

WABCO

Installation Guide

Enhanced Easy-Stop™ Trailer ABS 2S/1M Basic with PLC Installation Instructions

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

How to Obtain Additional Maintenance, Service and Product Information

Refer to Maintenance Manual MM-0180, Enhanced Easy-Stop™ Trailer ABS with PLC; Maintenance Manual 33, Easy-Stop™ Trailer ABS; and Parts Book PB-96133, Enhanced Easy-Stop™ with PLC and Easy-Stop™ Trailer ABS. To obtain these publications, or for more information about the WABCO product line, contact WABCO North America Customer Care at 855-228-3203 or visit our website: wabco-na.com

Important Information

This bulletin contains instructions for mounting the ECU/single modulator valve assembly as one unit. If you are mounting the ECU and valve separately, please contact WABCO North America Customer Care at 855-228-3203 for specific installation requirements and instructions.

Use only genuine WABCO components. Other manufacturers' parts are not designed for use with a WABCO ABS system and may not function correctly.

WABCO recommends that a control line filter, part number 432-500-005-0, be installed on the air system's control line, upstream of the ABS ECU/valve assembly.

Preparation

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

The Anti-lock Braking System (ABS) is an electrical system. When you work on the ABS, take the same precautions that you must take with any electrical system to avoid serious personal injury. As with any electrical system, the danger of electrical shock or sparks exists that can ignite flammable substances. You must always disconnect the battery ground cable before working on the electrical system.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

End of line testing must be done after all installations. WABCO recommends using TOOLBOX™ Software to perform this testing. If you do not have TOOLBOX™ Software, this bulletin also includes instructions for testing without the software.

1. Before beginning the installation procedure, inspect the ECU/single modulator valve assembly for damage that may have occurred during shipping or storage.
 - Look for crushed or bent connectors.
 - Verify that the retainer clips have not been bent or otherwise damaged.
 - Attach the ABS relay valve cable to the ECU with the WABCO ID face down. Ensure the cable is free from cuts or breaks.
 - Do not install a damaged ECU/single modulator valve assembly. Notify your supervisor, or contact WABCO if there is any apparent damage.
2. Have the following installation material available.
 - * ECU/single modulator valve assembly
 - * Power cable or power/diagnostic cable
 - * Sensor extension cables (two pieces)
 - * Sensors (two) for non-ABS-prepped axles

* ABS Indicator Label (TP-95172)

5/8-inch O.D. nylon tubing for supply (frame mounts)

Pipe plug (3/4-inch NPTF)

Schedule 80 hex pipe nipple (3/4-inch NPTF) for air tank mounts or two Grade 8 bolts (3/8-inch) and prevailing torque nuts for frame mounts

SAE-standard, DOT-approved thread sealant

To ensure correct lamp operation, use an incandescent-type DOT-approved lamp, or an LED with integral load resistor.

* WABCO components

3. Study the ECU/single modulator valve assembly. Note the location of the various ports and electrical connections on the ECU. Figure 1.

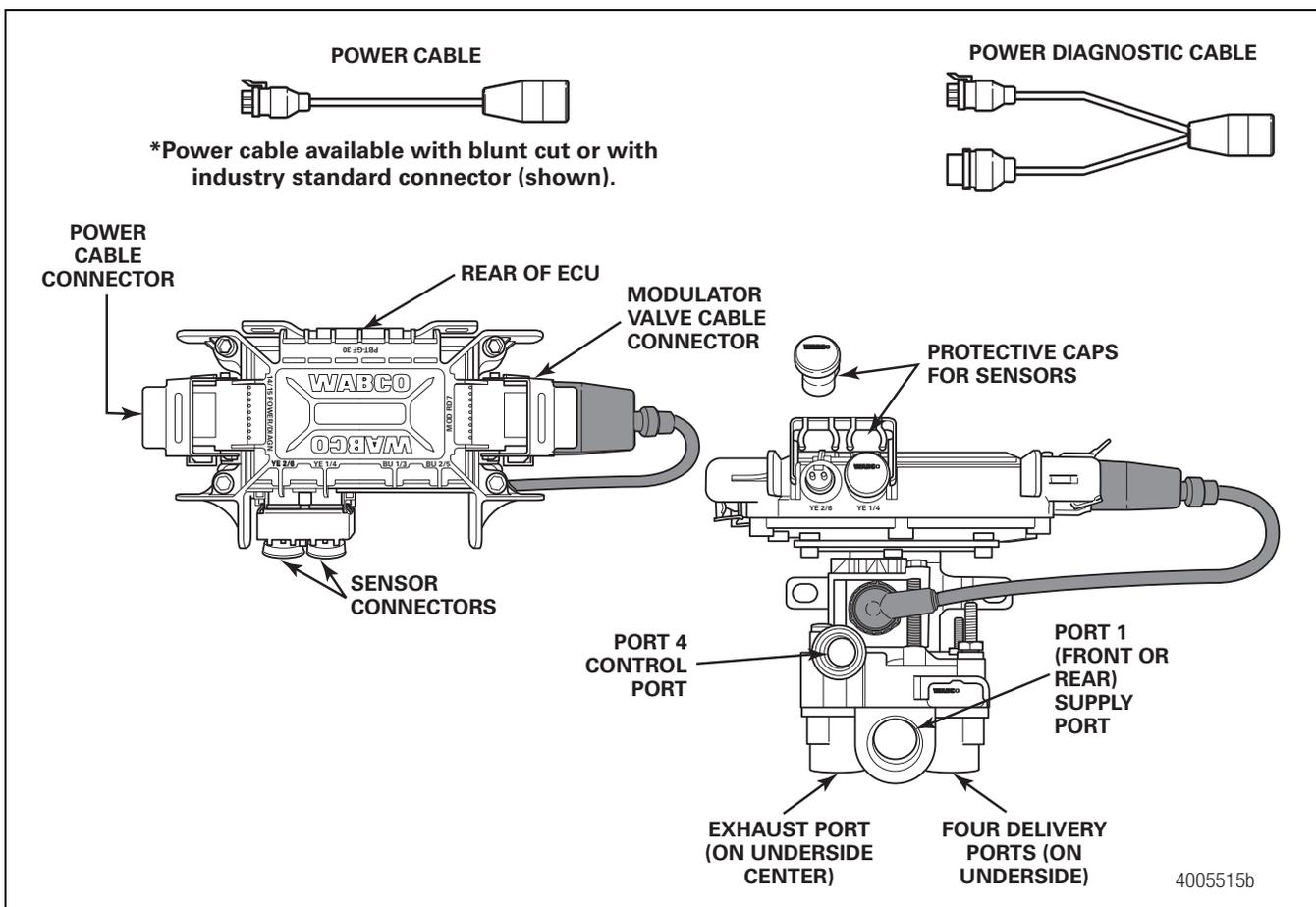


Figure 1

Installation

I. Install the ECU/single modulator valve assembly.

The assembly may be mounted on the air tank or on the cross member of the vehicle.

Tank-Mounted

⚠ WARNING

You must use a Schedule 80 hex nipple (3/4-inch NPTF) to mount the ECU/single modulator valve assembly securely to the air tank to avoid possible serious personal injury and damage to the component.

1. Use a 3/4-inch NPTF Schedule 80 hex nipple to attach the ECU/single modulator valve assembly to a reinforced air tank. Do not overtighten.

WABCO does not recommend the use of a vise when installing the hex nipple. Use of a vise may cause overclamping. Overclamping may damage the internal components of the ECU/single modulator valve assembly.

2. Use a 3/4-inch NPTF pipe plug to plug the unused supply port (Port 1). Apply SAE-standard, DOT-approved Teflon tape or paste-type thread sealant to all pipe threads beyond the first two threads. Pipes with pre-applied thread sealant may also be used.
3. Rotate and tighten the ECU/single modulator valve assembly until the exhaust port faces DOWN and the connection is secure. Use a torque wrench or ratchet with an extension at the 3/4-inch pipe plug installed on the front supply port (Port 1). Figure 2.

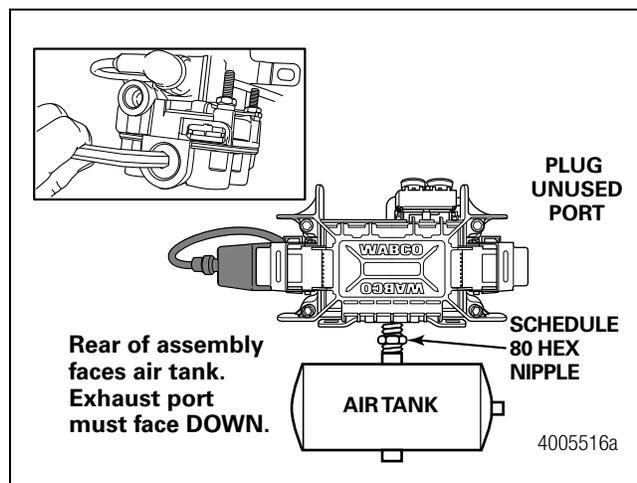


Figure 2

Bracket-Mounted to Cross Member of Vehicle

1. Install a 3/4-inch NPTF fitting in the supply port (Port 1).
 - Use a 3/4-inch NPTF pipe plug to plug the unused supply port (Port 1). Apply SAE-standard, DOT-approved Teflon tape or paste-type thread sealant to all pipe threads beyond the first two threads. Pipes with pre-applied thread sealant may also be used.
2. Mark the location of two mounting holes on the vehicle cross member. Mounting holes must be 4-3/4 inches apart. Figure 3.

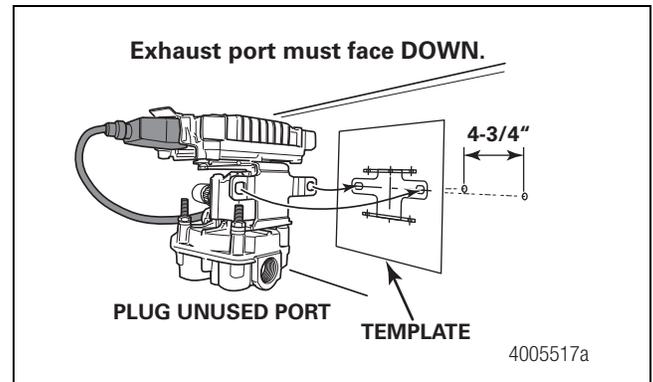


Figure 3

3. Drill two 3/8-inch holes into the center of the vehicle cross member.

⚠ CAUTION

Place a thin barrier of plastic, mylar or similar material between the bracket and mounting surface. The barrier is necessary to inhibit corrosion, which can occur from contact between dissimilar metals. Galvanic corrosion can result in damage to the ECU/modulator assembly.

4. Place a thin barrier made of plastic, mylar or similar material between the bracket and mounting surface to inhibit the possibility of corrosion.
5. Attach the mounting bracket to the vehicle cross member midway between the side rails, close to the brake chambers the valve serves.
6. Use two 3/8-inch Grade 8 bolts with prevailing torque nuts and washers to attach the assembly to the vehicle cross member. Tighten the bolts to 18 lb-ft (24 N•m). **ⓘ**

II. Connect the air lines.

Plumb the spring brake relay or emergency relay valve into the system as usual.

1. For bracket mounts, connect the air supply line from the supply tank to ECU/single modulator valve assembly supply Port 1.
Use 5/8-inch O.D. min. nylon tubing for frame mounts.
2. Connect the air delivery lines from the service chambers to the ECU/single modulator valve assembly Port 2 (3/8-inch NPTF). Figure 4.
 - Attach the opposite ends of the air delivery lines to the appropriate brake chambers (3/8-inch NPTF).

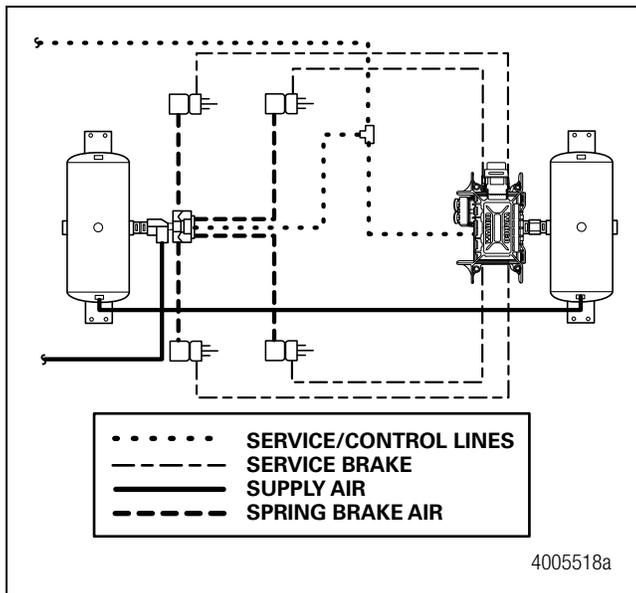


Figure 4

3. Connect the brake service control line to the ECU/single modulator valve assembly Port 4 (3/8-inch NPTF). Figure 4.
4. Plug any unused delivery ports. Apply SAE-standard, DOT-approved Teflon tape or paste-type thread sealant to all pipe threads beyond the first two threads. Pipes with pre-applied thread sealant may also be used.

III. Install the two sensor extension cables (ABS-Prepped Axles).

Instructions for installing sensors on non-ABS-prepped axles are included in Appendix I.

WABCO recommends placing sensors on the axle that will provide the most braking performance. The suspension manufacturer can provide this information.

1. Visually inspect the tooth wheel and sensor to ensure no damage occurred during shipping. Perform any necessary repairs.

2. Connect the sensor and cables on the prepped axles to the sensor extension cables. Figure 5.

Ensure that each connection is secure.

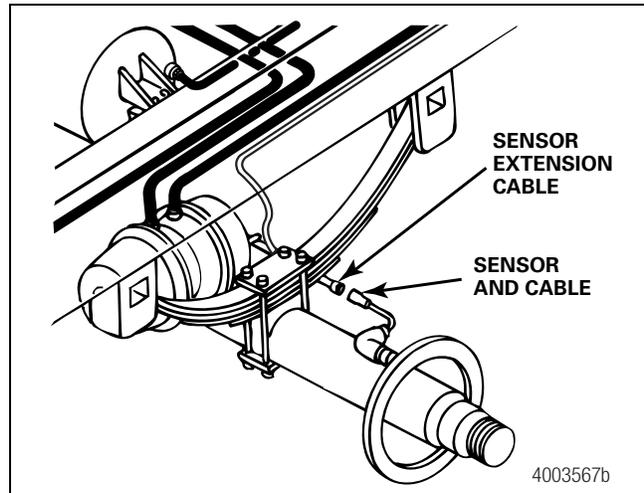


Figure 5

3. Route the sensor cable along the back side of the trailer axle to the ECU/single modulator valve assembly. Route the cable with the brake hose. Figure 5.

Do not overtighten the tie wraps on a cable. Overtightening can damage the cable. Do not tie wrap the molded sensor plug. The sensor extension cable must follow the brake hose to the ECU/single modulator valve assembly to allow for axle jounce and rebound.

4. Secure the cables every eight inches (203 mm) with tie wraps or cable clips.
5. Push the sensor retainer clip on the ECU/single modulator valve assembly UP.
6. Remove the protective caps from the YE2 and YE1 sensor connectors. Figure 6.

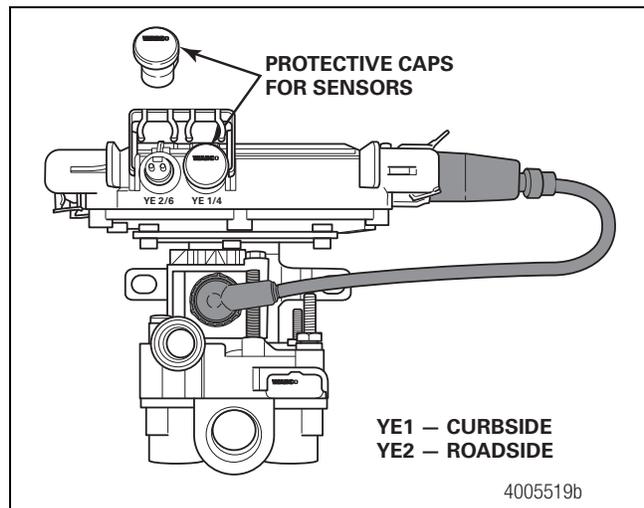


Figure 6

7. Plug the sensor extension cable into the ECU/single modulator valve assembly. To secure the connection, push the sensor retainer clip DOWN. Retainer clips must fit in the groove of the sensor connectors to ensure correct connection.
 - Connect the curbside sensor at YE1.
 - Connect the roadside sensor at YE2.
8. Create a strain relief to protect the sensor extension connector terminals. Without the strain relief, normal trailer jounce and vibration will cause the terminals to spread and loosen. Use a tie wrap or clip to secure the cable to the air hose as close to the fitting as possible. Figure 7.

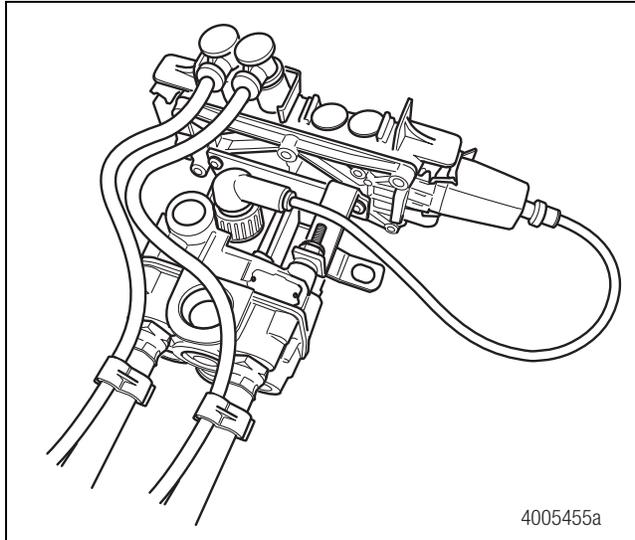


Figure 7

9. Bundle any excess cable in a "Z"-shaped loop. Figure 8.

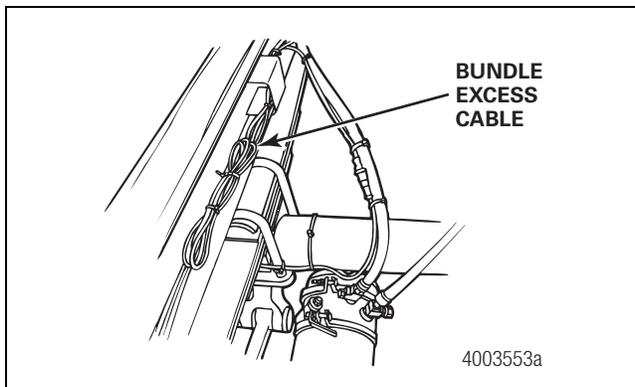


Figure 8

10. Secure excess cable in the sub-frame of the vehicle or along the air hoses as appropriate. Excess cable should not exceed two feet (0.61 meter).

NOTE: Correct strain relief of cables is discussed in Appendix II.

IV. Install the power or power/diagnostic cable.

1. Identify the type of cable to be installed.
 - ABS trailer industry-standard pigtail connector cable
 - Blunt-cut power cable
2. For industry-standard pigtail connector cables, route the cable from the harness connector to the ECU/single modulator valve assembly and secure it to prevent damage.

For a blunt-cut power cable, route the cable from the ECU/single modulator valve assembly to a junction box which interfaces with the seven-way connector at the front of the trailer.

Leave enough slack in the cable to compensate for flexing of the trailer and sub-frame.
3. Bundle any excess cable in a loop (bow tie) and secure it in the sub-frame of the trailer body to prevent cable damage.
4. Push the hinged power connector retaining clip UP and remove the protective cap from the ECU/single modulator valve assembly. Figure 9.

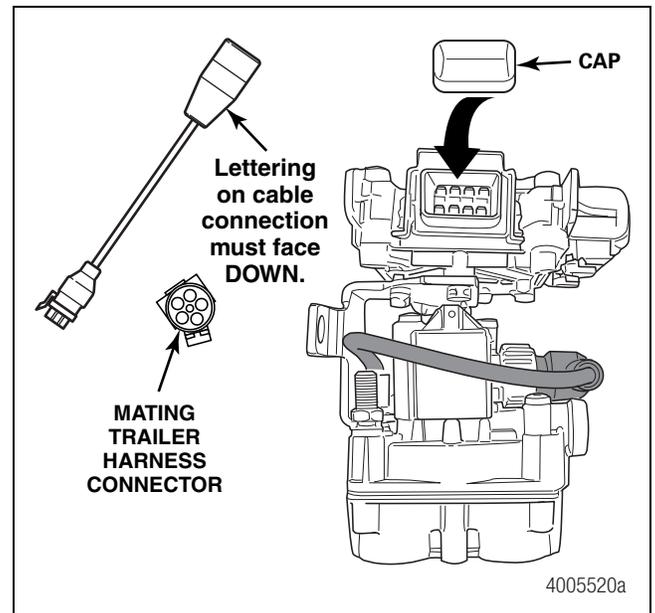


Figure 9

5. Plug the power 8-pin connector on the power or power cable into the ECU/single modulator valve assembly. WABCO identification on the cable connection must face DOWN.
6. Pull the hinged power connector retaining clip on the ECU/single modulator valve assembly DOWN to secure the connection.
7. If you are installing the power cable only, go to Step 9.

8. If you are installing the power/diagnostic “Y” cable:
 - A. Install the diagnostic cable bracket so that the diagnostic plug is accessible. The normal location is on the right front corner of the sub-frame, but will vary depending on the type of trailer.
 - B. Route the diagnostic cable from the ECU/single modulator valve assembly to the diagnostic cable bracket.
 - C. Correctly secure the cable in the sub-frame to prevent cable damage.

Leave enough slack in the cable to compensate for flexing of the trailer and sub-frame.
 - D. Bundle any excess cable in a loop (bow tie) and secure the cable in the sub-frame.

9. Install the ABS indicator lamp on the trailer. Refer to the vehicle specification sheet for the exact location of the indicator lamp. Use a DOT-approved lamp with ABS etched on the lens (available from major trailer parts suppliers).

If you are using the industry-standard connector cable and do not have access to the mating trailer harness, mask the open connector to protect it from paint or grease.

10. Connect the power. Use the industry-standard connector cable or a blunt-cut power cable.
 - **For industry-standard connector cables:** Attach the power cable’s round Weather Pack connector to the ABS break-out connector on the trailer power harness. Figure 9.
 - **For an optional blunt-cut power cable:** Wire the cable and ABS indicator lamp to the seven-way connector on the trailer according to the following diagram. Figure 10.

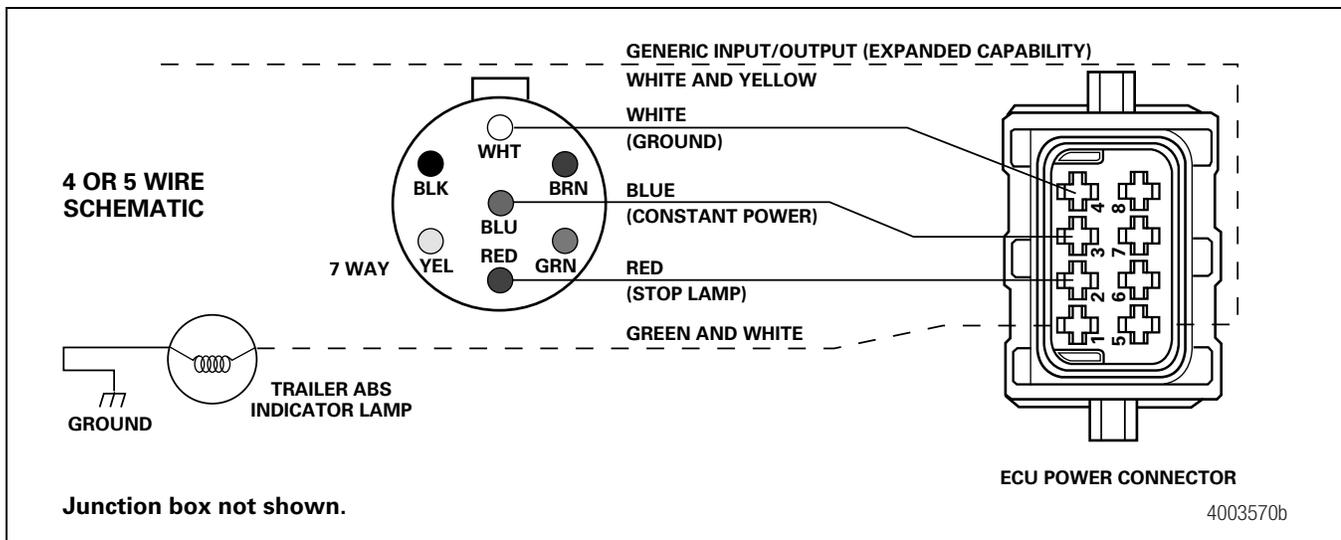


Figure 10

Typical Easy-Stop™ Trailer ABS Installations

Refer to Figure 11 for typical Easy-Stop™ trailer ABS installations.

WABCO recommends placing sensors on the axle that will provide the most braking performance. The suspension manufacturer can provide this information.

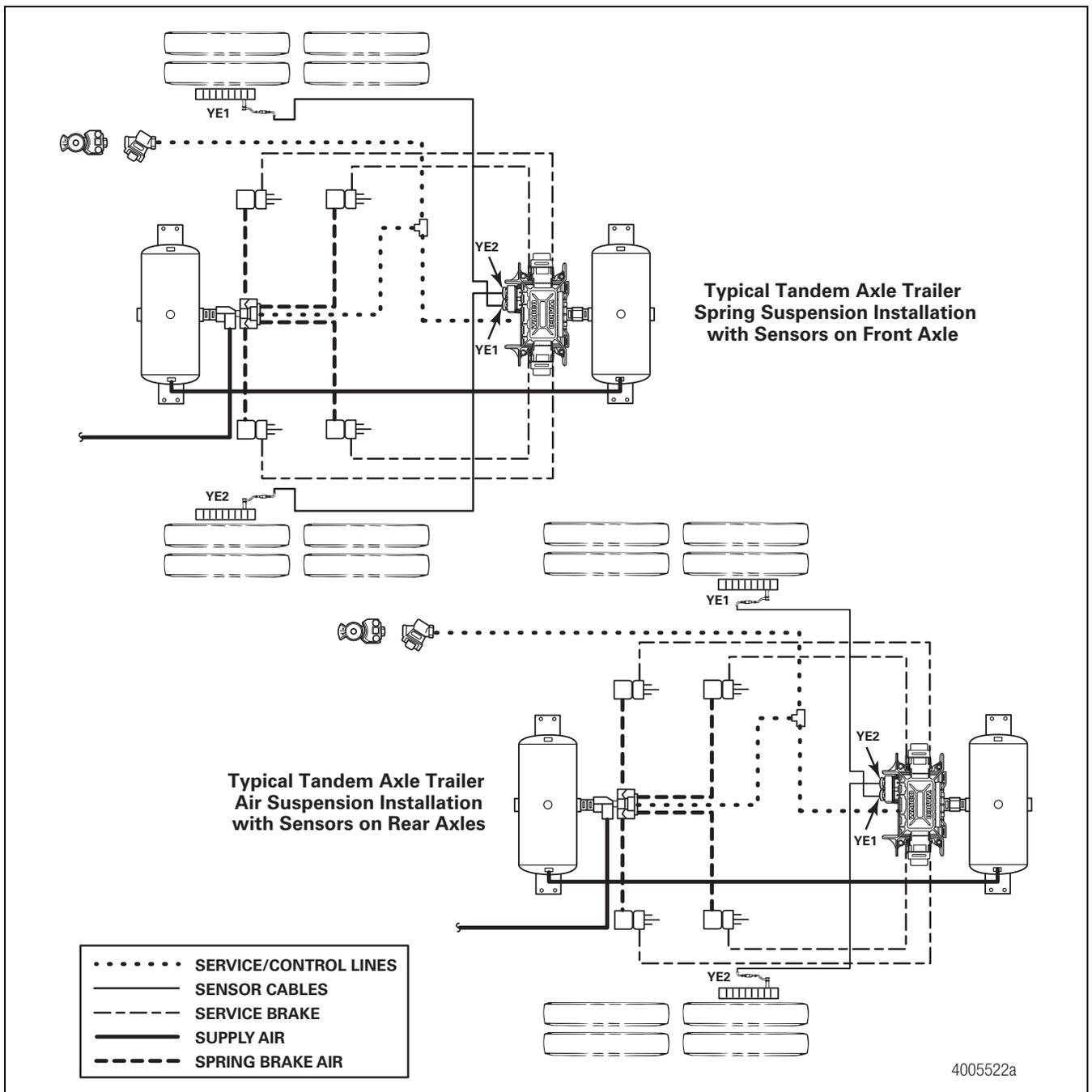


Figure 11

End of Line Testing

End of line testing is required on all Enhanced Easy-Stop™ installations. To run these tests, WABCO recommends you use TOOLBOX™ Software.

TOOLBOX™ Software and general test procedures are included in this bulletin. If you are using a Pro-Link, refer to the operating manual for test instructions.

Enhanced Easy-Stop™ 2S/1M Basic Installation — End of Line Testing Procedure Using TOOLBOX™ Software

If you are testing an installation that has a power only cable, temporarily install a WABCO combination power/diagnostics “Y” style cable.

1. Connect the diagnostic connector on the cable to the PC serial port/SAE diagnostic interface (J1587/J1708 to RS232 interface).

Refer to the Software Owner’s Manual, TP-99102, for instructions for running TOOLBOX™ Software.

2. Display the **Trailer ABS Main Screen**.
3. Verify the power supply.
 - Apply 12 volts DC to the blue wire (constant). Check the screen for the correct voltage (9.4 to 14 volts). Constant power voltage is displayed in the PRIMARY field. Figure 12.
 - Apply 12 volts DC to the red wire (stoplight power). Check the screen for the correct voltage (9.4 to 14 volts). Stoplight power voltage is displayed in the SECONDARY field. Figure 13.

The internal field is not applicable to this test.

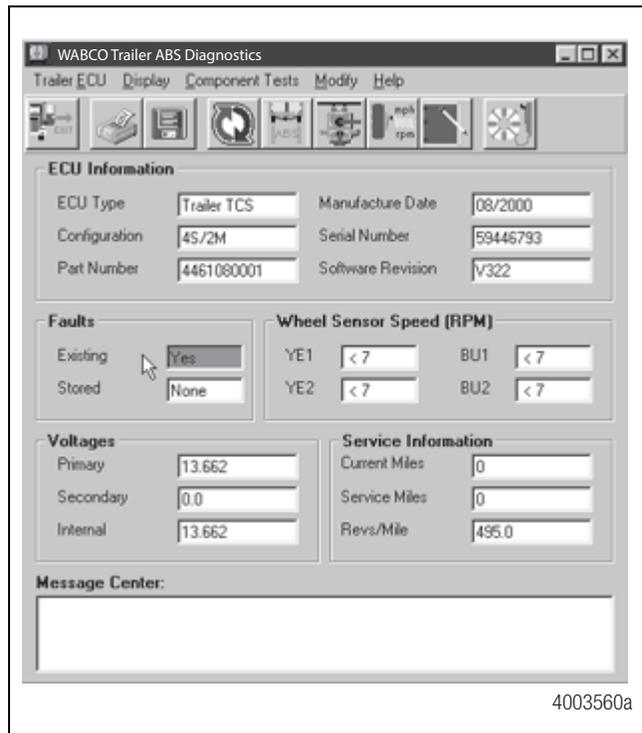


Figure 12

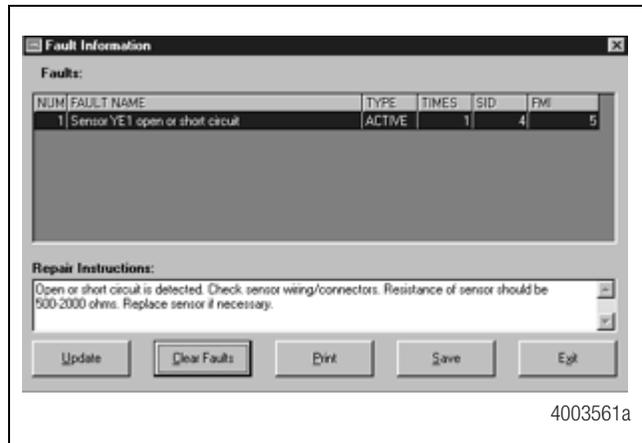


Figure 13

4. Check the Faults field on the Main Screen.
 - NONE** = No faults present, proceed with end of line test.
 - YES** = Faults present, double-click on “YES” to bring up the fault information screen.

Use the information in the **Repair Instructions** field to perform the necessary repairs.

End of Line Test with TOOLBOX™ Software

Verify Correct Valve and Lamp Installation

To verify valve and lamp installations with TOOLBOX™ Software:

1. At the **Trailer Main Screen**, click on **Component Test**, then select **Valves/Lamp** to display the **Valve Activation Screen**. Figure 14.



Figure 14

2. The Red valve indicator will be selected. Click on the **Activate** button and listen for the valve to click, indicating a good installation. The **Test Status** box at the bottom of the menu will also display the status of this test.
3. Click on the **Test** button to activate the ABS indicator lamp — this is the lamp that is mounted on the side of the trailer. The lamp will flash eight times, indicating lamp installation is OK. The **Test Status** box at the bottom of the menu will also display the status of this test.
4. Click on **Close** to exit.

Sensor Orientation Test

The sensor orientation test must be performed as part of the end of line testing procedure.

Sensor Orientation Test Screen

Before beginning this test, look at the ECU to see if the wheel end sensors face the front or rear of the trailer. TOOLBOX™ will ask for this information to start the test (Step 5). To perform the sensor orientation test:

1. Raise the sensed wheel ends off the ground.

2. Apply air to the emergency (supply) line to fill the air tanks and release the spring brakes so that the wheels can be rotated.
3. Apply 12 volts DC to the ABS.
4. At the **Trailer Main Menu**, click on **Component Test**, then select **Sensor Orientation Test** to display the **Sensor Orientation Test** screen. Figure 15.

When the **Sensor Orientation Test** screen first appears, the **Sensors Facing** field will display the default — **Front**. This will occur regardless of the actual sensor orientation of the installation being tested.

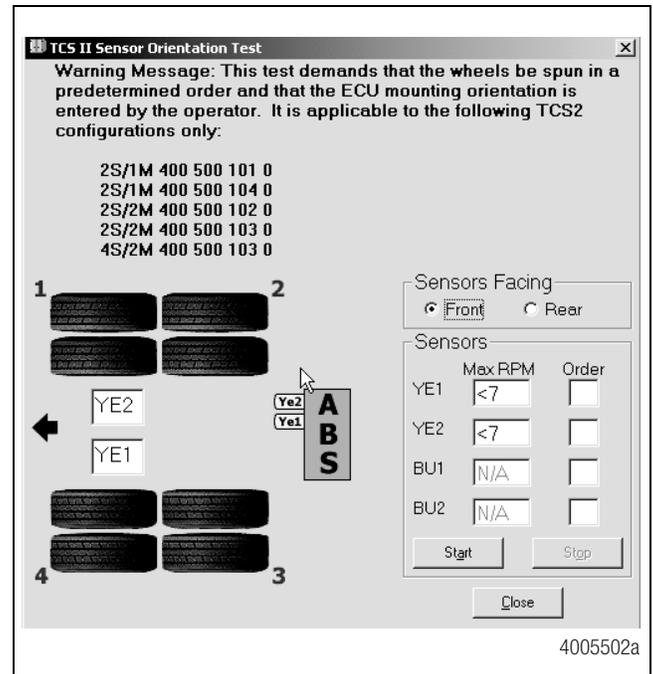


Figure 15

5. Click on **Front** or **Rear** in the **Sensors Facing** field to select the mounting orientation of the ECU/single modulator valve assembly.

Refer to Figure 15 and Figure 16 for illustrations of the ECU mounted with sensors facing forward and rear. The correct mounting orientation must be selected prior to starting the test.

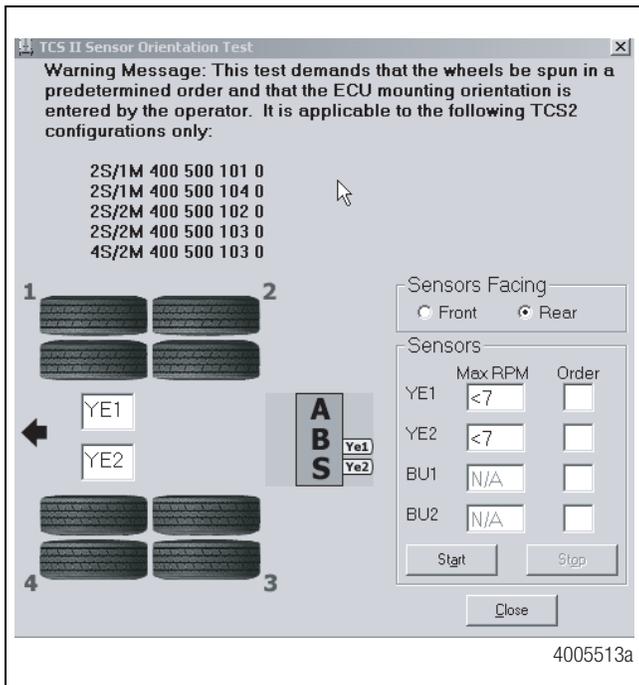


Figure 16

6. Click on **Start** to begin the test. Figure 17.

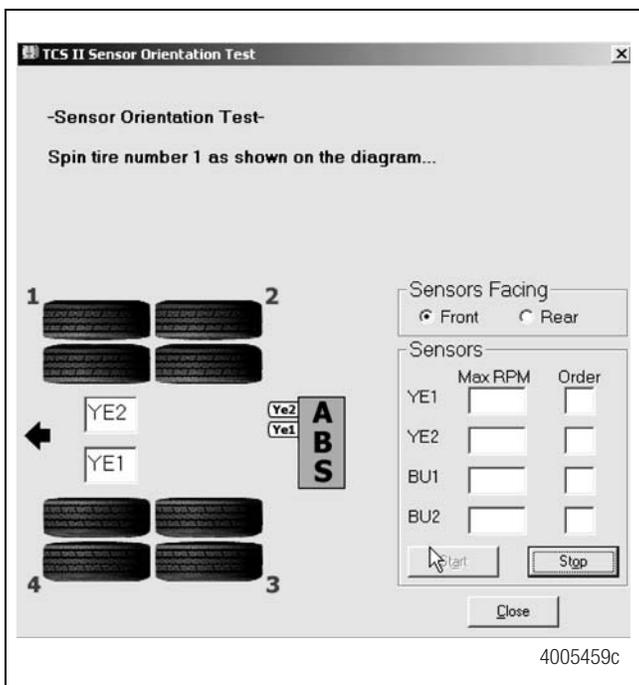


Figure 17

7. Follow the screen prompts, starting with 1, to rotate each sensed wheel end at a rate of 1/2 revolution per second. This rate equals a wheel speed of approximately 4 mph (7 kph). As each sensed wheel is rotated, check the color of the sensor identification block on the screen for results. Sensor identification boxes are located in the bottom left portion of the **Sensor Orientation Test** screen. Figure 16.

NOTE: Spinning the wheels 10 mph (16 kph) or faster may cause the software to terminate the sensor test.

Green background: Correct sensor location. Spin the next sensed wheel as indicated by the screen prompt.

Red background: Incorrect sensor location. If you get a red background, you must stop the test (click on **Stop**), make the necessary corrections and repeat Steps 3 through 6.

8. To finish the Sensor Orientation Test, click on **Stop**, then on **Close**.

9. Verify there is sensor output. If there is no sensor output, verify that a tone ring has been installed and that the sensor is pushed all the way in against the tone ring. Perform the necessary repairs and repeat the test. If the problem persists, contact WABCO North America Customer Care at 855-228-3203. Sensor output appears in the Sensors field located in the bottom right portion of the **Sensor Orientation Test** screen. Figure 16.

End of Line Testing without TOOLBOX™ Software

1. Apply 12 volts DC power to the ABS.
2. The ECU/single modulator valve assembly should click two times.
3. If the indicator lamp **comes on** for three seconds and **goes out**:

This indicates a correct installation. The end of line test is complete.

If the ABS indicator lamp **comes on** and **stays on**, check the sensor installation:

- A. Remove the power from the ABS and raise the sensed wheels so they may be rotated.
- B. Repeat Step 1 and Step 2.
- C. Rotate each sensed wheel — one at a time — at a rate of 1/2 revolution per second. This rate equals a wheel speed of approximately 4 mph (7 kph).

The ABS indicator lamp should now go out and stay out indicating a correct installation. The end of line test is complete.

- If the ABS lamp does not go out, there is a sensor gap problem or hardware fault. Adjust the sensor and, if necessary, perform a fault code check.

Sensor Gap Adjustment

Push the sensor into its holder until it contacts the tooth wheel. At installation, there must be no gap between the sensor and the tooth wheel.

Measure the AC voltage output. The value should be 0.2 volt AC when the wheel is rotated at a rate of 1/2 revolution per second.

Perform any necessary repairs.

Repeat the sensor installation check. If the trailer lamp still does not go out, a system fault exists. Perform a fault code check.

Fault Code Check

Use constant power activation to perform the following fault code check.

- Apply constant power to the ECU/single modulator valve assembly for more than one, but less than five seconds.
- Remove the power.
- Reapply the power.
- Check the trailer ABS indicator lamp on the side of the trailer. The fault code will be displayed three times.
- Find the fault on the chart and perform the necessary repairs.
- After performing the necessary repairs, repeat the end of line test to verify correct sensor installation.

Blink Code Chart		
Blink Code	Problem Area	Action
4	Sensor YE1 (curbside sensor)	Check sensor installation. Perform necessary repairs.
6	Sensor YE2 (roadside sensor)	Check sensor installation. Perform necessary repairs.
7	ECU/single modulator valve assembly	Verify correct installation. If code continues, contact WABCO for assistance.
14	Power Supply	Verify correct electrical installation. Check power supply. Perform necessary repairs.
15	ECU Failure	Verify correct installation. If code continues, contact WABCO for assistance.

Blink Code Chart		
Blink Code	Problem Area	Action
16	SAE J1708 Failure	Internal failure, contact WABCO.
17	SAE J2497 Failure	Internal failure, contact WABCO.
18	Generic I/O Failure	Verify correct electrical installation. Check power supply. Perform necessary repairs.

Trailer Identification

After ensuring the Enhanced Easy-Stop™ trailer ABS has been correctly installed, attach the ABS indicator label included with the ECU/single modulator valve assembly to the trailer. Generally, this will be applied near the ABS trailer indicator lamp. Figure 18. Refer to the vehicle specification sheet for the correct location.

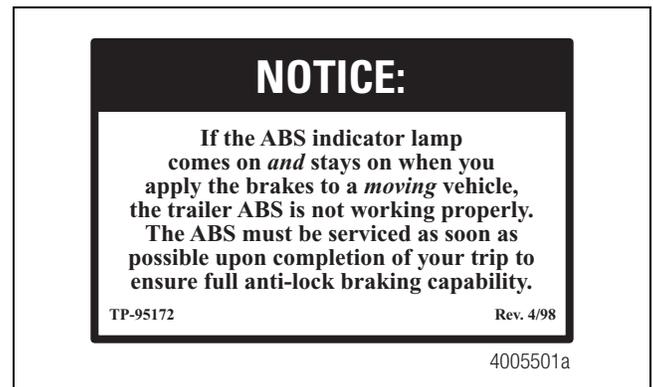


Figure 18

If this label is not included with the assembly, let your supervisor know. Labels are available from WABCO. Ask for part number TP-95172.

For additional assistance, contact WABCO North America Customer Care at 855-228-3203.

Parts List

Parts

Part Number	Description	Detail
400 500 101 0	2S/1M Basic ECU Assembly	ECU Valve Assembly
400 500 104 0	2S/1M Basic for Dollies	ECU Valve Assembly
400 500 106 0	2S/1M Basic with GIOs	ECU Valve Assembly
899 759 815 4	Sensor Spring Clip	
449 326 005 0	Power Cable	0.5 meter
449 326 047 0	Power Cable	4.7 meter
449 713 018 0	Sensor Extension Cable	1.8 meter
449 713 030 0	Sensor Extension Cable	3.0 meter
449 713 050 0	Sensor Extension Cable	5.0 meter
441 032 808 0	Wheel End Sensor	0.4 meter
441 032 809 0	Wheel End Sensor	1.0 meter
432 500 005 0	In-Line Air Filter	
899 201 842 4	In-Line Air Filter Label	
TP-95172	ABS Warning Label	

A complete part listing can be found in WABCO Parts Book PB-96133 available at wabco-na.com.

Appendix I

Installing Sensors on Non-ABS-Prepped Axles

Sensor locations vary due to suspension type. WABCO recommends placing the sensor on the axle that will provide the most braking performance. Contact your suspension manufacturer for further information.

1. Apply a mineral oil-based grease that contains molydisulfide to the sensor spring clip, the body of the sensor and the bore of the sensor block. The grease must be anti-corrosive and contain adhesive properties that will continuously endure temperatures from -40° to 300°F (-40° to 150°C).
2. Push the spring clip into the sensor holder from the inboard side, until the spring clip tabs are against the sensor holder. Push the sensor into the spring clip as far as possible.

Use WABCO spring clips to ensure a correct fit.

3. Push the spring clip into the sensor holder from the inboard side until the spring clip tabs are against the sensor holder. Push the sensor into the spring clip as far as possible. Figure 19.

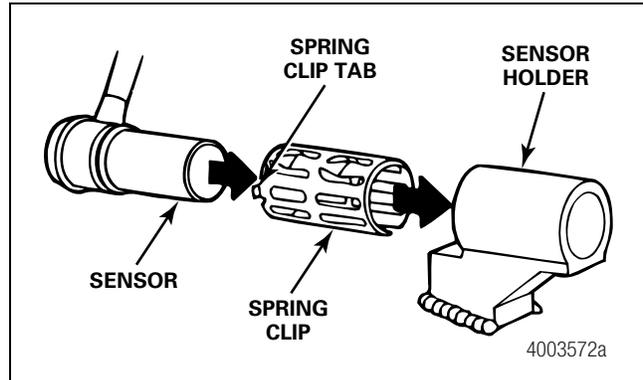


Figure 19

4. Route the sensor cable toward the brake chamber, over the brake spider or through the pre-stamped hole dedicated to ABS sensors. Route to the back side of the axle. Secure the cable to the axle between the brake spider and the suspension brackets. Continue to route the sensor cable behind the spring seats. Secure the cable to the axle one inch from the molded sensor plug. Figure 20.

Do not overtighten tie wraps on a cable. Overtightening can damage the cable. Do not tie wrap the molded sensor plug. The sensor extension cable must follow the brake hose to the ECU/valve assembly to allow for axle jounce and rebound.

Brake hose clips with a provision for the sensor extension cable are recommended as opposed to tie wraps. WABCO does not supply this part.

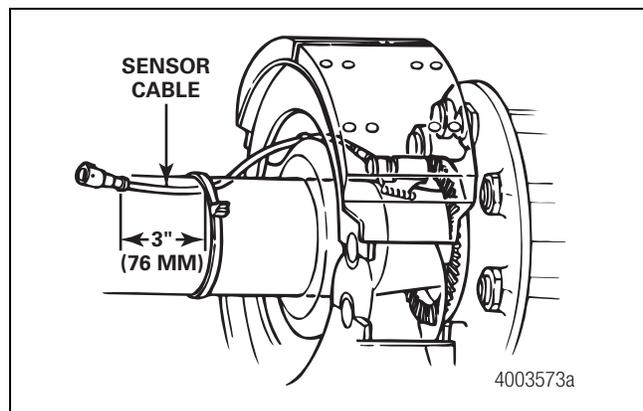


Figure 20

5. Install the wheel hub carefully so that the tooth wheel pushes against the sensor as the wheel bearings are adjusted. There should be no gap between the sensor and the tooth wheel.

- Test the sensor output voltage. Use a volt/ohm meter to check the output voltage of the sensors while rotating the wheel at approximately 1/2 revolution per second. Minimum output must be 0.2 volt AC. If minimum output is less than 0.2 volt AC, push the sensor toward the tooth wheel. Recheck the sensor output.

Appendix II

Cable Strain Relief Guidelines

It is important that cabling follow good strain relief practices to ensure maximum performance and durability. Failure to provide adequate strain relief on the cables can result in future maintenance that is not covered under warranty.

Strain relief is defined as a small amount of slack in the cable at the area of connection. This lack of cable tension allows for slight movement of the cable during times when components of the suspension and air system may be in motion. A small amount of slack also eases access to other system components.

A taut cable can affect the lifespan of the cable. Cables without adequate strain relief can potentially stress a cable connection enough that moisture could intrude. Unnecessary wear at bend points can be the result of a cable under tension.

Cable strain relief is a universal practice. It applies to all WABCO product lines from Anti-Lock Brake Systems (ABS) to Roll Stability Systems (RSS).

Excess Cable Length

In cases where the length of cable exceeds what is required, the excess must be bundled in an efficient manner. It should not be draped or wrapped around components or left unsecured. Any slack remaining in the cable once the connections are made can be gathered up in a Z-shaped loop. Do not coil the cable and pinch into a bowtie or dog-bone shape. All cable zip ties should be tightened in a manner only to the extent that the cable is held sufficiently in place. Fasten the excess cable to an area that is free of sharp edges and moving components.

WABCO has many lengths of cables available so it is a best practice to obtain a length that best suits the requirements of the installation.

Strain Relief at the ECU — Bracket Mounting

WABCO recommends that cable connections to a component, such as an ECU valve assembly, display a visible amount of slack in the cable up to the first tie or clip that secures the cable to the trailer structure or air line. This first anchor point should be a minimum 6-inches (152 mm) of cable length from the cable/component connection and maximum of 12-inches (305 mm). This applies to all sensor, power, valve and GIO cables. Regardless of whether zip ties or cable clips are used, cables should be secured at intervals not greater than 18-inches (457 mm) to avoid cable vibration.

Ideally, cables should be affixed to the rigid structure of the trailer. A good rule of thumb is to have the bend of the cable, also known as bend radius, be greater than or equal to ten times the diameter of the cable. If the cable is 1/4-inch (6.35 mm) in diameter, then the bend should be a minimum of 2-1/2-inches (64 mm). Refer to Figure 21 for 2S/1M ABS.

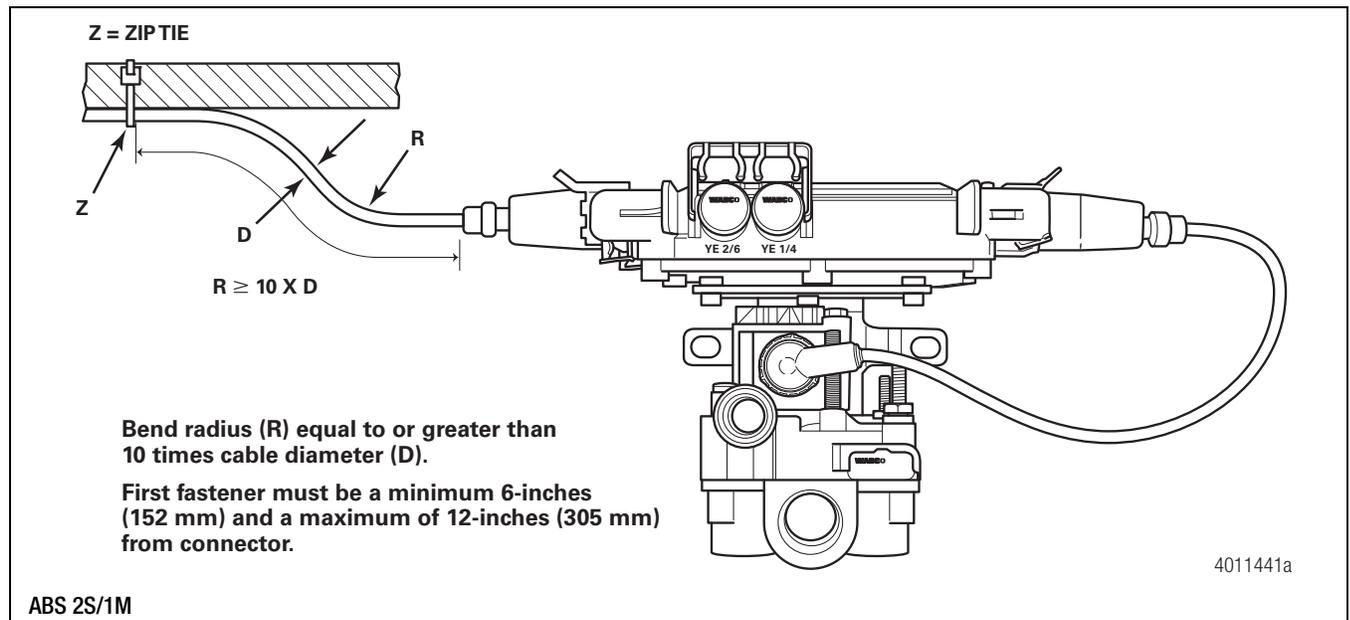


Figure 21

Strain Relief at the ECU — Tank Mounting

It is necessary that cable connections to a component, such as an ECU valve assembly, display a visible amount of slack in the cable up to the first tie or clip that secures the cable to the trailer structure or air line. This first anchor point should be a minimum 6-inches (152 mm) of cable length from the cable/component connection and a maximum of 12-inches (305 mm). This applies to all sensor, power, valve and GIO cables. Regardless of whether zip ties or cable clips are used, cables should be secured at intervals not greater than 18-inches (457 mm) to avoid cable vibration.

Ideally, cables should be affixed to the rigid structure of the trailer. However, structure is not always available on tank-mounted installations. In these cases, securing the cable may be accomplished by fastening the cable to nearby air lines. It is important to note that cables should be secured only to the extent that the cable is held sufficiently in place. Refer to Figure 22 for 2S/1M ABS.

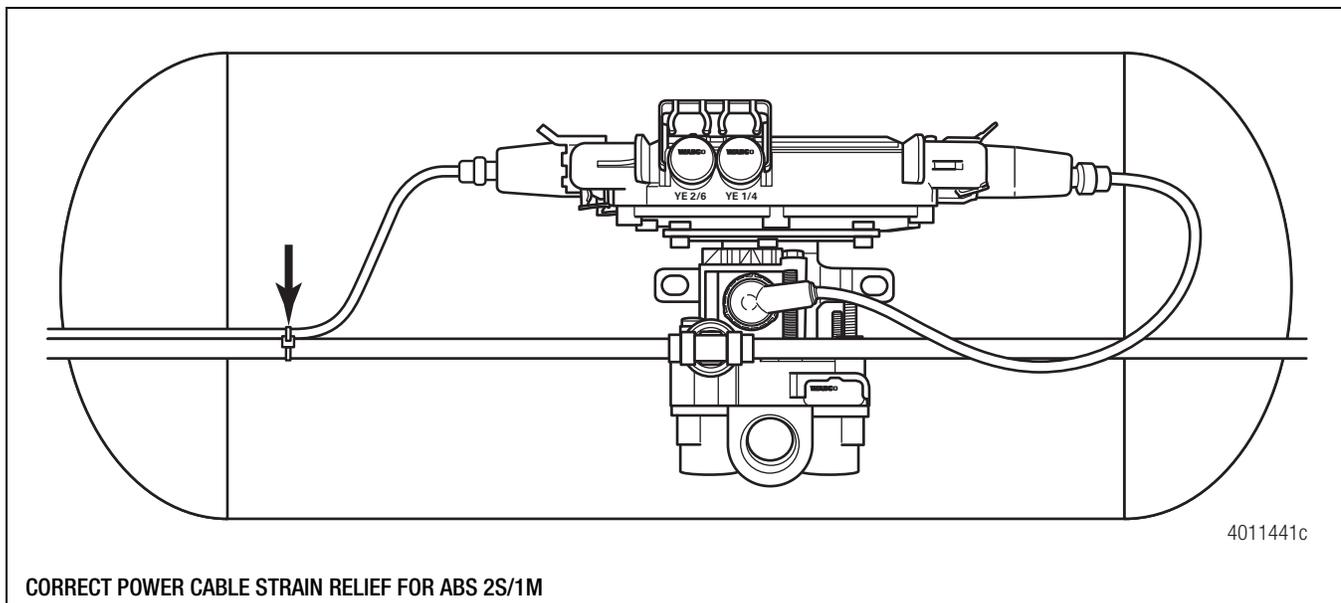


Figure 22

Sensor Extension Cables at the ECU

On valves that are tank mounted with no trailer structure nearby, or have remote-mounted cables, the sensor extension cables are attached to the air lines. Cable clips are preferred over zip ties. It is important to remember that cables should be fastened in a manner where the cable is secured enough where the cable will not move or chafe against what it is mounted to. A small amount of slack should be present to ensure that the cables do not become taut after installation or the servicing of components. Figure 23 illustrates the correct amount of slack in the sensor extension cables and correct attachment to the air delivery lines for 2S/1M ABS ECUs.

Appendix III

Vehicle Electrical Grounding Guidelines

Ensure that the vehicle includes a correct common chassis ground point. A common chassis ground point connects the trailer frame/chassis to the ground pin of the J560 seven-way connector and will protect the vehicle electrical system from unwanted electrical noise.

Common chassis ground can be verified by measuring the resistance between the J560 ground pin and the vehicle chassis (or frame) and confirming that the resistance is less than 10 Ohm ($< 10 \Omega$). If this is not the case, the electrical contact at the common chassis ground point is not sufficient or not present. If a common chassis ground point is present, but not sufficient, ensure that there is no paint or debris inhibiting electrical contact at the ground point. If a common chassis ground point is not present, WABCO recommends adding one.

NOTE: Do not add more than one common chassis ground point (connecting the J560 ground pin to the chassis) to avoid potential ground shifts within the vehicle electrical system.

Additionally, all standard trailer components, such as axles, should also be electrically connected to the common chassis ground. If the axles are not correctly grounded to the chassis, a ground strap electrically connecting the axle to the chassis may be added to ensure adequate protection from unwanted electrical noise. This can be verified by measuring the resistance between the vehicle chassis/frame and the other trailer component, then confirming that the resistance is less than 10 Ohm ($< 10 \Omega$).

For more details concerning correct vehicle grounding, reference SAE standard J1908.

Note during welding work on the trailer:

- Disconnect power to the trailer.
- Disconnect all cable connections to devices and components and protect the plug-ins and connections from contamination and humidity.
- Always connect the grounding electrode directly with the metal next to the welding position when welding, to prevent magnetic fields and current flow via the cable or components.
- Make sure that grounding connections are robust by removing paint or rust at the connection points.
- Prevent heat influences from the welding activity on devices and cabling when welding.

Note during electrostatic painting the trailer frame or bogie:

- Disconnect all cable connections to devices and components and protect the plug-ins and connections from contamination and humidity.

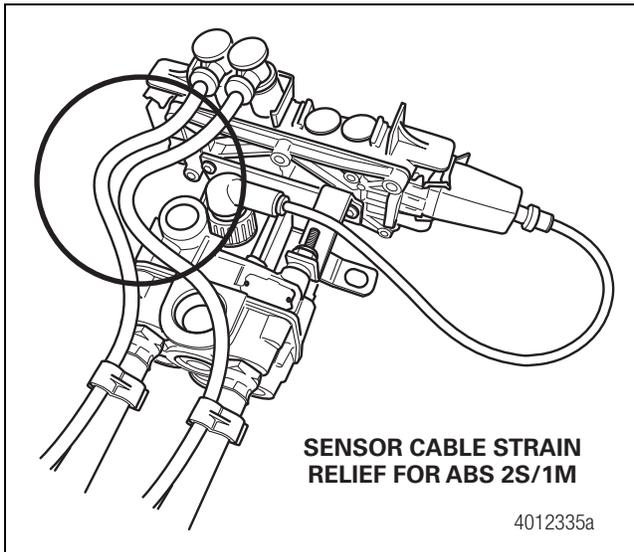


Figure 23

Cable-to-Cable Connections

It is important to ensure all cable-to-cable connections maintain good strain relief. Cable restraints must be placed between 2- and 4-inches (51-102 mm) from the cable connector to ensure correct strain relief. Regardless of whether zip ties or cable clips are used, cables should be secured at intervals not greater than 18-inches (457 mm) to avoid cable vibration. Refer to Figure 24 for air line attachment and Figure 25 for axle attachment.

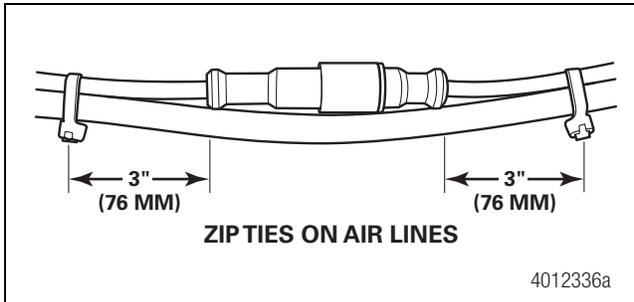


Figure 24

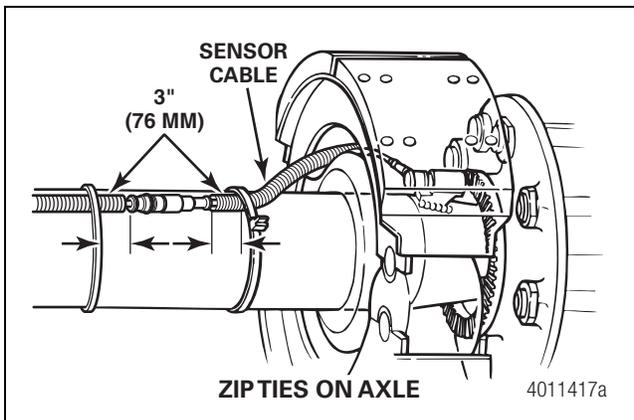


Figure 25

WABCO

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