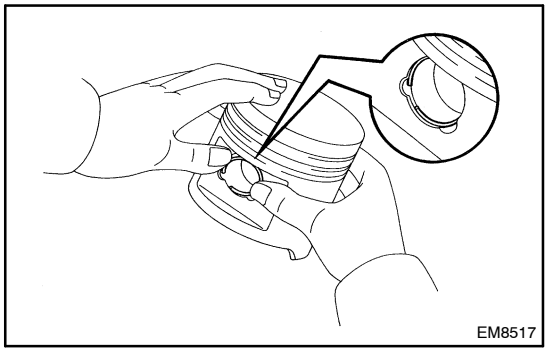
EM15N–01

# REASSEMBLY


EM8517

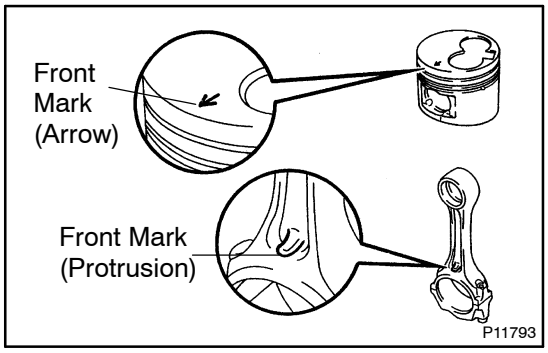
HINT:

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

**1. ASSEMBLE PISTON AND CONNECTING ROD**

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

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

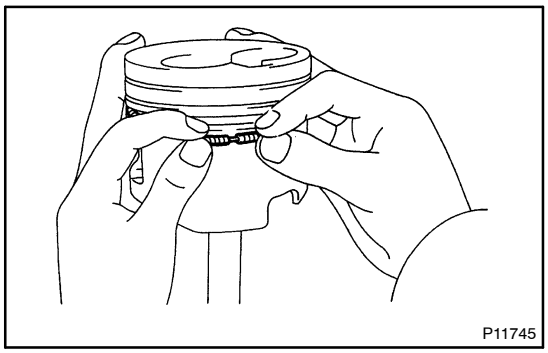


P11793

(c) Coat the piston pin with engine oil.

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

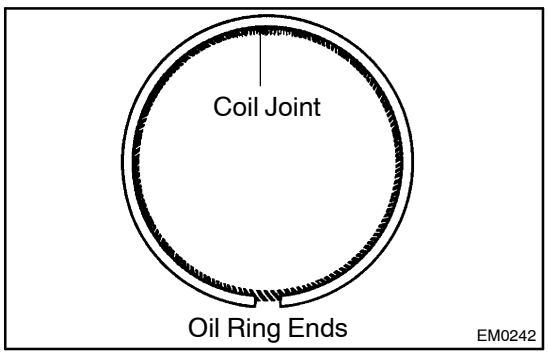
(e) Install a new snap ring on the other side of the piston pin hole.


P11745

**2. INSTALL PISTON RINGS**

(a) Install the coil by hand.

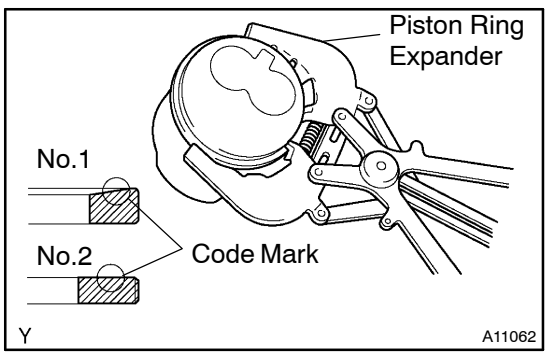
(b) Install a piston ring expander, install the oil ring.



EM0242

HINT:

Face the end gap of the oil ring in the opposite direction of coil joint.

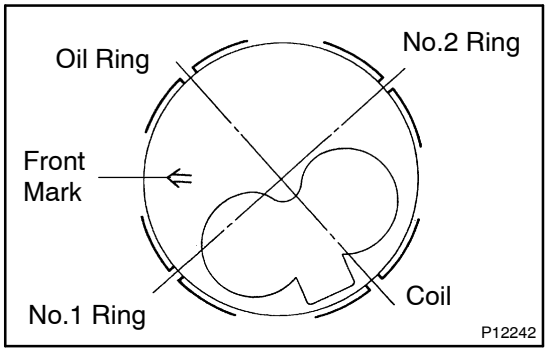


A11062

(c) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

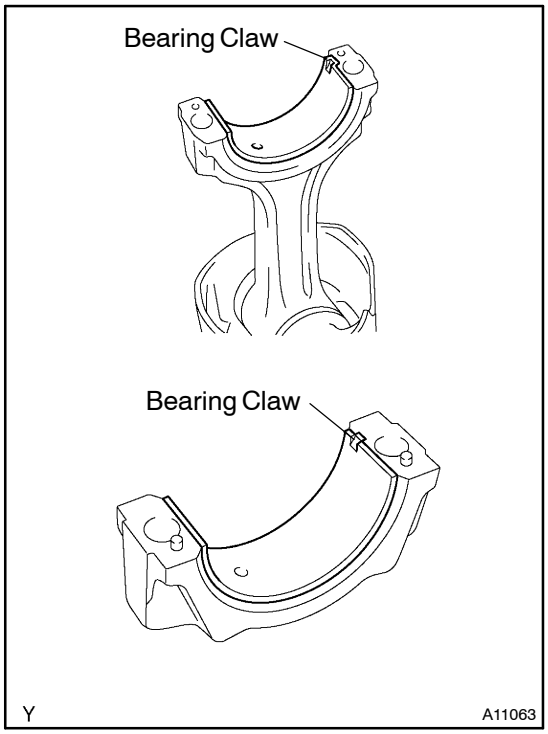
**Code mark:**

| | |
|---|---|
| No.1 | 1N |
| No.2 | 2N |




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

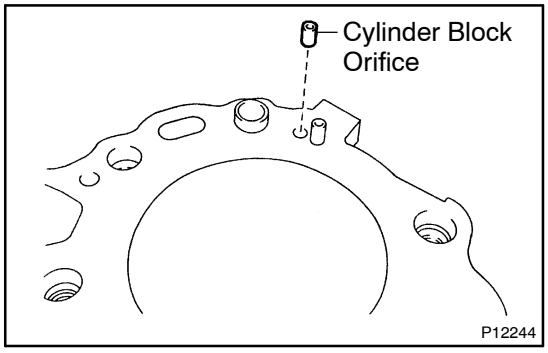
**NOTICE:**
**Do not align the ring ends.**




**3. INSTALL BEARINGS**

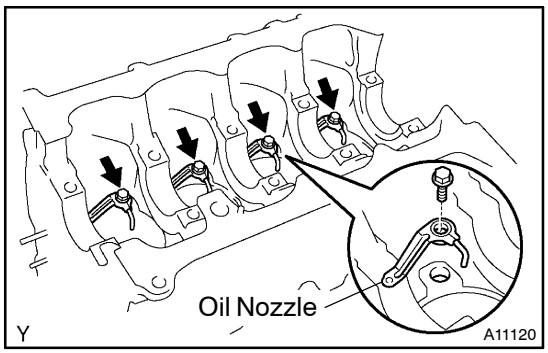
(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

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




**4. INSTALL CYLINDER BLOCK ORIFICE**

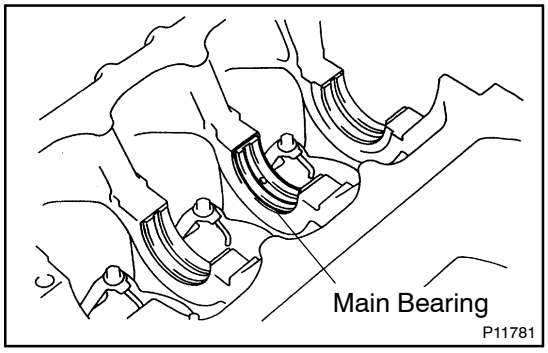
Install the cylinder block orifice to the cylinder brock.




**5. INSTALL OIL NOZZLES AND CHECK VALVES**

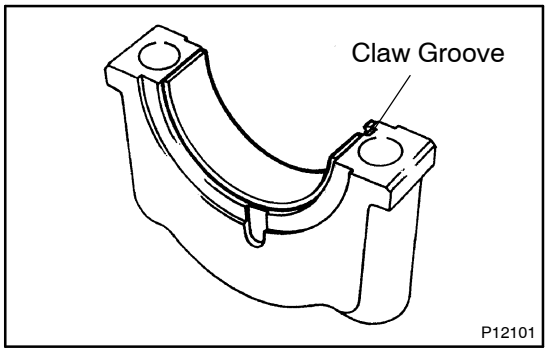
(a) Align the pin of the oil nozzle with the pin hole of the cylinder block.

(b) Install the oil nozzle with the check valve. Install the 4 oil nozzles and check valves.
**Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)**




**6. INSTALL MAIN BEARINGS**

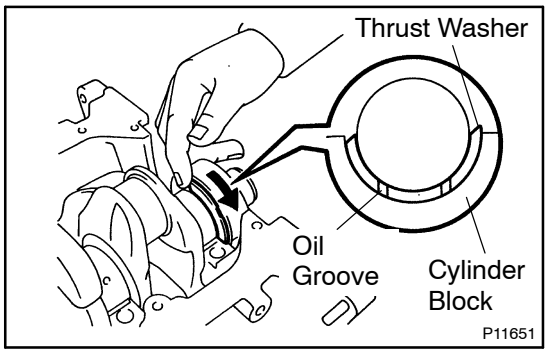
(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.




(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

**7. PLACE CRANKSHAFT ON CYLINDER BLOCK**

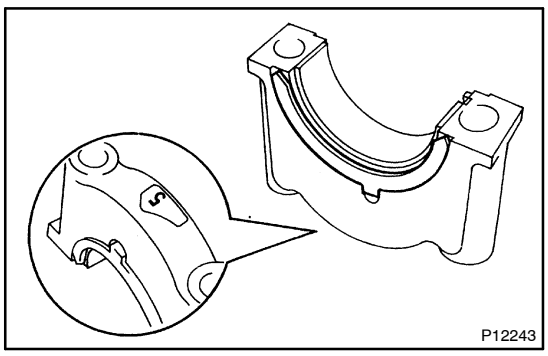
Place the crankshaft on the cylinder brock.




**8. INSTALL UPPER THRUST WASHERS**

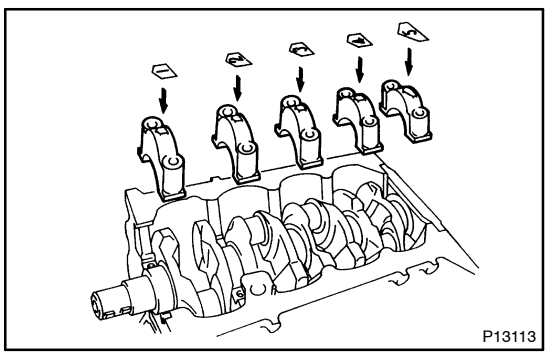
(a) Push the crankshaft toward the front (rear) side.

(b) Install the 2 thrust washers to the No.5 journal position of the cylinder block with the oil grooves facing outward.




**9. PLACE MAIN BEARING CAP AND LOWER THRUST WASHERS ON CYLINDER BLOCK**

(a) Install the 2 thrust washers on the No.5 bearing cap with the grooves facing outward.




(b) Install the 5 main bearing caps in their proper locations.

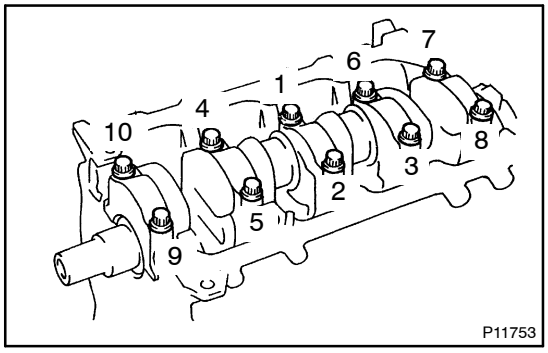
HINT:

Each bearing cap has a number and front mark.

**10. INSTALL MAIN BEARING CAP BOLTS**

HINT:

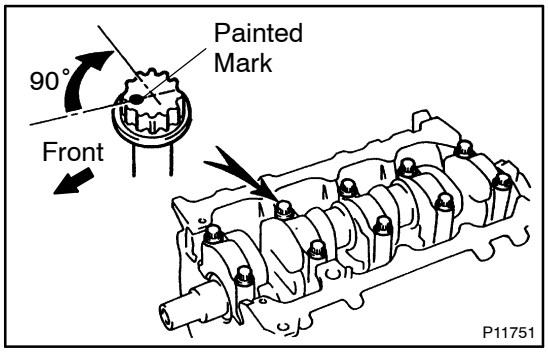
- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any one of the main bearing cap bolt is broken or deformed, replace it.



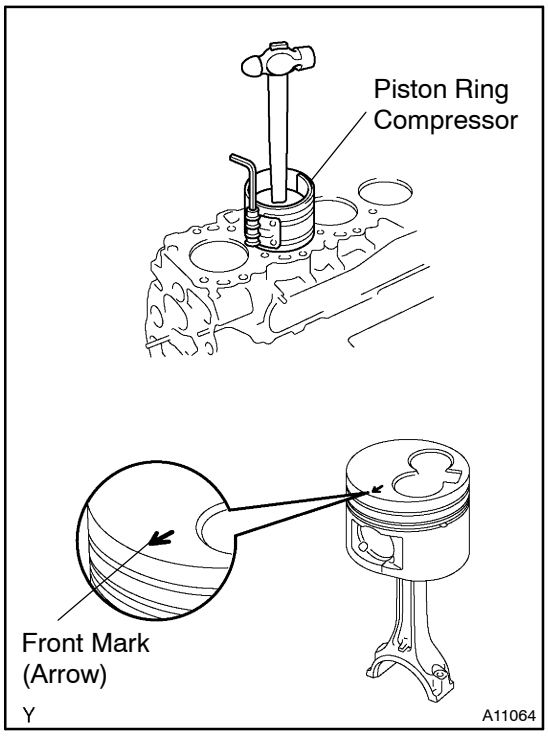

(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.
(b) Install and uniformly tighten the 10 bolts of the main bearing caps in several passes, in the sequence shown.
**Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)**

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

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

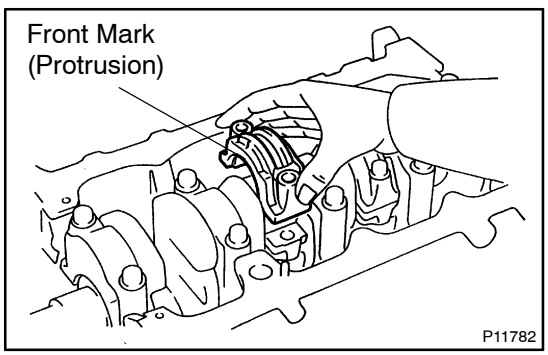



(1) Retighten the main bearing cap bolts 90 ° in the numerical order shown above.
(2) Check that the painted mark is now at a 90 ° angle to the front.
(3) Check that the crankshaft turns smoothly.
(4) Check the crankshaft thrust clearance(See page EM–91).



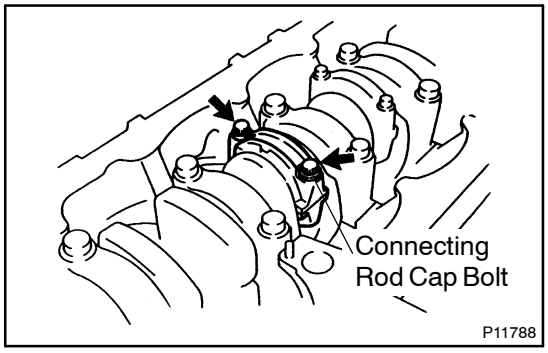

**11. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES**

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.




**12. PLACE CONNECTING ROD CAP ON CONNECTING ROD**

(a) Match the numbered connecting rod cap with the connecting rod.
(b) Install the connecting rod cap with the front mark facing forward.




(c) Install the connecting rod cap bolts.

HINT:

- The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace it.

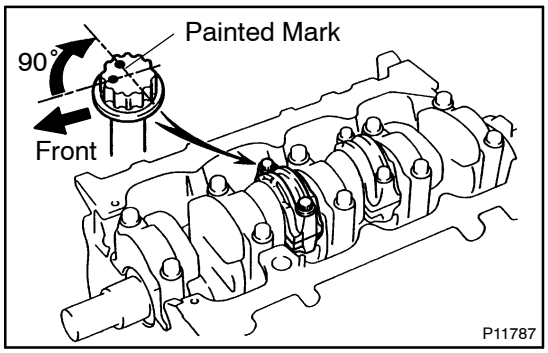
(d) Apply a light of engine oil on the threads and under the heads of the connecting rod cap bolts.

(e) Install and alternately tighten the bolts of the connecting rod cap in several passes.

**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**

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

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




(g) Retighen the connecting rod cap bolts 90° as shown .

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

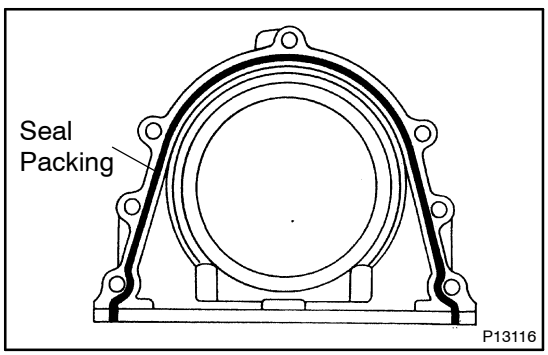
(i) Check that the crankshaft turns smoothly.

**13. CHECK CONNECTING ROD THRUST CLEARANCE (See step EM–75)**

**14. 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 illustration.

**Seal packing: Part No. 08826–00080 or equivalent**

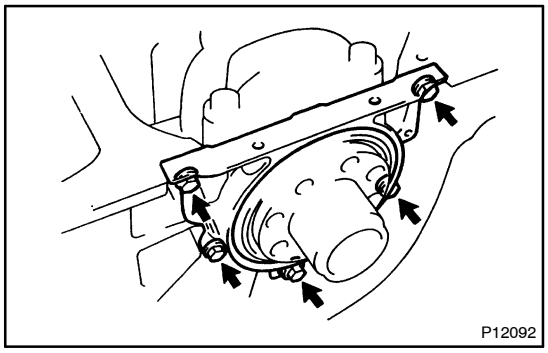
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:

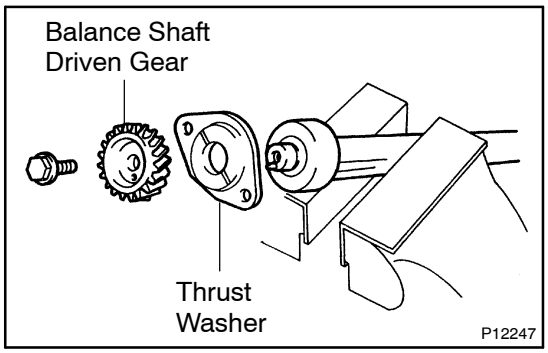
Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.

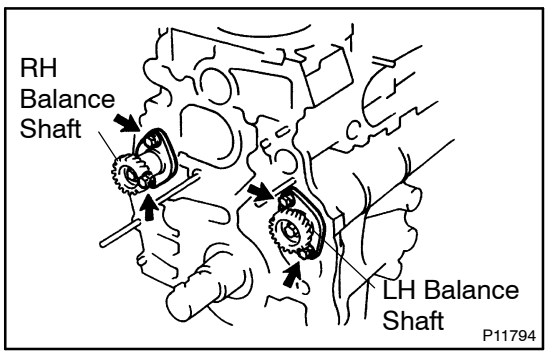
- Immediately remove nozzle from the tube and reinstall cap.




(c) Install the retainer with the 5 bolts.
**Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)**

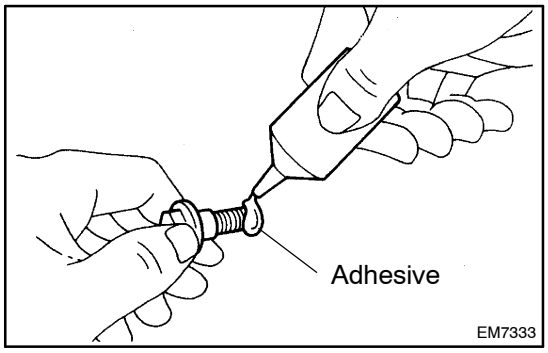



**15. ASSEMBLY RH AND LH BALANCE SHAFTS**
(a) Mount the weight of the balance shaft in a vise.
**NOTICE:**
**Be careful not to damage the balance shafts.**
(b) Align the balance shaft knock pin with the knock pin hole of the balance shaft driven gear, install the thrust washer and balance shaft driven gear.
(c) Install and torque the bolt.
**Torque: 32 N·m (320 kgf·cm, 23 ft·lbf)**

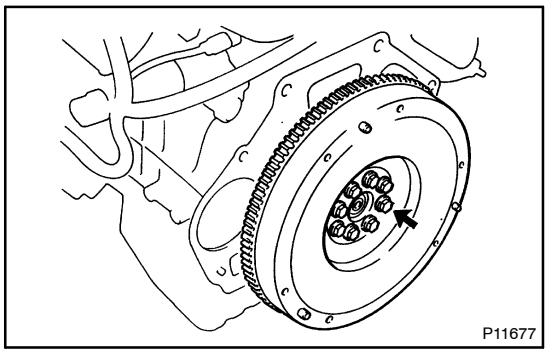



**16. INSTALL RH AND LH BALANCE SHAFTS**
(a) Install the RH balance shaft with the 2 bolts.
(b) Install the LH balance shaft with the 2 bolts.
**Torque: 8 N·m (85 kgf·cm, 74 in.·lbf)**
**17. INSTALL PLUG HOLE**
**18. INSTALL ENGINE MOUNTING**
**Torque: 68 N·m (693 kgf·cm, 50 ft·lbf)**
**19. INSTALL WATER TEMPERATURE SENSOR**
**20. INSTALL WATER INLET AND THRMOSTAT (See page CO–13)**
**21. INSTALL OIL COOLER (See page LU–21)**
**22. INSTALL OIL PAN AND TIMING GEAR CASE (See page LU–12)**
**23. INSTALL INJECTION PUMP (See page FU–25)**
**24. INSTALL TIMING GEARS (See page EM–34)**
**25. INSTALL WATER PUMP (See page CO–8)**
**26. INSTALL ALTERNATOR AND ALTERNATOR BRACKET (See page CO–8)**
**27. INSTALL CYLINDER HEAD (See page EM–64)**

**28. INSTALL TIMING BELT AND PULLEYS**
**(See page EM–18)**
**29. DISCONNECT ENGINE FROM ENGINE STAND**




**30. INSTALL REAR END PLATE**
Install the rear end plate with the bolt.
**Torque: 8 N·m (85 kgf·cm, 74 in.·lbf)**
**31. INSTALL FLYWHEEL**
(a) Apply adhesive to 2 or 3 threads of the mounting bolt end.
**Adhesive:**
**Part No. 08833–00070, THREE BOND 1324, or equivalent**




(b) Install the flywheel on the crankshaft.
(c) Install and uniformly tighten the mounting bolts in several passes, in the sequence shown.
**Torque: 178 N·m (1,820 kgf·cm, 131 ft·lbf)**
**32. INSTALL CLUTCH COVER AND DISC**