Warm Cozy Floors

SetPoint 511s and 512 Controllers
Installation and Operation Manual

SetPoint 512

SetPoint 511s

RADIANT FLOORS
COMFORT HEATING

RADIANT FLOORS
COMFORT HEATING

Setpoint 511s and 512 Controllers
Installation and Operation Manual
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Life, Safety, Comfort Systems

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Introduction

The SetPoint 511s and 512 Controllers are microprocessor-based controls that sense the air temperature in a specific area and increase the comfort level of that area as well as increase the energy efficiency of the heating or cooling system.
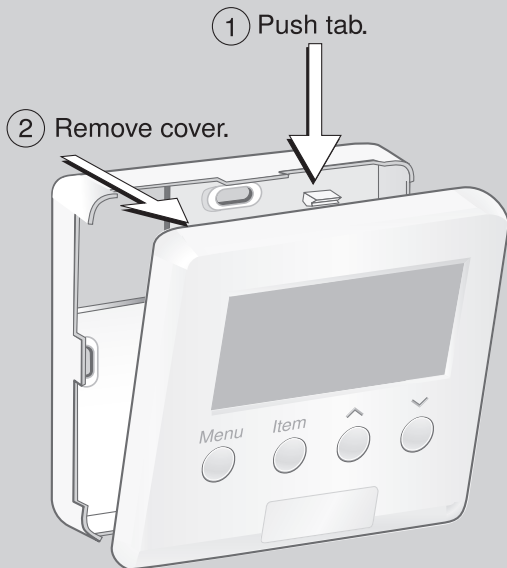
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① Push tab.

② Remove cover.

Figure 1: Removing the Front Cover

#6 1" screws

Figure 2: Mounting the Base

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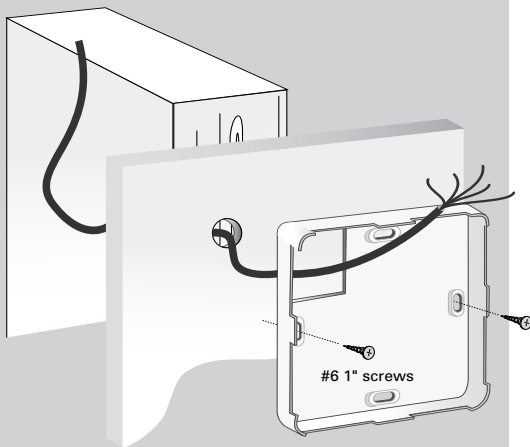
Installation
Getting Ready
Check the contents of this package. If any contents listed below are missing or damaged, please contact your Uponor Wirsbo sales representative or distributor for assistance.

- SetPoint 511s (part number A3041511) includes one programmable setpoint controller, one floor sensor (part number A3040079), an Installation and Operation Manual and a User Manual.

- SetPoint 512 (part number A3040512) includes one programmable setpoint controller, an Installation and Operation Manual and a User Manual.

Removing the Front Cover
1. Place a screwdriver or similar object into the small slot located in the top of the controller.

2. Push the screwdriver against the plastic tab and pull the top of the front cover so that it pivots around the bottom edge of the base. (See **Figure 1**.)

Mounting the Base
1. Install the controller on an interior wall of the desired zone approximately 5 feet (1.5m) above the floor.

   Note: Do not mount the controller in a location that may be affected by localized heat sources or cold drafts.

2. If necessary, install a draft barrier behind the controller to prevent air from blowing through the wiring hole and affecting the controller's built-in sensor.

3. Mount the base directly to the wall using two #6 1-inch screws. (See **Figure 2**.)

4. Insert the screws through the mounting holes, and fasten the base securely to the wall. If possible, at least one of the screws should enter a wall stud or similar surface.

5. If the controller is mounted to a 2x4 electrical box, order a Cover Plate for the 500 Series Controllers (part number A3040007). This plate mounts to the electrical box and the controller mounts to the plate. Ensure that the electrical box does not provide cold air to the controller.

Note: If the controllers are used for remote sensing (i.e., the built-in air sensor is disabled and an indoor sensor is used), mount the controller in the desired location.

Rough-in Wiring

Note: 18 AWG or similar wire is recommended for all 24VAC wiring.

1. Strip all wires to ¼" (6mm) to ensure proper connection to the control.

2. Run wires from the 24VAC power to the controller. Use a clean power source to ensure proper operation.

3. If using an optional sensor, install the sensor according to the appropriate installation sheet and run two wires from the sensor to the controller.

4. Run wires from the heating and cooling device to the controller.

Wiring the Controller

Refer to the wiring examples on **pages 4** and **5** to properly wire the controller.

1. Connect the 24VAC power to the R and C terminals on the controller. This connection provides power to the microprocessor and display of the controller.

2. When wiring an optional sensor, connect the two wires from the sensor to the Com and S1 terminals.

Note: The Heat terminals are isolated outputs. There is no power available on these terminals from the controller. Use these terminals as a switch for a 24VAC circuit. This circuit can operate a low-current, 24VAC device directly or an external relay to enable a line voltage or high-current device.

Note: The Heat 2/Cool terminals (SetPoint 512 only) are isolated outputs. No power is available on these terminals from the controller. This circuit can operate a low-current, 24VAC device directly or an external relay to enable a line voltage or high-current device.

Installing the Front Cover

1. Align the hinges on the bottom of the front cover with the bottom of the controller mounting base.

2. Pivot the front cover around the bottom hinges and push the top against the mounting base until it snaps firmly in place. (See **Figure 3**.)
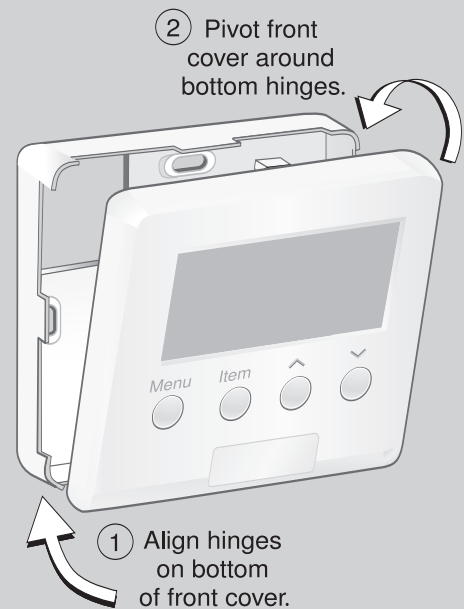
Figure 3: Installing the Front Cover

2 Pivot front cover around bottom hinges.

1 Align hinges on bottom of front cover.

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Wiring Examples for the SetPoint 511s and SetPoint 512

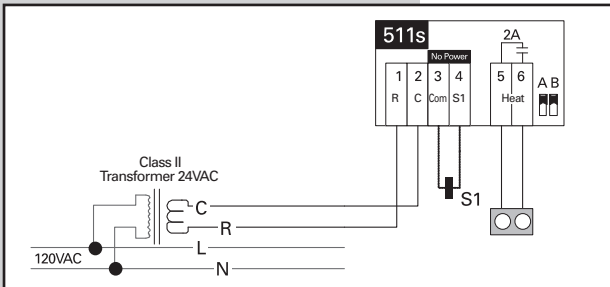Refer to the figures below to wire 24VAC power and the optional sensors.
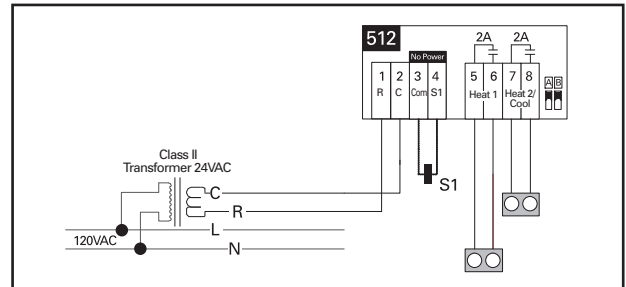

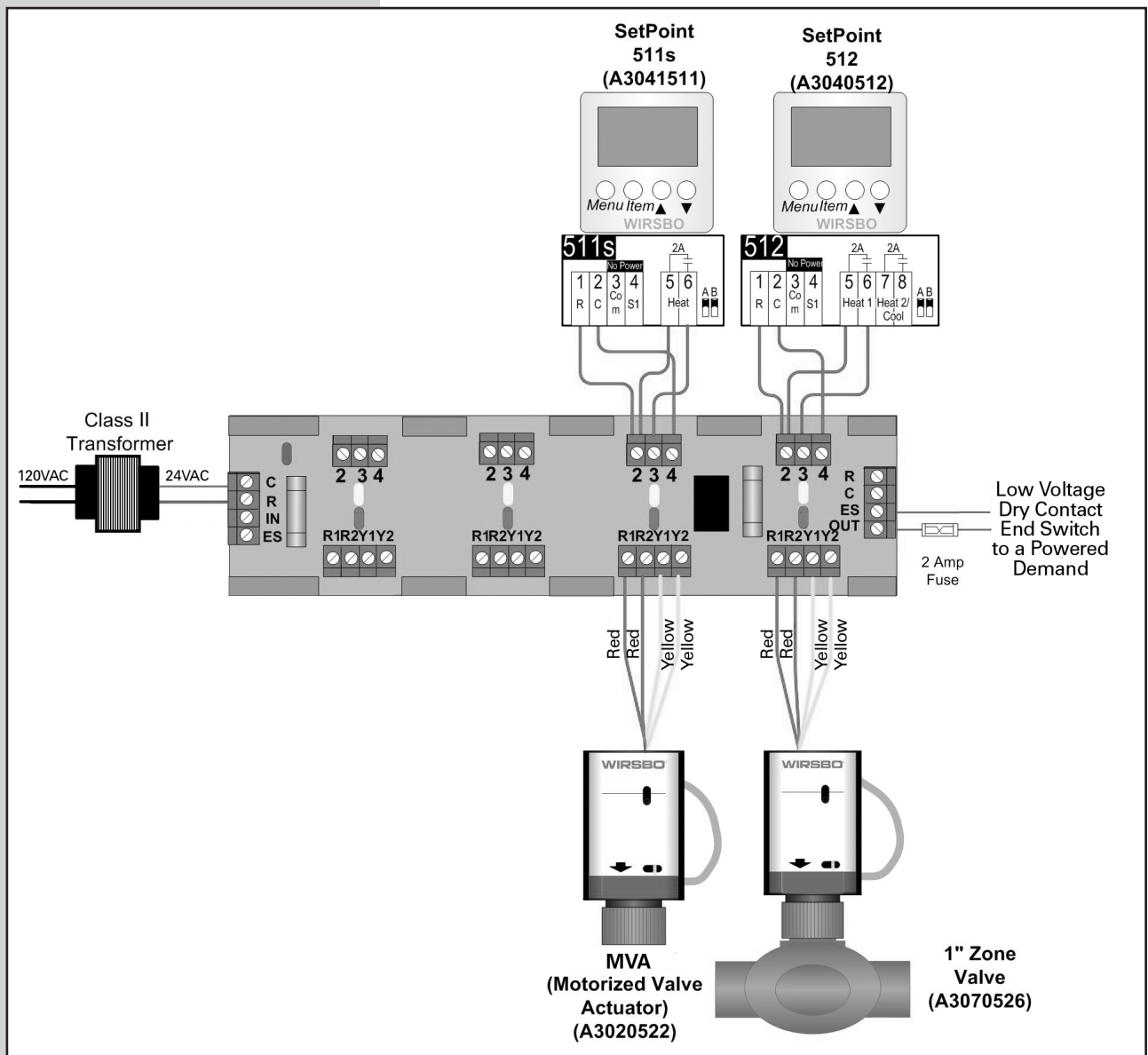**Figure 4:** Wiring the SetPoint 511s

Figure 5: Wiring the SetPoint 512

Figure 6: Wiring the Zone Control Module (ZCM)
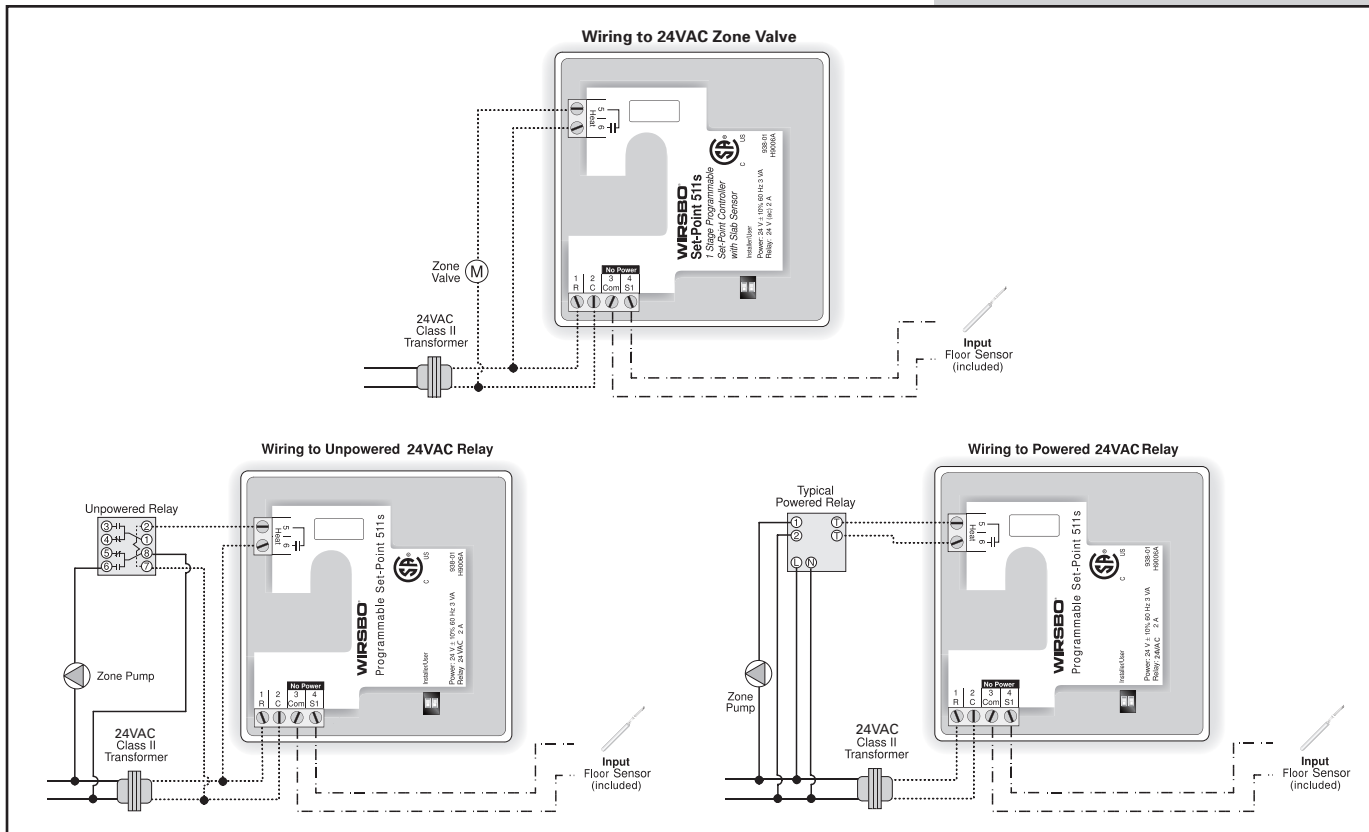
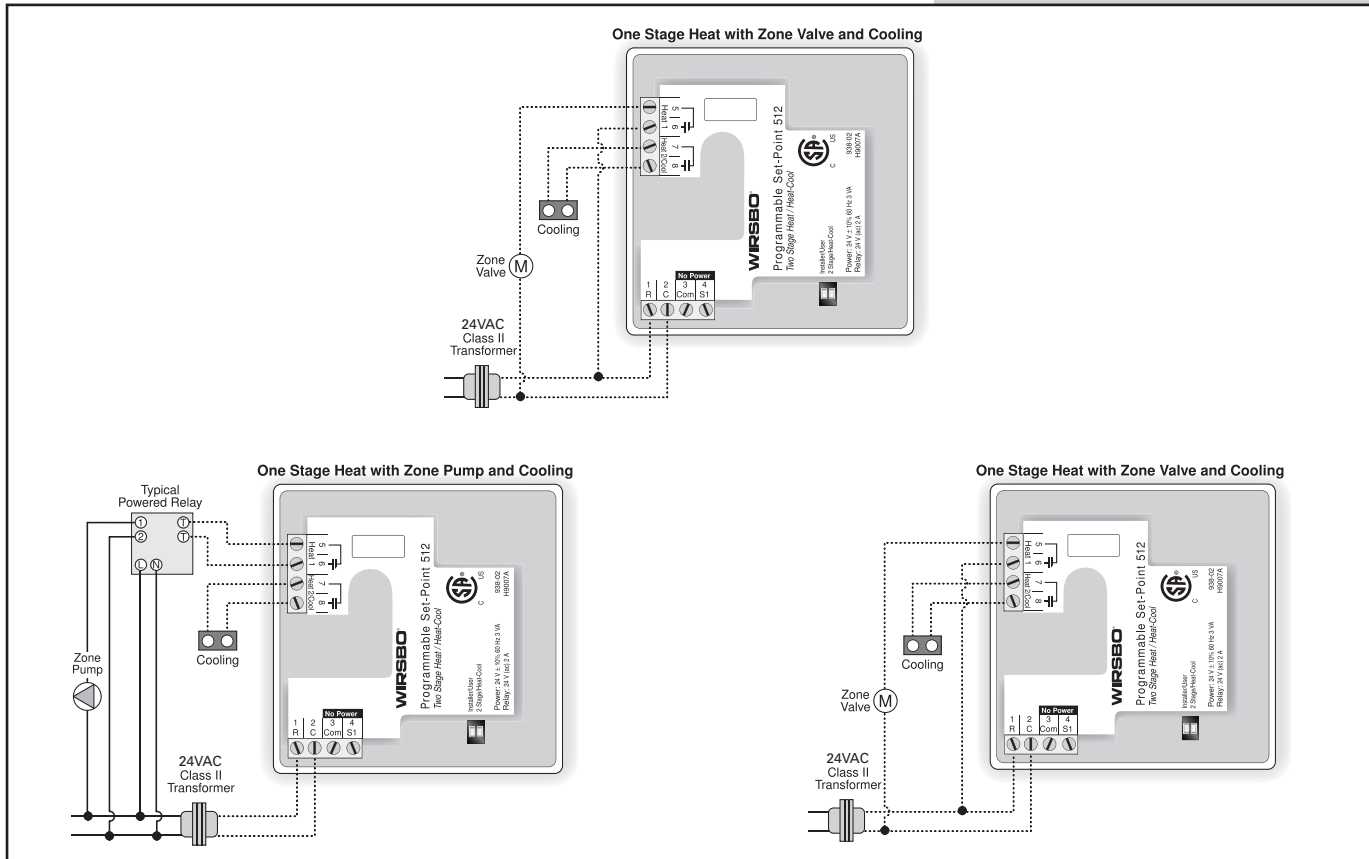**Figure 7: Wiring the 511s**

Figure 8: Wiring the 512

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Display and Keypad Operation

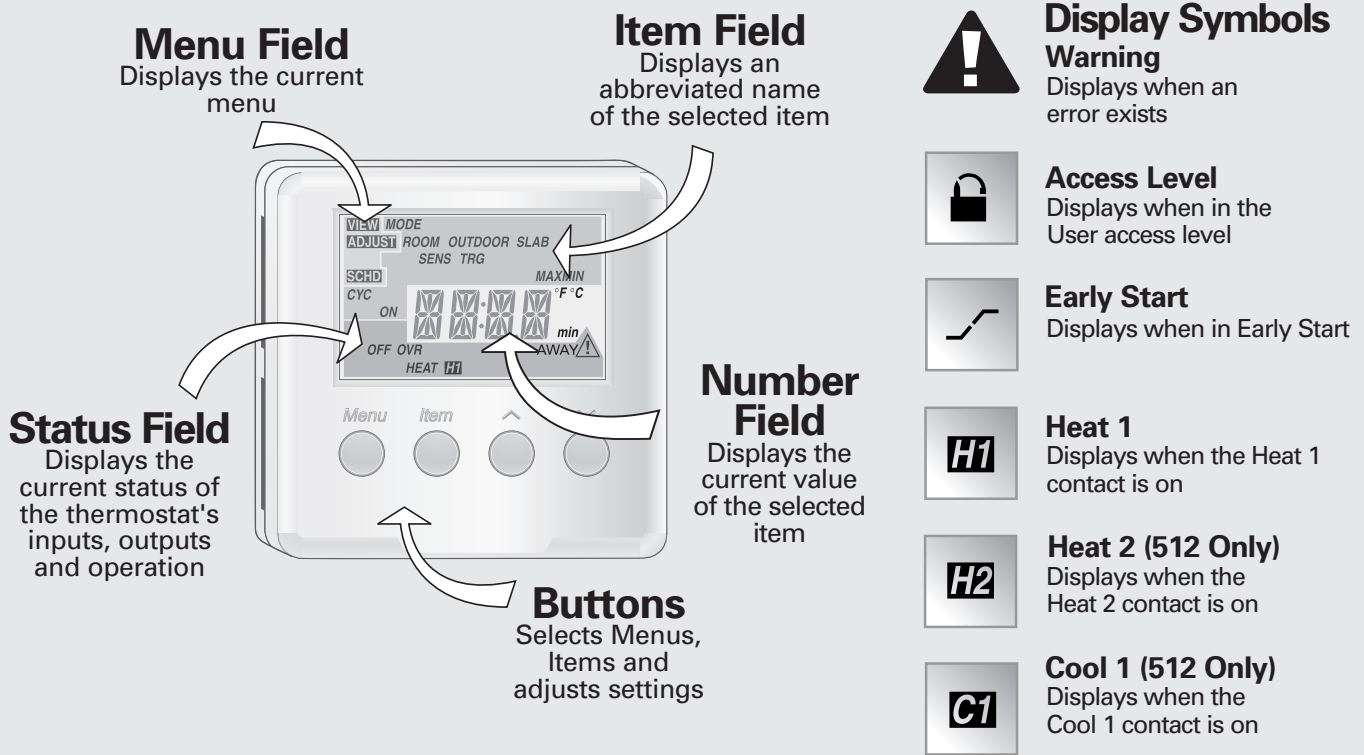The SetPoint 511s and 512 Controllers feature four fields: Menu, Item, Number and Status. (See **Figure 9**.)

Menu Field
Displays the current menu

Item Field
Displays an abbreviated name of the selected item

Display Symbols

Warning
Displays when an error exists

Access Level
Displays when in the User access level

Early Start
Displays when in Early Start

Status Field
Displays the current status of the thermostat's inputs, outputs and operation

Number Field
Displays the current value of the selected item

Buttons
Selects Menus, Items and adjusts settings

Heat 1
Displays when the Heat 1 contact is on

Heat 2 (512 Only)
Displays when the Heat 2 contact is on

Cool 1 (512 Only)
Displays when the Cool 1 contact is on

Figure 9: SetPoint Controller Fields and Display

Cycles per Hour

The SetPoint 511s and 512 controllers operate on cycles per hour. The number of cycles per hour is adjustable through the Heat Cycle and Cool Cycle (SetPoint 512 only) settings in the Adjust menu. During each cycle that heating or cooling is required, the controller turns on the Heat or Cool relays for a calculated amount of time. This amount of time is called the on time. The on time is calculated based on the requirements of the zone. If the zone requires more heating or cooling, the appropriate on time is increased. If the zone requires less heating or cooling, the appropriate on time is reduced. (See **Figure 10**.)

The controllers ensure the relays remain on or off for a minimum amount of time to prevent short cycling. For the SetPoint 512, the minimum cooling on-and-off time settings are adjusted in the Adjust Menu to prevent short cycling of the Cool relay.

An Auto Cycle setting is available for both the heating and cooling cycles. This setting determines the optimum number of cycles per hour to balance temperature swings and equipment cycles.
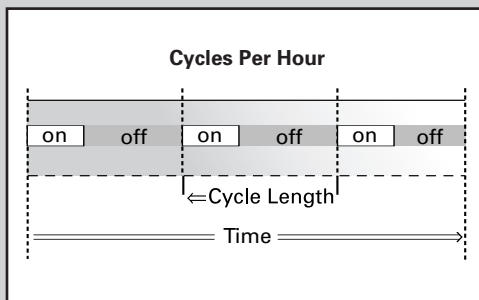
Cycles Per Hour

on | off | on | off | on | off

⇐Cycle Length

Time

Figure 10: Cycles per Hour

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Installation

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Installation

Early Start

The Early Start function for heating ensures that the zone is up to the proper temperature at the beginning of each period. The controller learns the recovery rate over multiple setback events in order to determine the proper lead time for the zone. If an air sensor and a slab or floor sensor are used, the lead time is the greater of the air, slab or floor sensor's requirements.

The Early Start function for cooling allows the cooling system to turn on 30 minutes prior to the beginning of a period that requires cooling. (See **Figure 11**.)

Note: The Early Start feature occurs when the schedule changes from a low temperature to a higher temperature.

Optional Sensors

Each controller has a single built-in sensor to measure air temperature. In addition to this built-in sensor, the controllers feature terminals to connect one additional sensor (e.g., indoor sensor, outdoor sensor, slab or floor sensor or sensor placed in a remote location).

Indoor Sensor

An indoor sensor measures the air temperature in the zone that the SetPoint is controlling. The temperature measured by the outdoor sensor is used in the on-time calculations for the relay in the controller. Select this setting on the Adjust menu. If the built-in sensor is on and the auxiliary sensor is set to Indoor, the temperatures of the sensors are averaged and used to calculate the on time of the relay.

Outdoor Sensor

An outdoor sensor measures the temperature of the air outside. The temperature measured by the outdoor sensor does not affect the on time of the relay and is only used for display purposes.

Slab or Floor Sensor

A slab or floor sensor measures the slab or floor temperature in the zone that the controller is controlling. The temperature the slab or floor sensor reads is used in the on-time calculations for the Heat relay and allows the controller to operate the slab between the minimum and maximum slab settings.

Access Levels

The SetPoint controllers feature two access levels — User and Installer — which restrict the number of items available in the display menus. Change the access level via the DIP switch located on the circuit board inside the controller. (See **Figure 12**.)

The Installer access level allows the installer to adjust all the settings in the controller including those required to match the controller to the mechanical system and devices. The User access level allows the end user to adjust the time, temperatures and schedules.

Note: The SetPoint 512 features an additional DIP switch for selecting between the two-stage heating or cooling modes.
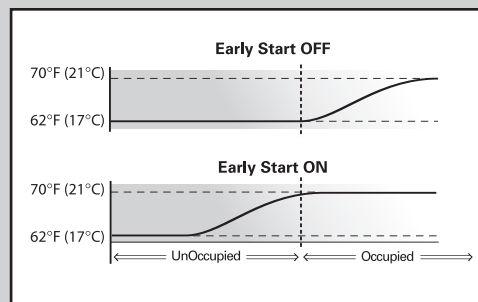

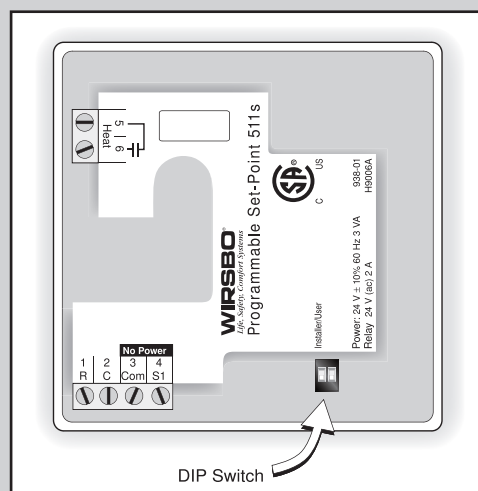**Figure 11: Early Start Function**

Figure 12: DIP Switch Location

Sequence of Operation for the SetPoint 511s
Air Sensor Only Operation
When operating with only an air sensor, the on time for the Heat relay is calculated to satisfy the requirements of the air sensor.

Slab or Floor Sensor Only Operation
When operating with only a slab or floor sensor, the on time for the Heat relay is calculated to satisfy the requirements of the slab or floor sensor. The controller operates to maintain the slab at the minimum slab temperature setting.

Note: Using only a slab or floor sensor may cause overheating or underheating of the space.

Air and Slab or Floor Sensor Operation
When operating with both air and slab or floor sensors, the controller calculates an on time for the Heat relay to satisfy the slab or floor sensor's requirements and an on time to satisfy the air sensor's requirements. The Heat relay operates for the longer of these two on times.

During light heating loads, overheating can occur due to the minimum slab or floor temperature requirements.

During heavy heating loads, the maximum slab or floor temperature setting limits the on time of the Heat relay. In this situation, underheating can occur.

Mode
Heat
In the heat mode, the Heat relay satisfies the temperature requirement of the zone.

Off
The Heat relay does not operate in the Off mode.

Note: If an air, slab or floor sensor is active in the Off mode, a freeze-protection function enables, allowing the Heat relay to operate and keep the zone above 35°F (2°C).

Sequence of Operation for the SetPoint 512 (Two-stage Heat) Controller
Select the two-stage mode of operation by using the DIP switch located on the circuit board inside the SetPoint 512.

In cases where a one-stage heating system cannot provide sufficient heat under all conditions, a second stage of heat is added to supplement the first stage. Therefore, a two-stage system has one unit controlling two output relays.

Two-stage Logic
The temperature in a two-stage zone is controlled by varying the on time of the Heat 1 and Heat 2 relays during a cycle. Under light loads, the Heat 1 relay is cycled on and off. As the load increases, the Heat 1 relay on time increases until it reaches the maximum of the cycle length. If using a slab or floor sensor, the Heat 1 relay on time increases until the temperature reaches the slab or floor maximum setting. The Heat 2 relay is then cycled, and its on time increases as the load increases. When the heating load decreases, the on time of the Heat 2 relay reduces until the Heat 2 relay turns off completely. The controller then reduces the on time of the Heat 1 relay. (See **Figure 13**.)

Note: When using a slab or floor sensor, the Heat 2 relay may be on while the Heat 1 relay is off if the slab or floor temperature has reached the slab maximum setting.
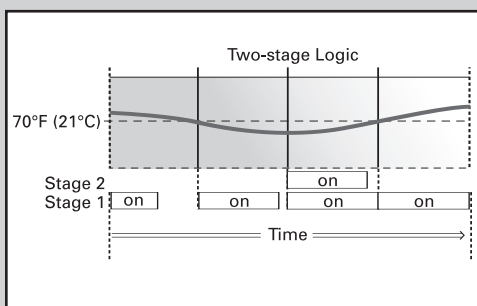

Figure 13: Two-stage Logic

Air Sensor Only Operation
When operating with only an air sensor, the on times for the Heat 1 and Heat 2 relays are calculated to satisfy the requirements of the air sensor.

Slab or Floor Sensor Only Operation
When operating with only a slab or floor sensor, the on times for the Heat 1 and Heat 2 relays are calculated to satisfy the requirements of the slab or floor sensor. The SetPoint 512 operates to maintain the slab or floor at the minimum slab temperature setting.

Note: Operating with only a slab or floor sensor can lead to either overheating or underheating of the space.

Air and Slab or Floor Sensor Operation
When operating the air and slab or floor sensors concurrently, the controller calculates an on time for the Heat 1 relay to satisfy the slab or floor sensor's requirements and on times for the Heat 1 and Heat 2 relays to satisfy the air sensor's requirements. The controller operates the Heat 1 relay for the longer of these two on times.

While the minimum slab or floor temperature is satisfied, the on times of the Heat 1 and Heat 2 relays are calculated to satisfy the air temperature requirements.

During heavy loads, the maximum slab or floor temperature setting limits the on time of the Heat 1 relay. In this situation, the Heat 2 relay may be on while the Heat 1 relay is off.

Note: During light heating loads, overheating can occur due to the minimum slab or floor temperature requirements.

Mode
Heat
In the Heat mode, the Heat 1 and Heat 2 relays satisfy the temperature requirement of the zone.

Off
The Heat 1 and Heat 2 relays do not operate in the Off mode.

Note: If an air, slab or floor sensor is active in the Off mode, a freeze-protection function enables, allowing the relays to operate and keep the zone above 35°F (2°C).

Sequence of Operation for the SetPoint 512 (Heat and Cool) Controller
Use the DIP switch located on the circuit board inside the thermostat to select the Heat and Cool mode of operation.

Air Sensor Only Operation
When operating with only an air sensor, the on times of the Heat 1 relay and the Cool relay are calculated to satisfy the requirements of the air sensor.

Slab or Floor Sensor Only Operation
When operating with only a slab or floor sensor, the on time of the Heat 1 relay is calculated to satisfy the requirements of the slab or floor sensor. The SetPoint 512 operates to maintain the slab or floor at the minimum slab temperature setting.

Note: When operating with only a slab or floor sensor, the Cool relay does not operate. Operating with only a slab or floor sensor can lead to either overheating or underheating of the space.

Air and Slab or Floor Sensor Operation
When operating the air and slab or floor sensors concurrently, the controller calculates an on time for the Heat 1 relay to satisfy the slab or floor sensor's requirements and an on time to satisfy the air sensor's requirements. The Heat 1 relay operates for the longer of these two on times. The controller also calculates an on time for the Cool relay to satisfy the air sensor's requirements. In this situation, heating and cooling can happen at the same time to prevent the space from overheating. This is most likely to occur when the slab is operating at the slab minimum temperature.

While the minimum slab temperature is satisfied, the Heat 1 relay on time is calculated to satisfy the air temperature setting. However, the maximum slab temperature setting limits the Heat 1 relay on time when the slab temperature becomes too warm. In this situation, underheating can occur in the space.

Mode
Auto
In the Auto mode, the controller automatically switches between heating and cooling the space. However, the heating operation has priority over the cooling operation. In this mode, the minimum slab or floor temperature is maintained even when the controller is cooling the air.

Heat
In the Heat mode, the Heat 1 relay operates to satisfy the heating temperature requirement of the zone, and disable the cooling mode.

Cool
In the Cool mode, the Cool relay operates to satisfy the cooling temperature requirement of the zone, and disable the heating mode. When using a slab or floor sensor, the slab minimum temperature is ignored.

Off
In the Off mode, the Heat 1 and Cool relays do not operate.

Note: If an air, slab or floor sensor is active in the Off mode, a freeze-protection function enables, allowing the Heat 1 relay to operate and keep the zone above 35°F (2°C).

Heating and Cooling Interlock
Time Interlock
The SetPoint 512 features a Cooling Interlock setting to prevent frequent changes between heating and cooling. Once the Heat 1 relay is off for a minimum of one heating cycle or the length of the Cooling Interlock, whichever is longer, cooling is permitted.

Temperature Interlock
In the Auto mode, the cooling temperature is limited to 3°F (1.5°C) above the heating temperature. If the cooling temperature is set below the heating temperature, the controller automatically adjusts the cooling setpoint.

When operating in the Cool mode, there is no interlock between the heating and cooling temperature.

Navigating the Menus

View Menu

ROOM TARGET
This displays the current desired air temperature for the space (one active air sensor required). This is only available when in the Installer access level. (See **Figure 14**.)
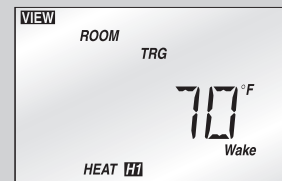

Figure 14

ROOM
This displays the current air temperature for the space that is the average of all active air sensors (one active air sensor required). (See **Figure 15**.)
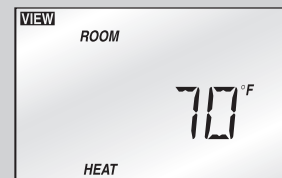

Figure 15

OUTDOOR
This displays the current temperature at the outdoor sensor. (See **Figure 16**.)
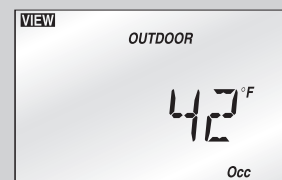
Note: SENS must be set to OUT.

Figure 16

SLAB
This displays the current slab or floor temperature (one active air sensor required). If two slab or floor sensors are present, this is the average temperature. MIN is displayed when the slab or floor minimum temperature is calling for heat. The slab or floor sensor may call for heat even though the room setpoint temperature is satisfied. (See **Figure 17**.)
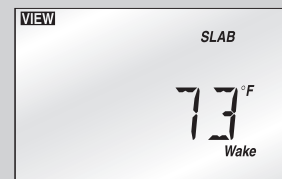

Figure 17

Adjust Menu

MODE
This displays the current mode of operation of the thermostat. (See **Figure 18**.)
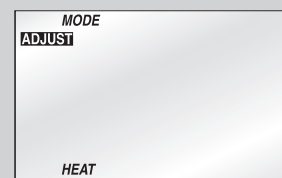
**OFF, HEAT (511s) or
OFF, COOL, AUTO, HEAT (512)**

Figure 18

ROOM HEAT
This displays the desired temperature for heating (must set active air sensor to Heat or Auto). (See **Figure 19**.)
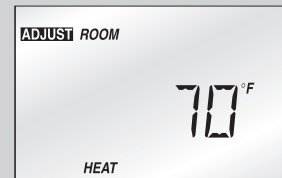
35 to 100°F (2 to 38°C)

Figure 19

ROOM COOL (512 Only)
This displays the desired temperature for cooling (must set active air sensor to Cool or Auto). (See **Figure 20**.)

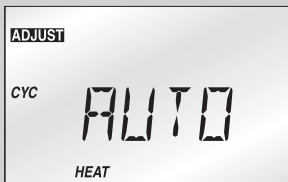**Figure 20**

Figure 21

Figure 22

Figure 23

Figure 24

Figure 25

Figure 26

Figure 27

Programming

SLAB MIN
This displays the minimum slab or floor temperature (one active air sensor required). (See **Figure 21**.)

OFF, 34 to 122°F (OFF, 1.0 to 50.0°C)

SLAB MAX
This displays the maximum slab or floor temperature (one active air sensor required). This is only available when in the Installer access level. (See **Figure 22**.)

34 to 122°F, OFF (1.0 to 50.0°C, OFF)

SENS
This selects the type of optional sensor present (only available in the Installer access level). (See **Figure 23**.)

OFF, Indr, SLAB, OUT

ROOM SENS
This enables or disables the built-in sensor (only available in the Installer access level). (See **Figure 24**.)

OFF, ON

CYC HEAT
This displays the number of cycles per hour for heating (only available in the Installer access level). (See **Figure 25**.)

AUTO, 2 to 12

CYC COOL (512 Only)
This displays the number of cycles per hour for cooling (only available in the Installer access level). (See **Figure 26**.)

AUTO, 2 to 12

INTL COOL (512 Only)
This selects the time delay between the heating and cooling relays (only available in the Installer access level). (See **Figure 27**.)

10 to 180 minutes

MIN ON COOL (512 Only)
This sets the minimum on time of the cooling contact to prevent short cycling (only available in the Installer access level). (See **Figure 28**.)

0:30 to 5:00 minutes

Figure 28

MIN OFF COOL (512 Only)
This sets the minimum off time of the cooling contact to prevent short cycling (only available in the Installer access level). (See **Figure 29**.)

0:30 to 10:00 minutes

Figure 29

EARLY START
This enables or disables the Early Start feature (only available in the Installer access level). (See **Figure 30**.)

Figure 30

LITE
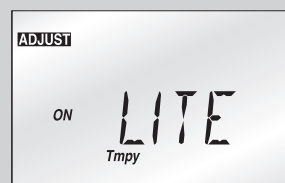This sets the LCD backlighting. (See **Figure 31**.)

ON, Tmpy (temporary) ON, OFF

Figure 31

UNITS
This displays the units of temperature used. (See **Figure 32**.)

°F, °C

Figure 32

ROOM HEAT WAKE
This displays the desired heating temperature when waking up. Set the active air sensor to Heat or Auto. (See **Figure 33**.)

35 to 100°F (2 to 38°C, OFF)

Figure 33

ROOM HEAT UnOcc
This displays the desired heating temperature when the space is unoccupied. Set the active air sensor to Heat or Auto. (See **Figure 34**.)

35 to 100°F (2 to 38°C, OFF)

Figure 34

Programming

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Figure 35

Figure 36

Figure 37
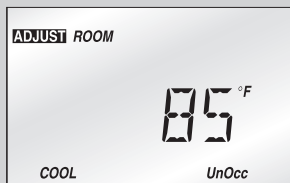
Figure 38

Figure 39

Figure 40

Figure 41

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ROOM HEAT Occ
This displays the desired heating temperature when the space is occupied. Set the active air sensor to Heat or Auto.
(See **Figure 35**.)
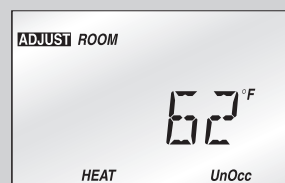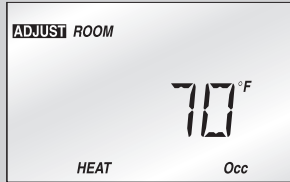
35 to 100°F (2 to 38°C, OFF)

ROOM HEAT Sleep
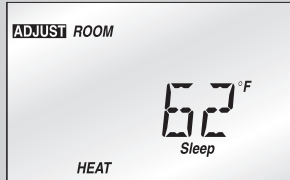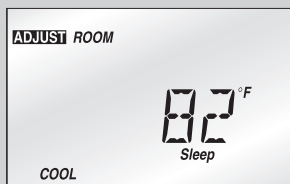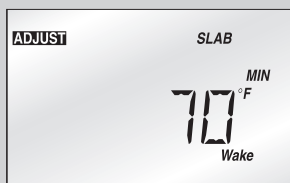This displays the desired heating temperature when sleeping.
Set the active air sensor to Heat or Auto. (See **Figure 36**.)

35 to 100°F (2 to 38°C, OFF)

ROOM COOL Wake (512 Only)
This displays the desired cooling temperature when waking up.
Set the active air sensor to Cool or Auto. (See **Figure 37**.)

35 to 100°F (2 to 38°C, OFF)

ROOM COOL UnOcc (512 Only)
This displays the desired cooling temperature when the space is unoccupied. Set the active air sensor to Cool or Auto.
(See **Figure 38**.)

35 to 100°F (2 to 38°C, OFF)

ROOM COOL Occ (512 Only)
This displays the desired cooling temperature when the space is occupied. Set the active air sensor to Cool or Auto.
(See **Figure 39**.)

35 to 100°F (2 to 38°C, OFF)

ROOM COOL Sleep (512 Only)
This displays the desired cooling temperature when sleeping.
Set the active air sensor to Heat or Auto. (See **Figure 40**.)

35 to 100°F (2 to 38°C, OFF)

SLAB MIN Wake
This displays the minimum slab or floor temperature when waking up (active slab or floor sensor required). (See **Figure 41**.)

OFF, 34 to 122°F (OFF, 1 to 50°C, OFF)

SLAB MIN UnOcc
This displays the minimum slab or floor temperature when the space is unoccupied (active slab or floor sensor required). (See **Figure 42**.)

OFF, 34 to 122°F (OFF, 1 to 50°C, OFF)

Figure 42

SLAB MIN Occ
This displays the minimum slab or floor temperature when the space is occupied (active slab or floor sensor required). (See **Figure 43**.)

OFF, 34 to 122°F (OFF, 1 to 50°C, OFF)

Figure 43

SLAB MIN Sleep
This displays the minimum slab or floor temperature when sleeping (active slab or floor sensor required). (See **Figure 44**.)

OFF, 34 to 122°F (OFF, 1 to 50°C, OFF)

Figure 44

Programming

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Figure 45

Figure 46
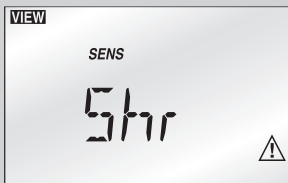

Figure 47

Figure 48

Figure 49

Figure 50

Error Messages

E01
The controller was unable to read a piece of information stored in its memory and was required to load the factory settings. The controller will stop operation until all settings are checked. To clear this error, select the Installer access level and check all the settings in the Adjust menu. (See **Figure 45**.)

E02
There are no active sensors selected on the controller. Either turn on the internal sensor or set the auxiliary sensor to INDR or SLAB. After correcting the fault, press any button to clear the error message. (See **Figure 46**.)

ROOM Shr
The controller's internal air sensor has a short circuit. This error cannot be repaired in the field. Replace or return the controller for repair. (See **Figure 47**.)

ROOM OPN
The controller's internal air sensor has an open circuit. This cannot be repaired in the field. Either turn off the internal sensor and set an auxiliary sensor to INDR, or replace the controller and return the faulty controller for repair. After correcting the fault, press any button to clear the error message.
(See **Figure 48**.)

SENS Shr
The optional sensor has a short circuit. Locate and repair the problem as described in the appropriate sensor brochure. After correcting the fault, press any button to clear the error message. (See **Figure 49**.)

SENS OPN
The optional sensor has an open circuit. Locate and repair the problem as described in the appropriate sensor brochure. After correcting the fault, press any button to clear the error message. (See **Figure 50**.)

Technical Data

SetPoint 511s

Literature	SetPoint 511s and 512 Controllers Installation and Operation Manual
Control	Microprocessor PI control; This is not a safety (limit) control.
Packaged Weight	0.54 lb. (245 g), Enclosure J, white PVC plastic
Dimensions	2⅞" H x 2⅞" W x 13⁄16" D (73 x 73 x 21mm)
Approvals	CSA C US, meets ICES and FCC regulations for EMI/RFI
Ambient Conditions	Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing
Adjustment Range for Slab or Floor Setting	34 to 122°F (1 to 50°C)
Power Supply	24VAC ±10% 60 Hz 3 VA
Relay	24VAC 2, A, Latching
Sensors	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
Included	Floor Sensor (A3040079)
Optional	Outdoor Sensor (A3060070), Universal Sensor (A3060071) and Epoxy-coated Slab Sensor (A3060072)

SetPoint 512

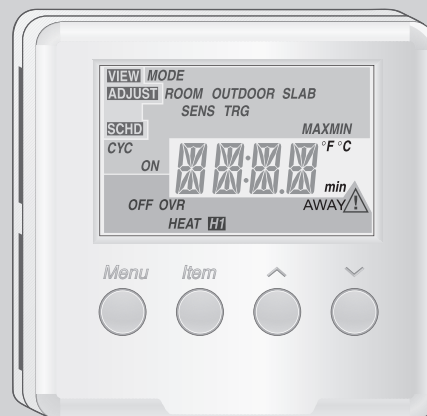|	
Literature	SetPoint 511s and 512 Controllers Installation and Operation Manual
Control	Microprocessor PI control; This is not a safety (limit) control.
Packaged Weight	0.46 lb. (210 g), Enclosure J, white PVC plastic
Dimensions	2⅞" H x 2⅞" W x 13⁄16" D (73 x 73 x 21mm)
Approvals	CSA C US, meets ICES and FCC regulations for EMI/RFI
Ambient Conditions	Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing
Adjustment Range for Slab or Floor Setting	34 to 122°F (1 to 50°C)
Power Supply	24VAC ±10% 60 Hz 3 VA
Relay	24VAC 2 A, Latching
Sensors	NTC thermistor, 10 kΩ@ 77°F (25°C ±0.2°C) ß=3892
Optional	Floor Sensor (A3040079), Outdoor Sensor (A3060070), Universal Sensor (A3060071) and Epoxy-coated Slab Sensor (A3060072)

RADIANT FLOORS
COMFORT HEATING

Figure 51: SetPoint 511s

Figure 52: SetPoint 512

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Technical Data

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