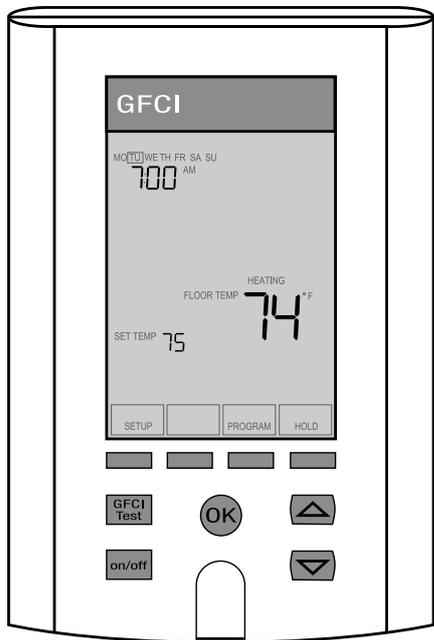


Installation & Operation Manual

SunStat® Pro II

Programmable Thermostat

Model 500775 (-BB, -HB, -SB, -WB)



The SunStat Pro II model 500775 is designed to operate either a 120 VAC or 240 VAC resistance floor heating system. It comes with an easy setup wizard, a typical Program Schedule ready to go, and a GFCI inside to meet safety needs.

⚠ WARNING



Read this Manual BEFORE using this equipment. Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment. Keep this Manual for future reference.

⚠ WARNING

Installation must be performed by qualified personnel, in accordance with local codes and standards. A licensed electrician is recommended.

⚠ WARNING



As with any electrical product, care should be taken to guard against the potential risk of fire, electric shock, and injury to persons. The following must be observed:

- Wire all circuits as Class 1, Electric Light and Power Circuits.
- Wire all circuits with insulation rated 600V minimum.
- Mount this control only to a grounded metallic box or a nonmetallic box.
- Use power supply wires suitable for at least 90°C.
- High voltage – disconnect power supply before servicing.
- The GFCI (ground-fault circuit interrupter) in this thermostat control does not protect against shock if both bare conductors are touched at the same time.
- Do not exceed 15 amps on this thermostat control. Doing so will cause risk of fire hazard and damage.
- Make sure the house power supply voltage matches the voltage rating of the floor heating system. Do not apply 240 VAC to a 120 VAC rated system. Connecting the wrong voltage may cause overheating and damage to the system, the control, floor coverings, etc.

Local building or electrical codes may require modifications to the information provided. You are required to consult the local building and electrical codes prior to installation. If this information is not consistent with local building or electrical codes, the local codes should be followed.

Items included

Unpack the thermostat control and make sure everything is in good condition. Do not use a damaged control or part. The package comes with these items:

- (1) Thermostat
- (1) Thermostat Floor Sensor
- (5) Wire Nuts (Marettes®)
- (2) Mounting Screws
- (1) Screwdriver

Tools and supplies needed

- No. 2 Phillips screwdriver
- Hole saw (if installing in an existing wall)
- Wire strippers, wire cutters, and other electrical tools
- Electrical wall box (plastic or metal)*

NOTICE

*A single-gang extra-deep box allows sufficient space to connect 1 or 2 heating mats or cables. For 3 heating mats or cables, a 4-inch square extra-deep electrical box with a single-gang “mud ring” is necessary. Alternately, a junction box may be installed to connect multiple heating mats or cables, then run power supply wire from the junction box to the control electrical box. See the Installation Instructions provided with the floor heating system for more details.

Installation

Locating the Control

Find a suitable location for the control. Consider the following:

- It is designed for indoor dry location only.
- It may be placed on an insulated or uninsulated wall, preferably an interior wall to avoid overheating from outside sun heat.
- Keep it away from all water sources such as sinks, showers, and bathtubs as well as heat sources such as hot-water piping, heat ducting, wall-mount lighting, and direct sunlight.
- Locate it at a suitable height, normally about 4-1/2' to 5' (1.4 m to 1.5 m) from the floor.

Mounting the Electrical Box

- When mounting on an existing wall, cut the opening for the electrical box for the control. To make it easier to pull the wiring, wait to install the electrical box until after all wiring is drawn into this opening.
- When mounting on an open wall, secure the electrical box for the control to the wall stud. Conduit from the electrical box to the floor is recommended (check local codes for requirements) for additional protection. Install one conduit for the floor sensor. Install another conduit for the floor heating system power leads.
- Refer to the Installation Instructions supplied with the floor heating system for additional installation details.

Wiring

⚠ WARNING



To prevent the risk of personal injury and/or death, make sure power is not applied to the product until it is fully installed and ready for final testing. All work must be done with power turned off to the circuit being worked on.

House Wiring

Pull power supply wiring to the control location. Consider the following:

- Leave about 6 to 8 inches (15 to 20 cm) of wire for connections later.
- This wiring should be size 12 or 14 AWG following appropriate local code requirements.
- A qualified person should run a dedicated circuit from the main circuit breaker panel to the control location. If a dedicated circuit is not possible, it is acceptable to tap into an existing circuit. However, there must be enough capacity to handle the load (amps) of the floor heating system being installed and any possible appliance, such as a hair dryer or vacuum cleaner.
- Avoid circuits that have ballasted lighting, motors, exhaust fans, or hot tub pumps due to possible interference.
- The circuit breaker should be rated 20 amps for total circuit loads up to 15 amps. A 15 amp circuit breaker may be used for total circuit loads up to 12 amps.
- A GFCI (ground-fault circuit interrupter) or AFCI (arc-fault circuit interrupter) type circuit breaker may be used if desired, but is not necessary.

Floor Sensor

1. Test the Thermostat Floor Sensor included to make sure it has not been damaged in handling. Use a digital multimeter set to the 20k Ω range. The resistance varies according to the temperature sensed. These are approximate values for reference:

Table 1 – Sensor resistances

Temperature	Typical Values
55°F (13°C)	17 k Ω
65°F (18°C)	13 k Ω
75°F (24°C)	10 k Ω
85°F (29°C)	8 k Ω

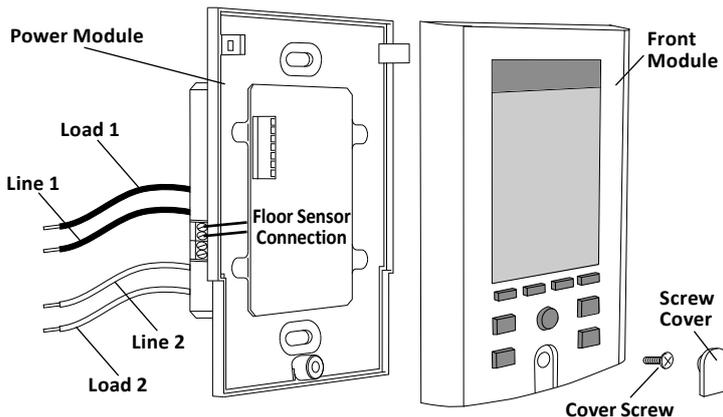
2. Pull the floor sensor wire up the wall (or conduit) to the control location. Consider the following:
 - Leave about 6 to 8 inches (15 to 20 cm) of wire for connections later.
 - The sensor wire may be cut shorter if desired, but do not cut it shorter until the sensor is fully installed (see below). Re-strip the sensor wire ends 1/8" to 3/16" (3 mm to 4.5 mm) long. If the ends are stripped longer than this they may short-circuit resulting in an Err2 code.
 - If the sensor wire is not long enough to reach the control location, it may be extended an additional 15 feet (4.5 m) using minimum 20 AWG 2-conductor unshielded wire, or an additional 50 feet (15 m) using shielded wire. When using shielded wire, the "shield" must be connected to the lower sensor terminal, nearest to Bus A. A junction box may be required by local code for the connection to this extension wire.
3. After the floor heating system is completely installed according to its instructions, secure the thick sensor tip to the floor. Consider the following:
 - It must be located halfway between heating wires and at least 1 foot into the heating area.
 - Use hot-glue to secure the sensor tip and wire in place.
 - Do not cross over a heating wire.
 - Avoid placing it in an area where heating wires are spaced further apart than the rest of the floor, like a large gap between mats or cables.
 - Avoid placing it in an area where a heat duct or recessed light will cause improper measurements.
 - Try to avoid locating it where future items such as a clothes hamper or similar could trap heat and cause improper measurement.

Power Leads from Heating Mat or Cable

Pull the power lead wires from the floor heating system into the control location. Excess power lead wire may be cut off, but leave about 6 to 8 inches (15 to 20 cm) of wire for connections.

Removing the Thermostat Front Module

1. Remove the Screw Cover at the bottom and loosen the screw.
2. Lift the Front Module away from the Power Module.



Wiring Connections (see Figure 1 and 2)

Connect the wires as shown in the diagram. Consider the following:

- Gently tug on the wires to make sure they are secure. For added security, overwrap the Wire Nut connections with electrical tape.
- If the electrical box is metal, a short length of wire must be secured to the electrical box from the ground connection.
- When connecting the Floor Sensor to the Sensor terminals, it does not matter which wire goes into which terminal.
- The Bus A and B terminals are used to communicate with a SunStat Relay II. Please read and follow the instructions provided with the SunStat Relay II for further details.

Figure 1

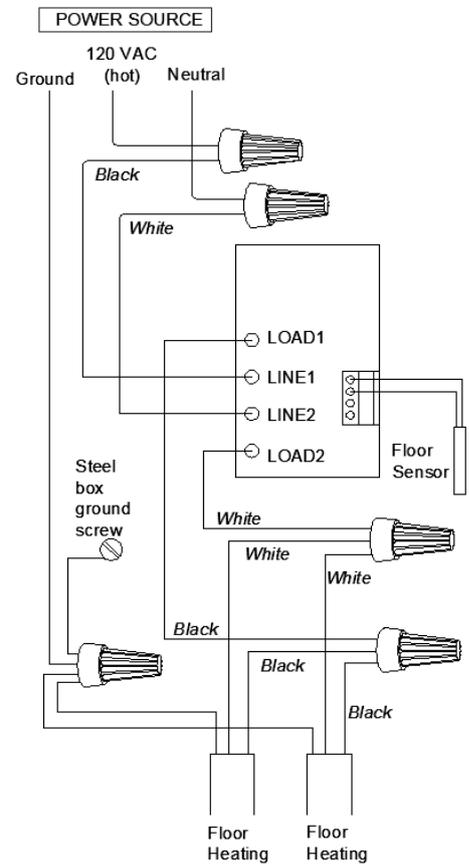
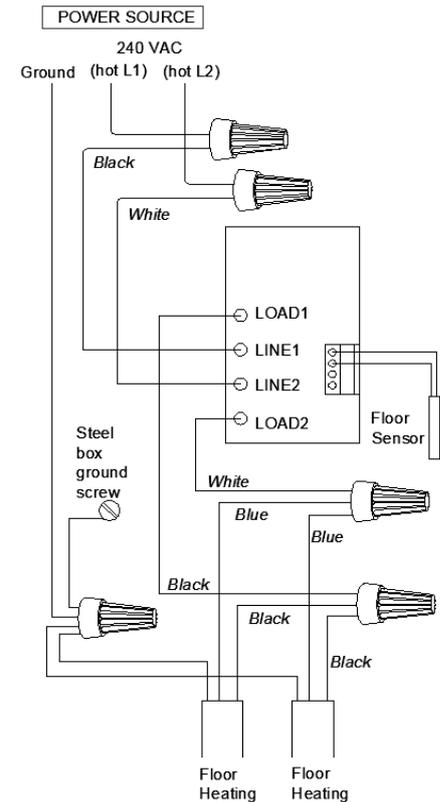


Figure 2

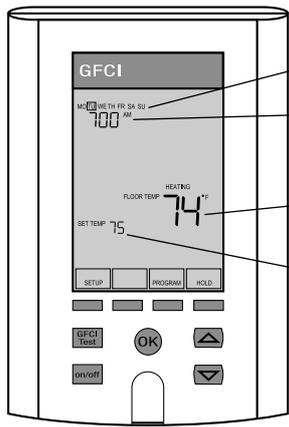


Mounting the Thermostat

1. Make sure the power supply to the circuit is turned off at the circuit breaker.
2. Carefully press the wires back into the electrical box.
 - DO NOT use the control to push wires in, as this may cause connections to loosen and possible failure.
3. Use the Mounting Screws provided to secure to the electrical box and tighten by hand.
 - DO NOT over-tighten the screws causing the plastic to distort, as this may cause improper function of the thermostat.
4. Press the Front Module onto the Power Module. Make sure both tabs at the top are completely engaged.
 - DO NOT install the Front Module with power applied on the Power Module, as this may cause improper function of the thermostat.
5. Secure the screw at the bottom and replace the Screw Cover.
 - DO NOT over-tighten the screw causing it to strip. Turn it until snug.



Operation Overview



- Day
- Time
- Floor temperature
- Setpoint temperature

Press a button if the display is dark. This wakes the display backlight. An Interactive Tutorial is also available on the website to help.

On/Off and Reset

Pressing **on/off** will turn the thermostat on or off. This also resets the thermostat to clear an error or GFCI fault. See “GFCI Testing” and “Troubleshooting”.

Startup

When first powered on, the thermostat begins a “startup wizard” to help the user through basic setup. For each setting, press **▲** or **▼** buttons to adjust and press **OK** to accept.

1. Set the year, month, day, hour, and minutes.
2. Select the sensing method (Floor or Air). Recommended is “FLOOR TEMP”.
3. Select a Pre-Programmed Schedule. Recommended is “NORMAL DAY” where it makes the floor warmer during morning and evening hours. Any of the schedules can be customized later to fit your needs.
4. Press **OK** and the thermostat will begin working automatically.

Table 2 - Pre-Programmed Schedules – Customize to fit your needs

NORMAL DAY				
	WAKE	LEAVE	RETURN	SLEEP
Monday-Friday	6:00 AM 82°F (27.8°C)	8:00 AM 74°F (23.3°C)	5:00 PM 82°F (27.8°C)	10:00 PM 74°F (23.3°C)
Saturday	7:00 AM 82°F (27.8°C)	9:00 AM 74°F (23.3°C)	5:00 PM 82°F (27.8°C)	11:00 PM 74°F (23.3°C)
Sunday	7:00 AM 82°F (27.8°C)	9:00 AM 74°F (23.3°C)	5:00 PM 82°F (27.8°C)	11:00 PM 74°F (23.3°C)
WARM ALL NIGHT				
	WAKE	LEAVE	RETURN	SLEEP
Monday-Friday	--	8:00 AM	5:00 PM	--
Saturday	--	9:00 AM	5:00 PM	--
Sunday	--	74°F (23.3°C)	82°F (27.8°C)	--
HOME DURING DAY				
	WAKE	LEAVE	RETURN	SLEEP
Monday-Friday	6:00 AM 82°F (27.8°C)	--	--	10:00 PM 74°F (23.3°C)
Saturday	7:00 AM 82°F (27.8°C)	--	--	11:00 PM 74°F (23.3°C)
Sunday	7:00 AM 82°F (27.8°C)	--	--	11:00 PM 74°F (23.3°C)

Air Sensing mode default temperatures are 70°F and 62°F.

GFCI Testing

The GFCI (Ground Fault Circuit Interrupter) in this control must be tested when installation is finished and once each month.

1. Make sure the control shows “HEATING”. This may require temporarily increasing the Setpoint temperature by pressing the **▲** button.
2. Press the **GFCI Test** button. “GFCI TRIP” should be indicated on the control. There will also be a click sound, indicating power has been removed from the floor heating system. If either of these indications fail, turn off the thermostat and replace it. Do not continue to use.
3. To reset the GFCI TRIP, press the **on/off** button off and back on.

Adjusting the Temperature

Temporary Adjustment

1. Press **▲** or **▼** buttons to adjust the setpoint temperature and press **OK** to accept. The display will show “HOLD SET TEMP UNTIL NEXT PERIOD”. This setpoint will be held until the next Program Schedule time.
2. Pressing **CANCEL** will return the setpoint to the Program Schedule setting.

Hold a Setpoint Temperature

1. Press **HOLD** to hold the setpoint temperature instead of using the Program Schedule.
2. Press **▲** or **▼** buttons to select an option and press **OK** to accept.
 - Selecting “CONTINUOUS” will hold the temperature indefinitely.
 - Selecting “FOR 01 DAYS” will hold for one day. The number of days can be adjusted by pressing **EDIT** and then pressing **▲** or **▼**. Press **OK** to save.
3. Pressing **CANCEL** will return the setpoint to the Program Schedule setting.

Customizing the Program Schedule

1. Press **PROGRAM**.
2. Press **▲** or **▼** buttons to select the period and day to customize.
 - Each day has 4 periods (WAKE, LEAVE, RETURN, SLEEP). A period is a certain time that you wish the thermostat to begin heating at a certain setpoint temperature.

EXAMPLE:

- To have the floor warm up to 80F at 5:30 AM in the morning, set the WAKE period to these values.
 - To save energy and allow my floor to cool to 74F after leaving at 7:15 AM, set the LEAVE period to these values.
 - To have the floor warm again to 80°F when returning home at 6:00 PM, set the RETURN period to these values.
 - Finally, to save energy overnight and cool the floor to 74°F after 10:00 PM, set the SLEEP period accordingly.
 - With the SmartStart feature turned on (see SmartStart below), the thermostat will learn how long it takes the floor to reach 80°F and begin warming up a little early, reaching approximately 80°F by the WAKE time 5:30 AM and again at the RETURN time 6:00 PM. It will take a couple days to learn.
3. Press **EDIT**.
 - To clear a period, useful if you want to only raise and lower the temperature once in a day, press **CLEAR**. The thermostat will skip over this period in the schedule. There must be two periods in the schedule.
 4. Press **▲** or **▼** buttons to adjust the time and press **OK** to save.
 5. Press **▲** or **▼** buttons to adjust the setpoint temperature and **OK** to save.
 6. Press **▲** or **▼** buttons to select another period and day to customize, or press **OK** to return to the home screen.

Changing Settings

1. Press **SETUP**.
2. Use the **▲** or **▼** buttons and the **OK** button to select the setting.
3. Use the **▲** or **▼** buttons to adjust the setting or move between Options.
4. Press **OK** to save the adjustment or press **BACK** to cancel the adjustment and return to the home screen.

Table 3 - Settings

Setting	Options
°F/°C Format of clock and temperature.	°F/12-hour format °C/24-hour format
CLOCK Set the time, year, month, day.	
USAGE The thermostat stores in memory the number of hours that it is heating. This information may be useful in calculating the energy used by the floor heating system. To reset these counters to zero, press CLEAR .	1 day (since midnight) 7 days 30 days
FLOOR/AIR The thermostat is designed to operate best in Floor Sensing mode. It is also possible to operate in Air Sensing mode with Floor Sensing limitation. However, make sure to set a proper maximum Floor Limit temperature (see Floor Limit above) to avoid overheating certain floor coverings. Also note that internal heating in the thermostat may affect the air sensor temperature reading.	FLOOR TEMP AIR TEMP Default:FLOOR TEMP
FLOOR LIMIT Minimum and maximum allowable setpoint temperatures of the floor sensor. This is useful when the floor covering cannot exceed a certain temperature (84°F is common for many wood or laminate products. Consult your floor covering manufacturer for recommended limits). It is also useful to limit adjustment by users. And it is useful if the thermostat is being operated in Air Sensing mode (see FLOOR/AIR above) but it is still desired to maintain a minimum floor temperature regardless of the air temperature.	40-99°F (4.5-37°C) Default maximum: 99°F (37°C) Default minimum: 40°F (4.5°C)
SMART START Allows the thermostat to learn and automatically determine the best time to begin heating, reaching the setpoint temperature at the scheduled time. For example, the schedule may have a “WAKE” start time of 6:00AM to be 82°F (27.8°C) and SmartStart may begin pre-heating at 5:30AM to reach 82°F by 6:00AM. It will take a couple days to learn.	ON OFF Default: ON
FACTORY RESET Use with caution! This will clear all programming and settings to factory condition. This is useful if there are problems or errors which cannot be corrected.	

Other Features

These other features are available on the thermostat.

Lockout

The thermostat has the ability to lock out adjustments. This may be useful in public locations. To use this feature, press \blacktriangle or \blacktriangledown buttons at the same time and hold for 2 seconds. "LOCK" will show in the display. To cancel, press \blacktriangle or \blacktriangledown buttons at the same time and hold for 2 seconds.

Calibration

Under special circumstances it may be desired to slightly adjust the temperature that is displayed for the sensor. Normally this is not recommended. However, it can be done by pressing **SETUP** for 1 second. The display will show "CAL" and the current sensor temperature and the offset value. Adjust by pressing \blacktriangle or \blacktriangledown buttons. Press **OK** to save and return to the home screen.

Troubleshooting

If problems arise with the thermostat, please consult this troubleshooting guide. If not qualified to perform electrical work, it is highly recommended a qualified, licensed electrician be hired. Any electrical troubleshooting work should be performed with the power removed from the circuit, unless otherwise noted. Although this troubleshooting guide is provided to assist with problems experienced with a system, results are never guaranteed. Watts Radiant does not assume any liability or responsibility for damage or injury that may occur from using this guide. If problems with the system persist, call the manufacturer.

Table 4 - Troubleshooting

Problem	Display	Solution
The following are common issues and solutions. A more complete list and more solutions are on the manufacturer website.		
No heat	GFCI TRIP	Reset by turning thermostat off/on. Reset by turning circuit breaker off/on. Electrician: Check for loose wire connections at breaker and junctions. Check for short-circuit to ground on heating system.
No heat	HEATING	Allow sufficient time. Verify floor is insulated. Electrician: Check for correct resistance between heating system power lead wires. Check for correct voltage supplied to heating system. Check for correct amps drawn by heating system.
No display	None	Reset circuit breaker. Check contacts between Power Module and Front Module and clean with alcohol wipe. Electrician: Check for loose wire connections at circuit breaker and junctions. Check for correct voltage between LINE1 and LINE2.
Heating occurs at the wrong times	HEATING	Check that the current time and schedule times are properly set to AM or PM. On uninsulated concrete slab floors the SmartStart feature may start heating very early. You may turn this feature off if not desired.
No heat	FLOOR LIMIT	Check Floor Limit values (see Table 3).
No heat	95°F or higher	Electrician: Check to make sure only one Floor Sensor is attached.

Error Codes: An error code may display due to a power glitch or other false issue. Always:

1. Try clearing the Error code once by turning the thermostat off, resetting the circuit breaker, and then turning the thermostat back on.
2. Check the contacts between Power Base and Front Module for dirt or damage. Turn the circuit breaker off and remove the Front Module. Are the contacts bent or dirty? Try gently cleaning them with a rubbing alcohol wipe. Dirt or oil may have contaminated them during installation. In most locations this step may be performed without an electrician since there is no power available.
3. Check that the Mounting Screws are not too tight causing distortion. Turn the circuit breaker off and remove the Front Module. Back the screws out until the Power Base is just snug to the wall.
4. Check that both clips at the top are engaged and that the screw at the bottom is snug.

If these actions and the following do not resolve the issue, turn off the circuit breaker and contact the manufacturer for direction. Do not continue using the system to prevent further risk of damage, fire, or electrical shock.

Table 4 - Troubleshooting continued

Problem	Display	Solution
No heat	Err1	Floor Sensor may be wrong type. Electrician: Check floor sensor resistance. See Table 1 in the Installation section above.
No heat	Err2	Floor Sensor wires may be crossed. Electrician: Check if the Floor Sensor wires crossed and short-circuited. Check Floor Sensor resistance (see Table 1 in the Installation section above).
No heat	Err3	Floor Sensor wires may not be connected. Check Floor Sensor connections and mounting screws as stated above. Electrician: Check if Floor Sensor is attached. If not, attach and reset the circuit breaker.
No heat	Err4 or Err5 and Air	Internal air sensor may be faulty. Change setting to Floor Sensing mode (see Table 3 above).
No heat	Err6	Internal temperature limit may be exceeded. Check if sunlight or other heat source is causing added heat to thermostat. Electrician: Check if load exceeds 15 amps.
No heat	Err7	Contacts or internal connections may be faulty. Check connections and mounting screws as stated above. Reset circuit breaker.
No heat	Err8	Internal device error.

Specifications

Power Supply	120 / 240 VAC, 50/60 Hz
Maximum Load	15 A, resistive
Maximum Power	1800 W at 120 VAC / 3600 W at 240 VAC
GFCI	Class A (5 mA trip nominal)
Display Range	32°F to 99°F (0°C to 37°C)
Setting Range	40°F to 99°F (4°C to 37°C)
Accuracy	± 0.9°F (0.5°C)
Environment	Indoor dry location only
Storage Temperature	0°F to 120°F (-17°C to 49°C)
Floor Sensor	Thermistor, 10k NTC type, double insulated, Class2
Memory	Programming retained indefinitely. Current time/day will need reset if power is lost more than 30 minutes.
ETL Listing	Control No. 3037530. Conforms to UL 873, UL 943, CSA C22.2 No. 24, CSA/CAN C22.2 No. 144.

Limited Warranty

Watts Radiant warrants this control (the product) to be free from defect in material and workmanship for a period of (3) years from the date of original purchase from authorized dealers. During this period, Watts Radiant will replace the product or refund the original cost of the product at Watts Radiant's option, without charge, if the product is proven defective in normal use. Please return the control to your distributor to begin the warranty process.

This limited warranty does not cover shipping costs. Nor does it cover a product subjected to misuse or accidental damage. This warranty does not cover the cost of installation, diagnosis, removal or reinstallation, or any material costs or loss of use.

This limited warranty is in lieu of all other warranties, obligations, or liabilities expressed or implied by the company. In no event shall Watts Radiant be liable for consequential or incidental damages resulting from installation of this product. Some states or provinces do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above exclusions or limitations may not apply to you. This warranty gives you specific legal rights and you may also have other rights that vary from state to state.

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. For more information: www.watts.com/prop65



WattsRadiant™

A Watts Water Technologies Company

USA: Springfield, MO • Tel. (800) 276-2419 •
Fax: (417) 864-8161 • www.wattsradiant.com