1816, 1816B, AND 1816C UNI-LOADERS

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CASE CORPORATION

8-41040
March 1982

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SPECIAL TORQUES

	Pound-Feet	Newton-Metres
Gear Cover Cap Screws	8 - 10	11 - 14
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Below is a list of common problems with possible causes and corrections.

ENGINE DOES NOT START OR IS DIFFICULT TO START

POSSIBLE CAUSE	CORRECTION
No fuel in fuel tank.	Fill fuel tank with clean fuel.
Obstruction in vent in fuel filler cap.	Clean vent in fuel filler cap.
Obstruction in fuel line.	Clean fuel filter and fuel line. If necessary, remove and clean carburetor.
Water in fuel.	Drain fuel tank. Clean carburetor and fuel lines. Clean spark plug electrodes. Fill fuel tank with clean fuel
Carburetor adjustment is not correct.	Adjust carburetor. See Section 3002.
Loose or damaged wiring.	Check wiring for short circuits or grounds. Repair as necessary.
Defect in ignition system.	Check and repair ignition system. See Section 4002.
Foreign material on spark plug electrode.	Clean spark plug and check spark plug gap.
Spark plug insulator damaged.	Replace spark plug.
Poor compression.	Check compression. Correct compression is approximately 100 psi (689 kPa). Both cylinders must be approximately the same.
No spark at spark plug.	See Section 4002.
Starter does not turn engine.	See Section 4006.

KNOCK IN ENGINE

POSSIBLE CAUSE	CORRECTION
Carbon in combustion chamber.	Remove cylinder head and clean carbon from cylinder head and piston.
Loose or worn connecting rod.	Replace connecting rod.
Loose flywheel.	Check flywheel key and keyway. Replace parts if necessary. Tighten flywheel cap screw to correct torque (See Section 1003).

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FLUIDS AND LUBRICANTS

COMPONENT	CAPACITY		SPECIFICATIONS
	U.S.	Metric	
Fuel tank	8.5 gallons	32.2 litres	See the Operators Manual
Engine crankcase With filter change Without filter change	2.3 quarts 1.75 quarts	2.2 litres 1.6 litres	Engine oil with API service classification of SE or SE/CC. Above 32° F (0°) ..... SAE 30 or SAE 40 Below 32° F (0°) ..... SAE 10W-30 or SAE 10W-40 Below 0° F (-18°) ..... SAE 5W-30 or SAE 5W-20
Hydraulic reservoir With filter change Without filter change	 15 quarts 14 quarts	 14.2 litres 13.2 litres	SAE 10W-40 engine oil with API classification of SD or SE
Grease fittings	As required		Case molydisulfide multipurpose grease
Battery	As required		Clean water or distilled water
Hydrostatic motor shaft splines	As required		Molykote, Type G grease, Case part number D60210

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MAINTENANCE CHART

This chart shows maximum service intervals for the correct maintenance of the machine. Some working conditions will make it necessary to shorten the service intervals.

INTERVAL	SERVICE	INSTRUCTIONS
After the first two hours of operation, new machine only	Check the drive belt tensions. Tighten wheel nuts every two hours until the wheel nuts stay tight.	1816 - See Section 2003. 1816B and 1816C - See Section 6012. See Section 6014.
After the first 20 hours of operation, new machine only	Do the After Delivery Check.	See the Operators Manual.
After the first 50 hours of operation, new machine only	Check the engine valve clearance.	1816 and 1816B - See the Tecumseh manual. 1816C - See Section 2006.
Every five hours of operation or two times each day	Check the engine oil level.	
Every 10 hours of operation or each day, whichever occurs first	Clean the dust cup in the air cleaner. Make sure that the hydraulic oil cooler is clean. Check for damage. Check the hydraulic filter condition indicator. Lubricate the pivot points on the loader and the grapple. Clean or replace all safety and instruction decals that cannot be read. Check the tires for deep cuts and other damage. Visually check the machine for loose, broken, or missing parts. Check for oil leaks.	See Section 2007. See Section 8002. See Section 9004.
Every 25 hours or operation or two times each week	Change the engine oil. Tighten all hose clamps.	

(Continued on next page)

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ENGINE REMOVAL

1. Park the machine on a level surface.

2. Raise the loader frame and use the support strut to fasten the loader frame in position.

3. Put the belt clutch control in the OFF position.

4. Stop the engine.

5. Remove the RH side screen from the machine.

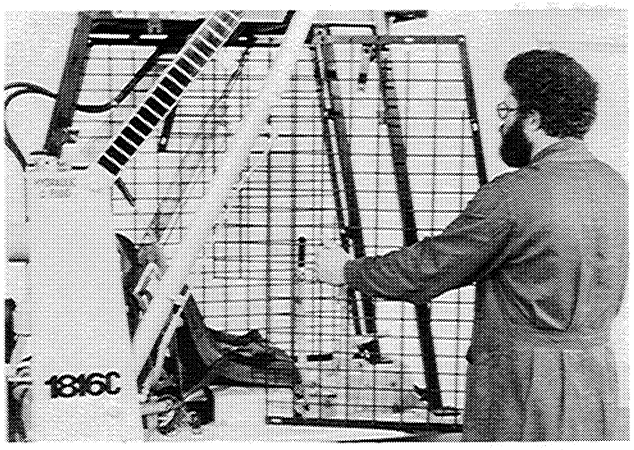


Figure 1

6. Remove the seat from the machine.

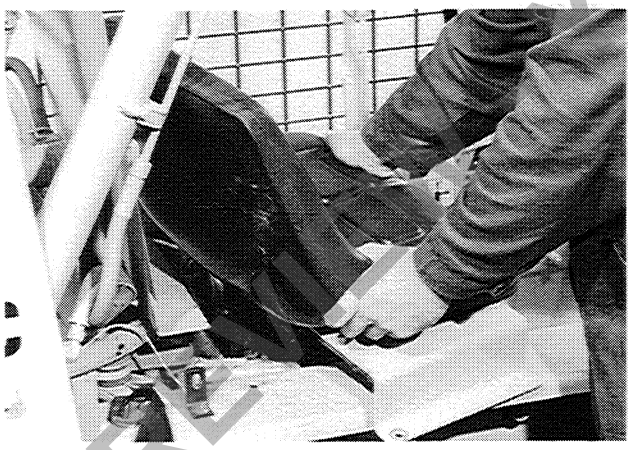
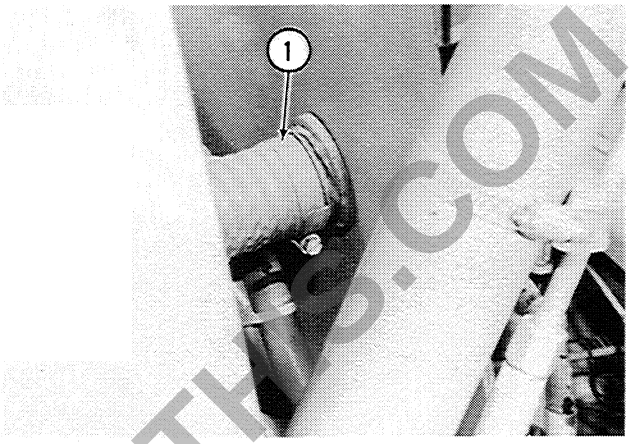


Figure 2

7. Loosen the clamp which fastens the air inlet hose to the tube in the heat shield. Disconnect the air inlet hose from the tube. Put the air inlet hose out of the way.



1. Clamp

Figure 3

8. Remove the heat shield from the machine.



Figure 4

9. Remove the RH floor plate from the machine.

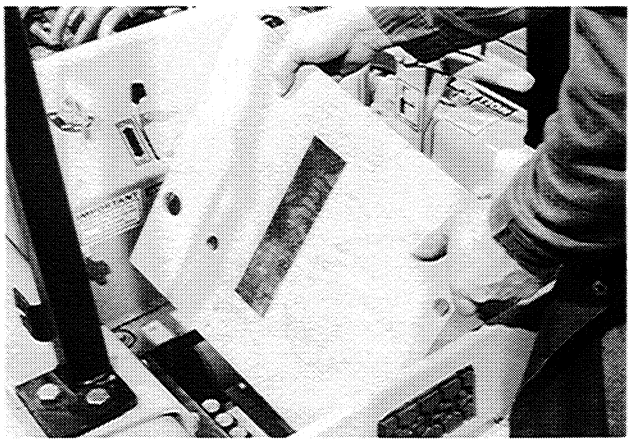


Figure 5

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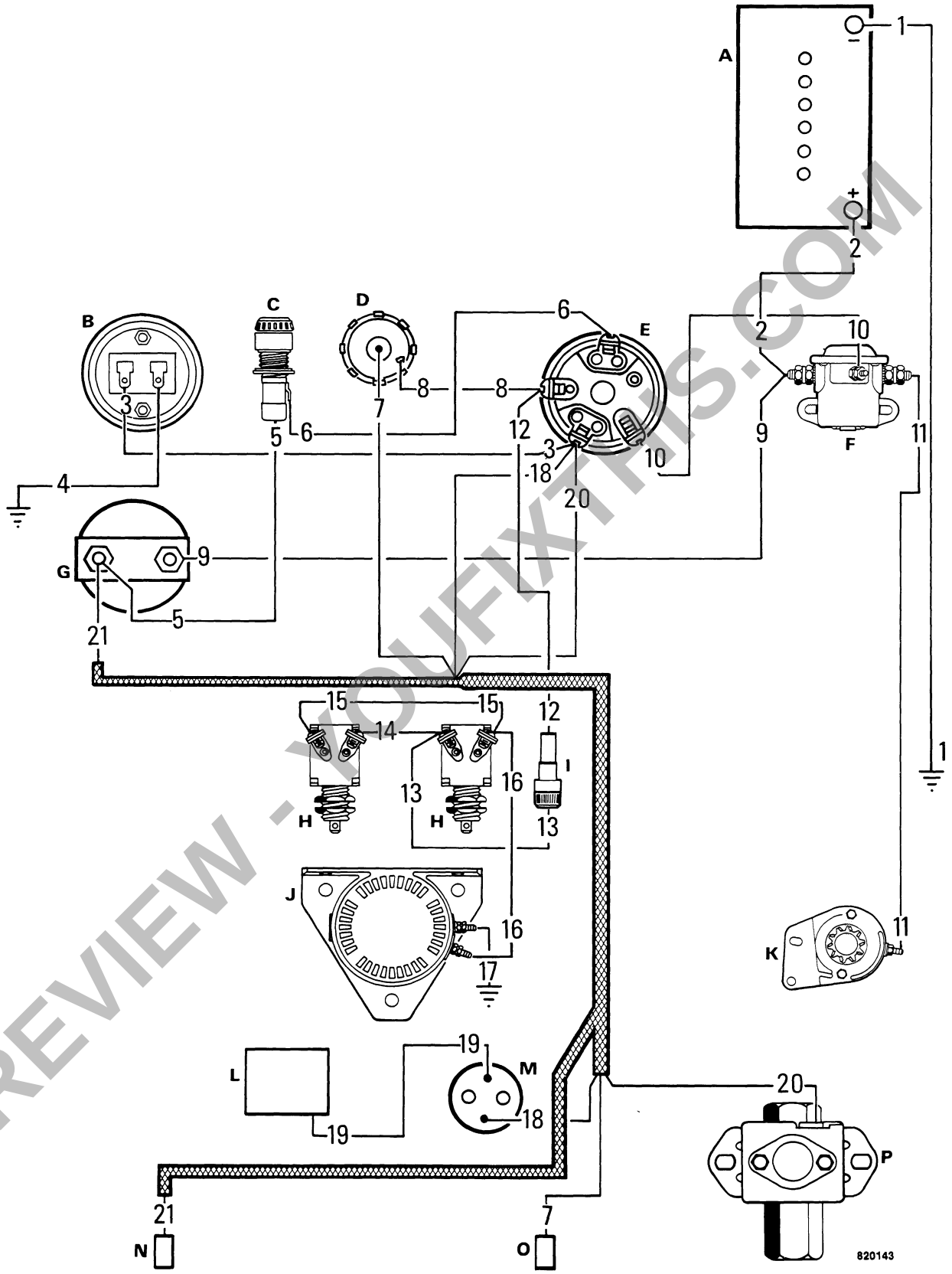


Figure 5 - Wiring Diagram (1816C)

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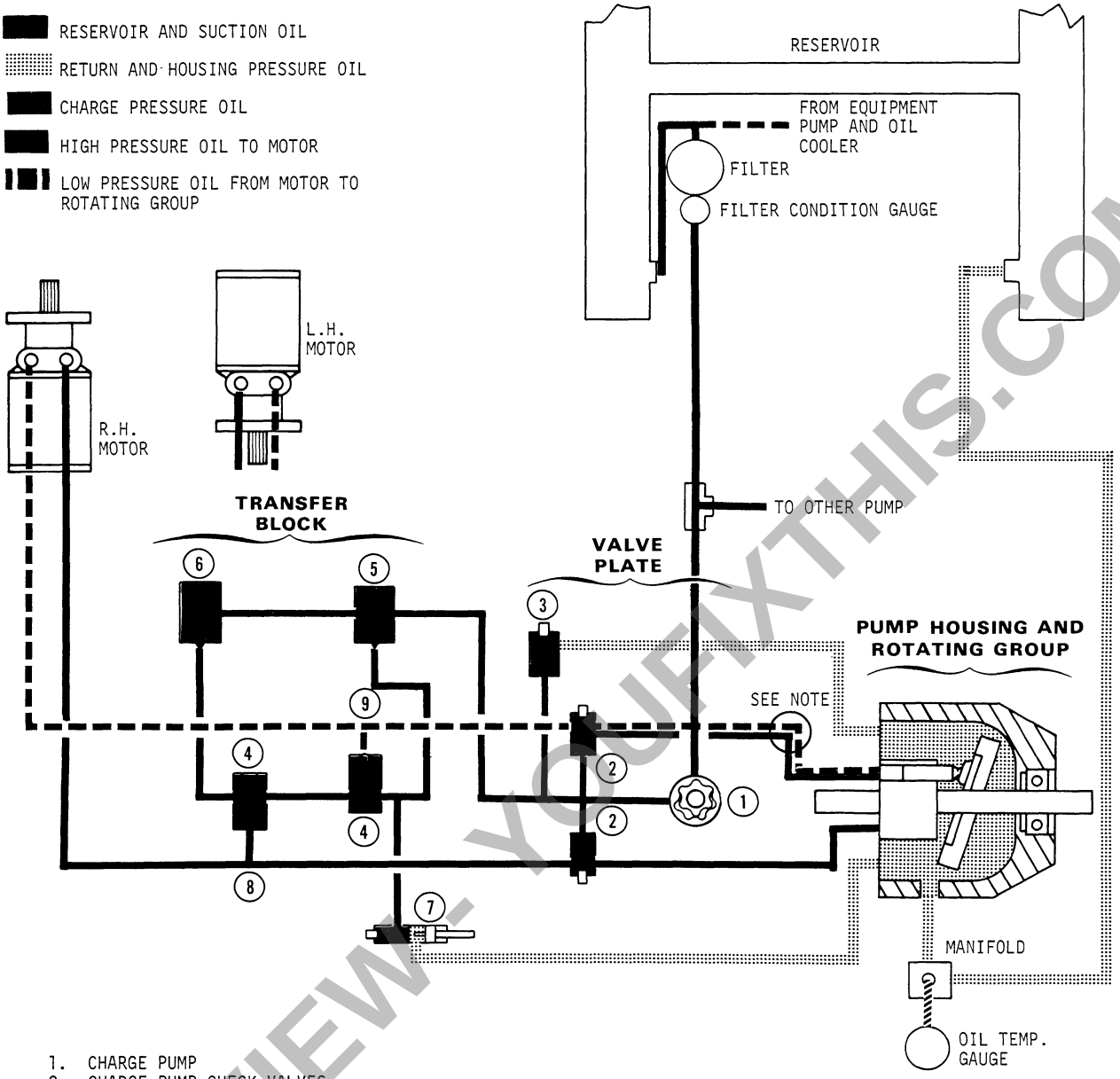
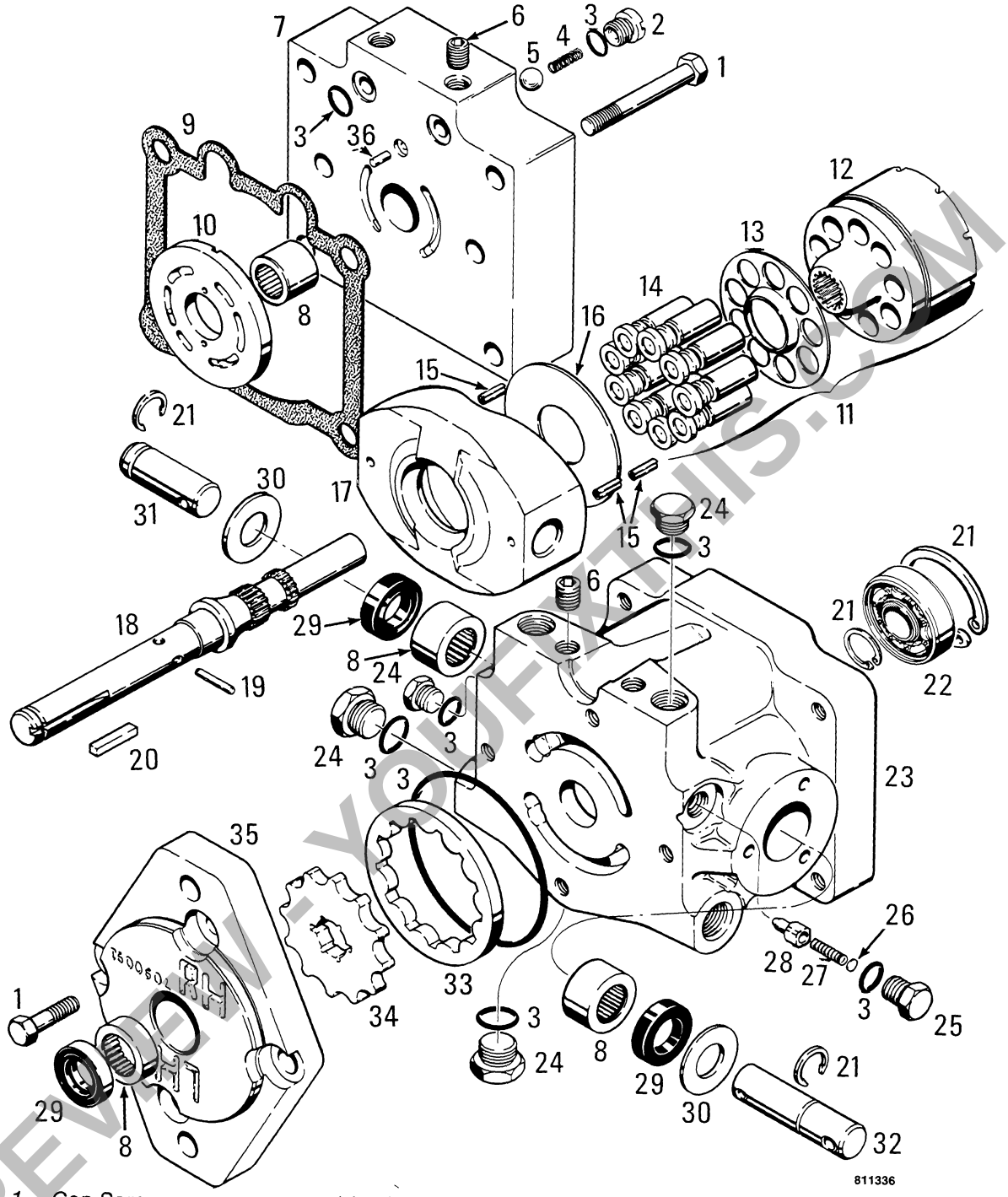


Figure 1 - Oil Flow, Left Side forward or Right Side Reverse

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1. Cap Screw
2. Slotted Plug
3. O-ring
4. Spring
5. Ball
6. Pipe Plug
7. End Cap
8. Needle Bearing
9. Gasket
10. Valve Plate
11. Rotating Group
12. Piston Block
13. Piston Guide
14. Pistons
15. Spirol Pin
16. Thrust Plate
17. Swash Plate
18. Pump Shaft
19. Drive Pin for the Charge Pump
20. Key
21. Snap Ring
22. Ball Bearing
23. Housing
24. Hex Head Plug
25. Relief Valve Plug
26. Shim (If Used)
27. Relief Valve Spring
28. Relief Valve Poppet
29. Seal
30. Special Washer
31. Short Trunnion
32. Long Trunnion
33. Gear Ring for the Charge Pump
34. Gear for the Charge Pump
35. Mounting Flange
36. Pin

Figure 141 - Piston Pump

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SAFETY RULES

This Symbol Shows Important Information About Safety In This Manual. When You See This Symbol, Carefully Read The Information That Follows and Understand The Possible Causes of Injury Or Death. 1-1-A

IMPORTANT: *To prevent injury on the job, follow the Warning, Caution, and Danger notes in this section and other sections throughout this manual. Follow the instructions carefully.*

The procedures recommended and shown in this manual are good, effective service methods. However, all possible procedures and service hazards may not be covered. Therefore, if you use a tool or procedure not recommended, you must make sure that the method you select is a safe method.

Put the warning tag shown below on the key for the key switch when you are servicing or repairing this machine. One warning tag is on every new machine. You can buy additional warning tags, part number 331-4614, from Service Parts Supply.

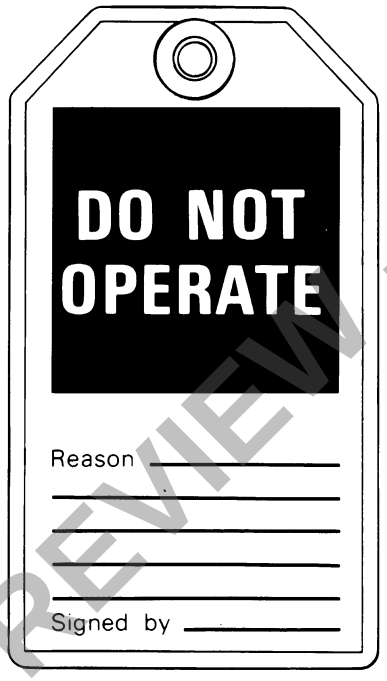


Figure 1

DANGER: *Engine exhaust fumes can cause death. If it is necessary to start the engine in a closed place, remove the exhaust fumes from the area with an exhaust pipe extension. If you do not have an exhaust pipe extension, open the doors and get outside air into the area.* *48-56*

WARNING: *Read operator's manual to familiarize yourself with control lever functions.* *46-27*

WARNING: *Operate tractor and equipment controls from the seat position only. Any other method could result in serious injury.* *48-55*

WARNING: *This is a one man machine, no riders allowed.* *35-8*

WARNING: *If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.* *45-3-A*

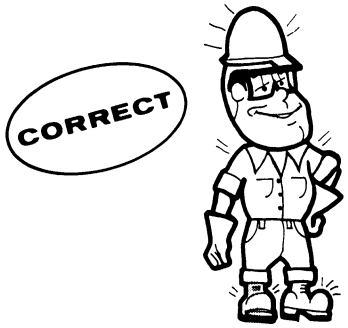


Figure 2

WARNING: *Operate controls from the operator's seat only.* *35-7*

WARNING: *When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution.* *35-4*

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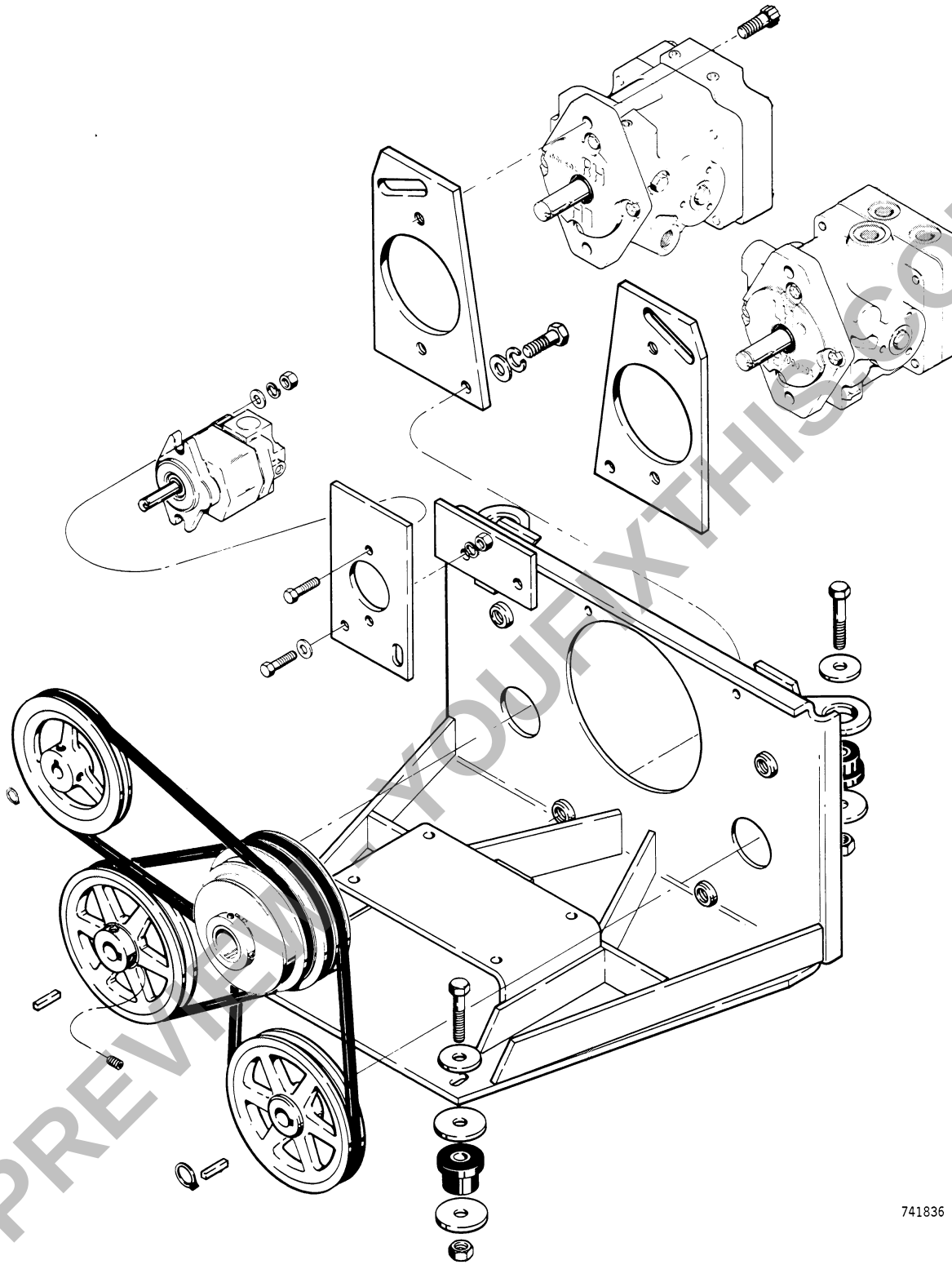


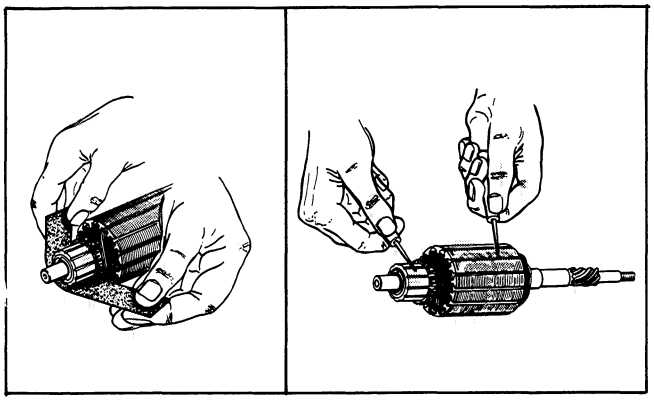
Figure 2 - Pump Installation, Late Production

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CHECK FIELD. Using a continuity light or ohm meter, check field by attaching one lead to each field coil connection. Continuity should exist between these two points. Check continuity between each field coil connection and the starter housing. No continuity should exist.

ARMATURE CHECK. If commutator bars are glazed or dirty they can be turned down in a lathe. While rotating, hold a strip of 00 sandpaper lightly on the commutator, moving it back and forth. (Do not use emery cloth). Recut grooves between commutator bars to a depth equal to the width of the insulators.



Using a continuity tester to make certain no continuity exists between the commutator (copper) and the iron of the armature, rotate armature and check out all commutator bars.

The armature can be thoroughly checked with a growler if available.

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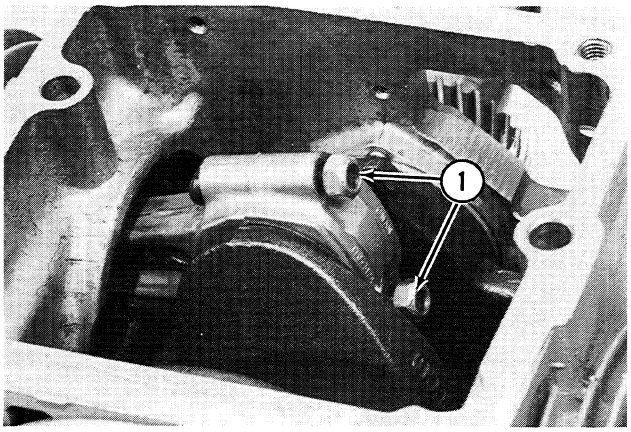
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ELECTRICAL CONTROL PANEL TROUBLESHOOTING FOR ELECTRICAL CONTROL PANEL, SERVICE PART NO. 730155.		
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
Electric Starter Does Not Crank Engine	Check to determine if crankshaft turns freely; if not, check for binding belts, pulleys, clutches, etc.	Relieve load on crankshaft. Disengage associated equipment clutches, belts or pulleys.
	Check battery connections for corrosion and/or breaks.	Correct problem.
	Weak or bad battery.	Replace or charge battery if less than 3/4 charged.
	Push button starter switch.	Replace if inoperative. See Service Instruction on preceding pages.
	Electric starter.	See troubleshooting chart.
	Panel wiring.	Correct problem.
Starter Cranks Engine But Engine Does Not Start	Toggle switch.	If inoperative, replace. See Service Instructions on preceding pages.
	Insure spade connectors are secured to appropriate switch terminals.	Correct. See Service Instructions on preceding pages. See "Engine Fails to Start"
Ammeter Does Not Show A Charge (If battery is fully charged, ammeter will not show a charge)	Weak or bad battery.	Charge or replace.
	Faulty wiring and/or connections.	Correct or replace.
	Shorted or open alternator.	Replace.
	Regulator-Rectifier.	Replace.
	Ammeter.	Replace if inoperable. See Service Instruction on preceding pages.
Ammeter Shows A Discharge.	Broken wiring and/or insulation.	Correct problem.
	Toggle switch.	Check and replace if inoperable. See Service Instructions on preceding pages.

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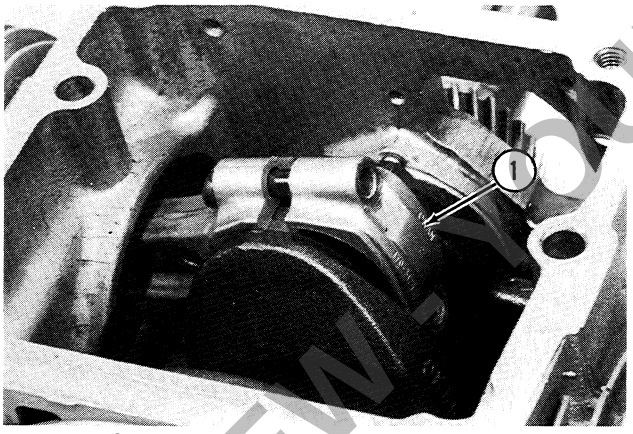
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86. Turn the engine block upside down on the bench. Turn the crankshaft as necessary to put number one connecting rod in the position shown in Figure 94. (Number one cylinder is the cylinder closest to the flywheel end of the engine.) Remove the self-locking nuts from the connecting rod bolts.



1. Self-Locking Nut Figure 94

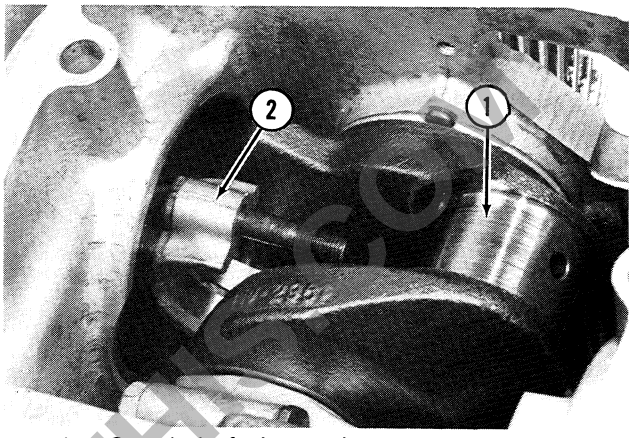
87. Remove the cap from the connecting rod.



1. Cap Figure 95

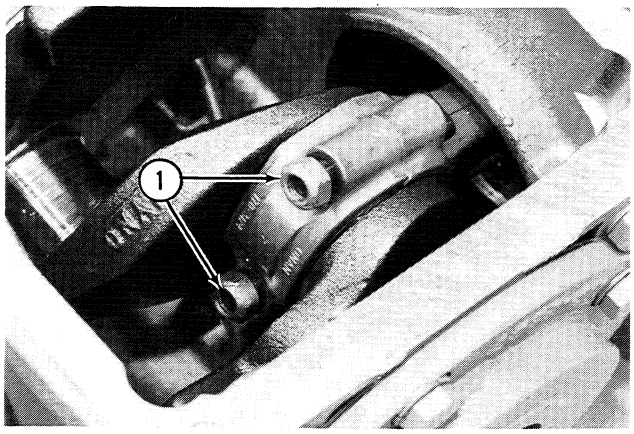
88. See Figure 96. Turn the crankshaft so that the crankshaft journal is away from the connecting rod. Use an acceptable tool, such as a hammer handle, to push the piston and connecting rod out of the cylinder. Be careful so that you do not damage the parts.

NOTE: *If the pistons and connecting rods are to be used again, be sure to keep the parts of each assembly together and install identification tags so that the parts can be installed in the same locations during assembly.*



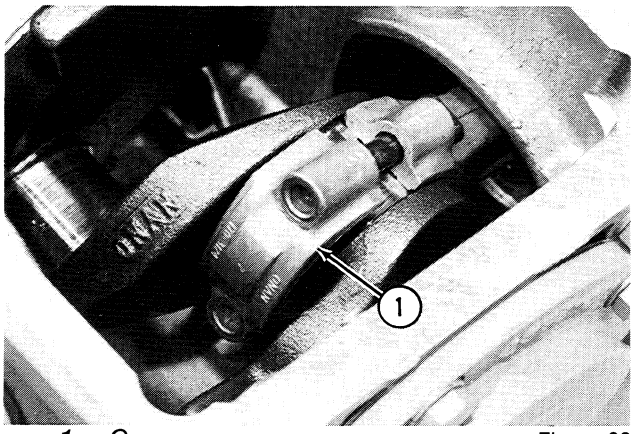
1. Crankshaft Journal
2. Connecting Rod Figure 96

89. Turn the crankshaft as necessary to put number two connecting rod in the position shown in Figure 97. Remove the self-locking nuts from the connecting rod bolts.



1. Self-Locking Nut Figure 97

90. Remove the cap from the connecting rod.



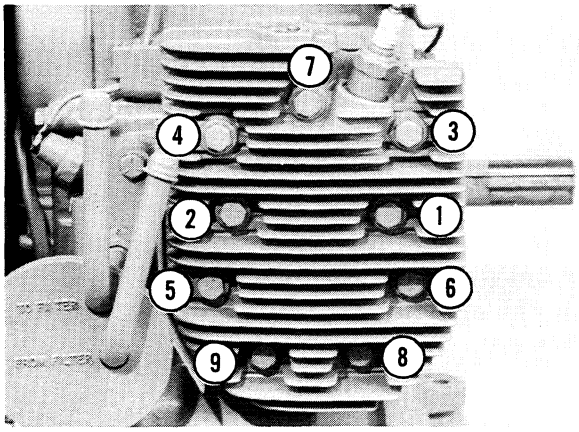
1. Cap Figure 98

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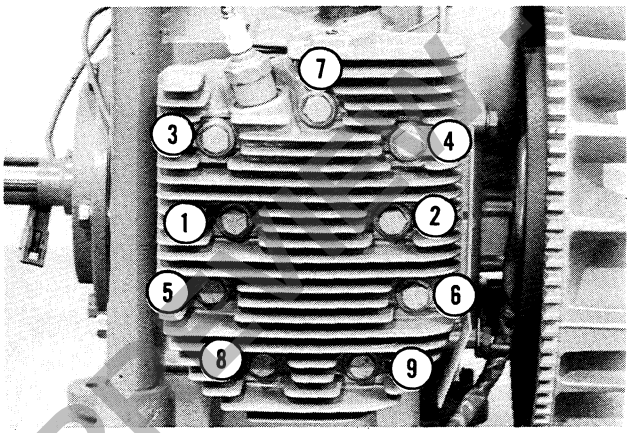
120. The procedure for tightening the cap screws must be followed exactly to prevent cylinder leakage. First, tighten the cap screws to a torque of 180 pound-inches (20.3 N m) according to the tightening sequence shown in Figure 274. After all the cap screws are tight, wait for five minutes. Then tighten all the cap screws again to a torque of 180 pound-inches (20.3 N m).

NOTE: *This procedure is for a cold engine. Do not try to install cylinder heads unless the engine is cold.*



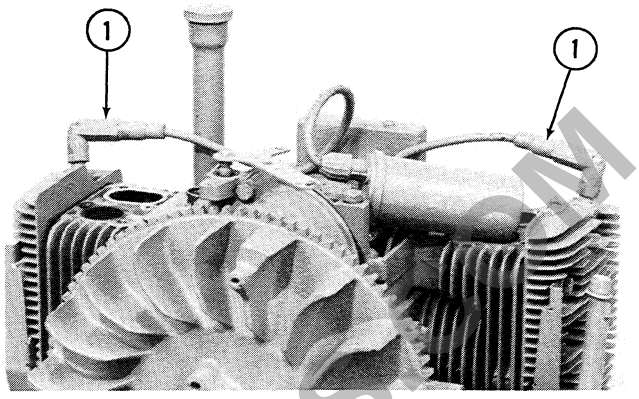
Tightening Sequence for Number Two Cylinder Head Figure 274

121. Repeat steps 118, 119, 120 to install the gasket and cylinder head on number one cylinder. Use the tightening sequence shown in Figure 275.



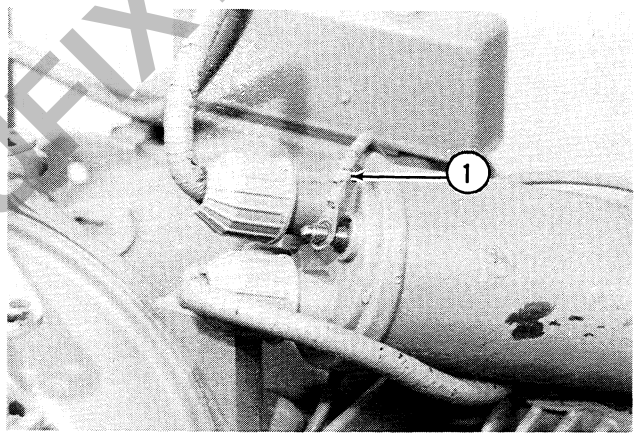
Tightening Sequence for Number One Cylinder Head Figure 275

122. Connect the spark plug wires to the spark plugs.



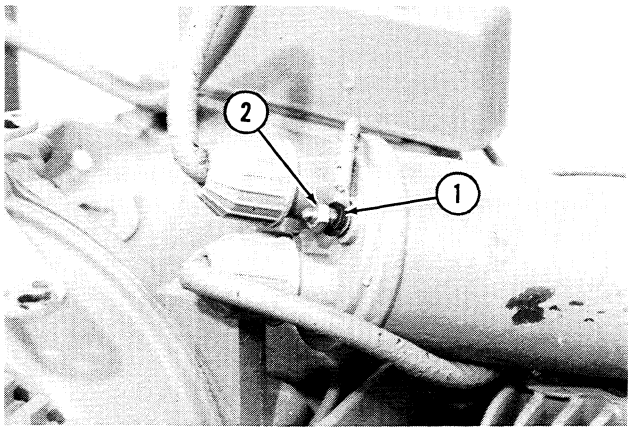
1. *Spark Plug Wires* Figure 276

123. Find the wire connected to the breaker box. Connect the opposite end of the wire to the front terminal (- terminal) of the ignition coil.



1. *Wire* Figure 277

124. Install the lock washer and nut on the front terminal.

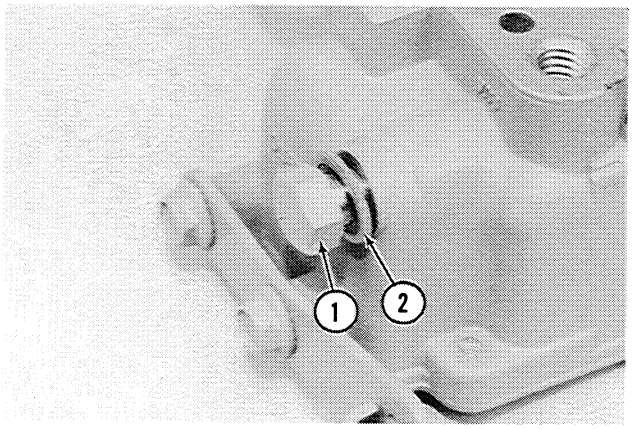


1. *Lock Washer* Figure 278
2. *Nut*

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29. Remove the plug and the gasket from the LH side of the carburetor body.



1. *Plug*
2. *Gasket*

Figure 45

30. Remove the gasket from the plug.

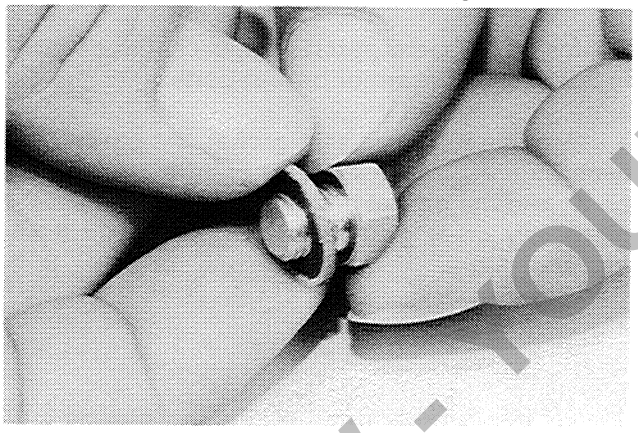
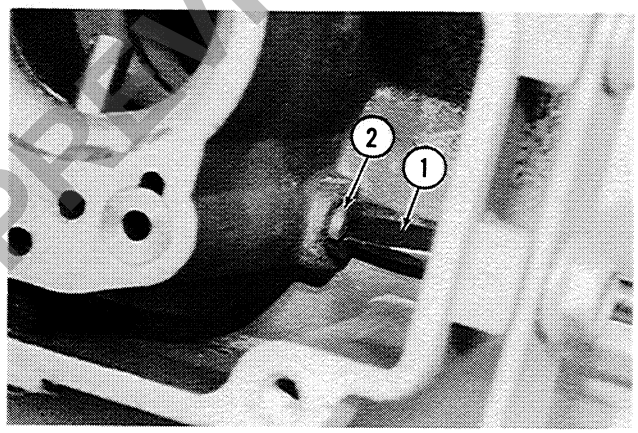


Figure 46

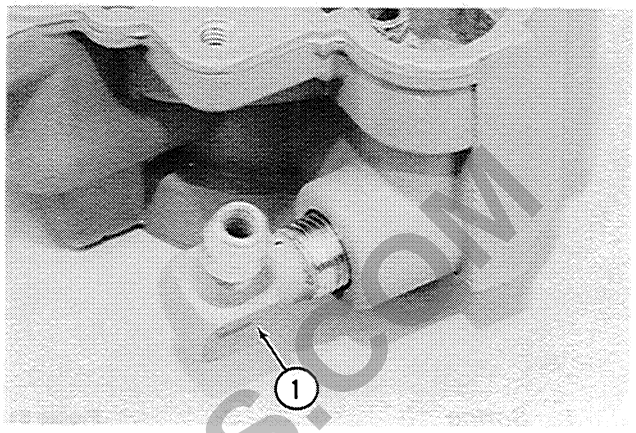
31. Put a screwdriver through the hole from which you removed the plug in step 29. Use the screwdriver to remove the jet from the carburetor body.



1. *Screwdriver*
2. *Jet*

Figure 47

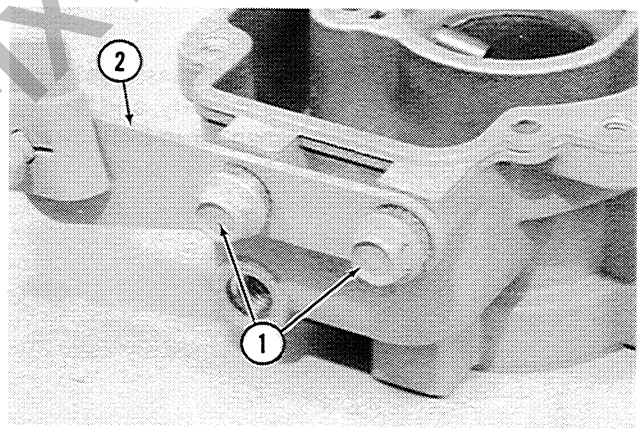
32. Remove the barb fitting from the LH side of the carburetor body.



1. *Barb Fitting*

Figure 48

33. Remove the two cap screws which fasten the choke cable bracket to the carburetor body. Remove the choke cable bracket.



1. *Cap Screw*
2. *Choke Cable Bracket*

Figure 49

34. Remove the idle mixture screw and the spring from the front of the carburetor body.

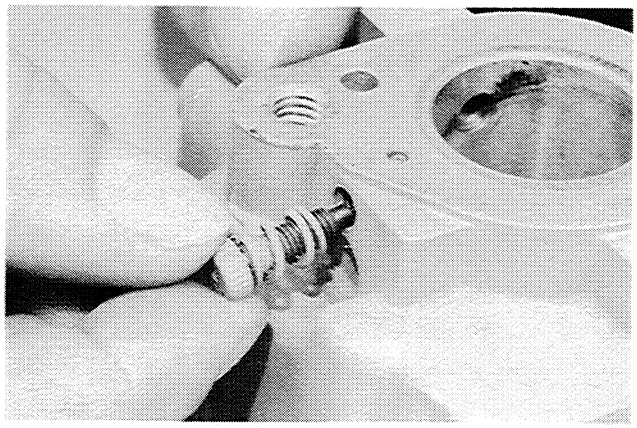


Figure 50

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7. Remove the positive brush assembly from the commutator end cap.

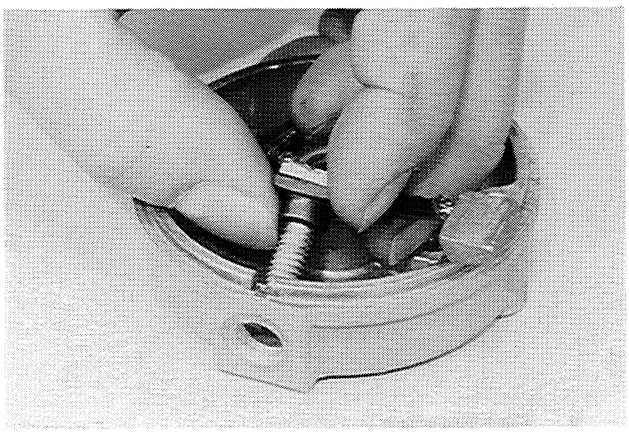
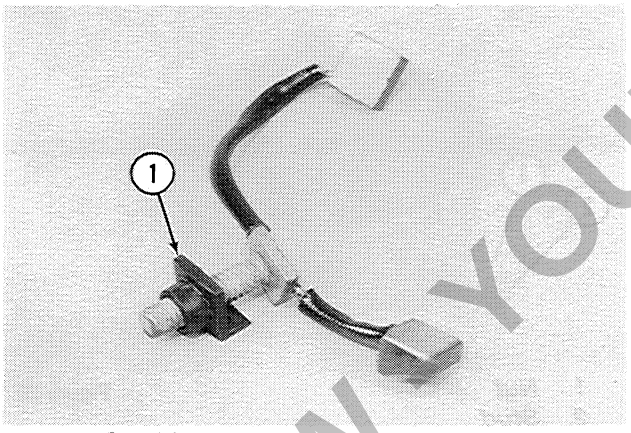


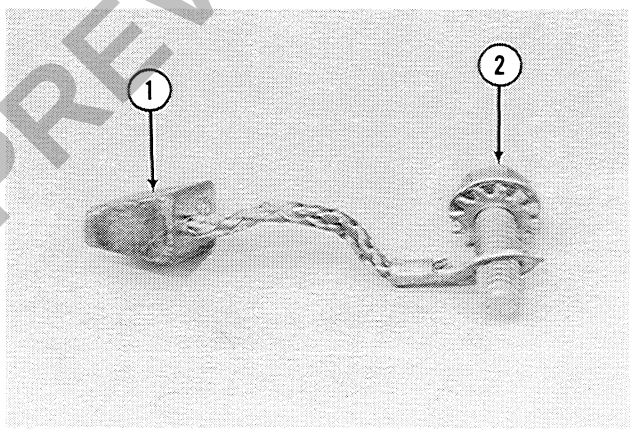
Figure 20

8. Remove the stud insulator from the positive brush assembly. Install the stud insulator on the new positive brush assembly.



1. Stud Insulator Figure 21

9. Remove the negative brushes from the flange head screws. Install new negative brushes on the flange head screws.



1. Negative Brush
2. Flange Head Screw Figure 22

10. Install the positive brush assembly in the commutator end cap.

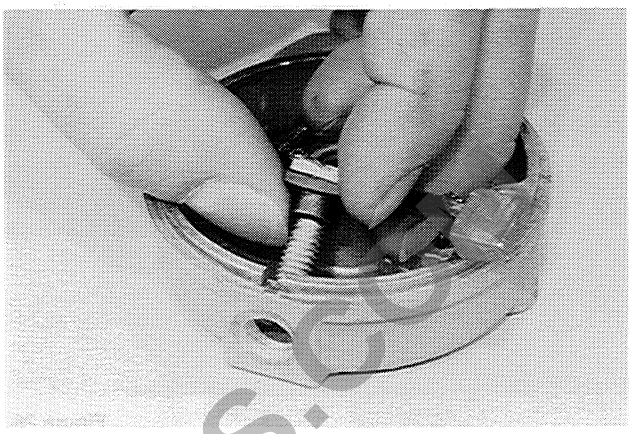


Figure 23

11. Put the brush holder in place in the commutator end cap.

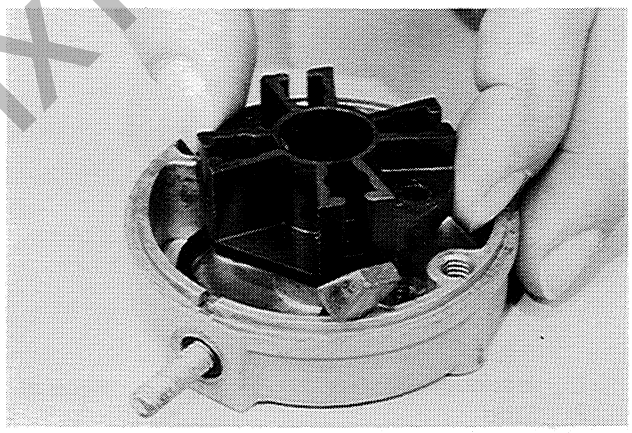
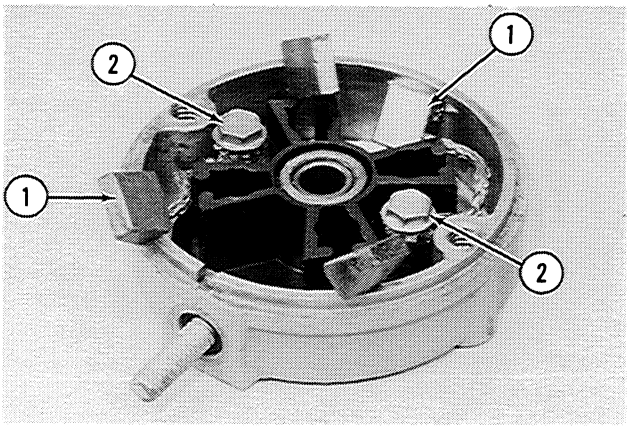


Figure 24

12. Install the negative brushes, the lock washers, and the flange head screws in the commutator end cap.



1. Negative Brushes
2. Flange Head Screws Figure 25

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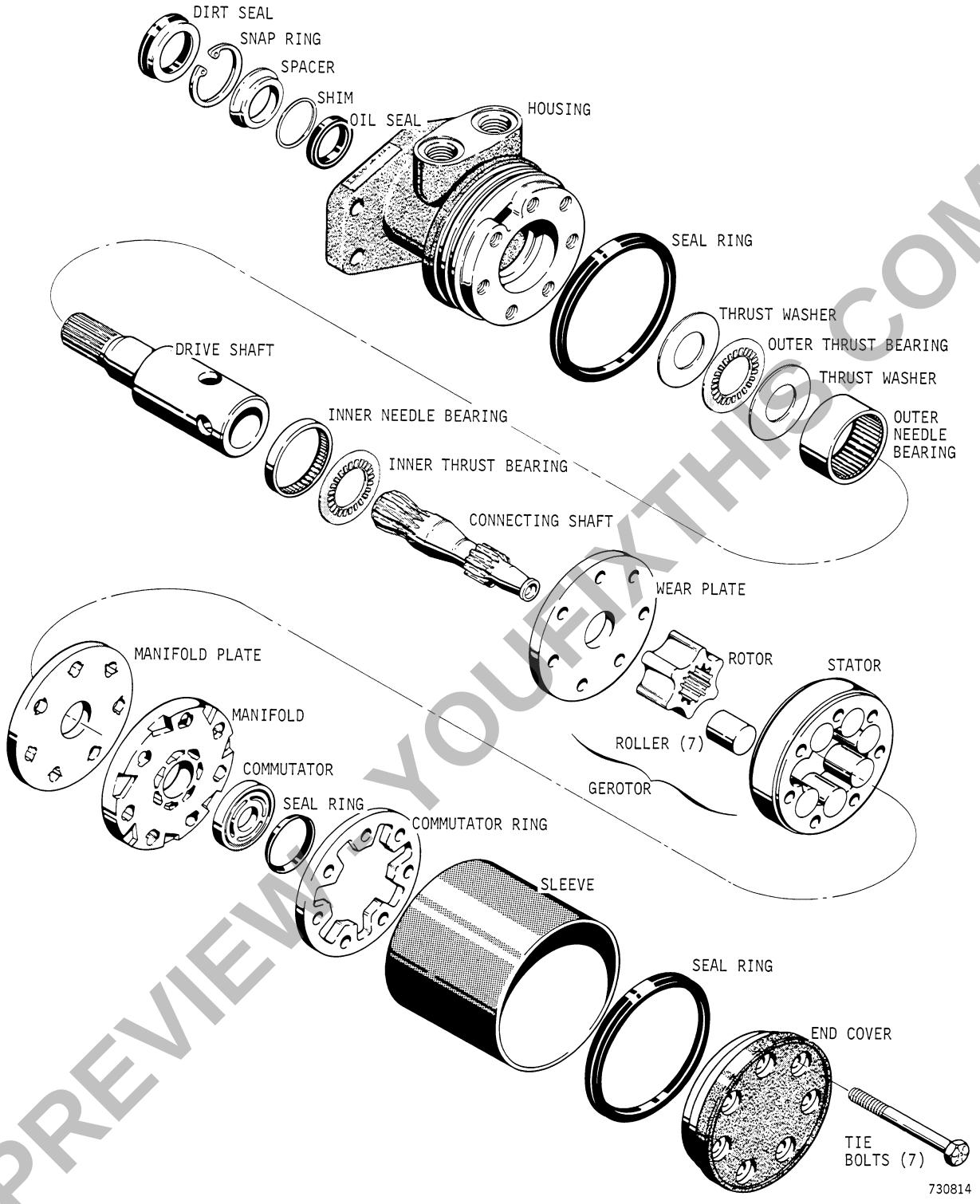


Figure 6 - Exploded View of Hydrostatic Motor

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37. Remove the snap ring from the bore in the housing.

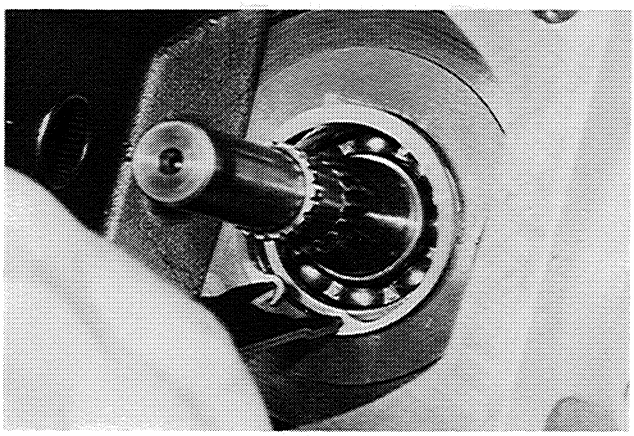


Figure 37

38. Remove the pump shaft and ball bearing assembly from the housing.

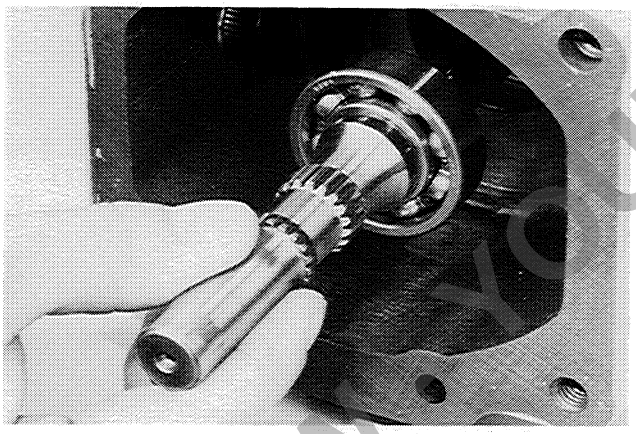


Figure 38

39. Remove the relief valve plug from the housing.

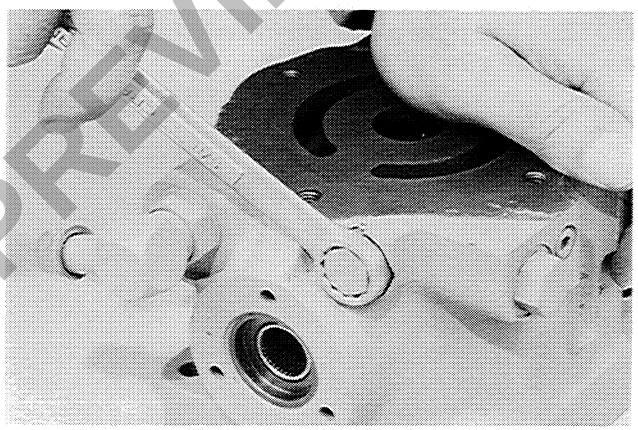


Figure 39

40. Remove the relief valve spring.



Figure 40

41. Remove the relief valve poppet.

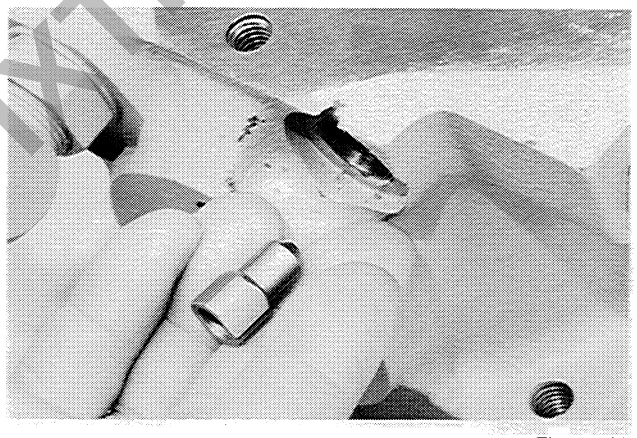
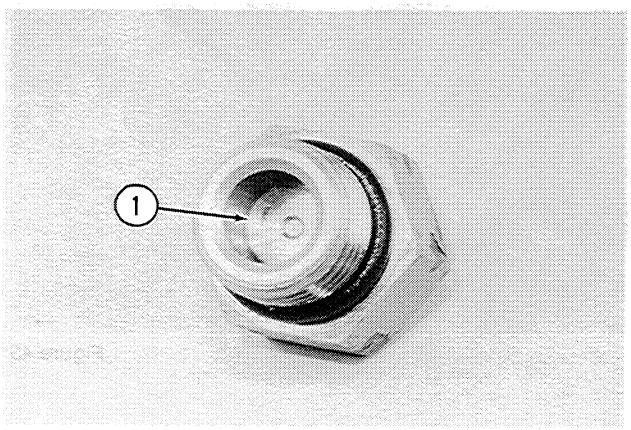


Figure 41

42. There can be shims inside the relief valve plug. If there are shims in the relief valve plug, make sure that you do not lose any of the shims. The same number of shims must be installed during assembly.



1. Shims

Figure 42

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12. Put numbers on the startor and the rollers as shown so that the parts can be matched in the same way during assembly.

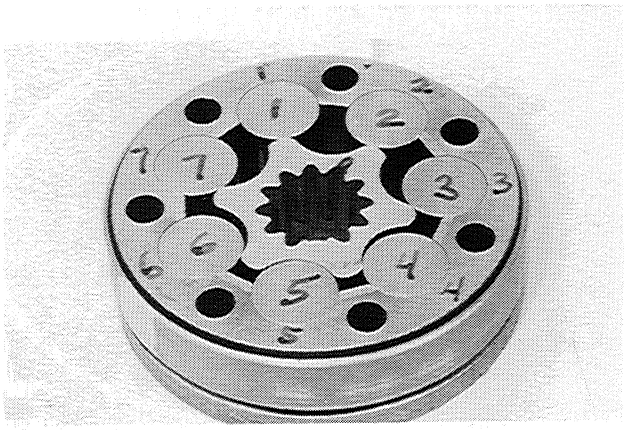


Figure 15

13. Check the clearance between the rotor and one of the rollers. To check this clearance, put the rotor in position so that one of the tips of the rotor is centered on one of the rollers. Push the rotor away from the roller as far as possible and use a feeler gauge to measure the clearance. If the clearance is larger than .015 inch (0.38 mm), it is recommended that a new gerotor be installed during assembly.

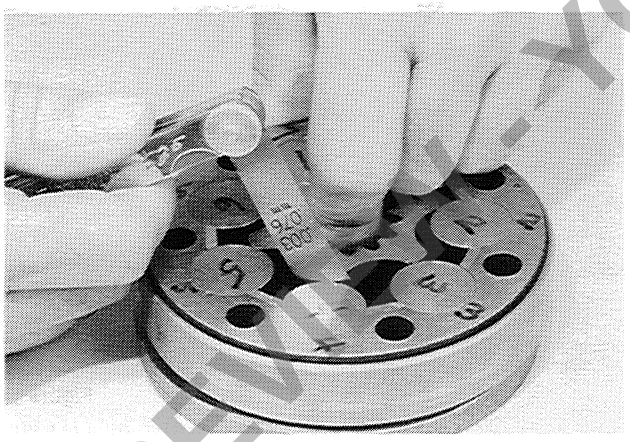


Figure 16

14. Remove the rotor from the stator.

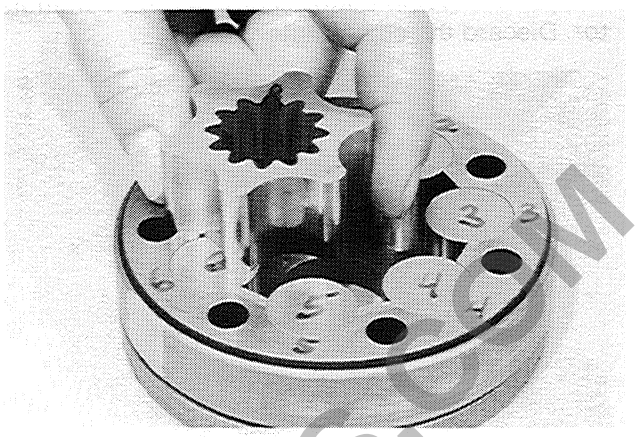


Figure 17

15. Remove the rollers from the stator.

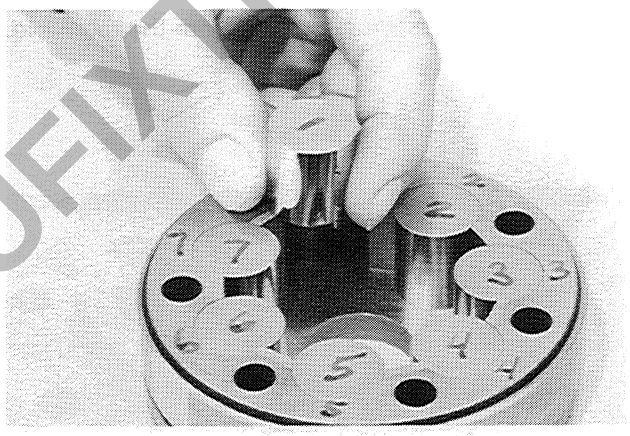


Figure 18

16. Slide the stator from the wear plate.

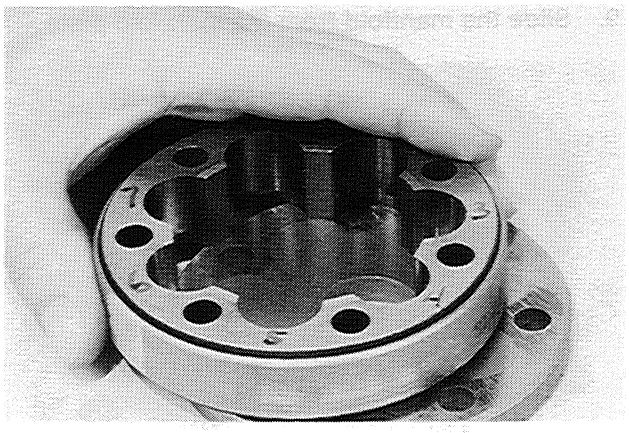
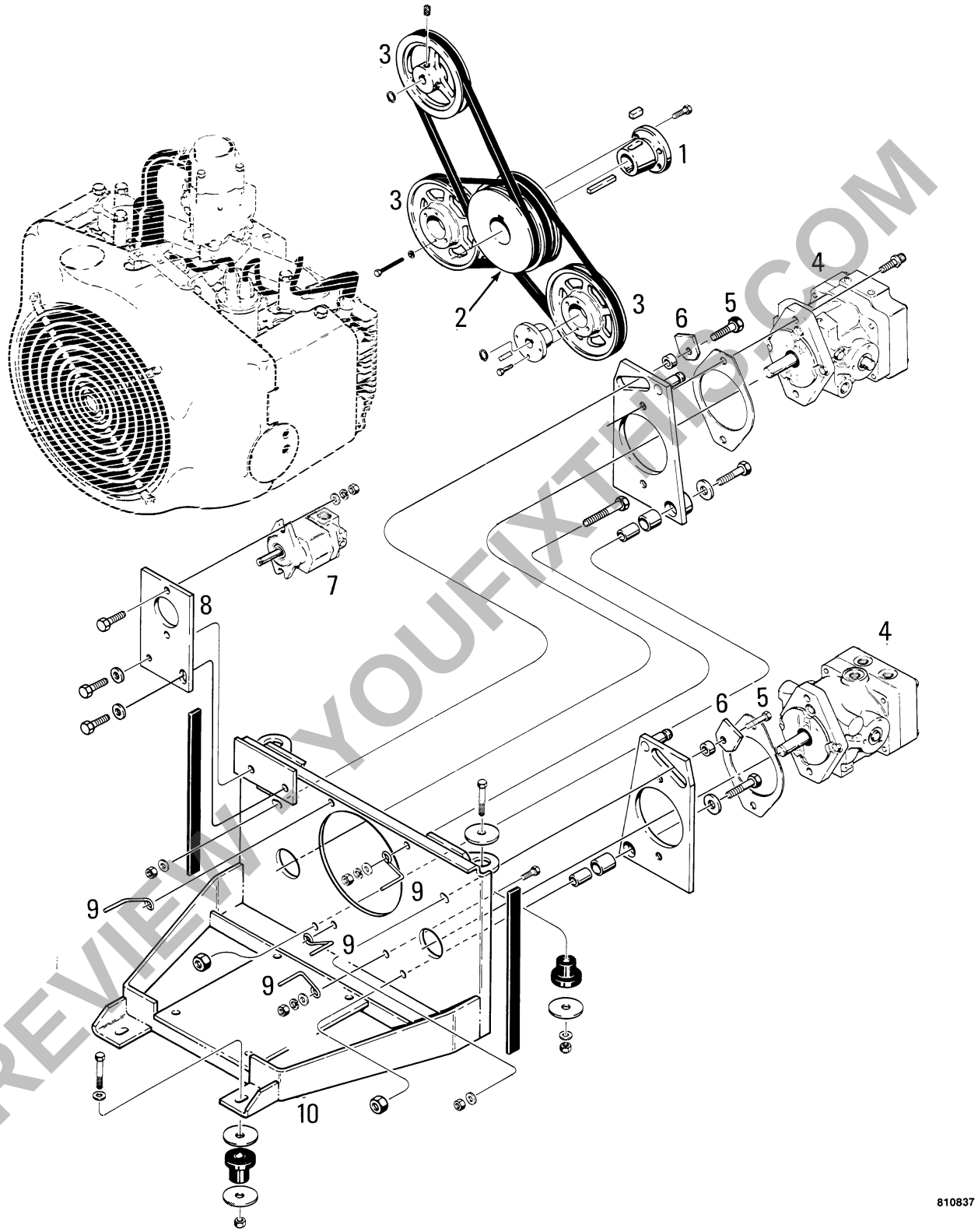


Figure 19

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1. *Split Tapered Bushing*
2. *Drive Sheave*
3. *Driven Sheave*
4. *Piston Pump*
5. *Adjusting Bolt*
6. *Wear Plate*
7. *Equipment Hydraulic Pump*
8. *Mounting Plate for Equipment Hydraulic Pump*
9. *Belt Guide*
10. *Engine and Pump Mounting Plate*

Figure 9 - Pump Mounting and Drive Belt Installation - 1816C

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15. If the temperature is less than 130° F (54° C), do the following procedure:

a. Run the engine at full throttle.

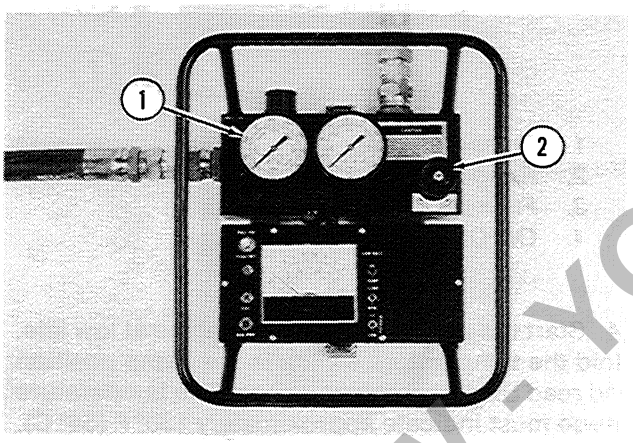
b. Turn the pressure valve for the flowmeter until the high pressure gauge indicates 800 psi (5516 kPa).

NOTE: *The pressure valve must never be completely closed during Test No. 1 because there is no relief valve in the circuit during this test.*

c. Hold the temperature switch in the Temp position.

d. Continue to turn the engine at full throttle until the temperature gauge indicates approximately 130° F (54° C).

e. Open the pressure valve completely. Decrease the engine speed to low idle.



1. *High Pressure Gauge*
2. *Pressure Valve*

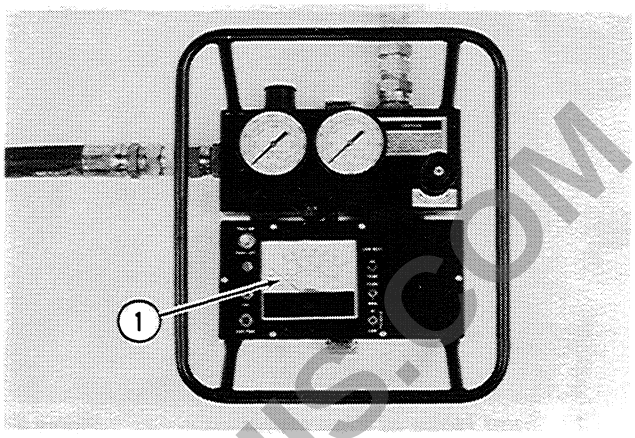
Figure 14

NOTE: *The temperature of the oil in the hydraulic system must be 130 - 150°* F (54 - 66° C) during the remainder of the test.

16. Make sure that the pressure valve is completely open.

17. Increase the engine speed to full throttle.

18. Read the indication on the flow gauge of the flowmeter and write the indication on the check sheet.



1. *Flow Gauge*

Figure 15

19. Continue to run the engine at full throttle. Slowly close the pressure valve until the high pressure gauge indicates 650 psi (4482 kPa). Read the indication on the flow gauge and write the indication on the check sheet.

NOTE: *The pressure valve must never be completely closed during Test No. 1 because there is no relief valve in the circuit during this test.*

20. Continue to run the engine at full throttle. Slowly close the pressure valve until the high pressure gauge indicates 1150 psi (7927 kPa). Read the indication on the flow gauge and write the indication on the check sheet.

NOTE: *The pressure valve must never be completely closed during Test No. 1 because there is no relief valve in the circuit during this test.*

21. Open the pressure valve, decrease the engine speed, and stop the engine.

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OPERATION

Oil Flow, Lift Spool Actuated

See Figure 2. The lift spool is moved into the equipment control valve. The following conditions occur:

a. The open center passage is closed.

b. With the open center passage closed, oil from the equipment pump flows to the A port of the lift spool. From the A port, oil flows to the rod ends of the lift cylinders, causing the loader frame to lower.

c. At the same time, the B port of the lift spool is open to the return passage. Oil which is pushed from the closed ends of the lift cylinders returns to the hydraulic reservoir.

When the lift spool is returned to the Neutral position, oil is held between the equipment control valve and the lift cylinders, preventing movement of the loader frame.

To raise the loader frame, the lift spool is moved out of the equipment control valve, and the oil flow is the reverse of the description given above.

Main Relief Valve

The main relief valve is at the inlet of the equipment control valve. The passage in the poppet seat connects the main relief valve to the open center passage.

When the cylinders are extended to the end of their travel or are prevented from moving for any reason when the spool is in a power position, the main relief valve opens to protect the hydraulic system from damage. When the main relief valve is open, oil from the equipment pump flows to the hydraulic reservoir.

1. See Figure 2. In this example the loader frame is completely lowered, and the spool is held in the power position.

2. With the open center passage closed and the cylinders prevented from moving, pressure in the open center passage increases immediately to the setting of the main relief valve.

3. This pressure in the open center passage pushes the poppet off the poppet seat.

4. Oil from the equipment pump then flows through the return passage and back to the hydraulic reservoir.

5. The main relief valve stays open until the spool is returned to the Neutral position.

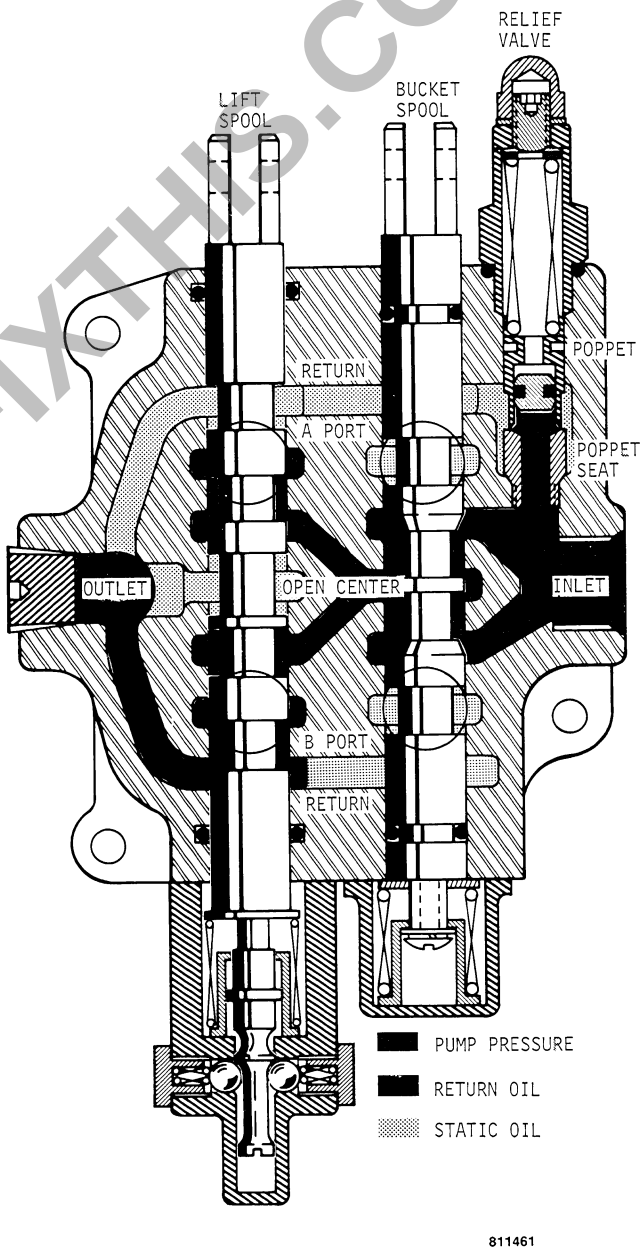
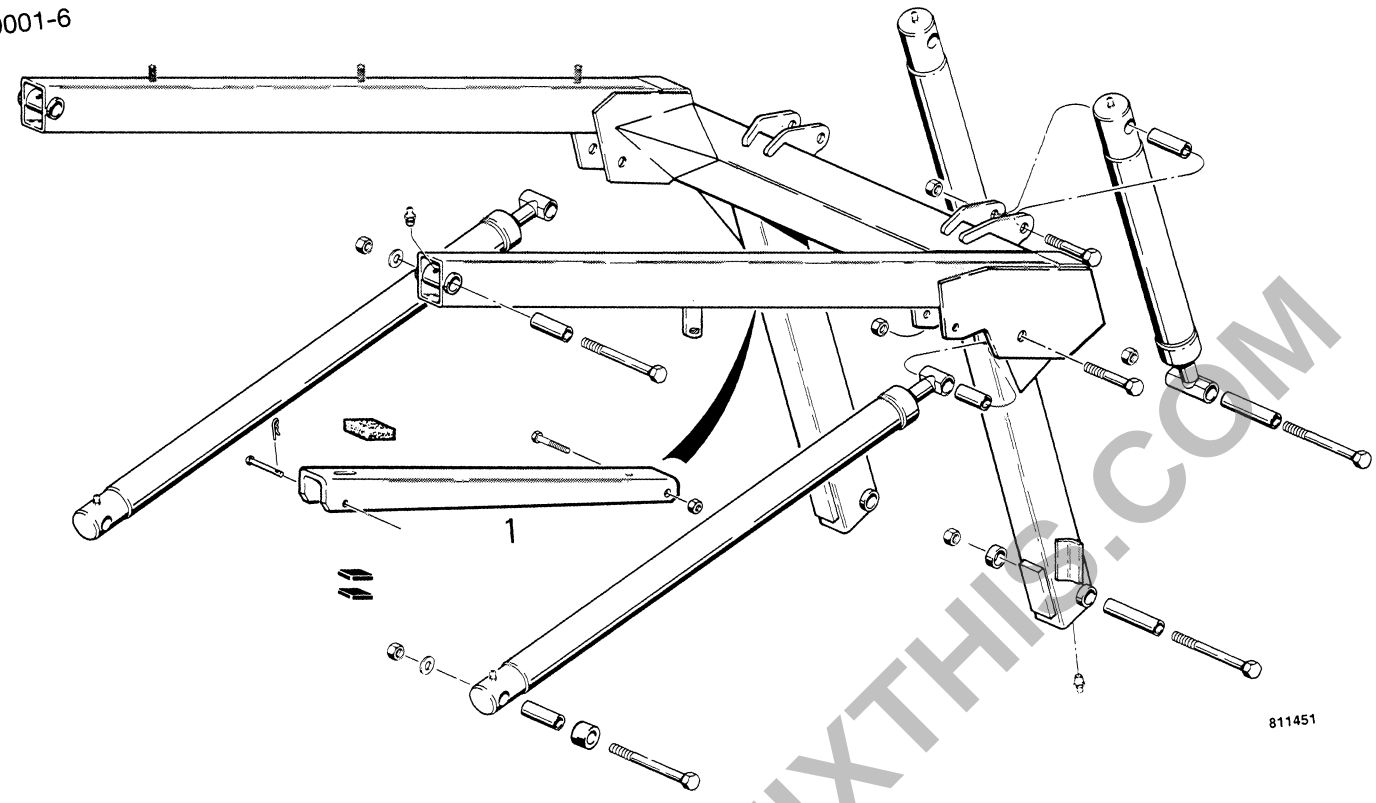


Figure 2 - Oil Flow, Lift Spool Actuated

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1. *Loader Strut*

Figure 11 - Loader Frame Installation - Late Production

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