$ 20.00

Troubleshooting and Maintenance Manual

JAKE BRAKE®

Jacobs®

P/N 013680B

7/95

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Introduction

Jacobs Engine Brakes are manufactured to the highest standards of quality. Care has been taken in every step of manufacture to produce a product capable of functioning reliably at normal and peak performance. This manual has been prepared to assist the operator and mechanic in correct maintenance and troubleshooting procedures that ensure satisfactory engine brake operation.

Troubleshooting, as discussed in Section 1, is a step-by-step procedure to determine the cause of malfunctions and problems interfering with satisfactory engine brake operation. Malfunctions and/or problems occurring in the Jake Brake can be classified as Electrical or Hydraulic/ Mechanical in nature. To effectively troubleshoot the engine brake system, the mechanic must have a working knowledge of these two systems.

Section 1 also describes the basic operation of engine brakes and components, and recommends procedures to follow when troubleshooting.

Proper maintenance, as discussed in Section 2, will assure maximum engine brake performance and a reliable service life.

Safety Precautions

The following symbols in this manual signal potentially dangerous conditions to the mechanic or equipment. Read this manual carefully and know when these conditions can exist. 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.

Do not work on this equipment when mentally or physically fatigued. Always wear eye protection.

Fuels, electrical equipment, exhaust gases and moving parts present potential hazards that could result in personal injury. Take care when installing an engine brake. Always use correct tools and proper procedures.

The Jake Brake is a vehicle slowing device, not a vehicle stopping device. It is not a substitute for the service braking system. The vehicle's service brakes must be used to bring the vehicle to a complete stop.

Jacobs Service Letters should be consulted for additional applications and updated information.

Engine Brake Part Replacement

Each engine brake housing assembly has an identification tag showing model number and part number. A packaged housing assembly has a different part number than the housing assembly inside the package. When ordering a replacement housing assembly, the packaged housing assembly part number must be used.

The Installation Manual should be used in conjunction with the Jacobs Parts Manual when additional replacement part information is required. The Parts Manual can be obtained from your Jacobs distributor.

For more information on driving with the Jake Brake, read your Jacobs Driver Manual.

Automatic Transmissions

For vehicles with automatic transmission, refer to Jacobs Service Publications or contact your nearest distributor.

1.1 Electrical System

Electric and Electronic Controls

Advancements in vehicle and engine controls have demanded changes to Jacobs Engine Brake control systems. New engine control systems include the following:

Caterpillar: PEEC	Cummins: CELECT
Detroit Diesel: DDEC	Mack: V-MAC

Section 1.1 Electrical System covers basic information and troubleshooting of electric and electronic control systems.

Electrical power to energize the Jake Brake should always come from a terminal on the vehicle ignition switch that is energized when the switch is turned "on". This circuit must be protected by a 10-amp fuse or circuit breaker. The circuit is then connected to the ON/OFF switch, clutch switch, fuel pump (buffer) switch, and then to the solenoid valves.

Refer to the wiring diagram for specific engine brake models being worked on.

NOTE:

A DIODE IS INCORPORATED IN THE SYSTEM AT THE FUEL PUMP (BUFFER) SWITCH. THE DIODE PREVENTS HIGH VOLTAGE SPIKES THAT OCCUR EACH TIME THE SOLENOIDS ARE DE-ENERGIZED. THIS PREVENTS INTERNAL DAMAGE TO THE SWITCHES.

Required Tools

The following tools should be available to troubleshoot electrical problems:

1. Volt/OHM/AMP meter (digital readout)
2. Continuity tester
3. Test light

Preliminary Electrical Checks

1. **Vehicle Electrical Power.** Using a voltmeter, check to see that the supply voltage is at least 12 - 14 VDC or 24 - 28 VDC. Verify that wiring follows the correct Jacobs Engine Brake wiring schematic.

   If the truck is factory pre-wired and the power source is from a breaker panel, make sure the circuit breaker is correctly reset. Make certain power is not drawn from a source with an additional ON/OFF switch or power draw for other components.

2. **Jacobs' Switches.** Using a voltmeter, check the dash switch, clutch switch and throttle switch for a voltage drop across each switch with the switch closed. Replace the switch if a voltage drop is 0.4 VDC or greater.

   Inspect switches for correct adjustment. Check the throttle and clutch return springs for correct adjustment and operation.

3. **Wiring.** Check for short circuit in the wiring. Replace any broken, brittle, chafed, scorched or melted wires. It is recommended that all under-hood or under-doghouse wiring be covered by Jacobs' Auto-Loom or similar good quality loom. Replace Jacobs in-line fuse (10 amps) if blown or reset circuit breaker if necessary..

The following procedures are recommended:

Wire-end terminals should be securely attached to wires. If not, replace terminal. Wire size should be no smaller than 16 gage.

Wire-end terminals should be attached tightly to space connectors. If not, remove and replace, or if necessary, re-crimp and reattach.

Harness wire or loom should be carefully routed and should not contact moving equipment such as throttle, clutch or transmission linkage.

Harness wire or loom should not contact high temperature engine components such as exhaust manifold or turbo housings.

Harness should be secured in place with tie-wraps at regular intervals.

Clutch Switch

Adjust the switch by moving the switch along the mounting bracket. The actuator arm should be deflected 1.0 - 1.5" (25 - 38 mm), measured at the tip of the actuator, when the clutch pedal is in the up (clutch engaged) position.

Check installation by moving the clutch pedal. The switch should click from the open to closed position of the switch contacts in the free-play motion of the clutch pedal before actual clutch disengagement takes place.

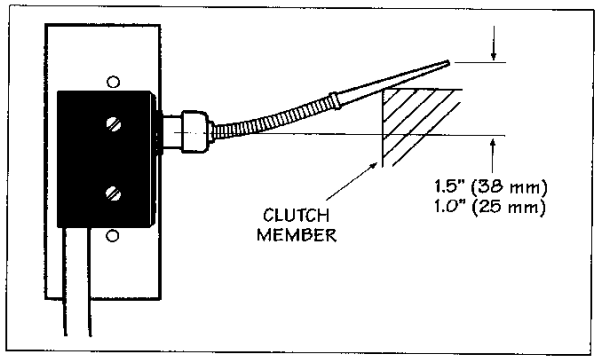

FIG. 1.1.1

⚠ CAUTION

EXCEEDING 1.5" DEFLECTION OF THE ACTUATOR ARM MAY CAUSE SWITCH DAMAGE, RESULTING IN ENGINE BRAKE MALFUNCTION.

Fuel Pump Switch (Cummins PT Fuel Pump)

Move the throttle to the low idle position and insert a 0.05" (1.27 mm) feeler gage between the switch plunger and actuating lever (A, Fig. 1.1.2). Push the switch lever against the switch plunger until the plunger bottoms. Tighten the cap screw to 7 lb.-ft. (10 N•m).

⚠ WARNING

AFTER INSTALLING THE ACTUATING ARM, CHECK THE FUEL PUMP THROTTLE SHAFT TO BE SURE THE THROTTLE PEDAL WILL MOVE THE SHAFT TO THE FULL FUEL POSITION. FAILURE TO DO SO MAY RESULT IN RESTRICTED ENGINE CONTROL. IF THE RESTRICTED MOVEMENT IS FOUND, CORRECT THE PROBLEM AND READJUST THE ACTUATING LEVER.

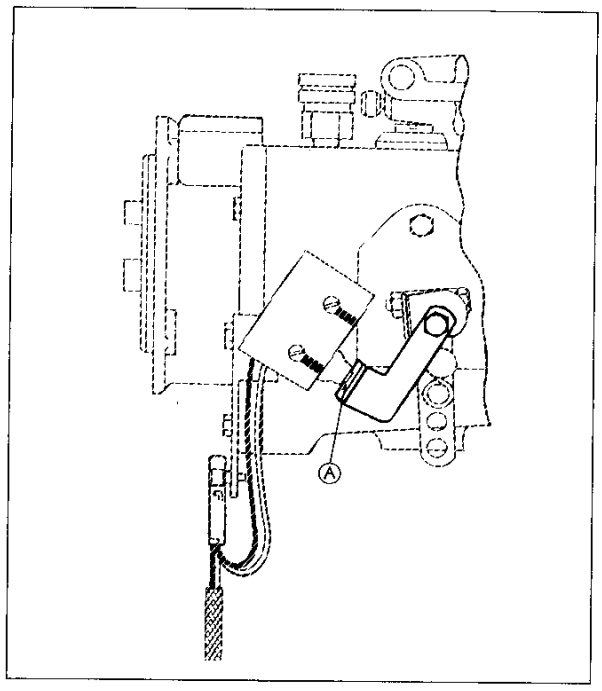

FIG. 1.1.2

Diode Protection

NOTE:

SWITCH CONTACTS ARE PROTECTED AGAINST ARCING BY A SMALL DIODE CONNECTED BETWEEN THE LOAD SIDE SWITCH TERMINAL AND GROUND. THE ENGINE BRAKE MUST BE CONNECTED TO THE LOAD SIDE TERMINAL. IF THE VEHICLE HAS A POSITIVE GROUND ELECTRICAL SYSTEM, REVERSE THE DIRECTION OF THE DIODE (FIG. 1.1.3).

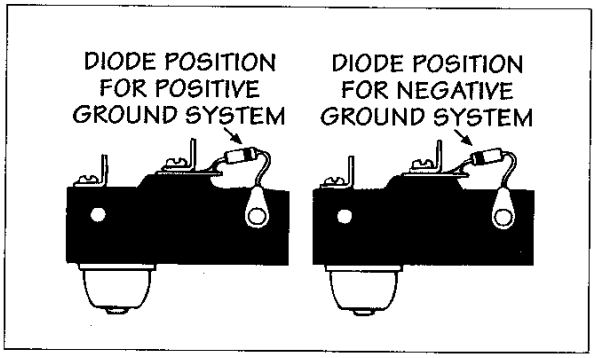

FIG. 1.1.3

Buffer Switch Adjustment

Buffer Switch - Detroit Diesel

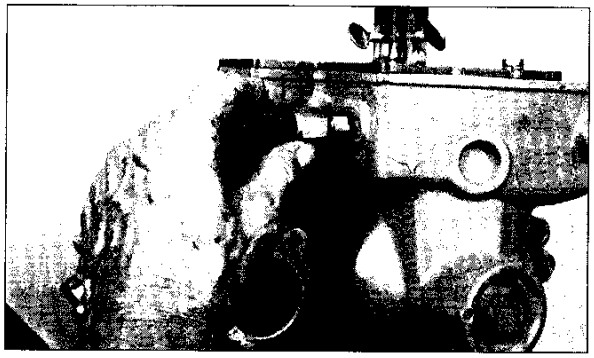

FIG. 1.1.4

1. Start the engine and allow to warm up. Record the idle RPM and maximum no load RPM.
2. With the idle speed set, adjust the buffer switch as follows:
   a. Turn the buffer switch in until it contacts the connecting link as lightly as possible and eliminates engine roll (Fig. 1.1.4).

      NOTE:

      ENGINE IDLE SPEED WITH THE BUFFER SWITCH MUST NOT INCREASE MORE THAN 15 RPM FROM THE READING RECORDED IN STEP 1.

   b. Hold switch in this position and tighten locknut.

      ⚠ CAUTION

      DO NOT TIGHTEN LOCKNUT MORE THAN 60 LB.-IN. (7 N•M). SWITCH FAILURE WILL RESULT FROM OVER-TORQUING.

   c. Check maximum no-load speed. If the increase is more than 25 RPM from the reading recorded in Step 1, back off buffer switch until increase is less than 25 RPM.
3. Shut down engine.
4. Early style buffer switches are polarity sensitive. Attach **NEGATIVE** lead (load side) to tin-plated terminal and the **POSITIVE** lead (power side) to the brass-colored terminal of the switch.
5. Current style buffer switches include a two-diode system for switch protection. The two-diode type switch is not polarity sensitive and electrical connections can be made to either terminal (see Fig. 1.1.5). This switch must only be used with negative ground systems.

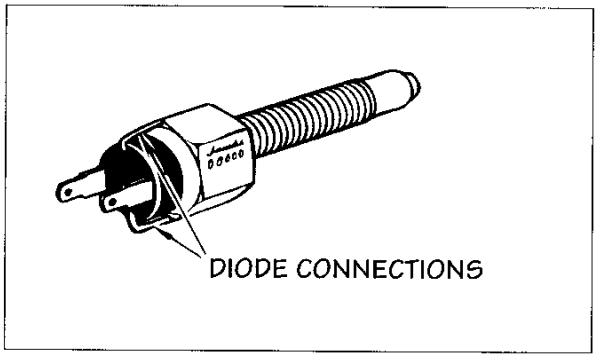

FIG. 1.1.5

Fuel Pump Switch Adjustment - CAT

1. Start engine and check low idle RPM. Disconnect the throttle linkage and adjust the idle per Caterpillar specification by turning the switch clockwise to increase and counterclockwise to decrease engine RPM (Fig. 1.1.6).

Fuel Pump Switch - Caterpillar 3406

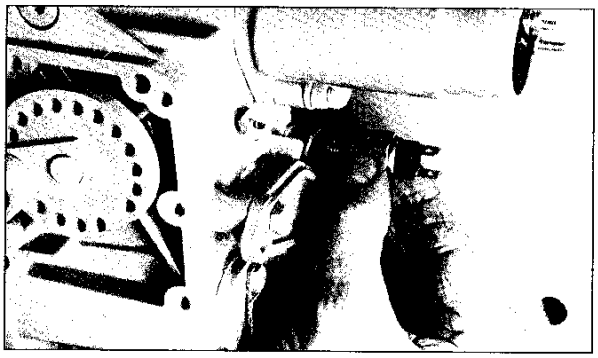

FIG. 1.1.6