



LISTED
Radiant Heating Panel
4UH6

Certified Underwriters
Laboratories Inc & UL 1683



WARM WAVES



**Design,
Assembly and
Installation Manual
Stone and Tile
WWF13NW 120/240 V
WWF13GNW 120/240 V**

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For additional information regarding any aspect of installation, please contact us at:

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All information in this manual may be updated without notice.

Cautions and Warnings



This symbol indicates safety cautions and warnings. This symbol alerts you to potential hazards that can hurt you and others in serious personal injuries or damage to property. You must read and follow the cautions and warnings for safety.



This symbol indicates that an electric hazard and shock may exist if a particular action is not followed.



This symbol indicates that an electrical hazard may cause a fire if a particular action is not followed.



The Warm Waves Heating System shall be installed only by qualified personnel who are familiar with the construction and operation of the apparatus and the risks involved. The requirement that the installation shall be made in accordance with Article 424, of the National Electrical Code, ANSI/NFPA 70.



If the Warm Waves Heating System is not installed properly, fire or shock could occur resulting in serious personal injuries or damage to property. You must follow the instructions, warnings and cautions contained in this manual.



Make sure that the work area is always neat and clean prior to any installation of Warm Waves. Nails, screws, and other sharp debris can damage the panels. Any and all panels that are torn or penetrated must be discarded. Be sure the subfloor is clean, rigid, flat, level, and free of cracks



The installation of this heating product shall be in accordance with the manufacturer's instructions and regulations of the authority having jurisdiction.



Before installation, check the electrical capacity of the area. It should be enough for the total output of the film. All wiring, fuse, and /or circuit breaker must conform to National Electric Codes. Appointed thermostat must be used and it must have a ground fault circuit interrupter (GFCI) to prevent electrical hazards. Do not allow any electrical cable to cross themselves or each other.



Do not install over expansion joints. Follow the manufacturer's instructions. Heating Mats should never be installed at or below 32 Degrees F.

Never install one mat on top of another or overlap the mat on itself. This will cause dangerous overheating. Don't forget to install the floor sensor. Do not install Warm Waves in any walls. Do not install mats under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the mat can be damaged by fasteners (nails, screws, etc.) used to install built-ins



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.

Cautions and Warnings

Product Description

The Warm Waves under floor heating system is designed to be embedded in thin-set mortar. It will create warm comfortable floors. It is possible to use Warm Waves for primary heat when properly designed for the specific space and environment.

Warm Waves is a low density group of heating panels. It is recommended to cover the majority of open floor space to create optimal comfort.

Warm Waves Heating mats draw 13 watts per Sq/ft providing even heating throughout the mat. The system can be wired in 120v or 240v. Floor temperature is controlled by a programmable thermostat (refer to the controller specifications section). The maximum shipping size of the product is 40 inches in width and 328 feet in length. The maximum usable size per panel is 32 feet long for a 120v wired panel and 64 Feet for a 240v wired panel.

Warm Wave panels are designed for thin-set applications only. Any finished flooring surface cannot exceed R-1. The Warm Waves Heating panels are designed to be imbedded underneath the following surfaces.

- A. High Density floors
- B. Engineered Wood floors
- C. Natural Stone Floors
- D. Ceramic Tiles

Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set installations and for recommendations on proper movement joints within the plane of the tile per detail EJ-171.



10 Year Limited Warranty

The Warm Waves heating system standard warranty is 10 years for the film from the date of purchase. This warranty is for the film only from the date of purchase. The warranty system is activated when Manufacturer returns a warranty card. The warranty card is mailed to the address of the installation only after the system registration card is received by the manufacturer, who is not responsible for lost or misdirected mail.



Documentation

The Check List and Registration defines in detail the installation just performed. All information must be filled out. There are three copies. One should be left with the homeowner and one retained by the installer and the final submitted to the Manufacturer.



The manual must be attached to the service panel and must be easily recognizable and accessible. This can help the homeowner or contractor define any problems and solutions.

Important Notes to Assemblers and Installers

This manual contains the information required to design, assemble and install the Warm Waves radiant heating panel product being described. **Completely Read This Manual Before Installing the Product.** This manual serves as the document and information of record for installation. No other information or representations, including verbal, supersede or replace the information in this manual.



- ALL REQUIRED INSPECTIONS MUST BE COMPLETED BEFORE COVERING THE WARM WAVES FILM INSTALLATION.

- The installation of this heating product must be in accordance with the manufacturer's Instructions and the regulations of the authority having jurisdiction.



- Only personnel licensed for and familiar with the local and national electrical codes should be conducting the electrical installation.



- The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



- Thin-set used in the installation must be cured for 28 days before energizing mats. It is the responsibility of the installer to ensure that the thin-set has cured to prevent residual conductivity that would trip the thermostat GFCI.



- The product must not be used in any way other than described in this manual. The Warm Waves must be connected to a **dedicated 20 amp** electrical circuit.



- DO NOT overlap the film.



- 240 VAC power is connected to the 2 outer embedded copper strips.
120 VAC power is connected to all 3 embedded copper strips.



- Indicate and label on the electrical panel which circuit is used for the electric floor heating system.



- It is mandatory to install a Class "A" GFCI or GFCI circuit breaker with each Warm Waves Installation. DO NOT have multiple GFCI's on a single circuit as this can cause inadvertent tripping.



- DO NOT USE sharp tools or power tools to clean grout lines. Cleaning grout lines with sharp tools or power tools may damage the film and will void the warranty.



- Subfloor must be prepared in accordance to ANSI specifications.



- The ambient air temperature must be above 0° C or 32° F when the Warm Waves film is being installed.

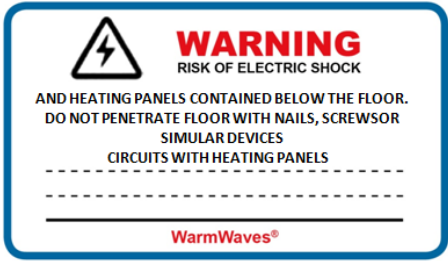




- The maximum R value of all floor coverings is R-1

Product Description

- Warm Waves film can be field cut and configured, eliminating the necessity to be wired and sized in the factory.
- The Warm Waves film is supplied in a roll. It can be cut to length, as well as cut from its 40 inch width to 20 inches, in order to accommodate the layout of a given installation.
- Virtually any size room and installation can be accommodated.
- A Warm Waves layout can be “changed on the fly” if there is a change or unanticipated condition at the point of installation. This is a significant advantage over factory-built systems.
- The product can be wired for either 120 VAC or 240 VAC power.
- Warm Waves is rated for 13 watts per square foot of film, which produces 42 BTU per square foot.
- Warm Waves heating panels temperature can be limited to a specific set point if the flooring material requires it.
- An installation uses a Dual Input Thermostat, which provides control from both a floor sensor and from the ambient air temperature. Floor temperature can be limited in this fashion. Room temperature can be controlled at a comfortable setting. “A/F Mode” controls the floor temperature and room temperature together.
- Warm Waves comes with a 10 year limited warranty.
- This manual covers the use of Warm Waves film specifically for installations that require fully embedded in thin-set installations
- Warm Waves can be covered with carpet, vinyl or hardwood if the mat is installed in a minimum of 3/8” cement- based or gypsum-based material to provide a rigid surface which to install the material
- Use of anti-fracture membranes and underlayment for stone and tile is allowed. Warm Waves should be installed above the membrane.

Warm Waves Components

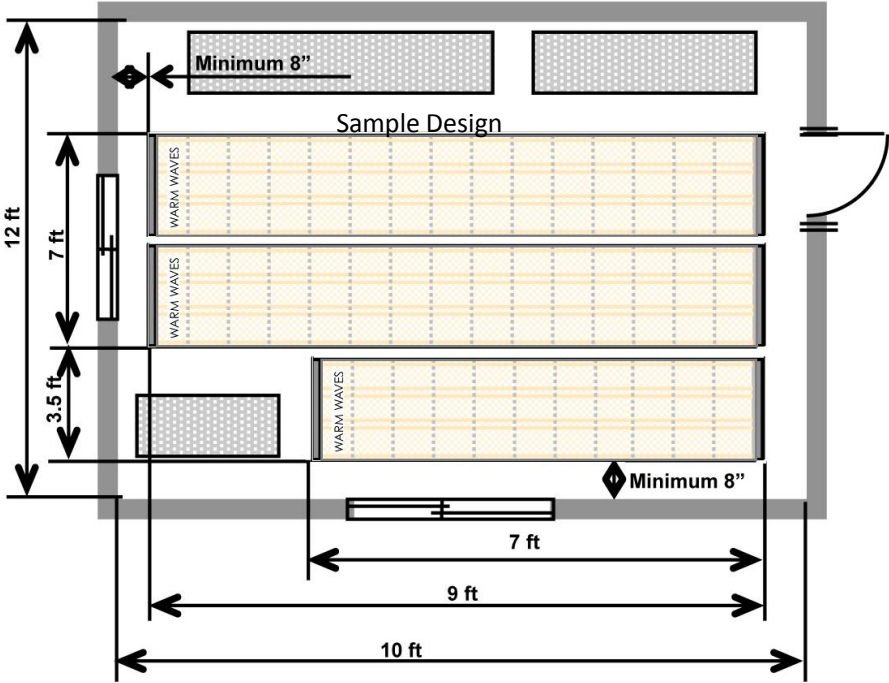
Product	Description
Warm Waves Heating panels	Warm Waves Heating Panels cut to the specific size you determine.
Thermostat and or controller	UL Listed thermostat. The capacity of the thermostat must be 20% greater then the installed heating load. If relays are used, a low voltage control thermostat may be used.
Junction Boxes	Use junction boxes to house relays and the thermostat. Size the boxes to the specific use required.
Multi-Meter or OHM Meter	An ohm meter is required to measure the resistance prior to heating to panels. A digital meter is recommended.
This instruction and operating manual	A full review and understanding of this document is required prior to starting an installation
<p>Warning Labels</p> <p>Affix to the electrical panel. Record the number of systems installed. Along with a amp, watts and ohm reading.</p>	<p>WW13WAR</p> 
<p>Affix to other points of access where the wiring or heating panels are accessible.</p>	<p>WW13CAU</p> 
<p>Affix to the device that is controlling the Warm Waves heating panel system.</p>	<p>WW13JUN</p> 

Section 1 Designing System

Step 1 Designing the Warm Waves Panel system

Design the Warm Waves Heating System

- Measure and design the installation area. (Net: film area and gross: total space area)
- Determine the total output of the system based on the next section



Sample Design

Total area	Gross Area	120 ft²	In total
	Net area	87.5 ft²	WWF13GNW 240V
	Total Amp	Amp 4.7	0.054A/ ft ² *87.5 ft ²
	Total Watt	WATT 1140	13W / ft ² *87.5 ft ²

Your Design

Total area	Gross Area	ft²	in total
	Net area	ft²	Warm waves Heating system
	Total Amp	Amp	
	Total Watt	WATT	

Section 1 Designing System

Step 2 Choosing the Correct Panels and Power

Recommended for this Use	WWF13 NW 120v	WWF13N W 240V	WWF13G NW 120V	WWF13GNW 240V
Heating a tile room	Good	Great	Good	Great
Heating over an non insulated space	OK	Great	OK	Great
Heating a kitchen floor	Good	Great	Good	Great
Heating more than 138 SF	NO	Great	NO	Great
Heating a basement floor	OK	Great	OK	Great
Heating a room over a garage	OK	Great	OK	Great
Misc large installations	OK	Great	OK	Great

Choosing a Heating Panel

Review the chart above and decide the panel for your intended use. As a rule if 240V is available we recommend it.

Assuming you plan to heat a tile room like the prior drawings. You will need to assemble three individual mats. In this case we will use the WWF13GNW 120V Heating Panel.

The first thing you want to do is unroll the panel on a clean flat surface. Make sure its free and clear of anything that might damage it. It might be easiest to put it on a work table if available.

Second measure the exact length and the exact width of the panel. For quick reference the panels are roughly 8 inches apart and they can be cut down to 20 inches in width.

After you determine the exact length you can prepare to cut the panel to size. We advise sharp quality scissors for this phase.

Section 1 Designing System

Step 3 Calculating The Power Requirements

Power requirements and size of a single panel

Model	Overall Minimum Size	(Half Width) Overall Maximum section size	(Full Width) Overall Maximum Section size	Voltage, Vac.	Ohm/FT Squared	Amps/ft squared	Maximum Density W/ft squared	Maximum Length
WWF13NW	8in x 20in	1.7 ft x 32ft	3.35 ft x 32ft	120	1107	0.108	13	32
WWF13NW	8in x 20in	1.7 ft x 64ft	3.35 ft x 64ft	240	4430	0.054	13	64
WWF13GNW	8in x 20in	1.7 ft x 32 ft	3.35 ft x 32ft	120	1107	0.108	13	32
WWF13GNW	8in x 20in	1.7 ft x 64ft	3.35 ft x 64ft	240	4430	0.054	13	64

Power requirements and size of a system of panels

Model	Maximum Watts per individual panel	Maximum Amps per circuit	Maximum watts per system of panels	Voltage, Vac.	Maximum system of panels/SF
WWF13NW	1400	15	1800	120	138
WWF13NW	2800	15	3600	240	277
WWF13GNW	1400	15	1800	120	138
WWF13GNW	2800	15	3600	240	277

Model Name	WWF13GNW+ WWF13NW 240V	WWF13GNW+ WWF13NW 120V
Rated Voltage	240V-60Hz	120V-60Hz
Rated Amp	0.054~0.06 /ft ² ± 5%	0.105~0.115A /ft ² ± 5%
Power Output	~13 W /ft ² ± 5%	~13 W /ft ² ± 5%

Power requirements for example(Model WWF13GNW 240V)

Total area	Gross Area	120 ft ²	In total
	Net area	87.5 ft ²	WWF13GNW 240V
	Total Amp	Amp 4.725	0.054A/ ft ² *87.5 ft ²
	Total Watt	WATT 1137	13W / ft ² *87.5 ft ²

Watts per foot x sf = total Watt
 (13 x 87.5 =1137)
 Net Sf x amp per foot = total amp
 (87.5 x.054 =4.725)



If the installation area exceeds the maximum installation area with 1 thermostat, install a relay slave in accordance with the capacity of recommended thermostat.



Do not design a system to exceed the above standard (Amp. & Watt): Maximum output with 1 thermostat or Slave

Section 2 Assembling the Mat

Step 1 Materials and Tools Required

Product	Materials for Assembly
Warm Waves Heating panels	Warm Waves Heating Panels cut to the specific size you determine.
Electrical Wire	Listed. 14 AWG, Stranded, Type THWN or THWN-2g
Terminal connector	Tyco Amp 330716. This is the clip to be used to terminate the 14 gauge wires to the Warm Waves Heating panels.
Thin-set	Multi purpose and polymer. It must be mixed on site. Product should not be premixed.
This instruction and operating manual	A full review and understanding of this document is required prior to starting an installation
WW End Tape system For covering cold lead section	Eterna Bond Webseal or and 3m # 69 electrical tape. Or Glass cloth 600v tape.
WW End Tape system For covering bottom section	Eterna Bond Webseal or and 3m # 69 electrical tape. Or Glass cloth 600v tape.

Product	Tools for Assembly
Tape Measure	25 ft.
Crimp	LS-01.
Knife/ Scissors	Heavy gauge scissors or utility knife
Wire stripper	Stripper and cutter
thermometer	Infrared Thermometer
Multi-meter	Amp. W. Ω



After you assemble the materials and tools required you can begin assembling the mat. Take your design and calculations and prepare a clean working area. It is advisable to assemble the mats on a clean sturdy table and then move the assembled mats into the installation area.

Section 2 Assembling the Mat

Step 2 Cutting The heating panels

Working With the Film – Cutting Film

Warm Waves film can be cut and wired in the field.

Precautions:



Only cut on the dashed cut lines that are clearly marked on the film



The film can only be divided in half at the center cut line only.



Care should be taken on the WWF13GNW film **to never cut the honeycomb pattern**. Cut the film only on the dotted cut lines. Refer to section “Working with the film” for further instruction

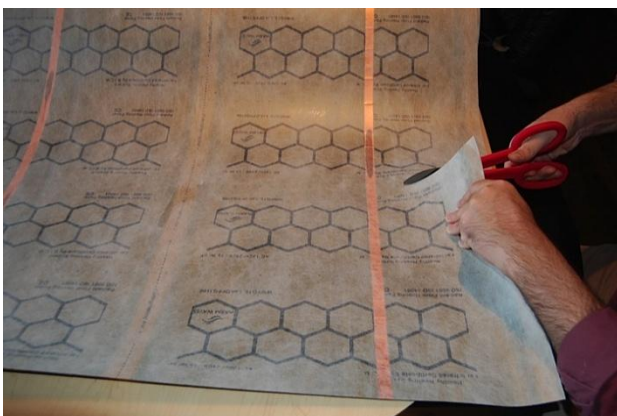


Insulate the cut edge of film WW end tape system as noted in the materials list.



Assembling WWF13GNW for 120 VOLTS application

Cut film in half only on the center cut line

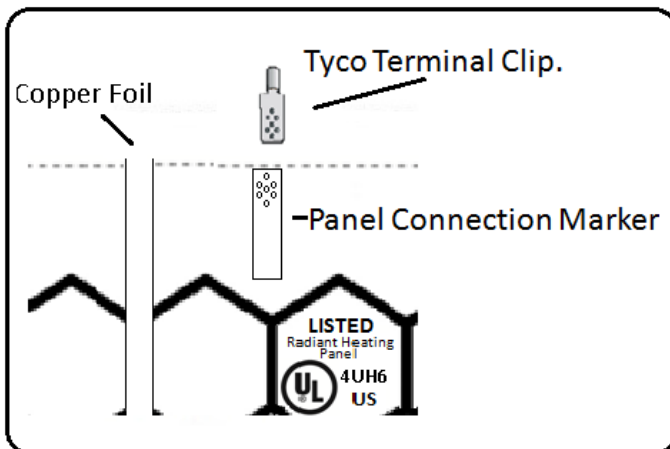
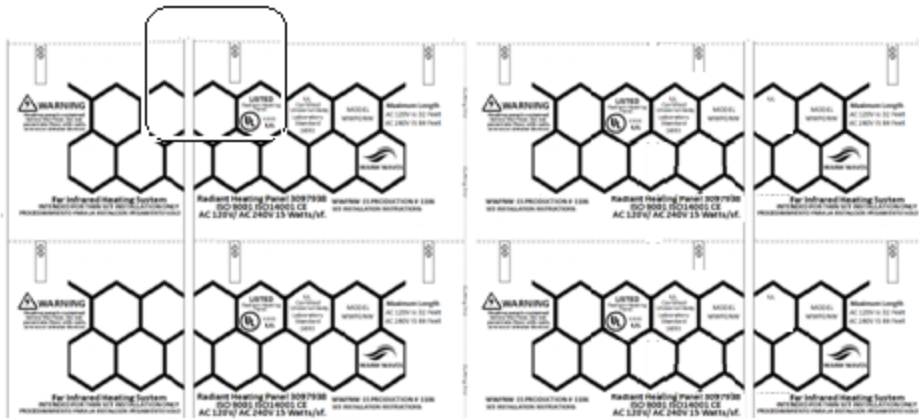


Cut to length in the field only on the cut lines marked every 8 inches

Section 2 Assembling the Mat

Step 3 Identify Panel Connection Markers and Tune Crimping Tool

Notice there are three Connection Markers on each panel. You can also notice a visible copper foil wire running vertically to the left or right of center. These markers are the connection points to the power source. The wiring is simple but different for 120V versions and 240V versions. A simple way to think about it is 240V has more power and sf. Potential. 120V has less power and less square foot potential.



Find the 3 copper “Panel Connection Markers” Shown on the panel. If you are assembling a full 40” width panel there will be 6 “Panel Connection Markers” and two copper foils.

NOTE: The “Copper Foil Wire” can be clearly seen. The 3 Conductor electrical copper foils are located directly under the “Panel Connection Marker”

Checking the Crimping Tool

Before fixing the crimp connectors check that the LS- 01 crimping tool is correctly adjusted to the required 1.25-1.40mm (50-55 thou.) gap when fully closed.

If adjustment is required:

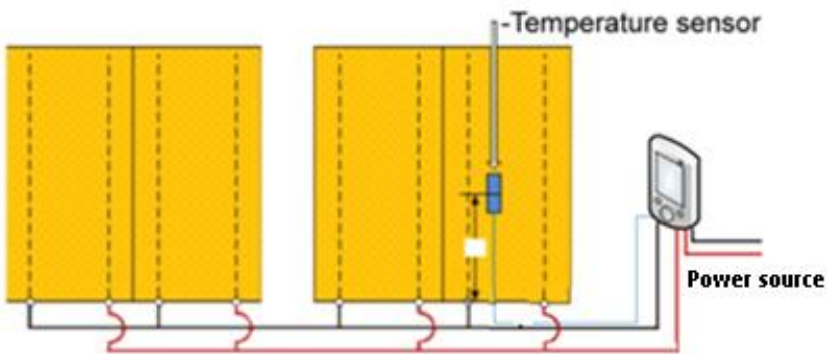
1. Remove the retaining ring or the locking screw from the eccentric axle.
2. Where fitted, remove the toothed lock washer and turn the axle to loosen or tighten the tool adjustment.
3. Alternatively, move the toothed washer in the direction indicated to loosen or tighten the tool adjustment.
4. Replace lock washer with retainer ring/bolt or the locking screw.
5. Recheck the flat parallel jaw gap with a feeler gauge.



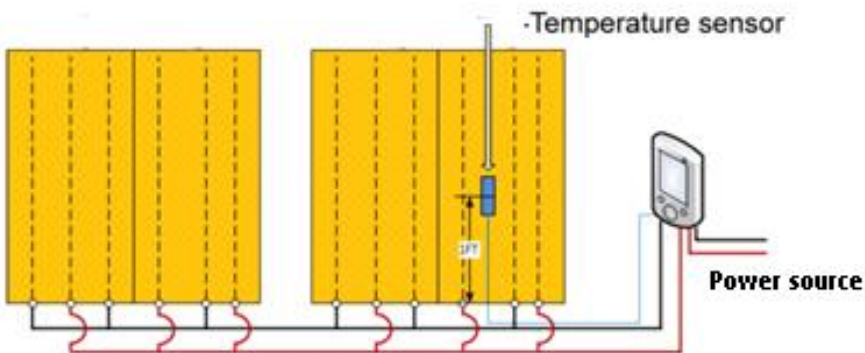
Section 2 Assembling the Mat

Step 4 Identify Wiring Pattern for Use

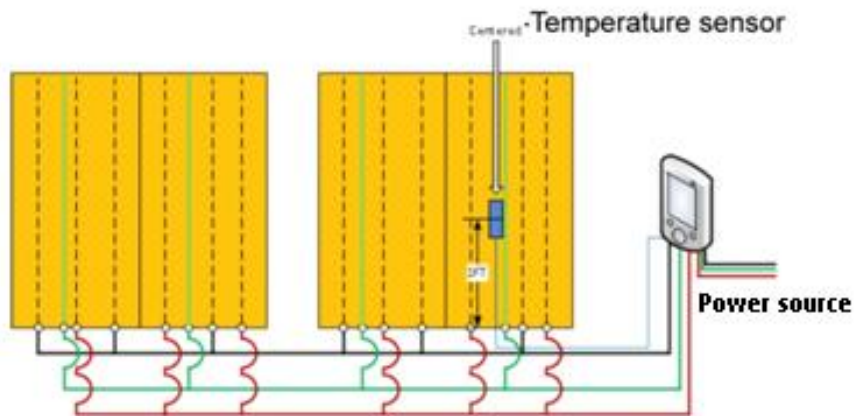
Follow the circuit diagram for each model.



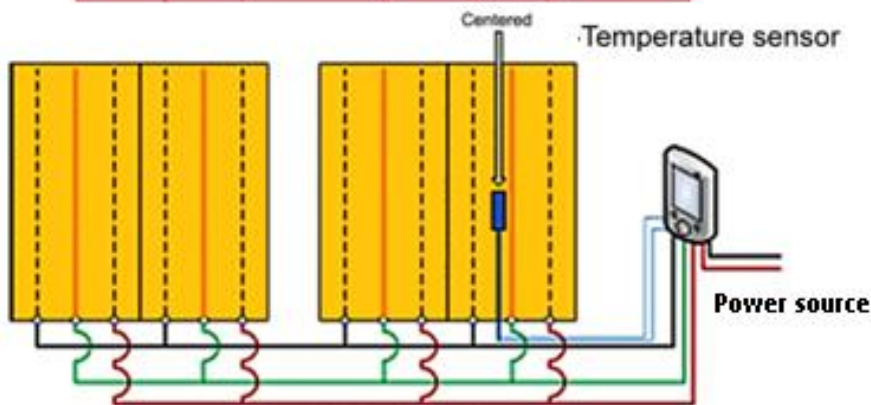
A. Wiring diagram for Model no. WWF13NW Wired for a 240VAC application



B. Wiring diagram for Model no. WWF13NW for 120VAC application



C. Wiring diagram for Model no. WWF13GNW for A 120VAC application



D. Wiring diagram for Model no. WWF13GNW for A 240VAC application

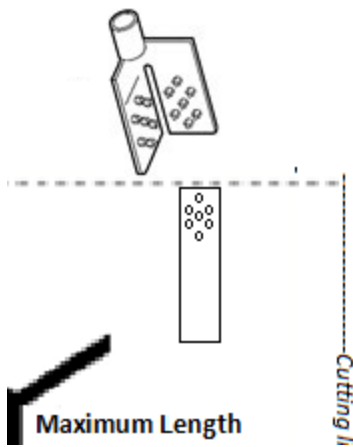
Section 2 Assembling the Mat

Step 5 Connecting the Terminal to the Mats

Use only the **LS-01** crimping pliers supplied. Attach metal clip connectors to all copper conductors at one end of the element. Locate the crimp centrally on the end of the copper strip, then fold shut between thumb and forefinger.

The crimping pliers are now utilized with 2 diagonal applications (firstly from the hinge side of the crimp, and then from the open side) to ensure that the whole area of the crimp in contact with the element is pressed flat. The ratchet mechanism on these pliers prevents the jaws being opened until the correct pressure has been applied

NOTE: First crimp clip to copper strip then connect wire to clip.



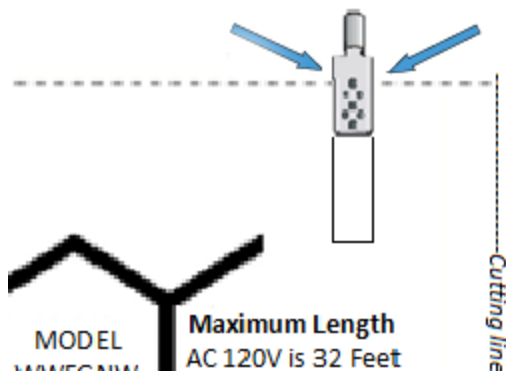
Use one of the Tyco amp terminal connectors.

Line up the dotted holes of the Tyco terminal with the dots on the "Panel Connection Marker."

Fold the Tyco Terminal over the edge of the heating panel. Use your thumb and forefinger.

Make sure the Tyco terminal is seated on the "Panel Connection Marker" and covers all of the dots.

Close up View
Tyco Terminal Clip.
Panel Connection Marker



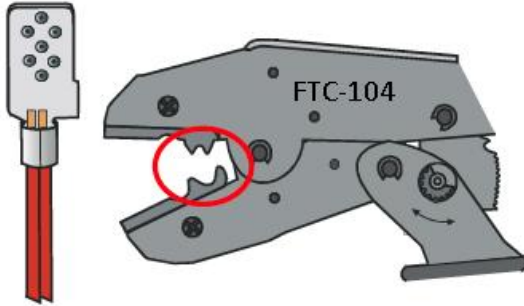
The crimping pliers are now utilized with 2 diagonal applications (first, from the hinge side of the crimp, and then from the open side) to ensure that the whole area of the crimp in contact with the element is pressed flat. The ratchet mechanism on these pliers prevents the jaws being opened until the correct pressure has been applied.

NOTE: First crimp clip to "Panel Connection Marker" then connect wires to Terminal connector.

Section 2 Assembling the Mat

Step 6 Crimping terminal to the mat.

Attaching Tyco Amp 330716 Clips To the cold Leads



Strip wires and insert
Singly or in pairs into the
cylindrical ferrule of the crimp
connector. Hold back wires from
heating panels.



2 wires may be attached to the clip. Use the recommended tool so that the "W" form of the tool is to the seamed side of the cylindrical female of the crimp.

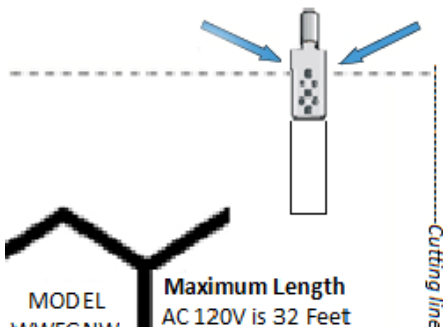


Standard pliers must not be used for this operation as crimps fitted incorrectly, may overheat due to high contact resistance






Crimp Clip twice, 45 degrees on
both sides

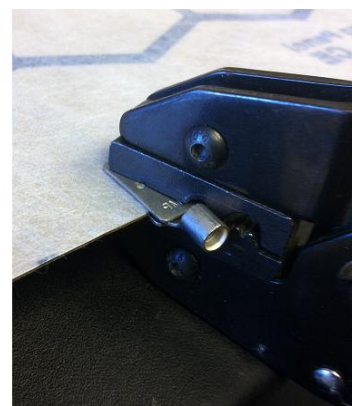
Crimp Wire/s



Section 2 Preparing for Cold Leads

Step 7 Defining Cold Leads

Action	Description
Define Cold lead	The wires that start at the heating panel and are to be run to the conduit system are called cold leads. They are attached to the terminal amp connectors..
Length	Cold leads should be installed so that the entire cold lead can reach the junction box or reach the thermostat connection. Small connecting cold leads encapsulated in the mat should be trimmed to size.
Purpose	The cold leads are the power wires to the amp terminals installed to the heating panels. The wires inside of the end tape are cold lead components of the mat. The wires outside of the end tape are cold leads, These need to be long enough to reach the thermostat or junction box.
Organize wires 	Connect the cold leads and cold lead components by strictly following the wiring layout in section 2 step 4. Make sure to wire the mats exactly as shown and to connect to the terminals exactly as shown in section 2 step 6.
Caution 	Cold leads must never pass over heating panels.
Smoothing out 	Make sure all connections are calibrated, firm and wired correctly. Make sure that your final home run cold leads are long enough to reach the thermostat or junction box.



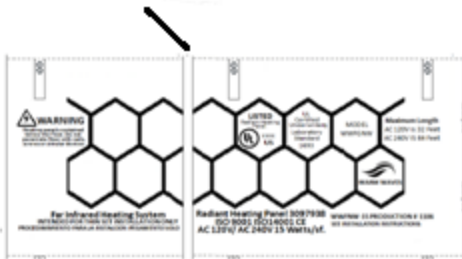
Section 2 Assembling the Mat

Step 8 Capacitance Wire

Working With the Film – Capacitance Collection wire Only on The WWF13GNW. 120V and 240V Panels.

Locate the flat visible copper foil wire, which is the only easily visible copper foil wire. With a utility knife, carefully cut the PET covering the copper foil wire making sure not to cut into PET below this wire. Peel back 2 inches on both the wired side on the top of the panel and the bottom of the panel. On the wired end, attach the clip to the copper foil wire and secure with Tyco AMP 330716. Seal with Electrical tape. On the dead end, fold the copper strip back from the cut end and secure with WW end tape system.

Copper Foil



Locate the flat visible copper foil wire. It is the only easily visible copper foil wire.

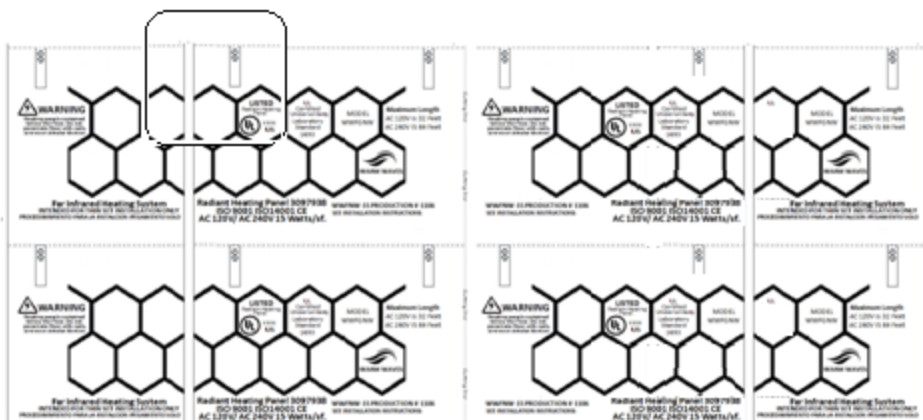


With a utility knife, carefully cut the PET covering the copper foil wire making sure not to cut into PET below the foil wire.




Carefully separate the copper foil wire. Fold this wire back. Don't cut PET below. Fold back 1 inch on the top of the heating panel. If your panel is cut to the desired length, strip the bottom of the panel back the same 1 inch.

You must make sure the bottom of the panel is striped back and taped. If it is not it has the potential to become conductive. Peel it back and fold it over and tape it flat to the panel

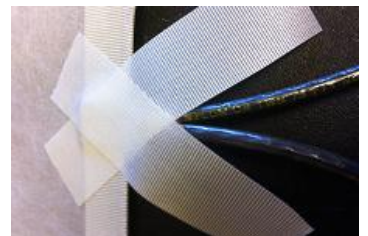
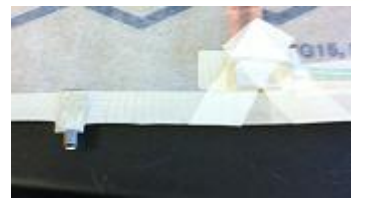


Section 2 Assembling the Mat

Step 9 Installing the 3M #69 tape system Section with terminals

Make sure the tape system completely covers the AMP clips. 

Action	Description
Preparing end tape for the top of the film that protects the connections	Lay the film on a flat clean surface. From one end to the other tape over all AMP connectors. This should leave a 1/4" extension over the edge of the film. Carefully cut tape on the sides of the clips and fold tape under the film.
Capacitance connection	If the film Chosen has a capacitance connection. Connect it now and fold the connection over the small piece of protective tape.
Completely cover all terminal connections	After all connectors are secured to the panel tape over any exposed connector areas and exposed wires. Crisscross 2 pieces of tape and mirror the taping on the back side of the film. IF for any reason there is bare metal or wires exposed continue to add tape until completely covered.
Capacitance connector	Cover the capacitance connector in the same manner as the other connectors with a crisscross pattern.
Organize wires	It is a good idea to organize the wires using the tape to keep them together. This will help when installing the end tape cover.
Sealing the top	Before you go to the next step. Flip the film over and mark one inch below the tape fold over. Draw a parallel line one inch down.
Smoothing out	Take a piece of the discarded tape cover or smooth cardboard and rub it over the wires and tape to assure a good bond.



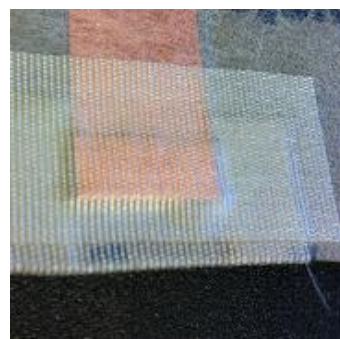
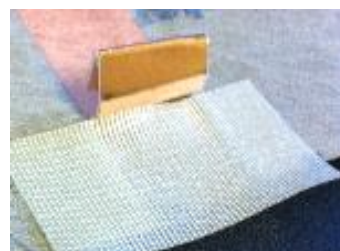
Section 2 Assembling the Mat

Step 9.1 Installing the 3M #69 tape system Bottom section of Film with no terminals



Warning:

Make sure that the copper foil ON THE NON WIRED END has been folded over and is not touching the end of the heating panel. This can make the copper foil conductive.



Action	Description
Preparing end tape for the Bottom of the film Section with no wires	Peel back the copper strip. If there is a capacitance wire on the panel.
Capacitance coverage	Fold the wire back on its self. Make sure the fold is at least ½ inch from the edge of the film.. Place a small strip of tape and wrap it to the back side.
Completely cover the folded over copper tab	Place another piece of tape large enough to cover the fold and to securely adhere to the film
Capacitance connector. I	Take a full strip of tape and place it under the film. Fold the entire length to the front. Make sure there is equal coverage on both sides of the film.
Smooth out tape	Cover this entire end of the film with the end tape cover and smooth the end with left over release paper.

Section 2 Assembling the Mat.

Step 10 Cover the top and bottom of panel with Eterna Bond end tape.

Eterna bond 6" and 2" width.

Release ½ of the liner of the 6 inch wide Eterna bond. Place the Eterna bond on the back side of the film. The tape should line up with the 1 inch marking you did in the last section

Rout the wires (from the front side) in the sticky part created by putting the Eterna bond from the back side installation

Run the final connections out of the mat. These wires are the cold leads that will be connected to the thermostat and the power source.

When you are satisfied with the wire locations slowly peel off the front section of liner and cover the front side.

Take a waste piece of the release liner and use it to smooth out the Eterna bond cover.

Trim the over lap of the Eterna bond cover on an angle back to the film.

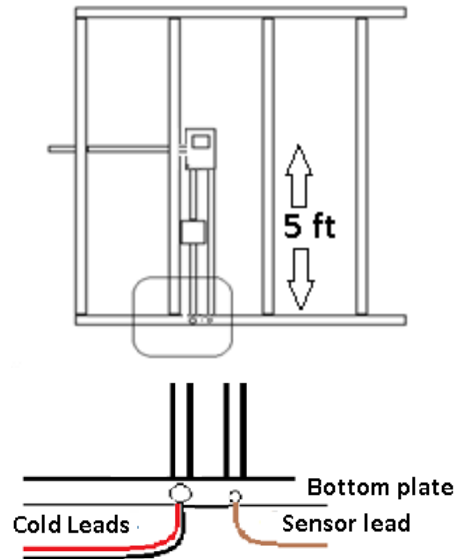
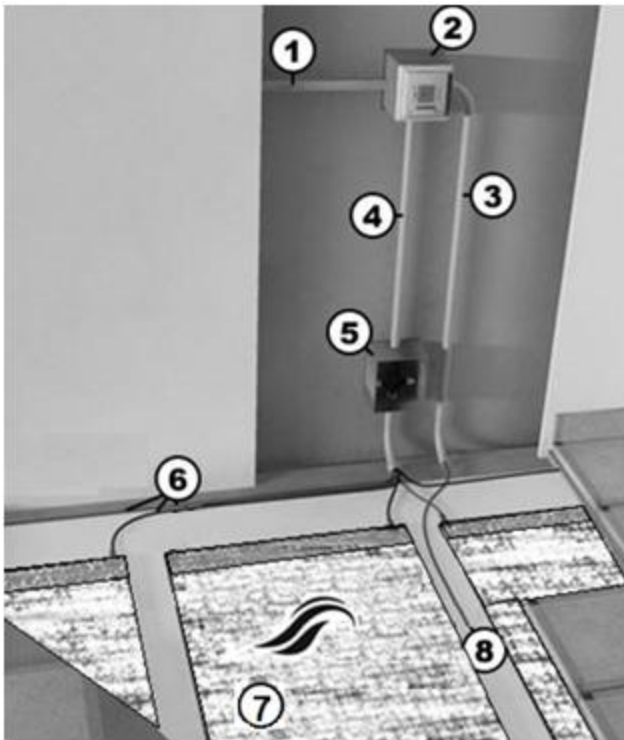
Repeat this process with the 2 inch Eterna bond for the bottom side of the panel (area with no wires)



Section 3 Wiring

Step 1 Roughing in the cold leads

Roughing in the cold leads to the power source and thermostat.



For clarity, the framing members have been removed. Note the line drawing to show standard framing and the bottom plate

1. Power source
2. Thermostat 4 " square
3. Conduit for the sensor line
4. Conduit for the cold leads
5. Junction box if needed
6. Cold leads
7. Warm Waves Heating panels
8. Sensor



Type NM and NMC non-metallic sheathed cable is not suitable for installing the product. UL797,UL1242,UL6,BS4568,BS31 UL listed conduit is required for all installations.



The cold leads of the heating products shall be suitable for the applied voltage and the temperature to which they are subjected under normal and abnormal operating conditions and shall be the following.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Caution: Use copper only as supply conductor.

Section 3 Wiring

Step 2 Preparation Before Installation

Confirm the electric capacity of the installation location. It should be enough to accommodate the total output of the heating panels. The circuit breaker should be rated for a maximum of 20 amps (no greater than a 15 amp load). Determine how many thermostats should be needed and the location of each thermostat and /or relay. Drill or cut hole for electrical junction box. Make groove for the path of wires (power & sensor). Never install one mat on top of another or overlap the mat on itself. This will cause dangerous overheating. Do not forget to install the floor sensor.



Be sure the subfloor is clean, rigid, flat, level, free of cracks and objects that can damage the film. **DO NOT INSTALL FILM OVER EXPANSION JOINT.**



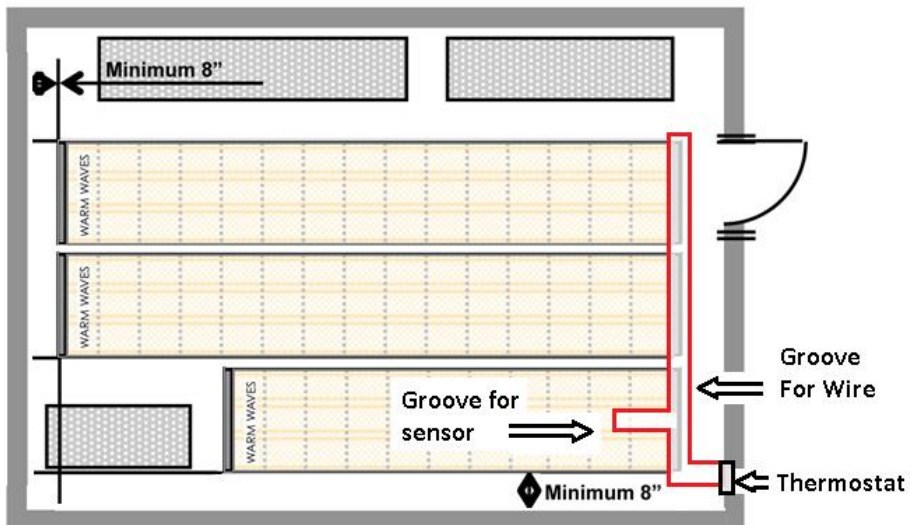
Heating Mats should never be installed at or below 32 degrees. Make sure that the work area is always neat and clean prior to any installation of Warm Waves. Nails, screws, and other sharp debris can damage the panels. Any and all panels that are torn or penetrated must be discarded.



Never install mats under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the mat can be damaged by fasteners (nails, screws, etc.) used to install built-ins.



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper movement joints within the plane of the tile per Detail EJ-171.



Section 3 Wiring

Step 3 Wiring Resistance Inspection

A. Visual Inspection



Before finishing the floor, check carefully for damage or scratches that might have occurred during installation on the heating film. If any damage or scratches are found, you must replace the heating film.

B. Electrical Inspection without electric power input. Check the resistance in total. The results must be

$$R(\text{Ohms}) = \frac{W}{I^2} \pm 10\%$$

I: Designed Amp.
(voltage factor X Sq Ft)
Voltage Factor - 120V = .108
 - 240V = .054
W: Designed output

OHM test example-

- 20 Sq Ft
- 13 watts per ft
- 120 volt - Amps = .108 x Sq Ft

$$55 \text{ OHMs} = \frac{260 \text{ watts (20sq ft x 13 watt)}}{4.66 \text{ Amp} = (20 \text{ sq ft X } .108)^2}$$



Check all electric connection points and the path of electric wires. If all connections and wires are securely assembled proceed.



Result is Zero (0) System circuit is shorted. Check all electric connection points and the path of all electric wires. If damaged sections are found on the film or electrical parts, replace the entire panel. The terminal clips are designed to be used once. Then perform a recheck.



If the resistance is not matched with the limits, you should check all heating panel sections and the wiring. Fix the problems, then move to next step.

C. Electrical Inspection with Electric Power Input



After passing inspection "B," supply the rated power and check whether the heating panels work properly by using an infrared thermometer on the surface of the heating panels. (Check the heat on all panels.) If the surface temperature does not increase by 3 degrees F in one minute, repeat inspection A and B.

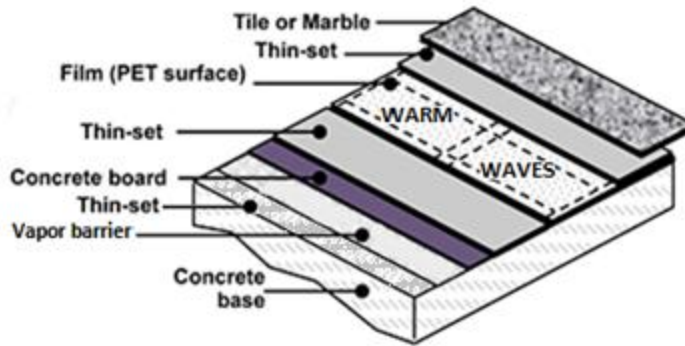


Route and secure wires between heating panels and the power source or junction box using code mandated wiring practices.

Section 4 Installation of System

Step 1-A Installing System in a Concrete Base

Installing Warm Waves in a Concrete Base for Stone and Tile Option



	Spec	Thickness	How to Install
Tile or Marble	-	Per supplier	Refer to Manufacturer's guide
Thin-set	-	3/8"	
Warm Waves	Non Woven Surface	1/32 "	
Thin-set	-	3/8"	Refer to Manufacturer's guide
Concrete Board optional	Concrete Board	3/8"	Refer to Manufacturer's guide
Vapor Barrier	-	1/32"	
Base	Concrete	-	



NOTE: Do not apply mats to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs per 1,000 sq in 24 hours per the Calcium Chloride test method.



Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.

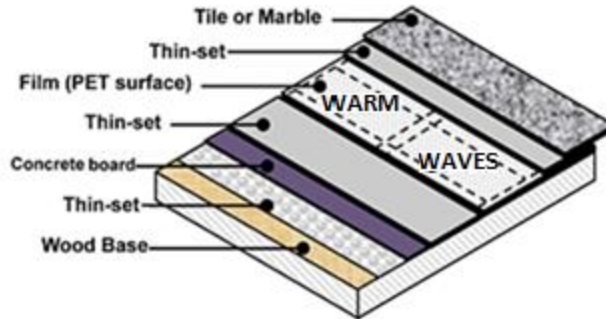


ALWAYS: Completely embed the heating mats and connection in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 4 Installation of System

Step 1-B Installing System in a Wood Base

Installing Warm Waves in a Wood Base for Stone and Tile Option



	Spec	Thickness	How to Install
Tile or Marble	-	Per supplier	Refer to Manufacturer's guide
Thin-set	-	3/8"	
Warm Waves	Non Woven Surface	1/32"	
Thin-set	-	3/8"	Refer to Manufacturer's guide
Concrete Board	Concrete Board	3/8"	Refer to Manufacturer's guide
Thin-set	-	3/8"	
Base	Wood	-	



NOTE: Do not apply mats to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs per 1,000 sq in 24 hours per the Calcium Chloride test method.



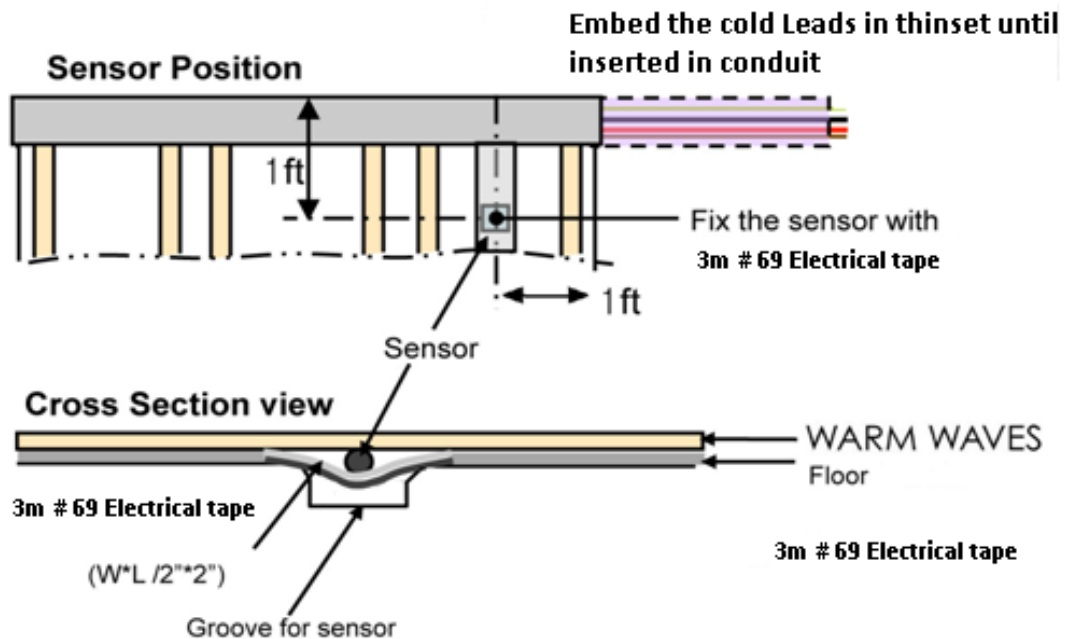
Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.



ALWAYS: Completely embed the heating mats and connection in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 4 Installation of System

Step 2 Installing Sensor and Thermostat



Thermostat and Sensor Requirements



A line Voltage thermostat that measures ambient air temperature and floor temperature through a sensor must be installed. A low voltage controller can be used if it controls slave relays that are required if the heating panels are larger than the maximum power requirements.



The thermostat is required to have a built in GFCI and must be rated to handle the required voltage.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Affix to the device that is controlling the Warm Waves heating panel system.

WW13JUN

RADIANT FLOOR HEATING DEVICE

WarmWaves®

Section 4 Installation of System

Step 3 Connecting Sensor, Thermostat and Labels

Complete the installation.



With the flooring in place and cured to the manufacture's specifications, you can now complete the final hook up to the power and sensor system.



Install the control device thermostat and any required relays according to the manufacturer's instructions to the junction box and the thermostat box.

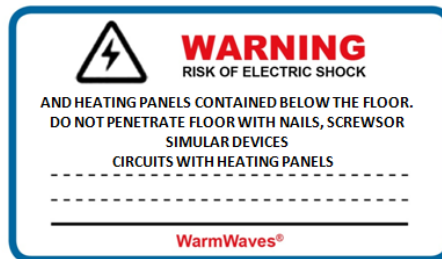


Refer to the wiring section 3 step 1-6 for additional information regarding proper wiring and testing.



Make sure 28 days has passed prior to testing the heating output of the system.

WW13WAR



WW13CAU



WW13JUN



Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper movement joints within the plane of the tile per detail EJ-171.

System Record (Information Card)

Customer Information

Name			
Address			
Tel. Mobile Fax			
Installation Address			

Name			
Address			
Tel. Mobile Fax			
Installation Address			

System Information Designed Specification

Location	Model name	Sq.ft	V	A	W

Inspection Data

Location	Model name	Sq.ft	V	A	W

System Record

Sketch of the System

Diagram of circuit

Location	Sq.ft	W	A	Model

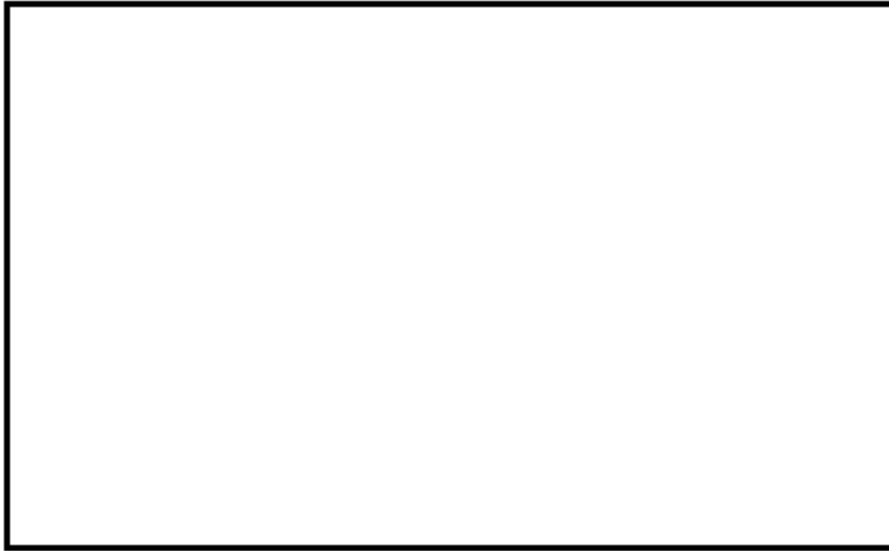


Diagram of circuit

Location	Sq.ft	W	A	Model



System Record
Sketch of the System