Anti-Lock Braking System (ABS)

Troubleshooting and Service Manual

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Introduction

Anti-lock braking systems (ABS) are designed to improve stability of the trailer during severe braking events. When ABS is not active, the driver brake command is passed through the module, directly to the brakes, the same as a trailer without ABS. When an individual wheel is about to lock, the ABS control module will temporarily reduce braking below the driver command on individual wheels to preserve trailer and wheel stability. When the wheel is stable, the wheel brake command will be the same as the driver command. If there is no power to the ABS module, or if a DTC is active, the trailer's brake outputs will follow the driver brake command, but the ABS will not be functional.

Safety

Read and understand all instructions before installing or operating this product. Adhere to all safety labels.

This document provides general instructions. Many variables can change the circumstances of any procedure, i.e. the degree of difficulty involved in the service operation and the ability level of the individual performing the operation. This document cannot begin to plot out procedures for every possibility, but will provide the general instructions for effectively installing, removing or servicing the system. In the event the skill level required is too advanced or the procedure too difficult, a certified technician should be consulted before performing the necessary operation. Failure to correctly install, remove or service the system may result in voiding the warranty, inflicting injury or even death.

⚠WARNING

The "WARNING" symbol above is a sign that a procedure has a safety risk involved and may cause death or serious personal injury if not performed safely and within the parameters set forth in this manual.

⚠WARNING

Trailer MUST be supported per manufacturer's recommendations before working underneath. Failure to do so may result in death or serious personal injury.

⚠WARNING

Failure to follow instructions provided in this manual may result in death, serious personal injury and/or severe product and property damage, including voiding of the component warranty.

⚠CAUTION

The "CAUTION" symbol is a sign that a procedure has a risk involved that may cause personal injury or property damage if not performed safely and within the parameters set forth in this manual.

⚠CAUTION

Moving parts can pinch, crush or cut. Keep clear and use caution.

Resources Required

- Mobile smart device
- Lippert Diagnostics App

NOTE: Lippert Diagnostics App is currently available only for Android™ smart devices on Google Play™.

Definitions

- **Actuator:** Another term for brake magnets.
- **Axle Harness:** Wire harness that contains the 23-pin connector at the ABS control module and is routed to the wheel ends of the axle. This harness also contains the two-pin factory diagnostic port.
- **Brake Magnet Main Ground:** This is the point where all brake magnets connect to the trailer chassis ground. This is either through a grounding lug directly to the frame near the module, or a wire that is routed to the front of the trailer and connected to the trailer's main battery ground.
- **Drive-Off Test:** This test checks the continuity of the brake magnets and wire harness. The ABS module will automatically run this test every hour as long as the trailer is stationary and has no brake signal from a tow vehicle. Service personnel can force a drive-off test at any time interval for diagnostics purposes.
- **Main Harness:** Wire harness that contains the 14-pin connector at the ABS control module and is routed to the front of the trailer where connections are made with power (12V+), ground (12V-) and the 7-way tow vehicle connector.
- **Power Cycle:** Disconnect the 12V source of power and make sure there is no other source of power connected, such as power from the 7-way, shore power, solar, etc. Wait 10 seconds. Reconnect power.
- **Wheel Speed Sensor (WSS):** The sensor placed on the backing plate of each brake to monitor the rotational speed of the wheel. The sensor contains a 24" pigtail with a two-pin connector.

Troubleshooting

Specific Diagnostic Trouble Codes (DTC) are stored in the memory of the Lippert ABS controller and can be viewed using the Lippert Diagnostics Mobile App.

1. Install app on mobile smart device and proceed through setup prompts.
2. Scan QR code of Lippert anti-lock brake controller. Controller will be located on either the inside left or inside right frame rail within 12" of the first axle. A QR code sticker may also have been placed in an interior cupboard or on support documentation to permit the end user to scan the code for the OneControl app connection.
3. Take note of Diagnostic Trouble Code (DTC) or codes shown and see the chart below.

ABS Troubleshooting			
DTC #	DTC: Diagnostic Trouble Code	Description	Troubleshooting Steps Recommended next steps when DTC is set
068Ah	BATTERY_TOO_LOW_TO_OPERATE	The module has entered low power non-operating mode.	• Power cycle the module. • Check battery condition. If battery is OK, charge it. If not, replace battery. • If battery is fully charged, check all power connections of the main harness. • If power connections pass inspection, disconnect the main harness 14-pin connector from the ABS module and check voltage between the battery + and battery - pins. If the recorded voltage is lower than battery voltage by two volts or more, replace main harness. • If main harness voltage is within spec, replace module.
0006h	BATTERY_VOLTAGE_HIGH	The voltage reading has exceeded the maximum allowable value to allow the module to function.	• If battery voltage is over the threshold of 30V or higher, correct source of over-voltage and replace module. If battery voltage is between 16.5V and 30V, correct source of over-voltage. • Check to see if DTC is set or clear. • If DTC is active, check voltage at battery. If voltage is over 16V, find source of over-voltage. • If voltage is under 16V, then check voltage at the 14-pin connector of the main harness (pins 1, 2 and 6). If voltage is under 16V, replace module. If voltage is over 16V at the module end of the main harness (pins 1, 2 and 6 on the harness), then replace main harness. Check to see if DTC still reads as set after replacing the power harness. Check for other signs of over-voltage or shorts in the trailer electronics and wiring. • If DTC is in history, check for other signs of over-voltage or shorts in the trailer electronics and wiring. If no source of over-voltage is found, then clear codes. Monitor to see if DTC returns.
071Eh	BRAKE_CONTROLLER_LOSS_OF_COMM_BLE_MICRO	Communication is lost from the ESP32, Bluetooth microprocessor.	• Power cycle the module. • If code remains set, replace module due to component failure.

DTC #	DTC: Diagnostic Trouble Code	Description	Troubleshooting Steps Recommended next steps when DTC is set
071Fh	BRAKE_CONTROLLER_ MODULE_FAILURE	General DTC for module failure.	• Power cycle the module. • Replace module due to component failure.
0726h	BRAKE_CONTROLLER_ MODULE_OVER_ TEMPERATURE	Brake module over temperature.	• Power cycle the module. • Determine source of heat. Remove source of heat, as possible. If problem persists, replace module.
06DBh	AXLE_1_LEFT_ACTUATOR_ OPEN	Axle 1/2/3 Left/ Right Brake Magnet Actuator circuit is open.	• Power cycle the module. • Inspect connectors and ensure complete connection at all ends of the axle harness. This includes inspecting the brake magnet main ground. If connectors are found disconnected, or a faulty ground is found, correct the issues, clear all codes and perform a drive-off test using a diagnostics tool. • If DTC returns as set, confirm axle harness is not pinched/cut anywhere, such as being caught in the suspension. Also inspect the condition and inspect for correct location of the connector contact pins at all brake connections and the 23-pin connector on the axle harness. If any issues are found, repair or replace the axle harness. • If all connectors pass inspection and DTC is still set, test particular brake magnet for proper ohm reading. If an open is found, replace brake magnet. • If no open is found, test particular brake wire for continuity from the axle harness 23-pin connector to the chassis ground. If no open is found, replace module.
06E2h	AXLE_1_RIGHT_ ACTUATOR_OPEN		
06E9h	AXLE_2_LEFT_ACTUATOR_ OPEN		
06F0h	AXLE_2_RIGHT_ ACTUATOR_OPEN		
06F7h	AXLE_3_LEFT_ACTUATOR_ OPEN		
06FEh	AXLE_3_RIGHT_ ACTUATOR_OPEN		
06DCh	AXLE_1_LEFT_ACTUATOR_ SHORT_TO_BATT	Axle 1/2/3 Left/ Right Brake Magnet Actuator is shorted to battery.	• Confirm axle harness is not pinched/cut anywhere, such as being caught in the suspension. Also inspect the condition and for correct location of the connector contact pins at the axle harness 23-pin connector. If any issues are found, repair or replace the axle harness. • If all connections pass inspection and DTC is still set, with the ABS module disconnected from the axle harness 23-pin connector, test particular brake wire for continuity between brake + and battery +. If a short is found, repair or replace affected harness. • Check main chassis ground, where battery connects to chassis. Repair if ground is loose or intermittent. • If no short is found, replace module. **NOTE:** After any repairs, clear all codes and perform a drive-off test to ensure proper corrections have been made.
06E3h	AXLE_1_RIGHT_ACTUATOR_ SHORT_TO_BATT		
06EAh	AXLE_2_LEFT_ACTUATOR_ SHORT_TO_BATT		
06F1h	AXLE_2_RIGHT_ACTUATOR_ SHORT_TO_BATT		
06F8h	AXLE_3_LEFT_ACTUATOR_ SHORT_TO_BATT		
06FFh	AXLE_3_RIGHT_ACTUATOR_ SHORT_TO_BATT		

DTC #	DTC: Diagnostic Trouble Code	Description	Troubleshooting Steps Recommended next steps when DTC is set
06DDh	AXLE_1_LEFT_ACTUATOR_SHORT_TO_GROUND	Axle 1/2/3 Left/Right Wheel Speed Sensor is shorted to ground.	• Confirm axle harness is not pinched/cut anywhere, such as being caught in the suspension. Also inspect the condition and inspect for correct location of the connector contact pins at each brake connector and the 23-pin connector on the axle harness. If any issues are found, repair or replace the axle harness. • If all connections pass inspection and DTC is still present, with the ABS module disconnected from the axle harness, test particular brake wire for continuity between brake + and chassis ground. If a short to ground is found, disconnect the affected brake from the axle harness and recheck for a short to ground. If the short to ground remains, replace the axle harness. • If all wiring on the axle harness passes inspection and DTC is still set, test particular brake magnet for a proper ohm reading and check both brake wires for continuity to a grounding point on the axle. If a short to axle ground is found, replace brake magnet. • If no short is found, replace module. **NOTE:** After any repairs, clear all codes and perform a drive-off test to ensure proper corrections have been made.
06E4h	AXLE_1_RIGHT_ACTUATOR_SHORT_TO_GROUND		
06EBh	AXLE_2_LEFT_ACTUATOR_SHORT_TO_GROUND		
06F2h	AXLE_2_RIGHT_ACTUATOR_SHORT_TO_GROUND		
06F9h	AXLE_3_LEFT_ACTUATOR_SHORT_TO_GROUND		
0700h	AXLE_3_RIGHT_ACTUATOR_SHORT_TO_GROUND		
06DFh	AXLE_1_LEFT_WSS_OPEN	Axle 1/2/3 Left/Right Wheel Speed Sensor circuit is open.	• Confirm axle harness is not pinched/cut anywhere, such as being caught in the suspension. Also inspect the condition and for correct location of the connector contact pins at the wheel speed sensor and the 23-pin connector on the axle harness. If any issues are found, repair or replace the affected parts. **NOTE:** Wheel speed sensors are continually checked by the ABS module and a drive-off test is not required to re-check for codes. • If the axle harness and all other connectors pass inspection and DTC is still set, replace wheel speed sensor. • If DTC is still set, replace module. **NOTE:** Wheel speed sensors and their pigtails are not serviceable. If the pigtail is cut or damaged in any way, the wheel speed sensor must be replaced.
06E6h	AXLE_1_RIGHT_WSS_OPEN		
06EDh	AXLE_2_LEFT_WSS_OPEN		
06F4h	AXLE_2_RIGHT_WSS_OPEN		
06FBh	AXLE_3_LEFT_WSS_OPEN		
0702h	AXLE_3_RIGHT_WSS_OPEN		

DTC #	DTC: Diagnostic Trouble Code	Description	Troubleshooting Steps Recommended next steps when DTC is set
06E0h	AXLE_1_LEFT_WSS_ SHORT_TO_BATT	Axle 1/2/3 Left/Right Wheel Speed sensor is shorted to battery.	• Confirm wiring harness is not pinched/cut anywhere, such as being caught in the suspension. Also inspect the condition and for correct location of the connector contact pins at the wheel speed sensor and the 23-pin connector on the axle harness. If any issues are found, repair or replace the affected parts. **NOTE:** Wheel speed sensors are continually checked by the ABS module and a drive-off test is not required to re-check for codes. • If the axle harness and all other connectors pass inspection and DTC is still set, with the ABS module disconnected from the axle harness 23-pin connector, test particular wheel speed sensor wires for continuity between each sensor wire and battery +. If a short is found, determine short location and replace the affected harness or wheel speed sensor. • If no short is found, replace module. **NOTE:** Wheel speed sensors and their pigtails are not serviceable. If the pigtail is cut or damaged in any way, the wheel speed sensor must be replaced.
06E7h	AXLE_1_RIGHT_WSS_ SHORT_TO_BATT		
06EEh	AXLE_2_LEFT_WSS_ SHORT_TO_BATT		
06F5h	AXLE_2_RIGHT_WSS_ SHORT_TO_BATT		
06FCh	AXLE_3_LEFT_WSS_ SHORT_TO_BATT		
0703h	AXLE_3_RIGHT_WSS_ SHORT_TO_BATT		
06E1h	AXLE_1_LEFT_WSS_ SHORT_TO_GROUND	Axle 1/2/3 Left/Right Wheel Speed Sensor is shorted to ground.	• Confirm wiring harness is not pinched/cut anywhere, such as being caught in the suspension. Also inspect the condition and for correct location of the connector contact pins at the wheel speed sensor and the 23-pin connector on the axle harness. If any issues are found, repair or replace the affected parts. • If all connections pass inspection and DTC is still present, with the ABS module disconnected from the axle harness 23-pin connector, test particular wheel speed sensor wires for continuity between both sensor wires and chassis ground. If a short is found, disconnect the wheel speed sensor from the axle harness and, if the short remains, replace the axle harness. If the short is no longer present with the wheel speed sensor disconnected, then replace the wheel speed sensor. **NOTE:** Wheel speed sensors are continually checked by the ABS module and a drive-off test is not required to re-check for codes. • If all connectors and wires pass inspection and DTC is still set, replace wheel speed sensor. • If DTC is still set, replace module. **NOTE:** Wheel speed sensors and their pigtails are not serviceable. If the pigtail is cut or damaged in any way, the wheel speed sensor must be replaced.
06E8h	AXLE_1_RIGHT_WSS_ SHORT_TO_GROUND		
06EFh	AXLE_2_LEFT_WSS_ SHORT_TO_GROUND		
06F6h	AXLE_2_RIGHT_WSS_ SHORT_TO_GROUND		
06FDh	AXLE_3_LEFT_WSS_ SHORT_TO_GROUND		
0704h	AXLE_3_RIGHT_WSS_ SHORT_TO_GROUND		

DTC #	DTC: Diagnostic Trouble Code	Description	Troubleshooting Steps Recommended next steps when DTC is set
0720h	WSS_A1L_ MECHANICAL_FAILURE	Axle 1/2/3 Left/Right Wheel Speed Sensor Mechanical Failure.	• This type of DTC will most likely accompany an "actuator short to batt" DTC. This is a symptom of an actuator shorted to battery. In that case, ***this DTC should be diagnosed only after all other DTCs have been corrected.*** • Verify particular brake has not mechanically failed and the wheel is locked and dragging. If this is true, mechanically fix the brake. Then clear the DTCs and tow the vehicle over 30 mph for at least one mile. Check for codes again. If the DTC does not return, the issue is fixed. • If the DTC returns, inspect the condition of the wheel bearings for excessive amount of play. Also inspect the "teeth" on the rear edge of the of brake drum for evidence of broken or missing teeth. Finally, clean any debris from the wheel speed sensor barrel. If any significant issues are found, make corrections and test before diagnosing further. • Confirm axle harness is not pinched/cut anywhere, such as being caught in the suspension. Also inspect the condition and inspect for correct location of the connector contact pins of the axle harness and the 23-pin connector. If any issues are found, repair or replace the axle harness. • If the DTC is still present (active or history), confirm sensor is properly mounted with proper air gap of 1.25 mm +/- 0.5 mm. If the air gap is out of range, correct the air gap using additional shims to increase the air gap or grind the existing shims to decrease the air gap. Clear DTCs and tow the vehicle above 10 kph. • If the DTC is still present (active or history), replace wheel speed sensor and set proper air gap. **NOTE:** If the trailer is being serviced and only one of the wheels is rotated longer than 10 seconds, the "mechanical failure" code may be present on all but one rotating wheel. If this happens, the code will clear when all wheels are rotated when towing.
0721h	WSS_A1R_ MECHANICAL_FAILURE		
0722h	WSS_A2L_ MECHANICAL_FAILURE		
0723h	WSS_A2R_ MECHANICAL_FAILURE		
0724h	WSS_A3L_ MECHANICAL_FAILURE		
0725h	WSS_A3R_ MECHANICAL_FAILURE		

Connector Pinout Tables

NOTE: The order of the harness wires in the diagrams is viewed from the perspective of the wires coming from the back of the harness connectors.

Main Harness Pinout		
Pin	Function	Color/Stripe
1	Battery +	Black
2	Battery +	Black
3	Right turn and stop light In	Brown
4	Right turn and stop light out	Brown/White
5	Left turn and stop light In	Red
6	Battery +	Black
7		Plug
8	Backup light	Yellow
9	Left turn and stop light out	Red/White
10	(Tow) Brake	Blue
11	(Tow) Brake	Blue
12	(Tow) Brake	Blue
13		Plug
14	Battery -	White

View Looking Into Harness Connector

Double Axle Harness Pinout		
Pin	Function	Color/Stripe
GND WIRE	Ground	White (Spliced)
1		Plug
2		Plug
3	Axle 1 far side brake	Blue/Green
4	Axle 1 module side brake	Blue/Orange
5	Axle 2 far side brake	Blue/Violet
6	Axle 2 module side brake	Blue/Yellow
7		Plug
8		Plug
9		Plug
10	Axle 1 far side WSS return	Red/Green
11	Axle 1 module side WSS return	Red/Orange
12	Axle 2 far side WSS return	Red/Violet
13	Axle 2 module side WSS return	Red/Yellow
14		Plug
15		Plug
16	CAN low	Pink
17	CAN high	Brown
18	Axle 1 far side WSS signal	Green
19	Axle 1 module side WSS signal	Orange
20	Axle 2 far side WSS return	Violet
21	Axle 2 module side WSS return	Yellow
22		Plug
23		Plug

View Looking Into Harness Connector

Triple Axle Harness Pinout		
Pin	Function	Color/Stripe
GND WIRE	Ground	White (Spliced)
1		Plug
2		Plug
3	Axle 1 far side brake	Blue/Green
4	Axle 1 module side brake	Blue/Orange
5	Axle 2 far side brake	Blue/Violet
6	Axle 2 module side brake	Blue/Yellow
7	Axle 3 far side brake	Blue/White
8	Axle 3 module side brake	Blue/Black
9		Plug
10	Axle 1 far side WSS return	Red/Green
11	Axle 1 module side WSS return	Red/Orange
12	Axle 2 far side WSS return	Red/Violet
13	Axle 2 module side WSS return	Red/Yellow
14	Axle 3 far side WSS return	Red/White
15	Axle 3 module side WSS return	Red/Black
16	CAN low	Pink
17	CAN high	Brown
18	Axle 1 left speed sensor	Green
19	Axle 1 right speed sensor	Orange
20	Axle 2 left speed sensor	Violet
21	Axle 2 right speed sensor	Yellow
22	Axle 3 left speed sensor	White
23	Axle 3 right speed sensor	Black

View Looking Into Harness Connector

Notes

Please recycle all obsolete materials.

For all concerns or questions, please contact Lippert
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