Bendix® TABS-6™ Advanced Single-Channel Trailer ABS Module

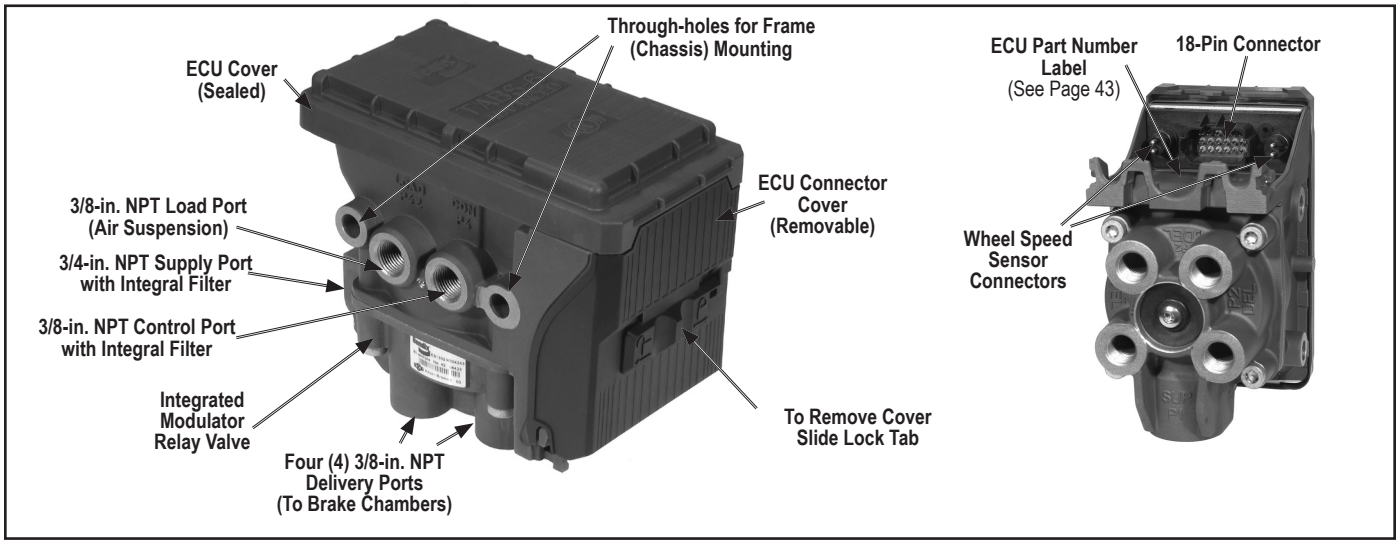


FIGURE 1 - ***TABS-6 ADVANCED SINGLE-CHANNEL MODULE (TABS-6 ADV) PLUS VIEW OF CONNECTOR***

1. INTRODUCTION

The Bendix® TABS-6™ Advanced module is an integrated single-channel (2S/1M) trailer service brake module controller for air-braked heavy-duty semi-trailers that features Bendix® Antilock Brake System (ABS) and Bendix® Trailer Roll Stability Program (TRSP®).

Installed on semi-trailers, the module acts as a relay valve during normal braking, but during ABS events it will intervene to help maintain vehicle stability and minimize stopping distance by preventing wheel lock-up. The Bendix TRSP monitors the trailer's motion and reduces the risk of roll overs by automatically applying the brakes when a risk of roll over is detected.

This module features:

- A modular design with an integrated Electronic Control Unit (ECU); pressure sensors; a lateral acceleration sensor; and Modulator Relay Valve (MRV) – eliminating external pigtail harnesses for these components.
- An operating voltage range of 8 - 32 volts.
- Optional mounting to the service reservoir or to the chassis, without additional brackets.
- An electronic odometer with trip counters & service interval options.
- A scratch-pad feature with up to 1,008 bytes of freely definable read/write text space available for customer use.

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- An extended data logging feature, including a resettable drive recorder.
- A wide variety of electrical inputs/outputs (I/Os) allow the customer to program auxiliary functions such as: automatic Lift-Axle Control (LAC); Integrated Speed Switch (ISS); external load sensors; and Auxiliary Design Language (ADL) for customized auxiliary functions.
- A wide range of diagnostic tools for flexible troubleshooting: Blink Codes; SAE J2497 (PLC); SAE J1939(CAN) Diagnostics; the Bendix® Trailer Remote Diagnostic Unit (TRDU); and the Bendix® Trailer Information Module.
- Support for SAE J2497 Power Line Carrier (PLC) communication to the towing vehicle and diagnostics.
- Support for SAE J1939 (CAN) communication for diagnostics and external devices.
- A pressure-equalizing valve in the sealed ECU housing to give improved protection from water, etc.
- Serviceable nylon filters to help prevent foreign material from entering the Control Port, Load Sensor Port, and Supply Port.
- Locking dust cover to provide electrical connector and cable protection.

GENERAL SAFETY GUIDELINES

WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following guidelines should be observed AT ALL TIMES:

- **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear personal protection equipment.**
- **Stop the engine and remove the ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated, or electrically charged components.**
- **Do not attempt to install, remove, disassemble, or assemble a component until you have read, and thoroughly understand, the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.**
- **If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with a Bendix® AD-IS® air dryer system, a Bendix® DRM™ dryer reservoir module, a Bendix® AD-9si®, AD-HF®, or AD-HFi® air dryer, be sure to drain the purge reservoir.**
- **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**
- **Never exceed manufacturer's recommended pressures.**
- **Never connect or disconnect a hose or line containing pressure; it may whip and/or cause hazardous airborne dust and dirt particles. Wear eye protection. Slowly open connections with care, and verify that no pressure is present. Never remove a component or plug unless you are certain all system pressure has been depleted.**
- **Use only genuine Bendix® brand replacement parts, components, and kits. Replacement hardware, tubing, hose, fittings, wiring, etc. must be of equivalent size, type, and strength as original equipment and be designed specifically for such applications and systems.**
- **Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.**
- **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**
- **For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.**
- **The power MUST be temporarily disconnected from the radar sensor whenever any tests USING A DYNAMOMETER are conducted on a vehicle equipped with a Bendix® Wingman® system.**
- **You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.**

WARNING

Disconnect the electrical connectors from the ABS/TRSP Controller before welding on the trailer.

WARNING

Dielectric grease should be applied to electrical connectors to help protect against moisture intrusion.

IMPORTANT

Bendix®-brand Electronic Control Units (ECUs) are not designed to store data for purposes of accident reconstruction, and Bendix® ACom® Diagnostic Software is not intended to retrieve data for purposes of accident reconstruction. Bendix makes no representations as to the accuracy of data or video retrieved and interpreted from ECUs for purposes of accident reconstruction. Bendix does not offer accident reconstruction services or interpretation of stored data. Bendix ECUs are not protected from fire, loss of power, impact damage, or other conditions that may be sustained in a crash situation and may cause data to be unavailable or irretrievable.

3. ANTILOCK BRAKE SYSTEM (ABS) OPERATION

The Bendix® TABS-6™ Advanced module uses wheel speed sensors, a modulator relay valve (MRV), and an ECU to optimize the contact between the tires and the road surface during a braking event where excessive wheel slip – or wheel lock-up – is detected.

When a situation is detected where the system needs to intervene, the ECU will activate the MRV to apply controlled brake pressure at the wheel ends.

The TABS-6 Advanced module ECU is able to modulate the brake pressure with greater speed and accuracy than a driver.

Normal Braking

During normal braking the TABS-6 Advanced module functions as a standard relay valve. If the ECU does not detect excessive wheel slip, it will not activate the ABS system, and the vehicle will stop with normal braking.

Axle Control

Axle control uses the MRV to control the wheels at both ends of a given axle (or multiple axles in cases where the MRV is controlling several axles).

In the case of braking surfaces with poor overall traction (e.g. roads that are worn, slippery, or are made of loose gravel) – or braking surfaces with areas of poor traction (e.g. asphalt roads with patches of ice) – axle control ABS interventions will maintain the wheel that is not slipping at just under the speed that will lock the wheel. The system permits the other wheel (that is experiencing slippage) temporary periods of wheel-lock during the intervention.

Axle control should not be used on fifth wheel dollies or steerable axles.

When intervening on regular traction road surfaces, a system configured for axle control performs similar to a side control, two-modulator system.

ABS Fail-Safe

The TABS-6 Advanced module is designed to react in a fail-safe manner in the event of a system Diagnostic Trouble Code (DTC). For example, if the ECU detects that a sensor is not responding, an ABS system DTC will be set and the TABS-6 Advanced module will illuminate the trailer ABS indicator lamp and revert to a fail-safe mode where some, or all, Advanced ABS functions (including TRSP) may not function. Even in cases where the ABS system is completely disabled, the standard pneumatic brake function of the vehicle will still be available, but without the benefits of ABS. The TRSP feature is also disabled with an active ABS system DTC. If the indicator lamp is illuminated, always have the ABS system serviced at the earliest opportunity.

WARNING

For all NPT fittings, use of a thread sealant is required. For NPTF fittings, the use of a thread sealant is recommended. This can be a pre-applied or a hand-applied sealant product (with PTFE). When using a hand-applied sealant, use caution so as not to over-apply. Always follow the fitting manufacturer's pre-applied or hand-applied thread sealant recommendations. Use of PTFE tape is not approved and will void the Bendix ABS/TRSP valve warranty.

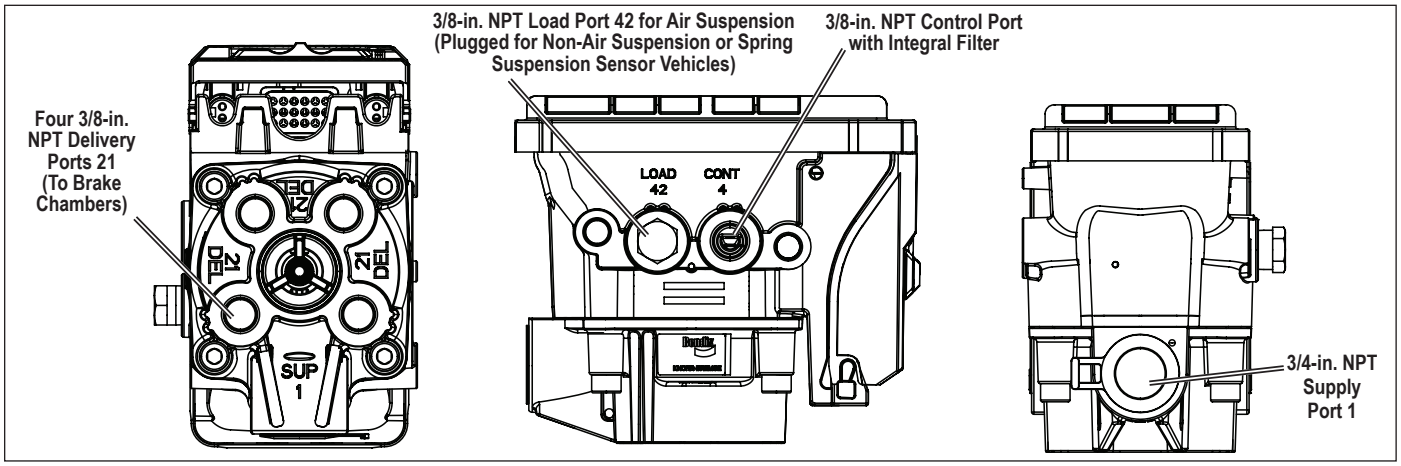


FIGURE 2 - *PORTS USED*

4. BENDIX® TRAILER ROLL STABILITY PROGRAM (TRSP®) OPERATION

⚠ WARNING

During a Bendix® TRSP® system intervention, the vehicle automatically decelerates. The TABS-6 Advanced module can slow the vehicle with or without the driver applying the brake pedal, and even when the driver applies the throttle.

⚠ WARNING

Even with TRSP system-equipped vehicles, the driver remains responsible for ensuring vehicle stability during operation. The TRSP system only functions within the limits of physics. The system can help mitigate potential vehicle stability incidents, but cannot prevent them in all cases. Other factors – such as driving too fast for the road, traffic or weather conditions, over-steering, an excessively high vehicle Center of Gravity (CG), poor road conditions, or insufficient vehicle maintenance – can cause vehicle instability that is beyond the capability of any stability system to mitigate.

⚠ WARNING

The TRSP system should only be used on specific vehicle platforms that have been validated and approved by Bendix engineering.

⚠ WARNING

The TRSP system is not approved for use on combination vehicles (commonly referred to as "doubles" or "triples"). The TABS-6 Advanced module shall not be installed on towing trailers that can be used for "double" or "triple" trailer applications (including B-trains).

⚠ WARNING

For vehicles installed with spring suspension systems, care must be taken to prevent damage to the load sensor when lifting the trailer. The linkage rod must be disconnected from the sensor's rubber boot whenever the frame of the trailer is lifted, dropping the axle(s). This includes situations where a jack is used on the rear bumper or when a crane is used to lift the trailer.

⚠ WARNING

Operating the vehicle with a damaged/disconnected load sensor could lead to a serious accident. The Bendix® Advanced Trailer ABS used on this vehicle uses sensors, including the load sensor, to assist the Trailer Roll Stability function.

The TRSP system reduces the risk of roll-overs during driving by automatic application of the service brakes when the system detects potential rollover conditions. This is accomplished with monitoring sensors both at the trailer wheel-ends and within the TABS-6 Advanced module. The Bendix TRSP system reacts by applying the trailer service brakes and slowing the vehicle combination.

The Bendix TRSP system uses the following sensors:

- **Lateral Acceleration:**A lateral accelerometer is located within the Bendix TABS-6 Advanced module. This sensor detects the lateral motion (or "roll") of the vehicle as it moves. The TABS-6 Advanced module may be mounted either in line with or at right angles to the main trailer chassis to function correctly – *See Troubleshooting section for full details of acceptable installation locations. Do not attempt to change the location of the module without contacting Bendix for engineering approval.* **NOTE**: Part numbers labeled R001 and forward can only be mounted in the 0- or 180-degree orientations to function properly. See Figure 18 for more details.
- **Vehicle Speed:** The TRSP system obtains information about the vehicle speed and rate of acceleration from the wheel speed sensors.
- **Axle/Bogie Load:**The trailer's axle load information is obtained either by the use of:
  (a) An integrated pressure sensor port (P42) of the TABS-6 Advanced module, where a direct reading of the suspension air spring pressure is taken; or
  (b) If configured for a mechanical spring deflection sensor, a voltage reading that is proportional to the spring deflection.

TRSP Intervention with Driver Actions

It is quite possible that the driver will also apply the brakes before or during a TRSP intervention by the TABS-6 Advanced module.In all cases, the Electronic Control Unit (ECU) monitors the driver's brake application and compares that to the amount of braking the TRSP program has calculated needs to be applied. The pressure delivered to the brakes will always be the higher of the two values.

5. COMPONENTS

Installations of the TABS-6 Advanced module use the following components:

Internal:

- **Electronic Control Unit (ECU):**The ECU monitors the speed sensor signals, lateral accelerometer sensor signal and various pressure sensors (and if configured, external spring deflection sensor) to determine when ABS and/or TRSP intervention is required. When needed, the ECU actuates the pressure modulator valve to optimize the brake pressure. The ECU monitors the system to detect and warn the driver of any malfunctions.Diagnostic Trouble Codes (DTCs) are stored in the ECU and can be reviewed to diagnose the TABS-6 Advanced module system.
- **Lateral Accelerometer Sensor:**Lateral accelerometer sensors sense the lateral movement of the trailer and send an electrical signal directly proportional to the trailer's lateral acceleration to the ECU.
- **Internal Load Sensor:**

  For air suspension systems, the Load Sensor Port (P42) must be plumbed to a fixed axle air ride bellows. **NOTE***:* The sensor must not be plumbed to a lift-axle bellows since they are not charged when the axle is not being used. The function of this sensor is to monitor the pressure and send an electrical signal directly proportional to the trailer's axle load to the ECU.
- **Brake Demand Pressure Sensor:**This sensor monitors the trailer service brake pressure being applied by the driver and sends an electrical signal directly proportional to the driver's brake demand to the ECU.
- **Brake Delivery Pressure Sensor:**This sensor (P21) monitors the trailer service brake pressure that is being delivered to the wheel ends through, or by, the TABS-6 Advanced module system and sends an electrical signal directly proportional to the delivered trailer service brake pressure to the ECU.
- **Modulator Relay Valve (MRV):**An MRV is integrated into the module and is controlled electrically by the ECU to decrease, hold, or allow the full applied brake pressure into the brake chamber to control the braking torque at the wheels.
- **Modulator Relay Valve (MRV) Crack Pressure:**The Bendix TABS-6 ABS modulator relay valves are available with nominal crack pressure of 4.5 ± 0.5 psi. Previous models of TABS-6 modulator relay valves came with a nominal crack pressure of 3.0 ± 0.5 psi. Installation drawings are available that can provide information on which version you have.

External:

- **Wheel Speed Sensors (WSS):**Located at selected hubs, wheel speed sensors detect the rotation of individual wheels and send an electrical signal to the ECU proportional to the rotational velocity. S*ee Figure 3.*

⚠ WARNING

Use of cable ties/tie wraps to attach wheel speed sensor leads to rubber hoses/jounce lines is not approved. The hose may expand during braking due to air pressure and the cable tie may not, so the conductor material/insulation of the speed sensor extensions may be damaged. Bendix instead recommends only open-ended clips be used to hold sensor leads to jounce lines.

- **External Load Sensor:**

  For spring suspension systems, an **external** electrical spring deflection sensor is installed – typically as close to the center (±5 in.) as possible of an axle with linkage attached to the center of the axle (but *MUST NOT* be installed on a lift-axle), *See Figure 4.* Vehicles with a mechanical load sensor have the Load Sensor Port (P42) used for sensing the air suspension system plugged.

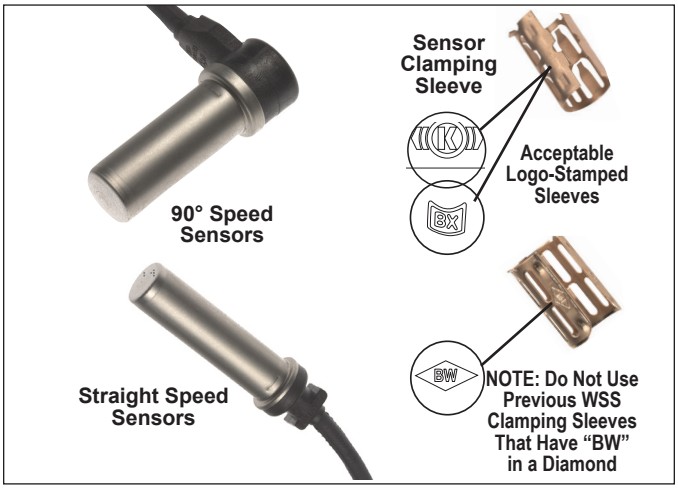
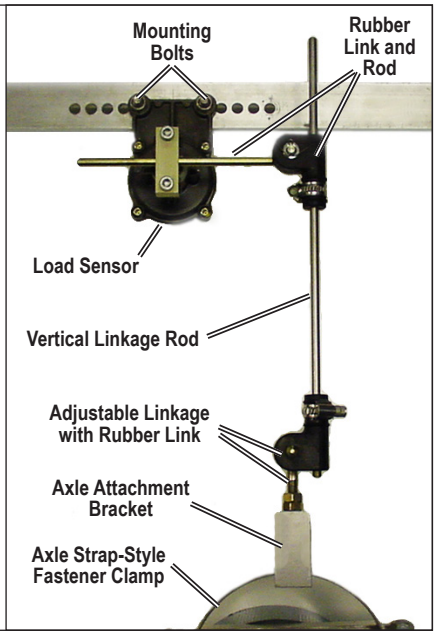


FIGURE 3 - *BENDIX® WS-24™ WHEEL SPEED SENSORS*

FIGURE 4 - *TYPICAL EXTERNAL LOAD SENSOR INSTALLATION*



- **Trailer ABS Indicator Lamp:**Controlled by the ECU to show the ABS status, the trailer ABS indicator lamp illuminates when a DTC is active. S*ee Figure 5*. If there are no ABS diagnostic trouble codes present, when ignition power is applied to the ECU, the lamp will illuminate as a bulb check lasting typically two (2), up to six (6) seconds at most.

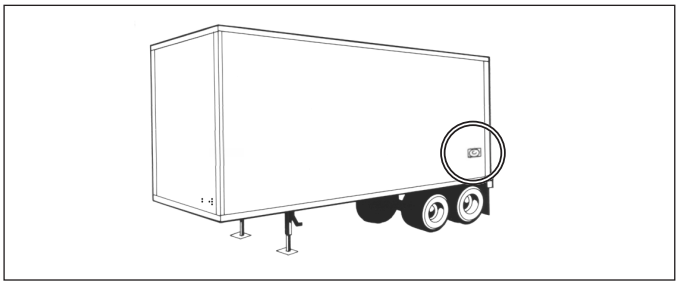


FIGURE 5 - ***TRAILER-MOUNTED ABS INDICATOR LAMP***

- **Pigtail Wiring Harness:**A power pigtail harness is required, variations that include auxiliary sub-harnesses are available, as needed. *See Figure 6.*
- **Lift-axle Sensing:**If a trailer is equipped with a lift-axle, then lift-axle sensing must be used, unless configured for automatic lift-axle control *(see below)*. A pressure threshold switch must be installed in the lift bag for the lift-axle and connected to the ECU. The ECU can then monitor the position of the lift-axle and will compensate correctly for the load transfer to the other axle(s) when the lift-axle is raised.
- **Lift-axle Control:**The TABS-6 Advanced can be configured to automatically raise (and lower) lift-axle(s) when a pre-configured load is sensed.

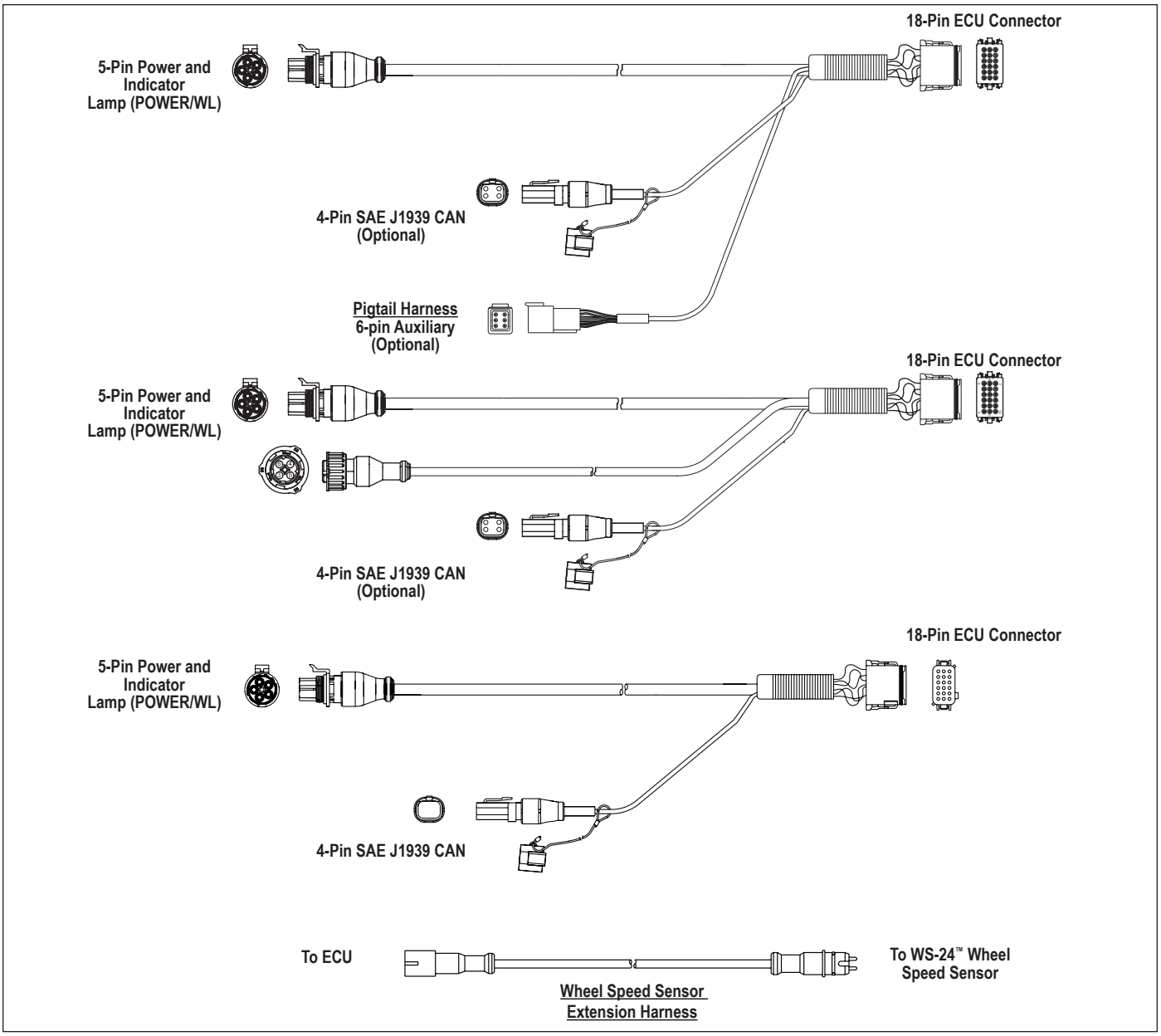


FIGURE 6 - ***EXAMPLES OF PIGTAIL WIRE HARNESSES***

- **Load Sensor:**If a trailer is equipped with an external electrical spring deflection sensor, *See Figure 4*, a linkage is attached to an axle (but must not be installed on a lift-axle) – within (five) 5 in. of the center of the axle – connects to a load sensor attached to the chassis of the vehicle. The output from the sensor is an electrical signal that is proportional to the spring deflection. The connection to the Electronic Control Unit (ECU) is via an auxiliary sub-harness (part of the power harness). *See Figure 6*.

6. MOUNTING CONFIGURATIONS

Tank (Nipple) Mount

The TABS-6 Advanced module can be tank-mounted using a schedule 80 (heavy gauge steel) 3/4-in. NPT nipple directly between the trailer supply tank and the module's Supply Port.A tank with a reinforced port must be used.

Frame (Chassis) Mount

The TABS-6 Advanced module provides through-holes for frame mounting directly to the trailer frame rail or cross-member. It is recommended to use two Grade 5 $^{3}/_{8}$-16 bolts, typical length 5 in., torqued to 180-220 in-lbs.

7. PIGTAIL WIRING HARNESSES

Several pigtail wire harnesses are available to connect the TABS-6 Advanced module with the ABS and other trailer system components. Pigtail harness are weather sealed at the connector interface and are clearly labeled for proper installation. Because of the over-molded design of the TABS-6 Advanced module wiring harnesses, Bendix recommends that the complete harness be replaced if damage or corrosion occurs.

See Figure 1. TABS-6 Advanced modules include two primary wheel speed sensor connections and the harnesses used for them are separate from the main pigtail harness.

ECU Connectors

TABS-6 Advanced module ECU connectors use an 18-pin Deutsch DT series connector for brake light power, constant power, ground, the trailer-mounted ABS indicator lamp and auxiliary I/Os.

Power/ABS Indicator Lamp Connector

The TABS-6 Advanced module pigtail uses a TTMA RP 7-99 five (5)-pin Packard Weather Pack connector for brake light power, constant power, ground and the trailer-mounted ABS indicator lamp.

The Power/ABS indicator lamp lead of the pigtail harness is available in several lengths to satisfy most installation requirements (e.g. slider axles).

SAE J1939 (CAN) Connector

See Figure 6.

TABS-6 Advanced module pigtail harnesses provide a 4-pin connection for various ECU communications. Typical uses include J1939 diagnostics, and connection to the Bendix® Trailer Information Module.

Auxiliary I/O Connector

The TABS-6 Advanced module pigtails provide an option for up to four auxiliary I/Os and two active sensor inputs.

Examples of uses of the auxiliary connector are:

- Lift-axle sensing.
- Rear axle suspension air bag dump.
- Automatic lift-axle control.
- External spring deflection sensor for mechanical spring suspensions.

POWER AND GROUND

Trailer electrical power is supplied to the TABS-6 Advanced module from the ignition and brake light circuits.

See Charts 1 and 2 for output values and pin locations.

Function Mode	Value
Operating Range	8.0 to 32.0 VDC
ECU Active	150 mA @ 12 VDC
ABS Active	2.0 A @ 12 VDC

CHART 1 – *VALUES FOR OUTPUTS*

Circuit	7-Pin Trailer Conn.	5-Pin ABS Conn.	18-Pin ECU Conn.
Ignition Power PLC (Blue Wire)	7	B	6
Brake Light Power (Red Wire)	4	A	12
Ground (White Wire)	1	E	18
Indicator Lamp (White/Green Wire)	N/A	D	5

CHART 2 – *POWER AND GROUND*

8. ABS INDICATOR LAMP

Trailer-mounted Lamp

The TABS-6 Advanced module controls an ABS indicator lamp to show the trailer ABS status.With power supplied by the towing vehicle – if there is an active DTC, or during the bulb test at start-up – the module illuminates the ABS indicator lamp by providing a 12.0 VDC signal. (The other side of the lamp is grounded.) The ABS indicator lamp output uses pin five (5) of the 18-pin connector on the module.

Dash-mounted Lamp (PLC Controlled)

TABS-6 Advanced modules use SAE J2497 standards to support Power Line Carrier (PLC) communication.The status of the trailer ABS is transmitted over the ignition power wire (the blue wire of the J560 connector) – pin 6 of the 18-pin module connector.

If there is an active DTC, during the bulb check at start-up, the TABS-6 Advanced module will transmit a signal over the power line to the towing vehicle's ECU. The towing vehicle's ABS controller will then illuminate the trailer ABS indicator lamp mounted on the dash.

9. BENDIX® WS-24™ WHEEL SPEED SENSORS

See Figure 4. Wheel speed data is provided to the TABS-6 Advanced module by the Bendix® WS-24™ wheel speed sensors. Typically, the WS-24 wheel speed sensor is installed in a mounting block that is welded to the axle housing. The WS-24 wheel speed sensors are protected by a stainless steel sheath. They are designed to be used with beryllium copper clamping sleeves (sometimes referred to as a "retainer bushing", "friction sleeve", or "clip") (*See Figure 4*). The clamping sleeve provides a friction fit between the mounting block bore and the WS-24 sensor.

Vehicles have an exciter ring (or "tone ring") as part of the wheel assembly. (The default setting expects a 100-tooth tone ring to be used. *See Section 17 for more information.*) As the wheel turns, the teeth of the exciter ring pass the wheel speed sensor, generating an AC signal which is delivered to the TABS-6 Advanced module ECU. The signal varies in voltage and frequency as the wheel speed changes.

See Figure 20for an electrical system schematic showing wheel speed sensor connector pin locations.

⚠ CAUTION

Correct wheel speed sensor installation is necessary for optimal ABS operation.

Sensors should not be installed on a lift-axle.

1. For increased corrosion protection Bendix recommends that a high-temperature rated silicone- or lithium-based grease be applied to the interior of the mounting block, the sensor, and to a new clamping sleeve.
2. Install the new clamping sleeve fully into the block, with the retaining tabs toward the inside of the vehicle. Please note that Bendix WS-24 wheel speed sensors must use the correct clamping sleeve to avoid problems associated with reduced retention force, such as sensor movement and resulting ABS trouble codes. *See Figure 4.*
3. Gently push (DO NOT STRIKE) the sensor into the mounting block hole until it bottoms out on the face of the tone ring. Secure the cable lead wire to the knuckle/ axle housing 3-6 in. from the sensor.
4. Apply a moderate amount of dielectric non-conductive grease to both the sensor and harness connectors.
5. Engage the connectors, and push them together until the lock tab snaps into place. It is permissible to use an extra wire retainer (part number 300122, or equivalent), if available, to hold the connectors together.

The friction fit allows the WS-24 sensor to slide back and forth under force but to retain its position when the force is removed. When the WS-24 sensor is inserted all the way into the mounting block and the wheel is installed on the axle, the hub exciter contacts the sensor, which pushes the sensor back. Also, normal bearing play will "bump" the sensor away from the exciter. The combination of these two actions will establish a running clearance, or air gap, between the sensor and exciter.

⚠ CAUTION

Wheel bearing maintenance is an important part of keeping the wheel speed sensors in the correct position. Excessive wheel end play can result in DTCs in cases where the sensor is pushed too far away from the tone ring for a good signal to be produced. Maintain wheel bearings per the manufacturer's recommendations.

10. SAE J2497 (PLC) DIAGNOSTIC LINK

All newer towed vehicles transmit a signal over the power line to the towing vehicle ABS ECU. The signal, using a heavy vehicle industry standard known as Power Line Carrier (PLC/J2497), is broadcast by the trailer ABS ECU over the blue wire (ignition power line) of the SAE J560 connector and controls an in-cab trailer ABS indicator lamp. *See Figures 7 and 8.*

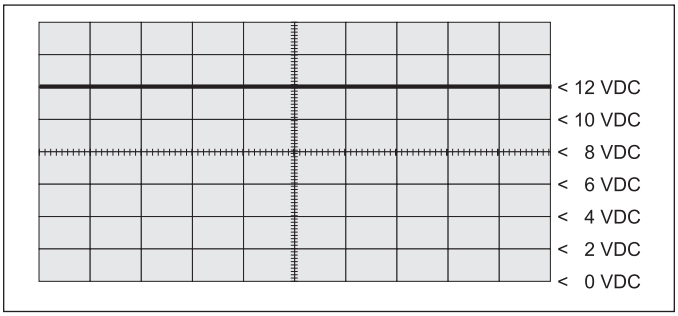


FIGURE 7 - *POWER LINE WITHOUT PLC SIGNAL*

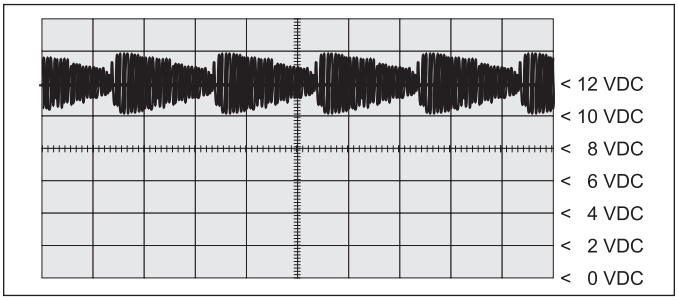


FIGURE 8 - *POWER LINE WITH PLC SIGNAL*

The TABS-6 Advanced module provides a data link for PLC communication following the SAE J2497 standard.

Bendix® ACom® Diagnostic Software and the Bendix® Trailer Remote Diagnostic Unit (TRDU™) both support PLC communication with the TABS-6 Advanced module.

PLC communication is applicable for 12-volt vehicle applications only. The PLC communication is disabled for voltages greater than 18 volts.

Identifying and Measuring the PLC Signal

A TABS-6 Advanced module will continuously broadcast PLC messages that indicate trailer ABS status. At power-up, or during a trailer ABS DTC condition, the TABS-6 Advanced module will signal the tractor ABS unit to illuminate the dash-mounted trailer ABS indicator lamp.

Diagnostic tools are available that detect the presence of a PLC signal and perform further system diagnostics directly, using the power line. For more information on these diagnostic tools, contact Bendix or refer to your local authorized Bendix dealer or distributor.

An oscilloscope can also be used to verify the presence and strength of a PLC signal on the power line. The PLC signal is an amplitude and frequency modulated signal. Depending on the load on the power line, the amplitude of the PLC signal can range from 2.5 mV p-p to 7.0 V p-p.

Suggested oscilloscope settings are (AC coupling, 1 volt/div, 100 µsec/div). The signal should be measured on pin 7 of the J560 connector at the nose of the trailer.

11. SAE J1939 (CAN) DIAGNOSTIC LINK

The TABS-6 Advanced module provides a data link for transmitting CAN information following the SAE J1939 standard.

ACom Diagnostic Software and the Bendix Trailer Information Module both support CAN communication with the TABS-6 Advanced module.

Ignition power must be provided to the TABS-6 Advanced module for the diagnostic link to be active.

12. AUXILIARY I/O

The TABS-6 Advanced module provides for up to six auxiliary input/output (I/O) functions. *See Chart 3.*

Name	ECU Pin	Auxiliary Functions	Auxiliary Type
AUX1	14	High-Side Driver	Output
		Digital Input	Input
AUX2	8	High-Side Driver	Output
		Digital Input	Input
AUX4	3	High-Side Driver	Output
		Digital Input	Input
AUX6	2	High-Side Driver	Output
		Digital Input	Input
GND12	15	Low-Side Driver	Output
GND6	13	Low-Side Driver	Output
SEN1	4	+5V Sensor Supply	Output
	9	Analog Input	Input
	10	Ground	Input
SEN2	11	+5V Sensor Supply	Output
	17	Analog Input	Input
	16	Ground	Input

CHART 3 – *AUXILIARY I/OS*

ACom Diagnostic Software supports the configuration of the TABS-6 Advanced module auxiliary I/Os.

13. BENDIX® ABS FLEX™ PROGRAM

The Bendix ABS Flex program uses Auxiliary Design Language (ADL) to allow customized auxiliary functions to be carried out by the TABS-6 Advanced module. Programs developed in the ABS Flex program may be downloaded at the production line, or in the field, to control non-braking functions of the trailer.

For example, the ABS Flex program can potentially communicate the status of: tire inflation and/or temperature; reefer temperature; load presence; slider pin position; lift-axle position; proximity/reverse alarm; and vehicle weight.

ABS Flex programs monitor the auxiliary I/Os and/or the SAE J1939 (CAN) and SAE J2497 (PLC) data links. Contact your Bendix Account Manager to discuss an ABS Flex program for your vehicle(s).

14. CUSTOMER SCRATCH PAD

The TABS-6 Advanced module has a Customer Scratch Pad feature which allows the customer, or end-user, to store up to 1,008 bytes of information. This information can then be read using the ACom Diagnostic Software.

15. POWER-UP SEQUENCE

At power-up, the TABS-6 Advanced module performs a series of self-checks that can assist a technician to determine the ABS system status and configuration.

Trailer ABS Indicator Lamp

At power-up, with no detected DTCs, the trailer ABS indicator lamp will illuminate for approximately two (2) to six (6) seconds as a bulb check and then turn off. *See Figure 9*.

If any active ABS- or TRSP-related diagnostic codes are present, the trailer ABS indicator lamp will remain illuminated.

For non-ABS or TRSP-related DTCs, such as auxiliary functions, at power-up the trailer ABS indicator lamp will turn on for approximately six and a half (6.5) seconds as an extended bulb check and then turn off.

If a PLC-ready towing vehicle and trailer are powered at the same time, the TABS-6 Advanced module will also trigger a bulb check on the dash-mounted trailer ABS indicator lamp.

Modulator Chuff Test at Power-Up

At power-up, the TABS-6 Advanced module activates a modulator chuff test. This electrical and pneumatic ABS modulator test can help the technician identify problems with modulator installations and/or wiring.

With brake pressure applied, a properly installed modulator will cause two rapid audible chuffs of air pressure. The TABS-6 Advanced module will not perform a modulator chuff test with an active ABS DTC.

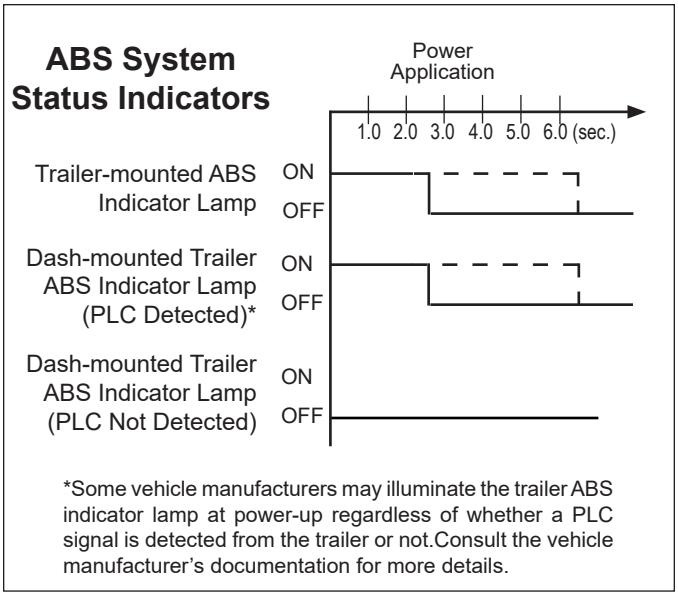


FIGURE 9 - *TRAILER ABS LAMP POWER-UP SEQUENCE*

16. ODOMETER FUNCTION

Odometer

The TABS-6 Advanced module includes an odometer function to provide a means of storing the accumulated mileage of the vehicle. The mileage is computed by using information received from the vehicle wheel speed sensors.

This feature is accurate to within 0.62 miles per power-up and will typically store mileage up to 1,000,000 miles.The mileage can be displayed using PC diagnostics, a Trailer Information Module, TRDU, or through blink codes.

Whenever the TABS-6 Advanced module is towed using a pre-1997 tractor (with no constant power supplied to the trailer), no information about mileage will be stored during that time, and the mileage can be considered out-of-calibration.

Trip Counter

The TABS-6 Advanced module provides a counter to record the trip mileage. The feature can be accessed using PC Diagnostics or the Trailer Information Module.

Service Interval

The TABS-6 Advanced module provides a feature that can be used to indicate a service interval for the trailer. The service interval can be accessed using PC diagnostics or the Trailer Information Module. If configured, the TABS-6 Advanced module can flash the indicator lamp when the vehicle is at standstill to indicate when the service interval has been exceeded.

17. NON-STANDARD TIRE SIZE

The TABS-6 Advanced module allows for tire rolling radius and tone ring tooth count parameters to be set for the axle being sensed using the ACom Diagnostic Software. These adjustments may be necessary for the module to accurately calculate the vehicle velocity and odometer mileage. Wheels of the same axle must have, and be set to the same, rolling radius and tone ring tooth count. Refer to the manufacturer's tire specification for correct values.

The tone ring size is defaulted to 100 teeth, and the tire-rolling radius is defaulted to 511 revolutions per mile. These parameters can be adjusted as shown in Chart 4.

Tone Ring Size	Tire Rolling Radius – Allowable Range
60 teeth	712 to 1005 rpm's
80 teeth	512 to 801 rpm's
90 teeth	456 to 711 rpm's
100 teeth	410 to 640 rpm's
120 teeth	356 to 502 rpm's

CHART 4 – *TONE RING SIZE TO TIRE ROLLING RADIUS*

18. DIAGNOSTIC TROUBLE CODE DETECTION

The TABS-6 Advanced module contains self-testing diagnostic circuitry that monitors the ABS components and wiring.

When the TABS-6Advanced module senses an erroneous system condition, it activates the external trailer-mounted ABS indicator lamp; disables all or part of the affected ABSand/or TRSP functions; and it stores the DTC in memory, so that the information is retained even when the power is removed. The TABS-6 Advanced module also uses PLC communications to send the system status to the towing vehicle.

For some DTCs, the TABS-6 Advanced module will automatically reset ("self-heal") the active DTC when the error is corrected (e.g. when a wheel speed sensor is re-aligned). However, repeated occurrences of a given DTC can cause the code to "latch" – that is, be retained as active – even if the condition is only intermittent. Once the code is latched, a manual reset will be necessary. Technicians can use these latched codes to assist them in troubleshooting intermittent errors. After the problem is repaired, the DTC can be reset using blink code diagnostics, or with a diagnostic tool.

When a DTC self-heals or is manually reset, the code remains stored as an inactive DTC in the ECU memory. This inactive DTC can be retrieved using blink code diagnostics or with a diagnostic tool.

19. PARTIAL ABS SHUTDOWN

Depending on the DTC detected, the ABS ECU will partially or completely disable the ABS and/or TRSP functionality. In cases where the ABS is completely disabled, the vehicle reverts to normal braking (without ABS or TRSP interventions). Always repair ABS DTCs at the earliest opportunity.

ECU Diagnostic Trouble Codes

All ABS functions are completely disabled. The system reverts to normal braking.

Voltage Diagnostic Trouble Code

The operating voltage range is 8.0 to 32.0 VDC. If the voltage is detected as being out of range, the ABS and TRSP system braking features will be disabled, and the system reverts to normal braking. When the correct voltage level is restored, full ABS and TRSP is typically available again.

20. BLINK CODE DIAGNOSTICS

The TABS-6 Advanced module provides diagnostic functions through blink code diagnostics. This means that the technician – even without diagnostic tools – can read a series of ABS indicator lamp blinks to diagnose the DTCs being generated.

With no towing vehicle attached, the technician may enter the blink code diagnostics mode by providing constant power to the ignition circuit and then select the desired mode by toggling the brake light power input the specific number of times shown in Chart 5.

With a parked towing vehicle attached, apply ignition power, and after the power-up sequence is complete, enter the diagnostics mode by depressing and releasing the brake pedal the specific number of times shown in Chart 5, for the desired mode.

Cycles of the Brake Light Power Input Required to Enter Desired Mode	
Mode	**Cycles**
Active DTC Retrieval	3
Inactive DTC Retrieval (DTC History)	4
Clear Active DTCs	5
Odometer Mileage Display	7

CHART 5 – *BLINK CODE INFORMATION*

Depending on the blink code mode activated, the TABS-6 Advanced module will blink the trailer-mounted ABS indicator lamp to display: active DTC codes; inactive DTCs; and odometer mileage. Blink code diagnostics can also be used to clear active DTCs.

Wait until after the modulator chuff test before activating the brake light power. Alternatively, wait five (5) seconds.

NOTE*:* If certain DTCs are set, typically where modulator DTCs have occurred, the chuff test may not run.

Following a single display of all available messages, the ABS indicator lamp will remain on for five (5) seconds and then return to normal operating mode. Blink code diagnostics can only be activated following a power-up, where wheel speeds have not been detected. If the vehicle moves during the blink code diagnostics mode, the TABS-6 Advanced module will cancel the blink code diagnostics and return to normal operating mode.

Blink code diagnostics must be activated within the first 15 seconds of ignition power being applied.

If brake light power is continuously applied for greater than five (5) seconds, blink code diagnostics will be disabled until the next time the ignition power is cycled.

Display Active Diagnostic Trouble Codes (DTCs)

To display active DTCs, apply ignition power and depress and release the brake pedal three (3) times within 15 seconds (allowing one second between each application). Following this activation, there will be a five (5) second delay followed by a blink code display sequence of all active DTCs. (See pages 13-17 for more information about DTCs.)

Display Inactive Diagnostic Trouble Codes (DTCs)

To display inactive DTCs – those that are not currently set, but have occurred and are stored in the ECUs memory – apply ignition power and depress and release the brake pedal four (4) times within 15 seconds. Following this activation, there will be a five (5) second delay followed by a blink code display sequence of all inactive DTCs stored. (See pages 13-17 for more information.)

Reset Active Diagnostic Trouble Codes

To reset active codes, apply ignition power and depress and release the brake pedal five (5) times within 15 seconds. Following activation, there will be a five (5) second delay followed by:

(a) If no DTCs remain, a blink code message of 1-1, (System Fully Operational - No DTCs Detected) and the ABS indicator lamp will cease to be illuminated; or

(b) If there are remaining active DTCs, a sequence of blink codes will display all of the remaining active DTCs, and the ABS indicator lamp will stay on.

Resetting active DTCs with blink code diagnostics does not clear information from trouble code history. Both blink code diagnostics or diagnostic tools can retrieve inactive DTCs, but only diagnostic tools can clear this information.

Display Odometer Mileage

To display the trailer odometer mileage, apply ignition power and depress / release the brake pedal seven (7) times within 15 seconds. Following activation, there will be a five (5) second delay followed by a blink code display of the odometer information (x1000).

Example: 152,431 miles will be displayed as: 152 (x1000) or 1 blink (pause); 5 blinks (pause); 2 blinks.

Zeros will be displayed by the ABS indicator lamp strobing twice.

Odometer mileage cannot be altered with blink code diagnostics. Complete odometer information can be retrieved using a diagnostic tool.

21. AUXILIARY FEATURES

Rear Axle Suspension Dump

Some spread-axle trailers are equipped with a rear-axle suspension air bag dump feature to assist with cornering at low speeds. The TABS-6 Advanced module may be configured to use this feature. When this feature is used below a pre-determined threshold vehicle speed, the ECU will partially exhaust the rear axle air suspension bags, and then re-inflate them when the vehicle speed rises above the threshold. For more information about this feature, contact your local Bendix Account Manager by calling 1-800-AIR-BRAKE (1-800-247-2725).

Lift-axle Control (Automatic)

The TABS-6 Advanced module can be configured to automatically raise a lift-axle when the load on the trailer drops below a configured level. Changes to the trailer to allow for this feature include the use of one of the auxiliary outputs to operate a lift-axle control valve.

22.Diagnostic Trouble Codes (DTCs)

1st Digit	2nd Digit	Diagnostic Code Description	Possible Causes / Repair Information	J1587 (SID/ FMI)	J1939 (SPN/ FMI)
1	1	No diagnostic codes	• TABS-6 Advanced system fully operational – no diagnostic codes detected	000/00	000/00
Wheel Speed Sensors (WSS); "S-C" & "S-D"					
2	1	Large Air Gap: Sensor "S-C"	Dynamic Wheel Speed Sensor DTC - large air gap between sensor and tone ring. *Go to Section E, Dynamic Wheel Speed Sensor DTC, on page 32.*	001/00	789/00
3	1	Large Air Gap: Sensor "S-D"		002/00	790/00
2	2	Shorted or open wire: Sensor "S-C"	Static Wheel Speed Sensor DTC - shorted or open sensor wire. *Go to Section E, Static Wheel Speed Sensor DTC, on page 32.*	001/03 001/04	789/03 789/04
3	2	Shorted or open wire: Sensor "S-D"		002/03 002/04	790/03 790/04
2	3	Dynamic Issue: Sensor "S-C"	Dynamic Wheel Speed Sensor DTC - incorrect wheel speed signal detected while vehicle is in motion. *Go to Section E, Dynamic Wheel Speed Sensor DTC, on page 32.*	001/08 001/01 001/02	789/08 789/01 789/02
3	3	Dynamic Issue: Sensor "S-D"		002/08 002/01 002/02	790/08 790/01 790/02
2	4	Tire Diameter Out of Range: Sensor "S-C"	• Verify correct tire size and proper tire inflation. • Verify correct number of exciter/tone ring teeth. • Verify that the TABS-6 Advanced ECU has been programmed with the proper tire size and tone ring settings.	001/13	789/13
3	4	Tire Diameter Out of Range: Sensor "S-D"		002/13	790/13
Trailer Power					
6	1	Over-voltage	Power Supply DTC - trailer power above 32 volts. *Go to Section D on page 31.*	251/03	3597/03
6	2	Low-voltage	Power Supply DTC - trailer power below 8 volts. *Go to Section D on page 31.*	251/04	3597/04
6	3	Excessive power line resistance	Power Supply DTC - possible corroded or shorted trailer power circuit.*Go to Section D on page 31.*	251/13	3597/13
Pressure Sensors (Internal): "P4", "P42", & "P21"					
7	1	Internal Pressure Sensor Reading Incorrect: Control Port "P4"	• Verify the trailer's control (service) pressure is < 130 psi. • After repairs – or if no issues are found – clear the diagnostic code. • If the diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	077/12	1067/12
7	2	Internal Pressure Sensor Reading Incorrect: Load Port "P42"	• See the suspension manufacturer's specifications for load versus pressure.Verify that the trailer's air suspension pressure is <130 psi and is within the allowable range for the specific suspension/airbag combination. [below 50% of airbag pressure at the unladen weight, or above 50% of airbag pressure at GVWR for axles] • After repairs – or if no issues are found – clear the diagnostic code. • If the diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	069/12	1059/12
7	3	Internal Pressure Sensor Reading Incorrect: Delivery Port "P21"	• Perform a Pressure Component Test using the ACom Diagnostic Software. • Verify the trailer's control (service) and brake delivery pressures are comparable and < 130 psi. • After repairs – or if no issues are found – clear the diagnostic code. • If the diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	059/12	1049/12

Diagnostic Trouble Codes (DTCs) (continued)

1st Digit	2nd Digit	Diagnostic Code Description	Possible Causes / Repair Information	J1587 (SID/ FMI)	J1939 (SPN/ FMI)
Lateral Acceleration Sensor (Internal or External)					
8	1	Internal Lateral Acceleration Sensor - Mounting Error	• Before troubleshooting, verify that the trailer has been parked on level ground. • Verify that the TABS-6 Advanced ECU has been programmed with the proper ECU orientation, tire size and tone ring settings. • Verify that the TABS-6 Advanced module has been mounted as per the Installation Guidelines (*See Troubleshooting Section G, page 34)*: - The configured ECU orientation matches the actual ECU orientation. - Verify that wheel speed sensors are installed correctly (left/right) (*See Figure 18*) • After repairs or if no issues are found, then clear diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	099/14	1809/14
8	2	Internal Lateral Acceleration Sensor - Signal Out Of Range	• Before troubleshooting, verify that the trailer has been parked on level ground. • Verify that the TABS-6 Advanced module has been mounted as per the Installation Guidelines. • Perform a Lateral Acceleration Sensor (installation angle) Component Test using the ACom Diagnostic Software: - Verify the roll angle of the TABS-6 Advanced module is within ±5° as measured from a flat horizontal plane. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	099/14	1809/14
8	3	Internal Lateral Acceleration Sensor - Offset Error	• Before troubleshooting, verify that the trailer has been parked on level ground. • Verify that the TABS-6 Advanced module has been mounted as per the Installation Guidelines. • Perform a Lateral Acceleration Sensor (installation angle) Component Test using the ACom Diagnostic Software. - Verify the roll angle of the TABS-6 Advanced module is within ±5° as measured from a flat horizontal plane. - If the roll angle is out of tolerance, clear the diagnostic code and test drive the vehicle. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	099/02	1809/02
8	4	Internal Lateral Acceleration Sensor -Sensor Signal Not Found	• Verify that the TABS-6 Advanced module has been mounted as per the Installation Guidelines: - TABS-6 Advanced module mounted either in 0°, 90°, 180° or 270° orientation. • If the ECU has been configured for an external lateral acceleration sensor: - Check for corroded/damaged wiring or connectors between the ECU and the external lateral acceleration sensor. - Verify correct wiring between the ECU and the external lateral acceleration sensor.	099/14	1809/14
8	5	External Lateral Acceleration - Signal Not Found	• Check for corroded/damaged wiring or connectors between the ECU and the external lateral acceleration sensor. • Verify correct wiring between the ECU and the external lateral acceleration sensor. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, replace the external lateral acceleration sensor.	099/14	1809/14

Diagnostic Trouble Codes (DTCs) (continued)

1st Digit	2nd Digit	Diagnostic Code Description	Possible Causes / Repair Information	J1587 (SID/ FMI)	J1939 (SPN/ FMI)
Trailer System Braking					
9	1	Extended Brake Application Detected	• Verify that there is no residual pressure in the trailer's control (service) line. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your BCVS local representative before replacing the TABS-6 Advanced module.	057/07	1047/07
9	2	Excessive ABS Activity Detected	Dynamic Wheel Speed Sensor DTC - possible incorrect wheel speed signal while vehicle in motion resulted in long ABS event. Go to Section E on page 32.	057/07	1047/07
9	3	Excessive TRSP Activity Detected	• Clear diagnostic codes. • If diagnostic code persists, contact the local Bendix representative before replacing the TABS-6 Advanced module.	057/07	1047/07
TABS-6 Advanced Module (TABS-6 Adv)					
10	1	TABS-6 Advanced Internal Error	• Check for damaged or corroded connectors. • Check for damaged wiring. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	254/12	629/12
10	2	TABS-6 Advanced Configuration Error	• Verify the ECU parameters and actual system installation is compatible using the ACom Diagnostic Software. • Re-program ECU as necessary. • If necessary, contact your local Bendix representative to obtain the correct configuration data.	254/13	629/13
10	3	TABS-6 Advanced EEPROM Error	• Verify the ECU parameters and actual system installation is compatible using the ACom Diagnostic Software. • Re-program ECU as necessary. • If necessary, contact your local Bendix representative to obtain the correct configuration data.	254/13	629/13
10	4	TABS-6 Advanced Not Configured	• Re-program the ECU to be compatible to the actual system configuration using the ACom Diagnostic Software. • If necessary, contact your local Bendix representative to obtain the correct configuration data.	254/13	629/13
10	5	TABS-6 Advanced EOL Test Not Completed	• Perform the Installation Test using the ACom Diagnostic Software, or Trailer Information Module.	254/14	629/14
Auxiliary Design Language (ADL) & Auxiliary I/O's					
11	1	TABS-6 Advanced Auxiliary I/O Error: AUX I/O #7 (Trailer ABS Indicator Lamp)	• Check for corroded/damaged wiring or connectors between the ECU and the ABS Indicator Lamp. • Check Pin X1-5 of the ECU 'Power' connector for the following: -Pin not pushed back. -Correctly wired to the ABS Indicator Lamp (Pin X1-5 – supply). -Shorted to ground, Vbat or other ECU pins. • Verify the ABS Indicator Lamp is properly grounded and not burnt out. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	152/12	612/12

Diagnostic Trouble Codes (DTCs) (continued)

1st Digit	2nd Digit	Diagnostic Code Description	Possible Causes / Repair Information	J1587 (SID/ FMI)	J1939 (SPN/ FMI)
11	2	TABS-6 Advanced Auxiliary I/O Error: AUX I/O #1	• Check for corroded/damaged wiring or connectors between the ECU and the auxiliary device. • Check Pins X1-14 & X1-15 of the ECU 'Power' connector for the following: - Pins not pushed back. - Correctly wired to the auxiliary device (Pin X1-14 to supply, Pin X1-15 to ground). - Shorted to ground, Vbat or other ECU pins. • Verify the auxiliary device is properly functioning and rated for maximum load of ≤ 2 amps. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	152/12	612/12
11	3	TABS-6 Advanced Auxiliary I/O Error: AUX I/O #2	• Check for corroded/damaged wiring or connectors between the ECU and the auxiliary device. • Check Pins X1-8 & X1-15 of the ECU 'Power' connector for the following: - Pins not pushed back. - Correctly wired to the auxiliary device (Pin X1-8 to supply, Pin X1-15 to ground). - Shorted to ground, Vbat or other ECU pins. • Verify the auxiliary device is properly functioning and rated for maximum load of ≤ 2 amps. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	152/12	612/12
11	4	TABS-6 Advanced Auxiliary I/O Error: AUX I/O #4	• Check for corroded/damaged wiring or connectors between the ECU and the auxiliary device. • Check Pin X1-3 of the ECU 'Power' connector for the following: - Pin not pushed back. - Correctly wired to the auxiliary device (Pin X1-3 to supply). - Shorted to ground, Vbat or other ECU pins. • Verify the auxiliary device is properly functioning and rated for maximum load of ≤ 1.5 amps. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	152/12	612/12
11	5	TABS-6 Advanced Auxiliary I/O Error: AUX I/O #6	• Check for corroded/damaged wiring or connectors between the ECU and the auxiliary device. • Check Pins X1-2 & X1-13 of the ECU 'Power' connector for the following: - Pins not pushed back. - Correctly wired to the auxiliary device (Pin X1-2 to supply, Pin X1-13 to ground). - Shorted to ground, Vbat or other ECU pins. • Verify the auxiliary device is properly functioning and rated for maximum load of ≤ 1.5 amps. • After repairs or if no issues are found, then clear the diagnostic codes. • If diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	152/12	612/12

Diagnostic Trouble Codes (DTCs) (continued)

1st Digit	2nd Digit	Diagnostic Code Description	Possible Causes / Repair Information	J1587 (SID/ FMI)	J1939 (SPN/ FMI)
11	9	TABS-6 Advanced Auxiliary Program Error: ADL	• Verify that the Auxiliary I/O ECU pin-outs match the ADL parameters using the ACom Diagnostic Software. • If necessary, contact your local Bendix representative to troubleshoot the ADL program.	152/12	612/12
11	11	WL Information: ADL	• Verify that the ADL parameters are correct using the ACom Diagnostic Software. • If necessary, contact your local Bendix representative to troubleshoot the ADL program.	152/14	612/12
Miscellaneous					
12	1	Service Distance or Date Exceeded	• Perform scheduled trailer maintenance and/or reset the Service Distance or Date using the ACom Diagnostic Software.	153/00	612/00
12	2	Trailer Load Out of Range	• If trailer is equipped with a raise/lower valve, verify it is in the drive position. • Verify that the ECU parameters for the empty and fully loaded trailer conditions are correct using the ACom Diagnostic Software. • If necessary, contact your local Bendix representative to troubleshoot the trailer's loading condition.	069/13	1059/13
12	3	Brake Pads Worn	• Manually check the condition of the pads on each brake to determine if any require replacement. • If no pads require replacement, check the wear sensors and cables for damage or defects.	070/01	1060/01
12	8	Trailer Information Module Missing	• Trailer Information Module and/or harness damaged or not present.	254/11	0/11
Mechanical Load Sensor					
13	4	Load Sensor Error	• (Spring Suspension Systems)Inspect the linkage:Check that the linkage is attached to the axle, inspect for damage to the linkage components, loose connectors and mis-installation. • If the diagnostic code persists, contact your local Bendix representative before replacing the TABS-6 Advanced module.	69/13	0/13

Troubleshooting

USING HAND-HELD OR PC-BASED DIAGNOSTICS

Troubleshooting and DTC clearing, as well as beginning a reconfiguration, may also be carried out using hand-held or PC-based diagnostic tools such as the Trailer Remote TRDU, ACom® Diagnostic Software, or the Trailer Information Module.

23. BENDIX ABS DIAGNOSTIC TOOLS

Bendix ACom Diagnostic Software

ACom Diagnostic Software is an RP-1210 compliant PC-based Diagnostic Software program that provides the highest level of diagnostic support for the TABS-6 Advanced module. With Bendix ACom Diagnostic Software, maintenance personnel can:

- Obtain DTC information (both active and inactive DTCs)
- Retrieve event history
- Clear inactive DTCs and event history
- Verify ECU configuration
- Perform system and component tests
- Read/write customer information in the scratch pad
- Save and print information
- Receive troubleshooting assistance

When diagnosing the Bendix TABS-6 Advanced module using a PC and ACom Diagnostic Software, the computer's serial or parallel port can be connected to the vehicle's diagnostic connector through an RP-1210 compliant communications device.

For more information on the ACom Diagnostic Software, or RP-1210 compliant tools, contact Bendix or refer to your local authorized Bendix parts outlet.

Bendix® Trailer Remote Diagnostic Unit (TRDU™) Tool (802162)

The TRDU tool provides the technician with a visual indication of ABS component DTC information. The TRDU tool is specifically designed for use with trailer ABS systems and Bendix makes no claims for its operation and/or usability with other brands of trailer ABS.



FIGURE 10 - *THE BENDIX® TRDU™*

Features of the Bendix TRDU Tool

The TRDU tool attaches to a 7-pin-to-7-pin adapter *(See Figure 11)* and then into the J560 connector of the towing vehicle.



FIGURE 11 - *TRDU™ TOOL AND ADAPTER*

The TRDU tool communicates across PLC.

The TRDU tool allows the technician to:

- Troubleshoot ABS system component problems using DTC reporting via LEDs.
- Reset DTCs on ABS ECUs by holding a magnet over the reset of the TRDU tool for less than 6 seconds.

How the Bendix® TRDU™ Tool Operates

When the TRDU tool is plugged into the adapter – and the adapter/TRDU tool is installed between the trailer connector and the J560 connector of the towing vehicle that has theignition on – all the LEDs will illuminate, and the green LED will flash 4 times to indicate communications have been established.

If the ABS ECU has no active DTCs, only the green LED will remain illuminated.

If the ABS ECU has at least one active DTC the TRDU tool displays the first DTC by illuminating the red LEDs, indicating the malfunctioning ABS component and its location on the vehicle *(See Figure 12).*

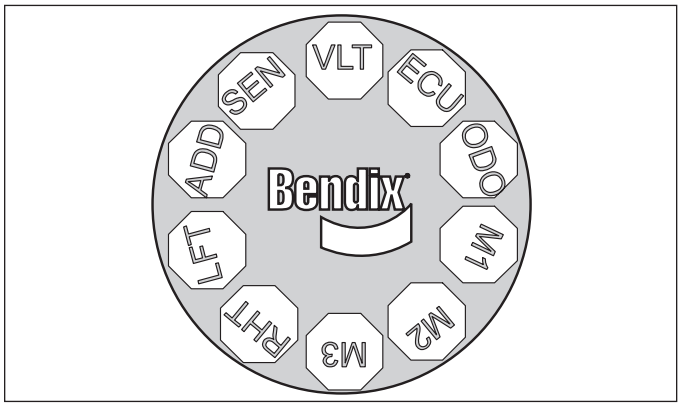
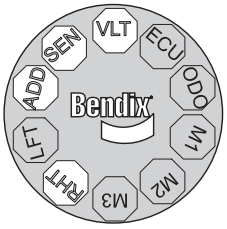


FIGURE 12 - *THE BENDIX® TRDU™ TOOL DISPLAY*

LED Diagnostic Trouble Codes

VLT -	Power	LFT -	Left
ECU -	ABS Controller	RHT -	Right
SEN -	Wheel Speed Sensor	ADD -	Additional
		ODO -	Odometer
MOD1 -	Modulator 1		
MOD2 -	Modulator 2		
MOD3 -	Modulator 3		

Example: If the Diagnostic Trouble Code is "Right Additional Sensor", the TRDU™ tool will display one green andthree red LEDs



LEDs
Green
VLT
Blue
ODO
All others are Red

FIGURE 13 - *DIAGNOSTIC TROUBLE CODES USING THE BENDIX® TRDU™ TOOL*

If there are multiple DTCs on the ABS system, the TRDU tool will display one DTC first, then once that DTC has been repaired and cleared, the next code will be displayed.

The TRDU tool repeatedly blinks out the mileage stored once communications have been established. By counting the sequence of blinks and/or strobes on the blue LED, the odometer reading is given. See Section 10 for more details.

- VLT (Flashing indicates either over- or under-voltage condition)

To pinpoint the root cause and to ensure the system DTC is properly corrected the first time, additional troubleshooting may be necessary.

NOTE: When a TRDU tool is connected to a system with a TABS-6 Advanced module, and has established communications, the ECU will use the ABS indicator lamp to blink codes for all active DTCs.

Bendix® TRDU Tool Reset Function

The magnetic reset switch is located by the letter "B" in the Bendix logo on the top of the TRDU tool.When a magnet (with minimum of 30 gauss) is held over the switch for less than 6 seconds the "clear DTCs" command is sent. (If a magnet is not available, you may use a spare wheel speed sensor, since its internal magnet will be sufficient.)

Additionally, it is recommended at the end of any inspection that the technician switches off and restores the power to the ABS ECU, and then re-checks the ABS indicator lamp and TRDU tool to see if they indicate any remaining DTCs.

Bendix® Trailer Information Module

The Bendix Trailer Information Module is a display device that combines the functionality of system diagnostics with the ability to display and store other trailer-related information of value to an operator, driver or workshop. Maximum benefit is obtained from the module functionality when it is mounted on the trailer so that it is able to record events that occur during driving. Alternatively, it may also be used as a workshop tool to access diagnostic information or to check the configuration or run an installation test. In both cases the module is connected to the J1939 5V TI (CAN) connection of the auxiliary connector which supplies the necessary information.



FIGURE 14 - *TRAILER INFORMATION MODULE*

Technical Assistance

For additional assistance, the Bendix Tech Team can be reached by email at techteam@bendix.com or by phone at 1-800-AIR-BRAKE (1-800-247-2725), option 2.

Bendix Tech Team representatives are available Monday through Thursday, 8:00 a.m. – 6:00 p.m., and Friday, 8:00 a.m. – 5:00 p.m. ET

SERVICING THE BENDIX® TABS-6™ ADVANCED MODULE

⚠ CAUTION

Special considerations need to be taken to ensure that the TABS-6 Advanced module has been properly installed on the trailer.These include:

- **Location and orientation of the module.**
- **Correct plumbing of the module.**
- **Correct deflection sensor installation (where used).**
- **Correct location of the wheel speed sensors.**
- **Configuration of the ECU for ABS and TRSP system parameters.**
- **Installation Test to verify proper installation of the ABS/TRSP system.**

Incorrect installation of the TABS-6 Advanced module system can result in impaired ABS & TRSP system functions. It is the responsibility of the end-user to ensure that the TABS-6 Advanced module system has been installed correctly and tested as per the Bendix recommended installation guidelines and system drawings.

Prior to performing service to the TABS-6 Advanced module, always perform the following steps:

1. Follow all industry safe maintenance practices including those on page 2 of this document.
2. Ideally, before removing the module, use ACom Diagnostic Software to save the configuration to the desktop. (After the module has been replaced, the technician can restore the previous configuration settings.)
3. Turn the power off.
4. Drain the air pressure from all reservoirs.
5. Remove as much contamination as possible prior to disconnecting electrical connections and air hoses.
6. Note the TABS-6 Advanced module's mounting position on the vehicle.

REMOVING THE TABS-6 ADVANCED MODULE

1. Open the end cover by sliding the locking tab to the left.If the module is to be reinstalled, retain the cover.
2. Disconnect the 18-pin ECU connector and the two 2-pin wheel speed sensor connectors.
3. Mark for reinstallation and then remove all air hoses connected to the TABS-6 Advanced module.
4. Remove the Advanced module from the vehicle by removing the mounting fasteners or by rotating the entire assembly counterclockwise from the tank mount.

SERVICING THE CONTROL PORT FILTER

⚠ CAUTION

The TABS-6 Advanced module has an in-line filter in the Control Port (*See Figure 2*). This filter should be inspected and cleaned (if any contamination is found), every four months, 34,000 miles or 1,200 operating hours.

For severe applications, this inspection interval may be reduced. If the filter is found to be damaged, install a replacement. The filter should also be inspected as part of any troubleshooting where the service brakes are slow to apply and other possible causes have been ruled out.

REINSTALLATION OF THE BENDIX® TABS-6™ ADVANCED MODULE

⚠ CAUTION

All service replacement parts for the TABS-6 Advanced module are configured specifically by part number.

As mentioned during the *Servicing the Bendix TABS-6 Advanced Module step*, ideally, before removing the module, use ACom Diagnostic Software to save the configuration to the desktop. The technician can use ACom diagnostics to restore the previous configuration settings.

Always verify that the correct service replacement ECU is being installed by verifying that the part number is the same as the original TABS-6 Advanced module.To verify proper installation, perform the Installation Test using the ACom Diagnostic Software or use the Trailer Information Module.

Inspect the original mounting hardware. If it is in good condition, it can be reused for installation.If replacement hardware is needed, use Grade-5 3/8-18 bolts, nuts and lock washers for the frame-mount unit, or a schedule 80 (heavy gauge steel) ¾-in. nipple for the tank-mount unit.

Inspect the location selected for installation and clean as necessary.

NOTE: Inspect all components, including the replacement TABS-6 Advanced module, for any external damage, such as cracked valve ports, electronic housings, etc. Any components found to be damaged should not be installed on the vehicle and must be replaced.

1. The TABS-6 Advanced module shall be installed with the following considerations *(see Figures 15 through 17):*
   - With exhaust port facing downward and unobstructed with significant free space below (> 1 in.).
   - Within ± 40 in. of the center of the axle(s) for proper balanced brake applications.
   - Within ± 2 in. from the center line of the trailer (default). **NOTE***:* A left/right offset greater than ± 2 in. may have been programmed in the ECU and can be verified using Bendix ACom Diagnostic Software.
   - Yaw angle shall be ± 10° as measured from the center line of the trailer.
   - Pitch angle shall be ± 10° as measured from a flat horizontal plane.
   - Roll angle shall be within ± five degrees (±5°) as measured from a flat horizontal plane.

For tank-mount modules: Install the nipple fitting into the modulator-valve Supply Port. Then rotate the entire assembly into the tank port until secure. Over-torquing of the tank nipple could cause damage to the valve body.

For frame-mount modules: Torque the mounting nuts to 180-220 in-lbs.

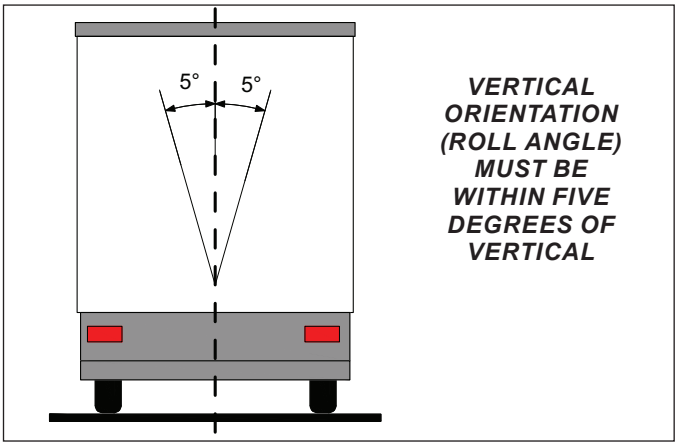


FIGURE 15 - *INSTALLATION ON TRAILER (VERTICAL)*

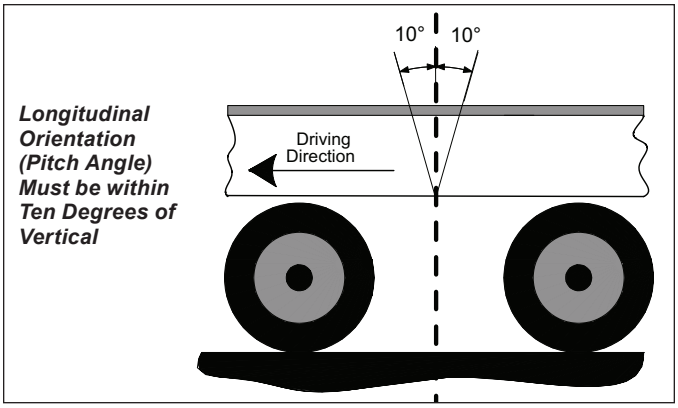


FIGURE 16 - *INSTALLATION ON TRAILER (LONGITUDINAL)*

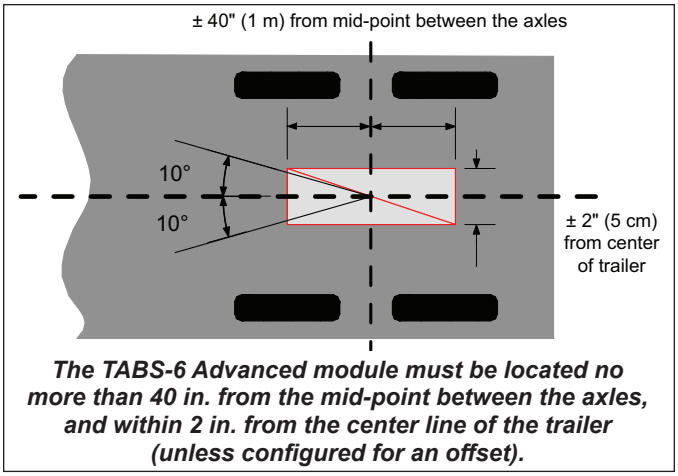
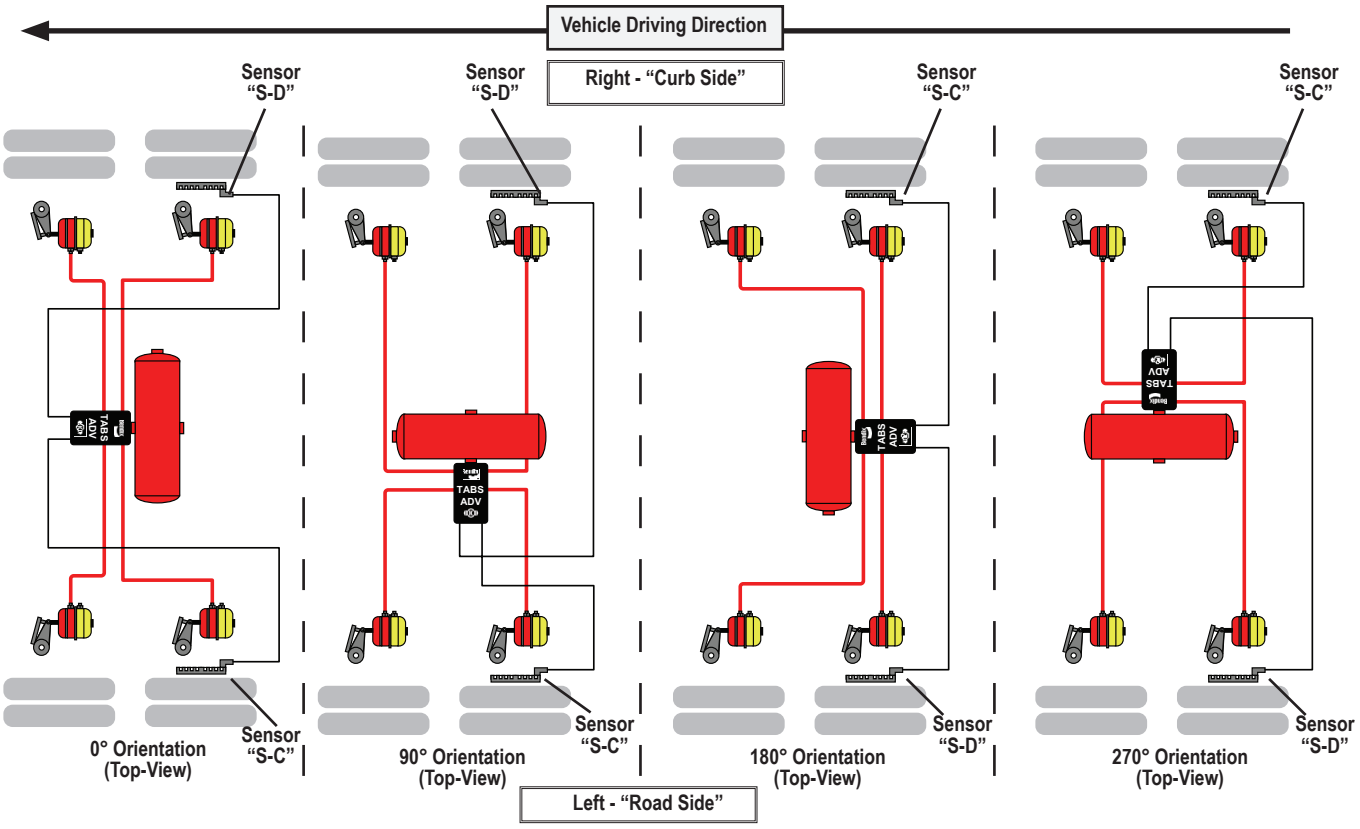


FIGURE 17 - *INSTALLATION ON TRAILER (CENTER LINE)*



NOTE: Part numbers labeled R001 and forward can only be mounted in the 0- or 180-degree orientations to function properly.

Part Number	Orientation			
	0	90	180	270
K027233R000	✓	✓	✓	✓
K029053R000	✓	✓	✓	✓
K032041R000	✓	✓	✓	✓
K032042R000	✓	✓	✓	✓
K041383R000	✓	✓	✓	✓
K095116R000	✓	✓	✓	✓
K260200R000	✓	✓	✓	✓
K037939R000	✓	✓	✓	✓

Part Number	Orientation			
	0	90	180	270
K027235R001	✓		✓	
K027241R001	✓		✓	
K032108R001	✓		✓	
K035805R001	✓		✓	
K065528R001	✓		✓	
K109325R001	✓		✓	
K125229R001	✓		✓	
K125231R001	✓		✓	
K125233R001	✓		✓	
K125235R001	✓		✓	
K132954R001	✓		✓	
K133148R001	✓		✓	
K142372R001	✓		✓	
K149288R001	✓		✓	
K149289R001	✓		✓	
K149290R001	✓		✓	
K171084R001	✓		✓	
K171086R001	✓		✓	

FIGURE 18 - *WHEEL SPEED SENSOR INSTALLATION*

2. Reconnect all air hoses and plugs to the module. Depending on the installation, additional plugs may be necessary. Thread sealant products that contain Teflon may be used, however thread sealant tape is not recommended as there is a potential for tape material entering the valve and affecting the valve's operation. Make certain that no thread sealant enters the valve. All air hoses and fittings should be checked for leaks prior to returning the vehicle to service.

   Make sure that the Load Sensor Port P42 is connected to the suspension system at a location as far away from the height-control valve as possible. Preferrably, directly to a fixed-axle air bag.

3. Reconnect the ECU power, auxiliary if present and wheel speed sensor electrical connectors to the ECU. Apply a moderate amount of non-conductive electrical grease to each connector pin before reconnecting.

   NOTE: The wheel speed sensors must follow the orientation of the module as shown in Figure 18 for fixed axle trailers.

   - It is necessary to fix the wheel speed sensors to the orientation of the lateral acceleration sensor for plausibility checks between the sensors.
   - If the wheel sensor location does not match the orientation of the TABS-6 Advanced module shown in Figure 18, a DTC will be generated and the ABS indicator lamp will be illuminated.
   - Refer to the large label inside the connector cover for wheel speed designation, "S-C" and "S-D".

4. Leakage and Operational Tests must be performed before returning the vehicle to service.

LEAKAGE AND OPERATIONAL TESTS

⚠ WARNING

For all NPT fittings use of a thread sealant is required.For NPTF fittings the use of a thread sealant is recommended. This can be a pre-applied or a hand-applied sealant product (with PTFE). When using a hand-applied sealant, use caution so as not to over-apply. Always follow the fitting manufacturer's pre-applied or hand-applied thread sealant recommendations. Use of PTFE tape is not approved and will void the Bendix ABS/TRSP valve warranty.

1. Before performing the leakage tests, block the wheels.
2. Fully charge the air brake system and verify proper brake adjustment.
3. Make several trailer brake applications and check for prompt application and release at each wheel.
4. Check the TABS-6 Advanced module, modulator valve and all air hose fittings for leakage using a soap solution.

   Check the ABS solenoid body with the trailer service brakes fully applied. If leakage is excessive – more than a single 1-in. bubble within 1 minute – replace the TABS-6 Advanced module.

   Check the relay exhaust port with the trailer service brakes released to be sure that leakage is less than a single 1-in. bubble within 3 seconds. If excessive leakage is detected at the relay exhaust port, perform the following test before replacing the TABS-6 Advanced module:

   - Apply the trailer spring brakes.Recheck for leakage around the relay exhaust port. If the exhaust port stops leaking, this indicates a leak between the emergency and service sides of the spring brake chamber. However, if the relay exhaust port continues to leak excessively, replace the TABS-6 Advanced module.

5. Apply power and monitor the power-up sequence to verify proper system operation. *See Section 15.*
6. Calibrate and set odometer parameters, if necessary, using a diagnostic tool. See Section 16.
7. Perform an installation test using a diagnostic tool. Minimum tests that are required to verify the proper installation of the ABS/TRSP system are:

   - **ECU Information:**This test provides the user with specific ECU information.It is required that no DTCs (other than "end-of-line test not completed") are present and that the ECU has been configured.
   - **Wheel End Sequence Test:**During this test, checks are carried out that verify the correlation of the wheel installed with a Wheel Speed Sensor and the Pressure Modulator that controls the pressure to the associated brake.
   - **Lateral Acceleration Test:**The installation angle information is retrieved from the ECU and compared to the predefined limits (±5 degrees). This test verifies that the unit is installed as close to horizontal as possible.
   - **Pressure Sensor Test:**During this test, checks are carried out that verify that the proper response is received from the pressure sensors during a brake application.
   - **Axle Load Sensing Test (Air Ride):**The test has the user verify the expected measurement of the load pressure sensor, Port 42, for air ride suspensions. The program provides the reading of the sensor.

- **Mechanical Load Sensor Test (Mechanical Spring Ride):**The test has the user verify the expected measurement of the spring deflection sensor. The program provides the reading of the sensor.
- **Customer Scratch Pad:**The tester is requested to input data into the fields displayed on the screen. This data will be stored in the ECU and also can be stored to a file on the computer or printed out for reference.

8. Where a safe location (e.g. restricted access area or test track) is available, it is possible to road test the ABS function by making an abrupt stop from a vehicle speed of about 20 MPH to check for proper function. The wheels should not enter a prolonged lock condition and ABS function should be audible. It is the responsibility of the technician to perform this test in a safe location.

ABS WIRING

⚠ WARNING

Disconnect the electrical connectors from the ABS/ TRSP Controller before welding on the trailer.

⚠ WARNING

Dielectric grease should be applied to electrical connectors to help protect against moisture intrusion.

All connector leads of the TABS-6 Advanced module pigtail harness are weather sealed at the connector interface and are clearly labeled for proper installation.

Bendix provides over-molded versions of the TABS-6 wiring harness and Bendix recommends that the complete harness be replaced if corrosion or damage occurs.

When troubleshooting ABS wiring, some general rules should be followed where applicable.

1. Check all wiring and connectors to ensure they are secure and free from visible damage (e.g. cuts, abrasions, etc.).
2. Check for evidence of wire chafing due to poor routing, or poor securing of wires.
3. Check connectors for proper insertion and locking.
4. Verify that the connector pins are properly greased with a non-conductive electrical grease compound.
5. Connector terminals must not show signs of corrosion or exposure to the environment.
6. Never pierce wire insulation when checking for continuity.
7. Do not deform individual pins or sockets during probing with a volt/ohm meter.
8. It is strongly recommended that all wiring harnesses and sensor leads are properly secured at least every 18 in.
9. Apply a moderate amount of non-conductive electrical grease to each connector pin before reconnecting.

MISCELLANEOUS MAINTENANCE

⚠ WARNING



GLAD HAND MAINTENANCE

▲ NEVER POUR ANY LIQUIDS (alcohol, anti-freeze, additives, etc.) into the glad hands. Liquids may cause the o-rings and seals to swell, may result in lubrication loss and leave harmful residues.

▲ Prevent nesting insects and contaminants from entering and blocking the air hoses. Check that screens are present and clean.

▲ Drain the trailer air tanks a minimum of every six (6) months.

Liquids/Contamination can cause TRAILER AIR BRAKE FAILURE and/or the INABILITY TO RELEASE the trailer parking brakes.

⚠ WARNING

BENDIX® ABS SYSTEM POWER-UP CHECK

At power-up the trailer ABS indicator lamp should briefly illuminate "ON" as a bulb check.

If the indicator lamp does not illuminate at power-up, the ABS system may not be powered, or the bulb may need to be replaced. Service the trailer ABS system.

▲ If the lamp remains "ON" after power-up there may be active Diagnostic Trouble Codes.Service the trailer ABS system. (To ensure full ABS/TRSP functionality, service as soon as possible.)

Other Important Practices:

▲ Follow all standard industry safety practices.

▲ Sealant for ABS Fittings: Use pre- or hand-applied; Never PTFE tape (Voids Bendix ABS Warranty).

▲ Use open-ended clips (never cable ties) to hold sensor leads to jounce lines.

▲ Drain the trailer air tanks a minumum of every six (6) months.

▲ Disconnect the electrical connectors from the ABS Controller when welding on the trailer.

Troubleshooting: Electrical Schematics

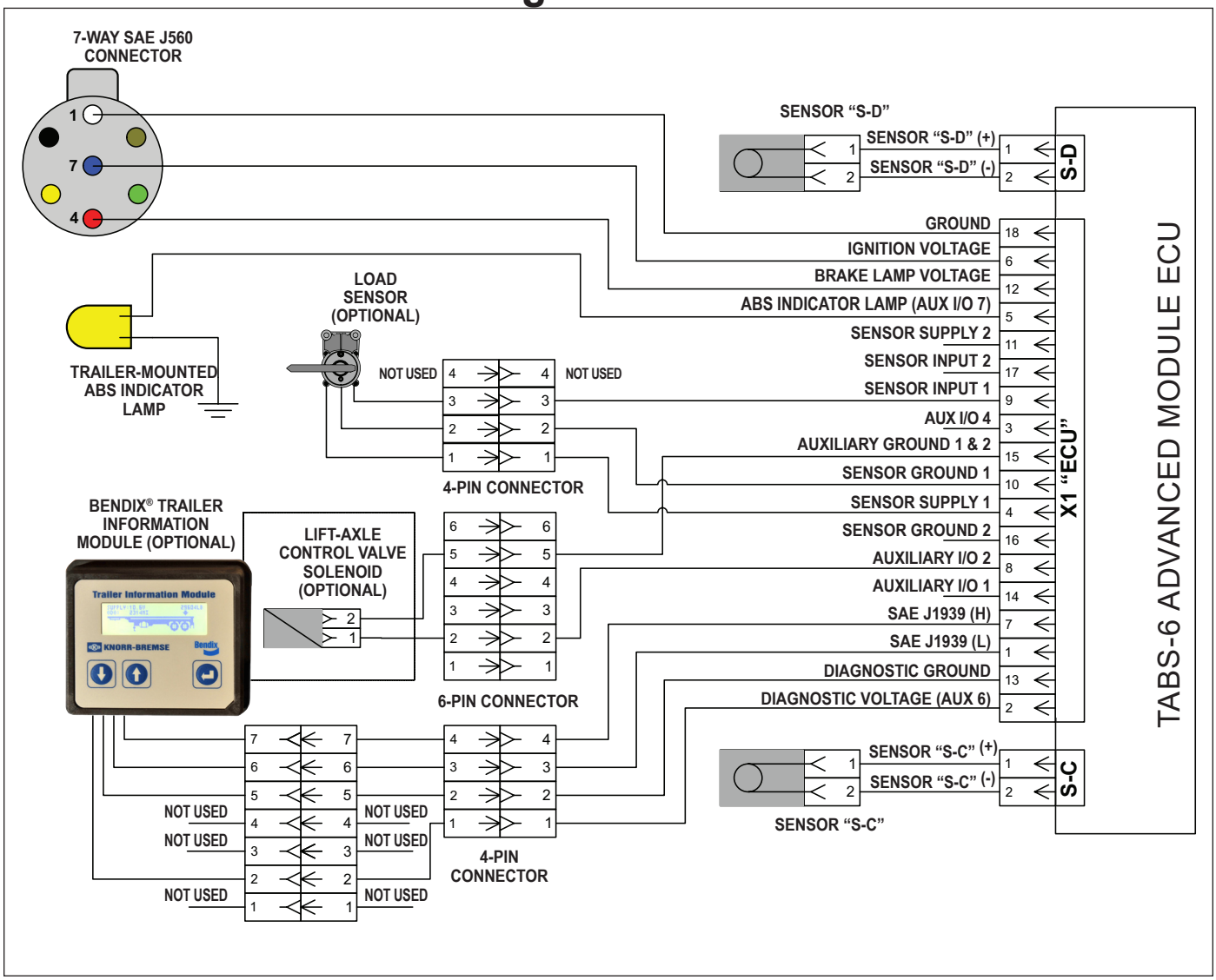


FIGURE 19 - *BENDIX® TABS-6™ ADVANCED MODULE ELECTRICAL SCHEMATIC - 2S/1M*

Troubleshooting: System Schematics

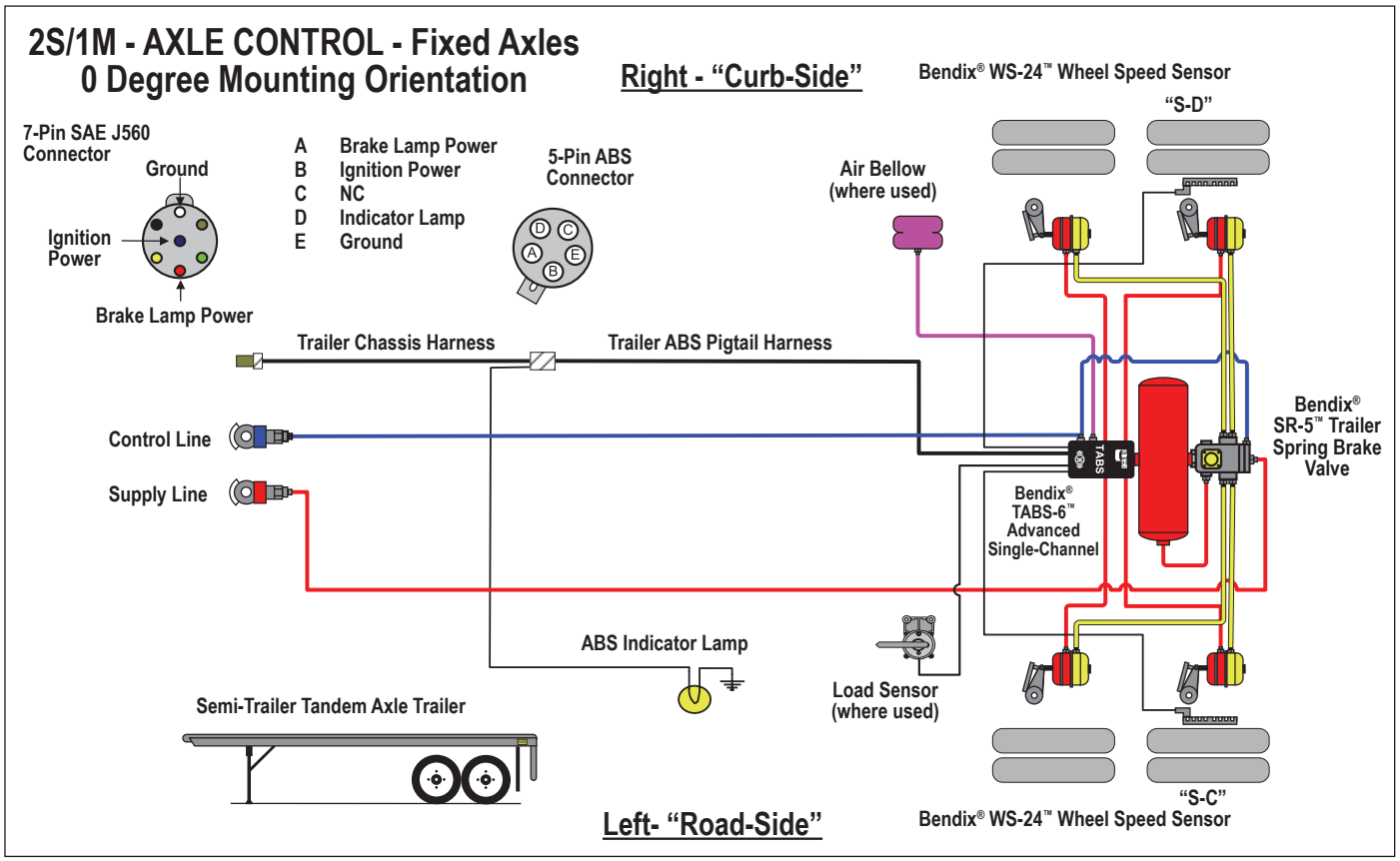


FIGURE 20 - *BENDIX® TABS-6™ ADVANCED MODULE - 2S/1M AXLE CONTROL (0 DEGREE) ABS ELECTRICAL & AIR SYSTEM*

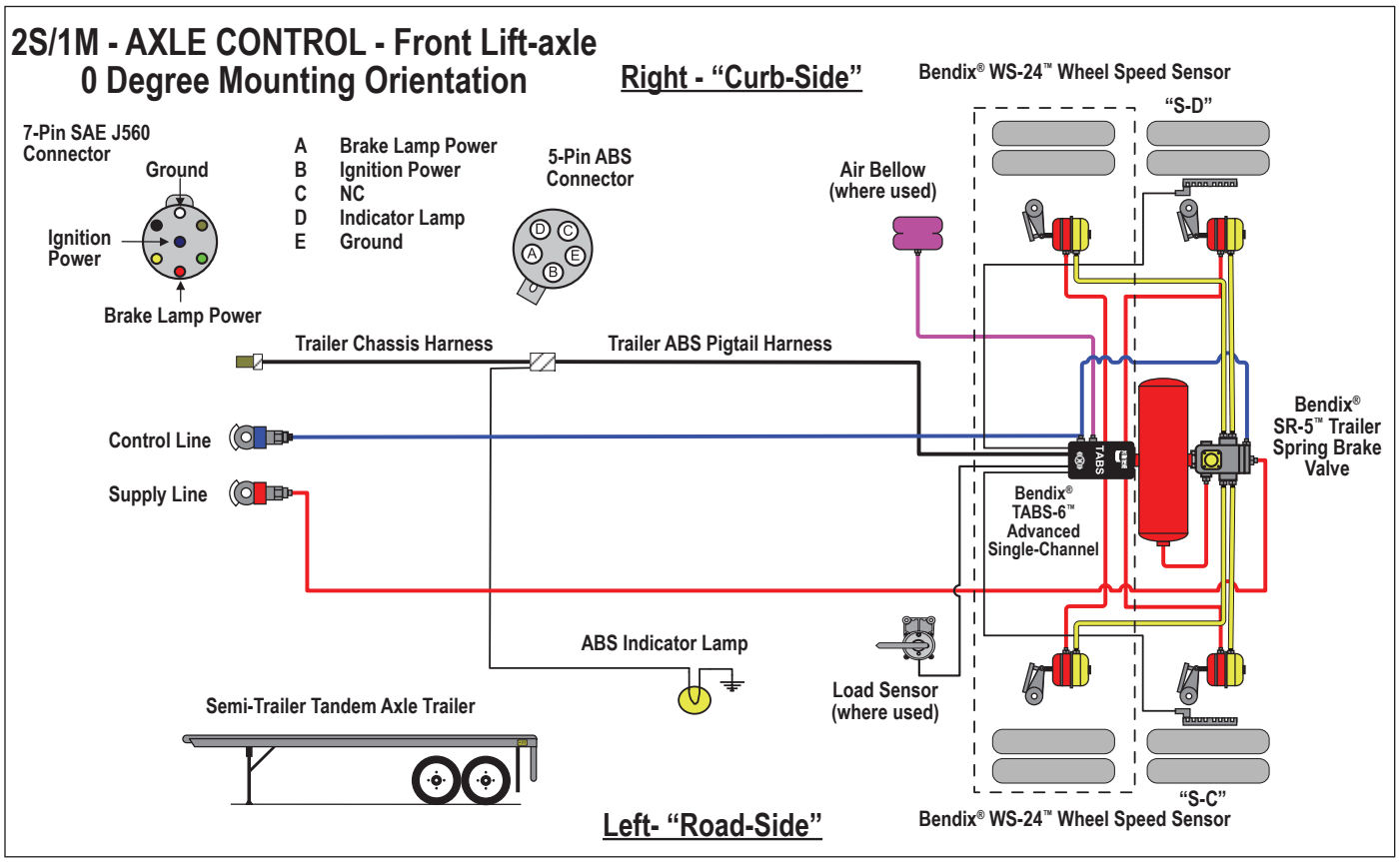


FIGURE 21 - *BENDIX® TABS-6™ ADVANCED MODULE - 2S/1M AXLE CONTROL (0 DEGREE) WITH FRONT LIFT-AXLE, ABS ELECTRICAL & AIR SYSTEM*

Troubleshooting: System Schematics

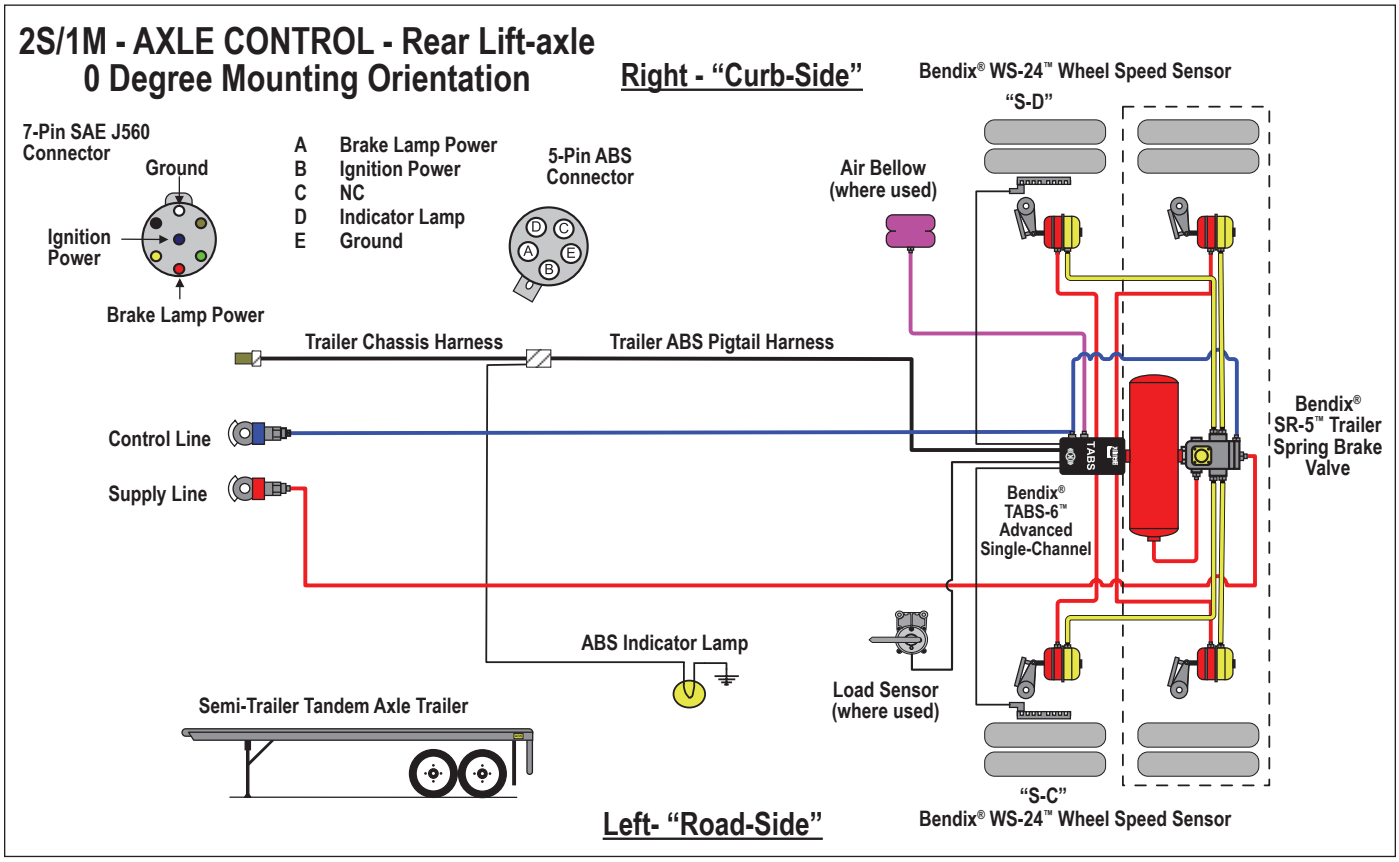


FIGURE 22 - *BENDIX® TABS-6™ ADVANCED MODULE - 2S/1M AXLE CONTROL (0 DEGREE) WITH REAR LIFT-AXLE, ABS ELECTRICAL & AIR SYSTEM*

Troubleshooting: Flowcharts

Diagnostic trouble code information can be retrieved from the TABS-6 Advanced module by using blink code diagnostics, or a diagnostic tool. The following troubleshooting flowcharts will help the technician isolate the cause and confirm whether the problem resides in the component, wiring or connectors.

Troubleshooting should always begin by observing the dash or trailer-mounted ABS indicator lamp during the TABS-6 Advanced module's power-up sequence. If it is necessary to take electrical measurements, always begin by taking voltage and resistance measurements at the 18-pin ECU pigtail harness connector.

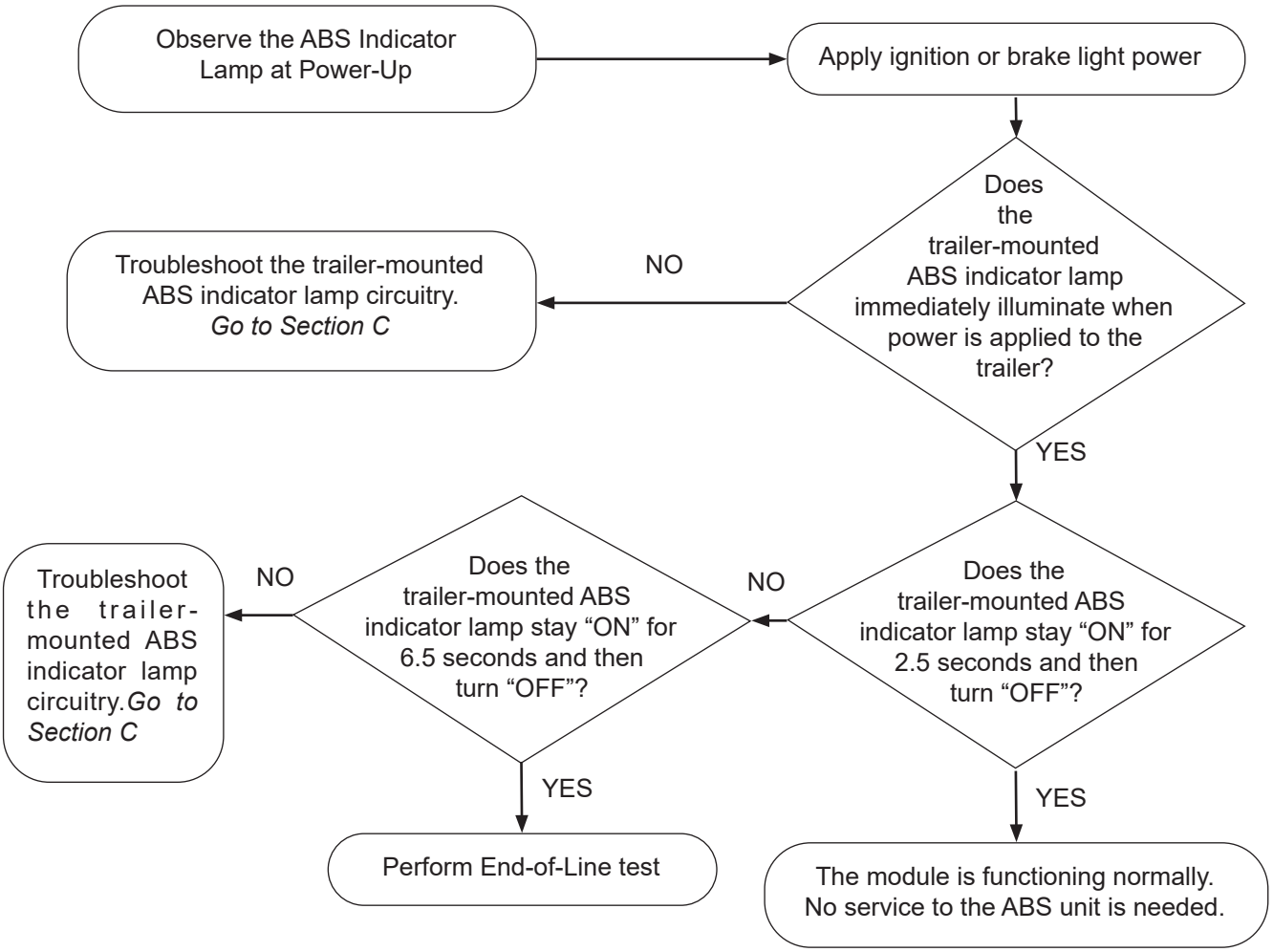
Once the source of the problem is found, isolate the area needing repair by repeating the measurements at all connections in the affected circuit towards the modulator, wheel speed sensor, etc.

No voltage or resistance measurements are to be made on the bulkhead connector pins of the module.

Section A: (Power-Up Sequence) **Trailer-Mounted ABS Indicator Lamp . . . . . Page 28**
Section B: (Power-Up Sequence) **Dash-Mounted ABS Indicator Lamp . . . . . Page 29**
Section C: **Troubleshooting the Trailer-Mounted ABS Indicator Lamp Circuitry . . . . . Page 30**
Section D: **Troubleshooting the Power Supply. . . . . Page 31**
Section E: **Troubleshooting the WS-24™ Wheel Speed Sensors. . . . . Page 32**
Section F: **Troubleshooting the Load Sensor (Out-of-Range Condition). . . . . Page 33**
Section G: **Troubleshooting the ECU and Wheel Speed Sensor. . . . . Page 34**
Section H: **Troubleshooting an Automatic Lift-axle That Remains Lowered. . . . . Page 35-39**
Section J: **Troubleshooting an Automatic Lift-axle That Remains Raised. . . . . Page 40-42**

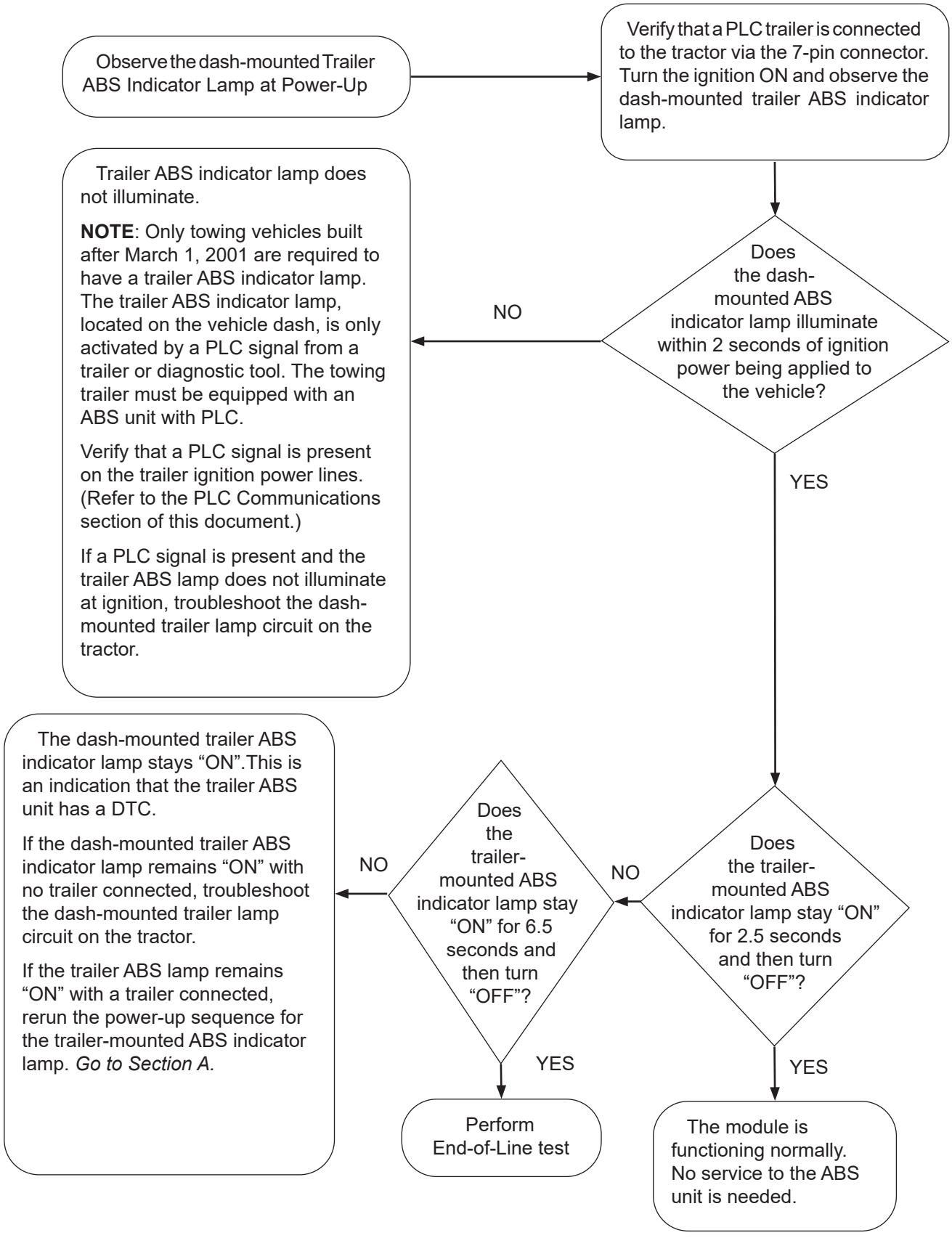
SECTION A: POWER-UP SEQUENCE - TRAILER-MOUNTED

ABS INDICATOR LAMP



SECTION B: (POWER-UP SEQUENCE)

DASH-MOUNTED ABS INDICATOR LAMP



SECTION C: TROUBLESHOOTING THE TRAILER-MOUNTED ABS INDICATOR LAMP CIRCUITRY

Is the tractor ignition or Battery box (if not using tractor as power source) switched on?

NO → Switch on the ignition and recheck if the trailer ABS indicator lamp does a power on check. *Go to Troubleshooting Section B.*

YES

Is SAE J560 cable (green, spiral) connected from tractor/battery box to trailer?

NO → Connect a SAE J560 cable. Verify that ABS warning lamp turns on and off during ignition power-up.

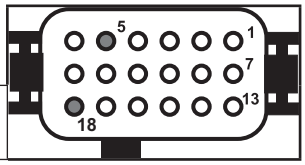
YES

Check the tractor for constant power (blue wire). Does the trailer ECU perform an ABS indicator lamp power-on test when the brake is applied while the trailer is stationary?

NO → Troubleshoot main trailer power harness for miswiring; open circuits; and/or short circuits.

YES

Add constant power blue wire to the center pin of the SAE J560 connector.



Looking into the TABS-6 Advanced Module 18-pin Connector Pigtail Harness. Pin 18 is the ground pin. Pin 5 is the ABS indicator lamp pin.

ACTION: If the trailer-mounted ABS indicator lamp did not illuminate during the power-up sequence.

Troubleshoot the power supply to the ABS module.*Go to Section D.*
Continue if the power and ground wiring are OK.

Turn off the power to the module.Inspect the condition of the ABS indicator lamp, connector and ground. Using a volt/ohm meter, verify continuity from the trailer chassis ground (pin 18) to the ground pin of the indicator lamp.

If repairs are made, rerun the power-up sequence.*Go to Section A.*

Continue if the indicator lamp and ground wire check out OK.

With power off to the ABS module, disconnect the 18-pin ECU connector.
Verify continuity from the ABS indicator lamp pin (pin 5) of the ECU connector to the ABS indicator lamp connector.
If repairs are made, rerun the power-up sequence.*Go to Section A.*
If the condition persists, replace the ABS module.

ACTION: If the trailer-mounted ABS indicator lamp remains "ON" during the power-up sequence.

Determine if a module DTC exists using any of the following methods:

- Blink code diagnostics, Section 20,
- PC diagnostics, Section 23,
- Trailer Remote Diagnostic Unit, Section 23, or
- Trailer Information Module, also Section 23.

If DTC(s) exist, and repairs are made, rerun the power-up sequence.*Go to Section A.*

Continue if no DTCs are found and the ABS module appears to be functioning normally.

With power off to the ABS module, disconnect the 18-pin ECU connector.

Using a volt meter, verify that there is not a short to the Vbat between the ABS WL pin of the ECU connector and the ABS indicator lamp connector.

If repairs are made, rerun the power-up sequence.*Go to Section A.*

If the condition persists, replace the ABS module.

SECTION D: TROUBLESHOOTING THE POWER SUPPLY

Turn off the power to the module, disconnect the 18-pin ECU connector.

With ignition power to the trailer, measure the voltage between the ignition Power pin and the Ground pin of the ECU connector.

Repeat the voltage measurement with brake lamp power to the trailer, and between the Brake Lamp Power pin and the Ground pin of the ECU connector.

The operating range of the module is 8.0-32.0 VDC. Can you verify that measurements found are equal to the vehicle voltage (within 1 VDC) at both the ignition and brake power inputs?

YES

Check for high resistance (corrosion, wire/connector damage or improper termination) of the power lines, resulting in a high voltage drop across the lines.

Measure the voltage under load by placing a load such as a type 1157 brake light bulb between the Ignition Power pin and Ground pin of the ECU connector, while the lamp is in place.

With ignition power to the trailer, measure the voltage between the Ignition Power (pin 6) and Ground (pin 18) of the ECU connector.

Repeat the voltage measurement with brake lamp power to the trailer, between the Brake Lamp Power (pin 12) and the Ground (pin 18) of the ECU connector.

The operating range of the module is 8.0-32.0 VDC.Verify that the voltage drop measurements are no less than 1.0 VDC from the vehicle voltage at both the ignition and brake power inputs.

With a volt/ohm meter, check the power and ground wiring. Look for corroded or damaged wires or connectors.

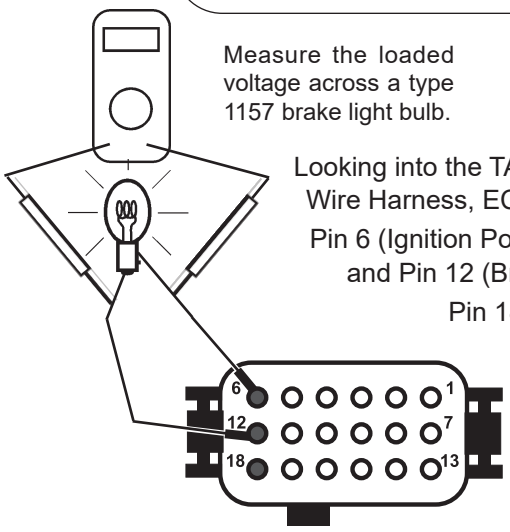
If repairs are made, rerun the power-up sequence. *Go to Section A.*

If proper loaded and unloaded voltage is measured at the ECU connector, and no corrosion or damage is found on the wiring, connectors or ECU, replace the module.

NO

With a volt/ohm meter, check the power and ground wiring. Look for corroded or damaged wire or connectors.

If repairs are made, rerun the power-up sequence.*Go to Section A.*



Measure the loaded voltage across a type 1157 brake light bulb.

Looking into the TABS-6 Advanced module Wire Harness, ECU Connector Measure: Pin 6 (Ignition Power) to Pin 18 (Ground) and Pin 12 (Brake Light Power) to Pin 18 (Ground).

SECTION E: TROUBLESHOOTING THE BENDIX® WS-24™ WHEEL SPEED SENSORS (WSS)

Turn off the power to the module, disconnect the wheel speed sensor connector.

If Dynamic WSS DTCs are present:

Rotate the affected wheel and verify a minimum of 0.25 VAC sensor output @ 0.5 RPS across the wheel speed sensor pins.A properly positioned sensor can output more than 2.0 VAC @ 1 RPS.

Verify/inspect the following:

- Speed sensors properly contact the tone ring.
- The condition and retention force of the sensor sleeve.
- Proper sensor lead condition, routing and clamping sleeve.
- Condition of tone ring mounting and teeth.
- Proper number of tone ring teeth per sensed wheel.
- Proper adjustment of wheel bearings.
- Condition of foundation brakes.
- Check for corroded/damaged wiring or connectors between the ECU and the WSS.

Make repairs as needed (replace wiring and/or ABS components).

Reset active DTCs by using any of the following methods:

- Blink Code Diagnostics, Section 20.
- PC diagnostics, Section 23.
- Bendix Trailer Remote Diagnostic Unit (TRDU) and magnet, Section 23.
- Trailer Information Module, Section 23.

(If you do not reset manually, typically these will reset automatically after a power cycle and the vehicle has been driven for a period of time.)

Then rerun the power-up sequence. *Go to Section A.*

If Static WSS DTCs are present:

Using a volt/ohm meter to measure the connector pins of the sensor with a DTC, verify 950-1950 OHMS across the sensor connector pins.

Verify/inspect the following:

- No continuity from sensor connector pins to ground.
- Vbat not measured at either sensor connector pins.
- Verify there is no continuity between the sensor leads and other sensors.
- Sensor/ECU wiring and connectors are not damaged or corroded.
- Proper sensor wire routing and clamping.

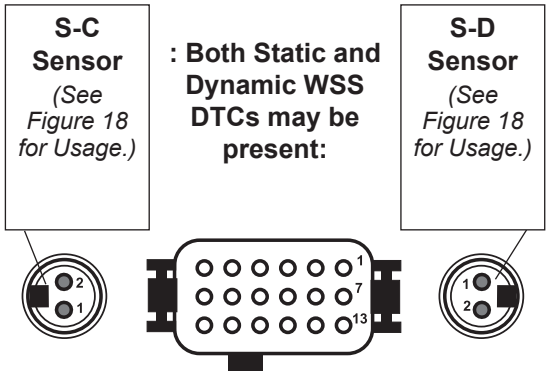
Make repairs as needed (replace wiring and/or ABS components).

Reset active DTCs by using any of the following methods:

- Blink Code Diagnostics, Section 20.
- PC diagnostics, Section 23.
- Bendix Trailer Remote Diagnostic Unit (TRDU) and magnet, Section 23.
- Bendix® Trailer Information Module, Section 23.

Then check for Dynamic WSS DTCs, see left column.

Then rerun the power-up sequence. *Go to Section A.*



Looking into TABS-6
Advanced Module Wire Harnesses

SECTION F: TROUBLESHOOTING THE LOAD SENSOR (OUT-OF-RANGE CONDITION)

(**NOTE***:* The indicator lamp for this condition is illuminated only after the vehicle moves.)

Turn off the power to the module.

For spring suspension system trailers:

Verify/inspect the following:

1. Inspect the load sensor linkage:

- Check that the linkage is attached to the axle clamp.
- Inspect for damage to the linkage components, loose connectors and mis-installation.
- Check that the load sensor lever rod is in a horizontal position with the trailer empty.
- Verify that the sensor linkage has not flipped over so that it faces the opposite direction.

2. Switch on power to the module.Using ACom Diagnostic Software, open the TRSP Sensors screen and select “Start.” Find the load (in lbs.) that the sensor is registering, and verify that the actual trailer load is consistent with the value found.
3. Where the value does not appear to be correct, perform the load sensor resistance check:

- Unplug the 18-pin connector from the module.
- With the load sensor lever in the horizontal position, verify that approximately 2.5K Ohms is measured between pins four (4) and nine (9) and between pins nine (9) and ten (10). Using ACom Diagnostic Software open the configuration screen. Select the Load and Sensor Configuration tab, and then view the “Load Sensing” panel.Verify that the current “Sensing Type” is shown as “External.” If not, change the selection to “External.”
- Note the values shown on the screen for the current load and sensor voltage. Verify that the values shown on the screen for the empty and laden weight and voltage are correct.

  Where the value does not appear to be correct, enter the correct value(s) on the configuration screen. If your version of Bendix ACom Diagnostic Software does not permit you to make these changes, update your copy of the program (available as a download from the support pages at www.B2Bendix.com.)

NOTE: Use a scale to obtain the actual empty trailer weight. Where possible, obtain the load/deflection curve from the suspension/spring manufacturer for the specific suspension/spring combination to find the expected values for this vehicle.

Then rerun the power-up sequence. *Go to Section A.*

For air suspension system trailers:

Verify/inspect the following:

1. Check that the Load Port P42 is connected to the primary suspension air bags ***at a location as far from the height control valve as possible***. Verify that the air hose is not kinked.
2. Check that the suspension height control valve is functioning correctly.
3. Check for air leakage in the suspension system.
4. Switch on power to the module. Using Bendix ACom Diagnostic Software, open the TRSP Sensors screen and select “Start.” Find the load (in lbs.) that the sensor is registering, and verify that the actual trailer load is consistent with the value found.
5. Where the value does not appear to be correct, using Bendix ACom Diagnostic Software, open the “Pressures” screen and select “Start.” Read the pressure shown for the Load Port (P42). If the pressure value is not as expected, open the “Configuration” screen; then select the Load and Sensor Configuration tab, and then view the “Load Sensing” panel. Verify that the current “Sensing Type” is shown as “Internal.” If not, change the selection to “Internal.”

   Note the values shown on the screen for the current load and pressure. Verify that the values shown on the screen for the empty and laden weight and pressures are correct.

   Where the value does not appear to be correct, select “modify”, and enter the correct value(s) on the configuration screen. If your version of ACom Diagnostic Software does not permit you to make these changes, update your copy of the program (available as a download from the support pages at www.B2Bendix.com).

NOTE: Use a scale to obtain the actual empty trailer weight and use a pressure gauge to obtain actual empty trailer suspension air bag pressure. Where possible, obtain the load/pressure curve from the suspension manufacturer for the specific suspension/air bag combination to find the expected values for this vehicle.

Then rerun the power-up sequence. *Go to Section A.*

SECTION G: TROUBLESHOOTING THE ECU AND WHEEL SPEED SENSOR

(**NOTE**:The indicator lamp for this condition is illuminated only after the vehicle moves.)

Turn off the power to the module.

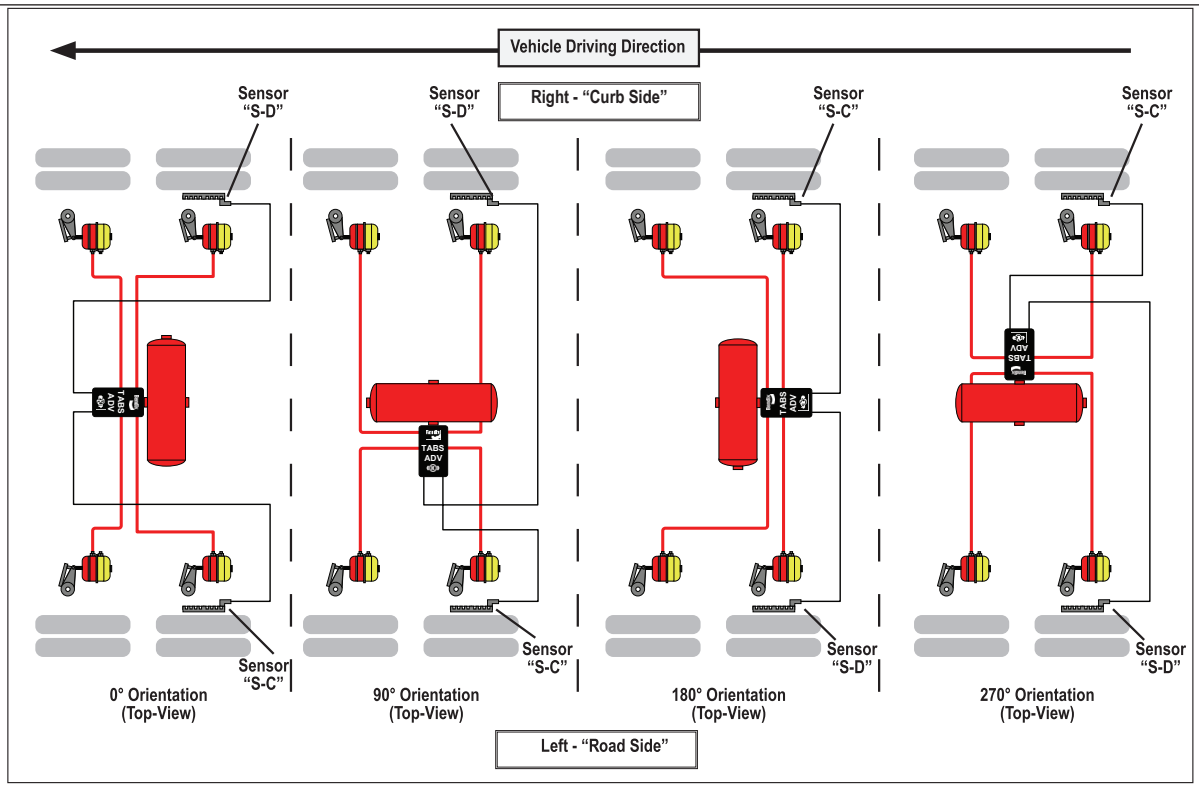
1.Check that the ECU is installed correctly (expected orientation to vehicle).

Each TABS-6 Advanced ECU comes preconfigured for a certain orientation (0/90/180/270 degrees from the vehicle driving direction). **NOTE:** Part numbers labeled R001 and forward can only be mounted in the 0- or 180-degree orientations to function properly. See Figure 18 for more details. Use ACom Diagnostic Software to view the current configured orientation of the Bendix TABS-6 Advanced ECU on the controller configuration screen. Then use the Figure below to verify that the TABS-6 Advanced ECU is installed per the configured orientation. If it is determined that the ECU is not installed per the configured orientation, then verify that the configured orientation is correct for the part number of the ECU. This will require contacting a Bendix representative at 1-800-AIR-BRAKE (1-800-247-2725).If the configured orientation matches the orientation for the specific ECU part number then reinstall the ECU to match the configured orientation. After reinstalling the ECU for the correct orientation, perform an End-of-Line Test (installation test) using Bendix ACom Diagnostic Software or a Trailer Information Module.

If the configured orientation of the ECU does not match the orientation for the specific part number, it is possible that the configured orientation was manually configured using ACom Diagnostic Software at a previous date. If possible, change the configured orientation back to the correct orientation for the given part number. This may require assistance from a Bendix representative at 1-800-AIR-BRAKE (1-800-247-2725). After reconfiguring the orientation of the ECU, reinstall per the new orientation if required. Perform an End-of-Line Test (installation test).

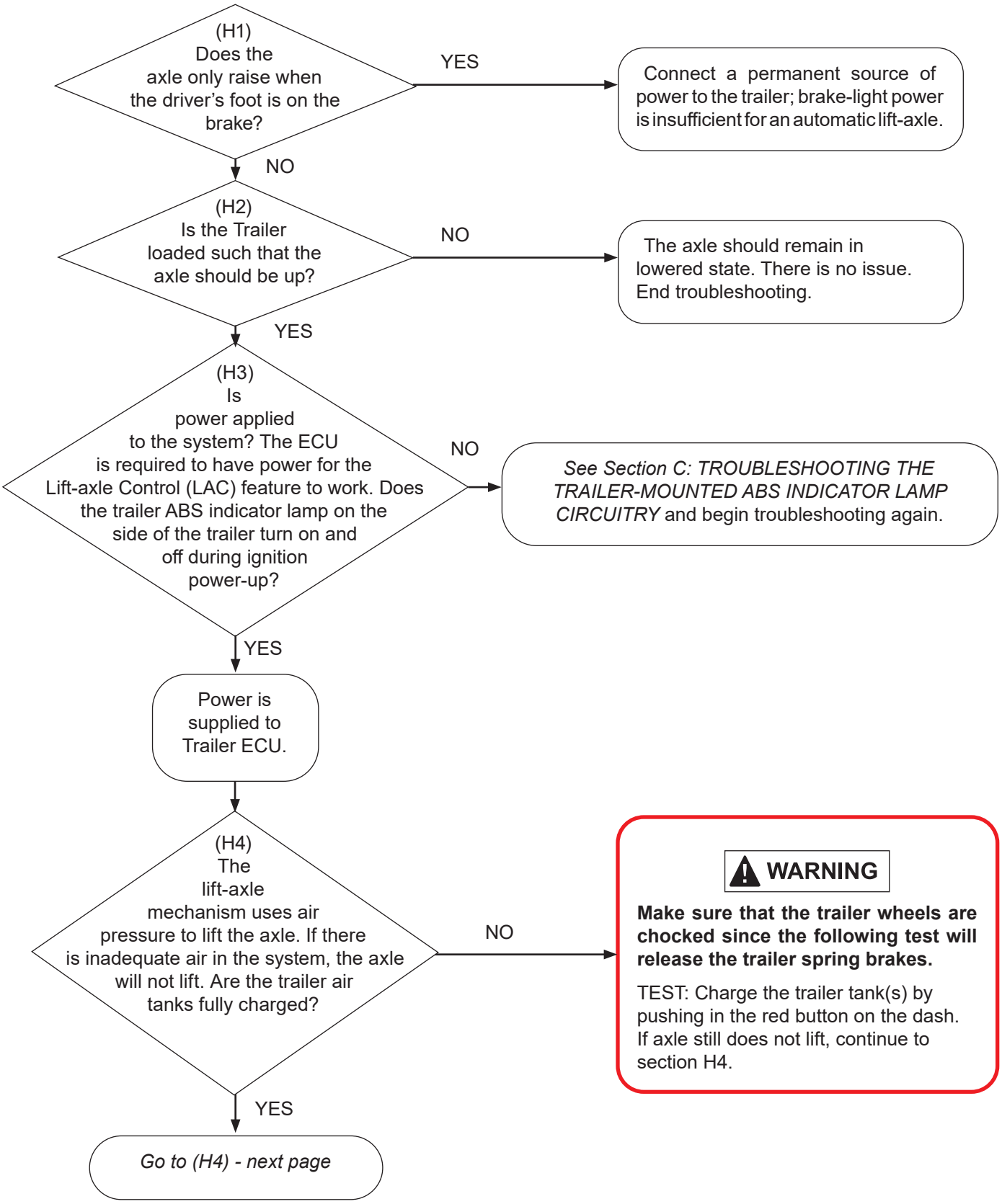
2.Check if the wheel speed sensors SC and SD are swapped.

Since this DTC is caused by the ECU comparing the difference in wheel speed readings between left and right wheel speed sensors to cross-check with the on-board lateral accelerometer's data, if the sensors are reversed, a DTC can be triggered. The correct installation location of wheel speed sensors SC and SD are specific to the ECU's orientation. Each TABS-6 Advanced ECU comes preconfigured for a certain orientation. Use ACom Diagnostic Software to view the orientation on the controller configuration screen. Then use the Figure below to verify the correct installation of wheel speed sensors for this orientation. Use ACom Diagnostic Software to run the TABS-6 Advanced End-of-Line Test (installation test) to verify if the installation of wheel speed sensors SC and SD is correct.

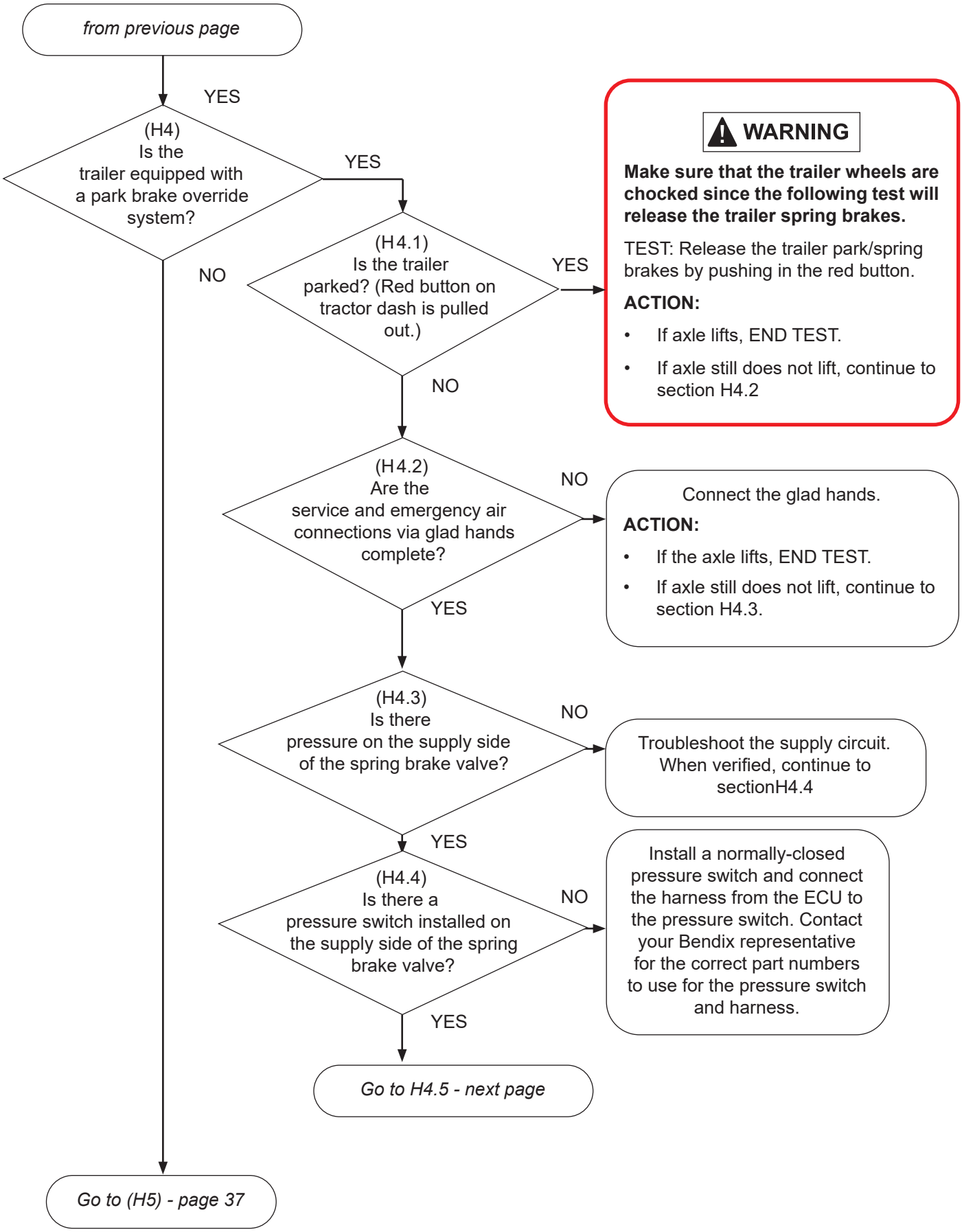


NOTE: Part numbers labeled R001 and forward can only be mounted in the 0- or 180-degree orientations to function properly.

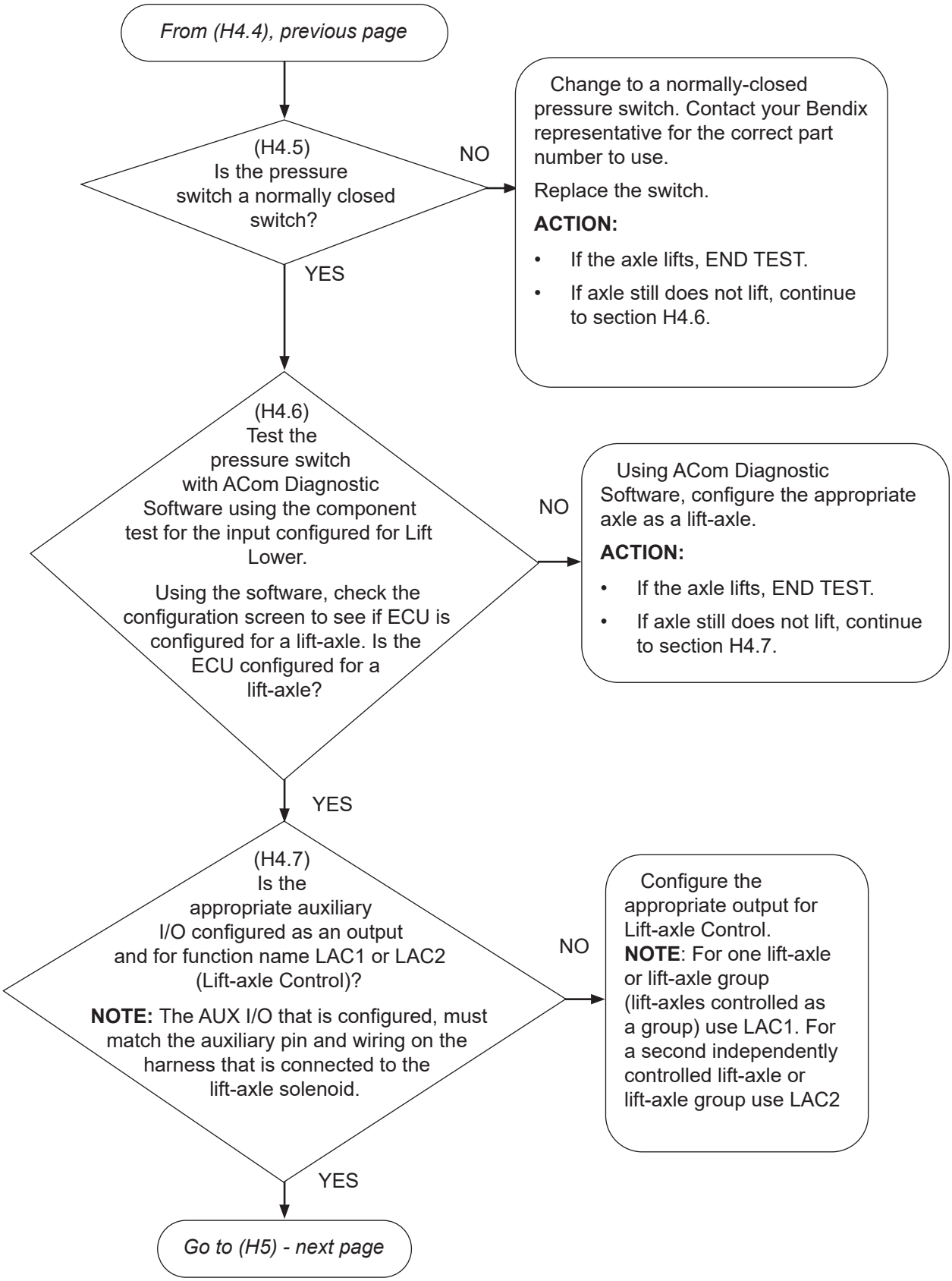
SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS LOWERED



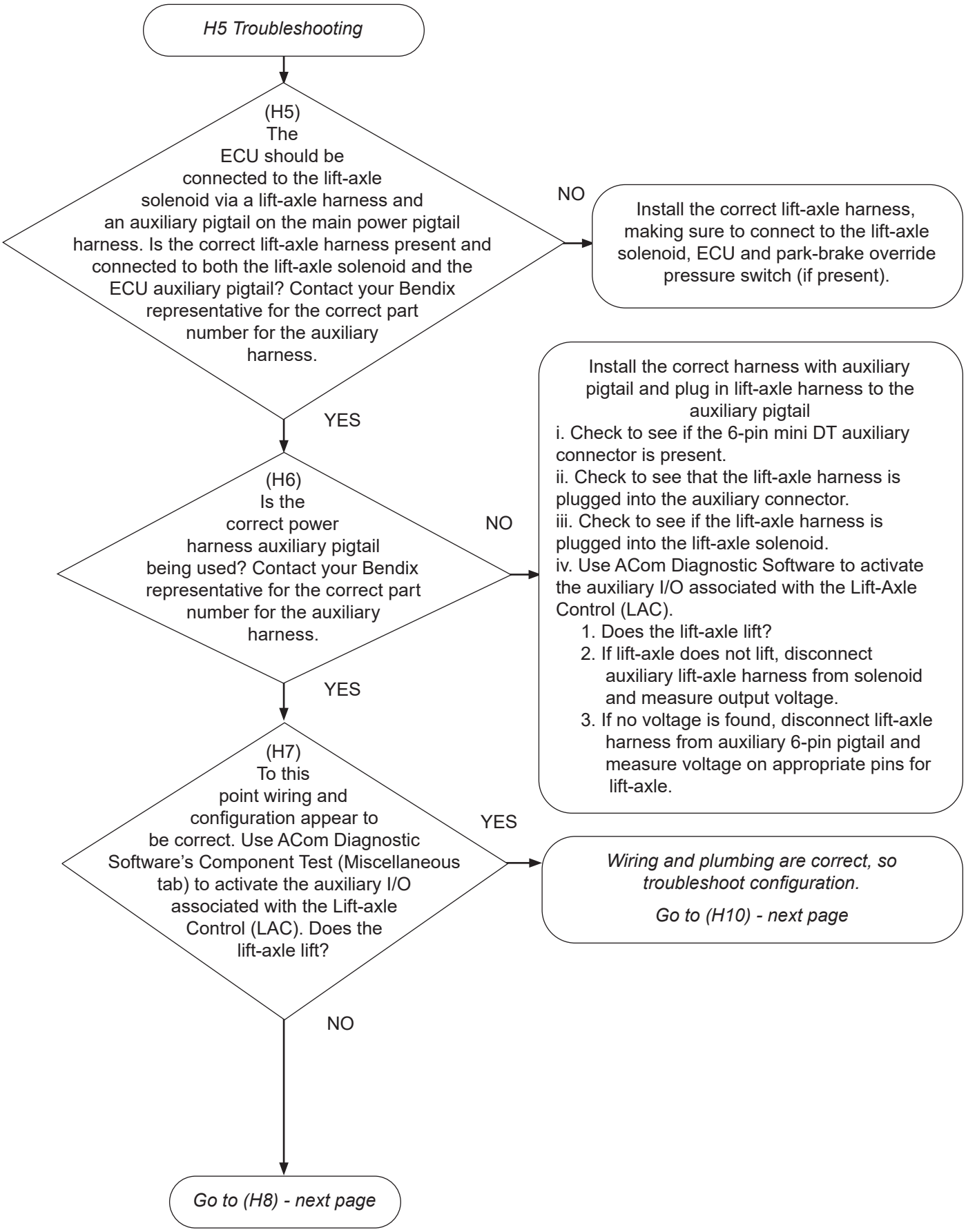
SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS LOWERED (CONTINUED)



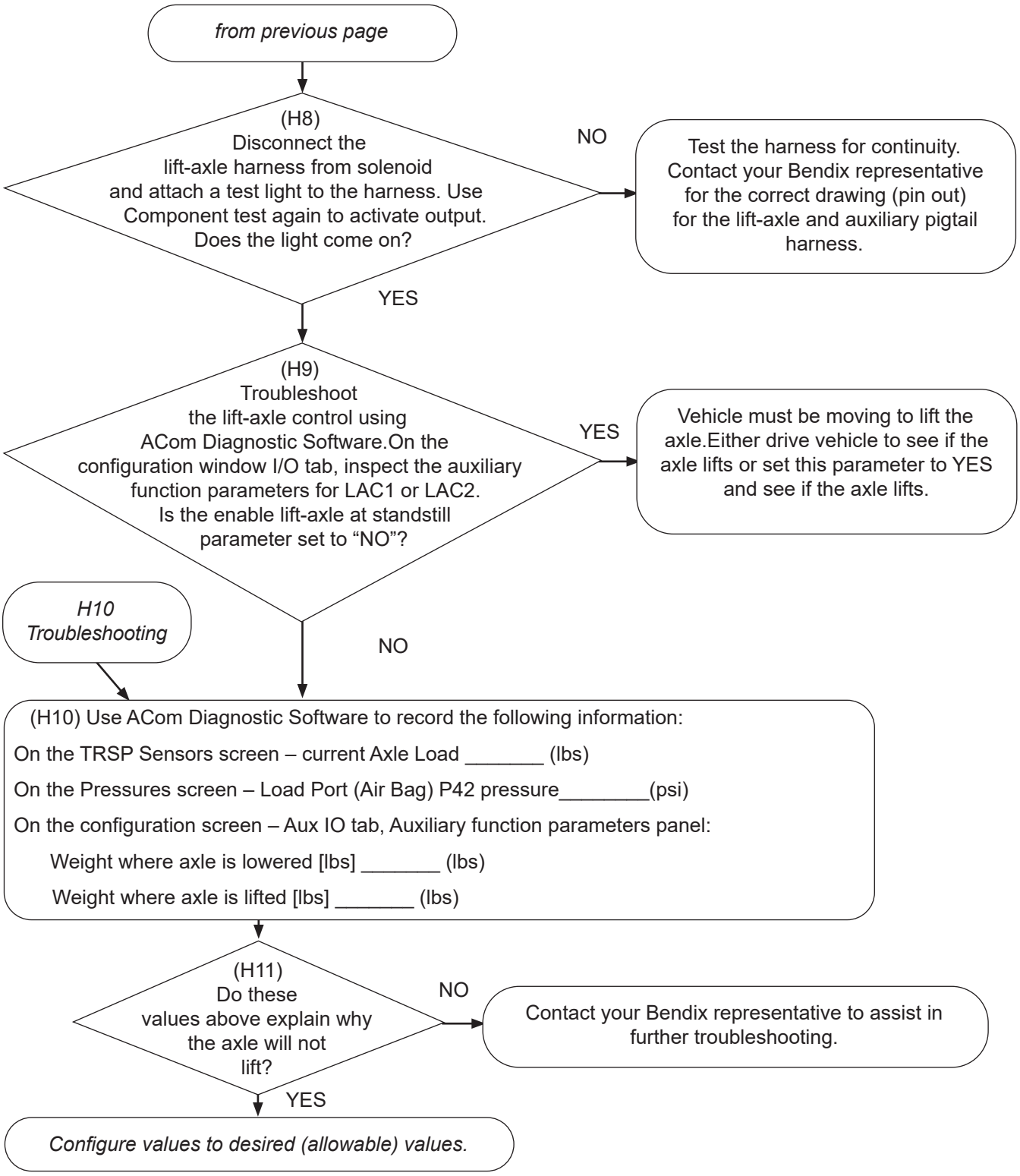
SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS LOWERED (CONTINUED)



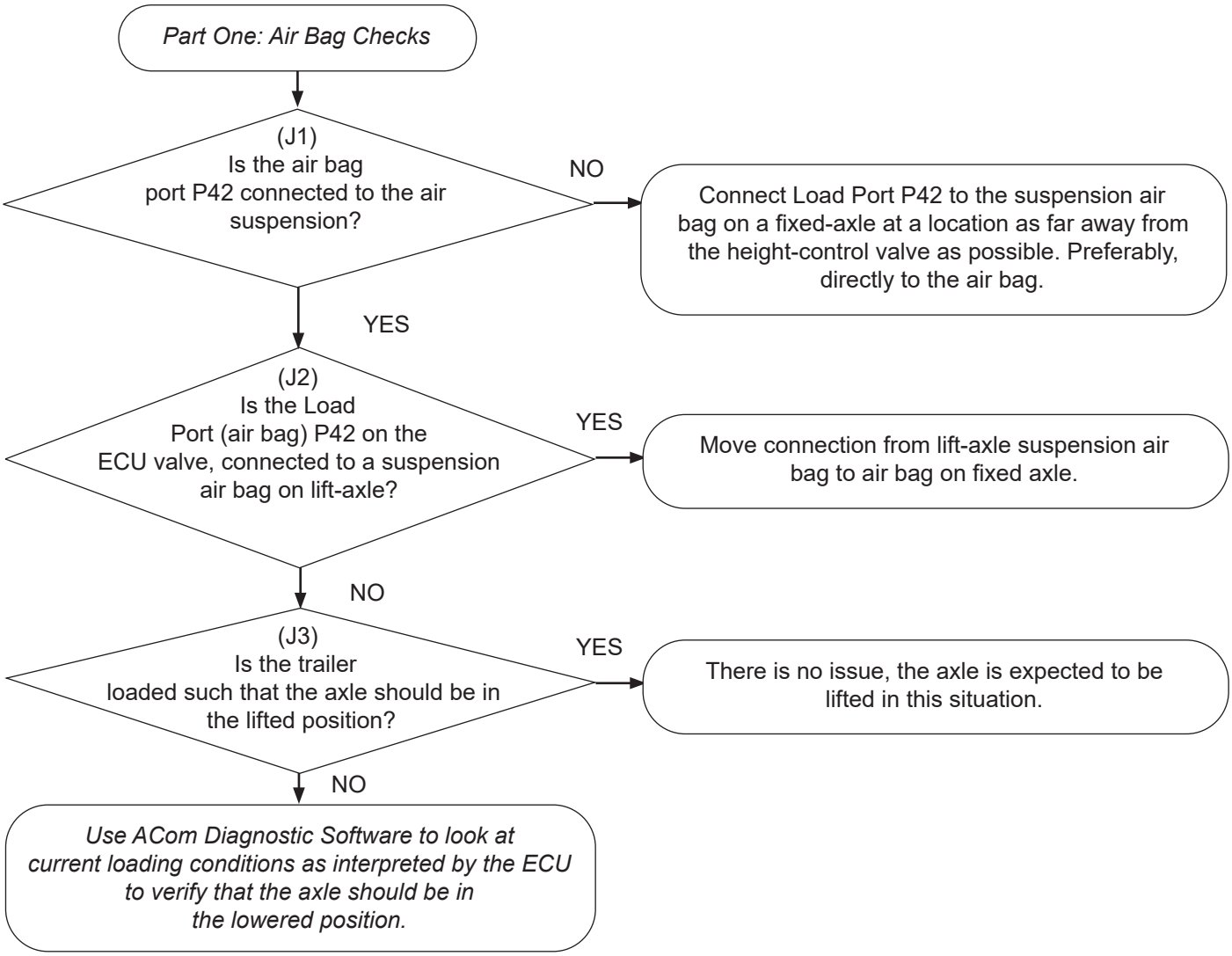
SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS LOWERED (CONTINUED)



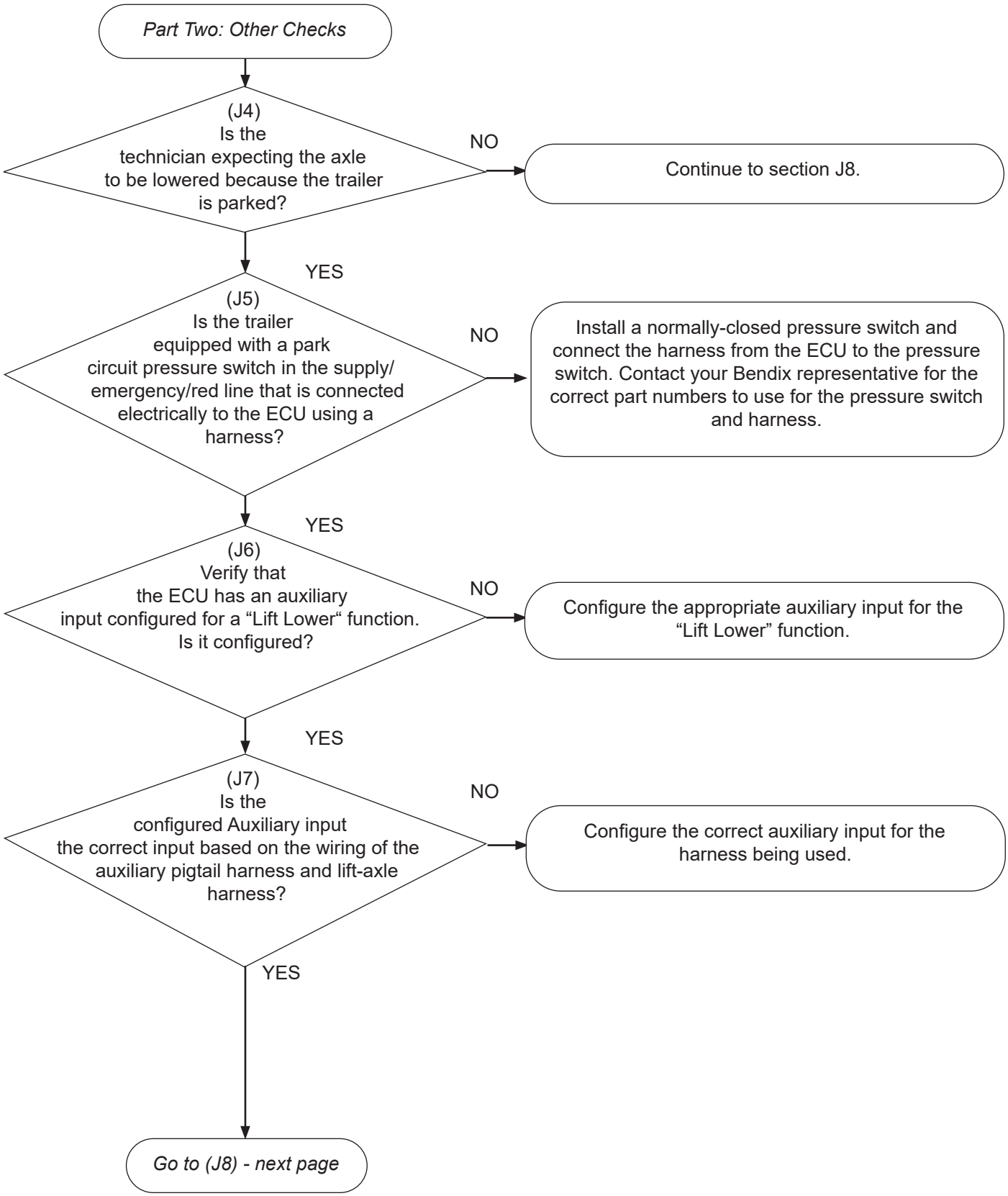
SECTION H: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS LOWERED (CONTINUED)



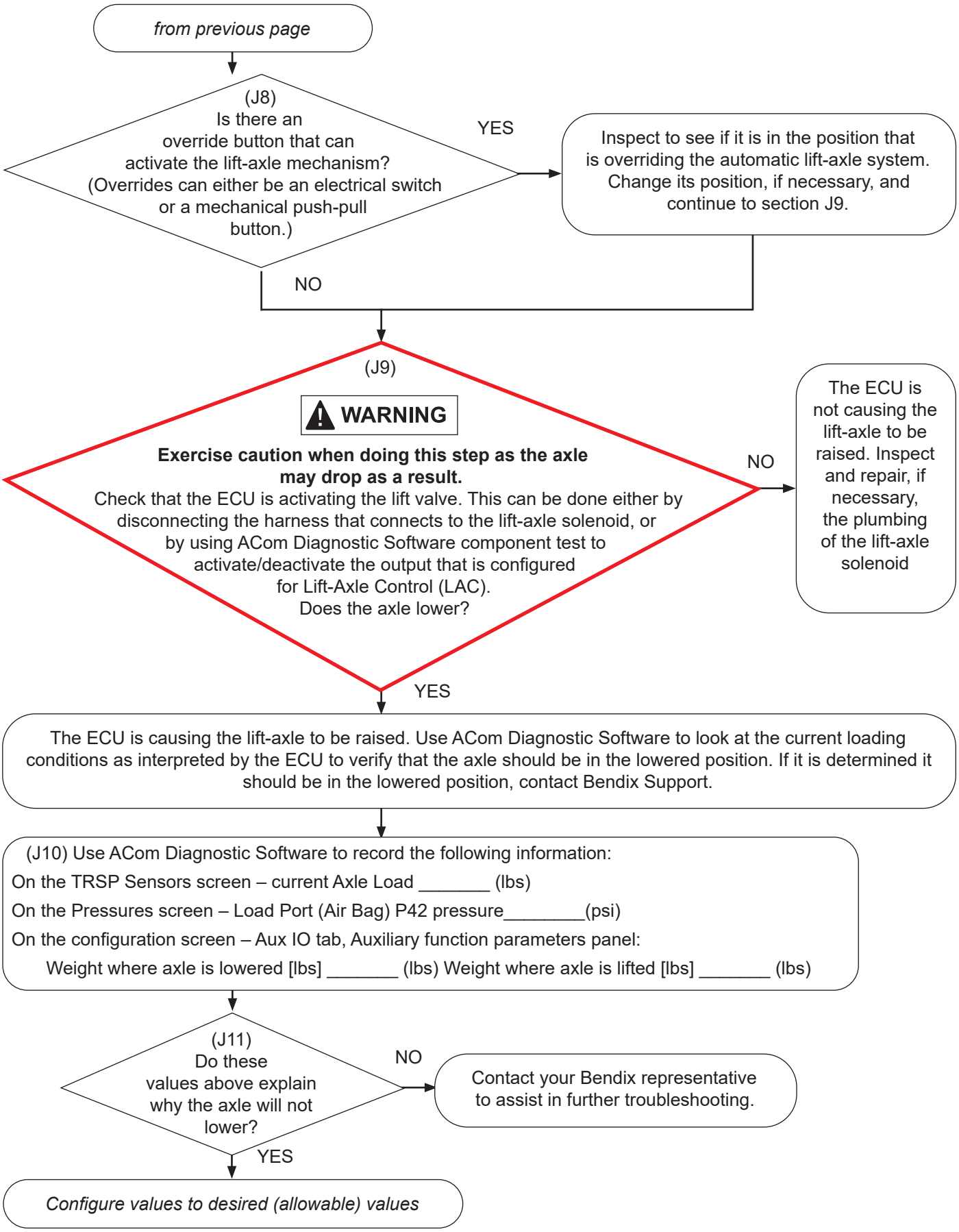
SECTION J: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS RAISED



SECTION J: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS RAISED (CONTINUED)



SECTION J: TROUBLESHOOTING AN AUTOMATIC LIFT-AXLE THAT REMAINS RAISED (CONTINUED)



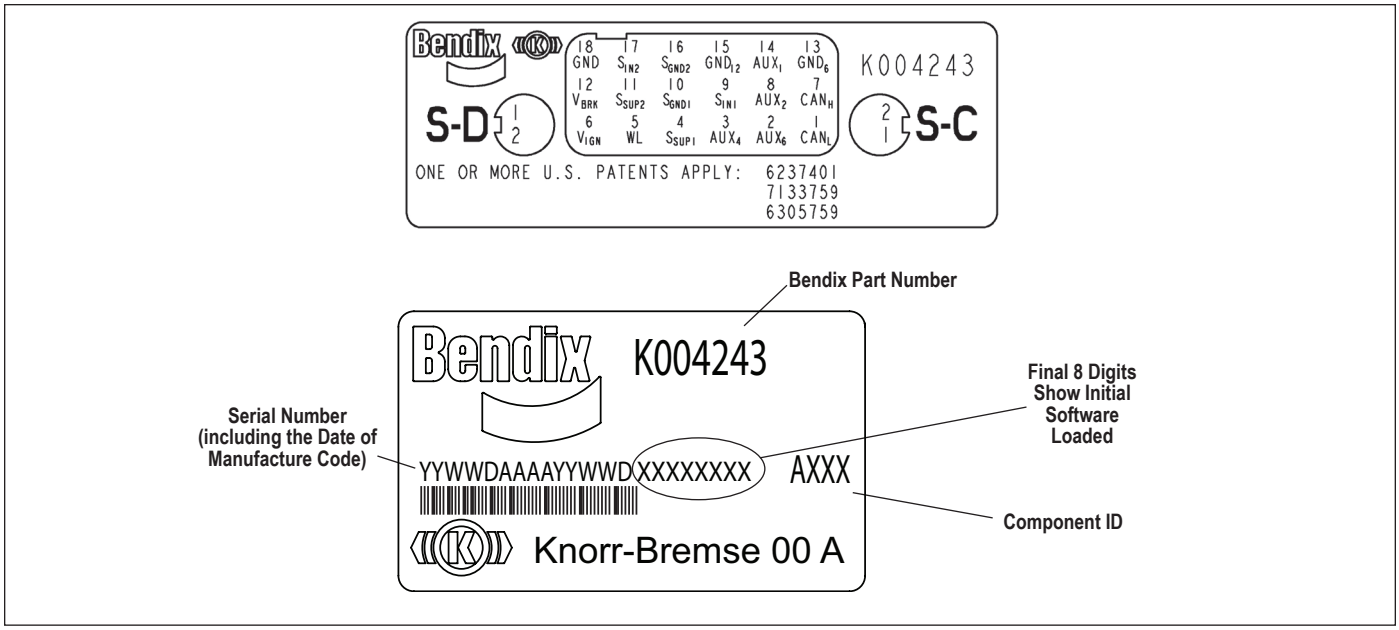


FIGURE 23 - *LABEL INFORMATION*

ECU Part Number Label

See Figure 23. The external part number label is located above the Control Port of the module. If this label is not readable for any reason, the Bendix part number is etched into the module casting above the Control Port *(See Figure 1)*. A Bendix manufacturing date code is to the right of the part number inscription.

There is an additional label under one of the covers that shows a pin-out diagram for the 18-pin main connector.

Software Revision Level

The number of the initial software loaded on the ECU is also indicated. The current software revision number can be read using a diagnostic tool.

Document Revision Level

For additional information on Bendix products and to ensure you have the latest version of the Service Data Sheet, please visit www.B2Bendix.com.

- SD-13-4767: Bendix® TABS-6™ Standard and Premium Trailer ABS Module
- SD-13-47672: Bendix® TABS 6™ Advanced Multi-Channel Trailer ABS Module
- SD-13-4650: Bendix® WS-24™ AntiLock Wheel Speed Sensor



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