

KIT-RSRTDN Installation Guide

Version 2.0

Auber Instruments, 730 Culworth Manor, Alpharetta, GA 30022

e-mail: info@aubersins.com

Tel: 770-569-8420

www.aubersins.com

This is a PID controller kit installation guide solely distributed to our clients, who have purchased the KIT-RS kit. Once you are done with this guide, please send us your feedback, comments, and/or suggestions (via e-mail to aubersins@gmail.com) so that we may continue making improvements to this guide. Your help is greatly appreciated!

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

Disclaimer:

This product was created and distributed by Auber Instruments Inc. Everything included in this guide (images, text, etc.) is the intellectual property of Auber Instruments Inc. Thus, this guide is not to be replicated, altered, or sold without express written permission from Auber Instruments Inc. If you did not receive this document from Auber Instruments Inc, please let us know as it is subject to inaccuracy and/or obsolescence. The Rancilio Silvia names and trademarks are owned by Rancilio Macchine per caffè. S.p.A.

The modifications of Rancilio Silvia involve tampering with high-wattage electrical circuits in a wet environment, which could result in electric shock, burns, other 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.

Parts Identification.



Figure 1. PID Controller, Aluminum extrusion box, rubber grommet, double sided tape pre-assembled - Front view on left. Back view on right.



Figure 2. Solid State Relay (SSR), mounting screw nut and washer for SSR, silicone heat transfer compound (white paste in the vial) for SSR and sensor, and RTD jumper cable (see section D part 3).



Figure 3. Cables for connecting SSR output to heater. Terminated with spade tongue terminal on one end and tab terminal on the on other end.

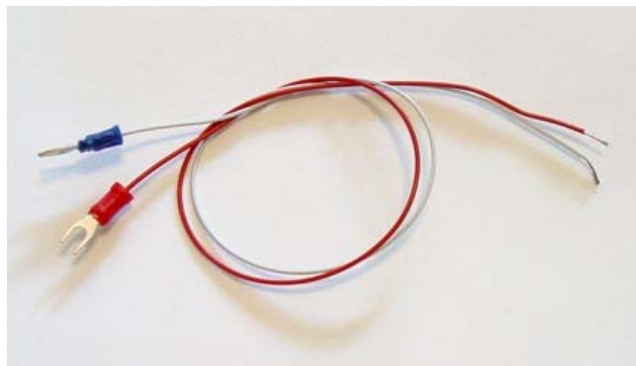


Figure 4. Cables for connecting controller output to SSR input. Red colored cable for positive. White colored cable for negative. Terminated with spade tongue terminal on one end.

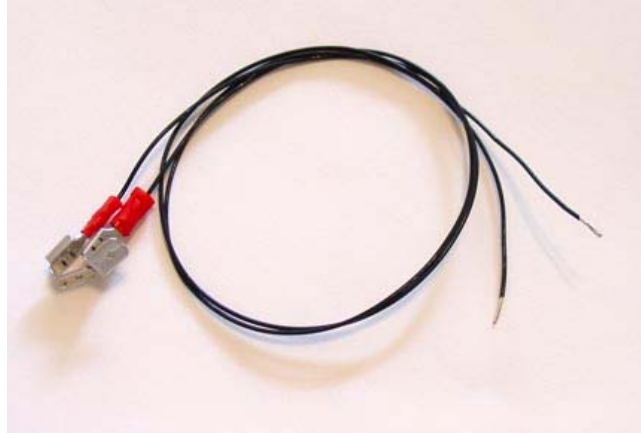


Figure 5. Cables for tapping power to controller. Terminated with piggyback connector on one end.



Figure 6. The RTD temperature sensor.

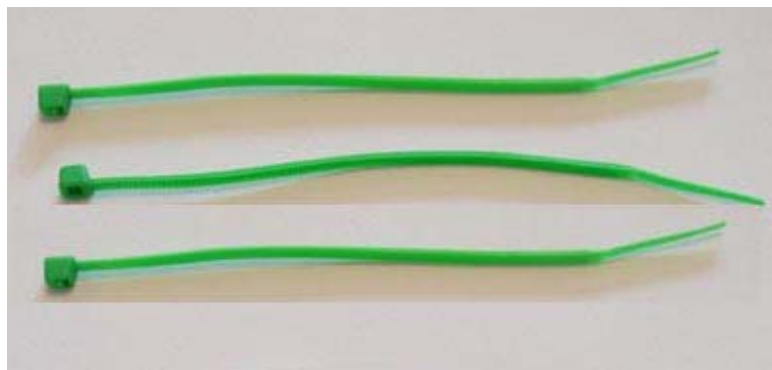


Figure 7. Cable ties

Procedure

A. Preparation for installation.

- 1) Disconnect the power cord from power outlet. Remove the water tank, portafilter, and drip tray.
- 2) Remove the splash guard panel after removing the screws indicated by the red arrows in Fig 8. Slide the stainless panel out from left side.



Figure 8. Red arrows indicates the screws that hold the splash guard panel.

- 3) Remove the top cover after removing the screws indicated by the red arrows in Fig 9. Pull out the top panel.



Figure 9. Top panel. Red arrows indicate the screws that hold the top panel.

B. Install the SSR

- 1) Assemble the cables on SSR as illustrated in Fig 10a. The two red colored thick cables with soft silicone rubber insulation should be connected to the terminal marked as 1 and 2. It doesn't matter which of the two thick red cables goes to 1 or 2. The red colored the thin cable should be connected to 3 (+). The white colored thin cable should be connected to 4 (-). The clear plastic protection cover on the SSR can be removed for easy installation of the cable. Tighten the screw. Make sure the cables hold secure.

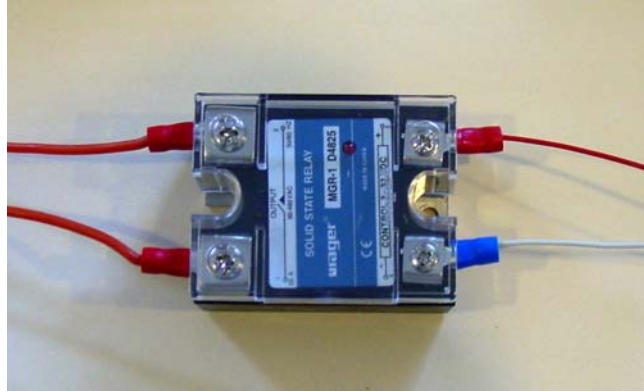


Figure 10a. SSR wiring.

- 2) The SSR is mounted on the wall behind the splash guard panel (lower right corner as shown in fig. 10b). Apply small amount of the silicone heat transfer compound to the bottom metal surface of the SSR. Mount the SSR to the screw post as shown. Use the M4 screw nut and washer supplied in the kit to hold the SSR. The M4 screw can be tighten with a 7 mm socket wrench. Use a cable tie to hold four cables in place.

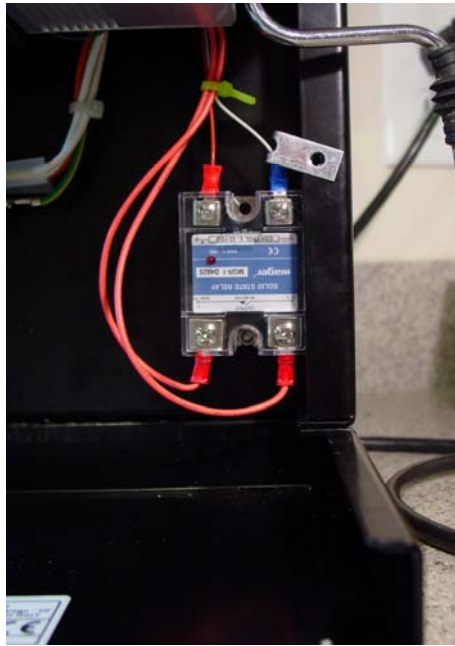


Figure 10b. SSR installed.

- 3) Install the splash guard panel back to its original position (figure 8 above). Feed the two SSR output cables into the boiler compartment. Feed the SSR input cables (the thin red and white ones) to the outside through the space around the steam wand (Fig 15 below)

C. Installation in boiler compartment

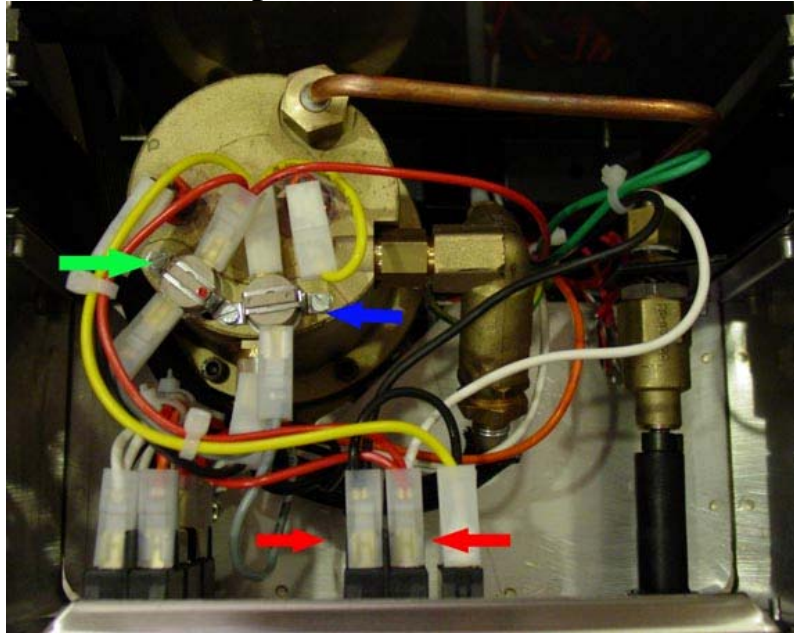


Figure 11. Top view of original wiring. Red arrows indicating where the controller power cable will be tapped. Green arrow points to brew water control thermostat. Blue arrow points to the screw under which the RTD sensor will be mounted.

- 1) There are two thermostats on top of the boiler. The one on left with a red dot on top is the brewing water temperature control thermostat (marked with green arrow). The one on the right is for controlling the steaming temperature (marked with blue arrow). You need to remove the cable connectors on both side of brew water temperature thermostat (connectors with red and gray cable). They need to be connected to the output cables of SSR (the two thick red wires). The blue arrows in Fig 12a show what it should look like at this step.

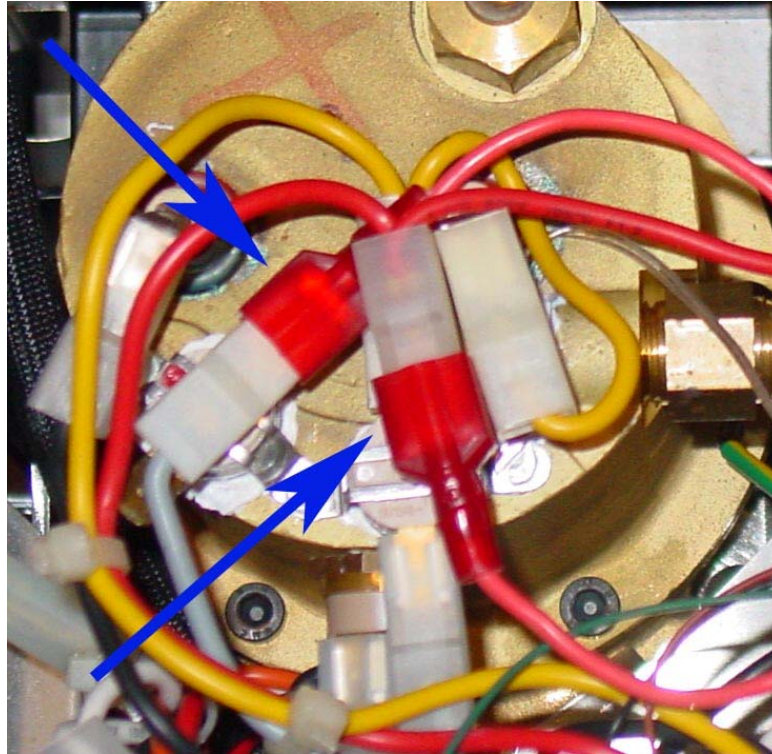


Figure 12a. Connecting SSR output cable to heater.

- 2) Install the RTD sensor. The RTD sensor should sit in the same place as the original brew thermostat was located (indicated by the green arrow in Fig 11). Remove the brew thermostat by loose the screws that hold it. Insert the RTD sensor to the same bracket that was used to hold the brew thermostat. Sometimes, it is convenient to work on the screws by temporarily removing the cable connector on the left side terminal of the heater. Please note that if the machine is old and as a result, the plastic protection guard of the heater connector is brittle, it might break off and leave some unprotected spots. You need to use a small to medium sized flat head screw driver to remove the screw. Be very careful to not let it drop into the gap below. If it drops to the top of the grouphead, it could be a lot of trouble to take it out. A magnetized screw driver will help. Apply a small amount of silicone heat transfer compound to the bottom of the RTD sensor before installation. This will ensure a fast and accurate temperature measurement. Fig 12b shows the RTD has been installed (marked with red arrow).

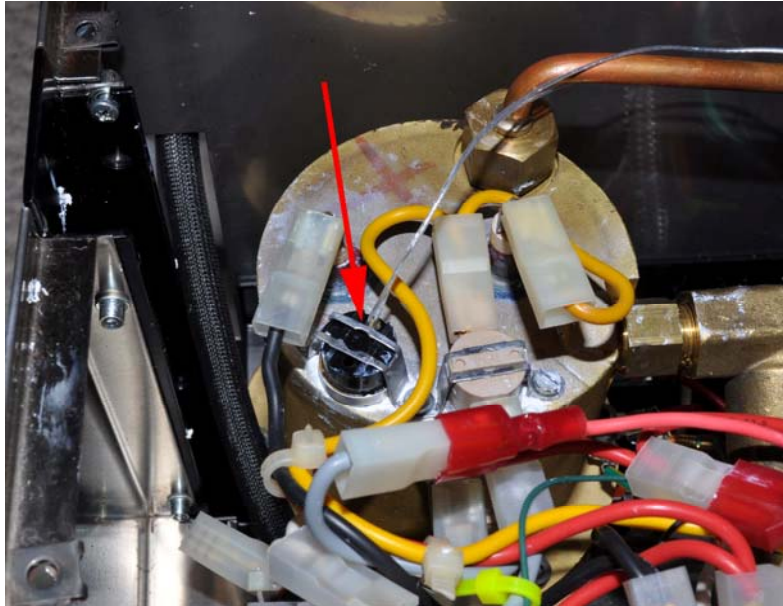


Figure 12b. RTD sensor mounting.

- 3) The power for the controller box is tapped from the main power switch by using the piggyback connectors on the new black cables. Remove the connectors with black and red cable on the main power switch (red arrows on Fig 11). Remember the original position: the connector with black cable was on the left and connector with red cable in the center). Slide the two controller power cable piggyback connectors on to the switch as shown in Fig 13. The tab on the piggyback connector should be on the top. You need to bend it downward a little bit if the angle is too high. There is no difference between the two black colored cables. After installing the connectors, connect the cables that were just removed to the tab on the piggyback connector. It is very important to keep the original position, black on the left and red in the center (Fig. 14).

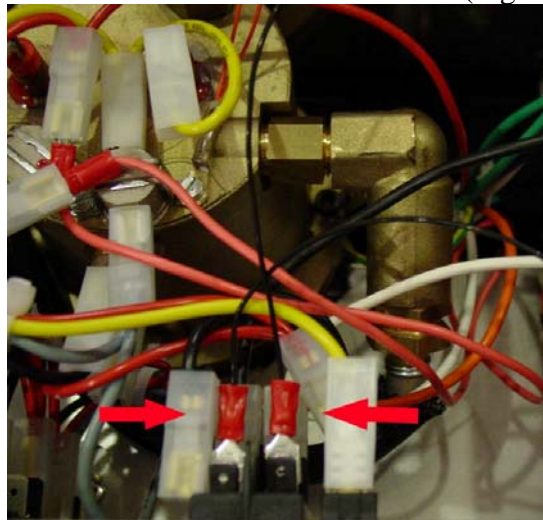


Figure 13. The controller power cable piggyback connector location (red arrow).

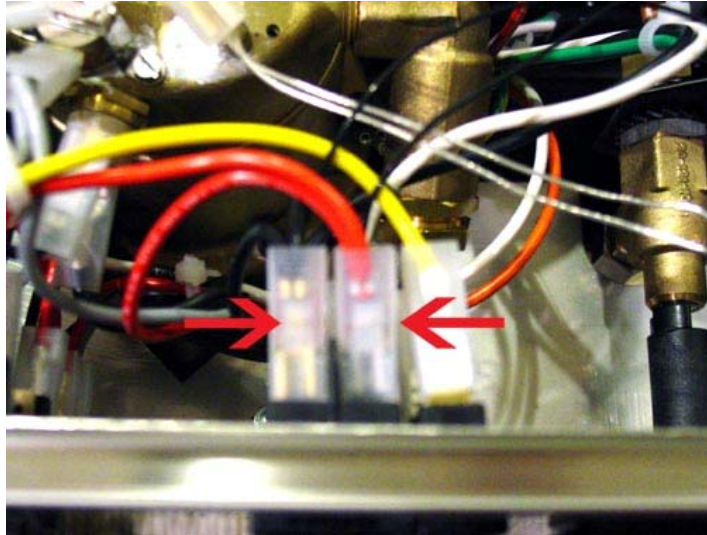


Figure 14. Put the original power cables back.

D. Connecting the controller.

- 1) Remove all 8 screws on the controller box. Save them in a safe place.
- 2) Fit the controller power cables and RTD sensor cables to the outside through the gap around the steam wand (red arrow in Fig. 15). Collect the SSR control cables from the back of the splash guard pane. Fit all cables through the rubber grommet on the back panel of the controller box. Make sure the direction of the back panel is as shown in figure 15. The surface with countersunk screw hole is the outside surface. Cables should come from the outside surface to the inside. You need to fit the cables through the grommet one at a time. There are six cables total.



Figure 15. Cables going through the back panel of the controller box.

- 3) Feed the cables through the controller box. Connect them to the controller as shown in Fig 16a. Wiring the controller correctly is a very critical step. Failure to install it correctly can cause damage to the machine and electric shock. The terminal numbers are printed on labels located on both sides of the controller. The black colored power cables need to be

connected to terminal 1 and 2. SSR input cable has a polarity. The red colored cable from SSR has polarity (+) and is connected to terminal 10 and white colored cable is for terminal 9. The clear colored RTD cables need to be connected to terminal 7 and 8. The white colored RTD jumper cable needs to connect to terminal 6 and 7. The detail is shown in Table 1 and Fig 16b.

Table 1. Wiring to the controller

Color code of wire	Terminal
Black power cables	1 & 2
White RTD jumper cable	6 & 7
Clear RTD cables	7 & 8
White cable from SSR	9
Red cable from SSR	10

Bending the wire tip will make the insertion of the cable easier as shown in Fig 17. In order to prevent the cables from coming loose when pulling on them during box installation, make sure all cables are securely tightened by a screw driver. Also, make sure there are no small wires touching the other terminals, causing a short circuit.

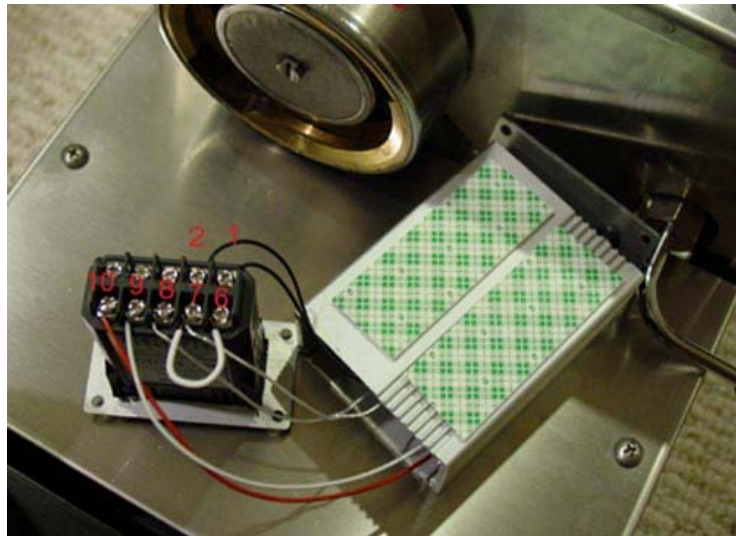


Figure16a. Feed wires through the box before connecting to the controller.

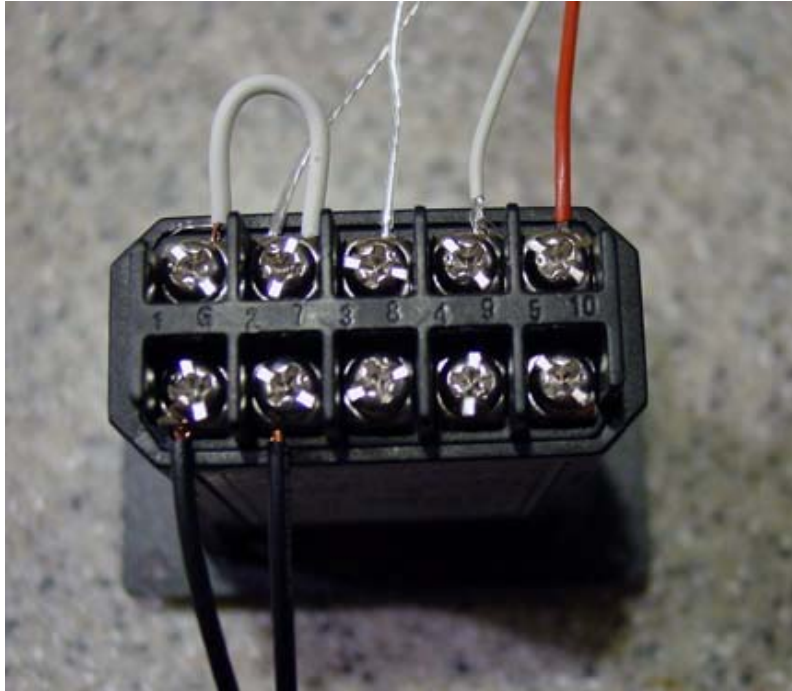


Figure 16b. Detailed view of wiring on the controller terminal.



Figure 17. Bend the wire for easier insertion.

4) Install a cable tie as strain relief

Place a cable tie at 1.5 to 2 inches away from the back of the controller. Cut off the tail of the tie as shown in Fig. 18. This tie will function as strain relief to preventing the wire being pulled off the terminal.

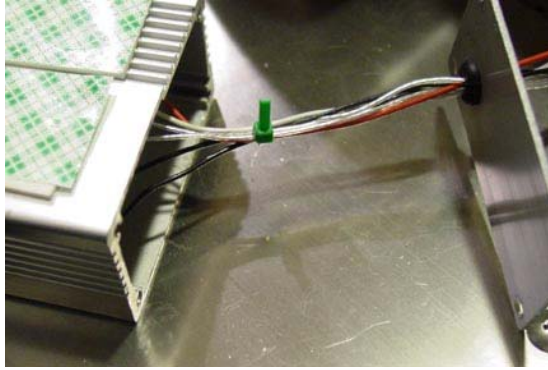


Figure 18. Install a cable tie as strain relief.

- 5) Install the controller to the box. Screw the front panel first. Make sure the surface of the box with double sided tape is on top of the controller. Then, gently pull out the cable from the back panel of the box until it is stopped by strain relief. Screw on the back panel. Make sure the rubber grommet is on the right upper corner (viewing from front) position as shown in Fig. 19.

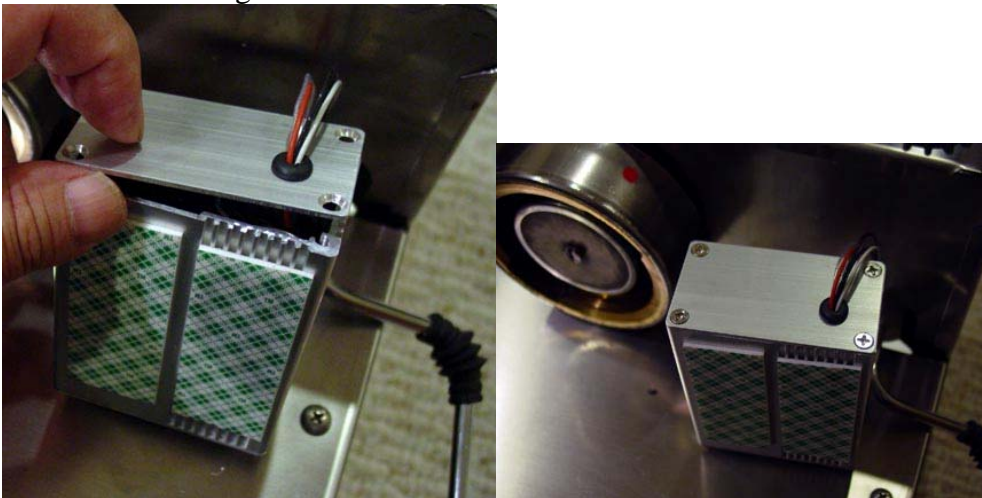


Figure 19. Left, press the back panel on with a little force. Right, screw is on.

- 6) Clean the controller box mounting area on the espresso machine with a cotton ball soaked with alcohol to ensure a good adhesion of the box. Fig 20. This is very important because the metal surface might contain oil that reduces the bonding strength of the tape. When properly installed, 3M double tape is very strong and durable. It has been used for industrial use such as in building structures and automobile parts.



Figure 20. Cleaning the box mounting area with alcohol.

- 7) Remove the protection film on the double side tape on the box. Slowly and carefully mount it on the espresso machine. Make sure there is a gap between the group head and box as shown on Fig. 21. It is for reducing the heat transfer to the controller. The front panel of the controller box should be flush with the machine front panel for neatness. You have only one chance to put it in the right position. If you remove it and try to put back again, the bonding will not be as good.



Figure 21. Control box position.

- 8) Tie up the wire in the boiler compartment (Fig.22). Make sure there are no cables touching the boiler surface. This is especially important for the cables installed by the factory. The cables installed by the factory have PVC insulation that will melt when touching the hot boiler surface. It can result in electric shock.

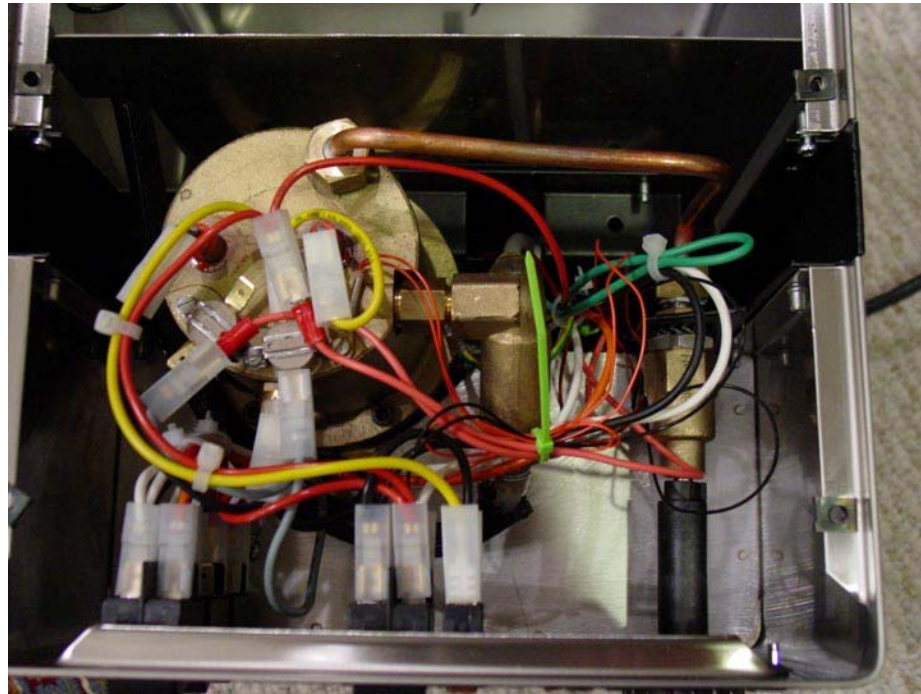


Figure 22. Tie up the cables with green colored cable tie.

- 9) Before re-installing the top cover, cut the excess tail of the cable ties. Check all connections that have been changed. Make sure that there are no exposed wires or connectors that will touch the top cover metal when it is installed. Some of the cables that stayed above the level of the cover when fitted will move when the cover is installed. If that cable has an exposed metal connector, it could result in an electric short.

- 10) Install the water tank.

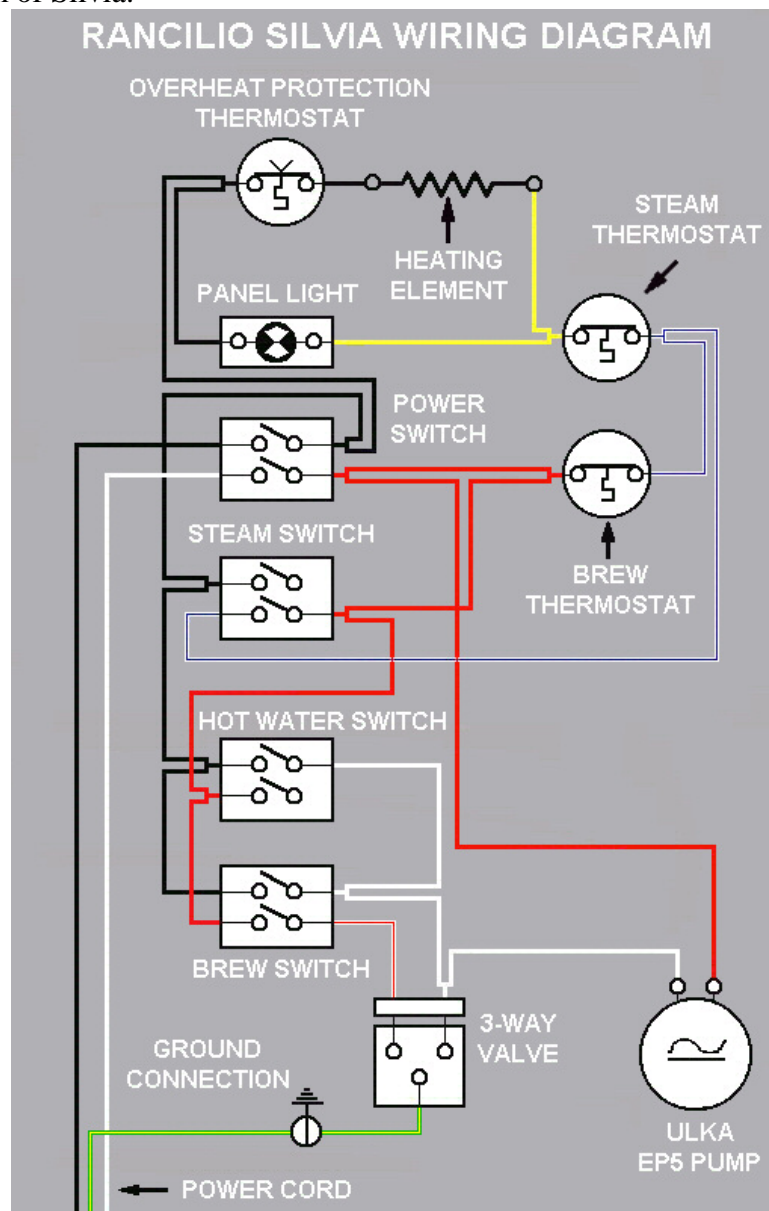
The project is done. This is how the machine should look like now.



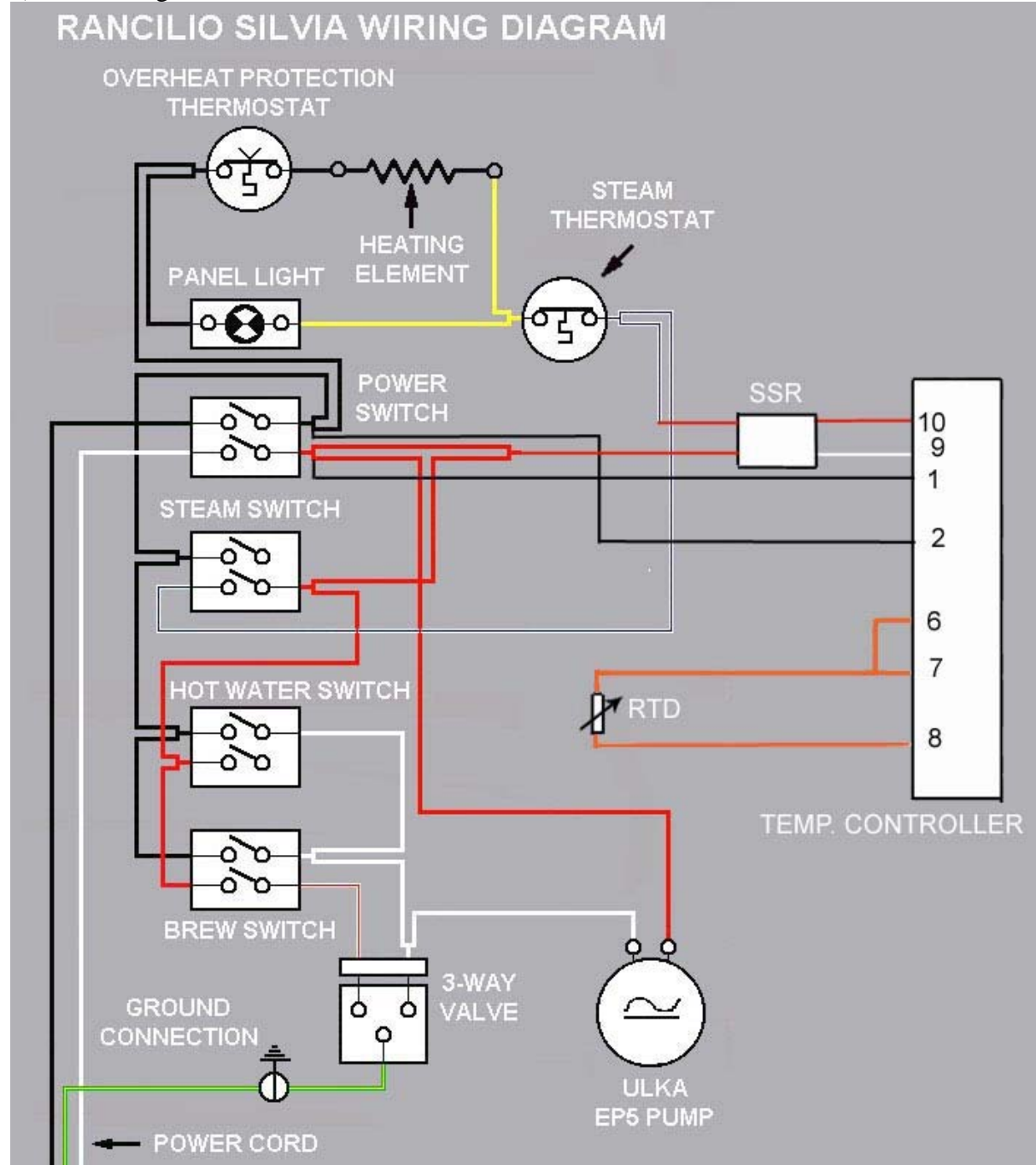
To use the machine, please read “Operation manual for Rancilio Kit”.

Appendix

1) Circuit diagram of Silvia.



2) Circuit diagram of Silvia with the KIT-RSRTDN connection



3) Trouble shooting procedure for not heating or not heating properly.

a) The controller “OUT” LED (on the left front of the controller), the LED on the SSR (on the black plastic cover), and the espresso boiler resistance light (the neon lamp by the main power switch) should be synchronized. When they are on, the heater should heat. When they are off, the heater should not heat.

b) If all three lights lit up but no heat. There are two possibilities a) **the thermal protection thermostat was triggered.** The most common cause is that the temperature sensor's round section didn't touch the boiler surface. It slows down the temperature response, causing the boiler to overheat. This could happen for the kit with steam control. In addition, if you change the setting or offset of the controller without adjust the steam temperature, the boiler can get overheat to trigger the thermostat. The thermal protection thermostat is mounted on the sidewall of the boiler with a red button on the top. You can reset the thermostat by press the red button until you feel a click. b) the heater is broken. To verify if the heater is broken, you can use a multimeter to measure the resistance when the machine is off and unplugged. A working heater should have about 12 ohm resistance (48 ohm for 220V model).

c) If the "OUT" LED of controller lit but SSR LED and espresso boiler resistance light are off, the problem is between the controller and SSR. Use a multimeter to measure the voltage between A1 and A2 of the SSR. There should be a 7-8 VDC across it. If there is no voltage, try to measure the voltage at controller between terminal 9 and 10. If there is still no voltage, the controller is bad, Otherwise, the wiring is the problem. If there is a 7-8 VDC between A1 and A2 of the SSR, most likely, the wiring polarity is wrong, A1 should be positive. If there is voltage and polarity is right, the SSR is bad.

d) If the "OUT" LED of controller and SSR LED lit, but espresso boiler resistance light is off, the problem is between the SSR and espresso. Use a multimeter to measure the voltage between L1 and T1 of SSR (meter needs to be set for AC voltage). If there is a 120 VAC (or 220VAC for the 220 line voltage), the problem is the SSR (assuming the heater is connected correctly and heater was working).

e) If the "OUT" LED of controller and SSR LED are off, but espresso boiler resistance light is on and heater is heating. The SSR can be defective. Remove the cable on A1 to see if that can turn off the heater. If not, the SSR is bad.

If you don't have a multimeter or don't know how to use one, please contact us to see if other diagnostic method can be used, based on your electricity knowledge and the tools you have.