

METHOD OF DRIVING A VEHICLE EQUIPPED WITH A JACOBS ENGINE BRAKE

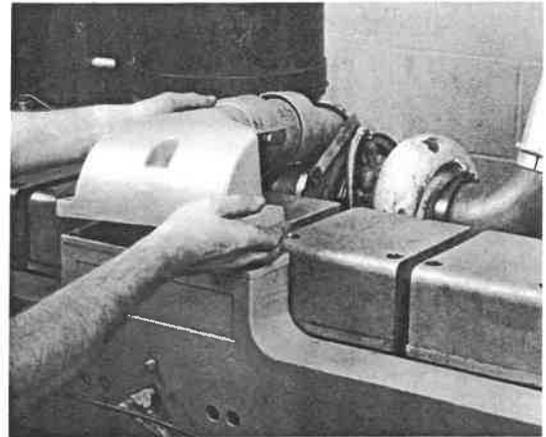
The proper method of driving a vehicle equipped with a Jacobs Engine Brake will be simple for an operator to learn. Since the Engine Brake is most effective at rated engine speeds, gear selection is very important. Gearing down the vehicle, within the limits of rated engine speed, makes the Engine Brake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

The K-200 Engine Brake kit contains a progressive switch that provides three or six-cylinder operation of the Engine Brake. This switch provides the operator with greater flexibility of engine retarding.

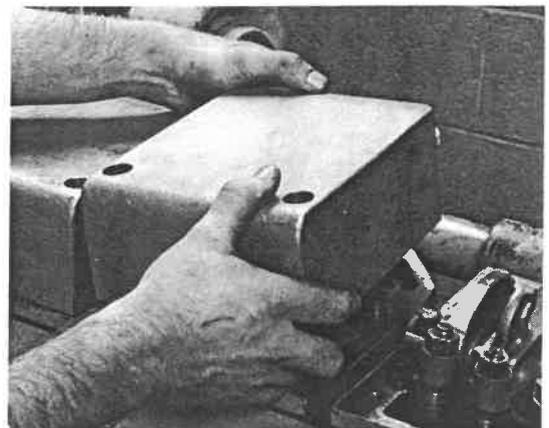
After short practice, drivers will learn the combination of gears that will give the best results over a particular route.

ENGINE PREPARATION

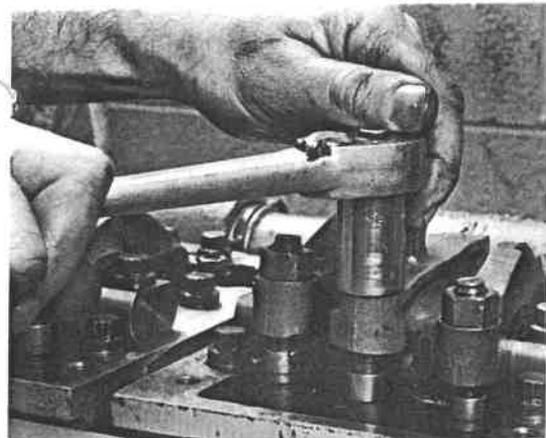
Clean engine thoroughly and remove intake crossover manifold and any other components as necessary in order to gain clear access to all rocker lever housing covers. Cover intake with clean rag to prevent foreign material from entering.



Remove rocker lever housing covers from each cylinder.



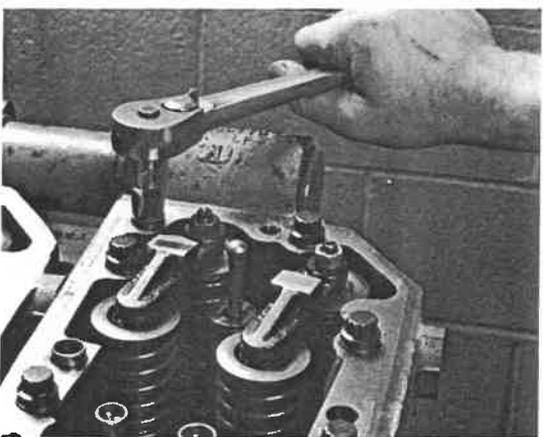
ENGINE PREPARATION



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 the engine.



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



Remove Cummins exhaust valve crossheads.

INSTALLATION OF BRAKE UNITS ON ENGINE

Install Jacobs exhaust valve crossheads, making sure that the adjusting screw locknuts are loose and that the adjusting screws have been backed off and seated in their sockets.

Install the crosshead so that the chamfer on the upper face is positioned towards the front of the engine.

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 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" to 11/64" drift punch, carefully drive the plug provided into the hole (45° chamfers leading) to a depth of about 1/32" to 1/16" 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.

When installing Jacobs brake housings on the engine, there is a possibility that the nose and/or upper rib of the Cummins part number 206982 exhaust rocker lever may interfere with the slave piston of the brake. If this situation occurs, the interfering lever should be carefully modified by grinding as follows:

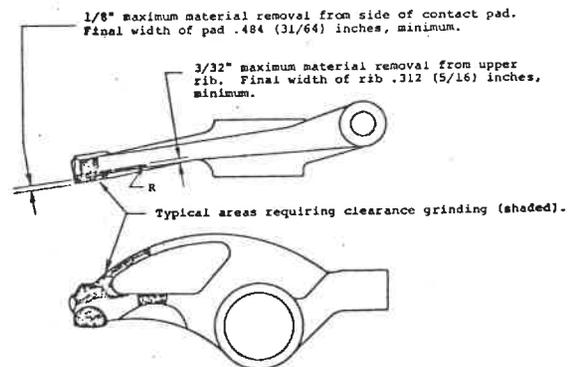
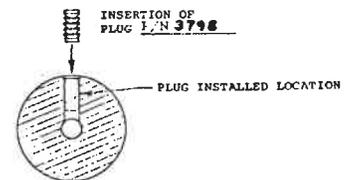
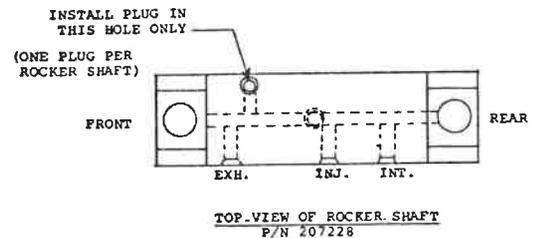
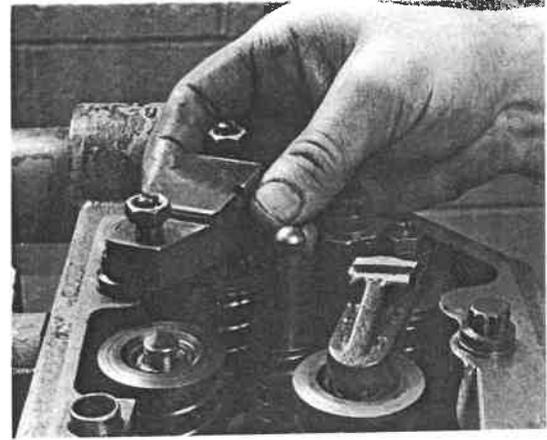
Remove adjusting screw from rocker lever. Grind areas of interference lightly, being extremely careful not to overheat the part. See illustration for typical areas that may require grinding.

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

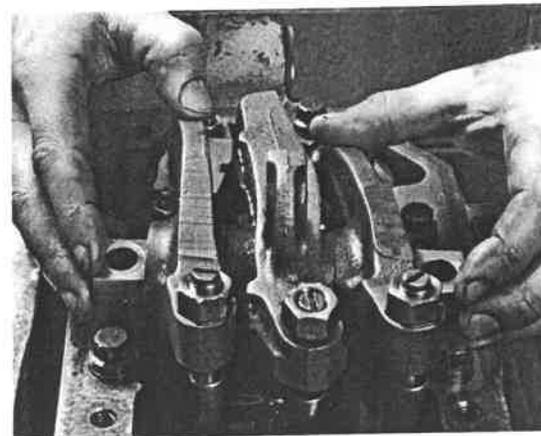
No more than 3/32" of material may be safely removed from the side of the upper rib, as shown.

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 holddown capscrews.



When enough material has been removed to provide clearance with the slave piston, remove burrs from rocker lever contact pad and clean the lever thoroughly.



INSTALLATION OF BRAKE UNITS ON ENGINE

Check the torque on all rocker lever housing holddown capscrews (65 to 70 ft. lbs.). Place engine brake housing assembly over rocker housing and install the three long Jacobs capscrews, using Cummins washers. Torque the capscrews to 65 to 70 ft. lbs. (9.0 to 9.7 kgm).

ENGINE BRAKE ADJUSTMENT

Due to its unique design, the K-200 Engine Brake, unlike other models of Jacobs Engine Brakes, does not have an adjusting screw. The slave piston lash adjustment is accomplished by moving (and leveling) the Jacobs crosshead relative to the slave piston. THE SLAVE PISTON ADJUSTMENT MUST BE MADE PRIOR TO THE NORMAL EXHAUST VALVE ADJUSTMENT. After the slave pistons have been adjusted, the valves and injectors can be adjusted in accordance with Cummins Engine Company 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.

SLAVE PISTON ADJUSTMENT PROCEDURE

Engine brake adjustment must be made before exhaust valve rocker adjustment. Bar the engine in the direction of rotation to the valve set position of the cylinder being adjusted. Loosen exhaust valve rocker lever adjusting screw and back off adjustment. Place a 0.018" (0.46mm) thick feeler gauge between the slave piston feet and the top of the Jacobs crosshead. Alternately and evenly, using 1/8 turn increments, first turn in the front adjusting screw (next to water manifold) and then turn in the screw under the rocker lever. Turn until crosshead and feeler gauge make contact with slave piston. (Make sure that adjusting screw sockets are bottomed on valve stem). When proper clearance is obtained, hold adjusting screws and lock locknuts. Torque locknuts to 47-49 ft. lbs. (6.5-6.8 kgm) using adapter and torque wrench. Adjust valves and injectors per Cummins Engine Company instructions.

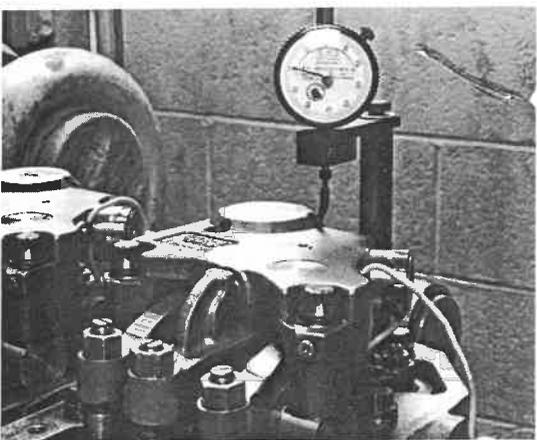
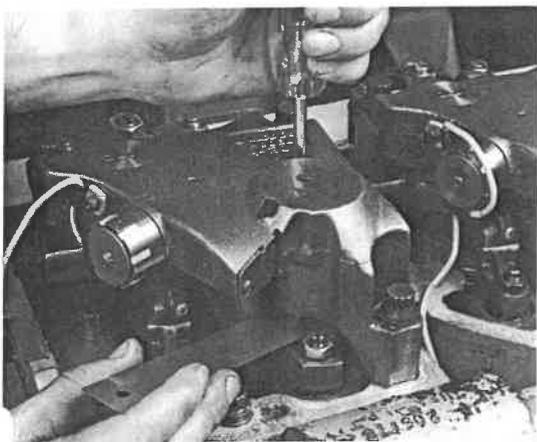
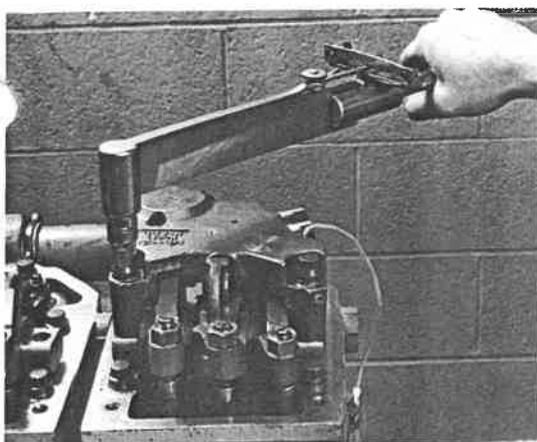
NOTE: Because of the crosshead leveling requirements, under no circumstances should the Jacobs crosshead be used without an engine brake housing installed and adjusted.

FINAL ENGINE PREPARATION

With the rocker housing covers off, cover each Engine Brake unit with a clean rag, start engine and allow to warm up. After engine has warmed up, observe oil pressure and manually depress each solenoid valve five or six times in succession to permit the flow of oil to fill all Engine Brake passages. This will bleed the brake units for immediate operation.

CAUTION

Remove rubber band retaining the master piston before operating brake.

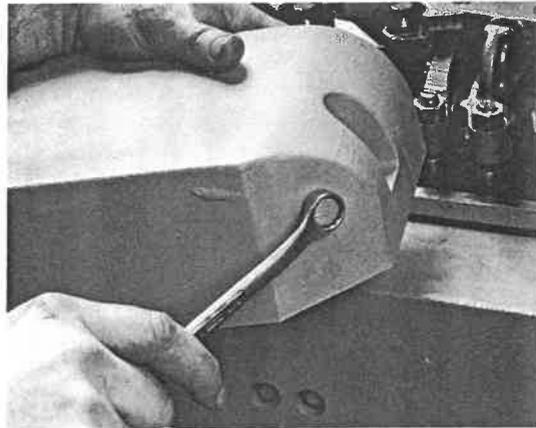


Injector and Valve Set Position

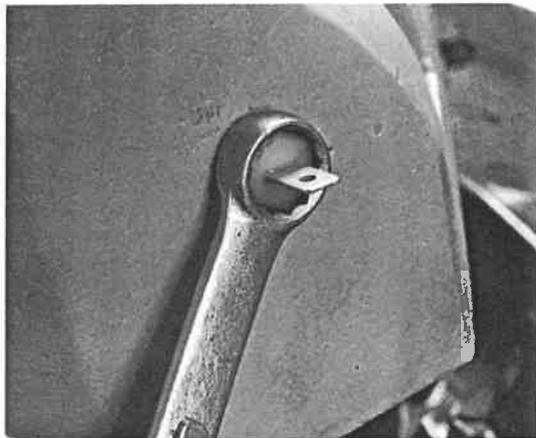
Bar in Direction	Pulley Position	Set Cylinder	
		Injector	Valve
Start	A	3	5
Adv. To	B	6	3
Adv. To	C	2	6
Adv. To	A	4	2
Adv. To	B	1	4
Adv. To	C	5	1

Firing Order 1-5-3-6-2-4

Remove plug from Cummins rocker housing covers.

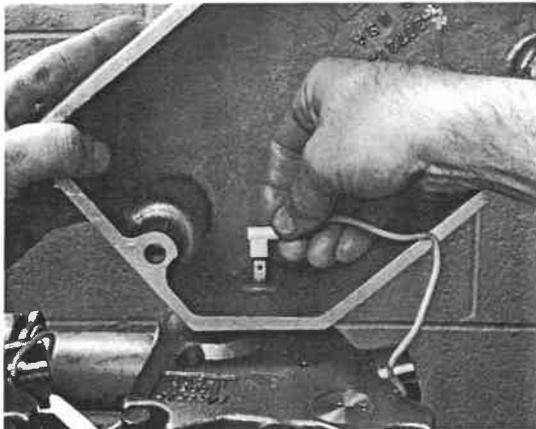


Install the Jacobs electrical terminal bushing into the rocker housing covers, using a box type wrench. Screw bushing all the way in to prevent any oil leakage.



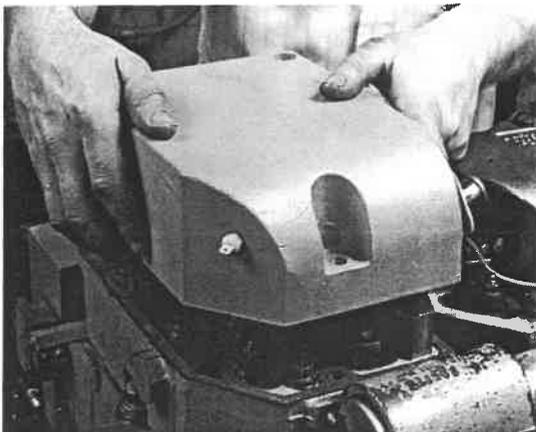
Clean all rocker cover and crossover gasket surfaces.

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

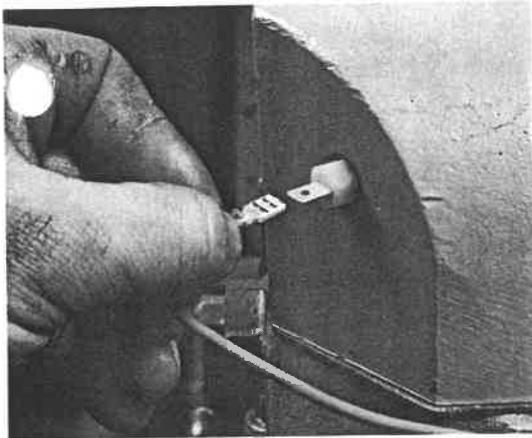


Install the rocker housing covers and intake crossover, using new gaskets.

Check that the solenoid valve lead wire does not interfere with the cover or any moving parts.



INSTALLATION OF CONTROL SYSTEM

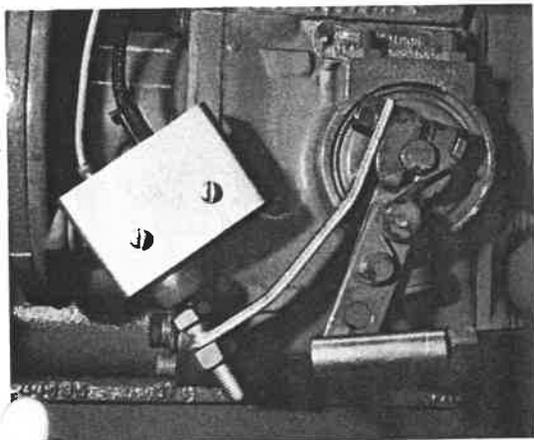


Connect control wire to electrical terminal bushings in rocker housing covers.

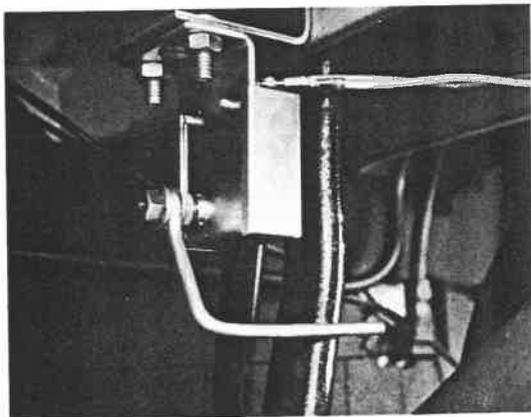
IMPORTANT

CAUTION	ADJUSTMENT
JACOBS ENGINE BRAKE SLAVE PISTON ADJUSTMENT 0.018 INCH (0.46 MM) SET WITH FEELER GAUGE	
PROCEDURE	
• BAR ENGINE IN DIRECTION OF ROTATION TO VALVE SET POSITION OF CYLINDER BEING ADJUSTED.	
• LOOSEN EXHAUST VALVE ROCKER LEVER ADJUSTING SCREW AND BACK OFF ADJUSTMENT.	
• PLACE FEELER GAUGE BETWEEN SLAVE PISTON FEET AND TOP OF JACOBS CROSSHEAD.	
• TURN BOTH ADJUSTING SCREWS IN ALTERNATELY AND EVENLY USING 1/8 TURN INCREMENTS UNTIL CROSSHEAD AND FEELER GAUGE MAKE CONTACT WITH SLAVE PISTON. (MAKE SURE THAT ADJUSTING SCREW SOCKETS ARE BOTTOMED ON VALVE STEMS). THIS PROCEDURE KEEPS THE CROSSHEAD LEVEL AND ALSO OBTAINS THE PROPER SLAVE PISTON CLEARANCE.	
• WHEN PROPER CLEARANCE IS OBTAINED, HOLD ADJUSTING SCREWS AND LOCK LOCKNUTS.	
• TORQUE LOCKNUTS TO 47-49 FT. LBS. (6.5-6.8 Kgm) USING ADAPTER AND TORQUE WRENCH.	
• READJUST EXHAUST VALVE ROCKER LASH.	

An adjustment sticker has been packed in the Information Group. This sticker must be placed on the top of one of the rocker housing covers. Clean area thoroughly before applying.



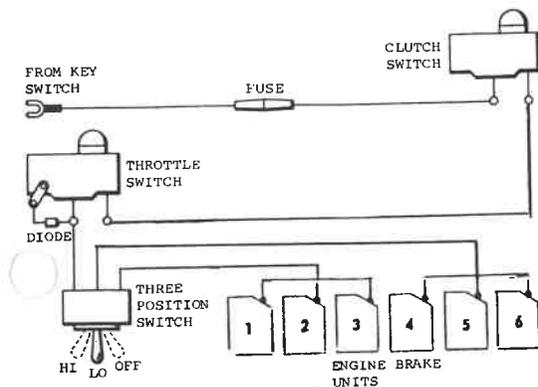
Mount the throttle switch as shown. Adjust the switch so that an audible "click" is heard when the throttle arm moves to the idle fuel position.



Install the shielded clutch switch in any convenient area free from dirt, ice, etc. The switch actuator arm may be bent to obtain motion from the clutch arm. This is a normally open switch and should be installed so that the switch contacts are open when the clutch pedal is depressed. (Clutch Disengaged)

NOTE: For installations on automatic transmissions, consult a Jacobs distributor for special instructions.

WIRING DIAGRAM (STANDARD)

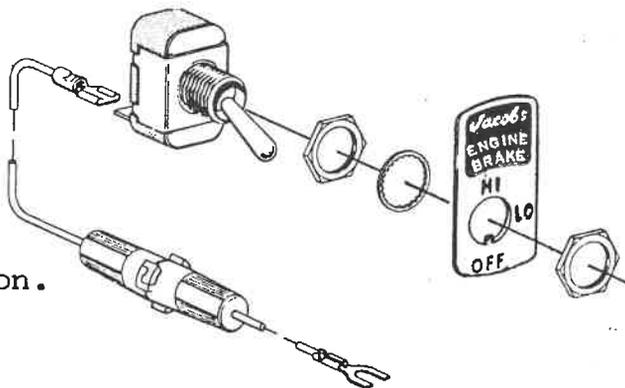


NOTE: The switch contacts are protected against arcing by a small diode connected between throttle switch load side terminal and ground. The Engine Brake must be connected to the load side terminal. If the vehicle has a positive ground electrical system, reverse the direction of the diode.

INSTALLATION OF CONTROL SYSTEM

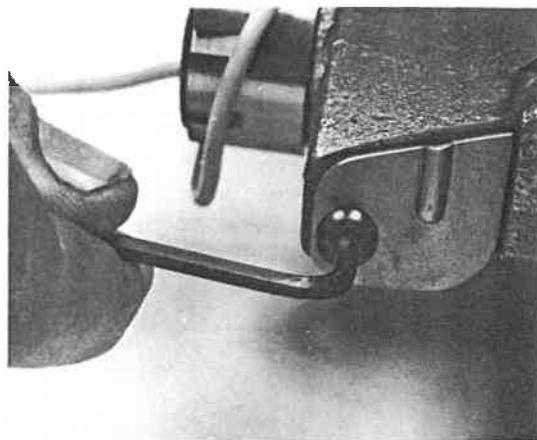
Mount the dash switch in a convenient position for operation by the driver. Install the wiring in the vehicle as shown in wiring diagram.

NOTE: Plastic ties are included in the Engine Brake kits and should be used to secure the wiring for a neat installation. Cut the wire to the required length to eliminate bundling up of loose wire.

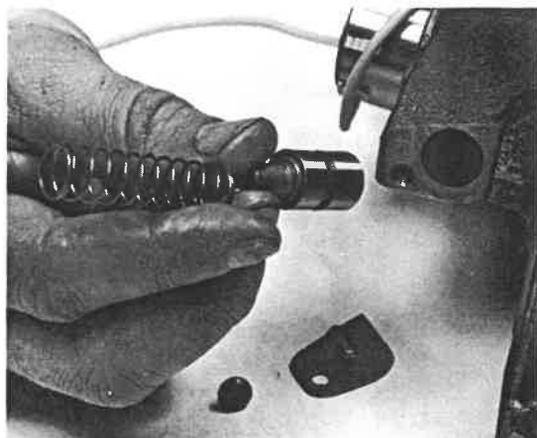


TEARDOWN AND REBUILDING OF ENGINE BRAKE

Remove the button head capscrew and cover from the side of the Engine Brake housing.

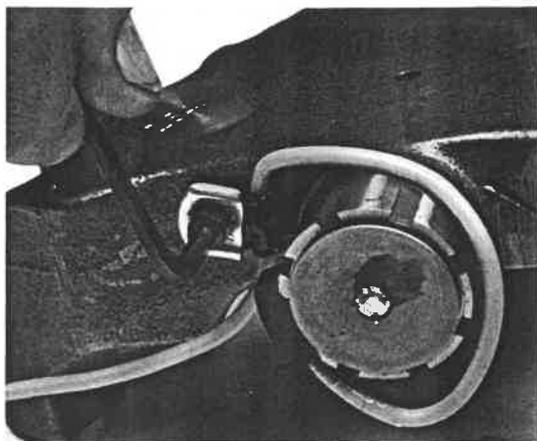


Remove control valve spring and carefully withdraw the control valve from the Engine Brake housing.



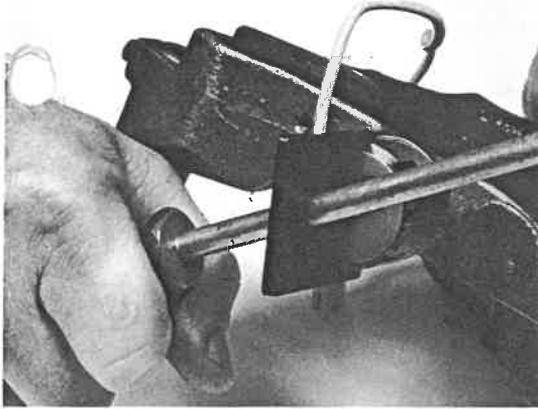
REMOVAL OF SOLENOID VALVE

Remove the solenoid lead wire clamp from the housing.



TEARDOWN AND REBUILDING OF ENGINE BRAKE

REMOVAL OF SOLENOID VALVE



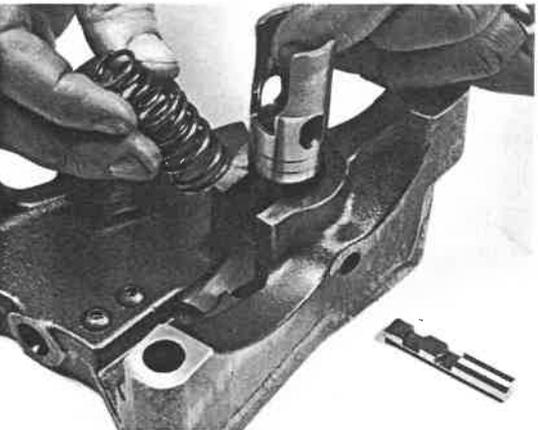
Insert screw driver into Jacobs solenoid wrench and loosen solenoid. Screw out solenoid valve.

INSTALLATION OF SOLENOID VALVE



Lubricate the seal rings with engine lube oil before assembling. Install lower seal ring (1083) into the solenoid bore in the bottom of the housing. Install upper seal ring (1081) on the solenoid valve. Install center seal ring (1082) on the solenoid valve. Insert the solenoid with seals into the housing gently without disturbing the seal rings and turn all the way in.

REMOVAL OF SLAVE PISTON



Using the slave piston assembly tool part number 3453 and a suitable clamping device, compress the slave piston springs so that the spring retaining pin can be easily removed.

NOTE: The slave piston spring is under heavy compression and care should be taken during the installation and removal.

Pull the slave piston straight up and out of its bore.



NOTE: The master piston is not retained in the housing. To remove, pull straight out of its bore.

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. (See photo).

RECOMMENDED TORQUE VALUES

PART NAME	TORQUE - FT. LBS.
Exhaust Valve Crosshead Adjusting Screw Locknuts	47-49 (6.5-6.8 kgm)
Rocker Assembly and Engine Brake Hold Down Bolts	65-70 (9.0-9.7 kgm)

SPRING DATA

Slave Piston Spring (outer) Part Number - 3408	Load at .875 in. 48 lbs. \pm 4 lbs. Load at .785 in. 55.5 lbs. \pm 4 lbs. Free length 1.320 inches Number of coils - 6 approx.
Slave Piston Spring (inner) Part Number - 3409	Load at .875 in. 25 lbs. \pm 2 lbs. Load at .785 in. 29.31 lbs. \pm 2 lbs. Free length 1.395 inches Number of coils - 8 approx.
Control Valve Spring Part Number - 3410	Load at .813 in. 1.00 lbs. \pm .10 lbs. Load at .500 in. 1.35 lbs. \pm .14 lbs. Free length 1.693 inches Number of coils - 13 approx.

WARRANTY

Products of the Jacobs Manufacturing Company are sold with the following warranty:

Products of the Vehicle Equipment Division of The Jacobs Manufacturing Company are warranted to be free of any defects in workmanship and material under normal use and service. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. Under this warranty our factory is obligated to replace, without charge, any part or parts returned to us which our examination shall disclose to our satisfaction to have been defective, within the time period indicated below, from the date of delivery of the product in question to the original user. Jacobs will also pay for all repairs to a damaged engine in which an Engine Brake has been properly installed, provided the damage is shown to be a direct result of a defect of the Engine Brake under normal operation. This warranty will not apply to any part or parts which have been altered or repaired outside of our factory, nor to parts which have been subjected to misuse, abuse, neglect or accident nor to parts which have been improperly applied or installed. Improper installation or application, or substitution of parts not manufactured or approved by us, shall void this warranty. JACOBS' LIABILITY IS LIMITED TO THE OBLIGATIONS SET FORTH HEREIN, AND JACOBS SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES.

Warranty Coverage:

Engine Brake housing assembly and related attaching parts less seals, O-rings and gaskets -- one year or 100,000 miles.

All control system components, seals, gaskets, switches and attaching parts not of Jacobs manufacture -- three months or 24,000 miles.

JAKE BRAKE is the exclusive trademark of the Jacobs Manufacturing Company for its line of diesel engine retarders. The Jake Brake should not be construed as a primary or service braking system.