

**WARNING!** This troubleshooting method uses tools that use **VERY HIGH VOLTAGE**. We recommend that only licensed electricians use these high voltage tools. Please note: When energizing the heating wire, be advised that the heating wire may retain dangerous high voltage for a few minutes after the tools have been disconnected. Do not plug Hi-Pot into a GFCI protected circuit. Troubleshooting Kits received damaged or missing parts will not receive a refund of any deposit until any damaged items are replaced or repaired.

## Tools needed:

1. 1KV adjustable Hi Pot device
2. Thermal Imaging Camera
3. 16 awg extension cord with 8"-12" of the outer insulation removed to expose the hot, neutral and ground wires for clamp meter testing of amperage- plug on one end and exposed wire on other end.
4. 16 AWG (or larger) extension cord
5. Digital clamp amp meter
6. Variac Transformer

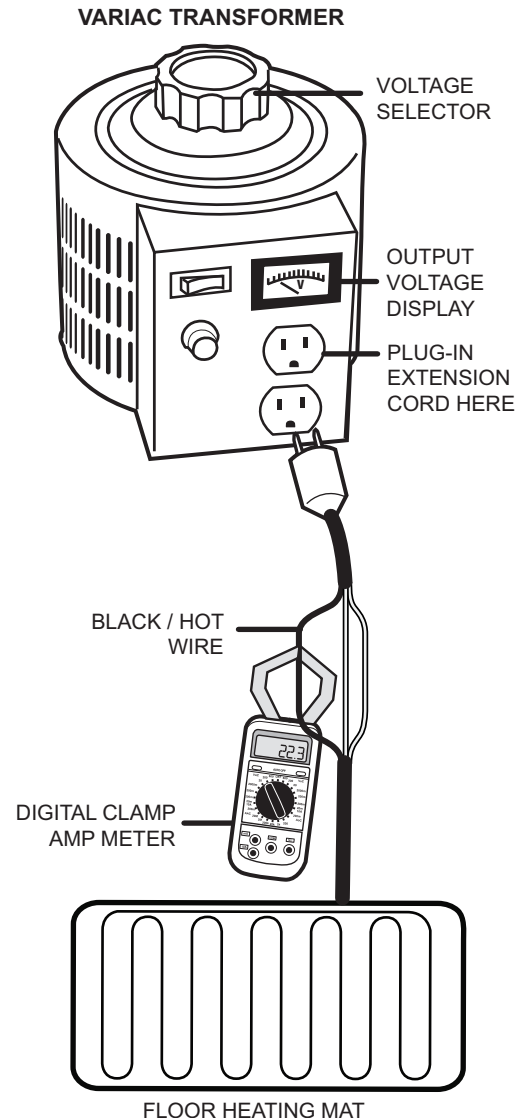
**Step 1:** Take ohms readings of cores and grounds, and across core to ground. Record these readings for reference. Ideally, there will be continuity (resistance) between one or both of the core/s and ground shield. This will indicate there is a complete circuit present and the variac may be used. If there is no continuity between the core and ground of either wire, please skip to Step 2. You will return to this step after step 2 is completed.

With the Variac turned off, start by plugging in the extension cord in to the outlet available on the device. The exposed end will be attached the floor heating mat wire with the continuity reading between it's core and ground. In the instance both wires have continuity to their respective ground shields, choose the wire with the lower resistance value.

It is always a good idea to know in advance the original ohms value and voltage of the roll that is being diagnosed. If there is an ohm reading across a core wire and the ground, what is it? What percentage is that number compared to the factory value? If it is 50% of the factory value, the absolute maximum voltage to use during troubleshooting is 50% of the voltage normally used with the heating wire. That maximum voltage would be 60 volts for a 120v system and 120v for a 240v system. Never start at this voltage! Always start at zero volts and use the dial at the top of the variac to slowly increase the voltage being sent to the wires in the floor. If the maximum voltage is 50-60 volts, excellent results will be visible with a thermal camera at 20-30 volts. Do NOT increase voltage to speed up this process! Using too high a voltage will burn out the circuit that was just made. If there is no information on the size or ohm values of the wire, use the following tips.

Attach the exposed black wire from the extension cord to the inner-conductor wire from the floor mat and the white wire can then be attached to the ground shield of the same wire. The green (ground) wire from the extension cord should be capped off, as it will not be used. Affix the amp probe clamp around the extension cord's black wire and set the dial to measure amperage. Turn the Variac on. Slowly turn the dial up from zero. The amp probe should begin to display an amperage reading. 6 volts should be sufficient to achieve an amperage draw on most heating systems. For 120 volt mats, no more than 12 volts should be used. Do NOT try to use more voltage to expedite the process. The Variac may need to run low voltage through this circuit for up to 15 to 20 minutes to achieve results. This process will heat the wire right up to the point of the failure and the precise location of the failure can be seen with the thermal imaging camera.

Mark the location of the failure with tape or a grease pencil. This location will need to have the tile removed and thinset chipped away to expose the wire for the necessary repair.



# Floor Fault Location Thermal Camera Method

**Step 2:** If there is no continuity between the core wires, and no continuity between the core and ground at both ends, the core is likely broken or vaporized. If no reading is present across the ground shields, the wire has been severed. The Hi-Pot device is used to establish continuity between the core wires, or from the core wire to its respective ground shield by "fusing" the wire together sufficient enough so that it may carry the low voltage current of the Variac transformer illustrated in Step 1 of this process.

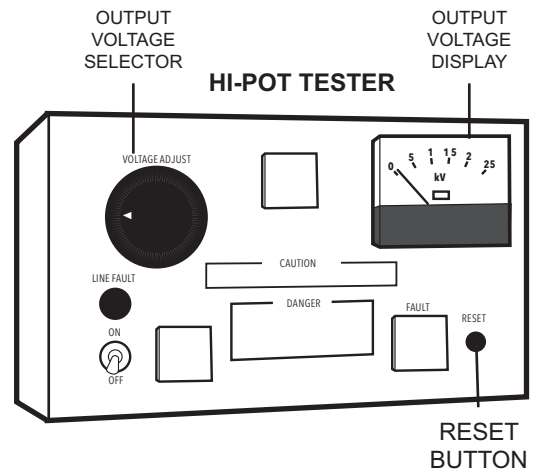
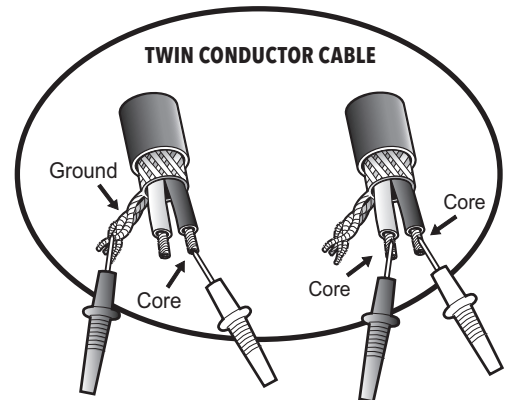
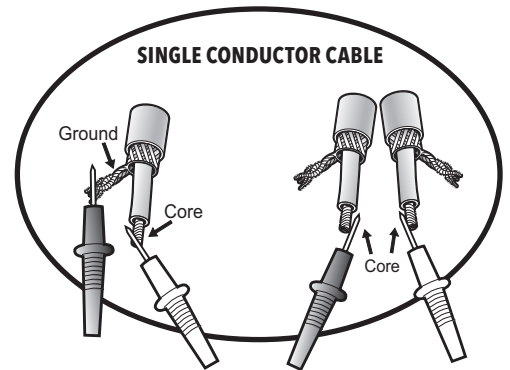
**ATTENTION! DO NOT APPLY CURRENT TO THE WIRE FOR MORE THAN 2-3 SECONDS AT A TIME! DOING SO WILL PERMANENTLY DAMAGE THE HI-POT DEVICE.** If the Hi-Pot is returned to WarmlyYours in a non-functional state, up to \$1500 dollars will be deducted from your deposit refund.

Prepare the Hi-Pot. Attach the black probe from the Hi-Pot device to the ground shield of the floor heat. Touch the red probe to the core wire. Turn the dial slowly to increase the voltage. You may use 200-400 volts down the core and ground wires to see if the voltage will jump through the inner insulation. If the current jumps, the unit will need to be reset using the plunger on the front of the Hi-Pot. If it doesn't jump, causing the Hi-Pot to click, try moving the voltage selector on the Hi-Pot up another 50 volts. Repeat up to approximately 500-600 volts. If the Hi-Pot resets, it means the electricity is jumping the gap in the insulation between the core and the ground. Once the unit resets, test for ohms across the core and ground. If ohms are present, there is a complete circuit. If this happens, hold the plunger on the front of the Hi-Pot down with a finger, continuing to hit the wires with 2-3 second bursts of electricity. This process actually will begin to heat at the failed area. Use the thermal camera to try to locate the area of failure. It may be necessary to increase the voltage output in 50v increments or so up to 500-600 volts. Continue to apply voltage in 2 to 3 second bursts as before. Proceed to Step 1 and follow the steps detailed there.

If there is no response across these wires, repeat until the Ground and Core melt together. This process may need to be repeated for 10-15 minutes. After this amount of time, this failure will most likely be warmer than the surrounding area and be visible to a thermal camera. Scan the entire area of the floor with the thermal camera. If there is a warm spot present, mark the location of the failure with tape or a permanent marker. This location will need to have the tile removed and thinset chipped away to expose the wire for the necessary repair. If the warm spot is not visible, it may be under a cabinet or other fixture. If this process does not reveal the fault area, move to the core wire process detailed in Step 3.

**Step 3:** Attach the black probe to one of the core wires, the red probe will be attached to the opposite core wire of the heating system. This step requires sending 200-600 volts down the core wires to see if the voltage will jump through the gap in the core wire. If the unit resets during this operation, that is good. Always use the minimum amount of voltage necessary to cause the Hi-Pot to reset. Sometimes the cores will melt together. If this happens, hold the plunger on the front of the Hi-Pot down with a finger, continuing to hit the wires with 2-3 second bursts of electricity. This process actually will begin to heat at the failed area. Use the thermal camera to try to locate the area of failure. It may be necessary to increase the voltage output in 50v increments or so up to 500-600 volts. Continue to apply voltage in 2 to 3 second bursts as before.

If the failure is found at the factory splice, remove the splice and a couple of inches of cold lead on each side of the splice. Do NOT open the splice or apply voltage to the splice! Send this splice to WarmlyYours for testing. Before shipping, contact WarmlyYours for the shipping instructions. If the splice is defective, WarmlyYours will reimburse repair/replacement costs.



**Do not plug Hi-Pot into a GFCI protected circuit. If the Hi-Pot will not reset, and the fault light is illuminated, the circuit that the Hi-Pot is attached to is not wired correctly. Find another available circuit to use.**