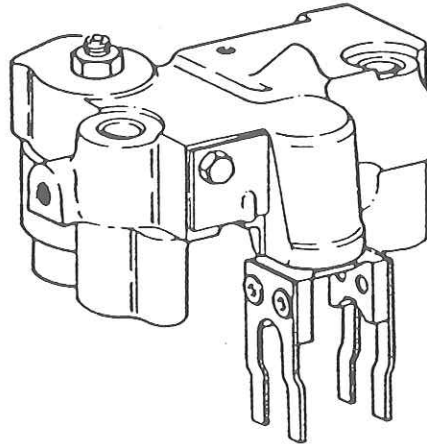




Installation Manual for Model 53A Engine Brake



The Model 53A *Jake Brake* engine retarder is designed for use on Detroit Diesel series 53 engines. This manual covers installation, disassembly and assembly instructions for the model 6V-53A *Jake Brake*.

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WARNING

**See *Jacobs Driver's Manual*
for proper engine brake
driver techniques**

The *Jake Brake* Retarder is a vehicle slowing device, not a vehicle stopping device. It is not a substitute for the service braking system. The vehicle's service brakes must be used to bring the vehicle to a complete stop.

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SAFETY PRECAUTIONS

The following symbols in this manual signal potentially dangerous conditions to the mechanic or equipment. Read this manual carefully. Know when these conditions can exist. Then take necessary steps to protect personnel as well as equipment.



This symbol warns of possible personal injury.



This symbol refers to possible equipment damage.

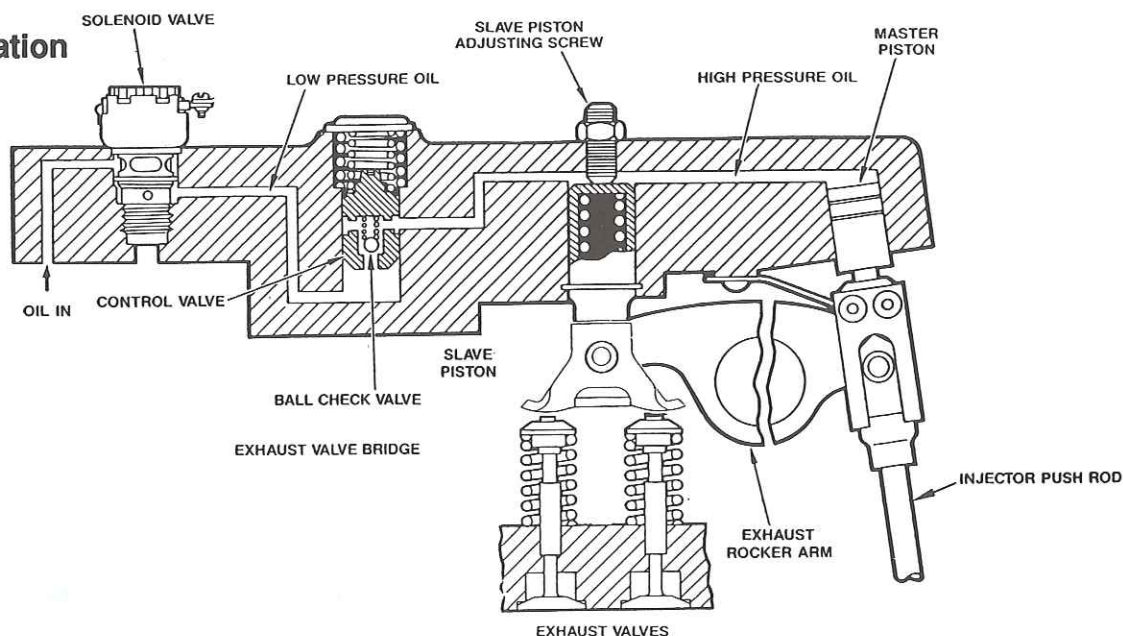
NOTE:

Indicates an operation, procedure or instruction that is important for correct service.

Fuels, electrical equipment, exhaust gases and moving engine parts present potential hazards that could result in personal injury. Take care when installing an engine brake. Always wear eye protection. Always use correct tools and proper procedures as outlined in this manual.

SECTION 1

Theory of Operation



THEORY OF OPERATION- Simply stated, energizing the EngineBrake effectly converts a power producing diesel engine into a power absorbing air compressor. this is accomplished through motion transfer using a master-slave piston arrangement which opens cylinder exhaust valves near the top of the normal compression stroke, releasing the compressed cylinder charge to exhaust.

The blowdown of compressed air to atmosphere prevents the return of energy to the engine piston on the expansion stroke, the effect being a net energy loss, since the work done in compressing the cylinder charge is not returned during the expansion process.

EXHAUST BLOWDOWN -Referring to the schematic diagram,exhaust blowdown occurs as follows:

1. The energized solenoid valve permits engine lube oil to flow under pressure through the control valve to both the master piston and the slave piston. Through a system of switches the solenoid valve operates only when the engine is in the no fuel condition.
2. Oil pressure causes the master piston assembly to move down, coming to rest on the injector rocker arm clevis.
3. The injector rocker arm clevis begins upward travel (as in normal injection cycle) forcing the master piston assembly upward and directing high pressure oil to the slave piston. The ball check valve in the control valve imprisons high pressure oil in the master - slave piston system.
4. High pressure oil causes the slave piston to move down, momentarily opening the exhaust valves, while the engine piston is near its top center position , releasing compressed cylinder air to the exhaust manifold.
5. Compressed air escapes to atmosphere completing a compression braking cycle.

SECTION 2

ENGINE PREPARATION

Remove valve rocker covers. Remove fuel inlet and outlet pipes.

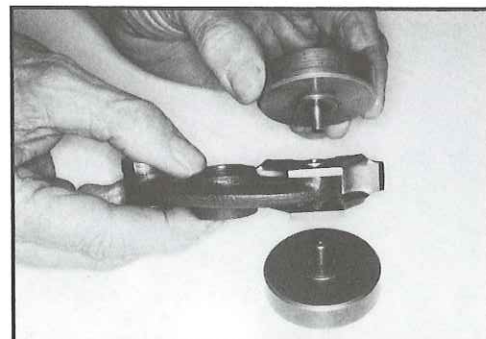
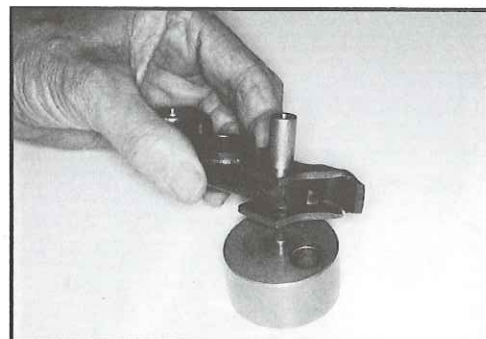
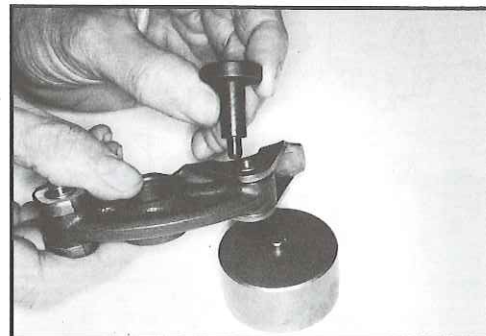
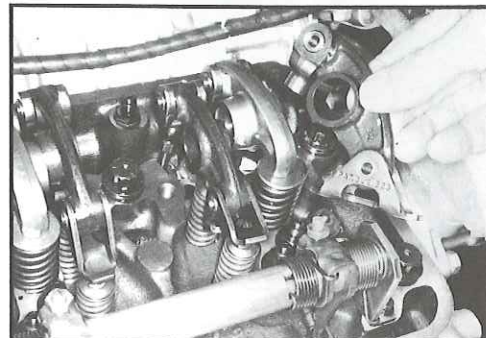
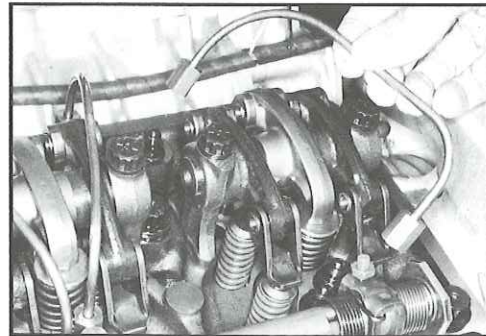
Disassemble the rocker shafts and pedestals. Loosen the locknut on the right hand pushrod (as viewed from the exhaust valve side) and remove the right hand rocker arm assembly.

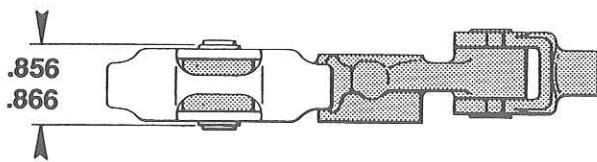
Jacobs Bridge and Pin Installation

Remove Detroit Diesel bridge from rocker by pressing out pin with *Jacobs* tools P/N 2874 and 2875.

With the rocker lever bushing in its original position, assemble *Jacobs* bridge and pin and Detroit Diesel rocker as shown. Tool P/N 2875 is used to establish the correct depth setting. Press the pin until it bottoms in the tool gauge bore.

Place one crimping die P/N 2873 into each end of the *Jacobs* pin as shown. Using an arbor press, apply an impact force of 2,000 lbs. to 2,300 lbs. If an hydraulic press is used, apply a steady load of 8,500 lbs. to 10,000 lbs.





After crimping, check for proper shear by measuring the pin crimp section as shown. The dimension must fall within the tolerance shown.

NOTE:

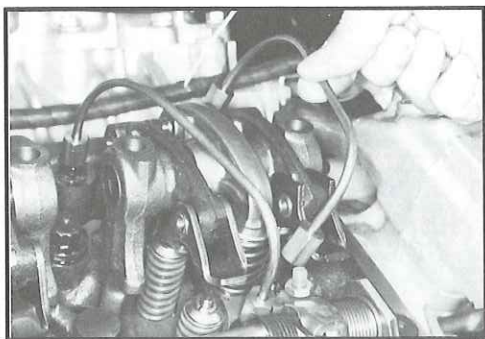
Bridges must operate freely before rocker assembly is reinstalled in engine.

Replace the rocker levers, pedestals, and rocker shafts.

Install *new* standard fuel pipes on left (outlet) side of each injector. Install *special* DDC fuel pipe P/N 8925651 on right (inlet) side of each injector. Fuel pipe P/N 8925651 is designed to provide clearance with the engine brake housing.

CAUTION:

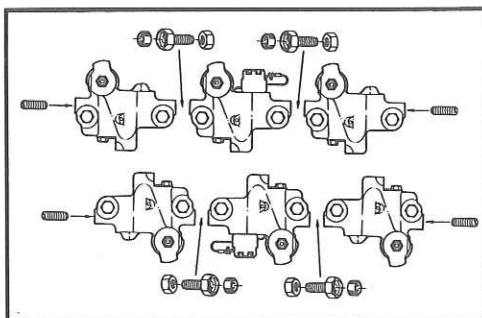
Do not reuse fuel pipes. Fuel leakage can occur and may cause engine damage. Whenever fuel pipes are removed, replace them with new pipes.



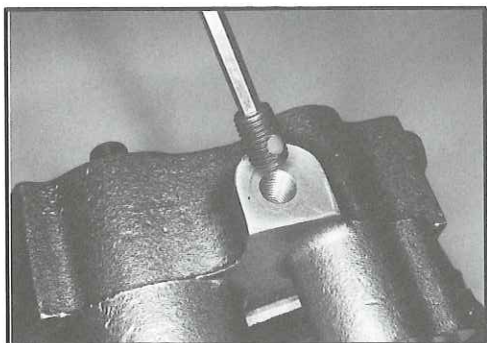
Use fuel pipe nut wrench Kent Moore P/N J-8932-01 and torque fuel pipe nuts to 120 lbin. (13.6 N·m). Failure to properly torque fuel pipe nuts may result in fuel leakage and engine damage.

SECTION 3

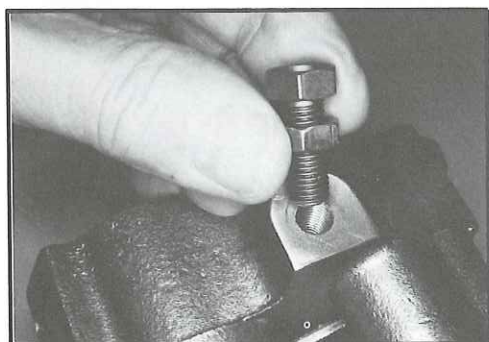
Installation and Adjustment of Brake Units



Brake arrangement for 6V-53 engine.

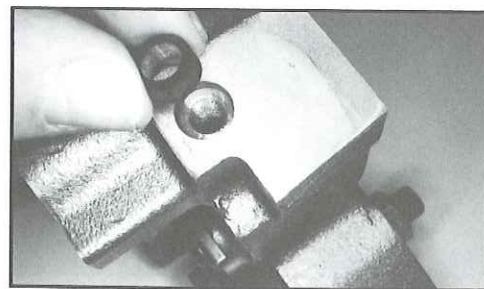


Insert and tighten plugs on outboard side of end units.

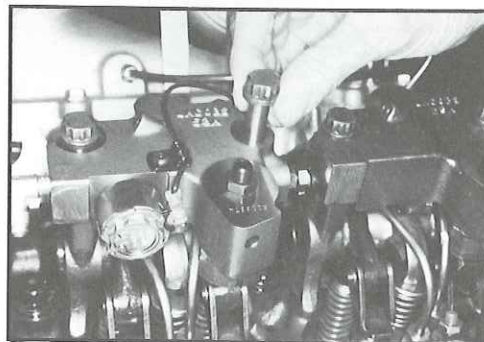


Insert oil connector screws and locknuts between units. Screw in about 1/2 in.

Insert rubber seal rings in each housing counterbore located between housings.



Check the elbow fitting on supply housings to be sure it is tight. Fitting should be tightened to the position shown in the photo to connect with the oil supply hose. Set engine brake in place over rocker arm shaft pedestals.

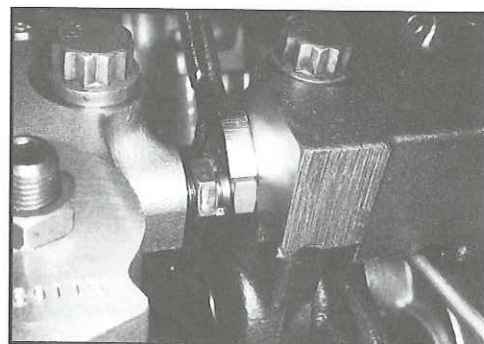


Tighten bolts to 55 lbft. (75 N·m).



After tightening bolts be sure there is clearance between the housings and the right hand fuel pipe. Failure to provide clearance will result in fuel pipe leakage and engine damage. If there is interference remove the housing and rebend the fuel pipe as instructed on page 4.

Reposition seal ring if necessary to insure proper fit into oil jumper. Back out oil jumper until contact is made with adjacent housing. Back off $1/6$ turn from contact to provide working clearance. Hold jumper in this position and tighten locknut.

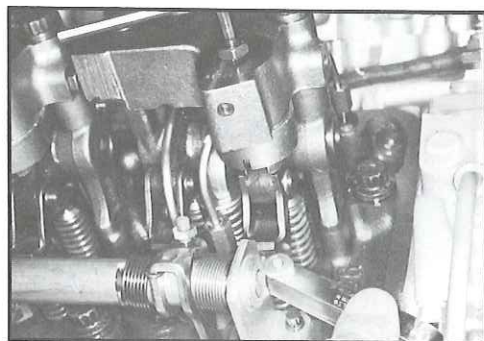


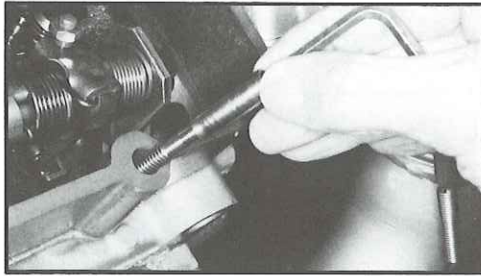
Valve and Injector adjustment

Adjust valves and injectors as outlined in Detroit Diesel publications.

Engine Brake Slave Piston Adjustment

With exhaust valves fully closed (injector spring fully depressed) insert a .002 in. feeler gauge between the exhaust valve bridge and both exhaust valve stems. Turn in the slave piston adjusting screw until a light drag is felt on the feeler gauge. Due to the difference in valve stem heights, the drag will be felt between the bridge and only *one* valve stem. From this position back out the adjusting screw $1 \frac{1}{2}$ turns. Tighten locknut to 18 lbft (24 N·m).

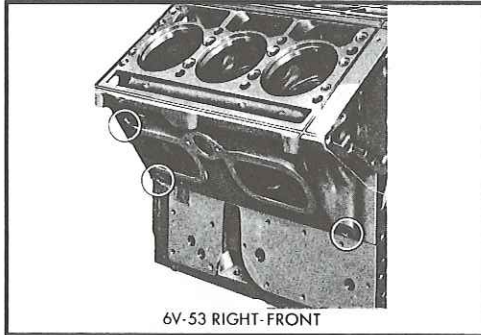




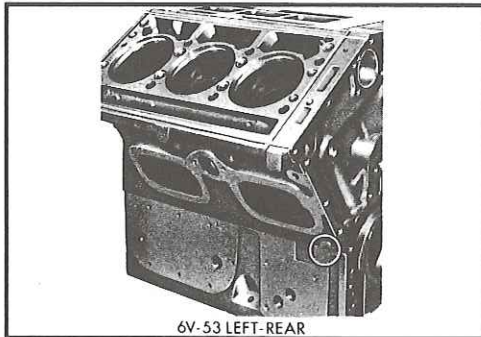
SECTION 4

Oil Supply And Spacer Installation

Install new gasket and *Jacobs* spacer using studs in counter-bored holes. Use hex wrench to tighten.



6V-53 RIGHT-FRONT



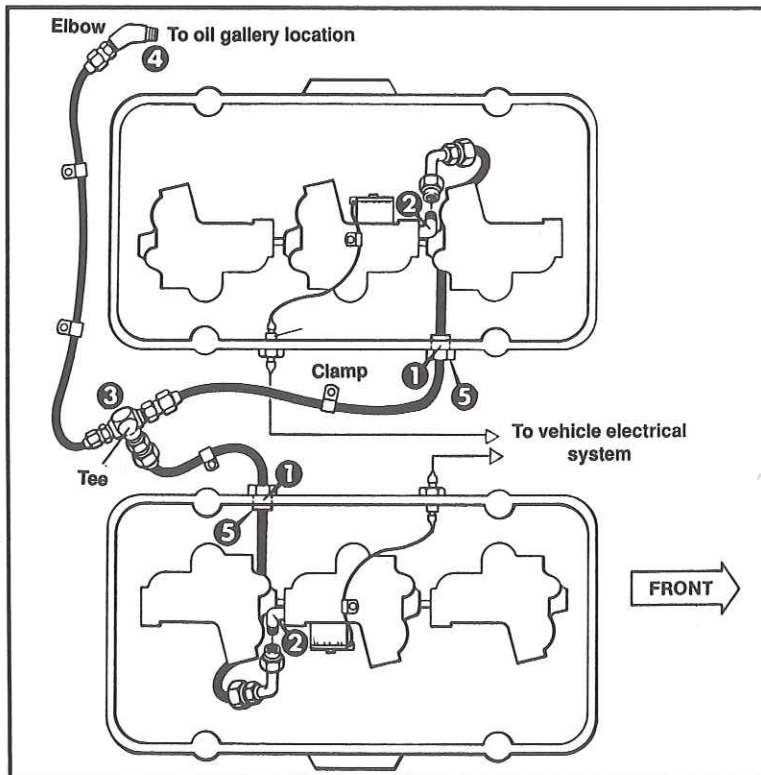
6V-53 LEFT-REAR

The 6V-53 cylinder block illustrations show the main oil gallery supply locations that are available for oil supply to the engine brake. Select one of these locations for connecting the *Jacobs* oil supply hose.



Brake operating oil pressure above 80 psi will cause bent exhaust valves. Check the maximum oil pressure at high idle engine speed at the selected location to be sure it is below 80 psi.

Insert elbow ends of hose assemblies through holes in *Jacobs* spacers (1) and connect elbows (2) to engine brake supply housings. Tighten the nylon nuts (5) to the spacer so that the hose is secured to the nut. Connect other ends of hose assemblies to *Jacobs* tee (3). Connect male end of hose assembly to tee (3). Connect female end of hose assembly to *Jacobs* elbow and connect to selected main oil gallery. Attach hose clamps at suitable locations to prevent hose vibration.



SECTION 5

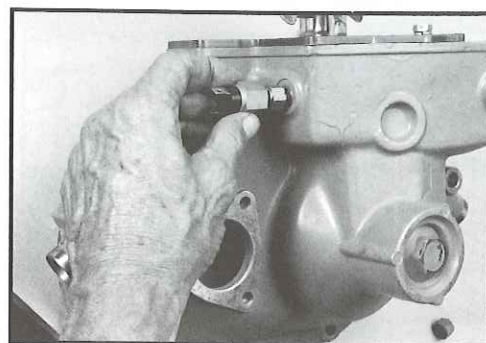
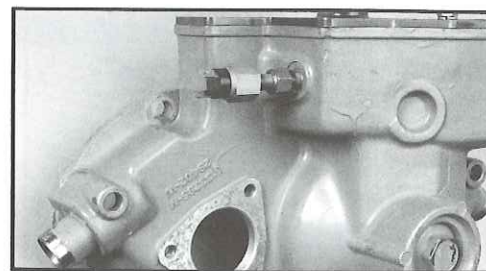
Buffer Switch Installation

1. Remove buffer screw assembly from governor housing.
2. Install the buffer screw locknut on the *Jacobs* buffer switch and install assembly into governor housing about one turn.
3. Start engine and allow to warm up. Observe the idle RPM and maximum no load RPM.
4. With the idle speed set, adjust the buffer switch as follows:
 - a. Turn the buffer screw in until it lightly contacts the connecting link and eliminates engine "roll".

NOTE:

Do not increase engine idle speed more than 15 RPM with the buffer switch.

- b. Hold switch in this position and tighten locknut.
 - c. Check maximum no load speed. If the increase is more than 25 RPM, back out the buffer switch until the increase is less than 25 RPM.
5. Shut down engine.



15 RPM MAX.
IDLE INCREASE



25 RPM MAX.
NO LOAD
INCREASE

SECTION 6

Housing Disassembly and Assembly

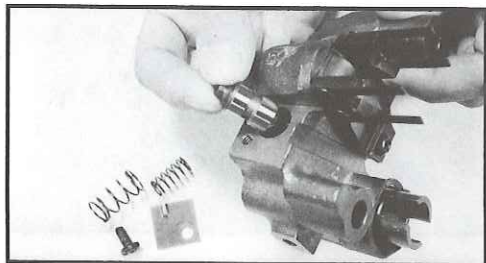
Control Valve

Remove hex head screw and cover at rear of housing.



Remove springs and control valve.

Replace parts by reversing removal procedure.



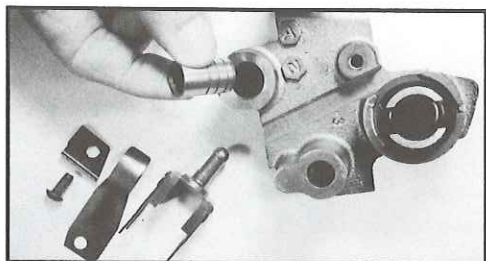
Master Piston Assembly

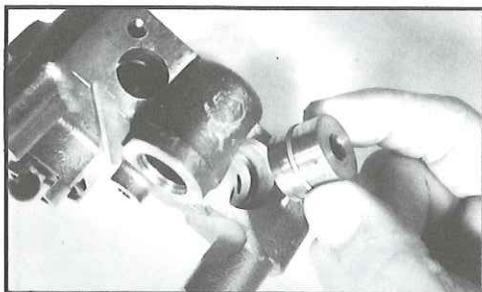
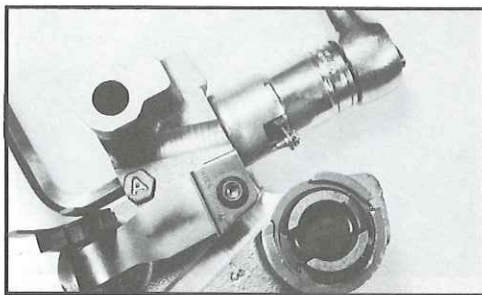
Remove button head screw from bottom of housing.

Remove retainer, flat spring, fork assembly and master piston from housing.

Replace parts by reversing removal procedure.

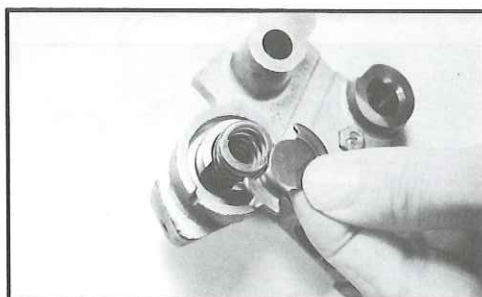
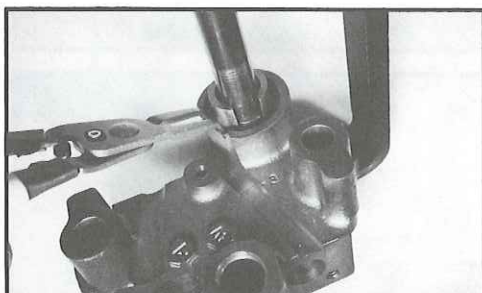
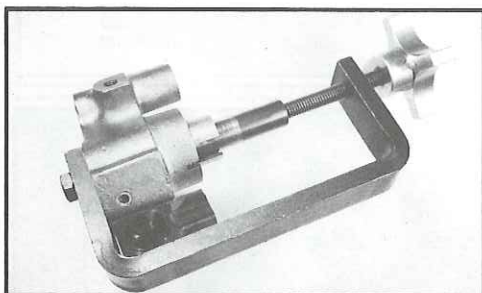
Retainer must be installed with the printing "this side out" facing out.





⚠ WARNING

Wear safety glasses. Remove slave piston carefully. The slave piston is retained by springs that are under heavy compression. If these instructions are not followed and proper tools not used, the spring could be discharged with enough force to cause personal injury.



Solenoid Valve

Remove solenoid lead wire and clamp from housing.

Hold the solenoid nut with a 3/8 in. hex wrench and remove the solenoid valve using a 7/8 in. socket wrench.

Remove and discard the three solenoid seal rings.

Remove the solenoid nut. Remove and discard the seal ring from the nut.

Reinstall the solenoid and nut using new seal rings.

Torque the solenoid to 5 lbft. (7 N·m).

Slave Piston

1. Remove the locknut from the slave piston adjusting screw . Back out the adjusting screw until the slave piston is fully retracted (screw is loose).
2. Place the hole in the *Jacobs* slave piston tool over the slave piston adjusting screw .
3. Turn the handle slowly until the retainer is depressed about 0.040" (1 mm) relieving pressure against the retaining ring.
4. Remove the retaining ring with retaining ring pliers. Back out the holder until the springs are loose. Remove the tool.
5. Remove all components, ensuring there is no binding or burrs. Clean in an approved cleaning solvent, or replace as necessary.
6. Use clamp fixture to reinstall piston and springs. Be sure retaining ring is placed on the retainer before screwing the clampholder down over the slave piston.

NOTE:

Be sure components are reassembled in proper order.

7. Compress the slave piston spring down until the retainer is about 0.040 in. (1mm) below the retaining ring groove. Reinstall the retaining ring. Be sure the retaining ring is fully seated in the groove. Retaining ring opening must be located at large slot in housing.
8. Remove the clamp fixture slowly to insure proper seating of retaining ring.
9. Assemble adjusting screw and nut; do not tighten.