valve open	3.2 – 4.2	
4	VC – E2		–	4.5 – 5.5	FI-34
	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, No.3, No.4 – E01, E02	IG SW ON		10 – 14	FI-35
6	THA1 – E2	IG SW ON	Intake air temp. 20°C (68°F)	1 – 3	FI-36
7	THW – E2		Coolant temp. 80°C (176°F)	0.1 – 1.1	FI-37
8	STA – E1	Cranking		6 – 14	FI-38
9	IGT – E1	Cranking or idling		0.8 – 1.2	FI-39
10	RSC, RSO – E1	IG SW ON		8 – 14	FI-40
11	W – E1	No trouble ("CHECK" engine warning light off) and engine running		10 – 14	FI-41
12	PIM – E2	IG SW ON		2.5 – 4.5	FI-42
	VC – E2			4.5 – 5.5	
13	AC1 – E1	IG SW ON	Air conditioning ON	8 – 14	FI-43

Engine ECU Terminals



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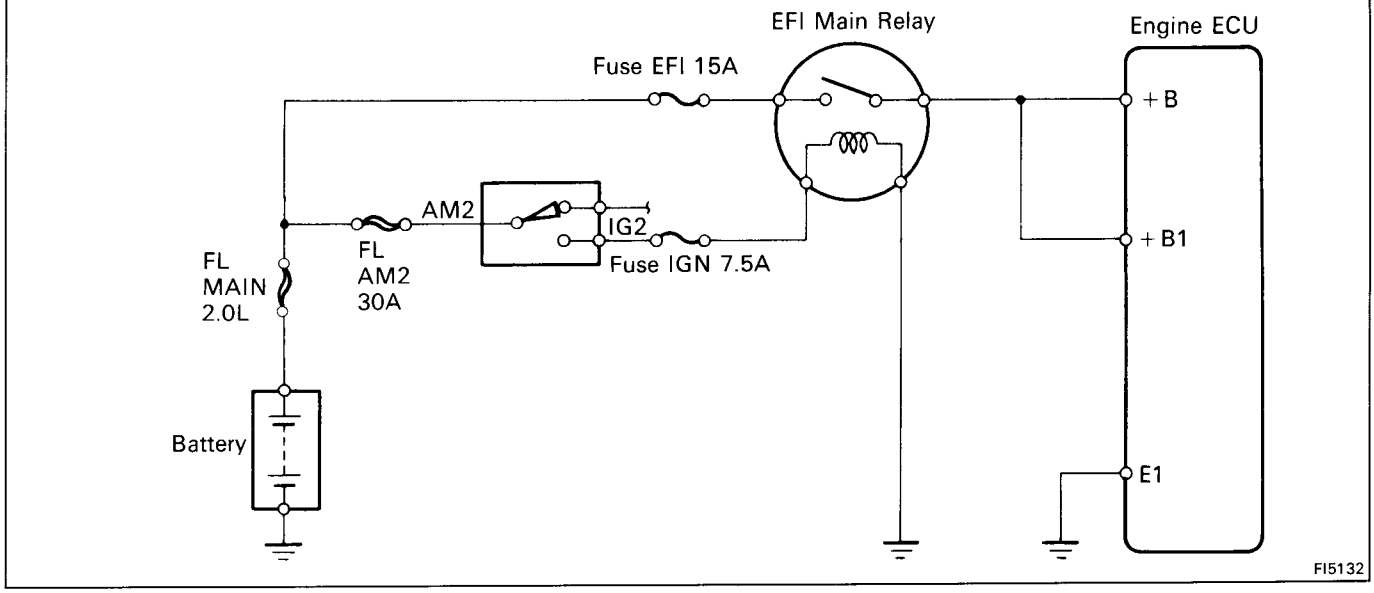
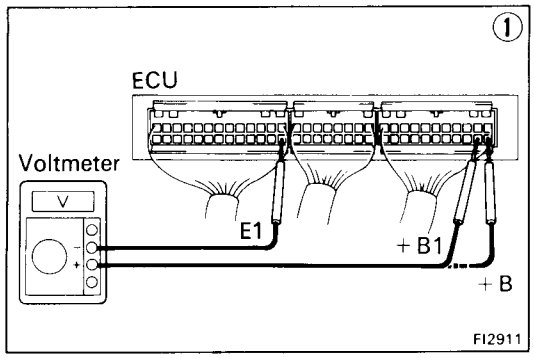
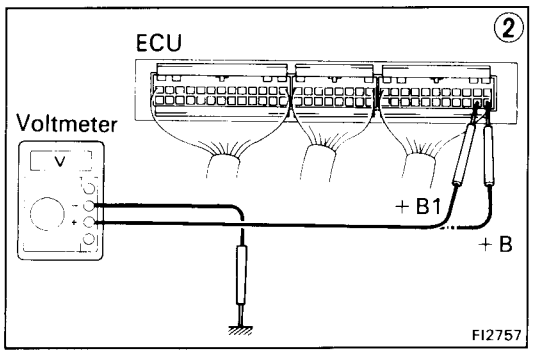
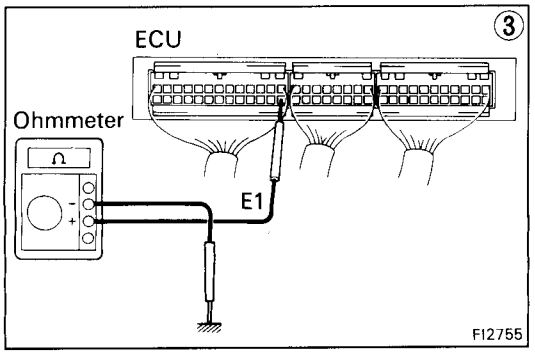
No.	Terminals	Trouble	Condition	STD voltage
1	+B, +B1 – E1	No voltage	IG SW ON	10 – 14 V









① There is no voltage between ECU terminals +B or +B1 and E1. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B or +B1 and body ground. **(IG SW ON)**

NO → ③ Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

OK ↓

Check fuse, fusible link and ignition switch.
- BAD → Repair or replace.

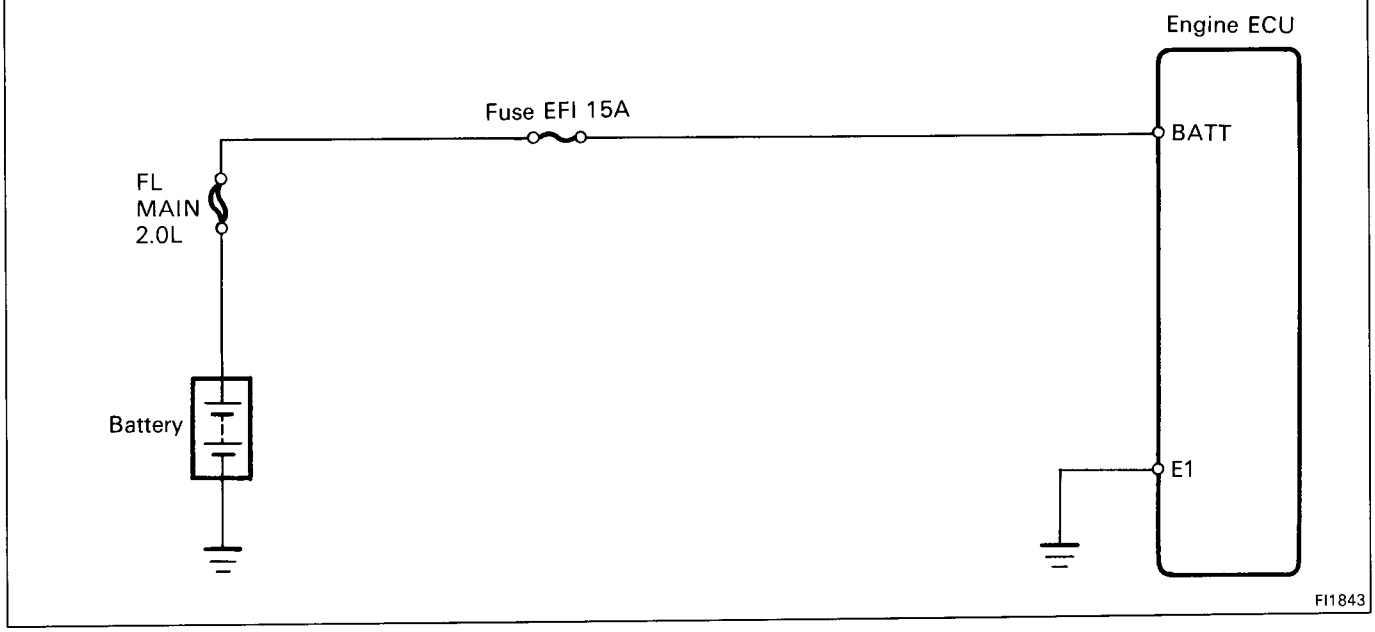
OK ↓

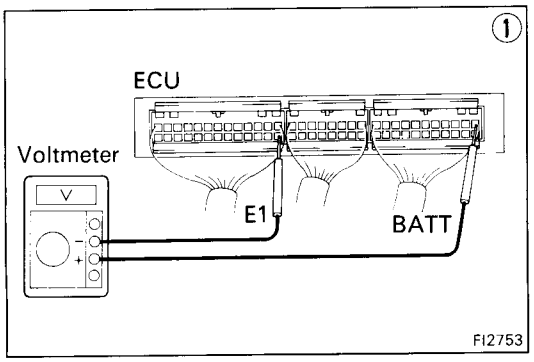
Check EFI main relay. (See page FI-79)
- BAD → Replace.

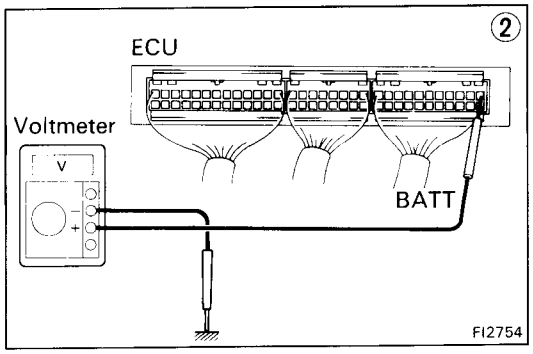
OK ↓

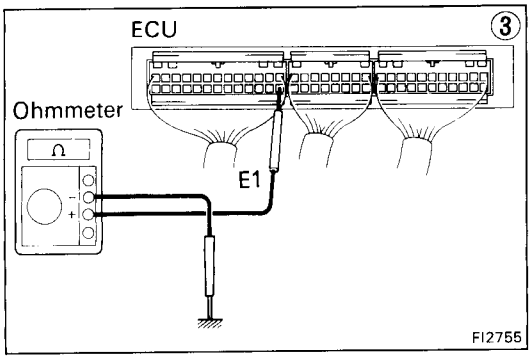
Check wiring between EFI main relay and battery.
- BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
2	BATT – E1	No voltage	–	10 – 14 V









① There is no voltage between ECU terminals BATT and E1.

② Check that there is voltage between ECU terminal BATT and body ground.

NO → ③ Check wiring between ECU terminal E1 and body ground.

③ OK → Try another ECU.

③ BAD → Repair or replace.

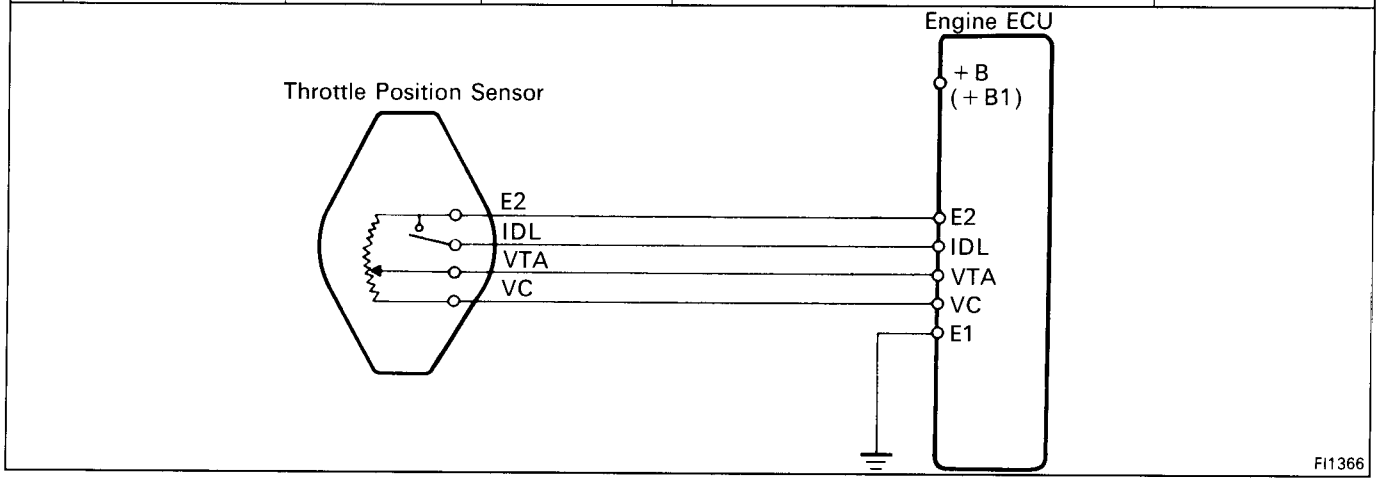
② OK → Check fuse and fusible link.

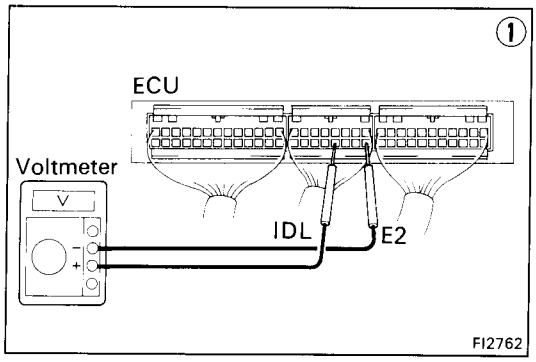
Check fuse and fusible link. BAD → Replace.

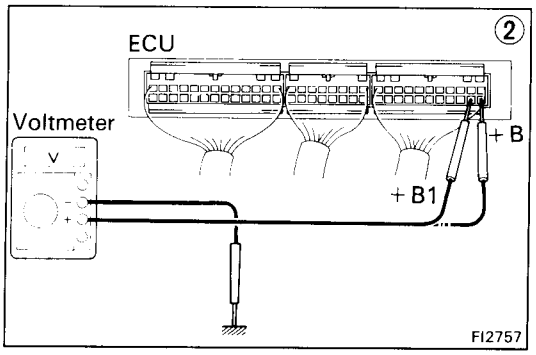
Check fuse and fusible link. OK → Check wiring between ECU terminal and battery.

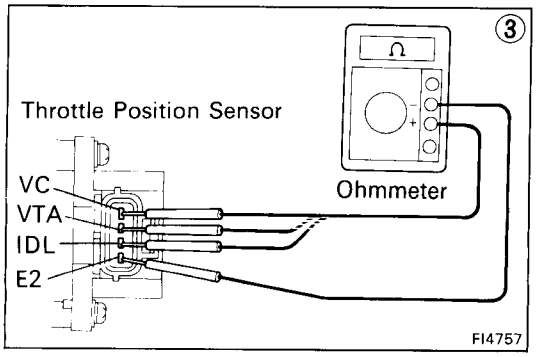
Check wiring between ECU terminal and battery. BAD → Repair or replace.

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	0.1 – 1.0 V
				Throttle valve fully open	3.2 – 4.2 V









• IDL – E2

① There is no voltage between ECU terminals IDL and E2. **(IG SW ON)** (Throttle valve open)

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

NO → Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

OK →

Refer to No.1. (See page FI-30)

BAD → Repair or replace.

OK →

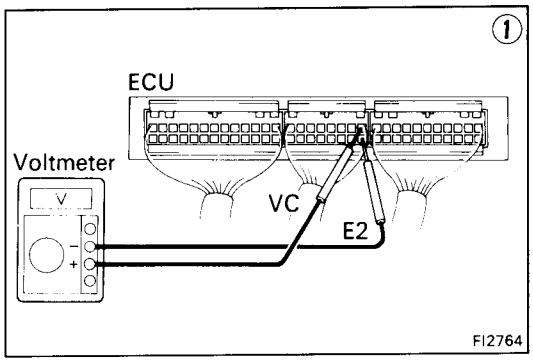
③ Check throttle position sensor. (See page FI-71)

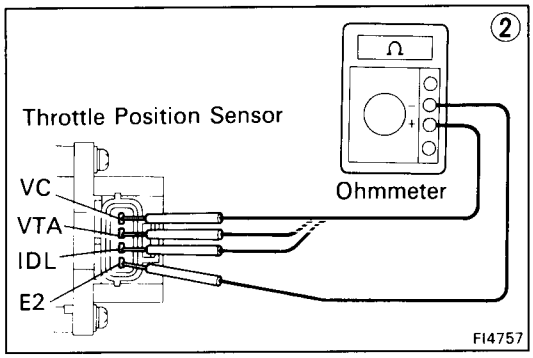
BAD → Repair or replace throttle position sensor.

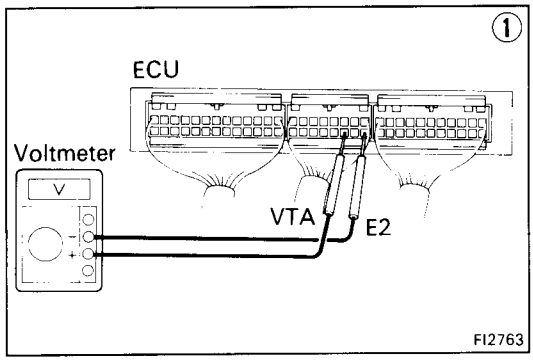
OK → Check wiring between ECU and throttle position sensor.

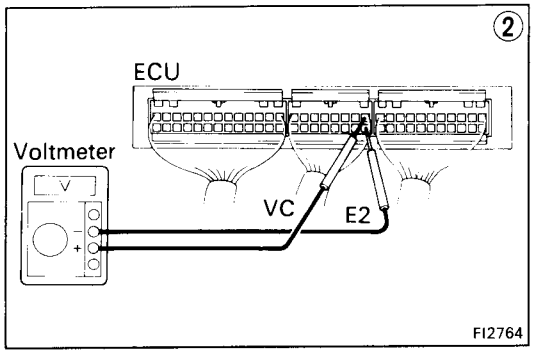
BAD → Repair or replace.

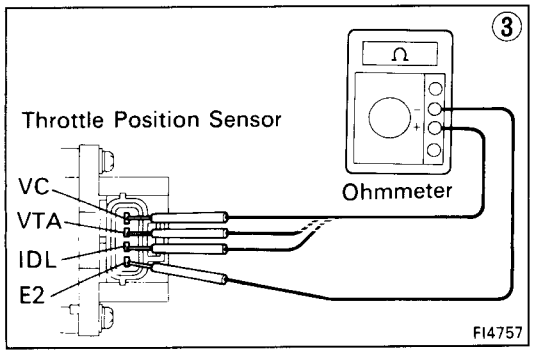
OK → Try another ECU.











• VC – E2

① There is no voltage between ECU terminals VC and E2. **(IG SW ON)**

↓

Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK → ② Check throttle position sensor. (See page FI-71)

NO → Refer to No.1. (See page FI-30)

② BAD → Repair or replace.

② OK → Check wiring between ECU and throttle position sensor.

Check wiring OK → Try another ECU.

Check wiring BAD → Repair or replace wiring

• VTA – E2

① There is no specified voltage at ECU terminals VTA and E2. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminals VC and E2. **(IG SW ON)**

② NO → Refer to VC – E2 trouble section.

Refer to VC – E2 trouble section. OK → ③ Check throttle position sensor. (See page FI-71)

② OK → ③ Check throttle position sensor. (See page FI-71)

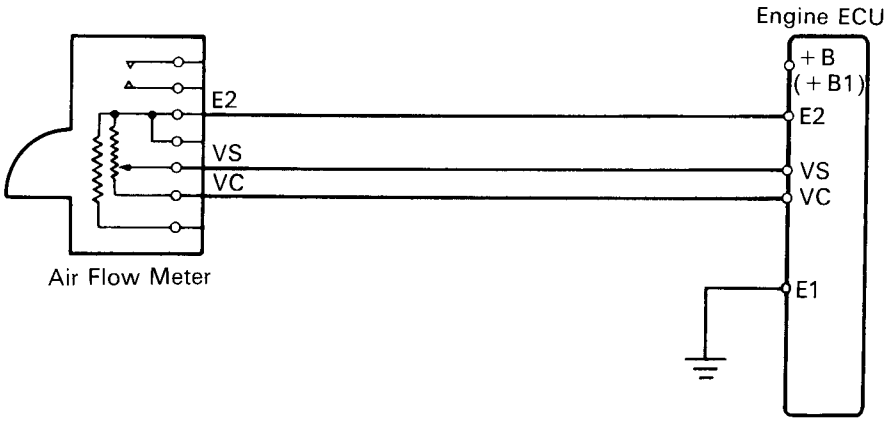
③ BAD → Repair or replace.

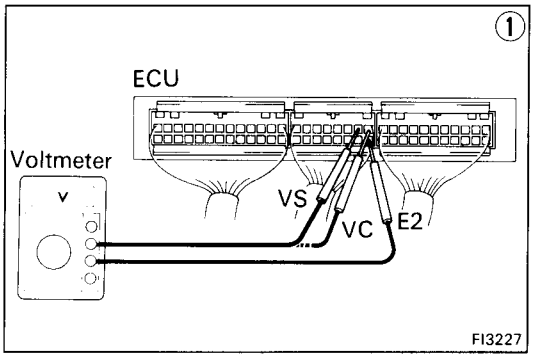
③ OK → Check wiring between ECU and throttle position sensor.

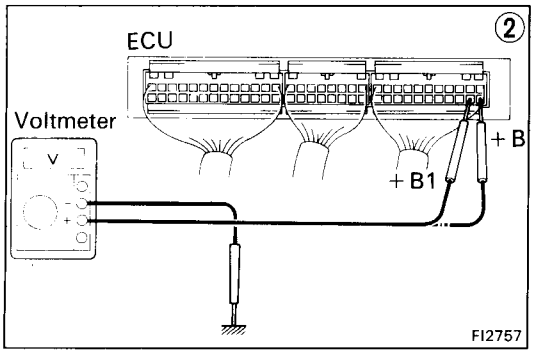
Check wiring BAD → Repair or replace.

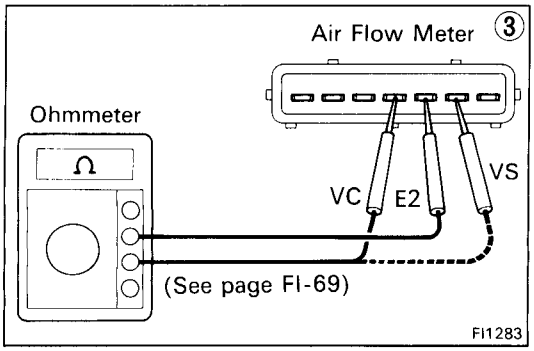
Check wiring OK → Try another ECU.

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
			Idling		1.6 – 4.1 V
			3,000 rpm		1.0 – 2.0 V









① There is no specified voltage at ECU terminals VC or VS and E2. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No.1. (See page FI-30)

↓

Check wiring between ECU terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

③ Check air flow meter. (See page FI-69)

BAD → Repair or replace air flow meter.

OK → ↓

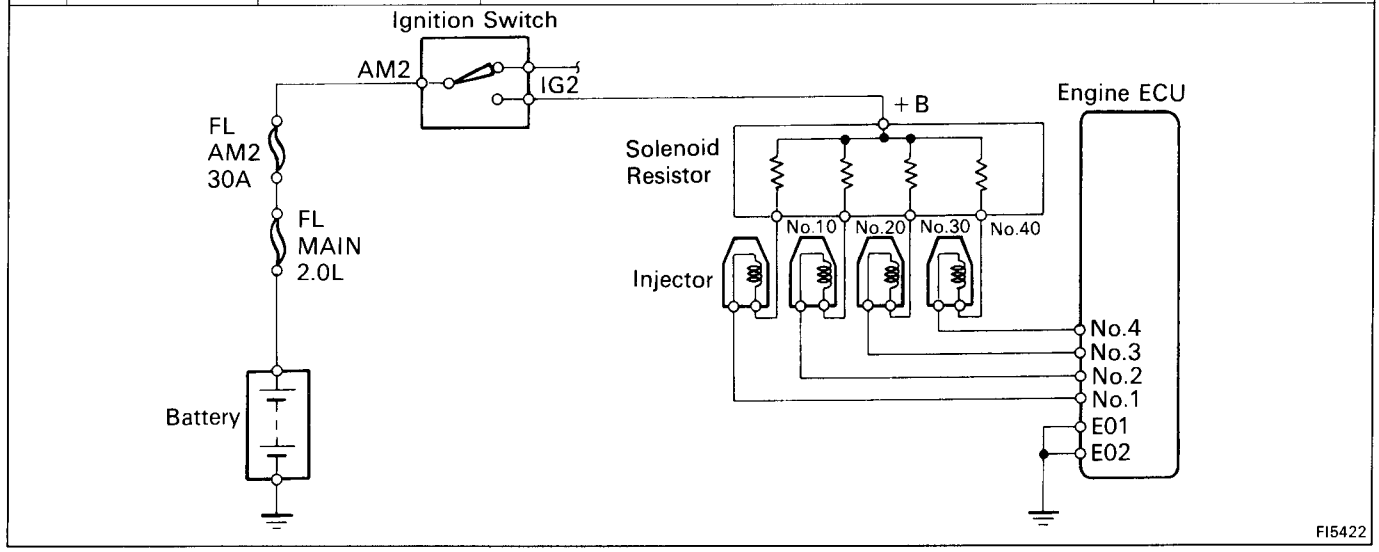
Check wiring between ECU and air flow meter.

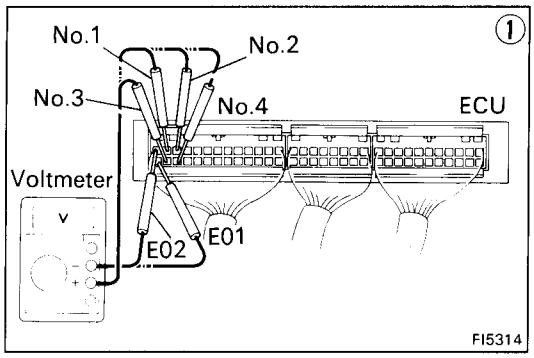
OK → ↓

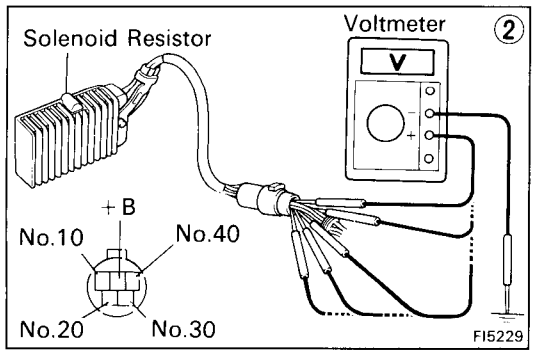
Try another ECU.

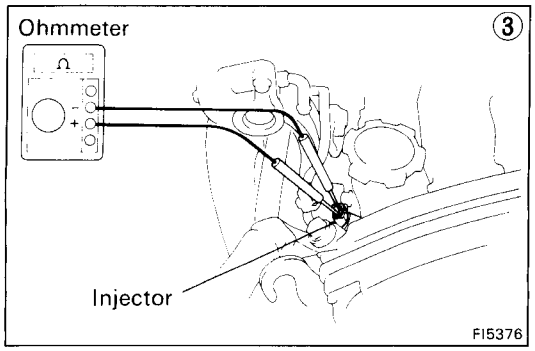
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
5	No. 1 No. 2 – E01 No. 3 – E02 No. 4	No voltage	IG SW ON	10 – 14 V









① There is no voltage between ECU terminals No.1, No.2, No.3 and/or No.4 and E01 and/or E02. **(IG SW ON)**

↓

② Check that there is specified voltage between solenoid resistor terminal +B and body ground. **STD voltage: 10 – 14 V**

OK ↓ NO → Check fusible link, wiring and ignition switch. → BAD → Repair or replace.

↓

② Check that there is specified voltage between resistor terminals (No.10, No.20, No.30 or No.40) and body ground. **STD voltage: 10 – 14 V**

OK ↓ NO → Replace resistor.

↓

③ Check resistance of each injector. **STD resistance: 2 – 4 Ω**

OK ↓ BAD → Replace injector.

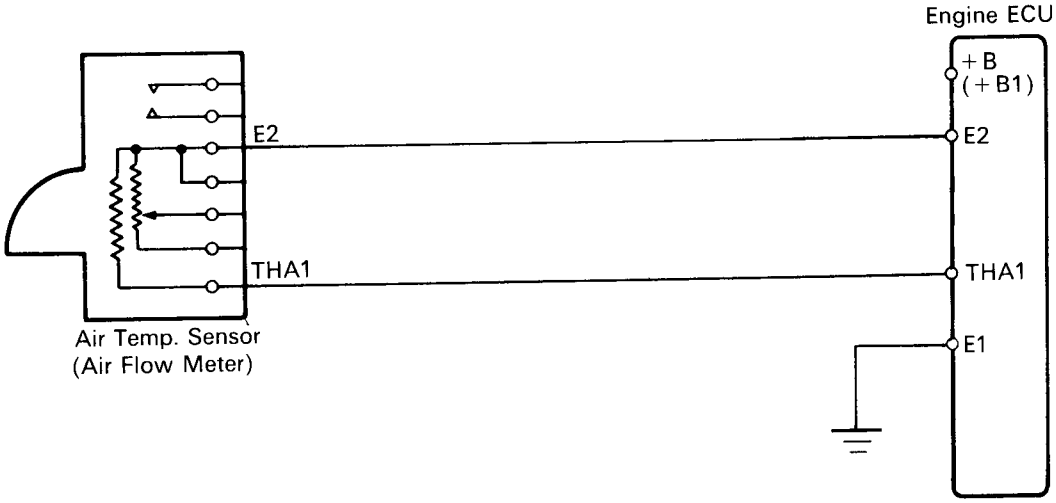
↓

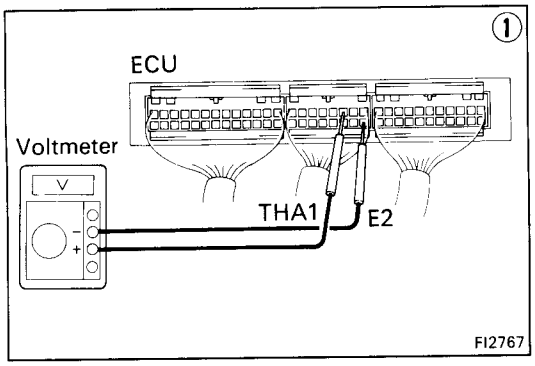
Check wiring between ECU and resistor → BAD → Repair or replace wiring

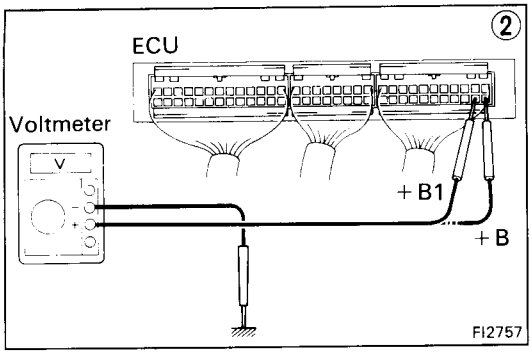
↓ OK

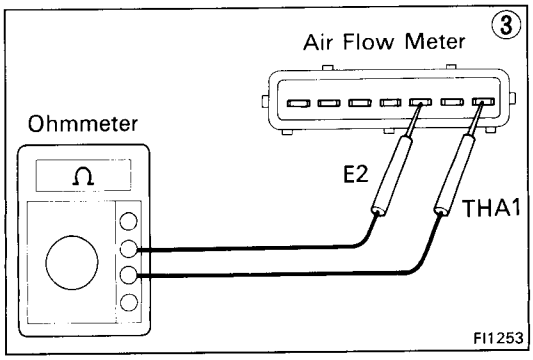
Try another ECU.

No.	Terminals	Trouble	Condition		STD voltage
6	THA1 – E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	1 – 3 V









① There is no voltage between ECU terminals THA1 and E2. **(IG SW ON)**

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK

NO

Refer to No.1. (See page FI-30)

Check wiring between ECU terminal E1 and body ground.

OK

BAD

③ Check air temp. sensor. (See page FI-69)

Repair or replace.

BAD

OK

Replace air flow meter.

Check wiring between ECU and air temp. sensor.

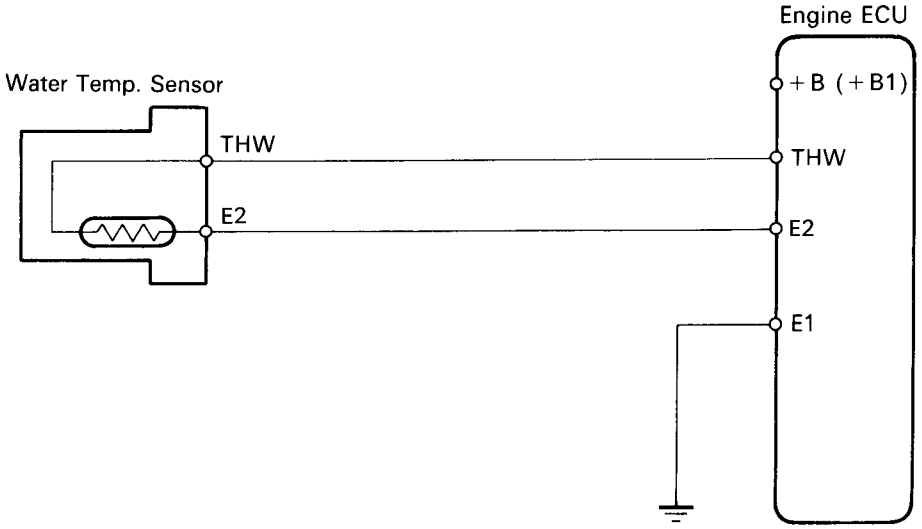
OK

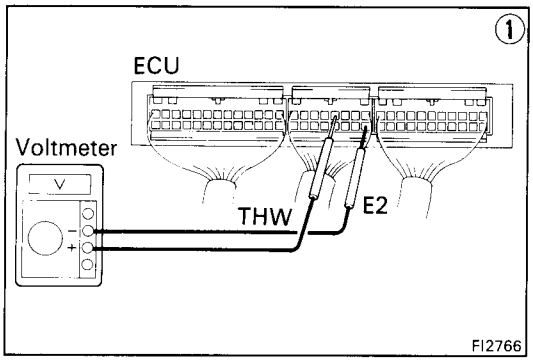
BAD

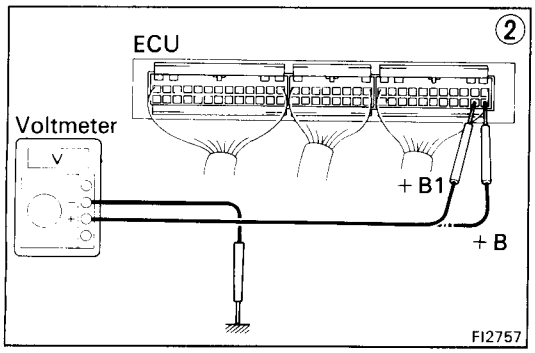
Try another ECU.

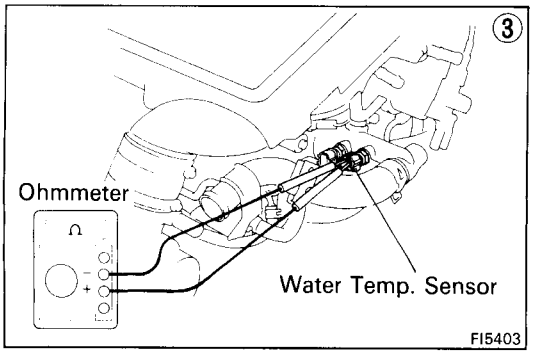
Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
7	THW – E2	No voltage	IG SW ON	Coolant temperature 80°C (176°F)	0.1 – 1.1 V









① There is no voltage between ECU terminals THW and E2. **(IG SW ON)**

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK → Check wiring between ECU terminal E1 and body ground.

NO → Refer to No1. (See page FI-30)

OK → ③ Check water temp. sensor. (See page FI-83)

BAD → Repair or replace.

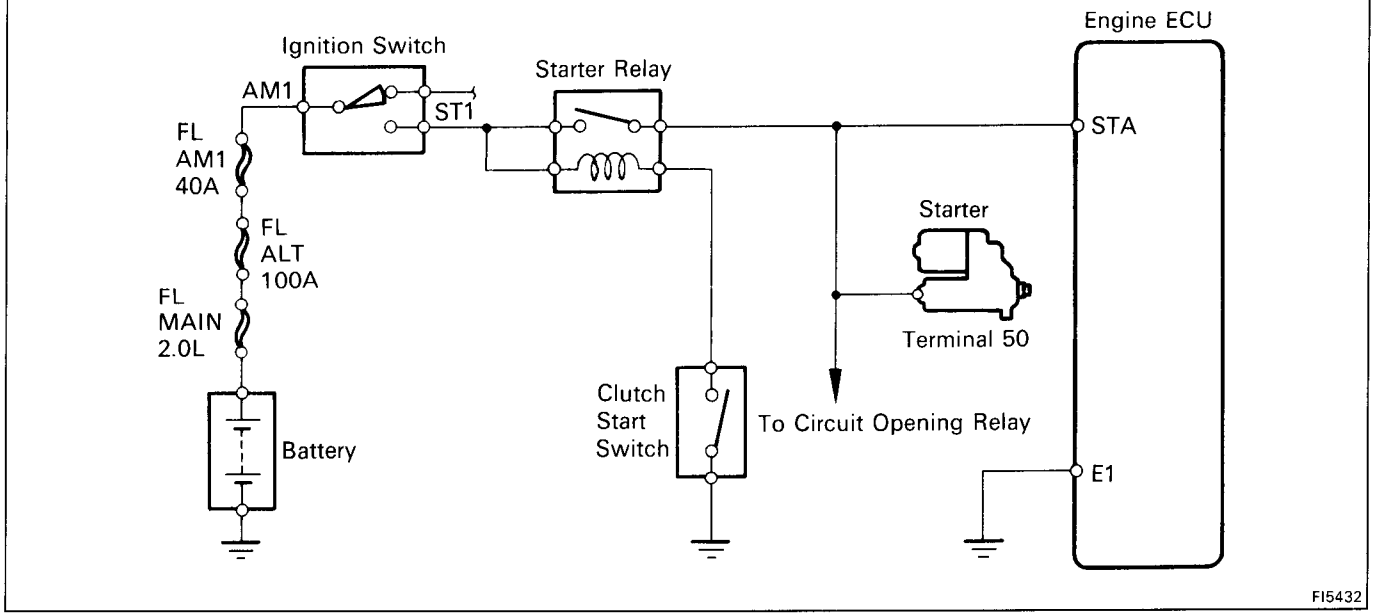
BAD → Replace water temp. sensor.

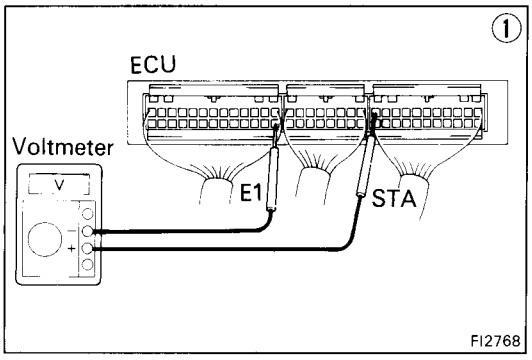
OK → Check wiring between ECU and water temp. sensor.

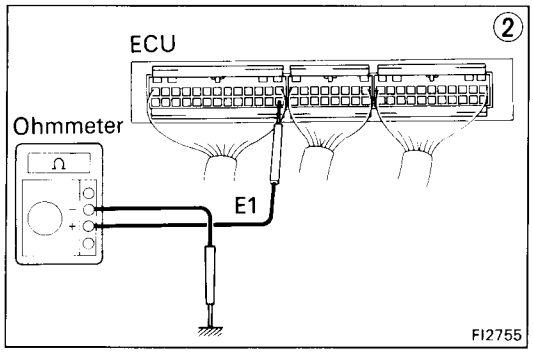
OK → Try another ECU.

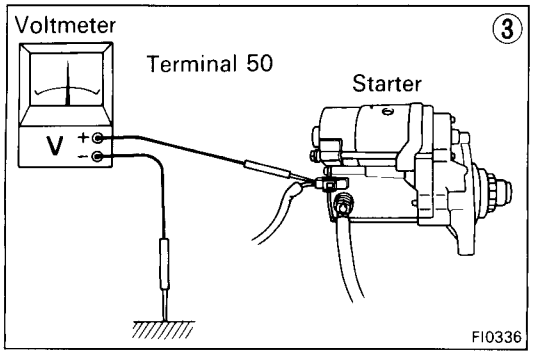
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
8	STA – E1	No voltage	Cranking	6 – 14 V









① There is no voltage between ECU terminals STA and E1. **(IG SW ON)**

Check starter operation. — OK → Check wiring between ECU terminal STA and ignition switch terminal ST1.

BAD

OK

BAD → Repair or replace.

② Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check fusible link, battery, wiring, ignition switch, clutch start switch and starter relay. — BAD → Repair or replace.

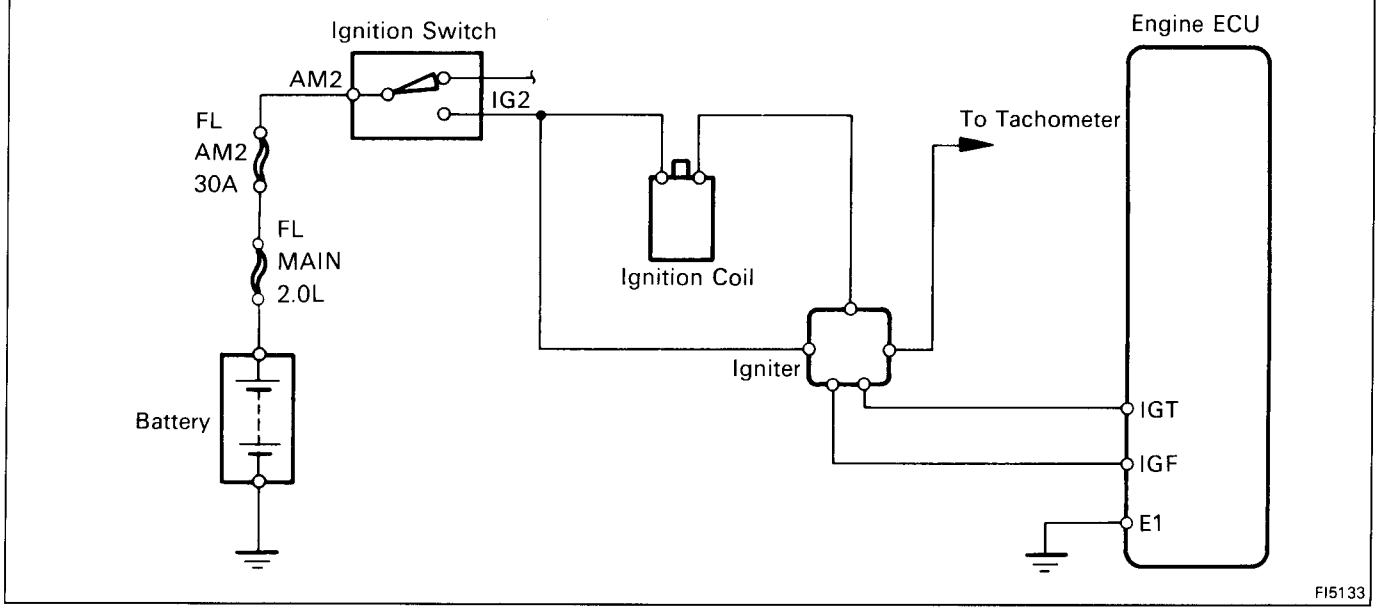
OK

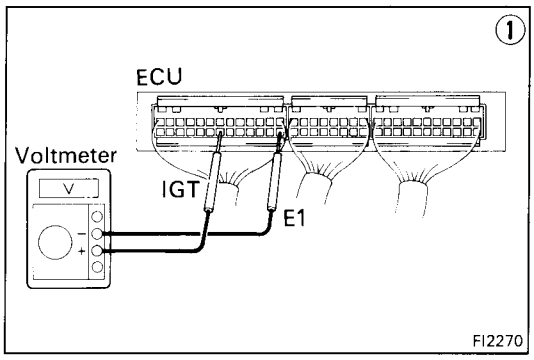
③ Check that there is voltage at terminal 50 of starter. **(IG SW START) STD voltage: 6 – 14 V**

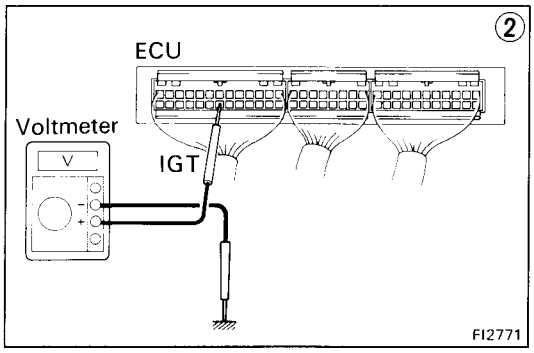
OK → Check starter.

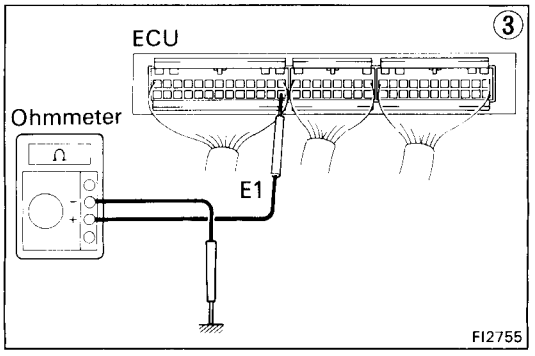
NO → Check wiring between ignition switch terminal ST1 and starter terminal 50.

No.	Terminals	Trouble	Condition	STD voltage
9	IGT – E1	No voltage	Idling	0.8 – 1.2 V









① There is no voltage between ECU terminals IGT and E1. **(Idling)**

↓

② Check that there is voltage between ECU terminal IGT and body ground. **(Idling)**

NO → ↓ OK

③ Check wiring between ECU terminal E1 and body ground. → BAD → Repair or Replace.

↓ OK

Try another ECU.

↓

Check fusible link and ignition switch. → BAD → Repair or replace.

↓ OK

Check distributor. (See page IG-8) → BAD → Repair or replace.

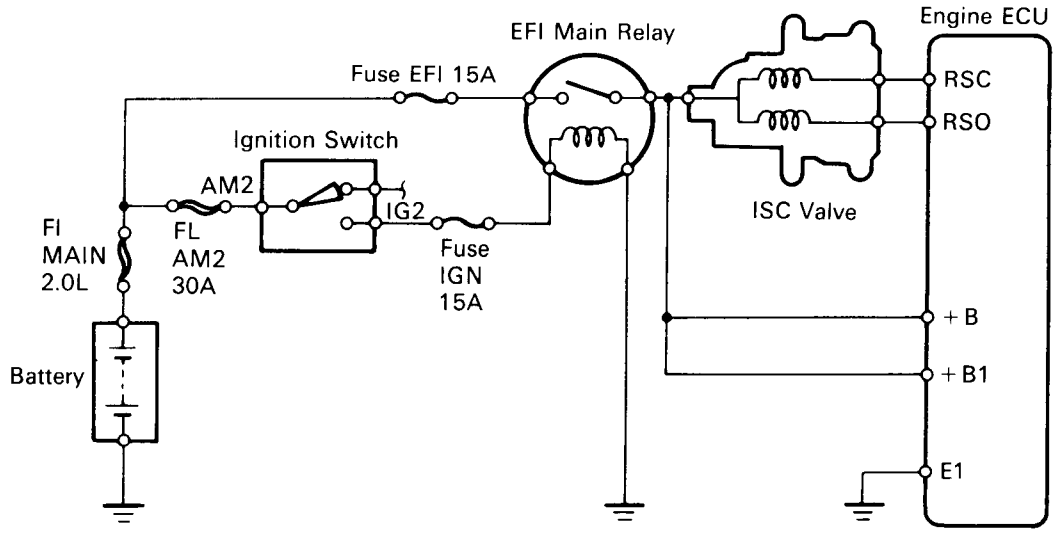
↓ OK

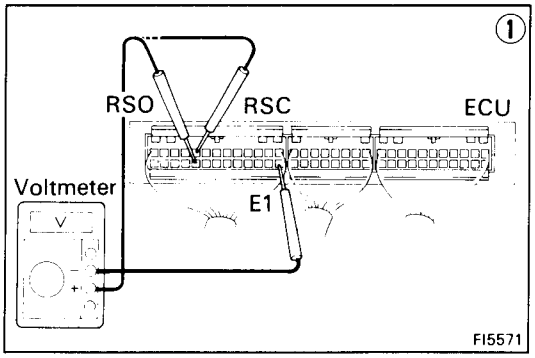
Check wiring between ECU and battery. → BAD → Repair or replace.

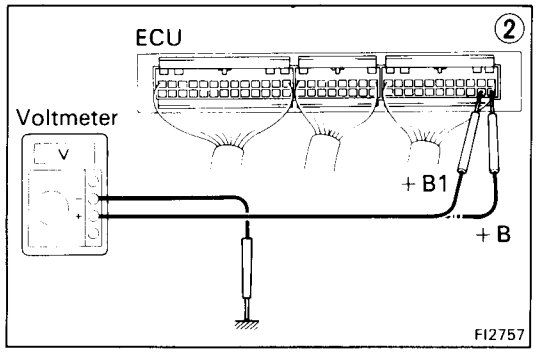
↓ OK

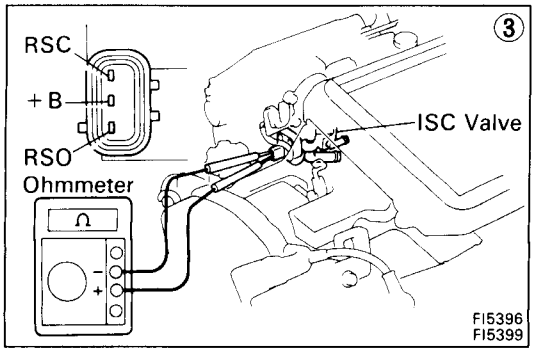
Check igniter. (See page IG-9) → BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
10	RSC, RSO – E1	No voltage	IG SW ON	8 – 14 V









① There is no voltage between ECU terminals RSC or RSO and E1. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK ↓

NO → Refer to No.1. (See page FI-30)

↓

③ Check resistance between ISC valve terminals +B and RSC or RSO. **STD resistance: 19.3 – 22.3 Ω**

BAD → Replace ISC valve.

OK ↓

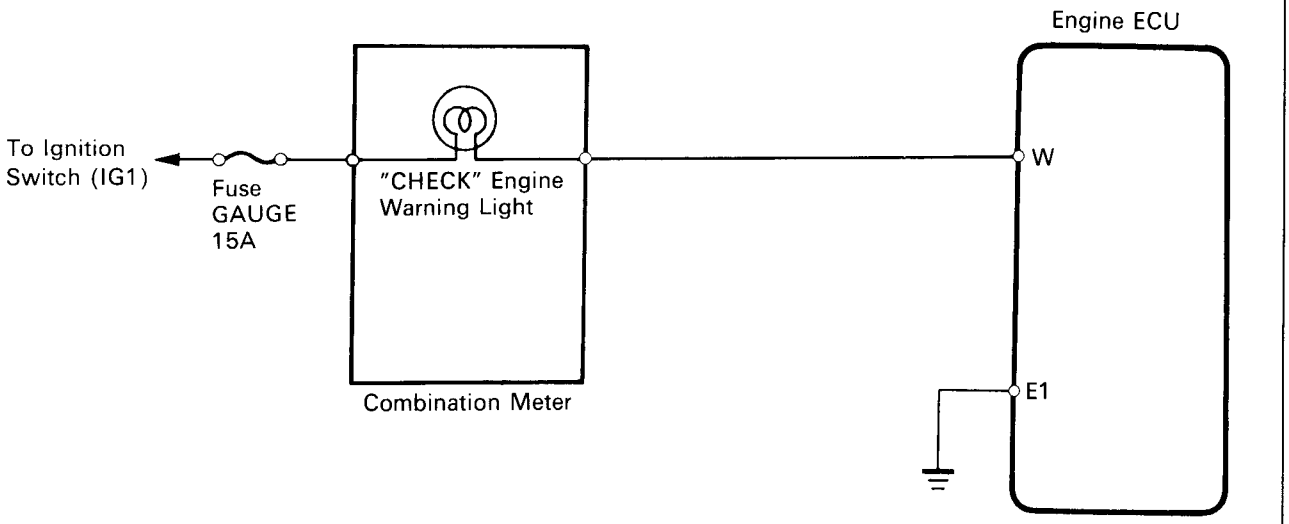
Check wiring between ECU and ISC valve.

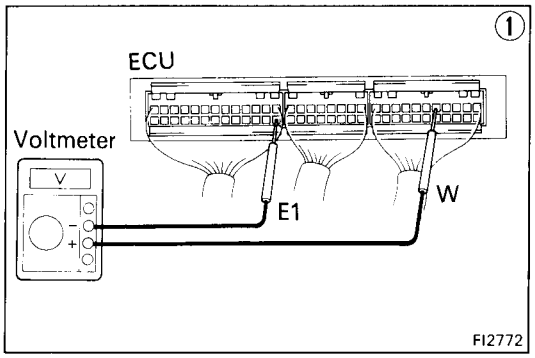
BAD → Repair or replace wiring.

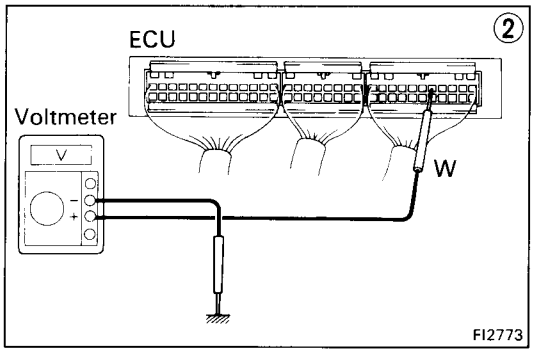
OK ↓

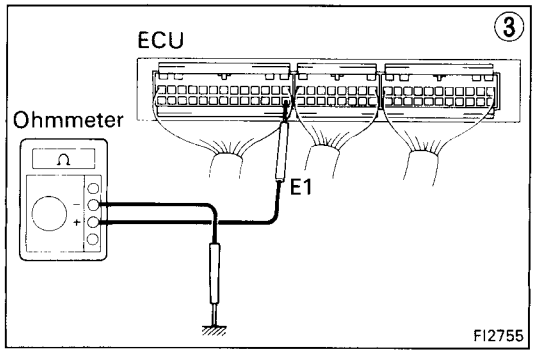
Try another ECU.

No.	Terminals	Trouble	Condition	STD voltage
11	W – E1	No voltage	No trouble ("CHECK" engine warning light off) and engine running.	10 – 14 V









① There is no voltage between ECU terminals W and E1. **(Idling)**

② Check that there is voltage between ECU terminal W and body ground.

NO

OK

③ Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check GAUGE fuse (15A) and check engine warning light.

OK

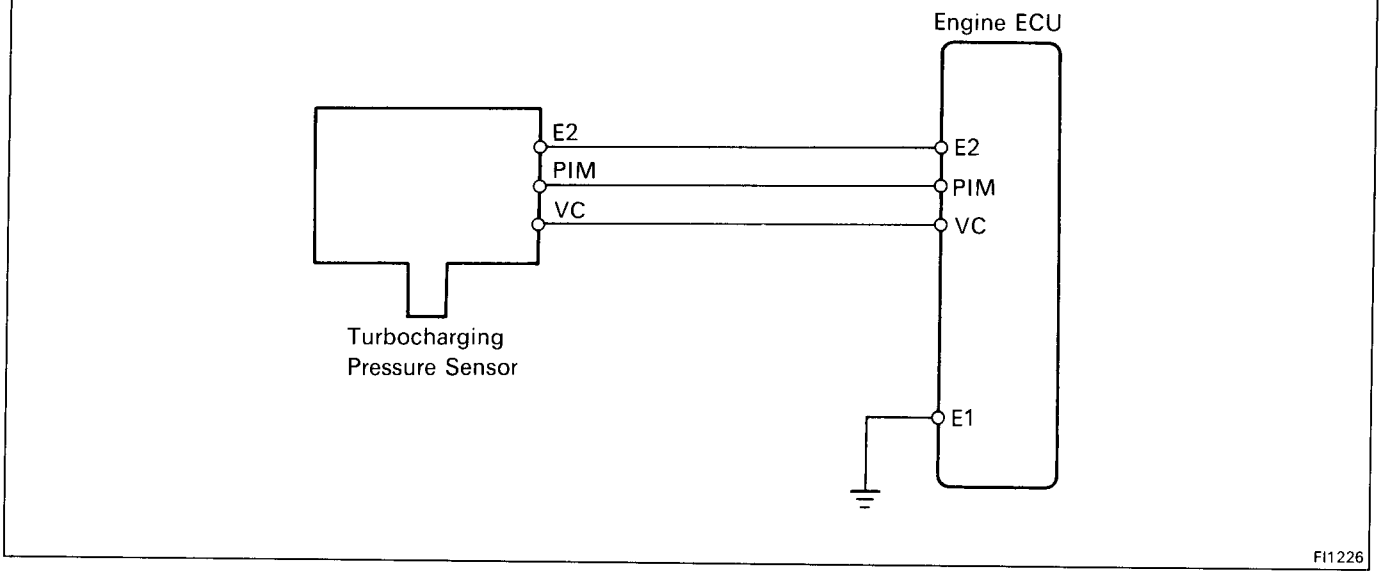
BAD → Repair or replace.

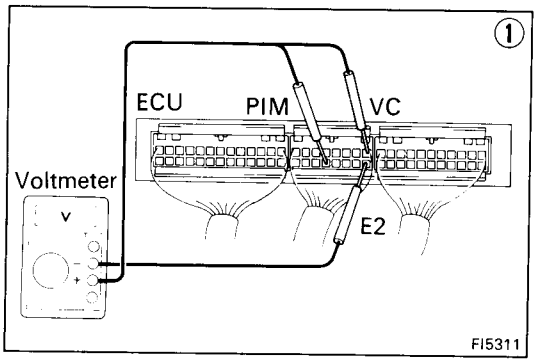
Fuse blows again

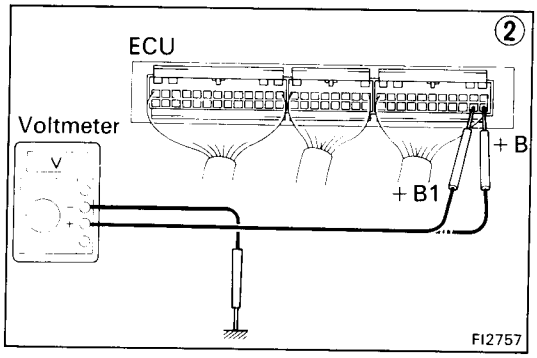
Check wiring between ECU terminal W and fuse.

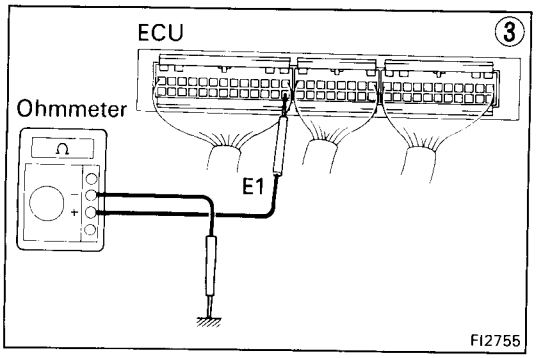
BAD → Repair or replace.

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









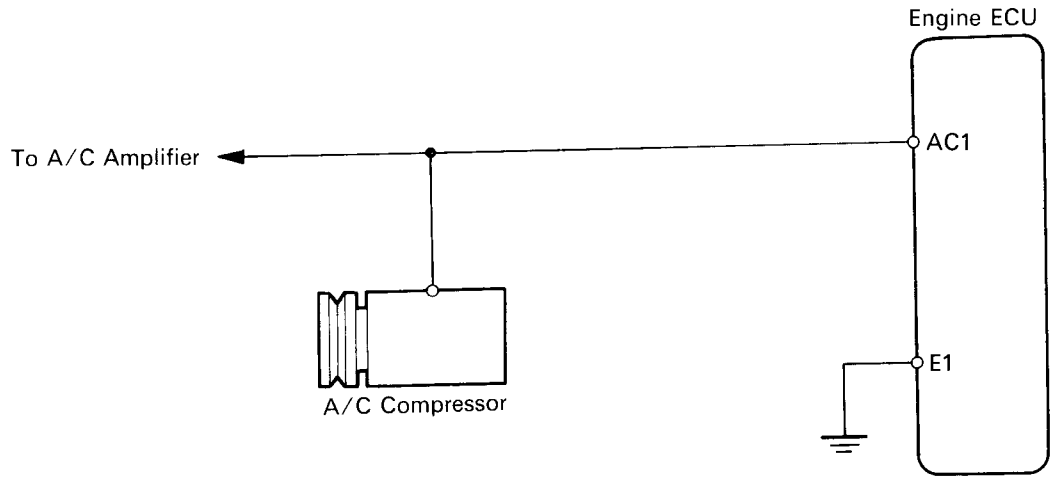
● **PIM – E2, VC – E2**

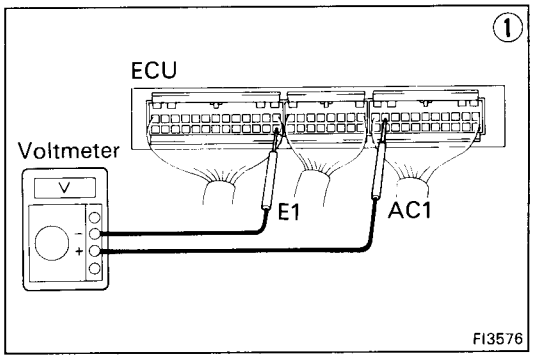
① There is no voltage between ECU terminals PIM or VC and E2. **(IG SW ON)**

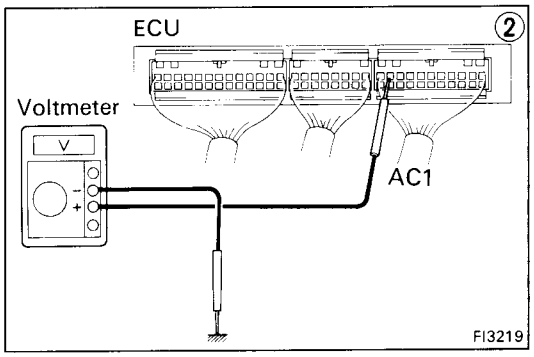
② Check that there is voltage between ECU terminal +B or +B1 and body ground. **(IG SW ON)**

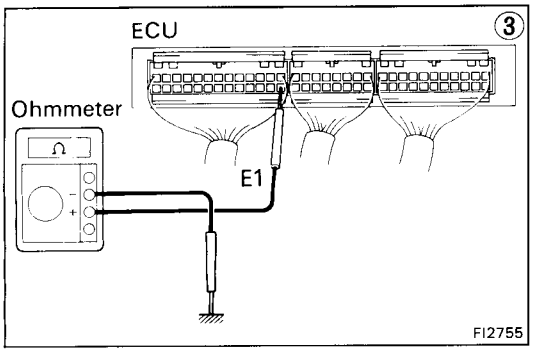
- OK → ③ Check wiring between ECU terminal E1 and body ground.
  - OK → Check turbocharging pressure sensor. (See page FI-89)
    - BAD → Replace turbocharging pressure sensor.
    - OK → Check wiring between ECU and turbocharging pressure sensor.
      - OK → Try another ECU.
      - BAD → Repair or replace.
  - BAD → Repair or replace.
- NO → Refer to No.1. (See page FI-30)

No.	Terminal	Trouble	Condition	STD voltage
13	AC1 – E1	No voltage	Air conditioning ON	8 – 14 V









① There is no voltage between ECU terminals AC1 and E1. **(Air conditioning ON)**

② Check that there is voltage between ECU terminal AC1 and body ground.

NO

OK

③ Check wiring between ECU terminal E1 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check compressor running.

OK

Check wiring between ECU terminal AC1 and amplifier.

BAD

Repair or replace.

BAD

Check that there is voltage between amplifier terminal and body ground.

BAD

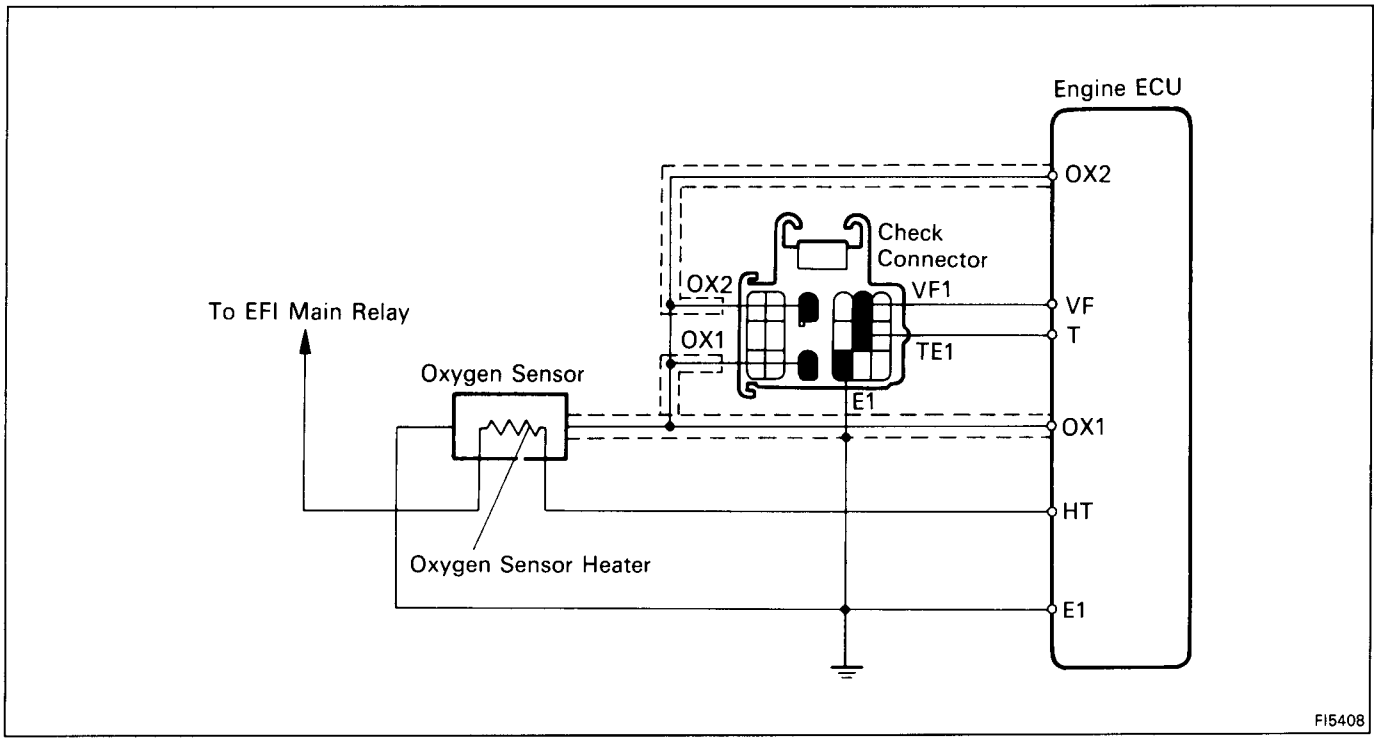
Repair or replace.

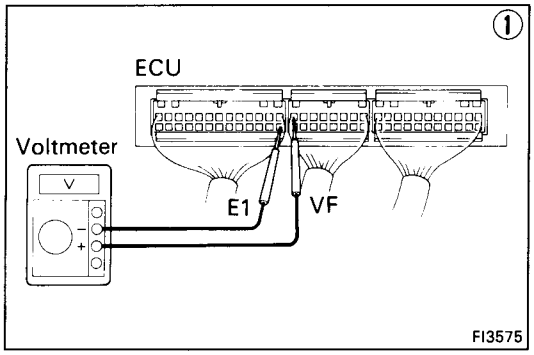
OK

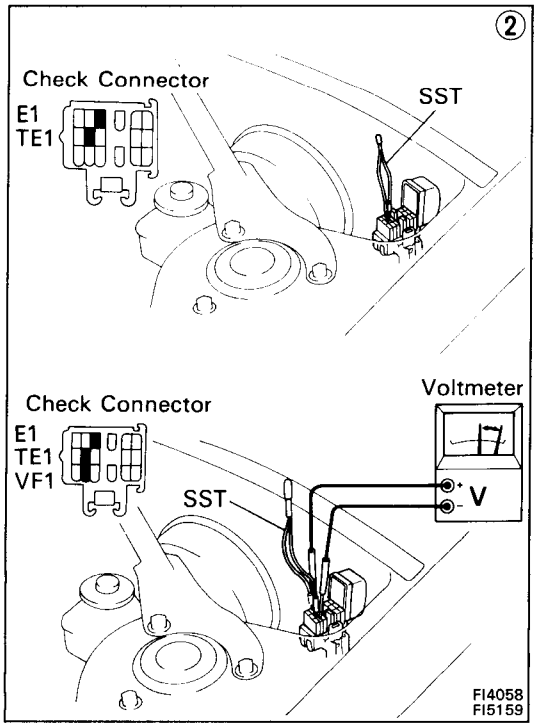
Check wiring between amplifier and ECU or compressor.

BAD

Repair or replace.







① There is no voltage between ECU terminals VF and E1.

↓

Check that there is voltage between ECU terminal VF and body ground.

NO → ↓ OK

Check wiring between ECU terminal E1 and body ground.

↓ OK → Try another ECU.

↓ BAD → Repair or replace.

Is air leaking into air induction system? YES → Repair air leak.

↓ NO

Check spark plugs. (See page IG-5) BAD → Repair or replace.

↓ OK

Check distributor and ignition system. (See page IG-4) BAD → Repair or replace.

↓ OK

Check fuel pressure. (See page FI-47) BAD → Repair or replace.

↓ OK

Check injectors. (See page FI-58) BAD → Repair or replace.

↓ OK

* Check cold start injector. (See page FI-53) BAD → Repair or replace.

↓ OK

Check air flow meter. (See page FI-69) BAD → Repair or replace.

↓ OK

② Check operation of oxygen sensor. (See page FI-92) BAD → System Normal

↓ BAD

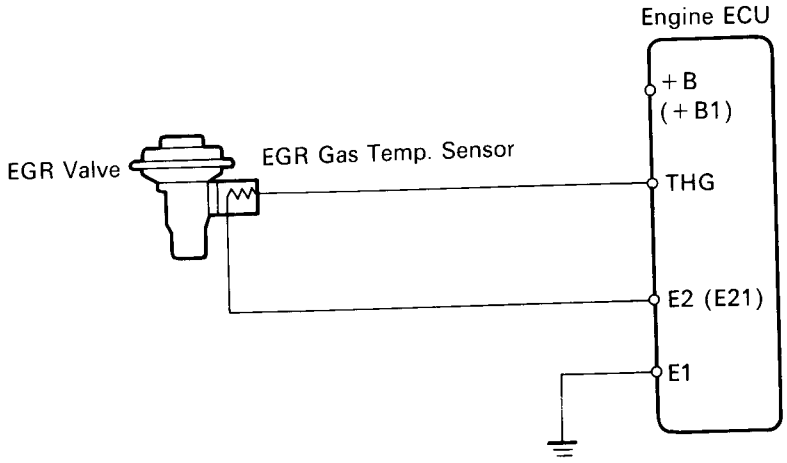
Check wiring between oxygen sensor and ECU. BAD → Repair wiring.

↓ OK

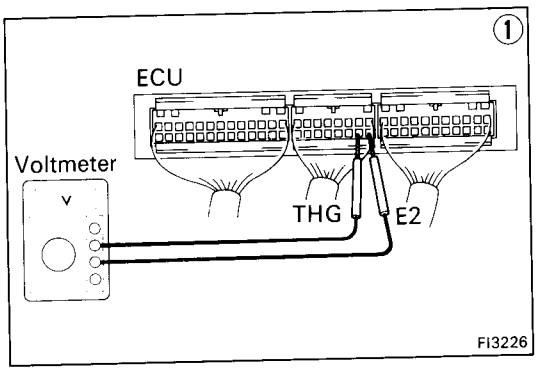
Replace oxygen sensor.

* Rich malfunction only

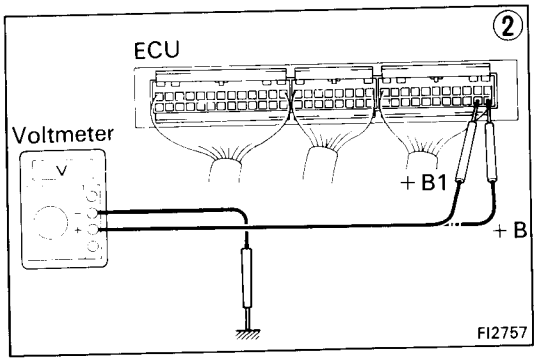
CALIF. only



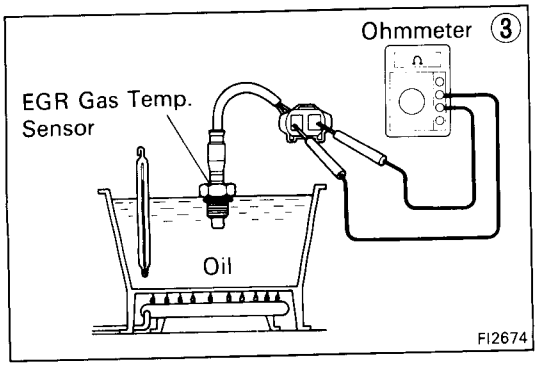
FI2680



FI3226



FI2757



FI2674

① There is no voltage between ECU terminals THG and E2. **(IG SW ON)**

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK

NO → Refer to No.1. (See page FI-30)

Check wiring between ECU terminal E1 and body ground.

OK

BAD → Repair or replace.

Check EGR system. (See page EC-8)

BAD → Repair or replace.

OK

③ Check EGR gas temp. sensor. (See page FI-91)

BAD → Replace EGR gas temp. sensor.

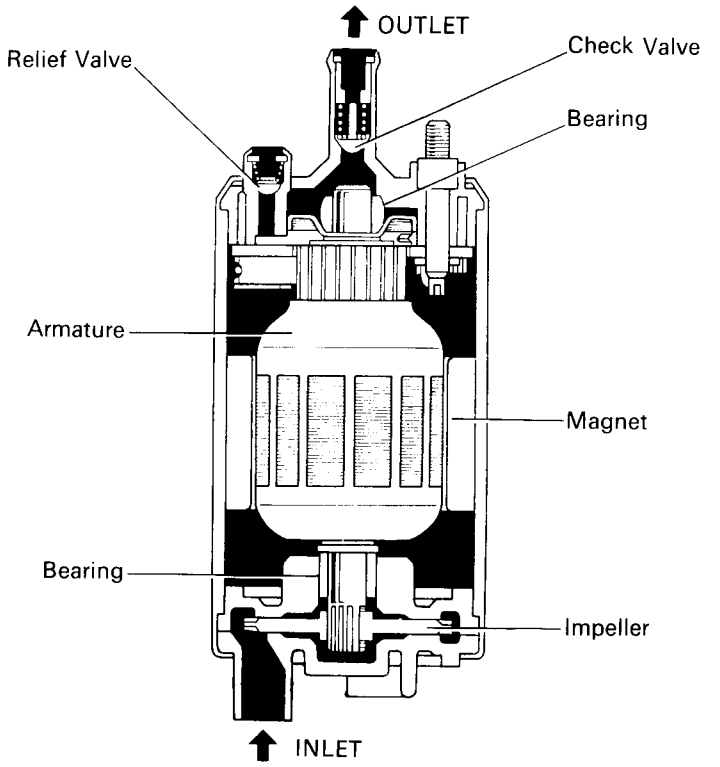
OK → Check wiring between ECU and EGR gas temp. sensor

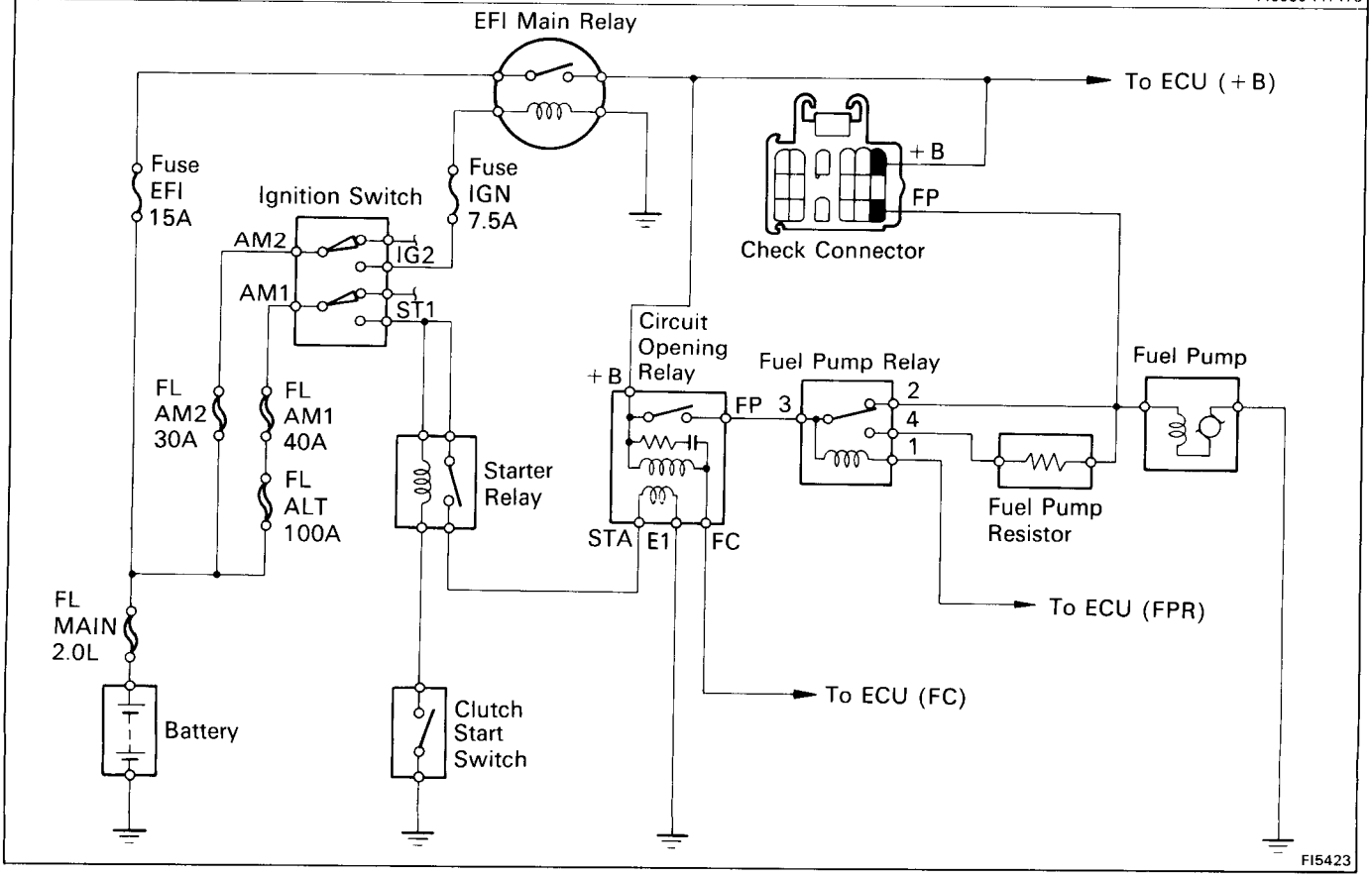
OK → Try another ECU.

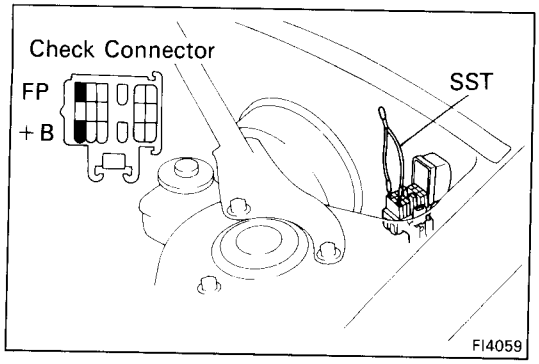
BAD → Repair or replace.

FUEL SYSTEM

Fuel Pump







ON-VEHICLE INSPECTION

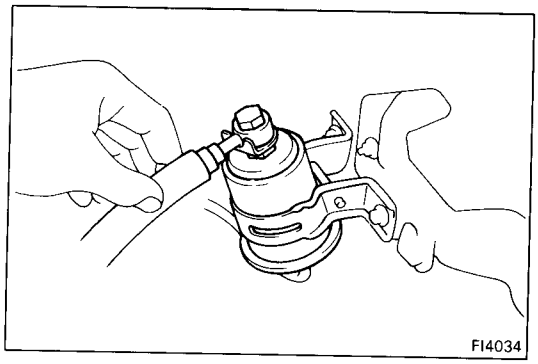
1. CHECK FUEL PUMP OPERATION

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

SST 09843-18020

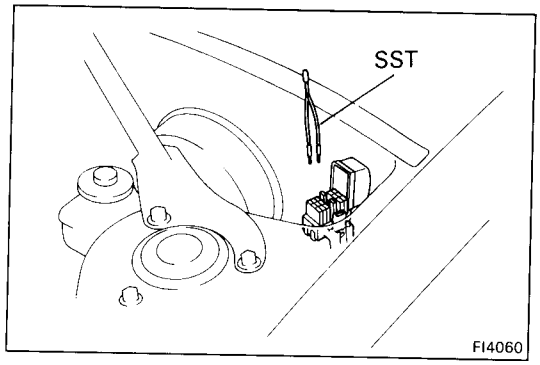
(b) Turn the ignition switch ON.

NOTICE: Do not start the engine.



(c) Check that there is pressure in the 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:

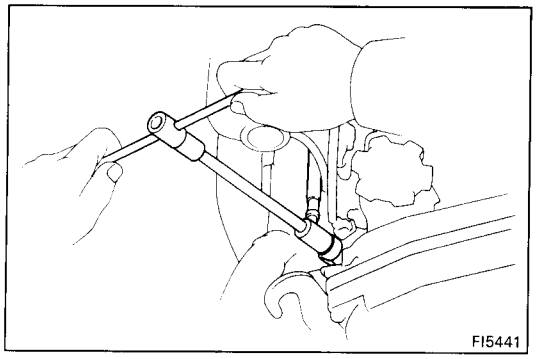
- Fusible links
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Fuel pump
- Fuel pump relay
- Fuel pump resistor
- ECU
- Wiring connections

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.

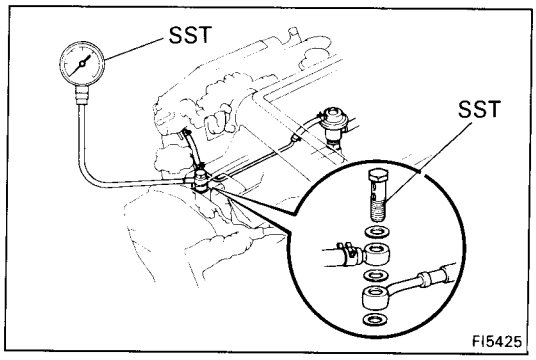
CAUTION: Work must be started after approx. 20 seconds or longer from he time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.



(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.



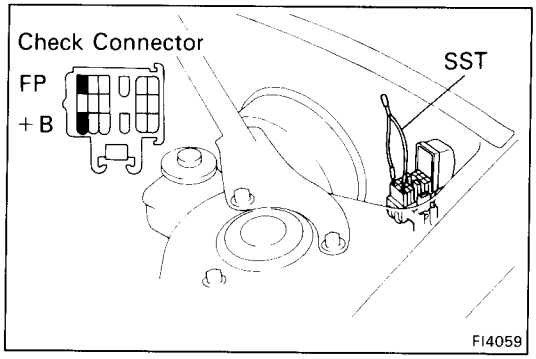
(d) Install the fuel inlet hose and SST (pressure gauge) to the delivery pipe with three new gaskets and SST (union bolt).

SST 09268-45012

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

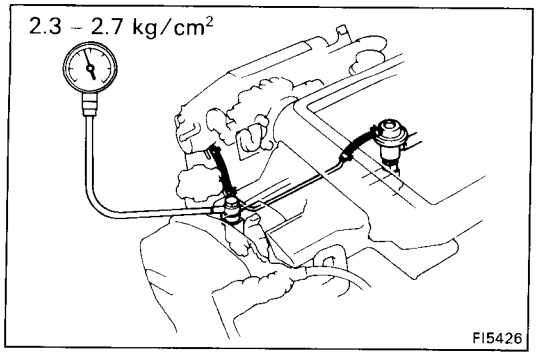
(e) Wipe off any splattered gasoline.

(f) Reconnect the battery negative (–) cable.



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

SST 09843-18020



(h) Turn the ignition switch ON.

(i) Measure the fuel pressure.

Fuel pressure: 2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)

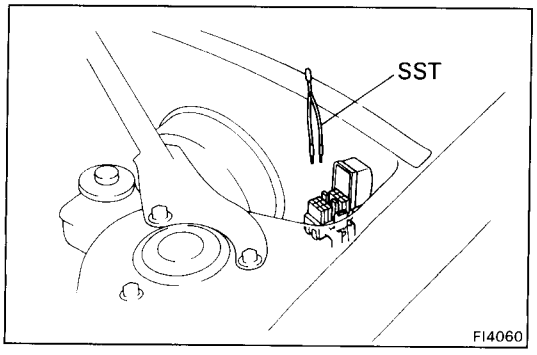
If pressure is high, replace the fuel pressure regulator.

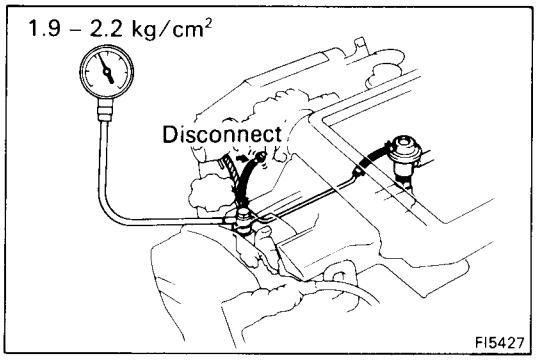
If pressure is low, check the following parts:

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

(j) Remove SST.

SST 09843-18020



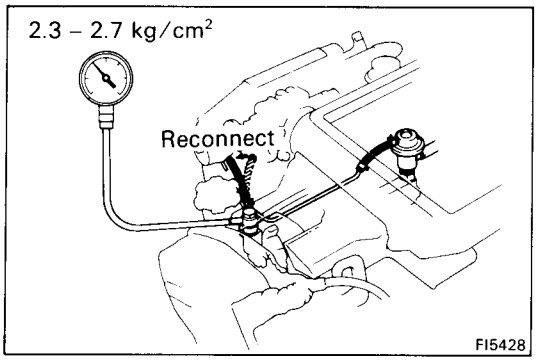


(k) Start the engine.

(l) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.

(m) Measure the fuel pressure at idling.

Fuel pressure: 2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)



(n) Reconnect the vacuum sensing hose to the fuel pressure regulator and plug the hose end.

(o) Measure the fuel pressure at idling.

Fuel pressure: 1.9 – 2.2 kg/cm² (27 – 31 psi, 186 – 216 kPa)

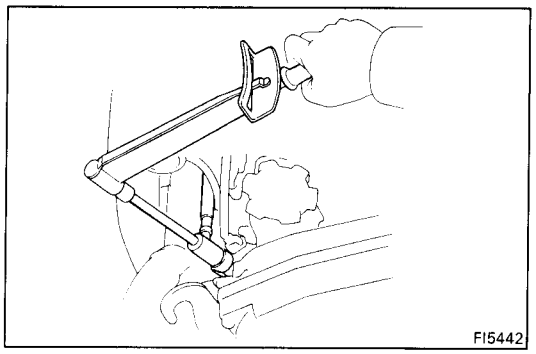
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

(p) Stop the engine. Check that the fuel pressure remains 1.5 kg/cm² (21 psi, 147 kPa) 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.

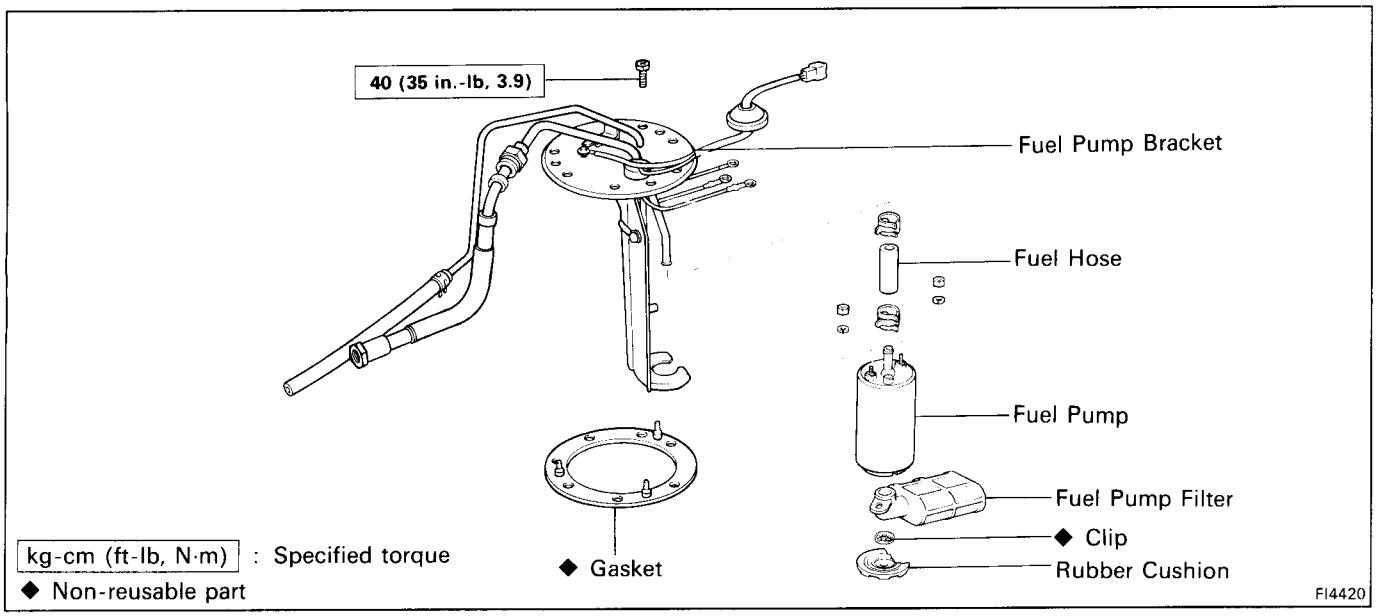
Torque: 300 kg-cm (22 ft-lb, 29 N·m)

(s) Reconnect the cable to the negative (–) terminal of the battery.

(t) Check for fuel leakage. (See page FI-8)

REMOVAL OF FUEL PUMP

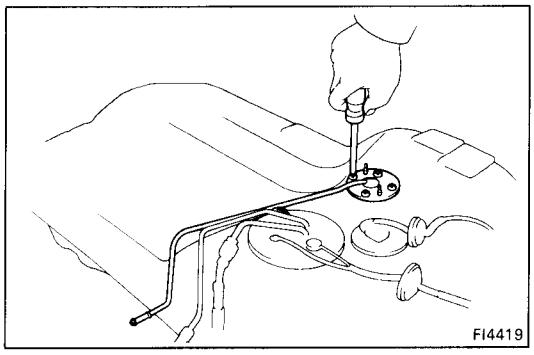
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.



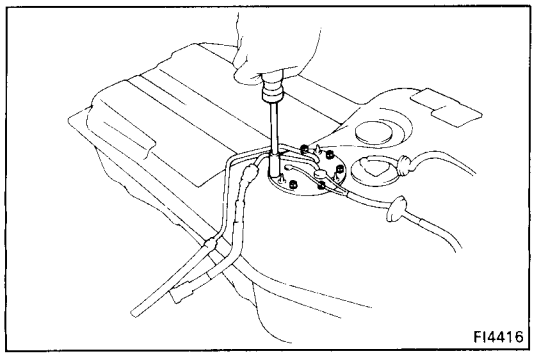
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

   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.

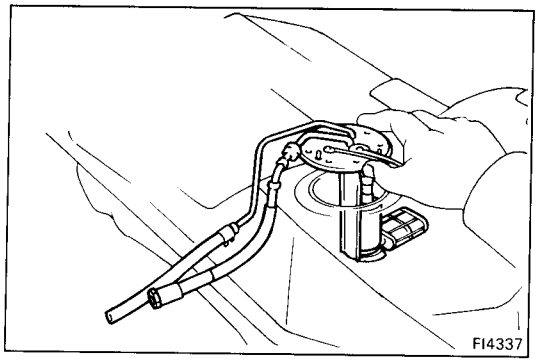
2. **REMOVE FUEL TANK**
   (See procedure Fuel Tank Components on page FI-67)



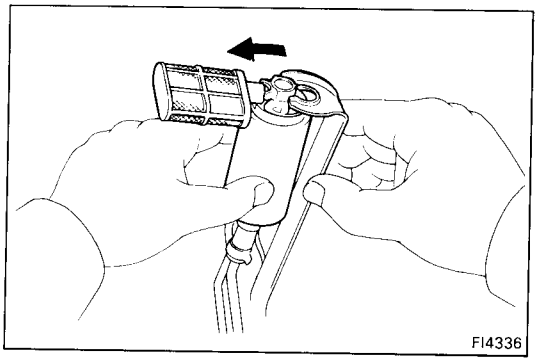
3. **REMOVE FUEL EVAPORATION BENT TUBE**
   (a) Remove the bolt holding the bent tube to the fuel pump bracket.
   (b) Remove the four screws, bent tube and gasket.



4. **REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK**
   (a) Remove the six bolts.

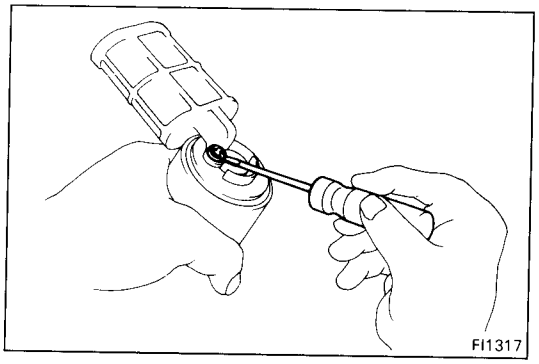


(b) Pull out the pump bracket assembly.
(c) Remove the gasket from the pump bracket.



5. 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.



6. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Using a small screwdriver, remove the clip.
(b) Pull out the pump filter.

INSTALLATION OF FUEL PUMP

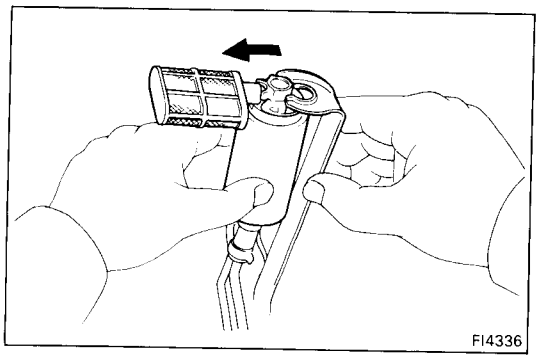
(See page FI-50)

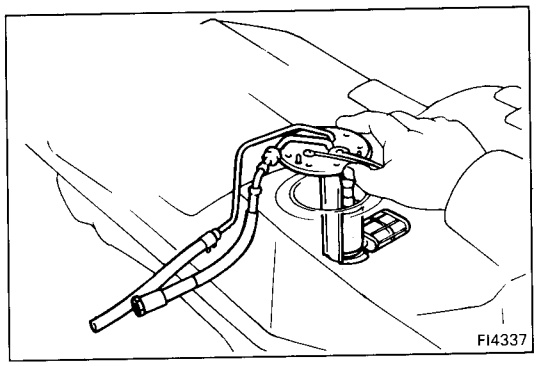
1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

Install the pump filter with a new clip.

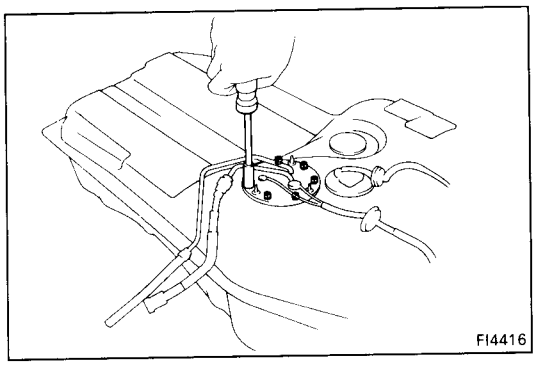
2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

(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.

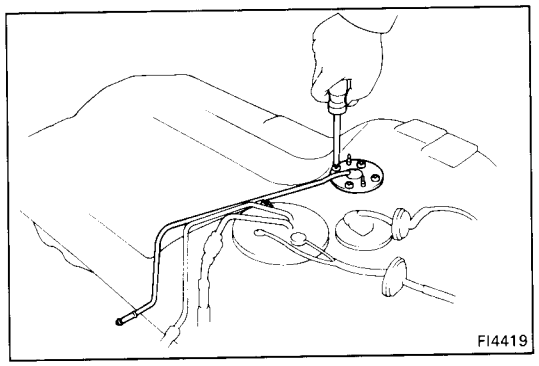




3. **INSTALL FUEL PUMP BRACKET ASSEMBLY TO FUEL TANK**
   (a) Install a new gasket to the pump bracket.
   (b) Insert the pump bracket assembly into the fuel tank.



   (c) Install the pump bracket with the six bolts.
   Torque: 40 kg-cm (35 in.-lb, 3.9 N·m)



4. **INSTALL FUEL EVAPORATION BENT TUBE**
   (a) Install a new gasket to the bent tube.
   (b) Install the bent tube with the four screws.
   Torque: 15 kg-cm (13 in.-lb, 1.5 N·m)
   (c) Install the bolt holding the bent tube to the fuel pump bracket.
   Torque: 30 kg-cm (26 in.-lb, 2.9 N·m)

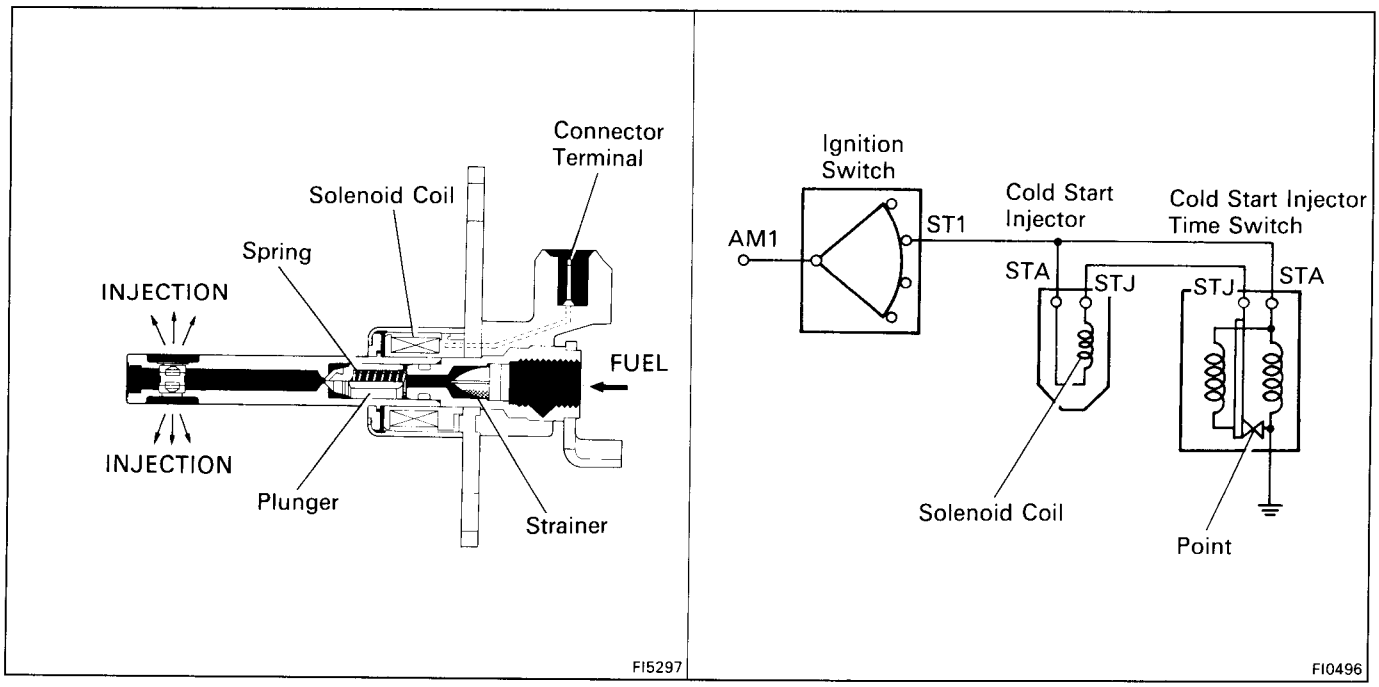
5. **INSTALL FUEL TANK**
   (See procedure Fuel Tank Components on page FI-67)

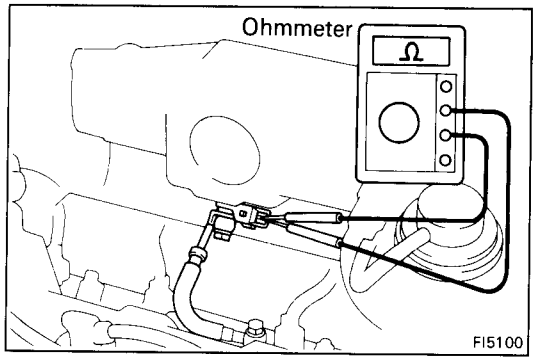
6. **FILL WITH FUEL**

7. **CHECK FOR FUEL LEAKAGE (See page FI-8)**

8. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

Cold Start Injector





ON-VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

(a) Remove the throttle body.
(See steps 1 to 8, 10 and 11 on pages FI-72 and 73)

(b) Disconnect the cold start injector connector.

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

Resistance: 2 – 4 Ω

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

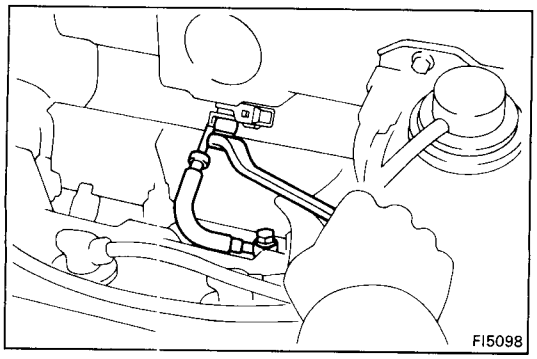
(d) Reconnect the cold start injector connector.

(e) Reinstall the throttle body.
(See steps 2, 3 and 5 to 12 on pages FI-74 and 75)

REMOVAL OF COLD START INJECTOR

1. **REMOVE THROTTLE BODY**
(See steps 1 to 8, 10 and 11 on pages FI-72 and 73)

2. **DISCONNECT COLD START INJECTOR CONNECTOR**

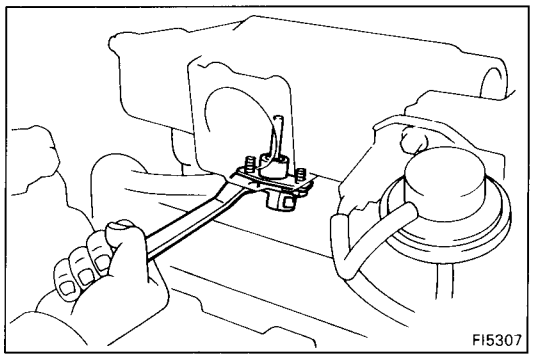


3. **REMOVE COLD START INJECTOR PIPE**

Remove the two union bolts and four gaskets and injector pipe.

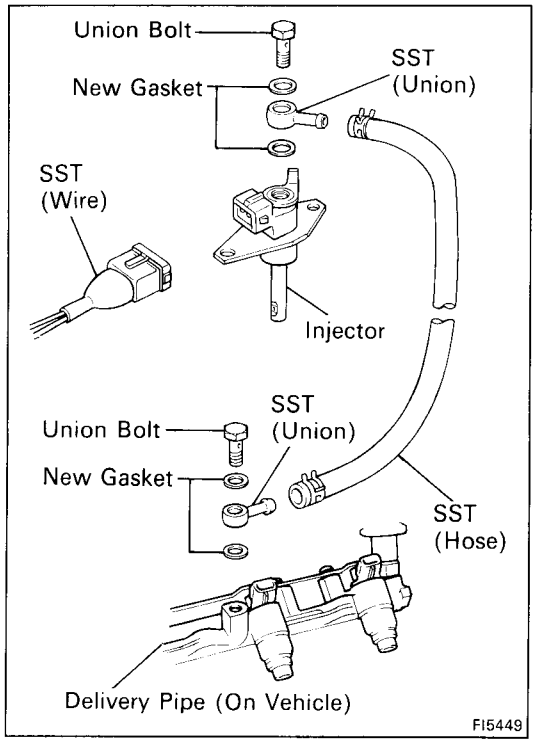
HINT:

- Put a suitable container or shop towel under the injector pipe.
- Slowly loosen the union bolt.



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)

(b) Connect SST (hose) to the unions.

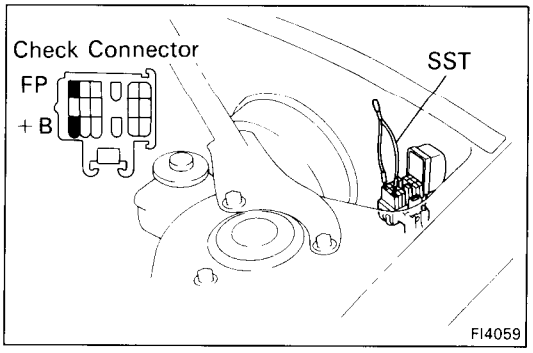
SST 09268-41045

(c) Connect SST (wire) to the injector.

SST 09842-30050

(d) Put a container under the injector.

(e) Reconnect the battery negative (–) cable.

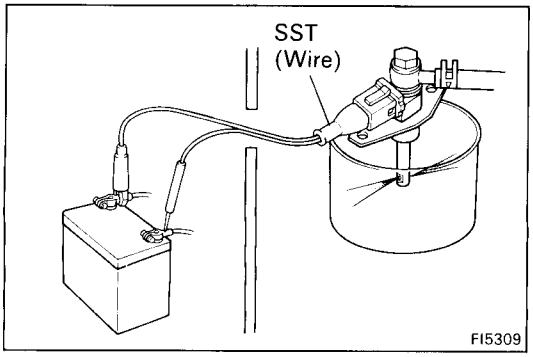


(f) Using SST, connect terminals +B and FP of the check connector.

SST 09843-18020

(g) Turn the ignition switch ON.

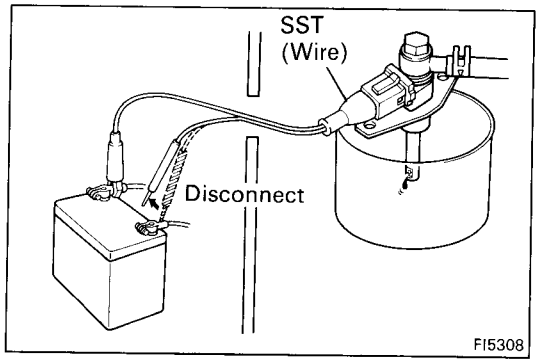
NOTICE: Do not start the engine.



(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.

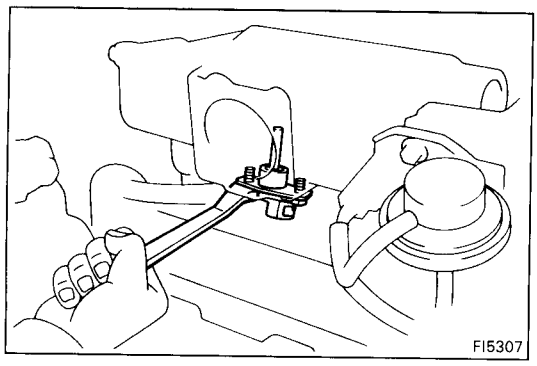
SST 09842-30050

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

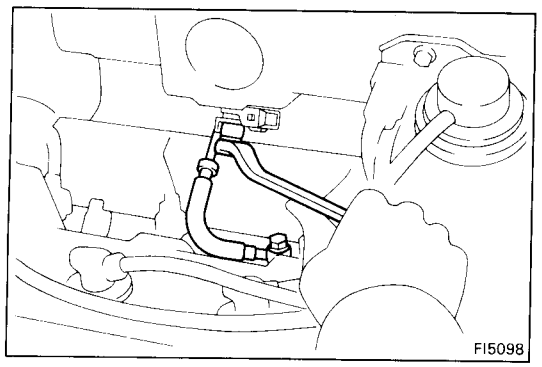


INSTALLATION OF COLD START INJECTOR

1. **INSTALL COLD START INJECTOR**

Install a new gasket and the injector with the two bolts.

Torque: 60 kg-cm (52 in.-lb, 5.9 N·m)



2. **INSTALL COLD START INJECTOR PIPE**

Install the injector pipe with four new gaskets and the two union bolts.

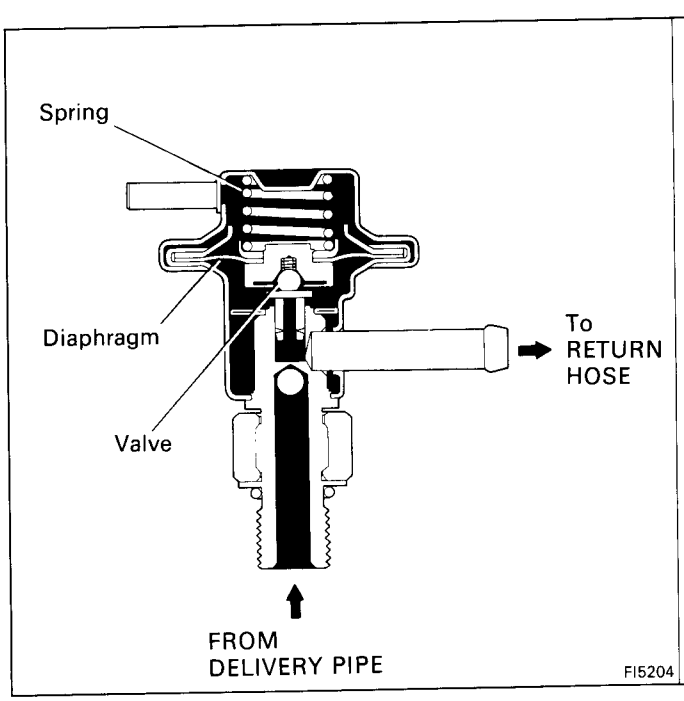
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

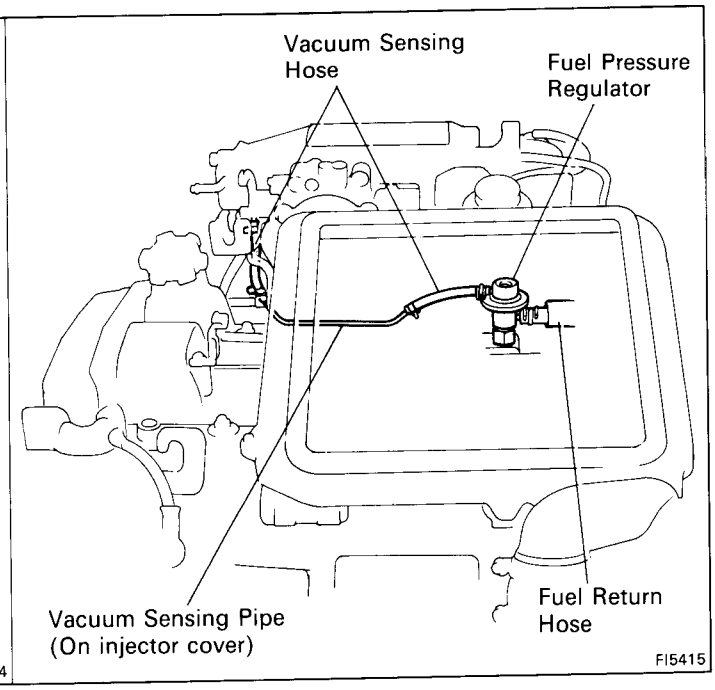
3. **CONNECT COLD START INJECTOR CONNECTOR**

4. **INSTALL THROTTLE BODY**

(See steps 2, 3 and 5 to 12 on pages FI-74 and 75)

Fuel Pressure Regulator



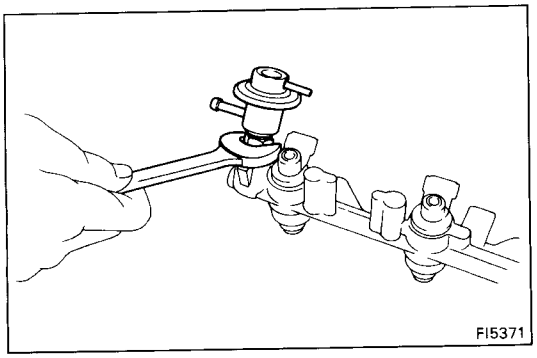


ON-VEHICLE INSPECTION

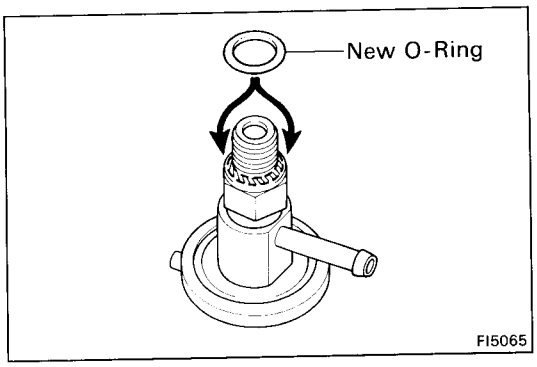
INSPECT FUEL PRESSURE (See page FI-47)

REMOVAL OF FUEL PRESSURE REGULATOR

1. **REMOVE THROTTLE BODY (See steps 1 to 8, 10 and 11 on pages FI-72 and 73)**
2. **REMOVE INJECTORS, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY (See steps 1 to 13 on pages FI-59 and 60)**
3. **REMOVE FUEL INLET HOSE FROM DELIVERY PIPE (See step 11 on page FI-60)**
4. **REMOVE INJECTOR COVER FROM DELIVERY PIPE (See step 1 on page FI-62)**



5. **REMOVE FUEL PRESSURE REGULATOR**
   (a) Loosen the lock nut, and remove the pressure regulator.
   (b) Remove the O-ring from the pressure regulator.

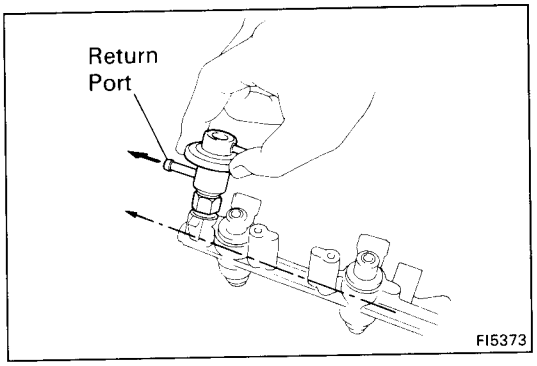


INSTALLATION OF FUEL PRESSURE REGULATOR

1. INSTALL FUEL PRESSURE REGULATOR

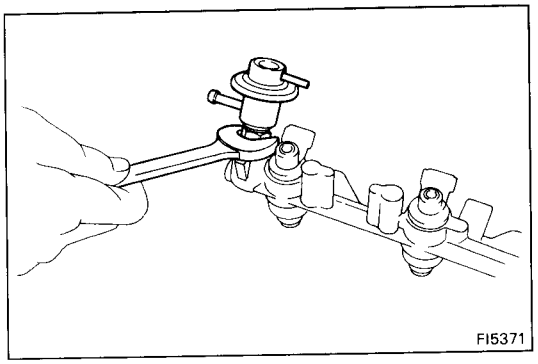
(a) Fully loosen the lock nut on the pressure regulator.

(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 figure.



(e) Tighten the lock nut.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

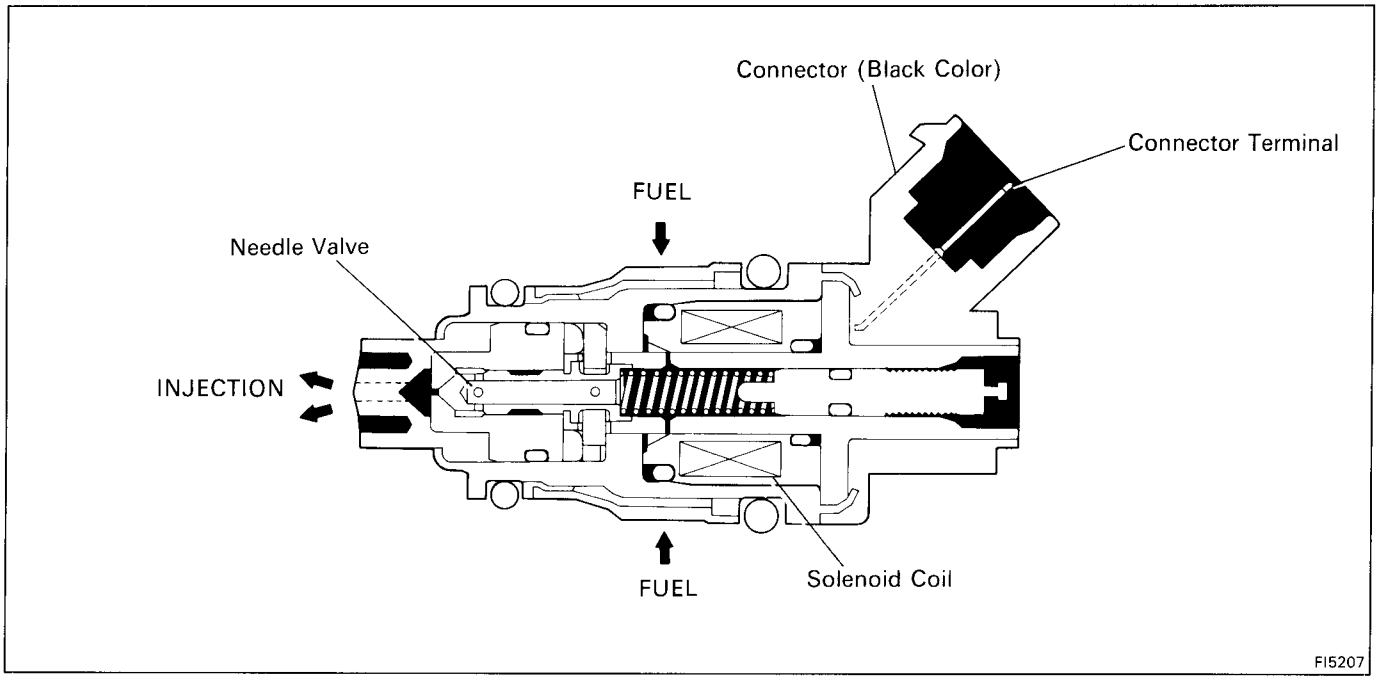
2. INSTALL INJECTOR COVER TO DELIVERY PIPE
(See step 4 on page FI-63)

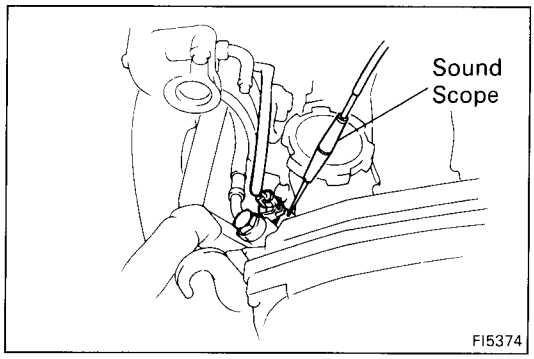
3. INSTALL FUEL INLET HOSE TO DELIVERY PIPE
(See step 1 on page FI-64)

4. INSTALL INJECTORS, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY
(See steps 2 to 13 on pages FI-64 to 66)

5. INSTALL THROTTLE BODY
(See steps 2, 3 and 5 to 12 on pages FI-74 and 75)

Injectors



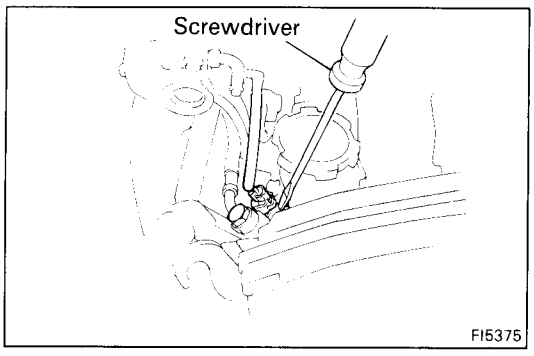


ON-VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

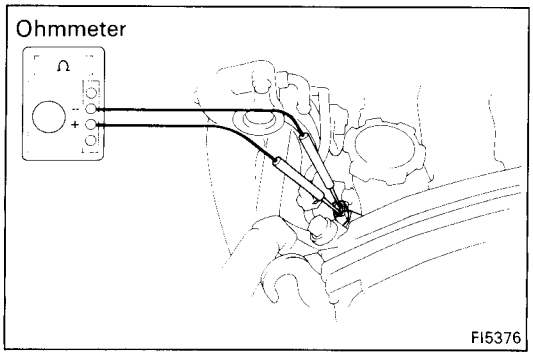
Check operation sound from each injector.

(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 an unusual sound is heard, check the wiring connector, injector or injection signal from the ECU.



2. INSPECT INJECTOR RESISTANCE

(a) Remove the throttle body.
(See steps 1 to 8, 10 and 11 on pages FI-72 and 73)

(b) Disconnect the injector connector.

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

Resistance: 2 – 4 Ω

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-74 and 75)

REMOVAL OF INJECTORS

1. **REMOVE THROTTLE BODY**
   (See steps 1 to 8, 10 and 11 on pages FI-72 and 73)

2. **REMOVE AIR CLEANER ASSEMBLY**
   (See step 7 on page EM-75)

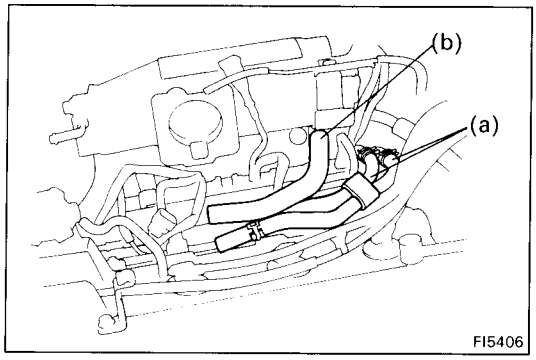
3. **REMOVE CHARCOAL CANISTER**
   (See step 20 on page EM-77)

4. **REMOVE EGR VSV, VACUUM MODULATOR AND BRACKET (See step 20 on page EM-45)**

5. **REMOVE EGR VALVE AND PIPE ASSEMBLY**
   (See step 21 on page EM-45)

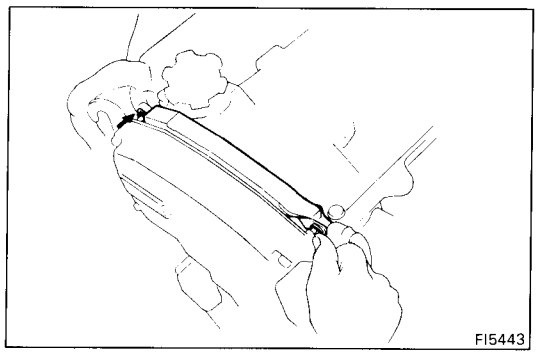
6. **REMOVE COLD START INJECTOR PIPE**
   (See step 3 on page FI-53)

7. **REMOVE COLD START INJECTOR**
   (See step 4 on page FI-54)

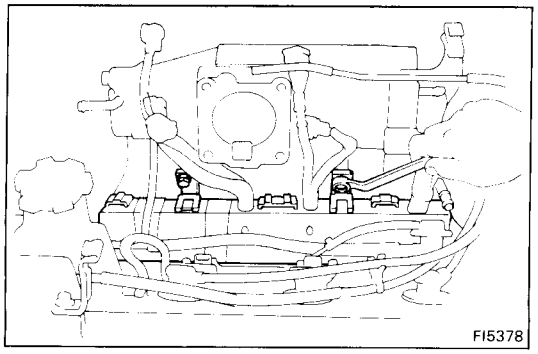


8. **REMOVE WATER BY-PASS HOSES AND AIR HOSE**
   (a) Two ISC water by-pass hoses from No.1 air tube
   (b) ISC air hose from No.1 air tube

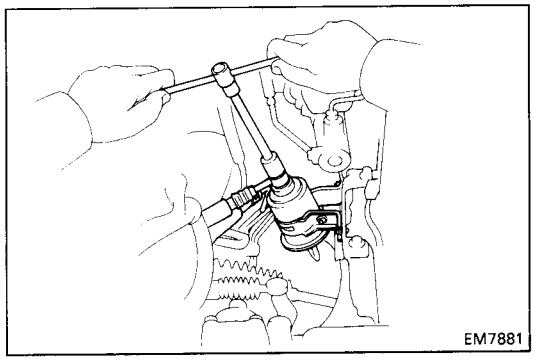
9. **DISCONNECT INJECTOR CONNECTORS**



10. **DISCONNECT ENGINE WIRE**
    (a) Disconnect the two wire clamps from the mount bolts of the No.2 timing belt cover.

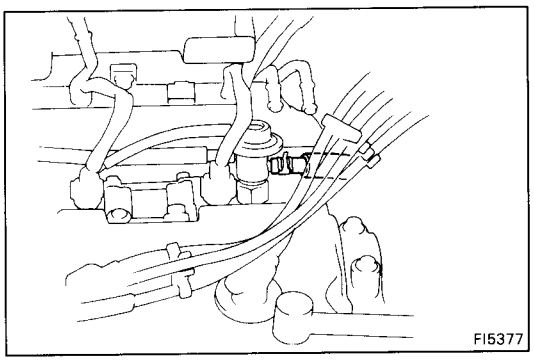


(b) Disconnect the two wire clamps from the wire brackets on the intake manifold.

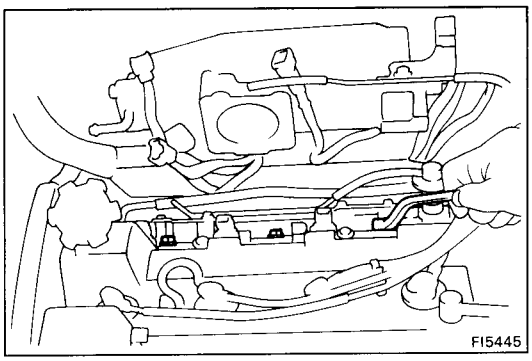


11. DISCONNECT FUEL INLET HOSE FROM FUEL FILTER

Remove the union bolt and two gaskets, and disconnect the inlet hose.

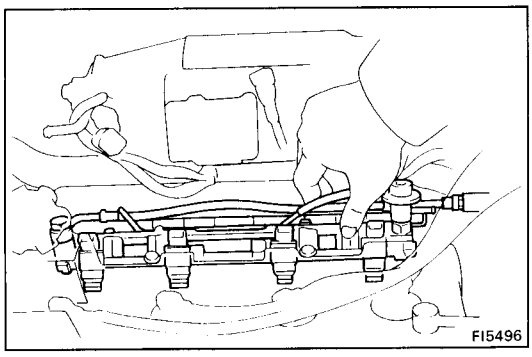


12. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR



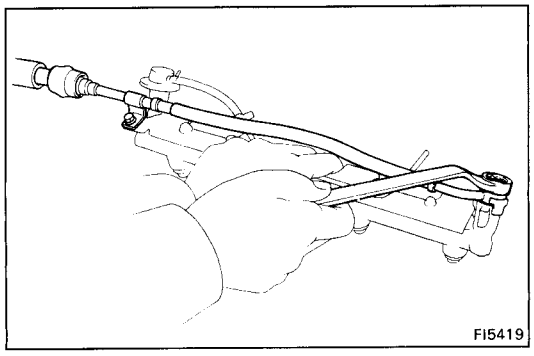
13. REMOVE INJECTOR, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY

(a) Remove the three bolts holding the delivery pipe to the cylinder head.



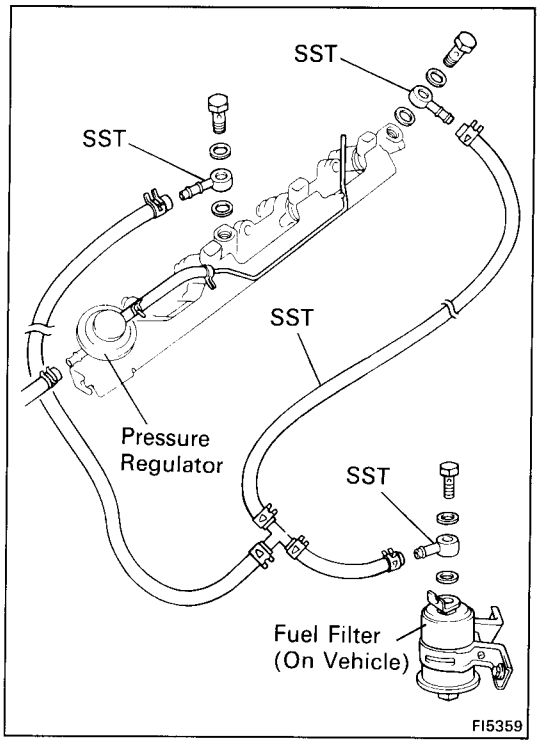
(b) Remove the delivery pipe assembly.

(c) Remove the four insulators and three spacers.



14. REMOVE FUEL INLET HOSE FROM DELIVERY PIPE

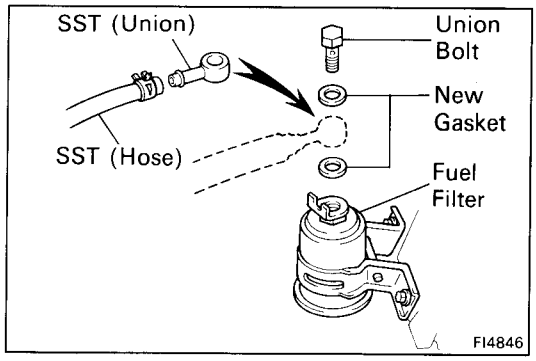
Remove the bolt, union bolt, two gaskets and inlet hose.



INSPECTION OF INJECTORS

1. **INSPECT INJECTOR INJECTION**

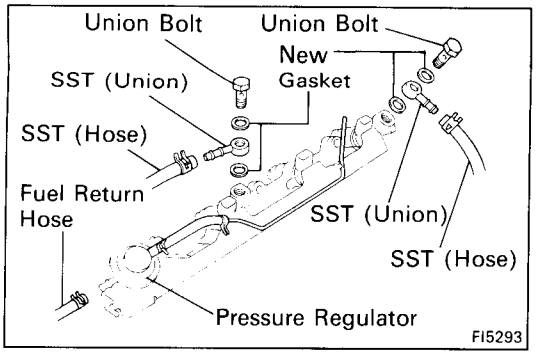
CAUTION: Keep injector clear of sparks during the test.



(a) Connect SST (union and hose) to the fuel filter outlet with two new gaskets and the union bolt.

SST 09268-41045 (90405-09015)

HINT: Use the vehicle's fuel filter.



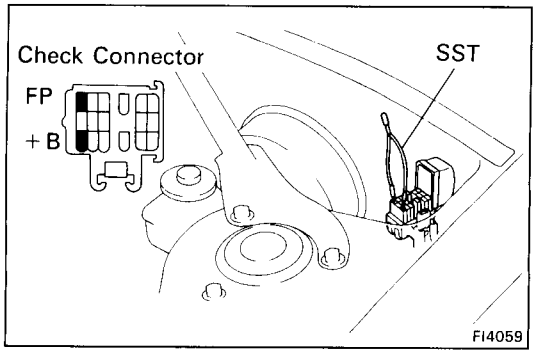
(b) Connect the fuel return hose to the fuel outlet of the pressure regulator on the delivery pipe.

(c) Connect SST (union and hose) to the delivery pipe with four new gaskets and the two union bolts.

SST 09268-41045 (09268-41080, 90405-09015)

(d) Put the injector into the graduated cylinder.

(e) Reconnect the battery negative (–) cable.

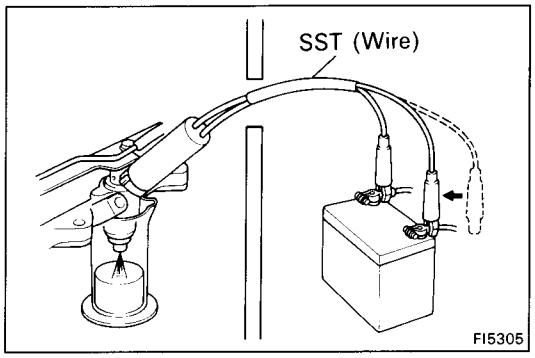


(f) Using SST, connect terminals +B and FP of the check connector.

SST 09843-18020

(g) Turn the ignition switch ON.

NOTICE: Do not start the engine.



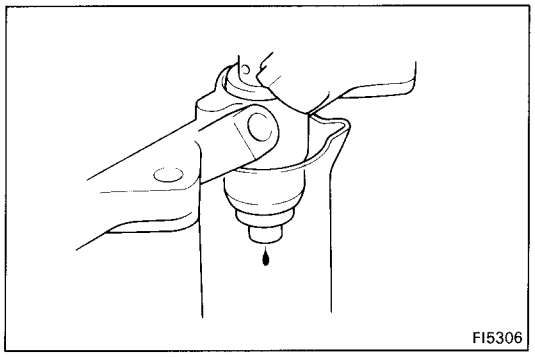
(h) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.

SST 09842-30060

Volume: 95 – 120 cc (5.8 – 7.3 cu in.) per 15 sec.

Difference between each injector:
5 cc (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

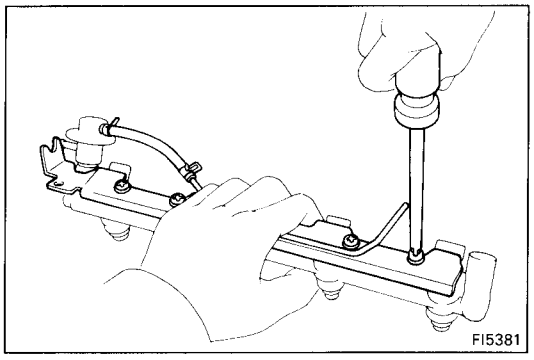
Fuel drop: One drop or less per minute

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

(c) Remove SST.

SST 09268-41045 and 09843-18020

REPLACEMENT OF INJECTORS

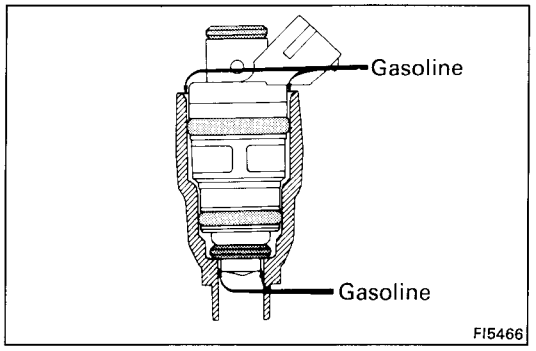


1. REMOVE INJECTOR COVER

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

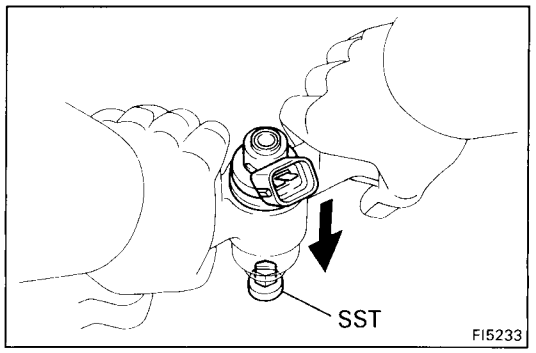
(b) Remove the four screws and injector cover.

(c) Remove the four insulators from the injectors.



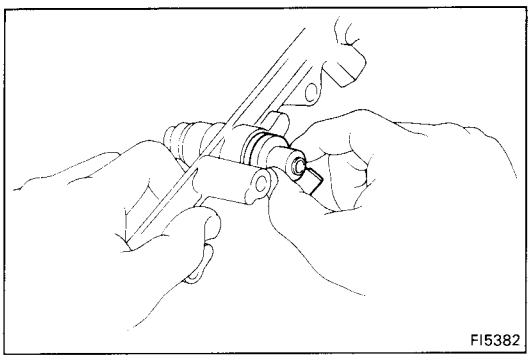
2. REMOVE INJECTORS

(a) Apply gasoline between the delivery pipe and injectors.



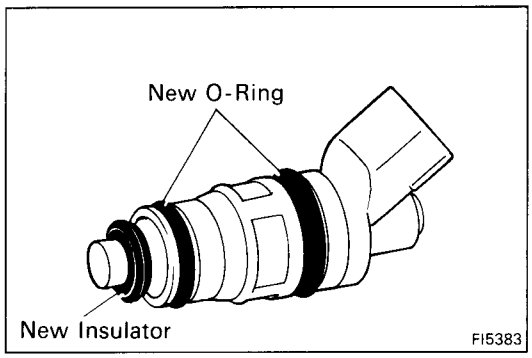
(b) Using SST, lift up the injector.

SST 09268-74010



(c) Pull out the four injectors from the delivery pipe.

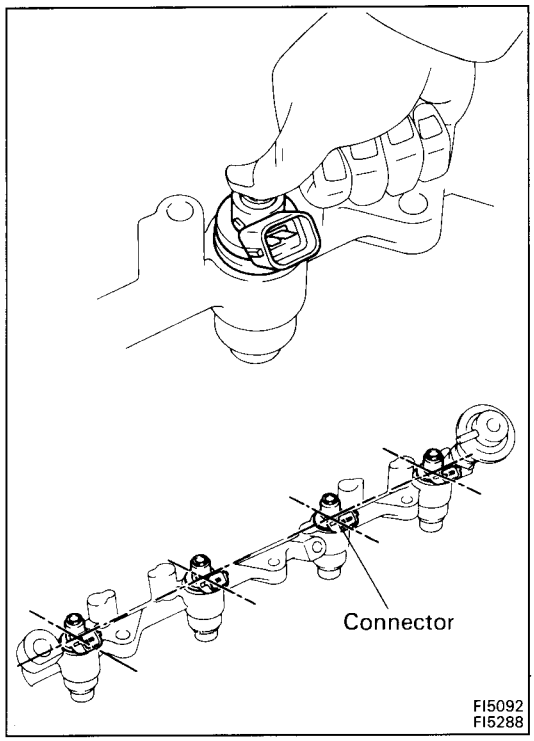
(d) Remove the insulator and two O-rings from each injector.



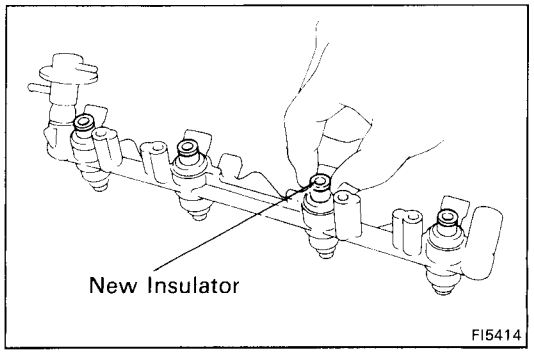
3. INSTALL INJECTORS

(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.

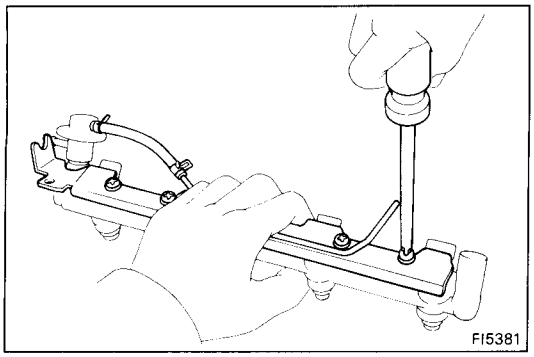


(c) Push in the four injectors so that the injector connectors are positioned as shown in the figure.



4. INSTALL INJECTOR COVER

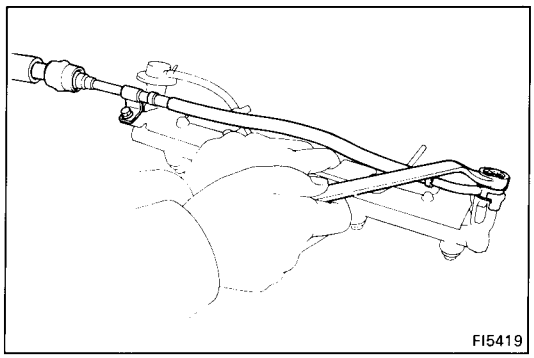
(a) Place a new insulator on each injector.



(b) Install the injector cover with the four screws.

Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)

(c) Connect the vacuum sensing hose to the pressure regulator.



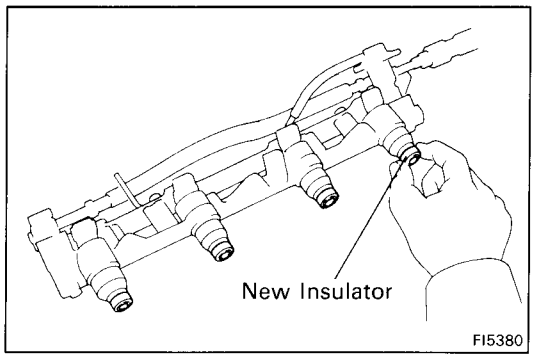
INSTALLATION OF INJECTORS

1. INSTALL FUEL INLET HOSE TO DELIVERY PIPE

Install the inlet hose with the bolt, two new gaskets and union bolt.

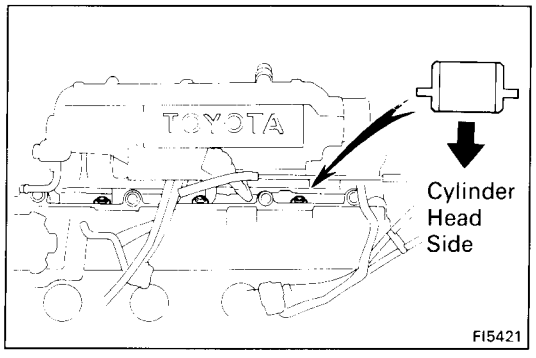
Torque:

Bolt	**80 kg-cm (69 in.-lb, 7.8 N·m)**
Union bolt	**300 kg-cm (22 ft-lb, 29 N·m)**

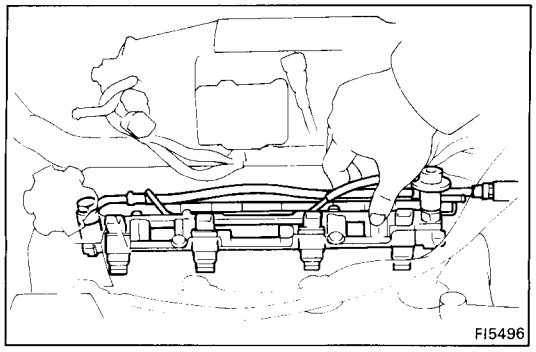


2. INSTALL INJECTORS, FUEL PRESSURE REGULATOR AND DELIVERY PIPE ASSEMBLY

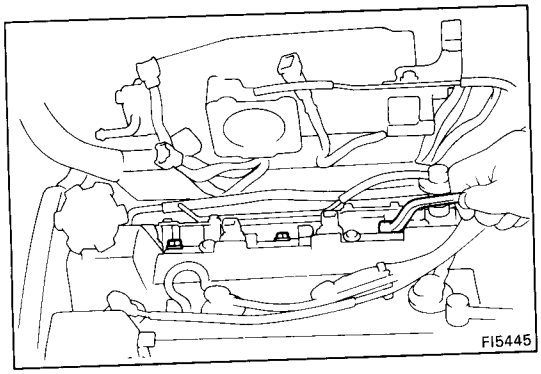
(a) Install a new insulator to each injector.



(b) Place the three spacers in position on the cylinder head.

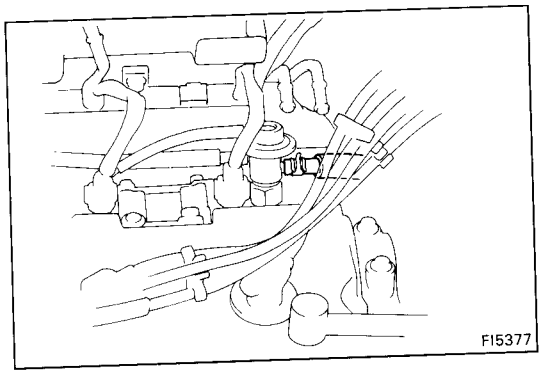


(c) Place the delivery pipe in position on the cylinder head.

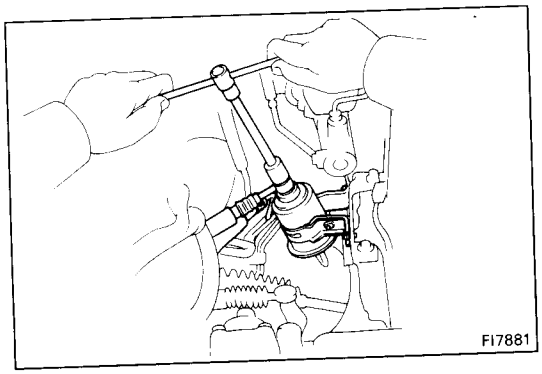


(d) Install the three bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



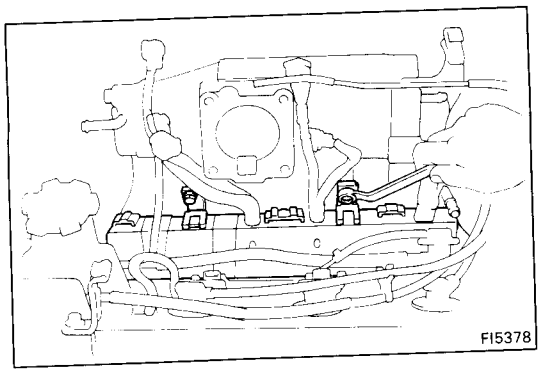
3. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR



4. CONNECT FUEL INLET HOSE TO FUEL FILTER

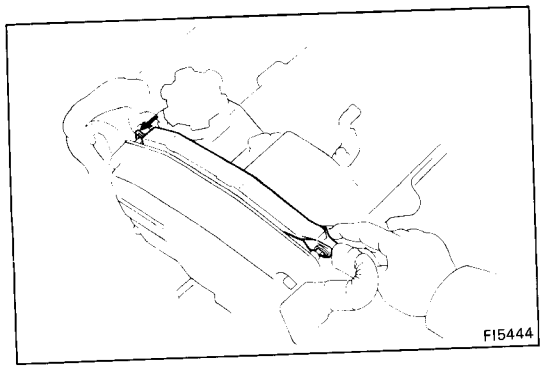
Install the inlet hose with two new gaskets and the union bolt.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

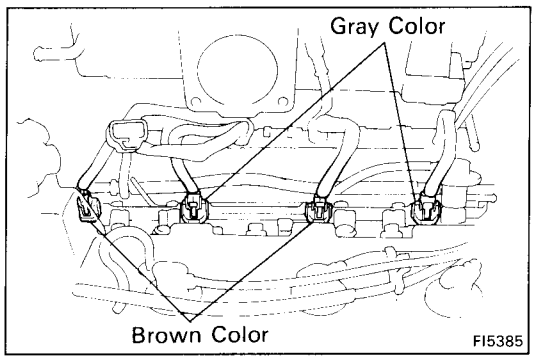


5. INSTALL ENGINE WIRE

(a) Install the two wire clamps to the wire brackets on the intake manifold.



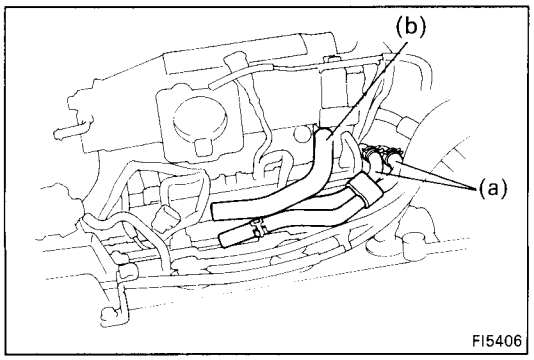
(b) Install the two wire clamps to the mount bolts of the No.2 timing belt cover.



6. **CONNECT INJECTOR CONNECTORS**

Connect the injector connectors as shown in the figure.

HINT: No.1 and No.3 injector connectors are brown. No.2 and No.4 injector connectors are gray.



7. **INSTALL WATER BY-PASS HOSES AND AIR HOSE**

(a) Two ISC water by-pass hoses from No.1 air tube

(b) ISC air hose from No.1 air tube

8. **INSTALL COLD START INJECTOR**
(See step 1 on page FI-55)

9. **INSTALL COLD START INJECTOR PIPE**
(See step 2 on page FI-55)

10. **INSTALL EGR VALVE AND PIPE**
(See step 20 on page EM-69)

11. **INSTALL EGR VSV, VACUUM MODULATOR AND BRACKET (See step 21 on page EM-70)**

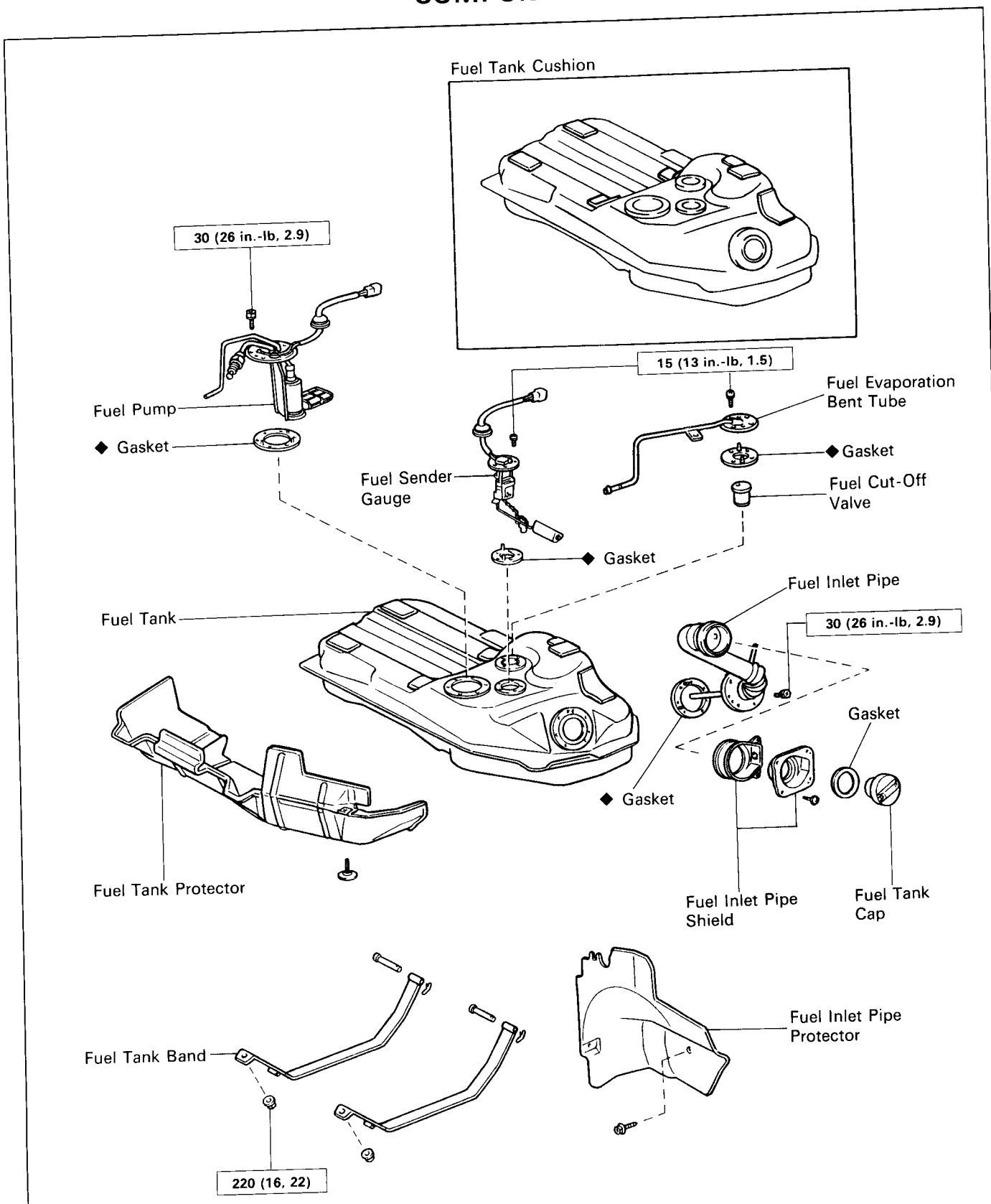
12. **INSTALL CHARCOAL CANISTER**
(See step 31 on page EM-115)

13. **INSTALL AIR CLEANER ASSEMBLY**
(See step 44 on page EM-117)

14. **INSTALL THROTTLE BODY**
(See steps 2, 3 and 5 to 12 on pages FI-74 and 75)

Fuel Tank and Lines

COMPONENTS



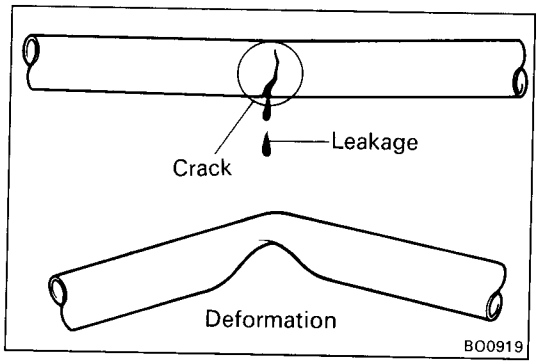
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

FI5495

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.

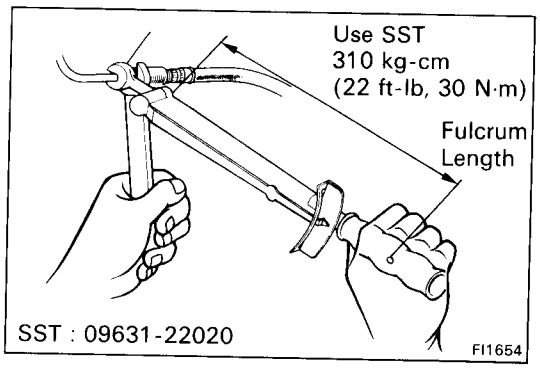
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

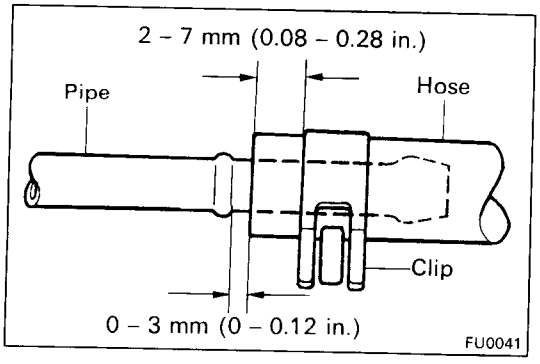
(c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

(d) Check the filler neck for damage or fuel leakage.

(e) Hose and tube connections are as shown in the illustration.

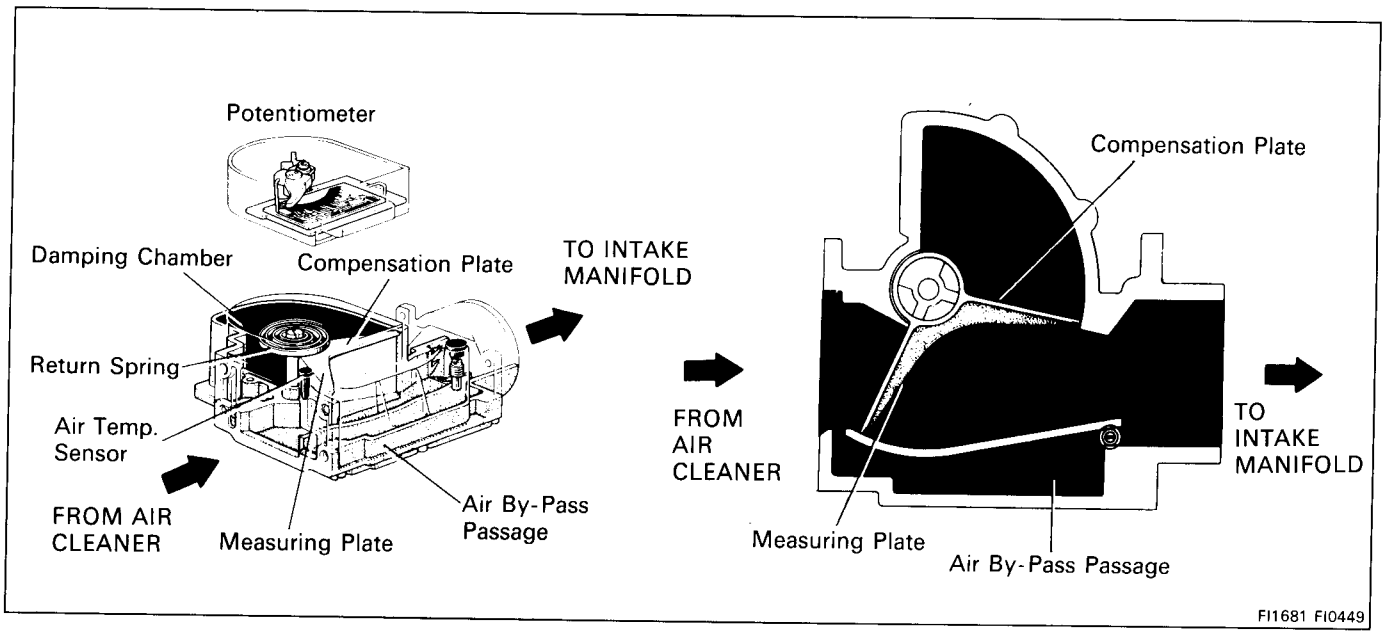
If a problem is found, repair or replace the parts as necessary.

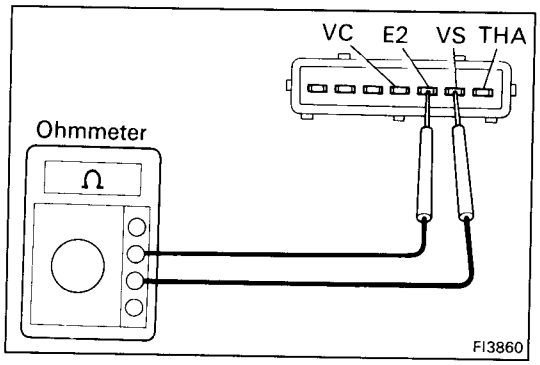


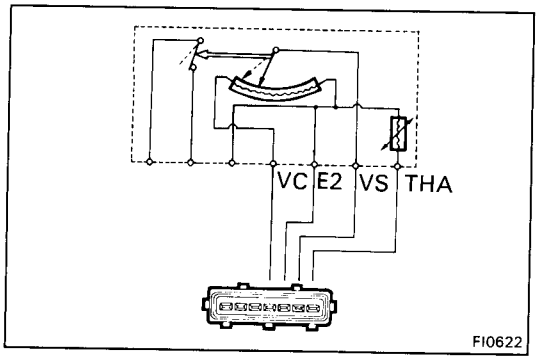


AIR INDUCTION SYSTEM

Air Flow Meter







ON-VEHICLE INSPECTION

INSPECT RESISTANCE OF AIR FLOW METER

(a) Disconnect the air flow meter connector.

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

Between terminals	Resistance	Temperature
VS – E2	200 – 600 Ω	–
VC – E2	200 – 400 Ω	–
THA – E2	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 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 air flow meter.

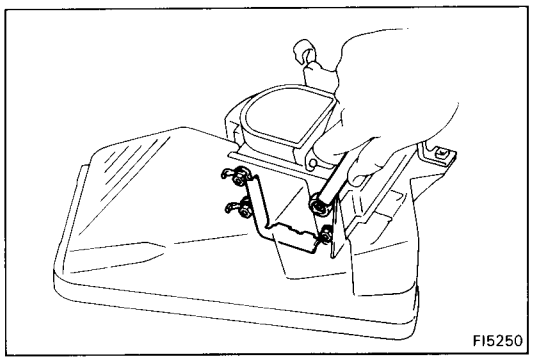
(c) Reconnect the air flow meter connecter.

REMOVAL OF AIR FLOW METER

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.

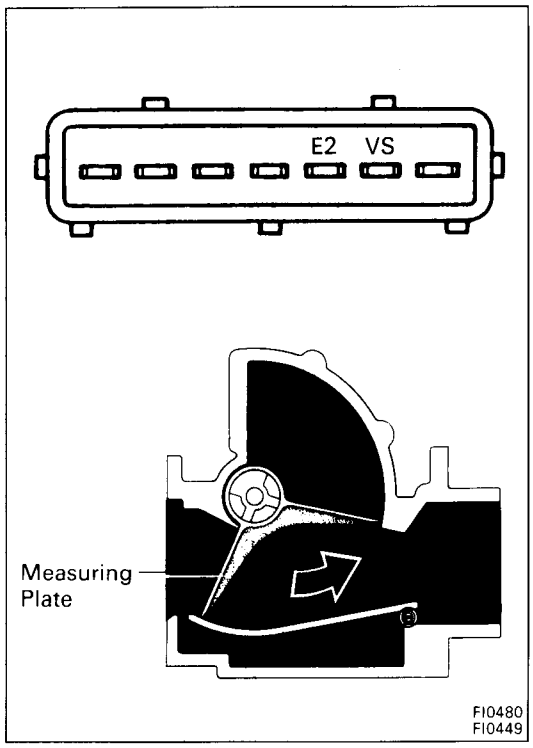
2. **DISCONNECT AIR FLOW METER CONNECTOR**



3. **DISCONNECT AIR CLEANER HOSE FROM AIR FLOW METER**

4. **REMOVE AIR CLEANER CAP AND AIR FLOW METER ASSEMBLY**

5. **REMOVE AIR FLOW METER FROM AIR CLEANER CAP**
   (a) Pry off the lock plates.
   (b) Remove the bolt, four nuts, air flow meter and gasket.



INSPECTION OF AIR FLOW METER

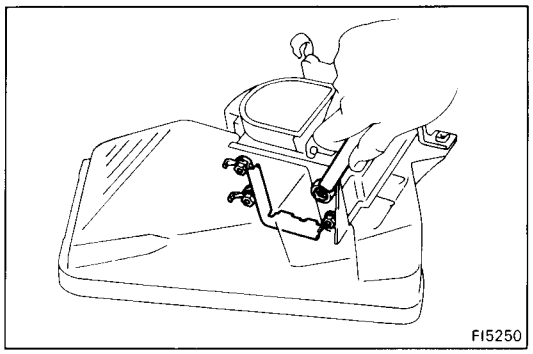
INSPECT AIR FLOW METER

Using an ohmmeter, measure the resistance between terminals VS and E2 by moving the measuring plate.

Resistance: 200 – 600 Ω at fully closed
20 – 1,200 Ω 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 air flow meter.



INSTALLATION OF AIR FLOW METER

1. **INSTALL AIR FLOW METER TO AIR CLEANER CAP**
   (a) Install a new gasket and the air flow meter with the bolt, two lock plates and four nuts.
   (b) Pry the lock plates.

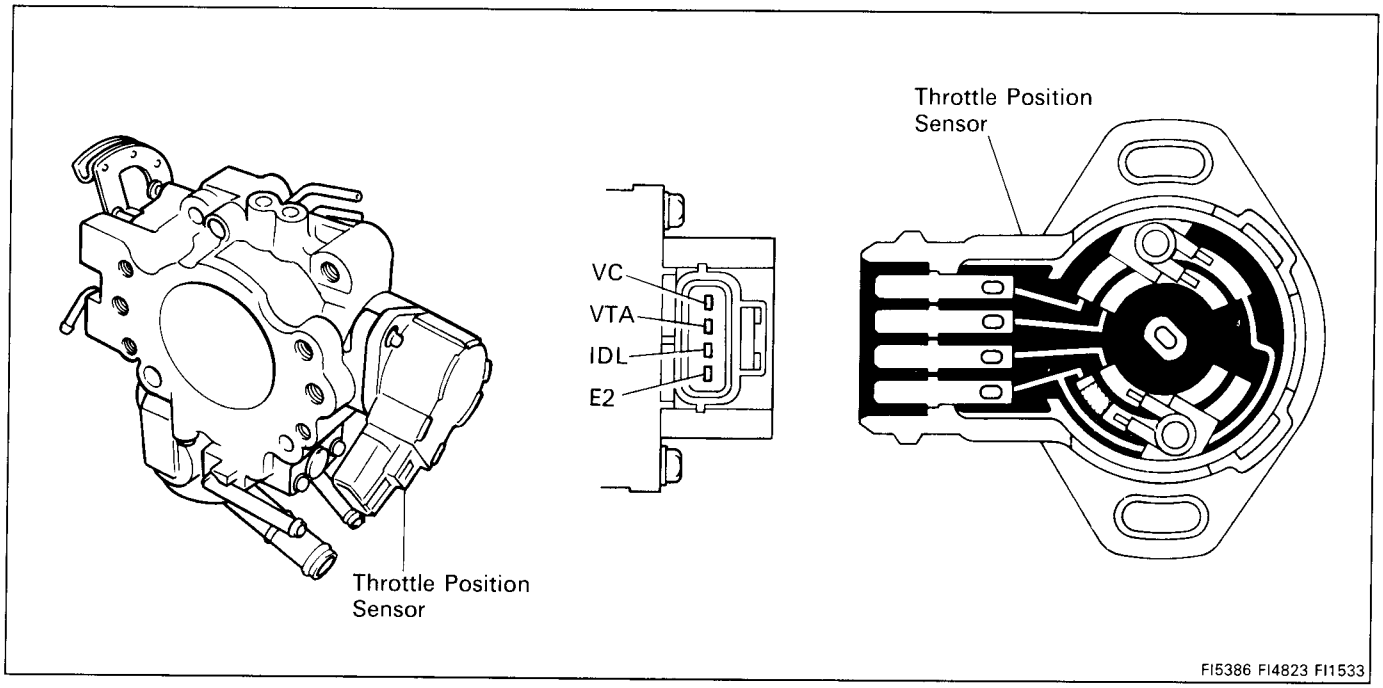
2. **INSTALL AIR CLEANER CAP AND AIR FLOW METER ASSEMBLY**

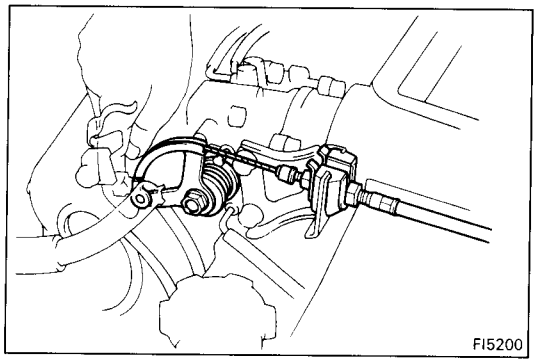
3. **CONNECT AIR CLEANER HOSE TO AIR FLOW METER**

4. **CONNECT AIR FLOW METER CONNECTOR**

5. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

Throttle Body

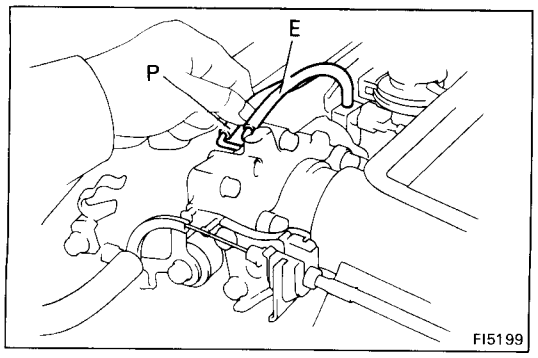




ON-VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

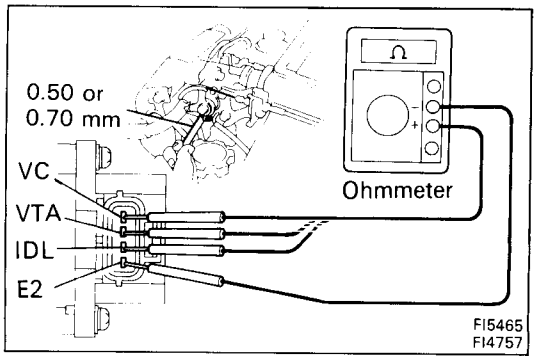
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

Port No.	At idling	Other than idling
E	No vacuum	Vacuum
P	No vacuum	Vacuum

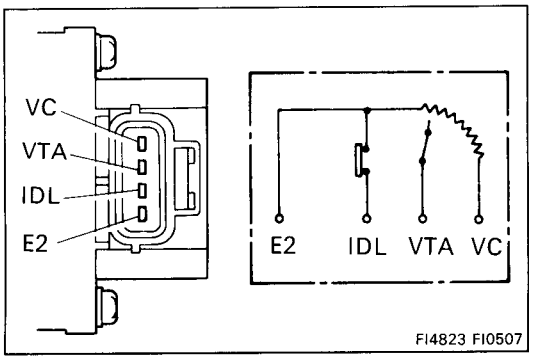


2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

(b) Insert a feeler 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	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 0.8 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	3.3 – 10.3 kΩ
–	VC – E2	3 – 8.3 kΩ

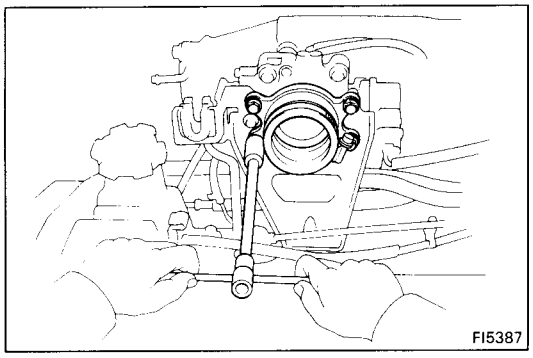
(d) Reconnect the sensor connector.

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-4)**

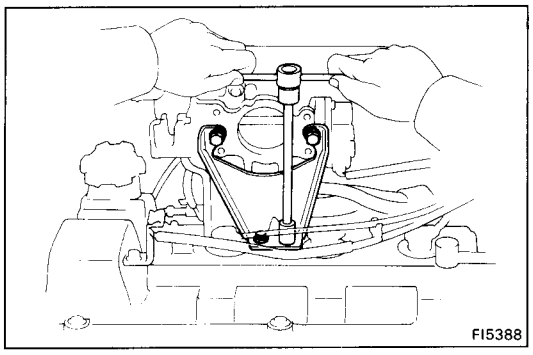


3. **DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE**

4. **REMOVE INTERCOOLER**
   (See steps 13 to 15 on pages TC-9 and 10)

5. **REMOVE INTAKE AIR CONNECTOR**

   Remove the four bolts and air connector.

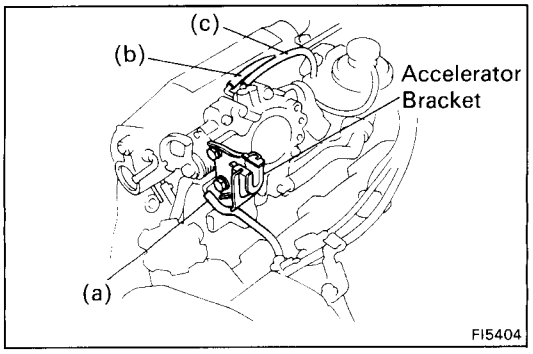


6. **REMOVE INTAKE AIR CONNECTOR STAY**

   Remove the four bolts, air connector stay and two spacers.

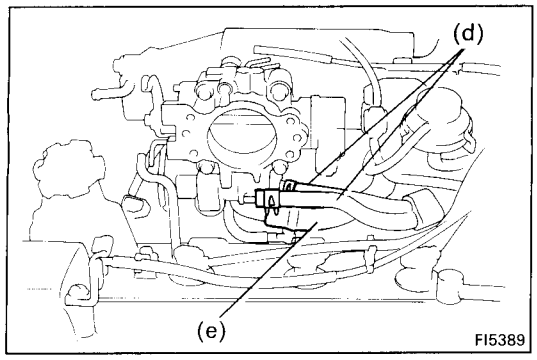
7. **DISCONNECT THROTTLE POSITION SENSOR CONNECTOR**

8. **DISCONNECT ISC VALVE CONNECTOR**

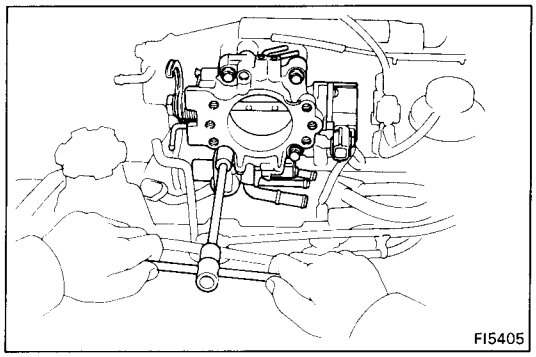


9. **REMOVE ACCELERATOR BRACKET**

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) Two water by-pass hoses from No.1 air tube
(e) Air hose from No.1 air tube

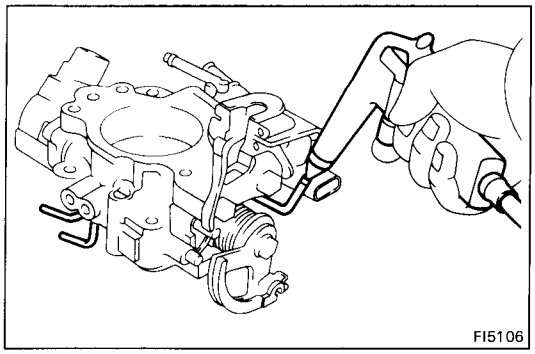


11. REMOVE THROTTLE BODY

Remove the four bolts, throttle body and gasket.

12. IF NECESSARY, REMOVE ISC VALVE FROM THROTTLE BODY

(See step 2 on page FI-77)

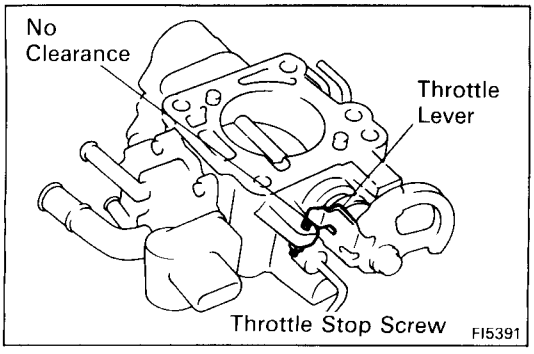


INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

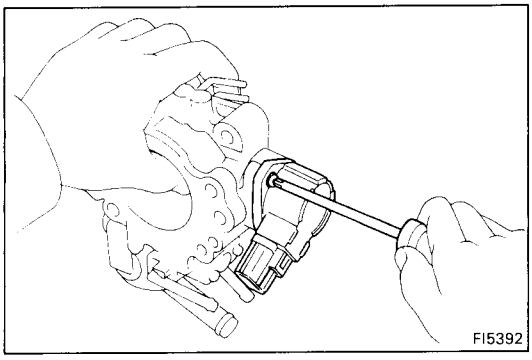
(a) Using a soft brush and carburetor cleaner, clean the cast parts.
(b) Using compressed air, clean all the passages and apertures.

NOTICE: To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE VALVE

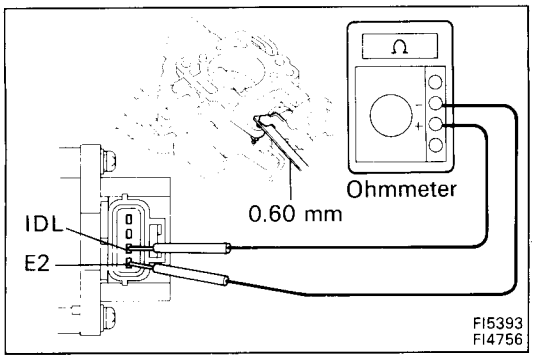
Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.



3. **INSPECT THROTTLE POSITION SENSOR**
(See step 2 on page FI-71)

4. **IF NECESSARY, ADJUST THROTTLE POSITION SENSOR**

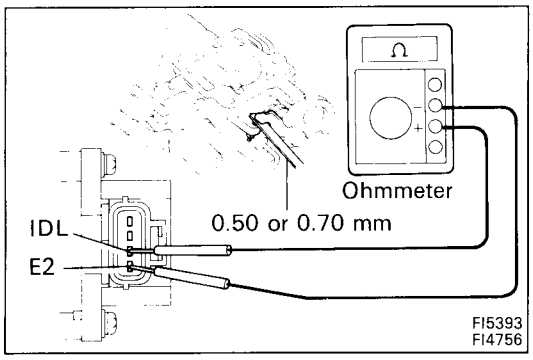
(a) Loosen the two set screws of the sensor.



(b) Insert a 0.60 mm (0.024 in.) feeler gauge, between the throttle stop screw and stop lever.

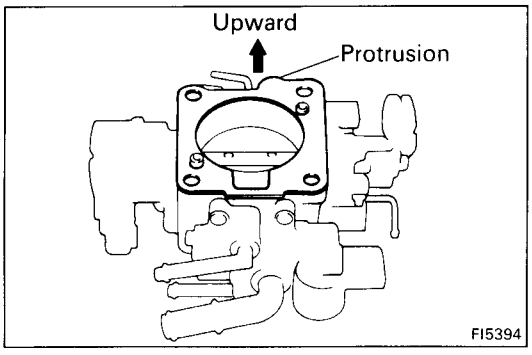
(c) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.

(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)
0.50 mm (0.020 in.)	Continuity
0.70 mm (0.028 in.)	No continuity

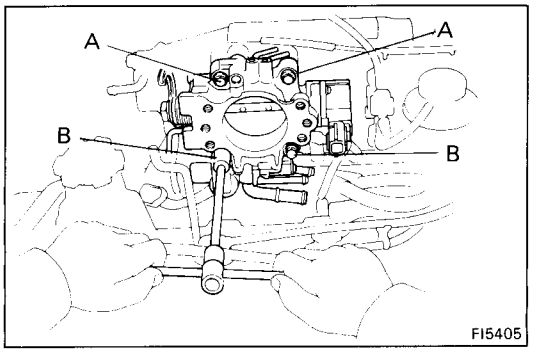


INSTALLATION OF THROTTLE BODY

1. **INSTALL ISC VALVE TO THROTTLE BODY**
(See step 1 on page FI-77)

2. **INSTALL THROTTLE BODY**

(a) Place a new gasket on the throttle body, facing the protrusion upward.

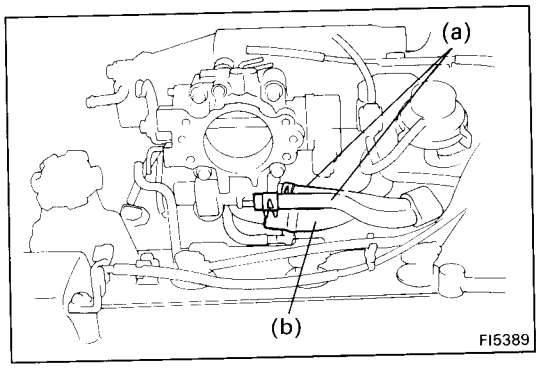


(b) Install the throttle body with the four bolts.

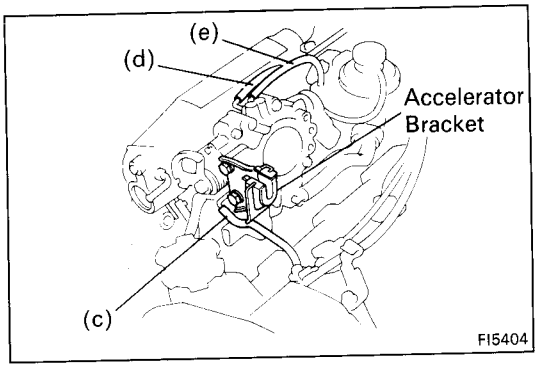
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

HINT: Each bolt is indicated in the figure.

Bolt length: A 45 mm (1.77 in.)
B 70 mm (2.76 in.)



3. **CONNECT HOSES TO THROTTLE BODY**
   (a) Two water by-pass hoses from No.1 air tube
   (b) Air hose from No.1 air tube

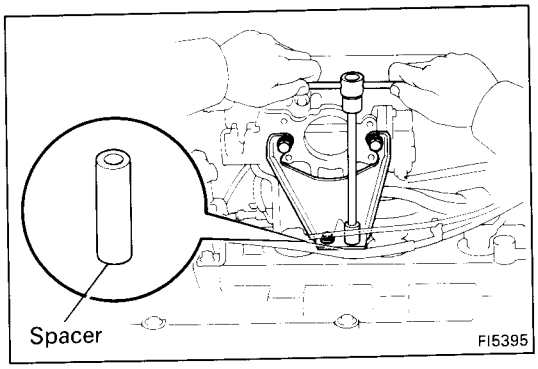


   (c) PCV hose from cylinder head cover
   (d) Vacuum hose (from throttle body P port) from vacuum pipe
   (e) Vacuum hose (from throttle body E port) from EGR VSV

4. **INSTALL ACCELERATOR BRACKET**

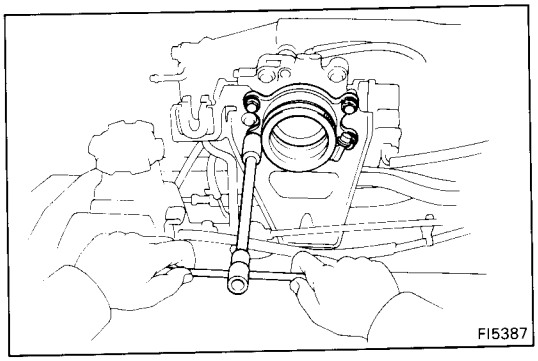
5. **CONNECT ISC VALVE CONNECTOR**

6. **CONNECT THROTTLE POSITION SENSOR CONNECTOR**



7. **INSTALL INTAKE AIR CONNECTOR STAY**
   Install the two spacers and air connector stay with the four bolts.

   Torque:
   10 mm head bolt 80 kg-cm (69 in.-lb, 7.8 N·m)
   12 mm head bolt 195 kg-cm (14 ft-lb, 19 N·m)



8. **INSTALL INTAKE AIR CONNECTOR**
   Install the air connector with the four bolts.
   Torque: 195 kg-cm (14 ft-lb, 19 N·m)

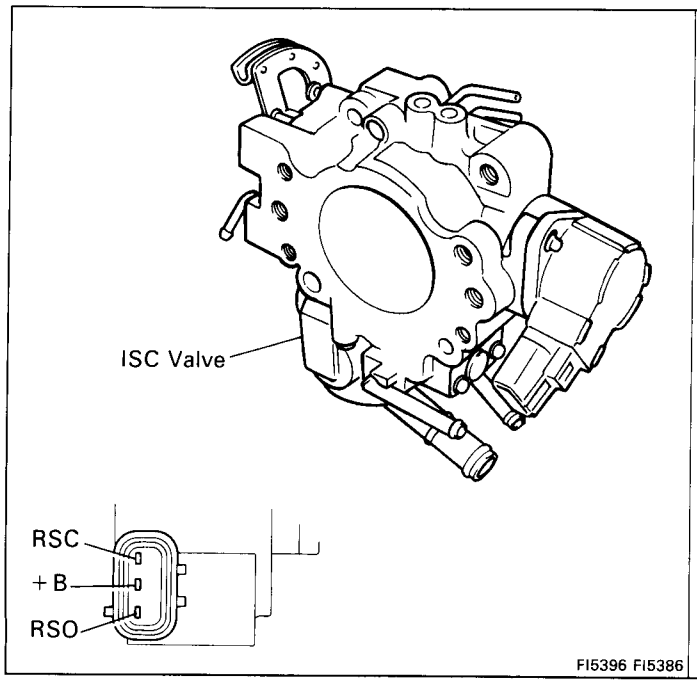
9. **INSTALL INTERCOOLER**
   (See steps 11 to 13 on page TC-17)

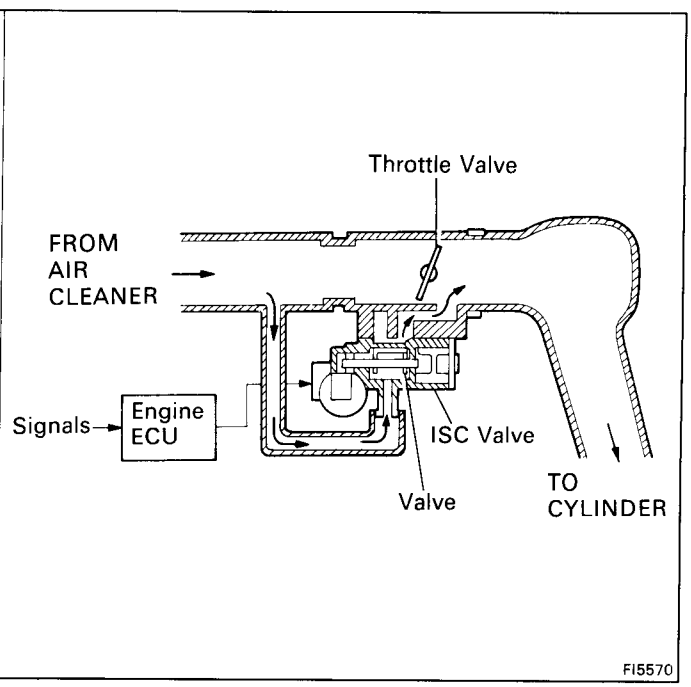
10. **CONNECT ACCELERATOR CABLE, AND ADJUST IT**

11. **FILL WITH ENGINE COOLANT (See page CO-4)**

12. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

Idle Speed Control (ISC) Valve



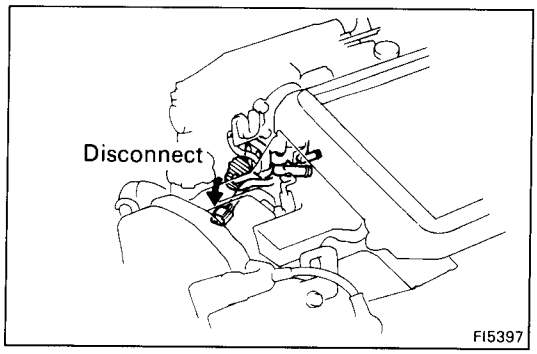


ON-VEHICLE INSPECTION

1. INSPECT ISC VALVE OPERATION

(a) Initial conditions:

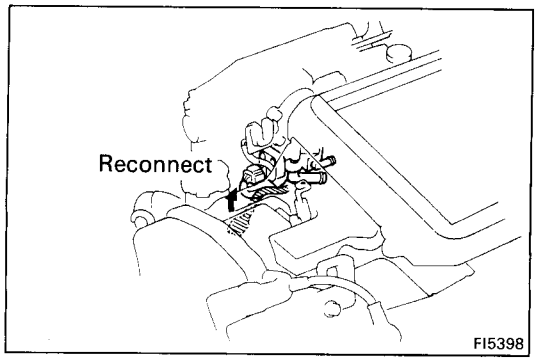
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission neutral range



(b) Disconnect the ISC valve connector.

(c) Check the engine rpm.

Engine rpm: 1,000 rpm or more

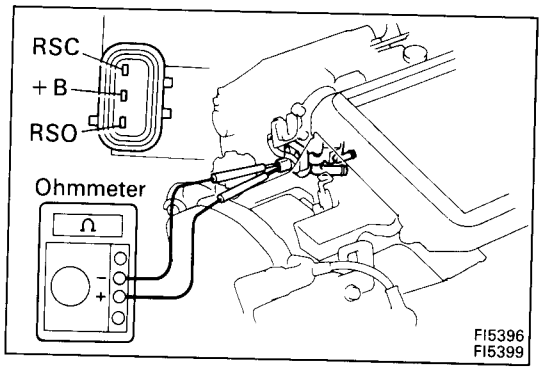


(d) Reconnect the ISC valve connector.

(e) Check that they return to the idle speed.

Idle speed: 800 ± 50 rpm

If the rpm operation is not as specified, check the ISC valve, wiring and ECU.



2. INSPECT ISC VALVE RESISTANCE

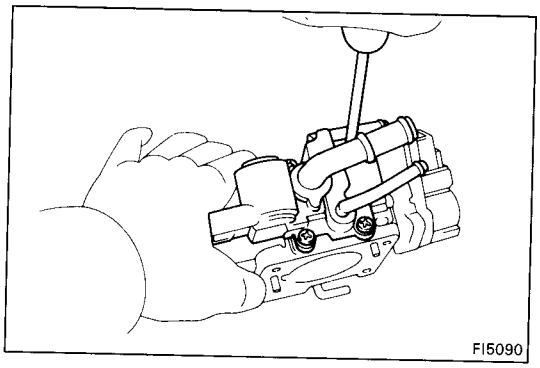
(a) Disconnect the ISC valve connector.

(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (RSC, RSO).

Resistance: 19.3 – 22.3 Ω

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

(c) Reconnect the ISC valve connector.

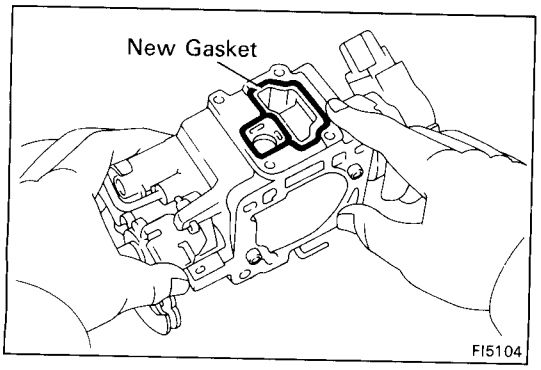


REMOVAL OF ISC VALVE

1. REMOVE THROTTLE BODY
(See steps 1 to 11 on pages FI-72 and 73)

2. REMOVE ISC VALVE

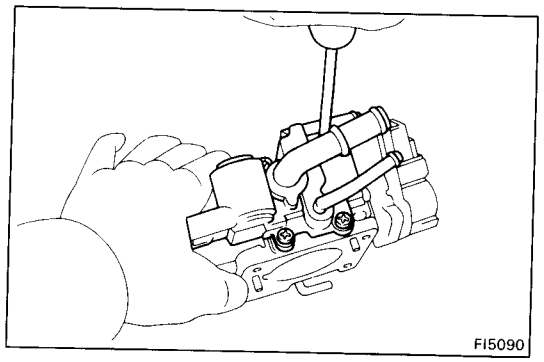
Remove the four screws, ISC valve and gasket.



INSTALLATION OF ISC VALVE

1. INSTALL ISC VALVE

(a) Place a new gasket on the throttle body.

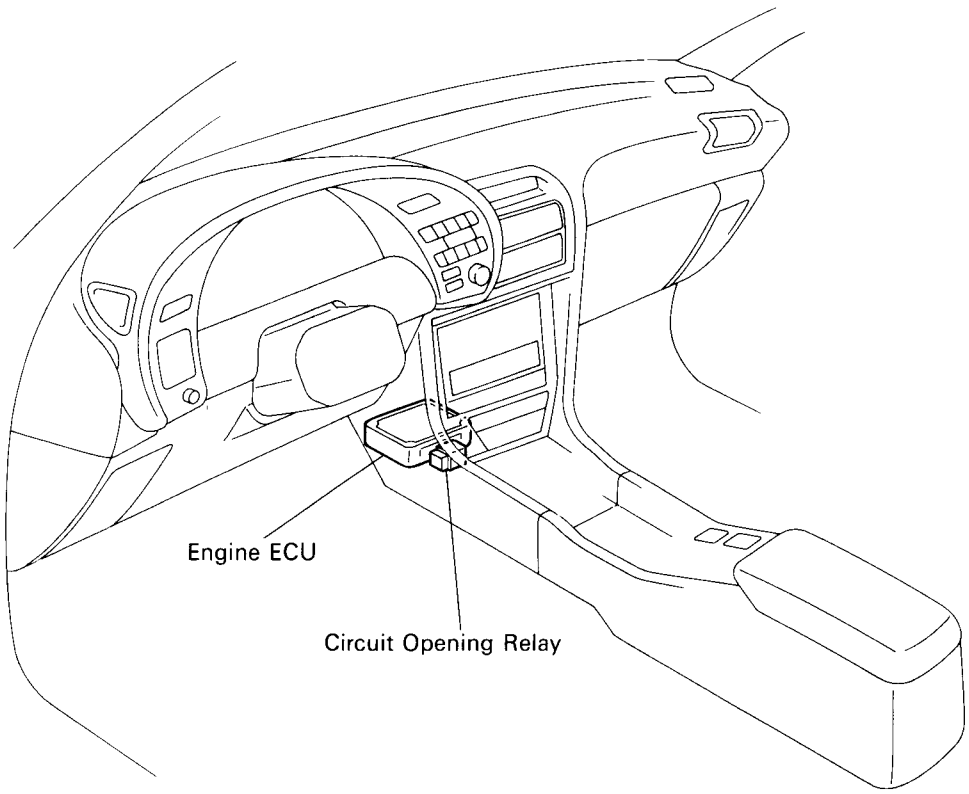


(b) Install the ISC valve with the four screws.

2. INSTALL THROTTLE BODY
(See steps 2 to 12 on pages FI-74 and 75)

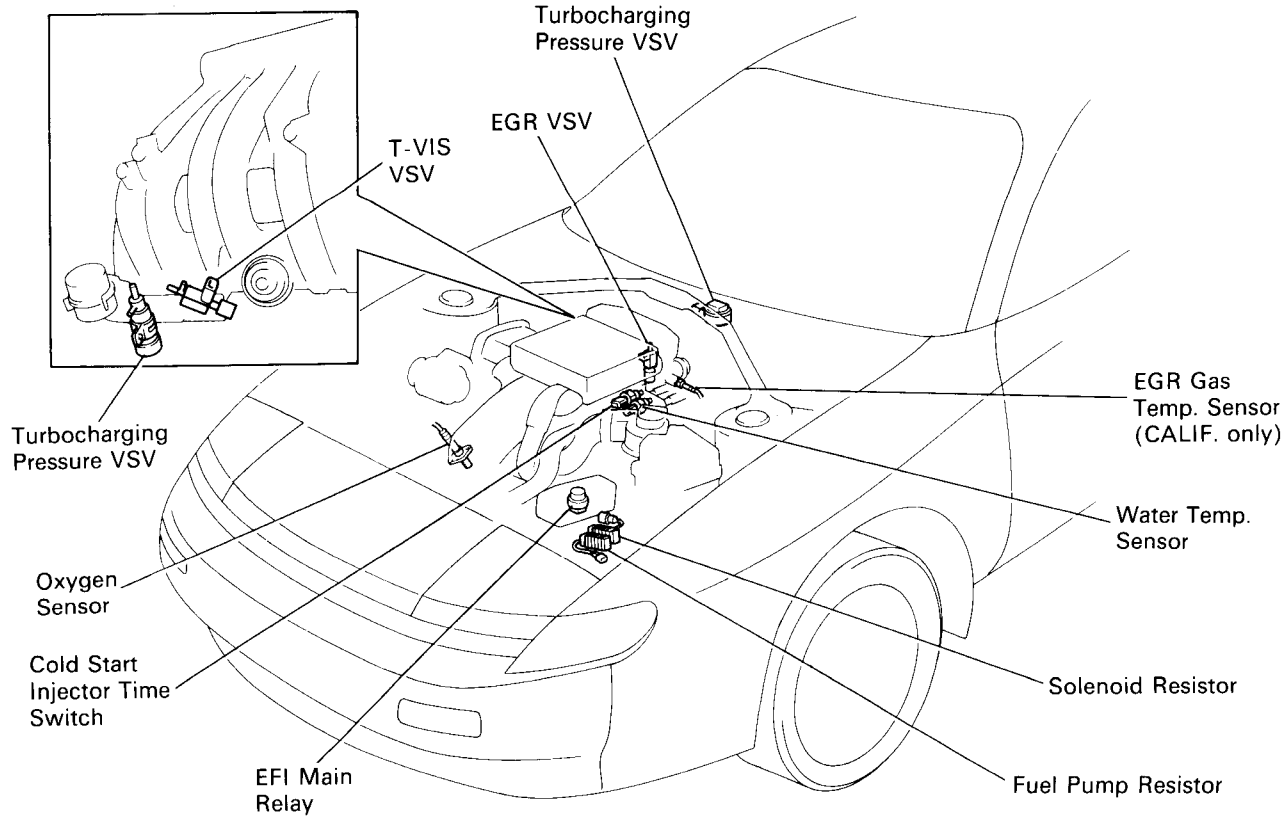
ELECTRONIC CONTROL SYSTEM
Location of Electronic Control Parts

ECU and Circuit Opening Relay



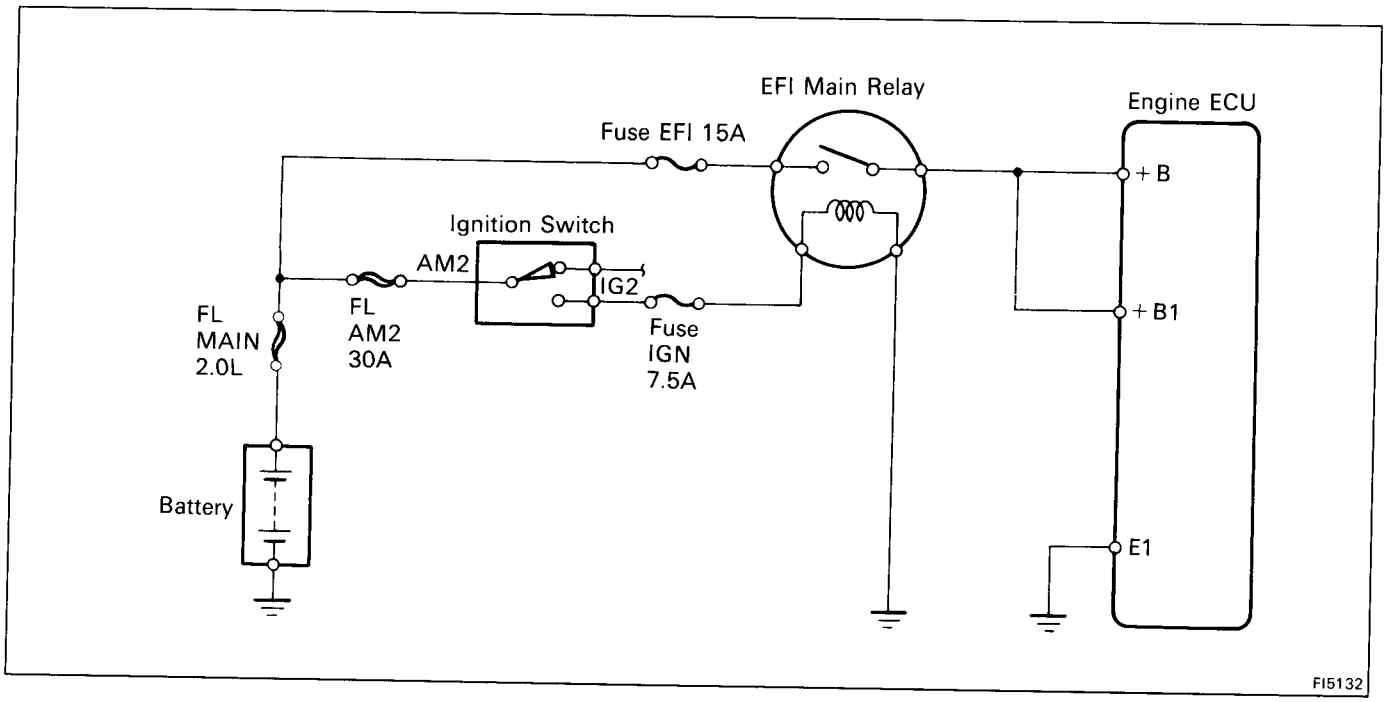
FI5450

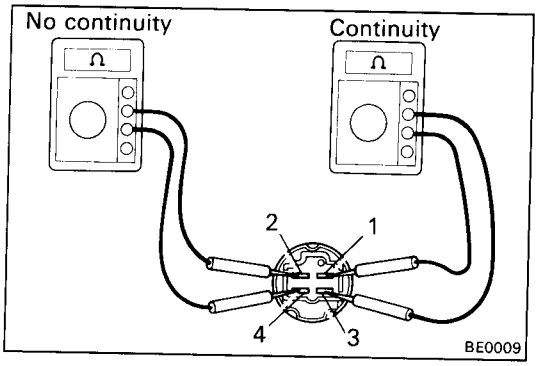
Other Control Parts



FI5573

EFI Main Relay





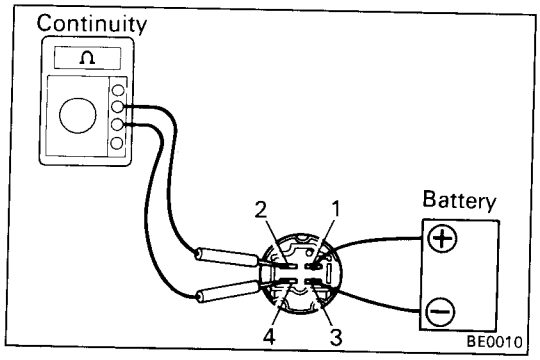
INSPECTION OF EFI MAIN RELAY

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.



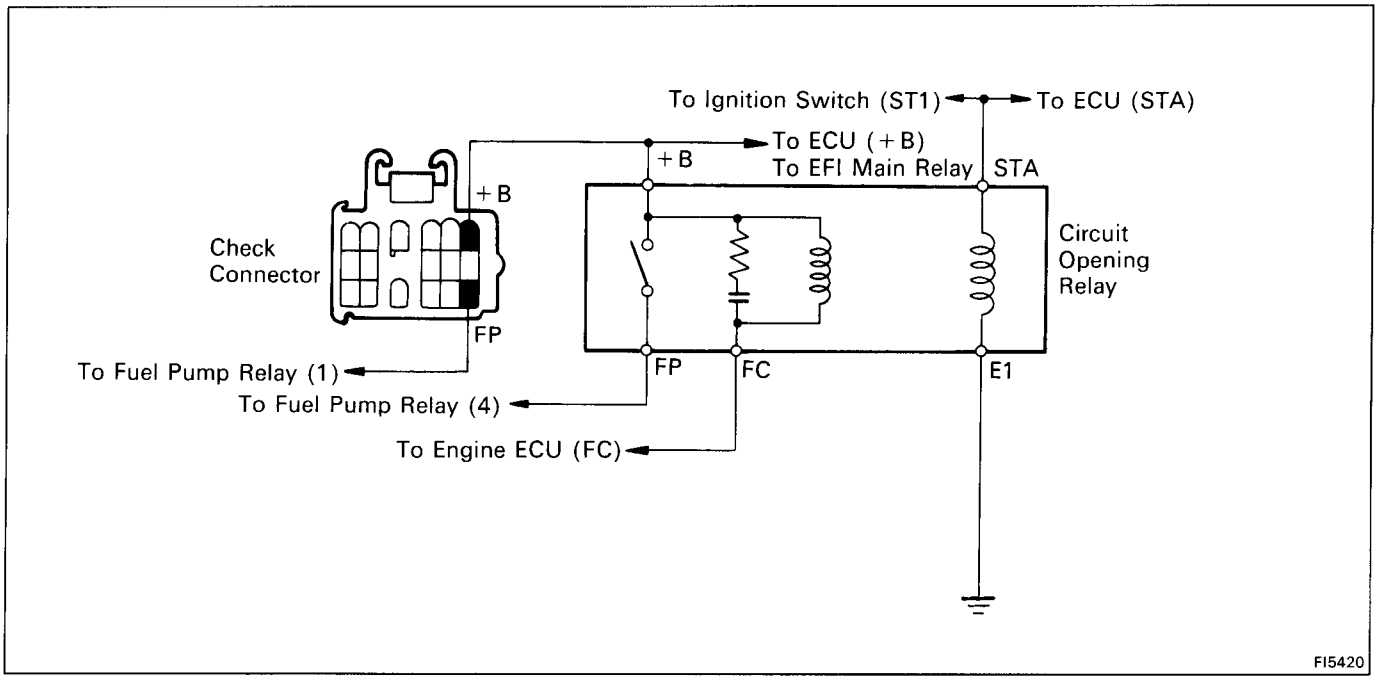
2. INSPECT RELAY OPERATION

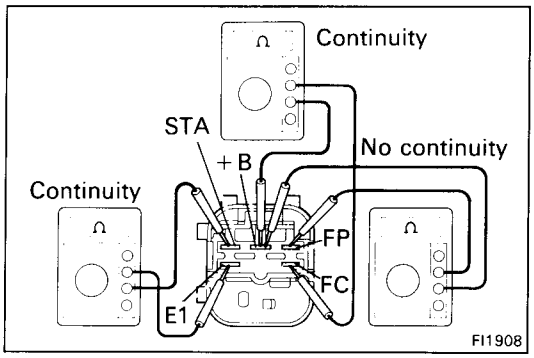
(a) Apply battery voltage across terminals 1 and 3.

(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





INSPECTION OF CIRCUIT OPENING RELAY

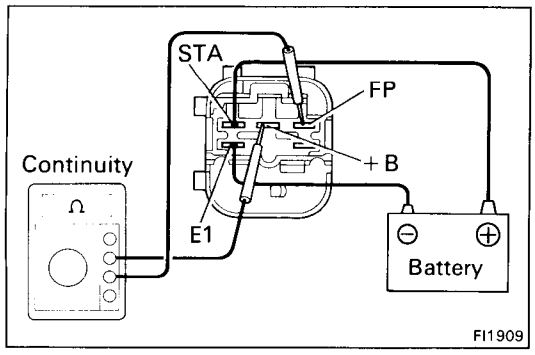
1. INSPECT RELAY CONTINUITY

(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.

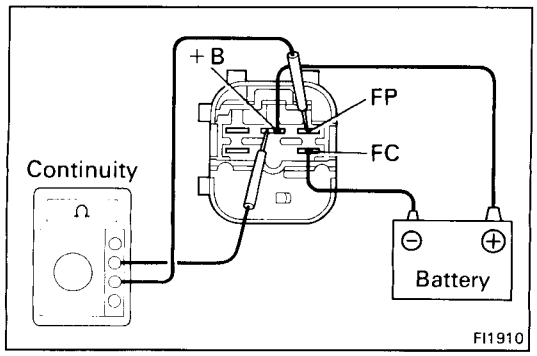
If continuity is not as specified, replace the relay.



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.

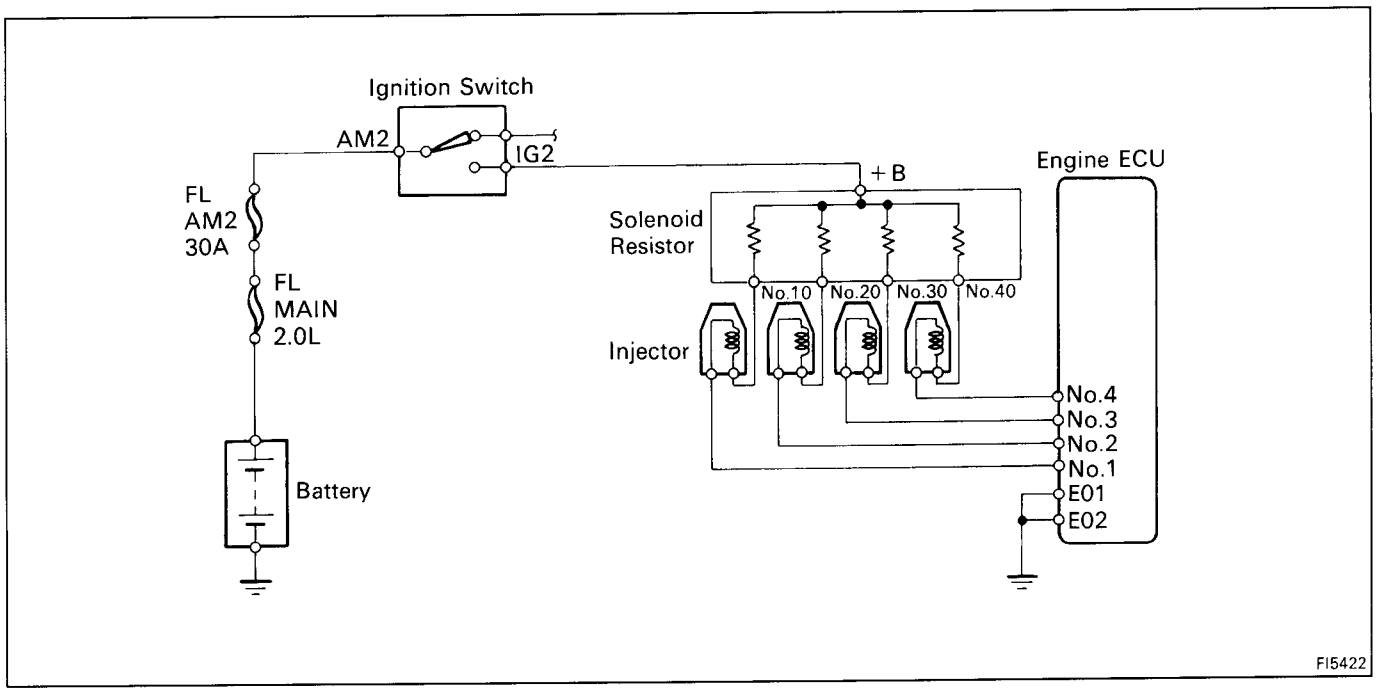


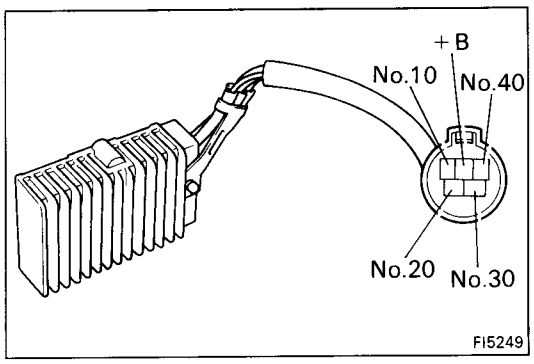
(c) Apply battery voltage across terminals +B and FC.

(d) Check that there is continuity between terminals +B and FP.

If operation is not as specified, replace the relay.

Solenoid Resistor





INSPECTION OF SOLENOID RESISTOR

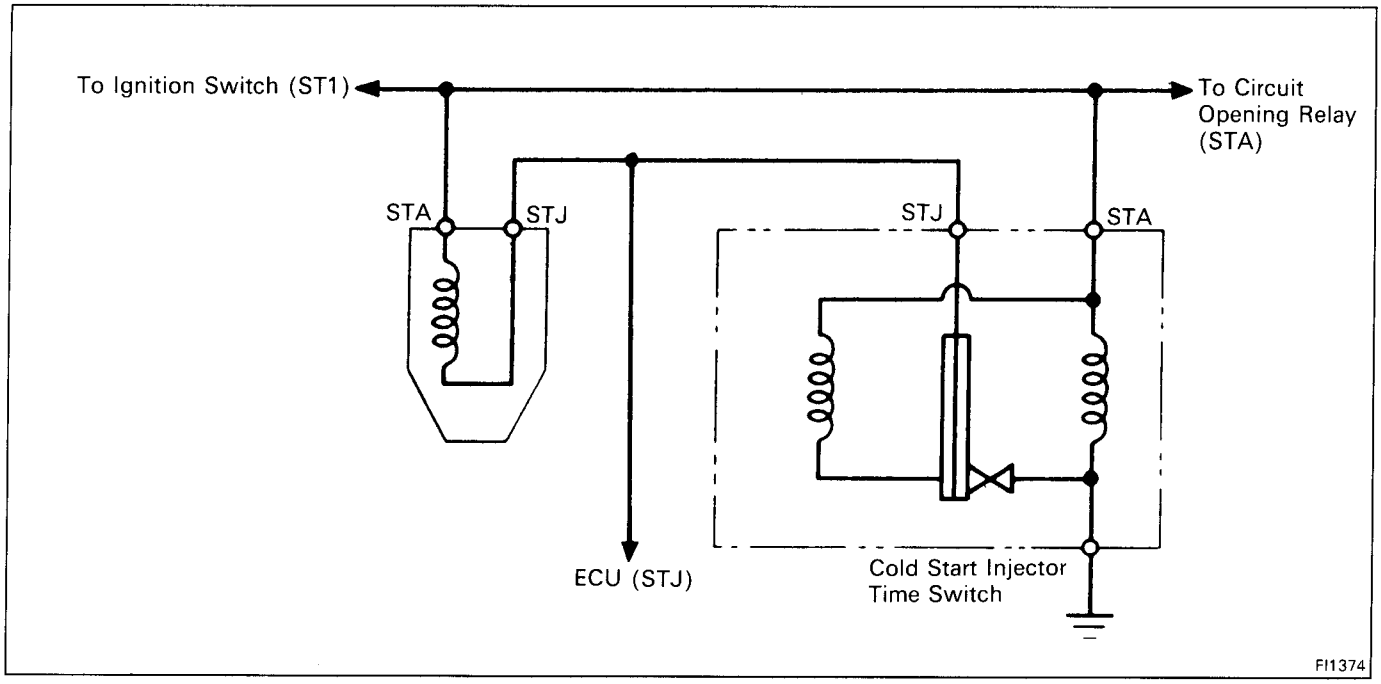
INSPECT SOLENOID RESISTOR

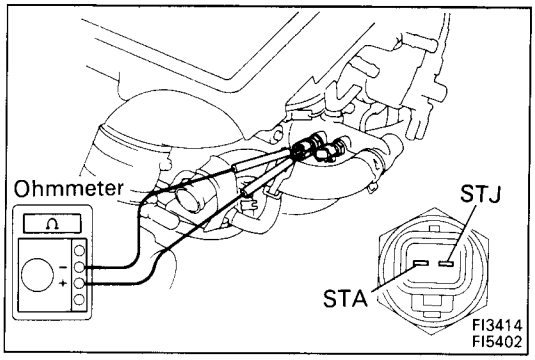
Using an ohmmeter, measure the resistance between terminal +B and other terminals.

Resistance: 4 – 6 Ω

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

Cold Start Injector Time Switch





INSPECTION OF COLD START INJECTOR TIME SWITCH

INSPECT COLD START INJECTOR TIME SWITCH

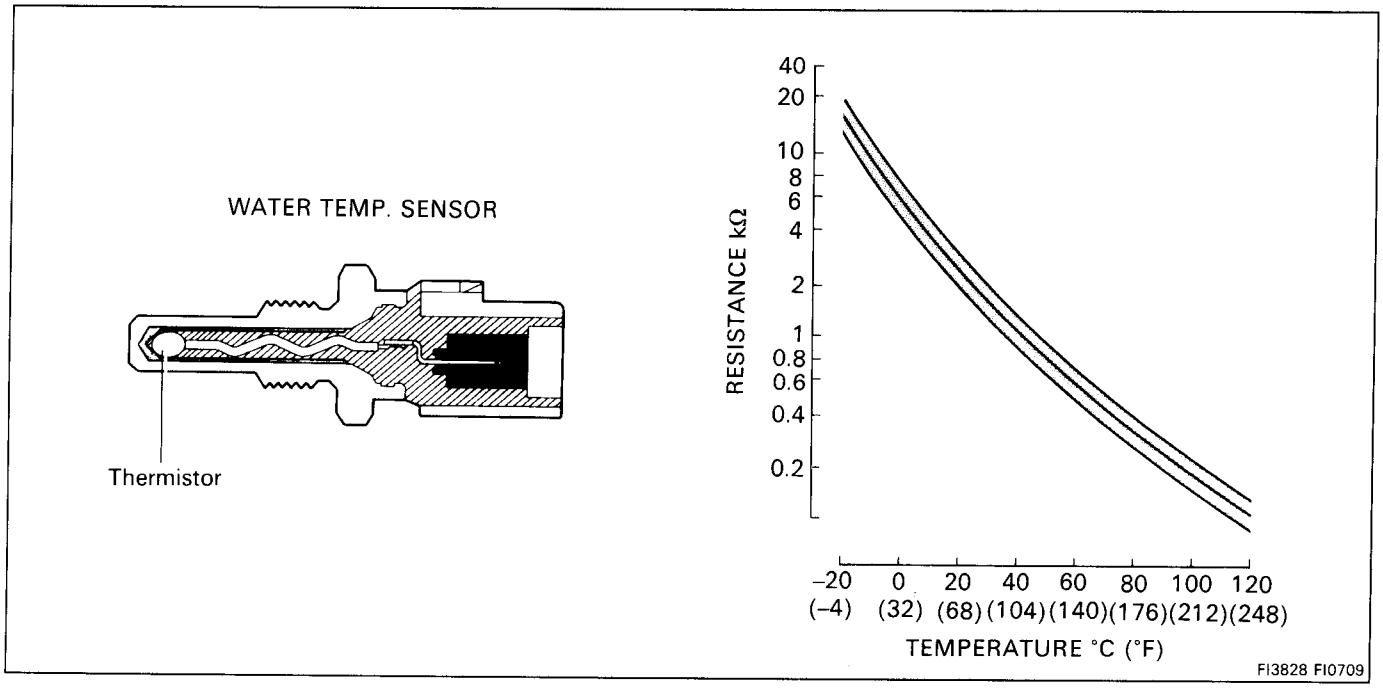
Using an ohmmeter, measure the resistance between each terminal.

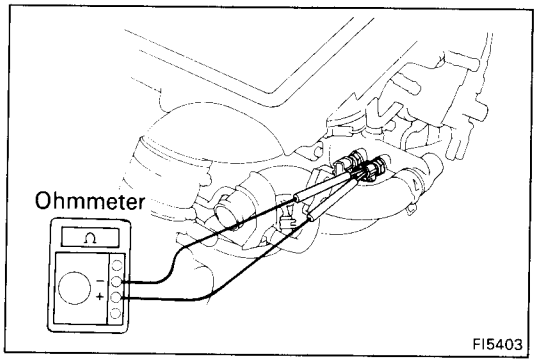
Resistance:

STA – STJ	**30 – 50 Ω below 10°C (50°F)**
	70 – 90 Ω above 25°C (77°F)
STA – Ground	**30 – 90 Ω**

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

Water Temperature Sensor





INSPECTION OF WATER TEMPERATURE SENSOR

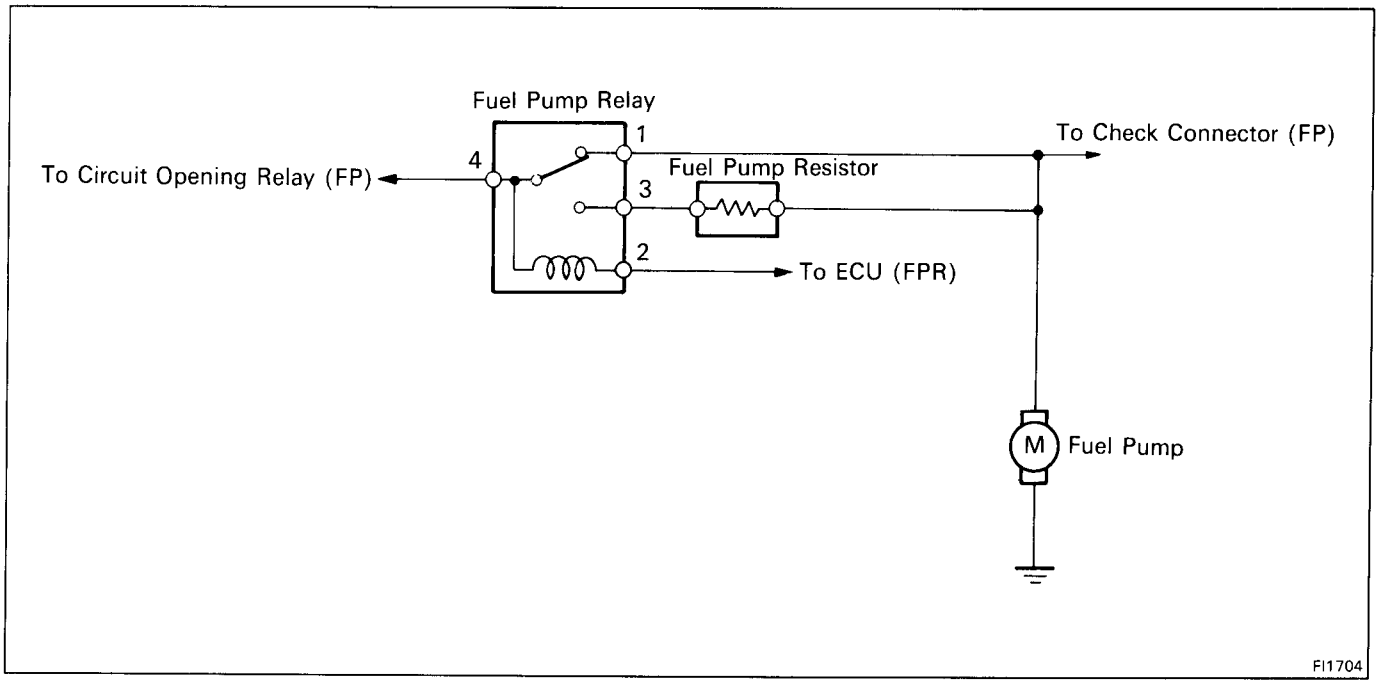
INSPECT WATER TEMPERATURE SENSOR

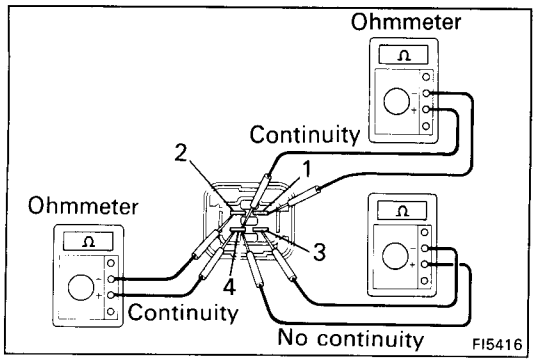
Using an ohmmeter, measure the resistance between the terminals.

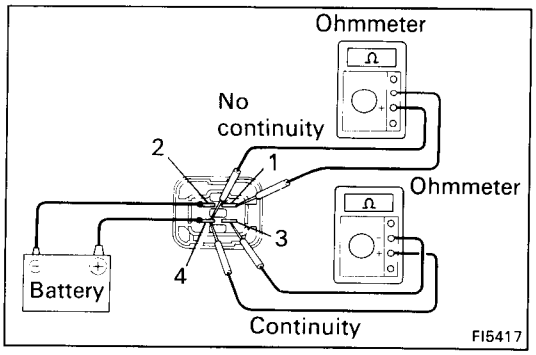
Resistance: Refer to the chart above

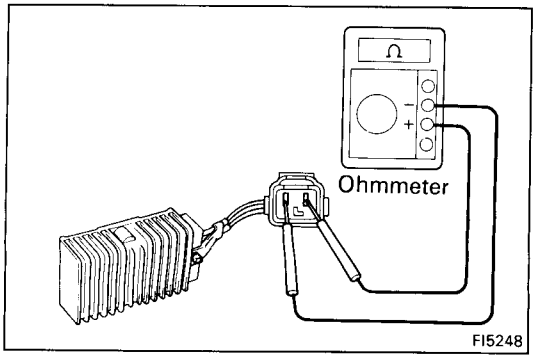
If the resistance is not as specified, replace the sensor.

Fuel Pump Relay and Resistor









INSPECTION OF FUEL PUMP RELAY AND RESISTOR

1. INSPECT FUEL PUMP RELAY

A. Inspect relay continuity

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

(b) Check that there is continuity between terminals 1 and 4.

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

If continuity is not as specified, replace the relay.

B. Inspect relay operation

(a) Apply battery voltage across terminals 2 and 4.

(b) Using an ohmmeter, check that there is no continuity between terminals 1 and 4.

(c) Check that there is continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.

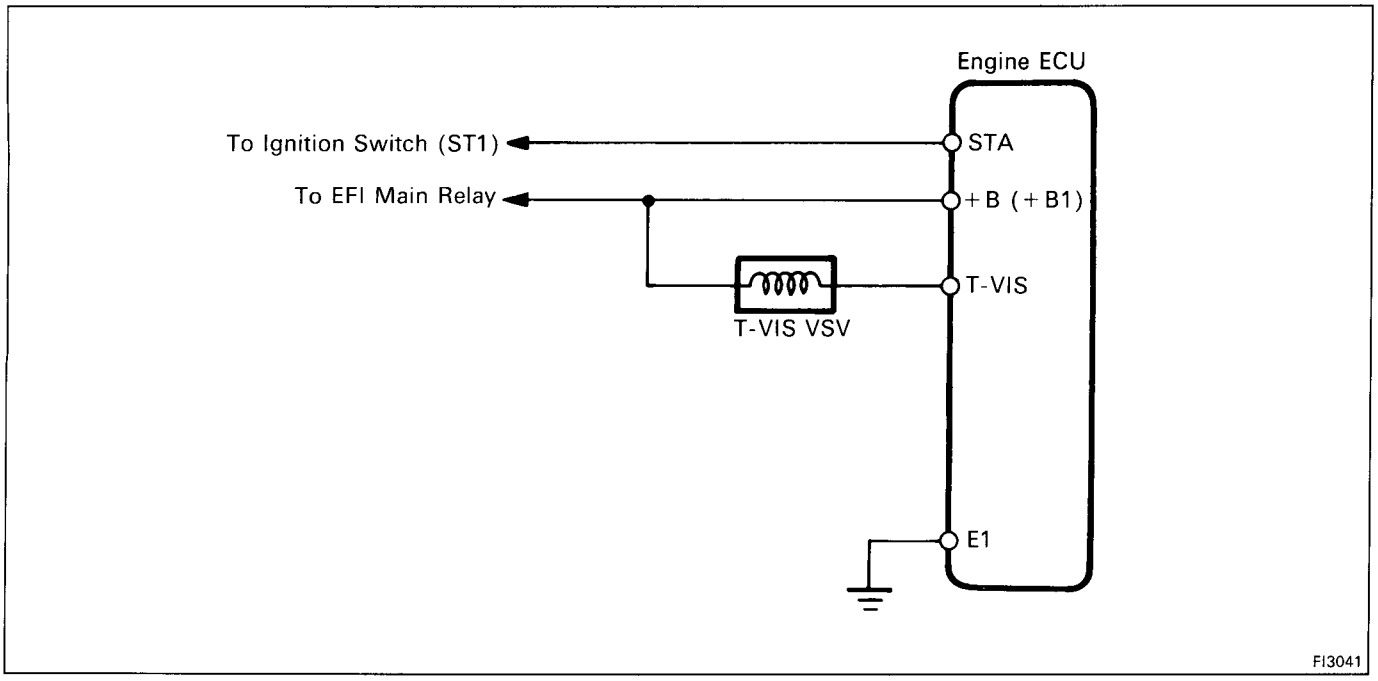
2. INSPECT FUEL PUMP RESISTOR

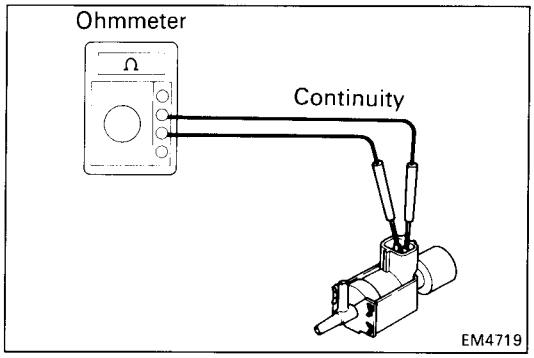
Using an ohmmeter, measure the resistance between the terminals.

Resistance: Approx. 0.73 Ω

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

T-VIS VSV





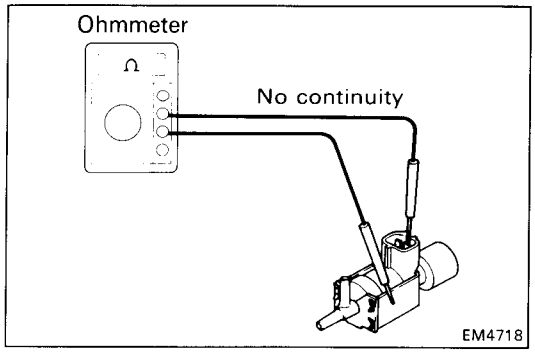
INSPECTION OF T-VIS VSV

1. INSPECT VSV FOR OPEN CIRCUIT

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

Resistance (Cold): 33 – 39 Ω

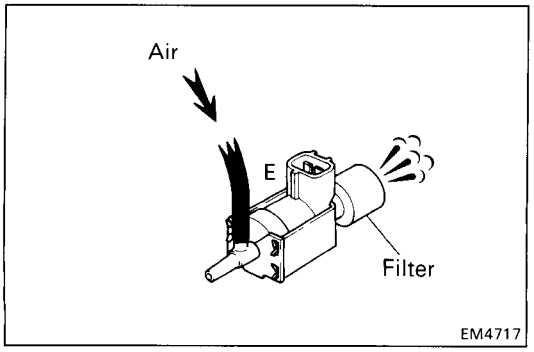
If there is no continuity, replace the VSV.



2. INSPECT VSV FOR GROUND

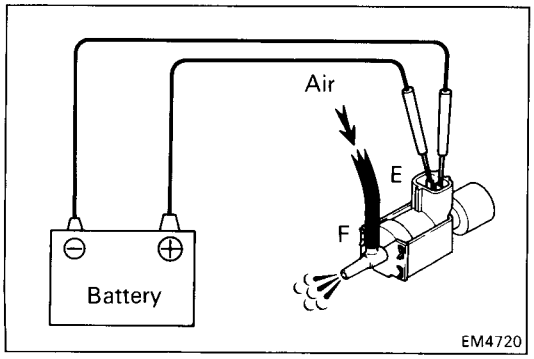
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



3. INSPECT VSV OPERATION

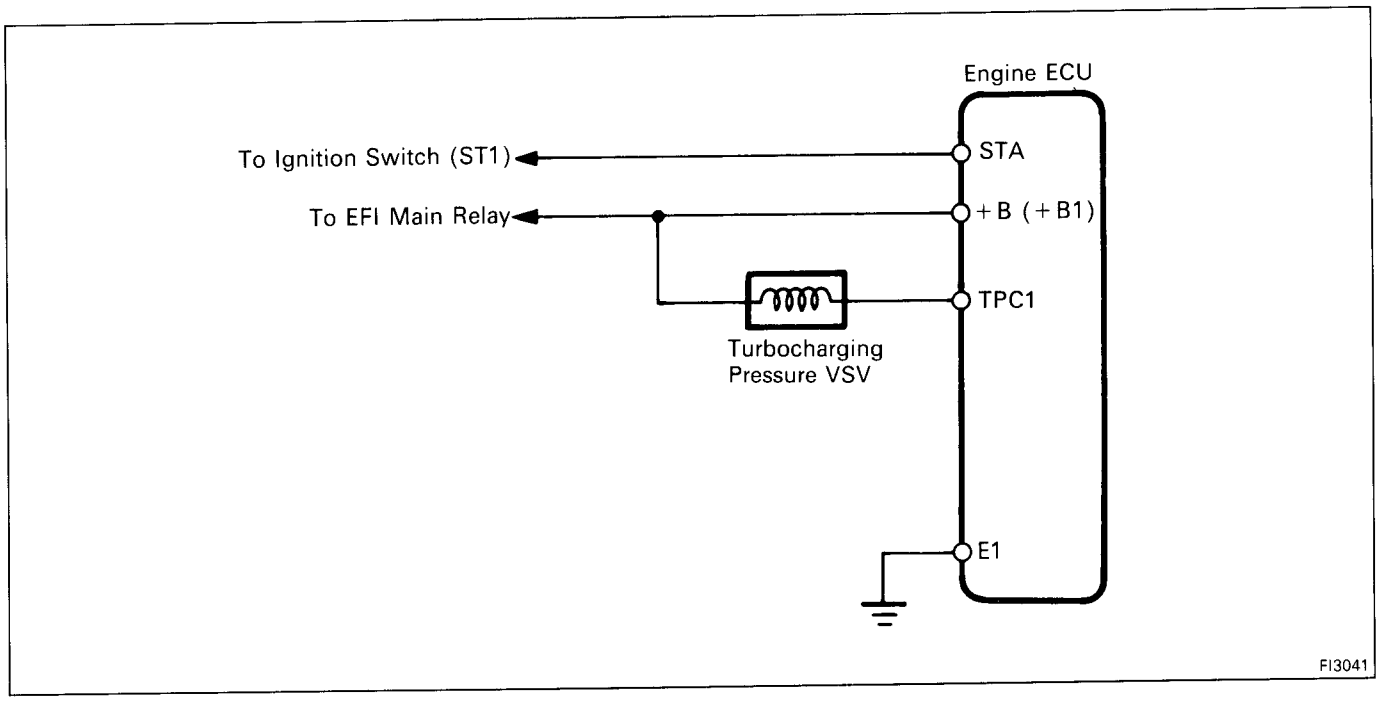
(a) Check that air flows from port E to the filter.

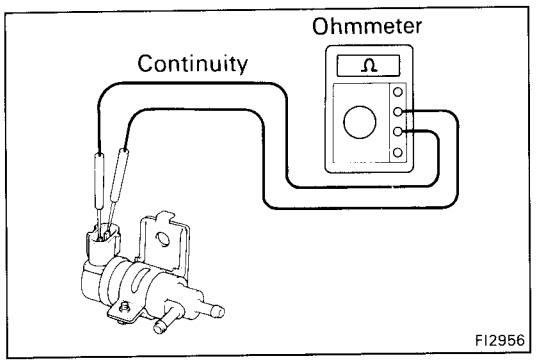


(b) Apply battery voltage across the terminals.
(c) Check that air flows from ports E to F.

If operation is not as specified, replace the VSV.

Turbocharging Pressure VSV





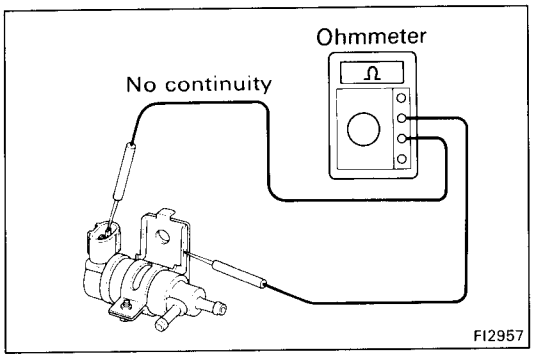
INSPECTION OF TURBOCHARGING PRESSURE VSV

1. **INSPECT VSV FOR OPEN CIRCUIT**

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

Resistance (Cold): 24 – 30 Ω

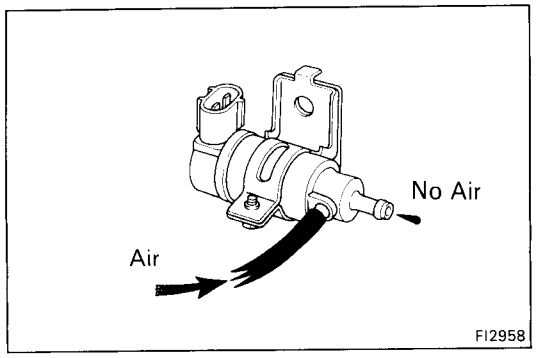
If there is no continuity, replace the VSV.



2. **INSPECT VSV FOR GROUND**

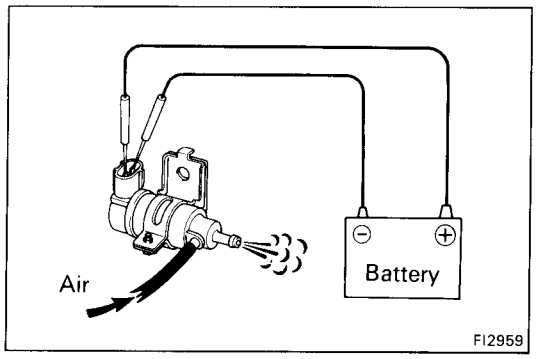
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



3. **INSPECT VSV OPERATION**

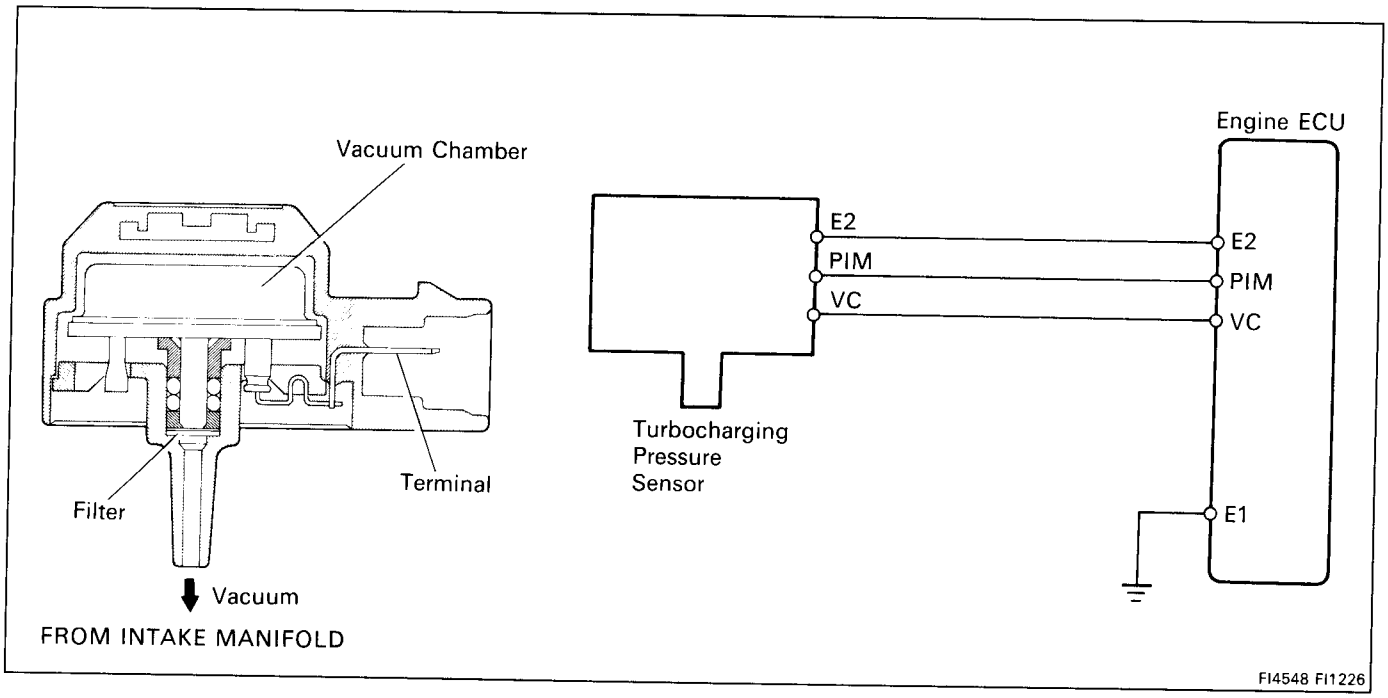
(a) Check that air does not flow from ports E to F.

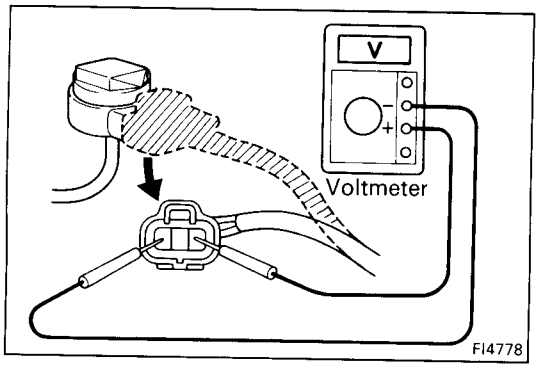


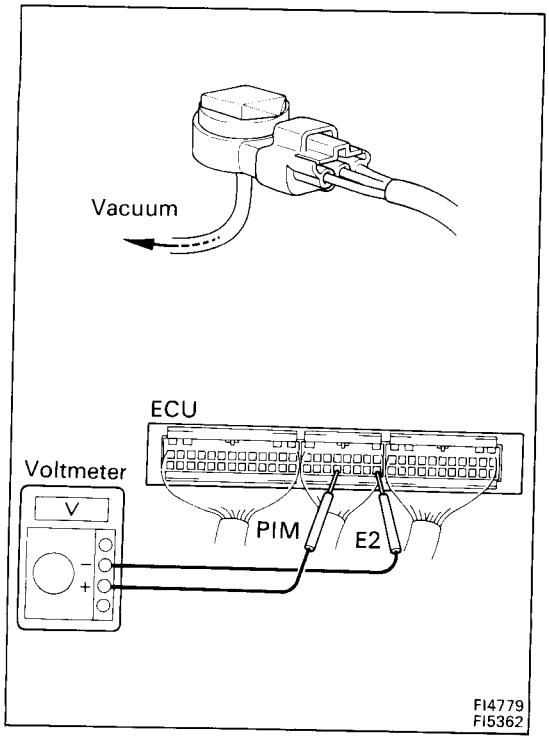
(b) Apply battery voltage across the terminals.
(c) Check that air flows from ports E to F.

If operation is not as specified, replace the VSV.

Turbocharging Pressure Sensor







INSPECTION OF TURBOCHARGING PRESSURE SENSOR

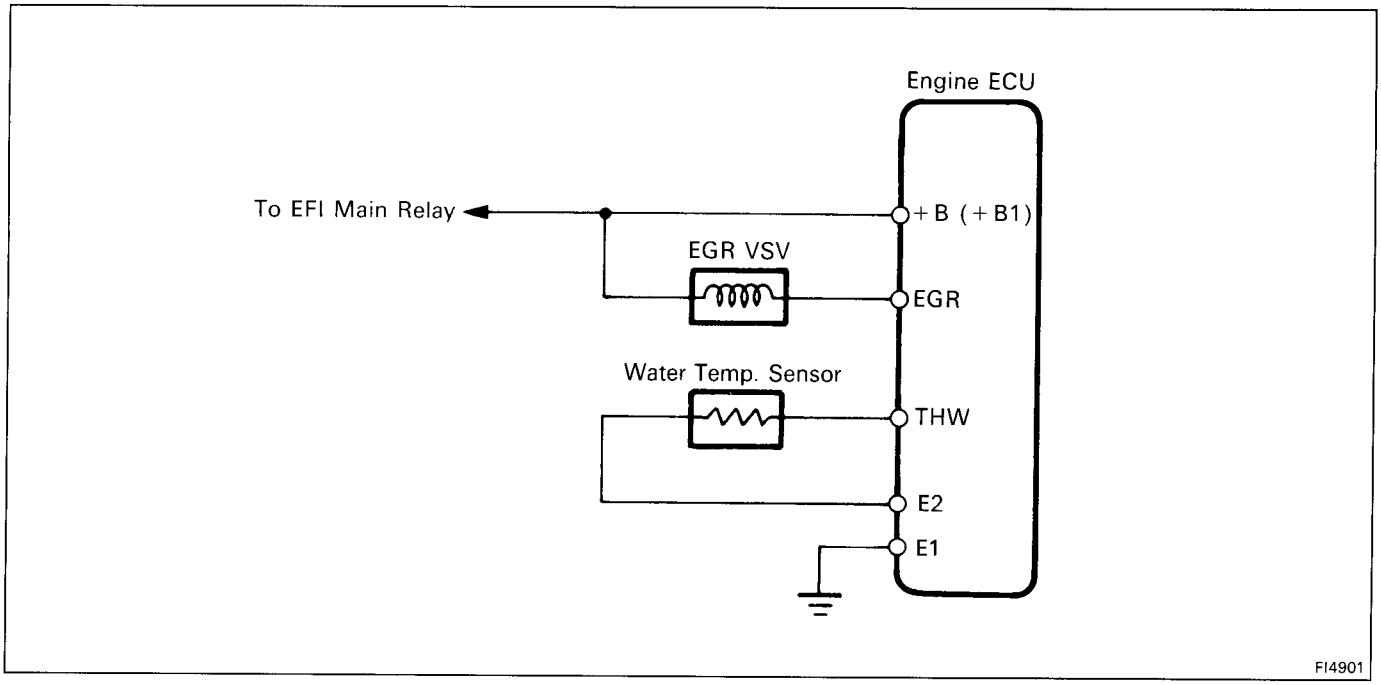
1. **INSPECT POWER SOURCE VOLTAGE OF TURBOCHARGING PRESSURE SENSOR**
   (a) Disconnect the pressure sensor connector.
   (b) Turn the ignition switch ON.
   (c) Using a voltmeter, measure the voltage between terminals VC and E2.
   Voltage: 4.5 – 5.5 V
   (d) Reconnect the pressure sensor connector.

2. **INSPECT POWER OUTPUT OF TURBOCHARGING PRESSURE 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 ECU, and measure and record the output voltage under ambient atmospheric pressure.
   (d) Apply vacuum to the pressure sensor in 100 mmHg (3.94 in.Hg, 13.3 kPa) segments to 500 mmHg (19.69 in.Hg, 66.7 kPa).
   (e) Measure voltage drop from step (c) above for each segment.

Voltage drop

Applied Vacuum mmHg (in.Hg, kPa)	100 (3.94, 13.3)	200 (7.87, 26.7)	300 (11.81, 40.0)	400 (15.75, 53.3)	500 (19.69, 66.7)
Voltage drop V	0.15 – 0.35	0.4 – 0.6	0.65 – 0.85	0.9 – 1.1	1.15 – 1.35

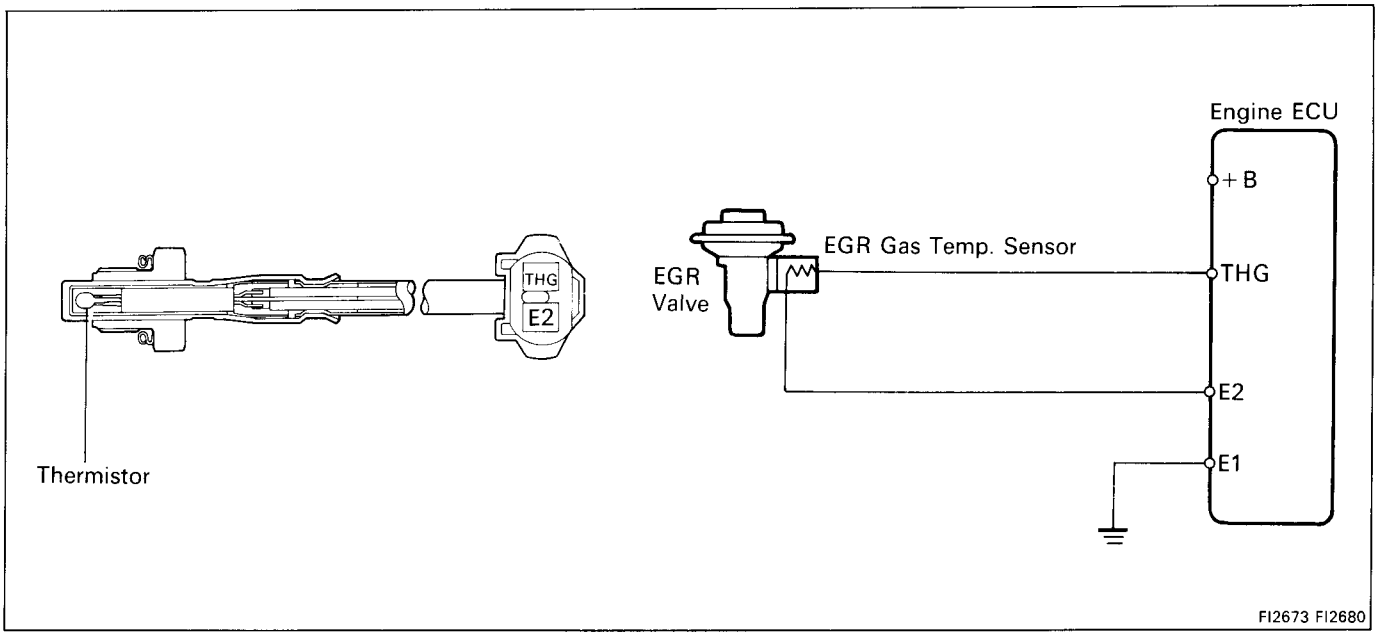
EGR VSV

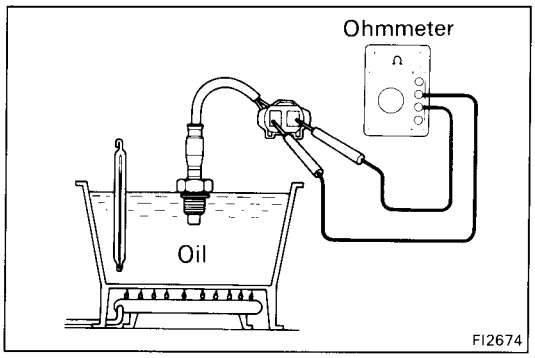


INSPECTION OF EGR VSV

(See page EC-10)

EGR Gas Temperature Sensor (CALIF. only)





INSPECTION OF EGR GAS TEMPERATURE SENSOR

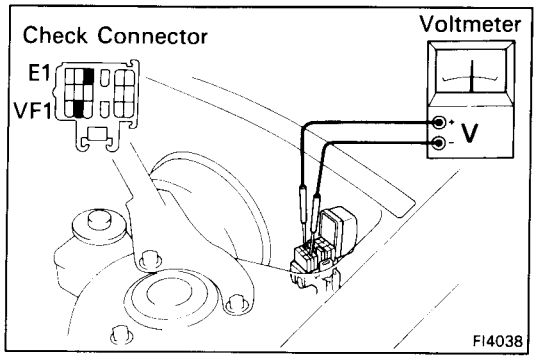
INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

69.40 – 88.50 kΩ at 50°C (112°F)
11.89 – 14.37 kΩ at 100°C (212°F)
2.79 – 3.59 kΩ at 150°C (302°F)

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



Oxygen Sensor

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 check connector, and negative (–) probe to terminal E1. Perform the test as follows:

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 120 seconds.

Connect terminals TE1 and E1 of the check connector. And maintain engine at 2,500 rpm.

Replace the ECU.

Zero again

After replacing the oxygen sensor

Check the number of times the voltmeter needle fluctuates in 10 seconds.

Less than 8 times

8 times or more

Zero

Normal

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 120 seconds. And maintain engine at 2,500 rpm.

Check the number of times the voltmeter needle fluctuates in 10 seconds.

8 times or more

Zero

Less than 8 times

Disconnect terminals TE1 and E1 of the check connector. And maintain engine at 2,500 rpm.

Measure voltage between terminals VF1 and E1.

0V

More then 0 V

Read and record diagnostic codes. (See page FI-24)

Normal code, code Nos. 21, 25 and 26

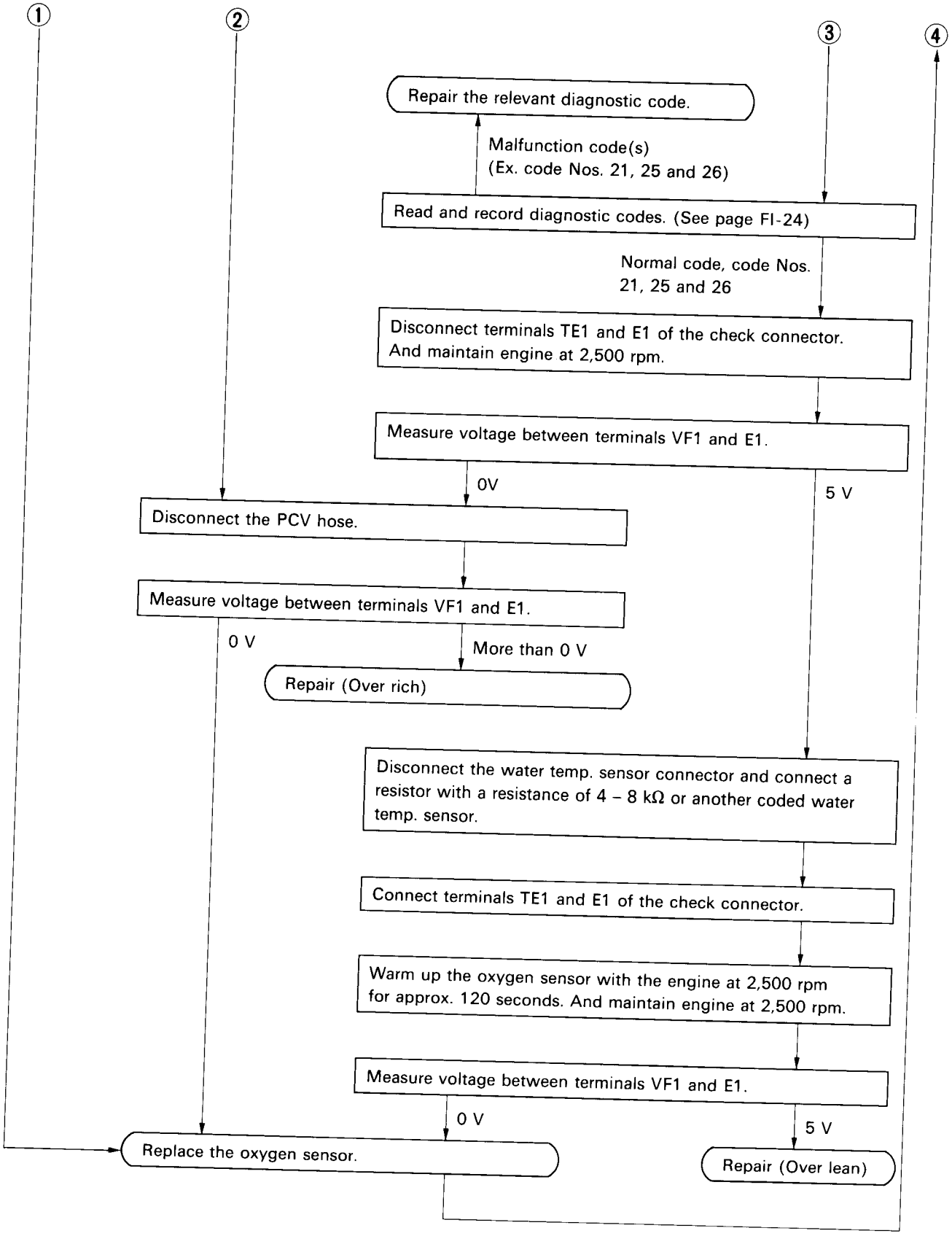
Malfunction code(s) (Ex. code Nos. 21, 25 and 26)

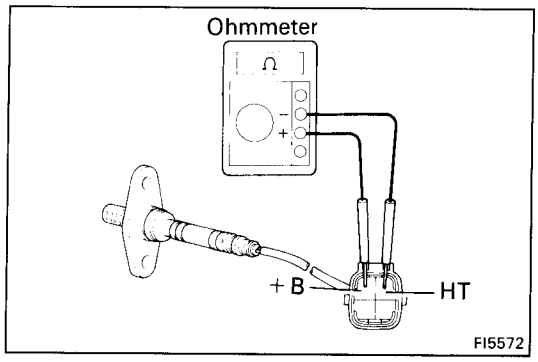
Repair the relevant diagnostic code.

① ② ③ ④

CONTINUED ON PAGE FI-93

CONTINUED FROM PAGE FI-92



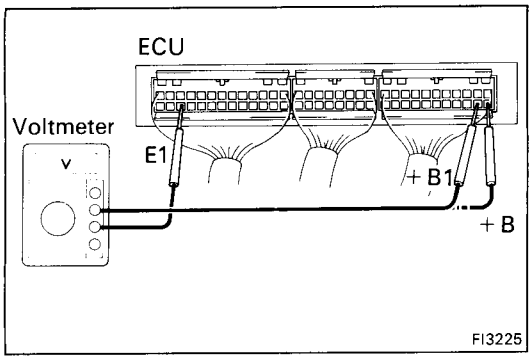


3. **INSPECT HEATER RESISTANCE OF OXYGEN SENSOR**

Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance: 5.1 – 6.3 Ω at 20°C (68°F)

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



Electronic Control Unit (ECU)

INSPECTION OF ECU

HINT: The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.

1. INSPECT VOLTAGE OF ECU

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
- Measure the voltage at each terminal.

HINT:

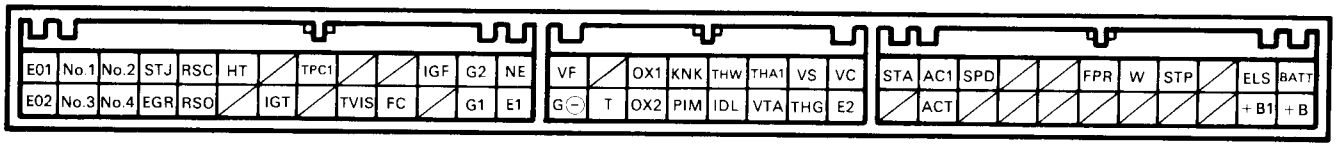
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

Voltage at ECU Wiring Connectors

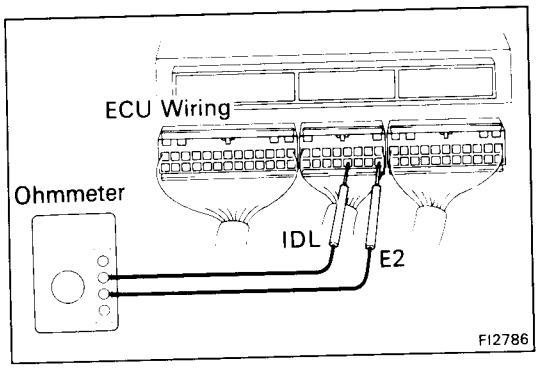
Terminals	Condition		STD voltage (V)
+B, +B1 – E1	IG SW ON		10 – 14
BATT – E1	–		10 – 14
IDL – E2	IG SW ON	Throttle valve open	4.5 – 5.5
VTA – E2		Throttle valve fully closed	0.1 – 1.0
		Throttle valve open	3.2 – 4.2
VC – E2		–	4.5 – 5.5
VS – E2		Measuring plate fully closed	3.7 – 4.3
		Measuring plate fully open	0.2 – 0.5
	Idling		1.6 – 4.1
	3,000 rpm		1.0 – 2.0
No. 1, No. 2, No. 3, No. 4 – E01, E02	IG SW ON		10 – 14
THA1 – 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 – E1	IG SW ON		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
AC1 – 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
T – E1	IG SW ON	Check connector TE1 – E1 not connected	10 – 14
		Check connector TE1 – E1 connected	0.5 or less

Engine ECU Terminals

*1 w/ Regular Unleaded Gasoline *2 w/ Premium Unleaded Gasoline



FI2796



2. INSPECT RESISTANCE OF ECU

NOTICE:

- **Do not touch the ECU terminals.**
- **The tester probe should be inserted into the wiring connector from the wiring side.**

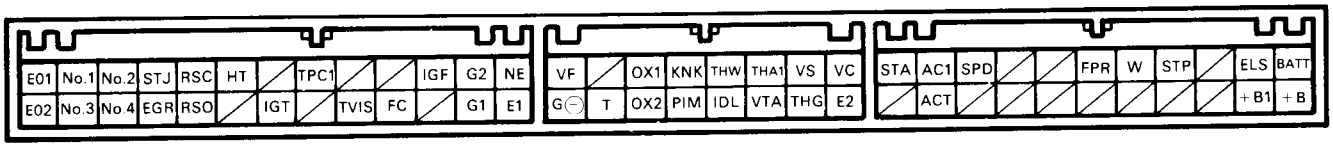
Check the resistance between each terminal of the wiring connectors.

- Disconnect the connectors from the ECU.
- Measure the resistance at each terminal.

Resistance of ECU Wiring Connectors

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	3,500 – 10,000
	Throttle valve fully closed	200 – 800
VC – E2	–	200 – 400
VS – E2	Measuring plate fully closed	200 – 600
	Measuring plate fully open	20 – 1,200
THA1 – E2	Intake air temp. 20°C (68°F)	2,000 – 3,000
THW – E2	Coolant temp. 80°C (176°F)	200 – 400
G1, G2 – G⊖	–	140 – 180
NE – G⊖	–	180 – 220
RSC, RSO – +B, +B1	–	19.3 – 22.3

Engine ECU Terminals



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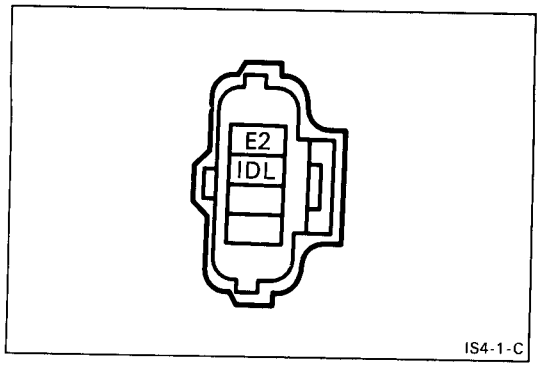
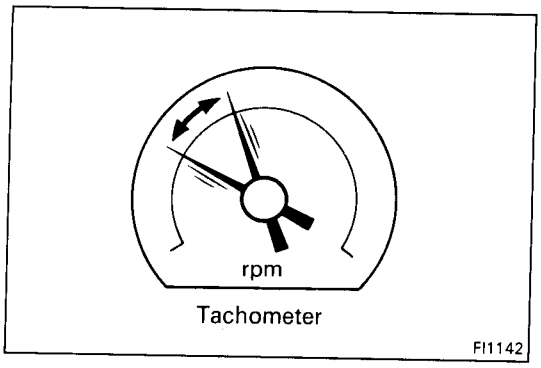




Fuel Cut RPM

INSPECTION OF FUEL CUT RPM

1. **WARM UP ENGINE**

   Allow the engine to warp up to normal operating temperature.

2. **INSPECT FUEL CUT RPM**

   (a) Disconnect the connector from the throttle position sensor.

   (b) Connect terminals IDL and E2 of the wiring connector.

   (c) Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

   HINT:
   - The vehicle should be stopped.
   - Measure with the A/C OFF.

   Fuel cut rpm: 2,000 rpm

   Fuel return rpm: 1,600 rpm

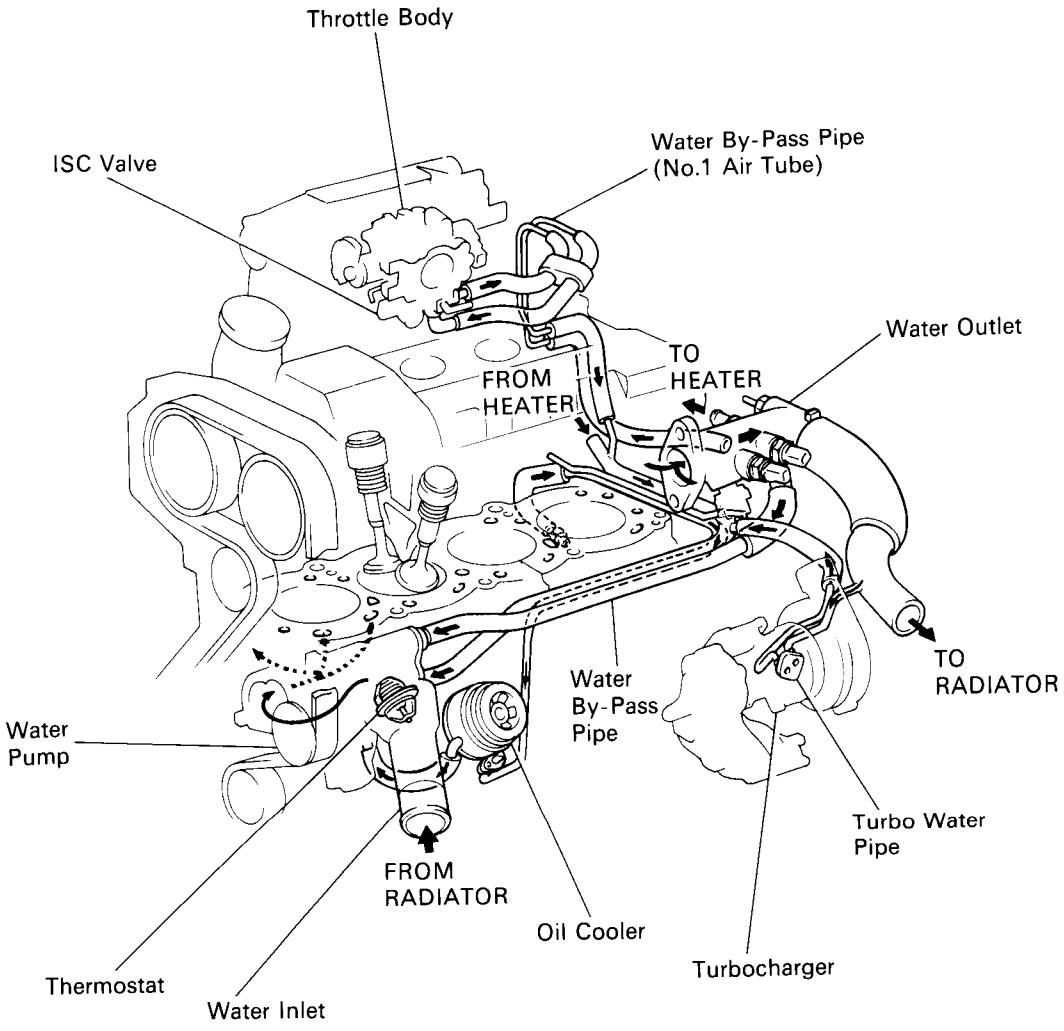
COOLING SYSTEM

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

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.



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 are 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 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 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 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 (coolant temperature: 110 – 120°C, 230 – 248°F, pressure; 0.3 – 1.0 kg/cm^2, 4.3-14.2 psi, 29.4-98.1 kPa). The vacuum valve opens to alleviate the vacuum which develops in the coolant system after the engine is stopped and the coolant temperature drops. The valve's opening allows the coolant in the reservoir tank to return to the cooling system.

RESERVOIR TANK

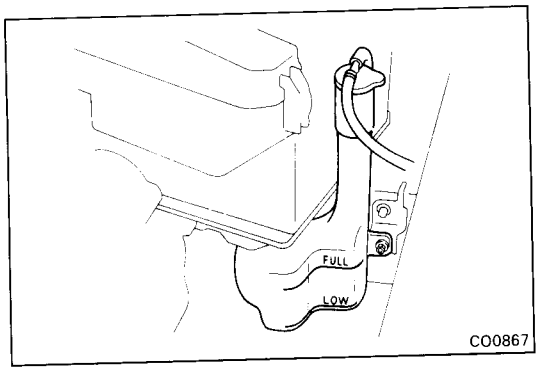
The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. The coolant in the reservoir tank returns to the radiator when the coolant temperature drops, thus keeping the radiator full at all times and avoiding needless 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 timing belt.

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 coolant temperature. This valve closes when the 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 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).

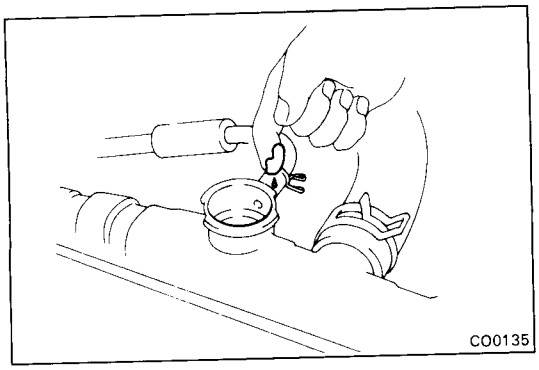


CHECK AND REPLACEMENT OF ENGINE COOLANT

1. CHECK ENGINE COOLANT LEVEL AT RESERVE TANK

The coolant level should be between the "LOW" and "FULL" lines.

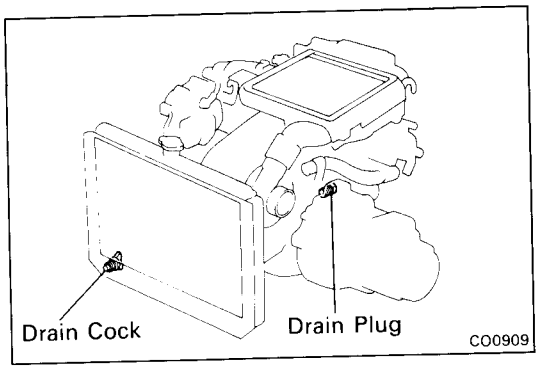
If low, check for leaks and add coolant up to the "FULL" line.



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 the radiator cap 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 and engine (Engine drain plug are at the rear left of engine block.)

(c) Close the drain cocks.

Torque (Engine drain cock):
130 kg-cm (9 ft-lb, 13 N·m)

(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 is recommended).

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

Capacity (w/ Heater):
6.4 liters (6.8 US qts, 5.6 Imp. qts)

(e) Reinstall the radiator cap.

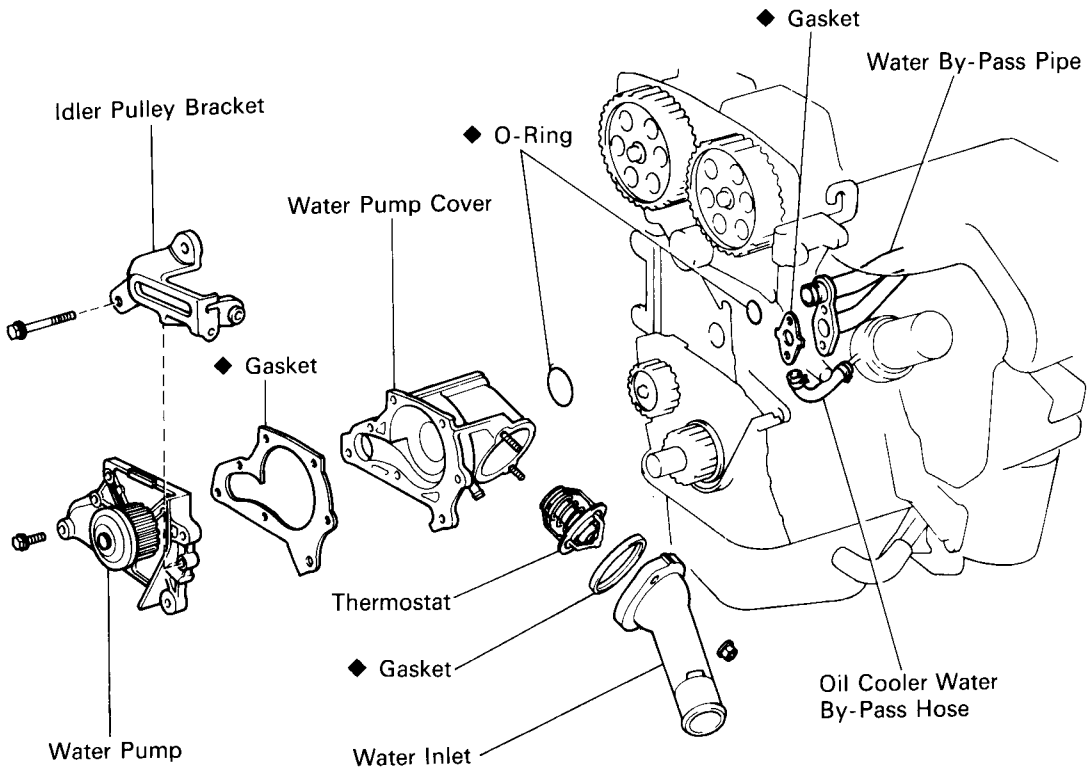
(f) Warm up the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.

WATER PUMP

(Refer to 5S-FE)

COMPONENTS



◆ Non-reusable part

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.

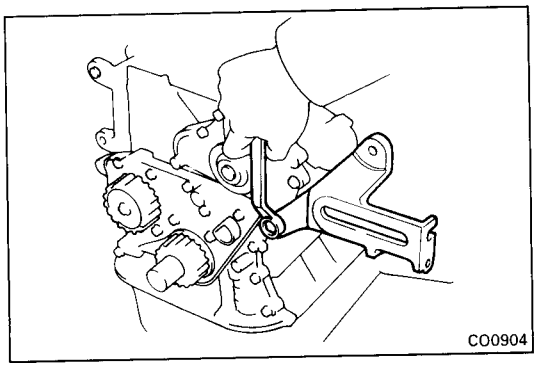
2. DRAIN ENGINE COOLANT (See page CO-4).

3. REMOVE TIMING BELT
   (See steps 2 to 23 on pages EM-19 to 24)

4. REMOVE NO. 2 IDLER PULLEY
   (See step 25 on page EM-25)

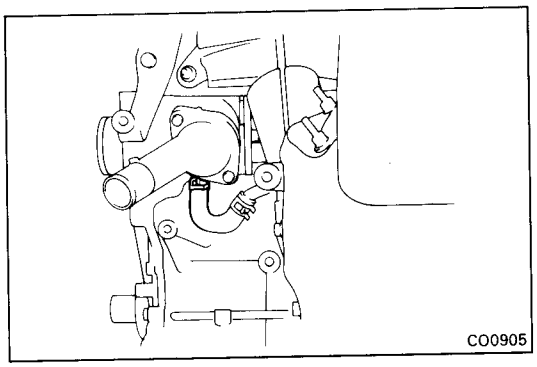
5. DISCONNECT LOWER RADIATOR HOSE FROM WATER INLET

6. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
   (See steps 38 and 39 on page EM-80)



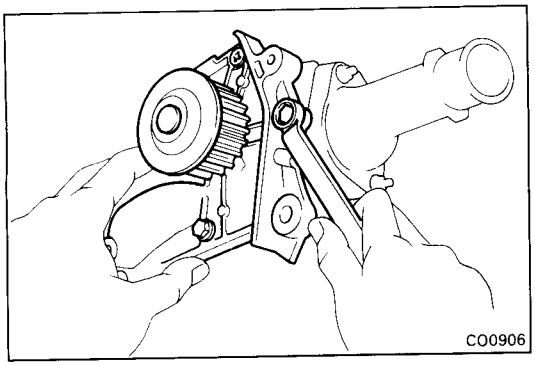
7. **REMOVE IDLER PULLEY BRACKET**

Remove the bolt and pulley bracket.



8. **DISCONNECT OIL COOLER WATER BY-PASS HOSE**

9. **REMOVE WATER PUMP AND WATER PUMP COVER ASSEMBLY**



10. **SEPARATE WATER PUMP AND WATER PUMP COVER**

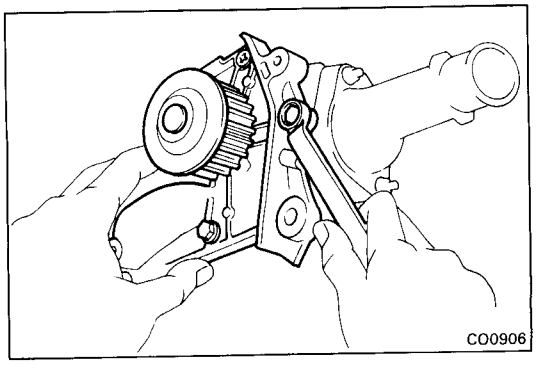
Remove the screw, two bolts, water pump and gasket from the water pump cover.

11. **REMOVE WATER INLET AND THERMOSTAT FROM WATER PUMP COVER (See step 6 on page CO-8)**

INSTALLATION OF WATER PUMP

(See page CO-5)

1. **INSTALL THERMOSTAT AND WATER INLET TO WATER PUMP COVER (See steps 1 and 2 on page CO-8)**

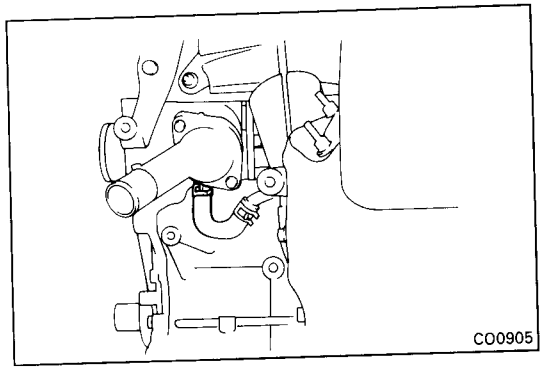


2. **ASSEMBLE WATER PUMP AND WATER PUMP COVER**

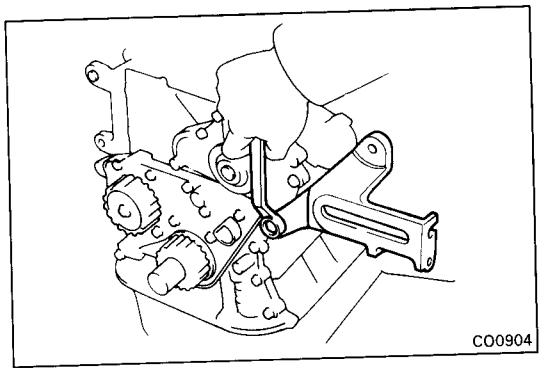
Install a new gasket and the water pump to the pump cover with the screw and two bolts.

Torque: 95 kg-cm (82 in.-lb, 9.3 N·m)

3. **INSTALL WATER PUMP AND WATER PUMP COVER ASSEMBLY**



4. CONNECT OIL COOLER WATER BY-PASS HOSE



5. INSTALL IDLER PULLEY BRACKET
Temporarily install pulley bracket with the bolt.

6. INSTALL A/C COMPRESSOR
(See steps 12 and 13 on page EM-112)

7. CONNECT LOWER RADIATOR HOSE TO WATER INLET

8. INSTALL NO. 2 IDLER PULLEY
(See step 3 on page EM-28)

9. INSTALL TIMING BELT
(See steps 5 to 30 on pages EM-28 to 34)

10. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

11. FILL WITH ENGINE COOLANT (See page CO-4)

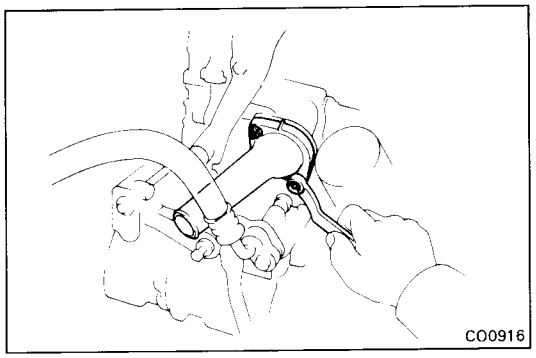
THERMOSTAT

REMOVAL OF THERMOSTAT

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-4)

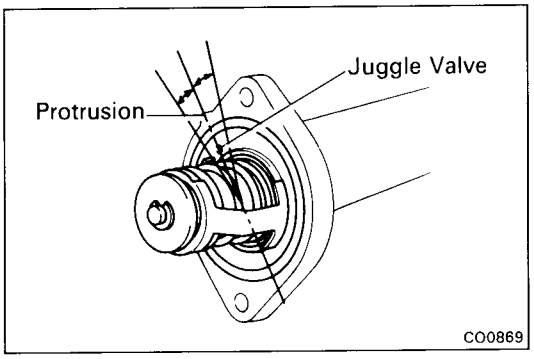


3. REMOVE ALTERNATOR

4. DISCONNECT LOWER RADIATOR HOSE

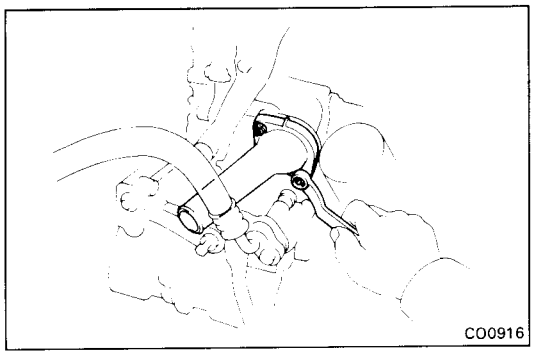
5. REMOVE WATER INLET AND THERMOSTAT
   (a) Remove the two nuts and water inlet from the water pump.
   (b) Remove the thermostat.
   (c) Remove the gasket from the thermostat.

INSTALLATION OF THERMOSTAT



1. PLACE THERMOSTAT IN WATER INLET
   (a) Install a new gasket to the thermostat.
   (b) Align the jiggle valve of the thermostat with the protrusion, and insert the thermostat in the water inlet.

   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: 90 kg-cm (78 in.-lb, 8.8 N·m)

3. CONNECT LOWER RADIATOR HOSE

4. INSTALL ALTERNATOR

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

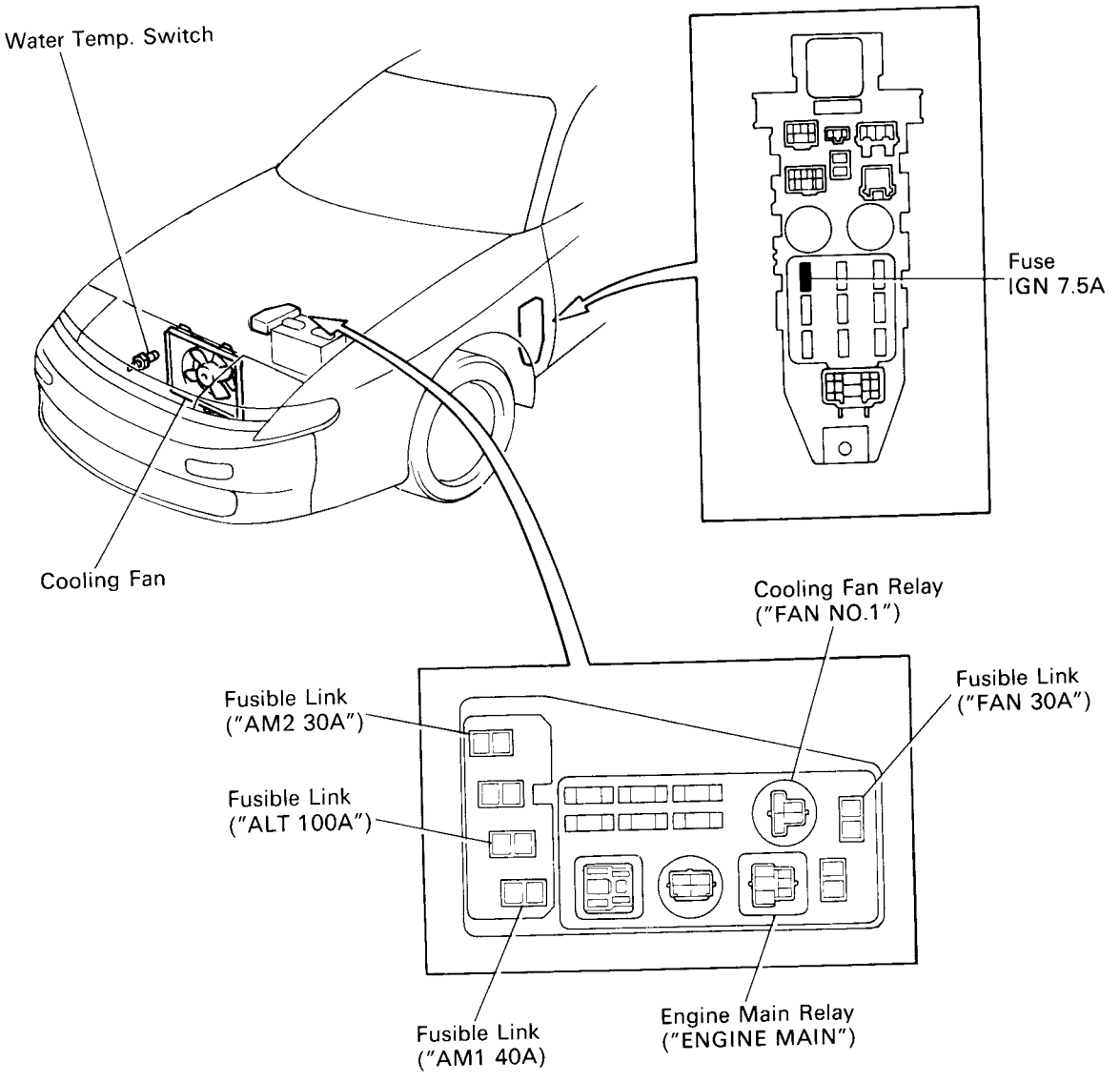
6. FILL WITH ENGINE COOLANT (See page CO-4)

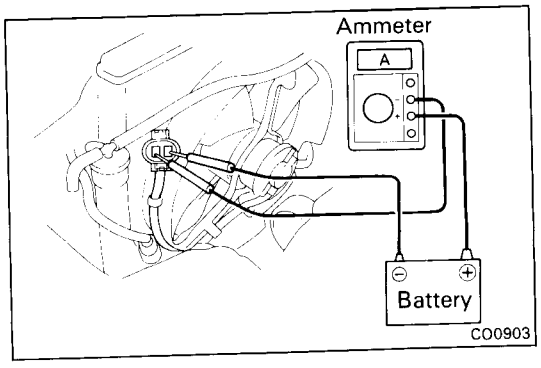
7. START ENGINE AND CHECK FOR LEAKS

ELECTRIC COOLING FANS

(Refer to 5S-FE)

LOCATION OF ELECTRIC COOLING FAN COMPONENTS





INSPECTION OF ELECTRIC COOLING FAN COMPONENTS

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: 8.8 – 10.8 A

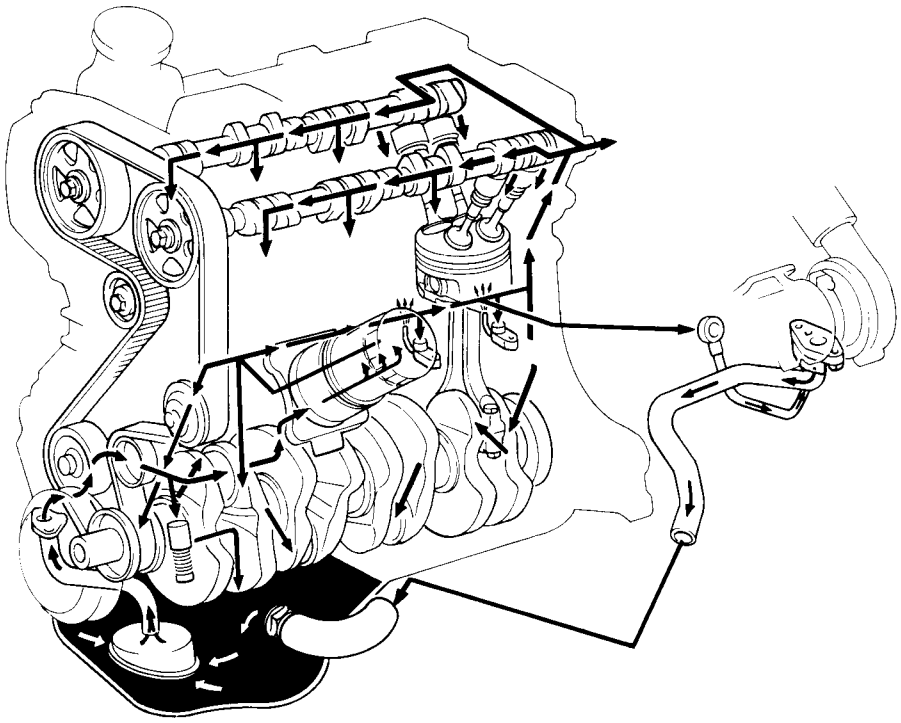
LUBRICATION SYSTEM

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

DESCRIPTION

A fully pressurized, fully filtered lubrication system has been adopted for this engine.



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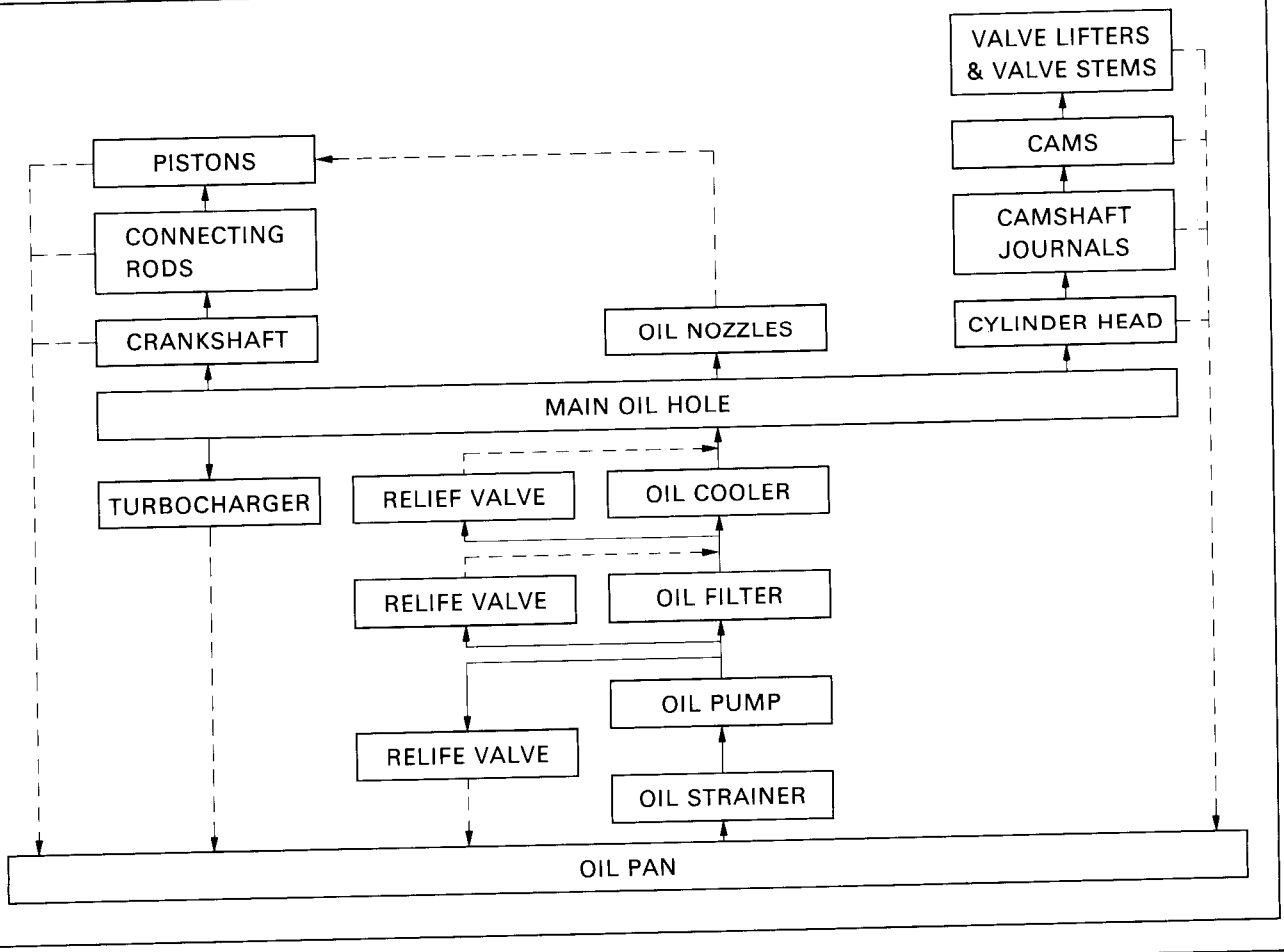


A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration 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

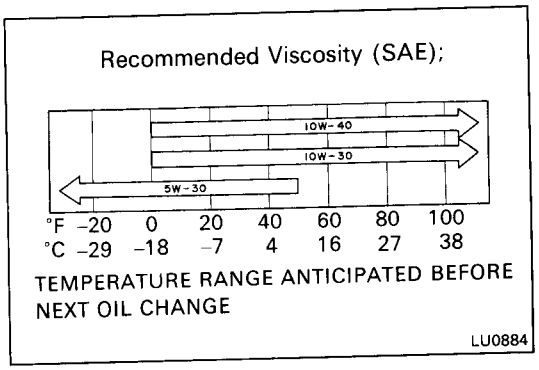
The oil pump pumps up oil from the oil pan and sends it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil pump to remove impurities. The oil pump itself is a trochoid type pump, inside of which is a drive rotor and a driven rotor. When the drive rotor rotates, the driven rotor rotates in the same direction, and since the axis of the drive rotor shaft is different from the center of the driven rotor, the space between the two rotors is changed as they rotate. Oil is drawn in when the space widen and is discharged when the space becomes narrow.

OIL PRESSURE REGULATOR

At high engine speeds, the engine oil supplied by the oil 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 bypass closed, but when too much oil is being fed, the pressure become 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 sizing 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.



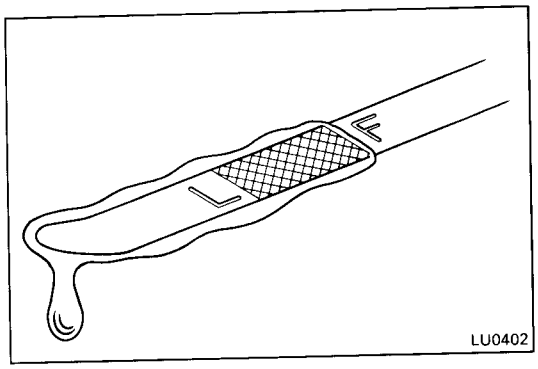
OIL PRESSURE CHECK

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is poor, replace the oil.

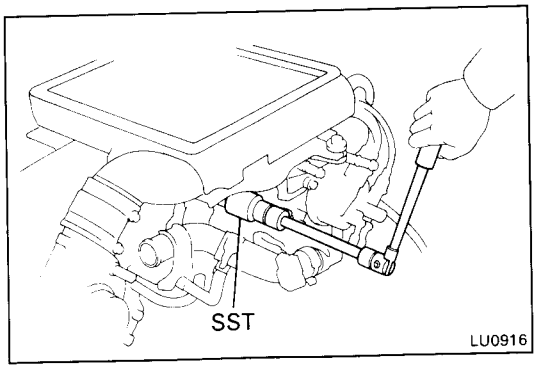
Oil grade: API grade SG, multigrade, fuel-efficient and recommended viscosity oil



2. CHECK ENGINE OIL LEVEL

The oil level should be between the "L" and "F" marks on the dipstick.

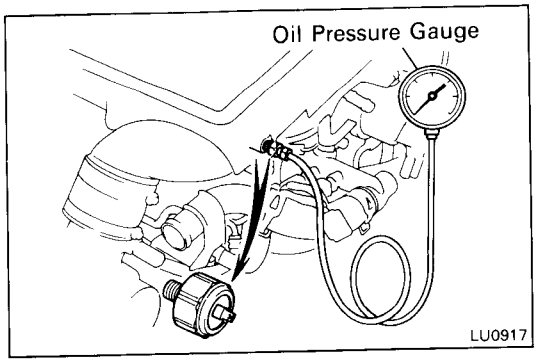
If low, check for leakage and add oil up to "F" mark.



3. REMOVE OIL PRESSURE SWITCH

Using SST, remove the oil pressure switch.

SST 09816-30010



4. INSTALL OIL PRESSURE GAUGE

5. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

6. CHECK OIL PRESSURE

Oil pressure:

At idling	**0.3 kg/cm² (4.3 psi, 29 kPa) or more**
At 3,000 rpm	**2.5 – 5.0 kg/cm² (36 – 71 psi, 245 – 490 kPa)**

7. REMOVE OIL PRESSURE GAUGE, AND REINSTALL OIL PRESSURE SWITCH

Apply adhesive to two or three threads of the oil pressure switch.

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

8. START ENGINE AND CHECK FOR LEAKS

REPLACEMENT OF ENGINE OIL AND OIL FILTER

NOTICE:

- **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 thorougthly 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**

(a) Remove the oil filler cap.

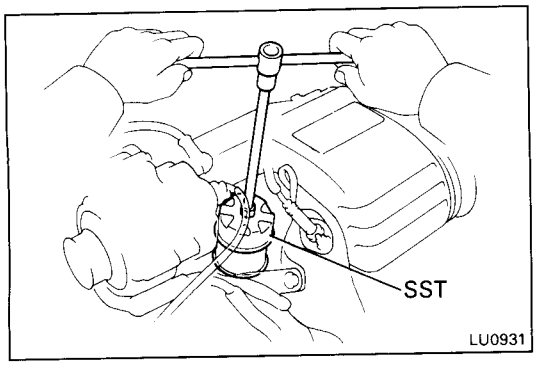
(b) Remove the oil drain plug, and drain the oil into a container.

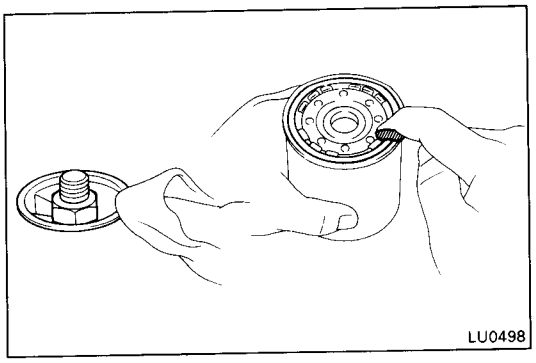
2. **REPLACE OIL FILTER**

(a) Remove the air duct from the alternator.

(b) Using SST, remove the oil filter.

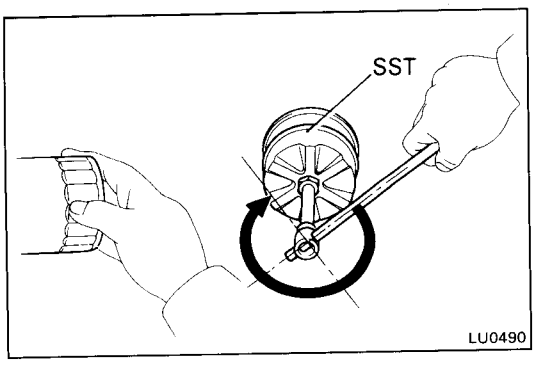
SST 09228-06500





(c) Check and clean the oil filter installation surface.

(d) Apply clean engine oil to the gasket of a new oil filter.



(e) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

(f) Using SST, tighten it an additional 3/4 turn.

SST 09228-06500

(g) Reinstall the air duct to the alternator.

3. **FILL WITH ENGINE OIL**

   (a) Clean and install the oil drain plug with a new gasket.

   Torque: 250 kg-cm (18 ft-lb, 25 N·m)

   (b) Fill with new engine oil.

   Oil grade: See page LU-4

   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)

   (c) Reinstall the oil filler cap.

4. **START ENGINE AND CHECK FOR LEAKS**

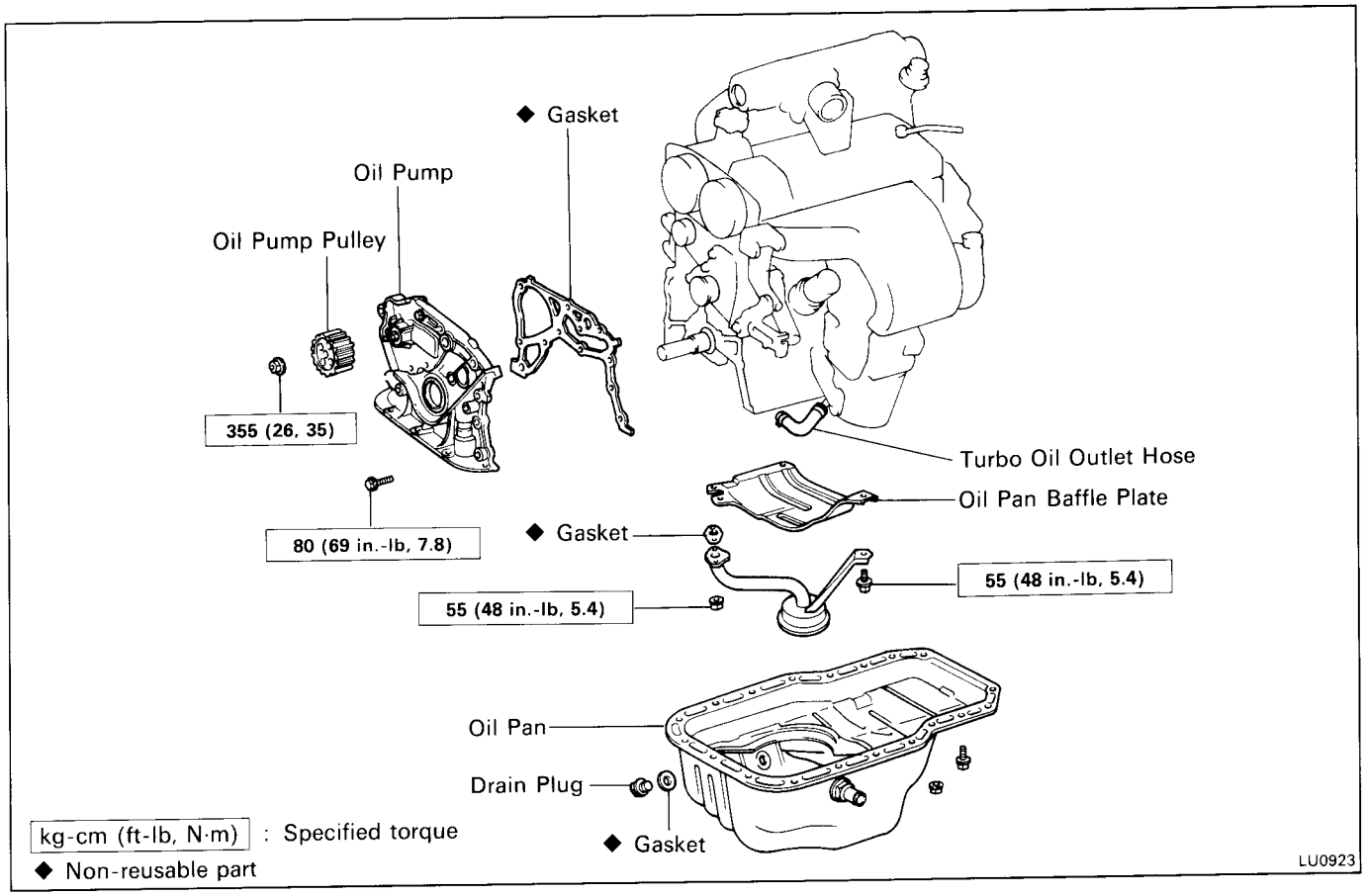
5. **RECHECK ENGINE OIL LEVEL (See page LU-4)**

OIL PUMP

(Refer to 5S-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 dosconnected from the battery.

2. **REMOVE HOOD**

3. **REMOVE ENGINE UNDER COVERS**

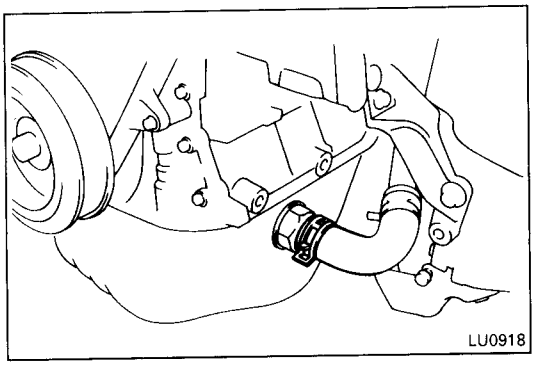
4. **DRAIN ENGINE OIL (See page LU-5)**

5. **REMOVE SUSPENSION LOWER CROSSMEMBER (See step 32 on page EM-79)**

6. **REMOVE FRONT EXHAUST PIPE (See step 33 on page EM-80)**

7. **REMOVE ENGINE MOUNTING CENTER MEMBER (See step 41 on page EM-80)**

8. **REMOVE STIFFENER PLATE**



9. DISCONNECT TURBOCHARGER OIL OUTLET HOSE FROM OIL PAN

10. REMOVE OIL PAN

11. REMOVE OIL STRAINER AND BAFFLE PLATE

12. SUSPEND ENGINE WITH ENGINE CHAIN HOIST

13. REMOVE TIMING BELT
(See steps 2 to 23 on pages EM-19 to 24)

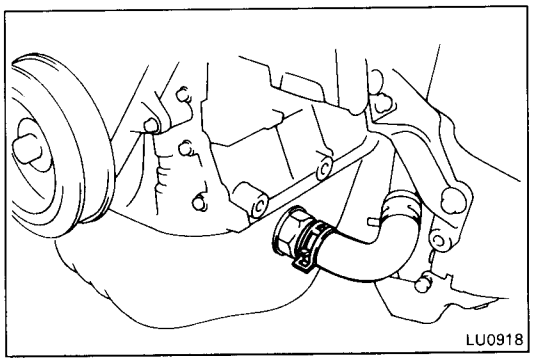
14. REMOVE NO.2 IDLER PULLEY, CRANKSHAFT TIMING PULLEY AND OIL PUMP PULLEY
(See steps 25 to 27 on page EM-25)

15. REMOVE OIL PUMP

INSTALLATION OF OIL PUMP

(See page LU-7)

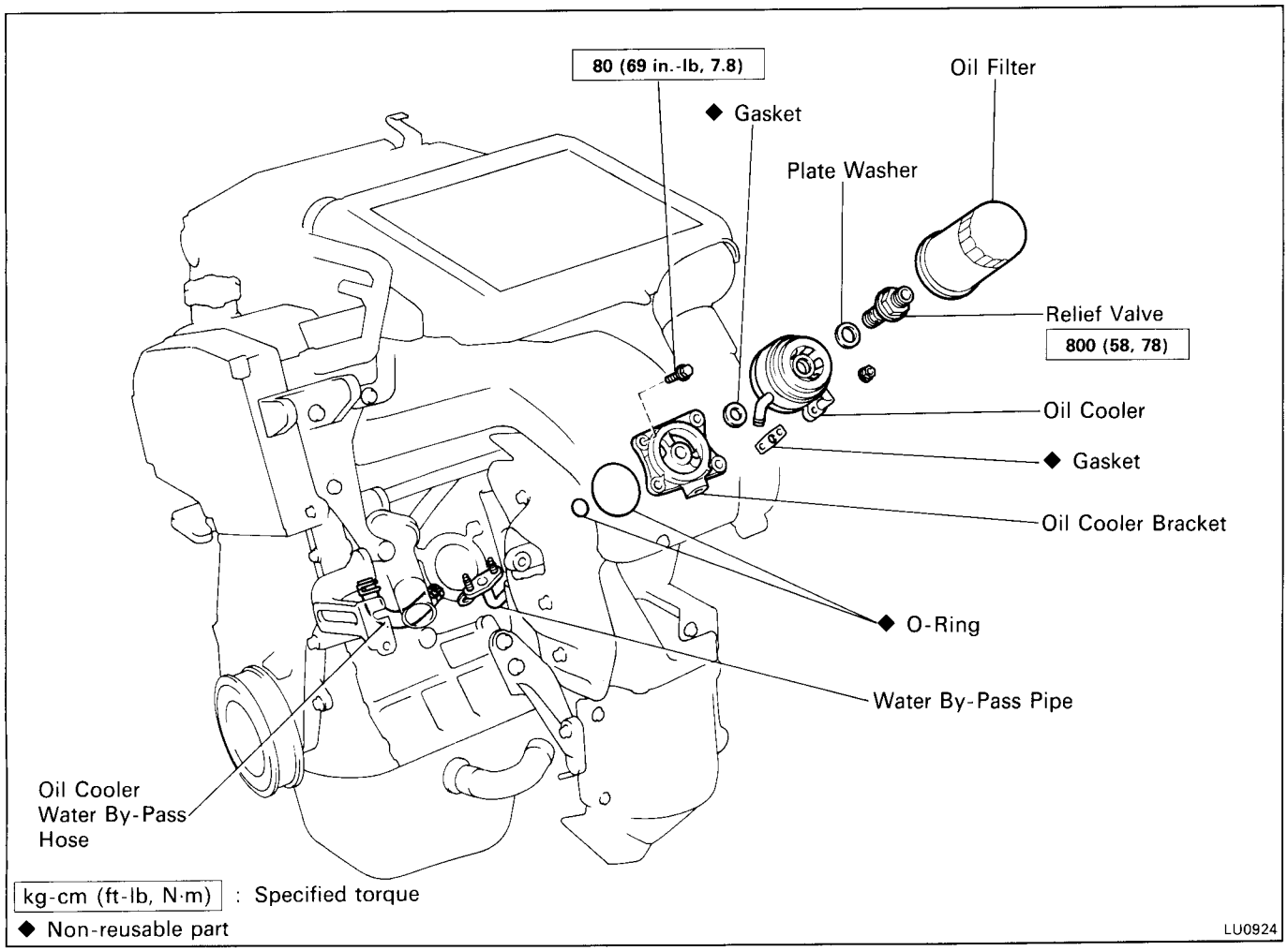
1. INSTALL OIL PUMP
2. ISTALL OIL PUMP PULLEY, CRANKSHAFT TIMING PULLEY AND NO.2 IDLER PULLEY
   (See steps 1 to 3 on page EM-28)
3. INSTALL TIMING BELT
   (See steps 5 to 30 on pages EM-28 to 34)
4. REMOVE ENGINE CHAIN HOIST FROM ENGINE
5. INSTALL BAFFLE PLATE AND OIL STRAINER
6. INSTALL OIL PAN



7. CONNECT TURBOCHARGER OIL OUTLET HOSE TO OIL PAN
8. INSTALL STIFFENER PLATE
9. INSTALL ENGINE MOUNTING CENTER MEMBER
   (See step 9 on page EM-111)
10. INSTALL FRONT EXHAUST PIPE
    (See step 18 on page EM-112)
11. INSTALL SUSPENSION LOWER CROSSMEMBER
    (See step 19 on page EM-113)
12. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
13. FILL WITH ENGINE OIL (See page LU-6)
14. START ENGINE AND CHECK FOR LEAKS
15. RECHECK ENGINE OIL LEVEL (See page LU-4)
16. INSTALL HOOD
17. INSTALL ENGINE UNDER COVERS

OIL COOLER

COMPONENTS



REMOVAL OF OIL COOLER

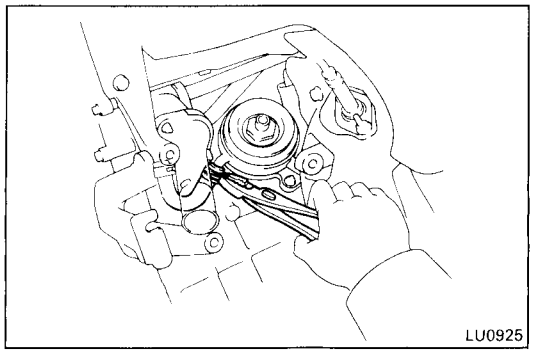
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

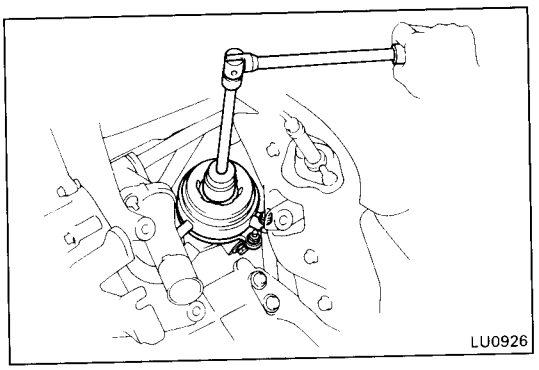
   CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is dosconnected from the battery.

2. **REMOVE ALTERNATOR (See pages CH-5 and 6)**

3. **REMOVE OIL FILTER (See page LU-5)**

4. **DISCONNECT WATER BY-PASS HOSE FROM OIL COOLER**



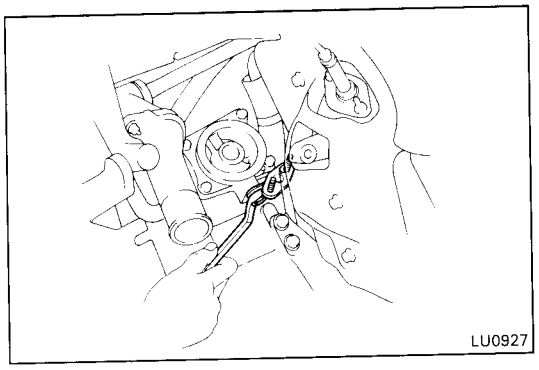


5. **REMOVE OIL COOLER**

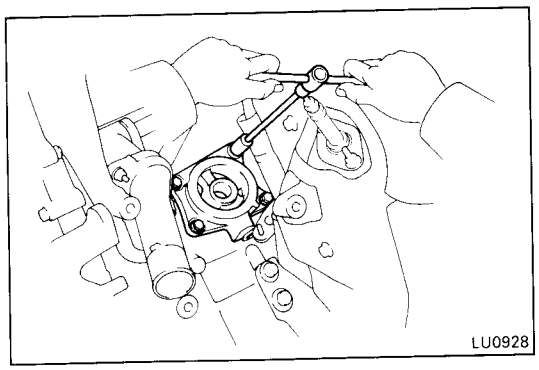
(a) Remove the relief valve and plate washer.

(b) Remove the two nuts, oil cooler and two gaskets.

(c) Remove the O-ring from the oil cooler.



(d) Remove the bolt, and disconnect the water by-pass pipe from the oil cooler bracket.

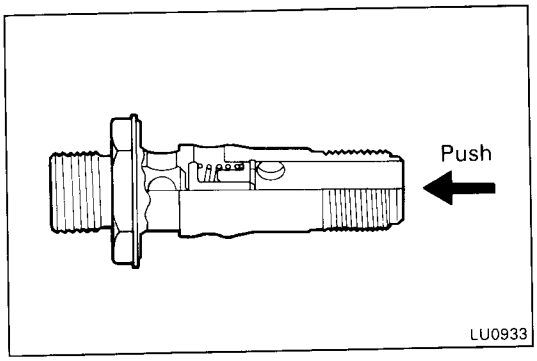


6. **REMOVE OIL COOLER BRACKET**

(a) Remove the four bolts and oil cooler bracket.

(b) Remove the two O-rings from the oil cooler.

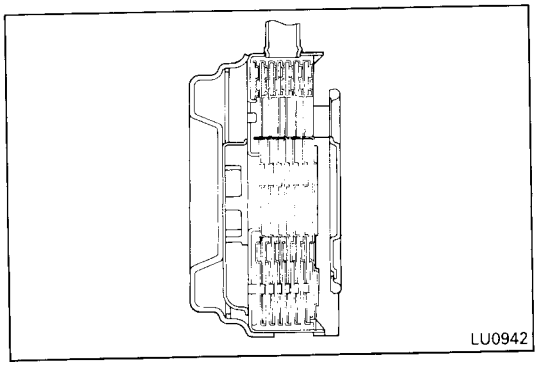
INSPECTION OF OIL COOLER



1. **INSPECT RELIEF VALVE**

Push the valve with a wooden stick to check if it is stuck.

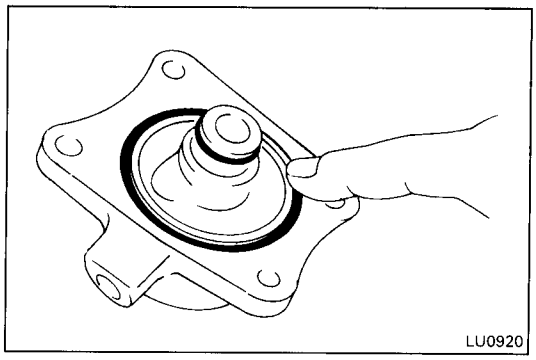
If stuck, replace the relief valve.



2. **INSPECT OIL COOLER**

Check the oil cooler for damage or clogging.

If necessary, replace the oil cooler.

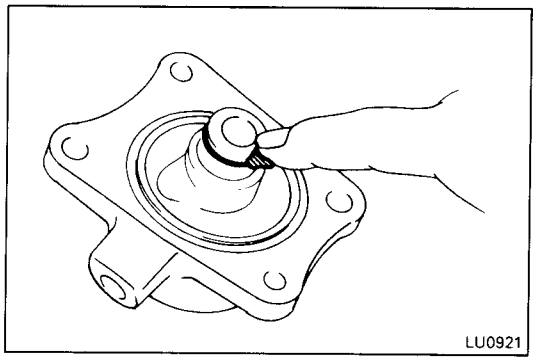


INSTALLATION OF OIL COOLER

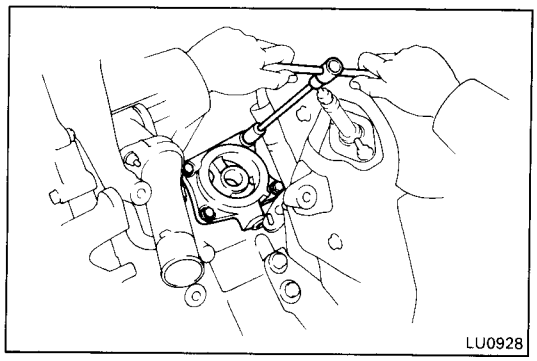
(See page LU-10)

1. INSTALL OIL COOLER BRACKET

(a) Install two new O-rings to the oil cooler bracket.

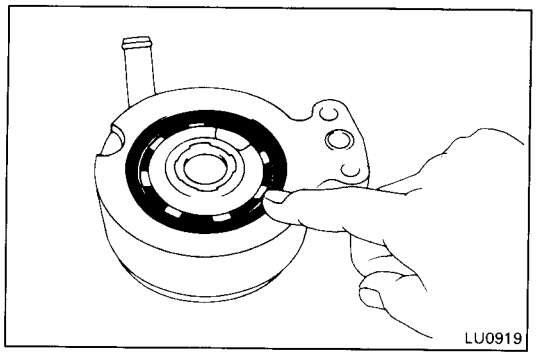


(b) Apply a light coat of engine oil on the small O-ring.



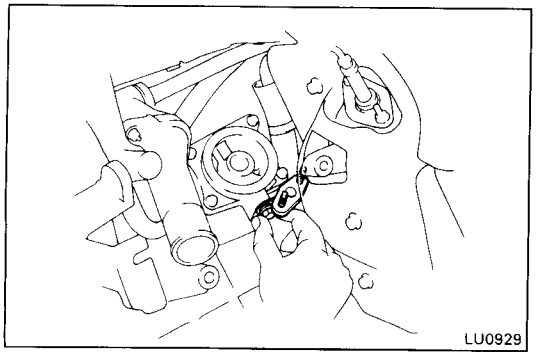
(c) Install the oil cooler bracket with the four bolts.

Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)

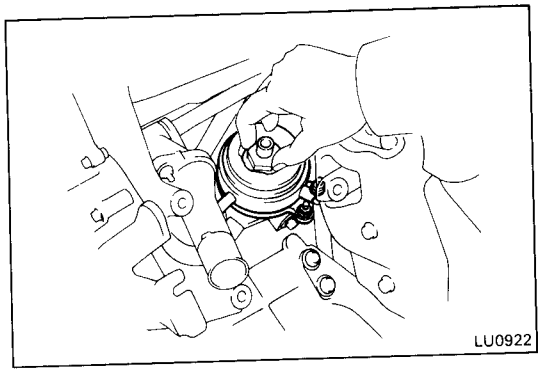


2. INSTALL OIL COOLER

(a) Install a new O-ring to the oil cooler.

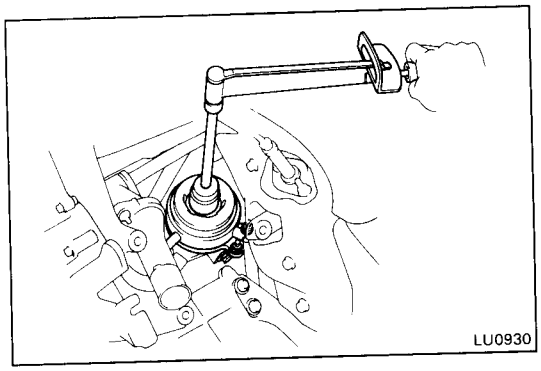


(b) Temporarily install the water by-pass pipe with the bolt.



(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.

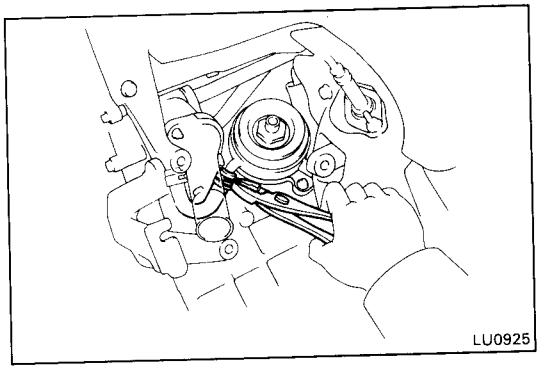
Torque: 800 kg-cm (58 ft-lb, 78 N·m)

(f) Tighten the two nuts holding the oil cooler to the water by-pass pipe.

Torque: 120 kg-cm (9 ft-lb, 12 N·m)

(g) Tighten the bolt holding the water by-pass pipe to oil cooler bracket.

Torque: 180 kg-cm (13 ft-lb, 18 N·m)



3. **CONNECT WATER BY-PASS HOSE TO OIL COOLER**

4. **INSTALL OIL FILTER (See page LU-5)**

5. **INSTALL ALTERNATOR (See page CH-7)**

6. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

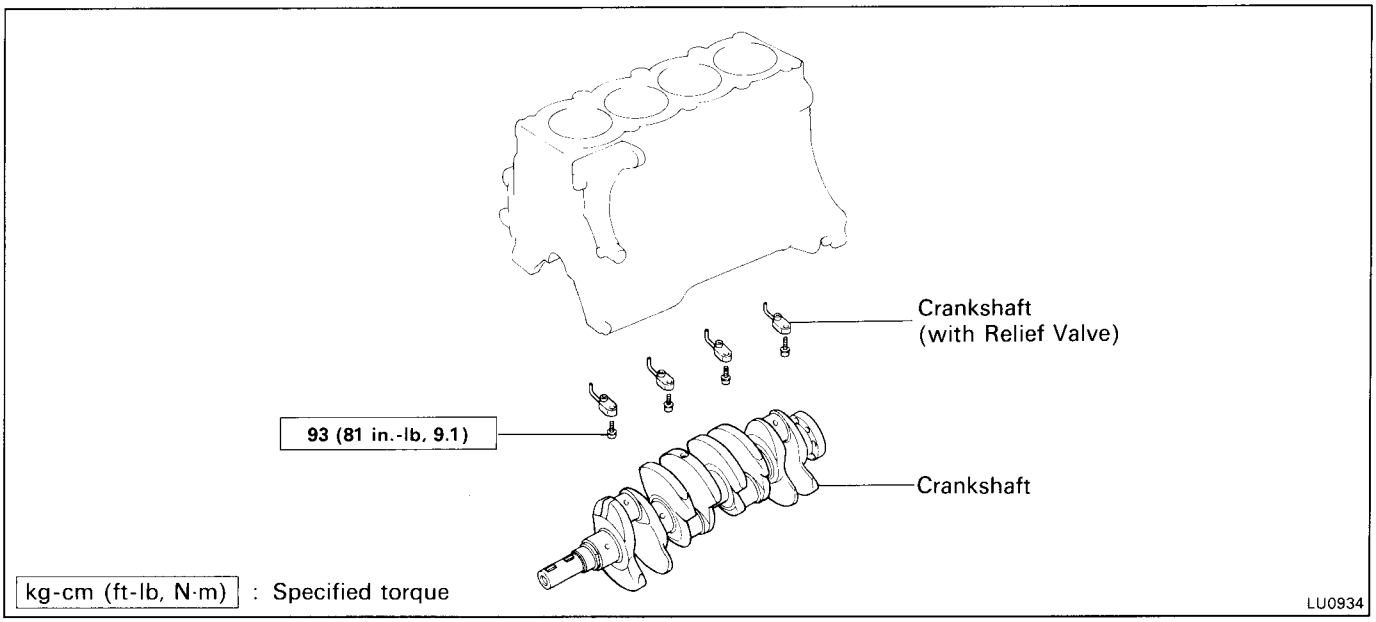
7. **FILL WITH ENGINE COOLANT (See page CO-4)**

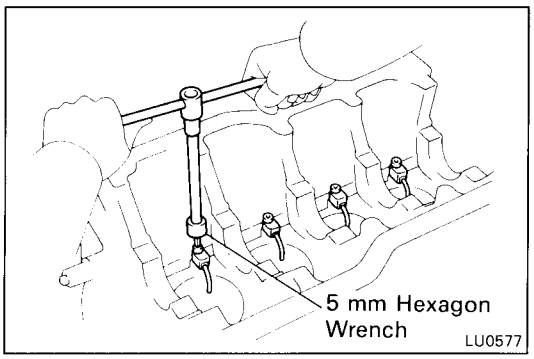
8. **START ENGINE AND CHECK FOR LEAKS**

9. **CHECK ENGINE OIL LELEL (See page LU-4)**

OIL NOZZLES

COMPONENTS



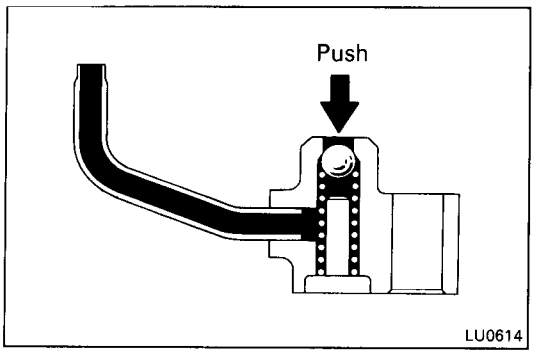


REMOVAL OF OIL NOZZLES

1. **REMOVE CRANKSHAFT (See pages EM-75 to 90)**

2. **REMOVE OIL NOZZLES (WITH RELIEF VALVES)**

   Using a 5 mm hexagon wrench, remove the bolt and oil nozzle. Remove the four oil nozzles.

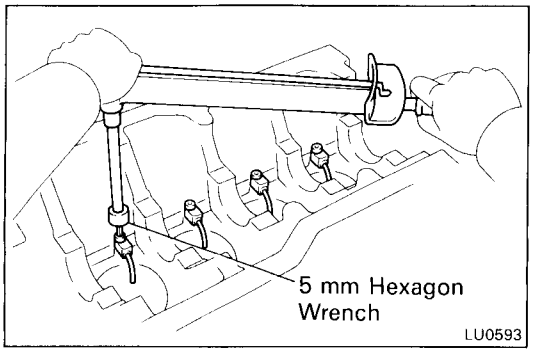


INSPECTION OF OIL NOZZLES

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

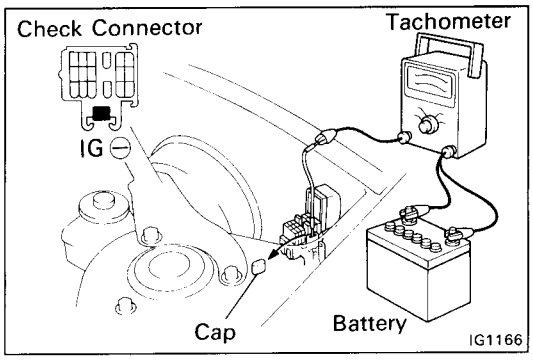
1. **INSTALL OIL NOZZLES (WITH RELIEF VALVES)**

   Using a 5 mm hexagon wrench, install the oil nozzle with the bolt. Install the four oil nozzles.

   Torque: 93 kg-cm (81 in.-lb, 9.1 N·m)

2. **REMOVE CRANKSHAFT (See pages EM-104 to 118)**

IGNITION SYSTEM



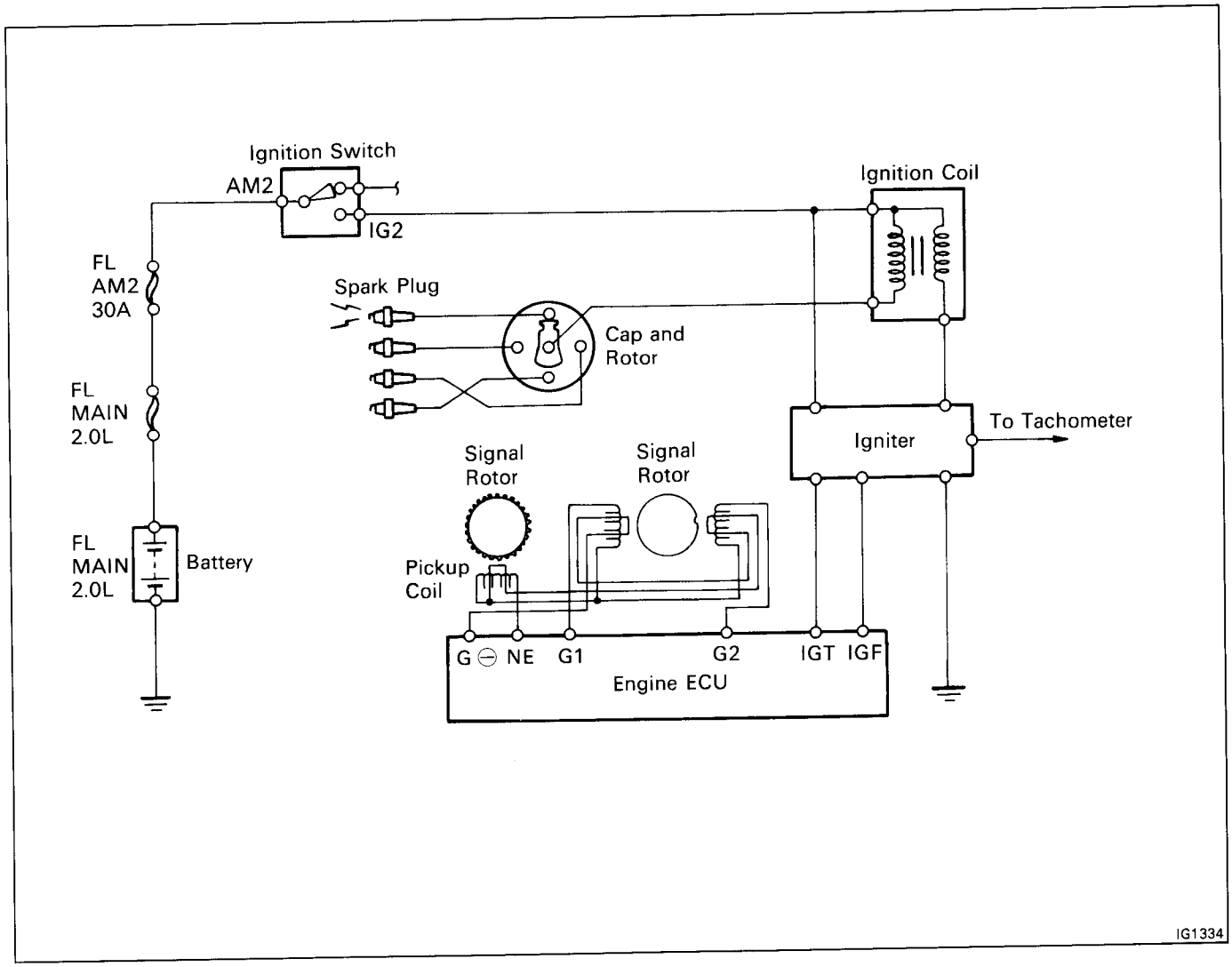
PRECAUTIONS

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 check connector.
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	Reset timing	IG-13
	Ignition problems		
	• Ignition coil	Inspect coil	IG-8
	• Igniter	Inspect igniter	IG-9
	• Distributor	Inspect distributor	IG-8
	• High-tension cords	Inspect high-tension cords	IG-6
	Ignition wiring disconnected or broken	Inspect wiring	
Rough idle or stalls	Spark plug faulty	Inspect plugs	IG-6
	Ignition wiring faulty	Inspect wiring	
	Incorrect ignition timing	Reset timing	IG-13
	Ignition problems		
	• Ignition coil	Inspect coil	IG-8
	• Igniter	Inspect igniter	IG-9
	• Distributor	Inspect distributor	IG-8
	• High-tension cords	Inspect high-tension cords	IG-6
Engine hesitates/ poor acceleration	Spark plug faulty	Inspect plugs	IG-6
	Ignition wiring faulty	Inspect wiring	
	Incorrect ignition timing	Reset timing	IG-13
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	IG-13
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG-13
Engine backfires	Incorrect ignition timing	Reset timing	IG-13
Poor gasoline mileage	Spark plug faulty	Inspect plugs	IG-6
	Incorrect ignition timing	Reset timing	IG-13
Engine overheats	Incorrect ignition timing	Reset timing	IG-13

IGNITION SYSTEM CIRCUIT



ELECTRONIC SPARK ADVANCE (ESA)

The ECU 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 temperature, etc.) the microcomputer (ECU) triggers the spark at precisely the right instant.

ON-VEHICLE INSPECTION

SPARK TEST

CHECK THAT SPARK OCCURS

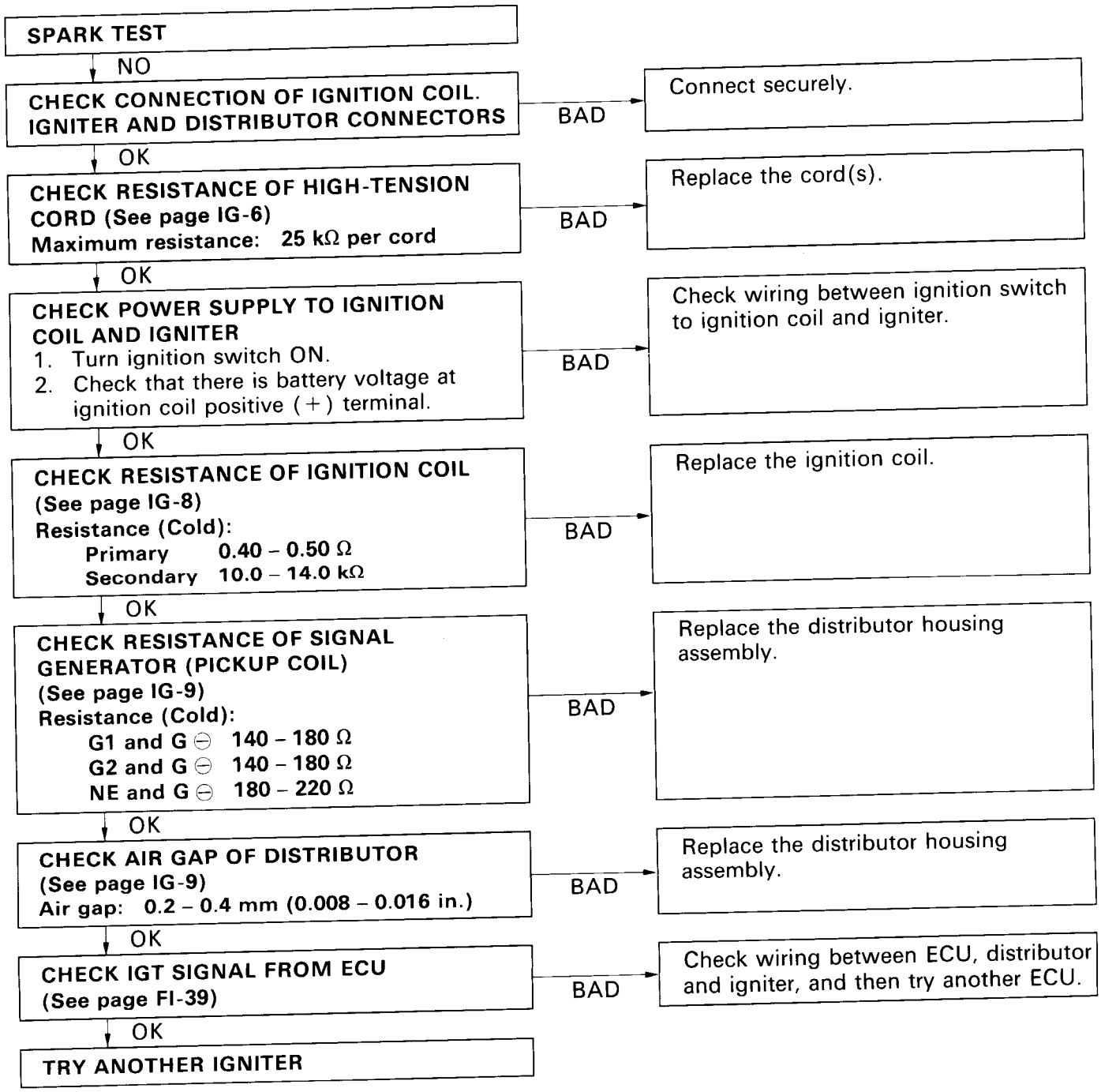
(a) Disconnect the high-tension cord from the distributor.

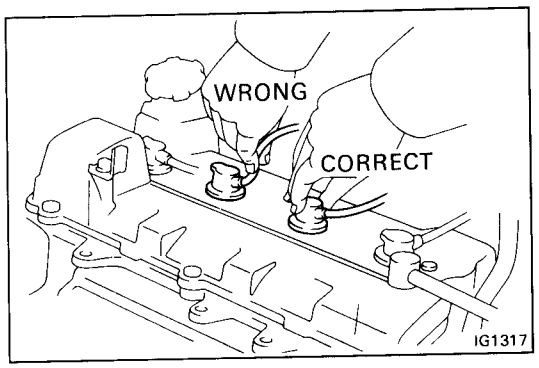
(b) Hold the end about 12.5 mm (0.50 in.) from the body of car.

(c) Check if spark occurs while engine is being cranked.

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

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





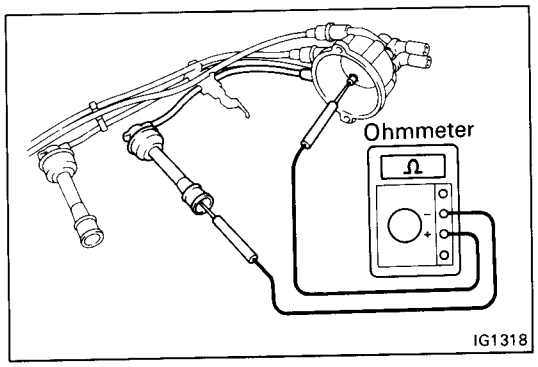
INSPECTION OF HIGH-TENSION CORDS

1. **REMOVE INTERCOOLER**
   (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 kΩ 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**

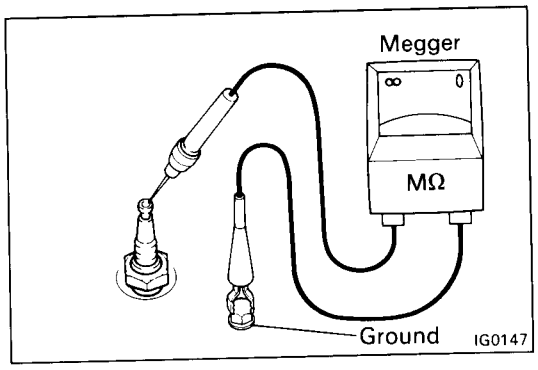
9. **REINSTALL INTERCOOLER**
   (See steps 11 to 15 on page TC-17)

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

2. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**



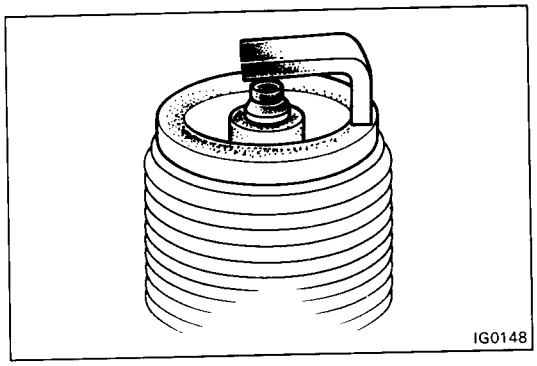
3. INSPECT ELECTRODE

Using a megger (insulation resistance meter), measure the insulation resistance.

Standard correct insulation resistance:
10 MΩ 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 fairy accurate results.



(Simple Method)

(a) Quickly race the engine to 4,000 rpm five times.

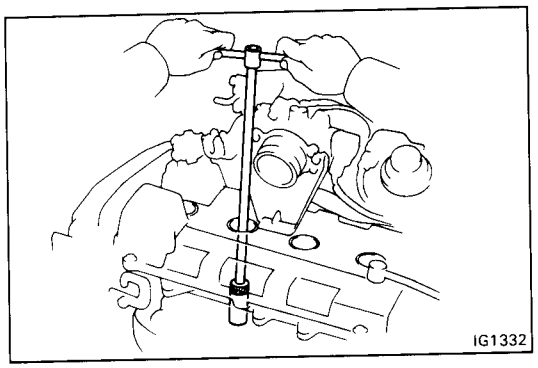
(b) Remove the spark plug. (See step 4)

(c) Visually check the spark plug.

If the electrode is dry ... Okey

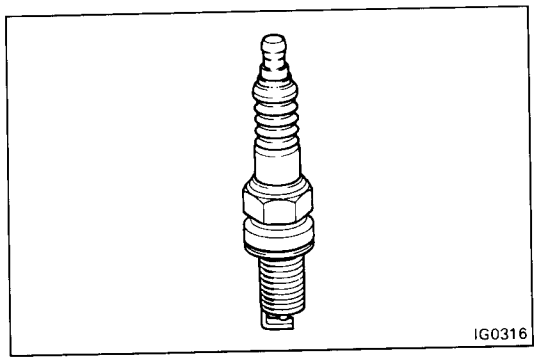
If the electrode is wet ... Proceed to step 5

(d) Reinstall the spark plug.
(See step 8 on page IG-8)



4. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.

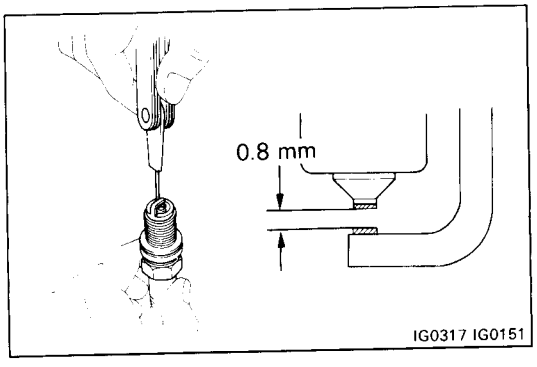


5. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug: **ND PK20R8**
NGK BKR6EP8



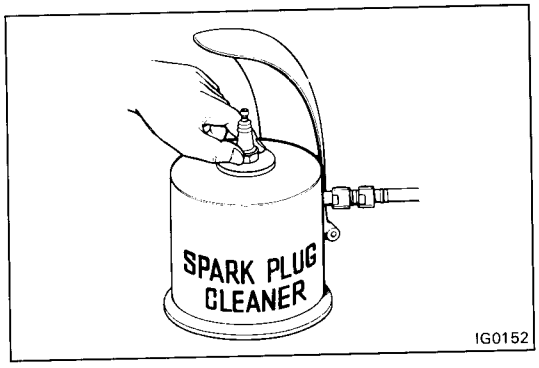
6. INSPECT ELECTRODE GAP

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.



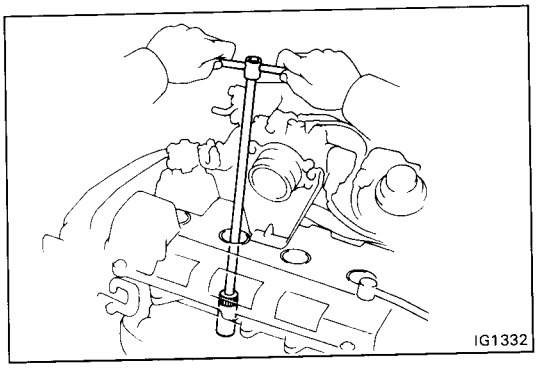
7. **CLEAN SPARK PLUGS**

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

Air pressure: Below 6 kg/cm² (85 psi, 588 kPa)

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: 180 kg-cm (13 ft-lb, 18 N·m)

9. **RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS**

10. **REINSTALL INTERCOOLER**
(See steps 11 to 13 on page TC-17)

INSPECTION OF IGNITION COIL

1. **DISCONNECT IGNITION COIL CONNECTOR**

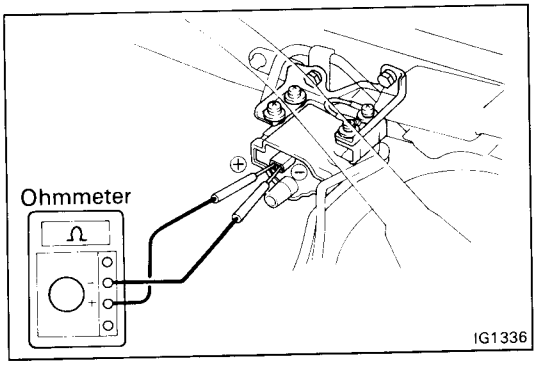
2. **DISCONNECT HIGH-TENSION CORD**

3. **INSPECT PRIMARY COIL RESISTANCE**

Using an ohmmeter, measure the resistance between positive (+) and negative (–) terminals.

Primary coil resistance (Cold): 0.40 – 0.50 Ω

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

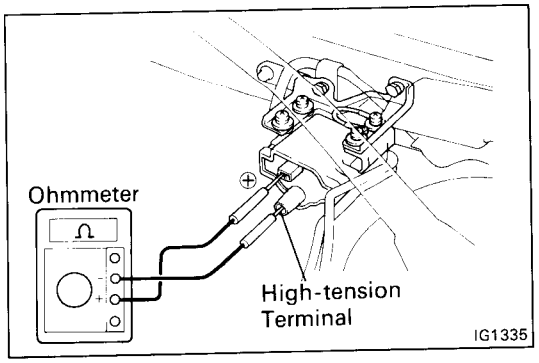


4. **INSPECT SECONDARY COIL RESISTANCE**

Using an ohmmeter, measure the resistance between positive (+) and high-tension terminals

Secondary coil resistance (Cold): 10.0 – 14.0 kΩ

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



5. **RECONNECT HIGH-TENSION CORD**

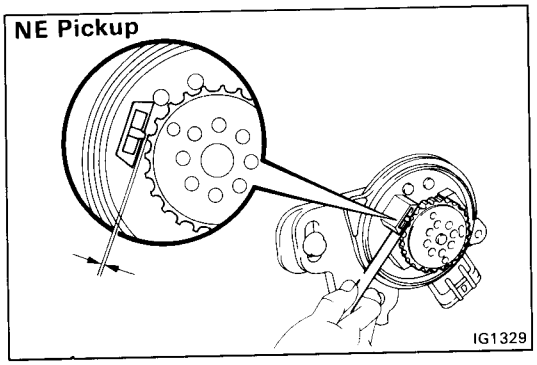
6. **RECONNECT IGNITION COIL CONNECTOR**

INSPECTION OF DISTRIBUTOR

1. **DISCONNECT DISTRIBUTOR CONNECTOR**

2. **REMOVE DISTRIBUTOR CAP**

3. **REMOVE ROTOR**



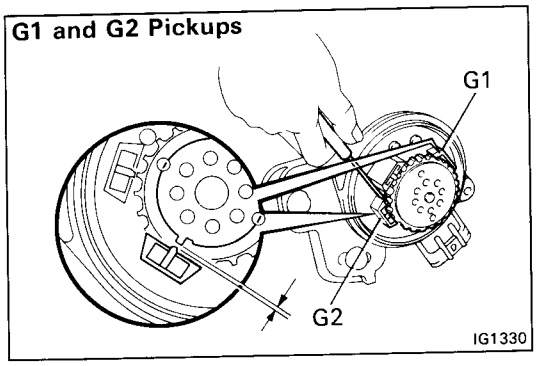
4. **INSPECT AIR GAP**

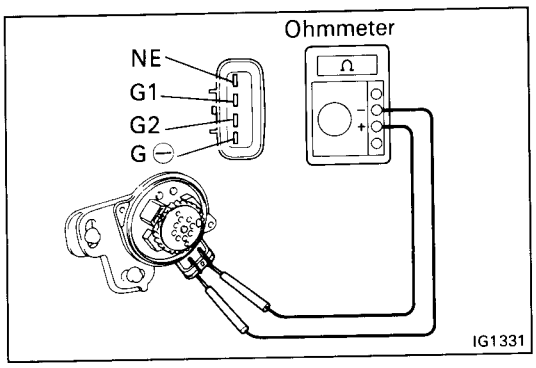
Using SST (G1 and G2 pickups) and a feeler gauge (NE pickup), measure the air gap between the signal rotor and pickup coil projection.

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⊖	**140 – 180 Ω**
G2 and G⊖	**140 – 180 Ω**
NE and G⊖	**180 – 220 Ω**

If the resistance is not as specified, replace the distributor housing assembly.

6. **REINSTALL ROTOR**

7. **REINSTALL DISTRIBUTOR CAP**

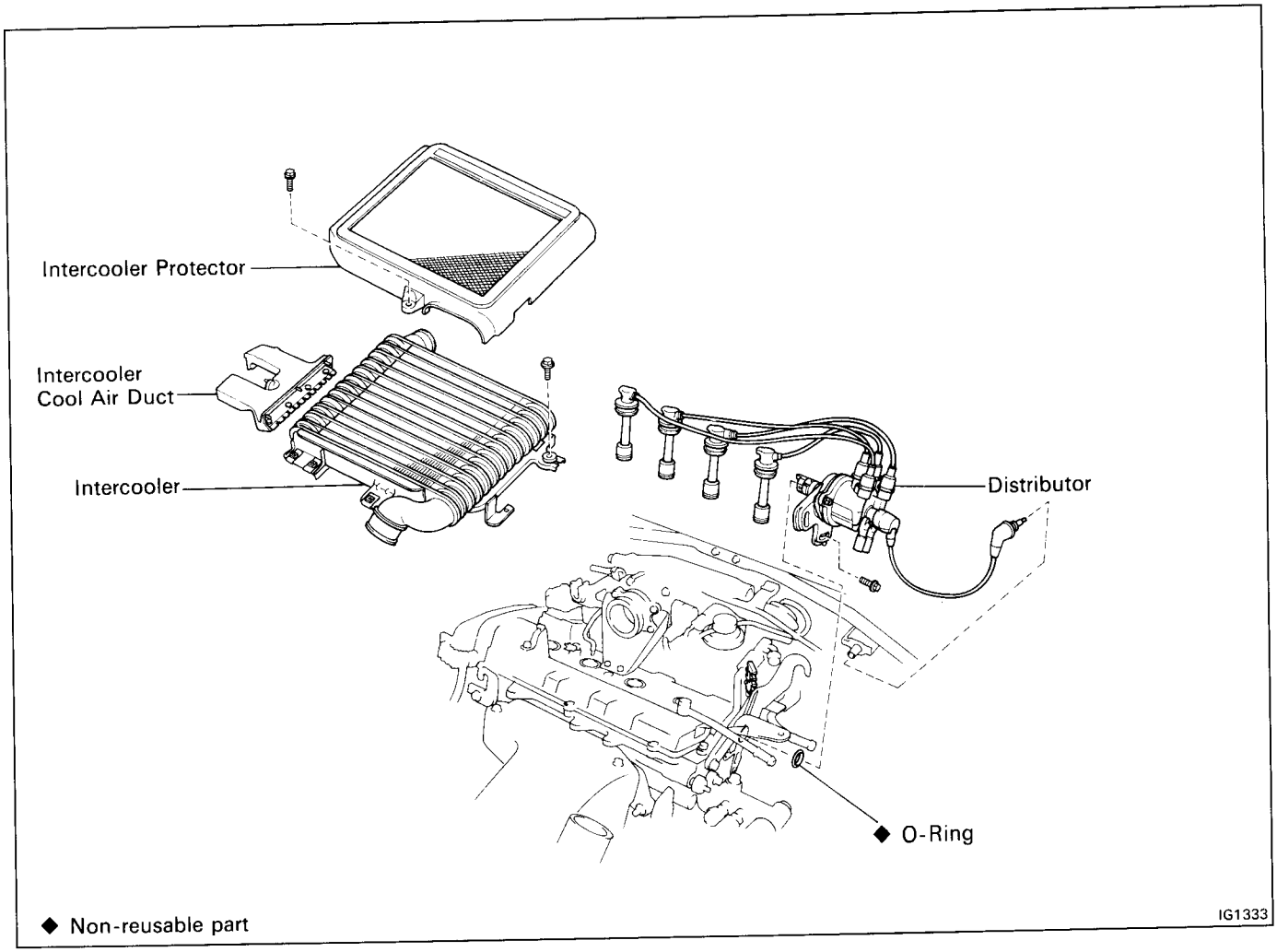
8. **RECONNECT DISTRIBUTOR CONNECTOR**

INSPECTION OF IGNITER

(See procedure Spark Test on page IG-5)

DISTRIBUTOR

REMOVAL OF DISTRIBUTOR



1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

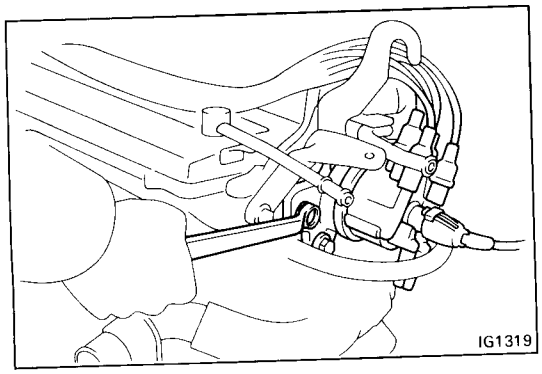
   CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. **REMOVE INTERCOOLER**
   (See steps 13 to 15 on pages TC-9 and 10)

3. **DISCONNECT DISTRIBUTOR CONNECTOR**

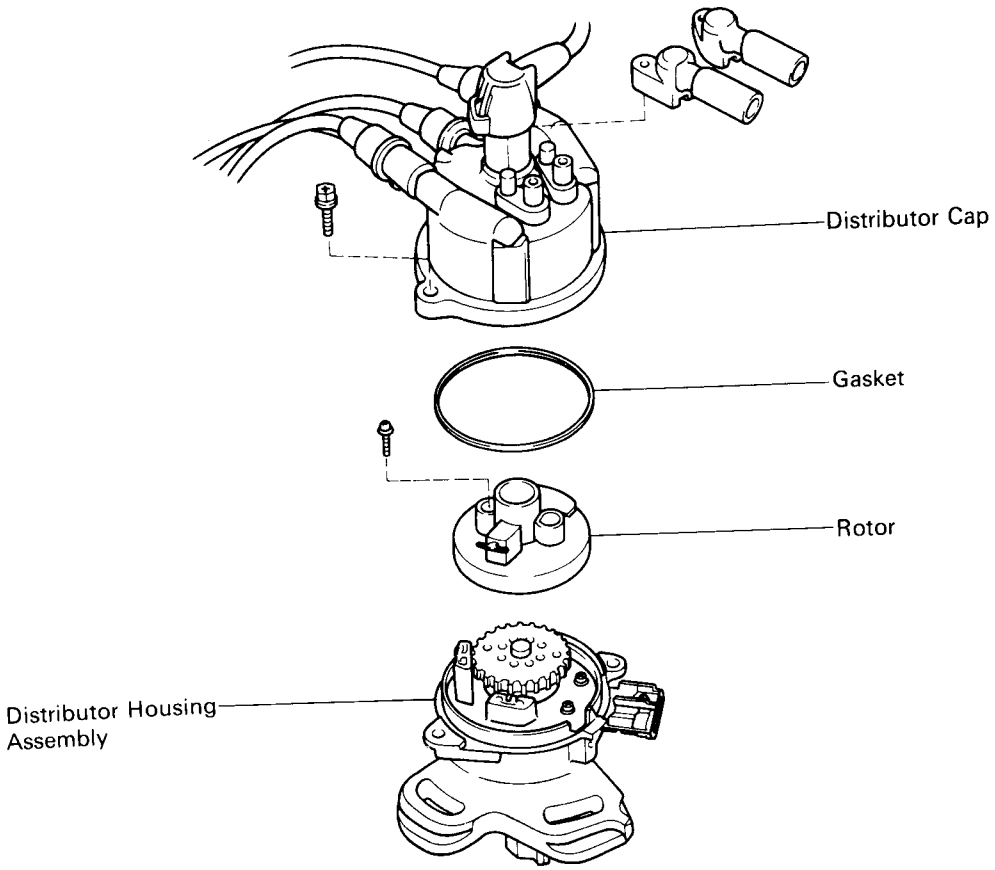
4. **DISCONNECT HIGH-TENSION CORD FROM IGNITION COIL**

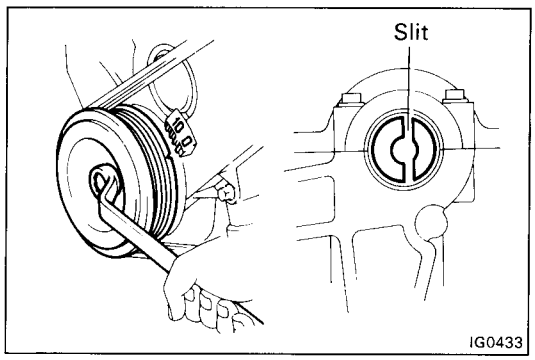
5. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**
   (a) Disconnect the four high-tension cords from the cord clamp.
   (b) Disconnect the four high-tension cords from the spark plugs.



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

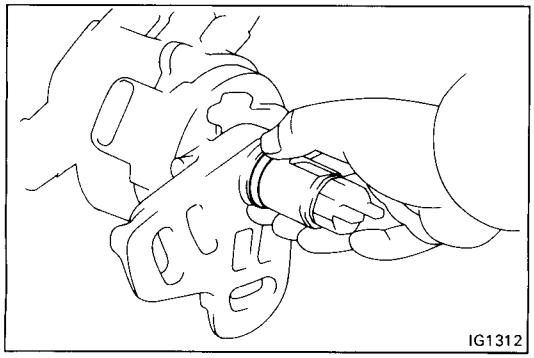




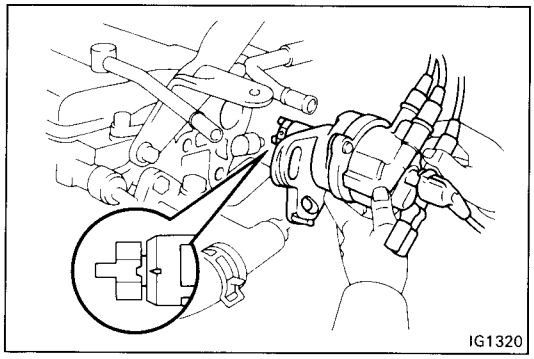
INSTALLATION OF DISTRIBUTOR

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.

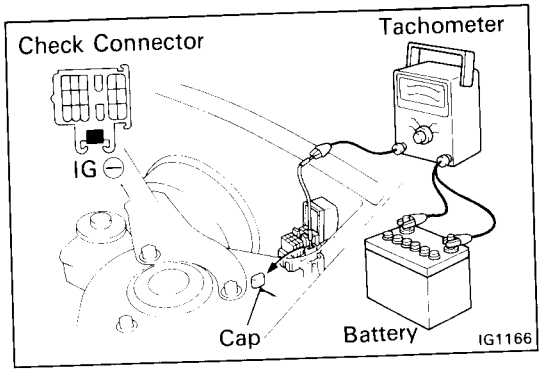
5. **CONNECT DISTRIBUTOR CONNECTOR**

6. **INSTALL INTERCOOLER**
   (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.

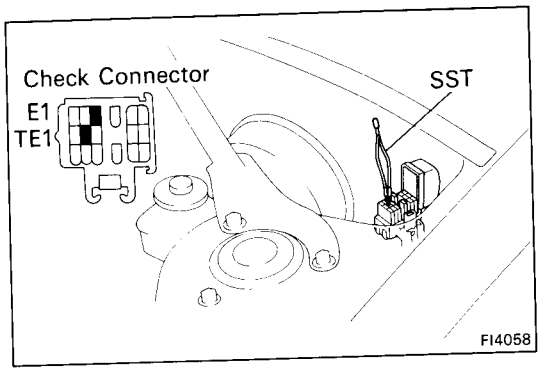


9. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG⊖ of the check connector.

NOTICE:

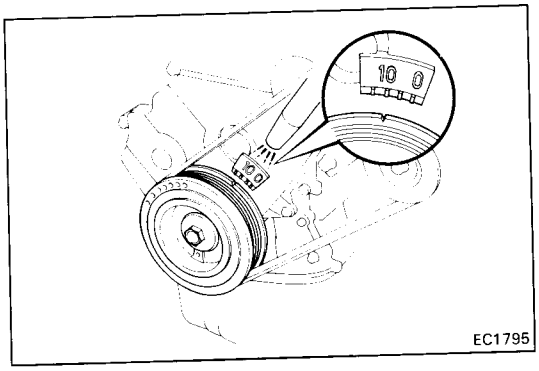
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



10. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the check connector.

SST 09843-18020



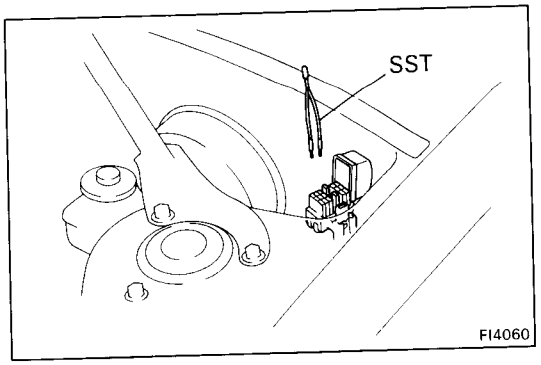
(b) Using a timing light, check the ignition timing.

Ignition timing: 10° BTDC @ idle (Transmission in neutral range)

(c) Loosen the two hold-down bolts, and adjust by turning the distributor.

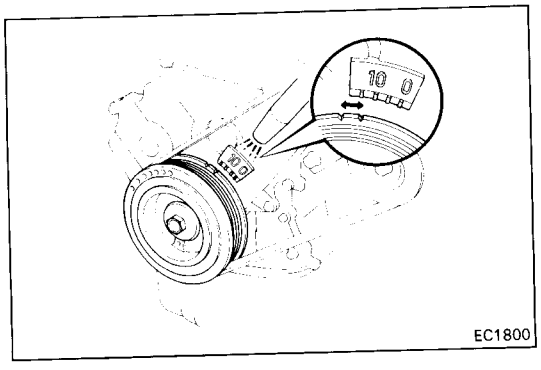
(d) Tighten the two hold-down bolts, and recheck the ignition timing.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



(e) Remove the SST.

SST 09843-18020



11. FURTHER CHECK IGNITION TIMING

Ignition timing: 12 – 21° BTDC @ idle (Transmission in neutral range)

HINT: The timing mark moves in a range between 12° and 21°.

12. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

STARTING SYSTEM

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

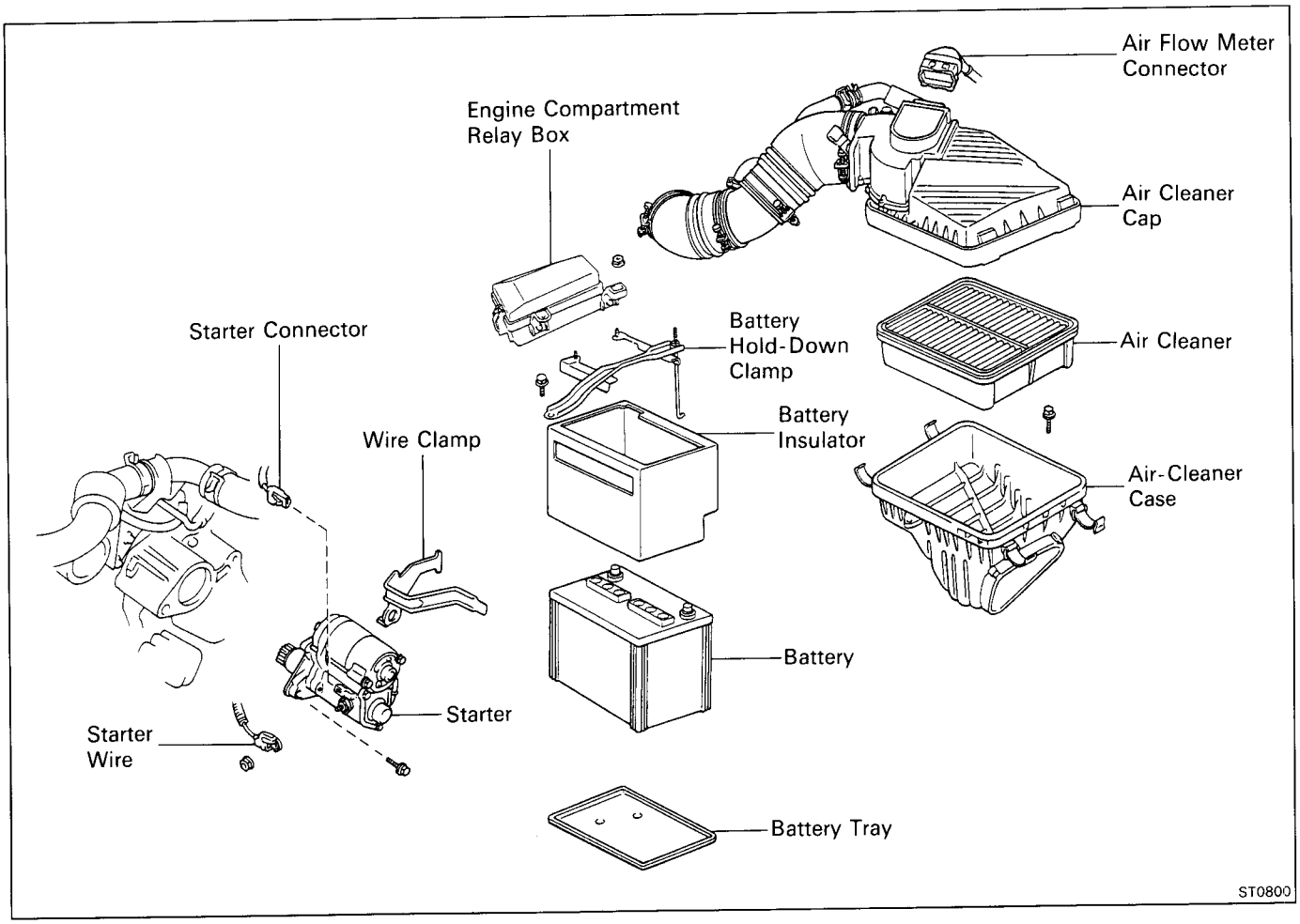
NOTE: The following pages contain only the points which differ from the above listed manual.

ST

STARTER

(Refer to 5S-FE)

REMOVAL OF STARTER

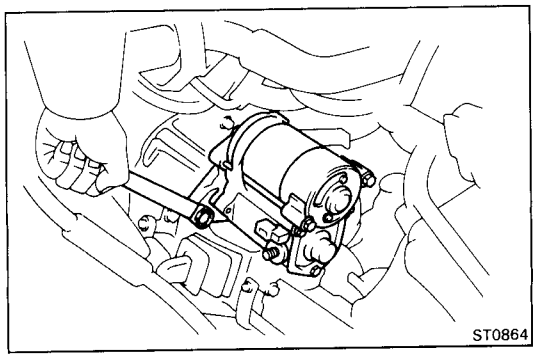


1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

   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.

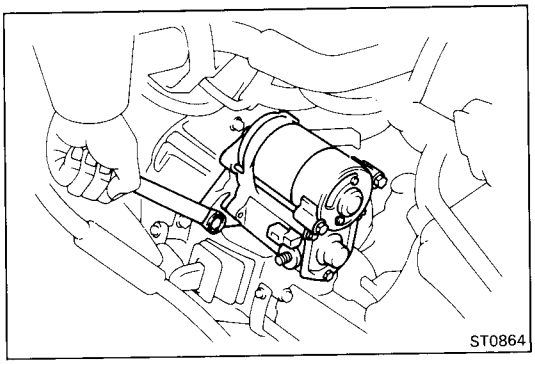
2. **REMOVE AIR CLEANER ASSEMBLY**
   (See step 7 on page EM-75)

3. **REMOVE ENGINE COMPARTMENT RELAY BOX**
   (See step 9 on page EM-75)



4. **REMOVE BATTERY**

5. **REMOVE STARTER**
   (a) Disconnect the starter connector.
   (b) Remove the nut, and disconnect the starter wire.
   (c) Remove the two bolts, wire clamp and starter.



INSTALLATION OF STARTER

(See page ST-2)

1. INSTALL STARTER
   (a) Install the starter with the two bolts.
   Torque: 400 kg-cm (29 ft-lb, 39 N·m)
   (b) Connect the starter wire with the nut.
   (c) Connect the starter connector.

2. INSTALL CRUISE CONTROL ACTUATOR

3. INSTALL ENGINE COMPARTMENT RELAY BOX
(See step 43 on page EM-117)

4. INSTALL AIR CLEANER ASSEMBLY
(See step 44 on page EM-117)

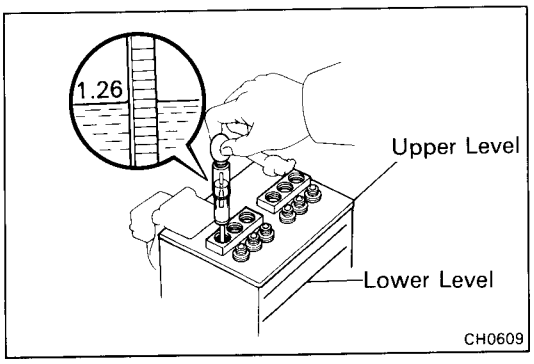
5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

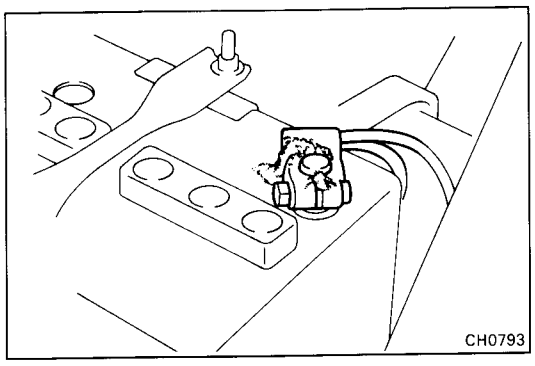
6. CHECK THAT ENGINE STARTS

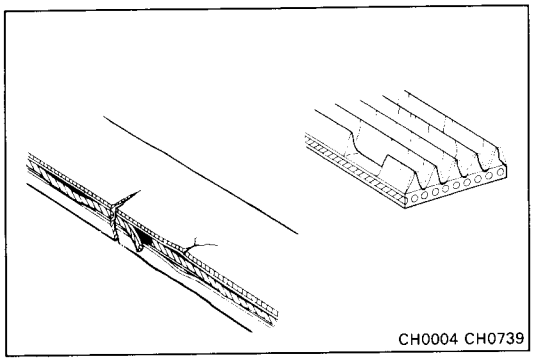
CHARGING SYSTEM

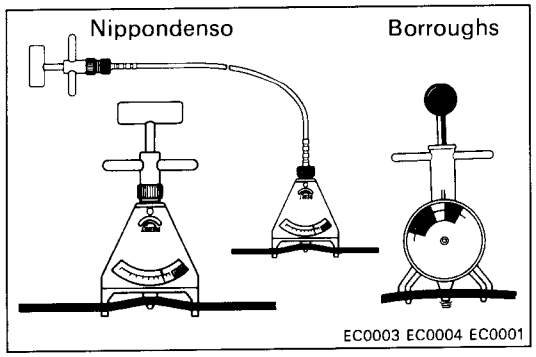
REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

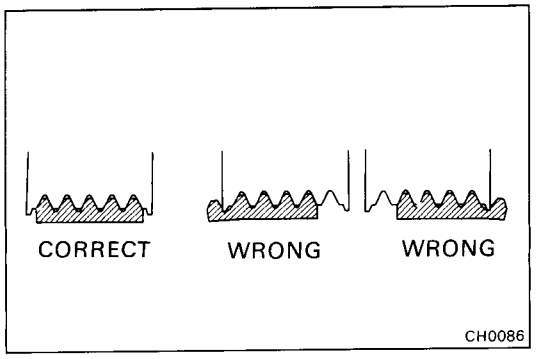
NOTE: The following pages contain only the points which differ from the above listed manual.











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 quantity of each cell.

If insufficient, refill with distilled (or purified) water.

2. CHECK BATTERY TERMINALS, FUSIBLE LINKS 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**
	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 cirds 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

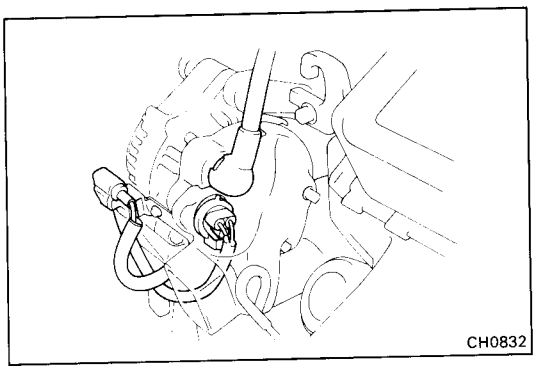
Drive belt tension:

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

If the belt tension is not as specified, adjust it.

HINT:

- "New belt" refers to a belt which has been used 5 minutes or less 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 ALTERNATOR 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 alternator while the engine is running.

5. INSPECT CHARGE WARNING LIGHT CIRCUIT

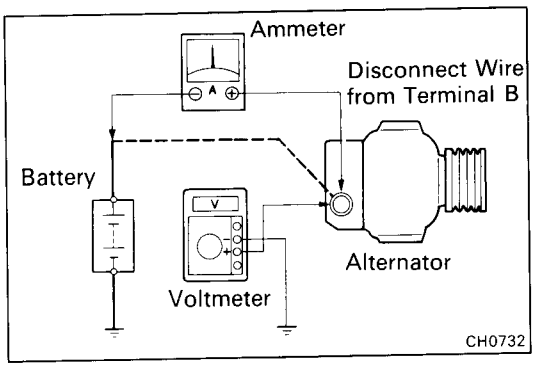
(a) Warm up the engine and then turn it off.

(b) Turn off all accessories.

(c) Turn the ignition switch to "ON". Check that the charge warning light is lit.

(d) Start the engine. Check that the light goes out.

If the light does not go off as specified, troubleshoot the charge light circuit.

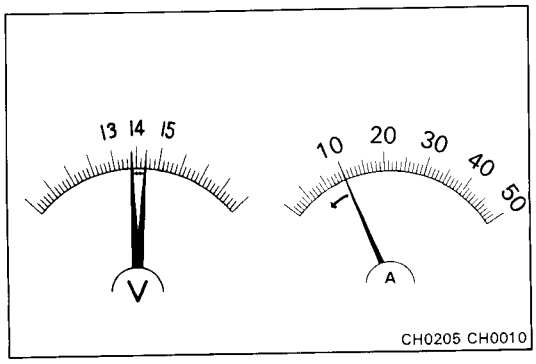


6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/alternator tester is available, connect the tester to the charging circuit as per manufacturer's instructions.

(a) 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 alternator and connect it to the negative (–) probe of the ammeter.
- Connect the positive (+) probe of the ammeter to terminal B of the alternator.
- Connect the positive (+) probe of the voltmeter to terminal B of the alternator.
- Ground the negative (–) probe of the voltmeter.



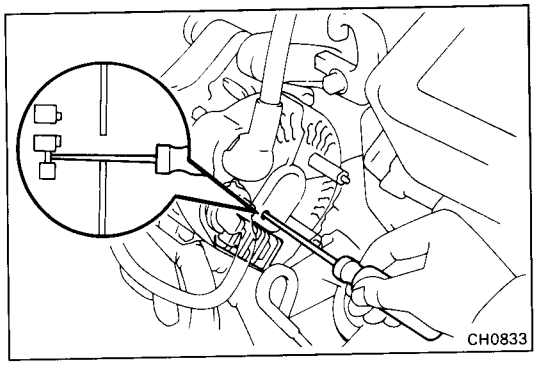
(b) Check the charging circuit as follows:

With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: **10 A or less**

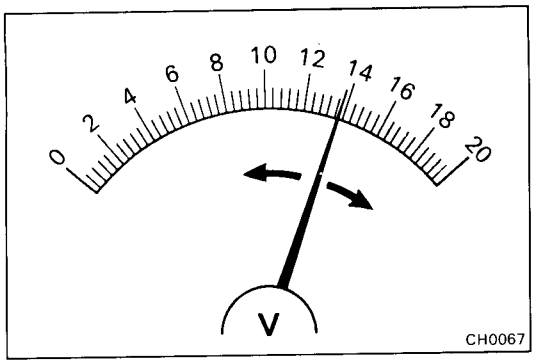
Standard voltage: **13.9 – 15.1 V at 25°C (77°F)**
13.5 – 14.3 V at 115°C (239°F)

If the voltmeter reading is greater than standard voltage, replace the IC regulator.

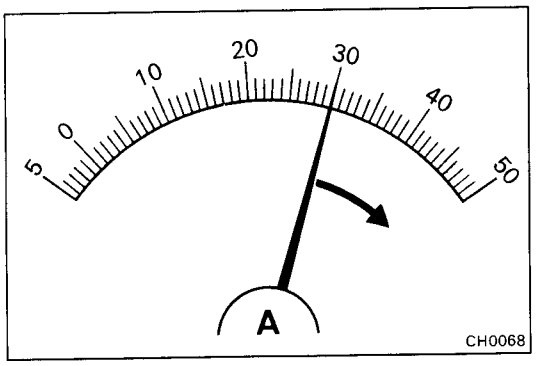


If the voltmeter reading is less than standard voltage, check the IC regulator and alternator as follows:

- Remove the alternator ducts.
- With terminal F grounded, start the engine and check the voltmeter reading of terminal B.



- If the voltmeter reading is greater than standard voltage, replace the IC regulator.
- If the voltmeter reading is less than standard voltage, check the alternator.
- Reinstall the alternator ducts.

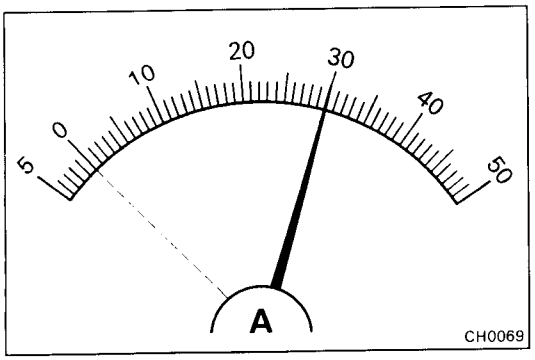


7. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI".

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more



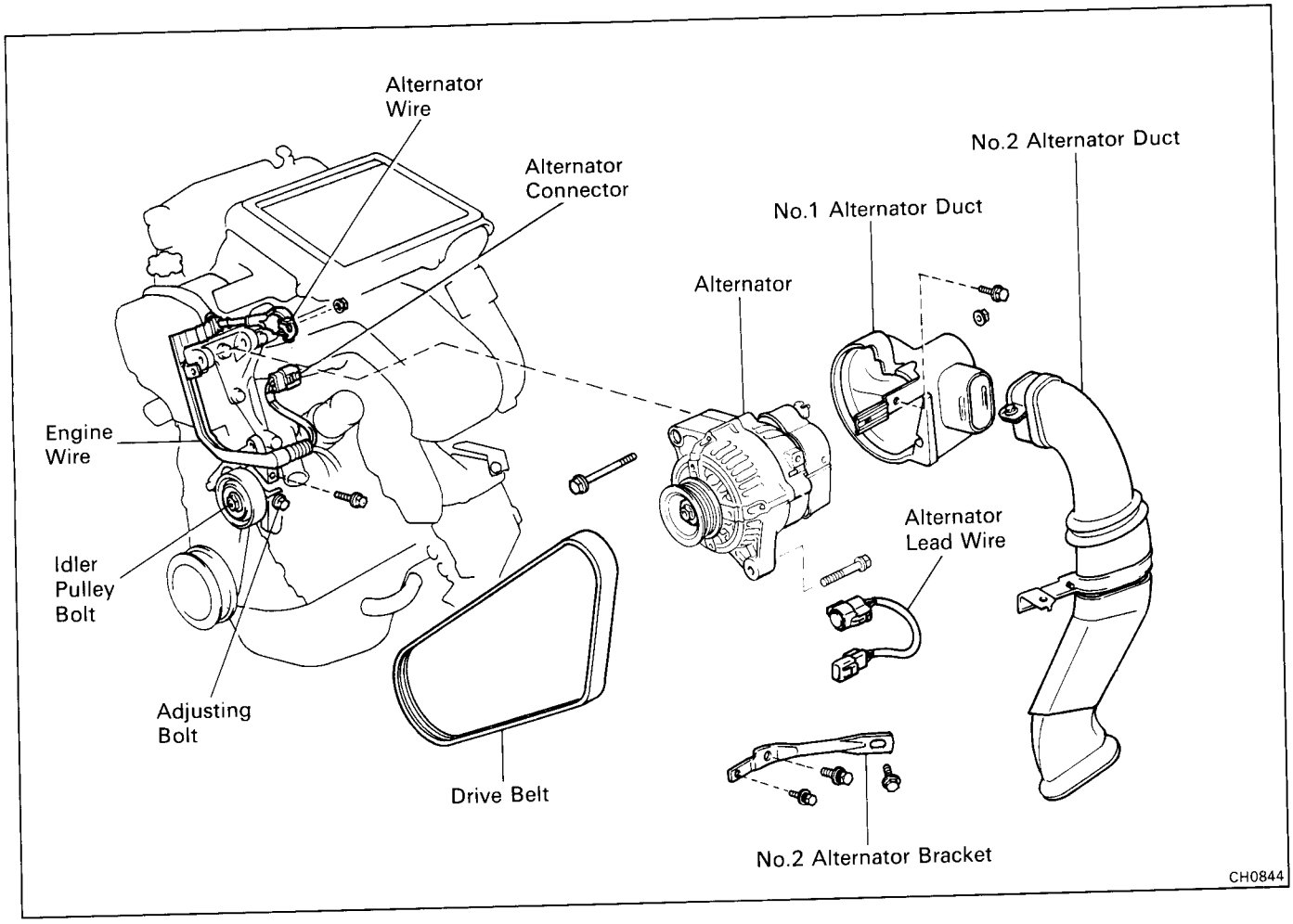
If the ammeter reading is less than standard amperage, repair the alternator. (See page CH-5)

HINT: With the battery fully charged, the indication will sometimes be less than standard amperage.

ALTERNATOR

(Refer to 5S-FE (A/T))

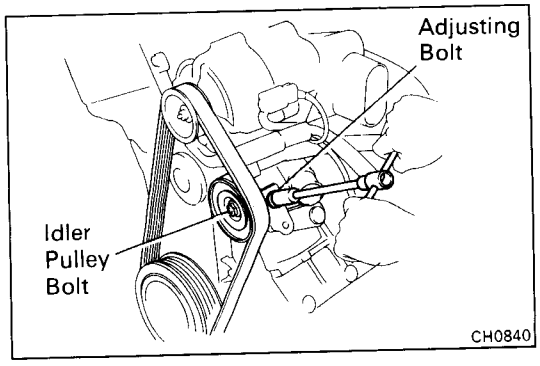
REMOVAL OF ALTERNATOR



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.

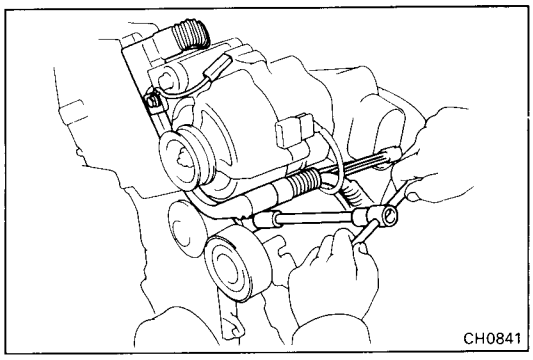
2. **REMOVE NO.2 ALTERNATOR DUCT**



3. **REMOVE DRIVE BELT**

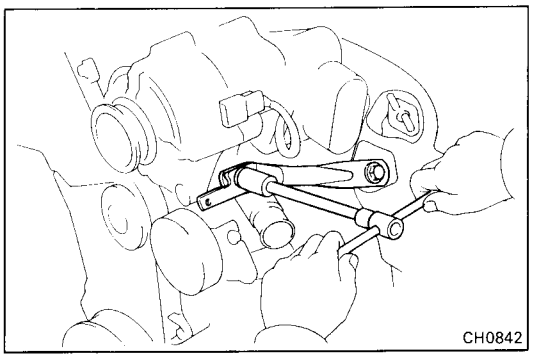
   (a) Loosen the idler pulley bolt.

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

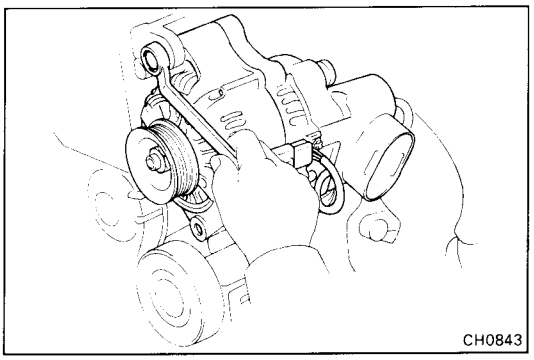


4. **DISCONNECT ENGINE WIRE**
   (a) Disconnect the following connectors and wire:
   - Alternator connector from lead wire
   - Alternator wire
   - A/C compressor connector
   - Water temperature switch connecror
   - Oxygen sensor connector

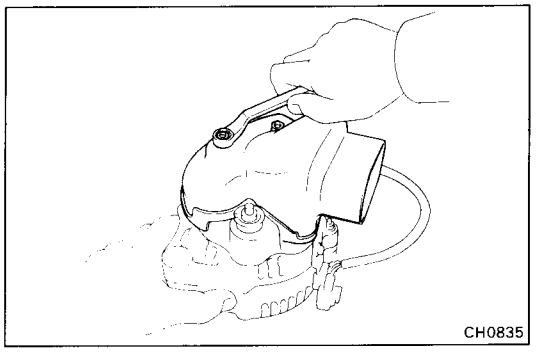
   (b) Remove the two bolts, and disconnect the ground strap and engine wire from the brackets.



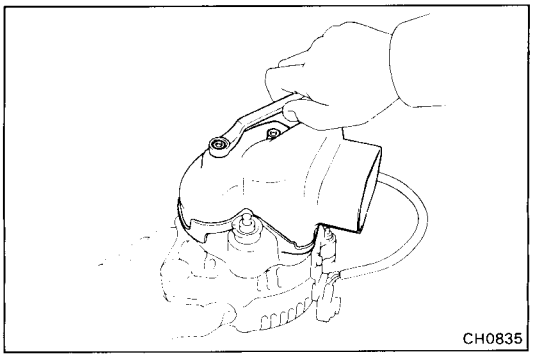
5. **REMOVE NO.2 ALTERNATOR BRACKET**
   Remove the two bolts and alternator bracket.



6. **REMOVE ALTERNATOR**
   Remove the two bolts and alternator.



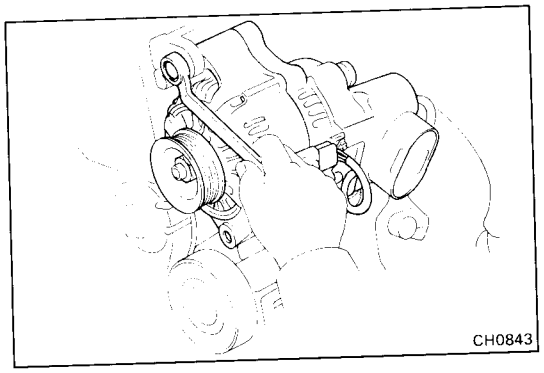
7. **REMOVE NO.1 ALTERNATOR DUCT**
   (a) Remove the two nuts and alternator duct.
   (b) Remove the alternator lead wire.



INSTALLATION OF ALTERNATOR

(See page CH-5)

1. **INSTALL NO.1 ALTERNATOR DUCT**
   (a) Install the alternator lead wire.
   (b) Remove the alternator duct with the two nuts.

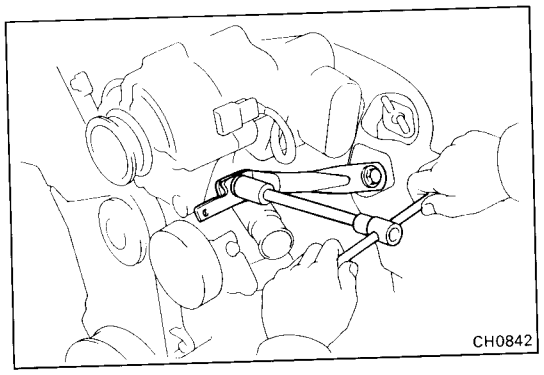


2. **INSTALL ALTERNATOR**

Install the alternator with the two bolts.

Torque:

12 mm head bolt	**195 kg-cm (14 ft-lb, 19 N·m)**
14 mm head bolt	**530 kg-cm (38 ft-lb, 52 N·m)**

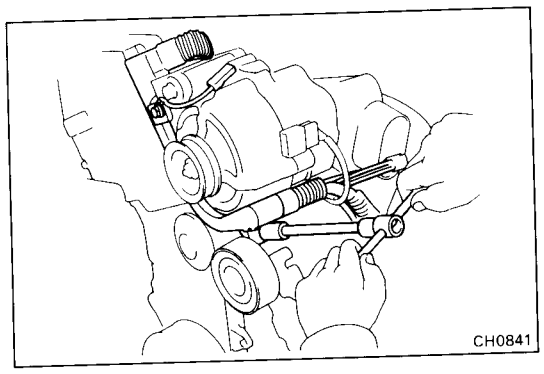


3. **INSTALL NO.2 ALTERNATOR BRACKET**

Install the alternator bracket with the two bolts.

Torque:

To turbine outlet elbow
440 kg-cm (32 ft-lb, 43 N·m)
To No.1 alternator bracket
400 kg-cm (29 ft-lb, 39 N·m)



4. **INSTALL ENGINE WIRE**

(a) Install the engine wire and ground strap with the two bolts.

(b) Connect the following connectors and wire:

- Alternator connector from lead wire
- Alternator wire
- A/C compressor connector
- Water temperature switch connecror
- Oxygen sensor connector

5. **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 lb**
	Used belt	**84 ± 15 lb**
w/o A/C	**New belt**	**150 ± 25 lb**
	Used belt	**130 ± 25 lb**

6. **INSTALL NO.2 ALTERNATOR DUCT**

7. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

8. **PERFORM ON-VEHICLE INSPECTION**
(See steps 5 to 7 on pages CH-3 and 4)

CLUTCH

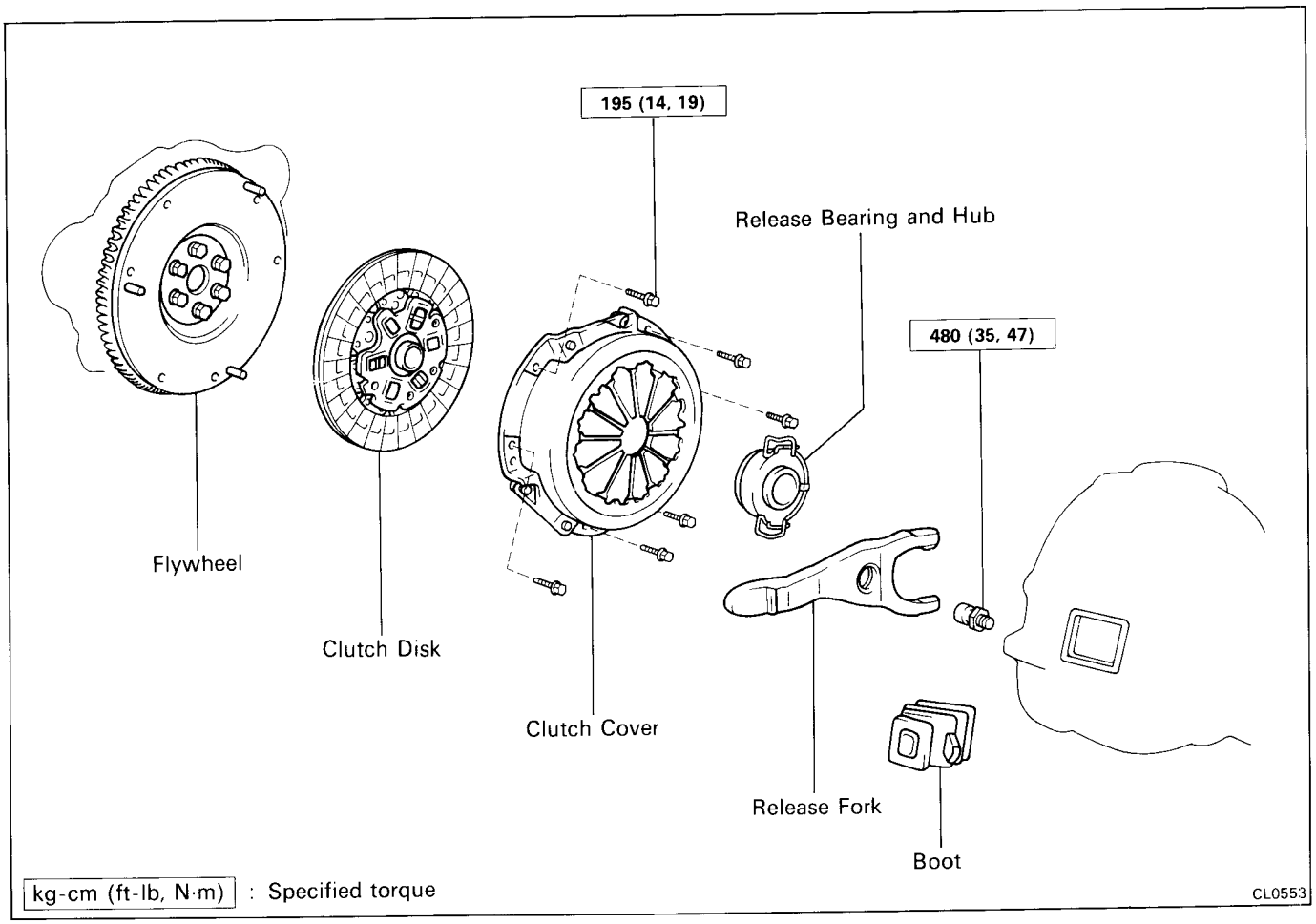
REFER TO 1990 CELIICA REPAIR MANUAL (Pub. No. RM149U)

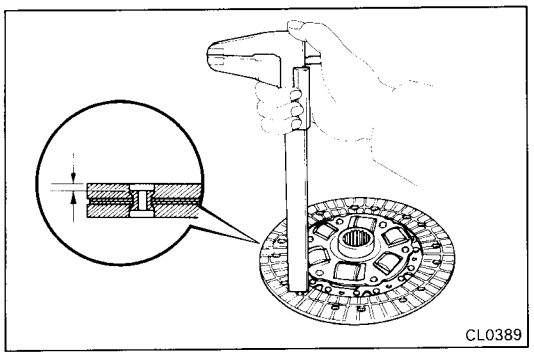
NOTE: The following pages contain only the points which differ from the above listed manual.

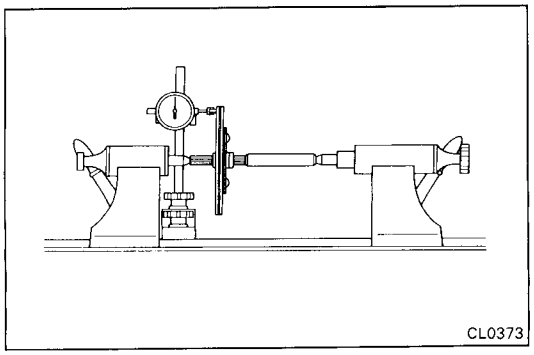
CLUTCH UNIT

REMOVAL OF CLUTCH UNIT

Remove the parts as shown.







INSPECTION OF CLUTCH PARTS

1. **INSPECT CLUTCH DISC FOR WEAR OR DAMAGE**

   Using calipers, measure the rivet head depth.

   Maximum rivet depth: 0.3 mm (0.012 in.)

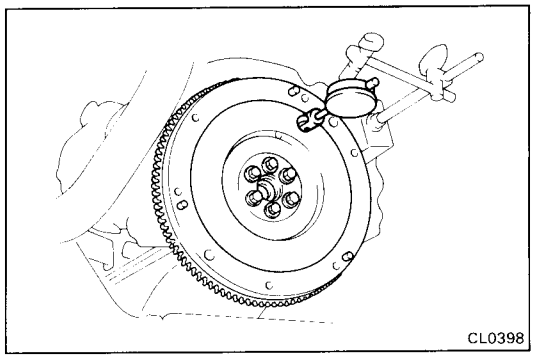
   If a problem is found, replace the clutch disc.

2. **INSPECT CLUTCH DISC RUNOUT**

   Using a dial indicator, check the disc runout.

   Maximum runout: 0.8 mm (0.031 in.)

   If runout is excessive, replace the clutch disc.

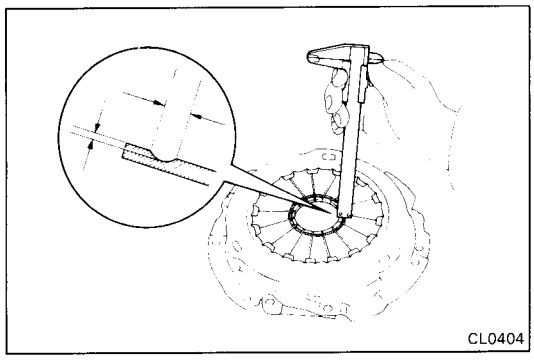


3. **INSPECT FLYWHEEL RUNOUT**

Using a dial indicator, check the flywheel runout.

Maximum runout: 0.1 mm (0.004 in.)

If runout is excessive, replace the flywheel.

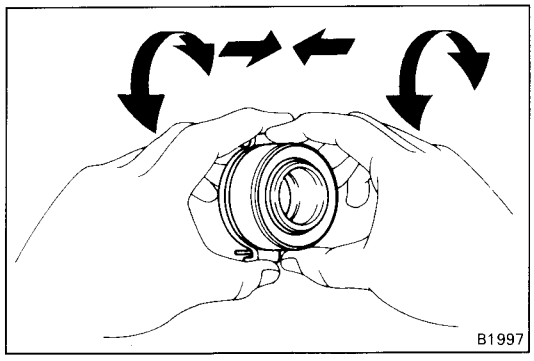


4. **INSPECT DIAPHRAGM SPRING FOR WEAR**

Using calipers, measure the diaphragm spring for depth and width of wear.

Maximum: Depth 0.6 mm (0.024 in.)
Width 5.0 mm (0.197 in.)

If necessary, replace the clutch cover.



5. **INSPECT RELEASE BEARING**

Turn the bearing by hand while applying force in the axial direction.

HINT: The bearing is permanently lubricated and requires no cleaning or lubrication.

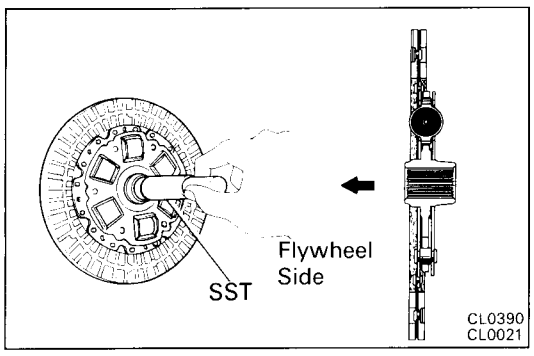
If a problem is found, replace the bearing together with the hub.

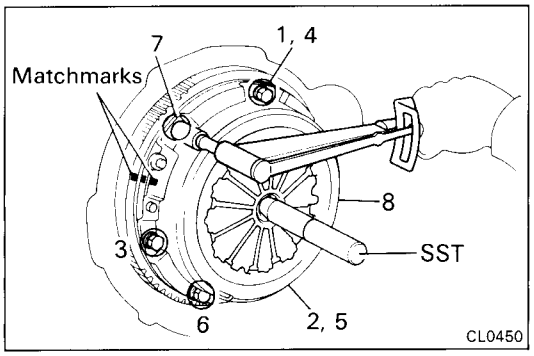
INSTALLATION OF CLUTCH UNIT (MAIN POINT OF INSTALLATION)

1. **INSTALL CLUTCH DISC AND COVER ON FLYWHEEL**

(a) Insert the SST in the clutch disc, and then set them and the cover in position.

SST 09301-17010



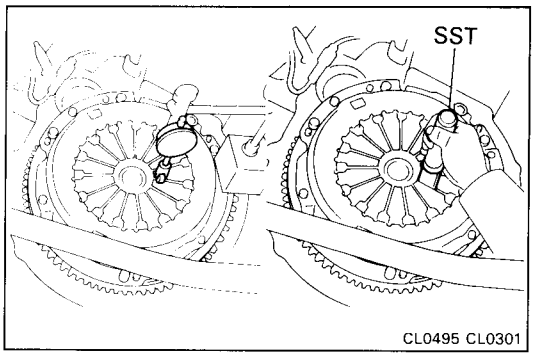


(b) Align the matchmarks on the clutch cover and flywheel.

(c) Torque the bolts on the clutch cover in the order shown.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

HINT: Temporarily tighten the No.1 and No.2 bolts.



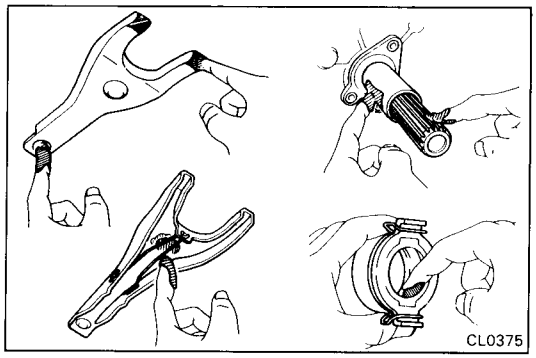
2. **CHECK DIAPHRAGM SPRING TIP ALIGNMENT**

Using dial indicator, check the diaphragm spring tip alignment.

Maximum non-alignment: 0.5 mm (0.020 in.)

If alignment is not as specified, using SST, adjust the diaphragm spring tip alignment.

SST 09333-00013



3. **APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE (NLGI NO.2) AS SHOWN**

MANUAL TRANSAXLE

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

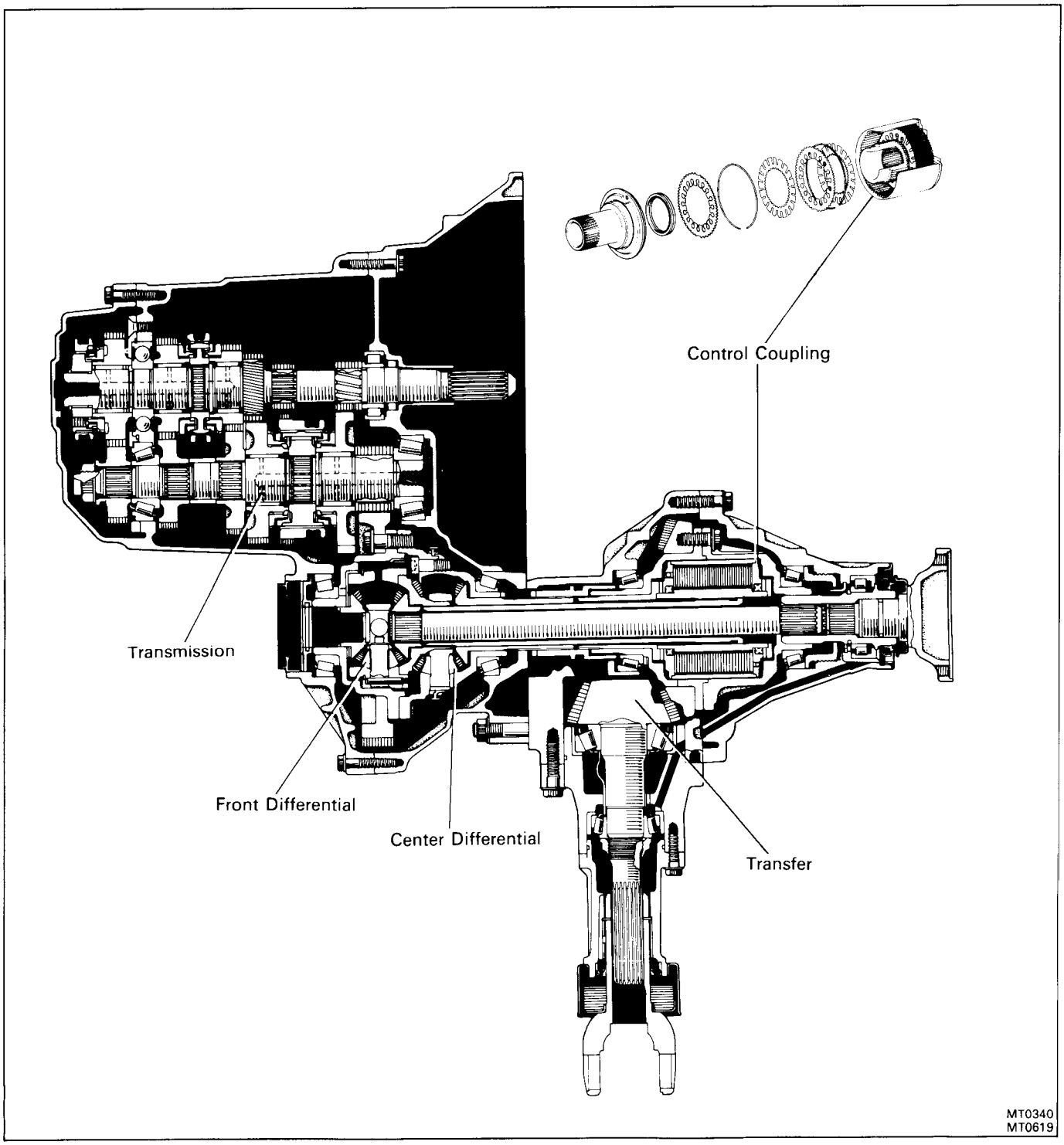
MT

(E150F TRANSAXLE/4WD)

DESCRIPTION

GENERAL

- The E150F transaxle has been compactly designed by arranging the transmission, the center differential, the front differential and the transfer on the same quadruple case axle.
- The center differential, which compensates the difference in rotation speed between the front and rear wheels, utilizes bevel gear to provide durability and reliability by distributing the engine power from the transmission 50/50 to both front and rear propeller shafts. This center differential has been equipped with a control coupling which functions as a LSD.

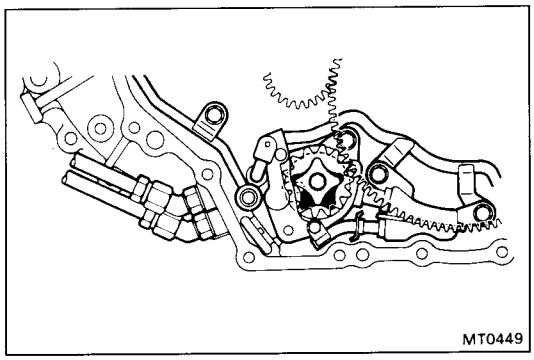


Transaxle type	E150F	
Transmission	Operation method	Floor shift vehicles provided with push-pull type remote control
	Transmission type	Forward: Constant mesh Reverse: Sliding mesh
Center differential	Reduction side (Gear type)	Helical gear
	Differential side (Gear type)	Bevel gear
	Type of differential center mechanism	Viscous coupling
Transfer	Gear Type	Hypoid gear

- The oil used in each transaxle is as follow:

  Transaxle oil E50 (08885-80206) or equivalent
  (Recommended oil
  Oil grade: API GL-5
  Viscosity: SAE 75W-90 or 80W-90
  Above – 18°C (0°F) SAE90
  Below – 18°C (0°F) SAE80W)

- The oil capacity: 5.2 litters (5.5 US qts, 4.6 Imp.qts)

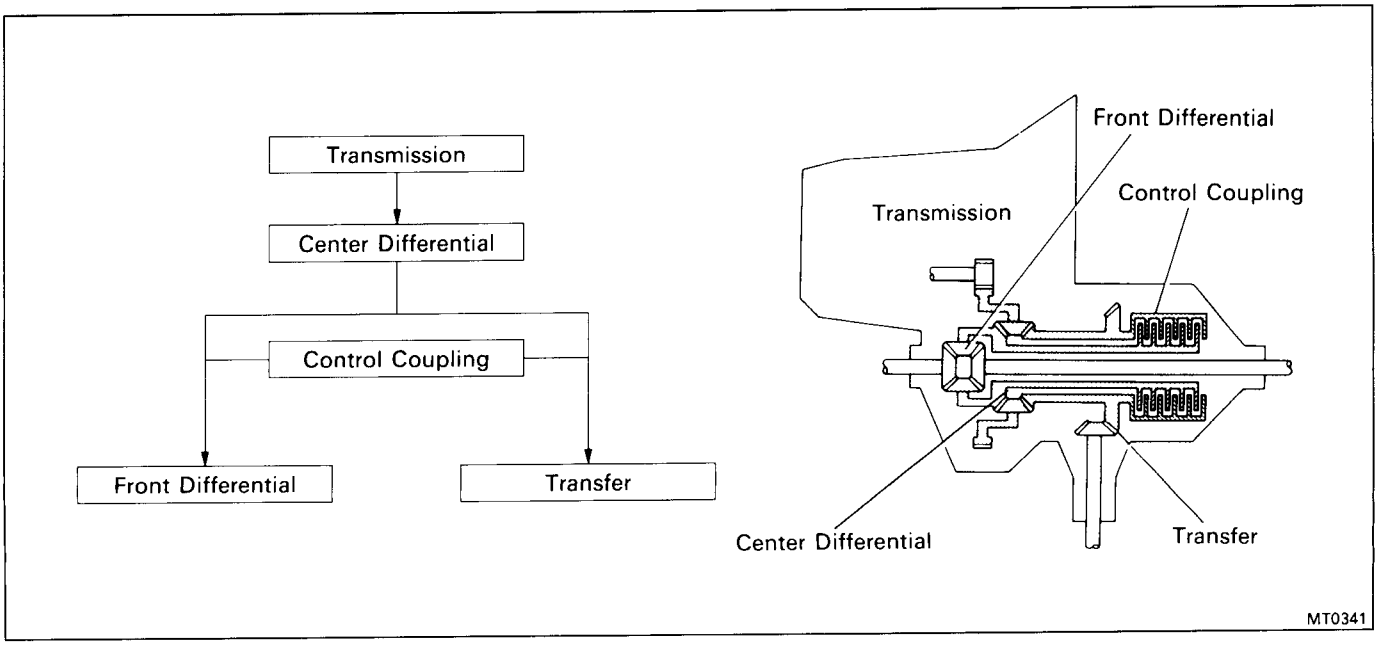


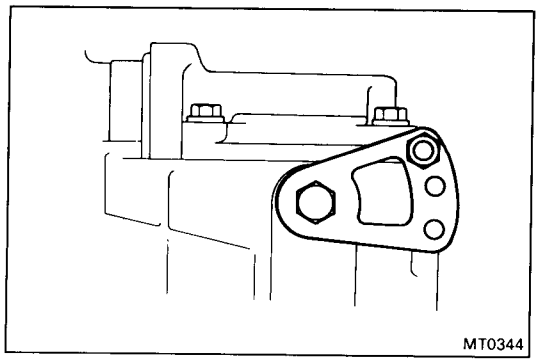
OIL PUMP

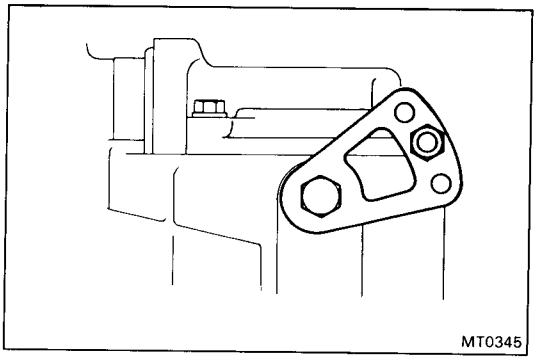
- The oil pump is of the trochoid type, and is driven by the differential ring gear and the pump drive gear. It is located at the bottom of the transaxle case.

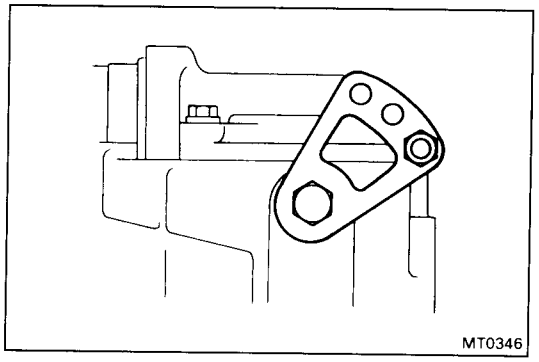
POWER TRANSMISSION

- Power from the transmission is transmitted along the route shown below:




MT0344


MT0345


MT0346

SELECT LEVER FOR SERVICING

- Ordinarily, there is no need for the ordinary customer to operate anything.
- However, to operate 2 wheels out of the four, the following switches have been installed.

VISCOUS MODE

This is the mode for use during normal driving. After finishing inspection, be sure to return the lever to this mode and attach the lock bolt.

VISCOUS FREE MODE

This mode cuts off the driving force transmitted from the center differential to the control coupling, and makes the center differential free.

NOTICE: Never use this during normal driving.

FF MODE

This mode cuts off the driving force transmitted from the center differential to the transfer, and locks the center differential.

However, when the lever is shifted to this mode, the driving force is transmitted only to the front wheels.

NOTICE: Never use this during normal driving. It will have a bad effect on the transaxle.

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- **Using a razor blade and gasket scraper, remove all th old packing (FIPG) material from the gasket surface.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non-residue solvent.**
- **Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Transmission, differential or transfer faulty Wrong oil grade Oil level low	Disassemble and inspect transmission, differential or transfer Replace oil Add oil	MT-8 MT-7
Oil leakage	Oil level too high Oil seal, O-ring or gasket worn or damaged	Drain oil Replace oil seal, O-ring or gasket	 MT-8
Hard to shift or will not shift	Control cable faulty Transmission faulty	Replace control cable Disassemble and inspect transmission	MT-96 MT-8
Tight corner braking	Differential, center differential or transfer faulty	Replace differential, center differential or transfer	MT-43 MT-59

REMOVAL AND INSTALLATION OF TRANSAXLE

REMOVAL AND INSTALLATION OF ENGINE

REMOVE ENGINE WITH TRANSAXLE

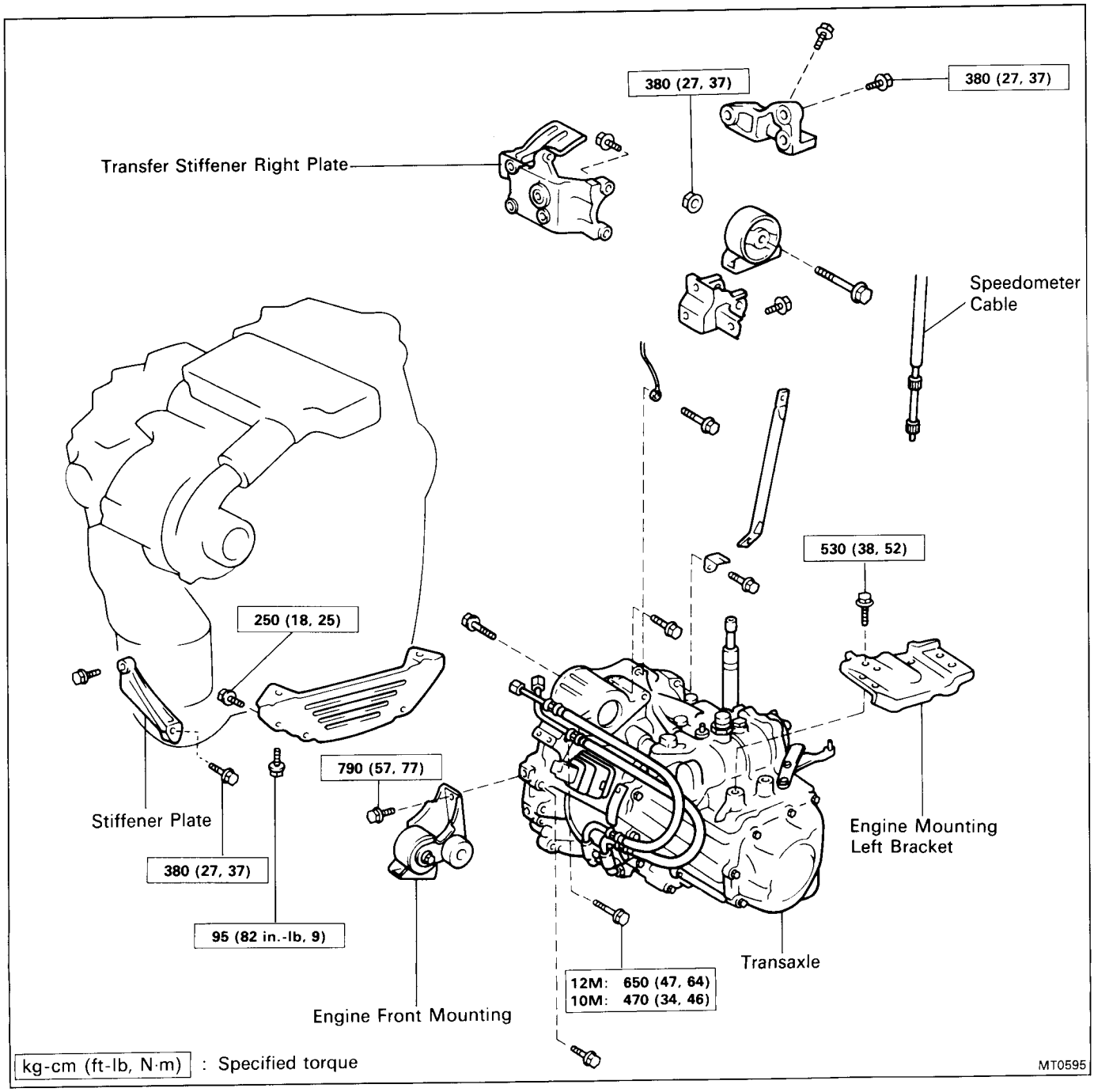
(See page EM-75)

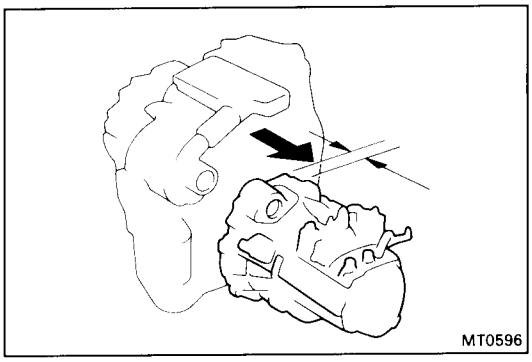
INSTALL ENGINE WITH TRANSAXLE

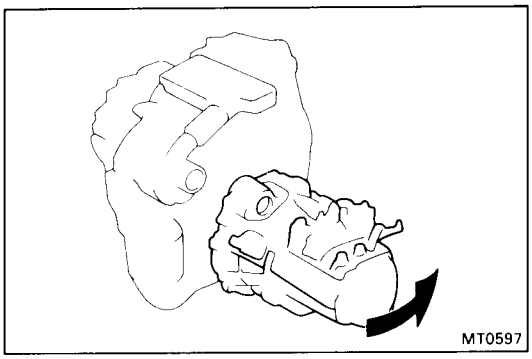
(See page EM-109)

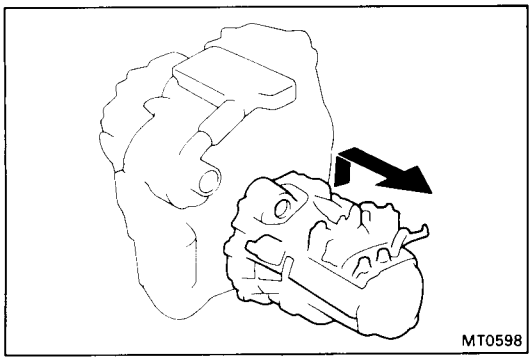
REMOVAL AND INSTALLATION OF TRANSAXLE

REMOVE AND INSTALL TRANSAXLE AS SHOWN









(MAIN POINT OF REMOVAL AND INSTALLATION)

1. **REMOVE TRANSAXLE ASSEMBLY**

   HINT: When removing transaxle from engine, remove as the following procedure since cylinder block rib contacts transfer case.

   (a) Pull straight until there are space of 60 – 80 mm (2 – 3 in.) between engine and transaxle case.

   (b) Move the transmission case cover to the arrow in the illustration.

   (c) While holding transfer output slightly, pull out whole transaxle.

2. **INSTALL TRANSAXLE ASSEMBLY FOLLOWING REMOVAL SEQUENCE IN REVERSE**

REPLACEMENT OF TRANSAXLE GEAR OIL

1. **DRAIN TRANSAXLE OIL**

2. **FILL TRANSAXLE WITH GEAR OIL**

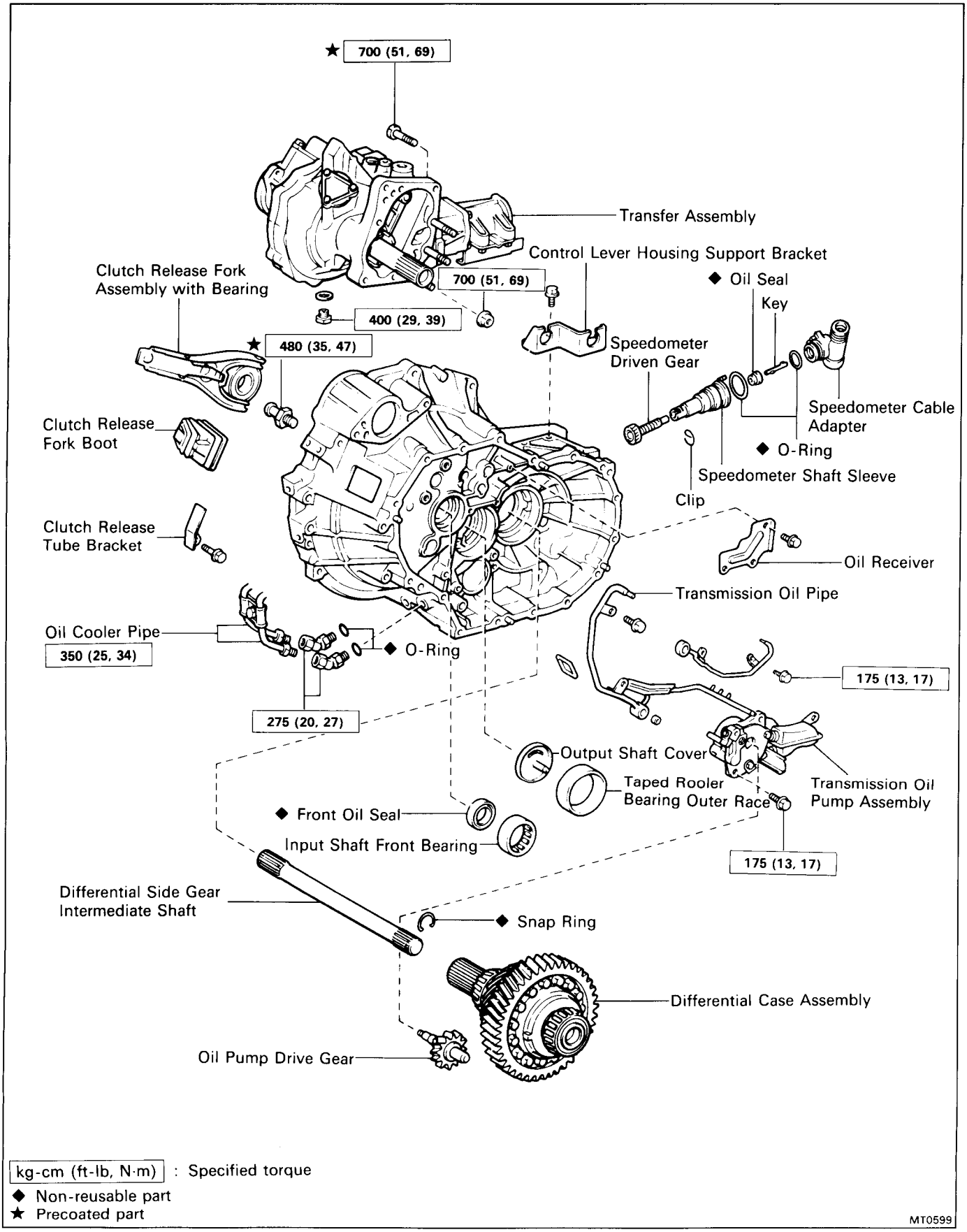
   Oil: Transaxle oil E50 (08885-80206) or equivalent

   Recommended 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 litters (5.5 US qts, 4.6 Imp. qts)

REMOVAL OF COMPONENT PARTS

COMPONENTS



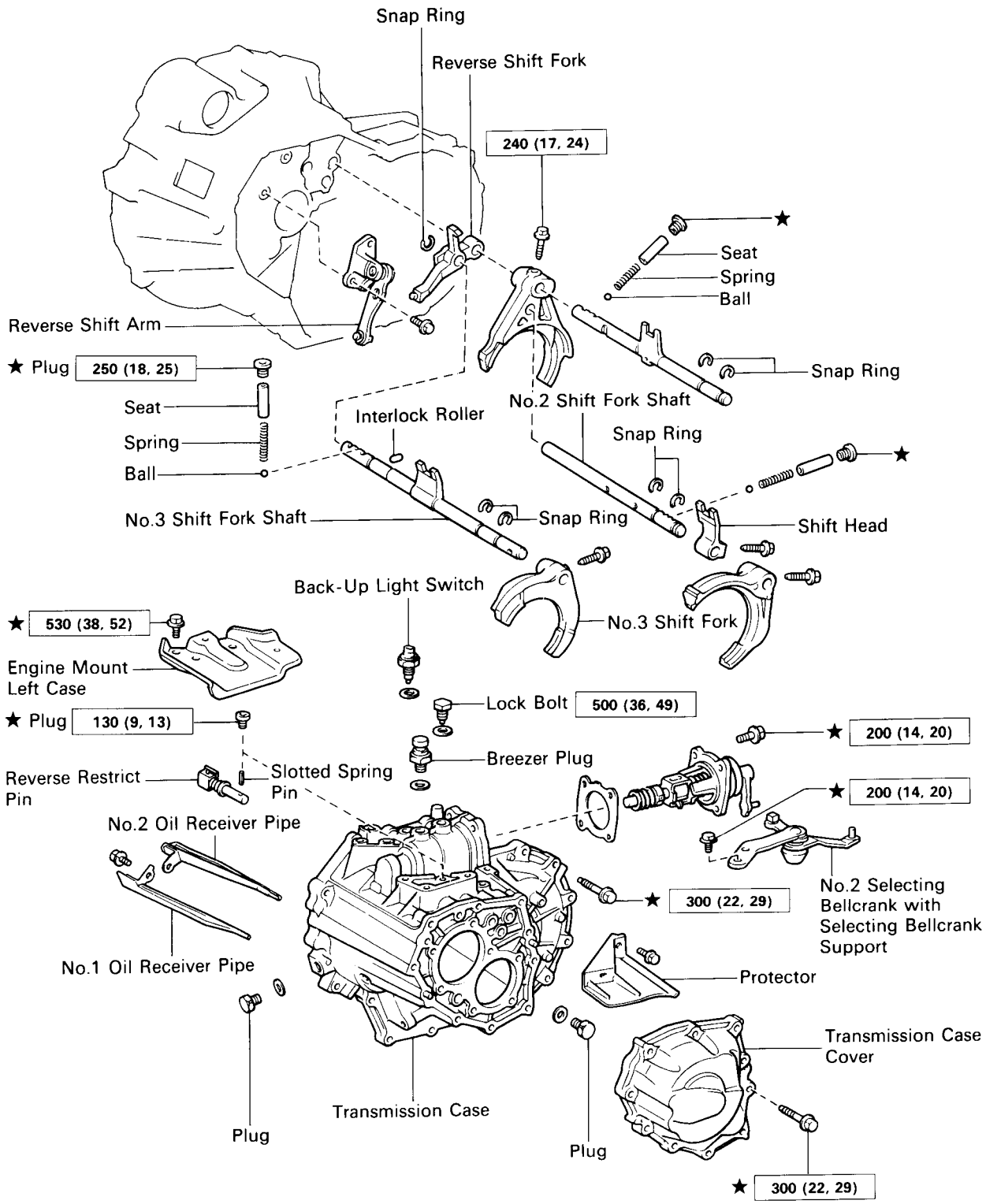
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

★ Precoated part

MT0599

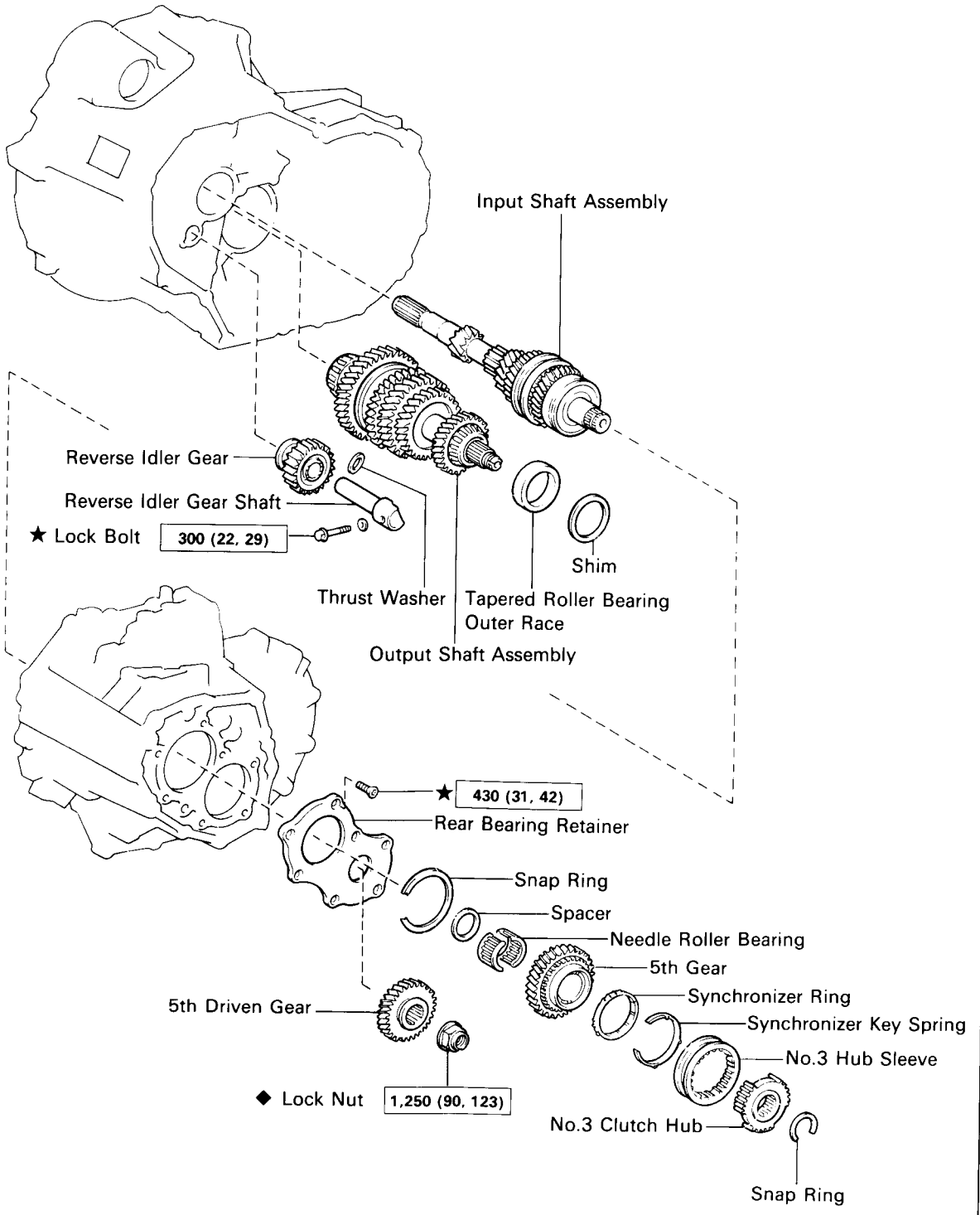
COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part
★ Precoated part

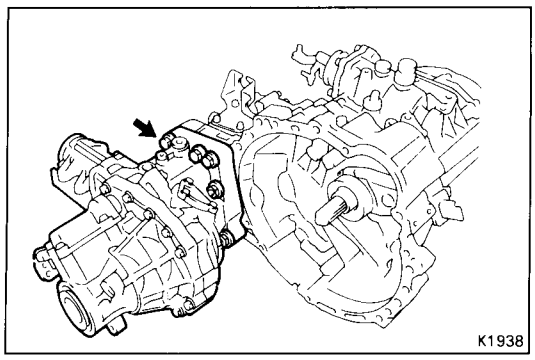
K2047

COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part
★ Precoated part

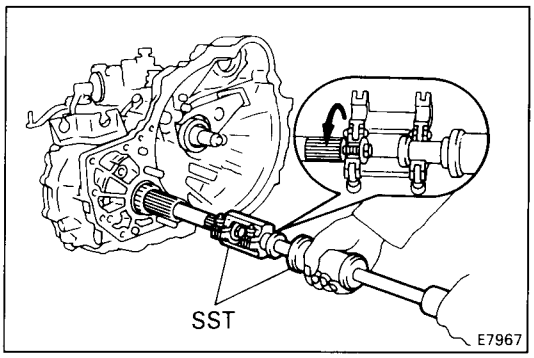
E8601



1. REMOVE TRANSFER ASSEMBLY

(a) Remove the three bolts and five nuts.

(b) Using a plastic hammer, remove the transfer assembly from the transaxle.

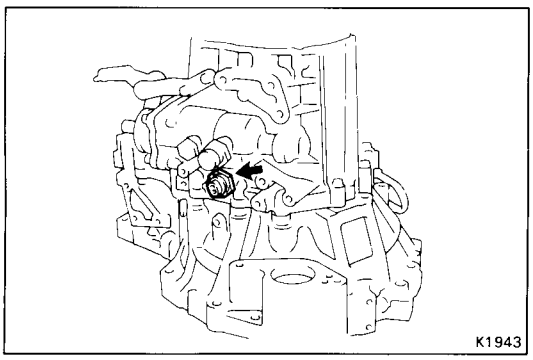


2. REMOVE DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Screw in a suitable bolt with washer into the side gear intermediate shaft.

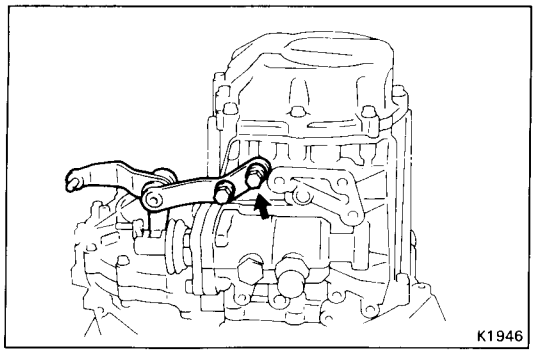
(b) Using SST, remove the side gear intermediate shaft.

SST 09910-00015 (09911-00011, 09912-00010)



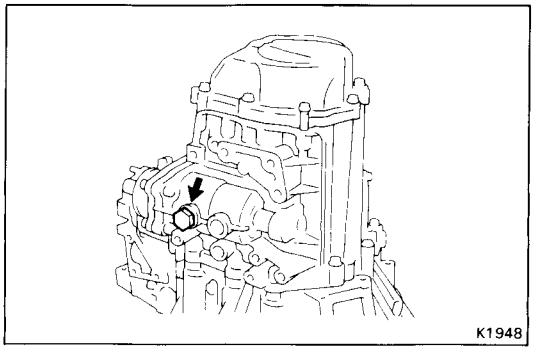
3. REMOVE RELEASE FORK AND BEARING

4. REMOVE BACK-UP LIGHT SWITCH

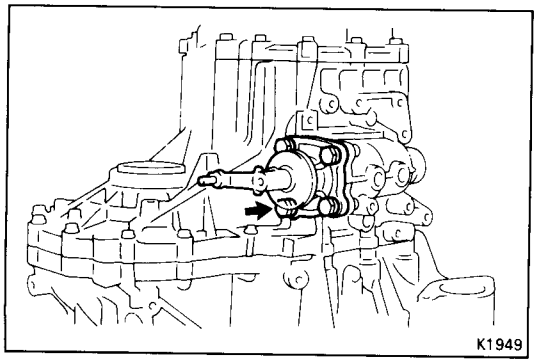


5. REMOVE SPEEDOMETER DRIVEN GEAR

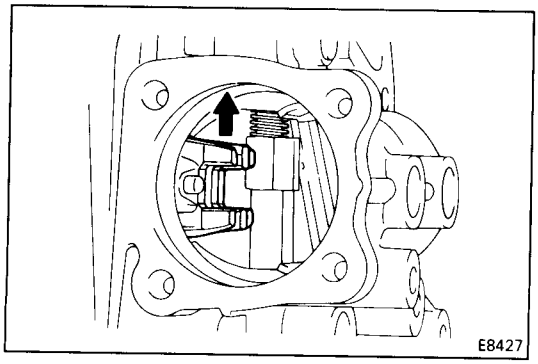
6. REMOVE NO.2 SELECTING BELLCRANK WITH SELECTING BELLCRANK SUPPORT



7. REMOVE SHIFT AND SELECT LEVER SHAFT LOCK BOLT



8. REMOVE SHIFT AND SELECTING LEVER ASSEMBLY

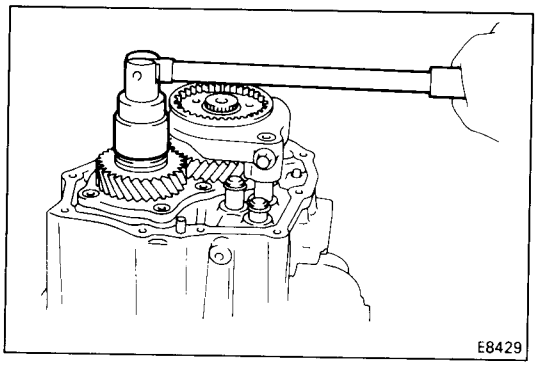


9. REMOVE TRANSMISSION CASE COVER

10. REMOVE OUTPUT SHAFT LOCK NUT

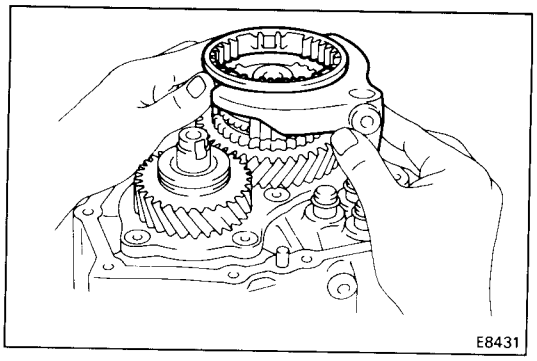
(a) Unstake the lock nut.

(b) Engage the gear double meshing.



(c) Remove the lock nut.

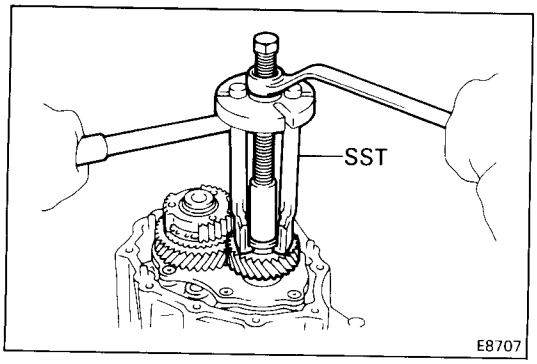
(d) Disengage the gear double meshing.



11. REMOVE NO.3 HUB SLEEVE AND FIFTH SHIFT FORK

(a) Remove the No.3 shift fork set bolt.

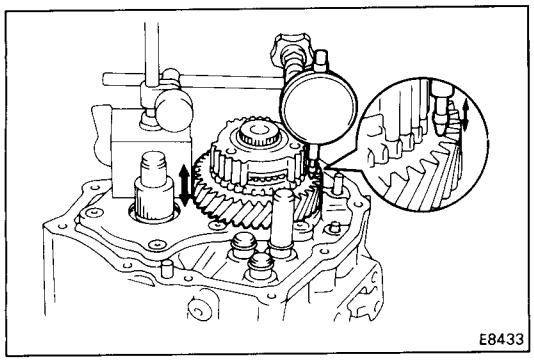
(b) Remove the No.3 hub sleeve and No.3 shift fork.



12. REMOVE FIFTH DRIVEN GEAR

Using SST, remove the 5th driven gear.

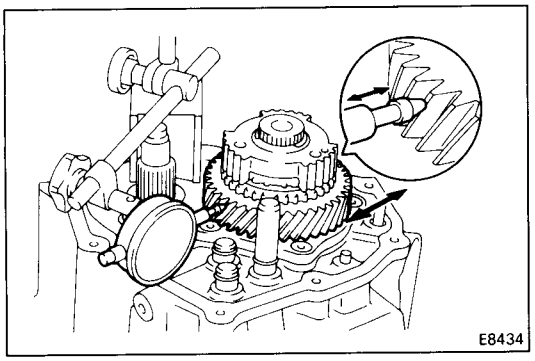
SST 09310-17010 (09310-07010, 09310-07020
09310-07040, 09310-07050)



13. MEASURE FIFTH GEAR THRUST CLEARANCE

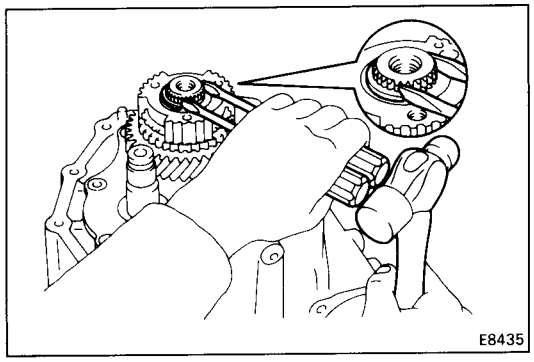
(a) Using a dial indicator, measure the thrust clearance.

Standard clearance: 0.10 – 0.57 mm (0.0039 – 0.0224 in.)
Maximum clearance: 0.65 mm (0.0256 in.)



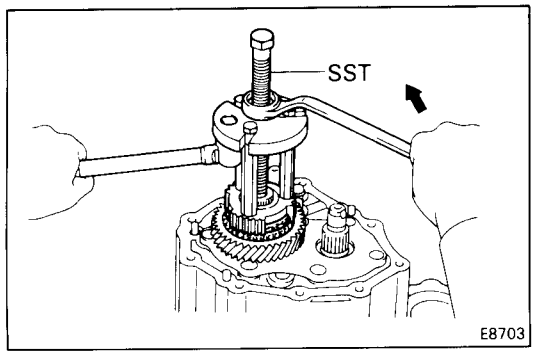
(b) Using a dial indicator, measure the oil clearance.

Standard clearance: 0.009 – 0.050 mm (0.0004 – 0.0020 in.)
Maximum clearance: 0.070 mm (0.0028 in.)



14. REMOVE NO.3 CLUTCH HUB AND FIFTH GEAR

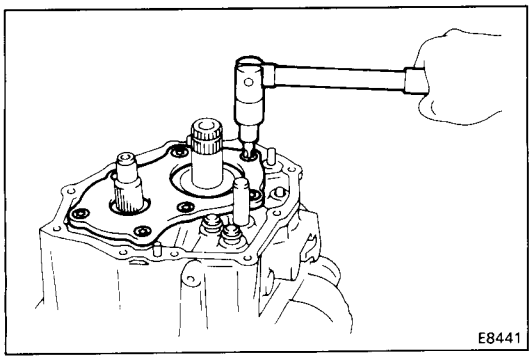
(a) Using two screwdrivers and hammer, tap out the snap ring.



(b) Using SST, remove th No.3 clutch hub with synchronizer ring and 5th gear.

SST 09310-17010 (09310-07010, 09310-07020 09310-07040, 09310-07050)

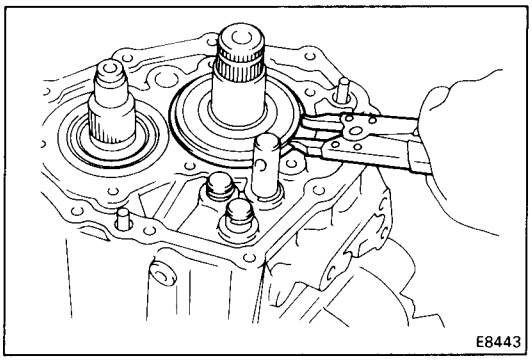
15. REMOVE NEEDLE ROLLER BEARING AND SPACER



16. REMOVE REAR BEARING RETAINER

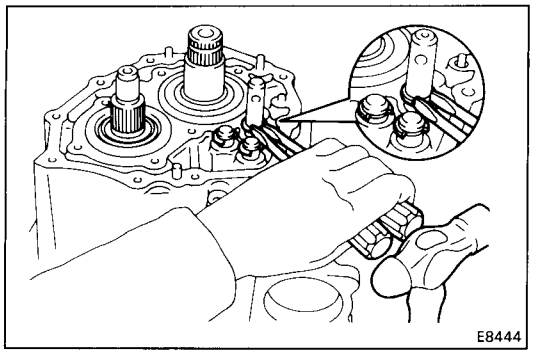
(a) Using a torx wrench, remove the seven torx screws and bearing retainer.

(b) Remove the adjust shim.

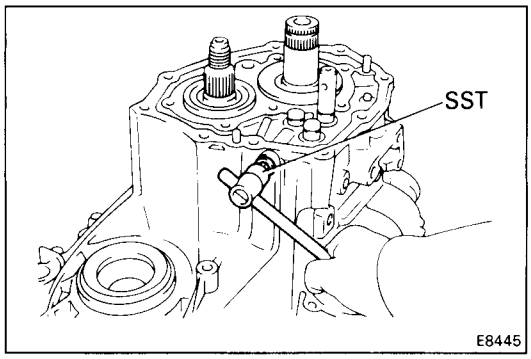


17. REMOVE SNAP RING

(a) Using snap ring pliers, remove the snap ring.



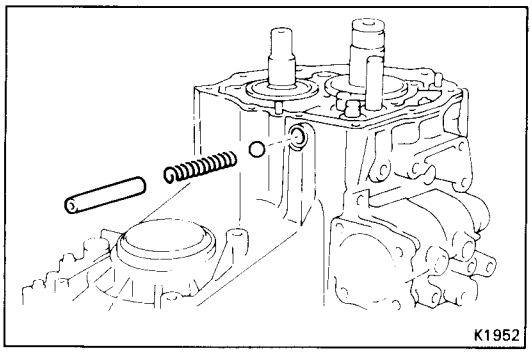
(b) Using two screwdrivers and a hammer, remove the three snap rings.



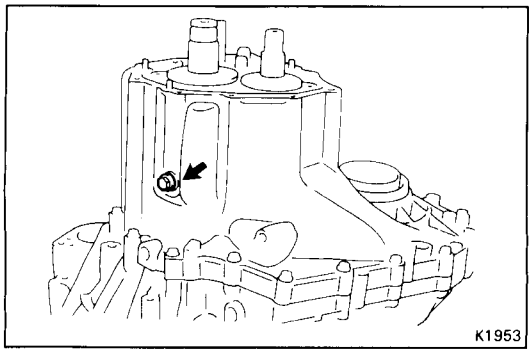
18. REMOVE PLUG, SEAT, SPRING AND LOCKING BALL

(a) Using SST, remove the plug.

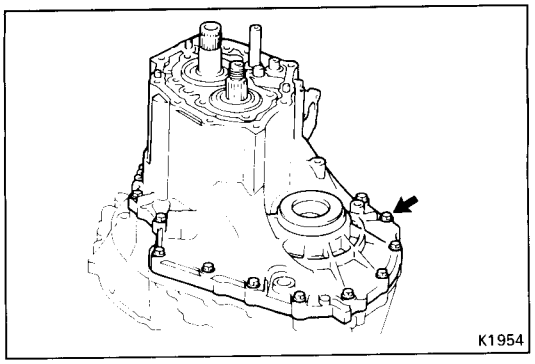
SST 09313-30021



(b) Using a magnetic finger, remove the seat, spring and ball.

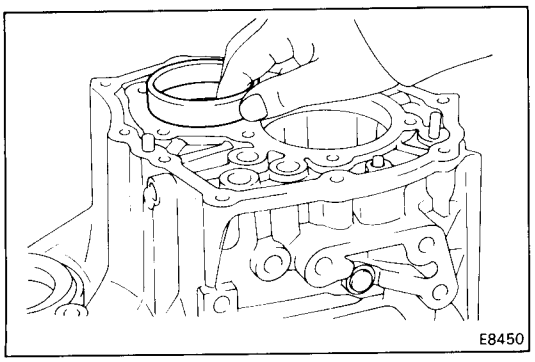


19. REMOVE REVERSE IDLER GEAR SHAFT RETAINING BOLT

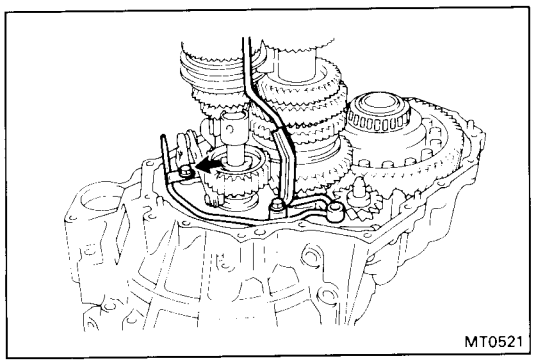


20. REMOVE TRANSMISSION CASE

Remove the seventeen bolts and tap off the case with a plastic hammer.



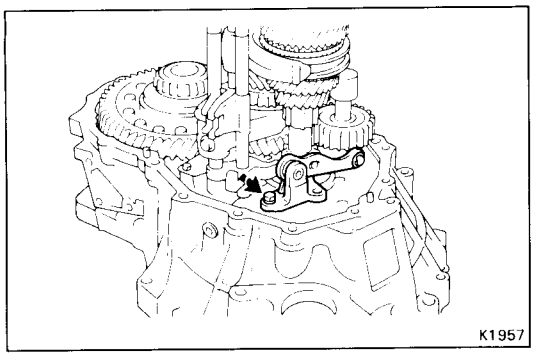
21. REMOVE OUTPUT SHAFT REAR TAPERED ROLLER BEARING OUTER RACE



22. REMOVE NO.2 OIL PIPE

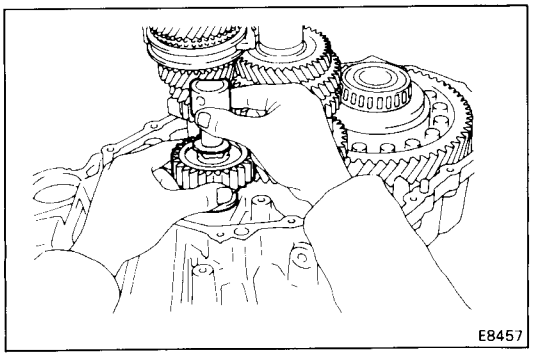
(a) Remove the gasket.

(b) Remove th two bolts and oil pipe.



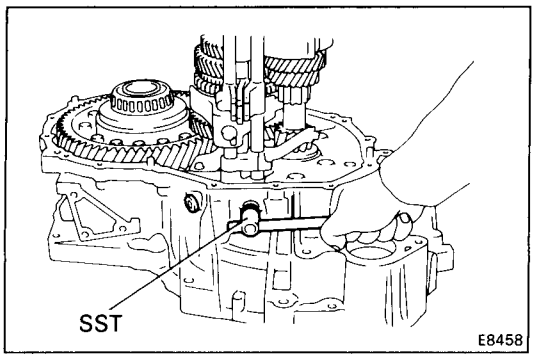
23. REMOVE REVERSE SHIFT ARM

Remove the bolt and pull off th bracket.



24. REMOVE REVERSE IDLER GEAR AND SHAFT

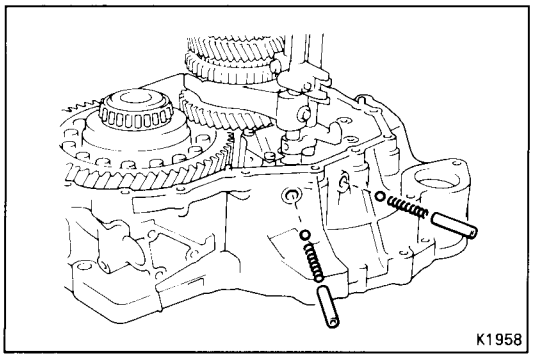
Pull out the shaft, remove th reverse idler gear.



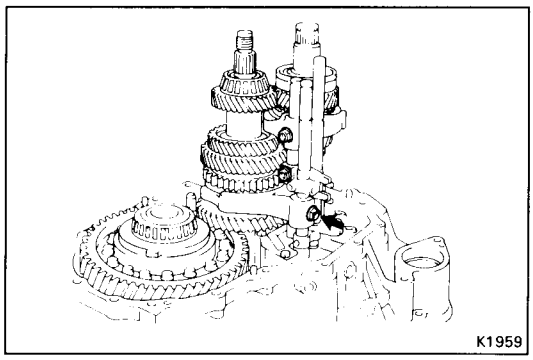
25. REMOVE PLUGS, SEATS, SPRINGS AND BALLS

(a) Using SST, remove the two plugs.

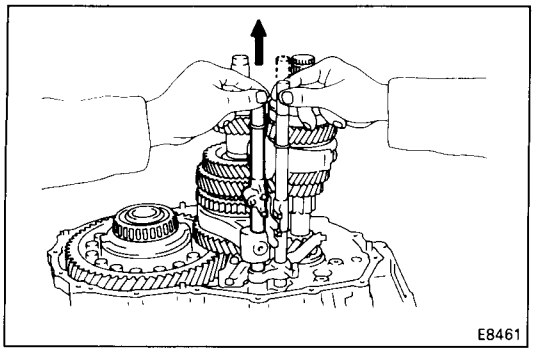
SST 09313-30021



(b) Using a magnetic finger, remove the two seats, springs and balls.

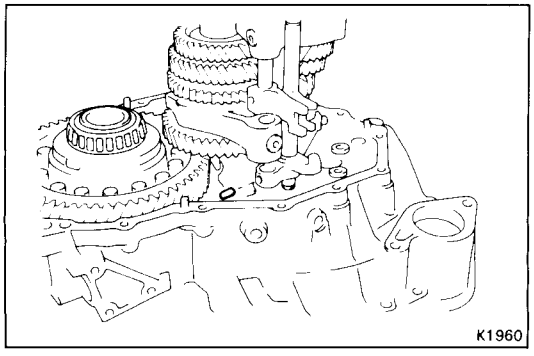


26. REMOVE SET BOLTS



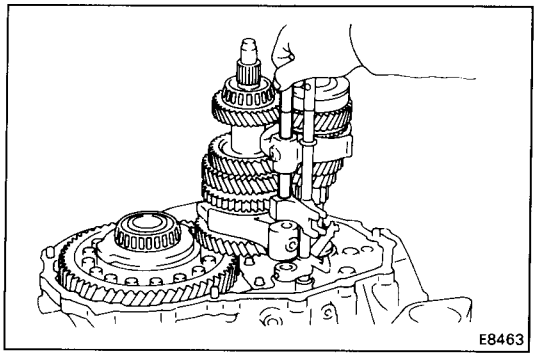
27. REMOVE NO.1 SHIFT FORK SHAFT

Pull up No.3 shift fork shaft, remove the No.1 shift fork shaft.



28. REMOVE INTERLOCK ROLLER

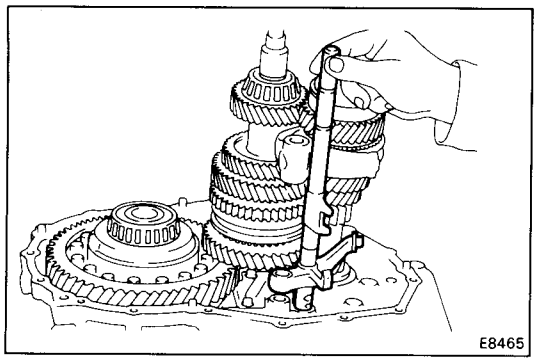
Using a magnetic finger, remove the interlock roller from the reverse shift fork.



29. REMOVE NO.2 SHIFT FORK SHAFT, SHIFT HEAD AND NO.1 SHIFT FORK

(a) Pull out the No.2 shift fork shaft.

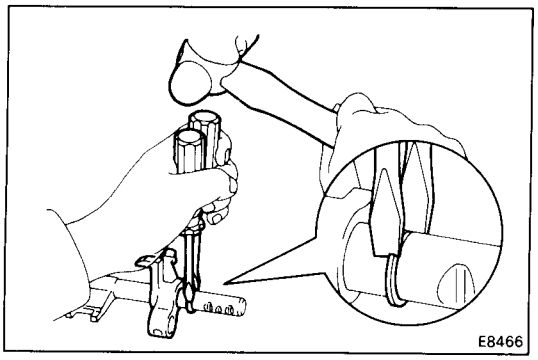
(b) Remove the shift head and No.1 shift fork.



30. REMOVE NO.3 SHIFT FORK SHAFT WITH REVERSE SHIFT FORK AND NO.2 SHIFT FORK

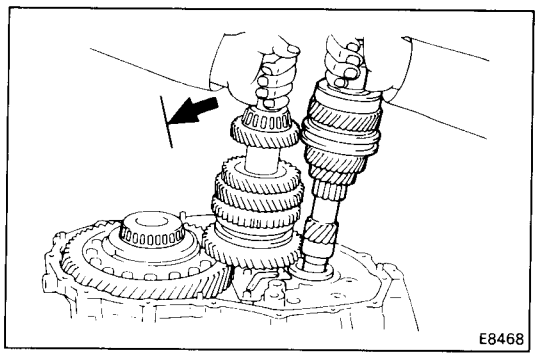
(a) Pull out the No.3 shift fork shaft with reverse shift fork.

(b) Remove the No.2 shift fork.



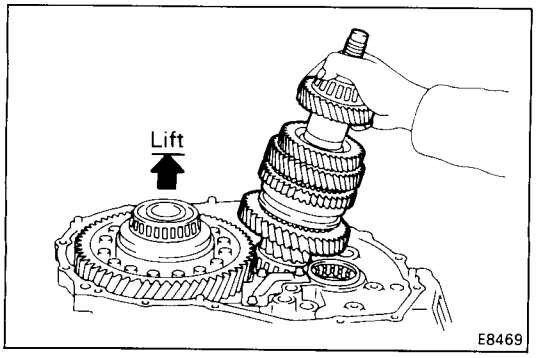
31. REMOVE REVERSE SHIFT FORK

Using two screwdrivers and a hammer, remove the snap ring and reverse shift fork from the No.3 shift fork shaft.

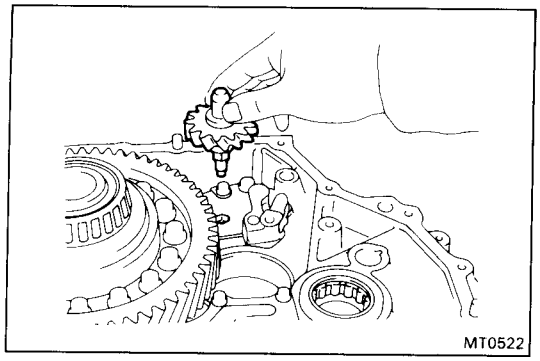


32. REMOVE INPUT AND OUTPUT SHAFT ASSEMBLY

(a) Leaning the output shaft to the differential side, remove the input shaft assembly.

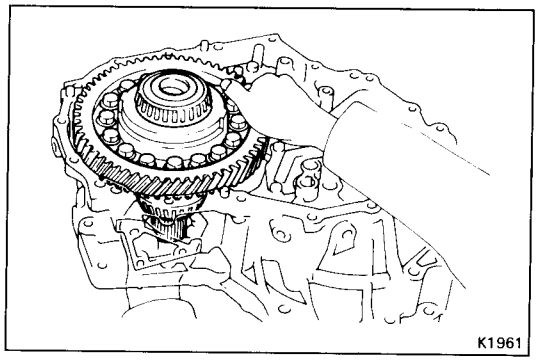


(b) Lift up the differential case assembly, remove output shaft assembly.

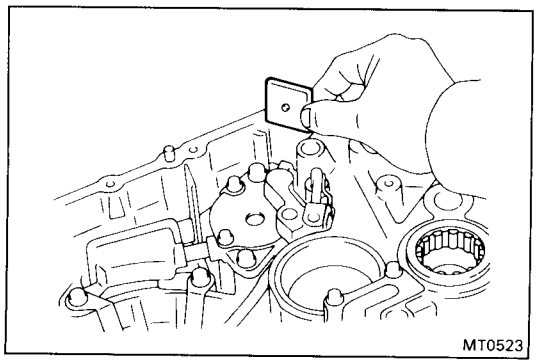


33. REMOVE DIFFERENTIAL ASSEMBLY

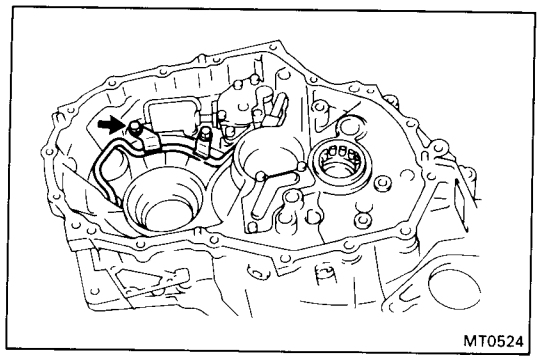
(a) Remove the oil pump drive gear.



(b) Remove the differential case assembly.

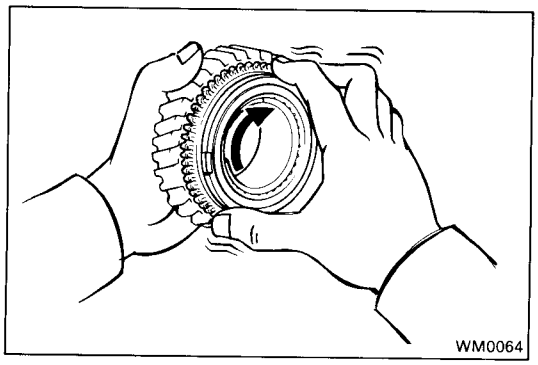


34. REMOVE MAGNET FROM TRANSAXLE CASE



35. REMOVE OIL PUMP ASSEMBLY

Remove the four bolts, oil pipe and oil pump.

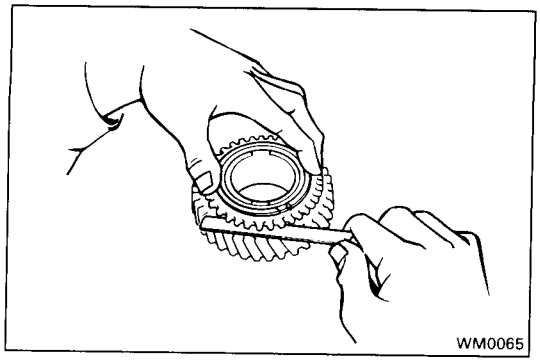


INSPECTION OF COMPONENT PARTS

1. INSPECT SYNCHRONIZER RING OF FIFTH GEAR

(a) Check for wear or damage.

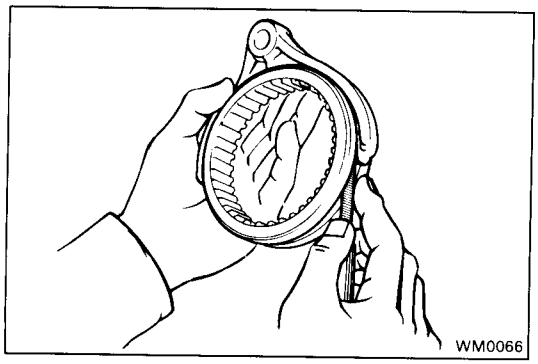
(b) Turn the ring and push it in to check the braking action.



(c) Measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

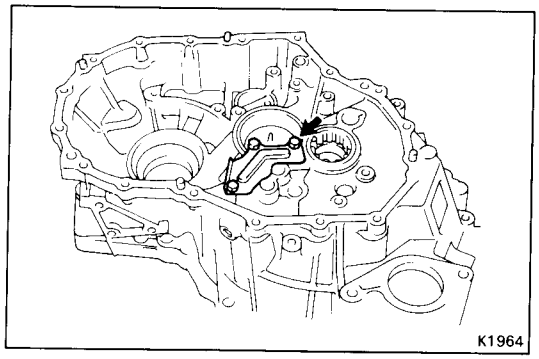


2. MEASURE CLEARANCE OF SHIFT FORK AND HUB SLEEVE

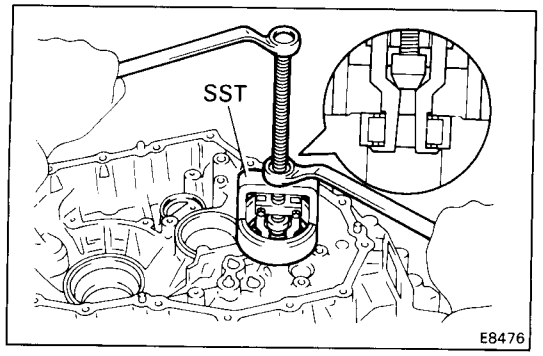
Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.



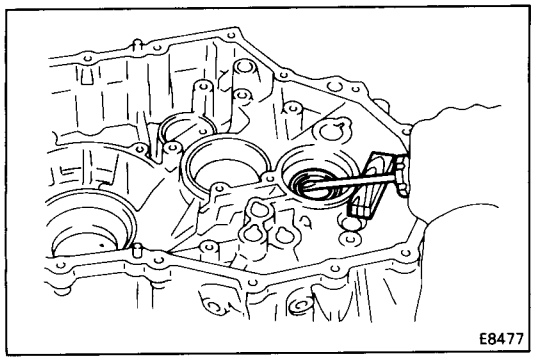
3. REMOVE TRANSAXLE CASE RECEIVER



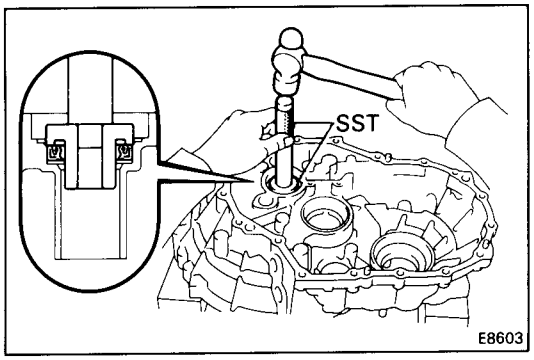
4. IF NECESSARY, REPLACE INPUT SHAFT BEARING AND OIL SEAL

(a) Using SST, Pull out the bearing.

SST 09612-65014



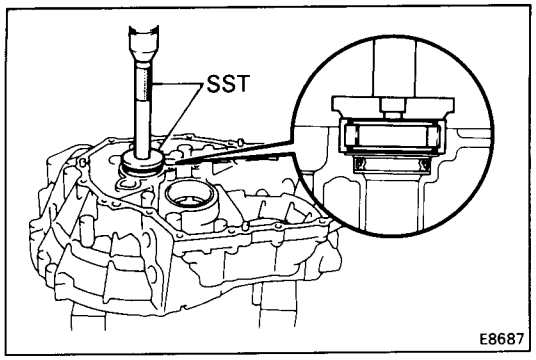
(b) Using a screwdriver, remove the oil seal.



(c) Using SST, drive in a new oil seal.

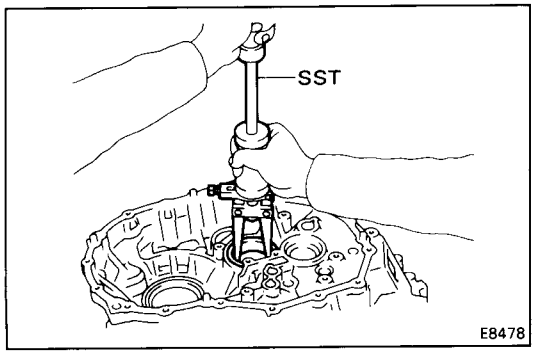
SST 09608-12010 (09608-00020, 09608-00080)

(d) Coat the lip of oil seal with MP grease.



(e) Using SST, drive in a new bearing.

SST 09608-12010 (09608-00020, 09608-00060)

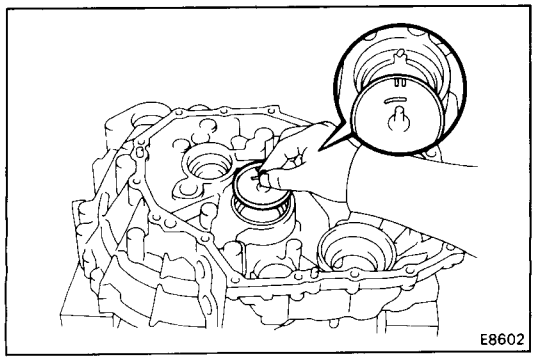


5. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT OUTER RACE AND OUTPUT SHAFT COVER

(a) Using SST, pull out the outer race.

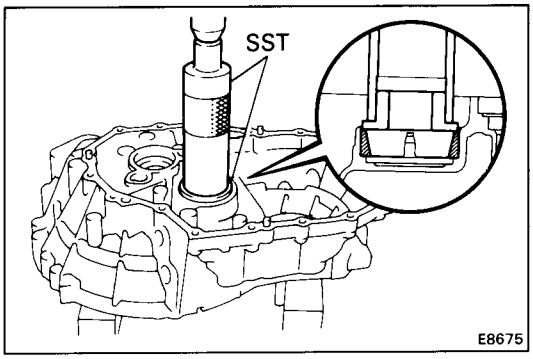
SST 09308-00010

(b) Remove the output shaft front cover.

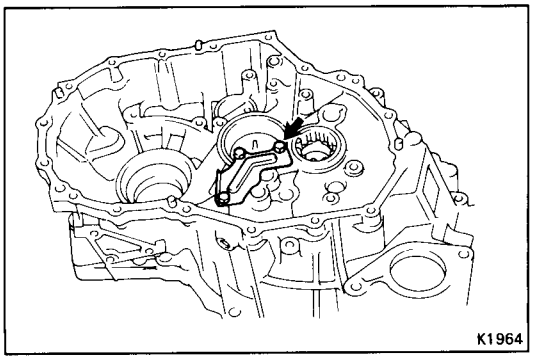


(c) Install the output shaft front cover.

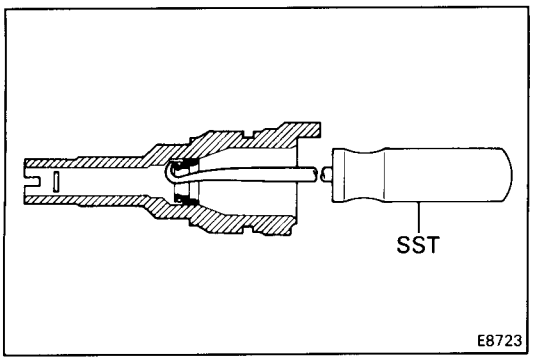
HINT: Install the output shaft cover projection into the case side groove.



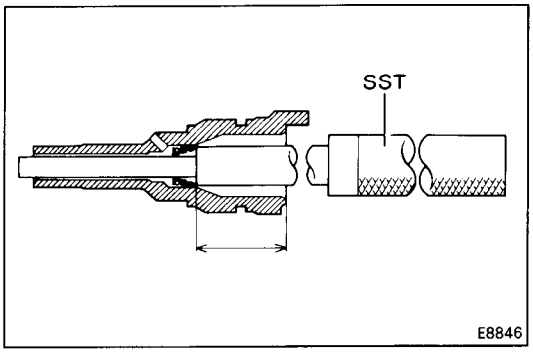
(d) Using SST, press in a new outer race.
SST 09316-60010 (09316-00010, 09316-00020)



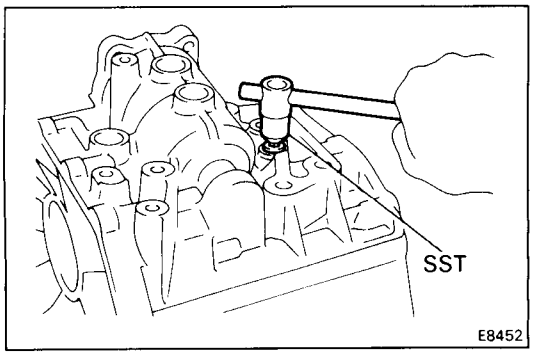
6. INSTALL AND TORQUE TRANSAXLE CASE RECEIVER
Torque: 75 kg-cm (65 in.-lb,7.4 N·m)



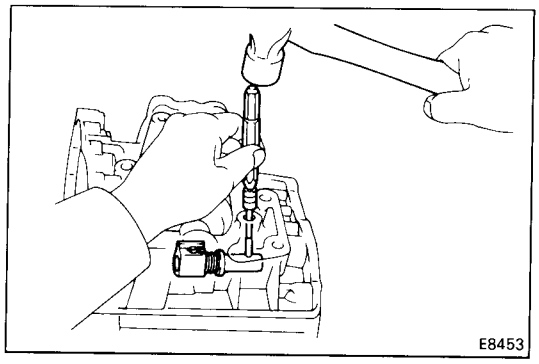
7. IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL
(a) Using SST, pull out the oil seal.
SST 09921-00010



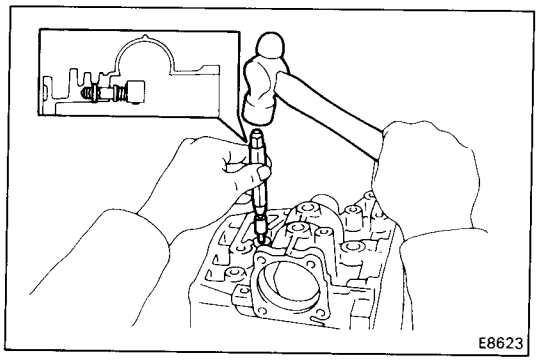
(b) Using SST, drive in a new oil seal.
SST 09201-60011
Drive in depth: 33 mm (1.30 in.)
(c) Coat the lip of oil seal with MP grease.



8. IF NECESSARY, REPLACE REVERSE RESTRICT PIN
(a) Using SST, remove the screw plug.
SST 09313-30021

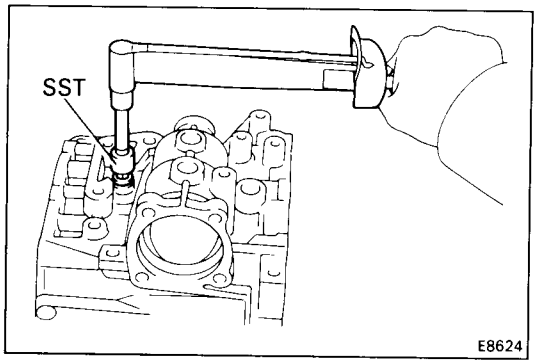


(b) Using a pin punch and hammer, drive out the slotted spring pin.



(c) Replace the reverse restrict pin.

(d) Using a pin punch, drive in the slotted spring pin.



(e) Apply liquid sealant to the plug threads.

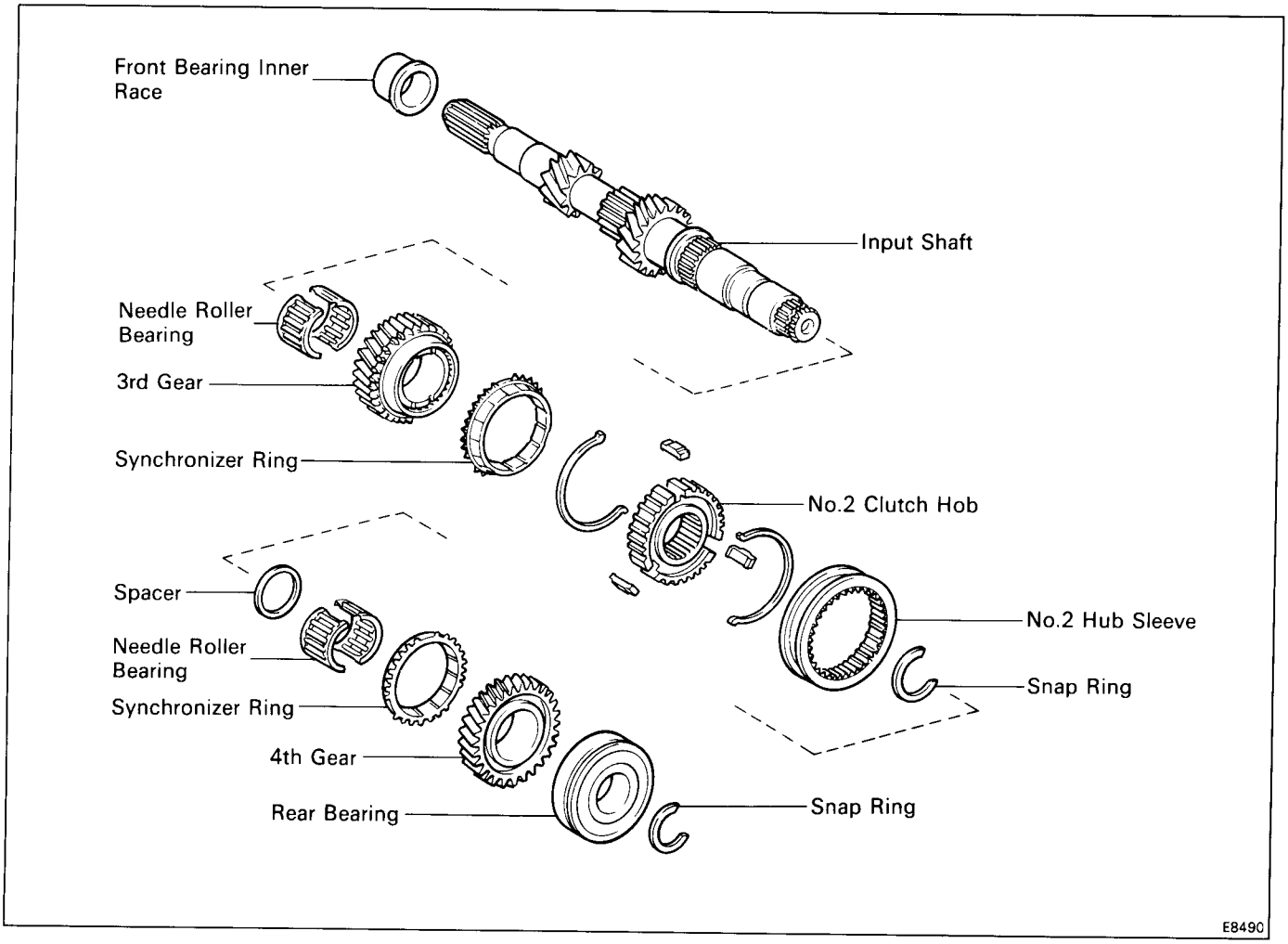
Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

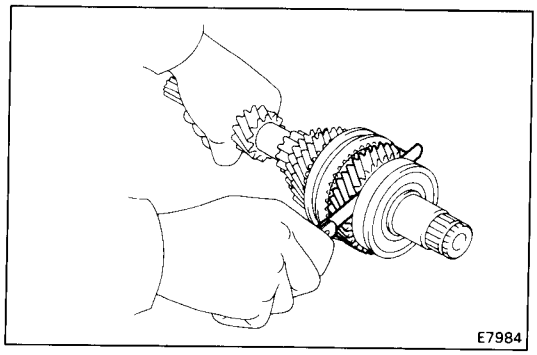
(f) Using SST, install the screw plug.

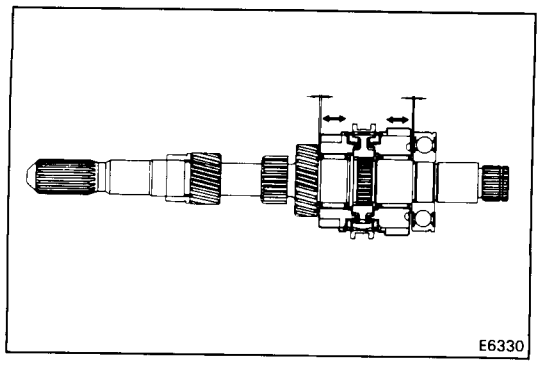
SST 09313-30021

COMPONENT PARTS

Input Shaft Assembly







DISASSEMBLY OF INPUT SHAFT ASSEMBLY

1. **MEASURE THIRD AND FOURTH GEAR THRUST CLEARANCE**

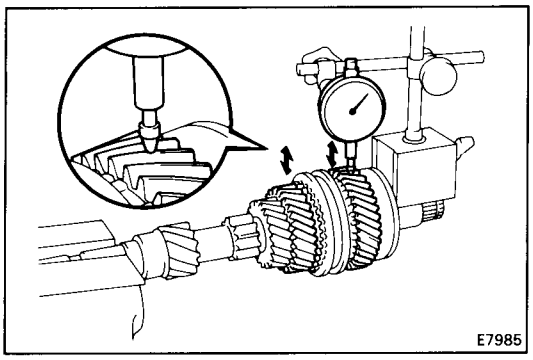
   Using a feeler gauge, measure the thrust clearance.

   Standard clearance:

3rd gear	**0.10 – 0.35 mm (0.0039 – 0.0138 in.)**
4th gear	**0.10 – 0.55 mm (0.0039 – 0.0217 in.)**

   Maximum clearance:

3rd gear	**0.40 mm (0.0157 in.)**
4th gear	**0.60 mm (0.0236 in.)**



2. **CHECK OIL CLEARANCE OF THIRD AND FOURTH GEAR**

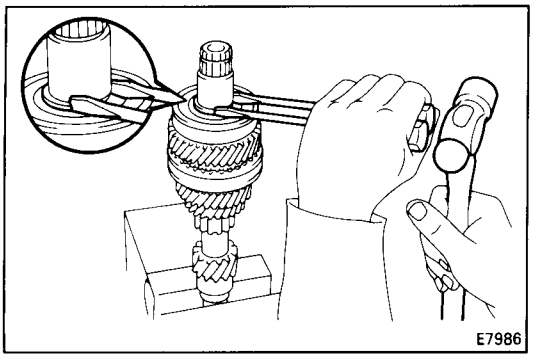
Using dial indicator, measure the oil clearance between the gear and shaft.

Standard clearance:

3rd gear	**0.009 – 0.053 mm (0.0004 – 0.0020 in.)**
4th gear	**0.009 – 0.051 mm (0.0004 – 0.0020 in.)**

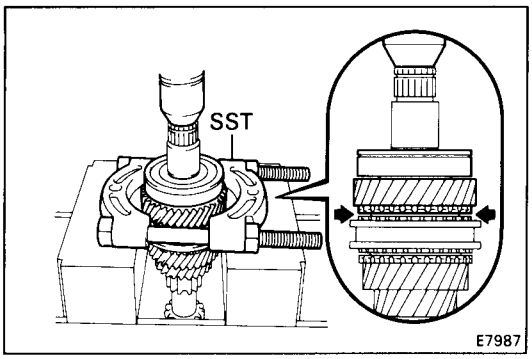
Maximum clearance: 0.080 mm (0.003 in.)

If clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



3. **REMOVE SNAP RING**

Using two screwdrivers and a hammer, tap out the snap ring.

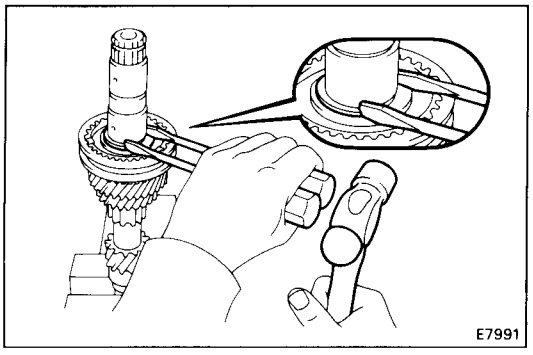


4. **REMOVE INPUT SHAFT REAR BEARING AND FOURTH GEAR**

Using SST and a press, remove the input shaft rear bearing.

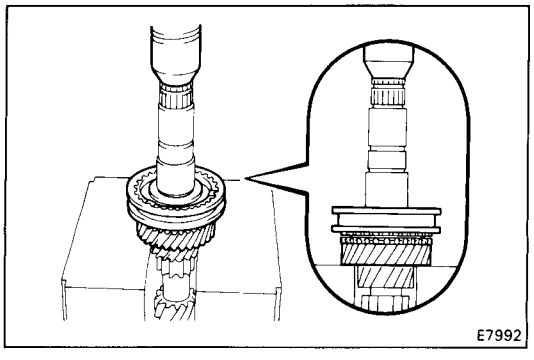
SST 09950-00020

5. **REMOVE NEEDLE ROLLER BEARING, SPACER AND SYNCHRONIZER RING**



6. **REMOVE SNAP RING**

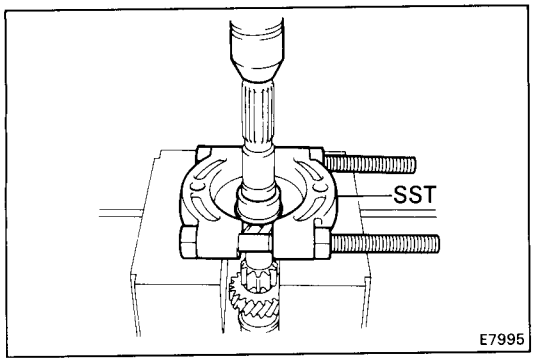
Using two screwdrivers and a hammer, tap out the snap ring.



7. **REMOVE NO.2 CLUTCH HUB ASSEMBLY, SYNCHRONIZER RING AND THIRD GEAR**

Using a press, remove No.2 hub sleeve, 3rd gear, synchronizer ring and needle roller bearings.

8. **REMOVE NEEDLE ROLLER BEARING**

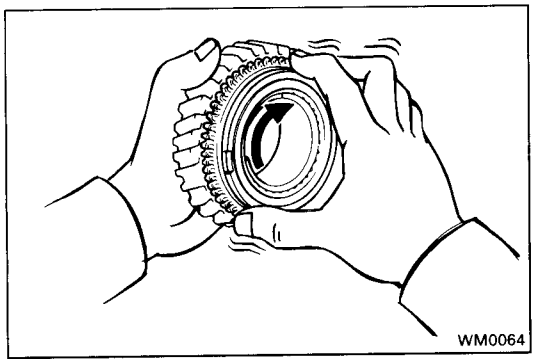


9. REMOVE INPUT SHAFT FRONT BEARING INNER RACE

Using SST and a press, remove the inner race.

SST 09950-00020

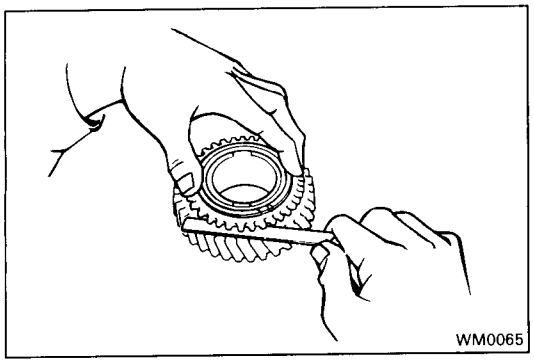
INSPECTION OF INPUT SHAFT COMPONENT PARTS



1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

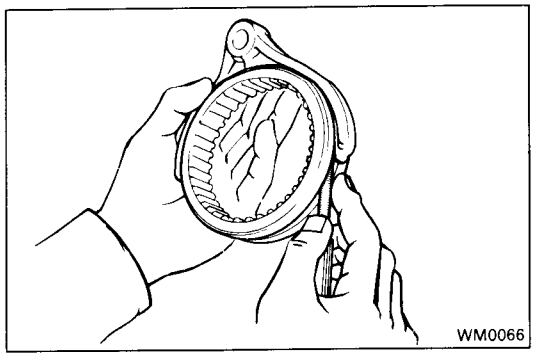
(b) Turn the ring and push it in to check the braking action.



(c) Measure the clearance between the synchronizer ring back and gear spline end.

Maximum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

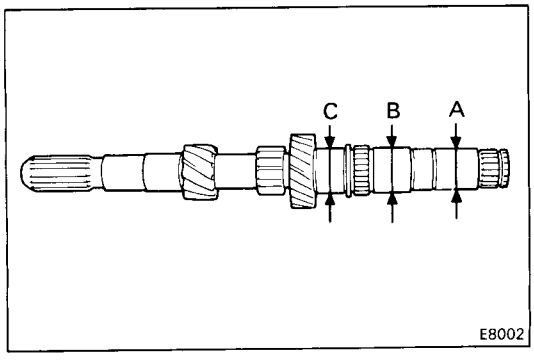


2. MEASURE CLEARANCE OF NO.2 SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.



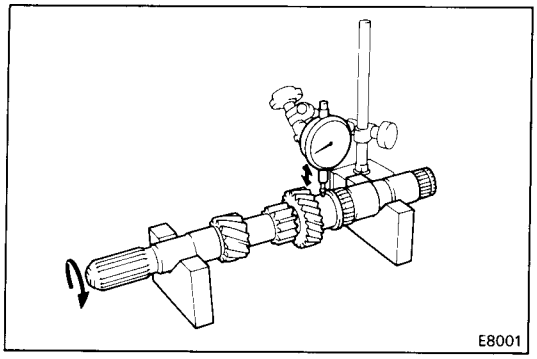
3. INSPECT INPUT SHAFT

(a) Check the input shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the input shaft journal surface.

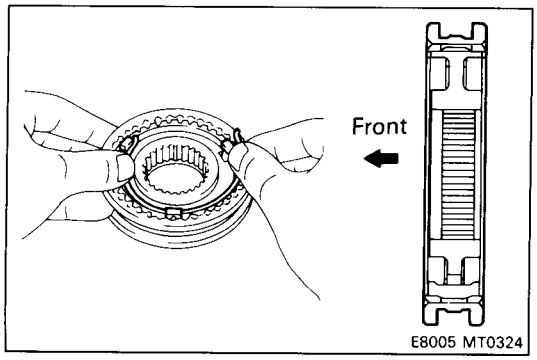
Minimum outer diameter:

Part A	**32.930 mm (1.2964 in.)**
B and C	**35.950 mm (1.4154 in.)**



(c) Using a dial indicator, check the shaft runout.

Maximum runout: 0.060 mm (0.0024 in.)



ASSEMBLY OF INPUT SHAFT ASSEMBLY

(See page MT-23)

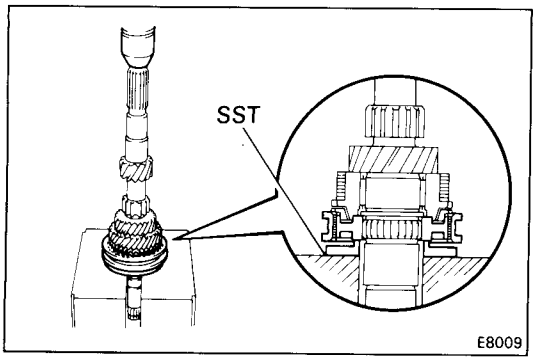
HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. INSERT NO.2 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.



2. INSTALL NEEDLE ROLLER BEARING, THIRD GEAR, SYNCHRONIZER RING AND NO.2 HUB SLEEVE ASSEMBLY TO INPUT SHAFT

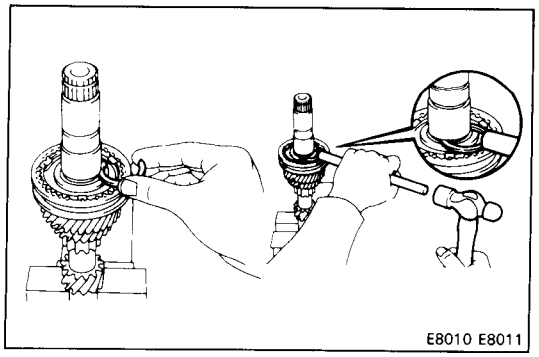
(a) Apply MP grease to the needle roller bearing.

(b) Install the 3rd gear.

(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(d) Using SST and press, install the 3rd gear and No.2 hub sleeve.

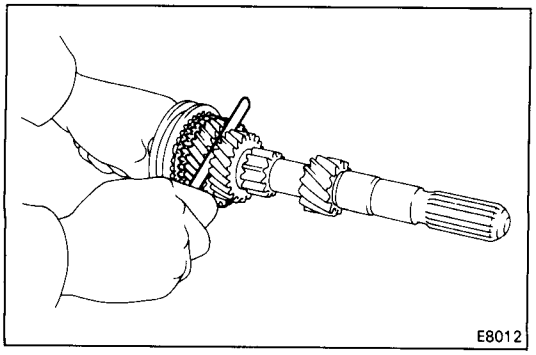
SST 09506-35010



3. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

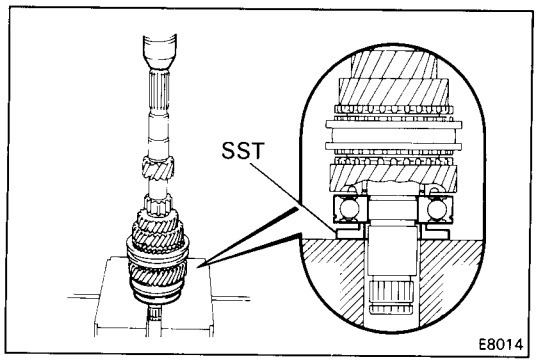
Mark	Thickness mm (in.)
H	2.30 – 2.35 (0.0906 – 0.0925)
J	2.35 – 2.40 (0.0925 – 0.0945)
K	2.40 – 2.45 (0.0945 – 0.0965)
L	2.45 – 2.50 (0.0965 – 0.0984)
M	2.50 – 2.55 (0.0984 – 0.1004)
N	2.55 – 2.60 (0.1004 – 0.1024)
P	2.60 – 2.65 (0.1024 – 0.1043)

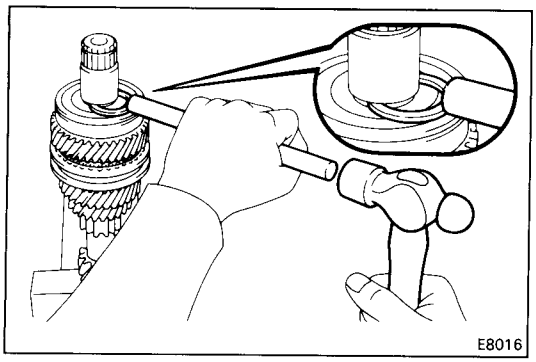


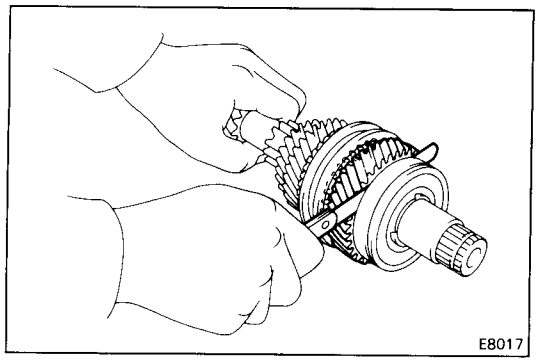
4. MEASURE THIRD GEAR THRUST CLEARANCE

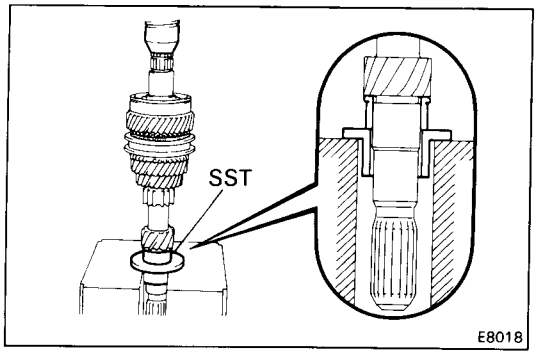
Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)









5. INSTALL SPACER, SYNCHRONIZER RING, NEEDLE ROLLER BEARINGS, FOURTH GEAR AND RADIAL BALL BEARING

(a) Install the spacer.

(b) Apply MP grease to the needle roller bearing.

(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(d) Install the 4th gear.

(e) Using SST and press, install the radial ball bearing.

SST 09506-35010

6. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
1	2.35 – 2.40 (0.0925 – 0.0945)
2	2.40 – 2.45 (0.0945 – 0.0965)
3	2.45 – 2.50 (0.0965 – 0.0984)
4	2.50 – 2.55 (0.0984 – 0.1004)
5	2.55 – 2.60 (0.1004 – 0.1024)
6	2.60 – 2.65 (0.1024 – 0.1043)
7	2.65 – 2.70 (0.1043 – 0.1063)
8	2.70 – 2.75 (0.1063 – 0.1083)

7. MEASURE FOURTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 4th gear thrust clearance.

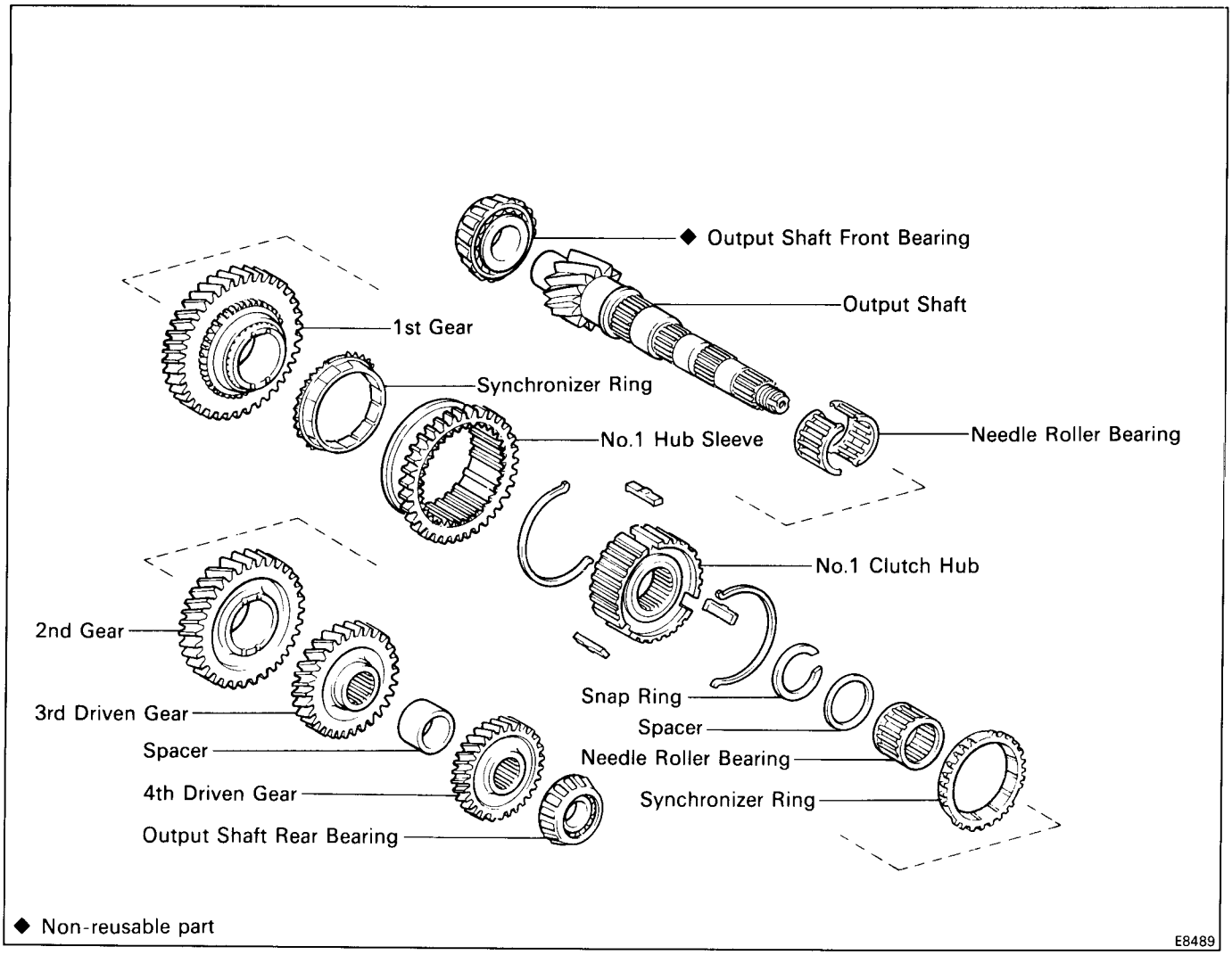
Standard clearance: 0.10 – 0.55 mm (0.0039 – 0.0217 in.)

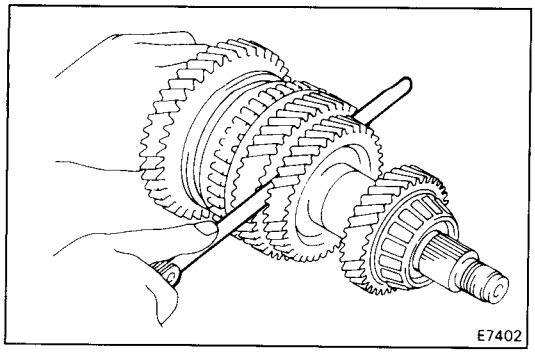
8. INSTALL INPUT SHAFT FRONT BEARING INNER RACE

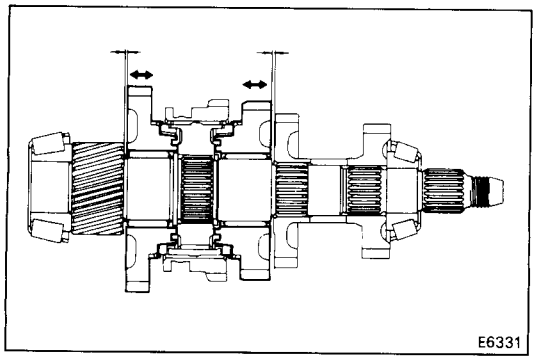
Using SST and press, install the input shaft front bearing inner race.

SST 09316-60010 (09316-00020)

Output Shaft Assembly







DISASSEMBLY OF OUTPUT SHAFT ASSEMBLY

1. MEASURE FIRST AND SECOND GEAR THRUST CLEARANCE

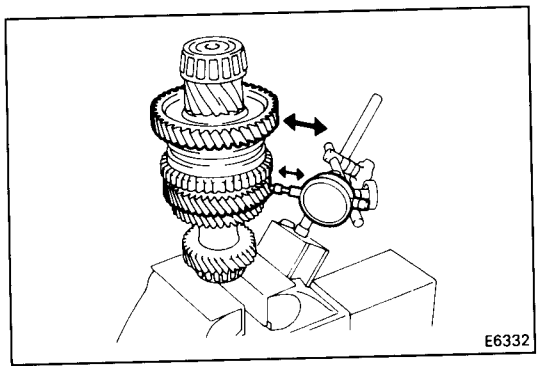
Using a feeler gauge, measure the thrust clearance.

Standard clearance:

1st gear	0.10 – 0.35 mm (0.0039 – 0.0138 in.)
2nd gear	0.10 – 0.45 mm (0.0039 – 0.0177 in.)

Maximum clearance:

1st gear	0.40 mm (0.0157 in.)
2nd gear	0.50 mm (0.0197 in.)



2. **CHECK OIL CLEARANCE OF FIRST AND SECOND GEAR**

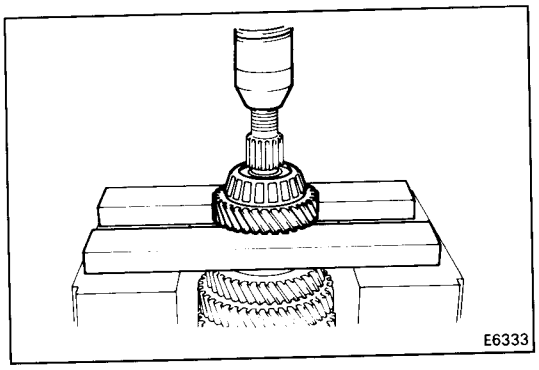
Using a dial indicator, measure the oil clearance between the gear and shaft.

Standard clearance:

1st gear	**0.009 – 0.051 mm (0.0004 – 0.0020 in.)**
2nd gear	**0.009 – 0.053 mm (0.0004 – 0.0020 in.)**

Maximum clearance: 0.080 mm (0.003 in.)

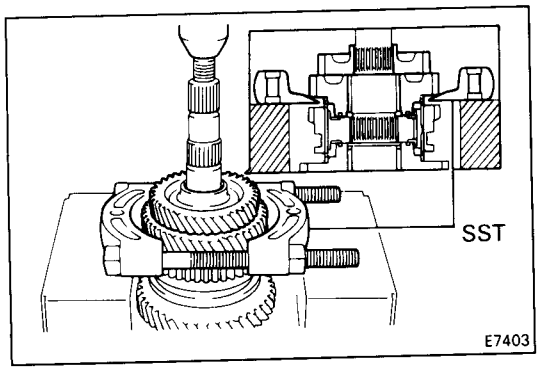
If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



3. **REMOVE OUTPUT SHAFT REAR BEARING, FORTH DRIVEN GEAR AND SPACER**

(a) Using a press, remove the bearing and 4th driven gear.

(b) Remove th spacer.

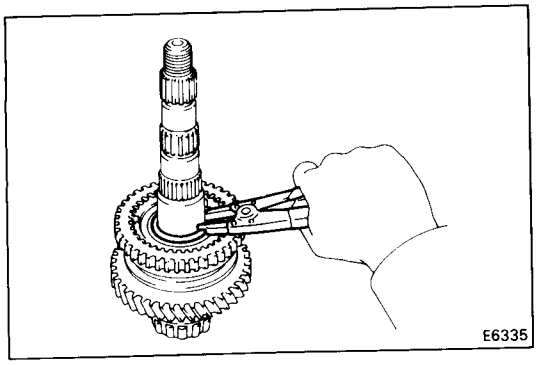


4. **REMOVE THIRD DRIVEN GEAR AND SECOND GEAR**

Using SST and a press, remove the 3rd driven gear and 2nd gear.

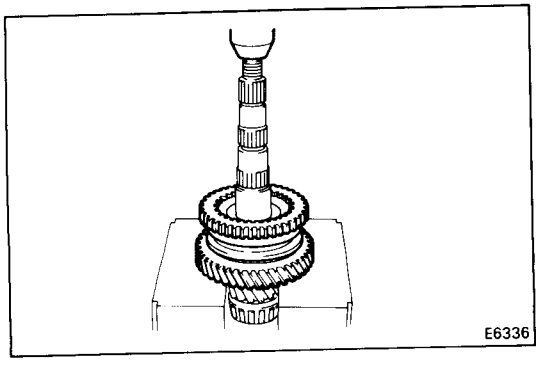
SST 09950-00020

5. **REMOVE NEEDLE ROLLER BEARINGS, SPACER AND SYNCHRONIZER RING**



6. **REMOVE SNAP RING**

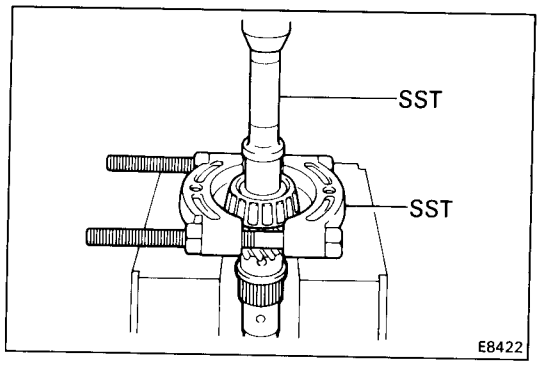
Using snap ring pliers, remove the snap ring.



7. **REMOVE NO.1 HUB SLEEVE ASSEMBLY AND FIRST GEAR**

Using a press, remove No.1 hub sleeve and 1st gear.

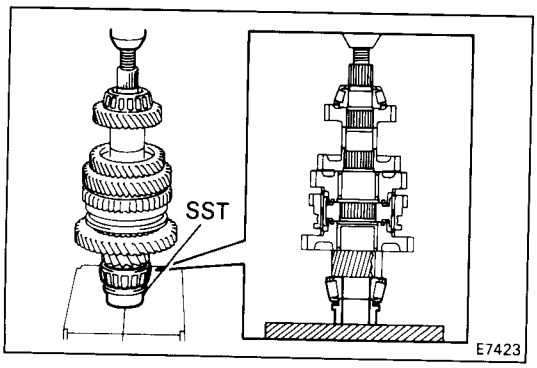
8. **REMOVE SYNCHRONIZER RING AND NEEDLE ROLLER BEARING**



9. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING

(a) Using SST and a press, remove the bearing.

SST 09307-12010, 09950-00020



(b) Using SST and a press, install a new bearing.

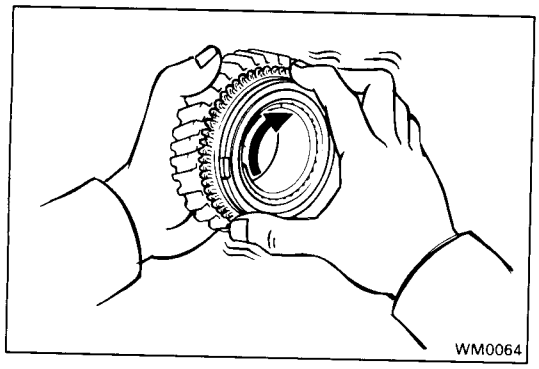
SST 09316-60010 (09316-00070)

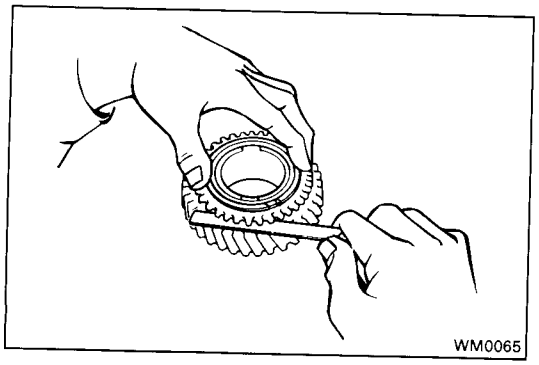
INSPECTION OF OUTPUT SHAFT COMPONENT PARTS

1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

(b) Turn the ring and push it in to check the braking action.

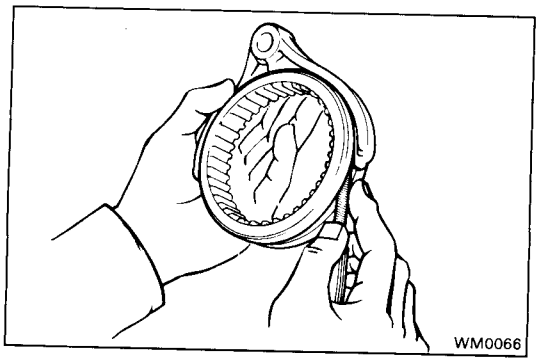




(c) Measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

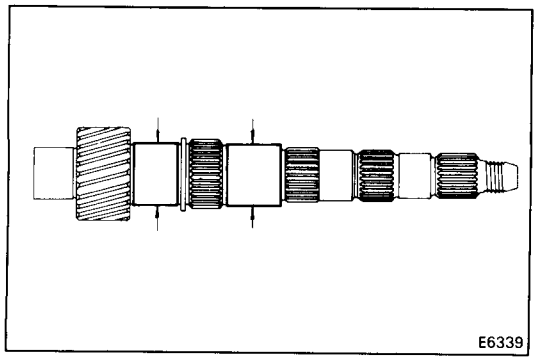


2. MEASURE CLEARANCE OF NO.1 SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

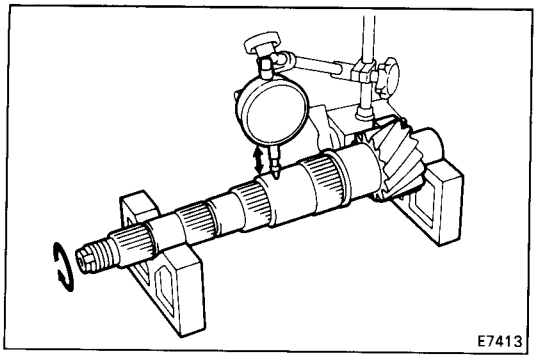

E6339

3. **INSPECT OUTPUT SHAFT**

(a) Check the output shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the output shaft journal surface.

Minimum outer diameter: 38.950 mm (1.5335 in.)


E7413

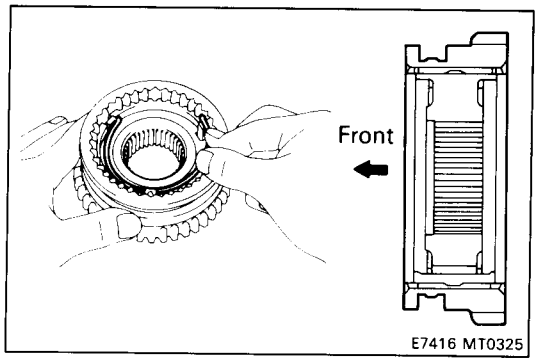
(c) Using a dial indicator, check the shaft runout.

Maximum clearance: 0.060 mm (0.0024 in.)

ASSEMBLY OF OUTPUT SHAFT ASSEMBLY

(See page MT-28)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.



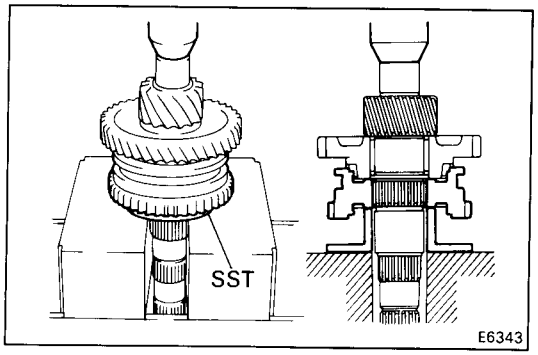
E7416 MT0325

1. **INSERT NO.1 CLUTCH HUB INTO HUB SLEEVE**

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.



E6343

2. **INSTALL NEEDLE ROLLER BEARINGS, FIRST GEAR, SYNCHRONIZER RING AND NO.1 HUB SLEEVE TO OUTPUT SHAFT**

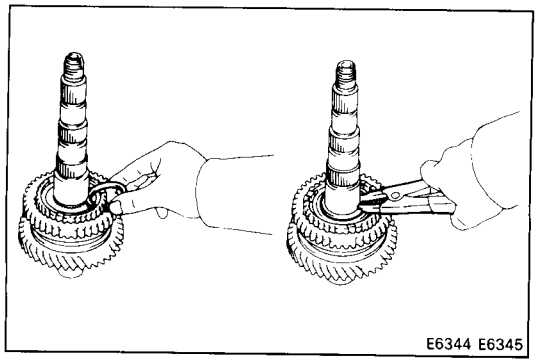
(a) Apply MP grease to the needle roller bearings.

(b) Install the 1st gear.

(c) Place the synchronizer ring (for 1st gear) on the gear and align the ring slots with the shifting keys.

(d) Using SST and a press, install the 1st gear and No.1 hub sleeve.

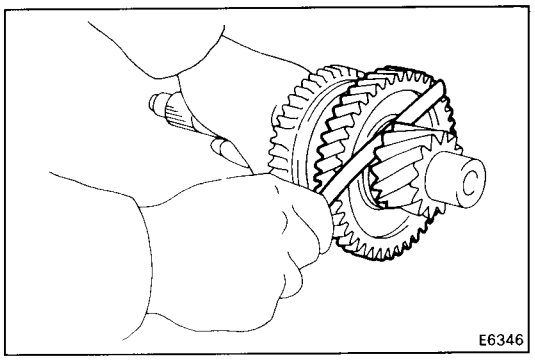
SST 09316-60010 (09316-00040)


E6344 E6345

3. **INSTALL SNAP RING**

Select a snap ring that will allow minimum axial play and install it on the shaft.

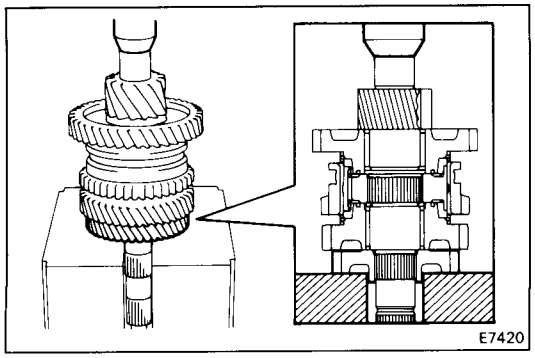
Mark	Thickness mm (in.)
A	2.80 – 2.85 (0.1102 – 0.1122)
B	2.85 – 2.90 (0.1122 – 0.1142)
C	2.90 – 2.95 (0.1142 – 0.1161)
D	2.95 – 3.00 (0.1161 – 0.1181)
E	3.00 – 3.05 (0.1181 – 0.1201)
F	3.05 – 3.10 (0.1201 – 0.1220)
G	3.10 – 3.15 (0.1220 – 0.1240)



4. MEASURE FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st gear thrust clearance.

Standard clearance: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)



5. INSTALL SPACER, NEEDLE ROLLER BEARING, SYNCHRONIZER RING, SECOND GEAR AND THIRD DRIVEN GEAR

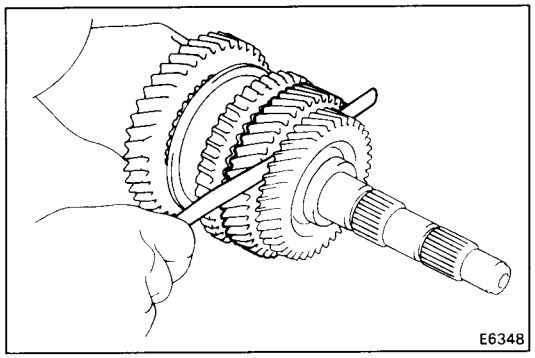
(a) Install the spacer.

(b) Apply MP grease to the needle roller bearing.

(c) Place the synchronizer ring (for 2nd gear) on the gear and align the ring slots with the shifting keys.

(d) Install the 2nd gear.

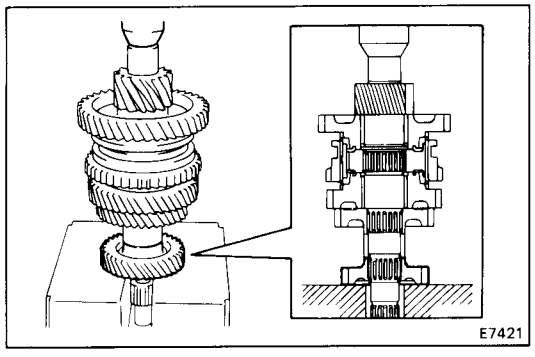
(e) Using a press, install the 3rd gear.



6. MEASURE SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 2nd gear thrust clearance.

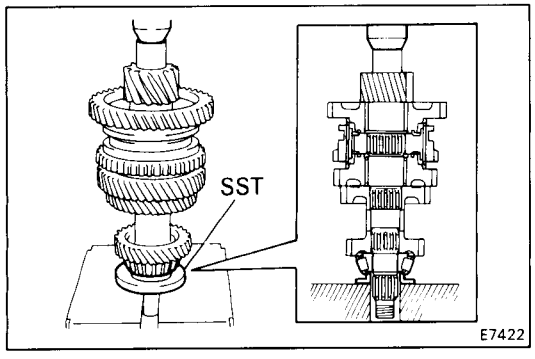
Standard clearance: 0.10 – 0.45 mm (0.0039 – 0.0177 in.)



7. INSTALL SPACER AND FOURTH DRIVEN GEAR

(a) Install the spacer.

(b) Using a press, install the 4th driven gear.

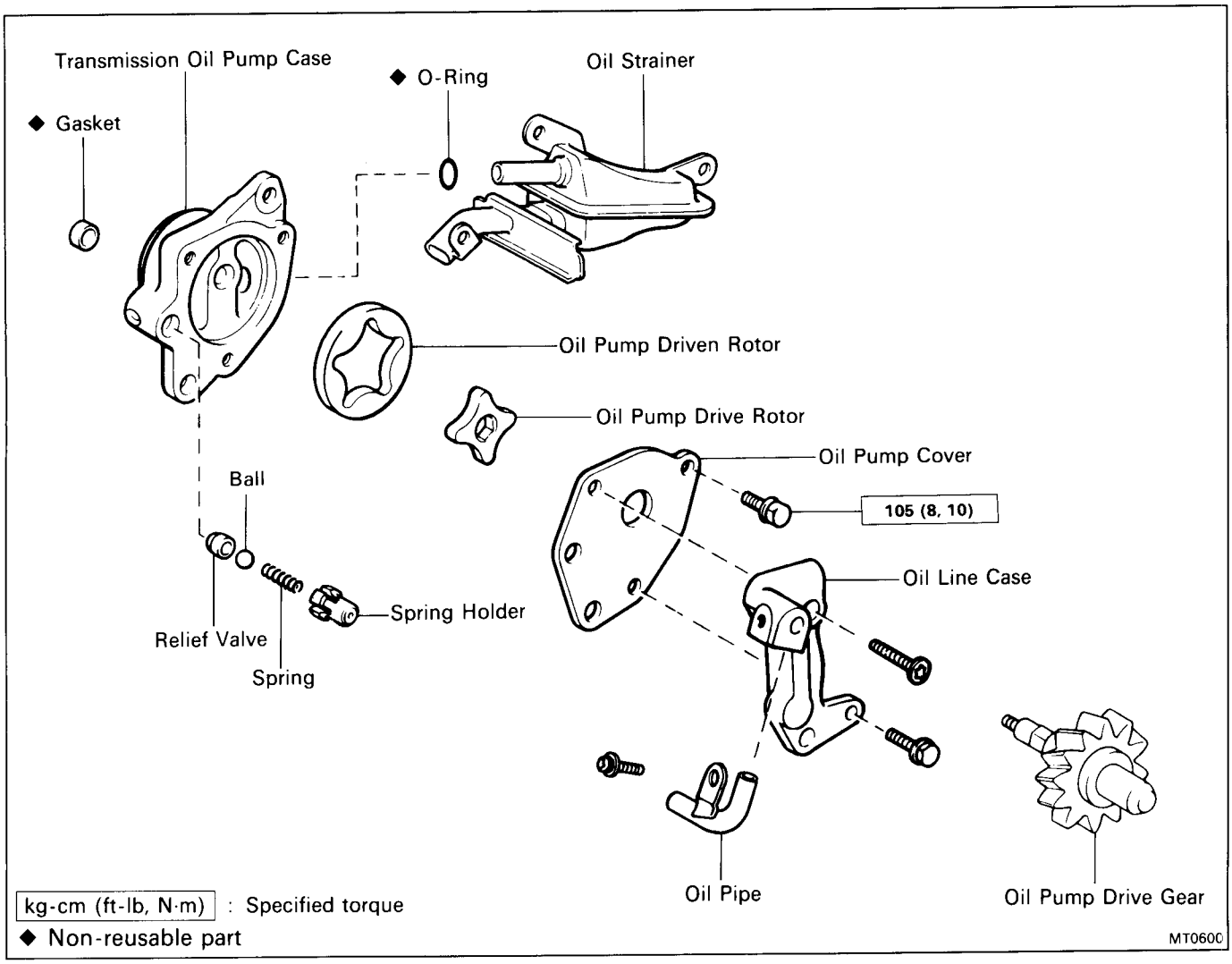


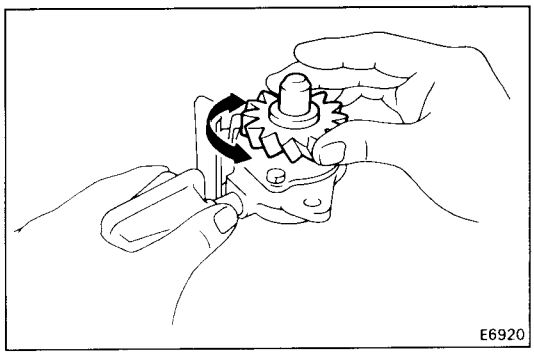
8. INSTALL OUTPUT SHAFT REAR BEARING

Using SST and a press, install the output shaft rear taper roller bearing.

SST 09506-30012

Oil Pump

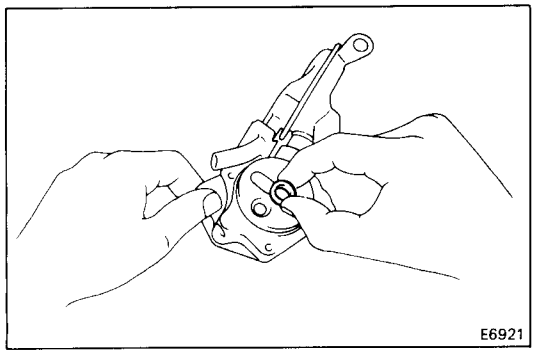




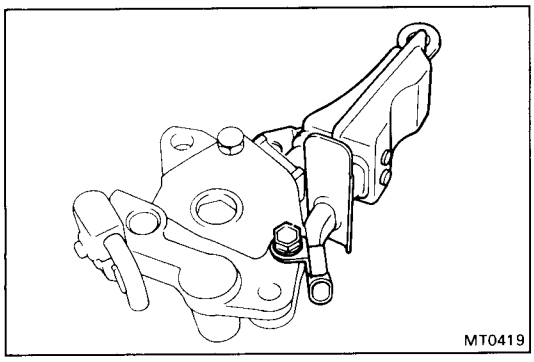
DISASSEMBLY OF OIL PUMP

1. CHECK OPERATION OF OIL PUMP

Install the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.

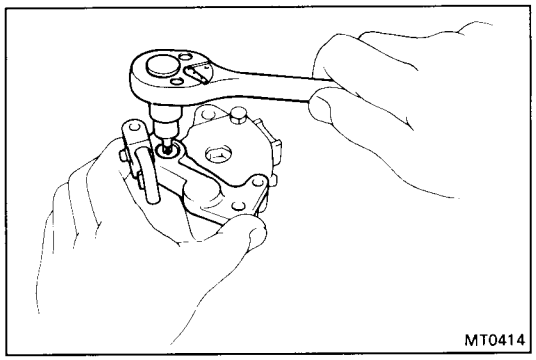


2. REMOVE GASKET FROM OIL PUMP CASE



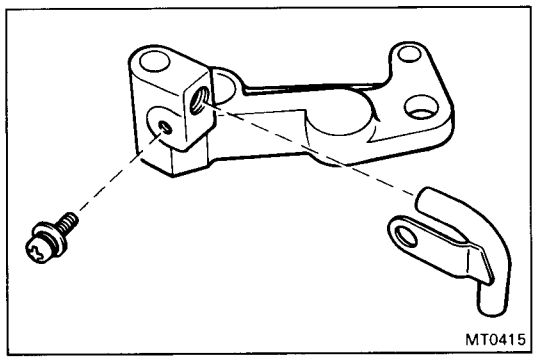
3. **REMOVE OIL STRAINER**

Remove the bolt and pull out the oil strainer.

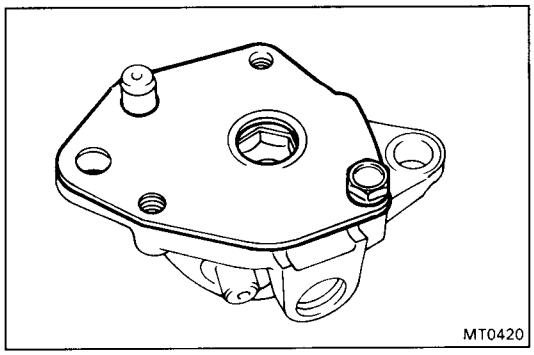


4. **REMOVE OIL LINE CASE AND OIL PIPE**

(a) Using a torx wrench, remove the torx screw and oil line case.

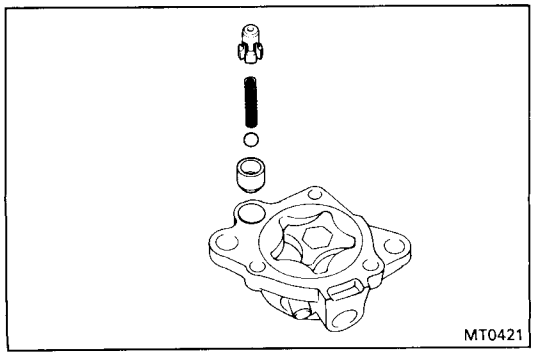


(b) Remove the No.3 oil pipe from the oil line case.

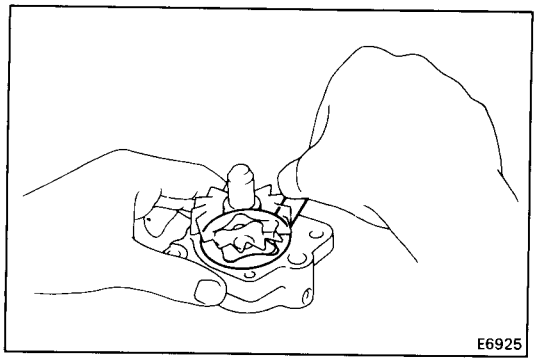


5. **REMOVE OIL PUMP COVER**

Remove the bolt and the oil pump cover.



6. **REMOVE NO.1 RELIEF VALVE ASSEMBLY**

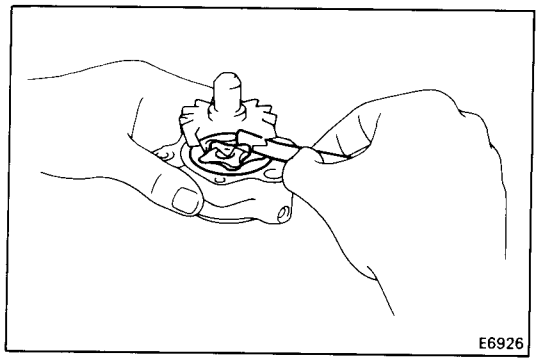


7. CHECK ROTOR BODY CLEARANCE

(a) Install the oil pump drive gear to the drive rotor.

(b) Using a feeler gauge, measure the body clearance between the driven rotor and oil pump case.

Standard clearance: 0.10 – 0.16 mm (0.0039 – 0.0063 in.)
Maximum clearance: 0.30 mm (0.0118 in.)

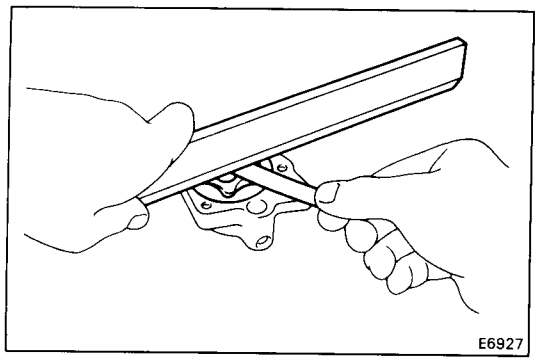


8. CHECK ROTOR TIP CLEARANCE

(a) Install the oil pump drive gear to the drive rotor.

(b) Using a feeler gauge, measure the tip clearance between the drive and driven rotors.

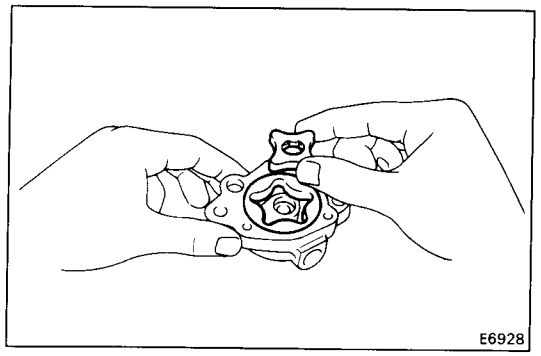
Standard clearance: 0.08 – 0.15 mm (0.0031 – 0.0059 in.)
Maximum clearance: 0.30 mm (0.0118 in.)



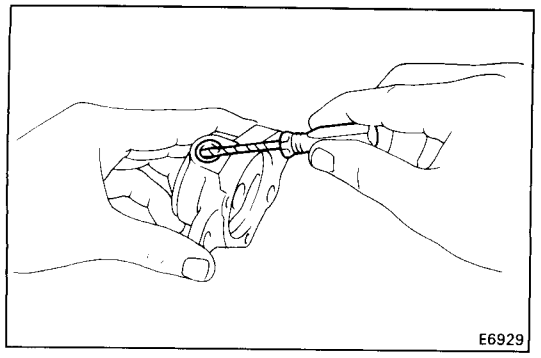
9. CHECK SIDE CLEARANCE

Using a precision straight edge and feeler gauge, measure the side clearance of both rotors.

Standard clearance: 0.03 – 0.08 mm (0.0012 – 0.0031 in.)
Maximum clearance: 0.15 mm (0.0059 in.)

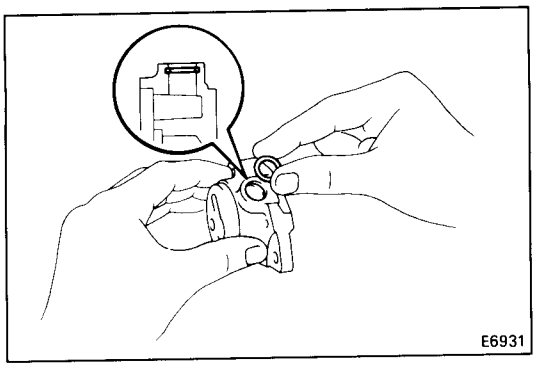


10. REMOVE OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR



11. REMOVE O-RING

Using a screwdriver, remove the O-ring from the oil pump case.



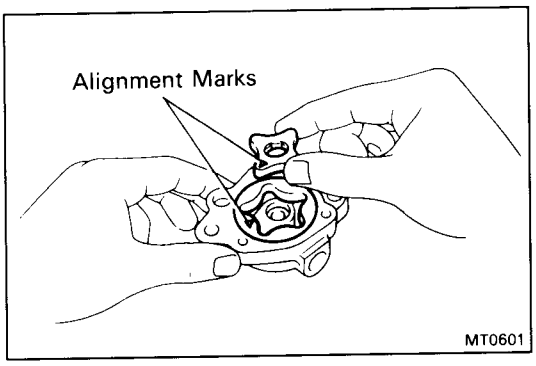
ASSEMBLY OF OIL PUMP

(See page MT-33)

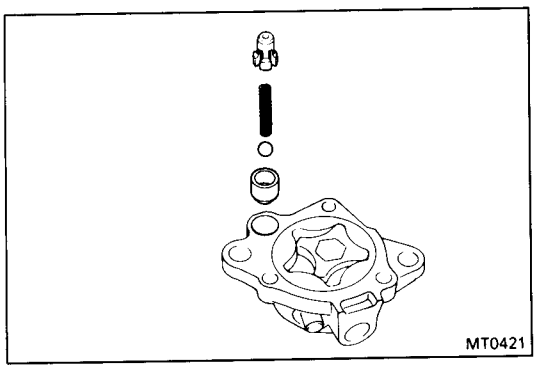
1. INSTALL NEW O-RING

(a) Apply the gear oil to a new O-ring.

(b) Install a new O-ring to the oil pump case.

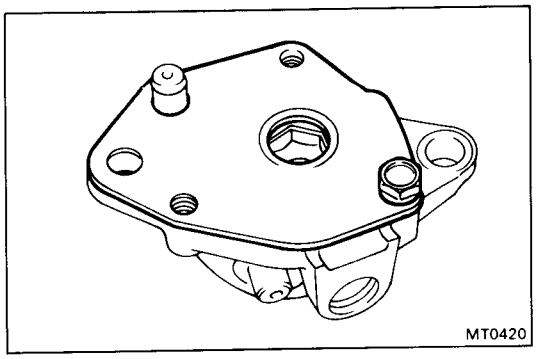


2. INSTALL DRIVEN ROTOR AND DRIVE ROTOR



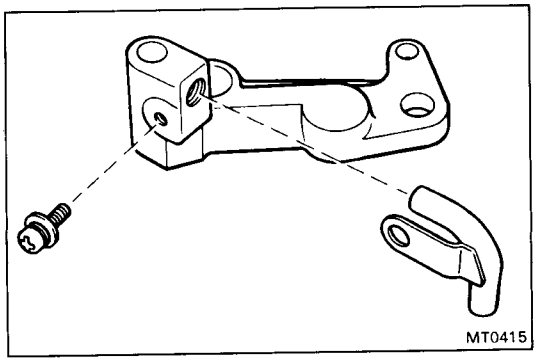
3. INSTALL NO.1 RELIEF VALVE ASSEMBLY

Install the relief valve seat, ball, spring and spring holder to the oil pump case.



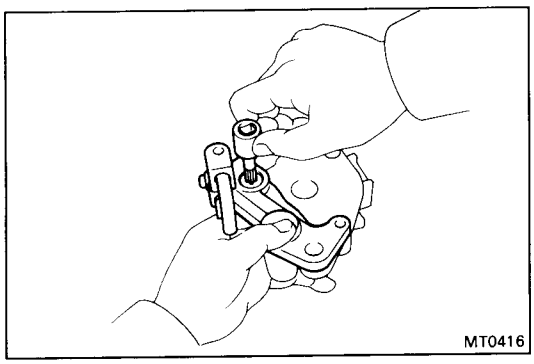
4. INSTALL OIL PUMP COVER

Temporarily install the bolt.

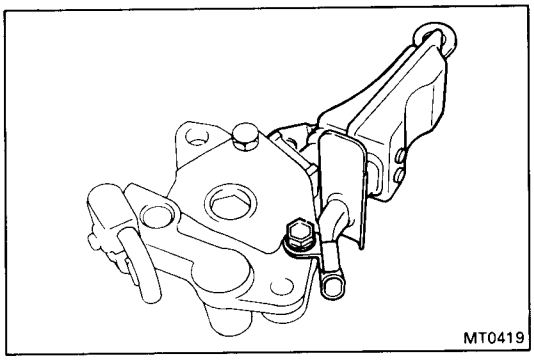


5. INSTALL OIL LINE CASE

(a) Install the No.3 oil pipe to the oil line case.

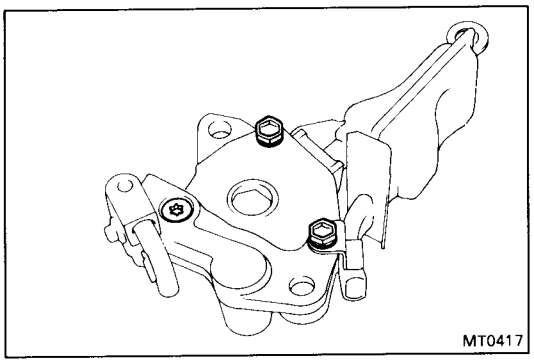


(b) Using a torx wrench, temporarily install the torx screw.



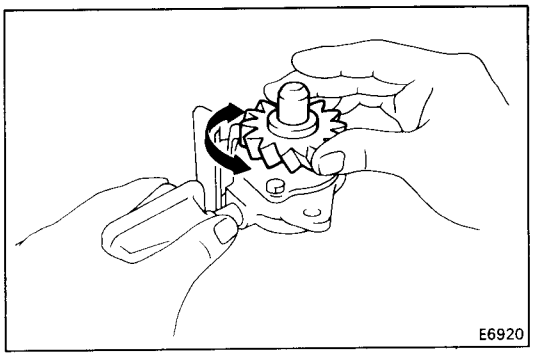
6. INSTALL OIL STRAINER

Install the oil strainer to the oil pump case, temporarily install the bolt.



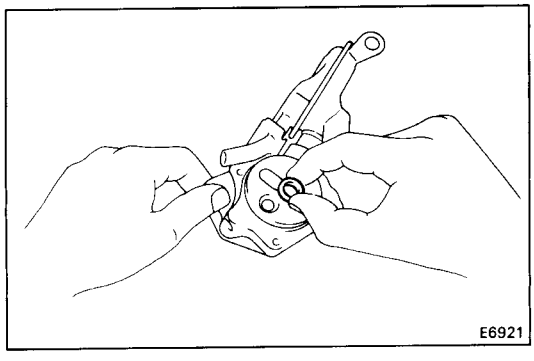
7. TORQUE OIL PUMP COVER BOLTS AND OIL LINE CASE TORX SCREW

Torque: 105 kg-cm (8 ft-lb, 10 N·m)



8. CHECK OPERATION OF OIL PUMP

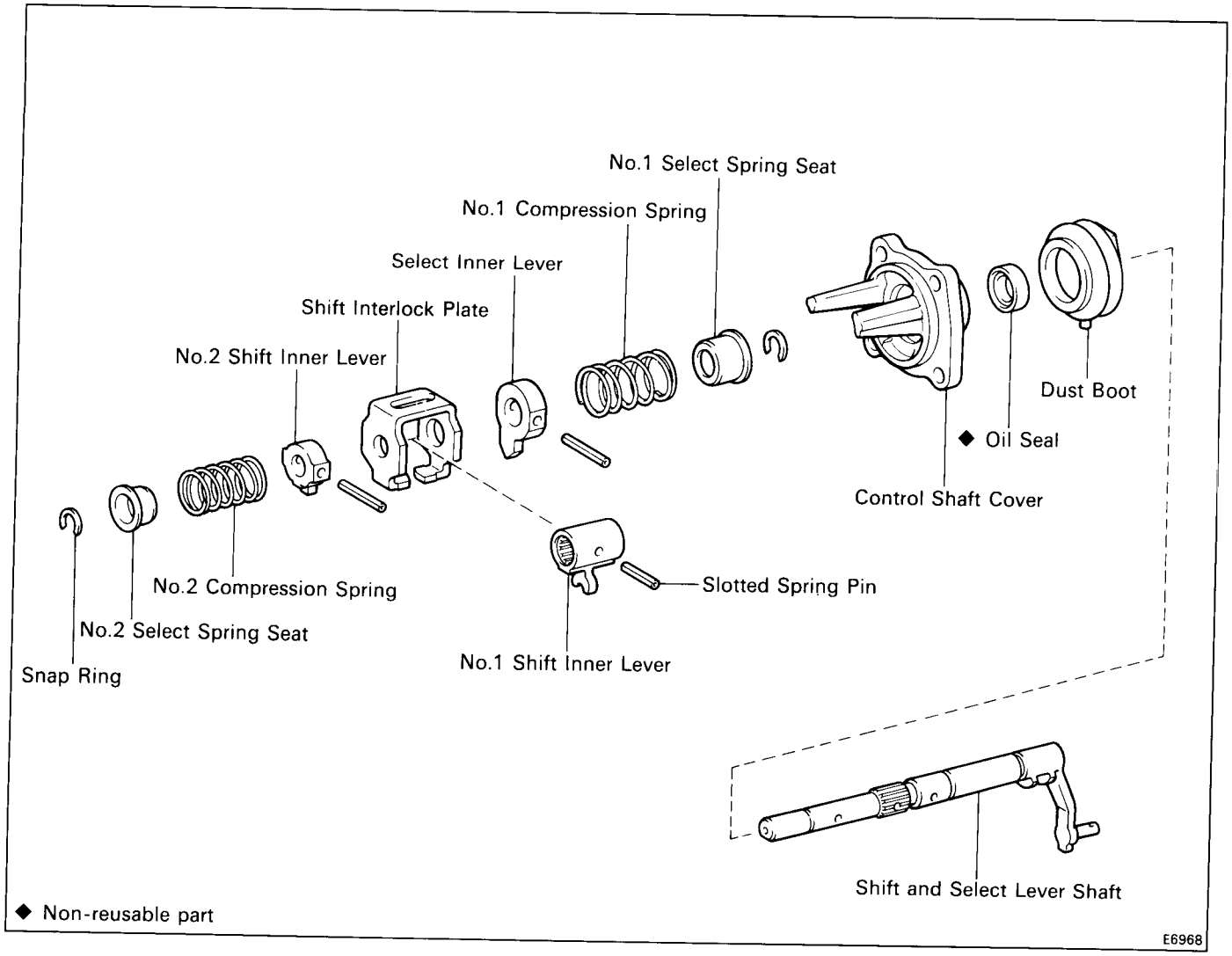
Insert the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.

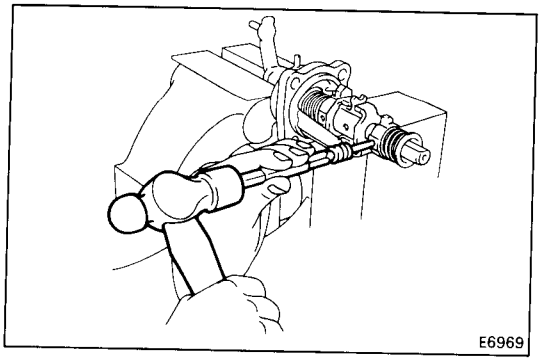


9. INSTALL GASKET

Install a new gasket to the oil pump case.

Shift and Select Lever Shaft

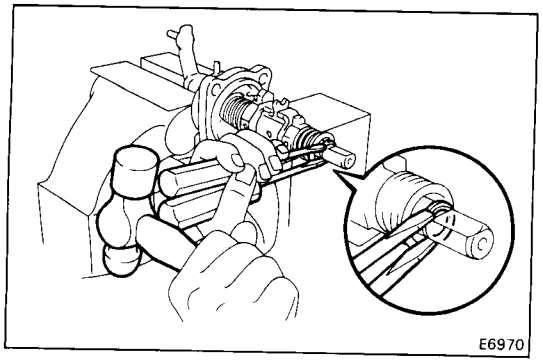




DISASSEMBLY OF SHIFT AND SELECT LEVER SHAFT

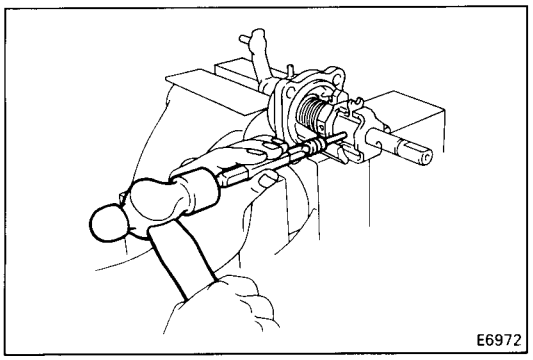
1. REMOVE NO.2 SHIFT INNER LEVER

(a) Using a pin punch and a hammer, drive out the slotted spring pin from No.2 shift inner lever.



(b) Using two screwdrivers and a hammer, remove the snap ring.

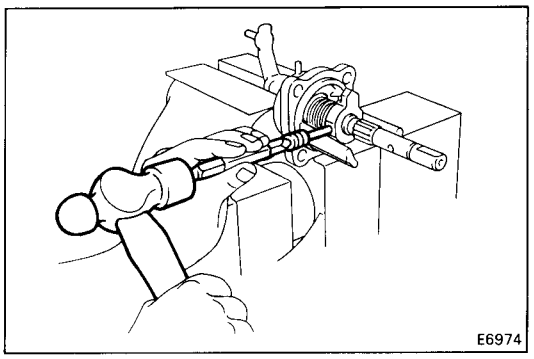
(c) Remove No.2 select spring seat, No.2 compression spring and No.2 shift inner lever.



2. REMOVE SHIFT INTERLOCK PLATE AND NO.1 SHAFT INNER LEVER

(a) Using a pin punch and hammer, drive out the slotted spring pin.

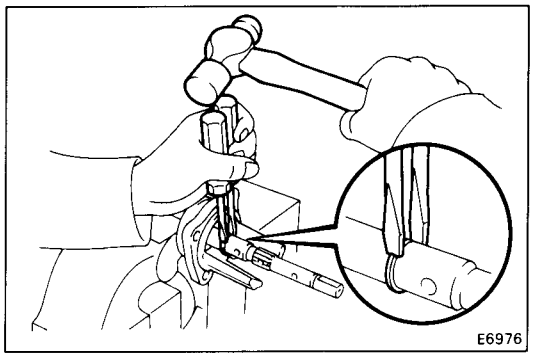
(b) Remove the shift interlock plate and No.1 shift inner lever.



3. REMOVE SELECT INNER LEVER

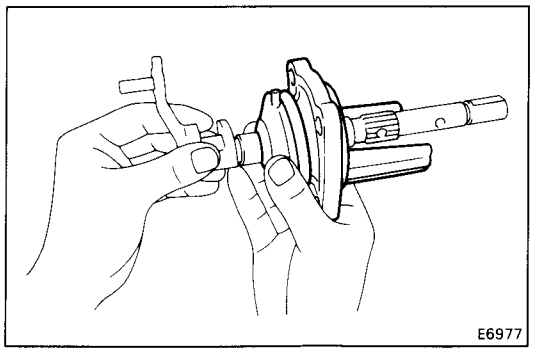
(a) Using a pin punch and hammer, drive out the slotted spring pin.

(b) Remove the select inner lever, No.1 compression spring and No.1 select spring seat.

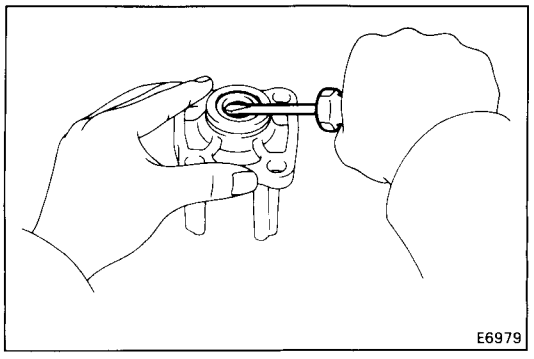


4. REMOVE SNAP RING

Using two screwdrivers and hammer, remove the snap ring.

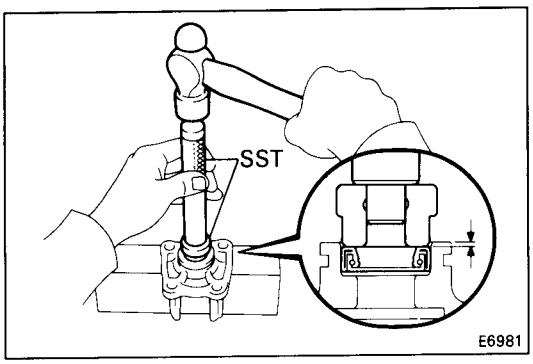


5. REMOVE CONTROL SHAFT COVER AND DUST BOOT



6. IF NECESSARY, REPLACE CONTROL SHAFT COVER OIL SEAL

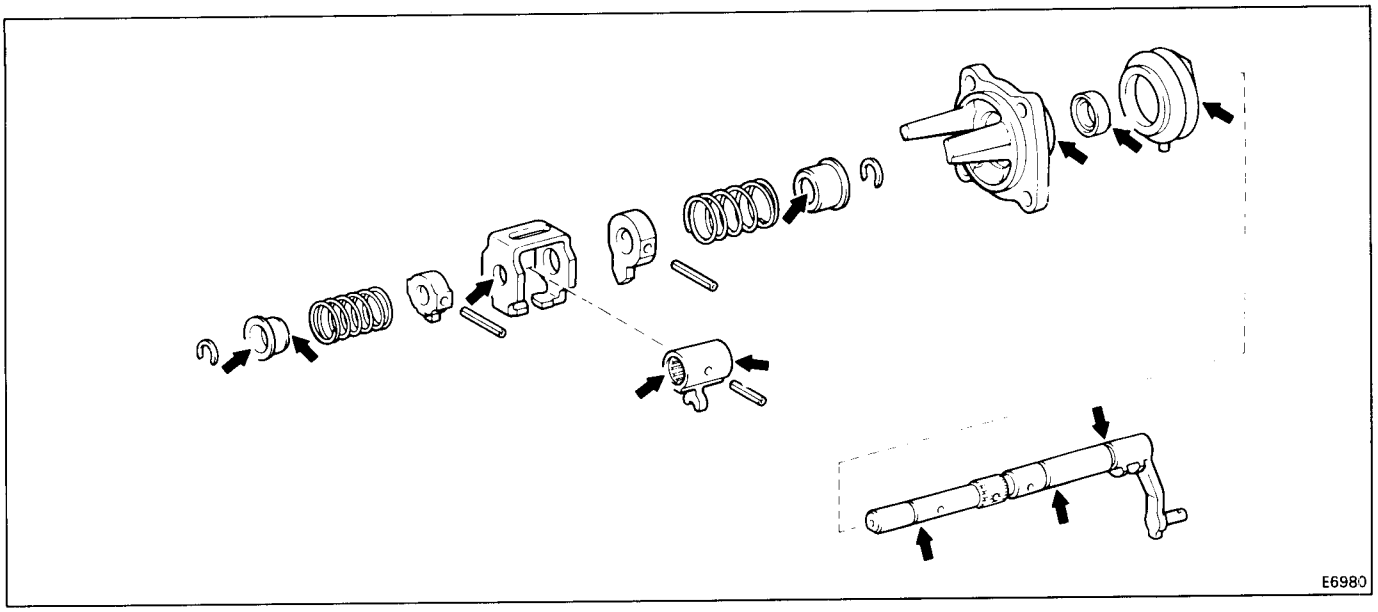
(a) Using a screwdriver, remove oil seal.



(b) Using SST and a hammer, drive in a new oil seal.
SST 09620-30010 (09627-30010, 09631-00020)
Oil seal depth: 0 – 1.0 mm (0 – 0.039 in.)
(c) Apply MP grease to the oil seal lip.

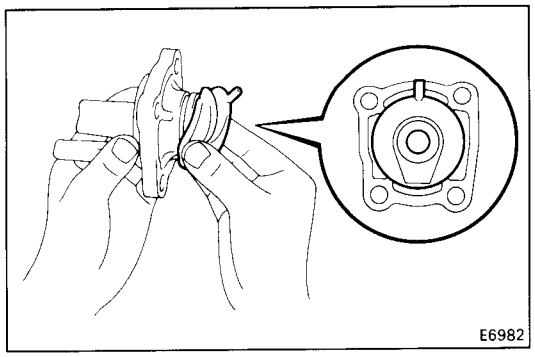
ASSEMBLY OF SHIFT AND SELECT LEVER SHAFT

1. APPLY MP GREASE TO PARTS, AS SHOWN

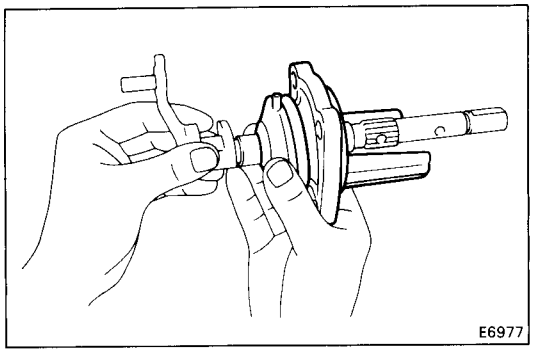


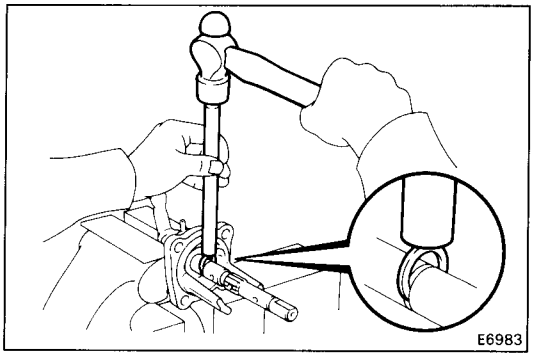
2. INSTALL SHIFT AND SELECT LEVER SHAFT

(a) Install the boot to the control shaft cover, as shown.



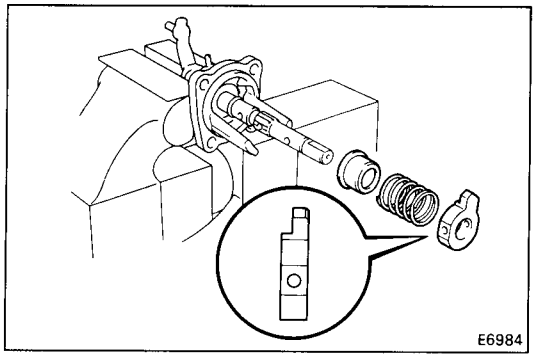
(b) Install the shift and select lever shaft to the control shaft cover.





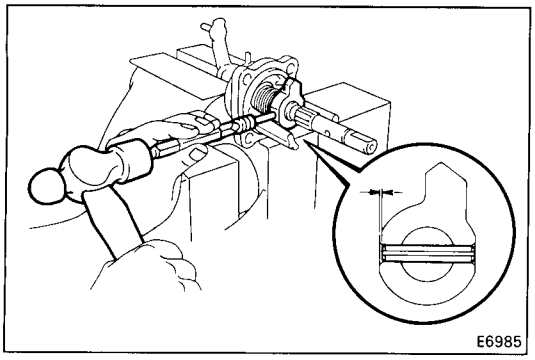
3. **INSTALL SNAP RING**

Using a brass bar and hammer, install the snap ring and spring seat.

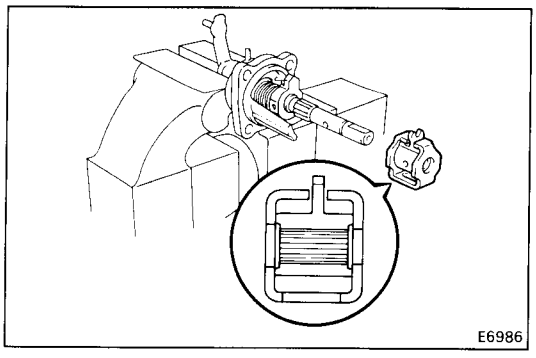


4. **INSTALL SELECT INNER LEVER**

(a) Install the No.1 spring seat, No.1 select spring and select inner lever, as shown.

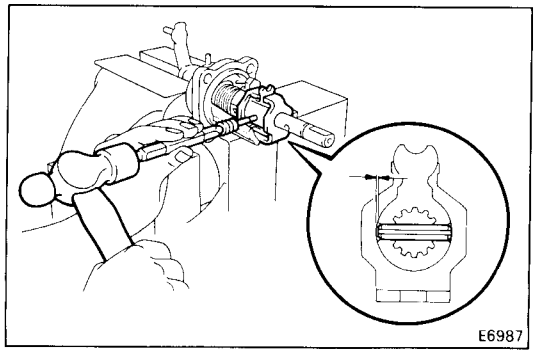


(b) Using a pin punch and hammer, drive in the slotted spring pin.



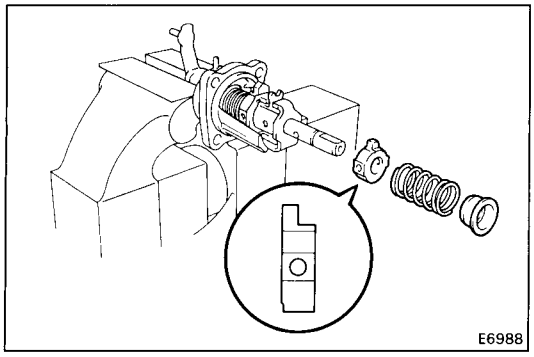
5. **INSTALL SHIFT INTERLOCK PLATE AND NO.1 SHIFT INNER LEVER**

(a) Install the shift interlock plate and No.1 shift inner lever.



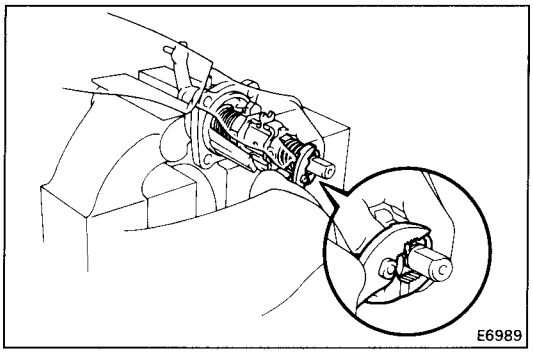
(b) Using a pin punch and hammer, drive in the slotted spring pin.

(c) Check that the shift interlock plate turns smoothly.

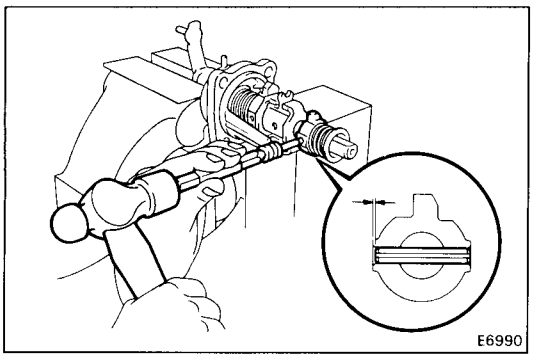


6. INSTALL NO.2 SHIFT INNER LEVER

(a) Install the No.2 shift inner lever, No.2 compression spring and No.2 select spring seat, as shown.

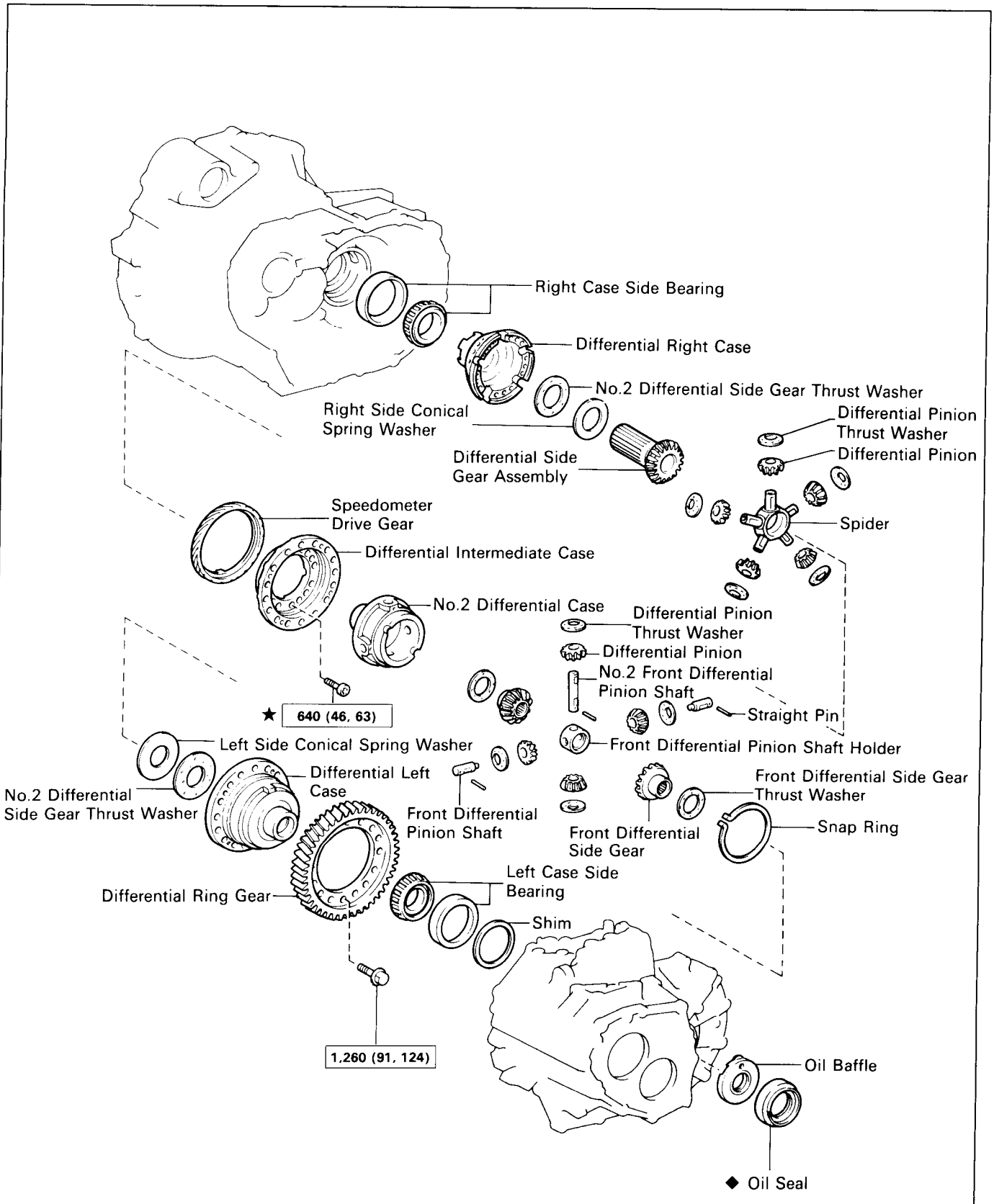


(b) Install the snap ring.



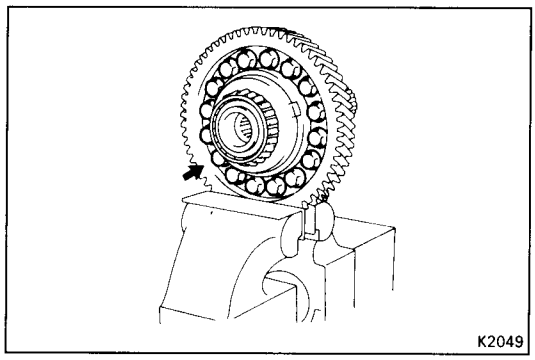
(c) Using a pin punch and hammer, drive in the slotted spring pin.

Differential Case



kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part
★ Precoated part

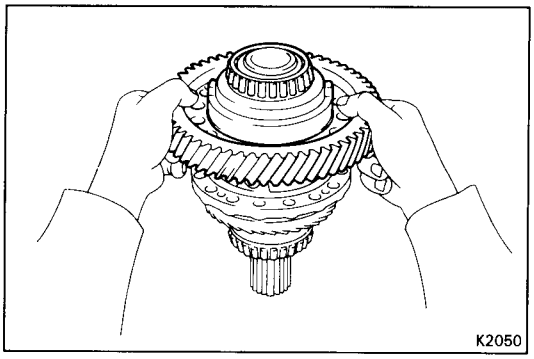
MT0602



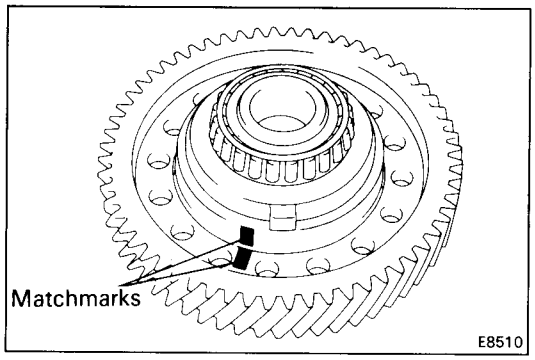
DISASSEMBLY OF DIFFERENTIAL CASE

1. REMOVE DIFFERENTIAL LEFT CASE

(a) Remove the sixteen bolts.

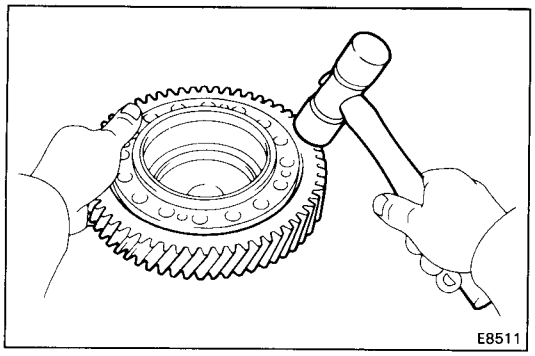


(b) Remove the differential left case up ward.

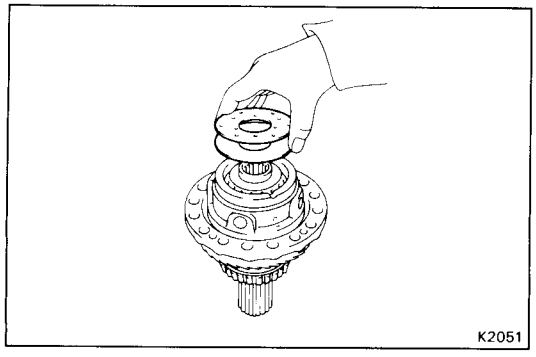


2. REMOVE RING GEAR

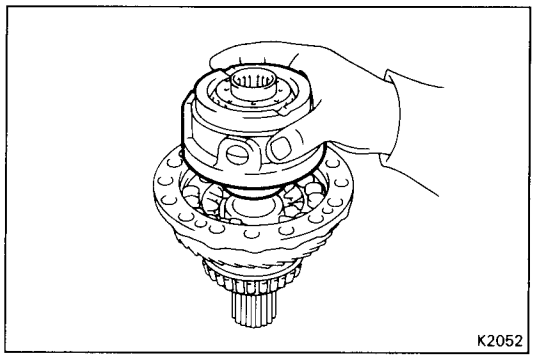
(a) Place the matchmarks on both the differential case and ring gear.



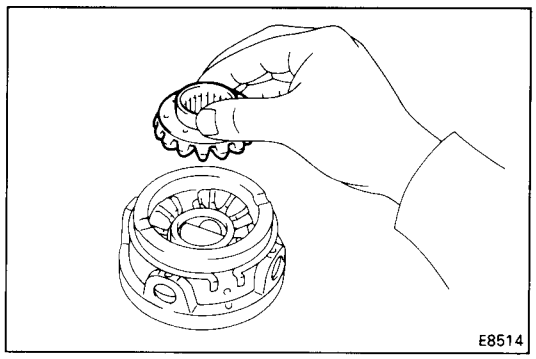
(b) Using a plastic hammer, tap out the ring gear.



3. REMOVE NO.2 DIFFERENTIAL SIDE GEAR THRUST WASHER AND CONICAL SPRING WASHER



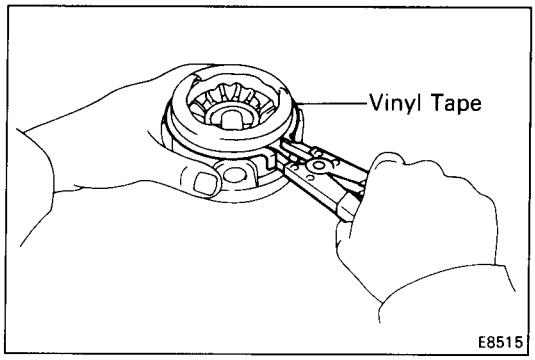
4. REMOVE DIFFERENTIAL NO.2 CASE ASSEMBLY



5. DISASSEMBLY DIFFERENTIAL NO.2 CASE

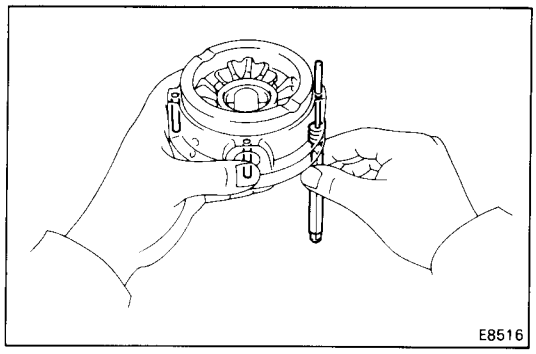
(a) Remove the front differential side gear together with thrust washer.

(b) Remove the front differential side gear thrust washer from the side gear.

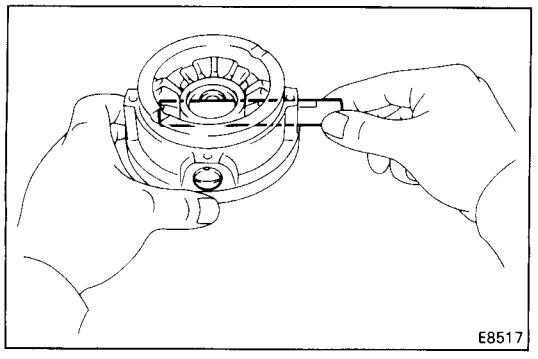


(c) Using snap ring pliers, remove the snap ring.

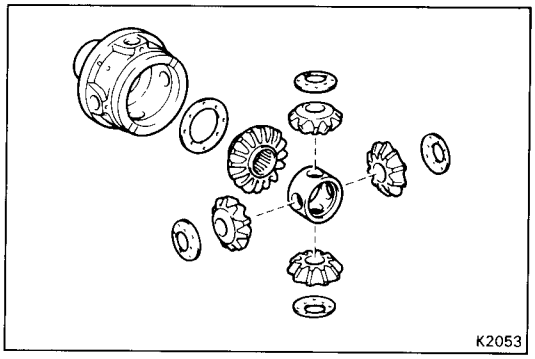
HINT: Before removing the shaft snap ring, wrap vinyl tape around the case prevent from damage.



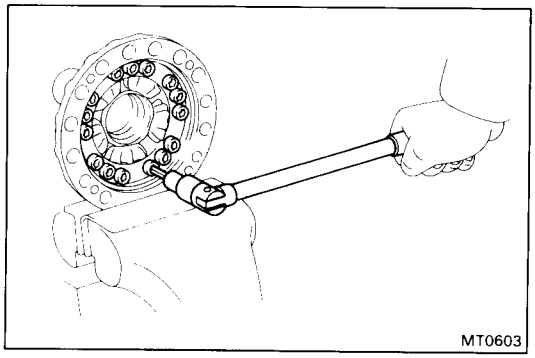
(d) Using a pin punch, push out the three straight pins.



(e) Remove the two front differential pinion shafts and No.2 front differential pinion shaft.

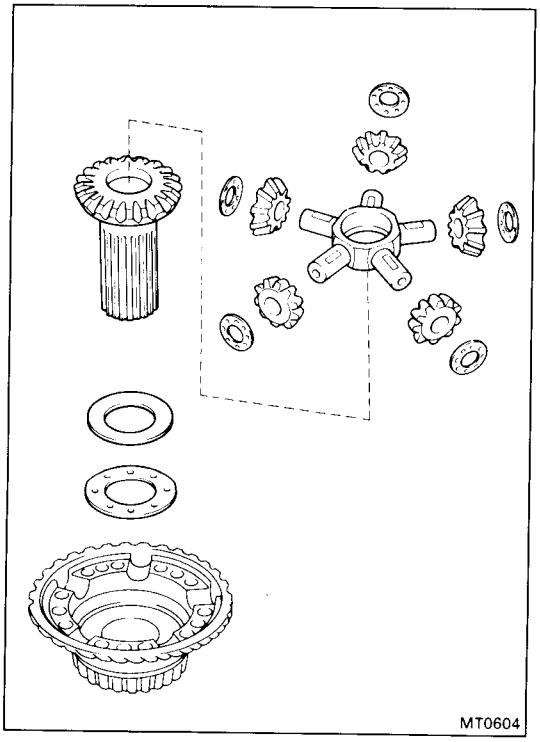


(f) Remove the pinion shaft holder, four differential pinions, pinion thrust washers, front side gear and thrust washer from the differential No.2 case.



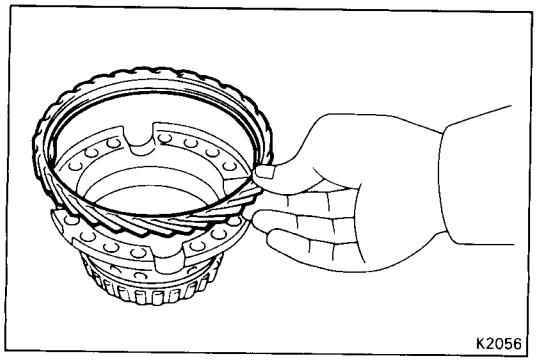
6. REMOVE DIFFERENTIAL INTERMEDIATE CASE

Using a torx wrench, remove the fifteen torx screws and differential intermediate case.

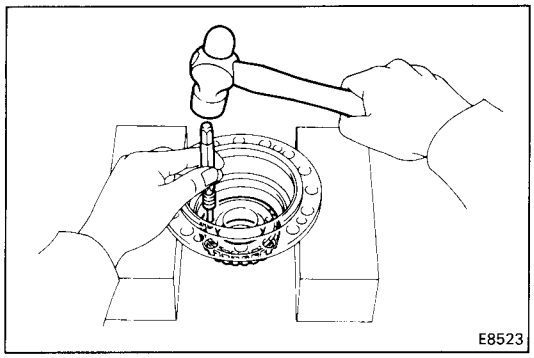


7. DISASSEMBLY DIFFERENTIAL RIGHT CASE

(a) Remove the differential spider, five pinions, pinion thrust washers, side gear subassembly, conical spring washer and No.2 side gear thrust washer.

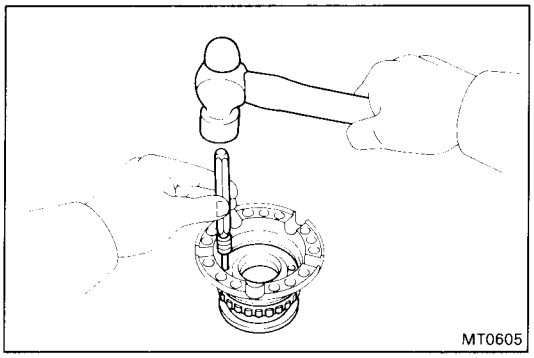


8. REMOVE SPEEDOMETER DRIVE GEAR



9. REMOVE SIDE BEARING

(a) Using a pin punch and hammer, drive out the side bearing evenly through two holes in the differential left case.



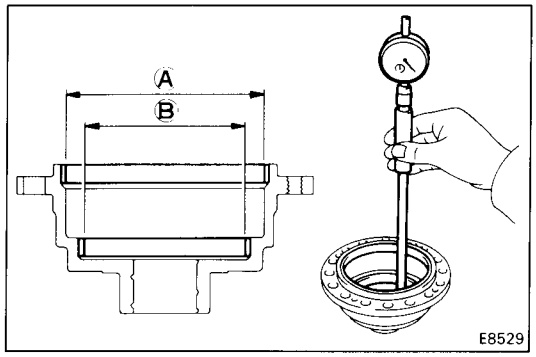
(b) Using a pin punch, hammer and SST, drive out the side bearing evenly through four holes in the differential right case.

SST 09316-60010 (09316-00020)

INSPECTION OF DIFFERENTIAL CASE

1. MEASURE DIFFERENTIAL LEFT CASE

Using a cylinder gauge, measure the inner diameter of the differential left case bushing.

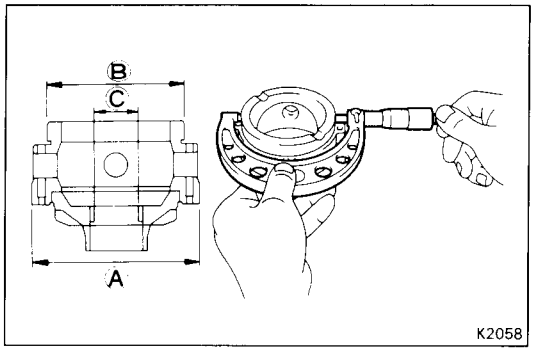


Standard clearance: **A 111.000 – 111.035 mm (4.3701 – 4.3714 in.)**
B 90.500 – 90.535 mm (3.5630 – 3.5644 in.)

Maximum diameter: **A 111.060 mm (4.3331 in.)**
B 90.560 mm (3.5653 in.)

2. MEASURE DIFFERENTIAL NO.2 CASE

Using a micrometer, measure the outer diameter of differential No.2 case.



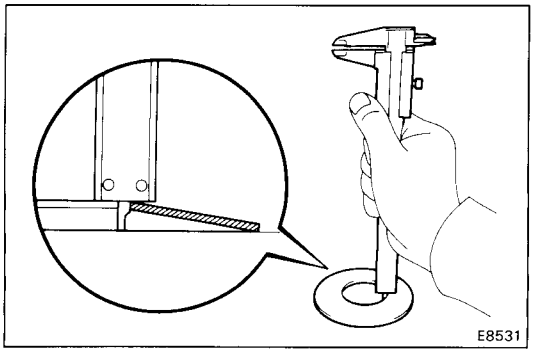
Standard clearance: **A 110.929 – 110.964 mm (4.3673 – 4.3686 in.)**
B 90.429 – 90.464 mm (3.5606 – 3.5615 in.)
C 35.000 – 35.025 mm (1.3778 – 1.3789 in.)

Minimum diameter: **A 110.850 mm (4.3642 in.)**
B 90.350 mm (3.5571 in.)

Maximum diameter: **C 35.030 mm (1.3791 in.)**

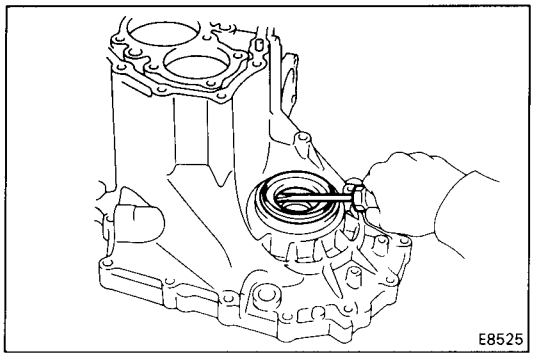
3. MEASURE CONICAL SPRING WASHER

Using a caliper, measure the height of the conical spring washer.



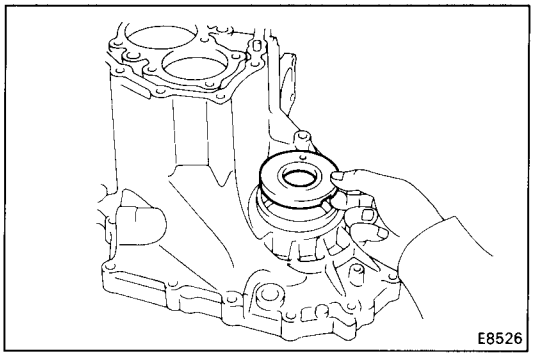
Standard height:
Left conical spring washer
2.60 – 2.80 mm (0.102 – 0.110 in.)
Right conical spring washer
1.70 – 1.90 mm (0.067 – 0.075 in.)

Minimum height:
Left conical spring washer
2.50 mm (0.098 in.)
Right conical spring washer
1.60 mm (0.063 in.)

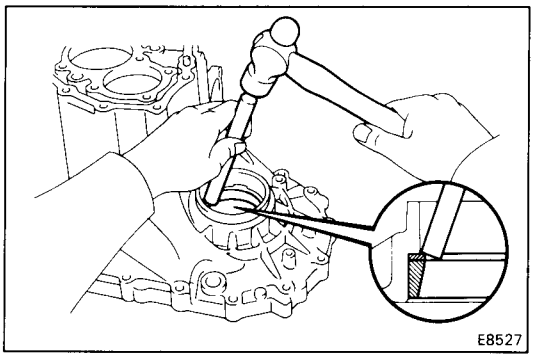


4. **(Transmission Case Side)**
IF NECESSARY, REPLACE OIL SEAL AND TAPERED ROLLER BEARING OUTER RACE

(a) Using a screwdriver, remove the oil seal.

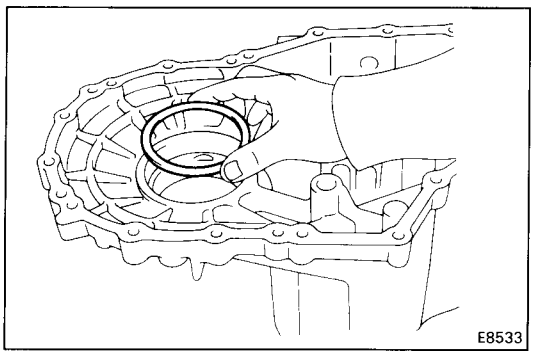


(b) Remove the transmission oil baffle.



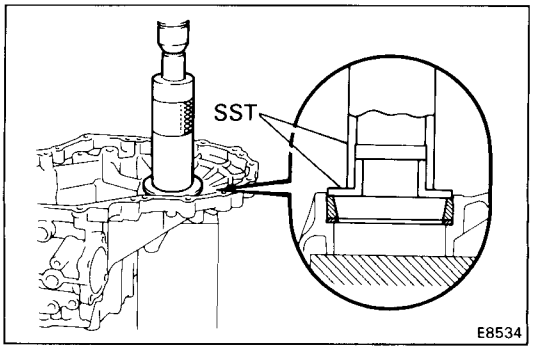
(c) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly.

(d) Remove the adjust shim.



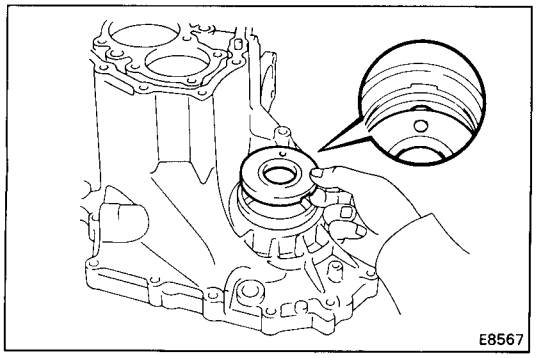
(e) Install the adjust shim.
(See page MT-83)

HINT: First select and install a shim of lesser thickness than before.



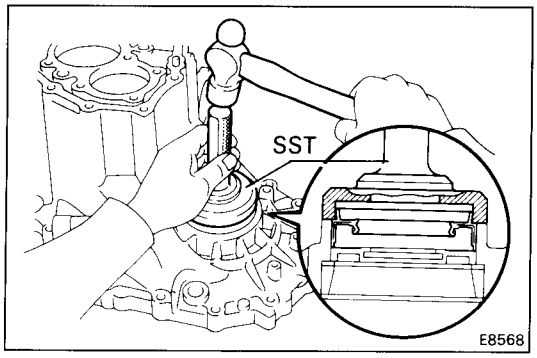
(f) Using SST and a press, install the tapered roller bearing outer race.

SST 09316-60010 (09316-00010,09316-00040)



(g) Install the transmission oil baffle.

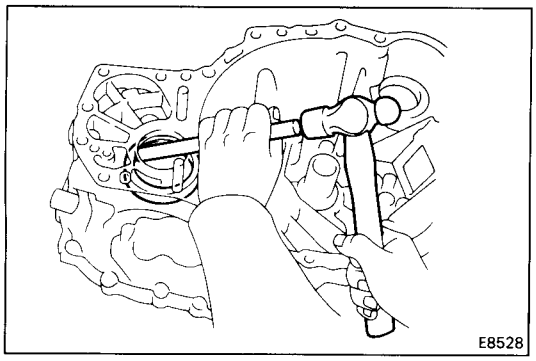
HINT: Install the transmission oil baffle projection into the case side cutout.



(h) Using SST, drive in a new oil seal.

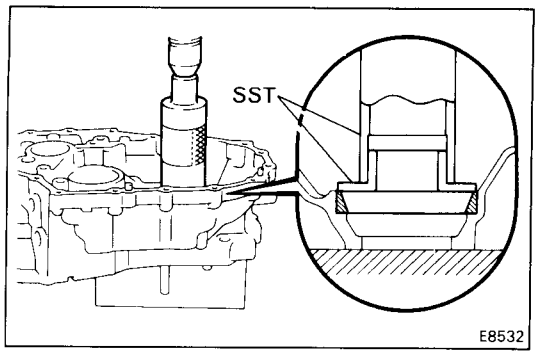
SST 09223-15010

(i) Coat the lip of the oil seal with MP grease.



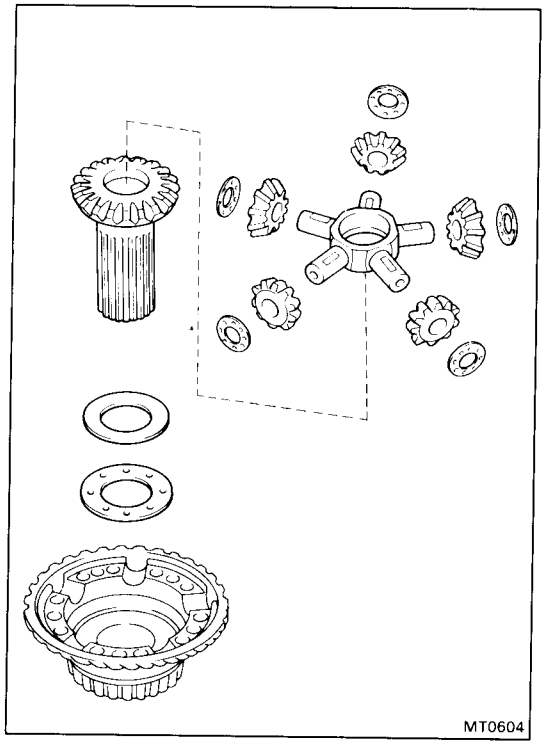
5. **(Transfer Case Side)**
IF NECESSARY, REPLACE TAPERED ROLLER BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly through the cut-out portion on the transaxle case.



(b) Using SST and a press, install the tapered roller bearing outer race.

SST 09316-60010 (09316-00010, 09316-00040)



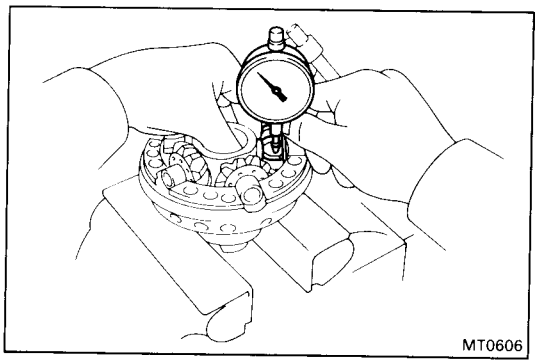
ASSEMBLY OF DIFFERENTIAL CASE

HINT: Coat all of the sliding surface with gear oil before assembly.

1. **CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR BACKLASH**
(Differential Side Gear Sub Assembly)

(a) Install the No.2 side gear thrust washer, (Temporarily install) 1.0 mm (0.039 in.) size thrust washer, differential side gear subassembly, spider, five pinions and pinion thrust washers to the differential right case.

HINT: Thrust washer 1.0 mm (0.039 in.) size is for check of backlash.



(b) Using a dial indicator, measure the backlash of one pinion gear while holding the differential side gear sub assembly toward the case.

Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

HINT: Push the pinion gear of the right side of the differential case.

Referring to the table below, select the No.2 thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

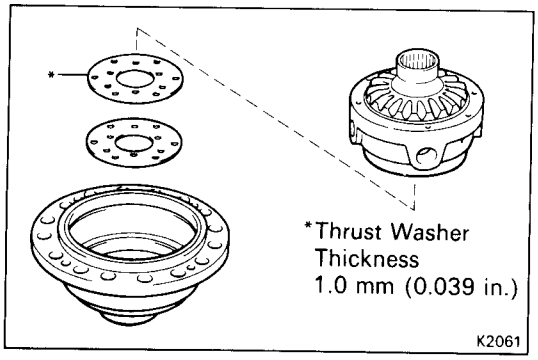
Mark	Thickness mm (in)	Mark	Thickness mm (in.)
–	0.80 (0.0315)	–	1.15 (0.0453)
–	0.85 (0.0335)	–	1.20 (0.0472)
–	0.90 (0.0354)	–	1.25 (0.0492)
–	0.95 (0.0374)	–	1.30 (0.0512)
–	1.00 (0.0394)	–	1.35 (0.0531)
–	1.05 (0.0413)	–	1.40 (0.0551)
–	1.10 (0.0433)		

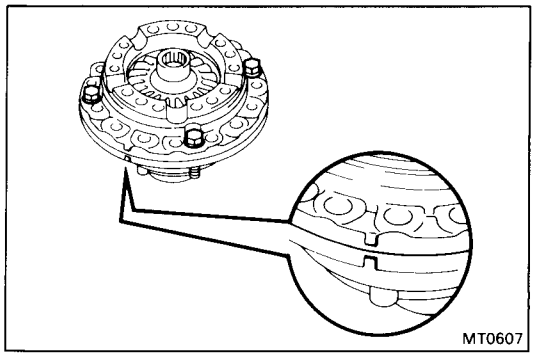
(c) Remove the differential right case.

(No.2 Differential Case)

(a) Install the No.2 side gear thrust washer, (Temporarily install) 1.0 mm (0.039 in.) size thrust washer and differential No.2 case to the differential left case.

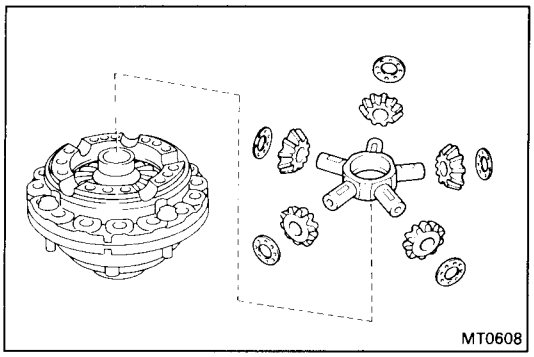
HINT: Thrust washer 1.0 mm (0.039 in.) size is for check of backlash.



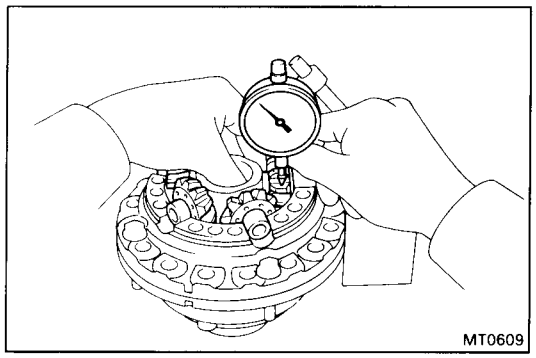


(b) Using four transmission case cover bolts, install the differential intermediate case to the left case.

HINT: Align the alignment marks on the differential left case and connect the intermediate case.



(c) Install the differential spider, five pinions and pinion thrust washers to the differential intermediate case.



(d) Using a dial indicator, measure the backlash of one pinion gear while holding the No.2 differential case.

Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

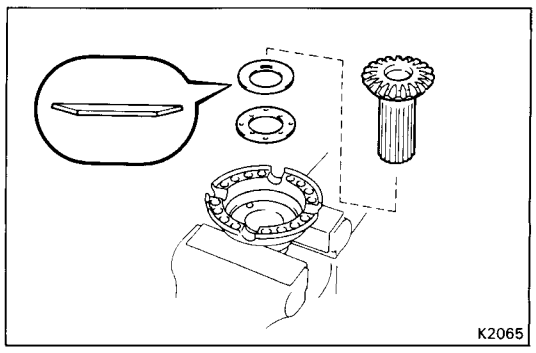
HINT: Push the pinion gear of the differential intermediate case.

Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
–	0.80 (0.0315)	–	1.15 (0.0453)
–	0.85 (0.0335)	–	1.20 (0.0472)
–	0.90 (0.0354)	–	1.25 (0.0492)
–	0.95 (0.0374)	–	1.30 (0.0512)
–	1.00 (0.0394)	–	1.35 (0.0531)
–	1.05 (0.0413)	–	1.40 (0.0551)
–	1.10 (0.0433)		

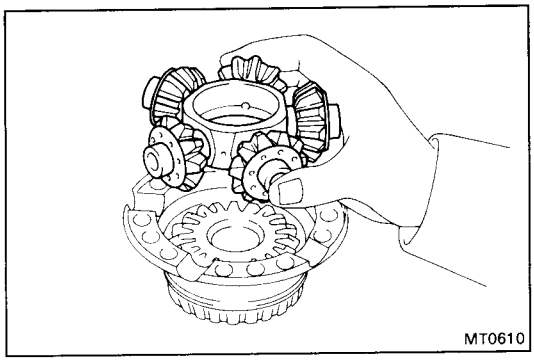
(e) Remove the differential case.

2. ASSEMBLY DIFFERENTIAL RIGHT CASE

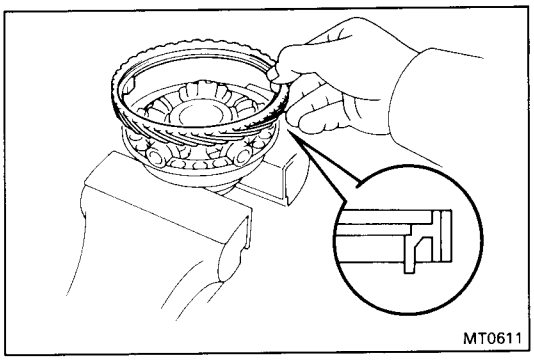


(a) Install the No.2 side gear thrust washer (previously selected), conical spring washer and differential side gear subassembly to the right case.

HINT: Be careful not to mistake the direction of conical spring washer.

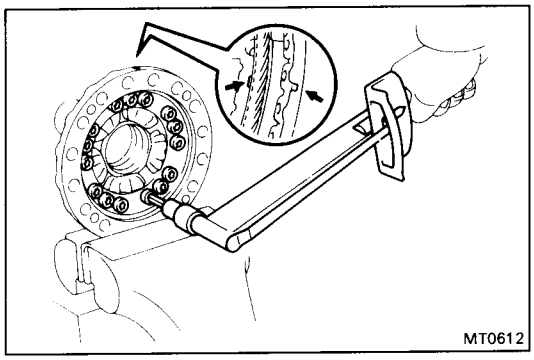


(b) Install the differential spider, five pinion and pinion thrust washers to the differential right case.



3. INSTALL SPEEDOMETER DRIVE GEAR

Install the speedometer drive gear to the differential right case.

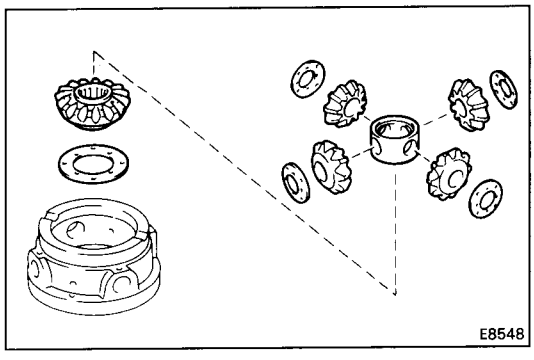


4. INSTALL DIFFERENTIAL INTERMEDIATE CASE

(a) Align the alignment marks on the right case and connect the intermediate case.

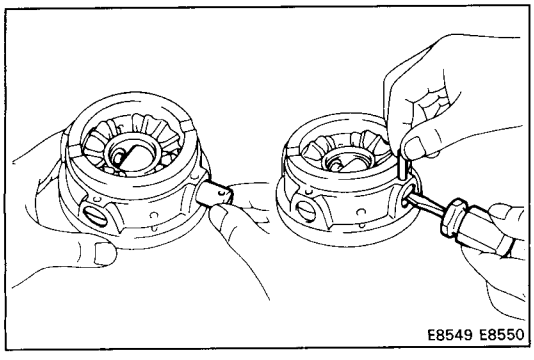
(b) Install the fifteen torx screws. Using a torx wrench, tighten the screws uniformly and a little at a time in succession. Torque the screws.

Torque: 640 kg-cm (46 ft-lb, 63 N·m)



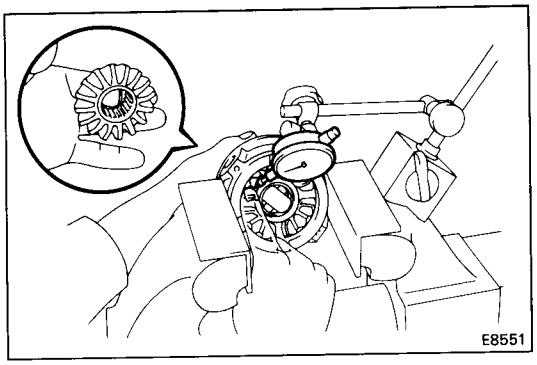
5. CHECK AND ADJUST FRONT SIDE GEAR BACKLASH (Differential No.2 Case)

(a) Install the front differential side gear thrust washer, side gear, pinion shaft holder, four pinions and thrust washers.



(b) Fit No.2 case pin hole and pinion shaft pin hole, install the No.2 pinion shaft and two pinion shafts to the No.2 case.

(c) Install the three straight pins.



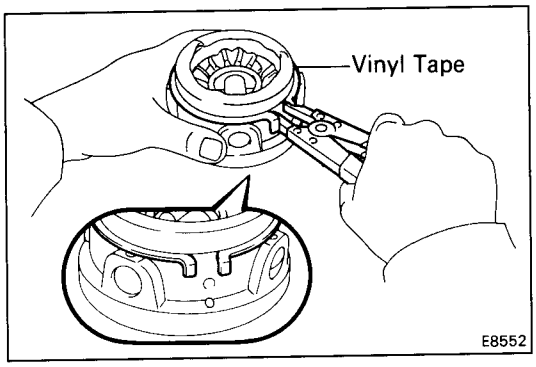
(d) Using a dial indicator, measure the backlash of one pinion gear while holding the front differential side gear toward the case.

Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

HINT: Do not mount the surface of No.2 differential case which contacts with bushing in a vise.

Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

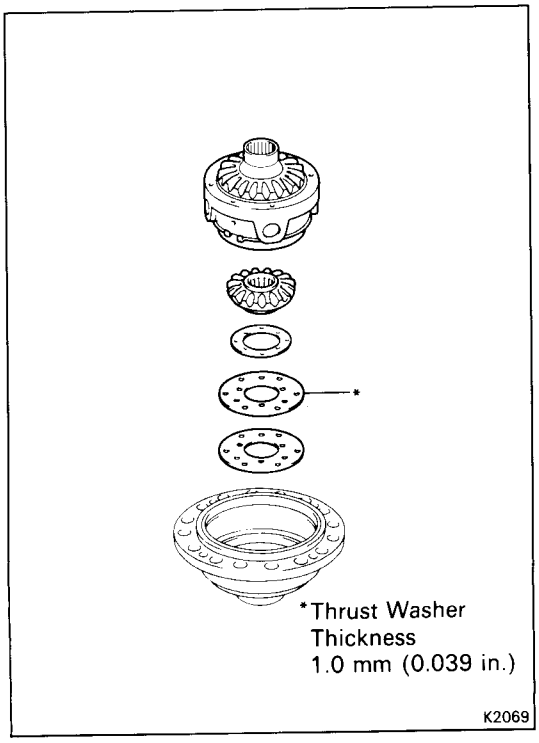
Mark	Thickness	mm (in.)
B	1.00	(0.0394)
C	1.05	(0.0413)
D	1.10	(0.0433)
E	1.15	(0.0453)
F	1.20	(0.0472)
G	1.25	(0.0492)



6. INSTALL SNAP RING

Using snap ring pliers, install the shaft snap ring toward as shown.

HINT: Before installing the shaft snap ring, wrap vinyl tape around the case prevent from damage.

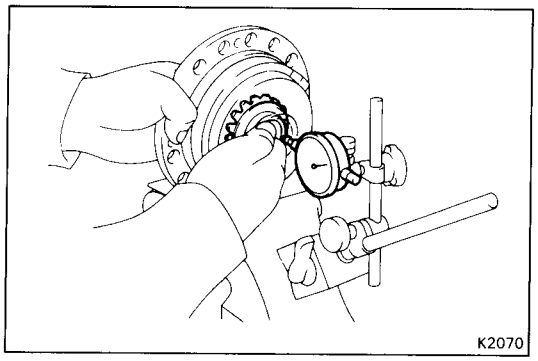


7. CHECK AND ADJUST FRONT DIFFERENTIAL SIDE GEAR THRUST CLEARANCE

(Differential Left Case)

(a) Install the No.2 side gear thrust washer, (Temporarily install) 1.0 mm (0.039 in.) size No.2 side gear thrust washer, front differential side gear thrust washer, side gear and No.2 case assembly.

HINT: Engage the front differential side gear and pinion gear of No.2 case.


K2070

(b) Using a dial indicator, measure the thrust clearance of front differential side gear while holding the No.2 case on the left side.

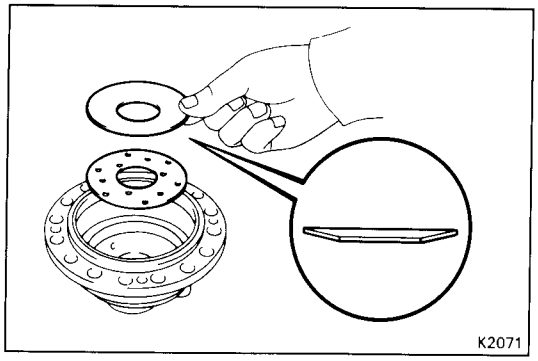
Standard clearance: 0.14 – 0.21 mm (0.006 – 0.008 in.)

HINT: Turning the side gear a bit, check the maximum value of thrust clearance.

Referring to the table below, select the thrust washer which will ensure that the thrust clearance within specification. Try to select a washer of the same size.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	0.95 (0.0374)	F	1.20 (0.0472)
B	1.00 (0.0394)	G	1.25 (0.0492)
C	1.05 (0.0413)	H	1.30 (0.0512)
D	1.10 (0.0433)	J	1.35 (0.0531)
E	1.15 (0.0453)	K	1.40 (0.0551)

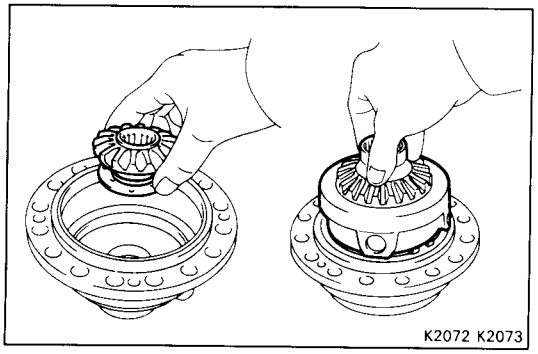
(c) Remove the differential left case.


K2071

8. ASSEMBLY DIFFERENTIAL LEFT CASE

(a) Install the No.2 side gear thrust washer (previously selected) and conical spring washer to the left case.

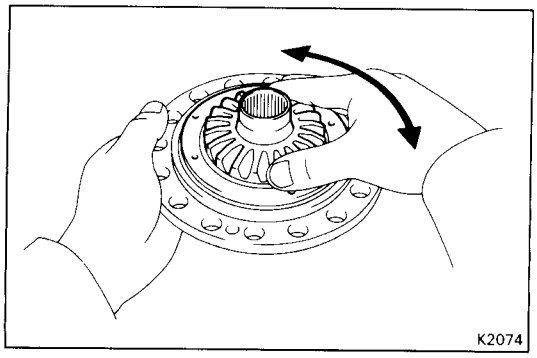
HINT: Be careful not to mistake the direction of conical spring washer.


K2072 K2073

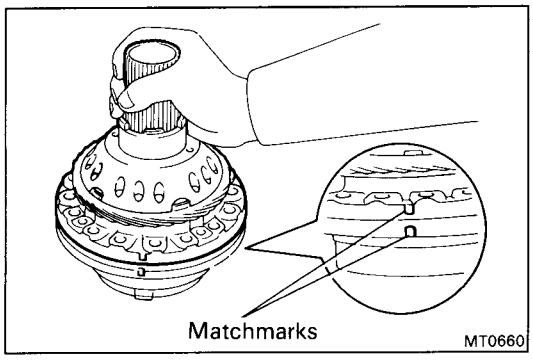
(b) Install the front differential side gear thrust washer and side gear to the left case.

(c) Install the differential No.2 case assembly.

HINT: Engage the front differential side gear and pinion gear of No.2 case.

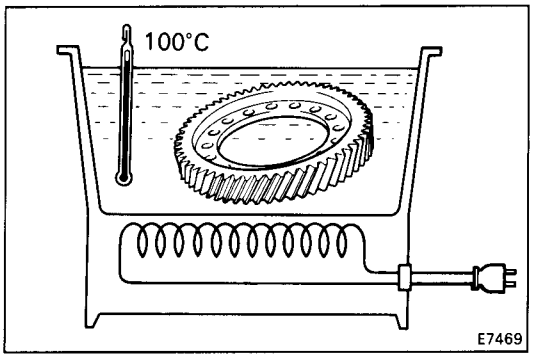

K2074

(d) Turning the differential No.2 case, check the turns smoothly.



(e) Install the intermediate case to the differential left case.

HINT: Align the matchmarks on the differential left case and connect the intermediate case.



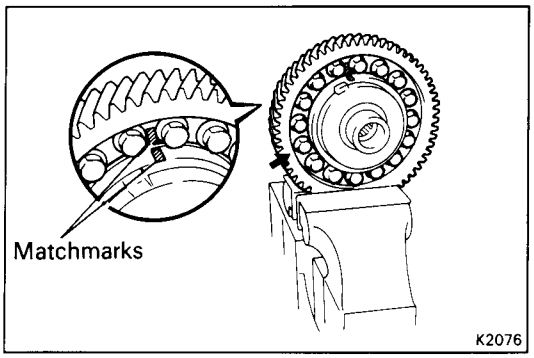
9. INSTALL RING GEAR

(a) Clean the contact surface of the differential left case.

(b) Heat the ring gear to about 100 °C (212 °F) in an oil bath.

NOTICE: Do not heat the ring gear above 110 °C (230 °F)

(c) Clean the contact surface of the ring gear with cleaning solvent.

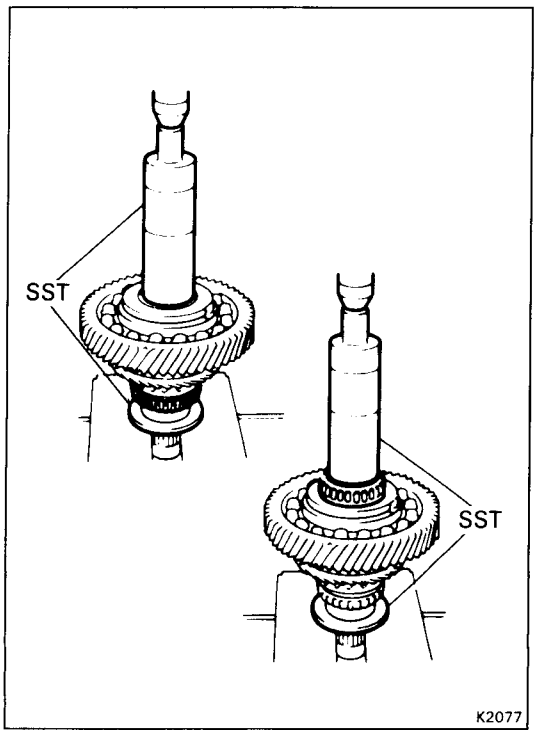


(d) Then quickly install the ring gear on the differential case.

HINT: Align the matchmarks on the differential left case and connect the ring gear.

(e) Install the sixteen set bolts. Tighten the set bolts uniformly and a little at a time in succession. Torque the bolts.

Torque: 1260 kg-cm (91 ft-lb, 124 N·m)

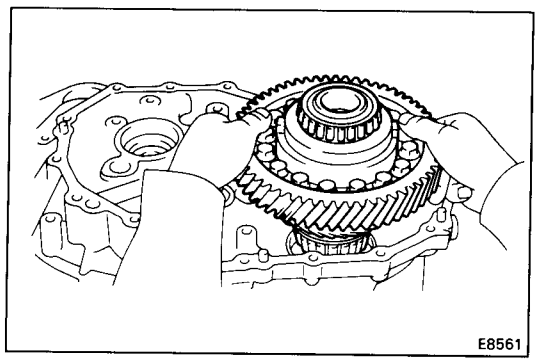


10. INSTALL SIDE BEARING

Using SST and a press, install the side bearing to the differential case.

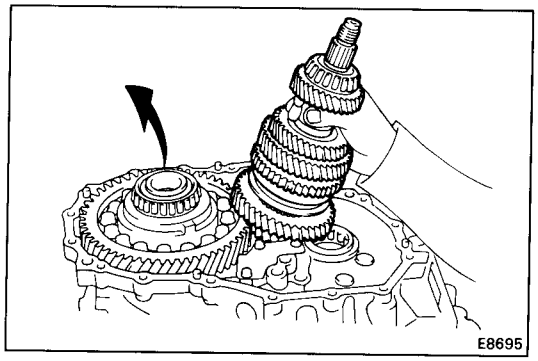
SST 09316-20011 and 09316-60010 (09316-00010)

11. ADJUST OUTPUT SHAFT PRELOAD
(See page MT-84)



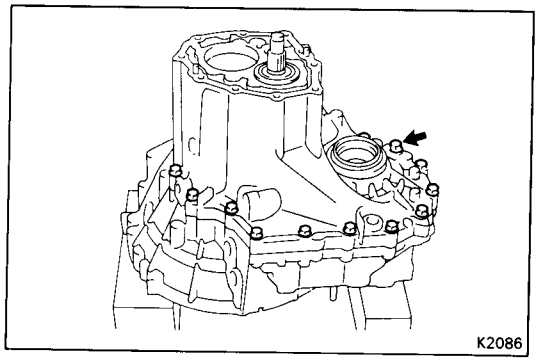
12. INSTALL DIFFERENTIAL CASE ASSEMBLY

Install the differential case assembly to the transaxle case.



13. INSTALL OUTPUT SHAFT ASSEMBLY

Lift up the differential case, install the output shaft assembly.



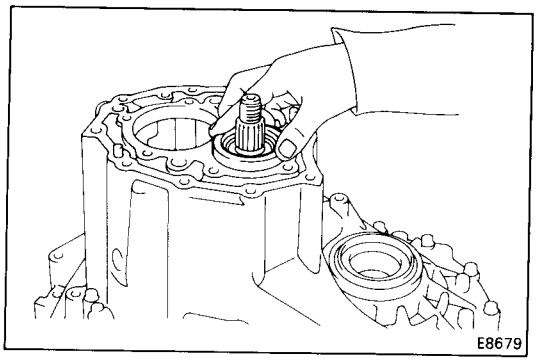
14. INSTALL TRANSMISSION CASE

(a) Install the transmission case.

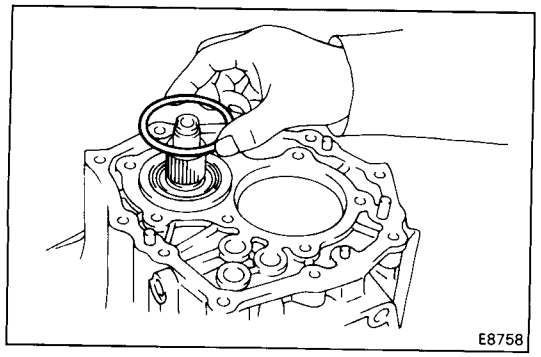
HINT: If necessary, tap on the case with a plastic hammer.

(b) Install and torque the seventeen bolts.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

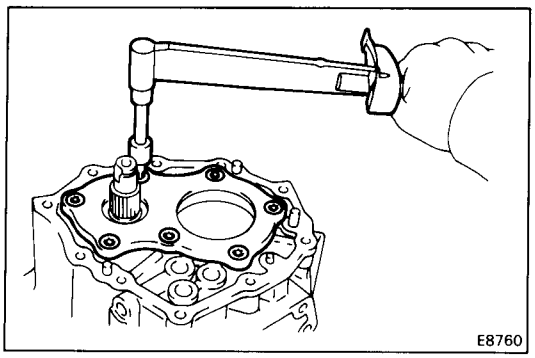


15. INSTALL OUTPUT SHAFT REAR TAPERED ROLLER BEARING OUTER RACE



16. INSTALL ADJUST SHIM
(See page MT-83)

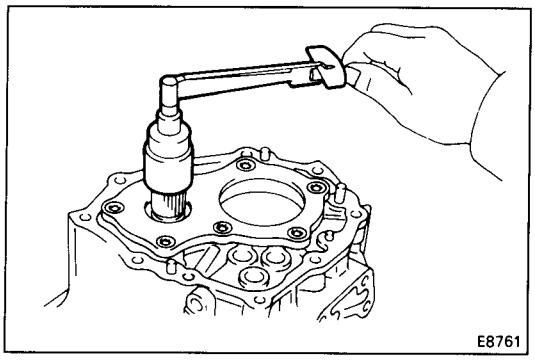
HINT: Install the previously selected shim.



17. INSTALL REAR BEARING RETAINER

Using a torx wrench, install and torque the seven torx screws.

Torque: 430 kg-cm (31 ft-lb, 42 N·m)



18. ADJUST DIFFERENTIAL CASE PRELOAD

(a) Install the new lock nut to the output shaft.

(b) Turn the output shaft right and left two or three times to allow the bearings to settle.

(c) Using a torque wrench, measure the preload.

Preload (at starting):

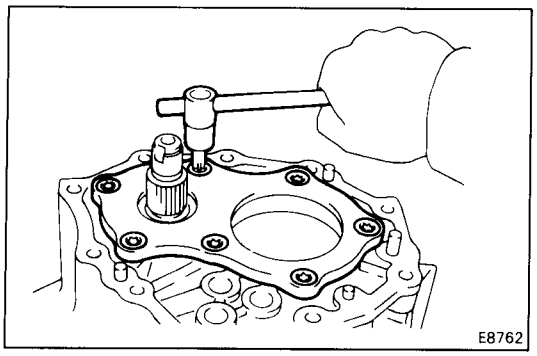
New bearing
Add output shaft preload
1.9 – 3.7 kg-cm
(1.6 – 3.2 in.-lb, 0.2 – 0.4 N·m)

Reused bearing
Add output shaft preload
1.2 – 2.3 kg-cm
(1.0 – 2.0 in.-lb, 0.1 – 0.2 N·m)

If the preload is not within specification, select the thrust washers.

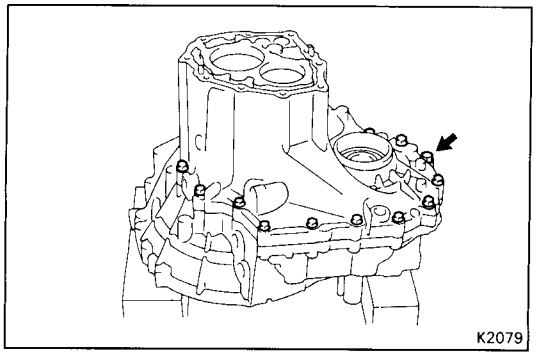
HINT: The preload will change about 1.3 kg-cm (1.13 in.-lb, 0.13 N·m) with each shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	2.00 (0.0787)	9	2.45 (0.0965)
1	2.05 (0.0807)	A	2.50 (0.0984)
2	2.10 (0.0827)	B	2.55 (0.1004)
3	2.15 (0.0846)	C	2.60 (0.1024)
4	2.20 (0.0866)	D	2.65 (0.1043)
5	2.25 (0.0886)	E	2.70 (0.1063)
6	2.30 (0.0906)	F	2.75 (0.1083)
7	2.35 (0.0925)	G	2.80 (0.1102)
8	2.40 (0.0945)	H	2.85 (0.1122)



19. REMOVE REAR BEARING RETAINER

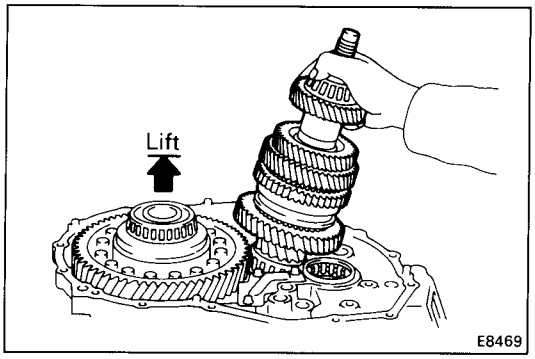
Using torx wrench, remove the seven torx screws and rear bearing retainer.



20. REMOVE ADJUST SHIM

21. REMOVE TRANSMISSION CASE

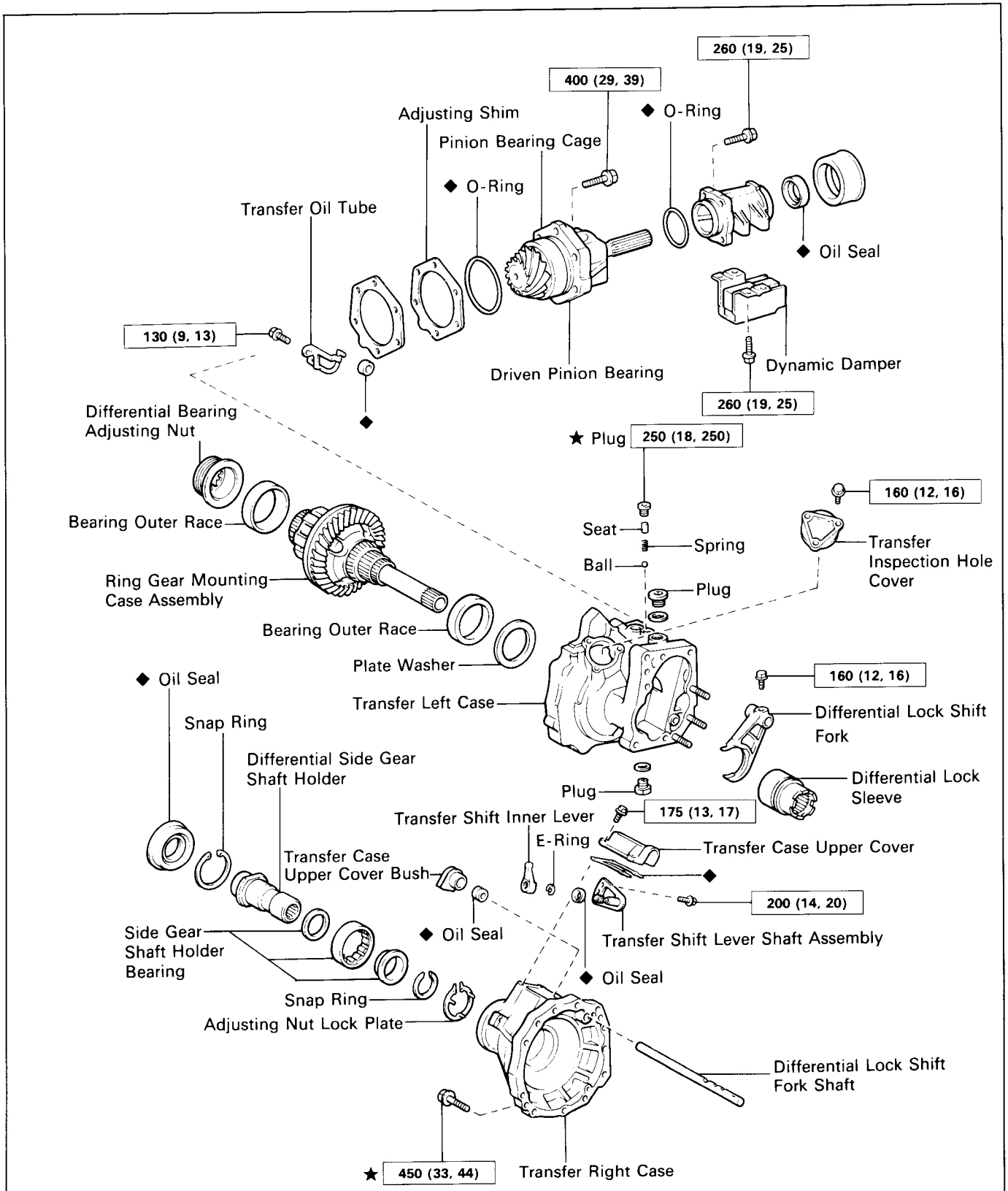
Remove the seventeen bolts and tap off the case with a plastic hammer.



22. **REMOVE OUTPUT SHAFT ASSEMBLY**

23. **REMOVE DIFFERENTIAL CASE ASSEMBLY**

Transfer

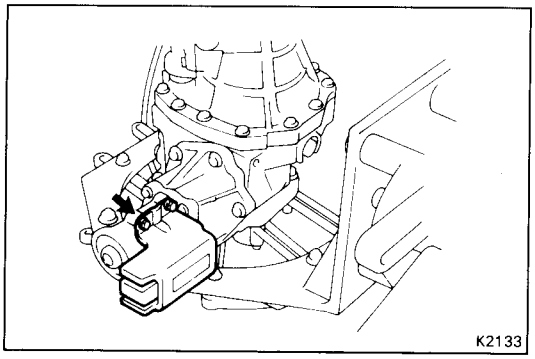


kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

★ Precoated part

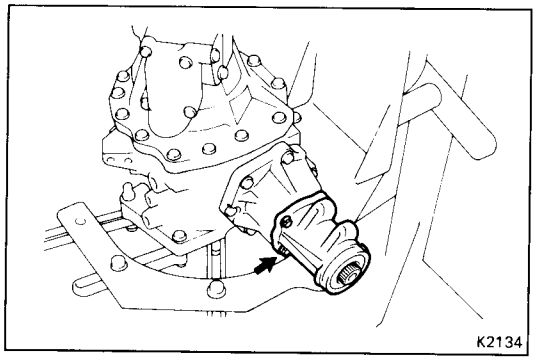
K2111



DISASSEMBLY OF TRANSFER COMPONENT PARTS

1. REMOVE DYNAMIC DAMPER

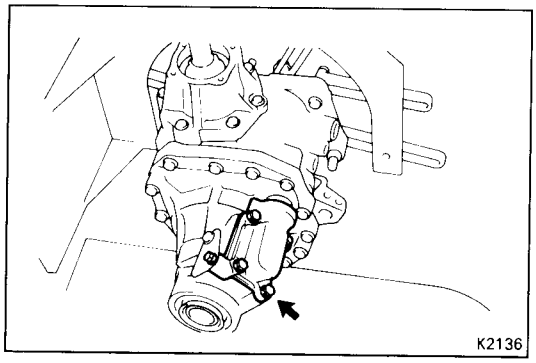
Remove the four bolts and dynamic damper.



2. REMOVE EXTENSION HOUSING

(a) Remove the four bolts and tap off the housing with a plastic hammer.

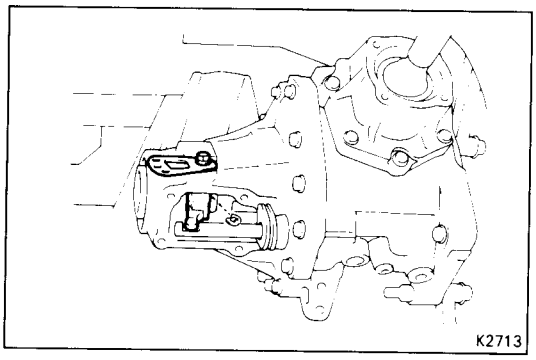
(b) Remove the O-ring from the extension housing.



3. REMOVE TRANSFER CASE COVER

(a) Remove the five bolts.

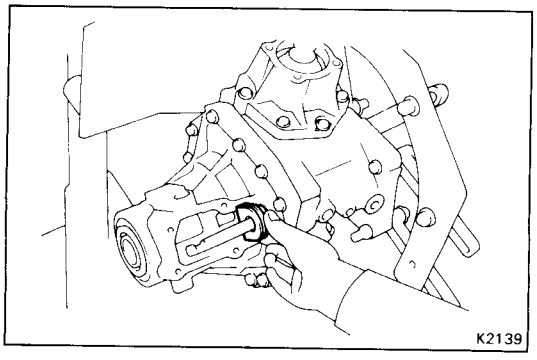
(b) Remove the case cover and gasket.



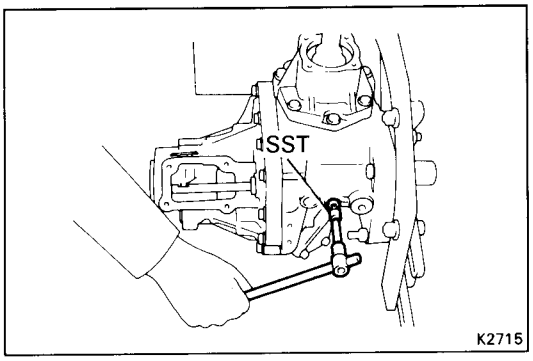
4. REMOVE SHIFT LEVER SHAFT AND INNER LEVER

(a) Remove the E-ring.

(b) Remove the shift lever shaft and inner lever.



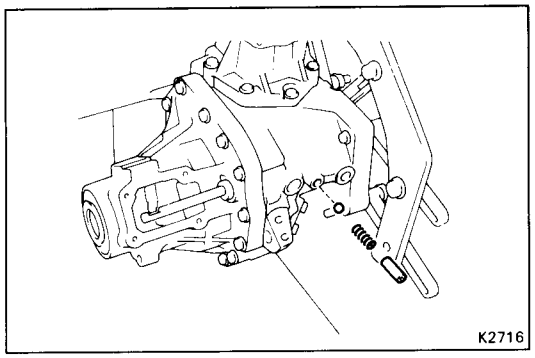
5. REMOVE TRANSFER CASE UPPER BUSHING



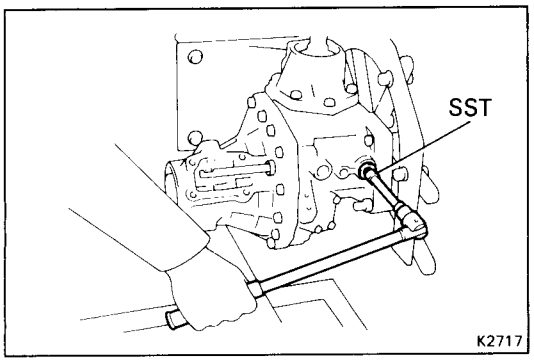
6. REMOVE PLUG, SEAT, SPRING AND LOCKING BALL

(a) Using SST, remove the plug.

SST 09313-30021



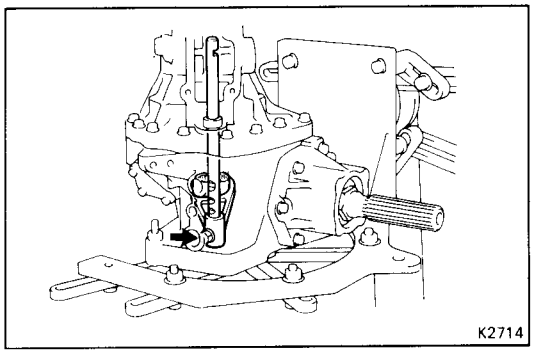
(b) Using a magnetic finger, remove the seat, spring and ball.



7. REMOVE DIFFERENTIAL LOCK SHIFT FORK AND SHIFT FORK SHAFT

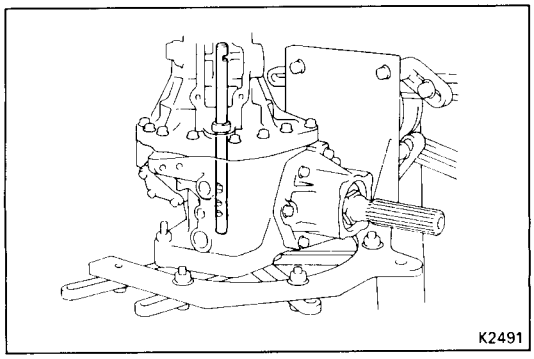
(a) Using SST, remove the plug.

SST 09043-38100

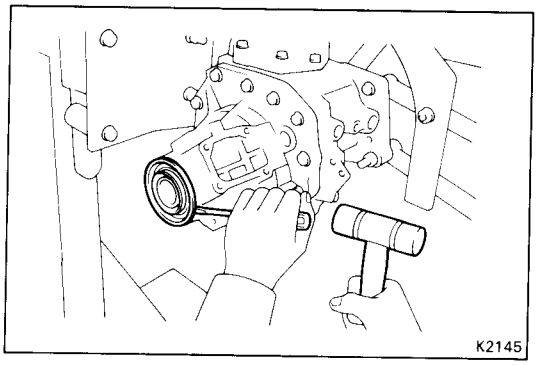


(b) Remove the set bolt.

(c) Remove the differential lock sleeve and shift fork.

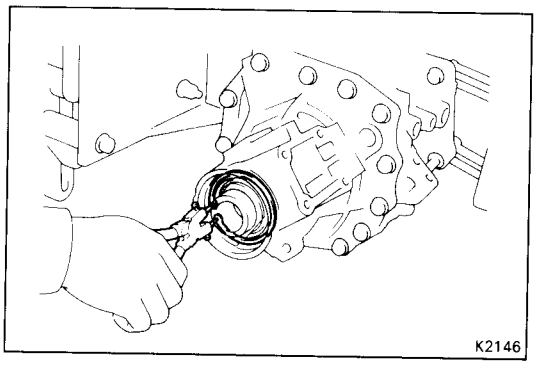


(d) Pull out the shift fork shaft.

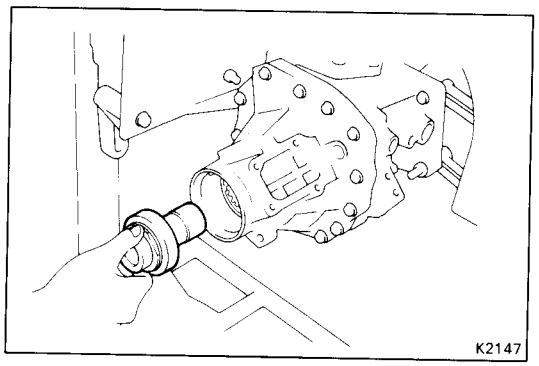


8. REMOVE SIDE GEAR SHAFT HOLDER

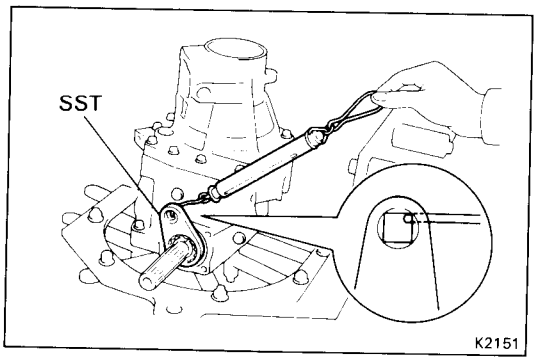
(a) Using a screwdriver and hammer, remove the oil seal.



(b) Using snap ring pliers, remove the snap ring.



(c) Remove the shaft holder.



9. CHECK PRELOAD

(a) Using SST and a spring tension gauge, measure the driven pinion preload of the backlash between the driven pinion and ring gear.

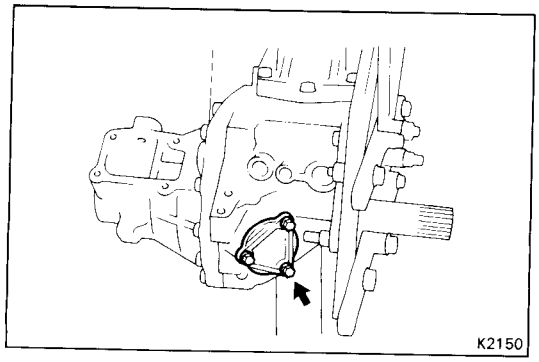
SST 09326-20011

Preload (at starting): 0.9 – 1.4 kg (2 – 3 lb, 9 – 14 N)

(b) Using SST and a spring tension gauge, measure the total preload.

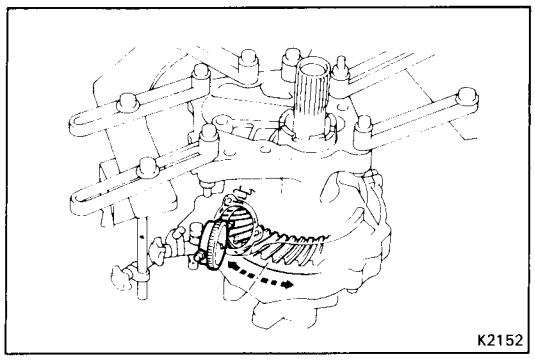
SST 09326-20011

Total preload (at starting):
Add driven pinion preload
0.5 – 0.9 kg (1 – 2 lb, 5 – 9 N)



10. REMOVE TRANSFER INSPECTION HOLE COVER

Remove the three bolts and a cover.

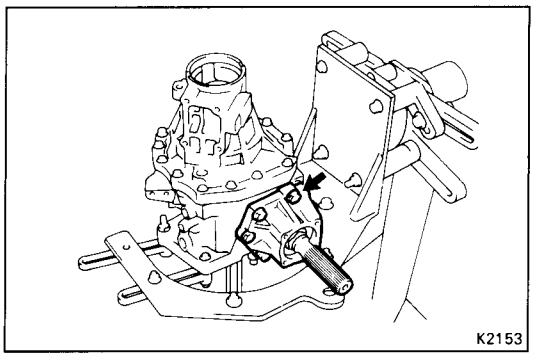


11. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

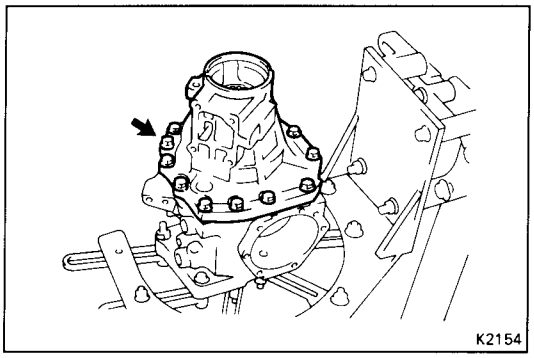
12. CHECK TOOTH CONTACT (See page MT-77)



13. REMOVE DRIVEN PINION BEARING CAGE ASSEMBLY

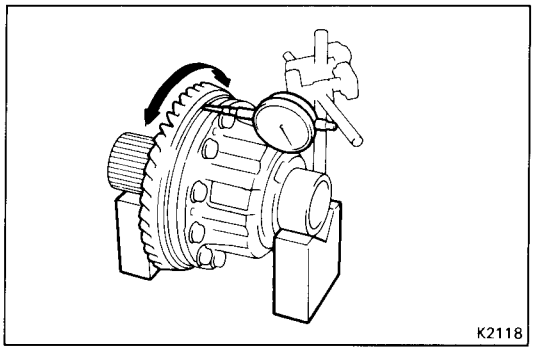
(a) Remove the six bolts and tap off the bearing cage assembly with a plastic hammer.

(b) Remove the O-ring from the driven pinion bearing cage.

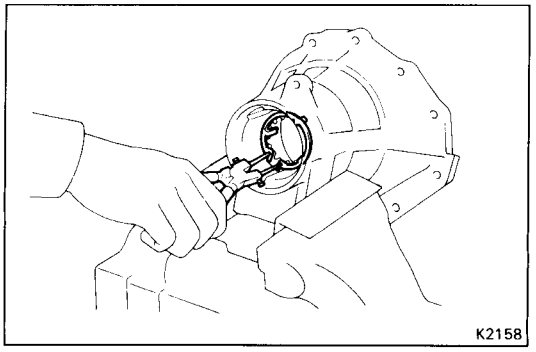


14. REMOVE TRANSFER RIGHT CASE

Remove the twelve bolts and tap off the case with a plastic hammer.

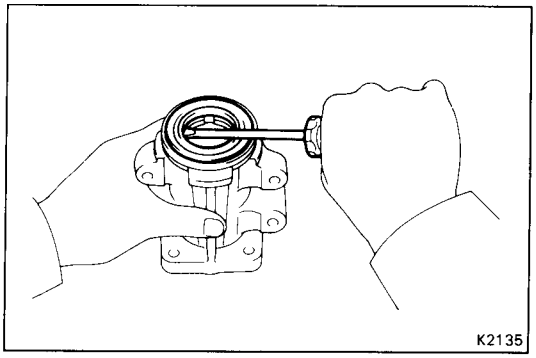


15. REMOVE RING GEAR MOUNTING CASE ASSEMBLY



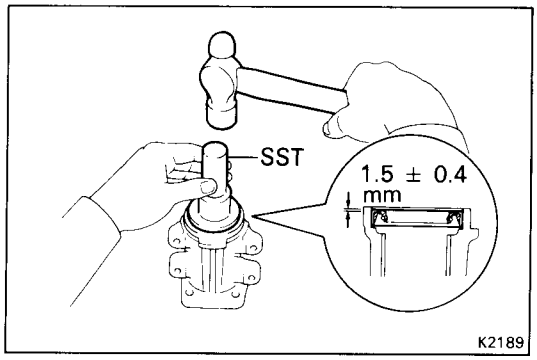
16. REMOVE ADJUSTING NUT LOCK PLATE

Using snap ring pliers, remove the lock plate from the transfer right case.



17. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Using a screwdriver, remove the oil seal.

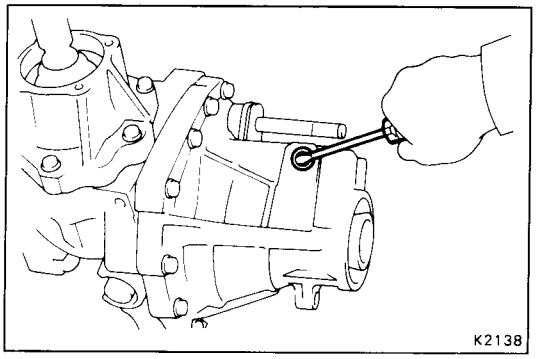


(b) Using SST and a hammer, drive in a new oil seal.

SST 09325-20010

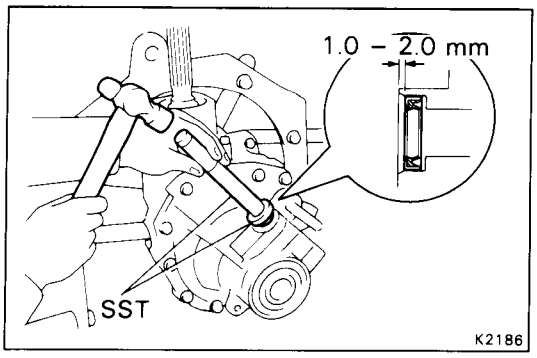
Oil seal depth: 1.1 – 1.9 mm (0.043 – 0.075 in.)

(c) Coat the lip of oil seal with MP grease.



18. IF NECESSARY, REPLACE DIFFERENTIAL LOCK SHIFT LEVER SHAFT OIL SEAL

(a) Using a screwdriver, remove the oil seal.

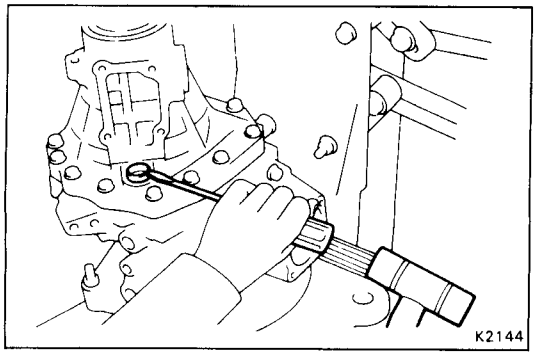


(b) Coat the lip of oil seal with MP grease.

(c) Using SST and a hammer, drive in a new oil seal.

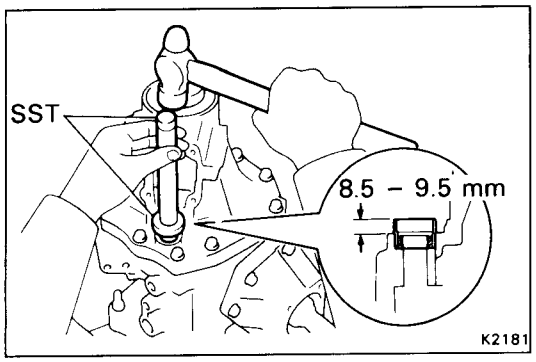
SST 09620-30010 (09625-30010, 09631-00020)

Oil seal depth: 1.0 – 2.0 mm (0.039 – 0.079 in.)



19. IF NECESSARY, REPLACE SHIFT FORK SHAFT OIL SEAL

(a) Using a screwdriver and hammer, remove the oil seal.

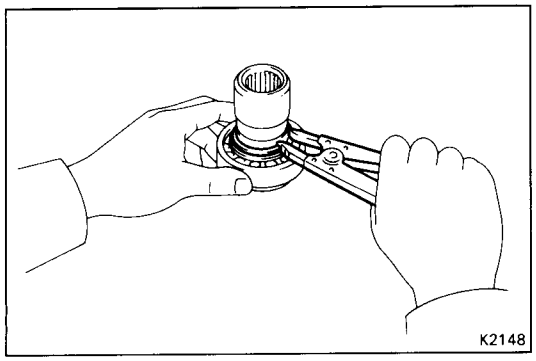


(b) Coat the lip of the oil seal with MP grease.

(c) Using SST and a hammer, drive in a new oil seal as shown.

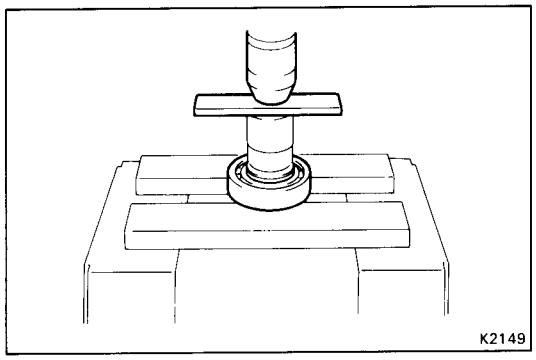
SST 09620-30010 (09625-30010, 09631-00020)

Oil seal height: 8.5 – 9.5 mm (0.335 – 0.374 in.)

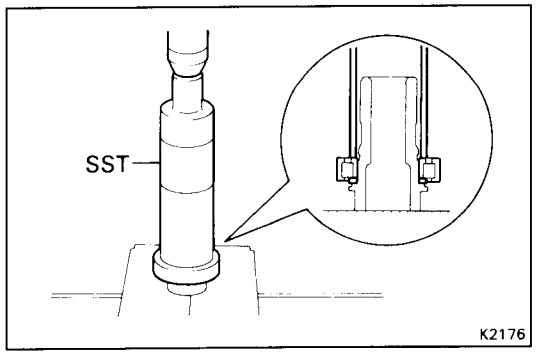


20. IF NECESSARY, REPLACE SIDE GEAR SHAFT HOLDER BEARING

(a) Using snap ring pliers, remove the snap ring.

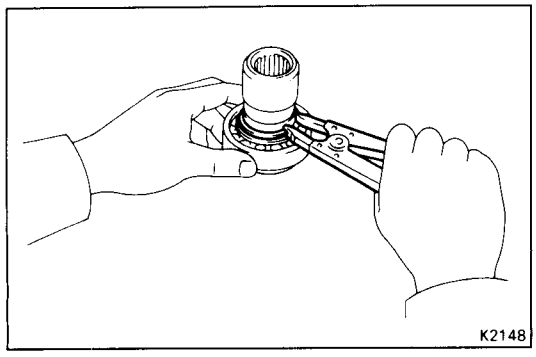


(b) Using a press, remove the bearing from the side gear shaft holder.

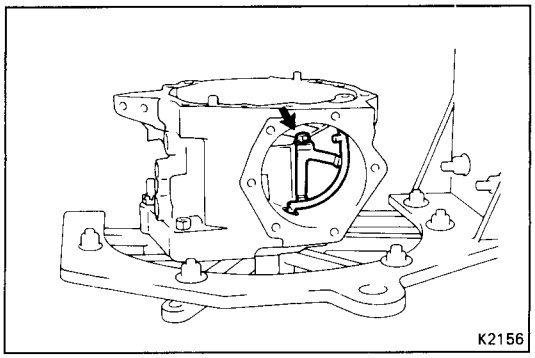


(c) Using SST and a press, install a new bearing as shown.

SST 09316-60010 (09316-00010)

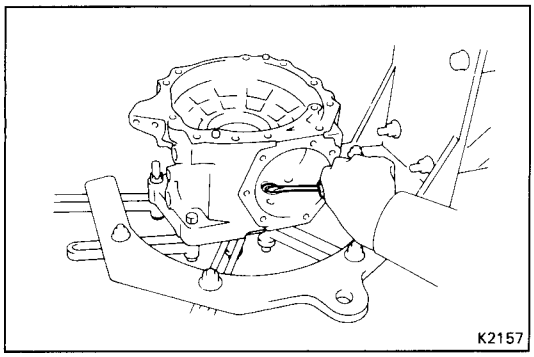


(d) Using snap ring pliers, install the snap ring.

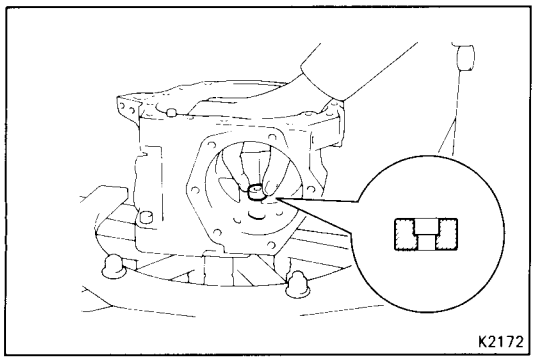


21. IF NECESSARY, REPLACE TRANSFER OIL TUBE

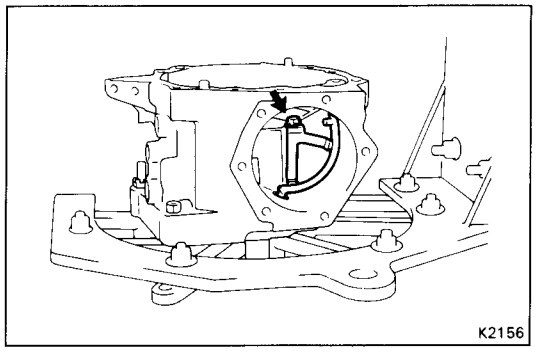
(a) Remove the bolt and oil tube.



(b) Using a screwdriver, remove the cushion.



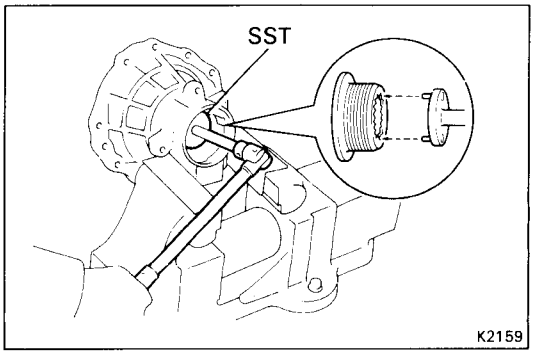
(c) Install a new cushion.



(d) Install the oil tube.

(e) Install and torque the bolt.

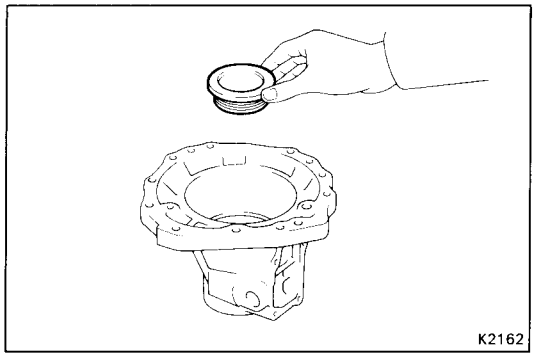
Torque: 130 kg-cm (9 ft-lb, 13 N·m)



22. IF NECESSARY, REPLACE RING GEAR MOUNTING CASE SIDE BEARING OUTER RACE (Transfer Right Case)

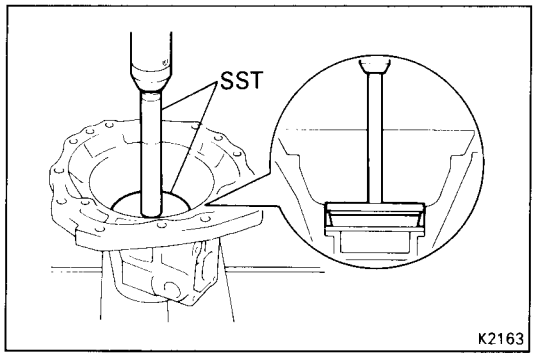
(a) Using SST, turn the bearing adjusting nut, remove the outer race and bearing adjusting nut.

SST 09318-20010



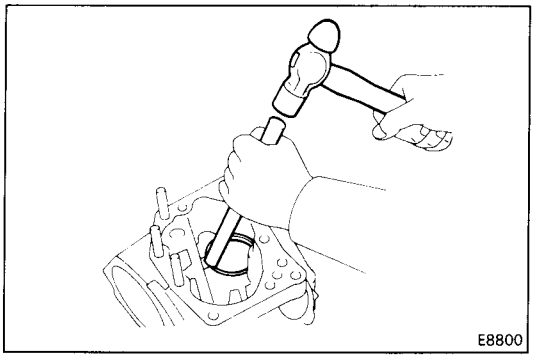
(b) Install the bearing adjusting nut until it touches the lip of the case.

HINT: If the nut is difficult to turn, use SST (09318-20010)



(c) Using SST and a press, install the bearing outer race until it is almost touching the bearing adjusting nut.

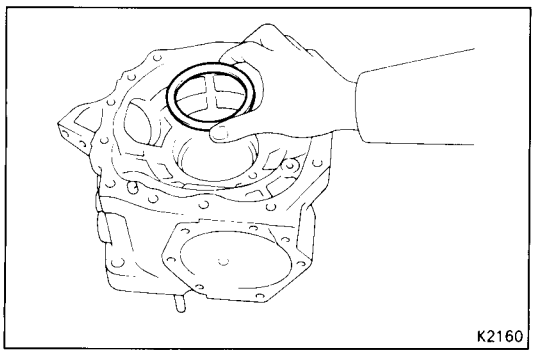
SST 09608-35014 (09608-06020, 09608-06180)



(Transfer Left Case)

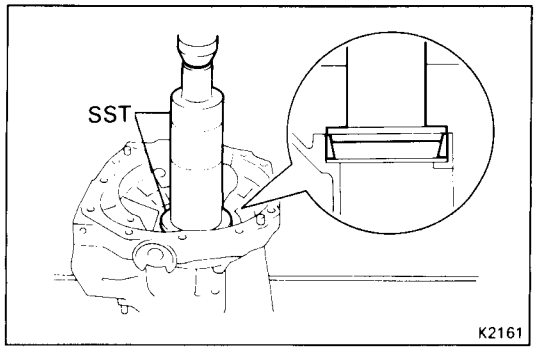
(a) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly.

(b) Remove the plate washer.



(c) Install the plate washer.

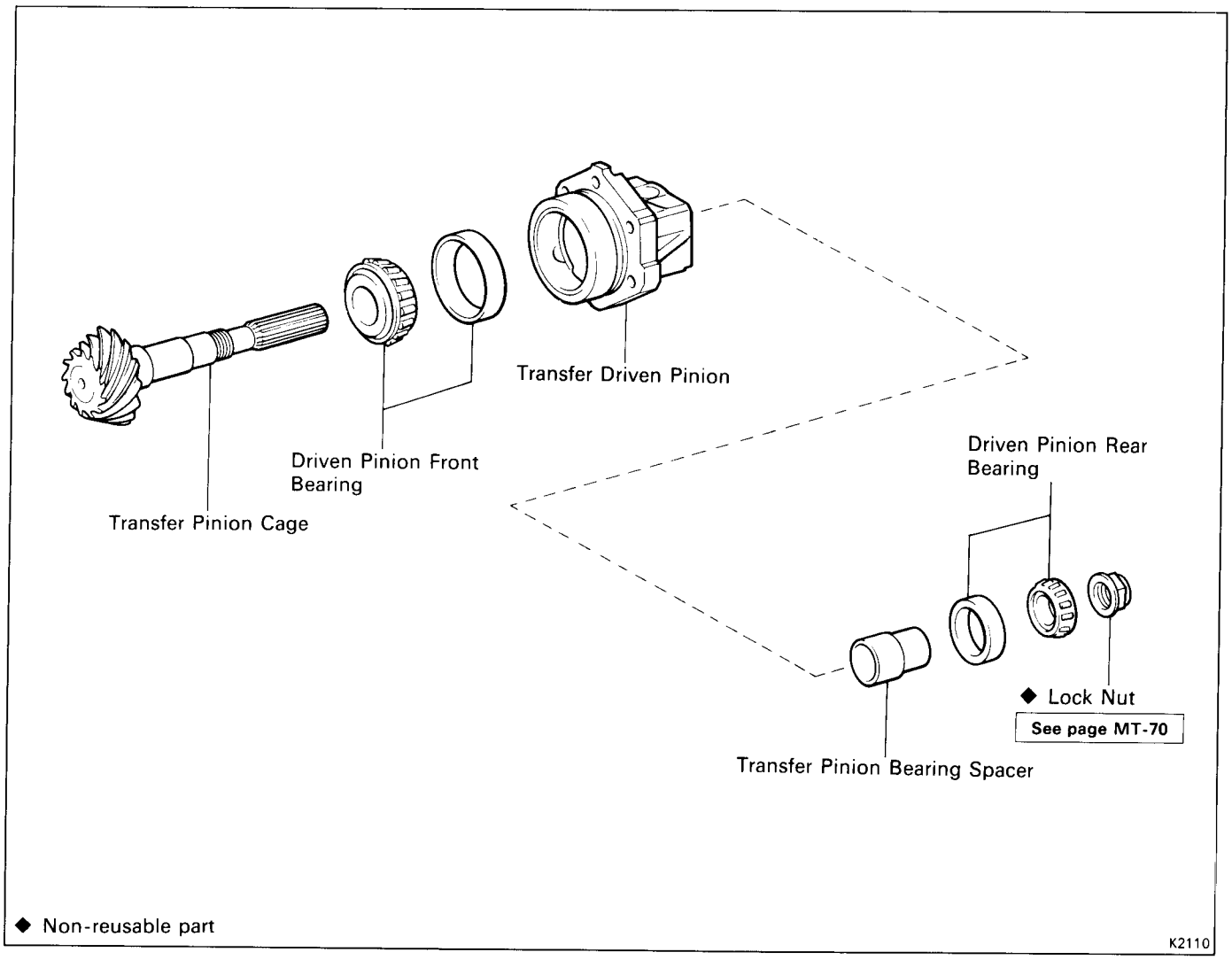
HINT: First install a washer of the same thickness as before.

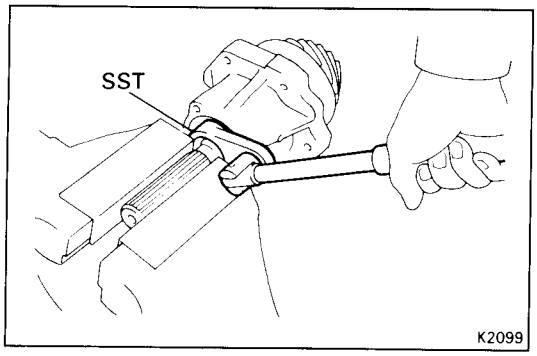


(d) Using SST and a press, install the outer race.

SST 09316-60010 (09316-00010, 09316-00060)

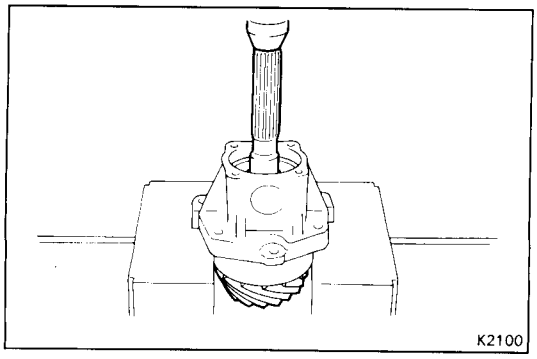
DRIVEN PINION BEARING CAGE ASSEMBLY



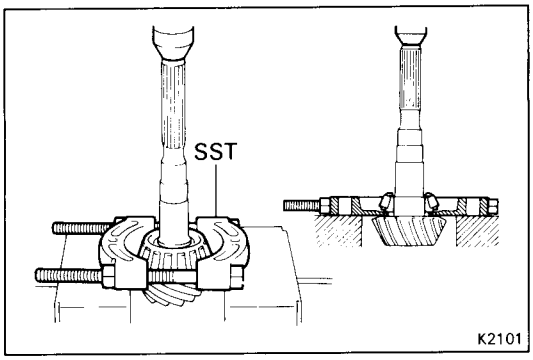


DISASSEMBLY OF DRIVEN PINION BEARING CAGE

1. **REMOVE LOCK NUT**
   (a) Unstake the lock nut.
   (b) Using SST, remove the lock nut.
   SST 09326-20011



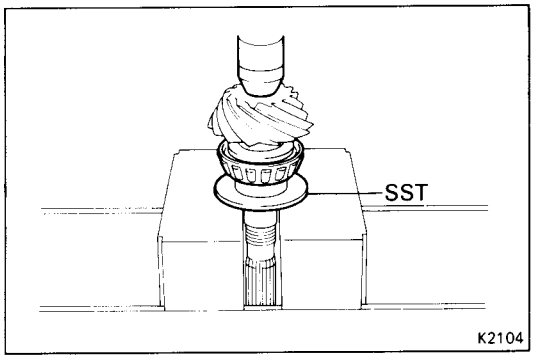
2. **REMOVE DRIVEN PINION**
   Using a press, remove the driven pinion, rear bearing and spacer.



3. IF NECESSARY, REPLACE DRIVEN PINION FRONT BEARING

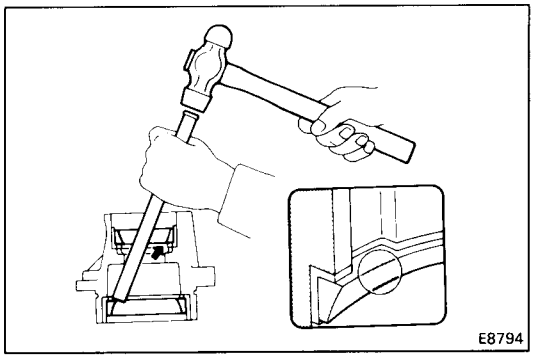
(a) Using SST and a press, remove the front bearing.

SST 09950-00020



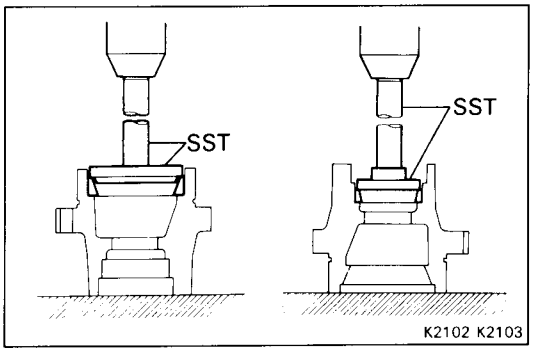
(b) Using SST and a press, install the front bearing.

SST 09316-60010 (09316-00050)



4. IF NECESSARY, REPLACE FRONT AND REAR BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly.

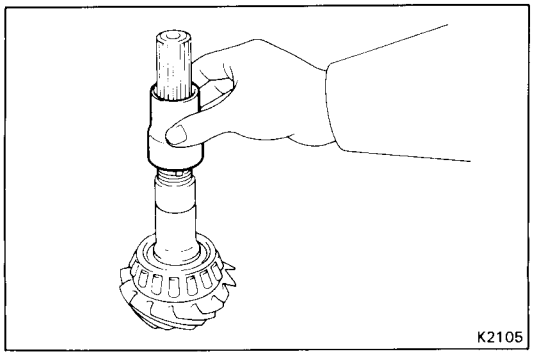


(b) Using SST and a press, install the front bearing outer race.

SST 09608-35014 (09608-06020, 09608-06120)

(c) Using SST and a press, install the rear bearing outer race.

SST 09550-10012 (09252-10010, 09555-10010)



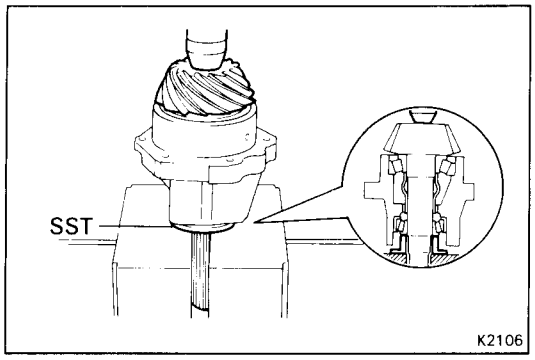
ASSEMBLY OF DRIVEN PINION BEARING CAGE

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. INSTALL DRIVEN PINION BEARING CAGE

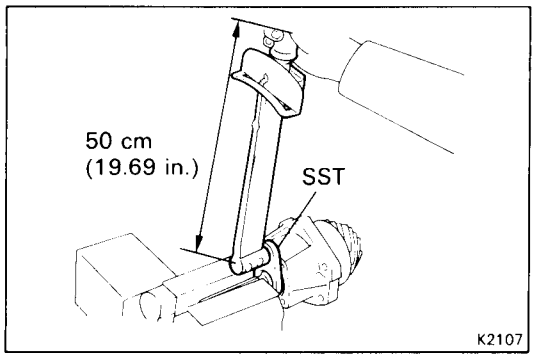
(a) Install the new bearing spacer.

HINT: Insert the spacer with the smaller facing upwards.



(b) Using SST and a press, install the rear bearing.

HINT: Press down until the pinion can just move slightly up and down.



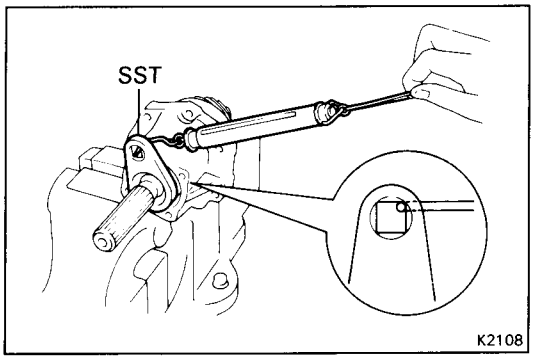
2. ADJUST DRIVEN PINION PRELOAD

(a) Using SST, install and torque the new lock nut.

SST 09326-20011

Torque: 1,000 kg-cm (72 ft-lb, 98 N·m)

HINT: Use a torque wrench with a fulcrum length of 50 cm (19.69 in.)



(b) Using SST and spring tension gauge, measure the driven pinion preload.

HINT: Turn the driven pinion right and left two or three times to allow the bearing to settle.

Preload (at starting):

New bearing	**1.8 – 2.9 kg (4.0 – 6.4 lb, 17.7 – 28.4 N)**
Reused bearing	**0.9 – 1.4 kg (1.1 – 2.0 lb, 4.9 – 8.8 N)**

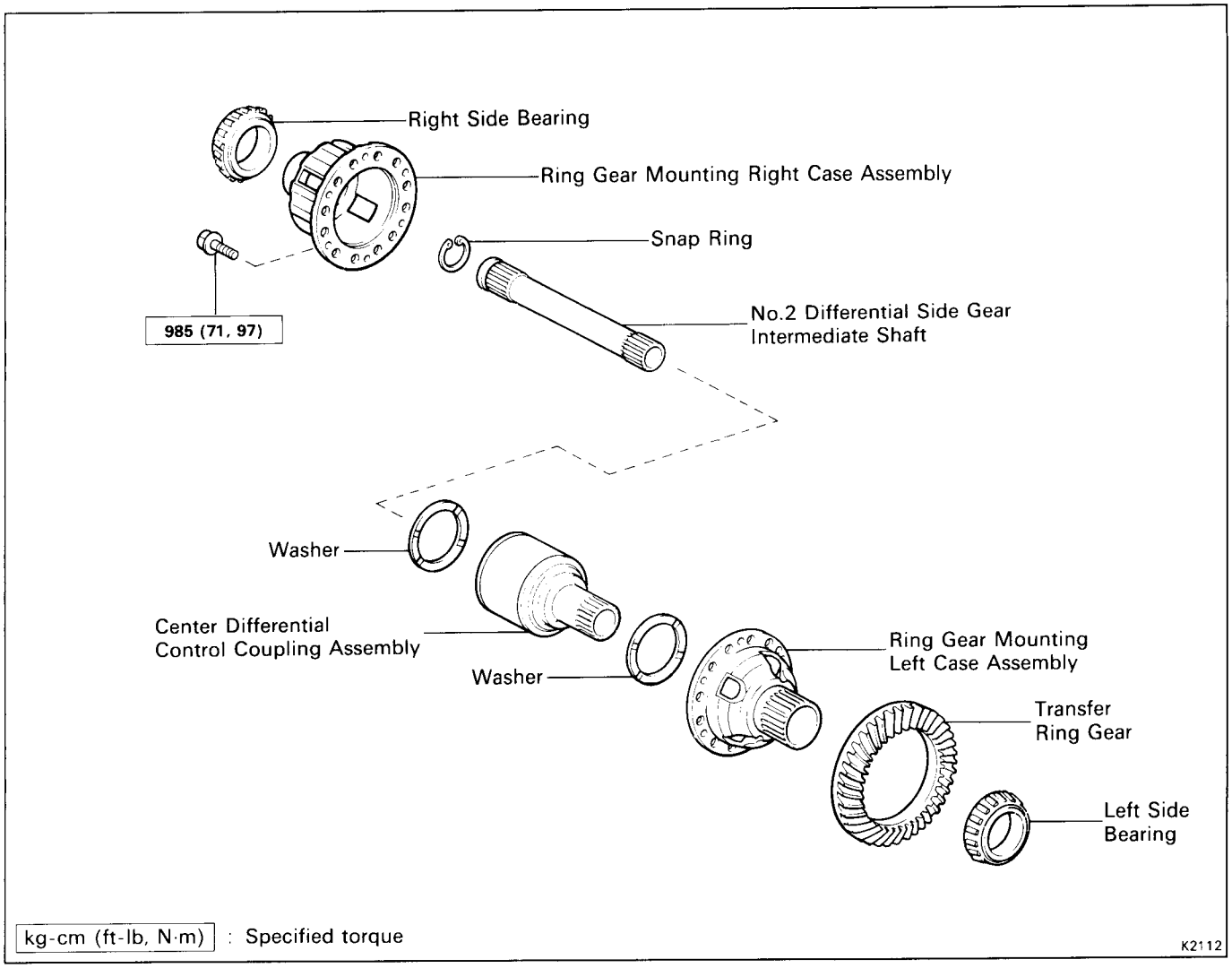
- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 5 – 10° at a time until the specified preload is reached.

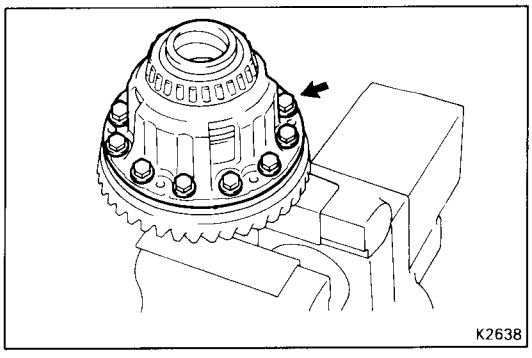
If the maximum torque is exceed while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,200 kg-cm (159 ft-lb, 216 N·m)

3. STAKE LOCK NUT

RING GEAR MOUNTING CASE ASSEMBLY

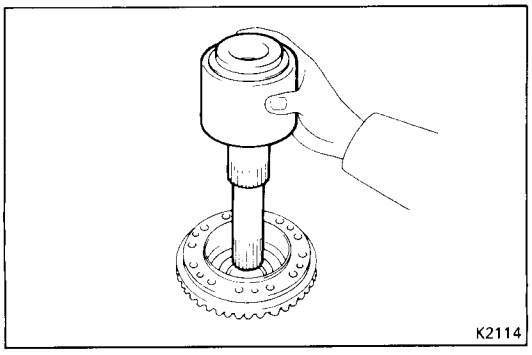




DISASSEMBLY OF RING GEAR MOUNTING CASE

1. REMOVE RING GEAR MOUNTING RIGHT CASE

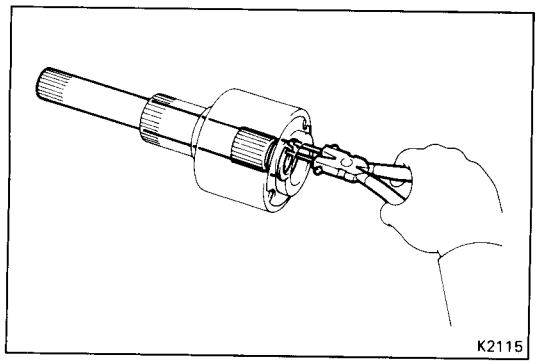
Remove twelve bolts and right case.



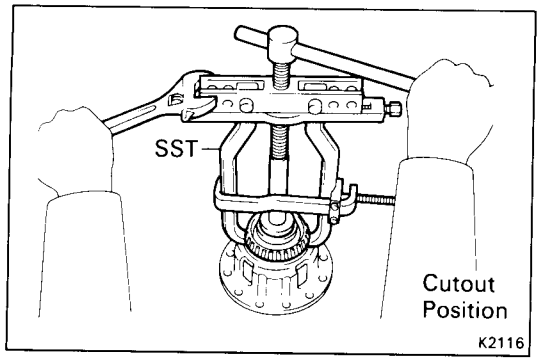
2. REMOVE CENTER DIFFERENTIAL CONTROL COUPLING

(a) Remove the control coupling form the left case.

(b) Remove the two washers from the control coupling.



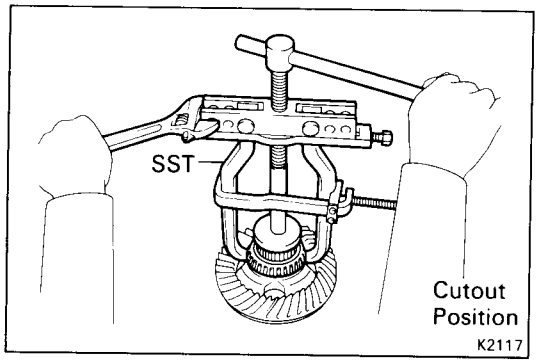
(c) Using a snap ring pliers, remove the snap ring and No.2 intermediate shaft.



3. REMOVE MOUNTING CASE SIDE BEARING (Right Case Side)

Using SST, remove the side bearing.

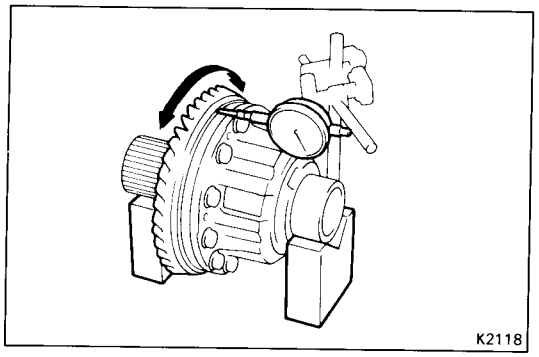
SST 09950-20017



(Left Case Side)

Using SST, remove the side bearing.

SST 09950-20017



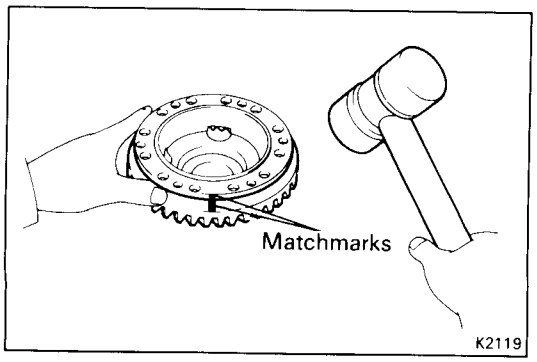
4. CHECK RING GEAR RUNOUT

(a) Install the mounting right case to the left case.

(b) Using a dial indicator, check the ring gear runout.

Maximum runout: 0.1 mm (0.004 in.)

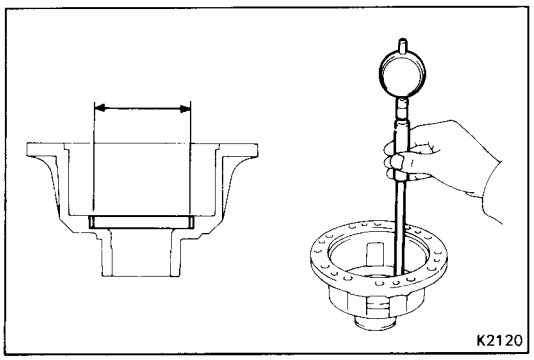
(c) Remove the mounting right case from the left case.



5. REMOVE RING GEAR

(a) Place the matchmarks on both the mounting left case and ring gear.

(b) Using a plastic hammer, tap out the ring gear.

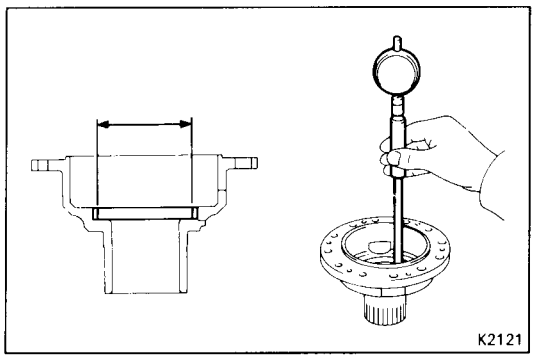


INSPECTION OF RING GEAR MOUNTING CASE

1. MEASURE RING GEAR MOUNTING CASE

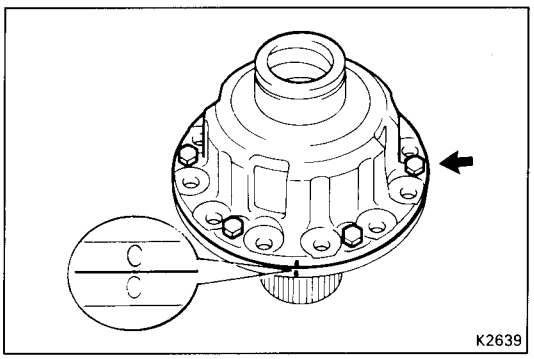
(a) Using a cylinder gauge, measure the inner diameter of the mounting right case bushing.

Standard diameter: **69.000 – 69.035 mm (2.7165 – 2.7179 in.)**
Maximum diameter: **69.060 mm (2.7189 in.)**



(b) Using a cylinder gauge, measure the inner diameter of the mounting left case bushing.

Standard diameter: **69.000 – 69.035 mm (2.7165 – 2.7179 in.)**
Maximum diameter: **69.060 mm (2.7189 in.)**

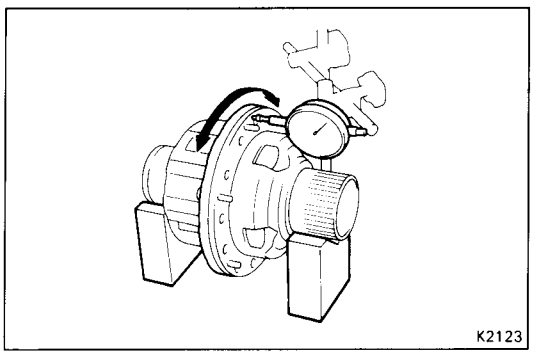


2. CHECK RING GEAR MOUNTING CASE RUNOUT

HINT: Perform only when the limit is exceeded in the ring gear runout inspection.

(a) Using six bolts (Diameter 8 mm, Pitch 1.25 mm), install the mounting right case to the left case.

HINT: Align the matchmarks on the right case and connect the left case.

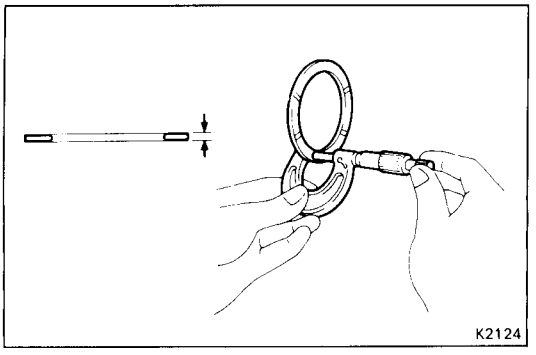


(b) Using a dial indicator, check the mounting case runout.

Maximum runout: **0.1 mm (0.004 in.)**

(c) Remove the six bolts.

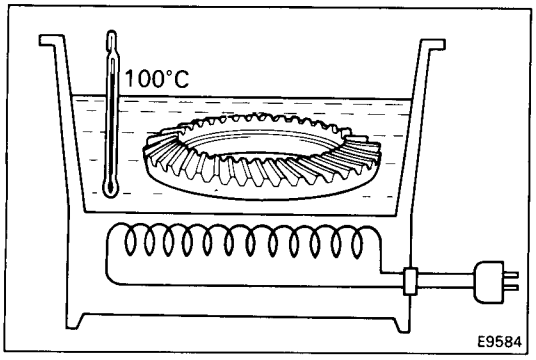
(d) Remove the mounting right case from the left case.



3. MEASURE WASHER

Using a micrometer, measure the two washers thickness.

Standard thickness: **1.49 – 1.51 mm (0.0587 – 0.0594 in.)**
Minimum thickness: **1.45 mm (0.0571 in.)**



ASSEMBLY OF RING GEAR MOUNTING CASE

1. **INSTALL RING GEAR**

   (a) Clean the contact surface of the mounting left case.

   (b) Heat the ring gear to about 100 °C (212 °F) in an oil bath.

   NOTICE: Do not heat the ring gear above 110 °C (230 °F).

   (c) Clean the contact surface of the ring gear with cleaning solvent.

   (d) Turn quickly install the ring gear on the mounting left case.

   HINT: Align the matchmarks on the mounting left case and connect the ring gear.

2. **CHECK RING GEAR RUNOUT**
   (See page MT-72)

3. **INSTALL MOUNTING CASE SIDE BEARING**
   (Right Case Side)

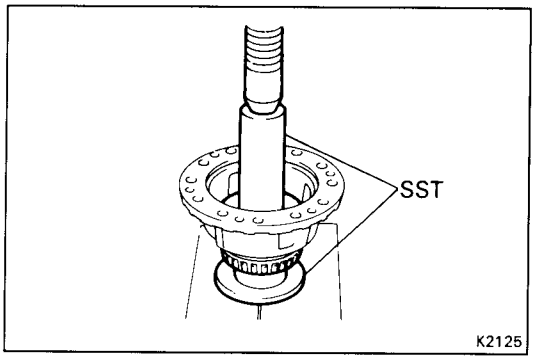
   Using SST and a press, install the side bearing.

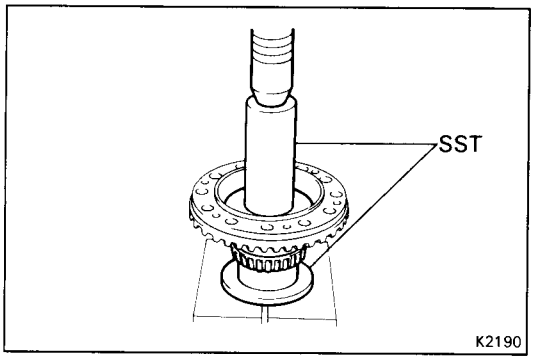
   SST 09309-36010, 09316-20011

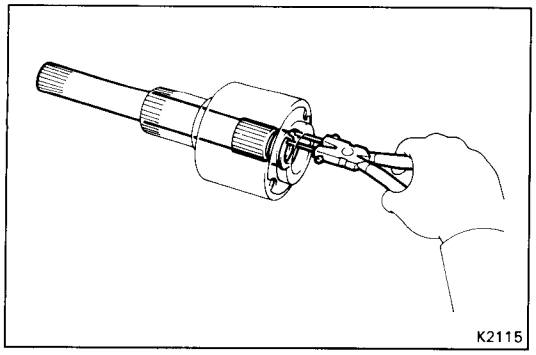
   (Left Case Side)

   Using SST and a press, install the side bearing.

   SST 09309-36010, 09316-20011



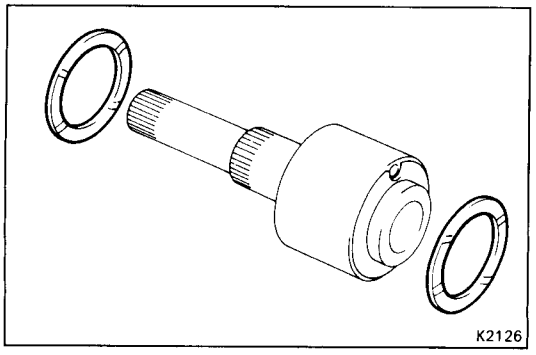




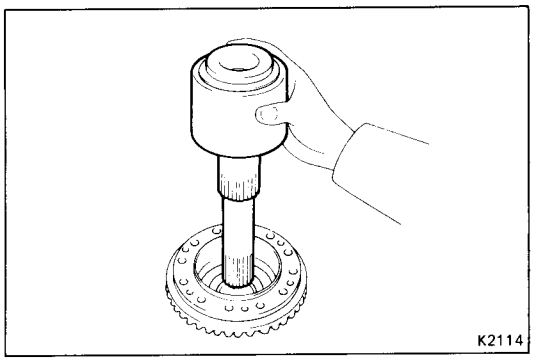
4. **INSTALL CENTER DIFFERENTIAL CONTROL COUPLING**

   (a) Insert the No.2 intermediate shaft to the center differential control coupling.

   (b) Using snap ring pliers, install the snap ring.

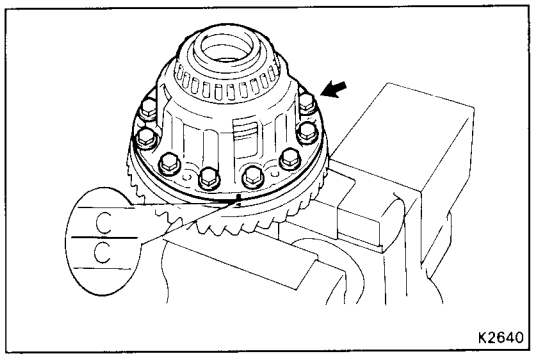


   (c) Install the two washers to the center differential control coupling.



(d) Install the center differential control coupling to the left case.

HINT: Do not drop the washer.



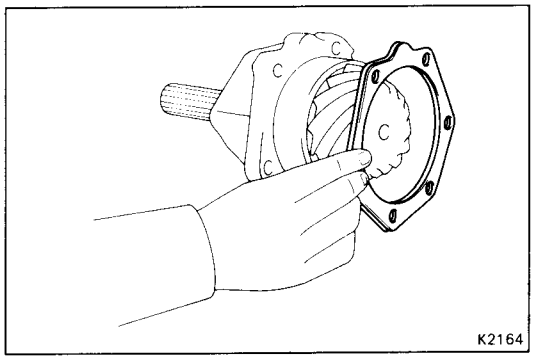
5. INSTALL RING GEAR MOUNTING RIGHT CASE

(a) Install the right case to the left case.

(b) Install and torque the twelve bolts.

Torque: 985 kg-cm (71 ft-lb, 97 N·m)

HINT: Align the matchmarks on the left case and connect the right case.



ASSEMBLY OF TRANSFER COMPONENT PARTS

(See page MT-59)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. ADJUST RING GEAR BACKLASH

(a) Install the adjusting shim to the driven pinion bearing cage assembly.

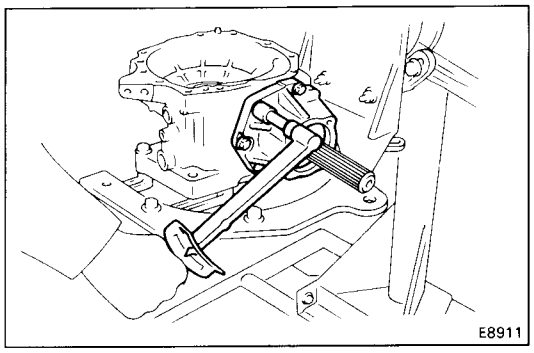
HINT: First install a shim of the same thickness as before.

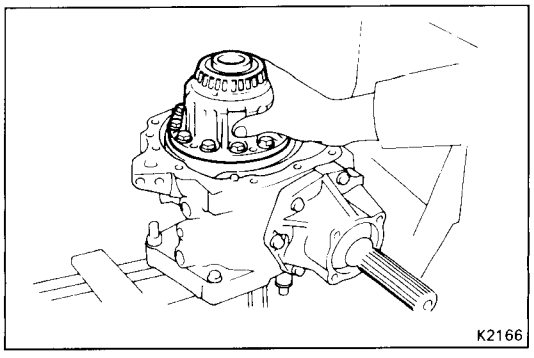
(b) Install the driven pinion bearing cage assembly to the transfer left case.

(c) Install and torque the six bolts.

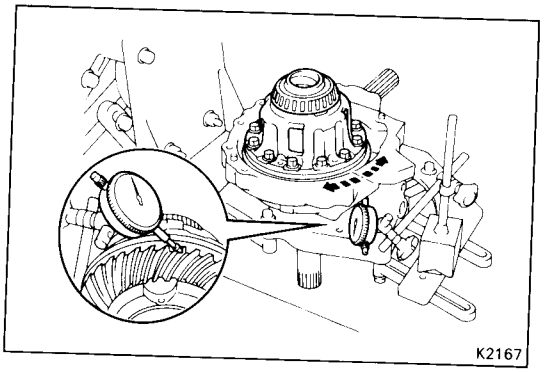
Torque: 400 kg-cm (29 ft-lb, 39 N·m)

HINT: Do not install the O-ring.





(d) Install the ring gear mounting case assembly to the transfer left case.



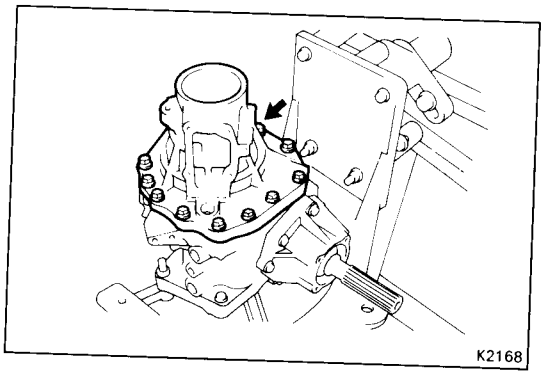
(e) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(f) Referring to the table below, select the plate washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

HINT: The backlash will change about 0.02 mm (0.0008 in.) with each shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	2.13 (0.0839)	13	2.49 (0.0980)
2	2.16 (0.0850)	14	2.52 (0.0992)
3	2.19 (0.0862)	15	2.55 (0.1004)
4	2.22 (0.0874)	16	2.58 (0.1016)
5	2.25 (0.0886)	17	2.61 (0.1028)
6	2.28 (0.0898)	18	2.64 (0.1039)
7	2.31 (0.0909)	19	2.67 (0.1051)
8	2.34 (0.0921)	20	2.70 (0.1063)
9	2.37 (0.0933)	21	2.73 (0.1075)
10	2.40 (0.0945)	22	2.76 (0.1087)
11	2.43 (0.0957)	23	2.79 (0.1098)
12	2.46 (0.0968)	24	2.82 (0.1110)

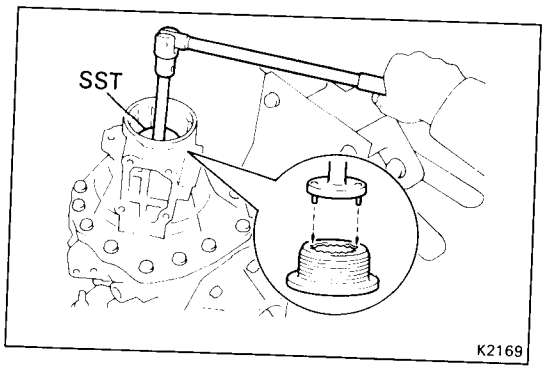


2. ADJUST TOTAL PRELOAD

(a) Install the transfer right case.

(b) Install and torque the twelve bolts.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)



(c) Adjust the total preload by tightening the bearing adjusting nut.

Using SST, tightening the adjusting nut.

SST 09318-20010

HINT: Measure the preload while tightening the adjusting nut a little at a time.

(d) Using SST and a spring tension gauge, measure the total preload.

SST 09326-20011

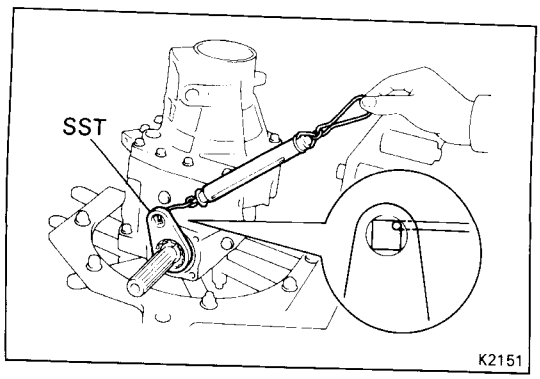
Preload (at starting):

New bearing

Add driven pinion preload 1.3 – 1.4 kg (2.9 – 3.1 lb, 13 – 14 N)

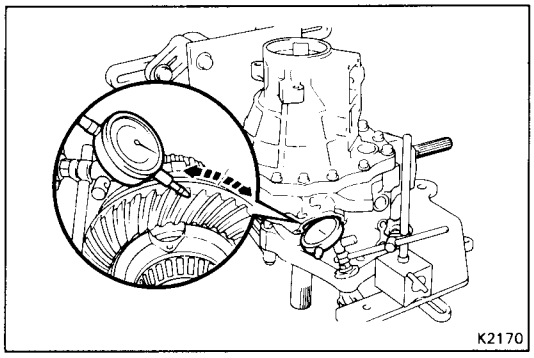
Reused bearing

Add driven pinion preload 0.5 – 0.9 kg (1 – 2 lb, 5 – 9 N)



HINT: Turn the output shaft counterclockwise and clockwise several times.

(e) When the standard value for total preload is exceeded, remove the transfer right case, push in the adjusting nut and outer race. Again adjust the total preload.

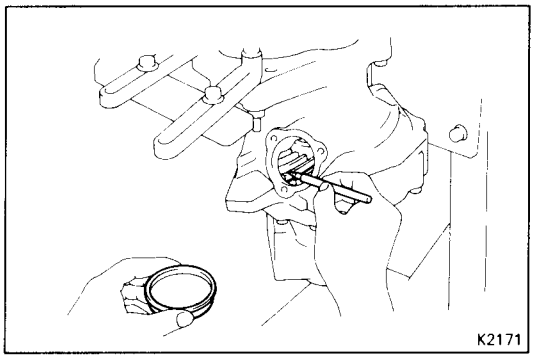


3. CHECK RING GEAR BACKLASH

(a) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

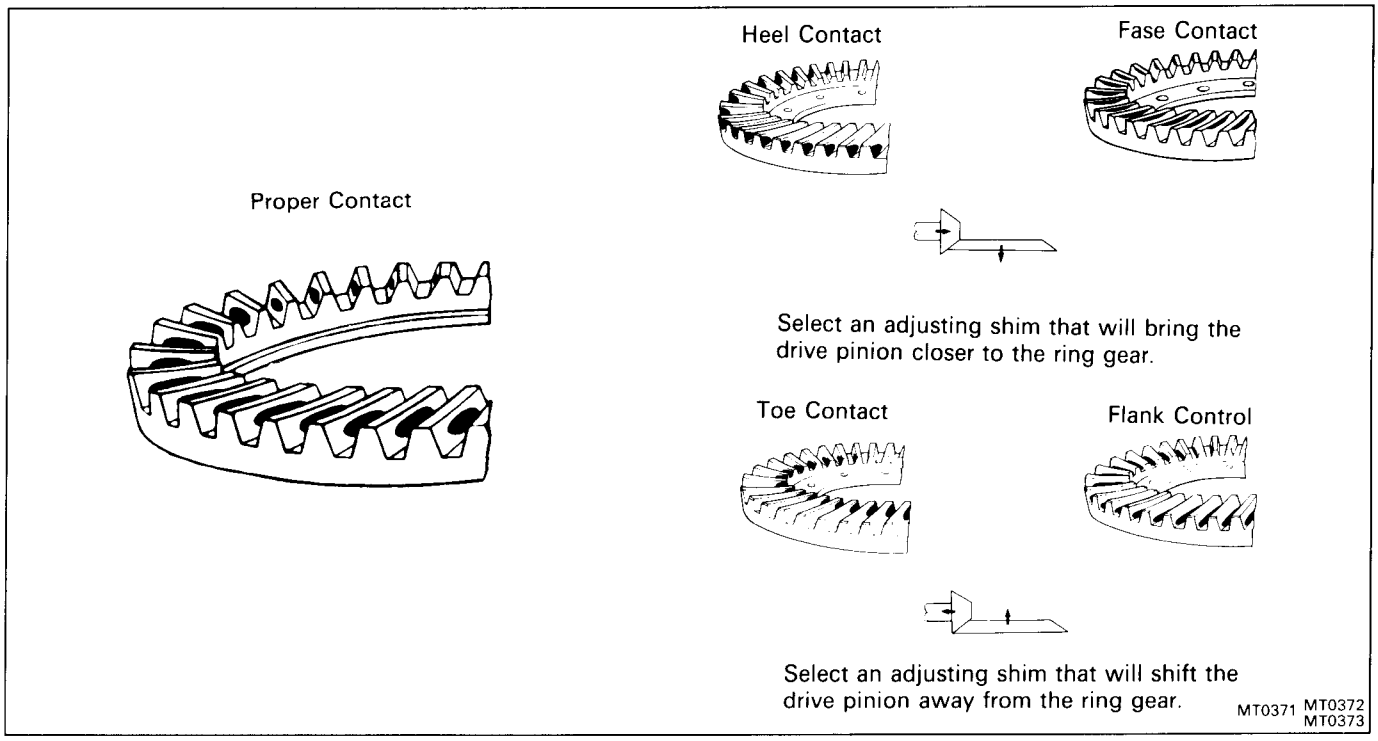
(b) When the backlash is outside the standard value, select a different plate washer to the one selected step 2. Again adjust the backlash and total preload.



4. CHECK TOOTH CONTACT

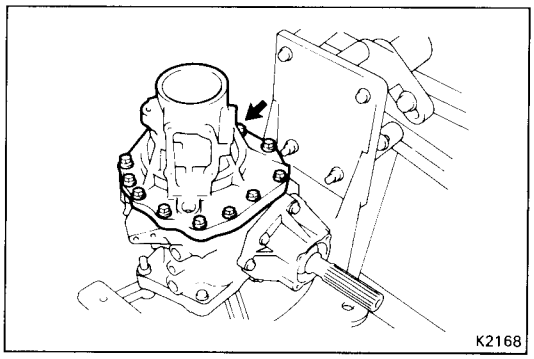
(a) Coat 3 or 4 teeth at four different position on the ring gear with red lead.

(b) Rotate the ring gear, inspect the teeth pattern.



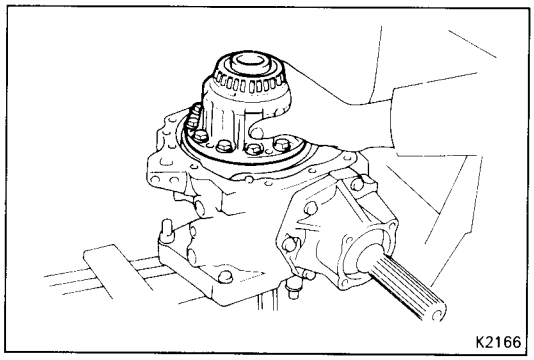
(c) If the teeth are not contacting properly, again select the proper shim and plate.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	0.30 (0.0118)	F	0.45 (0.0177)
B	0.33 (0.0130)	G	0.48 (0.0189)
C	0.36 (0.0142)	H	0.51 (0.0201)
D	0.39 (0.0154)	J	0.54 (0.0213)
E	0.42 (0.0165)	K	0.57 (0.0224)

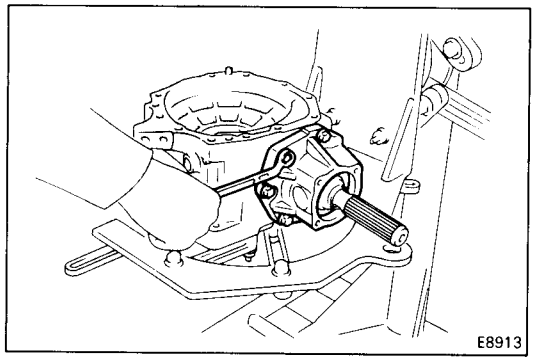


5. REMOVE RING GEAR MOUNTING CASE ASSEMBLY

(a) Remove the twelve bolts and transfer right case.

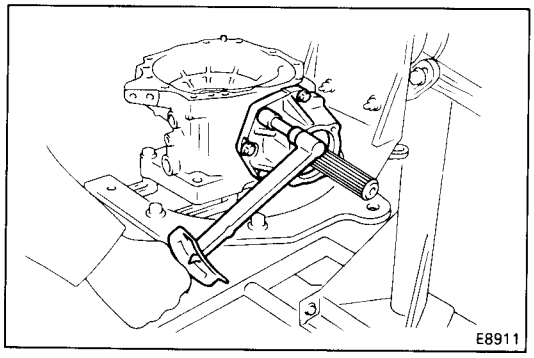


(b) Remove the ring gear mounting case assembly.



6. REMOVE DRIVEN PINION BEARING CAGE ASSEMBLY

Remove the six bolts and bearing cage assembly.



7. INSTALL DRIVEN PINION BEARING CAGE ASSEMBLY

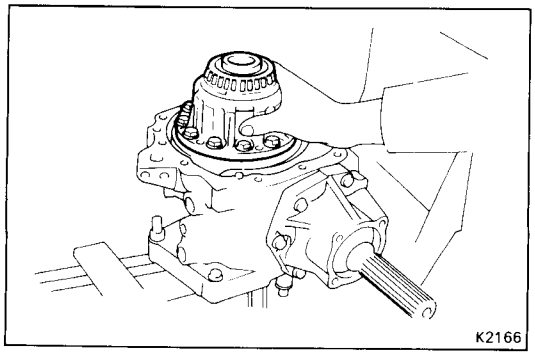
(a) Coat the O-ring with gear oil.

(b) Install the O-ring to the driven pinion bearing cage.

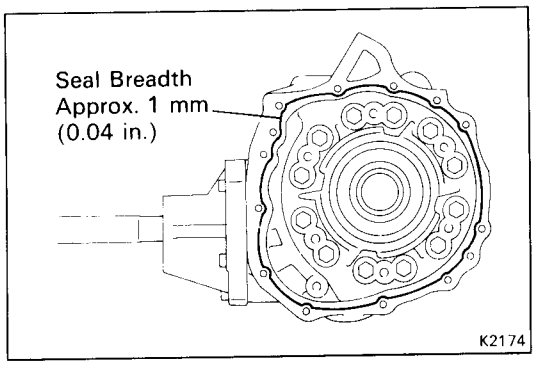
(c) Install the driven pinion bearing cage with the adjusting shim (previously selected) to the transfer left case.

(d) Install and torque the six bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



8. INSTALL RING GEAR MOUNTING CASE ASSEMBLY



9. **INSTALL TRANSFER RIGHT CASE**

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer left case or right case.

(b) Apply seal packing to the transfer left case as shown in the figure.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the transfer right case as soon as the seal packing is applied.

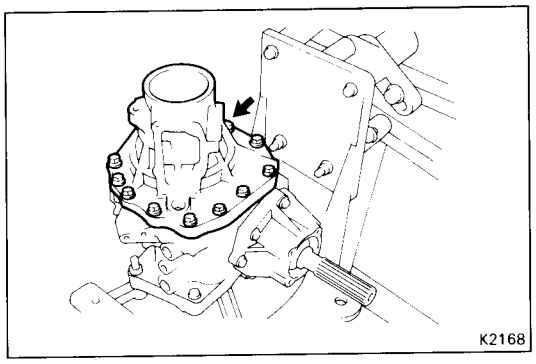
(c) Apply sealant to the bolt threads.

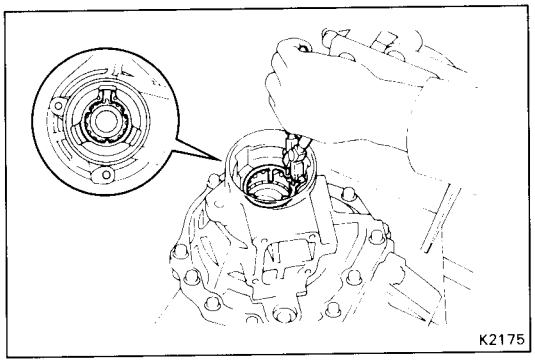
Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Install and torque the twelve bolts.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

10. **CHECK TOTAL PRELOAD**
(See page MT-76)

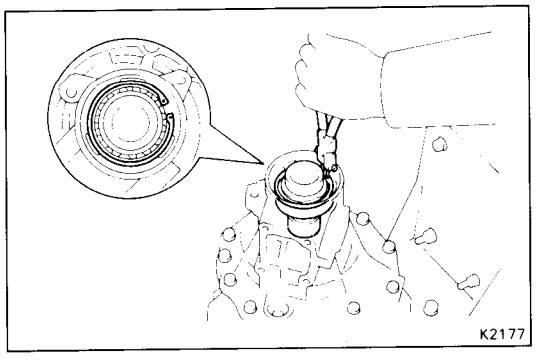




11. **INSTALL ADJUSTING NUT LOCK PLATE**

Using snap ring pliers, install the lock plate so that the projection from the lock plate fits properly into the groove of the adjusting nut.

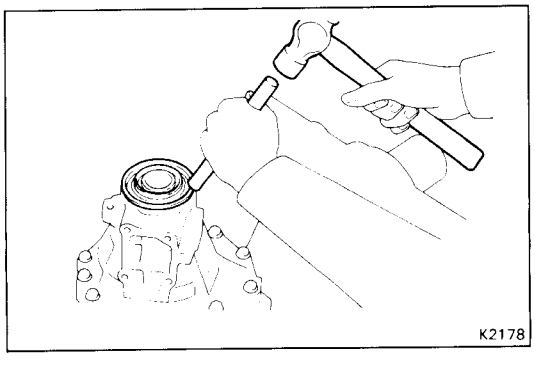
HINT: Choose one of the two types of lock plate can be installed, tighten the adjusting nut to the minimum limit.



12. **INSTALL SIDE GEAR SHAFT HOLDER**

(a) Install the side gear shaft holder to the transfer right case.

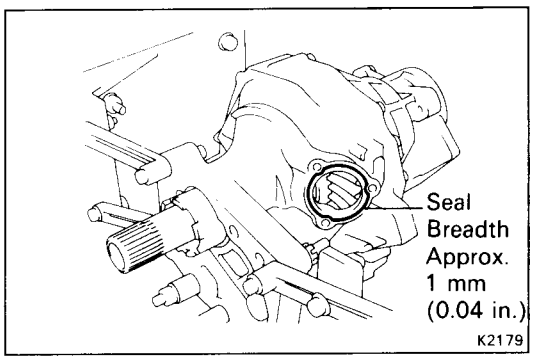
(b) Using snap ring pliers, install the snap ring.



13. **INSTALL OIL SEAL**

(a) Coat the lip of the oil seal with MP grease.

(b) Using a brass bar and hammer, drive in a new oil seal.



14. INSTALL TRANSFER INSPECTION HOLE COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of transfer left case or transfer inspection hole cover.

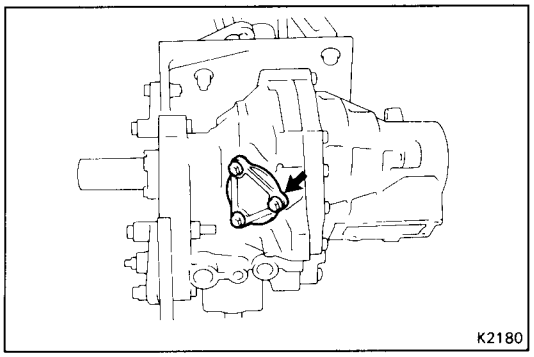
(b) Apply seal packing to the transfer left case as shown in the figure.

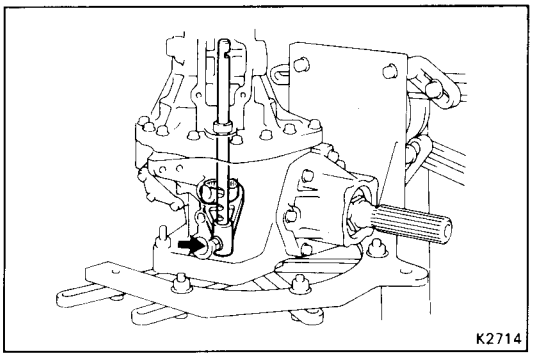
Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the transfer inspection hole cover as soon as the seal packing is applied.

(c) Install and torque the three bolts.

Torque: 160 kg-cm (12 ft-lb, 16 N·m)





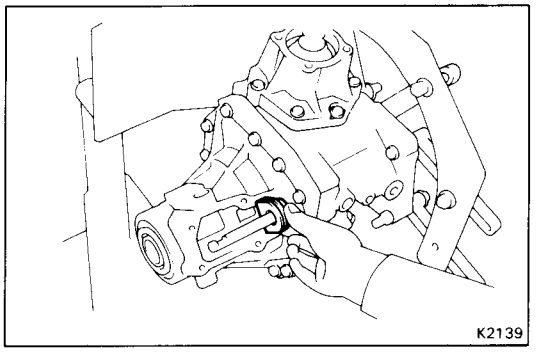
15. INSTALL DIFFERENTIAL LOCK SHIFT FORK SHAFT

(a) Install the differential lock sleeve with shift fork.

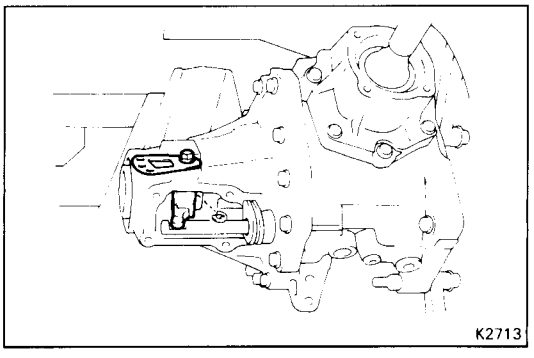
(b) Install the shift fork shaft to the transfer case.

(c) Install and torque the bolt.

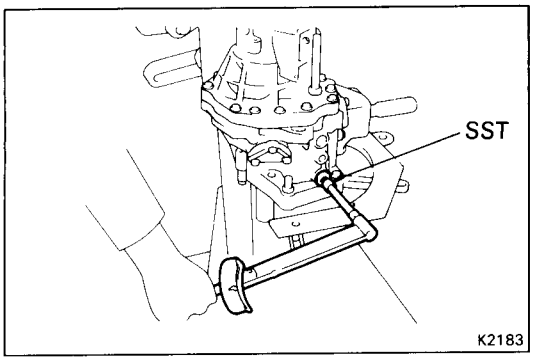
Torque: 160 kg-cm (12 ft-lb, 16 N·m)



(d) Install the transfer case upper cover bushing.



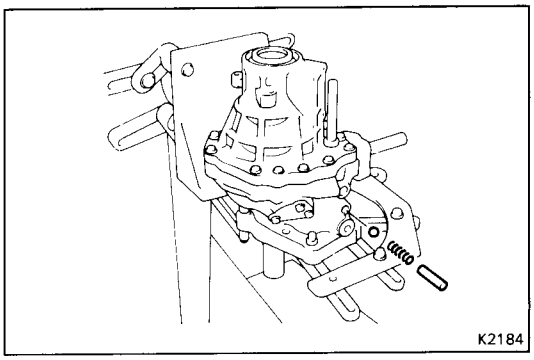
(e) Install the inner lever in the shift fork shaft groove. Insert the shift lever shaft and install the E-ring.



(f) Using SST, install and torque the plug.

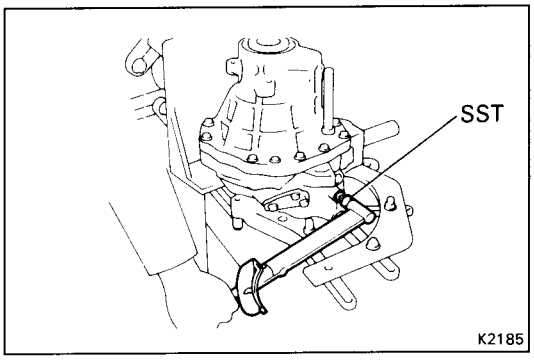
SST 09043-38100

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



16. INSTALL LOCKING BALL, SPRING, SEAT AND PLUG

(a) Using magnetic finger, install the locking ball, spring and seat.



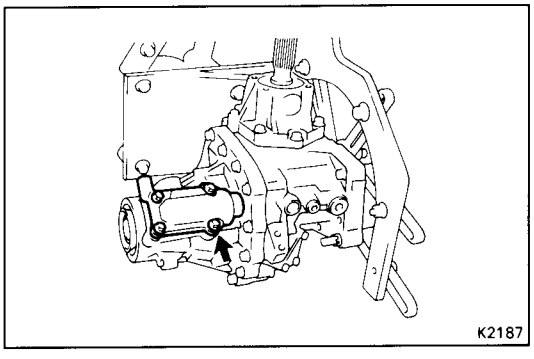
(b) Apply sealant to the plug threads.

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

(c) Using SST, install and torque the plug.

SST 09313-30021

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

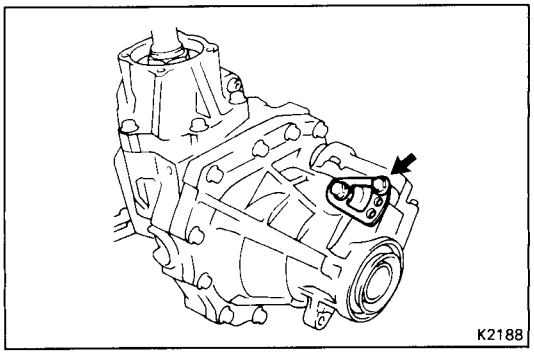


17. INSTALL TRANSFER CASE COVER

(a) Install the new gasket and case cover.

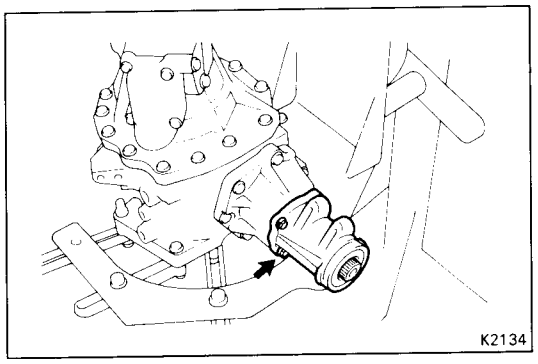
(b) Install and torque the four bolts.

Torque: 175 kg-cm (13 ft-lb, 17 N·m)



(c) Install the bolt to the shift lever shaft as shown.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)



18. INSTALL EXTENSION HOUSING

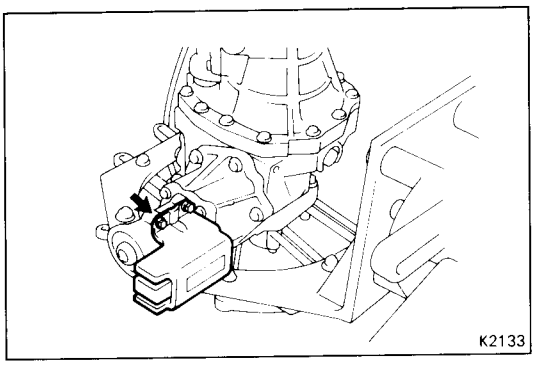
(a) Coat the O-ring with gear oil.

(b) Install the O-ring to the extension housing.

(c) Install the extension housing to the driven pinion bearing cage.

(d) Install and torque the four bolts.

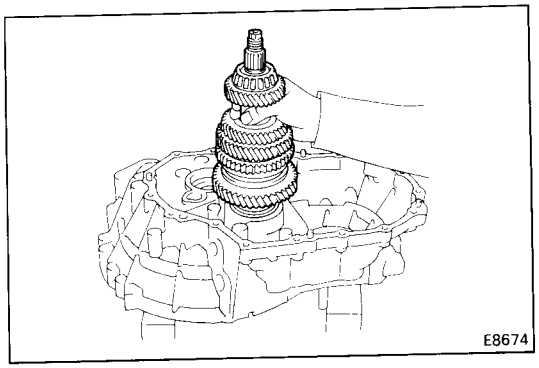
Torque: 260 kg-cm (19 ft-lb, 25 N·m)



19. INSTALL DYNAMIC DAMPER

Install and torque the four bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)



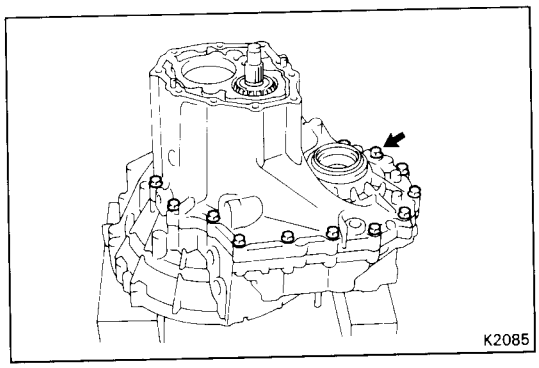
INSTALLATION OF COMPONENT PARTS

(See page MT-8 to MT-10)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. ADJUST OUTPUT SHAFT PRELOAD

(a) Install the output shaft assembly to the transaxle case.

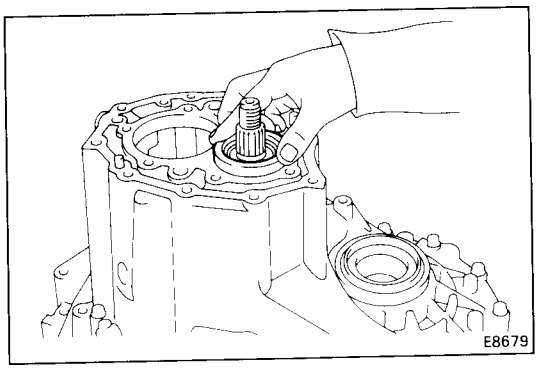


(b) Install the transmission case to the transaxle case.

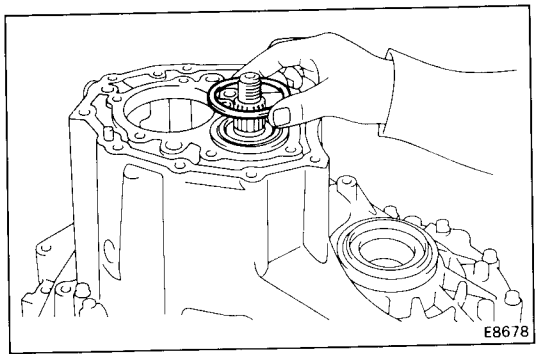
If necessary, tap on the case with a plastic hammer.

(c) Install and torque the seventeen bolts.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

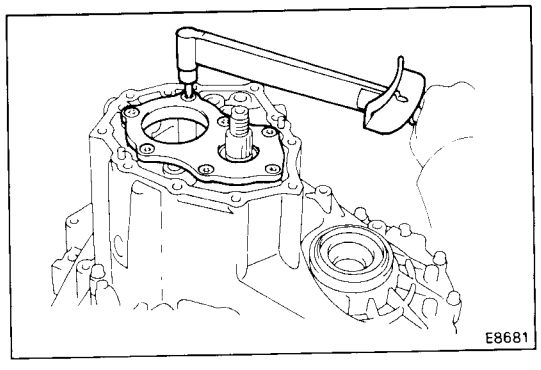


(d) Install the output shaft rear bearing outer race.



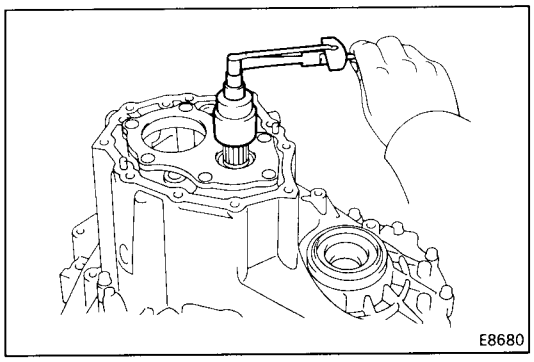
(e) Install the adjust shim.

HINT: When reusing the output shaft bearing, first install a shim of the same thickness as before. If installing a new tapered roller bearing, first select and install a shim of lesser thickness than before.



(f) Using a torx wrench, install and torque the seven torx screws.

Torque: 430 kg-cm (31 ft-lb, 42 N·m)


E8680

(g) Install the new lock nut to the output shaft.

(h) Turn the output shaft counterclockwise and clockwise several times.

(i) Using a torque meter, measure the preload of the output shaft.

Preload (at starting)

New bearing

8.0 – 16.0 kg-cm
(6.9 – 13.9 in.-lb, 0.78 – 1.57 N·m)

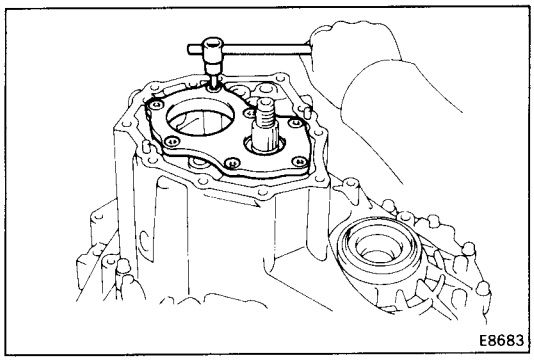
Reused bearing

5.0 – 10.0 kg-cm
(4.3 – 8.7 in.-lb, 0.49 – 0.98 N·m)

If the preload is not within specification, select the thrust washers.

HINT: The preload will changed about 4 – 5 kg-cm (3.5 – 4.3 in.-lb, 0.4 – 0.5 N·m) with each shim thickness.

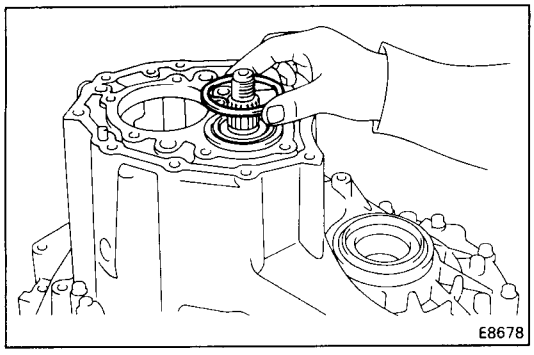
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	0.40 (0.0157)	E	1.10 (0.0433)
1	0.45 (0.0177)	F	1.15 (0.0453)
2	0.50 (0.0197)	G	1.20 (0.0472)
3	0.55 (0.0217)	H	1.25 (0.0492)
4	0.60 (0.0236)	J	1.30 (0.0512)
5	0.65 (0.0256)	K	1.35 (0.0531)
6	0.70 (0.0276)	L	1.40 (0.0551)
7	0.75 (0.0295)	M	1.45 (0.0571)
8	0.80 (0.0315)	N	1.50 (0.0591)
9	0.85 (0.0335)	P	1.55 (0.0610)
A	0.90 (0.0354)	Q	1.60 (0.0630)
B	0.95 (0.0374)		
C	1.00 (0.0394)		
D	1.05 (0.0413)		

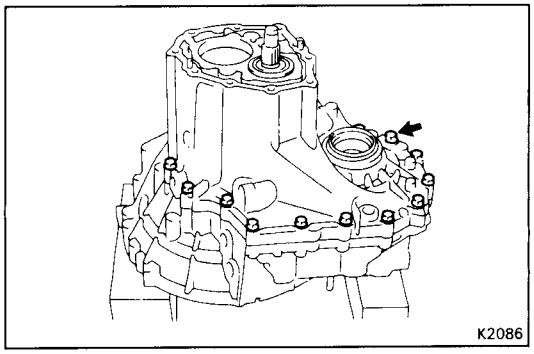

E8683

(j) Remove the lock nut.

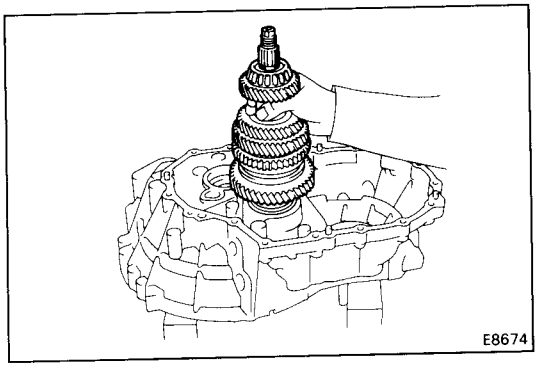
(k) Using a torx wrench, remove the seven torx screws.

(l) Remove the adjusting shim.

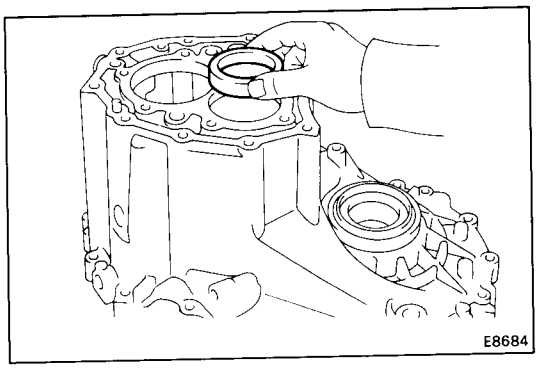

E8678


K2086

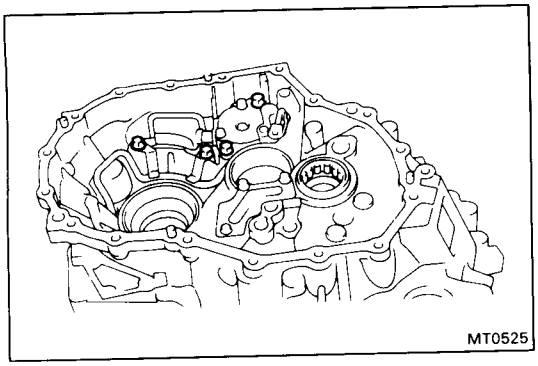
(m) Remove the seventeen bolts and tap off the case with a plastic hammer.



(n) Remove the output shaft rear bearing outer race.



(o) Remove the output shaft assembly.



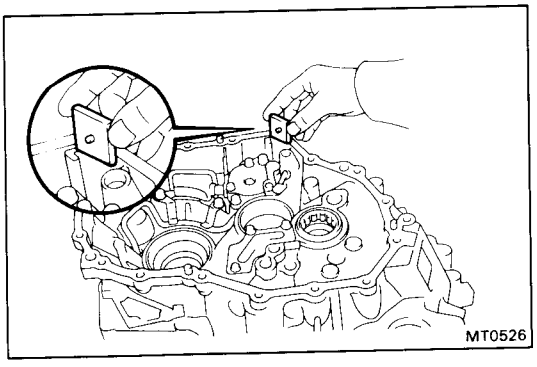
2. INSTALL OIL PUMP ASSEMBLY WITH OIL PIPE

(a) Install the oil pump assembly with oil pipe.

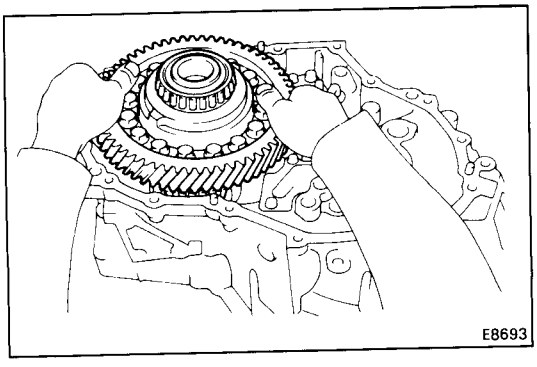
HINT: Do not drop the oil pump gasket.

(b) Install and torque the four bolts.

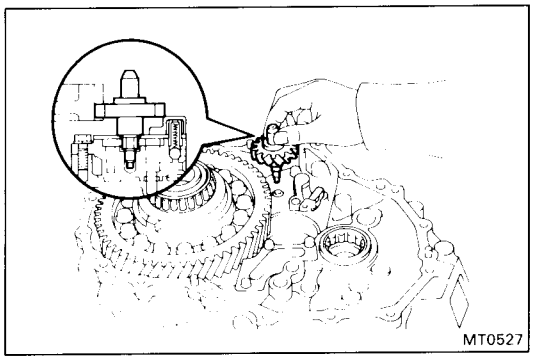
Torque: 175 kg-cm (13 ft-lb, 17 N·m)



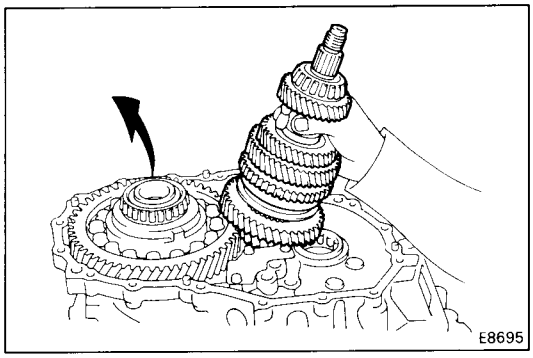
3. INSTALL MAGNET TO TRANSAXLE CASE



4. INSTALL DIFFERENTIAL CASE ASSEMBLY

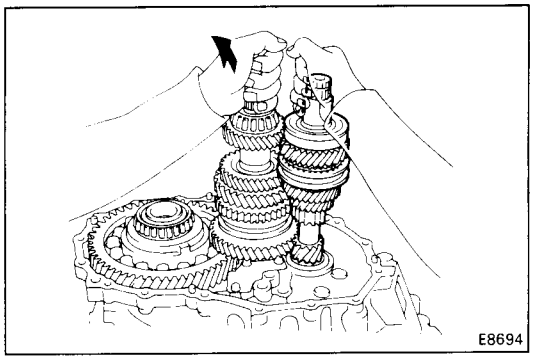


5. INSTALL OIL PUMP DRIVE GEAR



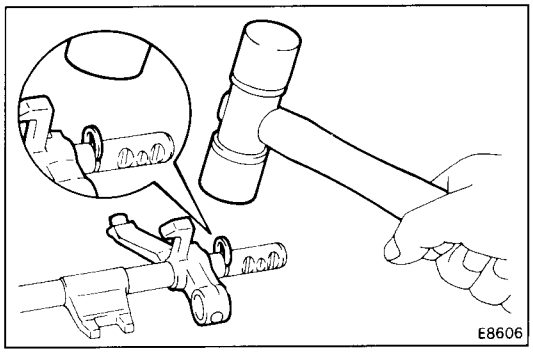
6. INSTALL OUTPUT SHAFT ASSEMBLY

Lift the differential case assembly, install the output shaft assembly.



7. INSTALL INPUT SHAFT ASSEMBLY

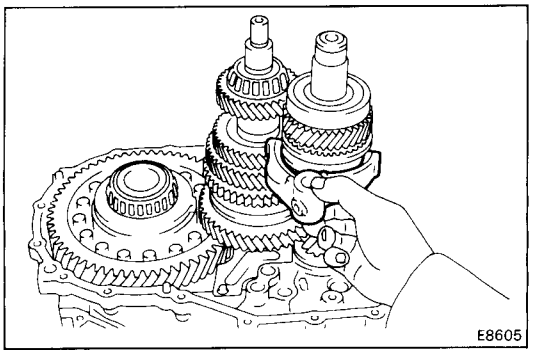
Leaning the output shaft to the differential side, install the input shaft assembly.



8. INSTALL SNAP RING

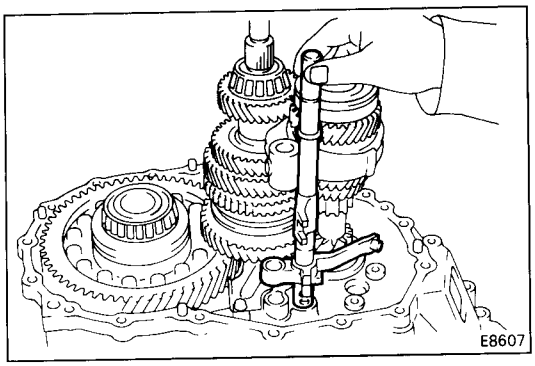
(a) Install the reverse shift fork to the No.3 shift fork.

(b) Using a hammer, install the snap ring.

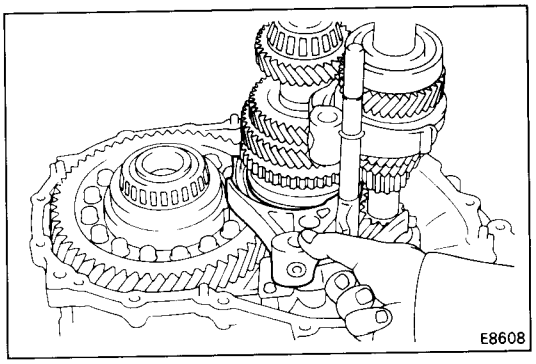


9. INSTALL NO.2 SHIFT FORK AND NO.3 SHIFT FORK SHAFT WITH REVERSE SHIFT FORK

(a) Place No.2 shift fork into the groove of No.2 hub sleeve.

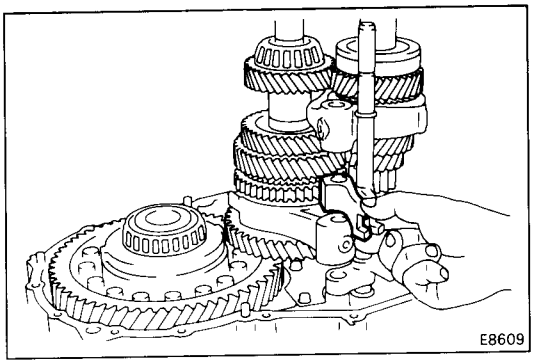


(b) Install the No.3 shift fork shaft with reverse shift fork to the case.

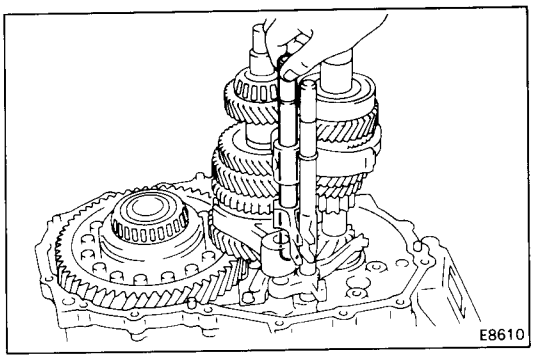


10. INSTALL NO.1 SHIFT FORK, SHIFT HEAD AND NO.2 SHIFT FORK SHAFT

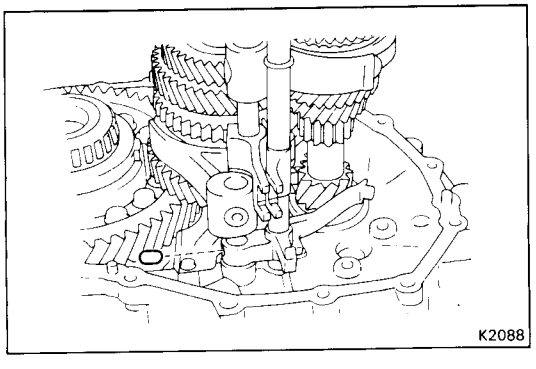
(a) Place No.1 shift fork into the groove of No.1 hub sleeve.



(b) Put shift head onto the No.1 shift fork.

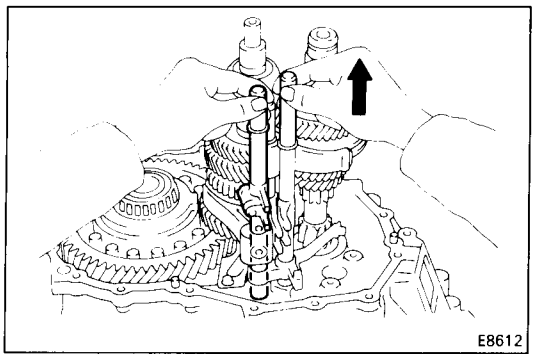


(c) Install the No.2 shift fork shaft to the case, through the No.2 shift fork, the shift head and the No.1 shift fork.



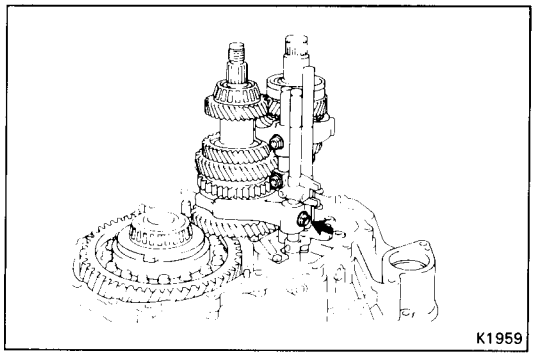
11. INSTALL NO.1 SHIFT FORK SHAFT

(a) Using a magnetic finger, install the interlock roller into the reverse shift fork.



(b) Install the No.1 shift fork shaft to the case, through the No.1 shift fork and reverse shift fork.

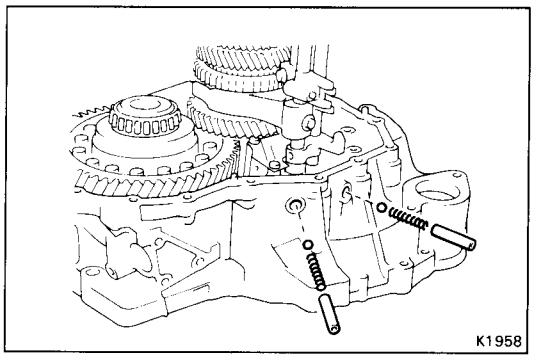
HINT: If it is difficult to put the fork shaft through the reverse shift fork, pull up the No.3 shift fork shaft.



12. INSTALL SET BOLTS

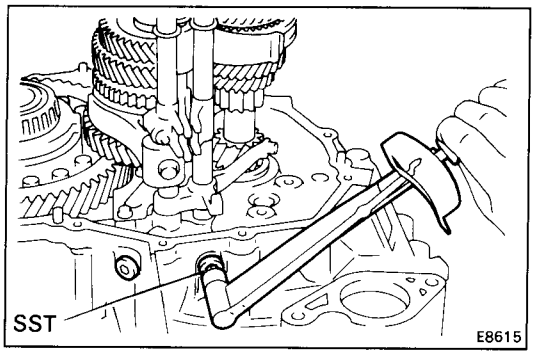
Install and torque the three bolts.

Torque: 240 kg-cm (17 ft-lb, 24 N·m)



13. INSTALL LOCKING BALLS, SPRINGS, SPRING SEATS AND SCREW PLUGS

(a) Install the two locking balls, spring and spring seats.



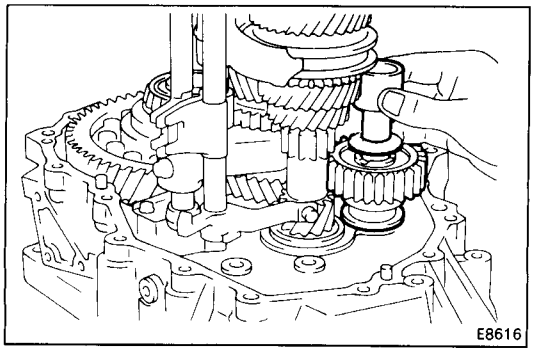
(b) Apply sealant to the screw plugs.

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

(c) Using SST, torque the screw plugs.

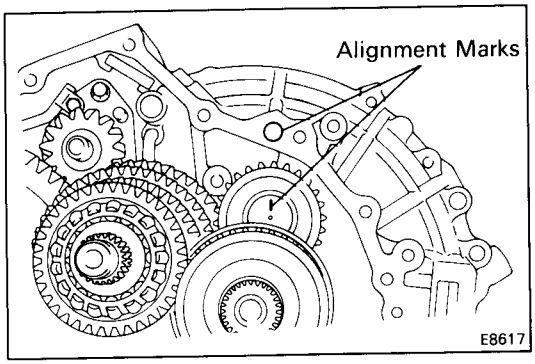
SST 09313-30021

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

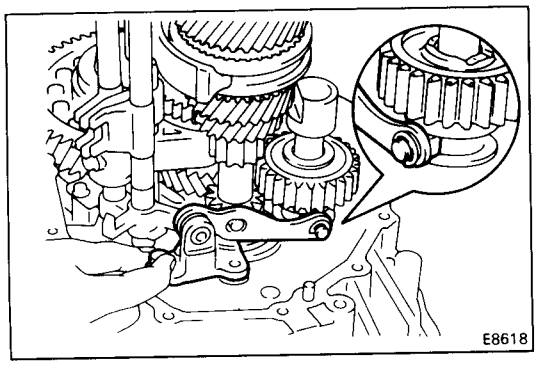


14. INSTALL REVERSE IDLER GEAR SHAFT AND GEAR

(a) Install the reverse idler gear shaft with gear to the case.



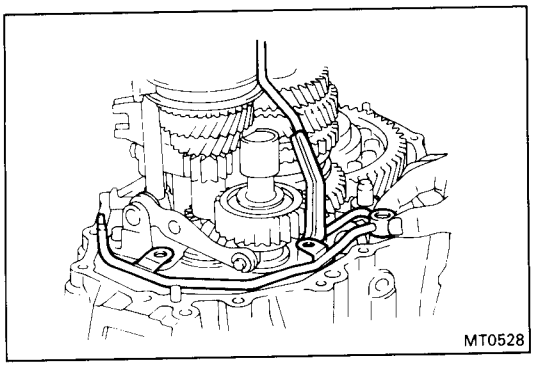
(b) Align the alignment marks as shown.



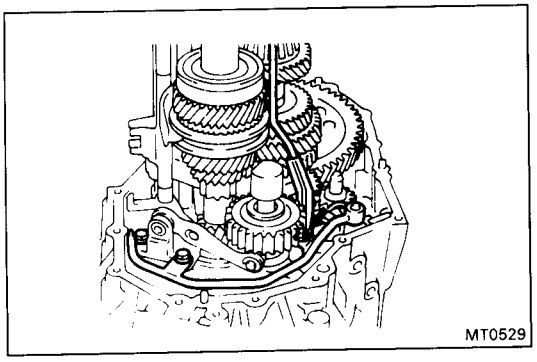
15. INSTALL REVRESE SHIFT ARM BRACKET ASSEMBLY AND NO.2 OIL PIPE

(a) Put the reverse shift fork pivot into the reverse shift arm and install the reverse shift arm bracket to the transaxle case.

(b) Install the bolt.

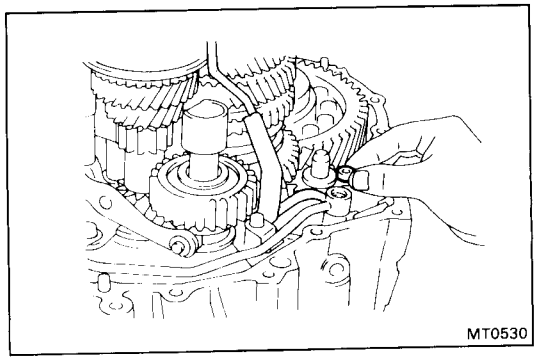


(c) Install the No.2 oil pipe.

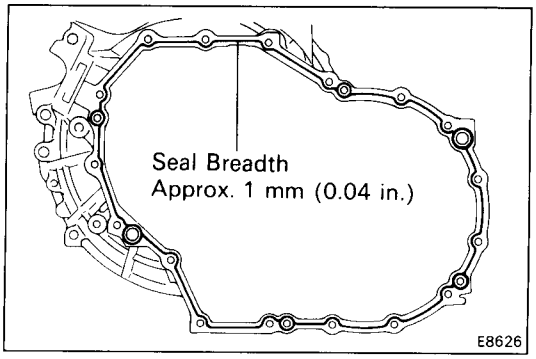


(d) Torque the two oil pipe bolts and shift arm bracket bolt.

Torque: 175 kg-cm (13 ft-lb, 17 N·m)



(e) Install a new gasket to the oil pipe.



16. INSTALL TRANSMISSION CASE

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transaxle case.

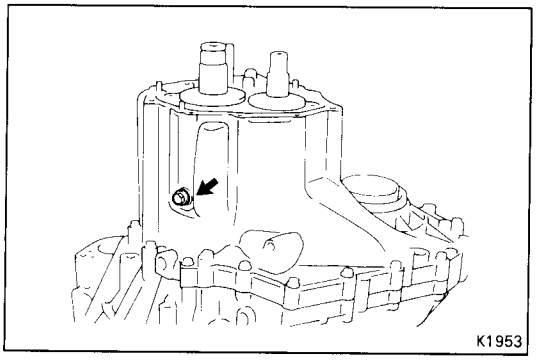
(b) Apply seal packing to the transmission case as shown in the figure.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the transmission case as soon as the seal packing is applied.

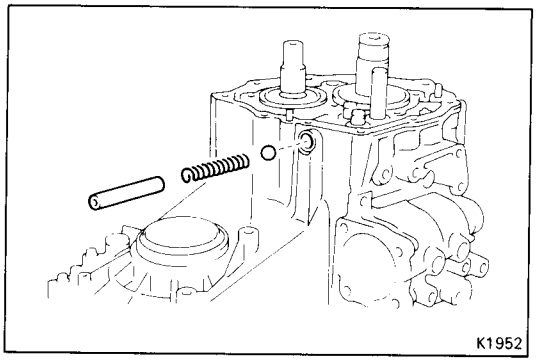
(c) Install and torque the seventeen bolts.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



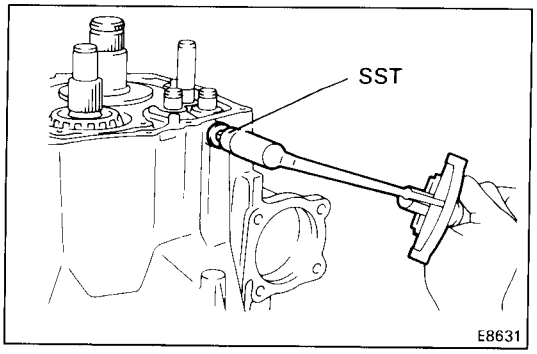
17. INSTALL AND TORQUE REVERSE IDLER GEAR SHAFT BOLT WITH GASKET

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



18. INSTALL LOCKING BALL, SPRING, SPRING SEAT AND SCREW PLUG

(a) Install the locking ball, spring and spring seat.



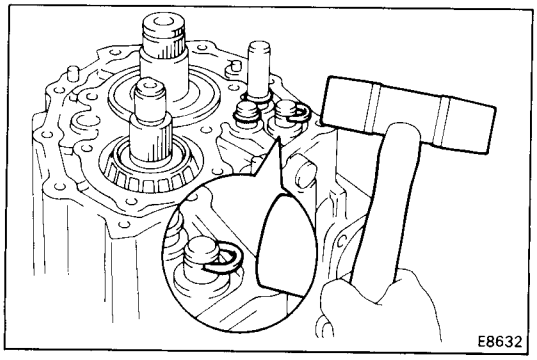
(b) Apply sealant to the screw plug.

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

(c) Using SST, torque the screw plug.

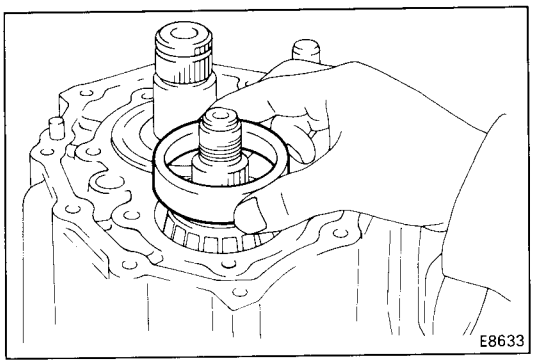
SST 09313-30021

Torque: 250 kg-cm (18 ft-lb, 25 N·m)



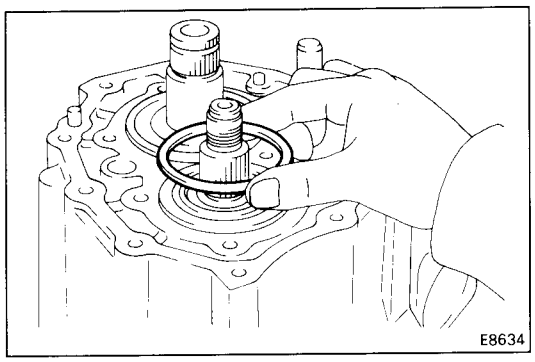
19. INSTALL SNAP RING

Using a plastic hammer, install the three snap rings.

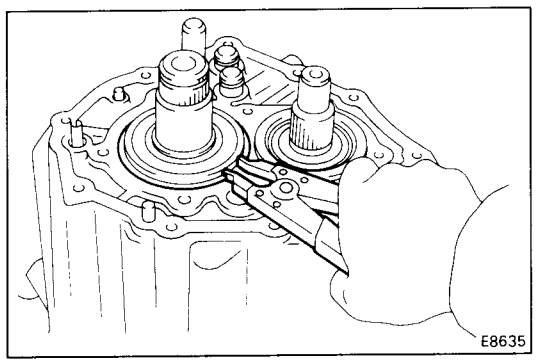


20. INSTALL REAR BEARING RETAINER

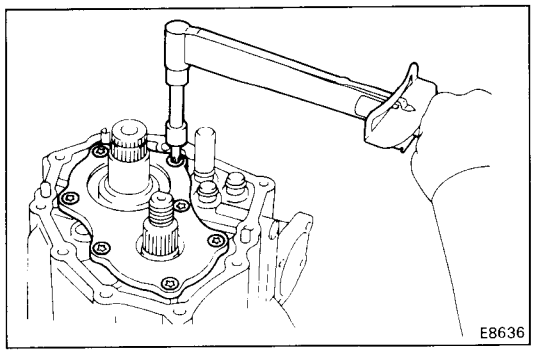
(a) Install the output shaft rear bearing outer race.



(b) Install the adjusting shim.



(c) Using snap ring pliers, install the snap ring to the input shaft rear bearing.

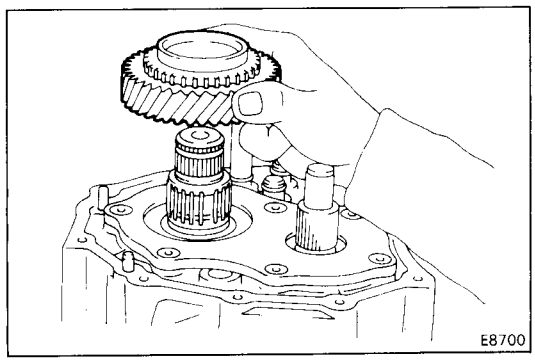


(d) Apply sealant to the screw plug.

Sealant: Part No. 08833-00070, THREE BOND 1324

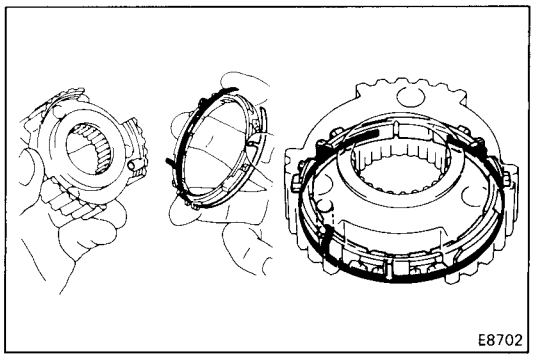
(e) Using a torx wrench, torque the seven screw plugs.

Torque: 430 kg-cm (31 ft-lb, 42 N·m)

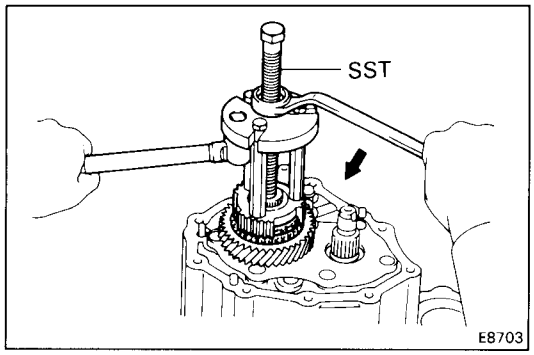


21. INSTALL FIFTH GEAR AND NO.3 CLUTCH HUB

(a) Install the spacer, needle roller bearing and 5th gear.


E8702

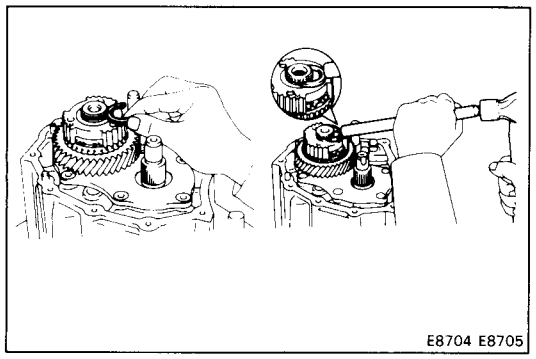
(b) Install the synchronizer ring and key spring to the No.3 clutch hub.



E8703

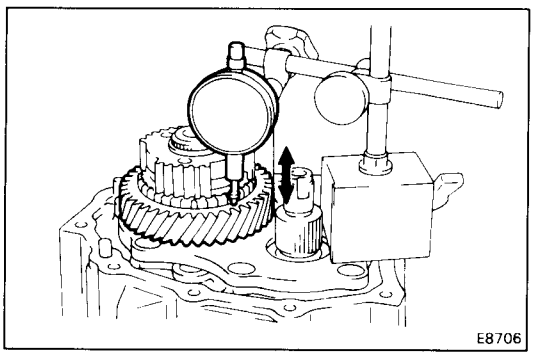
(c) Using SST, install the No.3 clutch hub with synchronizer ring and key spring.

SST 09310-17010 (09310-07010, 09310-07020, 9310-07030)


E8704 E8705

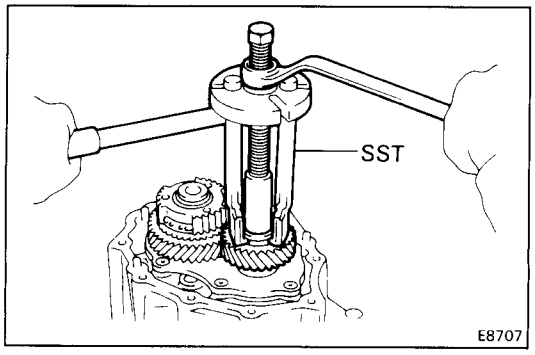
(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
Q	2.25 – 2.30 (0.0886 – 0.0906)
R	2.30 – 2.35 (0.0906 – 0.0925)
S	2.35 – 2.40 (0.0925 – 0.0945)
T	2.40 – 2.45 (0.0945 – 0.0965)
U	2.45 – 2.50 (0.0965 – 0.0984)
V	2.50 – 2.55 (0.0984 – 0.1004)
W	2.55 – 2.60 (0.1004 – 0.1024)
X	2.60 – 2.65 (0.1024 – 0.1043)
Y	2.65 – 2.70 (0.1043 – 0.1063)


E8706

(e) Using a dial indicator, measure the 5th gear thrust clearance.

Standard clearance: 0.10 – 0.57 mm (0.004 – 0.022 in.)

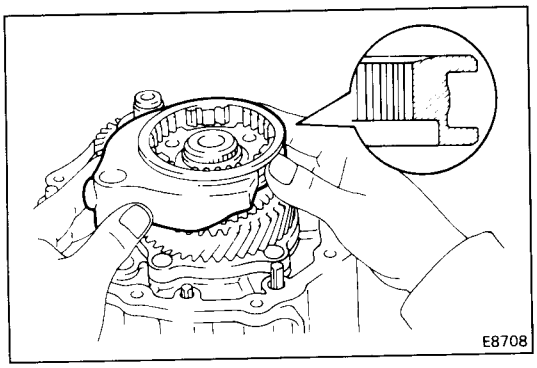


E8707

22. INSTALL FIFTH DRIVEN GEAR

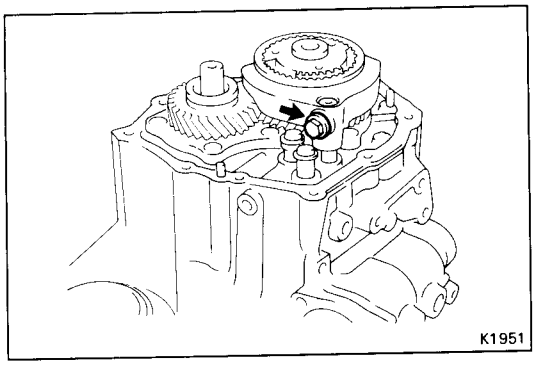
Using SST, install the 5th driven gear.

SST 09310-17010 (09310-07010, 09310-07020 09310-07040, 09310-07050)



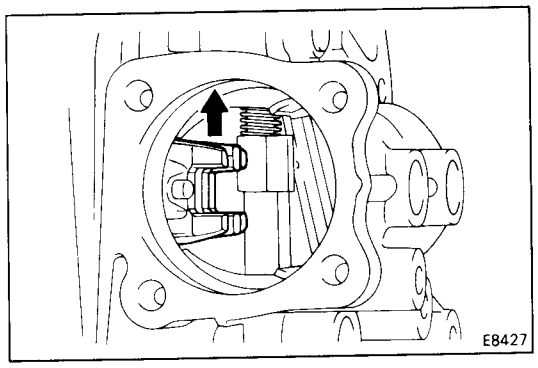
23. INSTALL NO.3 HUB SLEEVE AND FIFTH SHIFT FORK

(a) Install the No.3 hub sleeve and 5th shift fork.



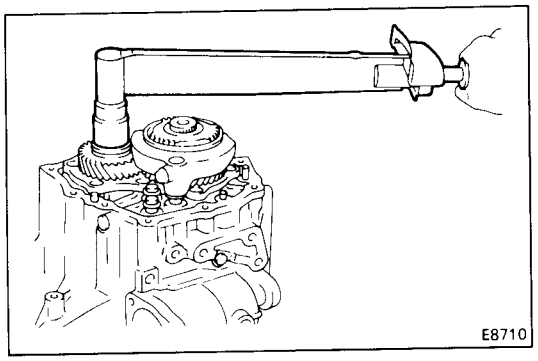
(b) Install and torque the set bolt.

Torque: 240 kg-cm (17 ft-lb, 24 N·m)



24. INSTALL LOCK NUT

(a) Engage the gear double meshing.

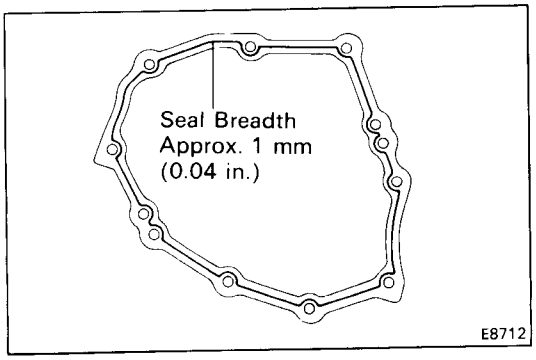


(b) Install and torque the nut.

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

(c) Disengage the gear double meshing.

(d) Stake the lock nut.



25. INSTALL TRANSMISSION CASE COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmission case cover.

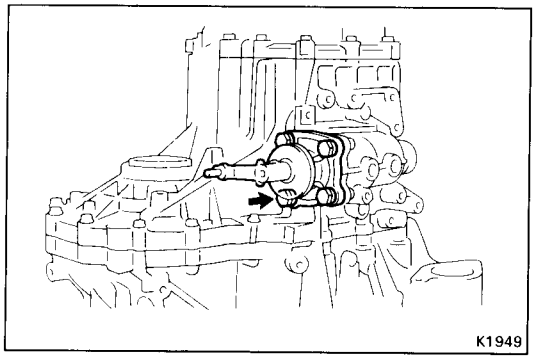
(b) Apply seal packing to the transmission case as shown in the figure.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the transmission case cover as soon as the seal packing is applied.

(c) Install and torque the ten bolts.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



26. INSTALL SHIFT AND SELECT LEVER SHAFT ASSEMBLY

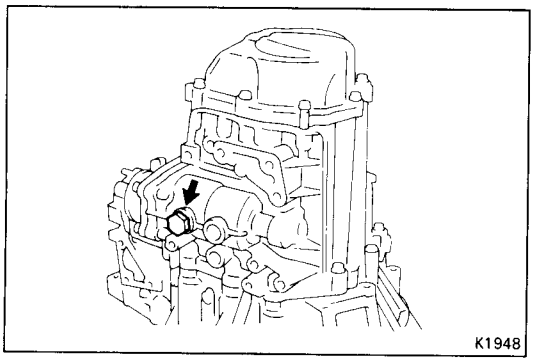
(a) Install the shift and select lever shaft assembly and new gasket.

(b) Apply sealant to the bolt threads.

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

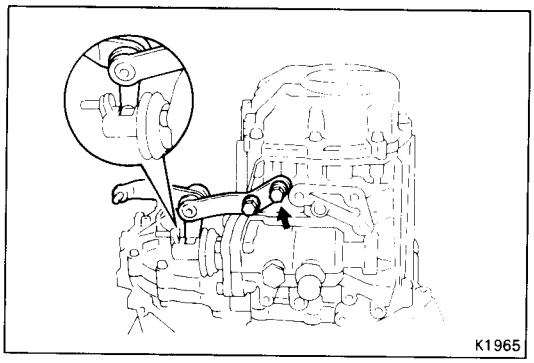
(c) Install and torque the four bolts.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)



(d) Install and torque the lock bolt with gasket.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)



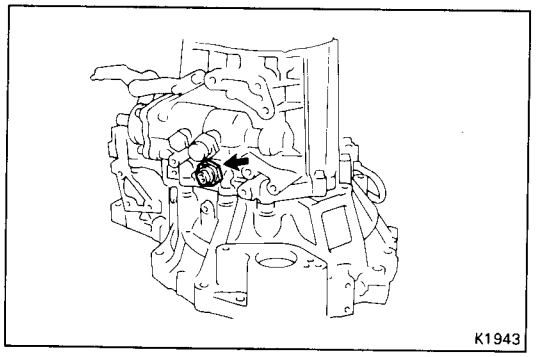
27. INSTALL NO.2 SELECTING BELLCRANK WITH SELECTING BELLCRANK SUPPORT

(a) Apply sealant to the bolt threads.

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

(b) Install and torque the two bolts.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

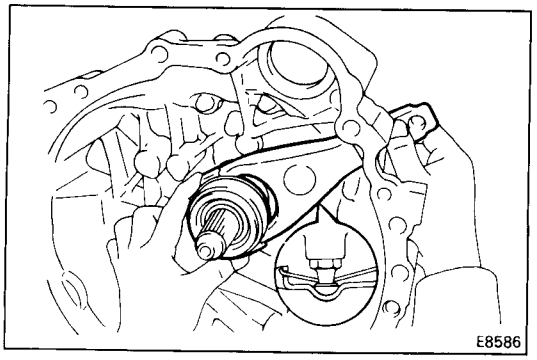


28. INSTALL BACK-UP LIGHT SWITCH

Install and torque the back-up light switch.

Torque: 410 kg-cm (30 ft-lb, 40 N·m)

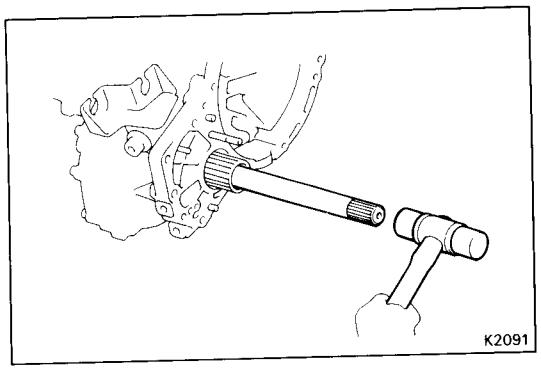
29. INSTALL SPEEDOMETER DRIVEN GEAR



30. INSTALL RELEASE FORK AND BEARING

Apply molybdenum disulphide lithium base grease to the following part:

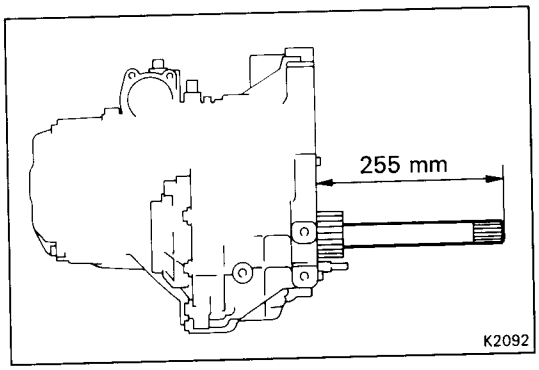
- Release bearing hub inside groove
- Input shaft spline
- Release fork contact surface



31. INSTALL DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

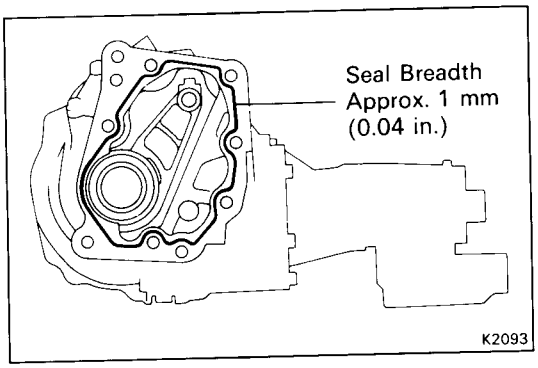
(a) Coat the MP grease to the intermediate shaft.

(b) Using a plastic hammer, correctly drive the intermediate shaft straight until the top of it touches the differential pinion shaft.



HINT: Keeping the intermediate shaft on the pinion shaft of differential, measure the point in the illustration.

Protrusion length: 255 mm (10.04 in.)



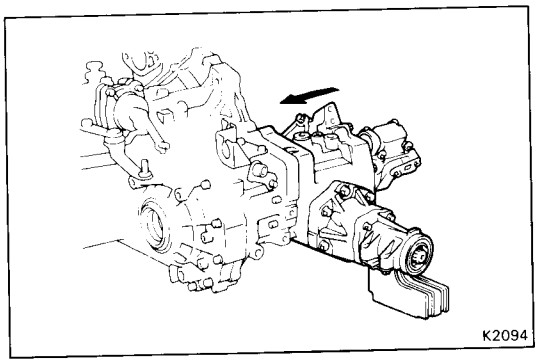
32. INSTALL TRANSFER ASSEMBLY

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer or transaxle.

(b) Apply seal packing to the transfer as shown in the figure.

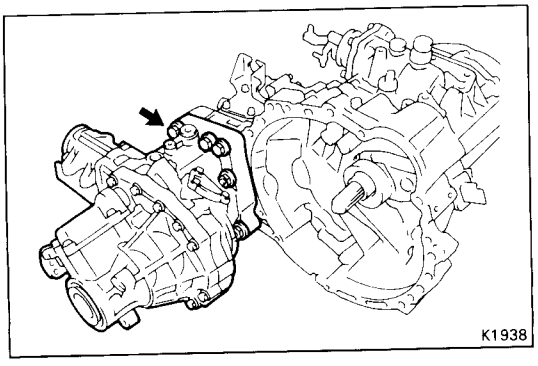
Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the transfer as soon as the seal packing is applied.



(c) Install the transfer assembly to the transaxle assembly.

HINT: Shift into 4th gear, install the transfer assembly while turning the input shaft of the transaxle.



(d) Apply sealant to the bolt threads.

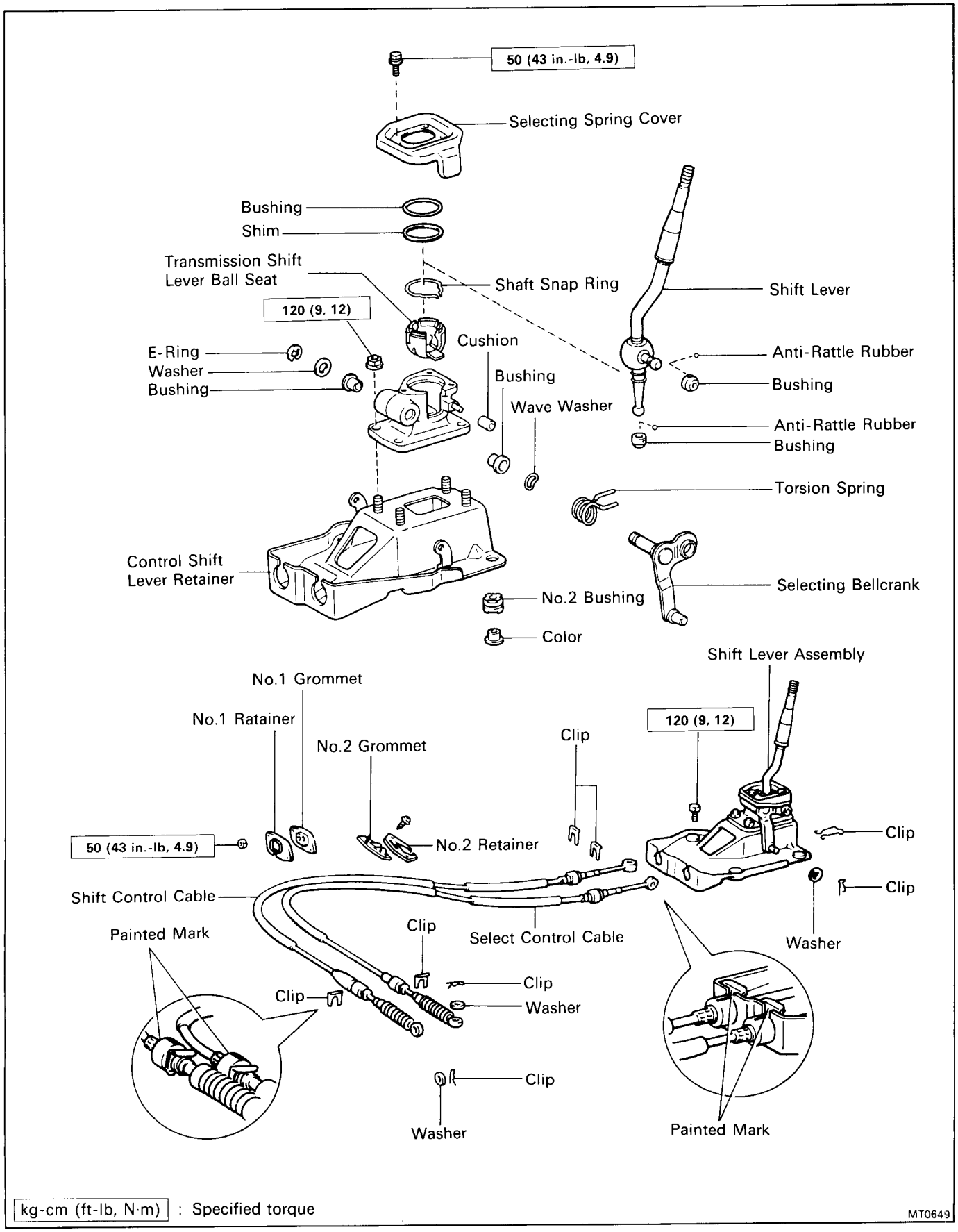
Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(e) Install and torque the three bolts and five nuts.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

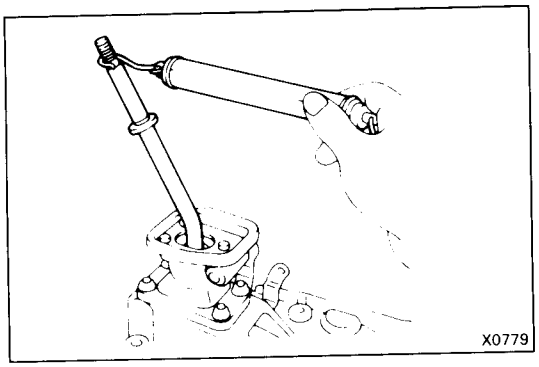
SHIFT LEVER AND CONTROL CABLE

COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

MT0649



INSPECTION OF SHIFT LEVER

INSPECT SHIFT LEVER

(a) Remove selecting spring cover, selecting bellcrank and torsion spring.

(b) Install and torque the selecting spring cover.

Torque: 50 kg-cm (43 in.-lb, 5.0 N·m)

(c) Selecting shim of a thickness that allow a preload of 60 – 150 g (0.1 – 0.3 lb, 0.49 – 1.47 N) at the top of lever and install it in the shift lever seat.

Shim thickness

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	0.5 (0.020)	H	1.2 (0.047)
B	0.6 (0.024)	J	1.3 (0.051)
C	0.7 (0.028)	K	1.4 (0.055)
D	0.8 (0.031)	L	1.5 (0.059)
E	0.9 (0.035)	M	1.6 (0.063)
F	1.0 (0.039)	N	1.7 (0.067)
G	1.1 (0.043)		

PROPELLER SHAFT

PRECAUTION

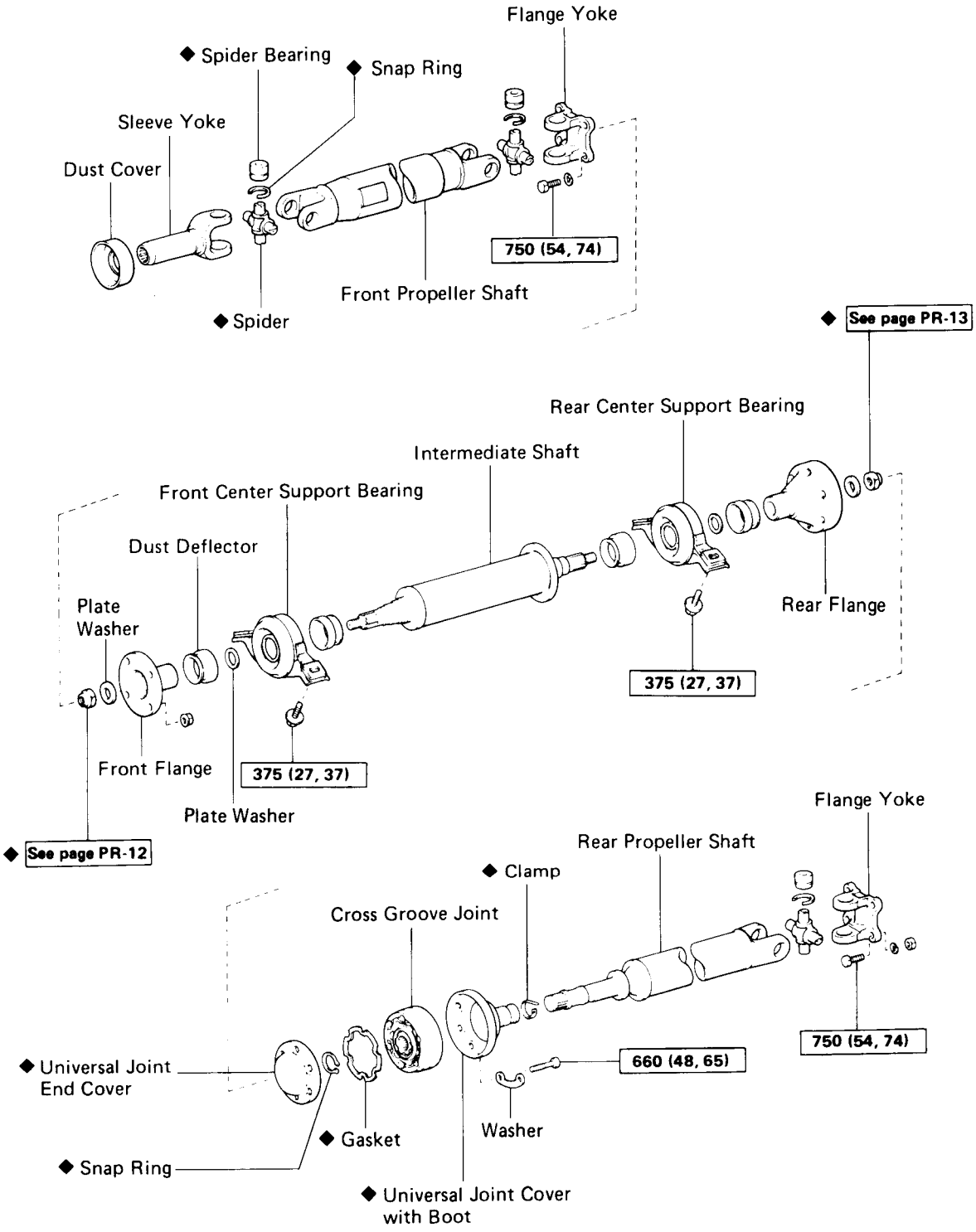
Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Sleeve yoke spline worn	Replace sleeve yoke	PR-4
	Center support bearing worn	Replace center support bearing	PR-4
	Spider bearing worn or stuck	Replace spider bearing	PR-9
Vibration	Propeller and intermediate shafts runout	Replace shafts	PR-4
	Propeller shafts imbalance	Balance propeller shafts	
	Front flange runout	Replace front flange	PR-7
	Rear flange runout	Replace rear flange	PR-6
	Cross groove joint stuck or damaged	Replace cross groove joint	PR-8
	Transfer extention housing rear bushing worn	Replace bushing	
	Sleeve yoke spline stuck	Replace sleeve yoke	PR-4

PROPELLER SHAFT

COMPONENTS

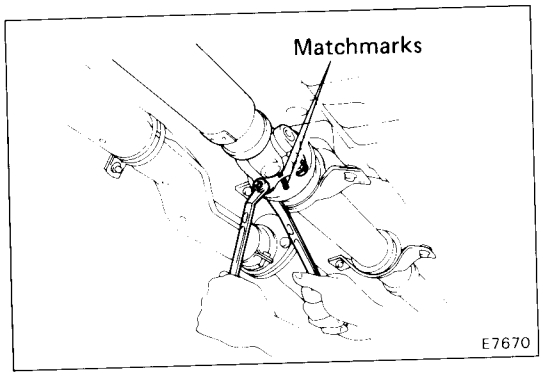


◆ Non-reusable part

kg-cm (ft-lb, N·m) : Specified torque

PR0173

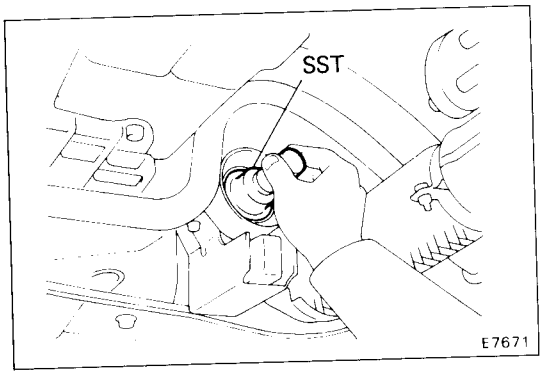
REMOVAL OF PROPELLER SHAFT



1. DISCONNECT FRONT PROPELLER SHAFT

(a) Place the matchmarks on the both flanges.

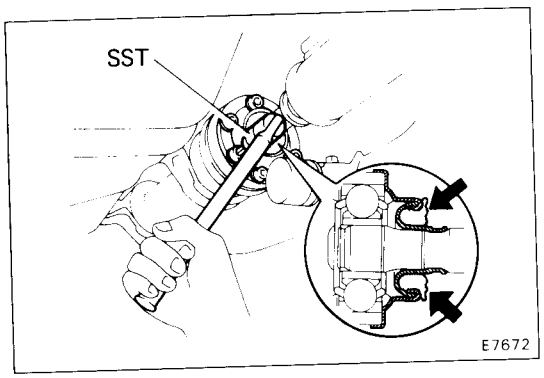
(b) Remove the four bolts, washers and nuts.



(c) Pull the yoke from the transfer.

(d) Insert SST in the transfer to prevent oil leakage.

SST 09325-20010



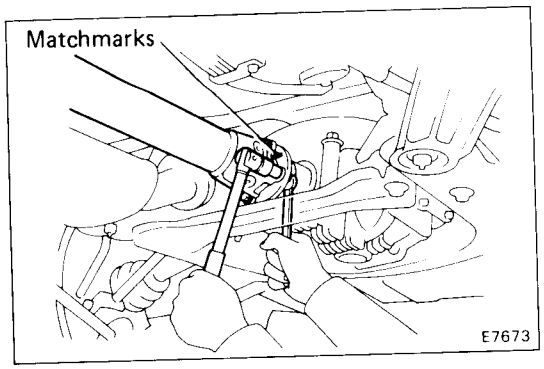
2. LOOSEN CROSS GROOVE JOINT SET BOLT

(a) Depress the brake pedal and hold it.

(b) Using a SST, loosen the cross groove joint set bolts 1/2 turn.

SST 09923-00020

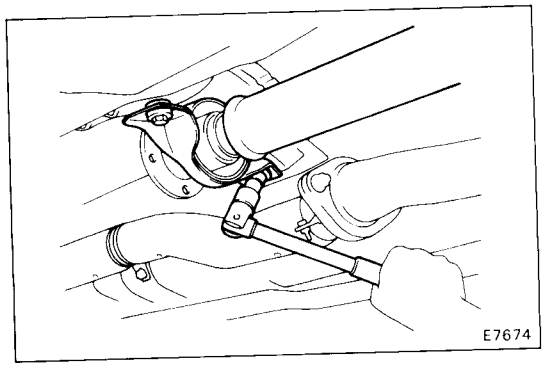
HINT: Put a piece of cloth or an equivalent into the inside of the universal joint cover so that the boot would not be touched to the inside of the universal joint cover.



3. REMOVE INTERMEDIATE SHAFT AND REAR PROPELLER SHAFT

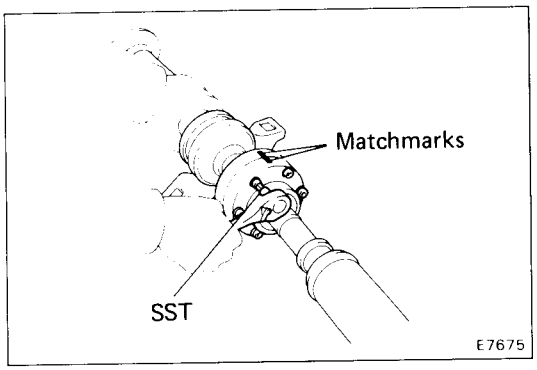
(a) Place the matchmarks on the both flanges.

(b) Remove the bolts, nuts and washers.



(c) Remove the two bolts, front center support bearing and washers.

(d) Remove rear center support bearing and washers.



4. **SEPARATE INTERMEDIATE SHAFT AND REAR PROPELLER SHAFT**

(a) Place the matchmarks on the joint and flange.

HINT: Do not place the matchmarks with a punch.

(b) Using SST, remove the six bolts and three washers to separate intermediate shaft and rear propeller shaft.

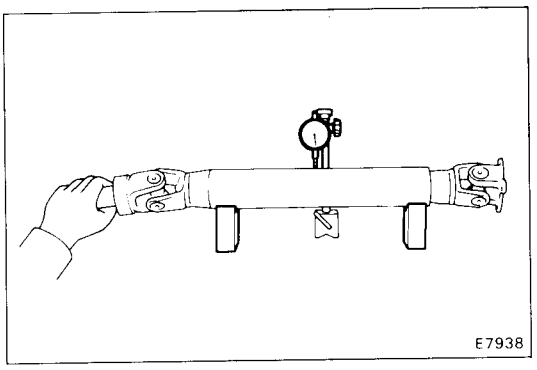
SST 09923-00020

INSPECTION OF PROPELLER SHAFT

1. **INSPECT PROPELLER AND INTERMEDIATE SHAFTS RUNOUT**

If shaft runout is greater than maximum, replace the shaft.

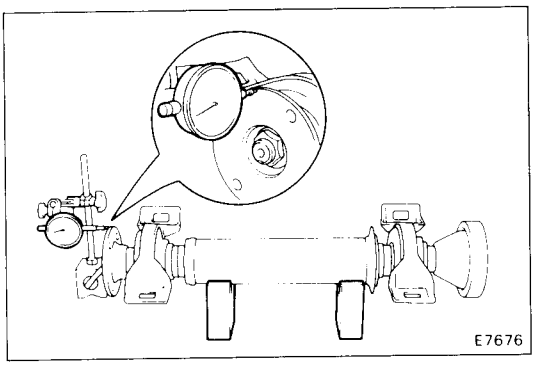
Maximum runout: 0.8 mm (0.031in.)



2. **INSPECT INTERMEDIATE SHAFT FLANGE RUNOUT**

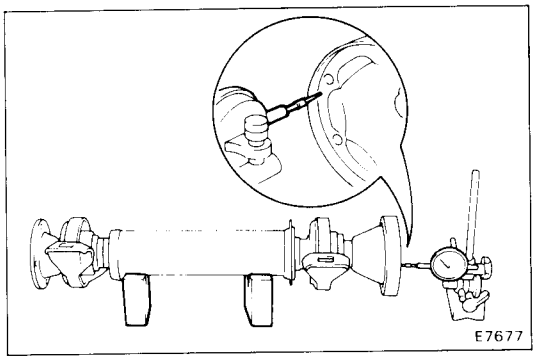
(a) Inspect the front side of intermediate shaft flange runout.

Maximum runout: 0.1 mm (0.004 in.)



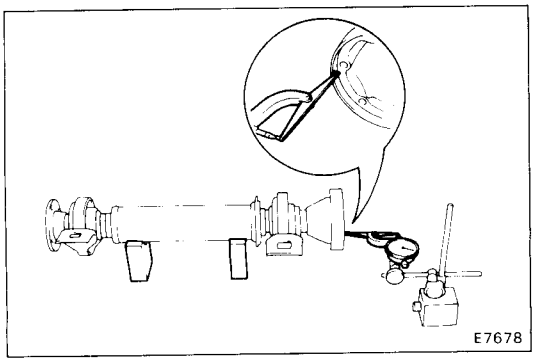
(b) Inspect the rear side of intermediate shaft flange runout in horizontal direction.

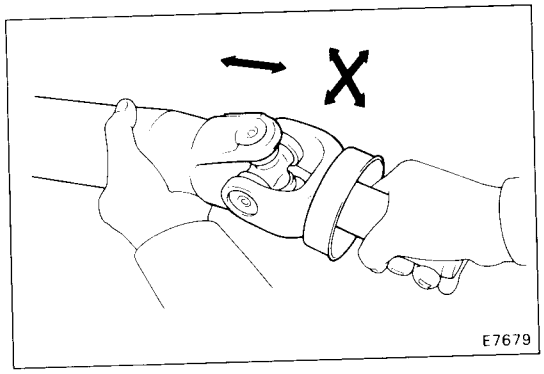
Maximum runout: 0.1 mm (0.004 in.)



(c) Inspect the rear side of intermediate shaft flange runout in vertical direction.

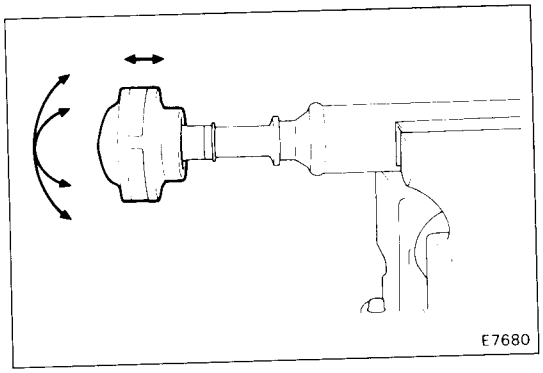
Maximum runout: 0.1 mm (0.004 in.)





3. INSPECT SPIDER BEARINGS

Check the spider bearing axial play by turning the flange while holding the shaft tightly.



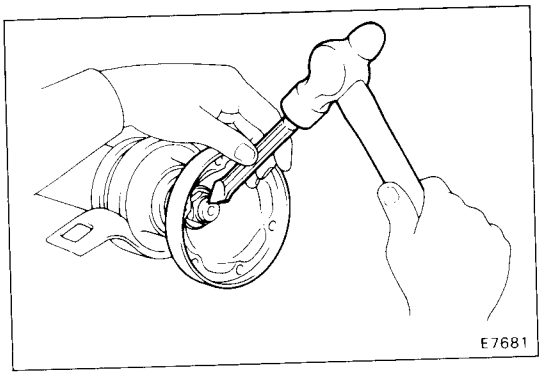
4. INSPECT CROSS GROOVE JOINT

Check the joint smooth play by turning the joint in directions as shown. And check the crack or damage or grease leakage of boot. If problem is found, replace the joint.

DISASSEMBLY OF PROPELLER SHAFT

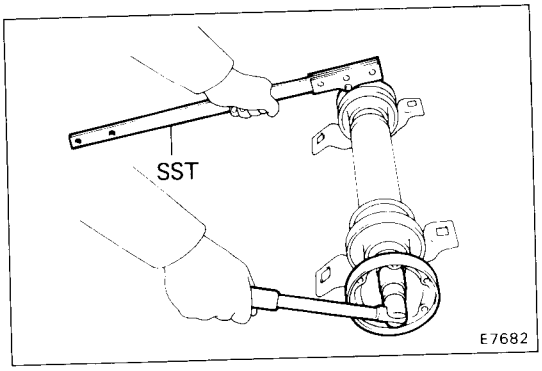
1. REMOVE REAR CENTER SUPPORT BEARING

(a) Using a hammer and chisel, loosen the staked part of the nut.

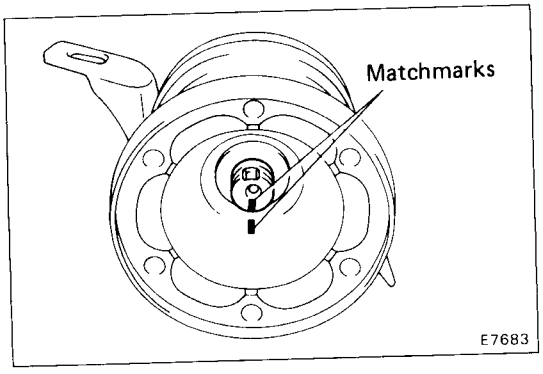


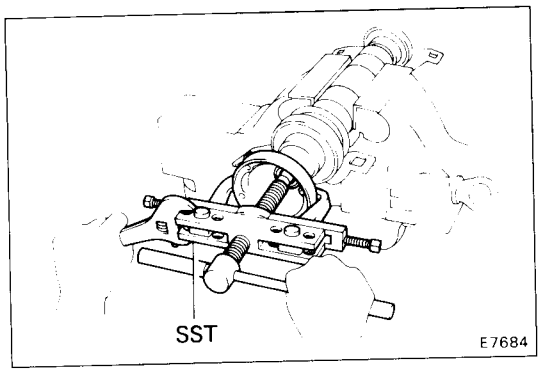
(b) Using SST to hold the front flange, remove the nut and plate washer.

SST 09330-00021



(c) Place the matchmarks on the rear flange and shaft.

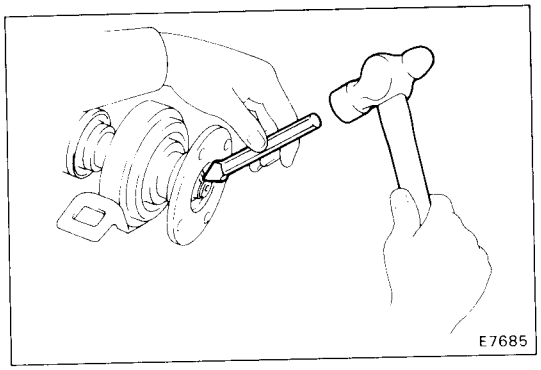




(d) Using SST, remove the rear flange.

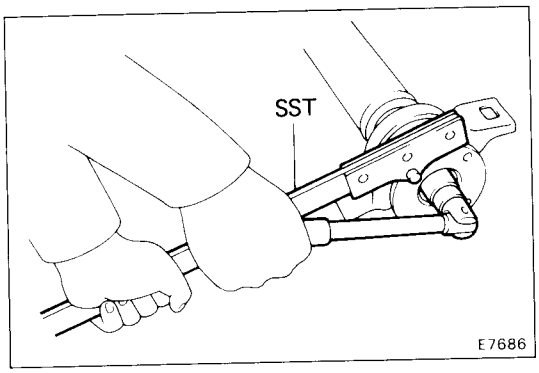
SST 09950-20017

(e) Remove the rear center support bearing and plate washer.



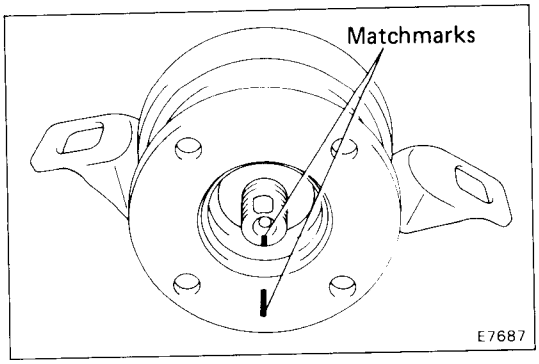
2. REMOVE FRONT CENTER SUPPORT BEARING

(a) Using a hammer and chisel, loosen the staked part of the nut.

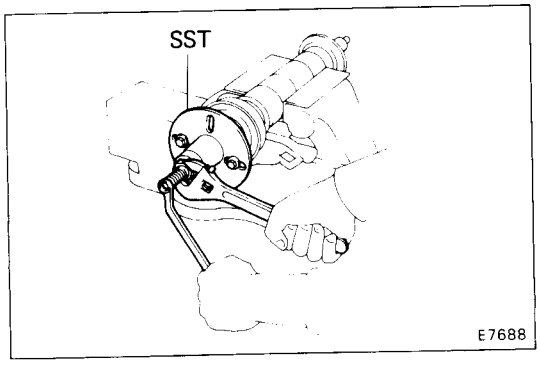


(b) Using SST to hold the flange, remove the nut and plate washer.

SST 09330-00021



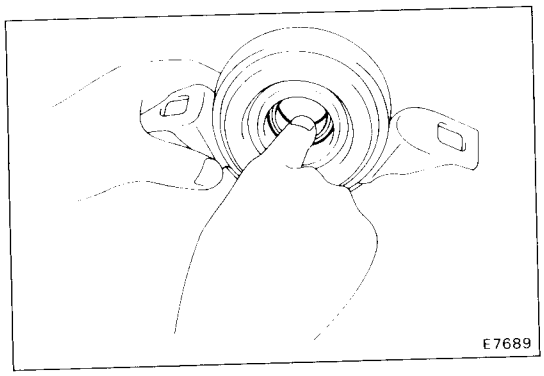
(c) Place the matchmarks on the flange and the shaft.



(d) Using SST, remove the flange.

SST 09557-22022 (09557-22050)

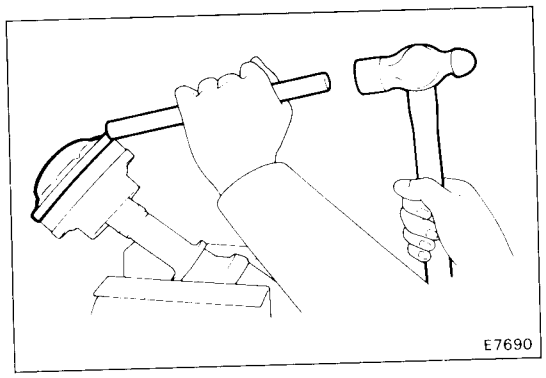
(e) Remove the front center support bearing and plate washer.



3. INSPECT CENTER SUPPORT BEARING

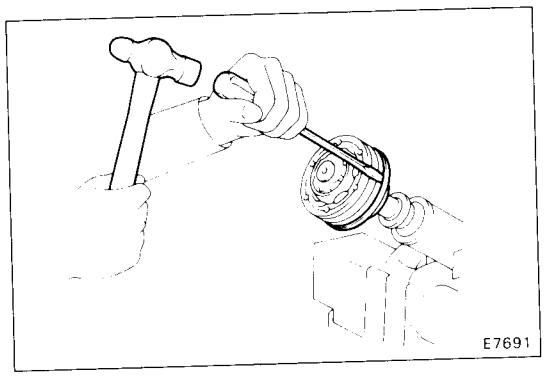
(a) Turning the bearing by hand while applying force in the rotation direction. Check the bearing smooth play.

(b) Check that there are no cracks and no damages about both seals.

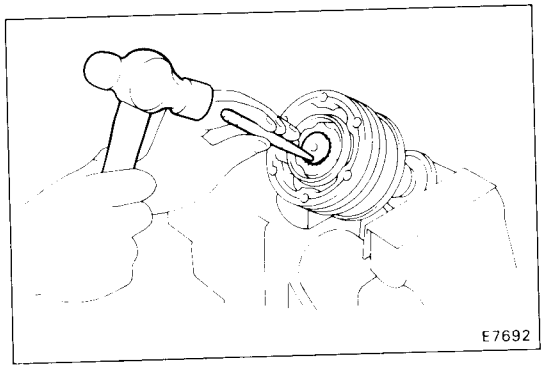


4. REMOVE CROSS GROOVE JOINT

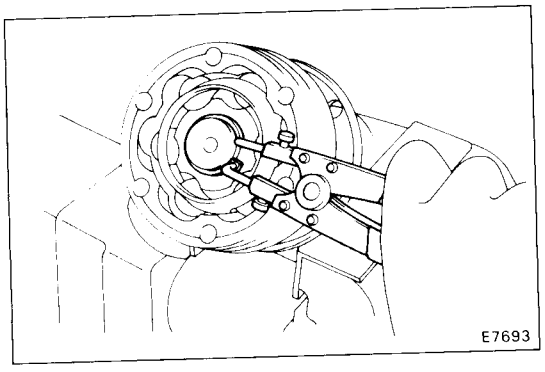
(a) Using a hammer and brass bar, remove the joint end cover.



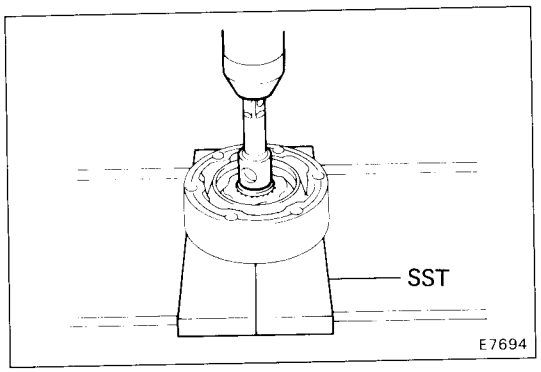
(b) Using a hammer and screwdriver, remove the cover.



(c) Place the matchmarks on the inner race and shaft.



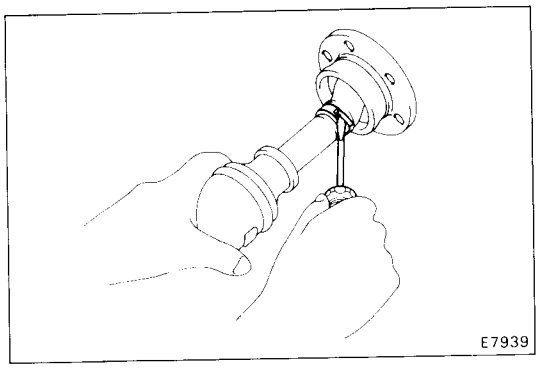
(d) Using snap ring pliers, remove the snap ring.



(e) Using SST, extension bar and press, remove the cross groove joint.

SST 09527-21011

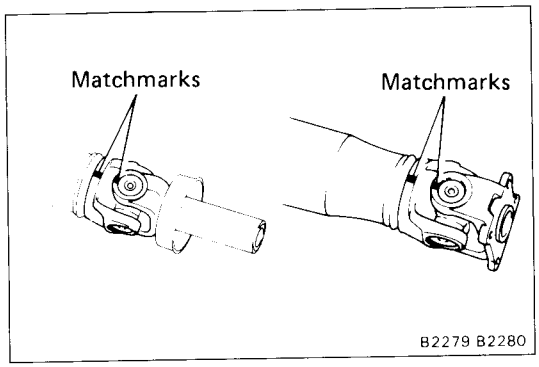
(f) Remove the joint end cover gasket.



5. REMOVE UNIVERSAL JOINT COVER WITH BOOT

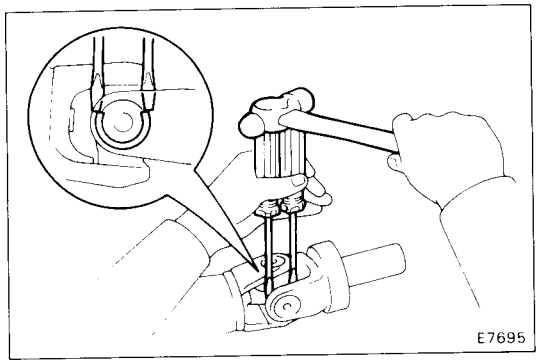
Remove the clamp and the universal joint cover with boot.

REPLACEMENT OF SPIDER BEARING



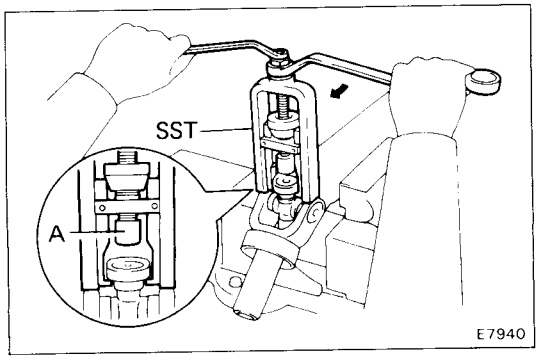
1. REMOVE SNAP RINGS

(a) Place matchmarks on shaft and flange or yoke.



(b) Slightly tap in the bearing outer races.

(c) Using two screwdrivers, remove the four snap rings from the grooves.

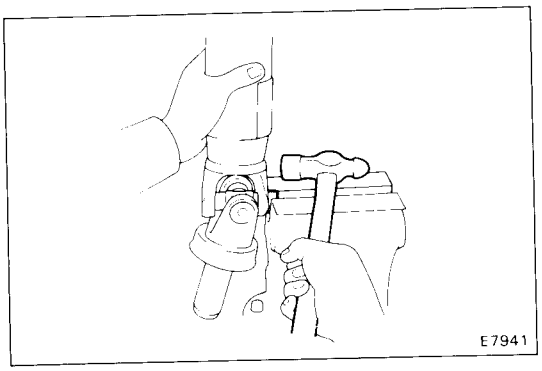


2. REMOVE SPIDER BEARINGS

(a) Using SST, push out the bearing from the shaft.

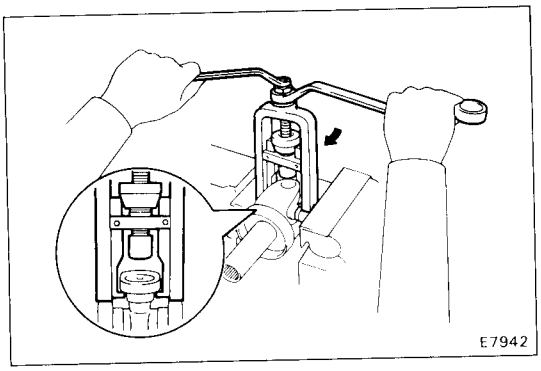
SST 09332-25010

HINT: Sufficiently raise the part indicated by A so that it does not come int contact with the bearing.



(b) Clamp the bearing outer race in a vise and tap off the shaft with a hammer.

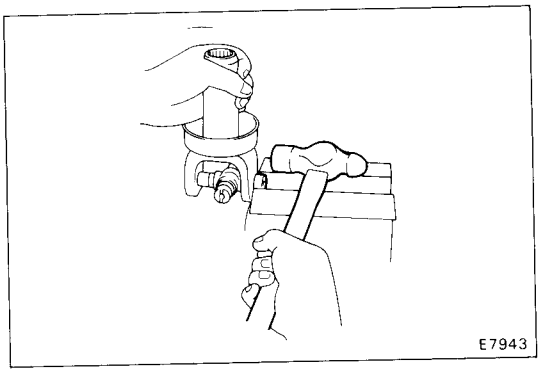
HINT: Remove the bearing on the opposite side in the same procedure.



(c) Install the two removed bearing outer races to the spider.

(d) Using SST, push out the bearing from the yoke.

SST 09332-25010



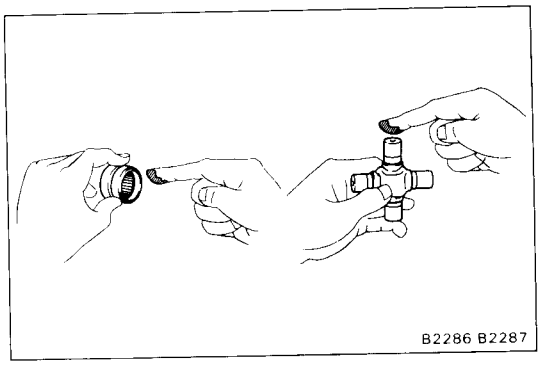
(e) Clamp the bearing outer race in a vise and tap off the yoke with a hammer.

HINT: Remove the bearing on the opposite side in the same procedure.

3. INSTALL SPIDER BEARINGS

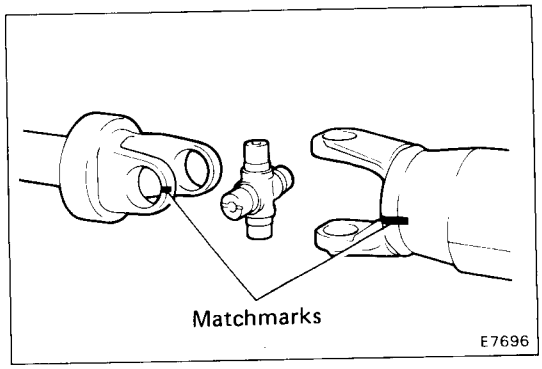
(a) Apply MP grease to the new spider and bearings.

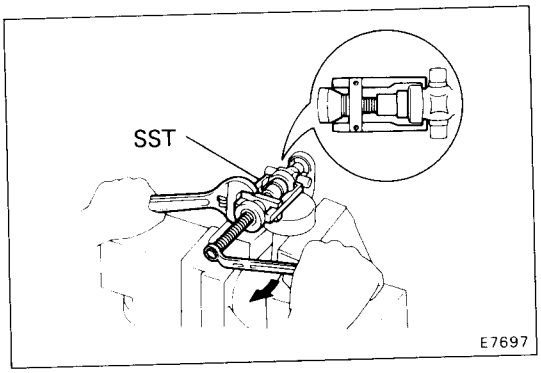
HINT: Be careful not to apply too much grease.



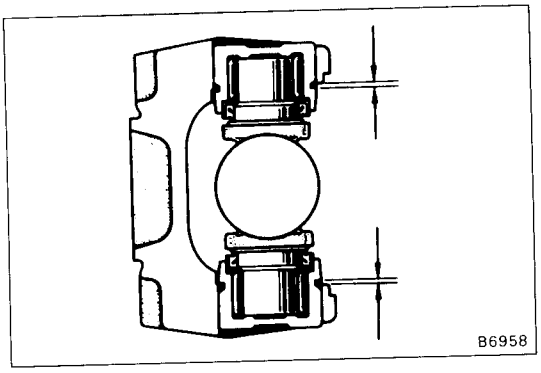
(b) Align the matchmarks on the yoke and shaft.

(c) Fit a new spider into the yoke.

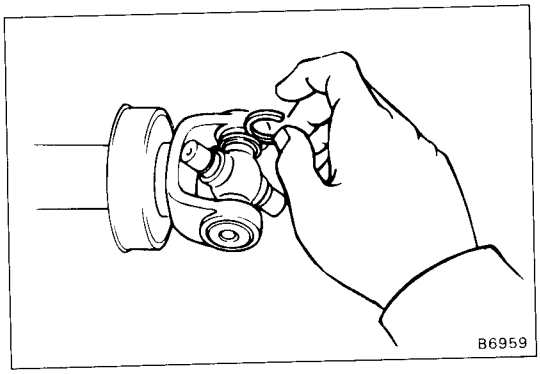




(d) Using SST, install new bearings on the spider.
SST 09332-25010



HINT: Adjust both bearings so that the snap ring grooves are at maximum and equal width.

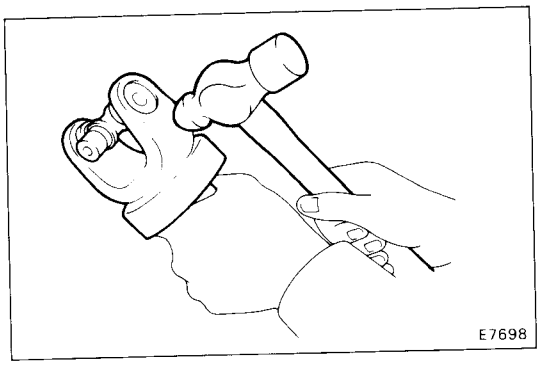


4. INSTALL SNAP RINGS

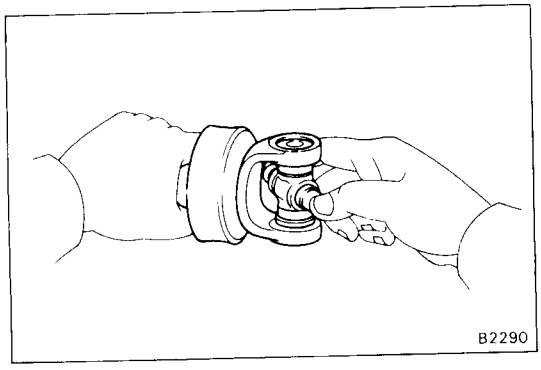
(a) Install two snap rings of equal thickness which will allow 0 – 0.05 mm (0 – 0.0020 in.) axial play.

HINT: Do not reuse the snap ring.

Color	Thickness mm (in.)
–	1.475 – 1.525 (0.0581 – 0.0600)
Brown	1.525 – 1.575 (0.0600 – 0.0620)
Blue	1.575 – 1.625 (0.0620 – 0.0640)



(b) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.



5. CHECK SPIDER BEARING

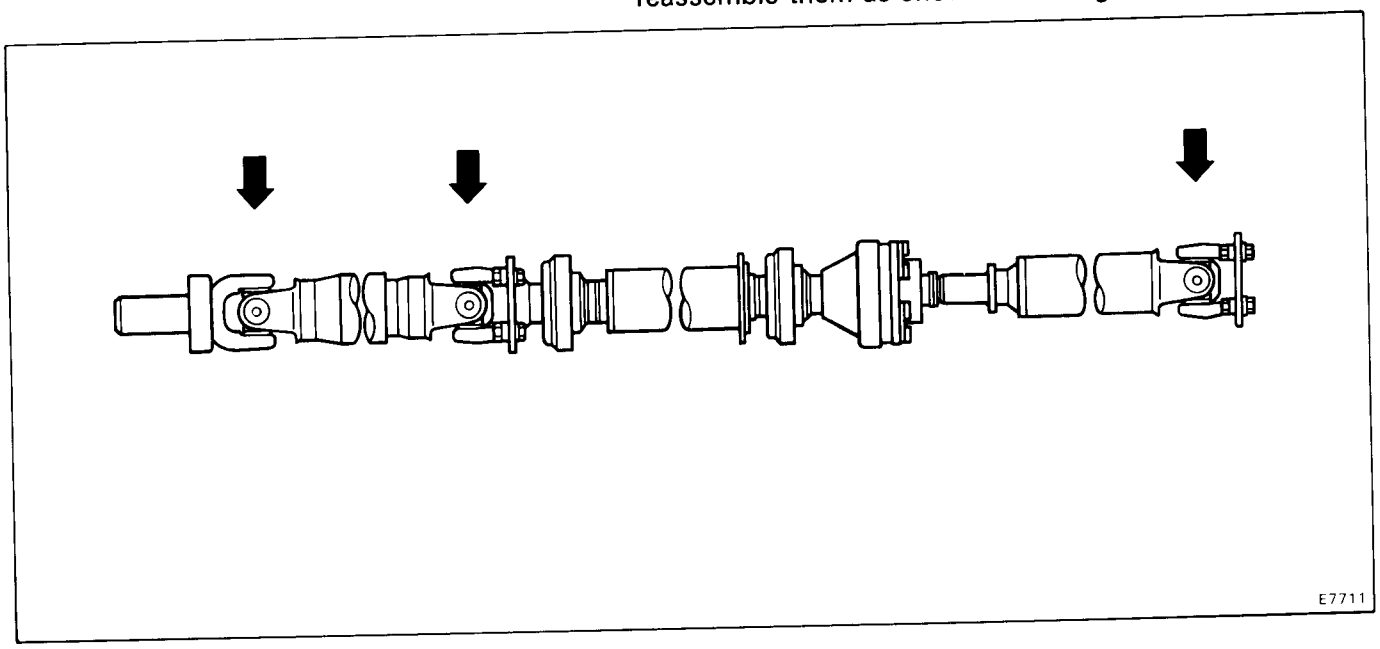
(a) Check that the spider bearing moves smoothly.

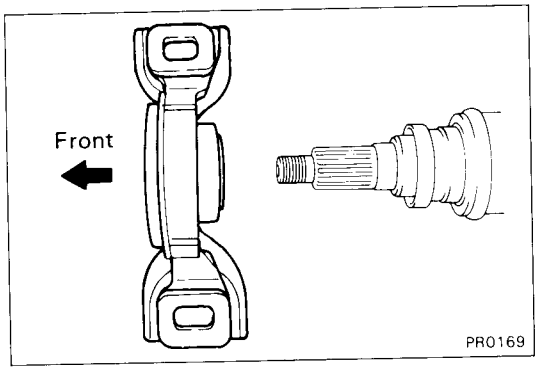
(b) Check the spider bearing axial play.

HINT: Install new spider bearings on the shaft side in the procedure described above.

ASSEMBLY OF PROPELLER SHAFT

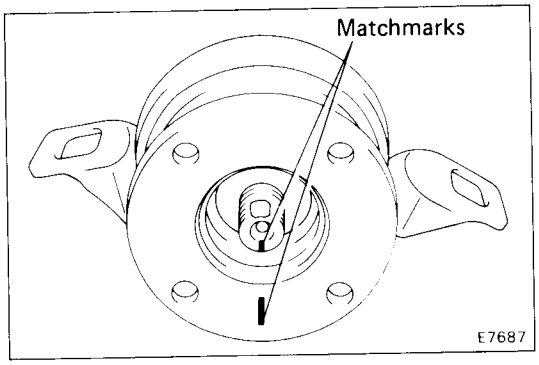
HINT: If replacing or disassembling propeller shaft parts, reassemble them as shown in the figure below.





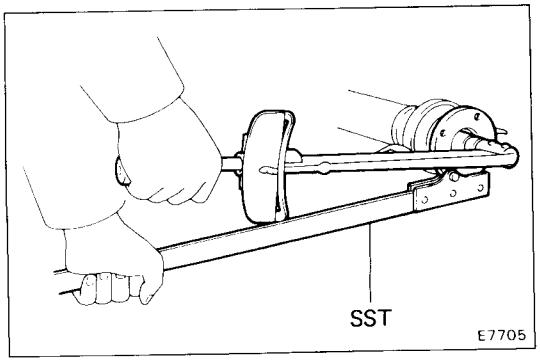
1. INSTALL FRONT CENTER SUPPORT BEARING

(a) Set the front center support bearing on the intermediate shaft as shown.



(b) Install the plate washer to the intermediate shaft.

(c) Align the matchmarks on the flange and shaft and place the flange on the shaft.



(d) Using SST to hold the flange, press the bearing into position by tightening down a new nut and washer.

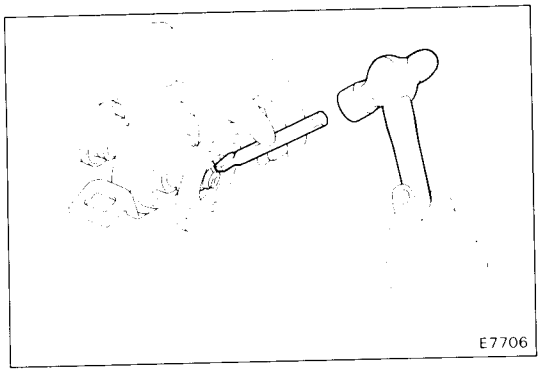
SST 09330-00021

Torque: 1850 kg-cm (134 ft-lb, 181 N·m)

(e) Loosen the nut.

(f) Torque the nut again.

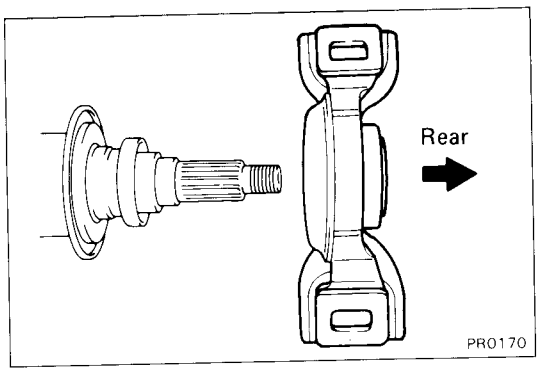
Torque: 700 kg-cm (51 ft-lb, 69 N·m)



(g) Using a hammer and chisel, stake the nut.

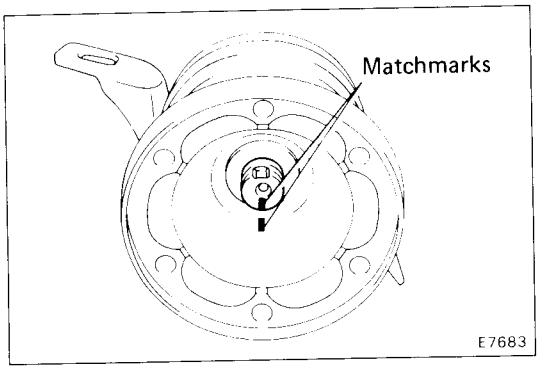
2. INSTALL REAR CENTER SUPPORT BEARING

(a) Set the rear center support bearing on the intermediate shaft as shown.



(b) Install the plate washer to the intermediate shaft.

(c) Align the matchmarks on the flange and shaft and place the flange on the shaft.



(d) Using SST to hold the flange, press the bearing into position by tightening down a new nut and washer.

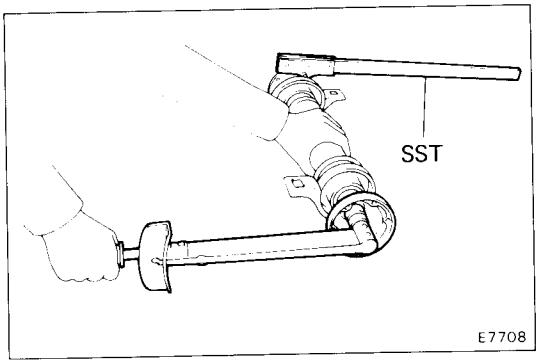
SST 09330-00021

Torque: 1850 kg-cm (134 ft-lb, 181 N·m)

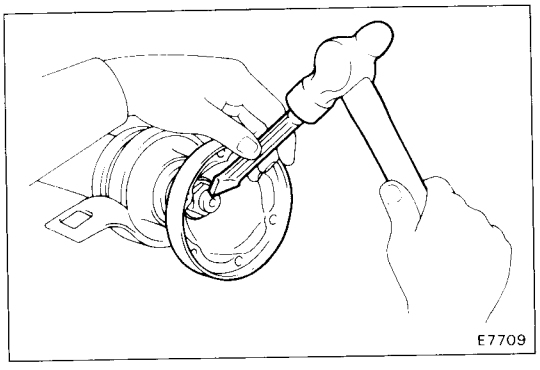
(e) Loosen the nut.

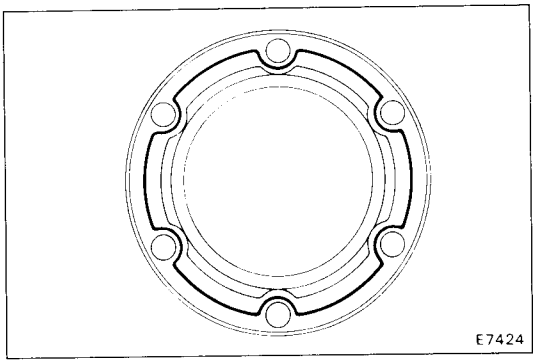
(f) Torque the nut again.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)



(g) Using a hammer and chisel, stake the nut.



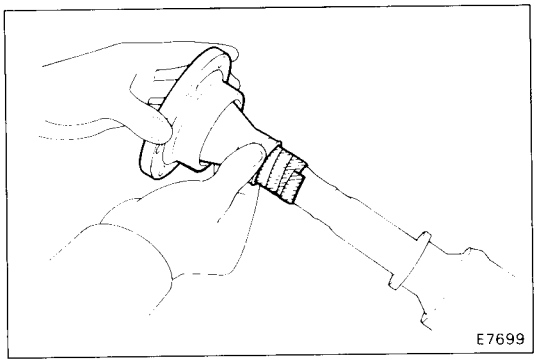


3. **INSTALL UNIVERSAL JOINT COVER WITH BOOT**

(a) Apply sealant to the new joint cover with boot as shown in the illustration.

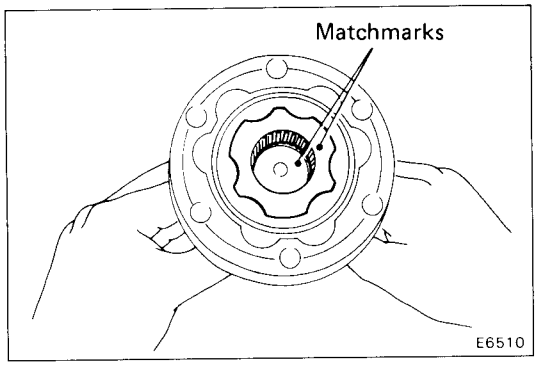
Sealant: Part No.08828-00801

HINT: The diameter of sealant along the bolt hole keeps 1.0 – 1.8 mm (0.0394 – 0.0709 in.).



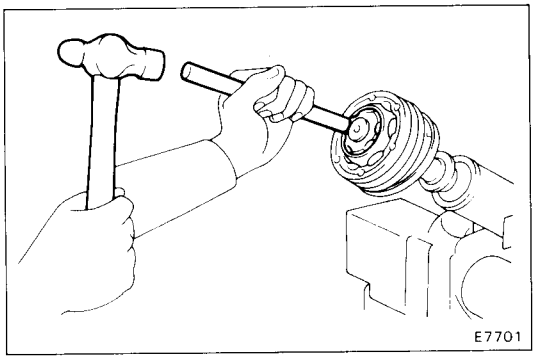
(b) Apply the adhesive tape from the top of shaft to the spline to prevent damaging the boot.

(c) Install the universal joint cover with boot to the shaft.



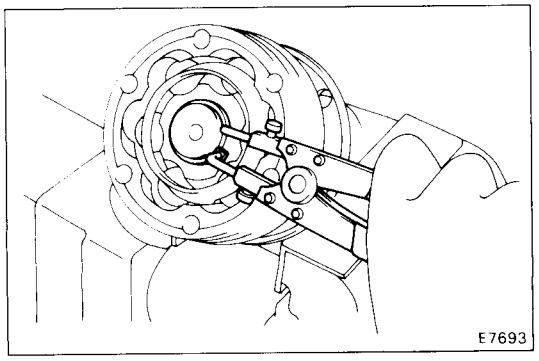
4. **INSTALL CROSS GROOVE JOINT**

(a) Align the matchmarks on the shaft and the inner race.

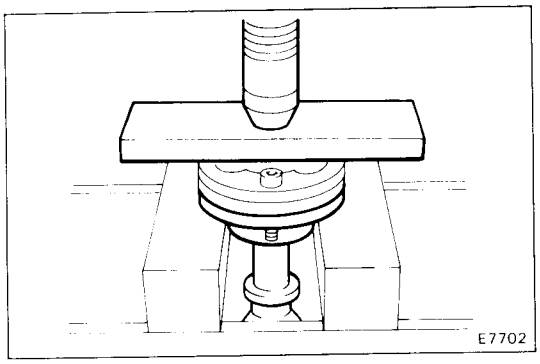


(b) Using a hammer and brass bar, tap the cross groove joint.

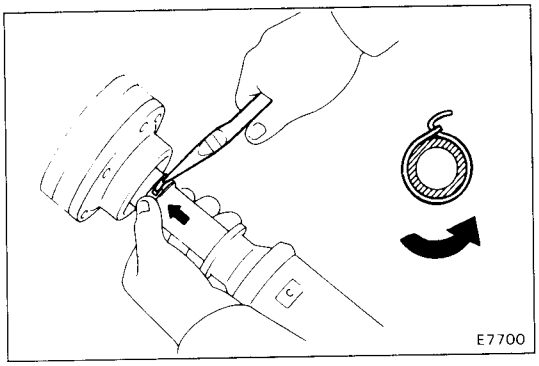
HINT: **Be sure to put the brass bar on the inner race.**



(c) Using snap ring pliers, install the new snap ring.

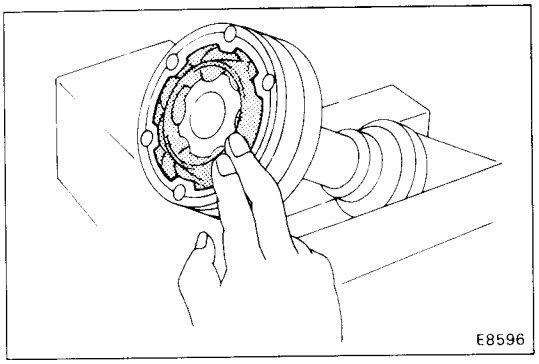


(d) Pass the bolt through to align the both bolt holes, then using a press and steel plate, press the universal joint cover with boot.



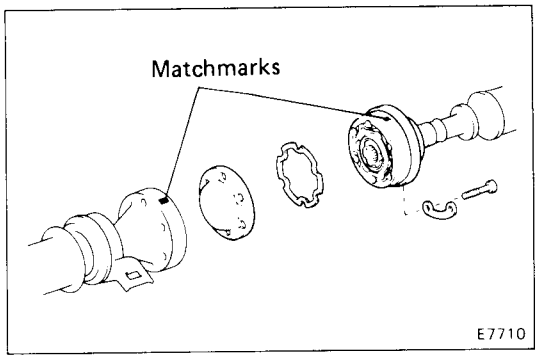
(e) Install the new boot clamp.

HINT: **Bend the clamp in opposite direction of shaft turning.**



(f) Fill the grease into the joint.

Grease capacity: 110 g (0.24 lb)



5. INSTALL JOINT END COVER

(a) Remove the backing paper from the new gasket, then attach the gasket.

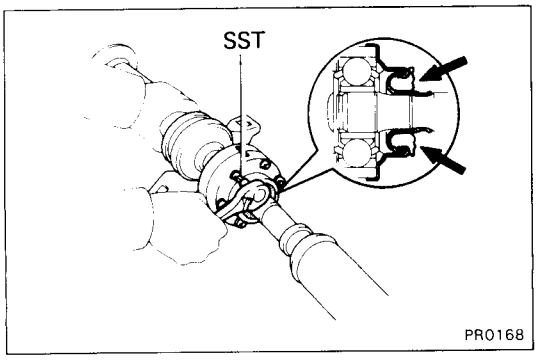
(b) Install the joint end cover.

(c) Align the matchmarks and install the universal joint flange to the cross groove joint.

(d) Tighten the six bolts and three washers to press the joint end cover.

HINT: **Tighten the bolts gradually and equally to prevent damaging the end cover.**

(e) Remove the six bolts and three washers and separate the universal joint flange from the cross groove joint.



6. INSPECT CROSS GROOVE JOINT

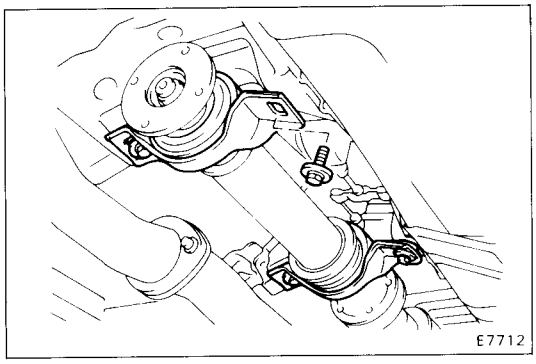
(See step 4 on page PR-6)

7. CONNECT INTERMEDIATE SHAFT WITH REAR PROPELLER SHAFT

Using SST, tighten the six bolts and three washers temporarily.

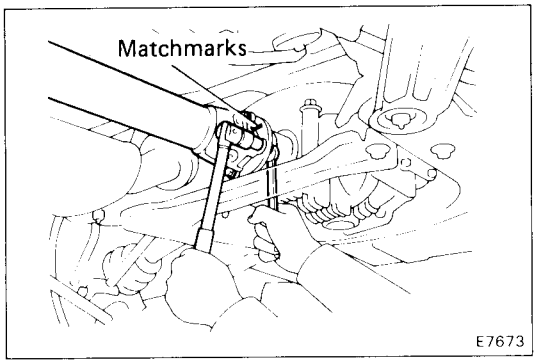
SST 09923-00020

HINT: **Put a piece of cloth or an equivalent into the inside of the universal joint cover.**



INSTALLATION OF PROPELLER SHAFT

1. INSTALL CENTER SUPPORT BEARING TEMPORARILY

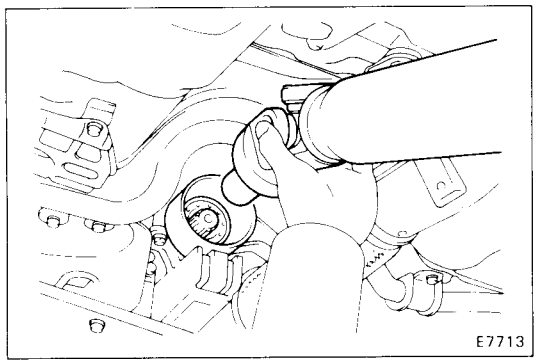


2. INSTALL REAR PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the shaft with the four bolts, washers and nuts.

(b) Torque the bolts and nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

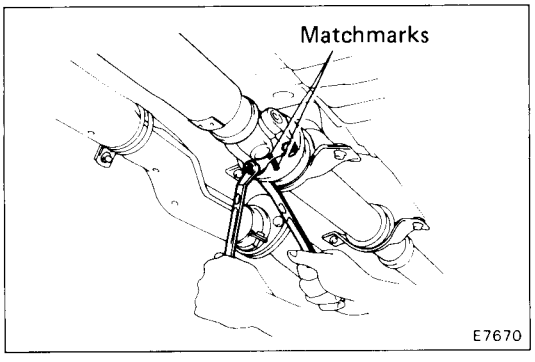


3. INSTALL FRONT PROPELLER SHAFT

(a) Remove SST from the transfer.

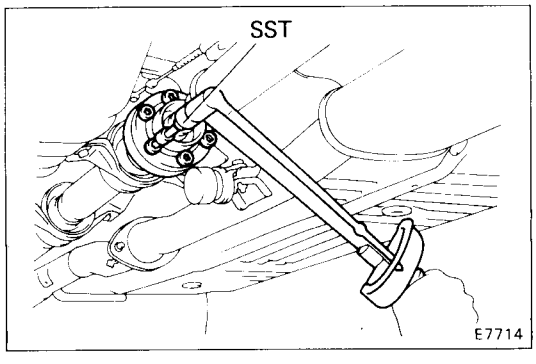
SST 09325-20010

(b) Insert the yoke into the transfer.



(c) Align the matchmarks on the both flanges, then install the bolts, washers and nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)



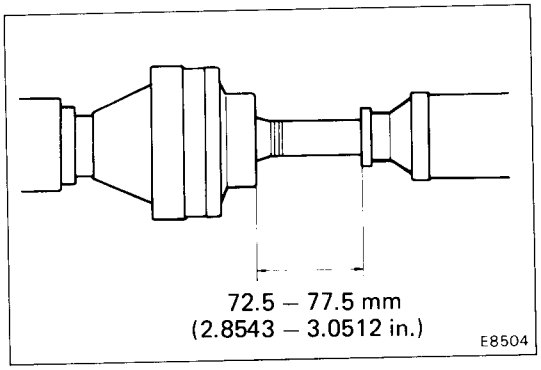
4. TIGHTEN CROSS GROOVE JOINT SET BOLT

(a) Depress the brake pedal and hold it.

(b) Using a SST, tighten the cross groove joint set bolts.

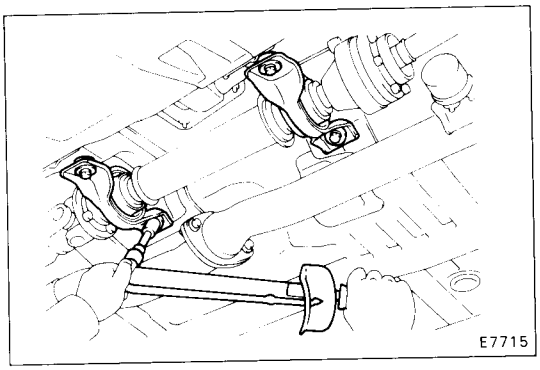
SST 09923-00020

Torque: 660 kg-cm (48 ft-lb, 65 N·m)



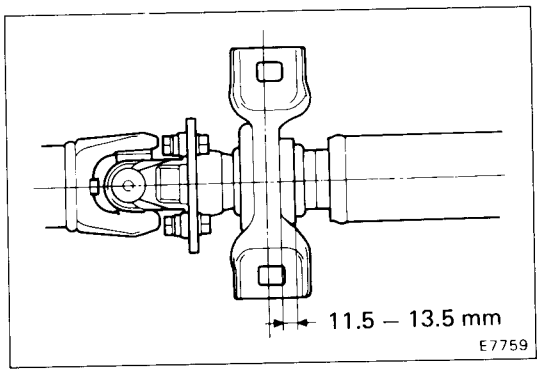
5. INSTALL CENTER SUPPORT BEARING

(a) With a vehicle unladen condition, adjust the intervals between the rear side of cover and the shaft as shown in the illustration.



(b) With the same condition, adjust the intervals between the rear side of center bearing housing and the rear side of cushion at 11.5 – 13.5 mm (0.4528 in. – 0.5315 in.) as shown in the illustration below, then torque the bolts.

Torque: 375 kg-cm (27 ft-lb, 37 N·m)



(c) Check that the center line of the bracket is at right angles at the shaft axial direction.

SUSPENSION AND AXLE

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

WHEEL ALIGNMENT

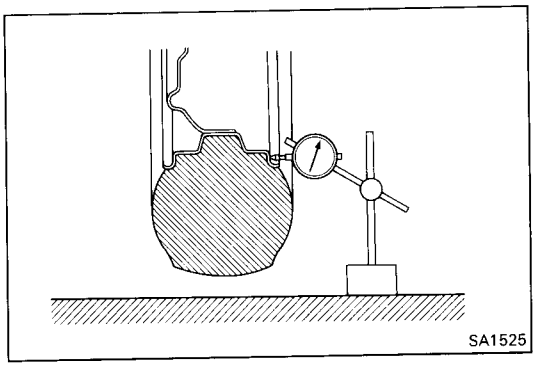
1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear proper inflation pressure.

Cold tire inflation pressure:

kg/cm² (psi, kPa)

Tire size	Front	Rear
215/50R15 88V	2.2 (32, 220)	2.1 (30, 210)



(b) Check the wheel runout.

Lateral runout: Less than 1.0 mm (0.039 in.)

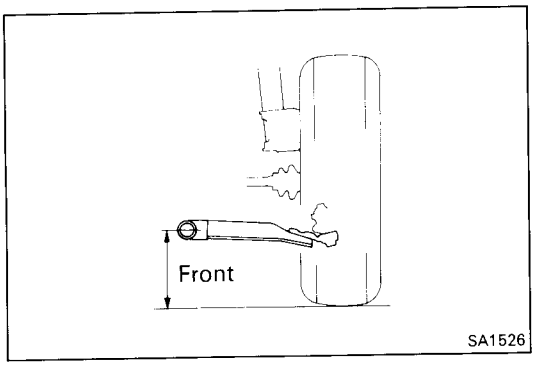
(c) Check the front wheel bearings for looseness.

(d) Check the front suspension for looseness.

(e) Check the steering linkage for looseness.

(f) Check the ball joint for excessive looseness.

(g) Check that the front shock absorber work properly by using the standard bounce test.



2. MEASURE VEHICLE HEIGHT

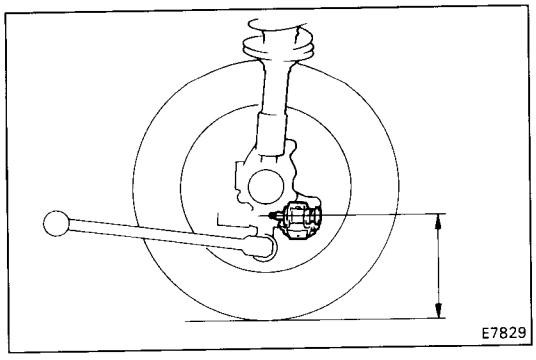
Vehicle height:

Front 191.0 mm (7.520 in.)
Rear 233.5 mm (9.193 in.)

HINT:

- Measuring point
  - Front – Measure from the ground to the center of the lower suspension arm mounting bolt.
  - Rear – Measure from the ground to the center of the body side No.2 suspension arm mounting bolt.
- Before inspecting the wheel alignment, adjust the chassis ground clearance to specification.

If the clearance of the vehicle is not standard, try to adjust it by pushing down in the body or by lifting the body. If still not correct, check for bad springs or suspension parts.



Front Wheel Alignment

1. **INSPECT TOE-IN**

Measure toe-in with a toe-in gauge in the following procedure.

(a) Bounce the vehicle up and down to stabilize the suspension.

(b) Move the vehicle forward about 5 m (16.4 ft) with the front wheel in the straight-ahead position on a level place.

(c) Mark the center of each rear tread and measure the distance between the marks of the right and left tires.

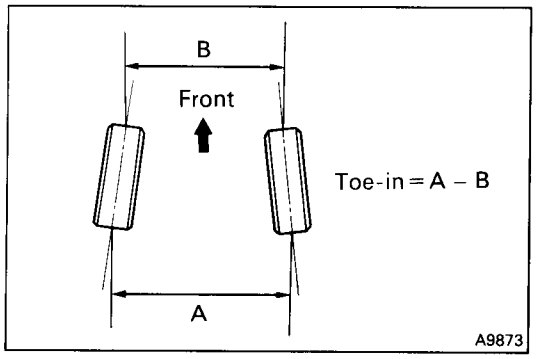
(d) Advance the vehicle until the marks on the rear sides of the tires come to the measuring heights of the gauge on the front side.

HINT: If the tire rolls too far, repeat from step (b).

(e) Measure the distance between the marks on the front of the tires.

Inspection standard: 0 ± 2 mm (0 ± 0.08 in.)

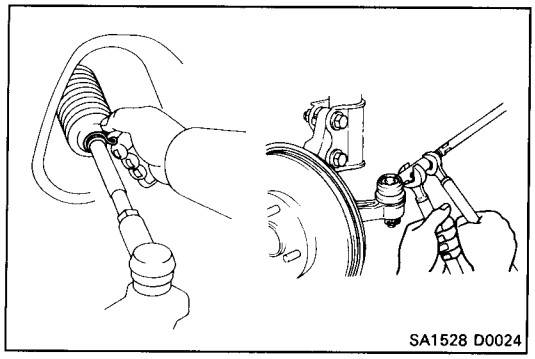
If toe-in is not within specification, adjust by the tie rod end.

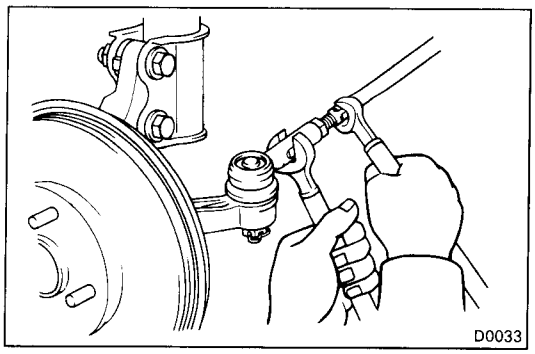


2. **ADJUST TOE-IN**

(a) Remove the boot clips.

(b) Loosen the tie rod end lock nut.





(c) Turn the left and right tie rod ends an equal amount to adjust the toe-in.

Adjustment standard: 0 ± 1 mm (0 ± 0.04 in.)

HINT: Insure that the lengths of the left and right tie rod ends length are the same.

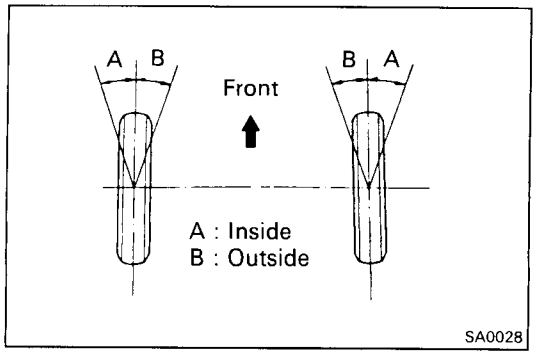
Tie rod end length left-right error:
1.0 mm (0.039 in.) or less

(d) Torque the tie rod end lock nuts.

Torque: 570 kg-cm (41 ft-lb, 56 N·m)

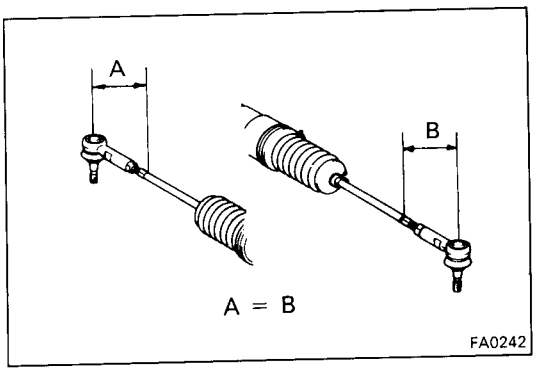
(e) Place the boot on the seat and clamp it.

HINT: Insure that the boots are not twisted.



3. **CHECK WHEEL ANGLE**

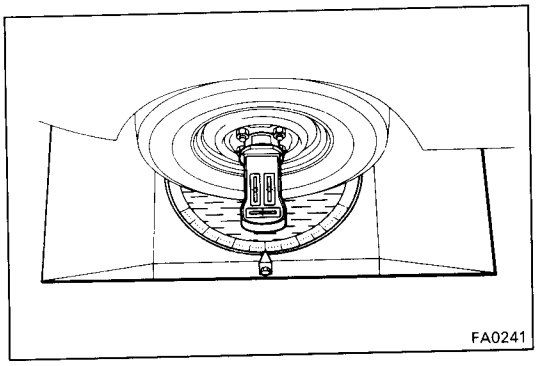
Wheel Angle (Maximum):	**Inside wheel**	**33°30′**
	Outside wheel	**29°30′**



If wheel angles differ from the standard specifications, check to see if the lengths of the left and right tie rods are the same.

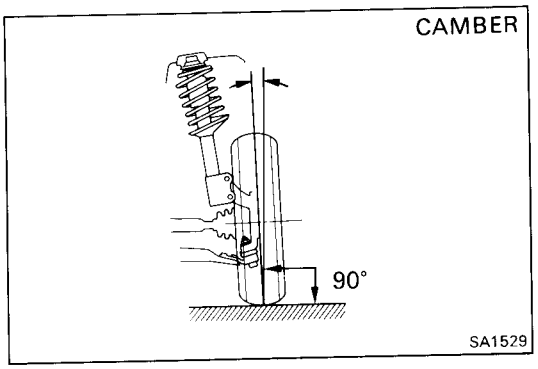
HINT: If th tie rod lengths are not equal, the wheel angle cannot be adjusted properly.

If the tie rod lengths were changed to adjust the wheel angle, inspect the toe-in.



4. INSTALL WHEEL ALIGNMENT EQUIPMENT

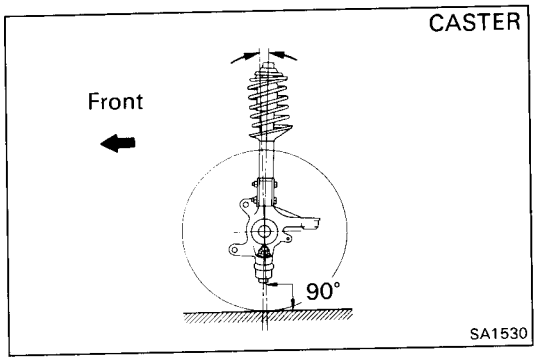
Follow the specific instructions of the equipment manufacturer.



5. CHECK CAMBER

Camber: Inspection standard −10′ ± 45′
Left-right error 30′ or less

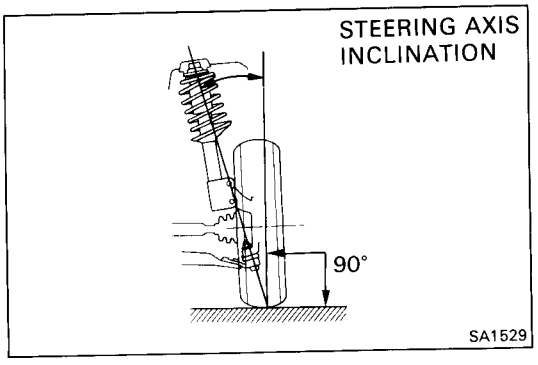
HINT: Camber is not adjustable, if measurement is not within specification, inspect and replace the suspension parts as necessary.



6. CHECK CASTER

Caster: Inspection standard 1°00′ ± 45′
Left-right error 30′ or less

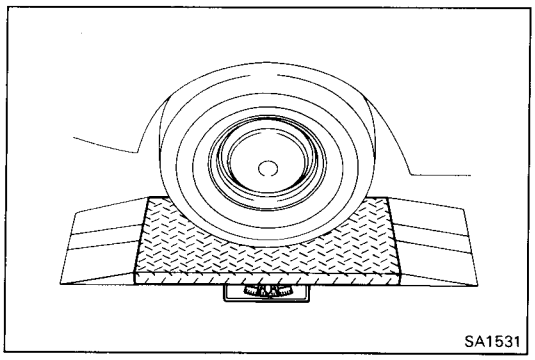
HINT: Caster is not adjustable, if measurement is not within specification, inspect and replace the suspension parts as necessary.



7. CHECK STEERING AXIS INCLINATION

Steering axis inclination:
Inspection standard 14°10′ ± 45′
Left-right error 30′ or less

HINT: Steering axis inclination is not adjustable, if measurement is not within specification, inspect and replace the suspension parts as necessary.



8. **CHECK SIDE SLIP (REFERENCE ONLY)**

Side slip: 3.0 mm/m (0.118 in./3.3 ft) or less

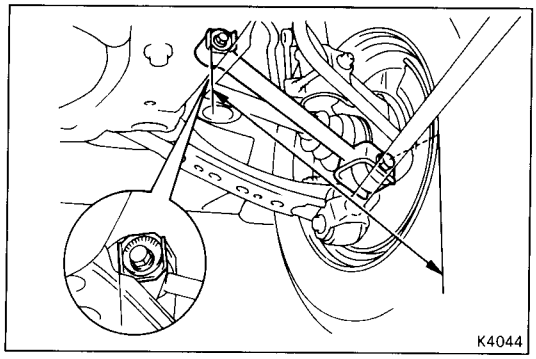
Rear Wheel Alignment

1. **INSPECT TOE-IN**

(See step 1 on page SA-3)

Inspection standard: 5 ± 2 mm (0.20 ± 0.08 in.)

If toe-in is not within specification, adjust by the cam.

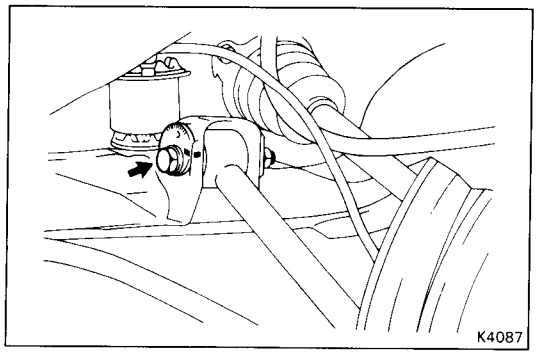


2. **ADJUST TOE-IN**

(a) Measure the distance between each wheel disc and corner of the cam bracket, then confirm that both are the same.

Left-right error: Less than 3 mm (0.12 in.)

If the left-right error is greater than 3 mm (0.12 in.), adjust following the procedures below.



(b) Loosen the bolt.

(c) If the toe-in is out of the standard toward toe-out side, lengthen the longer arm by the cam.

(d) If the toe-in is out of the standard toward toe-in side, lengthen the shorter arm by the cam.

(e) Measure the toe-in.

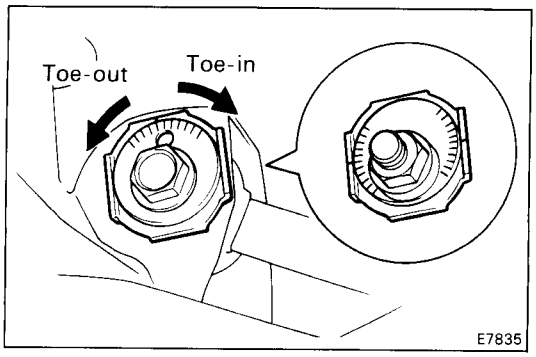
Adjustment standard: 5 ± 1 mm (0.20 ± 0.04 in.)

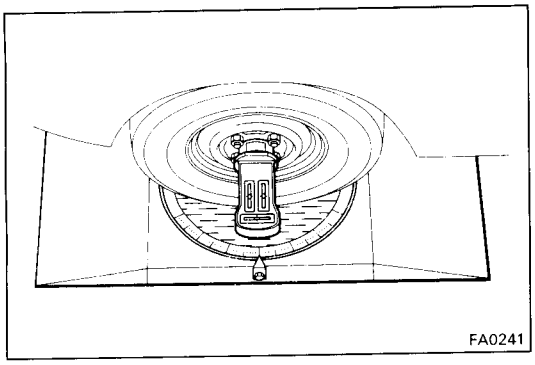
If the left-right error is within specifications but the overall toe-in is not, lengthen or shorten both arms an equal amount by turning the two cams in the opposite direction, until the adjustment standard is obtained.

HINT: The toe-in will change about 4.5 mm (0.177 in.) with each graduation of the cam (one side).

(f) Tighten the bolt.

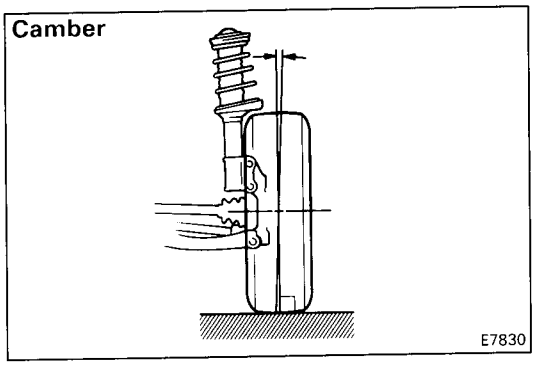
Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)




FA0241

3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.



E7830

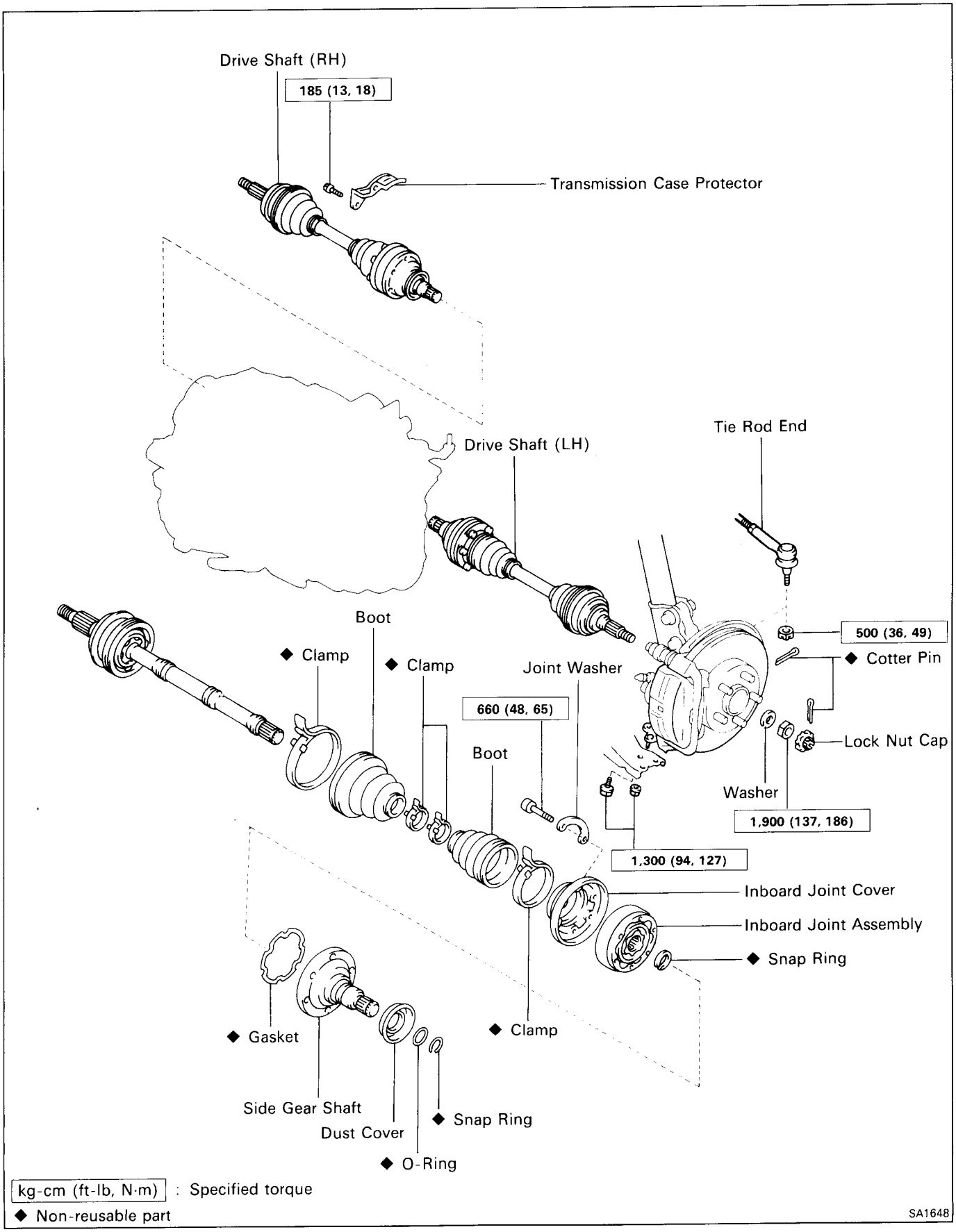
4. CHECK CAMBER

Camber:	**Inspection standard**	**–45' ± 30'**
	Left-right error	**30' or less**

HINT: Camber is not adjustable, if measurement is not within specification, inspect and replace the suspension parts as necessary.

FRONT DRIVE SHAFT

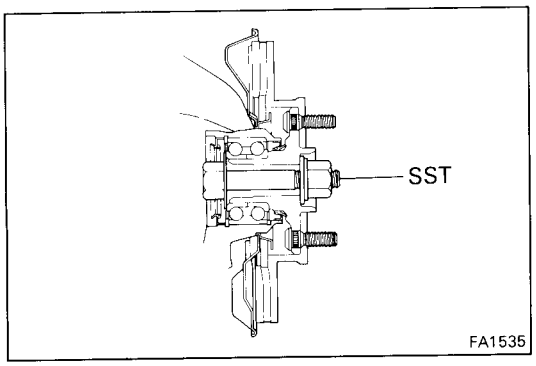
COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

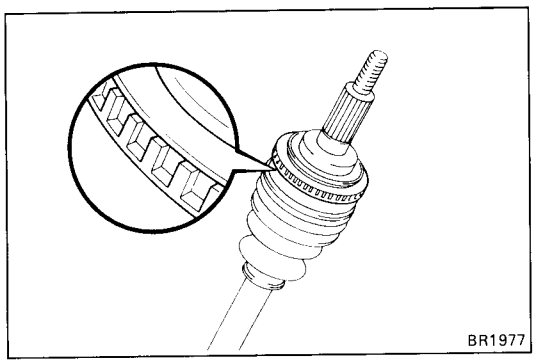
SA1648



NOTICE:

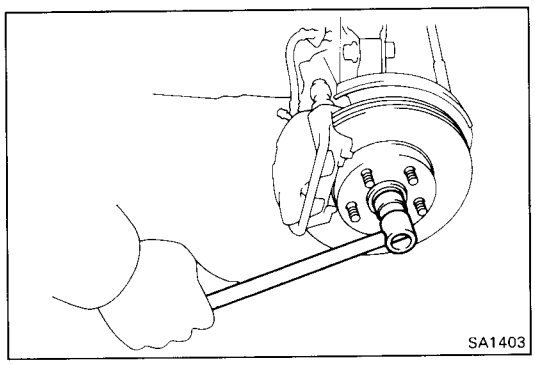
- **The hub bearing could be damaged if it is subjected to the vehicle weight,such as when moving the vehicle with the drive shaft removed. Therefore, if it is absolutely necessary to place the vehicle weight on the hub bearing, first support it with SST.**

SST 09608-16041 (09608-02020, 09608-02040)



- **(w/ ABS)**

  After disconnecting the drive shaft from the axle hub, work carefully so as not to damage the sensor rotor serrations on the drive shaft.

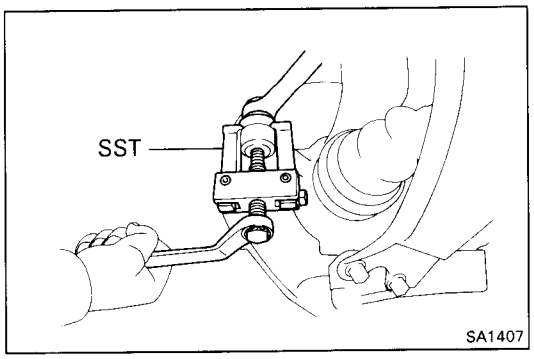


REMOVAL OF FRONT DRIVE SHAFT

(See page SA-7)

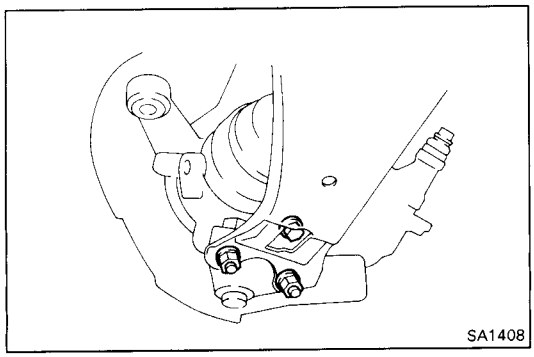
1. **REMOVE FRONT WHEELS**

2. **REMOVE COTTER PIN, LOCK NUT CAP AND LOCK NUT**
   (a) Remove the cotter pin and lock nut cap.
   (b) Loosen the bearing lock nut while depressing the brake pedal.
   (c) Remove the bearing lock nut and plate washer.



3. **DISCONNECT TIE ROD END**
   (a) Remove the cotter pin and nut from the tie rod end.
   (b) Using SST, disconnect the tie rod end from the steering knuckle.

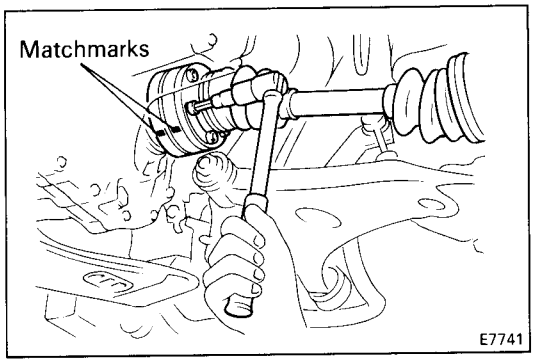
   SST 09628-62011



4. **DISCONNECT STEERING KNUCKLE FROM LOWER ARM**

   Remove the bolt and two nuts and disconnect the steering knuckle from the lower arm.

5. **DRAIN TRANSAXLE OIL**



6. REMOVE DRIVE SHAFT

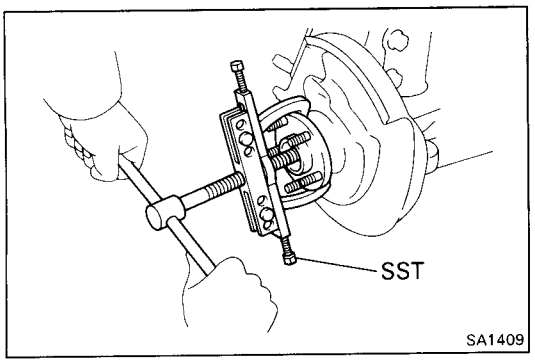
(a) Place matchmarks on the drive shaft and side gear shaft.

NOTICE: Do not use a punch to mark the matchmarks.

Use paint, etc.

(b) Using SST, loosen the six hexagon bolts while depressing the brake pedal.

SST 09043-88010

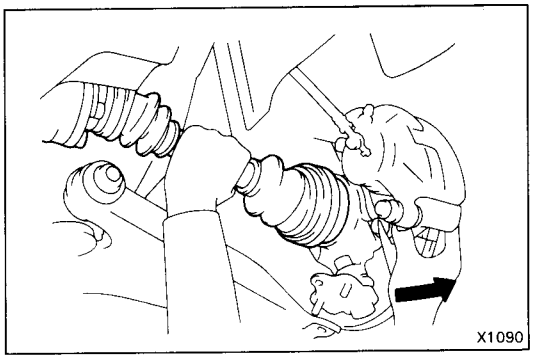


(c) Using SST, disconnect the drive shaft from the steering knuckle.

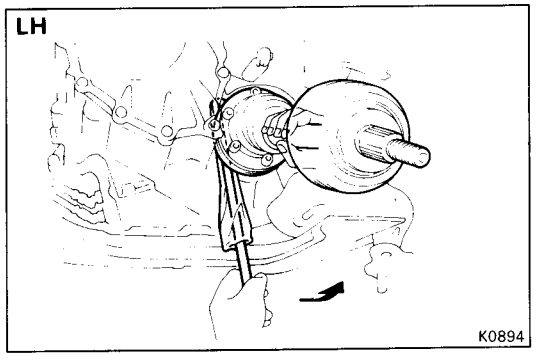
SST 09950-20017

NOTICE:

- **Before removing the drive shaft, wrap vinyl tape around the threads of the drive shaft to prevent damaging the oil seal.**
- **Cover the drive shaft boot with cloth to protect it from damage.**



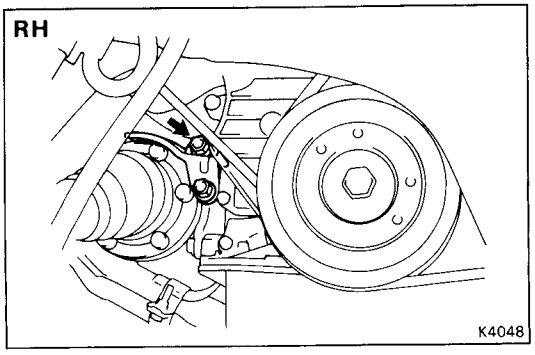
(d) Push the front axle carrier towards the outside of the vehicle, and separate the drive shaft from the steering knuckle.



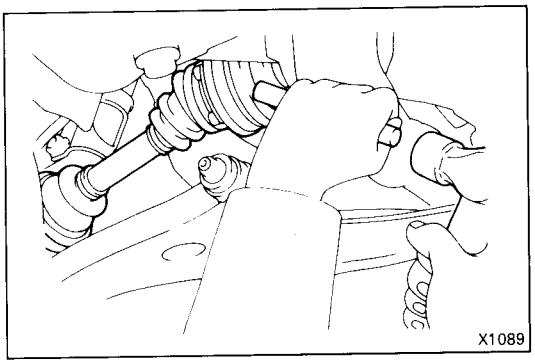
(e) (LH drive shaft)
Using a hub nut wrench or equivalent, pry out the LH drive shaft.

NOTICE:

- **Be careful not to damage the dust cover.**
- **Cover the hub nut wrench or an equivalent with cloth so as not to damage the transaxle body.**



(f) Remove the two bolts and transmission case protector.

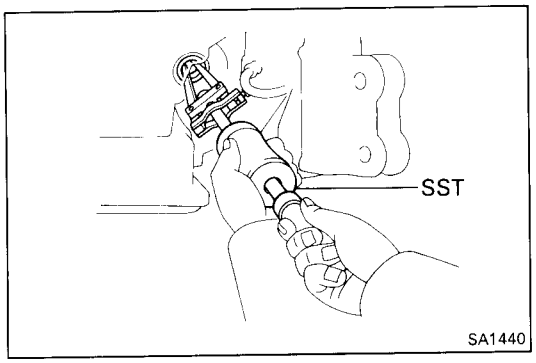


(g) Using a brass bar and hammer, drive out the drive shaft.

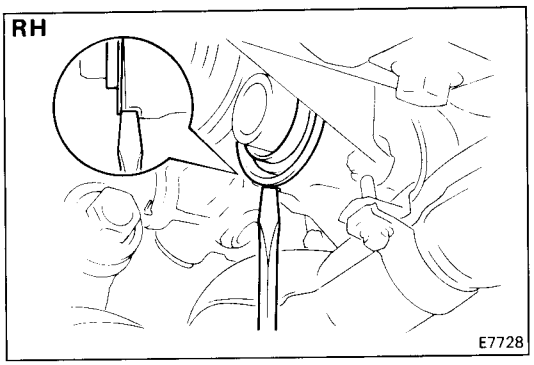
ON-VEHICLE REPLACEMENT OF SIDE GEAR SHAFT OIL SEAL

1. **REMOVE DRIVE SHAFT**
(See page SA-7)

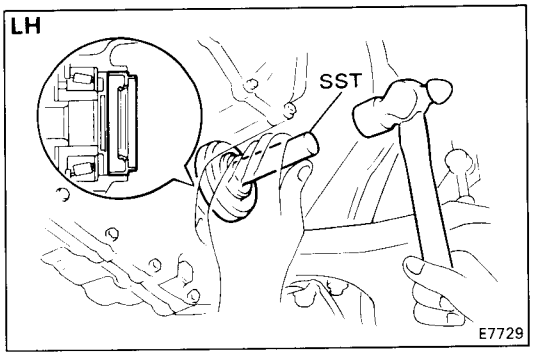
2. **REMOVE LH OIL SEAL**
Using SST, drive out the oil seal from the case.
SST 09308-00010



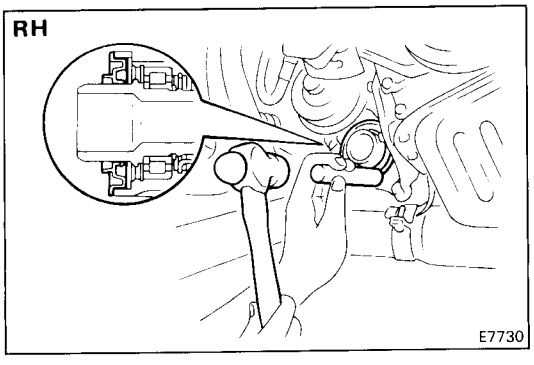
3. **REMOVE RH OIL SEAL**
Using a screwdriver, remove the oil seal as shown.



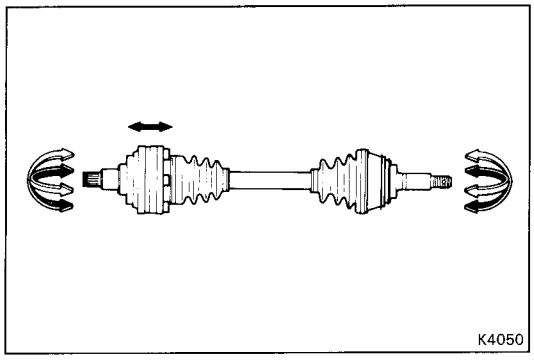
4. **INSTALL LH OIL SEAL**
Using SST and hammer, tap in a new oil seal.
SST 09223-15010
HINT: Coat the oil seal lip with MP grease.



5. **INSTALL RH OIL SEAL**
Using a brass bar and hammer, tap in a new oil seal.
HINT: Coat the oil seal lip with MP grease.



6. **INSTALL DRIVE SHAFT**
(See page SA-18)


K4050

DISASSEMBLY OF FRONT DRIVE SHAFT

(See page SA-7)

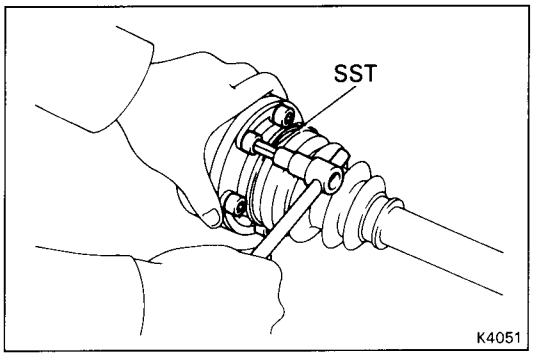
1. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the outboard joint.

(b) Check to see that the inboard joint slides smoothly in the thrust direction.

(c) Check to see that there is no remarkable play in the radial direction of the inboard joint.

(d) Check for damage to boots.



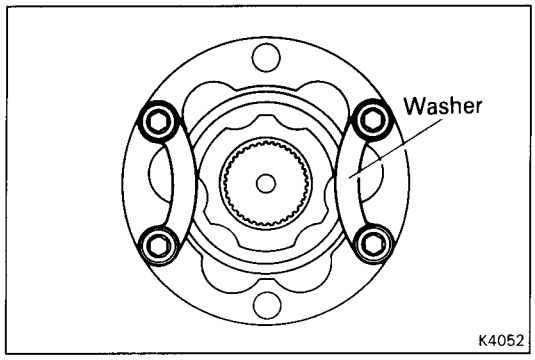
K4051

2. DISCONNECT SIDE GEAR SHAFT

(a) Using SST, remove the six hexagon bolts and the three washers.

SST 09043-88010

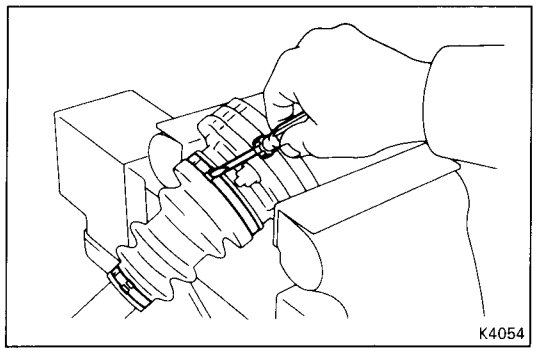
(b) Disconnect the side gear shaft from the drive shaft.



K4052

(c) Use bolts, nuts and washers to keep the inboard joint together.

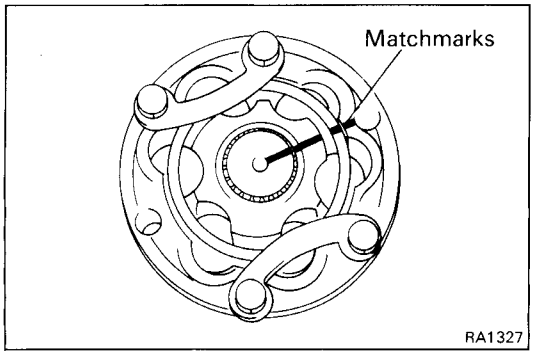
NOTICE: Tighten the bolts by hand to avoid scratching the flange surface.


K4054

3. REMOVE BOOT CLAMPS

(a) Using a screwdriver, remove the four boot clamps from the inboard joint and outboard joint.

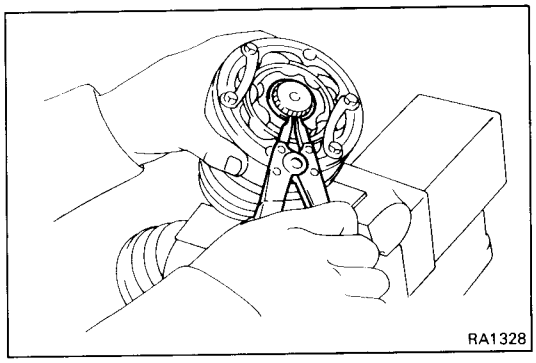
(b) Remove the inboard joint boot from the inboard joint cover.



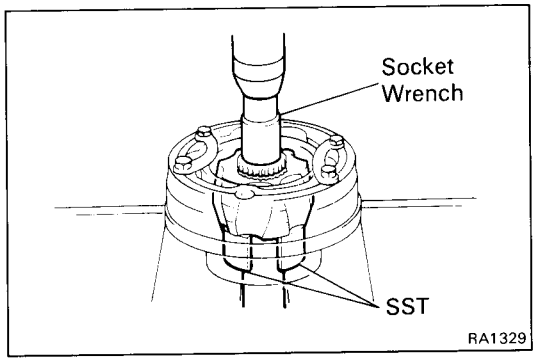
RA1327

4. DISASSEMBLE INBOARD JOINT

(a) Place matchmarks on the inboard joint and drive shaft.



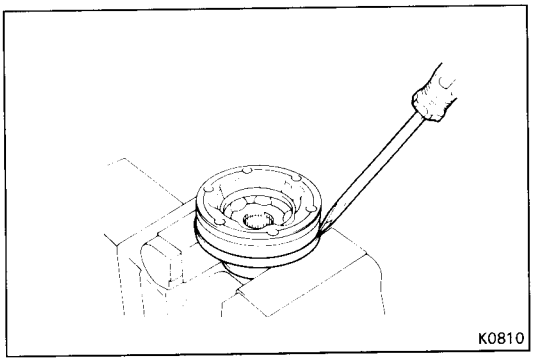
(b) Using snap ring pliers, remove the snap ring.



(c) Using SST, a socket wrench and a press, remove the inboard joint from the drive shaft.

SST 09726-10010 (09726-00030)

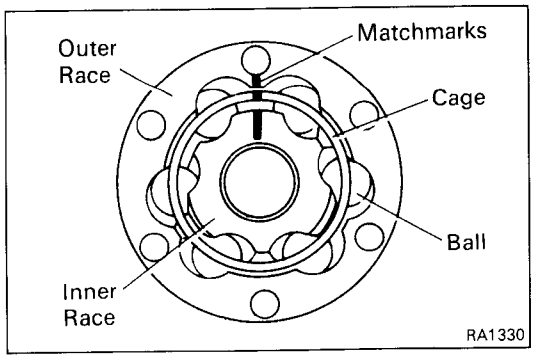
(d) Remove the four bolts and two washers from the inboard joint.



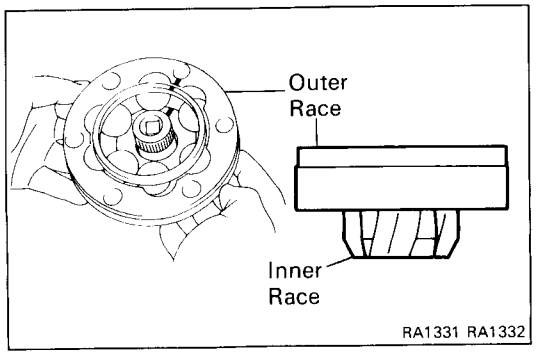
(e) Using a screwdriver, unstake the inboard joint cover.

(f) Using a screwdriver, pry out the inboard joint from the inboard joint cover.

NOTICE: When lifting the inboard joint, hold onto the inner race and outer race.



HINT: Should the joint become disassembled, re-assemble it in the way shown.

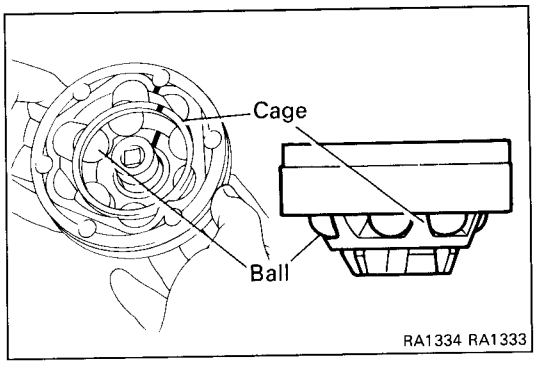


SERVICE HINT

(a) Align the matchmarks placed before disassembly.

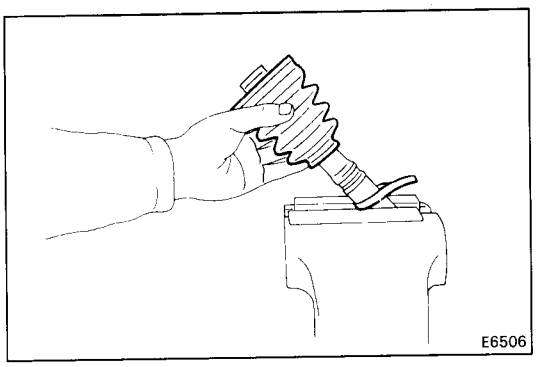
(b) Insert the spark plug wrench into the inner race.

(c) Lift the outer race and cage, and insert the six balls.



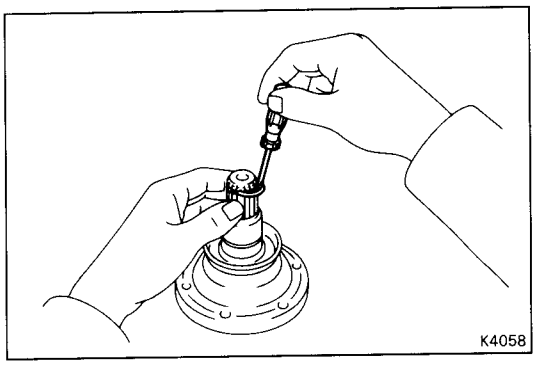
(d) Jiggle the outer race and cage as shown to place the balls in their respective grooves.

(e) Lower the outer race and cage so that they fit tightly with the inner race.



5. REMOVE BOOTS

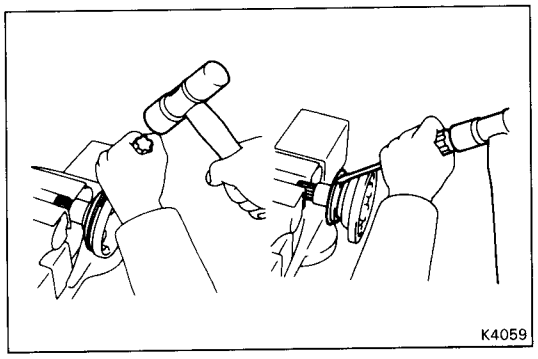
Remove boots of the inboard joint and outboard joint.



6. REPLACE SIDE GEAR SHAFT SNAP RING

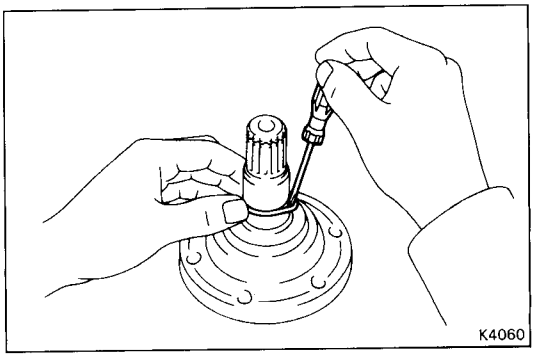
(a) Using a screwdriver, pry out the snap ring.

(b) Using snap ring pliers, install the new snap ring.



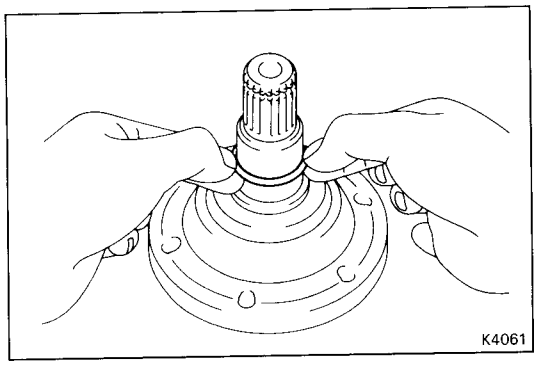
7. REMOVE DUST COVER FROM SIDE GEAR SHAFT

Using a screwdriver and hammer, tap out the dust cover.



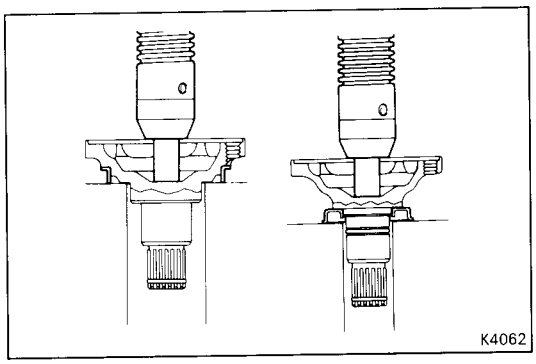
8. REPLACE SIDE GEAR SHAFT O-RING

(a) Using a screwdriver, remove the O-ring.



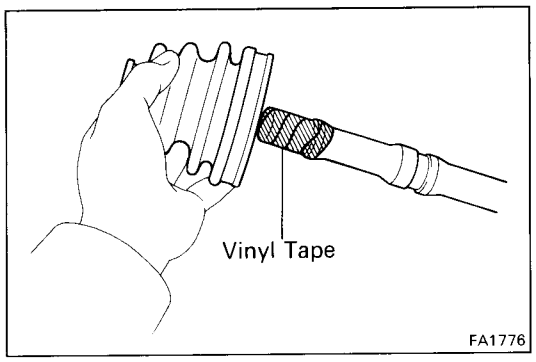
(b) Coat O-ring with MP grease.

(c) Install a new O-ring.



9. INSTALL DUST COVER TO SIDE GEAR SHAFT

Using a press, install a new dust cover.



ASSEMBLY OF FRONT DRIVE SHAFT

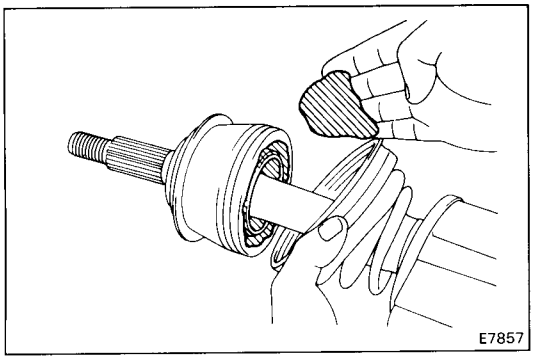
(See page SA-7)

1. TEMPORARILY INSTALL BOOTS AND NEW BOOT CLAMPS

HINT: Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.

NOTICE: The boot and clamp of the outboard joint are smaller than those of the inboard joint.

Temporarily install the two boots and four new clamps to the outboard joint and inboard joint.

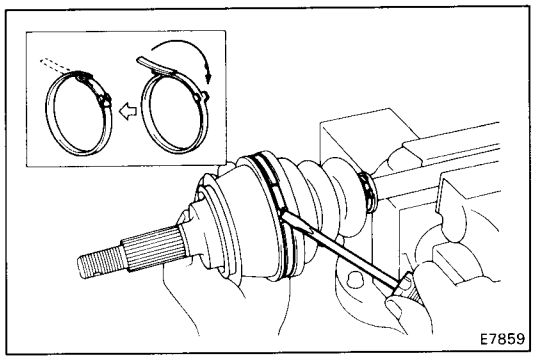


2. INSTALL BOOT TO OUTBOARD JOINT

(a) Before assembling the boots, pack in grease.

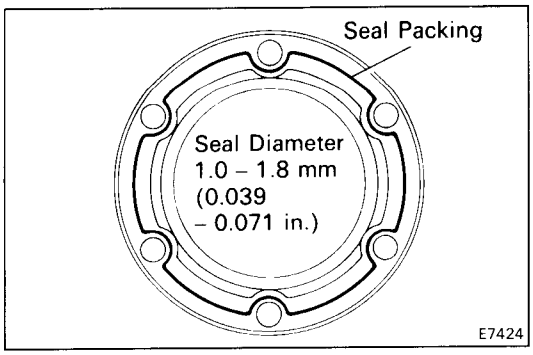
HINT: Use the grease supplied in the boot kit.

Grease capacity: 120 g (0.26 lb)



(b) Install the two boot clamps to the outboard joint boot.

(c) Bend the boot clamp and lock it as shown.



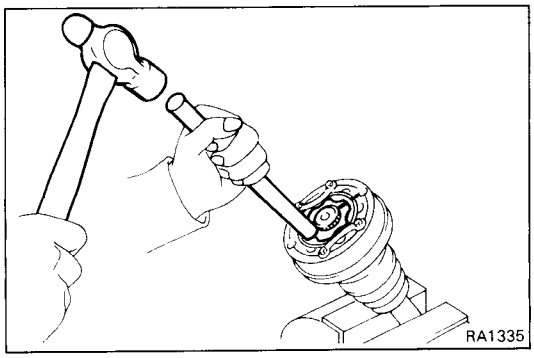
3. INSTALL INBOARD JOINT COVER

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

(b) Apply seal packing to the inboard joint cover as shown.

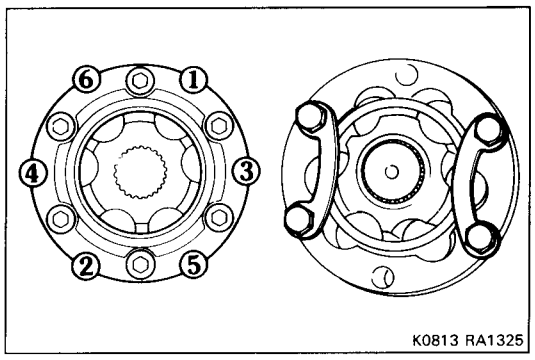
Seal packing: Part No.08826-00801, THREE BOND 1121 or equivalent

HINT: Avoid applying an excess amount to the surface.



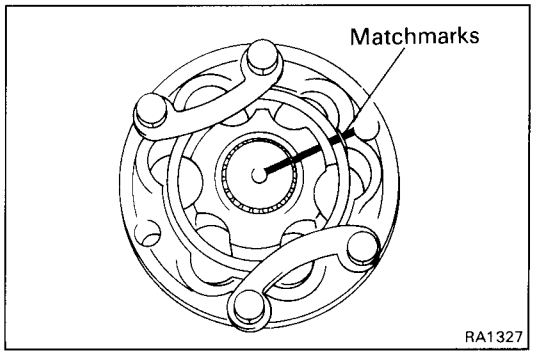
(c) Align the bolt holes of the cover with those of the inboard joint, then insert the hexagon bolts.

(d) Using a hammer and brass bar, tap the rim of the inboard joint cover into place. Do this in the order shown, and repeat several times.



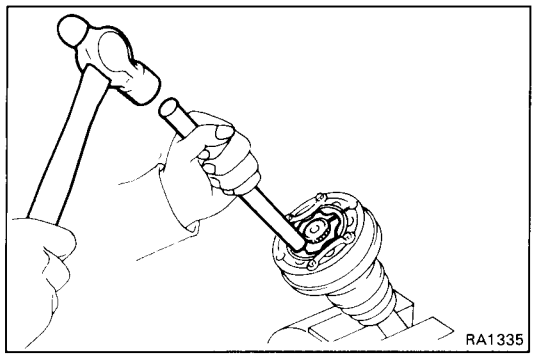
(e) Use bolts, nuts and washers to keep the inboard joint together.

NOTICE: Tighten the bolts by hand to avoid scratching the flange surface.



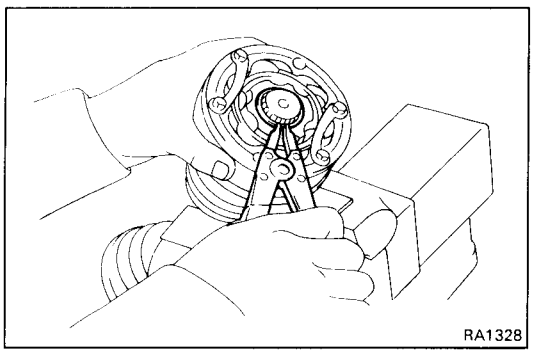
4. ASSEMBLE INBOARD JOINT

(a) Align the matchmarks placed before disassembly.

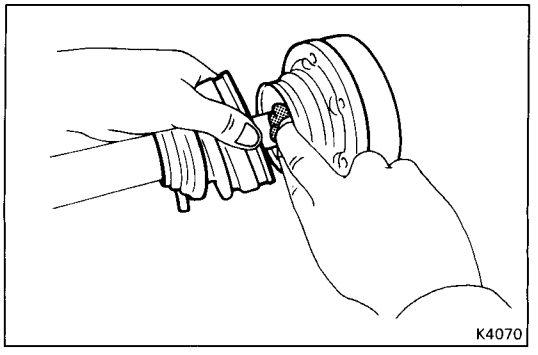


(b) Using a brass bar and hammer, tap the inboard joint onto the drive shaft.

NOTICE: Make sure that the brass bar is touching the inner race, and not the cage.



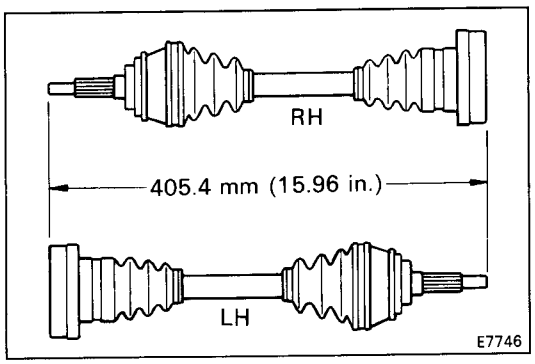
(c) Using snap ring pliers, install a new snap ring.



(d) Pack in grease to the inboard tulip and boot.

HINT: Use the grease supplied in the boot kit.

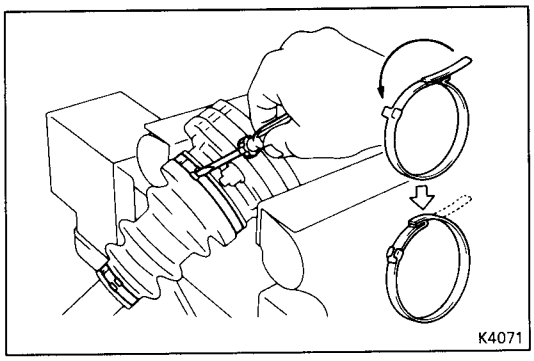
Grease capacity: 90 g (0.20 lb)



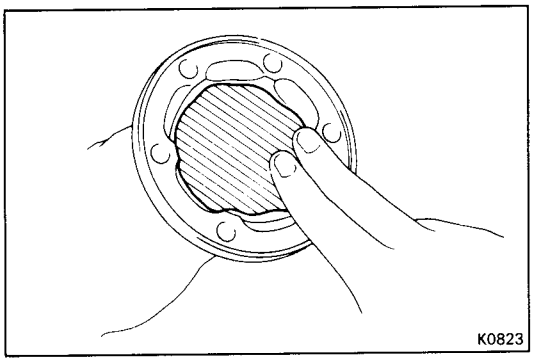
(e) Be sure the boot is on the shaft groove.

(f) Insure that the boot is not stretched or contracted when the drive shaft is at standard length.

Drive shaft length: 405.4 mm (15.96 in.)



(g) Bend the boot clamp and lock it as shown.



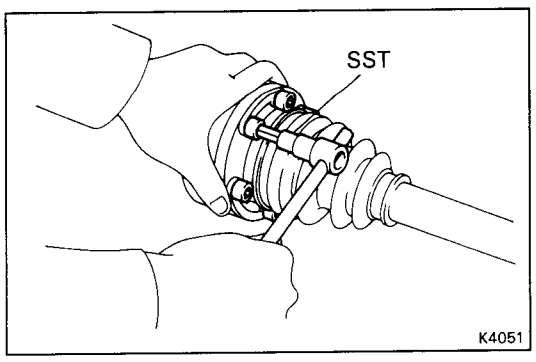
5. INSTALL SIDE GEAR SHAFT

(a) Pack in grease to the side gear shaft.

HINT: Use the grease supplied in the boot kit.

Grease capacity: 43 g (0.09 lb)

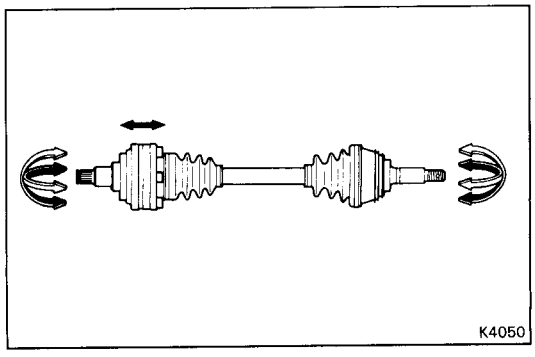
(b) Remove the two washers and four bolts from the drive shaft.



(c) Align matchmarks and install the side gear shaft with a new gasket to the drive shaft.

(d) Using SST, finger tighten the six hexagon bolts with three washers.

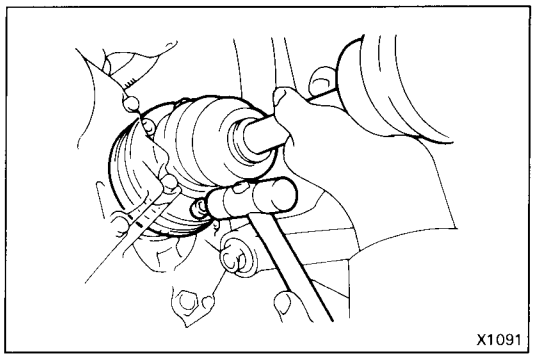
SST 09043-88010



6. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard joint and outboard joint.

(b) Check to see that the inboard joint slide smoothly in the thrust direction.


X1091

INSTALLATION OF FRONT DRIVE SHAFT

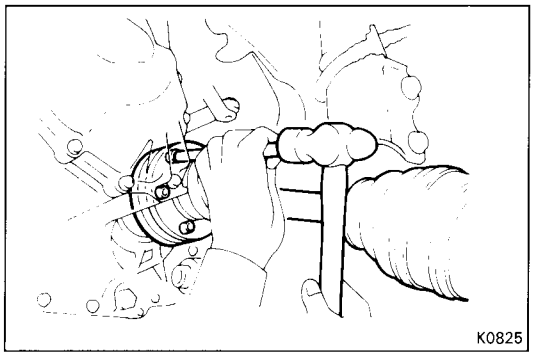
(See page SA-7)

1. **INSTALL DRIVE SHAFT**

(a) Temporarily install the drive shaft with a plastic hammer.

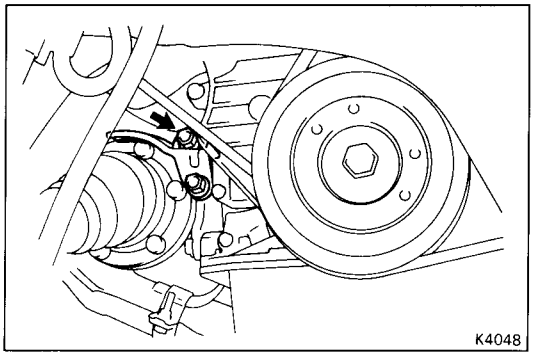
HINT: Before installing the drive shaft, set the snap ring opening side facing downward.

NOTICE: Be careful not to damage the boot, oil seal and deflector.


K0825

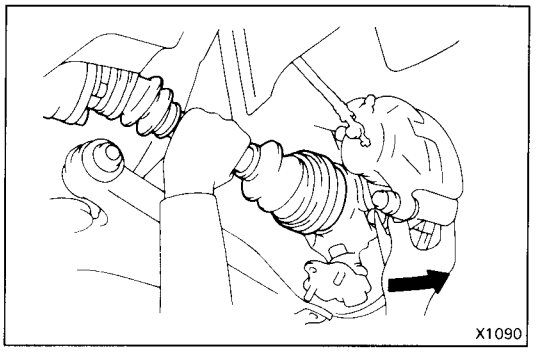
(b) Using a brass bar and hammer, tap in the hexagon bolt head of the drive shaft until it makes contact with the pinion shaft.

HINT: Whether or not the drive shaft is making contact with the pinion shaft con be known by sound or feeling when driving it in.


K4048

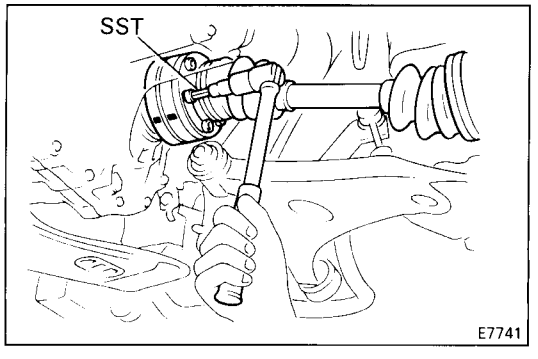
(c) Install the transmission case protector with two bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)


X1090

(d) Install the outboard joint side of the drive shaft to the axle hub.

NOTICE: Be careful not to damage the oil seal and boot.

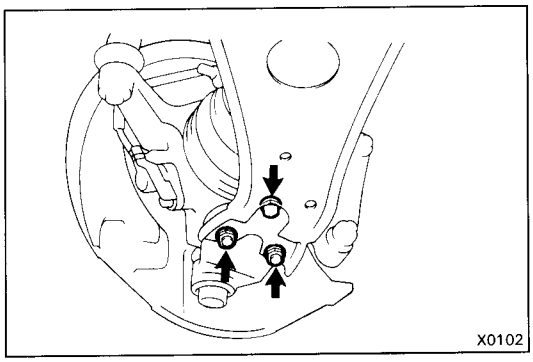


E7741

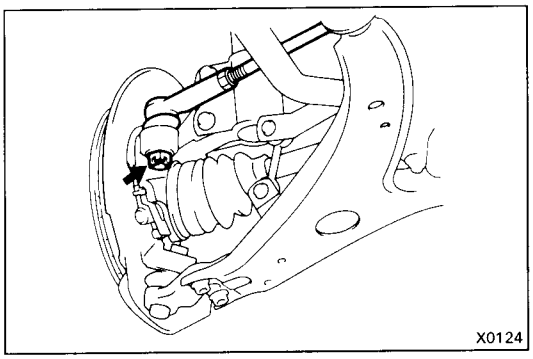
(e) Using SST, torque the six hexagon bolts while depressing the brake pedal.

SST 09043-88010

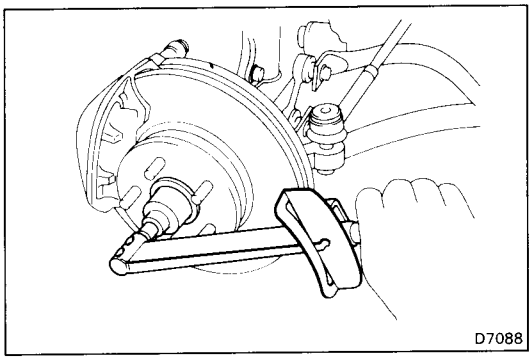
Torque: 660 kg-cm (48 ft-lb, 65 N·m)



2. **CONNECT STEERING KNUCKLE TO LOWER ARM**
   (a) Install the steering knuckle to the lower arm.
   (b) Install and torque the bolt and two nuts.
   Torque: 1,300 kg-cm (94 ft-lb, 127 N·m)



3. **CONNECT TIE ROD END TO STEERING KNUCKLE**
   (a) Install the tie rod end to the steering knuckle with a nut.
   (b) Torque the nut.
   Torque: 500 kg-cm (36 ft-lb, 49 N·m)
   (c) Install a new cotter pin.
   HINT: If the cotter pin hole does not line up, correct by tightening the nut by the smallest amount possible.



4. **INSTALL BEARING LOCK NUT, LOCK NUT CAP AND NEW COTTER PIN**
   (a) Install the washer and lock nut.
   (b) Torque the lock nut while depressing the brake pedal.
   Torque: 1,900 kg-cm (137 ft-lb, 186 N·m)
   (c) Install the lock nut cap, and using pliers, install a new cotter pin.

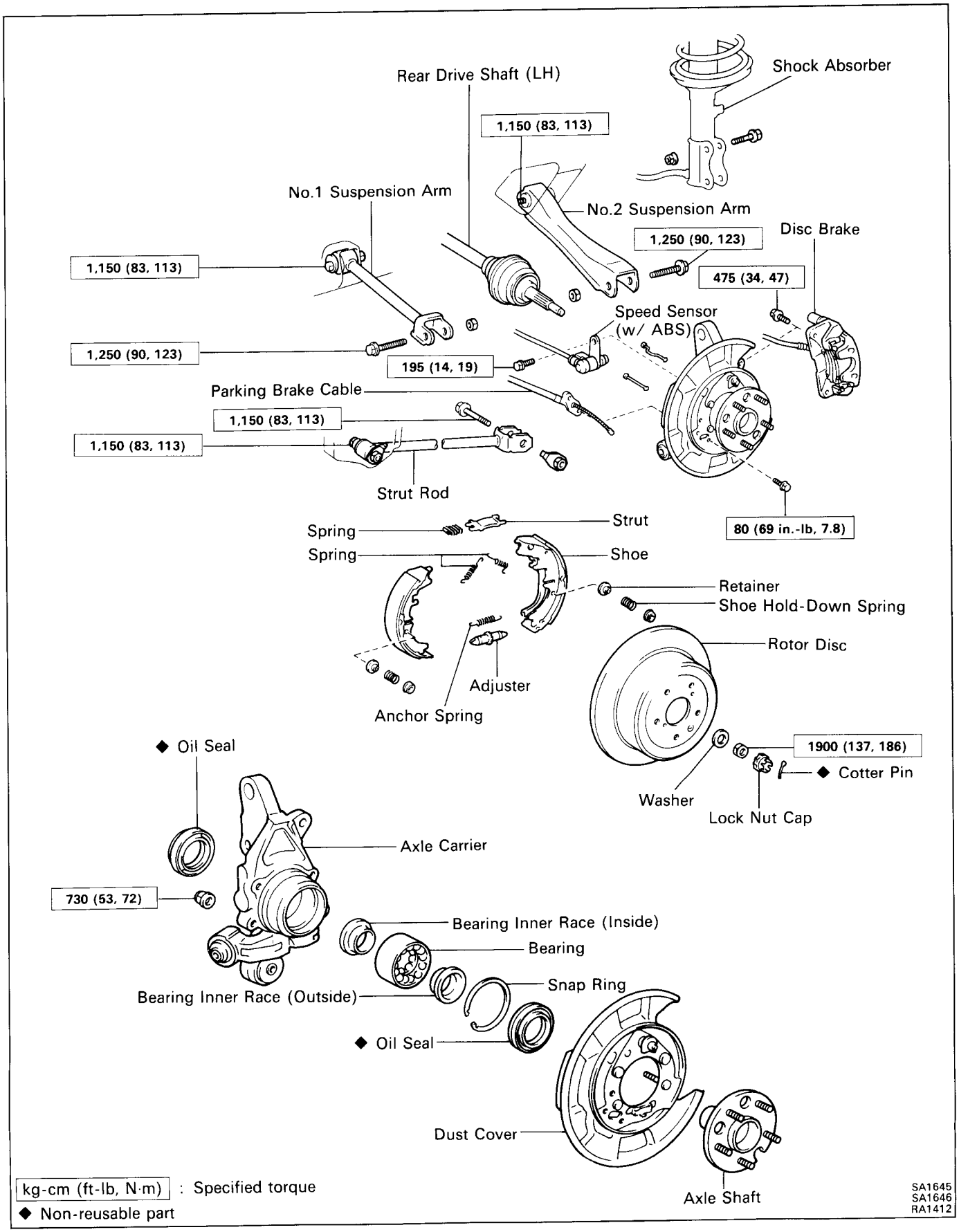
5. **INSTALL FRONT WHEELS**

6. **FILL TRANSAXLE WITH GEAR OIL**

7. **CHECK FRONT WHEEL ALIGNMENT**
   (See page SA-3)

REAR AXLE HUB AND CARRIER

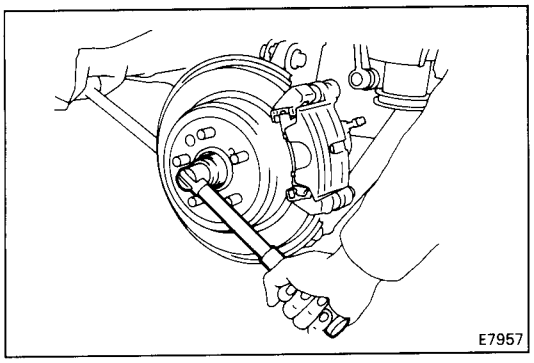
COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

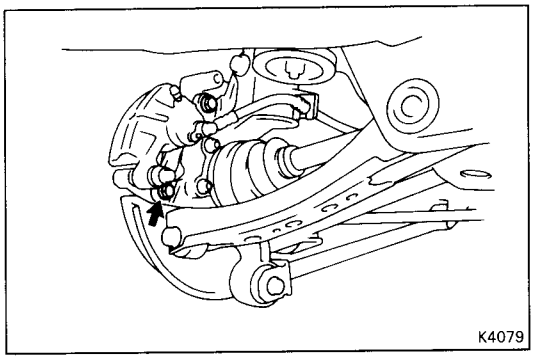
SA1645
SA1646
RA1412


E7957

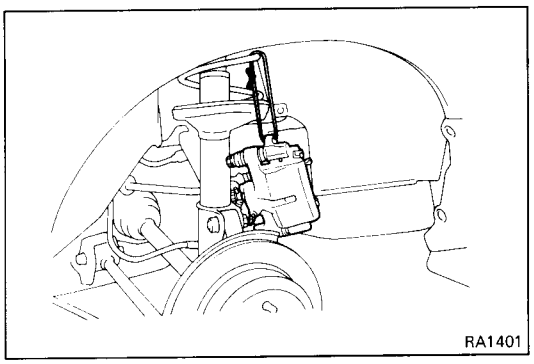
REMOVAL OF REAR AXLE HUB AND CARRIER

(See page SA-20)

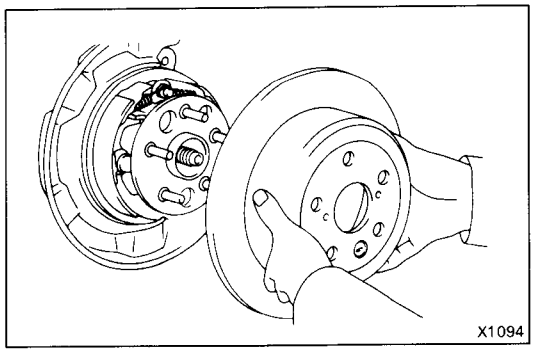
1. REMOVE COTTER PIN, BEARING LOCK NUT CAP AND BEARING LOCK NUT
   (a) Remove the cotter pin and bearing lock nut cap.
   (b) With the parking brake engaged, remove the bearing lock nut with plate washer.


K4079

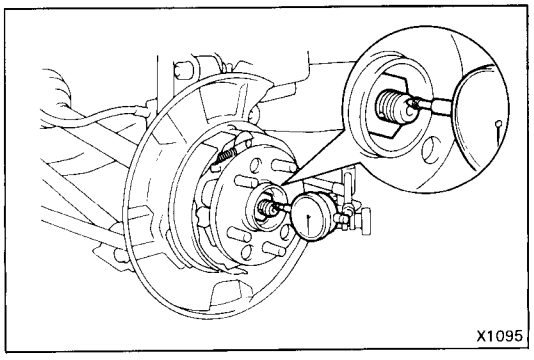
2. REMOVE BRAKE CALIPER
   (a) Remove the two bolts.


RA1401

   (b) Remove the brake caliper from the rear axle carrier and suspend it with wire.


X1094

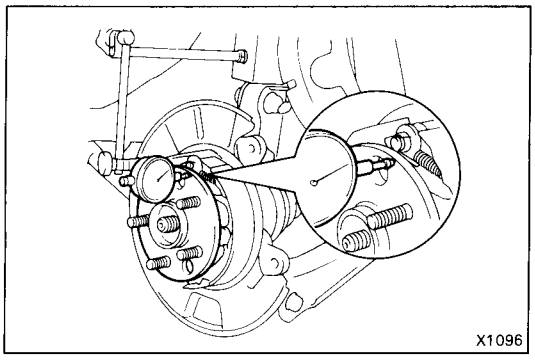
3. REMOVE ROTOR DISC
   (a) Place matchmarks on the rotor disc and axle hub.
   (b) Disengage the parking brake, and remove the rotor disc.


X1095

4 CHECK BEARING PLAY IN AXIAL DIRECTION

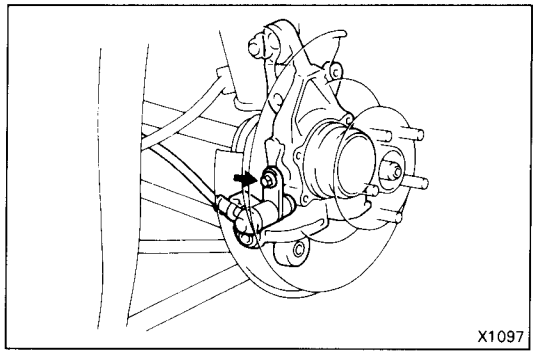
Bearing play: 0.05 mm (0.0020 in.) or less

If the bearing play is greater than the maximum, replace the bearing.



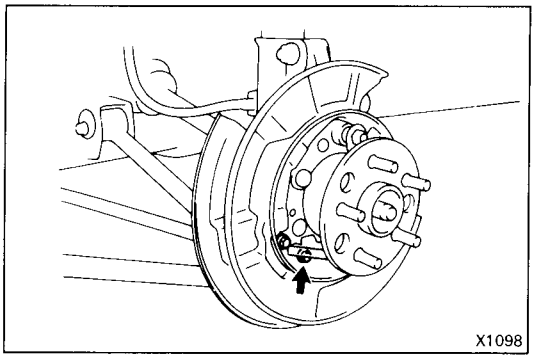
5. **CHECK AXLE SHAFT FLANGE RUNOUT**

Maximum flange runout: 0.07 mm (0.0028 in.) or less



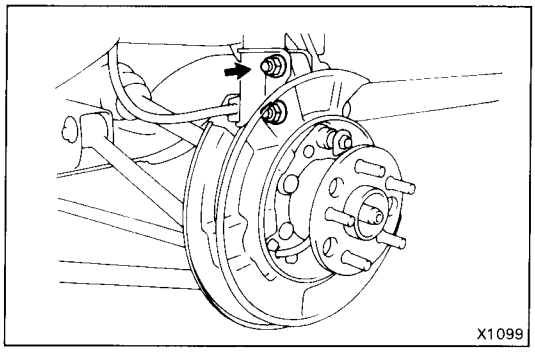
6. **REMOVE PARKING BRAKE ASSEMBLY**

7. **(w/ ABS)**
REMOVE REAR SPEED SENSOR

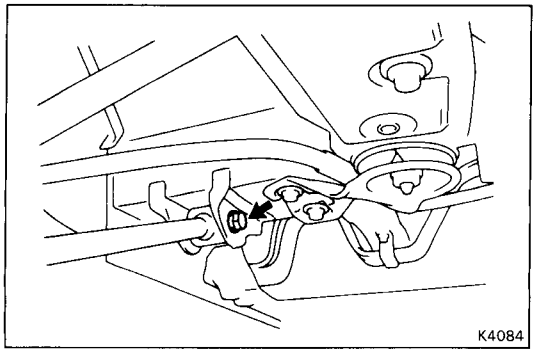


8. **REMOVE PARKING BRAKE CABLE**

Remove the two bolts and pull out the parking brake cable.

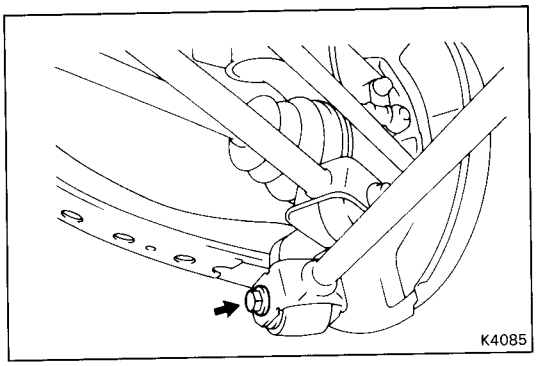


9. **LOOSEN TWO AXLE CARRIER MOUNTING NUTS**

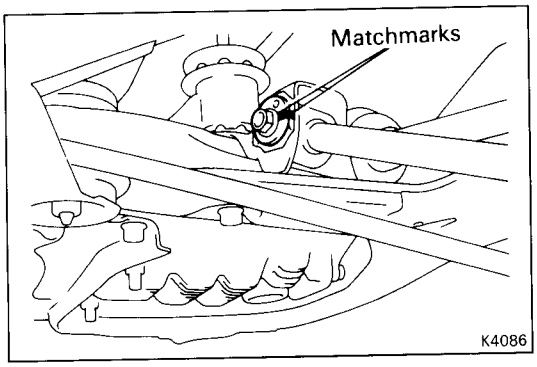


10. **DISCONNECT STRUT ROD**

(a) Loosen the strut rod mounting nut (body side).

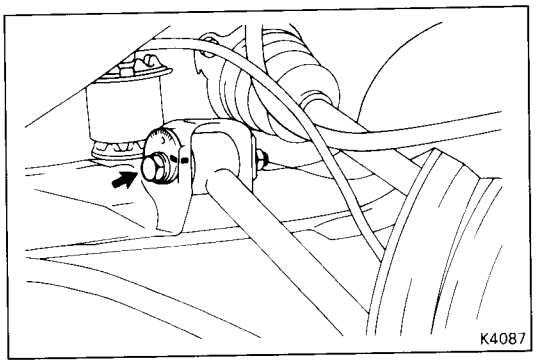


(b) Remove the strut rod mounting bolt and nut from the axle carrier.

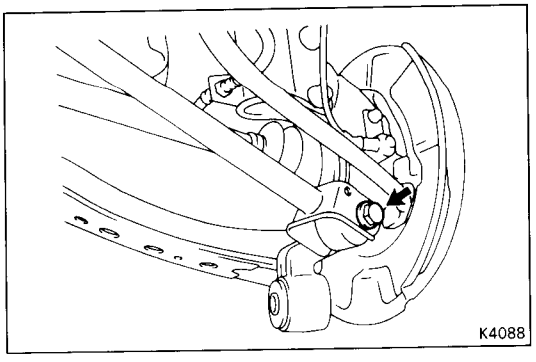


11. DISCONNECT NO.1 SUSPENSION ARM

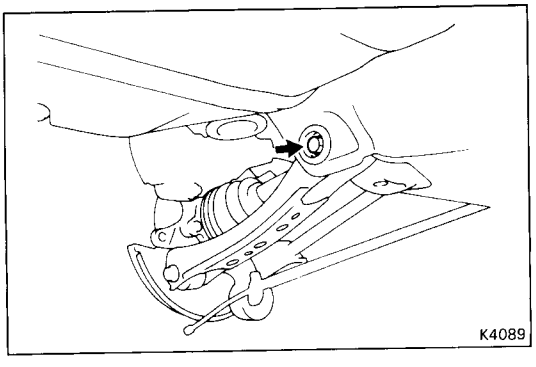
(a) Place matchmarks on the toe adjusting cam and control arm retainer.



(b) Loosen the No.1 suspension arm mounting bolt (rear suspension member side).

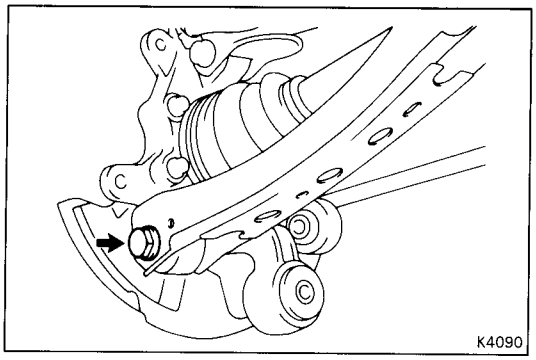


(c) Remove the No.1 suspension arm mounting bolt and nut from the axle carrier.

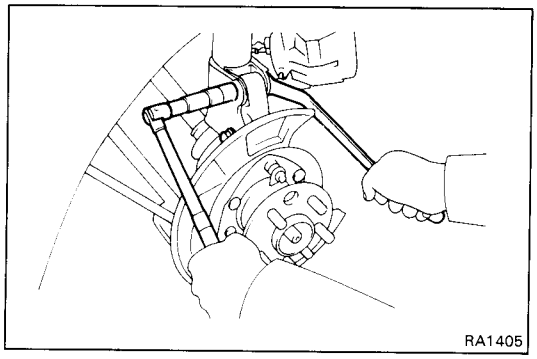


12. DISCONNECT NO.2 SUSPENSION ARM

(a) Loosen the No.2 suspension arm mounting bolt (rear suspension member side).



(b) Remove the bolt and nut from the axle carrier.

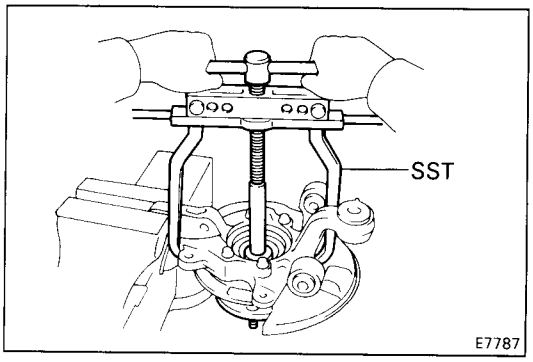


13. REMOVE AXLE CARRIER WITH AXLE HUB

(a) Remove the two axle carrier mounting bolts and nuts.

(b) Remove the axle carrier with axle hub.

NOTICE: Cover the drive shaft boot with cloth to protect it from damage.

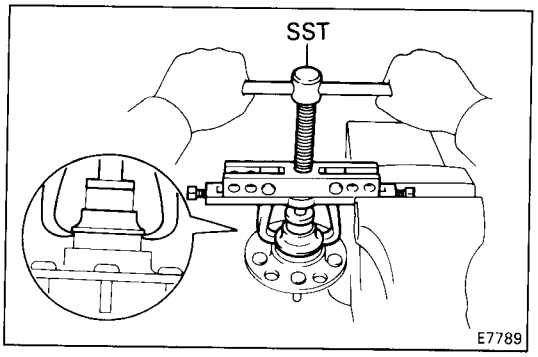


REPLACEMENT OF AXLE HUB AND BEARING

1. REMOVE AXLE SHAFT FROM AXLE HUB

Using SST, push the axle shaft off the axle hub.

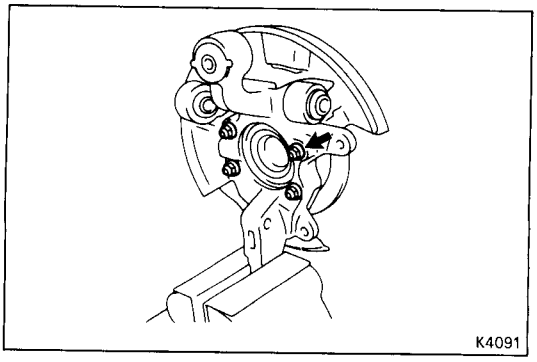
SST 09950-20017



2. REMOVE BEARING INNER RACE (OUTSIDE) FROM AXLE SHAFT

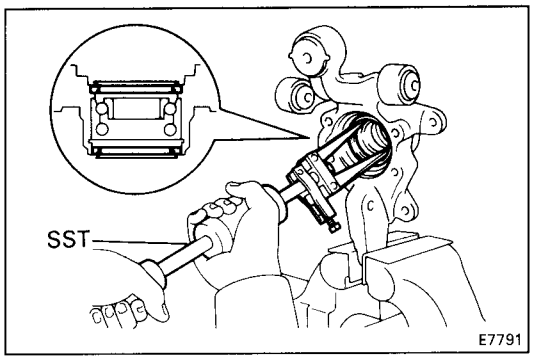
Using SST, pull off the bearing inner race (outside) from the axle shaft.

SST 09950-20017



3. REMOVE BACKING PLATE

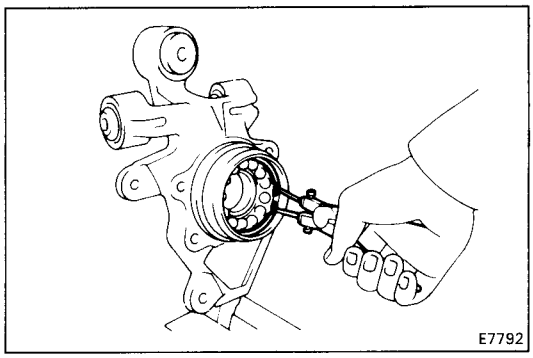
Remove the four nuts and backing plate.



4. REMOVE INNER AND OUTER OIL SEAL

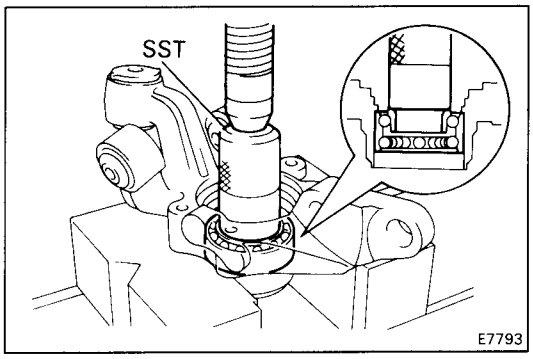
Using SST, remove the oil seal from the axle carrier.

SST 09308-00010



5. REMOVE SNAP RING

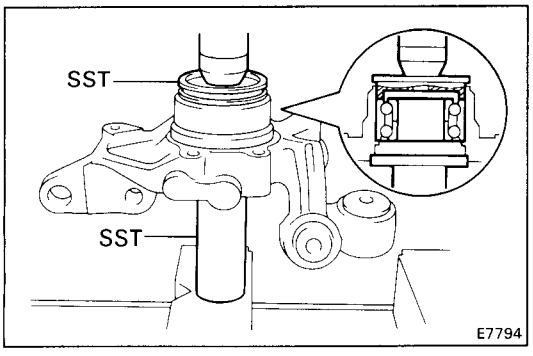
Using snap ring pliers, remove the snap ring from the axle carrier.



6. REMOVE BEARING

Using SST, press out the bearing from the axle carrier.

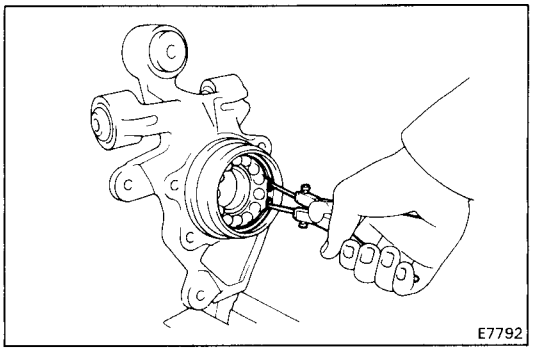
SST 09636-20010



7. INSTALL BEARING

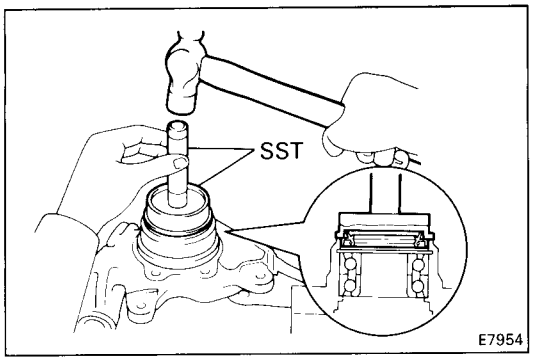
Using SST, press the bearing into the axle hub.

SST 09309-36010, 09608-32010



8. INSTALL SNAP RING

Using snap ring pliers, install a snap ring into the axle carrier.

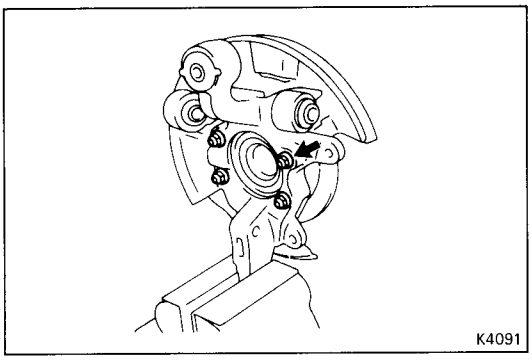


9. INSTALL OUTER OIL SEAL

(a) Using SST, drive in a new oil seal to the axle carrier.

SST 09608-30012 (09608-04020), 09608-32010

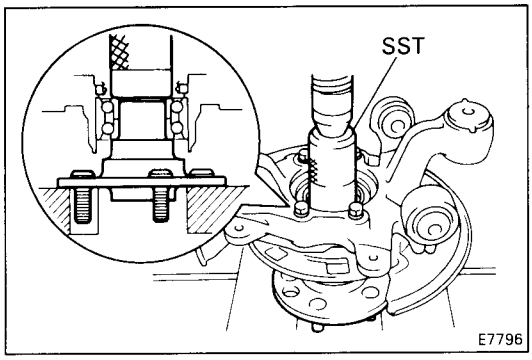
(b) Apply MP grease to the oil seal lip.



10. INSTALL BACKING PLATE

Install the backing plate to the axle carrier with new four nuts.

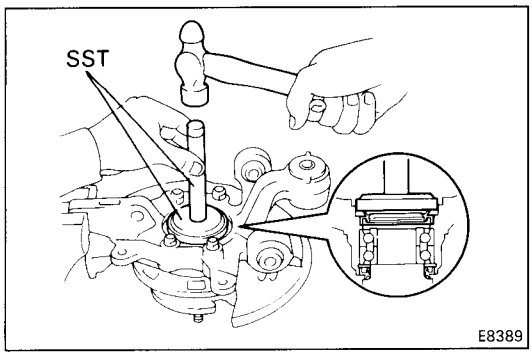
Torque: 730 kg-cm (53 ft-lb, 72 N·m)



11. INSTALL AXLE SHAFT

Using SST, press in the axle shaft to the axle carrier.

SST 09636-20010

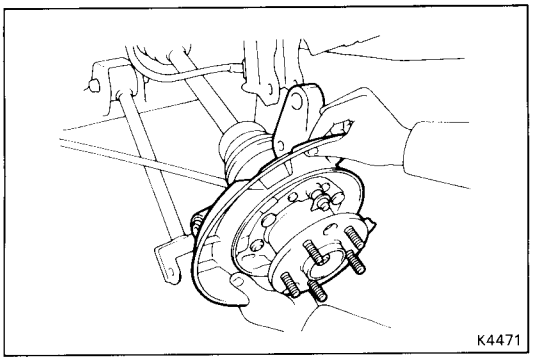


12. INSTALL INNER OIL SEAL

(a) Using SST, drive in a new oil seal to the axle carrier.

SST 09608-30012 (09608-04020, 09608-04110)

(b) Apply MP grease to the oil seal lip.



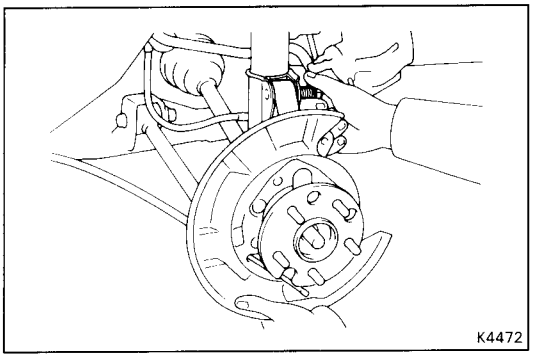
INSTALLATION OF REAR AXLE HUB AND CARRIER

1. INSTALL AXLE CARRIER WITH AXLE HUB

(a) Install the axle carrier to the drive shaft.

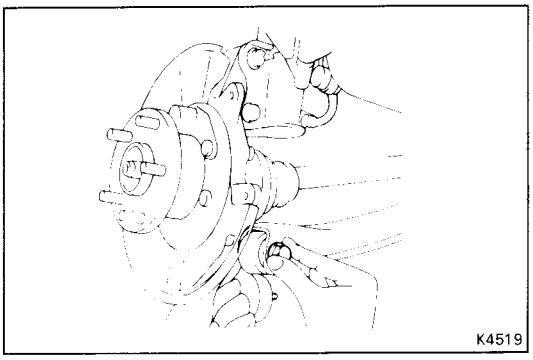
NOTICE: Be careful not to damage the oil seal.

(b) Connect the No.2 suspension arm with a bolt to the axle carrier.



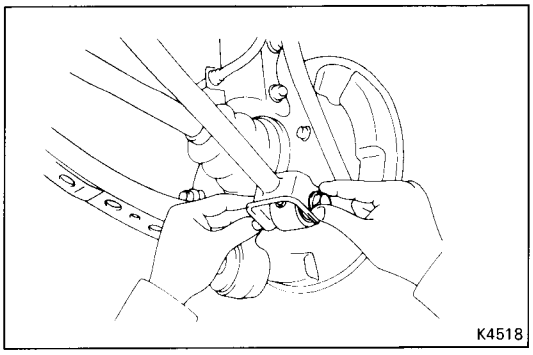
(c) Install the axle carrier to the shock absorber with two bolts.

(d) Install and finger tighten the two nuts.



2. INSTALL NO.2 SUSPENSION ARM NUT

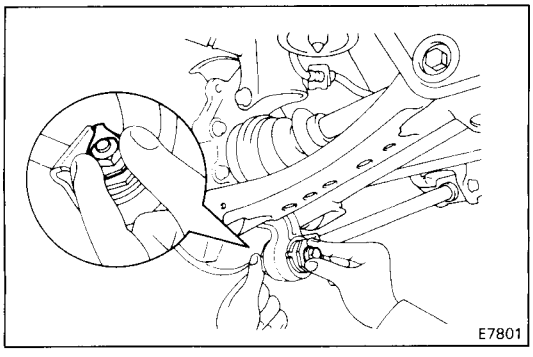
Install and finger tighten the nut.



3. CONNECT NO.1 SUSPENSION ARM

(a) Connect No.1 suspension arm with a bolt to the axle carrier.

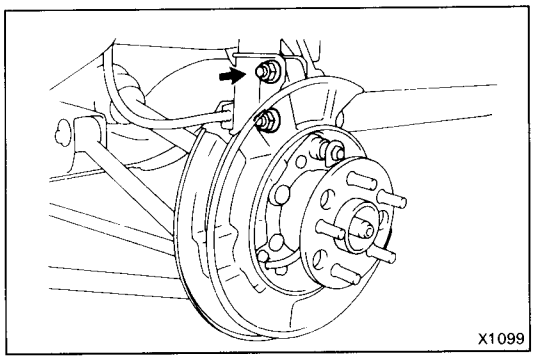
(b) Install and finger tighten the nut.



4. CONNECT STRUT ROD

(a) Connect strut rod with a bolt to the axle carrier.

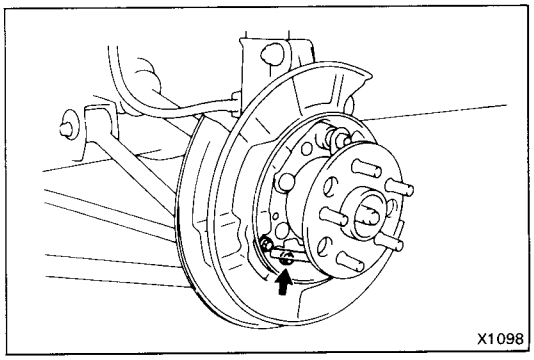
(b) Install and finger tighten the nut.



5. **TORQUE AXLE CARRIER NUTS**

Torque the two bolts and nuts.

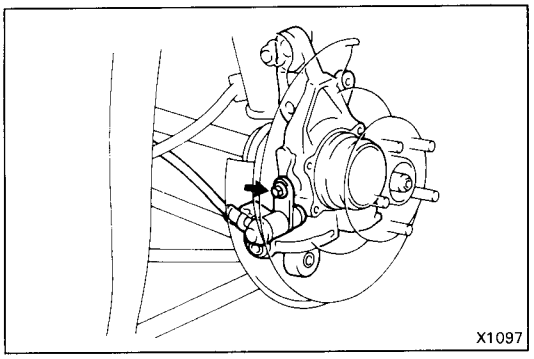
Torque: 2,600 kg-cm (188 ft-lb, 255 N·m)



6. **INSTALL PARKING BRAKE CABLE**

Install the parking brake cable with two bolts to the backing plate.

Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)

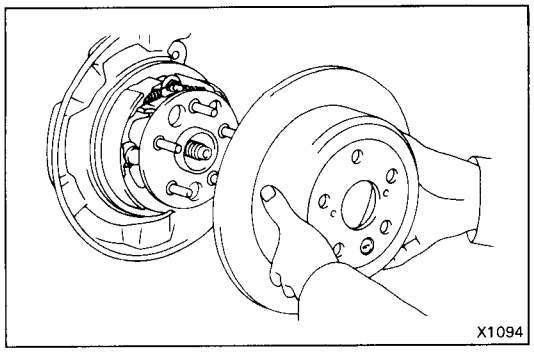


7. **(w/ ABS)**
INSTALL REAR SPEED SENSOR

Install the rear speed sensor with a bolt.

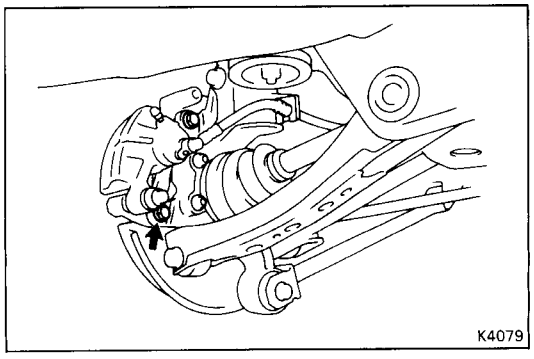
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

8. **INSTALL PARKING BRAKE ASSEMBLY**



9. **INSTALL ROTOR DISC**

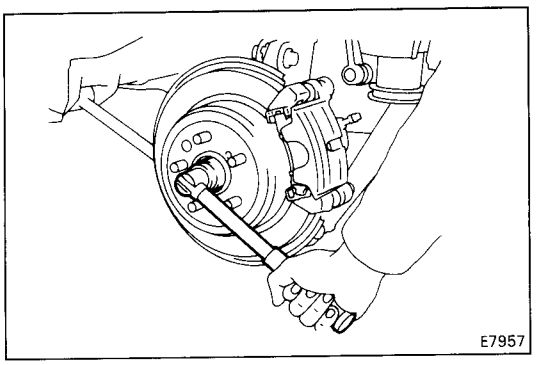
Align matchmarks on the axle hub and rotor disc, and install the rotor disc.



10. **INSTALL BRAKE CALIPER**

Install the brake caliper with two bolts and torque the two bolts.

Torque: 475 kg-cm (34 ft-lb, 47 N·m)



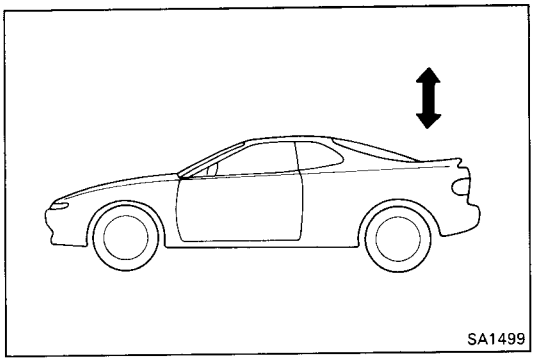
11. INSTALL PLATE WASHER, BEARING LOCK NUT, BEARING LOCK NUT CAP AND NEW COTTER PIN

(a) Install the plate washer and lock nut.

(b) With the parking brake engaged, and torque the nut.

Torque: 1,900 kg-cm (137 ft-lb, 186 N·m)

(c) Install the lock nut cap and a new cotter pin.

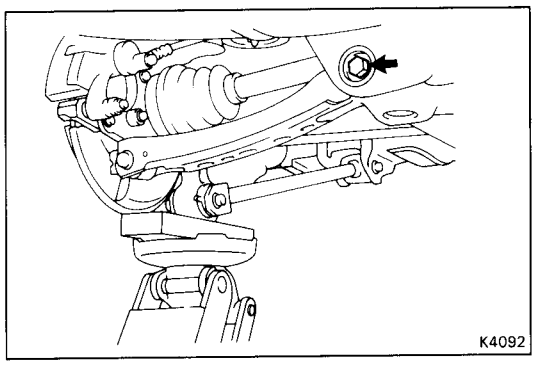


12. STABILIZE SUSPENSION

(a) Temporarily install wheels.

(b) Remove stands and bounce the vehicle up and down to stabilize the suspension.

13. JACK UP VEHICLE AND REMOVE WHEELS



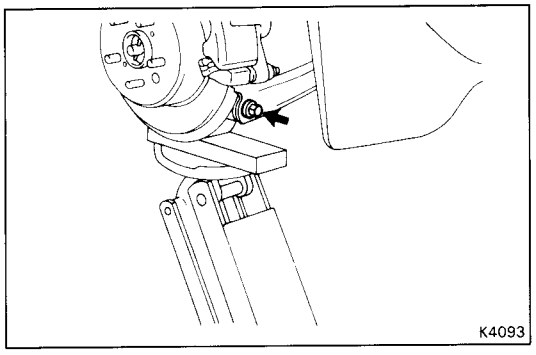
14. JACK UP AXLE CARRIER

Place wooden block on the jack and jack up axle carrier.

15. TORQUE NO.2 SUSPENSION ARM MOUNTING BOLT

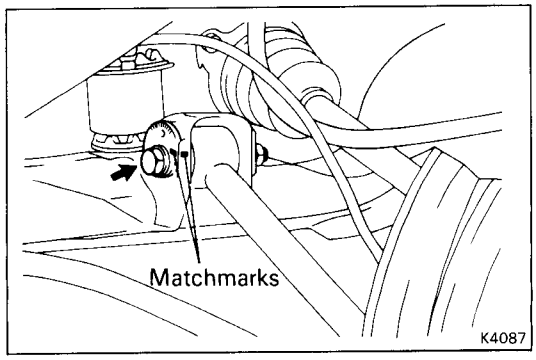
(a) Torque the No.2 suspension arm body side bolt.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)



(b) Torque the No.2 suspension arm axle carrier side bolt.

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

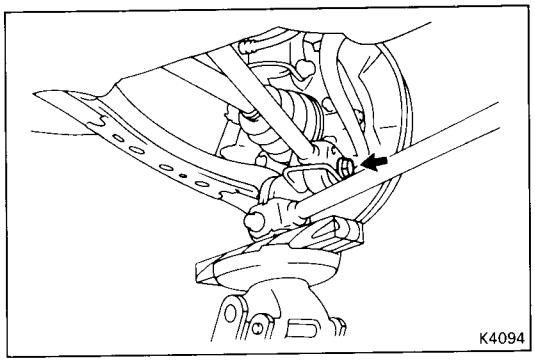


16. TORQUE NO.1 SUSPENSION ARM MOUNTING BOLT

(a) Align matchmarks on the adjusting cam and control arm retainer.

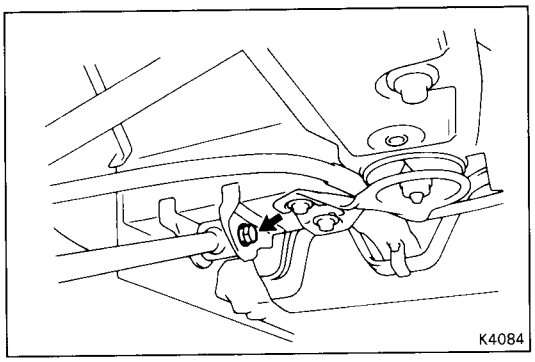
(b) Torque the No. 1 suspension arm mounting bolt.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)



(c) Torque the No.1 suspension arm axle carrier side bolt.

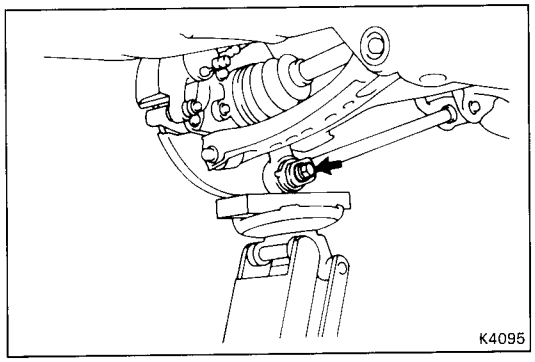
Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)



17. TORQUE STRUT ROD MOUNTING BOLT

(a) Torque the strut rod body side bolt.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)



(b) Torque the strut rod axle carrier side bolt.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)

18. INSTALL AND TORQUE WHEELS

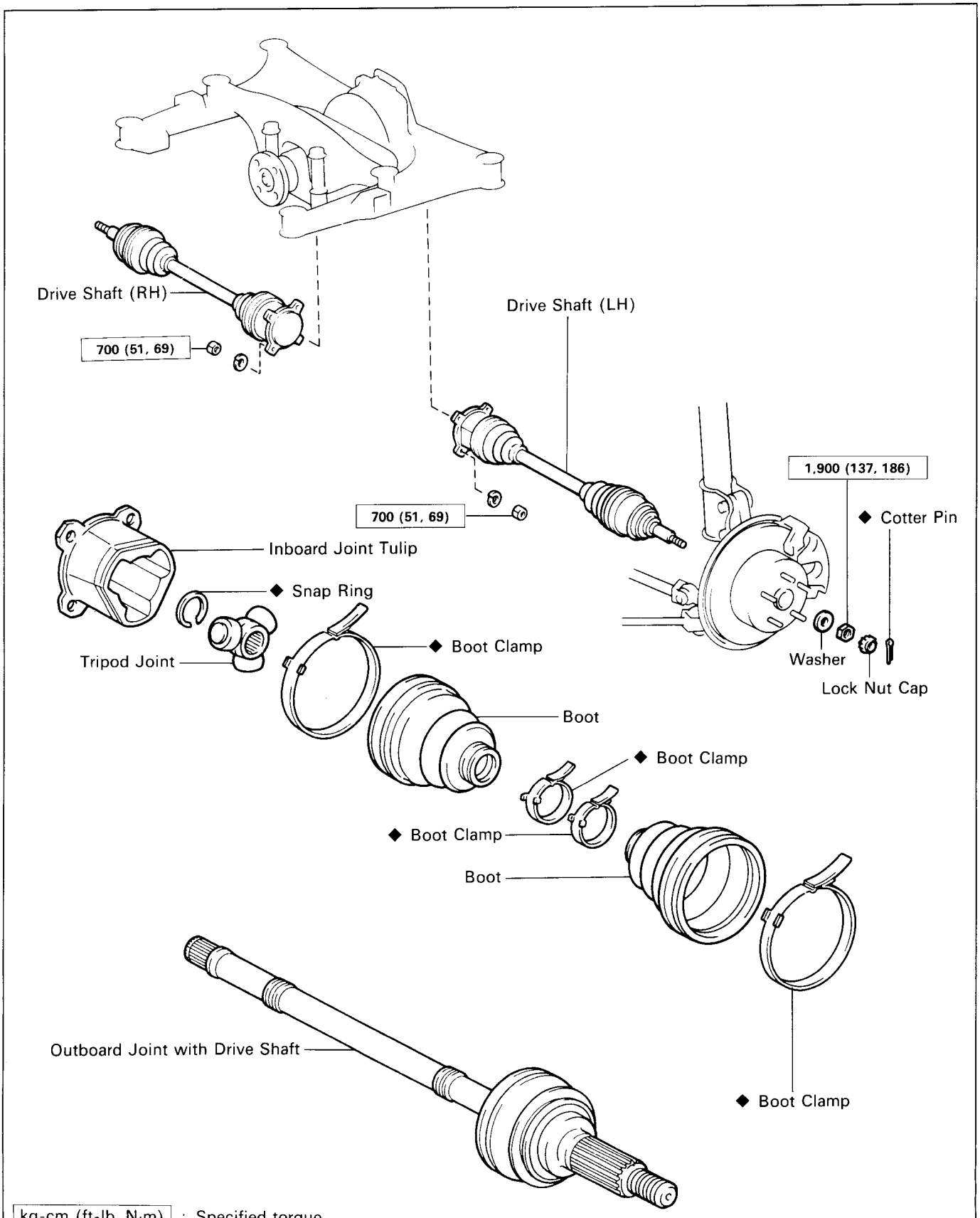
Torque: 1,050 kg-cm (76 ft-lb, 103 N·m)

19. BLEED BRAKE SYSTEM

20. CHECK REAR WHEEL ALIGNMENT
(See page SA-5)

REAR DRIVE SHAFT

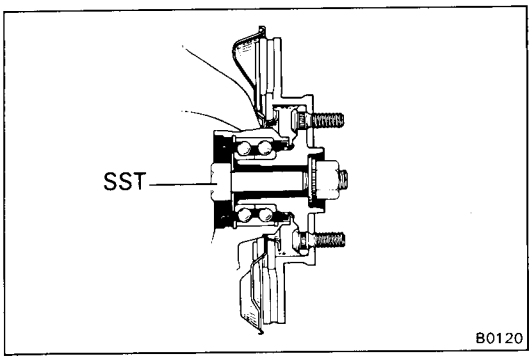
COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

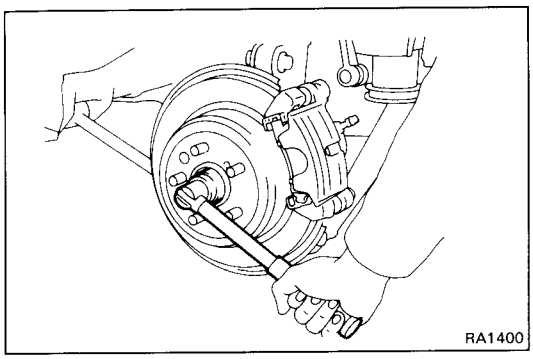
◆ Non-reusable part

RA1341
RA1342



NOTICE: The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed. Therefore, if it is absolutely necessary to place the vehicle weight on the hub bearing, first support it with SST.

SST 09608-16041 (09608-02020, 09608-02040)

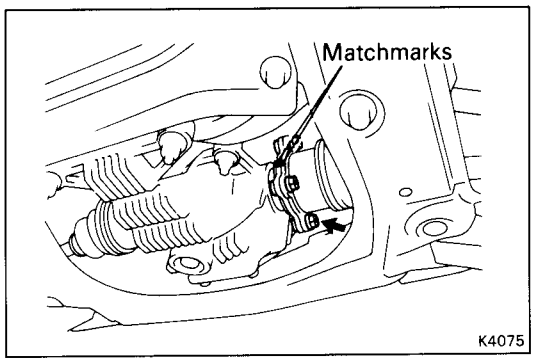


REMOVAL OF REAR DRIVE SHAFT

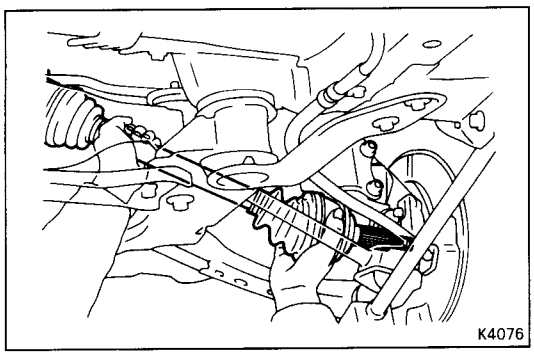
(See page SA-31)

1. **REMOVE REAR WHEELS**

2. **REMOVE COTTER PIN, LOCK NUT CAP AND LOCK NUT**
   (a) Remove the cotter pin and lock nut cap.
   (b) With the parking brake engaged, loosen the bearing lock nut.

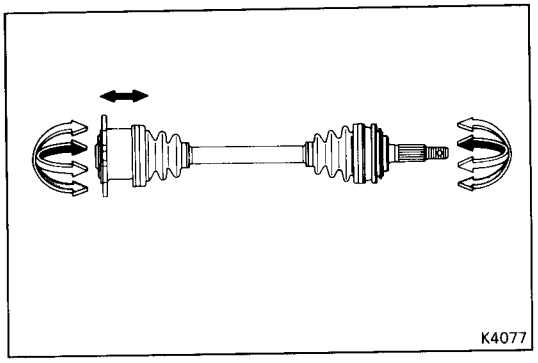


3. **REMOVE DRIVE SHAFT**
   (a) Place matchmarks on the inboard joint tulip and the side gear shaft flange.
   (b) With the parking brake engaged, remove the four nuts and washers.
   (c) Disconnect the drive shaft from the side gear shaft.



   (d) Remove the drive shaft from the axle carrier.

   HINT: Push the axle carrier towards the outside of vehicle, and separate the drive shaft from the axle carrier.



DISASSEMBLY OF REAR DRIVE SHAFT

(See page SA-31)

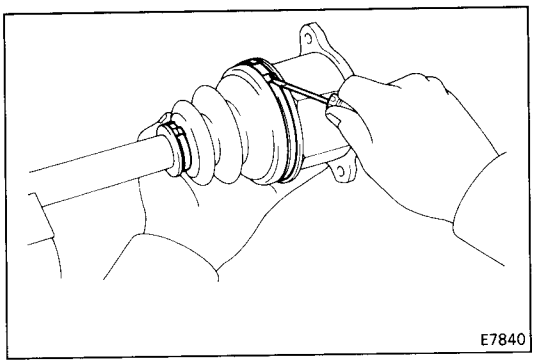
1. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard and outboard joints.

(b) Check to see that the inboard joint slide smoothly in the thrust direction.

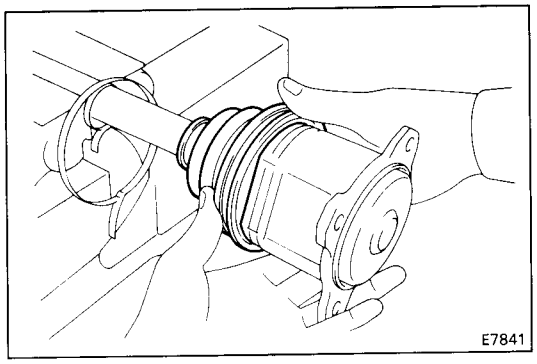
(c) Check to see that there is no remarkable play in the radial direction of the inboard joint.

(d) Check the damage of boot.

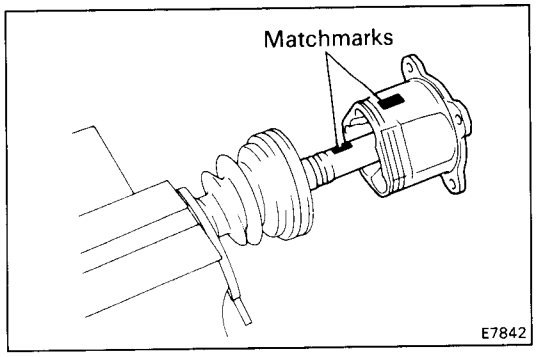


2. REMOVE INBOARD JOINT BOOT

(a) Using a screwdriver, remove the two boot clamps.



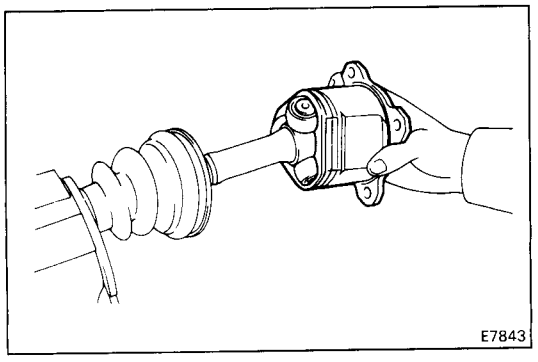
(b) Slide the inboard joint boot toward the outboard joint.



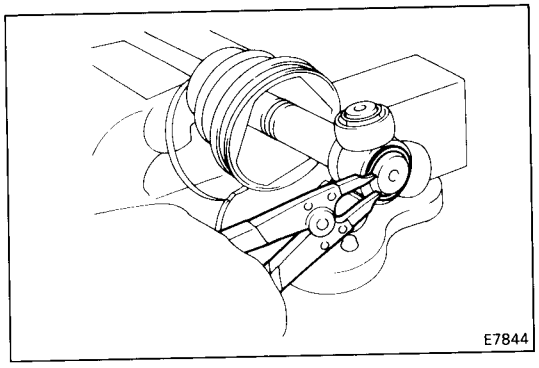
3. REMOVE INBOARD JOINT OUTER RACE

(a) Place matchmarks on the inboard joint tulip and drive shaft.

NOTICE: Do not punch the marks.

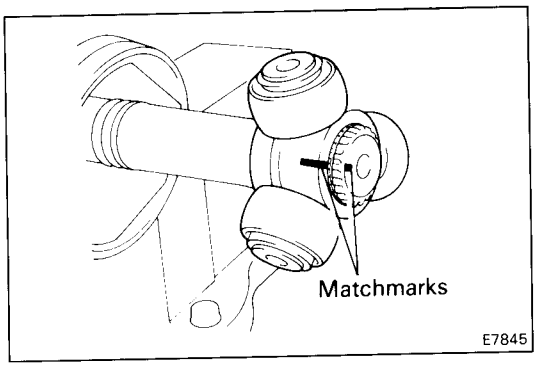


(b) Remove the inboard joint tulip from the drive shaft.



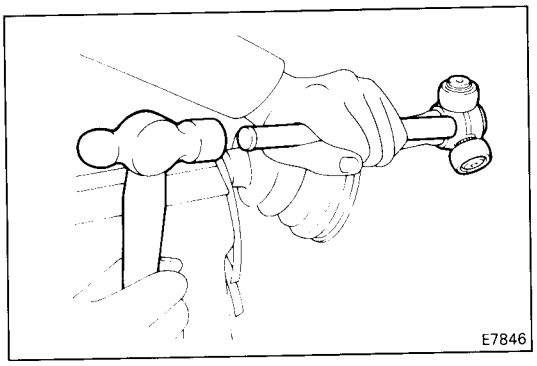
4. REMOVE TRIPOD JOINT

(a) Using snap ring pliers, remove the snap ring.



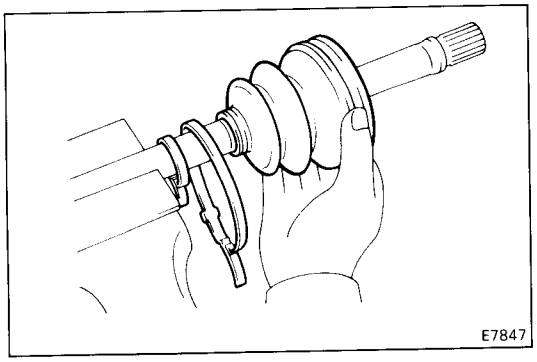
(b) Place matchmarks on the shaft and the tripod joint.

NOTICE: Do not use a punch to mark the matchmarks. Use paint, etc.

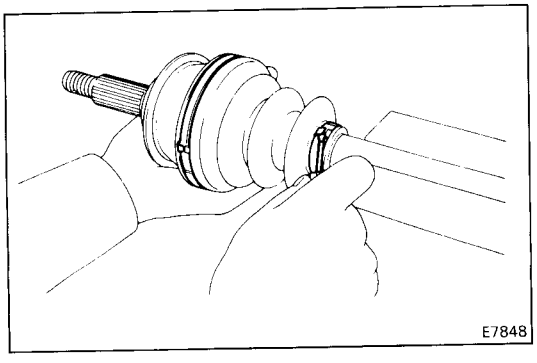


(c) Using a hammer and brass bar, drive out the tripod joint from the drive shaft.

NOTICE: Do not tap the roller.



5. REMOVE INBOARD JOINT BOOT AND CLAMPS

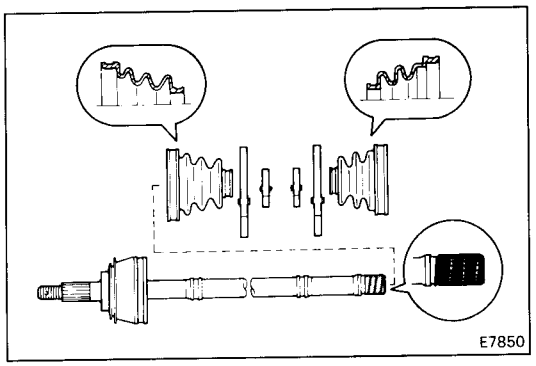


6. REMOVE OUTBOARD JOINT BOOT

(a) Using a screwdriver, remove the two boot clamps of the outboard joint boot.

(b) Remove the boot from the outboard joint.

NOTICE: Do not disassemble the outboard joint.



ASSEMBLY OF REAR DRIVE SHAFT

(See page SA-31)

1. TEMPORARILY INSTALL BOOTS AND NEW BOOT CLAMPS

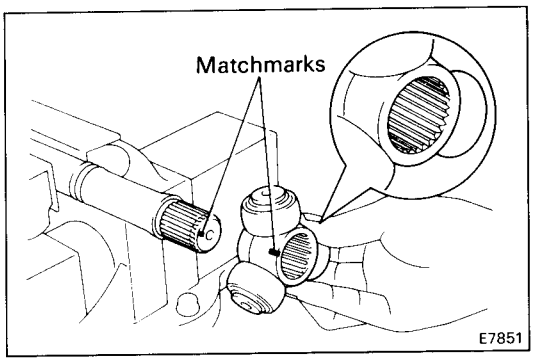
NOTICE: The boot and clamp of the outboard joint are smaller than those of the inboard joint.

HINT: Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.

Temporarily install the boots and new clamps to the drive shaft.

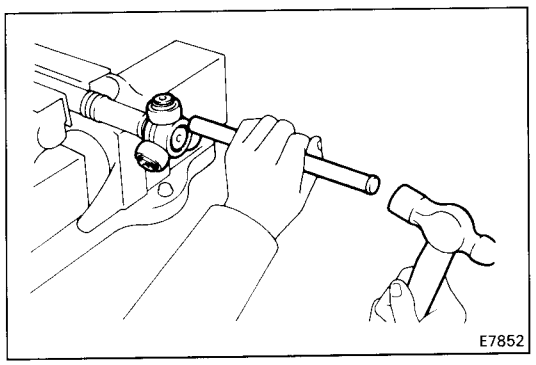
2. INSTALL TRIPOD JOINT

(a) Align the matchmarks placed before remove.

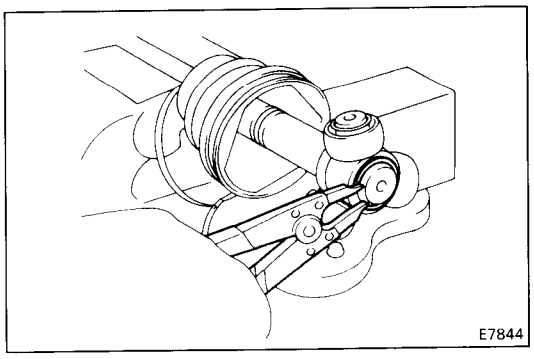


(b) Using a brass bar and hammer, tap in the tripod joint to the drive shaft.

NOTICE: Do not tap the roller.



(c) Using snap ring pliers, install a new snap ring.

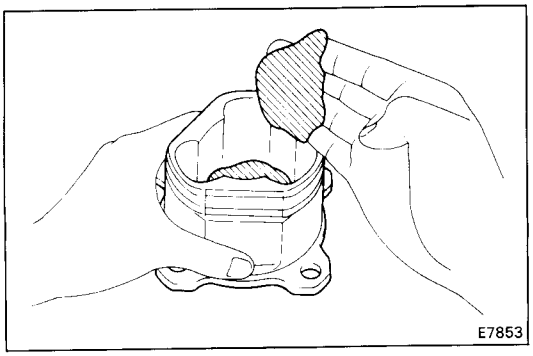


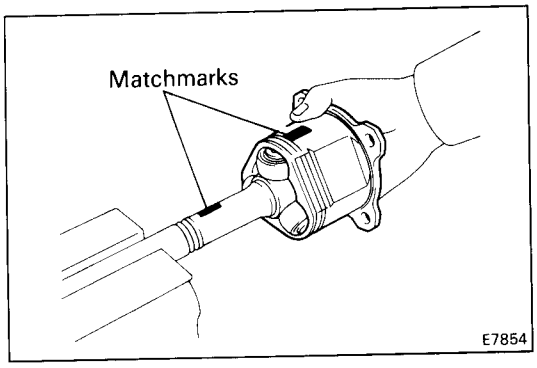
3. INSTALL INBOARD JOINT TULIP TO DRIVE SHAFT

(a) Pack in the grease to the inboard tulip.

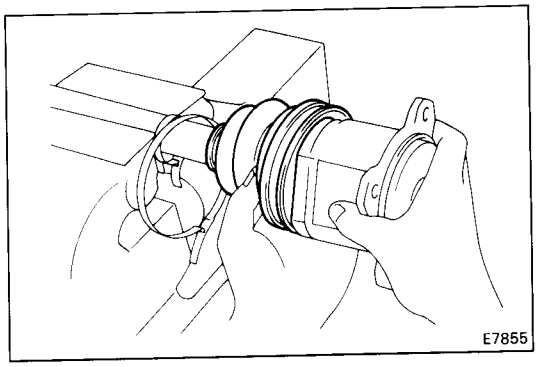
HINT: Use the grease supplied in the boot kit.

Grease capacity: 180 g (0.40 lb)





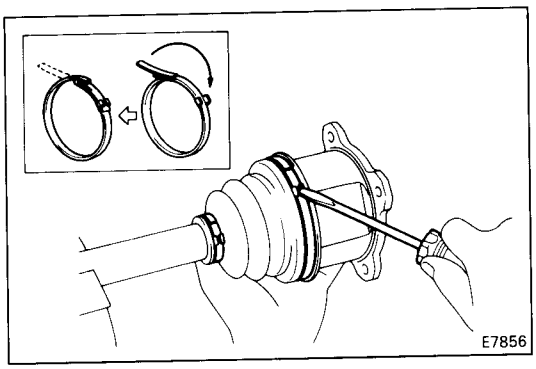
(b) Align the matchmarks placed before remove, and install the inboard joint tulip to the drive shaft.



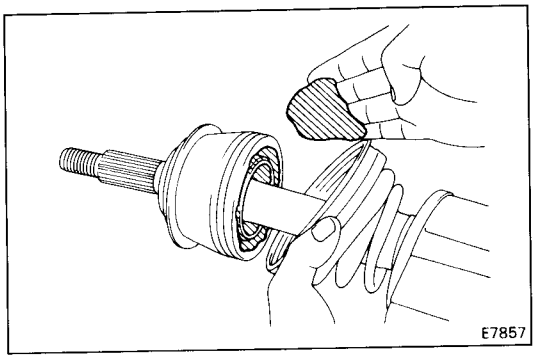
4. **INSTALL INBOARD JOINT BOOT**

NOTICE: The clamps of the inboard joint are smaller than those of the outboard joint.

(a) Be sure the boot is on the shaft groove.



(b) Using a screwdriver, bend the boot clamp and lock it as shown.



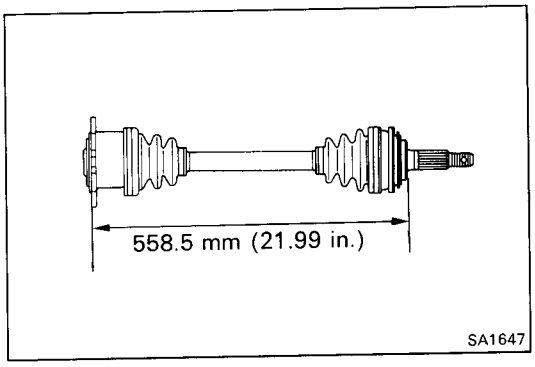
5. **INSTALL OUTBOARD JOINT BOOT**

(a) Before installing the boot, pack in grease.

HINT: Use the grease supplied in the boot kit.

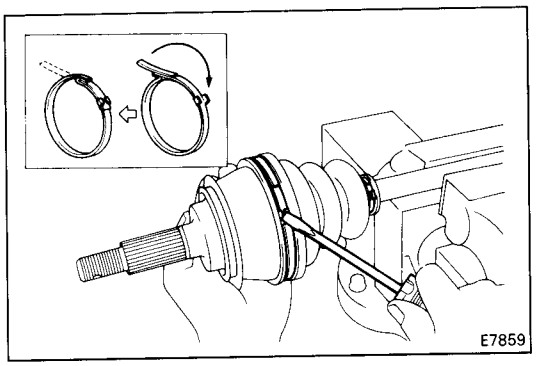
Grease capacity: 120 g (0.26 lb)

(b) Be sure the boot is on the shaft groove.

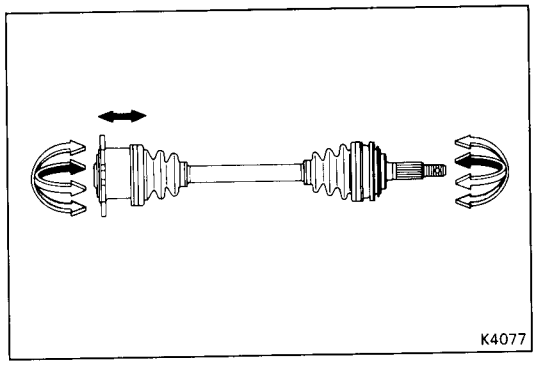


(c) Insure that the boot is not stretched or contracted when drive shaft is at standard length.

Drive shaft length: 558.5 mm (21.99 in.)



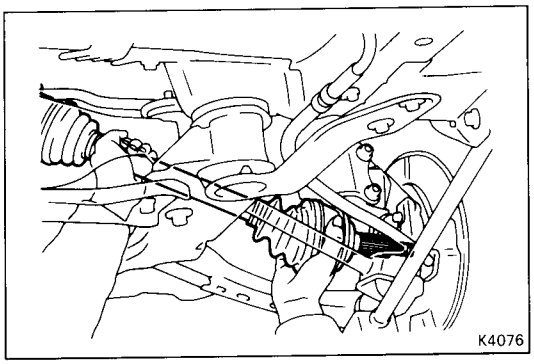
(d) Using a screwdriver, bend the boot clamp and lock it as shown.



6. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard joint and outboard joint.

(b) Check to see that the inboard joint side smoothly in the thrust direction.



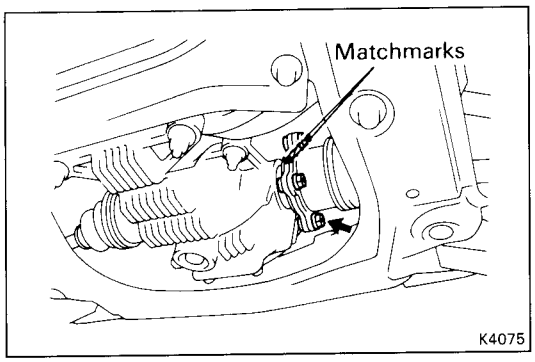
INSTALLATION OF REAR DRIVE SHAFT

(See page SA-31)

1. **INSTALL DRIVE SHAFT**

   (a) Install the drive shaft to the axle carrier.

   HINT: Be careful not to damage the boot.

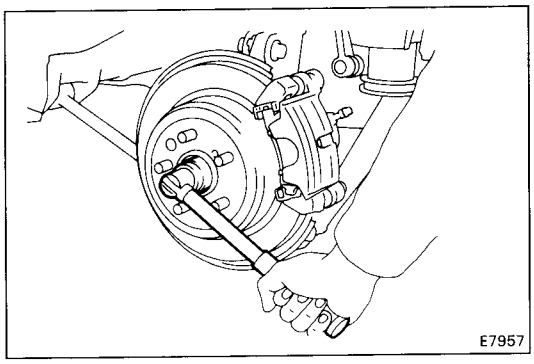


   (b) Align the matchmarks on the inboard joint tulip and the side gear shaft flange.

   (c) Connect the drive shaft with the four bolts and washer to the side gear shaft.

   (d) With the parking brake engaged, torque the four bolts.

   Torque: 700 kg-cm (51 ft-lb, 69 N·m)



2. **INSTALL BEARING LOCK NUT, LOCK NUT CAP AND COTTER PIN**

   (a) Install the washer and lock nut.

   (b) With the parking brake engaged, torque the lock nut.

   Torque: 1,900 kg-cm (137 ft-lb, 186 N·m)

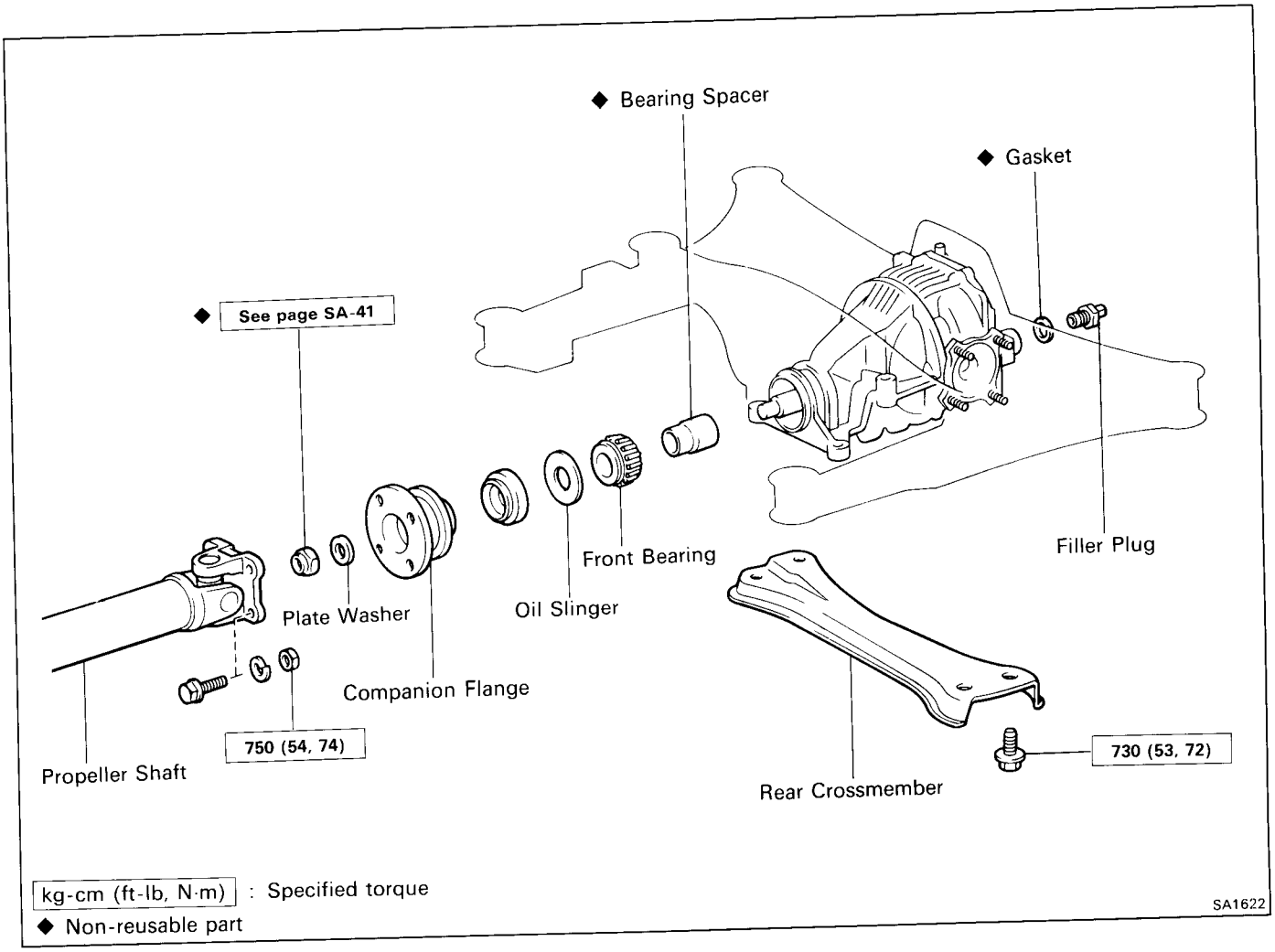
   (c) Install the lock nut cap, and using pliers, install a new cotter pin.

3. **INSTALL REAR WHEELS**

4. **CHECK REAR WHEEL ALIGNMENT**
   (See page SA-5)

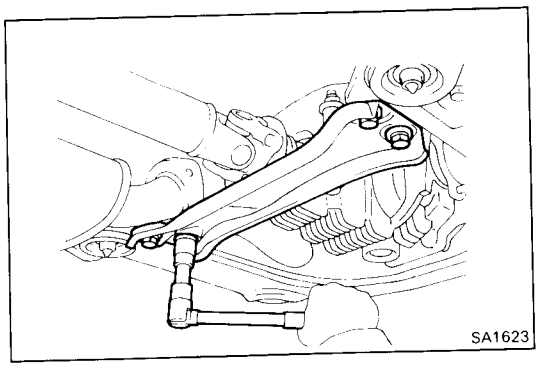
DIFFERENTIAL

On-Vehicle Repair



REPLACEMENT OF FRONT OIL SEAL

1. REMOVE REAR CROSSMEMBER

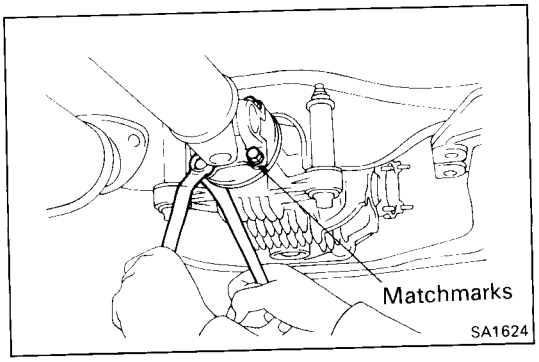


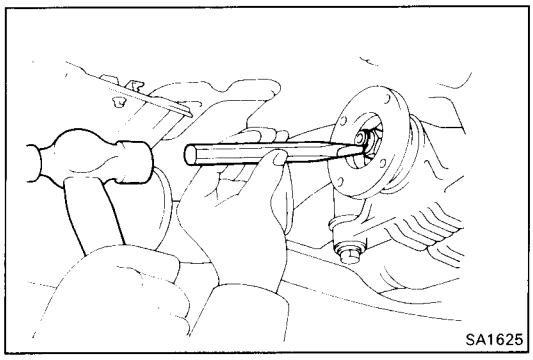
2. DISCONNECT PROPELLER SHAFT

(a) Place the matchmarks on the both flanges.

(b) Remove the four bolts, washers and nuts.

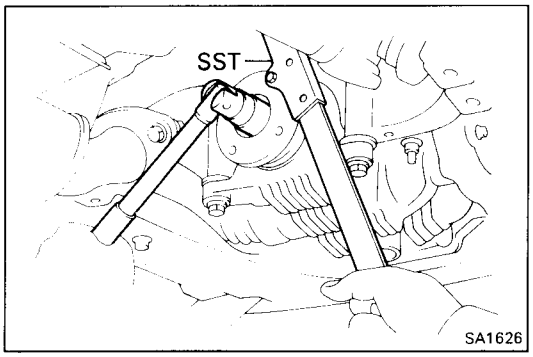
(c) Disconnect the propeller shaft from the differential.





3. REMOVE COMPANION FLANGE

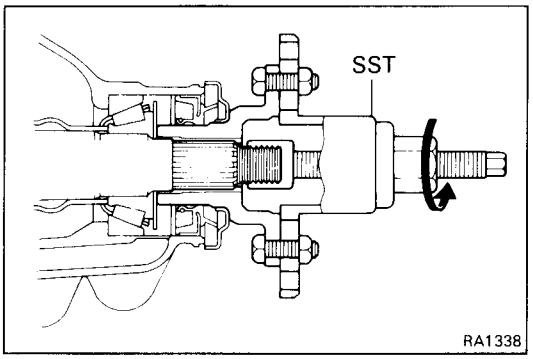
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.

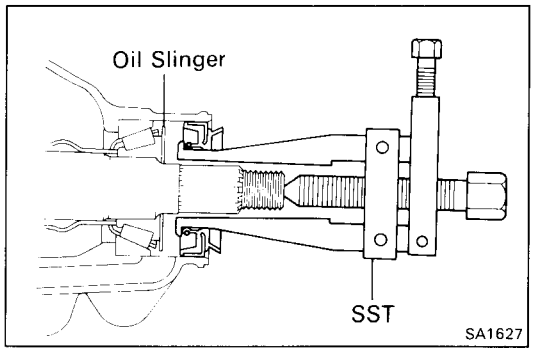
SST 09330-00021

(c) Remove the plate washer.



(d) Using SST, remove the companion flange.

SST 09557-22022

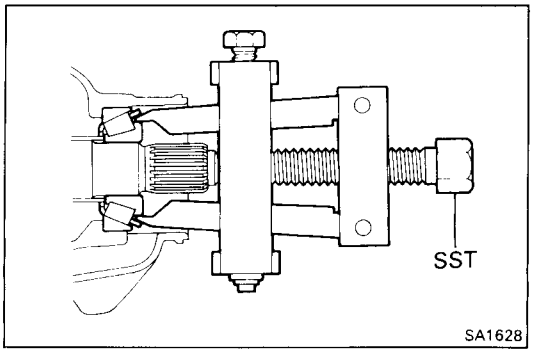


4. REMOVE FRONT OIL SEAL AND OIL SINGER

(a) Using SST, remove the front oil seal.

SST 09308-10010

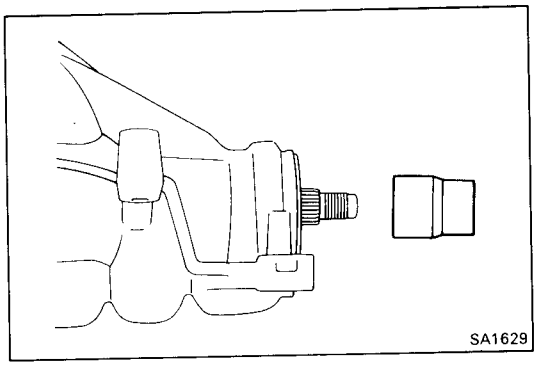
(b) Remove the oil slinger.



5. REMOVE FRONT BEARING AND BEARING SPACER

(a) Using SST, remove the front bearing.

SST 09556-22010

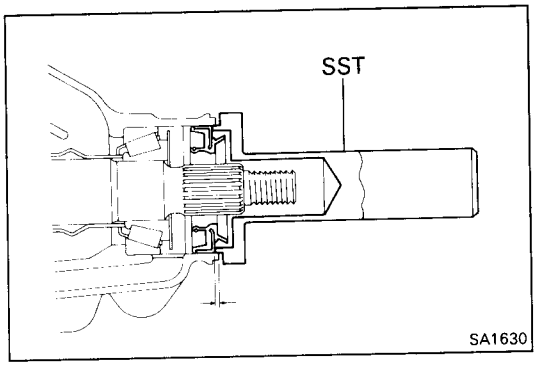


(b) Remove the bearing spacer.

6. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the shaft.

(b) Install the front bearing on the shaft.



7. INSTALL OIL SLINGER AND NEW OIL SEAL

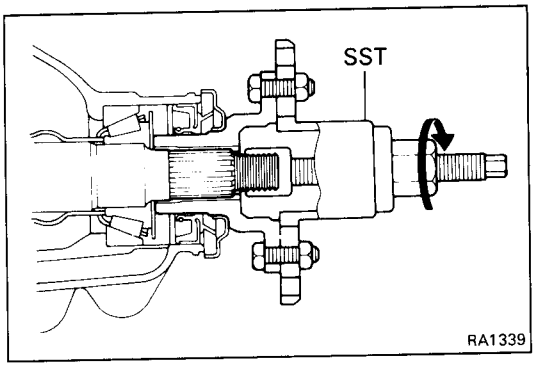
(a) Install the oil slinger on the shaft.

(b) Using SST, drive in a new oil seal.

SST 09554-22010

Oil seal drive in depth: 2.0 mm (0.079 in.)

(c) Apply MP grease to the oil seal lip.



8. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange.

SST 09557-22022

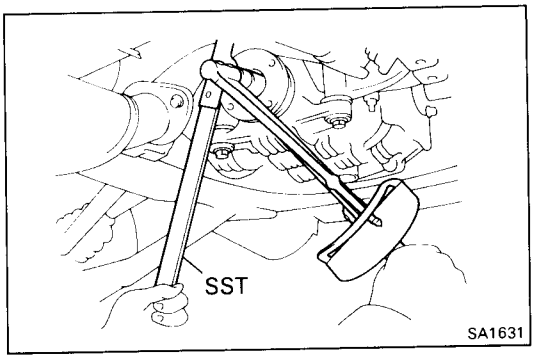
(b) Install the plate washer.

(c) Coat the threads of a new nut with gear oil.

(d) Using SST to hold the flange, tighten the nut.

SST 09330-00021

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)



9. CHECK DRIVE PINION BEARING PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

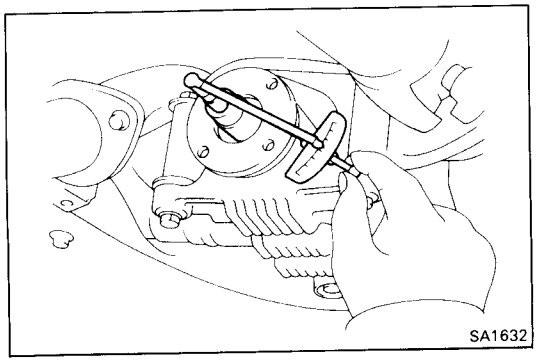
Preload (at starting):

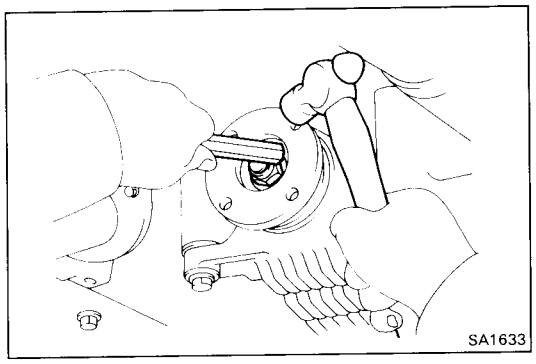
New bearing	**10 – 16 kg-cm (8.7 – 13.9 in.-lb, 1.0 – 1.6 N·m)**
Reused bearing	**5 – 8 kg-cm (4.3 – 6.9 in.-lb, 0.5 – 0.8 N·m)**

- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 130 kg-cm (9 ft-lb, 13 N·m) at a time until the specified preload is reached.

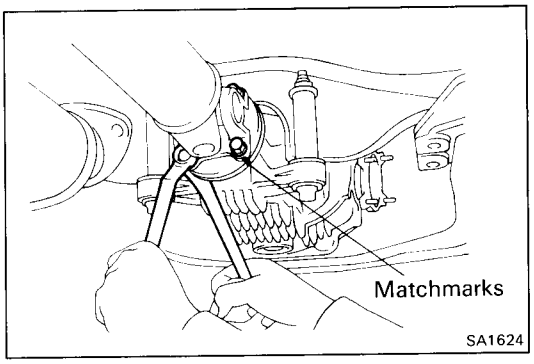
If the maximum torque is exceed while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg-cm (174 ft-lb, 235 N·m)





10. STAKE DRIVE PINION NUT

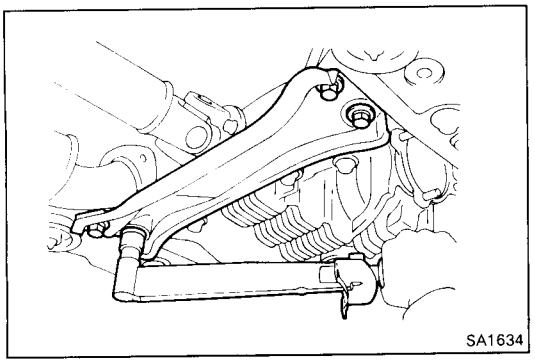


11. CONNECT PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the propeller shaft with the four bolts, washers and nuts.

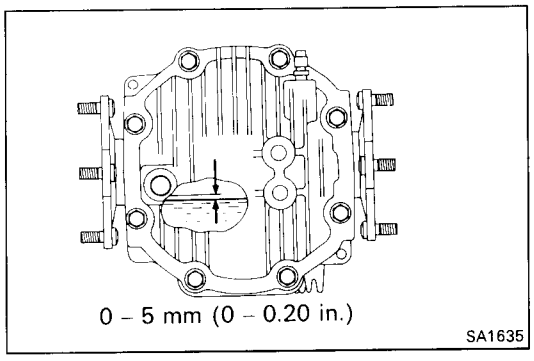
(b) Torque the bolts and nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)



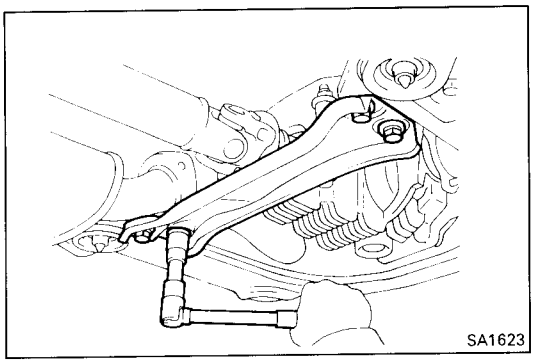
12. INSTALL REAR CROSSMEMBER

Torque: 730 kg-cm (53 ft-lb, 72 N·m)



13. CHECK OIL LEVEL

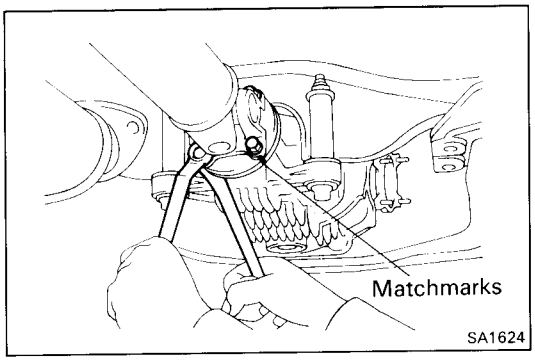
Oil grade: API GL-5 hypoid gear oil
Viscosity: Above –18°C (0°F) SAE 90
Below –18°C (0°F) SAE 80W-90
Capacity: 1.1 liters (1.2 US qts, 1.0 Imp.qts)


SA1623

REMOVAL OF DIFFERENTIAL

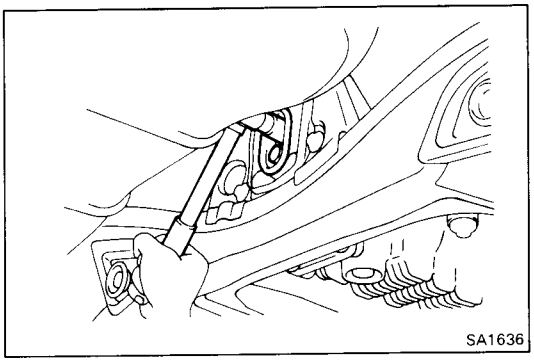
(See page SA-39)

1. DRAIN DIFFERENTIAL OIL
2. REMOVE DRIVE SHAFTS (See page SA-31)
3. REMOVE REAR CROSSMEMBER

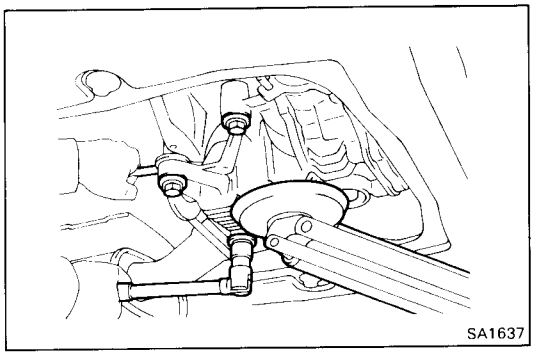


SA1624

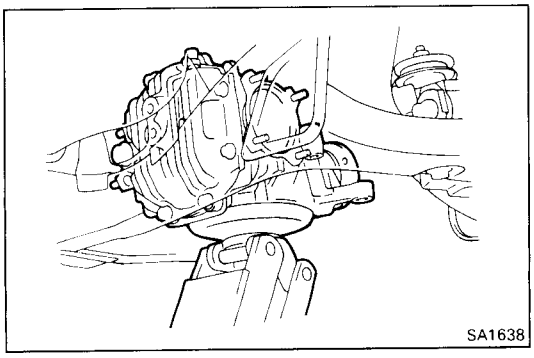
4. DISCONNECT PROPELLER SHAFT
   (a) Place the matchmarks on the both flanges.
   (b) Remove the four bolts, washers and nuts.
   (c) Disconnect the propeller shaft from the differential.


SA1636

5. REMOVE DIFFERENTIAL
   (a) Jack up the differential slightly.
   (b) Remove the two bolts.

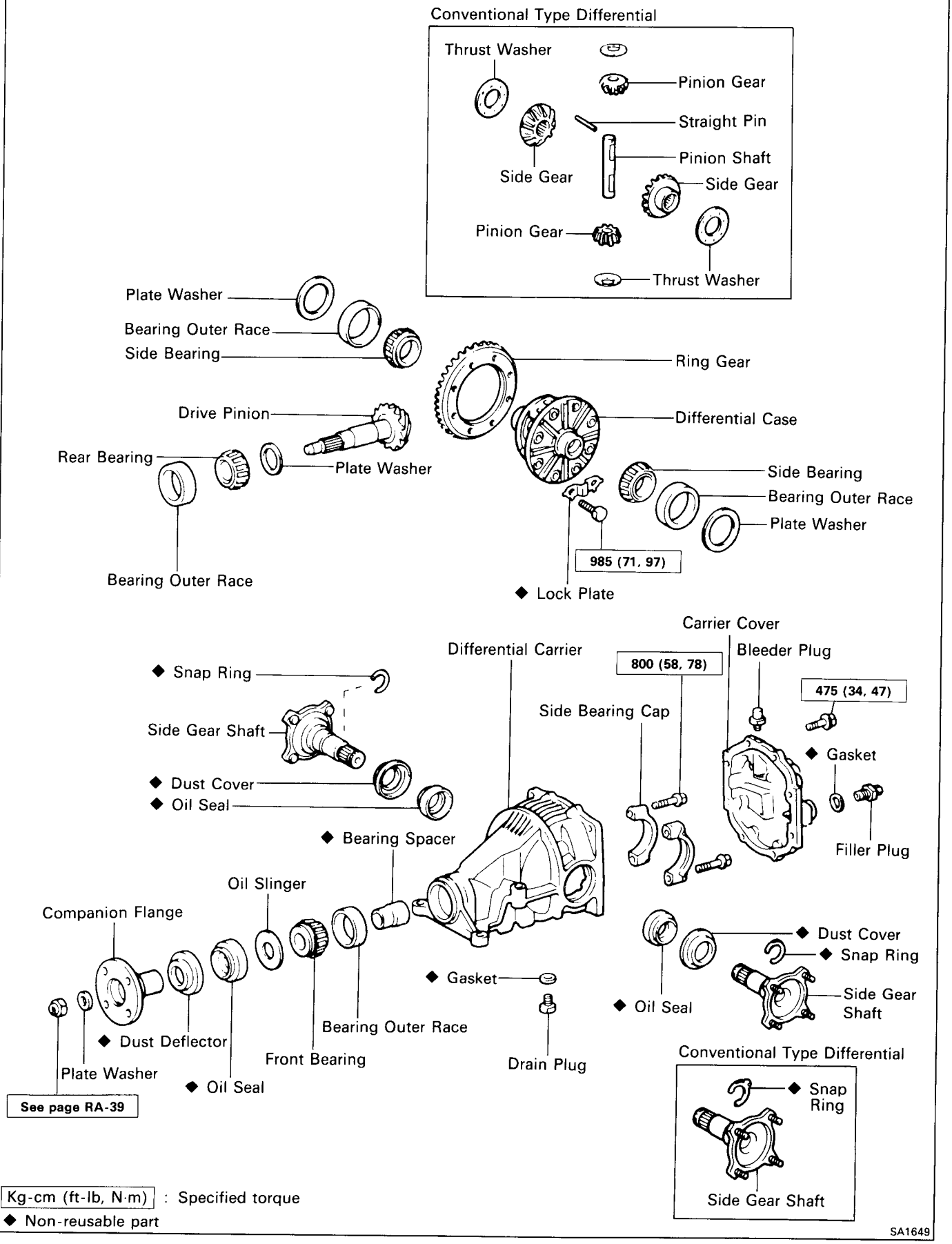

SA1637

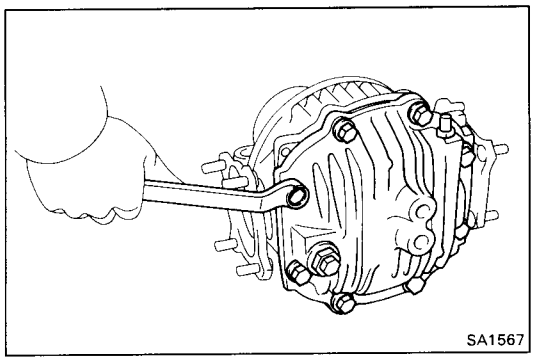
   (c) Remove the four nuts and bolts.


SA1638

   (d) Remove the differential from the body.

DIFFERENTIAL CARRIER

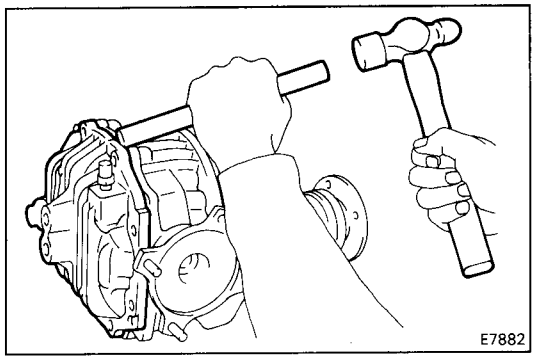



SA1567

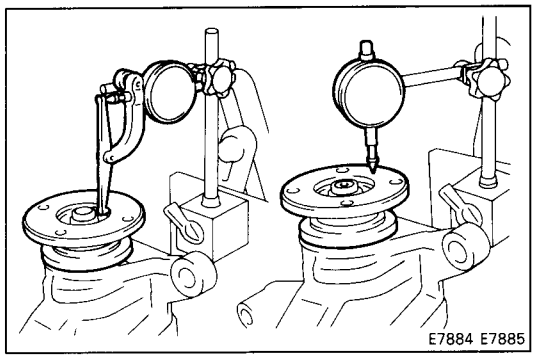
PRE-INSPECTION OF DIFFERENTIAL CARRIER

1. REMOVE DIFFERENTIAL CARRIER COVER

(a) Remove the eight bolts.


E7882

(b) Using a brass bar and hammer, separate the cover and carrier.

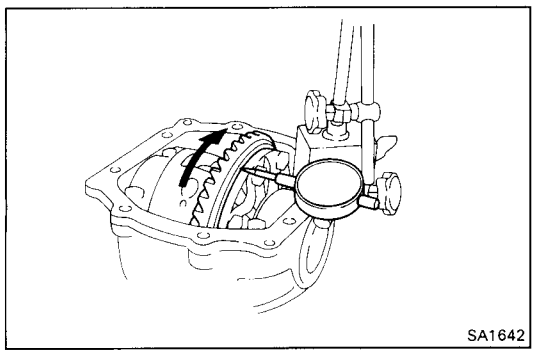

E7884 E7885

2. CHECK COMPANION FLANGE RUNOUT

Using a dial indicator, measure the lateral and radial runout of the companion flange.

Maximum lateral runout: 0.10 mm (0.039 in.)
Maximum radial runout: 0.10 mm (0.039 in.)

If the runout is greater than the maximum, replace the companion flange.

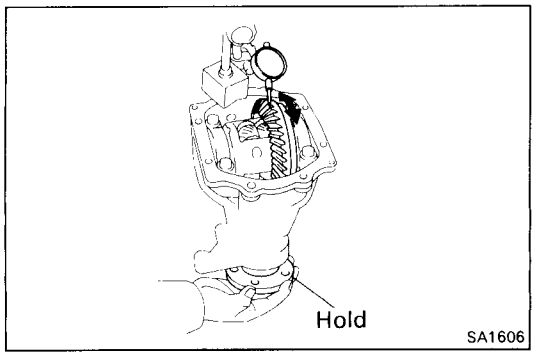

SA1642

3. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the runout of the ring gear.

Maximum runout: 0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the ring gear.



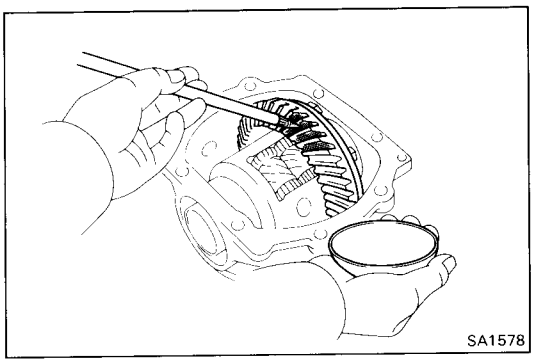
SA1606

4. CHECK RING GEAR BACKLASH

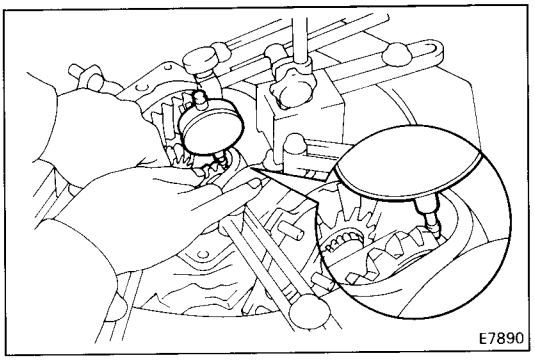
Using a dial indicator, check the backlash of the ring gear.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within specification, adjust the side bearing preload.



5. CHECK TOOTH CONTACT (See page SA-58)

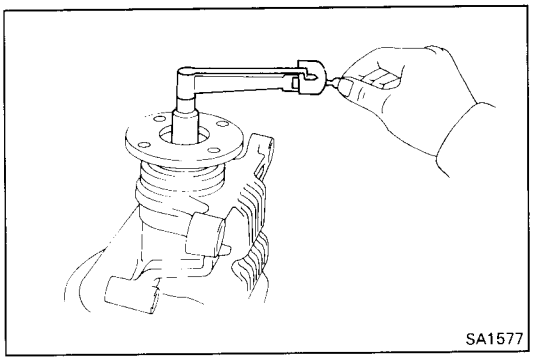


6. (CONVENTIONAL TYPE DIFFERENTIAL)
CHECK SIDE GEAR BACKLASH

Using a dial indicator, check the backlash of the side gear while holding one pinion gear toward the differential case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within specification, install the side gear thrust washers of diggerent thickness.



7. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Preload (at starting):
5 – 8 kg-cm (4.3 – 6.9 in.-lb, 0.5 – 0.8 N·m)

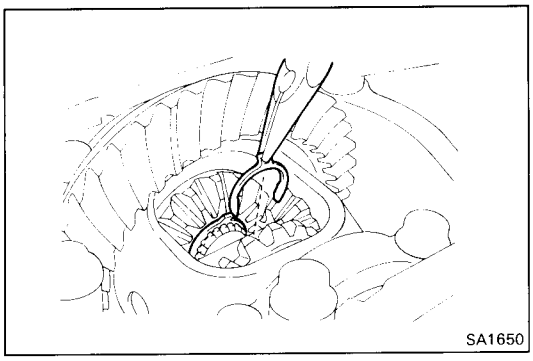
8. CHECK TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (at starting):
In addition to drive pinion preload
3 – 5 kg-cm (2.6 – 4.3 in.-lb, 0.3 – 0.5 N·m)

If necessary disassemble and inspect a differential.

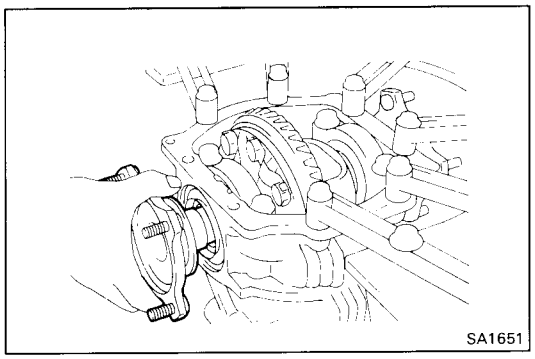
DISASSEMBLY OF DIFFERENTIAL CARRIER



1. REMOVE SIDE GEAR SHAFTS

(Conventional Type Differential)

(a) Using needle nose pliers, remove the two snap ring.

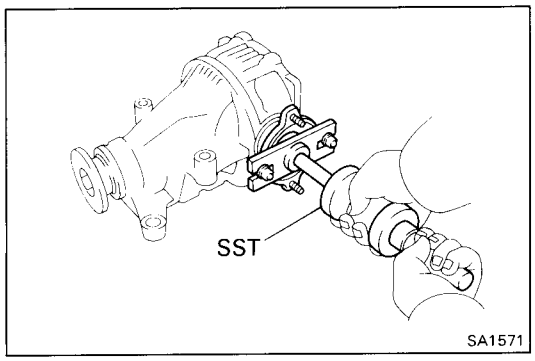


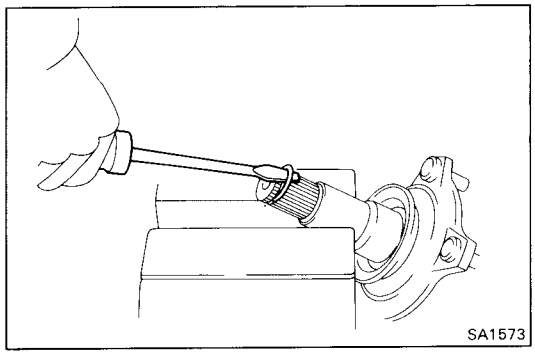
(b) Pull out the two side gear shafts.

(Torque Sensing Limited Slip Differential)

(a) Using SST, drive out the side gear shaft.

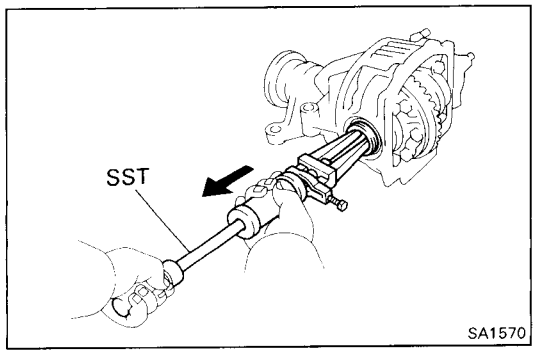
SST 09520-24010





(b) Remove the snap ring from the side gear shaft.

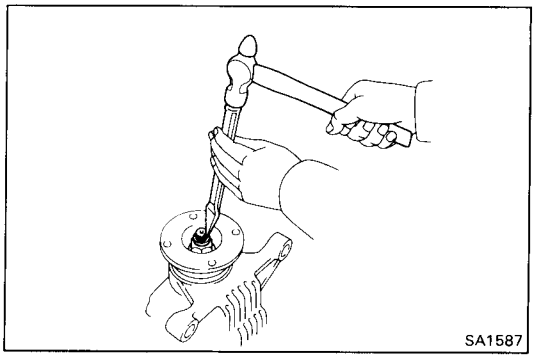
HINT: Use a soft jaw vise.



2. REMOVE SIDE GEAR SHAFT OIL SEALS

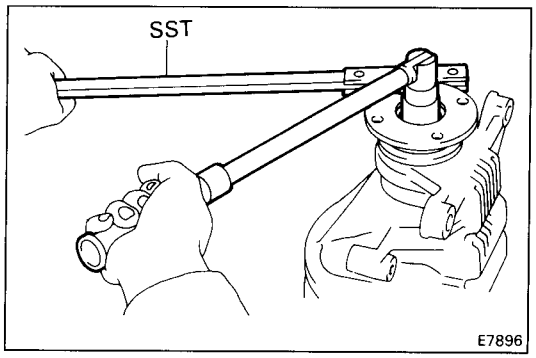
Using SST, remove the two oil seals form the housing.

SST 09308-00010



3. REMOVE COMPANION FLANGE

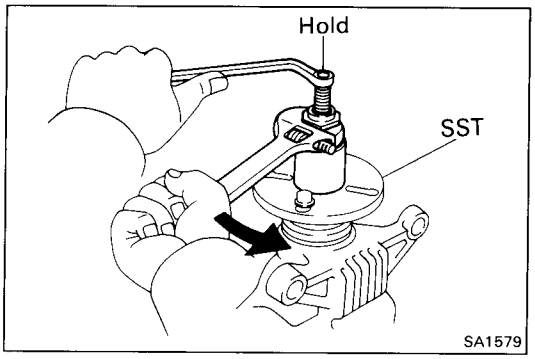
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.

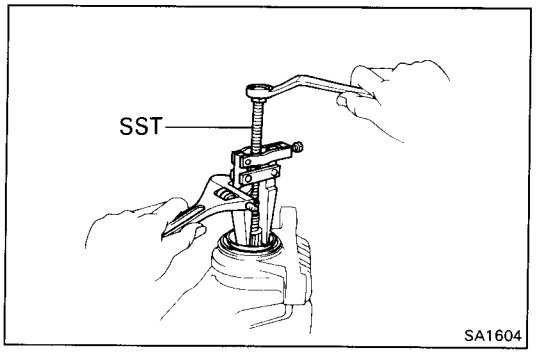
SST 09330-00021

(c) Remove the plate washer.



(d) Using SST, remove the companion flange.

SST 09557-22022 (09557-22040)

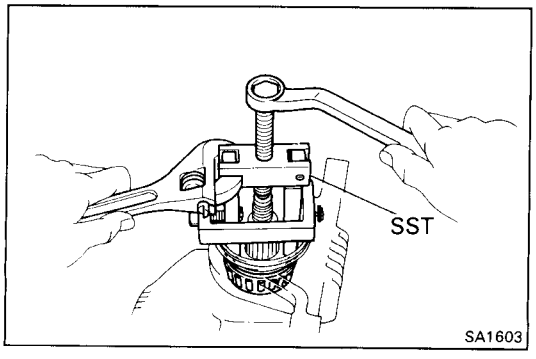


4. REMOVE FRONT OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.

SST 09308-10010

(b) Remove the oil slinger.

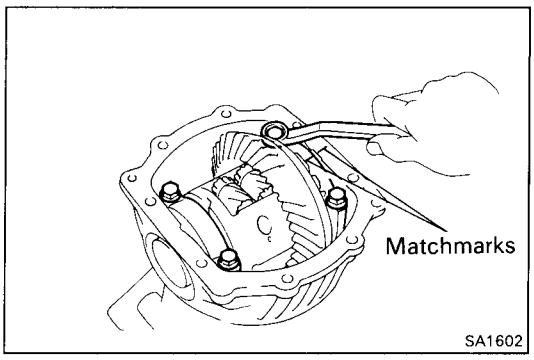


5. REMOVE FRONT BEARING AND BEARING SPACER

(a) Using SST, remove the bearing from the housing.

SST 09556-22010

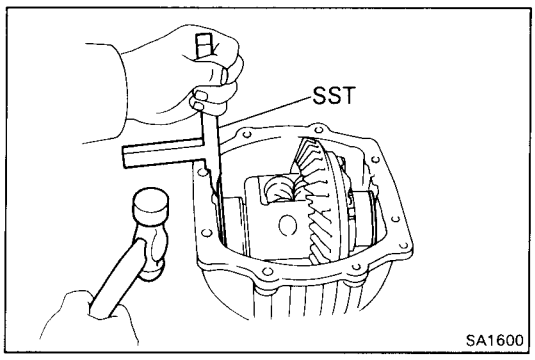
(b) Remove the bearing spacer.



6. REMOVE DIFFERENTIAL CASE

(a) Place matchmarks on the bearing cap and differential carrier.

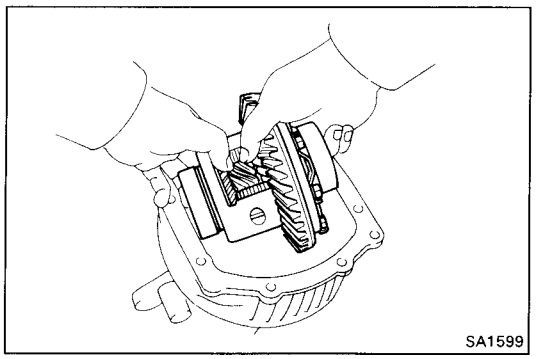
(b) Remove the two bearing caps.



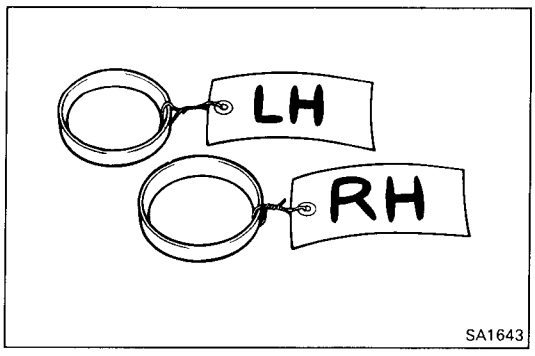
(c) Using SST, remove the two side bearing preload adjusting plate.

SST 09504-22011

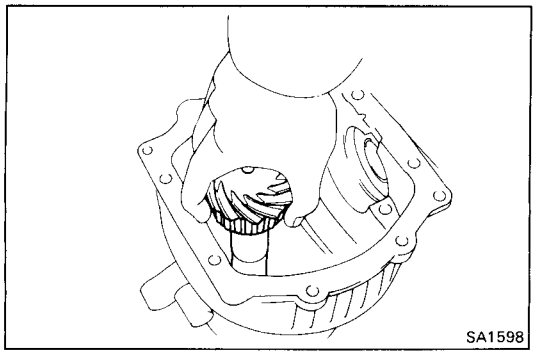
HINT: Measure the adjusting plate washer and note the thickness.



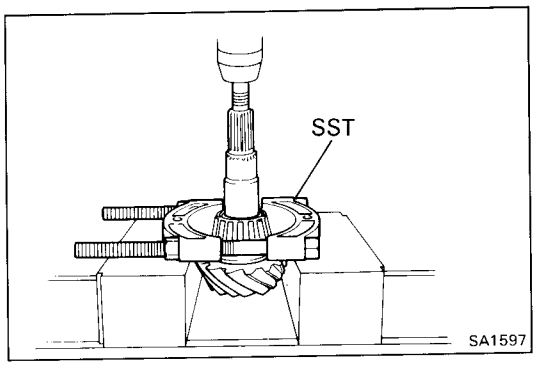
(d) Remove the differential case and bearing outer race from the carrier.



HINT: Tag the bearing outer races to show the location for reassembly.



7. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER



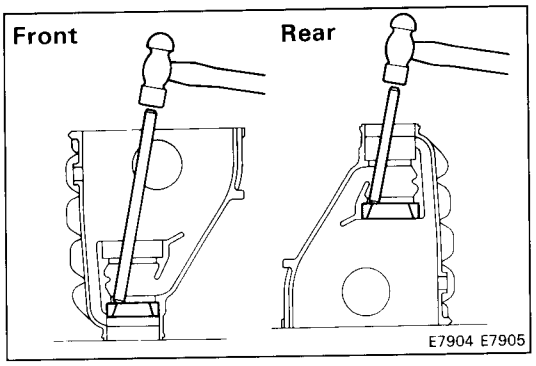
8. REMOVE DRIVE PINION REAR BEARING

(a) Using SST and a press, remove the bearing from the drive pinion.

SST 09950-00020

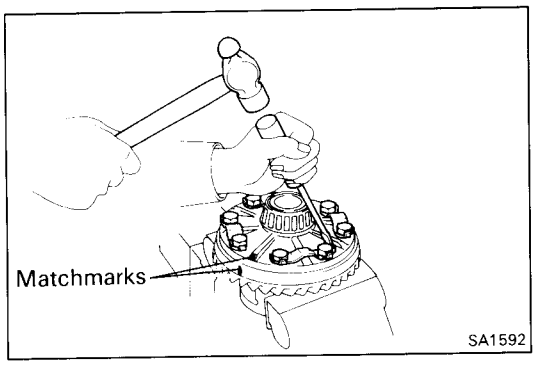
HINT: If the drive pinion or ring gear are damaged replace them a set.

(b) Remove the plate washer.



9. REMOVE FRONT AND REAR BEARING OUTER RACES

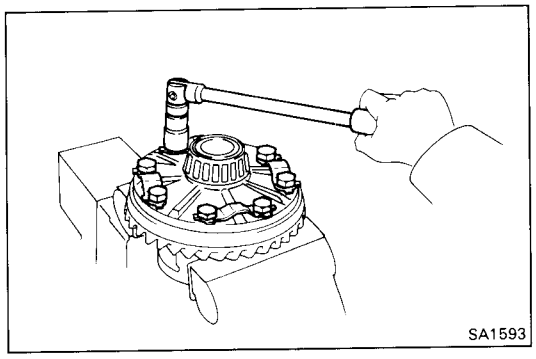
Using a hammer and brass bar, drive out the outer races from the carrier.



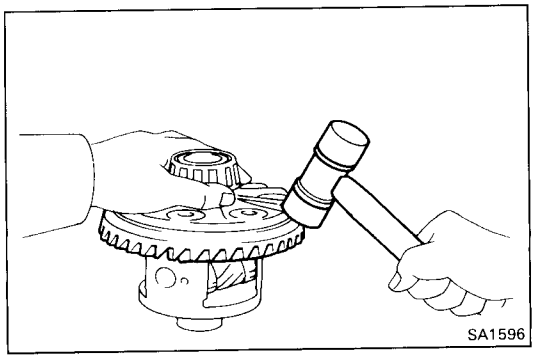
10. REMOVE RING GEAR

(a) Place the matchmarks on the ring gear and differential case.

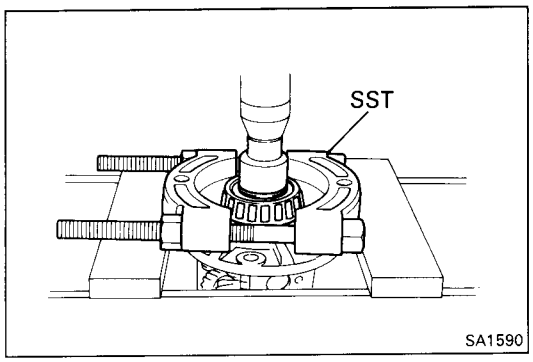
(b) Unstake the lock plates.



(c) Remove the eight bolts and four lock plates.



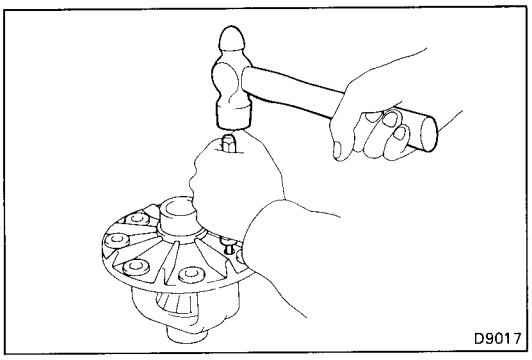
(d) Using a plastic hammer, tap on the ring gear to separate it from differential case.



11. REMOVE SIDE BEARINGS

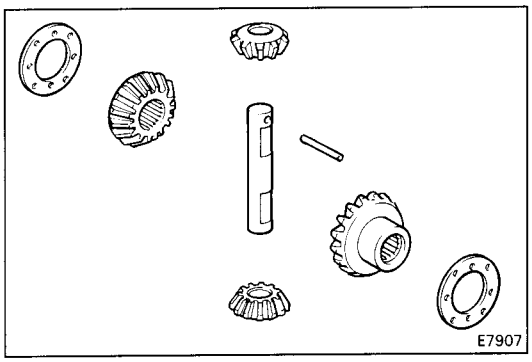
Using SST, press out two side bearings from differential case.

SST 09950-00020



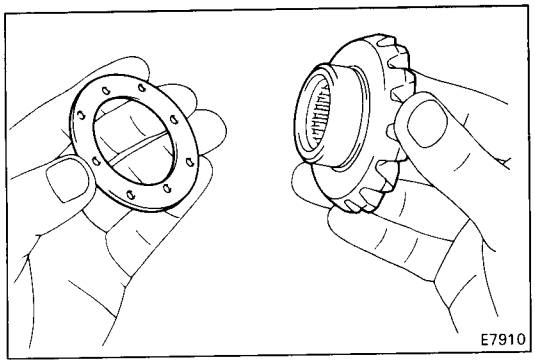
12. (CONVENTIONAL TYPE DIFFERENTIAL) DISASSEMBLE DIFFERENTIAL CASE

(a) Using a hammer and punch, drive out the straight pin.



(b) Remove the following parts from the differential case:

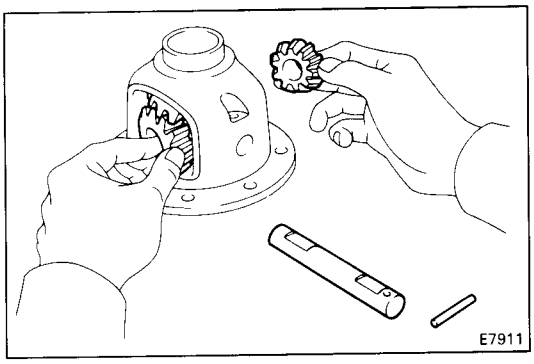
- Pinion shaft
- Two pinion gears
- Two side gears
- Four thrust washers



ASSEMBLY OF DIFFERENTIAL CARRIER

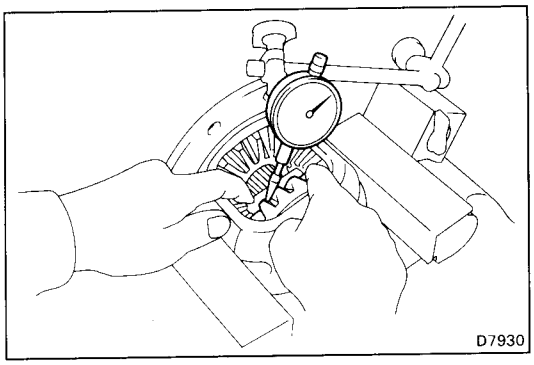
1. **(CONVENTIONAL TYPE DIFFERENTIAL) ASSEMBLE DIFFERENTIAL CASE**

(a) Install the thrust washers to the side gears.



(b) Install the side gears with thrust washers and pinion gears with thrust washers.

(c) Install the pinion shaft.

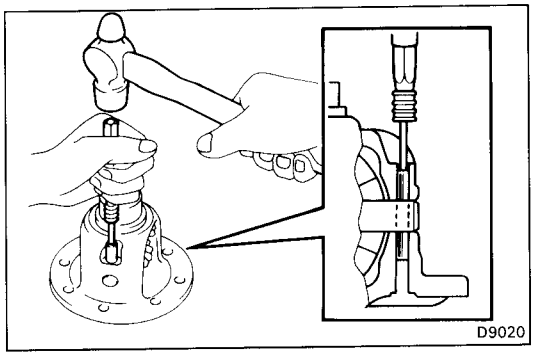


(d) Check the side gear backlash.
Measure the side gear backlash while holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

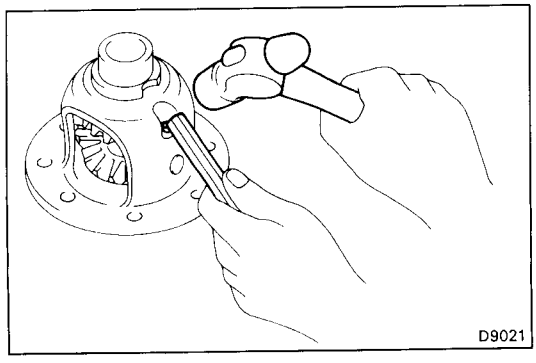
If the backlash is not within specification, install the side gear thrust washers of different thickness.

Thrust washer thickness	mm (in.)
0.95 (0.0374)	1.10 (0.0433)
1.00 (0.0394)	1.15 (0.0453)
1.05 (0.0413)	1.20 (0.0472)

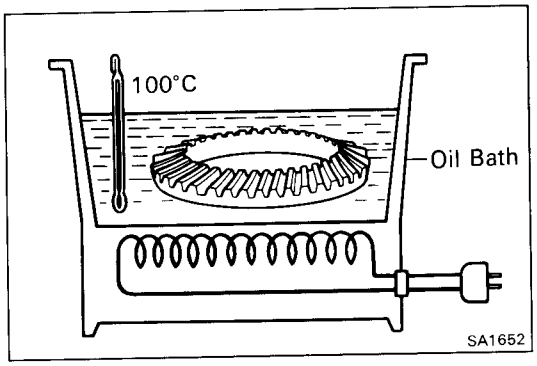


HINT: Use washers of same thickness on both the right and left sides.

(e) Using a hammer and punch, drive in the straight pin through the case and hole in the pinion shaft.



(f) Stake the case.



2. **INSTALL RING GEAR ON DIFFERENTIAL CASE**

(a) Clean the contact surface of the differential case.

(b) Heat the ring gear to about 100°C (212°F) in an oil bath.

NOTICE: Do not heat the ring gear above 110°C (230°F).

(c) Clean the contact surface of the ring gear with cleaning solvent.

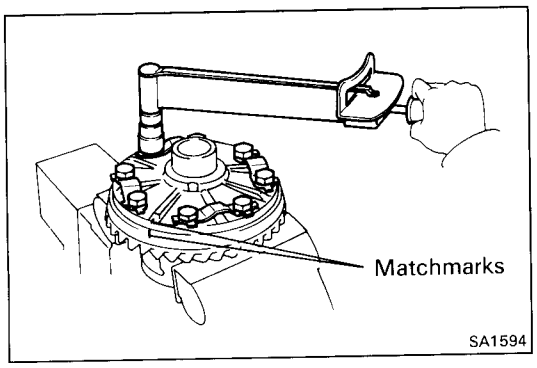
(d) Then quickly install the ring gear on the differential case.

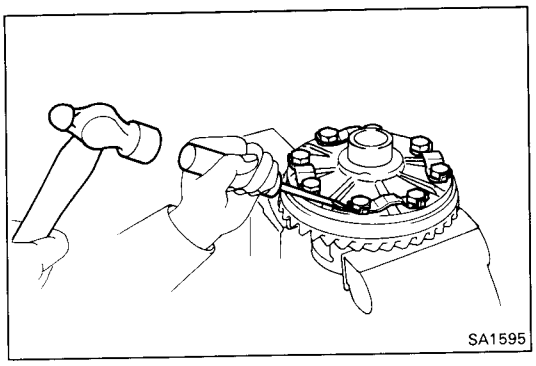
(e) Align the matchmarks on the ring gear and differential case.

(f) Temporarily install the lock plates and set bolts.

(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.

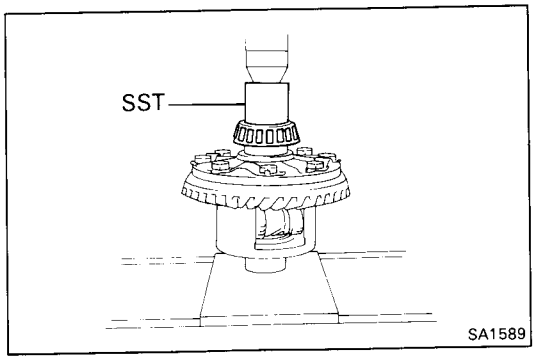
Torque: 985 kg-cm (71 ft-lb, 97 N·m)





(h) Using a hammer and drift punch, stake the lock plates.

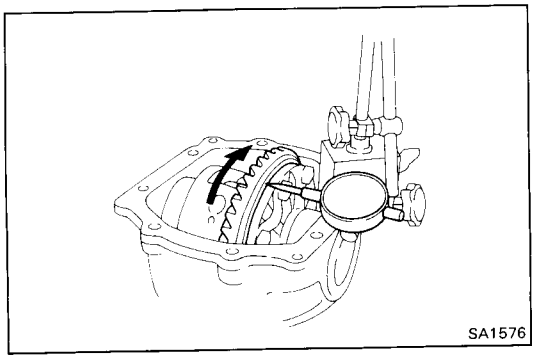
HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.



3. **INSTALL SIDE BEARINGS**

Using a press and SST, press in the bearings into the differential case.

SST 09710-22020 (09710-01030)



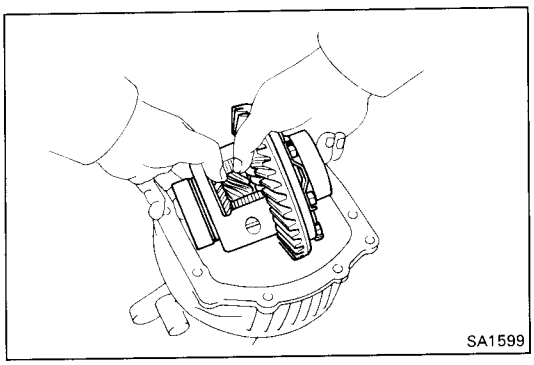
4. **CHECK RING GEAR RUNOUT**

(a) Install the differential case onto the carrier and install the plate washers to where there is no play in the bearing. (See page SA-55)

(b) Install bearing caps. (See page SA-57)

(c) Using a dial indicator, measure the runout of ring gear.

Maximum runout: 0.07 mm (0.0028 in.)

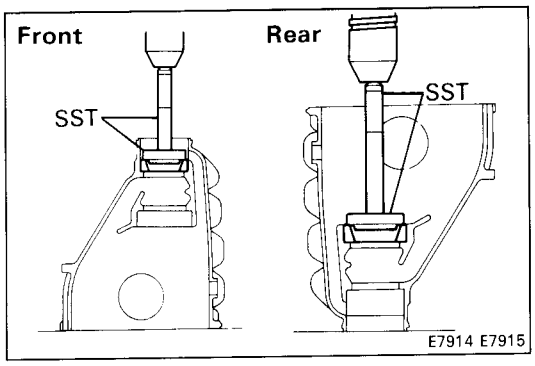


5. **REMOVE DIFFERENTIAL CASE**

(a) Remove the four bolts and two bearing caps.

(b) Remove the two plate washers.

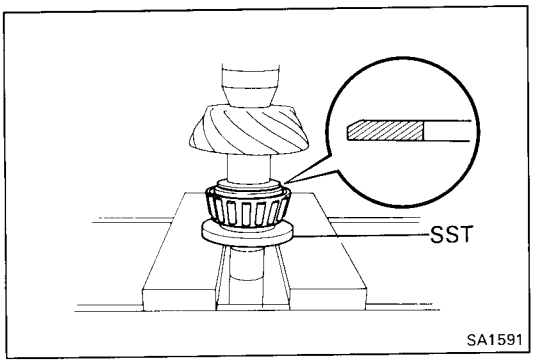
(c) Remove the differential case with bearing outer races.



6. **INSTALL FRONT AND REAR BEARING OUTER RACES**

Using a press and SST, press in the front and rear bearing outer races.

SST 09608-30012
Front (09608-04020, 09608-00060)
Rear (09608-04020, 09608-04100)

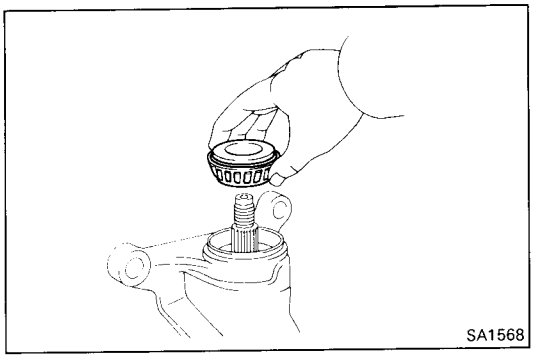


7. **INSTALL REAR BEARING TO DRIVE PINION**

(a) Install the plate washer on the drive pinion with the chamfered end facing toward the pinion gear.

(b) Using a press and SST, install the rear bearing onto the drive pinion.

SST 09506-30012

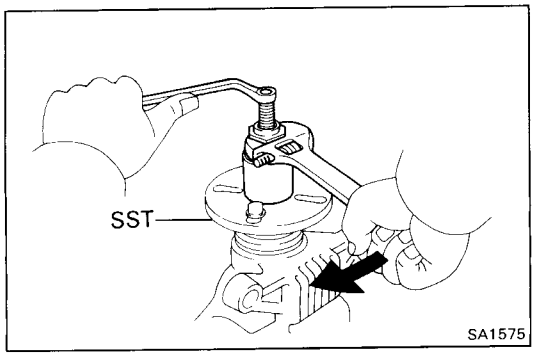


8. **TEMPORARILY ADJUST DRIVE PINION PRELOAD**

(a) Install the following parts:

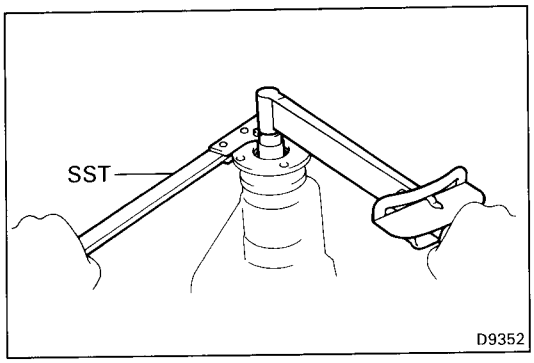
- Drive pinion
- Front bearing

HINT: Assemble the spacer, oil slinger and oil seal after adjusting the gear contact pattern.



(b) Install the companion flange with SST.

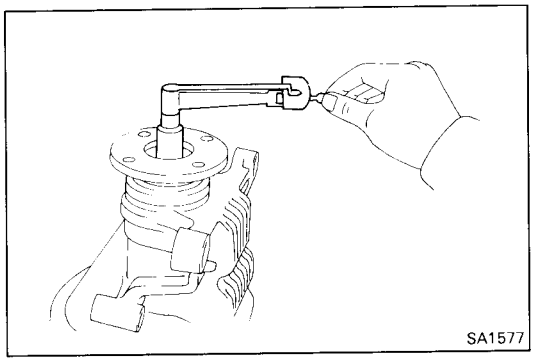
SST 09557-22022



(c) Adjusting the drive pinion preload by tightening the companion flange nut.

Using SST to hold the flange, tighten the nut.

SST 09330-00021



(d) Using a torque meter, measure the preload.

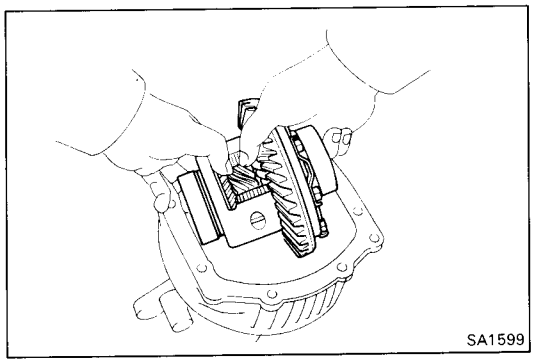
Preload (at starting)

New bearing

10 – 16 kg-cm (8.7 – 13.9 in.-lb, 1.0 – 1.6 N·m)

Reused bearing

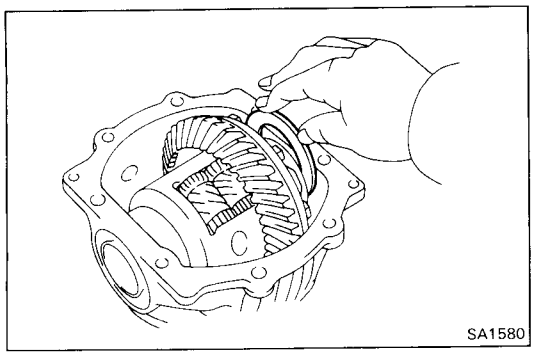
5 – 8 kg-cm (4.3 – 6.9 in.-lb, 0.5 – 0.8 N·m)



9. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

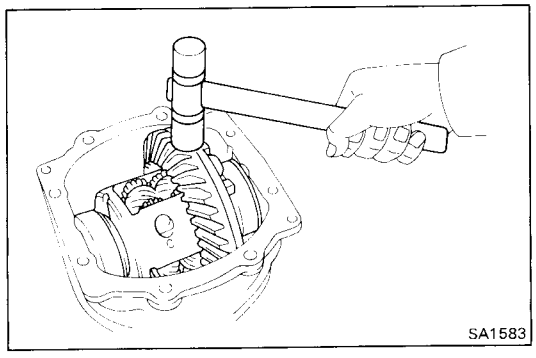
(b) Install the differential case in the carrier.



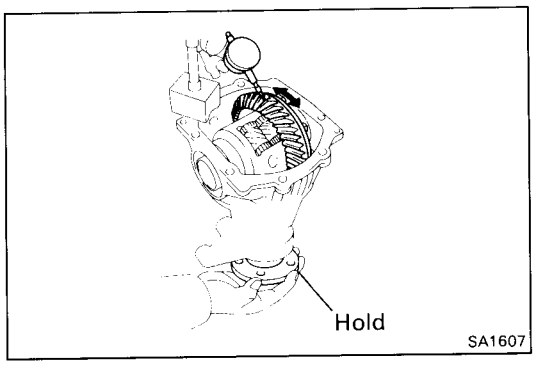
10. ADJUST RING GEAR BACKLASH

(a) Install only the plate washer on the ring gear back side.

HINT: Insure that the ring gear has backlash.

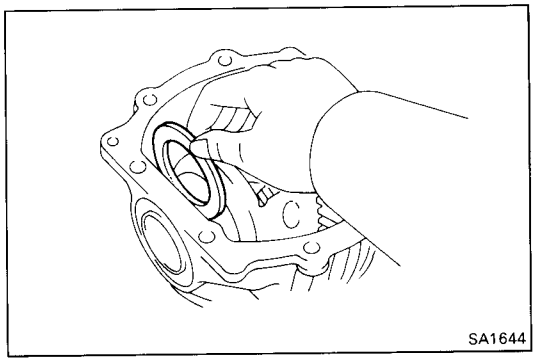


(b) Snug down the washer and bearing by tapping on the ring gear with a plastic hammer.



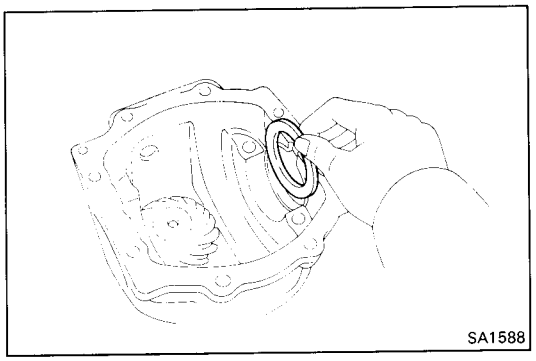
(c) Using a dial indicator, measure the backlash.

(d) Select a ring gear back side plate washer so that the backlash is 0.13 mm (0.0051 in.).

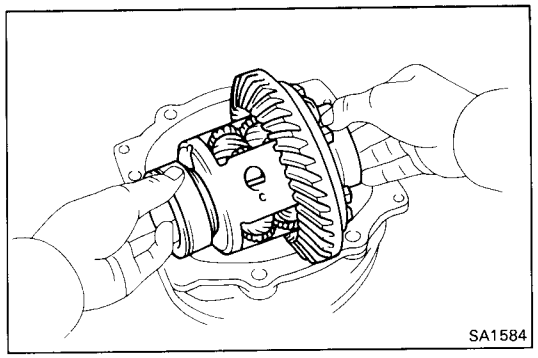


(e) Select a ring gear teeth side washer with a thickness which eliminates any clearance between the outer race and case.

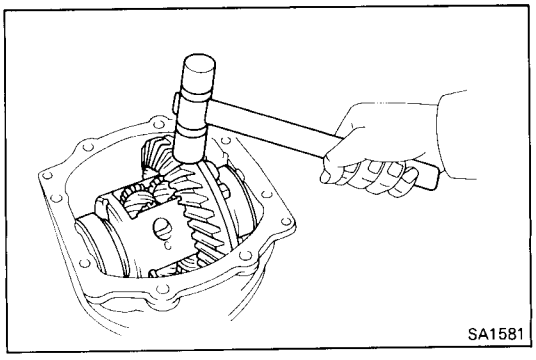
(f) Remove the plate washer and differential case.



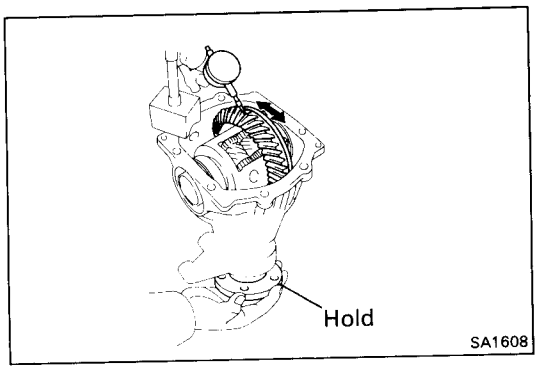
(g) Install the plate washer into the ring gear back side.



(h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.



(i) Using a plastic hammer, snug down the washer and bearing by tapping the ring gear.



(j) Using a dial indicator, measure the ring gear backlash.

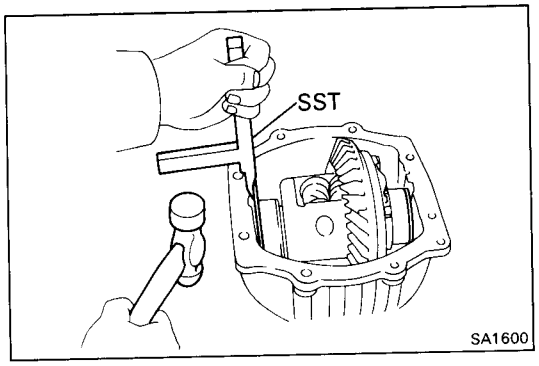
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(k) If not within the specification, adjust by either increasing on decreasing the number of washers on both sides by an equal amount.

HINT: There should be clearance between the plate washer and case.

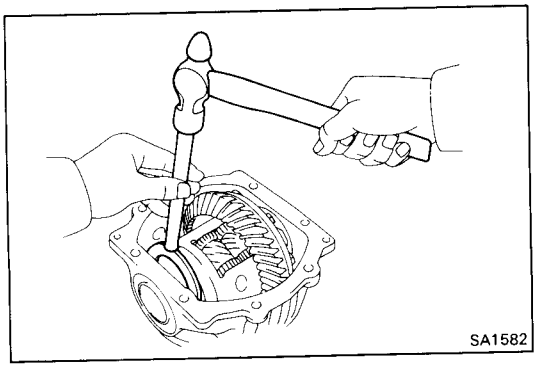
Insure that there is ring gear backlash.

11. ADJUST SIDE BEARING PRELOAD



(a) Using SST, remove the ring gear teeth side plate washer and measure the thickness.

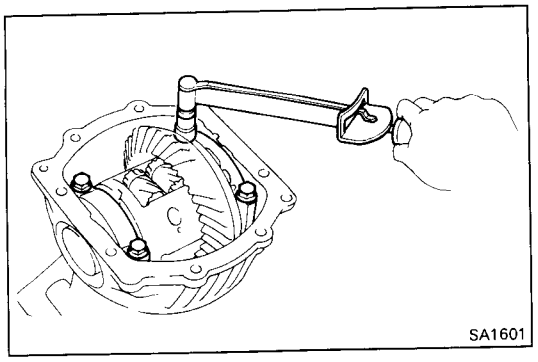
SST 09504-22011



(b) Install a new washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the removed washer.

HINT: Select a washer which can be pressed in 2/3 of the way by finger.

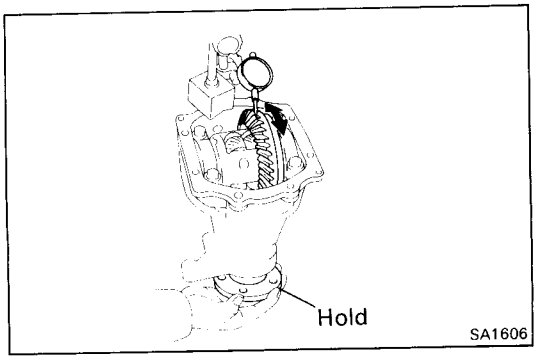
(c) Using a hammer and brass bar, tap in the side gear thrust washer.



(d) Install the side bearing caps.

HINT: Align the matchmarks on the cap and carrier.

Torque: 800 kg-cm (58 ft-lb, 78 N·m)



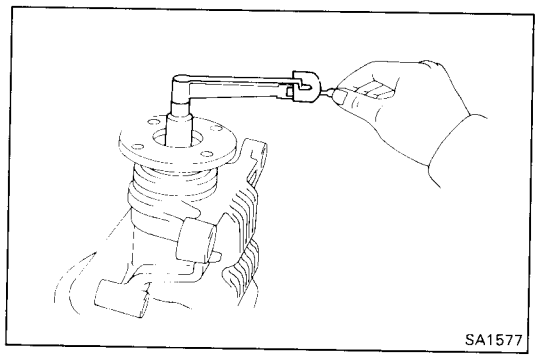
(e) Recheck the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(f) If not within the standard, adjust by either increasing or decreasing the washers on both sides by equal amount.

HINT: The backlash will change about 0.02 mm (0.0008 in.) with 0.03 mm (0.0012 in.) alteration of the side gear thrust washer.

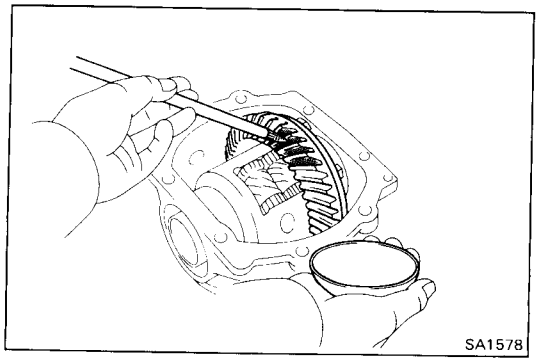
Washer thickness mm (in.)	
2.21-2.23 (0.0870-0.0878)	2.72-2.74 (0.1071-0.1079)
2.24-2.26 (0.0882-0.0890)	2.75-2.77 (0.1083-0.1091)
2.27-2.29 (0.0894-0.0902)	2.78-2.80 (0.1094-0.1102)
2.30-2.32 (0.0906-0.0913)	2.81-2.83 (0.1106-0.1114)
2.33-2.35 (0.0917-0.0925)	2.84-2.86 (0.1118-0.1126)
2.36-2.38 (0.0929-0.0937)	2.87-2.89 (0.1130-0.1138)
2.39-2.41 (0.0941-0.0949)	2.90-2.92 (0.1142-0.1150)
2.42-2.44 (0.0953-0.0961)	2.93-2.95 (0.1154-0.1161)
2.45-2.47 (0.0965-0.0972)	2.96-2.98 (0.1165-0.1173)
2.48-2.50 (0.0976-0.0984)	2.99-3.01 (0.1171-0.1185)
2.51-2.53 (0.0988-0.0996)	3.02-3.04 (0.1189-0.1197)
2.54-2.56 (0.1000-0.1008)	3.05-3.07 (0.1201-0.1209)
2.57-2.59 (0.1012-0.1020)	3.08-3.10 (0.1213-0.1220)
2.60-2.62 (0.1024-0.1031)	3.11-3.13 (0.1224-0.1232)
2.63-2.65 (0.1035-0.1043)	3.14-3.16 (0.1236-0.1244)
2.66-2.68 (0.1047-0.1055)	3.17-3.19 (0.1248-0.1256)
2.69-2.71 (0.1059-0.1067)	3.20-3.22 (0.1260-0.1268)


SA1577

12. MEASURE TOTAL PRELOAD

Using a torque meter, measure the total preload.

Total preload (at starting):
Add drive pinion preload
3 – 5 kg-cm (2.6 – 4.3 in.-lb, 0.3 – 0.5 N·m)

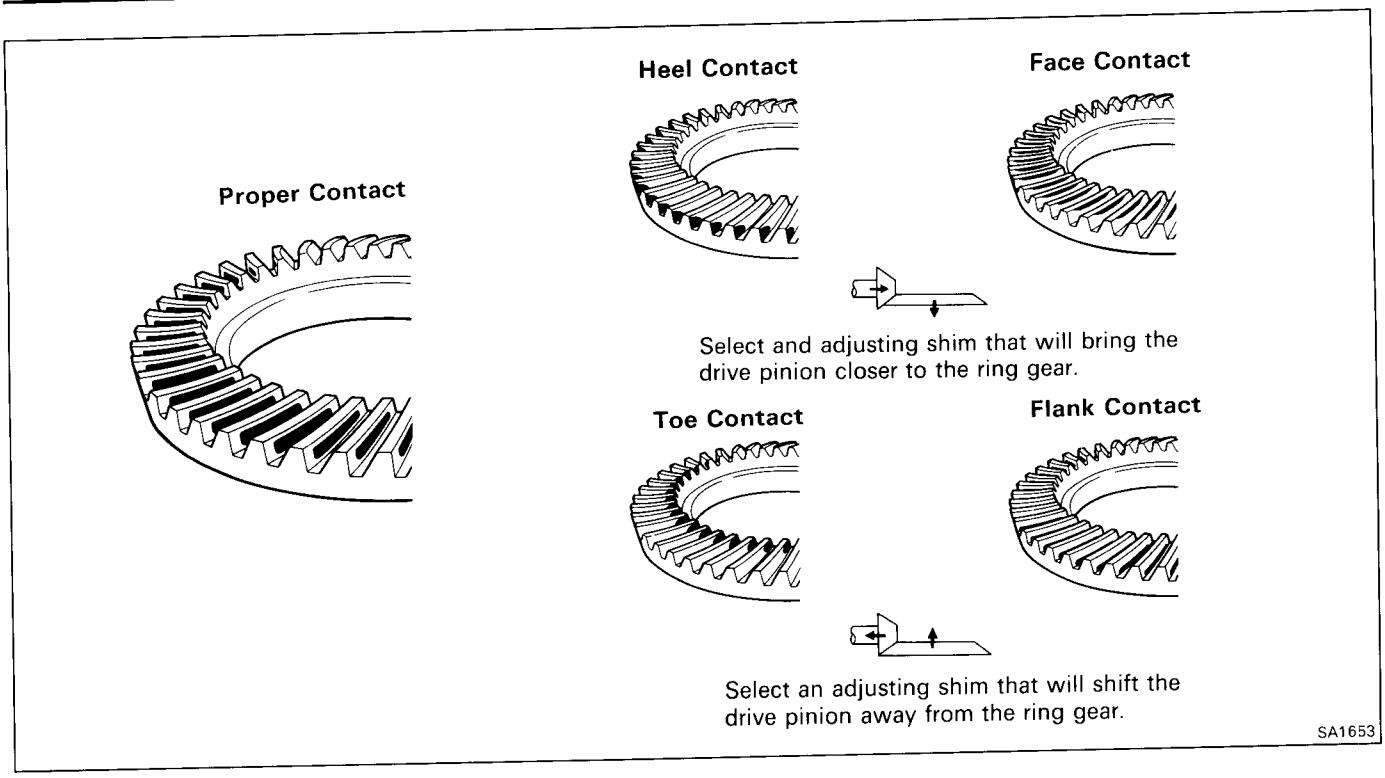

SA1578

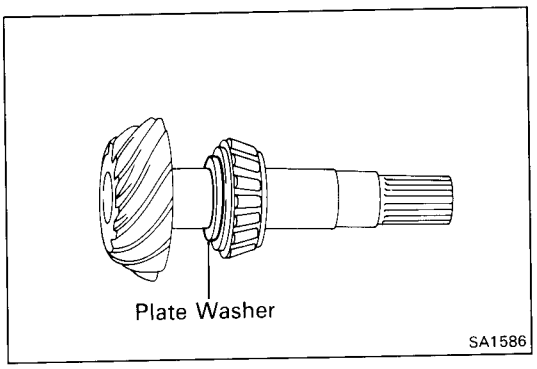
13. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth contact.



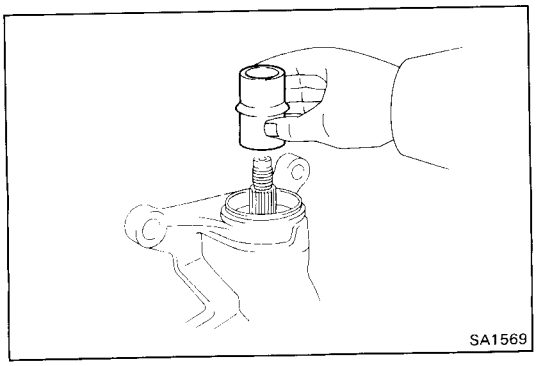


If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Thickness	mm (in.)
2.26-2.28 (0.0890-0.0898)	2.50-2.52 (0.0984-0.0992)
2.29-2.31 (0.0902-0.0909)	2.53-2.55 (0.0996-0.1004)
2.32-2.34 (0.0913-0.0921)	2.56-2.58 (0.1008-0.1016)
2.35-2.37 (0.0925-0.0933)	2.59-2.61 (0.1020-0.1028)
2.38-2.40 (0.0937-0.0945)	2.62-2.64 (0.1031-0.1039)
2.41-2.43 (0.0949-0.0957)	2.65-2.67 (0.1043-0.1051)
2.44-2.46 (0.0961-0.0969)	2.68-2.70 (0.1055-0.1063)
2.47-2.49 (0.0972-0.0980)	

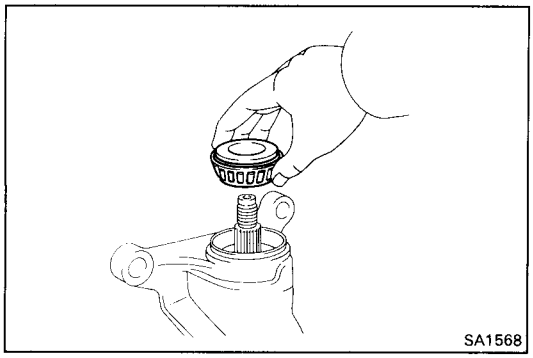
14. REMOVE COMPANION FLANGE
(See step 3 on page SA-47)

15. REMOVE FRONT BEARING
(See step 5 on page SA-48)

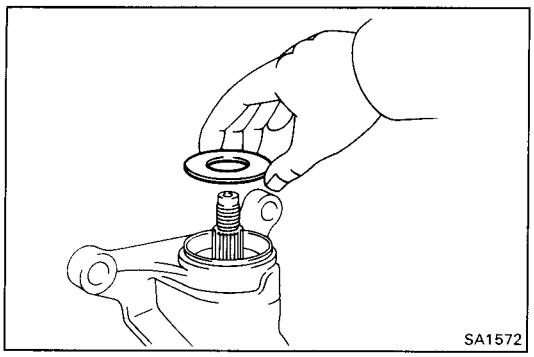


16. INSTALL NEW BEARING SPACER AND FRONT BEARING

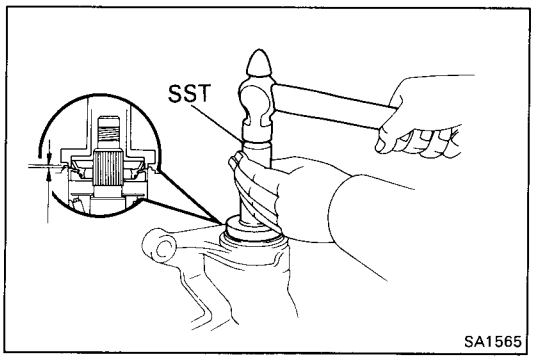
(a) Install a new bearing spacer on the drive pinion.



(b) Install the front bearing on the drive pinion.



17. INSTALL OIL SLINGER



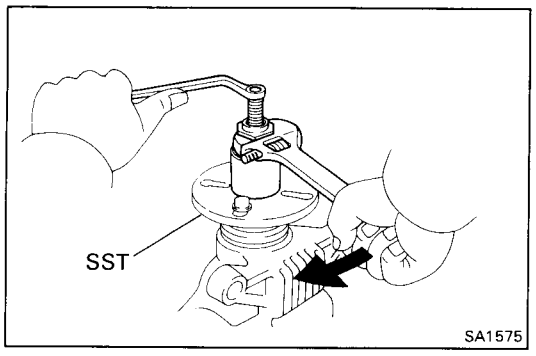
18. INSTALL NEW OIL SEAL

(a) Using SST, drive in a new oil seal.

SST 09554-22010

Oil seal drive in depth: 2.0 mm (0.079 in.)

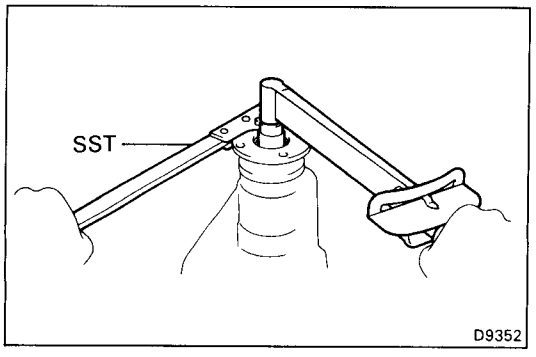
(b) Apply MP grease to oil seal lip.



19. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the shaft.

SST 09557-22022



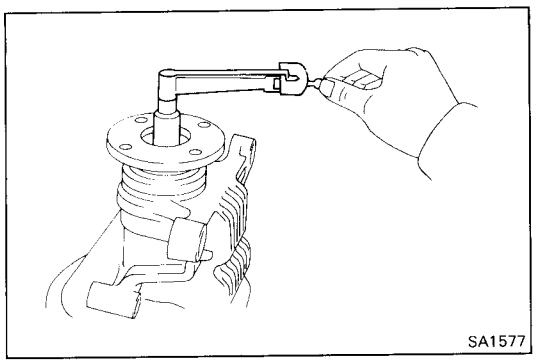
(b) Install the plate washer.

(c) Coat the threads of a new nut with gear oil.

(d) Using SST to hold the flange, tighten the nut.

SST 09330-00021

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)


SA1577

20. CHECK DRIVE PINION BEARING PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Preload (at starting):

New bearing	**10 – 16 kg-cm (8.7 – 13.9 in.-lb, 1.0 – 1.6 N·m)**
Reused bearing	**5 – 8 kg-cm (4.3 – 6.9 in.-lb, 0.5 – 0.8 N·m)**

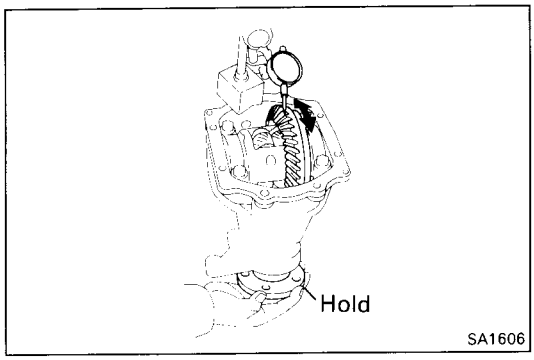
- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 130 kg-cm (9 ft-lb, 13 N·m) at a time until the specified preload is reached.

If the maximum torque is exceed while retighten the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg-cm (174 ft-lb, 235 N·m)

21. CHECK TOTAL PRELOAD

Total preload (at starting):
Add drive pinion preload
3 – 5 kg-cm (2.6 – 4.3 in.-lb, 0.3 – 0.5 N·m)



SA1606

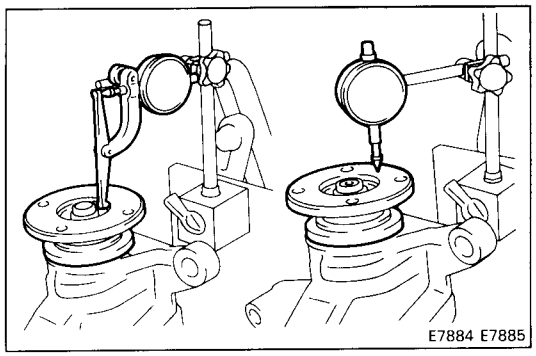
22. CHECK RING GEAR BACKLASH

Using a dial indicator, check the backlash of the ring gear.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within specification, adjust the side bearing preload.

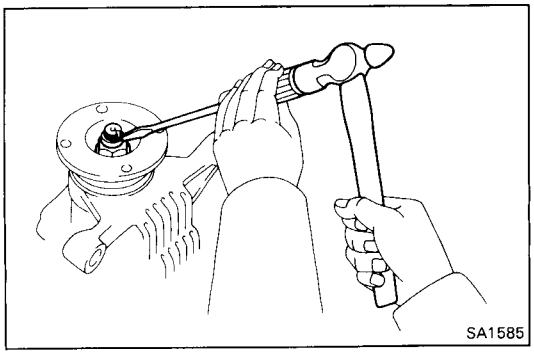
23. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA-58)


E7884 E7885

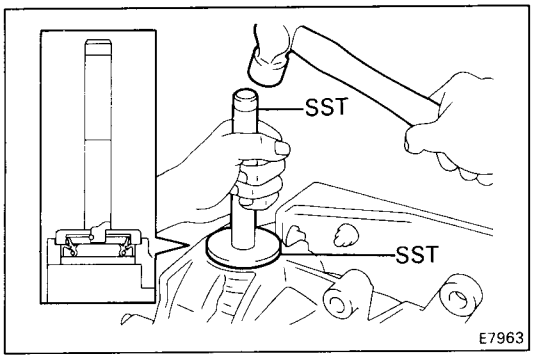
24. CHECK COMPANION FLANGE RUNOUT

Using a dial indicator, measure the lateral and radial runout of the companion flange.

Maximum lateral runout: 0.10 mm (0.0039 in.)
Maximum radial runout: 0.10 mm (0.0039 in.)


SA1585

25. STAKE DRIVE PINION NUT

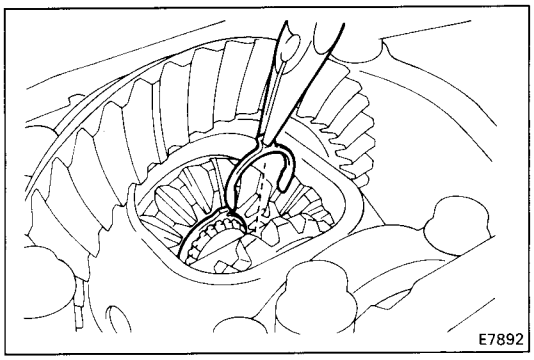


26. INSTALL NEW SIDE GEAR SHAFT OIL SEALS

(a) Using SST, drive in two new oil seals until they are flush with the carrier end surface.

SST 09550-22011 (09550-00020, 09550-00031)

(b) Coat the oil seal lips with MP grease.

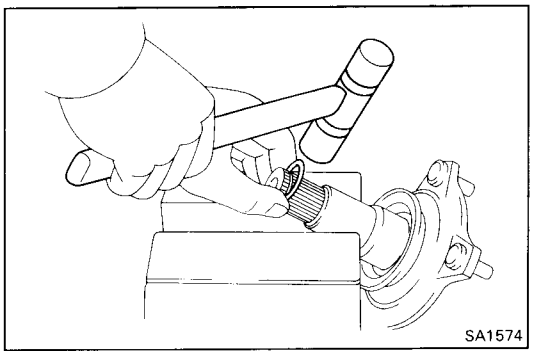


27. INSTALL SIDE GEAR SHAFTS

(Conventional Type Differential)

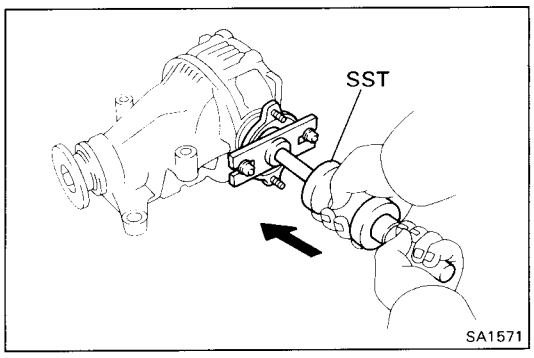
(a) Install the two side gear shafts to the differential case.

(b) Install two new shaft snap rings to the side gear shafts.



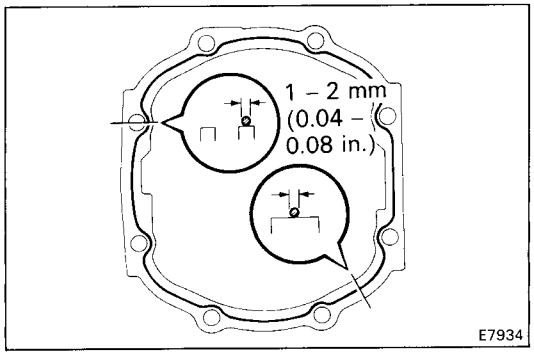
(Torque Sensing Limited Slip Differential)

(a) Install the new snap ring to the side gear shaft.



(b) Using SST, drive in the side gear shaft.

SST 09520-24010



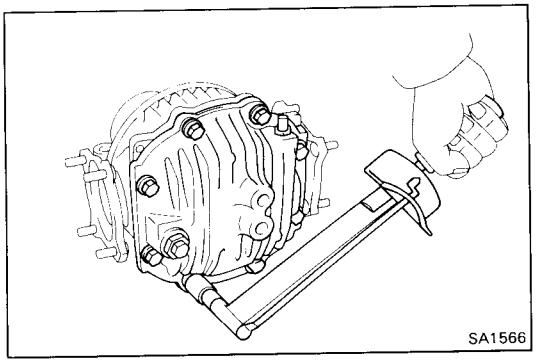
28. INSTALL DIFFERENTIAL CARRIER COVER

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

(b) Apply seal packing to the carrier.

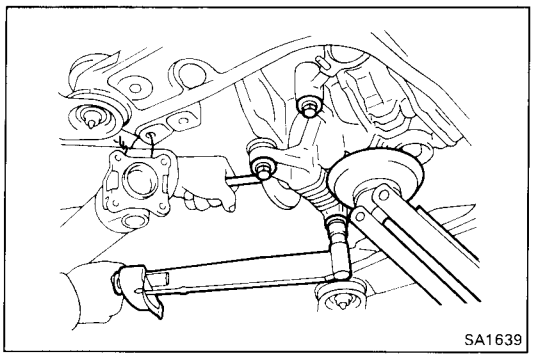
Seal packing: Part No.08826-00090, THREE BOND 1281 or equivalent

HINT: Install the carrier cover within 3 minutes after applying seal packing.



(c) Install and torque the eight set bolts.

Torque: 475 kg-cm (34 ft-lb, 47 N·m)

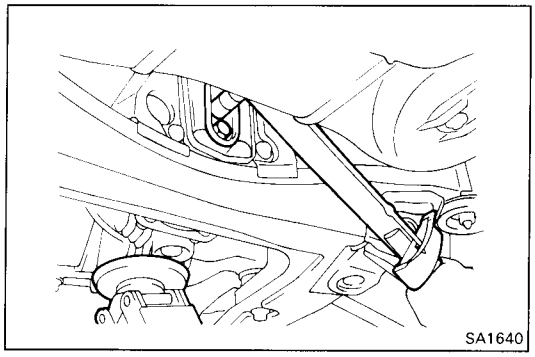

SA1639

INSTALLATION OF DIFFERENTIAL

1. **INSTALL DIFFERENTIAL**

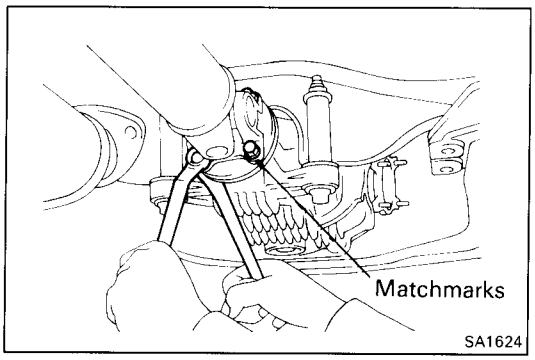
(a) Position the differential and torque the four bolts and nuts.

Torque: 970 kg-cm (70 ft-lb, 95 N·m)


SA1640

(b) Install and torque the two bolts.

Torque: 1,500 kg-cm (108 ft-lb, 147 N·m)



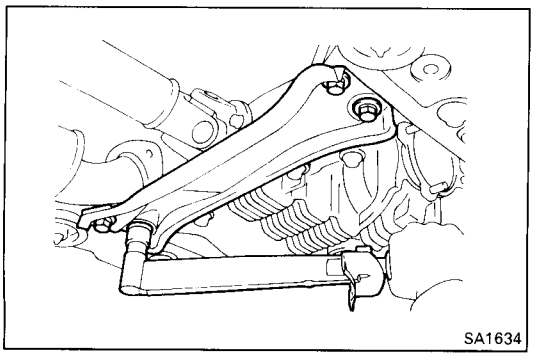
SA1624

2. **CONNECT PROPELLER SHAFT**

(a) Align the matchmarks on the flanges and connect the flanges with four bolts, nuts and washers.

(b) Torque the four bolts and nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

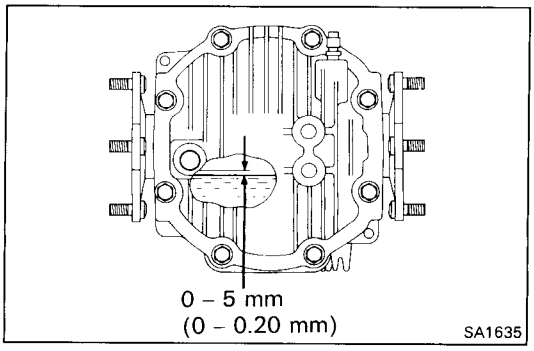

SA1634

3. **INSTALL REAR CROSSMEMBER**

Install the rear crossmember with four bolts.

Torque: 730 kg-cm (53 ft-lb, 72 N·m)

4. **CONNECT DRIVE SHAFTS**
(See page SA-31)



SA1635

5. **FILL DIFFERENTIAL WITH GEAR OIL**

(a) Install the drain plug with new gasket.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

(b) Fill the differential with gear oil.

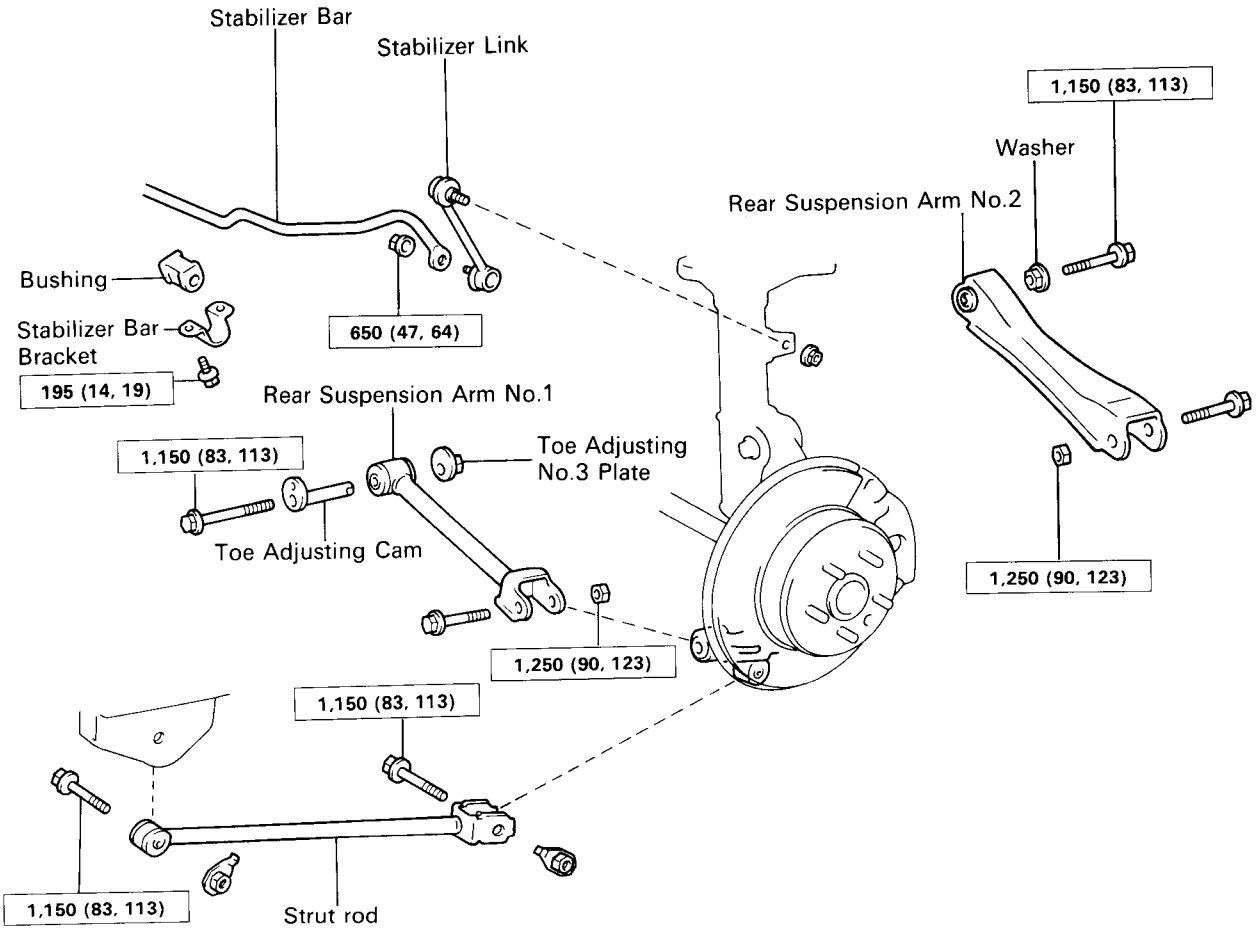
Oil grade: API GL-5 hypoid gear oil
Viscosity: Above –18°C (0°F) SAE 90
Below –18°C (0°F) SAE 80W-90
Capacity: 1.1 liters (1.2 US qts, 1.0 Imp.qts)

(c) Install the filler plug with new gasket.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

REAR SUSPENSION

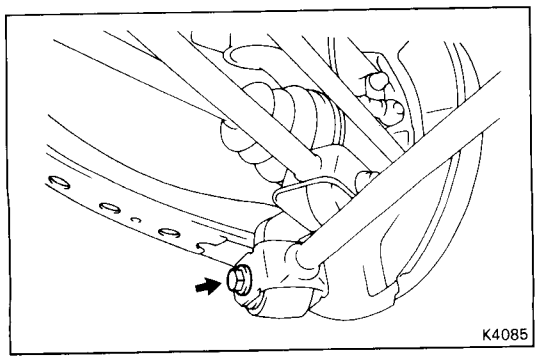
COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

SA1609



K4085

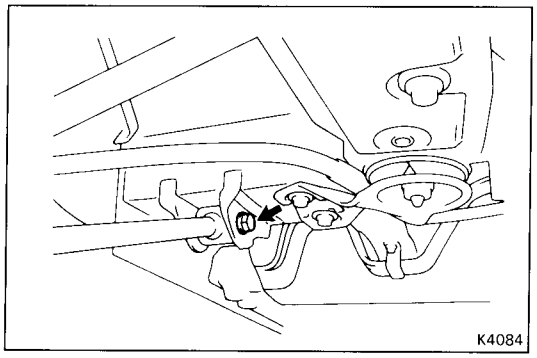
Strut Rod and Suspension Arm

REMOVAL OF STRUT ROD AND SUSPENSION ARM

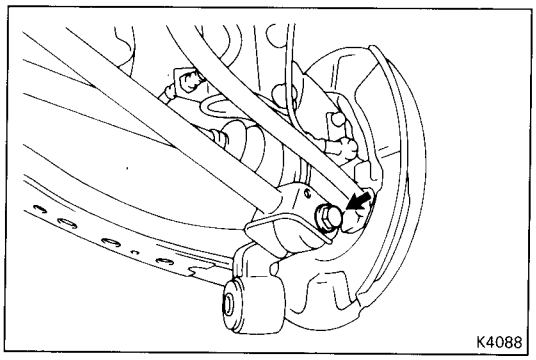
1. **REMOVE REAR WHEELS**

2. **REMOVE STRUT ROD**

   (a) Remove the bolt and nut from the axle carrier.

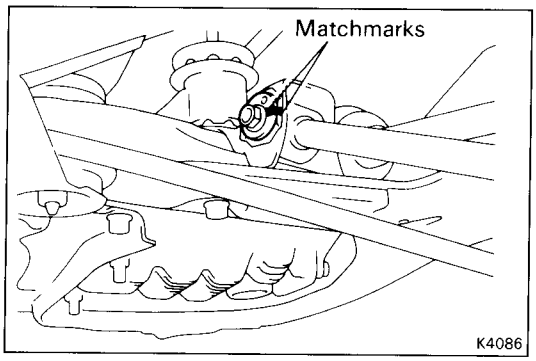


(b) Remove the bolt, nut and strut rod from body.

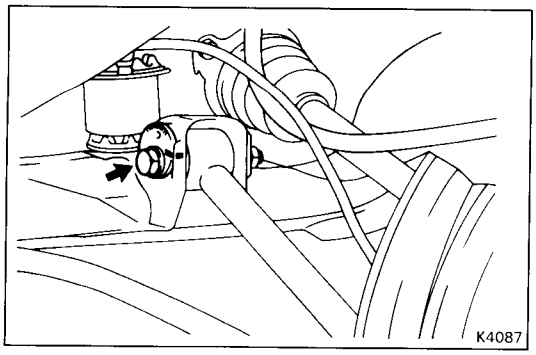


3. REMOVE NO.1 SUSPENSION ARM

(a) Remove the bolt and nut from the axle carrier.

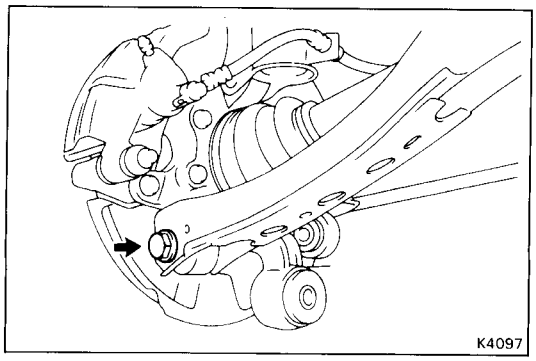


(b) Place matchmarks on the toe adjusting cam and control arm retainer.



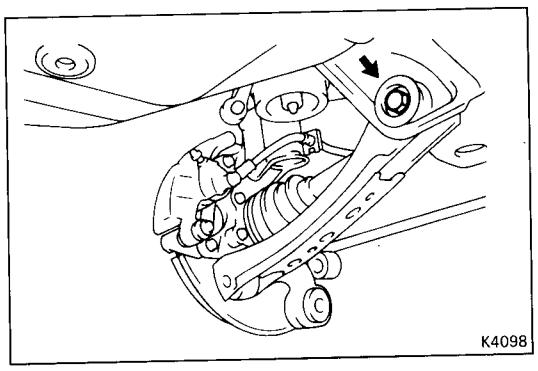
(c) Remove the bolt, toe adjusting cam and toe adjusting plate No.2.

(d) Remove the No.1 suspension arm.



4. REMOVE NO.2 SUSPENSION ARM

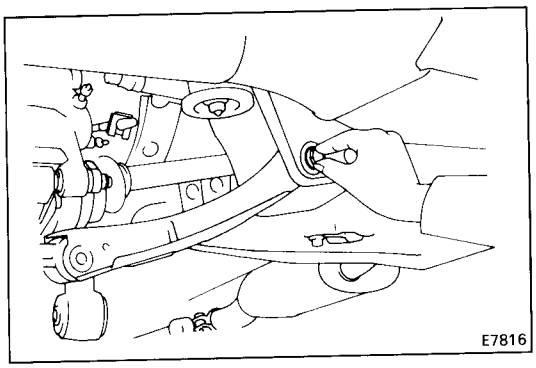
(a) Remove the bolt and nut from the axle carrier.



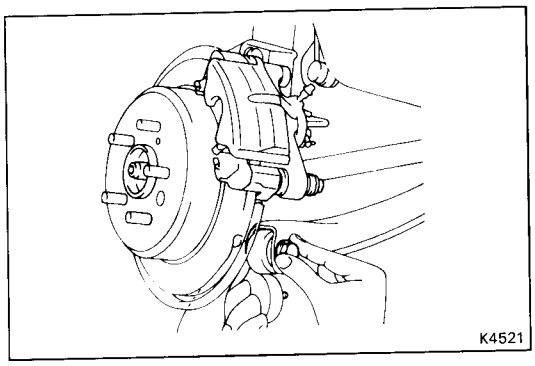
(b) Remove the bolt, washer and No.2 suspension arm.

INSTALLATION OF STRUT ROD AND SUSPENSION ARM

1. INSTALL NO.2 SUSPENSION ARM

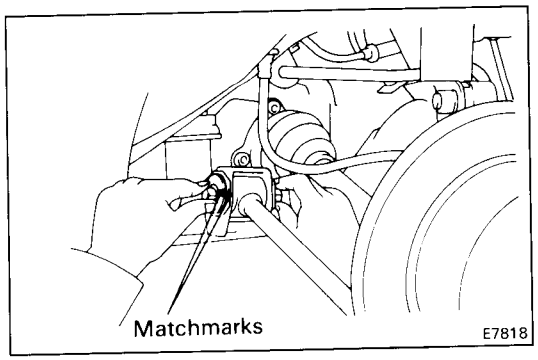


(a) Install the No.2 suspension arm to the rear suspension member and finger tighten the bolt with washer.



(b) Install the No.2 suspension arm to the axle carrier and finger tighten the bolt and nut.

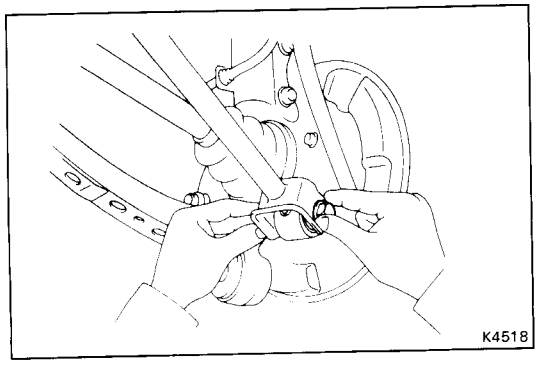
2. INSTALL NO.1 SUSPENSION ARM



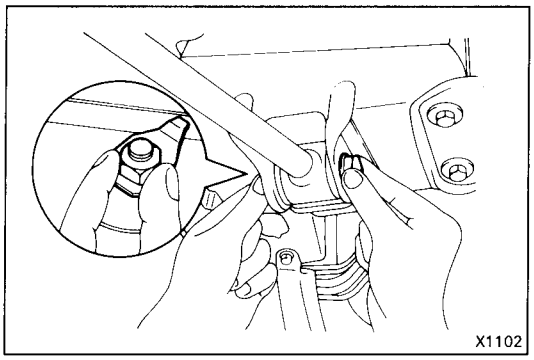
(a) Install the No.1 suspension arm to the rear suspension member.

(b) Align matchmarks on the toe adjusting cam and control arm retainer.

(c) Install the toe adjusting plate No.2 and finger tighten the bolt.

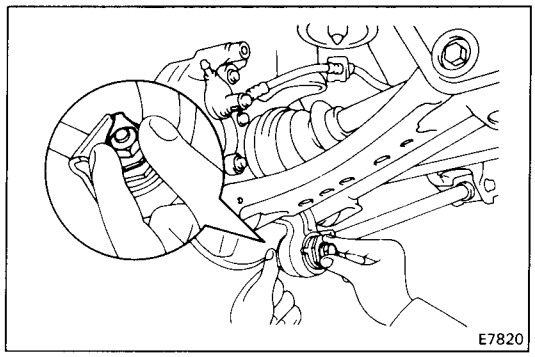


(d) Install the No.1 suspension arm to the axle carrier and finger tighten the bolt.



3. **INSTALL STRUT ROD**

(a) Install the strut rod to the body and finger tighten the bolt.



(b) Install the strut rod to the axle carrier and finger tighten the bolt.

4. **TEMPORARILY INSTALL REAR WHEELS**

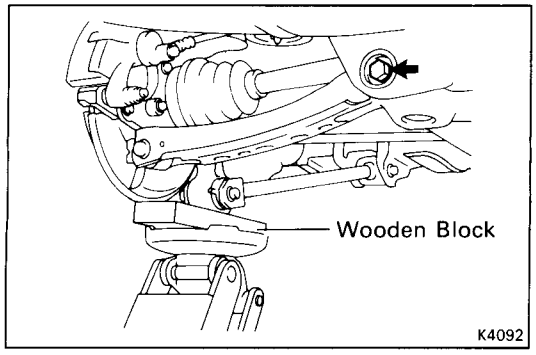
5. **LOWER VEHICLE**

Remove the stands and bounce the vehicle up and down to stabilize the suspension.

6. **REMOVE WHEELS**

(a) Jack up vehicle and install stands.

(b) Remove the rear wheels.

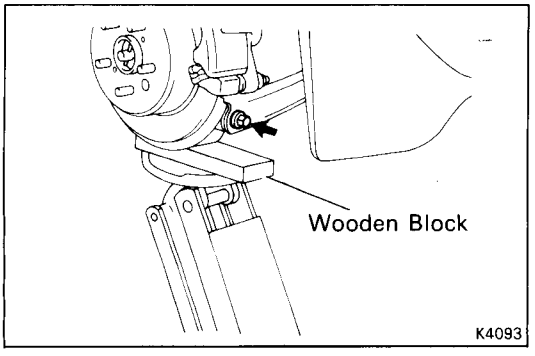


7. **TORQUE NO.2 SUSPENSION ARM**

(a) Jack up the rear axle.

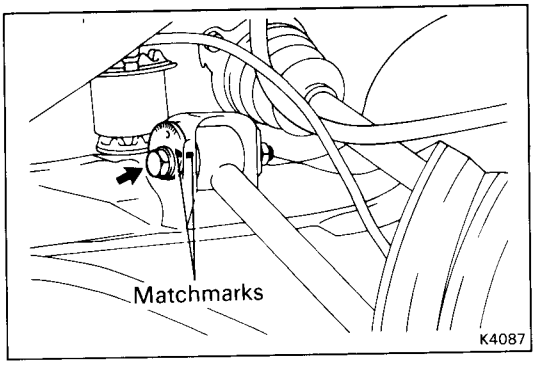
(b) Torque the No.2 suspension arm bolt of suspension member side.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)



(c) Torque the No.2 suspension arm bolt of axle carrier side.

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

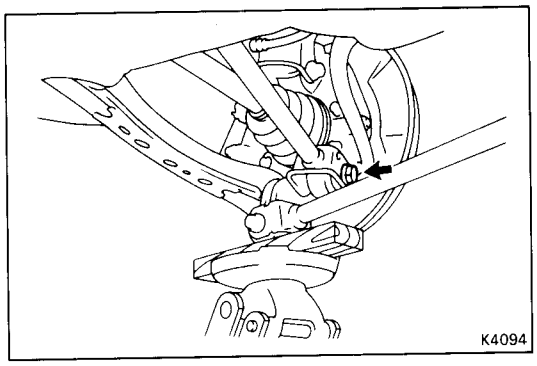


8. **TORQUE NO.1 SUSPENSION ARM**

(a) Align matchmarks on the toe adjusting cam and control arm retainer.

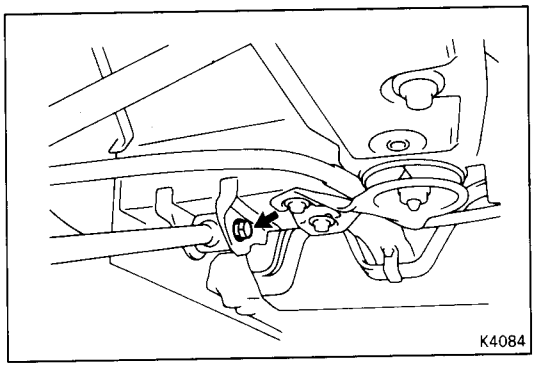
(b) Torque the No.1 suspension arm bolt of the suspension member side.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)



(c) Torque the No.1 suspension arm bolt of the axle carrier side.

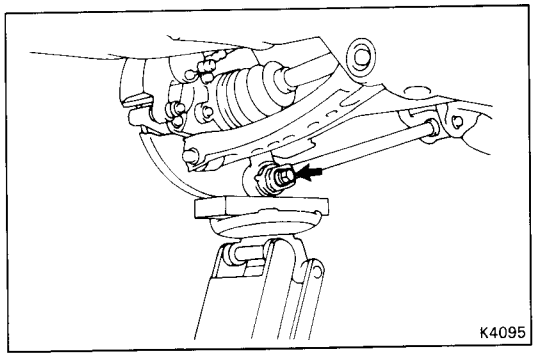
Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)



9. **TORQUE STRUT ROD**

(a) Torque the strut rod bolt of the body side.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)

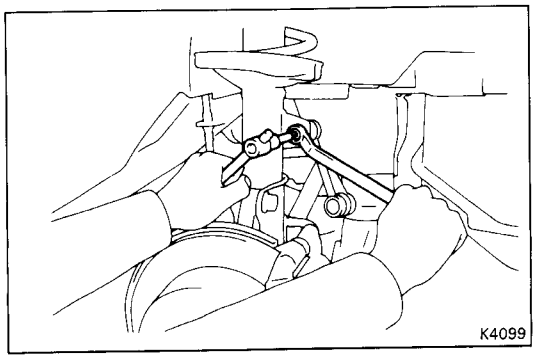


(b) Torque the strut rod bolt of the axle carrier side.

Torque: 1,150 kg-cm (83 ft-lb, 113 N·m)

10. **INSTALL REAR WHEELS**

11. **CHECK REAR WHEEL ALIGNMENT**



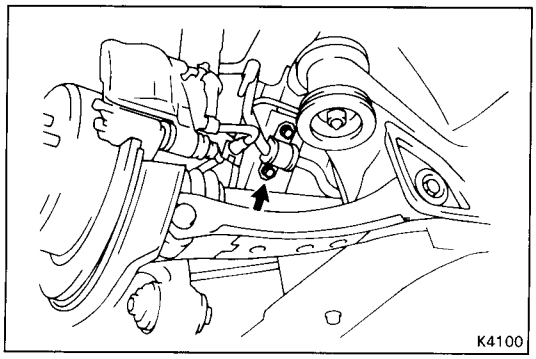
Stabilizer Bar

REMOVAL OF STABILIZER BAR

1. **REMOVE REAR WHEELS**

2. **REMOVE STABILIZER LINK**

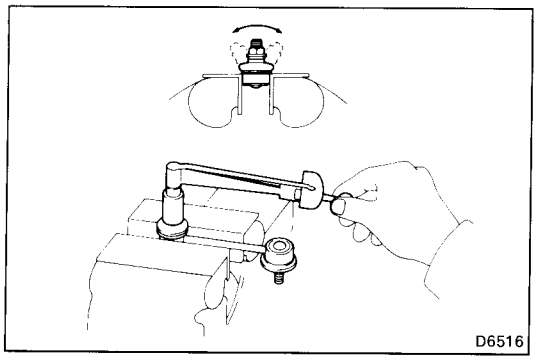
Using a hexagon wrench and offset wrench, remove the two nut and stabilizer link.



3. **REMOVE STABILIZER BRACKET WITH BUSHING**

   Remove the four bolts and stabilizer bracket with bushings.

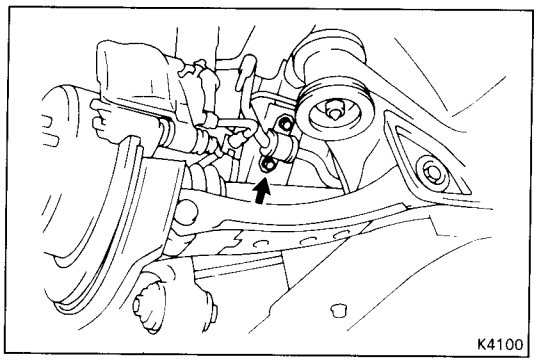
4. **REMOVE STABILIZER BAR**



INSPECTION OF STABILIZER LINK

INSPECT STABILIZER LINK

Rotate ball joint arm in all direction. If the movement is not smooth and free, replace the stabilizer link.

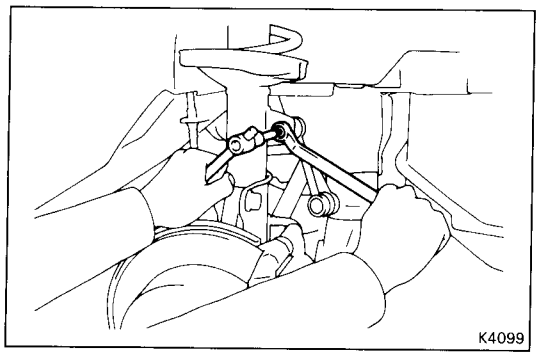


INSTALLATION OF STABILIZER BAR

1. **INSTALL STABILIZER BAR**

2. **INSTALL STABILIZER BRACKET WITH BUSHING**
   (a) Install the two bushings to the stabilizer bar.
   (b) Install the two brackets with four bolts to the stabilizer bar.

   Torque: 195 kg-cm (14 ft-lb, 19 N·m)



3. **INSTALL STABILIZER LINK**
   (a) Install the stabilizer link to the stabilizer bar and finger tighten the nut.
   (b) Install the stabilizer link to the shock absorber bracket and finger tighten the nut.
   (c) Using a hexagon wrench, torque the two nuts.

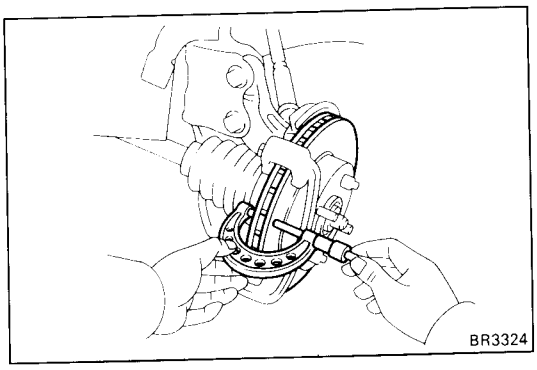
   Torque: 650 kg-cm (47 ft-lb, 64 N·m)

4. **INSTALL REAR WHEELS**

BRAKE SYSTEM

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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



FRONT BRAKE

INSPECTION OF FRONT BRAKE COMPONENTS

MEASURE ROTOR DISC THICKNESS

Standard thickness: **25.0 mm (0.984 in.)**
Minimum thickness: **23.0 mm (0.906 in.)**

If the disc is scored or worn, of if thickness is less than minimum, repair or replace the disc.

PROPORTIONING VALVE (P VALVE)

INSPECTION OF FLUID PRESSURE

RAISE MASTER CYLINDER PRESSURE AND CHECK REAR WHEEL CYLINDER PRESSURE

Specifications

Master cylinder pressure	Rear wheel cylinder pressure
40 kg/cm^2 (569 psi, 3,923 kPa)	40 kg/cm^2 (569 psi, 3,923 kPa)
90 kg/cm^2 (1,280 psi, 8,826 kPa)	58.5 kg/cm^2 (832 psi, 5,737 kPa)

If the rear wheel cylinder pressure is incorrect, replace the P & B valve assembly.

ANTI-LOCK BRAKE SYSTEM (ABS)

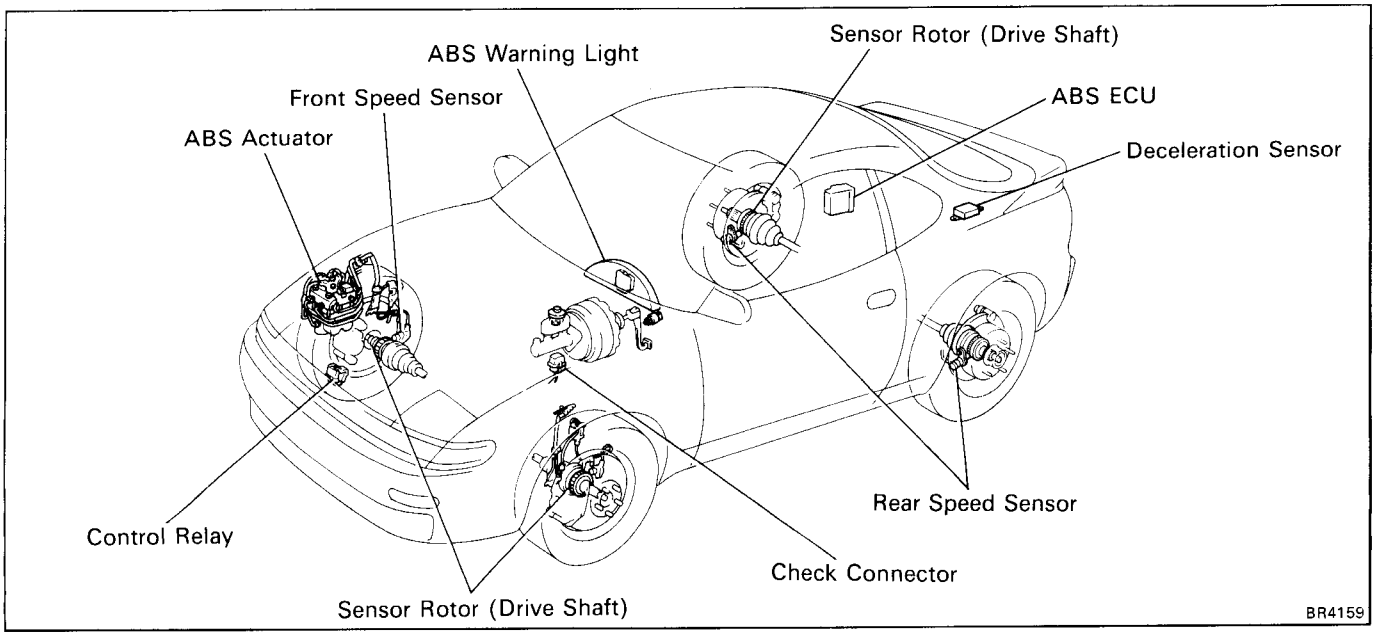
Description

- The ABS is a brake system which controls the wheel cylinder hydraulic pressure of all four wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking. This ABS provides the following benefits:
  (1) Enables steeling round an obstacle with a greater degree of certainly even when panic braking.
  (2) Enables stopping in a panic brake while keeping effect upon stability and steerability to a minimum, even on curves.
- The function of the ABS is to help maintain directional stability and vehicle steerability on most road conditions. However, the system cannot prevent the vehicle from skidding if the cornering speed limit is exceeded.
- The ABS has a longitudianal deceleration sensor to match braking characteristics to the full-time four-wheel drive.
- In case a malfunction occurs, a diagnosis function and fail-safe system have been adopted for the ABS to increase serviceability.

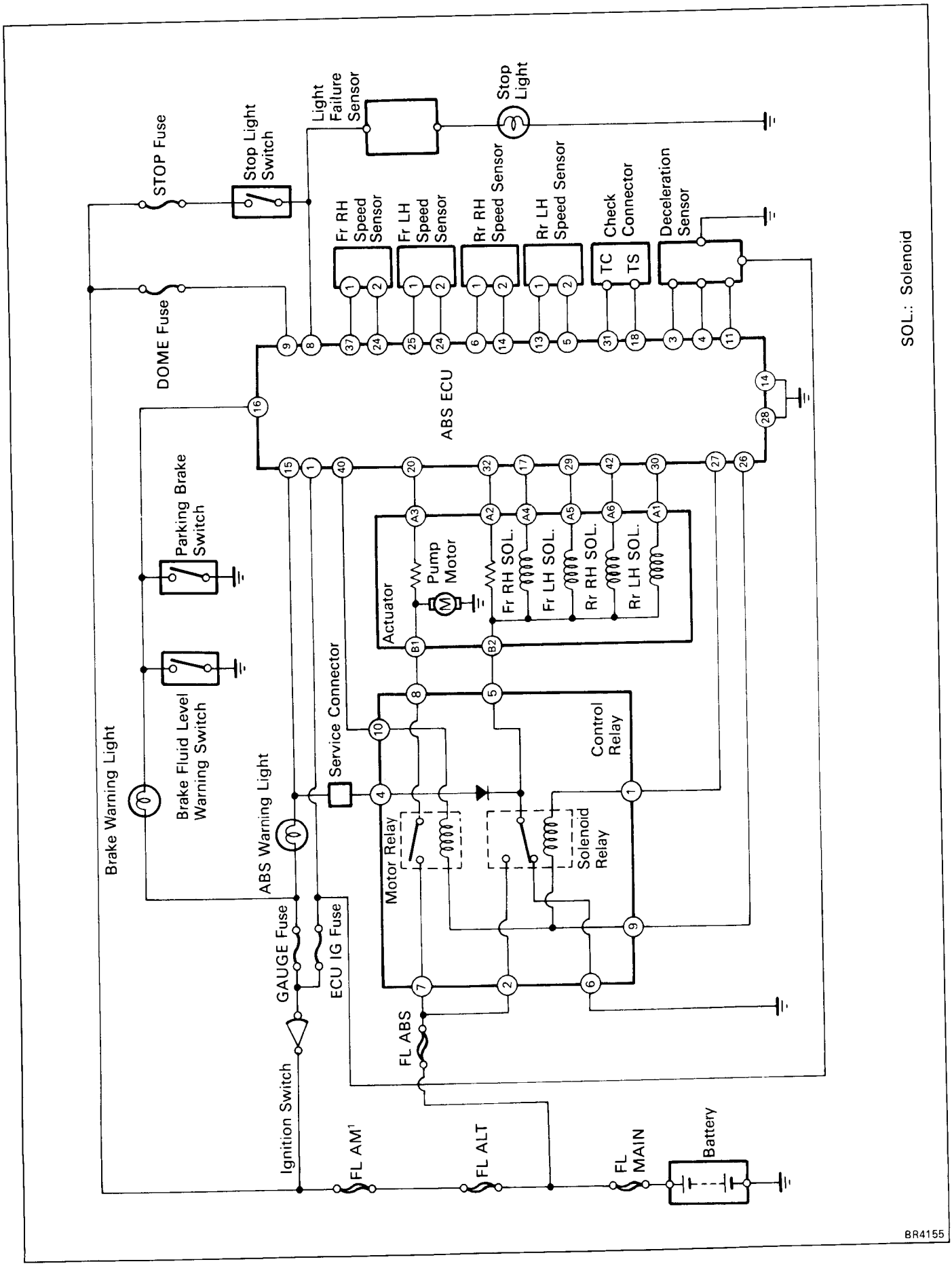
FUNCTION OF COMPONENTS

Component	Function
Front Speed Sensor	Detect the wheel speed of each of the left and right front wheels.
Rear Speed Sensor	Detect the wheel speed of each of the left the right rear wheels.
Deceleration Sensor	Detects the deceleration speed of the vehicle and sends a signal accordingly to the ABS ECU.
ABS Warning Light	Lights up to alert the drive when trouble has occured in the Antilock Brake System.
Actuator	Controls the brake fluid pressure to each disc brake cylinder through signals from the computer.
ABS ECU	From the wheel speed signals from each sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.

LOCATION OF SYSTEM PARTS



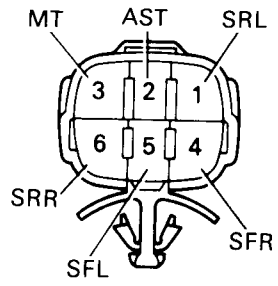
WIRING DIAGRAM



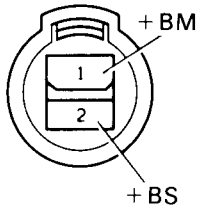
CONNECTORS

ABS Actuator

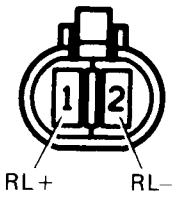
CONNECTOR A



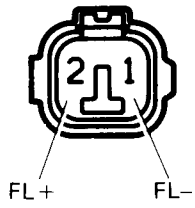
CONNECTOR B



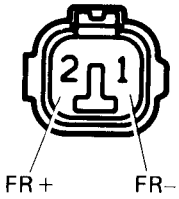
Rear Speed Sensor (LH)



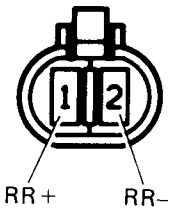
Front Speed Sensor (LH)



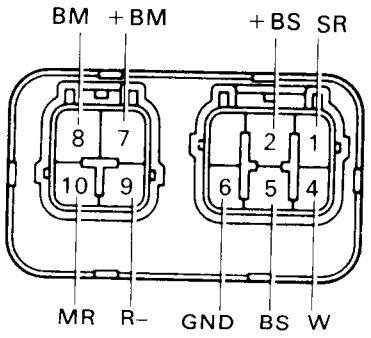
Front Speed Sensor (RH)



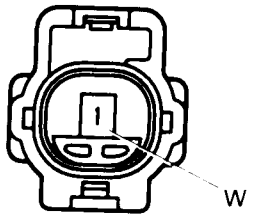
Rear Speed Sensor (RH)



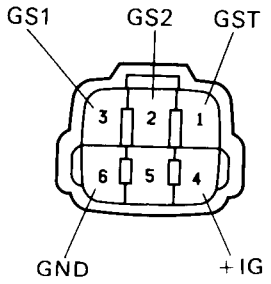
Control Relay



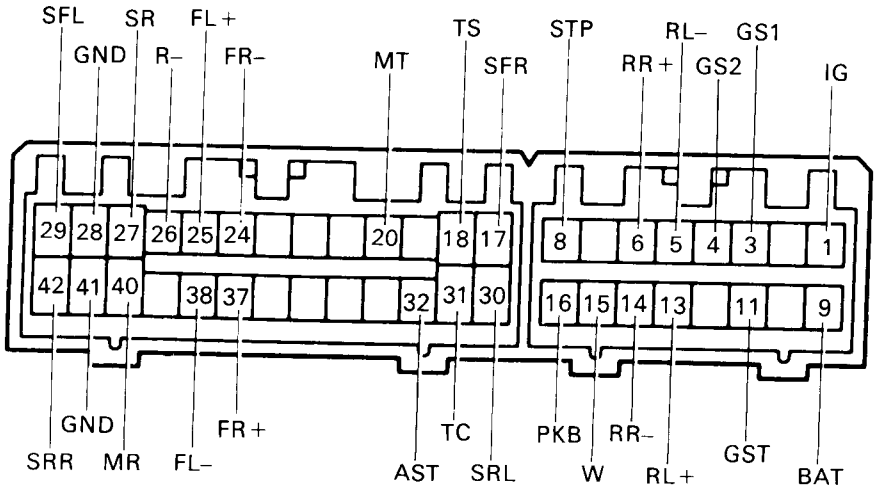
Service Connector
(Wire Harness Side)



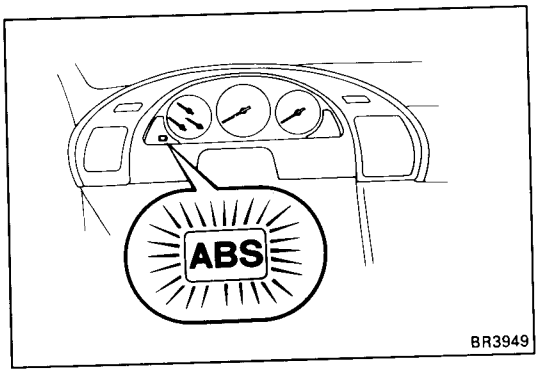
Deceleration Sensor

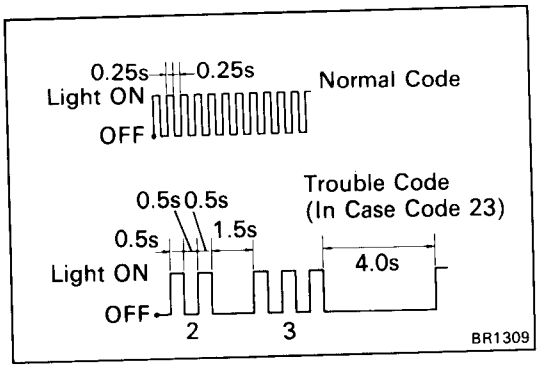


ABS ECU



E2402 ID-2-2 IS-2-1B
IS-2-2-0 IS-2-2-0 IS-2-1-B
BR3999 Ie-1-1 IS-6-2-B
BR4078





Diagnosis System

DESCRIPTION

If a malfunction occurs, the system will identify the problem and the ECU will stores the codes for the trouble items.

At the same time, the system informs the driver of a malfunction via the "ABS" warning light in the combination meter.

To identify the trouble by the number of blinks (diagnostic code) of the warning light turn on the ignition switch, disconnect the service connector, and use SST to connect Tc and E1 of the check connector.

In the event of two codes, that having the smallest number (code) will be identified first.

HINT: The warning light does not show the diagnostic codes while the vehicle is running.

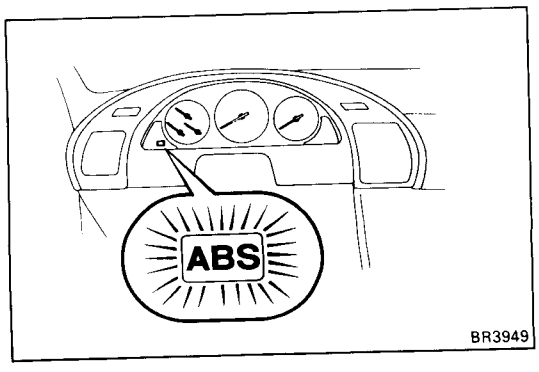
INITIAL CHECK

CHECK ACTUATOR OPERATION NOISE

(a) Start the engine and drive at a speed over 6 km/h (4 mph).

(b) Check that the actuator operation noise is heard.

HINT: A initial check is carried out once each time after the engine has been started and initial speed exceeds 6 km/h (4 mph). The respective functions, in order, of the 3 position solenoid and pump motor in the actuator are checked. However, if the brake pedal is depressed, the initial check is not carried out, but is started after the pedal has been released.



INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY VOLTAGE

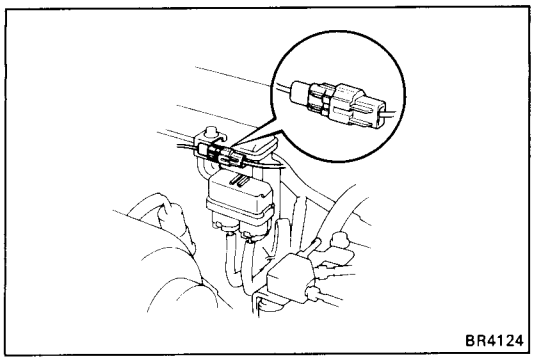
Inspect that the battery voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch on.

(b) Check that the "ABS" warning light turns on for 3 seconds.

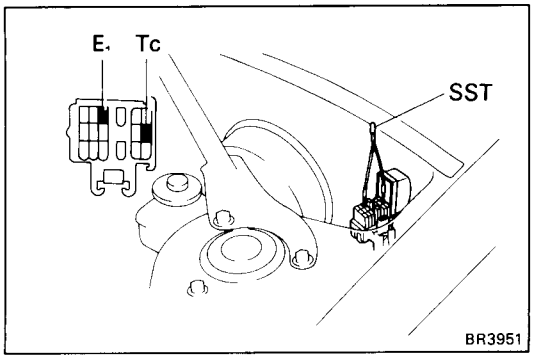
If not, inspect and repair or replace the fuse, bulb and wire harness.



3. READ DIAGNOSTIC CODE

(a) Turn the ignition switch on.

(b) Disconnect the service connector.



(c) Using SST, connect terminals Tc and E1 of the check connector.

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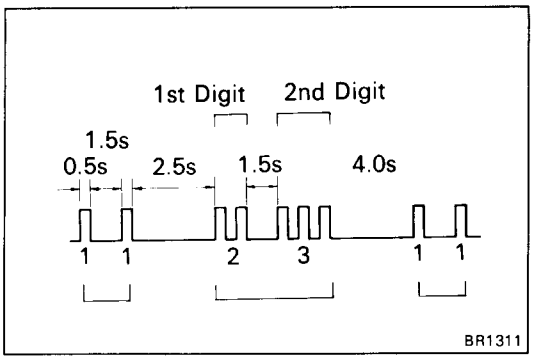


(d) In event of a malfunction, 4 seconds later the warning light will begin to blink. Read the number of blinks.
(See DIAGNOSTIC CODE on page BR-8)

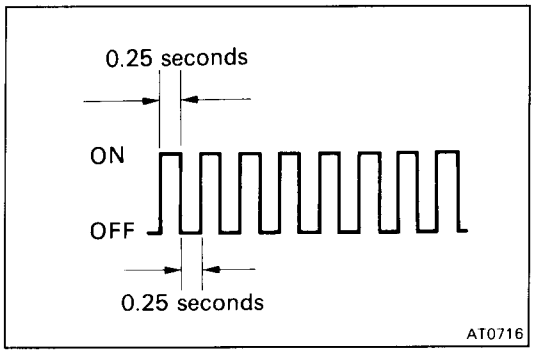
HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each, and indication will begin after 4.0 second pause from the smaller value and continue in order to larger.

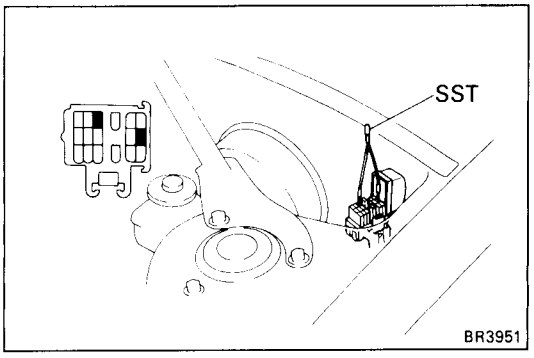
(e) If the system is operating normally (no malfunction), the warning light will blink once every 0.5 seconds.

(f) Repair the system.

(g) After the malfunctioning components has been repaired, clear the diagnostic codes stored in the ECU.
(See page BR-9)

HINT: If you disconnect the battery cable while repairing, all diagnostic codes in the ECU will erased.



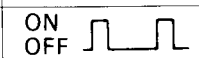
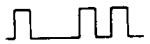
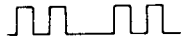
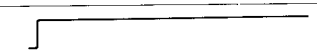


(h) Remove the SST from terminals Tc and E1 of the check connector.

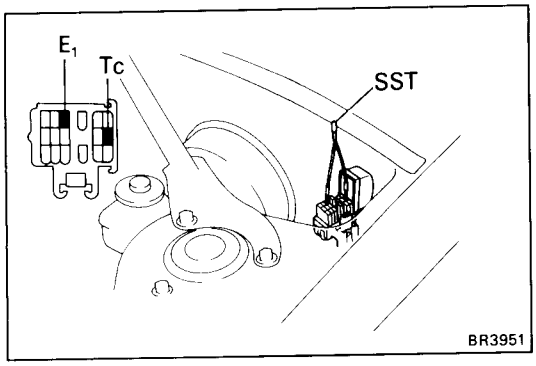
SST 09843-18020

(i) Connect the service connector.

(j) Turn the ignition switch on, and check that the "ABS" warning light goes off after the warning light goes on for 3 seconds.

Code No.	Light Pattern	Diagnosis	Trouble Part
11		Open circuit in selenoid relay circuit	• Actuator inside wire harness • Control relay • Wire harness and connector of solenoid relay circuit
12		Short circuit in solenoid relay circuit	
13		Open circuit in pump motor relay circuit	• Actuator inside wire harness • Control relay • Wire harness and connector of pump motor relay circuit
14		Short circuit in pump motor relay circuit	
21		Open or short circuit in 3 position solenoid of front right wheel	• Actuator solenoid • Wire harness and connector of actuator solenoid circuit
22		Open or short circuit in 3 position solenoid of front left wheel	
23		Open or short circuit in 3 position solenoid of rear right wheel	
24		Open or short circuit in 3 position solenoid of rear left wheel	
31		Front right wheel speed sensor signal malfunction	• Speed sensor • Sensor rotor • Wire harness and connector of speed sensor
32		Front left wheel speed sensor signal malfunction	
33		Rear right wheel speed sensor signal malfunction	
34		Rear left wheel speed sensor signal malfunction	
35		Open circuit in front left or rear right wheel speed sensor	
36		Open circuit in front right or rear left wheel speed sensor	
41		Abnormal battery voltage (9.5 V less than or 16.2 V more than)	• Battery • Voltage regulator
43		Malfunction in deceleration sensor	• Deceleration sensor • Deceleration sensor installation • Wire harness and connector of deceleration sensor
44		Open or short circuit in deceleration sensor	
51		Pump motor of actuator locked or open circuit in pump motor circuit in actuator	• Pump motor, relay and battery • Wire harness, connector and ground bolt or actuator pump motor circuit
Always on		Malfunction in computer	• ECU

BR4289



CLEARING OF DIAGNOSTIC CODES

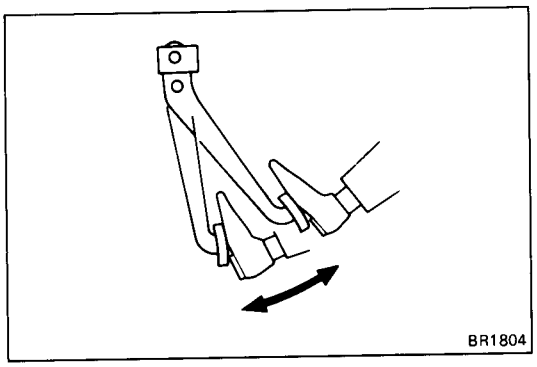
CLEAR DIAGNOSTIC CODES

(a) Turn the ignition switch on.

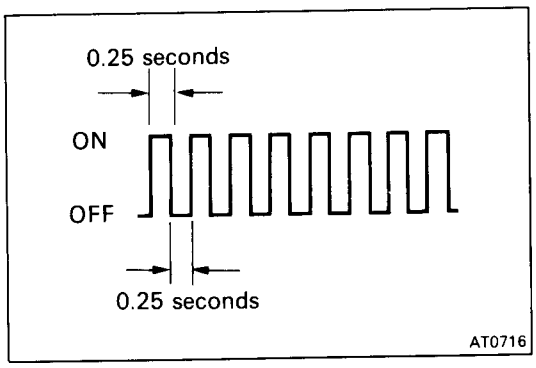
(b) Using SST, connect terminals Tc and E1 of the check connector.

SST 09843-18020

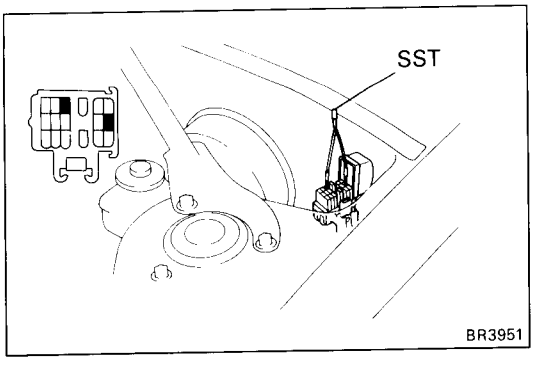
HINT: Keep the vehicle stopped vehicle speed 0 km/h (0 mph).



(c) Clear the diagnostic codes stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.



(d) Check that the warning light shows the normal code.



(e) Remove the SST from terminals Tc and E1 of the check connector.

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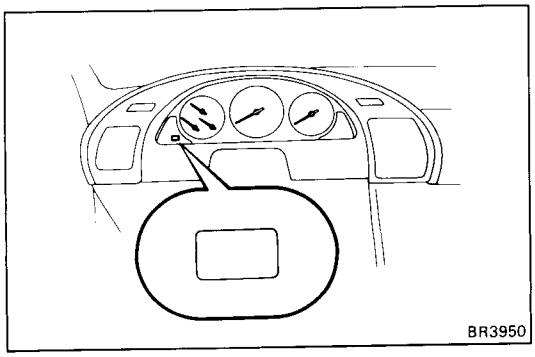


(f) Check that the warning light goes off.

Troubleshooting

Problem		No.
"ABS" warning light	Always comes on after ignition switch is turned on.	1
	Does not come on for 3 seconds after ignition switch on.	2
	Comes on and off.	3
	Comes on while running.	1
Brake working	Brakes pull.	4
	Braking inefficient.	4
	ABS operates at ordinary braking.	4
	ABS operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while ABS is operating.	4
	Skidding noise occurs while ABS working. (ABS works inefficiently)	5

1	"ABS" warning light comes on.

Disconnect service connector and connect terminals Tc and E_1 of check connector. (See page BR-7)

↓

Does warning light always come on or show the normal code? (Ignition switch on)

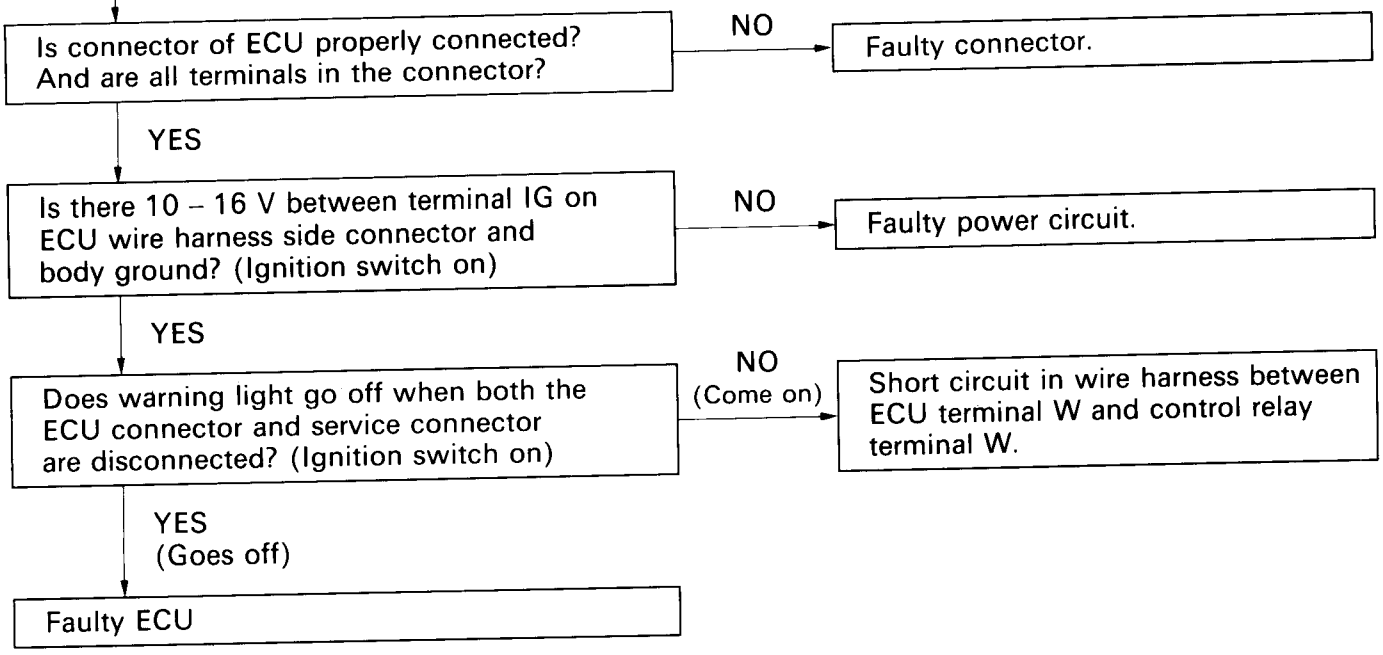
NO → See diagnostic code. (See page BR-8)

YES

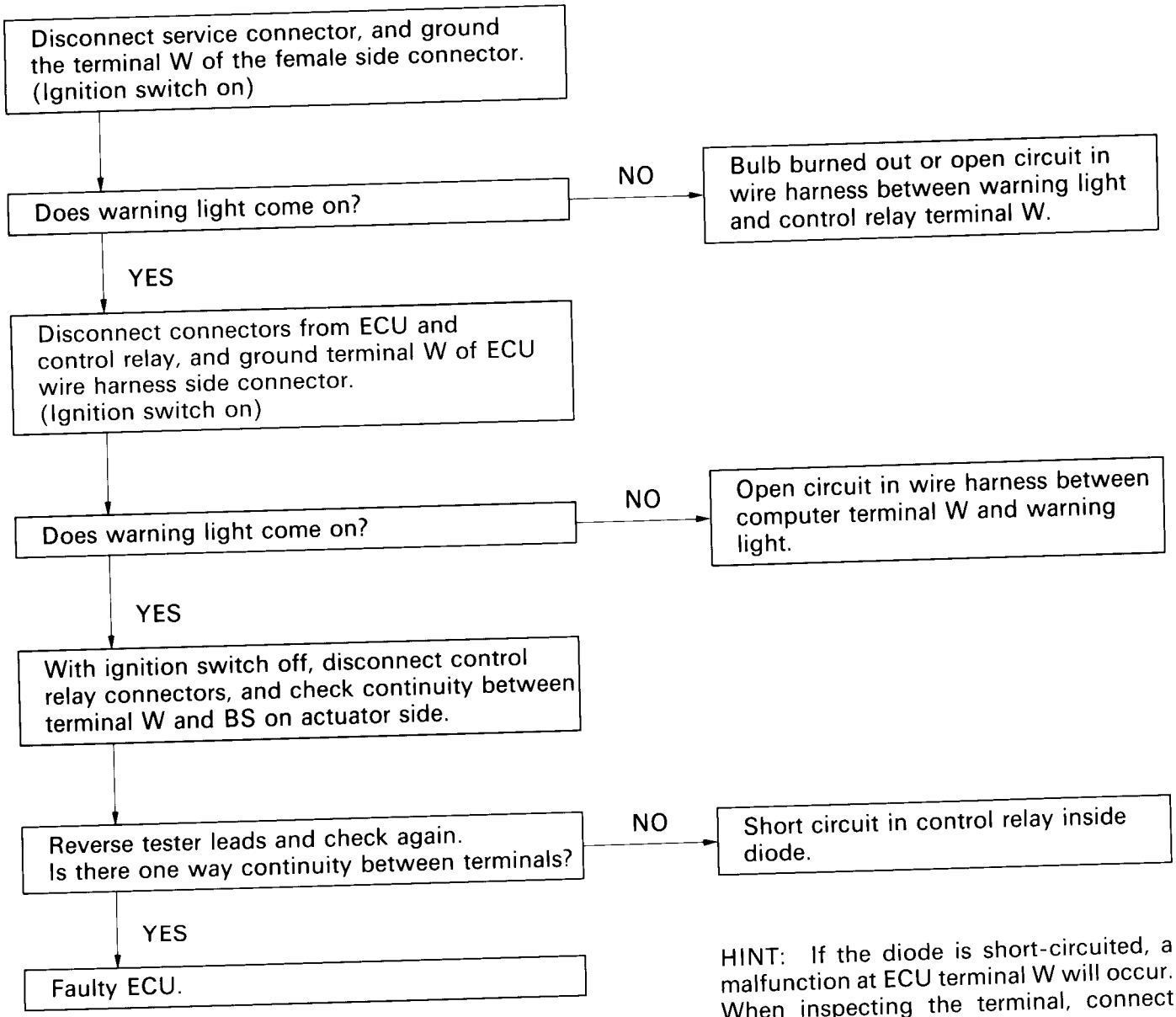
↓

Continued on page BR-11

Continued from page BR-10



2	"ABS" warning light does not come on for 3 seconds after ignition switch on.



HINT: If the diode is short-circuited, a malfunction at ECU terminal W will occur. When inspecting the terminal, connect the ECU connector, and disconnect control relay connectors and service connector. Then turn the ignition switch on, and check that the warning light goes on. If it does, the ECU terminal is OK.

3	"ABS" warning light comes on and off.

- Check for short circuit in wire harness between terminal Tc and E_1 or Ts and E_1 of check connector.

4	• Brakes pull. • Braking inefficient. • ABS operates at ordinary braking. • ABS operates just before stopping at ordinary braking. • Brake pedal pulsates abnormally while ABS working.

Disconnect service connector and connect terminals Tc and E_1 of check connector.
(See page BR-7)

↓

Does warning light show the diagnostic normal code? (Ignition switch on)

NO → See diagnostic code. (See page BR-8)

↓ YES

Try speed sensor diagnosis system.
Is sensor signal level OK?
(See page BR-16)

NO → Inspect speed sensor, and replace if necessary.

↓ YES

Try speed sensor diagnosis system.
Is sensor signal change OK?
(See page BR-16)

NO → Inspect sensor rotor, and replace if necessary.

↓ YES

Are each speed sensors installed in place?
And are each installation bolts tightened securely?

NO → Speed sensor installation faulty.

↓ YES

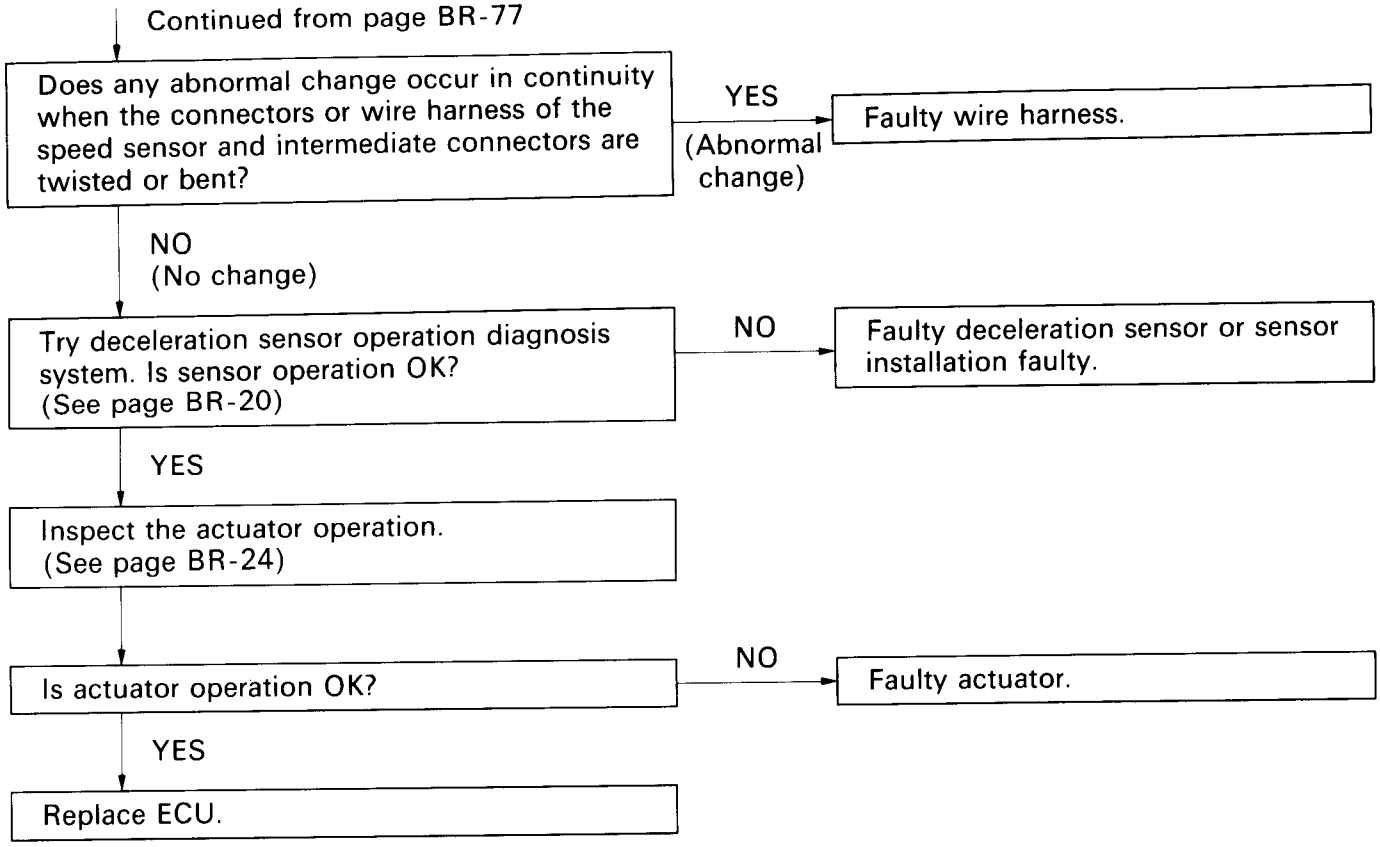
Is there foreign material or ferric chips on the sensor tip?

YES → Clean chips from the speed sensor.

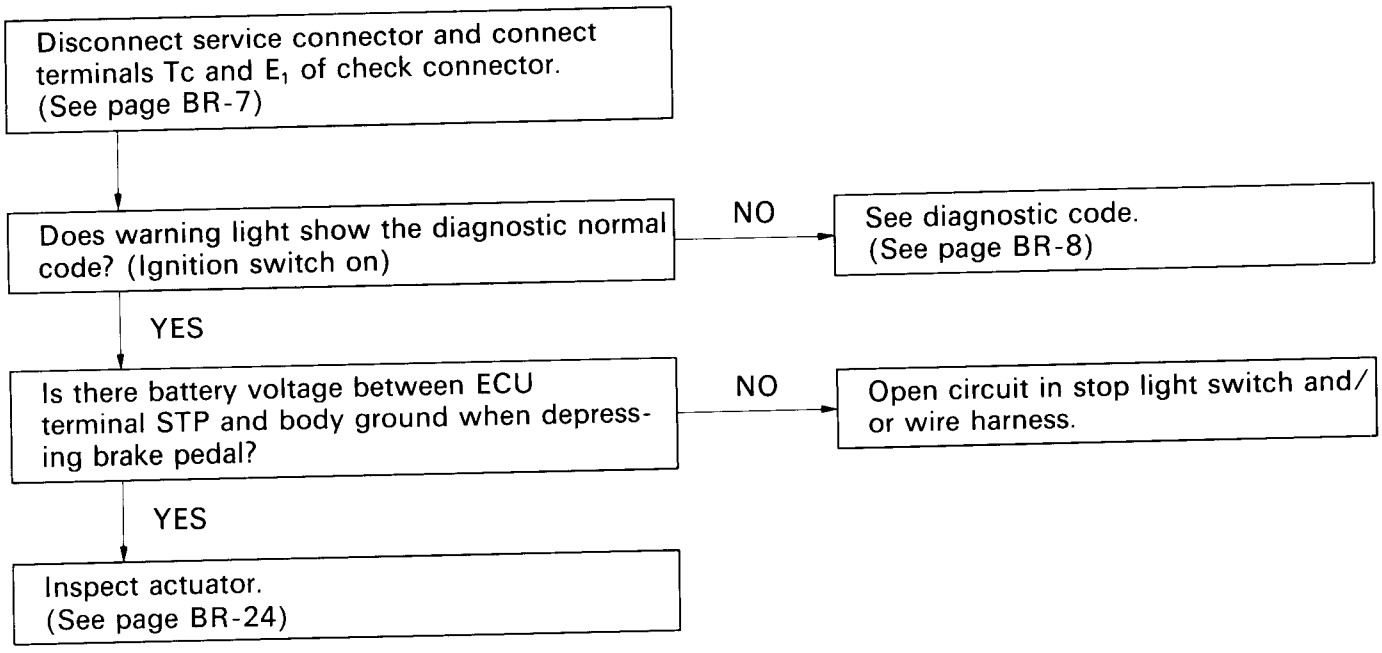
↓ NO

Disconnect connector from ECU, inspect continuity between each speed sensor terminals on wire harness side.
(See page BR-32)

Continued on page BR-14


Continued from page BR-77
Does any abnormal change occur in continuity when the connectors or wire harness of the speed sensor and intermediate connectors are twisted or bent?
YES
(Abnormal change)
Faulty wire harness.
NO
(No change)
Try deceleration sensor operation diagnosis system. Is sensor operation OK?
(See page BR-20)
NO
Faulty deceleration sensor or sensor installation faulty.
YES
Inspect the actuator operation.
(See page BR-24)
Is actuator operation OK?
NO
Faulty actuator.
YES
Replace ECU.

5	Antilock brake system works inefficiently.



Speed Sensor Diagnosis System

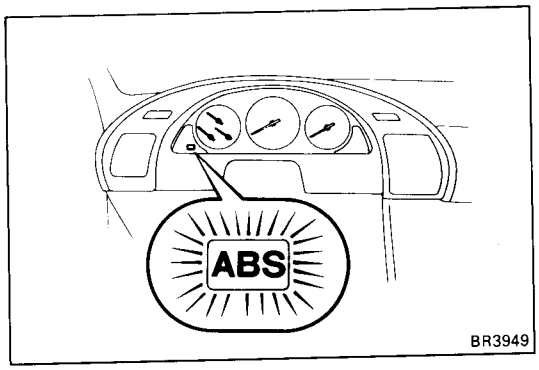
PRECAUTION

While checking the speed sensor diagnosis system, ABS does not work and brake system works as normal brake system.

INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.



2. CHECK THAT WARNING LIGHT TURNS ON

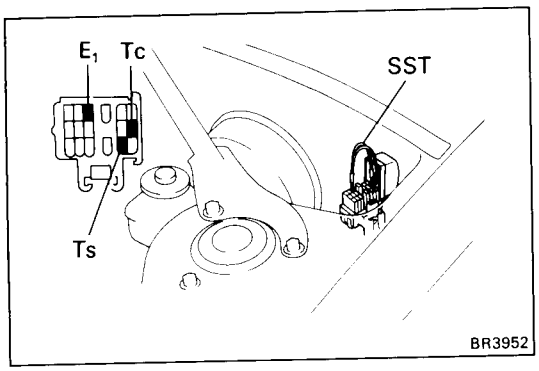
(a) Turn the ignition switch on.

(b) Check that the "ABS" warning light turns on for 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

(c) Check that the "ABS" warning light turns off.

(d) Turn the ignition switch off.



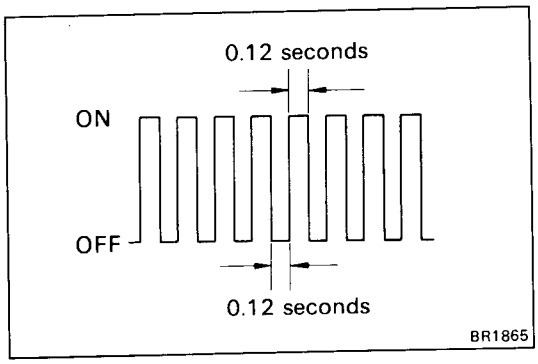
3. PERFORM FOLLOWING STEPS

(a) Using SST, connect terminals E1 and Tc, Ts of the check connector.

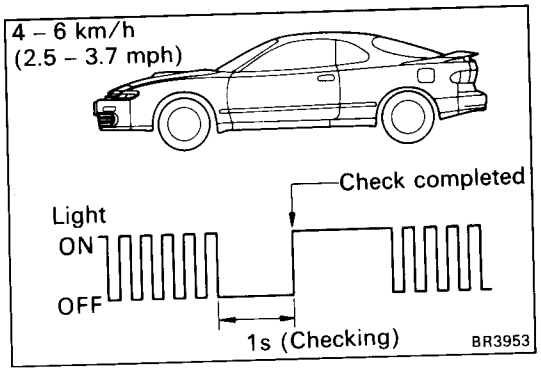
SST 09843-18020

(b) Pull the parking brake lever up, and start the engine.

HINT: Do not depress the brake pedal.



(c) Check that the warning light blinks about 4 times every 1 second as shown.



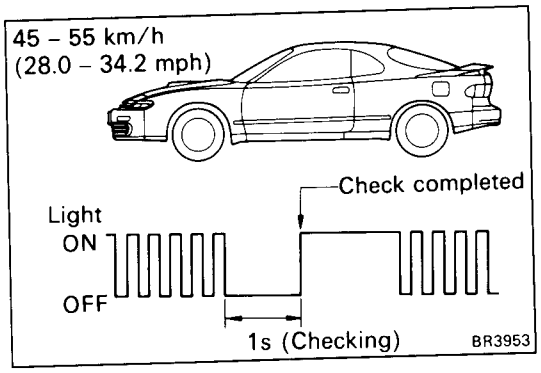
4. **INSPECT SENSOR SIGNAL LEVEL**

Drive the vehicle straight ahead at about 4 – 6 km/h (2.5 – 3.7 mph), and check that the warning light turns on after a 1 second pause.

If the warning light turns on without blinking when the vehicle speed is not within the specified speed range above, stop the vehicle and read the diagnostic code, and repair the malfunctioning parts.
(See step 6 on this page)

HINT: If the warning light turns on while the vehicle speed is within specified speed range above, the check is completed. And when the vehicle speed exceeds 6 km/h (3.7 mph), the warning light will blink again. In this condition, speed sensors are OK.

NOTICE: While the warning light is off, do not give any shocks to vehicle such as acceleration, deceleration, braking, shift change, steering or shocks from the road condition.



5. **INSPECT SENSOR SIGNAL CHANGE**

Drive the vehicle straight ahead at about 45 – 55 km/h (28.0 – 34.2 mph), and check that the warning light turns on after a 1 second pause.

If the warning light turns on without blinking when the vehicle speed is not within the specified speed range above, stop the vehicle and read the diagnostic code, and repair the malfunctioning parts.
(See step 6 on this page)

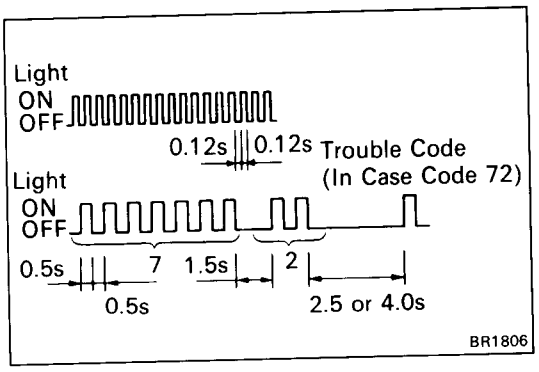
HINT: If the warning light turns on while the vehicle speed is within specified speed range above, the check is completed. And when the vehicle speed is not within specified speed range, the warning light will blink again. In this condition, sensor rotors are OK.

NOTICE: While the warning light is off, do not give any shocks to vehicle such as acceleration, deceleration, braking, shift change, steering or shocks from the road condition.

6. **READ DIAGNOSTIC CODE**

Stop the vehicle, and warning light will begin to blink. Read the number of blinks.
(See DIAGNOSTIC CODE on page BR-19)

NOTICE: Do not depress the brake pedal more than 16 times after the diagnosis system begins to work, or the diagnostic codes stored in ECU will be cleared.



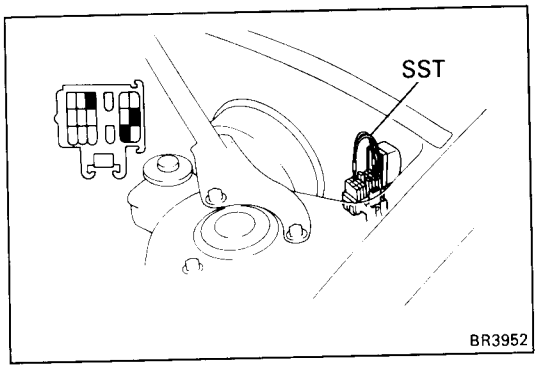
HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each code, and then indication will begin again after a 4.0 second pause, continuing in order from the smaller value up to the larger one.

7. REPAIR MALFUNCTIONING PARTS

Repair or replace the malfunctioning parts.

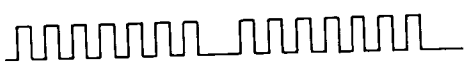
8. PERFORM FOLLOWING STEPS

(a) Turn the ignition switch off.



(b) Remove the SST from terminals E1 and Tc, Ts of the check connector.

DIAGNOSTIC CODE

Code No.	Light Pattern	Diagnosis	Malfunctioning Part
	ON OFF 	All speed sensors and sensor rotors are normal	
71		Low voltage of front right speed sensor signal	• Front right speed sensor • Sensor installation
72		Low voltage of front left speed sensor signal	• Front left speed sensor • Sensor installation
73		Low voltage of rear right speed sensor signal	• Rear right speed sensor • Sensor installation
74		Low voltage of rear left speed sensor signal	• Rear left speed sensor • Sensor installation
75		Abnormal change of front right speed sensor signal	• Front right sensor rotor
76		Abnormal change of front left speed sensor signal	• Front left sensor rotor
77		Abnormal change of rear right speed sensor signal	• Rear right sensor rotor
78		Abnormal change of rear left speed sensor signal	• Rear left sensor rotor

BR1807

Deceleration Sensor Operation Diagnosis System

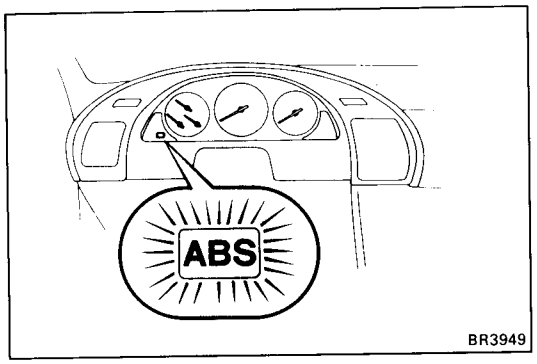
PRECAUTION

While checking the deceleration sensor diagnosis system, ABS does not work and brake system works as normal brake system.

INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.



2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch on.

(b) Check that the "ABS" warning light turns on for 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

(c) Check that the "ABS" warning light turns off.

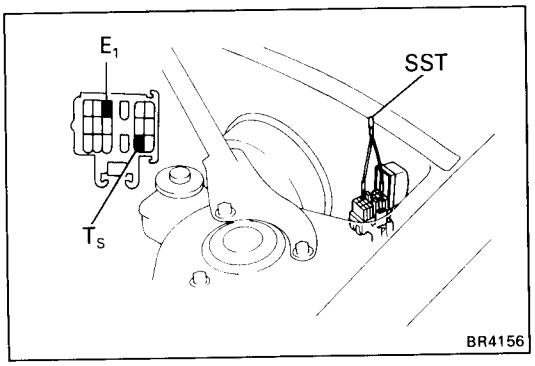
(d) Turn the ignition switch off.

3. PERFORM FOLLOWING STEPS

(a) Using SST, connect terminals Ts and E1 of the check connector.

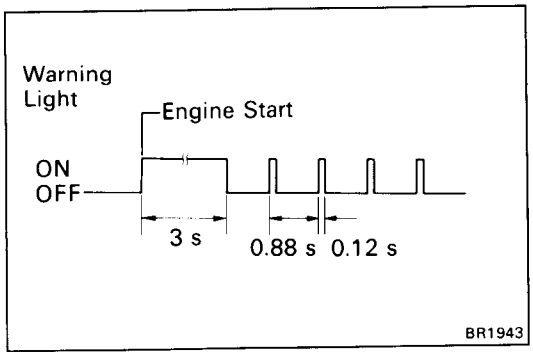
SST 09843-18020

(c) Pull the parking brake lever up and depress the brake pedal, and start the engine.



(d) Check that the warning light blinks about 1 time every 1 second as shown.

If the warning light does not blink, inspect the parking brake switch, stop light switch, Ts connector, deceleration sensor installation and computer.



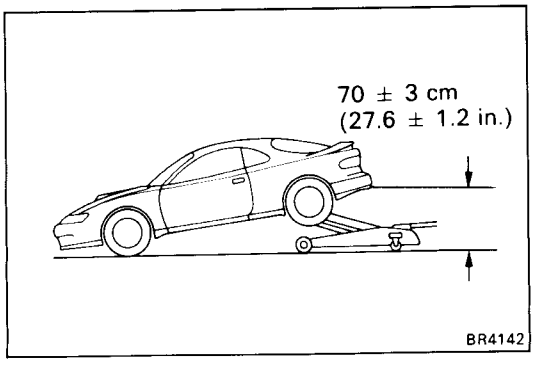
4. INSPECT SENSOR DETECTION POINT

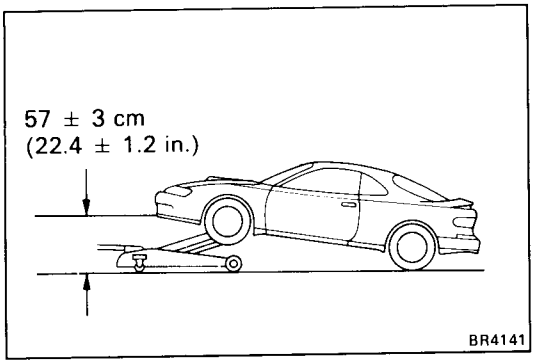
(a) Jack up the rear side of the vehicle slowly as shown.

HINT: When measuring the height, measure at the center of the rear bumper lower edge.

(b) Check that the warning light does not turn on.

(c) Jack down the vehicle and check that the warning light blinking.





(d) Jack up the front side of the vehicle slowly as shown.

HINT: When measuring the height, measure at the center of the lower body or spoiler edge of the vehicle.

(e) Check that the warning light does not turn on.

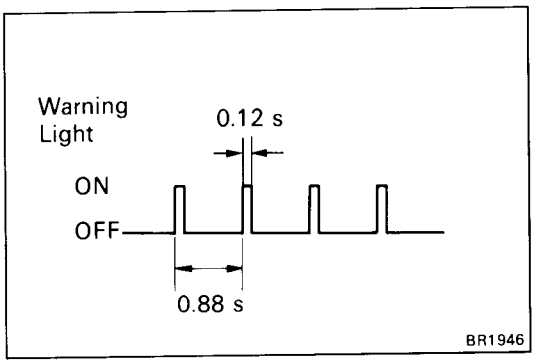
(f) Jack down the vehicle and check that the warning light blinking.

If the warning light turns on, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.

5. INSPECT SENSOR OPERATION

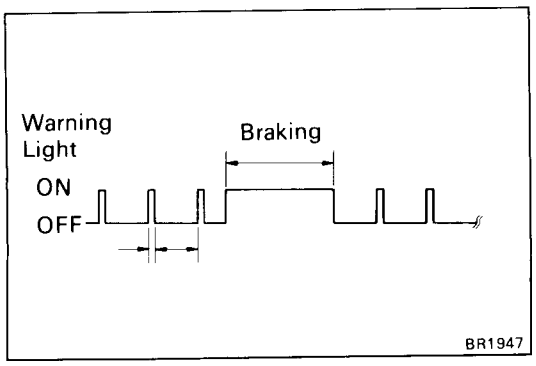
(a) Drive the vehicle straight ahead at about 10 km/h (6.2 mph) or more, lightly depress the brake pedal.

(b) Check that there is no change in the warning light light pattern.



(c) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal a little strong.

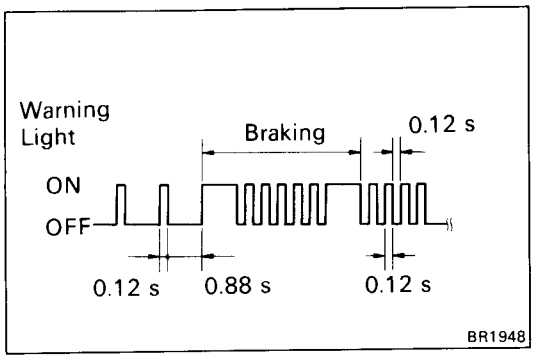
(d) Check that the warning light turns on while braking.



(e) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal strongly.

(f) Check that the warning light light pattern changes after braking as shown.

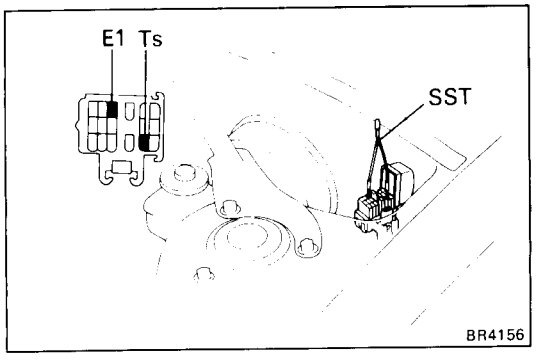
If the operation is not as specified, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.



6. PERFORM FOLLOWING STEPS

(a) Stop the engine.

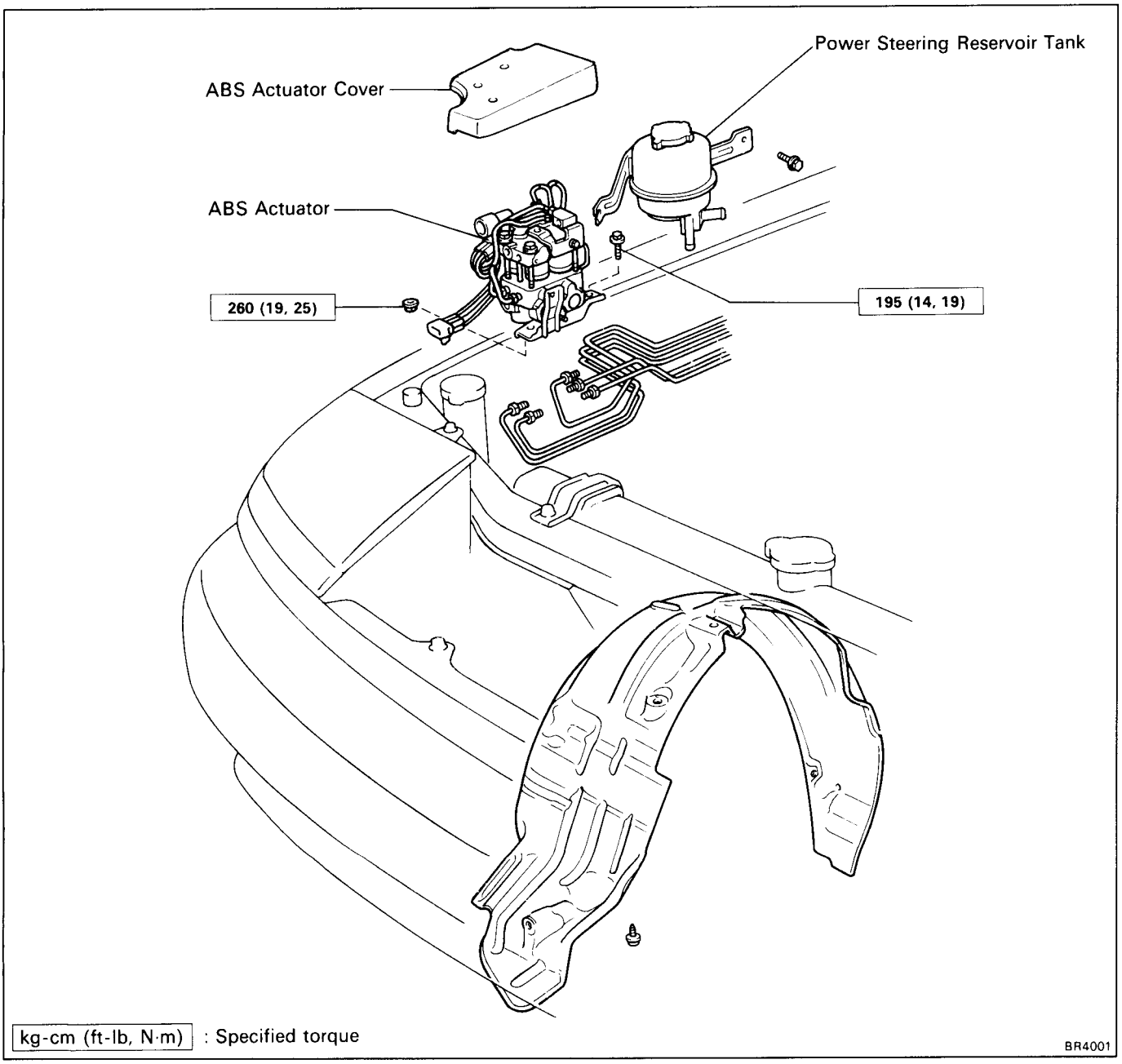
(b) Remove the SST from terminals Ts and E1 of the check connector.

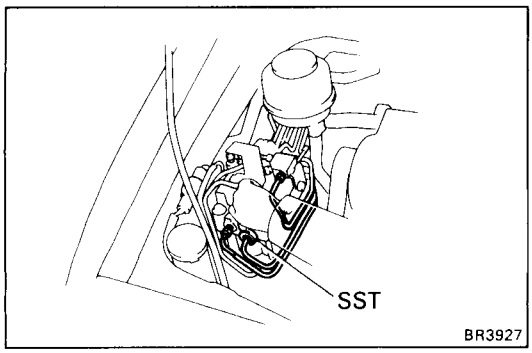


ABS Actuator

REMOVAL AND INSTALLATION OF ABS ACTUATOR

Remove and install the parts as shown.





1. **DISCONNECT AND CONNECT BRAKE TUBE**

   Using SST, disconnect and connect the brake tubes from/to the ABS actuator.

   SST 09751-36011

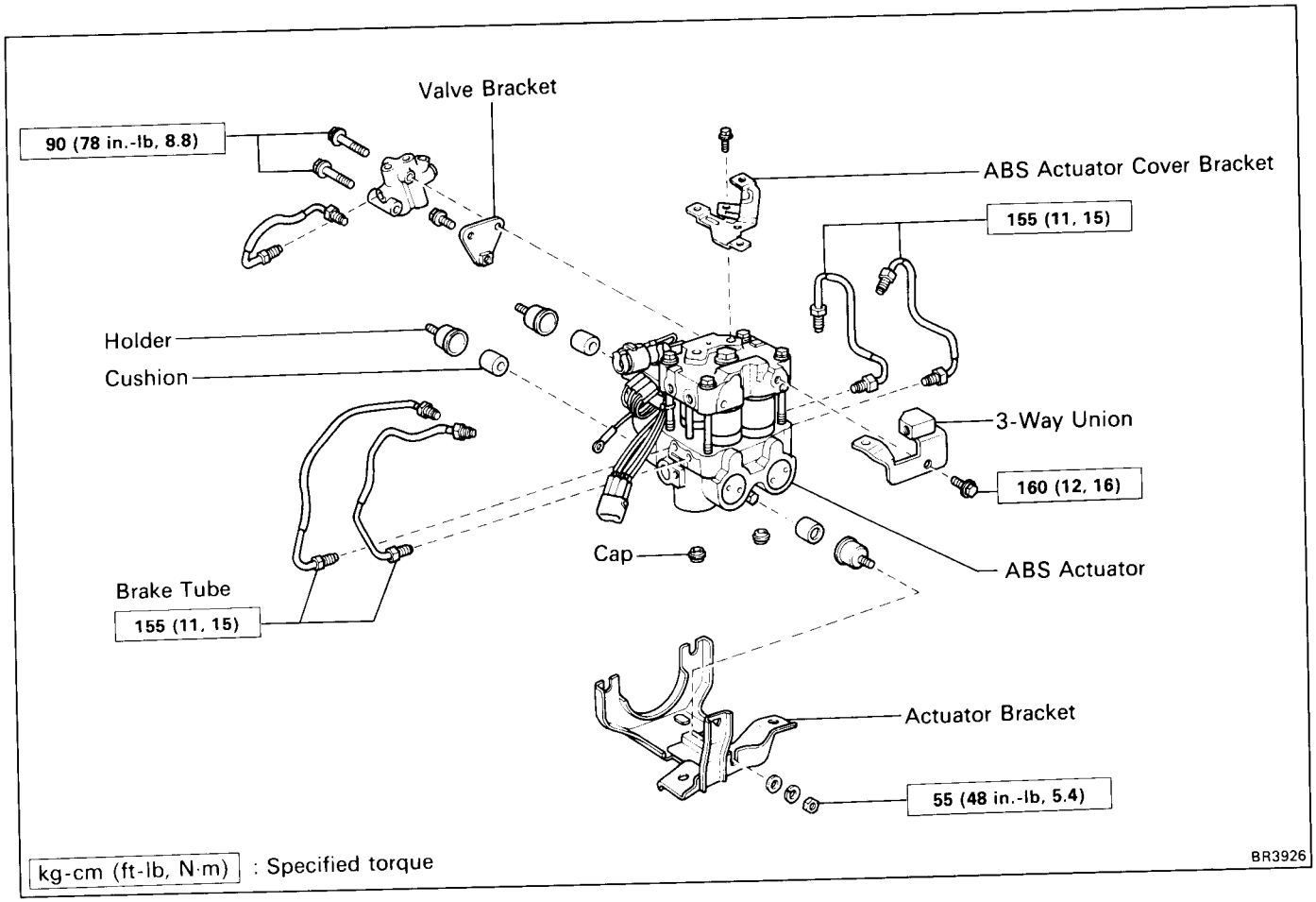
   Torque: 155 kg-cm (11 ft-lb, 15 N·m)

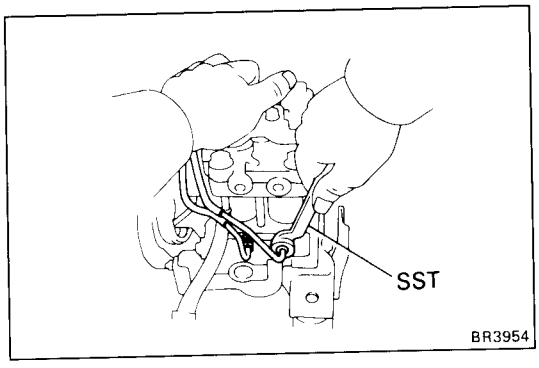
2. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**

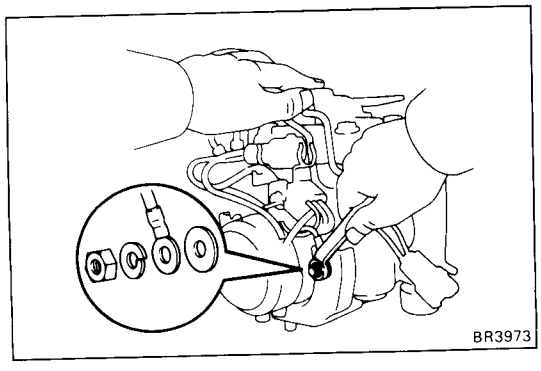
DISASSEMBLY AND ASSEMBLY OF ABS ACTUATOR

Remove and install the parts as shown.

COMPONTENTS







(MAIN POINT OF REMOVAL AND INSTALLATION)

1. DISCONNECT AND CONNECT BRAKE TUBE

Using SST, disconnect and connect the brake tubes from/to the ABS actuator.

SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)

2. INSTALL ACTUATOR

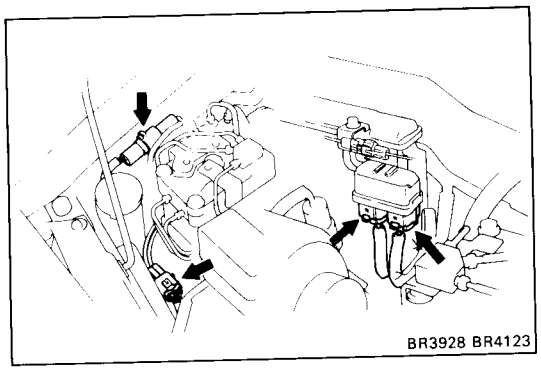
(a) Install the actuator to the actuator bracket in place.

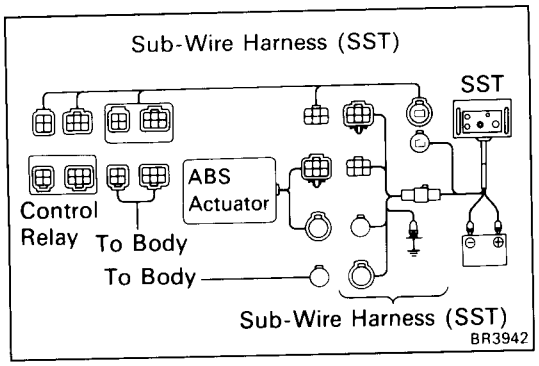
(b) Install the washers, wave washers and nuts.

(c) Tighten the three nuts.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

HINT: Before installing the front right side nut, install the motor ground terminal between the plate washer and spring washer.


BR3928 BR4123



INSPECTION OF ABS ACTUATOR OPERATION

1. **INSPECT BATTERY VOLTAGE**

   Battery voltage: 10 – 14.5 V

2. **REMOVE ACTUATOR COVER**

3. **DISCONNECT CONNECTORS**

   Disconnect the four connectors from the actuator and control relay.

4. **CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR**

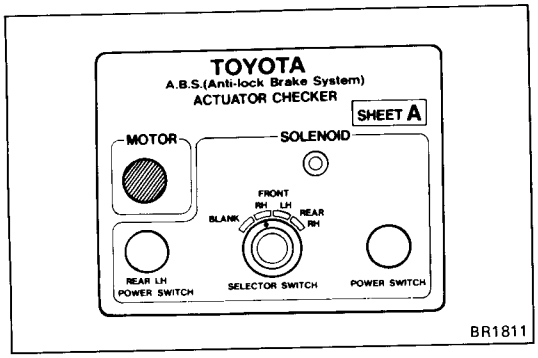
   (a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub-wire harness (SST) as shown.

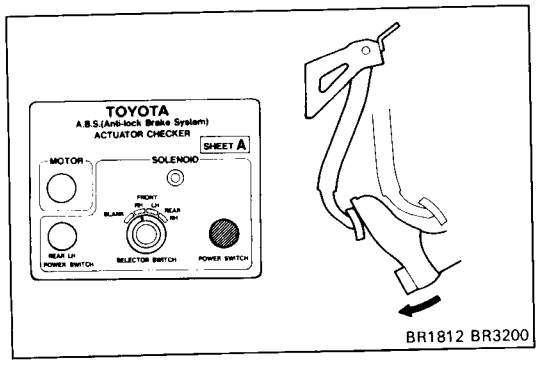
   SST 09990-00150 and 09990-00200

   (b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (–) terminal. Connect the black cable of the sub-wire harness to the battery negative (–) terminal or body ground.

   (c) Place the "SHEET A" (SST) on the actuator checker.

   SST 09990-00163





5. **INSPECT BRAKE ACTUATOR OPERATION**

   (a) Start the engine, and run it at idle.

   (b) Turn the selector switch of the actuator checker to "FRONT RH" position.

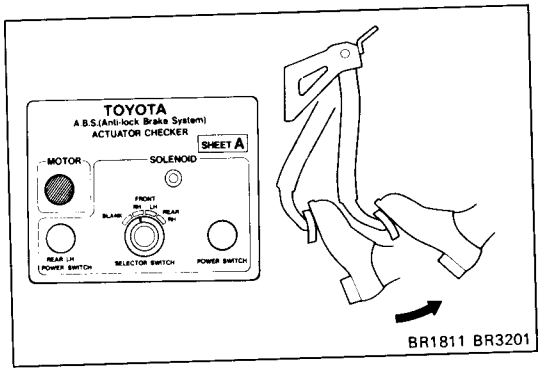
   (c) Push and hold in the MOTOR switch for a few seconds.

   (d) Depress the brake pedal and hold it until the step (g) is completed.

   (e) Push the POWER SWITCH, and check that the brake pedal does not go down.

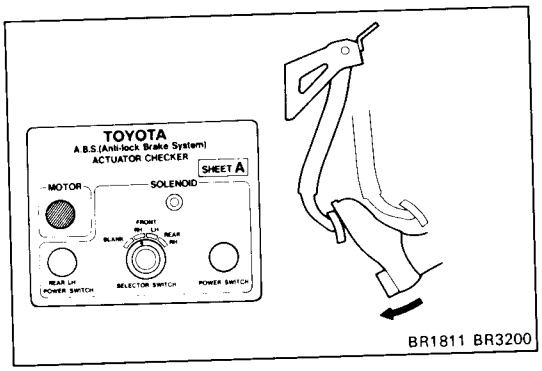
   NOTICE: Do not keep the POWER SWITCH pushing more than 10 seconds.

   (f) Release the switch, and check that the pedal go down.



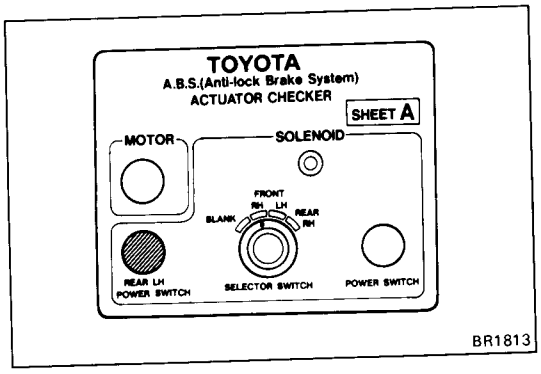
(g) Push and hold in the MOTOR switch for a few seconds, and check that the pedal returns.

(h) Release the brake pedal.



(i) Push and hold in the MOTOR switch for a few seconds.

(j) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.



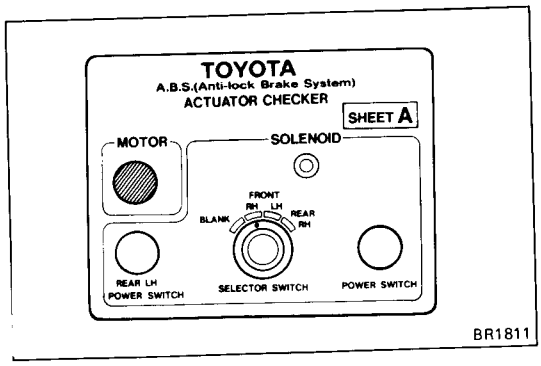
6. INSPECT FOR OTHER WHEELS

(a) Turn the selector switch to "FRONT LH" position.

(b) Repeating (c) to (j) of the step 5, check the actuator operation similarly.

(c) Similarly, inspect "REAR RH" and "REAR LH" position.

HINT: When inspecting "REAR LH" position, push the REAR LH switch instead of the POWER SWITCH, and you can inspect in any selector switch position.



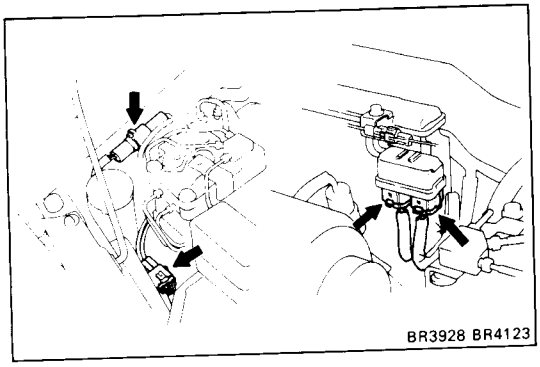
7. PUSH MOTOR SWITCH

Push and hold in the MOTOR switch for a few seconds.

8. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

(a) Remove the "SHEET A" (SST) and disconnect the actuator checker (SST) and sub-wire harness (SST) from the actuator, control relay and body side wire harness.

SST 09990-00150, 09990-00200 and 09990-00163



9. CONNECT ACTUATOR CONNECTORS

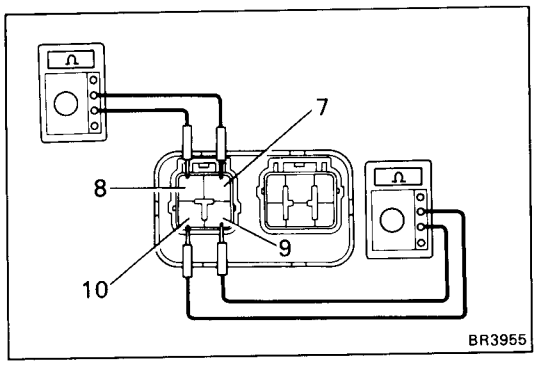
Connect the four connectors to actuator and control relay.

10. INSTALL CONNECTOR

Install the connector to the actuator bracket.

11. INSTALL ACTUATOR COVER

12. CLEAR DIAGNOSTIC CODES
(See page BR-9)



Control Relay

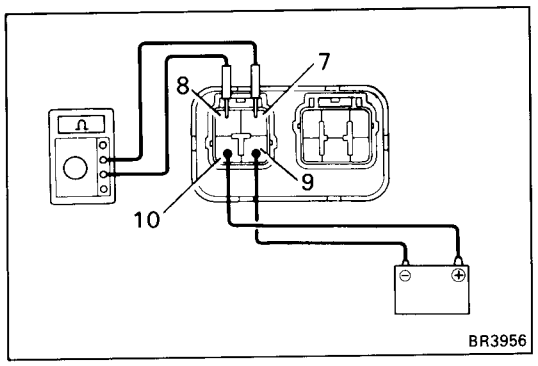
INSPECTION OF CONTROL RELAY

1. INSPECT CONTINUITY OF MOTOR RELAY CIRCUIT

(a) Check that there is continuity between terminals 9 and 10.

(b) Check that there is no continuity between terminals 7 and 8.

If continuity is not as specified, replace the relay.

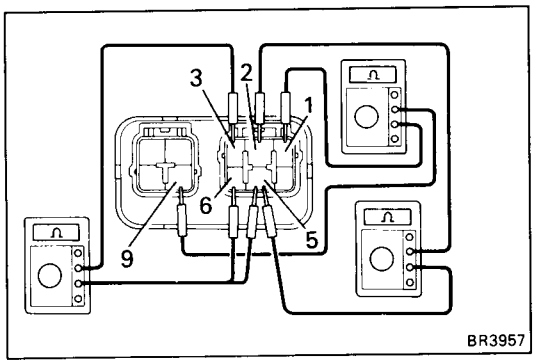


2. INSPECT OPERATION OF MOTOR RELAY CIRCUIT

(a) Connect the positive (+) lead from the battery to terminal 10 and negative (–) lead to terminal 9.

(b) Check that there is continuity between terminals 7 and 8.

If operation is not as specified, replace the relay.

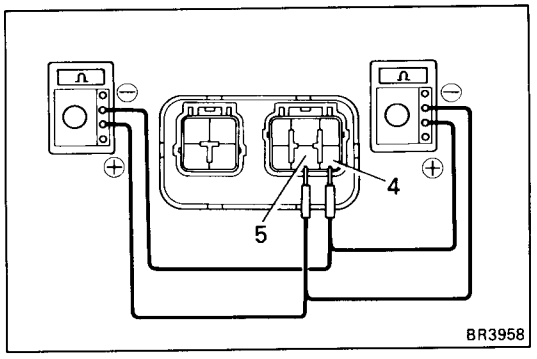


3. INSPECT CONTINUITY OF SOLENOID RELAY CIRCUIT

(a) Check that there is continuity between terminals 1 and 9.

(b) Check that there is no continuity between terminals 2 and 5.

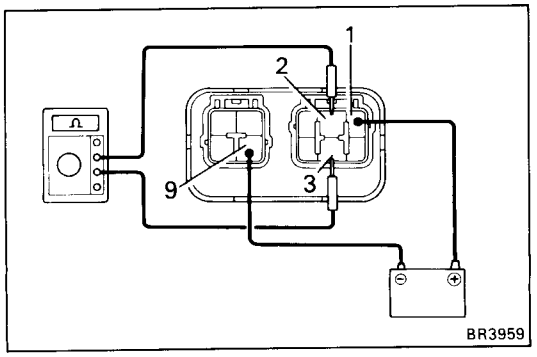
(c) Check that there is continuity between terminals 3 and 5 or 6.



(d) Connect the positive lead from the ohmmeter to terminal 5 and connect negative lead to terminal 4. Check that there is continuity between terminals.

(e) Connect the two leads in reverse, and check that there is no continuity between terminals.

If continuity is not as specified, replace the relay.



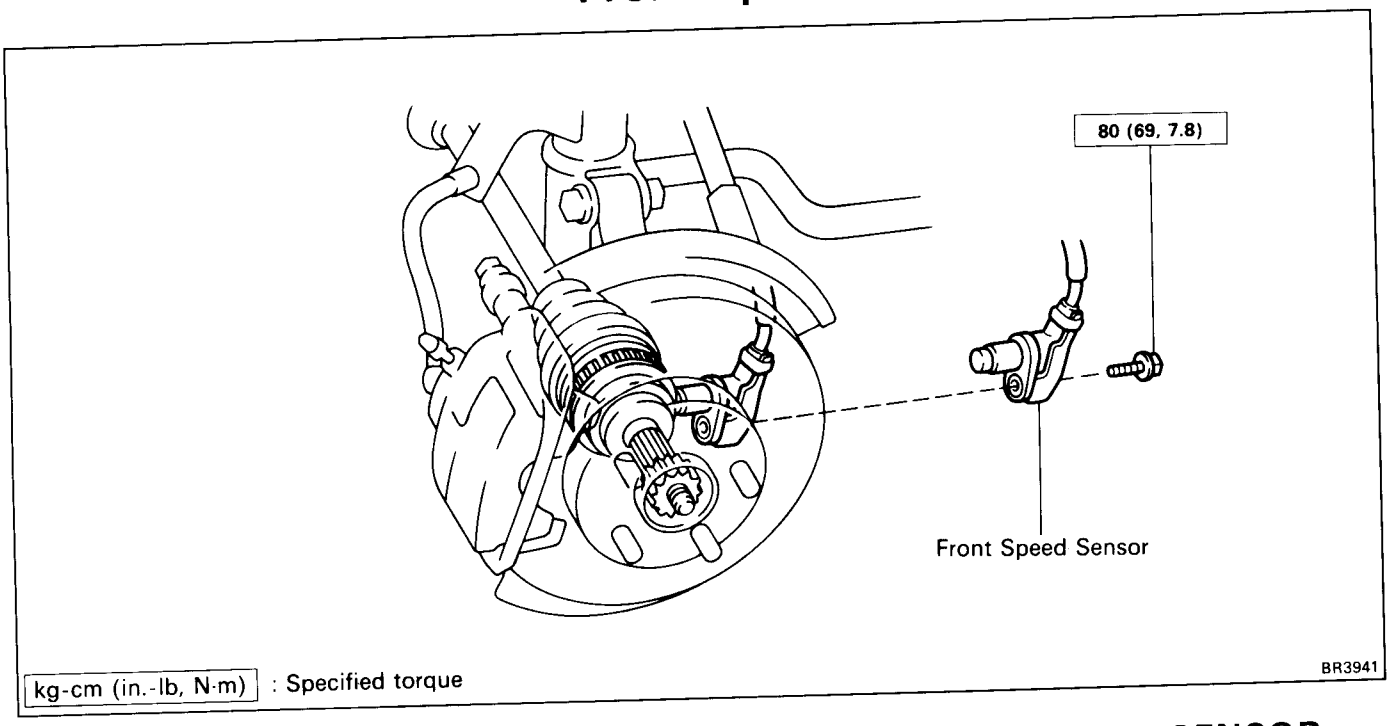
4. INSPECT OPERATION OF SOLENOID RELAY CIRCUIT

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 9.

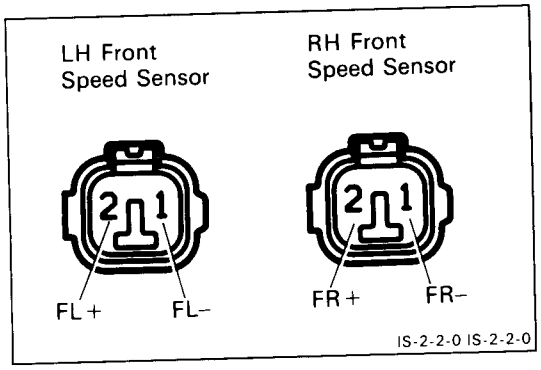
(b) Check that there is continuity between terminals 2 and 5.

If operation is not as specified, replace the relay.

Front Speed Sensor



kg-cm (in.-lb, N·m) : Specified torque



INSPECTION OF FRONT SPEED SENSOR

1. **INSPECT SPEED SENSOR**

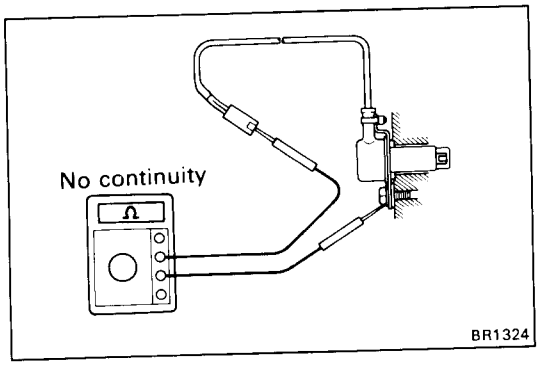
(a) Remove the bolt from the pipe clamp of the wire harness.

(b) Disconnect the speed sensor connector.

(c) Measure the resistance between terminals.

Resistance: 0.8 – 1.3 kΩ

If resistance value is not as specified, replace the sensor.

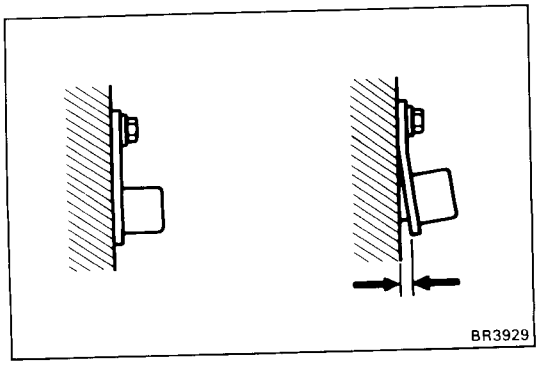


(d) Check that there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor.

(e) Connect the speed sensor connector.

(f) Install the bolt of the pipe clamp.



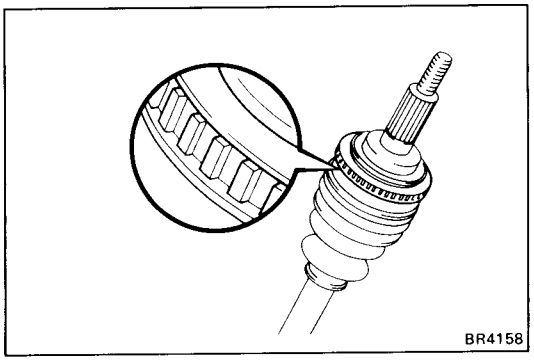
2. **INSPECT SENSOR INSTALLATION**

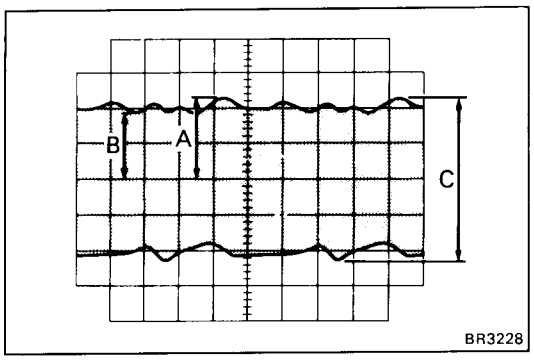
(a) Check that the sensor installation bolt is tighten properly. If not, tighten the bolt.

Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)

(b) Check that there is no clearance between the sensor and rear axle carrier as shown.

If there is clearance, replace the sensor.





3. **VISUALLY INSPECT SENSOR ROTOR SERRATIONS**

(a) Remove the drive shaft.
(See page SA-17 or 42)

(b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.

(c) Install the drive shaft.
(See page SA-17 or 42)

NOTICE: To prevent damage to the serrations, do not strike the drive shaft.

INSPECTION OF FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS (REFERANCE)

INSPECT FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

(a) Connect an oscilloscope to the speed sensor connector.

(b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.

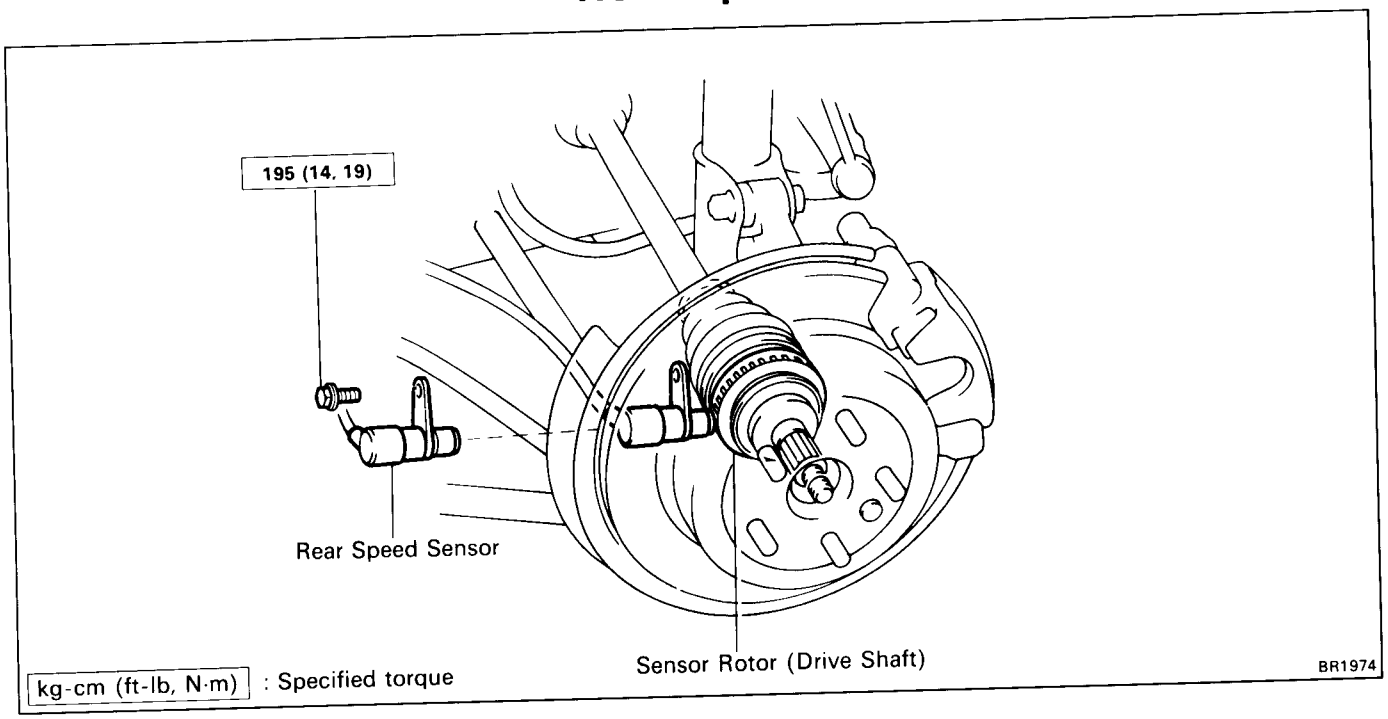
(c) Check that C is 0.5 V or more.

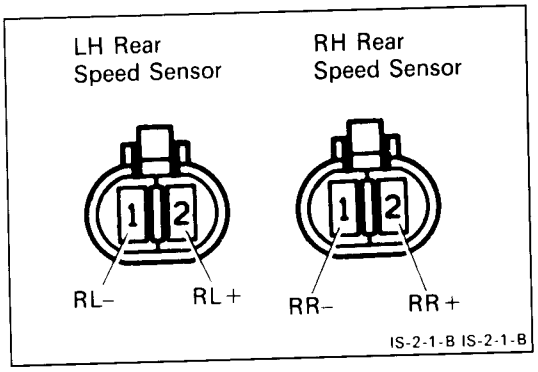
If not as specified, replace the speed sensor.

(d) Check that B is 70 % or more of A.

If not as specified, replace the drive shaft.

Rear Speed Sensor





INSPECTION OF REAR SPEED SENSOR

1. INSPECT SPEED SENSOR

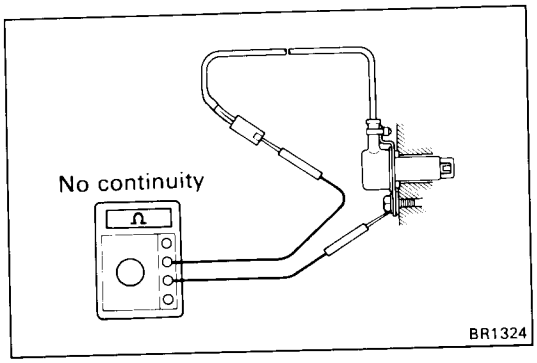
(a) Remove the seat cushion.

(b) Disconnect the speed sensor connector.

(c) Measure the resistance between terminals.

Resistance: 0.8 – 1.5 KΩ

If resistance value is not as specified, replace the sensor.

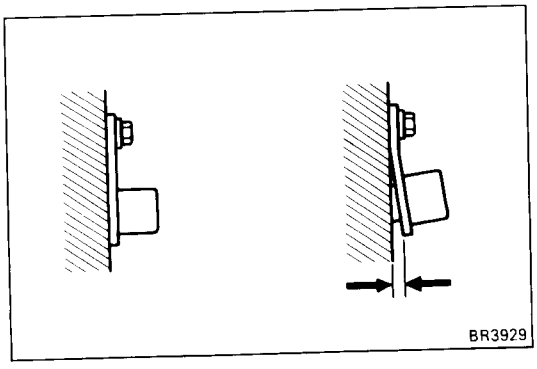


(d) Check that there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor.

(e) Connect the speed sensor connector.

(f) Install the seat cushion.



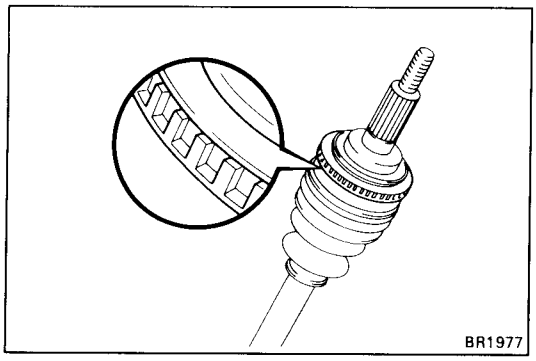
2. INSPECT SENSOR INSTALLATION

(a) Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 195 kg-cm (14 ft.-lb, 19 N·m)

(b) Check that there is no clearance between the sensor and rear axle carrier as shown.

If there is clearance, replace the sensor.



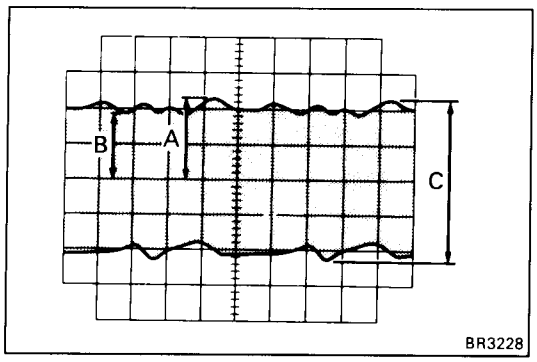
3. **VISUALLY INSPECT SENSOR ROTOR SERRATIONS**

(a) Remove the drive shaft.
(See page SA-87)

(b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.

(c) Install the drive shaft.
(See page SA-87)

NOTICE: To prevent damage to the serrations, do not strike the drive shaft.



INSPECTION OF REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS (REFERANCE)

INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

(a) Connect an oscilloscope to the speed sensor connector.

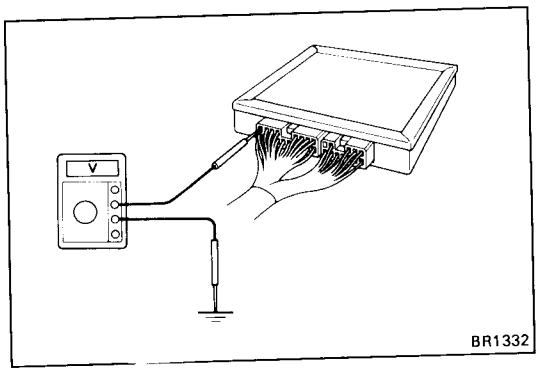
(b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.

(c) Check that C is 0.5 V or more.

If not as specified, replace the speed sensor.

(d) Check that B is 60 % or more of A.

If not as specified, replace the drive shaft.



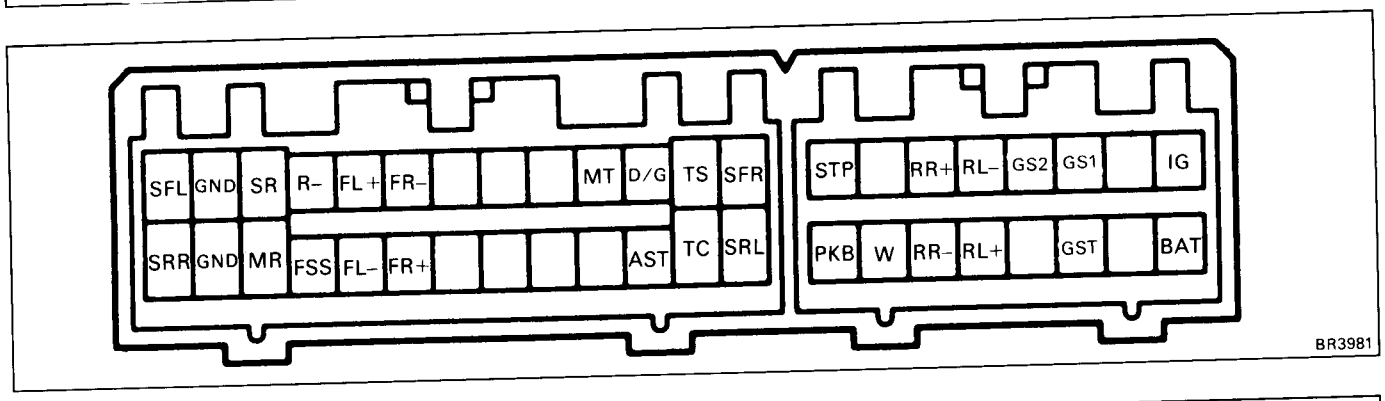
Anti-Lock Brake System Circuit

INSPECTION OF SYSTEM CIRCUIT

1. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CONNECTED

(a) Remove the ABS ECU.

(b) Using a voltmeter with high impedance (10 K ohm/V minimum), measure the voltage at each terminal and body ground.



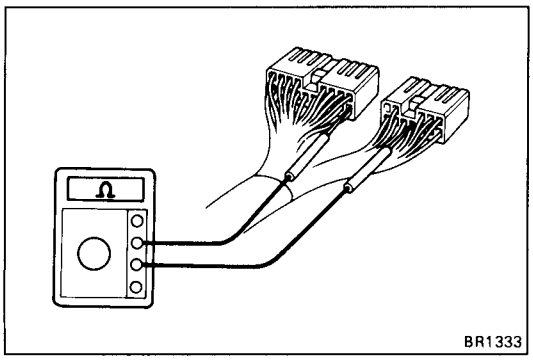
Tester Connection	Check Item	Condition	Specified Value	Trouble Part
IG	Voltage	IG switch on	Battery voltage	ECU-IG Fuse
GS1	Voltage	IG switch on	4 ~ 6 V	Deceleration Sensor
GS2	Voltage	IG switch on	4 ~ 6 V	
RL–	Continuity	IG switch off	Continuity	ABS ECU
STP	Voltage	IG switch off and brake pedal depressed	Battery voltage	Stop light switch Stop light
	Continuity	IG switch off and brake pedal returned	Continuity	
BAT	Voltage	IG switch off	Battery voltage	DOME Fuse
RR–	Continuity	IG switch off	Continuity	ABS ECU
W	Voltage	IG switch on and "ABS" warning light goes on	About 0V	ABS ECU "ABS" warning light
		IG switch on and "ABS" warning light goes off	Battery voltage	
PKB	Voltage	IG switch on and PKB lever pulled	About 0V	Parking brake switch Level warning switch
		IG switch on and PKB lever returned	Battery voltage	
SFR	Voltage	IG switch on and "ABS" warning light goes on	About 0V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	
TS	Voltage	IG switch on and check connector Ts-E_1 not connected	Battery voltage	ABS ECU
		IG switch on and check connector Ts-E_1 connected	About 0V	
D/G	Voltage	IG switch on and check connector Ts-E_1 not connected	About 0V	
FR–	Continuity	IG switch off	Continuity	
R–	Continuity	IG switch off	Continuity	ABS ECU
SR	Voltage	IG switch on and "ABS" warning light goes on	About 0V	
		IG switch on and "ABS" warning light goes off	Battery voltage	
GND	Continuity	IG switch off	Continuity	Wiring harness
SFL	Voltage	IG switch on and "ABS" warning light goes on	About 0V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	

Continued on page BR-32

Continued from page BR-31

Tester Connection	Check Item	Condition	Specified Value	Trouble Part
SRL	Voltage	IG switch on and "ABS" warning light goes on	About 0V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	
TC	Voltage	IG switch on and check connector Ts-E_1 not connected	Battery voltage	ABS ECU
		IG switch on and check connector Ts-E_1 connected	About 0V	
AST	Voltage	IG switch on and "ABS" warning light goes on	About 0V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	
FL–	Continuity	IG switch off	Continuity	ABS ECU
FSS	Continuity	IG switch off	Continuity	
SRR	Voltage	IG switch on and "ABS" warning light goes on	About 0V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.



2. INSPECT SYSTEM CIRCUIT WITH CONNECTOR DISCONNECTED

(a) Disconnect the connectors from the ECU, inspect at the wire harness side connector.

Tester Connection	Check Item	Specified Value	Trouble Part	Tester Connection	Check Item	Specified Value	Trouble Part
RR+ ↔ RR–	Resistance	0.8 ~ 1.5 kΩ	Rear RH speed sensor	SFL ↔ AST	Resistance	About 6 Ω	Actuator
RL+ ↔ RL–	Resistance	0.8 ~ 1.5 kΩ	Rear LH speed sensor	SRL ↔ AST	Resistance	About 6 Ω	Actuator
SFR ↔ AST	Resistance	About 6 Ω	Actuator	AST ↔ Body ground	Resistance	About 5 Ω	Actuator
MT ↔ Body ground	Continuity	Continuity	Actuator	FR+ ↔ FR–	Resistance	0.8 ~ 1.3 Ω	Front RH speed sensor
FL+ ↔ FL–	Resistance	0.8 ~ 1.3 kΩ	Front LH speed sensor	MR ↔ R–	Resistance	50 ~ 80 Ω	Control relay
SR ↔ R–	Resistance	60 ~ 100 Ω	Control relay	SRR ↔ AST	Resistance	About 6 Ω	Actuator

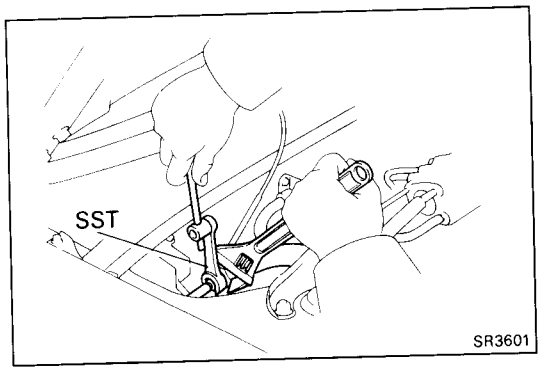
If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.

(b) Connect the connectors, and install the ECU in place.

STEERING

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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



POWER STEERING

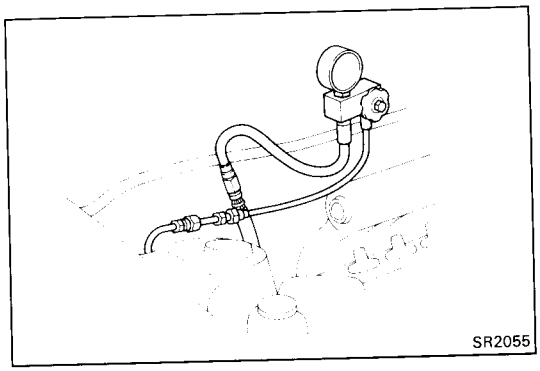
On-Vehicle Inspection

OIL PRESSURE CHECK

1. **CONNECT PRESSURE GAUGE**

   (a) Using SST, disconnect the pressure line joint.

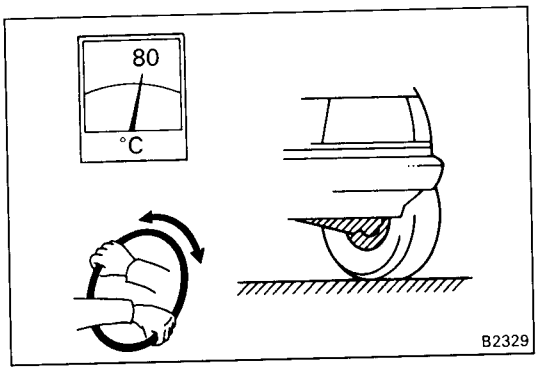
   SST 09631-22020



   (b) Connect the gauge side of the pressure gauge to the PS pump side, and the valve side to the gear housing side.

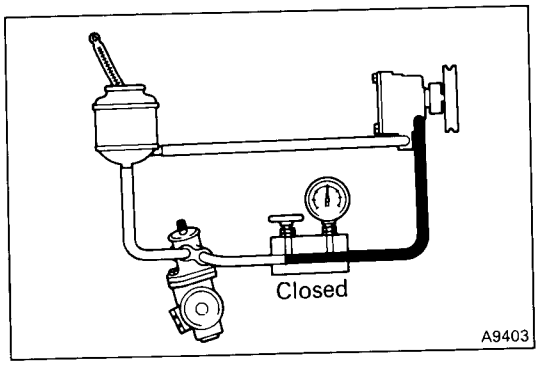
   (c) Bleed the system. Start the engine and turn the steering wheel from lock to lock two or three times.

   (d) Check that the fluid level is correct.



2. **CHECK THAT FLUID TEMPERATURE IS AT LEAST 80°C (176°F)**

3. **START ENGINE AND RUN IT AT IDLE**



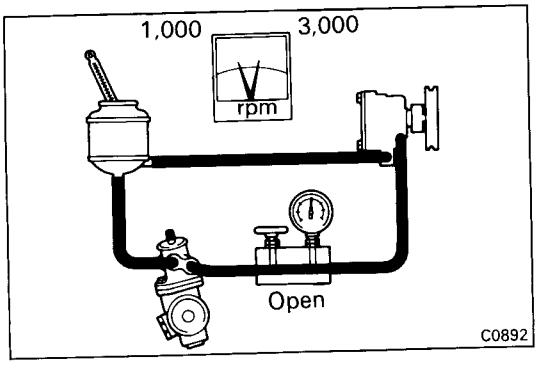
4. **CHECK FLUID PRESSURE READING WITH VALVE CLOSED**

   Close the pressure gauge valve and observe the reading on the gauge.

   Minimum pressure: 80 kg/cm² (1,138 psi, 7,845 kPa)

   NOTICE:
   - **Do not keep the valve closed for more than 10 seconds.**
   - **Do not let the fluid temperature become too high.**

   If pressure is low, repair or replace the PS pump.



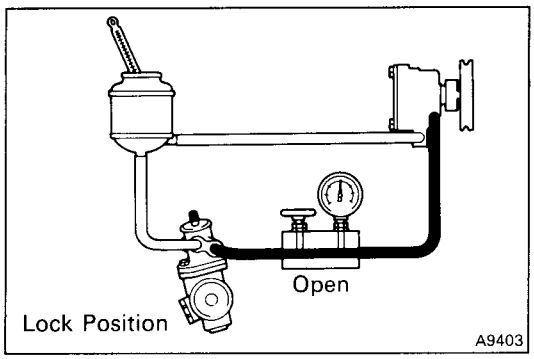
5. **OPEN VALVE FULLY**

6. **CHECK AND RECORD PRESSURE READING AT 1,000 RPM**

7. **CHECK AND RECORD PRESSURE READING AT 3,000 RPM**

   Check that there is 5 kg/cm² (71 psi, 490 kPa) or less difference in pressure between the 1,000 rpm and 3,000 rpm checks.

   If the difference is excessive, repair or replace the flow control valve of the PS pump.



8. CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK

Be sure the pressure gauge valve is fully opened and the engine idling.

Minimum pressure: 80 kg/cm² (1,138 psi, 7,845 kPa)

NOTICE:

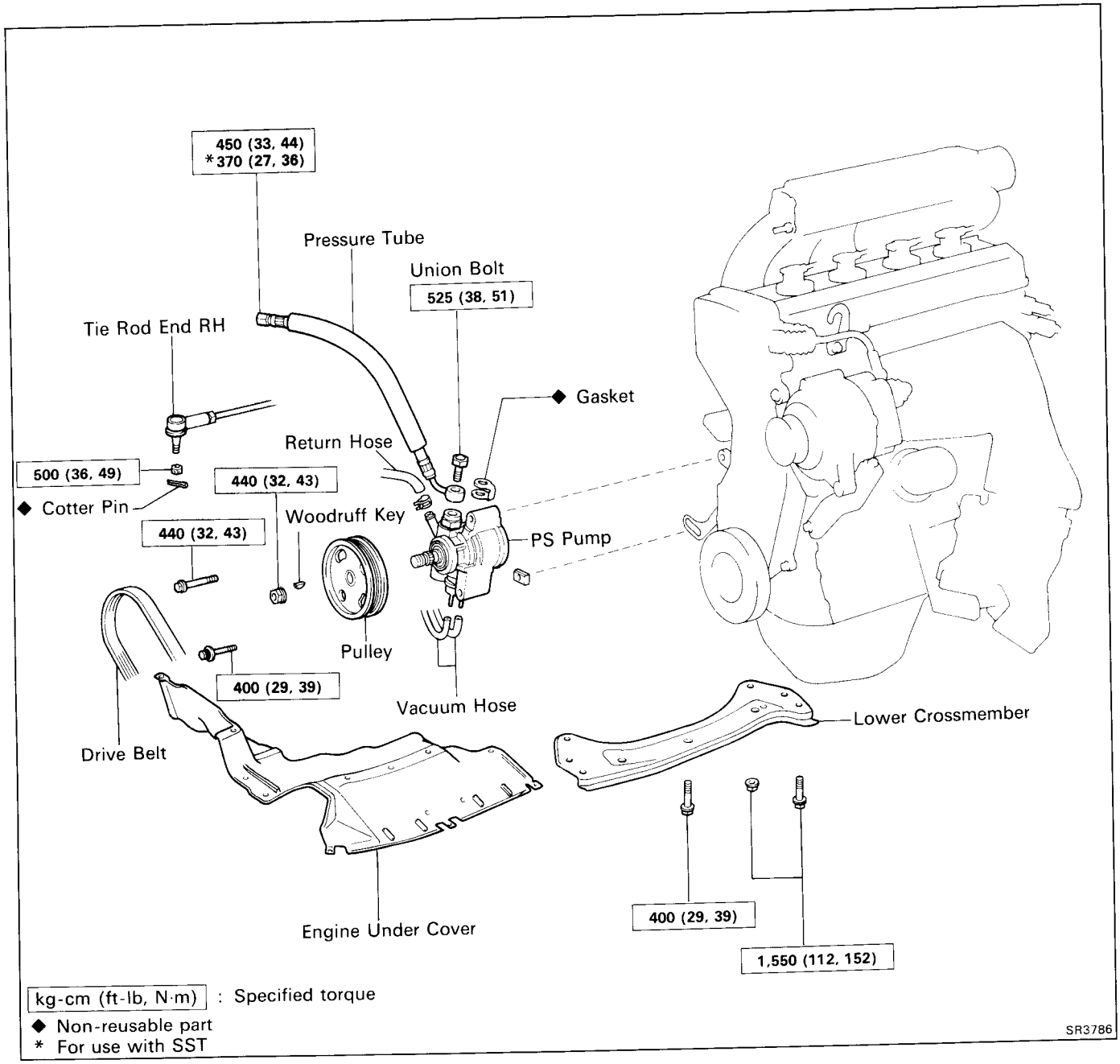
- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

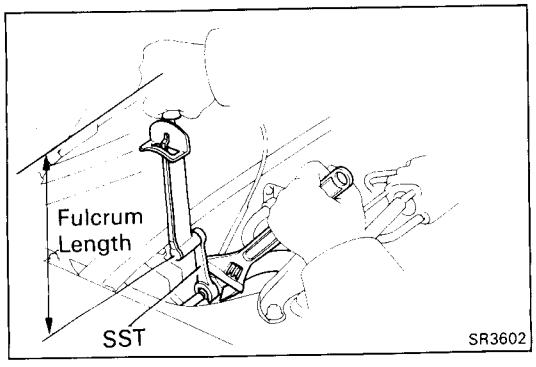
If pressure is low, the gear housing has an internal leak and must be repaired or replaced.

Power Steering Pump

REMOVAL AND INSTALLATION OF POWER STEERING PUMP

Remove and install the parts as shown.





(MAIN POINTS OF REMOVAL AND INSTALLATION)

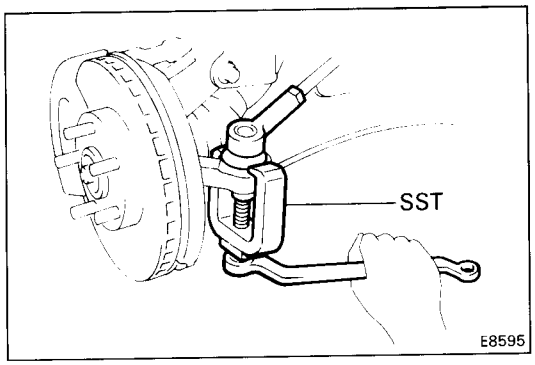
1. DISCONNECT AND CONNECT PRESSURE LINE

Using SST, disconnect and connect the pressure line.

SST 09631-22020

Torque: 370 kg-cm (27 ft-lb, 36 N·m)

HINT: When connecting, use a torque wrench with a fulcrum length of 300 mm (11.81 in.).

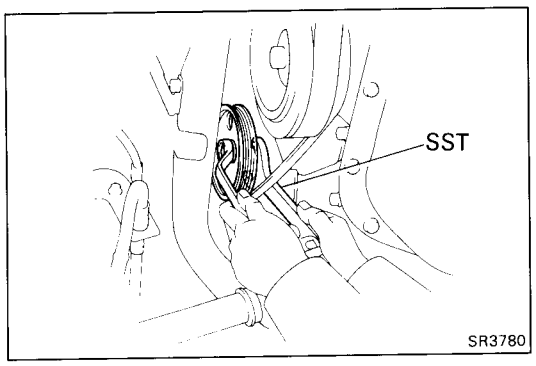


2. **DISCONNECT TIE ROD END RH**

(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the tie rod end RH.

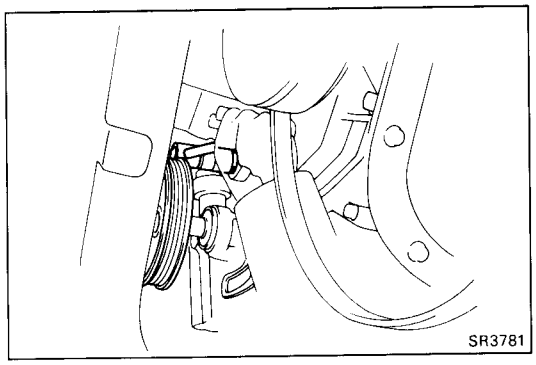
SST 09611-22012



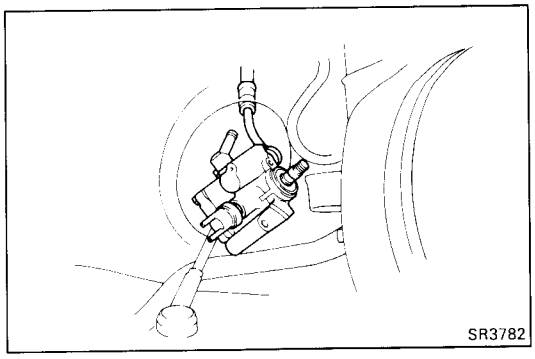
3. **REMOVE PS PUMP WITH PRESSURE TUBE**

(a) Using SST to hold the pulley, loosen the pulley set nut.

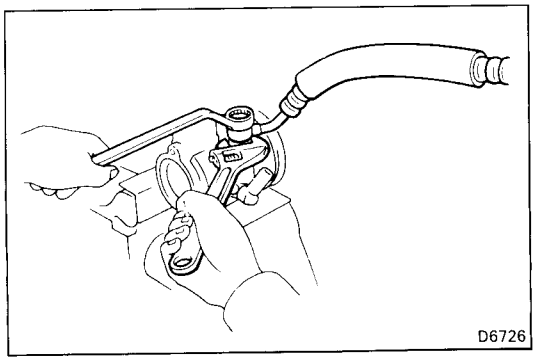
SST 09616-30020



(b) Slide the pump pulley, and loosen the through bolt.



(c) Remove the PS pump from the tie rod end hole.

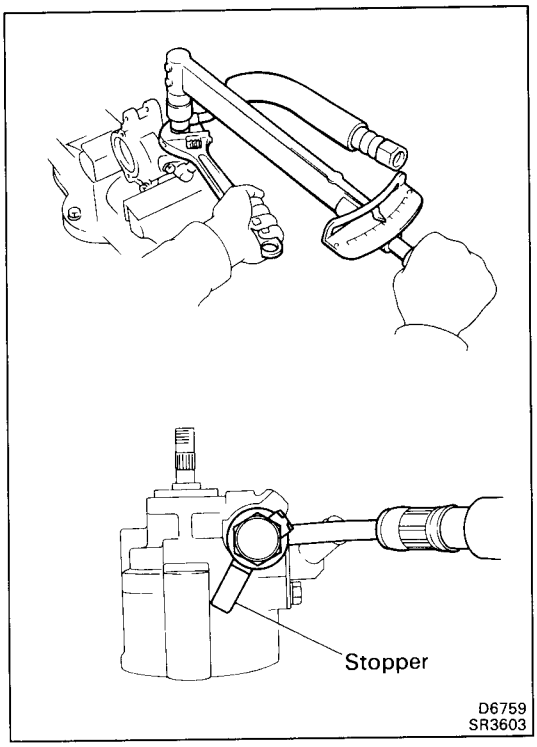


4. **REMOVE PRESSURE TUBE**

(a) Mount the PS pump in the vise.

NOTICE: Do not tighten the vise too tight.

(b) Remove the union bolt and pressure tube.



5. **INSTALL PRESSURE TUBE**

(a) Install the pressure tube with the union bolt and a new gasket.

(b) Make sure the stopper is touching the pump housing as shown, then torque the union bolt.

Torque: 525 kg-cm (38 ft-lb, 51 N·m)

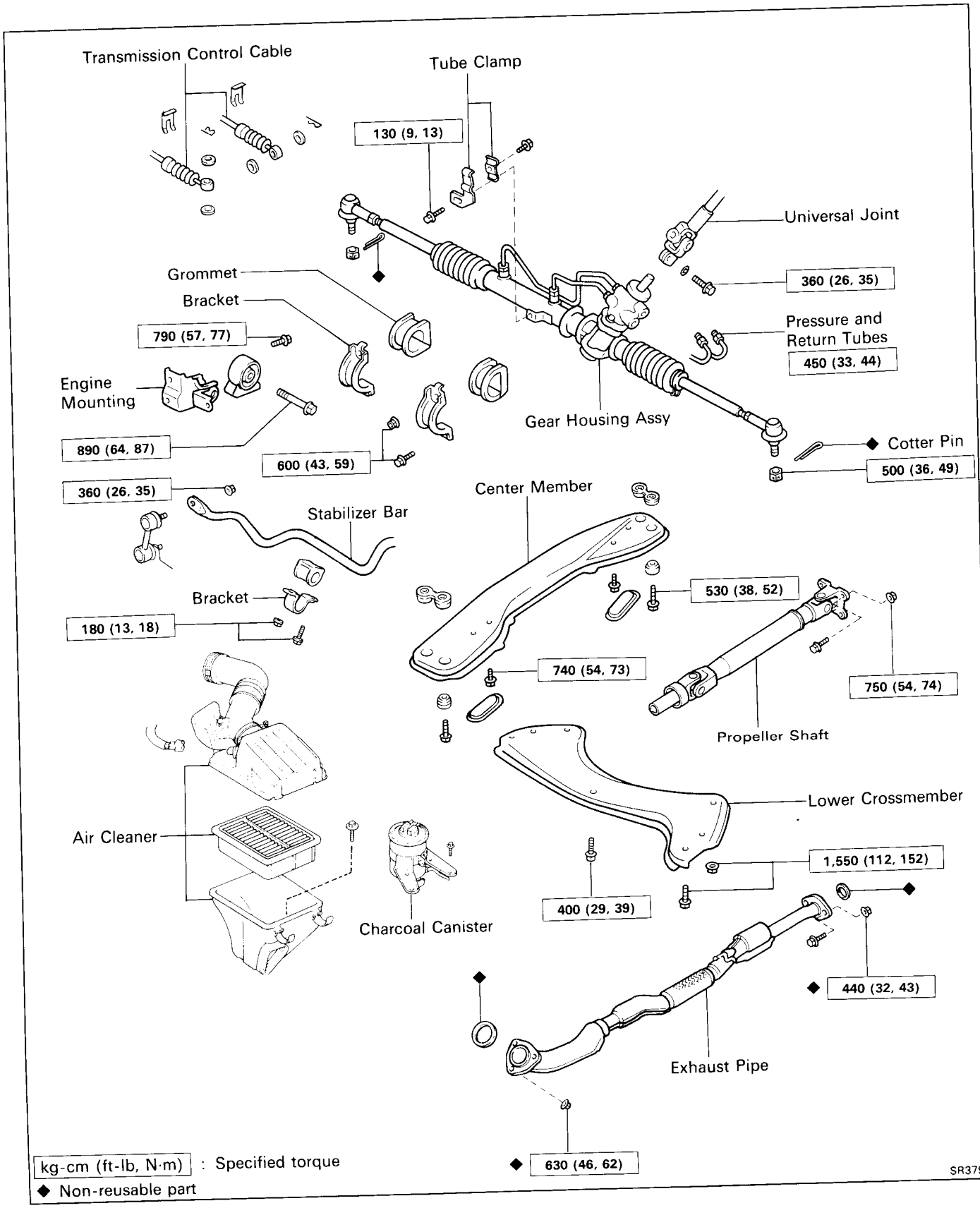
6. **ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP**

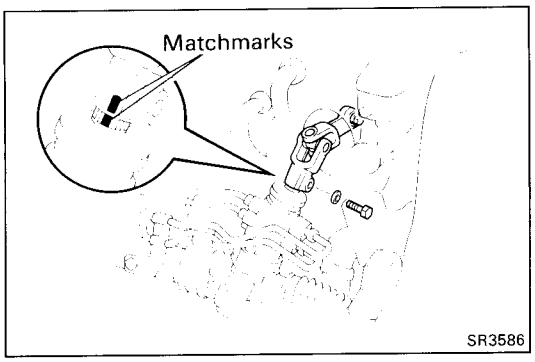
7. **BLEED POWER STEERING SYSTEM**

Gear Housing

REMOVAL AND INSTALLATION OF STEERING GEAR HOUSING

Remove and install the parts as shown.



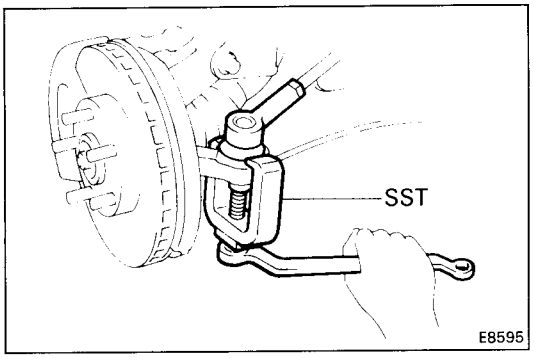


(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. DISCONNECT UNIVERSAL JOINT

(a) Place matchmarks on the universal joint and control valve shaft.

(b) Loosen the bolt on the upper side of the universal joint, remove the bolt on the lower side and disconnect the universal joint.

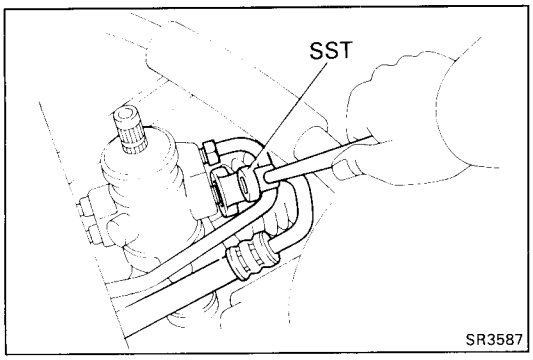


2. DISCONNECT TIE ROD ENDS

(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the tie rod end from the knuckle arm.

SST 09611-22012

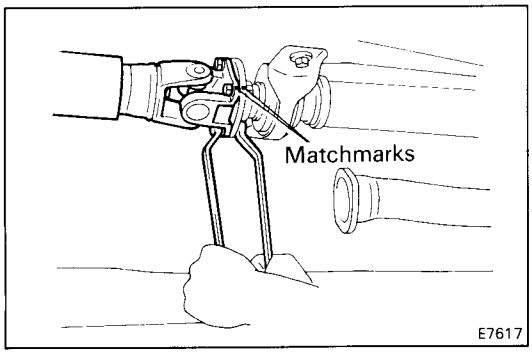


3. DISCONNECT AND CONNECT PRESSURE AND RETURN LINE

Using SST, disconnect and connect the pressure and return line.

SST 09631-22020

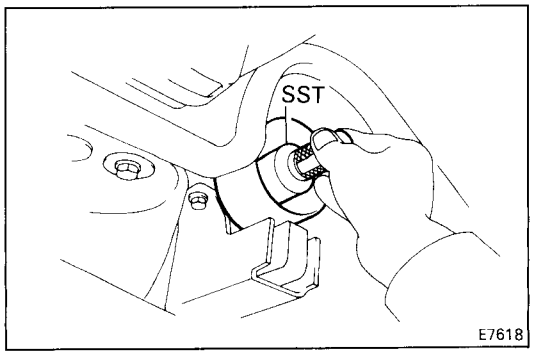
Torque: 450 kg-cm (33 ft-lb, 44 N·m)



4. REMOVE PROPELLER SHAFT

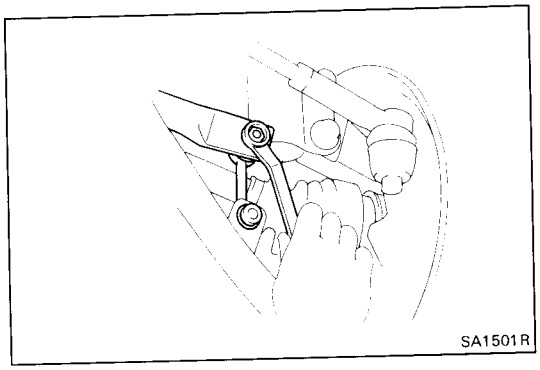
(a) Place matchmarks to the propeller shaft flange and intermediate shaft flange.

(b) Remove the four bolts and nuts.

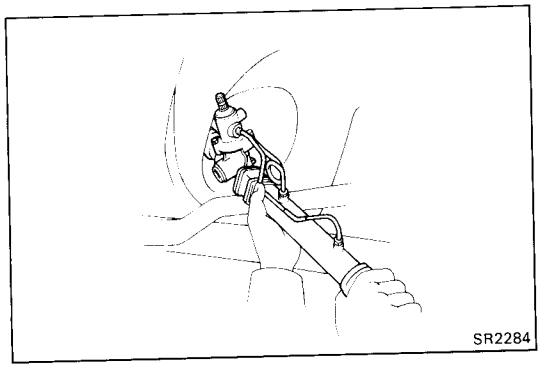


(c) Pull out the propeller shaft and insert SST.

SST 09325-20010



5. **DISCONNECT STABILIZER BAR RH**
   (a) Remove the stabilizer bar bracket RH.
   (b) Disconnect the stabilizer bar from the link.



6. **REMOVE GEAR HOUSING**
   (a) Remove the two bolts, two nuts and the two brackets.
   (b) Remove the PS tube clamp bolt.
   (c) Move the gear housing to the right side.
   (d) Remove the gear housing through the RH hole.

7. **CHECK STEERING WHEEL CENTER POINT**

8. **CHECK TOE-IN**

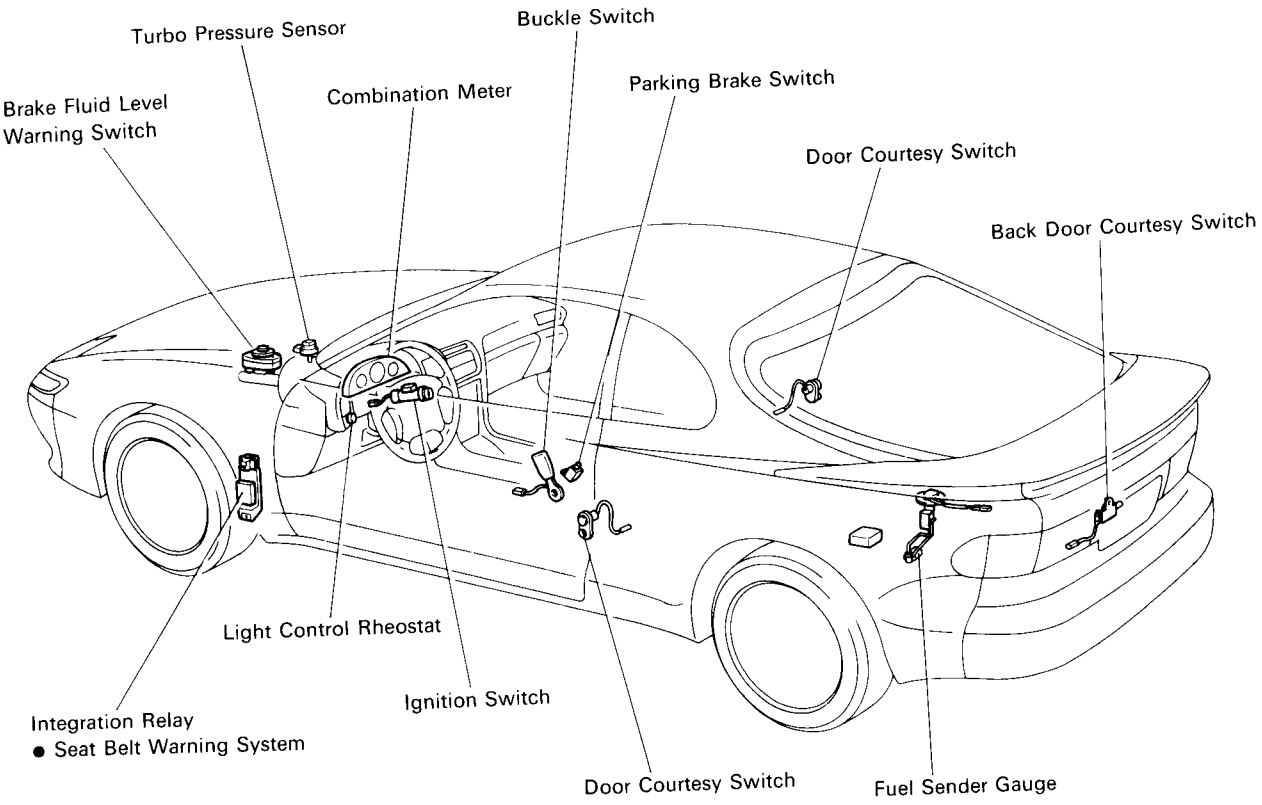
BODY ELECTRICAL SYSTEM

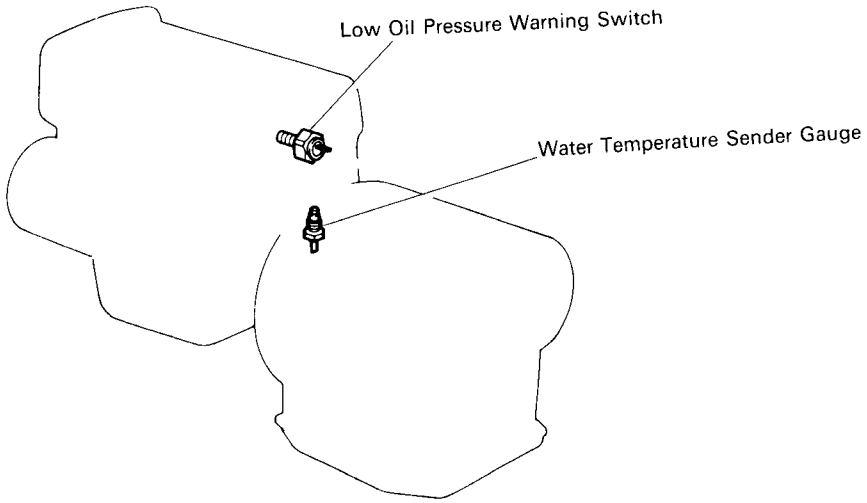
REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

COMBINATION METER

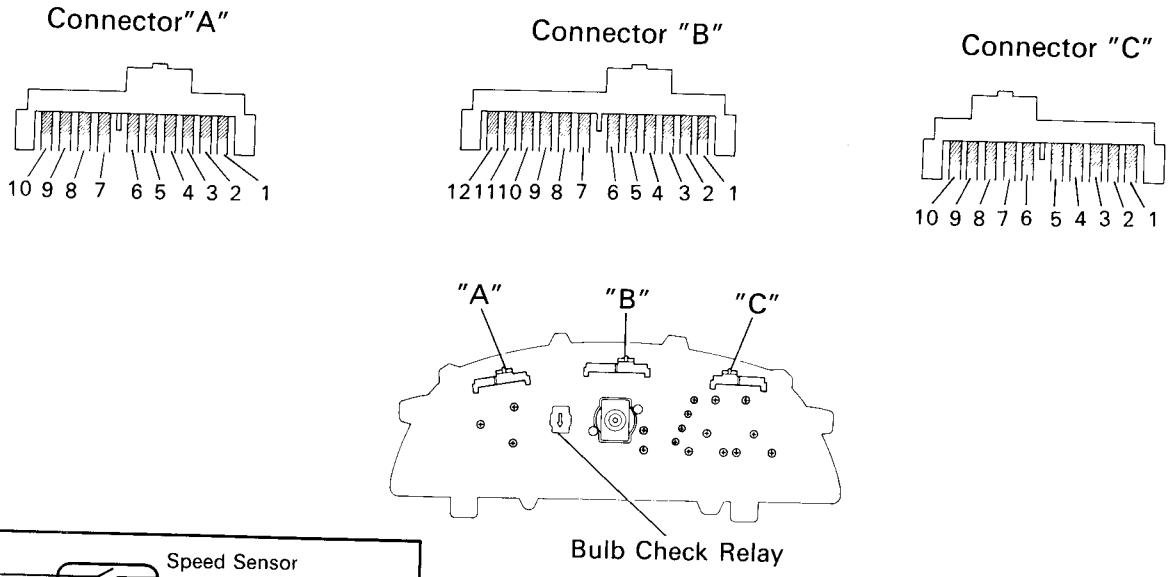
Parts Location

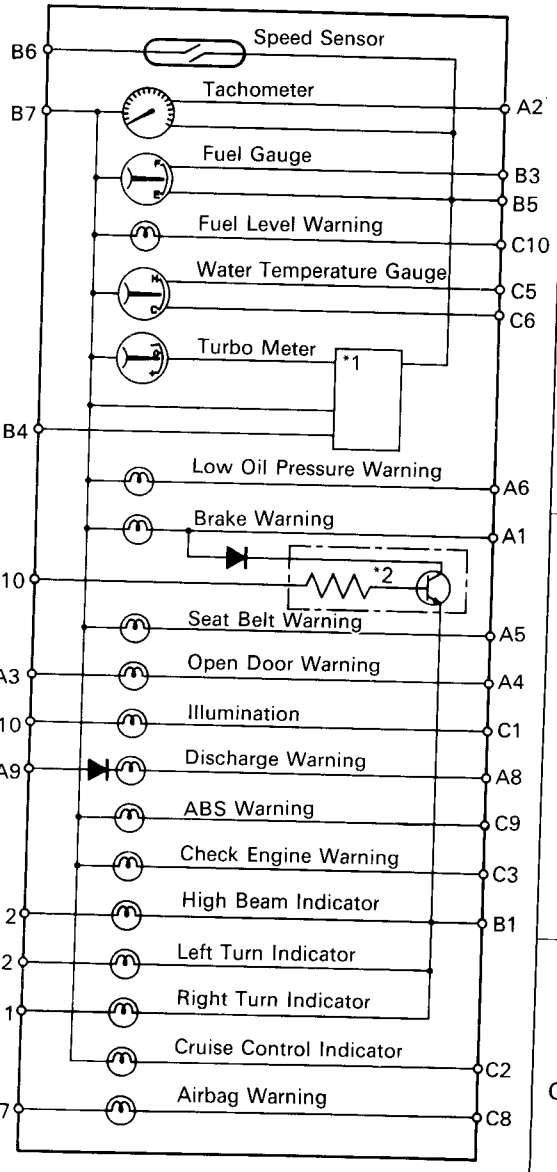




BE4537
BE4538

Meter Circuit





*1 Turbo Meter Drive Circuit
*2 Bulb Check Relay

BE4015 BE4016 BE4017 BE4689 BE4535

No.		Wiring connector side
A	1	Brake Fluid Level Warning Switch-terminal 1, and Parking Brake Switch
	2	Igniter
	3	Fuse DOME
	4	Door Courtesy Switch
	5	Integration Relay-terminal 4
	6	Low Oil Pressure Warning Switch
	8	Alternator-terminal "L"
	9	Fuse IGN
	10	Fuse TAIL
B	1	Ground
	2	Headlight Dimmer and Turn Signal Switch, and Hazard Warning Switch
	3	Fuel Sender Gauge-terminal 3
	4	Turbo Pressure sensor-terminal 2
	5	Ground
	6	Speed Control Unit
	7	Fuse Gauge
	10	Starter Relay
	11	Headlight Dimmer and Turn Signal Switch, and Hazard Warning Switch
	12	Headlight Dimmer and Turn Signal Switch, and Headlight LO (LH)
C	1	Light Control Rheostat-terminal 3
	2	Cruise Control ECU
	3	Engine ECU
	5	Ground
	6	Water Temperature Sender Gauge
	7	Fuse ECU-B
	8	Airbag ECU
	9	ABS ECU
	10	Fuel Sender Gauge-terminal 2

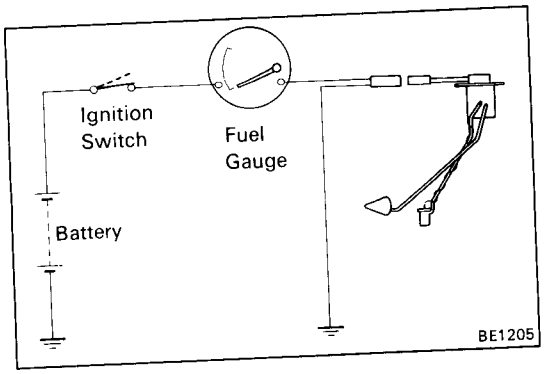
Troubleshooting

Problem	Possible cause	Remedy	Page
* Gauges and indicator lights do not operate	"GAUGE" fuse faulty Wiring or ground faulty	Replace fuse and check for short Repair as necessary	
Turbo meter does not operate	Turbo meter faulty Turbo pressure sensor faulty Turbo meter drive circuit faulty Wiring or ground faulty	Check turbo meter Check sensor Check drive circuit Repair as necessary	BE-7 BE-7, 8 BE-8
Fuel gauge does not operate	Receiver gauge faulty Sender gauge faulty Wiring or ground faulty	Check gauge Check gauge Repair as necessary	BE-4, 5 BE-5
Fuel level warning light does not light up	Bulb burned out Warning switch faulty Wiring or ground faulty	Replace bulb Check gauge Repair as necessary	BE-5, 6
Water temperature gauge does not operate	Receiver gauge faulty Sender gauge faulty Wiring or ground faulty	Check gauge Check gauge Repair as necessary	BE-6 BE-6

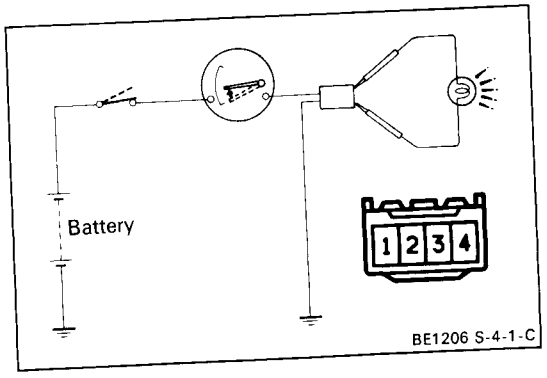
* Tachometer, Fuel Gauge, Fuel Level Warning Light, Water Temperature Gauge, Turbo Meter, Low Oil Pressure Warning Light, Brake Warning Light, Seat Belt Warning Light, ABS Warning Light, Check Engine Warning and Cruise Control Indicator light

Parts Inspection

Fuel Gauge System



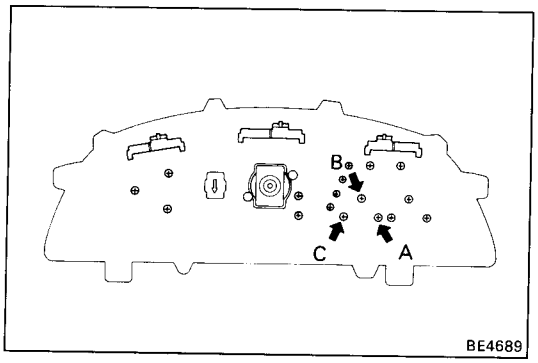
1. **INSPECT RECEIVER GAUGE (Operation)**
   (a) Disconnect the connector from the sender gauge.
   (b) Turn the ignition switch ON, Check that the receiver gauge needle indicates EMPTY.



   (c) Connect terminals 3 and 4 on the wire harness side connector through a 3.4 watts test bulb.
   (d) Turn the ignition switch ON, check that the bulb lights up and receiver gauge needle moves toward the full side.

HINT: Because of the silicon oil in the gauge, it will take a short time for the needle to stabilize.

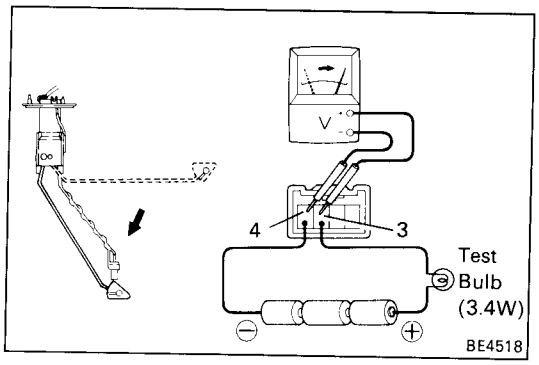
If operation is not as specified, inspect the receiver gauge resistance.



(Resistance)
Measure the resistance between terminals.

Between terminals	Resistance (Ω)
A – B	Approx. 83
A – C	Approx. 234
B – C	Approx. 151

If resistance value is not as specified, replace the receiver gauge.

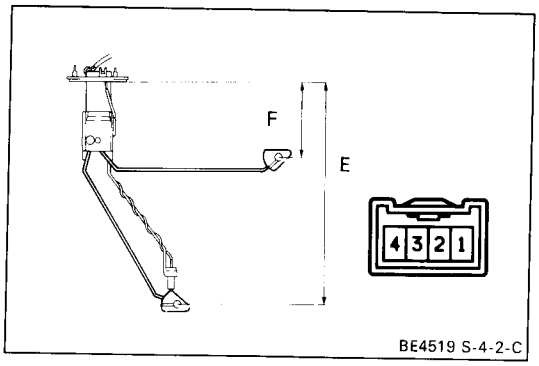


2. INSPECT SENDER GAUGE
(Operation)

(a) Connect a series of three 1.5 V dry cell batteries.

(b) Connect the positive (+) lead from the dry cellbatteries to terminal 3 through a 3.4 watts test bulb and the negative (–) lead to terminals 4.

(c) Check that the voltage rises between terminals 3 and 4 as the float is moved from the top to bottom position.

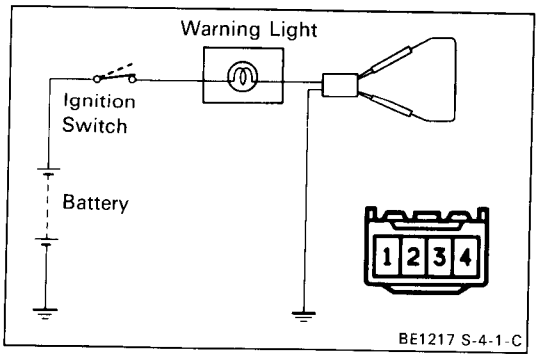


(Resistance)

Measure the resistance between terminals 3 and 4 for each float position.

Float position mm (in.)		Resistance (Ω)
F	Approx. 97.1 (3.823)	Approx. 3
E	Approx. 272.4 (10.724)	Approx. 110

If resistance value is not as specified, replace the sender gauge.



Fuel Level Warning System

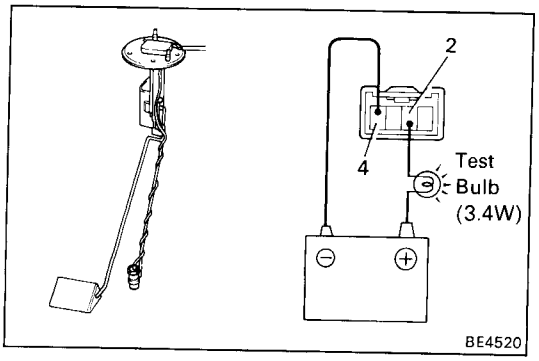
1. INSPECT WARNING LIGHT

(a) Disconnect the connector from the sender gauge.

(b) Connect terminals 2 and 4 on the wire harness side connector.

(c) Turn the ignition switch ON, check that the warning light lights up.

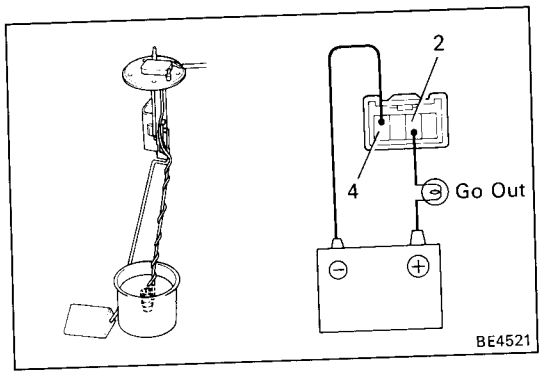
If the warning light does not light up, test the bulb.



2. INSPECT WARNING SWITCH

(a) Apply battery voltage between terminals 2 and 4 through a 3.4 watts test bulb, check that the bulb lights up.

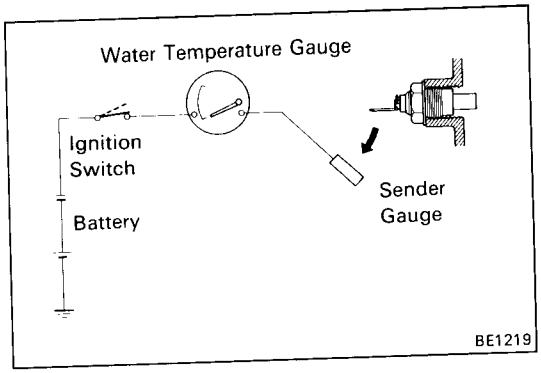
HINT: It will take a short time for the bulb to light up.



(b) Submerge the switch in fuel, check that the bulb goes out.

If operation is not as specified, replace the sender gauge.

Water Temperature Gauge System

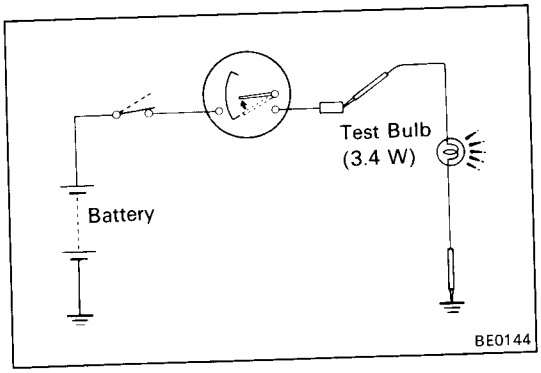


1. INSPECT RECEIVER GAUGE

(Operation)

(a) Disconnect the connector from the sender gauge.

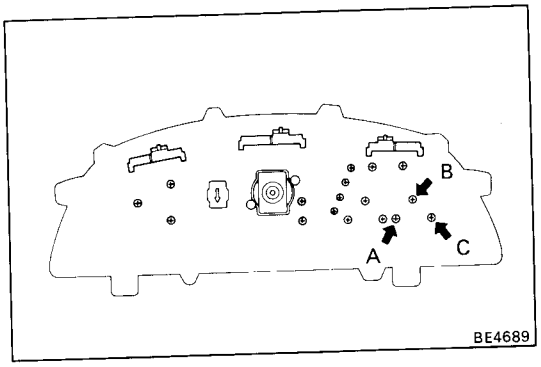
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates COOL.



(c) Ground terminal on the wire harness side connector through a 3.4 watts test bulb.

(d) Turn the ignition switch ON, check that the bulb lights up and receiver gauge needle moves toward the hot side.

If operation is not as specified, measure the receiver gauge resistance.



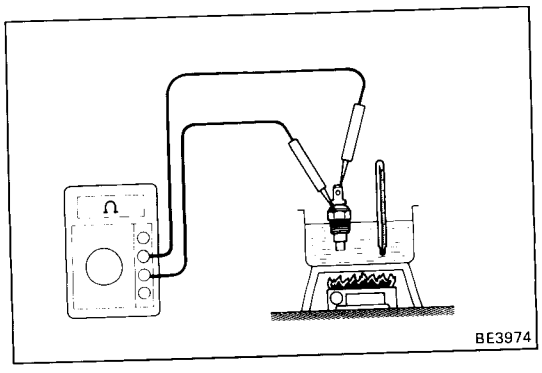
(Resistance)

Measure the resistance between terminals.

HINT: Connect the test leads so that the current from the ohmmeter can flow according to the chart order.

Between terminals	Resistance (Ω)
A → B	Approx. 198
A → C	Approx. 147
B → C	Approx. 51

If resistance value is not as specified, replace the receiver gauge.

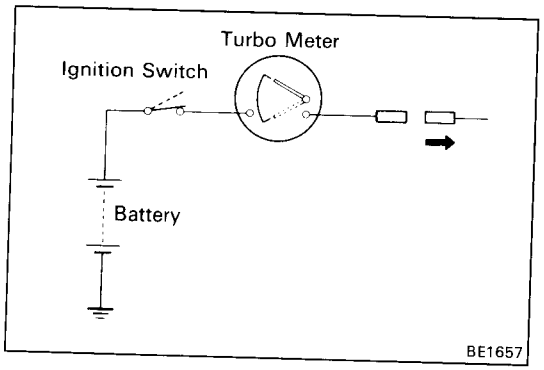


2. INSPECT SENDER GAUGE

Measure the resistance between terminal and the gauge body.

Water temperature °C (°F)	Resistance (Ω)
50 (122)	Approx. 226
115 (239)	Approx. 26

If resistance value is not as specified, replace the receiver gauge.

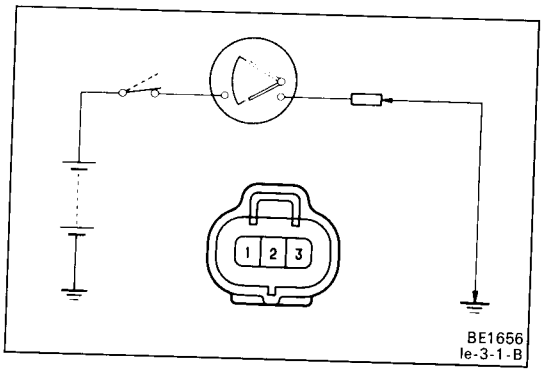


Turbo Meter System

1. **INSPECT TURBO METER (Operation)**

(a) Disconnect the connector from the pressure sensor.

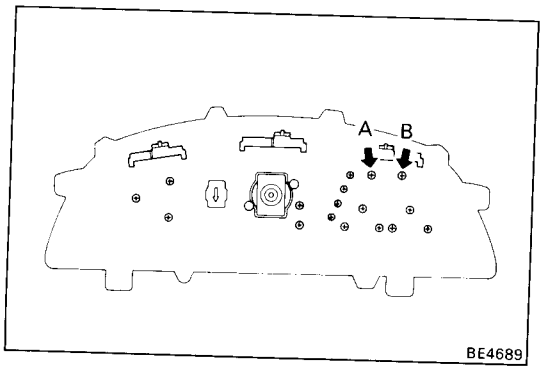
(b) Turn the ignition switch ON. Check that the meter needle moves to upper position.



(c) Ground terminal 2 on the wire harness side.

Check that the meter needle moves to lower position.

If operation is not as specified, inspect the turbo meter drive circuit and resistance.

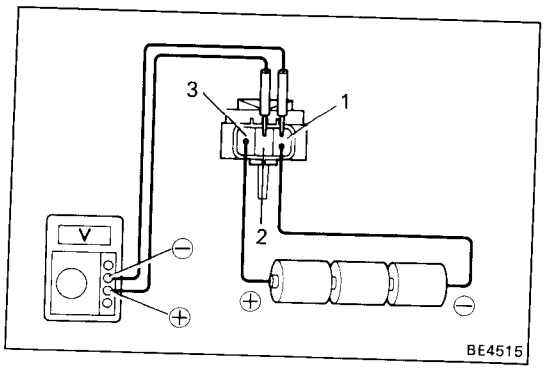


(Resistance)

Measure the resistance between terminals A and B.

Resistance: Approx. 72 Ω

If resistance value is not as specified, replace the turbo meter.



2. **INSPECT TURBO PRESSURE SENSOR**

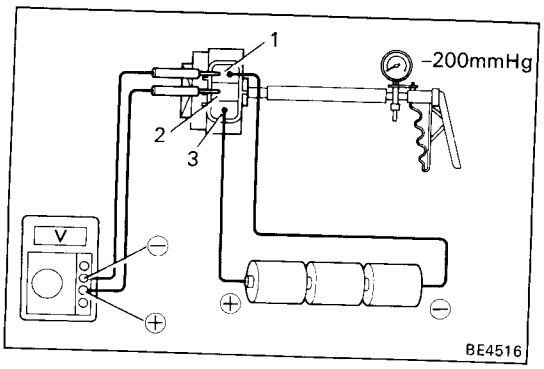
(a) Connect a series of three 1.5 V dry cell batteries.

(b) Connect the positive (+) lead from the dry cell batteries to terminal 3 and the negative (–) lead to terminal 1.

(c) Connect the positive (+) lead from the voltmeter to terminal 2 and the negative (–) lead to terminal 1.

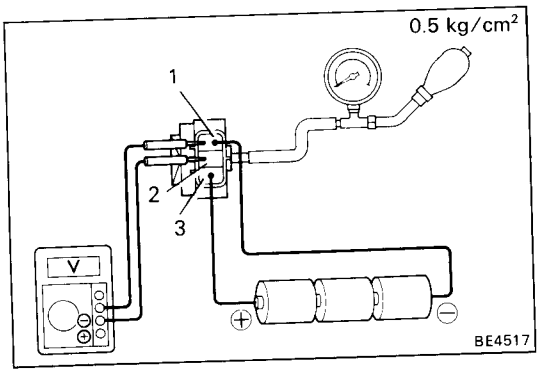
(d) Check that the voltage between terminals 2 and 1.

Voltage: Approx. 2.4 V



(e) Apply 200 mmHg (7.87 in.Hg. 26.7 kPa) of vacuum.

Check that the voltage drops below approximately 2.4 V.

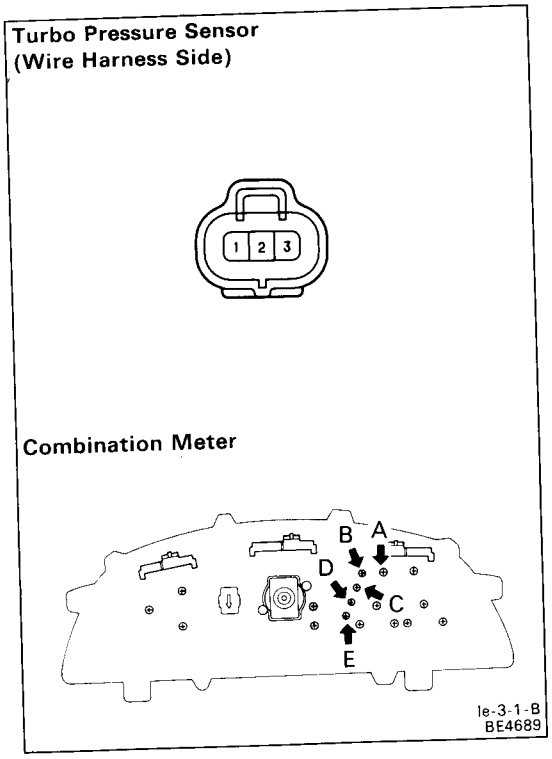


(f) Using SST, apply 0.5 kg/cm² (7.1 psi, 4.9 kPa) of pressure.

Check that the voltage rises approximately 2.4 V.

SST 09992-00241

If operations are not as specified, replace the sensor.



3. INSPECT TURBO METER DRIVE CIRCUIT

(a) Disconnect the connector from the turbo pressure sensor.

(b) Remove the combination meter with connected three connectors.

(c) Inspect the connector on the wire harness side and terminals of the turbo meter drive circuit as shown in the chart.

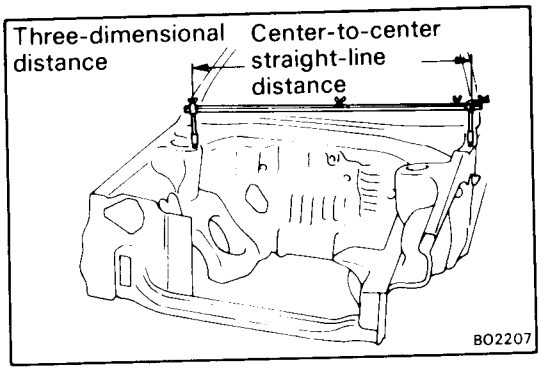
Check for	Tester connection	Condition		Specified value
Continuity	A – B	Constant		Continuity
	C – 2	Constant		Continuity
	D – Ground	Constant		Continuity
	I – Ground	Constant		Continuity
Voltage	E – Ground	Ignition Switch position	LOCK or ACC	No voltage
			ON	Battery voltage
	3 – Ground	Ignition switch position	LOCK or ACC	No voltage
			ON	Battery voltage

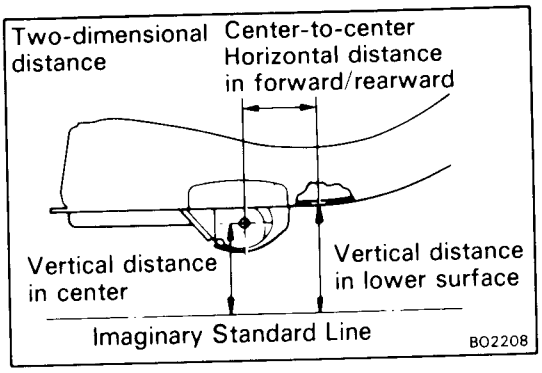
If circuit is as specified, replace the drive circuit.

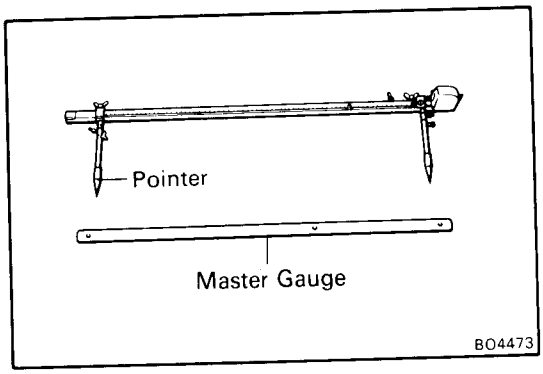
BODY

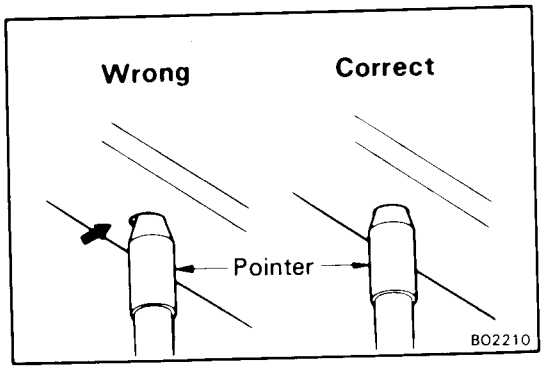
REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

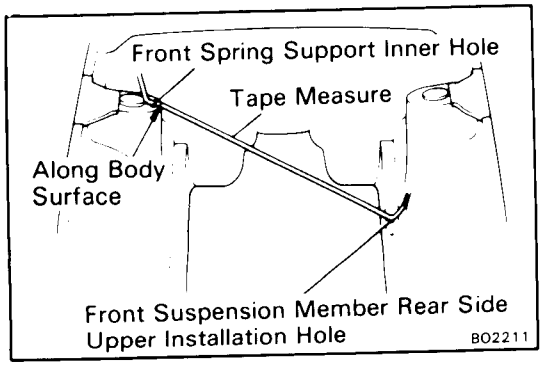
NOTE: The following pages contain only the points which differ from the above listed manual.











BODY DIMENSIONS

General Information

1. BASIC DIMENSIONS

(a) There are two types of dimensions in the diagram.
(Three-dimensional distance)

- Straight-line distance between the centers of two measuring points.

(Two-dimensional distance)

- Horizontal distance in forward/rearward between the centers of two measuring points.
- The height from an imaginary standard line.

(b) Incases in which only one dimension is given, left and right are symmetrical.

(c) The dimensions in the following drawing indicate actual distance. Therefore, please use the dimensions as a reference.

2. MEASURING

(a) Basically, all measurements are to be done with a tracking gauge. For portions where it is not possible to use a tracking gauge, a tape measure should be used.

(b) Use only a tracking gauge that has no looseness in the body, measuring plate, or pointers.

HINT:

1. The height of the left and right pointers must be equal.
2. Always calibrate the tracking gauge before measuring or after adjusting the pointer height.
3. Take care not to drip the tracking gauge or otherwise shock it.
4. Confirm that the pointers are securely in the holes.

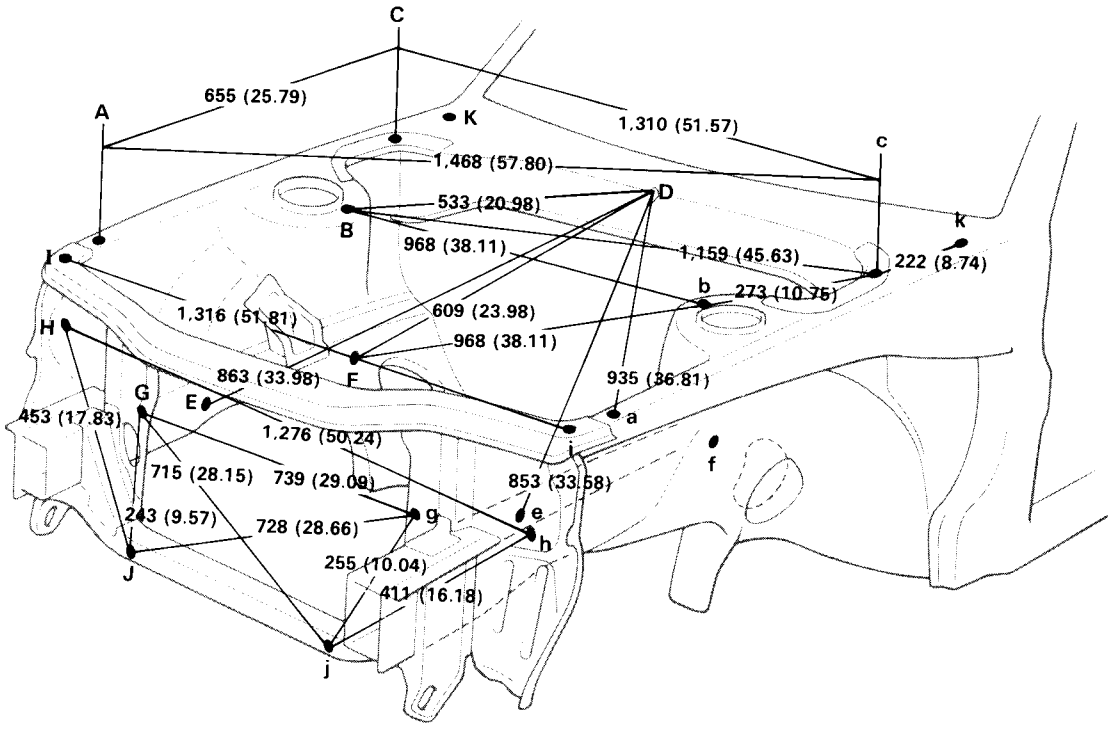
(c) When using a tape measure, avoid twists and bends in the tape.

(d) When tracking a diagonal measurement from the front spring support inner hole to the suspension member upper rear installation hole, measure along the front spring support panel surface.

Body Dimensions

ENGINE COMPARTMENT

(Three-Dimensional Distance)



A – I or a – i	C – I or c – i	C – i or c – I	I – i
140 (5.51)	794 (31.26)	1,519 (59.80)	1,281 (50.43)

mm (in.)

Symbol	Name	Hole dia.
A,a	Front fender apron standard hole	10 (0.39)
B,b	Cowl top to apron brace standard hole	11 (0.43)
C,c	Cowl top to apron brace standard hole	10 (0.39)
D	Cowl top panel center mark	–
E,e	Front side member standard hole	15 (0.59)
F,f	Front side member standard hole	15 (0.59)
G,g	Radiator support standard hole	10 (0.39)
H,h	Radiator support standard hole	10 (0.39)
I,i	Front fender installation nut	6 (0.24) nut
J,j	Cooler condenser installation nut	6 (0.24) nut
K,k	Cowl top panel standard hole	10 (0.39)

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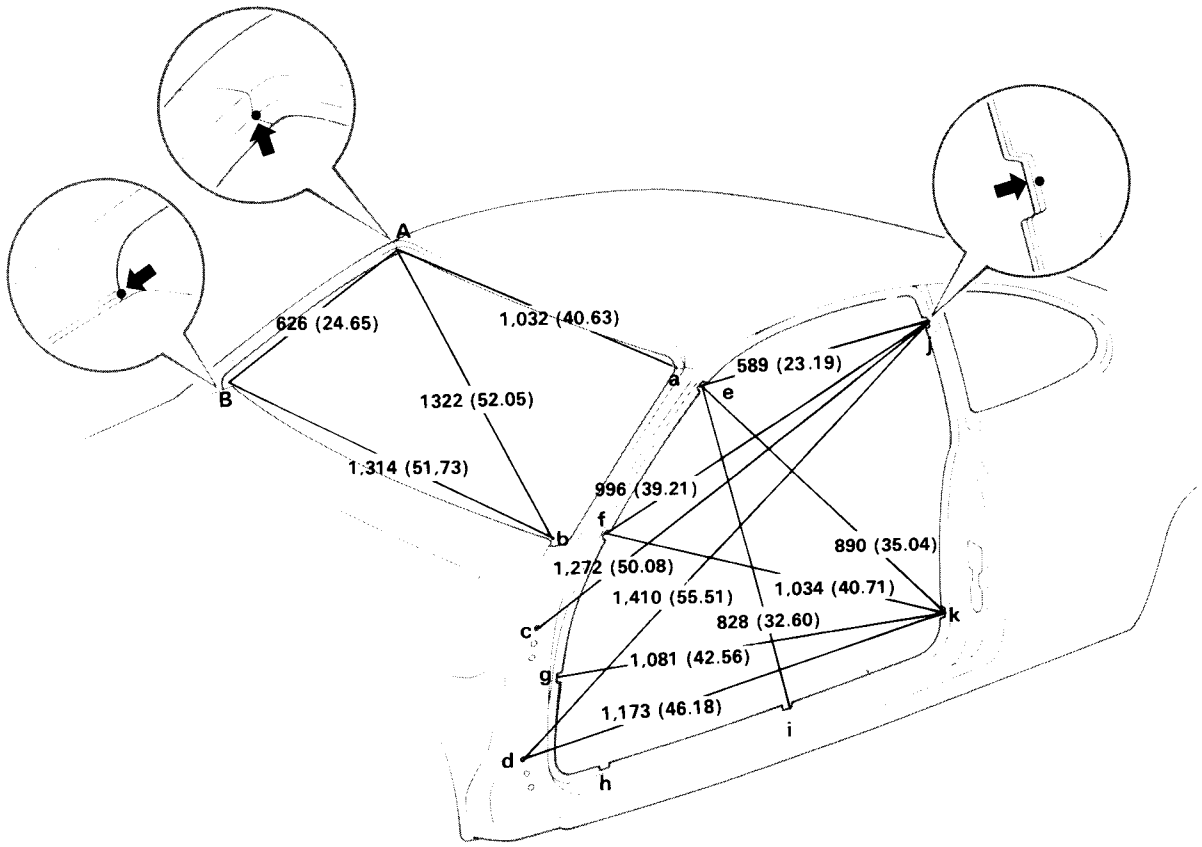
BODY OPENING AREAS (Side View)

(Three-Dimensional Distance)



Vehicle Dimensions Left ↔ Right

C – c	D – d	E – e	F – f	G – g	H – h	I – i	J – j	K – k
1,495 (58.86)	1,527 (60.12)	1,086 (42.76)	1,308 (51.50)	1,373 (54.06)	1,450 (57.09)	1,450 (57.09)	1,118 (44.02)	1,433 (56.42)

E – i or e – I	E – j or e – J	E – k or e – K	F – h or f – H	F – j or f – J	F – k or f – K	G – j or g – J	G – k or g – K	I – j or i – J
1,504 (59.21)	1,249 (49.17)	1,532 (60.31)	1,494 (58.82)	1,567 (61.69)	1,715 (67.52)	1,731 (68.15)	1,771 (69.72)	1,590 (62.60)

HINT: For Symbols, Capital letters indicate right side of vehicle, small letters indicate left side of vehicle.
(Seen from rear)

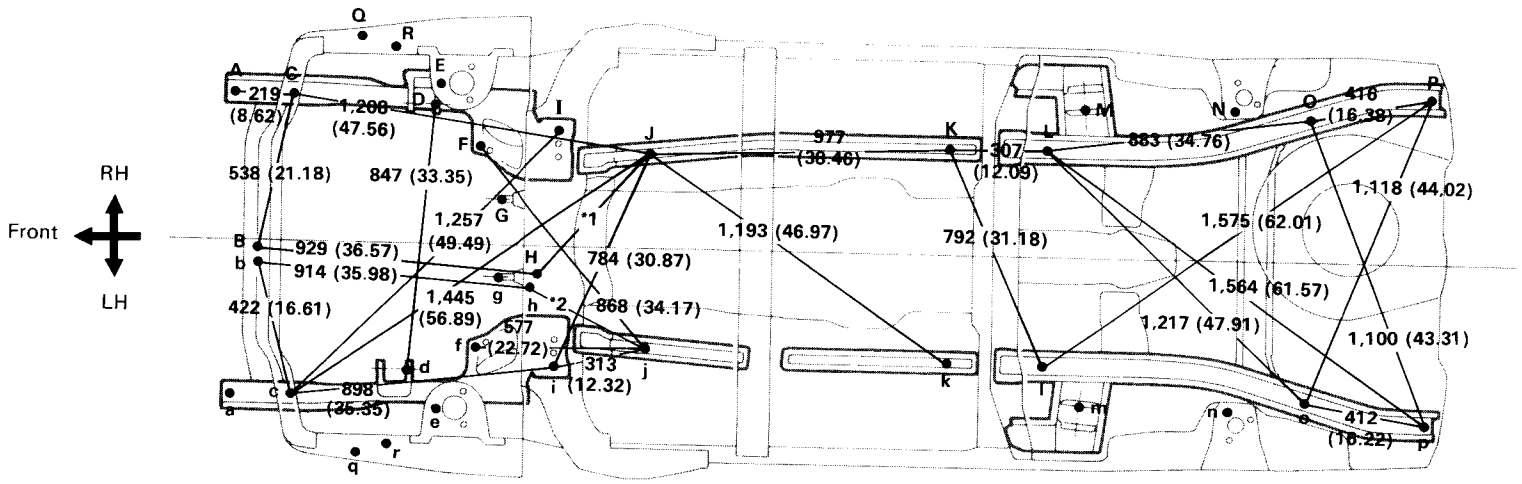
mm (in.)

Symbol	Name	Hole dia.
A,a	Roof panel/Front body pillar adjoining portion	–
B,b	Front body pillar/Cowl panel adjoining portion	–
C,c	Front door hinge installation nut	8 (0.31) nut
D,d	Front door hinge installation nut	8 (0.31) nut
E,e	Front body pillar assembly mark	–
F,f	Front body pillar assembly mark	–
G,g	Front body pillar assembly mark	–
H,h	Rocker panel assembly mark	–
I,i	Rocker panel assembly mark	–
J,j	Quarter panel assembly mark	–
K,k	Quarter panel assembly mark	–

BO4463

UNDER BODY

(Three-Dimensional Distance)



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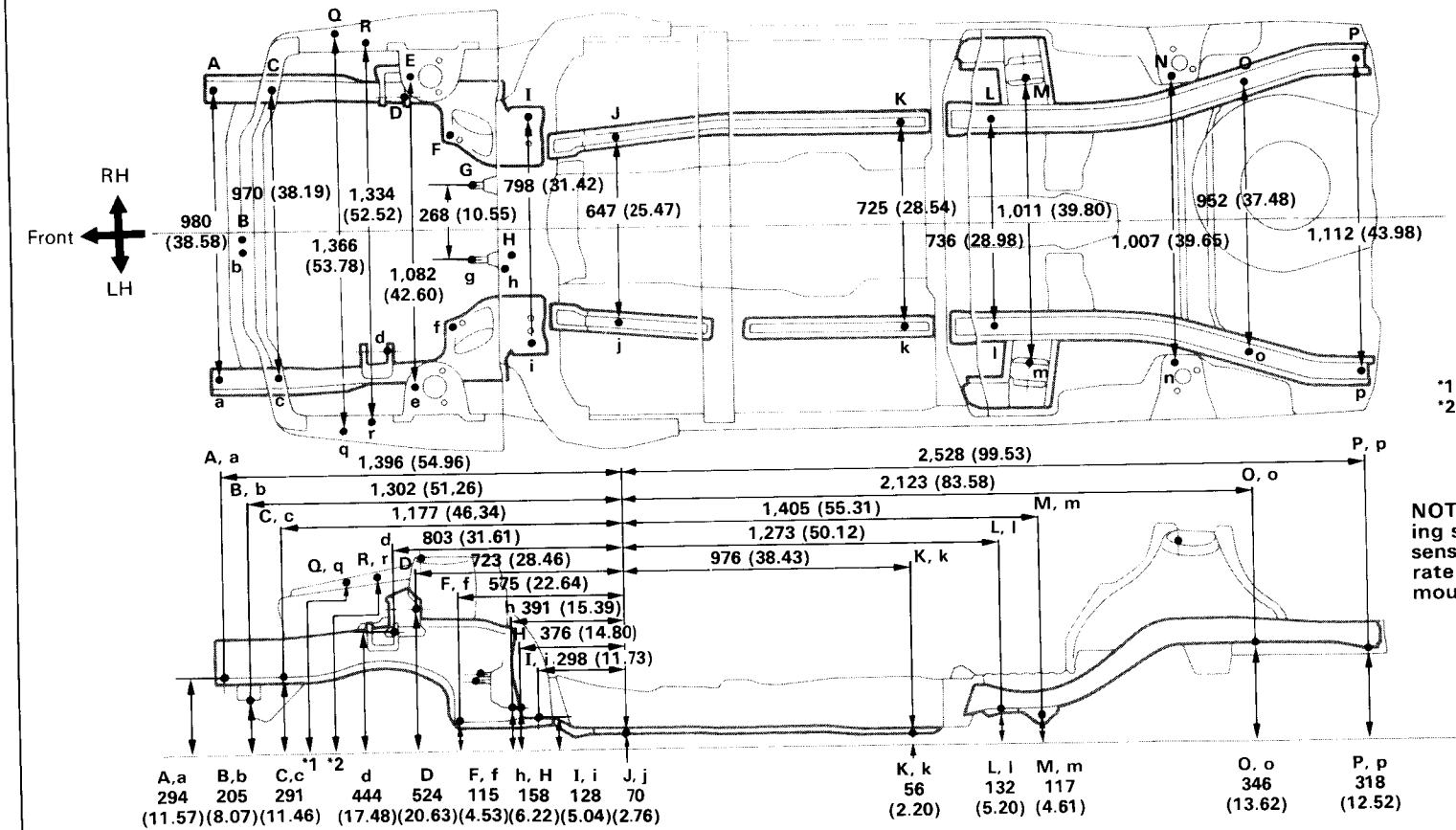
mm (in.)

Symbol	Name	Hole dia.
A,a	Front side member bumper installation hole	RH 14 (0.55) LH 18 (0.71)
B,b	Engine mounting member installation nut	10 (0.39) nut
C,c	Front side member standard hole	15 (0.59)
D,d	Engine mounting bracket hole – rear	13 (0.51)
E,e	Front spring support hole – front	11 (0.43)
F,f	Lower arm installation nut	14 (0.55) nut
G,g	Steering gear box installation bolt	12 (0.47) bolt
H,h	Engine mounting member installation nut	10 (0.39) nut

Symbol	Name	Hole dia.
I,i	Lower arm installation nut	12 (0.47) nut
J,j	Front floor under reinforcement standard hole	15 (0.59)
K,k	Front floor under reinforcement standard hole	15 (0.59)
L,l	Rear floor side member standard hole	18 (0.71)
M,m	Strut bar installation hole – inner	12 (0.47)
N,n	Rear spring support hole – front = inner	9.5 (0.374)
O,o	Rear floor side member standard hole	10 (0.39)
P,p	Rear floor side member standard hole	18 (0.71)
Q,q·R,r	Front airbag sensor installation nut	8 (0.31)

(Two-Dimensional Distance)

Wheel base	2,525 (99.41)



NOTICE: True up the mounting section of the front airbag sensor very carefully and accurately so that the sensor can be mounted at the correct angle.

BO4465

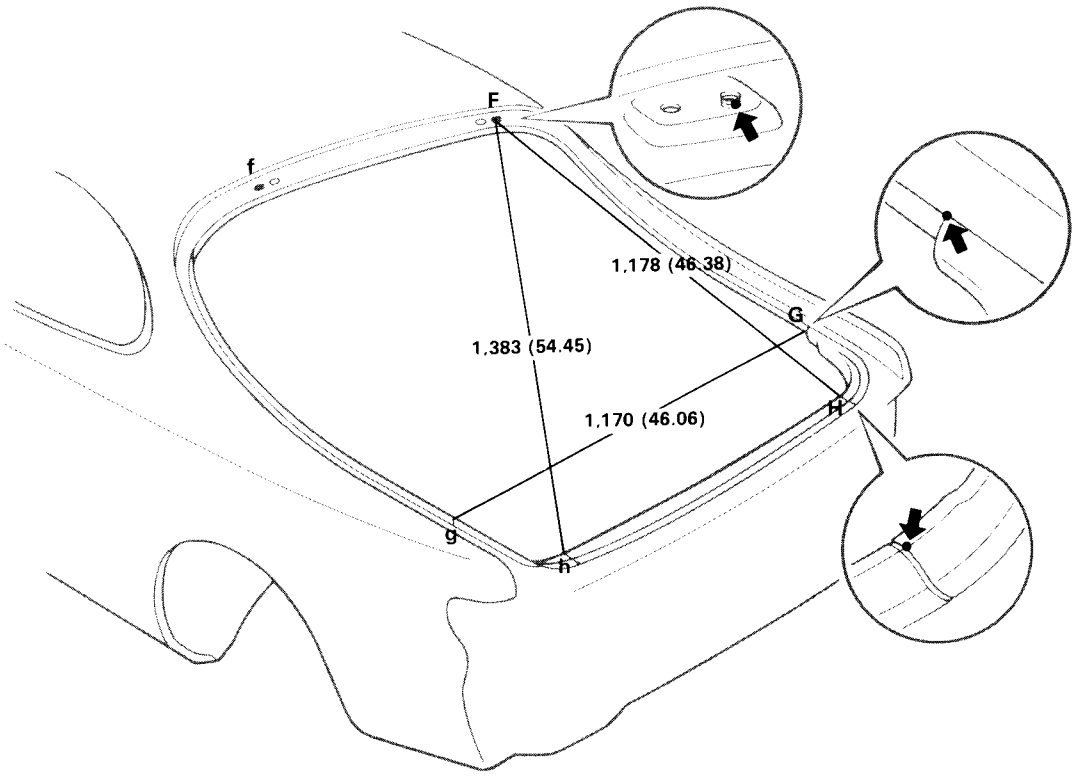
mm (in.)

Symbol	Name	Hole dia.
A,a	Front side member bumper installation hole	RH 14 (0.55) LH 18 (0.71)
B,b	Engine mounting member installation nut	10 (0.39) nut
C,c	Front side member standard hole	15 (0.59)
D,d	Engine mounting bracket hole – rear	13 (0.51)
E,e	Front spring support hole – front	11 (0.43)
F,f	Lower arm installation nut	14 (0.55) nut
G,g	Steering gear box installation bolt	12 (0.47) bolt
H,h	Engine mounting member installation nut	10 (0.39) nut

Symbol	Name	Hole dia.
I,i	Lower arm installation nut	12 (0.47) nut
J,j	Front floor under reinforcement standard hole	15 (0.59)
K,k	Front floor under reinforcement standard hole	15 (0.59)
L,l	Rear floor side member standard hole	18 (0.71)
M,m	Strut bar installation hole – inner	12 (0.47)
N,n	Rear spring support hole – front = inner	9.5 (0.374)
O,o	Rear floor side member standard hole	10 (0.39)
P,p	Rear floor side member standard hole	18 (0.71)
Q,q·R,r	Front airbag sensor installation nut	8 (0.31)

LUGGAGE COMPARTMENT (Liftback)

(Three - Dimensional Distance)



mm (in.)

Symbol	Name	Hole dia.
F,f	Back door hinge installation hole - outer : rear end	11 (0.43)
G,g	Opening reinforcement/Quarter panel adjoining portion	–
H,h	Opening rein forcement/Lower back panel adjoining portion	–

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SERVICE SPECIFICATIONS

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

MAINTENANCE

Engine

Drive belt tension					
Alternator	w/ A/C	New belt	165 ± 10 lb		
		Used belt	84 ± 10 lb		
	w/o A/C	New belt	150 ± 25 lb		
		Used belt	130 ± 25 lb		
PS pump		New belt	125 ± 25 lb		
		Used belt	80 ± 20 lb		
Engine coolant capacity (w/ Heater)			6.4 liters	6.8 US qts	5.6 Imp. qts
Engine oil capacity (Drain and refill)					
w/ Oil filter change			3.9 liters	3.7 US qts	3.4 Imp. qts
w/o Oil filter change			3.6 liters	3.8 US qts	3.2 Imp. qts
Spark plug		ND	PK20R8		
Type		NGK	BKR6EP8		
Air gap			0.8 mm	0.031 in.	
Firing order			1 – 3 – 4 – 2		
Valve clearance		Intake	0.15 – 0.25 mm	0.006 – 0.010 in.	
		Exhaust	0.20 – 0.30 mm	0.008 – 0.012 in.	

Chassis

Front and rear brakes					
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 in.	
Disc runout	Limit	Front	0.07 mm	0.0028 in.	
		Rear	0.15 mm	0.0059 in.	
Parking brake					
Lining thickness		Limit	1.0 mm	0.039 in.	
Drum inside diameter		Limit	171 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 mount bolts			375 kg-cm	27 ft-lb	37 N·m
Engine mounting center member-to-body mount bolts			530 kg-cm	38 ft-lb	52 N·m
Front suspension lower crossmember-to-body mount bolts			1,550 kg-cm	112 ft-lb	152 N·m
Rear suspension lower crossmember-to-body mount bolts			1,280 kg-cm	93 ft-lb	126 N·m

ENGINE MECHANICAL

Specifications

Idle speed			800 ± 50 rpm	
Intake manifold vacuum	at Idle speed		450 mmHg	17.7 in.Hg 60 kPa
Compression	at 250 rpm	STD	11.5 kg/cm² (164 psi, 1,128 kPa) or more	
		Limit	9.0 kg/cm²	128 psi 883 kPa
	Difference of pressure between each cylinder		1.0 kg/cm² (14 psi, 98 kPa) or less	
Timing belt tensioner	Protrusion		8.5 – 9.5 mm	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 – 11.91 mm	0.4362 – 0.4367 in.
Valve	Valve overall length STD	Intake	105.50 mm	4.1535 in.
		Exhaust	99.55 mm	3.9193 in.
	Limit	Intake	104.80 mm	4.1260 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.)		20.5 – 24.1 kg (45.2 – 53.1 lb, 201 – 236 N)	
Valve lifter	Lifter diameter		27.975 – 27.985 mm	1.1014 – 1.1018 in.
	Lifter bore diameter		28.000 – 28.021 mm	1.1024 – 1.1032 in.
	Oil clearance	STD	0.015 – 0.046 mm	0.0006 – 0.0018 in.
		Limit	0.07 mm	0.0028 in.
Manifold	Warpage	Limit	0.20 mm	0.0079 in.

Specifications (Cont'd)

Camshaft	Thrust clearance	STD	0.120 – 0.240 mm	0.0047 – 0.0094 in.
		Limit	0.30 mm	0.0118 in.
	Journal oil clearance	STD	0.025 – 0.062 mm	0.0010 – 0.0024 in.
		Limit	0.08 mm	0.0031 in.
	Journal diameter		26.959 – 26.975 mm	1.0614 – 1.0620 in.
	Circle runout	Limit	0.06 mm	0.0024 in.
	Cam lobe height	STD	41.010 – 41.110 mm	1.6146 – 1.6185 in.
		Limit	39.90 mm	1.5709 in.
T-VIS valve	Warpage	Limit	0.20 mm	0.0079 in.
Cylinder block	Cylinder head surface warpage	Limit	0.05 mm	0.0020 in.
	Cylinder bore diameter STD	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	3.3866 – 3.3870 in.
		Limit	86.23 mm	3.3949 in.
Piston and piston ring	Piston diameter	Mark 1	85.920 – 85.930 mm	3.3927 – 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.
	Piston oil clearance	STD	0.070 – 0.090 mm	0.0028 – 0.0035 in.
		Limit	0.110 mm	0.0043 in.
	Piston 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.
	Piston ring end gap STD	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	0.200 – 0.600 mm	0.0079 – 0.0236 in.
	Limit	No.1	0.85 mm	0.0335 in.
		No.2	0.97 mm	0.0382 in.
		Oil	0.90 mm	0.0354 in.
Connecting rod	Thrust clearance	STD	0.160 – 0.312 mm	0.0063 – 0.0123 in.
		Limit	0.35 mm	0.35 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.
		U/S 0.25	0.023 – 0.069 mm	0.0009 – 0.0027 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.)		0.15 mm	0.0059 in.
	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.

Specifications (Cont'd)

Crankshaft	Thrust clearance		STD	0.020 – 0.220 mm	0.0008 – 0.0087 in.
			Limit	0.30 mm	0.0118 in.
	Thrust washer thickness		STD	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		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.
	STD	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 – 0.0891 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.
	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 and out-of-round		Limit	0.02 mm	0.0008 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Oil pump pulley x Oil pump drive shaft		355	26	35
No.2 idler pulley x Cylinder block		440	32	43
No.1 idler pulley bracket x Cylinder head		440	32	43
Crankshaft pulley x Crankshaft		1,100	80	108
Camshaft timing pulley x Camshaft		600	43	59
	For SST	420	30	41
Timing belt tensioner x Cylinder head		210	15	21
Cylinder head x Cylinder block	1st	500	36	49
	2nd	Turn 90°		
Camshaft bearing cap x Cylinder head		190	14	19
No.3 timing belt cover x Cylinder head		25	21 in.-lb	2.5
Cylinder head cover x Cylinder head		180	13	18
RH rear engine hanger x Cylinder head		195	14	19
Intake manifold x Cylinder head		195	14	19
Intake manifold stay x Intake manifold		260	19	25
Intake manifold stay x Cylinder block		260	19	25
Water by-pass pipe x Water pump cover		80	69 in.-lb	7.8

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
Water outlet x Cylinder head		400	29	39
EGR valve x Intake manifold		195	14	19
EGR pipe x Cylinder head		195	14	19
LH engine hanger x Cylinder head	12 mm head bolt	130	9	13
	14 mm head bolt	195	14	19
Exhaust manifold x Cylinder head		530	38	52
Catalytic converter x Turbine outlet elbow		300	22	29
Catalytic converter stay x Catalytic converter		600	43	59
No.1 alternator bracket x Cylinder head		400	29	39
Main bearing cap x Cylinder block		600	43	59
Connecting rod cap x Connecting rod		680	49	67
Rear oil seal retainer x Cylinder block		95	82 in.-lb	9.3
Knock sensor x Cylinder head		450	33	44
RH engine mounting bracket x Cylinder block		530	38	52
PS pump bracket x Cylinder block		440	32	43
Rear end plate x Cylinder block		95	82 in.-lb	9.3
Flywheel x Crankshaft		1,100	80	108
LH engine mounting bracket x Transaxle		530	38	52
LH engine mounting insulator x LH engine mounting bracket		650	47	63
LH engine mounting insulator x Body		890	64	87
RH engine mounting insulator x RH engine mounting bracket		530	38	52
RH engine mounting insulator x Body		890	64	87
RH engine mounting stay x RH engine mounting insulator		740	54	73
RH engine mounting stay x No.1 alternator bracket		740	54	73
LH engine mounting stay x LH engine mounting insulator		210	15	21
LH engine mounting stay x Transaxle		210	15	21
Front engine mounting bracket x Transaxle		530	38	52
Rear engine mounting bracket x Transaxle		790	57	77
Engine mounting center member x Body		530	38	52
Engine mounting center member x Front engine mounting insulator		740	54	73
Engine mounting center member x Rear engine mounting insulator		740	54	73
Front engine mounting insulator x Front engine mounting insulator		890	64	87
Rear engine mounting insulator x Rear engine mounting insulator		890	64	87
Suspension lower crossmember x Body		1,550	112	152
Suspension upper brace x Body	Bolt	210	15	21
	Nut	650	47	64

EXHAUST SYSTEM

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Front exhaust pipe x Catalytic converter	630	46	62
Front exhaust pipe x Center exhaust pipe	440	32	43
Center exhaust pipe x Tailpipe	440	32	43

TURBOCHARGER SYSTEM

Specifications

Turbocharger	Turbocharging pressure	0.50 – 0.83 kg/cm^2 (7.1 – 11.8 psi, 49 – 81 kPa)
	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		kg-cm	ft-lb	N·m
Turbine outlet elbow x Turbocharger		650	47	64
Side bearing housing plate x Turbocharger		120	9	11
Turbo water pipe x Turbocharger		120	9	11
Turbocharger x Exhaust manifold		650	47	64
Oil pipe x Turbocharger		175	13	17
Oil pipe x Cylinder block	Bolt	440	32	43
	Union bolt	525	38	51
Turbocharger stay x Turbocharger		705	51	69
Turbocharger stay x Cylinder block		600	43	59
Oxygen sensor x Turbine outlet elbow		450	33	44

EFI SYSTEM

Specifications

Fuel pressure regulator	Fuel pressure	at No vacuum	2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)
Cold start injector	Resistance		2 – 4 Ω
	Fuel leakage		One drop or less per minute
Injector	Resistance		2 – 4 Ω
	Injection volume		95 – 120 cc (5.8 – 7.3 cu in.) per 15 sec.
	Difference between each cylinder		5 cc (0.3 cu in.) or less
	Fuel leakage		One drop or less per minute
Throttle body	Throttle body fully closed angle		6°
Throttle position sensor	Clearance between stop screw and lever	Between terminals	Resistance
	0 mm (0 in.)	VTA – E2	0.2 – 0.8 kΩ
	0.50 mm (0.020 in.)	IDL – E2	Less than 2.3 kΩ
	0.70 mm (0.028 in.)	IDL – E2	Infinity
	Throttle valve fully opened position	VTA – E2	3.3 – 10.3 kΩ
	–	VC – E2	3 – 8.3 kΩ
ISC valve	Resistance	+B – RSC or RSO	19.3 – 22.3 Ω
Cold start injector time switch	Resistance	STA – STJ below 10°C (50°F)	30 – 50 Ω
		STA – STJ above 25°C (77°F)	70 – 90 Ω
		STA – Ground	30 – 90 Ω
Air flow meter	Resistance	VS – E2	200 – 600 Ω (Measuring plate fully closed)
			20 – 1,200 Ω (Measuring plate fully open)
		VC – E2	200 – 400 Ω
		THA – E2 at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
Fuel pump resistor	Resistance		Approx. 0.73 Ω
Solenoid resistor	Resistance	+B – No.10, No.20, No.30 or No.40	5 – 7 Ω
Water temp.	Resistance	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 7 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (140°F)	0.2 – 0.4 kΩ
Oxygen sensor	Heater coil resistance		5.1 – 6.3 Ω

Specifications (Cont'd)

T-VIS VSV	Resistance			33 – 39 Ω
EGR VSV	Resistance			33 – 39 Ω
Turbocharging pressure VSV	Resistance			24 – 30 Ω
ECU	HINT: ● Perform all voltage and resistance measurements with the ECU connected. ● Verity that the battery voltage in 11 V or above with the ignition switch is ON.			
	Voltage			
	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	4.5 – 5.5
	VTA – E2		Throttle valve fully closed	0.1 – 1.0
			Throttle valve 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, No.3, No.4 – E01, E02	IG SW ON		10 – 14
	THA1 – 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 – E1	IG SW ON		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
	AC1 – E1	IG SW ON	Air conditioning ON	8 – 14
	ACT – E1		Air conditioning ON	4.5 – 5.5

Specifications (Cont'd)

ECU (cont'd)

Voltage (cont'd)

Terminals	Condition		STD voltage (V)
*1 TVIS – E1	IG SW ON	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
T – 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 open	Infinity
	Throttle valve fully closed	2,300 Ω or less
VTA – E2	Throttle valve fully open	3,500 – 10,000
	Throttle valve fully closed	200 – 800
VC – E2	–	200 – 400
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
G1, G2 – G⊖	–	140 – 180
NE – G⊖	–	180 – 220
RSC, RSO – +B, +B1	–	19.3 – 22.3

Fuel cut rpm	w/ Vehicle speed 0 km/h and coolant and coolant temp. 80°C (176°F)	Fuel cut rpm	2,000 rpm
		Fuel return rpm	1,600 rpm

*1 w/ Regular Unleaded Gasoline *2 w/ Premium Unleaded Gasoline

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Fuel line	Union bolt type	300	22	29
	Flare nut type	310	22	30
Fuel pump x Fuel tank		30	26 in.-lb	2.9
Fuel sender gauge x Fuel tank		15	13 in.-lb	1.5

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
Fuel evaporation bent tube x Fuel tank		15	13 in.-lb	1.5
Fuel tank band x Body		220	16	2.9
Fuel inlet pipe x Fuel tank		30	26 in.-lb	2.9
Cold start injector x Air intake chamber		60	52 in.-lb	5.9
Cold start injector pipe x Cold start injector		180	13	18
Cold start injector pipe x Delivery pipe		180	13	18
Fuel pressure regulator x Delivery pipe		300	22	29
Delivery pipe x Cylinder head		195	14	19
Injector cover x Delivery pipe		80	69 in.-lb	7.8
Fuel inlet hose x Delivery pipe	Bolt	80	69 in.-lb	7.8
	Union bolt	300	22	29
Fuel inlet hose x Fuel filter		300	22	29
Throttle body x Intake manifold		195	14	19
Intake air connector stay x Throttle body		195	14	19
Intake air connector stay x Cylinder head		80	69 in.-lb	7.8
Intake air connector x Throttle body		195	14	19

COOLING SYSTEM

Specifications

Engine coolant capacity (w/ Heater)	6.4 liters	6.8 US qts	5.6 Imp. qts

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Engine coolant x Drain plug	130	9	13
Water pump x Water pump cover	95	82 in.-lb	9.3

LUBRICATION SYSTEM

Specifications

Engine oil capacity		See page A-25
Oil pressure	at Idling	0.3 kg/cm^2 (4.3 psi, 29 kPa) or more
	at 3,000 rpm	2.5 – 5.0 kg/cm^2 (36 – 71 psi, 245 – 490 kPa)

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Engine oil drain plug	250	18	25
Oil cooler bracket x Cylinder head	80	69 in.-lb	7.8
Oil cooler x Cylinder block	800	58	78
Water by-pass pipe x Oil cooler	120	9	12
Water by-pass pipe x Oil cooler bracket	180	13	18
Oil nozzle x Cylinder block	93	81 in.-lb	9.1

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 Secondary coil resistance	0.41 – 0.50 Ω 10.2 – 13.8 kΩ
Distributor	Air gap Signal generator (pickup coil) resistance G1 – G⊖ G2 – G⊖ NE – G⊖	0.2 – 0.4 mm 0.008 – 0.016 in. 140 – 180 Ω 140 – 180 Ω 180 – 220 Ω

CHARGING SYSTEM

Drive belt tension	See page A-2
Battery specific gravity when full charge at 20°C (68°F)	1.25 – 1.27

CLUTCH

Specifications

Disc rivet head depth		Limit	0.3 mm	0.012 in.
Disc runout		Limit	0.8 mm	0.031 in.
Diaphragm spring out of alignment		Limit	0.5 mm	0.020 in.
Diaphragm spring finger wear	Depth	Limit	0.6 mm	0.024 in.
	Width	Limit	5.0 mm	0.197 in.
Flywheel runout		Limit	0.1 mm	0.004 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Clutch cover x Flywheel	195	14	19
Release fork support	480	35	47

MANUAL TRANSAXLE (E150F)

Specifications

TRANSMISSION ASSEMBLY				
Input shaft				
Roller bearing journal diameter		Limit	32.930 mm	1.2964 in.
3rd gear journal diameter		Limit	35.950 mm	1.4154 in.
4th gear journal diameter		Limit	35.950 mm	1.4154 in.
Runout		Limit	0.060 mm	0.0024 in.
Output shaft				
1st gear journal diameter		Limit	38.950 mm	1.5335 in.
2nd gear journal diameter		Limit	38.950 mm	1.5335 in.
Runout		Limit	0.060 mm	0.0024 in.
Gear thrust clearance	1st	STD	0.10 – 0.35 mm	0.0039 – 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	2nd	STD	0.10 – 0.45 mm	0.0039 – 0.0177 in.
		Limit	0.50 mm	0.0197 in.
	3rd	STD	0.10 – 0.35 mm	0.0039 – 0.0139 in.
		Limit	0.40 mm	0.0157 in.
	4th	STD	0.10 – 0.55 mm	0.0039 – 0.0217 in.
		Limit	0.60 mm	0.0236 in.
	5th	STD	0.10 – 0.57 mm	0.0039 – 0.0224 in.
		Limit	0.65 mm	0.0256 in.
Gear oil clearance				
1st and 4th gear		STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
		Limit	0.080 mm	0.0031 in.
2nd and 3rd gear		STD	0.009 – 0.053 mm	0.0004 – 0.0020 in.
		Limit	0.080 mm	0.0031 in.
5th gear		STD	0.009 – 0.050 mm	0.0004 – 0.0020 in.
		Limit	0.070 mm	0.0028 in.
Shift fork to hub sleeve clearance		Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearance		Limit	0.6 mm	0.024 in.
Oil pump assembly				
Rotor body clearance		STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
		Limit	0.30 mm	0.0118 in.
Rotor tip clearance		STD	0.08 – 0.15 mm	0.0031 – 0.0059 in.
		Limit	0.30 mm	0.0118 in.
Side clearance		STD	0.03 – 0.08 mm	0.0012 – 0.0031 in.
		Limit	0.15 mm	0.0059 in.
Oil seal drive in depth				
Control shaft cover			0 – 1.0 mm	0 – 0.039 in.
Input shaft snap ring thickness				
No.2 clutch hub		Mark		
		H	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		J	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		K	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		L	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		M	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		N	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		P	2.60 – 2.65 mm	0.1024 – 0.1043 in.

Specifications (Cont'd)

Input shaft snap ring thickness (cont'd)				
4th gear and rear bearing	Mark			
	1	2.35 – 2.40 mm	0.0925 – 0.0945 in.	
	2	2.40 – 2.45 mm	0.0945 – 0.0965 in.	
	3	2.45 – 2.50 mm	0.0965 – 0.0984 in.	
	4	2.50 – 2.55 mm	0.0984 – 0.1004 in.	
	5	2.55 – 2.60 mm	0.1004 – 0.1024 in.	
	6	2.60 – 2.65 mm	0.1024 – 0.1043 in.	
	7	2.65 – 2.70 mm	0.1043 – 0.1063 in.	
	8	2.70 – 2.75 mm	0.1063 – 0.1083 in.	
No.3 clutch hub	Mark			
	Q	2.25 – 2.30 mm	0.0886 – 0.0906 in.	
	R	2.30 – 2.35 mm	0.0906 – 0.0925 in.	
	S	2.35 – 2.40 mm	0.0925 – 0.0945 in.	
	T	2.40 – 2.45 mm	0.0945 – 0.0965 in.	
	U	2.45 – 2.50 mm	0.0965 – 0.0984 in.	
	V	2.50 – 2.55 mm	0.0984 – 0.1004 in.	
	W	2.55 – 2.60 mm	0.1004 – 0.1024 in.	
	X	2.60 – 2.65 mm	0.1024 – 0.1043 in.	
	Y	2.65 – 2.70 mm	0.1043 – 0.1063 in.	
Output shaft snap ring thickness				
No.1 clutch hub	Mark			
	A	2.80 – 2.85 mm	0.1102 – 0.1122 in.	
	B	2.85 – 2.90 mm	0.1122 – 0.1142 in.	
	C	2.90 – 2.95 mm	0.1142 – 0.1161 in.	
	D	2.95 – 3.00 mm	0.1161 – 0.1181 in.	
	E	3.00 – 3.05 mm	0.1181 – 0.1201 in.	
	F	3.05 – 3.10 mm	0.1201 – 0.1220 in.	
	G	3.10 – 3.15 mm	0.1220 – 0.1240 in.	
DIFFERENTIAL ASSEMBLY				
Output shaft preload (at starting)	New bearing	8.0 – 16.0 kg-cm	6.9 – 13.9 in.-lb	0.78 – 1.57 N·m
	Reused bearing	5.0 – 10.0 kg-cm	4.3 – 8.7 in.-lb	0.49 – 0.98 N·m
Differential case preload (at starting)	New bearing	1.9 – 3.7 kg-cm	1.6 – 3.2 in.-lb	0.2 – 0.4 N·m
	Reused bearing	1.2 – 2.3 kg-cm	1.0 – 2.0 in.-lb	0.1 – 0.2 N·m
Left case inner diameter				
Right case bushing	STD	111.000 – 111.035 mm	4.3701 – 4.3714 in.	
	Limit	110.060 mm	4.3724 in.	
Left case bushing	STD	90.500 – 90.535 mm	3.5630 – 3.5644 in.	
	Limit	90.560 mm	3.5653 in.	
No.2 differential case outer diameter				
Right side	STD	110.929 – 110.964 mm	4.3673 – 4.3687 in.	
	Limit	110.850 mm	4.3632 in.	
Left side	STD	90.429 – 90.464 mm	3.5602 – 3.5616 in.	
	Limit	90.350 mm	3.5571 in.	
Differential No.2 case inner diameter				
Side gear bushing	STD	35.000 – 35.025 mm	1.3780 – 1.3789 in.	
	Limit	35.030 mm	1.3791 in.	

Specifications (Cont'd)

Conical spring washer height			
Left conical spring washer	STD	2.60 – 2.80 mm	0.1024 – 0.1102 in.
	Limit	2.50 mm	0.0984 in.
Right conical spring washer	STD	1.70 – 1.90 mm	0.0669 – 0.0748 in.
	Limit	1.60 mm	0.0630 in.
Right case backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.
No.2 differential case backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.
Intermediate case backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.
Front differential side gear backlash		0.14 – 0.21 mm	0.0055 – 0.0083 in.
Thrust washer thickness			
For right case side gear		0.80 mm	0.0315 in.
		0.85 mm	0.0335 in.
		0.90 mm	0.0354 in.
		0.95 mm	0.0374 in.
		1.00 mm	0.0394 in.
		1.05 mm	0.0413 in.
		1.10 mm	0.0433 in.
		1.15 mm	0.0453 in.
		1.20 mm	0.0472 in.
		1.25 mm	0.0492 in.
		1.30 mm	0.0512 in.
		1.35 mm	0.0531 in.
		1.40 mm	0.0551 in.
For intermediate case side gear		0.80 mm	0.0315 in.
		0.85 mm	0.0335 in.
		0.90 mm	0.0354 in.
		0.95 mm	0.0374 in.
		1.00 mm	0.0394 in.
		1.05 mm	0.0413 in.
		1.10 mm	0.0433 in.
		1.15 mm	0.0453 in.
		1.20 mm	0.0472 in.
		1.25 mm	0.0492 in.
		1.30 mm	0.0512 in.
		1.35 mm	0.0531 in.
		1.40 mm	0.0551 in.
For No.2 differential case side gear	Mark		
	B	1.00 mm	0.0394 in.
	C	1.05 mm	0.0413 in.
	D	1.10 mm	0.0433 in.
	E	1.15 mm	0.0453 in.
	F	1.20 mm	0.0472 in.
	G	1.25 mm	0.0492 in.
For left case side gear	Mark		
	A	0.95 mm	0.0374 in.
	B	1.00 mm	0.0394 in.
	C	1.05 mm	0.0413 in.
	D	1.10 mm	0.0433 in.
	E	1.15 mm	0.0453 in.

Specifications (Cont'd)

Thrust washer thickness (cont'd)			
For left case side gear (cont'd)	Mark		
	F	1.20 mm	0.0472 in.
	G	1.25 mm	0.0492 in.
	H	1.30 mm	0.0512 in.
	J	1.35 mm	0.0531 in.
	K	1.40 mm	0.0551 in.
Adjusting shim thickness			
For differential preload	Mark		
	0	2.00 mm	0.0787 in.
	1	2.05 mm	0.0807 in.
	2	2.10 mm	0.0827 in.
	3	2.15 mm	0.0846 in.
	4	2.20 mm	0.0866 in.
	5	2.25 mm	0.0886 in.
	6	2.30 mm	0.0906 in.
	7	2.35 mm	0.0925 in.
	8	2.40 mm	0.0945 in.
	9	2.45 mm	0.0965 in.
	A	2.50 mm	0.0984 in.
	B	2.55 mm	0.1004 in.
	C	2.60 mm	0.1024 in.
	D	2.65 mm	0.1043 in.
	E	2.70 mm	0.1063 in.
	F	2.75 mm	0.1083 in.
	G	2.80 mm	0.1102 in.
	H	2.85 mm	0.1122 in.
For output shaft preload	Mark		
	0	0.40 mm	0.0157 in.
	1	0.45 mm	0.0177 in.
	2	0.50 mm	0.0197 in.
	3	0.55 mm	0.0217 in.
	4	0.60 mm	0.0236 in.
	5	0.65 mm	0.0256 in.
	6	0.70 mm	0.0276 in.
	7	0.75 mm	0.0295 in.
	8	0.80 mm	0.0315 in.
	9	0.85 mm	0.0335 in.
	A	0.90 mm	0.0354 in.
	B	0.95 mm	0.0374 in.
	C	1.00 mm	0.0394 in.
	D	1.05 mm	0.0413 in.
	E	1.10 mm	0.0433 in.
	F	1.15 mm	0.0453 in.
	G	1.20 mm	0.0472 in.
	H	1.25 mm	0.0492 in.
	J	1.30 mm	0.0512 in.
	K	1.35 mm	0.0531 in.
	L	1.40 mm	0.0551 in.

Specifications (Cont'd)

Adjusting shim thickness (cont'd)				
For output shaft preload (cont'd)	M	1.45 mm		0.0571 in.
	N	1.50 mm		0.0591 in.
	P	1.55 mm		0.0610 in.
	Q	1.60 mm		0.0630 in.
TRANSFER ASSEMBLY				
Ring gear backlash		0.13 – 0.18 mm		0.0051 – 0.0071 in.
Ring gear runout	Limit	0.1 mm		0.004 in.
Driven pinion preload (at starting)	New bearing	1.8 – 2.9 kg	4.0 – 6.4 lb	17.7 – 28.4 N
	Reused bearing	0.9 – 1.4 kg	2.0 – 3.1 lb	8.8 – 13.7 N
Transfer total preload (at starting)				
(Add driven pinion preload)	New bearing	1.3 – 1.4 kg	2.9 – 3.1 lb	12.7 – 13.7 N
	Reused bearing	0.5 – 0.9 kg	1.1 – 2.0 lb	4.9 – 8.8 N
Right case bushing inner diameter	STD	69.000 – 69.035 mm		2.7165 – 2.7179 in.
	Limit	69.060 mm		2.7189 in.
Left case bushing inner diameter	STD	69.000 – 69.035 mm		2.7165 – 2.7179 in.
	Limit	69.060 mm		2.7189 in.
Control coupling washer thickness	STD	1.49 – 1.51 mm		0.0587 – 0.0594 in.
	Limit	1.45 mm		0.0571 in.
Oil seal drive in depth				
Extension housing		1.1 – 1.9 mm		0.043 – 0.075 in.
Differential lock shift lever shaft		1.0 – 2.0 mm		0.039 – 0.079 in.
Shift fork shaft		8.5 – 9.5 mm		0.335 – 0.374 in.
Adjusting shim thickness				
For ring gear backlash	Mark			
	1	2.13 mm		0.0839 in.
	2	2.16 mm		0.0850 in.
	3	2.19 mm		0.0862 in.
	4	2.22 mm		0.0874 in.
	5	2.25 mm		0.0886 in.
	6	2.28 mm		0.0898 in.
	7	2.31 mm		0.0909 in.
	8	2.34 mm		0.0921 in.
	9	2.37 mm		0.0933 in.
	10	2.40 mm		0.0945 in.
	11	2.43 mm		0.0957 in.
	12	2.46 mm		0.0968 in.
	13	2.49 mm		0.0980 in.
	14	2.52 mm		0.0992 in.
	15	2.55 mm		0.1004 in.
	16	2.58 mm		0.1016 in.
	17	2.61 mm		0.1028 in.
	18	2.64 mm		0.1039 in.
	19	2.67 mm		0.1051 in.
	20	2.70 mm		0.1063 in.
	21	2.73 mm		0.1075 in.
	22	2.76 mm		0.1087 in.
	23	2.79 mm		0.1098 in.
	24	2.82 mm		0.1110 in.

Specifications (Cont'd)

Adjusting shim thickness (cont'd)				
For tooth contact	Mark			
	A	0.30 mm		0.0118 in.
	B	0.33 mm		0.0130 in.
	C	0.36 mm		0.0142 in.
	D	0.39 mm		0.0154 in.
	E	0.42 mm		0.0165 in.
	F	0.45 mm		0.0177 in.
	G	0.48 mm		0.0189 in.
	H	0.51 mm		0.0201 in.
	J	0.54 mm		0.0213 in.
	K	0.57 mm		0.0224 in.
Shift lever preload		60 – 150 g	0.1 – 0.3 lb	0.49 – 1.47 N
Shift lever seat shim thickness	Mark			
	A	0.5 mm		0.020 in.
	B	0.6 mm		0.024 in.
	C	0.7 mm		0.028 in.
	D	0.8 mm		0.031 in.
	E	0.9 mm		0.035 in.
	F	1.0 mm		0.039 in.
	G	1.1 mm		0.043 in.
	H	1.2 mm		0.047 in.
	J	1.3 mm		0.051 in.
	K	1.4 mm		0.055 in.
	L	1.5 mm		0.059 in.
	M	1.6 mm		0.063 in.
	N	1.7 mm		0.067 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Oil pump x Cover	105	8	10
Oil cooler pipe x Union	350	25	34
Ring gear x Differential case	1,260	91	124
Union x Transaxle	275	20	27
Rear bearing retainer x Transmission case	430	31	42
Straight screw plug	250	18	25
Transmission case x Transaxle case	300	22	29
Reverse restrict pin holder plug	130	9	13
Oil pump assembly x Transaxle case	175	13	17
Control shaft lock bolt	500	36	49
Shift fork x Fork shaft	240	17	24
Reverse idler gear shaft lock bolt	300	22	29
Oil pipe x Housing	175	13	17
Rear bearing retainer x Transmission case	430	31	42
Transmission case x Transmission case cover	300	22	29
5th driven gear lock nut	1,250	90	123
Shift and select lever assembly x Transmission case	200	14	20

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
Transaxle case receiver x Transaxle case		75	65 in.-lb	7.4
Bellcrank x Transmission case		200	14	20
Shift arm bracket bolt x Transaxle case		175	13	17
Back-up light switch x Transmission case		410	30	40
Differential right case x Intermediate case		640	46	63
Driven pinion x Bearing cage		See page MT-78		
Ring gear x Ring gear mounting		985	71	97
Driven pinion cage x Transfer case		400	29	39
Transfer case x Transfer right case		450	33	44
Transfer case x Inspection hole cover		160	12	16
Transfer shift lever shaft x Left case		200	14	20
Differential lock sleeve x Shift fork		160	12	16
Transfer right case x Transfer case cover		175	13	17
Transfer oil tube set bolt		130	9	13
Driven pinion cage x Extension housing		260	19	25
Differential lock shift fork shaft lock screw		400	29	39
Extension housing x Dynamic damper		260	19	25
Transaxle assembly x Transfer assembly		700	51	69
Drain plug		400	29	39
Transaxle assembly x Engine	M12 bolt	650	47	64
	M10 bolt	470	34	46
LH engine mounting bracket x Transaxle		530	38	52
Mounting insulator x Mounting bracket		890	64	87
Mounting bracket x Transaxle bracket		650	47	63
RH mounting insulator x Bracket		530	38	52
RH mounting stay bolt		740	54	73
LH mounting stay bolt		210	15	21
Catalytic converter mounting bolt		300	22	29
Converter stay set bolt		600	43	59
Front mounting bracket x Transaxle		790	57	77
Rear mounting bracket x Transaxle		790	57	77
Center member x Body		530	38	52
Center member x Mounting bracket		740	54	73
A/C compressor x Idler pulley bracket		280	20	27
Exhaust pipe x Converter		630	46	62
Exhaust pipe x Center exhaust pipe		440	32	43
Lower crossmember x Body		1,500	112	152
Fuel hose union bolt		300	22	29
Suspension upper brace x Body	Bolt	210	15	21
	Nut	650	47	64
Shift lever retainer x Plate		120	9	12
Selecting spring cover x Shift lever retainer		50	43 in.-lb	4.9
Shift lever retainer plate x Body		120	9	12

PROPELLER SHAFT

Specifications

Bearing axial play			0.05 mm	0.0020 in.
Front propeller shaft runout		Limit	0.8 mm	0.031 in.
Intermediate shaft runout		Limit	0.8 mm	0.031 in.
Rear propeller shaft runout		Limit	0.8 mm	0.031 in.
Intermediate shaft flange runout		Limit	0.1 mm	0.0039 in.
Snap ring thickness	Color	None	1.475 – 1.525 mm	0.0581 – 0.0600 in.
		Brown	1.525 – 1.575 mm	0.0600 – 0.0620 in.
		Blue	1.575 – 1.625 mm	0.0620 – 0.0640 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Propeller shaft x Differential		750	54	74
Intermediate shaft x Propeller shaft		750	54	74
Center support bearing x Body		375	27	37
Intermediate shaft x Center support bearing x Joint flange				
	1st	1,850	134	181
	2nd	Loosen nut		
	3rd	700	51	69
Cross groove joint set bolt		660	48	65

SUSPENSION AND AXLE

Specifications

Cold tire inflation pressure kg/cm² (psi, kPa)	Tire size	Front	Rear
	215/50R15 88V	2.2 (32, 210)	2.1 (30, 206)
Chassis ground clearance mm (in.)	All models	191.0 (7.520)	233.5 (9.193)
Rear wheel alignment		Inspection STD	Adjustment STD
	Toe-in	5 ± 2 mm (0.20 ± 0.08 in.)	5 ± 1 mm (0.20 ± 0.04 in.)
	Left-right error	3.0 mm (0.12 in.) or less	3.0 mm (0.12 in.) or less
	Camber	–45′ ± 30′	–
	Left-right error	30′ or less	–
Wheel lateral runout		Less than 1.0 mm (0.039 in.)	

Front axle and suspension	Hub bearing axial direction play	Limit	0.05 mm	0.0020 in.
	Ball joint rotation condition		10 – 30 kg-cm	9 – 26 in.-lb 1.0 – 2.9 N·m
	Ball joint vertical play		0 mm	0 in.
	Drive shaft grease capacity			
	Outboard joint		120 g	0.26 lb
	Inboard joint		90 g	0.20 lb
	Side gear shaft		43 g	0.09 lb
	Drive shaft standard length		405.4 mm	15.96 in.
Rear axle and suspension	Hub bearing axial direction play	Limit	0.05 mm	0.0020 in.
	Rear axle hub runout	Limit	0.07 mm	0.0028 in.
	Stabilizer bar link			
	Ball joint rotation condition		0.5 – 10.0 kg-cm (0.434 – 8.680 in.-lb, 0.049 – 0.981 N·m)	
	Drive shaft grease capacity			
	Inboard joint		180 g	0.40 lb
	Outboard joint		120 g	0.26 lb
	Drive shaft standard length		558.5 mm	21.99 in.
Differential	Drive pinion bearing preload (at Starting)			
	New bearing		10 – 16 kg-cm (8.7 – 13.9 in.-lb, 1.0 – 1.6 N·m)	
	Reused bearing		5 – 8 kg-cm (4.3 – 6.9 in.-lb, 0.5 – 0.8 N·m)	
	Total preload (at Starting)		Add drive pinion bearing preload 3 – 5 kg-cm (2.6 – 4.3 in.-lb, 0.3 – 0.5 N·m)	
	Drive pinion to ring gear backlash		0.13 – 0.18 mm	0.0051 – 0.0071 in.
	Side gear backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.
	Ring gear runout	Limit	0.07 mm	0.0028 in.

Specifications (Cont'd)

Differential (cont'd)	Companion flange runout		
	Lateral runout	Limit	0.1 mm 0.004 in.
	Radial runout	Limit	0.1 mm 0.004 in.
	Ring gear installing temperature		90 – 110°C 194 – 230°F
	Drive pinion oil seal drive in depth		2.0 mm 0.079 in.
	Side gear oil seal drive in depth		Flash the carrier end surface
	Side gear thrust washer thickness		0.95 mm 0.0374 in.
			1.00 mm 0.0394 in.
			1.05 mm 0.0413 in.
			1.10 mm 0.0433 in.
			1.15 mm 0.0453 in.
			1.20 mm 0.0472 in.
	Side bearing adjusting washer thickness		2.21 – 2.23 mm 0.0870 – 0.0878 in.
			2.24 – 2.26 mm 0.0882 – 0.0890 in.
			2.27 – 2.29 mm 0.0894 – 0.0902 in.
			2.30 – 2.32 mm 0.0906 – 0.0913 in.
			2.33 – 2.35 mm 0.0917 – 0.0925 in.
			2.36 – 2.38 mm 0.0929 – 0.0937 in.
			2.39 – 2.41 mm 0.0941 – 0.0949 in.
			2.42 – 2.44 mm 0.0953 – 0.0961 in.
			2.45 – 2.47 mm 0.0965 – 0.0972 in.
			2.48 – 2.50 mm 0.0976 – 0.0984 in.
			2.51 – 2.53 mm 0.0988 – 0.0996 in.
			2.54 – 2.56 mm 0.1000 – 0.1008 in.
			2.57 – 2.59 mm 0.1012 – 0.1020 in.
			2.60 – 2.62 mm 0.1024 – 0.1031 in.
			2.63 – 2.65 mm 0.1035 – 0.1043 in.
			2.66 – 2.68 mm 0.1047 – 0.1055 in.
			2.69 – 2.71 mm 0.1059 – 0.1067 in.
			2.72 – 2.74 mm 0.1071 – 0.1079 in.
			2.75 – 2.77 mm 0.1083 – 0.1091 in.
			2.78 – 2.80 mm 0.1094 – 0.1102 in.
			2.81 – 2.83 mm 0.1106 – 0.1114 in.
			2.84 – 2.86 mm 0.1118 – 0.1126 in.
			2.87 – 2.89 mm 0.1130 – 0.1138 in.
			2.90 – 2.92 mm 0.1142 – 0.1150 in.
			2.93 – 2.95 mm 0.1154 – 0.1161 in.
			2.96 – 2.98 mm 0.1165 – 0.1173 in.
			2.99 – 3.01 mm 0.1177 – 0.1185 in.
			3.02 – 3.04 mm 0.1189 – 0.1197 in.
			3.05 – 3.07 mm 0.1201 – 0.1209 in.
			3.08 – 3.10 mm 0.1213 – 0.1220 in.
			3.11 – 3.13 mm 0.1224 – 0.1232 in.
			3.14 – 3.16 mm 0.1236 – 0.1244 in.
			3.17 – 3.19 mm 0.1248 – 0.1256 in.
			3.20 – 3.22 mm 0.1260 – 0.1268 in.
	Drive pinion adjusting washer thickness		2.26 – 2.28 mm 0.0890 – 0.0898 in.
			2.29 – 2.31 mm 0.0902 – 0.0909 in.

Specifications (Cont'd)

Differential (cont'd)	Drive pinion adjusting washer thickness (cont'd)	2.32 – 2.34 mm	0.0913 – 0.0921 in.
		2.35 – 2.37 mm	0.0925 – 0.0933 in.
		2.38 – 2.40 mm	0.0937 – 0.0945 in.
		2.41 – 2.43 mm	0.0949 – 0.0957 in.
		2.44 – 2.46 mm	0.0961 – 0.0969 in.
		2.47 – 2.49 mm	0.0972 – 0.0980 in.
		2.50 – 2.52 mm	0.0984 – 0.0992 in.
		2.53 – 2.55 mm	0.0996 – 0.1004 in.
		2.56 – 2.58 mm	0.1008 – 0.1016 in.
		2.59 – 2.61 mm	0.1020 – 0.1028 in.
		2.62 – 2.64 mm	0.1031 – 0.1039 in.
		2.65 – 2.67 mm	0.1043 – 0.1051 in.
		2.68 – 2.70 mm	0.1055 – 0.1063 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
FRONT AXLE AND SUSPENSION				
Tie rod end x Steering knuckle		500	36	49
Ball joint x Lower arm		1,300	94	127
Hub bearing lock nut		1,900	137	186
Transmission case protector bolt		185	13	18
Drive shaft x Side gear shaft		660	48	65
REAR AXLE AND SUSPENSION				
Brake caliper x Axle carrier		475	34	47
Strut rod x Axle carrier		1,150	83	113
Rear speed sensor x Axle carrier (w/ ABS)		195	14	19
Axle carrier x Backing plate		730	53	72
Parking brake cable x Backing plate		80	69 in.-lb	7.8
Rear drive shaft x Axle hub		1,900	137	186
Suspension arm x Body		1,150	83	113
Suspension arm x Axle carrier		1,250	90	123
Strut rod x Body		1,150	83	113
Hub bolt x Wheel		1,050	76	103
Drive shaft x Side gear shaft		700	51	69
Propeller shaft x Companion flange		750	54	74
Rear crossmember x Body		730	53	72
Differential case x Ring gear		985	71	97
Bearing cap x Differential carrier		800	58	78
Differential carrier x Carrier cover		475	34	47
Differential x Support member	Upper side	970	70	95
	Rear side	1,500	108	147
Drain plug		500	36	49
Filler plug		400	29	39
Shock absorber x Axle carrier		2,600	188	255
Shock absorber x Stabilizer link		650	47	64
Stabilizer bracket x Body		195	14	19

BRAKE SYSTEM

Specifications

Front brake	Disc thickness	STD	25.0 mm	0.984 in.
		Limit	23.0 mm	0.906 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
ABS actuator x Proportioning valve bracket	90	78 in.-lb	8.8
ABS actuator x 3-way union	160	12	16
Proportioning valve installation bolt	90	78 in.-lb	8.8
ABS actuator x Actuator bracket	55	48 in.-lb	5.4
Front speed sensor installation bolt	80	69 in.-lb	7.8
Rear speed sensor installation bolt	195	14	19

STEERING

Specifications

Power steering	Oil pressure	at Idle speed	80 – 85 kg/cm^2 (1,138 – 1,209 psi, 7,845 – 8,336 kPa)

Torque Specifications

	Part tightened		kg-cm	ft-lb	N·m
Power steering (Power steering pump)	Drive pulley nut		440	32	43
	Pressure tube union bolt		525	38	51
	Pressure tube union nut		370	27	36
	PS pump x Bracket	Upper	440	32	43
		Lower	400	29	39
	Tie rod end x Knuckle arm		500	36	49
	Lower crossmember	RH and LH sides	1,550	112	152
		Center	400	29	39
(Gear housing)	Gear housing x Body		600	43	59
	Gear housing x Return line		450	33	44
	Gear housing x Pressure line		450	33	44
	Center member x Body		530	38	52
	Tie rod end x Knuckle arm		500	36	49
	Control valve shaft x Universal joint		360	26	35
	Lower crossmember	RH and LH sides	1,550	112	152
		Center	400	29	39
	Tube clamp set bolt		130	9	13
	Engine x Engine mounting		790	57	77
	Engine mounting x Insulator		890	64	87
	Engine mounting x Center member		740	54	73
	Exhaust front pipe x Manifold		630	46	62
	Exhaust front pipe x Center pipe		440	32	43
	Propeller shaft x Intermediate shaft		750	54	74
	Stabilizer bar x Link		360	26	35
	Stabilizer bar bracket		180	13	18

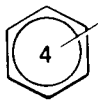
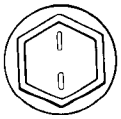
LUBRICANT

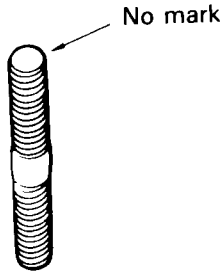
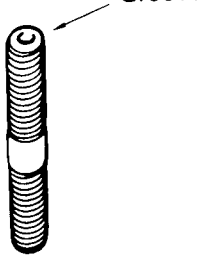
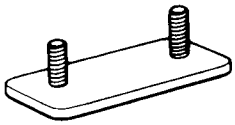
Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Engine oil Drain and refill w/ Oil filter change w/o Oil filter change Dry fill	 3.9 3.6 4.3	 4.1 3.8 4.5	 3.4 3.2 3.8	API grade SG, multigrade fuel-efficient and recommended viscosity oil
Manual transaxle oil (E150F)	5.2	5.5	4.6	API GL-5 Viscosity: Above – 18°C (0°F) SAE90 Below – 18°C (0°F) SAE80W
Differential oil	1.1	1.2	1.0	API GL-5 Hypoid gear oil Viscosity: Above – 18°C (0°F) SAE90 Below – 18°C (0°F) SAE80W-90
Brake fluid	–			SAE J1703 or FMVSS No. 116 DOT3

STANDARD BOLT TORQUE SPECIFICATIONS

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	 Bolt head No. 4– 4T; 5– 5T; 6– 6T; 7– 7T; 8– 8T; 9– 9T; 10– 10T; 11– 11T	
	 No mark	4T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt w/ washer hexagon bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T

	Mark	Class
Stud bolt	 No mark	4T
	 Grooved	6T
Welded bolt		4T

SPECIFIED TORQUE FOR STANDARD BOLTS

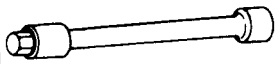
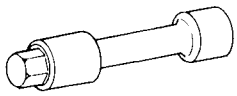
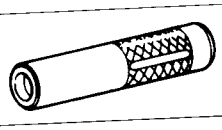
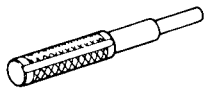
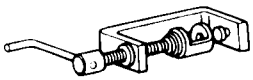
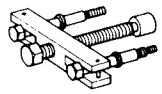
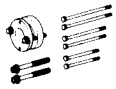
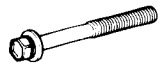
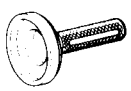
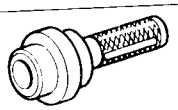
Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			kg-cm	ft-lb	N·m	kg-cm	ft-lb	N·m
4T	6	1	55	48 in.-lb	5	60	52 in.-lb	6
	8	1.25	130	9	12.5	145	10	14
	10	1.25	260	19	26	290	21	29
	12	1.25	480	35	47	540	39	53
	14	1.5	760	55	74	850	61	84
	16	1.5	1,150	83	115	—	—	—
5T	6	1	65	56 in.-lb	6.5	75	65 in.-lb	7.5
	8	1.25	160	12	15.5	175	13	17.5
	10	1.25	330	24	32	360	26	36
	12	1.25	600	43	59	670	48	65
	14	1.5	930	67	91	1,050	76	100
	16	1.5	1,400	101	140	—	—	—
6T	6	1	80	69 in.-lb	8	90	78 in.-lb	9
	8	1.25	195	14	19	210	15	21
	10	1.25	400	29	39	440	32	44
	12	1.25	730	53	71	810	59	80
	14	1.5	1,100	80	110	1,250	90	125
	16	1.5	1,750	127	170	—	—	—
7T	6	1	110	8	10.5	120	9	12
	8	1.25	260	19	25	290	21	28
	10	1.25	530	38	52	590	43	58
	12	1.25	970	70	95	1,050	76	105
	14	1.5	1,500	108	145	1,700	123	165
	16	1.5	2,300	166	230	—	—	—
8T	8	1.25	300	22	29	330	24	33
	10	1.25	620	45	61	690	50	68
	12	1.25	1,100	80	110	1,250	90	120
9T	8	1.25	340	25	34	380	27	37
	10	1.25	710	51	70	790	57	78
	12	1.25	1,300	94	125	1,450	105	140
10T	8	1.25	390	28	38	430	31	42
	10	1.25	800	58	78	890	64	88
	12	1.25	1,450	105	140	1,600	116	155
11T	8	1.25	430	31	42	480	35	47
	10	1.25	890	64	87	990	72	97
	12	1.25	1,600	116	155	1,800	130	175

SST AND SSM

REFER TO 1990 CELICA REPAIR MANUAL (Pub. No. RM149U)

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

SST (SPECIAL SERVICE TOOLS)

Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA Front	SA Rear	BR	SR
	09043-38100	Hexagon 10 mm Wrench	●						●					
	09043-88010	Hexagon 8 mm Wrench									●			
	09201-41020	Valve Stem Oil Seal Replacer	●											
	09201-60011	Valve Guide Bushing Remover & Replacer							*1 ●					
	09201-70010	Valve Guide Bushing Remover & Replacer	●											
	09202-70010	Valve Spring Compressor	●											
	09213-31021	Crankshaft Pulley Puller	●											
	09213-54015	Crankshaft Pulley Holding Tool	●											
	(90119-08216)	(Bolt)	●											
	09222-30010	Connecting Rod Bushing Remover & Replacer	●											
	09223-15010	Crankshaft Rear Oil Seal Replacer								*2 ●		●		
	09223-50010	Crankshaft Front Oil Seal Replacer		*3 ●										

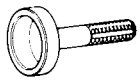
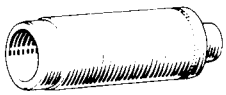
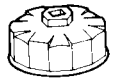
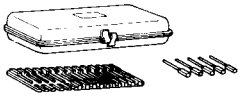
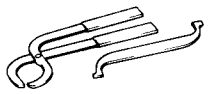
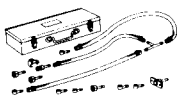
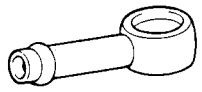
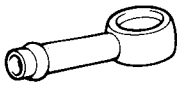
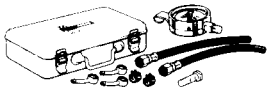
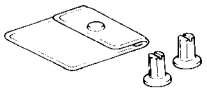
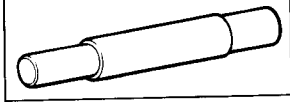
Remarks:

*1 Speedometer driven gear oil seal

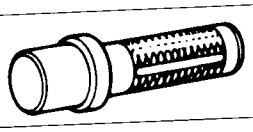
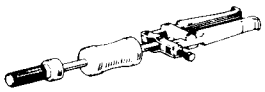
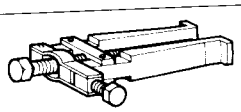
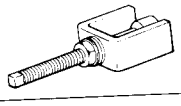
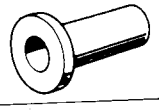
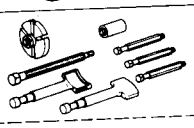
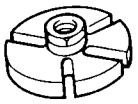
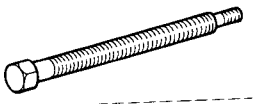
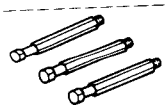
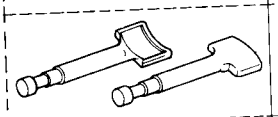
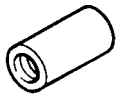
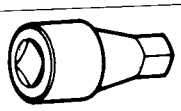
*2 Side bearing oil seal

*3 Camshaft oil seal

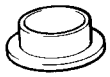
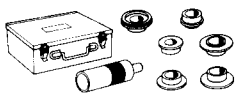
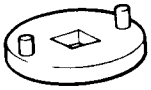
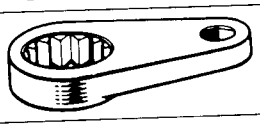
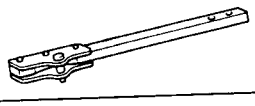
SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	09223-63010	Crankshaft Rear Oil Seal Replacer	●											
	09226-10010	Crankshaft Front & Rear Bearing Replacer	●											
	09228-06500	Oil Filter Wrench				●								
	09240-00020	Wire Gauge Set					●							
	09248-55010	Valve Clearance Adjust Tool Set	●											
	09249-63010	Torque Wrench Adaptor	●											
	09268-41045	Injection Measuring Tool Set			●									
	(09268-41080)	(No. 6 Union)			●									
	(90405-09015)	(No. 1 Union)			●									
	09268-45012	EFI Fuel Pressure Gauge			●									
	09268-74010	Injector Remover			●									
	09301-17010	Clutch Guide Tool						●						

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	09307-12010	Extension Housing Bushing Replacer							●					
	09308-00010	Oil Seal Puller							●		●	●		
	09308-10010	Oil Seal Puller										●		
	09309-32050	5th Driven Gear Replacer							●					
	09309-36010	Transmission Rear Bearing Replacer							●			●		
	09310-17010	Transaxle Gear Remover & Replacer							●					
	(09310-07010)	(Plate)							●					
	(09310-07020)	(Center Bolt)							●					
	(09310-07030)	(Set Bolt)							●					
	(09310-07040)	(Claw)							●					
	(09310-07050)	(Adaptor)							●					
	09313-30021	Detent Ball Plug Socket							●					

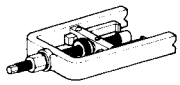
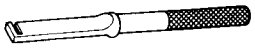
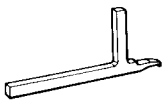
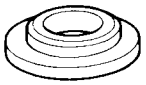
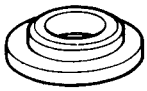
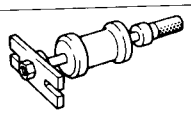
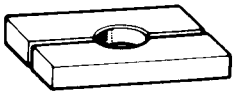
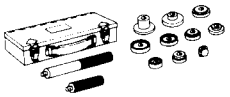
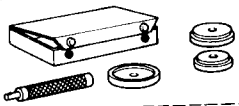
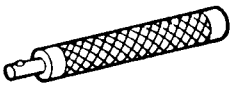
SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA Front	SA Rear	BR	SR
	09316-20011	Transfer Bearing Replacer							●					
	09316-60010	Transmission & Transfer Bearing Replacer							●					
	(09316-00010)	(Replacer Pipe)							●					
	(09316-00020)	(Replacer "A")							●					
	(09316-00040)	(Replacer "C")							●					
	(09316-00050)	(Replacer "D")							●					
	(09316-00060)	(Replacer "E")							●					
	(09316-00070)	(Replacer "F")							●					
	09318-20010	Transfer Side Bearing Adjusting Nut Wrench							●					
	09325-20010	Transmission Oil Plug							●	●				●
	09326-20011	Output Shaft Bearing Lock Nut Wrench							●					
	09330-00021	Companion Flange Holding Tool		*1 ●							●		●	

Remark:

*1 Crankshaft pulley

SST (SPECIAL SERVICE TOOLS) (Cont'd)

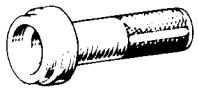
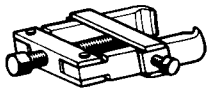
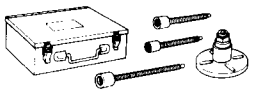
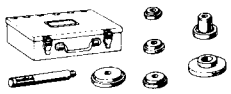
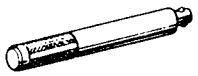
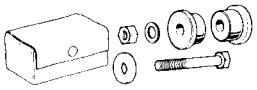
Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	09332-25010	Universal Joint Bearing Remover & Replacer								●				
	09333-00013	Clutch Diaphragm Spring Aligner						●						
	09504-22011	Differential Side Washer Remover & Replacer										●		
	09506-30012	Differential Drive Pinion Bearing Cone Replacer							*1 ●			●		
	09506-35010	Differential Drive Pinion Rear Bearing Replacer							*2 ●					
	09520-24010	Differential Side Gear Shaft Puller										●		
	09527-21011	Rear Axle Shaft Bearing Remover								●				
	09550-10012	Replacer Set "B"							●					
	(09252-10010)	(No. 1 Replacer Handle)							●					
	(09555-10010)	(Differential Drive Pinion Rear Bearing Replacer)							●					
	09550-22011	Rear Axle Bearing & Differential Tool Set										●		
	(09550-00020)	(Handle)										●		

Remarks:

*1 Output shaft rear bearing

*2 No.2 clutch hub and input shaft rear bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

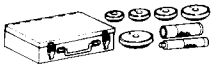
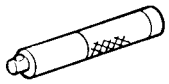
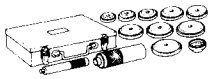
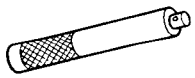
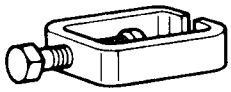
Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	(09550-00031)	(Replacer)										●		
	09554-22010	Differential Oil Seal Replacer										●		
	09556-22010	Drive Pinion Front Bearing Remover										●		
	09557-22022	Companion Flange Remover & Replacer								●		●		
	(09557-22040)	(No. 2 Bolt)										●		
	(09557-22050)	(No. 3 Bolt)								●				
	09608-12010	Front Hub & Drive Pinion Bearing Replacer Set							●					
	(09608-00020)	(Remover & Replacer Handle)							*1 ●					
	(09608-00060)	(Drive Pinion Front Bearing Cup Replacer)							*2 ●					
	(09608-00080)	(Differential Side Bearing Cone Replacer)							*1 ●					
	09608-16041	Front Hub Bearing Adjusting Tool									●	●		
	(09608-02020)	(Bolt & Nut)									●	●		

Remarks:

*1 Input shaft front seal

*2 Input shaft bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

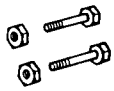
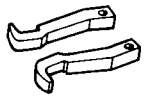
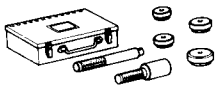
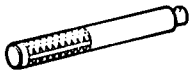
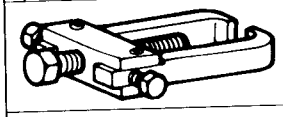
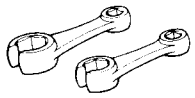
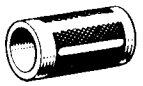
Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	(09608-02040)	(Retainer)									●	●		
	09608-30012	Front Hub & Drive Pinion Bearing Tool Set										●		
	(09608-00060)	(Drive Pinion Front Bearing Cup Replacer)										●		
	(09608-04020)	(Handle)										●		
	(09608-04100)	(Drive Pinion Front Bearing Cup Replacer)										●		
	(09608-04110)	(Drive Pinion Rear Bearing Cup Replacer)										●		
	09608-32010	Steering Knuckle Oil Seal Replacer										●		
	09608-35014	Axle Hub & Drive Pinion Bearing Tool Set							●					
	(09608-06020)	(Handle)							*1 ●					
	(09608-06120)	(Front Hub Outer Bearing Cup Replacer)							●					
	(09608-06180)	(Drive Pinion Rear Bearing Cup Replacer)							*2 ●					
	09611-22012	Tie Rod End Puller												●

Remarks:

*1 Ring gear mounting case side bearing outer race

*2 Front bearing outer race and rear bearing outer race

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	09612-65014	Steering Worm Bearing Puller							●					
	(09612-01050)	(Hanger Pin with Nut)							*1 ●					
	(09612-01060)	(Claw "E")							*1 ●					
	09616-30011	Steering Worm Bearing Adjusting Screw Wrench	*2 ●											
	09616-30020	Steering Worm Bearing Adjusting Screw Wrench												●
	09620-30010	Steering Gear Box Replacer Set							●					
	(09627-30010)	(Steering Sector Shaft Bushing Replacer)							*3 ●					
	(09631-00020)	(Handle)							*3 ●					
	09628-62011	Ball Joint Puller									●			
	09631-22020	Power Steering Hose Nut 14 x 17 mm Wrench Set			*4 ●									●
	09636-20010	Upper Ball Joint Dust Cover Replacer										●		
	09710-22020	Front Suspension Bushing Tool Set										●		

Remarks:

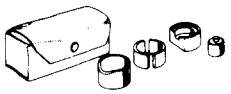
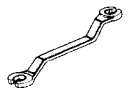
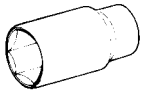
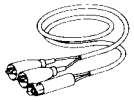
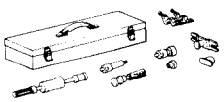
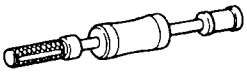
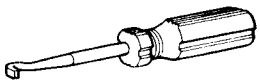
*1 Input shaft bearing

*2 Oil pump pulley

*3 Control shaft cover oil seal, differential lock shift lever shaft oil seal and shift fork shaft oil seal

*4 Fuel line flare nut

SST (SPECIAL SERVICE TOOLS) (Cont'd)

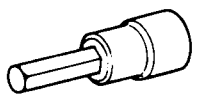
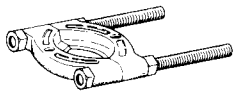
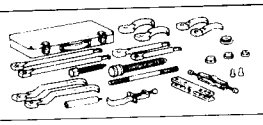
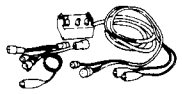
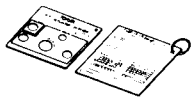
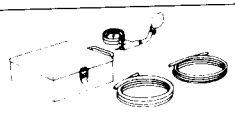
Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	(09710-01030)	(Upper Arm Bushing Replacer)										●		
	09726-10010	Lower Suspension Arm Bushing Remover & Replacer									●			
	(09726-00030)	(Spacer)									●			
	09751-36011	Brake Tube Union Nut 10 x 12 mm Wrench											●	
	09816-30010	Oil Pressure Switch Socket	*1 ●			●								
	09842-30050	Wire "A" EFI Inspection			●									
	09842-30060	Wire "E" EFI Inspection			●									
	09843-18020	Diagnosis Check Wire			●		●						●	
	09910-00015	Puller Set							●					
	(09911-00011)	(Puller Clamp)							●					
	(09912-00010)	(Puller Slide Hammer)							●					
	09921-00010	Spring Tension Tool							*2 ●					

Remarks:

*1 Knock sensor

*2 Speedometer driven gear oil seal

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	TC	FI	LU	IG	CL	MT	PR	SA		BR	SR
											Front	Rear		
	09923-00020	Hexagon 8 mm Wrench								●				
	09950-00020	Bearing Remover							●			●		
	09950-20017	Universal Puller							●	●	●	●		
	09990-00150	ABS (Anti-lock Brake System) Actuator Checker & Sub-harness											●	
	09990-00163	ABS Actuator Checker Sheet "A"											●	
	09990-00200	ABS Actuator Checker Sub-harness "C"											●	
	09992-00241	Turbocharger Pressure Gauge		●										

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Sec.	Use etc.
Seal packing or equivalent	08826-00080	EM	Camshaft bearing cap
Seal packing 1281, Three bond 1281 or equivalent	08826-00090	MT	Transaxle case x Transmission case Transmission case x Case cover Transfer left case Transmission x Transfer Transfer inspection cover
		SA	Differential carrier cover
Seal packing 1121, Three bond 1121 or equivalent	08826-00801	PR	Universal joint cover
		SA	Inboard joint cover
Adhesive 1324, Three bond 1324 or equivalent	08833-00070	EM	Flywheel mount bolt for M/T
		EC	BVSV for EVAP
Adhesive 1344, Three bond 1344, Loctite 242 or equivalent	08833-00080	EM	No.1 idler pulley pivot bolt
		LU	Oil pressure switch
		MT	Rear bearing retainer set screw Reverse restrict pin holder plug Straight screw plug Control shaft cover Bellcrank support lock bolt Transfer set bolt Transfer left case bolt

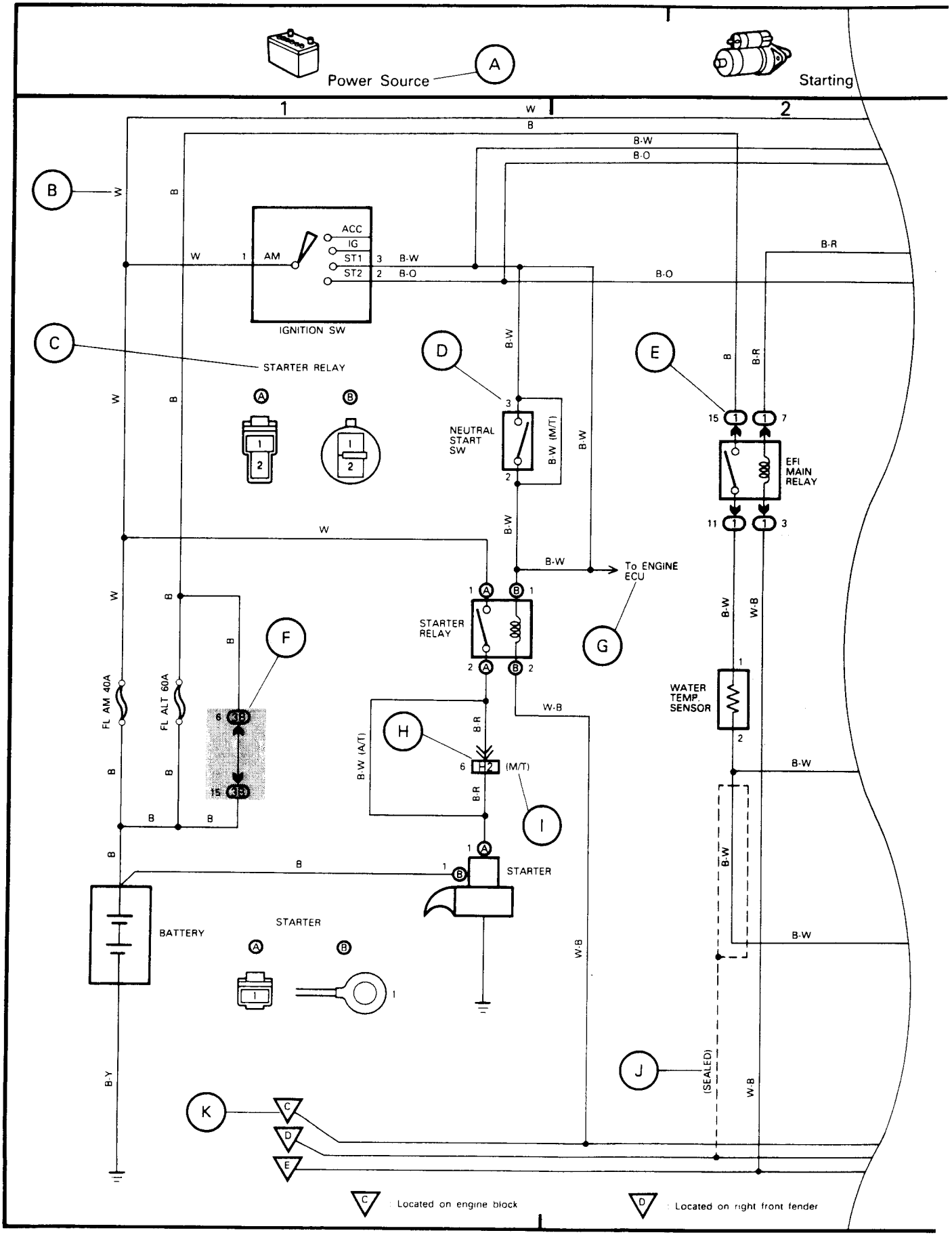
ELECTRICAL WIRING DIAGRAMS

ABBREVIATION

The following abbreviations are used in this wiring diagram.

ABS	=	Anti-Lock Brake System
A/C	=	Air Conditioner
CB	=	Circuit Breaker
CD	=	Compact Disc
COMB.	=	Combination
ECU	=	Electronic Control Unit
EFI	=	Electronic Fuel Injection
FL	=	Fusible Link
J/B	=	Junction Block
LH	=	Left-Hand
R/B	=	Relay Block
RH	=	Right-Hand
SRS	=	Supplemental Restraint System
SW	=	Switch
TEMP.	=	Temperature
VSV	=	Vacuum Switching Valve
w	=	With
w/o	=	Without

HOW TO READ THIS SECTION



Ⓐ: System Title

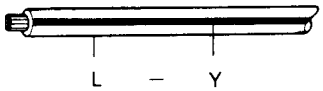
Ⓑ: Indicates the wiring color.

Wire colors are indicated by an alphabetical code.

B	= Black	L	= Blue	R	= Red
BR	= Brown	LG	= Light Green	V	= Violet
G	= Green	O	= Orange	W	= White
GR	= Gray	P	= Pink	Y	= Yellow

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

Example: L—Y



L — Y
(Blue) (Yellow)

Ⓒ: Indicates the connector to be connected to a part (the numeral indicates the pin No.)

Ⓓ: Indicates the pin number of the connector. The numbering system is different for female and male connectors.

Example: Numbered in order from upper left to lower right / Numbered in order from upper right to lower left

Female Male

BE0832

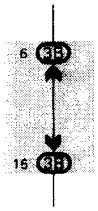
The numbering system for the overall wiring diagram is the same as above.

Ⓔ: Indicates a Relay Block. No shading is used and only the Relay Block No. is shown to distinguish it from the J/B.

Example: ① Indicates Relay Block No.1.

Ⓕ: Junction Block (The number in the circle is the J/B No. and the connector code is shown beside it). Junction Blocks are shaded to clearly separate them from other parts (different junction blocks are shaded differently for further clarification).

Example:

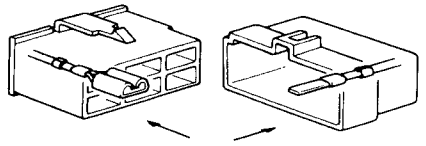


3B indicates that it is inside Junction Block No.3.

Ⓖ: Indicates related system.

Ⓗ: Indicates the wiring harness and wiring harness connector. The wiring harness with male terminal is shown with arrows (⩔). Outside numerals are pin numbers.

- All connectors are shown from the open end, and the lock is on top.



Female Male (⩔)

BE0833

Ⓘ: ( ) are used to indicate different wiring and connector, etc. when the vehicle model, engine type, or specification is different.

Ⓙ: Indicates a sealed wiring harness.

Ⓚ: Indicates a ground point.

SYSTEM INDEX

CELICA

1990 Model (Page 1 to Page 22)

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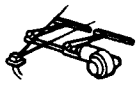
Front Wiper and Washer		6-2
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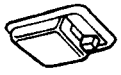
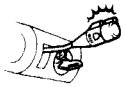
Interior Lights		7-3
Light Reminder		3-4

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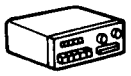
Radio and Player		10-4 (w/o CD) 11-3 (w/ CD)
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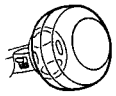
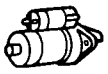
SRS Airbag		6-4
Starting		1-2
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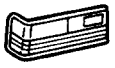
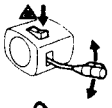
Taillights		3-2
Turn Signal and Hazard		5-2
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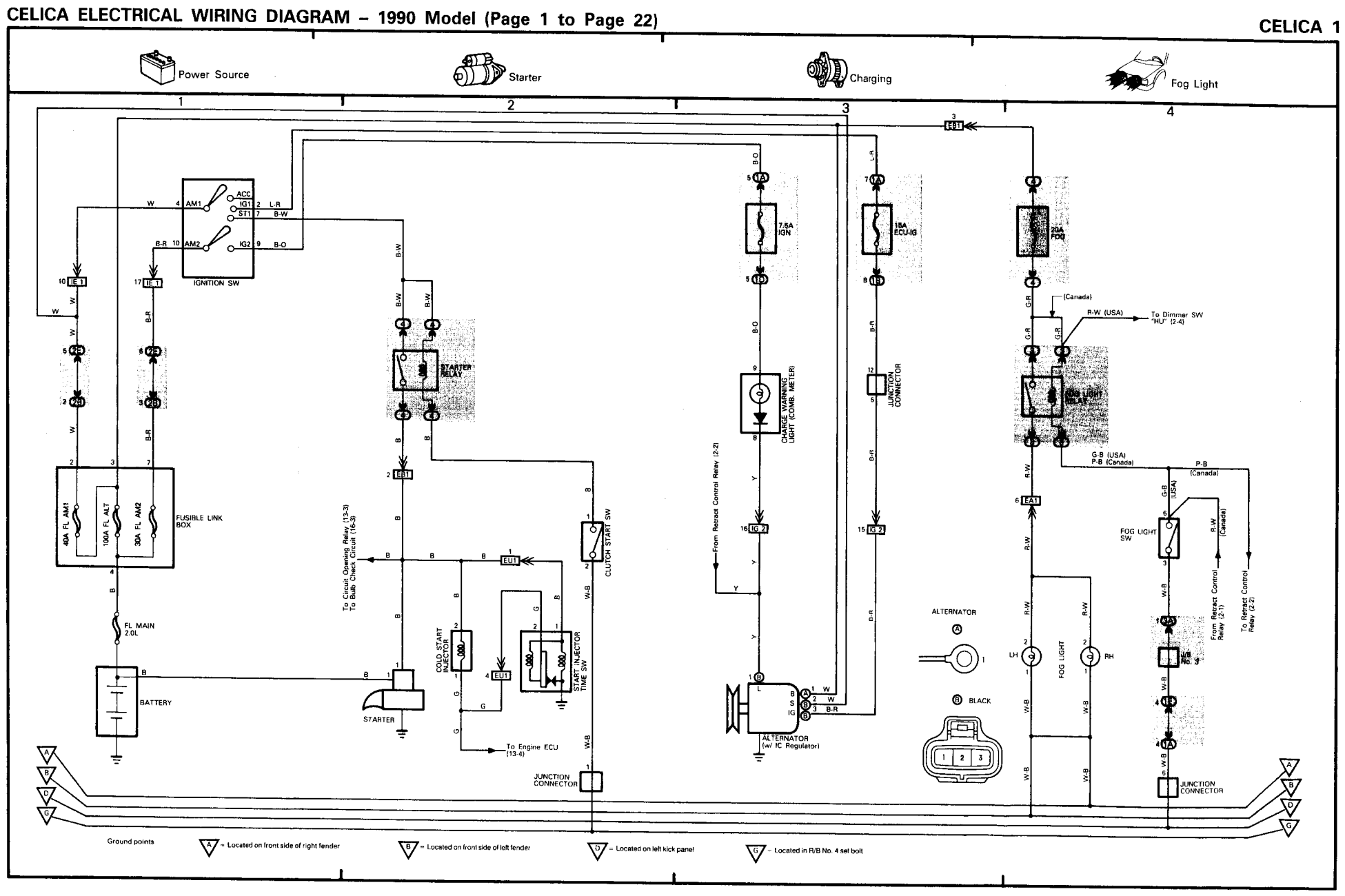
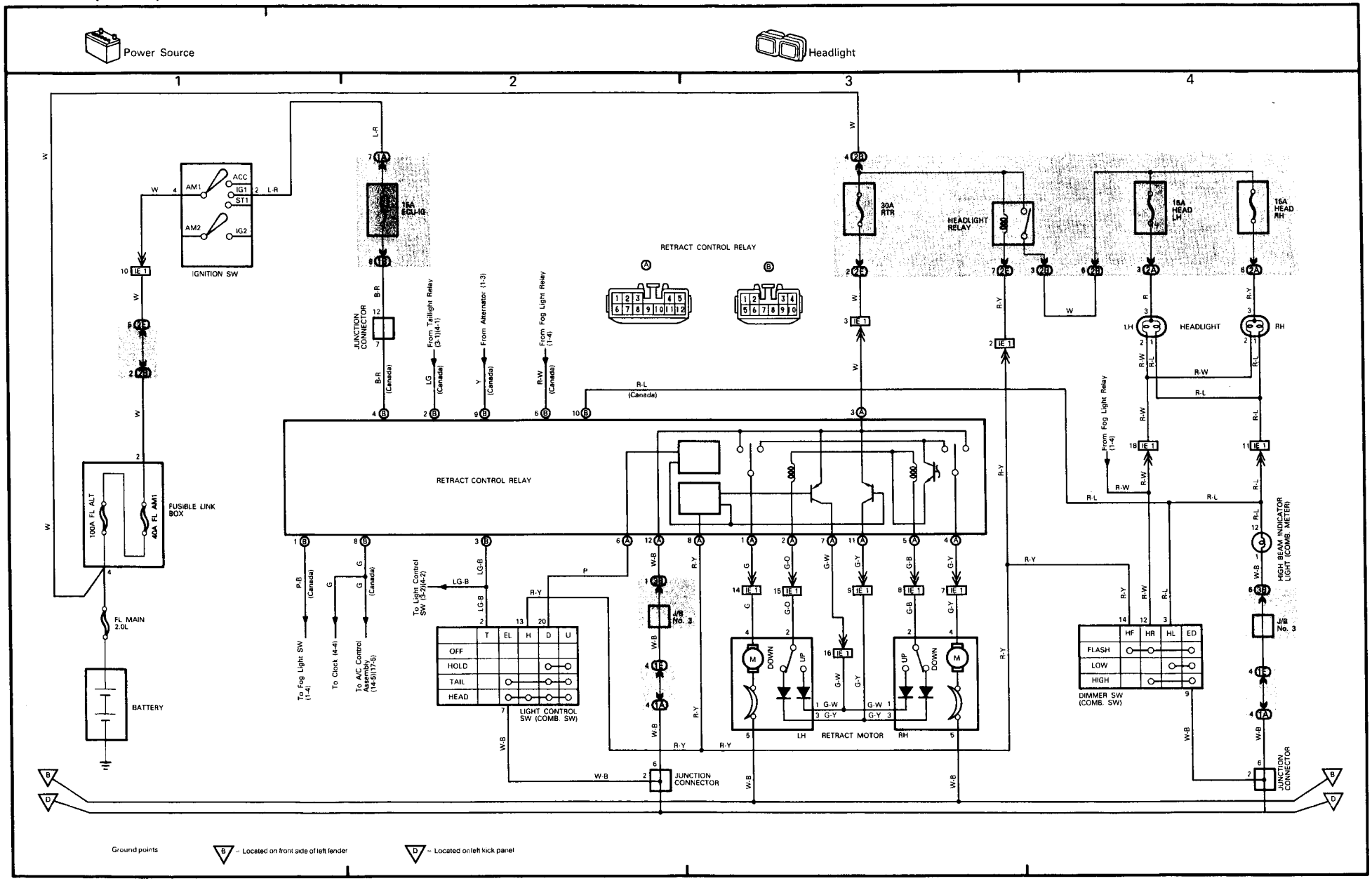
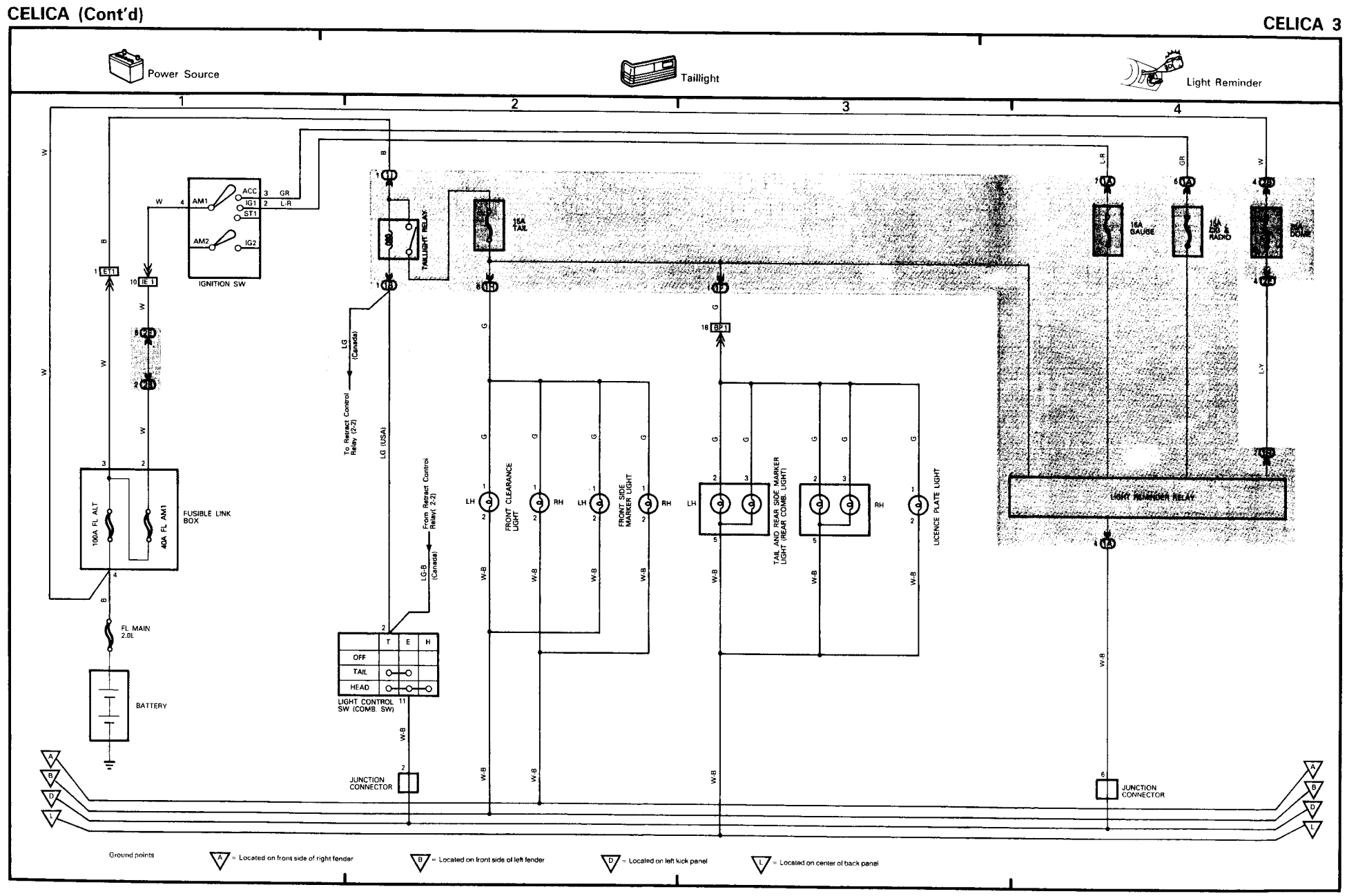

Power Source
Starter
Charging
Fog Light
1
2
3
4
IGNITION SW
ACC
IG1
ST1
AM1
AM2
IG2
STARTER RELAY
FUSIBLE LINK BOX
40A FL AM1
100A FL ALT
30A FL AM2
FL MAIN 2.0L
BATTERY
STARTER
To Circuit Opening Relay (13-3)
To Bulb Check Circuit (16-3)
COLD START INJECTOR
START INJECTOR TIME SW
To Engine ECU (13-4)
CLUTCH START SW
JUNCTION CONNECTOR
7.5A IGN
CHARGE WARNING LIGHT (COMB. METER)
From Retract Control Relay (2-2)
ALTERNATOR (w/ IC Regulator)
15A ECU-IG
20A FOG
(Canada)
R-W (USA)
To Dimmer SW "HU" (2-4)
FOG LIGHT RELAY
G-B (USA)
P-B (Canada)
FOG LIGHT SW
LH
RH
FOG LIGHT
From Retract Control Relay (2-1)
To Retract Control Relay (2-2)
ALTERNATOR
BLACK
Ground points
A = Located on front side of right fender
B = Located on front side of left fender
D = Located on left kick panel
G = Located in R/B No. 4 set bolt


Power Source
Headlight
1
2
3
4
IGNITION SW
ACC
IG1
ST1
IG2
AM1
AM2
15A ECU-IG
JUNCTION CONNECTOR
From Taillight Relay (3-1)(4-1)
From Alternator (1-3)
From Fog Light Relay (1-4)
RETRACT CONTROL RELAY
30A RTR
HEADLIGHT RELAY
15A HEAD LH
15A HEAD RH
HEADLIGHT
LH
RH
100A FL ALT
40A FL AM1
FUSIBLE LINK BOX
FL MAIN 2.0L
BATTERY
To Fog Light SW (1-4)
To Clock (4-4)
To A/C Control Assembly (14-5)(17-5)
To Light Control SW (3-2)(4-2)
J/B No. 3
OFF
HOLD
TAIL
HEAD
LIGHT CONTROL SW (COMB. SW)
DOWN
UP
RETRACT MOTOR
FLASH
LOW
HIGH
DIMMER SW (COMB. SW)
HIGH BEAM INDICATOR LIGHT (COMB. METER)
JUNCTION CONNECTOR
Ground points
B - Located on front side of left fender
D - Located on left kick panel

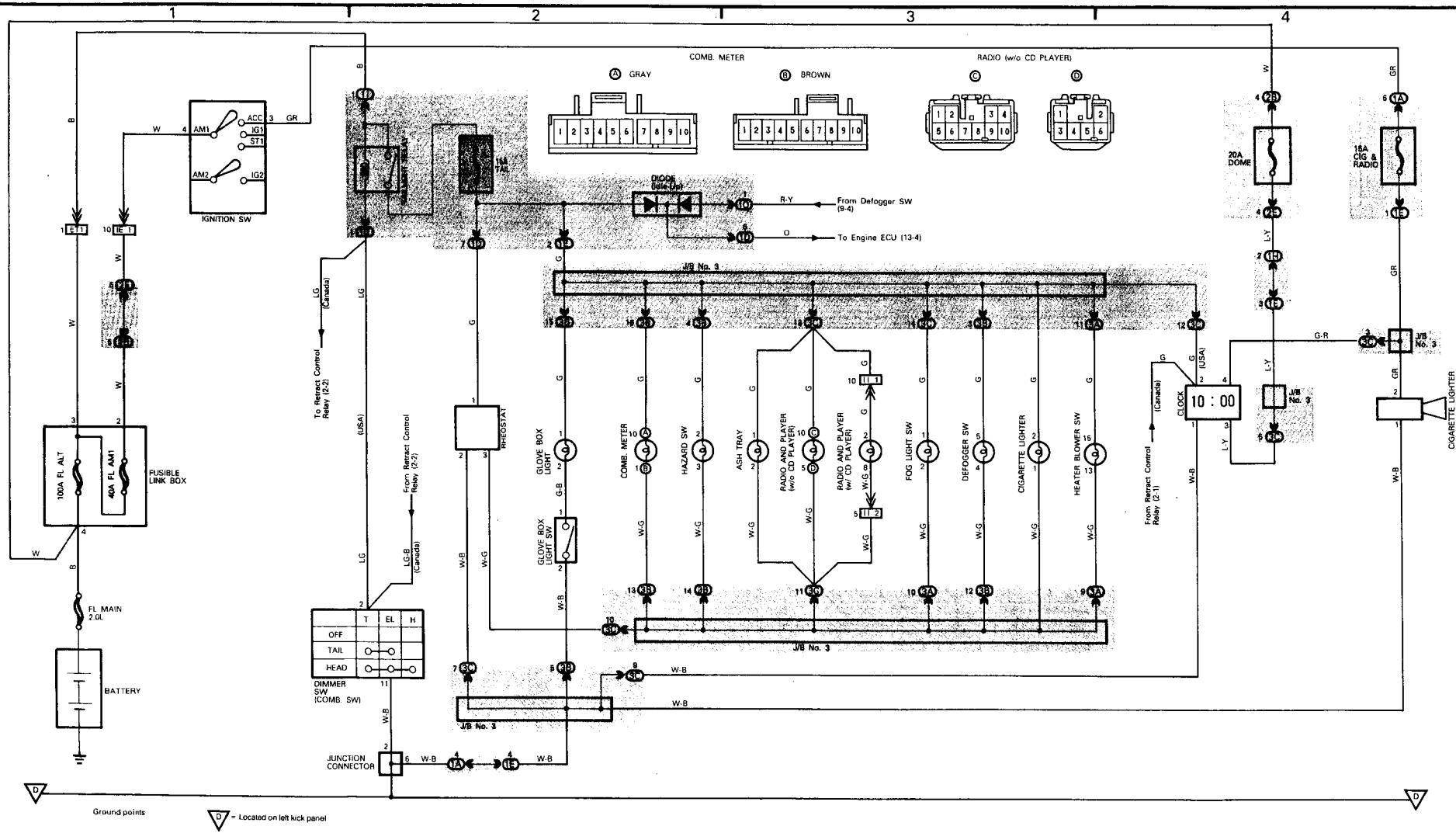

Power Source
Taillight
Light Reminder
1
2
3
4
IGNITION SW
ACC
IG1
ST1
IG2
AM1
AM2
TAILLIGHT RELAY
15A TAIL
16A GAUGE
10A A/C & RADIO
10A DOME
LIGHT REMINDER RELAY
FUSIBLE LINK BOX
100A FL ALT
40A FL AM1
FL MAIN 2.0L
BATTERY
LIGHT CONTROL SW (COMB. SW)
OFF
TAIL
HEAD
JUNCTION CONNECTOR
FRONT CLEARANCE LIGHT
FRONT SIDE MARKER LIGHT
TAIL AND REAR SIDE MARKER LIGHT (REAR COMB. LIGHT)
LICENCE PLATE LIGHT
LH
RH
To Retract Control Relay (2-2)
From Retract Control Relay (2-2)
LG (Canada)
LG (USA)
LG-B (Canada)
Ground points
A = Located on front side of right fender
B = Located on front side of left fender
D = Located on left kick panel
L = Located on center of back panel

Power Source

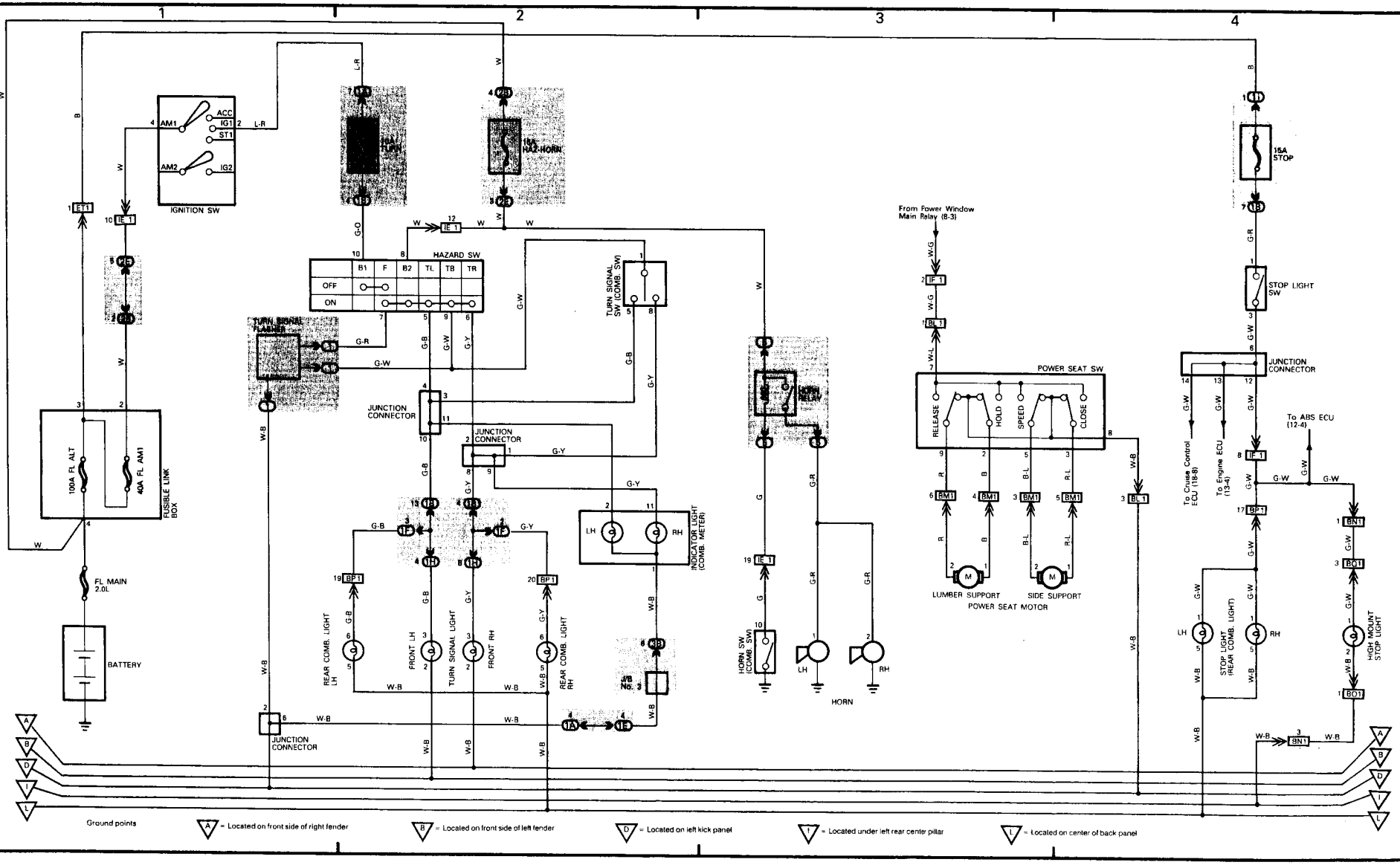
Illumination

Clock

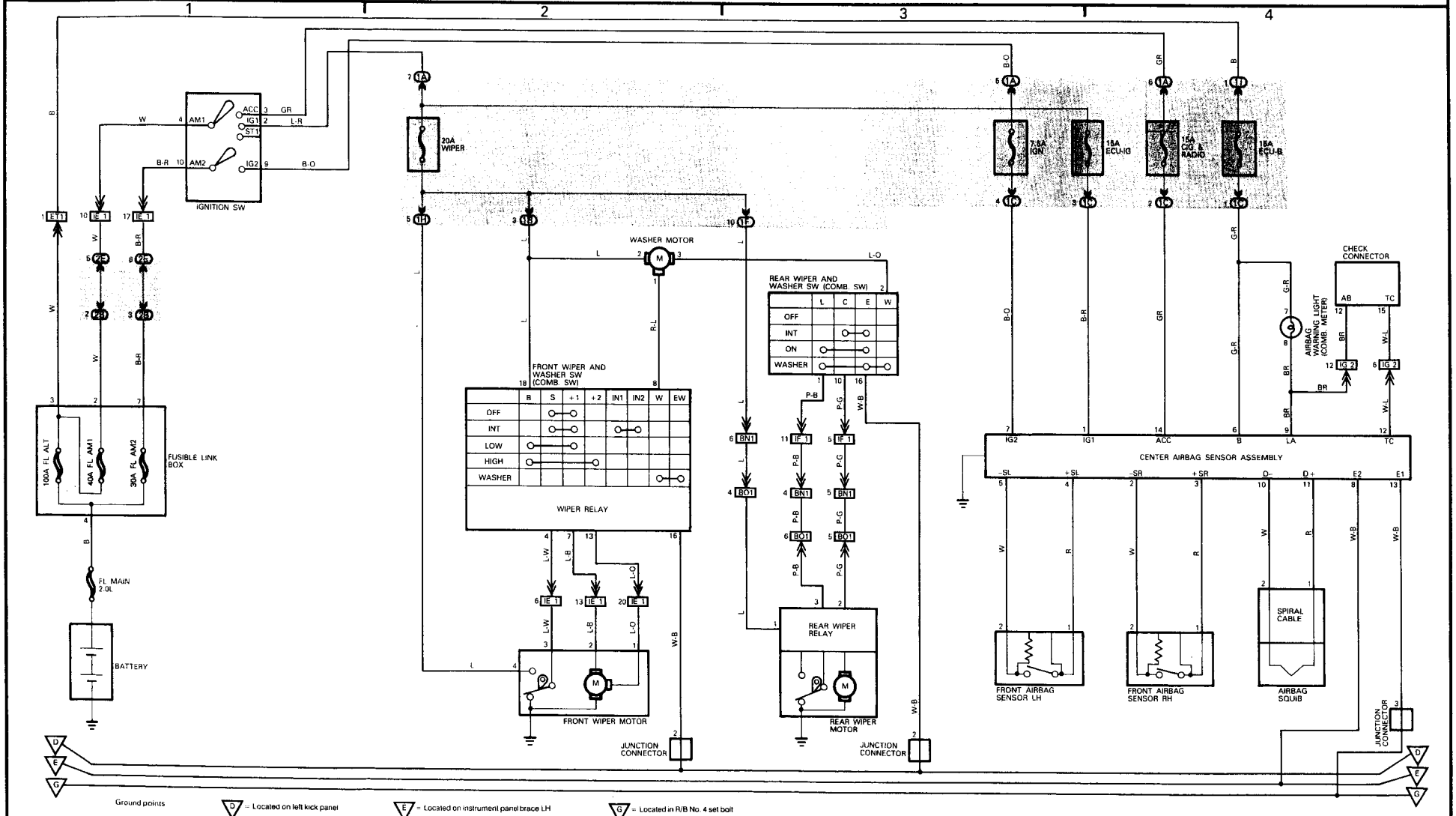
Cigarette Lighter



Power Source | Turn Signal and Hazard | Horn | Power Seat | Stop Light



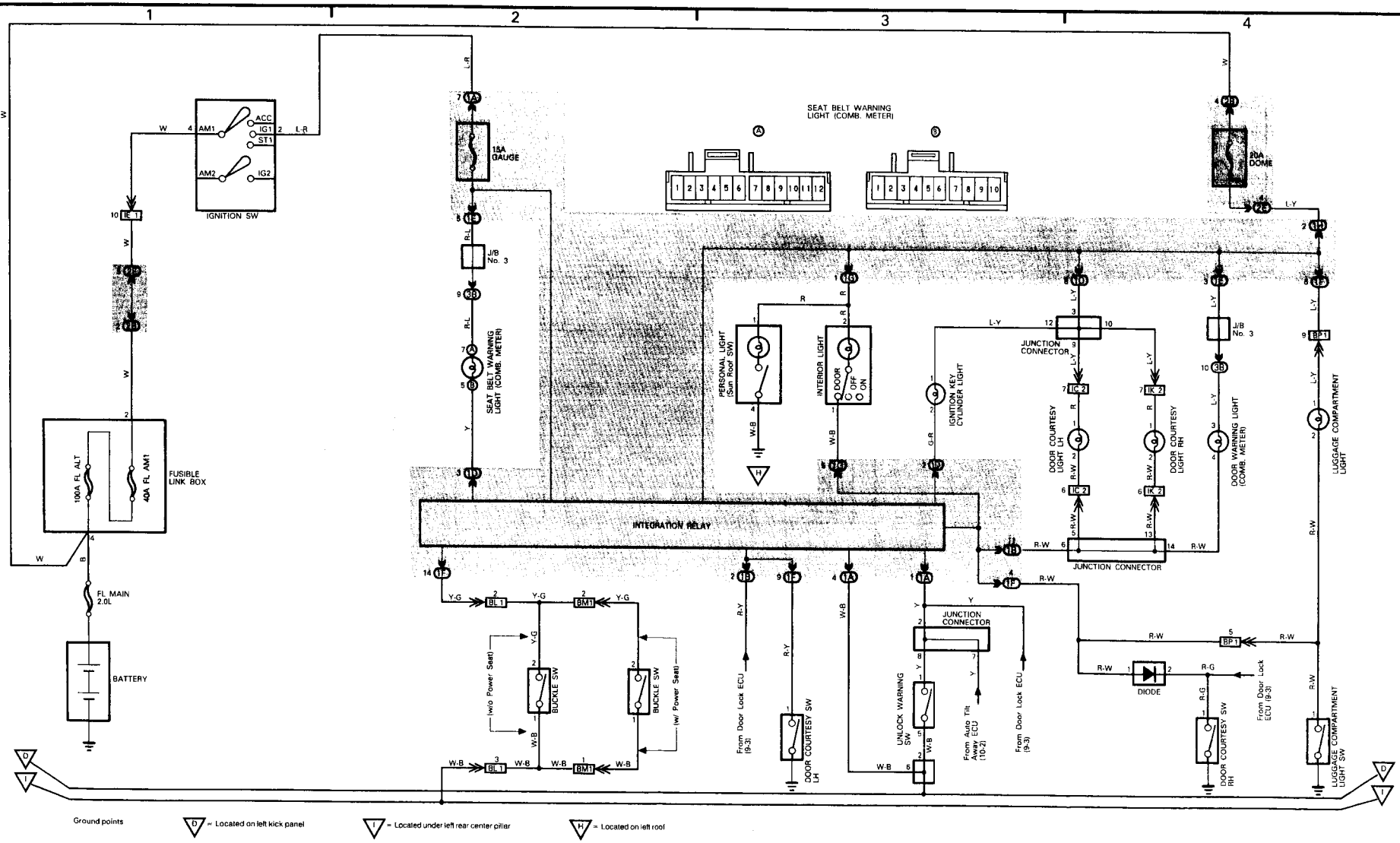
Power Source | Front Wiper and Washer | Rear Wiper and Washer | SRS Airbag



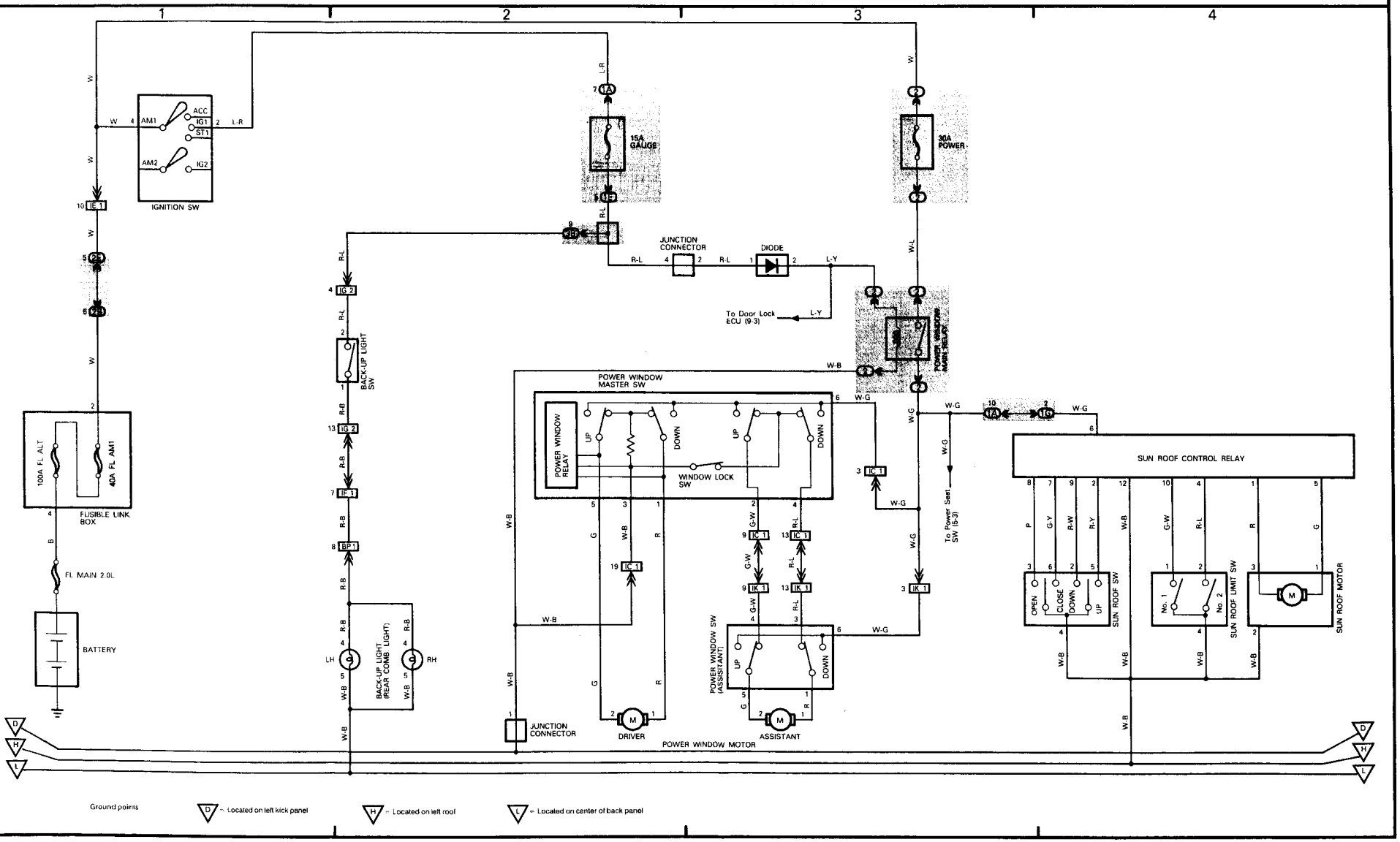
Power Source

Unlock and Seat Belt Warning

Interior Light



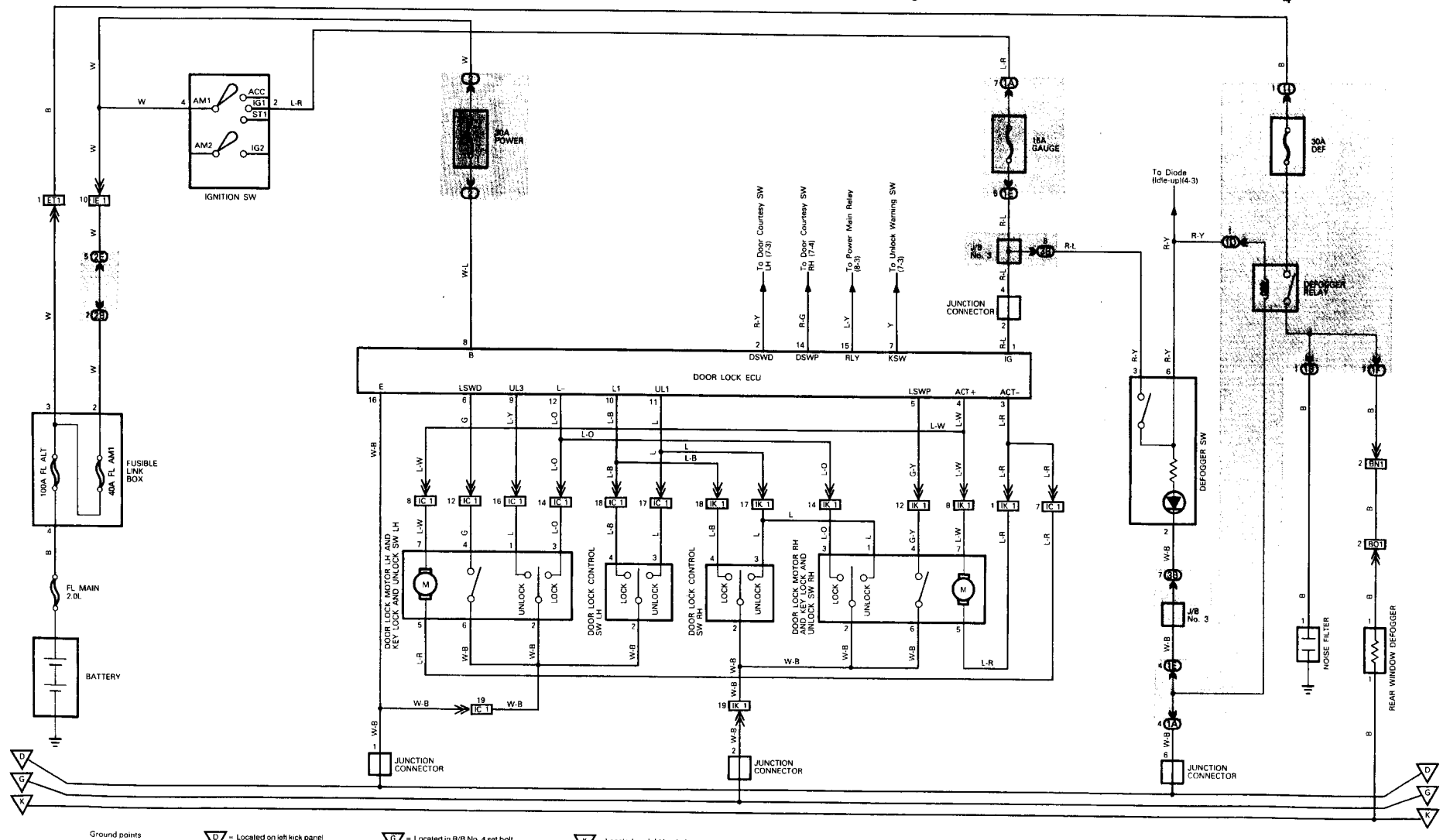
Power Source | Back-Up Light | Power Window | Sun Roof



Power Source

Door Lock

Rear Window Defogger

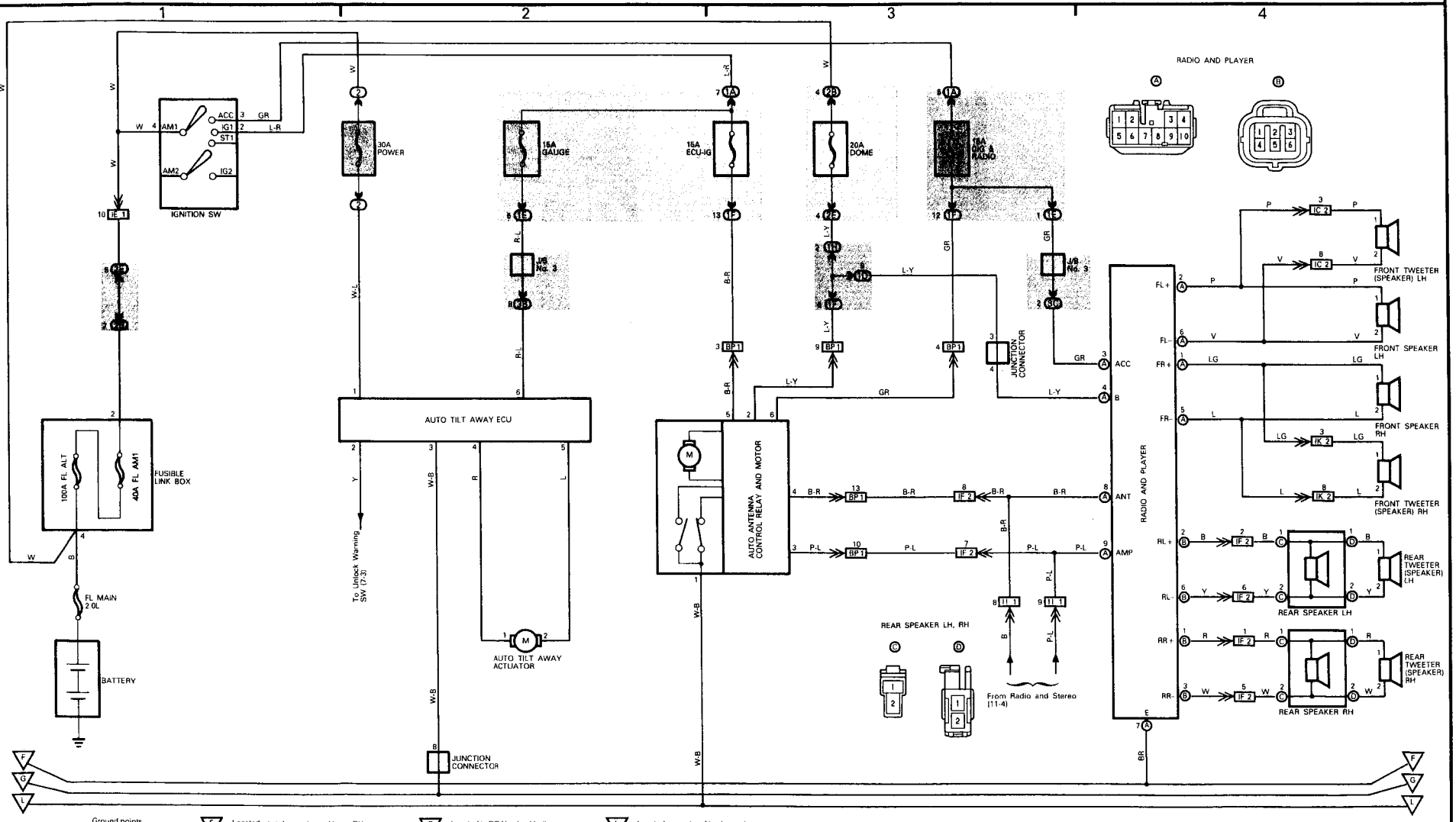


Power Source

Auto Tilt Away Steering

Auto Antenna

Radio and Player (w/o CD Player)



Ground points

F = Located on instrument panel brace RH

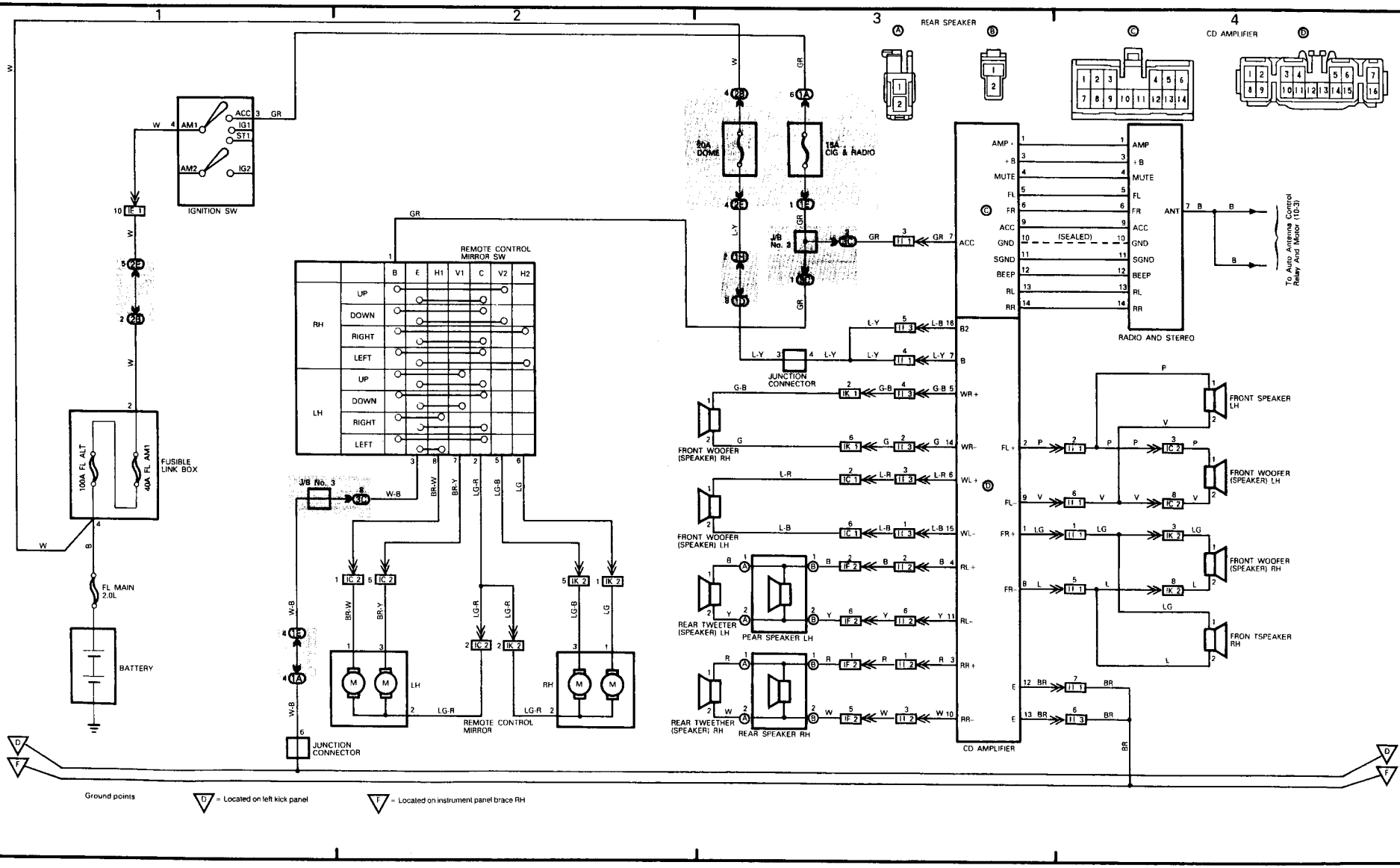
G = Located in R/B No. 4 set bolt

L = Located on center of back panel

Power Source

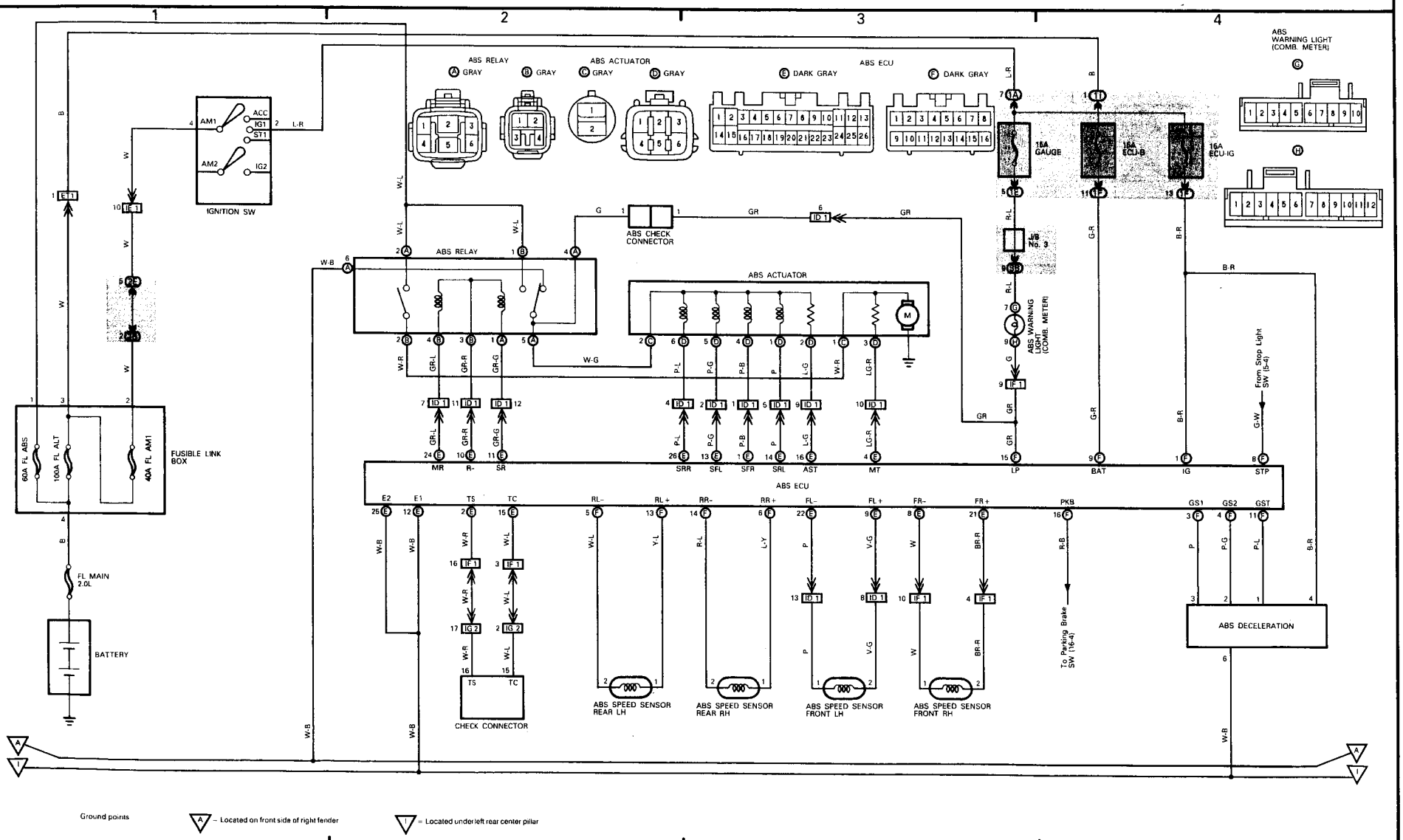
Remote Control Mirrors

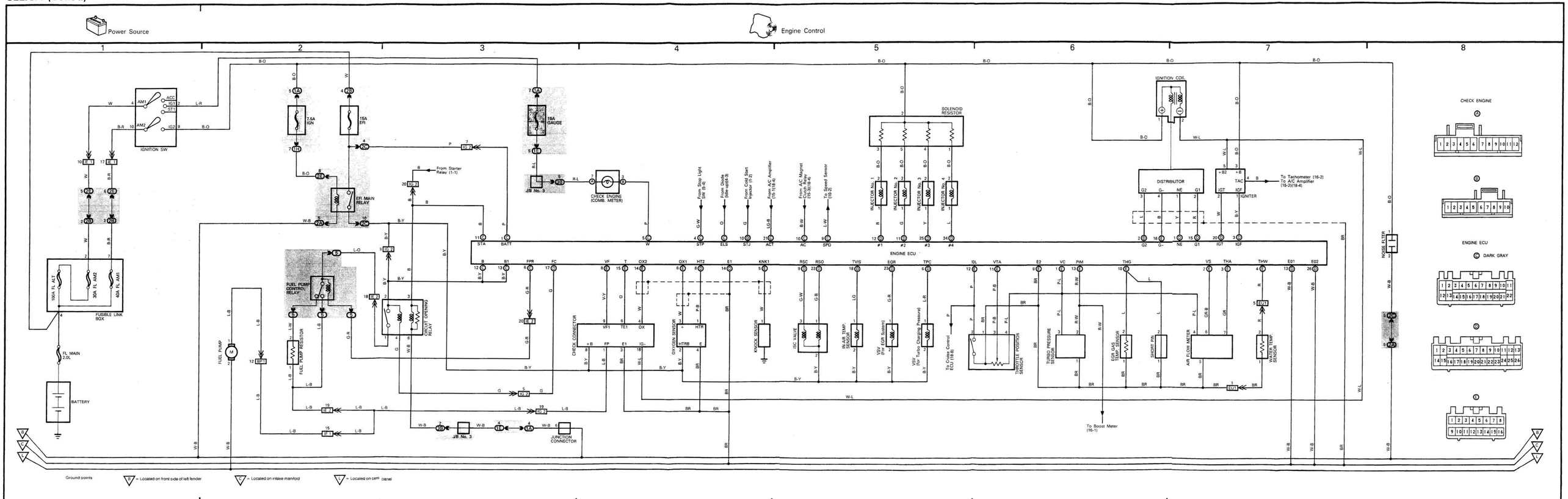
Radio and Player (w/ CD player)



Power Source

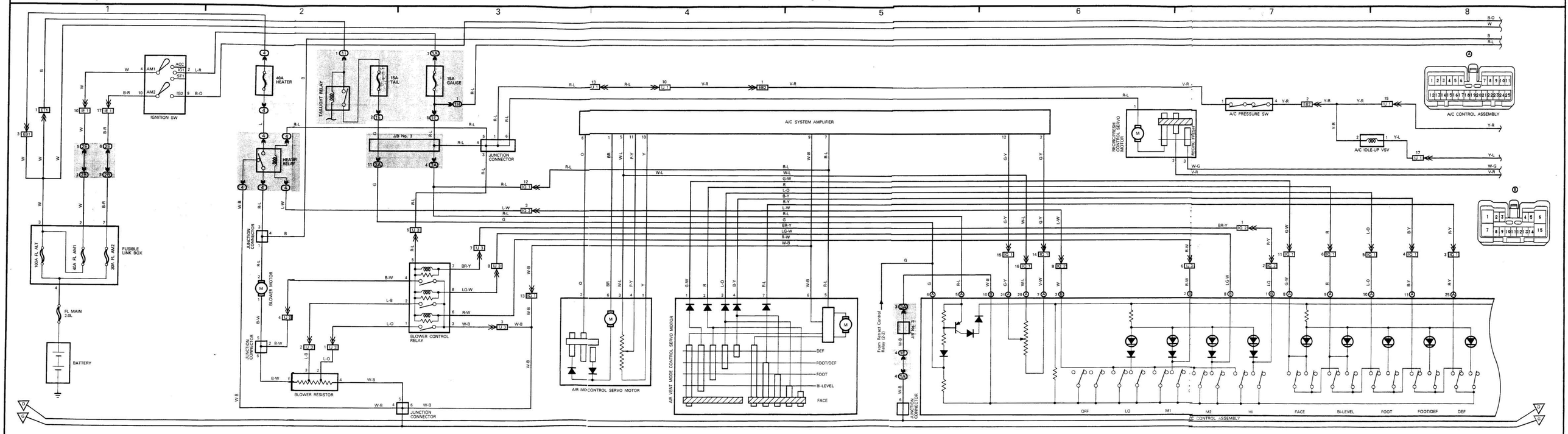
ABS (Auti-Lock Brake System)




Power Source
Engine Control
1
2
3
4
5
6
7
8
IGNITION SW
ACC
IG1
ST1
IG2
AM1
AM2
7.5A IGN
15A EFI
15A GAUGE
J/B No. 3
EFI MAIN RELAY
FUEL PUMP CONTROL RELAY
FUEL CUT OPENING RELAY
FUEL PUMP RESISTOR
FUEL PUMP
FUSIBLE LINK BOX
100A FL ALT
30A FL AM2
40A FL AM1
FL MAIN 2.0L
BATTERY
CHECK ENGINE (COMB. METER)
From Starter Relay (1-1)
From Stop Light SW (8-4)
From Diode (Idle-up)(4-3)
From Cold Start Injector (1-2)
From A/C Amplifier (21-14)
From A/C Magnet Clutch Relay (10-3)(16-6)
To Speed Sensor (10-2)
SOLENOID RESISTOR
INJECTOR No. 1
INJECTOR No. 2
INJECTOR No. 3
INJECTOR No. 4
ENGINE ECU
CHECK CONNECTOR
OXYGEN SENSOR
KNOCK SENSOR
ISC VALVE
IN-AIR TEMP. SENSOR
VSV (For EGR System)
VSV (For Turbo Charging Pressure)
To Cruise Control ECU (18-6)
THROTTLE POSITION SENSOR
TURBO PRESSURE SENSOR
EGR GAS TEMP. SENSOR
SHORT PIN
AIR FLOW METER
WATER TEMP. SENSOR
IGNITION COIL
DISTRIBUTOR
IGNITER
To Tachometer (16-2)
To A/C Amplifier (15-2)(18-4)
To Boost Meter (16-1)
JUNCTION CONNECTOR
NOISE FILTER
CHECK ENGINE
ENGINE ECU
DARK GRAY
Ground points
= Located on front side of left fender
= Located on intake manifold
= Located on cent panel

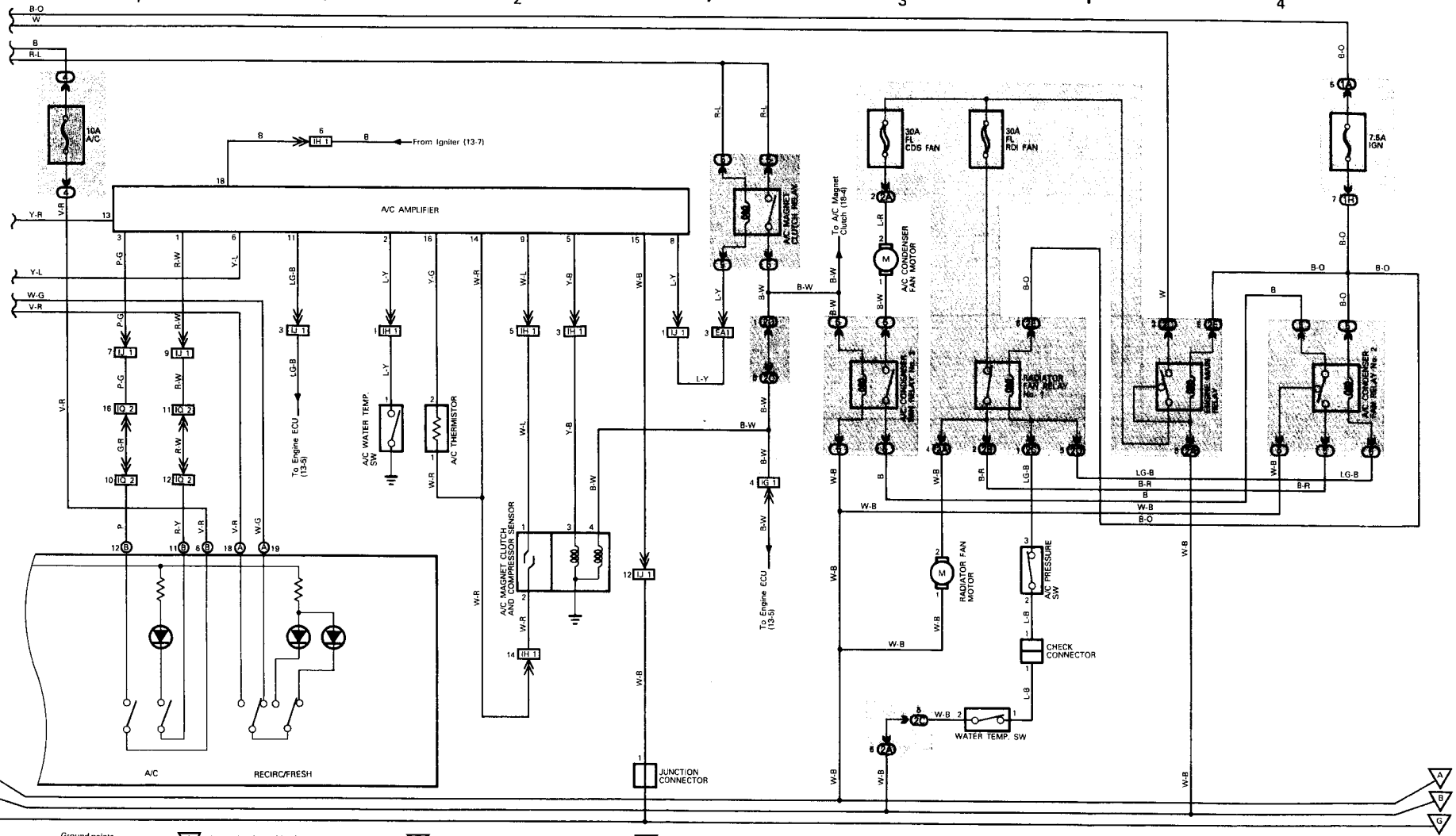
Power Source

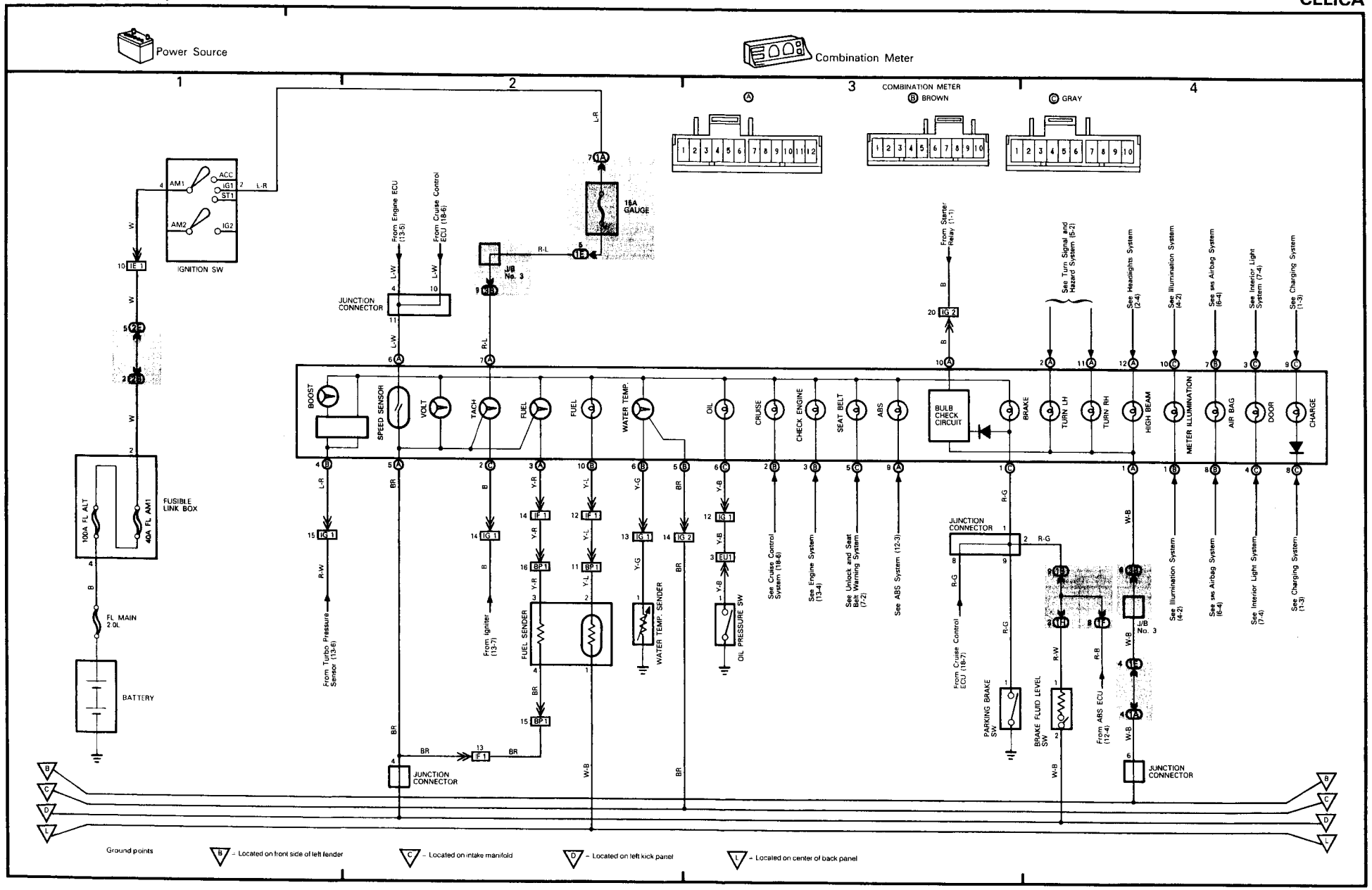
Air Conditioner, Cooler and Heater (Manual)



Air Conditioner, Cooler and Heater (Manual)

Radiator Fan and Condenser Fan

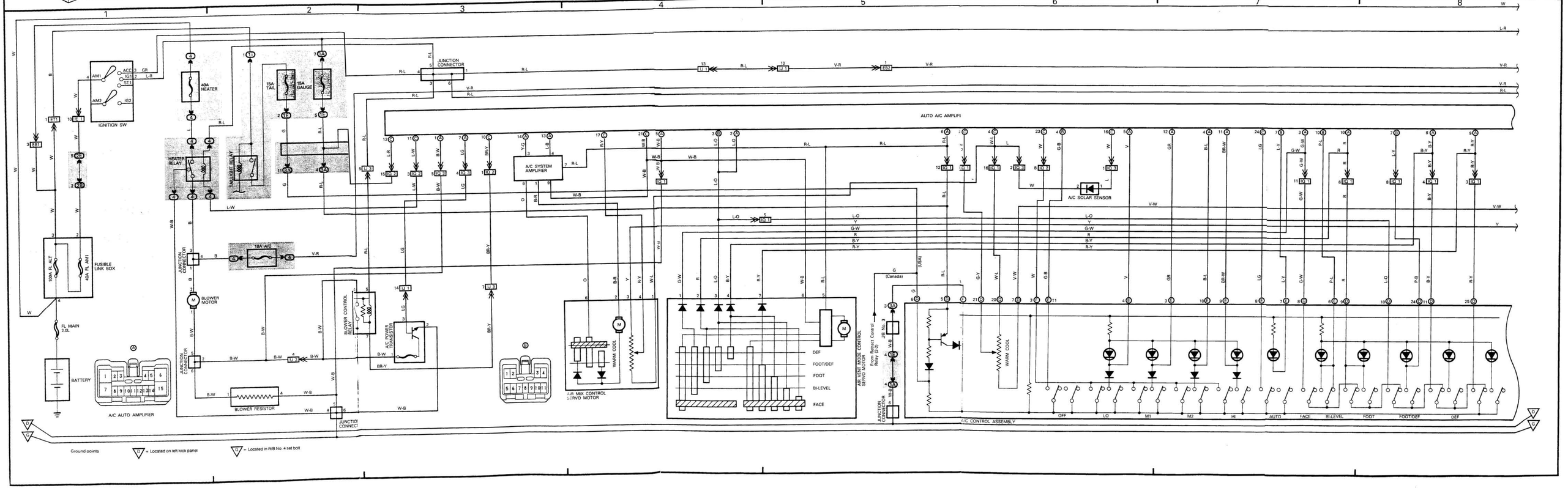



Power Source
Combination Meter
1
2
3
4
COMBINATION METER
Ⓑ BROWN
Ⓒ GRAY
IGNITION SW
ACC
IG1
ST1
IG2
AM1
AM2
FUSIBLE LINK BOX
100A FL ALT
40A FL AM1
FL MAIN 2.0L
BATTERY
JUNCTION CONNECTOR
J/B No. 3
15A GAUGE
From Engine ECU (13-5)
From Cruise Control ECU (18-6)
From Starter Relay (1-1)
BOOST
SPEED SENSOR
VOLT
TACH
FUEL
FUEL
WATER TEMP.
OIL
CRUISE
CHECK ENGINE
SEAT BELT
ABS
BULB CHECK CIRCUIT
BRAKE
TURN LH
TURN RH
HIGH BEAM
METER ILLUMINATION
AIR BAG
DOOR
CHARGE
See Turn Signal and Hazard System (5-2)
See Headlights System (2-4)
See Illumination System (4-2)
See ss Airbag System (6-4)
See Interior Light System (7-4)
See Charging System (1-3)
From Turbo Pressure Sensor (13-6)
From Igniter (13-7)
FUEL SENDER
WATER TEMP. SENDER
OIL PRESSURE SW
See Cruise Control System (18-6)
See Engine System (13-4)
See Unlock and Seat Belt Warning System (7-2)
See ABS System (12-3)
From Cruise Control ECU (18-7)
PARKING BRAKE SW
BRAKE FLUID LEVEL SW
From ABS ECU (12-4)
See Illumination System (4-2)
See ss Airbag System (6-4)
See Interior Light System (7-4)
See Charging System (1-3)
Ground points
B - Located on front side of left fender
C - Located on intake manifold
D - Located on left kick panel
L - Located on center of back panel

Power Source

Air Conditioner, Cooler and Heater (Auto)

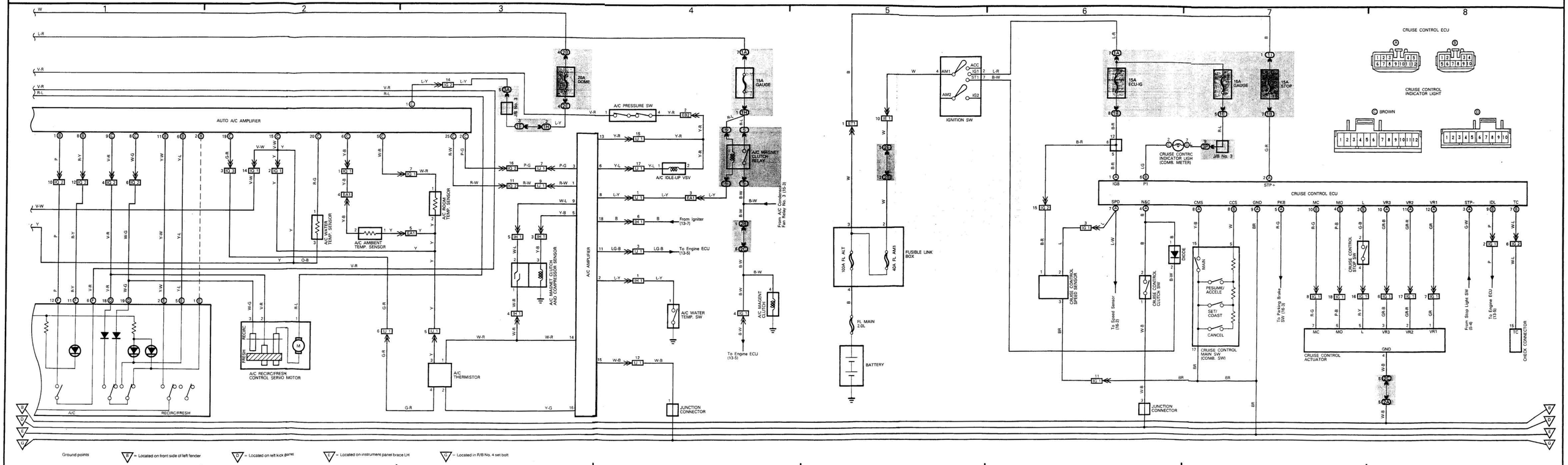
A/C AUTO AMPLIFIER, A/C CONTROL ASSEMBLY



Air Conditioner, Cooler and Heater (Auto)

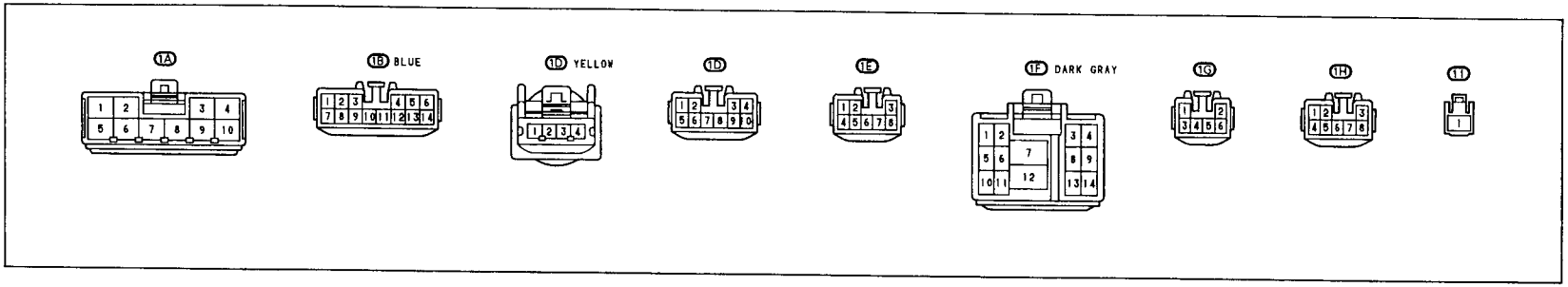
Power source

Cruise Control

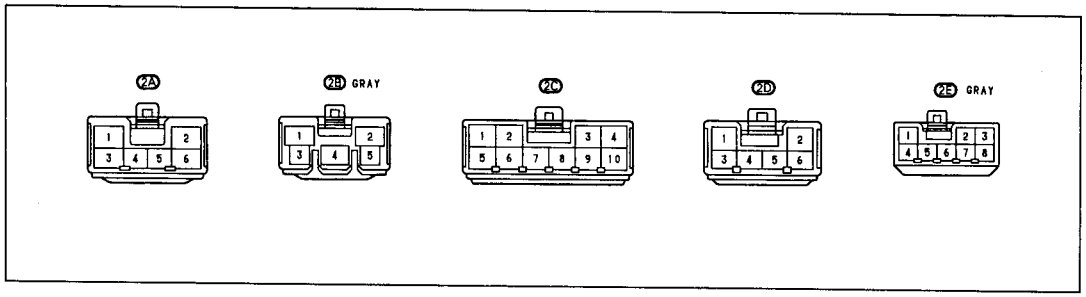


Junction Block and Wire Harness Connector

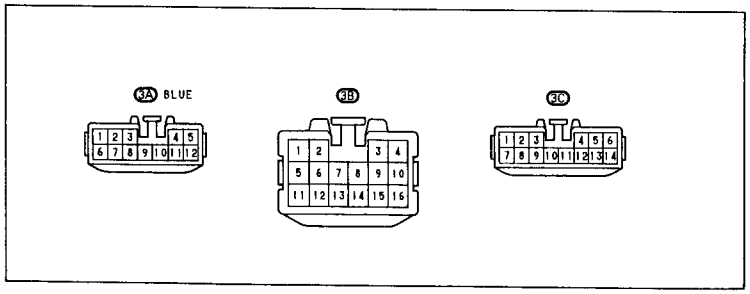
J/B No. 1



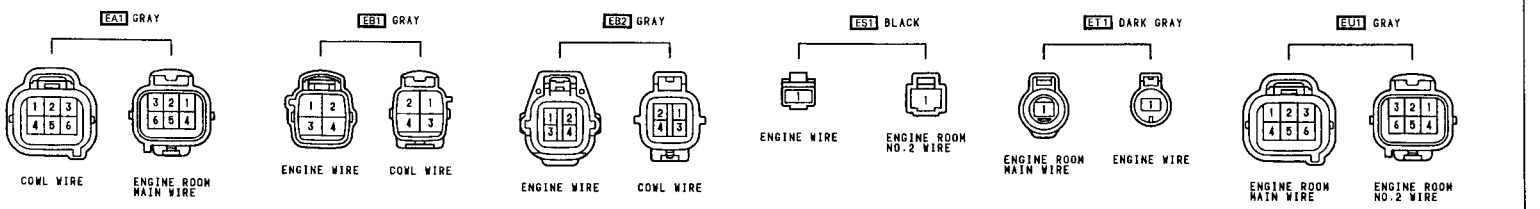
J/B No. 2



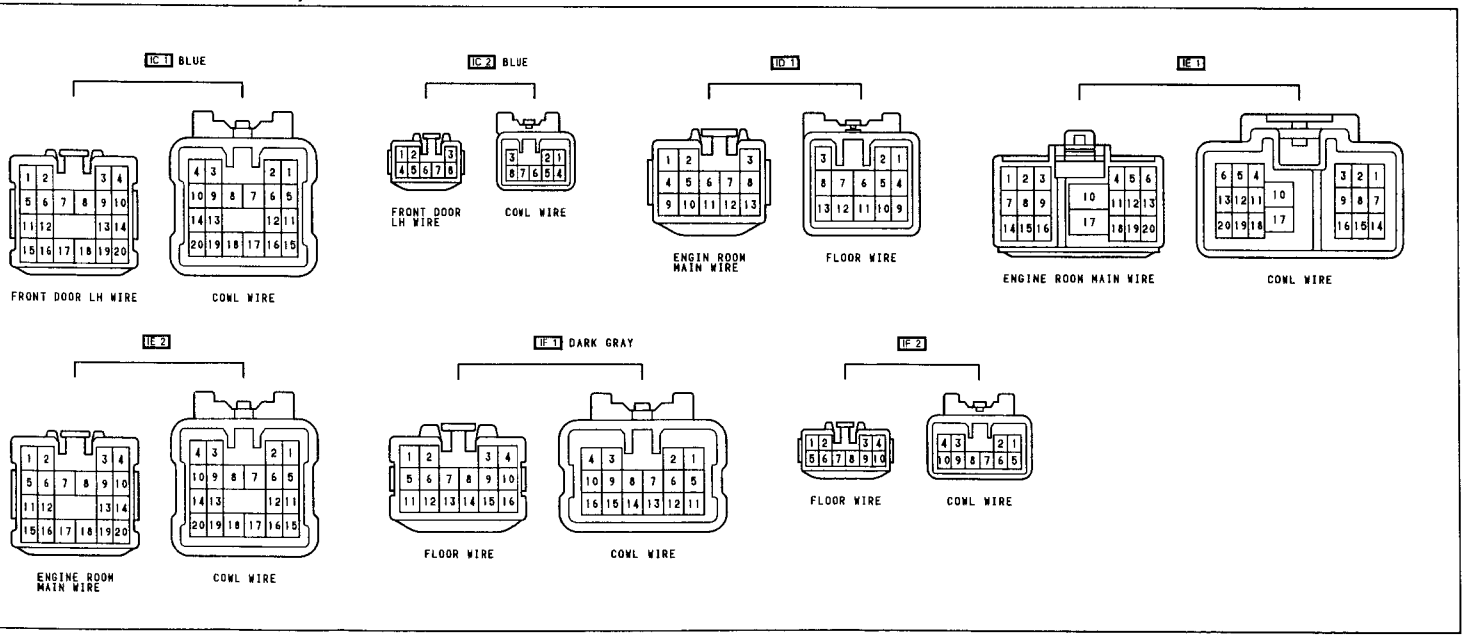
J/B No. 3



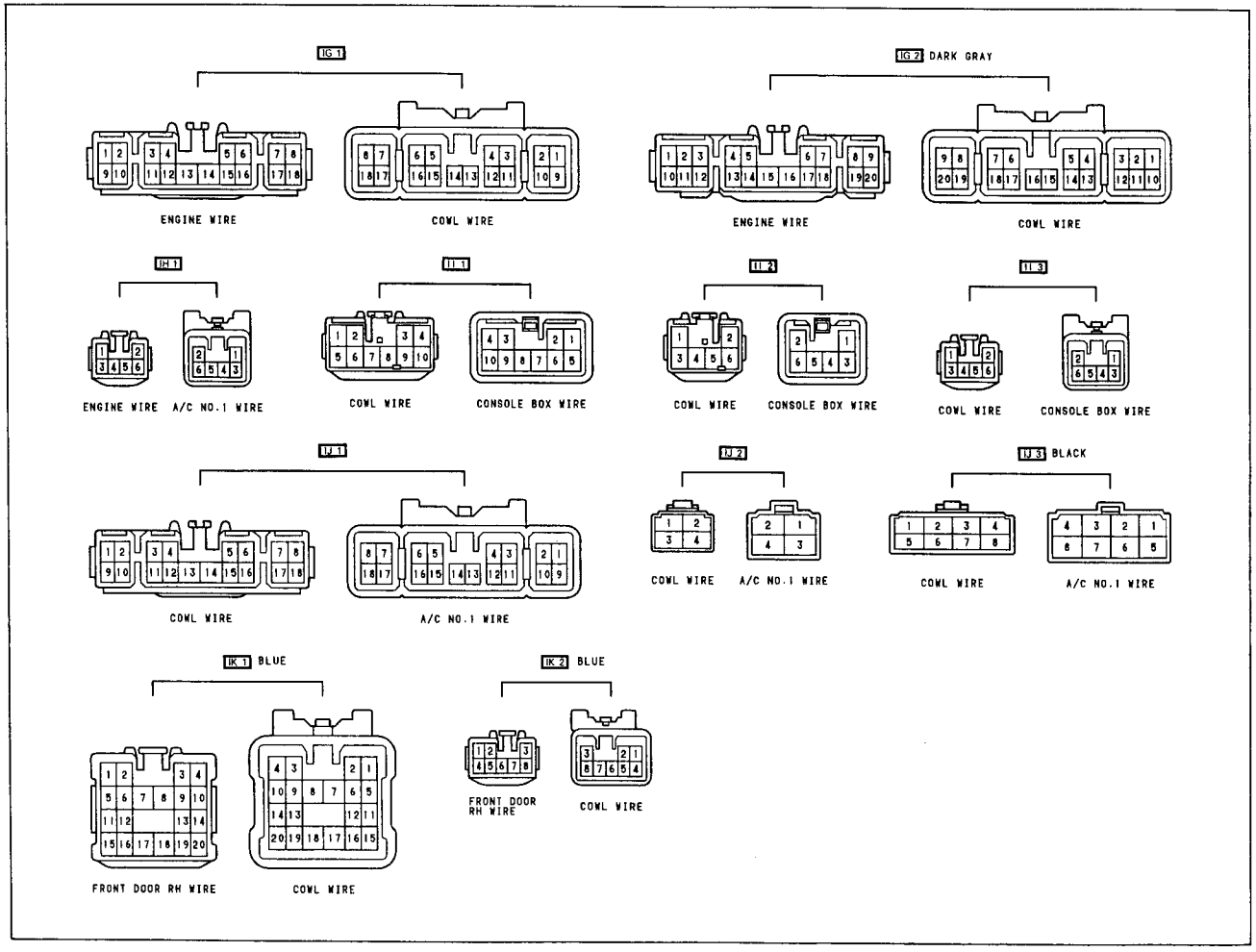
Connector Joining Wire Harness and Wire Harness
(E Group: Engine Compartment area)



(I Group: Instrument Panel area)



Connector Joining Wire Harness and Wire Harness
(I Group: Instrument Panel area)



Connector Joining Wire Harness and Wire Harness
(B Group : Body and Surrounding area)