TECBRAKE
Engine Brakes

Installation Manual

Model T430A Engine Brakes

For Cummins
NTC/88NT Series Engines

TecBrake
P.O. Box 27822
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INSTALLATION MANUAL

TECBRAKE MODEL T430A ENGINE BRAKE FOR CUMMINS NTC/88NT SERIES ENGINE

SECTION 1- INTRODUCTION

The TecBrake T430A engine brake may be installed on popular versions of the Cummins NTC/88NT series engine. It can **not** be installed on earlier versions of the Cummins NTC series engines, which use a different cylinder head configuration. The TecBrake application chart can be used to identify the engine model and determine if the engine is approved for installation of an engine brake.

The Model T430A engine brake will fit on NTC/88NT engines equipped with either Fixed Timing or Step Timing Control (STC). Earlier STC engine applications required that the rear brake housing be connected to the Step Timing Control Valve. This is not required on the TecBrake Model T430A.

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.

Special Tools

The following special tools are required for installation:
1. Crowfoot wrench- 9/16"
2. Crowfoot wrench- 5/8"
3. Socket, extra deep- 5/8"
4. Feeler gauge- 0.018"
5. STC Tappet setting tool- Cummins Part No.3822648

Recommended Torque Values

Crosshead Adj. Screw locknuts -	25 lbft (35 N*m)
Engine Brake Hold-down Nuts -	60 lbft (80 N*m)
Rocker Housing Studs-	70 lbft (95 N*m)
Rocker Arm Adj. Screw Nuts -	45 lbft (60 N*m)
Slave Piston Adj. Screw Nuts -	25 lbft (35 N*m)
Fuel Pump Sw. Mtg. Brkt. Bolts-	100lbin (10 N*m)

SECTION 2 - ENGINE PREPARATION

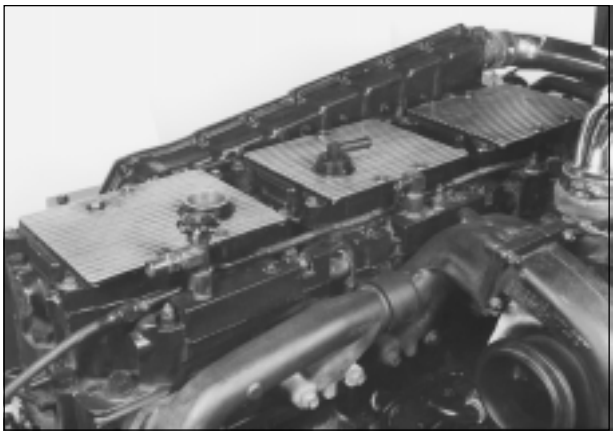

Figure 2-1

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

It is not necessary to remove the rocker lever housing to install the Model T430A engine brake.

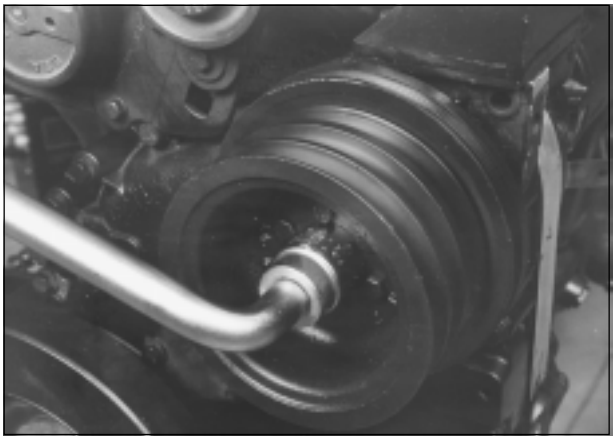

Figure 2-2

2. Rotate engine crankshaft to proper position for making adjustments to Injector, exhaust valve, and slave pistons later on.

3. Turn crankshaft clockwise until the "A" mark on the accessory drive pulley is aligned with pointer on the gear case cover.

4 At this point, the intake and exhaust valves should be closed for cylinder No. 5 and the rocker levers should be "loose". The injector plunger for cylinder No. 3 must also be at the top of it's travel. If it is not, turn the crankshaft another 360 degrees and realign the "A" mark with the pointer.

5. After the engine brake is installed the engine will be in position to begin setting the injector, exhaust valve and slave piston adjusting screws.

6. Remove the rocker arm adjusting screws from the exhaust rocker levers. Retain the Cummins locknuts and screws.

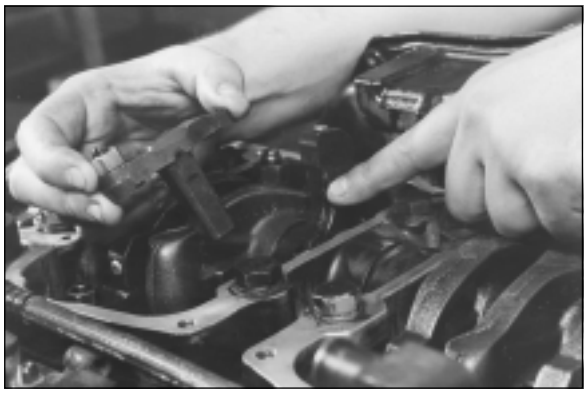

Figure 2-3

7. Move the exhaust push tube to one side; rotate the exhaust rocker lever to permit removal of Cummins crosshead.

8. Install the new TecBrake crosshead. Note that it comes with a new crosshead adjusting screw and nut. Lubricate the crosshead and guide with oil before installation. Make sure the crosshead adjusting screw is on the exhaust manifold side of the engine.

9. Adjust the crosshead by holding it down against the valve stem nearest the push tube, then turn in the adjusting screw until it touches the valve stem.

10. Hold the adjusting screw in place and tighten the locknut to 25 lbft (35N*m). Repeat operation for all crossheads

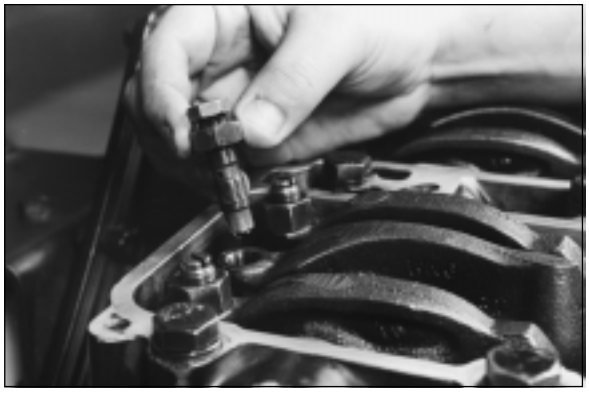

Figure 2-4

11. Remove the injector adjusting screws from injector rocker arm. Install the TecBrake injector adjusting screws (hex head) furnished in kit. Reuse the Cummins adjusting screw lock nuts.

CAUTION

The injector adjusting screw used in the TecBrake Model T430A has a 5/8" hex head and height of 2". Earlier model engine brakes used either a 5/8" or 7/16" hex head and were 2.2" in height. These screws are not interchangeable. Use of the wrong screw will result in damage to the engine and brake.

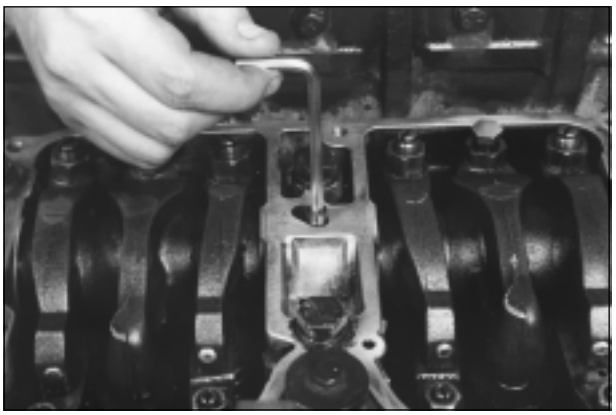

Figure 2-5

12. Remove the Cummins solid rocker shaft locking screws from the cylinder heads and replace them with the hollow set screws supplied in kit. Be sure screw is below flat surface of the rocker housing when installed.

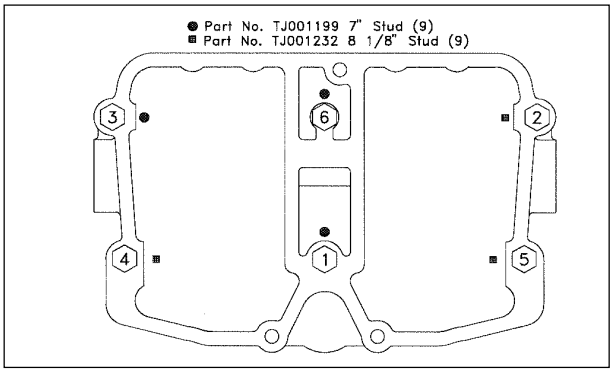

Figure 2-6

13.Remove three capscrews from each rocker housing in positions1, 2, and 3 as indicated in Figure 2-6. ***Do not remove all six of the capscrews at the same time, as this will permit the housing and gasket to move.***

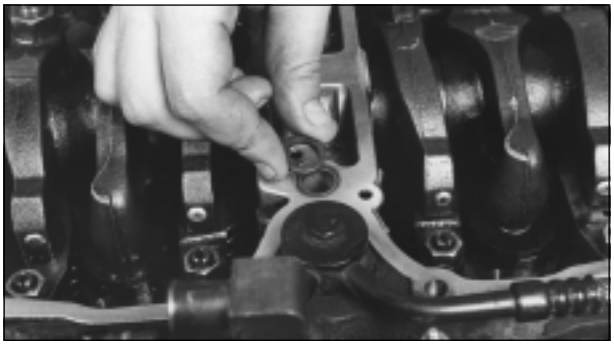

Figure 2-7

14. Install the special bearing washer into each rocker housing capscrew bolt hole with the smaller diameter down. NOTE: Bearing washers are not required in positions 2 and 5 if a fan brace is used.

15. Install studs supplied with kit in positions1, 2 & 3 as indicated in Figure 2-6. Torque studs to 70 lbft (95 N*m).

16. Remove capscrews from positions 4, 5 & 6 as indicated in Figure 2-6. Install new studs and torque to 70 lbft).

SECTION 3 - VALVE AND INJECTOR ADJUSTMENT

Different procedures are used in setting injectors on STC versus fixed timed engines. Refer to the Injector and Valve Setting Chart (Figure 3-1) to determine the crankshaft position when adjusting injectors and exhaust valves.

Injector and Valve Setting- Crankshaft Position Chart

Bar in Direction of Rotation	Pulley Position	Set Injector	Set Valves
START	A	3	5
ADVANCE TO	B	6	3
ADVANCE TO	C	2	6
ADVANCE TO	A	4	2
ADVANCE TO	B	1	4
ADVANCE TO	C	5	1

Figure 3-1

1. If you did not previously position the crankshaft for valve and injector adjustments, turn crankshaft clockwise until the “A” mark on the accessory drive pulley is aligned with pointer on the gear case cover.

2. At this point, the intake and exhaust valves should be closed for cylinder No. 5 and the rocker levers should be “loose”. The injector plunger for cylinder No. 3 must also be at the top of its travel. If it is not, turn the crankshaft another 360 degrees and realign the “A” mark with the pointer.

Setting Injectors

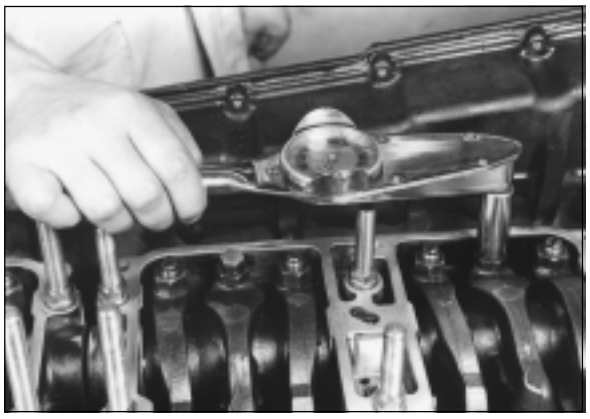

Figure 3-2

Fixed Timing Control -

1. Set injector adjusting screws to 6 lbin. (0.7N*m) following the setting chart (Figure 3-1). Cummins injector adjusting tool (Part No. 3376592) may be used.

Figure 3-3

2. Tighten adjusting screw locknut to 45 lbft (60 N*m).

Step Timing Control -

A special tappet tool (Cummins No. ST-3822648) must be used to set the STC style injectors. This tool has a small locating pin that locates the tool in one of the four holes in the tappet.

Figure 3-4

1. Place the tool on top of the tappet then rotate it until the pin is inserted into one of the holes in the tappet. Apply pressure to the tool handle in order to hold the tappet at the maximum extended position.

2. Set the injector rocker arm adjusting screw to 5-6 lbin. Remove tool before baring the engine to the next position as indicated in the setting chart (Figure 3-1).

3. Tighten adjusting screw locknut to 45 lbft (60 N*m).

Setting Intake and Exhaust Valves -

1. Using the setting chart (Figure 3-1), adjust the valves using a feeler gauge between the rocker lever and the crosshead. The exhaust valve clearance should be 0.023" and the intake valve clearance should be 0.011".
Note: Some engines may have different valve and injector adjustments. Check the engine data plate to verify settings.

2. Tighten adjusting screw locknut to 45 lbft (60 N*m).

SECTION 4 - INSTALLING THE BRAKE-

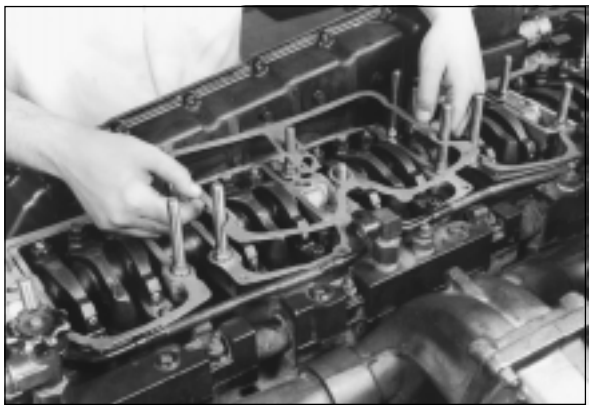

Figure 4-1

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).

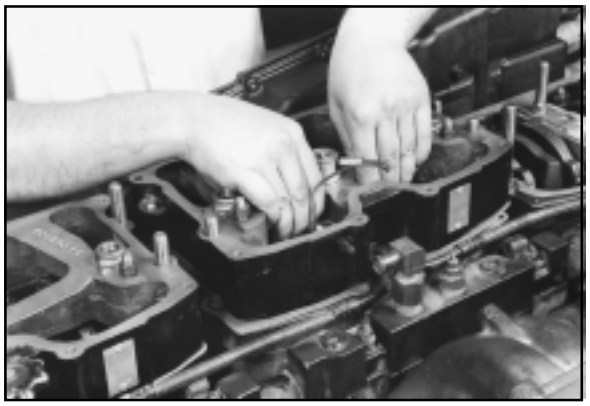

Figure 4-2

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

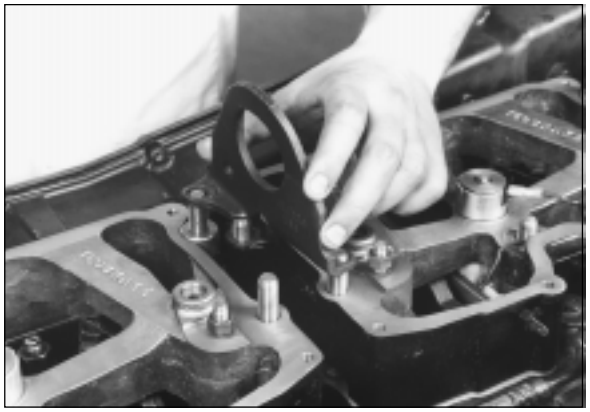

Figure 4-3

4. If lifting or mounting brackets are used, install spacers as required.

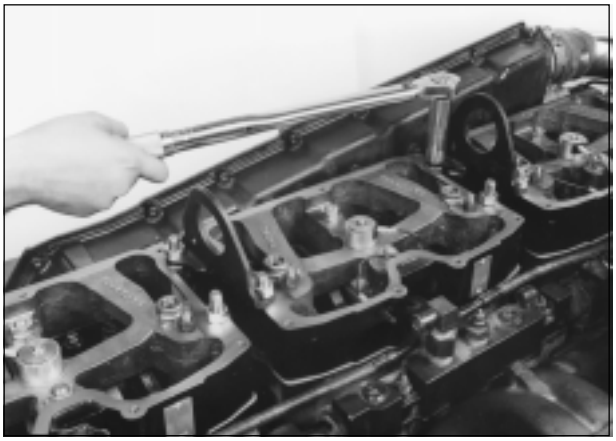

Figure 4-4

5. Install the nuts provided in the kit and tighten to 30 lbft (40 N*m) in sequence as shown in Figure 4-5 then re-torque to 60lbft (80M*m).

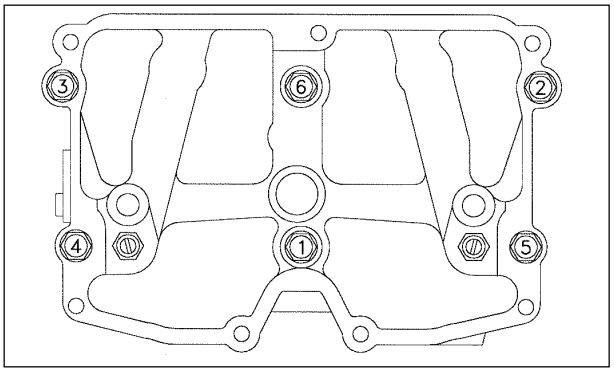

Figure 4-5

Slave Piston Adjusting Screw

Two adjusting screws are provided with the kit. Refer to the Application chart shown in Figure 4-6 to identify which screw should be used. The most commonly used screws (black) are pre-installed in the brake. If the chart calls for the Beige adjusting screw, they should be installed in place of the other (black) screw.

APPLICATION CHART

CPL NO.	ENGINE MODEL	ADJUSTING SCREW PART NO.	COLOR
827	NTC400 88NT	TB924921	BEIGE
838	NTC315 88NT	TB924922	BLACK
840	NTC350 88NT	TB924922	BLACK
910	NTC444 88NT	TB924921	BEIGE
1185	NTC400 88NT	TB924921	BEIGE
1187	FLEET 285 88NT	TB924922	BLACK
1188	NTC350 88NT STC	TB924921	BEIGE
1210	NTC444 88NT STC	TB924921	BEIGE
1211	NTC400 88NT STC	TB924921	BEIGE
1256	NTC444 88NT	TB924921	BEIGE
1280	NTC444 88NT	TB924921	BEIGE
1285	NTC444 88NT	TB924921	BEIGE
1286	NTC444 88NT	TB924921	BEIGE
1352	FLEET 300 88NT	TB924922	BLACK

Figure 4-6

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 ºF.

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 0.018" 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 lbft (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.

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.

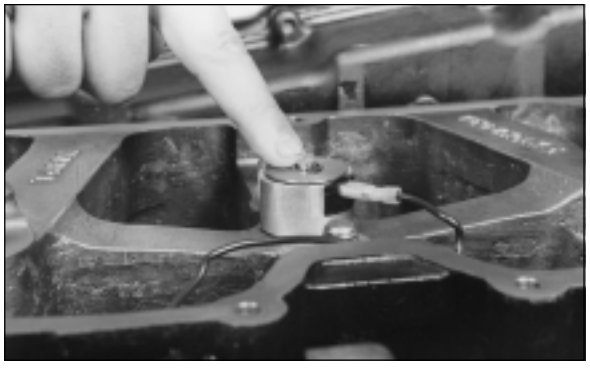

Figure 4-7

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.

SECTION 5- ELECTRICAL SYSTEM INSTALLATION

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 5-8.

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.

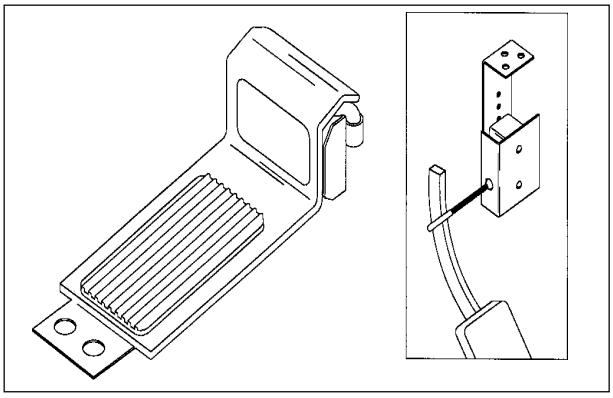

Figure 5-1

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 5-1.

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.

Optional Foot Switch

An optional foot switch may be used in place of the clutch switch. The foot switch should be mounted on the cab floor to the left of the clutch pedal and should be located so that it can be conveniently operated with the drivers left foot.

Fuel Pump Switch

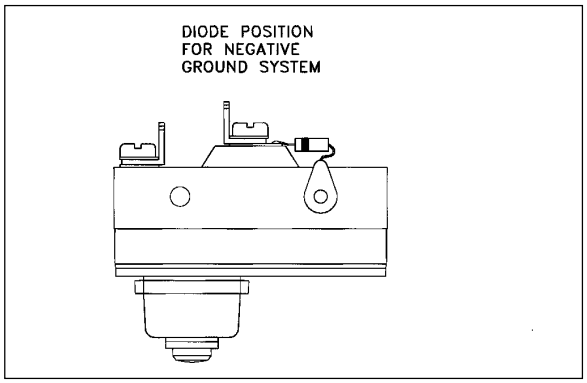

Figure 5-2

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.

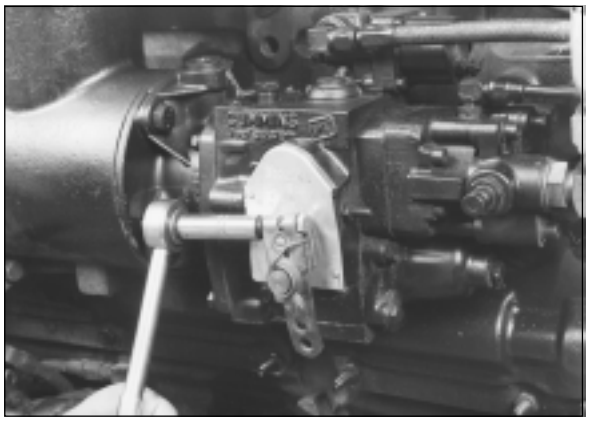

Figure 5-3

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

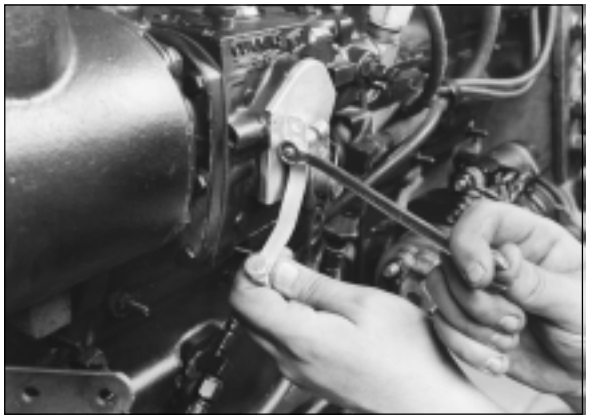

Figure 5-4

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

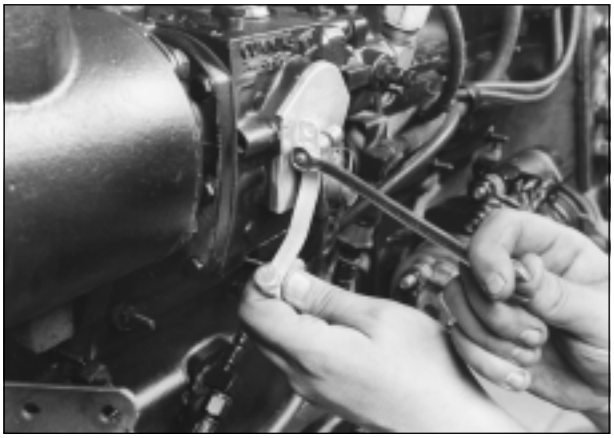

Figure 5-5

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

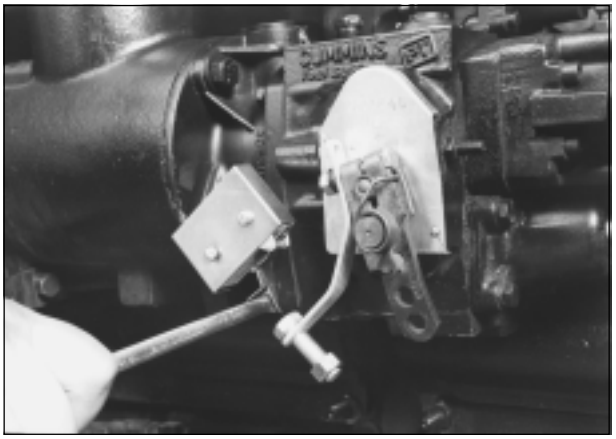

Figure 5-6

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.

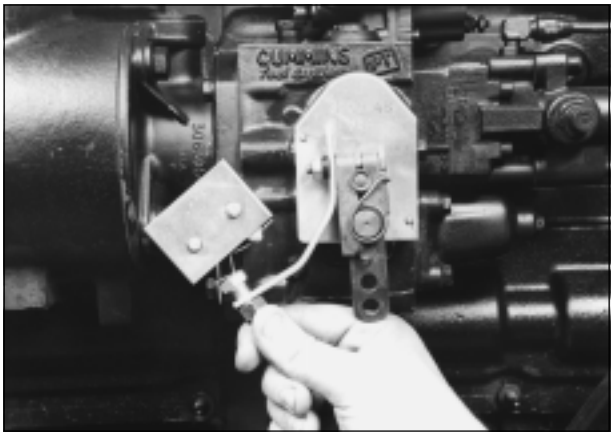

Figure 5-7

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.**

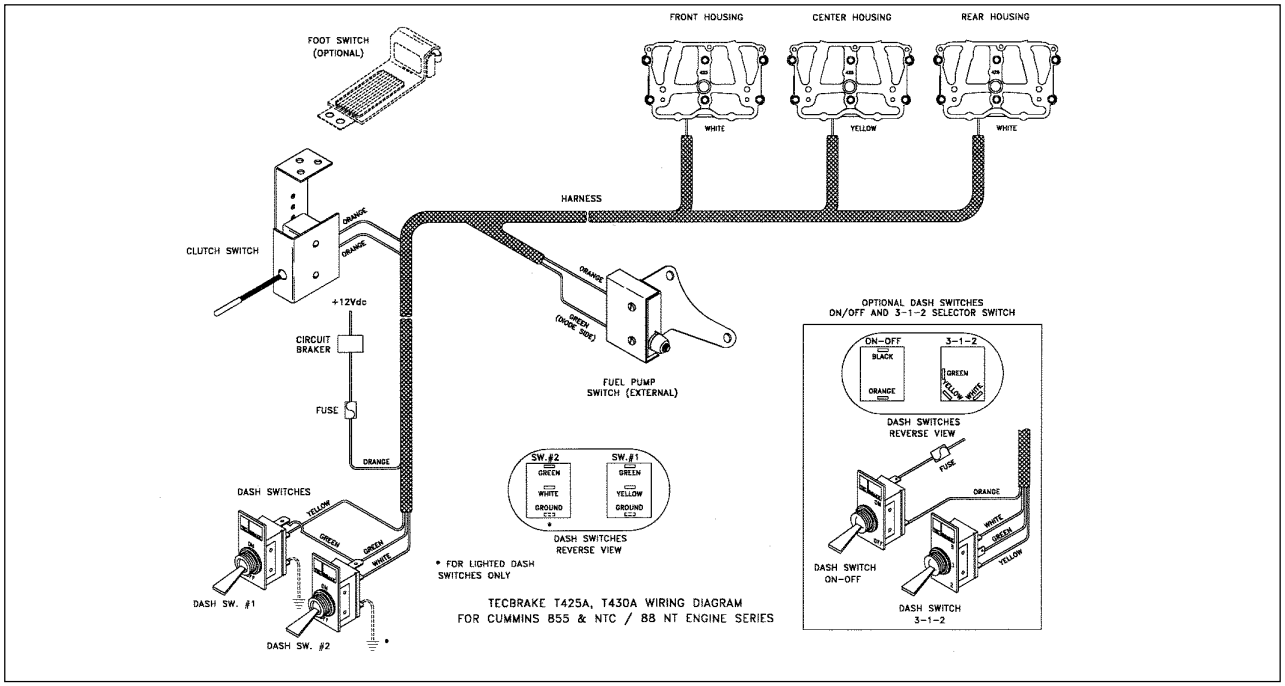

Figure 5-8

Wiring

A universal wiring harness and other miscellaneous wiring materials are included in the kit.

1. Install solenoid harness by connecting one end to the solenoid valve and the other to the inside terminal in the spacer assembly.

2. Install the remainder of the wiring following the instructions included with the universal wiring harness and wiring diagram shown in Figure 5-8.

3. All wiring should be routed to avoid areas of high heat and mechanical interference where chaffing could occur.

4. Check system to determine if voltage is present at terminals in engine brake spacer assembly. Voltage should be present when engine is not running, with ignition on, clutch disengaged, throttle in idle position, and all dash switches in the “on” position.

5. While monitoring voltage at terminals in the engine brake spacer, operate the switches to determine if they are functioning properly. Depressing either the clutch or the throttle pedal should cause the voltage to be interrupted.

SECTION 6 - ENGINE BRAKE MAINTENANCE

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 6-1

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 6-2

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

Control Valve

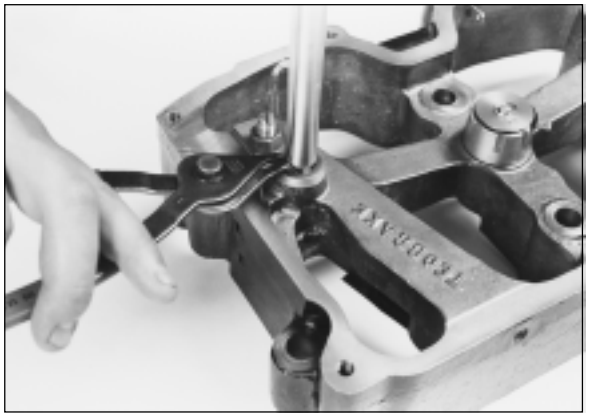

Figure 6-3

1. Remove hex head capscrews from control valve covers.

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

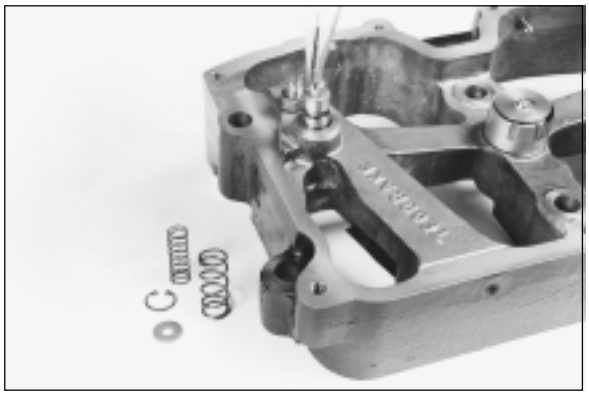

Figure 6-4

2. Remove control valve using needle nose pliers.

3. Wash control valve with solvent.

4. 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.

5. 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.

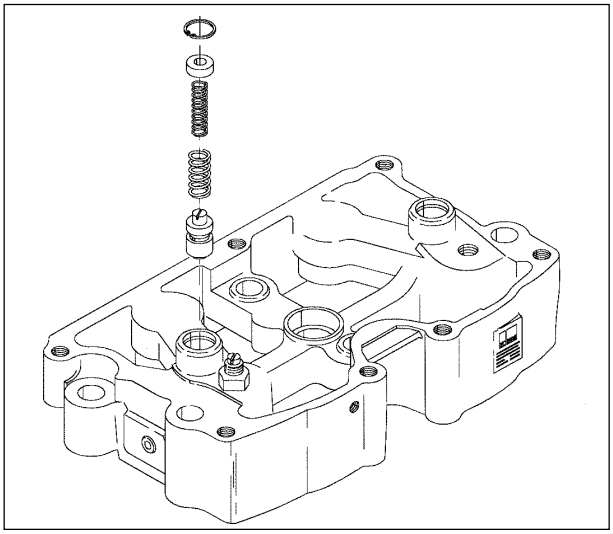

Figure 6-5

6. Install both control valve springs in control valve bore and install cover with hex head capscrew.

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.

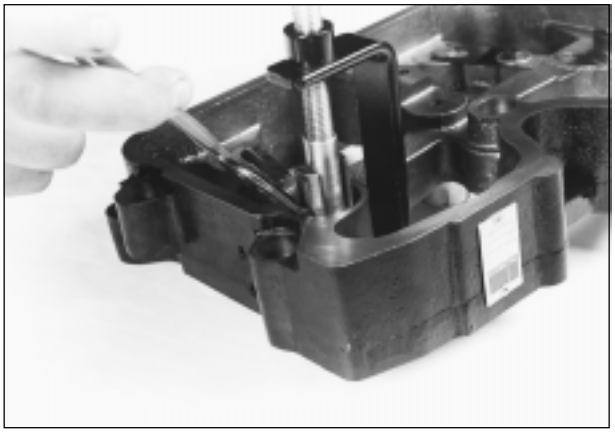

Figure 6-6

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.

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 burs or defects.

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

Figure 6-7

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.

Master Piston

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.

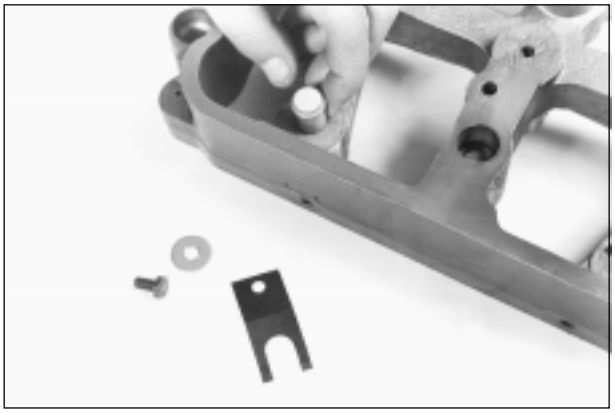

Figure 6-8

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.

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