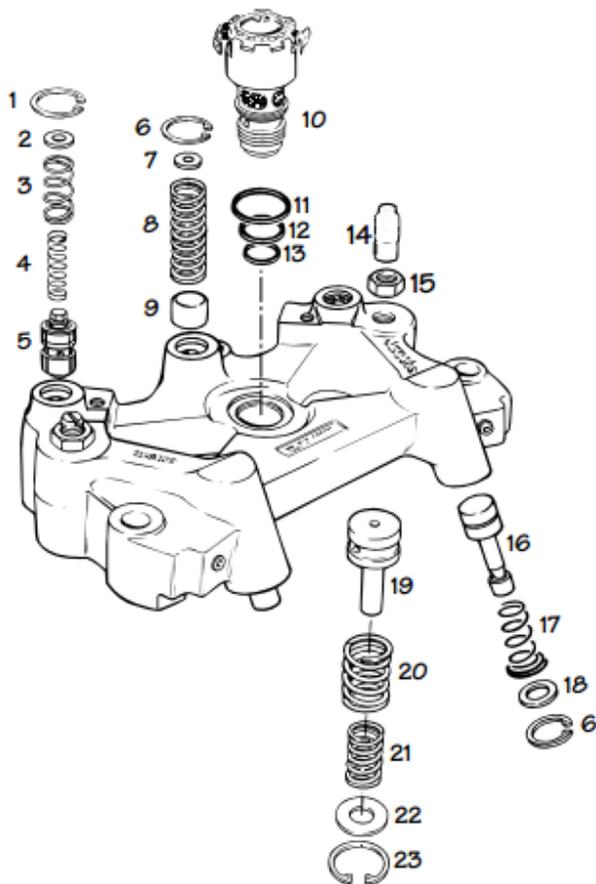




# Model 310A, 312A & 317D/E Tune-Up Kit Instructions

Jacobs P/N 019502



## Tune-up Kit Contents

Ill. No.	Jacobs P/N	Part Name	Qty.
1	015561	Control Valve Retaining Ring	6
2	014928	Control Valve Cover	6
3	011434	Control Valve Outer Spring	6
4	011823	Control Valve Inner Spring	6
5	039025	Control Valve	6
6	012991	Accumulator Retaining Ring	3
7	016505	Accumulator Washer	3
8	012990	Accumulator Spring	3
11	020229	Upper Seal Ring	3
12	001082	Center Seal Ring	3
13	001083	Lower Seal Ring	3
17	019353	Master Piston Spring	6
NI	015906	Spacer Gasket	3
NI	019503	Instructions	1

NI = Not Illustrated

## General Information

These instructions briefly describe how to properly remove, clean, and reinstall engine brake components. For additional information refer to Installation Manual P/N 021222 for 310A/312A (C10 and C12 engines), Installation Manual P/N 019642 for 310A (3176/B engines), Installation Addendum P/N 020684 for 3176 engines.

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. 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**

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.

## 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 the valve covers.
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



**CAUTION**

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

1. Disconnect the solenoid harness. Using 7/8" socket and extension, unscrew the 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.

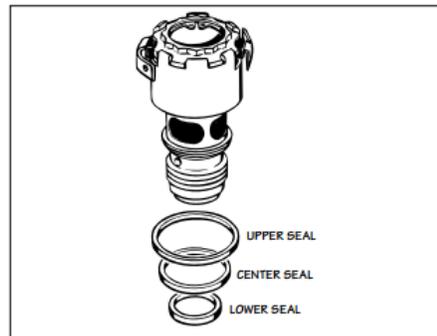


FIG. 1

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 have lint and residue which can plug the oil passageways.
5. Coat the new solenoid seal rings 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 (see Fig. 2).
6. Be sure the seals are seated properly and carefully screw the solenoid into the housing without unseating or twisting the seals. Torque the valve to 110 lb.-in. (12.5 Nm). Use this torque setting even if the solenoid specifies 60 lb.-in.

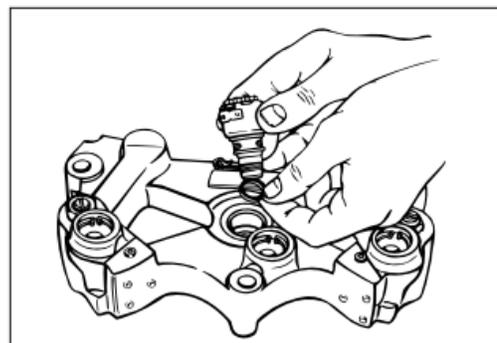


FIG. 2

## Control Valve



REMOVE CONTROL VALVE COVERS CAREFULLY AS THEY ARE UNDER LOAD FROM THE CONTROL VALVE SPRINGS. REMOVE WITH CARE TO AVOID PERSONAL INJURY.

1. Apply pressure on the control valve cover (1). Remove the retaining ring (2) using retaining ring pliers (see Fig. 3).

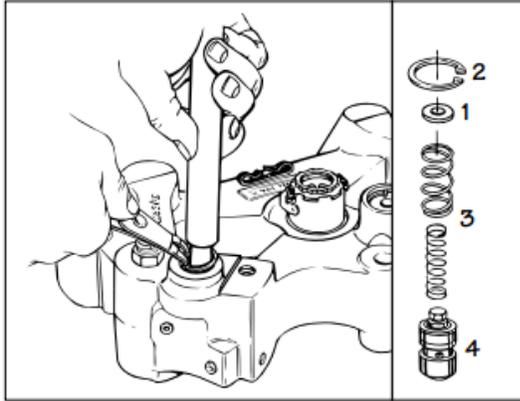


FIG. 3

2. Slowly remove the cover until spring pressure ceases, then remove the two control valve springs (3).
3. Using needle-nose pliers, reach into the bore and grasp the stem of the control valve (4). Remove the control valve.
4. Thoroughly clean the control valve bore in the housing using clean paper towels.
5. Install the new control valves, springs, covers and retaining rings.

## Accumulator



THE ACCUMULATOR SPRING IS UNDER STRONG COMPRESSION. USE CAUTION WHEN REMOVING THE RETAINING RING AND COVER. WEAR SAFETY GLASSES. IF THE SPRING IS ACCIDENTALLY DISCHARGED, PERSONAL INJURY MAY RESULT.

1. Push down on the accumulator cover using the appropriate diameter rod and remove the retaining ring (see Fig. 4).
2. Relieve pressure on the accumulator cover and remove the cover and spring.
3. Use a magnet to remove the piston from the accumulator bore.

4. Inspect the parts for wear or damage and replace if needed.
5. Reassemble by installing the piston, spring, cover and retaining ring.

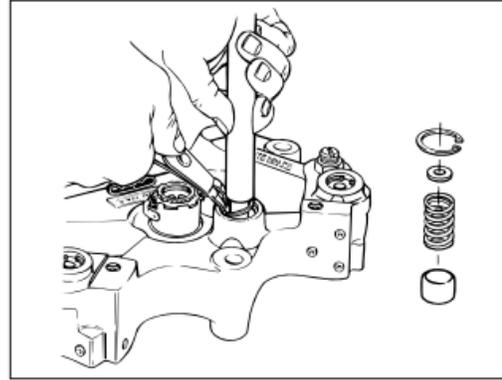


FIG. 4

## Slave Piston Adjusting Screw (Power-Lash/D-Lash)

1. Loosen the slave piston adjusting screw locknut and remove the adjusting screw from the housing (see Fig. 5).

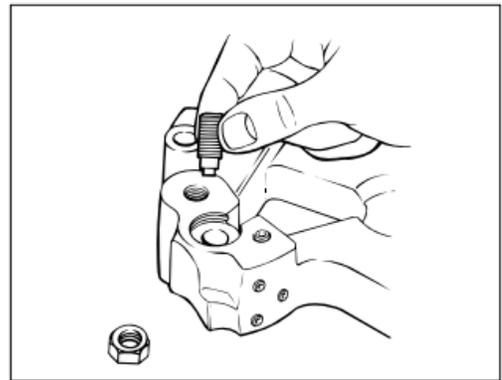


FIG. 5

### NOTE:

THE PART NUMBER FOR THE SCREW IS LOCATED AT THE TOP OF THE SCREW NEXT TO THE SCREWDRIVER SLOT. REFER TO THE PARTS MANUAL FOR PART NUMBER IDENTIFICATION.



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

2. Clean in an approved cleaning solvent.
3. Inspect the slave piston adjusting screw. The plunger on both the Power-Lash and the D-Lash should protrude from the bottom of the screw and should move freely. The Power-Lash should have light spring pressure present when depressed (see Fig. 6 on page 4). The D-Lash does not contain a spring. Replace the entire screw assembly if any defect is found.

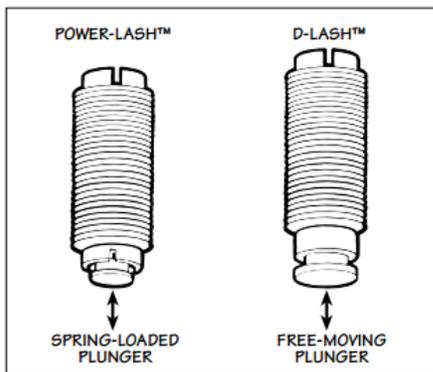


FIG. 6

## Master Piston

1. Press down on the master piston retaining washer to relieve the spring force. While holding the washer, use a pair of snap ring pliers to remove the retaining ring from the groove. Carefully release the retainer and remove it along with the old spring.
2. Remove the master piston from the bore. Clean in an approved solvent and inspect for wear on the piston and foot. Also inspect the bore.
3. Install a new master piston return spring by inserting the small end into the bore. The large coil, identified by white paint, should be facing out.
4. Place the retaining washer and snap ring over the foot of the master piston and compress them into the bore. Using snap ring pliers, replace the snap ring in the groove to retain the master piston.

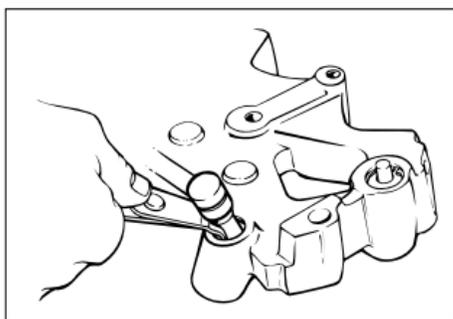


FIG. 7

5. Ensure the snap ring is properly engaged in the groove by gently grasping the master piston foot and pulling out until the master piston bottoms on the retaining washer. Release the master piston. If the assembly is correct, all parts should return to their original position.
6. Repeat this procedure on the remaining 5 locations.

### NOTE:

AFTER THE NEW SPRING IS INSTALLED WITHIN THE RETAINING WASHER AND SNAP RING, IT IS NORMAL TO BE ABLE TO SEE THE SPRING IN THE BORE AROUND THE RETAINING WASHER.

## Slave Piston



WARNING

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

1. Remove the locknut (3) (Fig. 8) from the slave piston adjusting screw (1). Back out the adjusting screw until the slave piston is fully retracted (screw is loose).

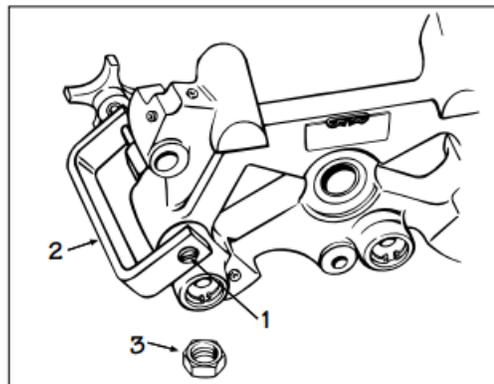


FIG. 8

2. Place the hole in the clamp fixture (2) over the slave piston adjusting screw.
3. While holding the fixture in position, screw the holder down over the slave piston (4) until the spring retainer (7) is contacted (see Fig. 9).

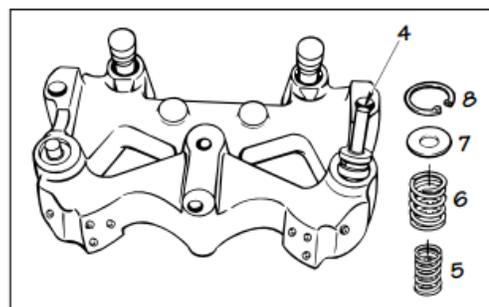


FIG. 9

4. Turn the handle slowly until the retainer is depressed about 0.040" (1 mm), relieving pressure against the retaining ring (8).
5. Remove the retaining ring with retaining ring pliers. Back out the holder until the springs (5, 6) are loose. Remove the fixture.
6. Remove all components, ensuring there is no binding or burrs. Clean in an approved cleaning solvent. Inspect parts and replace as necessary.

**NOTE:** BE SURE COMPONENTS ARE REASSEMBLED IN PROPER ORDER (SEE FIG. 9).

7. Use the clamp fixture to reinstall the piston and springs. Be sure the retaining ring is placed on the retainer before screwing the clamp-holder down over the slave piston.
8. 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.
9. Remove the slave piston tool slowly to insure proper seating of retaining ring.

### Brake Housing Installation

1. Refer to Fig. 10. Torque the cylinder head bolt spacer (1) to 70 lb.-ft. (95 Nm). Torque the brake mounting studs (2) to 70 lb.-ft. (95 Nm).

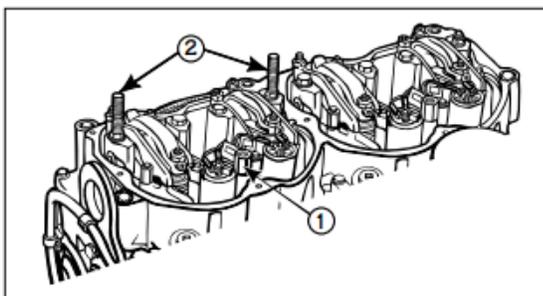


FIG. 10

2. Refer to Fig. 11. Position the engine brake housings on the mounting stud nuts and install the Jacobs hold-down nuts (1) on the brake mounting studs. Torque to 59 lb.-ft. (80 Nm).

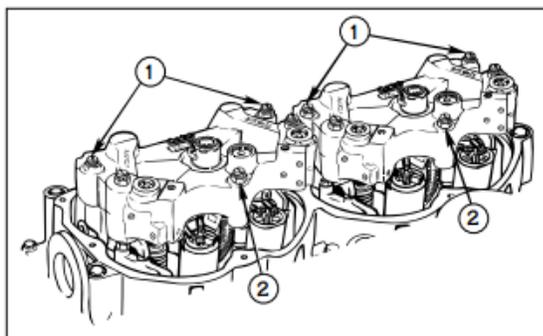


FIG. 11

3. Refer to Fig. 11. Install the 70 mm bolts (2) through the housing into the spacer (one per housing) and torque to 41 lb.-ft. (55 Nm).
4. Refer to Fig. 12. Be sure the slave piston foot (1) is aligned squarely over the bridge screw and pin assembly (2) to insure full contact of the exhaust valve stem. Reposition the housing if necessary.

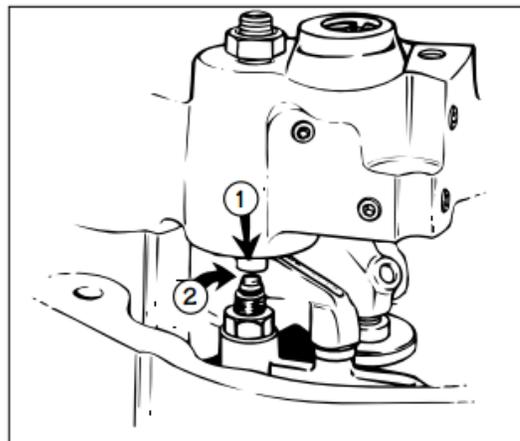


FIG. 12

### Slave Piston Adjustment

#### Slave Piston Adjustment Sequence

Set Engine	Set Slave Piston No.
Cyl. #1 TC Compression	1, 3, 5
Cyl. #6 TC Compression	2, 4, 6

#### Slave Piston Clearance Setting

Engine	Engine S/N	Clearance	Gage P/N
3176B	9CK	0.025" (0.64 mm)	022045
C-10	2PN	0.025" (0.64 mm)	022045

1. With the exhaust valves closed on the cylinder to be adjusted, insert the proper Jacobs' feeler gage (2) between the slave piston and the actuating pin (3) in the valve bridge adjust screw (see Fig. 13).

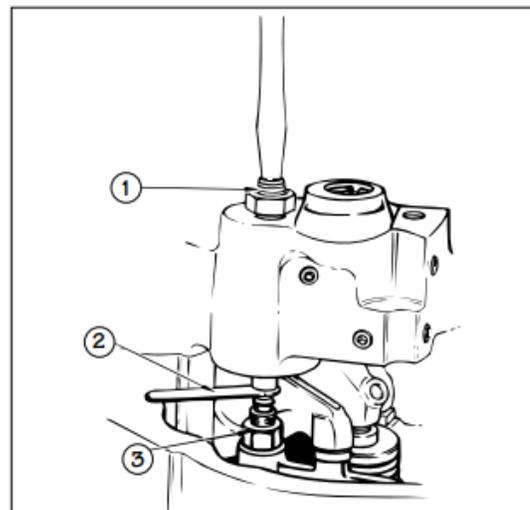


FIG. 13

2. Turn the slave piston adjusting screw (1) in until a slight drag is felt on the feeler gage.
3. Hold the adjusting screw in this position and tighten the locknut to 25 lb.-ft. (35 Nm).
4. Rotate the engine 360° and set the clearance on the remaining slave pistons.

## Spacer Installation

1. Be sure the seal is seated in the groove at the bottom of the surface of the Jacobs' spacer (see Fig. 14).

**NOTE:**

A 0.375" (9.5 mm) GAP SHOULD BE LEFT BETWEEN EACH END OF THE GASKET AND THE SPACER.

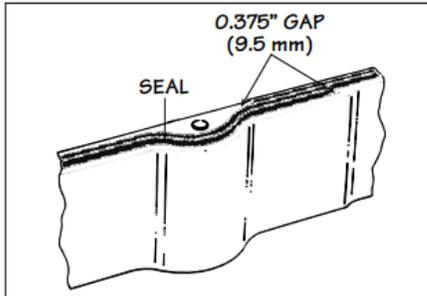


FIG. 14

2. Connect both solenoid lead wires to the terminal lead outs on the solenoids (see Fig. 15).

**NOTE:**

THE SOLENOID LEAD WIRES ARE NOT POLARITY SENSITIVE AND MAY BE CONNECTED IN EITHER DIRECTION.

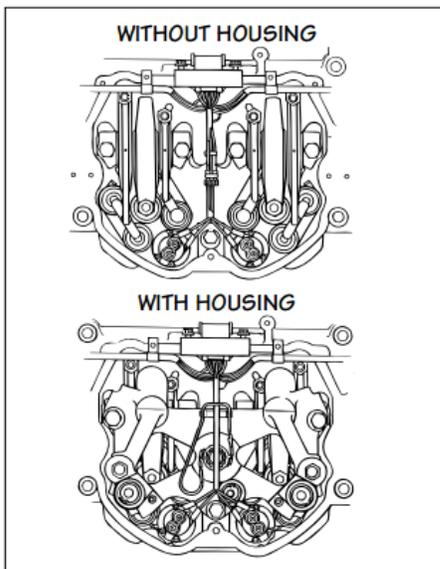


FIG. 15

3. Install the three Jacobs' spacers on the valve cover base (see Fig. 16, only 2 shown for clarity).

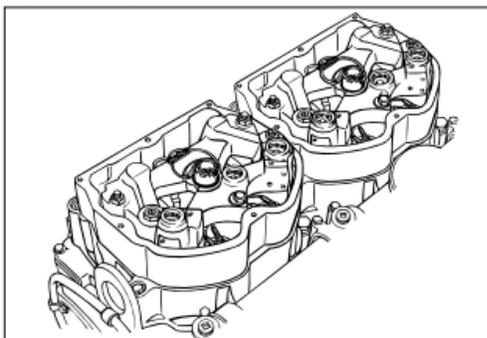


FIG. 16

## Bleed Engine Brake Housings

WEAR EYE PROTECTION AND DO NOT EXPOSE YOUR FACE OVER THE ENGINE AREA. TAKE PRECAUTIONS TO PREVENT OIL LEAKAGE ONTO THE ENGINE.



WHENEVER THE ENGINE IS RUNNING WITH THE VALVE COVERS REMOVED, OIL SPLASHING IN THE ENGINE AREA COULD CAUSE PERSONAL INJURY.

1. Start the engine and allow to run for a few minutes.
2. Depress and release the engine brake solenoid disc several times to allow the housing to be filled with oil (see Fig. 17).

**NOTE:**

PLACE A RAG OVER THE CONTROL VALVE AND ACCUMULATOR COVERS TO REDUCE OIL SPRAY.

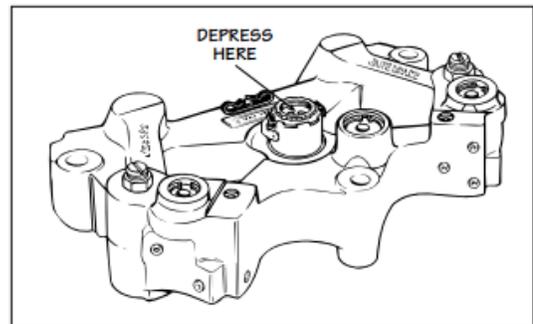


FIG. 17

3. Watch the master piston to be sure it is moving down onto the injector rocker arm pad.
4. Watch the slave piston assembly. It should move down to contact the pin in the exhaust valve screw.
5. Check each housing to be sure they are functioning.
6. Shut down the engine. Clean the gasket surface for the cover.

## Rocker Cover Installation

Be sure the seal is located in the groove of the cover (Fig. 18) and install the cover on the spacer. Install the Jacobs' bolts, six per cover. Torque to 5 lb.-ft. (7 Nm). Tighten in steps to assure uniform compression of the seals.

**CAUTION**

BE SURE TO TIGHTEN ALL ROCKER COVER BOLTS EVENLY. EXCESSIVE OR UNEVEN TIGHTENING MAY CAUSE THE ROCKER COVER TO CRACK.

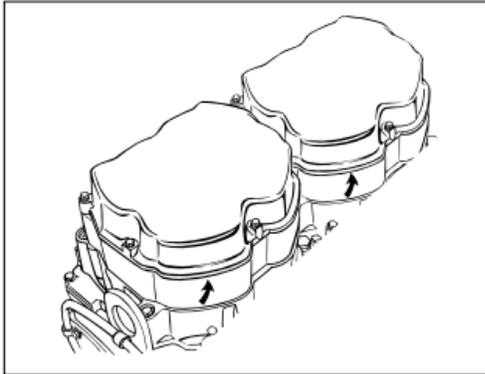


FIG. 18

