



**SINGLE
CYLINDER
AIR COMPRESSOR**

INTRODUCTION

This publication has instructions and procedures for the subject on the front cover. The information, specifications, and illustrations in this publication are on the basis of information that was current at the time this issue was written.

Correct operation, maintenance, test and repair procedures will give this product a long service life. Before starting a test, repair or rebuild job, the serviceman must read the respective sections of the Service Manual, and know all the components he will work on.

Your safety, and the safety of others, is at all times very important. When you see this symbol  or this symbol  in the manual, you must know that caution is needed for the procedure next to it. The symbols are warnings. To work safely, you must understand the job you do. Read all instructions to know what is safe and what is not safe.

It is very important to know the weight of parts. Do not lift heavy parts by hand. Use a hoist. Make sure heavy parts have a good stability on the ground. A sudden fall can cause an accident. When lifting part of a machine, make sure the machine has blocks at front and rear. Never let the machine hang on a hoist, put blocks or stands under the weight.

When using a hoist, follow the recommendation in the manual. Use correct lift tools as shown in illustrations to get the correct balance of the component you lift. This makes your work safe at all times.

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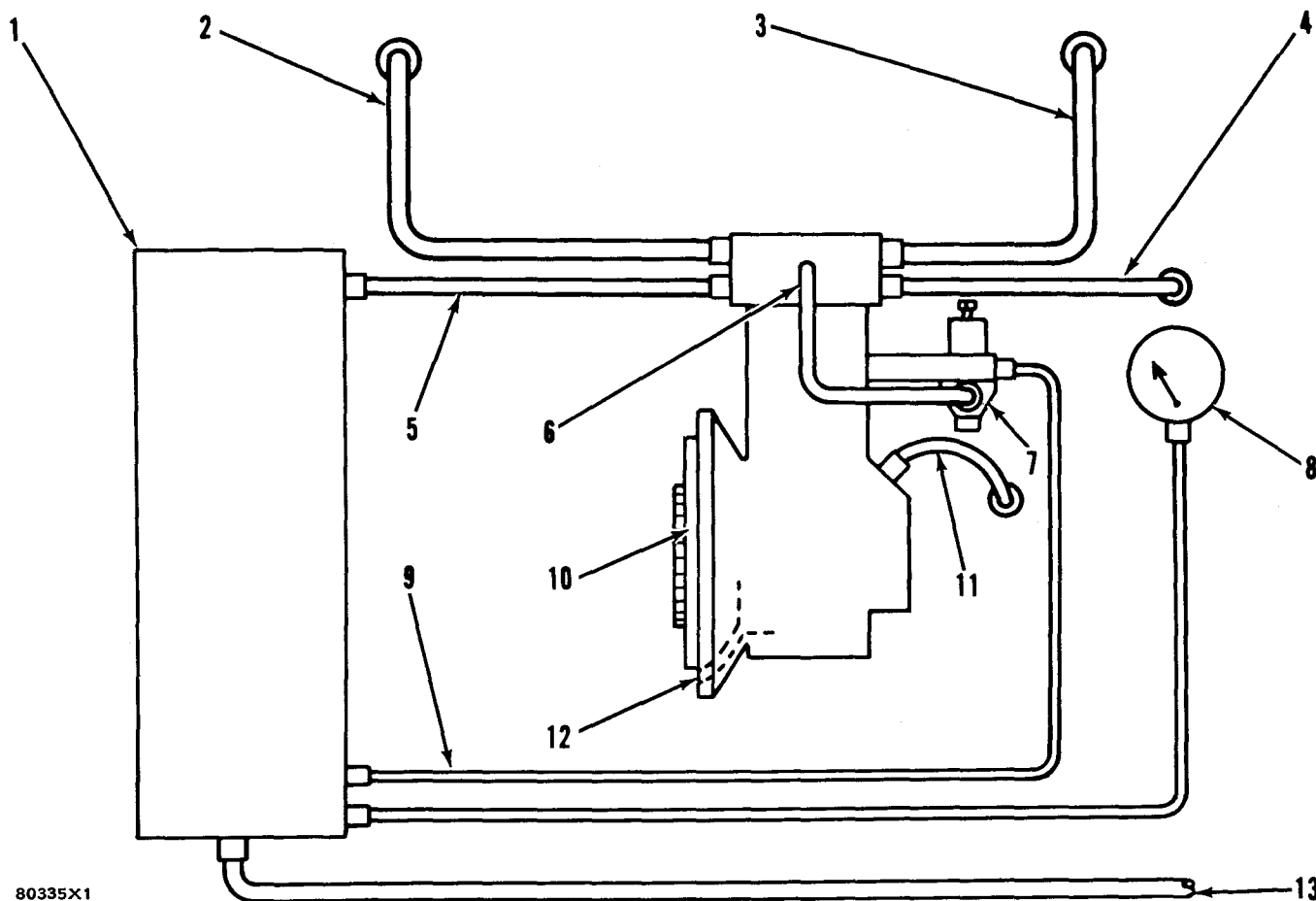
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AIR COMPRESSOR OPERATION



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TYPICAL AIR COMPRESSOR SYSTEM

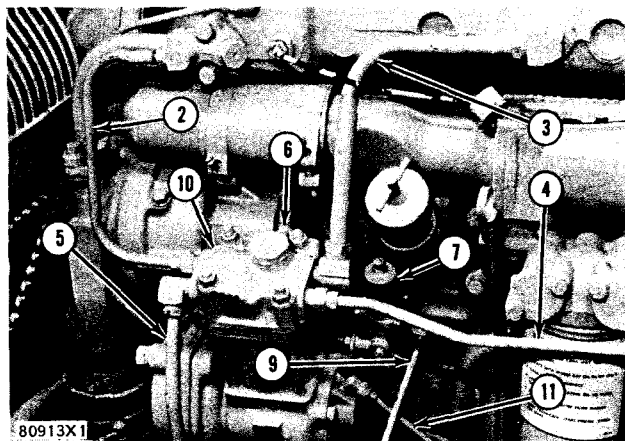
1. Air tank. 2. Coolant line to engine. 3. Air line from the air inlet manifold for the engine. 4. Coolant line from engine. 5. Air line to air tank. 6. Air line to unloader valve in head assembly. 7. Air governor. 8. Pressure gauge. 9. Air line to air governor. 10. Air compressor. 11. Oil line from engine for lubrication. 12. Oil outlet to engine. 13. Air line to components that need air for operation.

The air compressor (10) is a pump that fills tank (1) with air. The crankshaft in the air compressor is driven by the engine and the air compressor operates when the engine is running. The head assembly gets the coolant from the engine. The coolant goes through a line (4) connected to the coolant manifold from the water pump of the engine. The coolant goes through the head of the air compressor and through a line (2) to the coolant manifold to the radiator of the engine.

When the crankshaft is turning, it moves a connecting rod and piston up and down in the cylinder of the air compressor. When the crankshaft moves the rod and piston down, the inlet valve in the head assembly opens and air from the inlet manifold of the engine goes through a line (3), through the open inlet valve and into the liner of the air compressor. As the crankshaft turns farther it moves the rod and piston up and the inlet valve closes and the exhaust valve opens. The piston pushes the air from the cylinder through the open

exhaust valve and through a line (5) to the air tank (1). The movement of the crankshaft, rods and piston puts more and more air into the tank and the pressure of the air gets an increase. The air in the tank is also in the line (9) to the air governor (7) and in the line to the pressure gauge (8).

The air compressor puts air into the tank (1) and in line (9) until the increase in the pressure of the air gets to the cut out pressure setting of the air governor (7). The pressure of the air now moves a plunger in the air governor and the air from the tank through air line (9) goes through the open valve in the air governor, through a line (6) and into the unloader valve in the head which moves the inlet valve open. As the air compressor piston moves down, air from line (3) goes through the open inlet valve into the cylinder. When the piston moves up, the air in the cylinder moves out through the open inlet valve but does not go to the air tank.



TYPICAL AIR COMPRESSOR INSTALLATION

2. Coolant line to engine. 3. Air line from air inlet manifold of the engine. 4. Coolant line from the engine. 5. Air line to air tank. 6. Air line to unloader valve in head assembly. 7. Air governor. 9. Air line from tank to air governor. 10. Air compressor. 11. Oil line from engine for lubrication.

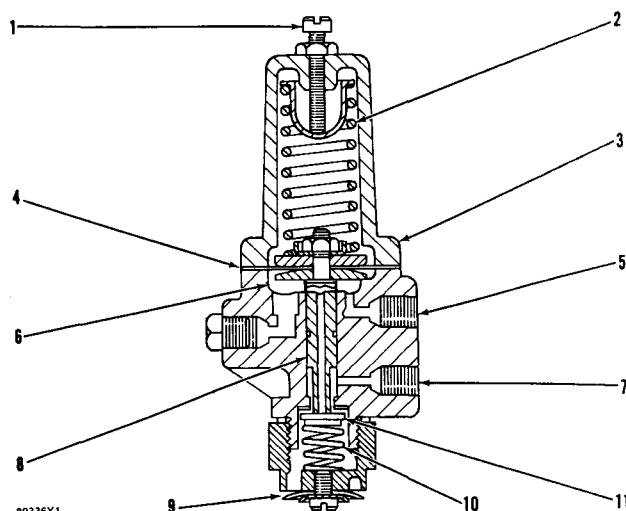
Components connected to the air line (13) from the air tank (1) use the air in the tank and the pressure of the air gets a decrease. When the pressure of the air (getting less and less) gets to the cut in pressure setting of the air governor, the plunger in the air governor closes. Now the air from the line (9) can not go through the line (6) to the unloader valve in the head assembly. The air goes out of the line (6) and the unloader valve moves away from the inlet valve. The inlet valve can again open and close with the movement of the piston. Air from the air compressor (10) now goes to the air tank (1).

AIR GOVERNOR

A line from the air tank is connected to inlet (5) of the air governor. The pressure of the air in inlet (5) and in chamber (6) is the same as the pressure of the air in the tank. The air in inlet (5) also goes into an air passage in plunger (8). Spring (10) holds exhaust valve (11) against the opening in the end of the air passage and the air can not get out of plunger (8).

As the air compressor puts more air into the tank the pressure of the air in the tank and also in chamber (6) gets an increase. The pressure of the air in chamber (6) moves diaphragm (4) against the force of spring (2). The diaphragm also moves plunger (8). Spring (10) keeps the exhaust valve (11) against the plunger as it moves. The cut out pressure setting of the air governor is when the pressure of the air in chamber (6) has moved diaphragm (4) and plunger (8) until spring (10) moves exhaust valve (11) against the seat in body (3) and

the air passage in the end of the plunger is open. Now the air from the tank goes through inlet (5), through the air passage in plunger (8) and through outlet (7) to the unloader valve in the cylinder head of the air compressor.



AIR GOVERNOR

1. Adjustment screw. 2. Spring. 3. Body. 4. Diaphragm. 5. Inlet. 6. Air chamber. 7. Outlet. 8. Plunger. 9. Exhaust outlet. 10. Spring. 11. Exhaust valve.

When the air in the tank is used, the pressure of the air in the tank gets a decrease. Now spring (2) moves diaphragm (4) and plunger (8). The cut in pressure is when the pressure of the air in the tank and in chamber (6) is less than the force of spring (2) and the spring moves plunger (8) far enough to move exhaust valve (11) away from the seat in body (3). Now the air from the unloader valve goes into outlet (7) and through exhaust outlet (9) and the unloader valve lets the inlet valve for the air compressor operate.

Adjustment screw (1) can be turned to either make an increase or a decrease in the cut out pressure setting of the air governor. The cut in pressure is always approximately 15 psi (1.05 kg/cm²) less than the cut out pressure setting.

AIR COMPRESSOR LUBRICATION

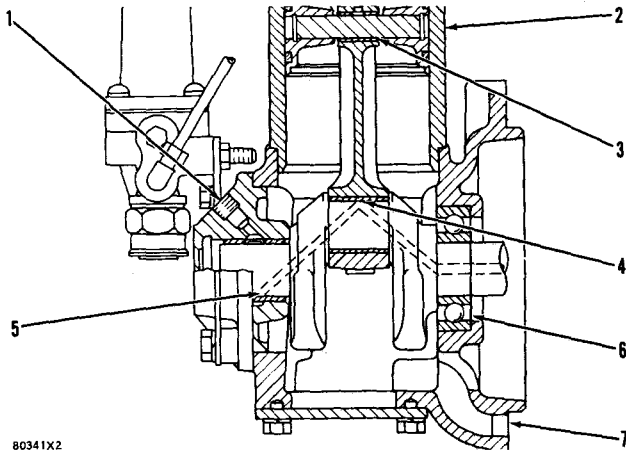
An oil line from the engine lubricating oil system is connected to opening (1) in the end cover of the air compressor.

Pressure oil from opening (1) goes through an opening in the bearing and the main journal of the crankshaft gets lubrication. The oil goes through opening (5) in the main bearing journal, through a passage in the crankshaft and through opening (4) in the rod bearing journal. With the oil going out through opening (4) and running out between the

SINGLE CYLINDER AIR COMPRESSOR

SYSTEMS OPERATION

rod and the crankshaft and with the movements of both the rod and the crankshaft, the oil gets in the liner wall (2), the piston pin and in bearing (3) for lubrication. The oil goes through ball bearing (6) and through outlet passage (7) to the engine lubrication system.



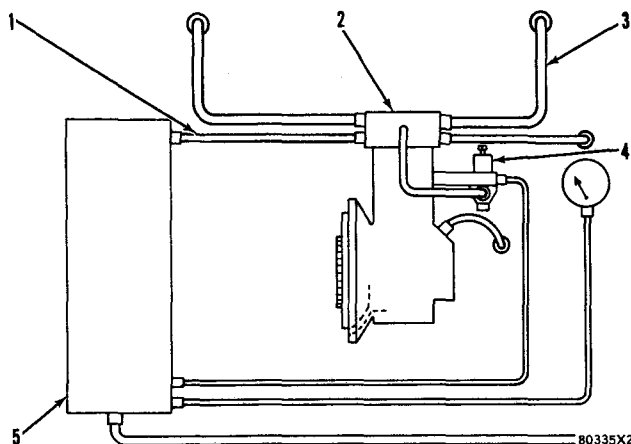
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AIR COMPRESSOR LUBRICATION

1. Opening in end cover. 2. Cylinder. 3. Bearing for piston pin. 4. Opening in rod bearing journal of crankshaft. 5. Opening in main bearing journal of crankshaft. 6. Ball bearing in main bearing journal of crankshaft. 7. Oil outlet.

TESTING AND ADJUSTING

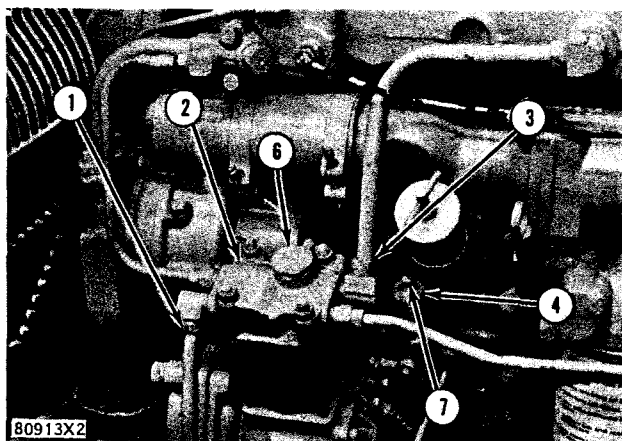
The air pressure gauge will show low air pressure in the system when air system checks or tests are needed. Air system checks are needed if the needle in the air pressure gauge keeps moving when the components in the air system are not being used.



AIR SYSTEM SCHEMATIC

1. Air line between tank and air compressor. 2. Head for air compressor. 3. Inlet air line from engine manifold. 4. Air governor. 5. Air tank.

The complete air system, including the components in the air system, must be checked for any air leaks. The air lines must have no breaks and all of the air line connections must be tight and have no air leaks. If all of the air leaks have been stopped and the air pressure gauge still has indications of low air pressure further tests are needed.



TYPICAL AIR COMPRESSOR INSTALLATION

1. Air line between tank and air compressor. 2. Head on air compressor. 3. Inlet air line from engine manifold. 4. Air governor. 6. Cover over unloader valve. 7. Adjustment screw.

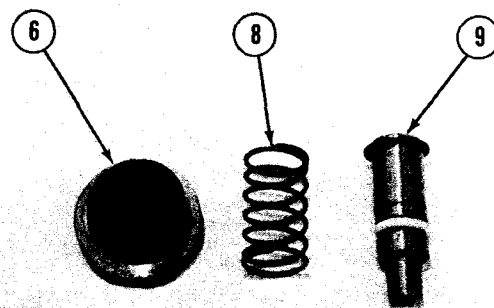
Stop the engine and let all of the air out of the tank (5) and the air system. Disconnect line (1) from the cylinder head (2) to the air tank.

Start the engine and let it run for a minute. With the engine running hold a white card approximately 2 in. (50.8 mm) from the opening in the head (2), where air line (1) was disconnected but for no more than 10 seconds. A large area of oil on the card is an indication of wear either in the bore of the liner or the piston rings (and piston). A little oil in fine drops is an indication of correct lubrication. If the card test shows no wear, connect air line (1) and let the air compressor fill the air tank until the air pressure gauge will not indicate any more pressure.

Run the engine at low idle speed and disconnect air inlet line (3) from the cylinder head (2). With the engine still running slow, hold your hand close to the opening in head (2) where air line (3) was disconnected. If air can be felt coming from the opening when the piston of the air compressor is on the compression stroke, the inlet valve is not closing. Either the unloader valve under cover (6) is holding the inlet valve open or there is dirt on the inlet valve holding it open. A broken spring under the inlet valve will also keep the valve open.

The unloader valve can be cleaned by removing cover (6), spring (8) and unloader valve (9). Clean the unloader valve and the passage in the head where the unloader valve fits.

Install the unloader valve, the spring and the cover. Torque for cover (6) is 60 lb.ft. (8.3 mkg). Start the engine and feel for air coming from the opening where air line (3) was disconnected, if air can be felt the inlet valve is not closing and the head assembly must be removed to clean the inlet valve.



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UNLOADER VALVE

6. Cover. 8. Spring. 9. Unloader valve.

The cut out pressure setting of air governor (4) is the pressure of the air in the system. The governor has an adjustment screw (7) for changing the cut out setting of the governor. Loosen the locknut and turn screw (7) clockwise to get an increase in the pressure of the air in the system.

The cut in pressure of the air governor is approximately 15 psi (1.05 kg/cm²) less than the cut out pressure setting. When the cut out pressure setting is changed the cut in pressure also changes.

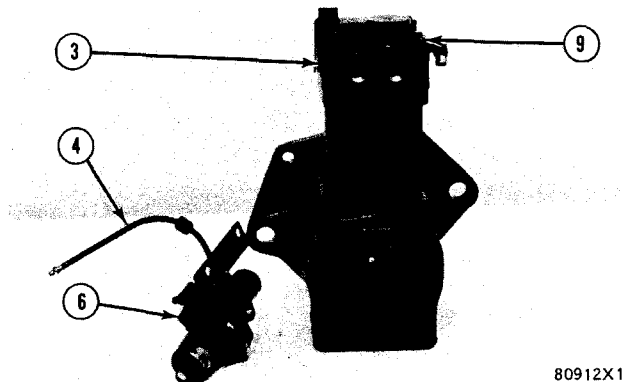
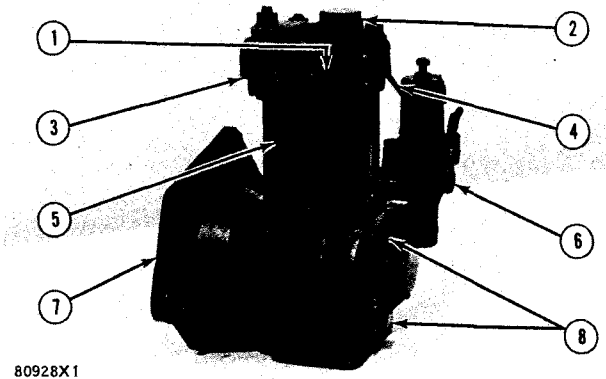
HEAD ASSEMBLY

REMOVE HEAD ASSEMBLY

11-1065

1. Loosen two set screws (1) and cover (2).
2. Put alignment marks on head assembly (3) and on liner (5) and also on the liner and on crankcase (7) so parts can be put in correct location when they are assembled.
3. Disconnect air line (4) and remove two bolts (8) and governor assembly (6).
4. Remove four nuts (9) and remove head assembly (3).

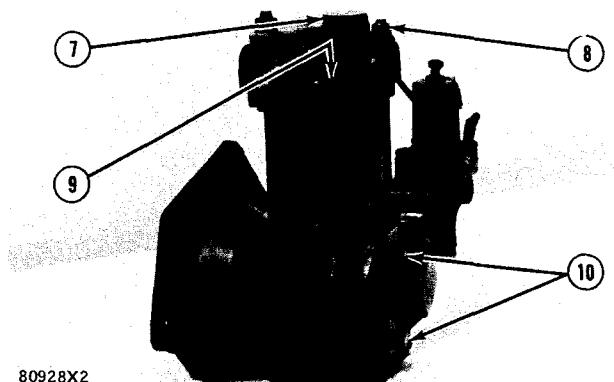
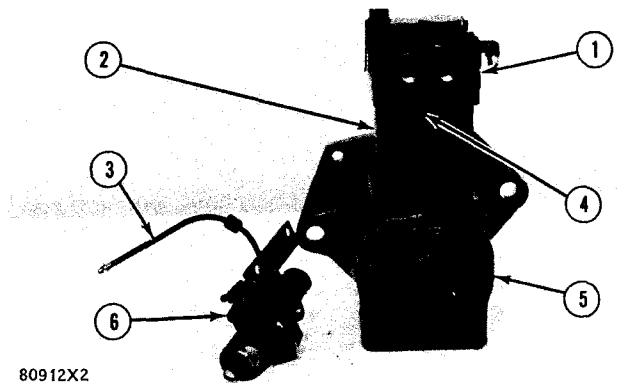
NOTE: If needed, hit head assembly (3) with a soft hammer and then remove the head assembly.



INSTALL HEAD ASSEMBLY

12-1065

1. Install new gasket (4) on liner (2).
2. Install head assembly (1) on liner (2).
3. Put alignment marks on the liner and head assembly together and tighten four nuts (8). Torque for nuts is 14 ± 3 lb.ft. (1.9 ± 0.04 mkg).
4. Install governor assembly (6) on end cover (5) and tighten bolts (10). Torque for bolts is 10 lb.ft. (1.38 mkg). Connect air line (3) to head assembly (1).
5. Tighten cover (7). Torque for cover is 60 lb.ft. (8.3 mkg).
6. Tighten two set screws (9). Torque for set screws is 50 to 96 lb.in. (57.6 to 110.7 cm.kg).



HEAD ASSEMBLY

DISASSEMBLE AND ASSEMBLE

17-1065

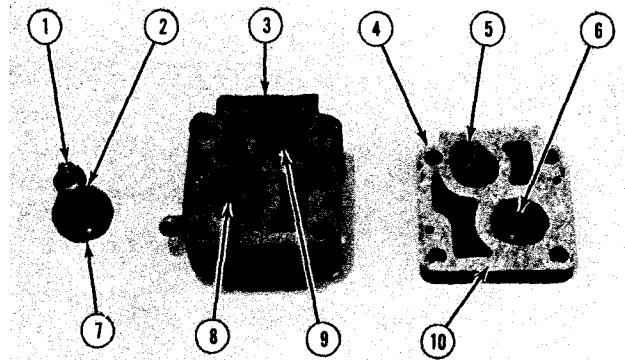
start by:

a) remove head assembly

1. Remove cover (7), unloader valve (1) and spring (2) from top half (3) of head and clean the unloader valve.
2. Remove two set screws from top half (3) and hit either top half (3) or bottom half (4) with a soft hammer to separate the head.
3. Remove and clean exhaust valve (5) and spring (6).
4. Remove and clean inlet valve (8) and spring.
5. Clean all of the passages in both top half (3) and bottom half (4).
6. Place a new gasket (10), spring (6) and exhaust valve (5) on bottom half (4) of the head.
7. Place inlet valve (8) and spring (9) on top half (3) of the head.
8. Carefully put half (3) on half (4). Inlet valve (8) can be moved to the correct location with a rod through the opening for the unloader valve.
9. Install the two set screws to hold the top half (3) and the bottom half (4) of the head together.
10. Install unloader valve (1), spring (2) and cover (7) in the head.

end by:

a) install head assembly



PISTON AND ROD

PISTON AND ROD REMOVAL

11-1065

start by:

a) remove head assembly

1. Remove cylinder (1) and gasket (2).

2. Remove bolts (3) and end cover (4).

3. Remove four bolts and cover (6).

4. Put marks on rod cap (9) and rod (10) so rod and rod cap can be installed on crankshaft (11) in the same location as they were removed.

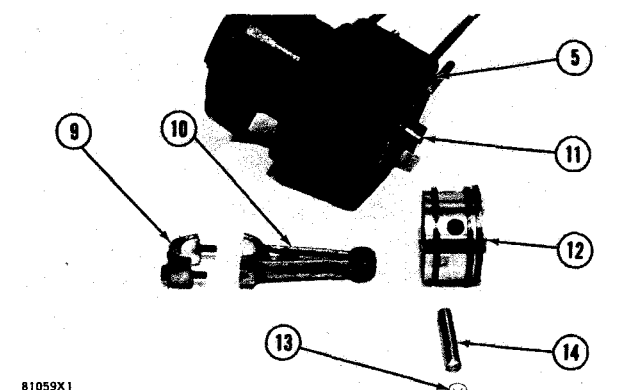
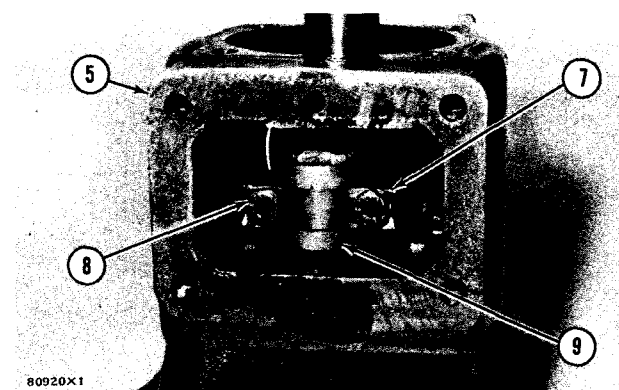
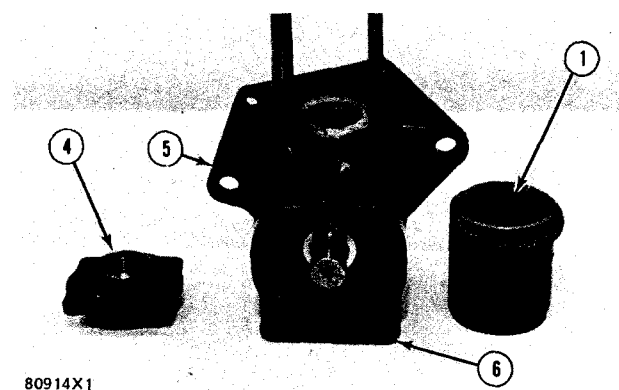
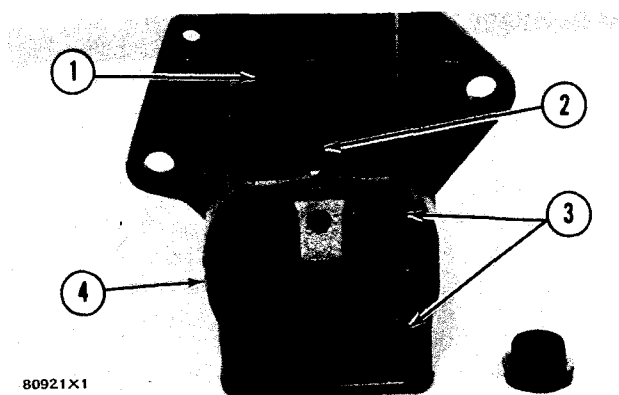
5. Bend lock (7) and remove bolts (8) and rod cap (9). Remove rod (10) and piston (12) from crankcase (5).

6. Mark piston (12) so it can be installed on rod (10) in the same location as it was removed.

7. Remove pin lock (13) and push pin (4) out of piston (12) and rod (10).

8. Clean all parts.

9. Remove piston rings and clean the ring grooves in piston (12) with a piece of hard wood.

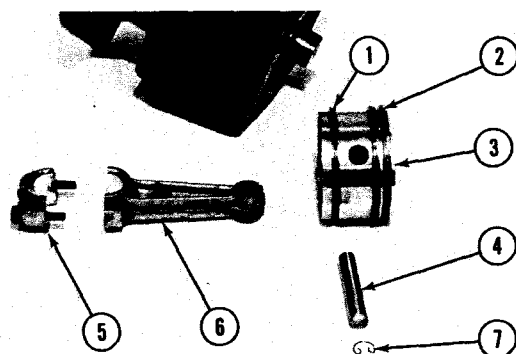


PISTON AND ROD

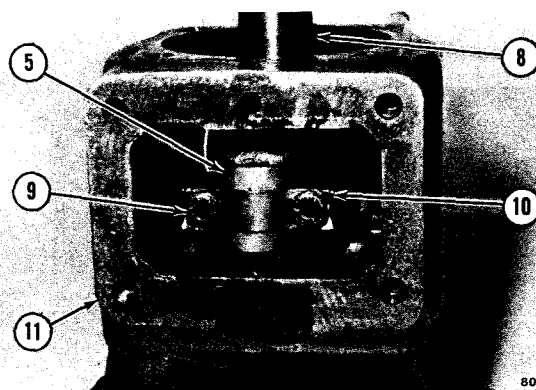
INSTALL PISTON AND ROD

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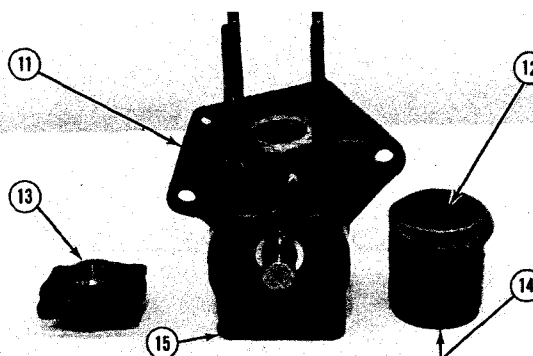
1. The gap for oil ring (1) and the gap for rings (2) is measured with the rings near the bottom in cylinder (12). The gap for each ring is .003 to .009 in. (0.08 to 0.23 mm).
 2. Install rings (1) and (2) on piston (3). The gap for each ring must not be near the piston pin bore and each gap must be approximately 120° from the gap in the next ring.
 3. Install pin (4) in piston (3) and rod (6). Install pin lock (7). The mark put on the piston shows if the location of the piston on the rod is correct.
 4. Put rod (6) and piston (3) into crankcase (11). Install rod cap (5). The marks put on the rod cap and rod show the correct location of the rod in crankcase (11).
 5. Tighten bolts (9) to a torque of 35 to 40 lb.in. (40.6 to 46.1 cm.kg). Bend lock (10) over bolt heads.
 6. Put a new gasket on both end cover (13) and cover (15) and install the covers and gaskets on crankcase (11).
 7. Put a new gasket (14) on cylinder (12) and put the gasket and cylinder on crankcase (11). The marks put on the cylinder and crankcase, before the head assembly was removed, must be together.
- end by:
- a) install head assembly



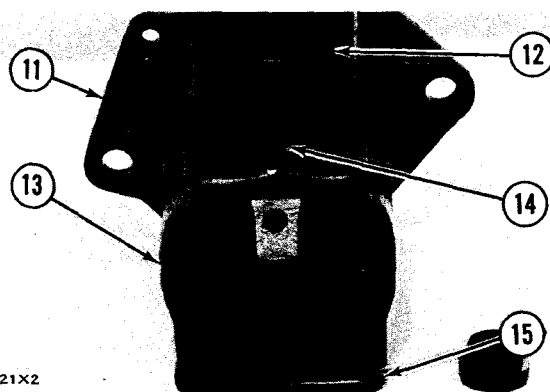
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80921X2

CRANKSHAFT

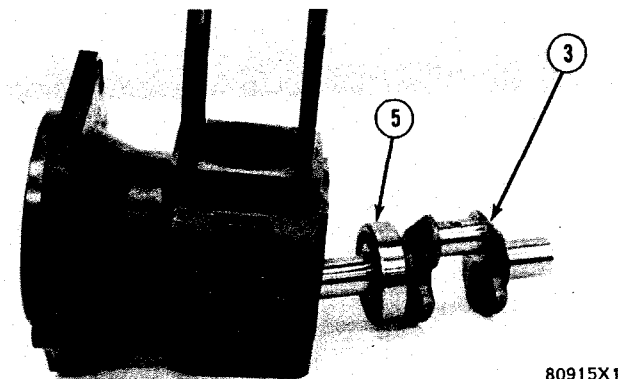
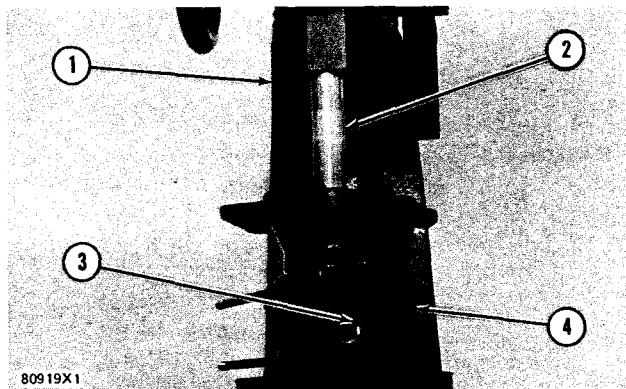
REMOVE CRANKSHAFT

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start by:

- a) remove head assembly
- b) remove piston and rod

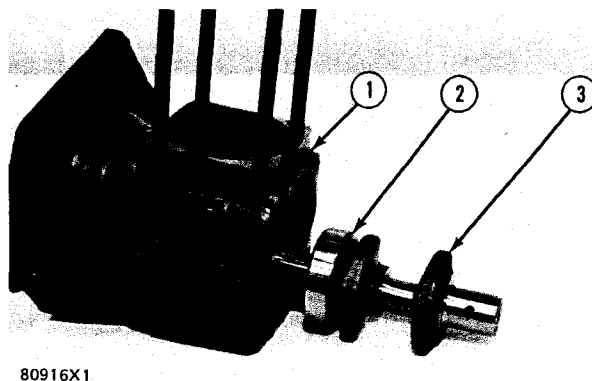
1. A press (1) can be used to remove crankshaft (3) from crankcase (4).
2. Put a pipe (2), with a bore larger than 1.03 in. (26.2 mm) and a diameter of approximately 2 in. (50.8 mm) with an approximate length of 6 in. (152.4 mm), over the end of crankshaft (3) and on bearing (5).
3. Push crankshaft (3) and bearing (5) out of crankcase (4) as a unit.
4. Remove bearing (5).



INSTALL CRANKSHAFT

12-1065

1. Heat the crankshaft ball bearing in oil to a temperature of not over 350°F (175°C) and put the bearing on crankshaft (3).
 2. Put the bearing and crankshaft (3) into crankcase (1) with the crankcase resting on the large flange end.
 3. Outer race (2) of the bearing is pushed into the crankcase with a soft metal rod put at many locations on outer race (2) while hitting the rod with a hammer.
- end by:
- a) installing piston and rod
 - b) installing head assembly



AIR GOVERNOR

DISASSEMBLE AIR GOVERNOR

15-1065

1. Remove air governor from air compressor. Remove air line (1) from body (11).

2. Put a mark (A) on cover (4) and body (11) so the cover can be installed on the body in the correct location.

3. Measure the distance from cover (4) to the top of screw (5) and make a record of the measurement. Loosen the locknut and remove screw (5).

4. Remove four screws (2), identification tag (3), cover (4), spring (6) and spring seat (7).

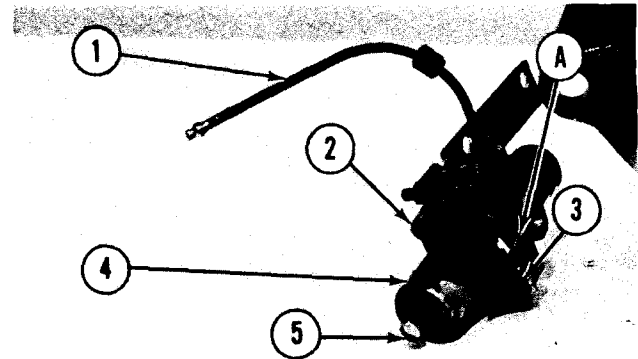
5. Remove nut (8), plunger (10) and diaphragm (9) as a unit.

6. A rod with a diameter of .12 in. (3.05 mm) put in the hole in plunger (10) is used to hold the plunger when nut (8) is removed.

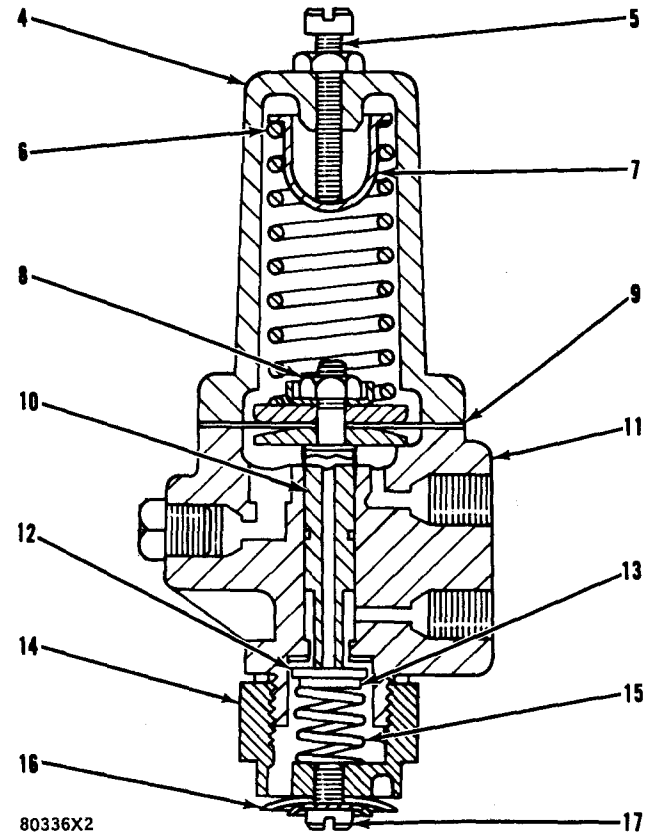
7. Remove screw (17) and exhaust diaphragm (16).

8. Remove exhaust nut (14), spring (15), exhaust valve (12) and spring retainer (13).

9. Clean all of the parts and the passages in body (11) and plunger (10).



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AIR GOVERNOR

ASSEMBLE AIR GOVERNOR

16-1065

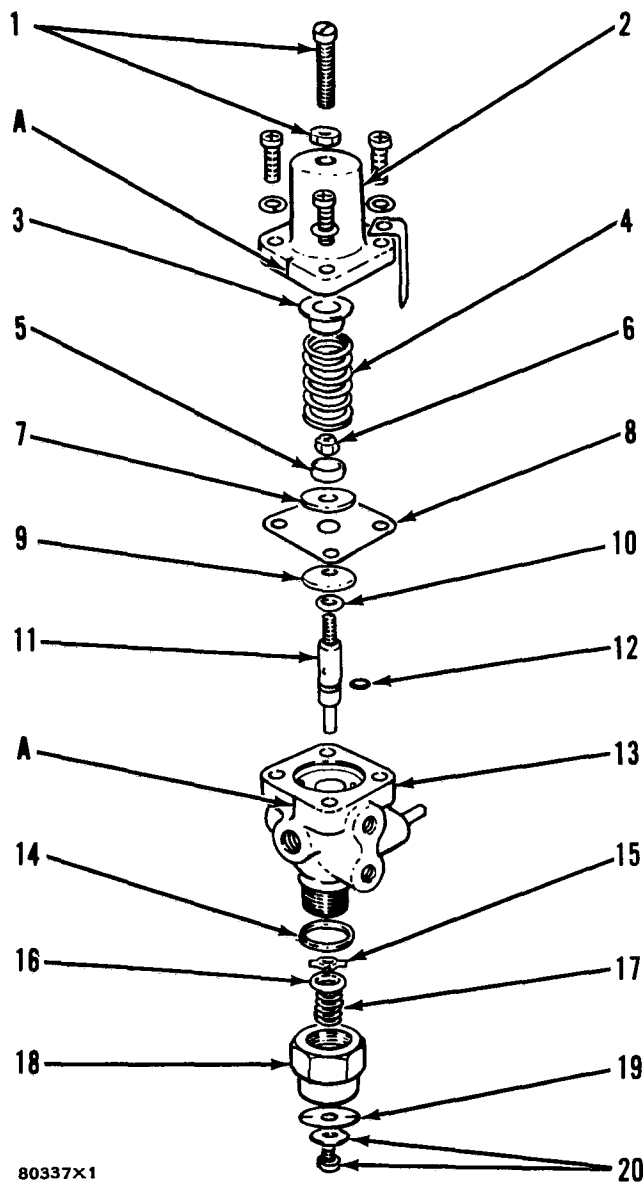
1. Install seal (12) on plunger (11).
2. Put new soft washer (10), follower (9), new diaphragm (8), follower (7), spring guide (5) and new nut (6) on plunger (11).

NOTE: The diaphragm is between the chamfered sides of followers (7) and (9).

3. A rod with a diameter of .12 in. (3.05 mm) put in the hole in plunger (11) is used to hold the plunger when nut (6) is tightened.
4. Lubricant is put on plunger (11) and in body (13). Install plunger in body.
5. Install spring seat (3) in spring (4) and put them on spring guide (5).
6. Install cover (2) over spring seat (3) and spring (4). Mark (A) on cover (2) must be in alignment with mark (A) on body (11) when the four lockwashers and screws in the cover are tightened.

NOTE: The governor identification tag is under one of the four screws.



7. Install screw and nut (1) in cover (2). Make an adjustment for the length of the screw to get the same measurement before the screw was removed from the cover.
8. Install screw and diaphragm washer (23) and new exhaust diaphragm (19) on exhaust nut (18).
9. Install spring (17), spring retainer (16) and new exhaust valve (15) in exhaust nut (18).
10. Install washer (14) and exhaust nut (18), spring retainer and spring in body (13). Install air governor and air line on air compressor.



GENERAL TIGHTENING TORQUE FOR BOLTS, NUTS AND TAPERLOCK STUDS

The following charts give the standard torque values for bolts, nuts and taperlock studs of SAE Grade 5 or better quality. Exceptions are given in the Specifications.

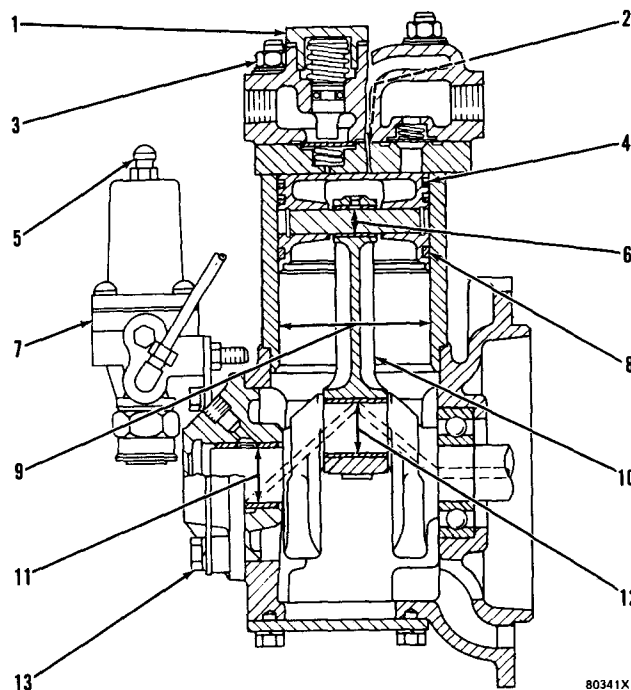


THREAD DIAMETER		STANDARD TORQUE	
inches	millimeters	lb. ft.	mkg
Standard thread 		Use these torques for bolts and nuts with standard threads.	
1/4	6.35	9 ± 3	1.24 ± 0.4
5/16	7.94	18 ± 5	2.5 ± 0.7
3/8	9.53	32 ± 5	4.4 ± 0.7
7/16	11.11	50 ± 10	6.9 ± 1.4
1/2	12.70	75 ± 10	10.4 ± 1.4
9/16	14.29	110 ± 15	15.2 ± 2.0
5/8	15.88	150 ± 20	20.7 ± 2.8
3/4	19.05	265 ± 35	36.6 ± 4.8
7/8	22.23	420 ± 60	58.1 ± 8.3
1	25.40	640 ± 80	88.5 ± 11.1
1 1/8	28.58	800 ± 100	110.6 ± 13.8
1 1/4	31.75	1000 ± 120	138 ± 16.6
1 3/8	34.93	1200 ± 150	166 ± 20.7
1 1/2	38.10	1500 ± 200	207 ± 27.7
Use these torques for bolts and nuts on hydraulic valve bodies.			
5/16	7.94	13 ± 2	1.8 ± 0.3
3/8	9.53	24 ± 2	3.3 ± 0.3
7/16	11.11	39 ± 2	5.4 ± 0.3
1/2	12.70	60 ± 3	8.3 ± 0.4
5/8	15.88	118 ± 4	16.3 ± 0.5
Taperlock stud 		Use these torques for studs with Taperlock threads.	
1/4	6.35	5 ± 2	0.69 ± 0.3
5/16	7.94	10 ± 3	1.4 ± 0.4
3/8	9.53	20 ± 3	2.8 ± 0.4
7/16	11.11	30 ± 5	4.1 ± 0.7
1/2	12.70	40 ± 5	5.5 ± 0.7
9/16	14.29	60 ± 10	8.3 ± 1.4
5/8	15.88	75 ± 10	10.4 ± 1.4
3/4	19.05	110 ± 15	15.2 ± 2.0
7/8	22.23	170 ± 20	23.5 ± 2.8
1	25.40	260 ± 30	35.9 ± 4.1
1 1/8	28.58	320 ± 30	44.2 ± 4.1
1 1/4	31.75	400 ± 40	55 ± 5.5
1 3/8	34.93	480 ± 40	66 ± 5.5
1 1/2	38.10	550 ± 50	76 ± 7

T95416-5

AIR COMPRESSOR

- (1) Torque for cover (unloader valve) 60 lb.ft. (8.3 mkg)
- (2) Torque for two setscrews
(in head) 50 to 96 lb.in. (57.6 to 110.7 cm.kg)
- (3) Torque for nuts on head 14 ± 3 lb.ft. (1.9 ± 0.04 mkg)
- (4) Compression rings:
Ring gap003 to .009 in. (0.08 to 0.23 mm)
Ring side clearance0006 to .0026 in. (0.02 to 0.07 mm)
- (5) Adjustment screw:
Turn screw clockwise for an increase in cut out pressure
- (6) Bore in pin
bearing (new)4377 to .4379 in. (11.118 to 11.220 mm)
Diameter of
pin (new)4359 to .4373 in. (11.07 to 11.11 mm)
- (7) 2P7809 Governor Assembly
(APSA2870E-3W) cut out
pressure setting 110 ± 2 psi (7.73 ± 0.14 kg/cm²)
- (7) 2P9578 Governor Assembly
(APSA2870E-2W) cut out
pressure setting 122 ± 2 psi (8.58 ± 0.14 kg/cm²)
- (7) 9S5147 Governor Assembly
(APSA2870E-2) cut out
pressure setting 122 ± 2 psi (8.58 ± 0.14 kg/cm²)
- (8) Oil ring:
Ring gap003 to .009 in. (0.08 to 0.23 mm)
Ring side clearance0006 to .0026 in. (0.02 to 0.07 mm)
- (9) Bore in cylinder
(new) 2.6258 to 2.6265 in. (66.70 to 66.71 mm)
Diameter of piston
(new) 2.6213 to 2.6222 in. (66.58 to 66.60 mm)
- (10) Rod, center to
center length $3.656 \pm .003$ in. (90.60 ± 0.08 mm)
Torque for rod
cap bolts 35 to 48 lb.in. (40.4 to 46.1 cm.kg)
- (11) Bore in main bearing
(new) 1.0005 to 1.0013 in. (25.41 to 25.43 mm)
Diameter of
journal (new)9988 to .9993 in. (27.37 to 25.38 mm)
- (12) Bore in rod bearing
(new)875 to .876 in. (22.22 to 22.25 mm)
Diameter of new
journal8735 to .8740 in. (22.19 to 22.20 mm)
- (13) Torque for bolts (end cover) 10 lb.ft. (1.4 mkg)
Torque for nut on crankshaft for
gear (when used) 150 ± 20 lb.ft. (20.7 ± 2.8 mkg)





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