

# Heating Cable Repair Kit Installation Guidelines

**Warranty Disclaimer:** This repair kit and these installation guidelines are provided by Watts Radiant to assist in repairing a Watts Radiant heating cable damaged at the job site. Watts Radiant does not, in any way, warranty the repair or ensure proper function of the product following the repair. Only a qualified electrician should make repairs to the Watts Radiant heating cables. It is highly recommended that an experienced tile installer remove the tile over the damage. For further assistance, please contact Watts Radiant.

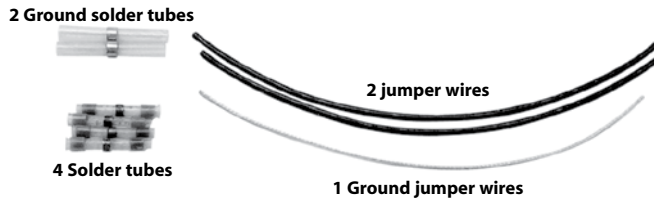
Watts Radiant does not qualify electricians, tile installers, or Watts Radiant installers to perform diagnostics, tile removal, or cable repair. It is the responsibility of the installing party or homeowner to contact a qualified person to follow these guidelines.

DO NOT USE this repair kit to splice different cables together. The kit is only for making a repair within a cable.

DO NOT USE this repair kit to repair a cable within a shower area or a mat that extends into a shower area.

## Materials and Tools Needed

**Heating Cable Repair Kit:** Manufacturer order number 81007142.



This heating cable repair kit contains components for making a repair at one location. Certain components may not be used depending on the method of repair selected.

**Electrical Repair Kit:** Manufacturer order number 81007201. Available for rent or purchase as a kit. NOTE: Items are subject to change.



### Heat gun

- Must be able to heat to about 1000°F.
- Milwaukee Model 8975.

### Thermal wire strippers

- For stripping the heating wires.
- Omega Model TW-1.

### Scoring tool

- For cable with an outside jacket.
- Ideal Model 45-403 with blade Part K-6502.

### Wire strippers

- For cutting and stripping 16-AWG wire.
- GB Model GESP-55.

### Small screwdriver

- To help separate heating wire from braid.
- Paper clip or similar pointed tool may also be used.

**Electrical Test Tools:** Manufacturer order number 81007187. Available for rent as a kit.

NOTE: Items are subject to change.

### Digital multimeter

- Must measure up to 20,000 ohms.
- A.W. Sperry Model DM-2000.

### TDR (Time Domain Reflectometry) meter

- For diagnostic testing if additional damage is detected.
- Harris Corp. Model TS-90 or TS-100 "Cable Fault Finder."



### Other Tools

#### Hammer and chisel

- For removal of tile and mortar if needed, and for creating a "valley" in which to lay the splice.

#### Hot glue gun with standard stick adhesive

- For adhering splice into the "valley" chiseled into floor.

#### Scissors

## Part 1. Getting Started

**Step 1.1.** Make sure the power is OFF!

**Step 1.2.** Two repair methods are shown in these guidelines. Choose the method that is best for the installation.

**Direct splice:** This method is used when the damaged cable has enough "play" to be cut and overlapped by about 3/4 of an inch. This also gives the best possible heating uniformity over the splice versus using the jumper splice.

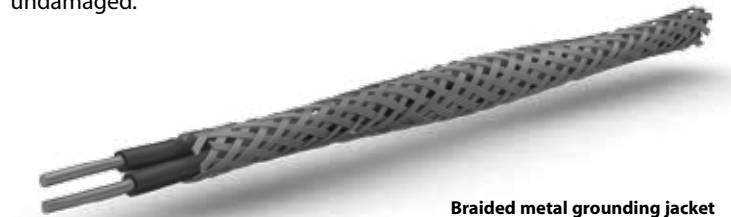
**Jumper splice:** This method is used when the damaged cable does not have enough "play" to be cut and overlapped. This also results in a splice section that will have very little heating directly over the splice.

**Step 1.3.** Depending on the installation, the heating cable is constructed in one of the two following ways:

**Jacketed heating cable:** This cable is comprised of two insulated heating wires, covered by a metal braid, which in turn is covered by an outer covering. Each heating wire consists of one heating element that must be kept intact and undamaged.



**Non-jacketed heating cable:** This cable is comprised of two insulated heating wires covered by a stainless steel braid. Each wire consists of one small heating element that must be kept intact and undamaged.



## Part 2. Tile and Mortar Removal



**Step 2.1.** If not done so already, carefully remove the tile/stone/marble floor covering over the damaged cable area. Removal of the grout around the affected tile(s) must be done with a blunt instrument such as a hand-held grout-removal tool. **DO NOT USE A KNIFE!** Gently break out the tile with a small hammer, removing the fragments as the tile is broken up. See [wattsradiant.com](http://wattsradiant.com) for additional instructions and tips regarding tile removal.



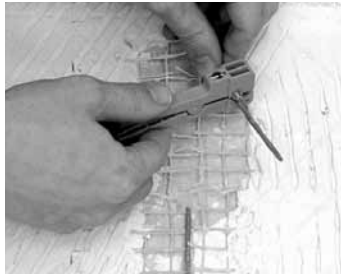
**Step 2.2.** Remove enough mortar and tile to expose about 4" to 5" of free wire on both sides of the damaged portion. Part of the wire may be visible so that the mortar can be removed carefully around the damaged wire using the hammer and/or chisel. Mesh can be cut with scissors in order to free the wire.

## Part 3. Installing a Direct Splice

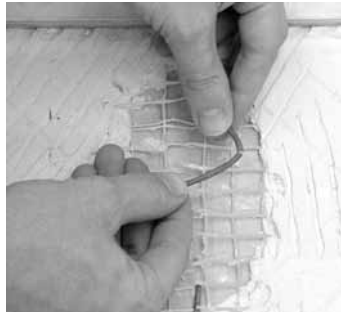
To install a jumper splice (please see Step 1.2), skip to Step 4.1.



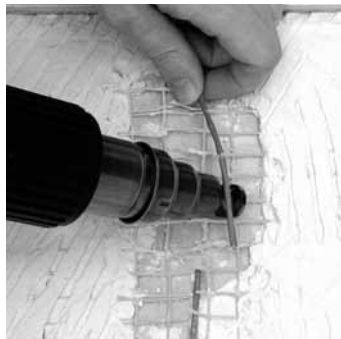
**Step 3.1.** Cut out the damaged wire location, creating two ends or leads. **If the cable being repaired is not the jacketed heating cable, skip to Step 3.6.**



**Step 3.2.** Use the scoring tool to carefully score the jacket about 2" from the end of each lead. Do this by placing the cable lead into the V-notch of the tool and rotating the tool only one or two revolutions around the cable. Do not place any additional pressure on the tool head to cut deeper. Let the tool apply its own spring-loaded pressure.



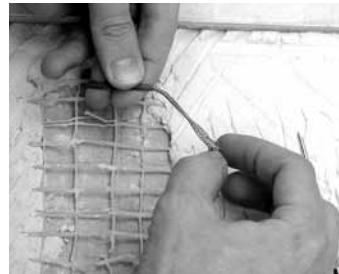
**Step 3.3.** Bend the cable to snap the jacket slug completely loose at the score.



**Step 3.4.** Use the heat gun (set to HI temperature, about 1000°F) and move the gun back and forth under the jacket slug for about 3 to 4 seconds until it starts to loosen and slightly shrinks at the ends.



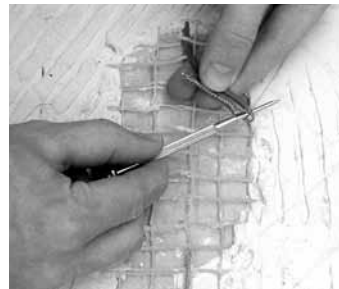
**Step 3.5.** Use a glove or other protective cloth to pull off the loosened jacket slug. **Do not touch** the hot jacket slug with bare fingers. The slug will be very hot and will burn!



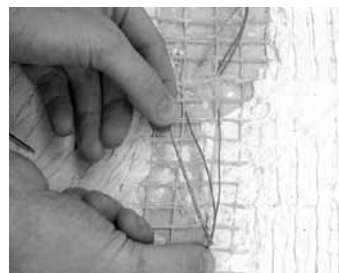
**Step 3.6.** Loosen the braid by pushing back on the braid about 1/4" and cause the ends of the heating wires to be exposed.



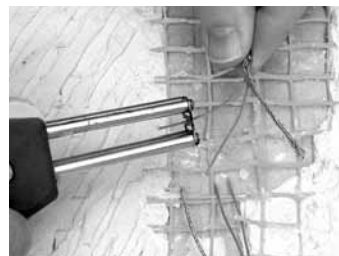
**Step 3.7.** Bend the cable back onto itself.



**Step 3.8.** Use the small screwdriver, paper clip, fingernail, or similar blunt instrument to pry between the braid and make an opening through which to pull the heating wires. Pull each wire through the braid.

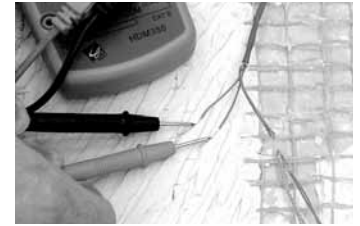


**Step 3.9.** Pull the braid tight to make it into a pigtail.

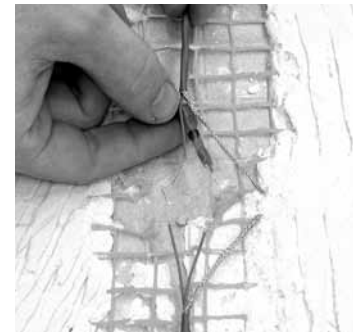


**Step 3.10.** Use the thermal wire strippers to carefully strip off exactly 1/2" of the insulation from the heating wires. Count the little heating elements to make sure none were

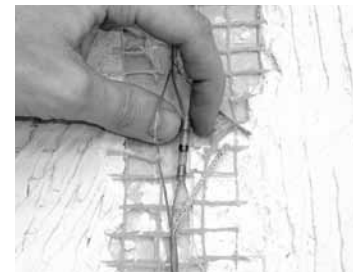
cut off and thereby cause a hot spot or possible failure. A fiber strand will also be found among the heating elements. There is no need to separate or remove this fiber strand.



**Step 3.11.** Use the digital multimeter and TDR at this repair location before proceeding. Check for any additional damage locations in the heating cable by "looking" in both directions. For assistance in using these instruments, consult the instructions that came with them or contact Watts Radiant.



**Step 3.12.** Slide the solder tube over one of the heating wires.



**Step 3.13.** Pull the heating wires together to overlap the heating elements of both leads. Lightly twist the elements together to better join them. Slide the solder tube over the twisted elements, centering the elements between the gray adhesive bands. If this is not done correctly, the elements may pull out and cause the splice to fail.

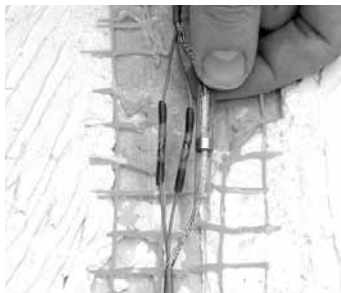


**Step 3.14.** Use the heat gun (set to HI temperature, about 1000°F) to carefully heat the solder tube. First, heat directly under the solder ring in the middle of the tube. **IMPORTANT!** When the solder completely melts

and flows into the wires, continue heating for another 3 seconds. If the heat is removed too soon, an incomplete solder connection will result, causing connection failure later. When the solder is completely melted, begin moving the heat gun back and forth under the rest of the solder tube to shrink the tube and cause the adhesive bands at the ends to melt and flow onto the wire insulation. After the tube is completely shrunk and the adhesive bands are fully melted, stop heating the tube. Additional heating will not help and may cause either scorching of the tube or splice failure. Allow the solder tube to cool for about 1 minute.



**Step 3.15.** REPEAT Steps 3.12 through 3.14 for the other heating wire.



**Step 3.16.** Slide a ground solder tube over a ground braid lead. Overlap the braid ends and twist them to help hold them together. Slide the ground solder tube over the twisted braid ends, centering them under the ring of solder.

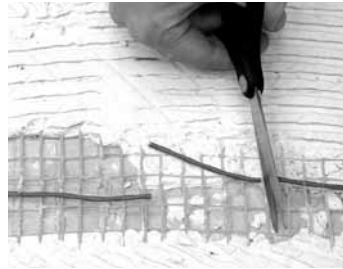


**Step 3.17.** Heat the tube to shrink it completely and cause the solder to flow into the twisted wires completely. When it cools, the connection should be secure.



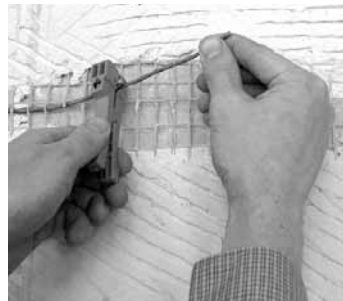
**Step 3.18.** The connection should now be complete and ready to test. Go to Step 5.1 under "Testing the Repair."

### Part 4. Installing a Jumper Splice

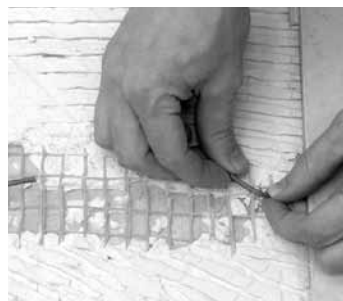


**Step 4.1.** Cut out a 2"- to 3"-long section of the heating cable around the damaged area, creating two ends or leads.

*If the cable is not a jacketed heating cable, SKIP to Step 4.6.*



**Step 4.2.** Use the scoring tool to carefully score the jacket about 2" from the end of each lead. Do this by placing the cable lead into the V-notch of the tool and rotating the tool only one or two revolutions around the cable. Do not place any additional pressure on the tool head to cut deeper. Let the tool apply its own spring-loaded pressure.



**Step 4.3.** Bend the cable to snap the jacket slug completely loose at the score.



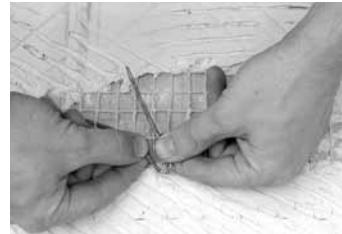
**Step 4.4.** Use the heat gun (set to HI temperature, about 1000°F) and move the gun back and forth under the jacket slug for about 3 to 4 seconds until it starts to loosen and slightly shrinks at the ends.



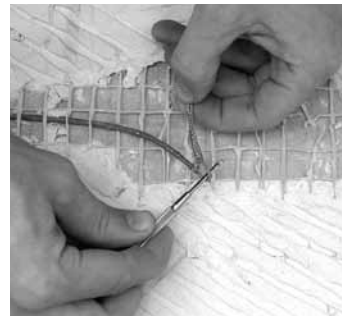
**Step 4.5.** Use a glove or other protective cloth to pull off the loosened jacket slug. *Do not touch* the hot jacket slug with bare fingers. The slug will be very hot and will burn!



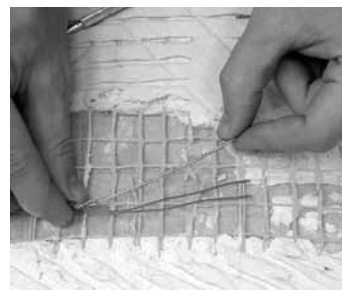
**Step 4.6.** Loosen the braid by pushing back on the braid about 1/4", causing the ends of the heating wires to be exposed.



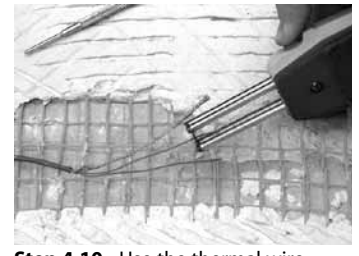
**Step 4.7.** Bend the cable back onto itself.



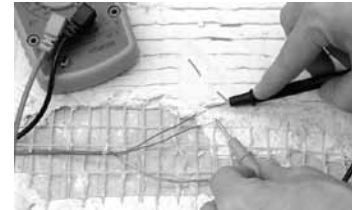
**Step 4.8.** Use the small screwdriver, paper clip, fingernail, or similar instrument to pry between the braid and make an opening through which to pull the heating wires. Pull each wire through the braid.



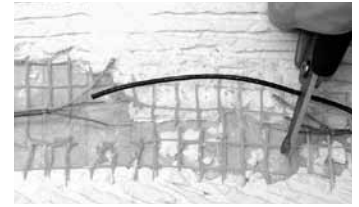
**Step 4.9.** Pull the braid tight to make it into a pigtail.



**Step 4.10.** Use the thermal wire strippers to carefully strip off exactly 1/2" of the insulation from the heating wires. Count the little heating elements to make sure none were cut off and thereby cause a hot spot or possible failure. A fiber strand will also be found among the heating elements. There is no need to separate or remove this fiber strand.



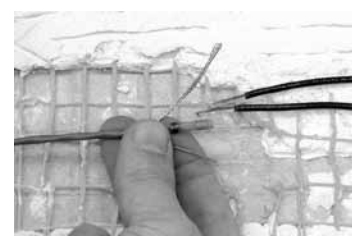
**Step 4.11.** Use the digital multimeter and TDR at this repair location before proceeding. Check for any additional damage locations in the heating cable by "looking" in both directions. For assistance in using these instruments, consult the instructions that came with them or contact Watts Radiant.



**Step 4.12.** Cut the black jumper wires shorter, if necessary, so that they overlap the stripped ends of the heating wires.

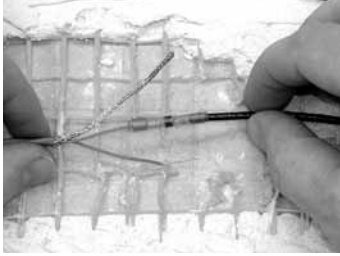


**Step 4.13.** Use the 16 AWG setting on the wire strippers to strip off exactly 1/2" of the insulation from both ends of the black jumper wires.

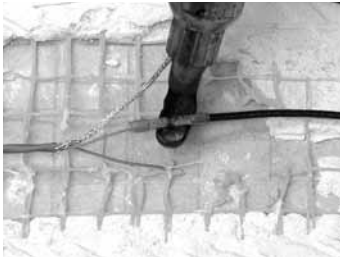


**Step 4.14.** Slide a solder tube over one of the heating wires on one lead of the heating cable.

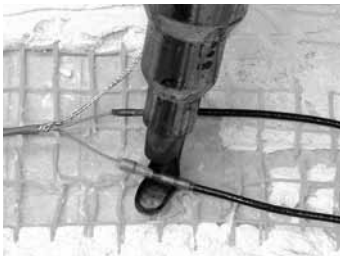
## 4 Heating Cable Repair Kit Guidelines



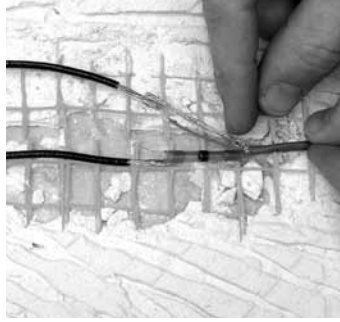
**Step 4.15.** Place the heating elements and black jumper wire ends alongside each other. **Lightly** twist the elements together to better join them. Slide the solder tube over the twisted elements and over the edge of the insulation on the black jumper wire. Make sure the twisted wires are fully inside the solder tube and located between the adhesive bands at the ends of the solder tube. If this is not done correctly, the elements may pull out and cause the splice to fail.



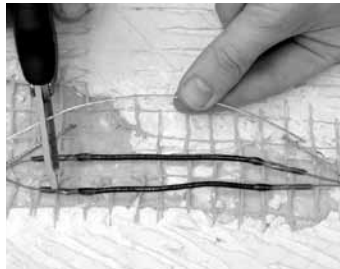
**Step 4.16.** Use the heat gun (set to HI temperature, about 1000°F) to carefully heat the solder tube. First, heat directly under the solder ring in the middle of the tube. **IMPORTANT!** When the solder **completely** melts and flows into the wires, continue heating for another 3 seconds. If the heat is removed too soon, an incomplete solder connection will result and cause connection failure later. When the solder has completely melted, begin moving the heat gun back and forth under the rest of the solder tube to shrink the tube and cause the adhesive bands at the ends to melt and flow onto the wire insulation. After the tube is completely shrunk and the adhesive bands are fully melted, stop heating the tube. Additional heating will not help and may cause either scorching of the tube or splice failure. Allow the solder tube to cool for about 1 minute.



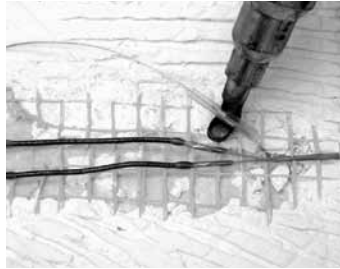
**Step 4.17.** REPEAT Steps 4.14 through 4.16 for the other heating wire on the same lead.



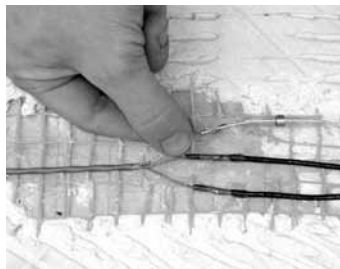
**Step 4.18.** At the other end of the black jumper wires, slide a solder tube over a heating wire. REPEAT Steps 4.14 through 4.17 to complete the jumper wire connections at this end.



**Step 4.19.** If necessary, cut the ground jumper wire shorter so that it overlaps the ends of the ground braid lead wires by about 1/2" to 3/4".



**Step 4.20.** Overlap the ends of a ground braid lead and the ground jumper wire by about 1/2" and twist them to help join them together. Slide a ground solder tube over the twisted ends, centering the ends under the solder ring. Heat the tube to shrink it completely and cause the solder to flow into the wires completely. When it cools, the connection should be secure.



**Step 4.21.** At the other end of the ground jumper wire, slide a ground solder tube over the wire. REPEAT Step 4.20 to complete this connection.



**Step 4.22.** The connection should now be complete and ready to test. Go to Step 5.1 under "Testing the Repair."

## Part 5. Testing the Repair

After completing the splice connections and letting them cool, test the repair as follows:

**Step 5.1.** Gently tug on each wire splice to make sure they do not pull apart.

**Step 5.2.** Use a digital multimeter to measure the resistance of the heating cable. This measurement should now fall within the resistance range specified for this heating cable between the heating wires, and no resistance should be measurable between either heating wire and the green ground wire. If assistance is needed with this step, follow the steps shown

in the installation manual for this cable, or call Watts Radiant.

**Step 5.3.** Properly connect the repaired heating cable to the power source through a GFCI, such as the Watts Radiant thermostat. Operate the cable for a few days or at least for ten to fifteen 5-minute heating cycles. If the GFCI trips or the cable does not heat, the cable will need to be checked for additional damage, or else the repair may have failed.

## Part 6. Final Steps

Make sure the splice is protected and lays flat on the floor before installing floor coverings.

**Step 6.1.** If necessary, use a chisel to carefully carve a "valley" into the sub-floor under the splice.

**Step 6.2.** Use the hot glue gun and place a bead of adhesive into the valley. Press the splice into the adhesive to recess it in the valley.

**Step 6.3.** If floor coverings are not being immediately installed, temporarily cover the splice and surrounding heating cable with a loose tile or similar hard material to protect them against damage.



**WattsRadiant**  
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