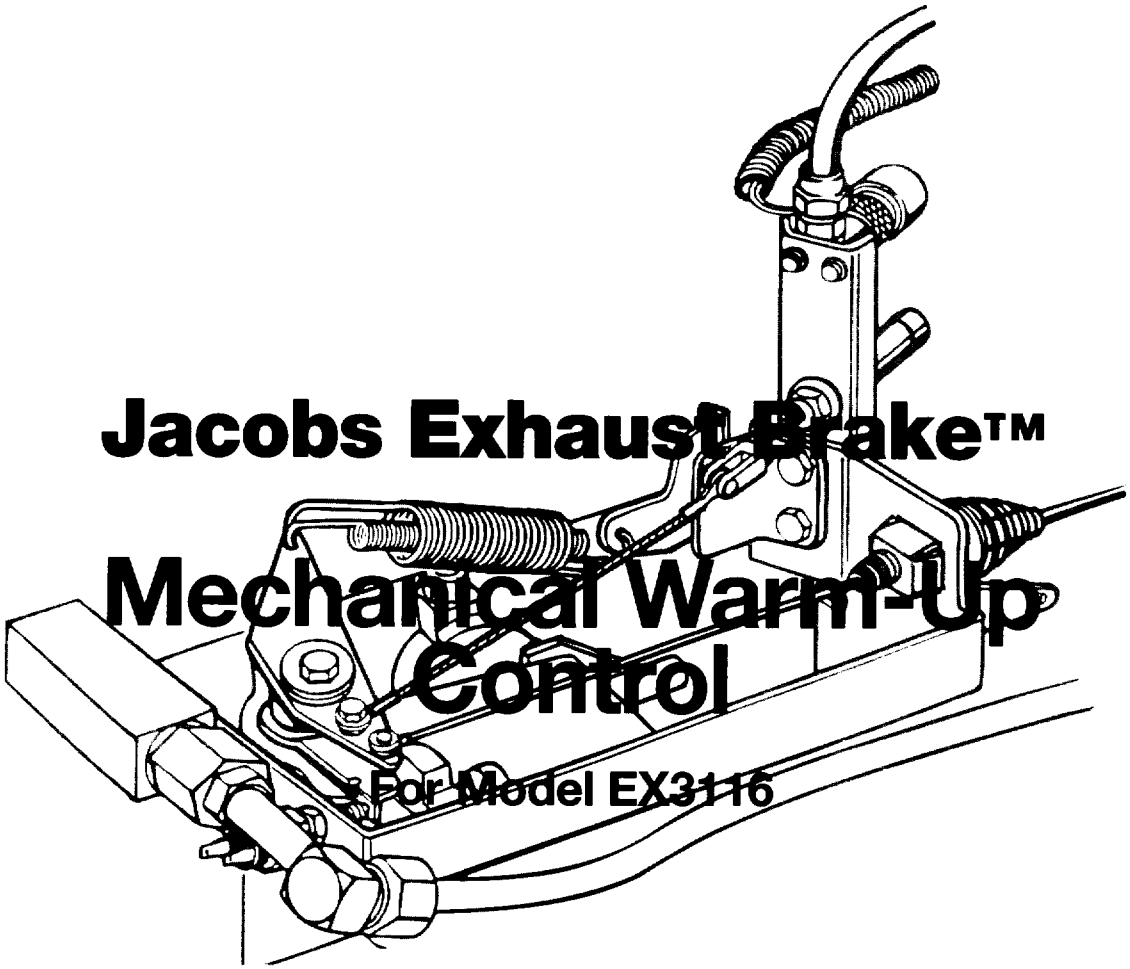
Jacobs Vehicle Systems™

Jacobs Exhaust Brake™

Mechanical Warm-Up Control

For Model EX3116



PARTS/INSTALLATION

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Another quality Jake Brake® product.

Theory and Application

The Warm-Up Control allows the operator to warm up a cold engine quickly. The Warm-Up Control functions by using the back pressure created by the exhaust brake in conjuction with an engine speed control mechanism to increase engine load.

The Mechanical Warm-Up Control (P/N 022707) is designed for use in vehicles equipped with Jacobs Exhaust Brake™ EX3116. This kit may be installed at the same time the EX3116 Exhaust Brake is installed, or at any time after the EX3116 has been installed.

Warm-Up Control Kit Contents

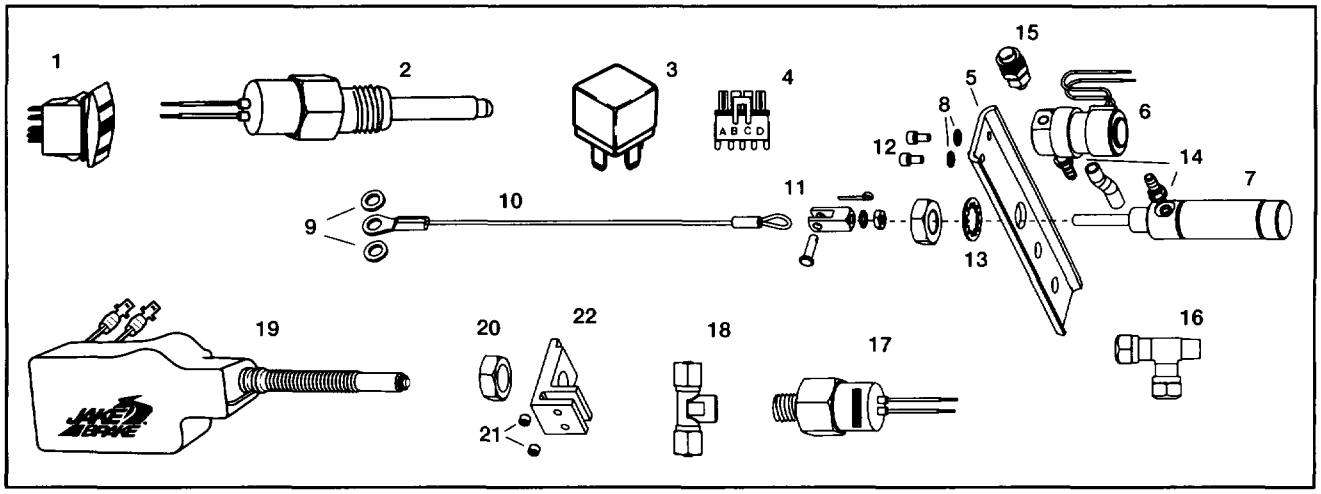

Figure 1

Illus. No.	P/N	Part Name	Quantity
NI	022636	Engine wire harness	1
NI	022779	Cab wire harness	1
1	022660	Dash switch	1
2	022680	Thermal switch	1
3	018257	Relay	1
4	017642	Four-way tower connector	1
	022703	**Throttle Kick-Up Group***	
5	022627	Throttle kick-up bracket	1
6	022679	Solenoid assembly	1
7	022633	Air throttle kick-up cylinder	1
	022765	**Throttle Kick-up Sub Group***	
8	001559	Lock washer, #6	2
9	018903	Plain washer	2
10	024044	Throttle cable	1
11	022631	Clevis assembly	1
12	022635	Socket head cap screw, 6-32	2
13	022647	Lock washer, 7/16"	1
NI	024045	Machine screw, M6 X 1	1
NI	024046	Lock nut, M6 X 1	1

NI - Not Illustrated

* May be ordered as a replacement part set

Illus. No.	P/N	Part Name	Quantity
	022706	**Pneumatic Group***	
NI	018910	Air brake tubing (6 ft)	1
	022766	**Pneumatic Sub Group***	
14	022700	Barb fitting 10-32	2
15	022701	Straight fitting, 10-32 to 1/4	1
16	022702	Compression T-fitting	1
	022974	**Air Brake Safety Switch Group***	
17	022972	Air brake pressure switch	1
18	022973	T-Fitting	1
NI	013078	Splice connector	2
	024153	**Hydraulic Brake Safety Switch Group***	
19	022351	Buffer switch screw assembly	1
20	001026	Hex jam nut, 3/8-24	1
21	024152	Set screw, #6 x .125	2
22	024140	Parking brake switch bracket	1
NI	016467	Quick disconnect receptacle	2
	019662	**Engine Control Group*†**	
NI	014115	Fuel pump switch	1
NI	019666	Fuel pump switch bracket	1
NI	001026	Hex jam nut, 3/8-26	1
NI	019808	Template	1

† These parts are required for installation of the exhaust brake if it has not already been installed. The Exhaust Brake Installation Manual (P/N 019747) provides installation procedures for these parts.

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 safey glasses. Always use correct tools and follow proper procedures as outlined in this manual.

Section 1: Exhaust Brake Preparation

NOTE: INSTALLATION STEPS WILL VARY DEPENDING ON WHETHER THE EXHAUST BRAKE HAS BEEN INSTALLED PREVIOUSLY OR IS BEING INSTALLED AT THE SAME TIME AS THE WARM-UP CONTROL. DIFFERENCES ARE NOTED WHERE THEY OCCUR. FOR ADDITIONAL INFORMATION ON THE EX3116 EXHAUST BRAKE, REFER TO JACOBS EXHAUST BRAKE INSTALLATION MANUAL (P/N 019747B).

⚠WARNING THE AIR SYSTEM ON THE VEHICLE MUST BE BLED BEFORE INSTALLATION OF THE EXHAUST BRAKE OR WARM-UP CONTROL.

If the exhaust brake has been previously installed, proceed to Section A. If the exhaust brake is being installed at this time, proceed to Section B.

A. If the exhaust brake was installed previously:

1. Remove the Exhaust Brake Compression Fitting Assembly (P/N 018912) from the inlet side of the Exhaust Brake Solenoid Valve (P/N 019304). Refer to Figure 3 of the Exhaust Brake Installation Manual (P/N 019747B).

2. Using Teflon® tape, install the T-fitting from the Warm-Up kit (P/N 022702) in place of the Compression Fitting Assembly removed in step 1.

3. Reconnect tubing as required, leaving an outlet open on the T-fitting for installation of the air brake tubing in Section 3 below.

4. Remove the existing exhaust brake wire harness and dash switch.

Proceed to Section 2 on the next page.

B. If you are installing the exhaust brake at this time: Proceed with the installation of the exhaust brake. Follow the Exhaust Brake Installation Manual (P/N 019747B), with the following exceptions.

1. In Section 2 of the Installation Manual, substitute the T-fitting from the Warm-Up kit (P/N 022702) for the Compression Fitting Assembly (P/N 018912) from the EX3116 Exhaust Brake kit. One outlet of the T-fitting will be used to supply air for the Warm-Up Control. Make the pneumatic connections outlined in Section 2 of the Exhaust Brake Installation Manual, leaving an outlet open on the T-fitting for installation of the Air Brake tubing in the next section.

3. When installing the Fuel Pump Switch (Section 3 of the Exhaust Brake Manual), before re-installing the throttle lever, drill the hole for the Throttle-Kick-up Cable as outlined in Section 2.B on the next page.

Proceed to Section 2 on the next page.

Section 2: Engine Controls

Throttle Kick-Up Assembly

Assembly of the Throttle Kick-up depends on whether you are installing the exhaust brake at this time. If the exhaust brake has been previously installed, proceed to Section A. If the exhaust brake is being installed at this time, proceed to Section B.

A. Exhaust brake installed previously:

Remove the two throttle return springs, throttle lever, bolt, and washers. Drill a 1/4" hole in the throttle lever 1/2" from the standard throttle cable connection. Replace the throttle lever and throttle return springs.

Proceed to **Section C** below.

B. Installing exhaust brake **at this time:**

Proceed with the Installation of the Fuel Pump Switch as outlined in Section 3 of the Exhaust Brake Installation Manual (P/N 019747B), with the following additional step: Before replacing the throttle lever and throttle return springs, Drill a 1/4" hole in the throttle lever 1/2" from the standard throttle cable connection. Continue the installation of the Fuel Pump Switch as described in Section 3 of the Exhaust Brake Installation Manual.

NOTE: DO NOT INSTALL THE WIRE HARNESS AS DESCRIBED IN THE EXHAUST BRAKE MANUAL, AND DO NOT PERFORM THE FINAL TEST OF THE EXHAUST BRAKE UNTIL ALL INSTALLATION STEPS FOR BOTH THE WARM-UP CONTROL AND THE EXHAUST BRAKE HAVE BEEN PERFORMED.

Proceed to **Section C** below.

C. Common installation procedures

1. Assemble the Throttle Kick-up Group, following the steps below.

   a. Insert the Air Throttle Kick-up Cylinder (P/N 022633) through the hole near the center of the Throttle Kick-up Bracket (P/N 022627), positioning it as illustrated in Figure 1 on page 2. Use the 7/16" Lock Washer (P/N 022647) and the nut included with the cylinder. Do not tighten at this time.

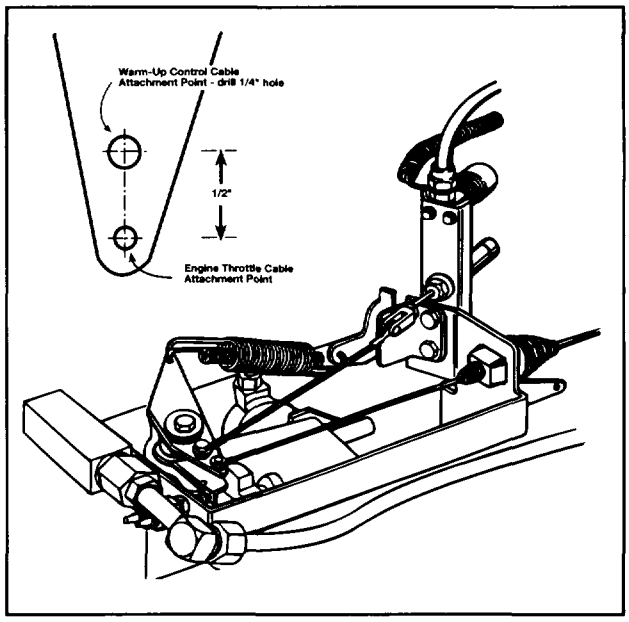

Figure 2

   b. Cut a 7/8" section from the air brake tubing provided. Attach it to the Throttle Kick-up Cylinder, using one Barb Fitting (P/N 022700).

   c. Using the other Barb Fitting, attach the free end of the brake tubing to the Solenoid Assembly (P/N 022679), using the port marked "OUT". Attach the Solenoid Assembly to the top of the Throttle Kick-up Bracket using the two 6-32 Socket Head Cap Screws (P/N 022635) and lock washers (P/N 001559). The port marked "IN" should be pointing to the short end of the bracket. Tighten the Throttle Kick-up Cylinder jam nut (included with the Throttle Kick-up Cylinder).

   d. Attach the Clevis head to the threaded end of the Kick-up Cylinder using the lock washer and nut included in the Clevis parts bag. Attach the Throttle Cable (P/N 024044) with the looped cable end through the Clevis head. Bend the cotter pin only enough to secure the cable temporarily until final testing and adjustment in Section 4. Also, do not tighten the Clevis head locknut until adjustments are made during final testing.

2. Remove the hex screws indicated by the arrows in Figure 2. Mount the Throttle Kick-

up Group assembled in step 1 as shown, using the original screws.

3. Attach the ring end of the Throttle Cable to the throttle lever, using the M6 x 1 Machine screw (P/N 024045) and M6 x 1 Locknut (P/N 024046). The machine screw will only thread into the locknut a predetermined distance, allowing the cable ring to "float" on the screw.

Thermo Switch Installation

Locate the thermostat block on the front of the engine for installation of the Thermo Switch. If a port is available for installation, install the Thermo Switch (P/N 022680). If a port is not available, obtain and install the required T-fitting (not included) to install the switch.

4. Using thread lock compound (Loctite® 243 or equivalent), install Straight Fitting (P/N 022701) to the Throttle Kick-up Solenoid port marked "IN". Use a section of air brake tubing to connect the fitting on the Throttle Kick-up Solenoid to the T-fitting on the Exhaust Brake Solenoid.

Engine Wire Harness

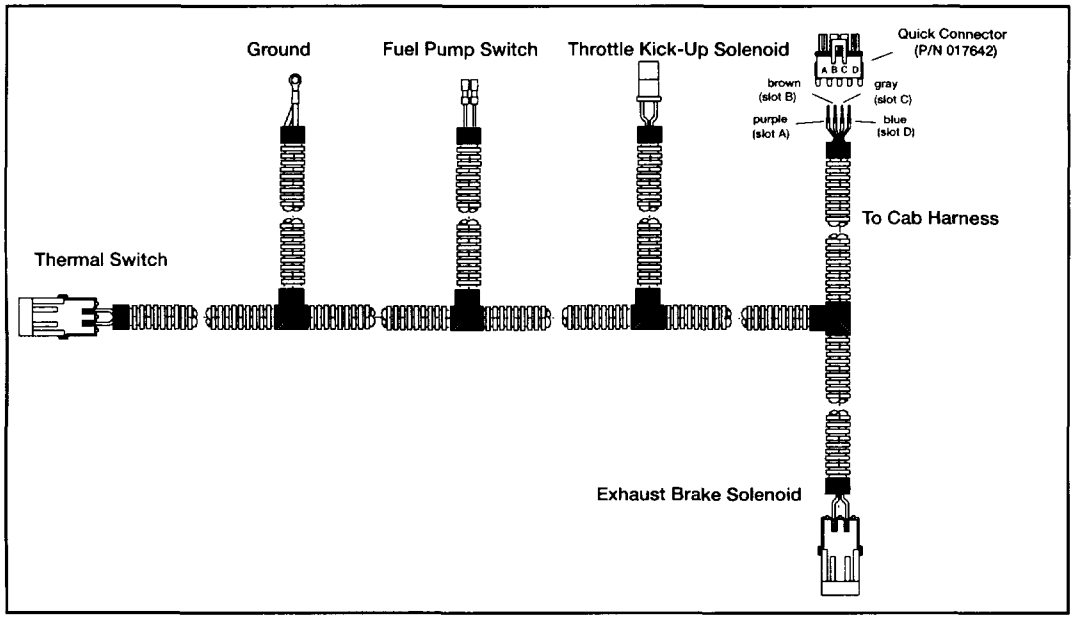

Figure 3

NOTE: IF THE EXHAUST BRAKE HAS BEEN PREVIOUSLY INSTALLED, THE WIRE HARNESSES INCLUDED WITH THE WARM-UP CONTROL WILL REPLACE THE EXISTING WIRE HARNESS. THE ORIGINAL WIRING HARNESS DISTRIBUTED WITH THE EX3116 EXHAUST BRAKE CONNECTED TO A CLUTCH SWITCH. THIS SWITCH IS NOT REQUIRED FOR THE EXHAUST BRAKE OPERATION. THEREFORE, THERE IS NO CONNECTOR FOR THE CLUTCH SWITCH ON THE WIRE HARNESSES INCLUDED WITH THE WARM-UP KIT.

Install the Engine Wire Harness (P/N 022636), observing the following connections (see Figure 3):

1. Attach the connector with the blue and green wires to the Thermo Switch installed above.

2. Connect the green wire with the ring terminal to a common ground bolt or good chassis ground.

3. Attach the blue and yellow wires with the spade connectors to the exhaust brake Fuel Pump Switch.

4. Attach the connector with the green and brown wires to the Throttle Kick-up Solenoid installed above.

5. Attach the connector with the green and yellow wires to the Exhaust Brake Solenoid.

6. The harness section containing the brown, purple, gray, and blue wires must be routed to the cab. Once the wires are routed to the cab area, they must be inserted into connector (P/N 017642) in the following order:

   purple wire - slot A

   brown wire - slot B

   gray wire - slot C

   blue wire - slot D

7. Once the connections are made, secure the harness using cable ties (not included).

Section 3: Cab Controls

Parking Brake Safety Switch

The Warm-up Control requires the parking brake to be engaged in order to function. Installation depends on whether the vehicle has hydraulic or air brakes. If the vehicle has air brakes, proceed to Section A below. If the vehicle has hydraulic brakes, proceed to Section B.

A. Safety Switch Installation - Air Brakes

1. Splice the T-fitting (P/N 022973) to a parking brake air line in the cab compartment. The T-fitting must be installed on an air line that is switched with the parking brake.

2. Using Teflon® tape, connect the Air Brake Safety Switch (P/N 022974) to the T-fitting as shown in Figure 4.

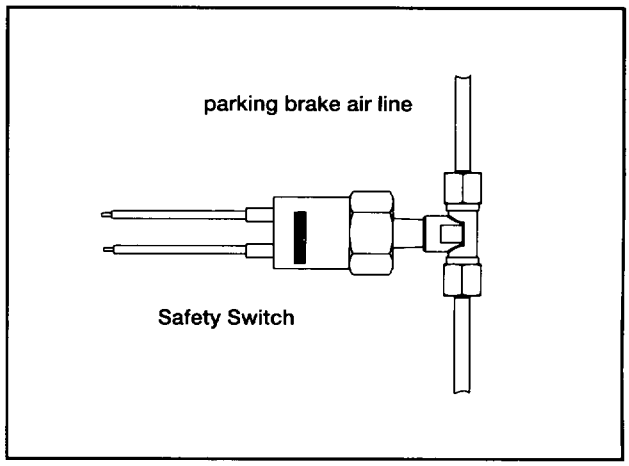

Figure 4

B. Safety Switch Installation - Hydraulic Brakes

1. Thread the Hydraulic Brake Safety Switch (P/N 024153) in the Hydraulic Brake Switch Bracket (P/N 024140) as shown in Figure 5, using Hex Jam Nut (P/N 001026). Do not tighten at this time.

2. Attach the Switch and Bracket assembly to the parking brake lever. The bracket slides over the parking brake lever and is secured by tightening the two set screws on the bracket (see Figure 5).

   The bracket must be positioned on the parking brake lever so that when the parking brake is engaged, the plunger on the switch is depressed. Bracket position will vary depending on the exact configuration of the parking brake lever. Once correct position has been determined, apply thread lock compound (Loctite® 243 or equivalent) to set screws and tighten.

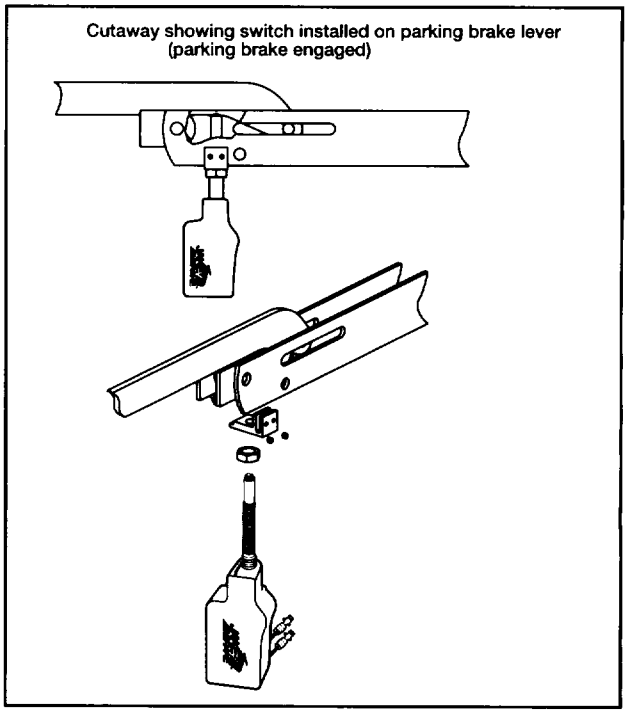

Figure 5

Section 5: Maintenance and Troubleshooting

Maintenance Procedures

1. Make sure the engine is below normal operating temperature. Start the engine and turn on the Warm-Up Control. The dash switch will not remain in the Warm-Up position, but the switch will light to indicate the Warm-Up Control has been activated.

2. Ensure the Warm-Up Control increases engine speed to approximately 1200 RPM. If engine speed is above or below 1200 RPM, adjust the Throttle Kick-up assembly following the procedure in step 4 of Section 4 of the Warm-Up Control Installation Manual (P/N 022767).

3. Visually check to make sure the exhaust brake is operating when the Warm-Up Control is on. To determine exhaust brake operation, check pivot arm position. The exhaust brake pivot arm should be off the pivot arm stop when the brake is operating.

4. Check all air fittings for leaks. Repair any leaks immediately to prevent loss of air pressure. This is particularly important in a vehicle equipped with air brakes.

5. Check all electrical connections.

6. Check the cable connecting the Throttle Kick-up Cylinder to the throttle lever, making sure all bolts, screws, and nuts are tight and the cable is securely fastened to the clevis head. Also check the condition of the cotter pin and replace as necessary..

7. Check the operation of the Thermo Switch. The Thermo Switch should shut off the Warm-Up Control when the engine reaches normal operation temperature (approximately 180° F).

If Warm-Up Does Not Operate

1. Check the harness fuse at the red harness wire. If the fuse is intact, check to make sure that there is keyed power to the Warm-Up Control harness (through the red fused wire).

2. Check the Parking Brake Safety Switch for proper operation. The switch should be closed when the parking brake is engaged. For hydraulic brakes, adjust the switch position (if required) as described in Section 3. For air brakes, check to ensure air pressure is released when parking brake is engaged and that switch is closed. If switch does not close when air pressure is released, replace switch (P/N 022972).

3. Check Thermal Switch operation. Thermal Switch should be closed when the engine is cold. Switch should open when engine reaches normal operating temperature (approximately 180° F). Replace Thermal Switch as required (P/N 022680).

4. Check the operation of the Warm-Up Control Relay. To check Relay operation, apply 12 V across the Relay coil (pins 86 and 85 – see wiring diagram, Fig. 7, on the next page), then check for a closed circuit across pins 30 and 87 (a closed circuit indicates proper relay operation).

5. Check the operation of the Throttle Kick-up solenoid. Solenoid should open with 12 V applied (polarity does not need to be maintained). Replace solenoid as required (P/N 022679). If the solenoid operates correctly, check to make sure the Throttle Kick-up Cylinder closes, opening the throttle.

7. Check exhaust brake solenoid operation in the same manner, making sure that the solenoid operates the exhaust brake valve. Visually check valve operation as described in step 3 of the Maintenance Procedures above.

8. Check dash switch operation. Ensure that depressing the switch at the Warm-Up position temporarily closes the circuit until the switch is released.

Warm-Up Control Wiring Diagram

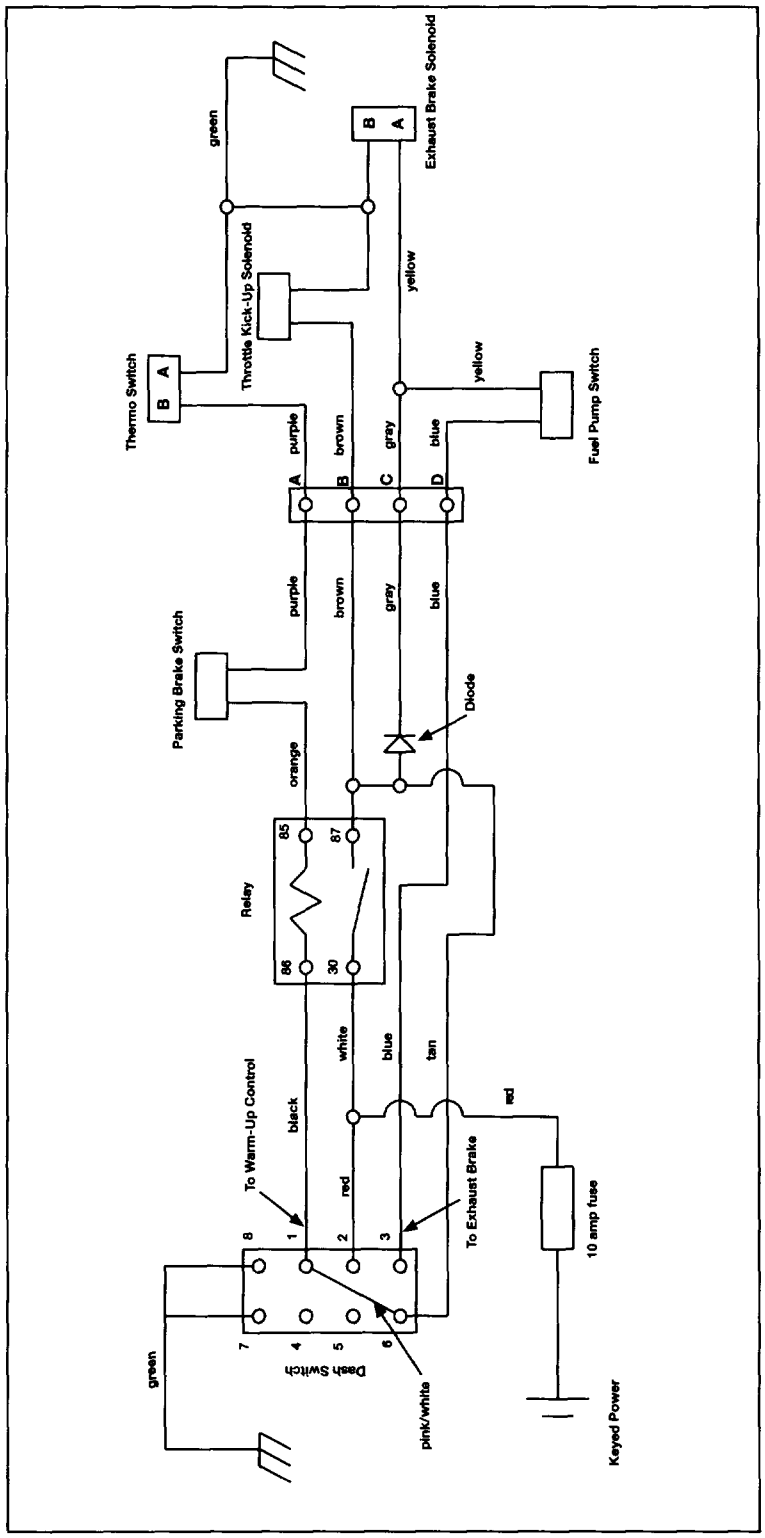

Figure 7

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