



Installation Manual

Model T440/A Engine Brakes

**For Cummins
91N14 Series Engines**

TecBrake
P.O. Box 27822
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INSTALLATION MANUAL

TEC BRAKE MODEL T440/A ENGINE BRAKE FOR CUMMINS 91N14 SERIES ENGINE

The TecBrake T440/A engine brake may be installed on popular versions of the Cummins 91N14 STC and Celect series engines. It can **not** be installed on the Cummins 855, 88NT, 94N14 or N14Plus model engines. It should only be installed on engines whose CPL numbers are included in the Application Guide.

SECTION 1- INTRODUCTION

NOTICE

The TecBrake Engine Brake is designed as a device for slowing a vehicle, not stopping it. It is to be used in conjunction with, but not a substitute for the vehicle's service brakes. The service brakes must be in good operating condition and used to bring the vehicle to a complete stop.

Material Required

The TecBrake kit includes all of the parts required to make an installation on the most common engine configurations.

Prior to making installation, determine the engine CPL number to verify that the engine brake being installed is correct for the engine. The CPL number can be found on the engine identification plate that is located on the engine gear case flange. Also determine whether the engine is a STC model with PT fuel pump system or a CELECT version having electronic fuel injection. Depending on fuel system, a different control group is required.

Special Tools

The following special tools are required for installation:

1. 7/16" 12 point socket
2. Feeler gauge 0.023"

Recommended Torque Values

Engine Brake Hold-down screws - 70 lbft (95 N*m)
Slave Piston Adj. Screw Nuts - 25 lbft (35 N*m)
Valve Cover capscrews - 9 lbft (12N*m)

NOTICE

Injector adjusting screws and exhaust crossheads are not replaced on this installation.

SECTION 2-ENGINE PREPARATION

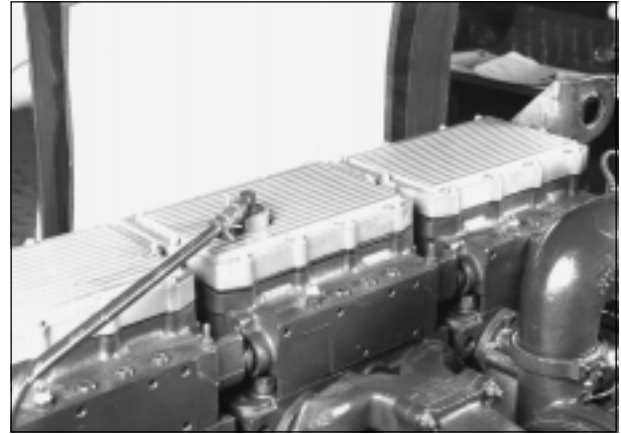


Figure 2-1

1. Thoroughly clean engine before beginning installation. Remove all engine components necessary to permit access to cylinder heads. Remove valve covers, save the gaskets.



Figure 2-2

2. Remove the pipe plug from the center web of each rocker lever housing to allow oil flow into the engine brake housing.

SECTION 3- BRAKE HOUSING INSTALLATION

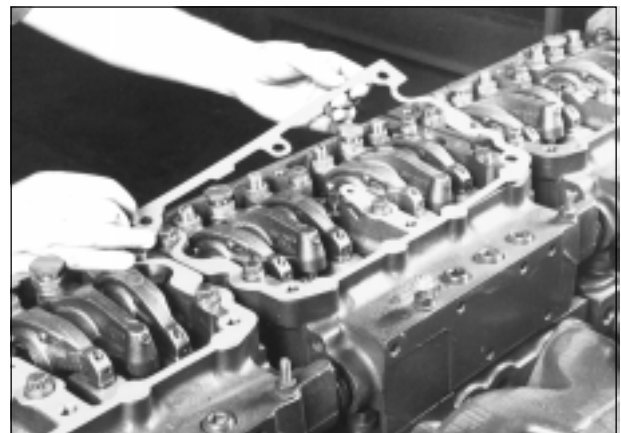


Figure 3-1

1. Install the engine brake housing gaskets. Make sure that the oil supply slots align correctly with the oil supply screws in the housings.

2. Before installing the brake housings, back out the slave adjusting screws (located above the slave piston) so that the slave pistons are fully retracted (up).

3. Place the three engine brake housings on the rocker housings. Check rocker levers to be sure there is no interference.

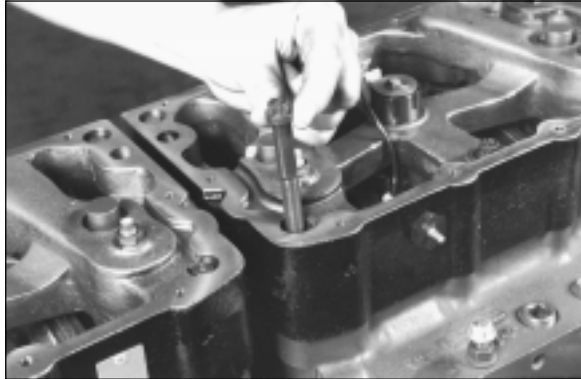


Figure 3-2

4. Install the six mounting screws into each engine brake housing.

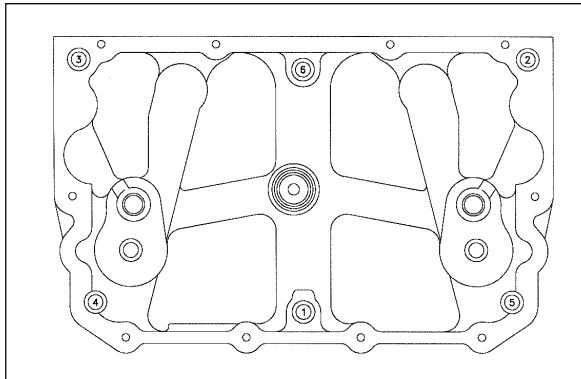


Figure 3-3

5. Tighten the capscrews to 35 lbft (48 N*m) in sequence as shown in Figure 3-3 then re-torque to 70lbft (95N*m).

Slave Piston Adjusting Screw

Only one adjusting screw (color code white), is required for both STC and Celect applications.

Slave Piston Adjustment

Adjustment of the slave piston adjusting screw is critical. Proper adjustment is necessary in order to provide peak braking efficiency without over stressing the engine.

Slave piston adjusting screw adjustment must be made with the engine stopped and engine temperature stabilized below 140 °F (60°C).

A) Dial Indicator Method

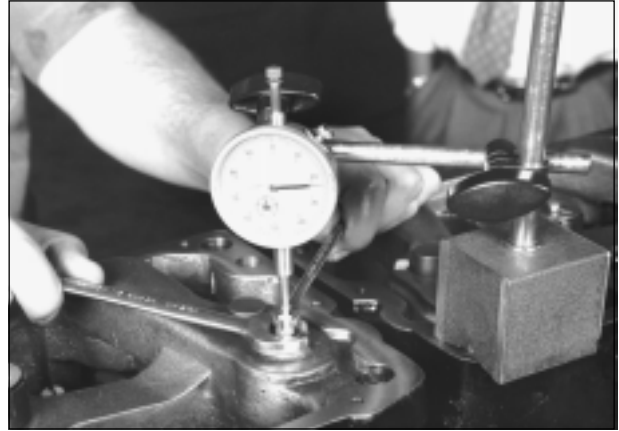


Figure 3-4

1. Set engine brake valve lash using the adjusting screw located above each slave piston. The engine crankshaft must be rotated to allow the exhaust valve to be fully closed prior to making adjustment on each cylinder.

2. Install a dial indicator over the slave piston adjusting screw for the cylinder to be adjusted. Turn the screw down until the slave piston contacts the crosshead. Zero the dial indicator on this position. Back out the adjusting screw until the dial shows 0.023" (0.58mm).

3. Tighten the adjusting screw lock nut to 25 lbft (35 N*m) torque. Rotate the crankshaft, adjusting each adjusting screw in firing order sequence.

B) Feeler Gauge Method



Figure 3-5

1. Set engine brake valve lash using the adjusting screw located above each slave piston. The engine crankshaft must be rotated to allow the exhaust valve to be fully closed prior to making adjustment on each cylinder.

2. Back out the adjusting screw on each cylinder to be adjusted. Using a 0.023" feeler gauge between the slave piston and the exhaust crosshead, turn in the slave piston adjusting screw until a slight drag is felt on the gauge.

3. Tighten the adjusting screw lock nut to 25 lbf (35 N*m) torque. Rotate the crankshaft, adjusting each adjusting screw in firing order sequence.

Operational Check

Installation of the brake housings is now complete. Functioning of the brakes should be checked before proceeding further.

1. Start the engine and let it idle for a short time.

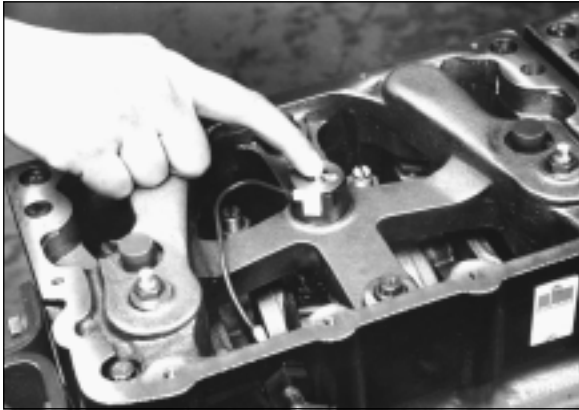


Figure 3-6

2. Bleed air from the engine brake housing. Accelerate the engine to about 1800 RPM then release the throttle. Quickly depress the solenoid as shown to cause the brake to operate. This process should be repeated 5-6 times on each brake assembly in order to fill the housings with lube oil. When all of the air has been removed the brake should operate immediately when the solenoid is depressed.

CAUTION

Wear eye protection. When engine is running with valve covers removed, oil splashing will occur. Take precautions to prevent oil contaminating engine and engine compartment.

SECTION 4- ELECTRICAL SYSTEM INSTALLATION

A) 91N14 Cummins STC Engines

Installation of the electrical system involves the mounting of dash switches, a clutch switch, and a fuel pump switch. An optional foot switch may be installed in place of the clutch switch. Wiring harnesses are provided in the kit to complete the installation. Refer to the wiring diagram Figure 4-7.

Dash Switches

Dash switches should be installed in dash where they are visible and convenient to operate.

1. Drill holes in dash to accommodate switches and install switches with proper name plates.

Clutch Switch

It is recommended that the clutch switch be mounted inside the vehicle cab to protect it from road contamination.

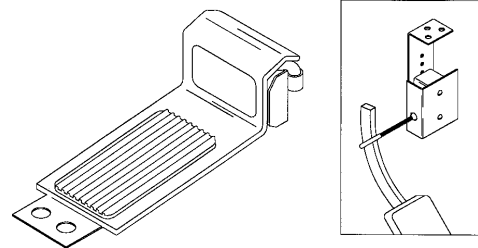


Figure 4-1

1. Mount the clutch switch in a convenient location near the clutch pedal so that movement of the clutch pedal will contact the clutch switch actuator arm. See Figure 4-1.
2. Adjust the clutch switch so that the actuator arm is deflected from 1" to 1.5" (25 mm to 38 mm) when the clutch is in the up (clutch engaged) position.
3. Check the switch by depressing the clutch. The switch should «click» to an open electrical position as soon as the free play in the clutch is taken up. When the clutch is released, the switch should «click» to a closed electrical position.

Fuel Pump Switch

DIODE POSITION
FOR NEGATIVE
GROUND SYSTEM

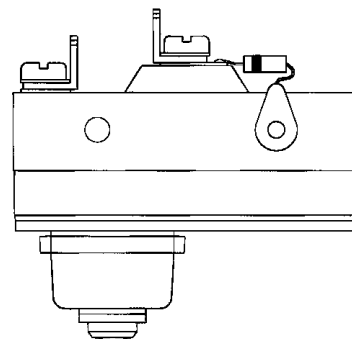


Figure 4-2

1. Diode on fuel pump switch is wired for a negative ground electrical system. If vehicle uses a positive ground system, the diode must be removed and reversed.

2. Remove nut, bolt and washer from bottom of fuel pump operating lever.

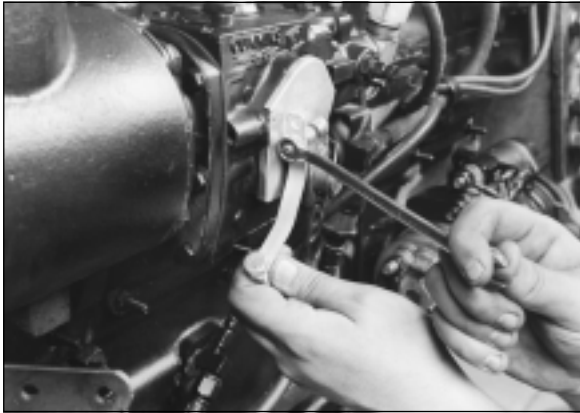


Figure 4-3

3. Install the actuating arm on the fuel control throttle level using the nut, bolt and washer previously removed.

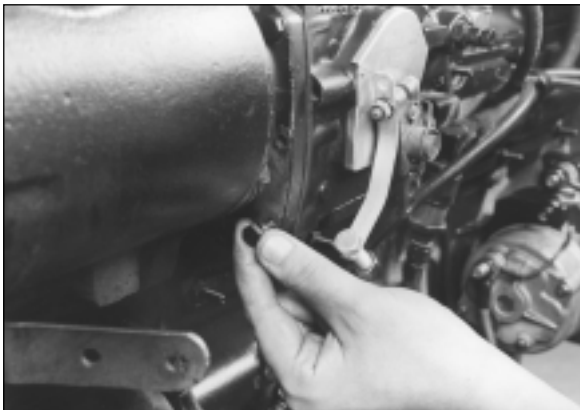


Figure 4-4

4. Remove two fuel pump mounting screws from rear of fuel pump as shown.

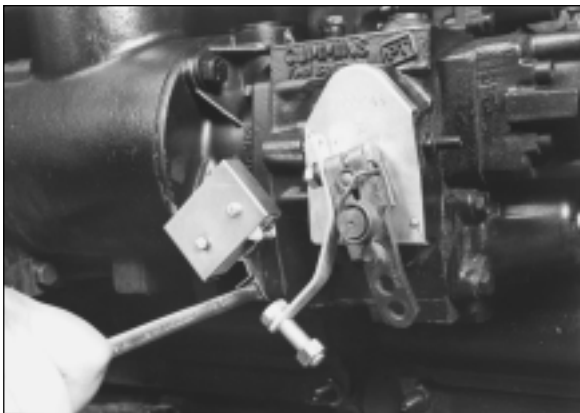


Figure 4-5

5. Attach the fuel pump switch and mounting bracket to the fuel pump using the screws just removed. Tighten to 100 lbin (10N*m) torque.

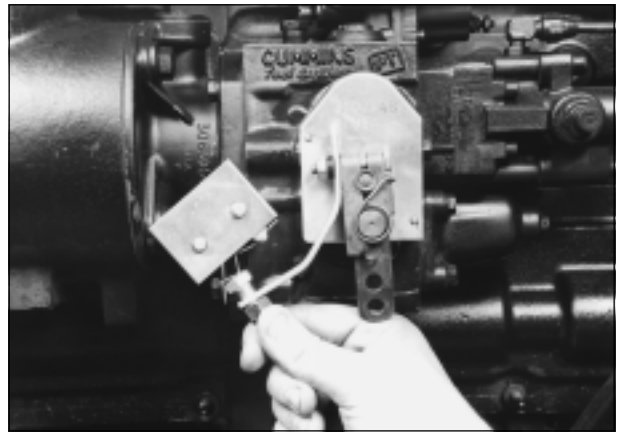


Figure 4-6

6. Adjust actuating arm to contact switch when throttle is in idle position. Switch should "click" as soon as throttle lever is moved off of idle position. **Check to be sure throttle linkage moves freely after installation of fuel pump switch.**

B) 91N14 Cummins Celect Engines

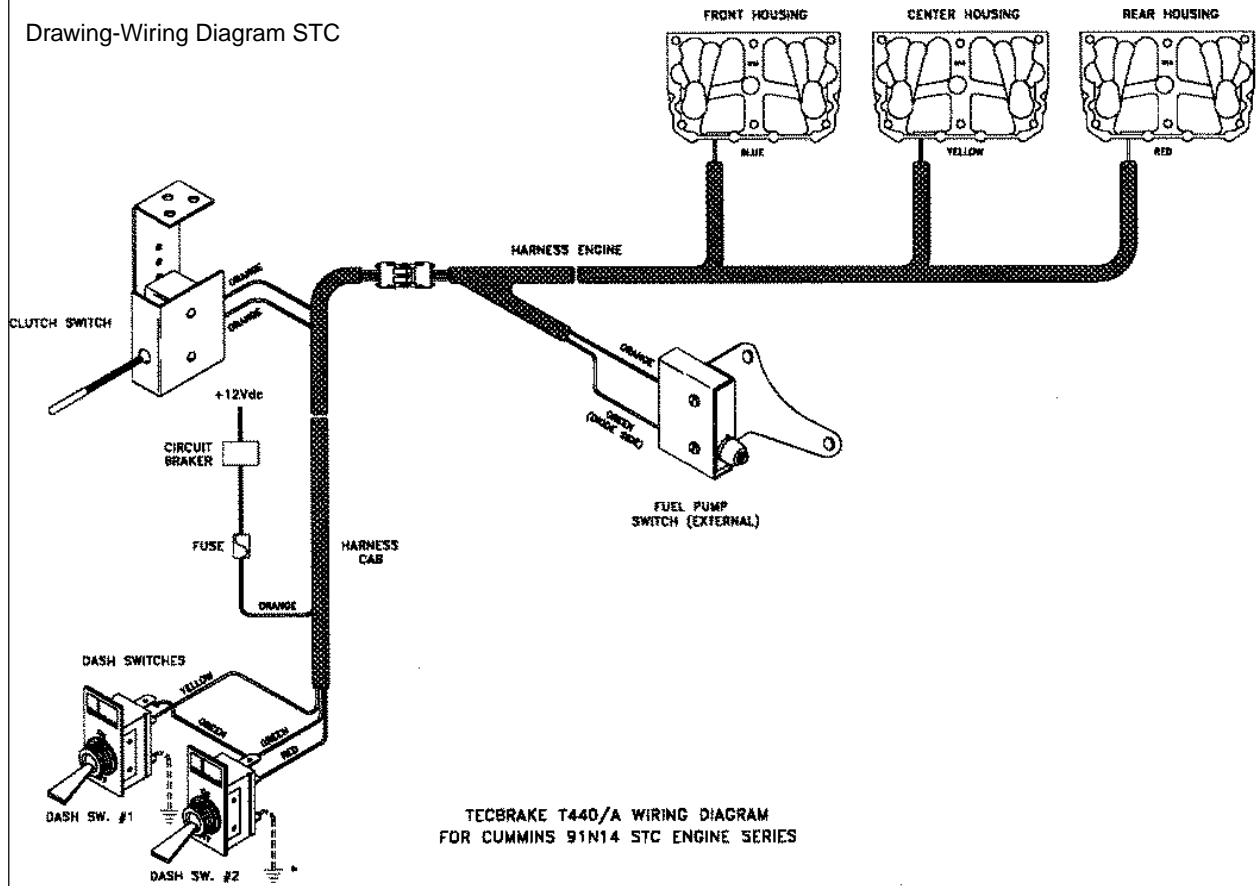
Installation of the electrical system involves the mounting of an ON/OFF dash switch that has gold-plated contacts, a selector dash switch and a relay. Wiring harnesses and wiring diagram are provided in the control group to complete the installation. Refer to the wiring diagram Figure 4-7.

Dash Switches

Dash switches should be installed in dash where they are visible and convenient to operate.

1. Drill holes in dash to accommodate switches and install switches with proper name plates.
2. To check the electrical system, start the engine. Select position 1 and activate engine brake with the ON/OFF switch. The Celect low speed shut off will prevent the engine brake from coming on at idle. Accelerate until the engine reach 1800 RPM and release the throttle. The center engine brake housing should operate in position one. Repeat this operation for the remaining 2 and 3 positions. The front and rear brake housings should operate in position 2 and all three engine brake housings should operate in position 3. After this procedure, shut down engine.
3. To complete the installation, reinstall the Cummins valve cover gaskets, replace valve covers, and all previously removed parts. Torque valve cover capscrews to 9 lbf (12 N*m).

Drawing-Wiring Diagram STC



Drawing-Wiring Diagram Select

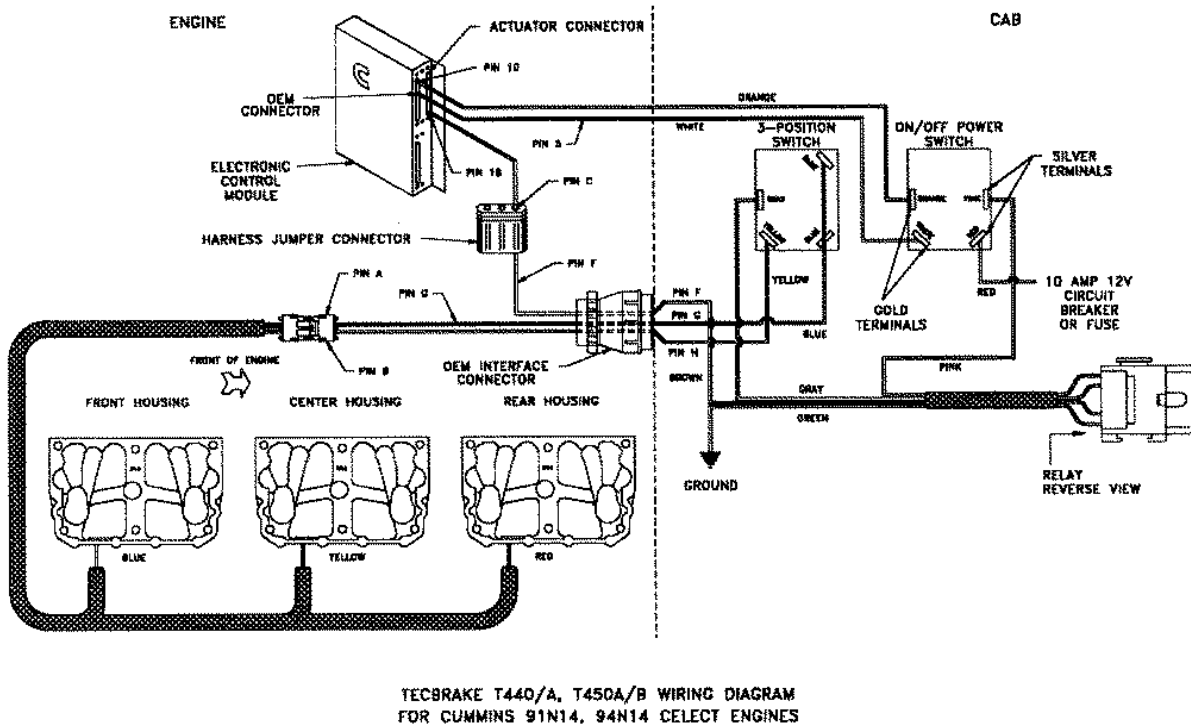


Figure 4-7

SECTION 5 - ENGINE BRAKE MAINTENANCE

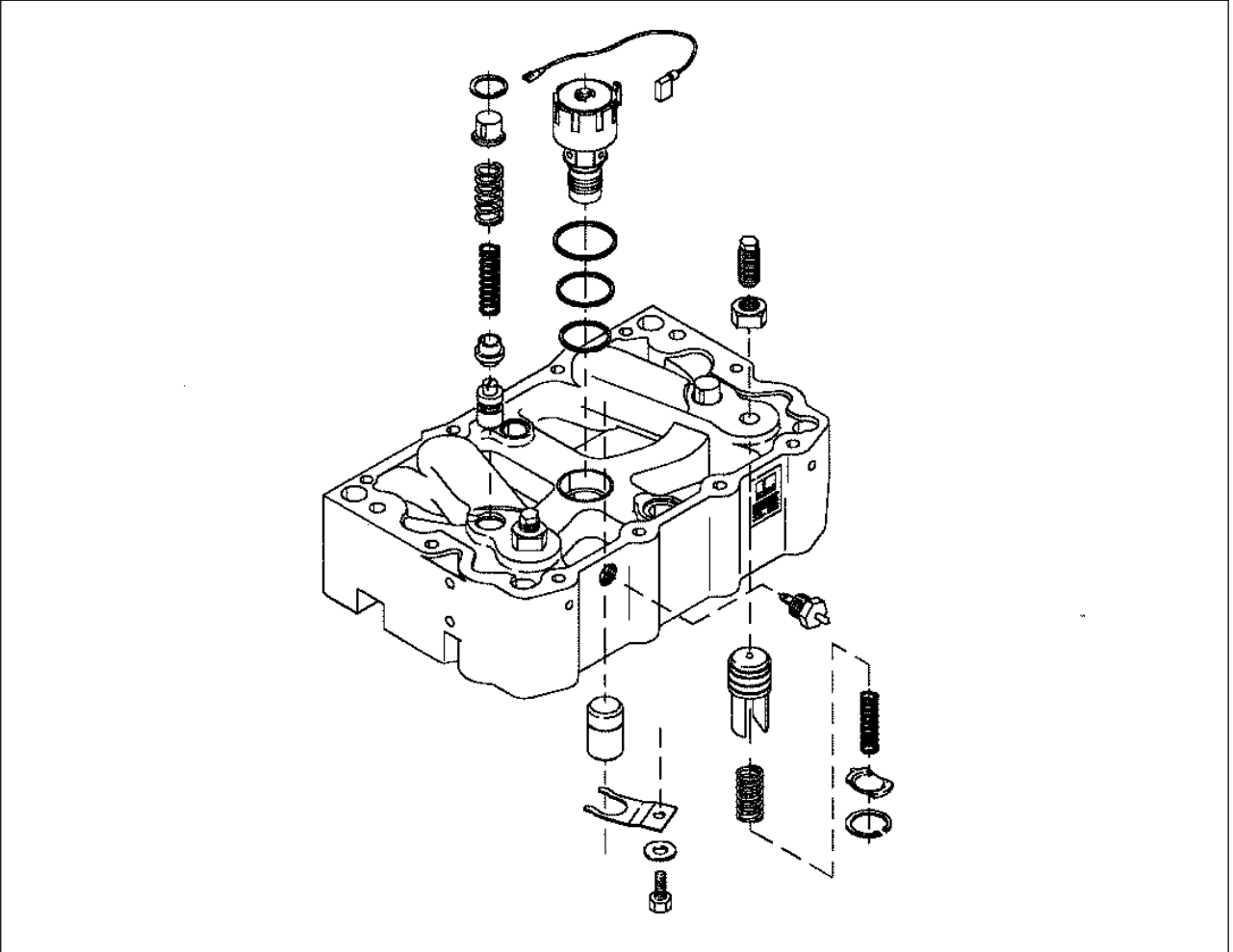


Figure 5-1

The engine brake is designed to be trouble free and does not require special maintenance. During regularly scheduled maintenance, or if a problem occurs, the procedures described below should be followed.

CAUTION

Do not remove any engine brake component while the engine running. This may result in personal injury. Use only approved cleaning solvents.

Solenoid Valve

1. Disconnect the electrical lead from the solenoid and remove solenoid with a spanner wrench. Remove and discard the three rubber seal rings.
2. Clean the filter screen and solenoid with solvent then dry with low air pressure.

3. Clean solenoid bore with solvent and wipe dry with paper towel. Be careful not to leave any lint or residue in bore that may contaminate brake hydraulic components.



Figure 5-2

4. Reinstall solenoid valve using three new o-rings. Coat solenoid body with engine lube oil and install upper and center seal rings on solenoid body. Seat lower seal ring in bottom bore of brake.

5. Carefully screw in solenoid valve, using care to assure O-rings remain in position and are not twisted or "rolled".

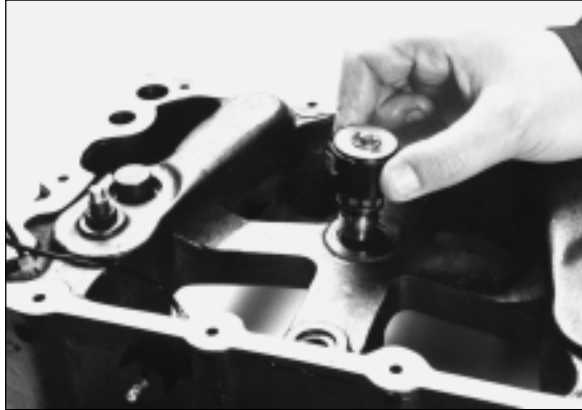


Figure 5-3

6. Tighten solenoid valve to 5 lbft (7 N*M) torque.

Control Valve



Figure 5-4

1. Press down on control valve cover to relieve spring pressure.

2. Remove retaining ring using retaining ring pliers.

3. Slowly remove the cover until spring pressure ceases, then remove the two control valve springs and collar.

4. Remove control valve using needle nose pliers.

5. Wash control valve with solvent.

CAUTION

Control valve covers are under load from control valve springs. Use care when removing control valve covers to avoid injury.

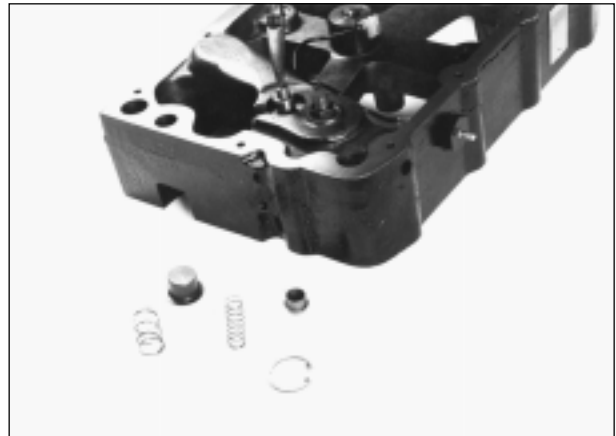


Figure 5-5

6. Push on the check valve ball with a small wire through the hole in the bottom of the control valve to make sure that there is spring tension on the ball. The ball should lift freely with a small amount of force and return quickly to the seat when the force is removed. Replace the control valve if it is defective.

7. Dip the control valve in engine lube oil and install in brake housing. Control valve should slide in without any binding. Replace control valve if binding occurs.

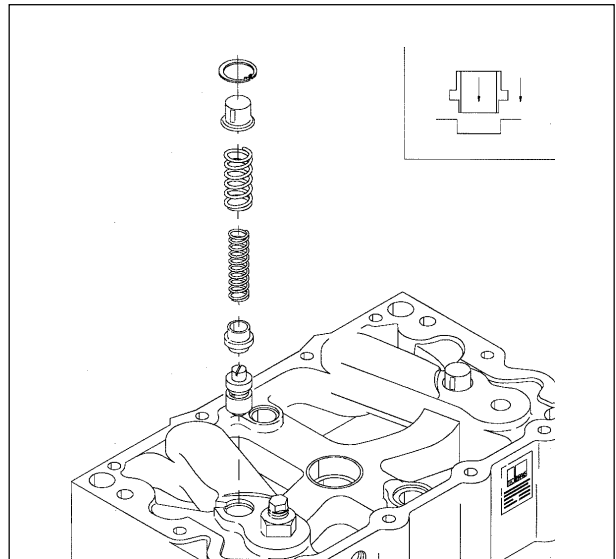


Figure 5-6

8. Install both control valve springs in control valve bore and install cover and retaining ring.

Slave Piston

1. Remove lock nut from slave piston adjusting screw.
2. Loosen slave piston adjusting screw until slave piston seats on bottom of bore.

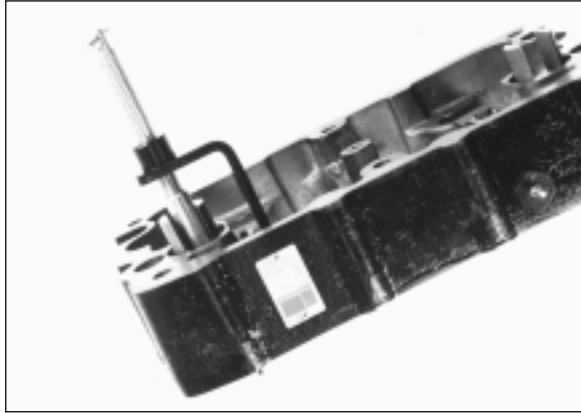


Figure 5-7

CAUTION

When removing slave pistons wear eye protection and use proper tools. Slave piston springs are highly compressed and may cause serious personal injury if not removed with caution.

3. Install slave piston spring removal tool as illustrated. Turn tool screw until all force is removed from spring retainer.
4. Using retaining ring pliers, orient the retaining ring end near slot in brake housing.
5. Compress the retaining ring with the retaining ring pliers and remove it from the groove in the housing.

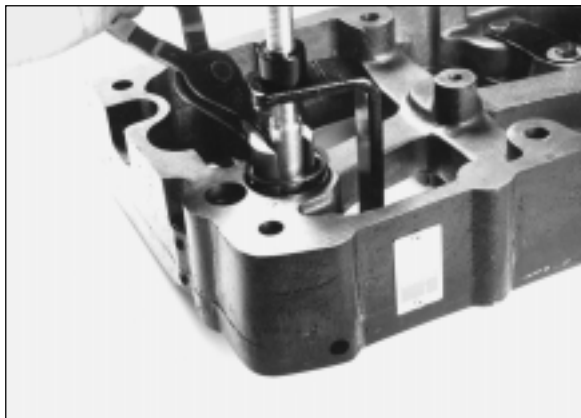


Figure 5-8

6. Loosen screw in spring removal tool slowly and carefully to remove the spring tension. Remove the retainer, springs and slave piston.

7. Check slave piston outside diameter ground surface for burrs or defects.
8. Clean all parts with approved solvent and lubricate with engine oil.



Figure 5-9

9. Insert piston in bore. Piston must slide in bore without binding. Replace if binding occurs.
10. Reassemble all parts in reverse order from disassembly procedure.
11. Before removing the slave piston spring removal tool, be sure the retaining ring is fully seated in the groove. Rotate retaining ring 90° away from the slot in brake housing.

Master Piston

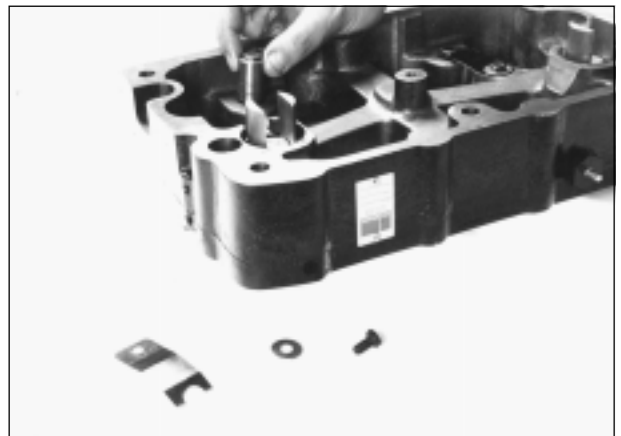


Figure 5-10

1. Remove button head screw, washer and flat spring from brake housing.
2. Remove master piston from bore.

3. Check master piston outside diameter ground surface for nicks or burrs. Piston must slide in bore without binding. Replace if binding occurs. Check top surface of piston. Replace piston if there are cracks or pitting.

4. Clean all parts with approved solvent and lubricate with engine oil.

5. Insert piston in bore. Piston must slide in bore without binding. Replace if binding occurs.

6. Reassemble all parts in reverse order from disassembly procedure.

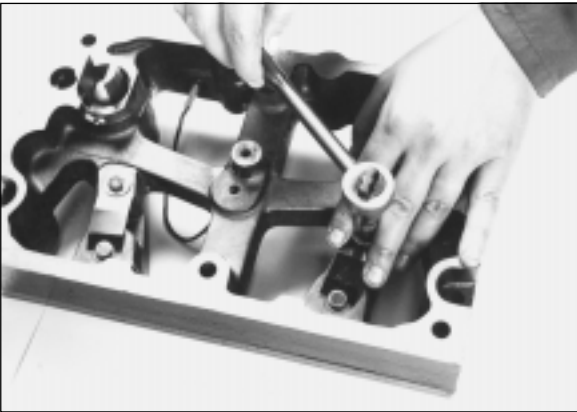


Figure 5-11

7. Make sure spring tabs are aligned with raised surface on end of piston.

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