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**Pantera Electronics Electric Parking Brake  
Controller Installation Manual**

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***READ THIS MANUAL THOROUGHLY BEFORE STARTING THE  
INSTALLATION. IF YOU DO NOT UNDERSTAND THE CONTENT DO  
NOT ATTEMPT TO INSTALL THE ELECTRIC PARKING BRAKE  
CONTROLLER***

***IT IS MANDATORY TO USE PROFESSIONAL AUTOMOTIVE  
WORKMANSHIP FOR INSTALLING THE ELECTRIC PARKING  
BRAKE CONTROLLER***

***DO NOT APPLY ELECTRIC PARKING BRAKE WHILE CAR IS IN  
MOTION IN EXCESS OF 10 MILES PER HOUR.***

***THERE ARE NO INTERLOCKS TO PREVENT APPLYING THIS  
PARKING BRAKE SWITCH AT ANYTIME.***

***THE ELECTRIC PARKING BRAKE CONTROLLER MAY CLOSE  
BOTH CALIPERS THE FIRST TIME IT IS POWERED.  
DO NOT ALLOW ANYTHING TO BE BETWEEN THE ROTORS AND  
CALIPER PADS THE FIRST TIME POWER IS APPLIED,  
INCLUDING FINGERS !***

***IF YOU DIDN'T FINISH HIGH SCHOOL DO NOT  
ATTEMPT THIS INSTALLATION.***

***DO NOT CONTACT PANTERA ELECTRONICS CONCERNING  
OPERATION OF THE Tesla CALIPERS! SEE PAGE 2 !***

***The EPB calipers can be tested before installation, use this  
document:***

***“Tesla Electric Parking Brake Caliper Test Manual”***

**DO NOT CONTACT PANTERA ELECTRONICS CONCERNING OPERATION OF THE Tesla CALIPERS !**  
**The calipers were removed from Tesla vehicles due to possible failure of the mechanical gear drive including the lead screw. This problem can permanently destroy the EPB Controller.**  
**Read the notice below !**

## Part 573 Safety Recall Report

17V-260

Page 2

### Description of Defect :

**Description of the Defect :** The Brembo electric parking brake calipers on some Tesla vehicles may contain an internal gear that was improperly manufactured by our supplier and could fracture under loads that occur during parking brake application. This gear transmits motion of an electric motor into motion of the brake pads. If this gear fractures, the electric motor will be unable to move the brake pad and the affected parking brake caliper will be unable to be released. The parking brake system on the affected vehicles includes electric parking brake calipers on each rear wheel, which are separate and independent from the vehicle's service brakes. There have been no reports of the parking brake system failing to hold a parked vehicle or failing to stop a vehicle in an emergency as a result of this condition. The condition has not resulted in any injuries or crashes.

FMVSS 1 : NR

FMVSS 2 : NR

**Description of the Safety Risk :** A parking brake that cannot be released can result in an inability to move a parked vehicle. Should the gear fracture prior to full parking brake engagement, the affected parking brake caliper may have less than the intended holding force, but Tesla is unaware of any instances where a vehicle was able to move as a result of this condition.

**Description of the Cause :** A small percentage (1-2%) of the subject gears may have been setup pieces rather than regular production pieces. The gear is a sintered part, and setup pieces may have been subject to a non-standard pressing operation, which could result in cracks in the powdered pieces prior to sintering.

**Identification of Any Warning that can Occur :** When attempting to release the parking brake, an alert will appear that reads "Parking Brake Did Not Release - Contact Tesla Service." When applying the parking brake, an alert will appear that reads "Parking Brake Needs Service - Car May Be Free Rolling."

### Supplier Identification :

#### Component Manufacturer

Name : Brembo North America  
 Address : 47765 Halyard Drive  
 Plymouth MICHIGAN 48170  
 Country : United States

SB-17-33-002

R2

November 10, 2017



Tesla, Inc.  
Service Bulletin

## Replace Parking Brake Calipers

**Classification** Recall Bulletin    **Section/Group** 33 - Brakes    **Country/Region** All

**Year** 2012-2017    **Model** Model S, Model X    **Version** All

*This Service Document supersedes SB-17-33-002 R1, dated 29-Jun-17. Each content change is marked by a vertical line in the left margin. Discard the previous version and replace it with this one.*

**Bulletin Classification:** This Recall bulletin must be applied to all vehicles listed below. Recall Bulletins are mandatory service procedures that must be carried out by Tesla-certified Service Centers only. Work must be logged and tracked by Tesla Service. Any work carried out by uncertified technicians on this issue may not be appropriately performed or recorded and could lead to an unsafe condition and/or void warranty provisions.

### Condition

A gear inside the parking brake caliper could break while the parking brake is being applied. If this occurs, the parking brake motor will be unable to move the brake pad and the affected parking brake will be unable to be released or further applied.

### Correction

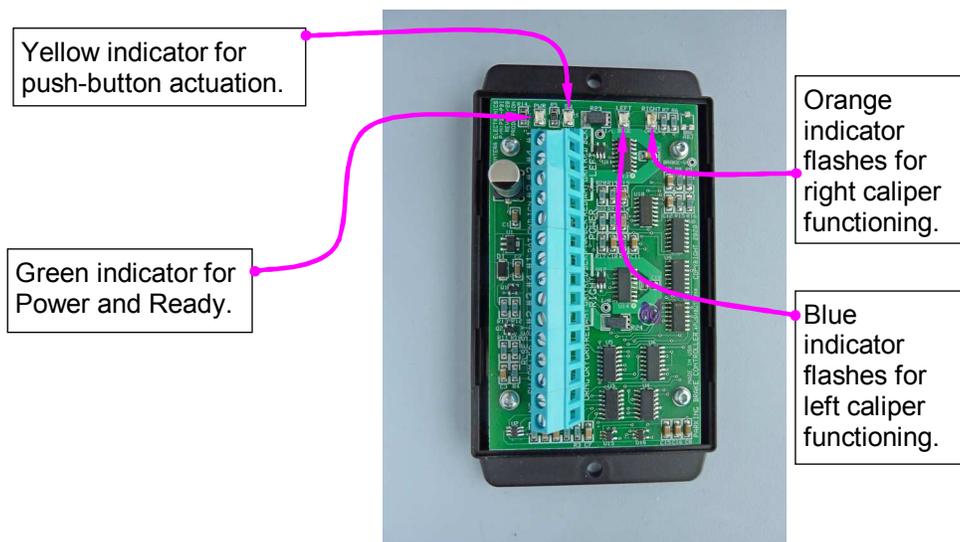
Replace the LH and RH parking brake calipers.

Correction Description	Correction	Time (Model S)	Time (Model X)
Replace LH and RH Parking Brake Calipers - Gear Recall	S011733002	0.80	0.65

Required Part(s):	Part Number	Description	Quantity
	1021251-S0-A	PARKING BRAKE CALIPERS AND PADS KIT	1

## ***Electric Parking Brake Controller Features and Operation***

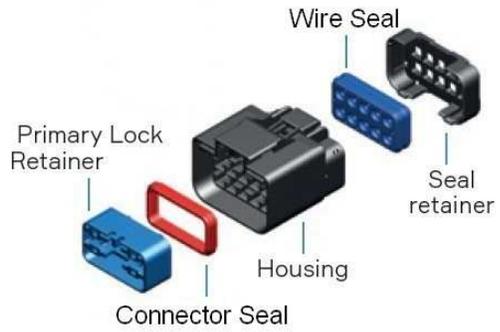
- > The **Push Button** version requires one momentary switch with normally open contacts. Press once to “SET” and press again to “RELEASE” the electric parking brake.
- > The **Hand Lever** version is to operate from a factory parking brake hand lever with a normally open contact switch. Lift the lever to “SET” and lower lever to “RELEASE” the electric parking brake calipers.
- > Independent monitor and control for left and right calipers with connections for green LED indicator for “RELEASE” and red LED indicator for “SET” parking brake.
- > The EPB Controller closes the caliper to a specific pressure and releases to a specific distance. EPB Controller automatically compensates for any brake pad wear.
- > Simple installation with Pantera Electronics installation kit which includes mating connectors, terminals for the calipers and 25 feet (7.62 meters) of 4 wire cable.
- > Internal indicators for proper installation and verification of each caliper operation.
- > Optional push button with internal LED indicator, RED for “SET” and GREEN for “RELEASE”.



## EPB Caliper / Connector Wiring

The wire size between the EPB switch and the calipers **must be 16 AWG, not larger or smaller AWG.**

Female terminal for Tesla / Brembo EPB caliper.



Female connector for Tesla/Brembo brake caliper

## EPB Installation Kit

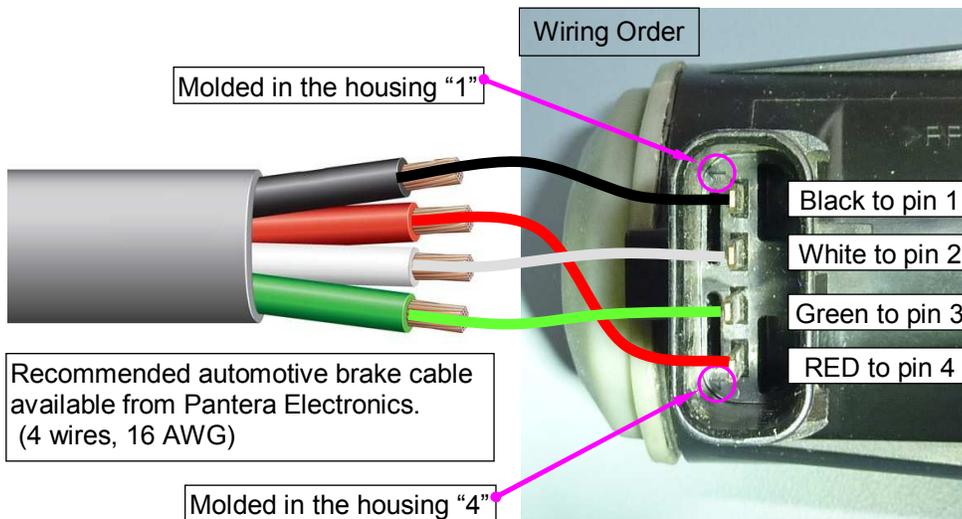
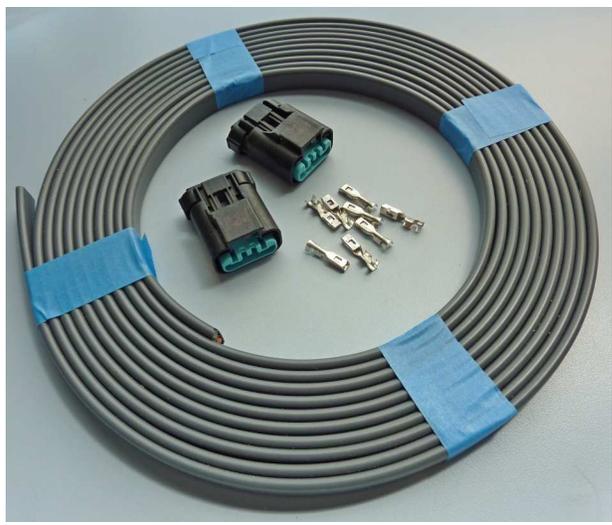
Part # EPB-KIT

An installation kit from Pantera Electronics consists of the following:

(1 length) 4 conductor, 16 AWG wire brake cable, 25 feet long.

(2) Compatible connectors for the Tesla / Brembo caliper.

(8) Terminals for the caliper connectors.



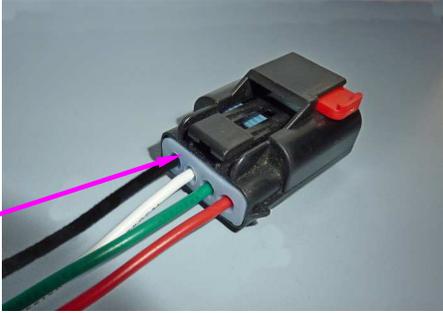
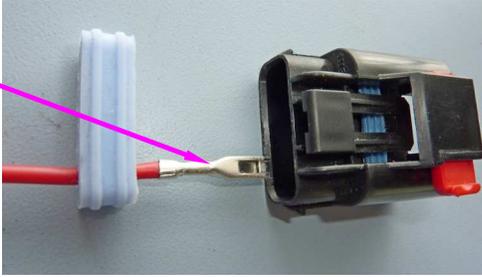
**Installing Wires Into the Connector**

Crimp a terminal on each wire of the cable. Insert the wire with terminal into the HOUSING. Note the correct origination of the terminal.

Do this for all 4 wires.

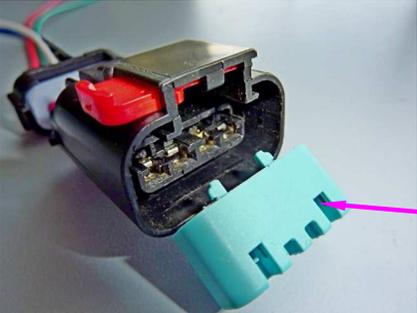
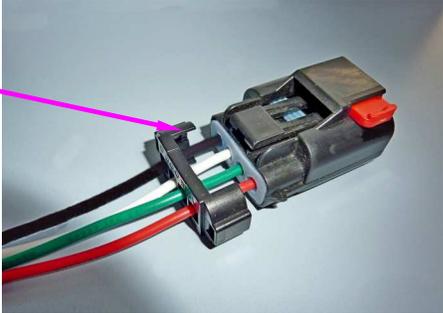
A click will be heard when the terminal seats properly.

Slide the WIRE SEAL over the wires.



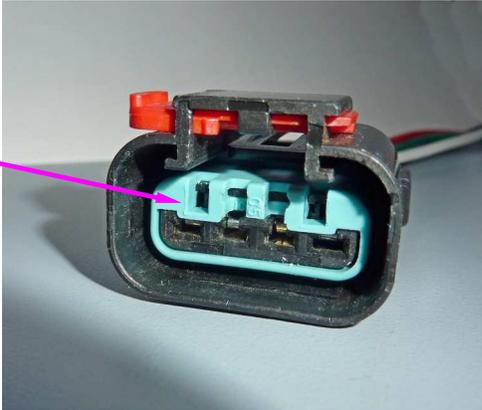
Slide the WIRE SEAL and press into the HOUSING.

Slide the SEAL RETAINER and press to the HOUSING, a click will be heard when the SEAL RETAINER is latched.



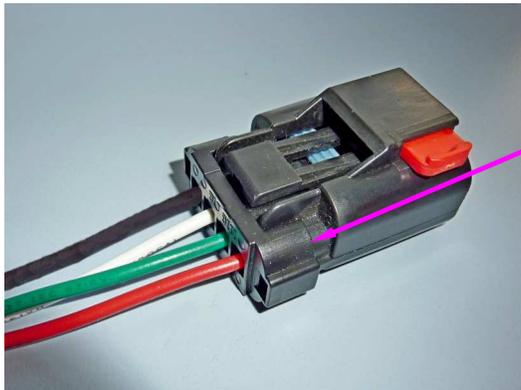
Position the Primary Lock Retainer as in picture.

Press the PRIMARY LOCK RETAINER over the Housing until it seats flush with the end of the HOUSING.

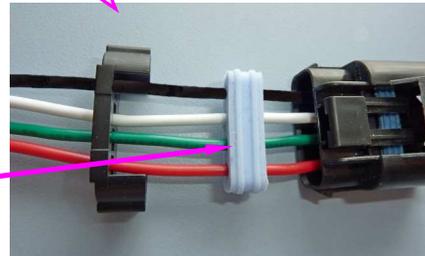


**Disassembling the Connector or Removing Wires From the Connector**

To disassemble the connector or if a wire with a terminal needs to be removed from the housing do the following.  
Remove the WIRE SEAL by prying the end of the WIRE SEAL inserting a small screw driver in the place as indicated in picture.

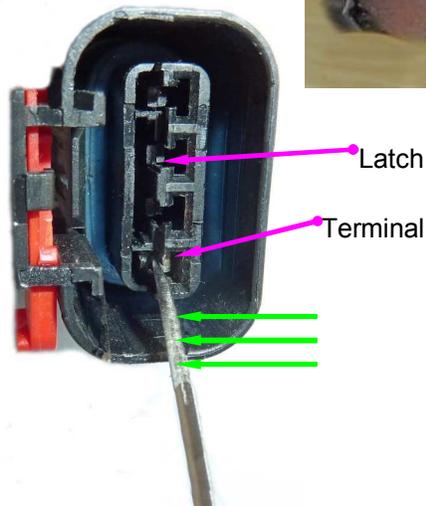
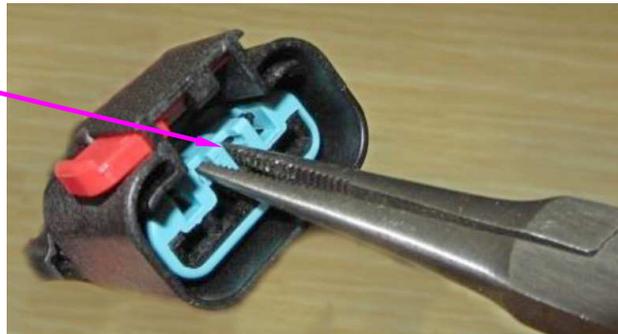


Pry outward from HOUSING.



Pry the WIRE SEAL out of the HOUSING and slide back.

Remove the PRIMARY LOCK RETAINER by grasping in the center as in picture. Gently rock the PRIMARY LOCK RETAINER while pulling.



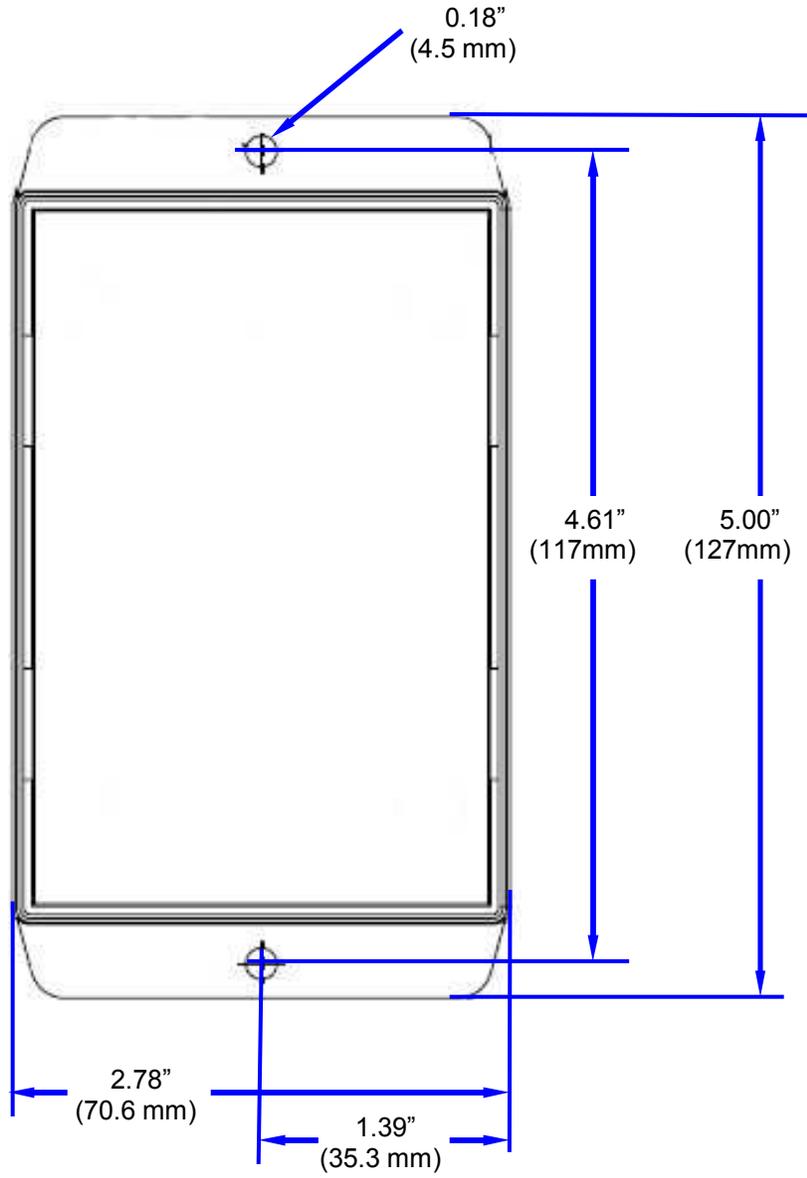
The wire terminal is retained in the HOUSING by a latch that must be moved slightly. It can be gently pushed with a paper clip wire or a pick.

Push in the direction of the green arrows and pull the terminal from the backside.

**Mounting Dimensions** (drawing is not to scale)

This enclosure is NOT sealed and NOT rated for wet conditions or impact from debris. Mounting location should be in a protected area.

RTV sealant can be used but condensation may form internally so leave some area not sealed as a vent.



## Opening the Enclosure

There are 4 internal latches that retain the lid to the base of the enclosure. The latch positions are located on the sides of the lid indicated by small round mold pin marks. (at arrows in picture)

Squeeze the sides of the lid approximately center on the side and pull the lid from the base.

To replace the lid align the latches to the slots in the base and press together.



**NOTE:** It's important to keep this installation manual for future reference since revisions to this product change the contents of the installation manual.

### Disclaimer

The products from Pantera Electronics have been design and manufactured with the best quality components known to the engineer. The installation instructions have been written to assist the owner in the proper use and installation of the products. Pantera Electronics can not be held responsible or held liable for the interpretation or incorrect implementation of the products.

**Disconnect the Battery by removing the negative (-) or ground cable from the battery terminal before connecting the Electric Parking Brake Controller.**

***EPBC Wiring and other important installation notes.***

The wiring between the EPBC and the calipers must be 16 AWG, not larger or smaller AWG. A 25 foot long 4 wire cable brake cable and compatible connectors for the Tesla / Brembo calipers are available from Pantera Electronics in the Installation Kit for Tesla/Brembo calipers.

The wiring between the EPBC and the power source to a terminal PINK "IGNITION" should be 16 AWG with a 15 amp fuse in series with the EPBC.

The ground wire, BLACK must be 16 AWG with a ring terminal and internal/external tooth lock washer mounted to the chassis on a paint free area.

**The PINK "BAT" connection is required to be powered all the time, this is necessary.** The current consumption is very low and will not be an issue.

The PINK "BAT" terminal maintains the memory for the EPBC to remember if the calipers are open or closed. When this terminal is not powered then re-powered the EPBC will not "know" in what position the calipers are in.

It may take several cycles of operating the calipers before the EPBC is synchronized with both calipers.

If the EPBC does not synchronize with both calipers then there maybe a problem with the calipers.

The Tesla / Brembo calipers may possibly have broken gears that would not allow proper movement of the calipers.  
See Tesla documents on page 2.

**ONLY LED indicators can be connected to the "RED" and "GREEN" terminal block positions. Incandescent indicators will not operate.**

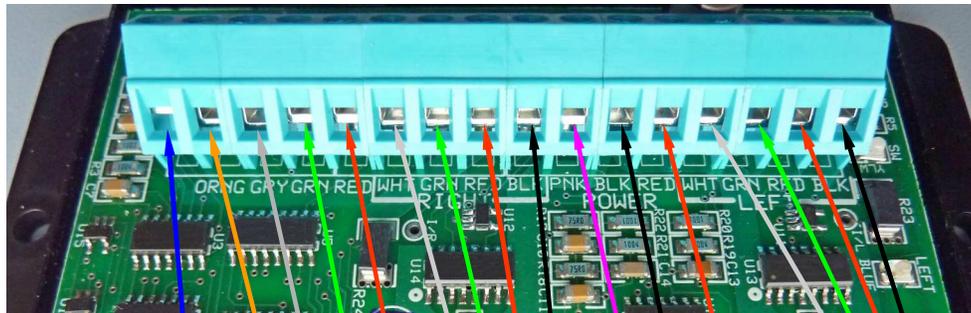
The LED "RED" and "GREEN" terminal block connections are current limited allowing 2 wire bidirectional LED's to be directly connected without a resistor.

If using 2 individual LED's are used then a 150 ohm resistor must be used for the "GREEN" terminal block connection.

***Inter-locks***

**Do not add electrical modifications or interlocks to any of the caliper cable wires, the caliper wires MUST wire directly to the controller. This can permanently damage the EPB Controller !**

## Terminal Layout



No connection

Connect ORNG to the un-marked terminal on the push-button switch. OR connect to the Hand Brake Lever switch.

Connect GRY to the un-marked terminal on the Push-Button and indicator. Or connect to the Hand Brake Lever switch.

Connect GRN RLSE to the (-) terminal on the push-button.

Connect RED SET to the (+) terminal on the push-button.

Connect to WHT, GRN, RED, BLK wires from RIGHT caliper

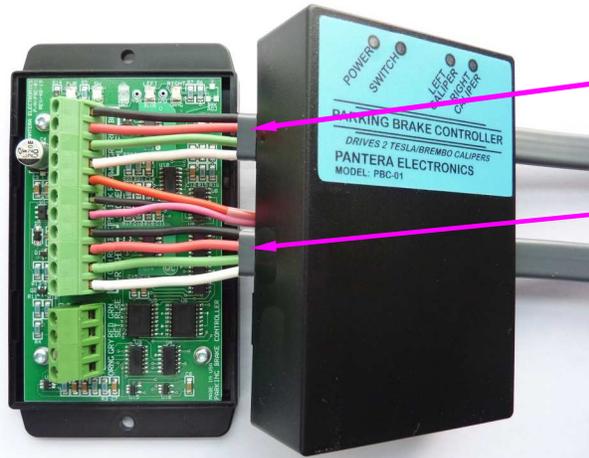
Connect PINK "BAT" 18 AWG wire to fuse that is **powered at all times**.

Connect to WHT, GRN, RED, BLK wires from LEFT caliper.

Connect RED 16 AWG wire to fuse that is "ON" in the ignition position IGN.

Connect a BLK 16 AWG wire to chassis ground with ring terminal and lock washer to GND.

## EPBC Wiring Layout



The brake cable in the picture is the 4 wire cable that is provided in the Pantera Electronics Installation Kit for the Tesla / Brembo calipers.



To use the grommets most effectively, group the wires as in the picture.

Top Grommet:  
Left caliper cable.  
RED power wire.  
BLACK power wire.  
PINK power wire.

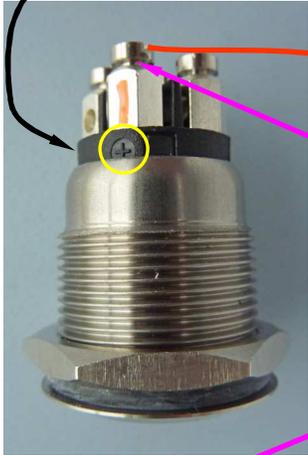
Bottom Grommet:  
Right caliper cable.  
GREY indicator wire.  
GREEN indicator wire.  
RED indicator wire.  
ORANGE switch wire.

Ring terminal, blue for 14-16 AWG wire and internal/external tooth lock washer.



### **EPB Controller Push-Button Switch Wiring with dual color LED Ring.**

Note: Dual color push-button has BLACK plastic body



There are 4 terminals on the push-button switch:

- (+) LED terminal
- (-) LED terminal
- (2) Un-marked switch terminals.

Use 18 AWG wire to connect push-button (+) LED terminal to RED SET on EPBC.

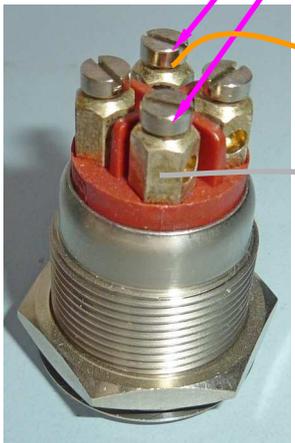
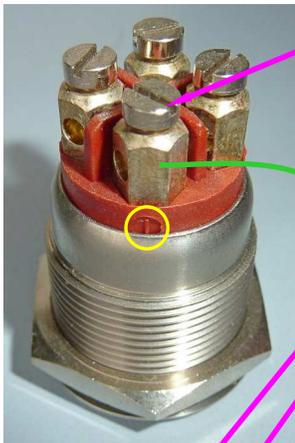
Use 18 AWG wire to connect push-button (-) LED terminal to GRN RLSE on EPBC.

Use 18 AWG wire to connect push-button un-marked terminal to ORNG on EPBC.

Use 18 AWG wire to connect push-button un-marked terminal to GRY on EPBC.

### EPB Controller Push-Button Switch Wiring with Red LED Ring.

Note: Single color RED push-button has red plastic body



There are 4 terminals on the push-button switch:

- (+) LED terminal
- (-) LED terminal
- (2) Un-marked switch terminals.

Use 18 AWG wire to connect push-button (+) LED terminal to RED SET on EPBC.

Use 18 AWG wire to connect push-button (-) LED terminal to GRN RLSE on EPBC. Note a 150 Ohm resistor must be used for the green wire connection.

Use 18 AWG wire to connect push-button un-marked terminal to ORNG on EPBC.

Use 18 AWG wire to connect push-button un-marked terminal to GRY on EPBC.



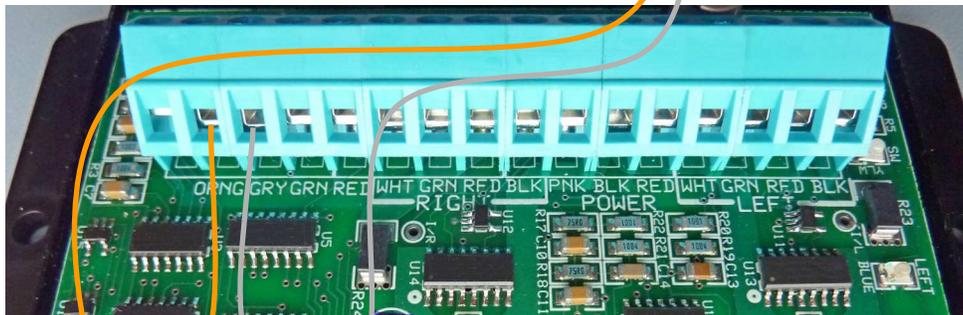
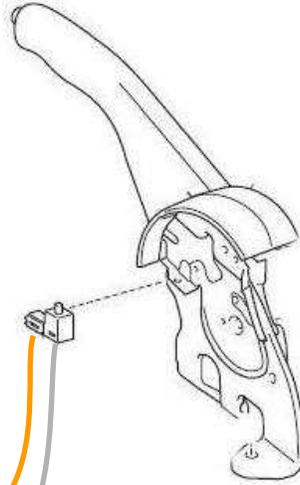
## EPB Controller Hand Lever Switch Wiring.

Factory wiring to the hand brake lever is typically to a light and to chassis ground.

Disconnect the factory light wire and connect the switch wires to the EPBC.

**Note that any other wiring CANNOT be connected with the EPBC of the hand brake level switch.**

If the switch is a single wire it's ground to the chassis, no additional grey wire is needed.

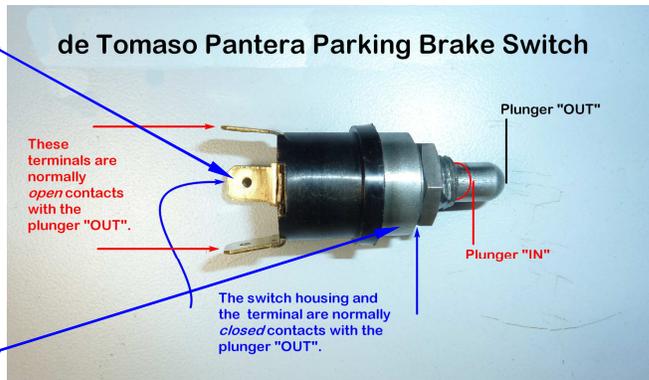


Use 18 AWG wire to connect the hand brake switch terminal to ORNG on the EPBC.

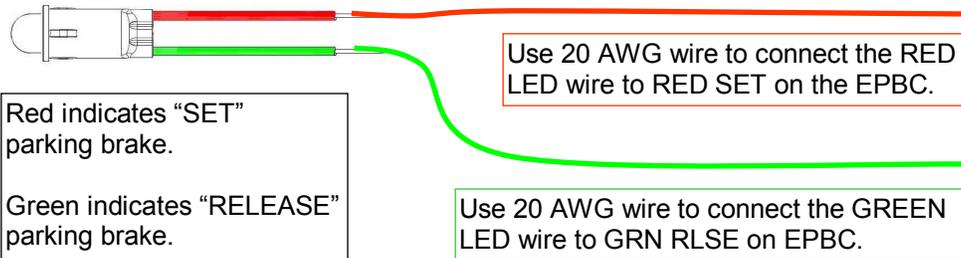
Use 18 AWG wire to connect the hand brake switch terminal to GRY on the EPBC.

Connect a 18 AWG orange wire from the hand brake switch, center terminal, to ORNG on the EPBC.

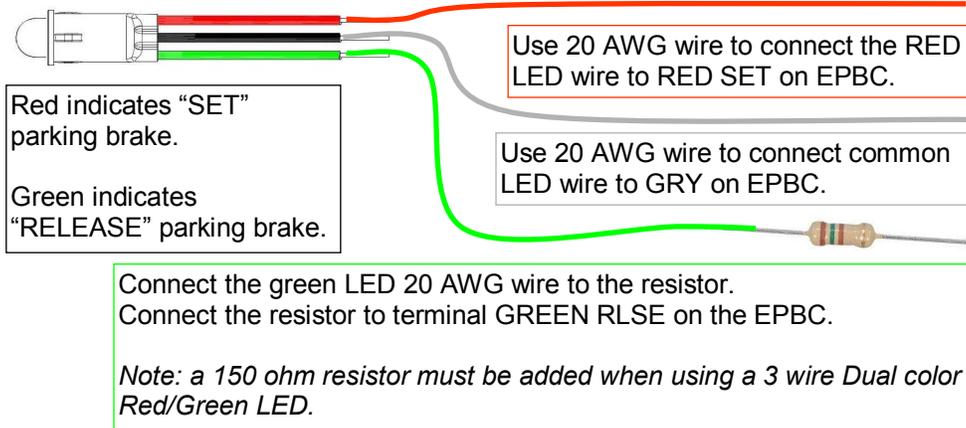
Note the switch housing is chassis ground and the GRY connection to the EPBC is also chassis ground. No wire is needed.



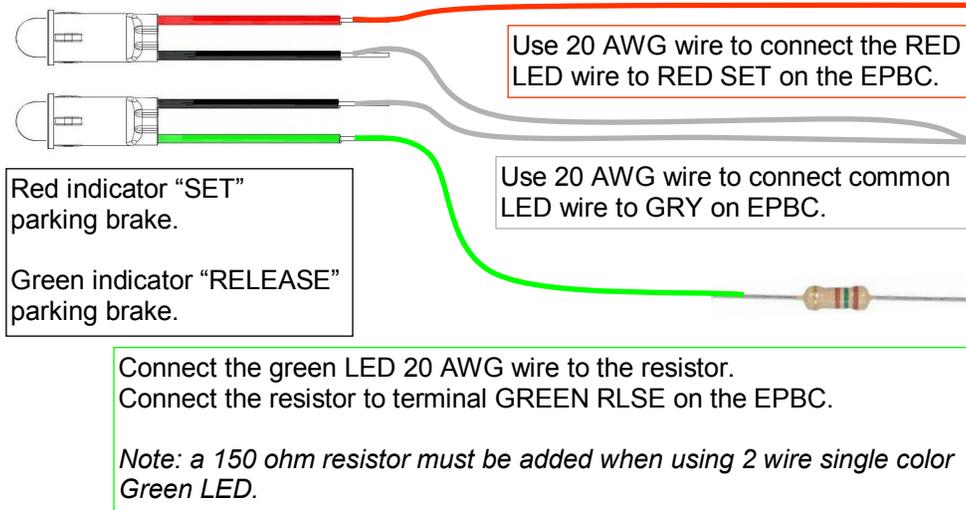
**EPB Controller Wiring with combined Red/Green LED indicator.**



**EPB Controller Wiring with combined Red/Green LED indicator.**



**EPB Controller Wiring with separate Red and Green LED Indicators**



## **Push Button Electric Parking Brake Controller Testing**

**The calipers MUST be installed and disk rotor in place BEFORE testing the EPBC.**

1. Re-connect battery negative (-) or ground cable from the battery terminal.
2. When the EPBC is first powered the indicators may be illuminated randomly, this will self-correct after the EPBC is cycled.
3. The BLUE internal indicator is for the left caliper and an ORANGE internal indicator is for the right caliper. **These indicators should flash ONLY when the caliper is MOVING.** When the calipers stop moving the indicators may be ON or OFF and does not matter.
4. Press the push button switch, the YELLOW internal indicator should flash once per push-button press. This verifies proper wiring to the push-button switch.
5. Press the push button switch this should cause both calipers to move clamping the disk. When the brake pads contact the disk the motor will continue to operate until pressure is developed. Verify that both blue and orange indicators *flash* until the caliper stops, this verifies both calipers are wired properly.

The RED indicator in the push-button switch will illuminate when both calipers are "SET".

6. Press the push button switch again this should cause both calipers to move away from the disk. The caliper will open a preset **distance of approximately 1/16" (1.6mm)** and should be enough to allow the disk to rotate freely. Verify that both blue and orange indicators *flash* until the caliper stops, this verifies both calipers are functioning properly.

The GREEN indicator in the push-button switch will illuminate when both calipers have "RELEASED".

### **IMPORTANT**

If the calipers open the entire distance of travel exceeding the 1/16" (1.6mm) then the calipers are not functioning properly. **This condition cannot be ignored** because the calipers are opening beyond the limit of movement and will mechanically jam at some time if not immediately. This will cause the EPB controller to fault and not operate the calipers. In this condition the EPB controller will no longer function until the caliper is unjammed.

### ***Push Button Electric Parking Brake Controller Testing Continued***

7. Press the push button switch again this should cause both calipers to close or “SET” and the RED indicator to illuminate then the calipers have clamped the disk at the preset pressure.
8. Try to move the car by manual pushing or using the engine and first gear to over-come the EPBC. If resistance is felt then the EPBC is functioning properly.
9. Press the push button switch again this should cause both calipers to move away from the disk.
10. Try to move the car by manual pushing or using the engine and first gear to over-come the EPBC. If resistance is no longer felt then the EPBC is functioning properly.
11. Testing complete.

## **Hand Lever Electric Parking Brake Controller Testing**

**The calipers MUST be installed and disk rotor in place BEFORE testing the EPBC.**

1. Re-connect battery negative (-) or ground cable from the battery terminal.
2. When the EPBC is first powered the indicators may be illuminated randomly, this will self-correct after the EPBC is cycled.
3. The BLUE internal indicator is for the left caliper and an ORANGE internal indicator is for the right caliper. **These indicators should flash ONLY when the caliper is MOVING. These indicators should flash ONLY when the caliper is MOVING. When the calipers stop moving the indicators may be ON or OFF and does not matter.**
4. Lift the hand lever, the YELLOW internal indicator should illuminate. This verifies proper wiring to the hand brake switch.
5. Both calipers will move clamping the disk and the RED indicator will illuminate when both calipers are "SET". When the brake pads contact the disk the motor will continue to operate until pressure is developed. Verify that both blue and orange indicators *flash* until the caliper stops, this verifies both calipers are wired properly.
6. Try to move the car by manual pushing or using the engine and first gear to over-come the EPBC. If resistance is felt then the EPBC is functioning properly.
7. Lower the hand lever, the YELLOW internal indicator should extinguish and both calipers will move away from the disk. The caliper will open a preset **distance of approximately 1/16" (1.6mm)** and should be enough to allow the disk to rotate freely. Verify that both blue and orange indicators *flash* until the caliper stops, this verifies both calipers are functioning properly.

### **IMPORTANT**

If the calipers open the entire distance of travel exceeding the 1/16" (1.6mm) then the calipers are not functioning properly. **This condition cannot be ignored** because the calipers are opening beyond the limit of movement and will mechanically jam at some time if not immediately. This will cause the EPB controller to fault and not operate the calipers. In this condition the EPB controller will no longer function until the caliper is unjammed.

8. Try to move the car by manual pushing or using the engine and first gear to over-come the EPBC. If resistance is no longer felt then the EPBC is functioning properly.
9. Testing complete.

### ***Important Notes about Operation***

1. SET or RELEASE the parking brake lever with the ignition "ON".
2. If the parking brake lever is moved while the ignition is OFF the calipers will NOT release.
3. If the hand lever is moved to the RELEASE position while the ignition is "OFF" and not returned to the SET position, when the ignition is initially turned "ON" the parking brake calipers will open immediately.
4. The parking brake lever can be lifted to SET the parking brake at any time after the ignition is "ON".
5. DO NOT move the parking brake lever while the calipers are in motion. This will disrupt the cycle and will stop the calipers from completing the SET or RELEASE.
6. If the parking brake lever is moved while the calipers are in motion and the cycle is disrupted, cycle the parking brake lever a few times and the calipers will reset and cycle normally.
7. Any time that +12V power is lost from the PINK "BAT" terminal, the calipers will not function properly. The controller and calipers must be re-synchronized in order to operate properly. See page 10.

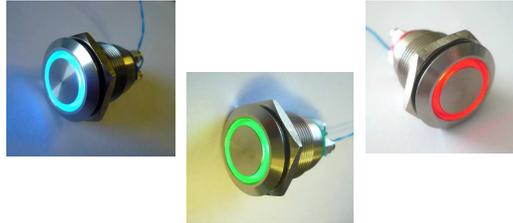
**Push-buttons Available from Pantera Electronics**

These pushbuttons will connect to the EPBS and provide an internal LED indicator for the caliper status.



Switch with dual color Red/Green changes status.

Single color type Red, Blue or Green



**Tesla / Brembo Caliper Installation on de Tomaso Pantera**

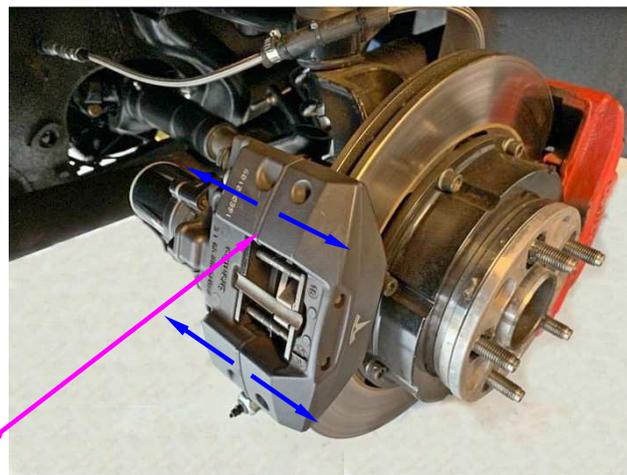
In order to have clearance for the motor on the Tesla / Brembo calipers the factory disk brake will need to be moved to the forward mounting ears on the upright. This can be readily done by utilizing a longer brake line. In the picture below a rubber hose is slid over the brake line to protect it from rubbing on the ball joint. Tie-raps are used to keep it position.

Maximum open distance for the Tesla / Brembo calipers is approximately 1.1" (28mm) For thicker disk rotors the calipers can be disassembled and a spacer is added to separate the caliper halves. Another way is to grind the pads until the caliper fits.

Pantera Electronics Caliper Spacer - Part # CS-01.

Note: The calipers MUST have enough space between the rotor and the pads so when the caliper opens there is enough travel. If there is not enough travel the caliper could jam in the open position and the controller indicates it is closed.

**There needs to be at least a minimum 1/16" (1.6mm) of space to open.**



Spacer added here