KIT-GGP Installation Guide for Gaggia Classic Pro (230V)

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This installation guide is based on a Gaggia Classic Pro machine sold in Europe in 2019 (RI9480, 230V). This is a PID controller kit installation guide distributed solely to our clients, who have purchased the KIT-GGP kit. Once you are done with this guide, please send us your feedback, comments, or suggestions to auberins@gmail.com so that we may continue making improvements on this guide. Your help is greatly appreciated!

CAUTION: Please read through the entire guide before attempting any kind of installation.

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The modifications of Gaggia involve tampering with high-wattage electrical circuits in a wet environment, which could result in electric shock, burns, serious personal injury or death, as well as, fire, explosion and other property damage. This kit is for users with proper electrical safety knowledge only. Attempting to access your espresso machine will void its warranty. You, the user, will assume full responsibility for any modifications undertaken. Auber Instruments Inc is not liable for any damage caused to your property as a result of improper use.

Identifying Parts in the Kit



Figure 1. Pre-assembled controller box, include a PID controller, an aluminum box, a piece of double-sided tape, and a rubber grommet on the back plate (not shown in this image).



Figure 2. A solid-state relay (SSR), a set of mounting screw, silicone heat transfer compound (white paste in the plastic vial) for SSR, and a piece of spiral cut tubing for protecting wires.



Figure 3. Wires for connecting the SSR's output pins to heaters. These wires are terminated with spade connector on one end and male tab connectors on the other end.

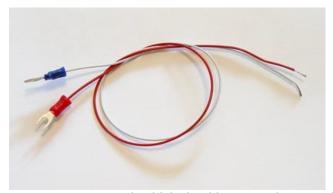


Figure 4. Wires for brew-temperature-control, which should connect the controller's output signal to the SSR's input pins. The red wire is for the positive signal, and the white wire is for the negative signal. These wires are terminated with spade connectors on one end, and bare tips on the other end.



Figure 5. Two pieces of wires for tapping the power to the controller. The black wire is for tapping the hot wire from the power switch, and the brown wire is for tapping the neutral wire on the power switch. They are both terminated with piggyback connectors on one end, and bare tips on the other end.



Figure 6. The PT100 RTD temperature sensor with screw tip (PT100M4).



Figure 7. Cable ties (left) and the jumper wires (right). The white jumper wire is for the RTD sensor, and the black jumper wire is for the water-pump control.



Figure 8. Wires for steam-temperature-control, which should connect the controller's output signal to the steam button. The blue wire is for the positive signal, and the white wire is for the negative signal. These wires are terminated with female connectors on one end, and bare tips on the other end.



Figure 9. A piece of green wire for water pump control. It is terminated with a piggyback connector on one end, and bare tip on the other end. Please note the difference between this wire and the grounding wire in Figure 10.



Figure 10. A piece of green wire for grounding the controller box. It is installed with a piggyback connector on one end, and a ring connector on the other end. Please note the difference between this wire and the pump control wire in Figure 9.

Tools Needed

Philips screw driver
Flat-head screw driver
Long nose pliers
Wire cutter (or scissors)
Electrical tape
Multimeter (recommended, but not required)
(Optional) Open-end wrench, 17 mm
(Optional) Open-end wrench, 8 mm
(Optional) Allen wrench (hex key), 5/32" or 4 mm

Installation

CAUTION: This installation guide is based on a Gaggia Classic Pro machine sold in Europe in 2019 (RI9480, 230V). If the wiring or wire colors might be different in the machine you are trying to install the kit. Please verify the wiring in your machine first before you proceed with the installation.

A. Preparation

1) Make sure the machine is disconnected from the power. Disconnect the power cord from the power outlet and from the espresso machine. Remove the drain pipe, drip tray, water tank, portafilter, and the top lid of the conveyor funnel.





Figure 11. (a) The red arrows indicate two screws which need to be removed. (b) The grounding wires attached to the top cover (pointed by the red arrows) need to be removed.

- 2) **Removing the top cover**. First, remove two screws from the top of machine as indicated by red arrows in Figure 11(a). Then, lift up the conveyor funnel. There are two grounding wires attached to the stainless-steel cover, which are pointed by the red arrows in Figure 11(b). Carefully pull off the grounding wires.
- 3) Identifying the critical parts and location. In Figure 12, we highlighted some critical parts on the coffee machine. The coffee thermostat (pointed by the blue arrow) is installed at the bottom-left side of the boiler, which is hard to see in this picture. The steam thermostat (pointed by the yellow arrow) is located on the top of the boiler. There is a grounding post on the top of the boiler, which is pointed by the red arrow. On the front panel, there are three buttons (switches) on which we will tap some of the wires from KIT-GGP. The solid-state relay (SSR) will be installed on the top-left corner of the back panel, indicated by the blue color shaded area. The green shaded dot indicates where the wires should go through.

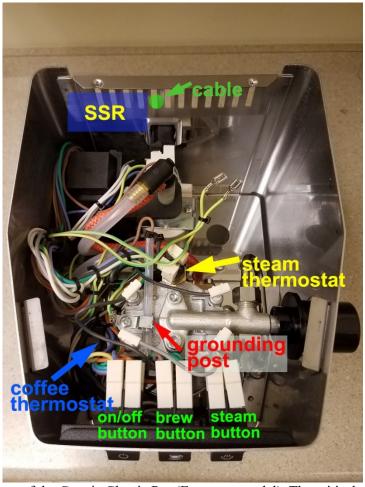


Figure 12. The top-view of the Gaggia Classic Pro (European model). The critical parts on the machine are highlighted by different colors.

B. Mounting the SSR

1) Connecting wires to the SSR. As shown in Figure 13, two pieces of red thicker wires with soft

silicone rubber insulation should be connected to the output side of the SSR, where pins are labeled as 1 and 2. It doesn't matter which wire goes to terminal 1 or 2. The red thinner wire should be connected to pin 3 (+). The white thinner wire should be connected to pin 4 (-). The clear plastic protection cover on the SSR can be removed temporarily for easier access to the screw terminals on the SSR. Tighten all screws and make sure all the connectors are held by the screws firmly. Remember to put the plastic cover back to the SSR.

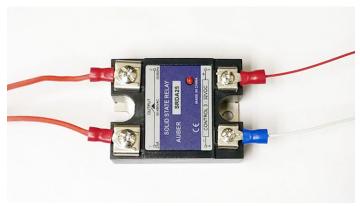
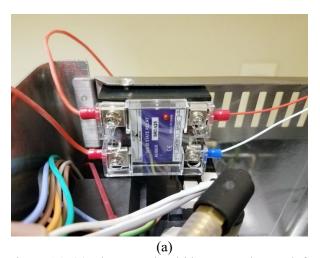


Figure 13. Connecting wires to the SSR.

2) **Mounting the SSR**. Apply a small amount of heat transfer compound to the bottom of the SSR. Mount the SSR horizontally to the top-left corner of the back panel. Please make sure the thicker output wires point to the left side and the thinner control wires are point to the right side as shown in Figure 14(a). Use the M4 screw set supplied in the kit to mount the SSR. The mounting screw of the SSR should look like Figure 14(b) after installation. (The M4 screw can be tightened with a 7 mm socket wrench.)



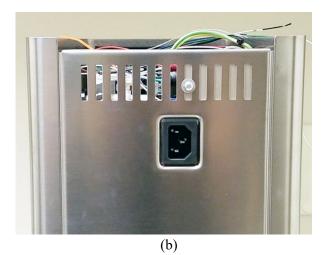


Figure 14. (a) The SSR should be put to the top-left corner with the thinner control wire pointing to the right. (b) The back-view of the machine shows where the mounting screw should be at.

C. Installing the RTD Sensor

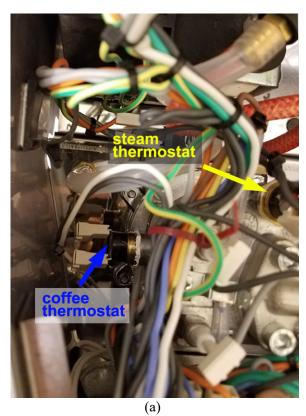
1) Locating the coffee thermostat. There are two thermostats on the boiler. The coffee thermostat

(or, brew stat), which controls the brew temperature, is located on the lower left side of the boiler. Please see Figure 15 for where the blue arrows pointed to. The thermostat located on the top of the boiler (pointed by the yellow arrow in Figure 15(a)) is the steam thermostat. Please take a closer look at the coffee thermostat in Figure 15(b). The wires attached to the coffee stat should be removed first, and then we can unscrew the coffee thermostat from its current position.

2) **Removing the coffee thermostat**. This step is a little bit tricky because thermostat is hard to reach. The other wires in the coffee machine may be blocking your access to the coffee thermostat. You can carefully cut the cable ties and push the wires aside. You may also want to lift the boiler/grouphead assembly a little bit so it's easier to reach the coffee thermostat. We include a section in APPENDIX A to show how to move the boiler.

To remove the thermostat, you need to unplug the two wires, one white wire and one black wire, (pointed by red arrows in Figure 15(b)) from the thermostat first. Use a pair of long nose pliers to help unplug the connectors on the coffee thermostat. The white wire will be connected to the SSR later.

The coffee thermostat is held in place by the thread on its tip (see Figure 16). Use a 17 mm wrench, or a pair of long-nose pliers, to turn the thermostat counterclockwise (look from the angle shown in Figure 17(a)) to loosen the thermostat.



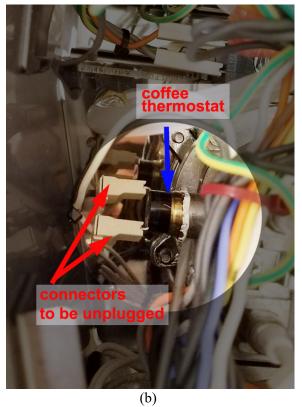
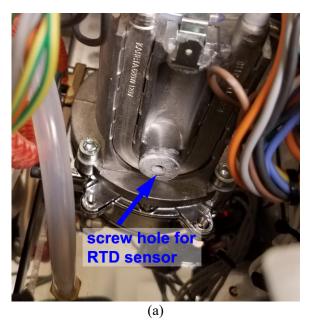


Figure 15. Coffee thermostat location is indicated by the blue arrow. It is on the left side of the boiler (viewed from the front), close to its bottom. The two wire connectors (pointed by red arrows) on the coffee thermostat need to be unplugged.



Figure 16. The original coffee thermostat on Gaggia Classic Pro.



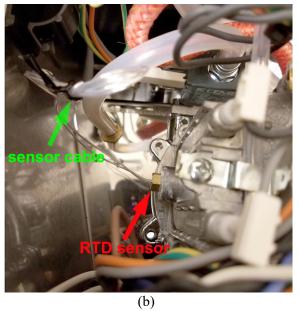


Figure 17. (a) The blue arrow points to the port that holds the original coffee thermostat. (b) The red arrow points to the RTD sensor after installation. Please note that the sensor cable should stay tied together (pointed by green arrow) during installing the RTD sensor.

3) **Installing the RTD sensor**. The wire connection on the RTD sensor is very fragile due to the small size of the sensor and its lack of strain relief. **Please** install the sensor with its wires still tied together as shown in Figure 6 and Figure 17(b). In this way, the entire wire bundle can rotate with the RTD sensor as it is screwed in, and much less stress will be applied to the section where the wire goes into the sensor. Otherwise, the twisting and pulling force generated while screwing in the sensor can damage the internal wires of the sensor. Apply a little bit of thermal grease to the sensor tip before you screw in the sensor. And when you screw in the sensor, please be careful not to get it cross-threaded. The sensor should turn easily with almost no resistance from the threads.

CAUTION:

- Do NOT remove the cable tie on the RTD sensor wire before you install the sensor.
- Be careful not to get the sensor cross-threaded when installing it.

The RTD sensor does not need to be screwed in very tight. A finger tight is enough. If you have an 8 mm open-end wrench or long nose pliers, gently tighten the sensor until the wrench or pliers won't turn. After the sensor is screw in place, you can remove the cable tie. The red arrow in Figure 17(b) points to the installed RTD sensor.

TIP: If you want to be sure that the sensor is still good after the installation, you can measure the resistance of the sensor using a multimeter. The resistance value should be around 110 ohms at room temperature.

D. Connecting Wires to the SSR

- 1) Checking the wires on the SSR. Double check the wires that are connected to the SSR as shown in Figure 13. The two thicker red wires should be connected to the pin 1 and 2 of the SSR, which is the output (load) side of the SSR.
- 2) Connecting the white wire from the coffee thermostat to the SSR. Originally, there were two wires attached to the coffee thermostat, a white wire and a black wire. We have unplugged them from the coffee thermostat (see the wires pointed by the blue arrows in Figure 18(a)). Connect the white wire to one of the red wires from the SSR as shown in Figure 18(a). It doesn't matter which red wire you pick. The black wire should be left unconnected.
- 3) Unplug the black wires from the steam thermostat to the SSR. Locate the steam thermostat on the top of the boiler (see Figure 12 or Figure 15). Those two wires attached to this thermostat are both black, one of them should be connected to the other red wire on the SSR. Unplug two black wires from the steam thermostat (pointed by yellow arrows in Figure 18(a)). These two connectors are randomly marked as S1 and S2 in Figure 18(b).

Use a multimeter to measure resistance. One of the black wires from the steam thermostat has nearly zero ohm resistance to the black wire from the coffee thermostat; while the other black wire from the steam thermostat has infinite resistance. Please use a multimeter or ohmmeter to measure the resistance between C2 and S1, and the resistance between C2 and S2 as shown in Figure 18(b). Identify which connector, S1 or S2, that has infinite resistance with C2 connector.

(Alternatively, if you don't have a multimeter, you can trace the black wires S1 and S2 see where do they lead to. The black wire that we are interested in should lead to one of the heater terminals on the boiler.)

Connect the identified black wire to the other red wire from the SSR as shown in Figure 18(c). The unconnected connectors in Figure 18(c) should have zero ohm between them as indicated by the green arrows.

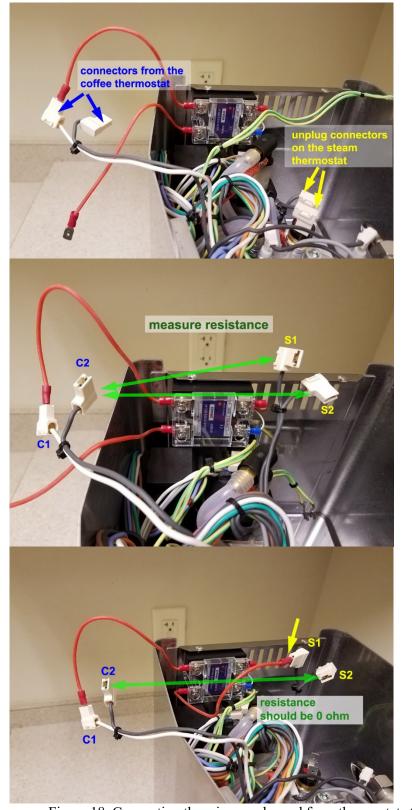


Figure 18(a)
Connect the white wire from the coffee thermostat to one of the red thicker wire on the SSR.

Figure 18(b) Unplug the two black wires from the steam thermostat (randomly marked as S1 and S2).

Figure 18(c). The C2 and S2 connector pointed by the green arrows should have zero resistance between them.

Figure 18. Connecting the wires unplugged from thermostats to the SSR.

E. Tapping the Grounding Post

- 1) Locating the grounding post on the top of the boiler. There is a grounding wire attached to a clip on the top of the boiler, which is pointed by the red arrow in Figure 19.
- 2) **Tapping the green grounding wire from the kit to this post.** Please attach the piggyback connector to this post as shown in Figure 19.

CAUTION: There are two pieces of green wires in this kit, they both have piggyback connector on one end. But the grounding wire has a ring connector on the other end. Please see Figure 10 to help you identify the correct grounding wire.

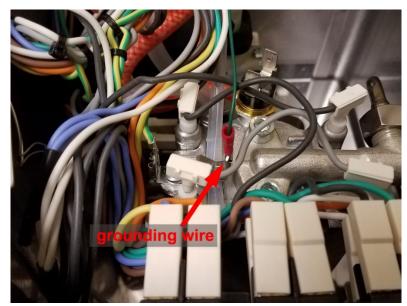


Figure 19. Tapping the grounding wire to the grounding post on the top of the boiler.

F. Tapping the Power Button

1) Locating the power button and identifying wires. The Gaggia Classic Pro is different from the older Gaggia Classic mainly in its switches (buttons). On the Classic Pro, there are three double-pole buttons. The one on the very left is the on/off button (i.e., power button). The power to the controller will be tapped from this power button. The image in Figure 20 shows the top view of the power button. The orange wire is the hot wire from the power-switching module. The blue wire is the neutral wire from the power-switching module. The diagram in Figure 21 shows a how the wires are attached to the back of the switch, and how the pins are labelled.

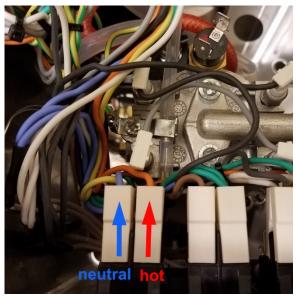


Figure 20. The top-view of the power button.

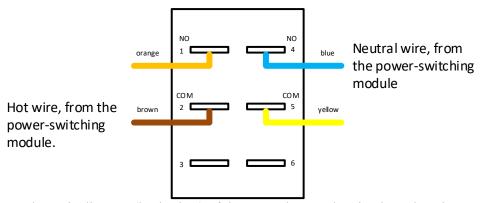


Figure 21. A schematic diagram (back-view) of the power button showing how the wires are attached.

2) Tapping the black wire and the brown wire from the kit to the power button. Identify the black wire and the brown wire from the kit. Both of these wires have piggyback connectors on one end. They should be tapped to the pin #1 and #4 on the power button as shown in Figure 22(a). Attached piggyback connector of the black thin wire from the kit to pin #1, i.e., where now the orange wire is. And then attach the piggyback connector of the brown thin wire from the kit to pin #4 of the power button, i.e., where the blue neutral wire is. Please refer to Figure 22(a) for how the wires should be tapped. Please make sure the tab on the piggyback connector is facing up. You'll also need to press the tab down a little bit. Now, re-connect the orange wire from the coffee machine to the tab on the black thin wire; and re-connect the blue wire from the coffee machine to the tab on the brown thin wire. Please see Figure 22(b) for a finished image. The diagram in Figure 23 shows the back-view of the power button.

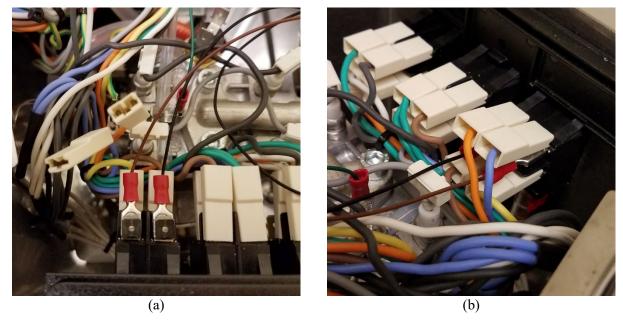


Figure 22. (a) Tapped the brown wire and the black wires to the power button. (b) Connect the original wires to the piggyback connectors.

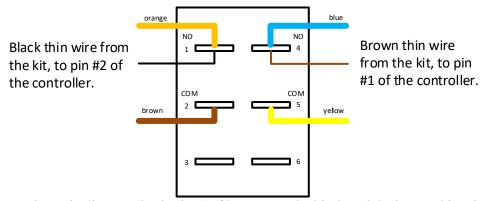


Figure 23. A schematic diagram (back-view) of how to tap the black and the brown thin wires from the kit to the power button.

G. Connecting the Pump-Control Wire

1) Swapping the brown wire and the gray wire on the brew button. On the brew button, remove the brown wire (indicated by green arrow in Figure 24(a)) that is attached to pin #4 of the brew button and a gray wire is attached to the middle (pin #5 of the brew button). Please swap the brown wire to the middle pin as pointed by the green arrow in Figure 24(b). You can refer to Figure 26 (a) and (b) for how the wires should be attached before and after this step.

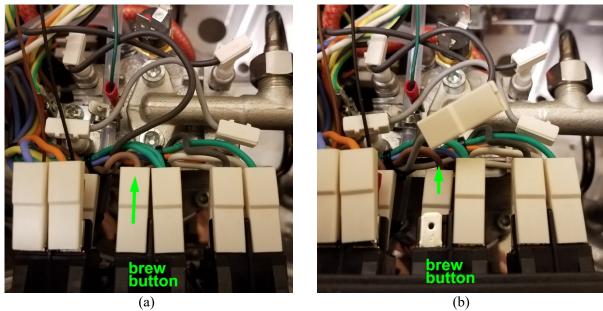


Figure 24. (a) The wires attached to the water-pump button. (b) Swap the brown wire pointed by the green arrow to the middle (pin #5) of the water-pump button.

2) Tapping the green pump-control wire from the kit to the brew button. Identify the green pump-control wire from the kit, which has a piggyback connector on one end and a bare tip on the other end. Attach the piggyback connector to the pin #4 on the water-pump button as shown in Figure 25(a). Please make sure the tab is facing up. Then press down the tab a little bit and reconnect the gray wire to the tab on the piggyback connector as pointed by the green arrow in Figure 25(a). The picture in Figure 25(b) shows how the brew button looks like when this step is finished. Refer to Figure 26 for diagrams of how wires are attached before and after this step.

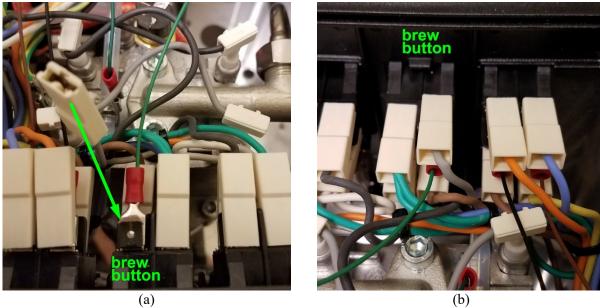


Figure 25. (a) Tap the piggyback connector of green pump-control wire to the top (pin #4) of the water-pump button. (b) Attach the gray wire to the tab on the piggyback connector.

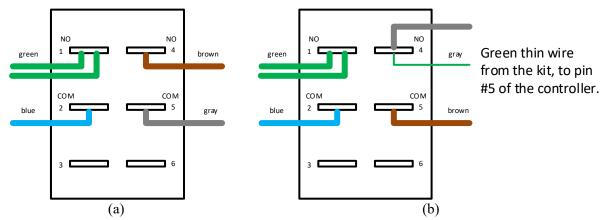


Figure 26. Schematic diagrams (back-view) of the brew button, (a) how the wires are originally attached to the brew button, and (b) how the pump-control wire should be attached.

H. Connecting the Steam-Control Wires

1) Removing two wires from the steam button. The black wire and the white wire pointed by the green arrows in Figure 27(a) should be removed from the steam button. These connectors can be just left un-connected or covered by electric tapes as shown in Figure 27(b). Please also make sure the connectors from the two wires are pointing away from any open pins of any switches.

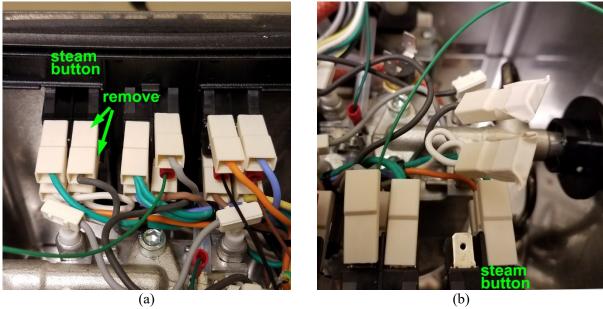


Figure 27. (a) Remove the black and the white wires pointed by the green arrows from the steam button. (b) These two open pins are where the steam-control wires from the kit will be attached to.

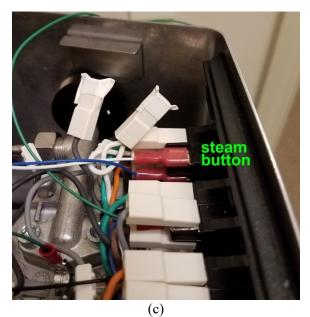


Figure 27. (c) Attach the blue wire and the white wire with red female connectors to the steam button.

2) **Tapping the steam-control wires**. Identify the steam control wires from the kit, a blue thin wire and a white thin wire, both of which has a red female connector on one end, and a bare tip on the other end. Connect these two wires to the pin #4 and #5 of the steam-button as shown in Figure 27(C). Please refer to Figure 28 for how wires are attached before and after this step.

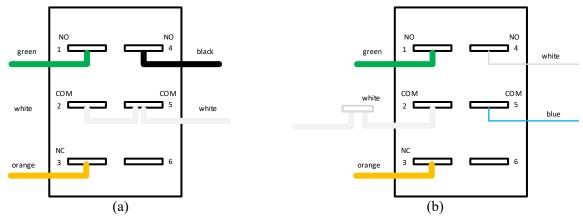


Figure 28. Schematic diagrams (back-view) of steam button, (a) how the wires are originally attached to the steam button, and (b) how the steam-temperature-control wires should be attached.

I. Connecting Wires to the Controller

1) Removing all 8 screws on the controller box. Place the screws in a safe place. Now you have the back-plate, the body of the box, and the front-plate with the controller mounted on it. The back plate of the control box has a small hole with rubber grommet. Please keep in mind that the side that you can see the countersink holes is the outer side of the plate.

2) Organizing all the control wires that have been installed to the espresso machine. Feed the wires from a middle slot on the back panel as shown in Figure 29. At this point, you can use a cable tie to loosely bundle these wires together. But do NOT tie up the cable tie yet.



Figure 29. Feed all wires through the slot next to the SSR.

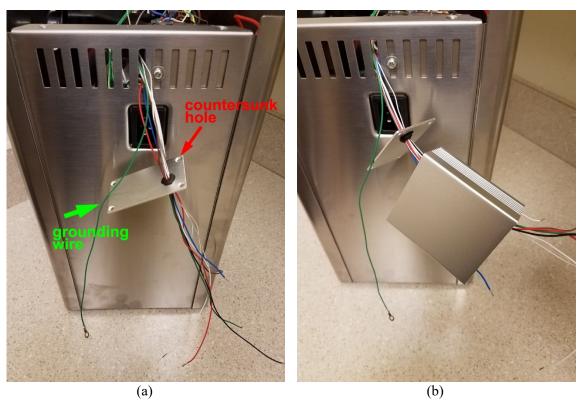


Figure 30. Feed wires through the rubber grommet of the back-plate. But the grounding wire need to be left out.

- 3) Feeding wires through the controller box. Feed all wires except the grounding wire (note: the grounding wire has a ring connector) through the rubber grommet on the back-plate of the controller box as shown in Figure 30(a). Please make sure wires are coming from the outer side of the plate and going to the inner side of the plate. The side that you can see the countersink holes is the outer side. You need to feed the wires through the grommet one at a time. Then feed the wire through the controller box before connecting them to the controller as shown in Figure 30(b).
- 4) Connecting wires to the controller. Wiring the controller correctly is a critical step. Failure to install wires correctly can damage the controller, the coffee machine, and may cause electric shock. The terminal numbers are printed on the labels on both sides of the controller. Please double-check the terminal number on the side label before you connect any wire. Do NOT rely on the molded number on the plastic enclosure of the controller.

The Table 1 below summarize how each wire should be connected to all terminals on the controller. The image in Figure 31 shows how all the wires are connected to the controller. At the end of this step, the controller box assembly should look like what is shown in Figure 32.

IMPORTANT: Tips regarding to connecting wires to the controller.

- Make sure the plastic insulation on the tip of the each is peeled off. Pay extra attention to the wires of the RTD sensor as the insulation is transparent. No plastic insulation should be clamped in the screw terminal.
- Twist the tip of each multistrand wire before inserting the wire to the screw terminal. Please make sure no stray wire is left outside the screw terminal nor touching other terminals. Otherwise, it may result in a short circuit.
- Please make sure all wires are firmly clamped between the screw terminals by a screw driver.

Table 1. Connecting wires to the correct terminals on the controller.

Wire color and function	Terminal #	Note
Brown, power	1	Neutral, AC
Black, power	2	Hot, AC
Black, short jumper wire	2 & 4	Hot, AC
Blue, steam-control	3	+9 VDC
Green, pump-control	5	Hot, AC
White, short jumper wire	6 & 7	For RTD sensor
Clear, RTD sensor	7 & 8	RTD sensor
White, steam-control wire (w/ female connector)	9	-9 VDC
White, SSR-control (w/ spade connector)	9	-9 VDC
Red, SSR-control	10	+9 VDC

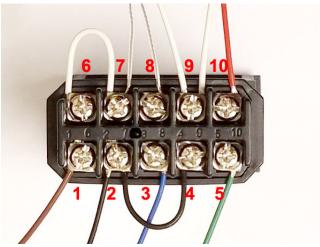


Figure 31. After all wires are connected, the back of the controller should look at this. Please note that the screw terminals on the bottom row, from left to right, are pin #1 to #5. The terminals on the top row, from left to right, are pin #6 to #10.

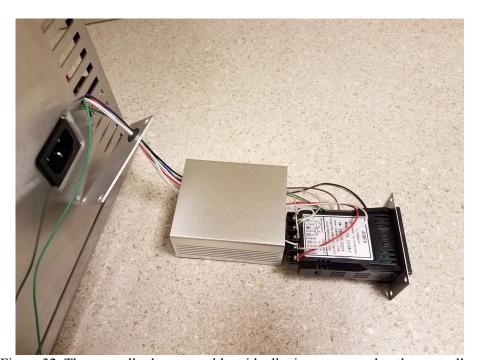


Figure 32. The controller box assembly with all wires connected to the controller.

5) **Assembling the controller box**. First, check the orientation of the box, make sure the smooth surface of the box is the top. Then install the front plate to the box as shown in Figure 33(a). Next, organize the wires, gently pull the slacks of all wires out of the back plate as shown in Figure 33(b). Make sure the rubber grommet is on the top-left corner (looking from the back), and install the back plate to the box. While you are installing the back plate, install the grounding wire to the top-left screw of the controller box as shown in Figure 33(c). Then, gently pull the slacks of all wires into the top compartment of the espresso machine. Apply the spiral cut tubing to bundle the wires as shown in Figure 33(d).

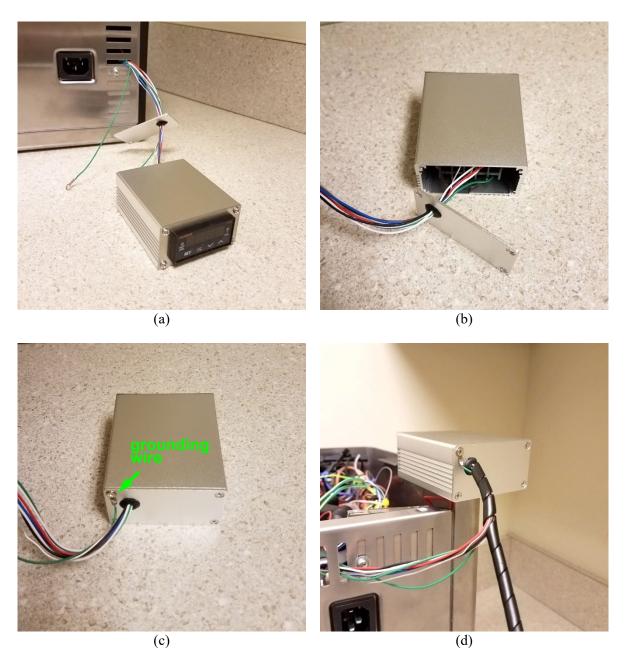


Figure 33. (a) Install the front plate. (b) Gently pull the wires out. (c) Install the back plate and grounding wire. (d) Apply the spiral cut tubing.

6) Mounting the controller box to the coffee machine. First, to ensure a good adhesion between the foam tape and the metal surface, clean the area that you want to mount the controller box using medical alcohol or rubbing alcohol. Make sure the mounting area is free of dirt or oil. Wait till this area is dry. When properly installed, the 3M double tape is very strong and durable. It is for industrial use in such as building structures and automobile parts. The red arrows in Figure 34 point to the area need to be cleaned.

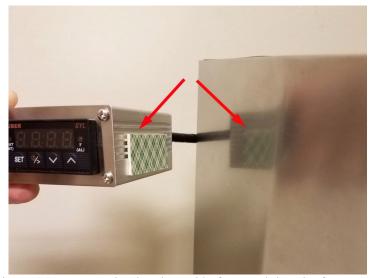


Figure 34. Area need to be cleaned before applying the foam tape.

Next, apply the foam tape to the side of the controller box. Then, remove the protective film on the foam tape, and slowly and carefully mount it on to the side-wall of the coffee machine. You have only one chance to put it in the right position! If you remove it and try to put it back again, the bonding will not be as good. The Figure 35 shows the controller box from the front and the back after it is mounted to the coffee machine.



Figure 35. (a) The front-view of mounted controller box. (b) The back-view of the controller box.

7) Tying up the wires and covering the open connectors with electrical tape. Organize all wires inside the espresso machine and use cable ties to bundle them together (as indicated by green arrows in Figure 36(a)). Cut off the tails of the cable ties. Cover the open connectors (including connectors removed from thermostats and the steam button) use electrical tape as indicated by blue arrows in Figure 36 (a) and (b).

IMPORTANT: tip for this step

- Make sure no wire is touching the boiler or any part that may get hot while the espresso machine is in use.
- Make sure any exposed wire connector is not touching any metal part of the machine. Cover the exposed connectors with electrical tape.

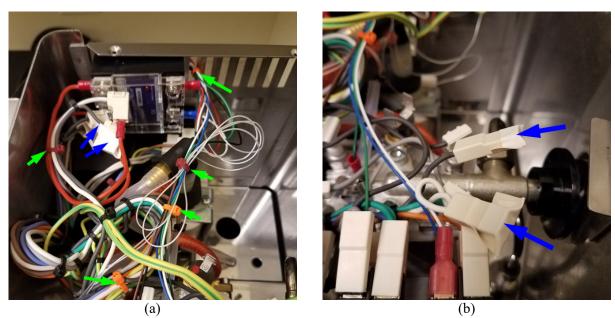


Figure 36. (a) Organize all wires and (b) cover any exposed connectors with electrical tape.

8) **Installing the top cover**. Put the cover back to the espresso machine, and install two mounting screws. **Now, the espresso machine is ready!** Connect the power cord, then press the power button to turn on the machine as well as the controller. Please see Figure 37 for a Gaggia Classic Pro installed with our control kit that is in operation. To learn more about how to use the machine with the controller, please read "Operation Manual for Gaggia Kit-GGP".

J. After Installing the Kit

All buttons on Gaggia machine function the same as before. However, the behavior of the "coffee temperature light" (below the brew button) and the "steam temperature light" (below the steam button) is slightly different. Originally, the "coffee temperature light" will turn on when brew temperature is reached; both lights will turn on when the steam button is flipped and the steam temperature is reached. After the kit is installed, these two lights will always turn on or turn off at the same time. In coffee mode, both lights will turn on when the brew temperature is reached. In steam mode, both lights will turn on when steam temperature is reached.



Figure 37. Gaggia Classic Pro (European model) with KIT-GGP (white LED display) installed.

APPENDIX

A. Move the Boiler Assembly

This section shows a few pictures regarding how to lift the boiler assembly. This can be helpful to users who may have difficulty in accessing wires on the coffee thermostat, in removing the thermostat, or in installing the PT100 screw sensor (i.e., PT100M4 sensor). You don't have to take the boiler out. Simply lift it a little can give you easier access to the coffee thermostat.

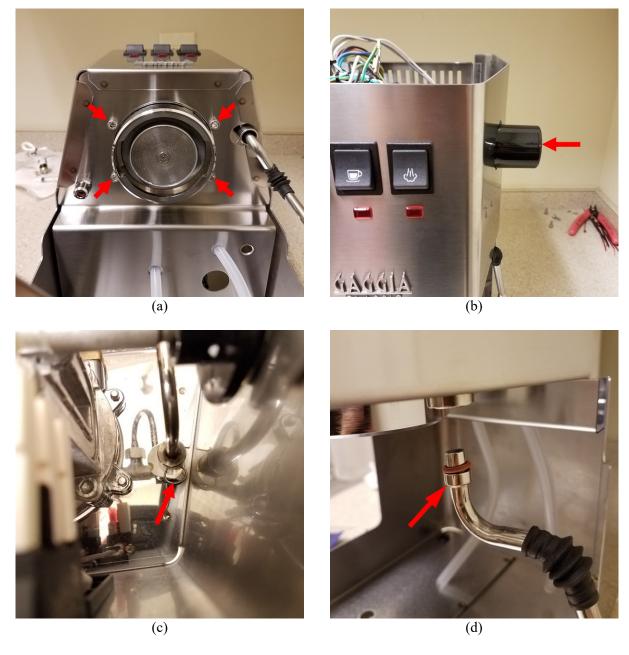


Figure 40. (a) Use a hex wrench to loosen 4 screws. (b) Pull out the steam knob. (c) Remove the clip. (d) Pull out the steam wand.

B. Wiring Diagrams

1) Circuit diagram of the European version Gaggia Classic Pro (RI9480, 230V).

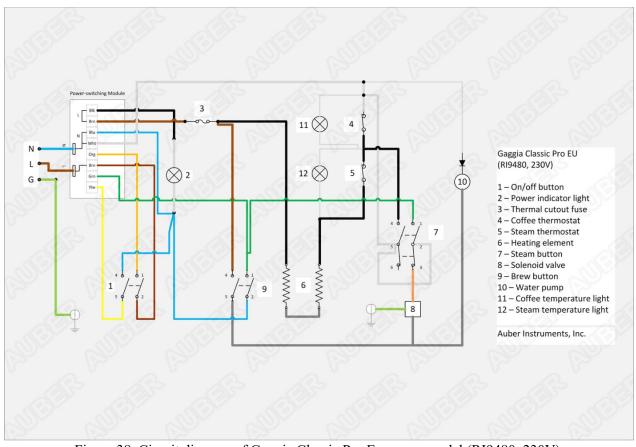


Figure 38. Circuit diagram of Gaggia Classic Pro European model (RI9480, 230V).

2) Circuit diagram of European version Gaggia Classic Pro (RI9480, 230V) with KIT-GGP.

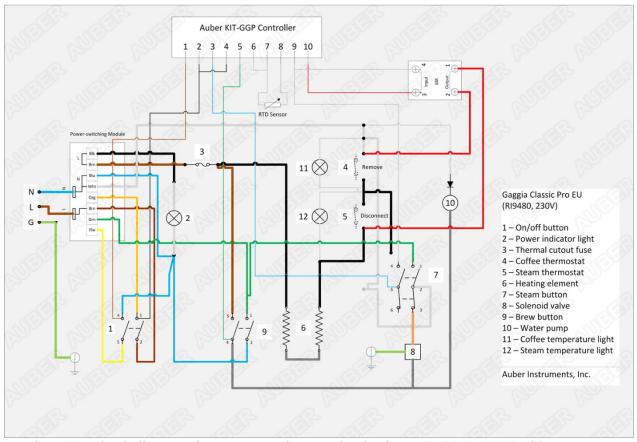


Figure 39. Circuit diagram of European version Gaggia Classic Pro (RI9480, 230V) with KIT-GGP.

(END)

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