Pantera Electronics *Advanced* Electric Parking Brake Controller Installation Manual

Advanced Rev-1

This EPB Controller will operate 1 pair of 2 or 4 terminal electric parking brake calipers or combination hydraulic calipers with the integrated electric actuator.

Input Power:
"BAT" & "IGN" operating voltage - 9.0 Volts to 15.5 Volts.
"BAT" maximum current - 15 Amps (current when "IGN" is OFF - 0.001 Amps)
"IGN" maximum current - 0.1 Amps.

Caliper Activation Switch Input:
Input current 0.020 mA. maximum, momentary SPST contacts.

Indicator Output:
5 Volts, current limited at 0.020 Amps maximum with 1 LED in series.
For LED indictor operation ONLY, Do NOT attempt to connect any other device to this output.

Maintenance Switch: (on-board)
A manual switch to open the calipers to any distance for setup and maintenance.

********** Only *Advanced* EPB controllers **********

E-Brake Indicator: "BRK SWTCH" terminal powers the E-brake indicator on the dash. It is active only if both calipers reach the proper clamp force.

Brake Pedal Interlock: Input Voltage Range - 9 to 16 Volt, Input Current - 0.002 Amps. This terminal activates the inter-lock that requires the brake pedal to be pressed during the activation of the push-button or hand lever.

Caliper Current Adjustment:
The closed caliper current adjustment for peak force in the clamped condition.

Open Caliper Distance Adjustment:
The distance the caliper opens based on time.
This should be set to open the caliper no more than what is needed to clear the rotor. This timing will vary from caliper manufacturer and model.

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.

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

THE ELECTRIC PARKING BRAKE CONTROLLER MAY CLOSE BOTH CALIPERS THE FIRST TIME IT IS POWERED.

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 Brake*** version requires one momentary switch with normally closed contacts. Hand lever UP to “SET” (switch contacts closed) and hand lever down (switch contacts open) to “RELEASE” the electric parking brake.

> 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 2 wire cable.

> Optional Brake Pedal Interlock requires the brake pedal to be pressed before the parking brake can be set.

> Optional push-button with internal LED indicator, RED for “SET” and GREEN for “RELEASE” available from Pantera Electronics.

Electric Parking Brake Controller Hand Lever Operation Only

>>>>> Operation of the hand brake when the ignition switch is OFF <<<<<

1. When the ignition switch is OFF the hand brake will NOT function.

2. If the hand brake is NOT moved from the position it was in AFTER the ignition switch was turned OFF, then when the ignition switch is turned back ON the position of the calipers and the LED status indicator will be as it was prior to turning the ignition switch OFF .

3. If the hand brake IS moved from the position it was in AFTER the ignition switch was turned OFF, then when the ignition switch is turned back ON, the EPB controller will need to be cycled so the LED status indicator and calipers can update to the new position of the hand brake.
This MUST to be done to release the calipers.

4. This is a different function from the Push Button version of the EPB controller.

EPB Caliper / Connector Wiring

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

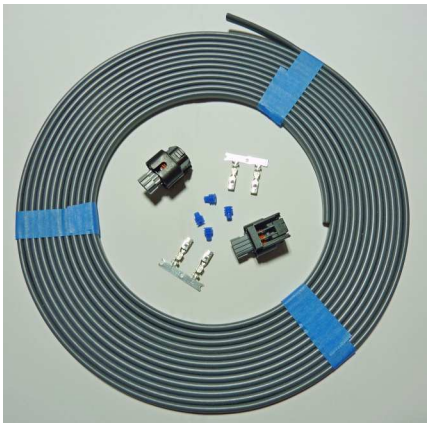
Recommended automotive brake cable is available from Pantera Electronics.
(2 wires,16 AWG, fully annealed copper for flexibility)

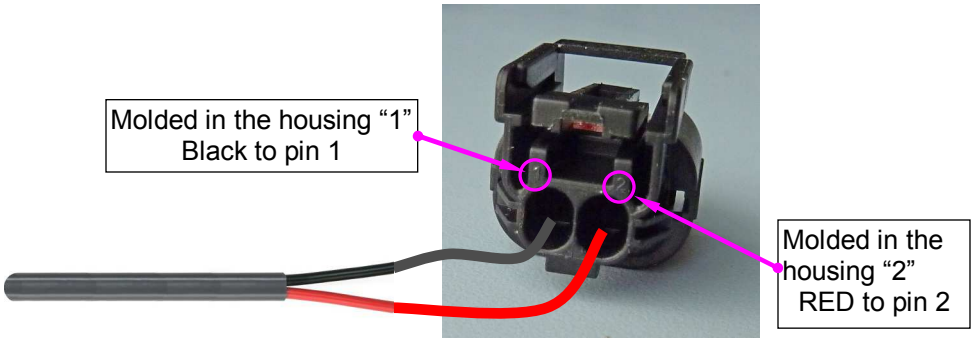
EPB Installation Kit
Part # EPB2-KiT
An installation kit from Pantera Electronics consists of the following:

(1 length) 2 conductor, 16 AWG wire brake cable, 25 feet long. (7.62 Meters)

(2) Connectors for Tesla Model 3 caliper.

(4) Terminals with seals for the connectors.

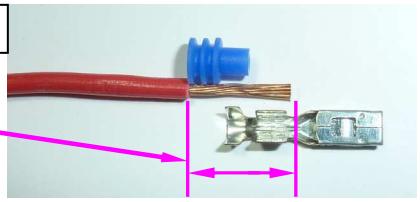


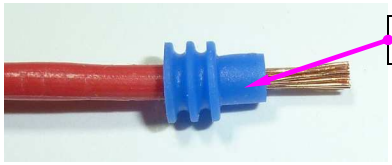


Ring terminal, blue for 14-16 AWG wire and internal/external tooth lock washer for grounding wires to the chassis.

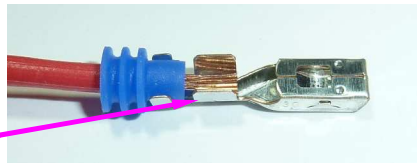
Installing Wires in a 2 wire Connector

Strip a length of the wire to accommodate the seal and the terminal.
Do this for both wires.

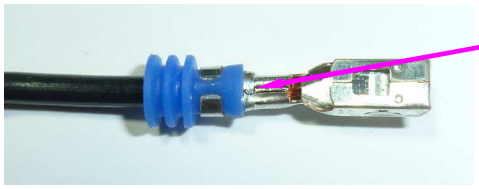




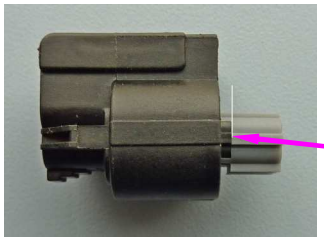
Slide the seal on the ***stripped*** section of the wire.



Assemble the terminal on the wire with seal.



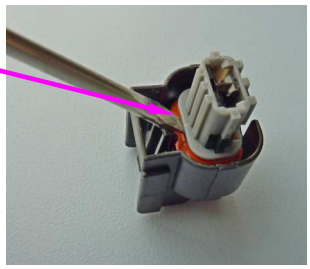
Crimp the assembly so that the seal and terminal look like in the picture.

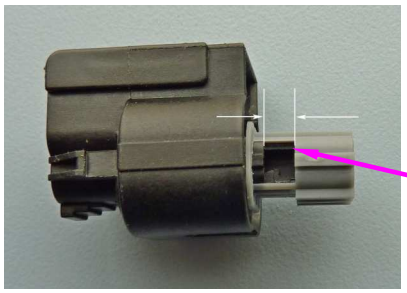


The connectors should be ready for terminal insertion with the grey part extended as in the lower picture.

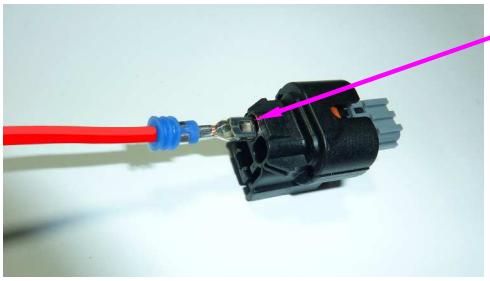
If not the grey part of the connector has to be slid out to a position for inserting the terminals but no further.

The connectors should be already ready for terminal insertion with the grey part extended.
Use a small screwdriver to pry the grey part outward.





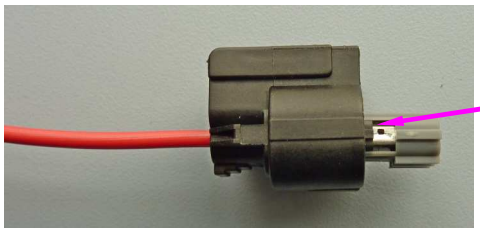
When the grey part is in the correct position a detent is felt. Then it is in the position to accept the terminals.
Note the space from moving the grey part.



Insert the red terminal in this hole with the connector retainer down.

Insert the terminal facing in the direction as in the picture.

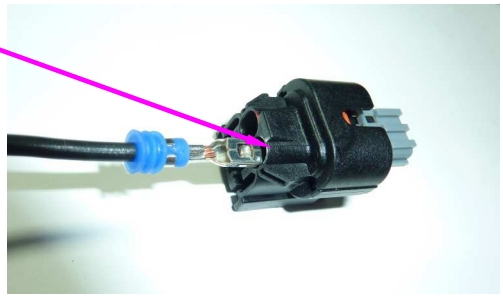
Installing Wires in a 2 wire Connector Continued

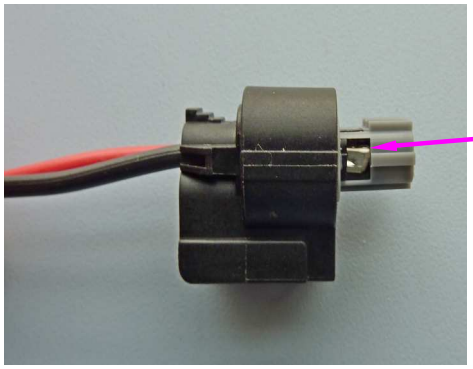


Push the terminal into the connector until is stops and the square hole in the terminal can be seen.

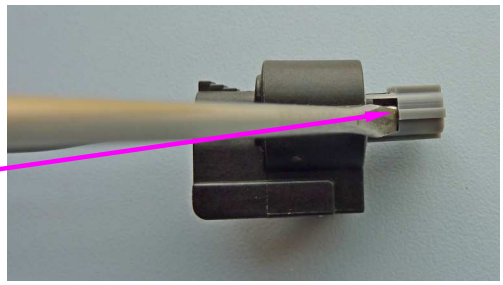
Insert the black terminal in this hole with the connector retainer down.

Insert the terminal facing in the direction as in the picture.

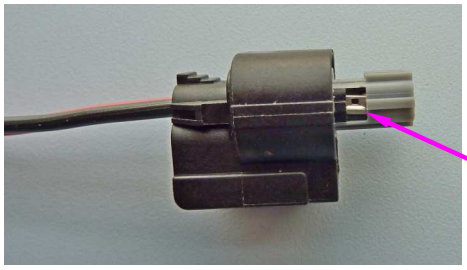




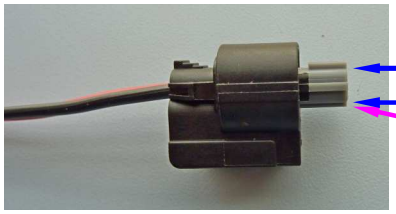
If the terminal does not push to the end it may be caught on the edge of the connector as shown in picture.



Use a small screw driver to push the terminal into alignment and push the terminal in further.



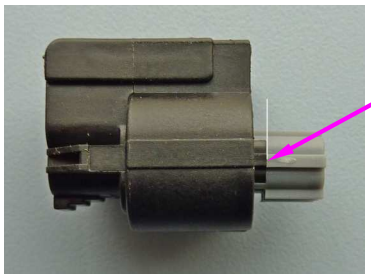
Push the terminal into the connector until is stops and the square hole in the terminal can be seen.



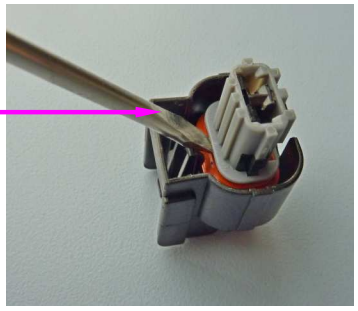
PUSH

Press the grey part into the rest of the connector so that it's flush on the end of the connector.

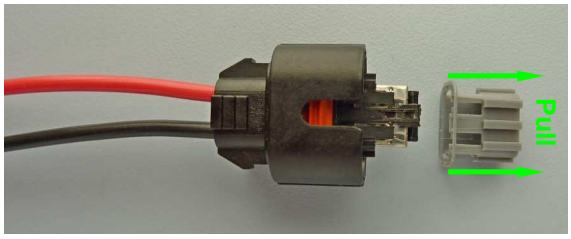
Disassembling the connector for removing wires from the 2 wire connector.
To disassemble the connector to remove a wire with a terminal do the following.



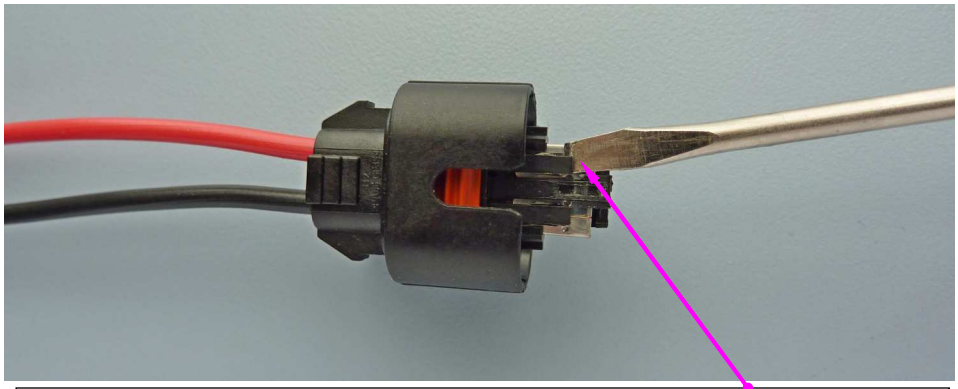
The grey part of the connector has to be slid out to the position for removing the terminals, but no further.
This is the connector as received



Use a small screwdriver to pry the grey part outward to loosen.



Pull the grey part completely from the rest of the connector.



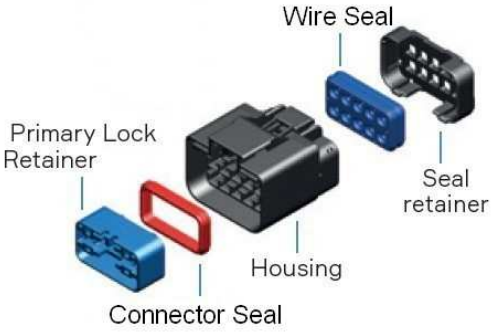
Use a small screwdriver to pry the small lever part upward and gently pull on the wire.
The lever part rests in a square hole in the terminal and must be raised enough out of the hole.

If the terminal doesn't move lift the lever a little more.

EPB Caliper 4 Terminal Connector for 2 wires.

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

Female terminal for the connector.



Female connector for Tesla/Brembo brake caliper

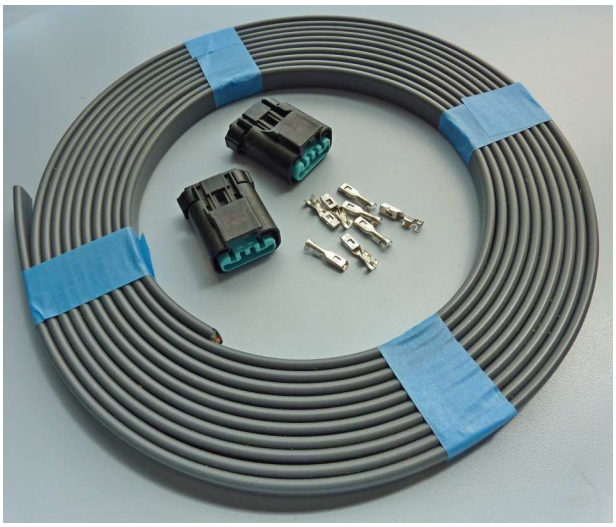
EPB Installation Kit
Part # EPB2/4-KiT

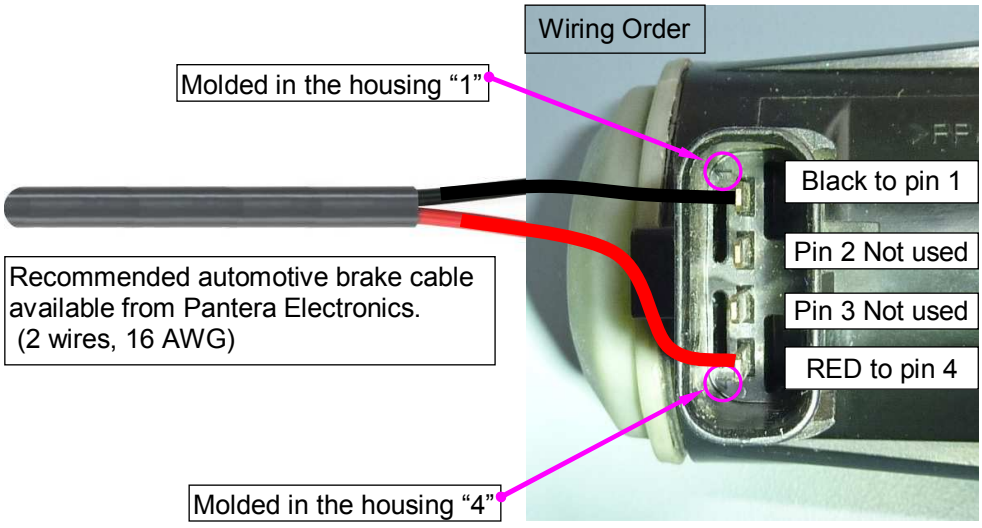
An installation kit from Pantera Electronics consists of the following:

(1 length) 2 conductor, 16 AWG wire brake cable, 25 feet (7.62 Meters) long.

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

(8) Terminals for the caliper connectors.





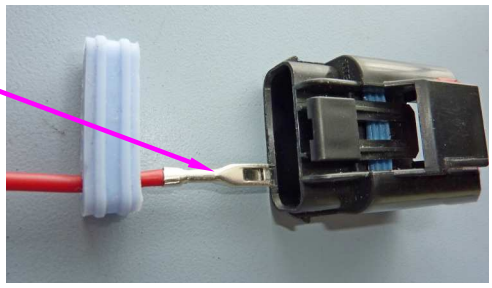
Installing Wires Into the Connector

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

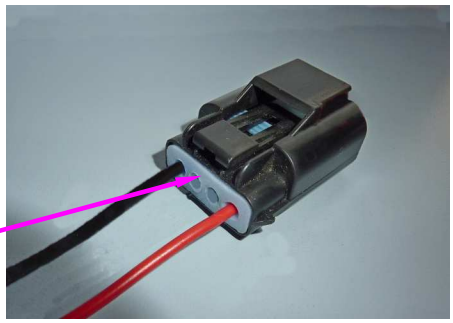
Do this for all 4 wires.

A click will be heard when the terminal seats properly.

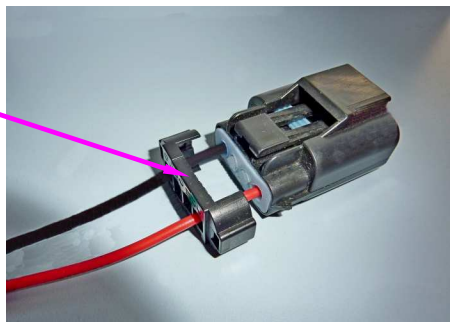
Slide the WIRE SEAL over the wires.

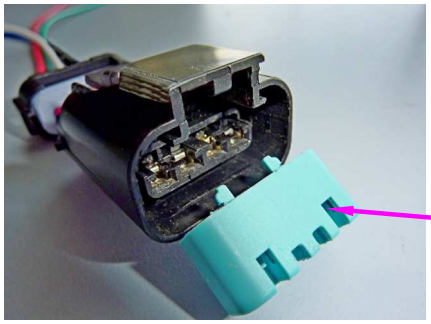


Slide the WIRE SEAL and press into the HOUSING.



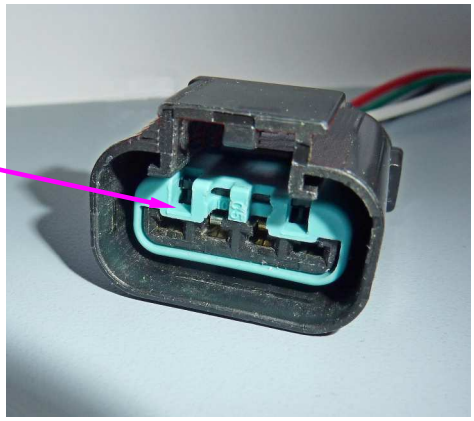
Slide the SEAL RETAINER and press to the HOUSING, a click will be heard when the SEAL RETAINER is latched.





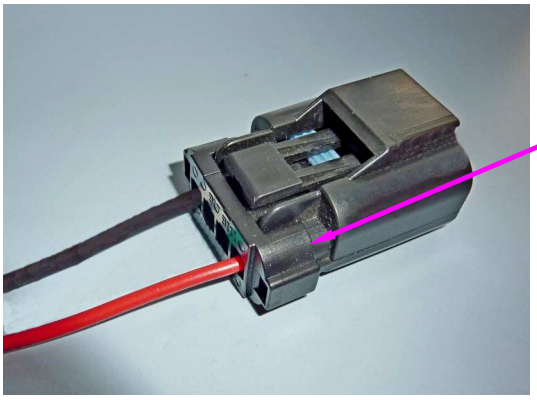
Position the Primary Lock Retainer as in picture.

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

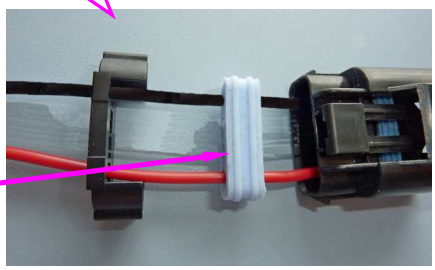


Disassembling the Connector or Removing Wires From the Connector

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.

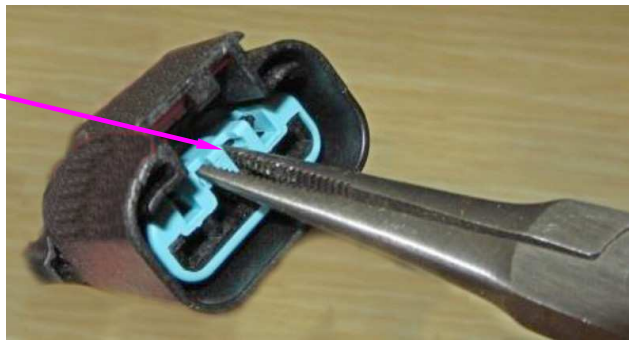


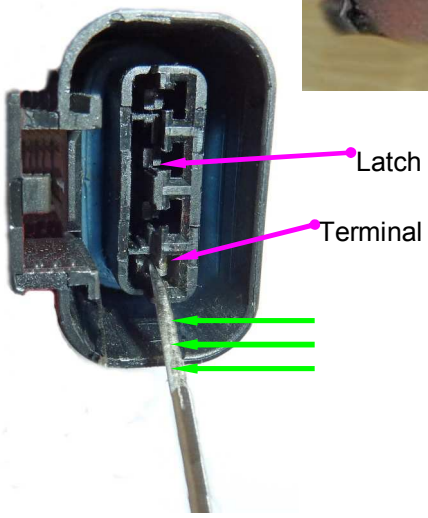
Pry outward from HOUSING.



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

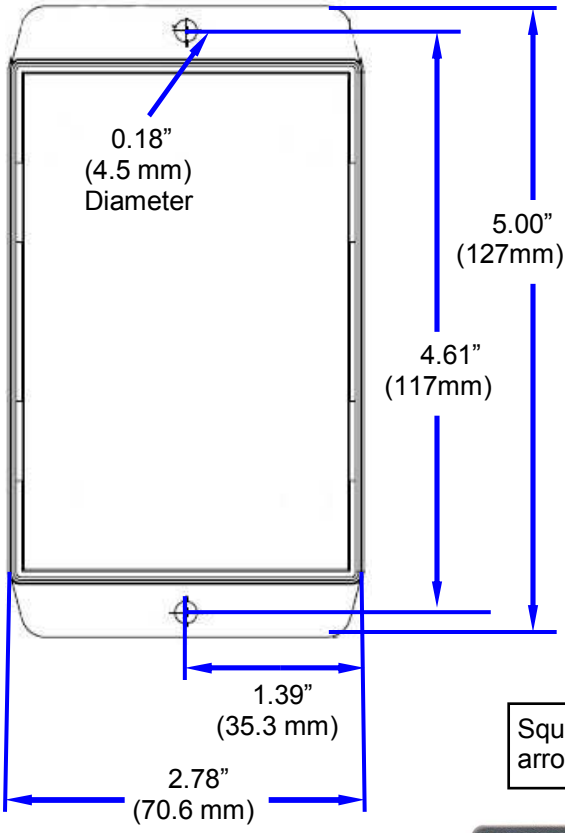
Remove the PRIMARY LOCK RETAINER by grasping in the center as in picture.
Gently rock the PRIMARY LOCK RETAINER while pulling.





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.

Squeeze and grasp at the arrows on side of the case.

Opening the Enclosure

There are 4 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.

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.

Indicator and Adjustment Locations

Green indicator for ignition power

Yellow indicator for switch actuation

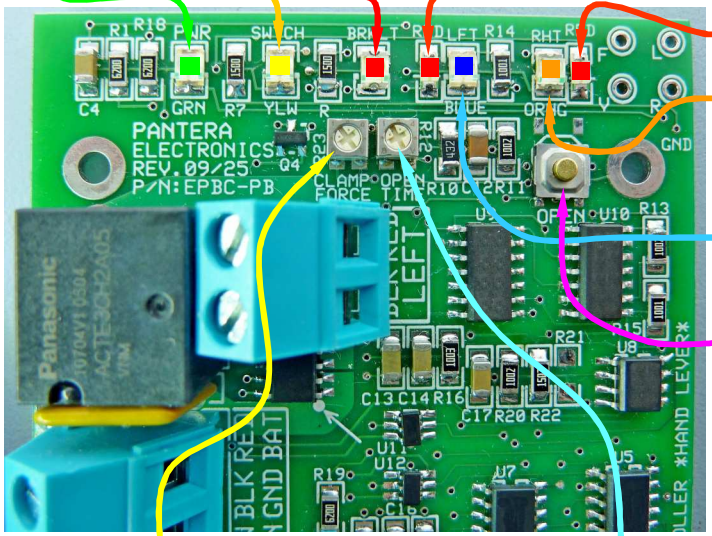
Red indicator for brake pedal switch

Red indicator is failure for the left caliper operation.

If the red indicator illuminates DO NOT continue to actuate the switch.

Red indicator is failure for the right caliper operation.

If the red indicator illuminates DO NOT continue to actuate the switch.



Orange indicator for right caliper ***release*** in process.

Blue indicator for left caliper ***release*** in process.

Manual caliper open switch. Press and hold for the desired open distance.

Advanced Version - CLAMP FORCE (Primarily a factory adjustment and set to 1.5V)

Rotate clockwise to increase the clamp pressure on the rotor.
A very small screw driver is required for the adjustment.

A reference voltage can be measured with a voltmeter from V test point and GND.

The range of the reference voltage is 1.40 Volts to 2.0 Volts. 1.4V is the lowest clamp force while 2.0V is the highest force. Set the force to be no more than what is needed to keep the vehicle in position.

Excessive force can cause a shorten life of the internal gears and lead screw.

Advanced Version - OPEN TIME (Factory adjusted to 800mS to 900mS typical)

Rotate clockwise to increase the time needed to open the caliper for rotor clearance.
A very small screw driver is required for the adjustment.

There isn't a reference voltage for setting this parameter. A trial and error technique is best.

Adjust the open time to allow enough clearance for the rotor. Excessive clearance will cause a longer time for the caliper to close which is not desirable for fastest reaction time.

Disconnect the vehicle 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 gauge. A 25 foot (7.62 Meters) long 2 wire cable brake cable are available from Pantera Electronics for the Installation.

Connect the YELLOW "IGN" terminal to a circuit with a 18 AWG wire in series with a 1 Amp fuse. This circuit should be the ignition circuit energized with the ignition switch "ON".

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.

Connect the RED "BAT" terminal to a circuit with a 16 AWG wire in series with a 20 Amp fuse. **The RED "BAT" connection is required to be powered *all the time*, this is necessary.** When the ignition is "OFF" the current consumption is very low and will not be an issue.

The RED "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.

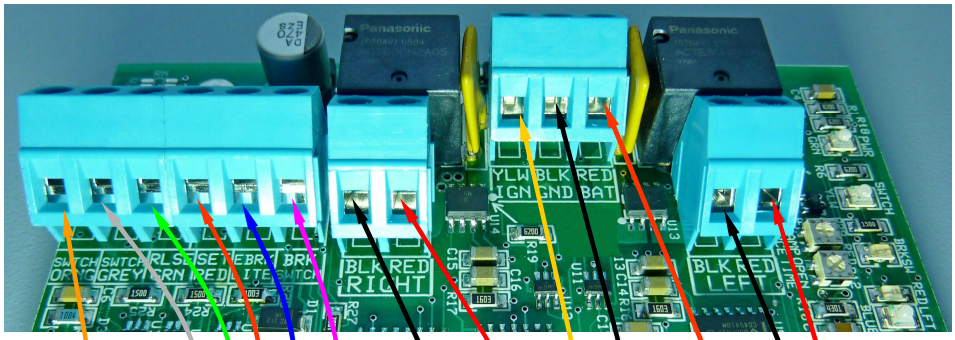
ONLY ***LED indicators*** can be connected to the "SET" "RED" and "RLSE" "GREEN" terminal block positions. Incandescent indicators will not operate.
The "SET" "RED" and "RLSE" "GREEN" terminal block connections are current limited allowing 2 wire bidirectional LED's to be directly connected without a resistor.

Brake Pedal Interlock. Connect the "BRK" "SWTCH" to the terminal on the brake light switch that has 12V when the brake pedal is pressed.
(see page 17) ***Note if not using this feature then add a wire from the "BRK SWTCH" terminal to the "YLW IGN" terminal.***

Optional Dash E-brake light. Connect the "BRK" "SWTCH" to the wire that was removed from the parking brake lever for the dash E-brake light. This will activate

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 !

EPB Controller Connections, Push-button Type



Connect SWTCH ORNG to the N.O. push-button switch.

Connect SWTCH GRY to the push-button switch.

Connect RLSE GRN to the push-button for LED indicator ring.

Connect SET RED to the push-button for LED indicator ring.

Connect EBRK LITE to the E-brake dash light.
(only Advanced version)

Connect RED, BLK wires to right caliper

Connect a YELLOW 18 AWG wire to YLW IGN fuse that is “ON” in the ignition position.

Connect BRK SWTCH to the brake pedal switch that operates the brake taillights.

This connection requires a +12V to enable setting the caliper.

If the brake pedal enable is not used then connect a wire from BRK SWTCH to YLW IGN.

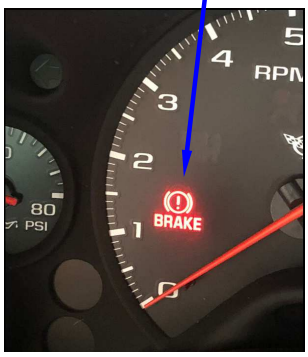
(only Advanced version)

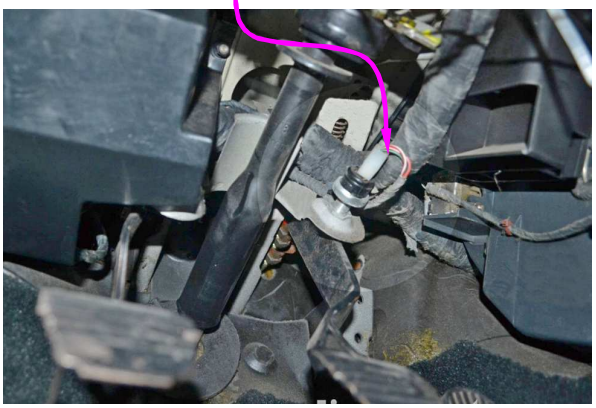
Connect RED, BLK wires to LEFT caliper

Connect a RED 16 AWG wire RED BAT to a fuse that is powered at all times.

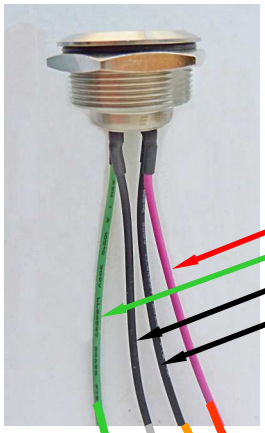
Connect a BLK 16 AWG wire BLK GND to chassis ground with ring terminal and lock washer to GND.

In the next page of the manual find the switch color wires that match these switch connections.





Pantera Electronics 25mm Push-Button Switch Wiring with Dual Color Red and Green LED Ring



25mm dual color push-button.

There are 4 wires on the push-button switch:

RED +LED wire
GREEN LED wire
BLACK Switch wire
BLACK Switch wire

Mounting hole size 1" (25mm")

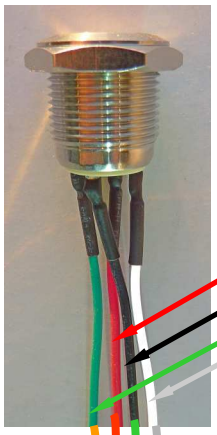
Use 18 AWG RED wire from push-button to "SET" "RED" on EPBC.

Use 18 AWG GREEN wire from push-button to "RLSE" "GRN" on EPBC.

Use 18 AWG ORANGE wire from push-button to "P/B" "ORNG" on EPBC.

Use 18 AWG GREY wire from push-button to "COM" "GRY" on EPBC.

Pantera Electronics 16mm Push-Button Switch Wiring with Dual Color Red and Green LED Ring.



16mm dual color push-button.

There are 4 wires on the push-button switch:

RED +LED wire
BLACK LED wire
GREEN Switch wire
WHITE Switch wire

Mounting hole size 0.625'" (16mm")

Use 18 AWG RED wire from push-button to "SET" "RED" on EPBC.

Use 18 AWG GREEN wire from push-button to "RLSE" "GRN" on EPBC.

Use 18 AWG ORANGE wire from push-button to "P/B" "ORNG" on EPBC.

Use 18 AWG GREY wire from push-button to "COM" "GRY" on EPBC.

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.

Push Button Electric Parking Brake Controller Testing

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

1. Re-connect battery negative (-) or ground cable from the battery terminal.

2. The BLUE internal indicator is for the left caliper and an ORANGE internal indicator is for the right caliper. These indicators illuminate ***only*** when the caliper is opening. When the calipers stop moving both indicators will be OFF.

3. 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.

4. Press the push button switch this should cause both calipers to move clamping the disk. When the brake pads contact the rotor the motor will continue to operate until pressure is developed.
[If the EPB controller has the Brake Pedal Interlock the brake pedal must be pressed]

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

5. Press the push button switch again this should cause both calipers to open. The caliper will open a preset **distance of approximately 0.1”** ***(2.5mm)*** and should be enough to allow the rotor to rotate freely. Verify that both blue and orange indicators are illuminated until the caliper stops, this verifies both calipers opened.

The GREEN indicator in the push-button switch will illuminate when both calipers “RELEASE”.
[Note the brake pedal does not need to be pressed to release the EPB]

6. 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 rotor at the preset pressure.

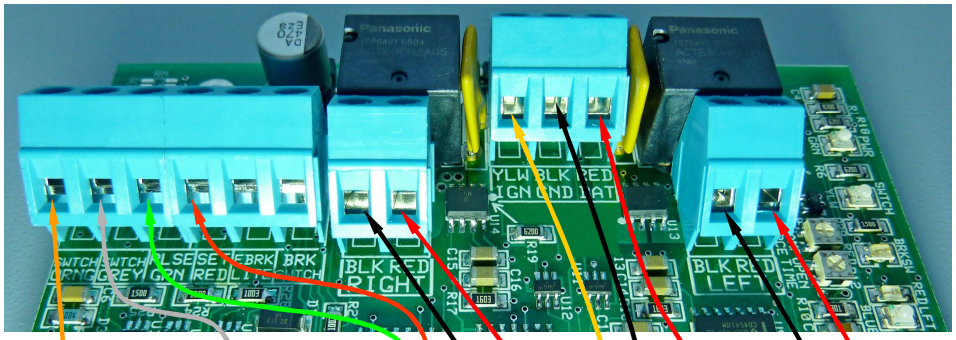
7. Try to move the vehicle by manual pushing or using the engine and first gear to over-come the EPBC. If resistance is felt then the EPBC is functioning properly.

8. Press the push button switch again this should cause both calipers to open.

9. Try to move the vehicle 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.

10. Testing complete.

EPB Controller Connections, Hand Lever Type



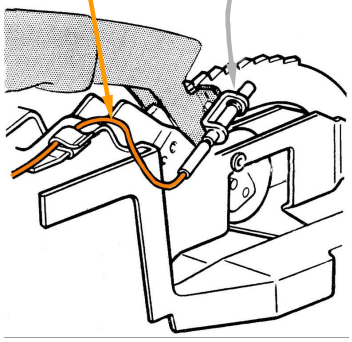
Connect "ORNG" "SW" to the N.O. lever switch terminal.

Connect SWTCH GRY to lever switch ground terminal.

Connect RED, BLK wires to right caliper

Connect RED, BLK wires to LEFT caliper

Connect a RED 16 AWG wire RED BAT to a fuse that is powered at all times.



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

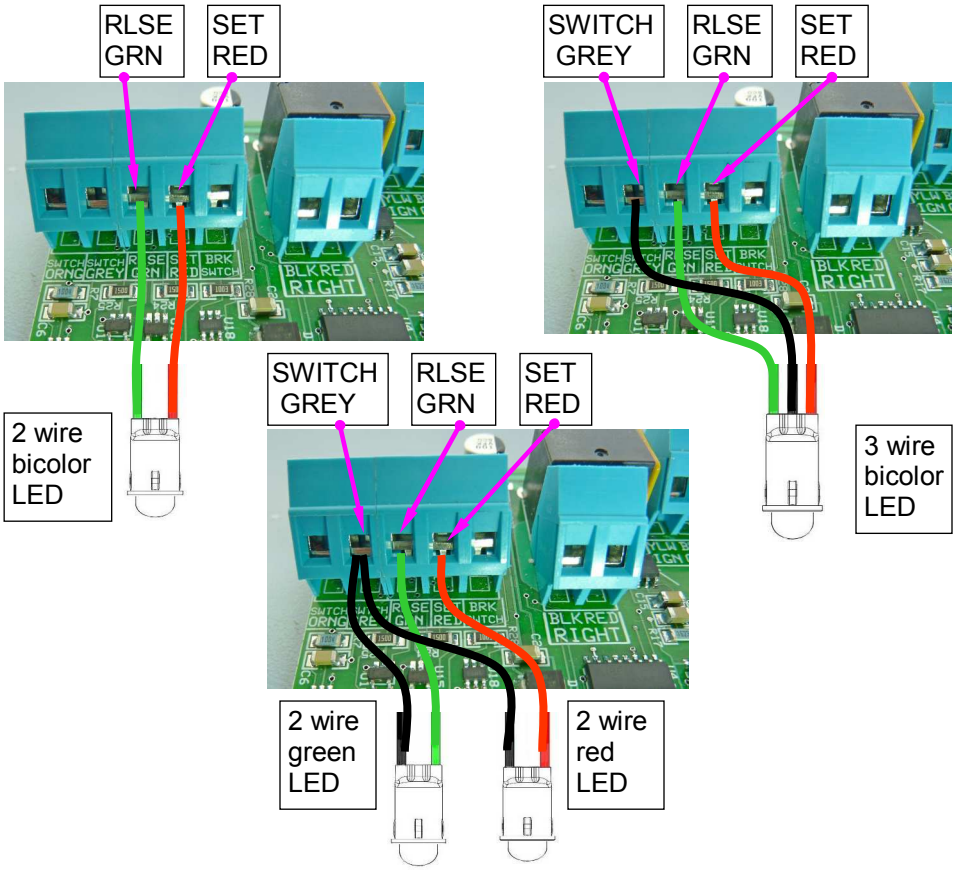
Connect a YELLOW 18 AWG wire to YLW IGN fuse that is "ON" in the ignition position.

Connect RLSE GRN to the (-) LED indicator terminal. Page 18.

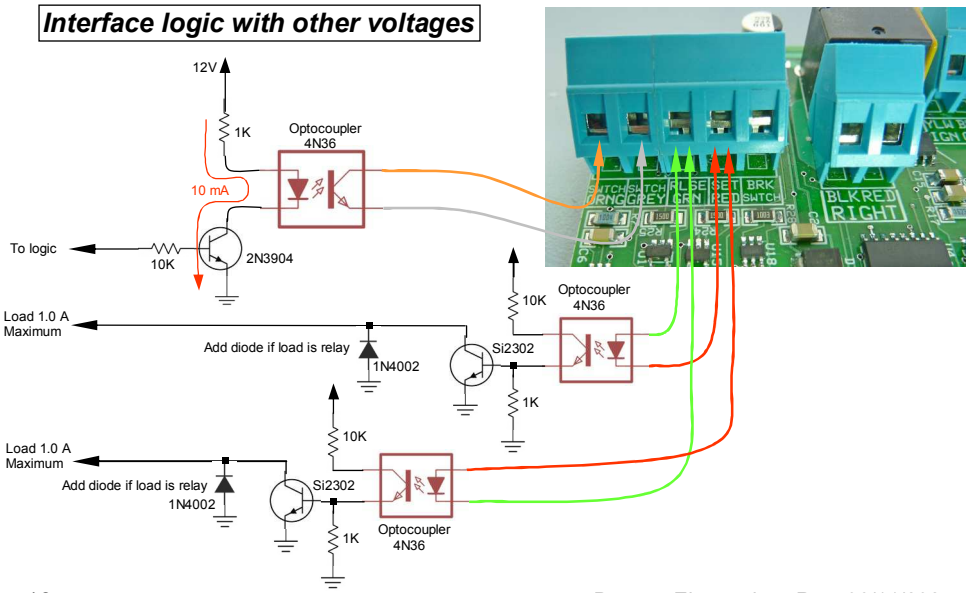
Connect SET RED to the (+) LED indicator terminal. Page 18.

EBRK LITE and BRK SWTCH connections are on page 13. (only Advanced version)

Types of LED Indicators and Connections



Interface logic with other voltages



Hand Lever Electric Parking Brake Controller Testing

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

1. Re-connect battery negative (-) or ground cable from the battery terminal.

2. The BLUE internal indicator is for the left caliper and an ORANGE internal indicator is for the right caliper. These indicators illuminate when the caliper is opening. When the calipers stop moving the indicators will be OFF.

3. Pull the hand lever, the YELLOW internal indicator should flash once per hand lever travel This verifies proper wiring to the hand lever switch.

4. When the hand lever is pulled up both calipers should move clamping the rotor. When the brake pads contact the rotor the motor will continue to operate until pressure is developed.
[If the EPB controller has the Brake Interlock the brake pedal must be pressed.]

The RED indicator will illuminate when both calipers are “SET”.

5. Release the hand lever this should cause both calipers to open. The caliper will open a preset **distance of approximately 0.1”** ***(2.5mm)*** and should be enough to allow the disk to rotate freely. Verify that both blue and orange indicators are illuminated until the caliper stops, this verifies both calipers opened.
[Note the brake pedal does not need to be pressed to release the EPB]

The GREEN indicator will illuminate when both calipers “RELEASE”.

6. Pull the hand lever this should cause both calipers to close or “SET” and the RED indicator to illuminate then the calipers have clamped the rotor at the preset pressure.

7. Try to move the vehicle 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.

8. Release the hand lever this should cause both calipers to open.

9. Try to move the vehicle 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.

10. Testing complete.

Electric Parking Brake Controller Maintenance Operation

The caliper can be opened further than in normal operation.
This would be for maintenance or removal of the caliper from it's mounting.

1. Press the on-board manual caliper open switch. As long as the button is pressed the calipers will continue to open.
This is the same for the Hand Lever version as well.

3. Power should be removed from the EPB controller so that there is no possibility of it closing accidently.

4. After the caliper is replaced on the mounting re-apply power and press the dash push-button until both calipers synchronize with the push-button.

Tesla Model S Caliper Installation on de Tomaso Pantera

In order to have clearance for the motor on the Tesla Model S calipers the factory hydraulic caliper 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 Model S 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.
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.