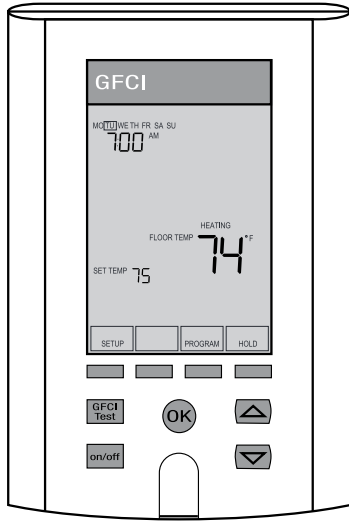


Owner's Manual

SunStat® Pro II

Programmable Thermostat

Model 500775



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 ready to go, and a GFCI inside to meet safety needs.

Please follow this manual for installation and operating instructions. Leave these instructions with the homeowner.

Installation

Cautions to Follow

You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product. FAILURE TO COMPLY WITH PROPER INSTALLATION AND MAINTENANCE INSTRUCTIONS COULD RESULT IN DAMAGE TO THE SYSTEM OR ELECTRIC SHOCK CAUSING PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH. Watts is not responsible for damages resulting from improper installation and/or maintenance.

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

CAUTION: This product requires electrical wiring. It is recommended that this product is installed by a qualified technician. Local codes may require this product be installed by an electrician. Prior to installation, consult your local codes for what is acceptable in your area. To the extent this information is not consistent with local codes, the local codes should be followed.

ALWAYS: Wire all circuits as Class 1, Electric Light and Power Circuits

ALWAYS: Wire all circuits with insulation rated 600V minimum.

ALWAYS: Mount this control only to a grounded metallic box or a nonmetallic box.

ALWAYS: Use power supply wires suitable for at least 90°C.

WARNING: High voltage – disconnect power supply before servicing.

WARNING: 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.

WARNING: Do not exceed 15 amps on this thermostat control. Doing so will cause risk of fire hazard and damage.

CAUTION: 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.

Parts Needed

Contents of package:

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
- (4) 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)*

***NOTE:** 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.

Locating the Control

Find a suitable location for the control. 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.

When mounting on an open wall, 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

CAUTION: Turn off power at the circuit breaker before doing any electrical work.

House Wiring

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.

WARNING: Do not exceed 15 amps on this thermostat control. Doing so will cause risk of fire hazard and damage.

Pull power supply wiring to the control location. 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.

Floor Sensor

Pull the floor sensor wire up the wall (or conduit) to the control location, leaving about 6 inches (15 cm) of wire for connection later. The sensor wire may be cut shorter if desired, but do not cut it shorter until the sensor is fully installed (see below).

Note: 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.

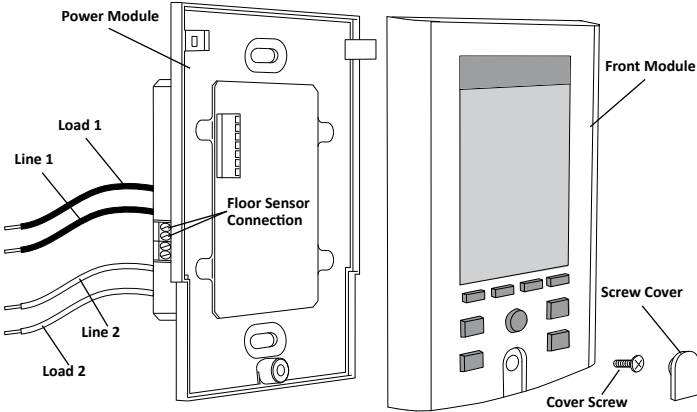
After the floor heating system is completely installed according to its instructions, secure the thick sensor tip to the floor. It must be located halfway between heating wires and at least 1 foot into the heating area. Use hot-glue to secure the sensor tip and wire in place. Do not cross over a heating 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.

Finish securing the sensor wire along the floor and up the wall. At the control location, cut the sensor wire shorter if needed, leaving at least 6 to 8 inches (15 to 20 cm) of wire for connections later. 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.

Mat or Cable Power Leads

Pull the power lead wires from the floor heating system into the control location. Leave about 6 to 8 inches (15 to 20 cm) of wire for connections.

Wire Connections



Match and connect the two wires marked “LINE1(L)” and “LINE2(N)” to the house power supply wires using the wire nuts provided. Gently tug on the wires to make sure they are secure, otherwise a wire could come loose and cause failure. For added security, overwrap the connections with electrical tape.

Match and connect the two wires marked “LOAD1” and “LOAD2” to the power lead wires from the floor heating system. Secure these wire connections the same way with the appropriate size wire nut for the number of wire connected.

CAUTION: 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.

Connect the house ground wire to the ground wire(s) from the floor heating system. If the electrical box is metal, a short length of wire must be secured to the electrical box from this ground connection.

Insert the ends of the floor sensor wire into the terminals marked “SENSOR” and snug the screws. It does not matter which wire goes into which terminal

SunStat Relay (optional)

Read and follow the instructions provided with the SunStat Relay.

Pull 18 AWG to 24 AWG 2-conductor shielded wire through the wall from the SunStat Relay location to this control location. This wire may be up 100 feet (30 m) in length. Strip the 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.

Connect the wire ends into the “BUS” A and B terminals. Make sure the wire in “A” terminal is connected to an “A” terminal in the SunStat Relay.

Mounting the Control

Carefully press the wires back into the electrical box. Do not use the control to push them in, as this may cause connections to loosen and possible failure.

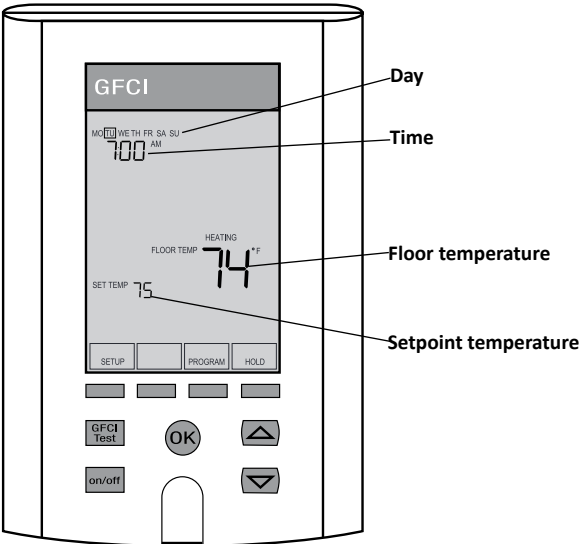
Loosen the screw and remove the front module from the power module. Secure the power module into the electrical box with the mounting screws provided.

Snap the front module onto the power module and tighten the screw. Press the Screw Cover in place to cover screw.

Operation

Overview of Features and Display

Press a button if the display is dark. This wakes the display backlight.



On/Off and GFCI

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”.

GFCI Testing

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

- Make sure the control shows it is Heating. This may require temporarily increasing the setpoint temperature.
- 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.
- To reset the GFCI TRIP, press **on/off** off and back on.

Startup Wizard

This thermostat comes with a “wizard” to help the user through basic setup.

- When first powered up, or upon resetting the factory defaults, the display will ask to set the year. Adjust the year by pressing **▲** or **▼** and press **OK**.
- Select the month and press **OK**.
- Select the day and press **OK**.
- Set the hour and minutes (format is 12-hour clock but this can be changed to a 24-hour clock). See Changing Settings Section.
- Select the sensing method (Floor or Air). Default is Floor. See cautions before using the Air Sensing method. See Changing Settings Section.
- Select a program schedule. The default is called “Normal Day” where it makes the floor warmer during morning and evening hours. Any of the schedules can be customized to fit your needs.
- Press **OK** and the thermostat will begin working automatically.

NORMAL DAY

Cycle	WAKE	LEAVE	RETURN	SLEEP
Monday – Friday	6:00 AM (6:00)	8:00 AM (8:00)	5:00 PM (17:00)	10:00 PM (22:00)
	82 F (27.8 C)	74 F (23.3 C)	82 F (27.8 C)	74 F (23.3 C)
Saturday	7:00 AM (7:00)	9:00 AM (9:00)	5:00 PM (17:00)	11:00 PM (23:00)
	82 F (27.8 C)	74 F (23.3 C)	82 F (27.8 C)	74 F (23.3 C)
Sunday	7:00 AM (7:00)	9:00 AM (9:00)	5:00 PM (17:00)	11:00 PM (23:00)
	82 F (27.8 C)	74 F (23.3 C)	82 F (27.8 C)	74 F (23.3 C)

NOTE: Air Sensing mode default temperatures are 70F and 62F.

WARM ALL NIGHT

Cycle	WAKE	LEAVE	RETURN	SLEEP
Monday – Friday	--	8:00 AM (8:00)	5:00 PM (17:00)	--
	--	74 F (23.3 C)	82 F (27.8 C)	--
Saturday	--	9:00 AM (9:00)	5:00 PM (17:00)	--
	--	74 F (23.3 C)	82 F (27.8 C)	--
Sunday	--	9:00 AM (9:00)	5:00 PM (17:00)	--
	--	74 F (23.3 C)	82 F (27.8 C)	--

NOTE: Air Sensing mode default temperatures are 70F and 62F.

HOME DURING DAY

Cycle	WAKE	LEAVE	RETURN	SLEEP
Monday – Friday	6:00 AM (6:00)	--	--	10:00 PM (22:00)
	82 F (27.8 C)	--	--	74 F (23.3 C)
Saturday	7:00 AM (7:00)	--	--	11:00 PM (23:00)
	82 F (27.8 C)	--	--	74 F (23.3 C)
Sunday	7:00 AM (7:00)	--	--	11:00 PM (23:00)
	82 F (27.8 C)	--	--	74 F (23.3 C)

NOTE: Air Sensing mode default temperatures are 70F and 62F.



Adjusting the Temperature

Normally the thermostat will run automatically based on the programmed settings. However, these settings may be overridden temporarily or for a specified period of time.

Overriding Temporarily

To only override the program until the next scheduled time, press **▲** or **▼** to select the desired setpoint temperature. After a few seconds it will indicate “HOLD SET TEMP UNTIL NEXT PERIOD” and **CANCEL** will show. To cancel this override and return to normal scheduled settings press **CANCEL**.

Holding the Override

To override the program for a specific period of time, press **HOLD**. Select whether to set this for a Continuous Hold or for a certain number of days by pressing **▲** or **▼**. The number of days can be adjusted by selecting EDIT and then pressing **▲** or **▼**. Press **OK** to save this selection. The display will show the Hold setting. The thermostat will operate at the setpoint temperature continuously or for the number of days selected before returning to normal schedule settings. This feature may be cancelled by pressing **CANCEL**.

Customizing the Program Schedule

Press **PROGRAM**. The schedule shown is set for the highlighted day shown at the top of the display. This is a 7-day programmable thermostat, allowing each day to have its own schedule. Press **▲** or **▼** to browse through each day(s) schedule.

How does a schedule work?

Example:

- To have the floor warm up to 82F at 6:00 AM in the morning, set the WAKE period to these values.
- To save energy and allow the floor to cool to 74F after leaving at 8:00 AM, set the LEAVE period to these values.
- To have the floor warm again to 82F when returning home at 5:00 PM, set the RETURN period to these values.
- Finally, to save energy overnight and cool the floor to 74F after 10:00 PM, set the SLEEP period accordingly.

NOTE: With the SmartStart feature turned on (see SmartStart below), the thermostat will learn how long it takes the floor to reach 82F and begin warming up a little early, reaching 82F by the WAKE time 6:00 AM and again at the RETURN time 5:00 PM.

Modifying the schedule

To modify the schedule, select the period desired and press **EDIT**.

Press **▲** or **▼** to adjust the time.

Press **OK** to save.

Press **▲** or **▼** to adjust the temperature.

Press **OK** to save.

Select another schedule to be edited, or press **OK** to return to the home screen.

NOTE: To clear a period, useful if you want to only raise and lower the floor temperature once in a day, select **CLEAR**. The thermostat will skip over this period in the schedule. There must be two periods in the schedule.

Changing Settings

Date/Time

Press **SETUP**. Press **▼** to select “CLOCK” and press **OK**. Adjust the hour and press **OK**. Adjust the minutes and press **OK**. Adjust the year, month, and day and press **OK** to save and return to the home screen.

Clock and Temperature Format

Press **SETUP**. Select “°F/°C” by pressing **OK**. The display will show the current time and temperature formats. Select either °F / 12-hour clock or °C / 24-hour clock. Press **OK** to save and return to the home screen.

Floor Limit

The thermostat can be adjusted for the minimum and maximum allowable setpoint temperatures of the floor sensor. This is useful when the floor covering cannot exceed a certain temperature (84F 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 Sensor Regulation below) but it is still desired to maintain a minimum floor temperature regardless of the air temperature.

Press **SETUP**. Press **▼** to select “FLOOR LIMIT” and press **OK**. Adjust the Maximum and Minimum allowed floor temperature setpoints. Press **OK** to save and return to the home screen.

Sensor Regulation

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.

Press **SETUP**. Press **▼** to select “AIR/FLOOR” and press **OK**. Select the desired sensor mode and press **OK** to save and return to the home screen.

SmartStart

The thermostat is factory set with the “SmartStart” feature turned on. This allows it 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 82F (27.8C) and SmartStart may begin pre-heating at 5:30AM to reach 82F by 6:00AM.

If this feature is not desired, it may be turned off. Press **SETUP**. Press **▼** to select “SMARTSTART” and press **OK**. Select “ON” or “OFF” and press **OK** to save and return to the home screen.

Other Features

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.

Press **SETUP**. Press **▼** to select “USAGE” and press **OK**. The display shows the number of hours it was heating today. Pressing **▼ ▲** will show the number of hours it was heating the last 7 days and 30 days. To reset these counters to zero, press **CLEAR**. Press **OK** to return to the home screen.

Lockout

The thermostat has the ability to lock out adjustments. This may be useful in public locations.

To use this feature, press **▼** and **▲** at the same time and hold for 2 seconds. “LOCK” will show in the display. To cancel, press **▼** and **▲** 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 2 seconds. The display will show “CAL” and the current sensor temperature and the offset value. Adjust by pressing **▼** or **▲**. Press **OK** to save and return to the home screen.

Reset Factory Defaults

To reset all programming and settings to the factory defaults, press **SETUP**. Press **▼** to select “FACTORY RESET” and press **OK**. It will ask you confirm this by pressing **OK** again, or select **BACK** to cancel.

Troubleshooting

Problem	Solution
Thermostat works but no heat from the system.	1. Check wiring connections. 2. If GFCI is tripped, reset thermostat with on/off switch. 3. Check resistances on floor heating system. See manual for system.
No display	1. Check wiring connections. 2. Check circuit breaker or other protection “upstream” of thermostat.
GFCI is tripped	1. Check wiring connections. 2. Reset thermostat by switching on/off. 3. Check resistances on floor heating system. See manual for system.
Heating occurs at the wrong times	1. Check that the current time and schedule times are properly set to AM or PM. 2. On uninsulated concrete SmartStart may start heating very early. You may turn this feature off if not desired.
Err1:Wrong floor sensor	Floor sensor not correct type or out of range. Check floor sensor resistance.
Err2:Floor sensor shorted	Floor sensor short-circuited. Turn off power at breaker. Make sure wires are not crossed at the terminals. Or replace sensor. Or Reset Factory Defaults.
Err3:Floor sensor missing	Floor sensor not attached and thermostat is in floor sense mode. Turn off power at breaker and attach sensor. Or Reset Factory Defaults.
Err4/Err5:Internal sensor fail	Internal air sensor is faulty. Replace thermostat or operate in floor sense mode.
Err6:Internal temp limit	Internal temperature overlimit. Make sure sunlight is not directed at the thermostat or other heat sources in proximity. Make sure load does not exceed 15 amps. Otherwise, turn off power at breaker and contact factory.
Err7:End-of-life	“End-of-life” indication. GFCI will no longer function correctly or safely. Reset the circuit breaker or replace thermostat.

Specifications

Power Supply	120/240 VAC, 50/60 Hz
Maximum Load	15 amps, resistive
Maximum Power	1800 watts at 120 VAC 3600 watts at 240 VAC
GFCI	Class A (5 milliamp 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
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.

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