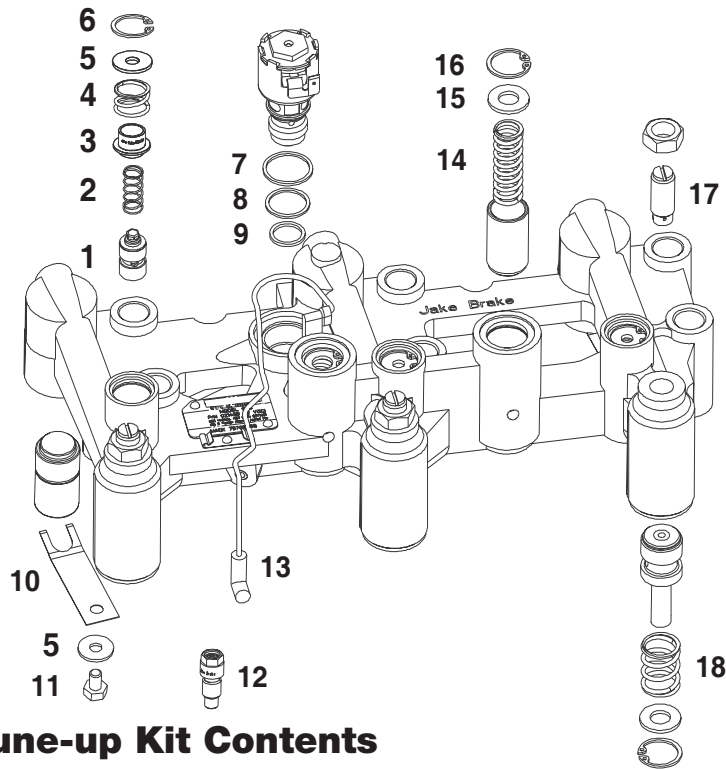




Jacobs Vehicle Systems®

Jacobs Engine Brake®

# Model 690 Series J-Tech™ Engine Brake P/N 031180



## Tune-up Kit Contents

Illus. No.	P/N	Part Name	Quantity per kit
1	039025	Valve, Control	6
2	018756	Spring, Inner Control Valve	6
3	028149	Collar, Control Valve	6
4	028189	Spring, Outer Control Valve	6
5	016505	Washer, Control Valve, Master Piston Retaining	12
6	012991	Ring, Retaining	6
7	020229	Seal Ring, Upper	2
8	001082	Seal Ring, Middle	2
9	001083	Seal Ring, Lower	2
10	013158	Spring, Flat	6
11	021740	Capscrew, Hex Head	6
12	025132	Oil Supply Screw	2
13	024223	Harness, Solenoid	2
14	030764	Spring, Accumulator	4
15	024861	Washer, Accumulator	4
16	024862	Ring, Retaining	4
17	032053	Reset Screw	6
18	030860	Spring, Ovate Wire, Slave Piston	6

TUNE-UP KIT INSTRUCTIONS

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## General Information

These instructions describe how to properly remove, clean and reinstall Jacobs Engine Brake™ components. For additional information on the J-TECH™ engine brakes, refer to Mack E-TECH engine manual (Engine 5-106).

Use OSHA-approved cleaning solvent for cleaning parts. Original parts to be reused should be inspected for wear and replaced as required. Be sure to coat parts with clean engine oil when reinstalling them.

## Safety Precautions

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

**WARNING**

THIS SYMBOL WARNS OF POSSIBLE PERSONAL INJURY.

**CAUTION**

THIS SYMBOL REFERS TO POSSIBLE EQUIPMENT DAMAGE.

**NOTE:** INDICATES AN OPERATION, PROCEDURE OR INSTRUCTION THAT IS IMPORTANT FOR CORRECT SERVICE.

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

## Instructions

**WARNING**

NEVER REMOVE ANY ENGINE BRAKE OR COMPONENT WITH THE ENGINE RUNNING.

### Access Engine Brake

1. Thoroughly clean engine.

2. Remove valve covers and spacers, disconnecting oil supply lines from the spacer as required.
3. Disconnect any oil supply lines connected to the brake housing.
4. Loosen slave piston adjusting screws and jam nuts and back out the slave piston adjusting screws so that the slave pistons are fully retracted into the housing.
5. Remove six mounting bolts from each housing and lift the housing up straight off of the oil supply or locating screw.
6. Place onto clean work bench.

**NOTE:** LATER MODEL ENGINES MAY USE MOUNTING STUDS AND NUTS IN PLACE OF MOUNTING BOLTS.

## Disassemble Housings

**WARNING**

WEAR SAFETY GLASSES. REMOVE CONTROL VALVE COVERS, SLAVE PISTON RETAINERS, AND

ACCUMULATOR RETAINERS CAREFULLY TO AVOID PERSONAL INJURY. COVERS ARE UNDER LOAD FROM CONTROL VALVE SPRINGS (2,4), SLAVE PISTON SPRINGS AND ACCUMULATOR SPRING (14).

1. Remove the solenoid wire (13) from the spacer and the solenoid. Discard solenoid wire.
2. Remove solenoid with a 3/4" (32mm) socket. Discard the three solenoid seals (7, 8, 9).
3. Hold down the control valve cover while removing the retaining ring (6). Remove and discard all control valve parts (1-6). A magnet may be required to remove the control valve.
4. Hold down accumulator cover (15) while removing the retaining ring (16). Remove all accumulator components. Retain only the accumulator piston, discard all other components.
5. Remove the reset screws (17) and reset screw lock nuts. Discard the reset screws. Retain the lock nuts for use during re-assembly.
6. Turn the housing upside down. Remove hex head cap screw (11), washer (5), and flat spring (10). These parts may be discarded. Remove master piston and inspect for wear or damage. Retain for later installation.

7. Model 690 engine brakes were manufactured with a check valve in the housing. A new oil supply screw was introduced in May 2000, which eliminated these components. If the check valve assembly is still in the housing, remove the assembly components as shown in Fig. 1 and discard.

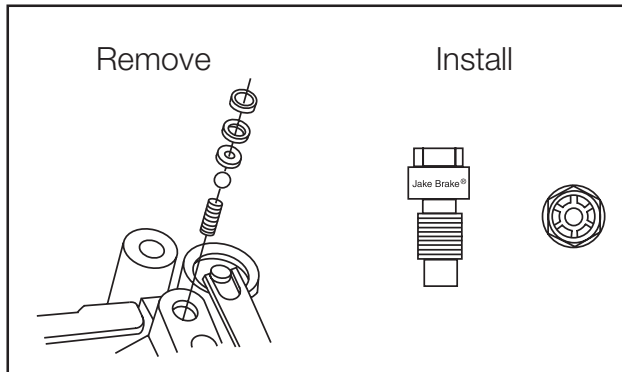


Figure 1

8. Using the slave piston removal/installation tool (tool part No. 025084, or equivalent), compress the slave piston springs to allow removal of the retaining ring, retaining washer and slave piston inner and outer springs (items are not numbered in illustration).
9. Remove the slave pistons and inspect them prior to reinstalling into the housing. Burnished and polished surfaces on the slave piston are common and normal. A wear-in ring pattern on the top end of the slave piston may be visible on some slave pistons. This is caused by contact between the reset screw body (outside diameter with screwdriver slot) and the slave piston. This in no way affects the product performance or reliability, and is acceptable for reinstallation.
10. Clean housing in a approved cleaning solvent. Be sure to rotate housing sufficiently to allow any foreign material to wash out of the blind passages. Dry with compressed air and inspect master piston and slave piston bores for wear or damage.

## Assemble Housings

**NOTE:** DURING INSTALLATION PROCEDURE BE SURE TO INSTALL ALL WASHERS AND SNAP RINGS WITH SHARP EDGES FACING UP.

1. Clean parts to be reused in an approved cleaning solvent. Dry with compressed air. New parts do not need to be cleaned.

2. Coat all parts to be installed into housings with clean lube oil.

**NOTE:** MODEL 690A AND 690B HOUSING DO NOT REQUIRE A LOWER SOLENOID SEAL.

3. Dip lower solenoid seal (9) in clean oil and place in the bottom of the solenoid bore (Model 690 only). Oil upper (7) and middle (8) seals and place them on the solenoid. Install solenoid in the housing and tighten with a 3/4 inch socket to 15 lb-ft (20 N•m). Install new solenoid wires to solenoids.

**NOTE:** EARLY MODEL 690 HOUSINGS (S/N D 690 060000 AND BELOW) USED A SINGLE-SPRING AND SPACER CONTROL VALVE CONFIGURATION. THE PARTS IN THIS KIT SUPERSEDE THIS EARLY CONFIGURATION.

4. Install the new control valve (1), collar (3), springs (2,4), washer (5) and retaining ring (6). Make sure the retaining ring is installed with the sharp edge up. Using one side of the snap ring pliers rotate the retaining ring to ensure that it is fully seated in the groove.

**NOTE:** INSTALL THE COLLAR (3) WITH LONG SIDE UP. IF THE COLLAR IS INSTALLED UPSIDE DOWN, THIS BRAKE CYLINDER WILL NOT OPERATE.

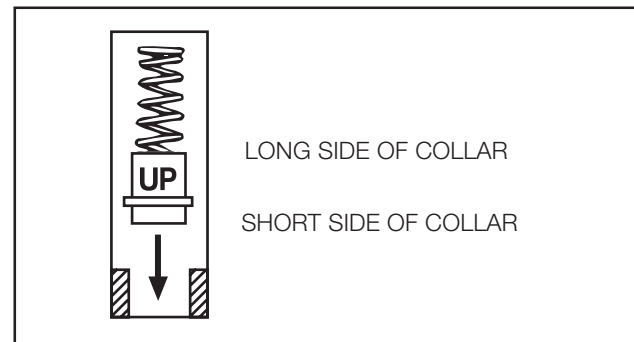


Figure 2

5. Turn housing over so that it faces up. Install slave pistons into the bores so that the stem of the piston is pointing at the installer. Be sure that slave pistons are moving freely within the bores. If not, be sure bores are clean and that the slave pistons have been visually inspected for any damage.

6. Place the slave piston springs into the bores, ensuring that the spring is completely inserted in the bore.

7. With the retaining washer positioned over the spring, use the slave piston removal/installation tool (part No. 020854, or equivalent), to compress the slave piston springs, and retaining washer. Once compressed install the retaining ring. Make certain that the retaining ring is installed with the sharp edge up, facing installer. Using one side of the retaining ring pliers rotate the retaining ring to ensure that it is fully seated in the mounting groove.
8. Install new reset screws and locknuts (previously removed). Do not tighten at this time.
9. Reinstall the master piston into the bore. Install new flat spring (10), washer (5) and hex screw (11). Make sure the flat spring is centered on the master piston and torque to 7 lb-ft (10 N•m). See figure 3.

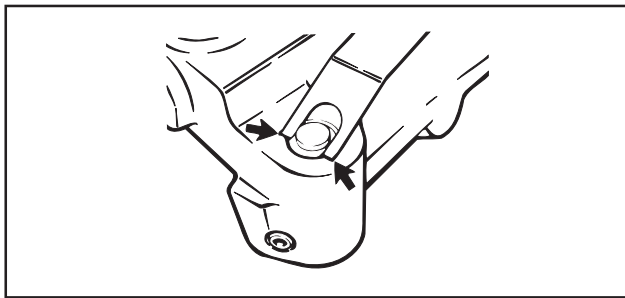


Figure 3

**CAUTION** WHEN TIGHTENING THE HEX SCREW, MAKE CERTAIN THE TWO SPRING TABS DO NOT INTERFERE WITH THE SIDES OF THE MASTER PISTON CENTER RAISED PORTION. FAILURE TO DO THIS COULD CAUSE PREMATURE FLAT SPRING FAILURE.

10. Reinstall accumulator pistons using new springs (14), washers (15), and retaining rings (16).

## Engine Brake Installation

1. Remove the oil supply screws from rocker pedestals and replace with new ones provided in the kit.
 

**NOTE:** OIL SUPPLY SCREWS FORMERLY USED O-RING SEALS. THESE SEALS ARE NO LONGER USED.
2. Slide housings down and into position.
3. Place mounting bolts in the brake housing mounting bolt holes. Starting with the center pair of mounting bolts, tighten all six bolts on each housing. Make sure the brake housing come down level to avoid possible damage to the rocker

shaft brackets. After each brake housing is seated on the cylinder head, torque the mounting bolts to 45 lb-ft (61 N•m).

**CAUTION** MAKE CERTAIN THAT ALL OF THE PUSH RODS REMAIN PROPERLY ENGAGED AT BOTH ENDS OR ENGINE DAMAGE CAN RESULT.

## Adjustments

**NOTE:** MAKE SLAVE PISTON ADJUSTMENT WITH THE ENGINE STOPPED AND COLD WITH THE EXHAUST VALVES IN THE CLOSED POSITION.

1. Adjust the final intake and exhaust valve lash using your engine manual.

**CAUTION** VERIFY THAT THE SLAVE PISTON ADJUSTING SCREWS ARE FULLY RETRACTED AND ALL THE SPHERICAL JAM NUTS ARE TURNED DOWN SNUG AGAINST THE ROCKER ARMS BEFORE ROTATING THE ENGINE CRANKSHAFT FOR VALVE ADJUSTMENT. ROTATING THE ENGINE CRANKSHAFT WITH THE SPHERICAL JAM NUTS LOOSE, OR THE SLAVE PISTON ADJUSTING SCREWS NOT FULLY RETRACTED, COULD DAMAGE THE BRAKE MASTER PISTONS OR THE ENGINE (VALVES).

## Engine Brake Adjustment

1. Place a 0.021 inch (0.533 mm) thickness gauge between the slave piston stem and the actuator pin in the yoke adjusting screw.
2. Turn the slave piston adjusting screw to set the lash.
3. Tighten the jam nut to 25 lb-ft (34 N•m).
4. Using the barring socket, manually rotate the engine crankshaft in normal rotation direction 120 degrees until pointer in flywheel housing aligns with the "2 & 5" mark on the flywheel and the No. 5 piston is on the compression stroke.
5. Adjust the intake and exhaust valve lash, and engine brake slave piston lash for cylinder No. 5 as described in the procedure for cylinder No. 1. (Continue this process for each of the remaining cylinder, following the engine firing order sequence, 1-5-3-6-2-4.)

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## Marking Housing

1. If the part number of the housing identification plate is 757GB58B, C, or D, the plate should be stamped with a 1/8" letter "E". If the part number of the housing identification plate is 757GB59A, the plate should be stamped with a 1/8" letter "C" as follows:

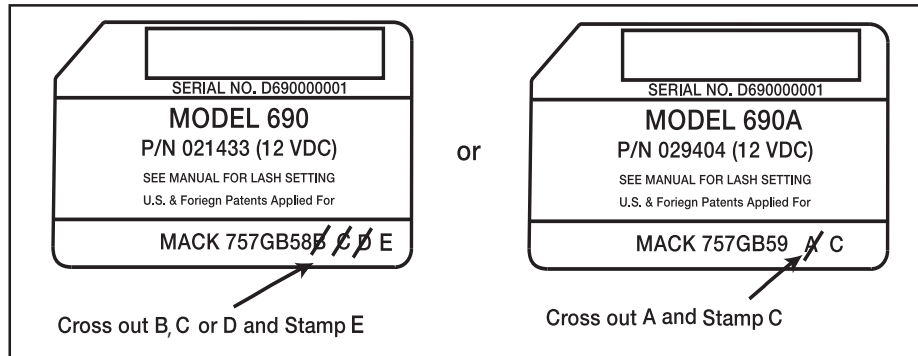


Figure 4

## Spacer and Cover Installation

1. Check gaskets on engine brake cylinder head cover spacers. Make sure the surfaces are clean. Place valve cover spacers in position on engine.
2. Reconnect wires from the engine harness to the spacer and from the solenoid to the spacer. Check for frayed or broken wires or corrosion. Repair as necessary.
3. Reconnect oil supply lines if used.
4. Check the gasket on the cylinder head valve covers and position the covers on the spacers. Make sure surfaces are clean.
5. Install six mounting bolts in each of the cylinder head covers/spacers and tighten the bolts to 16 lb-ft (21.7 N•m).

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