

Piston Rings



End Gap

1. Using a piston, push a new ring into the cylinder bore 15–20 mm (0.6–0.8 in.) from the bottom.
2. Measure the piston ring end-gap with a feeler gauge:
 - If the gap is too small, check to see if you have the proper rings for your engine.
 - If the gap is too large, re-check the cylinder bore diameter against the wear limits on page 5-59. If the bore is over limit, the engine block must be rebored.

Piston Ring End-Gap:

Top Ring

Standard (New): 0.20–0.35 mm
(0.008–0.014 in.)

Service Limit: 0.60 mm (0.02 in.)

Second Ring

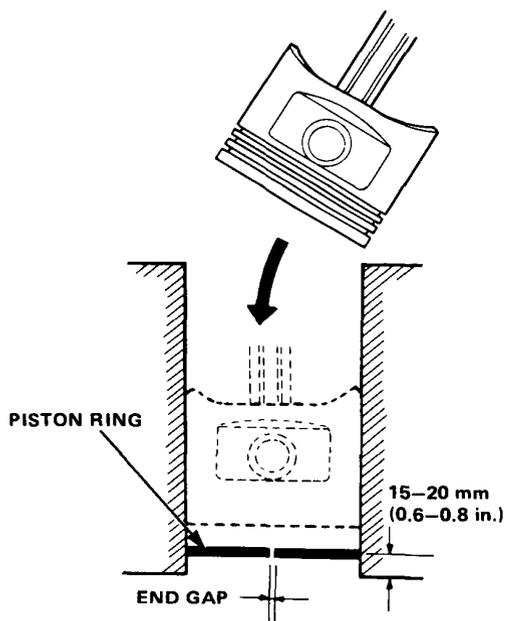
Standard (New): 0.35–0.50 mm
(0.014–0.020 in.)

Service Limit: 0.75 mm (0.03 in.)

Oil Ring

Standard (New): 0.2–0.7 mm (0.008–0.028 in.)

Service Limit: 0.8 mm (0.03 in.)



Replacement

1. Using ring expander, remove old piston rings.
2. Clean all ring grooves thoroughly.

NOTE: Use squared-off broken ring, or file down blade on ring groove cleaner to fit (compression rings are 1.2 mm wide; oil ring is 4.0 mm wide).

CAUTION: Do not use a wire brush to clean ring lands, or cut ring lands deeper with cleaning tool.

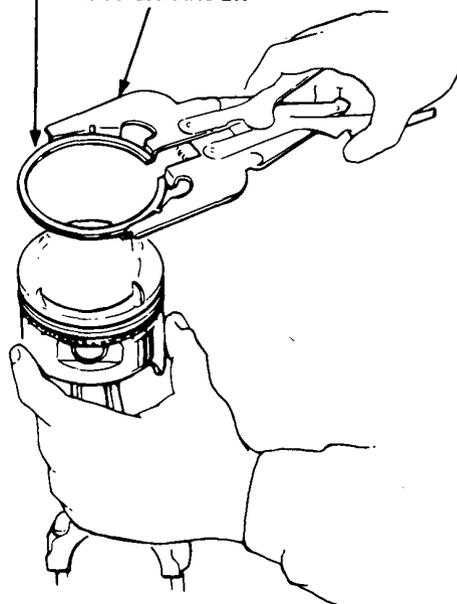
NOTE: If piston is to be separated from connecting rod, do not install new rings yet.

3. Install new rings in proper sequence and position (page 5-64).

NOTE: Do not re-use old piston rings.

PISTON RING

RING EXPANDER



Piston Rings

Land Clearances

After installing a new set of rings, measure ring-to-land clearances:

Top and Second Rings Clearance

Standard (New): 0.015–0.045 mm
(0.0006–0.0018 in.)

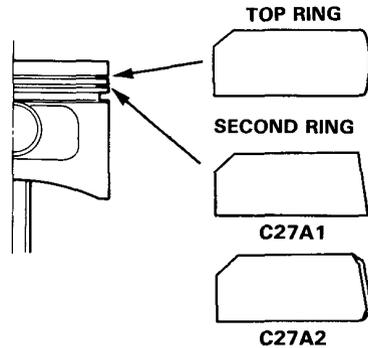
Service Limit: 0.13 mm (0.005 in.)



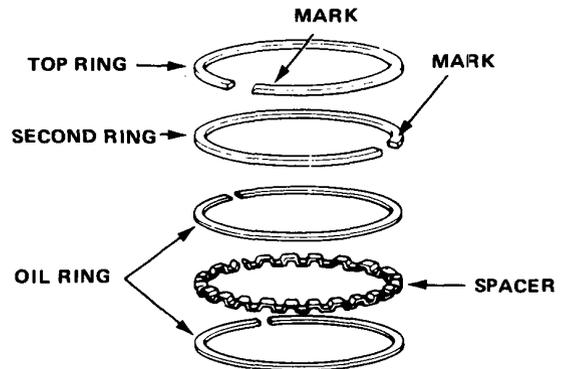
Alignment

1. Install the rings as shown on page 5-63.

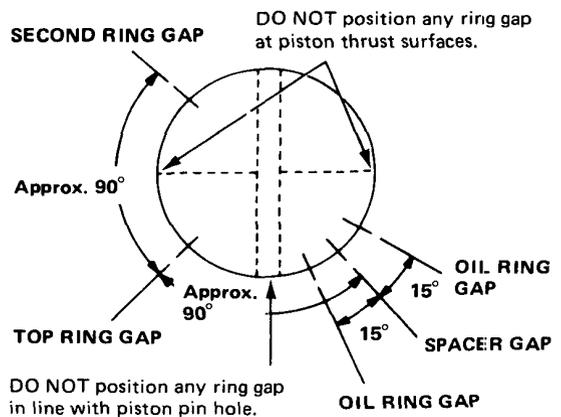
Identify top and second rings by the chamfer on the edge, and make sure they are in proper grooves on piston.



2. Rotate the rings in grooves to make sure they do not bind.
3. The manufacturing marks must be facing upward.



4. Position the ring end gaps as shown:



Pistons

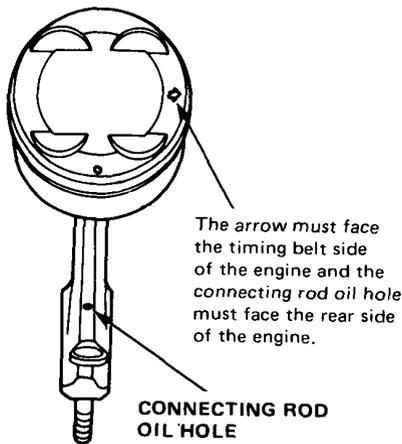
Installation

 Before installing the piston, apply a coat of engine oil to the ring grooves and cylinder bores.

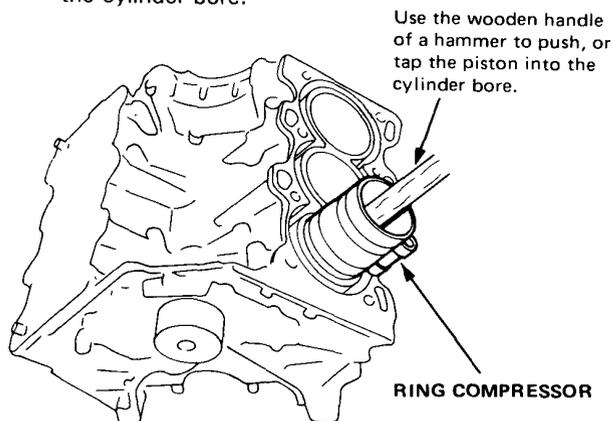
1. If the crankshaft is already installed:
 - Remove the connecting rod caps, then slip short sections of rubber hose over the threaded ends of the connecting rod bolts.
 - Install the ring compressor, check that the bearing is securely in place, then position the piston in the cylinder and drive it in using the wooden handle of a hammer.

Stop after the ring compressor pops free and check the connecting rod-to-crank journal alignment before driving rod into place.

 - Install the rod caps with bearings, and torque the nuts to 45 N·m (4.5 kg-m, 33 lb-ft).
2. If the crankshaft is not installed:
 - Remove the rod caps and bearings, install the ring compressor, then position the piston in the cylinder and drive it in using the wooden handle of a hammer.



NOTE: Maintain downward force on ring compressor to prevent rings from expanding before entering the cylinder bore.



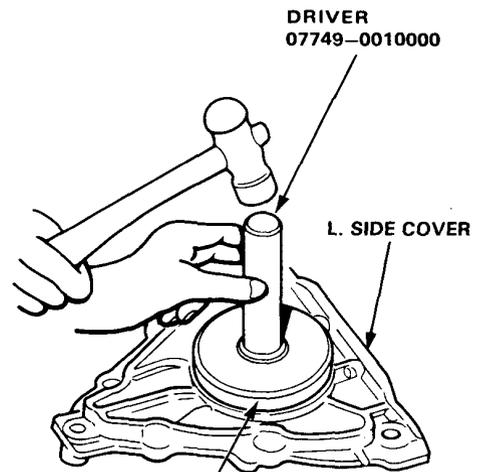
Oil Seal



Installation

 The seal surface on the block should be dry. Apply a light coat of oil to the crankshaft and to the lip of seal.

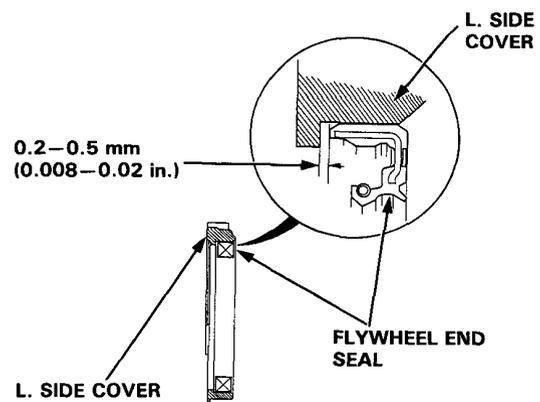
1. Drive in flywheel end seal against L. side cover.
NOTE: Drive in flywheel end seal squarely.



Install seal with the part number side facing out.

2. Confirm clearance is equal all the way around, with a feeler gauge.

Clearance: 0.2–0.5 mm (0.008–0.02 in.)



NOTE: Refer to page 5-75 for steps on the oil pump side oil seal.