



E BRAKE
by Jacobs®

**Installation
Manual
For ISB5.9/ISB02
Engines**

Table of Contents

1. Installation of the E Brake Assembly3

2. Pneumatic Group Installation5

3. Installation of the Controls7

4. Final Test 11

Application Notes

A. The E Brake for the ISB5.9 and ISB02 engine is designed for vehicles equipped with the Cummins ISB Series engine (for ISB5.9, all horsepower ratings and for ISB02, less than 250 horsepower ratings). The kit for ISB5.9 engine is available in two turbo-mount versions and an in-line version. The kit for ISB02 engine is available in turbo-mount full marmon mounting joint version and standard inline version.

There must be a minimum of 3" clearance from any exhaust component to the vehicle firewall or body after the E Brake is installed. The E Brake housing extends approximately 3" from the turbo outlet. If the vehicle does not have the required clearance around the turbo, you must install the in-line kit, Cummins P/N 3800441 for ISB5.9 engine, and Cummins P/N 4089593 for ISB02 engine.

For Turbo-mount applications, determine the type of mounting joint on the vehicle turbocharger. See Figure 1 for an illustration of the half Marmon and full Marmon joint types. In ISB5.9 engine, for full Marmon applications, install kit P/N 3800443 and for half Marmon applications, install kit P/N 3800442. In ISB02 engine, for full Marmon applications, install kit P/N 4089591.



B. **Vehicles with Allison Transmissions:** When

installing the E Brake on vehicles equipped with an Allison transmission, refer to E Brake Application Note 93-1, Bulletin 3698668, for detailed information.

C. **Selecting a Pneumatic Group:** Vehicles that do not have an on-board air supply, order the Pneumatic Group with Air Supply, P/N 3806237. Follow installation instructions included with the Pneumatic Group with Air Supply. For vehicles that have an on-board air supply, order Pneumatic Group P/N 3806238. Follow the installation instructions included in this manual.

Safety Precautions

The following symbols in this manual alerts potentially dangerous conditions 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.

-  THIS SYMBOL WARNS OF POSSIBLE PERSONAL INJURY.
-  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 an exhaust brake. Always use correct tools and proper procedures as outlined in this manual.

THE CUMMINS E BRAKE IS A VEHICLE SLOWING DEVICE, NOT A VEHICLE STOPPING DEVICE. IT IS NOT A SUBSTITUTE FOR THE SERVICE BRAKING SYSTEM.

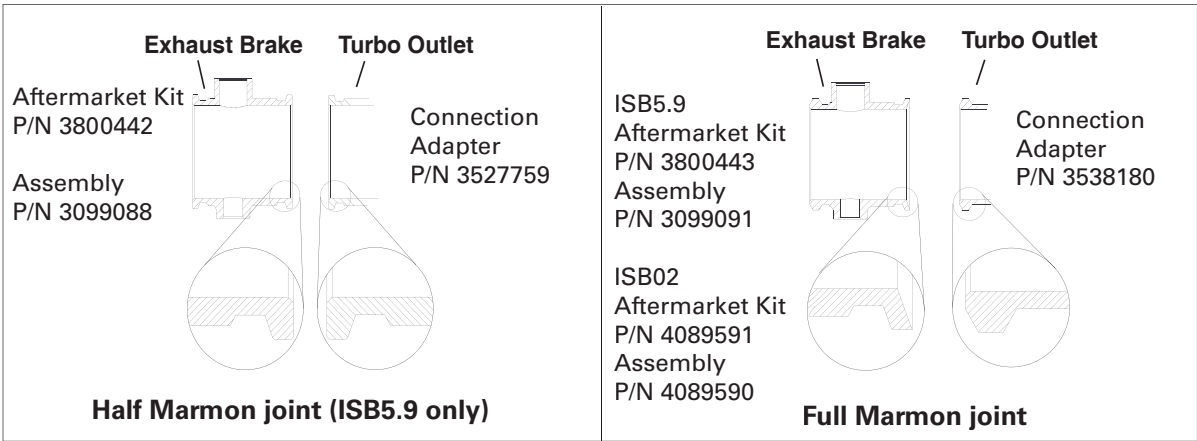


FIG. 1

1. Installation of the E Brake Assembly

For turbo-mount models, follow the procedure in 1A. For in-line models, follow the procedure in 1B.

NOTE: INSTALLATION PROCEDURES FOR THE HALF-MARMON TURBO MOUNT AND FULL MARMON TURBO MOUNT APPLICATIONS ARE IDENTICAL EXCEPT FOR PARTS USED.

ISB5.9: PART NUMBERS FOR THE FULL MARMON-TYPE TURBO MOUNT ARE ASSEMBLY P/N 3099088, GASKET P/N 3099094, AND CLAMP, P/N 3903652. PART NUMBERS FOR THE HALF MARMON-TYPE TURBO MOUNT ARE ASSEMBLY P/N 3099088, GASKET P/N 3099094, AND CLAMP, P/N 3903652.

ISB02: PART NUMBERS FOR THE FULL MARMON-TYPE TURBO MOUNT ARE ASSEMBLY P/N 4089590, GASKET P/N 3099094, AND CLAMP, P/N 3903652.

1A. Turbo-mount E Brake Installation

Refer to Figure 2 for the following procedures.

1. Loosen the "V" clamp holding the original exhaust pipe to the turbo. Remove the exhaust pipe, keeping the clamp to reconnect the exhaust pipe to the E Brake. Inspect the exhaust pipe for any sign of rust or damage. Replace if necessary.
2. In most installations, the exhaust pipe must be shortened to allow installation of the E Brake housing. The most convenient method is to modify the exhaust pipe length at a slip joint. Using a torch, heat the pipe sufficiently to disassemble the slip joint. Then remove the required length of exhaust pipe.
3. The E Brake assembly is mounted to the turbo outlet using the gasket and clamp provided (see Figure 2). The gasket is coated with an adhesive to ease installation. Remove the backing from the adhesive and apply the gasket to the turbo outlet, taking care to center the gasket.

NOTE: ENSURE THE GASKET IS CENTERED DURING INSTALLATION OF THE E BRAKE. GASKETS NOT CENTERED CORRECTLY DURING INSTALLATION CAN CAUSE UNNECESSARY RESTRICTION OF EXHAUST FLOW AND POSSIBLE LOSS OF POSITIVE POWER, OR A LEAK DURING BRAKING AND LOSS OF BRAKING POWER

4. Position the E Brake so the air cylinder is either above the E Brake housing or on the side of the housing opposite the engine, and mount to the turbo using the clamp provided.

TO PREVENT EXPOSURE TO EXCESSIVE HEAT, DO

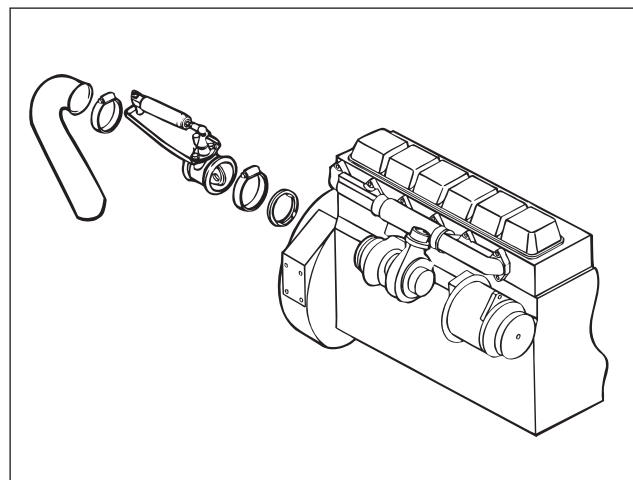


FIG. 2

CAUTION NOT INSTALL THE E BRAKE WITH THE AIR CYLINDER FACING THE ENGINE SIDE OF THE HOUSING. TO PREVENT ACCUMULATION OF WATER IN THE SOCKET JOINT, DO NOT INSTALL THE E BRAKE WITH THE AIR CYLINDER LOCATED BENEATH THE MAIN HOUSING.

5. When the E Brake assembly is properly positioned, torque the clamp bolts to 70 - 80 lb-in. (8 - 9 N•m).
6. Connect the original exhaust pipe to the E Brake housing, using the original exhaust system clamp. Tighten enough to loosely hold the parts in place.
7. Make the connection to the muffler using the parts (flex pipe and clamp) removed when the installation began. With the clamps still loose, align the exhaust system. Ensure that there is proper clearance between the exhaust system, including the E Brake and the engine and chassis. Now torque all the "V" clamps to 70 - 80 lb-in. (8 - 9 N•m).

Proceed to Section 2, Pneumatic Group Installation.

1B.In-line E Brake Installation

1. Loosen the "V" clamps holding the original exhaust pipe arrangement in place. Remove the exhaust pipe, inspect for any sign of rust or damage. Replace if necessary.
2. Select a location on the exhaust pipe for the E Brake. Locate the E Brake between the muffler and turbocharger. The E Brake should be as close to the turbocharger as possible while maintaining a minimum distance of 8" from the turbocharger. Where possible, mount the E Brake in a near vertical orientation with the E Brake air cylinder facing the front of the vehicle. This will ensure a flow of air over the cylinder (see Figure 3).

CAUTION DO NOT ATTEMPT TO MOUNT THE E BRAKE ANY CLOSER THAN 8" (20.32 CM) TO THE TURBOCHARGER. DO NOT LOCATE THE E BRAKE SO THE AIR CYLINDER IS IN A HORIZONTAL POSITION BELOW THE MAIN HOUSING.

3. Lay the exhaust pipe on the ground or bench with the E Brake and exhaust pipe sleeves, P/N 3929059 (see Fig. 4) and mark the pipe section to be removed. Cut out the necessary pipe section, ensuring the cut is square to the pipe. Weld the sleeve to the two exhaust pipe lengths.

NOTE: WELD THE SLEEVES TO THE PIPE CAREFULLY. THE WELDED JOINT BETWEEN THE TURBO AND THE EXHAUST BRAKE HOUSING WILL BE SUBJECTED TO HIGH INTERNAL PRESSURE. ANY EXHAUST GAS LEAKAGE WILL CAUSE A SIGNIFICANT LOSS OF PERFORMANCE.

4. Reinstall the exhaust pipe section to the turbocharger using gasket, P/N 3929058. The gasket is coated with an adhesive to ease installation. Remove the backing from the adhesive and apply the gasket to the turbo outlet, taking care to center the gasket. Install the original "V" clamp and tighten enough to loosely hold the parts in place.

NOTE: ENSURE THE GASKET IS CENTERED DURING INSTALLATION OF THE E BRAKE. GASKETS NOT CENTERED CORRECTLY DURING INSTALLATION CAN CAUSE UNNECESSARY RESTRICTION OF EXHAUST FLOW AND POSSIBLE LOSS OF POSITIVE POWER, OR A LEAK DURING BRAKING AND LOSS OF BRAKING POWER

5. Install the E Brake at the other end of this section of pipe using gasket, P/N 3929057, and "V" clamp, P/N 3929060. Orient the E Brake so that air cylinder bracket is facing

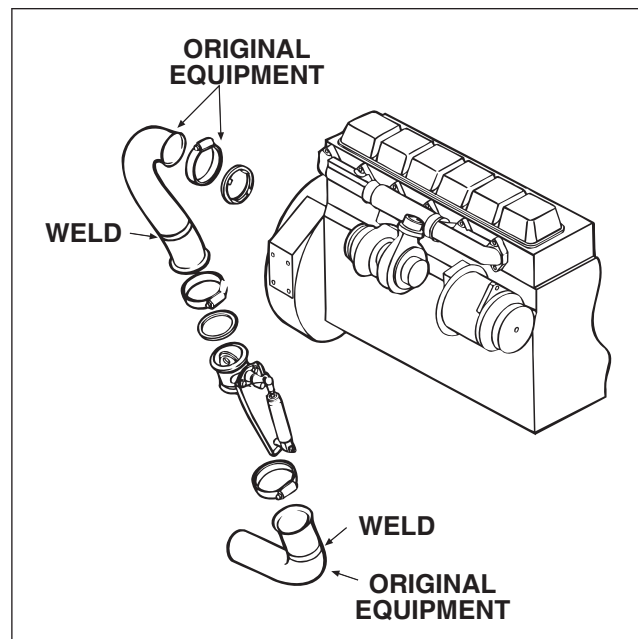


FIG. 3

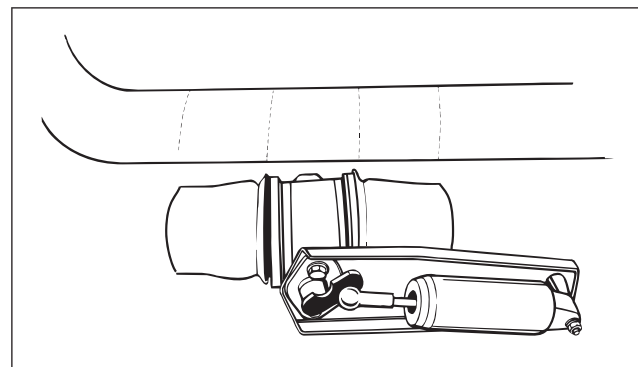


FIG. 4

away from the turbocharger. Make sure that the gasket is installed on the locating pilot on the E Brake inlet. Tighten the "V" clamp enough to loosely hold the parts in place.

6. Install the second section of exhaust pipe with the sleeve, P/N 3929059, attached and clamp to the E Brake outlet using the "V" clamp, P/N 3929060. No gasket is needed between the E Brake and this pipe section.
7. Make the connection to the muffler using the parts (flex pipe and clamp) removed when the installation began. With the clamps still loose, align the exhaust system. Ensure that there is proper clearance between the exhaust system, including the E Brake and the engine and chassis. Now torque all the "V" clamps to 70 - 80 lb-in. (8 - 9 N•m).

2. Pneumatic Group Installation

NOTE: INSTALLATION OF THE E BRAKE REQUIRES AN AIR SUPPLY ON THE VEHICLE. IF THE VEHICLE IS NOT EQUIPPED WITH AN AIR SUPPLY, AN AUXILIARY AIR SUPPLY MUST BE INSTALLED. FOR THESE CASES, INSTALL THE PNEUMATIC GROUP WITH AIR SUPPLY, P/N 3806237, AND THE AIR SUPPLY ELECTRICAL HARNESS GROUP, P/N 3803918. FOR VEHICLES WITH AN ON-BOARD AIR SUPPLY, INSTALL PNEUMATIC GROUP P/N 3806238. SEE THE APPLICATION NOTES ON PAGE 2 OF THIS MANUAL FOR MORE INFORMATION.



BLEED THE AIR TANK OF THE VEHICLE BEFORE STARTING THIS INSTALLATION.

A. Compression Fitting Assembly Instructions

Use the following guidelines when installing compression fittings.

1. Cut the tubing ends squarely.
2. Insert the tubing into the fitting until it bottoms on seat. Tighten nut with wrench until one thread remains visible on the fitting.

B. Hose Assembly Instructions

Use the following guidelines when installing compression fittings.

1. Determine the required length of the hose, ensuring that the minimum bend radius is 2" (51 mm).
2. Cut the hose squarely with a fine tooth hacksaw or cutoff wheel.
2. Put the socket in a vise. Screw the hose counterclockwise into socket until it bottoms, then back off 1/4 turn.
5. Lubricate the nipple thread and inside of the hose liberally with a heavy oil or Aeroquip hose assembly lube, Aeroquip P/N 222070.
6. Screw nipple clockwise into socket and hose. Leave 1/32" (0.8 mm) to 1/16" (1.6 mm) clearance between the nipple hex and socket.

Route the air tubing carefully and clamp using the clamps provided. Avoid tight bends and ensure there is no possibility of abrasion through contact with chassis components.

C. Installing the Pneumatic Group

NOTE: VEHICLES EQUIPPED WITH HYDRAULIC BRAKES REQUIRE INSTALLATION OF THE PNEUMATIC GROUP WITH AIR SUPPLY, P/N 3806237, AND THE AIR SUPPLY ELECTRICAL HARNESS GROUP, P/N 3803918. REFER TO THE INSTRUCTIONS INCLUDED IN THE KIT WHEN INSTALLING THE AUXILIARY AIR SUPPLY.

1. Install the protection valve at the air tank outlet chosen for the E Brake air supply, using the proper pipe fittings (see Figure 5 on the next page).

NOTE: USE TEFLON® PIPE THREAD COMPOUND ON ALL THREADED PIPE CONNECTIONS.



USE OF THE PROTECTION VALVE WILL MAINTAIN THE INTEGRITY OF THE ORIGINAL PNEUMATIC SYSTEM. UNDER NO CIRCUMSTANCES SHOULD THE PROTECTION VALVE BE OMITTED FROM THE INSTALLATION.

NOTE: IF A THREADED HOLE IS NOT AVAILABLE ON THE AIR TANK AND A "TEE" FITTING IS EMPLOYED TO TAP INTO THE ORIGINAL PNEUMATIC CONNECTIONS, ENSURE THAT THE ORIGINAL AIR CONNECTIONS ARE CORRECTLY RETORQUED.

2. Install the solenoid valve on the chassis rail, using existing predrilled holes. If no suitable location is available on the chassis rail, then mount the solenoid valve to the body sheet metal. Position the solenoid so that the exhaust port is facing down. Avoid excessive heat coming from the exhaust system. The distance from the solenoid valve to the air cylinder of the E Brake should be within the length of the supplied hose.
3. Connect the solenoid port marked "1" or "P" to the air tank using the air tubing.
4. Connect port "2" or "A" to the E Brake air cylinder using the air hose as shown in (see Fig. 5).
5. Use the 1/4 - 18 NPT compression fittings for the tubing connections from the air tank to the solenoid valve (see Fig. 5).

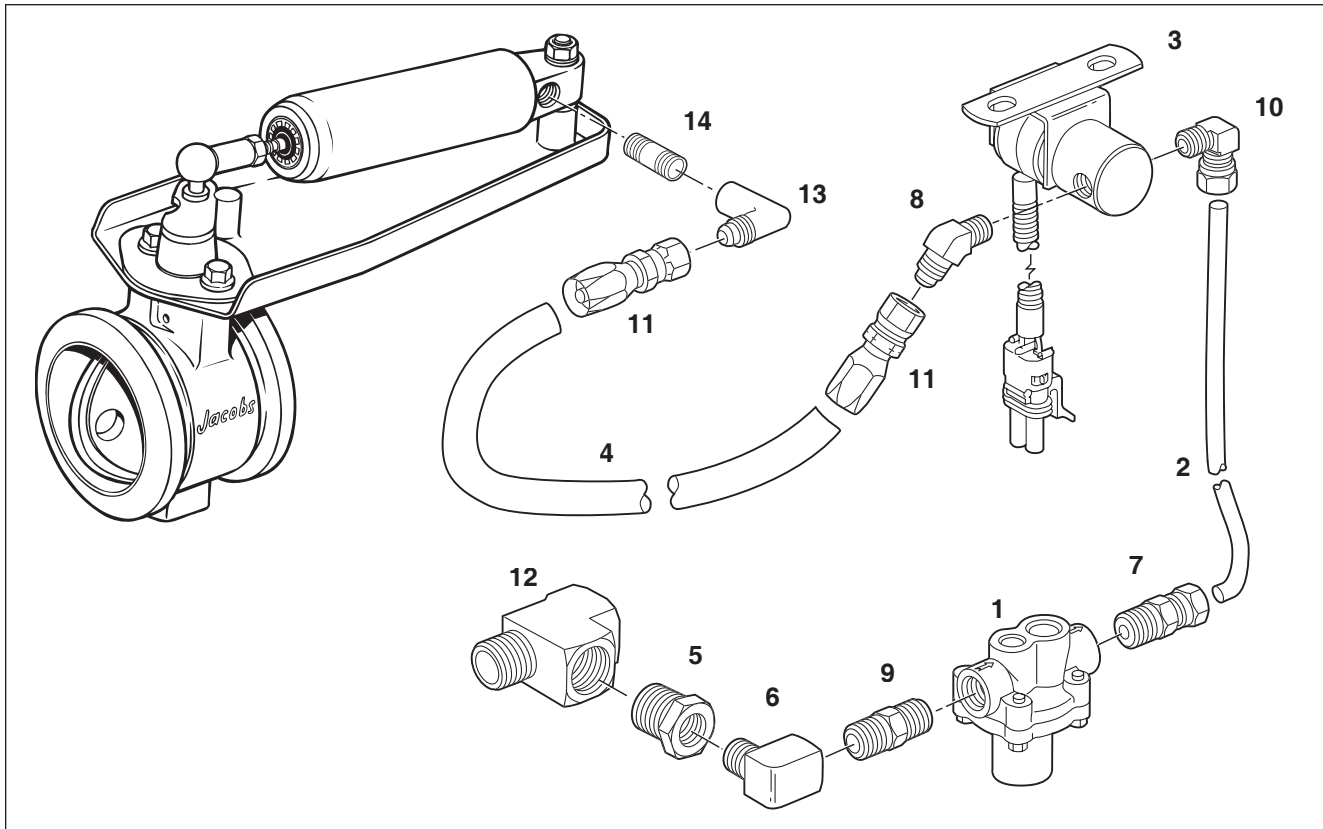


FIG. 5

III.		Quan./ Group	No. Description		Group
No.	Description				
1	Protection valve	1	8	45° flared, 45° elbow, 1/8 NPT	1
2	Air brake tube	1	9	Hex nipple	1
3	Solenoid valve assembly	1	10	Compression fit. assy.	1
4	Air brake hose	1	11	Hose fitting assembly	2
5	Bushing	1	12	Pipe tee	1
6	90° street elbow, 1/4 NPT	1	13	45° flared elbow, 1/4 NPT	1
7	Compression fit. assy.	1	14	Adapter	1
III.		Quan./			

3. Control Installation

NOTE: IF USING THE AUXILIARY AIR GROUP EMPLOYED ON HYDRAULIC BRAKE-EQUIPPED VEHICLES, THE E BRAKE WIRING IS SEPARATE AND INDEPENDENT FROM THE AIR COMPRESSOR WIRING.

A. Dash Switch

1. Find a convenient location on the dashboard for the dash switch, ensuring that it will be within easy reach of the driver. Drill a 5/8" hole in the dashboard at the selected location and install the switch.



DO NOT LOCATE SWITCH IN THE KNEE CRASH PANEL OF THE DASHBOARD.

2. Locate Switch ground harness. This harness is labeled "024901" or "3099283" (see Fig. 8). It is approximately 24" long and contains a green wire with a spade connector at one end and a ring terminal at the other end.
3. Connect the spade terminal on the Switch ground harness to one side of the E Brake On/Off switch. Connect the ring terminal on the other end of the harness to a good vehicle chassis ground.

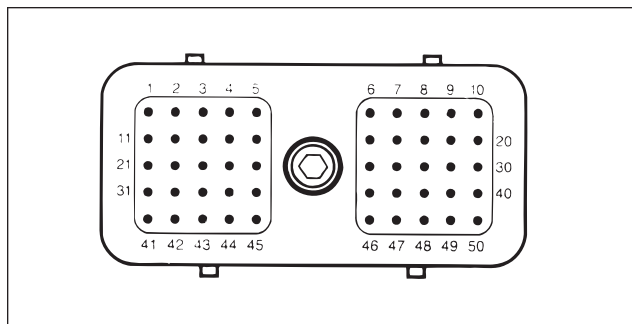


FIG. 6

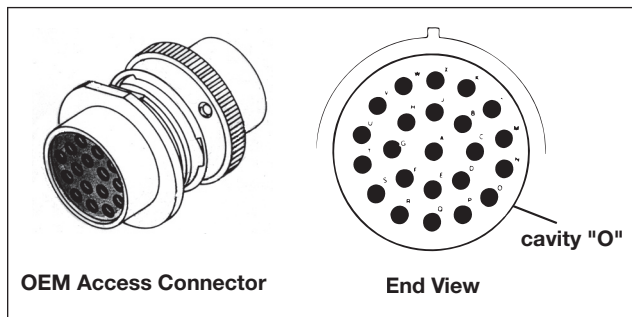


FIG. 7

B. Wire Harness

Wiring for the E Brake is connected to two engine input connectors. Figure 6 shows the 50-pin OEM connector located on the engine ECM. Figure 7 shows the 23-pin OEM access connector located on the harness connected to the engine ECM.

Installation procedures for the E Brake wiring depend on the vehicle transmission type.

- For vehicles with Allison World (Series MD) automatic transmissions, follow the procedures in Section B1.
- For vehicles equipped with Allison MT or AT automatic transmissions, follow the procedures in Section B2.
- For vehicles equipped with manual transmissions, follow the procedures in Section B3.
- For vehicles equipped with Allison WTEC III transmission, follow the procedures in Section B4.
- For vehicles equipped with Allison 2000 Series transmission, follow the procedures in Section B5.

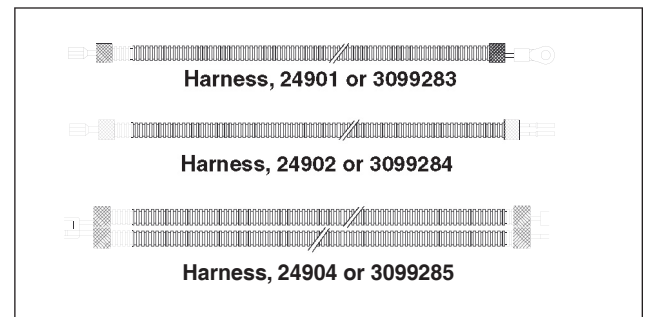


FIG. 8

B2. Wiring Vehicles equipped with the Allison MT or AT Transmissions

Refer to Figure 11 for the following procedures.

1. Dash Switch/ECM Connection. Locate ECM/Switch connector subharness, marked "024902" or "3099284" (see Fig. 8). This harness is approximately 60" long, and consists of two green wires terminating in a spade connector on one end and Deutsch sockets on the other end. Connect the harness as follows:
 - a. Locate the Engine Control Module (ECM) attached to the side of the engine block. Remove the sealing plugs from the 50 pin OEM connector, grommet locations B34 and B27 (see Fig. 6). Insert the Deutsch connectors from the ECM/Switch subharness into locations B34 and B27.

NOTE: IF THERE IS AN EXISTING WIRE INSERTED INTO GROMMET LOCATION B27, INSULATE THE DEUTSCH CONNECTOR ON THE HARNESS MARKED "024902" OR "3099284" WITH HEAT SHRINK TUBING.

- b. Route the subharness to the Cab, and connect the spade connector to the E Brake dash switch.

2. ECM/Ground Connection. Locate the harness marked "024904" or "3099285" (see Fig. 8). Connect the harness as follows:

- a. Locate the OEM Access Connector (see Figure 7). Remove the sealing plug from cavity "O" and insert the pink wire with the Deutsch connector into cavity "O".
 - b. Connect the ring terminal with the green wire to a good chassis ground.
 - c. Connect the Deutsch connector to the E Brake solenoid.

B3. Wiring Vehicles equipped with

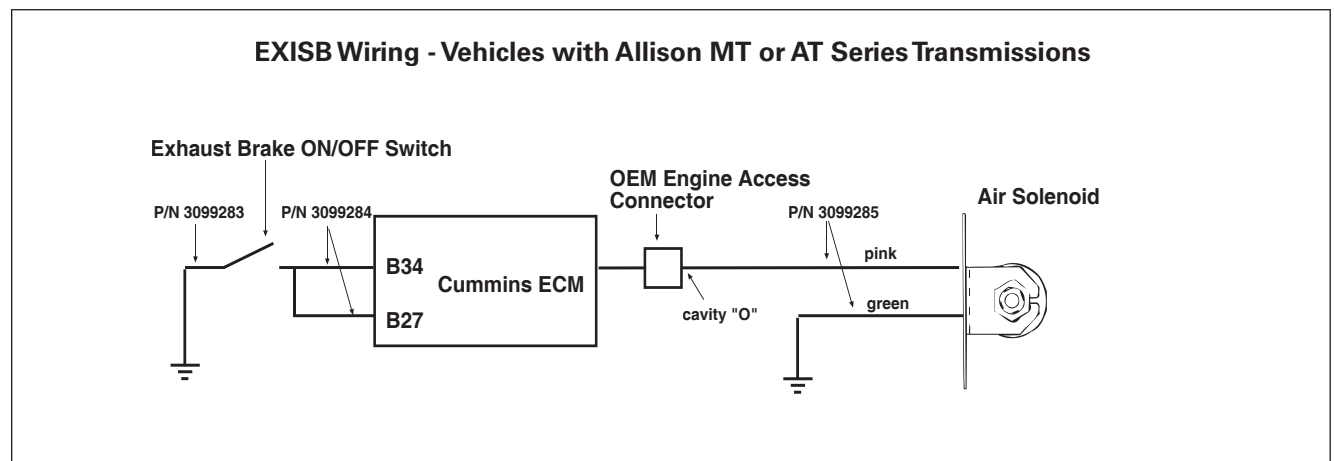


FIG. 11

Standard Transmissions

Refer to Figure 12 for the following procedures.

1. Dash Switch/ECM Connection. Locate ECM/Switch connector subharness, marked "024902" or "3099284" (see Fig. 8). This harness is approximately 60" long, and consists of two green wires terminating in a spade connector on one end and Deutsch sockets on the other end. Connect the harness as follows:
 - a. Locate the Engine Control Module (ECM) attached to the side of the engine block. Remove the sealing plugs from the 50 pin OEM connector, grommet locations B34 and B27 (see Fig. 6). Insert the Deutsch connectors from the ECM/Switch subharness into locations B34 and B27.

NOTE: IF THERE IS AN EXISTING WIRE INSERTED INTO GROMMET LOCATION B27, INSULATE THE DEUTSCH CONNECTOR ON HARNESS "024902" OR "3099284" WITH HEAT SHRINK TUBING.

- b. Route the subharness to the Cab, and connect the spade connector to the E Brake dash switch.

2. ECM/Ground Connection. Locate the harness marked "024904" or "3099285" (see Figure 8). Connect the harness as follows:

- a. Locate the OEM Access Connector (see Figure 7). Remove the sealing plug from cavity "O" and insert the pink wire with the Deutsch connector into cavity "O".
 - b. Connect the ring terminal with the green wire to a good chassis ground.
 - c. Connect the Deutsch connector to the E Brake solenoid.

EXISB Wiring - Vehicles with Standard Transmissions

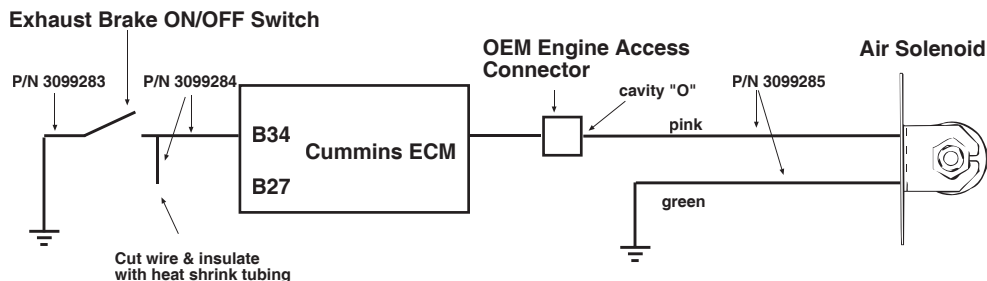


FIG. 12

Final Test

- A. Start the engine and run at low idle speed with the transmission in neutral and the parking brake set.
- B. Switch on the dash switch. The E Brake should come on within 0.25 seconds. Step on the accelerator pedal and increase engine speed. The E Brake must turn off immediately. Take your foot off the pedal and the E Brake should turn on again within 0.25 seconds.
- C. With the engine at idle, step on the clutch pedal. Again, the E Brake must turn off immediately. Take your foot off the clutch pedal and the E Brake should turn on again.
- D. Check for exhaust gas leakage around the "V" clamps at the turbo outlet and E Brake inlet. Any leakage will significantly reduce the effectiveness of the E Brake's retarding performance.
- E. Under normal operating conditions, do not use the E Brake at idle engine speed.
- F. Before returning the vehicle to service, make a final check of wiring and air tubing/hose routing to make sure that it does not run against hot surfaces or is abraded or kinked. Take the vehicle out for a road test to ensure that the system is functioning correctly.



E BRAKE
by Jacobs®



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