Using the "Cable Fault Finder" (for WarmWire™ only)

v.1 7/15/05

These instructions help give an approximate distance to a short-circuit or open-circuit damage in a Watts Radiant Warm Wire cable. Since the cable is laid out by the installer, knowledge of the layout pattern will be required to convert the pure distance of cable measured by the meter to a specific area of the floor. The accuracy of the instrument is very good, but occasionally it can give false readings. Results are never guaranteed.

What it is and how it works:

The Cable Fault Finder displays the number of feet to an "impedance change" in the circuit it is connected to. This impedance change could be an open-circuit or short-circuit or a junction between two different types of conductor. It will only display the first such problem that it comes to in the circuit. It works by sending a signal down the wire and, similar to sonar, the signal reflects back to the instrument where it decides what to do with what it has found.

Things to keep in mind:

1. Get all the information you can on the cable being tested: CABLE SIZE, EXACT LAYOUT OF THE CABLE INCLUDING ANY PICTURES OF LAYOUT.
2. The Cable Fault Finder is shipped from the factory with good "AA" batteries. However, if you have any difficulty getting a good reading, replace the batteries first.
3. This instrument has been tested with our product and has been found to be reasonably accurate, but is very dependent on the user knowing exactly how the cable was laid out.
4. If you have difficulty, feel free to call the factory and ask for technical assistance, 888-432-8932. We will do the best we can to help you locate the problem.

Test Procedure:

1. Disconnect the power to the circuit that feeds the cable in question.
2. Remove the thermostat control and disconnect the power leads that feed the problem cable, including the green ground wire that feeds the cable.
3. Attach the test leads that come with the Cable Fault Finder to the connector on top of the instrument, twist to lock it in.
4. Turn on the Cable Fault Finder by holding down either the UP or DOWN button on the front of it while pressing the ON/STANDBY button. The display should alternate between "0" and a value called the VOP (Velocity of Propagation). If the VOP is 65, then you may continue. If not, press the UP or DOWN button to change it to 65.
5. Turn off the Cable Fault Finder, then turn it back on WITHOUT pressing the UP or DOWN buttons. The display should show a steady "0".
6. Temporarily touch the tips of the test leads together to get a tone from the instrument. The sound indicates "continuity" within a circuit. You are now ready to use the instrument.
7. Attach the black test lead to the green ground wire of the cable's power leads.
8. Attach the red test lead to either one of the other two power leads feeding the cable.
9. If the display fluctuates or shows "ERR", try pulling the cable power leads apart further to get space between the test leads.
10. Write down the distance shown on the display and the color of the power lead you connected to.
    DISTANCE: COLOR OF LEAD:
11. Move the red lead to the other power lead feeding the cable.
12. Write down the distance shown on the display and the color of the power lead you connected to.
    DISTANCE: COLOR OF LEAD:

Calculations:

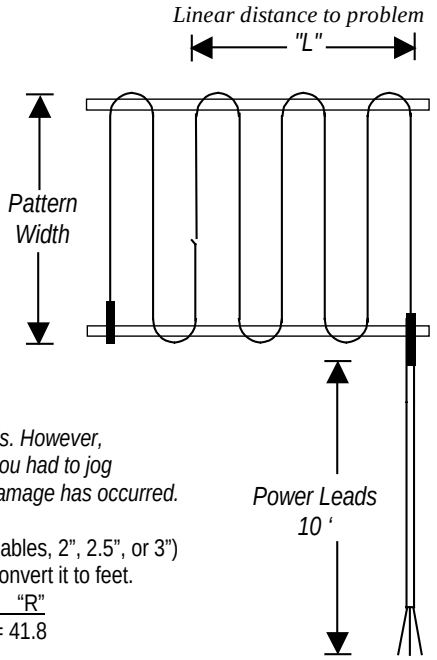
Note: The distance shown on the display is the number feet of cable to the problem, including the power leads and the heating cable itself.

1. Start with the shorter distance obtained from the Cable Fault Finder.
   - *Is it less than or equal to the length of the power leads? If so, STOP. The problem may be in the power leads at the distance found. (The mat is shipped with 10 feet of power leads connected to the cable)*
   - *Is it within 2 feet of the length of the power leads? If so, there are two possibilities: (1) there is a problem near the splice between the power leads and the cable, or (2) the Cable Fault Finder is giving a false reading because there is a large difference in the conductors of the power leads and the heating cable in the mat.*
2. Subtract the power lead length from the Fault Finder readout. The cable is shipped with a minimum 10 feet of power leads, but sometimes the installer cuts the leads shorter. Example: readout 154, less 8 ft. power leads, 146 feet.

This number may give you all the information you need to determine where your damage is. However, if your installation has a consistent weaving pattern and few obstructions in the floor that you had to jog around, the following calculations may help you narrow in on the area of the floor where damage has occurred.

3. Divide the result from step 2 by the "Width Factor" of the layout.
   (This is the distance between the straps, plus the width of the spacing between the cables, 2", 2.5", or 3")
   For instance, 40" between the straps plus 2" spacing between wires, 42", then convert it to feet.

	"Width Factor" in feet	"R"
42" converted to feet:	3.5'	146ft. divided by 3.5 = 41.8



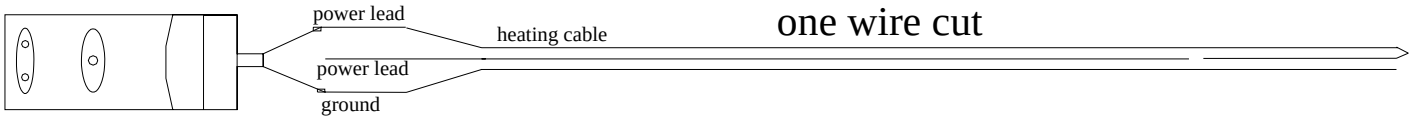
4. The result "R" is the number of "Runs" of cable to the problem, starting at the **beginning** of the heating cable. Using your knowledge of the layout of the cable, the width of cable spacing used and the number of individual "Runs" of cable to the problem, you can estimate the location of the damage to the cable by multiplying "R" by the width of the layout spacing. The example above indicates damage (41.8 Runs x 2"spacing = 83.6") about 7 feet out from the start of the cable layout pattern, indicated as "L" in the diagram above.
   (If your cable layout is more complicated than a simple rectangle, with more than one "Width Factor", it will require additional calculations.)

5. Take the longer distance obtained from the Cable Fault Finder and go through the same calculations shown above. Remember, if the other distance given by the Fault Finder is only a few feet longer than the first, it would be within the margin of error of the Fault Finder, and is typically an indication of a single area of damage.

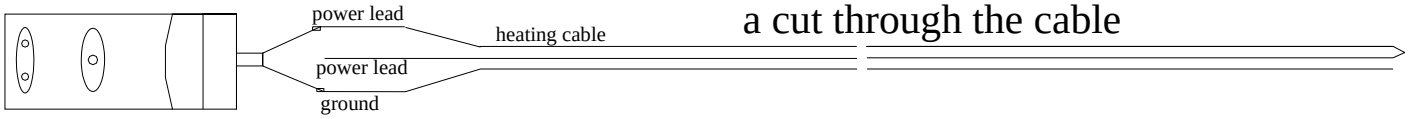
For additional pictures and examples of calculations and interpretations, please see other side of this sheet.

Additional Examples of Calculations and Interpretations:

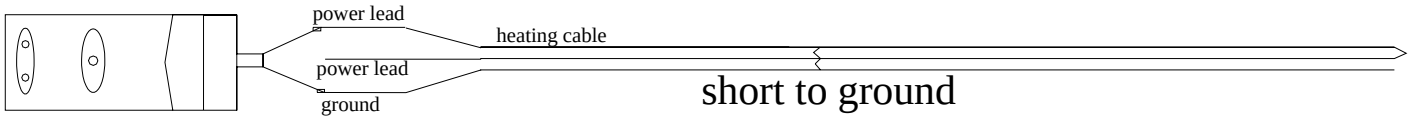
Example: The Fault Finder gives a readout of 187 feet, minus 7 feet of power leads, 180 feet, but the cable is only 165 feet long. 180-165=15 feet, the meter detects some type of damage about 15 linear feet from the far end of the cable. If the readout from the other power lead indicates damage substantially less than 150 feet from the start of the cable, there may be two areas of damage to a single heating element of the cable. Diagram below is of a heating cable with one cut through a single heating element wire.



Example: "R" calculated to be 24.6 Runs for one conductor, and from the other conductor "R" calculated to be 25.3 Runs. This is within the margin of error of the Fault Finder, and often an indication of a single point of damage to both heating elements of the cable, as shown in diagram below. 24.6 Runs x 3" spacing = 73.8" (Linear distance) from the first cable "Run" to the damaged area.

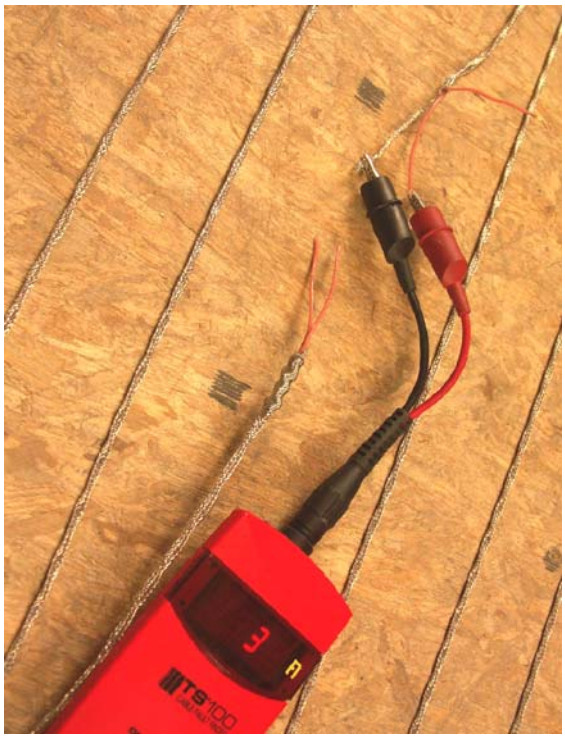


Example: Your ohm meter shows continuity between both power leads and the ground wire. The damage is causing a short to ground, as shown in the diagram below. "R" calculated to be about 27 Runs for each conductor, 27 x 2.5"spacing = 67.5" ("L"). You would measure 67.5 inches out from the start of your cable weaving pattern to determine the approximate area of the damage to this cable.



Pictures of the Fault Finder in use

This picture shows the Fault Finder connected to the power leads at the work box on the wall. Black test lead is connected to the cable's green ground lead, red test lead is connected to the black power lead.



This shows the Fault Finder connected at the floor where a wire has been prepped for splicing. This is recommended BEFORE the splice is installed, in this case the meter shows another problem about 3 feet away. This is also a procedure that can be used to narrow in on a point of damage. Use of a digital ohm meter from this location is also advised. Test the cable in both directions.