



Zoning

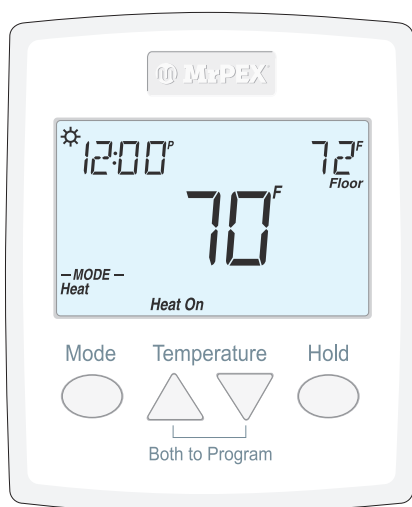
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Installation & Operation Manual

Introduction

The Programmable Thermostat 5110521 is designed for three different modes of operation: single stage heating, two stages of heating with a fan, or one stage of heating and one stage of cooling with a fan. Two auxiliary sensors may be added to measure the floor, outdoor or room temperature. A Slab Sensor 5110079 is included to measure floor temperature to protect the floor from overheating and enhance comfort. The programmable schedule supports either a 7 day or 24 hour schedule with 2 or 4 events per day. A permanent temperature hold button overrides the programmable schedule. An optional Adaptor Plate 5110012 is available to allow the thermostat to mount onto a single gang electrical box.



Energy Saving Features

- 7 Day Programmable Schedule

Additional Features

- Optimum Start
- Permanent Temperature Hold
- Radiant Floor Heating
- Two Stage Heating
- Cooling
- Fan
- Backlight
- Outdoor and Floor Temperature Display
- Time Clock
- Four Hour Battery-free Clock Backup

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Getting Started

Congratulations on the purchase of your new thermostat.

This manual will step through the complete installation, programming and sequence of operation for this control. At the back, there are tips for control and system troubleshooting.

Important Safety Information

WARNING



It is your responsibility to ensure that this control is safely installed according to all applicable codes and standards. tekmar is not responsible for damages resulting from improper installation and/or maintenance.

To avoid serious personal injury and damage to the equipment:



- Read Manual and all product labels BEFORE using the equipment. Do not use unless you know the safe and proper operation of this equipment.
- Keep this Manual available for easy access by all users.
- Replacement Manuals are available at tekmarControls.com



- Disconnect all power before opening the control.

- It is the installers responsibility to ensure that this control is safely installed according to all applicable codes and standards.
- Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury or death.
- This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit.
- Do not attempt to service the control. There are no user serviceable parts inside the control. Attempting to do so voids warranty.

Installation

Preparation

Tools Required

- jeweller screwdriver
- Wire Stripper
- Phillips head screwdriver

Materials Required

- 18 AWG LVT Solid Wire
(Low Voltage Connections)

Installation Location

Choose the placement of the thermostats early in the construction process to enable proper wiring during rough-in.

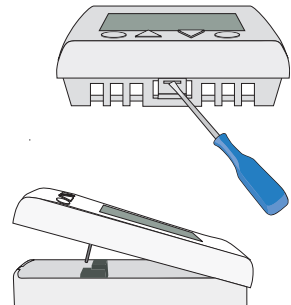
Consider the following:

- Interior Wall.
- Keep dry. Avoid potential leakage onto the control.
- Relative Humidity less than 90%. Non-condensing environment.
- No exposure to extreme temperatures beyond 32-122°F (0-50°C).
- No draft, direct sun, or other cause for inaccurate temperature readings.
- Away from equipment, appliances, or other sources of electrical interference.
- Easy access for wiring, viewing, and adjusting the display screen.
- Approximately 5 feet (1.5 m) off the finished floor.
- The maximum length of wire is 500 feet (150 m).
- Strip wire to 3/8" (10 mm) for all terminal connections.
- Use standard 5 conductor, 18 AWG wire.

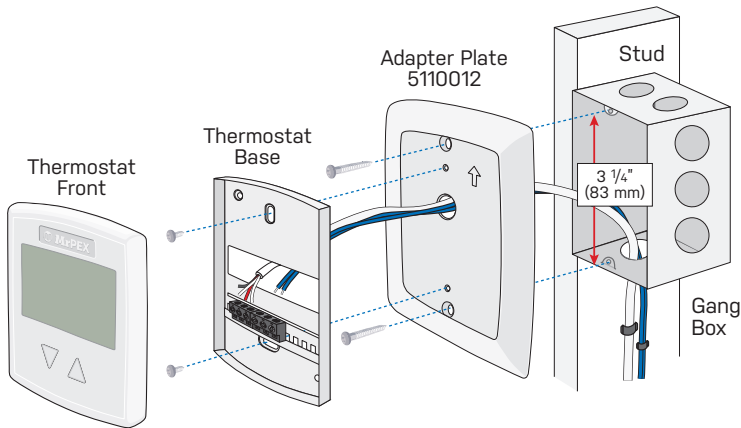
Removing The Thermostat Base

To remove the thermostat base:

- Locate the tab on the bottom of the thermostat.
- Push the tab with either your thumb or with a screwdriver.
- Lift the thermostat front away from the thermostat's base.

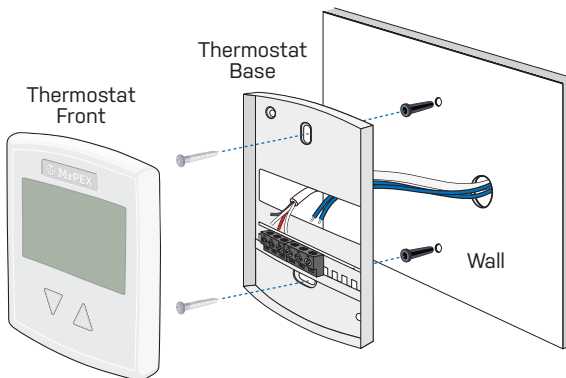


Mounting The Thermostat



If a single gang box is used:

- Adapter Plate 5110012 is required (sold separately).
- Feed the wiring through the hole in the adaptor plate and the thermostat base.
- Fasten the adaptor plate to the gang box.
- Fasten the base of the thermostat to the adaptor plate.
- Terminate wiring to the wiring strip.
- Push the thermostat front onto the thermostat base.



If mounting directly to the wall:

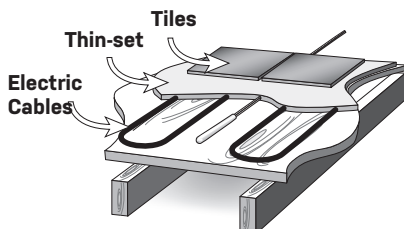
- Drill holes and install the wall anchors.
- Feed the wiring through the large hole in the thermostat base.
- Fasten the thermostat base to the wall using the wood screws to the wall anchors.
- Terminate wiring to the wiring strip.
- Push the thermostat front onto the thermostat base.

Slab Sensor 5110079 Installation

New Installations

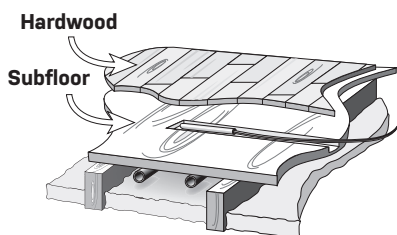
Thin-Set or Thin-Pour Applications

If the floor covering is to be installed over either a thin-set or thin-pour material of sufficient depth, the 5110079 slab sensor can be placed directly into either the thin-set material or the thin-pour material and covered over. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location. Splices within the thin-set or thin-pour should be avoided to ensure trouble free operation. The sensor should be located mid way between the heating elements to ensure a proper temperature reading.



Thin Floor Coverings (less than 3/8" (10 mm))

If a thin floor covering is to be installed directly to the subfloor, a groove 1/8" (4 mm) wide by 1/16" (2 mm) deep can be cut into the surface of the subfloor to accommodate the wire for the sensor. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location. Splices under the floor covering should be avoided to ensure trouble free operation. A groove 3/16" (5 mm) wide by 3/16" (5 mm) deep by 1-3/4" (45 mm) long should be cut to accommodate the sensor. The sensor should be located mid way between the heating elements to ensure a proper temperature reading.

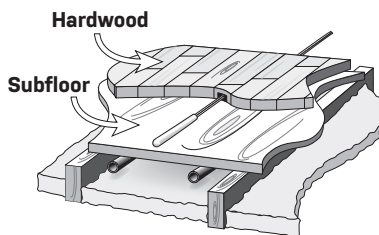


Thick Floor Coverings (greater than 3/8" (10 mm))

If a thick floor covering is to be installed directly to the subfloor, a groove 1/8" (4 mm) wide by 1/16" (2 mm) deep can be cut into the back of the flooring material to accommodate the wire for the sensor. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location.

Splices under the floor covering should be avoided to ensure trouble free operation. A groove 3/16" (5 mm) wide by 3/16" (5 mm) deep by 1-3/4" (45 mm) long should be cut to accommodate the sensor. The sensor should be located mid way between the heating elements to ensure a proper temperature reading.

If it is not practical to cut a groove in the surface covering, follow the installation method used for thin floor coverings.



Retrofit Installations

Tile Floor Coverings

If a Slab Sensor 5110079 is to be installed into an existing tile floor with sufficiently large grout lines, the sensor and wire can be installed in one of the grout lines between the tiles. Select a low traffic area of the floor that is mid way between the heating elements for the sensor location. Ensure that the sensor is located in such a position that the attached wire is able to reach to a suitable junction location. Splices within the grout should be avoided to ensure trouble free operation. Remove the appropriate grout line and place the sensor and wire in the floor. Re-grout the area.

Installing the Sensor to the Bottom of a Subfloor

If the sensor is to be installed to the bottom of a subfloor, cut a piece of 1" (25 mm) thick rigid insulation into a 6" (150 mm) by 6" (150 mm) square. A groove 3/16" (5 mm) wide by 3/16" (5 mm) deep by 1-3/4" (45 mm) long should be cut into the insulation to accommodate the sensor. Place the sensor in the groove and sandwich the sensor between the insulation and the subfloor. Use a suitable fastening method to affix the insulation to the subfloor.

NOTICE

Do not run sensor wires parallel to telephone or power cables. If the sensor wires are located in an area with strong sources of electromagnetic interference, shielded cable or twisted pair should be used or the wires can be run in a grounded metal conduit.

Slab Sensor 5110079 Wiring

The Slab Sensor 5110079 is supplied with 10' (3 m) of cable. If a longer length is required, 24 AWG or larger wire can be spliced onto the two wires from the sensor. The splices should be properly soldered and protected in an accessible junction box. Follow the sensor testing instructions given in this brochure and then connect the wires to the control.

Slab Sensor 5110079 Testing

A good quality test meter capable of measuring up to 5,000 k Ω (1 k Ω = 1000 Ω) is required to measure the sensor resistance. In addition to this, the actual temperature must be measured with either a good quality digital thermometer, or if a thermometer is not available, a second sensor can be placed alongside the one to be tested and the readings compared.

First measure the room temperature using the thermometer. Disconnect the S1 or S2 and Com wires from the thermostat. Using an electrical meter, measure the resistance of the S1 or S2 and Com wires at the thermostat location. Using the temperature versus resistance table, estimate the temperature measured by the sensor. The sensor measurement and thermometer readings should be close. If the test meter reads a very high resistance, there may be a broken wire, a poor wiring connection or a defective sensor. If the resistance is very low, the wiring may be shorted, there may be moisture in the sensor or the sensor may be defective. To test for a defective sensor, measure the resistance directly at the sensor location. Once the test has been completed, reconnect the S1 or S2 and Com wires to the thermostat.

Do not apply voltage to the temperature sensor terminals at any time as damage to the sensor may result.

Temperature vs. Resistance Table

| Temperature | | Resistance |
|-------------|-----|------------|
| °F | °C | Ω |
| -50 | -46 | 490,813 |
| -45 | -43 | 405,710 |
| -40 | -40 | 336,606 |
| -35 | -37 | 280,279 |
| -30 | -34 | 234,196 |
| -25 | -32 | 196,358 |
| -20 | -29 | 165,180 |
| -15 | -26 | 139,402 |
| -10 | -23 | 118,018 |
| -5 | -21 | 100,221 |
| 0 | -18 | 85,362 |
| 5 | -15 | 72,918 |
| 10 | -12 | 62,465 |
| 15 | -9 | 53,658 |
| 20 | -7 | 46,218 |

| Temperature | | Resistance |
|-------------|----|------------|
| °F | °C | Ω |
| 25 | -4 | 39,913 |
| 30 | -1 | 34,558 |
| 35 | 2 | 29,996 |
| 40 | 4 | 26,099 |
| 45 | 7 | 22,763 |
| 50 | 10 | 19,900 |
| 55 | 13 | 17,436 |
| 60 | 16 | 15,311 |
| 65 | 18 | 13,474 |
| 70 | 21 | 11,883 |
| 75 | 24 | 10,501 |
| 80 | 27 | 9,299 |
| 85 | 29 | 8,250 |
| 90 | 32 | 7,334 |
| 95 | 35 | 6,532 |

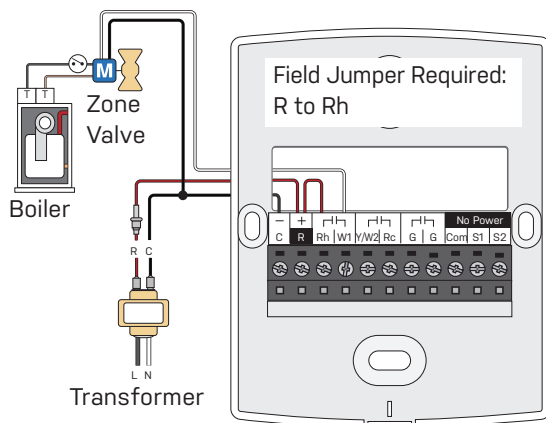
Temperature vs. Resistance Table - Continued

| Temperature | | Resistance |
|-------------|----|------------|
| °F | °C | Ω |
| 100 | 38 | 5,828 |
| 105 | 41 | 5,210 |
| 110 | 43 | 4,665 |
| 115 | 46 | 4,184 |
| 120 | 49 | 3,760 |
| 125 | 52 | 3,383 |
| 130 | 54 | 3,050 |
| 135 | 57 | 2,754 |
| 140 | 60 | 2,490 |
| 145 | 63 | 2,255 |
| 150 | 66 | 2,045 |
| 155 | 68 | 1,857 |
| 160 | 71 | 1,689 |

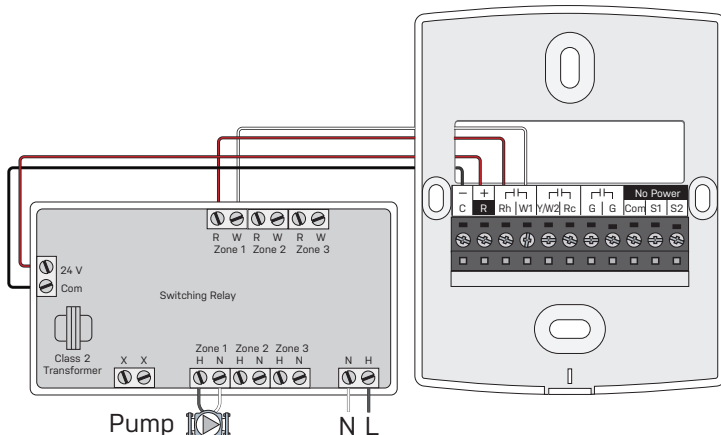
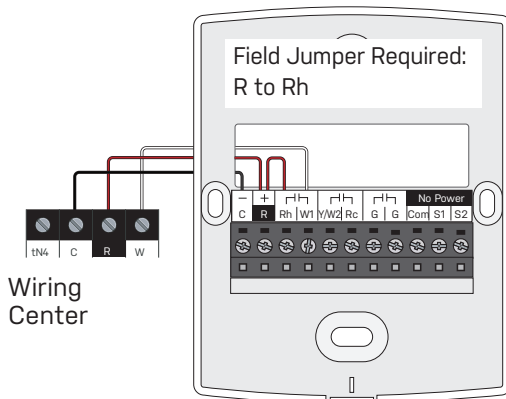
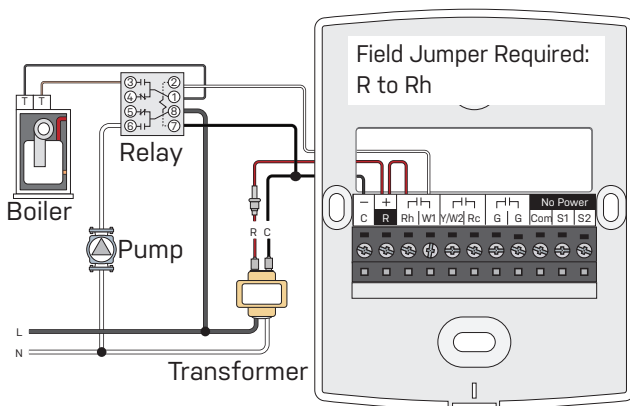
| Temperature | | Resistance |
|-------------|-----|------------|
| °F | °C | Ω |
| 165 | 74 | 1,538 |
| 170 | 77 | 1,403 |
| 175 | 79 | 1,281 |
| 180 | 82 | 1,172 |
| 185 | 85 | 1,073 |
| 190 | 88 | 983 |
| 195 | 91 | 903 |
| 200 | 93 | 829 |
| 205 | 96 | 763 |
| 210 | 99 | 703 |
| 215 | 102 | 648 |
| 220 | 104 | 598 |
| 225 | 107 | 553 |

Thermostat Wiring

Zone Valve

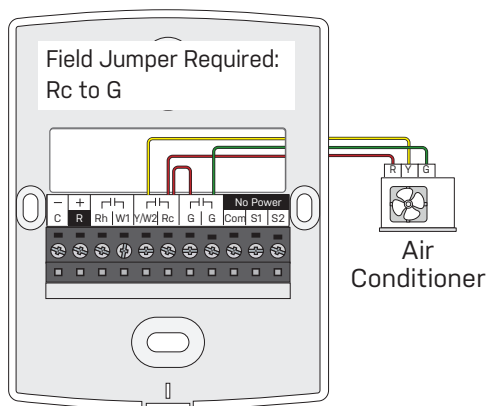


Relay

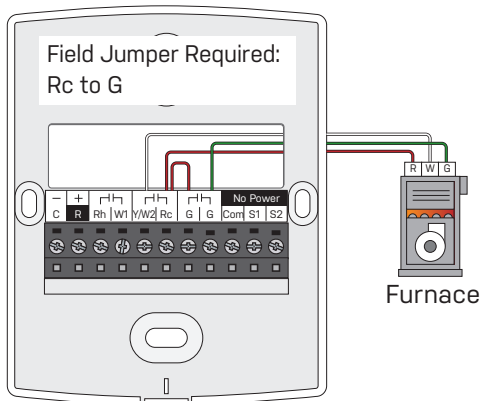


Thermostat Wiring

Air Conditioner



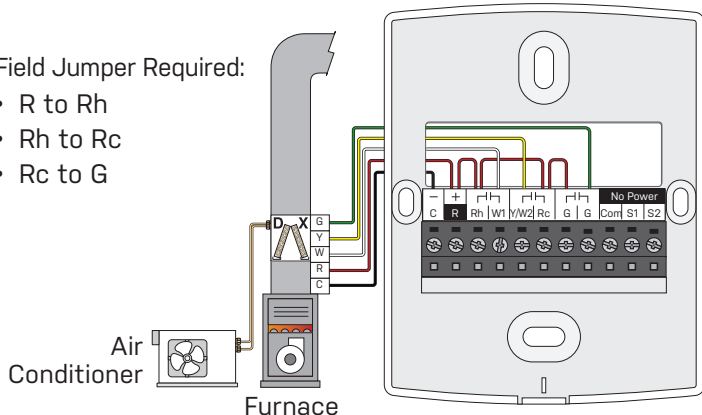
Furnace (second stage heat)

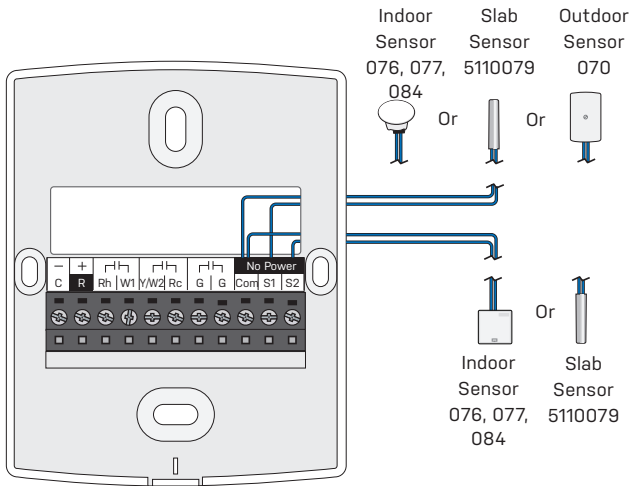


Furnace and Air Conditioner

Field Jumper Required:

- R to Rh
- Rh to Rc
- Rc to G





Testing the Thermostat Wiring

Testing the Power

If the thermostat display turns on, this indicates that power is applied correctly. In the event that the display is permanently off:

1. Remove the thermostat front.
2. Use an electrical meter to measure voltage between the R and C wiring terminals. For AC power supplies the voltage should measure between 10 to 30 V (ac). For DC power supplies the voltage should measure between 10 to 30 V (dc).
3. If the voltage on the R and C wire terminations is continuous and the thermostat display is not on, the thermostat may have a fault. Contact your tekmar sales representative for assistance.

If the thermostat display initially powers on but later shuts off intermittently, there may be a short circuit from the W1, W2, Y or G wire to the power common or ground, or the power supply is too small to power the load.

Testing the First Stage Heat Output Wiring

1. Press the Mode button and set to Heat.
2. Press the Δ button and set the heating temperature above the current room temperature. Make sure the display does not flash "Max" if using a floor sensor.
3. When the "Heat On" symbol appears on the display, use an electrical meter to check for voltage on the W1 and C wires connected to the zone valve, wiring center, relay or switching relay. The electrical meter should read 10 to 30 V (ac) or (dc).
4. If the W1 and C wires have voltage, check the zone valve, wiring center, relay or pump to determine if the heat device is operating correctly.

Testing the Cooling Output Wiring

Cooling is only available when the switch setting is set to H/C/F.

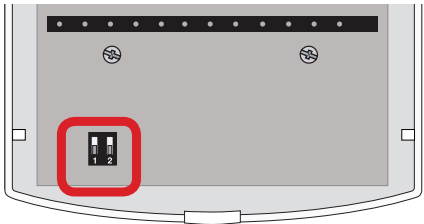
1. Press the Mode button and set to Cool.
2. Press the ▽ button and set the cooling temperature below the current room temperature setting.
3. When the "Cool On" symbol appears on the display, use an electrical meter to check for voltage on the Y and C wires on the cooling equipment. The meter should read 10 to 30 V (ac) or (dc).

Testing the Fan Output Wiring

The fan is only available when the Fan Mode setting is not set to off.

1. Press both the △ and ▽ buttons together.
2. The display will show FAN MENU. Press the PRGM button.
3. Press the up button to set the fan to On.
4. When the fan symbol appears on the display, use an electrical meter to check for voltage on the G and C wires on the fan equipment. The meter should read 10 to 30 V (ac) or (dc).

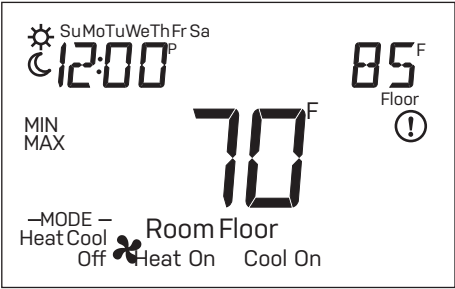
Switch Settings



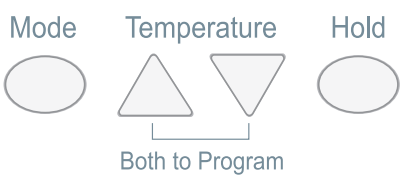
| Switch | Position | Action |
|--------|----------|---|
| 1 | ON | LOCK ACCESS LEVEL Thermostat is locked and the access level cannot be changed. Set to Lock when installation has been completed. |
| | OFF | UNLOCK ACCESS LEVEL Thermostat is unlocked and the access level may be changed. Go to the Setup menu to change the access level. Set to Unlock during the installation process. |
| 2 | ON | H/C/F Thermostat is configured to operate one stage heating, one stage cooling and fan. |
| | OFF | 1H OR 2H Thermostat is configured to operate one or two stage heating with a fan. |

User Interface

Home Screen







Mode Button
Change operation from Heat, Cool and Off.



Hold Button
Permanently overrides the schedule. Press hold to cancel.

Symbols Description

| | |
|---|--|
| <i>Heat On</i> HEAT ON Heat is turned on. |  SUN Schedule operating at the occupied temperature. |
| <i>Cool On</i> COOL ON Cooling is turned on. |  MOON Schedule operating at the unoccupied temperature. |
|  FAN The fan is turned on. |  WARNING SYMBOL Indicates an error is present. |
| <i>—MODE— Heat</i> MODE HEAT The heating system is allowed to operate. | <i>HOLD</i> HOLD Permanently holds the temperature and overrides the schedule. |
| <i>—MODE— Cool</i> MODE COOL The cooling system is allowed to operate. | <i>MIN</i> MIN The floor is at or below the floor minimum temperature. |
| <i>—MODE— Off</i> MODE OFF The heating and cooling systems are off. | <i>MAX</i> MAX The floor has reached the floor maximum temperature. |

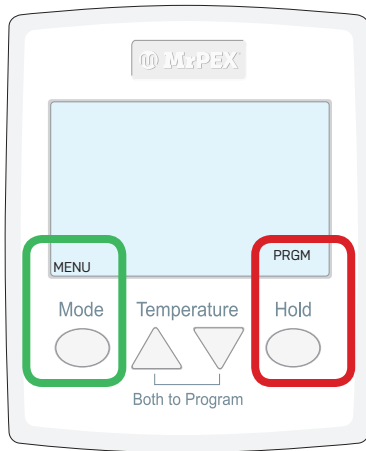
Programmable Settings

Navigation

1. Press and hold down both the \triangle and ∇ buttons together to enter the Programming Menu.

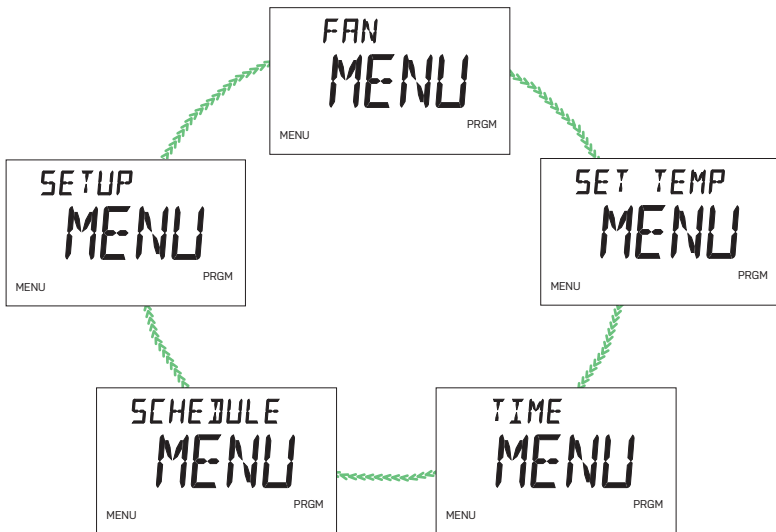
2. While in the Programming Menu, the MODE button changes function to become the MENU button.

Press the MENU button to change from one menu to the next.



3. While in the Programming Menu, the HOLD button changes function to become the PRGM (program) button.





Press the PRGM button to enter the menu.



4. While inside a menu, the HOLD button changes to become the ITEM button.
Press the ITEM button to change from one setting to the next.
5. Press the \triangle or ∇ button to change and save the setting's value.

| Fan Menu | |
|---|-------------------|
| Setting | Display |
| FAN Select if the fan should operate continuously (On) or only together with the heating or cooling equipment (Auto). | FAN |
| Access Level: Installer, User | Range: Auto or On |
| Conditions: Only available when FAN MODE is not set to OFF and a room temperature sensor is available. | Default: Auto |





| Set Temp Menu | |
|---|--|
| Setting | Display |
| SET HEAT ROOM ☼ Set the room heating temperature for the ☼ event. | ☼ SET HEAT |
| Access Level: Installer, User | Range: 40 to 95°F (4.5 to 35.0°C) |
| Conditions: Room Sensor On or Sensor 1 or 2 is set to Room. | Default: 70°F (21.0°C) |
| SET HEAT ROOM ☾ Set the room heating temperature for the ☾ event. | ☾ SET HEAT |
| Access Level: Installer, User | Range: 40 to 95°F (4.5 to 35.0°C) |
| Conditions: Room Sensor On or Sensor 1 or 2 is set to Room and Schedule is set to On. | Default: 65°F (18.5°C) |
| SET COOL ROOM ☼ Set the room cooling temperature for the ☼ event. | ☼ SET COOL |
| Access Level: Installer, User | Range: 50 to 100°F (10.0 to 38.0°C) |
| Conditions: Room Sensor On or Sensor 1 or 2 is set to Room. | Default: 78°F (25.5°C) |
| SET COOL ROOM ☾ Set the room cooling temperature for the ☾ event. | ☾ SET COOL |
| Access Level: Installer, User | Range: 50 to 100°F (10.0 to 38.0°C) |
| Conditions: Room Sensor On or Sensor 1 or 2 is set to Room and Schedule is set to On. | Default: 85°F (29.5°C) |
| SET FLOOR ☼ Set the floor heating temperature for the ☼ event. | ☼ SET FLOOR |
| Access Level: Installer, User | Range: OFF, 40 to 122°F (OFF, 4.5 to 50.0°C) |
| Conditions: Sensor 1 or 2 is set to Floor. | Default: 72°F (22.0°C) |

| Set Temp Menu | |
|--|---|
| Setting | Display |
| SET FLOOR  Set the floor heating temperature for the  event. |  SET FLOOR |
| Access Level: Installer, User | Range: OFF, 40 to 122°F (OFF, 4.5 to 50.0°C) |
| Conditions: Sensor 1 or 2 is set to Floor and Schedule is set to On. | Defaults Air & floor sensors: 65°F (18.5°C) Floor sensor only: OFF |
| SET FLOOR MAXIMUM Set the maximum floor heating temperature. |  SET FLOOR |
| Access Level: Installer | Range: 40 to 122°F, OFF (4.5 to 50.0°C, OFF) |
| Conditions: Sensor 1 or 2 is set to Floor. | Default: 85°F (29.5°C) |

| Time Menu | |
|--|-----------------------------------|
| Setting | Display |
| MINUTES Set the current time minutes. | 12:00 |
| Access Level: Installer, User | Range: 00 to 59 |
| Conditions: Always available. | Default: 00 |
| HOURS Set the current time hours. | 12:00 |
| Access Level: Installer, User | Range: 12 AM to 11 PM or 00 to 23 |
| Conditions: Always available. | Default: 12 AM |
| DAY OF WEEK Select the current day of the week. | MONDAY |
| Access Level: Installer, User | Range: Sunday to Saturday |
| Conditions: Always available. | Default: Sunday |
| TIME MODE Select either 12 or 24 hour time format. | TIME MODE |
| Access Level: Installer, User | Range: 12 or 24 hour |
| Conditions: Always available. | Default: 12 hour |
| CLOCK Select whether to show the time clock on the display. | CLOCK |
| Access Level: Installer, User | Range: OFF or ON |
| Conditions: The time is always shown when a schedule is used and the clock setting option is hidden. | Default: OFF |

Schedule Menu (1 of 2)

The schedule menu can operate on a 24 hour or 7 day repeating schedule. When a 24 hour schedule is selected, "SuMoTuWeThFrSa" is shown on the top of the screen to show that the event time applies to all days of the week. When a 7 day schedule is selected, each individual day of the week is shown with the event time.

| Setting | Display |
|---|--|
| EVENT 1 The first programmable schedule time period of the day. The ☀ temperature settings are used during this time period. |  SuMoTuWeThFrSa EVENT 1 |
| Access Level: Installer, User | Range: 12:00 AM to 11:50 PM, SKIP or 00:00 to 23:50, SKIP |
| Conditions: Schedule setting is set to On. | Default: 6:00 AM |
| EVENT 2 The second programmable schedule time period of the day. The 🌙 temperature settings are used during this time period. |  SuMoTuWeThFrSa EVENT 2 |
| Access Level: Installer, User | Range: 12:00 AM to 11:50 PM, SKIP or 00:00 to 23:50, SKIP |
| Conditions: Schedule setting is set to On. | Default: 10:00 PM when Event/Day is 2 8:00 AM when Event/Day is 4 |
| EVENT 3 The third programmable schedule time period of the day. The ☀ temperature settings are used during this time period. |  SuMoTuWeThFrSa EVENT 3 |
| Access Level: Installer, User | Range: 12:00 AM to 11:50 PM, SKIP or 00:00 to 23:50, SKIP |
| Conditions: Schedule setting is set to On. | Default: 6:00 PM |
| EVENT 4 The fourth programmable schedule time period of the day. The 🌙 temperature settings are used during this time period. |  SuMoTuWeThFrSa EVENT 4 |
| Access Level: Installer, User | Range: 12:00 AM to 11:50 PM, SKIP or 00:00 to 23:50, SKIP |
| Conditions: Schedule setting is set to On. | Default: 10:00 PM |

| Schedule Menu (2 of 2) | |
|---|-------------------------|
| Setting | Display |
| SCHEDULE Select if the thermostat should change the temperature automatically using a programmable schedule. | SCHEDULE |
| Access Level: Installer, User | Range: OFF or On |
| Conditions: Always available | Default: OFF |
| EVENT PER DAY Select either two or four scheduled events per day. | EVENT / DAY |
| Access Level: Installer, User | Range: 2 or 4 |
| Conditions: Schedule setting is set to On. | Default: 2 |
| 24 HOUR / 7 DAY Select either a 24 hour or a 7 day repeatable schedule. | 24hr / 7DAY |
| Access Level: Installer, User | Range: 24 hour or 7 day |
| Conditions: Schedule setting is set to On. | Default: 24 hour |
| OPTIMUM START Select whether or not to use optimum start. The thermostat learns the heat up rate of the room and starts heating in advance of Event 1 or Event 3. Only applies to radiant floor heating, baseboard or radiator heating. | OPT START |
| Access Level: Installer, User | Range: OFF or ON |
| Conditions: Schedule setting is set to On. | Default: ON |

Setup Menu (1 of 2)

| Setting | Display |
|---|--|
| ACCESS Selects the access level of the thermostat, which determines which menus and items are available. | ACCESS |
| Access Level: Installer, User | Range: Installer or User |
| Conditions: Only available when switch setting 1 is set to Unlocked. | Default: Installer |
| UNITS Select the temperature units. | UNITS |
| Access Level: Installer, User | Range: °F or °C |
| Conditions: Always available. | Default: °F |
| LIGHT Select when the display back light should operate. Auto operates the back light for 30 seconds after a keystroke. | LIGHT |
| Access Level: Installer, User | Range: OFF, AUTO, ON |
| Conditions: Always available. | Default: AUTO |
| TYPE Device Type number. Hold the Δ button to view the software version. | TYPE |
| Access Level: Installer, User | Range: 521 |
| Conditions: Always available. | Default: 521 |
| SENSOR 1 Select the type of auxiliary sensor 1. | SENSOR 1 |
| Access Level: Installer | Range: NONE, ROOM, FLOR (floor), OUT (Outdoor) |
| Conditions: Available when a sensor is automatically detected on auxiliary sensor 1 input. | Default: FLOR |
| SENSOR 2 Select the type of auxiliary sensor 2. | SENSOR 2 |
| Access Level: Installer | Range: NONE, ROOM, FLOR (floor) |
| Conditions: Available when a sensor is automatically detected on auxiliary sensor 2 input. | Default: ROOM |
| ROOM SENSOR Select if the built-in room temperature sensor is on or off. | SENSOR Room |
| Access Level: Installer | Range: OFF or ON |
| Conditions: When switch setting 2 is set to 1H or 2H, an auxiliary sensor must be set to Room or Floor. When switch setting 2 is set to H/C/F, an auxiliary sensor must be set to Room. | Default: ON |

Setup Menu (2 of 2)

| Setting | Display |
|---|--|
| W2 RELAY Select if a second stage heat is available. | W2 RELAY |
| Access Level: Installer | Range: OFF or On |
| Conditions: Available when switch setting 2 is set to 1H or 2H. | Default: OFF |
| W2 DELAY Select the time delay that the second stage must wait before turning on. | W2 DELAY |
| Access Level: Installer | Range: 1 to 180 minutes |
| Conditions: Available when switch setting 2 is set to 1H or 2H and W2 Relay is set to On. | Default: 20 minutes |
| W2 DIFFERENTIAL Select the differential below the Set Heat setpoint at which the second stage heat can turn on. | W2 DIFF |
| Access Level: Installer, User | Range: 1.5 to 8.0°F (1.5 to 8.0°C) |
| Conditions: Available when switch setting 2 is set to 1H or 2H and W2 Relay is set to On. | Default: 2.0°F |
| FAN MODE Select how the fan should operate together with the W1, W2 and Y relays. | FAN MODE |
| Access Level: Installer, User | Range: OFF, Y, W1, W1+Y (Switch setting is H/C/F) OFF, W1, W2, W1+2 (Switch setting is 1H or 2H) |
| Conditions: When switch setting 2 is set to H/C/F, always available. When switch setting 2 is set to 1H or 2H, available when a room sensor is available. If a floor sensor is available then W2 must also be set to On. Fan mode combinations with W1 are unavailable when a floor sensor is connected. | Default: Y (Switch setting 2 is H/C/F) OFF (Switch setting 2 is 1H or 2H) |

Sequence of Operation

Mode Button Operation

Pressing the Mode button selects the operation of the thermostat to be either Heating, Cooling, or Off. The thermostat must be configured for heat/cool/fan operation in order for the cooling operation to be available.

Heating Operation

Heating is available when the Mode is set to Heat. To change the heat temperature setting, push the Δ or ∇ button to select a preferred temperature setting for the current schedule time period. The Heat On symbol is shown on the display when the thermostat is heating.

To change the temperatures for the other time periods, enter the Set Temp menu by pressing both the Δ and ∇ buttons together, press Menu to locate the Set Temp menu, and press PRGM to enter the menu.

Hydronic Systems

When operating a hydronic radiant floor, baseboard or radiator heating system, the thermostat uses Pulse Width Modulation (PWM) operation and cycles the heat on and off within $\pm 1.5^{\circ}\text{F}$ (1°C) of the temperature setting.

Forced Air Systems

When operating a forced air heating system, the thermostat uses a differential of $\pm 0.7^{\circ}\text{F}$ (0.4°C).

Temperature Sensor Location

The thermostat can operate the heating system based upon either an air temperature sensor, a floor temperature sensor, or a combination of both the air and floor temperature sensors together.

Air Temperature Only

If there is only an air temperature sensor (no floor sensor), the thermostat maintains the desired air temperature.

Floor Temperature Only

If the air sensor has been disabled, the thermostat will only maintain floor temperature and ignore air temperature. This operation is recommended for areas such as bathrooms to ensure that tile floors are warm to the touch.

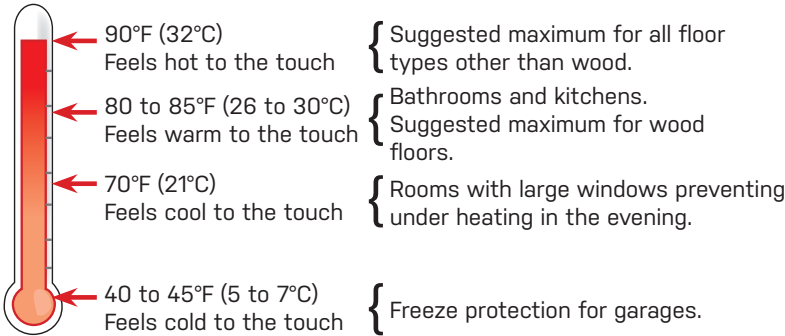
Floor and Air Temperature

If the air sensor is turned on and a floor sensor is connected, the thermostat will maintain the desired air temperature as well as a minimum floor temperature.

This operation is recommended for areas with large windows that allow the sun to shine into a room and keep it warm without the need for heat. This can allow the floors to cool off during the afternoon. When the sun goes down, it can take a long time for the floors to get warm again. This may cause the room to cool off too much in the

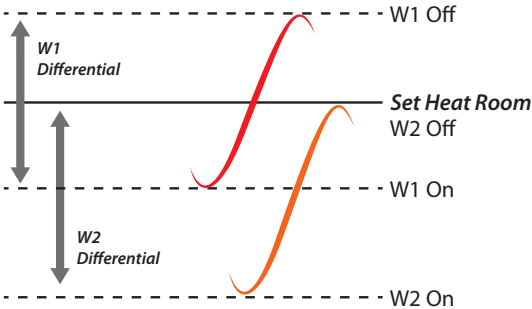
early evening. A floor minimum setting can help with this condition by maintaining a floor minimum temperature. Keep in mind the floor minimum temperature will override the air temperature, and if set too high, may overheat the room.

This operation is also recommended for rooms with hardwood floors. Setting floor minimum and maximum temperatures is a way of enhancing the comfort of the living space while protecting floor coverings.



Two-Stage Heating

The thermostat supports two-stage heating. The second stage heat turns on when the air temperature falls below the Set Heat minus the W2 Differential setting and the W2 Delay time expires. The second stage heat turns off when the room temperature reaches the Set Heat setting.



Freeze Protection

The thermostat operates the heat whenever the room temperature falls below 40°F (4.5°C) even when the mode is set to off.

Cooling Operation

Cooling is available when the Mode is set to Cool. The thermostat must be configured for heat/cool/fan operation in order for the cooling operation to be available.

To change the cool temperature setting, push the Δ or ∇ button to select a preferred temperature setting for the current schedule time period. The Cool On symbol is shown on the display when the thermostat is cooling.

To change the temperatures for the other time periods, enter the Set Temp menu by pressing both the Δ and ∇ buttons together, press Menu to locate the Set Temp menu, and press PRGM to enter the menu.

When operating a forced air cooling system, the thermostat uses a differential of +/- 0.7°F (0.4°C).

Fan Operation

A fan is available when the thermostat operates a forced air heating or cooling system. The fan can be set to On to allow air circulation through the building. This is useful if the air in the room is stale or if circulating cool air from a basement throughout a home can reduce the temperature in the upper floor without operating the cooling equipment.

Time Clock

The thermostat includes a time clock that is automatically visible in the Home menu when a programmable schedule is used. If the schedule is not used, the user has the option to select whether the time is shown in the Home menu.

During a loss of power, the thermostat continues to keep the correct time and date for at least 4 hours. If the power is off for more than 4 hours, the user will need to set the time.

Programmable Schedule

Energy savings can be achieved by lowering the heating temperature and increasing the cooling temperature when the building is unoccupied or during the night.

When operating on a programmable schedule, a ☀ or a 🌙 symbol is shown in the home menu. The ☀ or 🌙 indicates the current operating temperature.

All schedules are stored in permanent memory and are not affected by a loss of power.

| Display | Action |
|---------|-------------------|
| ☀ | Day temperature |
| 🌙 | Night temperature |

This thermostat can operate on a programmable schedule in order to automatically lower the room temperature setting. The schedule can be off or on.

The thermostat can support schedules that have either:

- 2 events per day
- 4 events per day

Schedules with four events per day are common for residential use while two events per day are common for commercial installations.

The schedules can be repeated every:

- 24 hours
- 7 days (week)

A 7 day schedule allows a unique time to be set to change the temperature for each day of the week.

The schedule also includes a "SKIP" option that allows the programmable schedule to skip a temperature change and remain at the previous temperature setting. The "SKIP" setting can be found between 11:50 PM (23:50 hours) and 12:00 AM (0:00 hours).

Optimum Start

Temperature Adjustment

Permanent Adjustment - No Schedule

Regressed Adjusted, With School Is

Permanent Adjustment - With Schedule

1 To adjust the temperature for both time periods, press and hold the Δ and ∇

2. Enter the "SET TEMP" menu to adjust the following settings:
 - Set Heat Room ☀ (air heating)
 - Set Heat Room ☾ (air heating)
 - Set Floor ☀ (floor heating)
 - Set Floor ☾ (floor heating)
 - Set Cool Room ☀ (air cooling)
 - Set Cool Room ☾ (air cooling)

Permanent Hold _____








Access Levels

Once the thermostat has been installed, set the Lock / Unlock switch setting to

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Troubleshooting

Error Messages

| Error Message | Description |
|---|---|
|  | SETUP MENU SAVE ERROR The thermostat failed to read the Programmable Settings from memory and has reloaded the factory default settings. The thermostat stops normal operation until the access level is changed to Installer and all Programmable Settings are checked. The thermostat continues to provide freeze protection. |
|  | ROOM SENSOR OPEN CIRCUIT ERROR The built-in air temperature sensor has an open circuit fault. Do not confuse this error with the auxiliary room sensor short circuit error. This error cannot be field repaired. Contact your wholesaler or tekmar sales representative for details on repair procedures. |
|  | ROOM SENSOR SHORT CIRCUIT ERROR The built-in air temperature sensor has a short circuit fault. Do not confuse this error with the auxiliary room sensor short circuit error. This error cannot be field repaired. Contact your wholesaler or tekmar sales representative for details on repair procedures. |
|  | AUXILIARY SENSOR 1 OPEN CIRCUIT ERROR The auxiliary sensor 1 has an open circuit. Check for loose or damaged wires. Locate and repair the problem as described in the Sensor Testing section of this brochure. The error clears after the auxiliary sensor fault is corrected. If the auxiliary sensor was intentionally removed, set access level to Installer and set Sensor 1 to None. |
|  | AUXILIARY SENSOR 1 SHORT CIRCUIT ERROR The auxiliary sensor 1 has a short circuit. Check for damaged wires. Locate and repair the problem as described in the Sensor Testing section of this brochure. The error clears after the auxiliary sensor fault is corrected. |
|  | AUXILIARY SENSOR 2 OPEN CIRCUIT ERROR The auxiliary sensor 2 has an open circuit. Check for loose or damaged wires. Locate and repair the problem as described in the Sensor Testing section of this brochure. The error clears after the auxiliary sensor fault is corrected. If the auxiliary sensor was intentionally removed, set access level to Installer and set Sensor 1 to None. |
|  | AUXILIARY SENSOR 2 SHORT CIRCUIT ERROR The auxiliary sensor 2 has a short circuit. Check for damaged wires. Locate and repair the problem as described in the Sensor Testing section of this brochure. The error clears after the auxiliary sensor fault is corrected. |

Frequently Asked Questions

| Symptom | Look for... | Corrective Action |
|---|--|--|
| Display powering on and off. | Measure voltage at wiring terminals R and C. | The power supply transformer may have limited VA capacity. A transformer with a larger VA rating is recommended. |
| Heat not on | Mode Off or Cool | Thermostat must be in Mode Heat in order to provide heating. |
| | Floor Max | The floor has reached the maximum operating temperature. |
| Room is too hot due to floor heating being on | Floor Min | Lower the Set Floor temperature setting. |
| Cooling not on | Mode Off or Heat | Thermostat must be in Mode Cool in order to provide cooling. |

Technical Data

Programmable Thermostat 521 *Two Heat or Heat-Cool (Includes Sensor 079)*

| | |
|--------------------|--|
| Literature | 521_A, 521_C, 521_D, 521_Q, 521_U |
| Control | Microprocessor control. This is not a safety (limit) control |
| Packaged weight | 0.6 lb. (290 g) |
| Dimensions | 3-11/16" H x 3" W x 15/16" D (94 x 76 x 24 mm) |
| Enclosure | White PVC plastic, NEMA type 1 |
| Approvals | Meets Class B: ICES & FCC Part 15, CE |
| Ambient conditions | Indoor use only, 32 to 122°F (0 to 50°C), RH ≤90% non-condensing |
| Power supply | 10 to 30 V (ac/dc), 50/60 Hz, 1.8 VA, Class 2 |
| Relay | 30 V (ac/dc) 2 A, Class 2 circuits |
| Sensor | NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892 |
| – Included | Slab Sensor 079 |
| – Optional | tekmar type # 070, 072, 073, 076, 077, 079, 084 |

Slab Sensor 079 *10' (3 m) wire*

| | |
|-----------------|---|
| Dimensions | 3/16" OD x 1-1/2" (5 mm OD x 38 mm) |
| Enclosure | 316 stainless steel, 10' (3 m) 24 AWG, 300 volt PVC insulated Zipcord |
| Approvals | CSA C US |
| Operating range | -58 to 221°F (-50 to 105°C) |
| Sensor | NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892 |

LIMITED WARRANTY—EFFECTIVE MAY 1, 2016 VALID FOR MRPEX® POTABLE PEX-A TUBING, FITTINGS AND OTHER SELECT PLUMBING PRODUCTS

Limited Warranty

MrPEX® Systems warrants to its "clients" that the MrPEX® POTABLE PEX-a Tubing and Plumbing Components, used for Plumbing applications, sold hereunder shall be free from defects in material and workmanship and that the components will conform to specifications stated in MrPEX® Publications. This Limited Warranty shall expire thirty (30) years for the MrPEX® POTABLE PEX-a tubing, five (5) years for Lead Free Brass F1807 PEX Press Fittings, PPSU F2159 PEX Press Fittings and two (2) years for all other components, from date of shipment by MrPEX® Systems unless otherwise specified in writing. MrPEX® Systems further warrants that products listed are compatible with Each other, but at the same time we disclaim warranty for claims related to compatibility with non-MrPEX® products. Components sold under this Limited Warranty must (1) be selected, designed, and installed according to the instructions in MrPEX® Publications using appropriate trade workmanship and according to the local building code(s), (2) remain in their originally installed location, (3) are connected to appropriate water and power supplies, (4) show no evidence of tampering, mishandling, neglect, accidental damage, modification or repair without the approval of MrPEX® Systems or damage done to the product by anyone other than MrPEX® Systems authorized personnel. A ten (10) year system warranty shall be offered when a potable water system is installed solely with MrPEX® Systems tubing, fittings, and components. MrPEX® Systems' sole obligation hereunder shall be, at its option, to issue credit, repair or replace any component or part thereof which is proved to be other than as warranted. No allowance shall be made to clients for transportation or labor charges unless such charges are authorized in writing in advance by MrPEX® Systems. Any repairs without the express written consent of MrPEX® Systems, shall render this Limited Warranty invalid. Warranty claims must be received by MrPEX® Systems within the applicable warranty period and within thirty (30) days from the time when the cause for the claim occurred or was discovered. Upon receipt of prompt notice of a warranty claim, MrPEX® Systems shall have ten (10) business days in which to determine whether it acknowledges responsibility for any asserted defects in material or workmanship and the appropriate action to be taken. This Limited Warranty and any claims arising from breach of warranty, or any other claim arising hereunder, shall be governed and construed under the laws of the State of Minnesota. No other persons than MrPEX® employees have any express or implied authority to bind MrPEX® to any agreement or warranty of any kind without the express written consent of MrPEX® Systems.

Disclaimer of Warranties

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All specifications are subject
to change without notice

