HAYES

BRAKE CONTROLLER COMPANY

G2

Electronic Brake Controller
Hayes BRAKE CONTROLLER P/N 81792K

INSTALLATION MANUAL
For trailers with 2-8 electric brakes and vehicles with 12 volt negative ground systems only.

TIP:
Special Dual-Mated "Quik-Connect" Wiring Harnesses are available for all Hayes Brake Controllers fitted with a connector on the wire leads, making connection a snap. Harnesses are available through all dealer resources.

READ AND SAVE THESE INSTRUCTIONS

» Before beginning installation, read and become familiar with these instructions.

» Leave in tow vehicle for future reference.

» IMPROPER INSTALLATION AND OPERATION COULD CAUSE PERSONAL INJURY, AND/OR EQUIPMENT AND PROPERTY DAMAGE

SAFETY SYMBOLS

WARNING
Indicates a potentially hazardous situation that, if not avoided, could result in death or serious personal injury.

CAUTION
Indicates a potentially hazardous situation that, if not avoided, could result in damage to product or property.

TIP
Contains helpful information to facilitate installation.

CAUTION:
In the automatic mode, noticeable braking is applied only when the deceleration sensor detects deceleration. With the vehicle at rest and the brake pedal depressed, there should only be slight output to the trailer brakes.

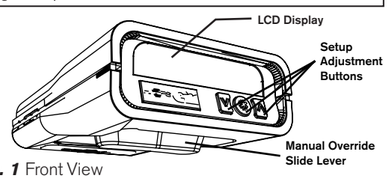


fig. 1 Front View

Mounting Angles

Mounting angles between -35 and + 90 degrees can be accommodated by the controller. THE UNIT MUST BE INSTALLED SO THAT IT IS PARALLEL WITH THE TRAVEL OF THE TOW VEHICLE AND TRAILER.

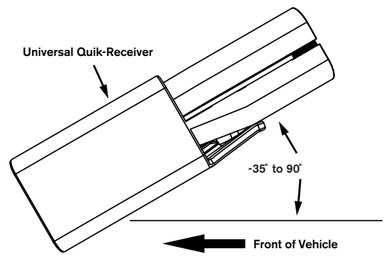


fig. 2 Acceptable Mounting Angles

Controller Mounting and Installation

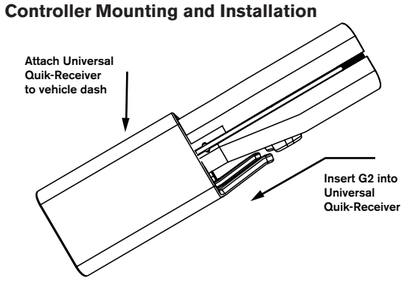


fig. 3 Attach Universal Quik-Receiver to Vehicle Dash

Controller and Universal Quik-Receiver®

» The Universal Quik-Receiver provided is to be used for mounting the controller to the tow vehicle.

» DO NOT MOUNT CONTROLLER UPSIDE DOWN OR SIDEWAYS.

WARNING:
If the controller is mounted incorrectly, the three axis accelerometer cannot operate correctly and may cause loss of braking.

Installation Steps

1. Install the Universal Quik-Receiver to a solid surface under the tow vehicle dash using the two machine screws or VHB high bonding tape applied to the Universal Quik-Receiver.
   See **fig. 2** *Acceptable Mounting Angles and* **fig. 3** *Attachment of Universal Quik Receiver.*

2. Mount in a location which allows the driver to easily apply the manual override and see the digital display.

WARNING:
All four controller wires must be connected properly for the controller to operate correctly.
Failure to properly connect all four wires can cause loss of trailer braking.
Improper wiring will destroy the controller and void the manufacturer's warranty.

CAUTION:
Care must be taken to ensure that the mounting surface is rigid enough to prevent excessive vibration.
Excessive vibration may result in poor performance.

Read all wiring instructions prior to making electrical connections to the tow vehicle.

WARNING:
To reduce the risk of injury or damage to property:
» Always connect the **white wire first** and the **black wire second.**
» All four controller wires must be connected properly for the controller to operate correctly.
» Failure to connect the wires correctly can cause loss of trailer braking.

WARNING:
The white wire must be connected to a known good ground (preferably the negative battery post).
Improper or no ground will result in poor controller performance or lack of performance altogether.
Improper ground connection can destroy the controller and void the factory warranty.

WARNING:
Improper connections may result in no trailer brakes or destroy the controller and void the manufacturer's warranty.

WARNING:
Follow wiring instructions.
Improper wiring will destroy the controller and void the manufacturer's warranty.

CAUTION:
DO NOT connect the black wire to any vehicle power supply line or fuse panel that could cause circuit overload or damage to tow vehicle wiring and vehicle electronics.
Route the black wire through a grommet hole in the fire wall to prevent grounding and away from the radio antenna to reduce any possible AM radio interference.

Controller Wiring Instructions

Important:
Make all controller wiring connections to the wiring harness before connecting the harness to the vehicle.

TIP:
Recommended use with the HBCC dual-mated harness for best results.

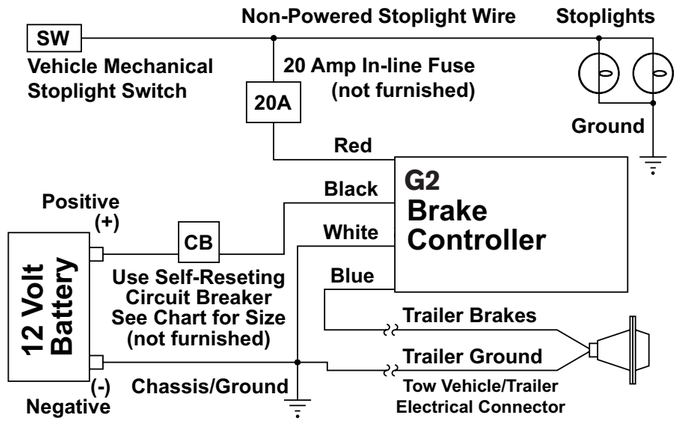
The following chart describes the function of each of the controller's wires:

Order:	Color:	Function:	Wire Size (AWG):	Connect to:
1st	White	Ground	16	Grounded metal part of firewall or directly to the negative (-) terminal of the battery. **Connect this wire first.**
2nd	Black	+ Connection to the vehicle's power system	12	Positive (+) terminal of the battery. MUST have a self-resetting Circuit Breaker in-line between the controller and the battery. See chart for proper size. Route the black wire through a grommet hole in the firewall to prevent wire grounding and away from the radio antenna to reduce any possible AM radio interference. **Connect this wire second.**
3rd	Red	Stoplight	14	Non-powered stoplight wire (of the stoplight switch) or trailer tow wiring harness. It is recommended that a 20-amp in-line fuse be installed between the controller's red wire and the stoplight switch. **The fuse is required in 1999 & later Fords.**
4th	Blue	Output to trailer brakes	12	The trailer brake wire or tow vehicle/trailer connector.

Self-Resetting Circuit Breaker Size Chart. NOTE: Each trailer brake magnet is assumed to draw 3 amps of current and each brake lamp bulb is assumed to draw 2 amps.

Number of Brake Light Bulbs (tow vehicle Plus trailer)	Number of Trailer Brakes			
	2 Brakes	4 Brakes	6 Brakes	8 Brakes
4 Bulbs (minimum)	20 AMP	30 AMP	30 AMP	40 AMP
5 Bulbs	20 AMP	30 AMP	30 AMP	40 AMP
6 Bulbs	20 AMP	30 AMP	40 AMP	40 AMP
7 Bulbs	30 AMP	30 AMP	40 AMP	40 AMP
8 Bulbs	30 AMP	30 AMP	40 AMP	50 AMP
9 Bulbs	30 AMP	40 AMP	40 AMP	50 AMP

fig. 4



Leveling the G2 Controller

1. The G2 is self leveling.
2. When the brakes are first applied, the G2 will read the level position before actual braking begins and apply the brakes proportional to the deceleration.

Special Conditions

For tow vehicles equipped with factory trailer-towing package:

» Refer to your vehicle owner's manual to determine the correct connection points for the controller.

For vehicles without a trailer-towing package:

» Refer to the wiring diagram in ***fig. 4***.

WARNING:
1989–1991 Ford Bronco, Econoline, F-Superduty, and F150-350 Series:
The red stoplight wire MUST splice into the turn signal connector harness and NOT in the stoplight switch.
Connecting to the terminal of the stoplight switch will break the switch and result in no stoplights and no trailer braking.

WARNING:
All 1999 and later Ford vehicles without the trailer wiring package:
The red controller wire must be connected to the light green wire of the brake stoplight through a 20-amp in-line fuse.
Failure to install a 20-amp in-line fuse can destroy the controller and void the manufacturer's warranty.

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OPERATIONS MANUAL
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4. Audible Alarm Mode:

The G2 brake controller has an audible alert for faults. This function can be turned off if not wanted. The default is for the audible alert to be set to ON.

Changing audible Alarm Mode (Manual and Automatic)

To do this, follow these steps (If not on the Main Screen, see the supplied Screen Menu for directions):

1. While at the Main Screen push the "enter" button to enter the setup screen, push the 'down" button until **Alarm Mode** is highlighted.
2. To turn the audible alert off select **Alert OFF** and push the "enter" button. This will return you to **Setup** screen and prevent the audible alert from being activated when a fault is detected.
3. To turn the audible alert on, follow the above instructions only select **Alert ON.**
4. Push the enter button and audible **Alert ON** is selected and the screen is returned to **Setup** screen.

5. Manual Slide Lever Operation

WARNING:
Manual operation via the manual slide lever may not disengage the Cruise Control on some vehicles

- The "Manual Slide Lever" **(Fig. 2)** is located on the bottom of the controller.
- The further the manual slide lever is moved toward the front of the controller, the greater the amount of trailer braking power.
- The manual slide lever operation is an independent circuit and overrides the maximum power setting to allow full braking power when required.
- The manual slide lever is used to apply the trailer brakes independently of the tow vehicle brakes or to override the automatic trailer brakes when more braking is required.

SAFETY SYMBOLS

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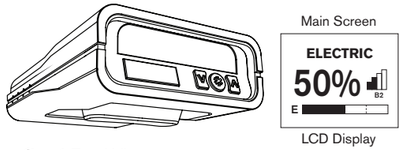
TIP
Contains helpful information to facilitate operation.

1. AUTOMATIC OPERATION

During braking, the G2 senses deceleration of the tow vehicle. An internal sensor measures the amount of deceleration and sends a proportional amount of power to the trailer brakes. The maximum braking supplied depends on the set up of the controller. The LCD display will indicate the amount of power being sent to the trailer brakes. Once the brake pedal is released, the unit will remain in the "MAIN SCREEN." While standing by and during braking, the controller will display the MAIN SCREEN: % power, voltage bar graph, brake type (electric or hydraulic) and selected Boost setting (B0-B4). Further explanation of the display is included in this document



Main Screen

LCD Display

fig. 1 Front View

- The manual slide lever is used in emergency stop situations when more braking may be required than is available with the maximum power setting or for control of excessive trailer sway.
- The tow vehicle and trailer brake stoplights will be illuminated during the manual lever activation.

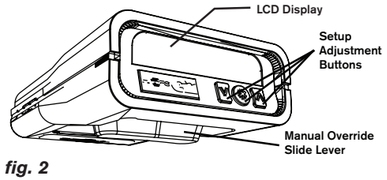


fig. 2

TIP:
It is normal to hear the trailer brake magnets "hum" when operating the trailer brakes.

6. TROUBLESHOOTING IN AUTOMATIC AND MANUAL MODES

To verify the brake controller is properly wired, follow these steps:

A. With the trailer connected to tow vehicle and vehicles at rest, make certain that the brake controller is set to the correct **BRAKE TYPE** (reference screen menu sheet).

B. From the **SETUP** screen, select **Diagnostics**. From the **DIAGNOSTICS** screen, select Troubleshoot. From the **TROUBLESHOOTING** screen, **Battery Volts**, **Stoplight Volts, Output Volts** and **Output Amps** may be selected for checking.

C. Select **Battery Volts**. Tow vehicle battery voltage will be displayed on the **BATTERY VOLTAGE** screen.

1.1 LCD Display

The LCD display shows various symbols and numbers that are used for set up and to monitor the trailer brake performance. It is also used when troubleshooting.

1.2 Definitions of Options

WARNING:
Improper adjustment of the controller could result in loss of trailer brakes, aggressive, grabby, pulsating, or delayed trailer brakes.

Power adjustments may be required based upon speed, trailer load, and road conditions.

Maximum trailer braking occurs just prior to lockup of the trailer wheels.

Trailer brake lockup could cause loss of control of the trailer and/or the tow vehicle.

1.3 Main Screen

- **During braking conditions** - the Main Screen displays the % of power, Boost setting, Brake Type and power/voltage (bar graph) being applied to the trailer brakes.
- The controller is factory pre-set to **50%** of maximum power. The scale for the power is **10%** to **100%.**
- The **BRAKE TYPE** is factory pre-set to **Electric**. For hydraulic actuated brakes, the **BRAKE TYPE** must to set to **Hydraulic**). The selected **BRAKE TYPE** is displayed **ELECTRIC** or **HYDRAULIC** at the top of the Main Screen.
- The BOOST is factory pre-set to **B2 (10%)**.

Maximum Power (for Automatic braking only):

The controller is factory pre-set to 50% of maximum power. When the controller senses maximum deceleration, the most power that the controller will send to the trailer brakes will be 50%.

D. Select **Stoplight Volts**. Voltage to the stoplights will be indicated on the **STOPLIGHT VOLTAGE** screen as either **On** or **Off.** To check for proper operation, apply enough pressure to the tow vehicle brake pedal to activate the stop lights. If the **STOPLIGHT VOLTAGE** screen indicates **On**, the brake controller red lead has been connected to the correct stop light circuit. With the brake pedal released, pull the brake controller manual slide lever toward the front of the controller. The **STOPLIGHT VOLTAGE** screen should also indicate **On**.

E. Select **Output Volts**. Pull the manual slide toward the front of the controller. The **OUTPUT VOLTAGE** screen will indicate a voltage that will vary from approximately 10% to nearly 100% of battery voltage depending on the position of the manual slide control.

F. Select **Output Amps.** Pull the manual slide toward the front of the controller. The **OUTPUT CURRENT** screen will indicate a current (amps) that will vary in accordance with the number of trailer brakes and the position of the manual slide control. With the manual slide control full on, each brake coil should draw approximately 3 amps. making this feature useful for determining if the total current draw of the trailer is within a proper range. This current reading may vary significantly due to the temperature of the brake coils.

6.1 Road Test and Performance Adjustment

To set the controller up for optimum performance with your tow vehicle / trailer combination, follow these steps:

A. Position the tow vehicle and trailer on a hard, flat, dry surface.

B. Set the controller display to the **Main Screen**.

C. When shipped from the factory, the controller's **Output** power is set to 50% and the **Boost** setting is 10% **(B2)**. For changing the **Output** power setting, refer to **"Changing Maximum Power"** section of this manual.

Changing Maximum Power for Automatic operation only (Manual operation is not affected)

Note: To change the maximum power level, the controller must be in "normal" operating mode. If the Main screen is not being displayed, see the supplied Screen Menu for directions.

The maximum power setting under non-braking conditions may be changed as follows:

1. **With the vehicle at rest**, press the "up" or "down" button and the LCD display will shows the existing maximum power setting in a percentage format (i.e. **50%**).
2. To increase the maximum power setting, press and release the "up" button. The current maximum power setting will be increased by **5%.** Continue to press and release the "up" button to increases the maximum output to the desired level. Press the "enter" button to save this setting or wait a few seconds and the displayed setting will be saved as the maximum output. The Main Screen will return and display actual outputs.
3. To decrease the maximum power setting, press and release the "down" button. The current maximum power setting will be decreased by **5%.** Continue to press and release the "down" button to decreases the maximum output to the desired level. Press the "enter" button to save this setting or wait a few seconds and the displayed setting will be saved as the maximum output. The Main Screen will return and display actual outputs.

Notes:

A. While the vehicle is moving, the maximum power setting can be changed as shown above. This procedure is not recommended if driving in traffic. This should be done in a deserted parking lot or another suitable place with no traffic.

B. After a few hours of being inactive (with or without a trailer connected), the display will go blank. While the display is blank, very little power will be used by the G2.

For changing the minimum or **Boost** level, refer to **"Changing Boost Setting"**section of this manual.

D. Accelerate to approximately 25 mph and apply the brakes in a normal manner. The vehicle should come to a stop without the trailer "pushing" the tow vehicle. A firm braking action should occur.

E. If the trailer brakes lock, decrease the **Output** power level.

F. If more braking power is needed, increase the **Output** power level.

G. Repeat this process until the desired amount of braking is achieved.

H. If needed, follow the instructions in the "**Changing Boost Setting**" section to increase or decrease the minimum power. The following guidelines should be used as a starting point for selecting this option:

Boost Setting Guidelines for Different Trailer Weights

If the Loaded Trailer weight is...	Then set the Boost to:
Much less than the tow vehicle	B0 or B1
Less than the tow vehicle	B2
Roughly equal to the tow vehicle	B2 or B3
Slightly greater than the tow vehicle	B3 or B4
Much greater than the tow vehicle	B4

TIP:
Warm trailer brakes tend to be more responsive than cold brakes.

CAUTION:
In the automatic mode and Boost setting of B0, B1 or B2, the trailer brakes are applied only when the sensor detects deceleration.

With the vehicle at rest and the brake pedal depressed, there should be no or slight output to the trailer brakes (when minimum power is set to B0, B1 or B2).

Higher at rest outputs and reverse braking can be obtained by increasing the Boost setting to B3 or B4.

2. BOOST SETTINGS:

(for Manual and Automatic operation)

CAUTION:
In the automatic mode and Boost setting of **B0, B1** or **B2**, the trailer brakes are applied only when the sensor detects deceleration.

With the vehicle at rest and the brake pedal depressed, there should be no or slight output to the trailer brakes (when minimum power is set to **B0, B1** or **B2**).

Higher at rest outputs and reverse braking can be obtained by increasing the Boost setting to **B3** or **B4**.

The controller is factory pre-set to a Boost Setting of **B2 (10%)**. At this setting, the MINIMUM amount of power that will be immediately applied to the trailer brakes is 10% (when the brake pedal is depressed and before deceleration is detected). The selected Boost setting controls the minimum power in automatic and manual operation (as a percentage of total available power).

Changing Boost Setting (Manual and Automatic)

Changing the Boost setting is designed to allow more or less power to be delivered to the brakes when the controller does not sense deceleration. See the section for loaded trailer weight guidelines and select the Boost setting required for your loaded trailer weight.

The Boost setting may be changed in **5%** increments **(B0 = off, B1 = 5%, B2 = 10%, B3 = 15%, and B4 = 20%)**

To do this, follow these steps:

1. **With the vehicle at rest**, push the "enter" button while on the Main Screen (if not on the Main Screen, see the supplied Screen Menu for directions). This will pull up the **SETTUP** screen.
2. Press the "down' button until the curser is on **Boost Mode.**
3. Press the "enter" button and the **BOOST MODE** screen will be displayed.
4. Move the curser up or down using the "up" or "down" key until the curser rest on the desired Boost setting.
5. Press the "enter" button to select the desired boost setting. The new Boost setting is now set.

Note:

The higher the Boost setting the more aggressive the braking. A setting of B0 and B1 will delay the braking output a small amount.

3. BRAKE TYPE:

Most trailers have electric brakes, but some have Electric over Hydraulic brakes. The Electric over Hydraulic brakes should not be connected to a brake controller that checks the electrical connection. For this reason, G2 brake controller needs to know the type brakes that are connected.

Changing the Brake Type:

Most trailers have electric brakes, but some have Electric over Hydraulic brakes. The following will describe how to change between Electric Brakes and Electric over Hydraulic brakes.

1. Enter the **SETUP** screen and select **Brake Type**. This will pull up the **Brake Type** screen.
2. Select the **Brake Type** that best describes your trailer (**Electric** or **Hydraulic**).
3. You will have to **Accept** to store your brake type and return to the Setup screen.

Note:

If the **WARNING/NO TRAILER** screen is displayed all the time, you must change the brake type to **Hydraulic** if this is the correct type of trailer brakes. See above for directions.

(continued below, far left)

6.2 Troubleshooting Using the display

The G2 will display warning screens to indicate problems with the trailer, tow vehicle or brake controller.

Short Circuit:

WARNING
OUTPUT SHORT
No Brakes

This indicates that the controller has sensed a direct short between the controller's output and ground**. This condition must be cleared before the controller is used.** It is usually an indication that a "hot" wire is connected to ground.

Current Limit:

WARNING
OVERLOAD
Excessive Amps

This indicates that the controller has sensed a power requirement greater than its maximum rated output but not a direct short. When this occurs, the controller will continue to supply full current (up to the maximum rating),however, the controller will begin to limit this current above this level. This could result from an intermittent short to ground in the trailer wiring, a faulty brake coil, or too many brake coils connected to the controller.

Open Circuit:

WARNING
NO TRAILER

This is an indication that there is no trailer connected to the tow vehicle. The display can be cleared by pressing any button on the controller or connecting a trailer. Connection to electric over hydraulic trailer brakes can also cause this screen to be displayed. If this occurs, the **Brake Type** must be changed from Electric to Hydraulic. Refer to Screen Menu.

Blue Wire Fault:

WARNING
BLUE WIRE FAULT
Voltage Present

This warning will be displayed when external voltage is detected on the blue wire. Removing the external voltage will clear the display. Possible causes can be the blue wire being connected to the wrong place, a short in the wiring or the connector, or a faulty or disconnected breakaway switch.

Troubleshooting

Symptom: Trailer brakes lock up

Possible Cause: Maximum power set too high
Remedy: Reduce maximum power setting

Possible Cause: Minimum power set too high
Remedy: Reduce Boost setting

Symptom: Low output to trailer brakes

Possible Cause: Maximum power set too low
Remedy: Increase maximum power setting

Possible Cause: Minimum power set too low
Remedy: Increase Boost setting

Symptom: Weak/Ineffective Brakes

Possible Cause: Overloaded trailer
Remedy: Check weight rating

Possible Cause: Loose or poor quality connections
Remedy: Inspect connections/check with meter

Possible Cause: Insufficient wire gauge
Remedy: Inspect/replace

Symptom: No output to trailer brakes (manual or automatic)

Possible Cause: Improper Wiring

Possible Cause: Improperly grounded
Remedy: Ensure that the following are grounded: controller (white wire); tow vehicle connector; trailer umbilical cord; each brake magnet

Symptom: No output to trailer brakes (automatic only)

Possible Cause: Faulty Brake Light Circuit on tow vehicle
Remedy: Troubleshoot/repair brake light circuit

Symptom: Intermittent or surging brakes

Possible Cause: Improperly grounded
Remedy: Check and repair all ground connections

Possible Cause: Out of round brake drums
Remedy: Repair/replace

Possible Cause: Worn wheel bearings
Remedy: Repair/replace

Symptom: No output to trailer brakes; ***Output Short Warning*** displayed when brakes applied

Possible Cause: Direct short to ground either in tow vehicle wiring or in trailer wiring
Remedy: Inspect and repair wiring

Possible Cause: Faulty brake magnets
Remedy: Test/replace brake magnets

Symptom: Reduced output to trailer brakes; ***Overload Warning*** displayed when brakes applied

Possible Cause: Too many brake magnets are attached to controller
Remedy: Controller only handles 1-4 axles with brakes

Possible Cause: Intermittent short to ground in tow vehicle or trailer wiring
Remedy: Inspect and repair wiring

Possible Cause: Defective brake magnets
Remedy: Test/replace brake magnets

Symptom: Trailer brakes lock up when trailer connector cable is attached

Possible Cause: Faulty breakaway switch
Remedy: Test/replace switch

Symptom: ***Blue Wire Fault Warning*** displayed

Possible Cause: Indicates presence of an unexpected 12 Volts on the blue (output) wire due to one of the following: faulty wiring; malfunctioning or disconnected breakaway switch
Remedy: Inspect wiring and breakaway switch. Ensure that there is no voltage on the blue wire when the brake pedal is not depressed.

Symptom: ***No Trailer Warning*** displayed

Possible Cause: No trailer connected
Remedy: Push any button to clear display or connect trailer

Possible Cause: Trailer with Electric over Hydraulic actuator attached
Remedy: Change **Brake Type** from **Electric** to **Hydraulic** (refer to Screen Menu)

Possible Cause: Blue controller wire not connected to correct wire
Remedy: Inspect and repair wiring

WARNING	WARNING	WARNING	WARNING
NO TRAILER	OUTPUT SHORT No Brakes	OVERLOAD Excessive Amps	BLUE WIRE FAULT Voltage Present

The warning screens are displayed when the relevant condition occurs. The screens are displayed until the situation clears or a button is pressed. When a button is pressed, the screen transitions to the SETUP screen and will remain there for a 30-second period if no other selections are made and then returns back to the warning screen.