

iABS™ TRAILER ABS SYSTEM WITH PLC AND CAN 2S/1M, 2S/2M, 4S/2M AND 4S/3M STANDARD/PREMIUM

MAINTENANCE MANUAL



MM19001

WABCO

Table of Contents

1	General Information	4
2	Safety Information	6
2.1	Trailer Grounding and Protection from Electrostatic Discharge	7
2.2	Vehicle Electrical Grounding Guidelines	7
3	Introduction	9
3.1	Identifying iABS.....	9
3.2	iABS Trailer ABS Parts.....	10
3.3	What Is WABCO's iABS Trailer ABS?.....	10
3.4	System Configuration.....	10
3.5	How Trailer ABS Works.....	11
3.6	System Components.....	11
4	ABS Questions and Answers	15
4.1	The ECU	15
4.2	Power Line Carrier (PLC).....	15
4.3	ABS Indicator Lamps	16
4.4	Types of Faults.....	18
4.5	Frequently Asked Questions	19
5	System Configurations	20
5.1	iABS Installation Diagrams	20
5.2	Power Cable Wiring Diagrams	29
6	Diagnostics	30
6.1	Important PLC Information for Blink Code Diagnostics.....	30
6.2	TOOLBOX PLUS™ SOFTWARE	31
6.3	Initial Power-up Check	37
6.4	Power and Ground Checks	37
6.5	Blink Code Diagnostics	38
7	Component Replacement	115
7.1	Wheel Speed Sensor	116
7.2	ABS Relay Valve (Figure 7.3)	117
7.3	ECU/Valve Assembly	118

8	Sensor Adjustment and Component Testing	123
8.1	How to Test Wheel Speed Sensors	123
8.2	Check ABS Functions	124
8.3	ABS External Modulator Valve	124
8.4	End of Line Testing	124
8.5	End of Line Testing without TOOLBOX PLUS™ Software.....	132
8.6	Inspect the Sensor and Air Line Installation (2S/2M Standard)	133
8.7	Trailer Identification.....	138
9	Troubleshooting	139
9.1	Automatic Lift Axle Troubleshooting	139
9.2	Tag Axle Troubleshooting.....	152
9.3	Axle Load Monitoring Troubleshooting.....	159
9.4	Tire Inflation Communication System Troubleshooting.....	163
9.5	Door Ajar System Troubleshooting	168
9.6	Integrated Speed Switch System.....	172
10	Appendix I.....	175
10.1	Trailer ABS Indicator Lamp on Vehicle Dash	175
11	Appendix II.....	177
11.1	Installing Sensors on Non-ABS-Prepped Axles	177
12	Appendix III.....	179
12.1	Cable Routing Guidelines	179
12.2	Cable Strain Relief Guidelines	180
13	Appendix IV	184
13.1	Vehicle Electrical Grounding Guidelines	184
14	Appendix V	185
14.1	Parts and Variant List.....	185

Edition 1

Version 1 (05.2020)
MM19001 (en)

This publication is not subject to any update service. Information contained in this publication was in effect at the time the publication was approved for printing and is subject to change without notice or liability. WABCO reserves the right to revise the information presented or to discontinue the production of parts described at any time.

1 General Information

Symbols used in this document

DANGER

Description of an immediate situation which will result in irreversible injury or death if the warning is ignored.

WARNING

Description of a possible situation which may result in irreversible injury or death if the warning is ignored.

CAUTION

Description of a possible situation which may result in irreversible injury if the warning is ignored.

NOTICE

Description of a possible situation which may result in material damage if the warning is ignored.



Important information, notes and/or tips



Reference to information on the internet

1. Action step

- Action step
- ⇒ Consequence of an action

■ List

- List

Note on the use of a tool/WABCO tool

How to Obtain Additional Maintenance, Service and Product Information

If you have any questions about the material covered in this publication, or for more information about the WABCO product line, please contact WABCO Customer Care Center at 855-228-3203, by email at wnacustomercare@wabco-auto.com, or visit our website: www.wabco-na.com.

General Information

How to Obtain Additional Maintenance, Service and Product Information

If you have any questions about the material covered in this publication, or for more information about the WABCO product line, please contact WABCO Customer Care Center at 855-228-3203, by email at wnacustomercenter@wabco-auto.com, or visit our website: www.wabco-na.com.

Refer to the Society of Automotive Engineers (SAE) website to find all current SAE documents and standards applicable to WABCO products (such as SAE J447 and SAE J908 at www.sae.org).

Refer to the National Highway Traffic Safety Administration (NHTSA) website to find all current documents referenced in the manual at www.nhtsa.gov.

WABCO TOOLBOX PLUS™ Software

The TOOLBOX PLUS™ Software provides PC diagnostics for WABCO products and can be purchased and downloaded from <https://wabco.snapon.com>. For complete instructions for using TOOLBOX™ Software version 12, refer to the TOOLBOX™ Quick Start Guide TP99102. For TOOLBOX PLUS™ refer to User's Guide MM19047. To obtain this literature, visit www.wabco-na.com/literature.

WABCO Academy



<https://www.wabco-academy.com/home/>

WABCO Online product catalog



<http://www.wabco-customercenter.com/>

Your direct contact to WABCO

WABCO North America LLC
WABCO USA LLC
1220 Pacific Drive
Auburn Hills, MI 48326
Customer Care Center: (855) 228-3203
www.wabco-na.com

2 Safety Information

Provisions for a safe work environment

- Only trained and qualified automotive technicians and auto mechanics may carry out work on the vehicle.
- Read this publication carefully.
- Follow all warnings, notices and instructions to avoid personal injury and property damage.
- Always abide by the vehicle and trailer manufacturer's specifications and instructions.
- Observe all accident regulations of the respective company as well as regional and national regulations.
- The workplace should be dry, sufficiently lit and ventilated.
- Use personal protective equipment if required (safety shoes, protective goggles, respiratory protection and ear protectors).

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

WARNING

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

WARNING

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 or fall over. Serious personal injury and damage to components can result.

WARNING

It is also recommended to disable or lower any lift axle or tag axle system on the trailer before working on it. Otherwise, the user has to be aware of possible sudden motion of trailer vehicle body that can lead to injuries.

CAUTION

Unintended voltages induced into the ECU can damage the electronic control unit (ECU). Disconnect all connectors from the ECU before you perform any welding, electrostatic painting, or any other activity that applies high voltage to the vehicle frame. Refer to the equipment manufacturer's recommended instructions for correct procedures.

This manual contains maintenance procedures for WABCO's iABS™ Trailer ABS system with PLC and CAN. Before you begin procedures:

1. Read and understand all instructions and procedures before you begin to service components.
2. Read and observe all Caution and Warning safety alerts that precede instructions or procedures you will perform. These alerts help to avoid damage to components, serious personal injury, or both.
3. Follow your company's maintenance and service, installation, and diagnostics guidelines.
4. Use special tools when required to help avoid serious personal injury and damage to components.

2.1 Trailer Grounding and Protection from Electrostatic Discharge

2.1.1 Note During Servicing the Trailer

Prevent potential resistance differences in grounding between components (such as axles) and the vehicle frame (chassis).

Make sure that the resistance between metallic parts of the components connected to the trailer frame is less than 10 Ohm (< 10).

Connect moving or insulated vehicle parts (such as axles) in an electrically conductive manner with the frame.

Ensure a secure and adequate chassis ground at the J560 seven way connector ground pin on the trailer.

Use electrically conductive bolted connections when fastening the ECUs to the trailer frame.

2.1.2 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.

2.1.3 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.

2.2 Vehicle Electrical Grounding Guidelines

Consult your trailer manufacturer (OEM) for further instructions on how to perform this task. This ensures that the trailer OE warranty is not voided.

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). 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 requires adding one.



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. This could potentially cause damage to the ABS ECU and other electric components on the trailer.

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 must be added to ensure adequate protection from unwanted electrical noise. This can be verified by measuring the maximum resistance between the vehicle chassis/frame and the other trailer component, then confirming that the resistance is less than 10 ohm (< 10).

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

3 Introduction

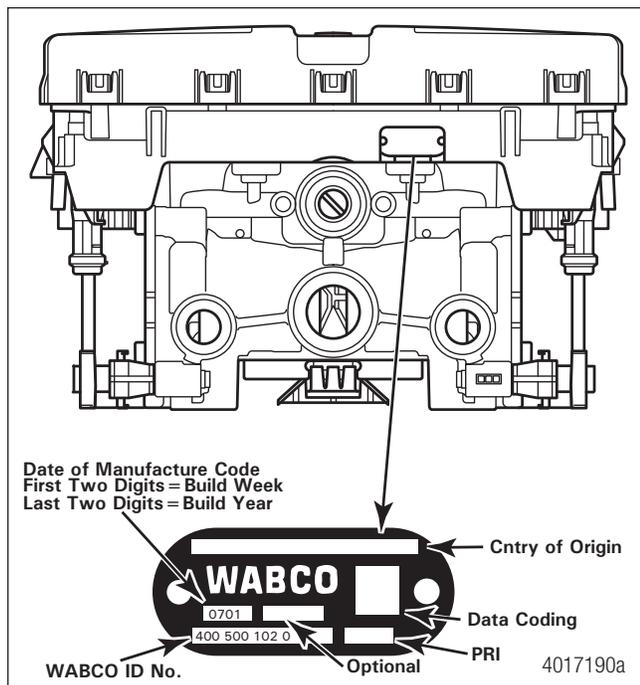
This manual contains service and diagnostic information for WABCO iABS Trailer ABS system with Power Line Carrier (PLC) and CAN capability.

3.1 Identifying iABS

To identify the iABS system, check the identification tag on the Electronic Control Unit (ECU). Figure 3.1. The part numbers for iABS systems are:

- 400 500 320 0 (2S/1M Standard)
- 400 500 420 0 (2S/2M, 4S/2M Standard)
- 400 500 425 0 (4S/2M Standard for Pull Trailers)
- 400 500 430 0 (2S/2M, 4S/2M and 4S/3M Premium)
- 400 500 350 0 (2S/1M Premium)

Fig. 3.1



If you are not able to identify the version and need to request service literature, please visit wabco-na.com. Otherwise, contact WABCO Customer Care at 855-228-3203.

This manual covers servicing and repair information for a trailer already equipped with an iABS valve assembly. If performing a new installation, refer to the following documents:

- iABS 2S/1M Install Guide: TP18007
- iABS 2S/2M, 4S/2M and 4S/3M Install Guide: TP18006

3.2 iABS Trailer ABS Parts

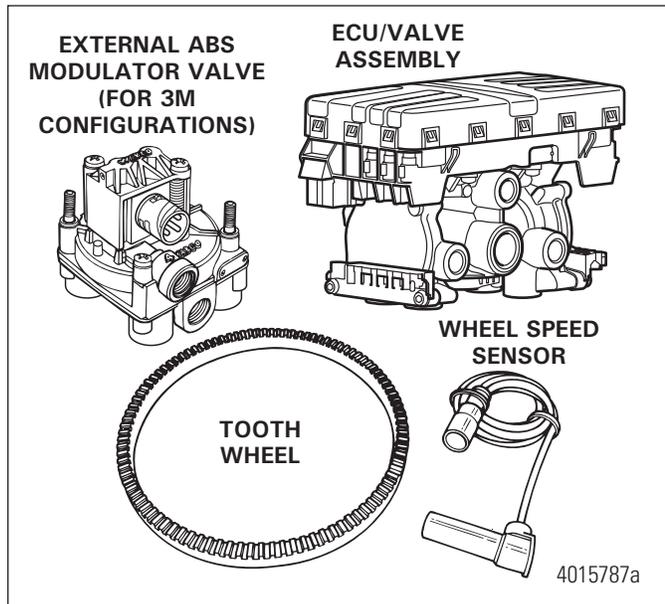
Parts book PB-8857AS lists WABCO iABS replacement parts. To obtain a copy, go to wabco-auto.com.

For warranty information refer to SP-1375 which can be found at www.wabco-auto.com. For further information, contact the WABCO Customer Care Center at 855-228-3203.

3.3 What Is WABCO's iABS Trailer ABS?

WABCO's iABS Trailer ABS is an electronic, self-monitoring system that works with standard air brakes. In addition, iABS includes Power Line Carrier (PLC) capability and CAN capability. PLC information is included in the ABS Q & A Section of this manual. The major components of the system are the **Electronic Control Unit (ECU)/Valve Assembly, External ABS Modulator Valve (for 3M systems), tooth wheel and wheel speed sensor.** Figure 3.2.

Fig. 3.2



3.4 System Configuration

The ABS **configuration** defines the number of wheel speed sensors and ABS modulator valves used in a system. For example, a **2S/1M** configuration includes two wheel sensors and one ABS modulator valve. A **2S/2M** configuration includes two wheel sensors and two ABS modulator valves. A **4S/2M** configuration includes four wheel sensors and two ABS modulator valves.

There is a specific ECU/valve assembly for each configuration:

- For 2S/1M Standard, the assembly consists of an ECU and a single modulator valve assembly
- For 2S/2M Standard and 4S/2M, the assembly consists of an ECU and a dual modulator valve assembly (one valve that combines the function of two modulator valves).
- A 4S/3M premium configuration consists of an ECU/dual modulator valve assembly and one external ABS modulator valve.

3.5 How Trailer ABS Works

WABCO ABS is an electronic system that monitors and controls wheel speed during braking. The system works with standard air brake systems.

ABS monitors wheel speeds at all times and controls braking during wheel lock situations. The system improves vehicle stability and control by reducing wheel lock during braking.

The ECU receives and processes signals from the wheel speed sensors. When the ECU detects a wheel lockup, the unit activates the appropriate modulator valve, and the air pressure is controlled to the wheel ends.

In the event of a malfunction in the system, the ABS in the affected wheel(s) is disabled; that wheel still has normal brakes. The other wheels keep the ABS function.

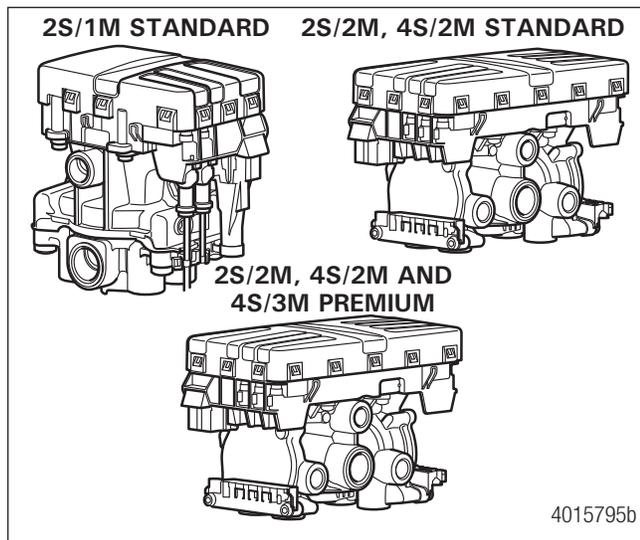
Two ABS indicator lamps (one on the dash of the tractor and one on the side of the trailer) let drivers know the status of the system.

3.6 System Components

3.6.1 ECU/Valve Assembly (Figure 3.3)

- 12 volt for Standard and 8-32 volt for Premium units.
- Integrated ECU and ABS relay valve.
 - ECU and valve assembly are serviceable items.
- The ECU/Valve Assembly may be mounted with the control port facing either the front or rear of the trailer.

Fig. 3.3



3.6.2 ABS External Modulator Valve (Figure 3.4)

- Controls air pressure to the brake chambers where it is plumbed.
- During ABS operation, the valve adjusts air pressure to the brake chambers to control braking and prevent wheel lock.
- Used in conjunction with ECU/Valve Assembly for 3M systems.

3.6.3 Sensor with Molded Socket (Figure 3.5)

- Measures the speed of a tooth wheel rotating with the vehicle wheel.
- Produces an output voltage proportional to wheel speed.

3.6.4 Sensor Clip (Figure 3.6)

- Holds the wheel speed sensor in close proximity to the tooth wheel.

3.6.5 Tooth Wheel (Figure 3.7)

- A machined ring mounted to the machined surface on the hub of each ABS-monitored wheel.

Fig. 3.4

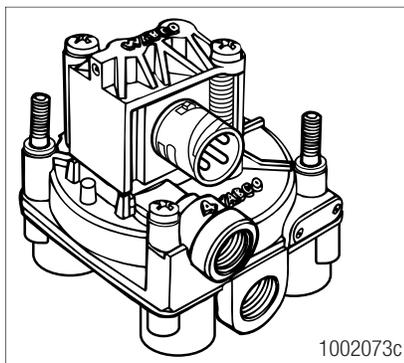


Fig. 3.5

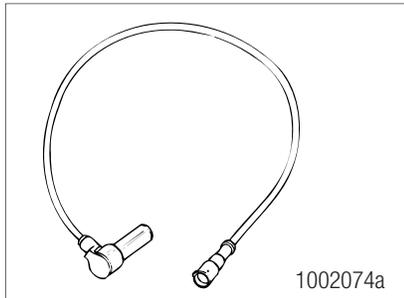


Fig. 3.6

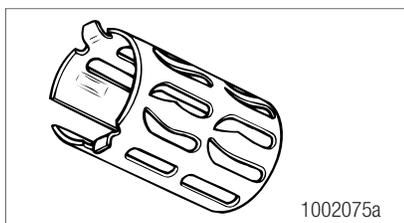
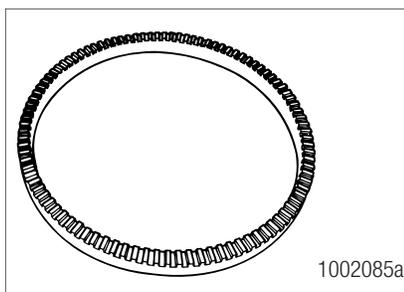
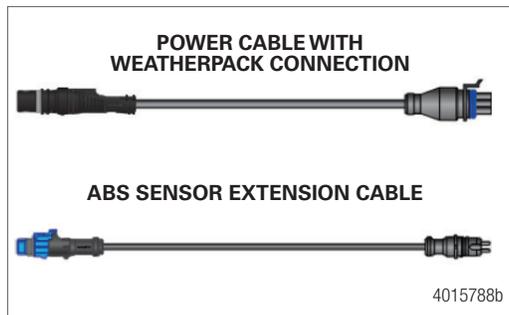


Fig. 3.7



3.6.6 Cables for iABS (Figure 3.8)

Fig. 3.8



3.6.7 iABS Trailer ABS Indicator

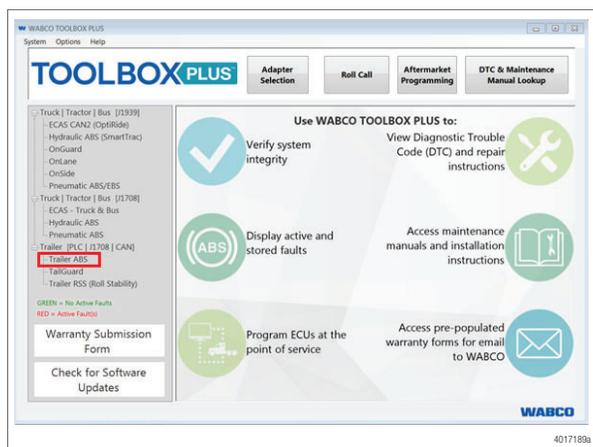
- Provides information about the operation of the ABS indicator lamp.
- Label is self-adhesive and is mounted on the trailer near the ABS indicator lamp.
- If there is no warning label on your trailer, let your supervisor know. Labels are available from WABCO. Ask for Part Number TP95172.

3.6.8 TOOLBOX PLUS™ Software (Figure 3.9)

TOOLBOX PLUS™ Software is a PC-based diagnostics program that can display fault codes, wheel speed data, test individual components, verify installation wiring and is required to perform a sign-off for the iABS system.

WABCO TOOLBOX PLUS™ Software supports the iABS system. TOOLBOX PLUS™ Software is available for purchase via download at the wabco.snapon.com website.

Fig. 3.9



3.6.9 Noregon DLA + PLC Adapter (Figure 3.10)

- Simulates the trailer ABS lamp, ensuring that the tractor is capable of “lighting the light.”
- Use as a trailer/tractor tester to ensure that PLC is functioning correctly.
- Currently replaced by the heavy duty trailer diagnostic adapter.

Fig. 3.10



Available from Noregon, not provided by WABCO.

3.6.10 Noregon Heavy Duty Trailer Diagnostic Adapter (Figure 3.11)

- Simulates the trailer ABS lamp, ensuring that the tractor is capable of “lighting the light.”
- Use as a trailer only tester to ensure that PLC is functioning correctly.

Fig. 3.11



Available from Noregon, not provided by WABCO.

4 ABS Questions and Answers

This section contains ABS questions and answers.

4.1 The ECU

How do you activate the ECU?

In a constant-powered system, the ECU activates and then begins a self-diagnostic check of the system when you turn the ignition ON. In a stoplight-powered system, the ECU activates when you apply the brakes. All trailers manufactured on or after March 1, 1998 are equipped with ABS that has constant power capability with stoplight power as back-up.

How does the ECU respond to a wheel approaching lock-up?

The ECU directs the ABS relay valve to function as a modulator valve and adjust air pressure to the chambers up to five times a second. This pressure adjustment allows a wheel (or wheels) to rotate without locking.

4.2 Power Line Carrier (PLC)

What is PLC communications?

PLC stands for Power Line Carrier, which is a method used to communicate information by multiplexing data on the same wire used for the ABS electrical power. PLC communications convert signal message data to a radio frequency (RF) signal on top of the +12V power line providing electrical power to the trailer.

What is multiplexing?

Multiplexing means communicating multiple signals or messages on the same transmission media. This provides an efficient and cost effective means by decreasing the number of wires and connectors which otherwise would be needed. Without multiplexing, it could take several wires and connections in order to transmit several different signals to various locations on a vehicle, but with multiplexing these wires and connectors can be significantly reduced.

Why add PLC technology to tractor and trailer ABS?

By adding PLC technology to the tractor and trailer ABS the industry is able to have the most cost effective means to meet the March 1, 2001 FMVSS-121 in-cab trailer indicator lamp mandate with no additional external hardware, harnesses or connectors. Additionally, this capability of communicating other information between tractor and trailers provides many more opportunities to further improve productivity and safety.

How does it work?

The trailer ABS with PLC takes message information to be sent to the tractor and converts it to an RF signal. The signal is then sent over the trailer ABS power line (blue wire) and the tractor ABS with PLC receives the signal. Messages can also be sent from the tractor to the trailer via PLC.

What if a tractor is equipped with PLC technology and the trailer is not, or vice-versa? Can you drive the combination safely in that situation?

Absolutely. If the tractor is equipped with PLC and the trailer is not, or vice-versa, your ABS in-cab trailer indicator lamp will not illuminate, but your ABS will continue to function as normal. To ensure that the trailer ABS is functioning correctly, the trailer ABS indicator lamp mounted on the trailer should be utilized.

What if a tractor has one manufacturer's ABS with PLC and the trailer has another manufacturer's ABS with PLC? Will the two systems be compatible and operate the trailer ABS lamp as expected?

Yes. ABS with PLC from different manufacturers are designed to be compatible by controlling the trailer ABS lamp according to the FMVSS-121 standard, even when systems from different manufacturers are connected to each other. However, certain features beyond the control of the trailer ABS indicator lamp may or may not be supported by all devices communicating via PLC. SAE task forces continue to standardize common messages so that maximum compatibility may exist in the future.

How do I diagnose PLC?

PLC can be diagnosed anywhere you can connect to the main power wire on the trailer, typically tools are designed to be plugged into the J560 connection at the nose of the trailer.

Can I use blink code diagnostics on iABS to diagnose PLC?

Yes. Section 5 of this manual describes the method of performing a blink code check using Constant Power (ignition activation). Blink Code 17 indicates a PLC failure.

If PLC does not seem to be operating correctly, but I don't get a Blink Code 17 when I run a blink code check, what else could be wrong?

If there is no Blink Code 17, the ECU is functioning correctly and does not need to be replaced; however, there could be a problem in the trailer's wiring harness. Check the wiring system and make the necessary repairs. If the problem persists, contact the WABCO Customer Care Center at 855-228-3203.

4.3 ABS Indicator Lamps



When replacing the bulb, to ensure correct lamp operation use an incandescent type DOT-approved lamp, or a LED with integral load resistor.

4.3.1 ABS Indicator Lamp (on Dash)

With iABS, there are two ABS indicator lamps; one on the vehicle dash and one on the side of the trailer. Refer to Appendix I for information about the operation of this lamp.

4.3.2 ABS Indicator Lamp (on Trailer)

What is the function of the ABS indicator lamp?

The indicator lamp enables a driver to monitor the ABS at all times. Refer to the DOT requirements for the mounting location of the indicator lamp.

How does the indicator lamp operate?

How the indicator lamp operates depends on whether the ABS is powered by stoplight or constant power:

- If the trailer was manufactured prior to February 28, 1998, or was manufactured outside of the United States, the ABS may be either stoplight or constant powered.
- If the trailer was manufactured March 1, 1998 or later — and was manufactured in the United States — it will have constant power capability. This is mandated by Federal Motor Vehicle Safety Standard (FMVSS) 121.

Check your trailer specification sheet to determine the type of ABS power. Table B in this section illustrate indicator lamp operation on stoplight and constant powered ABS systems.

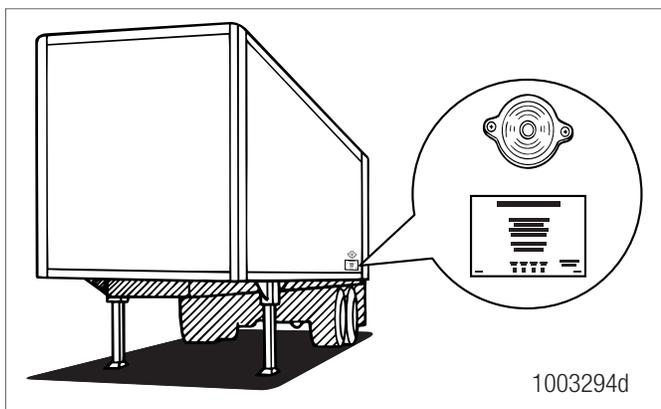
ABS Questions and Answers

Most trailers manufactured prior to February 1998 require that the brakes be applied to operate the ABS indicator lamp. If the indicator lamp stays on when the brakes are applied to a moving vehicle, service the ABS system.

What does the trailer ABS indicator lamp mean to service personnel?

The trailer ABS indicator lamp on the side of the trailer indicates the status of the trailer ABS. If it comes ON and stays ON when you apply the brakes to a moving vehicle, there is an ABS malfunction. It is normal for the lamp to come ON and go OFF to perform a bulb check, but it should not stay ON when the vehicle is moving above 4 mph. As with any safety system, it is important not to ignore this indicator. If the indicator lamp indicates a malfunction, the vehicle can be operated to complete the trip, but it is important to have it serviced as soon as possible using the appropriate maintenance manual to ensure correct braking performance and that the benefits of ABS remain available to your drivers. Typical ABS indicator lamp mounting locations are illustrated in Figure 4.1.

Fig. 4.1



Typical ABS Indicator Lamp Mounting Location on Side of Trailer

Can you continue to operate a vehicle when the indicator lamp indicates a fault?

Yes. When a fault exists in the ABS, standard braking returns to the affected wheel, and the ABS still controls other monitored wheels. This lets you complete the trip. You should not ignore the indicator lamp and should have the vehicle serviced as soon as possible after the lamp comes ON and stays ON.

TABLE A: CONSTANT POWER

System is Ignition Powered				
Brakes	Ignition	Fault in System	Vehicle Speed	Indicator Lamps (Trailer and Dash)
Released	OFF	N.A.	N.A.	OFF
	ON	NO	Less than 4 mph	ON for 3 seconds, then go OFF.
	ON	NO	Greater than 4 mph	OFF
	ON	YES	N.A.	ON
Applied	OFF	NO	Less than 4 mph	ON for 3 seconds, then go OFF.
	OFF	YES	N.A.	ON
	ON	NO	Less than 4 mph	OFF
	ON	NO	Greater than 4 mph	OFF
	ON	YES	N.A.	ON

TABLE B: STOPLIGHT POWER



Stoplight power is designed to be for backup only for the ABS, so if the light is not functioning per the Constant Power table, the power and ground should be checked on the system.

System Power Comes from Activating the Stoplight Circuit.

Brakes	Fault in System	Vehicle Speed	Indicator Lamp
Released	N.A.	N.A.	OFF
Applied	NO	Less than 4 mph	ON for 3 seconds, then goes OFF.
Applied	NO	Greater than 4 mph	Flashes once, then stays OFF for remainder of the brake application.
Applied	YES	N.A.	ON

4.4 Types of Faults

What is a fault in the system?

A fault in the system is a problem that can exist in the ABS or in the system's components. Faults can be either existing faults or intermittent stored faults.

What is an existing fault?

An **existing** fault is a problem that exists currently in the system. For example, a damaged sensor cable is an existing fault that the ECU will detect and store into memory until you identify the cause, repair the cable and clear the fault from the ECU.

What is an intermittent fault?

An **intermittent** fault is a problem that usually occurs only under certain driving conditions. For example, the ECU may detect a loose cable or wire or receive an erratic signal from a wheel sensor. Since intermittent faults can be unpredictable and may only happen periodically, you can use information stored in ECU memory to find and correct the loose cable or wire. An intermittent fault cannot be retrieved using blink codes.

Is an intermittent fault difficult to locate and repair?

It can be, because you may not be able to easily find the cause of the problem. WABCO recommends that you write down intermittent faults to help you isolate a fault that recurs over a period of time.

Can the ECU store more than one fault in memory?

Yes. The ECU retains existing and intermittent faults in memory even when you turn OFF the power to the ECU.

What if the ECU finds a fault in an ABS component during normal operation?

If the ECU senses a fault in the system (with an ABS valve, for example), the ECU turns the trailer ABS indicator lamp on and returns the wheel controlled by that valve to standard braking. Or, if the ECU finds a fault with one wheel speed sensor in a system that has four sensors on a tandem axle, the ECU uses information from the other sensor on the same side of the tandem to ensure continuous ABS function. The ECU continues to provide full ABS function to the wheels unaffected by system faults. However, the ECU will turn the trailer ABS indicator lamp on to tell the driver a fault has been detected in the system.

4.5 Frequently Asked Questions

What is the crack pressure of the ABS valve?

The pressure at which the ABS valve opens to allow air pressure to the wheel ends is 3 to 5 psi on the signal port of the valve.

What can cause the trailer to bounce up and down when the service brakes are applied?

It is possible the ABS is getting signal from the sensor and tone ring that it is going into an ABS event. If the issue is more noticeable when the trailer is unloaded, it is possible the trailer has worn suspension components that can cause the ABS to react and go into an ABS event. Review with the trailer suspension manufacturer.

Why are my brake lights on dimly any time the trailer is powered up?

If the trailer is equipped with LED brake lights and there is no resistor in the circuit, you will get unwanted illumination of the lights all the time. The 12v LED or circuit must have a resistor installed to prevent them from illuminating all the time.

5 System Configurations

5.1 iABS Installation Diagrams

With iABS, the 2S/1M, 2S/2M, 4S/2M and 4S/3M sensor location designations will change depending on how the ECU/dual modulator valve assembly is mounted. It may be mounted facing either the front or the rear of the trailer. It is important that you identify the location of these sensors before beginning any diagnostics. Sensor locations for both front and rear-facing installations are depicted in Figures 5.1 through 5.8.



Sensor locations for the 2S/1M Standard will not change.

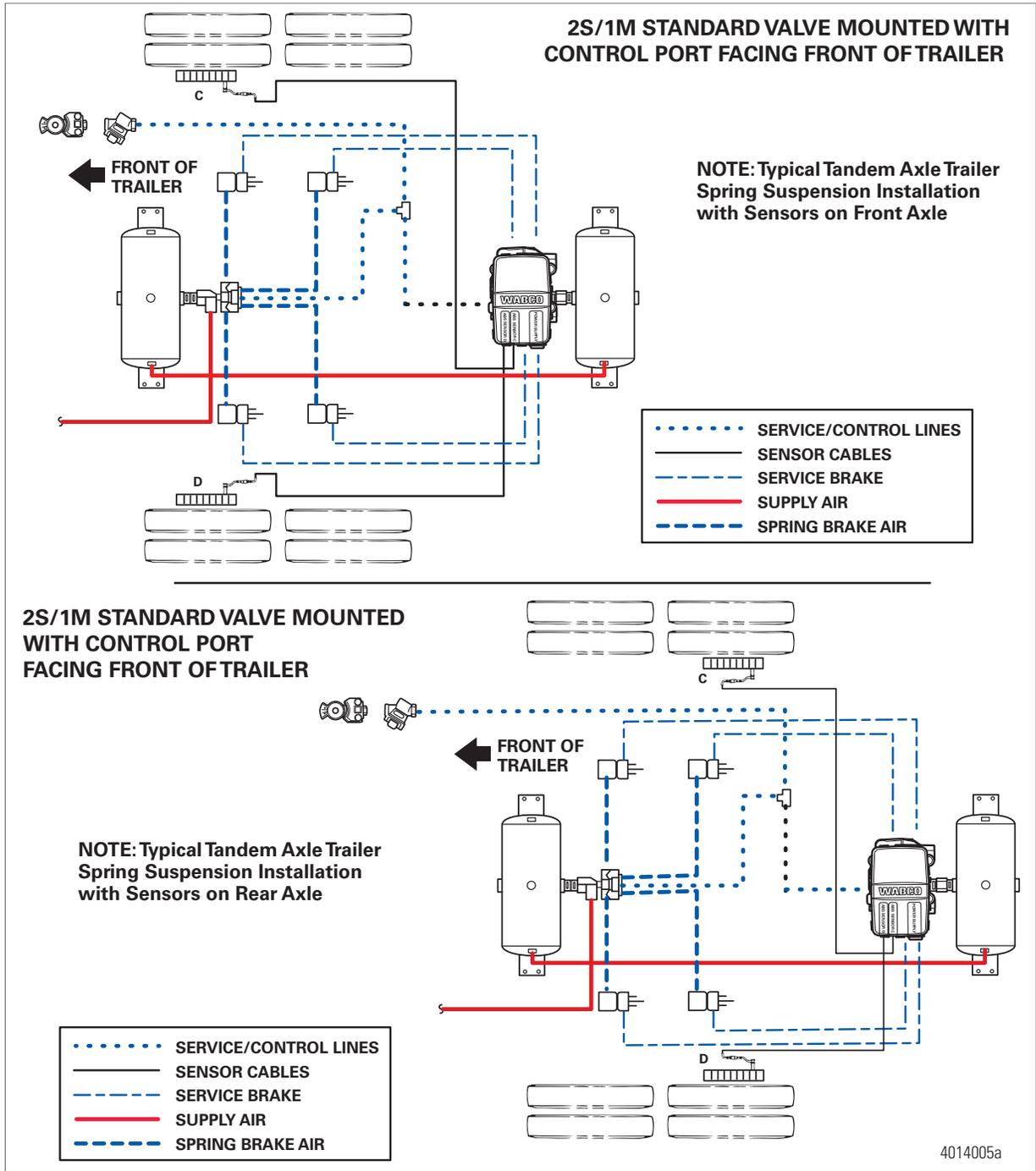
Configuration	Figure
2S/1M Standard	Figure 5.1
2S/2M Standard Mounted with Control Port Facing Front of Trailer	Figure 5.2
2S/2M Standard Mounted with Control Port Facing Rear of Trailer	Figure 5.3
2S/2M Standard Mounted with Control Port Facing Front of Trailer	Figure 5.4
2S/2M Standard Mounted with Control Port Facing Rear of Trailer	
4S/2M Standard Mounted with Control Port Facing Front of Trailer	Figure 5.5
4S/2M Standard Mounted with Control Port Facing Rear of Trailer	
4S/2M Standard - Typical Tri-Axle - Mounted with Control Port Facing Front of Trailer	Figure 5.6
4S/2M Standard - Typical Tri-Axle - Mounted with Control Port Facing Rear of Trailer	
4S/2M Standard - Typical Axle Control Installation - Mounted with Control Port Facing Front of Trailer	Figure 5.7
4S/2M Standard - Typical Axle Control Installation - Mounted with Control Port Facing Rear of Trailer	
4S/3M Premium - Typical Tri-Axle with Front Lift - Mounted with Control Port Facing Front of Trailer	Figure 5.8
4S/3M Premium - Typical Tri-Axle with Front Lift - Mounted with Control Port Facing Rear of Trailer	

System Configurations

5.1.1 Typical iABS Trailer installations are illustrated in Figure 5.1 through 5.8:

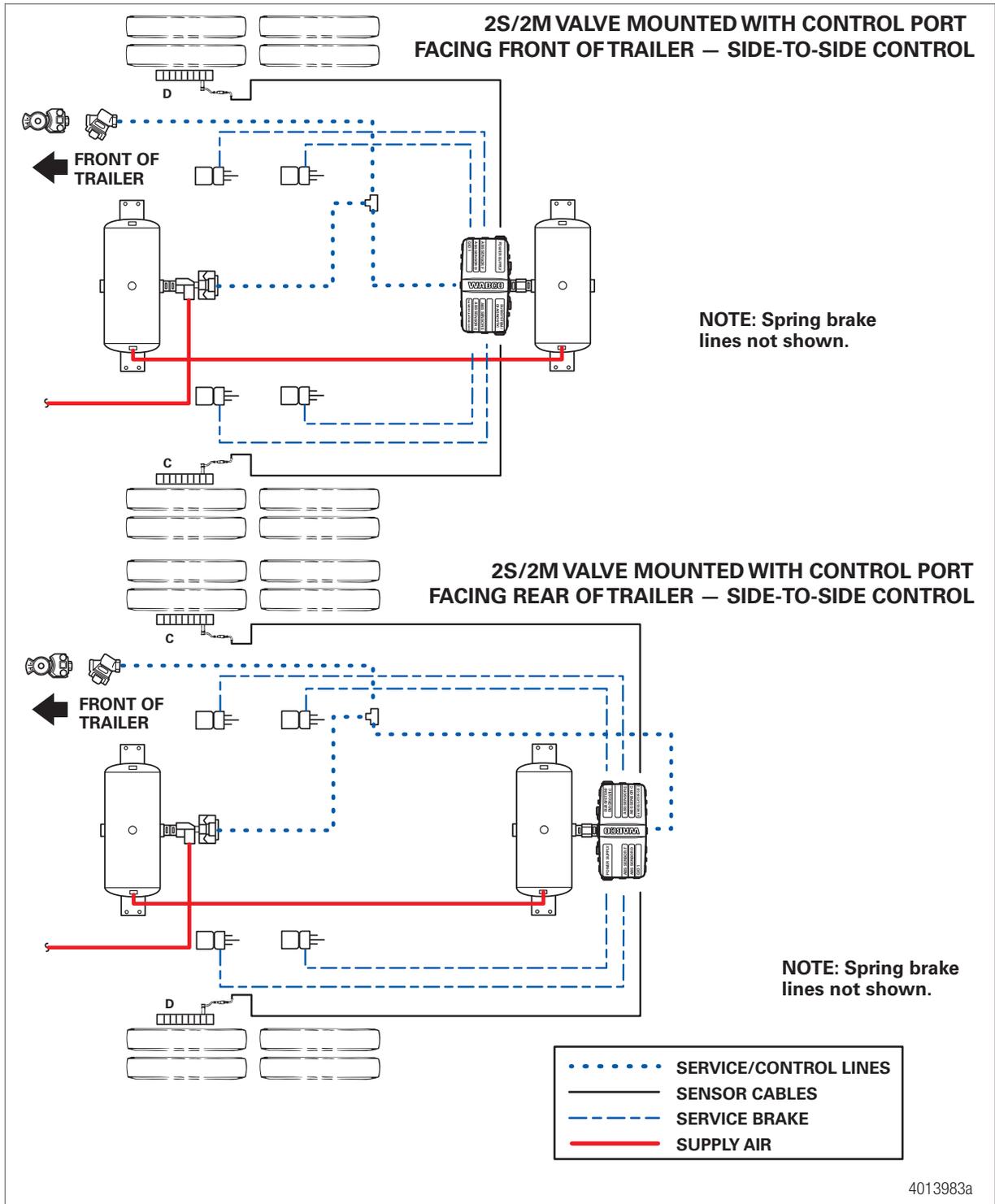
i WABCO recommends placing the sensors on the axle that will provide the most braking performance. This is based on the way the suspension reacts during heavy braking applications. The Trailer Manufacturer can help provide this information. The following Figures 5.1 through 5.8 are recommendations for many of the standard trailers built in North America.

Fig. 5.1



System Configurations

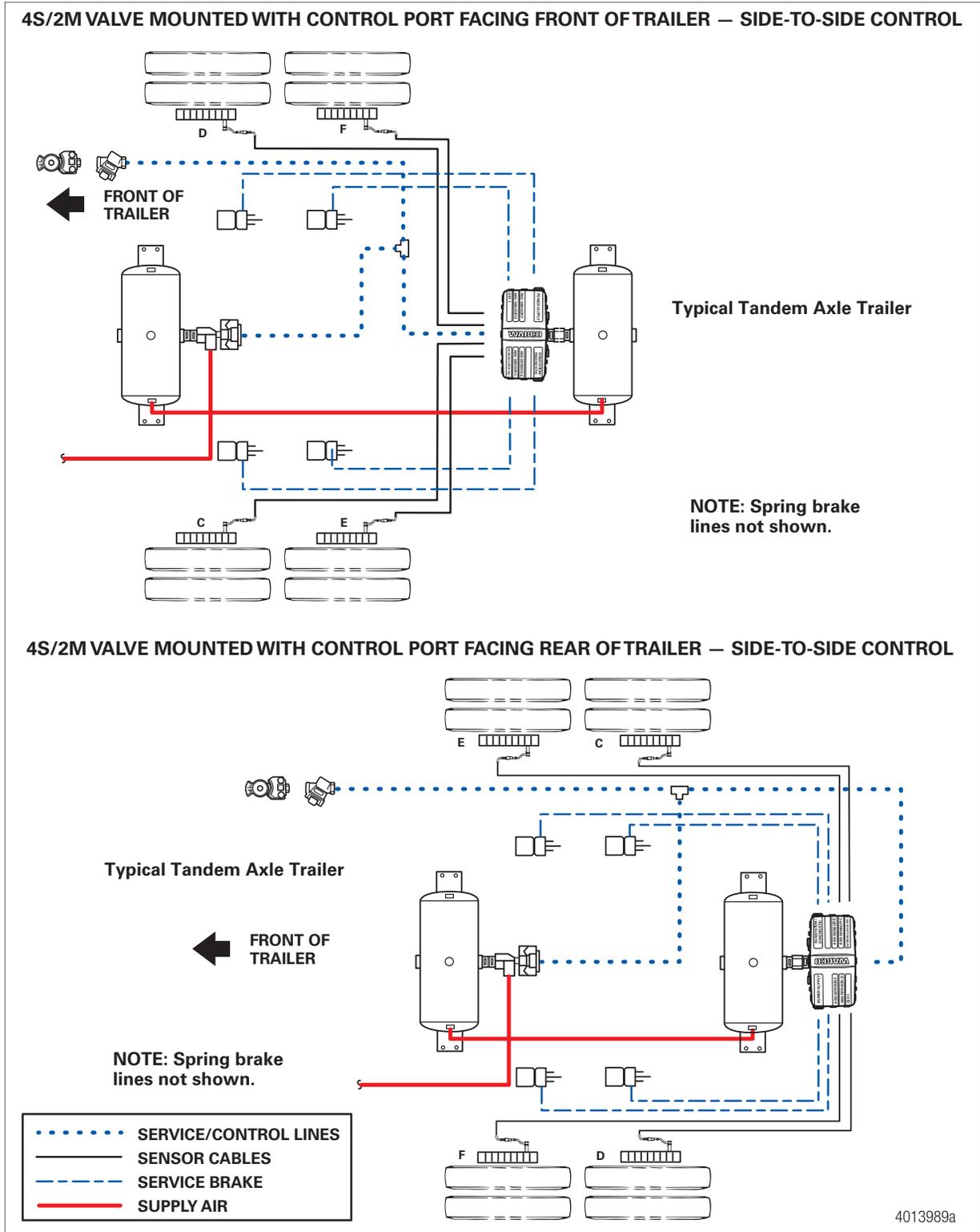
Fig. 5.2



4013983a

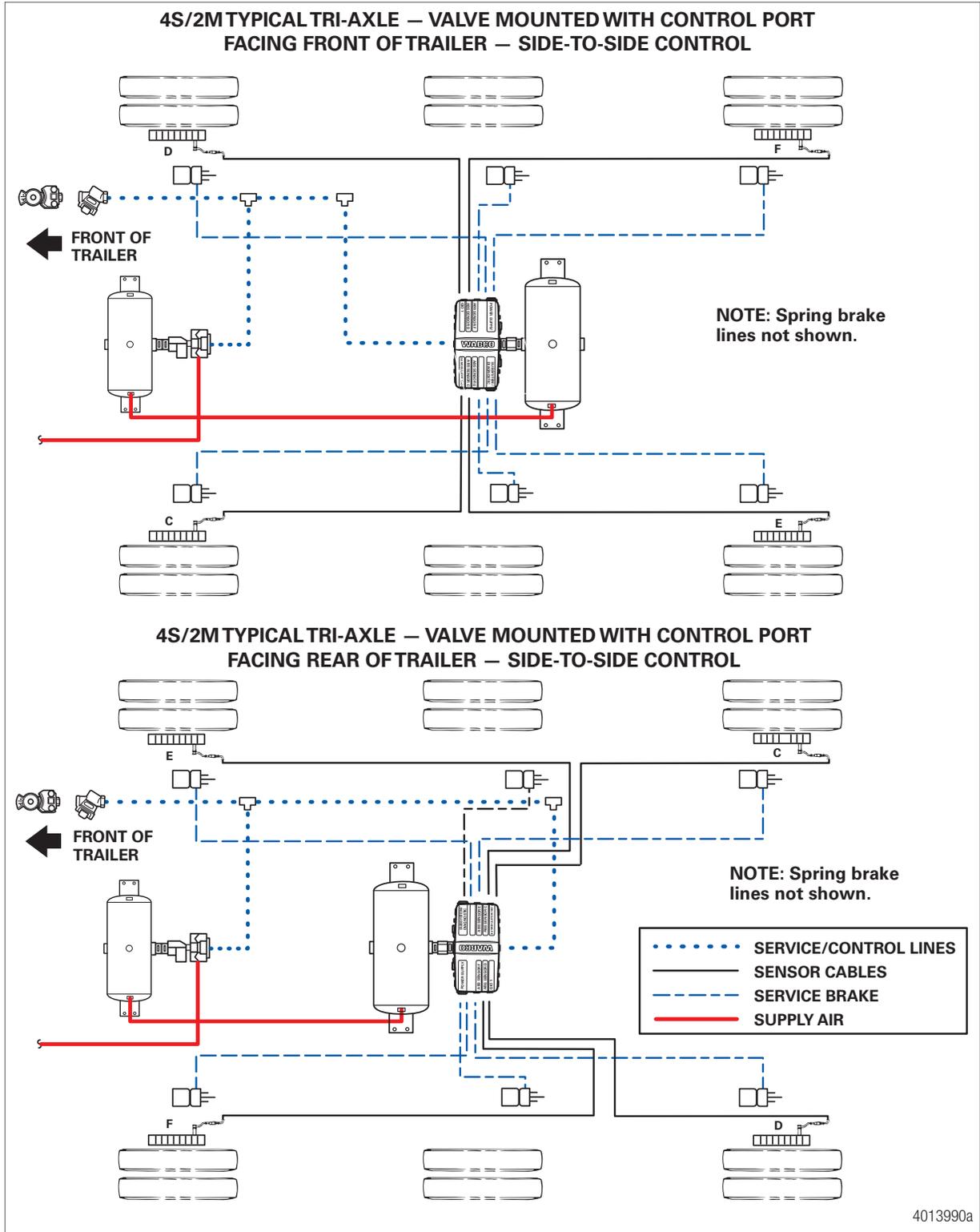
System Configurations

Fig. 5.3



System Configurations

Fig. 5.4

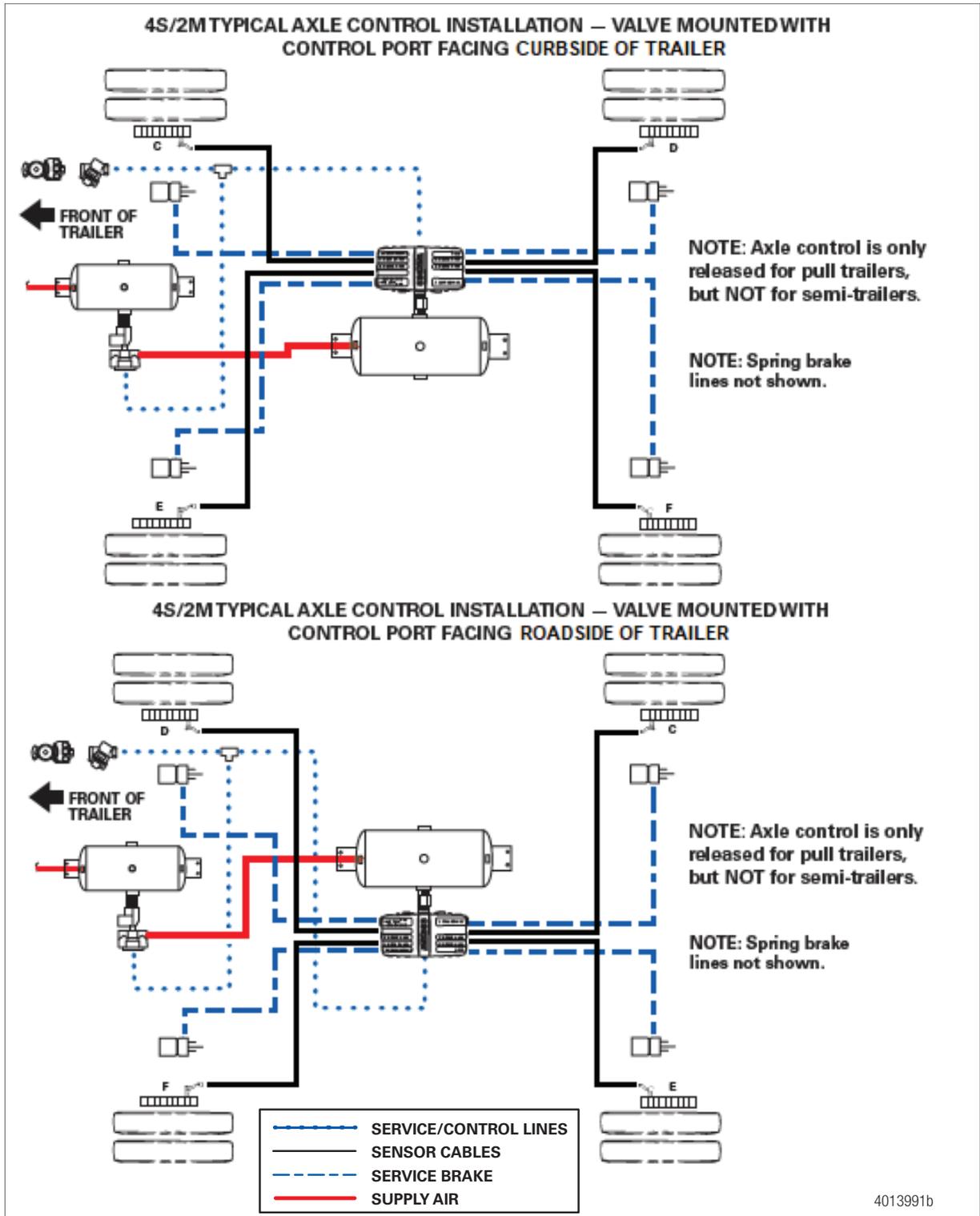


System Configurations



When using a 4-sensor capable ABS ECU, but only using 2 sensors, make sure the sensors used are C and D. If a sensor is plugged into the E or F port when powered up, the system will automatically configure to a 4-sensor system. To reconfigure an ECU to a 2-sensor configuration, TOOLBOX PLUS™ Software is required.

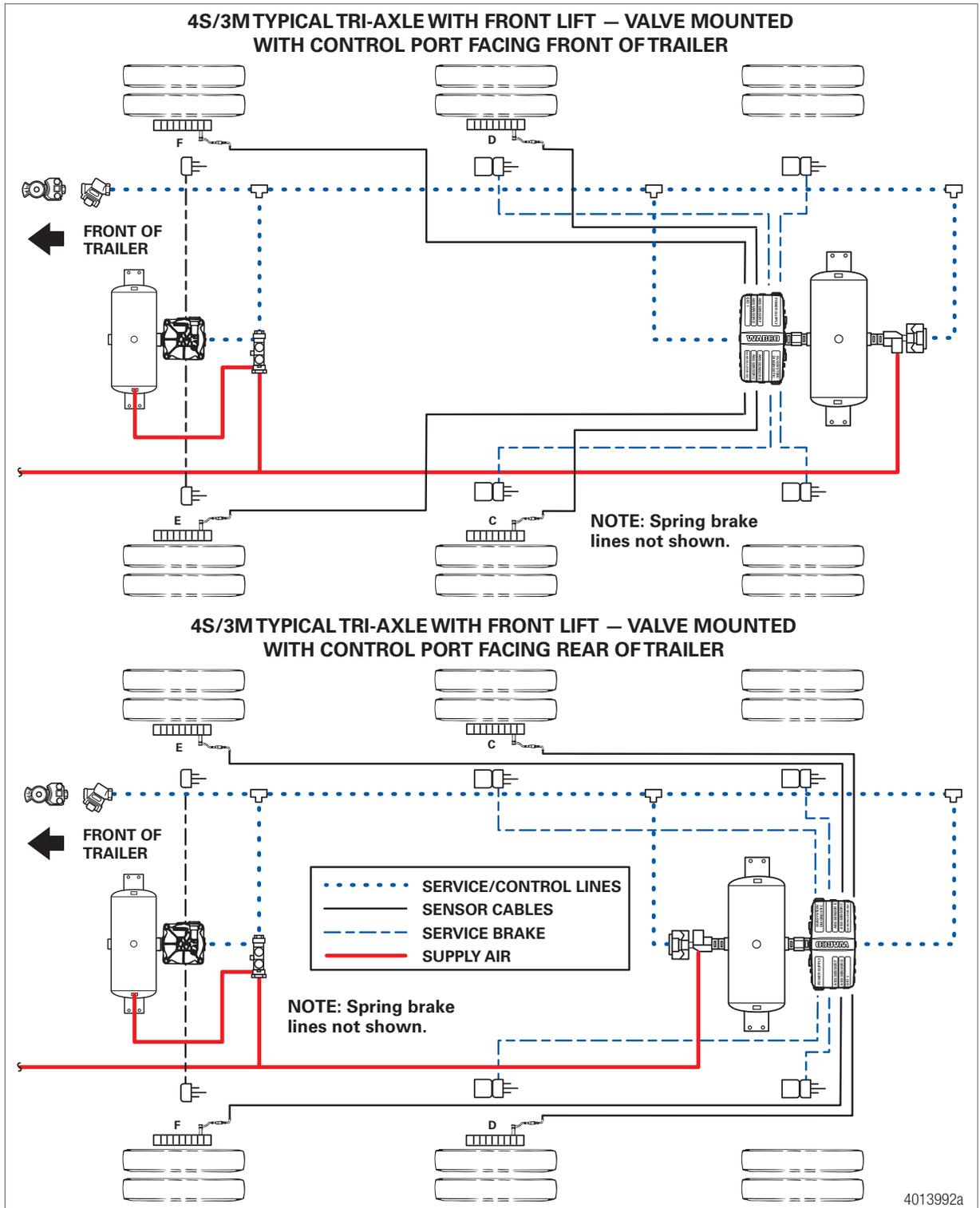
Fig. 5.5



4013991b

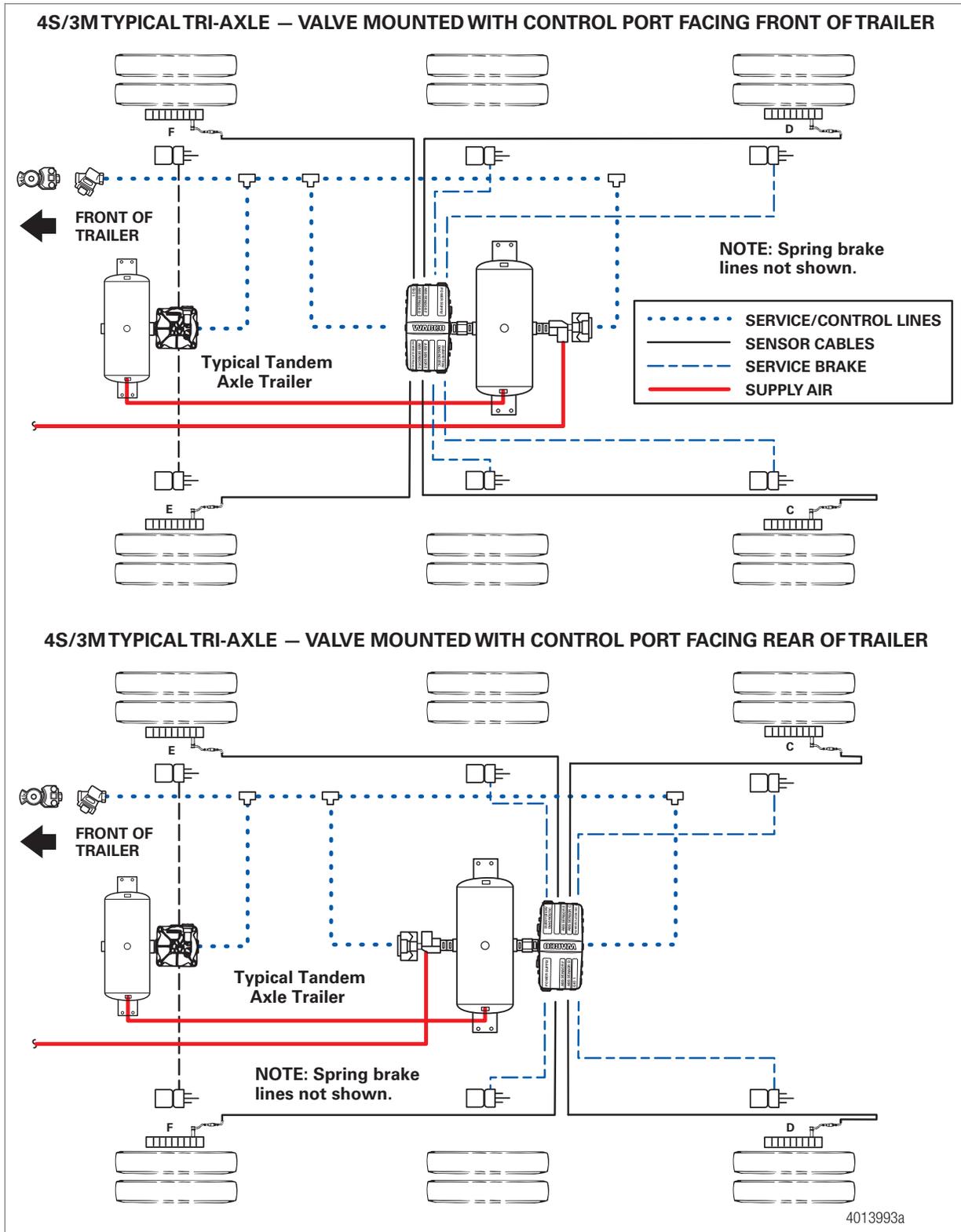
System Configurations

Fig. 5.6



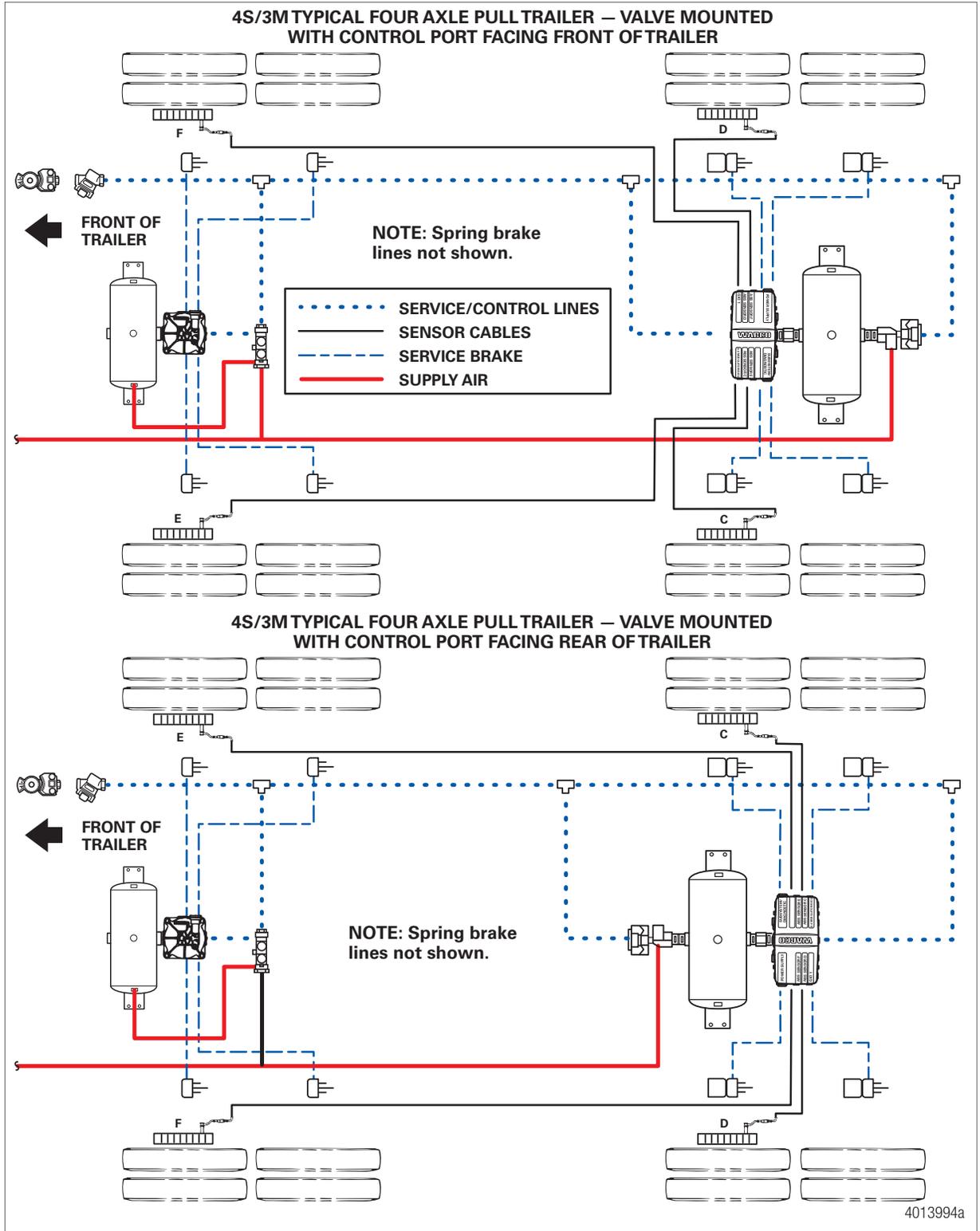
System Configurations

Fig. 5.7



System Configurations

Fig. 5.8



5.2 Power Cable Wiring Diagrams

Fig. 5.9

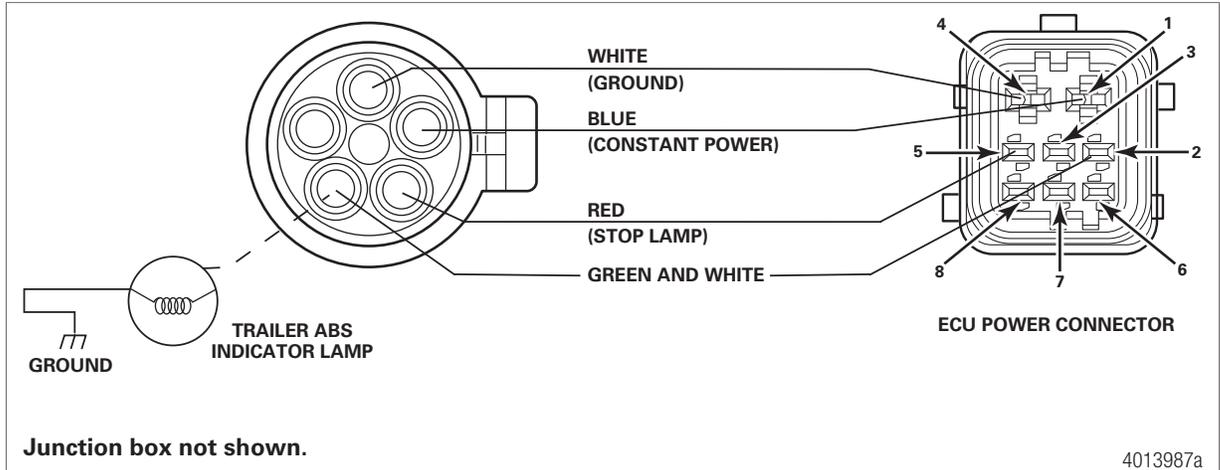
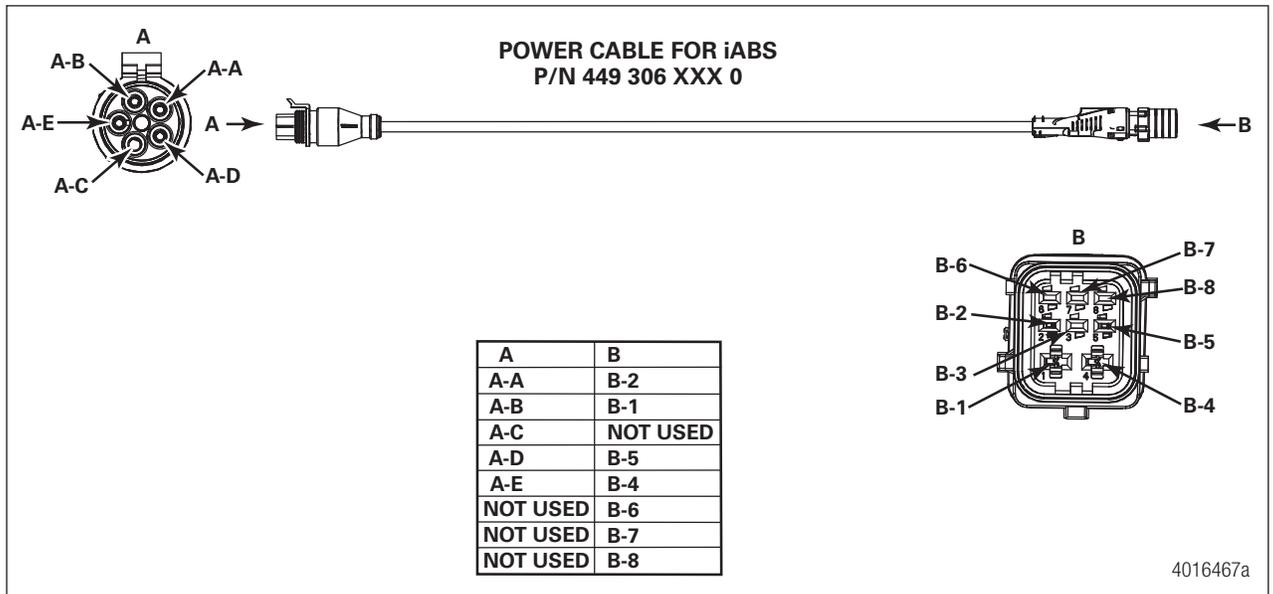


Fig. 5.10



6 Diagnostics

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.

WARNING

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

WARNING

The 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.

There are two methods used to get fault information from the ECU:

- TOOLBOX PLUS™ Software
- Blink code diagnostics
 - Ignition power activation

There is also a new diagnostic tool for checking PLC, the Heavy Duty Trailer Diagnostic adapter. Figure 6.1.

Fig. 6.1



Available from Noregon, not provided by WABCO.

6.1 Important PLC Information for Blink Code Diagnostics

Blink Code 17 indicates a PLC failure. If PLC does not seem to be operating correctly, but there is no Blink Code 17, the ECU is functioning correctly and does not need to be replaced; however, there could be a problem in the trailer's wiring harness. Check the wiring system and make the necessary repairs.

6.2 TOOLBOX PLUS™ SOFTWARE

TOOLBOX PLUS™ Software is a PC-based diagnostic program that can display fault codes, wheel speed data, test individual components, verify installation wiring and is required to perform signoff for the iABS with PLC installation. Figure 6.2.

Fig. 6.2



TOOLBOX PLUS™ Software is available for purchase via download 24 hours a day, seven days a week at wabco.snapon.com. TOOLBOX PLUS™ Software supports the iABS system.

TOOLBOX PLUS™ Software has the following functions.

- Supports iABS with PLC.
- Displays both constant and changing information from the ECU being tested.
- Displays both active and stored system faults, as well as the appropriate repair instructions.
- Activates system components to verify:
 - System integrity
 - Correct component operation
 - Installation wiring



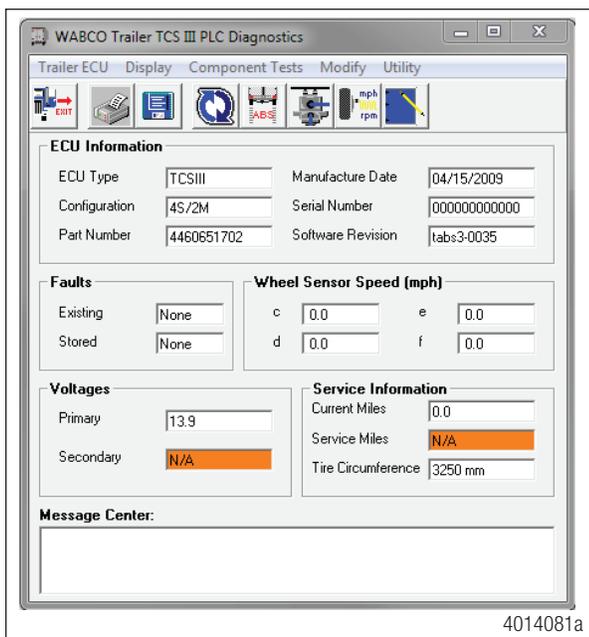
A J1587/J1708 to USB or PLC to J1708 interface is required to run this software.

6.2.1 TOOLBOX PLUS™ Software Screens

Main Screen

This screen provides icon and pull-down menu task selections. It also provides information about the current state of the WABCO iABS ECU/Valve Assembly. ECU information is read once from the ECU and does not change. Wheel speed, voltages, faults and information are read and updated continuously. Figure 6.3.

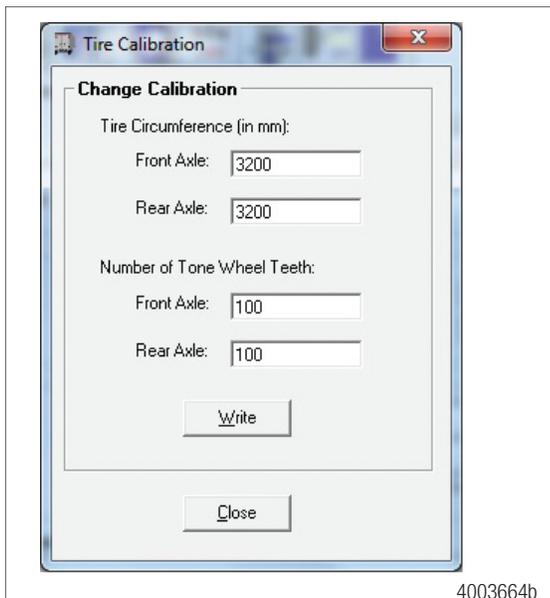
Fig. 6.3



Tire Calibration

Tire calibration may be accessed from the Modify pull-down on the Main Screen. Figure 6.4.

Fig. 6.4



The programmed number of millimeters for tire circumference is displayed on the Tire Calibration screen. The allowable range is dependent on the number of teeth on the tone ring. Use the tire manufacturer's recommended tire circumference in millimeters for this value. Enter the correct number of millimeters, and enter the appropriate tone ring number, and press the Write button. Refer to the table below.

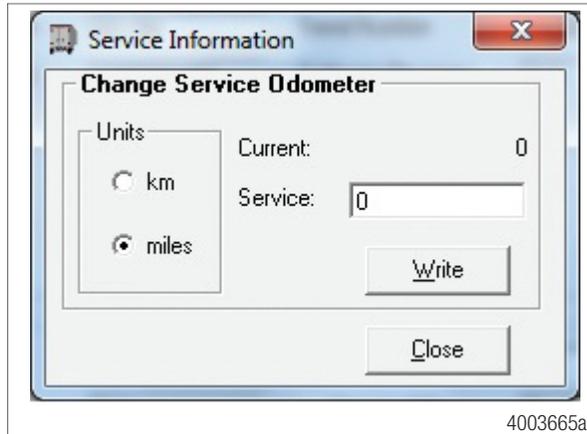
Tone Ring Teeth	Tire Circumference (mm)
80	2048-3072
90	2304-3456
100	2560-3840

Service Information

Service Information may be accessed from the Modify pull-down on the Main Screen.

In the Service Information field, the ECU, working with a constant powered tractor, can act as a mileage counter. This field can also be used to set service intervals. Figure 6.5.

Fig. 6.5



The mileage between scheduled maintenances is displayed on the Service Information screen in km or miles.

When the mileage displayed elapses, the iABS Trailer ABS indicator lamp on the side of the trailer will flash eight times, whenever the ignition switch is turned on until this parameter is changed. Figure 6.5.

Select the appropriate mileage units for the service information service interval by clicking on the appropriate selection.

Click in the Service field and key in the desired service interval. This is the distance to elapse beyond the current mileage displayed when the trailer ABS indicator light should flash and provide notification. Once the desired mileage interval has been input, click on the Write button. Click on the Close button to exit the function. Figure 6.5.

To disable the Service interval feature, change the mileage to 0 and click on the Write button. Click on the Close button to exit the function. Figure 6.5.

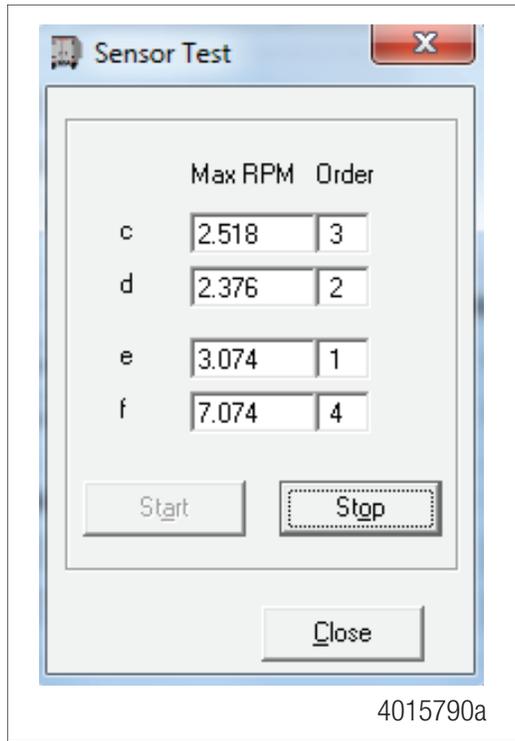
Sensor Test

The sensor test may be accessed from the Component Tests pull-down on the main screen.

The Sensor Test screen is used to determine the correct installation, wiring and functionality of the wheel speed sensors.

The screen display will provide maximum sensor RPM for installed sensors (unused sensor positions will be grayed out). Check the order field to verify sensors are installed in the correct location. Figure 6.6.

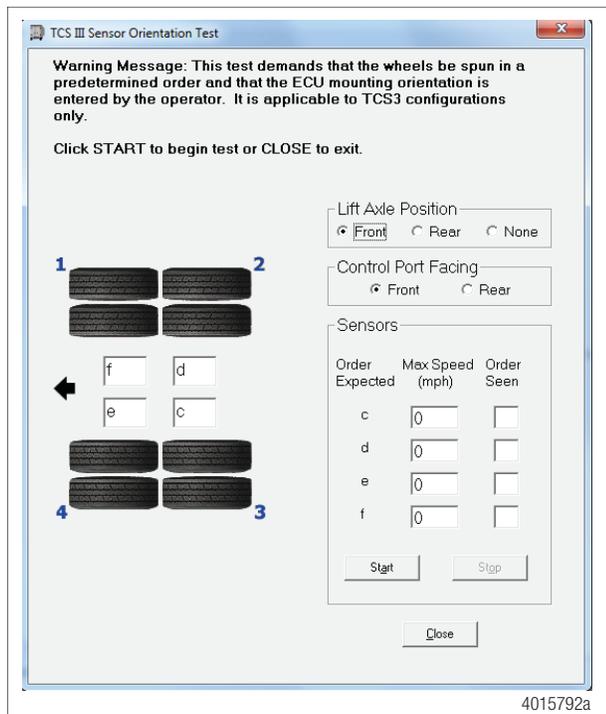
Fig. 6.6



Sensor Orientation Test

The Sensor Orientation Test is used to determine the correct installation, wiring and and confirm if sensors are installed on a lift axle that the correct sensors are used. The screen display will provide the maximum tested sensor RPM for the installed sensors. Visually check the order field to verify that sensors are installed in the correct location. Sensors E and F are always to be placed on the lift axle wheel ends. This prevents the warning lamp from coming on when the lift axle is in the raised position. Figure 6.7.

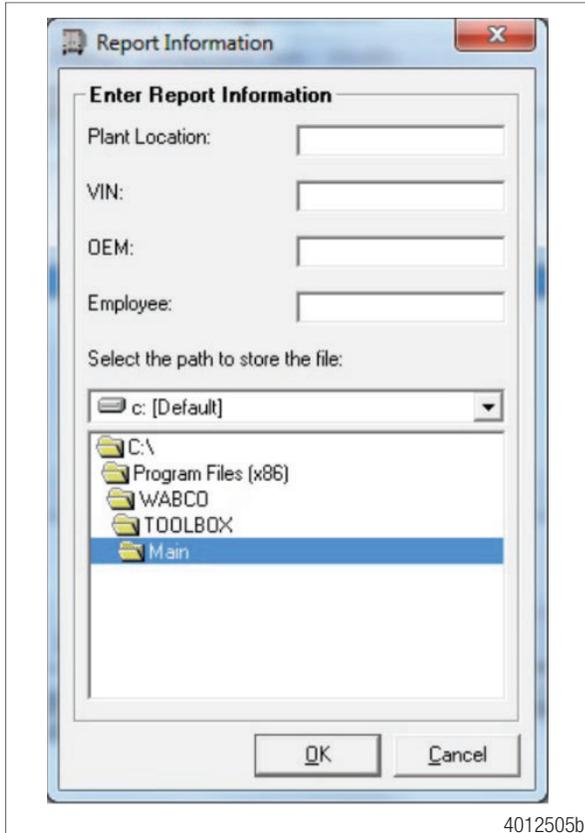
Fig. 6.7



Report Information

The Report Information screen allows the user to store information about a specific vehicle, including the Vehicle Identification Number (VIN) and Employee numbers. Figure 6.8.

Fig. 6.8



An example of a storable (or printable) report is displayed in Figure 6.9.

Fig. 6.9

```

WABCO ABS Fault Report

Date : March 19, 2019
Time : 3:15 PM

Plant Location      : AUB
VIN                : 12345678
Employee Information : KEALY
OEM                : WABCO
ABS System Config  : 4S/2M
ECU Revision       : tabs3-0040
Part Number        : 446-108-444-2
Serial Number      : 005750000222
Date of Manufacture : 06/07/2018
Current Miles      : 0.0
Service Miles      : 0.0

Fault #  Description                               Status  SID  FMI  Count
-----  -
1        wheel sensor c - Current Below Normal      Stored  48   5    1
2        wheel sensor c - Abnormal Rate Of Change    Stored  48  10    1
3        wheel sensor d - Current Below Normal      Stored  64   5    1
4        wheel sensor d - Abnormal Rate Of Change    Stored  64  10    1
5        wheel sensor f - Current Below Normal      Stored  96   5    1

Sensor Test Results: Passed
Sensor Orientation : Facing Front

Sensor              Max RPM              Order
-----              -
d                   2.976                1
c                   1.82                 4
f                   1.962                2
e                   2.049                3

Valve Tests Performed:

Valve              Status (Tested / Not Tested / N/A)
-----              -
H1                 Tested
H2                 Tested
L                  N/A
    
```

4015791a

Save and Print

1. Click on the heading Trailer ECU and click Save. A window will appear asking for the Plant Location, VIN, OEM and Employee number. Refer to Figure 6.8.
2. Provide this information and select where you would like the file saved and then press OK.
3. You can also Print the report by going back into the heading Trailer ECU and select Print. This will bring up the same display where the Plant Location, VIN, OEM and Employee number is entered.
4. Click Print.

6.3 Initial Power-up Check

Whenever the trailer is initially powered up, the ABS light should come on for three seconds and the valves should click during its self-test. If the ABS light comes on again during the same ignition cycle, it would indicate an issue. If the valves do not click during the self-test, power and ground checks need to be performed at the ECU power connector. Also in this case, ensure all cables are seated correctly at the ECU.

6.4 Power and Ground Checks

If the valve is not self-testing (no clicking from the valve), perform the following power and ground checks at the ABS ECU power connector shown in Figure 5.11.

1. Check the power cable connector at the ECU and verify that the lock tab pushed all the way in and the connector is secure.
2. Disconnect the cable from the ECU and check for any signs of moisture, corrosion, spread or damaged pins.
3. Check with the power on voltage from pin 1 (constant power) to chassis ground for 9 to 14 volts.
 - If power shows between 9 to 14 volts, go to step 4.
 - If power is less or more than 9 to 14 volts, check the wiring for damage and review with the OEM.
4. With power on, check voltage from pin 2 (stop light power) to chassis ground with the brake pedal depressed to chassis ground for 9 to 14 volts.
 - If power shows between 9 to 14 volts, go to step 5.
 - If power is less or more than 9 to 14 volts, check wiring for damage and review with the OEM.
5. With power off, check the resistance from pin 4 on the ECU power connector to chassis ground for less than 10 ohm.
 - If the resistance is less than 10 ohm, go to step 6.
 - If the resistance is higher than 10 ohm, check wiring for damage and review with the OEM.
6. With the power on, check constant power circuit. Perform a load lamp test across pins 1 to 4 and verify a bright light.
 - If the light is bright, go to step 8.
 - If the light does not light up brightly, diagnose and review the wiring with the OEM.
7. With the power on, check the stoplight circuit. Perform a load lamp test across pins 2 to 4 with the brakes applied and verify a bright light.
 - If the light is bright, go to step 8.
 - If the light does not light up brightly, diagnose and review the wiring with the OEM.
8. If no problems are found with the harness checks may indicate the ECU/valve assembly has failed.

6.5 Blink Code Diagnostics

The WABCO iABS ECU detects any electrical fault in the trailer ABS. Each of the faults has a code. When a fault occurs, the ECU stores the code for that fault in the memory.

There are two kinds of faults: active and stored. Active faults are those currently existing in the system, such as a broken wire. Stored faults are faults that have occurred but do not presently exist. Active faults can be cleared only after repairs are completed. Stored faults can only be diagnosed with TOOLBOX PLUS™ Software.

The ECU signals a malfunction by lighting the ABS indicator lamp when a fault exists. The ABS indicator lamp is usually mounted on the left rear of the trailer, near the rear wheels.

There is one way to obtain blink codes:

- Ignition Power Activation

Although the ECU can store multiple faults in its memory, it only displays one fault at a time. This is why it is important to recheck the blink codes after repairing a fault. If there are additional codes in the memory, they only blink after you have repaired the first fault.

Stored faults, clear faults and end of line test modes are available with the TOOLBOX PLUS™ Software.

6.5.1 Ignition Power Activation

Ignition Power Activation is the process of using the vehicle's ignition switch (or interrupting the power on the blue wire by some other means) to display blink codes on the trailer ABS indicator lamp located on the side of the trailer. This method is for constant power vehicles only.

To obtain blink codes using ignition power activation, perform the following procedure:

1. Turn the ignition switch on for no longer than 5 seconds. The ABS indicator lamp will be on.
2. Turn the ignition switch off. The ABS indicator lamp will go out.
3. Turn the ignition switch on. The ABS indicator lamp will then come on, then go out.
4. The blink code will be displayed three times by the ABS indicator lamp on the trailer.



For ignition power activation, power is provided by the ignition switch.

Blink Code Table

Blink Code	Problem Area	Action
3	Sensor C	Determine sensor location. Check sensor installation. Perform necessary repairs.
4	Sensor D	Determine sensor location. Check sensor installation. Perform necessary repairs.
5	Sensor E	Determine sensor location. Check sensor installation. Perform necessary repairs.
6	Sensor F	Determine sensor location. Check sensor installation. Perform necessary repairs.
7	External ABS Modulator Valve	Verify correct electrical installation. Check power supply. Perform necessary repairs.
9	Internal ABS Modulator Valve	Verify correct installation. If code continues, contact WABCO Customer Care Center at 855-228-3203 for assistance.
11	No Speed Failure	Spin tires or drive the vehicle above 4 mph.
12	External Pressure Sensor	Internal failure, contact WABCO Customer Care Center at 855-228-3203 for assistance.
14	Power Supply Failure	Verify correct electrical installation. Check power supply. Perform necessary repairs.
15	ECU Internal Failure	Verify correct installation. If code continues, contact WABCO Customer Care Center at 855-228-3203 for assistance.
17	PLC Failure	Internal failure, contact WABCO Customer Care Center at 855-228-3203 for assistance.
18	GIO Failure	Verify correct electrical installation. Check power supply. Perform necessary repairs.
19	Load Sensing Failure	Internal failure, contact WABCO Customer Care Center at 855-228-3203 for assistance.
20	Axle Load Failure	Internal failure, contact WABCO Customer Care Center at 855-228-3203 for assistance.
21	Brake Pad Sensor Failure	Internal failure, contact WABCO Customer Care Center at 855-228-3203 for assistance.

6.5.2 SID/FMI Diagnostic Codes

Diagnostic Table

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
3	3	1	Wheel Speed Sensor C	N/A	Air Gap	Sensor air gap is too large; sensor output voltage is too low but is high enough to be read by ECU.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check condition of ABS sensor head. - Check for loose wheel bearings or excessive hub runout. - Check mounting of ABS tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
3	3	2	Wheel Speed Sensor C	N/A	Wheel Speed Difference	System has detected a significant difference in the proportion of tire diameter to number of tone ring teeth between wheel ends.	<ul style="list-style-type: none"> - Check for tire size mismatch. - Check for correct number of tone ring teeth.
3	3	3	Wheel Speed Sensor C	N/A	Shorted to UBATT	Continuity between the sensor connection and battery voltage (short circuit) is detected.	<ul style="list-style-type: none"> - Verify 900-2000 ohms resistance through sensor circuit. - Verify no DC voltage through sensor cable with key is ON. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.
3	3	4	Wheel Speed Sensor C	N/A	Shorted to Ground	Continuity between the sensor connection and ground (short circuit) is detected.	<ul style="list-style-type: none"> - Verify 900-2000 ohms resistance through sensor circuit. - Check for continuity between the ABS sensor connection and ground. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
3	3	5	Wheel Speed Sensor C	N/A	Open Circuit	An open circuit has been detected, i.e. ECU detects a disconnected wheel speed sensor.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Verify 900-2000 ohms resistance through sensor circuit. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations, replace the suspect sensor.
3	3	6	Wheel Speed Sensor C	N/A	Short Circuit	Continuity interruption between the sensor connections (short circuit) has been detected.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Check for corrosion or discoloration at ECU sensor pins and/or connector. - Visually inspect sensor extension female connector to ensure it is not out of round or spread resulting in intermittent contact with the ECU sensor pins. - Verify 900-2000 ohms resistance through sensor circuit. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations replace the suspect sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
3	3	7	Wheel Speed Sensor C	N/A	Tone Ring Damaged	Wheel speed signal drops out periodically at speeds higher than 6 mph.	<ul style="list-style-type: none"> - Check for damaged or missing teeth on tone ring. - Verify tone ring is not corroded or with contamination. - Check for loose wheel bearings or excessive hub runout. Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. - If the fault code changes locations replace the suspect sensor.
3	3	8	Wheel Speed Sensor C	N/A	Excessive Slip	Wheel slip over 16 seconds continuously has been detected.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check sensor gap. - Check for loose wheel bearings or excessive hub runout.
3	3	9	Wheel Speed Sensor C	N/A	No Speed	A temporary loss of the ABS wheel speed signal has been detected.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
3	3	10	Wheel Speed Sensor C	N/A	Speed Jump Upwards or Downwards	Wheel speed difference.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
3	3	11	Wheel Speed Sensor C	N/A	Abnormal Speed (Chatter)	Brake drag or chatter has been detected. Abnormal vibrations detected which affect sensor signal.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
3	3	12	Wheel speed sensor c	N/A	Bad Intelligent Device or Component	A non-plausible sensor frequency has been measured.	<ul style="list-style-type: none"> - Check sensor wiring and connectors for intermittent contact. - Check if brake at this location is operating correctly, i.e., potentially dragging. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.
3	3	13	Wheel Speed Sensor C	N/A	Wheel Speed Oscillating	Tone ring signal irregular.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - If tone ring and sensor block are not aligned properly oscillation may occur. Small dimensional deviations can result in this failure code. Issue occurs shortly after going into service and after driving. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
4	4	0	Wheel Speed Sensor D	N/A	Data Valid, But Above Normal Operation Range (Most Severe Level)	Implausible high frequencies detected.	<ul style="list-style-type: none"> - Check for possible EM disturbances, that couple into the sensor line.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
4	4	1	Wheel Speed Sensor D	N/A	Air Gap	Sensor air gap is too large; sensor output voltage is too low but is high enough to be read by ECU.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check condition of ABS sensor head. - Check for loose wheel bearings or excessive hub runout. - Check mounting of ABS tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
4	4	2	Wheel Speed Sensor D	N/A	Wheel Speed Difference	System has detected a significant difference in the proportion of tire diameter to number of tone ring teeth between wheel ends.	<ul style="list-style-type: none"> - Check for tire size mismatch. - Check for correct number of tone ring teeth.
4	4	3	Wheel Speed Sensor D	N/A	Shorted to UBATT	Continuity between the sensor connection and battery voltage (short circuit) is detected.	<ul style="list-style-type: none"> - Verify 900-2000 ohms resistance through sensor circuit. - Verify no DC voltage through sensor circuit Key ON. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
4	4	4	Wheel Speed Sensor D	N/A	Shorted to Ground	Continuity between the sensor connection and ground (short circuit) is detected.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Verify 900-2000 ohms resistance through sensor circuit. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations replace the suspect sensor.
4	4	5	Wheel Speed Sensor D	N/A	Open Circuit	An open circuit has been detected, i.e. ECU detects a disconnected wheel speed sensor.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Check for corrosion or discoloration at ECU sensor pins and/or connector. - Visually inspect sensor extension female connector to ensure it is not out of round or spread resulting in intermittent contact with the ECU sensor pins. - Verify 900-2000 ohms resistance through sensor circuit. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations replace the suspect sensor.

Diagnosics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
4	4	6	Wheel Speed Sensor D	N/A	Short Circuit	Continuity interruption between the sensor connections (short circuit) has been detected.	<ul style="list-style-type: none"> - Check for damaged or missing teeth on tone ring. - Verify tone ring is not corroded or with contamination. - Check for loose wheel bearings or excessive hub runout. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations, replace the suspect sensor.
4	4	7	Wheel Speed Sensor D	N/A	Tone Ring Damaged	Wheel speed signal drops out periodically at speeds higher than 6 mph.	<ul style="list-style-type: none"> - Check for damaged or missing teeth on tone ring. - Verify tone ring is not corroded or with contamination. - Check for loose wheel bearings or excessive hub runout.
4	4	8	Wheel Speed Sensor D	N/A	Excessive Slip	Wheel slip over 16 seconds continuously has been detected.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check sensor gap. - Check for loose wheel bearings or excessive hub runout.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
4	4	9	Wheel Speed Sensor D	N/A	No Speed	A temporary loss of the ABS wheel speed signal has been detected.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
4	4	10	Wheel Speed Sensor D	N/A	Speed Jump Upwards or Downwards	Wheel speed difference.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
4	4	11	Wheel Speed Sensor D	N/A	Abnormal Speed (Chatter)	Brake drag or chatter has been detected. Abnormal vibrations detected which affect sensor signal.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
4	4	12	Wheel Speed Sensor D	N/A	Bad Intelligent Device or Component	A non-plausible sensor frequency has been measured.	<ul style="list-style-type: none"> - Check sensor wiring and connectors for intermittent contact. - Check if brake at this location is operating correctly, i.e., potentially dragging. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
4	4	13	Wheel Speed Sensor D	N/A	Wheel Speed Oscillating	Tone ring signal irregular.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - If tone ring and sensor block are not aligned properly oscillation may occur. Small dimensional deviations can result in this failure code. Issue occurs shortly after going into service and after driving. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
5	5	0	Wheel Speed Sensor E	N/A	Data Valid, But Above Normal Operation Range (Most Severe Level)	Implausible high frequencies detected.	<ul style="list-style-type: none"> - Check for possible EM disturbances that couple into the sensor line.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
5	5	1	Wheel Speed Sensor E	N/A	Air Gap	Sensor air gap is too large; sensor output voltage is too low but is high enough to be read by ECU.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check condition of ABS sensor head. - Check for loose wheel bearings or excessive hub runout. - Check mounting of ABS tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
5	5	2	Wheel Speed Sensor E	N/A	Wheel Speed Difference	System has detected a significant difference in the proportion of tire diameter to number of tone ring teeth between wheel ends.	<ul style="list-style-type: none"> - Check for tire size mismatch. - Check for correct number of tone ring teeth.
5	5	3	Wheel Speed Sensor E	N/A	Shorted to UBATT	Continuity between the sensor connection and battery voltage (short circuit) is detected.	<ul style="list-style-type: none"> - Verify 900-2000 ohms resistance through sensor circuit. - Verify no DC voltage through sensor circuit Key ON. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
5	5	4	Wheel Speed Sensor E	N/A	Shorted to Ground	Continuity between the sensor connection and ground (short circuit) is detected.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Verify 900-2000 ohms resistance through sensor circuit. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations replace the suspect sensor.
5	5	5	Wheel Speed Sensor E	N/A	Open Circuit	An open circuit has been detected, i.e. ECU detects a disconnected wheel speed sensor.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Check for corrosion or discoloration at ECU sensor pins and/or connector. - Visually inspect sensor extension female connector to ensure it is not out of round or spread resulting in intermittent contact with the ECU sensor pins. - Verify 900-2000 ohms resistance through sensor circuit. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations replace the suspect sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
5	5	6	Wheel Speed Sensor E	N/A	Short Circuit	Continuity interruption between the sensor connections (short circuit) has been detected.	<ul style="list-style-type: none"> - Check for damaged or missing teeth on tone ring. - Verify tone ring is not corroded or with contamination. - Check for loose wheel bearings or excessive hub runout. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations replace the suspect sensor.
5	5	7	Wheel Speed Sensor E	N/A	Tone Ring Damaged	Wheel speed signal drops out periodically at speeds higher than 6 mph.	<ul style="list-style-type: none"> - Check for damaged or missing teeth on tone ring. - Verify tone ring is not corroded or with contamination. - Check for loose wheel bearings or excessive hub runout.
5	5	8	Wheel Speed Sensor E	N/A	Excessive Slip	Wheel slip over 16 seconds continuously has been detected.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check sensor gap. - Check for loose wheel bearings or excessive hub runout.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
5	5	9	Wheel Speed Sensor E	N/A	No Speed	A temporary loss of the ABS wheel speed signal has been detected.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
5	5	10	Wheel Speed Sensor E	N/A	Speed Jump Upwards or Downwards	Wheel speed difference.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
5	5	11	Wheel Speed Sensor E	N/A	Abnormal Speed (Chatter)	Brake drag or chatter has been detected. Abnormal vibrations detected which affect sensor signal.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
5	5	12	Wheel Speed Sensor E	N/A	Bad Intelligent Device or Component	A non-plausible sensor frequency has been measured.	<ul style="list-style-type: none"> - Check sensor wiring and connectors for intermittent contact. - Check if brake at this location is operating correctly, i.e., potentially dragging. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
5	5	13	Wheel Speed Sensor E	N/A	Wheel Speed Oscillating	Tone ring signal irregular.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - If tone ring and sensor block are not aligned properly oscillation may occur. Small dimensional deviations can result in this failure code. Issue occurs shortly after going into service and after driving. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
5	5	14	Wheel Speed Sensor E	N/A	Special Instructions	Unexpected ECU configuration.	<ul style="list-style-type: none"> - Verify if system is a 4S/2M ECU and only 2 sensors are being used that they are plugged into the YE1 and BU1 ports on the ECU. - Verify no signs of moisture or corrosion at BU2 sensor port. - If a sensor has been installed on BU2 sensor port at some point and is no longer present, reconfigure the ECU using WABCO TOOLBOX PLUS™ diagnostic software.
6	6	0	Wheel Speed Sensor F	N/A	Data Valid, But Above Normal Operation Range (Most Severe Level)	Implausible high frequencies detected.	<ul style="list-style-type: none"> - Check for possible EM disturbances, that couple into the sensor line

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
6	6	1	Wheel Speed Sensor F	N/A	Air Gap	Sensor air gap is too large; sensor output voltage is too low but is high enough to be read by ECU.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check condition of ABS sensor head. - Check for loose wheel bearings or excessive hub runout. - Check mounting of ABS tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
6	6	2	Wheel Speed Sensor F	N/A	Wheel Speed Difference	System has detected a significant difference in the proportion of tire diameter to number of tone ring teeth between wheel ends.	<ul style="list-style-type: none"> - Check for tire size mismatch. - Check for correct number of tone ring teeth.
6	6	3	Wheel Speed Sensor F	N/A	Shorted to UBATT	Continuity between the sensor connection and battery voltage (short circuit) is detected.	<ul style="list-style-type: none"> - Verify 900-2000 ohms resistance through sensor circuit. - Verify no DC voltage through sensor circuit Key ON. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
6	6	4	Wheel Speed Sensor F	N/A	Shorted to Ground	Continuity between the sensor connection and ground (short circuit) is detected.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Verify 900-2000 ohms resistance through sensor circuit. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations replace the suspect sensor.
6	6	5	Wheel Speed Sensor F	N/A	Open Circuit	An open circuit has been detected, i.e. ECU detects a disconnected wheel speed sensor.	<ul style="list-style-type: none"> - Check sensor, sensor cable and connectors to verify no loose or damaged connection. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Check for corrosion or discoloration at ECU sensor pins and/or connector. - Visually inspect sensor extension female connector to ensure it is not out of round or spread resulting in intermittent contact with the ECU sensor pins. - Verify 900-2000 ohms resistance through sensor circuit. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations, replace the suspect sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
6	6	6	Wheel Speed Sensor F	N/A	Short Circuit	Continuity interruption between the sensor connections (short circuit) has been detected.	<ul style="list-style-type: none"> - Check for damaged or missing teeth on tone ring. - Verify tone ring is not corroded or with contamination. - Check for loose wheel bearings or excessive hub runout. - Swap sensor in question with adjacent sensor at the ECU. If the fault code stays in the same location, replace ECU. If the fault code changes locations ,replace the suspect sensor.
6	6	7	Wheel Speed Sensor F	N/A	Tone Ring Damaged	Wheel speed signal drops out periodically at speeds higher than 6 mph.	<ul style="list-style-type: none"> - Check for damaged or missing teeth on tone ring. - Verify tone ring is not corroded or with contamination. - Check for loose wheel bearings or excessive hub runout.
6	6	8	Wheel Speed Sensor F	N/A	Excessive Slip	Wheel slip over 16 seconds continuously has been detected.	<ul style="list-style-type: none"> - Adjust wheel sensor to touch tone ring. - Check sensor gap. - Check for loose wheel bearings or excessive hub runout.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
6	6	9	Wheel Speed Sensor F	N/A	No Speed	A temporary loss of the ABS wheel speed signal has been detected.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
6	6	10	Wheel Speed Sensor F	N/A	Speed Jump Upwards or Downwards	Wheel speed difference.	<ul style="list-style-type: none"> - Adjust wheel speed sensor until it touches the tone ring. - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check condition of ABS sensor head. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip. - Check ABS sensor cable routing and clipping. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
6	6	11	Wheel Speed Sensor F	N/A	Abnormal Speed (Chatter)	Brake drag or chatter has been detected. Abnormal vibrations detected which affect sensor signal.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
6	6	12	Wheel Speed Sensor F	N/A	Bad Intelligent Device or Component	A non-plausible sensor frequency has been measured.	<ul style="list-style-type: none"> - Check sensor wiring and connectors for intermittent contact. - Check if brake at this location is operating correctly, i.e., potentially dragging. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
6	6	13	Wheel Speed Sensor F	N/A	Wheel Speed Oscillating	Tone ring signal irregular.	<ul style="list-style-type: none"> - Check for loose wheel bearings or excessive hub runout. - Check sensor wiring and connectors for intermittent contact. - Check mounting of tone ring and condition of teeth. - If tone ring and sensor block are not aligned properly oscillation may occur. Small dimensional deviations can result in this failure code. Issue occurs shortly after going into service and after driving. - Check condition and retention of ABS sensor spring clip as well as the mounting block. - Check for corroded or damaged wiring between the ECU and the ABS wheel speed sensor. - Turn the wheel at half a revolution per second and verify 0.2 AC volt sensor output voltage.
6	6	14	Wheel Speed Sensor F	N/A	Special Instructions	Unexpected ECU configuration.	<ul style="list-style-type: none"> - Verify if system is a 4S/2M ECU and only 2 sensors are being used that they are plugged into the C and D sensor ports on the ECU. - Verify no signs of moisture or corrosion at E or F sensor port. - If a sensor has been installed on the E or F sensor port at some point and is no longer present, reconfigure the ECU using WABCO TOOLBOX PLUS™ diagnostic software.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
7	7	1	External Modulator Valve	N/A	ABS Relay Valve/ Solenoid Control - EV Load Too Low	Insufficient current consumption. Check if correct ABS relay valve is installed.	<ul style="list-style-type: none"> - Verify an external modulator is installed by checking to see if a cable is plugged in to the external modulator port of the ABS ECU. - Verify if no cable is attached, that the external modulator cap is sealed and there are no signs of moisture or corrosion on the pins of the ABS ECU. - If no external modulator valve is used and all previous checks pass, reconfigure the system to a 2S/2M or 4S/2M system depending on how many sensors are used through the WABCO TOOLBOX PLUS™ Software. - If equipped with an external modulator, verify resistance from the exhaust and inlet valve to ground is between 4 to 8 ohms through the whole circuit. - Verify there is no continuity on any of the pins of the external modulator valve cable to chassis ground.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
7	7	3	External Modulator Valve	N/A	ABS Relay Valve/ Solenoid Control - EV Overvoltage/ Short to Supply Voltage	Cable to ABS relay valve probably has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Verify an external modulator is installed by checking to see if a cable is plugged in to the external modulator port of the ABS ECU. - Verify if no cable is attached, that the external modulator cap is sealed and there are no signs of moisture or corrosion on the pins of the ABS ECU. - If no external modulator valve is used and all previous checks pass, reconfigure the system to a 2S/2M or 4S/2M system depending on how many sensors are used through the WABCO TOOLBOX PLUS™ Software. - If equipped with an external modulator verify resistance from the exhaust and inlet valve to ground is between 4 to 8 ohms through the whole circuit. - Verify there is no voltage on any of the pins of the external modulator valve cable to chassis ground.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
7	7	4	External Modulator Valve	N/A	ABS Relay Valve/ Solenoid Control - EV Under-voltage/ Short Circuit to Ground	Cable to ABS relay valve probably has a short circuit to ground.	<ul style="list-style-type: none"> - Verify an external modulator is installed by checking to see if a cable is plugged in to the external modulator port of the ABS ECU. - Verify if no cable is attached, that the external modulator cap is sealed and there are no signs of moisture or corrosion on the pins of the ABS ECU. - If no external modulator valve is used and all previous checks pass, reconfigure the system to a 2S/2M or 4S/2M system depending on how many sensors are used through the WABCO TOOLBOX PLUS™ Software. - If equipped with an external modulator verify resistance from the exhaust and inlet valve to ground is between 4 to 8 ohms through the whole circuit. - Verify there is no continuity on any of the pins of the external modulator valve cable to chassis ground.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
7	7	5	External Modulator Valve	N/A	ABS Relay Valve/ Solenoid Control - EV Supply Cable Interruption	Probable break in cable to ABS relay valve.	<ul style="list-style-type: none"> - Verify an external modulator is installed by checking to see if a cable is plugged in to the external modulator port of the ABS ECU. - Verify if no cable is attached, that the external modulator cap is sealed and there are no signs of moisture or corrosion on the pins of the ABS ECU. - If no external modulator valve is used and all previous checks pass, reconfigure the system to a 2S/2M or 4S/2M system depending on how many sensors are used through the WABCO TOOLBOX PLUS™ Software. - If equipped with an external modulator, verify resistance from the exhaust and inlet valve to ground is between 4 to 8 ohms through the whole circuit. - Verify there is no continuity on any of the pins of the external modulator valve cable to chassis ground.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
7	7	6	External Modulator Valve	N/A	ABS Relay Valve/ Solenoid Control - EV Current Too High or Circuit Grounded	Cable to ABS relay valve probably has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Verify an external modulator is installed by checking to see if a cable is plugged in to the external modulator port of the ABS ECU. - Verify if no cable is attached, that the external modulator cap is sealed and there are no signs of moisture or corrosion on the pins of the ABS ECU. - If no external modulator valve is used and all previous checks pass, reconfigure the system to a 2S/2M or 4S/2M system depending on how many sensors are used through the WABCO TOOLBOX PLUS™ Software. - If equipped with an external modulator, verify resistance from the exhaust and inlet valve to ground is between 4 to 8 ohms through the whole circuit. - Verify there is no continuity on any of the pins of the external modulator valve cable to chassis ground.
7	7	11	External Modulator Valve	N/A	ABS Relay Valve/FSC Actuator Control Timeout	External modulator error.	<ul style="list-style-type: none"> - Switch off ignition for at least 5s. If failure is no longer present, there may be a problem with the supply voltage. - Execute supply voltage check.
7	7	14	External Modulator Valve	N/A	Special Instructions	An error has occurred on the external modulator or on the ECU.	<ul style="list-style-type: none"> - Switch off the ignition for at least 5 seconds. If the error persists, contact WABCO Customer Care Center at 855-228-3203 for assistance.
9	9	1	Internal Modulator Valve	N/A	H1H2 Trailer Modulator/ Solenoid Valve Control - Load Too Low	Internal modulator error.	<ul style="list-style-type: none"> - Switch off ignition for at least 5s. If failure is no longer present, there may be a contact problem with the supply voltage. - Verify proper power, ground at the main ABS ECU power connector and load test the power and ground circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
9	9	3	Internal Modulator Valve	N/A	H1 Trailer Modulator/ Solenoid Valve Control - Overvoltage/ Short to Supply Voltage	ECU has detected an over voltage/ short to supply voltage condition on the internal H1 modulator.	<ul style="list-style-type: none"> - Verify the ABS ECU power connector is seated properly and has no signs of moisture or corrosion. - Verify proper power, ground at the main ABS ECU power connector and load test the power and ground circuit.
9	9	4	Internal Modulator Valve	N/A	H1 Trailer Modulator/ Solenoid Valve Control - Under-voltage/ Short Circuit to Ground	ECU has detected an undervoltage/ short to ground condition on the internal H1 modulator.	<ul style="list-style-type: none"> - Verify the ABS ECU power connector is seated properly and has no signs of moisture or corrosion. - Verify proper power, ground at the main ABS ECU power connector and load test the power and ground circuit.
9	9	5	Internal Modulator Valve	N/A	H1 Trailer Modulator/ Solenoid Valve Control - Supply Cable Interruption	ECU has detected an open circuit on the internal H1 modulator.	<ul style="list-style-type: none"> - Verify the ABS ECU power connector is seated properly and has no signs of moisture or corrosion. - Verify proper power, ground at the main ABS ECU power connector and load test the power and ground circuit.
9	9	6	Internal Modulator Valve	N/A	H1 Trailer Modulator/ Solenoid Valve Control - Current Too High or Circuit Grounded	ECU has detected a high current/ short to ground condition on the internal H1 modulator.	<ul style="list-style-type: none"> - Verify the ABS ECU power connector is seated properly and has no signs of moisture or corrosion. - Verify proper power, ground at the main ABS ECU power connector and load test the power and ground circuit.
9	9	11	Internal Modulator Valve	N/A	H2 Trailer Modulator/ Solenoid Valve Control - FSC Actuator Control Timeout	Internal modulator error.	<ul style="list-style-type: none"> - Switch off ignition for at least 5s. If failure is no longer present, there may be a contact problem with the supply voltage. - Verify proper power, ground at the main ABS ECU power connector and load test the power and ground circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
9	9	14	Internal Modulator Valve	N/A	Special Instructions	An error has occurred on the internal modulator or on the ECU.	<ul style="list-style-type: none"> - Switch off ignition for at least 5s. If the error persists, check the cable connection to the ABS relay valve and the ABS relay valve itself. If there are no abnormalities, contact WABCO Support.
21	75	3	Brake Pad Wear Sensor	Brake Pad Wear	Brake Pad Wear Sensor - Voltage Above Normal or Shorted High	The wear sensor or the cable between the trailer modulator and the wear sensor is faulty.	<ul style="list-style-type: none"> - The measured values from the wear sensor are above the valid operating range. There is a possible short circuit to supply voltage on the signal line. - Check the cable between modulator and the connected component - Check for tight seat of the connectors - Test the cable. - Check whether moisture has entered into one of the connectors and check the seals for proper fit - If no other fault can be found, replace the connected components.
21	75	12	Brake Pad Wear Sensor	Brake Pad Wear	Brake Pad Wear Sensor - Signal Open/ Line Interrupted	At least one brake lining is worn. Check linings and wear sensors and replace if necessary. It is also possible that the cable is not connected or defective.	<ul style="list-style-type: none"> - At least one brake lining is worn. Check linings and wear sensors, and replace if necessary. - The cable to the wear sensors may also be interrupted or a connector has become loose.
11	109	14	Internal ECU Error	N/A	Memory Bit - Limit of Power on Cycles Expired	Memory bit set. The vehicle has been standing with the ignition on for a long time, or the ignition was frequently turned on and off.	<ul style="list-style-type: none"> - Spin the tires or drive vehicle over 4 mph.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
19	118	3	GIO Component	Axle Load	Axle Load Sensor External (axle c-d) - Overvoltage/ Short to Supply Voltage	The cable to the external axle load sensor (axle c-d) is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connector. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
19	118	4	GIO Component	Axle Load	Axle Load Sensor External (axle c-d) - Under-voltage/ Short Circuit to Ground	The cable to the external axle load sensor (axle c-d) is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
19	118	12	GIO Component	External Supply Pressure Sensor	Axle Load Sensor External (axle c-d) - See Failure Note	The pressure in the support bellows of the air suspension is too low when driving.	<ul style="list-style-type: none"> - The pressure in the air suspension system was below half the parameterised bellows pressure_unladen for at least 5 minutes when driving. Check to see if there is a major leak in the air-suspension system.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
12	144	1	GIO Component	External Supply Pressure Sensor	External Supply Pressure Sensor - Signal Below Normal	Supply pressure on the trailer is below 4.5 bar.	<ul style="list-style-type: none"> - The supply pressure fell below 4.5 bar whilst the vehicle was being driven. - Attention: Spring brake actuators may apply or automatic braking may be triggered: Risk of overheating the wheel brakes. - The fault is stored if the supply pressure has exceeded 5.0 bar before dropping below 4.5 bar again at least once when driving.
12	144	3	GIO Component	External Supply Pressure Sensor	External Supply Pressure Sensor - Signal Overvoltage/ Short to Supply Voltage	The cable to the external supply pressure sensor is defective.	<ul style="list-style-type: none"> - The measured values from the supply pressure sensor in the trailer modulator are above the valid operating range. - There is a possible short circuit to supply voltage on the signal line. - Check the cable between modulator and the connected component. - Test the cable for continuity from end to end.
12	144	4	GIO Component	External Supply Pressure Sensor	External Supply Pressure Sensor - Signal Under-voltage/ Short Circuit to Ground	The cable to the external supply pressure sensor is defective.	<ul style="list-style-type: none"> - The measured values from the supply pressure sensor in the trailer modulator are below the valid operating range. - There is a possible short circuit to ground on the signal line. - Check the cable between modulator and the connected component. - Test the cable for continuity from end to end.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
12	144	6	GIO Component	External Supply Pressure Sensor	External Supply Pressure Sensor - Current Too High or Circuit to Ground	Overload was detected at external supply pressure sensor.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
20	163	13	GIO Component	Axle Load	Axle Load Calibration or Checksum is Faulty	The axle load calibration was not performed correctly.	<ul style="list-style-type: none"> - Redo the axle load calibration.
14	251	1	Power Supply	N/A	Power Supply - Under-voltage	A slight undervoltage has occurred.	<ul style="list-style-type: none"> - The voltage from the towing vehicle is below 8.5 V or the connector pins 1 or 2 of the truck-trailer connection is interrupted. Or the ignition has been switched off and the ECU is within follow-up time.
14	251	2	Power Supply	N/A	Power Supply - 24N Operating	The vehicle was controlled via the stop light supply.	<ul style="list-style-type: none"> - Check the main power supply to the trailer to verify there is power on the constant power pin coming from the towing vehicle. - Check the constant power pin at the ECU power cable connection.
14	251	3	Power Supply	N/A	Power Supply - Overvoltage	Voltage from towing vehicle is too high.	<ul style="list-style-type: none"> - The voltage from the towing vehicle is greater than 16V for 12V system and is greater than 32V for 24V system.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
14	251	4	Power Supply	N/A	Power Supply - Deep Under-voltage	A deep undervoltage has occurred.	<ul style="list-style-type: none"> - The power supply to the trailer modulator is insufficient and/or lies below the normal voltage range. - Check the voltage, with ignition on, at the coupling of the towing vehicle. Load the contacts using 12 V/ 55 W bulbs while measuring. - There must be approx. 12 V between pins 1 and 4. - Check the voltage of the vehicle battery. - Check all the contacts in the trailer socket on the towing vehicle and trailer for signs of corrosion. - Check all contacts in the power plug of the trailer modulator for corrosion. - Check the connection cable between the trailer modulator and the trailer plug connector. - Check the connection cable between the towing vehicle and the trailer. - Perform the power supply test.
14	251	5	Power Supply	N/A	Power Supply - CI15 Interruption When Driving	The cable or socket between towing vehicle and trailer is faulty.	<ul style="list-style-type: none"> - The ground connection between towing vehicle and trailer was interrupted during driving. - Check whether the cable is faulty.
14	251	6	Power Supply	N/A	Power Supply - GIO Overload	Total current consumption of GIO components is too high.	<ul style="list-style-type: none"> - Check the current consumption of each GIO component connected and identify the component(s) which consumes high current. - Disconnect one or more GIO Functions to reduce total current consumption.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
14	251	12	Power Supply	N/A	Power Supply - Under-voltage When Driving	A deep undervoltage has occurred.	<ul style="list-style-type: none"> - Check the cable between modulator and towing vehicle. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the cable and/or connectors.
15	253	2	Internal ECU Error	N/A	Parameter Setting - External Pin Not Compatible	The parameter setting is incorrect. A GIO function is parameterized to an improper pin.	<ul style="list-style-type: none"> - Define the modulator parameters again. If failure is still present, contact WABCO Customer Care Center at 855-228-3203 for assistance.
15	253	12	Internal ECU Error	N/A	Parameter Setting - FSC-AC Configuration Failed	Internal checksum error.	<ul style="list-style-type: none"> - Define the modulator parameters again. If failure is still present, contact WABCO Customer Care Center at 855-228-3203 for assistance.
15	254	3	Internal ECU Error	N/A	Trailer Modulator - (Uvent_g) Voltage Above Normal or Shorted High	Internal error.	<ul style="list-style-type: none"> - Switch ignition off for at least 5s. If the fault exists then, contact WABCO Customer Care Center at 855-228-3203 for assistance.
15	254	4	Internal ECU Error	N/A	Trailer Modulator - (Uvent_g) Under-voltage/ Short Circuit to Ground	Internal error.	<ul style="list-style-type: none"> - Switch ignition off for at least 5s. If the fault exists then, contact WABCO Customer Care Center at 855-228-3203 for assistance.
15	254	11	Internal ECU Error	N/A	GIO Service Indication - Memory Bit Service Signal Set	Memory bit set for service signal.	<ul style="list-style-type: none"> - Please perform defined service activity.
15	254	12	Internal ECU Error	N/A	Trailer Modulator - Err Watchdog	Internal error.	<ul style="list-style-type: none"> - Switch ignition off for at least 5s. If the fault exists then, contact WABCO Customer Care Center at 855-228-3203 for assistance.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
15	254	14	Internal ECU Error	N/A	Trap Handler - Trap Set	Internal checksum error.	- Switch ignition off for at least 5s. If the fault exists then, contact WABCO Customer Care Center at 855-228-3203 for assistance.
18	1264	5	Tire Inflation system	Tire Inflation	Tire Inflation System - Supply Cable Interruption	Possible break in cable to Tire Inflation System	- Check whether load is connected to the output of the Tire Inflation System. - Also check whether the cable is damage and has good continuity end to end. - If any damage or issue is found with the cable, replace it.
18	1440	3	GIO Component	Multiple ITP Functions	Free Configurable Function - (Aln1) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function analoge input 1.	- Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no voltage to ground is present on the GIO Circuit.
18	1440	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (Aln1) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at the freely configurable function analoge input 1.	- Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1441	3	GIO Component	Multiple ITP Functions	Free Configurable Function - (Aln2) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function analoge input 2.	- Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1441	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (Aln2) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at the freely configurable function analoge input 2.	- Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1456	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DIn1) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital input 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1457	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DIn2) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital input 2.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1458	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DIn3) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital input 3.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1459	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DIn4) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital input 4.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1472	3	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut1) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital output 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no voltage to ground is present on the GIO circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1472	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut1) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at the freely configurable function digital output 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1472	5	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut1) Supply Cable Interruption	Nothing is connected at the digital output 1 of the freely configurable function or the cable is defective.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit.
18	1472	6	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut1) Current Too High or Circuit Grounded	Overload was detected at the freely configurable function digital output 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1473	3	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut2) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital output 2.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1473	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut2) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at the freely configurable function digital output 2.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1473	5	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut2) Supply Cable Interruption	Nothing is connected at the digital output 2 of the freely configurable function or the cable is defective.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit.
18	1473	6	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut2) Current Too High or Circuit Grounded	Overload was detected at the freely configurable function digital output 2.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1474	3	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut3) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital output 3.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1474	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut3) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at the freely configurable function digital output 3.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1474	5	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut3) Supply Cable Interruption	Nothing is connected at the digital output 3 of the freely configurable function or the cable is defective.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1474	6	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut3) Current Too High or Circuit Grounded	Overload was detected at the freely configurable function digital output 3.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1475	3	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut4) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at the freely configurable function digital output 4.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1475	4	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut4) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at the freely configurable function digital output 4.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1475	5	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut4) Supply Cable Interruption	Nothing is connected at the digital output 4 of the freely configurable function or the cable is defective.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit.
18	1475	6	GIO Component	Multiple ITP Functions	Free Configurable Function - (DOut4) Current Too High or Circuit Grounded	Overload was detected at the freely configurable function digital output 4.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1568	3	GIO Component	Slider Status	Slider Status - Overvoltage/ Short to Supply Voltage	A short circuit to supply voltage was detected at Slider Status input.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no short to voltage is present on the GIO circuit.
18	1632	1	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage1) Load Too Low	Insufficient current consumption. Check if correct component is installed on GIO1 pin 1.	<ul style="list-style-type: none"> - Check whether the cable to the GIO Powerstage 1 or the connected load is defective. - Check whether the correct cables are used. - Verify connectors are properly seated and have no signs of moisture or corrosion.
18	1632	3	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage1) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at GIO1 pin 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no voltage to ground is present on the GIO circuit.
18	1632	4	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage1) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at GIO1 pin 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1632	5	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage1) Supply Cable Interruption	Cable break detected to load at GIO1 pin 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1632	6	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage1) Current Too High or Circuit Grounded	Overload was detected at GIO1 pin 1.	<ul style="list-style-type: none"> - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check for signs of damage to the cable or connectors. - Verify good continuity for the GIO circuit. - Verify no continuity to ground is present on the GIO circuit.
18	1632	11	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage1) Unkown Load	A component for which there are no parameter settings was detected at GIO1 pin 1.	<ul style="list-style-type: none"> - Check the parameter setting. - Check whether the correct cables are used. - Verify connectors are properly seated and have no signs of moisture or corrosion.
18	1633	11	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage1) Valve Status Ambiguous	A component for which there are no parameter settings was detected at GIO1 pin 1.	<ul style="list-style-type: none"> - Check the parameter setting. - Check whether the correct cables are used. - Verify connectors are properly seated and have no signs of moisture or corrosion.
18	1648	1	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage2) Load Too Low	Insufficient current consumption. Check if correct component is installed on GIO1 pin 4.	<ul style="list-style-type: none"> - Check whether the cable to the GIO Powerstage 2 or the connected load is defective. - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.
18	1648	3	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage2) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at GIO1 pin 4.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: <ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1648	4	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage2) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at GIO1 pin 4.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.
18	1648	5	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage2) Supply Cable Interruption	Cable break detected to load at GIO1 pin 4.	<ul style="list-style-type: none"> - The trailer modulator has detected an interruption on the load to GIO1 pin 4 connection. - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1648	6	GIO Component	Multiple ITP Functions	GIO_ Powerstage - (PwrStage2) Current Too High or Circuit Grounded	Overload was detected at GIO1 pin 4.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1648	11	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage2) Unkown Load	A component for which there are no parameter settings was detected at GIO1 pin 4.	<ul style="list-style-type: none"> - Check the parameter setting. - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.
18	1649	11	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage2) Valve Status Ambiguous	A component for which there are no parameter settings was detected at GIO1 pin 4.	<ul style="list-style-type: none"> - Check the parameter setting. - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.
18	1664	1	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage3) Load Too Low	Insufficient current consumption. Check if correct component is installed on GIO2 pin 1.	<ul style="list-style-type: none"> - Check whether the cable to the GIO Powerstage 3 or the connected load is defective. - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.
18	1664	3	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage3) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at GIO2 pin 1.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1664	4	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage3) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at GIO2 pin 1.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.
18	1664	5	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage3) Supply Cable Interruption	Cable break detected to load at GIO2 pin 1.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1664	6	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage3) Current Too High or Circuit Grounded	Overload was detected at GIO2 pin 1.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: <ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.
18	1664	11	GIO Component	Multiple ITP Functions	GIO Powerstage	Unknown load - A load has been detected on GIO powerstage 3, that is not parameterized.	<ul style="list-style-type: none"> - Check the parameter setting. - Check whether the correct cables are used. - Verify connectors are properly seated and have no signs of moisture or corrosion. - Check the cable between modulator and the connected component. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1665	11	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage3) Unknown Load	A component for which there are no parameter settings was detected at GIO2 pin 1.	<ul style="list-style-type: none"> - Check whether the cable to the GIO Powerstage 3 or the connected load is defective. - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.
18	1680	1	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage4) Load Too Low	Insufficient current consumption. Check if correct component is installed on GIO2 pin 4.	<ul style="list-style-type: none"> - Check whether the cable to the GIO Powerstage 4 or the connected load is defective. - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1680	3	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage4) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at GIO2 pin 4.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector / dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors - Test the cable for continuity from end to end. - Check whether the cable is frayed.
18	1680	4	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage4) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at GIO2 pin 4.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1680	5	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage4) Supply Cable Interruption	Cable break detected to load at GIO2 pin 4.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.
18	1680	6	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage4) Current Too High or Circuit Grounded	Overload was detected at GIO2 pin 4.	<ul style="list-style-type: none"> - Check whether water or moisture has entered into the connector/ dummy cap and check the seals for proper fit. - Check whether a function has been parameterised on this slot in addition; if this is the case, then: - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether the cable is frayed.
18	1680	11	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage4) Unknown Load	A component for which there are no parameter settings was detected at GIO2 pin 4.	<ul style="list-style-type: none"> - Check the parameter setting - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.
18	1681	11	GIO Component	Multiple ITP Functions	GIO_Powerstage - (PwrStage4) Valve Status Ambiguous	A component for which there are no parameter settings was detected at GIO2 pin 4.	<ul style="list-style-type: none"> - Check the parameter setting. - Check whether the correct cables are used. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1760	3	Diagnostic Connector	N/A	Subsystem Power Terminal - (Cl30) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at Subsystems pin 1 (cl.30).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1760	4	Diagnostic Connector	N/A	Subsystem Power Terminal - (Cl30) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at Subsystems pin 1 (cl.30).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1760	6	Diagnostic Connector	N/A	Subsystem Power Terminal - (Cl30) Current Too High or Circuit Grounded	Overload was detected at subsystem pin 1 (cl.30).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1761	3	Diagnostic Connector	N/A	Subsystem Power Terminal - (Cl15) Voltage Above Normal or Shorted High	A short circuit to supply voltage was detected at Subsystems pin 5 (cl.15).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1761	4	Diagnostic Connector	N/A	Subsystem Power Terminal - (Cl15) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at Subsystems pin 5 (cl.15).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1761	6	Diagnostic Connector	N/A	Subsystem Power Terminal - (Cl15) Current Too High or Circuit Grounded	Overload was detected at subsystem pin 5 (cl.15).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1792	3	GIO Component	Lift Axle	Forced Lowering Switch - Voltage Above Normal or Shorted High	The cable to the button for the forced lowering of the lifting axles is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1808	6	Subsystem Connection	Smart Board	Smartboard - Current Too High or Circuit Grounded	Overload was detected at power supply to SmartBoard.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1809	3	Subsystem Connection	Smart Board	Smartboard - Overvoltage/ Short to Supply Voltage	The cable to the SmartBoard has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1809	4	Subsystem Connection	Smart Board	Smartboard - Under-voltage/ Short Circuit to Ground	The cable to the SmartBoard has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1824	3	Subsystem Connection	N/A	Diagnostic Supply - Overvoltage/ Short to Supply Voltage	The cable to the diagnostic socket has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1824	4	Subsystem Connection	N/A	Diagnostic Supply - Under-voltage/ Short Circuit to Ground	The cable to the diagnostic socket has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1824	6	Subsystem Connection	N/A	Diagnostic Supply - Current Too High or Circuit Grounded	Overload was detected at diagnostic power supply.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1840	6	Subsystem Connection	N/A	Telematics - Current Too High or Circuit Grounded	Overload was detected at power supply to Telematics.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1841	3	Subsystem Connection	N/A	Telematics - Overvoltage/ Short to Supply Voltage	The cable to the Telematics has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1841	4	Subsystem Connection	N/A	Telematics - Under-voltage/ Short Circuit to Ground	The cable to the telematics system has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1856	6	GIO Component	IVTM	IVTM - Current Too High or Circuit Grounded	Overload was detected at power supply to IVTM.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	1857	3	GIO Component	IVTM	IVTM - Overvoltage/ Short to Supply Voltage	The cable to the IVTM has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	1857	4	GIO Component	IVTM	IVTM - Under-voltage/ Short Circuit to Ground	The cable to the IVTM has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2016	3	GIO Component	Multiple ITP Functions	Output Speed Signal - Overvoltage/ Short to Supply Voltage	The cable to the component on the speed output has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2016	4	GIO Component	Multiple ITP Functions	Output Speed Signal - Under-voltage/ Short Circuit to Ground	The cable to the component on the speed output has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2016	5	GIO Component	Multiple ITP Functions	Output Speed Signal - Supply Cable Interruption	The cable to the component on the speed output is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2016	6	GIO Component	Multiple ITP Functions	Output Speed Signal - Current Too High or Circuit Grounded	Overload was detected at speed signal output.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2080	3	GIO Component	Multiple ITP Functions	Permanent Power 1 - Overvoltage/ Short to Supply Voltage	The cable to the component on the permanent power output 1 has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2080	4	GIO Component	Multiple ITP Functions	Permanent Power 1 - Under-voltage/ Short Circuit to Ground	The cable to the component on the permanent power output 1 has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2080	5	GIO Component	Multiple ITP Functions	Permanent Power 1 - Supply Cable Interruption	The cable to the component on the permanent power output 1 is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2080	6	GIO Component	Multiple ITP Functions	Permanent Power 1 - Current Too High or Circuit Grounded	Overload was detected at the permanent power output 1.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2096	3	GIO Component	Multiple ITP Functions	Permanent Power 2 - Overvoltage/ Short to Supply Voltage	The cable to the component on the permanent power output 2 has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2096	4	GIO Component	Multiple ITP Functions	Permanent Power 2 - Under-voltage/ Short Circuit to Ground	The cable to the component on the permanent power output 2 has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2096	5	GIO Component	Multiple ITP Functions	Permanent Power 2 - Supply Cable Interruption	The cable to the component on the permanent power output 2 is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2096	6	GIO Component	Multiple ITP Functions	Permanent Power 2 - Current Too High or Circuit Grounded	Overload was detected at the permanent power output 2.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2128	3	GIO Component	Multiple ITP Functions	ABS Active Signal - Overvoltage/ Short to Supply Voltage	The cable to the component on the output "ABS active" has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2128	4	GIO Component	Multiple ITP Functions	ABS Active Signal - Under-voltage/ Short Circuit to Ground	The cable to the component on the output "ABS active" has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2128	5	GIO Component	Multiple ITP Functions	ABS Active Signal - Supply Cable Interruption	The cable to the component on the output "ABS active" is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2128	6	GIO Component	Multiple ITP Functions	ABS Active Signal - Current Too High or Circuit Grounded	Overload was detected at the output "ABS active".	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2192	3	GIO Component	Integrated Speed Switch	Speed Switch 2 - Overvoltage/ Short to Supply Voltage	The cable to the component on the speed switch 2 (ISS 2) has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2192	4	GIO Component	Integrated Speed Switch	Speed Switch 2 - Under-voltage/ Short Circuit to Ground	The cable to the component on the speed switch 2 (ISS 2) has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2192	5	GIO Component	Integrated Speed Switch	Speed Switch 2 - Supply Cable Interruption	The cable to the component on the speed switch 2 (ISS 2) is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2192	6	GIO Component	Integrated Speed Switch	Speed Switch 2 - Current Too High or Circuit Grounded	Overload was detected at the speed switch 2 (ISS 2).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2208	3	GIO Component	Integrated Speed Switch	Speed Switch 1 - Overvoltage/ Short to Supply Voltage	The cable to the component on the speed switch 1 (ISS 1) has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2208	4	GIO Component	Integrated Speed Switch	Speed Switch 1 - Under-voltage/ Short Circuit to Ground	The cable to the component on the speed switch 1 (ISS 1) has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2208	5	GIO Component	Integrated Speed Switch	Speed Switch 1 - Supply Cable Interruption	The cable to the component on the speed switch 1 (ISS 1) is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2208	6	GIO Component	Inte-grated Speed Switch	Speed Switch 1 - Current Too High or Circuit Grounded	Overload was detected at the speed switch 1 (ISS 1).	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2256	3	GIO Component	Lift Axle	Lifting Axle Valve 2 - Overvoltage/ Short to Supply Voltage	The cable to lifting axle valve 2 has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2256	4	GIO Component	Lift Axle	Lifting Axle Valve 2 - Under-voltage/ Short Circuit to Ground	The cable to the lifting axle valve 2 has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2256	5	GIO Component	Lift Axle	Lifting Axle Valve 2 - Supply Cable Interruption	The cable to the lifting axle valve 2 is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2256	6	GIO Component	Lift Axle	Lifting Axle Valve 2 - Current Too High or Circuit Grounded	Overload was detected at the lifting axle valve 2.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2272	3	GIO Component	Lift Axle	Lifting Axle Valve 1 - Overvoltage/ Short to Supply Voltage	The cable to lifting axle valve 1 has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2272	4	GIO Component	Lift Axle	Lifting Axle Valve 1 - Under-voltage/ Short Circuit to Ground	The cable to the lifting axle valve 1 has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2272	5	GIO Component	Lift Axle	Lifting Axle Valve 1 - Supply Cable Interruption	The cable to the lifting axle valve 1 is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2272	6	GIO Component	Lift Axle	Lifting Axle Valve 1 - Current Too High or Circuit Grounded	Overload was detected at the lifting axle valve 1.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2352	3	GIO Component	Lift Axle	Lifting Axle Status Lamp - Overvoltage/ Short to Supply Voltage	The cable to lifting axle status lamp has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2352	4	GIO Component	Lift Axle	Lifting Axle Status Lamp - Under-voltage/ Short Circuit to Ground	The cable to the lifting axle status lamp has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2352	5	GIO Component	Lift Axle	Lifting Axle Status Lamp - Supply Cable Interruption	The cable to the lifting axle status lamp is not connected or is defective.	<ul style="list-style-type: none"> - Check the cable to the status lamp and the lamp for interruption. - Test the cable for continuity from end to end. - If no other fault can be found, replace the defective component.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2352	6	GIO Component	Lift Axle	Lifting Axle Status Lamp - Current Too High or Circuit Grounded	Overload was detected at the lifting axle status lamp.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2384	4	GIO Component		Backup Light Detection - Under-voltage/ Short Circuit to Ground	The cable to the backup light detection has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2672	3	GIO Component	Steering Axle Lock	Steering Axle Lock Valve - Overvoltage/ Short to Supply Voltage	The cable for the steering axle lock has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2672	4	GIO Component	Steering Axle Lock	Steering Axle Lock Valve - Under-voltage/ Short Circuit to Ground	The cable for the steering axle lock has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2672	5	GIO Component	Steering Axle Lock	Steering Axle Lock Valve - Supply Cable Interruption	The cable for the steering axle lock function is not connected or cable is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2672	6	GIO Component	Steering Axle Lock	Steering Axle Lock Valve - Current Too High or Circuit Grounded	Overload was detected at the steering axle lock valve.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2688	3	GIO Component	Steering Axle Lock	Steering Axle Lock Switch - Overvoltage/ Short to Supply Voltage	The cable for the steering axle lock switch has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2688	12	GIO Component	Steering Axle Lock	Steering Axle Lock Switch - Switch Open	Check the cable for the steering axle lock switch. It may be that the wrong cable was installed or that it is defective.	<ul style="list-style-type: none"> - Plus-switch was parameterised for the function. A special resistance cable is required for this (see diagram). - Check the following points: - Check whether the correct cable was used. - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	2752	2	Subsystem Connection	ELEX	ELEX - Communication Aborted	Communication to the Electronic Extension Module is aborted.	<ul style="list-style-type: none"> - Check cable connection to Electronic Extension Module.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2752	3	Subsystem Connection	ELEX	ELEX Supply - (CL30) Overvoltage/ Short to Supply Voltage	A short circuit to supply voltage was detected at subsystem pin 1 (cl.30) for the Electronic Extension Module.	<ul style="list-style-type: none"> - Check the cable between modulator and the ELEX. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - Please open the fault memory dialogue ELEX and follow the error information there. Contact WABCO customer service for further help. - If no other fault can be found, replace the connected components.
18	2752	4	Subsystem Connection	ELEX	ELEX Supply - (CL30) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at subsystem pin 1 (cl.30) for the Electronic Extension Module.	<ul style="list-style-type: none"> - Check the cable between modulator and the ELEX. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - Please open the fault memory dialogue ELEX and follow the error information there. Contact WABCO customer service for further help. - If no other fault can be found, replace the connected components.

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2752	6	Subsystem Connection	ELEX	ELEX Supply - (CL30) Current Too High or Circuit Grounded	Overload was detected at subsystem pin 1 (cl.30) for the Electronic Extension Module.	<ul style="list-style-type: none"> - Check the cable between modulator and the ELEX. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed . - Please open the fault memory dialogue ELEX and follow the error information there. Contact WABCO customer service for further help. - If no other fault can be found, replace the connected components.
18	2752	11	Subsystem Connection	ELEX	ELEX - Internal Failure	See diagnostic memory of the Electronic Extension Module.	<ul style="list-style-type: none"> - Please open the fault memory dialogue ELEX and follow the error information there. - Contact WABCO customer service for further help.
18	2752	12	Subsystem Connection	ELEX	ELEX - Pin Configuration Not Available	A pin is not available in the Electronic Extension Module or there is a communication fault to the Electronic Extension Module.	<ul style="list-style-type: none"> - Possible the Electronic Extension Module is not connected or the cable to the Electronic Extension Module is defective. - Other faults with the identical operating hour may occur with this fault.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2753	3	Subsystem Connection	ELEX	ELEX Supply - (CL15) Overvoltage/ Short to Supply Voltage	A short circuit to supply voltage was detected at subsystem pin 5 (cl.15) for the Electronic Extension Module.	<ul style="list-style-type: none"> - Check the cable between modulator and the ELEX. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - Please open the fault memory dialogue ELEX and follow the error information there. Contact WABCO Customer Care Center at 855-228-3203 for assistance. - If no other fault can be found, replace the connected components.
18	2753	4	Subsystem Connection	ELEX	ELEX Supply - (CL15) Under-voltage/ Short Circuit to Ground	A short circuit to ground was detected at subsystem pin 5 (cl.15) for the Electronic Extension Module.	<ul style="list-style-type: none"> - Check the cable between modulator and the ELEX. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - Please open the fault memory dialogue ELEX and follow the error information there. Contact WABCO Customer Care Center at 855-228-3203 for assistance. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	2753	6	Subsystem Connection	ELEX	ELEX Supply - (CL15) Current Too High or Circuit Grounded	Overload was detected at subsystem pin 5 (cl.15) for the Electronic Extension Module.	<ul style="list-style-type: none"> - Check the cable between modulator and the ELEX. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - Please open the fault memory dialogue ELEX and follow the error information there. Contact WABCO Customer Care Center at 855-228-3203 for assistance. - If no other fault can be found, replace the connected components.
18	3392	3	GIO Component	Lift Axle	Lift Axle Off Switch 1 - Voltage Above Normal or Shorted High	The cable for the switch Lifting axle 1 off or Lifting 2 off has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	3393	3	GIO Component	Lift Axle	Lift Axle Off Switch 2 - Voltage Above Normal or Shorted High	The cable for the switch Lifting axle 1 off or Lifting 2 off has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	3712	3	GIO Component	Working Light	Working Light - Overvoltage/ Short to Supply Voltage	The cable for the working light has a short circuit to supply voltage.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	3712	4	GIO Component	Working Light	Working Light - Under-voltage/ Short Circuit to Ground	The cable for the working light has a short circuit to ground.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.

Diagnostics

Blink Code	SPN	FMI	Suspect Component and Location	ITP Function	Fault Description (FMI)	Cause	Repair Information
18	3712	5	GIO Component	Working Light	Working Light - Supply Cable Interruption	The cable for the working light is not connected or cable is defective.	<ul style="list-style-type: none"> - Check the cable between modulator and the connected component. - Check for tight seat of the connectors. - Test the cable for continuity from end to end. - Check whether water or moisture has entered into one of the connectors and check the seals for proper fit. - Check whether the cable is frayed. - If no other fault can be found, replace the connected components.
18	4050	14	GIO Component	N/A	Special Instructions	ECU reset is needed.	<ul style="list-style-type: none"> - Switch ignition off for at least 5s.

7 Component Replacement

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.

WARNING

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

WARNING

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 can result.

WARNING

The 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



Disconnect power from the ECU/Valve Assembly before you remove any components. Failure to disconnect power from the ECU can cause faults to be recorded and stored in ECU memory.

CAUTION

When welding on an ABS-equipped vehicle is necessary, disconnect the power connector from the ECU to avoid damage to the electrical system and ABS components.

CAUTION

High voltages can damage the electronic control unit (ECU). Disconnect all connectors from the ECU before you perform any welding, electrostatic painting, or any other activity that applies high voltage to the vehicle frame. Install blind plugs into the ECU to protect the connector openings. Ground the welding or painting equipment to the part you are working on. If you are working on a moving or insulated component such as an axle, make sure it is correctly grounded through the frame. Refer to the equipment manufacturer's recommended instructions for correct procedures.

7.1 Wheel Speed Sensor

7.1.1 How to Remove a Sensor

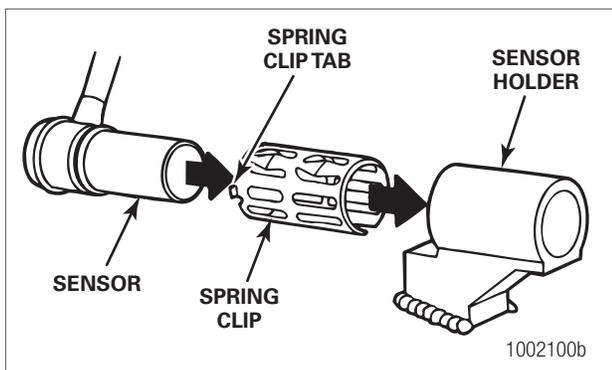
1. Follow the trailer manufacturer's instructions to back off the slack adjuster and remove the tire, wheel and drum.
2. Hold the sensor, not the cable, and use a twisting motion to pull the sensor out of its mounting block.
3. Remove the spring clip from the mounting block.
4. Remove any fasteners that hold the sensor cable to other components.
5. Disconnect the sensor cable from the extension cable.

7.1.2 How to Install a Sensor

Sensor locations vary according to suspension types. Typically, a spring suspension has sensors on the forward axle, and an air suspension has sensors on the rear axle.

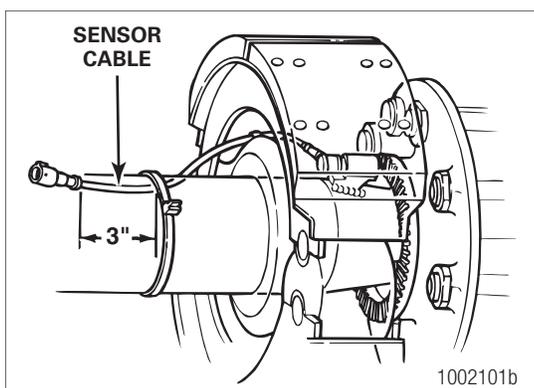
1. Apply a mineral oil-based grease that contains molydisulfide to the sensor spring clip and to the body of the sensor. The grease must be anti-corrosive and contain adhesive properties that will continuously endure temperatures from -40° to 300°F (-40° to 150°C). The use of non-approved lubricants is at your own risk. Please note that non-approved lubricants can reduce the performance of the parts or lead to damage of the product that may not be covered under warranty.
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. Figure 7.1.

Fig. 7.1



3. Route the sensor cable toward the brake chamber, over the brake spider, and behind 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 3 inches from the molded sensor plug. Figure 7.2.

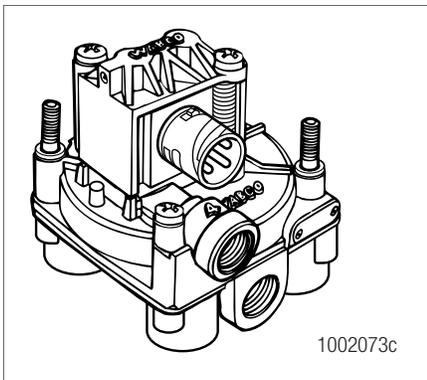
Fig. 7.2



4. Install the wheel hub carefully, so that the sensor pushes against the tooth wheel as you adjust the wheel bearings. After installation there should be no gap between the sensor and the tooth wheel. During normal operation a gap of 0.040-inch is allowable. If the gap is too large, this can cause the ECU to log a fault code.
5. **Sensor Output Voltage Test:** Use a volt/ohm meter to check the AC output voltage of the sensors while rotating the wheel at approximately one-half revolution per second. Minimum output must be 0.2 volts AC, though if the wheel is spun faster than 1/2 of a revolution per second, the reading will likely be higher. It is important to spin the wheel at the correct speed to determine the output is in fact correct. If minimum output is less than 0.2 volts AC, push the sensor toward the tooth wheel. Recheck the sensor output.

7.2 ABS Relay Valve (Figure 7.3)

Fig. 7.3



DANGER

Release all pressure from the air system before you disconnect any components. Pressurized air can cause serious personal injury.

7.2.1 How to Remove a Standard ABS Relay Valve

1. Release all pressure from the air system.
2. Disconnect the cable from the valve.
3. Attach labels to identify all of the air lines.
4. Disconnect the air lines from the valve.
5. Remove the mounting fasteners if the valve is not nipple-mounted directly to the air tank.
6. Remove the valve.

7.2.2 How to Install a Standard ABS Relay Valve

⚠ DANGER

You must use Schedule 80 pipe nipple (3/4-inch NPTF) to nipple-mount the ABS relay valve securely to the reinforced air tank to avoid possible serious personal injury and damage to components when tank mounting the ECU valve.

1. Install the valve with two lock nuts and washers as required. Tighten the hex nuts to a torque of 18 lb-ft (24 N·m) or nipple-mount the valve directly to the air tank with Schedule 80 pipe nipple (3/4-inch NPTF).
2. Connect the air lines to the ports according to the labels installed when the air lines were disconnected.
3. Connect the cable to the valve.
4. Pressurize the brake system. Apply the brakes and verify there are no air leaks.

7.3 ECU/Valve Assembly

⚠ DANGER

Release all pressure from the air system before you disconnect any components. Pressurized air can cause serious personal injury.

Fig. 7.4

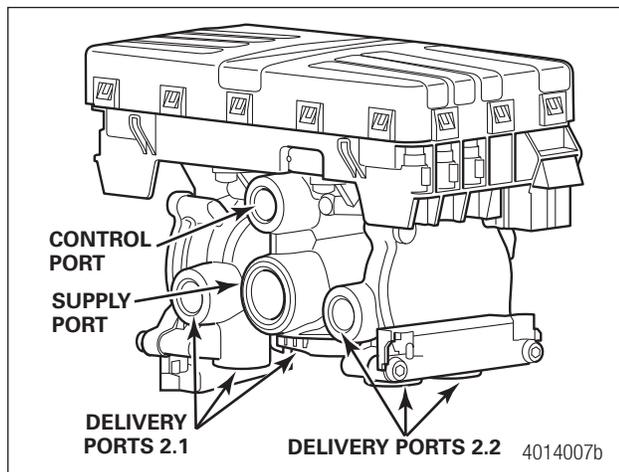
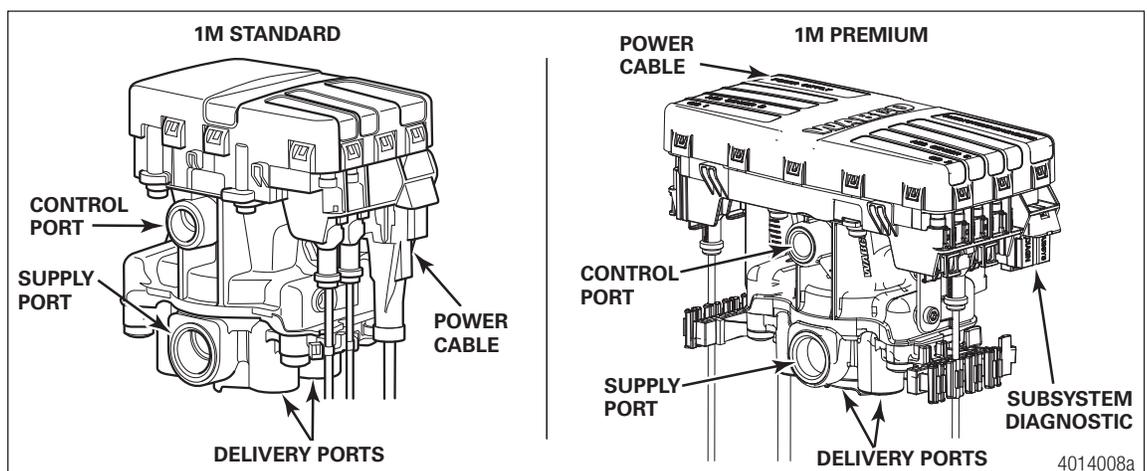


Fig. 7.5



Component Replacement

7.3.1 How to Remove the ECU/Valve Assembly

1. Release all pressure from the air system.
2. Attach labels to identify all air lines.
3. Disconnect the air lines from the ECU/Valve Assembly.
4. Disconnect the power cable, additional relay valve cable (if used), and all sensor cables from the ECU/Valve Assembly.
5. Remove the ECU/Valve Assembly from its mounting location:
 - A. **Bracket-mounted:** Loosen and remove the two mounting bolts and lock nuts that hold the assembly to the cross member. Remove the assembly.
 - B. **Nipple-mounted to Air Tank:** Unscrew the assembly from the air tank.
6. If the assembly being replaced is under warranty, please return it to the trailer OEM for replacement.

7.3.2 How to Install the ECU/Valve Assembly

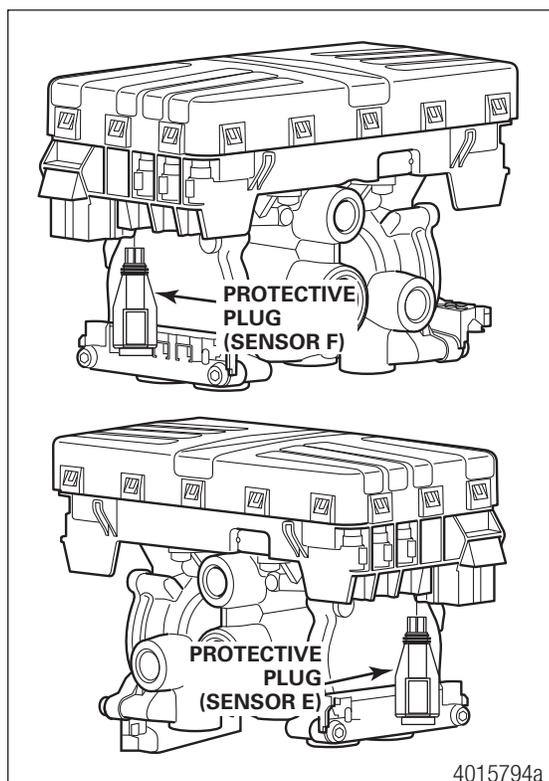


The ECU/Valve Assembly is supplied with black protective plugs only with the 2M valves in sensor ports E and F.



When a sensor cable is not plugged into a sensor connector, the black plug must remain on the connector to protect it from dirt and contamination. Figure 7.6.

Fig. 7.6



⚠ DANGER

You must use Schedule 80 pipe nipple (3/4-inch NPT) to nipple mount the ECU/Valve Assembly securely to the air tank to avoid possible serious personal injury and damage to components.

7.3.2.1 Tank-Mounted

⚠ DANGER

You must use Schedule 80 pipe nipple (3/4-inch NPT) to mount the ECU/single modulator valve securely to the air tank to avoid possible serious personal injury and damage to the components.

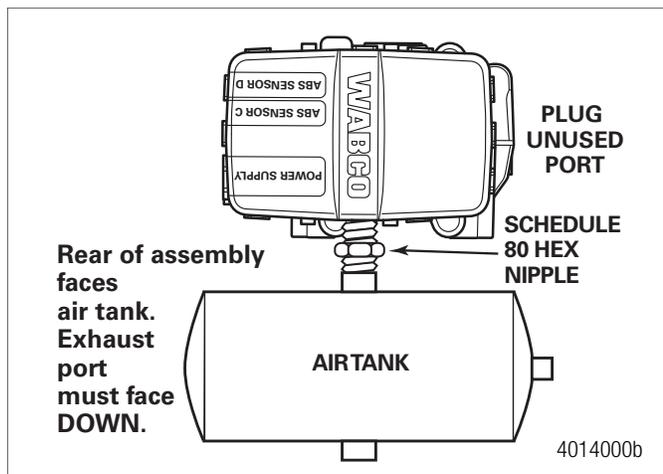
1. Use a 3/4-inch Schedule 80 hex nipple to attach ECU/single modulator valve assembly to a reinforced air tank. Do not overtighten.



WABCO does not recommend 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 pipe plug to plug unused supply port (Port 1). Apply SAE-standard, DOT-approved 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 extension at the 3/4-inch pipe plug installed on the front supply port (Port 1). Figure 7.7.

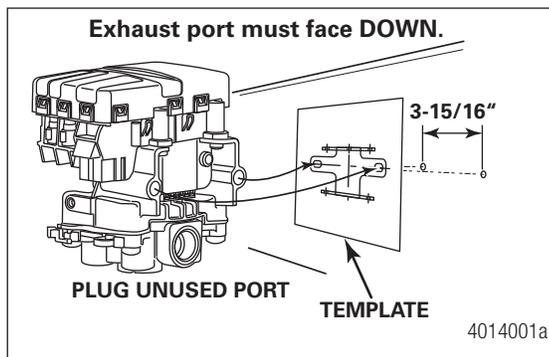
Fig. 7.7



7.3.2.2 Bracket-Mounted to Cross Member of Vehicle (2S/1M Standard)

1. Install a 3/4-inch NPT fitting in supply port (Port 1). Use a 3/4-inch pipe plug to plug unused supply port (Port 1).
 - Use a 3/4-inch pipe plug to plug unused supply port (Port 1). Apply SAE-standard, DOT-approved sealing paste to either the first few threads or over the whole length. Pipes with pre-applied thread sealant may also be used.
 2. Locate a position for mounting the assembly to the vehicle cross member midway between the side rails, close to the brake chambers the valve serves.
 - Drill two 3/8-inch mounting holes. The distance between the two holes (O.D.) must be 3-25/32-inches (96 mm) and mount directly to the cross member.
- OR
- Build a mounting bracket with two 3/8-inch mounting holes spaced 3-25/32-inches (96 mm) O.D. apart.
3. Use two 3/8-inch Grade 8 bolts with prevailing torque nuts and washers to attach assembly to the vehicle cross member. Tighten bolts to 20 lb-ft (27 N•m). Figure 7.8.

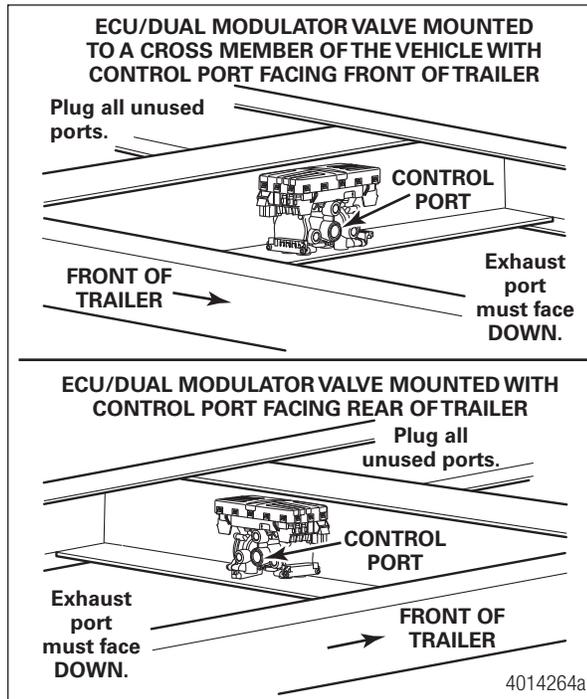
Fig. 7.8



7.3.2.3 Mounted to Cross Member of Vehicle — 2S/2M, 4S/3M Standard and Premium Mounting Bracket Not Supplied

1. Install a 3/4-inch NPT fitting in supply port. Use a 3/4-inch pipe plug to plug unused supply port (Port 1). Figure 7.9.
 - Apply SAE-standard, DOT-approved sealing paste to either the first few threads or over the whole length. Pipes with pre-applied thread sealant may also be used.

Fig. 7.9



2. Locate a position for mounting the assembly to the vehicle cross member midway between the side rails, close to the brake chambers the valve serves.
 - Drill two 3/8-inch mounting holes. The distance between the two holes (O.D.) must be 3-13/16-inches (97.2 mm) and mount directly to the cross member.

OR

- Build a mounting bracket with two 3/8-inch mounting holes spaced 3-13/16-inches (97.2 mm) O.D. apart.
3. Connect the air lines to the ports. Follow the label markers installed when the air lines were disconnected.
4. Connect the sensor cables, external relay valve cable (if used), and power cable to the ECU/Valve Assembly. Use the black protective connector caps included with the replacement assembly to cover unused cable connections.
5. Perform End of Line Check before returning the trailer to service.

8 Sensor Adjustment and Component Testing

8.1 How to Test Wheel Speed Sensors



At initial installation, no gap must exist between the sensor and the tooth wheel. Otherwise the sensor may not read wheel speed, and the ABS ECU may set a fault code.



After you install a hub, always check that the sensor is adjusted correctly.

Operating the trailer can cause a gap to develop between the sensor and the tooth wheel. If the gap exceeds 0.040-inch, the system may not function correctly.

To adjust the sensor, twist and push the sensor through the sensor bracket as far as possible or until the sensor touches the tooth wheel.

8.1.1 Sensor Test Procedure

1. Disconnect power to the ECU/Valve Assembly.
2. Disconnect the sensor electrical connector from the ECU/Valve Assembly.
3. Connect the volt/ohm meter leads to the two wire component terminals inside the disconnected connector.
4. When checking the resistance, the meter must read 900-2000 ohms.
5. Check and replace the sensor and cables as required.
6. Repeat Steps 1-5 for each sensor in the system.

8.1.2 Sensor Output Voltage Test

1. Disconnect power from the ECU/Valve Assembly.
2. Connect the AC volt/ohm meter leads to the sensor terminals inside the connector.
3. Rotate the corresponding wheel at a constant speed of one-half revolution per second.
4. The output voltage must be greater than 0.2 volts AC.
5. When there is no reading:
 - A. Trace the cable to verify that the cable connects to the wheel you turned.
 - B. Check that you turned the correct wheel.
 - C. Check that the system is wired correctly.
 - D. Check that the sensor touches the tooth wheel.
6. If the volt/ohm meter still indicates no reading or a low reading after following the above procedures, check and replace the component and cables as required.
7. Repeat Steps 1-5 for each sensor in the system.

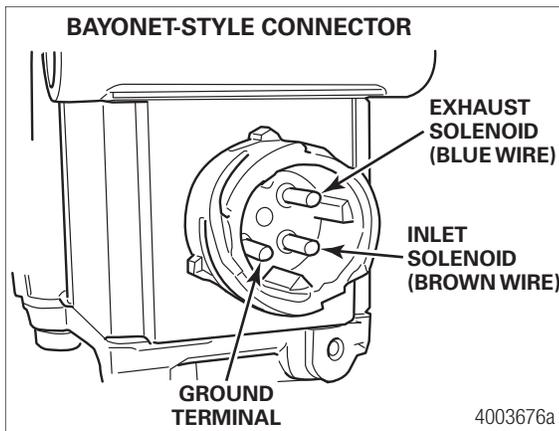
8.2 Check ABS Functions

- WABCO recommends that you test a vehicle's ABS after a new installation and after you diagnose, repair and erase faults in the ABS.
- Perform end of line check using TOOLBOX PLUS™ Software.

8.3 ABS External Modulator Valve

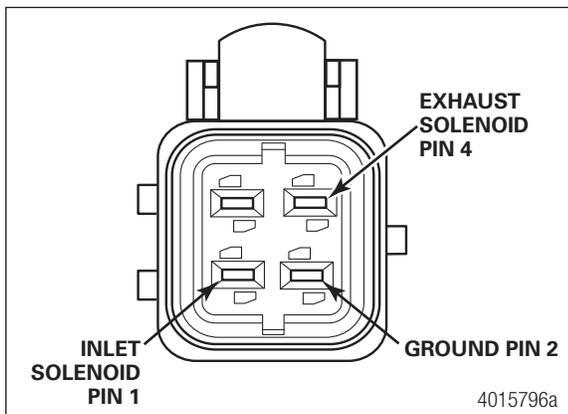
Measure resistance across each valve solenoid coil terminal and ground on the ABS valve to ensure 4.0 to 8.0 ohms. Valve and cable pinouts are illustrated in Figure 8.1.

Fig. 8.1



- To check the cable and the ABS valve as one unit, measure resistance across pins 1 and 2 and 2 and 3 on the ECU connector of the harness. Resistance should be between 4.0 and 8.0 ohms for each measurement. Figure 8.2.

Fig. 8.2



- If the resistance is greater than 8.0 ohms, clean the electrical contacts. Check the resistance again.

8.4 End of Line Testing

End of line testing is required on all iABS installations. To run these tests, WABCO recommends you use TOOLBOX PLUS™ Software.

TOOLBOX PLUS™ Software and general test procedures are included in this manual.

8.4.1 End of Line Testing Procedure Using TOOLBOX PLUS™ Software (All Installations)

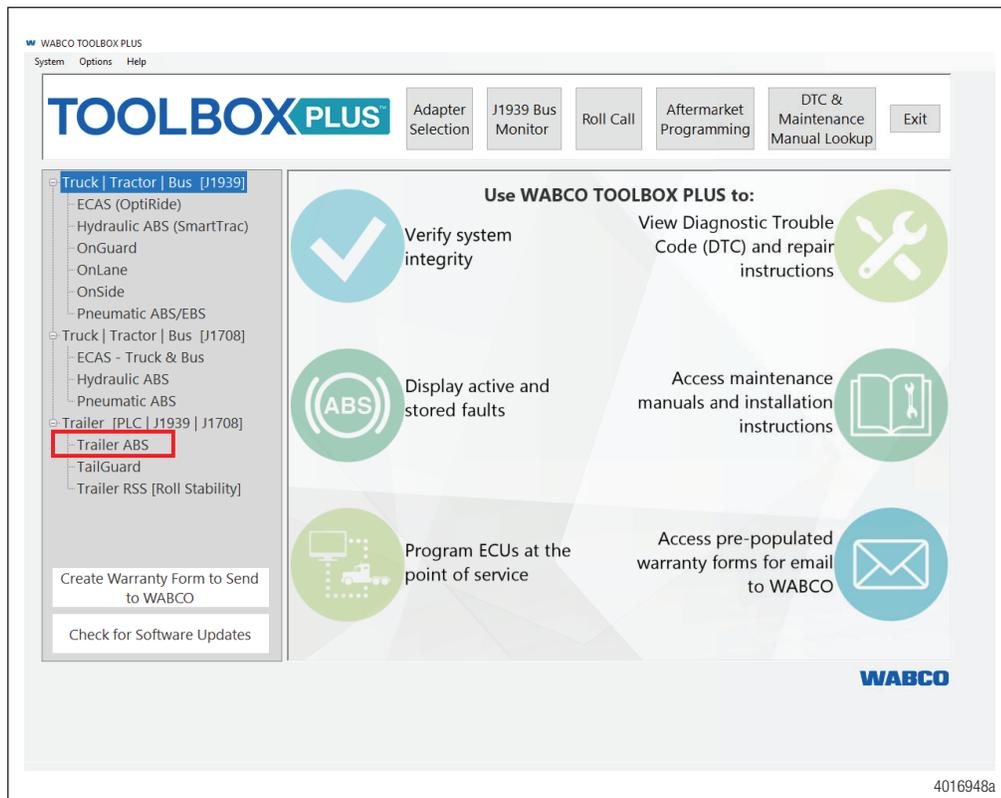
1. Connect the PLC diagnostic adapter to the J560 adapter and the USB cable to the computer with the WABCO TOOLBOX PLUS™ Software.



Refer to the MM19047 User Guide, for instructions for running TOOLBOX PLUS™ Software. The manual can be found at www.wabco-na.com in the literature section.

2. Open the i-ABS Diagnostics from the TOOLBOX PLUS™ Main Screen. Figure 8.3.

Fig. 8.3

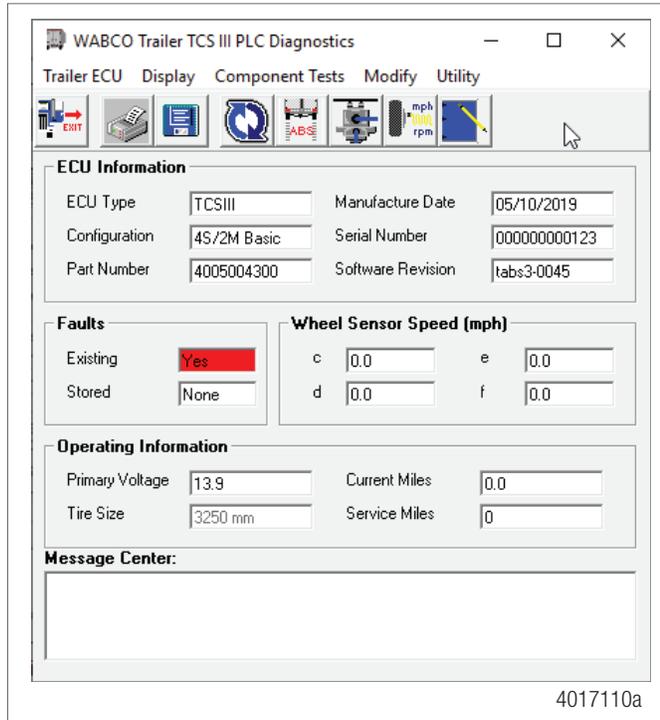


Sensor Adjustment and Component Testing

3. Verify power supply:

- Apply 12 (9.5 to 14 is acceptable) volts DC to the blue wire (constant power). Check the screen for the correct voltage it is displayed in the Primary Voltage field. Figure 8.4.

Fig. 8.4

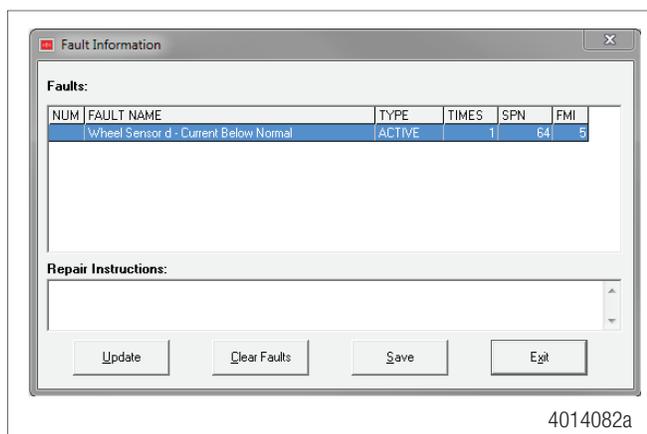


4. Check the Faults field on the Main Screen:

- 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 make the necessary repairs. Figure 8.5.

Fig. 8.5



8.4.2 Verify Correct Valve and Lamp Installation (2S/1M Standard)

To verify valve and lamp installations with TOOLBOX PLUS™ Software:

1. At the Trailer Main Screen click on **Component Test**, then select **Valves/Lamp** to display the Valve Activation Screen. Figure 8.6.

Sensor Adjustment and Component Testing

Fig. 8.6



2. The H1 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 multiple 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.

8.4.3 2S/2M, 4S/2M, 4S/3M (Standard and Premium)

To verify valve and lamp installations with TOOLBOX™ Software:

1. Apply 12 volts DC to the ABS.
2. Apply air to the emergency line to fill the air tanks and release the spring brakes.
3. Apply air to the control line.

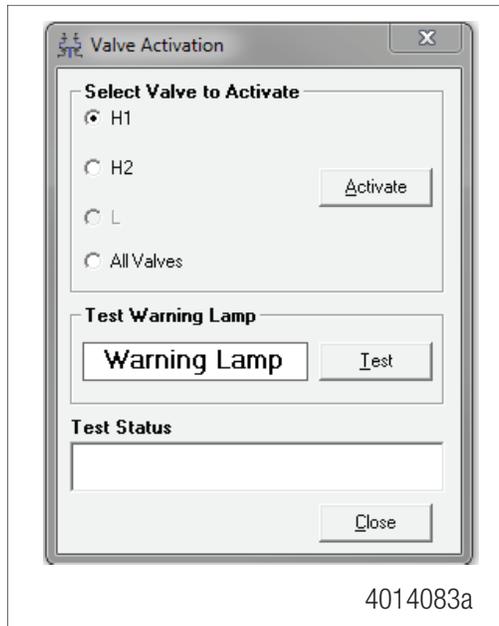
Sensor Adjustment and Component Testing

4. At the Trailer Main Screen click on **Component Test**, then select **Valves/Lamp** to display the Valve Activation Screen. The H1 valve indicator will be highlighted. Figure 8.7.



Selecting "All Valves" will sequence all of the valves beginning with the H1 valve.

Fig. 8.7



5. Click on the **Activate** button.
6. Check for correct air line installation. To do this, observe the slack adjusters:
 - If the control port faces **the front of the trailer**, the slack adjusters will move in and out as the **curbside** portion of the dual modulator valve cycles. If this does not happen, the air lines are not correctly connected. Make the necessary repairs.
 - If the control port faces **the rear of the trailer**, the slack adjusters will move in and out as the **roadside** portion of the dual modulator valve cycles. If this does not happen, the air lines are not correctly connected. Make the necessary repairs.



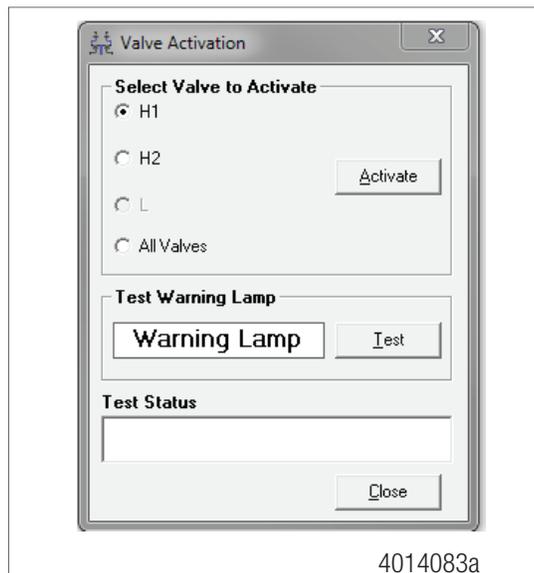
The Test Status box at the bottom of the menu will display the status of this test.

7. Repeat this test for the H2 valve.
 - A. Repeat Steps 1-4.
 - B. Select the H2 valve from the valve activation screen.
 - C. Click on the activate button to verify correct valve installation (H2).
 - D. Check for correct air line installation. To do this, observe the slack adjusters.
 - If the control port faces **the front of the trailer**, the slack adjusters will move in and out as the **roadside** portion of the dual modulator valve cycles. If this does not happen, the air lines are not correctly connected. Make the necessary repairs.

Sensor Adjustment and Component Testing

- If the control port faces **the rear of the trailer**, the slack adjusters will move in and out as the **curbside** portion of the dual modulator valve cycles. If this does not happen, the air lines are not correctly connected. Make the necessary repairs.
8. For 4S/3M installations: Repeat this test for the L valve.
L Valve: The external relay valve designated L is an axle control valve. It controls brake chambers on one or two axles. It is important that delivery lines from port #2 are plumbed as shown on the installation drawings. The 4S/3M system is designed to be used with a variety of trailer configurations.
 9. 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 multiple times, indicating lamp installation is OK. The Test Status box at the bottom of the menu will display the status of this test. Figure 8.8.

Fig. 8.8



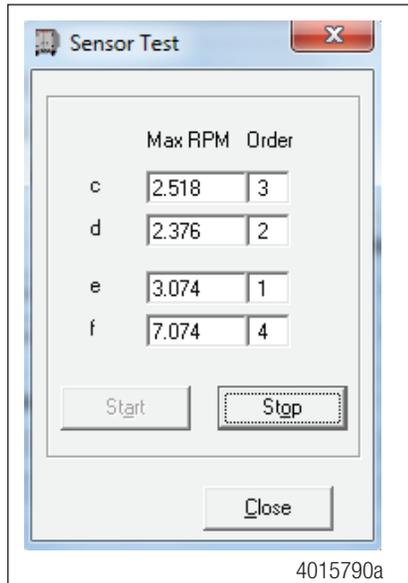
10. Click on **Close** to exit.

8.4.4 Sensor Installation Test (All Installations)

To test the sensor installation:

1. Raise all sensed wheel ends off of the ground.
2. Apply air to the emergency 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 Test** to display the Sensor Test screen.
5. Click on the **Start** button to start the test.
6. Rotate the sensed wheel ends at a rate of 1/2 revolution per second. This rate equals a wheel speed of approximately 4 mph (7 kph).
7. Check the screen for sensor output. Figure 8.9.

Fig. 8.9



- Make sure there is sensor output. If sensor output is displayed, sensor test is complete.
 - 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. Make the necessary repairs and repeat the sensor test. If the problem persists, contact WABCO Customer Care Center at 855-228-3203.
8. Check **Order** fields to verify sensors were installed in the right location based on orientation of the valves. Figure 7.7.



Refer to the sensor locations in this section.

8.4.5 Sensor Orientation Test

This test is not for use on 4S/3M or 4S/2M (Axle Control) installations.

For 4S/3M and 4S/2M (Axle Control) installations, use the standard Sensor Test. To run the standard test, select Sensor Test from the Components Test Menu.

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

8.4.5.1 Sensor Orientation Test Screen

For 4S/3M and 4S/2M (Axle Control) installations, use the standard Sensor Test. To run the standard test, select Sensor Test from the Components Test Menu.

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 control port to see if it faces the front or rear of the trailer. TOOLBOX PLUS™ will ask for this information to start the test (Step 5). To perform the sensor orientation test:

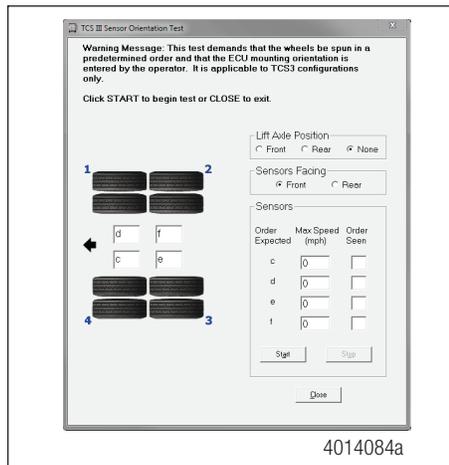
1. Raise the sensed wheel ends off the ground.
2. Apply air to the emergency line to fill the air tanks and release the spring brakes so that the wheels can be rotated.

Sensor Adjustment and Component Testing

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 8.10.

When the Sensor Orientation Test screen first appears, the Control Port Facing field will display the default—Front. This will occur regardless of the actual control port orientation of the installation being tested.

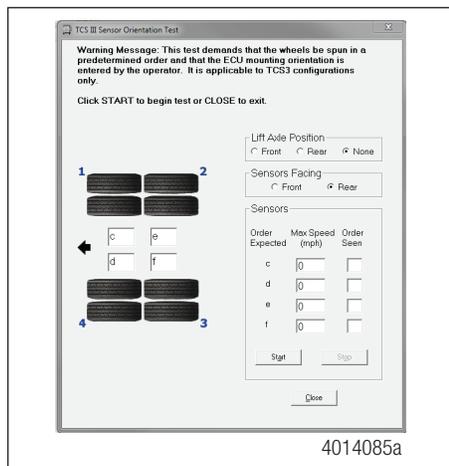
Fig. 8.10



5. Click on Front or Rear in the Control Port Facing field to select the mounting orientation of the ECU/dual modulator valve assembly. Figure 8.11.

Refer to Figure 8.10 and Figure 8.11 for illustrations of the ECU/dual modulator assembly mounted with the control port facing forward and rear. The correct mounting orientation must be selected prior to starting the test (Step 5).

Fig. 8.11

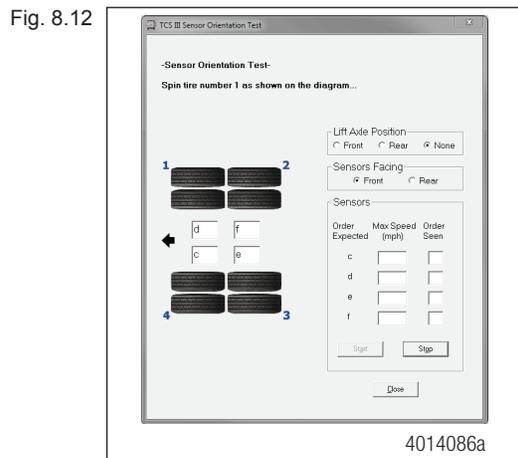


2S/2M installations use C and D locations.

6. Click on Front, Rear or None in the Lift Axle Position field to note if a lift axle is installed on an ABS sensed axle. Note: Sensors E and F should always be installed on the lift axle to prevent unwanted sensor faults.

Sensor Adjustment and Component Testing

- Click on Start to begin the test. Figure 8.12.



- 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 8.12.
 - 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.
- To finish the Sensor Orientation Test, click on Stop, then on Close.
- 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 the WABCO Customer Care Center at 855-228-3203. Sensor output appears in the Sensors field located in the bottom right portion of the Sensor Orientation Test screen. Figure 8.10.

8.5 End of Line Testing without TOOLBOX PLUS™ Software

8.5.1 2S/1M Standard

- Apply 12 volts DC power to the ABS.
- The ECU/single modulator valve assembly should click multiple times.
- 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:
 - Remove the power from the ABS and raise the sensed wheels so they may be rotated.
 - Repeat Step 1 and Step 2.
 - Rotate each sensed wheel — one at a time — at a rate **less than 25 rpm**. The ABS indicator lamp should now go out and stay out indicating a correct installation. The end of line test is complete.

Sensor Adjustment and Component Testing

4. 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.

8.6 Inspect the Sensor and Air Line Installation (2S/2M Standard)

8.6.1 Sensor Installation

1. Look at the C and D sensor connectors on the ECU/dual modulator valve assembly. Make sure the connectors are routed to the correct wheel end location, as follows:
 - If the ECU/dual modulator valve assembly is mounted with the control port facing the front of the trailer:
 - Sensor D must be routed to the curbside wheel end location
 - Sensor C must be routed to the roadside wheel end location
 - If the ECU/dual modulator valve assembly is mounted with control port facing the rear of the trailer:
 - Sensor D must be routed to the roadside wheel end location
 - Sensor C must be routed to the curbside wheel end location
2. If sensors are not correctly installed, make the necessary repairs.

8.6.2 Air Line Installation

1. Ensure that all unused air ports are plugged and that the exhaust port is facing DOWN.
2. Look at the air line installation to verify that all air lines are correctly installed.
 - If the ECU/dual modulator valve assembly is mounted with the control port facing the FRONT of the trailer, the air lines for the three delivery ports labeled 2.1 must be routed to CURBSIDE; the air lines for the three delivery ports labeled 2.2 on the opposite side of the valve must be routed to ROADSIDE. Figure 8.13.
 - If the ECU/dual modulator valve assembly is mounted with the control port facing the REAR of the trailer, the air lines for the three delivery ports labeled 2.1 must be routed to ROADSIDE; the air lines for the three delivery ports labeled 2.2 on the opposite side of the valve must be routed to CURBSIDE. Figure 8.14.

Fig. 8.13

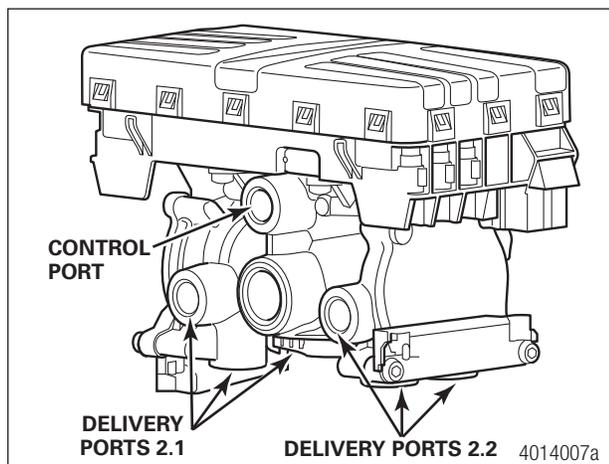
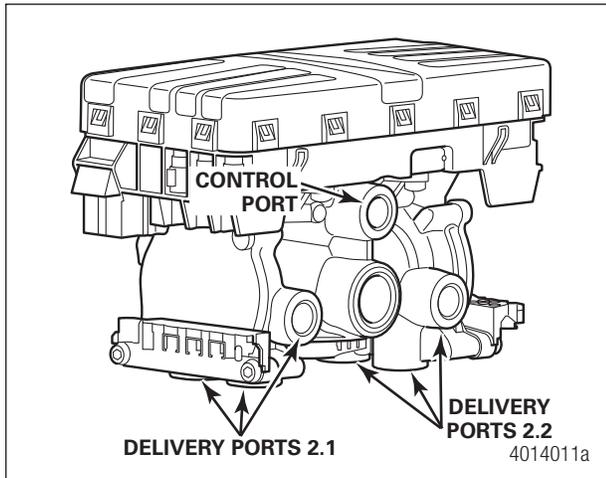


Fig. 8.14



3. If the air lines are not correctly routed, perform the necessary repairs.

8.6.3 Inspect the Sensor and Air Line Installation (2S/2M, 4S/2M and 4S/3M Standard and Premium)

8.6.3.1 Sensor Installation

1. Look at the control port on the ECU/dual modulator valve assembly. Ensure that the connectors are routed to the correct wheel-end location for a standard semi-trailer, as follows:

ECU/Dual Modulator Valve Assembly Mounted with Control Port Facing Front of Trailer

- 2S/2M
 - Connect curbside sensor at D.
 - Connect roadside sensor at C.
- 4S/2M*
 - Connect curbside front sensor at D.
 - Connect curbside rear sensor at F.
 - Connect roadside front sensor at C.
 - Connect roadside rear sensor at E.
- 4S/3M*— Sensor locations vary by type of installation. Refer to the diagrams for specific sensor locations.
 - Connect curbside sensor at D.
 - Connect curbside sensor at F.
 - Connect roadside sensor at C.
 - Connect roadside sensor at E.

ECU/Dual Modulator Valve Assembly Mounted with Control Port Facing Rear of Trailer

- 2S/2M
 - Connect curbside sensor at C.
 - Connect roadside sensor at D.

Sensor Adjustment and Component Testing

- 4S/2M*
 - Connect curbside front sensor at C.
 - Connect curbside rear sensor at E.
 - Connect roadside front sensor at D.
 - Connect roadside rear sensor at F.
- 4S/3M*— Sensor locations vary by type of installation. Refer to the diagrams for specific sensor locations.
 - Connect curbside sensor at C.
 - Connect curbside sensor at E.
 - Connect roadside sensor at D.
 - Connect roadside sensor at F.

* If the lift axle is sensed in 4S/2M and 4S/3M installations: Sensors E and F must always be used on the lift axle to avoid an unwanted ABS indicator lamp illumination.

2. If sensors are not correctly installed, perform the necessary repairs.

8.6.3.2 Air Line Installation

1. Ensure that all unused air ports are plugged and that the exhaust port is facing DOWN.
2. Look at the air line installation to verify that all air lines are correctly installed.
 - If the ECU/dual modulator valve assembly is mounted with the control port facing the FRONT of the trailer, the air lines for the three delivery ports labeled 2.1 must be routed to CURBSIDE; the air lines for the three delivery ports labeled 2.2 on the opposite side of the valve must be routed to ROADSIDE. Figure 8.15.
 - If the ECU/dual modulator valve assembly is mounted with the control port facing the REAR of the trailer, the air lines for the three delivery ports labeled 2.1 must be routed to ROADSIDE; the air lines for the three delivery ports labeled 2.2 on the opposite side of the valve must be routed to CURBSIDE. Figure 8.16.

Fig. 8.15

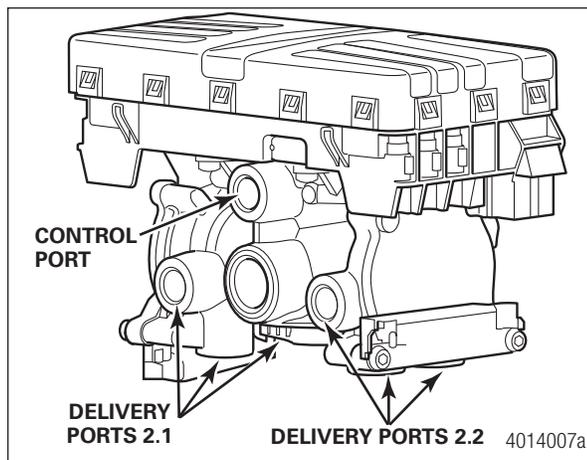
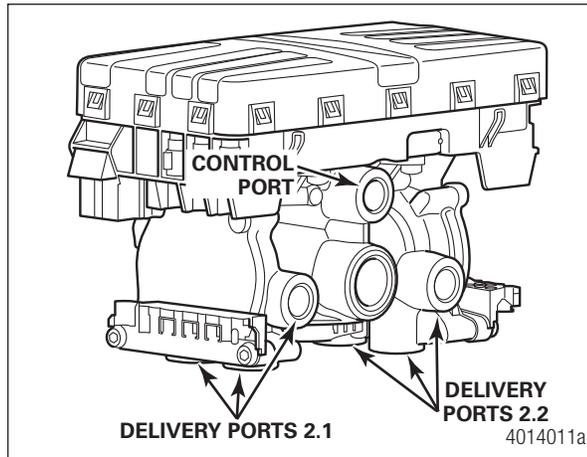


Fig. 8.16



3. For 4S/3M installations: Repeat this test for the external modulator valve. The external relay valve is an axle control valve. It controls the brake chambers on one or two axles. It is important that delivery lines from Port 2 are plumbed as shown in Figure 5.6, Figure 5.7 and Figure 5.8. The 4S/3M system is designed to be used with a variety of trailer configurations.
4. If the air lines are not correctly routed, perform the necessary repairs.

8.6.4 Perform End of Line Test (Standard and Premium Installations)

1. Apply 12 volts DC power to the ABS.
2. Listen for the ECU/dual modulator valve assembly to click multiple times.
3. If the indicator lamp comes on for three seconds then 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.
 - Remove the power from the ABS and raise the sensed wheels so they may be rotated.
 - Apply emergency air to fill the air tanks and release the spring brakes so that the wheels may be rotated. Repeat Steps 1 and 2.
 - 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.

4. 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.

8.6.4.1 Sensor Gap Adjustment (All Installations)

Push 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. Value should be 0.2 volt AC when wheel is rotated at a rate of 1/2 revolution per second.

8.6.4.2 Blink Code Check (All Installations)

Use constant power activation to perform the fault code check, as follows:

Sensor Adjustment and Component Testing

1. Apply constant power to the ECU/dual modulator valve assembly **for more than one, but less than five seconds**.
2. Remove power.
3. Reapply power.
4. Check the trailer ABS indicator lamp on the side of the trailer. The fault code will be displayed three times.
5. Find the fault on the table and make the necessary repairs.
6. After making the necessary corrections, repeat the end of line test.

Blink Code Table

Blink Code	Problem Area	Action
3	Sensor C	Determine sensor location. Check sensor installation. Perform necessary repairs.
4	Sensor D	Determine sensor location. Check sensor installation. Perform necessary repairs.
5	Sensor E	Determine sensor location. Check sensor installation. Perform necessary repairs.
6	Sensor F	Determine sensor location. Check sensor installation. Perform necessary repairs.
7	External ABS Modulator Valve	Verify correct electrical installation. Check power supply. Perform necessary repairs.
9	Internal ABS Modulator Valve	Verify correct installation. If code continues, contact WABCO for assistance.
11	No Speed Failure	Spin tires or drive the vehicle above 4 mph.
12	External Pressure Sensor	Internal failure, contact WABCO.
14	Power Supply Failure	Verify correct electrical installation. Check power supply. Perform necessary repairs.
15	ECU Internal Failure	Verify correct installation. If code continues, contact WABCO for assistance.
17	PLC Failure	Internal failure, contact WABCO.
18	GIO Failure	Verify correct electrical installation. Check power supply. Perform necessary repairs.
19	Load Sensing Failure	Internal failure, contact WABCO.
20	Axle Load Failure	Internal failure, contact WABCO.
21	Brake Pad Sensor Failure	Internal failure, contact WABCO.

To contact WABCO, call the WABCO Customer Care Center at 855-228-3203.

8.7 Trailer Identification

An iABS Trailer ABS warning label is generally affixed to the trailer near the ABS trailer indicator lamp.

If this label is not on the trailer, let your supervisor know. Labels are available from WABCO. Ask for Part Number TP95172.

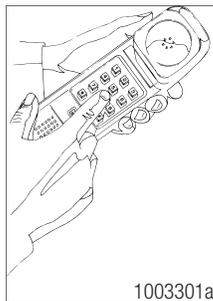
For additional assistance, contact the WABCO Customer Care Center at 855-228-3203.

Before calling the WABCO Customer Care Center, be prepared to provide the following information about the trailer you are working on:

1. Trailer make and model year.
2. What is the symptom/complaint? What is the component doing or not doing?
3. What is the ABS blink code or SPN/FMI code?
4. Have any resistance and/or voltage measurements been taken?
5. What is the result of visual inspection of connectors, harness and components?
6. When does the symptom occur (vehicle moving, trailer loaded, etc.)?
7. Does the trailer have any unusual characteristics (for example, mismatched tires or lift axles or other specialty systems)?
8. Were maintenance manuals available? If so, which ones were used?
9. What is the part number of the ECU/Valve Assembly? What is the system configuration (How many sensors/how many modulators)?

By having the above information ready when you call, your customer service technician will be better equipped to assist you. Figure 8.17.

Fig. 8.17



WABCO Customer Care Center, 855-228-3203

9 Troubleshooting

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.

DANGER

Release all pressure from the air system before you disconnect any components. Pressurized air can cause serious personal injury.

WARNING

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

WARNING

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.

WARNING

Ensure the trailer has correct electrical grounding; refer to SAE Specification J1908.

WARNING

When you work on an electrical system, the possibility of electrical shock exists, and sparks can ignite flammable substances. You must always disconnect the battery ground cable before you work on an electrical system to prevent serious personal injury and damage to components.

WARNING

It is also recommended to disable or lower any lift axle or tag axle system on the trailer before working on it. Otherwise, the user has to be aware of possible sudden motion of trailer vehicle body that can lead to injuries.

9.1 Automatic Lift Axle Troubleshooting

ECUs 400 500 350 and 400 500 430 0 (Premium iABS units) are the only trailer ABS ECU/valve assemblies that have the capability of the automatic lift axle feature being able to be activated and turned on.

The first step that should be taken when troubleshooting the Automatic Lift Axle system is to ensure that the system is pneumatically plumbed correct and electric connections are also correct. Refer to Figures 9.9, 9.10, and 9.11 in this section for the correct schematic, depending upon the override switch configuration.

For additional information, refer to TP19039, Automatic Lift Axle Installation Manual, available at www.wabco-na.com.

Troubleshooting

When testing the Lift Axle system, ensure the trailer is supplied with a minimum of 100 psi air pressure to the supply air and 12 volts DC power rated at a minimum of 10 amps to the trailer's constant power circuit. Use of a volt-ohm meter may be required. A lift axle test rig may be built by the maintenance shop to facilitate the testing of the lift axle system. See Figure 9.12.

The ability to raise the trailer's fixed axles in order to conduct an end of line test may be required.

The TOOLBOX PLUS™ Software is necessary to activate the Automatic Lift Axle function in the iABS Premium ECU. This process can be found in the Automatic Lift Axle Installation Manual, TP19039.

This troubleshooting section is based on the use of TOOLBOX PLUS™ Software version 13 or higher. If you have an earlier version of software, visit wabco.snapon.com to purchase and download the latest version of the software.

Condition Experienced	Action to Take	Troubleshooting Details
Lift Axle Function Unavailable in TOOLBOX PLUS™ Software	Inspect WABCO iABS part number.	Ensure that GIO-capable WABCO iABS is installed. Only 400 500 350 0 and 400 500 430 0 have Automatic Lift Axle functionality.
	Verify the WABCO TOOLBOX PLUS™ Software version.	Ensure TOOLBOX PLUS™ Software version 13.0 or later is installed.
Lift Axle Will Not Raise or Lower	Recycle trailer power.	ECU valve should audibly click during its power-up self-test. ABS warning light will illuminate and extinguish as a light test. If warning light remains on, begin diagnostics with TOOLBOX PLUS™ Software. If the ECU fails to click, ensure that the sensor extension cables and power cables are securely attached to the ECU and ensure that 12 volts is present at pin B-1 on the ECU power connector. Refer to Figure 9.1.
	Retrieve diagnostic information via TOOLBOX PLUS™ Software version.	When the trailer power is cycled, the trailer-mounted ABS warning light will illuminate and extinguish as a light test. If warning light remains on, begin diagnostics with TOOLBOX PLUS™ Software. Repair and clear all faults found.
	Verify the lift axle function is activated in TOOLBOX PLUS™ Software.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed.
	Verify Lift Axle Control Valve (LACV) cable P/N 449 408 XXX 0.	Ensure the LACV cable 449 408 XXX 0 is securely fastened to the LACV and to the port 2 of HUB cable P/N 894 600 121 2 connected at GIO 1.
	Inspect HUB cable/s 894 600 121 2.	Ensure the HUB cable/s 894 600 121 2 is/are securely fastened to the ECU and to the respective cables. Refer to Figure 9.3.
	Check lift axle control valve cable integrity and it's connection to HUB cable.	Using a volt/ohm meter, check for shorted or open circuits on LACV cable 449 408 XXX 0. Ensure the HUB cable 894 600 121 2 is securely fastened to the ECU and to the LACV cable 449 408 XXX 0. Refer to Figure 9.2.

Troubleshooting

Condition Experienced	Action to Take	Troubleshooting Details
	Test the pressure switch 431 700 002 0.	Refer to Figure 9.5 for the connector diagram of Pressure Switch 431 700 002 0. Use regulated shop air and an ohm meter to check the functionality of the switch. With greater than 70 psi (but less than 120 psi) applied to the switch, pins 1 and 2 resistance reading should show infinity. With less than 70 psi applied to the switch, pins 1 and 2 resistance reading should show less than 1 ohm.
	Test the pressure sensor 441 044 106 0.	Refer to Figure 9.12 for the construction of a Auto Lift Axle Test Rig. Attach regulated shop air to the pneumatic connector of pressure switch 441 044 106 0. Increase pressure so that it exceeds the parameterized lower axle threshold and the axle should deploy. Decrease pressure so that it drops below the parameterized threshold to raise the axle and the axle should rise. Replace the Pressure Sensor if axle fails to rise or lower.
	Check "Y" cable integrity (if applicable).	Using a volt/ohm meter, check for a shorted or open circuit on the lift axle "Y" cable 894 601 100 0. Refer to Figure 9.8.
Lift Axle with Automatic Override Will Not Lower When Trailer is Parked; Trailer Has Power and Air Applied	Using TOOLBOX PLUS™ Software, ensure there are no active faults.	Repair and clear all active faults. Cycle the ECU power.
	Inspect pressure switch 431 700 002 0 installation.	Ensure pressure switch is plumbed into the delivery line to the spring brake. Refer to Figure 9.10.
	Inspect the connection of pressure switch 431 700 002 0.	Ensure the pressure switch is correctly connected to the override cable 449 826 XXX 0 at port 2 of HUB cable 894 600 121 2 which is connected at GIO 1 port on the ECU.
	Test the pressure switch 431 700 002 0.	Refer to Figure 9.5 for the connector diagram of pressure switch 431 700 002 0. Use regulated shop air and an ohm meter to check the functionality of the switch. With greater than 70 psi applied to the switch, pins 1 and 2 resistance reading should show infinity. With less than 70 psi applied to the switch, pins 1 and 2 resistance reading should show less than 1 ohm.
	Check "Y" cable integrity (if applicable).	Using a volt/ohm meter, check for shorted or open circuits on ABS "Y" cable 894 601 100 0. Refer to Figure 9.8.
	Check override cable 449 826 XXX 0 integrity.	Using a volt/ohm meter, check for shorted or open circuits on cable 449 826 XXX 0. Refer to Figure 9.7.
Lift Axle Will Not Lower When Trailer Is Unpowered	Inspect the pneumatic connections at the lift axle control valve 463 084 050 0.	Refer to Figures 9.9 through 9.11 for the plumbing schematics, depending on system configuration.

Troubleshooting

Condition Experienced	Action to Take	Troubleshooting Details
Lift Axle Lowers Only When Tractor Brakes are Applied	Verify power to the ECU.	Ensure the trailer has blue center pin power at the J560 connector at the front of the trailer. Inspect the towing vehicle's power output to the J560. Ensure the J560 is wired correctly to the trailer OEM's specifications. Refer to Figure 9.13.
	Check power cable throughout.	Ensure 12 volts DC power is present at pin B-1 on power cable 449 306 XXX 0. Refer to Figure 9.1.
	Check power cable throughout.	Ensure 12 volts DC power is present to pin A-B at the power cable 449 306 XXX 0 from the ABS breakout of the trailer power cable. Refer to Figure 9.1.
	Inspect trailer power/light cable.	Using a volt/ohm meter, check for shorted or open circuits on the trailer power/light cable from the J560 connector at the trailer nose to the ABS breakout pigtail. Continuity should be found between pin 7 on the J560 and the pin mating with pin A-B on the ABS power cable. Refer to Figures 9.1 and 9.13.
Manual Override Switch Does Not Function	Inspect the manual override switch and cable 449 827 XXX 0.	Ensure the lift axle control valve is functional by disconnecting the LACV cable from the LACV. The axle should lower.
	Verify toggle switch operation.	Ensure the toggle switch is functional using an ohm meter. Switch output should show infinity ohms when the switch is in the OFF position and less than 1 ohm when the switch is in the ON position.
	Verify correct wiring of toggle switch.	Ensure that the green and red wires of the manual override switch cable 449 827 XXX 0 are attached to the toggle switch's contacts. Ensure that the yellow and red wire are capped and unused. Refer to Figure 9.6.
	Check "Y" cable integrity (if applicable).	Using a volt/ohm meter, check for shorted or open circuits on ABS "Y" cable 894 601 100 0. Refer to Figure 9.8.
	Check manual override switch cable integrity.	Using a volt/ohm meter, check for shorted or open circuits on manual override switch cable 449 827 XXX 0. Refer to Figure 9.6.
	Check HUB cable integrity.	Using a volt/ohm meter, check for shorted or open circuits on cable 894 600 121 2. Refer to Figure 9.3.
Lift Axle Lowers When Powered Trailer Stops Moving	Verify override switch functionality.	Ensure the manual override toggle switch is not intermittently functional by checking with an ohm meter. Switch output should show infinity ohms when the switch is in the OFF position and less than 1 ohm when the switch is in the ON position. Induce vibration to the switch and switch wiring when checking switch activation.
	Inspect toggle switch installation.	Ensure wires connected to the switch are secure and not damaged.

Troubleshooting

Condition Experienced	Action to Take	Troubleshooting Details
	Inspect pneumatic component installation.	Ensure pressure switch 431 700 002 0 is plumbed correctly. Refer to Figures 9.9 through 9.11 for the plumbing schematics, depending on system configuration.
	Inspect pneumatic component installation.	Ensure pressure sensor 441 044 106 0 is plumbed correctly. Refer to Figures 9.9 through 9.11 for the plumbing schematics, depending on system configuration.
	Ensure that Auto Lift Axle function is activated.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed. If it is not activated then follow the procedures to activate the function.
	Check HUB cable integrity.	Using a volt/ohm meter, check for shorted or open circuits on cable 894 600 121 2. Refer to Figure 9.4.
	Check manual override switch cable integrity.	Using a volt/ohm meter, check for shorted or open circuits on manual override switch cable 449 827 XXX 0. Refer to Figure 9.6.
	Check “Y” cable integrity (if applicable).	Using a volt/ohm meter, check for shorted or open circuits on ABS “Y” cable 894 601 100 0. Refer to Figure 9.8.
Lift Axle Lowers and/or Raises at Values Inconsistent With Values in the ECU Parameter Settings	Inspect pressure sensor 441 044 106 0 installation.	Ensure that there are no air leaks in the air circuit where pressure sensor 441 044 106 0 is attached.
	Inspect lift axle control valve 463 084 050 0 installation.	Ensure that there are no air leaks in the air circuit where lift Axle control valve 463 084 050 0 is attached.
	Inspect system wiring.	Ensure the system is wired correctly. Refer to Figures 9.9 through 9.11 depending on the system configuration.
	Ensure that Auto Lift Axle function is activated.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed. If it is not activated then follow the procedures to activate the function.
	Repair if no issues discovered from steps above.	Replace pressure sensor 441 044 106 0.
Optional Lift Axle Indicator Lamp Does Not Illuminate	Inspect LED lamp assembly.	Ensure the load-resistor LED or incandescent lamp is functional.
	Inspect LED lamp assembly.	Ensure load-resistor LED or incandescent lamp is wired correctly. Ensure the brown wire is connected to ground and the red wire is connected to power.
	Verify ECU voltage output.	A reading of 3 volts DC should be read across the two pins on the indication lamp cable 449 827 XXX 0 when the light is not illuminated (lift axle down). A reading of 12 volts DC should be read across the two pins on indication lamp cable 449 827 XXX 0 when the light is illuminated (lift axle up).

Troubleshooting

Condition Experienced	Action to Take	Troubleshooting Details
	Ensure that the correct indication lamp type is activated.	While entering the parameters to program the iABS with Auto Lift Axle function, ensure that Lift Axle Status Lamp is either LED or Incandescent Lamp.
	Check light output cable integrity.	Using a volt/ohm meter, check for a shorted or open circuit on lift axle indication lamp cable 449 827 XXX 0. Refer to Figure 9.6.
Optional Lift Axle LED Indicator Lamp Stays on Faintly	Inspect indicator lamp and cable.	If damaged, replace the LED lamp with a load-resistor LED or incandescent lamp.
	Inspect indicator light wiring.	Ensure the load-resistor LED lamp is wired correctly. Make sure the brown wire is connected to ground and the red wire hooked to power.
	Inspect indicator light.	When using an LED lamp, ensure the LED assembly has a load resistor. When using an incandescent light, ensure that a 12v light is being used.
	Check light output cable integrity.	Using a volt/ohm meter, check for a shorted or open circuit on lift axle indicator light cable 449 827 XXX 0. Refer to Figure 9.6.
Pressure Switch Test	Check pressure switch 431 700 002 0 functionality.	Refer to Figure 9.5 for the connector diagram of pressure switch 431 700 002 0. Use regulated shop air and an ohm meter to check the functionality of the switch. With greater than 70 psi (and less than 100 psi) applied to the switch, pins 1 and 2 resistance reading should show infinity. With less than 70 psi applied to the switch, pins 1 and 2 resistance reading should show less than 1 ohm.
Pressure Sensor Test	Test the pressure sensor 441 044 106 0 functionality.	Refer to Figure 9.212 for the construction of a Auto Lift Axle Test Rig. Attach regulated shop air to the pneumatic connector of pressure switch 441 044 106 0. Increase pressure so that it exceeds the parameterized lower axle threshold and the axle should deploy. Decrease pressure so that it drops below the parameterized threshold to raise the axle and the axle should rise.

Fig. 9.1

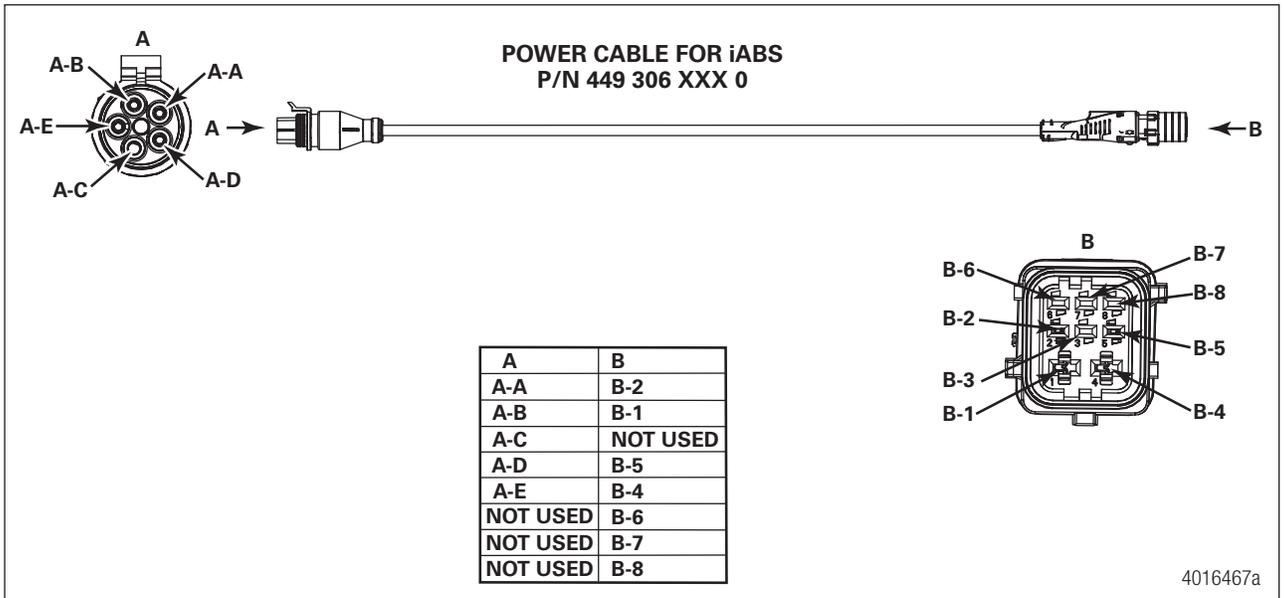


Fig. 9.2

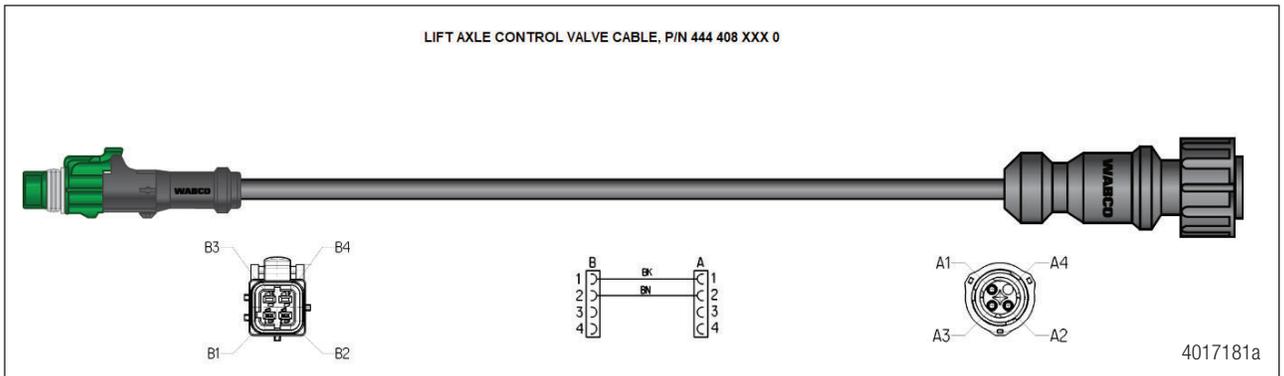


Fig. 9.3

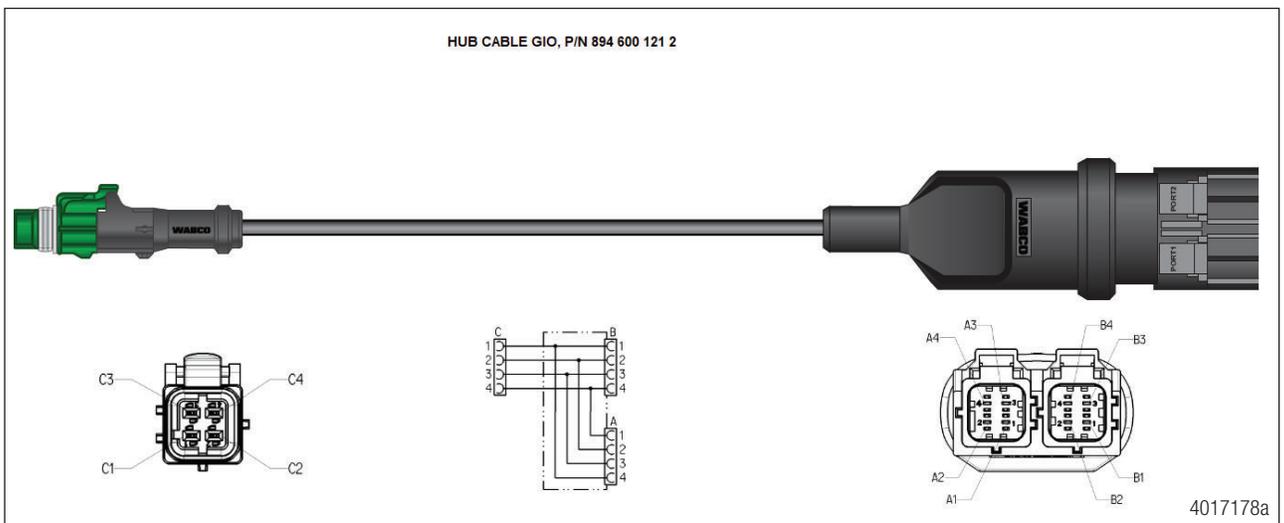


Fig. 9.4

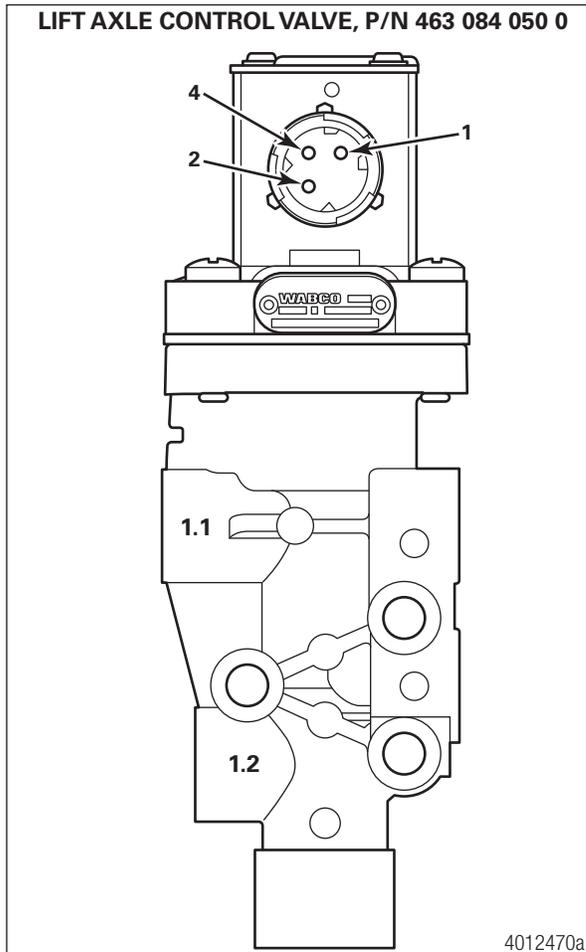


Fig. 9.5

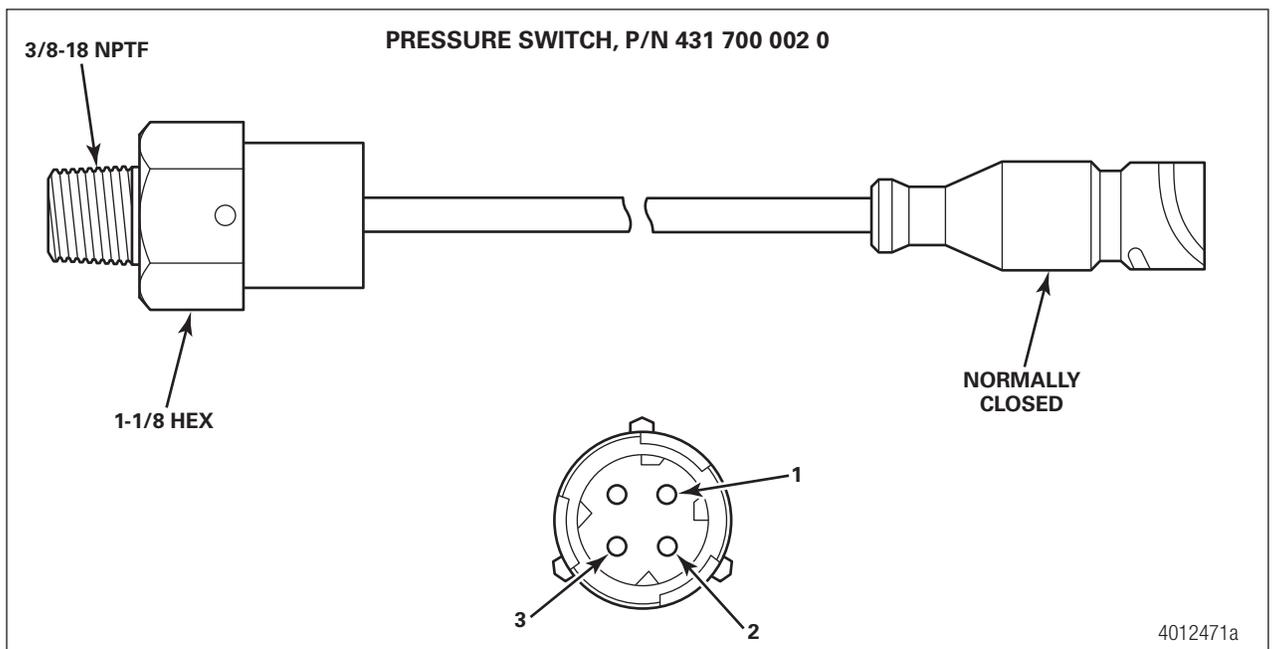


Fig. 9.6

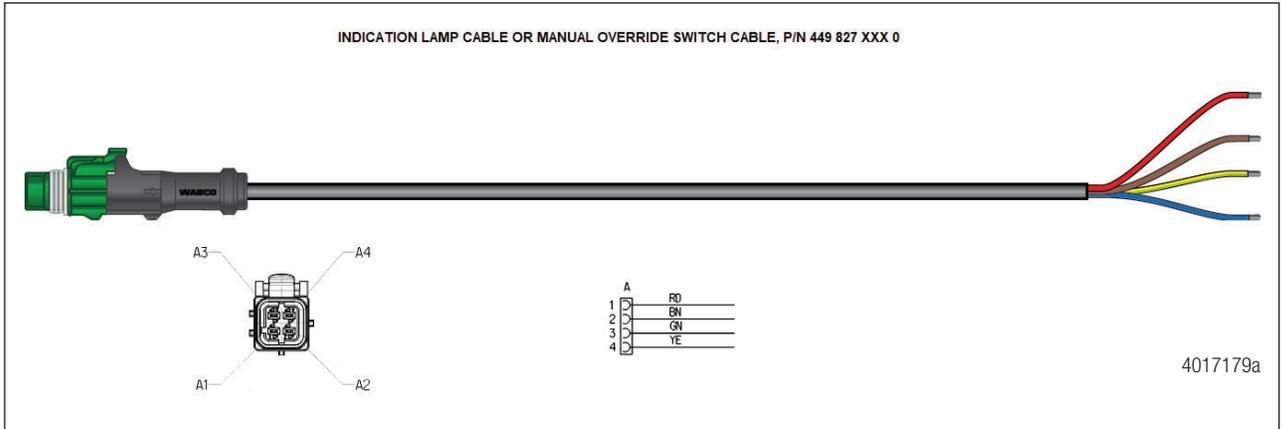


Fig. 9.7

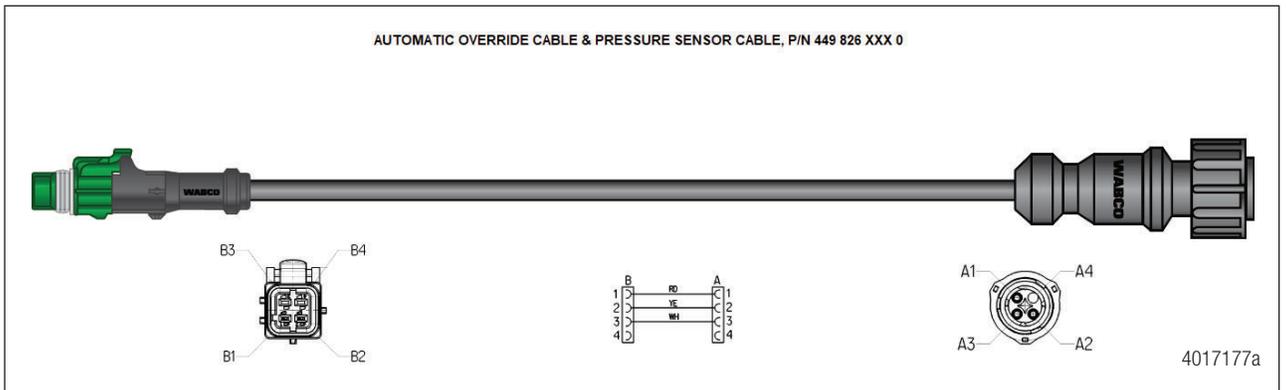


Fig. 9.8

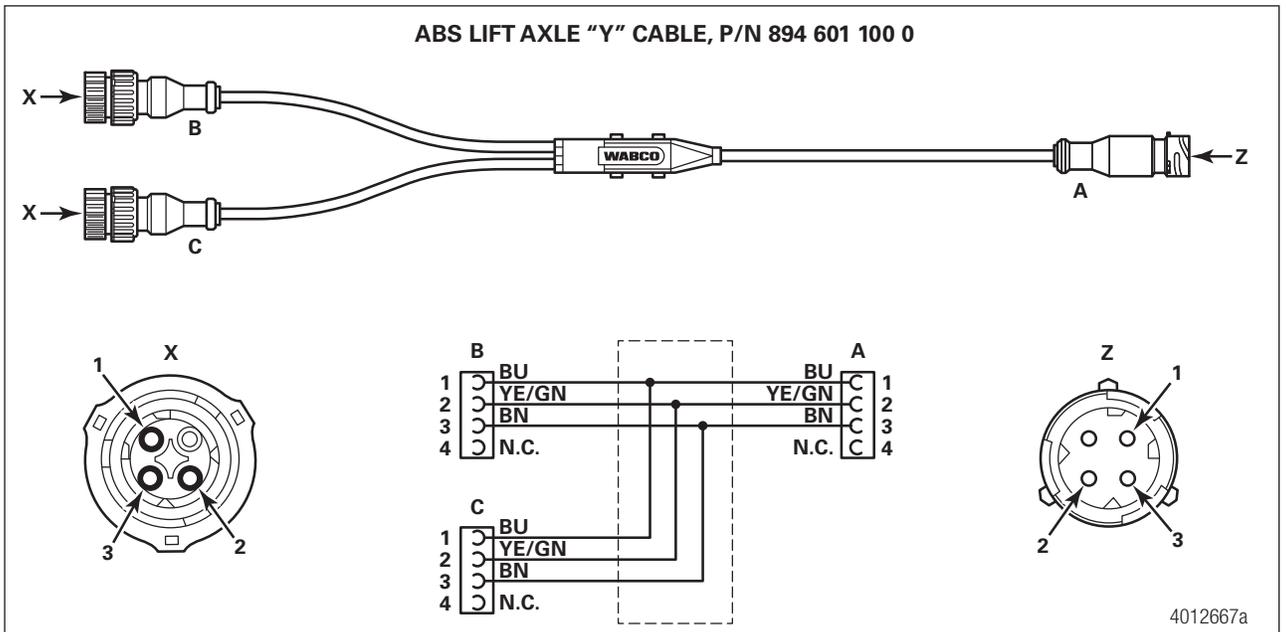


Fig. 9.9

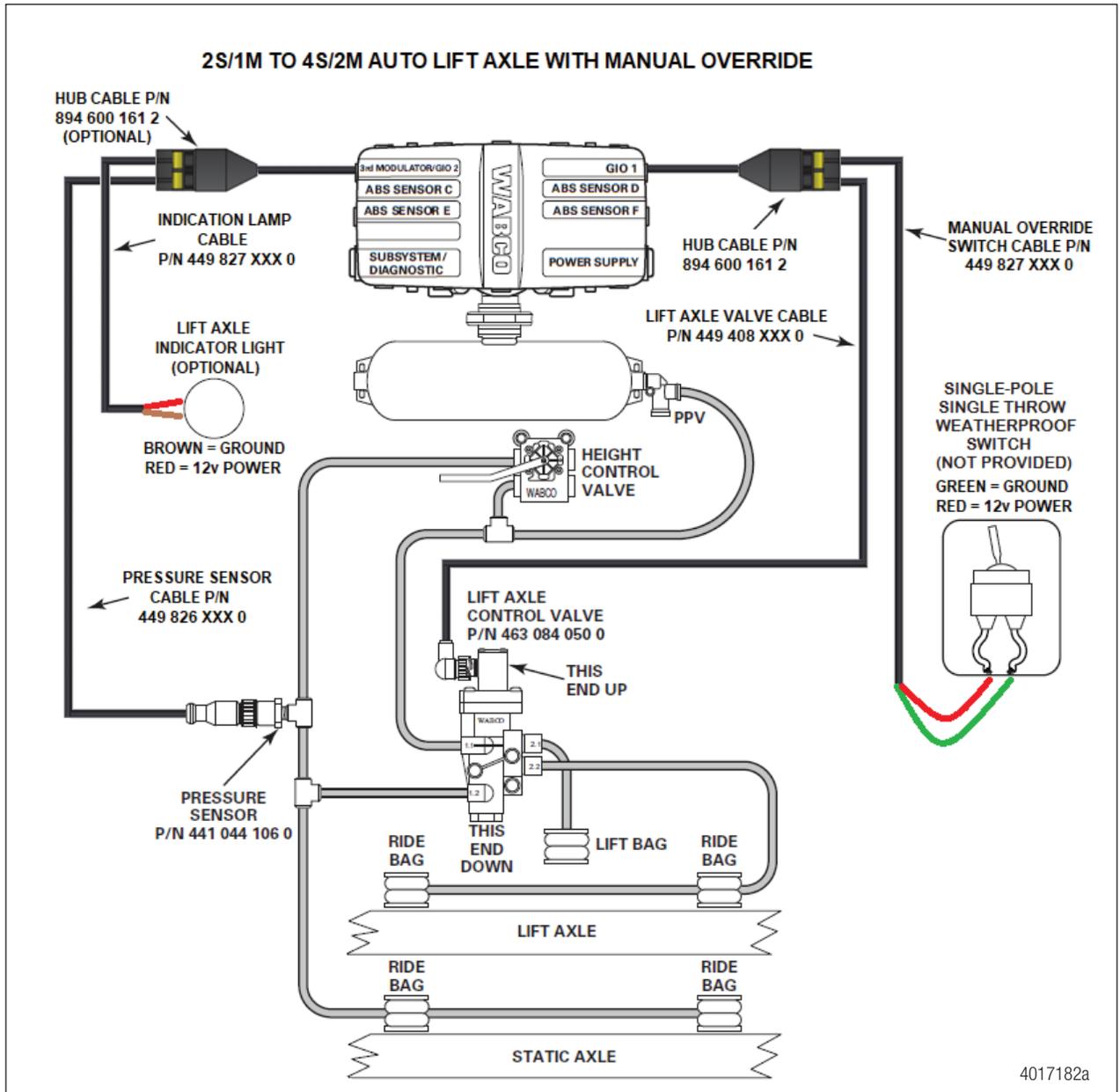


Fig. 9.10

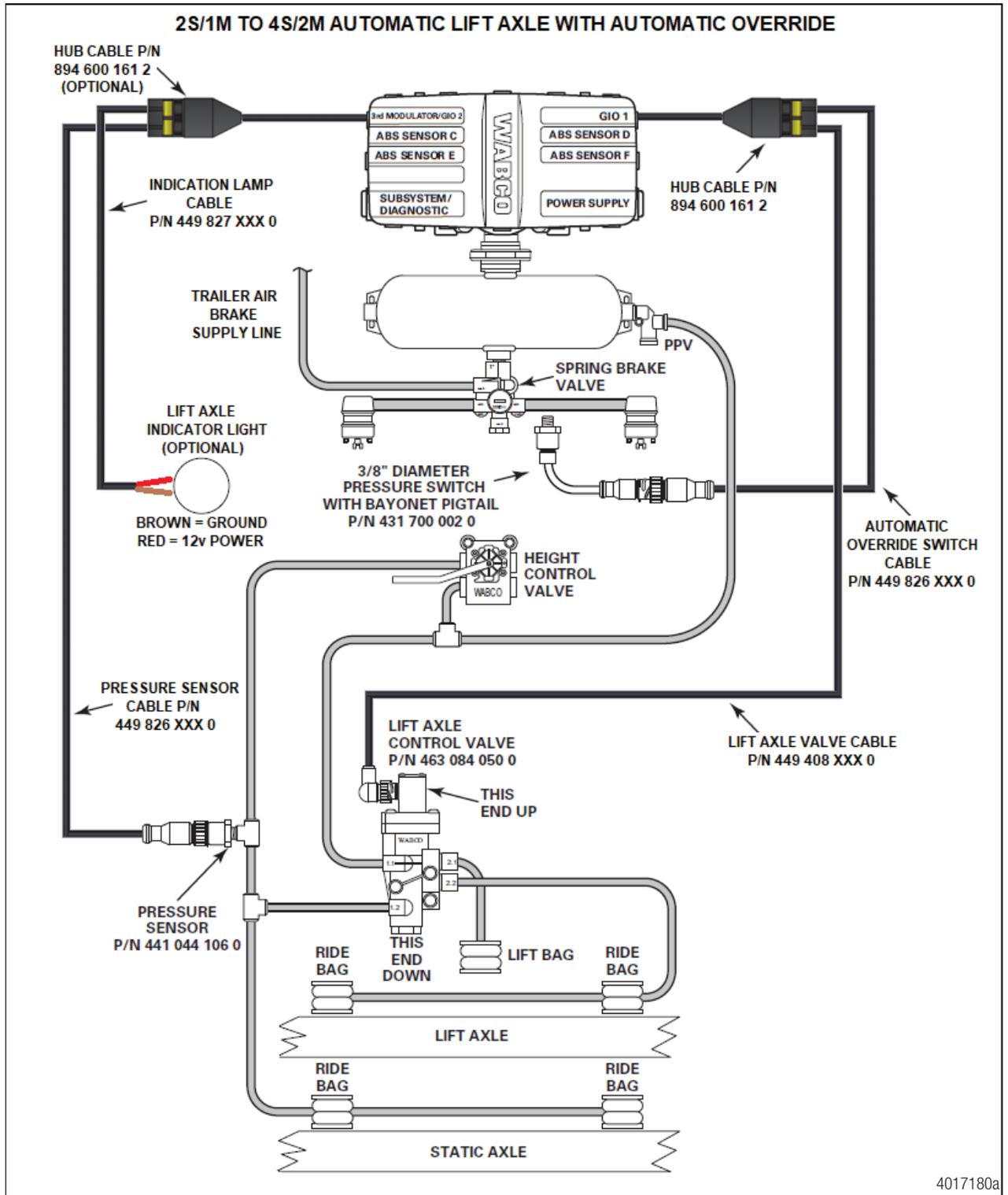


Fig. 9.11

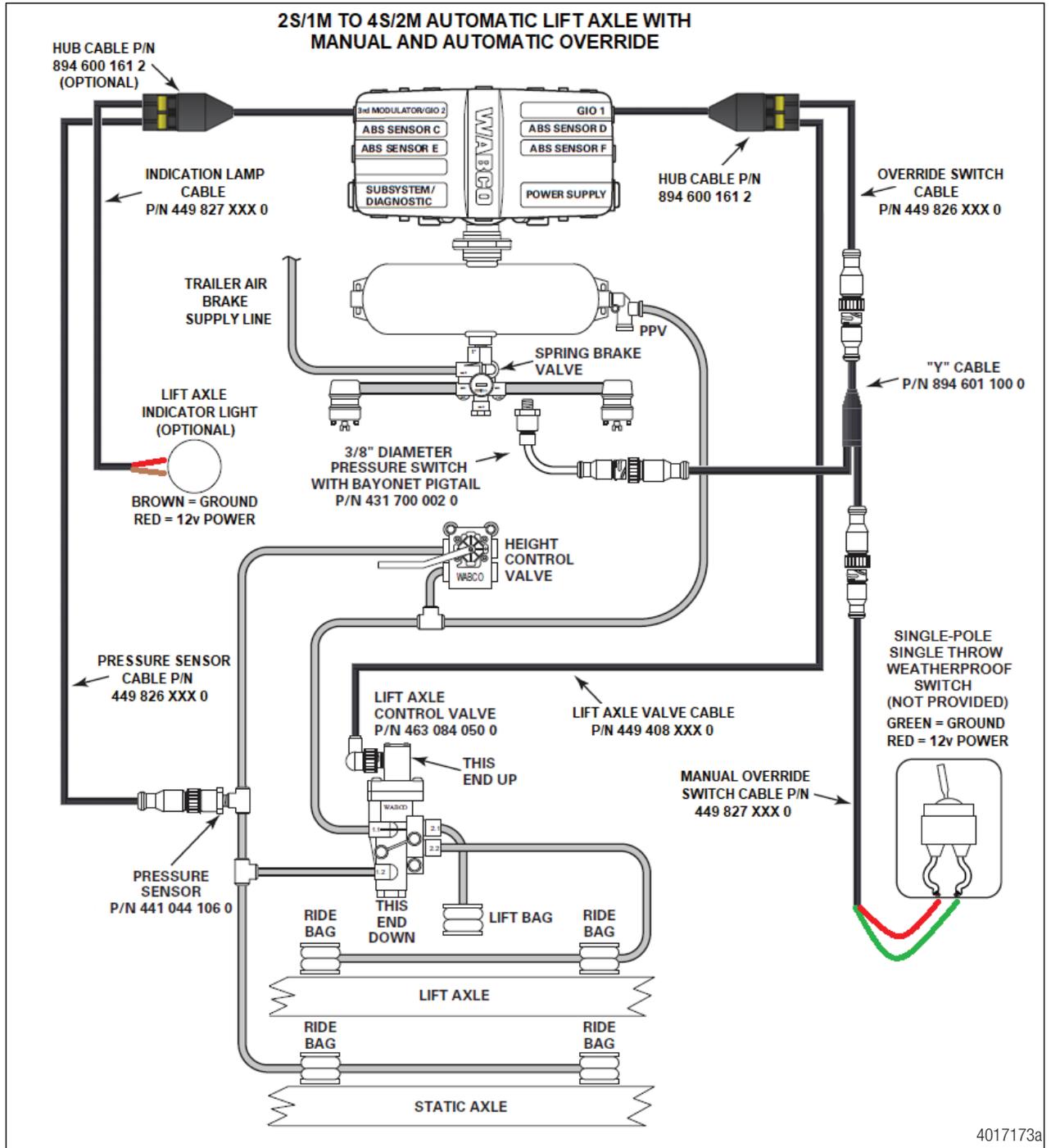


Fig. 9.12

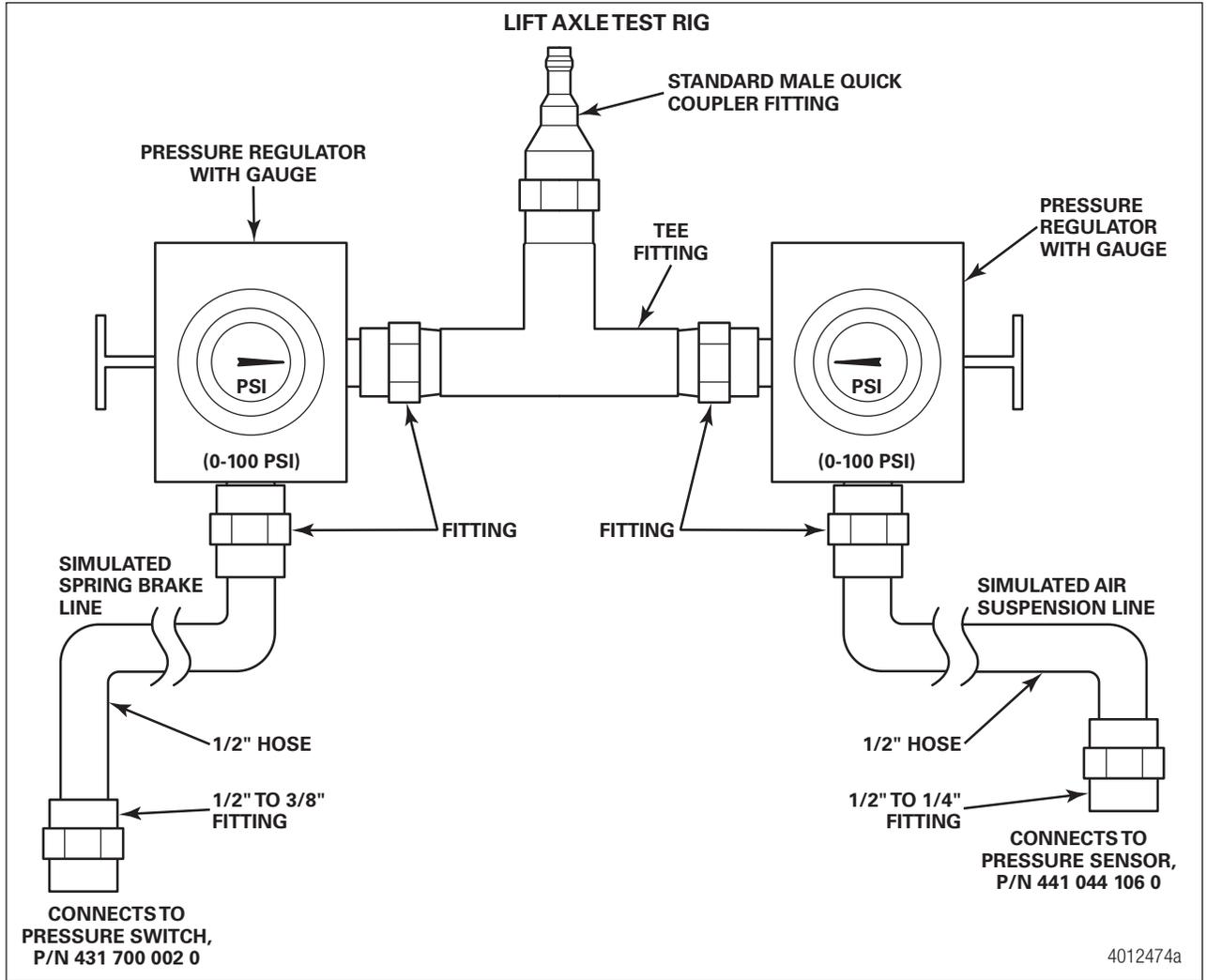
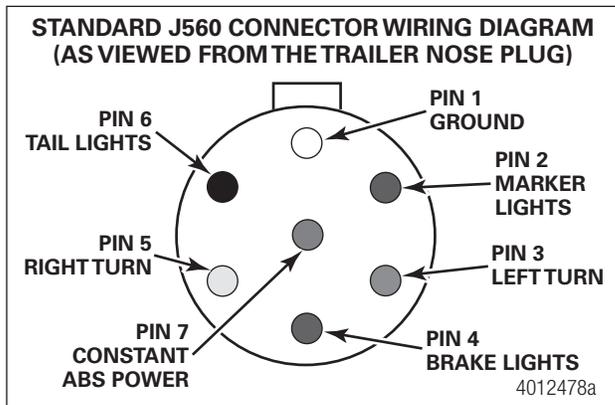


Fig. 9.13



9.2 Tag Axle Troubleshooting

ECUs 400 500 350 and 400 500 430 0 (Premium iABS units) are the only trailer ABS ECU/valve assemblies that have the capability of the Tag Axle feature being able to be activated and turned on.

The first step that should be taken when troubleshooting the Tag Axle system is to ensure that the system is pneumatically plumbed correct and electric connections are also correct. Refer to Figure 9.15 in this section for the correct schematic, depending upon the override switch configuration.

For additional information, refer to TP19030, Tag Axle Installation Manual, available at www.wabco-na.com.

When testing the Tag Axle system, ensure the trailer is supplied with 100-120 psi air pressure to the supply air and 12 volts DC power rated at a minimum of 10 amps to the trailer's constant power circuit.

Use of a volt-ohm meter may be required.

The TOOLBOX PLUS™ Software is necessary to activate the Tag Axle function in the iABS Premium ECU. This process can be found in the Tag Axle Installation Manual, TP19030.

This troubleshooting section is based on the use of TOOLBOX PLUS™ Software version 13 or higher. If you have an earlier version of software, visit wabco.snapon.com to purchase and download the latest version of the software.

Condition Experienced	Action to Take	Troubleshooting Details
Tag Axle Function Unavailable in TOOLBOX PLUS™ Software	Inspect WABCO iABS part number	Ensure that GIO-capable WABCO iABS is installed. Only 400 500 350 0 and 400 500 430 0 have Automatic Lift Axle functionality.
	Verify the WABCO TOOLBOX PLUS™ Software version	Ensure TOOLBOX PLUS™ Software version 13.0 or later is installed.
Tag Axle Function Will Not Activate	Cycle trailer power.	ECU valve should audibly click during its power-up self-test. ABS warning light will illuminate and extinguish as a light test. If warning light remains on, begin diagnostics with TOOLBOX PLUS™ Software. If the ECU fails to click, ensure that the sensor extension cables and power cables are securely attached to the ECU and ensure that 12 volts is present at pin B-1 on the ECU power connector. Refer to Figure 9.14.
	Retrieve diagnostic information via TOOLBOX PLUS™ Software.	If warning light is on, begin diagnostics with TOOLBOX PLUS™ Software. Repair and clear all faults found.
	Ensure the tag axle system is plumbed correctly.	Refer to Figure 9.15.
	Inspect the cab-mounted tag axle toggle switch.	Using an ohm meter, verify the switch functionality. Switch should be a single-pole, single-throw toggle switch. Refer to the switch manufacturer's documentation for electrical contact information.
	Verify toggle switch installation.	The cab-mounted toggle switch is connected to the brown and yellow wires from the switch and indication lamp cable 449 827 XXX 0. The green wire is unused and capped. Refer to Figure 9.16.

Troubleshooting

Condition Experienced	Action to Take	Troubleshooting Details
	Verify switch and indication lamp cable is correctly connected to ECU.	Ensure the switch and indication lamp cable 449 827 XXX 0 is securely connected at ECU.
	Verify the Tag axle function is activated in TOOLBOX PLUS™ Software.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed.
	Verify the switch and indication lamp cable 449 827 XXX 0 integrity.	Using a volt/ohm meter, check for shorted or open circuits on the switch and indication lamp cable. Refer to Figure 9.16.
Tag Axle Function Will Not Activate	Inspect the 3/2 solenoid valve 472 170 997 0.	Using an ohm meter, check the resistance across the two pins on the 3/2 solenoid valve, it should read (at room temperature) 9 ohms (+/- 2 ohms). Refer to Figure 9.17.
	Verify the operation of the 3/2 solenoid valve 472 170 997 0.	Apply 12v DC power and ground to pins 1 and 2 in the 3/2 valve's bayonet connector. The solenoid should energize and dump the air on the tag axle. Removing the power and ground will cause the tag axle air bags to re-inflate.
	Check tag axle valve cable 449 408 XXX 0 integrity.	Using a volt/ohm meter, check for shorted or open circuits on the tag axle valve cable. Refer to Figure 9.18.
	Verify tag axle valve cable 449 408 XXX 0 is correctly hooked up.	Refer to Figure 9.15.
Tag Axle Will Not Reset	Using TOOLBOX PLUS™ Software, ensure there are no active faults.	Repair and clear all active faults. Cycle the ECU power.
	Ensure the tag axle system is plumbed correctly.	Refer to Figure 9.15.
	Verify ECU is reading wheel speed.	Using TOOLBOX PLUS™ Software, perform the Sensor Test from the Component Tests pull down.
	Inspect the cab-mounted tag axle toggle switch.	Using an ohm meter, verify the switch functionality. Switch should be a single-pole, single-throw toggle switch. Refer to the switch manufacturer's documentation for electrical contact information.
	Verify toggle switch installation.	The cab-mounted toggle switch is connected to the brown and yellow wires from the switch and indication lamp cable 449 827 XXX 0 . The green wire is unused and capped. Refer to Figure 9.16.
	Verify switch and indication lamp cable is correctly connected to ECU.	Ensure the switch and indication lamp cable 449 827 XXX 0 is securely connected at ECU.
	Verify the switch and indication lamp cable 449 827 XXX 0 integrity.	Using a volt/ohm meter, check for shorted or open circuits on the switch and indication lamp cable. Refer to Figure 9.16.

Troubleshooting

Condition Experienced	Action to Take	Troubleshooting Details
	Verify the operation of the 3/2 solenoid valve 472 170 997 0.	Apply 12v DC power and ground to pins 1 and 2 in the 3/2 valve's bayonet connector. The solenoid should energize and dump the air on the tag axle. Removing the power and ground will cause the tag axle air bags to re-inflate.
Tag Axle Comes to Rest on Axle Bump Stops	Using TOOLBOX PLUS™ Software, ensure there are no active faults.	Repair and clear all active faults. Cycle the ECU power.
	Ensure the tag axle system is plumbed correctly.	Refer to Figure 9.15.
	Verify the 3/2 solenoid valve has optional components installed.	Refer to Figure 9.19.
	Check for air leaks.	Ensure no air leaks at the 1/4" to 3/8" adapter, the residual pressure valve and the check valve. Refer to Figure 9.19.
Tag Axle is Intermittent	Using TOOLBOX PLUS™ Software, ensure there are no active faults.	Repair and clear all active faults. Cycle the ECU power.
	Verify tag axle system is plumbed correctly and check for air leaks.	Refer to Figure 9.15.
	Ensure that the air volume capacity of the trailer meets trailer OEM standards for operating a tag axle.	Verify the output of the towing vehicle's air compressor to the trailer.
Optional Tag Axle Indicator Light Does Not Function	Using TOOLBOX PLUS™ Software, ensure there are no active faults.	Repair and clear all active faults. Cycle the ECU power.
	Verify the type of tag axle 12 volt DC indicator lamp.	The lamp must be an incandescent lamp or a load-resistor LED lamp.
	Verify the lamp is correctly wired to the switch and indication lamp cable 449 827 XXX 0.	The red wire is hooked to power and the brown wire is hooked to ground.
	Ensure that the correct indication lamp type is activated.	While entering the parameters to program the iABS with Tag Axle function, ensure that Tag Axle Status Lamp is either LED or Incandescent Lamp.
	Verify the switch and indication lamp cable 449 827 XXX 0 integrity.	Using a volt/ohm meter, check for shorted or open circuits on the switch and indication lamp cable. Refer to Figure 9.16.
Optional Tag Axle LED Indicator Lamp Stays on Faintly	Inspect the type of indicator lamp.	Replace generic LED lamp with a load-resistor LED or incandescent lamp. The red wire is hooked to power and the brown wire is hooked to ground.

Fig. 9.14

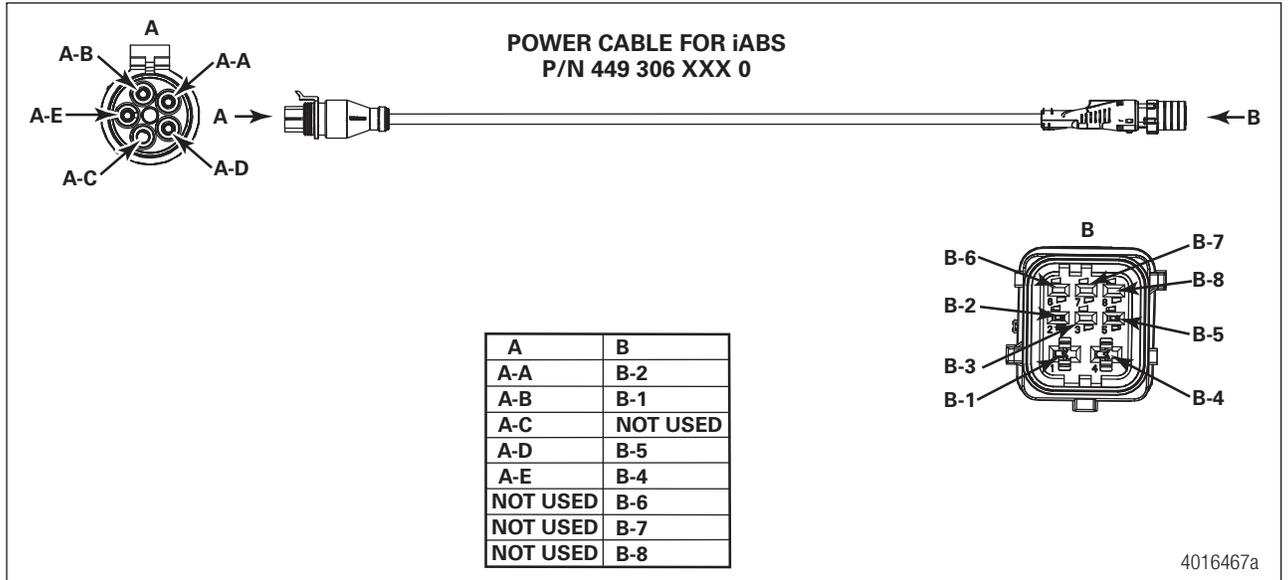


Fig. 9.15

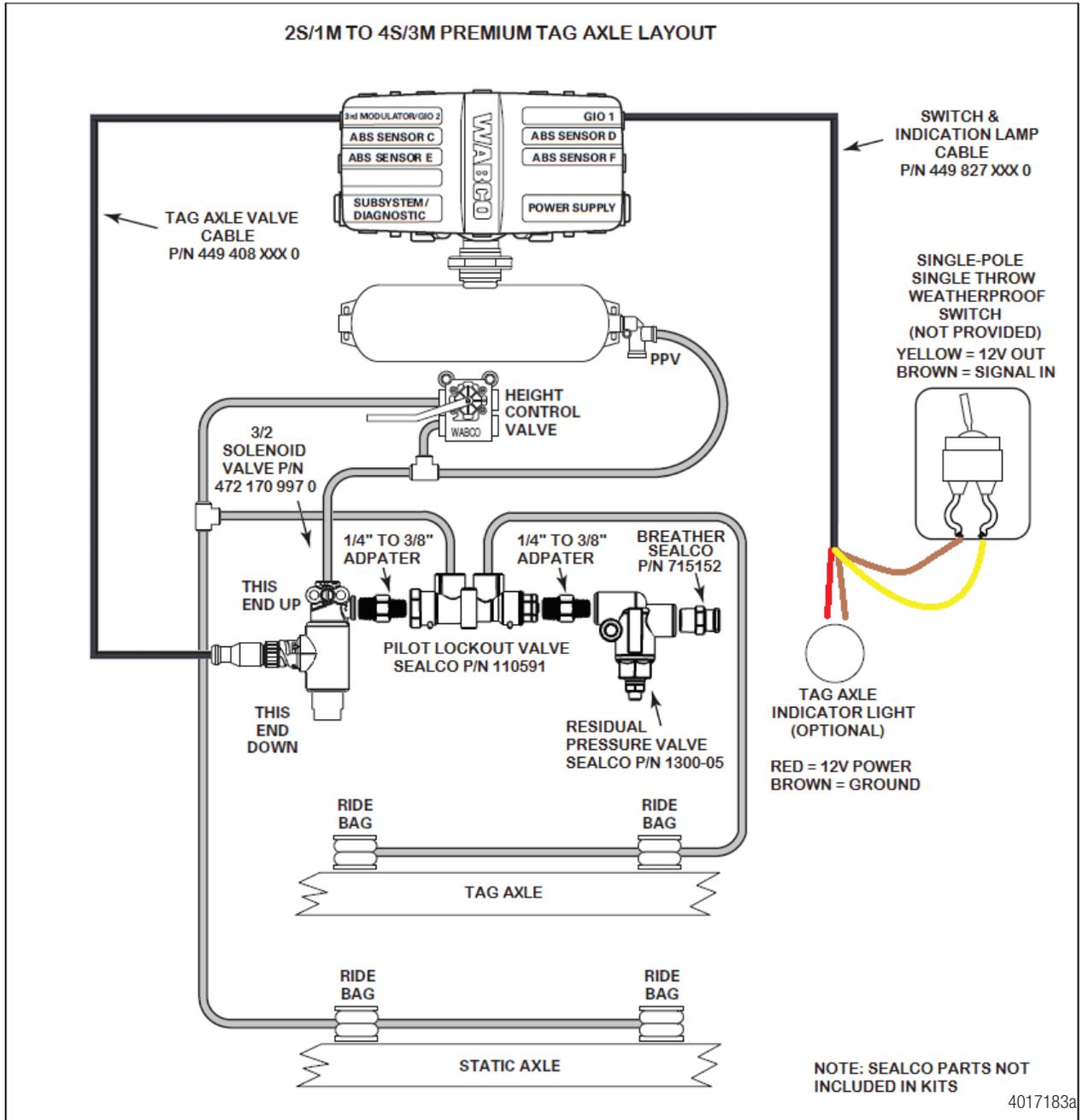


Fig. 9.16

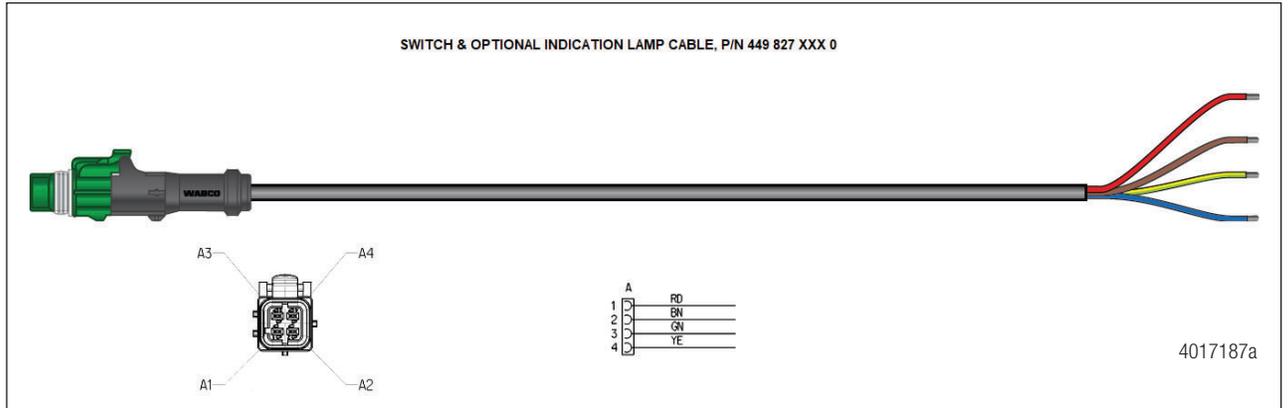


Fig. 9.17

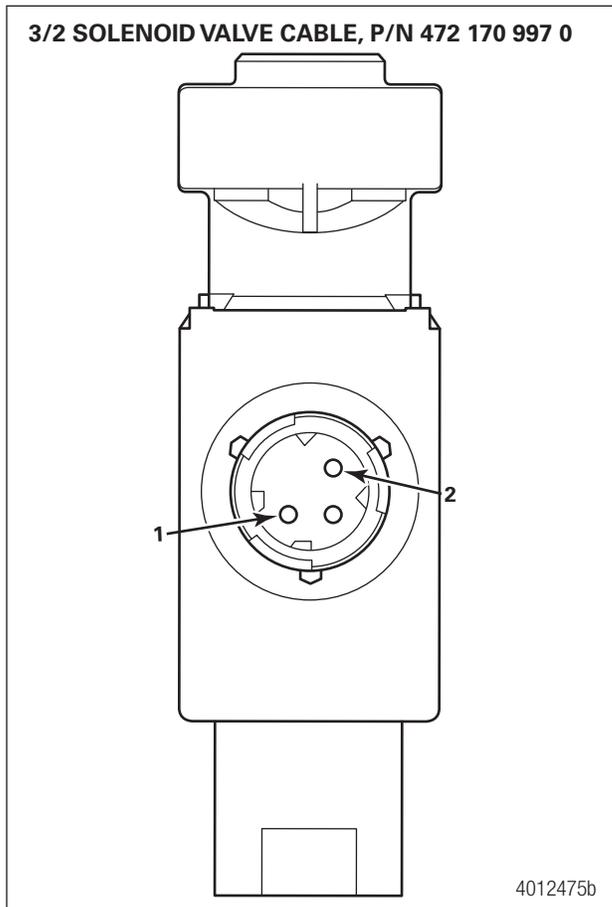


Fig. 9.18

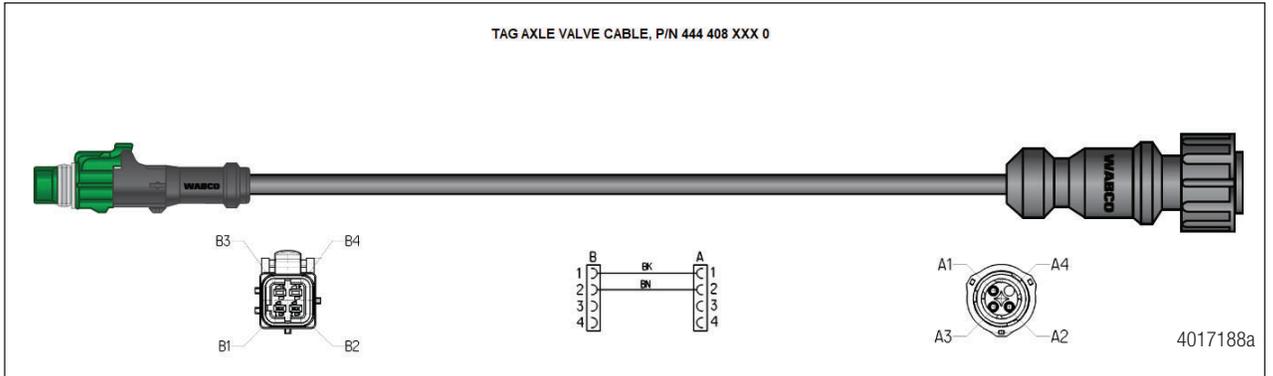
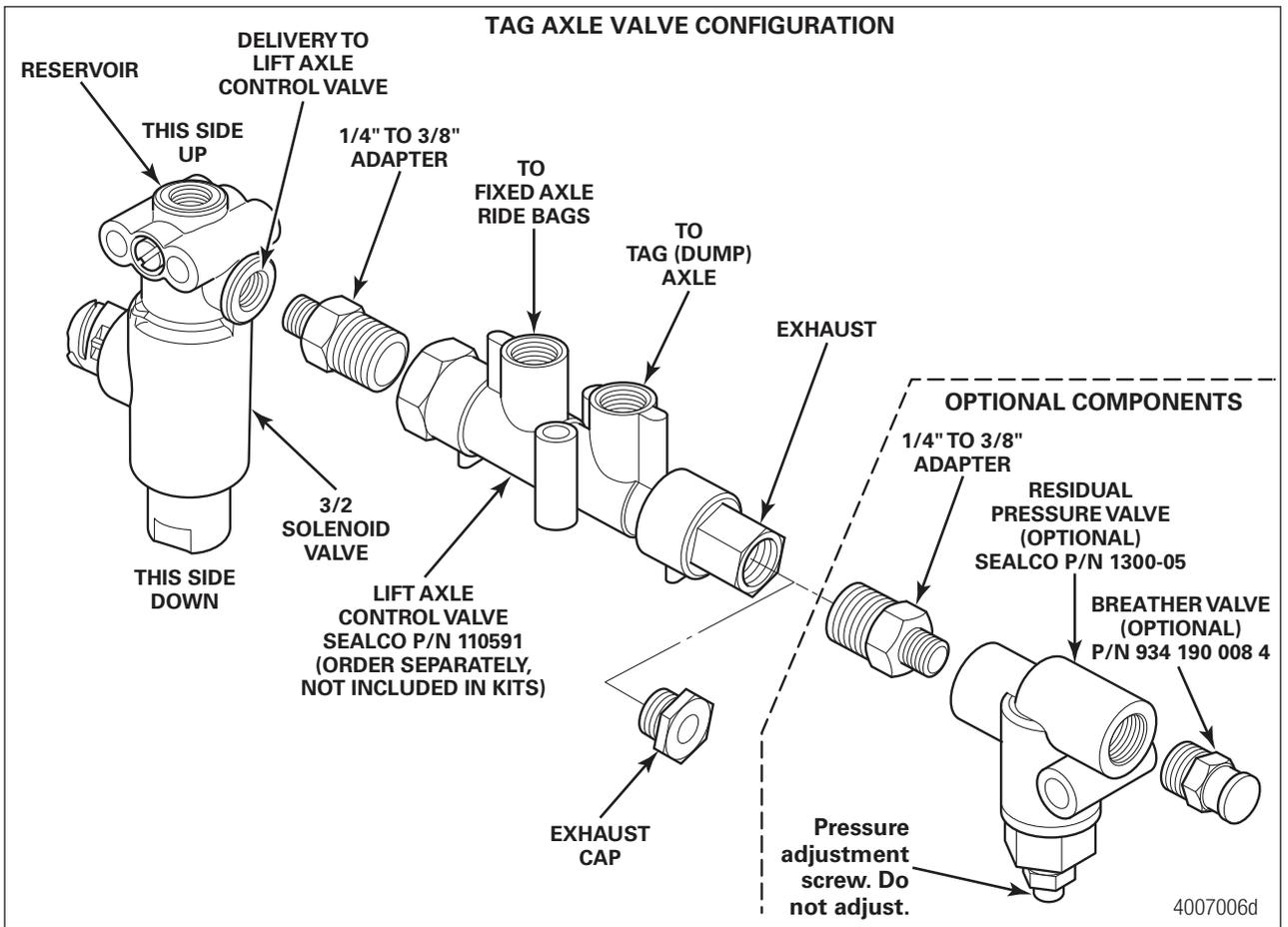


Fig. 9.19



9.3 Axle Load Monitoring Troubleshooting

ECUs 400 500 350 and 400 500 430 0 (Premium iABS units) are the only trailer ABS ECU/valve assemblies that have the capability of the Axle Load Monitoring feature being able to be activated and turned on.

The first step that should be taken when troubleshooting the Axle Load Monitoring system is to ensure that the system is pneumatically plumbed correct and electric connections are also correct. Refer to Figures 9.20 and 9.21 in this section for the correct schematic, depending upon the override switch configuration.

For additional information, refer to TP18055, Tag Axle Installation Manual, available at www.wabco-na.com.

When testing the system, ensure that 12-volts of DC power rated at a minimum of 10 amps is supplied to the trailer's constant power circuit.

Use of a volt-ohm meter may be required.

This troubleshooting section is based on the use of TOOLBOX PLUS™ Software version 13 or higher. If you have an earlier version of the software, visit wabco.snapon.com to purchase and download the latest version of the software.

Condition Experienced	Action to Take	Troubleshooting Details
Axle Load Monitoring Function Unavailable in TOOLBOX PLUS™ Software	Inspect WABCO iABS part number	Ensure that GIO-capable WABCO iABS is installed. Only 400 500 350 0 and 400 500 430 0 have Axle Load Monitoring functionality.
	Verify the WABCO TOOLBOX PLUS™ Software version	Ensure TOOLBOX PLUS™ software version 13.0 or later is installed.
Faults are present when Axle Load Monitoring Function Is Activated	Using TOOLBOX PLUS™ Software, check the active faults	Repair and clear all active faults. Cycle the ECU power.
Pressure Sensor is not reading the Pressure Value	Check Pressure Sensor Cable Connection at ECU	Check if Pressure Sensor Cable, P/N 449 826 XXX 0 is connected at GIO port 2. Refer to Figures 9.20 and 9.21 for correct installation.
		Make sure that cable is fully seated and secured at GIO port 2.
	Ensure that pressure sensor is not under torqued	Tighten the pressure sensor to 27 ±1.47 lb-ft (37 ±2 Nm).
	Ensure that pressure sensor is not over torqued	Tighten the pressure sensor to 27 ±1.47 lb-ft (37 ±2 Nm).
	Retrieve diagnostic information via TOOLBOX PLUS™ Software.	Check for active faults with TOOLBOX PLUS™ Software and repair all faults found.

Condition Experienced	Action to Take	Troubleshooting Details
Trailer Bogie Load is Not Displayed	Ensure that Axle Load Monitoring system is connected correctly.	Refer to Figures 9.20 and 9.21 for correct installation.
	Retrieve diagnostic information via TOOLBOX PLUS™ Software.	Check for active faults with TOOLBOX PLUS™ Software and repair all faults found.
	Ensure that Axle Load Monitoring function is activated.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed. If it is not activated then follow the procedures to activate the function.
"Calibration Unsuccessful" Message Appears While Performing Advanced Calibration	Check the state of trailer. (Unladen, Partially Laden, Laden)	Select the appropriate state of trailer and enter the exact trailer bogie load value that is displayed on weigh station.

Fig. 9.20

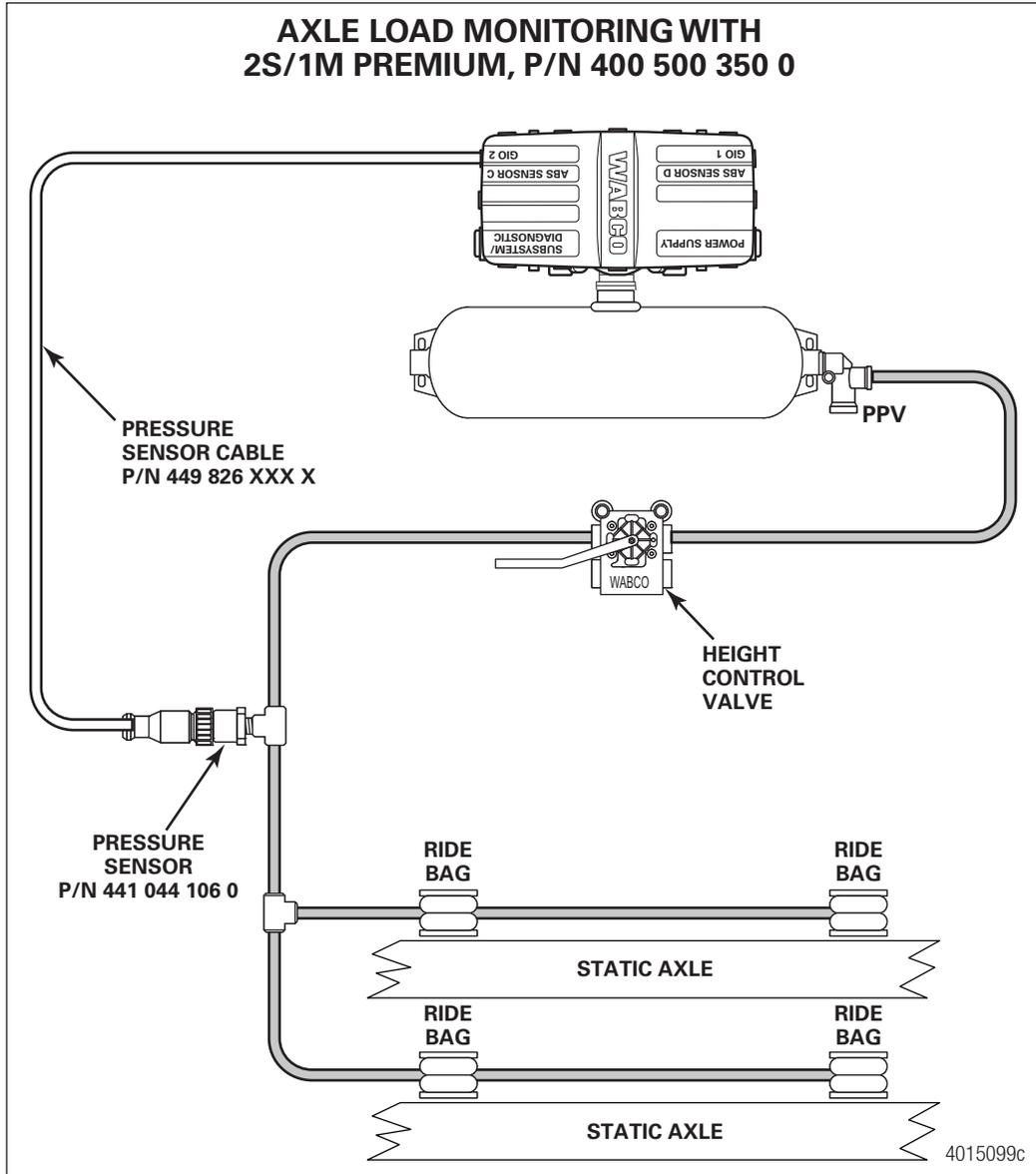


Fig. 9.21

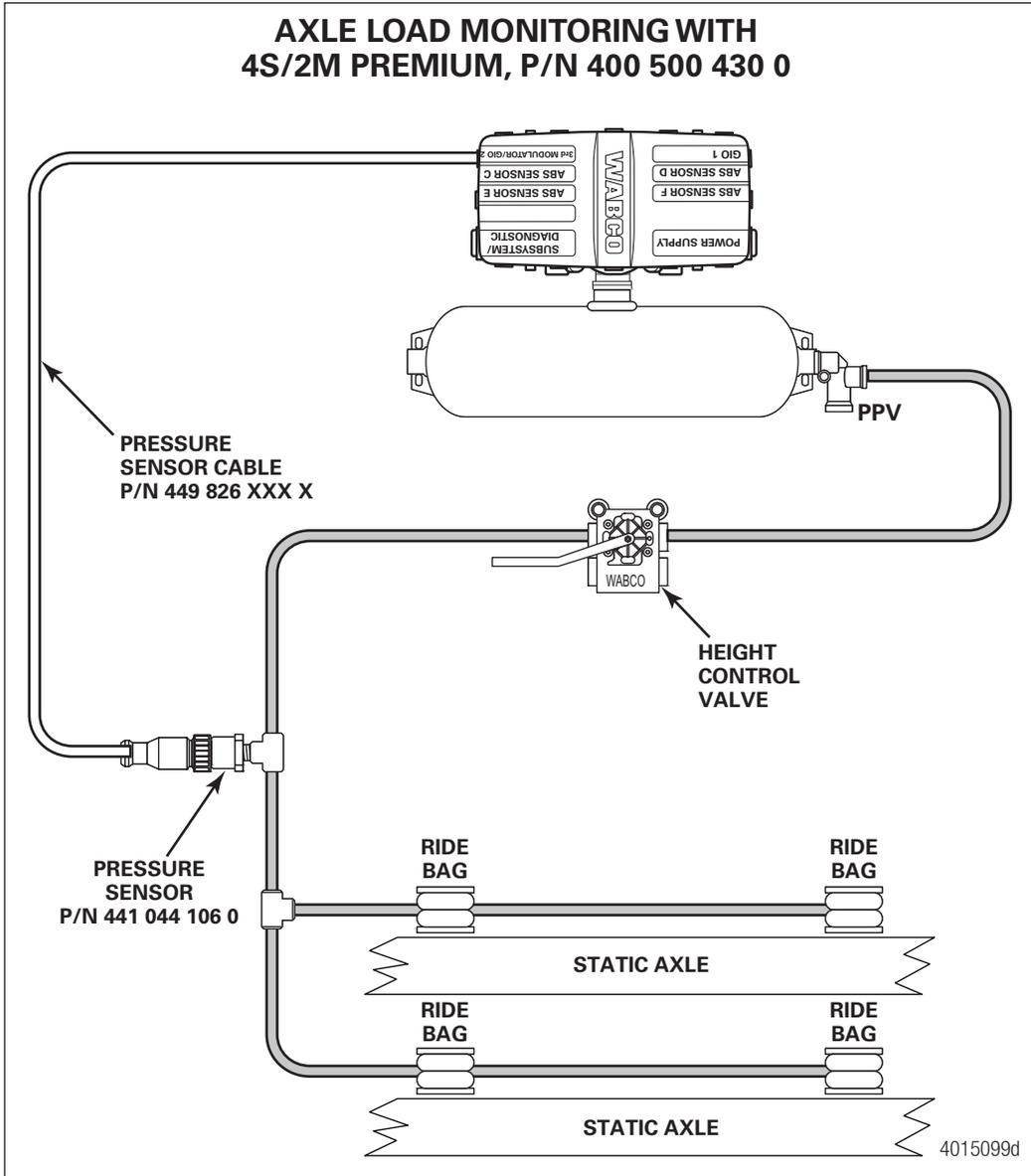
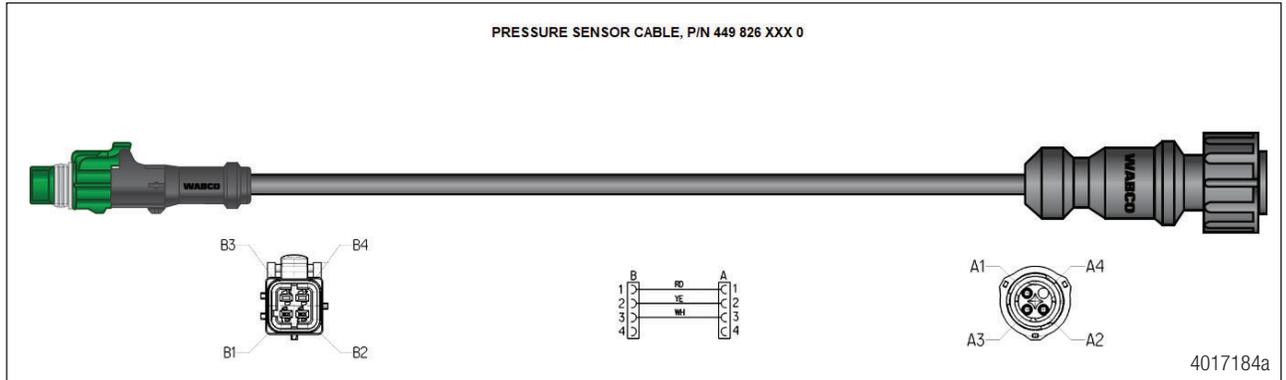


Fig. 9.22



9.4 Tire Inflation Communication System Troubleshooting

ECUs 400 500 350 and 400 500 430 0 (Premium iABS units) are the only trailer ABS ECU/valve assemblies that have the capability of the Tire Inflation Communication System feature being able to be activated and turned on.

The first step that should be taken when troubleshooting the Tire Inflation Communication system is to ensure that the system is connected correctly. Refer to Figure 9.26 in this section for the correct schematic, depending upon the override switch configuration.

For additional information, refer to TP19011, Tire Inflation Communication Installation Manual, available at www.wabco-na.com.



If the Tire Inflation system status lamp is not present or is not functioning, then the Tire Inflation Communication System will not function.

The TOOLBOX PLUS™ Software is necessary to activate the Tire Inflation Communication System function in the iABS Premium ECU. This process can be found in the Tire Inflation Communication System Installation Manual, TP19011.

This troubleshooting section is based on the use of TOOLBOX PLUS™ Software version 13 or higher. If you have an earlier version of TOOLBOX™ Software, visit www.wabco-na.com to purchase and download the latest version of the software.

Condition Experienced	Action to Take	Troubleshooting Details
TIS LED Illuminates with a Dim Glow All the Time	Confirm TIS is incandescent bulb or LED with load resistor.	Replace light as necessary.
		Ensure light is grounded correctly.

Condition Experienced	Action to Take	Troubleshooting Details
WABCO Tire Inflation Communication System is not Broadcasting a "Low Tire Pressure" Message When There is a Fill Event and the TIS Light is Illuminated	Correct installation needs to be verified.	<p>Confirm WABCO TIS Communication System is installed per Figures 9.26 and 9.28.</p> <p>Make sure all electrical connections are fully seated.</p>
	ECU valve should audibly click during its power-up self-test	ECU valve should audibly click during its power-up self-test. ABS warning light will illuminate and extinguish as a light test. If warning light remains on, begin diagnostics with TOOLBOX PLUS™ Software. If the ECU fails to click, ensure that the sensor extension cables and power cables are securely attached to the ECU and ensure that 12 volts is present at pin B-1 on the ECU power connector. Refer to Figure 9.23.
	Check continuity of the power cable	Check continuity for the 449 306 XXX 0 cable from the 8-pin connector (Pin 5). Refer to Figure 9.23.
	Check Meritor pigtail P/N 31184-00 (for Meritor Tire Inflation System)	Check diode on pre-installed TIS cable pigtail. Place the volt/ohm meter to "Diode". Place red lead on single male pin. Place the black lead on the dual tab connector. Continuity should be observed on the volt/ohm meter. Switching the leads in the opposite direction, an "Open" should be displayed on the volt/ohm meter. Refer to Figure 9.24.
	Check jumper harnesses P/N 449 025 XXX 0 (for Hendrickson Tiremaxx Tire Inflation System)	Check diode on jumper harness. Place the volt/ohm meter to "Diode". Place red lead on pin A-A and place the black lead on pin B-A. Continuity should be observed on the volt/ohm meter. Switching the leads in the opposite direction, an "Open" should be displayed on the volt/ohm meter. Refer to Figure 9.29.
	Inspect WABCO iABS part number	Ensure that GIO-capable WABCO iABS is installed. Only 400 500 350 0 and 400 500 430 0 have Tire Inflation Communication System.
	Verify the Tire Inflation function is activated in TOOLBOX PLUS™ Software.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed.
"Low Tire Pressure" Message is Being Broadcasted All the Time	Correct installation needs to be verified.	<p>Confirm WABCO TIS Communication System is installed per Figures 9.26 and 9.28.</p> <p>Make sure all electrical connections are fully seated.</p>
	Confirm TIS is incandescent bulb or LED with load resistor	<p>Replace light as necessary.</p> <p>Ensure light is grounded correctly.</p>
TIS LED Does Not Illuminate During a Fill Event	Correct installation needs to be verified.	<p>Confirm WABCO TIS Communication System is installed per Figures 9.26 and 9.28.</p> <p>Confirm TIS LED is not burned out.</p> <p>Replace TIS LED as required per manufacturer guideline.</p>

Fig. 9.23

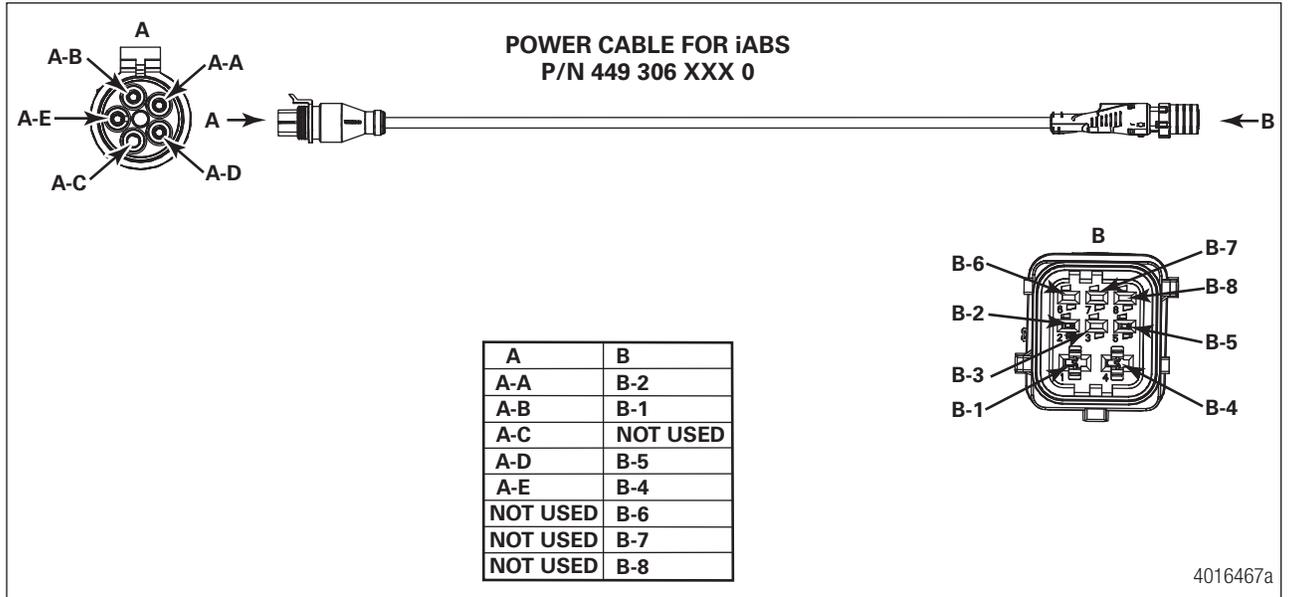


Fig. 9.24

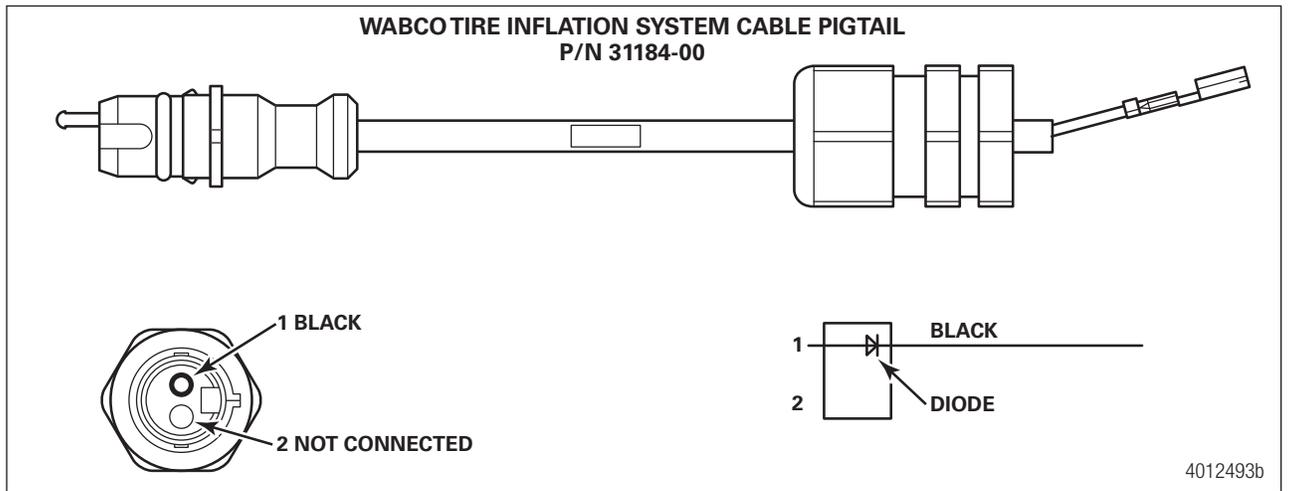


Fig. 9.25

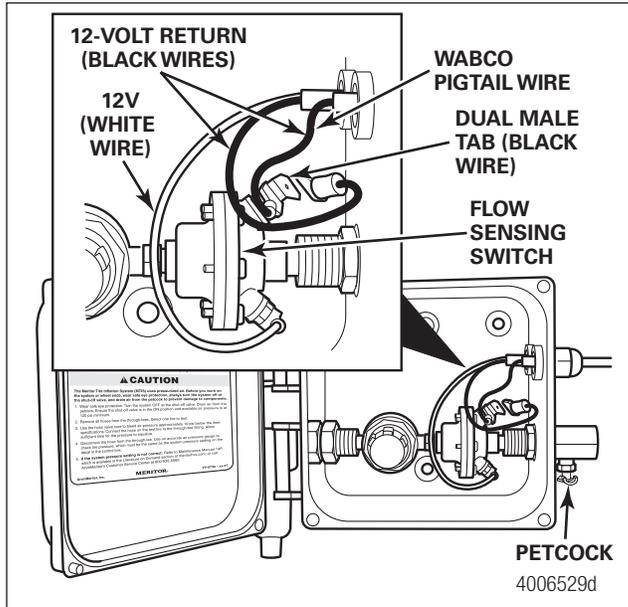


Fig. 9.26

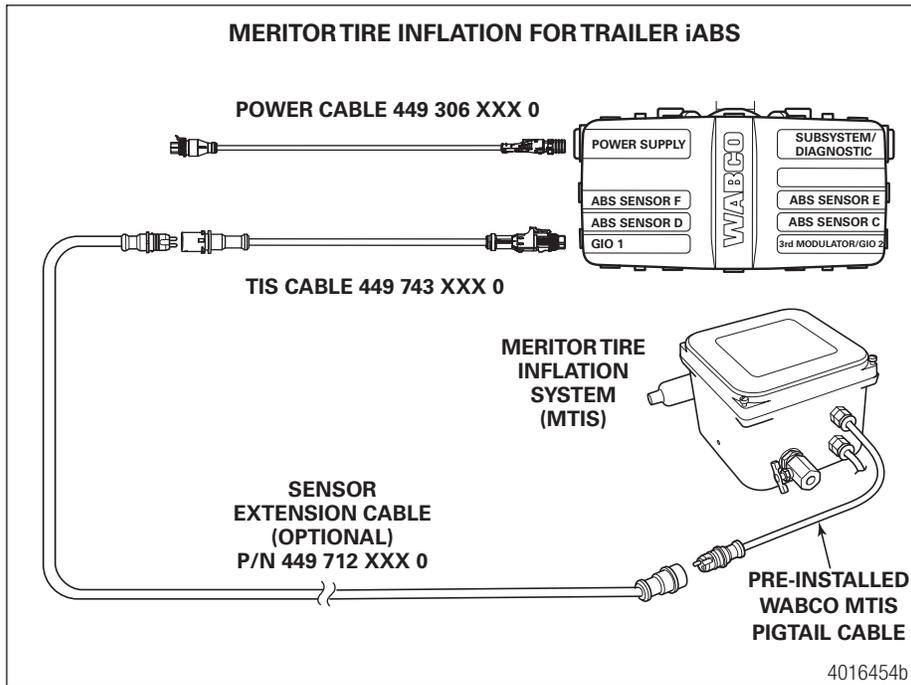


Fig. 9.27

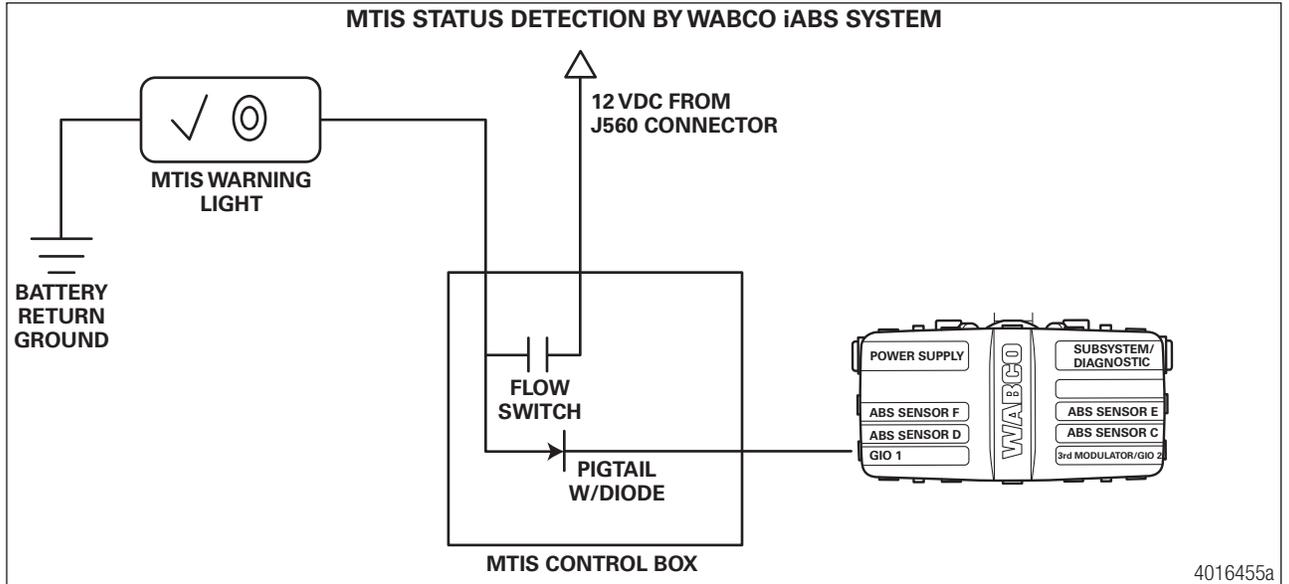


Fig. 9.28

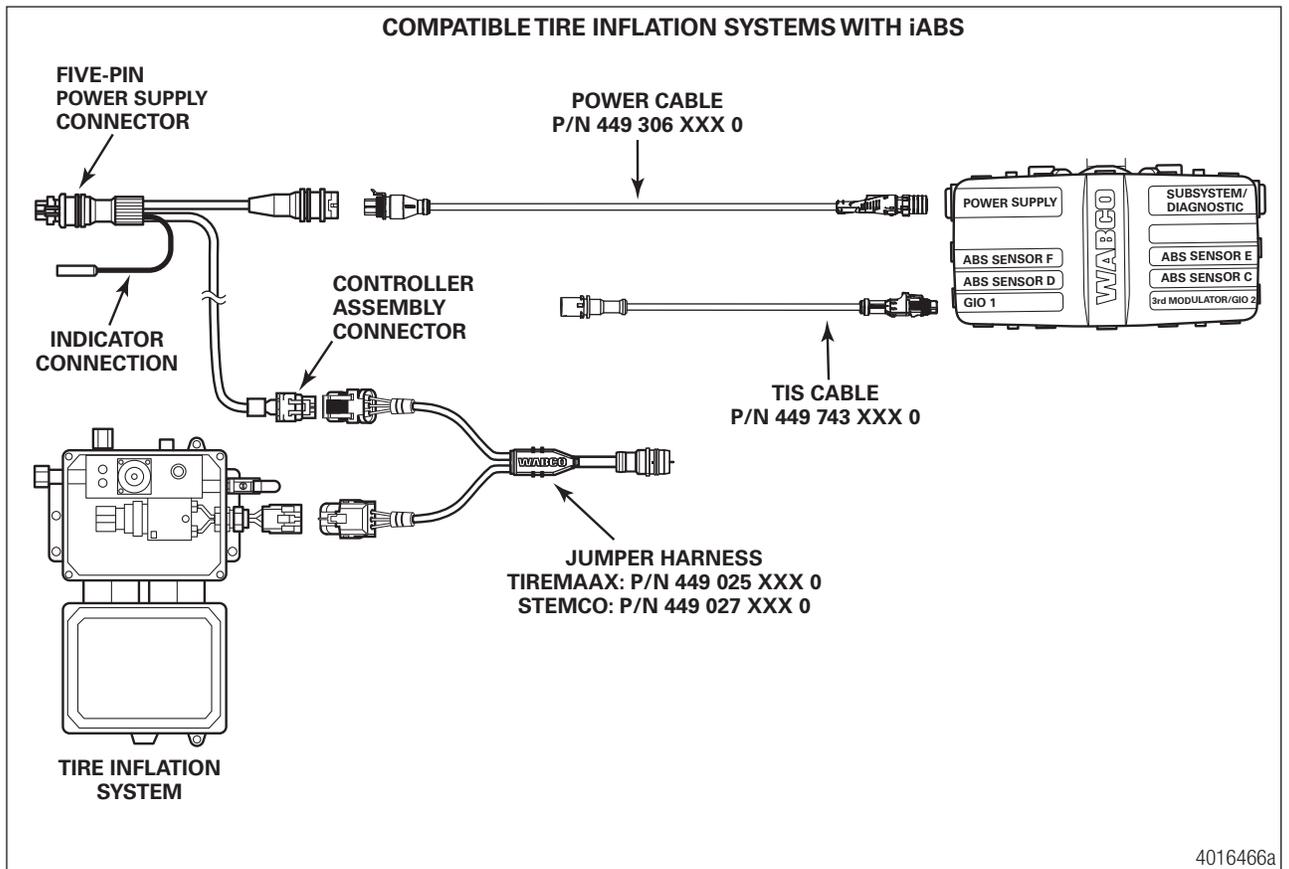
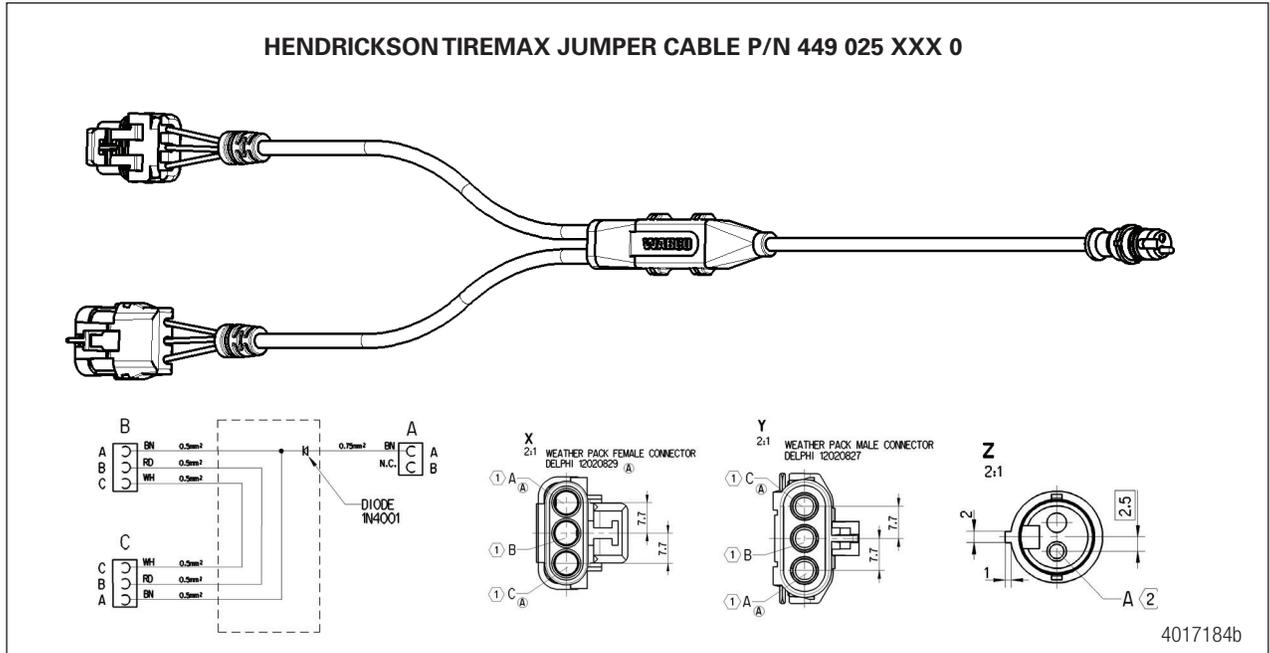


Fig. 9.29



9.5 Door Ajar System Troubleshooting

ECUs 400 500 350 and 400 500 430 0 (Premium iABS units) are the only trailer ABS ECU/valve assemblies that have the capability of the Door Ajar System feature being able to be activated and turned on.

The first step that should be taken when troubleshooting the Door Ajar System is to ensure that the system is connected correctly. Refer to Figures 9.30 and 9.31 in this section for the correct schematic, depending upon the override switch configuration.

For additional information, refer to TP19015, Door Ajar Installation Manual, available at www.wabco-na.com.

This troubleshooting section is based on the use of TOOLBOX PLUS™ Software version 13 or higher. If you have an earlier version of TOOLBOX™ Software, visit wabco.snapon.com to purchase and download the latest version of the software.

Condition Experienced	Action to Take	Troubleshooting Details
Door Ajar Function Unavailable in TOOLBOX PLUS™ Software	Inspect WABCO iABS part number.	Ensure that GIO-capable WABCO iABS is installed. Only 400 500 350 0 and 400 500 430 0 have Door Ajar functionality.
	Verify the WABCO TOOLBOX PLUS™ Software version.	Ensure TOOLBOX PLUS™ Software version 13.0 or later is installed.

Troubleshooting

Condition Experienced	Action to Take	Troubleshooting Details
Integrated Speed Switch Function Will Not Activate	Cycle trailer power.	ECU valve should audibly click during its power-up self-test. ABS warning light will illuminate and extinguish as a light test. If warning light remains on, begin diagnostics with TOOLBOX PLUS™ Software. If the ECU fails to click, ensure that the sensor extension cables are securely attached to the ECU.
	Ensure that Door Ajar system is connected correctly.	Refer to Figures 9.30 and 9.31 for correct installation.
	Verify the correct cable is used.	Ensure that Door Ajar Cable, P/N 449 827 XXX 0 is used.
	Check the Door Ajar Cable connection at ECU.	Check if Door Ajar Cable, P/N 449 827 XXX 0 is connected at GIO port 1. Refer to Figures 9.30 and 9.31 for correct installation
		Make sure that cable is fully seated and secured at GIO port 1.
Retrieve diagnostic information via TOOLBOX PLUS™ Software.	Check for active faults with TOOLBOX PLUS™ Software and repair all faults found.	
Door Ajar is not Functioning	Ensure that Door Ajar function is activated.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed. If it is not activated then follow the procedures to activate the function.
	Check the plumbing and electrical connections.	Refer to Figures 9.30 and 9.31 for correct installation.

Fig. 9.30

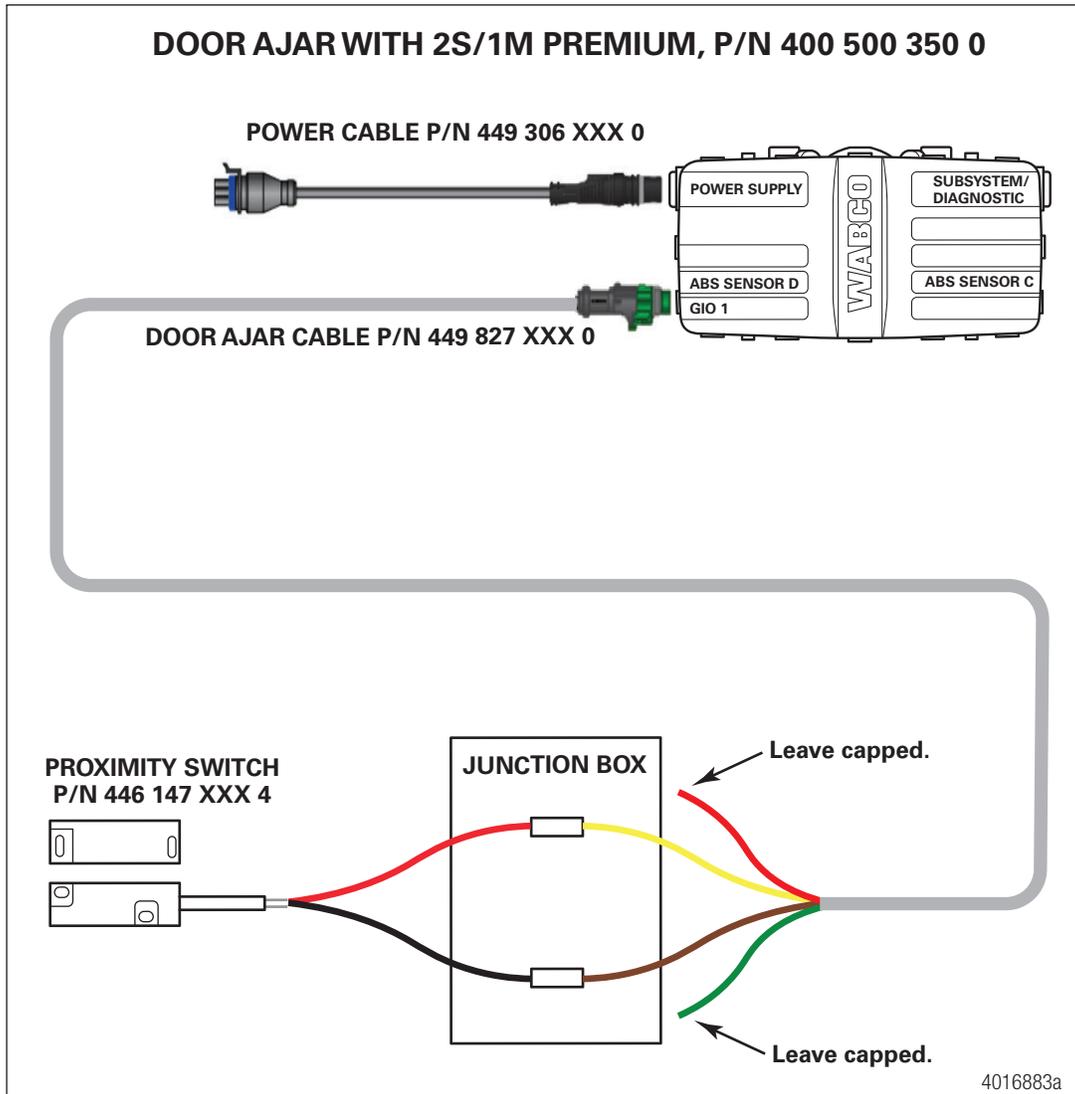


Fig. 9.31

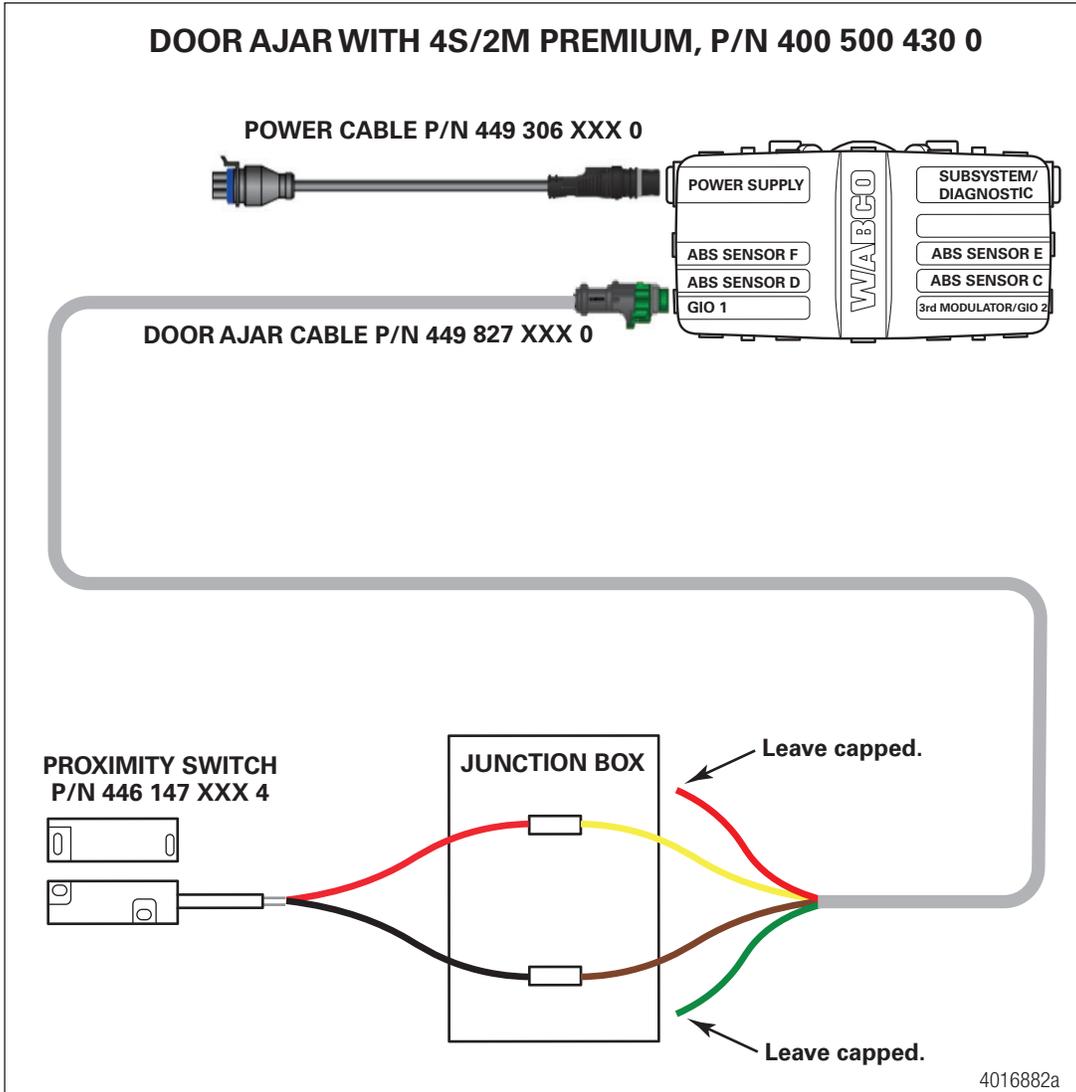
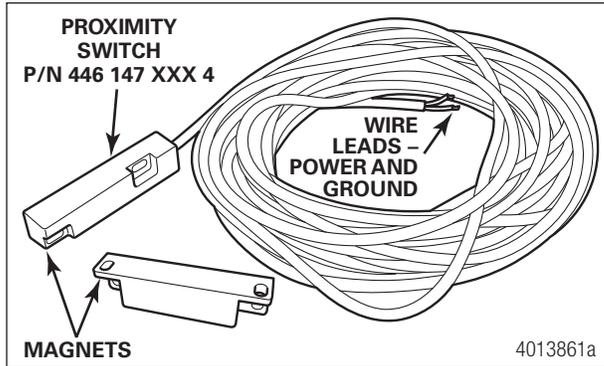


Fig. 9.32



9.6 Integrated Speed Switch System

ECUs 400 500 350 and 400 500 430 0 (Premium iABS units) are the only trailer ABS ECU/valve assemblies that have the capability of the Integrated Speed Switch System feature being able to be activated and turned on.

The first step that should be taken when troubleshooting the Integrated Speed Switch System is to ensure that the system is connected correctly. Refer to Figures 9.33 and 9.34 in this section for the correct schematic, depending upon the override switch configuration.

For additional information, refer to TP19031, Integrated Speed Installation Manual, available at www.wabco-na.com.

This troubleshooting section is based on the use of TOOLBOX PLUS™ Software version 13 or higher. If you have an earlier version of TOOLBOX™ Software, visit wabco.snapon.com to purchase and download the latest version of the software.

Condition Experienced	Action to Take	Troubleshooting Details
Integrated Speed Switch Function Unavailable in TOOLBOX PLUS™ Software	Inspect WABCO iABS part number	Ensure that GIO-capable WABCO iABS is installed. Only 400 500 350 0 and 400 500 430 0 have Speed Switch functionality.
	Verify the WABCO TOOLBOX PLUS™ Software version	Ensure TOOLBOX PLUS™ Software version 13.0 or later is installed.
Integrated Speed Switch Function Will Not Activate	Cycle trailer power.	ECU valve should audibly click during its power-up self-test. ABS warning light will illuminate and extinguish as a light test. If warning light remains on, begin diagnostics with TOOLBOX PLUS™ Software. If the ECU fails to click, ensure that the sensor extension cables are securely attached to the ECU.
	Ensure that speed switch system is connected correctly.	Refer to Figures 9.33 and 9.34 for correct installation.
	Verify the correct cable is used to connect the output component.	Ensure that Speed Switch Cable, P/N 449 827 XXX 0 is used.

Condition Experienced	Action to Take	Troubleshooting Details
	Check the speed switch Cable connection at ECU.	Check if the Speed Switch Cable, P/N 449 827 XXX 0 is connected at appropriate GIO port on the ECU. Refer to Figures 9.33 and 9.34 for correct installation. Make sure that cable is fully seated and secured at GIO port.
	Retrieve diagnostic information via TOOLBOX PLUS™ Software.	Check for active faults with TOOLBOX PLUS™ Software and repair all faults found.
Integrated Speed Switch is not Functioning correctly	Ensure that speed switch function is activated.	From the main screen of Trailer ABS diagnostics, select the Modify pull-down. Select GIO configurations and active settings will be displayed. If it is not activated then follow the procedures to activate the function.
	Check the plumbing and electrical connections.	Refer to Figures 9.33 and 9.34 for correct installation.

Fig. 9.33

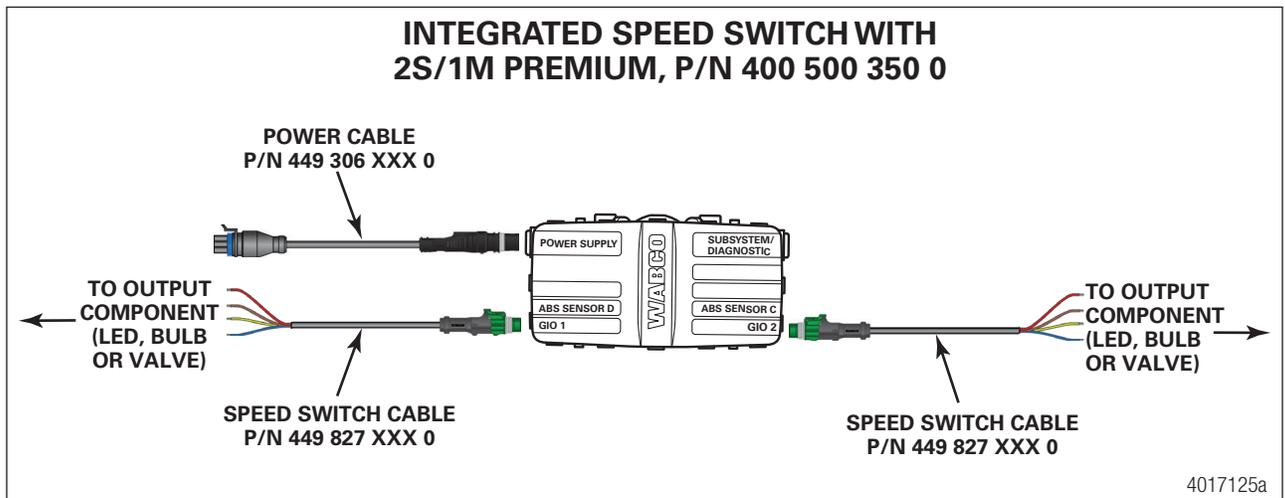


Fig. 9.34

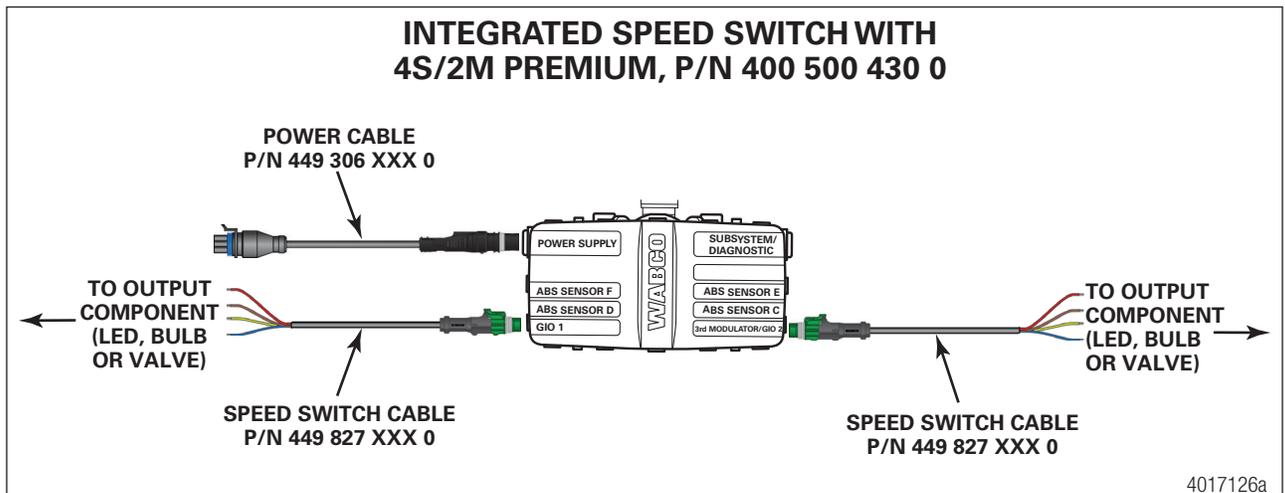
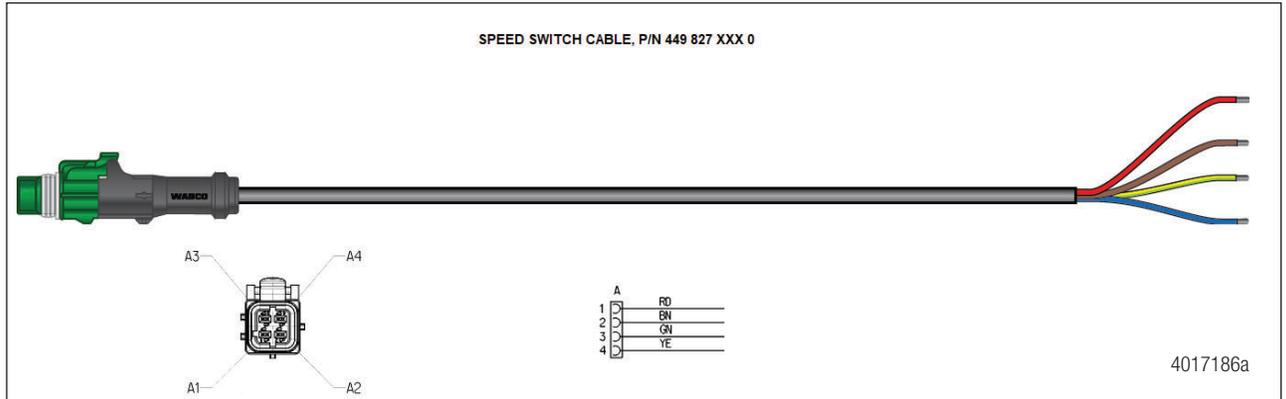


Fig. 9.35



10 Appendix I

10.1 Trailer ABS Indicator Lamp on Vehicle Dash

The trailer ABS indicator lamp on vehicle dash applies to Trailer ABS only. The lamp is controlled by a signal to the tractor ECU, which is sent over the power line (PLC function). When a trailer ABS fault is detected, an ON message is sent. When no fault is detected, the ECU receives an OFF message

Table C illustrates trailer ABS lamp operation at power-up or ignition on. Table D depicts lamp responses that occur during operation.

Lamp turn ON and OFF messages do not turn the lamp ON or OFF instantly. The delay between the receipt of the message and the lamp response time is intentional, because it prevents erratic lamp activity.



For doubles or triples, the lamp does not distinguish between trailers. A system fault in any of the trailers will activate the trailer ABS indicator lamp.

TABLE C: DASH-MOUNTED TRAILER ABS INDICATOR LAMP OPERATION — BULB CHECK (INFORMATION FOR DRIVERS)

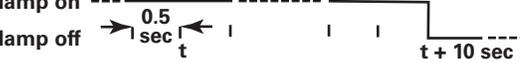
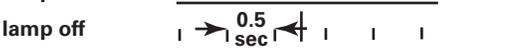
Signal from trailer to tractor ECU	Status of Trailer ABS Lamp on vehicle dash	Explanation
<p>Single or Multiple Trailers</p> <p>message OFF OFF OFF OFF OFF OFF OFF OFF</p> <p>lamp on ...</p> <p>lamp off </p>	<p>Trailer ABS lamp comes on at ignition, OFF message is detected within three seconds of ignition, Trailer ABS lamp goes out.</p>	<p>Bulb Check performed AND Trailer ABS system is OK. In this case, the lamp is ON for a Bulb Check only.</p>
<p>Single or Multiple Trailers</p> <p>message No ON or OFF messages</p> <p>lamp on OFF OFF ..</p> <p>lamp off </p>	<p>Trailer ABS lamp does not come on within three seconds of ignition.</p>	<p>No Bulb Check, trailer added after initial power-up, system OK. There was no trailer PLC message for at least three seconds following ignition ON.</p>

ON = Turn ON message to “trailer ABS” lamp

OFF = Turn OFF message to “trailer ABS” lamp

Removing a trailer with a fault will cause ABS lamp to turn off. Remember to have trailer with fault repaired as soon as possible before returning to service.

**TABLE D: DASH-MOUNTED TRAILER ABS INDICATOR LAMP OPERATION
(INFORMATION FOR SERVICE TECHNICIANS)**

Signal from trailer to tractor ECU	Status of Trailer ABS Lamp on vehicle dash	Explanation	Action
Single or Multiple Trailers message No ON or OFF messages lamp on lamp off 	Trailer ABS lamp does not come on within three seconds of ignition.	Not using the PLC system (no trailer connected) or trailer not equipped with PLC or fault in PLC system.	Use lamp on side of trailer to identify fault. Make necessary repairs.
Single Trailer message OFF OFF OFF ON ON ON ON ON lamp on ... 	Trailer ABS lamp comes on.	Trailer ABS fault(s) occurred during operation and still exists.	
Multiple Trailers/Dollies message OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF ON ON ON ON lamp on ... 			
Single Trailer message ON ON OFF OFF OFF OFF OFF OFF lamp on ... 	Trailer ABS lamp comes on but goes out after 2.5 seconds after fault is detected.	Trailer ABS fault occurred during operation and the fault was corrected.	None
Multiple Trailers/Dollies message OFF OFF OFF OFF OFF OFF OFF OFF ON ON OFF OFF OFF OFF OFF OFF lamp on ... 			
Single Trailer message ON ON ON No ON or OFF messages lamp on ... 	ABS lamp is off, comes on, then goes off, 10 seconds after loss of messages.	ABS fault existed, then signal was lost because trailer disconnected or PLC fault.	Use lamp on side of trailer to identify fault. Make necessary repairs.
Multiple Trailers/Dollies message OFF OFF OFF OFF OFF OFF OFF OFF ON ON lamp on ... 		ABS fault existed, then trailer with fault lost signal because trailer was disconnected or PLC fault.	
Single Trailer to Multiples message ON ON ON OFF OFF OFF ON ON ON lamp on ... 	ABS lamp is on and stays on when a new trailer with no new fault is added.	There was a fault in existence before the new trailer was added AND the ignition was not turned off before the trailer was added.	
Single Trailer to Multiples message ON ON ON ON ON ON ON ON ON lamp on ... 	ABS lamp is on and stays on when a new trailer with a new fault is added.	ABS fault was in existence before the new trailer was added AND the ignition was not turned off before the trailer was added AND the new trailer has an ABS fault.	

ON = Turn ON message to "trailer ABS" lamp

OFF = Turn OFF message to "trailer ABS" lamp

Removing a trailer with a fault will cause ABS lamp to turn off. Remember to have trailer with fault repaired as soon as possible before returning to service. To attach the valve to the ECU, tighten the four hexbolts to 5 lb-ft (6 N•m).

11 Appendix II

11.1 Installing Sensors on Non-ABS-Prepped Axles

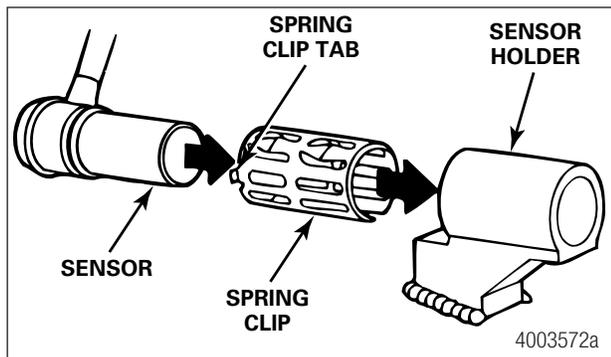
Sensor locations vary due to suspension type. WABCO recommends placing the sensors on the axle that will provide the most braking performance. The trailer manufacturer, suspension manufacturer, along with WABCO, work together to determine this information. Contact the necessary party for further information.

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).

Lubricants approved for use on WABCO sensors and spring clips are as follows. The use of non-approved lubricants is at your own risk. Please note that non-approved lubricants can reduce the performance of the parts or lead to damage of the product that may not be covered under warranty.

- Mobilith SHC-220 (Mobil)
 - TEK 662 (Roy Dean Products)
 - Staburags NBU 30 PTM (Kluber Lubrication)
 - Valvoline EP 633
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 11.1.

Fig. 11.1

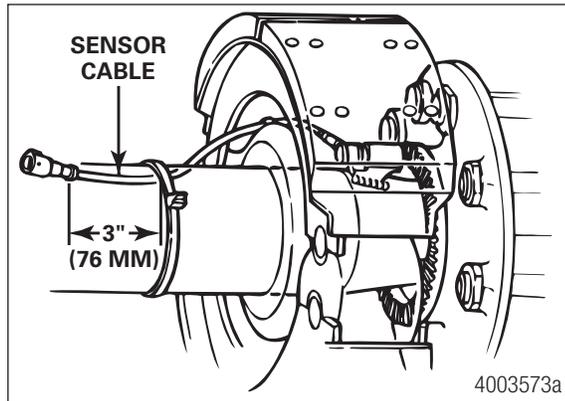


4. Route the sensor cable toward the brake chamber, over the brake spider or through the prestamped hole dedicated for ABS sensors. Route to the back side of the axle. Secure the cable to the axle between the brake spider and the suspension brackets. Continue to route the sensor cable behind the spring seats. Secure the cable to the axle one inch from the molded sensor plug. Figure 11.2.

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.

Fig. 11.2



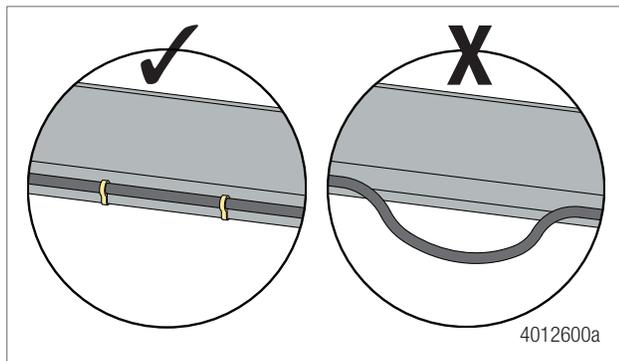
5. Install the wheel hub carefully so that the tooth wheel pushes against the sensor as the wheel bearings are adjusted. There should be no gap between the sensor and the tooth wheel. If the gap is too large, this can cause the ECU to log a fault code.
6. Test the sensor output voltage. Use a volt/ohm 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 volts AC, though if the wheel is spun faster than 1/2 of a revolution per second, the reading will likely be higher. It is important to spin the wheel at the correct speed to determine the output is in fact correct. If minimum output is less than 0.2 volt AC, push the sensor toward the tooth wheel. Recheck the sensor output.

12 Appendix III

12.1 Cable Routing Guidelines

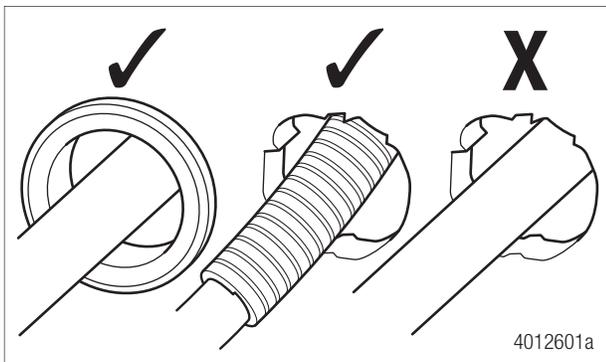
All wires should be tightly secured to a solid member in intervals not greater than 18-inches (457 mm) to avoid excess cable vibration and potential snags with road debris. The correct cable installation should not allow the cable to slide through beam clamps/zip ties, but not tight enough to pinch the internal wires. Refer to technical bulletins TP20212 and TP1593 for more information. Figure 12.1.

Fig. 12.1



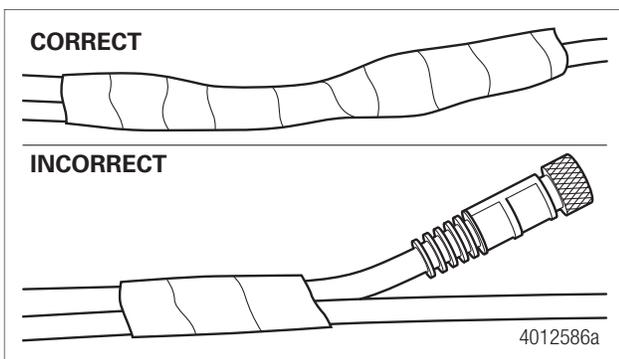
Wiring should NEVER go through any bare, unprotected metal holes. Use grommets, caulk or wire wrap to protect wire from premature. Figure 12.2.

Fig. 12.2

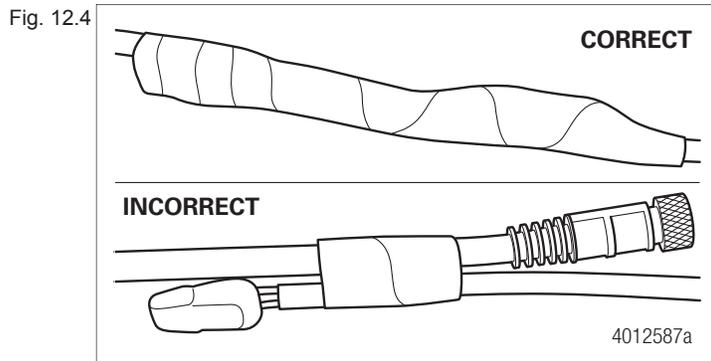


When routing the cable through the wiring channel on the edge or center of the trailer, secure the shorter leg of the latch connectors to the longer leg to ease wire routing. Figure 12.3.

Fig. 12.3



When using a wire snake to pull the cable up through the frame, make sure to tape the connectors correctly to the wire snake. Figure 12.4.



12.2 Cable Strain Relief Guidelines

It is important that cabling follows 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 are in motion. A small amount of slack also eases access to other system components.

A taut cable can negatively affect the lifespan of the cable and attached component. Cables without adequate strain relief can potentially stress a cable connection enough that moisture could intrude into the cable connector. Internal wire stress 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 (ABS) systems to Roll Stability Systems (RSS).

12.2.1 Excess Cable Length

In cases where the length of cable exceeds what is required, the excess must be bundled in an efficient manner.

- Cables should not be draped or wrapped around components or left unsecured.
- All slack remaining in the cable once the connections are made can be bundled in a Z-shaped loop. Do not coil the cable into a circular bundle.
- The bend at the end of the bundled cable should be greater than or equal to ten times the diameter of the cable.
- All cable fasteners should be tightened in a manner only to the extent that the cable is held sufficiently in place. Over tightening can result in damage to the cable.
- Fasten the excess cable to an area that is free of sharp edges and moving components.

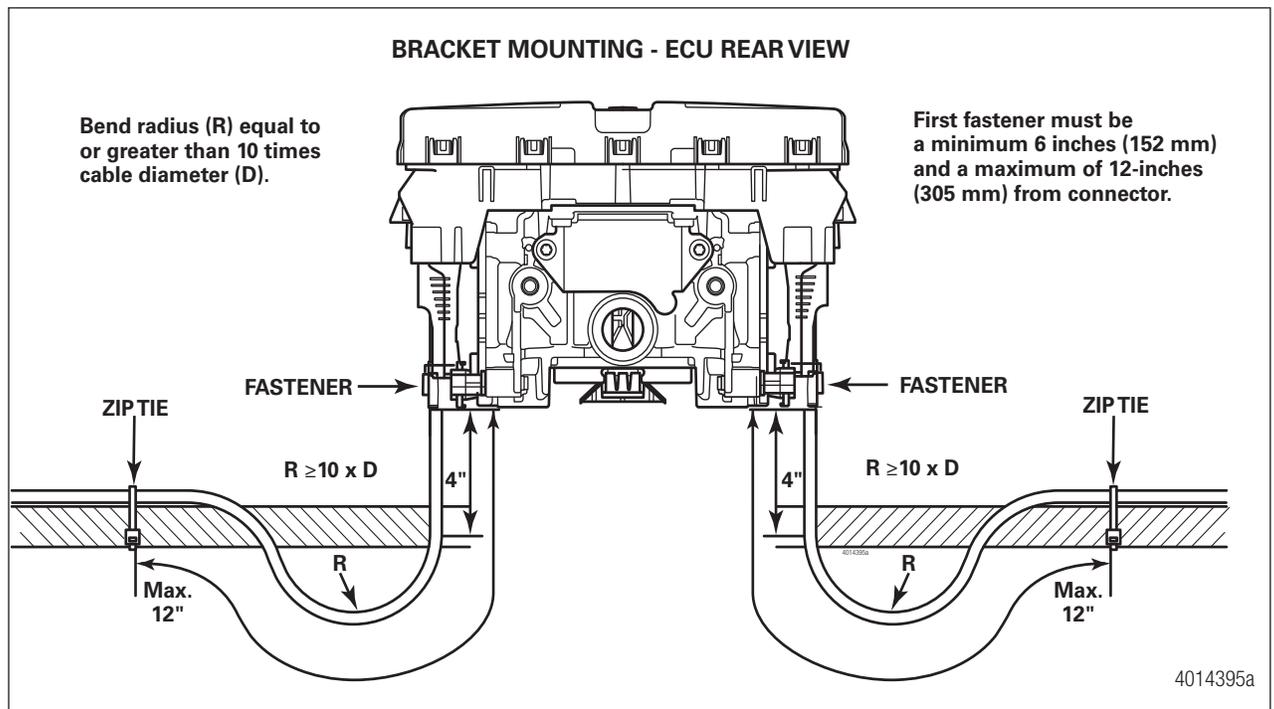
WABCO has many lengths of cables available so it is a best practice to obtain a length that suits the requirements of the installation. Refer the Parts list in Appendix IV to find the different cable lengths that WABCO offers.

12.2.2 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 12.5 for the ECU mounting of 2S/2M-4S/3M ABS.

Fig. 12.5



ABS 2S/2M-4S/3M

12.2.3 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 12.6 for 2S/2M-4S/3M ABS.

12.2.5 Securing WABCO Cables to Air Lines

Routing of cables near the ECU assembly and attached to air lines requires careful consideration. Care should be taken that cable fasteners are not over tightened on either the air line or the cable. The cables should be anchored only tight enough to prevent movement of the cable without pinching the air line.

Selection of the optimum fitting also has an impact of strain relief. Ensure that cables are not pinched, bent or wrapped around any fittings in the cable proximity.

12.2.6 Connection of Cables

It is important to ensure all cable-to-cable connections maintain correct strain relief. Cable restraints must be placed between two- and fourinches 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 of a maximum of 18-inches to avoid cable vibration. See Figure 12.8, Figure 12.9 and Figure 12.10.

Fig. 12.8

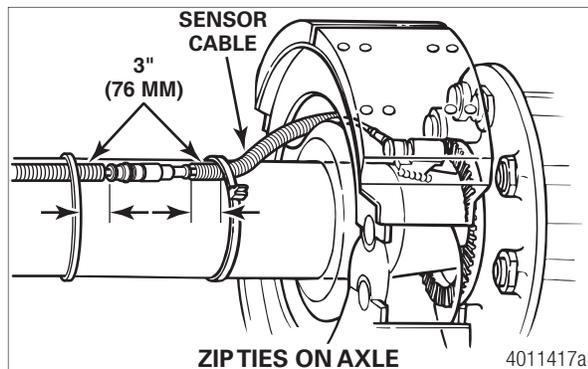


Fig. 12.9

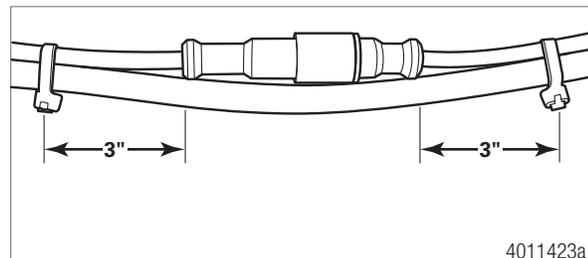
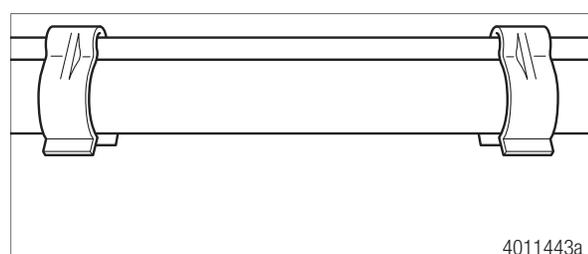


Fig. 12.10



13 Appendix IV

13.1 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.

14 Appendix V

14.1 Parts and Variant List

VARIANT LIST

Variants					
System Configuration	2S/1M Standard	2S/1M Premium	2S/2M to 4S/2M Standard	4S/2M Pull Trailer	2S/2M to 4S/3M Premium
Part Number	400 500 320 0	400 500 350 0	400 500 420 0	400 500 425 0	400 500 430 0
CAN Capable	Yes	Yes	Yes	Yes	Yes
GIO Capable	No	Yes	No	No	Yes
Direction of Control	Side to Side	Side to Side	Side to Side	Axle to Axle	Side to Side

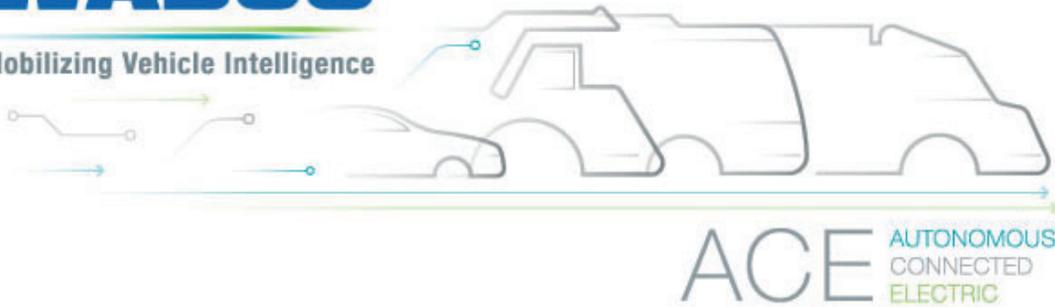
PARTS LIST

Slot on iABS Modulator	Application	Part Number	Length
Power	 Power Cable	449 306 005 0 449 306 010 0 449 306 030 0 449 306 047 0	0.5 M 1 M 3 M 4.7 M
Power	 Power Cable Blunt Cut	449 307 010 0 449 307 030 0	1 M 3 M
Subsystem	 Diagnostic Cable Blunt Cut 4 Wire	449 608 047 0	4.7 M
Subsystem	 Diagnostic Cable	449 606 030 0	3 M

PARTS LIST			
Slot on iABS Modulator	Application	Part Number	Length
Sensor Ports C,D,E,F	 Sensor Extension Cable	449 733 008 0	0.8 M
		449 733 013 0	1.3 M
		449 733 018 0	1.8 M
		449 733 030 0	3 M
		449 733 050 0	5 M
		449 733 070 0	7 M
		449 733 090 0	9 M
		449 733 120 0	12 M
Modulator	 GIO Cable 4 Pin (3rd Mod)	449 407 030 0	3 M
		449 407 060 0	6 M
		449 407 080 0	8 M
		449 407 120 0	12 M
GIO 1 or 2	 GIO Cable 3 Pin	449 826 010 0	1 M
		449 826 030 0	3 M
		449 826 100 0	10 M
GIO 1 or 2	 GIO Cable 2 Pin	449 408 010 0	1 M
		449 408 040 0	4 M
		449 408 060 0	6 M
GIO 1 or 2	 GIO Cable Blunt Cut 4 Wire	449 827 030 0	3 M
		449 827 060 0	6 M
		449 827 120 0	12M
		449 827 180 0	18 M
GIO 1 or 2	 Brake Pad Wear Cable	449 836 013 0	1.3 M
		449 836 030 0	3 M
GIO 1 or 2	 GIO Cable Tire Inflation	449 743 010 0	1 M
		449 743 030 0	3 M
Subsystem	 Subsystem Cable (OptiLink/IVTM)	449 928 050 0	5 M
		449 928 120 0	12 M
Subsystem	 Subsystem Cable (Smartboard II)	449 929 040 0	4 M
		449 929 060 0	6 M
		449 929 120 0	12 M
Subsystem	 HUB Cable Subsystem	894 600 161 2	0.5 M
Power	 HUB Cable Power (1M Only)	894 600 151 2	0.5 M
GIO 1 or 2	 HUB Cable GIO	894 600 121 2	0.5 M

WABCO

Mobilizing Vehicle Intelligence



About WABCO

WABCO (NYSE: WBC) is the leading global supplier of braking control systems and other advanced technologies that improve the safety, efficiency and connectivity of commercial vehicles. Originating from the Westinghouse Air Brake Company founded 150 years ago, WABCO is powerfully “Mobilizing Vehicle Intelligence” to support the increasingly autonomous, connected and electric future of the commercial vehicle industry. WABCO continues to pioneer innovations to address key technology milestones in autonomous mobility and apply its extensive expertise to integrate the complex control and fail-safe systems required to efficiently and safely govern vehicle dynamics at every stage of a vehicle’s journey – on the highway, in the city and at the depot. Today, leading truck, bus and trailer brands worldwide rely on WABCO’s differentiating technologies. Powered by its vision for accident-free driving and greener transportation solutions, WABCO is also at the forefront of advanced fleet management systems and digital services that contribute to commercial fleet efficiency. In 2019, WABCO reported sales of over \$3.4 billion and has nearly 14,000 employees in 40 countries. For more information, visit www.wabco-na.com.

WABCO