

# MAVAM ESPRESSO, LLC

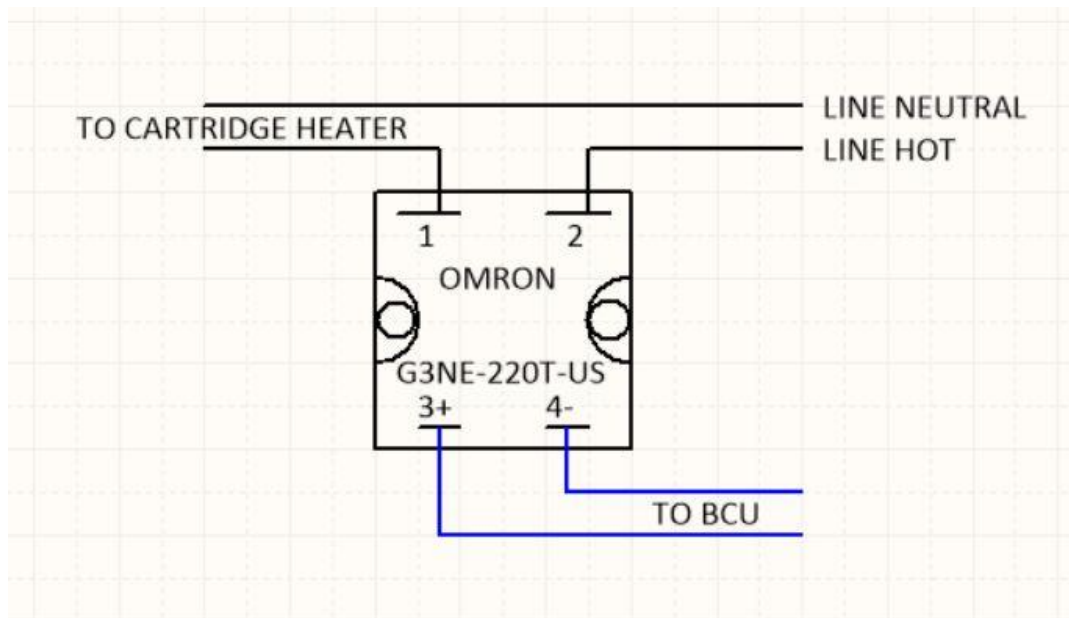
## TECHNICAL DOCUMENT

### 4007 Cartridge Heater Testing

#### Purpose and operation of the heater

The cartridge heater is an electric heating element that fits inside the brew head. The element keeps the brew head and water at the desired temperature. Heat is generated by electric current flowing through a resistive element inside the heater body. Current flow is controlled by a SSR (Solid State Relay). Operation of the SSR is controlled by the BCU circuit board. There is a thermal overlimit switch attached to the top of the brew head that will OPEN if the temperature exceeds limits. Once OPEN the electrical circuit from the SSR to the cartridge heater and back to the SSR is broken and no current will flow.

Diagram on next page.



Cartridge heater SSR

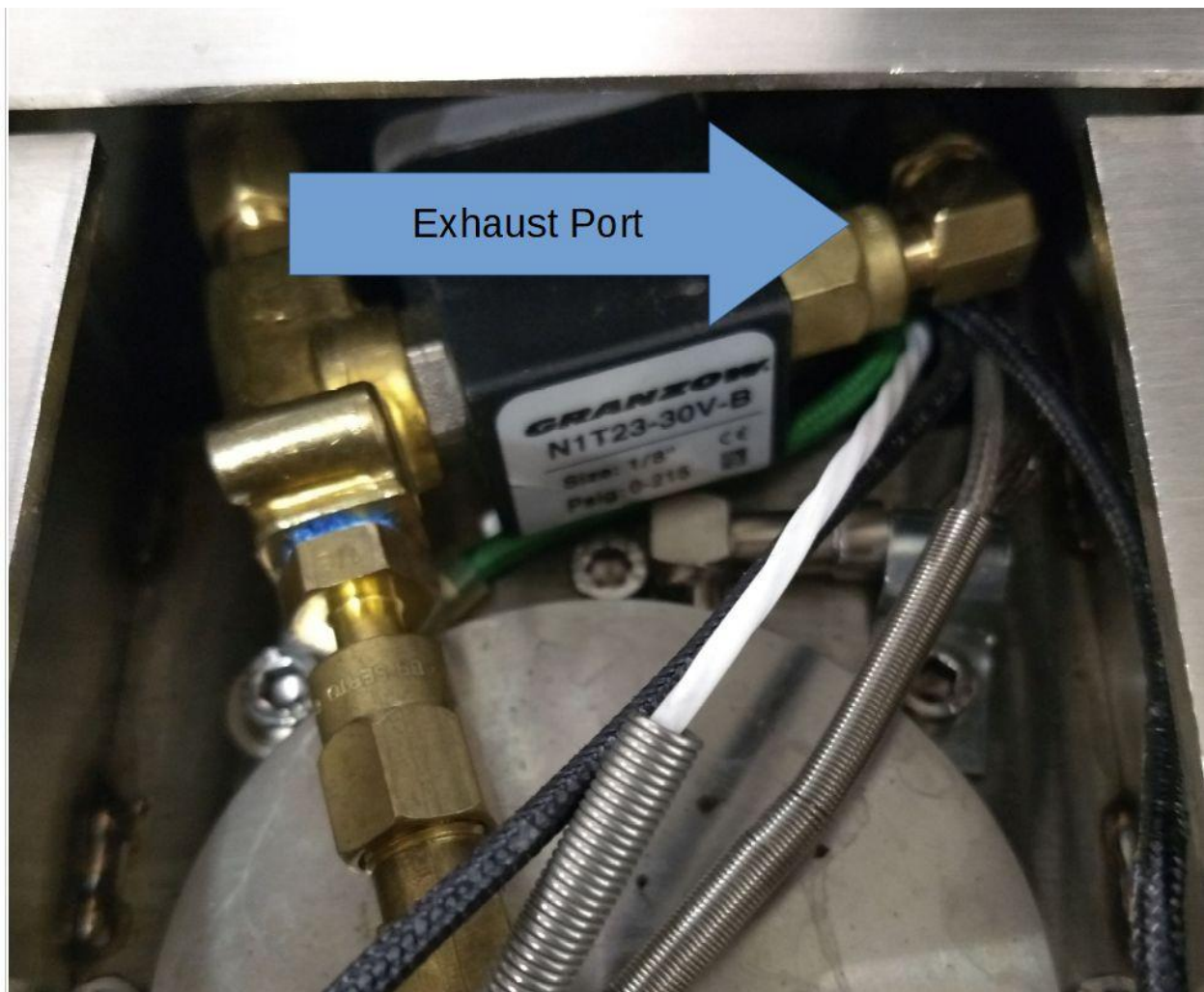


## Troubleshooting the heater

The steps listed next apply to both Under Counter and Mach 2 machines. The wiring path may be different but the electrical circuit is the same. Some common issues are, heater stops working, temperature over limit tripped, Intermittent operation. One of the most common issues is water leaking onto the heater harness connector, (3X2 Female on diagram above), causing a short circuit.

To check for water damage remove the cover of the brew head. On Mach 2 the entire panel must be removed. Place a blank flush portafilter and perform a flush cycle while looking at the exhaust port of the brew valve. If you see water, then turn the machine off and inspect the brew heater harness connector. Water damage will look like rust. If there is no water damage or the connector looks good continue with the remaining steps.

*NOTE: If you notice water leaking from the exhaust valve, even if the connector looks good, the leak should be fixed.*



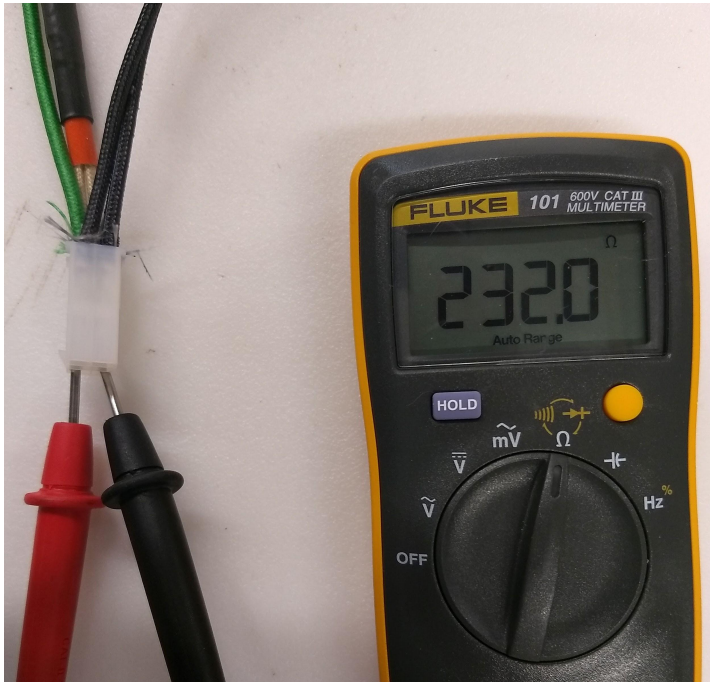
**NOTE: For the following steps the machine must be OFF**

Verify all connectors, wiring, and harnesses are not damaged. If GOOD then verify the heater signal path is good. You will need a multimeter for the following steps.

Disconnect the six pin connector from the brew head harness and the machine connector.

Measure the resistance between pins 3 and 6 of the heater connector, it should be around 225 ~ 235 Ohms.

## Measuring the resistance



Then measure the resistance between pin 3 and the machine body metal. Do the same with pin 6. Both readings should be OPEN, (infinite ohms). Make sure the temperature over limit switch is reset, (push the button on top of the switch). Measure the resistance between pins 1 and 4 of the heater harness connector, there should be almost zero resistance, (short).

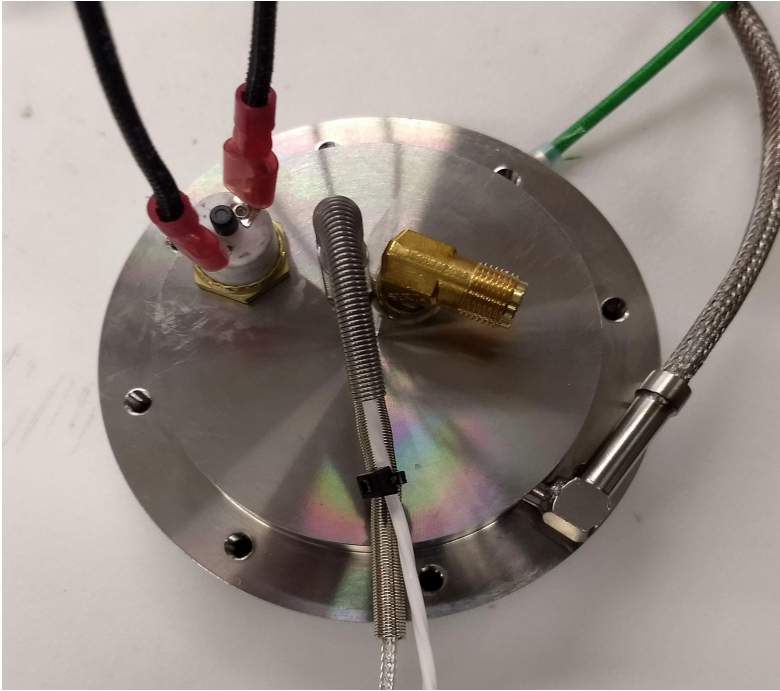
Re-connect the harness connectors. Identify the correct SSR for the heater in question. Then measure the resistance between AC Neutral and the Heater pin of the SSR, the resistance should be close to the measured resistance at the heater harness. Then

measure resistance between the heater pin of the SSR and machine metal, (ground), the reading should be OPEN. This last test checks all the connectors and harness wires for faults. If any of these measurements are out of range contact MAVAM for assistance. Consult the correct wiring diagram for correct SSR and connectors.

If all the above measurements are GOOD then check the input to the SSR. **To do this the machine must be ON.** Set the multimeter to measure DC voltage closest to 24V range. If the brew heater is functioning, (there are no errors on the component), place the meter leads on + / - tabs of the SSR. You should see a steady or pulsing 24V on the SSR input. If not there may be an error with the BCU or harness. If the inputs are good and all wiring, resistance is good with the heater and harness the SSR may be faulty.



Cartridge heater and harness



Cartridge heater, thermal overlimit switch and RTDs installed on Brew Head