Bendix

Service Data

SD-20-47682

Bendix® iTABS™ X Standard Single-Channel (SC) Trailer Antilock Braking System (ABS) Module

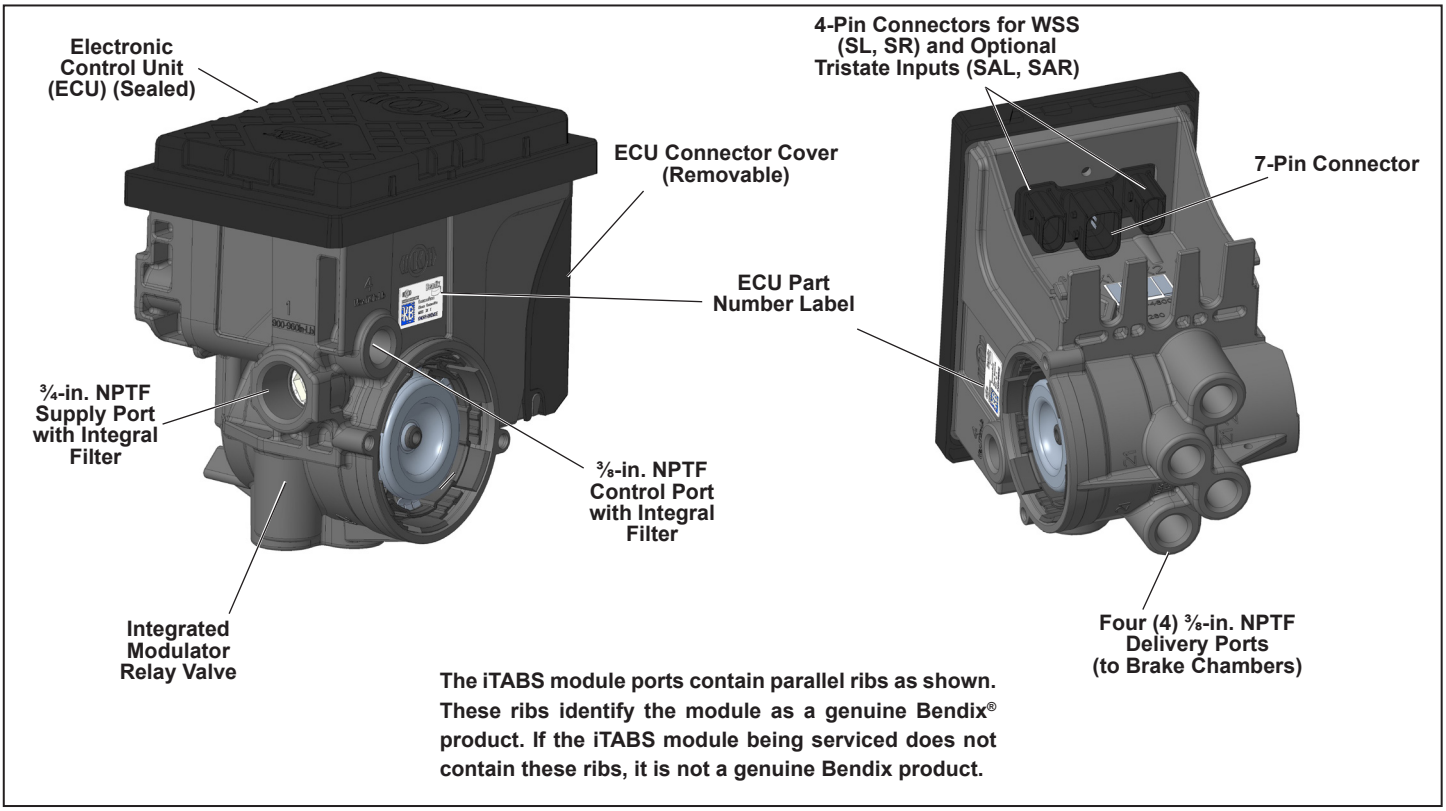

Figure 1 – Bendix® iTABS™ X Standard SC ABS Module

1. INTRODUCTION

The Bendix® iTABS™ X Standard Single-Channel (SC) Module (hereafter referred to as the iTABS module) is an integrated single-channel (2S/1M) trailer service brake module controller for air-braked, heavy-duty semi-trailers that features the Bendix® Antilock Braking System (ABS).

Installed on semi-trailers, the iTABS 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.

⚠ WARNING

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.

iTABS MODULE FEATURES

- A modular design with an integrated Electronic Control Unit (ECU) and Modulator Relay Valve (MRV) – eliminating external pigtail harnesses for these components
- An operating voltage range of 9.0-16.0 VDC
- Optional mounting to the service reservoir or to the chassis without additional brackets
- An electronic odometer with trip counters and service interval options
- A scratch-pad feature with freely definable read/write text space available for customer use
- An extended data-logging feature, including a resettable drive recorder
- A variety of electrical inputs and a single output (I/Os) allow the customer to program auxiliary functions such as Integrated Speed Switch (ISS) and Auxiliary Design Language (ADL) for customized auxiliary functions
- A wide range of diagnostic tools for flexible troubleshooting such as blink codes and SAE J1939 (CAN) diagnostics
- Support for SAE J2497 Power Line Carrier (PLC) communication to the towing vehicle
- 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 and supply ports
- Locking dust cover to provide electrical connector and cable protection

ECU PART NUMBER LABEL

See Figure 2. The external part number label is located next to the control port (P4) of the iTABS module. If this label is not readable for any reason, the part number can be read from the ECU using ACom Diagnostic Software.

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 ACom Diagnostic Software.

DOCUMENT REVISION LEVEL

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

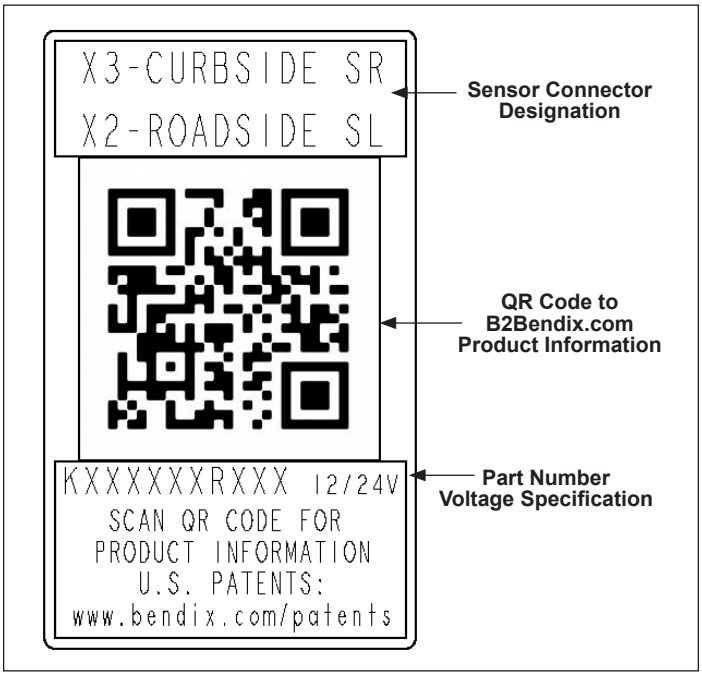

Figure 2 – Label Information

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To search DTCs and receive additional troubleshooting support, refer to:
B2Bendix.com > Services & Support > Diagnostic Trouble Code Search

2. GENERAL SAFETY GUIDELINES

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.**

3. ABS OPERATION

The iTABS module uses Wheel Speed Sensors (WSS), an 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 modulate controlled brake pressure at the wheel ends.

The iTABS ECU is able to modulate the brake pressure with greater speed and accuracy than a driver.

NORMAL BRAKING

During normal braking, the iTABS module functions as a standard relay valve. If the ECU does not detect excessive wheel slip, it will not activate the ABS, 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 (i.e. roads that are worn, slippery, or are made of loose gravel) – or braking surfaces with areas of poor traction (i.e., 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.

⚠ WARNING

Do not use axle control (select high) on fifth-wheel dollies or steerable axles. In these cases, it could cause a yaw moment during braking that results in unwanted steering of the axle. Use a dolly control (select low) configuration.

STEERABLE AXLES

For applications that have both fixed and steerable axles – such as drawbar trailers (full-pull trailers) – a 4S/2M axle configuration should be used. These configurations have the ability to minimize yaw on steerable axles.

ABS FAIL-SAFE

The iTABS 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. The iTABS module will illuminate the trailer ABS indicator lamp and revert to a fail-safe mode where some – or all – advanced ABS functions may not function. Even in cases where the ABS is completely disabled, the standard pneumatic brake function of the trailer will still be available, but without the benefits of ABS. If the indicator lamp is illuminated, always have the ABS system serviced at the earliest opportunity.

4. COMPONENTS

Installation of the iTABS module uses the following components:

INTERNAL COMPONENTS

- **Electronic Control Unit (ECU):** The ECU monitors the WSS signals to determine when ABS intervention is required. When needed, the ECU actuates the internal pressure modulator valve to optimize the brake pressure. The ECU monitors the system to detect and warn the driver of any malfunctions. DTCs are stored in the ECU and can be reviewed to diagnose the iTABS module.
- **Modulator Relay Valve (MRV):** An MRV is integrated into the iTABS module and is controlled electrically by the ECU to decrease, hold, or allow the fully applied brake pressure into the brake chamber to control the braking torque at the wheels.
- **MRV Crack Pressure:** The iTABS MRVs are supplied with a nominal crack pressure of 4.5 ± 0.5 psi.

EXTERNAL COMPONENTS

- **WSS:** S*ee Figure 3.* Located at select hubs, WSS detect the rotation of individual wheels and send an electrical signal to the ECU proportional to the rotational velocity. The WSS connectors, SR and SL, are used for detecting wheel speeds. Regardless of the mounting methodology of the module, the SR WSS is always curb side, and the SL WSS is always road side.

  Vehicles have an exciter ring (often referred to as "tone ring") as part of the wheel assembly. *(Hereafter, the exciter ring will be referred to as a tone ring throughout this document.)* The default setting expects a 100-tooth tone ring to be used. *Refer to Section 20* for more information. As the wheel turns, the teeth of the tone ring pass the WSS, generating an Alternating Current (AC) signal which is delivered to the iTABS ECU. The signal varies in voltage and frequency as the wheel speed changes. *See Figure 8* for an electrical schematic showing the WSS connector pin locations.

  Refer to SD-13-4860, Bendix® WS-24™ Antilock WSS, on B2Bendix.com for complete WSS information.

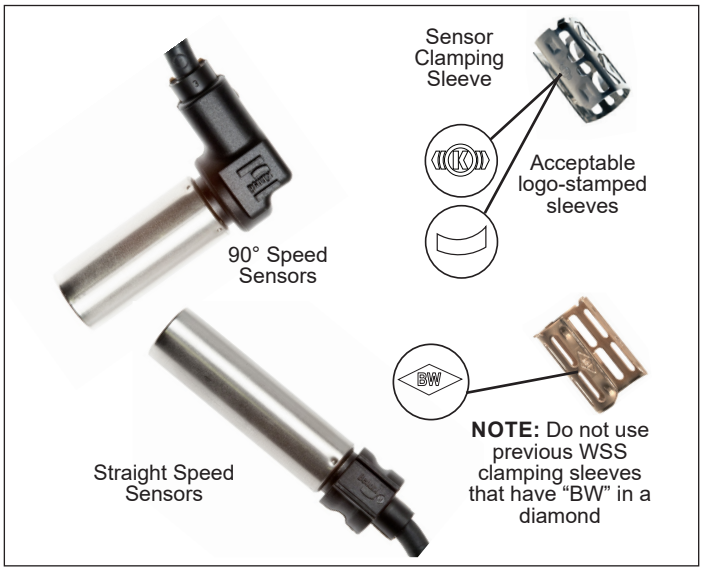

Figure 3 – Bendix® WS-24™ Wheel Speed Sensor

- **Trailer-Mounted ABS Indicator Lamp:** S*ee Figure 4*. The iTABS 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 startup – 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 4 of the 7-pin connector on the module.
- **Dash-Mounted ABS Indicator Lamp (PLC Controlled):** The iTABS module uses SAE J2497 standards to support PLC communication. The status of the trailer ABS is transmitted over the ignition power wire (the blue wire of the J560 connector) – Pin 2 of the 7-pin module connector. If there is an active DTC, during the bulb check at startup, the iTABS module will transmit a signal over the power line to the towing vehicle's ECU, thus illuminating the trailer ABS indicator lamp mounted on the dash.

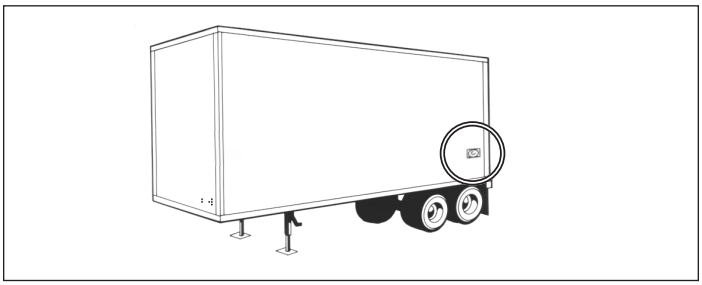

Figure 4 – Trailer-Mounted ABS Indicator Lamp

- **5-pin Power Harness:** *See Figure 5.* A power harness is required. Variations that include auxiliary sub-harnesses are available as needed.

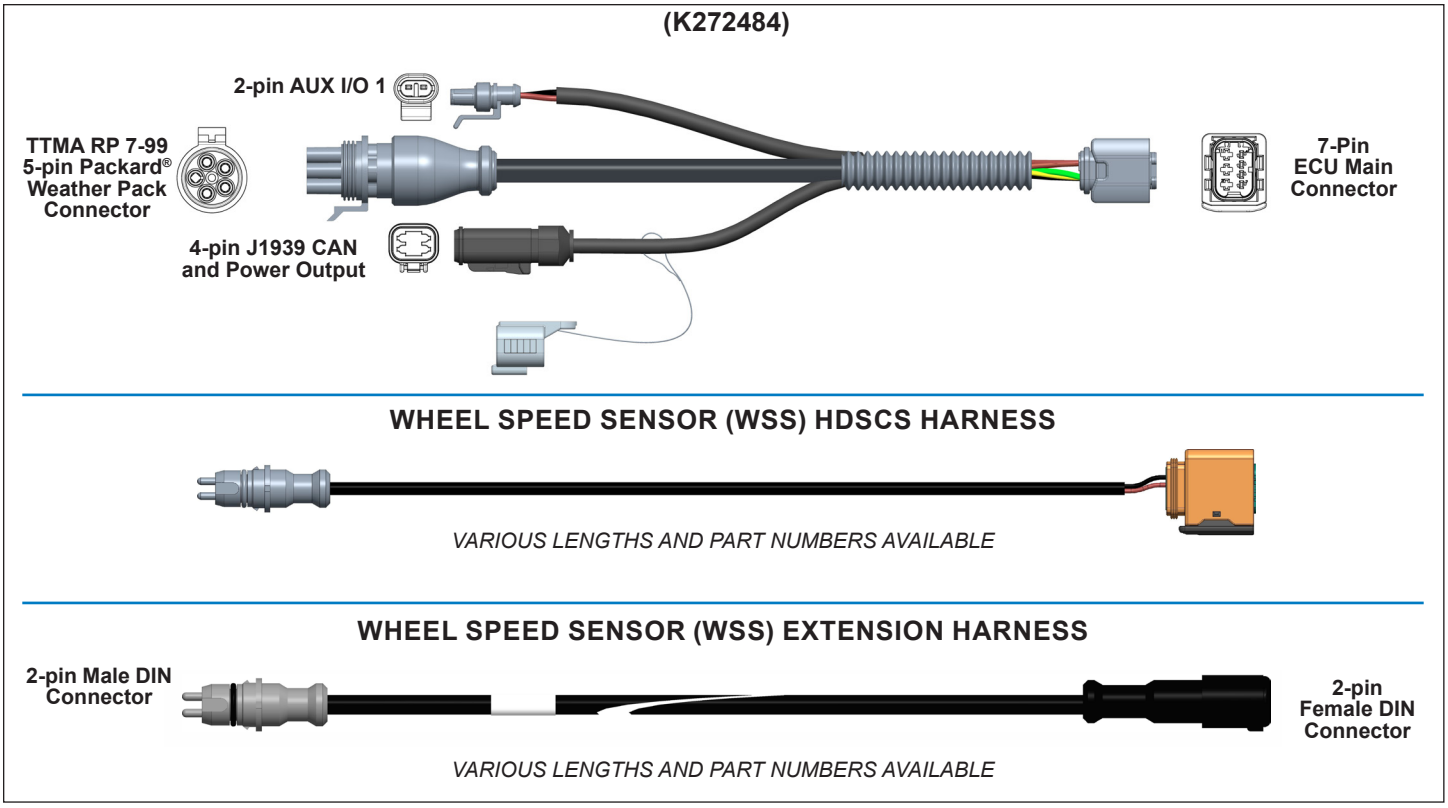

Figure 5 – Examples of Wiring Harnesses

5. MOUNTING CONFIGURATIONS

Refer to Section 20, Installing the iTABS Module.

- **Tank (Nipple) Mount:** The iTABS module can be tank-mounted using a schedule 80 (heavy-gauge steel) ¾-in. NPTF 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 iTABS module provides mounting stud ports for frame mounting directly to the trailer frame rail or cross-member. Using appropriate M10x1.5 mounting hardware, torque bolts to 221 in.-lb (25 N•m) and torque nuts to 354 in.-lb (40 N•m).

6. WIRING HARNESSES

See Figure 5. Wiring harnesses are available to connect the iTABS module to the main trailer power harness and other supported auxiliary features. Wiring harnesses are weather-sealed at the connector interface and are clearly labeled for proper installation. Because of the over-molded design of the iTABS module wiring harnesses, Bendix recommends the complete harness be replaced if damage or corrosion occurs.

See Figure 1. The iTABS module includes two (2) primary WSS inputs and two (2) additional tristate inputs. The harnesses used for them are separate from the main pigtail harness. *Refer to BW8292, Bendix® iTABS™ and iTEBS™ Harnesses and Connectors,* on B2Bendix.com.

ECU CONNECTORS

See Figure 5. iTABS module ECU connectors use a 7-pin TE Connectivity™ HDSCS connector for brake light power, constant power, the trailer-mounted ABS indicator lamp, ground, and – depending on the harness version – it may include the AUX 1 I/O. Note that some parts may be pre-configured with auxiliary features on the AUX I/Os and may require additional harnessing.

POWER/ABS INDICATOR LAMP CONNECTOR

The other end of the iTABS module harness uses a TTMA RP 7-99 5-pin Packard® Weather Pack connector for brake light power, constant power, ground, and the trailer-mounted ABS indicator lamp. *See Figure 7.*

SAE J1939 (CAN) CONNECTOR

The iTABS module main power harnesses provide a CAN connection for various ECU communications. Typical uses include J1939 diagnostics and a connection to telematics devices.

POWER AND GROUND

Trailer electrical power is supplied to the iTABS module from the ignition and brake light circuits as per SAE J560. *See Figure 6. Refer to Tables 1 and 2 for output values and pin locations.*

⚠ IMPORTANT

Bendix highly recommends using new power harnesses going from the nosebox of the trailer (the front electrical connection point between the trailer and tractor) to the iTABS module.

Function Mode	Value
Operating Range	9.0-16.0 VDC
ECU Active	150 mA @ 12 VDC
ABS Active	2.4 A @ 12 VDC

Table 1 – Values for Outputs

Circuit	7-Pin Trailer Conn.	5-Pin ABS Conn.	7-Pin ECU Conn.
Ignition PLC (Blue Wire)	7	B	2
Brake Light Power (Red Wire)	4	A	1
Ground (White Wire)	1	E	3
ABS Indicator Lamp (White/Green Wire)	N/A	D	4
AUX I/O 1 *(See Figure 4)* *(Use ground pin 3 on the 7-pin ECU connector)*	N/A	N/A	5
TI-CAN H	N/A	N/A	6
TI-CAN L	N/A	N/A	7

Table 2 – Main Power Harness and Connector Pins

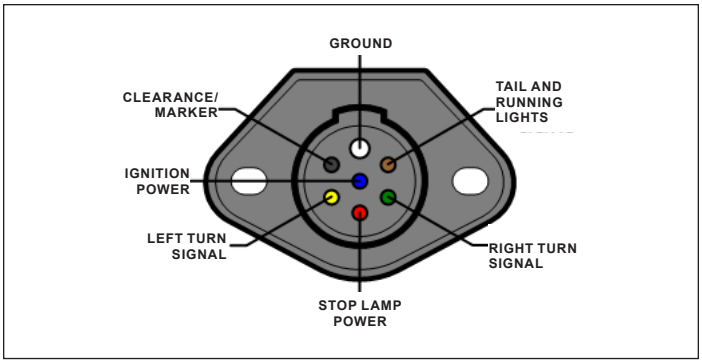

Figure 6 – J560 7-pin Trailer Connection Pinout

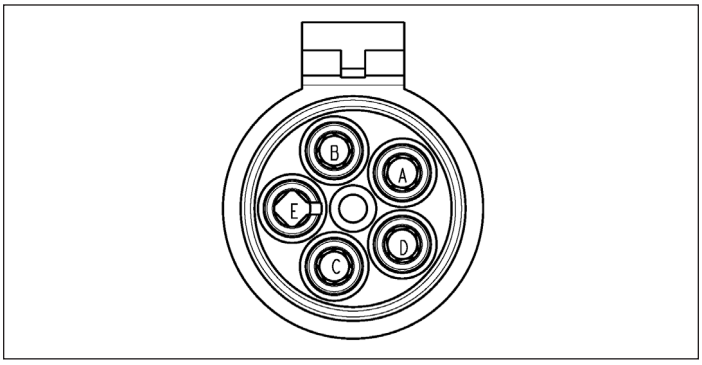

Figure 7 – 5-pin ABS Connector Pinout

NOTE: Pin "C" is not used.

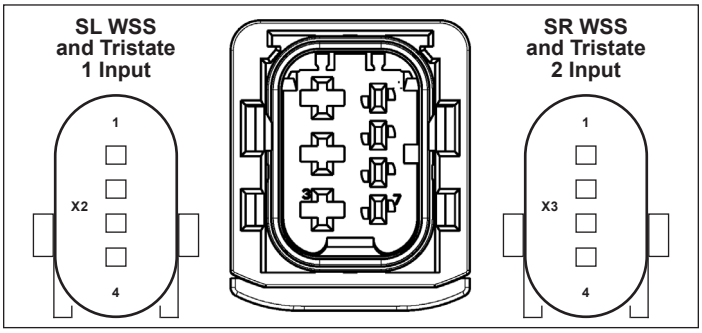

Figure 8 – 7-pin ECU Connector Pinout

7. SAE J2497 POWER LINE CARRIER (PLC) DIAGNOSTIC LINK

See Figures 9 and 10. 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.

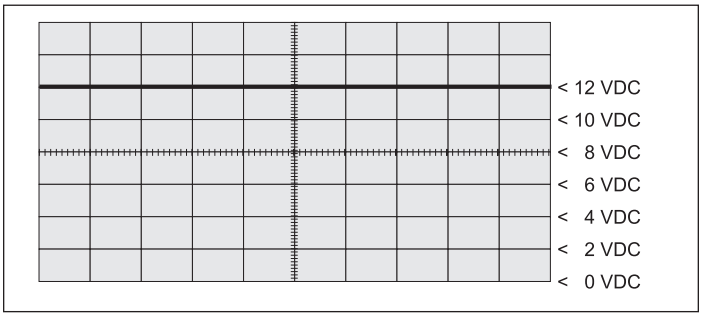

Figure 9 – Power Line Without PLC Signal

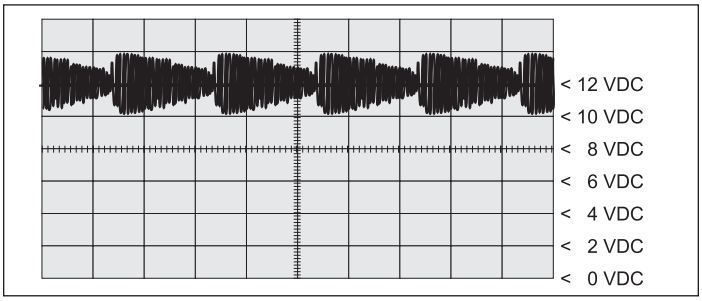

Figure 10 – Power Line With PLC Signal

IDENTIFYING AND MEASURING THE PLC SIGNAL

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

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 Alternating Current (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.

8. SAE J1939 (CAN) DIAGNOSTIC LINK

The iTABS module provides a data link for transmitting CAN information following the SAE J1939 standard. ACom Diagnostic Software supports CAN communication with the iTABS module. Ignition power must be provided to the iTABS module for the diagnostic link to be active.

NOTE: Suitable harnessing will be required for this function.

9. AUXILIARY I/O AND FUNCTIONS PINOUT

Refer to Table 3. The iTABS module provides for up to one (1) AUX I/O and two (2) tristate functions. For AUX1, use ground pin 3 on the 7-pin ECU connector (*refer to Table 2*).

Name	ECU Connector	ECU Pin	AUX Functions	AUX Type
AUX1	X1	5	High-Side Driver	Output
			Digital Input	Input
Tristate 1	X2	3 and 4	Tristate Input	Input
Tristate 2	X3	3 and 4	Tristate Input	Input

Table 3 – AUX I/O and Function Pinouts

10. CUSTOMER SCRATCH PAD

The iTABS 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 ACom Diagnostic Software.

11. POWER-UP SEQUENCE

At power-up, the iTABS module performs a series of self-checks that can assist a technician in determining the ABS system status.

TRAILER ABS INDICATOR LAMP

See Figure 11. At power-up, with no active DTC, the trailer ABS indicator lamp will illuminate for approximately two (2) to six (6) seconds as a bulb check and then turn off. If any active DTCS related to ABS are present, the trailer ABS indicator lamp will remain illuminated. If a PLC-ready towing vehicle and trailer are powered at the same time, the iTABS 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 iTABS 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 supply pressure applied, a properly installed modulator will cause two (2) rapid audible chuffs of air pressure. **NOTE:** The iTABS module will not perform a modulator chuff test with an active ABS DTC.

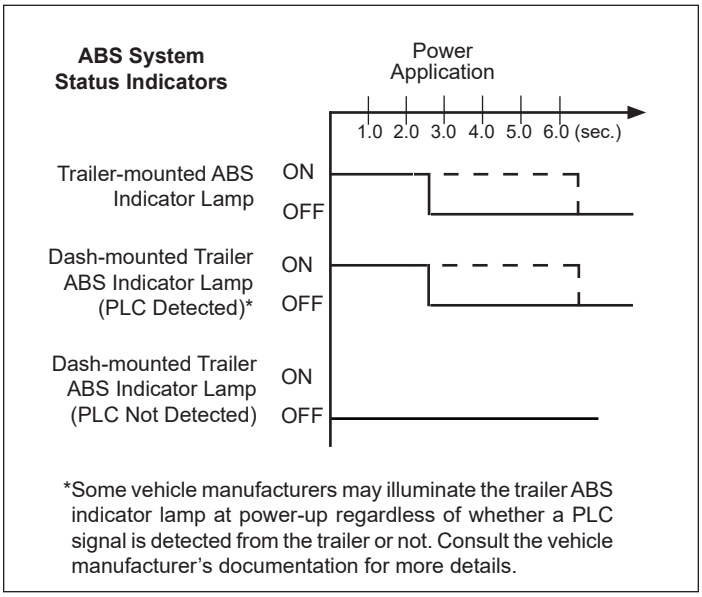

Figure 11 – Trailer ABS Lamp Power-Up Sequence

12. ODOMETER FUNCTION

ODOMETER

The iTABS 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 WSS.

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 or through blink codes.

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

The iTABS module can keep track of the trailer odometer mileage if a module replacement is done. This is done when the operator chooses to input a mileage offset. For example, if a module replacement has been done at a trailer odometer of 100,000 miles, the operator would input 100,000 miles as the offset using ACom Diagnostic Software.

TRIP COUNTER

The iTABS module provides a counter to record the trip mileage. The feature can be accessed using PC diagnostics.

SERVICE INTERVAL

The iTABS 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.

13. NON-STANDARD TIRE SIZE

The iTABS module allows for tire rolling radius and tone ring tooth count parameters to be set for the axle being sensed using 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. *Refer to Table 4* for parameter adjustments.

Tone Ring Size	Tire-Rolling Radius – Allowable Range (in revolutions per mile)
60 teeth	712 to 1005
80 teeth	512 to 801
90 teeth	456 to 711
100 teeth	410 to 640
120 teeth	356 to 502

Table 4 – Tone Ring Size to Tire-Rolling Radius

14. DTC DETECTION

The iTABS module contains self-testing diagnostic circuitry that monitors the ABS components and wiring. When the iTABS module senses an erroneous system condition, it activates the external trailer-mounted ABS indicator lamp, disables all or part of the affected ABS functions, and it stores the DTC in memory, so that the information is retained even when the power is removed. The iTABS module also uses PLC communications to send the system status to the towing vehicle.

For some DTCs, the iTABS module will automatically reset ("self-heal") the active DTC when the error is corrected. 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. After a certain number of power cycles to the iTABS module, an inactive DTC will clear itself automatically from the fault memory. For more information about this feature, contact your local Bendix representative.

15. PARTIAL ABS SHUTDOWN

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

ECU DTCS

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

VOLTAGE DTCS

The operating voltage range is 9.0-16.0 VDC. If the voltage is detected as being out of range, the ABS system braking features will be disabled, and the system will revert to normal braking. When the correct voltage level is restored, full ABS is typically available again.

16. BLINK CODE DIAGNOSTICS

The iTABS 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 *Table 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 *Table 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

Table 5 – Blink Code Information

Depending on the blink code mode activated, the iTABS module will blink the trailer-mounted ABS indicator lamp to display active DTCs, 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 active, 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 iTABS 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 more than five (5) seconds, blink code diagnostics will be disabled until the next time the ignition power is cycled.

DISPLAY ACTIVE DTCS

To display active DTCs, apply ignition power and depress and release the brake pedal three (3) times within 15 seconds (allowing one [1] 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.

DISPLAY INACTIVE DTCS

To display inactive DTCs – those that are not currently set, but have occurred and are stored in the ECU's 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.

RESET ACTIVE DTCS

To reset active DTCs, 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 the DTC history. Both blink code diagnostics and 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 and 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 one (1) blink (pause); five (5) blinks (pause); two (2) blinks.

Zeros (0s) will be displayed by the Antilock Braking System (ABS) indicator lamp strobing twice.

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

17. 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 iTABS 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 reinflate them when the vehicle speed rises above the threshold. For more information about this feature, contact your local Bendix representative.

LOW-PRESSURE WARNING EMERGENCY (LPWE)

The iTABS module can be configured for Low-Pressure Warning Emergency (LPWE). By monitoring the status of an external pressure switch installed in the emergency line or delivery line of the spring brake valve, the iTABS module will alert the driver of a low-pressure condition by illuminating the trailer ABS warning lamp. When the vehicle is moving and the pressure in the emergency line is below approximately 65 psi, which is the minimum pressure to release the spring brakes, the ABS warning light will illuminate. The speed threshold at which the alert activates is configurable. The fault will clear once the pressure in the emergency line is above approximately 65 psi. Contact your trailer OEM for system schematics.

NOTE: Your trailer may be equipped with a Bendix PLC relay, which has the ability to indicate when there is a low-pressure condition on the emergency line, using information received from the iTABS module. For LPWE troubleshooting, *refer to Section G in Appendix 1.*

TIRE INFLATION SYSTEM (TIS) SENSING

The iTABS module is capable of monitoring the state of the Tire Inflation System (TIS) flow switch and it can be configured to automatically broadcast the status of this switch over the PLC. Contact your trailer OEM for system schematics.

NOTE: Your trailer may be equipped with a Bendix PLC relay, which has the ability to indicate when the TIS is active, using information received from the iTABS module. For TIS troubleshooting, *refer to Section F in Appendix 1.*

PAD WEAR-SENSING

The iTABS module is capable of monitoring the state of the Bendix disc brake pad wear sensors installed on the air disc brakes, and it will activate a DTC whenever it detects that at least one (1) of the pads has reached the wear limit. The iTABS module can broadcast this DTC over the PLC. Contact your trailer OEM for system schematics.

NOTE: Your trailer may be equipped with a Bendix PLC relay, which has the ability to indicate when the pad wear-sensing DTC is active using information received from the iTABS module. For PW troubleshooting, *refer to Section H in Appendix 1*

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18. DIAGNOSTIC TROUBLE CODES (DTCs)

Go to B2Bendix.com > Services & Support > Diagnostic Trouble Code Search. Review the preliminary steps prior to referencing the DTCs on B2Bendix.com.

⚠ IMPORTANT

FOR ALL REPAIR STEPS, FIRST COMPLETE THE FOLLOWING:

1. **Generate an ACom Diagnostic Software report.**
2. **Clear DTCs.**
3. **Continue with repair information for each scenario.**

NOTE: After completing all repair steps, drive the vehicle to ensure the repairs were sufficient.

19. TROUBLESHOOTING

USING PC-BASED DIAGNOSTICS

Troubleshooting and DTC clearing, as well as beginning a reconfiguration, may also be carried out using a PC-based diagnostic tool such as ACom Diagnostic Software.

ABS DIAGNOSTIC TOOLS

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

- Obtain DTC information (both active and inactive)
- Retrieve event history
- Clear inactive DTCs and event history
- Verify Electronic Control Unit (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 iTABS module using a PC and ACom Diagnostic Software, the computer's USB port can be connected to the vehicle's diagnostic connector through an RP-1210-compliant communication device.

For more information on ACom Diagnostic Software or RP-1210-compliant tools, contact Bendix at 1-800-AIR-BRAKE (1-800-247-2725) and follow the prompts for ACom technical support.

ADDITIONAL SUPPORT

Go to B2Bendix.com for downloads of literature and ACom Diagnostic Software.

Refer to Appendix I in this document for the troubleshooting flowcharts.

BENDIX TECH TEAM

For technical support, contact the Bendix Tech Team by email at techteam@bendix.com or by phone at 1-800-AIR-BRAKE (1-800-247-2725), Monday through Thursday, 8:00 a.m. to 6:00 p.m. and Friday, 8:00 a.m. to 5:00 p.m. ET. To better serve you, please record the following information before contacting the Bendix Tech Team:

- Bendix product model number, part number, and configuration
- Vehicle make and model
- Vehicle configuration (number of axles, tire size, etc.)
- System performance symptoms: When do they occur?
- What DTCs have been identified using LEDs, blink codes, or diagnostic tools
- What troubleshooting/measurements have been performed
- A copy of the ACom Diagnostic Report

20. REPAIR

SERVICING THE iTABS MODULE

⚠ CAUTION

Special considerations need to be taken to ensure the iTABS module has been properly installed on the trailer. These include:

- Location and orientation of the module
- Correct plumbing of the module
- Correct location of the WSS
- Configuration of the ECU for ABS system parameters
- Installation test to verify proper installation of the ABS system

⚠ WARNING

It is the responsibility of the end-user to ensure the iTABS module has been installed correctly and tested as per the Bendix recommended installation guidelines and system drawings. Incorrect installation of the iTABS module can result in impaired ABS system functions, which could lead to loss-of-control of the vehicle, potential collisions, property damage, serious injuries, and/or death.

Prior to servicing the iTABS module, always perform the following steps:

1. Follow all industry safe maintenance practices including those within this document.
2. When possible, before removing the module, use ACom Diagnostic Software to save the configuration to the desktop. After the iTABS 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 iTABS module's mounting position on the vehicle.

REMOVING THE iTABS 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 7-pin ECU connector, any additional harnesses or shorting caps used on the auxiliary sensors, and the 4-pin WSS connectors. Ensure the old connectors are marked appropriately for reinstallation.
3. Mark for reinstallation and then remove all air hoses connected to the iTABS module.
4. Remove the iTABS module from the vehicle by removing the mounting fasteners or by rotating the entire assembly counterclockwise from the tank mount. There is a built-in hex port that can be accessed once the end cover has been removed.

SERVICING THE CONTROL PORT FILTER

⚠ CAUTION

The iTABS module has an inline filter in the control port and the supply port (*see Figure 1*). Inspect and clean these filters (if any contamination is found) every four (4) 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.

INSTALLING THE iTABS MODULE

⚠ CAUTION

All service replacement parts for the iTABS module are configured specifically by part number. Before removing the module, use ACom Diagnostic Software to save the configuration to the desktop. The technician can use ACom Diagnostic Software to restore the previous configuration settings.

Always ensure the correct service replacement ECU is being installed for the original iTABS module. To verify proper installation, perform the installation test using ACom Diagnostic Software.

Inspect the original mounting hardware. If replacement hardware is needed, use the appropriate grade 18 bolts, nuts, and lock washers as per the original installation. Alternatively, a schedule 80 (heavy-gauge steel) ¾-in. nipple for the tank-mount unit can be used. Inspect the location selected for installation and clean as necessary.

NOTE: Inspect all components, including the replacement iTABS 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 iTABS module must be installed with the following considerations *(See Figures 12 through 14):*
   - With the exhaust port facing sideways and unobstructed with significant free space (> 1 in. [2.5 cm]). This orientation makes it so the brake delivery ports always face downward.
   - Within ± 100 in. (2.5 m) of the center of the axle(s) for proper balanced brake application

Orientation	Offset	
	Road (Left)	Curb (Right)
0°	+	-
180°	-	+

Table 6 – Module Offset Sign

Yaw angle should be ± 10° as measured from the center line of the trailer

- Pitch angle should be ± 10° as measured from a flat horizontal plane
- Roll angle should be within ± five degrees (± 5°) as measured from a flat horizontal plane
- **Tank-mount Modules:** Install the nipple fitting into the modulator valve supply port. Rotate the entire assembly into the tank port until secure. Over-torquing of the tank nipple could cause damage to the valve body.
- **Frame-mount Modules:** Torque bolts to 221 in.-lb (25 N•m). Torque nuts to 354 in.-lb (40 N•m).

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 use of PTFE tape is not approved and will void the ABS valve warranty as there is a potential for tape material entering the valve and affecting the valve's operation. Ensure no thread sealant enters the valve. All air hoses and fittings should be checked for leaks prior to returning the vehicle to service.
3. Reconnect the ECU power, auxiliary (if present), and WSS electrical connectors to the ECU. Apply a small amount of non-conductive electrical grease to each connector pin before reconnecting.
   - Refer to the large label inside the connector cover for wheel speed designation, "SR" or "SL." *See Figure 1.*
4. Leakage and operational tests must be performed before returning the vehicle to service.

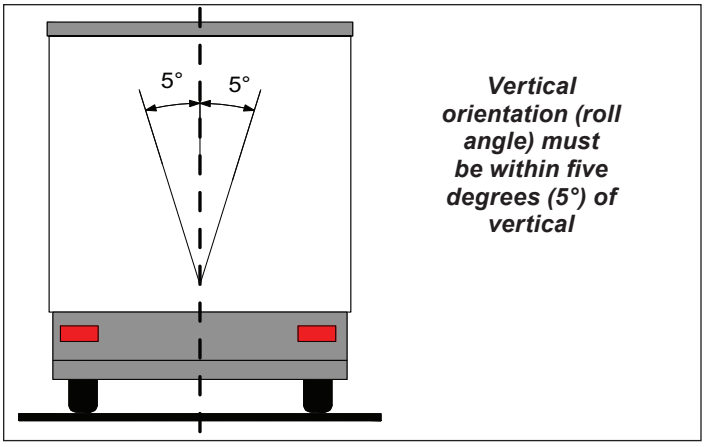


Figure 12 – Installation on Trailer (Vertical)

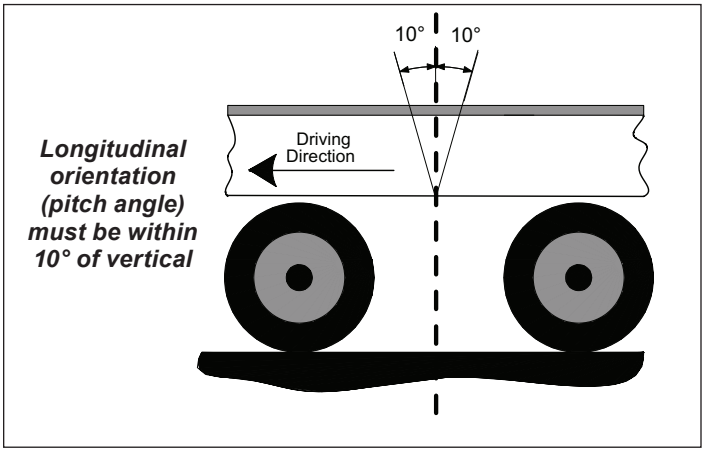


Figure 13 – Installation on Trailer (Longitudinal)

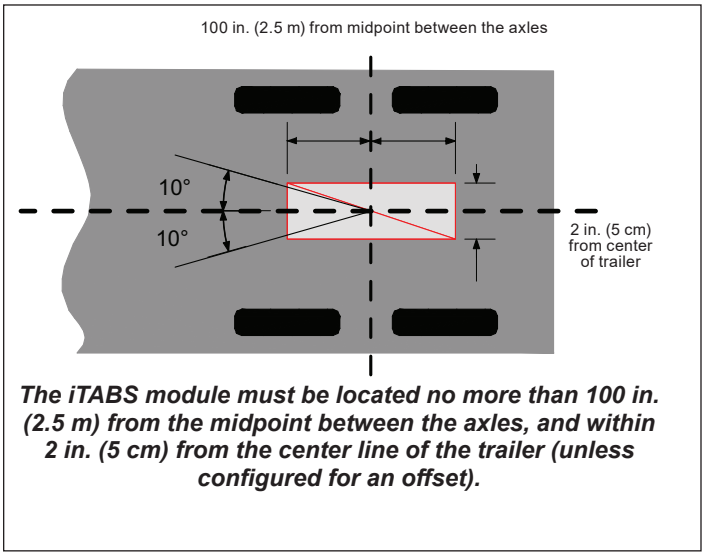


Figure 14 – Installation on Trailer (Center Line)

INSTALLING THE WSS

⚠ WARNING

Use of cable ties/tie wraps to attach WSS 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 WSS extensions may be damaged. Use only open-ended clips be used to hold sensor leads to jounce lines.

⚠ CAUTION

Correct WSS installation is necessary for optimal ABS operation.

Do not install sensors 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. *See Figure 2.* Install the new clamping sleeve fully into the block, with the retaining tabs toward the inside of the vehicle. Note that WS-24 WSS must use the correct clamping sleeve to avoid problems associated with reduced retention force, such as sensor movement, and resulting ABS DTCs.
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. (8-15 cm) from the sensor.
4. Apply a small amount of dielectric non-conductive grease to both the sensor and the 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 (*Bendix Part Number 300122, or equivalent*) – if available – to hold the connectors together.

The friction fit allows the WSS to slide back and forth under force, but to retain its position when the force is removed. When the WSS is inserted all the way into the mounting block and the wheel is installed on the axle, the tone ring contacts the sensor, which pushes the sensor back. Also, normal bearing play will “bump” the sensor away from the tone ring. The combination of these two actions will establish a running clearance, or air gap, between the sensor and the tone ring. *Refer to SD-13-4860, Bendix® WS-24™ Antilock WSS,* on B2Bendix.com for additional information.

ABS WIRING ON TOWING TRAILERS

For use on towing trailers, to minimize voltage-drop, the rear-mounted SAE J560 connector MUST BE connected directly to the front-mounted SAE J560 connector by a parallel wiring harness to the trailer wiring harness.

Any auxiliary power circuit (non-braking and running gear) shall be powered via the trailer ABS. The trailer ABS shall provide power management to ensure the braking functions are given priority. If the power requirement for the auxiliary power circuit exceeds the maximum current allowed for the AUX I/O, an external relay or electronic relay – which is to be controlled by the trailer ABS – is acceptable for use. In this case, it is the trailer manufacturer’s responsibility to ensure this circuit is suitably designed and rated for the application and the switch-off time is fast enough to ensure the braking power supply is protected. This should be proven by practical tests (*contact your local Bendix representative*).

LEAKAGE AND OPERATIONAL TESTS

⚠ WARNING

For all NPTF fittings, the 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 ABS 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. Perform the leak-down test procedure:
    - Set up the pressure circuits to apply emergency (red) line and service pressures with a regulator and a pressure gauge on each line.
    - Apply 110 - 120 psi to the trailer emergency (red) circuit to release the parking brake.
    - Apply the service brakes at 90 - 95 psi.
    - Identify and record the pressure from the gauge on the emergency (red) line and the service line.
    - Cut off the pressure to the emergency (red) line before the pressure gauge and monitor the pressure. If the pressure drops less than three (3) psi in one (1) minute, the emergency (red) line test passes. If the pressure drops more than three (3) psi in one (1) minute, identify and correct the source of the leak on the emergency (red) line.
    - If the emergency (red) line test passes, repeat the test for the service line. If the pressure drops less than two (2) psi in one (1) minute, the test passes. If the pressure drops more than two (2) psi in one (1) minute, identify and correct the source of the leak on the service line.
    - A soap and water solution can be used to identify sources of leaks on the fittings and valves.
    - If available, a Lite-Check® machine can be used to perform the leak-down test.
5. Apply power and monitor the power-up sequence to verify proper system operation. *Refer to Section 11.*
6. Calibrate and set the odometer parameters, if necessary, using a diagnostic tool. *Refer to Section 12.*
7. Perform an installation test using a diagnostic tool. Minimum tests that are required to verify the proper installation of the ABS system are:
    - **ECU Information:** This test provides the user with specific ECU information. It is required that no DTCs (other than "installation 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 WSS and the pressure modulator that controls the pressure to the associated brake.
    - **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 (i.e. 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 (32 kph) to check for proper function. The wheels should not enter a prolonged lock condition and the 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 controller before welding on the trailer.

⚠ WARNING

Apply dielectric grease to electrical connectors to help protect against moisture intrusion.

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

Bendix provides over-molded versions of the iTABS module wiring harness and Bendix recommends 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 (i.e. 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 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. (46 cm).
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, which 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/contaminants can cause TRAILER AIR BRAKE FAILURE and/or the INABILITY TO RELEASE the trailer parking brakes.**

⚠ WARNING

ABS 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 an active DTC. Service the trailer ABS system. (To ensure full ABS 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 use PTFE tape (voids Bendix ABS warranty).**
- **Use open-ended clips (never cable ties) to hold sensor leads to jounce lines.**

⚠ WARNING

Use of cable ties/tie wraps to attach WSS 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 WSS extensions may be damaged. Bendix instead recommends only open-ended clips be used to hold sensor leads to jounce lines.

- **Drain the trailer air tanks a minimum of every six (6) months.**
- **Disconnect the electrical connectors from the ABS controller when welding on the trailer.**

APPENDIX 1: TROUBLESHOOTING: FLOWCHARTS

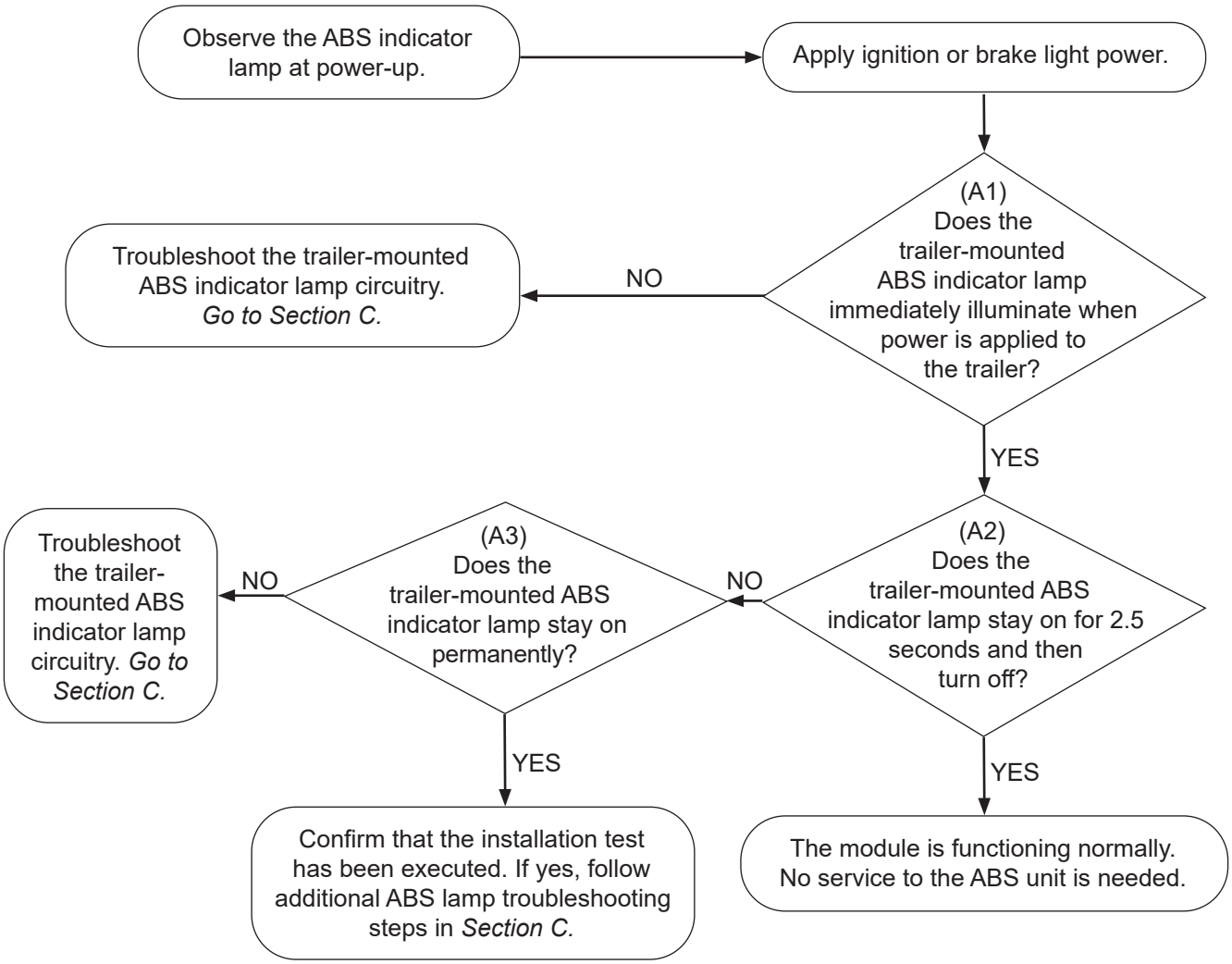
DTC information can be retrieved from the iTABS module by using blink code diagnostics or a diagnostic tool. The following troubleshooting flowcharts will help the technician isolate the cause and confirm whether the problem resides in the component, wiring, or connectors.

Troubleshooting should always begin by observing the dash- or trailer-mounted ABS indicator lamp during the iTABS module's power-up sequence. If it is necessary to take electrical measurements, always begin by taking voltage and resistance measurements at the 7-pin ECU pigtail harness connector.

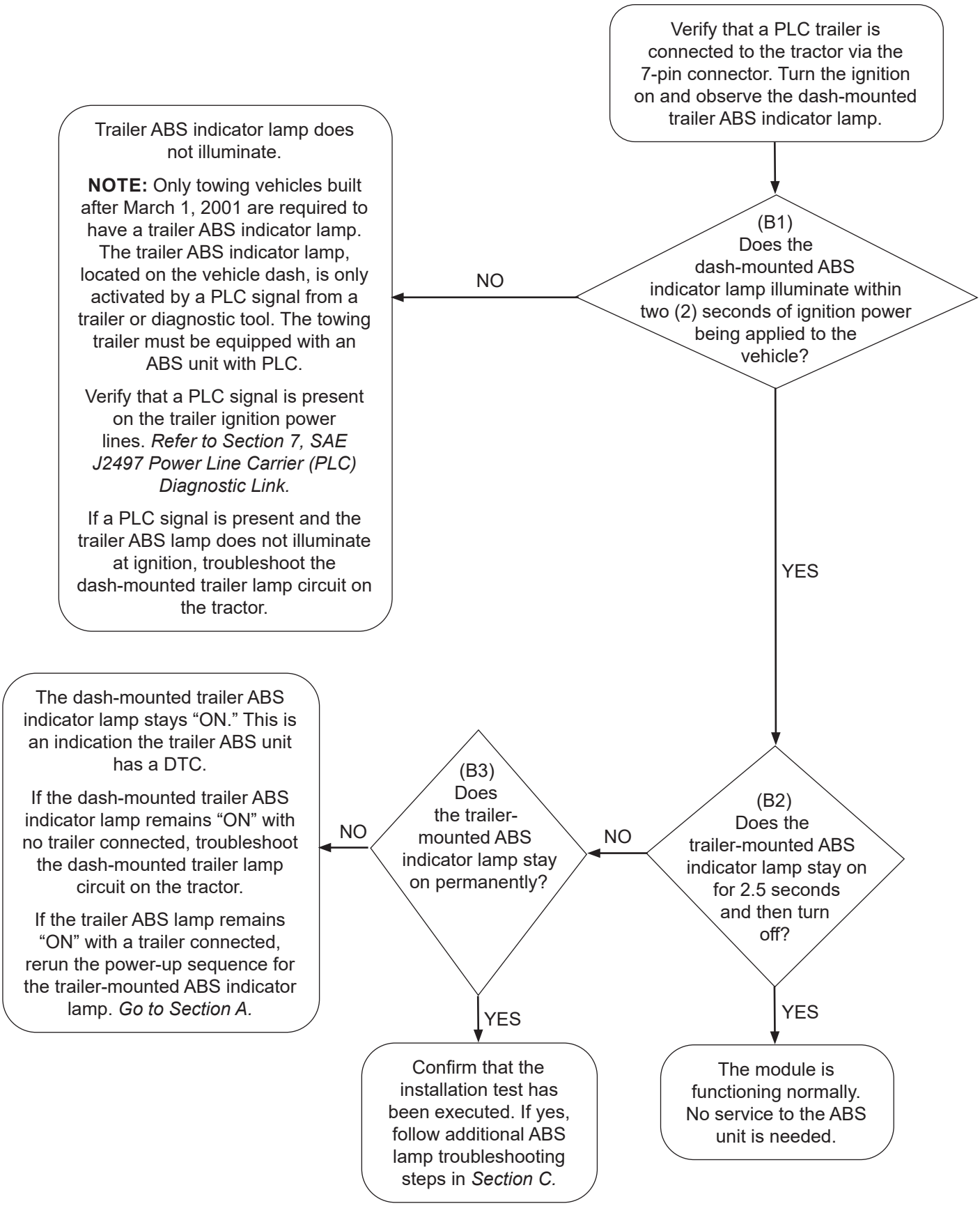
Once the source of the problem is found, isolate the area needing repair by repeating the measurements at all connections in the affected circuit towards the modulator, WSS, etc.

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

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

(C1)
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 Section B.*

YES

(C2)
Is SAE J560 cable (green, spiral) connected from tractor/ battery box to trailer?

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

YES

(C3)
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 the main trailer power harness for mis-wiring, open circuits, and/or short circuits.

YES

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

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.

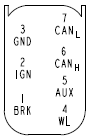
Turn off the power to the module. Inspect the condition of the ABS indicator lamp, connector and ground. Using a volt/ohm meter, verify continuity from the trailer chassis ground (pin 3) to the ground pin of the indicator lamp.

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 7-pin ECU connector. Verify continuity from the ABS indicator lamp pin (pin 4) 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, contact the Bendix Tech Team.

Looking into the iTABS module 7-pin Connector Pigtail Harness. Pin 3 is the ground pin. Pin 4 is the ABS indicator lamp pin.



ACTION: If the trailer-mounted ABS indicator lamp remains on after the standard power-up time interval of approximately 2.5 seconds.

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

- Blink Code Diagnostics, *Section 16*
- Troubleshooting, *Section 19*

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

If no DTCs are found, the ABS module appears to be functioning normally, but the ABS lamp remains “ON,” continue to the next step.

With power off to the ABS module, disconnect the 7-pin ECU connector. Apply power to the trailer. If the ABS lamp illuminates, there is a voltage short on the lamp circuit. Troubleshoot, repair, and retest.

Use a volt meter to check if there is a short to the voltage on the warning lamp circuit between the ABS indicator lamp pin (pin 4) and the lamp.

If repairs are made, rerun the power-up sequence.

Go to Section A. If the condition persists, contact the Bendix Tech Team.

SECTION D: TROUBLESHOOTING THE POWER SUPPLY

Turn off the power to the module and disconnect the 7-pin ECU connector.

With ignition power to the trailer, measure the voltage between the ignition power pin (pin 2) and the ground pin (pin 3) of the ECU connector.

Apply the service brakes. Repeat the voltage measurement between the brake lamp power pin (pin 1) and the ground pin (pin 3) of the ECU connector.

Are the measured ignition and brake lamp power voltages equal to the vehicle (supply) voltage with 1 volt tolerance?

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 2) and Ground (pin 3) of the ECU connector.

Apply the service brakes. Repeat the voltage measurement with brake lamp power to the trailer, between the brake lamp power (pin 1) and the Ground (pin 3) of the ECU connector.

Verify 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.

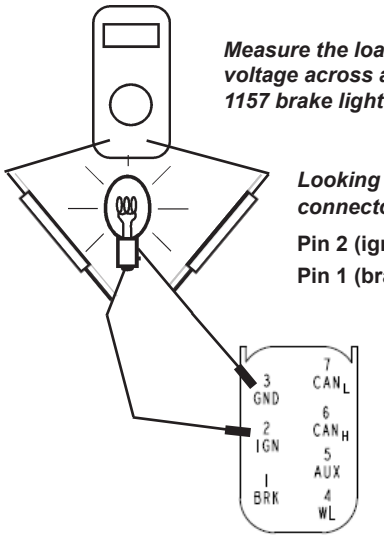
If repairs are made, rerun the power-up sequence. *Go to Section A.*

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, contact the Bendix Tech Team.

NO

Look for corroded or damaged wire or connectors. Check the power supply.

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 iTABS wire harness ECU connector measure:

Pin 2 (ignition power) to Pin 3 (ground) and Pin 1 (brake light power) to Pin 3 (ground).

SECTION E: TROUBLESHOOTING THE WS-24 WSS

Turn off the power to the module and disconnect the WSS connector.

For additional troubleshooting steps, refer to SD-13-4860, Bendix® WS-24™ Antilock WSS, on B2Bendix.com.

If dynamic WSS DTCs are present:

Rotate the affected wheel and verify a minimum of 0.25 VAC sensor output at 0.5 RPS across the WSS pins. A properly positioned sensor can output more than 2.0 VAC at 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 16*
- Troubleshooting, *Section 19*

(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.)

Finally, 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

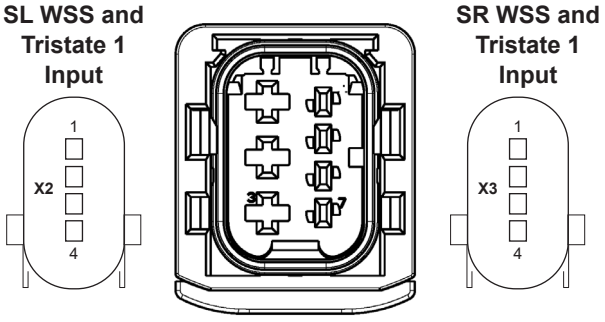
Make repairs as needed (replace wiring and/or ABS components).

Reset active DTCs by using any of the following methods:

- Blink Code Diagnostics, *Section 16*
- Troubleshooting, *Section 19*

Then check for Dynamic WSS DTCs *(see left column)*

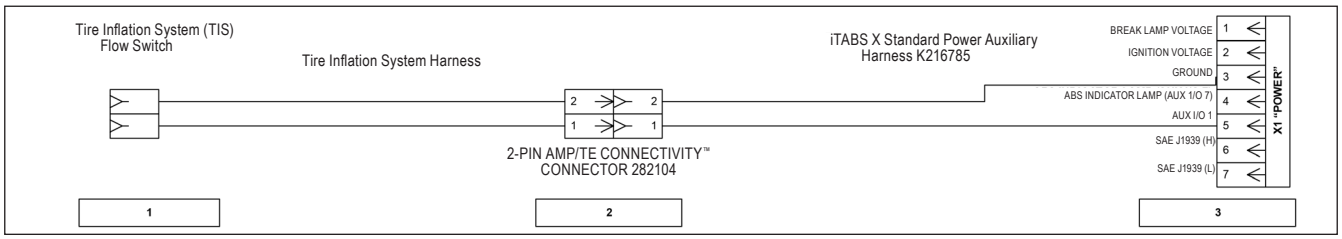
Finally, rerun the power-up sequence. *Go to Section A.*



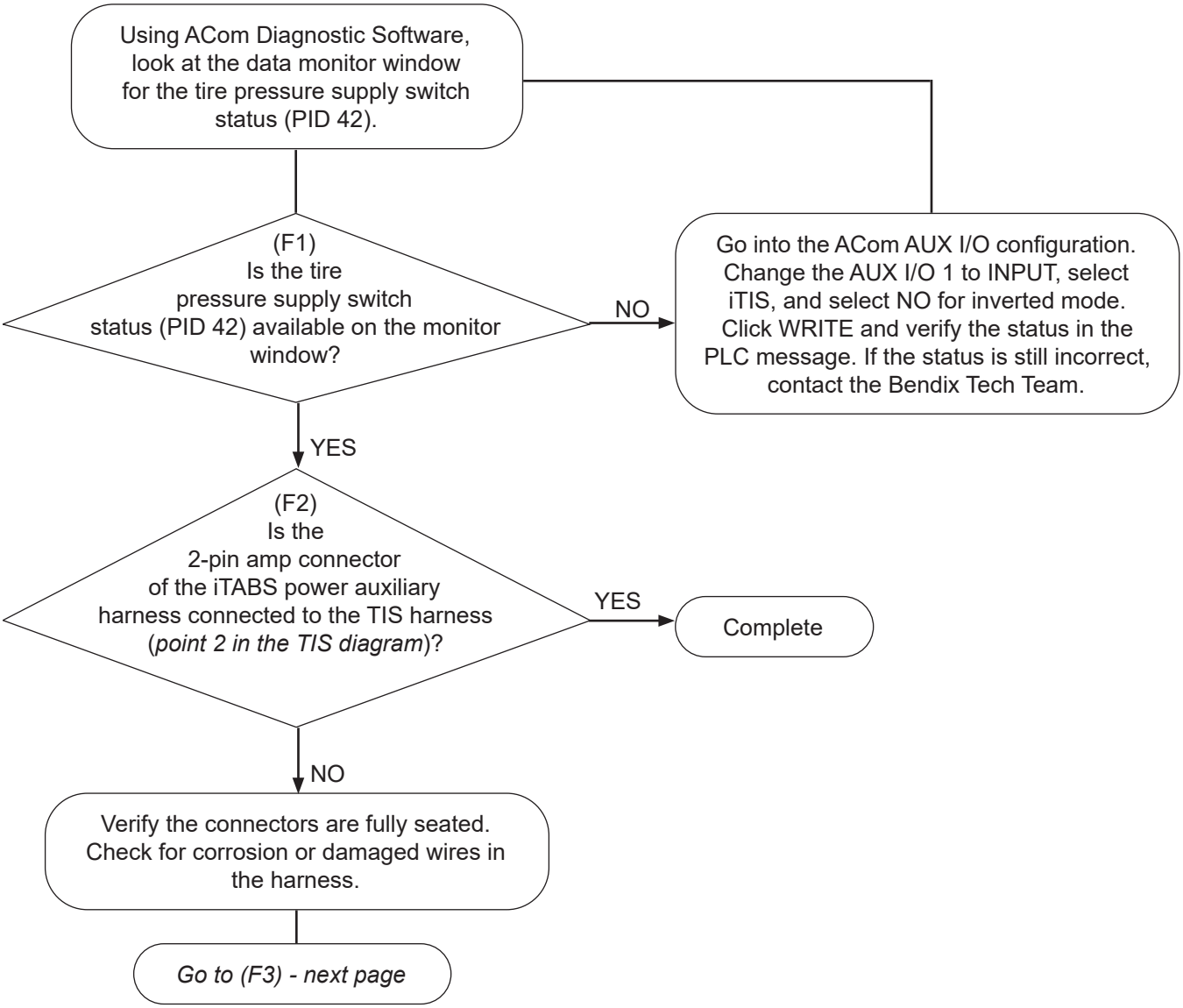
Looking into the iTABS Connectors

SECTION F: TROUBLESHOOTING THE TIS
SCENARIO 1: TIS IS ACTIVE BUT PLC MESSAGE STATUS IS INACTIVE

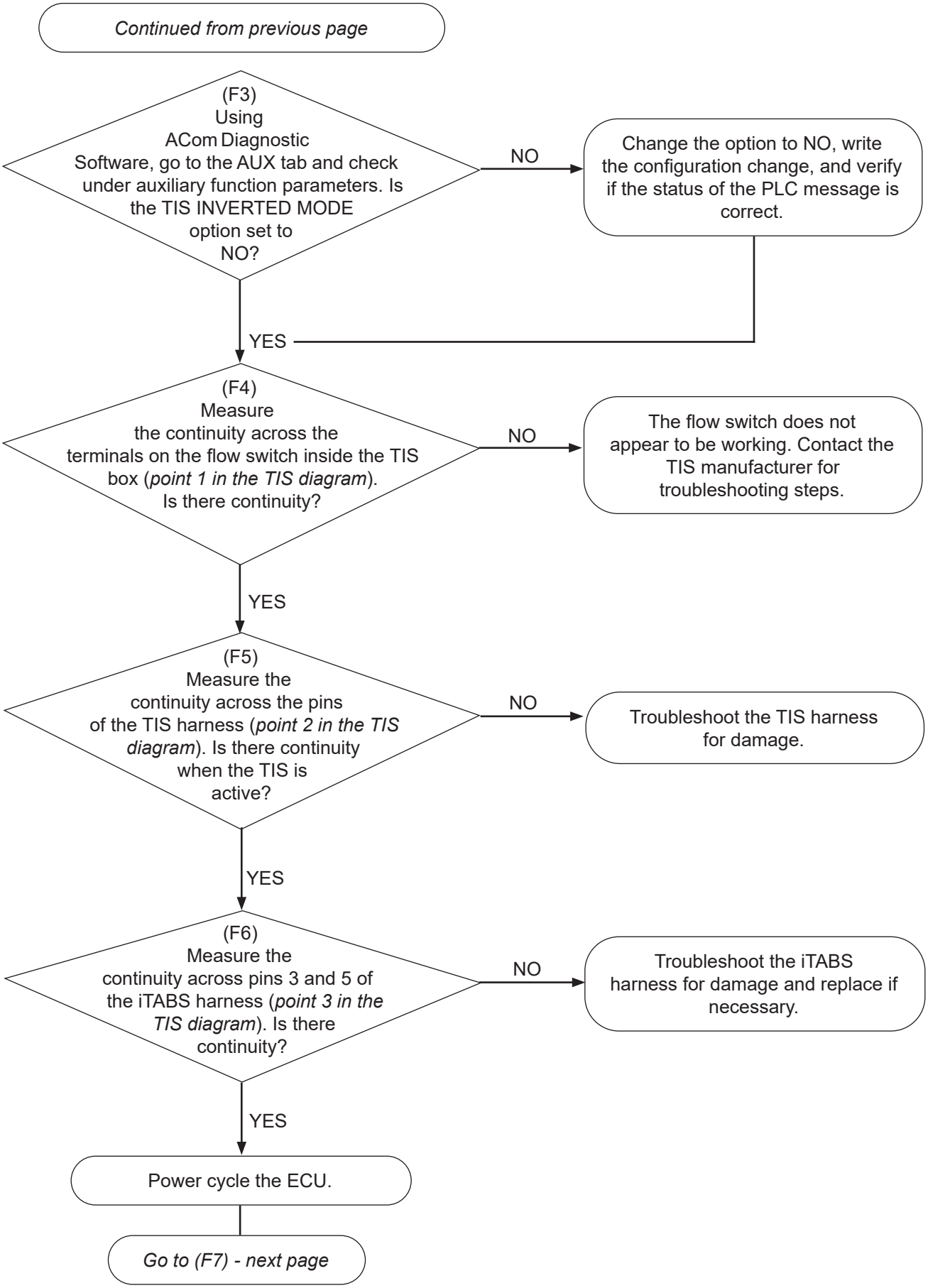
The following troubleshooting steps are designed to identify issues with the messaging and performance of the iTABS ECU. Additional functionality for the PLC relay unit should also be considered and confirmed as part of these troubleshooting steps.



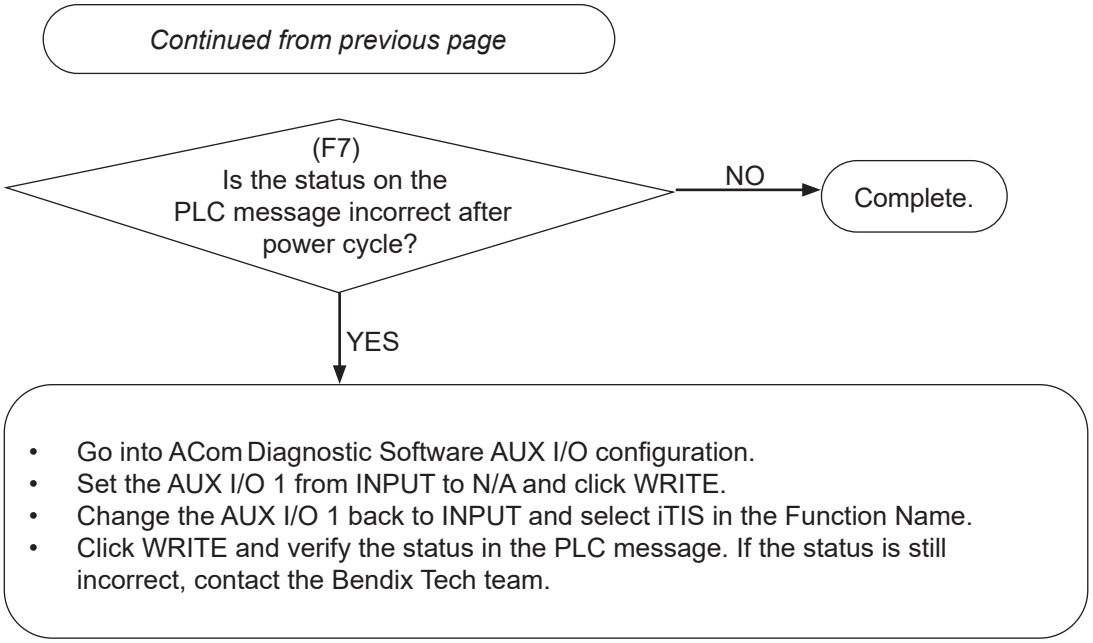
TIS Diagram



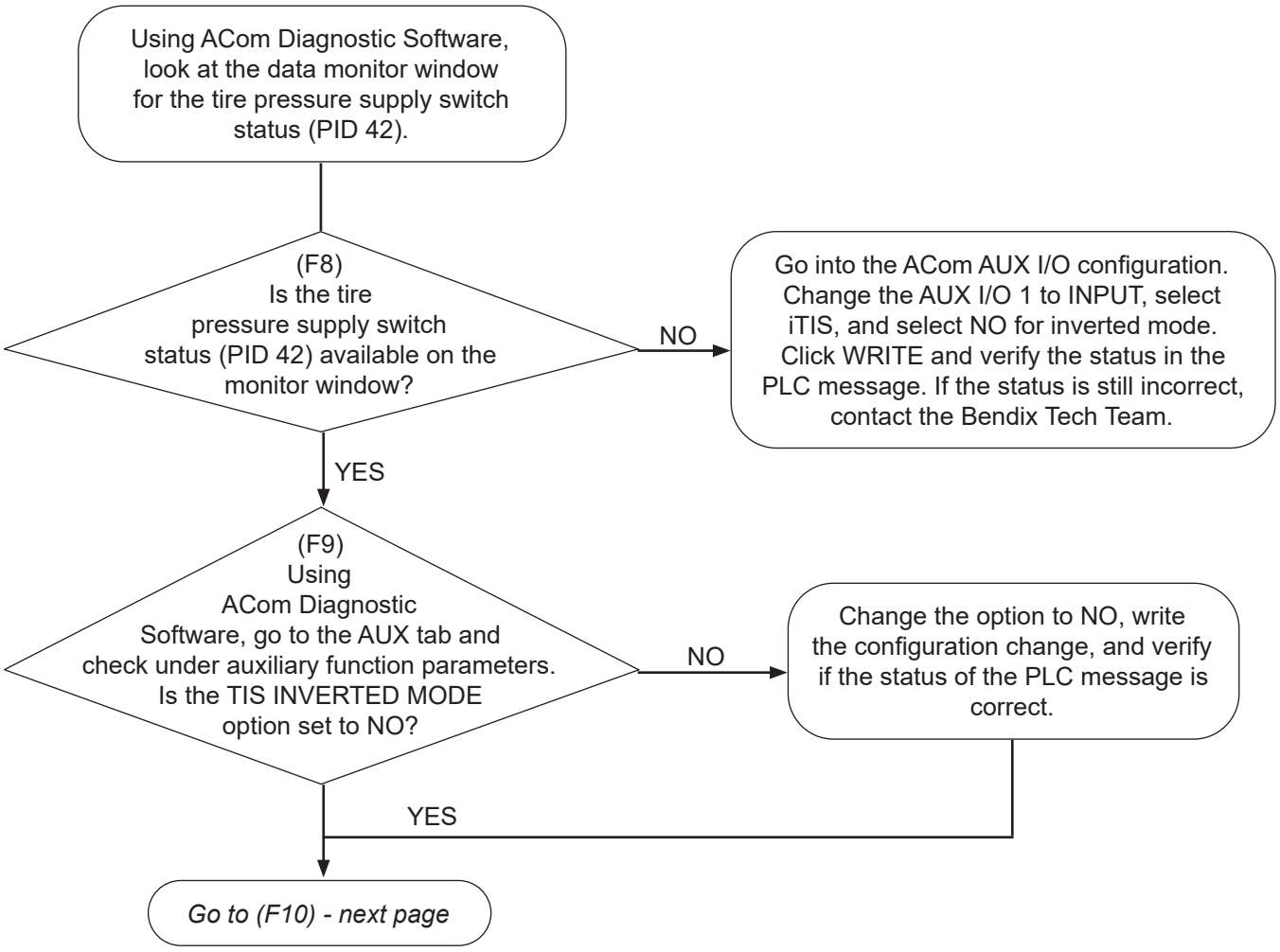
SECTION F: TROUBLESHOOTING THE TIS (CONTINUED)
SCENARIO 1: TIS IS ACTIVE BUT PLC MESSAGE STATUS IS INACTIVE



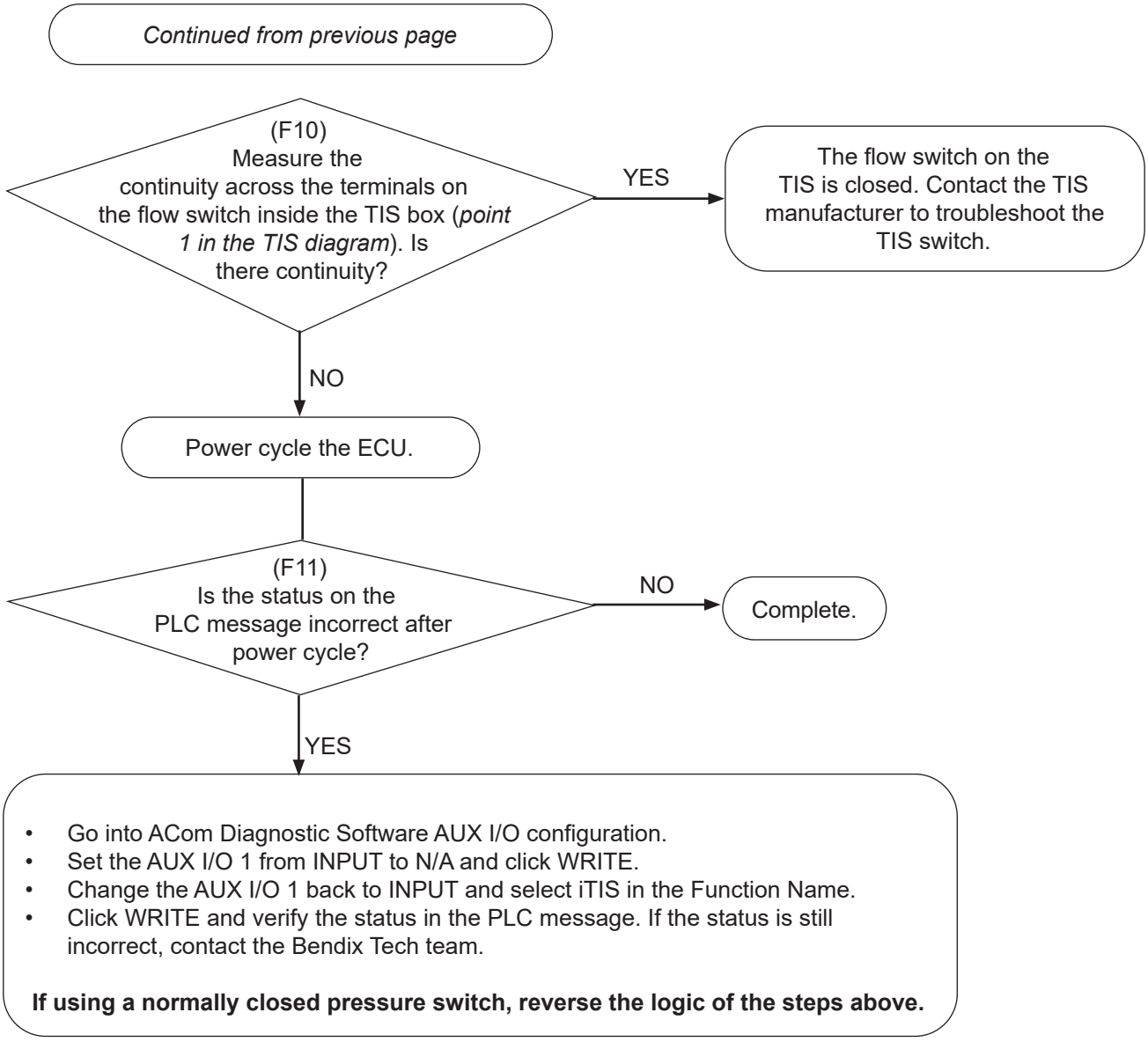
SECTION F: TROUBLESHOOTING THE TIS (CONTINUED)
SCENARIO 1: TIS IS ACTIVE BUT PLC MESSAGE STATUS IS INACTIVE



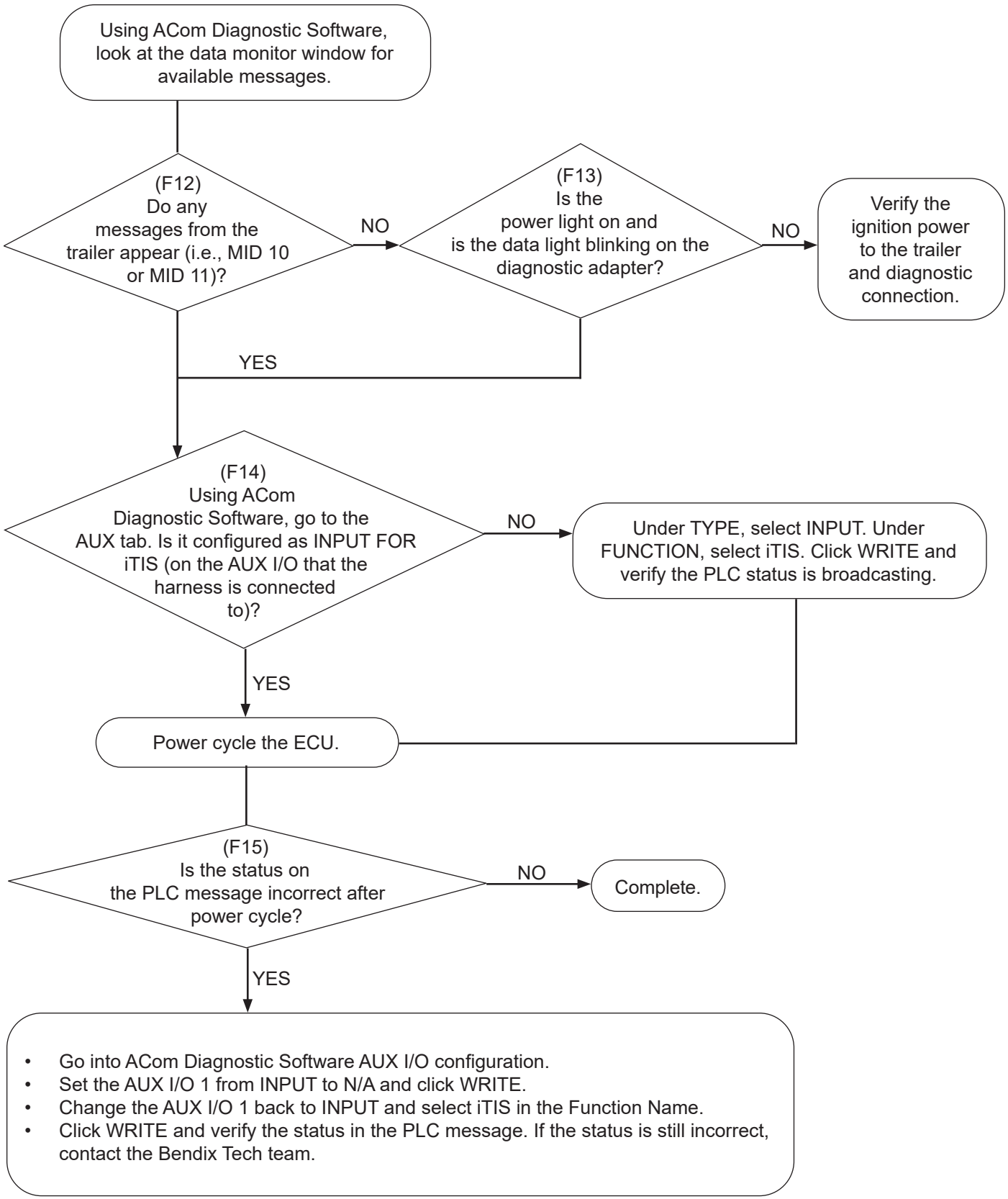
SECTION F: TROUBLESHOOTING THE TIS
SCENARIO 2: TIS IS INACTIVE BUT PLC MESSAGE STATUS IS ACTIVE



SECTION F: TROUBLESHOOTING THE TIS (CONTINUED)
SCENARIO 2: TIS IS INACTIVE BUT PLC MESSAGE STATUS IS ACTIVE

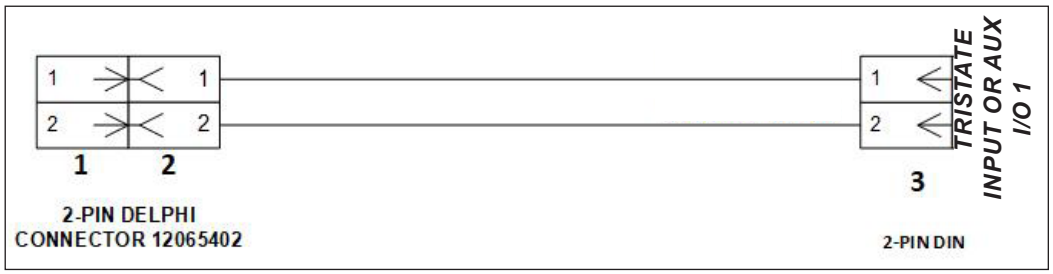


SECTION F: TROUBLESHOOTING THE TIS (CONTINUED)
SCENARIO 3: PLC MESSAGE IS NOT BROADCASTING



SECTION G: TROUBLESHOOTING LPWE FEATURE
SCENARIO 1: LOW PRESSURE CONDITION PRESENT (BELOW 65 PSI WITH NORMALLY OPEN PRESSURE SWITCH), BUT PLC MESSAGE STATUS IS INACTIVE

The following troubleshooting steps are designed to identify issues with the messaging and performance of the iTABS ECU. Additional functionality for the PLC relay unit should also be considered and confirmed as part of these troubleshooting steps.



LPWE Diagram

Using ACom Diagnostic Software, look at the data monitor window switches tab for the parking brake switch status (PID 70).

(G1) Is the PID 70 park brake switch status available on the monitor window?

NO → Go into the ACom AUX I/O configuration. Change the AUX I/O or one of the tristate inputs to INPUT and select iLPWE in the FUNCTION NAME. Ensure INPUT INVERTED MODE is set to NO and the ABS warning lamp is checked. Click WRITE and verify the status in the PLC message.

YES

(G2) Using ACom Diagnostic Software, go to the AUX tab and check under auxiliary function parameters. Is the LPWE INVERTED MODE option set to NO?

NO → Change the option to NO, write the configuration change, and verify the status of the PLC message is correct.

YES

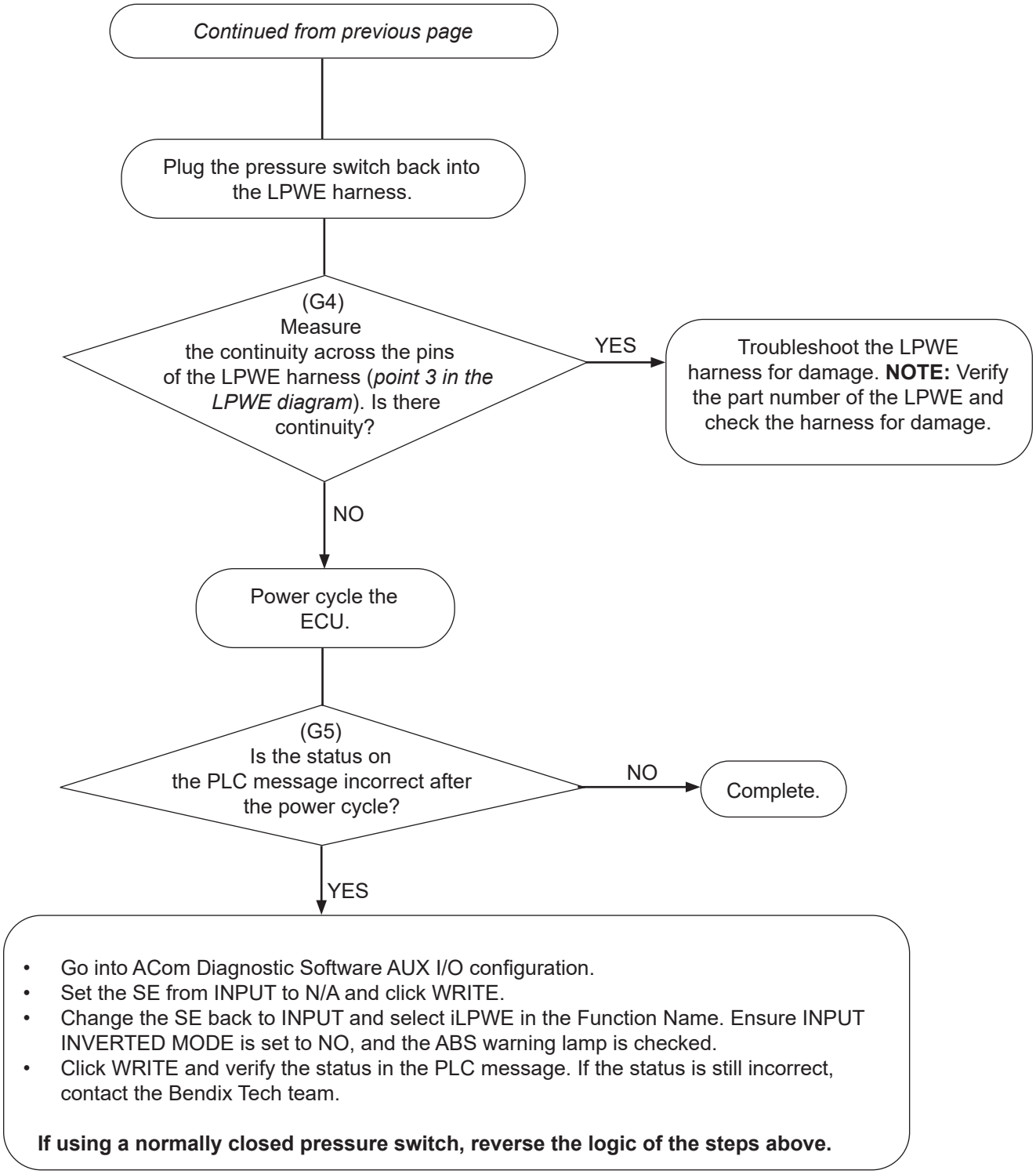
(G3) Unplug the pressure switch of the LPWE harness and measure the continuity across the terminals of the switch (*point 1 in the LPWE diagram*). Is there continuity?

YES → The threshold switch does not appear to be working. Replace the threshold switch.

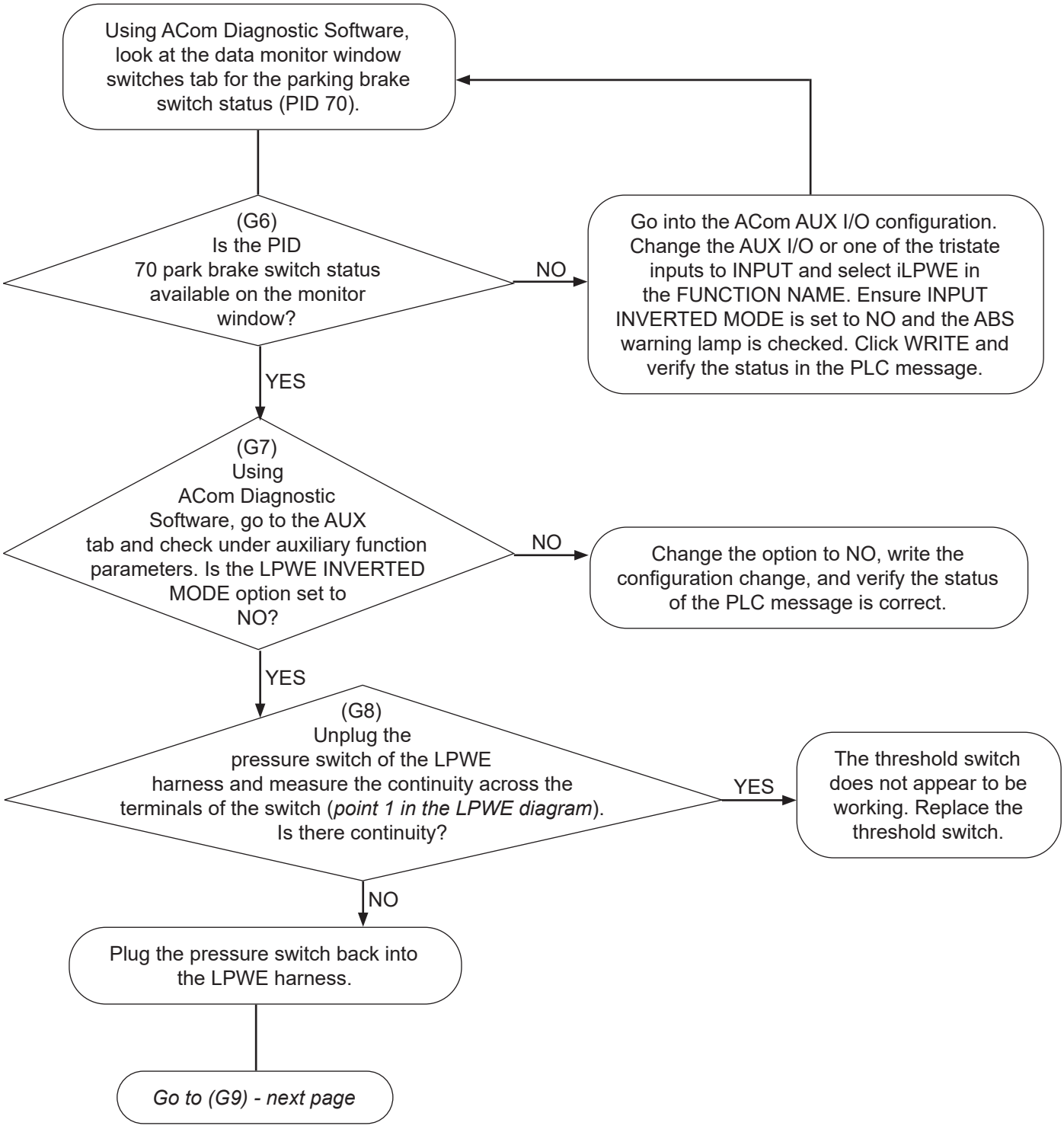
NO

Go to (G4) - next page

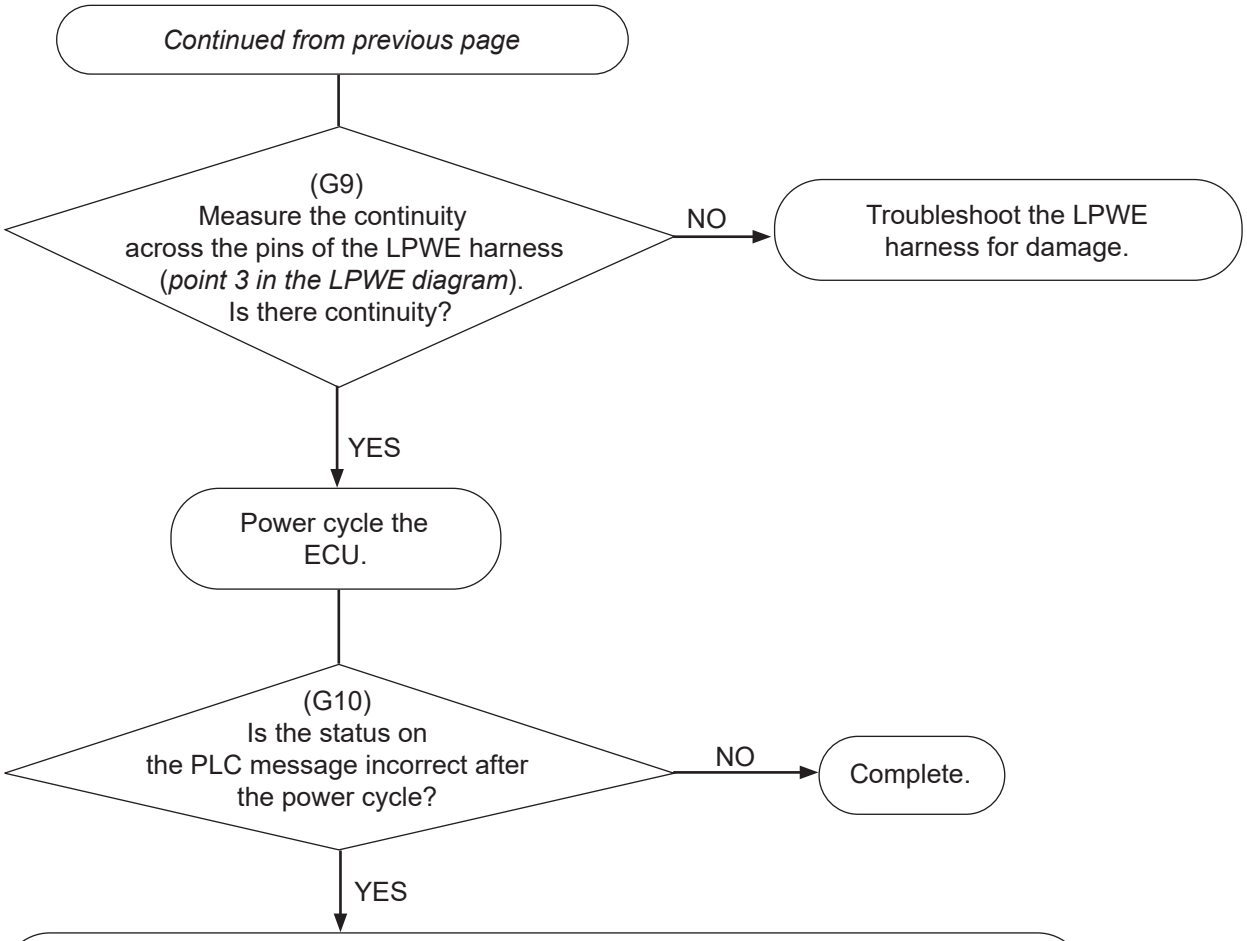
SECTION G: TROUBLESHOOTING LPWE FEATURE (CONTINUED)
SCENARIO 1: LOW PRESSURE CONDITION PRESENT (BELOW 65 PSI WITH NORMALLY OPEN PRESSURE SWITCH), BUT PLC MESSAGE STATUS IS INACTIVE



SECTION G: TROUBLESHOOTING LPWE FEATURE
SCENARIO 2: LOW PRESSURE CONDITION NOT PRESENT (ABOVE 65 PSI WITH NORMALLY OPEN PRESSURE SWITCH), BUT PLC MESSAGE STATUS IS ACTIVE



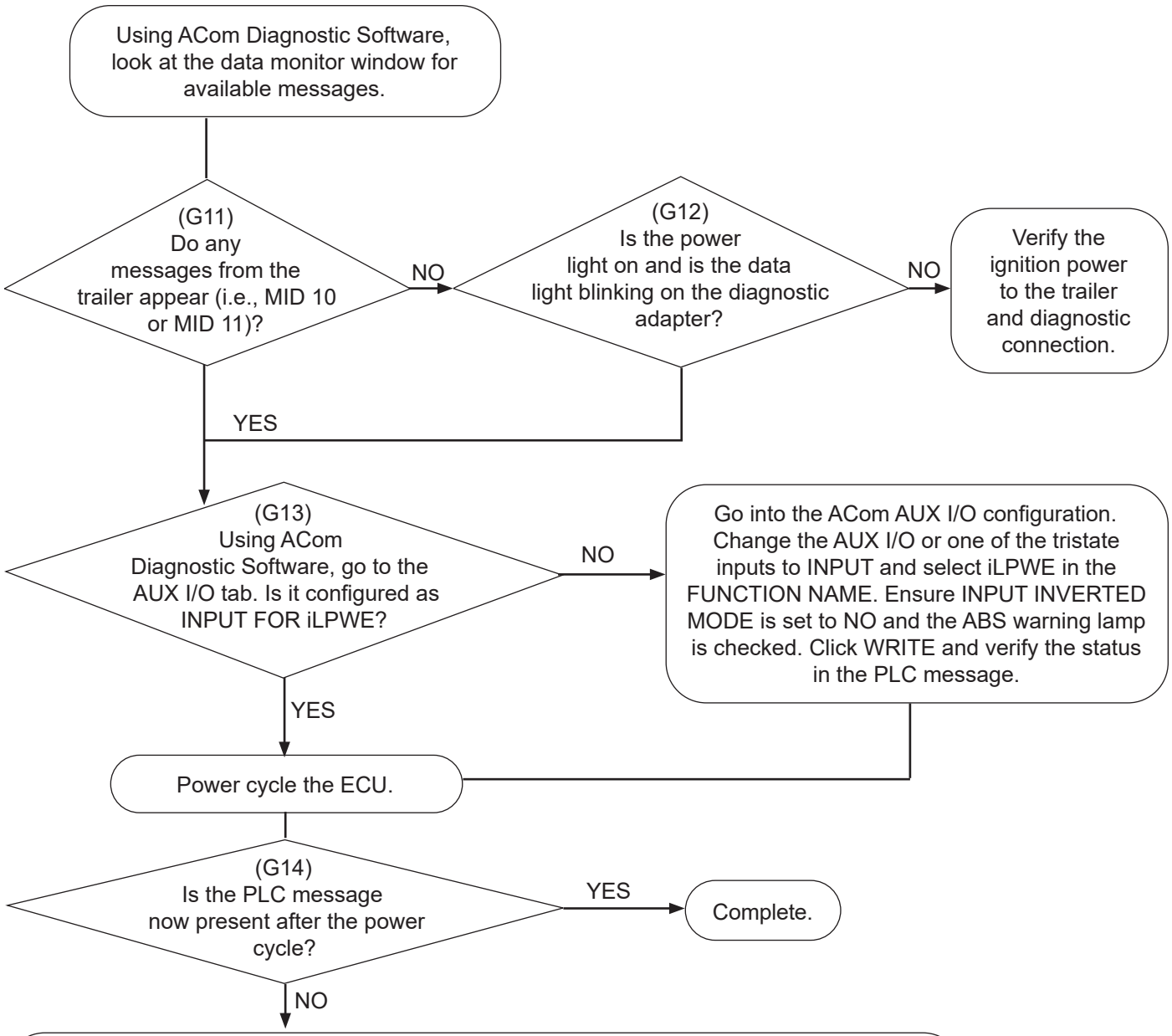
SECTION G: TROUBLESHOOTING LPWE FEATURE (CONTINUED)
SCENARIO 2: LOW PRESSURE CONDITION NOT PRESENT (ABOVE 65 PSI WITH NORMALLY OPEN PRESSURE SWITCH), BUT PLC MESSAGE STATUS IS ACTIVE



- Go into ACom Diagnostic Software AUX I/O configuration.
- Set the AUX I/O or one of the tristate inputs from INPUT to N/A and click WRITE.
- Change the AUX I/O or one of the tristate inputs back to INPUT and select iLPWE in the Function Name. Ensure INPUT INVERTED MODE is set to NO, and the ABS warning lamp is checked.
- Click WRITE and verify the status in the PLC message. If the status is still incorrect, contact the Bendix Tech team.

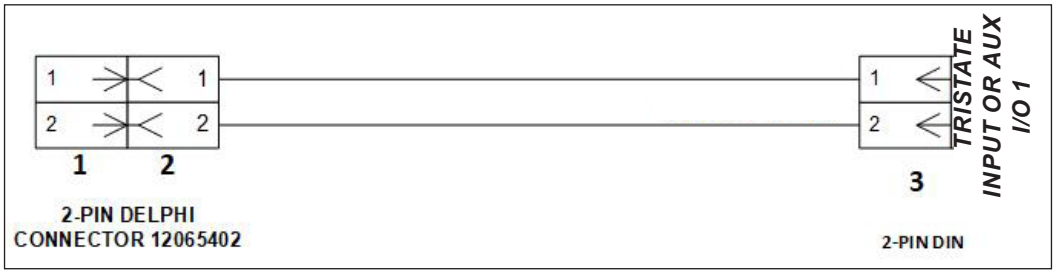
If using a normally closed pressure switch, reverse the logic of the steps above.

SECTION G: TROUBLESHOOTING LPWE FEATURE
SCENARIO 3: PLC MESSAGE IS NOT BROADCASTING

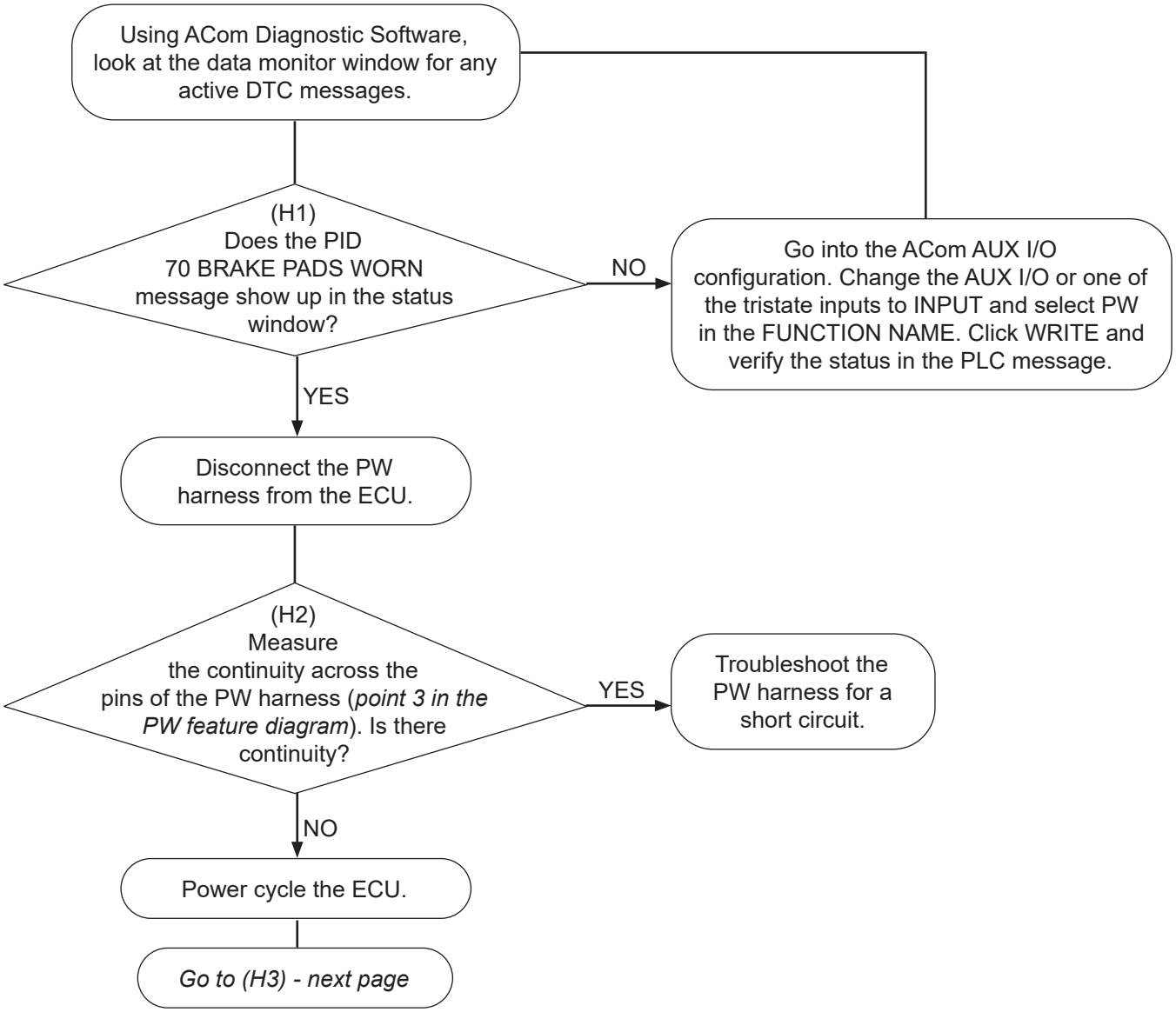


SECTION H: TROUBLESHOOTING PAD WEAR (PW) SENSING FEATURE
SCENARIO 1: BRAKE PAD WORN, BUT DTC IS INACTIVE

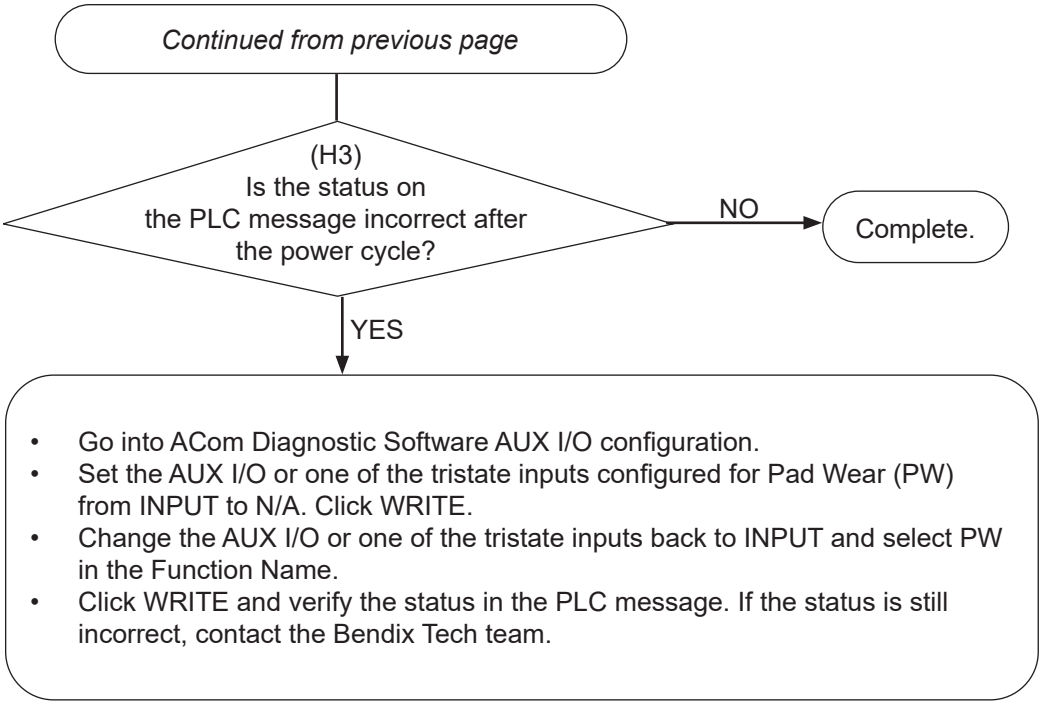
The following troubleshooting steps are designed to identify issues with the messaging and performance of the iTABS ECU. Additional functionality for the PLC relay unit should also be considered and confirmed as part of these troubleshooting steps.



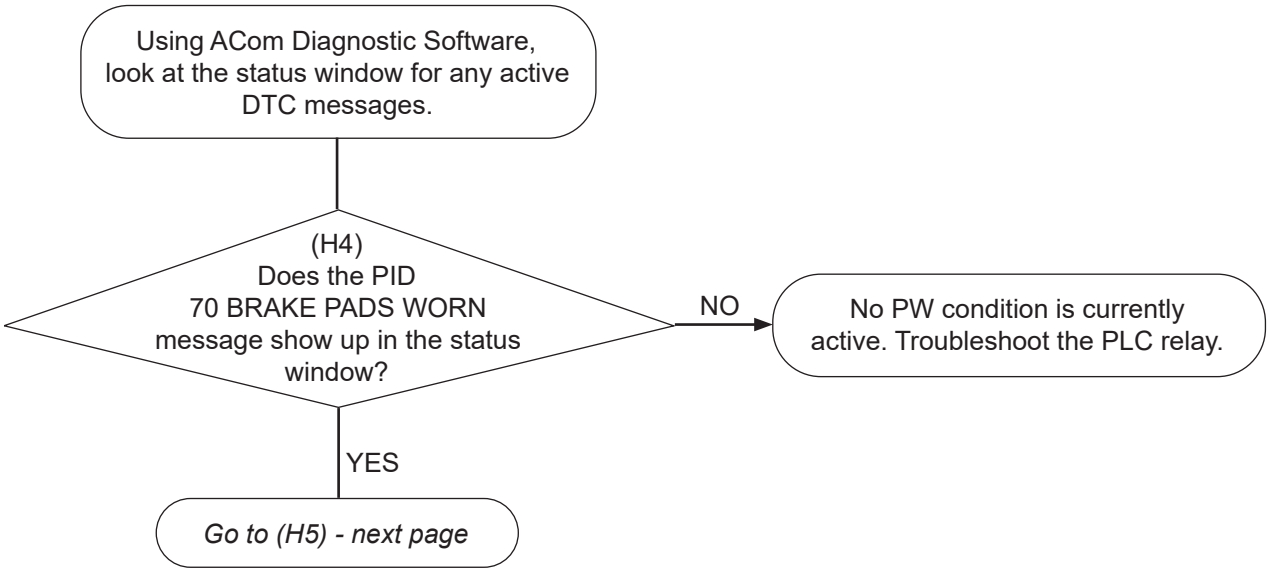
PW Feature Diagram



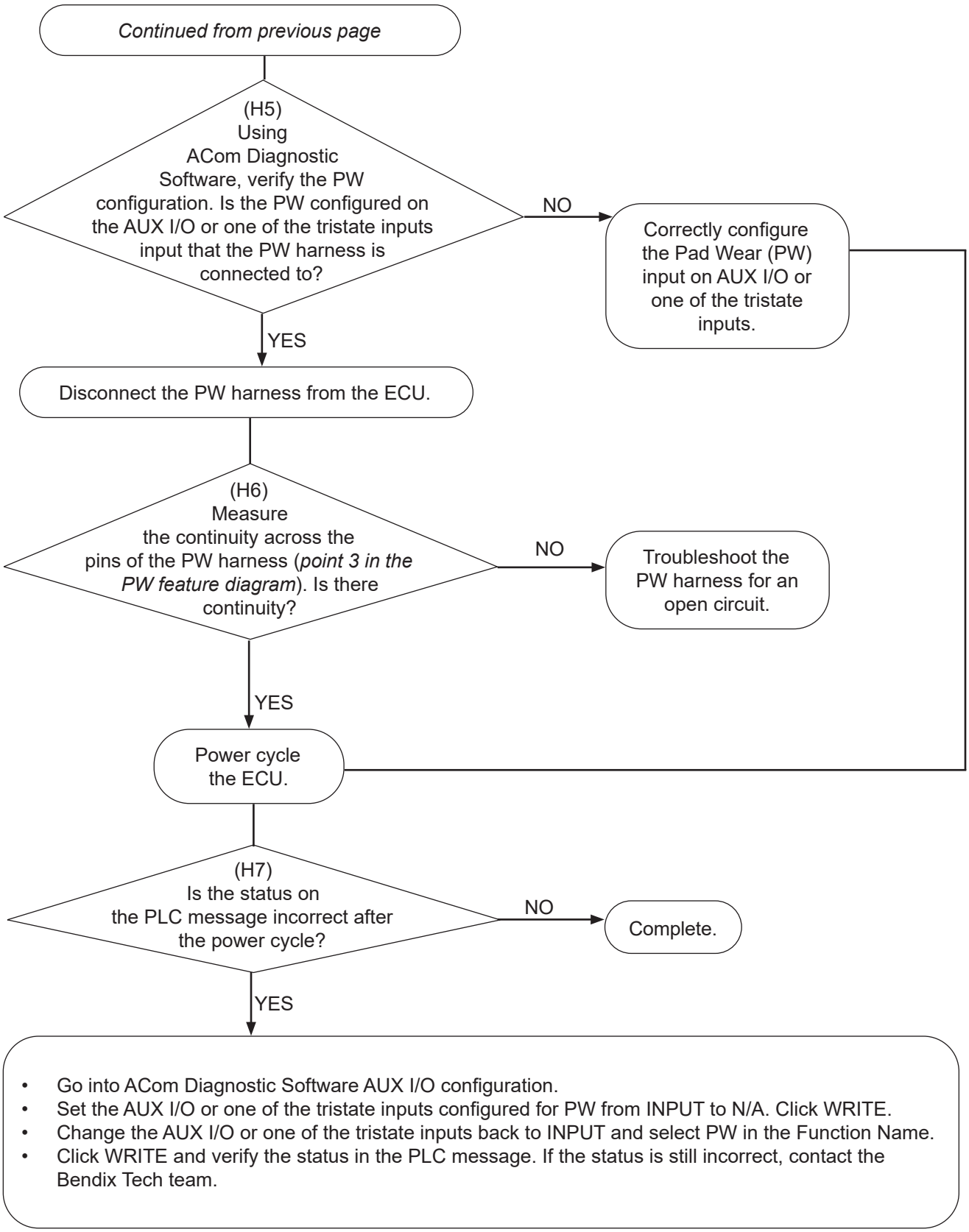
SECTION H: TROUBLESHOOTING PAD WEAR (PW) SENSING FEATURE (CONTINUED) - SCENARIO 1: BRAKE PAD WORN, BUT DTC IS INACTIVE



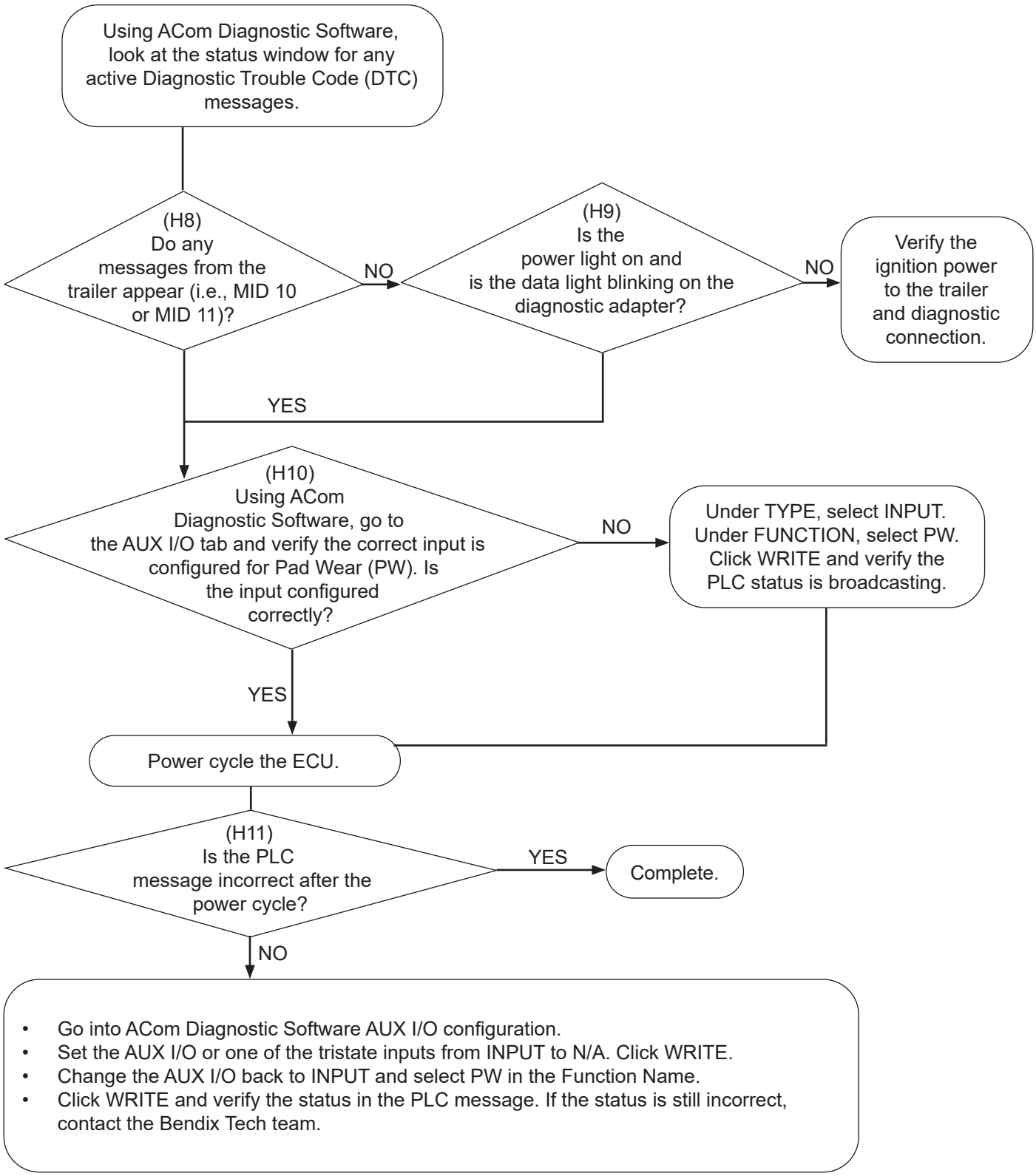
SECTION H: TROUBLESHOOTING PAD WEAR (PW) SENSING FEATURE SCENARIO 2: BRAKE PAD NOT WORN, BUT DTC IS ACTIVE



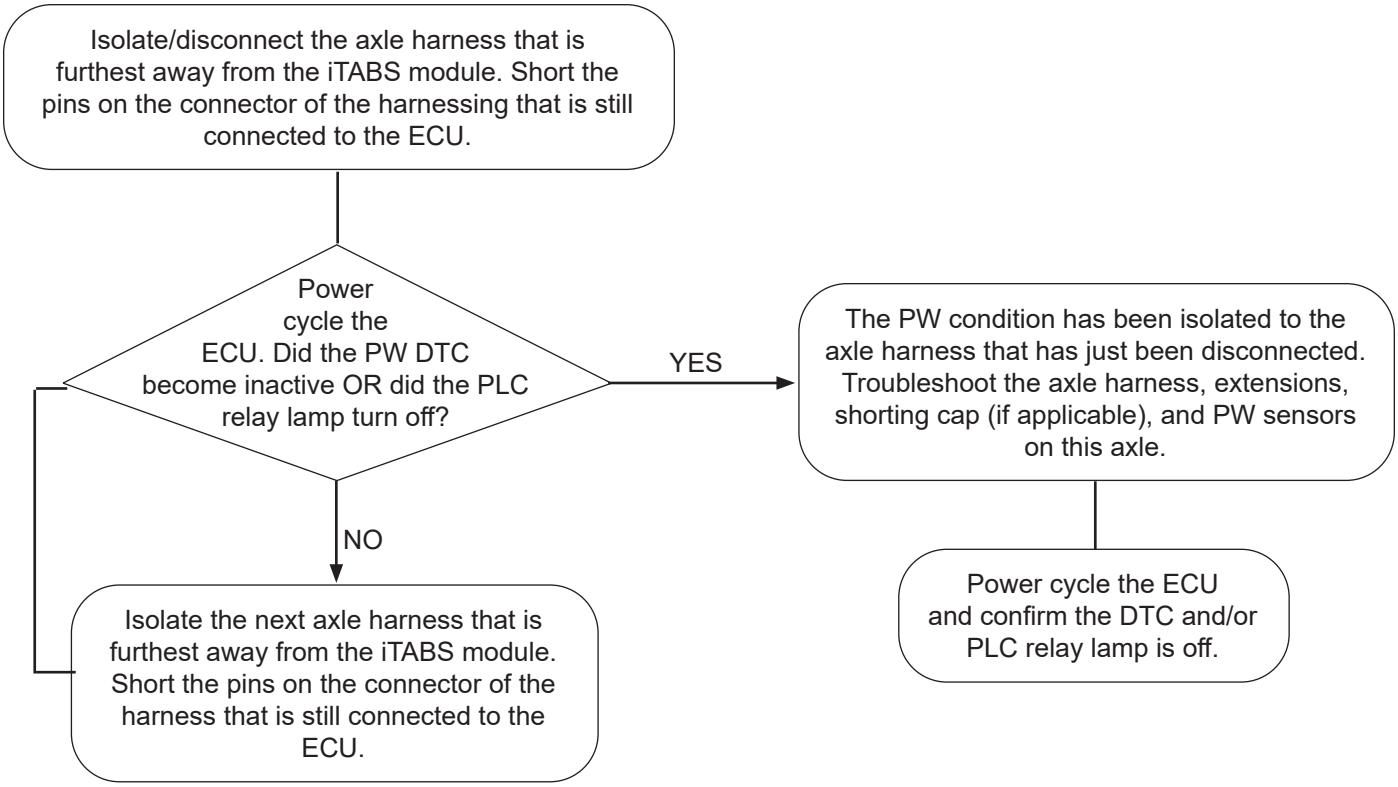
SECTION H: TROUBLESHOOTING PAD WEAR (PW) SENSING FEATURE (CONTINUED) SCENARIO 2: BRAKE PAD NOT WORN, BUT DTC IS ACTIVE



SECTION H: TROUBLESHOOTING PAD WEAR (PW) SENSING FEATURE
SCENARIO 3: PLC MESSAGE IS NOT BROADCASTING



SECTION H: TROUBLESHOOTING PAD WEAR (PW) SENSING FEATURE
SCENARIO 4: IDENTIFYING THE SOURCE OF A PW DTC



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