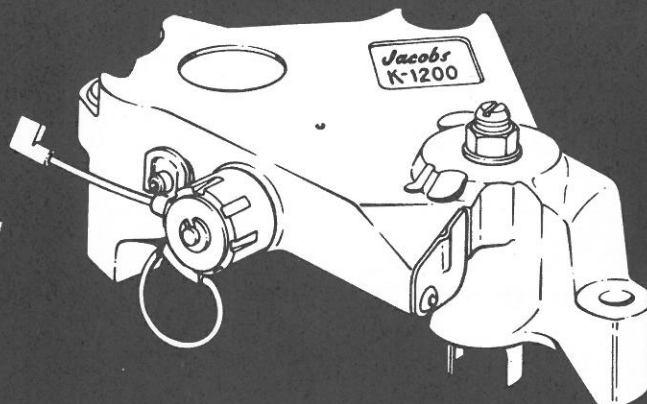


Installation Manual for

**Jacobs®
ENGINE
BRAKE**

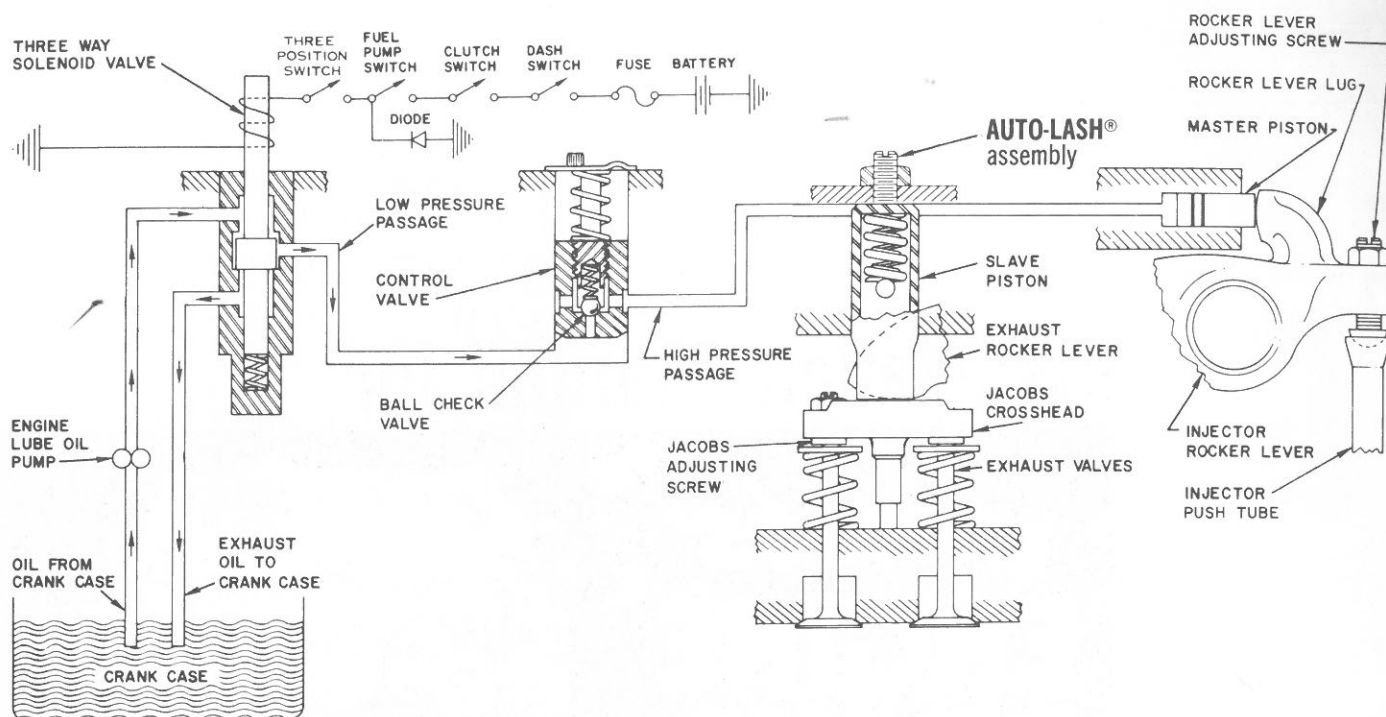


Model K-1200

- THE MODEL K-1200 JACOBS ENGINE BRAKE IS DESIGNED FOR USE ON THE FOLLOWING CUMMINS ENGINE MODELS:
KT-450, KTC-450, KTA-600, KTA-525 PTD
- THE MODEL K-1200 SUPERSEDES THE FORMER MODELS K-200 AND K-1150 ENGINE BRAKES. THE JACOBS INSTALLATION MANUAL PART NO. 007701 COVERS THE FORMER MODELS.
- KT-450 AND KTC-450 ENGINES WILL REQUIRE PN 009606 SPACER GROUP OPTION.
- JACOBS SERVICE LETTERS SHOULD BE CONSULTED FOR ADDITIONAL CURRENT APPLICATION INFORMATION.
- SPECIAL BRAKE TOOLS ARE NEEDED TO INSTALL AND ADJUST THE MODEL K-1200 ENGINE BRAKE. COMPLETE INFORMATION IS AVAILABLE THROUGH YOUR JACOBS DISTRIBUTOR.



The Jacobs Manufacturing Company
Vehicle Equipment Division
Bloomfield, CT 06002 U.S.A.



SCHEMATIC DIAGRAM OF ENGINE BRAKE OPERATION

THEORY OF OPERATION — Simply stated, energizing the Engine Brake effectively converts a power producing diesel engine into a power absorbing air compressor. This is accomplished when desired by motion transfer through 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 atmospheric pressure 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 drawing, exhaust blowdown occurs as follows:

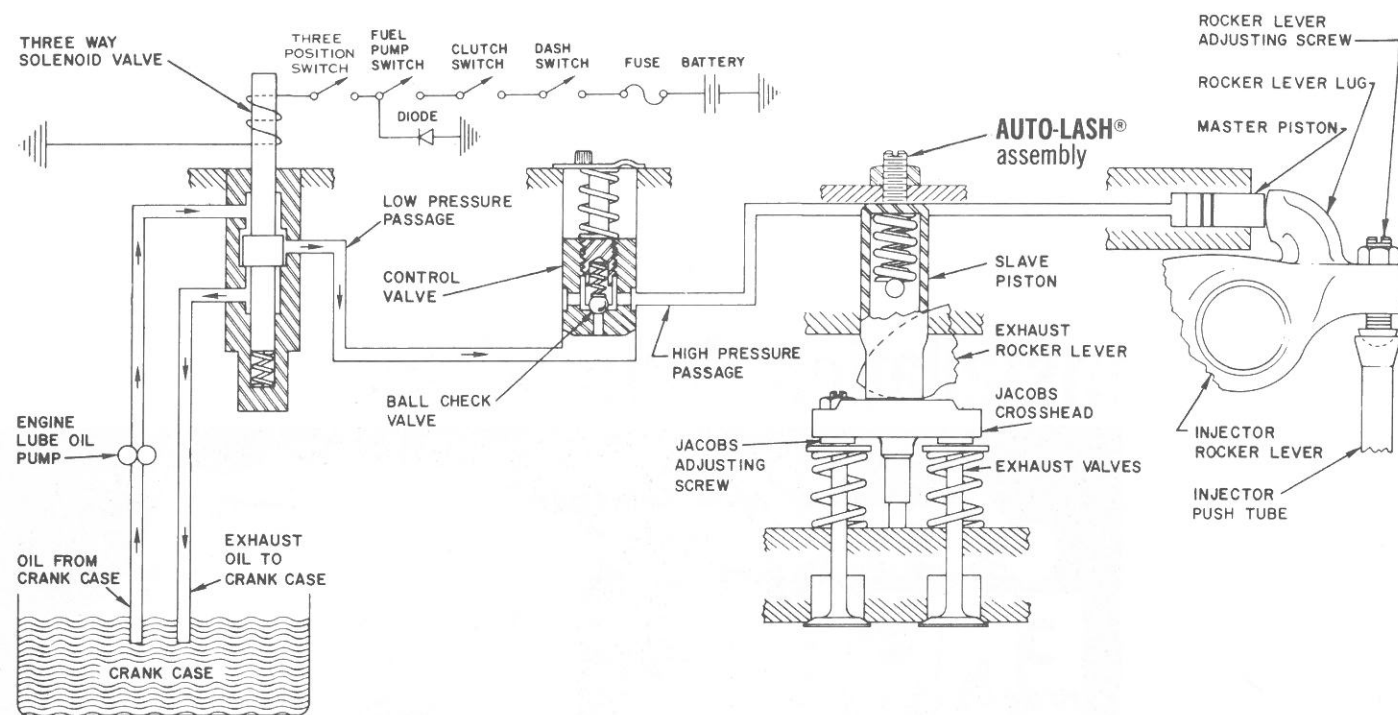
1. Energizing the solenoid valve permits engine lube oil to flow under pressure through the control valve to both the master piston and the slave piston.
2. Oil pressure causes the master piston to move out and follow the motion of the injector rocker lever lug.
3. The injector rocker lever begins upward travel (as in normal injection cycle) forcing the master piston in and creating a high pressure oil flow to the slave piston. The ball check valve in the control valve imprisons high pressure oil in the master-slave piston circuit.
4. The slave piston under the influence of the high pressure oil flow moves down, momentarily opening the exhaust valve, while the engine piston is near its top dead center position, releasing compressed cylinder air to the exhaust manifold.
5. Compressed air escapes to atmosphere completing a compression braking cycle.

METHOD OF DRIVING A VEHICLE EQUIPPED WITH A JACOBS ENGINE BRAKE

The proper method of driving a vehicle equipped with a Jacobs Engine Brake will be easy for an operator to learn. Since the Engine Brake is most effective at rated engine speeds, gear selection is very important. Gearing down the vehicle, within the limits of recommended engine speed, makes the Engine Brake a more effective retarder. Maximum retarding occurs with the selection of the lowest gear that prevents exceeding engine speed.

The Model K-1200 Engine Brake kits contain a progressive switch that provides two, four, or six-cylinder operation of the Engine Brake. This switch provides the operator with greater flexibility in selecting the amount of retarding needed for various road and load conditions.

For a detailed presentation of driving with the Jake Brake, consult your Jacobs distributor.



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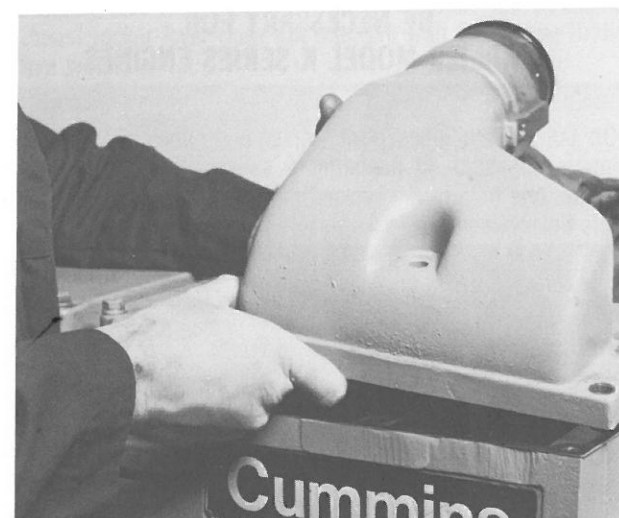
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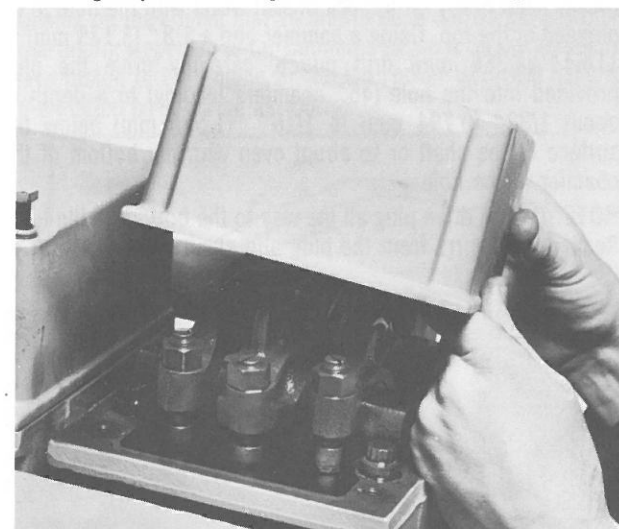
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ENGINE PREPARATION



Clean engine thoroughly and remove intake crossover manifold and any other components as necessary in order to gain clear access to all rocker lever housing covers. Cover intake with clean rag to prevent foreign material from entering.



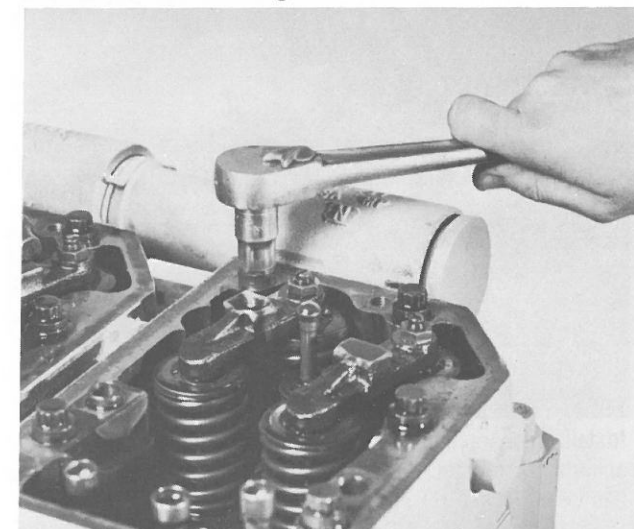
Remove rocker lever housing covers from each cylinder.



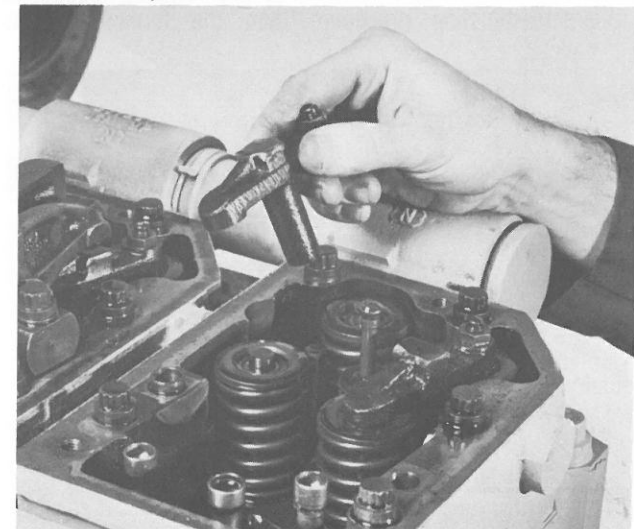
Loosen all valve and injector adjusting screw locknuts and back out adjusting screws one or two turns.



Remove rocker lever shaft holddown bolts and remove rocker shaft assemblies from engine.



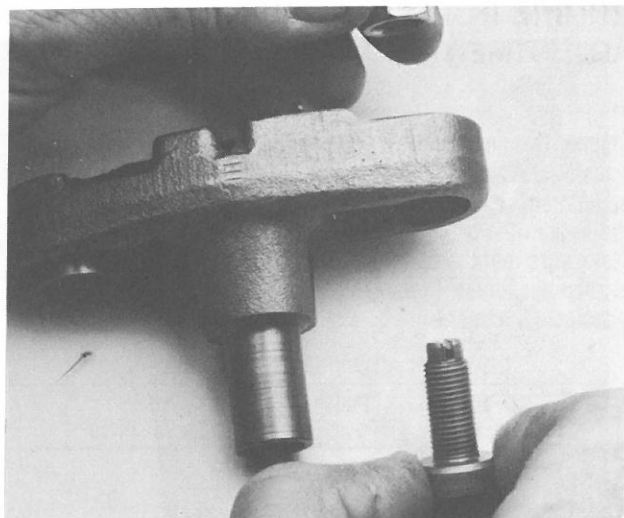
Remove front left hand rocker box bolt (as viewed from intake manifold side).



Remove Cummins exhaust valve crossheads.

**THE FOLLOWING PROCEDURE MAY
BE NECESSARY FOR
EARLIER MODEL K SERIES ENGINES**

On Cummins engines prior to Serial Number 31101242, to insure sufficient oil pressure to operate the Jacobs Engine Brake, one hole in the rocker shaft must be plugged. To plug this hole, remove all rocker levers from rocker lever shaft. Set

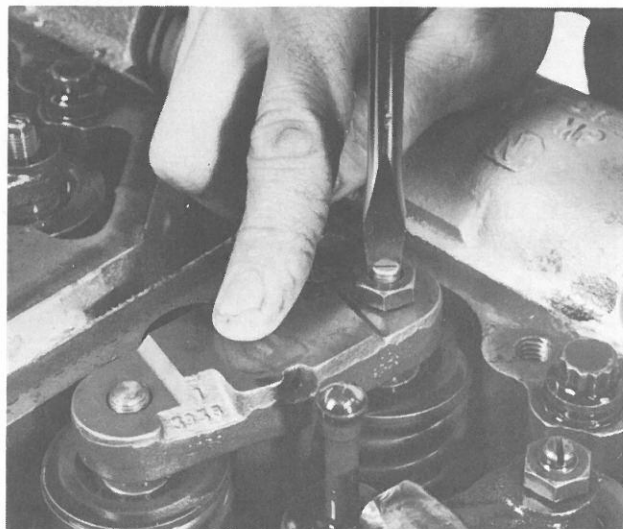


Assemble Jacobs crosshead adjusting screw and locknut to Jacobs crosshead.

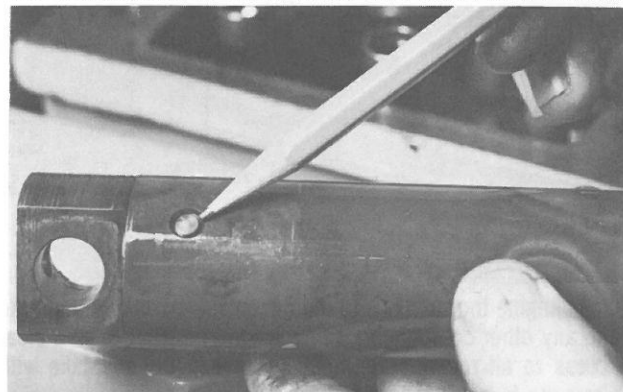


Install Jacobs exhaust valve crossheads, making sure that the adjusting screw locknut is loose and that the adjusting screw has been backed off and seated in its socket.

NOTE: The Jacobs Exhaust Valve Crosshead for the K-1200 Engine Brake has only one adjusting screw and requires a different adjusting procedure than the former K-1150 crosshead.

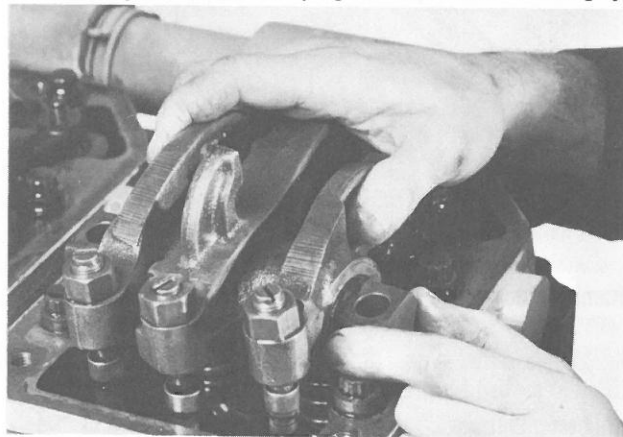


Adjust crossheads in accordance with the latest Cummins Instruction Manuals **EXCEPT** tighten lock-nuts to 30-35 lb.ft. (41-47 N·m).



rocker shaft firmly on a block of soft wood with the hole to be plugged at the top. Using a hammer and a 1/8" (3.175 mm) to 11/64" (4.366 mm) drift punch, carefully drive the plug provided into the hole (45° chamfers leading) to a depth of about 1/32" (0.794 mm) to 1/16" (1.588 mm) below the surface of the shaft or to about even with the bottom of the chamfer in the hole.

NOTE: Do not drive plug all the way to the bottom of the hole. Remove any burrs from the plug and clean shaft thoroughly.

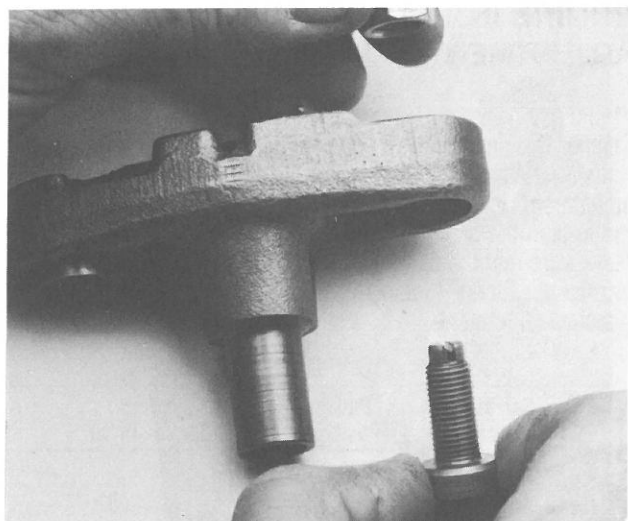


Set rocker shaft assembly in place on engine, making sure that the ball ends of all rocker arm adjusting screws are fitted into their respective push tube sockets.

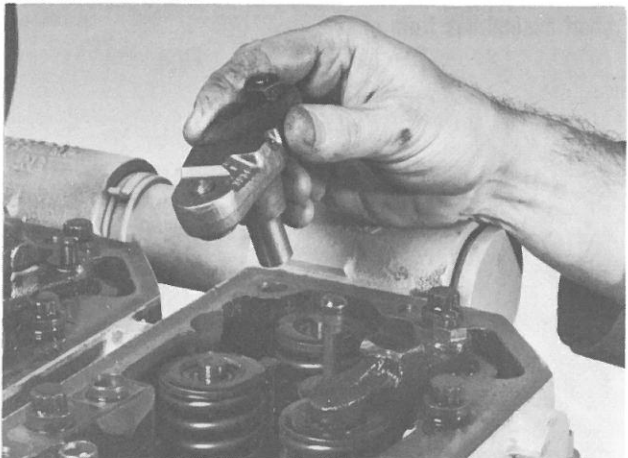
NOTE: Do not install the rocker lever shaft assembly hold-down cap screws.



Carefully locate Engine Brake housing over rocker assembly.

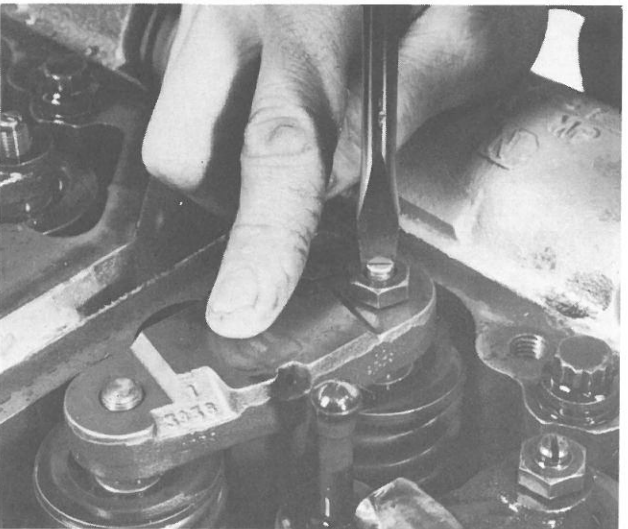


Assemble Jacobs crosshead adjusting screw and locknut to Jacobs crosshead.



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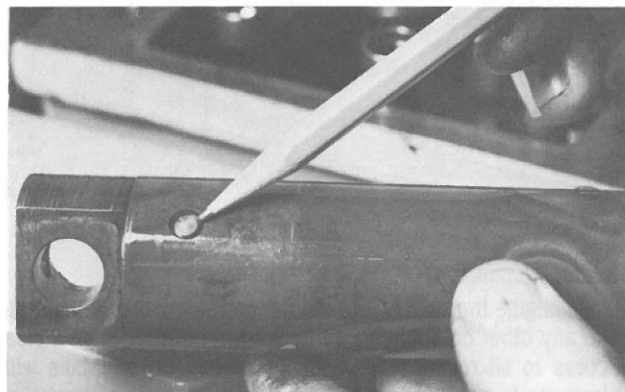
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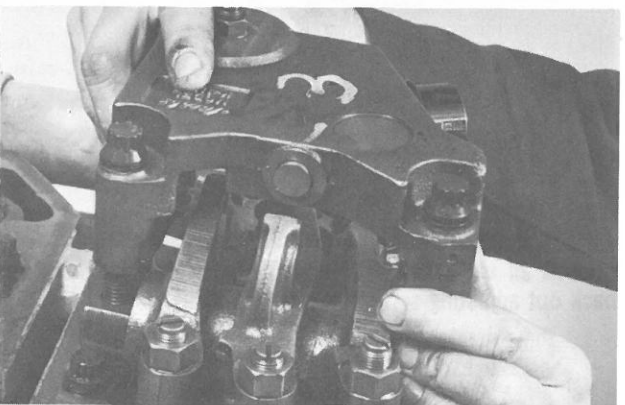
rocker shaft firmly on a block of soft wood with the hole to be plugged at the top. Using a hammer and a 1/8" (3.175 mm) to 11/64" (4.366 mm) drift punch, carefully drive the plug provided into the hole (45° chamfers leading) to a depth of about 1/32" (0.794 mm) to 1/16" (1.588 mm) below the surface of the shaft or to about even with the bottom of the chamfer in the hole.

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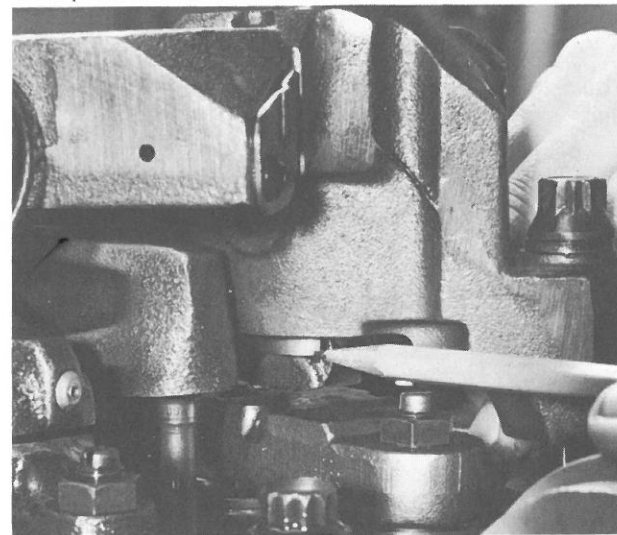
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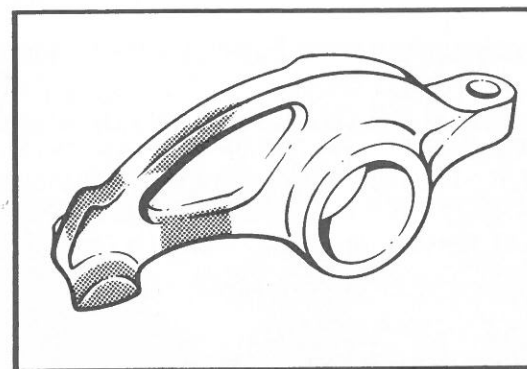


Carefully locate Engine Brake housing over rocker assembly.

When installing Jacobs Brake housings on the engine, be sure to check that the upper rib and/or nose of the Cummins exhaust rocker lever does not interfere with the Engine Brake slave piston.



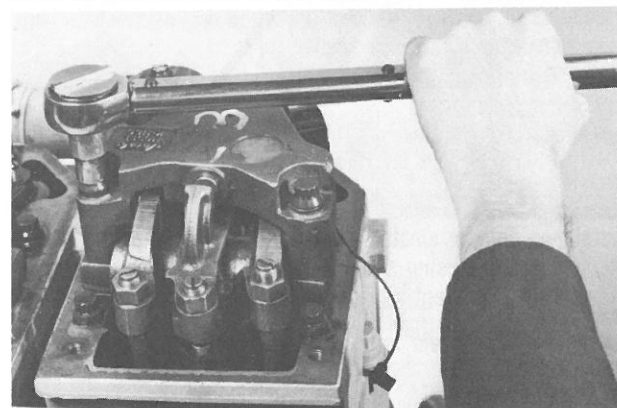
If it is found that when installing the Jacobs Engine Brake housing on the engine that an interference occurs between the nose and/or upper rib of the Cummins exhaust rocker lever and slave piston of the Engine Brake, the rocker lever will have to be modified by grinding as follows:



Remove adjusting screw from rocker lever. Grind areas of interference lightly, being extremely careful not to overheat the part. See illustration for typical areas that may require grinding.

NOTE: No more than 1/8" (3.175 mm) of material may be safely removed from the side of the contact pad, as shown.

No more than 3/32" (2.381 mm) of material may be safely removed from the side of the upper rib, as shown.



Place Engine Brake housing assembly over rocker housing and install the three long Jacobs cap screws and washers. Torque the cap screws to 65 to 70 lb.ft. (88.4-95.2 N-m).

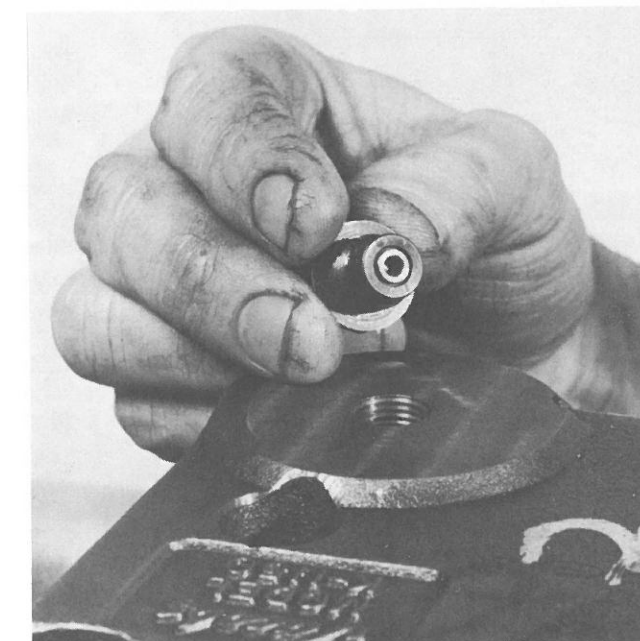
ENGINE INJECTOR & VALVE ADJUSTMENT

Adjust the valve and injectors in accordance with Cummins Engine Co. instructions. A hole is provided in the brake housing to accommodate a dial indicator stem for injector adjustment. The dial indicator stem extension must go through the hole in the brake housing and contact the injector plunger. Make sure that the dial indicator stem extension is not rubbing against the brake housing. This could lead to an erroneous injector adjustment.

INJECTOR AND VALVE SET POSITION

Bar in Direction	Pulley Position	Set Cylinder Injector	Valve
Start	A	3	5
Adv. To	B	6	3
Adv. To	C	2	6
Adv. To	A	4	2
Adv. To	B	1	4
Adv. To	C	5	1
Firing Order 1 - 5 - 3 - 6 - 2 - 4			

ENGINE BRAKE SLAVE PISTON ADJUSTMENT



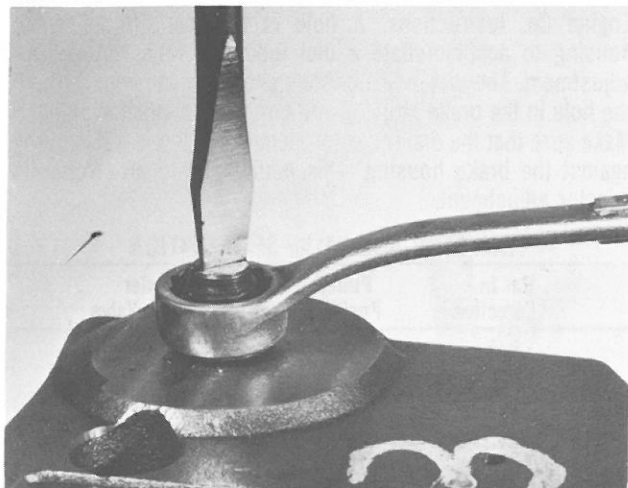
SPECIAL NOTE: The K-1200 Engine Brakes contain automatic lash adjusters, (AUTO-LASH™), built into the slave piston adjusting screws. The AUTO-LASH™ provides the correct exhaust valve operation for peak Engine Brake performance. The AUTO-LASH™ also permits easier slave piston and crosshead adjustment than the former K-1150 Engine Brakes.

Please observe the following adjustment procedures carefully.

NOTE: The Engine Brake slave piston adjustment can be made at the same time the exhaust valve adjustment is made.

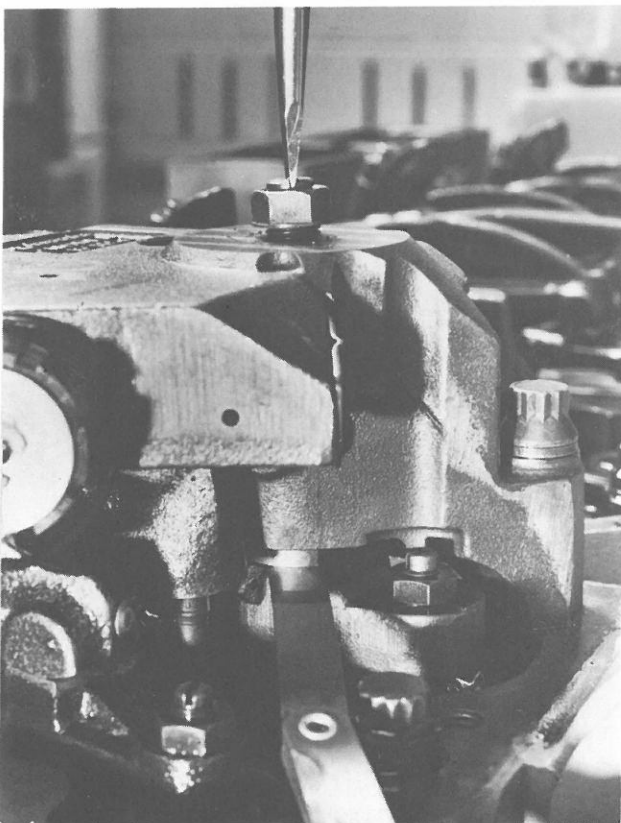
STEP 1

Bar the engine in the direction of rotation to the valve set position of the cylinder being adjusted. (See table)



STEP 2

Loosen and back off the slave piston adjusting screw.



STEP 3

Insert a 0.018" (0.46mm) thick feeler gauge between the slave piston feet and the top of the Jacobs crosshead.

STEP 4

Slowly turn in the adjusting screw moving the slave piston down until proper clearance is established between the slave piston and the exhaust valve crosshead.

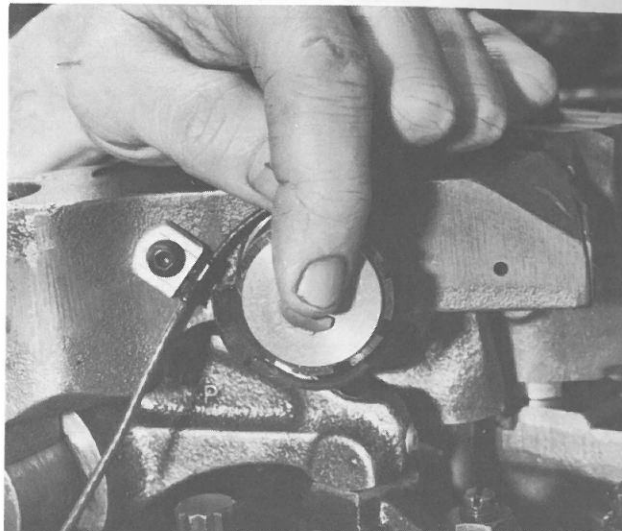
STEP 5

Hold adjusting screw and tighten locknut to 30-40 lb.ft. (41-54 N·m).

Repeat above five steps with the remaining cylinders in firing order.



CAUTION: Remove rubber band retaining the master piston before operation of engine brake.



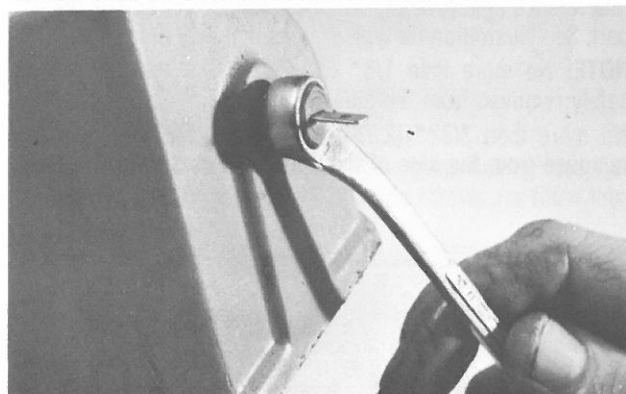
Bleed brake units for immediate operation. Start engine and allow to run several minutes. Accelerate engine to approximately 1800 rpm, release throttle **and then** manually depress solenoid armature. This procedure should be done five or six times to permit the engine oil to fill the brake housing passages.



CAUTION: WHENEVER ENGINE IS RUNNING AND THE VALVE COVERS ARE REMOVED, THERE IS SIGNIFICANT OIL SPLASH IN THE ENGINE BRAKE AREA. IT IS RECOMMENDED THAT EYE PROTECTION BE WORN AND THAT THERE IS NO FACIAL EXPOSURE OVER ENGINE BRAKE AREA. PLACE RAGS OVER THE CONTROL VALVE COVERS TO PREVENT EXHAUST OIL LEAKAGE DOWN ON ENGINE.

ROCKER COVER AND CROSSOVER INSTALLATION

Remove plug from Cummins rocker housing covers.

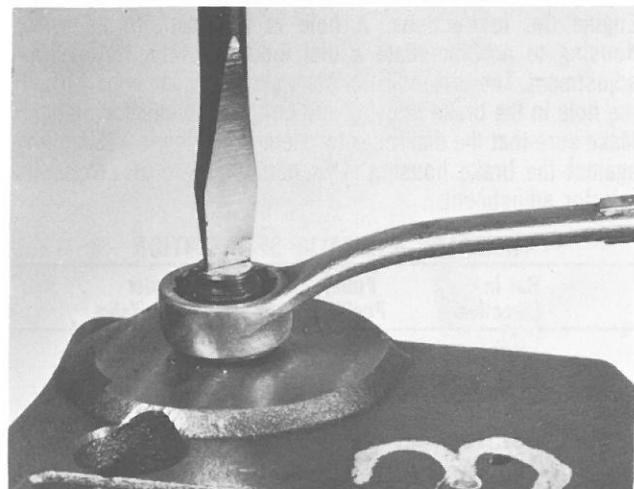


Install the Jacobs electrical terminal bushing into the rocker housing covers, using a box type wrench. Screw bushing all the way in to prevent any oil leakage.

Clean all rocker cover and crossover gasket surfaces.

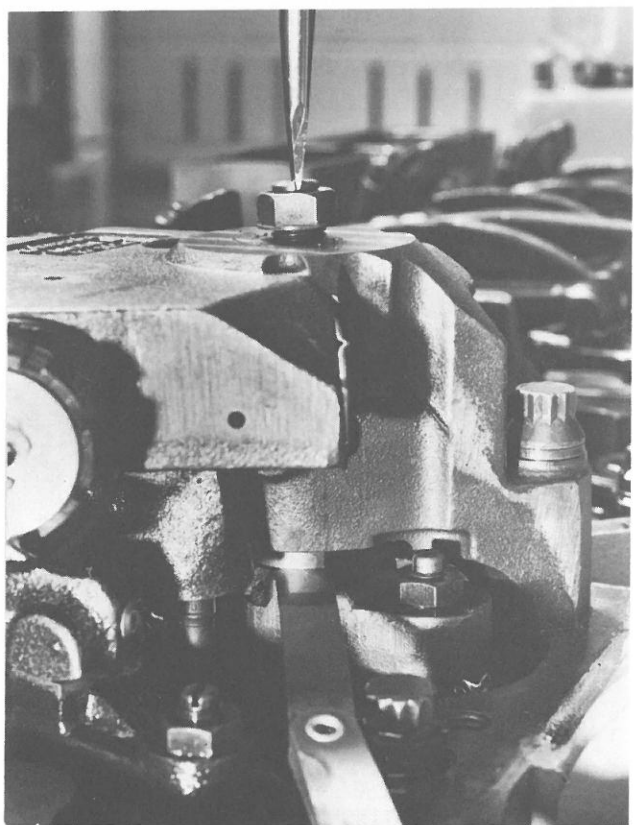
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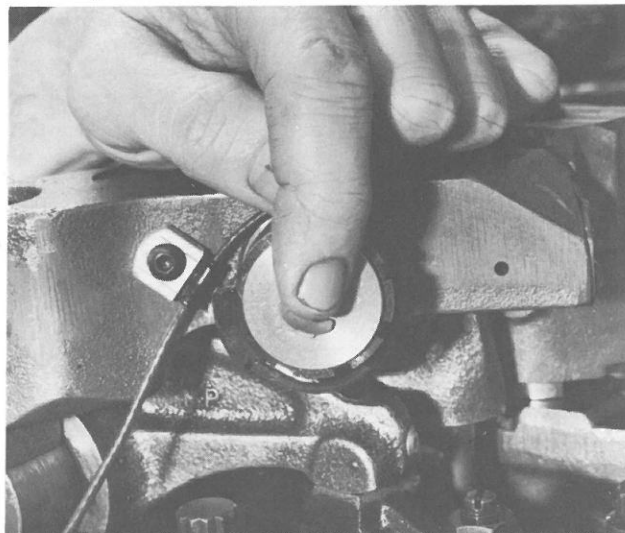
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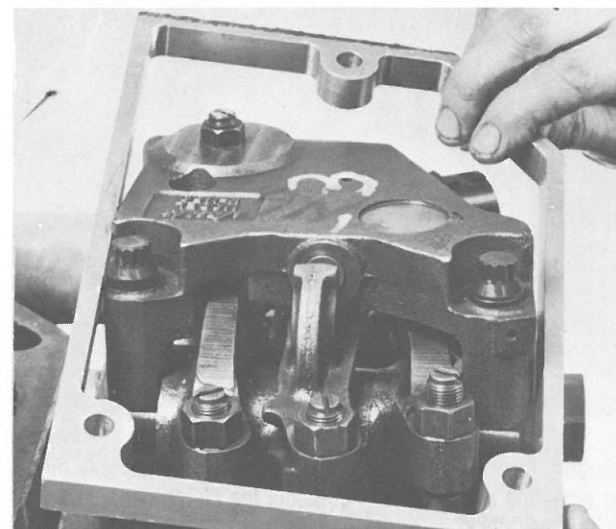
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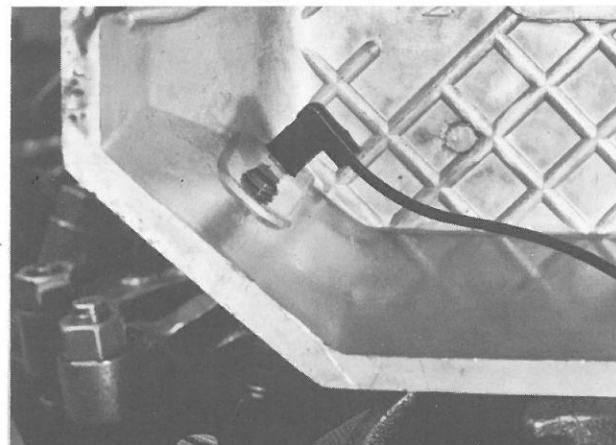


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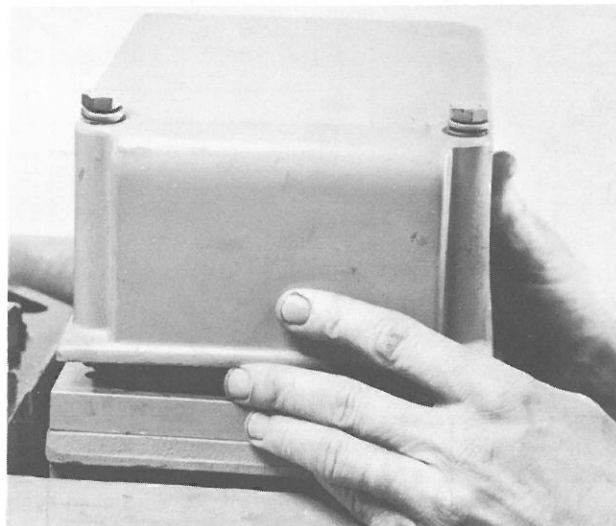
Clean all rocker cover and crossover gasket surfaces.



Install the rocker housing gaskets and cover spacers.



Connect the solenoid valve leadwire flag connector to the inside tab on the electrical terminal bushing.



Install rocker housing covers using new Jacobs capscrews supplied in kit. Re-use the Cummins washers.

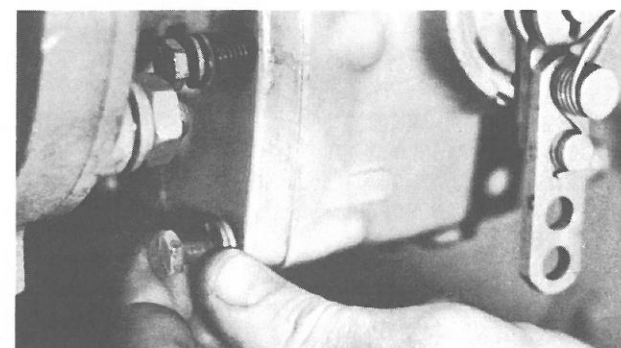
Replace intake crossover using new gasket.



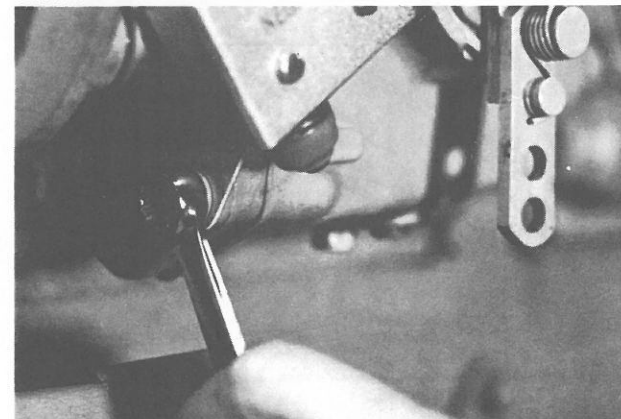
NOTE: On non-aftercooled engines, two 1/4" thick spacers are required on the intake manifold to provide clearance between the crossover and the rocker covers. The spacers and correct length bolts are included in the P/N 012417 spacer group.

CONTROL SYSTEM INSTALLATION

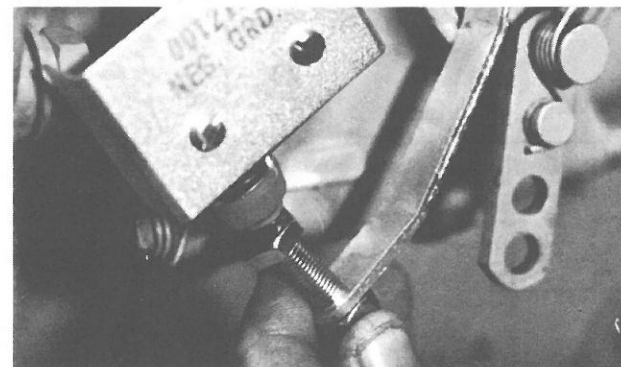
FUEL PUMP SWITCH



Remove the two screws from the fuel pump governor housing as shown.



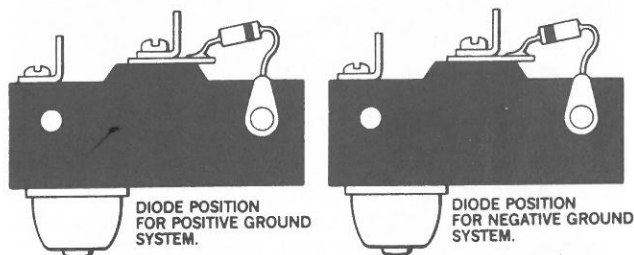
Install switch in position shown.



Install actuating arm on the fuel pump throttle shaft. The arm may be bent or manipulated so as to obtain the proper position for switch contact.

Proper adjustment of the switch is obtained by adjusting the screw in the actuating arm to a point where an audible "click" is heard when the throttle arm moves to an idle fuel position.

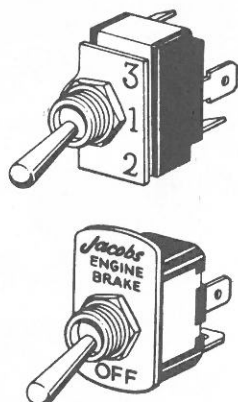
CAUTION: Check the fuel pump throttle shaft to insure that the throttle pedal will move the shaft to the full fuel position after installing the actuating arm.



NOTE: The throttle switch contacts are protected against arcing by a small diode connected between the load side switch terminal and ground. The Engine Brake must be connected to the load side terminal. If the vehicle has a positive ground electrical system, reverse the position of the diode.

DASH SWITCHES

Install the two dash switches in a convenient location in the cab. Carefully measure and cut all harnesses to proper length and install receptacles at the locations shown in the wiring diagram furnished in the kit.



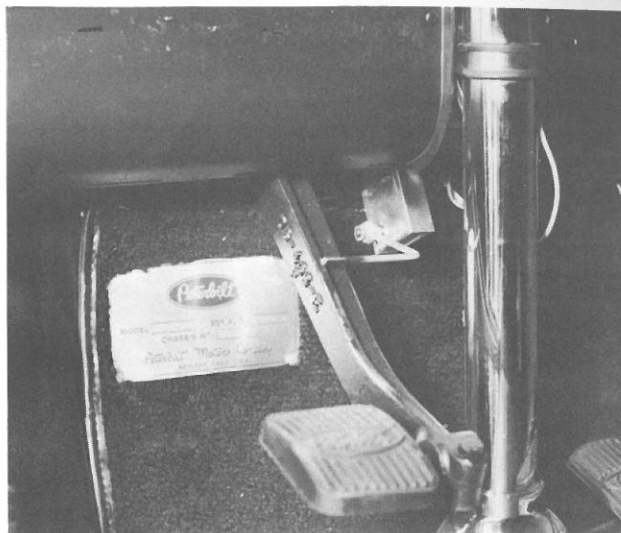
Be sure that all the wiring is neatly installed and properly tied off. Avoid routing wires where chafing, mechanical interference, etc. will take place.

REMEMBER! Of all Engine Brake problems, 75% are electrically related.

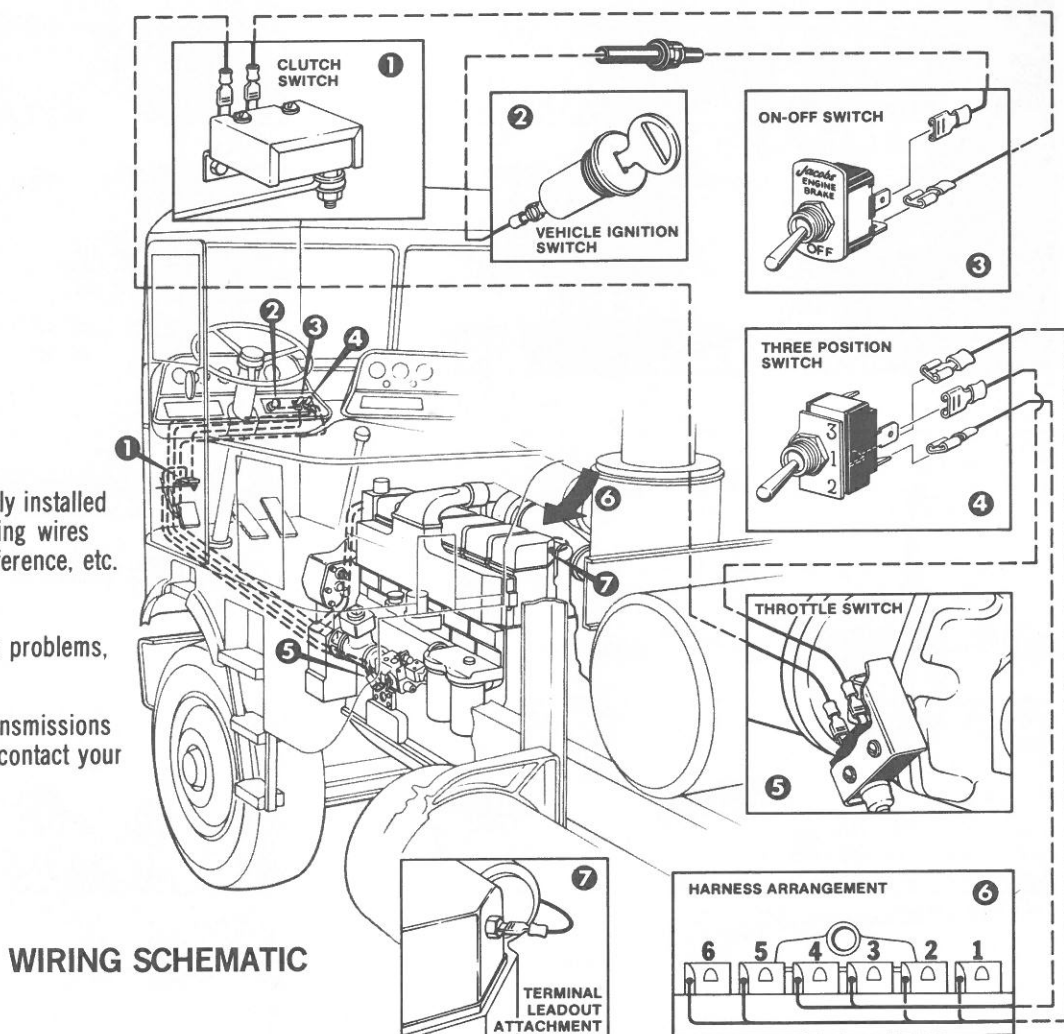
For vehicles with automatic transmissions refer to Jacobs service letters or contact your nearest distributor.

CLUTCH SWITCH

Mount the clutch switch in the most convenient or accessible location as possible. The actuating arm of switch can be bent so as to obtain the proper contact with the clutch pedal arm.



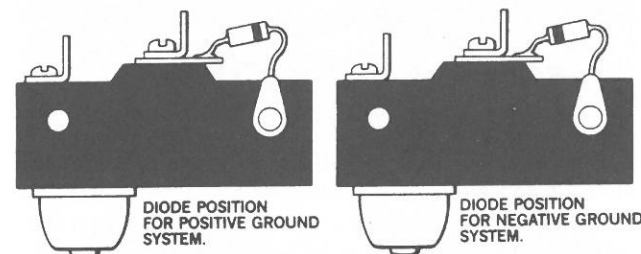
To adjust the switch, have the clutch pedal in a relaxed position. Loosen the outer nut on the switch assembly. Bend the actuating arm so that it contacts the clutch pedal arm and an audible "click" is heard. Tighten the outer nut. This adjustment should allow the switch to work on the "backlash" of the clutch pedal before actual clutch disengaging takes place.



WIRING SCHEMATIC

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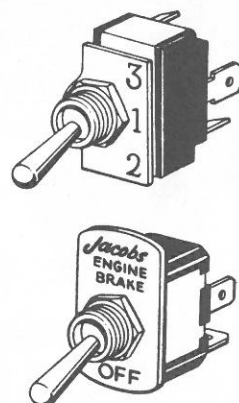
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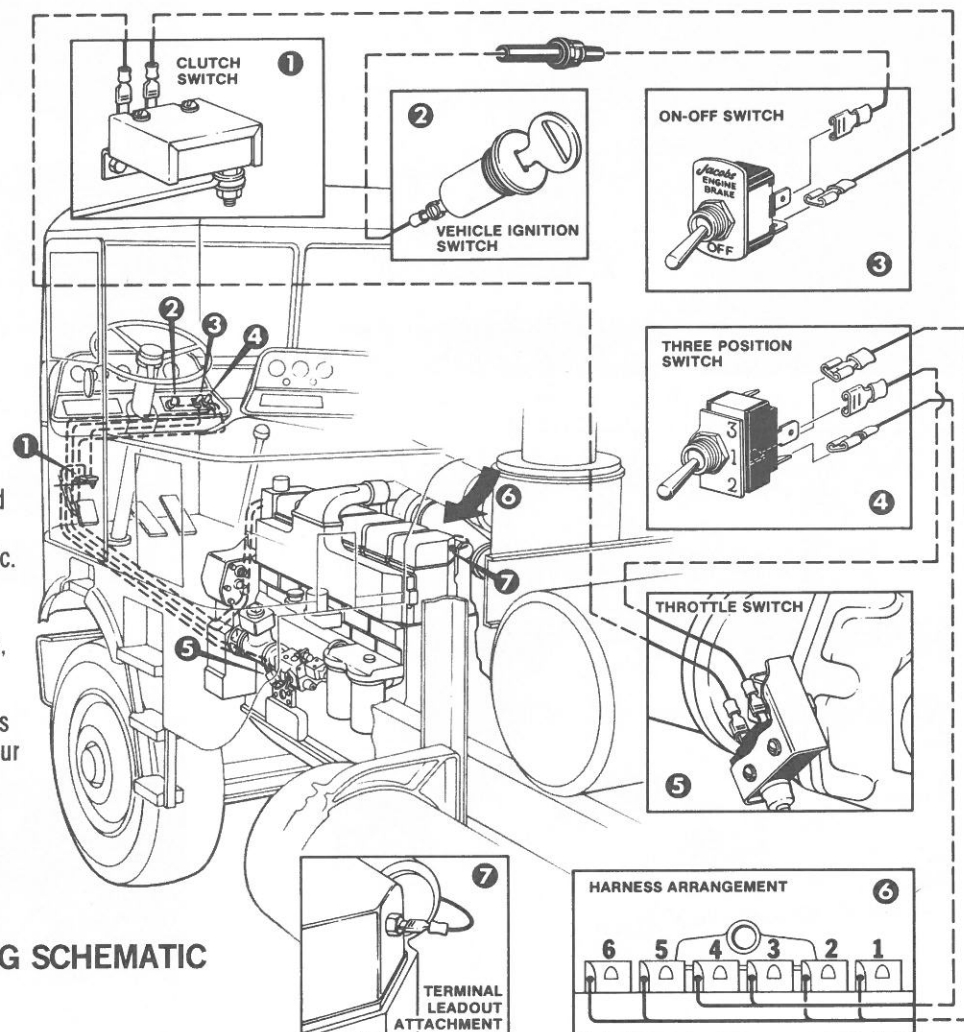


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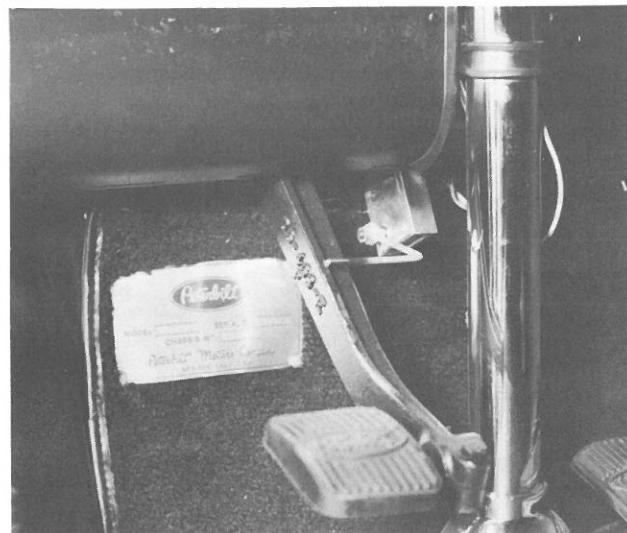
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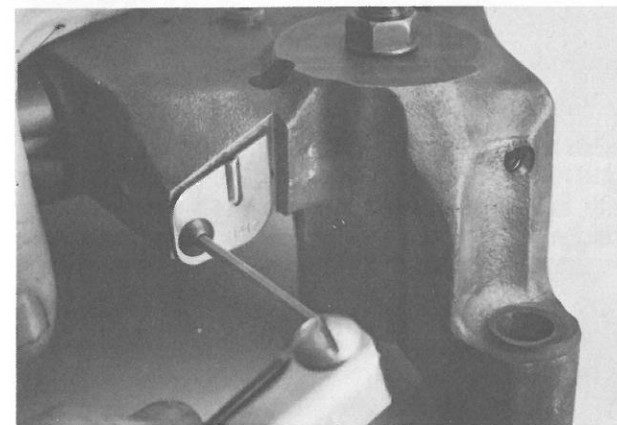
To adjust the switch, have the clutch pedal in a relaxed position. Loosen the outer nut on the switch assembly. Bend the actuating arm so that it contacts the clutch pedal arm and an audible "click" is heard. Tighten the outer nut. This adjustment should allow the switch to work on the "backlash" of the clutch pedal before actual clutch disengaging takes place.

ENGINE BRAKE MAINTENANCE

NEVER REMOVE ANY ENGINE BRAKE COMPONENTS WITH ENGINE RUNNING.

The Jacobs Engine Brake is a relatively trouble free and maintenance free device. It does require, from time to time, periodic inspections and part replacement. Use the following procedures to keep your Engine Brake in good condition.

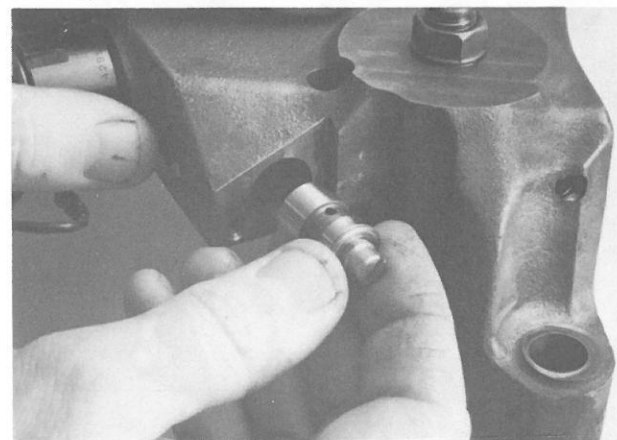
REMOVAL OF CONTROL VALVE



Remove capscrew slowly from cover plate as the stop springs are under pressure. Inspect or replace springs as necessary.

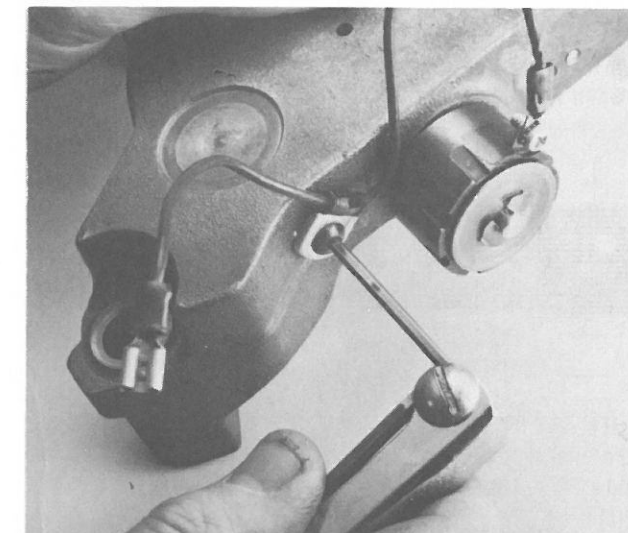


Carefully remove control valve springs.

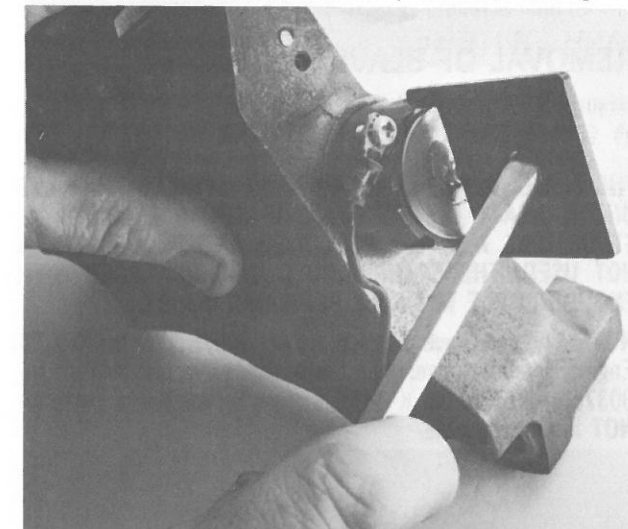


Using needle nose pliers or fingertips, pull control valve carefully and straight up and out of its bore. If binding occurs, clean or replace as necessary.

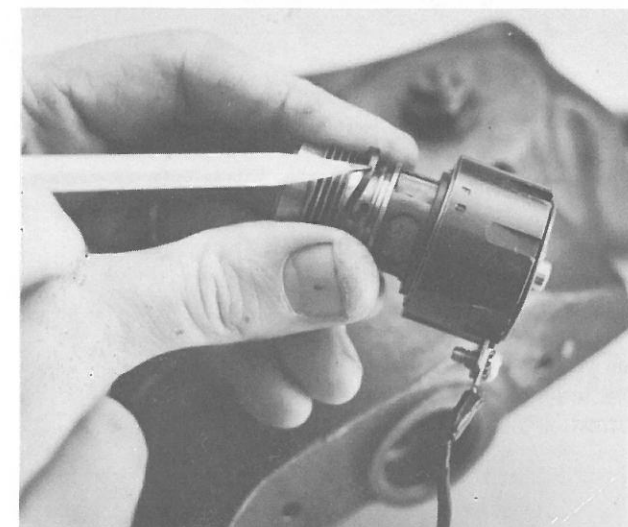
REMOVAL OF SOLENOID VALVE



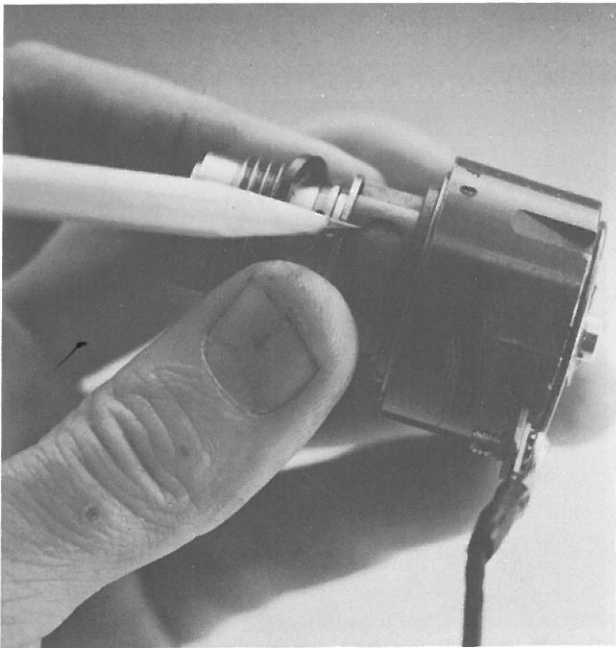
Remove the solenoid lead wire clamp from the housing.



Insert screw driver into Jacobs solenoid wrench and loosen solenoid. Screw out solenoid valve.



Inspect the three seals. Lubricate and replace them before re-assembly. Discard them if they appear "worn." When replacing solenoid valve be sure the seals are seated properly and gently screw the solenoid into housing without unseating the seals.



The oil filter screen may be inspected by removing the retainer.

REMOVAL OF SLAVE PISTON

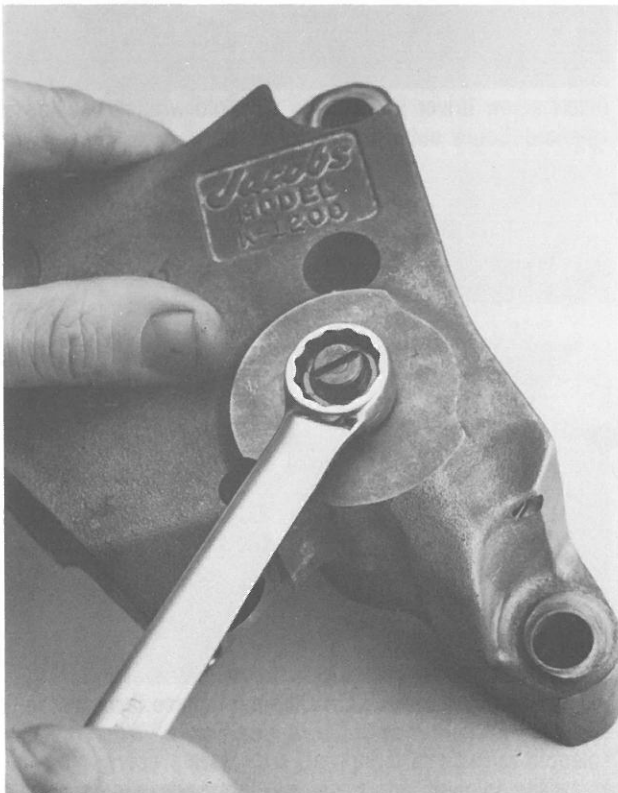


WARNING

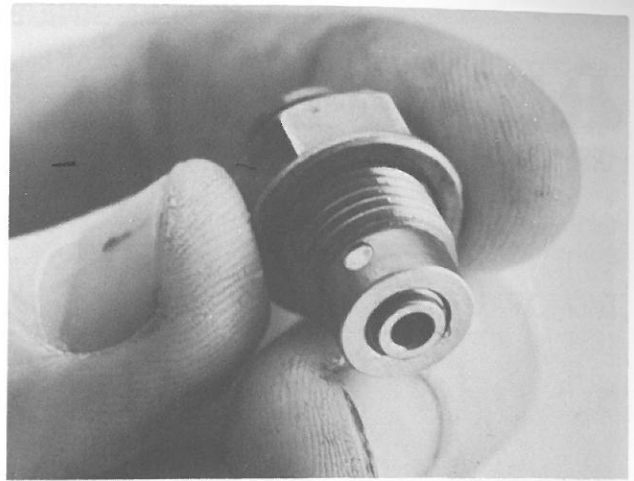


THE SLAVE PISTON IS RETAINED BY SPRINGS THAT ARE UNDER HEAVY COMPRESSION. IF THE FOLLOWING INSTRUCTIONS ARE NOT FOLLOWED AND PROPER TOOLS NOT USED, THE SPRING COULD BE DISCHARGED WITH ENOUGH FORCE TO CAUSE PERSONAL INJURY.

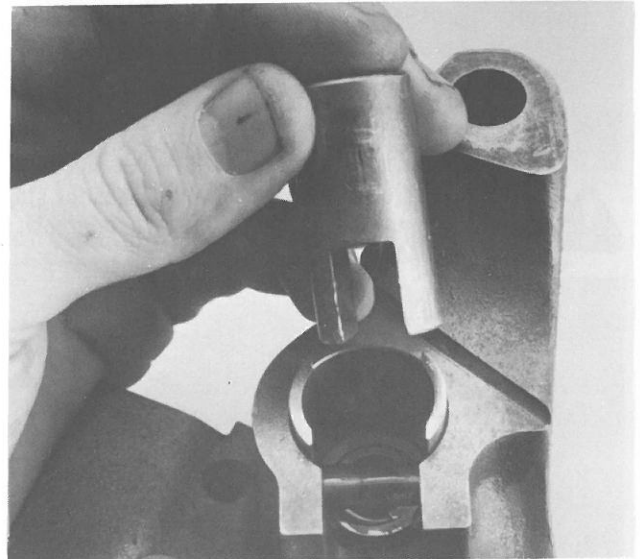
NOTE: The new slave piston (Part No. 009761) for the K-1200 Engine Brake is longer than the former slave piston (Part No. 003755) used in the K-1150 Engine Brake. These parts are **NOT** interchangeable.



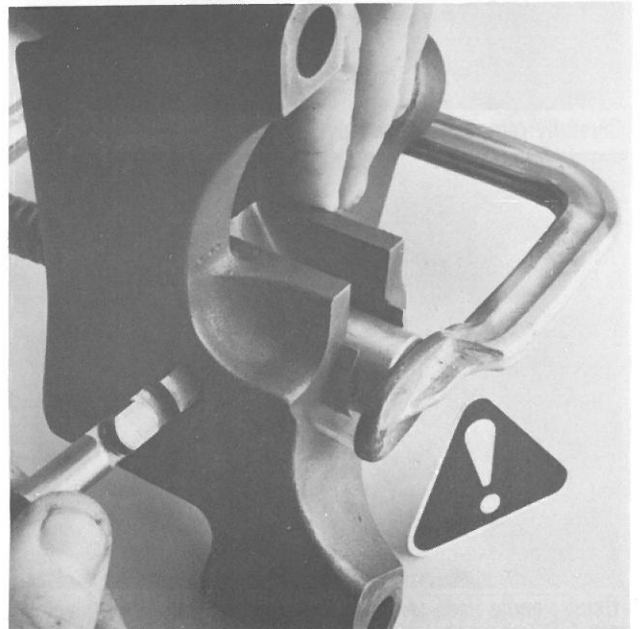
Loosen adjusting screw locknut and remove adjusting screw from housing.



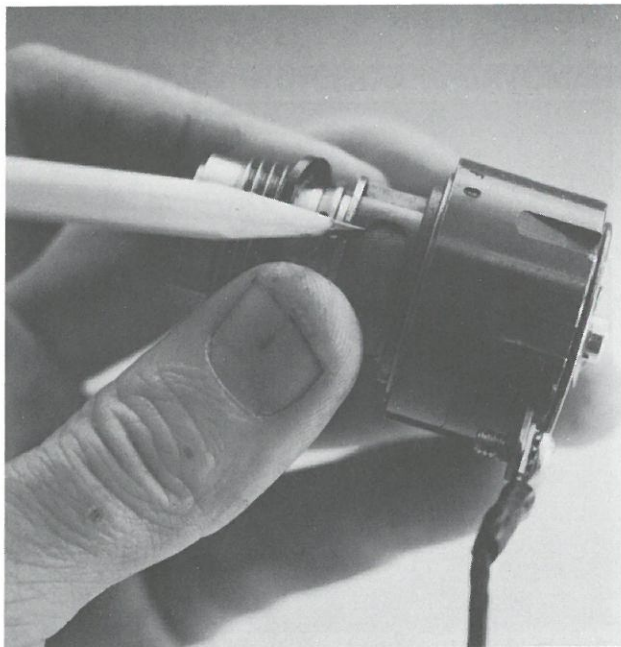
CAUTION: No attempt must be made to readjust or tamper with the adjusting screw. Changes could result in engine damage.



Using the slave piston assembly tool part number 003453



and a suitable clamping device, compress the slave piston springs so that the spring retaining pin can be easily removed.



The oil filter screen may be inspected by removing the retainer.

REMOVAL OF SLAVE PISTON

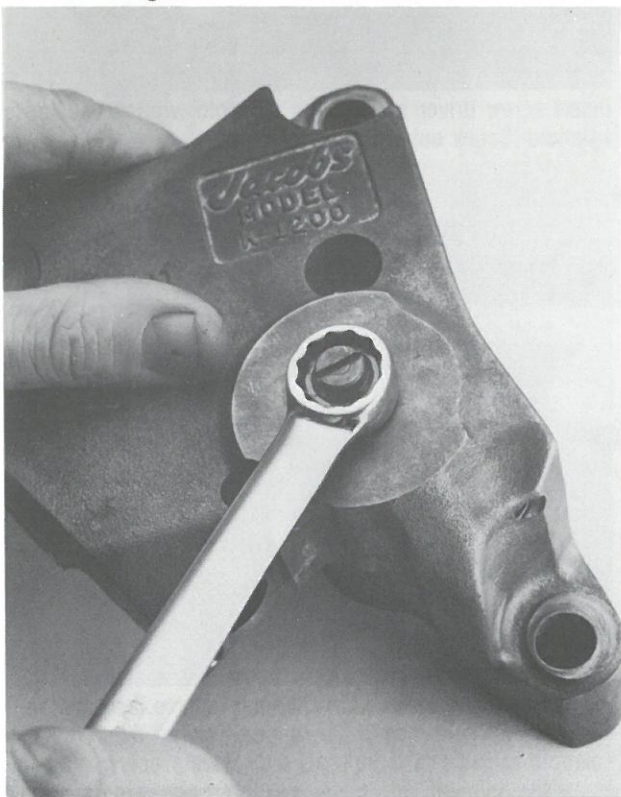


WARNING

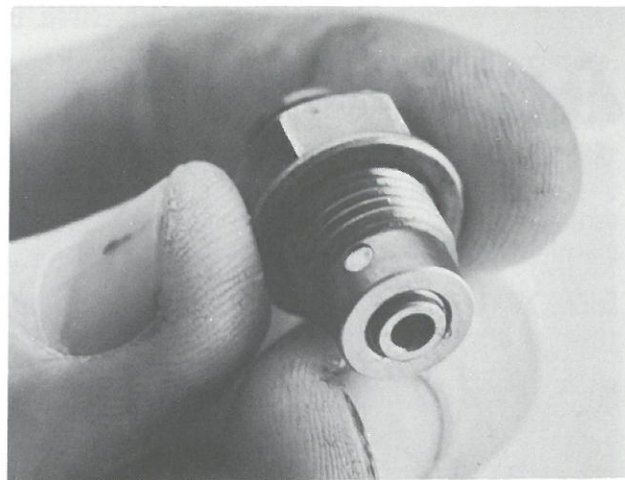


THE SLAVE PISTON IS RETAINED BY SPRINGS THAT ARE UNDER HEAVY COMPRESSION. IF THE FOLLOWING INSTRUCTIONS ARE NOT FOLLOWED AND PROPER TOOLS NOT USED, THE SPRING COULD BE DISCHARGED WITH ENOUGH FORCE TO CAUSE PERSONAL INJURY.

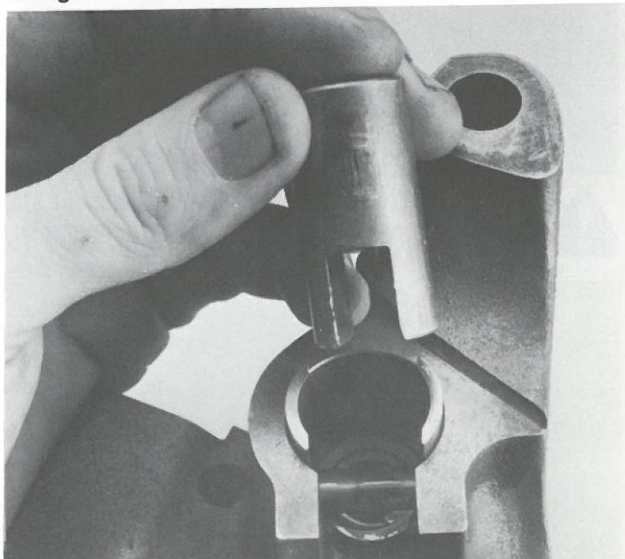
NOTE: The new slave piston (Part No. 009761) for the K-1200 Engine Brake is longer than the former slave piston (Part No. 003755) used in the K-1150 Engine Brake. These parts are **NOT** interchangeable.



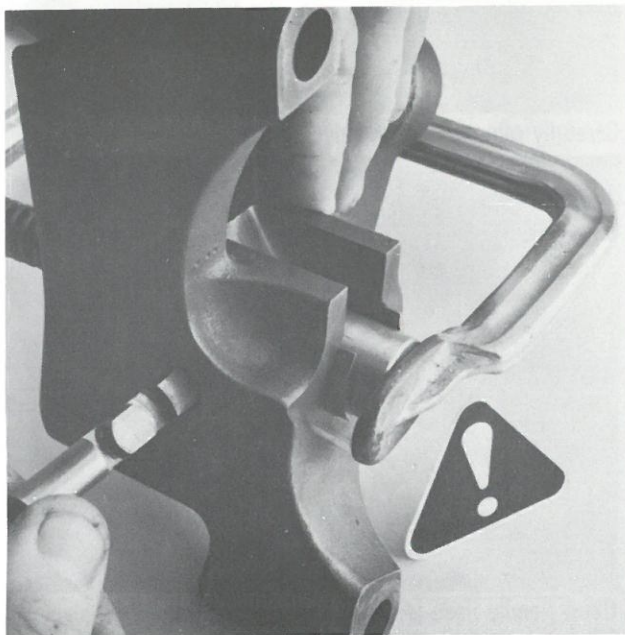
Loosen adjusting screw locknut and remove adjusting screw from housing.



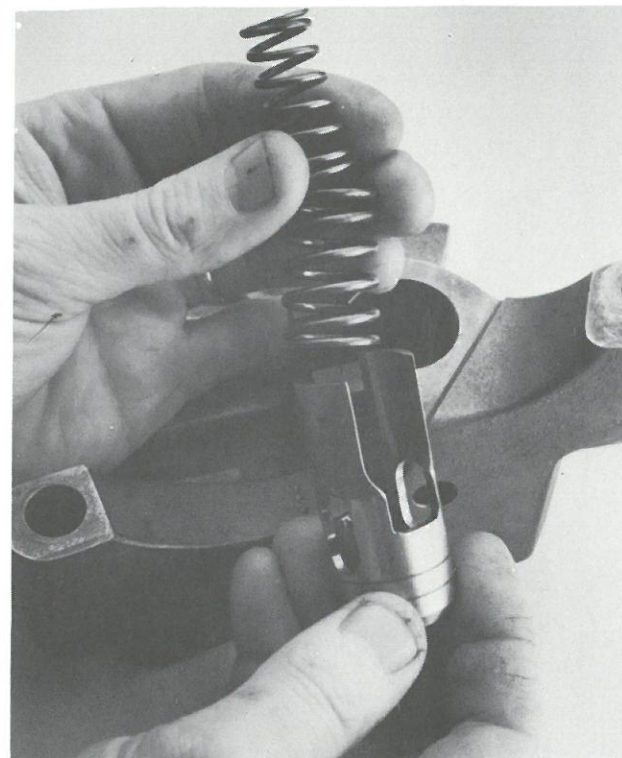
CAUTION: No attempt must be made to readjust or tamper with the adjusting screw. Changes could result in engine damage.



Using the slave piston assembly tool part number 003453



and a suitable clamping device, compress the slave piston springs so that the spring retaining pin can be easily removed.

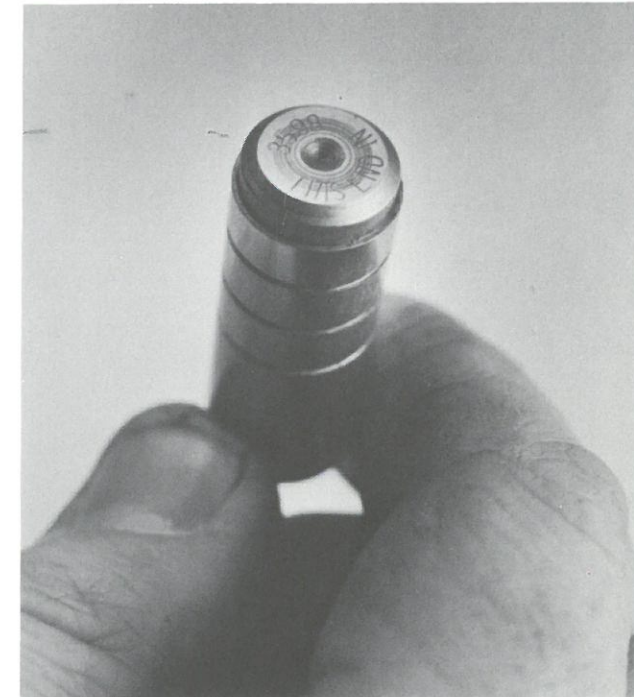


Remove slave piston and springs from housing. Check for binding or burrs. Clean or repalce as necessary.

REMOVAL OF MASTER PISTON



The Master Piston is not retained in the housing. To remove, elevate housing and the master piston should slide out.



IMPORTANT: when installing the master piston, make sure that the relief cut and three oil grooves enter the bore first. The relief cut should bottom in the bore.

RECOMMENDED TORQUE VALUES

PART NAME	TORQUE
Exhaust Valve Crosshead Adjusting Screw Locknuts	30-35 lb.ft. (41-47 N·m)
Rocker Assembly and Engine Brake Hold Down Bolts	65-70 lb.ft. (88-95 N·m)
Slave Piston Adjusting Screw Locknut	30-40 lb.ft. (41-54 N·m)