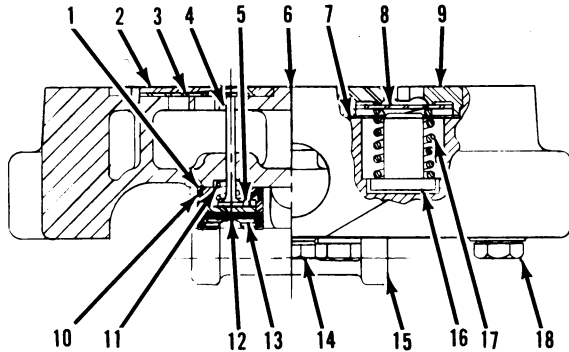


## Cylinder Head Disassembly

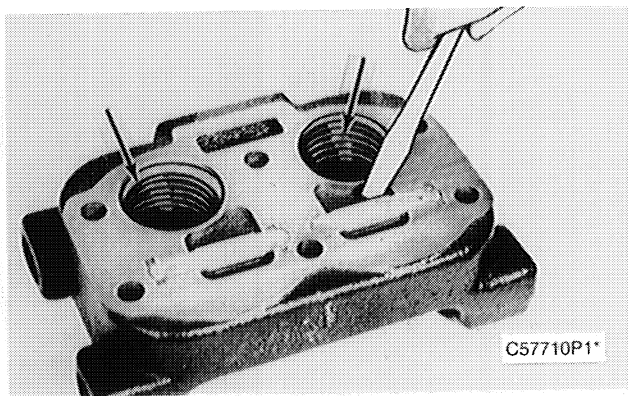
1. Place the cylinder head in a soft-jawed vise, bottom side up.



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(1) Bushing. (2) Inlet valve guard and pin assembly. (3) Inlet valve. (4) Unloader pin. (5) Disc. (6) Cylinder head. (7) Washer. (8) Exhaust valve. (9) Exhaust valve seat. (10) Retainer. (11) Spring. (12) Diaphragm. (13) Expander spring. (14) Cap screw. (15) Unloader body. (16) Exhaust valve cage. (17) Exhaust valve spring. (18) Bolt.

2. Loosen the exhaust valve seats (9).
3. Unscrew and remove the exhaust valve seats (9), exhaust valve springs (17), washers (7), and exhaust valve cages (16).
4. Discard the exhaust valve springs, exhaust valves, and washers.



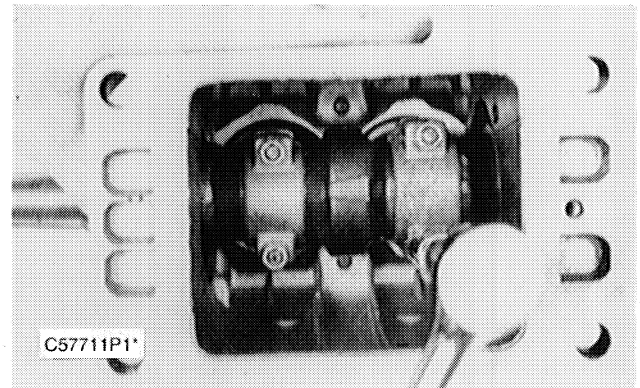
5. With a screwdriver carefully pry the inlet valve guards and pin assemblies (2) and inlet valves (3) from their cavities. Discard the inlet valves.
6. If the inlet valve guard is damaged during removal, replace with a new part.

**NOTE:** The inlet valve guards are prick punched to keep them in place during assembly. They are removed easily from their cavities.

## Cylinder Block Removal

1. Remove the six nuts or cap screws and lock washers holding the cylinder block to the crankcase.
2. Tap the cylinder block lightly with a plastic or brass hammer to loosen, if necessary.
3. Pull the cylinder block off the crankshaft and pistons.
4. Remove and discard the gasket. Clean the gasket surfaces. Do not damage the machined surfaces.

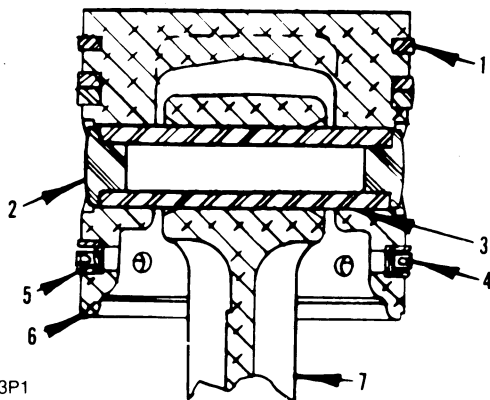
## Piston And Connecting Rod Removal



1. Place the air compressor on its side. On flange mounted air compressors, remove the bottom cover plate.
2. Mark the connecting rods and connecting rod caps to ensure they are returned to the same connecting rod from which they are removed.
3. Turn the crankshaft so that one connecting rod is at the bottom of its stroke.
4. Remove the connecting rod nuts.
5. Remove the connecting rod caps.
6. Lift the piston and connecting rod through the top of the crankcase.
7. Repeat Steps 2 through 6 on the remaining connecting rod.

**NOTE:** Each connecting rod cap must be installed on the same connecting rod from which it was removed.

## Piston And Connecting Rod Disassembly



Piston Assembly

(1) Compression rings. (2) Thrust button. (3) Piston rings. (4) Oil ring expander. (5) Oil ring. (6) Piston. (7) Connecting rod.

1. With a screwdriver remove the thrust buttons from the piston pins. On some EL-740 Air Compressors a wire pin is used in place of thrust buttons. The wire pin can be removed with a small screwdriver by prying the wire pin out of the retaining hole. Discard the wire pin. Replace it with thrust buttons.
2. Press the piston pin out of the piston and connecting rod assembly taking care not to damage the piston. The piston may be heated for ease of removal.
3. Remove the oil rings from the pistons using a piston ring expander, if necessary.
4. Discard all oil rings.

## Crankshaft Bearing Cap Removal

1. Remove the four bolts securing the bearing cap (flange mount) or caps (base mount) to the crankcase.
2. Tap the bearing caps lightly to loosen. Do not attempt to pry the bearing caps off. Remove the bearing caps from the crankcase. Discard the gaskets. Clean the gasket surfaces. Do not damage the machined surfaces.
3. Remove the oil seal from the front bearing cap and discard.
4. On air compressors having rear ball bearings, remove the O-ring, when present, and discard.
5. On air compressors that are bottom oiled, remove the dumb-bell from between the crankcase and the rear bearing cap. Remove and discard the O-ring on the dumb-bell.

## Crankshaft Removal

This manual does not include instructions for removing the crankshaft from the crankcase. If inspection shows the crankcase or crankshaft is damaged, the air compressor should be replaced with a new or remanufactured unit.

## Air Compressor Inspection Procedure

### Cleaning, Inspection And Repairing

1. Wash all parts in cleaning solvent. Blow dry all parts with compressed air.
2. Clean the carbon deposits from the interior surfaces of the cylinder head. Clean all interior air and water passageways.
3. Remove the carbon from the piston crowns and ring grooves. Carbon in ring grooves can be removed by using a piece of broken ring as a tool.
4. Blow out all drilled passageways with compressed air to ensure they are open.
5. Remove old gasket material sealer from the gasket surfaces.

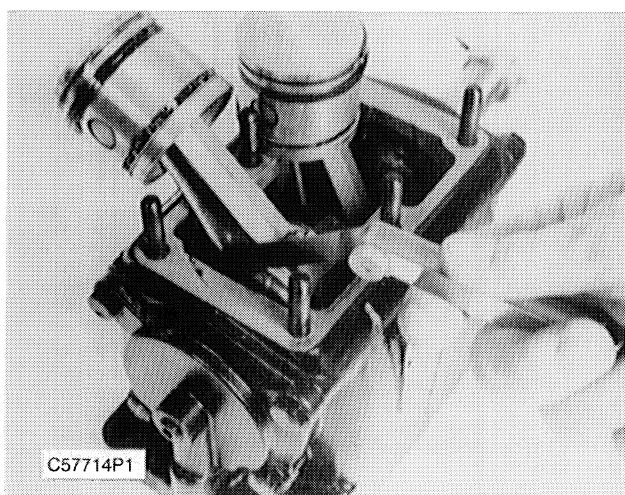
### Inspection - Cylinder Head And Components

**NOTE:** If component part measurements are not within the "Specifications" limits, the parts must be replaced.

1. Examine the cylinder head for cracks and damaged threads. All gasket surfaces and inlet valve surfaces must be free of nicks and gouges. Replace the cylinder head, if damaged.
2. Inspect the inlet and exhaust cavities for carbon deposits. Remove all carbon and clean the cavities.
3. Examine the exhaust valve seats for damage or wear. Measure the distance from the top of the valve seat to the valve seating surface. Dimensions must be within limits in the "Specifications" section. If the part is not within specified limits, discard and use a new part.

4. Examine the exhaust valve cages for damage or excessive wear.
  - A. Overall length. If parts are not within limits in the "Specifications" section, parts must be discarded and replaced with new parts.
  - B. Measure the distance from the tip (valve end) of the exhaust valve cage to the surface where the spring sets (this distance is to include any wear caused by the spring). If parts are not within limits in the "Specifications" section, parts must be discarded and replaced.
5. Examine the inlet valve guard for nicks, burrs or deformed parts. Damaged parts must be replaced.

### Pistons, Connecting Rods And Bearings



1. Examine the pistons for scoring, nicks, burrs, cracks, or other damage. Replace, as needed.
2. Measure the outside diameter of the piston at a 90 degree angle to the piston pin bore. Compare this measurement with the diameter of the cylinder bore. Piston to cylinder bore clearance should not exceed 0.20 mm (.008 in). If clearance exceeds 0.20 mm (.008 in), replace the pistons. The cylinder block must be replaced or bored oversize 0.25 mm (.010 in) or 0.50 mm (.020 in). Oversize pistons 0.25 mm (.010 in) or 0.50 mm (.020 in) and oversize piston ring sets are available.

**NOTE:** Oversize pistons and rings must be used in conjunction with oversize cylinder bores. When measuring the outside diameter of the piston the micrometer must be at a 90 degree angle to the piston pin bore. This will permit a correct measurement.

3. Check the fit of the piston pin in the piston and connecting rod. The piston pin must have a light interference fit in the piston and a slip fit in the connecting rod. Determine which part or parts are worn and replace as required. The connecting rod and connecting rod cap must be replaced as a unit.
4. Check the fit of the compression and oil rings in the piston ring grooves. The oil rings must move freely on the piston. Place the oil rings in the cylinder bores and measure the ring gap. If the ring gaps are not within the limits of the "Specifications" section, new oil rings must be installed.

**NOTE:** When new oil rings are used, cylinder bores should be re-honed.

5. Examine the connecting rod bearing inserts for scoring, pitting or visible wear. Check the fit of the connecting rod bearings on the crankshaft journals. Clearance between the rod bearings and the crankshaft journal must be between 0.013 mm (.0005 in) and 0.053 mm (.0021 in). If damage is evident or clearance does not meet the specified dimensions, new rod bearing inserts must be installed.
6. Check the clearance between the side of the connecting rod and the crankshaft. If clearance exceeds 0.254 mm (.0100 in), a new connecting rod assembly must be installed.

**NOTE:** The connecting rod and connecting rod cap must be replaced as a unit.

### Cylinder Block

1. Examine the cylinder block for cracks. Replace, if damaged.
2. Examine the cylinder bores for scratches, scoring and pitting. Check the cylinder bores for out-of-round or taper. If out-of-round more than 0.013 mm (.0005 in), or tapered more than 0.025 mm (.0010 in) from top to bottom of bore, or scratched, scored, or pitted, the cylinder block must be re-bored or honed oversize, or replaced with a new cylinder block. Service pistons are available at 0.25 mm (.010 in) and 0.50 mm (.020 in) oversize.

## Crankshaft And Bearings

1. A bent or twisted crankshaft cannot be repaired. If the connecting rod journals are scored beyond repair or worn beyond the limits in the "Specifications" section, replace with a new crankshaft or regrind the connecting rod journals. Service insert bearings are available at 0.25, 0.50 and 0.75 mm (.010, .020 and .030 in) undersize.
2. If the main bearing journal on an air compressor, which has a sleeve main bearing, is scored excessively or worn beyond the limits of the "Specifications" section, it must be replaced. No undersize bearings are available.
3. Keyway, threads and all ground and machined surfaces must not be damaged or worn.
4. Crankshaft oil passages must be cleaned to ensure oil flow.
5. Examine the ball bearings for worn or damaged balls; rotate the ball bearing by hand to detect roughness. If wear, roughness or damage is evident, the ball bearing must be replaced.

## Crankshaft Bearing Caps

1. Examine front and rear bearing caps (base mount). Replace if cracked, or if the gasket surfaces have been defaced.
2. On air compressors with a sleeve-type rear bearing, check the inside diameter of the rear bearing. If the dimensional limits of the rear bearings exceed the limits stated in the "Specifications" section or is damaged, the bearing cap must be replaced.

## Crankcase

1. Examine the crankcase for cracks and damage to the gasket surfaces. Replace, if necessary.
2. Inspect the studs in the crankcase, if used. Replace any bent or damaged studs.
3. On bottom lubricated crankcases the oil passage must be thoroughly cleaned to ensure oil flow.
4. Clean all gasket surfaces. Ensure that all gasket surfaces are free of nicks, scratches and burrs that would affect a good gasket seal. Replace, as required.

## Air Compressor Assembly

Before reassembly, put engine oil on the crankshaft, bearings, connecting rod bearings, pistons, pins and cylinder bores.

**NOTE:** Special parts, in addition to standard parts, are available for overhauling each air compressor. Included are: 0.25 and 0.50 mm (.010 and .020 in) oversize pistons and rings, cylinder blocks with 0.25 and 0.50 mm (.010 and .020 in) inch oversize cylinder bores, and 0.25, 0.50 and 0.75 mm (.010, .020 and .030 in) undersize bearing inserts. Refer to the "Specifications" section.

## Crankshaft Bearing Installation

1. Press a new oil seal into the front bearing cap. Use a sealer on the outer rim of the oil seal. The spring side of the oil seal must face the crankcase when installed. The seal case should be flush to 0.15 mm (.006 in) below the front surface of the bearing cap.
2. Place a new gasket on the crankcase cap mating surface.
3. Apply a small amount of engine oil to the lip of the oil seal. Slide the front bearing cap over the crankshaft end. Do not damage the oil seal.
4. Install the four bearing cap bolts torquing alternately to 13 to 18 N•m (120 to 160 lb ft).
5. Place a new gasket on the rear bearing cap.
6. On air compressors with sleeve-type bearings, slide the rear bearing cap over the crankshaft end. Align the crankshaft and bearing cap so that the bearing cap fits evenly in the crankcase bore.
7. On air compressors with rear ball bearings, slide the rear bearing cap over the ball bearing.
8. Install the four bearing cap bolts torquing alternately to 13 to 18 N•m (120 to 160 lb ft).
9. Ensure the crankshaft turns freely after installing the bearing caps.
10. On air compressors that are bottom oiled, place two new O-rings on the dumb-bell. (Lubricate the dumb-bell with a film of engine oil before assembly.). Insert the dumb-bell into the rear of the crankcase and proceed with Step 5 above.

### Assembly Of Pistons And Connecting Rods

1. Lubricate the piston pin, piston pin bores and piston pin diameters in the connecting rod with engine oil.
2. Position the connecting rod in the piston and press the piston pin into place.
3. Install thrust buttons into the piston pin ends.
4. Install compression rings in the two top grooves of the piston.

**NOTE:** Some pistons will require two compression rings; one in each of the two top grooves. Other pistons will require three compression rings; one in the top groove and two in the second or middle groove. Compression rings must be installed with surface marked "Top" facing top of the piston. Some compression rings may have dots indicating the top of the ring.

5. Install the expander ring and two oil rails in the bottom groove of the piston.
6. Press the connecting rod bearing inserts into the connecting rod and bearing cap. Ensure the locating lips on the bearing inserts engage the locking notches in the connecting rod and bearing cap. Ensure each connecting rod cap is installed on the connecting rod from which it was removed.
7. Lubricate with engine oil the connecting rod bearings.

### Assembly Of Piston And Connecting Rod To Crankshaft

1. Place the crankcase and crankshaft assembly on its side.
2. Remove the bearing cap and insert the assembly from the piston and connecting rod assembly.

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#### NOTICE

Care should be taken to ensure each connecting rod and connecting rod cap are always kept in the same pairing - DO NOT intermix connecting rods and connecting rod caps.

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3. Lubricate with engine oil the bearing inserts on the connecting rods and connecting rod caps, and the connecting rod journals on the crankshaft.
4. Ensure the bearing inserts are in proper position on their respective connecting rod; assemble the connecting rod and piston assembly to the crankshaft through the top of the crankcase.

5. Install the connecting rod bearing cap and insert to connecting rod. Refer to the "Notice" under Paragraph 2.
6. Install the connecting rod nuts and tighten to a torque of 11 to 16 N•m (100 to 140 lb in).
7. Assemble the second piston and connecting rod assembly using the same procedure.
8. Ensure that each connecting rod assembly moves freely on the crankshaft.

### Assembly Of Cylinder Block To Crankcase

1. Position the crankcase so that the pistons are pointing up. On flange mounted air compressors it may be advisable to place the crankcase in a soft-jawed vise.
2. Lubricate the cylinder block bores, pistons, and piston rings with lubricating oil.
3. Place a new gasket on the crankcase.
4. Rotate the crankshaft so that the piston and connecting rod assemblies are at the top center and bottom center, respectively.
5. Recheck the ring position gaps.
6. On cylinder blocks having an inlet mounting pad surface, rotate the cylinder block with respect to the crankshaft to ensure proper location of the air cleaner assembly.
7. Place the cylinder block over the pistons. Slowly bring the cylinder block down onto the pistons until the cylinder block is flush to the crankcase.

**NOTE:** A slight downward pressure will be required to move the cylinder block down as it will be squeezing the piston rings when they slide into their respective bores.

8. If the governor bracket was mounted to the cylinder block before disassembly, replace the governor bracket in its original position.
9. Assemble the six cap screws or nuts, and lock washers. Torque the two center bolts from 7 to 9 N•m (60 to 80 lb in); then the four end bolts. Increase the bolt torque from 13 to 18 N•m (120 to 160 lb ft) tightening the two center bolts and then the four end bolts.

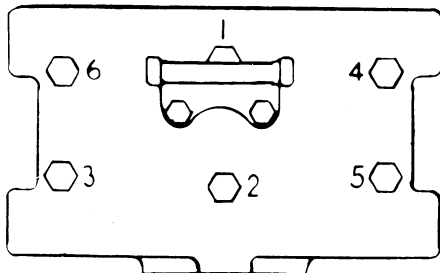
### Assembly Of Cylinder Head

1. Place the cylinder head, bottom side up in a soft-jawed vise.
2. Insert the exhaust valve cages into the exhaust cavities. (Use new parts, if necessary. Refer to the "Specifications" section.)
3. Place new exhaust valve springs on the exhaust valve cages.
4. Place new copper washers into the exhaust cavities.
5. Place new exhaust valve on the exhaust valve spring.
6. Assemble the exhaust valve seats. (Use new parts, if necessary. Refer to the "Specifications" section.)
7. Tighten the exhaust valve seats to a torque of 70 to 90 N•m (52 to 67 lb ft).
8. Place a new inlet valve over the pin on the inlet valve guard. (Replace the inlet valve guard, if damaged.) Place the valve and guard assembly into the inlet cavity of the cylinder head.
9. Prick-punch the valve guard into the cylinder head to keep the valve and guard assembly from falling out during installation of the cylinder head to the cylinder block.

**NOTE:** The inlet valve guard should not protrude more than 0.18 mm (.007 in) above the surface of the cylinder head.

### Installation Of Cylinder Head To Cylinder Block

1. Place new head to block gasket on cylinder block.
2. With cylinder head rotated to the proper position (to ensure proper porting); place the cylinder head onto the cylinder block.
3. If the governor bracket was mounted on the cylinder head before disassembly, replace the governor bracket to its proper position at this time.

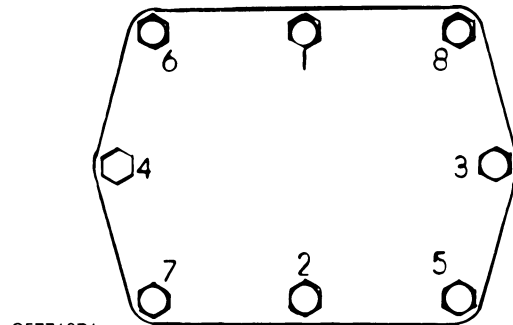


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4. Assemble the six bolts. Tighten the two center bolts to a torque of 14 to 18 N•m (125 to 160 lb in), then the four end bolts. Increase the bolt torque to 21 to 28 N•m (185 to 245 lb in). Torque the two center bolts first and then the four end bolts.

### Air Compressor Assembly

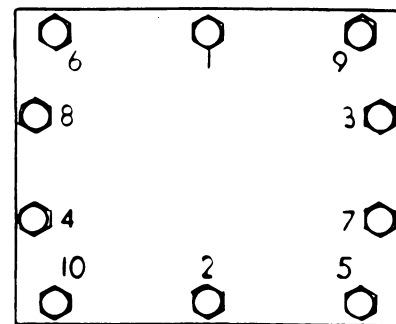
There are two bottom plates available with the EL-740 Air Compressor: an eight bolt and a ten bolt design.



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#### Bottom Plate Installation (Flange Type)

The eight bolt design should be tightened in numerical sequence to a torque of 11 to 17 N•m (100 to 150 lb in).



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#### Bottom Plate Installation (Flange Type)

The ten bolt design should be tightened in numerical sequence to a torque of 8 to 12 N•m (75 to 105 lb in).