CURT

INSTALLATION MANUAL

SPECTRUM™-2 BRAKE CONTROLLER

529022

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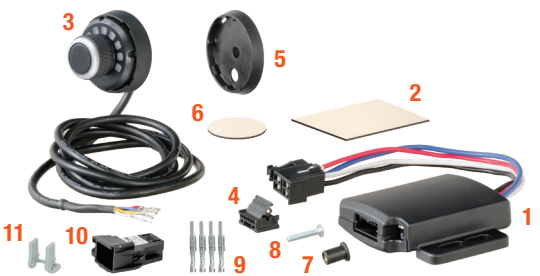


TOOLS LIST

1. Drill
2. Drill bit, 5/16" or 8mm
3. Phillips screwdriver
4. Pry tool

BEFORE YOU BEGIN

A connection harness will be required to connect the brake controller unit to the vehicle. You have two options:

1. Wire and connect the brake controller unit yourself using the supplied terminal crimps (9) and main connector (10,11).

For ease of connection, we recommend using model-specific towing e-kits with prepared brake controller connection points.

IMPORTANT: Read and follow installation manual carefully. Failure to do so could result in damage to the brake controller unit, loss of trailer brakes or poor brake performance.

Disconnect the electrical plug between the trailer and tow vehicle before testing a breakaway switch. Failure to disconnect may damage the brake controller unit. Avoid mounting the brake controller module near a CB radio or other RF transmitter.

WARNING The main module and rotary knob must be mounted firmly in place. Failure to do so could lead to improper operation and / or brake failure.

WARNING The main module's positive (with 30-amp circuit breaker) and ground wires must be connected directly to the tow vehicle's battery using a minimum of 14-gauge stranded wire. Connecting to existing wiring or an alternate ground may damage the vehicle's circuits, lead to failure of the brake controller module, loss of trailer brakes or vehicle fire.

NOTICE Removal of the factory quick plug can void the warranty.

WIRING

If you are using one of our universal connection harness kits, follow the instructions included with the connection harness kits otherwise follow the instructions below.

Disconnect the tow vehicle's negative battery terminal from its battery post before beginning the installation process. If the vehicle has been fitted with an towing harness, a brake controller connection point will already be included for ease of installation.

Check our website for the location of this connection point as well as the most suited universal or model specific connection harness.

The included main connector crimp terminals (9) need to be crimped onto the following four wires and inserted into the supplied main connector (10,11):

1. A BLACK 14 AWG wire for the power connection. Connect to the battery positive terminal using a 30-amp fused connection or circuit breaker with ring terminal.
2. A WHITE 14 AWG wire for the earth connection. Connect to the battery earth connection with a ring terminal. (Leave unconnected for now).
3. A BLUE 14 AWG wire for the brake signal output. Connect to the service brake terminal of the towing socket.
4. A RED 14 AWG wire for the brake signal input. Connect to an appropriate vehicle brake signal.

⚠ **IMPORTANT:** When passing wires through sheet metal, always go through an existing grommet. If there is no grommet, install one or use silicone sealant to protect the wires from sharp edges.

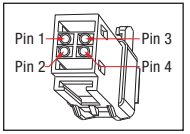
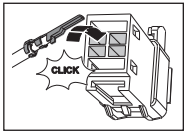


Figure 1

Pin	Color
1	Blue
2	Black
3	Red
4	White

Figure 1.1



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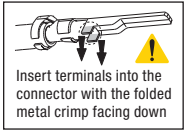


Figure 2.1

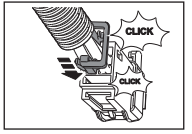


Figure 3

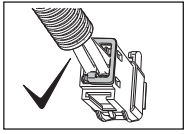
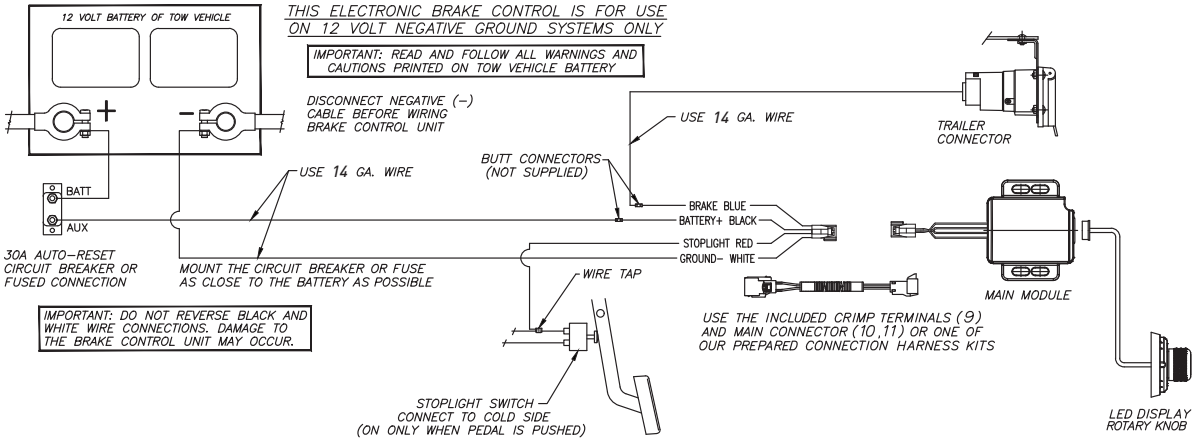


Figure 4

WIRING DIAGRAM



MOUNTING THE LED DISPLAY ROTARY KNOB

Install the LED display rotary knob before installing the main module. There are two options for mounting the LED display knob in the vehicle.

Notes: Do not insert terminals into the plug connector at this time. When inserting the LED display rotary knob into the base plate, ensure the top of the LED arc is facing the upright direction.

Base plate installation, drill mount option

1. Determine a suitable mounting location for the LED display knob.
   a. The LED display must be mounted securely to a solid surface.
   b. The LED display must be easily reached by the driver.
   c. The area behind the mounting location must be clear to avoid damage while drilling.
2. Hold the base plate in the selected position and mark the two hole locations through the base plate (Fig 1).
3. Using a 5/16" (8mm) drill bit, drill the holes at the marked locations (Fig 2). **Note:** Fig 2 - 4 show the mounting surface removed and upside down. Verify that the mounting screw hole is in the 12 o'clock position when the mounting surface is in place.
4. Insert the provided well-nut and screw into the outer hole of the base plate to secure the base plate to the dash panel (Fig 3).
5. Feed the cable of the LED display knob through the center hole. Insert the LED display rotary knob into the base plate with the LEDs in the upright position. Press down until you hear a 'click' (Fig 4).
6. Route the cable behind the dash from the LED display knob to the main module. See the 'Mounting the Main Module' section (page 8).

Figure 1 (dash panel in truck)

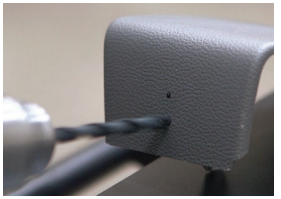


Figure 2 (dash panel removed)

Figure 3 (dash panel removed)

Figure 4 (dash panel removed)

MOUNTING THE LED DISPLAY ROTARY KNOB - *CONTINUED*

Base plate installation, surface adhesive mount option

1. Determine a suitable mounting location for the LED display knob.
   a. The LED display must be mounted securely to a solid surface.
   b. The LED display must be easily reached by the driver.
2. Place the base plate adhesive pad onto the base plate and adhere the base plate onto the dash in any of the four orientations (Fig 5).
3. Insert the LED display rotary knob into the base plate with the LEDs in the upright position. Press down until you hear a 'click' (Fig 6).
4. Route the cable coming from the LED display knob to the main module. See the 'Mounting the Main Module' section (page 8).

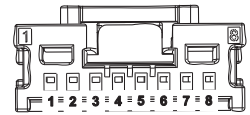
Figure 5

Figure 6

WIRING THE PLUG CONNECTOR TO THE LED DISPLAY KNOB

Refer to the plug connector image (Fig 1) for the below wire locations.
Note: Keep positions 1 and 8 empty.

Figure 1



1. No wire
2. White
3. Green
4. Brown
5. Blue
6. Black
7. Red
8. No wire

While holding the plug connector with the locking mechanism facing up, insert the terminals into the connector with the folded metal crimp facing up (Fig 2). As each terminal is fully inserted it will 'click' into place and the terminals will not pull out (Fig 3). When all six terminals are inserted into the plug connector and fully seated, close and latch the locking mechanism (Fig 4).

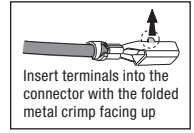


Figure 2

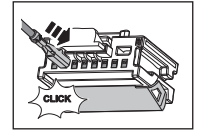


Figure 3

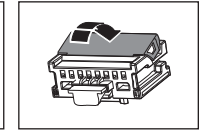


Figure 4

UNINSTALLING THE BRAKE CONTROLLER

If you wish to uninstall the brake controller, the plug connector attached to the LED display knob can be unpinned without cutting the interface cable.

Using a small flat head screw driver unlatch the two locking tabs securing the locking mechanism in place (Fig 1 & 2). Once the two locking tabs are unlatched the locking mechanism can open (Fig 3).

With the locking mechanism open, use a pin to gently pry up the plastic tab securing the terminal in place while gently pulling on the wire (Fig 4 & 5).

Repeat for all six terminals attached to the plug connector. Once all of the terminals are free the brake controller can be removed from the vehicle.

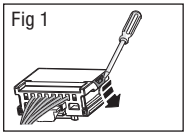


Fig 1

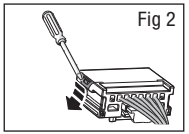


Fig 2

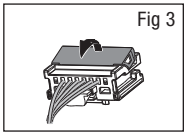


Fig 3

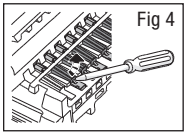


Fig 4

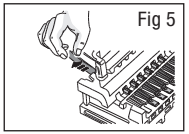


Fig 5

MOUNTING THE MAIN MODULE

1. Determine a suitable mounting location for the main module.
   a. The unit must be mounted **with the wires in a vertical orientation, with no more than 20° variance,** securely to a solid surface, preferably under the dash (Fig 1 & 2).
   b. The unit needs to be connected to the LED display rotary knob.


Fig 1

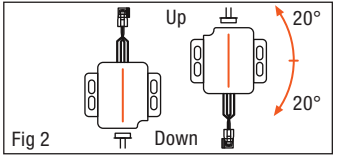


Fig 2

2. See the 'Wiring the Plug Connector to the LED Display Knob' section (page 7) before continuing the installation. Insert the plug connector attached to the LED display rotary knob into the main module.
3. See the 'Set Manual Control Output and Brake Light Switches' section (page 12) before mounting the main module. These settings may need to be accessed in the future.
4. Once the LED display rotary knob is connected, secure the main module in place using the provided main module adhesive pad and / or zip-ties. Ensure a solid mounting surface is used.
5. Plug in the main module to the pigtail harness or vehicle-specific quick plug. If harness is unavailable, hard wiring will be necessary.

MODES & INDICATORS ON THE LED DISPLAY

The LED display shows the output setting when the control is activated. It is used to setup and monitor the brake controller and can be used when trouble shooting. There are four modes of operation and three indicator sequences (shown below). See pages 9, 10 and 11 for more information.

Pressing control button switches between modes.

MODES

Manual (red) | Brightness (white) | Output (green - red) | Sensitivity (blue - red)

INDICATORS

Calibration (ramp-up) | Overloaded (flashing) | Disconnected (flashing)

Manual Control (red progression)

Manual brake controller activation is used in situations where a slow reduction in speed is desirable. As the manual control is pushed, the brake controller begins to apply the trailer brakes.

The manual control can be setup to allow 100% of the unit's power to the trailer brakes or to limit power to the output control setting. This feature is set up at installation via a small switch at the rear of the unit. See the 'Set Manual Control Output and Brake Light Switches' section (page 12). The brake controller unit is factory-set with the switch in the 'limited to the output control' position.

The output will be shown on the display when the manual control is actuated. Brake light activation with the manual control is also an optional setting. Some tow vehicle circuits do not allow power for brake lights from a second source. In these applications, the brake light feature can be switched off using a second small switch at the rear of the unit. The brake light connection (red wire) is still required to activate the Spectrum-2™ brake controller with the switch in either position. Be sure to check with your local regulations and ensure you are in compliance.

Manual Control (red progression) - *continued*

Manual
(red)

- Pressing and holding the button during any mode activates the manual brake output
- The manual output functions as time-based and ramps up over time
- The red LEDs light up in sequence proportionally to the brake output
- Adjust the gain in active process by rotating the knob clockwise to increase and counter-clockwise to decrease the gain while holding the button down
- Releasing the button returns to the previous mode

Brightness Control (white progression)

Brightness
(white)

- Default control state
- Rotating the knob clockwise will increase the brightness
- Rotating the knob counter-clockwise will decrease the brightness

Output Control (green to red progression)

The output control establishes the maximum amount of power available to the trailer brakes when braking. The only exception would be when the manual control is set up for 100% braking. See the 'Set Manual Control Output and Brake Light Switches' section (page 12).

The output control can be adjusted during initial setup, when trailer load changes, when different trailers are used or when adjustment is needed for changing road or driving conditions.

Output
(green - red)

- Rotating the knob clockwise increases braking output
- Rotating the knob counter-clockwise decreases the braking output
- Green represent lowest setting and red represent the highest setting
- After 10 seconds of no user input, the interface switches to brightness mode and the display goes to sleep.
- Pressing and holding down the button activates manual control

Sensitivity Control (blue to red progression)

The sensitivity control adjusts trailer brake aggressiveness. Sensitivity adjustment has no effect on the manual control. The sensitivity control can be adjusted for individual driver preference, trailer load changes or changing road conditions.

Sensitivity
(blue - red)

- Rotating the knob clockwise increases sensitivity
- Rotating the knob counter-clockwise decreases sensitivity
- Blue represents the lowest setting, while red represent the highest setting
- After 10 seconds of no user input, the interface switches to brightness mode and the display goes to sleep.

Calibration Indicator (ramp-up)

Calibration
(ramp-up)

- Indicates when the brake control is self-calibrating
- Occurs when power is applied to the brake controller and a trailer is connected
- The knob lights up green in clockwise sequence seven times

Overload Indicator (red and yellow flashing)

Overloaded
(flashing)

- Indicates when the brake controller is in an overload or short-circuit condition
- The LEDs flash red and yellow in sequence until the overload condition is removed

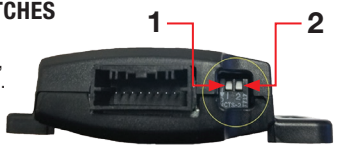
Disconnected Indicator (blue flashing)

Disconnected
(flashing)

- Indicates when the trailer has been disconnected (flashing) or if the manual control is pressed with no trailer connected (steady on as long as manual control is held)

SET MANUAL CONTROL OUTPUT AND BRAKE LIGHT SWITCHES

There are two small switches located at the front of the unit, next to the port on the module. Once accessed, the switch positions can be changed using a small pointed tool.



In the illustration above, the switch on the left (#1) controls the unit's brake light activation feature. The factory default setting is the 'ON' position with the switch down. This setting activates the tow vehicle and trailer brake lights when the manual control is actuated. Moving the switch up to the 'OFF' position turns off the brake light activation feature and the brake lights are not activated when the manual control is actuated.

The switch on the right (#2) controls the level of output available to the trailer brakes when using the manual control. The factory default setting is the 'ON' position with the switch down. This setting limits the manual control output to the level set using the output control. Moving this switch up to the 'OFF' position allows 100% of the output to the brakes when the manual control is actuated regardless of the output control setting.

INITIAL SETUP

Once all electrical connections are complete, plug the trailer's electrical connector into the tow vehicle's plug while parked on a level surface.

Connecting the trailer initiates the mounting position calibration mode. A green LED in ramp-up sequence will be seen on the LED display. To recalibrate, unplug and re-plug in the trailer's electrical connector.

Make the following preliminary adjustments with the trailer connected and engine running to ensure proper charge voltage. The vehicle must be in park or neutral with the parking brake applied, foot off of the brake pedal, and no manual control actuation.

Adjust the output by pressing the rotary knob until the brake controller is in the output control mode. Green-red LEDs will appear on the display. Rotate the knob clockwise or counter-clockwise as needed to set output control.

Adjust the sensitivity by pressing the rotary knob until the brake controller is in the sensitivity control mode. Blue-red LEDs will appear on the LED display. Rotate the knob clockwise or counter-clockwise as needed to set the sensitivity control.

TEST DRIVE & ADJUSTMENT

Both the output and sensitivity can be adjusted to achieve smooth, firm stops. Output and sensitivity adjustments should only be made while stopped, with the transmission in park or neutral, parking brake applied, foot off the brake pedal, and no manual control actuation. Output and sensitivity settings will be lit a few seconds after the adjustments are made and will then go into brightness mode.

Starting with the output adjustment, drive forward on a dry and level paved or concrete surface. At approximately 40 km/h, apply the vehicle's brakes. If trailer braking is insufficient, adjust the output control by rotating the LED display knob clockwise. If the trailer brakes lock up, adjust the output control by rotating the knob counter-clockwise. Repeat this process until stops are firm, just short of lock up.

Once the output is set, adjust the sensitivity by driving forward at approximately 40 km/h and press the brake pedal. The vehicle and trailer should make a smooth stop. If the stop seems slow and more aggressive braking is desired, adjust the sensitivity level by rotating the LED display knob clockwise. If the stop seems too aggressive, adjust the sensitivity level by rotating the knob counter-clockwise.

Make several stops at various speeds and adjust the sensitivity until stops are smooth and firm. Slight adjustment to the output control may also be desirable.

Note: If any problems occur during setup, refer to the 'Troubleshooting Guide' on the last two pages of this manual.

BENCH TEST

Parts Needed:

1. Standard 1156 automotive bulb in a socket
2. Charged 12V battery
3. Alligator clip test leads OR wire and wire nuts
4. Use the included pins in the kit

Note: If the correct pins are not available, push pins can be used to make a direct connection to the female terminals of the Spectrum-2™ quick plug housing.

⚠ CAUTION Ensure that the brake controller wires, quick plug wires, push pins and test leads do not make contact with each other or any other metal surface. Failure to do so may damage the brake controller.

Brake controller Setup

Connect the main module to the LED display using the wiring connector. Connect the quick plug to the main module to provide accessible wires for bench testing. Connect the white ground wire of the main module and the ground wire of the bulb to the negative terminal of the 12V battery. Leave the red brake input wire and blue output wire unconnected.

Connect the black battery wire of the main module to the positive terminal of the 12V battery. If the brake controller is wired properly and the Spectrum-2™ is operational, the LED display will flash blue on the edges.

BENCH TEST - *CONTINUED*

Brake Controller Setup - *continued*

Ensure the Spectrum-2™ is level to the bench surface and the control module wires are in a vertical orientation. connect the signal wire of the bulb to the blue brake output wire of the Spectrum-2™.

The LED display will ramp-up green to indicate it is checking calibration. This ensures power to the Spectrum-2™, and you can proceed to test manual control and accelerometer.

Manual Control Testing

Go to the output setting and rotate the LED display knob clockwise to its maximum setting. Go to the sensitivity settings and rotate the knob clockwise to its most aggressive setting. Activate the manual control up to its full output. While actuating the manual control the brightness of the bulb will correspond with the output shown by the brake controller. Release the manual control to deactivate.

Accelerometer Testing

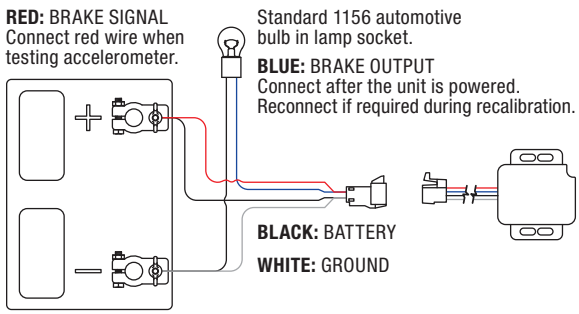
While keeping the brake controller level, connect the red brake input wire of the main module to the positive terminal of the 12V battery. The brake controller output will activate and the bulb may be dimly lit.

Slowly tilt the main module to about 45° and the brightness of the bulb will increase corresponding with the output shown by the brake controller.

Slowly tilt the main module back to level and the brightness of the bulb will decrease, corresponding with the output shown by the brake controller.

After testing, disconnect the wiring from the positive terminal of the 12V battery ensuring the exposed contacts do not make contact. If the Spectrum-2™ does not function as described during the above test steps, return the brake controller for service or replacement.

IMPORTANT: Read and follow all warnings and cautions shown on the battery.



TROUBLESHOOTING GUIDE

Condition	Display	Problem Cause	Possible Solution
LED display has no LEDs lit up		No power to brake controller, no ground, reversed black and white wire on the main module, LED display plug connector not wired correctly	Check brake controller wiring
LED display is lit red for more than 10 seconds		Red wire connected to ground side of stoplight switch or is shorted to ground	Check and repair connections (see 'Wiring' section)
LED display has no LEDs lit up to show output power when brake pedal is pushed or manual control is actuated		Brake controller unit mis-wired or contamination in trailer plug socket	Check brake controller wiring, clean and dry trailer plug
LED display shows green LED instead of red LED for output power when brake pedal is pushed or manual control is actuated		Red wire connected to ground side of stoplight switch or is shorted to ground	Check brake controller wiring, may require change to switch setting (see 'Manual Control' section)
LED display flashes red and yellow LEDs in sequence		Short in blue wire of main module or trailer plug	Locate and correct short
LED display shows purple LED ramp up		Accelerometer error	Unplug the trailer connector and plug it back in

TROUBLESHOOTING GUIDE - *CONTINUED*

Condition	Display	Problem Cause	Possible Solution
LED display shows blue LEDs at the edges		No connection between brake controller and trailer brakes - blue circuit	Confirm connection to trailer connected, confirm connector terminal positions, check trailer brakes
No trailer brakes, pedal or manual (LED display has no LEDs lit up)		Mis-wired trailer connector	Confirm trailer connector terminal position
No trailer brakes, pedal or manual (LED display flashes red and yellow LEDs in sequence		Short or overload in trailer brakes	Troubleshoot trailer brake circuit per brake manufacturer's instructions
Weak or no trailer brakes or trailer lights illuminate with brakes (LED display has no LEDs lit up)		Mis-wired trailer connector	Confirm trailer connector terminal position
Trailer brakes on all the time (LED display shows red LEDs)		Mis-wired trailer connector	Check and correct connector wire positions
No trailer brakes, pedal or manual (LED display shows flashing blue LEDs at the edges)		Loss of trailer connection, unplugged or bad wiring	Stop and check trailer connector