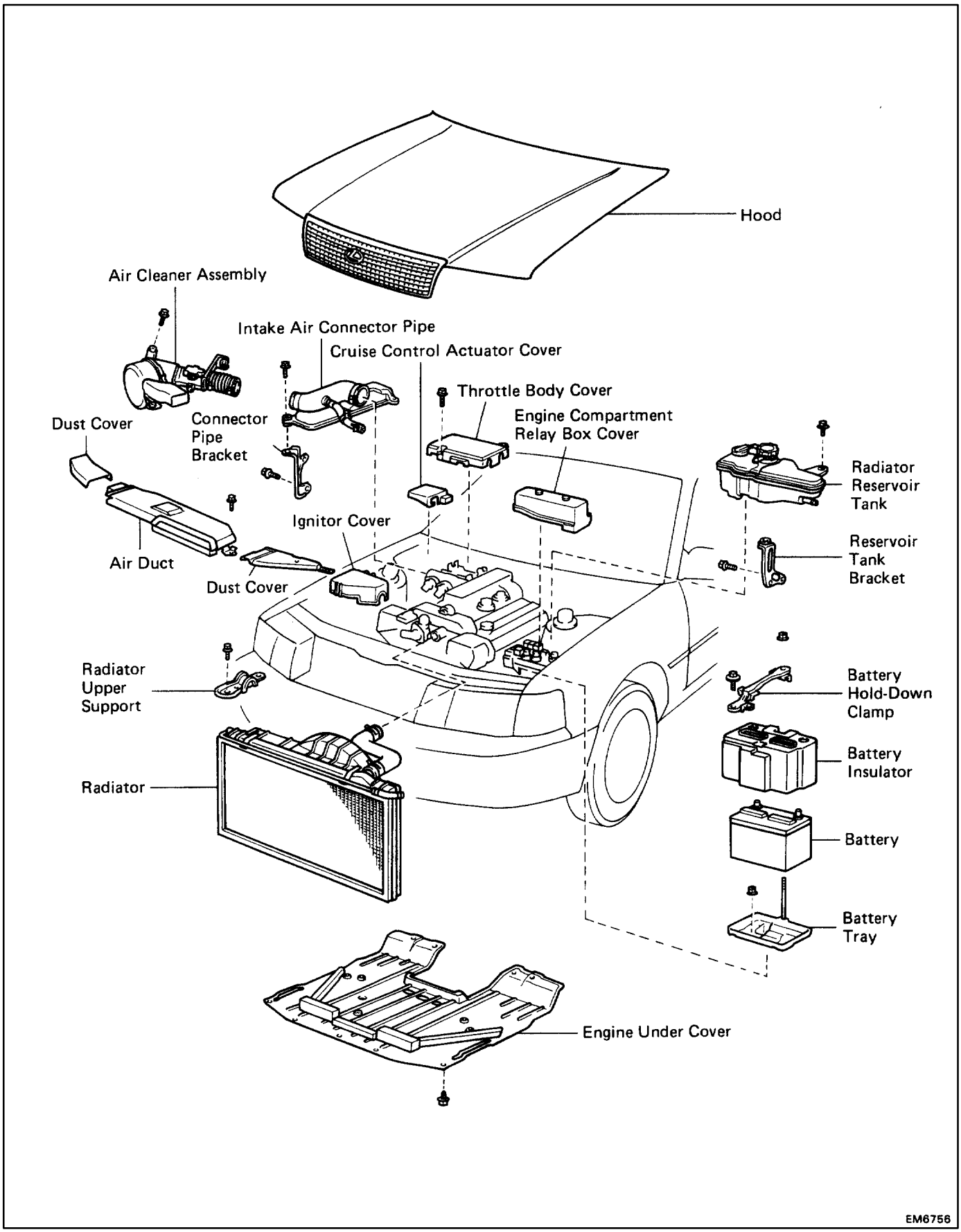
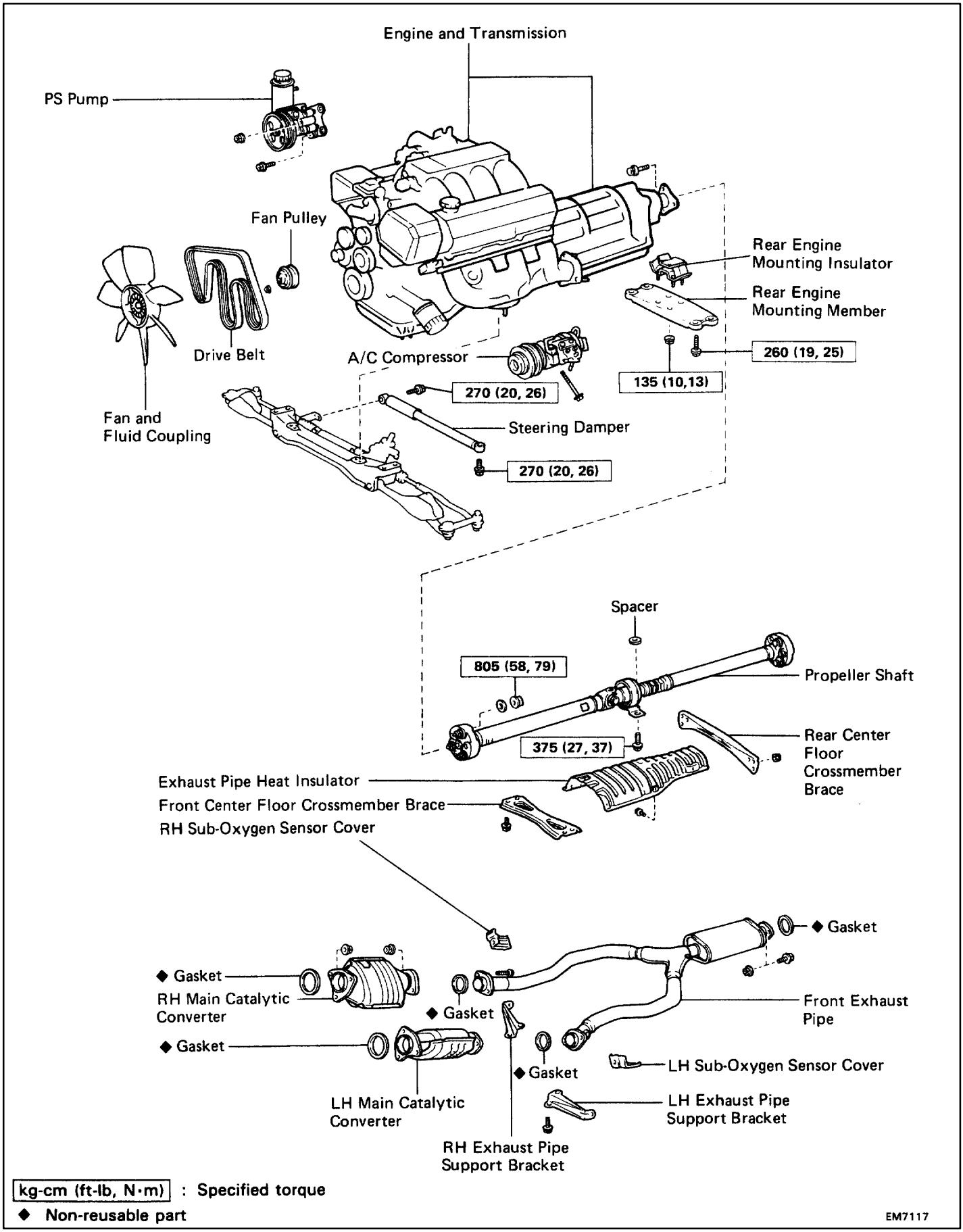
CYLINDER BLOCK
REMOVAL OF ENGINE

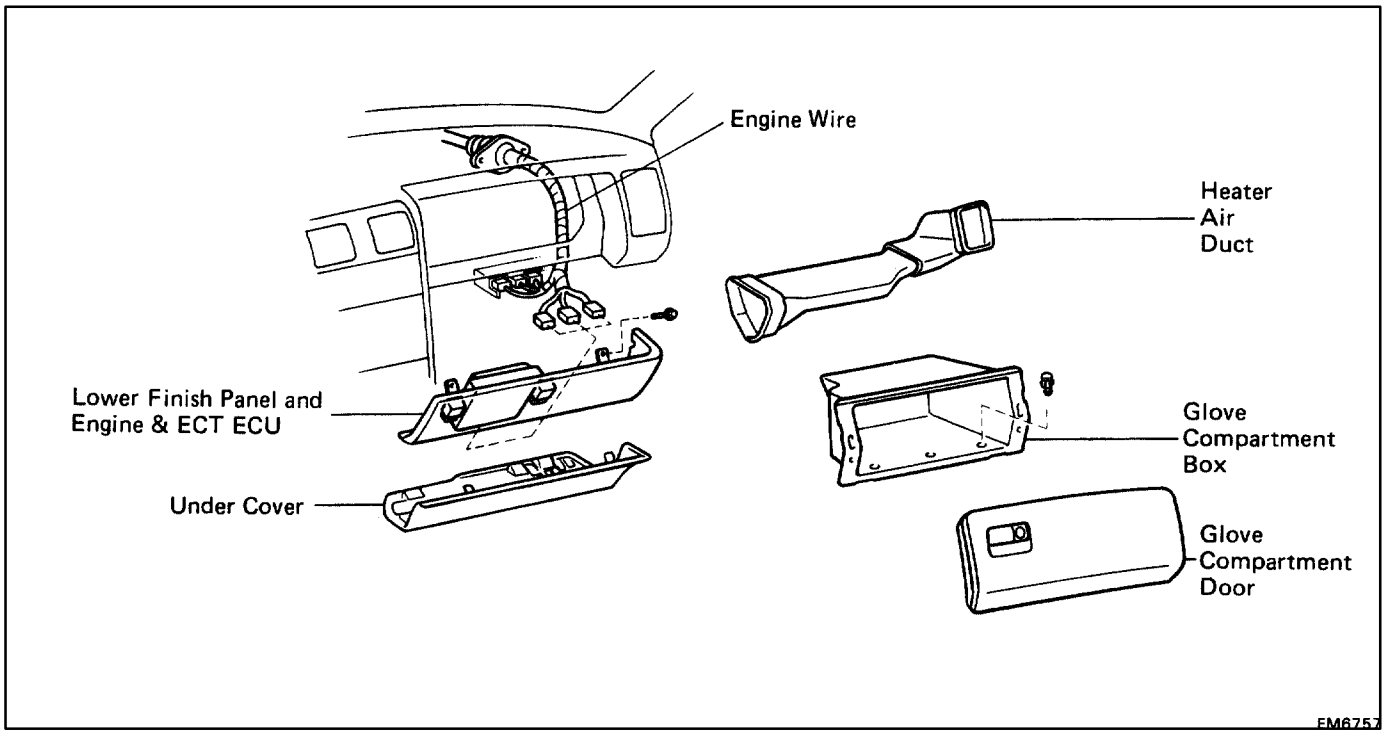


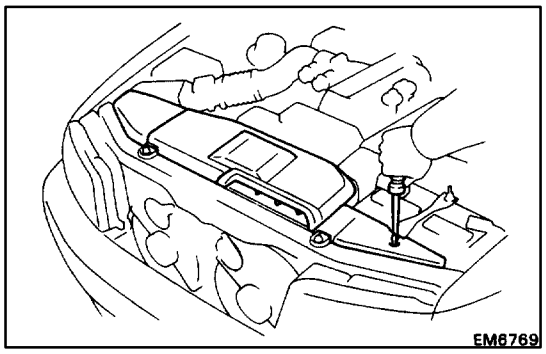


kg-cm (ft-lb, N·m) : Specified torque

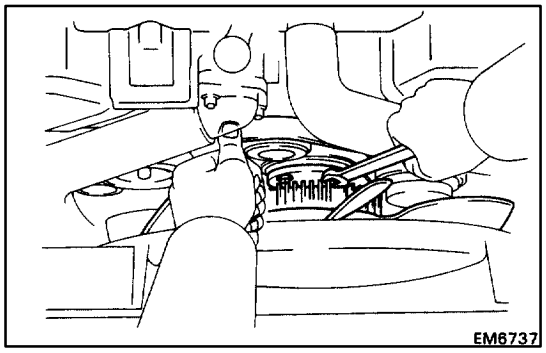
◆ Non-reusable part

EM7117

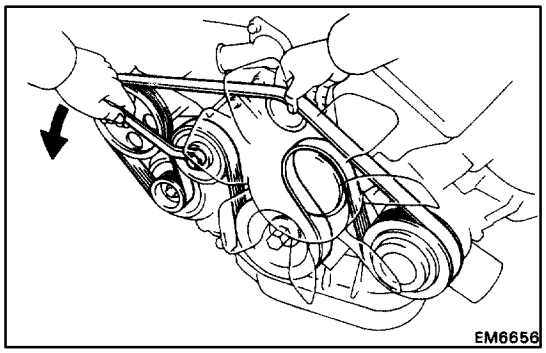




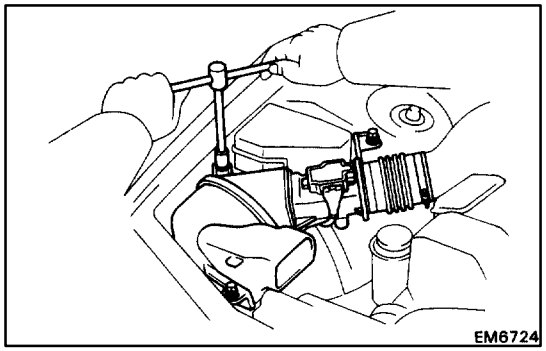
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **REMOVE HOOD**
3. **REMOVE DUST COVERS AND AIR DUCT**
4. **REMOVE BATTERY**



5. **REMOVE ENGINE UNDER COVER**
6. **DRAIN ENGINE OIL**
7. **DRAIN ENGINE COOLANT (See page CO–5)**
8. **REMOVE DRIVE BELT, FAN FLUID COUPLING AND FAN PULLEY**
   (a) Disconnect the radiator upper hose from the water inlet.
   (b) Loosen the four nuts holding the fluid coupling to the fan bracket.
   (c) Loosen the drive belt tension by turning the drive belt tensioner counterclockwise, and remove the drive belt.
   (d) Remove the four nuts, the fan, fluid coupling assembly and fan pulley.

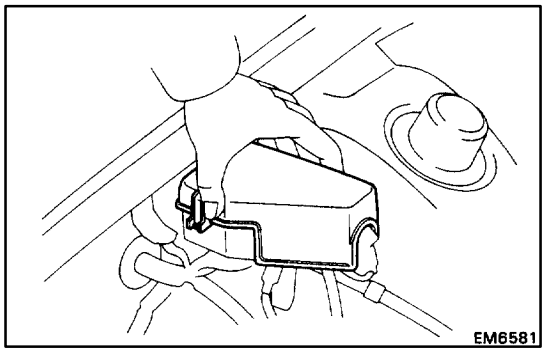


9. **REMOVE RADIATOR (See page CO–12)**



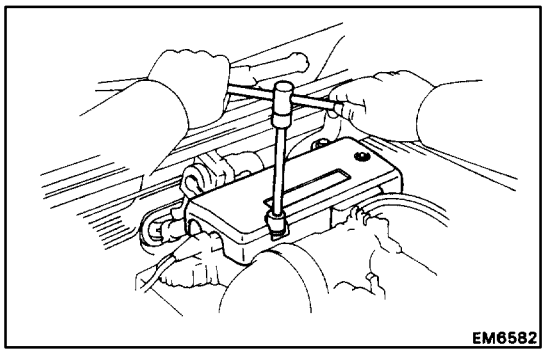
10. REMOVE AIR CLEANER ASSEMBLY

(a) Disconnect the air flow meter connector.
(b) Remove the three bolts.
(c) Disconnect the air cleaner hose from the intake air connector pipe, and remove the air cleaner, air flow meter and hose assembly.



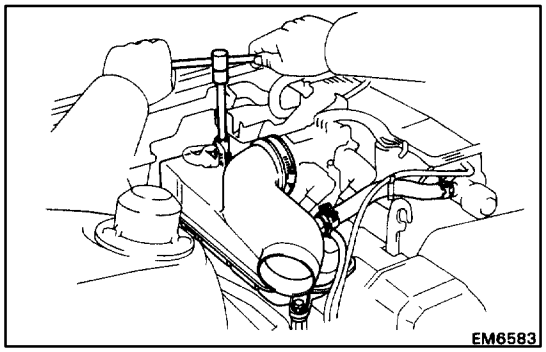
11. REMOVE IGNITER COVER, AND DISCONNECT CONNECTORS

(a) Remove the igniter cover.
(b) Disconnect the following connectors:
(1) Two igniter connectors
(2) Noise filter connector



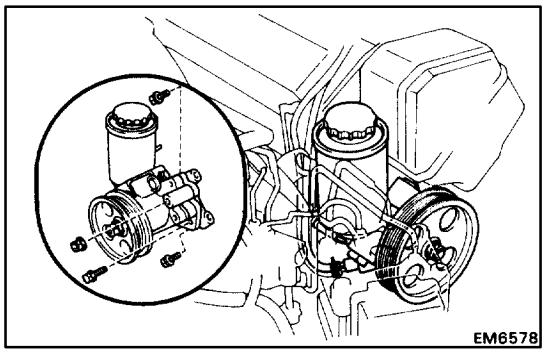
12. REMOVE THROTTLE BODY COVER, AND DISCONNECT CABLES

(a) Remove the two bolts, nut and throttle body cover.
(b) Disconnect the following cables from the throttle body:
(1) Accelerator cable
(2) Cruise control actuator cable



13. REMOVE INTAKE AIR CONNECTOR PIPE

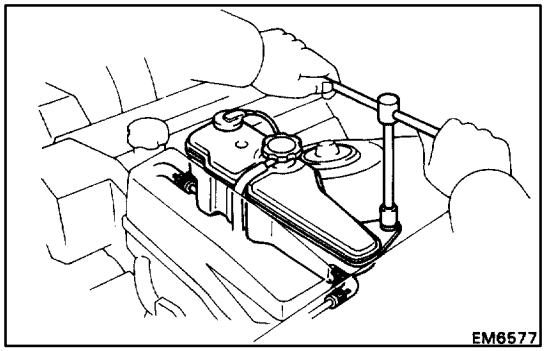
(a) Disconnect the following hose:
(1) Air hose from ISC valve
(2) Air hose from PS air control valve
(b) Remove the two bolts.
(c) Disconnect the air connector pipe from the throttle body, and remove the air connector pipe.
(d) Remove the bolt and connector pipe bracket.



14. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

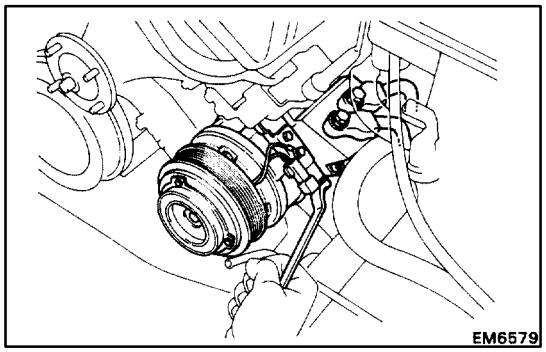
(a) Disconnect the air hose from the air intake chamber.
(b) Remove the three pump bolts and nut.

HINT: Put the PS pump aside.



15. REMOVE RADIATOR RESERVOIR TANK

(a) Remove the reservoir tank mount bolt.
(b) Disconnect the three water hoses from the reservoir tank.
(c) Disconnect the coolant level sensor connector, and remove the reservoir tank.
(d) Remove the two bolts and reservoir tank bracket.



16. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

(a) Disconnect the two connectors.
(b) Remove the three compressor bolts, and disconnect the compressor from the engine.

HINT: Put the compressor aside.

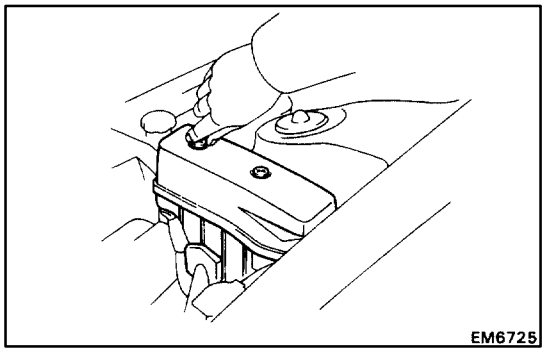
17. DISCONNECT HOSES

(a) Two heater water by–pass hoses
(b) Two fuel hoses

Plug the hose end.

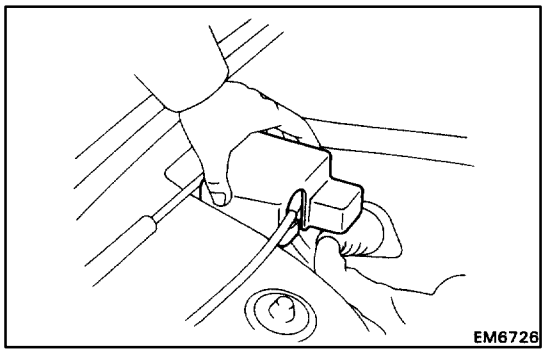
CAUTION: Catch leaking fuel in a container.

(c) Vacuum hose from brake booster union (on air intake chamber)
(d) A/C control valve vacuum hoses
(e) Vacuum hose from EVAP BVSV



18. REMOVE RELAY BOX COVER, AND DISCONNECT WIRES AND CONNECTORS

(a) Remove the cover from the relay box.
(b) Disconnect connector and ground cables from engine compartment relay box.
(c) Remove two ground straps from under fender aprons.



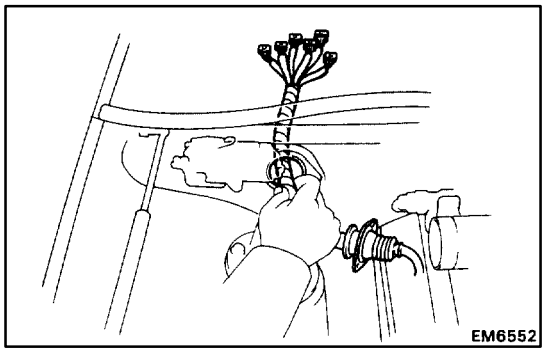
19. REMOVE CRUISE CONTROL ACTUATOR COVER

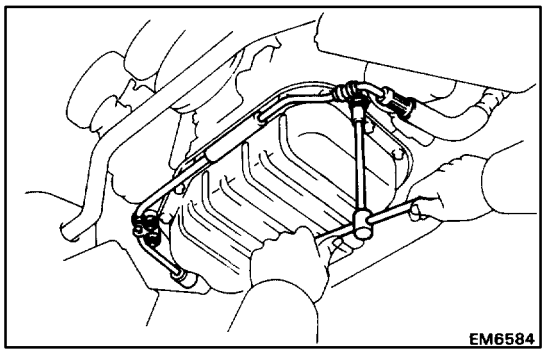
20. DISCONNECT ENGINE WIRE FROM CABIN

(a) Remove the following parts:
(1) Under cover
(2) Lower finish panel and engine & ECT ECU
(3) Glove compartment door
(4) Glove compartment light
(5) Glove compartment box
(6) A.B.S. ECU
(7) Heater air duct

(b) Disconnect the following connectors:
(1) Three engine & ECT ECU connectors
(2) Circuit opening relay connector
(3) Cowl wire connector
(4) Instrument panel wire connector

(c) Remove the two bolts, and pull out the engine wire from the cowl panel.

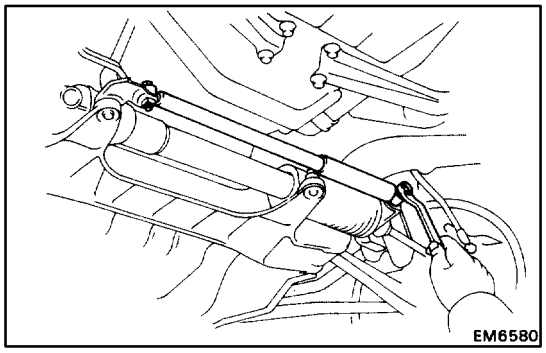




21. DISCONNECT PS OIL COOLER PIPE

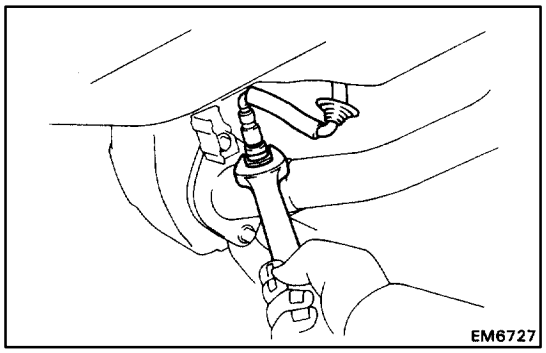
Remove the three bolts, and disconnect the oil cooler pipe from the engine oil pan.

22. REMOVE ENGINE WIRE FROM WIRE BRACKET ON FRONT SUSPENSION CROSSMEMBER



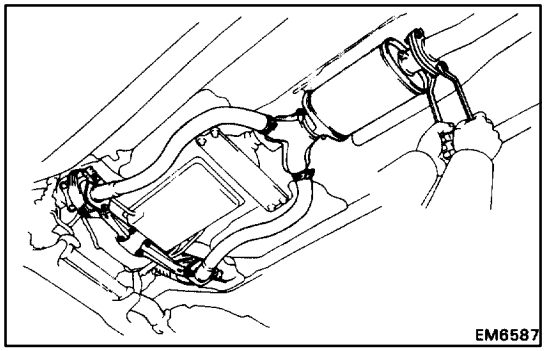
23. REMOVE STEERING DAMPER

Remove the two bolts and steering damper.

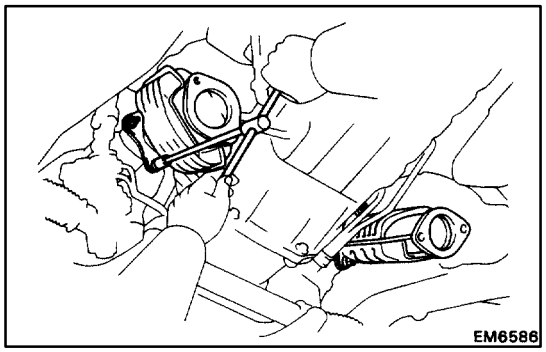


24. REMOVE FRONT EXHAUST PIPE

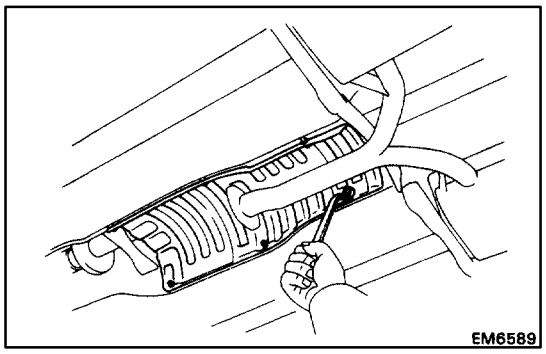
(a) Disconnect the grommet from the floor, and disconnect the sub–oxygen sensor from the exhaust pipe. Disconnect the two sub–oxygen sensors.



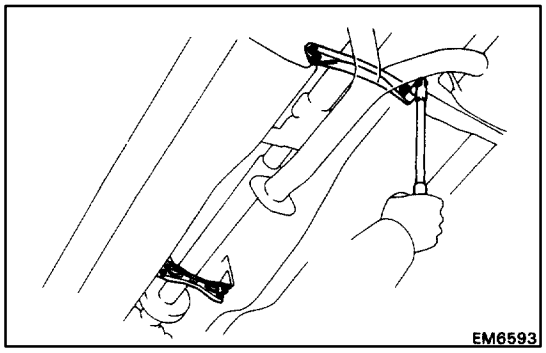
(b) Remove the two bolts and nuts holding the exhaust pipe to the rear pipe.
(c) Remove the four bolts and nuts holding the catalytic converters to the exhaust pipe, and remove the two sub–oxygen sensor covers, exhaust pipe and two gaskets.
(d) Remove the two bolts and exhaust pipe support bracket. Remove the two stays.



25. REMOVE MAIN CATALYTIC CONVERTERS
Remove the three nuts and catalytic converter. Remove the two catalytic converters.

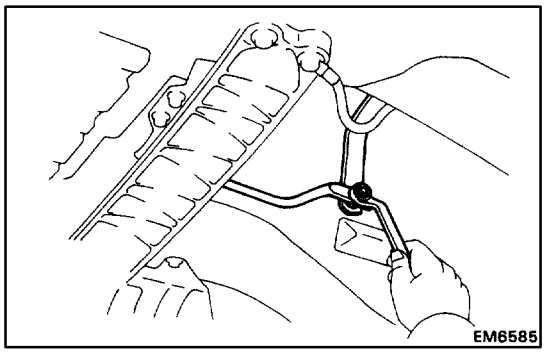


26. REMOVE EXHAUST PIPE HEAT INSULATOR
Remove the six bolts and heat insulator.

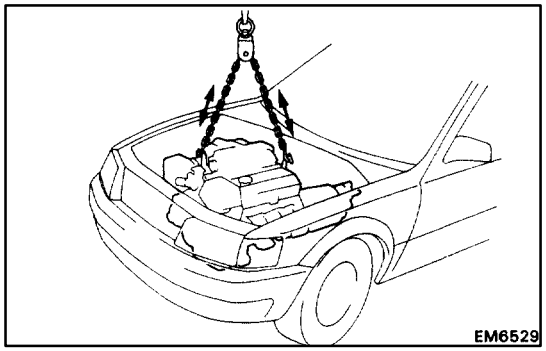


27. REMOVE CENTER FLOOR CROSSMEMBER BRACES
(a) (Front Brace)
Remove the four bolts and brace.
(b) (Front Brace)
Remove the four nuts and brace.

28. REMOVE PROPELLER SHAFT
(See step 4 on page PR–5)

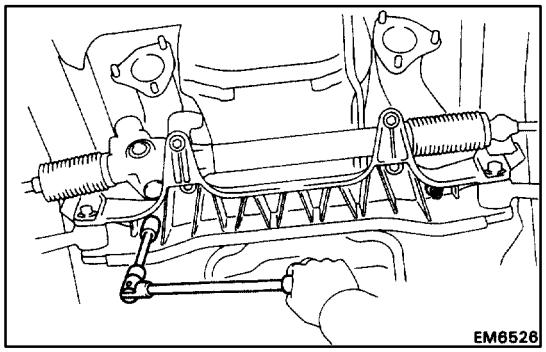


29. DISCONNECT TRANSMISSION CONTROL ROD
Remove the nut, and disconnect the control rod from the shift lever.

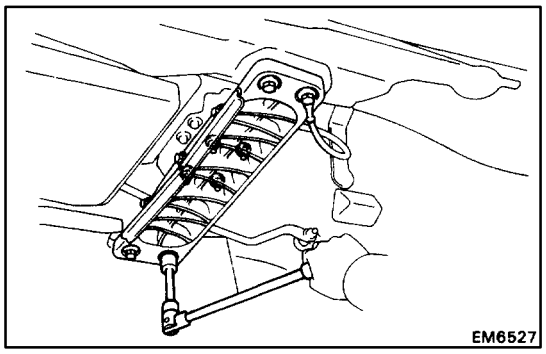


30. REMOVE ENGINE AND TRANSMISSION ASSEMBLY FROM VEHICLE

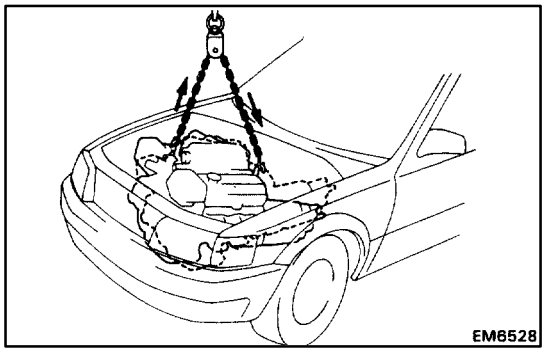
(a) Attach the engine chain hoist to the engine hangers.



(b) Remove the two nuts holding the engine mounting insulators to the front suspension crossmember.



(c) Remove the four bolts, four nuts and rear engine mounting member. Disconnect the ground strap.



(d) Lift the engine out of the vehicle slowly and carefully.

NOTICE: Be careful not to hit the PS gear housing, neutral start switch and A.B.S. actuator.

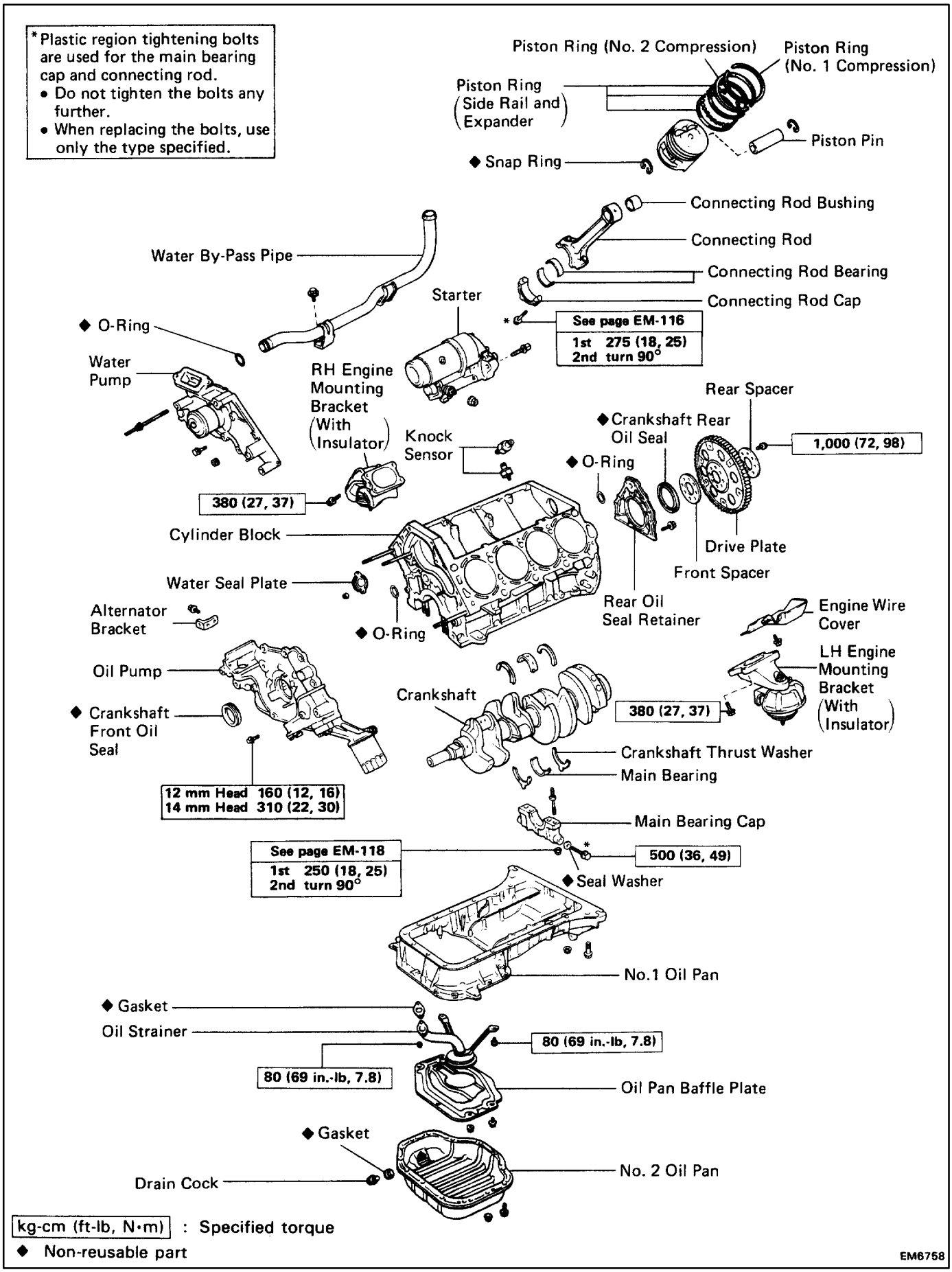
(e) Make sure the engine is clear of all wiring, hoses and cables.

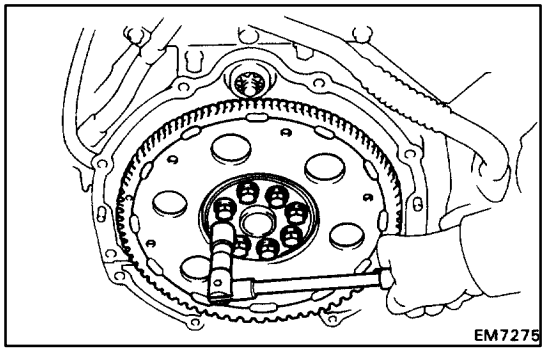
(f) Place the engine and transmission assembly on a stand.

31. SEPARATE ENGINE AND TRANSMISSION

(See page AT–24)

COMPONENTS

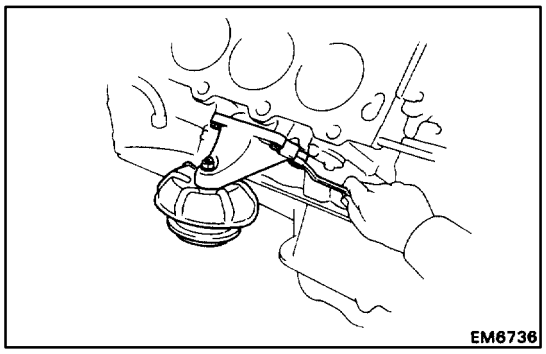

*Plastic region tightening bolts are used for the main bearing cap and connecting rod.
• Do not tighten the bolts any further.
• When replacing the bolts, use only the type specified.
Piston Ring (No. 2 Compression)
Piston Ring (No. 1 Compression)
Piston Ring (Side Rail and Expander)
Piston Pin
◆ Snap Ring
Connecting Rod Bushing
Connecting Rod
Connecting Rod Bearing
Connecting Rod Cap
Water By-Pass Pipe
Starter
* See page EM-116
1st 275 (18, 25)
2nd turn 90°
◆ O-Ring
Water Pump
RH Engine Mounting Bracket (With Insulator)
Knock Sensor
380 (27, 37)
Rear Spacer
◆ Crankshaft Rear Oil Seal
1,000 (72, 98)
◆ O-Ring
Cylinder Block
Drive Plate
Front Spacer
Water Seal Plate
Rear Oil Seal Retainer
Alternator Bracket
◆ O-Ring
Engine Wire Cover
LH Engine Mounting Bracket (With Insulator)
Oil Pump
Crankshaft
380 (27, 37)
◆ Crankshaft Front Oil Seal
Crankshaft Thrust Washer
Main Bearing
12 mm Head 160 (12, 16)
14 mm Head 310 (22, 30)
Main Bearing Cap
See page EM-118
1st 250 (18, 25)
2nd turn 90°
* 500 (36, 49)
◆ Seal Washer
No.1 Oil Pan
◆ Gasket
Oil Strainer
80 (69 in.-lb, 7.8)
80 (69 in.-lb, 7.8)
Oil Pan Baffle Plate
◆ Gasket
Drain Cock
No. 2 Oil Pan
kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part
EM6758



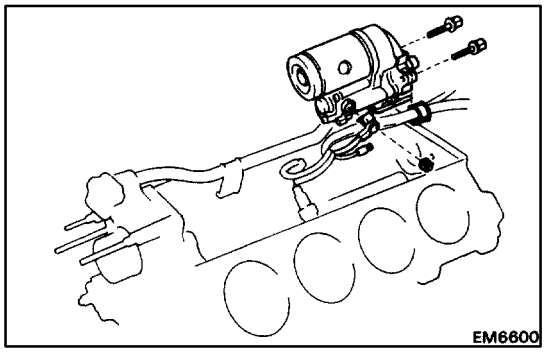
PREPARATION FOR DISASSEMBLY

(See page EM–90)

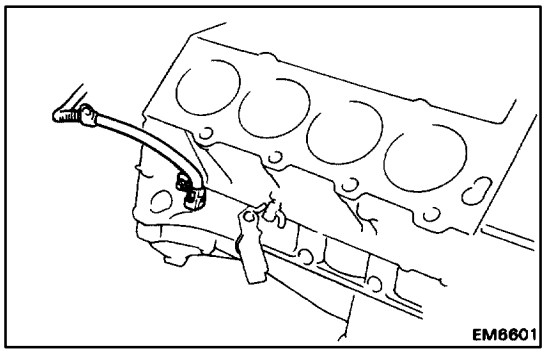
1. **REMOVE DRIVE PLATE**
   Remove the eight bolts, two spacers and drive plate.
2. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
3. **REMOVE TIMING BELT AND PULLEYS**
   (See pages EM–17 to 24)
4. **REMOVE CYLINDER HEADS**
   (See pages EM–39 to 50)



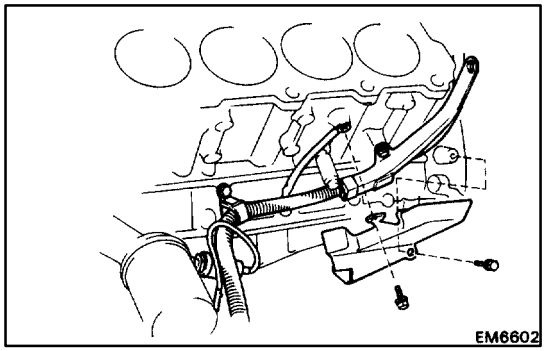
5. **REMOVE ENGINE MOUNTING BRACKETS**
   Remove the four bolts and mounting bracket. Remove the two mounting brackets.



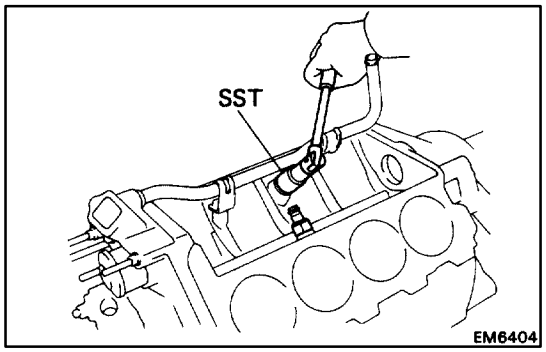
6. **REMOVE STARTER**
   (a) Remove the two bolts, and disconnect the starter from the cylinder block.
   (b) Disconnect the wire clamp from the bracket on the starter.
   (c) Remove the nut, and disconnect the wire.
   (d) Disconnect the connector, and remove the starter.



7. **REMOVE ENGINE WIRE**
   (a) Disconnect the following connectors:
      (1) Two knock sensor connectors
      (2) Oil pressure switch connector
   (b) Remove the wire clamp bolt of the cylinder block RH side, and disconnect the engine wire.

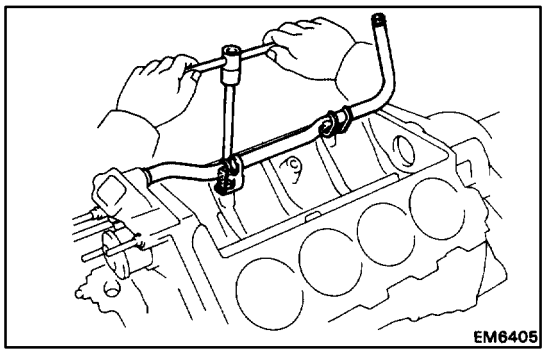


(c) Remove the two bolts and wire cover of the cylinder block LH side.
(d) Remove the two wire clamp bolts of the cylinder block LH side, and remove the engine wire.



8. REMOVE KNOCK SENSORS

Using SST, remove the two knock sensors.
SST 09816–30010



9. REMOVE WATER BY–PASS PIPE

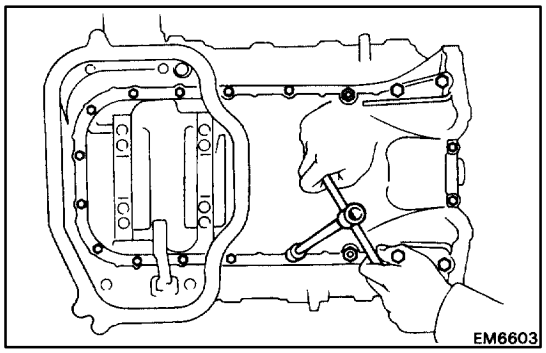
(a) Remove the two bolts.
(b) Pull out the by–pass pipe from the water pump.
(c) Remove the O–ring from the by–pass pipe.

10. REMOVE WATER PUMP
(See step on page CO–8)

11. REMOVE NO.2 OIL PAN
(See step on page LU–7)

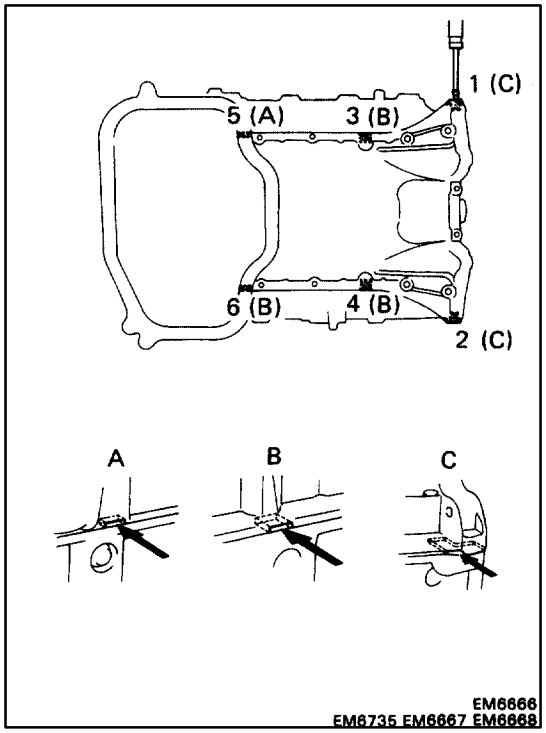
12. REMOVE OIL PAN BAFFLE PLATE
(See step on page LU–8)

13. REMOVE OIL STRAINER
(See step on page LU–8)

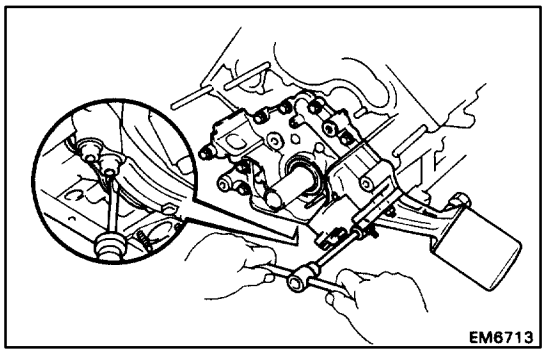


14. REMOVE NO.1 OIL PAN

(a) Remove the eighteen bolts and two nuts.



(b) Remove the oil pan by prying a screwdriver between the oil pan and cylinder block in the sequence shown.

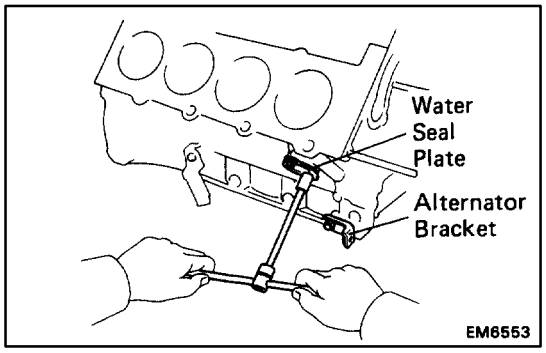


15. REMOVE OIL PUMP

(a) Remove the eight bolts.

(b) Remove the oil pump by prying a screwdriver between the oil pump and main bearing cap.

(c) Remove the O–ring from the cylinder block.

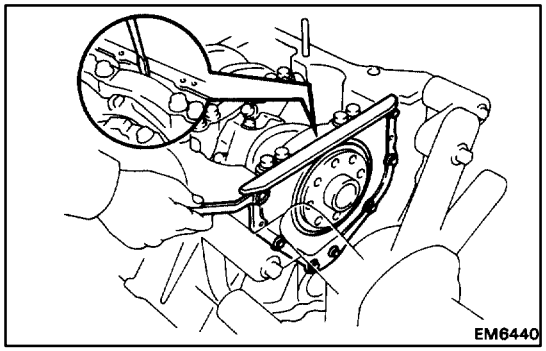


16. REMOVE ALTERNATOR BRACKET

Remove the bolt and bracket.

17. IF NECESSARY, REMOVE WATER SEAL PLATE

Remove the two nuts and seal plate.



DISASSEMBLY OF CYLINDER BLOCK

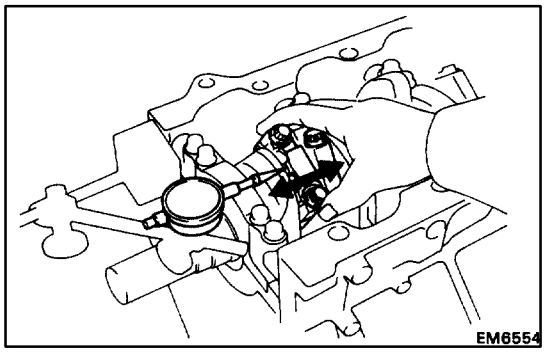
(See page EM–90)

1. REMOVE REAR OIL SEAL RETAINER

(a) Remove the seven bolts.

(b) Remove the oil seal retainer by prying a screwdriver between the oil seal retainer and main bearing cap.

(c) Remove the O–ring.



2. CHECK CONNECTING ROD THRUST CLEARANCE

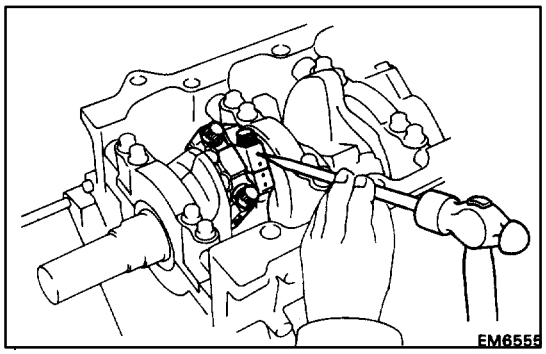
Using a dial indicator, measure the thrust clearance while moving the two connecting rods back and forth.

Standard thrust clearance: 0.160–0.290 mm (0.0063–0.0114 in.)

Maximum thrust clearance: 0.35 mm (0.0138 in.)

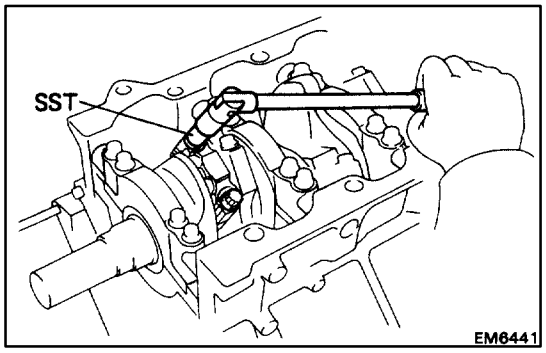
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

Connecting rod thickness: 22.880–22.920 mm (0.9008–0.9024 in.)



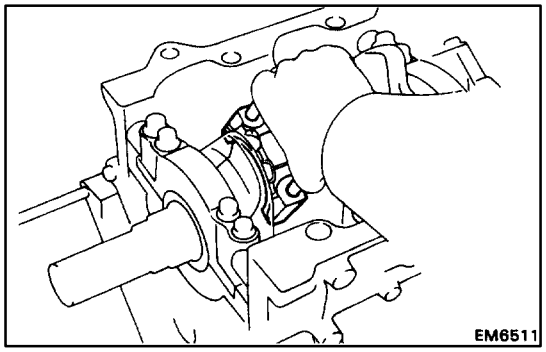
3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

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



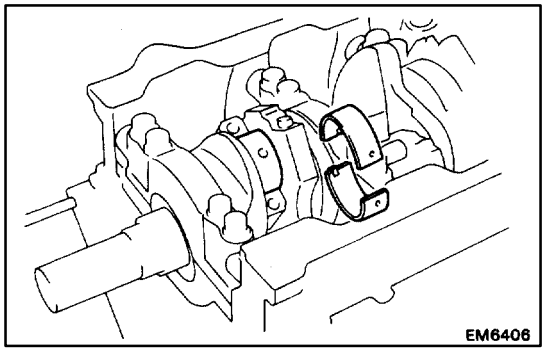
(b) Using SST, remove the two connecting rod bolts.

SST 09011–38121



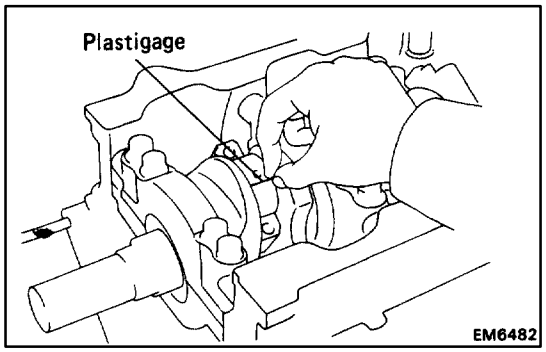
(c) Using the two removed connecting rod bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

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

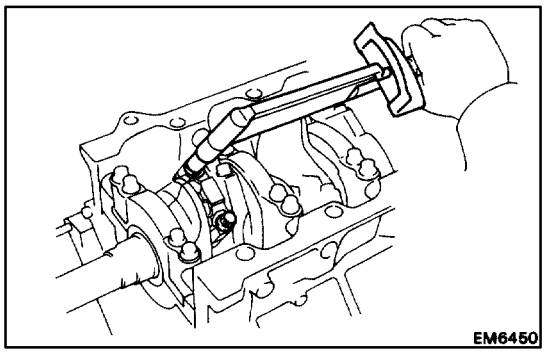


(d) Clean the crank pin and bearings.
(e) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing are damaged, replace the bearings. If necessary, replace the crankshaft.



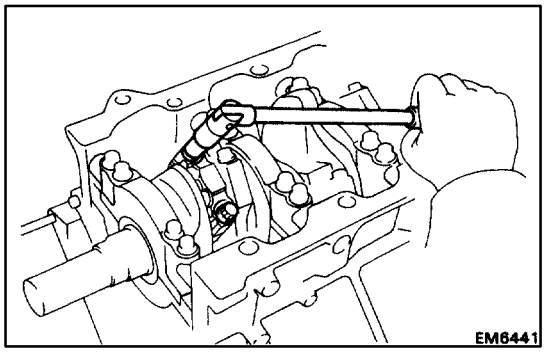
(f) Lay a strip of Plastigage across the crank pin.



(g) Install the connecting rod cap with the two bolts. (See step 6 on page EM–107)

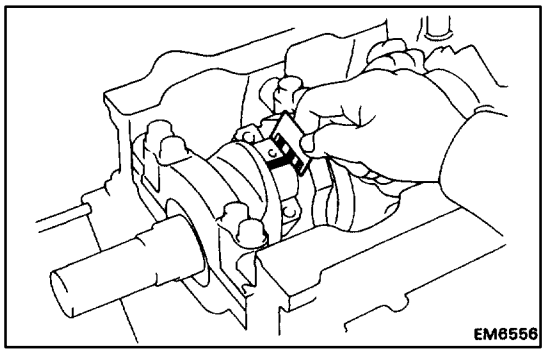
Torque: 1st 250 kg–cm (18 ft–lb, 25 N·m)
2nd turn 90°

NOTICE: Do not turn the crankshaft.



(h) Remove the two bolts, connecting rod cap and lower bearing.

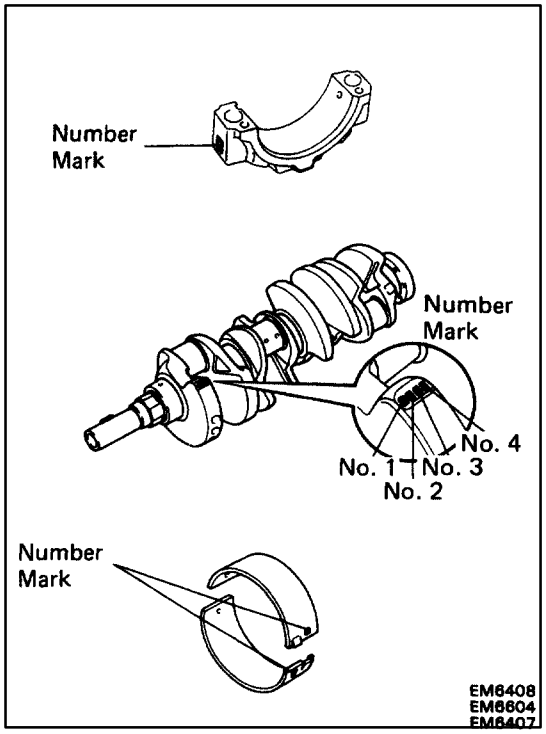
(See procedure (b) and (c) above)



(i) Measure the Plastigage at its widest point.

Standard oil clearance: 0.027–0.053 mm (0.0011–0.0021 in.)
Maximum oil clearance: 0.065 mm (0.0026 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



HINT: If using a standard bearing, replace 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 connecting rod cap and crankshaft, then selecting the bearing with the same number as the total. There are six sizes of standard bearings, marked “2”, “3”, “4”, “5”, “6” and “7” accordingly.

	Number mark											
Connecting rod cap	1	1	2	1	2	3	2	3	4	3	4	4
Crankshaft	1	2	1	3	2	1	3	2	1	3	2	3
Use bearing	2	3		4			5			6		7

EXAMPLE: Connecting rod cap “3” + Crankshaft “1” = Total number 4 (Use bearing “4”)

(Reference)

Connecting rod big end inside diameter:

Mark “1” 55.000–55.006 mm (2.1654–2.1656 in.)

Mark “2” 55.006–55.012 mm (2.1656–2.1658 in.)

Mark “3” 55.012–55.018 mm (2.1658–2.1661 in.)

Mark “4” 55.018–55.024 mm (2.1661–2.1663 in.)

Crankshaft crank pin diameter:

Mark “1” 51.994–52.000 mm (2.0470–2.0472 in.)

Mark “2” 51.988–51.994 mm (2.0468–2.0470 in.)

Mark “3” 51.982–51.988 mm (2.0465–2.0468 in.)

Standard sized bearing center wall thickness:

Mark “2” 1.484–1.487 mm (0.0584–0.0585 in.)

Mark “3” 1.487–1.490 mm (0.0585–0.0587 in.)

Mark “4” 1.490–1.493 mm (0.0587–0.0588 in.)

Mark “5” 1.493–1.496 mm (0.0588–0.0589 in.)

Mark “6” 1.496–1.499 mm (0.0589–0.0590 in.)

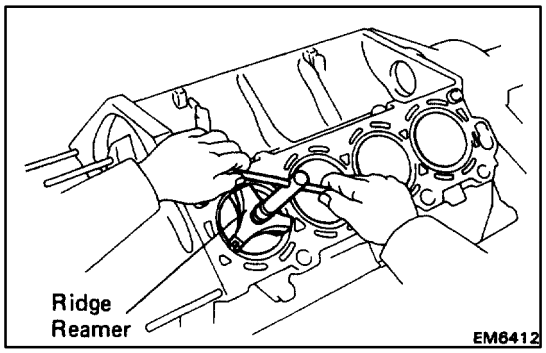
Mark “7” 1.499–1.502 mm (0.0590–0.0591 in.)

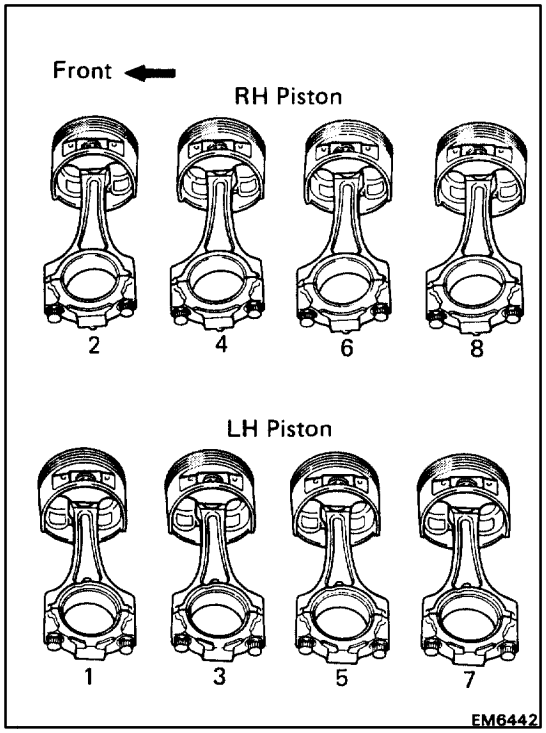
(j) Completely remove the Plastigage.

4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

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

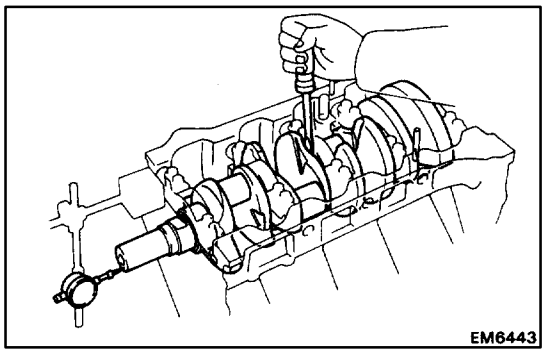
(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.





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.

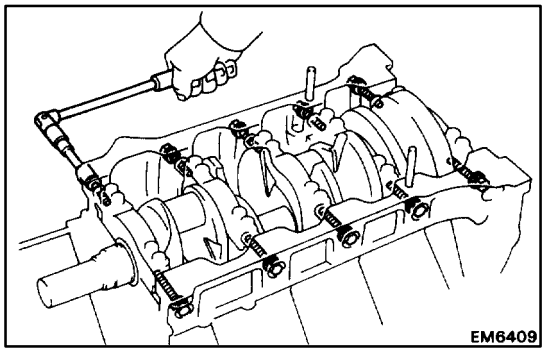
Standard thrust clearance: 0.020–0.220 mm (0.0008–0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

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

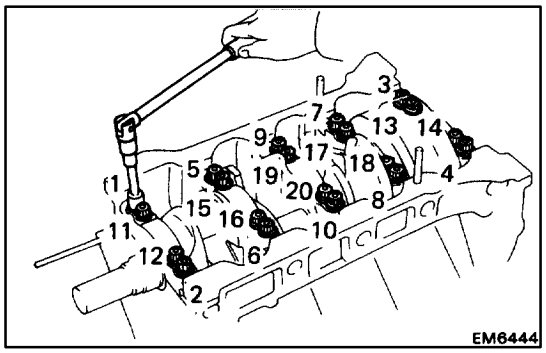
Thrust washer thickness:

2.440–2.490 mm (0.0961–0.0980 in.)

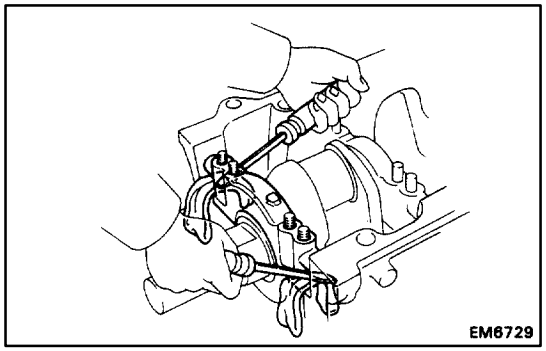


6. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

(a) Remove the ten main bearing cap bolts.



(b) Uniformly loosen and remove the twenty main bearing cap nuts in several passes in the sequence shown.



(c) Using two screwdrivers, pry up the main bearing caps, and remove the five main bearing caps, lower main bearings and two lower thrust washers (No.3 main bearing cap, only).

NOTICE: Be careful not to damage the cylinder block.

HINT:

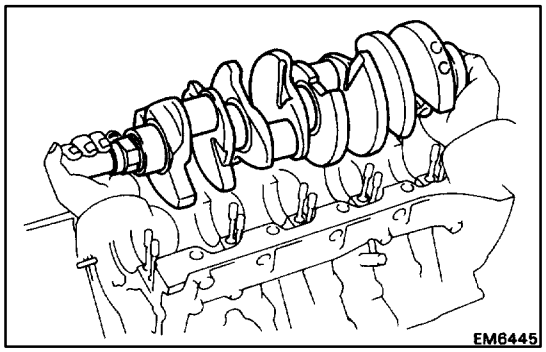
- Keep the lower main bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.

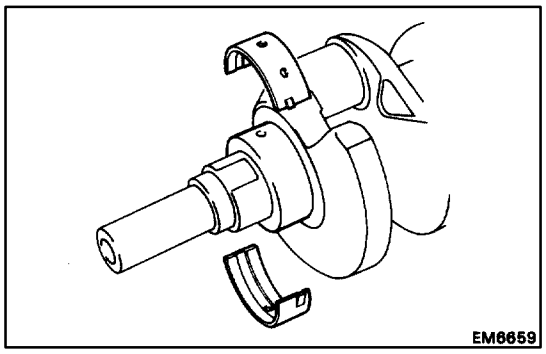
(d) Lift out the crankshaft.

(e) Remove the two upper thrust washers.

HINT:

- Arrange the upper thrust washers in correct order.
- Keep the upper main bearings together with the cylinder block.



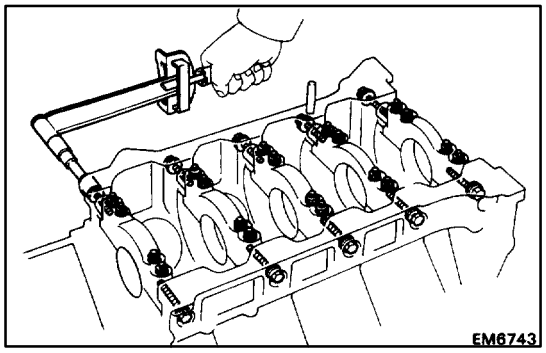


(f) Clean each main journal and bearing.

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

If the journal or bearing are damaged, replace the bearings.

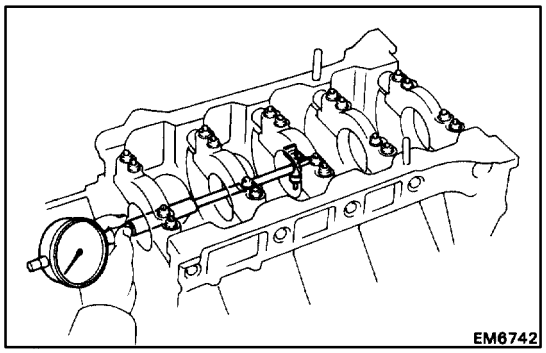
If necessary, replace the crankshaft.



(h) Install the five main bearing caps with the twenty nuts and ten bolts. Do not install the crankshaft.
(See step 4 on pages EM–116 and 117)

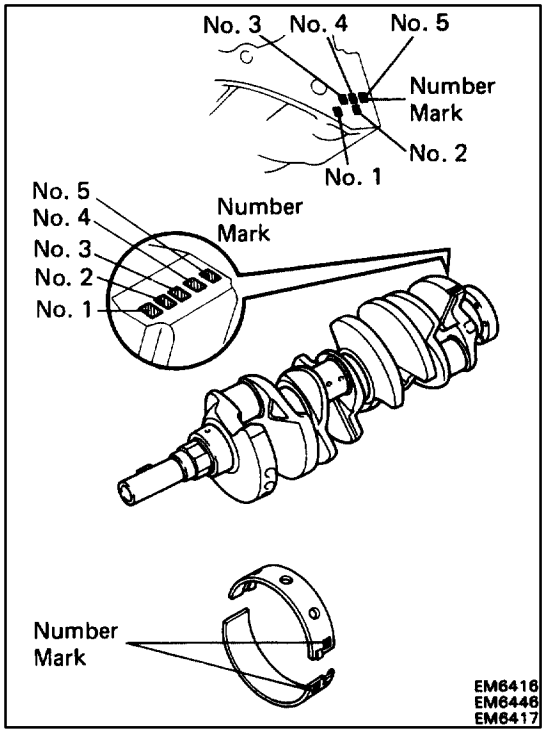
Torque:

Nut 1st 275 kg–cm (20 ft–lb, 27 N·m)
2nd turn 90°
Bolt 500 kg–cm (36 ft–lb, 49 N·m)



(i) Using a cylinder gauge, measure the inside diameter of the main bearing.

Bearing inside diameter: 67.026–67.033 mm (2.6388–2.6391 in.)



(j) Measure the diameter of the main journal.
(See page EM–110)

Main journal diameter: 66.988–67.000 mm (2.6373–2.6378 in.)

(k) Subtract the main journal diameter measurement from the main bearing inside diameter measurement.

Standard oil clearance: 0.026–0.045 mm (0.0010–0.0018 in.)

Maximum clearance: 0.055 mm (0.0022 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.

HINT: If using a standard bearing, replace 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 refer to the table below for the appropriate bearing number. There are five sizes of standard bearings, marked “1”, “2”, “3”, “4” and “5” accordingly.

	Total number				“ “: Number mark
Cylinder block (A) + Crankshaft (B) =	0–5	6–11	12–17	18–23	24–28
Use bearing	”1”	”2”	”3”	”4”	”5”

EXAMPLE: Cylinder block “06” (A) + Crankshaft “08” (B) = Total number 14 (Use bearing “3”)

(Reference)

Cylinder block main journal bore diameter (A):
Mark “00” 72.000 mm (2.8346 in.)
Mark “01” 72.001 mm (2.8347 in.)
Mark “02” 72.002 mm (2.8347 in.)
Mark “03” 72.003 mm (2.8348 in.)
Mark “04” 72.004 mm (2.8348 in.)
Mark “05” 72.005 mm (2.8348 in.)
Mark “06” 72.006 mm (2.8349 in.)
Mark “07” 72.007 mm (2.8349 in.)
Mark “08” 72.008 mm (2.8350 in.)
Mark “09” 72.009 mm (2.8350 in.)
Mark “10” 72.010 mm (2.8350 in.)
Mark “11” 72.011 mm (2.8351 in.)
Mark “12” 72.012 mm (2.8351 in.)
Mark “13” 72.013 mm (2.8352 in.)
Mark “14” 72.014 mm (2.8352 in.)
Mark “15” 72.015 mm (2.8352 in.)
Mark “16” 72.016 mm (2.8353 in.)

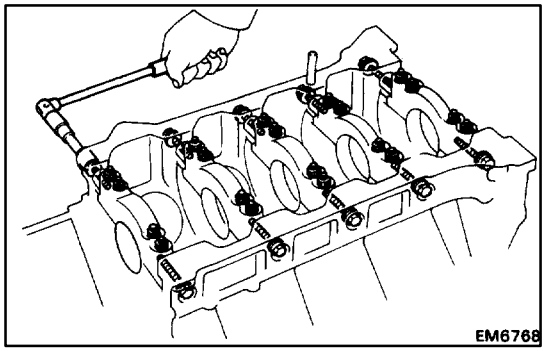
Crankshaft main journal diameter (B):
Mark “00” 67.000 mm (2.6378 in.)
Mark “01” 66.999 mm (2.6378 in.)
Mark “02” 66.998 mm (2.6377 in.)
Mark “03” 66.997 mm (2.6377 in.)
Mark “04” 66.996 mm (2.6376 in.)
Mark “05” 66.995 mm (2.6376 in.)
Mark “06” 66.994 mm (2.6376 in.)
Mark “07” 66.993 mm (2.6375 in.)
Mark “08” 66.992 mm (2.6375 in.)
Mark “09” 66.991 mm (2.6374 in.)
Mark “10” 66.990 mm (2.6374 in.)
Mark “11” 66.989 mm (2.6374 in.)
Mark “12” 66.988 mm (2.6373 in.)

Standard sized bearing center wall thickness:
Mark “1” 2.486–2.489 mm (0.0979–0.0980 in.)
Mark “2” 2.489–2.492 mm (0.0980–0.0981 in.)
Mark “3” 2.492–2.495 mm (0.0981–0.0982 in.)
Mark “4” 2.495–2.498 mm (0.0982–0.0983 in.)
Mark “5” 2.498–2.501 mm (0.0983–0.0985 in.)

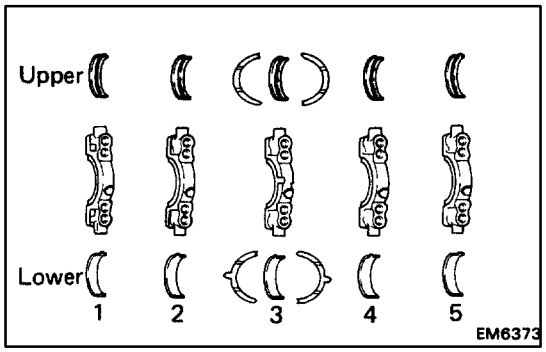
Standard Sized Bearing Selection Chart

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
00	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3
01	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3
02	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4
03	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4
04	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4
05	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4
06	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4
07	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4
08	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5
09	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5
10	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5
11	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5
12	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5

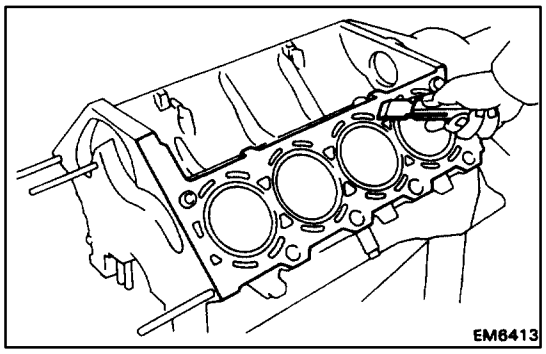
EXAMPLE: Cylinder block “06”, Crankshaft “08”
= Use bearing “3”



(k) Remove the ten bolts, twenty nuts and five main bearing caps. (See procedure (a) to (c) above)
(l) Remove the five upper main bearings from the cylinder block.



HINT: Arrange the main bearing caps, bearings and thrust washers in correct order.



INSPECTION AND REPAIR OF CYLINDER BLOCK

1. CLEAN CYLINDER BLOCK

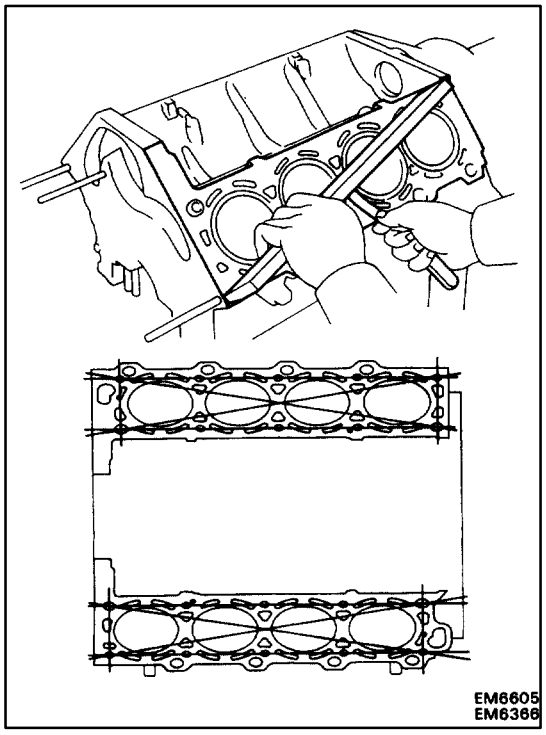
A. Remove gasket material

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

B. Clean cylinder block

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

NOTICE: If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block, so always wash the cylinder block at temperatures of 45° or less.

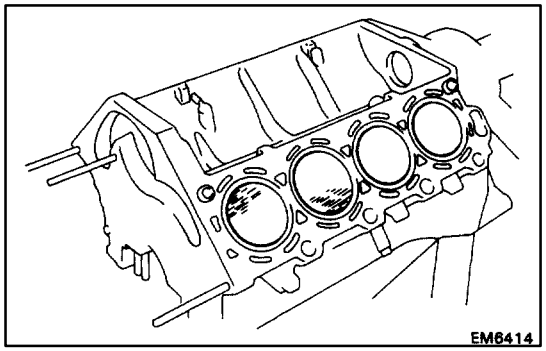


2. INSPECT TOP SURFACES OF CYLINDER BLOCK FOR FLATNESS

Using precision straight edge and feeler gauge, measure the top surfaces of the cylinder block for warpage.

Maximum warpage: 0.07 mm (0.0028 in.)

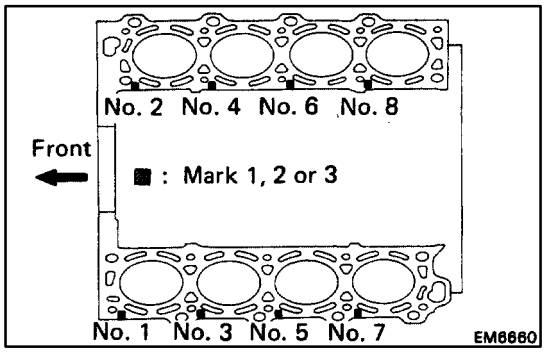
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

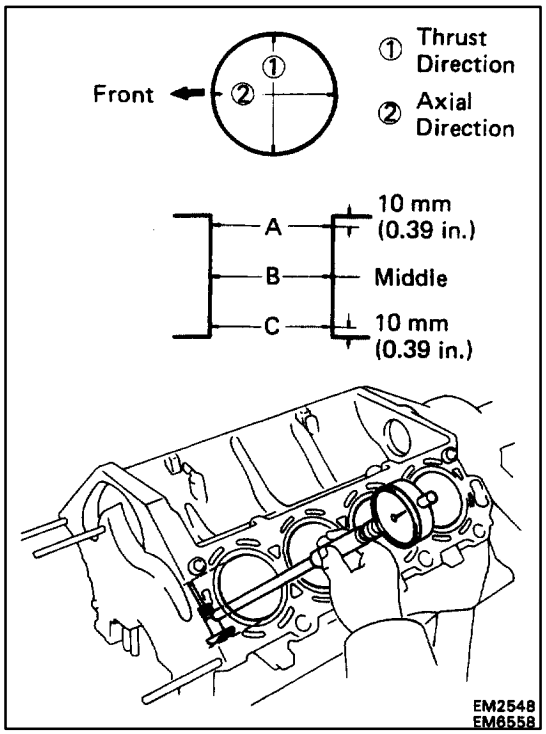
Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked ”1”, ”2” and ”3” accordingly. The mark is stamped on the top of the cylinder block.



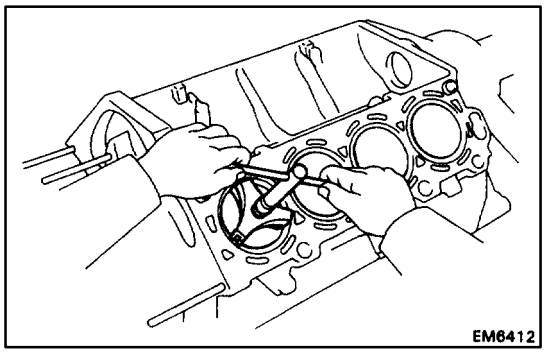
Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

Mark ”1”	**87.500–87.510 mm (3.4449–3.4453 in.)**
Mark ”2”	**87.510–87.520 mm (3.4453–3.4457 in.)**
Mark ”3”	**87.520–87.530 mm (3.4457–3.4461 in.)**

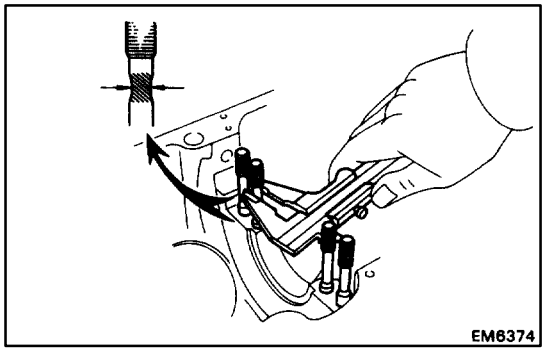
Maximum diameter: 87.73 mm (3.4539 in.)

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.



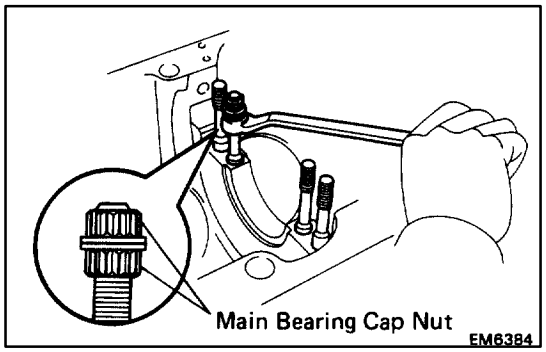
6. INSPECT MAIN BEARING CAP STUD BOLTS

Using vernier calipers, measure the tension portion diameter of the stud bolt.

Standard diameter: 7.500–7.600 mm (0.2953–0.2992 in.)

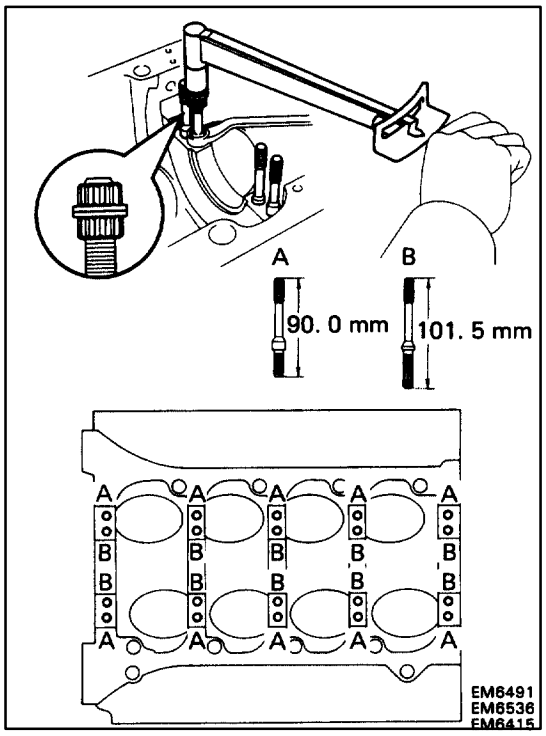
Minimum diameter: 7.40 mm (0.2913 in.)

If the diameter is less than minimum, replace the stud bolt.



7. IF NECESSARY, REPLACE MAIN BEARING CAP STUD BOLTS

(a) Using the two main bearing cap nuts, remove the stud bolt.

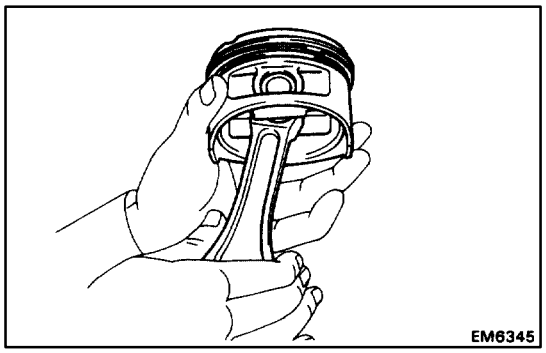


(b) Apply a light coat of engine oil on the threads and under the flange of the stud bolt.

(c) Using the two main bearing cap nuts, install and torque the stud bolt.

Torque: 100 kg–cm (7 ft–lb, 10 N·m)

HINT: Stud bolts come in lengths of 90.0 mm (3.543 in.) and 101.5 mm (3.996 in.). Install the 101.5 mm (3.996 in.) bolts in the inside positions. Install the 90.0 mm (3.543 in.) bolts in the outside positions.

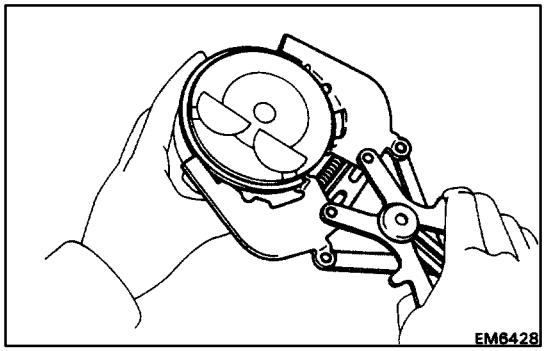


DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CHECK FIT BETWEEN PISTON AND PISTON PIN

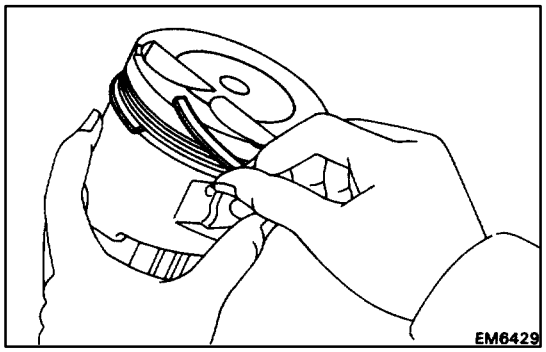
Try to move the piston back and forth on the piston pin.

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



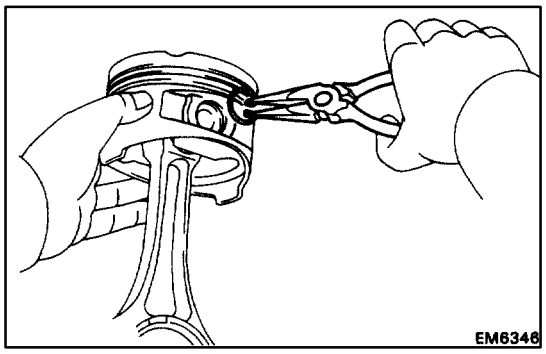
2. REMOVE PISTON RINGS

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



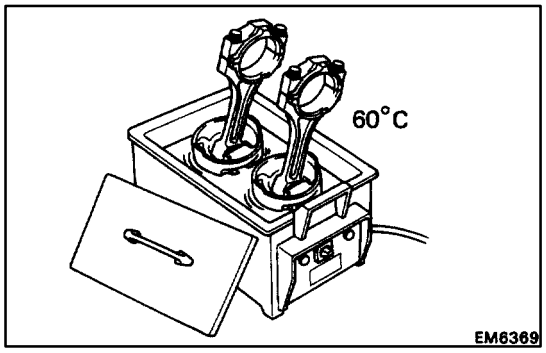
(b) Remove the two side rails and oil ring expander by hand.

HINT: Arrange the piston rings in correct order only.

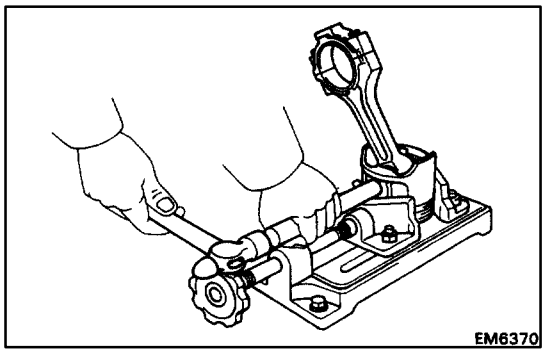


3. DISCONNECT CONNECTING ROD FROM PISTON

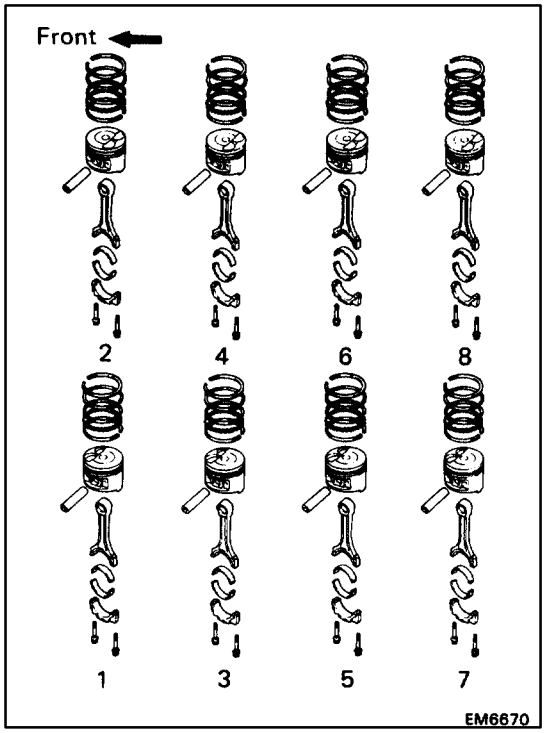
(a) Using needle–nose pliers, remove the two snap rings.



(b) Gradually heat the piston to approx. 60˚C (140˚F).

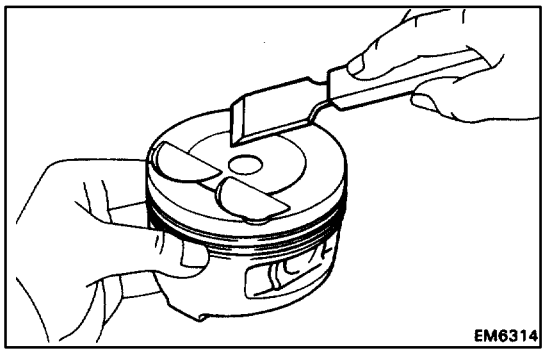


(c) Using plastic–face hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.



HINT:

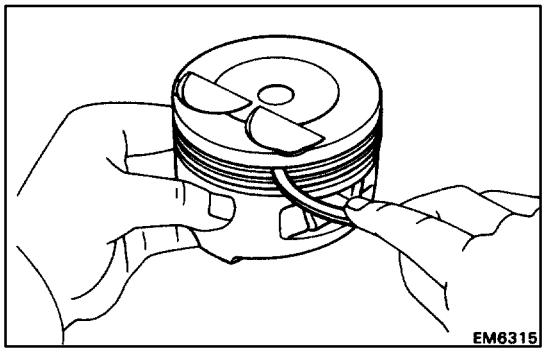
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



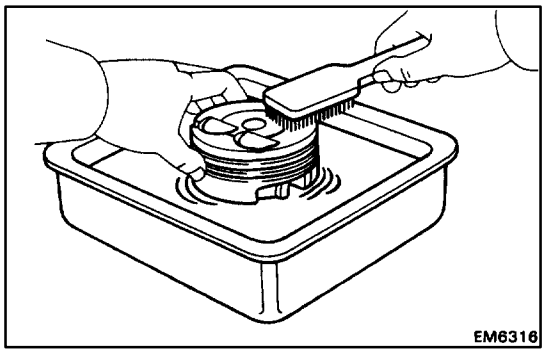
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

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

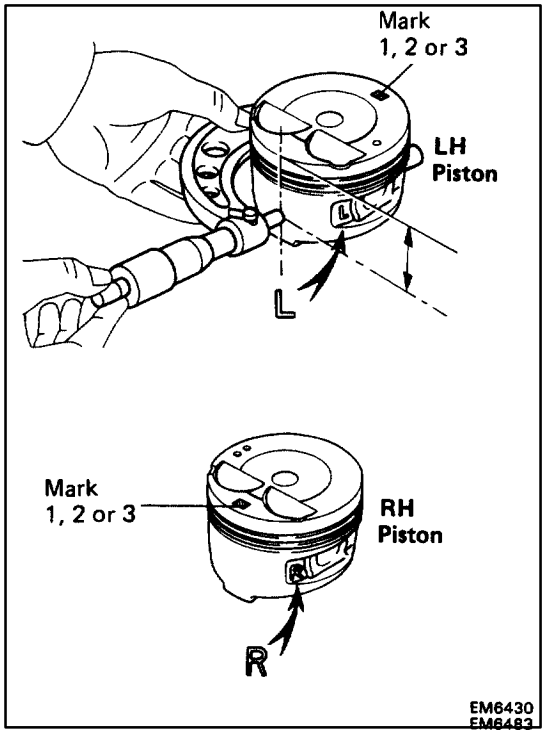


(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE: Do not use a wire brush.



2. INSPECT PISTON

A. Inspect piston oil clearance

HINT: There are three sizes of the standard piston, marked "1", "2" and "3" accordingly. The mark is stamped on the top of the piston.

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 49 mm (1.93 in.) from the piston head.

Piston diameter:

Mark "1"	**87.470–87.480 mm (3.4437 – 3.4441 in.)**
Mark "2"	**87.480 – 87.490 mm (3.4441–3.4445 in.)**
Mark "3"	**87.490–87.500 mm (3.4445–3.4449 in.)**

(b) Measure the cylinder bore diameter in the thrust directions. (See step 4 on page EM–102)

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

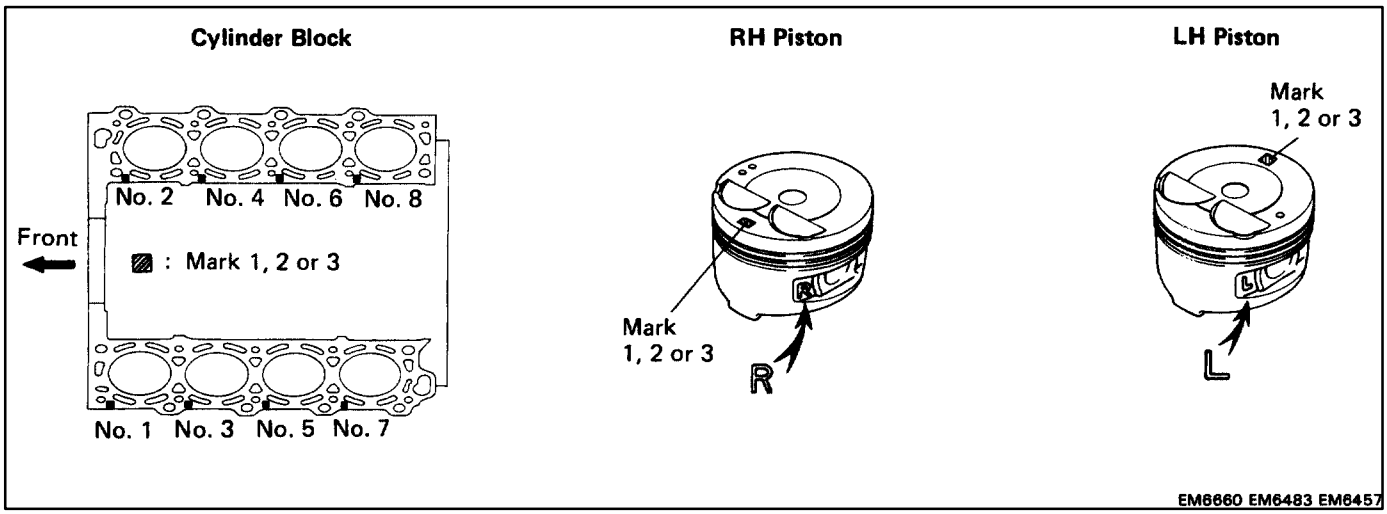
Standard oil clearance: 0.020 – 0.040 mm (0.0008–0.0016 in.)

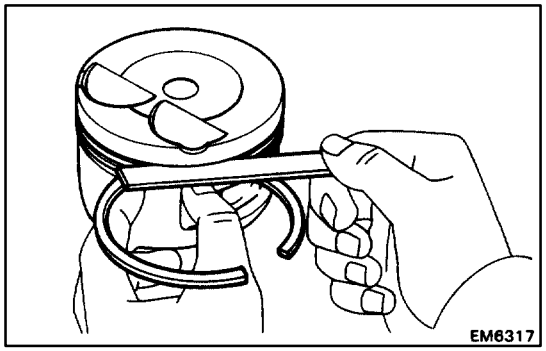
Maximum oil clearance: 0.06 mm (0.0024 in.)

If the oil clearance is greater than maximum, replace all the eight 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.
- The shape of the piston varies for the RH and LH banks. The RH piston is marked with "R", the LH piston with "L".





B. Inspect piston ring groove clearance

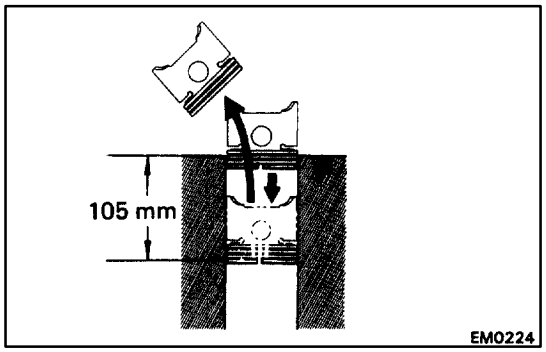
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:

No.1 0.020–0.060 mm (0.0008–0.0024 in.)

No.2 0.015–0.055 mm (0.0006–0.0022 in.)

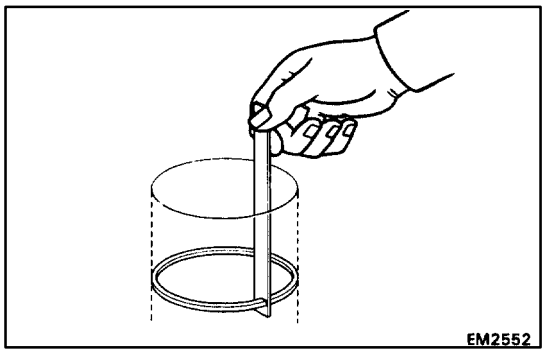
If the clearance is greater than maximum, replace the piston.



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, 105 mm (4.13 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the ring end gap.

Standard ring end gap:

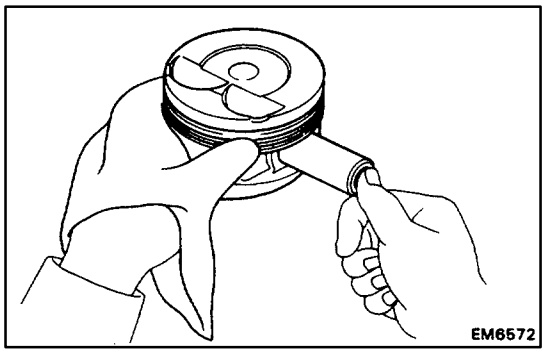
No. 1	**0.250–0.450 mm (0.0098–0.0177 in.)**
No. 2	**0.350–0.600 mm (0.0138 – 0.0236 in.)**
Oil (Side rail)	**0.150–0.500 mm (0.0059 – 0.0197 in.)**

Maximum ring end gap:

No. 1	**1.05 mm (0.0413 in.)**
No.2	**1.20 mm (0.0472 in.)**

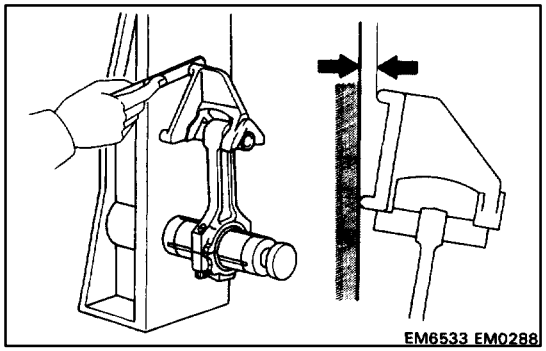
Oil (Side rail) 1.10 mm (0.0433 in.)

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

- Check for bending.

Maximum bending:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

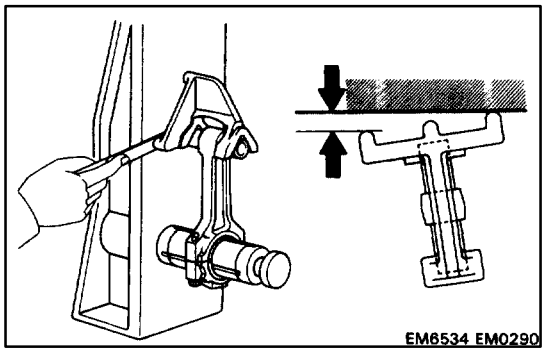
If bend is greater than maximum, replace the connecting rod assembly.

- Check for twist.

Maximum twist:

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

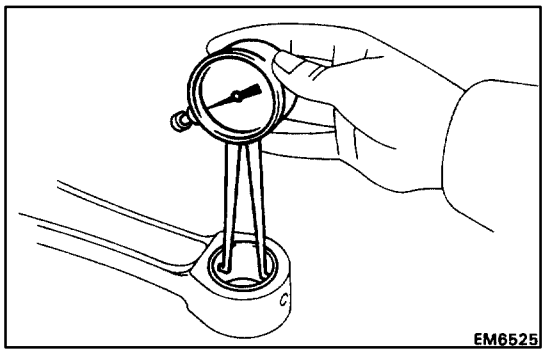
If twist is greater than maximum, replace the connecting rod assembly.



B. Inspect connecting rod bushings

(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.)



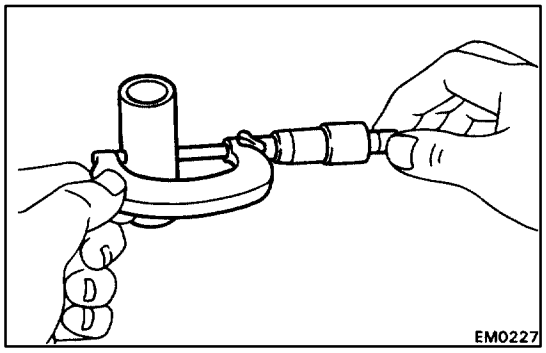
(b) Using a micrometer, measure the piston pin diameter.

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.)

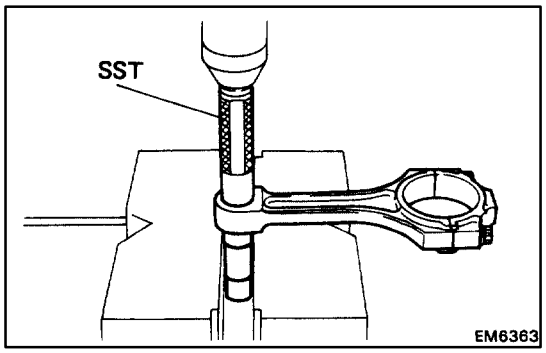
Maximum oil clearance: 0.05 mm (0.0020 in.)

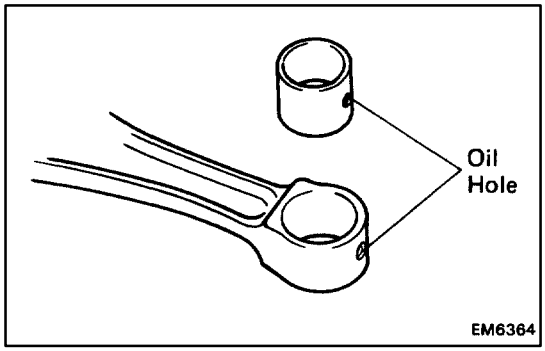


C. If necessary, replace connecting rod bushings

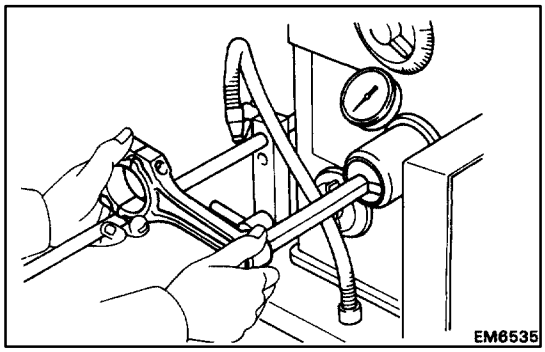
(a) Using SST and a press, press out the bushing.

SST 09222–30010

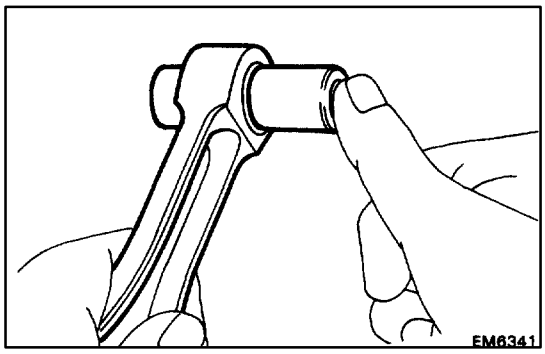




(b) Align the oil holes of the connecting rod and a new bushing.
(c) Using SST and a press, press in the bushing.
SST 09222–30010

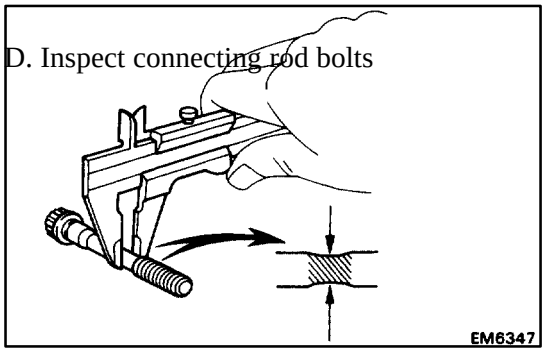


(d) Using a pin hone grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.

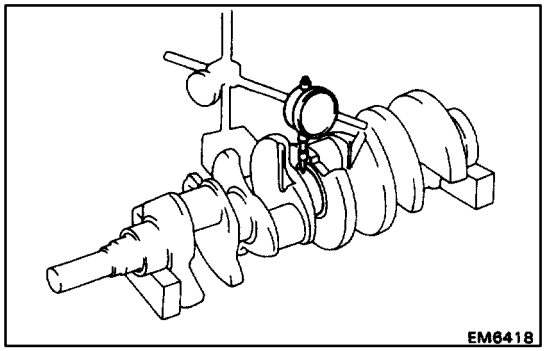


(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

D. Inspect connecting rod bolts



Using vernier calipers, measure the tension portion diameter of the bolt.
Standard diameter: 7.200 – 7.300 mm (0.2835–0.2874 in.)
Minimum diameter: 7.00 mm (0.2756 in.)
If the outer diameter is less than minimum, replace the bolt.


EM6418

INSPECTION OF CRANKSHAFT

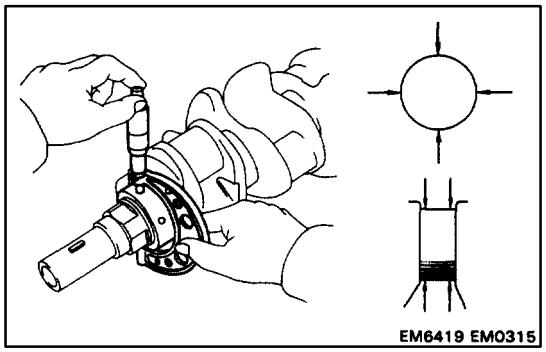
1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

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

Maximum circle runout: 0.08 mm (0.0031 in.)

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


EM6419 EM0315

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter: 66.988 – 67.000 mm (2.6373 – 2.6378 in.)

Crank pin diameter: 51.982 – 52.000 mm (2.0465 – 2.0472 in.)

If the diameter is not as specified, check the oil clearance (See page EM–95 or 98).

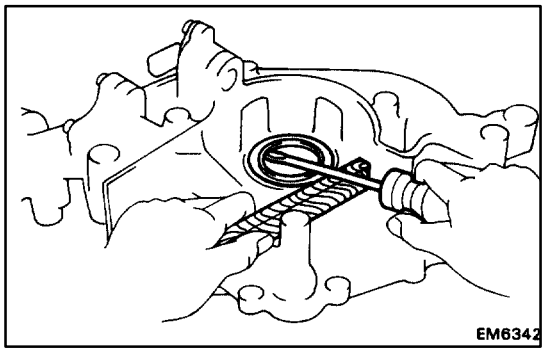
(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round: 0.02 mm (0.0008 in.)

If the taper or out–of–round is greater than maximum, replace the crankshaft.

REPLACEMENT OF CRANKSHAFT OIL SEALS

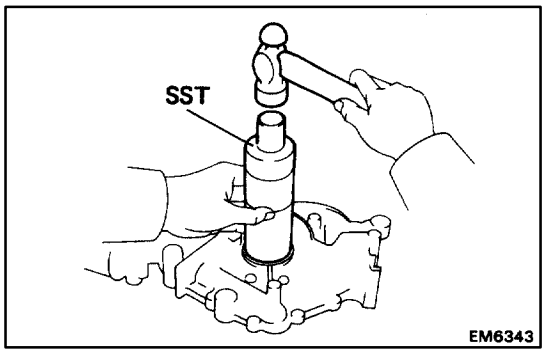
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

A. If oil pump is removed from cylinder block:

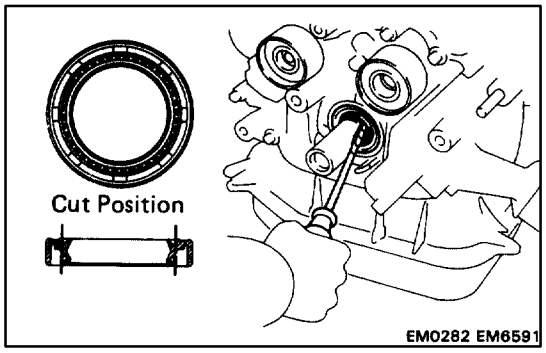
(a) Using a screwdriver, pry out the oil seal.



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

SST 09316–60010 (09316–00010)

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

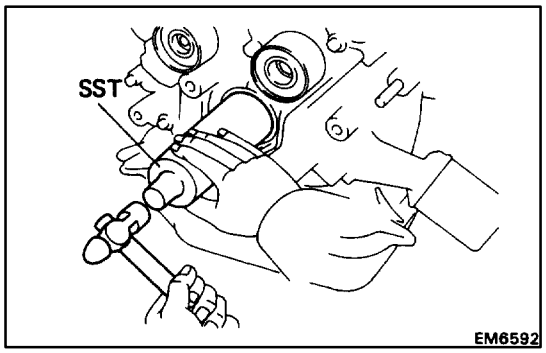


B. If oil pump is installed to the cylinder block:

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

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

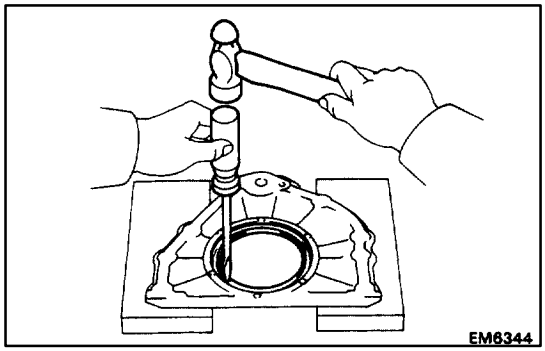
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(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.

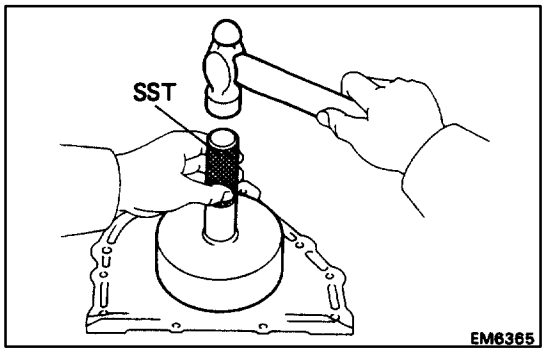
SST 09316–60010 (09316–00010)



2. REPLACE CRANKSHAFT REAR OIL SEAL

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

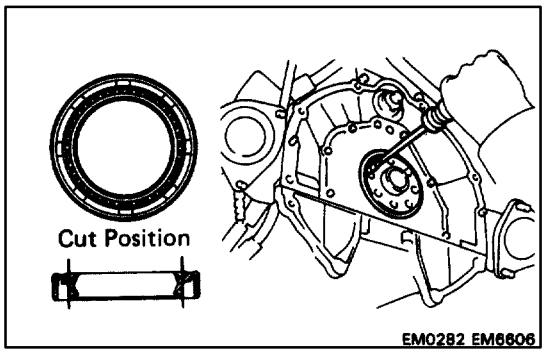
(a) Using screwdriver and hammer, tap out the oil seal.



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

SST 09223–56010

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

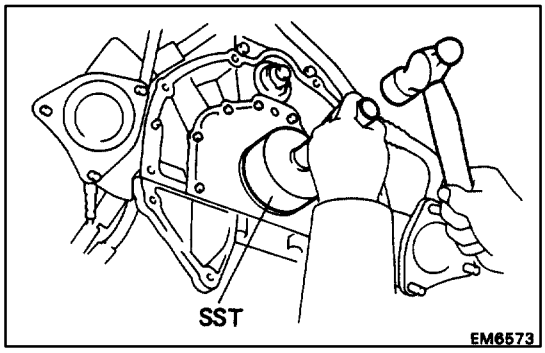


B. If rear oil seal retainer is installed to cylinder block:

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

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

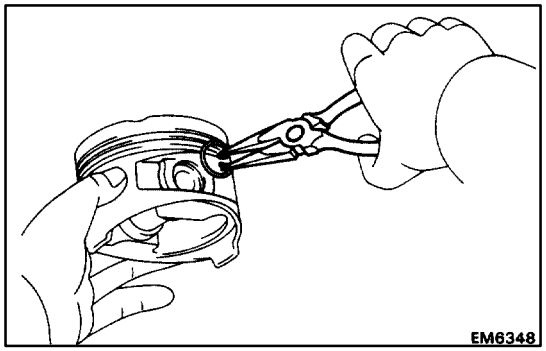
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(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.

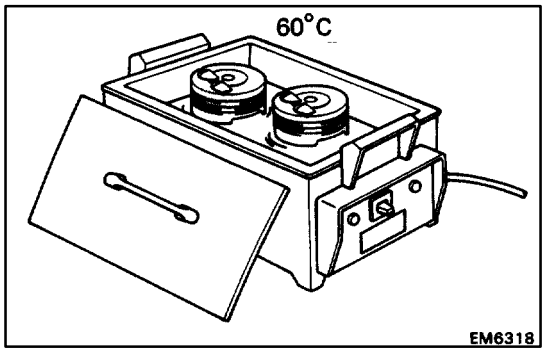
SST 09223–56010



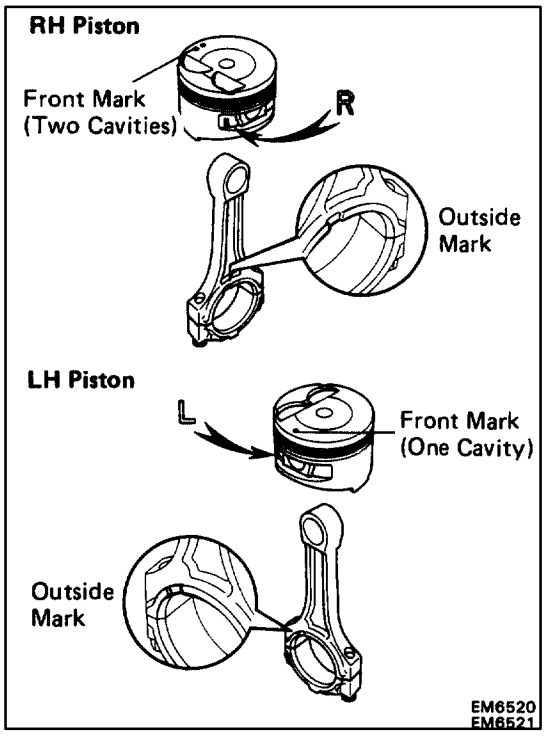
ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Using needle–nose pliers, install a new snap ring on one side of the piston pin hole.



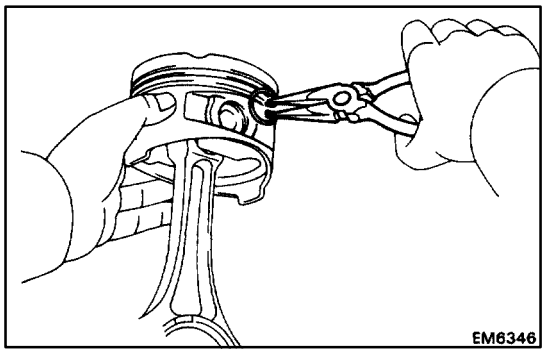
(b) Gradually heat the piston to about 60°C (140°F).



(c) Position the piston front mark with respect to the outside mark on the connecting rod as shown in the diagram.

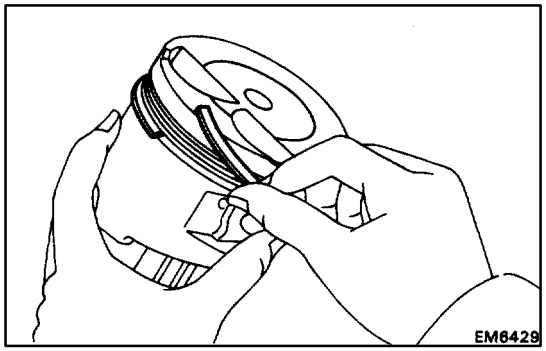
NOTICE: The installation direction of the piston and connecting rod are different for the RH and LH banks. The RH piston is marked with “R”, the LH piston with “L”.

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



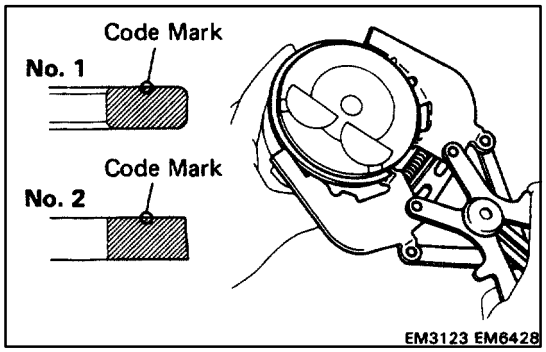
(e) Using needle–nose pliers, install a new snap ring on the other side of the piston pin hole.

NOTICE: When installing a new snap ring, install it so that the ends of the snap ring do not overlap.



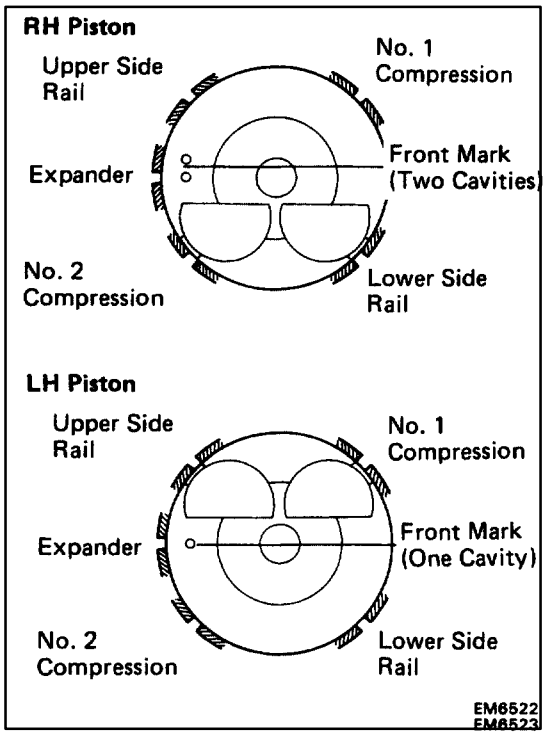
2. INSTALL PISTON RINGS

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



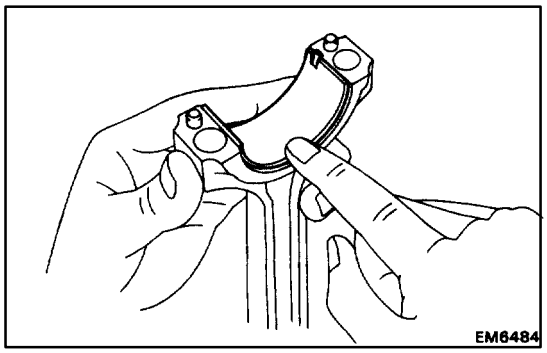
(b) Using a piston ring expander, install the two compression rings with the code mark facing upward.

Code mark: **No.1 1R or T**
No.2 2R or 2T



(c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the piston ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

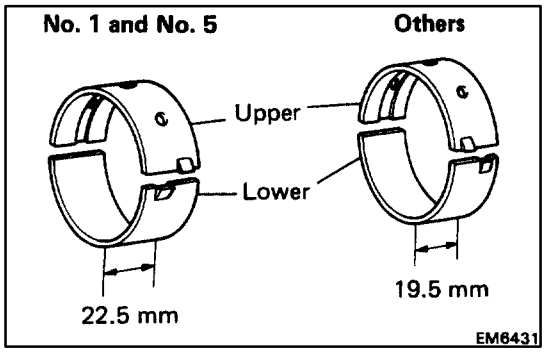
(b) Install the bearings in the connecting rod and connecting rod cap.

ASSEMBLY OF CYLINDER BLOCK

(See page EM–90)

HINT:

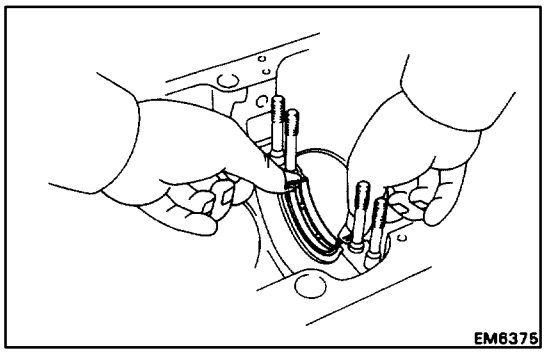
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.



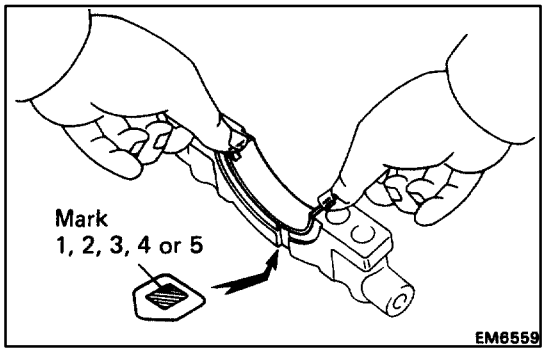
1. INSTALL MAIN BEARINGS

HINT:

- Main bearings come in widths of 19.5 mm (0.768 in.) and 22.5 mm (0.886 in.). Install the 22.5 mm (0.886 in.) bearings in the No.1 and No.5 cylinder block journal positions with the main bearing caps. Install the 19.5 mm (0.768 in.) bearings in the other positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.

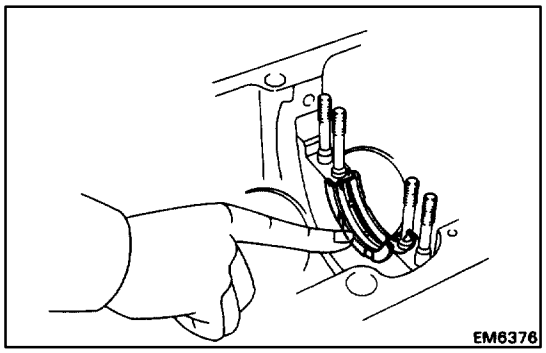


(a) Align the bearing claw with the claw groove of the cylinder block, and push in the five upper bearings.



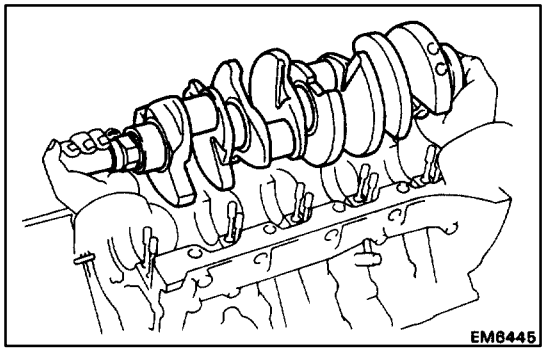
(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the five lower bearings.

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

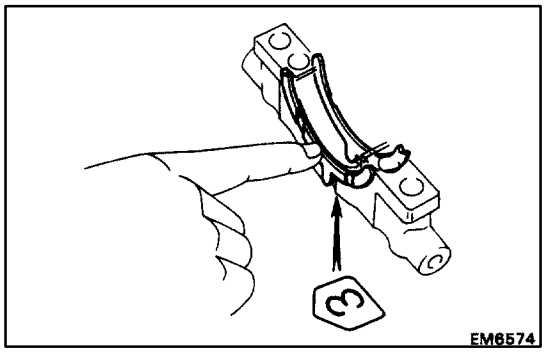


2. INSTALL UPPER THRUST WASHERS

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



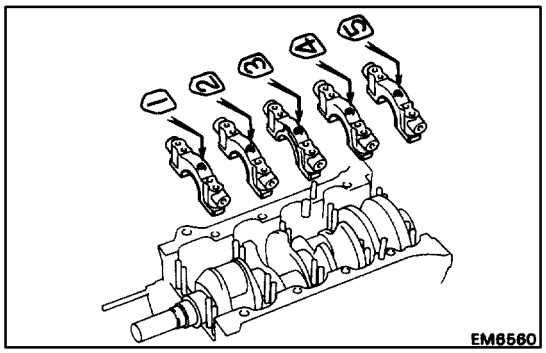
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



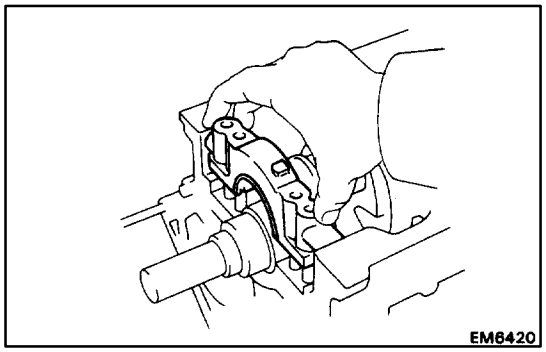
4. INSTALL MAIN BEARING CAP AND LOWER THRUST WASHERS

A. Place main bearing cap and lower thrust washers on cylinder block

(a) Install the two thrust washers on the No.3 main bearing cap with the grooves facing outward.



(b) Install the main bearing caps in their proper location.



(c) Place the five bearing caps in position on cylinder block.

HINT: Place the bearing caps level and let them return to their original position by their own weight.

NOTICE: Do not install the main bearing cap by tapping it.

B. Install main bearing cap nuts

HINT:

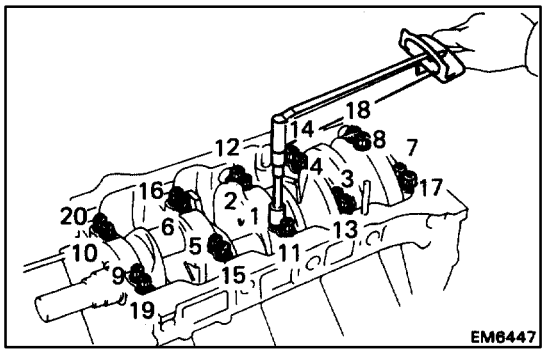
- The main bearing cap nuts are tightened in two progressive steps (steps (b) and (d)).
- If any main bearing cap stud bolt is broken or deformed, replace it.

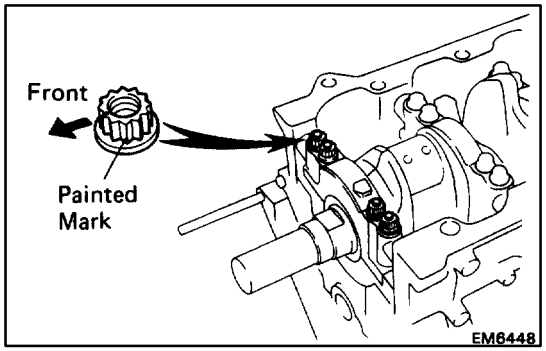
(a) Apply a light coat of engine oil on the threads and under the nuts of the main bearing caps.

(b) Install and uniformly tighten the twenty main bearing cap nuts in several passes in the sequence shown.

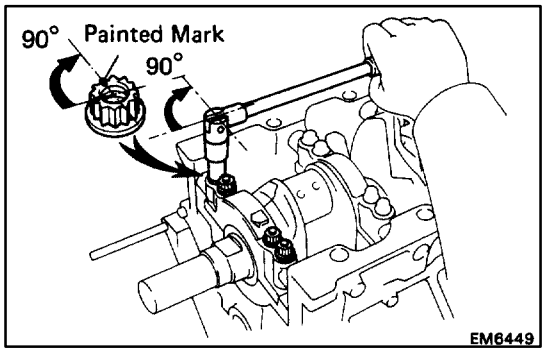
Torque: 275 kg–cm (20 ft–lb, 27 N·m)

If any one of the main bearing cap nuts does not meet the torque specification, replace the main bearing cap stud bolt.

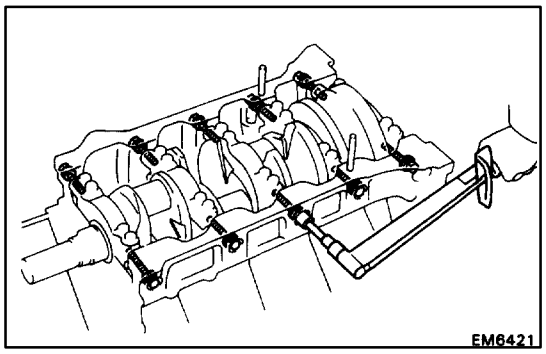




(c) Mark the front of the main bearing cap nut with paint.



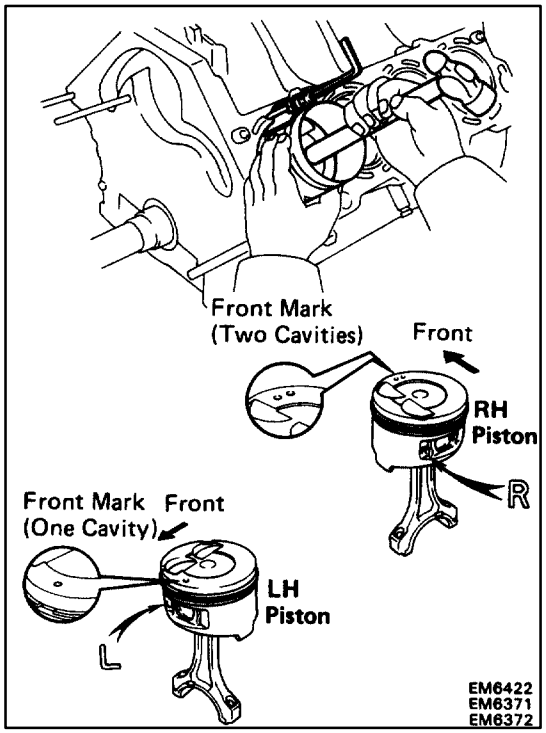
(d) Retighten the main bearing cap nuts 905 in the numerical order shown.
(e) Check that the painted mark is now at a 905 angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the crankshaft thrust clearance.
(See step 5 on page EM–97)



C. Install main bearing cap bolts

(a) Install a new seal washer to the main bearing cap bolt.
(b) Install the ten main bearing cap bolts.

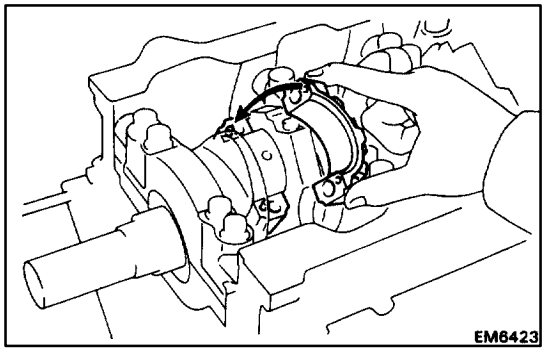
Torque: 500 kg–cm (36 ft–lb, 49 N·m)



5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

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.

NOTICE: The shape of the piston varies for the RH and LH banks. The RH piston is marked with “R”, the LH piston with “L”.

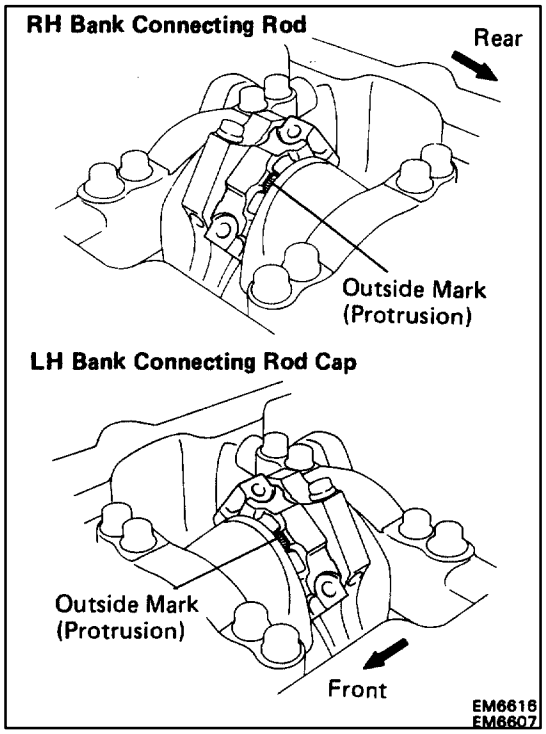


6. INSTALL CONNECTING ROD CAPS

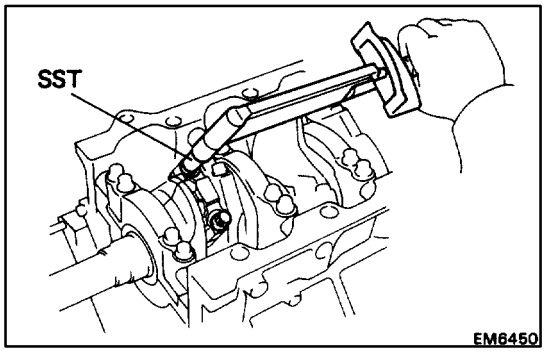
A. Place connecting rod cap on connecting rod

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Align the pin groove of the connecting rod cap with the pins of the connecting rod, and install the connecting rod cap.



(c) Check that the outside mark on the connecting rod cap is facing in the correct direction.



B. Install connecting rod cap bolts

HINT:

- The connecting rod cap bolts are tightened in two progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace it.

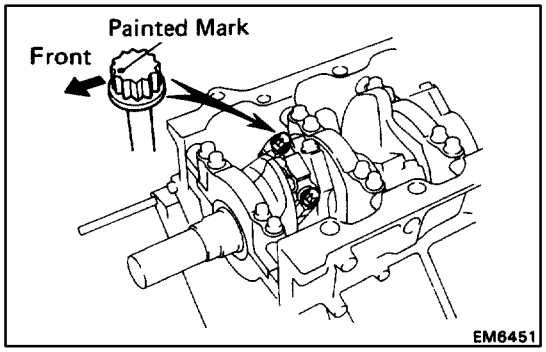
(a) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.

(b) Using SST, install and alternately tighten the two connecting rod cap bolts in several passes.

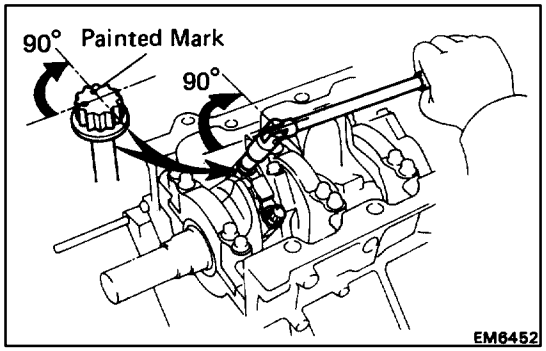
SST 09011–38121

Torque: 250 kg–cm (18 ft–lb, 25 N·m)

If any one of the connecting rod cap bolts does not meet the torque specification, replace the connecting rod cap bolt.



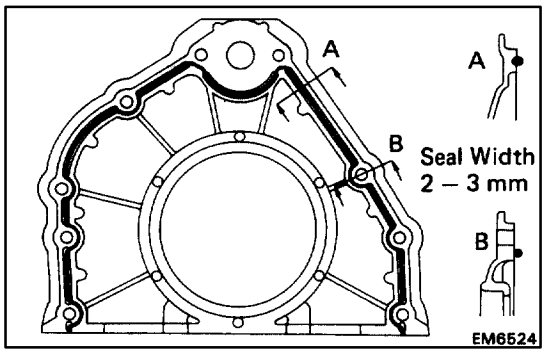
(c) Mark the front of the connecting rod cap bolt with paint.



(d) Retighten the connecting rod cap bolts 905 in the numerical order shown.
(e) Check that the painted mark is now at a 905 angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the connecting rod thrust clearance.
(See step 2 on page EM–94)

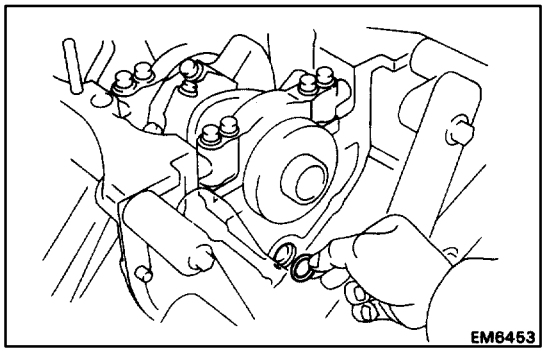
7. INSTALL REAR OIL SEAL RETAINER

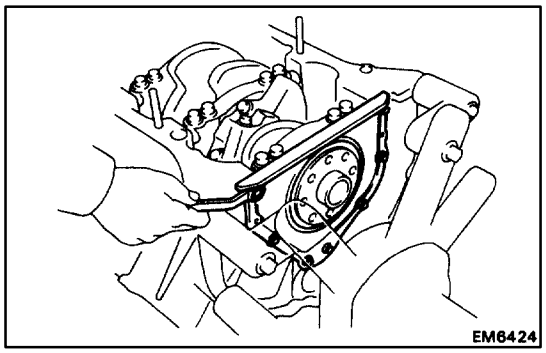
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the retainer as shown in the figure.
Seal packing: Part No.08826–00080 or equivalent
- Install a nozzle that has been cut to a 2–3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Place a new O–ring in position on the cylinder block.





(d) Install the retainer with the seven bolts.
Torque: 80 kg–cm (69 in.–lb, 7.8 N·m)

POST ASSEMBLY

(See page EM–99)

1. INSTALL WATER SEAL PLATE

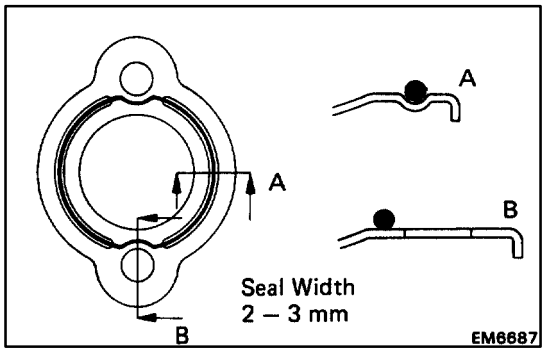
(a) Remove any old packing (FIPG) material.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the seal plate as shown in the figure.

Seal packing: Part No.08826–00100 or equivalent

- Install a nozzle that has been cut to a 2–3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



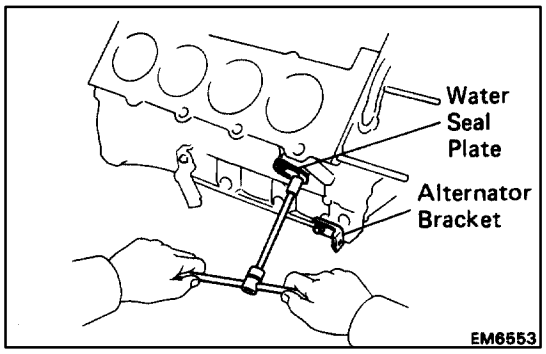
(c) Install the seal plate with the two nuts.

Torque: 145 kg–cm (10 ft–lb, 14 N·m)

2. INSTALL ALTERNATOR BRACKET

Install the bracket with the bolt.

Torque: 185 kg–cm (13 ft–lb, 18 N·m)



3. INSTALL OIL PUMP

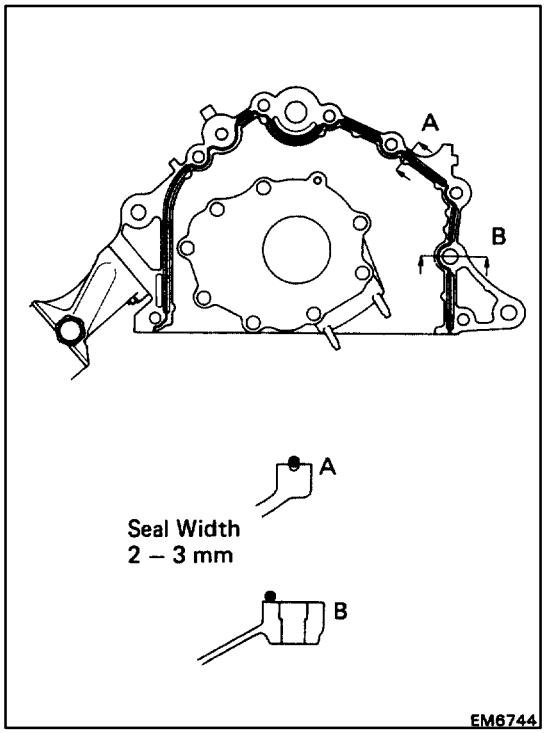
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.

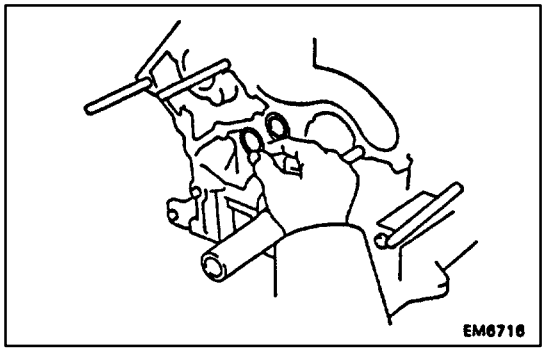
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the oil pump as shown in the figure.

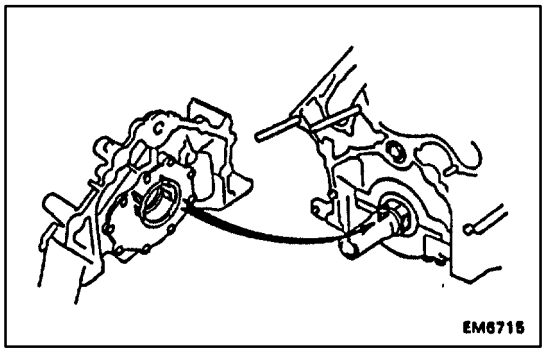
Seal packing: Part No.08826–00080 or equivalent

- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

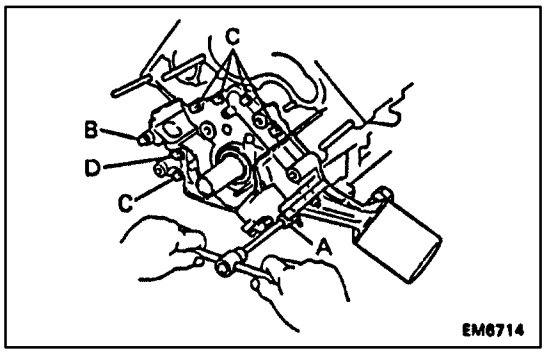




(c) Place a new O–ring in position on the cylinder block.



(d) Engage the spline teeth of the oil pump drive gear with the large teeth of the crankshaft, and slide on the oil pump.



(e) Install the oil pump with the eight bolts.

Torque:

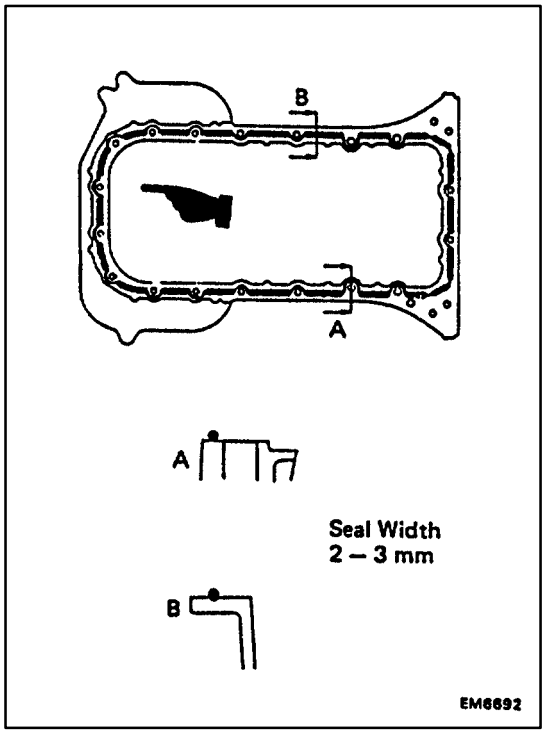
12 mm head 160 kg–cm (12 ft–lb, 16 N·m)

14 mm head 310 kg–cm (22 ft–lb, 30 N·m)

HINT: Each bolt length is indicated in the figure.

Bolt length:

A 50 mm (1.97 in.) for 12 mm head
B 106 mm (4.17 in.) for 12 mm head
C 30 mm (1.18 in.) for 12 mm head
D 40 mm (1.57 in.) for 14 mm head



4. INSTALL NO. 1 OIL PAN

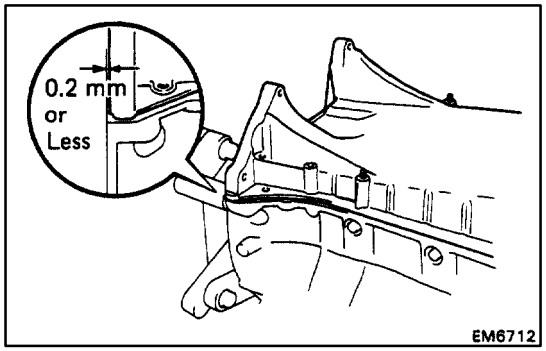
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan, cylinder block, oil pump and rear oil seal retainer.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the oil pan as shown in the figure.

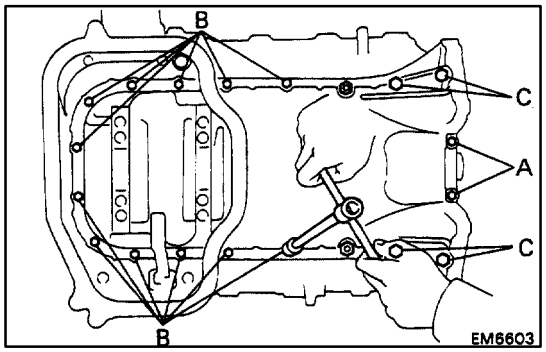
Seal packing: Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Place the oil pan in position on the cylinder block.

NOTICE: Make sure the clearance between the oil pan end and cylinder block end is 0.2 mm or less (0.008 in.). If the clearance is more than 0.2 mm (0.008 in.), the oil pan will be stretched.



(d) Install the oil pan with the eighteen bolts and two nuts.

Torque:

10 mm head 80 kg–cm (69 in.–lb, 7.8 N·m)

12 mm head 185 kg–cm (13 ft–lb, 18 N·m)

HINT: Each bolt length is indicated in the figure.

Bolt length:

A 20 mm (0.78 in.) for 10 mm head

B 35 mm (1.38 in.) for 10 mm head

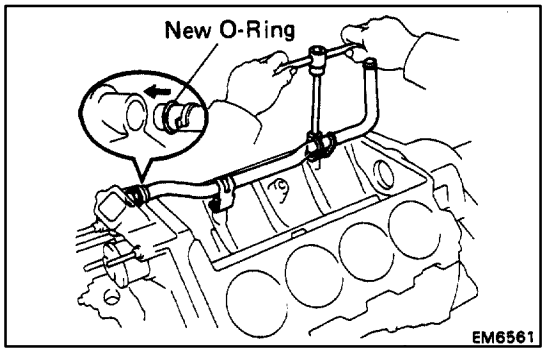
C 55 mm (2.17 in.) for 12 mm head

5. INSTALL OIL STRAINER
(See step 3 on page LU–12)

6. INSTALL OIL PAN BAFFLE PLATE
(See step 4 on page LU–12)

7. INSTALL NO.2 OIL PAN
(See step 5 on page LU–12)

8. INSTALL WATER PUMP
(See step 1 on page CO–9)



9. INSTALL WATER BY–PASS PIPE

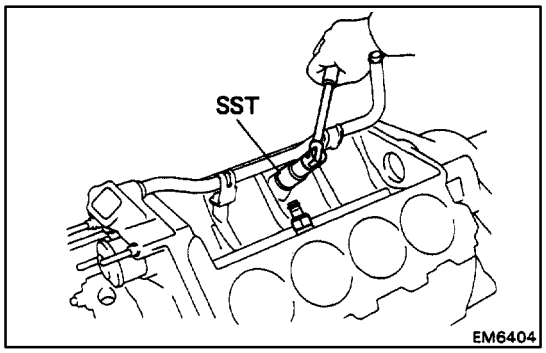
(a) Install a new O–ring to the by–pass pipe.

(b) Apply soapy water to the O–ring.

(c) Pull in the by–pass pipe end into the pipe hole of the water pump.

(d) Install the water by–pass pipe with the two bolts.

Torque: 185 kg–cm (13 ft–lb, 18 N·m)

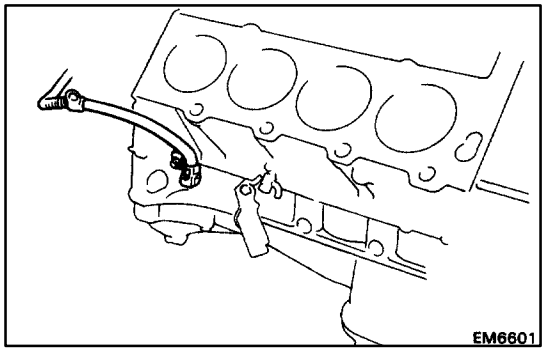


10. INSTALL KNOCK SENSORS

Using SST, install the two knock sensors.

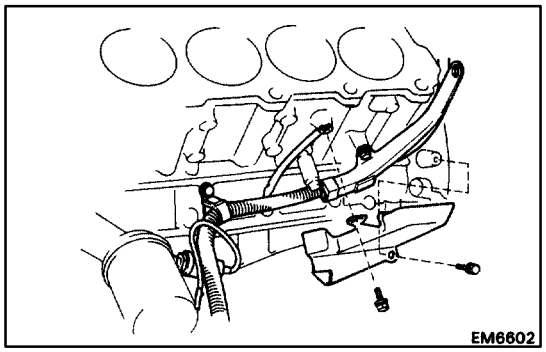
SST 09816–30010

Torque: 450 kg–cm (33 ft–lb, 44 N·m)

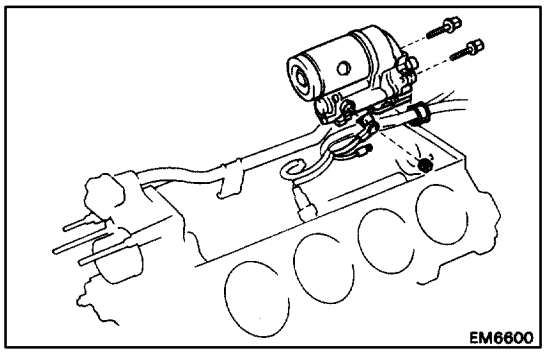


11. INSTALL ENGINE WIRE

(a) Install the engine wire to the RH side of the cylinder block with the wire clamp and bolt.



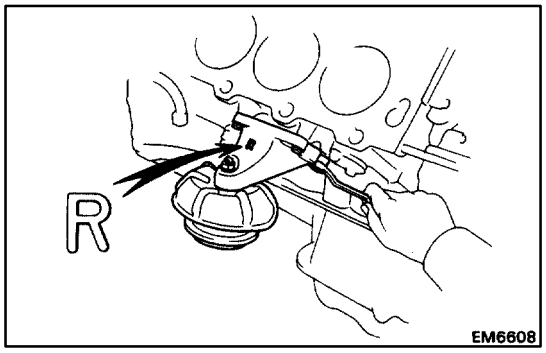
(b) Install the engine wire to the LH side of the cylinder block with the two wire clamps and bolts.
(c) Install the wire cover to the LH side of the cylinder block with the two bolts.
(d) Connect the following connectors:
  (1) Two knock sensor connectors
  (2) Oil pressure switch connector



12. INSTALL STARTER

(a) Connect the connector to the starter.
(b) Connect the wire to the starter with the nut.
(c) Install the starter with the two bolts.

Torque: 400 kg–cm (29 ft–lb, 39 N·m)

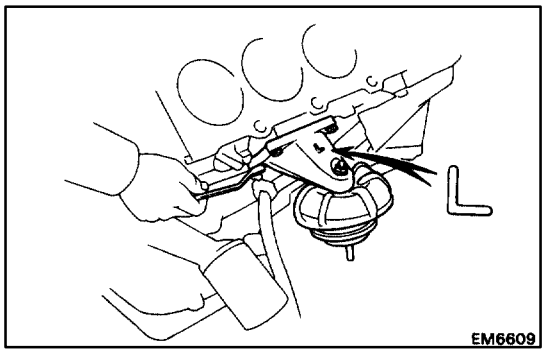


13. INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the four bolts.

Torque: 380 kg–cm (27 ft–lb, 37 N·m)

HINT: The RH mounting bracket is marked with “R”.



14. INSTALL LH ENGINE MOUNTING BRACKET

Install the mounting bracket with the four bolts.

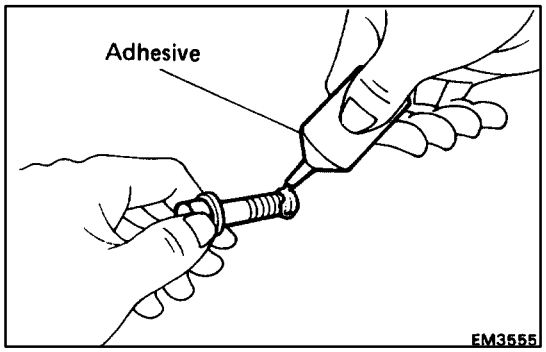
Torque: 380 kg–cm (27 ft–lb, 37 N·m)

HINT: The LH mounting bracket is marked with “L”.

15. INSTALL CYLINDER HEADS
(See pages EM–64 to 81)

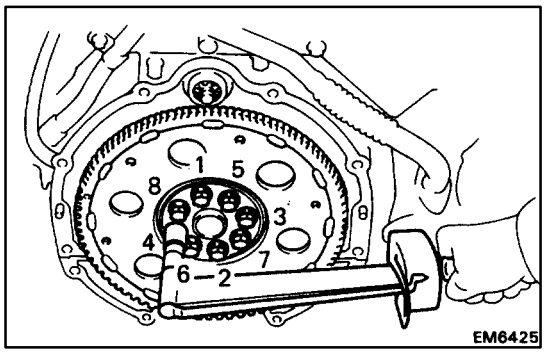
16. INSTALL TIMING PULLEYS AND BELT
(See pages EM–29 to 36)

17. REMOVE ENGINE STAND FROM ENGINE



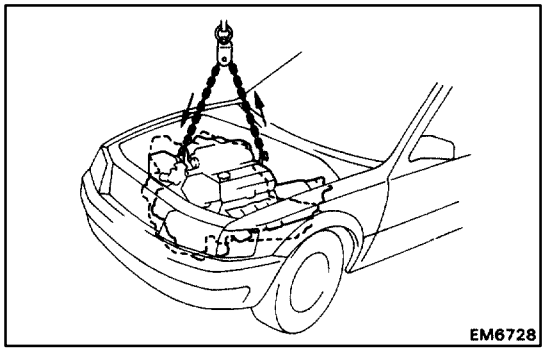
18. INSTALL DRIVE PLATE

(a) Apply adhesive to two or three threads of the bolt end.
Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent



(b) Install the front spacer, drive plate and rear spacer on the crankshaft.

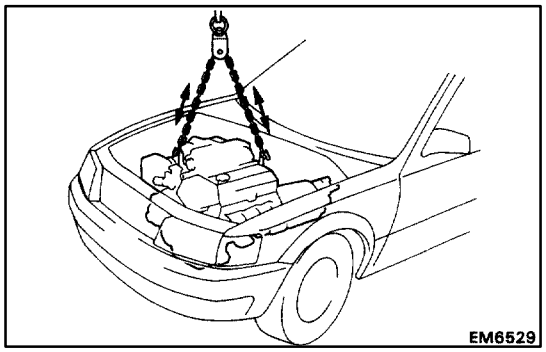
(c) Install and uniformly tighten the eight mount bolts in several passes in the sequence shown.
Torque: 1,000 kg–cm (72 ft–lb, 98 N·m)



INSTALLATION OF ENGINE

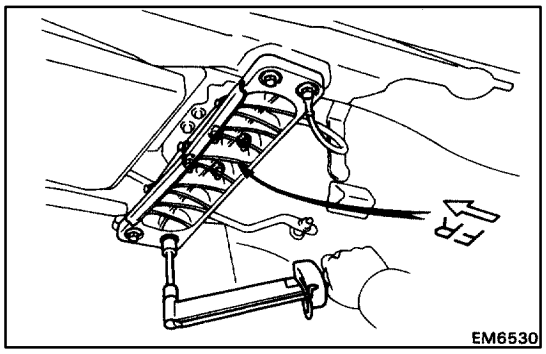
(See pages EM–82 to 84)

1. **ASSEMBLE ENGINE AND TRANSMISSION**
   (See page AT–24)
2. **INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE**
   (a) Attach the engine chain hoist to the engine hangers.
   (b) Lower the engine and transmission assembly into the engine compartment.



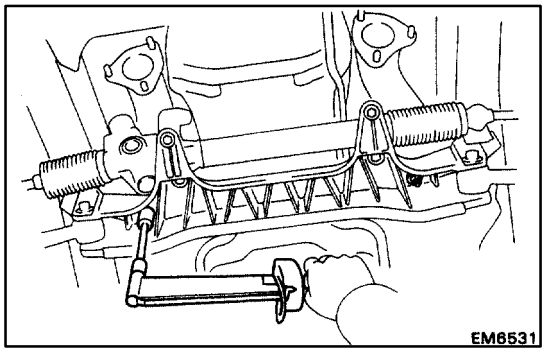
NOTICE: Be careful not to hit the PS gear housing or neutral start switch.

(c) Insert the stud bolts of the front engine mounting brackets into the stud bolt holes of the front suspension crossmember.
(d) Keep the engine level.



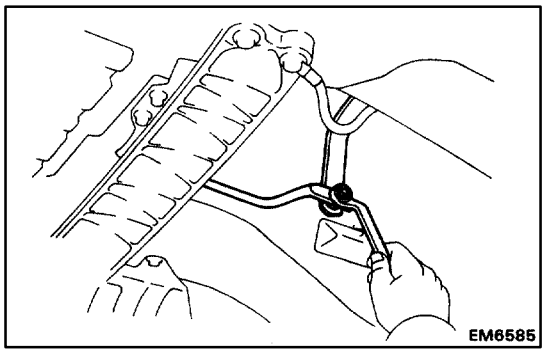
(e) Install the rear engine mounting member with the four bolts and four nuts with the front mark facing forward. Install the ground strap.

Torque:
Nut 135 kg–cm (10 ft–lb, 13 N·m)
Bolt 260 kg–cm (19 ft–lb, 25 N·m)

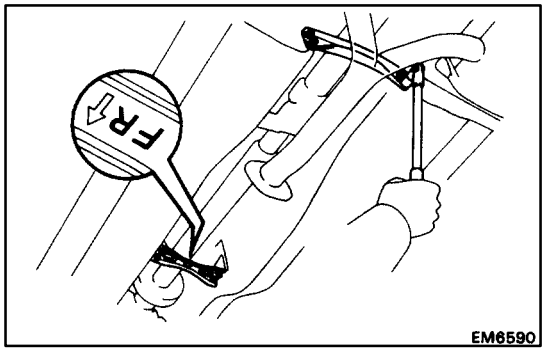


(f) Install the two nuts holding the engine mounting brackets to the front suspension crossmember.

Torque: 600 kg–cm (43 ft–lb, 59 N·m)



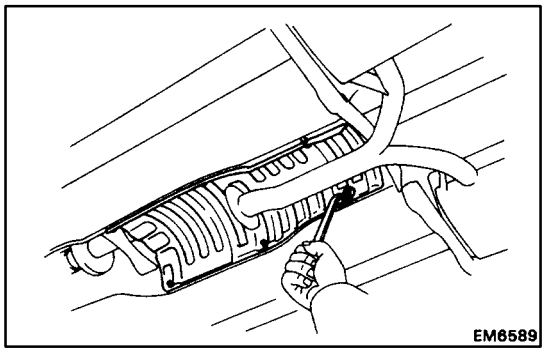
3. **CONNECT TRANSMISSION CONTROL ROD**
   Connect the control rod to the shift lever with the nut.
4. **INSTALL PROPELLER SHAFT**
   (See steps 1 and 2 on pages PR–10 and 11)



5. INSTALL CENTER FLOOR CROSSMEMBER BRACES

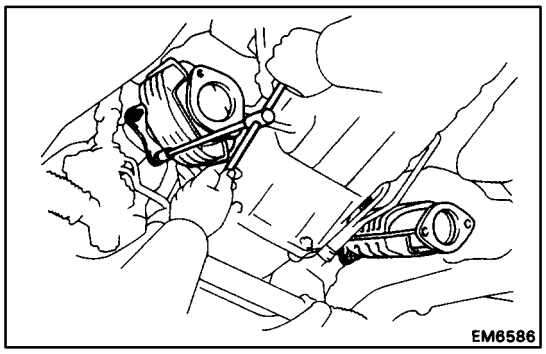
(a) (Front Brace)
Install the brace with the four bolts with the front mark facing forward.
Torque: 130 kg–cm (9 ft–lb, 13 N·m)

(b) (Front Brace)
Install the brace with the four nuts.
Torque: 130 kg–cm (9 ft–lb, 13 N·m)



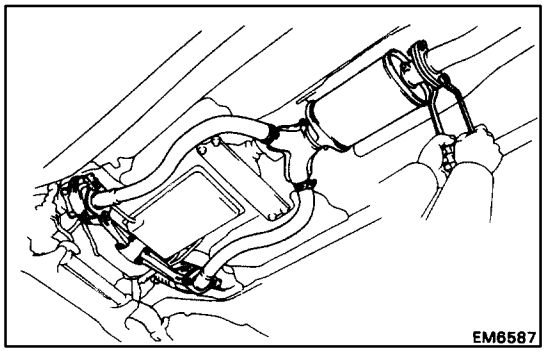
6. INSTALL EXHAUST PIPE HEAT INSULATOR

Install the heat insulator with the six bolts.



7. INSTALL MAIN CATALYTIC CONVERTERS

Install a new gasket and the catalytic converter with three new nuts. Install the two catalytic converters.
Torque: 630 kg–cm (46 ft–lb, 62 N·m)

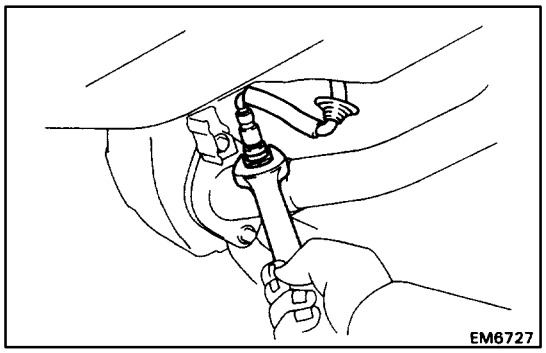


8. INSTALL FRONT EXHAUST PIPE

(a) Temporarily install the exhaust pipe support bracket with the two bolts. Install the two exhaust pipe support brackets.

(b) Install three new gaskets, the exhaust pipe and two sub–oxygen sensor covers with the four bolts and nuts.
Torque: 440 kg–cm (32 ft–lb, 43 N·m)

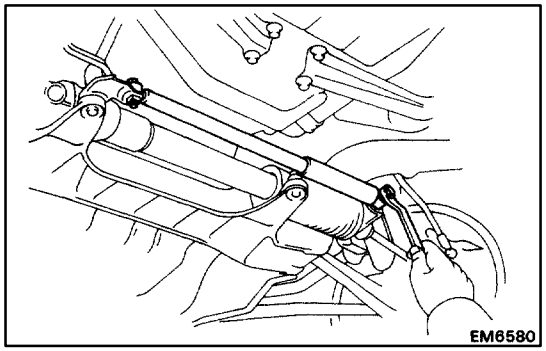
(c) Tighten the four bolts holding the exhaust pipe support brackets to the transmission.



(d) Install the two sub–oxygen sensors to the exhaust pipe.
Torque: 450 kg–cm (33 ft–lb, 44 N·m)
HINT:

- Before installing the sub–oxygen sensor, twist the sensor wire counterclockwise 3 1/2 turns.
- After installing the sub–oxygen sensor, check that the sensor wire is not twisted. If it is twisted, remove the sub–oxygen sensor and reinstall it.

(e) Install the wire grommets to the floor.

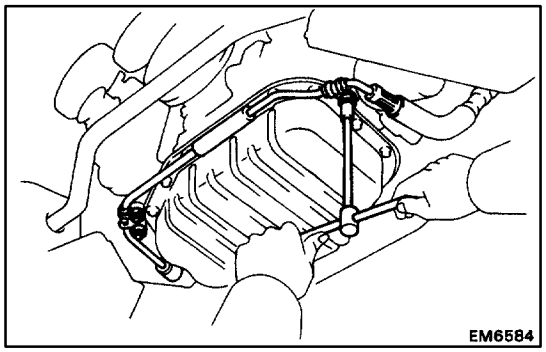


9. INSTALL STEERING DAMPER

Install the steering damper with the two bolts.

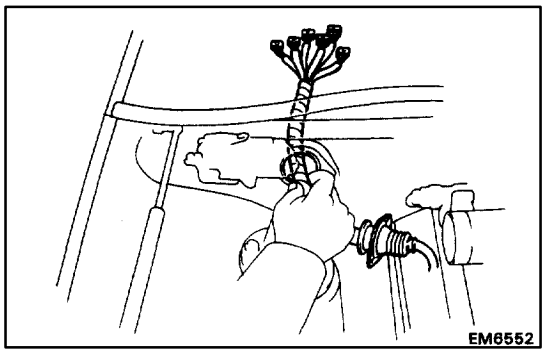
Torque: 270 kg–cm (20 ft–lb, 26 N·m)

10. INSTALL ENGINE WIRE TO WIRE BRACKET ON FRONT SUSPENSION CROSSMEMBER



11. INSTALL PS OIL COOLER PIPE

Install the oil cooler pipe to the engine oil pan with the two clamp and three bolts.



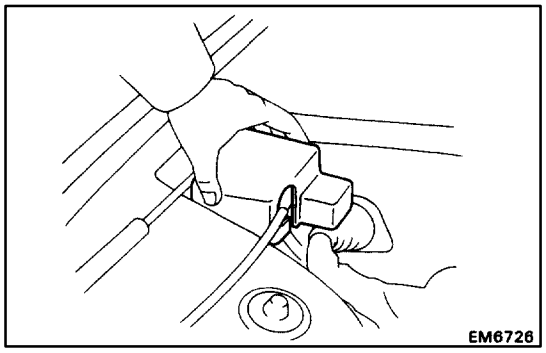
12. CONNECT ENGINE WIRE TO CABIN

(a) Push in the engine wire through the cowl panel, and install the engine wire retainer with the two bolts.

(b) Connect the following connectors:

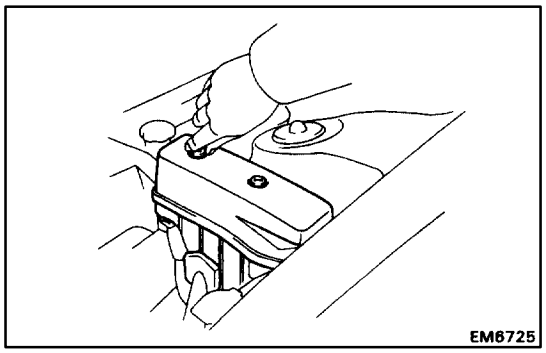
(1) Three engine & ECT ECU connector
(2) Circuit opening relay connector
(3) Cowl wire connector
(4) Instrument panel wire connector

(c) Install the following parts:



(1) Heater duct
(2) Glove compartment
(3) RH lower instrument panel pad and engine & ECT ECU
(4) RH instrument panel under cover

13. INSTALL CRUISE CONTROL ACTUATOR COVER



14. CONNECT WIRES AND INSTALL RELAY BOX UPPER COVER

(a) Connect the connector and ground cables to the relay box.

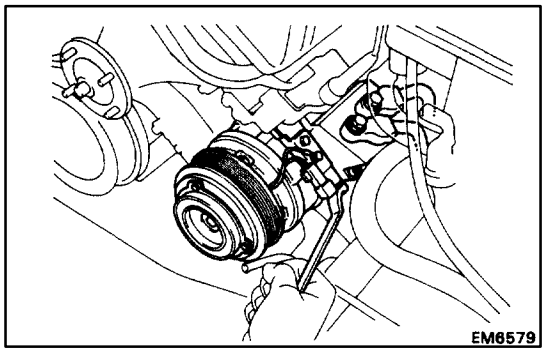
(b) Install the upper cover to the relay box.

15. CONNECT WIRES

Connect the two ground straps to the underside of the fender aprons.

16. CONNECT HOSES

(a) Two heater water by–pass hoses
(b) Two fuel hoses
(c) Vacuum hose to brake booster union (on air intake chamber)
(d) A/C control valve vacuum hoses
(e) Vacuum hose to EVAP BVSV

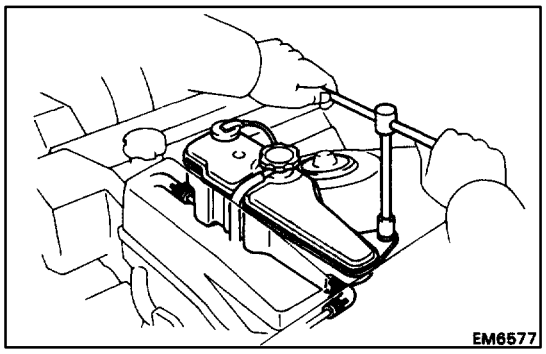


17. INSTALL A/C COMPRESSOR

(a) Install the compressor with the nut and three bolts.

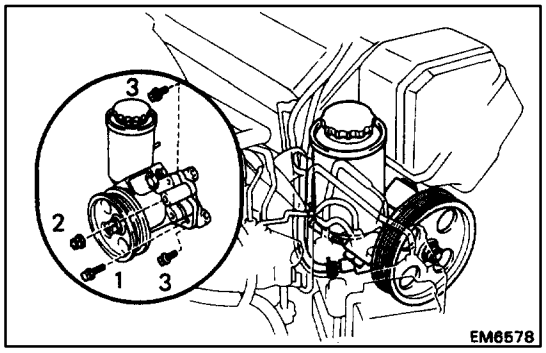
Torque: Bolt 500 kg–cm (36 ft–lb, 49 N·m)
Nut 300 kg–cm (22 ft–lb, 29 N·m)

(b) Connect the two connectors.



18. INSTALL RADIATOR RESERVOIR TANK

(a) Install the reservoir tank bracket with the two bolts.
(b) Connect the three water hoses to the reservoir tank.
(c) Install the reservoir tank with the bolt.
(d) Connect the coolant level sensor connector.

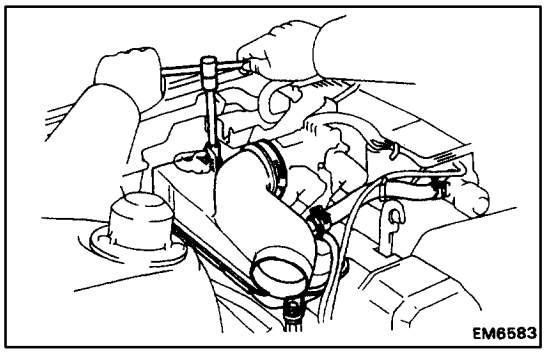


19. INSTALL PS PUMP

(a) Install the PS pump with the three bolts and nut. Tighten the bolts and nut in several passes in the sequence shown.

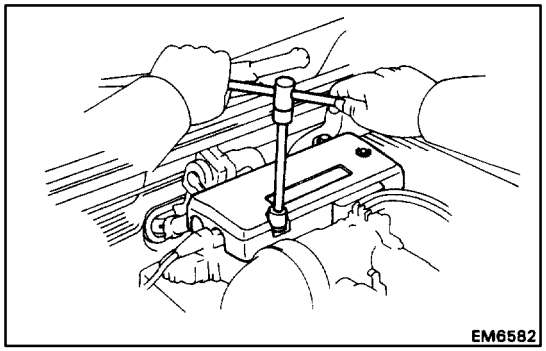
Torque:
Bolt 400 kg–cm (29 ft–lb, 39 N·m)
Nut 440 kg–cm (32 ft–lb, 43 N·m)

(b) Connect the air hose to the air intake chamber.



20. INSTALL INTAKE AIR CONNECTOR PIPE

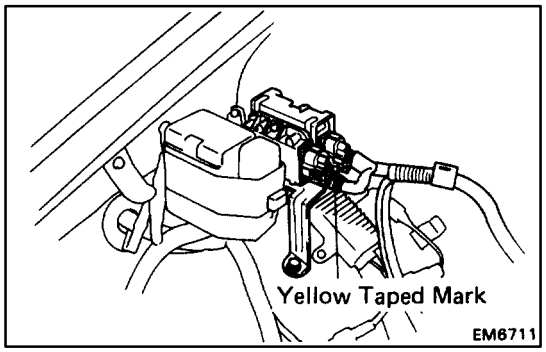
(a) Connect the air connector pipe to the throttle body.
(b) Install the air connector pipe with the two bolts.
(c) Connect the following hoses:
  (1) Air hose to ISC valve
  (2) Air hose to PS air control valve



21. CONNECT CABLES, AND INSTALL THROTTLE BODY COVER

(a) Connect the following cables to the throttle body:
  (1) Accelerator cable
  (2) Cruise control actuator cable

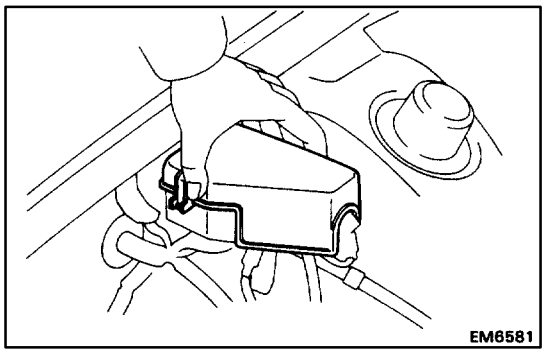
(b) Install the throttle body cover with the two bolts and nut.



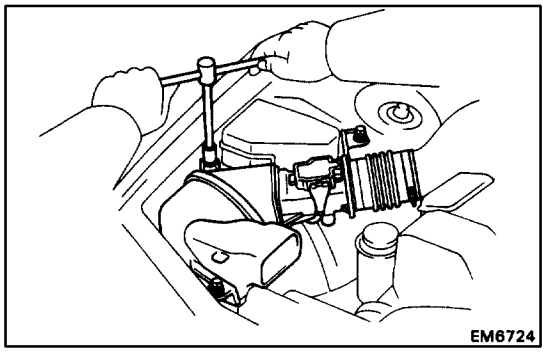
22. CONNECT CONNECTORS, AND INSTALL IGNITER COVER

(a) Connect the following connectors:
  (1) Two igniter connectors

HINT: Connect the yellow taped connector to the igniter on the front side.
  (2) Noise filter connector



(b) Install the igniter cover.



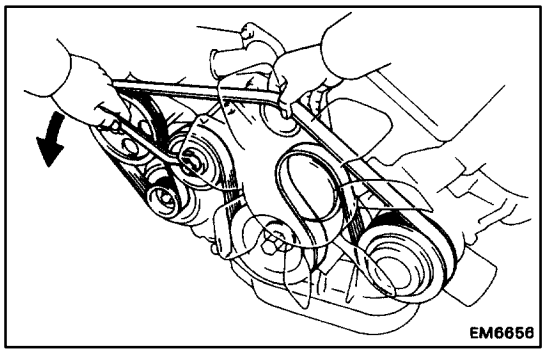
23. INSTALL AIR CLEANER ASSEMBLY

(a) Connect the air cleaner hose to the intake air connector pipe.

(b) Install the air cleaner, air flow meter and hose assembly with the three bolts.

(c) Connect the air flow meter connector.

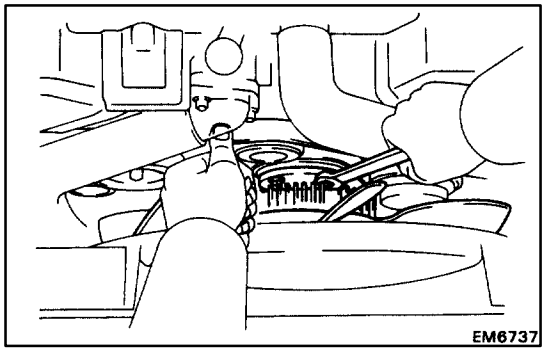
24. INSTALL RADIATOR (See page CO–13)



25. INSTALL FAN PULLEY, FAN, FLUID COUPLING AND DRIVE BELT

(a) Temporarily install the fan pulley, the fan, fluid coupling assembly with the four nuts.

(b) Install the drive belt by turning the drive belt tensioner counterclockwise.

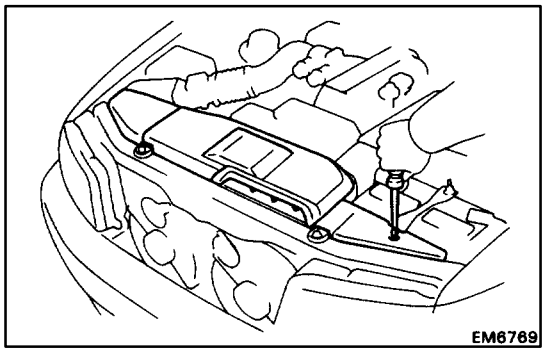


(c) Install the four nuts holding the fluid coupling to the fan bracket.

Torque: 215 kg–cm (16 ft–lb, 21 N·m)

(d) Connect the radiator upper hose to the water inlet.

26. INSTALL BATTERY



27. INSTALL AIR DUCTS AND DUST COVERS

28. FILL WITH ENGINE COOLANT (See pages CO–5 and 6)

29. FILL WITH ENGINE OIL (See page LU–6)

Capacity:

Drain and refill

w/ Oil filter change

5.0 liters (5.3 US qts, 4.4 Imp. qts)

w/o Oil filter change

4.7 liters (5.0 US qts, 4.1 Imp. qts)

Dry fill 6.0 liters (6.3 US qts, 5.3 Imp. qts)

30. START ENGINE AND CHECK FOR LEAKS

31. CHECK AUTOMATIC TRANSMISSION FLUID LEVEL

32. CHECK IGNITION TIMING (See page IG–19)

Ignition timing:

8–12° BTDC @ idle

(w/ Terminals TE1 and E1 connected)

33. INSTALL ENGINE UNDER COVER

34. INSTALL HOOD

35. PERFORM ROAD TEST

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

36. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS