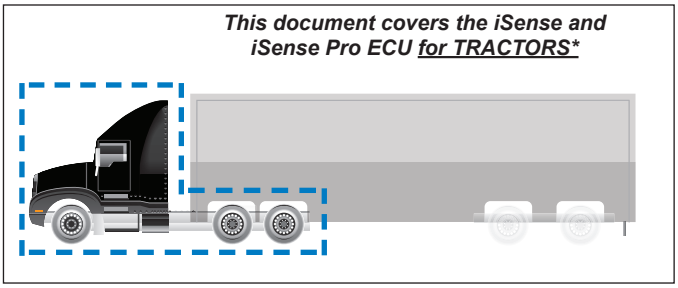
Bendix® iSense™ and iSense™ Pro Air Disc Brake (ADB) Electronic Control Unit (ECU) for TRACTORS



** Refer to SD-31-7570 on B2Bendix.com for information related to the iSense Pro ECUs for trailer.*

INTRODUCTION

The Bendix® iSense™ and iSense™ Pro Air Disc Brake (ADB) Wear-Sensing Tractor Electronic Control Unit (ECU) is a device designed to help improve the brake pad and rotor life-monitoring ability of vehicles equipped with Bendix tractor ADBs. The ECU makes use of the following types of Bendix wear sensors:

- iSense Wear Sensor: signals when the pad thickness approaches replacement condition for each wheel-end
- iSense Pro Wear Sensor: actively monitors the percentage of remaining brake life versus replacement condition at each wheel end as a combined measurement of the inboard pad, outboard pad, and rotor

The ECU can monitor ***either*** the iSense ***or*** iSense Pro wear sensor on up to eight (8) wheel-ends on a single vehicle.



Figure 1 – ADB Wear-Sensing ECU

⚠ WARNING

Bendix wear-sensing ECUs are designed to be warning-only devices. The information broadcast by the ECU should not be used to make adjustments to the braking characteristics of the vehicle.

⚠ WARNING

The driver is always responsible for the control and safe operation of the vehicle at all times. The Bendix wear-sensing ECU does not replace the need for a skilled, alert, professional driver, performing pre-trip inspections, reacting appropriately and in a timely manner, and using safe driving practices. Wear-sensing ECUs do not substitute the need to perform regular inspections and perform preventative maintenance.

⚠ IMPORTANT

Wear sensing does not replace the need for routine inspections. Routine inspections should always be conducted. *Refer to SD-23-7541, Bendix® ADB22X®, ADB22X-V™ and ADB22X®-LT Air Disc Brakes, on B2Bendix.com for further inspection details.*

HARDWARE CONFIGURATION

The ADB wear-sensing ECU is designed to work on a 12V system and is compatible with 250k and 500k baud rate J1939 CAN buses.

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.**

ECU MOUNTING

Bendix® Air Disc Brake (ADB) wear-sensing Electronic Control Units (ECUs) can be mounted within the cab or mounted on the rear of the chassis away from any heat sources and is compatible with either iSense or iSense Pro wear sensors. The ECU connector should be installed only by hand until it clicks into place. The ECU has two (2) through-hole mounting tabs to be used for mounting. Refer to Original Equipment Manufacturer (OEM) documentation regarding mounting methods and torques.

To ensure the product performs as intended and to prevent corrosion, all unused pin locations in the ECU connectors must be plugged and receive any necessary protection from moisture, etc. The ADB wear-sensing ECU utilizes a connector from the Deutsch® DT product family.

SOFTWARE CONFIGURATION

Bendix ADB wear-sensing ECUs are not re-configurable and are sold with a pre-configured software set that is identified by a part number. *Refer to B2Bendix.com* for the correct part number.

ELECTRONIC CONTROL UNIT (ECU) INPUTS AND OUTPUTS

The ADB wear-sensing ECU has one (1) ignition power and one (1) ground input and is designed to operate at a nominal supply voltage of 12V. The ignition power input is the power source for the ECU and should be supplied through a 5-amp fuse. The operating voltage range is 9.0V to 18.0V.

IMPORTANT

ECU operation is not guaranteed outside of the operating range.

ECU WIRING HARNESS

Bendix does not provide the wiring harness that connects to the ECU. It is the responsibility of the OEM to incorporate the wear-sensing ECU wiring harness into their vehicle harness. The minimum wire gauge for connectors is 20 AWG. The ECU connector should be secured by hand until the connector clicks into place. *Refer to the Troubleshooting: Electronic Control Unit (ECU) Wiring Harness Connectors section of this document.*

SENSOR POWER AND GROUND

The ECU supplies three (3) 5V power and ground outputs to be utilized by the iSense Pro wear sensor. *Refer to Table 2.*

SAE J1939 SERIAL COMMUNICATIONS

A Controller Area Network (CAN) data link (SAE J1939) is provided for communication. This link is used for various functions, including broadcasting the brake pad and rotor life remaining and circuit diagnostic messages.

The wear-sensing ECU utilizes SAE J1939 CAN protocol to communicate brake pad and rotor wear status. The ECU utilizes *PGN 65196 - Wheel Brake Lining Information* message to broadcast brake pad and rotor wear information.

DIAGNOSTIC TROUBLE CODES (DTCs) FOR ISENSE PRO SENSORS

If an issue is detected with one of the iSense Pro wear sensors, a DTC will be broadcast to indicate what kind of failure that sensor is experiencing. All other wear sensors should maintain normal function. *Refer to the Troubleshooting section for more information.*

ISENSE WEAR SENSOR

iSense wear sensors are clipped onto the inboard and outboard pad of the wheel end. The sensor is a wearable component that is to be replaced with each pad change.

ISENSE PRO WEAR SENSOR

iSense Pro wear sensors provide a combined measurement (as a percentage) of the inboard and outboard brake pads plus the remaining rotor thickness on each wheel-end ADB. The sensor is incorporated into the ADB for wear sensing from the factory. The calibrated wear sensor provides a voltage output to the ECU. This signal is then converted to a percentage and broadcast over the J1939 CAN bus. The iSense Pro wear sensor functions on a 5V supply voltage. If the sensor outputs a voltage signal of less than 4V, the brake wear life remaining is in the “good” range. If the sensor outputs a voltage signal of greater than or equal to 4V, the brake wear life remaining is considered to be “worn.”

IMPORTANT

Use of this sensor does not substitute the need for routine inspection and maintenance.

NOTE: Request of ADB wear sensing must be specified at the time of order, as iSense Pro wear sensors cannot be installed after the caliper has already been assembled.

PGN	PARAMETER GROUP LABEL	ACRONYM	SPN	SPN LABEL	DATA RANGE	ECU AXLE CONFIGURATION		
						2 AXLE	3 AXLE	4 AXLE
65196	Wheel Brake Lining Remaining Information	EBC4	1099	*Front Axle, Left Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%	X	X	X
			1100	*Front Axle, Right Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%	X	X	X
			1101	*Rear Axle #1, Left Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%	X	X	X
			1102	*Rear Axle #1, Right Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%	X	X	X
			1103	*Rear Axle #2, Left Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%		X	X
			1104	*Rear Axle #2, Right Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%		X	X
			1105	*Rear Axle #3, Left Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%			X
			1106	*Rear Axle #3, Right Wheel*	2% (iSense) *or* 100% iSense Pro: 0% to 100%			X
65216	Service Information	SERV	911	*Service Component Identification*	Not Broadcast (or 15)	X	X	X

Table 1 – Communication

COMMUNICATION

The ADB wear-sensing ECU can utilize all eight (8) SPNs of PGN 65196 correlating to the front axle, rear axle #1, rear axle #2, and rear axle #3 depending on the ECU axle configuration. *Refer to Table 1.*

Refer to Table 5 for further information on SPN/FMI.

DRIVER WARNING DEVICES

Individual OEMs are responsible for integrating this information into their dash. OEMs shall follow those rules laid out in Federal Motor Vehicle Safety Standards (FMVSS) for warning light operation, symbol, and color for brake pad and rotor wear.

IMPORTANT

The ADB wear-sensing ECU may broadcast the "Service Component Identification" message with the number "15" if any wheel position is below 10% life remaining or there is a Diagnostic Trouble Code (DTC) present. That message will not stop broadcasting until all wheel positions are above 15% life remaining and there are no DTCs active.

TROUBLESHOOTING

ECU DIAGNOSTICS

The ADB wear-sensing ECU contains self-testing diagnostic circuitry that continuously checks for the normal operation of external wear-sensing components and wiring. Diagnostics are only available on units configured for iSense Pro wear sensors. DTCs only pertain to iSense Pro applications. iSense applications will not broadcast DTCs.

ACTIVE DTCs

When a DTC is detected, the ADB wear-sensing ECU performs the following:

1. The ECU places the appropriate DTC information in the ECU memory.
2. The ECU communicates the appropriate DTC information over the serial communication diagnostic link as required.

ACTIVE DTC MODE

All active DTCs may be retrieved using a hand-held or PC-based diagnostic tool, such as Bendix® ACom® Diagnostic Software.

INACTIVE DTC MODE

The ADB wear-sensing ECU stores past DTCs in its memory. The record is commonly referred to as “event history.” When an active DTC is cleared, the ECU stores it in the event history memory as an inactive DTC. Inactive DTCs and event history may be retrieved and cleared by using a PC-based diagnostic tool, such as ACom Diagnostic Software.

USING PC-BASED DIAGNOSTICS

ACom Diagnostic Software is an RP-1210-compliant PC-based diagnostic software program. With ACom Diagnostic Software, maintenance personnel can:

- Obtain Diagnostic Trouble Code (DTC) information (both active and inactive DTCs)
- 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

PC-based diagnostic tools attach to the vehicle diagnostic connector. *See Figure 2.*

When using ACom Diagnostic Software to diagnose the Air Disc Brake (ADB) wear-sensing ECU, the computer’s serial, parallel, or USB port needs to be connected to the vehicle’s diagnostic connector. For more information and to download ACom Diagnostic Software, *visit B2Bendix.com.*



Figure 2 – Typical Vehicle Diagnostic Connector

WIRING HARNESS CONNECTOR PIN ASSIGNMENTS

The ECU utilizes one (1) Deutsch connector for wire harness connections. *See Figure 3 and refer to Table 2.*

⚠ WARNING

All unused pin locations must be populated by the appropriate wire plug.

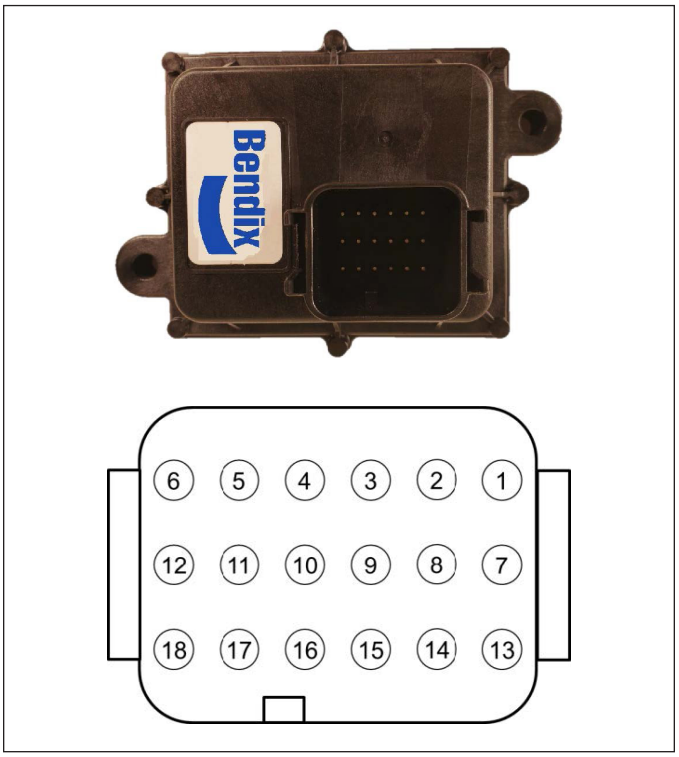


Figure 3 – Pin Assignments

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.

PIN	DESIGNATION	PIN	DESIGNATION	PIN	DESIGNATION
1	Ignition Power	7	Sensor Signal, Front Axle Left	13	Sensor Signal, Rear Axle #3 Left
2	Ground	8	Sensor Signal, Front Axle Right	14	Sensor Signal, Rear Axle #3 Right
3	J1939 CAN High	9	Sensor Signal, Rear Axle #1 Left	15	Sensor Power Out (+5V), Rear Axle #1*
4	J1939 CAN Low	10	Sensor Signal, Rear Axle #1 Right	16	Sensor Power Out (+5V), Rear Axles #2 and #3*
5	Sensor Power Out (+5V), Front Axle*	11	Sensor Signal, Rear Axle #2 Left	17	Sensor Ground, Rear Axle #1
6	Sensor Ground, Front Axle	12	Sensor Signal, Rear Axle #2 Right	18	Sensor Ground, Rear Axles #2 and #3
**5V sensor power out unused for iSense wear-sensing applications.*					

Table 2 – Pin Assignments

TROUBLESHOOTING DIAGNOSTIC: POWER SUPPLY

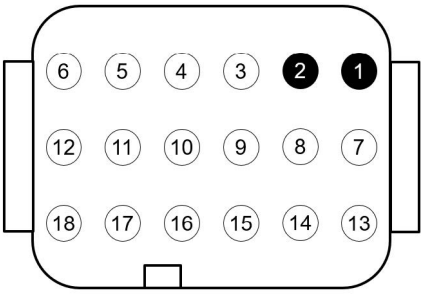
Possible symptoms that may indicate an issue with the power supply include:

- Lack of Electronic Control Unit (ECU) function
- Inconsistent ECU function

Perform the following to diagnose potential power supply issues:

- Take all measurements at the ECU harness connector.
- Check for damaged wiring and damaged or corroded connectors and connections.
- Place a load (i.e. an 1157 stop lamp) across ignition and ground connection and measure the ignition and battery voltage with the load. Ignition-to-ground should measure between 9.0V to 18.0V. If the voltage is outside of this range, proceed to the following steps.
- Check the condition of the vehicle battery and associated components.
- Check the alternator output for excessive noise.

See Figure 4 and refer to Table 3.



View from Back of Connector

PIN	DESIGNATION
1	Ignition Power
2	Ground

Figure 4 – Power Supply Tests

ISSUE	POTENTIAL SOLUTION
Voltage below 9V	• Check the vehicle battery and associated components. • Check for damaged wiring. • Check for damaged or corroded connectors and connections. • Contact the OEM for further assistance.
Voltage above 18V	• Ensure the battery voltage is correct for the ECU. • Check vehicle battery and associated components. • Check for damaged wiring. • Check for damaged or corroded connectors and connections. • Contact the OEM for further assistance.

Table 3 – Power Supply Troubleshooting

TROUBLESHOOTING DIAGNOSTIC: J1939 CAN COMMUNICATIONS

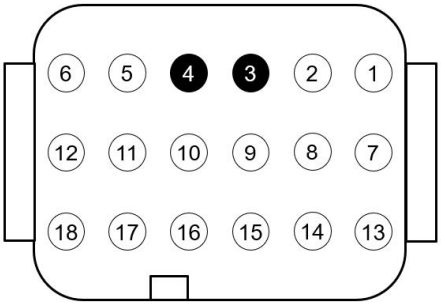
Possible symptoms that may indicate an issue with the J1939 CAN communication include:

- Lack of J1939 CAN communication
- Sporadic J1939 CAN communication

Perform the following to diagnose potential J1939 CAN communication issues:

- Take all measurements at the ECU harness connector.
- Check for corroded or damaged wiring connector problems such as opens or shorts to voltage or ground.
- Check for damaged or reversed J1939 wiring.
- Check for other J1939 devices which may be bringing down (inhibiting) J1939 communication.

See Figure 5 and refer to Table 4.



View from Back of Connector

PIN	DESIGNATION
3	J1939 High
4	J1939 Low

Figure 5 – J1939 CAN Communication Tests

ISSUE	POTENTIAL SOLUTION
ECU not identified in Bendix® ACom® Diagnostic Software	• Check for damaged or corroded connectors and connections. • Check the ECU part number and confirm it is configured to the correct baud rate. *Refer to B2Bendix.com.* • Check for damaged or reversed J1939 wires or power/ground wires. • Using Bendix® ACom® Diagnostic Software, check to see if the wear-sensing ECU is broadcasting CAN messages from a source address other than 154 (9A). • Confirm ECU failure by installing an ECU that has been verified to function properly.

Table 4 – J1939 CAN Communication Troubleshooting

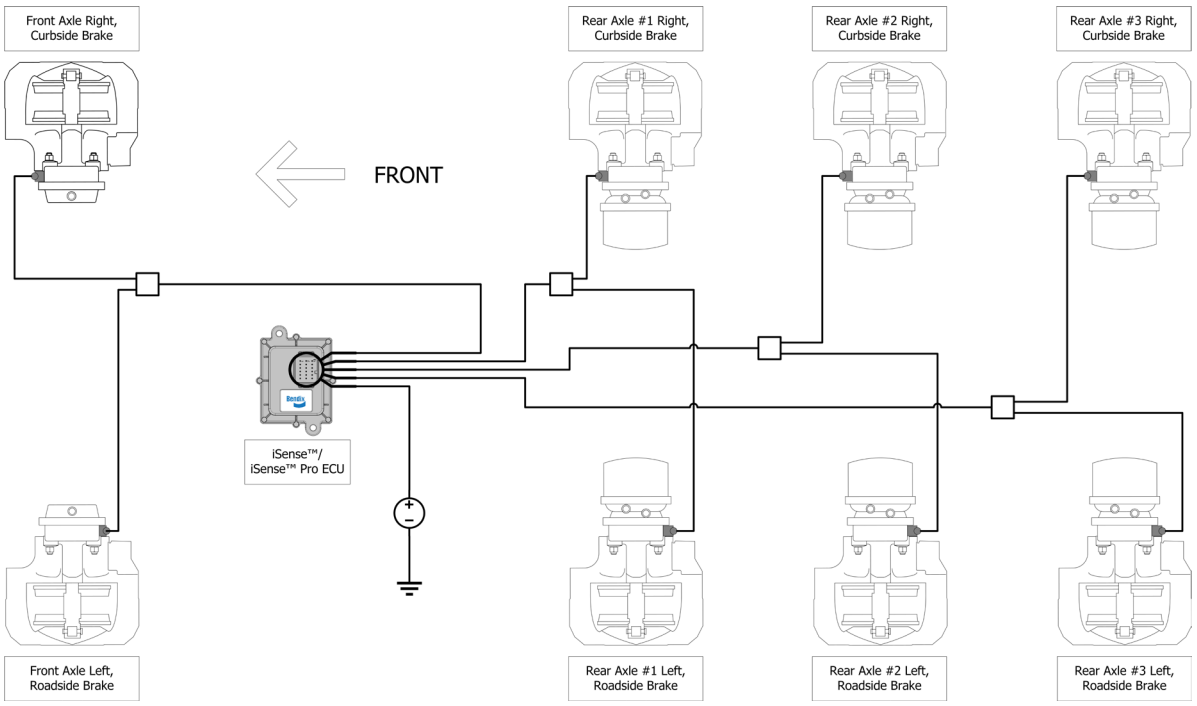
DIAGNOSTIC TROUBLE CODES (DTC) TABLE

Refer to Table 5, Figure 6, and the corresponding service action code in Table 6.

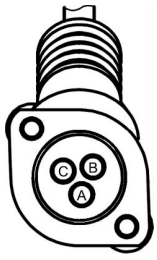
SPN (J1939)	FMI (J1939)	DTC NAME	DTC DESCRIPTION	GO TO SERVICE ACTION CODE LISTED IN TABLE 6
1099	3	Wear Sensor	Front Axle, Left Wheel, Wear Sensor Shorted to Voltage	A
1100			Front Axle, Right Wheel, Wear Sensor Shorted to Voltage	
1101			Rear Axle #1, Left Wheel, Wear Sensor Shorted to Voltage	
1102			Rear Axle #1, Right Wheel, Wear Sensor Shorted to Voltage	
1103			Rear Axle #2, Left Wheel, Wear Sensor Shorted to Voltage	
1104			Rear Axle #2, Right Wheel, Wear Sensor Shorted to Voltage	
1105			Rear Axle #3, Left Wheel, Wear Sensor Shorted to Voltage	
1106			Rear Axle #3, Right Wheel, Wear Sensor Shorted to Voltage	
1099	4	Wear Sensor	Front Axle, Left Wheel, Wear Sensor Shorted to Ground or Open Circuit	B
1100			Front Axle, Right Wheel, Wear Sensor Shorted to Ground or Open Circuit	
1101			Rear Axle #1, Left Wheel, Wear Sensor Shorted to Ground or Open Circuit	
1102			Rear Axle #1, Right Wheel, Wear Sensor Shorted to Ground or Open Circuit	
1103			Rear Axle #2, Left Wheel, Wear Sensor Shorted to Ground or Open Circuit	
1104			Rear Axle #2, Right Wheel, Wear Sensor Shorted to Ground or Open Circuit	
1105			Rear Axle #3, Left Wheel, Wear Sensor Shorted to Ground or Open Circuit	
1106			Rear Axle #3, Right Wheel, Wear Sensor Shorted to Ground or Open Circuit	

Table 5 – Diagnostic Trouble Codes (DTCs)

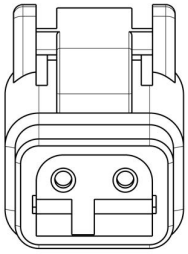
NOTE: Unless otherwise specified, diagnostics should be done with the vehicle ignition on and with the engine not running.



iSense Pro Sensor Harness Connector



iSense Sensor Harness Connector



PIN	DESCRIPTION	COLOR*
A	Signal	Black
B	Sensor Power	Yellow
C	Sensor Ground	Brown

**Color applies to sensor harnesses supplied by Bendix or Knorr-Bremse.*

Torque Spec: *1.0 - 1.1 N•m*

Figure 6 – Bendix® iSense™ Pro Tractor Wear-Sensing Electronic Control Unit (ECU) Layout

SERVICE ACTION CODE TABLE

Refer to Table 6. As situations are remedied, active Diagnostic Trouble Codes (DTCs) can be cleared by removing and re-applying ignition power. Alternately, DTCs may be cleared by using a PC-based diagnostic tool, such as Bendix® ACom® Diagnostic Software.

Service Action Code	Troubleshooting Measure	Action
A	1. Locate the Faulted Wheel-End Brake. Disconnect the iSense Pro Sensor Harness Connector and with a Digital Multi-Meter (DMM), measure the DC voltage between Pin A and Pin B within the iSense Pro Sensor Harness Connector.	**Measured Voltage** • 0-4.5V – Signal line not shorted to power source. *Proceed to Step 5.* • 4.5-5.5V – Signal line shorted to sensor power. *Proceed to Step 2.* • > 5.5V – Signal line shorted to vehicle power. *Proceed to Step 5.*
	2. Locate the Faulted Wheel-End Brake. Using a DMM in Continuity Check Mode, check the continuity between Pin A and Pin B within the iSense Pro Sensor Harness Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Short between sensor line and sensor power confirmed. o If secondary connectors are present between the Electronic Control Unit (ECU) Connector and the iSense Pro Sensor Harness Connector, *proceed to Step 3*. o If secondary connectors are not present between the ECU Connector and the iSense Pro Sensor Harness Connector, *proceed to Step 4.* • Continuity is ***Not Present***: Short not present between sensor line and sensor power. o Possible intermittent short. Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. If damaged wire insulation is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics are needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket.
	3. Locate the Faulted Wheel-End Brake and follow the iSense Pro Sensor Harness Connector to any OEM-specific connectors between the brake and the ECU Connector. Using a DMM in Continuity Check Mode, check the continuity between the Sensor Power and Sensor Signal Pins at each OEM-specific connector.	**Continuity Measurement Results** • Continuity is ***Present***: Short circuit confirmed in supply line. Supply line must be replaced. • Continuity is ***Not Present***: Short not present in supply line. *Proceed to Step 4.*

Table 6 – Service Action Codes

Service Action Code	Troubleshooting Measure	Action
A	4. Locate the iSense Pro Electronic Control Unit (ECU) and disconnect the ECU Connector. Using a Digital Multi-Meter (DMM) in Continuity Check Mode and referring to *Figure 3* and *Table 2*, check the continuity between the Sensor Power Out Pin corresponding to the axle on which the Faulted Wheel End resides and the Sensor Signal Pin corresponding to the Faulted Wheel End within the ECU Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Short circuit confirmed in vehicle harness. Short must be found and repaired. • Continuity is ***Not Present***: Short not present between sensor line and sensor power. o Possible intermittent short. Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. If damaged wire insulation is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics are needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket.
	5. Locate the iSense Pro ECU and disconnect the ECU Connector. Using a DMM in Continuity Check Mode, check the continuity between Pin 1 and the Sensor Signal Pin corresponding to the Faulted Wheel End within the ECU Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Short circuit confirmed in vehicle harness. Short must be found and repaired. • Continuity is ***Not Present***: Short not present between sensor line and sensor power. o Possible intermittent short. Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. If damaged wire insulation is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics are needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket.
	6. Locate the Faulted Wheel-End Brake. Using a DMM in Continuity Check Mode, check the continuity between Pin C within the iSense Pro Sensor Harness Connector and a chassis ground.	**Continuity Measurement Results** • Continuity is ***Present***: Ground circuit working properly. Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. If damaged wire insulation is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics are needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket. • Continuity is ***Not Present***: Sensor ground circuit is open. Open circuit must be found and repaired.

Table 6 – Service Action Codes

Service Action Code	Troubleshooting Measure	Action
B	1. Locate the Faulted Wheel-End Brake. Disconnect the iSense Pro Sensor Harness Connector and with a Digital Multi-Meter (DMM) in Continuity Check Mode, check the continuity between Pin B and Pin C within the iSense Pro Sensor Harness Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Short between sensor line and sensor ground confirmed. o If secondary connectors are present between the Electronic Control Unit (ECU) Connector and the iSense Pro Sensor Harness Connector, *proceed to Step 2.* o If secondary connectors are not present between the ECU Connector and the iSense Pro Sensor Harness Connector, *proceed to Step 3.* • Continuity is ***Not Present***: Short not present between sensor line and sensor ground. • Possible intermittent short. Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. If damaged wire insulation is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics are needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket.
	2. Locate the Faulted Wheel-End Brake and follow the iSense Pro Sensor Harness Connector to any OEM-specific connectors between the brake and the ECU Connector. At each OEM-specific connector with the DMM in Continuity Check Mode, check the continuity between the Sensor Power and Sensor Signal Pins.	**Continuity Measurement Results** • Continuity is ***Present***: Short circuit confirmed in supply line. Supply line must be replaced. • Continuity is ***Not Present***: Short not present in supply line. *Proceed to Step 3.*
	3. Locate the iSense Pro ECU and disconnect the ECU Connector. Using a DMM in Continuity Check Mode and referring to *Figure 3* and *Table 2*, check the continuity between the Sensor Ground Pin corresponding to the axle on which the Faulted Wheel End resides and the Sensor Signal Pin corresponding to the Faulted Wheel End within the ECU Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Short circuit confirmed in vehicle harness. Short must be found and repaired. • Continuity is ***Not Present***: Short not present between sensor line and sensor power. *Proceed to Step 4.*

Table 6 – Service Action Codes

Service Action Code	Troubleshooting Measure	Action
B	4. Locate the Faulted Wheel-End Brake and disconnect the iSense Pro Sensor Harness Connector. Locate the iSense Pro Electronic Control Unit (ECU) and disconnect the ECU Connector. Using a Digital Multi-Meter (DMM) in Continuity Check Mode and referring to *Figure 3* and *Table 2*, check the continuity between the Sensor Signal Pin corresponding to the Faulted Wheel End within the ECU Connector and Pin A within the iSense Pro Sensor Harness Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Open circuit not present in sensor signal line. *Proceed to Step 5.* • Continuity is ***Not Present***: Open circuit present in sensor signal line. o Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. If damaged wiring is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics is needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket.
	5. Locate the Faulted Wheel-End Brake and disconnect the iSense Pro Sensor Harness Connector. Locate the Sense Pro ECU and disconnect the ECU Connector. Using a DMM in Continuity Check Mode and referring to *Figure 3* and *Table 2*, check the continuity between the Sensor Ground Pin corresponding to the axle on which the Faulted Wheel End resides within the ECU Connector and Pin B within the iSense Pro Sensor Harness Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Open circuit not present in sensor power line. *Proceed to Step 6.* • Continuity is ***Not Present***: Open circuit present in sensor power line. o Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. If damaged wiring is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics is needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket.
	6. Locate the iSense Pro ECU and disconnect the ECU Connector. Using a DMM in Continuity Check Mode and referring to *Figure 3* and *Table 2*, check the continuity between the Sensor Ground Pin corresponding to the axle on which the Faulted Wheel End resides and the Sensor Signal Pin corresponding to the Faulted Wheel End within the ECU Connector.	**Continuity Measurement Results** • Continuity is ***Present***: Short circuit in vehicle harness confirmed. Short must be found and repaired. • Continuity is ***Not Present***: Short not present between sensor ground and sensor signal. o Possible intermittent short. Check the entire run of the harness between the ECU Connector and the iSense Pro Sensor Harness Connector connected to the Faulted Wheel-End Brake. Additionally, check the entire run of the harness between the ECU Connector and where it is connected on the vehicle harness. If damaged wire insulation is not found, proceed with replacing the ECU with a known good ECU. If the problem persists, further diagnostics are needed to locate the short. If the problem ceases, then proceed with replacing the ECU through warranty or aftermarket.

Table 6 – Service Action Codes

TROUBLESHOOTING: ELECTRONIC CONTROL UNIT (ECU) WIRING HARNESS CONNECTORS

Bendix® Air Disc Brake (ADB) Wear-sensing Electronic Control Units (ECUs) are designed to interface with a Deutsch DTV connector *as referenced in Table 7*. Follow the connector manufacturer's specifications for creating or repairing wiring harnesses

IMPORTANT

All wiring harness connectors must be properly seated. The use of secondary locks is strongly advised.

WARNING

All unused ECU pins must be covered and receive proper environmental protection.

As a matter of good practice and to ensure maximum system robustness, always use the maximum size wire supported by the wire harness connectors for ignition and ground. All sensor and serial communications circuits (J1939) must use twisted pair wiring (one to two twists per inch). *Reference the appropriate SAE J1939 standards document for additional details.*

WARNING

All wires must be carefully routed to avoid contact with rotating elements. Wiring must be properly secured approximately every 6 to 12 in. (15 to 30 cm) using UV-stabilized, non-metallic hose clamps or bow-tie cable ties to prevent pinching, binding, or fraying.

It is recommended that wires be routed straight out of a connector for a minimum of three (3) inches before the wire is allowed to bend. Ignition power and ground wires should be kept to a minimum length. If convoluted tubing is used, its inner diameter must match the size of the wire bundle as closely as possible.

CAUTION

Wiring harness lengths must be carefully selected for the vehicle. Harnesses that are too long increase the possibility of electrical interference and wiring damage. Excess lengths of wire are not to be wound to form coils; instead, re-route, repair, or replace the wiring harness. Do not attempt to stretch harnesses that are too short, as mechanical strain can result in wire breakage.

Route sensor wiring coming out of the wheel-ends away from moving brake components. Sensor wiring needs to be secured to the axle to prevent excess cable length and wiring damage.

Following the axle, the sensor wires must be attached along the length of the service brake hoses using cable ties with ultraviolet protection and secured every 6 to 8 in. (15 to 20 cm). Sufficient – but not excessive – cable length must be provided to permit full suspension travel and steering axle movement. Install wires so that they cannot touch rotating elements such as wheels, brake discs, or drive shafts.

Bendix does not recommend using standard tie-wraps to secure wiring harnesses directly to rubber air lines. This may cause premature wiring failure from the pressure exerted on the wiring when air pressure is applied through the air line. Non-metallic hose clamps or bow-tie tie-wraps are preferred.

The use of grommets or other suitable protection is required whenever the cable must pass through metallic frame members.

All sensor wiring must utilize twisted pair wire, with approximately one to two twists per inch.

It is recommended that wires be routed straight out of a connector for a minimum of three (3) inches before the wire is allowed to bend.

WIRE REQUIREMENT	CONNECTOR	WIRE TERMINAL	LOCKING CLIP	WIRE PLUG	TERMINAL CRIMP TOOL
ABD Wear-sensing ECU Harness Connector 18-pin Deutsch DTV	 DTV06-18SB	 0462-201-16141	 WV-18S	 114017-ZZ	 HDT-48-00
Wire Harness Mating Connector 2-pin Deutsch DTM **Applies only to iSense Wear-Sensing*	 DTM06-2S	 0462-201-20141	 WM-2S	N/A	

Table 7 – ADB Wear-sensing ECU Component Connectors

NOTE: Bendix does not supply these parts.

** As a matter of good practice and to ensure maximum system robustness, always use the maximum size wire supported by the wire harness terminals and connectors for ignition and ground.*

REMOVING THE BENDIX® AIR DISC BRAKE (ADB) WEAR-SENSING ELECTRONIC CONTROL UNIT (ECU)

1. Turn the vehicle ignition off.
2. Remove as much contamination from the Electronic Control Unit (ECU) as possible prior to disconnecting the electrical connections.
3. Note the ECU assembly mounting position on the vehicle.
4. Disconnect the electrical connector from the ECU.
5. Remove and retain the mounting bolts that secure the ECU.

INSTALLING A NEW BENDIX ADB WEAR-SENSING ECU

⚠ WARNING

When replacing the ADB wear-sensing ECU, verify that the unit you are installing has the correct default settings.

Verify correct operation of the ADB wear-sensing ECU by evaluating the system function with Bendix® ACom® Diagnostic Software or PC-based diagnostic tool. *Refer to the section titled Using PC-based Diagnostics in this document.*

For further information, contact either the OEM, Bendix®, or your local authorized Bendix® dealer.

1. Position and secure the ADB wear-sensing ECU in the original mounting orientation using the mounting bolts retained during removal. When mounting the unit in the cab, use no more torque than is necessary to firmly secure the ECU into position. The ECU connector should be installed only by hand until it clicks into place. The ECU has two (2) through-hole mounting tabs to be used for mounting. Refer to OEM documentation regarding mounting methods and torques.
2. Reconnect the electrical connector to the ECU. The connector should be installed only by hand until it clicks into place.
3. Start the vehicle and monitor Diagnostic Trouble Codes (DTCs) using a PC-based diagnostic tool, such as ACom Diagnostic Software.

Refer to the section titled Troubleshooting: Electronic Control Unit (ECU) Wiring Harness Connectors for more information on wiring harnesses.

TROUBLESHOOTING: BENDIX® AIR DISC BRAKE (ADB) WEAR-SENSING ELECTRONIC CONTROL UNIT (ECU) WIRING SCHEMATIC

4-AXLE/ISENSE PRO WEAR SENSOR

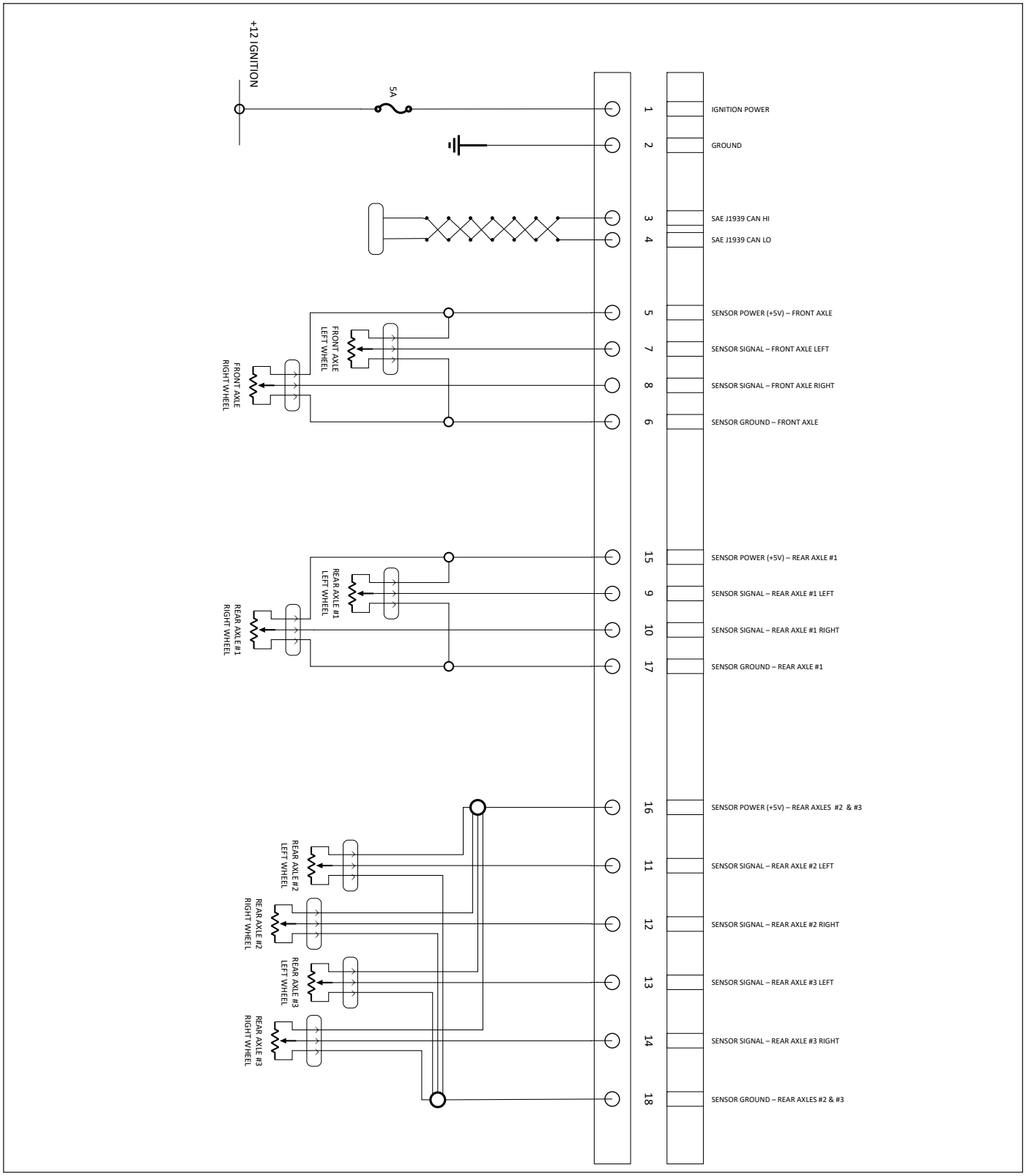


Figure 7 – 4-Axle/iSense Pro Schematic

TROUBLESHOOTING: BENDIX® AIR DISC BRAKE (ADB) WEAR-SENSING ELECTRONIC CONTROL UNIT (ECU) WIRING SCHEMATIC

4-AXLE/ISENSE WEAR SENSOR

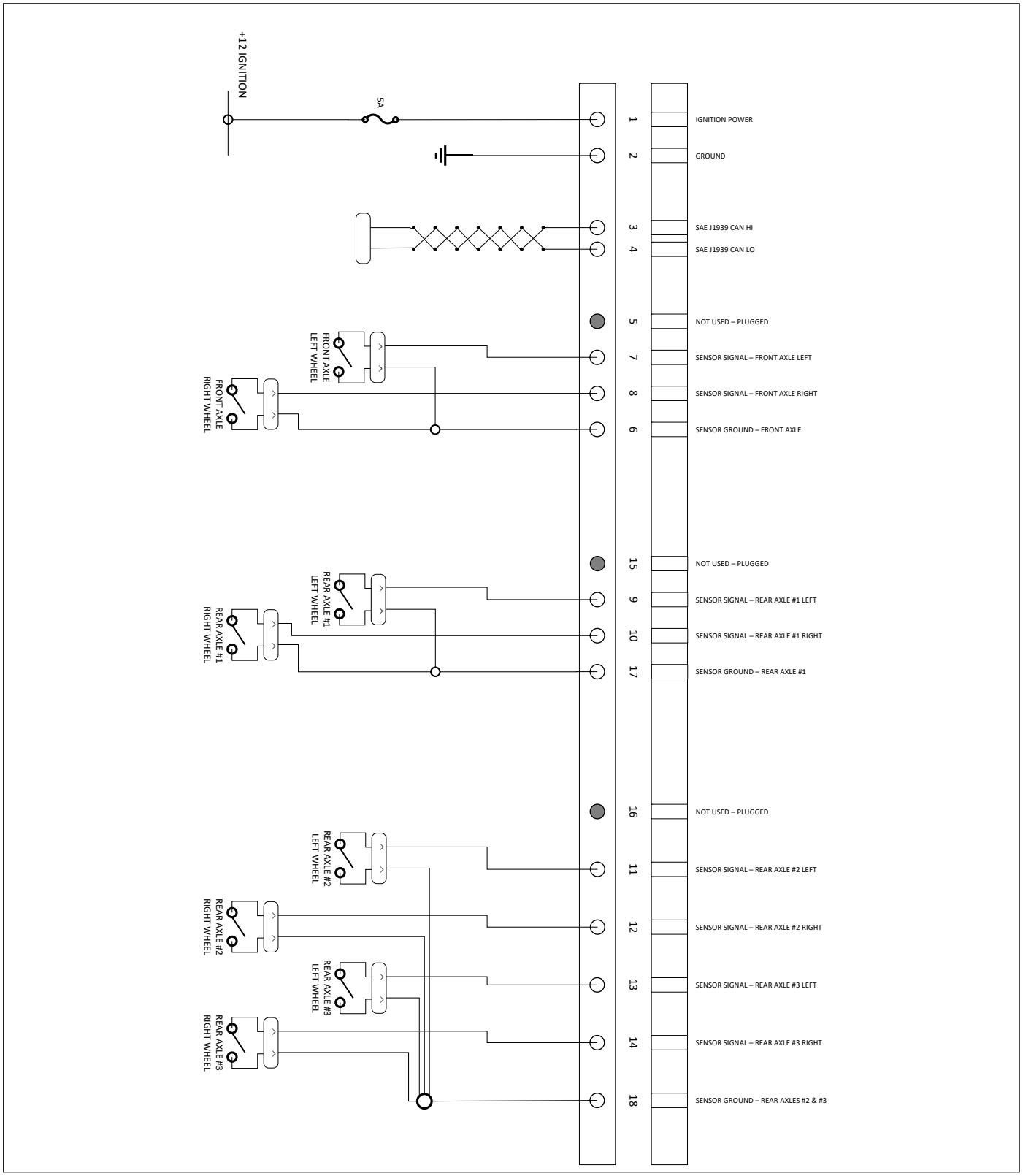


Figure 8 – 4-Axle/iSense Schematic

TROUBLESHOOTING: BENDIX® AIR DISC BRAKE (ADB) WEAR-SENSING ELECTRONIC CONTROL UNIT (ECU) WIRING SCHEMATIC

3-AXLE/ISENSE PRO WEAR SENSOR

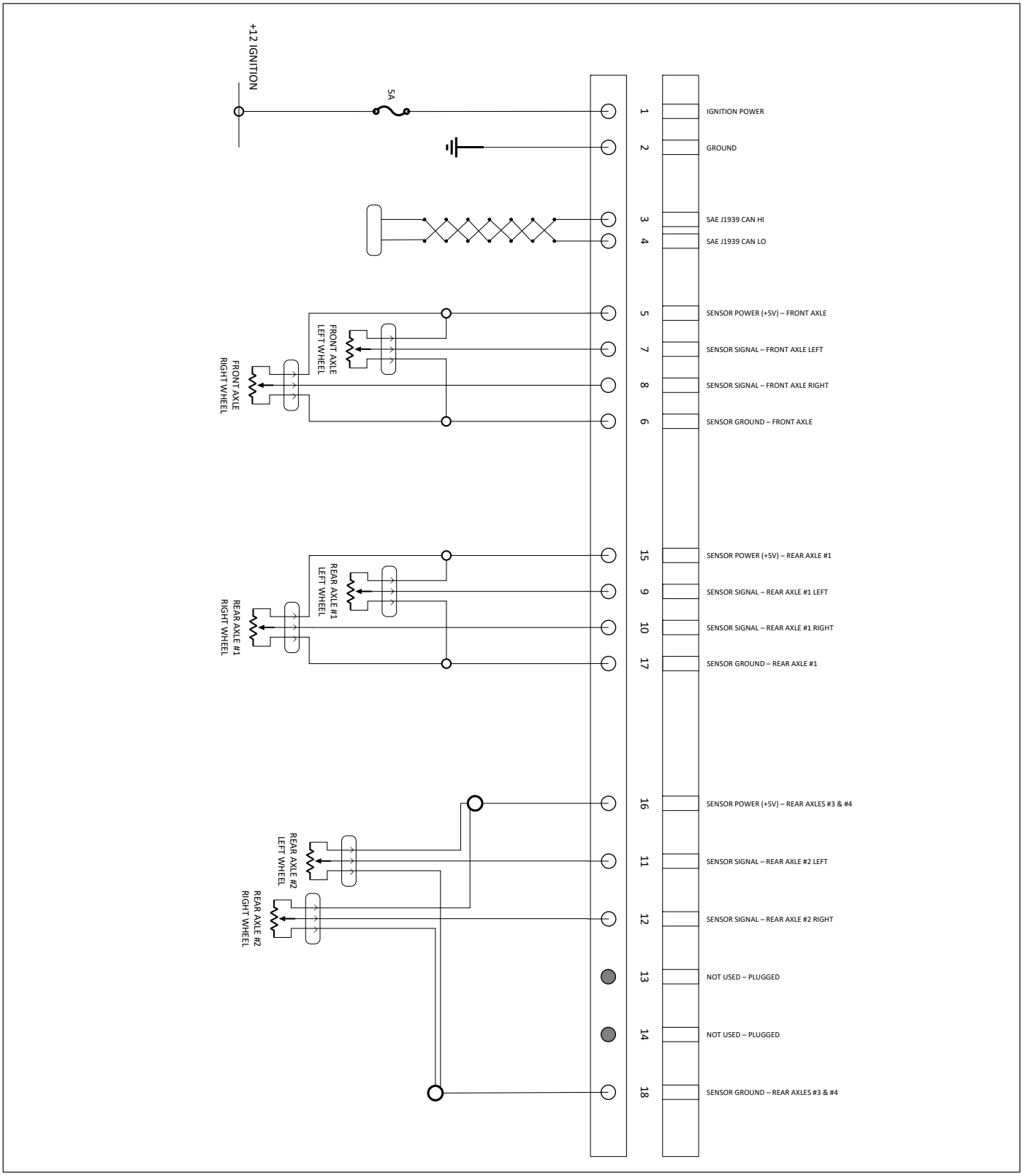


Figure 9 – 3-Axle/iSense Pro Schematic

TROUBLESHOOTING: BENDIX® AIR DISC BRAKE (ADB) WEAR-SENSING ELECTRONIC CONTROL UNIT (ECU) WIRING SCHEMATIC

3-AXLE/ISENSE WEAR SENSOR

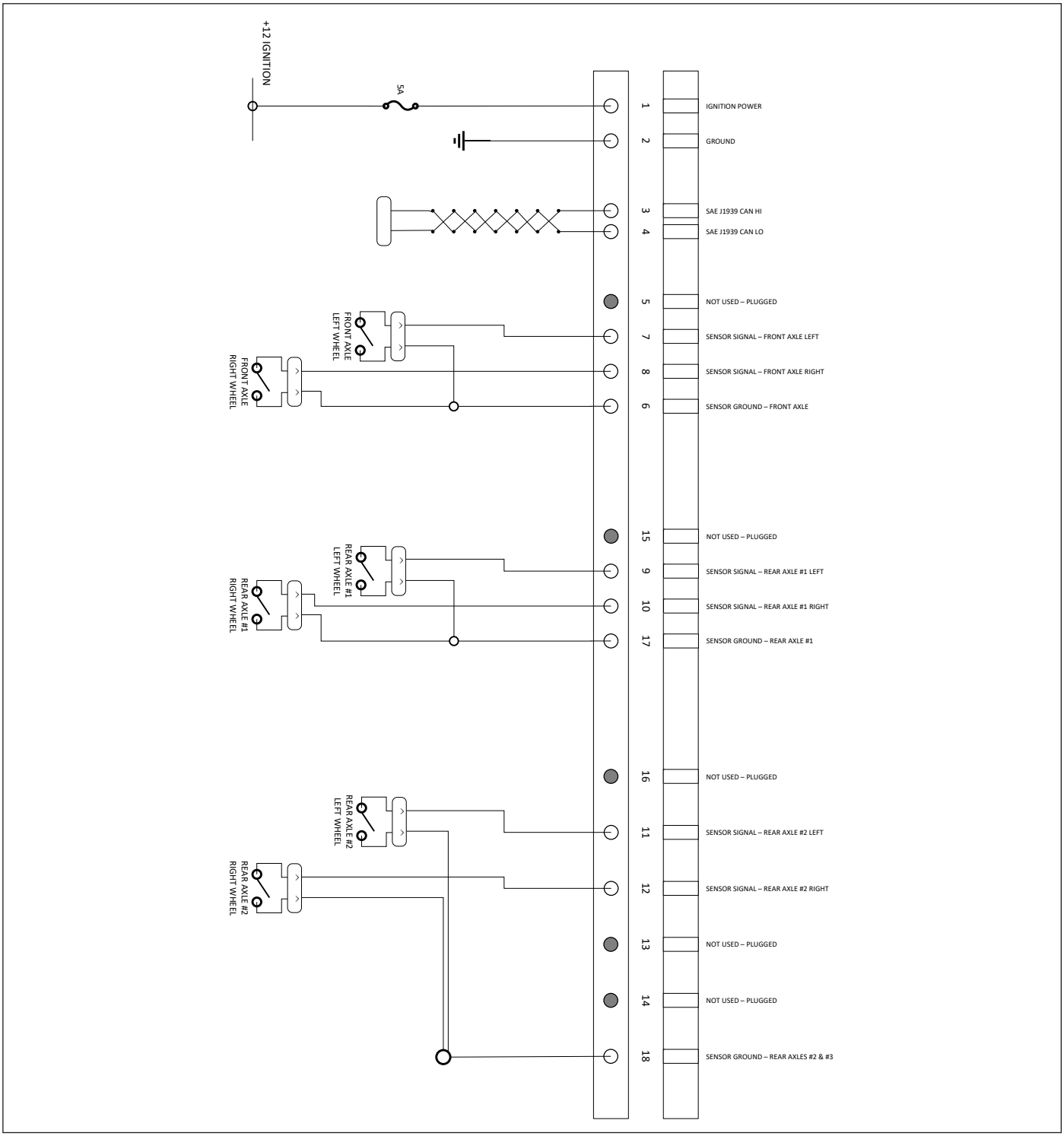


Figure 10 – 3-Axle/iSense Schematic

TROUBLESHOOTING: BENDIX® AIR DISC BRAKE (ADB) WEAR-SENSING ELECTRONIC CONTROL UNIT (ECU) WIRING SCHEMATIC

2-AXLE/ISENSE PRO WEAR SENSOR

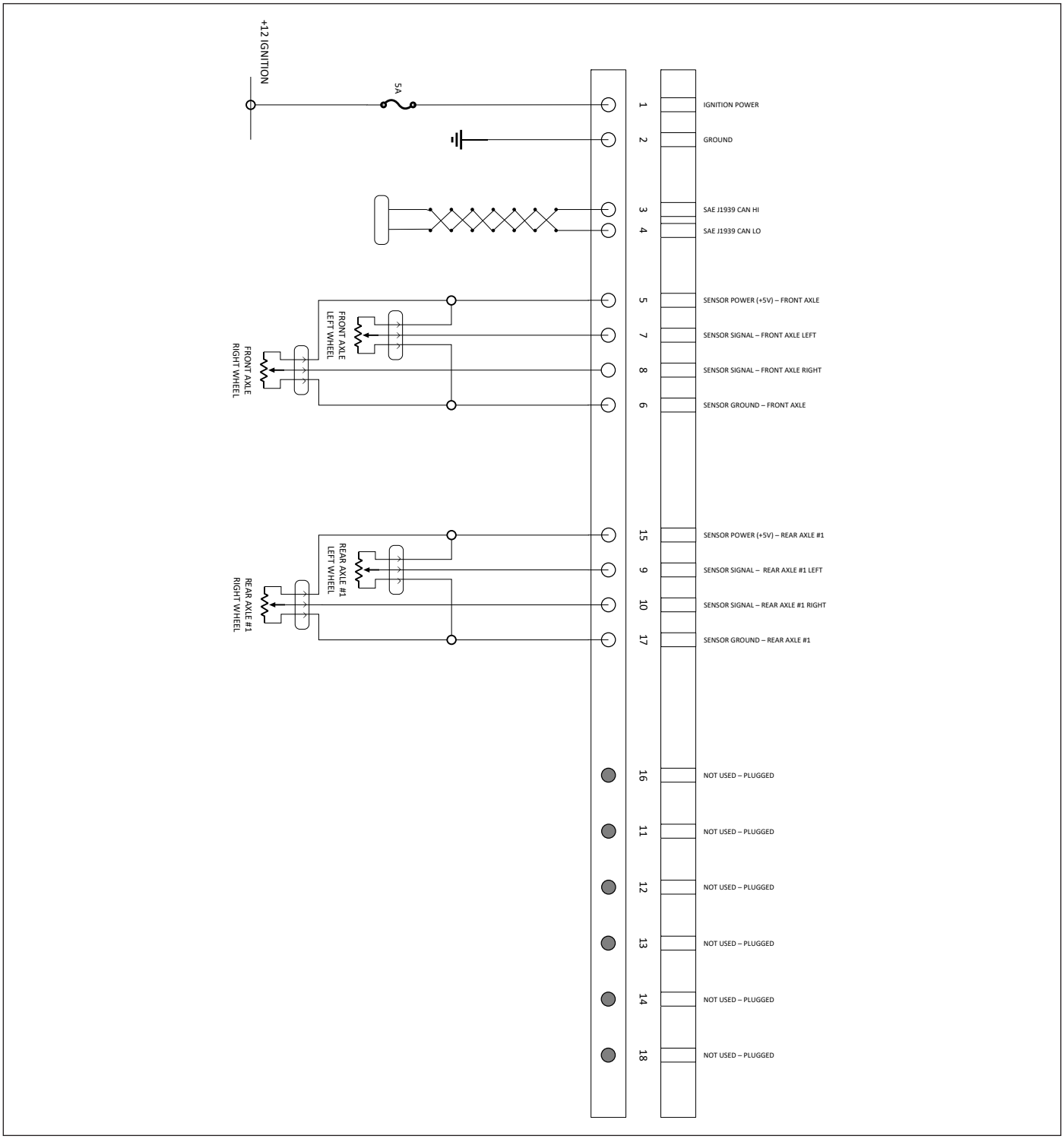


Figure 11 – 2-Axle/iSense Pro Schematic

TROUBLESHOOTING: BENDIX® AIR DISC BRAKE (ADB) WEAR-SENSING ELECTRONIC CONTROL UNIT (ECU) WIRING SCHEMATIC

2-AXLE/ISENSE WEAR SENSOR

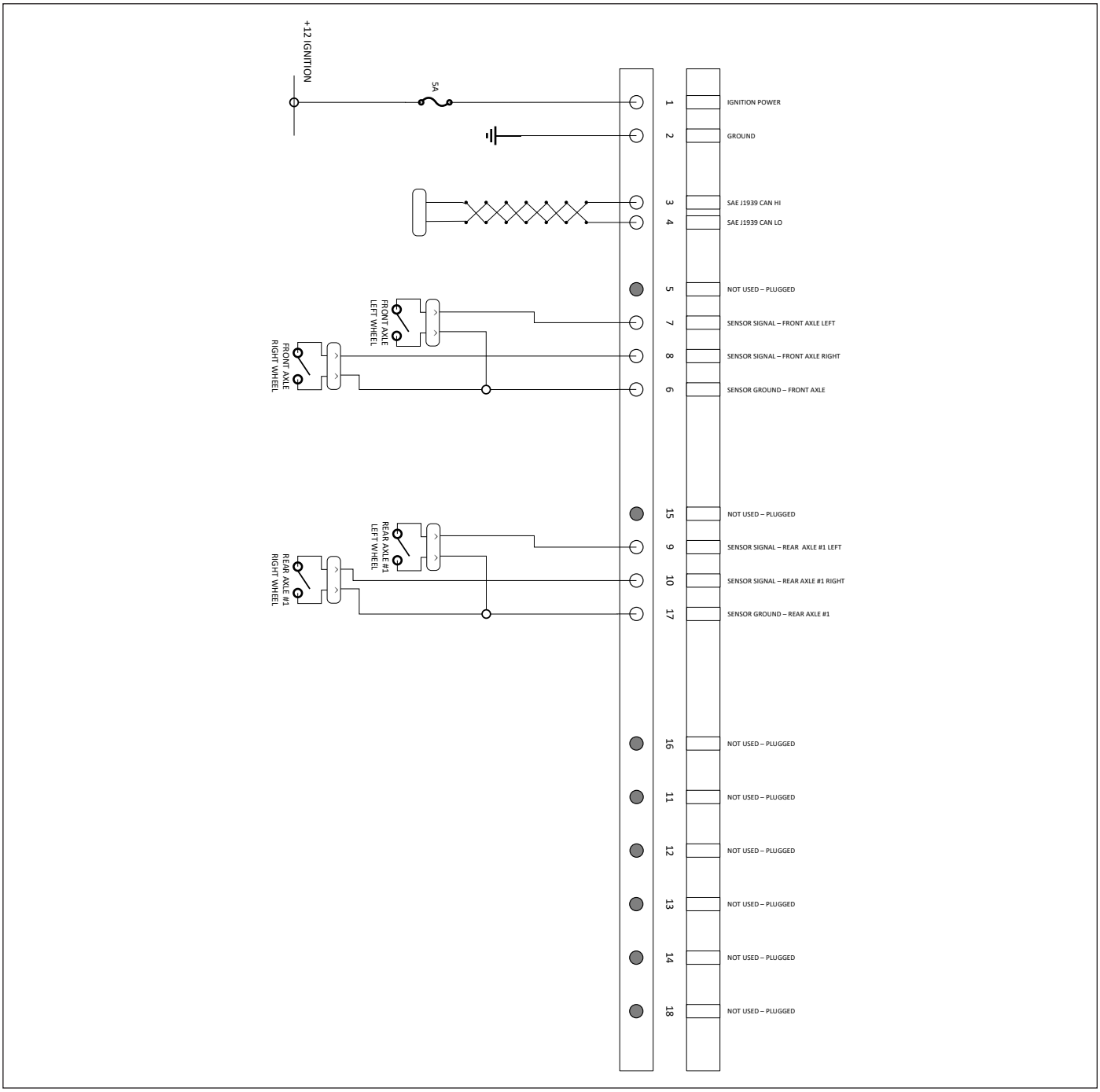


Figure 12 – 2-Axle/iSense Schematic

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