### Tune-up Kit Contents

<table>
<thead>
<tr>
<th>Illus. No.</th>
<th>Jacobs P/N</th>
<th>Part Name</th>
<th>Quantity Per Kit</th>
</tr>
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<tbody>
<tr>
<td>4</td>
<td>020229</td>
<td>Upper Seal Ring</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>001082</td>
<td>Center Seal Ring</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>001083</td>
<td>Lower Seal Ring</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>003790</td>
<td>Buttonhead Screw</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>018222</td>
<td>Control Valve Cover</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>011823</td>
<td>Control Valve Inner Spring</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>010843</td>
<td>Control Valve Outer Spring .054” Wire</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>039022*</td>
<td>Control Valve Assembly</td>
<td>6</td>
</tr>
<tr>
<td>20</td>
<td>018214</td>
<td>Master Piston Spring .035” Wire</td>
<td>6</td>
</tr>
<tr>
<td>NI</td>
<td>019655</td>
<td>Instructions</td>
<td>1</td>
</tr>
</tbody>
</table>

*039022 replaces 011930
General Information

For additional information on the Model 340 engine brake, refer to Jacobs Engine Brake Installation Manual, P/N 019644.

Use OSHA-approved cleaning solvent for cleaning parts. Original parts to be reused should be inspected for wear and replaced as required. Wear safety glasses where indicated.

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 Symbol](image)

**THIS SYMBOL WARNS OF POSSIBLE PERSONAL INJURY.**

![Caution Symbol](image)

**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.

Access Engine Brake

**WARNING**

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

**Access Engine Brake**

1. Thoroughly clean engine.
2. Remove valve cover.
3. Disconnect the lead wires from the solenoid valves.
4. Remove the mounting nuts and washers from each engine brake housing. Remove the housings.

Disassemble Housings

The following describes the disassembly and inspection procedure for each component group. Note that during reassembly, the parts included in the kit are to replace the appropriate parts removed from the housing.

Solenoid Valve

**NOTE:**

REFERENCE TECH TIP NO. 2003-01 FOR MORE INFORMATION ON THE APPLICATION OF SOLENOID SEALS.

![Warning Symbol](image)

**CAUTION**

DO NOT DISASSEMBLE OR TAMPER WITH THE SOLENOID VALVE. ENGINE DAMAGE COULD RESULT.

1. Disconnect the solenoid harness. Using 7/8” socket and extension, unscrew solenoid valve.
2. Remove and discard the three rubber seal rings (see Fig. 1). If the lower ring stays in the bottom of the housing solenoid bore, remove with a seal pick.

![Fig. 1](image)

3. Wash out the solenoid valve with an approved cleaning solvent. Use a brush to clean the oil screen. When clean, dry the valve with compressed air.
4. Clean out the solenoid valve bore in the housing. Use clean paper towels. Never use rags as they may leave lint and residue which can plug the oil passageways.
5. Using the new solenoid seal rings, coat them with clean lube oil. Install the upper and center seal rings on the solenoid body and the lower seal ring into the bottom of the solenoid bore in the housing.
6. Be sure the seals are seated properly and carefully screw the solenoid into the housing without unseating the seals. Torque the valve to 60 lb.-in. (7 qdNm). Be careful not to twist the seals while installing.
WEAR SAFETY GLASSES. REMOVE CONTROL VALVE COVERS CAREFULLY. CONTROL VALVE COVERS ARE UNDER LOAD FROM THE CONTROL VALVE SPRINGS. REMOVE WITH CARE TO AVOID PERSONAL INJURY.

INSTALLING THE INCORRECT SPRINGS IN THE CONTROL VALVE BORE WILL RESULT IN LOSS OF PERFORMANCE AND POSSIBLE ENGINE DAMAGE.

**WARNING**

1. Press down on the control valve cover to relieve spring pressure.
2. Remove the buttonhead screw using a 5/32" hex key.
3. Slowly remove the cover until spring force ceases, then remove the two control valve springs (see Fig. 2).
4. Using needle-nose pliers, remove the control valve.
5. Wash the control valves with approved cleaning solvent. Push a wire through the hole in the base of the valve to the distance required to insure that the ball check is free. The ball should lift with light pressure on the wire. If the ball is stuck, replace the control valve. Dry the valve with compressed air and wipe clean with a paper towel.
6. Thoroughly clean the control valve bore in the housing using clean paper towels. Dip the control valves in clean lube oil and replace the valve into its bore. If binding occurs, replace the control valve.

**Auto-Lash® Adjusting Screw**

NOTE: THIS SECTION DOES NOT APPLY TO MODEL 340D.

DO NOT DISASSEMBLE OR TAMPER WITH THE ADJUSTING SCREW. ENGINE DAMAGE COULD RESULT.

1. Loosen the slave piston adjusting screw locknut and remove the slave piston adjusting screw (Auto-Lash) from housing (See Fig. 3).

2. Inspect the adjusting screw. The plunger should protrude from the bottom of the screw. Approximately 12 lb.-ft. (53 Nm) force is required to move the plunger. Be sure the retaining pin is fully seated in its hole.
3. Clean in an approved cleaning solvent or replace the entire screw as necessary. The screw assembly is not to be serviced in the field.

**Master Piston**

INSTALLING THE INCORRECT SPRINGS IN THE MASTER PISTON BORE WILL RESULT IN LOSS OF PERFORMANCE AND POSSIBLE ENGINE DAMAGE.

1. Remove the master piston retainer using small retaining ring pliers. Slowly lift the ring out, holding the ring and retaining washer with the other hand. Remove the master piston spring.
2. Remove the master piston and pushrod from its bore. Use needle-nose pliers, if necessary, to pull the piston out. If binding occurs, check for burrs or contaminants in lube oil.
3. Clean in approved solvent. Inspect the pushrod/piston interface. Pitted, chipped, cracked or galled components should be replaced.
4. Reassemble in reverse order.

**NOTE:**
BE SURE COMPONENTS ARE REASSEMBLED IN PROPER ORDER (SEE FIG. 4).

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**Slave Piston**

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

1. Remove the locknut from the slave piston adjusting screw (Auto-Lash). Back out the adjusting screw until the slave piston is fully retracted (screw is loose).

2. Place the hole in the Jacobs slave piston tool (P/N 018238) over the slave piston adjusting screw (See Fig. 5).

3. Turn the handle slowly until the retainer is depressed about 0.040” (1mm), relieving pressure against the retaining ring.

4. Remove the retaining ring with retaining ring pliers. Back out the holder until the springs are loose. Remove the tool.

5. Remove all components, ensuring there is no binding or burrs. Clean in an approved cleaning solvent or replace as necessary. Check to see if the retaining ring in the foot is intact. Inspect the piston/pushrod interface. Pitted, cracked or galled components should be replaced.

**NOTE:**
BE SURE COMPONENTS ARE REASSEMBLED IN PROPER ORDER (SEE FIG. 6).

6. Use the slave piston tool to reinstall piston and springs. Be sure retaining ring is placed on the retainer before screwing the clamp-holder down over the slave piston.

7. Compress the slave piston springs down until the retainer is about 0.040” (1 mm) below the retaining ring groove. Reinstall the retaining ring. Be sure the retaining ring is fully seated in the groove.

8. Remove the slave piston tool slowly to insure proper seating of retaining ring.

9. Assemble adjusting screw (Auto-Lash®) and nut. Do not tighten at this time.
Brake Housing Installation

1. Place brake housing over the two studs. The brake housing will rest on the support tubes and rocker shaft.

   **NOTE:** BE SURE MASTER PISTON PUSH ROD IS SEATED IN THE POCKET OF THE INJECTOR ROCKER ARM (SEE FIG. 7).

2. Install capscrews and washers (4 each per housing) through brake housing and rocker shaft assembly into the cylinder head.

3. Place nut and washer on the two studs. Hand tighten.

4. Torque the four capscrews and the two stud nuts in two stages as follows (see Fig. 8):
   a. Starting with center capscrews and stud nuts and then progressing to outside capscrews, torque to 40 lb.-ft. (54 Nm).
   b. Repeat, torquing capscrews and stud nuts to 80 lb.-ft. (109 Nm).

Valve and Injector Adjustments

Intake and exhaust valves and injectors must be adjusted according to Caterpillar specifications. Use the following sequence:

1. With No. 1 Piston at TDC of compression stroke, set inlet valves on cylinders 1, 2 and 4. Set exhaust valves on cylinders 1, 3 and 5. Set unit injectors on cylinders 3, 5 and 6.

2. Turn crankshaft 360° in the direction of engine rotation (No. 6 Piston at TDC). Set inlet valves on cylinder 3, 5 and 6. Set exhaust valves on cylinders 2, 4 and 6. Set unit injectors on cylinders 1, 2 and 4.

<table>
<thead>
<tr>
<th>Engine Position</th>
<th>Set Inlet Valves</th>
<th>Set Exhaust Valves</th>
<th>Set Unit Injectors</th>
<th>Set Slave Lash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder 1</td>
<td>1, 2, 4</td>
<td>1, 3, 5</td>
<td>3, 5, 6</td>
<td>1, 3, 5</td>
</tr>
<tr>
<td>Cylinder 6</td>
<td>3, 5, 6</td>
<td>2, 4, 6</td>
<td>1, 2, 4</td>
<td>2, 4, 6</td>
</tr>
</tbody>
</table>

Slave Piston Clearance Adjustment

**NOTE:** SEE SERVICE LETTER E477 FOR FURTHER INFORMATION ON AUTO-LASH SETTING.

After the intake/exhaust valves and injectors are adjusted, set the slave piston clearance. Exhaust valves on the cylinder to be adjusted must be in the closed position.

1. Place the appropriate feeler gage (see Table 1 on page 8) between the slave piston foot and the exhaust rocker arm (see Fig. 9). Turn the slave piston adjusting screw (Auto-Lash®) in clockwise until a slight drag is felt on the feeler gage.

   **CAUTION:** DO NOT PLACE FEELER GAGE BETWEEN ROCKER ARM ADJUSTING SCREW AND VALVE BRIDGE. THIS WILL RESULT IN IMPROPER ADJUSTMENT AND POSSIBLE ENGINE DAMAGE.

2. Hold the adjusting screw and torque the locknut to 25 lb.-ft. (34 Nm).

3. Rotate the engine crankshaft to complete adjustment of all slave pistons.
Final Procedures

1. Connect the lead wires supplied in the undercover harness to the solenoid valves.

   **NOTE:** THE POSITIVE AND NEGATIVE LEADS MAY BE CONNECTED IN ANY ORDER.

2. Start engine and allow to run 5 to 10 minutes.

3. With the engine at low idle, manually depress the solenoid armature several times in succession until the master pistons move out of the housing and the engine brake begins to operate. Normal oil evacuating from the control valve covers should be free of air bubbles before replacing the valve covers. This permits oil to fill brake housing passages and readies the brake for operation.


5. Inspect the installation for oil leakage or component interference. If either is found, the problem must be corrected at this time.

Chassis Wiring

Consult vehicle manufacturer’s wiring diagrams to locate engine brake switch location and wire coding.

**NOTE:** MODEL TRUCKS AFTER 1994 SHOULD HAVE ENGINE BRAKE CONTROL WIRING LOCATED BEHIND THE DASH. LOCATE THE APPROPRIATE WIRES AND CONNECT TO CORRECT VEHICLE MANUFACTURER’S SWITCH. SWITCH MAY NEED TO BE PROCURED FROM VEHICLE MANUFACTURER.

Jacobs does not provide controls for models after 1994 products as these controls are integrated into the engine chassis.

Jacobs Engine Brake Replacement Parts Limited Warranty

Jacobs engine brake replacement parts, products of the Jacobs Vehicle Equipment Company, are sold with the following warranty:

Jacobs engine brake replacement parts are warranted to be free of defects in construction and operation under normal use and service for the warranty coverage periods set forth below.

THERE ARE NO REPRESENTATIONS OR WARRANTIES WHICH EXTEND BEYOND THE TERMS HEREOF OR THE DESCRIPTION OF THE PRODUCT CONTAINED IN THE CONTRACT FOR SALE.

Warranty Coverage

Replacement parts are warranted for 1 year/100,000 miles. Replacement parts installed during the original warranty coverage period for a Jacobs engine brake are warranted as stated in the Jacobs engine brake warranty.

Under this warranty, our factory is obligated to replace, without charge, any part returned to us which our examination discloses to our satisfaction to have been defective within the Warranty coverage period measured from the date of delivery of the product in question to the original user.

Jacobs will also pay for all repairs to damaged engine components in which Jacobs replacement parts have been properly installed, provided the damage is shown to be a direct result of a defect of Jacobs replacement parts occurring under normal operation during the warranty coverage periods specified above.

This warranty will not apply to any part or parts which have been altered or repaired outside of our factory or authorized Jacobs distributor service centers, 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’ SOLE LIABILITY AND YOUR EXCLUSIVE REMEDY IS LIMITED TO THE OBLIGATIONS SET FORTH HEREIN, AND JACOBS SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES.
### Table 1: Slave Lash Adjustment

<table>
<thead>
<tr>
<th>Engine S/N</th>
<th>Engine Displacement</th>
<th>Engine Brake Model</th>
<th>Engine Horsepower</th>
<th>Lash Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>5EK, up to S/N 01820</td>
<td>14.6 L</td>
<td>340</td>
<td>All</td>
<td>0.027&quot; (0.686 mm)</td>
</tr>
<tr>
<td>5EK</td>
<td>14.6 L</td>
<td>340A</td>
<td>410 and under 435 and over</td>
<td>0.027&quot; (0.686 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>435 and over</td>
<td>0.030&quot; (0.762 mm)</td>
</tr>
<tr>
<td>6TS</td>
<td>14.6 L</td>
<td>340A</td>
<td>410 and under 435 and over</td>
<td>0.027&quot; (0.686 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>435 and over</td>
<td>0.030&quot; (0.762 mm)</td>
</tr>
<tr>
<td>1LW</td>
<td>14.6 L</td>
<td>340C</td>
<td>410 and under 435 and over</td>
<td>0.033&quot; (0.838 mm)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>435 and over</td>
<td>0.027&quot; (0.686 mm)</td>
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<td>9AP</td>
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<td>340C</td>
<td>All</td>
<td>0.037&quot; (0.940 mm)</td>
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<td>15.8 L</td>
<td>340C</td>
<td>All</td>
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<td>340C</td>
<td>All</td>
<td>0.037&quot; (0.940 mm)</td>
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<td>MBN</td>
<td>14.6 L</td>
<td>340D</td>
<td>All</td>
<td>0.030&quot; (0.762 mm)</td>
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<tr>
<td>BXS</td>
<td>14.6 L</td>
<td>340E</td>
<td>All</td>
<td>0.033&quot; (0.838 mm)</td>
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### Table 2: Torque Values

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<th>Lb.-ft.</th>
<th>Nm</th>
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<td>Brake Mounting Studs</td>
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<td>88</td>
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<tr>
<td>Brake Mounting Bolts</td>
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<tr>
<td>Brake Mounting Bolts with Full Shank Bolts (p/n 257-2122)</td>
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<td>150</td>
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<tr>
<td>Stud Nuts</td>
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<tr>
<td>Auto-Lash Locknut</td>
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### Table 3: Special Tools

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<tr>
<td>Snap-on Stud Driver</td>
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<tr>
<td>Caterpillar Turning Tool</td>
<td>9S9082</td>
</tr>
</tbody>
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