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**Display / Keypad Operation**

These controllers have four distinct fields. These fields are the Menu field, the Item field, the Number field and the Status field. The four buttons on the face of the controllers are used to navigate through the menus and items to view and / or adjust the desired settings.

**Menu Field**  
Displays the current menu

**Item Field**  
Displays an abbreviated name of the selected item

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

**Buttons**  
Selects Menus, Items and adjusts settings

**Display Symbols**

- Warning**  
Displays when an error exists.
- Access Level**  
Displays when in the user access level.
- Early Start**  
Displays when the controller is in early start.
- Heat One**  
Displays when the heat one contact is on.
- Heat Two**  
Displays when the heat two contact is on.
- Cool One**  
Displays when the cool one contact is on.

**Number Field**  
Displays the current value of the selected item

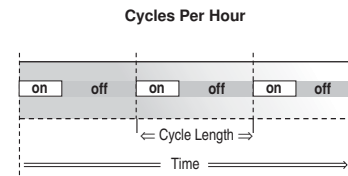
**General**

**CYCLES PER HOUR (HEAT CYCLE and COOL CYCLE)**

The operation of these controllers is based on cycles per hour. The number of cycles per hour is adjustable through the HEAT CYCLE and COOL CYCLE settings in the Adjust menu. During each cycle that heating or cooling is required, the controller turns on the Heat or Cool relay(s) for a calculated amount of time. This amount of time is 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 heat or cooling, the appropriate on time is reduced.

In order to prevent short cycling of the heating relay(s), the controller ensures that the relay(s) remains on or off for a minimum amount of time. In order to prevent short cycling of the Cool relay, the minimum cooling on time and minimum cooling off time settings are adjusted in the Adjust menu of the 512.

An Auto Cycle setting is available for both the heating cycle and the cooling cycle. This setting allows the controllers to determine the best number of cycles per hour that balances both temperature swings and equipment cycles.

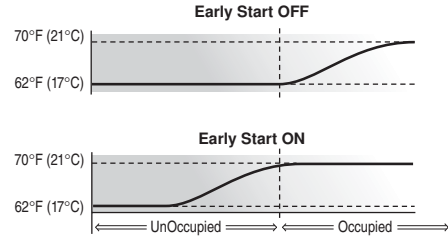


## EARLY START ( )

**Heating** - 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 both an air sensor and a floor sensor are used, the lead time is the greater of the air sensor's or the floor sensor's requirements.

**Cooling** - The early start function, when used with cooling, allows the cooling system to turn on 30 minutes prior to the beginning of a period that requires cooling.

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



## OPTIONAL SENSORS

The controllers have a single built-in sensor to measure air temperature. In addition to the built-in sensor, the 511s has terminals to connect a floor or remote sensor. Sensors connected to the 512 can be either indoor sensors, floor sensors, a remote sensor, or an outdoor sensor.

### Indoor Sensor

An indoor sensor is used to measure the air temperature in the zone that the controller is monitoring. The temperature being read by the indoor sensor is used in the calculations of the on times for the relay(s) by the controller. Either one or both of the optional sensor inputs can be configured for indoor sensors. This setting is made through the Adjust menu of the controller. If more than one sensor, either the built-in sensor or an optional sensor set as an indoor sensor, is being used to measure the zone temperature, the temperature of the active sensors is averaged and used to calculate the on time of the relay(s).

### Floor Sensor

A floor sensor is used to measure the floor temperature in the zone that the controller is monitoring. The temperature being read by the floor sensor is used in the calculations of the on time for the Heat relay and allows the controller to operate the floor between the floor minimum and floor maximum settings. If more than one floor sensor is used, the floor temperatures are averaged by the controller.

### Outdoor Sensor

A single outdoor sensor can be connected to the 512 controller. The temperature measured by an outdoor sensor does not affect the on time of the relays and is only used for display purposes.

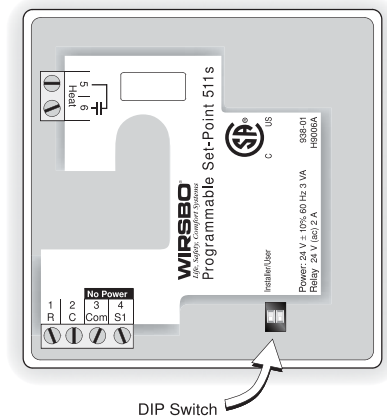
## ACCESS LEVELS

The Wirsbo Programmable Set Point controllers have two access levels. These access levels restrict the number of items available in the menus of the controllers. The two access levels are User and Installer. This selection is made using the DIP switch located on the circuit board inside the controllers.

The Installer access level allows the installer to adjust all of the settings in the controller including those required to match the controller to the mechanical system and the devices used.

The User access level allows the end user to adjust the time, temperatures and schedules used by the controller.

The 512 controller has an additional DIP switch for selecting between the 2-stage heating or cooling modes.



## Sequence of Operation

### TYPE 511S (One Stage Heat)

#### Air Sensor(s) 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.

### Floor Sensor Only Operation

When operating with only a floor sensor, the on time for the Heat relay is calculated to satisfy the requirements of the floor sensor. The 511s controller operates to maintain the floor at the minimum floor temperature setting.

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

### Air and Floor Sensor Operation

When operating with both air and floor sensors, the 511s controller calculates an on time for the Heat relay to satisfy the 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 floor temperature requirements.

During heavy heating loads, the maximum 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 is operated to satisfy the temperature requirement of the zone.

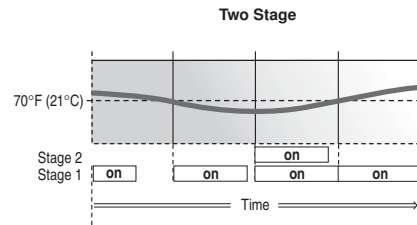
**Off** In the Off mode, the Heat relay is not operated.

**Note:** If an air or floor sensor is active in the Off mode, a freeze protection is enabled that allows the Heat relay to be operated to keep the zone above 35°F (2°C).

### TYPE 512 (Two Stage Heat)

The two stage mode of operation is selected using the DIP switch located on the circuit board inside the 512.

In cases where a one stage heating system can not provide sufficient heat under all conditions, a second stage of heat can be added to supplement the first stage. A two stage system therefore 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 is increased until it reaches the maximum of the cycle length or, if a floor sensor is used, the floor temperature reaches the floor maximum setting. The Heat 2 relay is then cycled and its on time is increased as the load increases. When the heating load decreases, the on time of the Heat 2 relay is reduced until the Heat 2 relay is turned off completely. The 512 controller then reduces the on time of the Heat 1 relay.

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

### Air Sensor(s) 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.

### Floor Sensor Only Operation

When operating with only a floor sensor, the on times for the Heat 1 and Heat 2 relays are calculated to satisfy the requirements of the floor sensor. The 512 controller operates to maintain the floor at the minimum floor temperature setting.

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

### Air and Floor Sensor Operation

When operating with both air and floor sensors, the 512 controller calculates an on time for the Heat 1 relay to satisfy the 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 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 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 floor temperature requirements.

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**Mode**

**Heat** In the heat mode, the Heat 1 and Heat 2 relays are operated to satisfy the temperature requirement of the zone.

**Off** In the Off mode, the Heat 1 and Heat 2 relays are not operated.

**Note:** If an air or floor sensor is active in the Off mode, a freeze protection is enabled that allows the relays to be operated to keep the zone above 35°F (2°C).

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**TYPE 512 (Heat / Cool)**

The Heat / Cool mode of operation is selected using the DIP switch located on the circuit board inside the thermostat.

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**Air Sensor(s) 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.

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**Floor Sensor Only Operation**

When operating with only a floor sensor, the on time of the Heat 1 relay is calculated to satisfy the requirements of the floor sensor. The 512 controller operates to maintain the floor at the minimum floor temperature setting.

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

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**Air and Floor Sensor Operation**

When operating with both air and floor sensors, the 512 controller calculates an on time for the Heat 1 relay to satisfy the 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 floor is operating at the floor minimum temperature.

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

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**Mode**

**Auto** In the Auto mode, the 512 controller automatically switches between heating and cooling the space. However, the heating operation has priority over the cooling operation. In this mode, the minimum floor temperature is maintained even when the controller is cooling the air.

**Heat** In the Heat mode, the Heat 1 relay is operated to satisfy the heating temperature requirement of the zone and cooling is disabled.

**Cool** In the Cool mode, the Cool relay is operated to satisfy the cooling temperature requirement of the zone and heating is disabled. If a floor sensor is used, the floor minimum is ignored.

**Off** In the Off mode, the Heat 1 and Cool relays are not operated.

**Note:** If an air or floor sensor is active in the Off mode, a freeze protection is enabled that allows the Heat 1 relay to be operated to keep the zone above 35°F (2°C).

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**Heating / Cooling Interlock****Time Interlock**

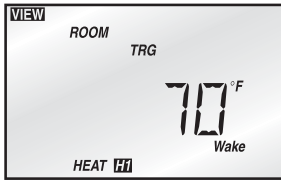
In order to prevent frequent changes between heating and cooling, the 512 controller has a Cooling Interlock setting. Once the Heat 1 relay has been off for a minimum of one heating cycle or the length of the Cooling Interlock, (whichever is longer) cooling is permitted.

**Temperature Interlock**

When 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.

## View Menu (1 of 1)



### Room Target

The current desired air temperature for the space. This item is only available in the Installer access level.

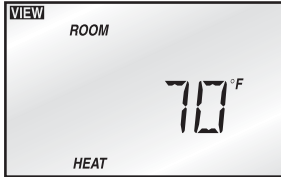
*(Must have an active air sensor.)*



### Floor

The current floor temperature.  
*(Must have an active floor sensor. If two floor sensors are present, this is the average temperature.)*

The MIN Setpoint is displayed when running on Min.



### Room

The current air temperature for the space.

*(Must have at least one active air sensor. This is the average of all active air sensors.)*

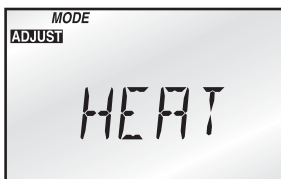


### Outdoor

The current temperature at the outdoor sensor .

*(Sens must be set to Out.)*

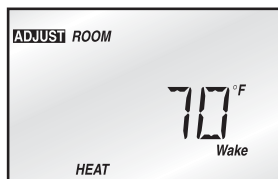
## Adjust Menu (1 of 3)



### Mode

Current mode of operation of the controller.

**OFF, HEAT or  
OFF, COOL, AUTO, HEAT**

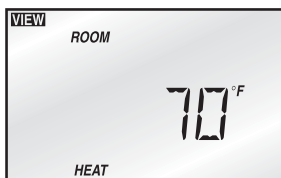


### Room Heat Wake

Desired temperature for heating during Wake.

*(Must have an active air sensor and be set to either Heat or Auto)*

**35 to 100°F (1.5 to 38.0°C)**

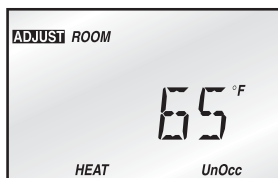


### Room Heat (No Schedule)

Desired temperature for heating.

*(Must have an active air sensor and be set to either Heat or Auto.)*

**35 to 100°F (1.5 to 38.0°C)**

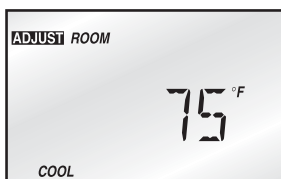


### Room Heat UnOcc

Desired temperature for heating during UnOccupied.

*(Must have an active air sensor and be set to either Heat or Auto)*

**35 to 100°F (1.5 to 38.0°C)**

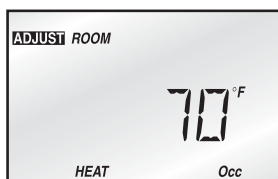


### Room Cool (No Schedule)

Desired temperature for cooling.

*(Must have an active air sensor and be set to either Cool or Auto.)*

**35 to 100°F (1.5 to 38.0°C)**



### Room Heat Occ

Desired temperature for heating during Occupied.

*(Must have an active air sensor and be set to either Heat or Auto)*

**35 to 100°F (1.5 to 38.0°C)**

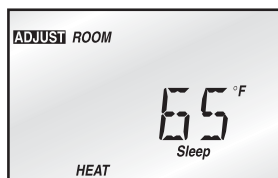


### Floor Minimum (No Schedule)

Minimum floor temperature.

*(Must have an active floor sensor.)*

**OFF, 34 to 122°F (OFF, 1.0 to 50.0°C)**



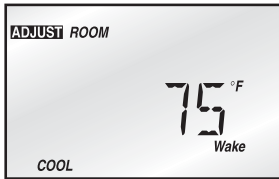
### Room Heat Sleep

Desired temperature for heating during Sleep.

*(Must have an active air sensor and be set to either Heat or Auto)*

**35 to 100°F (1.5 to 38.0°C)**

## Adjust Menu (2 of 3)



### Room Cool Wake

Desired temperature for cooling during Wake.

*(Must have an active air sensor and be set to either Cool or Auto)*

35 to 100°F (1.5 to 38.0°C)

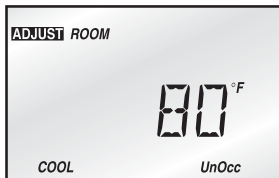


### Floor Minimum Sleep

Minimum floor temperature during Sleep.

*(Must have an active floor sensor.)*

OFF, 34 to 122°F (OFF, 1.0 to 50.0°C)



### Room Cool UnOcc

Desired temperature for cooling during UnOccupied.

*(Must have an active air sensor and be set to either Cool or Auto)*

35 to 100°F (1.5 to 38.0°C)

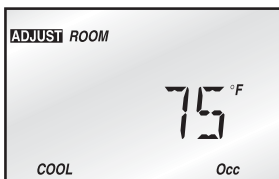


### Floor Maximum

Maximum floor temperature. This item is only available in the Installer access level.

*(Must have an active floor sensor.)*

34 to 122°F, OFF (1.0 to 50.0°C, OFF)

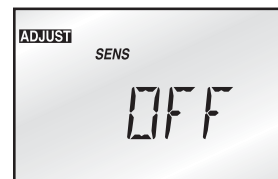


### Room Cool Occ

Desired temperature for cooling during Occupied.

*(Must have an active air sensor and be set to either Cool or Auto)*

35 to 100°F (1.5 to 38.0°C)



### Sensor

Selects the type of optional sensor present in the Sen 2 input. This item is only available in the Installer access level.

OFF, Indr, SLAB, OUT



### Room Cool Sleep

Desired temperature for cooling during Sleep.

*(Must have an active air sensor and be set to either Cool or Auto)*

35 to 100°F (1.5 to 38.0°C)



### Room Sensor

Selects whether the built-in sensor is functional or not. This item is only available in the Installer access level.

OFF, ON

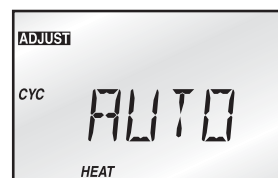


### Floor Minimum Wake

Minimum floor temperature during Wake.

*(Must have an active floor sensor.)*

OFF, 34 to 122°F (OFF, 1.0 to 50.0°C)



### Heating Cycle

Determines the number of cycles per hour for the heating equipment. This item is only available in the Installer access level.

Auto, 2 to 12



### Floor Minimum UnOcc

Minimum floor temperature during UnOccupied.

*(Must have an active floor sensor.)*

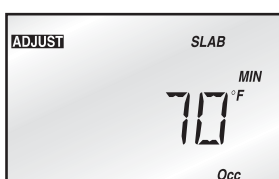
OFF, 34 to 122°F (OFF, 1.0 to 50.0°C)



### Cooling Cycle

Determines the number of cycles per hour for the cooling equipment. This item is only available in the Installer access level.

Auto, 2 to 12



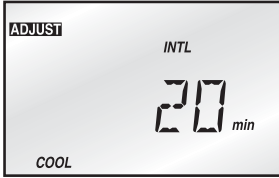
### Floor Minimum Occ

Minimum floor temperature during Occupied.

*(Must have an active floor sensor.)*

OFF, 34 to 122°F (OFF, 1.0 to 50.0°C)

## Adjust Menu (3 of 3)



### Cooling Interlock

Selects the time delay between the heating and cooling relays. This item is only available in the Installer access level.

10 to 180 min.



### Early Start

Selects whether or not the Early Start feature is active. This item is only available in the Installer access level.

OFF, ON



### Cooling Minimum On

Sets the minimum on time of the cooling contact. This is to prevent short cycling. This item is only available in the Installer access level.

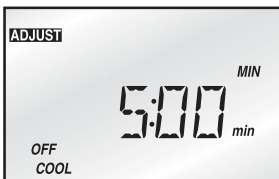
0:30 to 5:00 min.



### Lite

Sets the operation of the back-lighting of the LCD.

ON, Tmpy ON, OFF



### Cooling Minimum Off

Sets the minimum off time of the cooling contact. This is to prevent short cycling. This item is only available in the Installer access level.

0:30 to 10:00 min.



### Units

The units of temperature used to display the items.

°F, °C

## Error Messages (1 of 1)



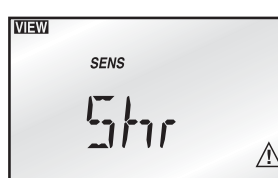
**E01** The controller was unable to read a piece of information stored in its memory. The controller was required to load the factory settings. The controller will stop operation until all settings are checked. To clear this error, select the Installer access level and check all of the settings in the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



**Room Open** The controller's internal air sensor is open circuit. This cannot be repaired in the field. Either turn off the internal sensor and use an optional sensor set to INDR or replace the controller. After the fault is corrected, press any button to clear the error message



**E02** There are no active sensors selected on the controller. Either the internal sensor must be turned on or at least one optional sensor must be set to either INDR or SLAB. After the fault is corrected, press any button to clear the error message.



**Sensor Short** The optional sensor connected to the Sens 2 terminal is short circuit. Locate and repair the problem. After the fault is corrected, press any button to clear the error message.



**Room Short** The controller's internal air sensor is short circuit. This cannot be repaired in the field. The controller should be replaced or returned for repair.



**Sensor Open** The optional sensor connected to the Sens 2 terminal is open circuit. Locate and repair the problem. After the fault is corrected, press any button to clear the error message.

## Technical Data

### Programmable Thermostat 512 *Two Stage Heat / Heat-Cool*

Control	— Microprocessor PI control; This is <b>not a safety (limit) control</b> .
Packaged weight	— 0.46 lb. (210 g), Enclosure J, white PVC plastic
Dimensions	— 2-7/8" H x 2-7/8" W x 13/16" D (73 x 73 x 21 mm)
Approvals	— CSA C US, meets ICES & FCC regulations for EMI/RFI.
Ambient conditions	— Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
Power supply	— 24 V ±10% 60 Hz 3 VA
Relays	— 24 V (ac) 2 A, Latching
Sensors	— NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
Included	— None
Optional	— tekmar type #: 070, 071, 072, 073, 076, 077, 078, 079.

### Programmable Thermostat 511s *Single Stage Heat*

Control	— Microprocessor PI control; This is <b>not a safety (limit) control</b> .
Packaged weight	— 0.54 lb. (245 g), Enclosure J, white PVC plastic
Dimensions	— 2-7/8" H x 2-7/8" W x 13/16" D (73 x 73 x 21 mm)
Approvals	— CSA C US, meets ICES & FCC regulations for EMI/RFI.
Ambient conditions	— Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
Power supply	— 24 V ±10% 60 Hz 3 VA
Relays	— 24 V (ac) 2 A, Latching
Sensors	— NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
Included	— Floor Sensor 079
Optional	— tekmar type #: 070, 071, 072, 073, 076, 077, 078, 079.



The installer must ensure that this control and its wiring are isolated and/or shielded from strong sources of electromagnetic noise. Conversely, this Class B digital apparatus complies with Part 15 of the FCC Rules and meets all requirements of the Canadian Interference-Causing Equipment Regulations. However, if this control does cause harmful interference to radio or television reception, which is determined by turning the control off and on, the user is encouraged to try to correct the interference by re-orientating or relocating the receiving antenna, relocating the receiver with respect to this control, and/or connecting the control to a different circuit from that to which the receiver is connected.

**Caution** The nonmetallic enclosure does not provide grounding between conduit connections. Use grounding type bushings and jumper wires.

Bringing  
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Uponor Wirsbo  
5925 148th STREET WEST  
APPLE VALLEY, MN 55124

TEL: 800-321-4739  
FAX: 952-891-1409  
[www.wirsbo.com](http://www.wirsbo.com)

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SPOP/02