SYNCRONIZER®

Electronic Brake Controller
Hayes Brake Controller Company P/N 81725

INSTALLATION MANUAL

For trailers with 2-4 electric brakes and vehicles with 12 volt negative ground systems only.

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.**
- Questions on installation, adjustment, trouble shooting, or operation of brake controllers:

SAFETY INFORMATION

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.

Installation

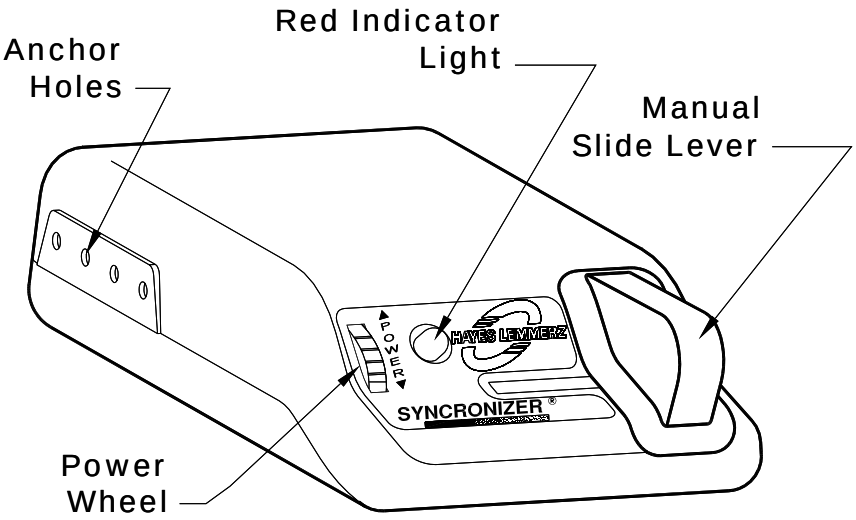

Figure 1 – front view of Syncronizer

Mounting angle and mounting direction

The Syncronizer can be mounted at any angle and in any direction. **It must be mounted in a location where the driver can see the Red Indicator Light. The driver must be able to reach and operate the manual slide.**

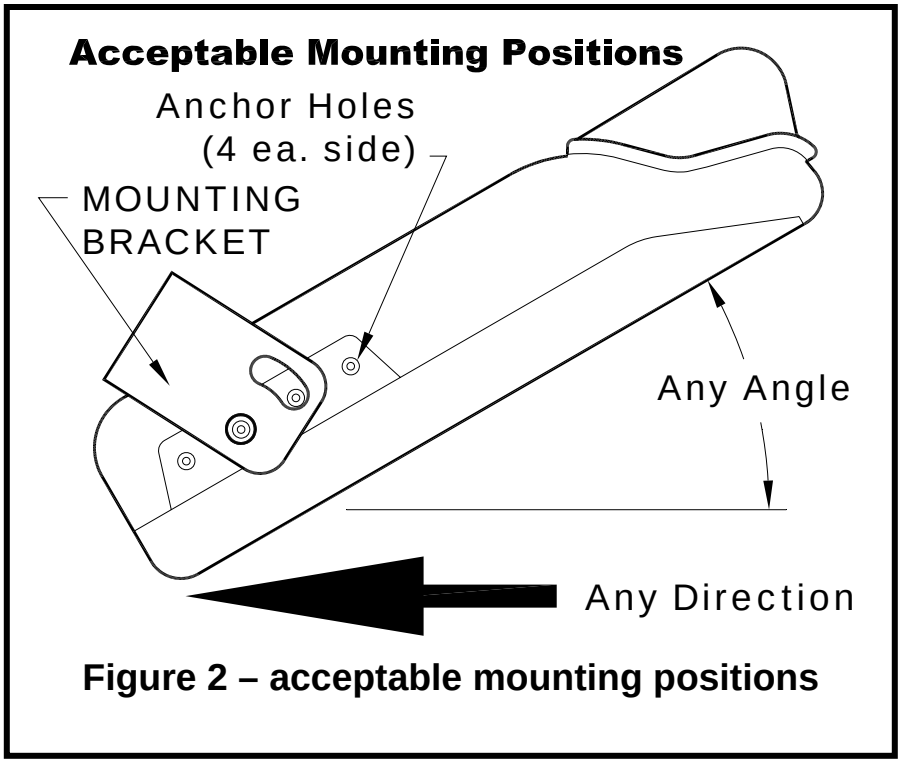

Figure 2 – acceptable mounting positions

Controller Mounting and Installation

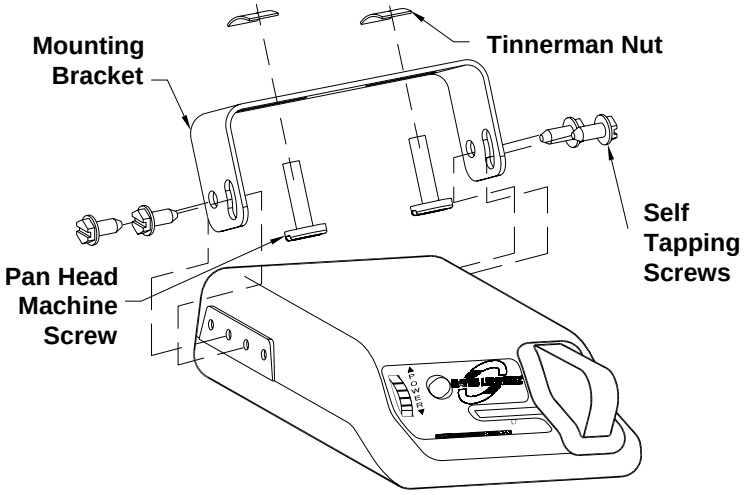

Figure 3 – attachment of Mounting Bracket

Controller and Mounting Bracket

- The bracket provided is to be used for mounting the controller to the tow vehicle.
- Use the reversible slotted bracket.
- **<u>Use only the provided screws to attach the bracket to the controller.</u>**

WARNING:

- Use of longer screws than those provided can damage the unit and cause loss of braking.

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.

Installation Steps

1. Install the mounting bracket to a solid surface under the tow vehicle dash using the two machine screws and fasteners provided. Tighten until snug. **See Figure 2 – acceptable mounting positions and Figure 3 – attachment of Mounting Bracket**.
2. Insert four of the self tapping screws provided through the mounting bracket holes and into the desired controller anchor holes. Tighten until snug.
3. **Mount in a location which allows the driver to easily apply the manual override and see the Red Indicator Light.**

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 manufacturer's 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 wire grounding and away from the radio antenna to reduce any possible AM radio interference.

Controller Wiring

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. Ask specifically for the Hayes Brake Controller Company (HBC) brand harnesses to match your controller.

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 the 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 fire wall 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 stop lamp wire (of the stop lamp switch) or trailer tow wiring harness. It is recommended that a 20-amp inline fuse be installed between the controller's red wire and the stop lamp switch. **The fuse is required in 1999 & later Fords.**
4th	Blue	Output to trailer brakes	14	the trailer brake wire or tow vehicle / trailer connector.

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

SELF-RESETTING CIRCUIT BREAKER SIZE CHART

Number of Brake Light Bulbs (tow vehicle plus trailer)	Number of Trailer Brakes	
	2 Brakes	4 Brakes
4 Bulbs (minimum)	20 AMP	30 AMP
5 Bulbs	20 AMP	30 AMP
6 Bulbs	20 AMP	30 AMP
7 Bulbs	30 AMP	30 AMP
8 Bulbs	30 AMP	30 AMP
9 Bulbs	30 AMP	40 AMP
Note: Each trailer brake magnet is assumed to draw 3 amps of current and each brake lamp bulb is assumed to draw 2 amps.		

Special Conditions

For tow vehicles equipped with factory trailer towing package:

- Refer to your vehicle-owner's manual or other information provided by the manufacturer in determining the correct connection points for the controller.
- See Appendix section for partial list of manufacturer wiring harness to controller conversions.

For vehicles without a trailer towing package refer to the wiring diagram in Figure 4.

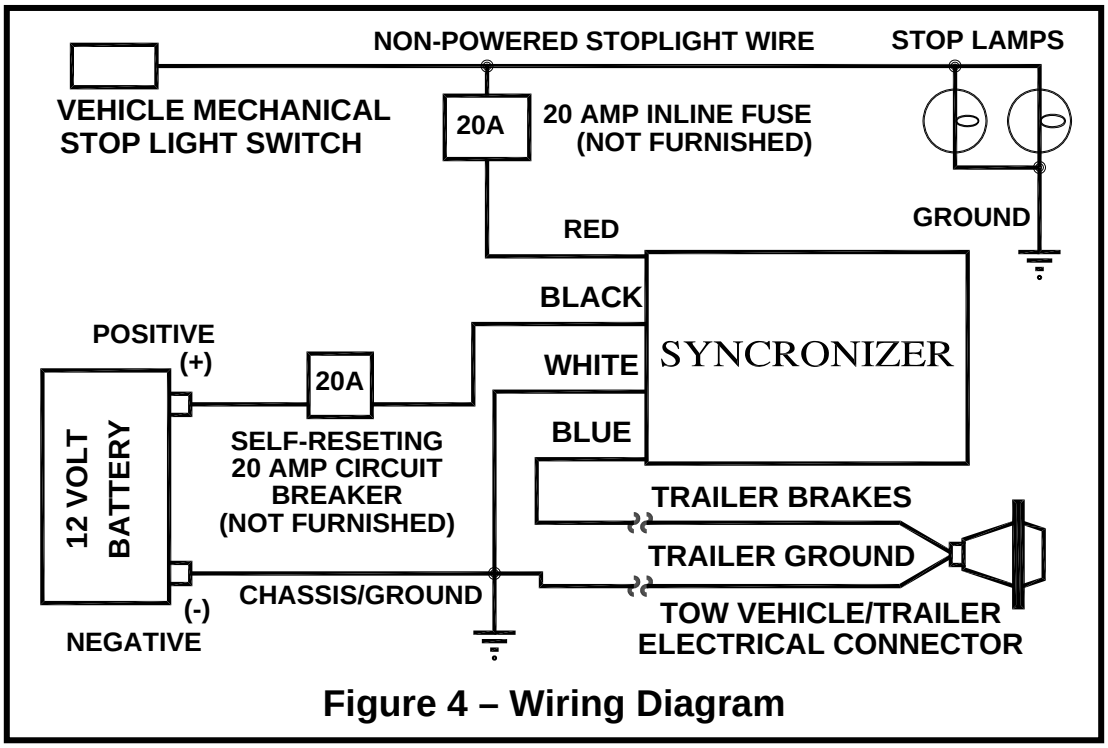

Figure 4 – Wiring Diagram

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 to the stoplight switch.
- Connecting to the terminal of the stoplight switch will break the switch's terminal 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 stop lamp through a 20-amp inline fuse.
- Failure to install a 20-amp inline fuse can destroy the controller and void the manufacturing warranty.

Appendix

OEM TOW VEHICLE WIRING CONVERSION

CHRYSLER (THROUGH 2002)	CONTROLLER	FUNCTION	CHRYSLER (NEW)
RED W/BLACK TRACE	BLACK	+12 VOLT SUPPLY	WHITE WITH RED TRACE
WHITE W/TAN TRACE	RED	STOPLIGHT	BLUE WITH WHITE TRACE
BLUE	BLUE	TRAILER BRAKES	BLUE
BLACK	WHITE	GROUND	GREEN WITH BLACK TRACE

FORD (THROUGH 2002)	CONTROLLER	FUNCTION	FORD (NEW)
RED	BLACK	+12 VOLT SUPPLY	PINK
LIGHT GREEN	RED	STOPLIGHT	RED
BLUE	BLUE	TRAILER BRAKES	BLUE
WHITE	WHITE	GROUND	WHITE
BROWN	NOT USED	ILLUMINATION	BROWN

FORD EXPEDITION	CONTROLLER	FUNCTION
RED	BLACK	+12 VOLT SUPPLY
RED/GREEN TRACE	RED	STOPLIGHT
BLUE	BLUE	TRAILER BRAKES
BLACK	WHITE	GROUND

GENERAL MOTORS	CONTROLLER	FUNCTION
RED	BLACK	+12 VOLT SUPPLY
LIGHT BLUE	RED	STOPLIGHT
DARK BLUE	BLUE	TRAILER BRAKES
BLACK	WHITE	GROUND
BROWN	NOT USED	ILLUMINATION

2004 INFINITY	CONTROLLER	FUNCTION
RED	BLACK	+12 VOLT SUPPLY
RED/GREEN	RED	STOPLIGHT
BROWN/WHITE	BLUE	TRAILER BRAKES
BLACK	WHITE	GROUND
RED/BLUE	NOT USED	ILLUMINATION

RANGE ROVER	CONTROLLER	FUNCTION
REMOVE TAIL LIGHT AND	BLACK	+12 VOLT SUPPLY
CONNECT RED	RED	STOPLIGHT
CONTROLLER WIRE TO	BLUE	TRAILER BRAKES
BLACK/BLUE TRACE, NO	WHITE	GROUND
LIGHT WITH MANUAL	NOT USED	ILLUMINATION

2004 TITAN/ARMADA	CONTROLLER	FUNCTION
RED	BLACK	+12 VOLT SUPPLY
RED/GREEN	RED	STOPLIGHT
BROWN/WHITE	BLUE	TRAILER BRAKES
BLACK	WHITE	GROUND
RED/BLUE	NOT USED	ILLUMINATION

2004 TOYOTA TUNDRA	CONTROLLER	FUNCTON
BLACK-RED	BLACK	+12 VOLT SUPPLY
GREEN-WHITE	RED	STOPLIGHT
RED	BLUE	TRAILER BRAKES
BROWN	WHITE	GROUND

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Automatic Operation

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.

The automatic mode modulates and controls the current from the battery to the trailer brakes and operates on a time-based circuitry. The longer the brake pedal is depressed, the greater the current delivered to the trailer brakes. The current will increase until it reaches the preset brake power adjustment setting.

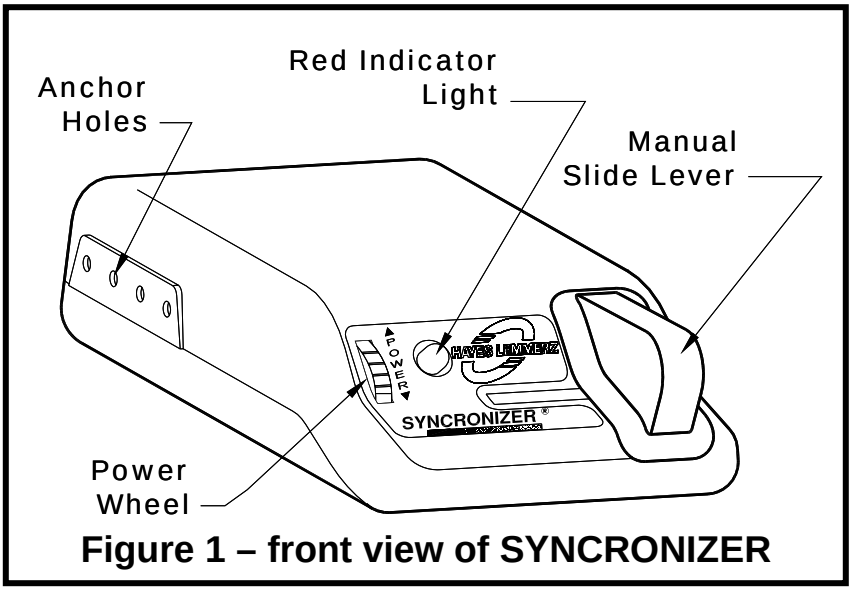

Figure 1 – front view of SYNCRONIZER

Power Wheel Adjustment (for Automatic Braking only)

- The **"Power Wheel"** (Figure 1) is located on the front left side of the controller.
- The Power Wheel is used to adjust the amount of current to the trailer brakes. It is responsible for obtaining smooth, proportional, and optimum tow vehicle and trailer brake responsiveness.
- **To increase** the amount of current, rotate the power wheel upward toward the top of the case.
- **To decrease** the amount of current, rotate the power wheel downward toward the bottom of the case.

Manual Operation

WARNING:

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

- The **"Manual Slide Lever"** (Figure 1) is located on the front right side of the controller.
- The further the manual slide lever is moved from the right to the left, the greater the amount of trailer braking power.
- The manual slide lever operation is an independent circuit and overrides the power wheel adjustment to allow full braking effort when required.
- 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 or less braking is required.
- The manual slide lever is used in emergency stop situations when more braking may be required than is available with the power wheel adjustment or for control of excessive trailer sway.
- The indicator light will illuminate from dim to bright as the manual lever is applied and remains off when the manual lever is released.
- The tow vehicle and trailer brake stoplights will be illuminated during the manual lever activation.

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

Troubleshooting using the manual slide

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

A. Disconnect the tow vehicle/trailer electrical connector. Move the manual slide lever (Figure 1) to the left. The red indicator light must become increasingly brighter and the tow vehicle stop lamps must illuminate.
B. If the red indicator light does not illuminate or glows dimly, the tow vehicle has a short to ground in the trailer brake circuit or the white ground wire is not connected to ground. Check and/or repair wiring and tow vehicle/trailer connector.
C. If the stop lamps do not illuminate, check the red stoplight wire connection of the brake controller for connections to the non-powered stop lamp wire of the vehicle stop lamp switch.
D. Connect the tow vehicle/trailer electrical connector.
E. Move the manual lever to the left. The red indicator light must illuminate from dim to bright and the trailer stop lamps must illuminate.
F. If the red indicator light does not illuminate or glows dimly, check the trailer brake magnets and trailer brake circuit (including the tow vehicle/trailer connector) for a short to ground.
G. If the trailer stop lamps do not illuminate, check and repair trailer wires, bulbs, bulb ground connections, and the tow vehicle/trailer connector.
H. Also check the red stop light wire connection of the brake controller for connections to the non-powered stop lamp wire of the vehicle stop lamp switch.

Red Indicator Light representation while brakes are applied manually

1) Dim to bright red illumination:
   - Controller operating normally with power to the trailer brakes.
2) Dim to No red illumination:
   - Faulty white ground wire connection, or faulty black battery (+) wire connection, or blue wire is shorted to ground.

Road Test and Performance Adjustments

To adjust the power wheel setting with the trailer connected:

A. Position vehicle on a flat, hard, dry surface.
B. Adjust the power wheel to the midrange setting.
C. At a moderate speed (25mph or less) push on the tow vehicle brake pedal in a normal manner. A firm braking action should occur.
D. The red indicator light should illuminate from dim to bright during the stop.
E. If more trailer braking is required, increase the power wheel. If less trailer braking is required, decrease the power wheel.
F. At a moderate speed (25mph or less) energize the brake controller by slowly moving the manual lever to the left. A much harder stop can always be obtained as the manual lever is not affected by the power wheel setting. The red indicator light should illuminate from dim to bright during the stop.

TIP:

- Warm trailer brakes tend to be more responsive than cold brakes.

Troubleshooting

Symptom	Possible Cause	Remedy
Trailer Brakes "Lock Up"	Power wheel set too high	Reduce Power wheel setting
	Pendulum leveling arm set too aggressive	Move pendulum arm to a less aggressive position. See adjusting pendulum section.
Low output to trailer brakes	Power wheel set too low	Increase Power wheel setting
	Pendulum leveling arm set too delayed	Move pendulum arm to a more aggressive position. See adjusting pendulum section.
Weak / Ineffective Brakes	Overloaded trailer	Check weight rating
	Loose or poor quality connections	Inspect connections / check with meter
	Insufficient wire gauge	Inspect / replace
	Trailer brakes out of adjustment	Inspect and adjust as needed
No output to trailer brakes (manual or automatic)	Improper Wiring	Check color codes of all wires.
	Improperly grounded	Ensure that the following are grounded: • Controller (white wire) • Tow vehicle connector • Trailer umbilical cord • Each brake magnet
	Trailer brakes out of adjustment	Inspect and adjust as needed
No output to trailer brakes (automatic only)	Faulty Brake Light Circuit on tow vehicle	Troubleshoot / repair brake light circuit
Intermittent or surging brakes	Improperly grounded	Check and repair all ground connections
	Out of Round brake drums	Repair / replace
	Worn wheel bearings	Repair / replace
No output to trailer brakes, red indicator light dim or off when brakes are applied.	Direct short to ground either in tow vehicle wiring or in trailer wiring.	Inspect and repair wiring
	Faulty brake magnets	Test / replace brake magnets
Reduced output to trailer brakes, red indicator light stops increasing in brightness with increased braking requirements.	Too many brake magnets are attached to controller	Energize III only handles 1-2 axles with brakes. Energizer XPC only handles 1-3 axles with brakes.
	Intermittent short to ground in tow vehicle or trailer wiring	Inspect and repair wiring
	Defective brake magnets	Test / replace brake magnets
Trailer brakes lock up when trailer connector cable is attached.	Faulty breakaway switch	Test / replace switch
Controller red indicator on all the time.	Indicates presence of an unexpected 12 Volts on the blue (output) wire due to one of the following: • Faulty wiring • Malfunctioning break-away switch	Inspect wiring and breakaway switch. Ensure that there is no voltage on the blue wire when the brake pedal is not depressed.
	Indicates presence of an unexpected 12 Volts on the red.	Inspect wiring. Ensure that there is no voltage on the red wire when the brake pedal is not depressed.