Installers and Users Installation and Operation Manuals

Operates a Modulating Motorized Valve, a Modulating Boiler, or Multi-Boiler Control

SMC
Snowmelt Control

With Optional BACnet Communication

⚠ WARNING

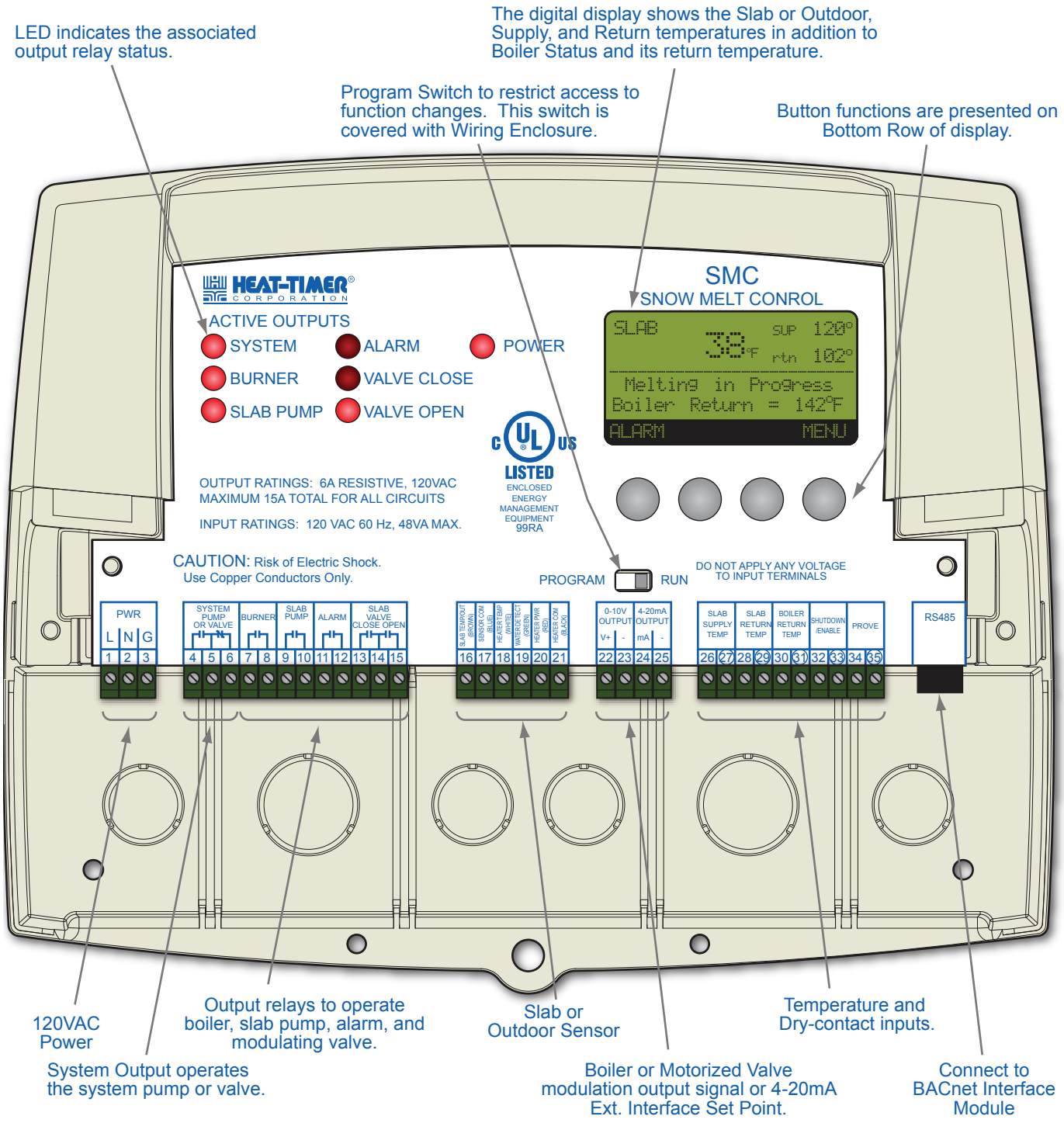
This Heat-Timer control is strictly an operating control; it should never be used as a primary limit or safety control. All equipment must have its own certified limit and safety controls required by local codes. The installer must verify proper operation and correct any safety problems prior to the installation of this Heat-Timer control.

HEAT-TIMER® CORPORATION

HT# 059115-00 B

CONTENT

SMC FUNCTION CHART



HT# 059115-00 B

DEFINITIONS

⚠ WARNING Warns of possible exposure to risk which can cause personal injury or property damage if ignored.

⚠ ALERT Attention is required to avoid wrong control operation or restricted access to some settings.

WWC Warm Weather Cutoff. See "Warm Weather Cutoff (WWC)" on page 26.

ISP Idle Set Point. See "Idle Set Point (ISP)" on page 26.

CWC Cold Weather Cutoff. See "Cold Weather Cutoff (CWC)" on page 28.

(Slab ΔT) The Slab Delta T is the difference in temperature between the Slab Supply temperature and the Slab Return temperature.

SMC OPERATION MODES

The Snowmelt Control (SMC) is designed to operate a radiant slab Hydronic heating system to prevent snow and ice accumulation on sidewalks, driveways, and other areas where buildup is undesirable. It does this using the provided Slab Sensor. This is the Heat-Timer preferred operation mode.

⚠ ALERT

In Slab Sensor Type mode, the slab sensor base and its conduit must be installed before the slab installation.

However, in some sites where the concrete slab is old and cannot be altered, the SMC can operate based on the Outdoor Sensor using the Outdoor Sensor Type mode. This method does not provide any moisture detection and requires the purchase of the optional Outdoor Sensor (HT# 904220-00).

SLAB SENSOR OPERATION OVERVIEW

The SMC uses the Slab Sensor in two steps. First, the SMC continuously monitors the slab temperature and detects moisture. When the SMC starts the Idle mode, it will try to maintain the slab temperature above freezing. Second, when it detects moisture and the temperature suggests possible ice or snow accumulation, the SMC activates the heating system to evaporate the moisture by raising the supply temperature.

The Slab Sensor provides the slab temperature and moisture information necessary to run the slab heating system. This Brass sensor is designed to become an integral part of the slab. Therefore, it is specifically engineered to support extreme heat and cold temperatures and to withstand pressure and impact, such as might occur when a car drives over it. Despite its sturdy structure, the sensor is very accurate. Its temperature accuracy is within one degree and its moisture sensitivity is adjustable to sense even traces of precipitation. The Slab Sensor does not allow any snow or ice accumulation. It does this using a built-in heater that operates below freezing temperatures.

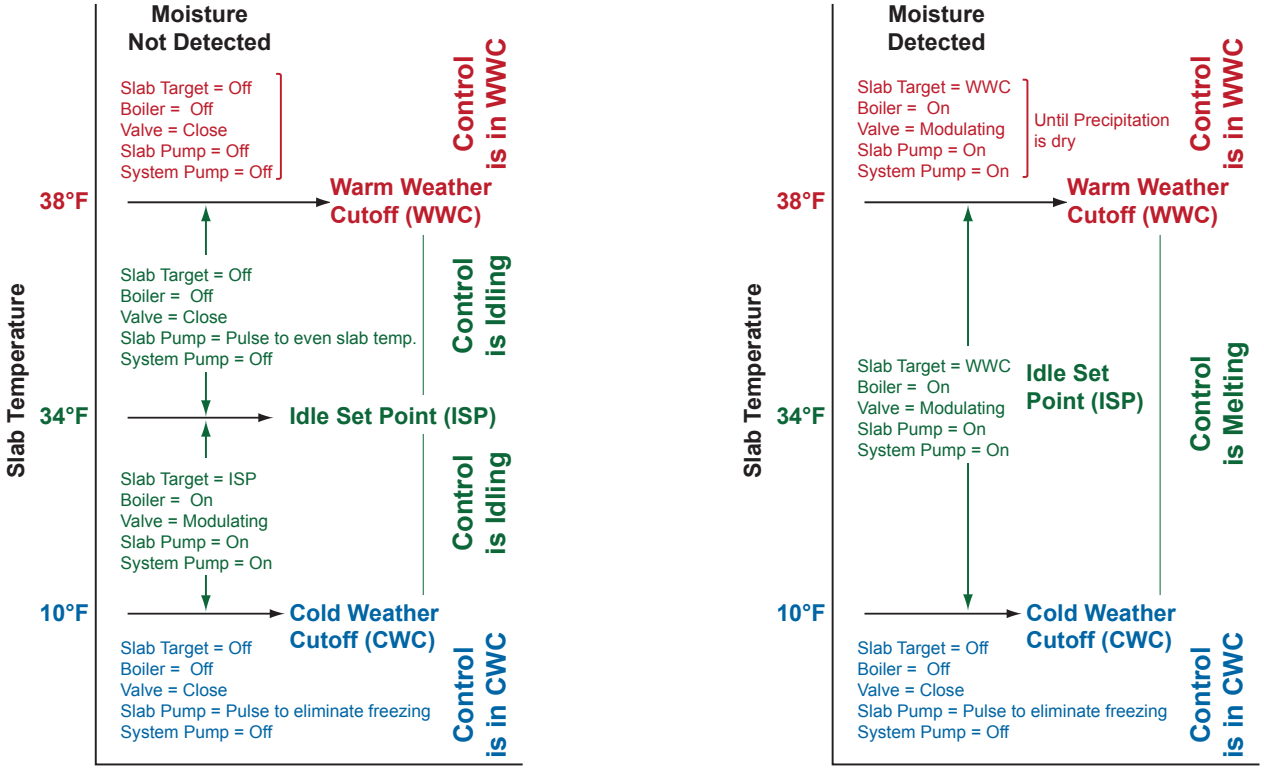
A snowmelt system generally includes a heating plant and a slab pump to move the water/anti-freeze solution through the slab's radiant piping. Whenever the Slab Sensor reads a temperature below the adjustable WWC, the SMC enables the Idle mode. In Idle mode the SMC maintains the slab temperature above freezing (at the ISP). It does this by pulsing the Slab Pump (15 seconds for every Antifreeze period) when the slab temperature is above the ISP. See "Antifreeze" on page 30. When the slab temperature drops below the ISP, the SMC activates the heating plant Slab and System Pumps to maintain the slab at the ISP temperature. This gives the slab a head start on melting should precipitation occur.

Once the slab heating system is activated, the amount of energy entering the slab is determined by the difference between the temperature of the fluid going to the slab (the Slab Supply temperature) and the temperature of the fluid returning from the slab (the Slab Return temperature). The difference between these two is called the Slab ΔT. The Slab ΔT is different for each slab composition based on the slab design. The higher the Slab ΔT, the more energy is being input to the slab. If the Slab ΔT is set larger than its design ΔT (Max ΔT), the slab itself may be damaged. The SMC provides a maximum Slab ΔT adjustment. This setting protects the slab during the initial warm-up periods. See "Maximum Delta Temperature (Max ΔT)" on page 29.

The slab must be kept above freezing whenever there could be frozen precipitation. As a result, any ice or snow that falls on the slab will melt immediately. If precipitation is allowed to accumulate before heating the slab, an effect called bridging can occur. The snow or ice directly in contact with the slab will melt. But, the snow above will act as an insulator, reflecting the heat back into the slab. The slab itself will have no ice touching its surface, but the remaining accumulation will melt very slowly. To prevent this, the SMC activates the slab heating system whenever the slab temperature falls below the adjustable WWC setting.

On a further drop in slab temperature below the CWC, the control is said to be in CWC Mode. In this mode the SMC stops its heating process. It does this by de-energizing the boiler and System Pump and closing the motorized valve. In addition, it pulses the Slab Pump to prevent the slab and its radiant solution from freezing. See "Antifreeze" on page 30.

The SMC includes several additional features that can be used to protect the plant and slab. The SMC can be used with a Boiler Return Sensor to help reduce boiler thermal shock possibility. Additionally, it is equipped with an Alarm output. This alarm is activated when any sensor fails to read correctly or if the slab was not receiving sufficient heat.



TYPICAL SLAB SENSOR MODE INSTALLATION STEPS

To install and set the control to operate based on the Slab Sensor follow these steps:

- Install the Slab Sensor Base, Dummy Plastic Plug, and conduit before the slab concrete pour. See "Slab Sensor Installation" on page 10.
- Install the SMC control indoors. See "Mounting the Enclosure" on page 9.
- Install and wire the Slab Supply, Slab Return, and the optional Boiler Return Sensor in their wells. See "Water Temperature Sensor Installation" on page 11.
- After the concrete pour and slab installation, replace the Dummy Plastic Plug with the Slab Sensor, making sure to run the cable through the conduit.
- Wire the power to the SMC. But do not power it. See "Wiring the Power" on page 12.
- Wire the SMC outputs to the System and Slab Pumps, Motorized Valve, and Boiler. See "Output Wiring" on page 12.
- Power the SMC.

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- Set the following SMC System Startup settings:
  - Sensor Type = Slab. See "Sensor Type" on page 22.
  - Control Mode = Select "Motorized Valve" if the slab loop is using a 2-way steam motorized valve (and a heat-exchanger) or a 3-way hydronic mixing motorized valve.
    = Select "Boiler" if the slab loop is heated directly by a modulating boiler.
    = Select "Ext. Interface" if the SMC is connected to a Heat-Timer multi-boiler control (Multi-MOD Platinum, Mini-MOD, SQ-Elite, etc..). Then set the EMS 4 and 20mA set points to match the boiler control 4-20mA set points. See "Control Mode" on page 22.
- Suggested starting point for SMC Operating settings:
  - WWC = 38°F. See "Warm Weather Cutoff (WWC)" on page 26.
  - CWC = 10°F or as per engineers criteria. See "Cold Weather Cutoff (CWC)" on page 28.
  - ISP = 34°F or as per engineers criteria. See "Idle Set Point (ISP)" on page 26.
  - Maximum Delta T = As per engineers criteria. See "Maximum Delta Temperature (Max ΔT)" on page 29.
  - Maximum Slab Supply = As per slab design engineer. See "Maximum Slab Supply" on page 29.
  - Minimum Boiler Return = As per boiler manufacturer specifications. See "Minimum Boiler Return" on page 29.
  - Season = Winter. See "Season" on page 26.

⚠ WARNING

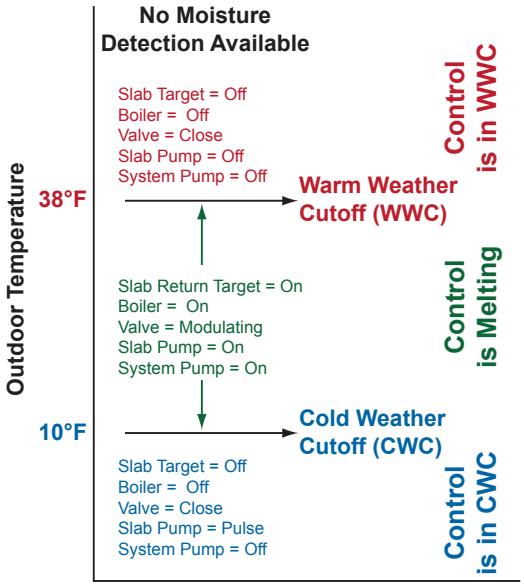
Heat-Timer recommends installing a high-limit control to shutdown the heating system in case of excessive high slab supply temperatures.

OUTDOOR SENSOR OPERATION OVERVIEW

The Snowmelt Control (SMC) is designed to control under slab heating systems to prevent accumulations of ice or snow. Heat-Timer recommends that the Slab Sensor be utilized, but the SMC can be used with an Outdoor Sensor instead in situations where a Slab Sensor installation is difficult. In the Outdoor Sensor Type mode, the SMC monitors three temperatures, the outside temperature, the temperature of the fluid going to the slab (Slab Supply temperature), and the temperature of the fluid returning from the slab (Slab return temperature).

The slab must be kept above freezing whenever there could be frozen precipitation. As a result, any ice or snow that falls on the slab will melt immediately. If precipitation is allowed to accumulate before heating the slab, an effect called bridging can occur. The snow or ice directly in contact with the slab will melt. But, the snow above will act as an insulator, reflecting the heat back into the slab. The slab itself will have no ice touching its surface, but the remaining accumulation will melt very slowly. To prevent this, the SMC activates the slab heating system whenever the outside temperature falls below the adjustable WWC setting.

Once the slab heating system is activated, the amount of energy entering the slab is determined by the difference between the temperature of the fluid going to the slab (the Slab Supply) and the temperature of the fluid returning from the slab (the Slab Return).



The difference between these two is called the Slab ΔT. The Slab ΔT is different for each slab composition based on the slab design. The higher the Slab ΔT, the more energy is being input to the slab. If the Slab ΔT is set larger than its design ΔT (Max ΔT), the slab itself may be damaged. The SMC provides a Maximum Slab ΔT adjustment. This setting protects the slab during the initial warm-up periods. See "Maximum Delta Temperature (Max ΔT)" on page 29.

After the warm-up period, each slab has a heat loss that varies with the outdoor temperature changes. Therefore, a slab might require 130°F fluid temperature at 0°F outdoor temperature to maintain its heat.

However, when the outdoor warms to 15°F, it might require only 100°F fluid temperature circulating. The SMC has a Heating Curve adjustment to insure the slab temperature is sufficiently warm to melt frozen precipitation once the warm-up period has ended. The curve value compensates for the different slab types and different outdoor weather conditions. After making a change in the Heating Curve value, it is necessary to wait at least four hours before assessing the effect it had on slab temperature. See "Heating Curve" on page 26.

TYPICAL OUTDOOR MODE INSTALLATION STEPS

To install and set the control to operate based on the Outdoor Sensor follow these steps:

- Install the SMC control indoors. See "Mounting the Enclosure" on page 9.
- Install and wire the Slab Supply, Slab Return, and the optional Boiler Return Sensor in their wells. See "Water Temperature Sensor Installation" on page 11.
- Install and wire the Outdoor Sensor. See "Outdoor Sensor Installation" on page 11.
- Wire the power to the SMC. But do not turn on circuit breaker. See "Wiring the Power" on page 12..
- Wire the SMC outputs to the System and Slab Pumps, Motorized Valve, and Boiler. See "Output Wiring" on page 12.
- Power the SMC.
- Set the following SMC System Startup settings:
  - Sensor Type = Outdoor. See "Sensor Type" on page 22.
  - Control Mode = Select Motorized Valve if the slab loop is using a 2-way or 3-way motorized valve.
    Select Boiler if the slab loop is heated directly by a modulating boiler.
    Select Ext. Interface if the SMC is connected to a multi-boiler control (Multi-MOD Platinum, Mini-MOD, SQ-Elite, etc..). Then set the EMS 4mA and 20mA set points to match the multi boiler control 4-20mA set points. See "Control Mode" on page 22.
- As a starting point the following SMC Operating settings needs to be set:
  - WWC = 38°F . See "Warm Weather Cutoff (WWC)" on page 26.
  - CWC = 10°F or as per engineers criteria. See "Cold Weather Cutoff (CWC)" on page 28.
  - Maximum Delta T = As per slab design engineer. See "Maximum Delta Temperature (Max ΔT)" on page 29.
  - Maximum Slab Supply = As per slab design engineer . See "Maximum Slab Supply" on page 29.
  - Minimum Boiler Return = As per boiler manufacturer specifications. See "Minimum Boiler Return" on page 29.
  - Season = Winter. See "Season" on page 26.

TYPICAL SNOWMELT PIPING CONFIGURATION

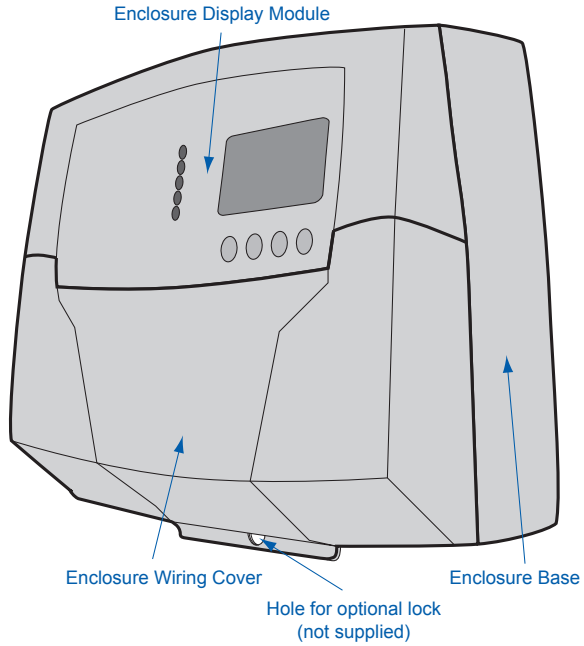
The SMC can regulate the temperature of the anti-freeze/water solution to the slab by one of the following methods:

- Modulate a condensing boiler using voltage or current modulating signal. See "SMC Controlling a Modulating Water Boiler - Piping" on page 42. In this scenario set the following startup settings:
  - ○ Control Mode = Boiler
- Modulate a 3-way motorized valve (Floating, 0-10V, or 4-20mA signal) to mix the hot solution with solution returning from the slab. The solution can be heated either directly using a condensing boiler or indirectly using a heat-exchanger. See "SMC Modulating a 3-Way Motorized Valve - Piping" on page 44 and pg 46. In this scenario set the following startup settings:
  - ○ Control Mode = Motorized Valve
- Modulate a 2-way valve to control the amount of steam entering the steam-to-water heat-exchanger. The temperature of the solution circulating the slab is controlled by a 2-way motorized valve installed on the steam side of the heat-exchanger. See "SMC Modulating a 2-Way Motorized Valve - Piping" on page 48. In this scenario set the following startup settings:
  - ○ Control Mode = Motorized Valve
- Sending a 4-20mA set point to a multi-boiler sequencing control (Multi-MOD Platinum, Mini-MOD, SMC). In this case , all boilers must be of the condensing type. See "SMC Controlling Multi-Boiler Control - Piping" on page 50. In this scenario set the following startup settings:
  - ○ Control Mode = Ext.Interface

MOUNTING THE ENCLOSURE

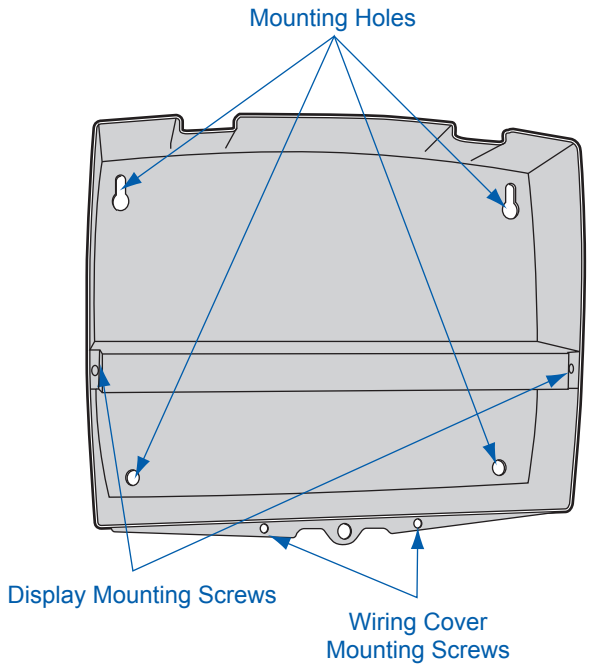
The SMC consists of three primary enclosure components.

- **The Enclosure Display Module:** contains the control electronic board, display, buttons, LEDs, and wiring terminals. It has two screws to hold it to the base. The Program/Run Switch is used to allow settings adjustment. This switch is enclosed with the Enclosure Wiring Cover for security. Wiring terminals are of the plug-in type to ease installation and removal.
- **The Enclosure Base:** contains the holes to mount and hold the control against the wall or any flat surface. All other enclosure components mount on the base. The bottom section of the Enclosure Base contains the wiring chamber with knockouts on the bottom to ease installation.
- **The Enclosure Wiring Cover:** seals the wires from the external environment. It has two screws to hold it to the base and a hole to secure a lock on the wiring enclosure. A plastic web that separates the wiring chamber into high and low volt sections has been provided.
- Select a location near the equipment to be controlled.
- The surface should be flat and sufficiently wide and strong to hold the SMC.
- Keep the control away from extreme heat, cold, or humidity. The ambient operating temperature is from 20 to 120°F.
- Remove the Enclosure Wiring Cover from the control enclosure by removing the two bottom screws.
- Remove the Enclosure Display Module by removing the two middle screws.
- Screw the Enclosure Base to the surface through the upper and lower mounting holes on the back of the enclosure.
- Replace the Enclosure Display Module and replace the two middle screws.
- Before operating the control, remove the battery's plastic tab.
- Do not replace the Enclosure Wiring Cover until all wiring is done.
- When purchasing a padlock for the enclosure, the maximum shank diameter should not exceed ¼"



⚠ WARNING

Use only the provided Enclosure Knockouts. Do not DRILL HOLES THROUGH THE ENCLOSURE, AS IT WILL VOID CONTROL WARRANTY.



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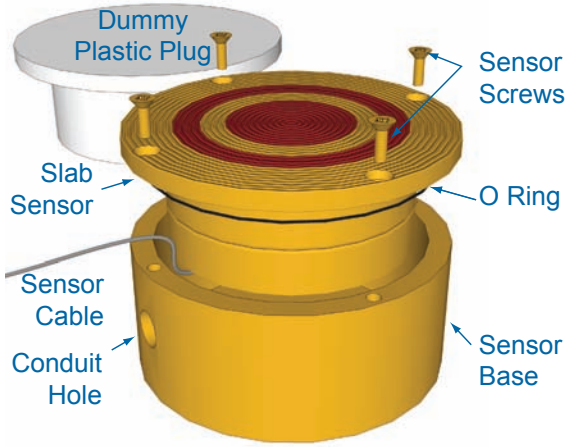
SENSOR INSTALLATION

SLAB SENSOR INSTALLATION

(Used Only when Sensor Type is set to Slab)

- The supplied Slab Sensor is an integral part of the SMC operation. It provides the SMC with the slab temperature and detects precipitation. See "Slab Sensor Operation Overview" on page 4.
- The Sensor consists of the following components:
  - The Brass Slab Sensor with 90 feet of cable
  - The Brass Sensor Base with a conduit hole
  - Dummy Plastic Plug (used to replace the slab sensor during slab installation).
  - Brass mounting screws and O-ring.
- The Brass Slab sensor incorporates a slab temperature sensor, a moisture detection sensor, a slab sensor heater, and a sensor to measure the heater temperature.
- The slab temperature sensor measures the actual slab temperature. The moisture detection sensor measures the moisture connectivity of the precipitation. Both sensors are used by the SMC snow melting logic.
- The slab sensor heater and its temperature sensor are used to melt any precipitation that is in contact with the Slab Sensor. However, its operation has no effect on the slab temperature sensor or the control operation.



⚠ ALERT

The slab sensor base and its conduit must be installed before the slab installation.

Slab Sensor Location Considerations

- When installed, the Slab Sensor must be level. Before the slab installation, support the Sensor Base to level the Dummy Plastic Plug with the finished grade.
- The Slab Sensor (HT #904200-00) should be placed in a location that represents the temperature of the majority of the slab. It should be placed away from any buildings, vents, or other heat sources. Also avoid placing it in a sunny area when most of the slab is in shade, or vice versa.
- An exception to this later rule would be when the sensor location is chosen to prevent snow or ice buildup in a known problem area.
- Run conduit from the sensor location to the panel to house the sensor wires. This will ease servicing the sensor.
- If more than 90 feet of wire is needed to reach the control panel, install a junction box along the way. (Up to 400 ft of 18 AWG 6-conductor wire may be spliced to the supplied wire).
- After the concrete has cured, remove the plug and install the Slab Sensor using the O-ring and screws provided.
- Do not pull all the sensor cable from the Sensor Base. Leave an additional 6-12" of sensor cable in the socket Base to ease servicing the sensor.

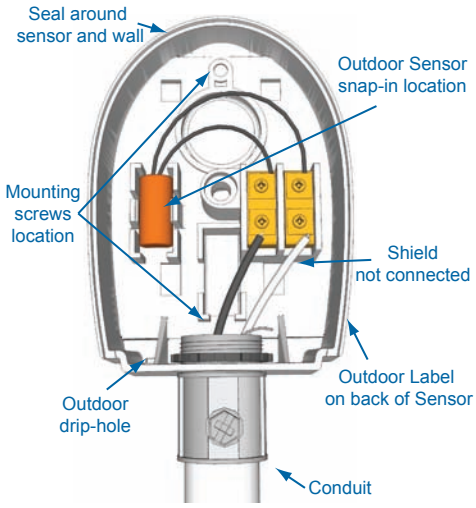
⚠ WARNING

The Slab Sensor is located outdoors and is likely to become covered with dirt that will adversely affect the sensor's moisture detection sensitivity. Therefore, it is important to periodically clean the sensor surface.

OUTDOOR SENSOR INSTALLATION

(Used Only when Sensor Type is set to Outdoor)

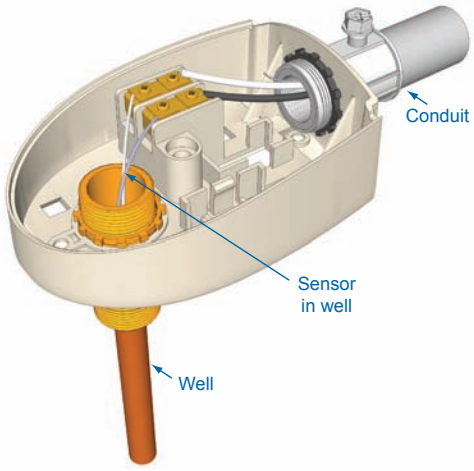
- The SMC does not come with the Outdoor Sensor (HT# 904220-00). It must be ordered separately. See "Outdoor Sensor Operation Overview" on page 6.
- Locate the sensor in the shade on the north side of the building.
- The sensor should never be in direct sunlight. Be sure the location is away from any possible heat or cool sources.
- The sensor should be mounted approximately 10' feet above ground.
- Adhere the Outdoor Label provided to the back of the sensor base.
- Use the Enclosure Base bottom knockout for the conduit. Use the locknut to hold the conduit and enclosure base together.
- The sensor wires can be extended up to 500' using 18 AWG 2-conductor shielded cable (HT# 703001-01).
- Do not connect the shield at the sensor end. However, connect the shield at the control using terminal 17.

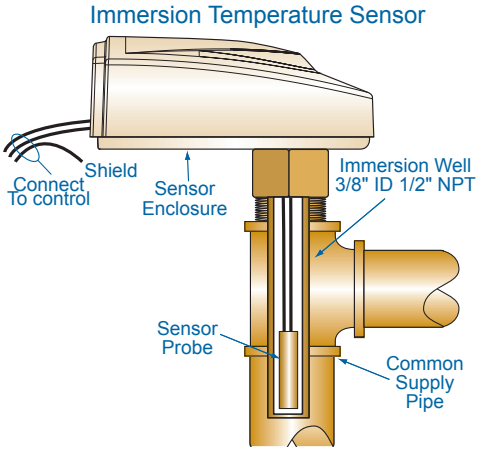


WATER TEMPERATURE SENSOR INSTALLATION

Slab Supply and Return Sensors

- The provided Slab Supply and Return sensors (HT# 904250) must be inserted in the provided wells (1/2"NPT, 3/8" I.D) (HT# 904011-00). The wells must be inserted in the pipe where it will be in fluid flow .
- Make sure the supply sensor is installed approximately ten feet of pipe downstream from the heat source to avoid temperature fluctuations.
- The slab return sensor can be installed in any convenient location where the anti-freeze solution has returned from all the slab branches.
- The sensor wires can be extended up to 500' using 18 AWG 2-conductor shielded cable (HT# 703001-01).
- Do not connect the shields at the sensors' ends. However, connect them to SMC terminals 27 and 29.





Boiler Return Sensor

- To help prevent thermal shock stress to the boiler, use the Boiler Return Sensor. The SMC can function without this sensor. However, when used in a Motorized Valve application, it prevents the boiler return from dropping below the Minimum Boiler Return setting. It does this by modulating the valve partially closed. See "Minimum Boiler Return" on page 29.

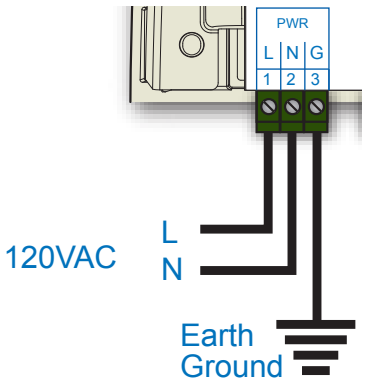
- This sensor should be an immersion type sensor (HT# 904250-00 or #904220-00). It must be inserted in a well (1/2"NPT, 3/8" I.D.) (HT# 904011-00). Both the sensor and the well must be ordered separately.
- The Boiler Return Sensor should be located after all the returns to the boiler merge.
- The sensor wires can be extended up to 500' using 18 AWG 2-conductor shielded cable (HT# 703001-01).
- Do not connect the shield at the sensor. However, connect it to SMC terminal 31.

⚠ WARNING
Class 1 voltage wires (low voltage) must use a different knockout, conduit, and path from any Class 2 voltage wires (high voltage).

WIRING THE POWER

Terminals (1) through (3)

- If possible, provide a dedicated circuit breaker for the SMC. Make sure not to connect the SMC to a circuit breaker shared with high inductance devices such as relays, pumps, fans, or motors.
- Bring the 120 VAC 60 Hz power wires through the enclosure left bottom knockout.
- Connect the hot line to terminal 1 (*L).*
- Connect the neutral line to the terminal 2 (*N)*.
- Connect the ground to Earth ground terminal 3 (*G)*. Do not use the neutral line as a ground.
- Heat-Timer recommends the installation of a Surge Suppressor and a Power Switch before the Power Line connection for safety and ease of service.



OUTPUT WIRING

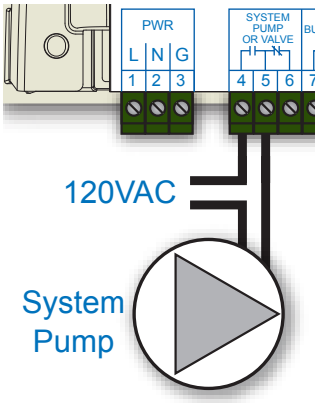
- The SMC outputs do not source any power. If power is needed to a specific output, a separate power source must be wired in series with the output.
- Each of the output relays can switch a 6A resistive load at 120 VAC or a 1A inductive load at 120 VAC.
- Each of the output relays has a LED to represent its status.

⚠ WARNING
Each of the pump relays can operate a maximum of ¼ HP pump. If a larger HP pump is used, use a pump starter.

⚠ ALERT
Output relays do not source any power.. A separate power source must be used when needed.

WIRING SYSTEM PUMP AND SLAB PUMP

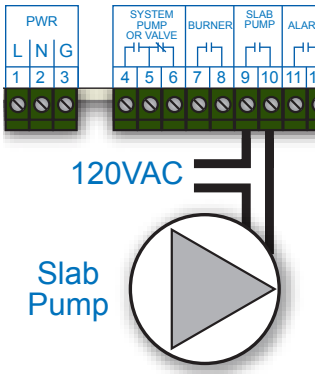
- The Slab Pump is designed to circulate the water/antifreeze solution through the slab radiant tubing.
- The System Pump circulates the boiler water through the boiler loop.
- A separate power source must be used to power each of the pumps. Use the relay to make or break the power to the HOT (Line) connection to the pump.
- The Slab Pump output has a Normally Open relay output.
- The System Pump output has a Normally Open (N.O.) and a Normally Close (N.C.) outputs. Use the (N.O.) relay output to operate the pump.



System Output Operation

System Pump Terminals (4) and (5)

- Whenever the SMC operates the boiler or the motorized valve, it activates the System output. See "Slab Sensor Operation Overview" on page 4 and "Outdoor Sensor Operation Overview" on page 6.
- After the SMC turns the boiler off or fully closes the motorized valve, it keeps the System Pump energized for the Run-On period. The Run-On period helps protect the boiler from reaching its limits by transferring its energy into the system.



Slab Output Operation without Precipitation

Slab Pump Terminals (9) and (10)

- In Idle Mode, the SMC shall intermittently energize the Slab Pump relay. It does this by energizing the pump for 15 seconds for every Antifreeze time setting. See "Antifreeze" on page 30.
- Whenever the slab temperature drops to or below the ISP, the SMC shall energize the Slab Pump relay to maintain the ISP.
- Whenever the slab temperature drops to or below the CWC setting, the SMC shall energize the Slab Pump relay for 15 seconds for every Antifreeze period setting. This reduces the possibility of freezing.

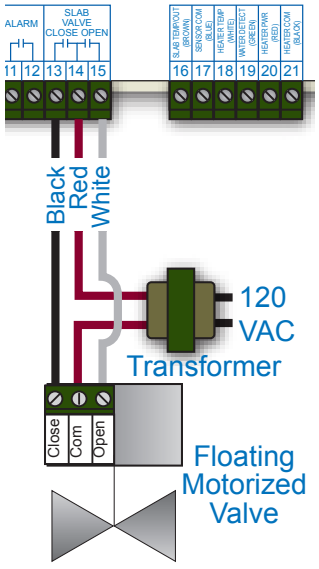
Slab Output Operation with Precipitation

- Whenever the slab temperature drops to or below the WWC setting, the SMC shall energize the Slab Pump relay to maintain the WWC during the melting period.

WIRING TO A FLOATING MOTORIZED VALVE

(Requires System Startup Control Mode to be set to Motorized Valve)
Terminals (13) through (15)

- The SMC is capable of modulating a floating motorized valve.
- In this case use the SMC output terminal 14 as the Common. Wire it to the 24 VAC power source (transformer).
- Connect the transformer's other wire to the actuator Common terminal.
- Wire output terminal 13 on the SMC to the actuator Close terminal.
- Wire output terminal 15 on the SMC to the actuator Open terminal.
- The transformer is the motorized valve power source.



WIRING TO A MODULATING MOTORIZED VALVE

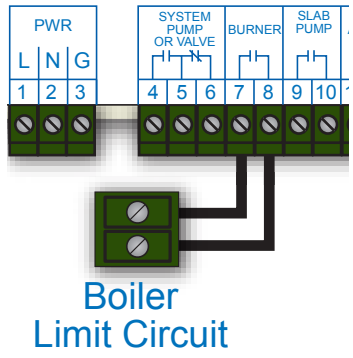
(Requires System Startup Control Mode to be set to Motorized Valve)

- The SMC is capable of operating a current or voltage modulating motorized valve.
- When operating a 0-10V modulating motorized valve use the SMC 0-10V Output terminals 22 and 23. See "0-10V Modulating Boiler or Valve Wiring" on page 14.
- When operating a 4-20mA modulating motorized valve use the SMC 4-20mA Output terminals 24 and 25. See "4-20mA Modulating Boiler or Valve Wiring" on page 14.

WIRING TO AN ON/OFF BOILER

Burner Terminals (7) and (8)

- When in Motorized Valve Control Mode, the SMC is designed to activate a boiler. The boiler can be either an On/Off or a modulating.
- In On/Off Boiler mode, the boiler will operate based on its own internal limits. Wire the burner limit in series with the SMC terminals 7 and 8.
- Some modulating boilers (Control Mode set to Boiler) require the use of terminals 7 and 8 as an activation. In this case, wire them in series with the boiler limit.



WIRING TO A MODULATING BOILER

(Requires System Startup Control Mode to be set to Boiler)

- One of the SMC Control Modes is designed to modulate a single boiler. In this option it can modulate either a 0-10V boiler or 4-20mA boiler.
- Some modulating boilers may require an activation signal in addition to the modulating output. In this case, wire the SMC Burner output terminals to the boiler activation.

⚠ WARNING

To avoid control or equipment damage, make sure to match the boiler modulating input signal to the control's modulating output signal.

0-10V Modulating Boiler or Valve Wiring

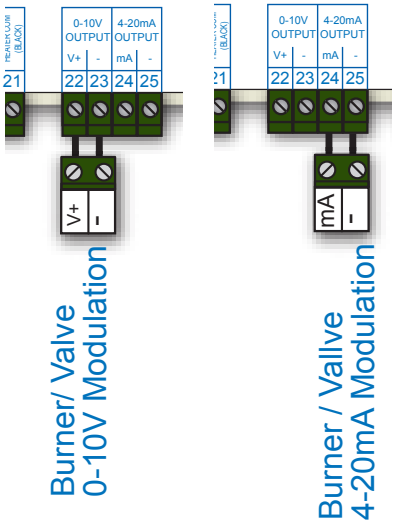
Terminals (22) and (23)

- Wire the boiler or valve (V or +) terminal to the SMC terminal 22 (V+).
- Wire the boiler or valve (-) terminal to the SMC terminal 23 (-).

4-20mA Modulating Boiler or Valve Wiring

Terminals (24) and (25)

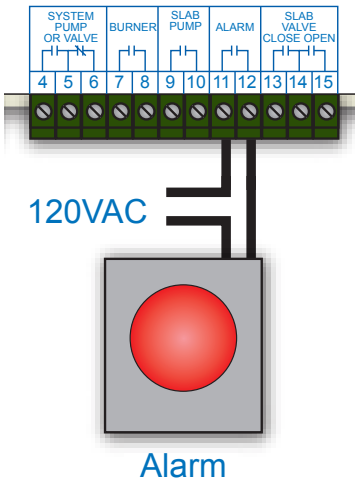
- Wire the boiler or valve (+) terminal to the SMC terminal 24 (mA).
- Wire the boiler or valve (-) terminal to the SMC terminal 25 (-).



WIRING ALARM OUTPUT TO VISUAL/AUDIO ALARM

Terminals (11) and (12)

- The SMC is designed to enable the Alarm output whenever any of the sensors fail or the heating system fails. See "Alarm List" on page 36.
- The Alarm output terminals do not source any power. A separate power source must be supplied.
- Connect the Alarm relay output to any type of alarm. An optional Heat-Timer Vis-U-Larm (visual audio alarm (HT #925011-00)) can be used. It has both a Red Alarm light and a sound alarm.
- The SMC's alarm output is capable of switching 1A Inductive, 6A Resistive at 120VAC.



WIRING ALARM OUTPUT TO BMS

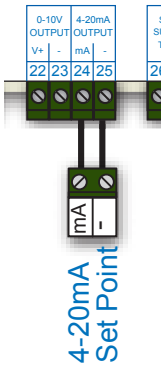
Terminals (11) and (12)

- The SMC is designed to enable the Alarm output whenever any of the sensors fail or the heating system fails. This output can be connected to a Building management System (BMS) to enable remote alarming and reporting.
- The Alarm output terminals do not source any power.
- Connect the SMC Alarm output to a dry-contact BMS alarm input.

WIRING TO 4-20MA REMOTE SET POINT

(Requires System Startup Control Mode to be set to Ext. Interface)
Terminals (24) and (25)

- One of the SMC Control Modes is designed to provide a 4-20mA remote temperature set point. This set point can be used by a multi-boiler control (Mini-MOD, SQ-Elite, Multi-MOD Platinum, HWRQ Platinum) to operate multiple modulating or staging boilers.
- Wire the SMC terminal 24 (mA) to the multi-boiler control's (+) terminal.
- Wire the SMC terminal 25 (-) to the multi-boiler control's (-) terminal.



INPUT WIRING

- All of the SMC's inputs are either sensors or dry-contact. Do not connect any power to the input terminals as it may damage the input.

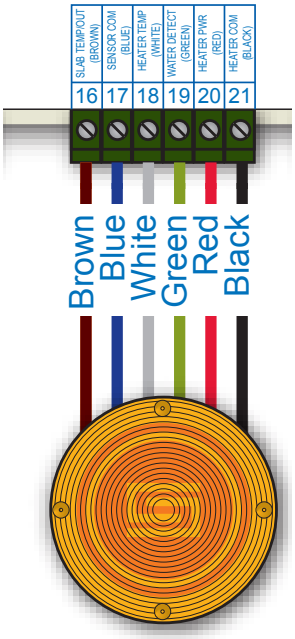
⚠ WARNING
Class 1 voltages wires (low voltage) must use a different knockout, conduit, and path from any Class 2 voltage wires (high voltage).

WIRING THE SLAB SENSOR

(Used when System Startup Sensor Type is set to Slab)
Terminals (16) through (21)

- The Slab Sensor is designed to measure the slab temperature and detect precipitation. See "Slab Sensor Installation" on page 10.
- The sensor wires can be extended with an additional 400' of 6-conductor cable.
- The Brown sensor wire connects to terminal 16 and Blue sensor wire connects to terminal 17. Both wires read the slab temperature.
- The White sensor wire connects to terminal 18 and Blue sensor wire connects to terminal 17. Both wires read the temperature of the slab heater. Its Ohm reading should be close to the temperature read on the Slab Temp display when control is in Melting or Idling stages.
- The Green sensor wire connects to terminal 19 and Blue sensor wire connects to terminal 17. Both wires detect precipitation.
- The Red sensor wire connects to terminal 20 and Black sensor wire connects to terminal 21. Both wires are the sensor heater power. This heater protect the sensor from freezing.

⚠ ALERT
Make sure that the sensor surface is clean to provide accurate precipitation readings and control operation. Periodic inspection and cleaning is recommended.



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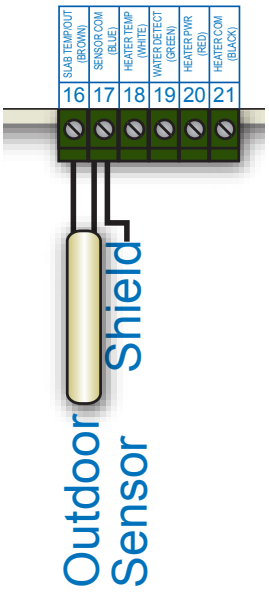
WIRING THE OUTDOOR SENSOR

(Used when System Startup Sensor Type is set to Outdoor)
Terminals (16) and (17)

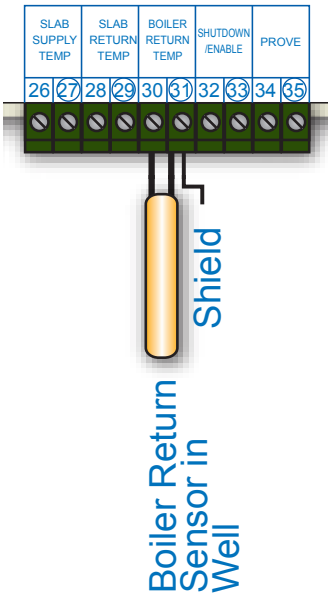
- The Outdoor Sensor is used only when it is difficult to use a Slab Sensor. See "Outdoor Sensor Installation" on page 11.
- You can extend the sensor wires up to 500' by splicing it with 2-conductor 18AWG shielded cable (Belden #8760 or equivalent).
- Temperature sensor wires have no polarity. Connect the sensor wires to the SMC's terminal 16 (Slab Temp/Out/Brown) and terminal 17 (Sensor Com/ Blue).
- Connect the shield to terminal 17 with one of the sensor wires. Do not connect the shield at the sensor.



WIRING THE BOILER RETURN SENSOR

(Available in Motorized Valve Control Mode Only)
Terminals (30) and (31)

- The use of the Boiler Return to help protect the boiler from condensation and thermal shock is optional. A Heat-Timer temperature sensor (HT #904250-00 or HT# 904220-00) immersed in a 3/8 ID well (HT# 904011-00) is required. Both the sensor and well must be purchased separately. See "Boiler Return Sensor" on page 11.
- If the Boiler Return Sensor is connected, the SMC will display its temperature during melting and below the ISP temperature.
- If the Boiler Return Sensor value was below the Minimum Return, the SMC will modulate the motorized valve to increase the return temperature.
- The sensor wires can be extended up to 500' using 2-conductor 18AWG shielded cable (Belden #8760 or equivalent).
- Temperature sensors have no polarity. Connect the sensor wires to the SMC's terminals 30 and 31.
- Connect the shield to the circled terminal 31 with one of the sensor wires. Do not connect the shield at the sensor.

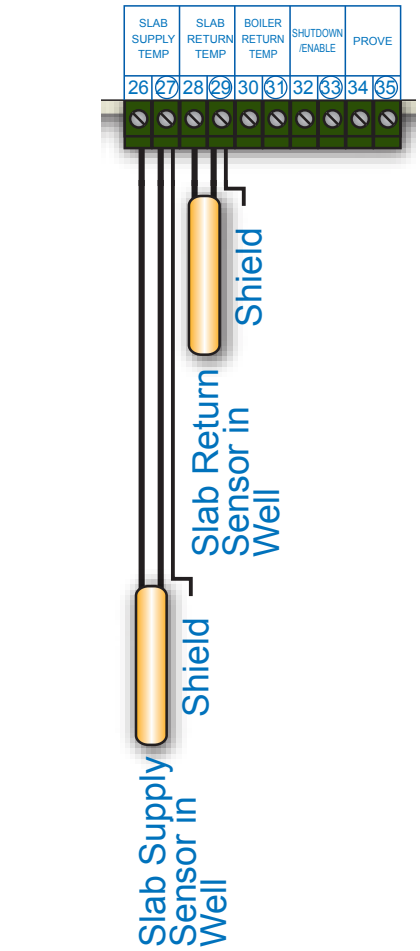


WIRING THE SLAB SUPPLY AND RETURN SENSORS

Slab Supply Terminals (26)and (27)
Slab Return Terminals (28) and (29)

- The SMC is designed to use the Slab Supply and Slab Return Temperature Sensors to calculate the energy put into the slab.
- Each sensor must be immersed in a 3/8 ID well (HT #904011-00). Both Sensors and their wells are supplied with the SMC.
- You can extend the sensor wires up to 500' by splicing it with 2-conductor 18AWG shielded cable (Belden #8760 or equivalent).
- Connect the Slab Supply sensor wires to the SMC 26 and 27 terminals.
- Connect the shield to the circled terminal 27 with one of the sensor wires. Do not connect it to the sensor.

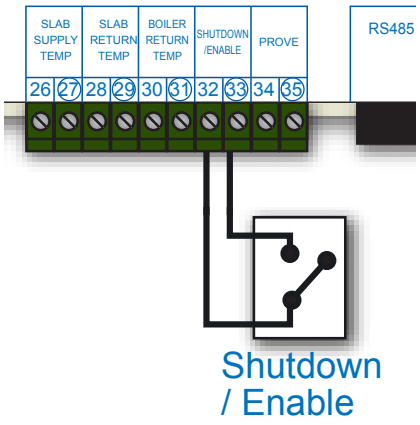
- Connect the Slab Return sensor wires to the SMC 28 and 29 terminals.
- Connect the shield to the circled terminal 29 with one of the sensor wires. Do not connect it at the sensor.



WIRING THE SHUTDOWN / ENABLE

Terminals (32) and (33)

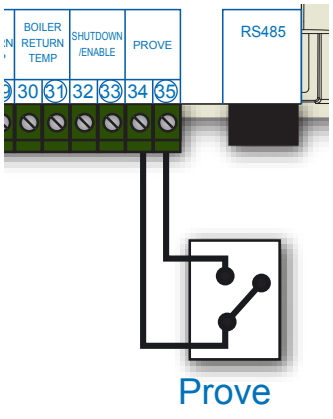
- These input terminals are used as a Shutdown or an Enable signal inputs. Their function varies depending on the Startup Menu External Input option selected. See "External Input" on page 22.
- The signal provided must be a dry contact input. No voltage can be placed across these terminals.
- The Shutdown feature can be used whenever it is desirable to turn off the SMC from a remote location or another controller by shorting the terminals.
- The Enable feature can be used whenever it is desirable to turn on the SMC from a remote location or another controller by shorting the terminals.
- The SMC shall close the motorized valve and de-energize the boiler output when the Shutdown is activated or the Enable is de-activated. The System Pump and slab pump relays will remain energized for the Run-On delay period and then turn off.
- Bring the two dry contact wires to the SMC 32 and 33 terminals.



WIRING THE PROVE

Terminals (34) and (35)

- The Prove feature is provided to check system component operation. It can be used to check on the combustion air damper or the system pump flow before energizing the boiler or opening the valve.
- If the Prove input is open, the SMC will enable only the System Output. The Burner output will be off and the motorized valve will be closed.
- A factory-installed jumper acts as the system prove signal. Do not remove the jumper unless it is replaced by a System Prove signal.
- Bring the two wires from the dry contact to the Prove 34 and 35 terminals. No voltage can be placed across the Prove terminals.



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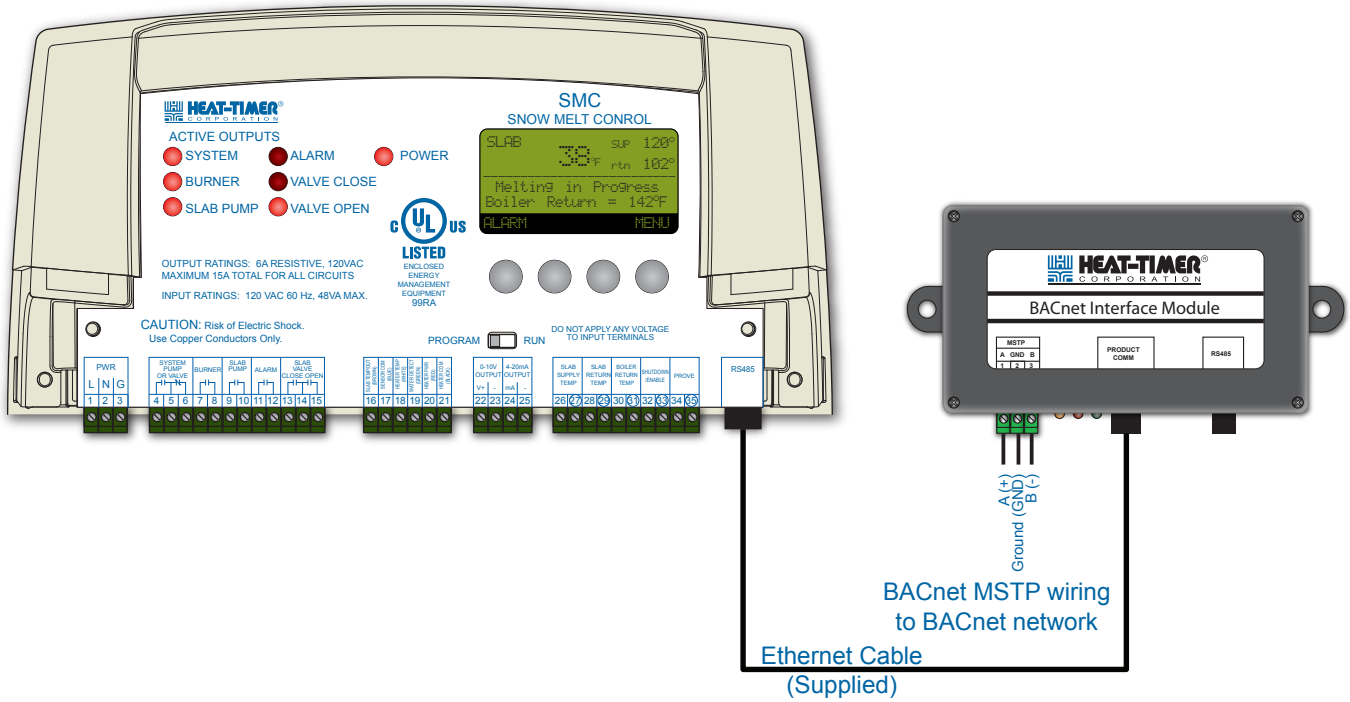
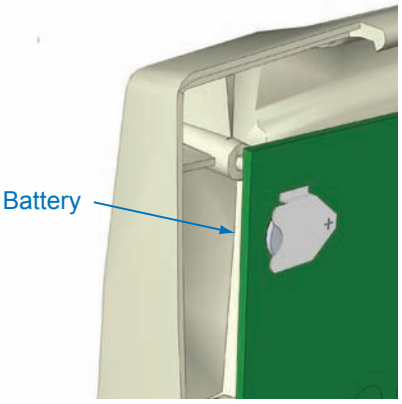
WIRING TO BACNET MSTP

- For the SMC to communicate over the BACnet MSTP network, the use of the BACnet Interface Module is required. The BACnet Interface Module must be ordered separately (HT# 926781-00).
- Connect the provided CAT-5 cable to both the BACnet Interface Module (Product Comm Ethernet port) and the SMC's (RS485 port). The BACnet Interface Module is powered through the control. See BACnet Interface Module Manual for BACnet setup.



ACTIVATE THE BATTERY

- The coin Lithium battery (CR2032) (HT# 020002-00) is on the back on the display module. It enables the control to maintain the clock time for up to 100 days of power outage. The clock is used in many aspects of the control operation including maintaining a 24-hour history of every sensor.
- To activate the battery, first disconnect the control power.
- Unscrew and remove the Enclosure Display Module to reveal the back of the control CPU Board.
- Remove the plastic tab that covers the battery to allow the battery holder contacts to touch the battery.



⚠ ALERT

Do not activate the battery unless you plan to keep the control continuously powered. If the control has no power, the battery will lose its charge in 100 days.

DISPLAY AND BUTTONS

Display

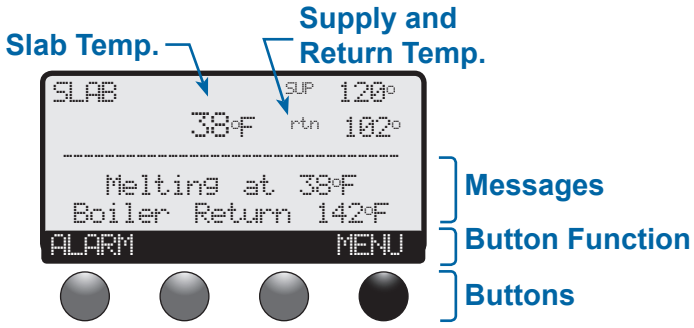
The SMC display layout provides information that gives an immediate picture of the operation status. All the information is brightly displayed. It can be viewed in virtually any light.

- Each of the button functions is presented on the bottom of the display.
- The area above the button function displays messages about the control operation. In normal operation it displays the current operating mode, sensor failures, and boiler return or boiler modulation percent.
- The display top area shows the critical sensor temperatures.

Buttons

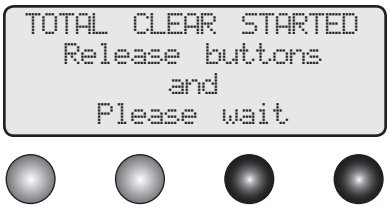
Each of the button functions vary based on the current screen. See the Button Function Table below.

BUTTON	Left	◄ or ▲	▼ or ►	Right
Default	**ALARM** Blinks when an Alarm is active. Otherwise, does not function	Has no function		**MENU** Enters the menu
Menu	**BACK** Goes back one menu step	▲ ▼ Scrolls up or down the menu		**SELECT** Selects the current menu item
Setting	**BACK** Goes back one menu step	▲ ▼ Increases or decreases the current setting value.		**SAVE** Saves the current setting
Alarm Menu	**BACK** Goes back to default screen	**▲ACKNOWLEDGE▲**		**OK** Goes back to default screen
History	**BACK** Goes back to one menu step	◄ ► Scrolls to a specific point in time		**NEXT** Goes to the next sensor history



SETTING THE CONTROL TO FACTORY DEFAULTS

To Reset the SMC control to its original factory defaults, power down the control. Hold down the two right most buttons while powering the control back up until the TOTAL CLEAR STARTED screen appears. The Display will direct you to the Startup menu to program the control to select the operating modes.



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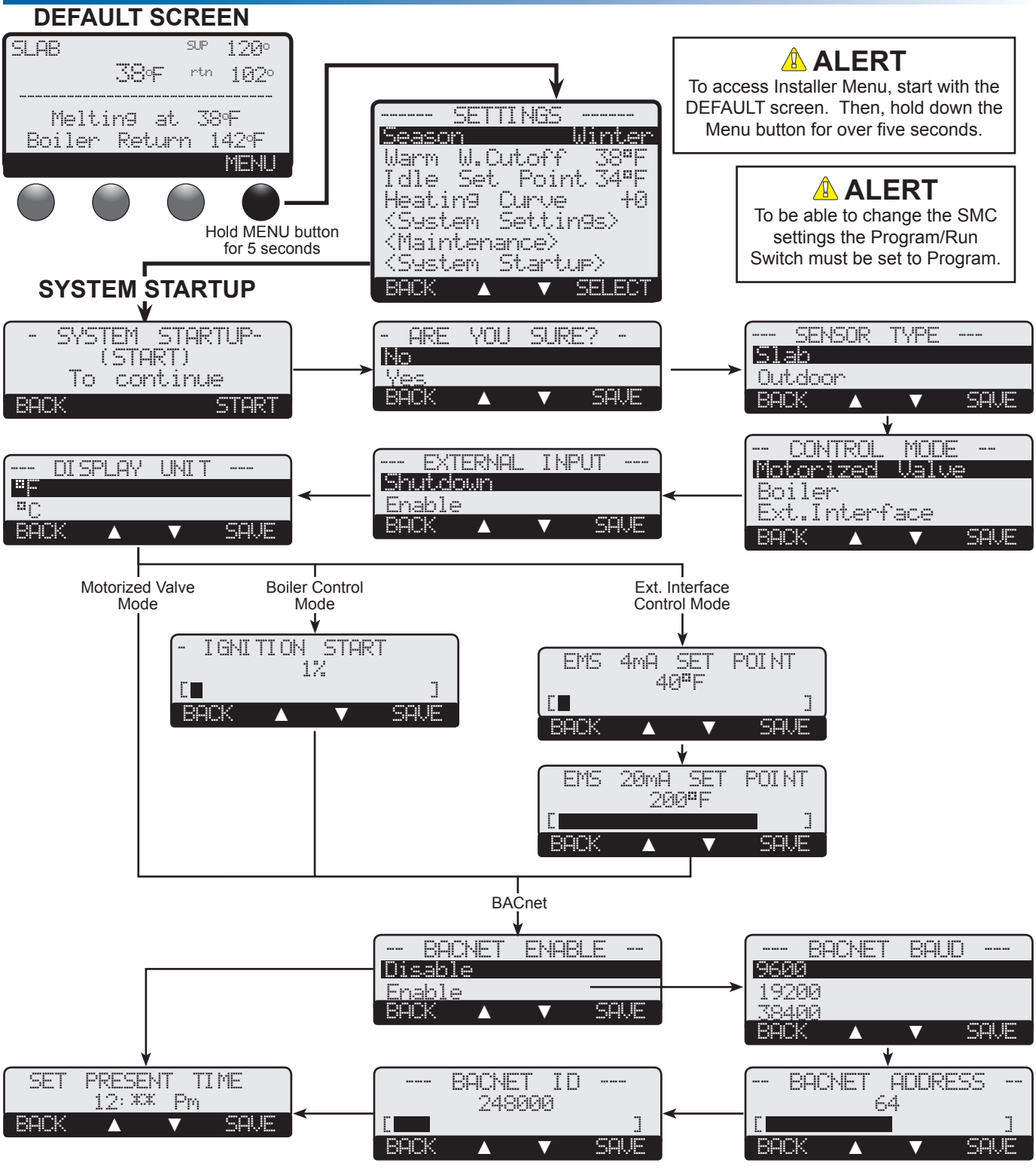
DISPLAY MESSAGES

- Cold-Weather Cutoff — The slab temperature is at or below the CWC setting. "Cold Weather Cutoff (CWC)" on page 28.
- Heating Disable — The External Input option is set to Enable and terminals 32 and 33 are open. "External Input" on page 22.
- Hold Boil.Rtn. 140°F — The Boiler Return Sensor reading dropped below the Minimum Boiler Return. The SMC closes the valve to increase the boiler return temperature. "Minimum Boiler Return" on page 29.
- Hold Idle at 34°F — The slab temperature is below the ISP. The SMC modulates the outputs to maintain the slab at 34°F. "Idle Set Point (ISP)" on page 26.
- Idle State — The slab temperature is between the WWC and the ISP with no precipitation or moisture detected. "Slab Sensor Operation Overview" on page 4.
- Interface Module Err — The BACnet Interface Module is not communicating to the BAcnet network.
- Melting at 38°F — Moisture has been detected. The control is increasing the Slab temperature to 38°F. "Slab Sensor Operation Overview" on page 4.
- Outdoor Snr.Failure — In Outdoor Sensor Mode, the Outdoor Sensor is reading Open or Short (---).
- Shutdown Active — The External Input option is set to Shutdown and terminals 32 and 33 are Shorted. See "External Input" on page 22.
- Slab Heater Failure — The Slab Sensor wiring is not correct or the sensor is damaged.
- Slab Rtn.Target=120°F — In Outdoor Sensor Mode, the Slab Return Temperature is below the Return Target during the melting period.
- Slab Snr.Failure — In Slab Sensor Mode, the Slab Sensor temperature is reading Open or Short (---).
- Summer — The Season is set to Summer. No output is activate. See "Season" on page 26.
- SYS Prove.Failure — The Prove input was not shorted (terminals 34 and 35). "Wiring the Prove" on page 17.
- Waiting for SYS Prove — The Prove input was shorted and then opened during boiler call (terminals 34 and 35). "Wiring the Prove" on page 17.
- Warm Weather Cutoff — The slab temperature is above the WWC setting. No output is activate. "Slab Sensor Operation Overview" on page 4

SYSTEM STARTUP MENUS

Available for Installers Only



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SYSTEM STARTUP

Available for Installers Only

Hold MENU Button: *<Settings>/<System Startup>*

- This menu can be accessed on the first power up or from the default screen by holding down the Menu button for five seconds.
- When powered, the SMC performs a self diagnostics-test.
- On the first power up, the System Startup screen will appear after the initialization is complete. If it doesn't, the SMC has already been configured.
- The System Startup menu sets the main operating modes that apply to the application. These settings must be set by the installer.

PROGRAM SWITCH SETTING

PROGRAM  RUN

To be able to change the SMC settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security.

SENSOR TYPE

Slab, Outdoor ***Default: Slab***

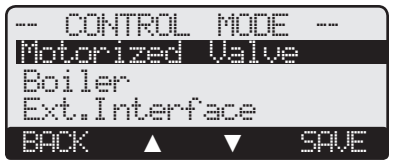
Hold MENU Button: *<Settings>/<System Startup>/..../Sensor Type*

- If Slab is selected, the SMC shall use the Slab sensor logic and measure the slab temperature and detect precipitation. See "Slab Sensor Operation Overview" on page 4.
- If Outdoor is selected, the SMC shall use the Outdoor temperature as the snow melting guide. See "Outdoor Sensor Operation Overview" on page 6.

CONTROL MODE

Motorized Valve, Boiler, Ext. Interface ***Default: Motorized Valve***

Hold MENU Button: *<Settings>/<System Startup>/..../Sensor Type/Control Mode*

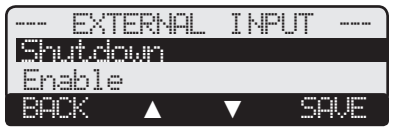


- The SMC offers three different methods to control the slab heating. See "Typical Snowmelt Piping Configuration" on page 8.
- The Motorized Valve option controls a floating or modulating (0-10V or 4-20mA) motorized valve. The valve can be a 3-way on the slab loop or a 2-way controlling steam to a shell-and-tube heat-exchanger.
- The Boiler option operates a 4-20mA or a 0-10V modulating boiler. This option targets installations using condensing boilers.
- The Ext. Interface option sends a 4-20mA signal as a slab target temperature to a multi-boiler control (Multi-MOD Platinum, Mini-MOD, or equivalent). This option will enable the 4mA and 20mA temperature setting menu.

EXTERNAL INPUT

Shutdown, Enable ***Default: Shutdown***

Hold MENU Button: *<Settings>/<System Startup>/..../Control Mode/ External Input*



- This menu determines the function of terminals 32 and 33. See "Wiring the Shutdown / Enable" on page 17.

- Shutdown can be used to turn off the control operation remotely or with a switch. It can be used during maintenance periods. If selected, closing the Shutdown terminals will disable all outputs. Note that the Slab Pump and System Pump shall de-energize after the Run-on period ends.
- Enable can be used to turn on the control operation remotely or with a switch. If Enable is selected, opening these terminals will disable all outputs. Note that the Slab Pump and System Pump shall de-energize after the Run-on period ends.

DISPLAY UNIT

°F, °C ***Default: °F***

Hold MENU Button: *<Settings>/<System Startup>/..../Control Mode/ External Input/Display Unit*

- This option allows you to change the sensors' display and all temperature settings standard between Fahrenheit and Celsius.

IGNITION START

Available Only when Boiler is the Control Mode

Adjustable from 1% to 50% ***Default: 1%***

Button: *<Settings>/<System Startup>/..../External Input/Display Unit/Ignition Start*

- The Ignition Start is the percent modulation that must be attained before the boiler can be activated. For most modern power draft boilers, the Ignition Point should be set at 1%. Older boilers or atmospheric units may require the modulating fuel valve to open from 20% to 50% before proper ignition can be attained. See boiler manufacturer recommendations.

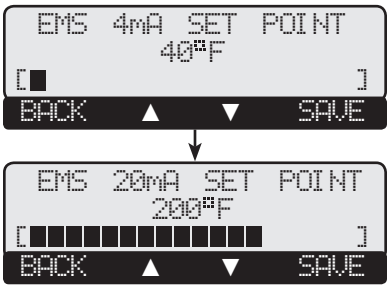
EMS 4MA AND 20MA SET POINT

Available Only when Ext. Interface is the Control Mode

4mA adjustable from 40°F/4°C to 200°F/93°C ***Default: 40°F/4°C***

20mA adjustable from 40°F/4°C to 200°F/93°C ***Default: 200°F/93°C***

Hold MENU Button: *<Settings>/<System Startup>/..../Ignition Start/EMS 4mA Set Point*



- The EMS 4mA and 20mA Set Points are the two temperature extremes the control will send to the multi-boiler control's (Multi-MOD Platinum, Mini-MOD, or equivalent).
- Each of the set points must match the multi-boiler control's temperature and mA range.

SET PRESENT TIME

Hold MENU Button: *<Settings>/<System Startup>/..../Set present Time*

- The control time is used to chart sensor history.
- The control has a coin Lithium battery (CR2032) (HT# 020002-00) that is used to maintain the control's time during power outages. This battery can maintain the clock for up to a total of 100 days. See "Activate the Battery" on page 18.

BACNET COMMUNICATION

Available for Installers Only

- The SMC control can be configured to communicate over BACnet MSTP. A BACnet Interface Module is required and must be ordered separately (HT# 926781-00).
- See "BACnet Variable List" on page 37

BACNET OPTION

None, MSTP ***Default: None***

Hold MENU Button: *<Settings>/<System Startup>/..../Ignition Start/BACnet Option*

- The BACnet MSTP connects to the BACnet network using RS485.

BACNET MSTP SETTINGS

(Available Only when BACnet Enable is selected)

BACNET BAUD

9600, 19200, 38400 ***Default: 19200***

Hold MENU Button: *<Settings>/<System Startup>/..../BACnet Option/BACnet Baud*

- For the control to communicate over a BACnet MSTP network, it must use the same Baud rate as the rest of the network.

BACNET ADDRESS

From 1 to 127 ***Default: 64***

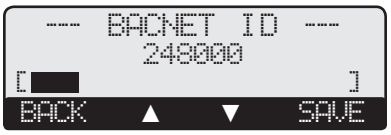
Hold MENU Button: *<Settings>/<System Startup>/..../BACnet Baud/BACnet Address*

- Each device on the MSTP network must have a unique address.

BACNET ID

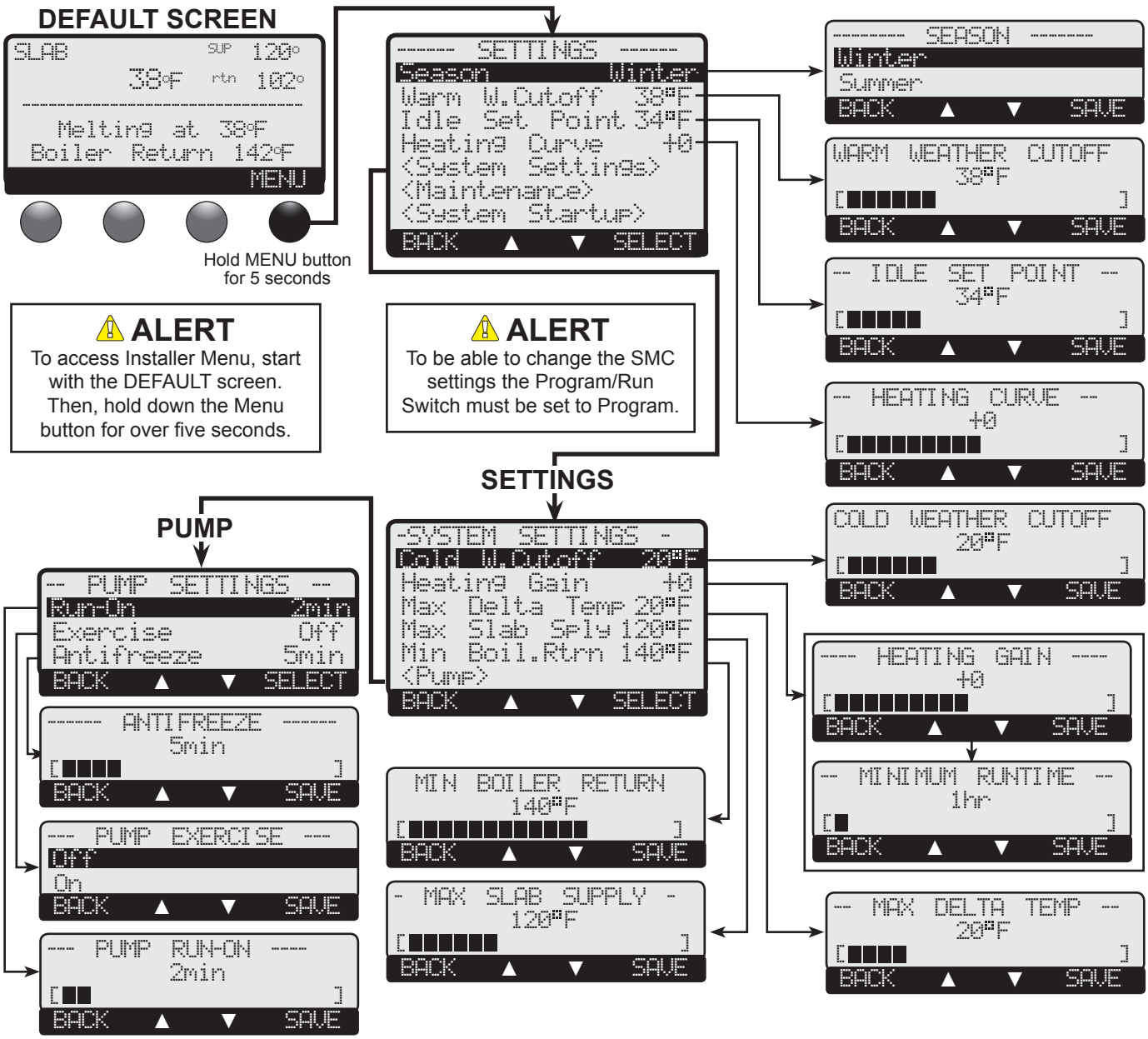
(Available Only when MSTP is selected)

Hold MENU Button: *<Settings>/<System Startup>/..../BACnet Address/BACnet ID*



- The BACnet ID is a unique 32 bit number that identifies the control within the BACnet network. No two ID shall be the same even if dealing across networks.
- It must be provided by the BACnet Network Administrator.

OPERATING MENUS
Available for Installers Only



OPERATING SETTINGS

Available for Installers Only

Hold MENU Button: *<Settings>/*

- The operating menus are for adjusting and fine-tuning the system for enhanced operation and more fuel savings. Different Startup Menu options will offer different Operating menus.
- This menu can be accessed from the default screen by holding down the Menu button for five seconds.

PROGRAM SWITCH SETTING

To be able to change the SMC settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security.

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SEASON

Summer, Winter ***Default: Winter***

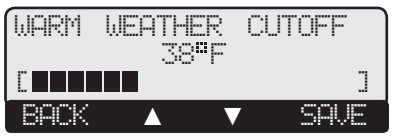
Hold MENU Button: *<Settings>/Season*

- The Season setting controls whether the SMC heats the slab. When set to Summer, the SMC does not provide any heat to the slab. When set to Winter, the SMC shall heat the slab whenever necessary.
- Set the control to Winter mode during the heating season.
- When the heating season is over, it is a good practice to switch the control to Summer to preserve the control battery life.

WARM WEATHER CUTOFF (WWC)

Adjustable from 34°F/1°C to 44°F/7°C ***Default: 38°F/3°C***

Hold MENU Button: *<Settings>/Warm W. Cutoff*



- The WWC is the slab heating upper limit. When the Sensor Type is set to Slab, the WWC is measured by the Slab Sensor. See "Sensor Type" on page 22. If the slab temperature rises higher than the WWC, heating will not begin even when moisture is detected.
- When the slab temperature falls below the WWC, the heating system will hold the slab at the ISP temperature until moisture is detected. A ±1F° differential is included in the WWC. This means that if the WWC is set for 38°F, the slab temperature must fall to 37°F before the heating system is activated. The heating system will remain activated until the slab temperature reaches 39°F.
- Once moisture has been detected and the slab temperature is below the WWC, melting begins. At this point, the WWC will serve as the set point at which the slab temperature will be held. Using the previous example, once a melting cycle has begun, the SMC will maintain the slab at 38° until the moisture is evaporated, or the minimum run time is exceeded, whichever comes last.
- When Outdoor is selected as the Sensor Type, the WWC is measured by the Outdoor Sensor. See "Sensor Type" on page 22. When the outdoor temperature falls below the WWC then the heating system will hold the slab return temperature at the slab return calculated target.

IDLE SET POINT (ISP)

Available Only when Slab is the Sensor Type

Adjustable from 20°F/-7°C to 44°F/7°C, and Off ***Default: 34°F/1°C***

Hold MENU Button: *<Settings>/Idle Set Point*

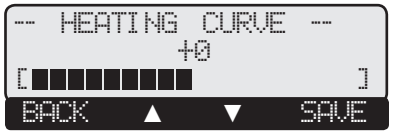
- The ISP is the temperature at which the slab will be held whenever the SMC is in Idle Mode. See "Slab Sensor Operation Overview" on page 4.
- The ISP can be turned OFF, so the slab is not heated unless moisture is detected.

HEATING CURVE

Available Only when Outdoor Sensor is the Sensor Type

Adjustable from -10 to +10 ***Default: 0***

Hold MENU Button: *<Settings>/Heating Curve*



- The Curve adjusts the final Return Target based on the outdoor temperature. "Heating Curve Table" on page 27.
- A higher curve number will result in a higher Return Target.
- The best curve is the one with the lowest number that can still melt snow. Therefore, provide the best snow melting efficiency for that slab.

- When precipitation is expected, start the slab heating system and let it run at least 24 hours. This time is needed to allow the slab temperature to reach the melting point.
- When the precipitation begins and after a full 24-hour warm-up period, start to monitor the slab. Check if the precipitation is beginning to accumulate or if it melts immediately.
- If there is accumulation, the slab temperature is too low. Increase the Curve value by one number (for example, from 0 to 1).
- If the precipitation is melting immediately, the slab may be using more energy than it needs. Decrease the Curve value by one number (for example, from 0 to -1).
- After making a change to the Curve value, wait at least four hours before evaluating its effect on the slab.
- Repeat the above procedure as necessary until the lowest Curve value that still melts the snow is determined.

HEATING CURVE TABLE

Return Target Temperature based on the Outdoor Temperature and Heating Curve

		Outdoor Temperature °F									
		35	**30**	**25**	**20**	**15**	**10**	**5**	**0**	**-5**	**-10**
Heating Curve	**-10**	33	40	48	55	63	70	78	85	93	100
	-9	36	44	52	60	67	75	83	91	98	106
	-8	40	48	56	64	72	80	88	96	104	112
	-7	44	52	60	69	77	85	93	102	110	118
	-6	48	56	65	73	82	90	99	107	116	124
	-5	51	60	69	78	86	95	104	113	121	130
	-4	55	64	73	82	91	100	109	118	127	136
	-3	59	68	77	87	96	105	114	124	133	142
	-2	63	72	82	91	101	110	120	129	139	148
	-1	66	76	86	96	105	115	125	135	144	154
	0	70	80	90	100	110	120	130	140	150	160
	1	74	84	94	105	115	125	135	146	156	166
	2	78	88	99	109	120	130	141	151	162	172
	3	81	92	103	114	124	135	146	157	167	178
	4	85	96	107	118	129	140	151	162	173	184
	5	89	100	111	123	134	145	156	168	179	190
	6	93	104	116	127	139	150	162	173	185	196
	7	96	108	120	132	143	155	167	179	190	202
	8	100	112	124	136	148	160	172	184	196	208
	9	104	116	128	141	153	165	177	190	202	214
	10	108	120	133	145	158	170	183	195	208	220

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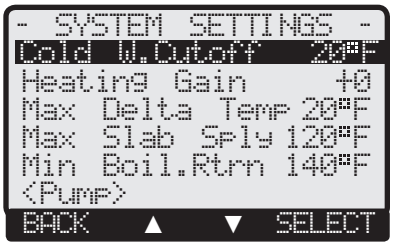
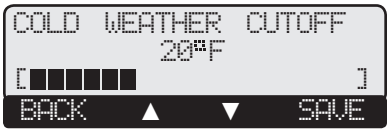
SYSTEM SETTINGS



COLD WEATHER CUTOFF (CWC)

Off, and from 0°F/-18°C to 20°F/-7°C ***Default: Off***

Button: *<Settings>/<System Settings>/Cold Weather Cutoff*

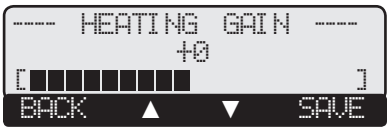


- The CWC prevents the slab from being heated during extreme cold temperatures. The setting for the Cutoff depends on two items, the slab heating capacity and the heating system capacity. As the slab becomes colder, the cost of heating the slab may become prohibitive. In addition, depending the heating system capacity, it may be impossible to raise the slab temperature enough to melt precipitation.
- The Off option disables the CWC allowing the slab to be heated in extreme cold weather. This is useful when heating hospital emergency ramps and similar applications where the driveways and walkways are used under all weather conditions.
- The CWC is measured by the Slab Sensor when Slab is selected as the Sensor Type. See "Sensor Type" on page 22.
- The CWC is measured by the Outdoor Sensor when Outdoor Sensor is selected as the Sensor Type. See "Sensor Type" on page 22.

HEATING GAIN

Adjustable from -10 to +10 ***Default: 0***

Hold MENU Button: *<Settings>/<System Settings>/Heating Gain*



- The Heating Gain adjusts how aggressive the controls adds heat into the slab. That is, a higher setting increases the valve or boiler modulating increments while a lower setting reduces it.
- A Heating Gain of 0 is a good starting point for all systems.
- If during normal load conditions, the Slab Supply temperature tends to oscillate significantly, decrease the Heating Gain by two numbers (for example, from 0 to -2).
- If during normal load conditions the Slab Supply temperature tends to remain consistently above below the Set Point, increase the Heating Gain by two numbers (for example, from 0 to 2).
- After making an adjustment, do not make any additional changes for at least 30 minutes before evaluating its effect on the system.

MINIMUM RUNTIME

Available Only when Slab is the Sensor Type

Available Only when Motorized Valve or Boiler is the Control Mode

Adjustable from 0 to 4 hours ***Default: 1 hour***

Hold MENU Button: *<Settings>/<System Settings>/Heating Gain/Minimum Runtime*

- The Minimum Runtime continues heating the slab after moisture detection ends to help dry the entire slab. In addition, it protects the slab from rapid temperature variations that may occur if the slab heating system were turned on and off repeatedly. Without a minimum runtime, this type of heating system cycling may occur when the temperature is around the WWC.
- The Minimum Runtime starts a timer once slab heat is activated. The SMC will continue melting until either all the moisture has evaporated off the sensor or until the Minimum Runtime has ended, whichever comes last.

MAXIMUM DELTA TEMPERATURE (MAX ΔT)

Adjustable from 10F°/-6C° to 50F°/28C° ***Default: 20F°/11C°***

Hold MENU Button: *<Settings>/<System Settings>/Max Delta Temp*

- The Max ΔT is designed to prevent too much heat from entering the slab at one time which can cause slab damage. Max ΔT is supplied by the slab design engineer.
- The SMC monitors the difference between the temperature of the heating solution going out to the slab (Slab Supply) and the temperature of the solution returning from the slab (Slab Return) . This is called the Slab ΔT.
- If the SMC calculates that the Slab ΔT may exceed the Max ΔT, the SMC will begin closing the slab motorized valve or decreasing the boiler modulation to help prevent excess heat from entering the slab.

MAXIMUM SLAB SUPPLY

Adjustable from 110°F/43°C to 190°F/88°C ***Default: 120°F/49°C***

Hold MENU Button: *<Settings>/<System Settings>/Max Slab Supply*

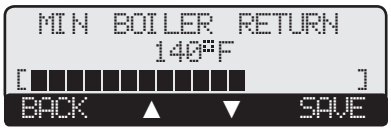
- The Maximum Slab Supply temperature is the highest water temperature the SMC will output to the slab. The setting should be determined by the slab design engineer.
- The SMC will modulate the motorized valve to close or reduce the boiler modulation if it calculates that the slab supply temperature might exceed the Maximum Slab Supply.

MINIMUM BOILER RETURN

Available when Boiler Return Sensor is Installed and Motorized Valve is the Control Mode

Off, and from 40°F/4°C to 140°F/60°C ***Default: 140°F/60°C***

Hold MENU Button: *<Settings>/<System Settings>/Minimum Boiler Return*



- The Minimum Boiler Return temperature is designed to help protect the boiler from thermal shock that may shorten its service life. Boiler thermal shock may occur when the cold return enters a hot boiler. The Minimum Boiler Return temperature should be determined by the boiler manufacturer.
- When the Boiler Return Sensor temperature falls below the Minimum Boiler Return, the SMC will modulate the slab motorized valve close until the Boiler Return Sensor reading increases above this setting.

PUMP SETTINGS

Hold MENU Button: *<Settings>/<System Settings>/<Pump Settings>*

RUN-ON

Adjustable from 0 to 60 minutes ***Default: 2 minutes***

Hold MENU Button: *<Settings>/<System Settings>/<Pump Settings>/Run-On*

- The Run-On is an adjustable extra time used to run the pump after the boiler is turned off or after the motorized valve is fully closed. This extra time helps transfer the remaining system energy into the slab.

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PUMP EXERCISE

Off or On ***Default: Off***

Hold MENU Button: *<Settings>/<System Settings>/<Pump Settings>/Pump Exercise*

- This option exercises the pumps to reduce the possibility of impellers locking after long off-season periods.
- It exercises any pump that has not run for 7 days for a period of 15 seconds.

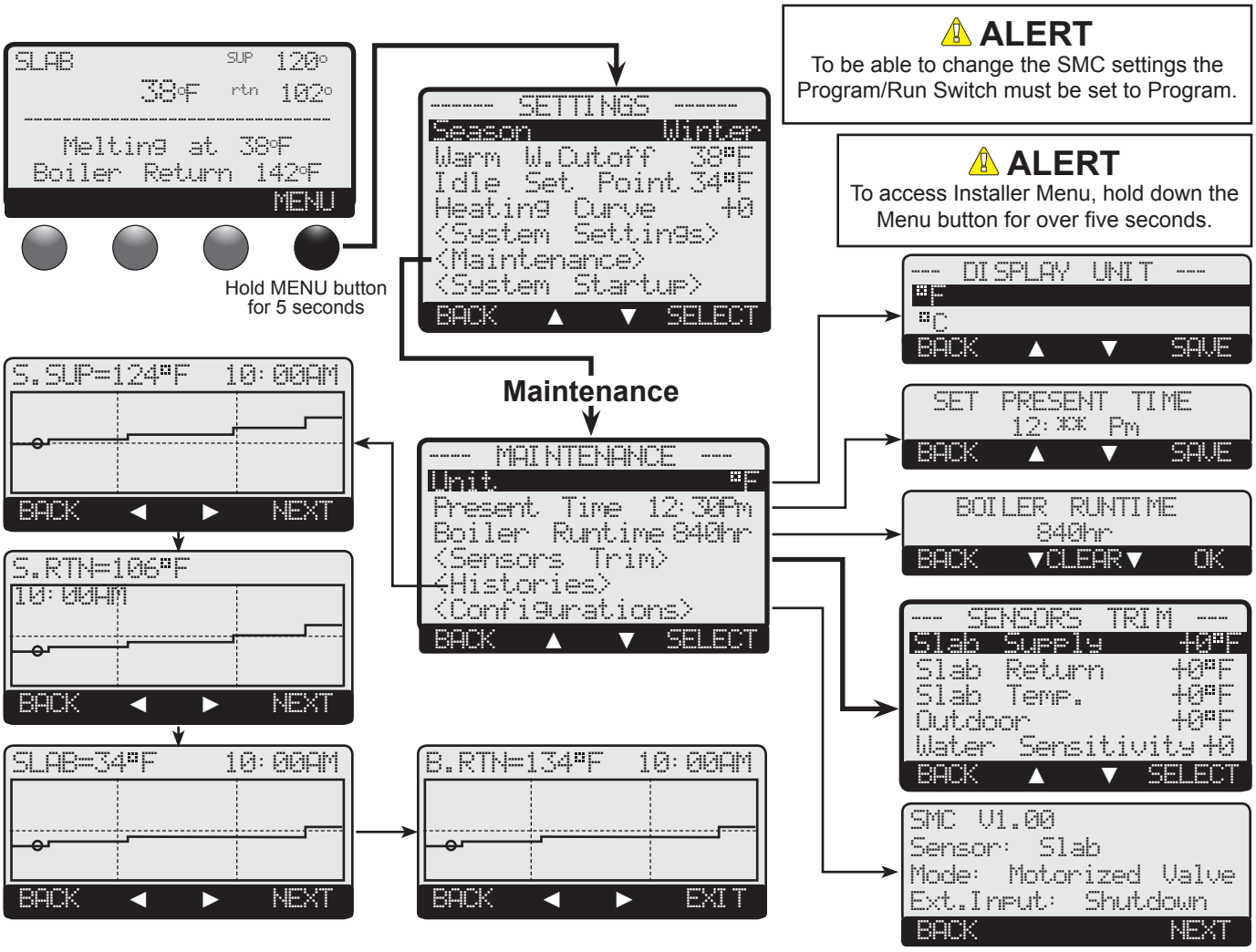
ANTIFREEZE

On, from 1 to 60 minutes, and Off ***Default: 5 minutes***

Hold MENU Button: *<Settings>/<System Settings>/<Pump Settings>/Antifreeze*

- This option runs the Slab pump for 15 seconds for every Antifreeze period when idling above the ISP or when the SMC is in CWC. It does this to help reduce the possibility of freezing the slab solution.
- In addition to having a timed setting the Antifreeze option can be set to ON. This is the best option for energy efficient Slab Pumps.
- The OFF option stops the Slab Pump when in Idling mode above the ISP. Also, it does not run the Slab pump when the slab temperature is below the CWC.

MAINTENANCE MENU
Available for Installers Only



ALERT
To be able to change the SMC settings the Program/Run Switch must be set to Program.

ALERT
To access Installer Menu, hold down the Menu button for over five seconds.

MAINTENANCE SETTINGS
Available for Installers Only
Hold MENU Button: *<Settings>/<Maintenance>*

PROGRAM SWITCH SETTING
To be able to change the SMC settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security.

PROGRAM RUN

DISPLAY UNIT
°F, °C ***Default: °F***
Hold MENU Button: *<Settings>/< Maintenance >/Unit*

- This option allows you to change the sensors' display and all temperature settings between Fahrenheit and Celsius.

SET PRESENT TIME
Hold MENU Button: *<Settings>/<Maintenance>/Present Time*

- The control time is used to chart sensor history.

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- The control has a coin Lithium battery (CR2032) (HT# 020002-00) that is used to maintain the control's time during power outages. This battery can maintain the clock for up to a total of 100 days. See "Activate the Battery" on page 18.

BOILER RUNTIME

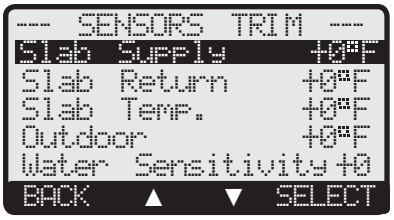
Hold MENU Button: *<Settings>/<Maintenance>/Boiler Runtime*

- This is the cumulative number of hours the SMC has energized the boiler output relay since the last time the runtime was cleared.
- The Runtime can be reset by pressing the two middle buttons.

SENSORS TRIM

Adjustable from -20° to +20° **Default: 0°**

Hold MENU Button: *<Settings>/<Maintenance>/<Sensors Trim>*



- The Heat-Timer temperature sensors are very accurate, and normally require no calibration. However, sometimes it may be desirable to make small adjustments to the displayed value.
- Do not use the Trim to make the Outdoor sensor match the one reported on the radio or TV. Outdoor temperature can vary widely over a broadcast range.
- Note that the Outdoor Sensor Trim is only available when the Sensor Type selected is Outdoor. "Sensor Type" on page 22.

⚠ WARNING

The Slab Sensor is located outdoors and is likely to become covered with dirt that will adversely affect the sensor's moisture detection sensitivity. Therefore, it is important to periodically clean the sensor surface.

WATER SENSITIVITY

Available when Slab is the Sensor Type Only

Adjustable from -10 to +10 **Default: 0**

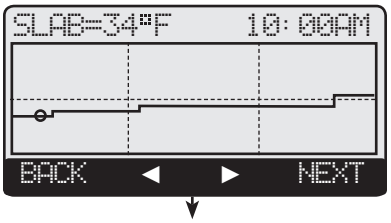
- The setting adjusts the Slab Sensor's water detection sensitivity.
- The Slab Sensor and the SMC are calibrated to detect moisture at the proper level, however Water Sensitivity can be temporarily adjusted to compensates for a dirty sensor.

⚠ ALERT

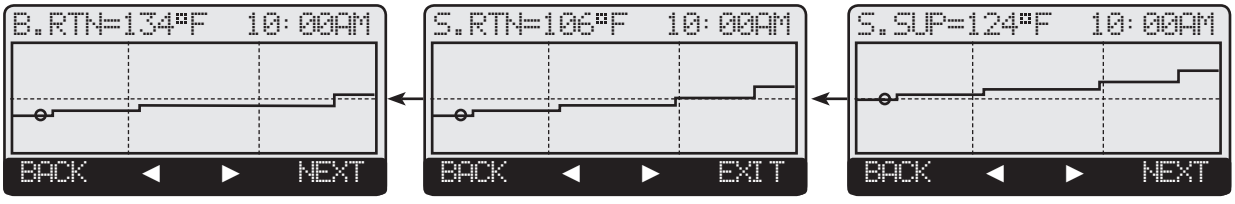
After cleaning the sensor, set the water sensitivity to zero for proper operation.

HISTORY

Hold MENU Button: *<Settings>/<Maintenance>/<Histories>*

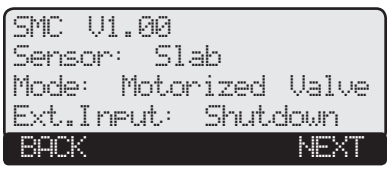


- The SMC displays a graphical history of all the temperature sensors for the previous 24 hours. The temperatures are sampled every 12 minutes.
- To view sensor values of a specific period, use the two middle buttons (◄ ►) to scroll to that time and read the sensor temperature at the upper left corner.
- Click the Next button to see the next sensor history.



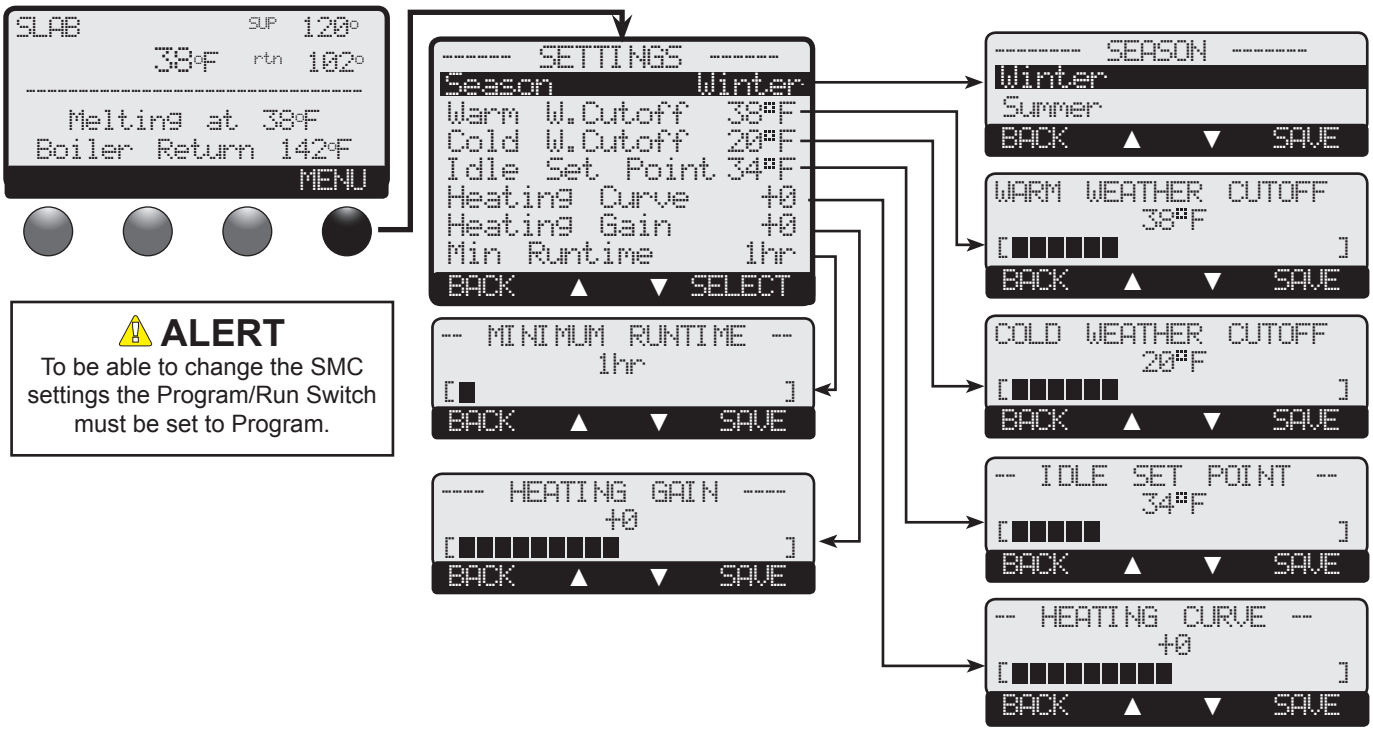
CONFIGURATION

Hold MENU Button: *<Settings>/<Maintenance>/<Configurations>*



- This menu provides a consolidated view of the SMC's Startup settings.

USER MENUS



⚠ ALERT
To be able to change the SMC settings the Program/Run Switch must be set to Program.

USER SETTINGS

MENU Button: <Settings>/

- This simplified menu is for operating users to access non-critical operating settings. It can be accessed by clicking the Menu button. Installer menu will have the same settings in addition to Startup and more advanced operation settings.

PROGRAM SWITCH SETTING

To be able to change the SMC settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security.

SEASON

Summer, Winter ***Default: Winter***

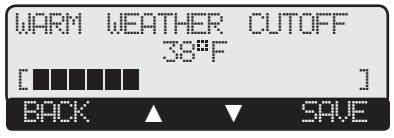
MENU Button: *<Settings>/Season*

- The Season setting controls whether the SMC heats the slab. When set to Summer, the SMC does not provide any heat to the slab. When set to Winter, the SMC shall heat the slab whenever necessary.
- Set the control to Winter mode during the heating season.
- When the heating season is over, it is a good practice to switch the control to Summer to preserve the control battery life.

WARM WEATHER CUTOFF (WWC)

Adjustable from 34°F/1°C to 44°F/7°C ***Default: 38°F/3°C***

MENU Button: *<Settings>/Warm W. Cutoff*



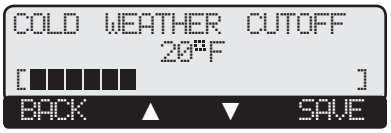
- The WWC is the slab heating upper limit. When the Sensor Type is set to Slab, the WWC is measured by the Slab Sensor. If the slab temperature rises higher than the WWC, heating will not begin even when moisture is detected.

- When the slab temperature falls below the WWC, the heating system will hold the slab at the ISP temperature until moisture is detected. A ±1F° differential is included in the WWC. This means that if the WWC is set for 38°F, the slab temperature must fall to 37°F before the heating system is activated. The heating system will remain activated until the slab temperature reaches 39°F.
- Once moisture has been detected and the slab temperature is below the WWC, melting begins. At this point, the WWC will serve as the set point at which the slab temperature will be held. Using the previous example, once a melting cycle has begun, the SMC will maintain the slab at 38° until the moisture is evaporated, or the minimum run time is exceeded, whichever comes last.
- When Outdoor is selected as the Sensor Type, the WWC is measured by the Outdoor Sensor. When the outdoor temperature falls below the WWC then the heating system will hold the slab return temperature at the slab return calculated target.

COLD WEATHER CUTOFF (CWC)

Off, and from 0°F/-18°C to 20°F/-7°C ***Default: Off***

MENU Button: *<Settings>/Cold Weather Cutoff*



- The CWC prevents the slab from being heated during extreme cold temperatures. The setting for the Cutoff depends on two items, the slab heating capacity and the heating system capacity. As the slab becomes colder, the cost of heating the slab may become prohibitive. In addition, depending the heating system capacity, it may be impossible to raise the slab temperature enough to melt precipitation.
- The Off option disables the CWC allowing the slab to be heated in extreme cold weather. This is useful when heating hospital emergency ramps and similar applications where the driveways and walkways are used under all weather conditions.
- The CWC is measured by the Slab Sensor when Slab is selected as the Sensor Type.
- The CWC is measured by the Outdoor Sensor when Outdoor Sensor is selected as the Sensor Type.

IDLE SET POINT (ISP)

Available Only when Slab is the Sensor Type

Adjustable from 20°F/-7°C to 44°F/7°C, and Off ***Default: 34°F/1°C***

MENU Button: *<Settings>/Idle Set Point*

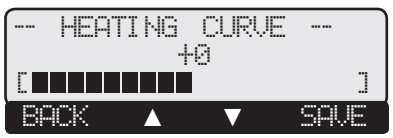
- This is the temperature at which the slab will be held during Idle Mode. See "Slab Sensor Operation Overview" on page 4.
- The ISP can be turned OFF, so the slab is not heated unless moisture is detected.

HEATING CURVE

Available Only when Outdoor Sensor is the Sensor Type

Adjustable from -10 to +10 ***Default: 0***

MENU Button: *MENU/Heating Curve*



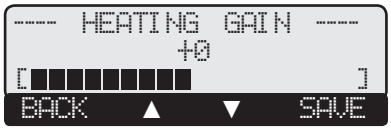
- The Curve adjusts the final Return Target based on the outdoor temperature. "Heating Curve Table" on page 27.
- A higher curve number will result in a higher Return Target.

- The best curve is the one with the lowest number that can still melt snow. Therefore, provide the best snowmelting efficiency for that slab.
- When precipitation is expected, start the slab heating system and let it run at least 24 hours. This time is needed to allow the slab temperature to reach the melting point.
- When the precipitation begins and after a full 24-hour warm-up period, start to monitor the slab. Check if the precipitation is beginning to accumulate or if it melts immediately.
- If there is accumulation, the slab temperature is too low. Increase the Curve value by one number (for example, from 0 to 1).
- If the precipitation is melting immediately, the slab may be using more energy than it needs. Decrease the Curve value by one number (for example, from 0 to -1).
- After making a change to the Curve value, wait at least four hours before evaluating its effect on the slab.
- Repeat the above procedure as necessary until the lowest Curve value that still melts the snow is determined.
- See "Heating Curve Table" on page 27.

HEATING GAIN

Adjustable from -10 to +10 ***Default: 0***

MENU Button: *<Settings>/Heating Gain*



- The Heating Gain adjusts how aggressive the controls adds heat into the slab. That is, a higher setting increases the valve or boiler modulating increments while a lower setting reduces it.
- A Heating Gain of 0 is a good starting point for all systems.
- If during normal load conditions, the Slab Supply temperature tends to oscillate significantly, decrease the Heating Gain by two numbers (for example, from 0 to -2).
- If during normal load conditions the Slab Supply temperature tends to remain consistently above below the Set Point, increase the Heating Gain by two numbers (for example, from 0 to 2).
- After making an adjustment, do not make any additional changes for at least 30 minutes before evaluating its effect on the system.

MINIMUM RUNTIME

Available with Slab Sensor Type Only

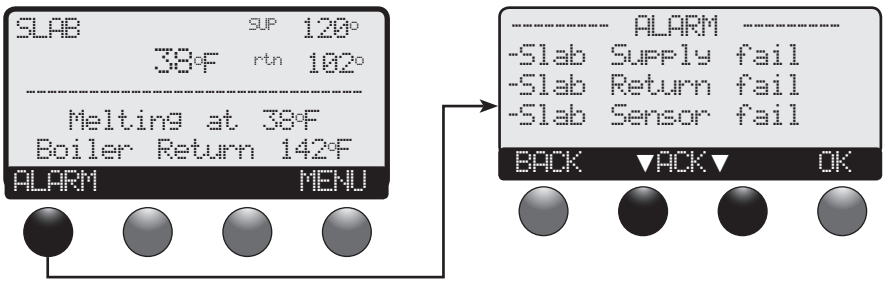
Available with Motorized Valve or Boiler Control Mode Only

Adjustable from 0 to 4 hours **Default: 1 hour**

MENU Button: *<Settings>/Heating Gain/Minimum Runtime*

- The Minimum Runtime continues heating the slab after moisture detection ends to help dry the entire slab. In addition, it protects the slab from rapid temperature variations that may occur if the slab heating system were turned on and off repeatedly. Without a minimum runtime, this type of heating system cycling may occur when the temperature is around the WWC.
- The Minimum Runtime starts a timer once slab heat is activated. The SMC will continue melting until either all the moisture has evaporated off the sensor or until the Minimum Runtime has ended, whichever comes last.

ALARMS MENU



⚠ ALERT
Before clearing the alarm list, make sure to notify the responsible individuals as the alarm list will not be available afterwards.

⚠ ALERT
Clearing the alarm list menu DOES NOT depend on the Program/Run Switch position.

ALARM

Alarm Button: *Alarm/*

- The Alarm button function flashes only when a least one alarm condition exist.
- The Alarm button opens the alarm list menu.
- To clear current alarm list press the two middle buttons (marked ACK) together.

ALARM LIST

The following is a list of possible alarms:

ALARM	CHECK THE FOLLOWING
• Slab Supply fail • Slab Return fail • Slab Temp. fail • Outdoor Temp. fail • Boiler Return fail	• Any sensor failure requires checking of the sensor and its wiring. See "Troubleshooting" on page 39.
• Slab Heater fail	• Check the wiring to the Slab sensor. Specifically terminals 20 and 21 and their wiring. See "Troubleshooting" on page 39.
• Prove fail	• The Prove input terminals are opened. Check the equipment wired to the prove terminals. If no equipment is connected to the prove input, reinstall the Prove Jumper provided with the control. See "Wiring the Prove" on page 17.
• Slab Temp. low	• The Slab Temperature did not reach its target within 24 hours. See "Troubleshooting" on page 39.
• Supply Temp. low	• The Slab Supply Temperature did not reach its target within 2 hours.

BACNET VARIABLE LIST

OBJECT ID	NAME	DESCRIPTION	TYPE♦	UOM	RANGE / STATES / SPECIAL VALUES	READ ONLY
Device	MODEL	Model				
Device	SNUMBER	Serial Number				X
Device	VERSION	Version				
100	CMODE	Control Mode			1= Valve, 2= Boiler, 3= External Control	X
200	CONSTAT	Control Status	MV		1=Normal Operation, 2=Shutdown Active, 3=Heating Disable, 4=Summer, 5=CWC, 6=WWC, 7=Waiting for SYS Prove, 8=Hold Boil.Rtn, 9=Slab Rtn.Targe, 10=Melting, 11=Hold idle, 12=Idle State, 13=In Alarm	X
300	SEA	Season			1 = Winter, 2 = Summer	
400	SLABTEMP/ ODTEMP	Slab/Outdoor Temperature				
500	DSLABSPPY	Slab Supply Temperature		°F	32000=OPEN, 3201=SHORT	X
600	SLABRTN	Slab Return Temperature				
700	BOILRTN	Boiler Return Temperature				
800	BRUN	Boiler Run Time		Hours		X
900	WWCUT	Warm Weather Cutoff			Integers Only (-1,0,1,2…)	
1000	CWCUT	Cold Weather Cutoff			Integers Only (from 0 to 20), -1=Off	
1100	BMINR	Boiler Minimun Return Temp	AV	°F	Integers Only (from 40 to 140), 39=Off	
1200	DTEMP	Delta Temperature			Integers Only (from 10 to 50)	
1300	MAXSLAB	Maximum Slab Temp			Integers Only (from 110 to 190)	
1400	ISP	Idle Setpoint			Integers Only (from 210 to 44), 19=Off	
1500	SEN	Water Sensitivity			Integers Only (from -10 to +10)	
1600	HTCV	Heating Curve				
1700	GAIN	Gain				
1800	MINRUN	Minimum Run Time		Hours	Integers Only (0,1,2…)	
1900	PRUNON	Pump Runon Time		Minutes	Integers Only (from 0 to 60)	
2000	PEX	Pump Exercise	MV		Integers Only (1,2)	
2100	ANTI	Anti-Freeze	AV	Minutes	0=Off, Integers Only (from 0 to 60), 61=On	
2200	SYSRLY	System Relay			0 = De-Energized, 1 = Energized	X
2300	ALARM	Alarm Relay				
3300	SSUPYFAIL	Slab Supply Sensor Fail				
2500	SRTNFAIL	Slab Sensor Fail				
2600	STEMFAIL	Slab Sensor Fail				
2700	OTEMPFAIL	Outdoor Sensor Fail				
2800	BRTNFAIL	Boiler Return Sensor Fail	BV		0 = Normal Operation, 1= In Alarm	X
2900	HEATFAIL	Slab Sensor Heater Fail				
3000	PROVEFAIL	Prove Fail				
3100	SUPSTAL	Supply Stall				
3200	SLBSTAL	Slab Stall				
3300	SSUPYFAIL	Slab Supply Sensor Fail				
3300	BURN	Burner Relay			0 = De-Energized, 1 = Energized	X
3400	SPUMP	Slab Pump Relay				
3500	MOD	Modulation Output	AV	Percent	% Modulation (0 - 100%)	X
3600	TIME	Time		Minutes	Time since midnight(1,2,3…1440)	

♦ AV=Analog-Value, BV= Binary-Value, MV=MultiState-Value. Only required BACnet object properties are supported.

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BACNET PICS STATEMENT

PRODUCT	MODEL NUMBER	PROTOCOL REVISION	SOFTWARE VERSION	FIRMWARE VERSION
SMC BACnet Control	SMC	1.5	2.xx	tbd
VENDOR	**VENDOR ID**	**ADDRESS AND PHONE**		
Heat-Timer Corporation	248	20 New Dutch Ln.Fairfield, NJ 07004 - (973)575-4004		
PRODUCT DESCRIPTION				
The SMC is a Snow Melt Control				

BACnet Standardized Device Profile (Annex L)

PRODUCT	DEVICE PROFILE
SMC BACnet Control	BACnet Application Specific Controller (B-ASC)

Supported BIBBs (Annex K)

SUPPORTED BIBBS	BIBB NAME
DS-RP-B	Data Sharing-ReadProperty-B
DS-WP-B	Data Sharing-WriteProperty-B
DM-DDB-B	Device Management-Dynamic Device Binding-B
DM-DOB-B	Device Management-Dynamic Object Binding-B
DM-DCC-B	Device Management-DeviceCommunicationControl-B

Standard Object Types Supported

OBJECT TYPE	CREATABLE	DELETABLE
Analog Value	No	No
Binary Value	No	No
Multi-State Value	No	No
Device	No	No

Data Link Layer Options (Annex J)

PRODUCT	DATA LINK	OPTIONS
SMC BACnet Control	BACnet/IP	

Segmentation Capability

SEGMENTATION TYPE	SUPPORTED	WINDOW SIZE (MS/TP PRODUCT LIMITED TO 1)
Able to transmit segmented messages	No	
Able to receive segmented messages	No	

Device Address Binding

PRODUCT	STATIC BINDING SUPPORTED
SMC BACnet Control	No

Character Sets

PRODUCT	CHARACTER SETS SUPPORTED
SMC BACnet Control	ANSI X3.4

TROUBLESHOOTING

Display shows Sensor Fault

- When any sensor reads ---, Open, or Short, check if the sensor wires are continuous to the SMC. Use a multi-meter set to measure resistance across the detached sensor wires. If the ohm reading is outside of the Temperature Sensor Chart range, then the sensor is damaged and needs to be replaced. If the ohm reading is within the Temperature Sensor Chart range, then the SMC may be damaged.

Display shows an Incorrect Temperature

- Remove the wires from the sensor terminals. The display should change to read --- or Open. If it does not, the SMC may be damaged. Using a multi-meter set to measure resistance, take an ohm reading across the detached sensor wires. Identify the temperature that corresponds to the ohm reading in the Temperature Sensor Chart. If the temperature is within 20°F of the actual temperature, use the sensor's trim setting to adjust the reading. If the difference was greater than 20°F then it is best to replace the sensor as it may be damaged. Note that sensors are not designed to be placed in the water or steam. A well (HT# 904011-00) or a strap-on sensor (HT# 904220-00) must be used.

Slab Sensor Diagnosis

- **If the Slab Temperature reads OPEN or SHORT, or the Slab Sensor Failure alarm is triggered:** Follow the "Display Shows Sensor Fault" steps above for the Brown and Blue Slab Sensor wires after detaching them from terminals 16 and 17.
- **If the Slab Temperature reads an Incorrect Temperature:** See if the Slab Sensor is being affected by the sun, is covered with ice, or has other factors that would cause it to read a temperature different from the rest of the slab. If none exist, follow the steps in "Display Shows an Incorrect Temperature".
- **Heater Sensor Failure alarm is triggered:** Follow the "Display shows Sensor Fault" steps above for the Blue and White wires when detached from terminals 17 and 18. When the SMC is Idling or Melting, the Brown and Blue wires ohm reading should be close to the Blue and White wires ohm reading. However, if the control was not in Melting or Idling, the Blue and White wires ohm reading should be between 5000Ω to 15,000Ω ohms.
- **Precipitation detection:** If the precipitation did occur but the Slab Sensor did not detect it, clean the Slab Sensor ridges and surface with a soft brush. If the cleaning did not resolve the issue, then increase the Water Sensitivity until the moisture is detected. "Sensors Trim" on page 32.
- **Precipitation not Melting on Slab Sensor:** If the precipitation is accumulating on the sensor and not melting, check the ohm value of Red and Black wires of the Slab Sensor. It should read from 50Ω to 100Ω ohms. Otherwise, the sensor may be damaged.

Snow Accumulation

- **If Snow is Accumulating:** This could be caused by one of the following:
  - **The SMC Started to Melt too Late.** The SMC needs to preheat the slab before the precipitation. It can take up to 24 hours of preheating before the slab is ready for melting. Make sure that the ISP is set higher than the freezing point. A good starting setting is 34°F.

Temperature Sensor Chart

TEMPERATURE		Value (in Ohms)
°F	°C	
OPEN		150000
-30	-34	117720
-20	-29	82823
-10	-23	59076
0	-18	42683
10	-12	31215
20	-7	23089
25	-4	19939
30	-1	17264
35	2	14985
40	4	13040
45	7	11374
50	10	9944
55	13	8714
60	16	7653
70	21	5941
80	27	4649
90	32	3667
100	38	2914
110	43	2332
120	49	1879
130	54	1524
140	60	1243
150	66	1021
160	71	842
170	77	699
180	82	583
190	88	489
200	93	412
210	99	349
220	104	297
230	110	253
240	116	217
250	121	187
SHORT		100

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- **The Slab Sensor Surface is Dirty.** If dirt covers the Slab Sensor surface, moisture may not be detected properly. The surface of the sensor must be cleaned regularly for proper operation.
- **The Slab Sensor Heater is Not Functioning.** Follow the instructions under the Slab Sensor Diagnosis (Precipitation not Melting on Slab Sensor).

Slab Temperature Low Alarm

- **The Slab Temperature did not reach its target for a continuous 24 hours:**
  - **The weather is too cold for the system capability.** The SMC is producing heat but may need more time due to extreme temperatures.
  - **The heating system may be malfunctioning.** Check the heating system components (boiler, pumps, valves).

Supply Temperature Low Alarm

- **The Slab Supply Temperature did not reach its target 2 hours:**
  - **The heating system may be malfunctioning.** Check the heating system components (boiler, pumps, valves).

No BACnet Communication

- **The BACnet Enable option must be set to Enable.** See "BACnet Option" on page 24.
- **The BACnet Interface Module is set to a different Baud Rate.** If the BACnet Baud was changed while connected to the BACnet network, the BACnet Interface must be re-powered by disconnecting and reconnecting its Ethernet cable. During proper communication, both the Green and Red LEDs will be blinking. To achieve this, it may take up to one minute from the BACnet Interface Module to initialize.
- **The BACnet Interface Module MSTP wiring.** If only the Red wire is on for along time, make sure that the ground wire connects the BACnet Interface Module to the BACnet network. If that did not solve the communication connection, try reversing the A and B wires. Different RS485 wiring may label their terminals differently.

WARRANTY

WARRANTIES AND LIMITATIONS OF LIABILITY AND DAMAGE: Heat-Timer Corporation warrants that it will replace, or at its option, repair any Heat-Timer Corporation manufactured product or part thereof which is found to be defective in material workmanship within one year from the date of installation only if the warranty registration has been properly filled out and returned within 30 days of the date of installation. Damages to the product or part thereof due to misuse, abuse, improper installation by others or caused by power failure, power surges, fire, flood or lightning are not covered by this warranty. Any service, repairs, modifications or alterations to the product not expressly authorized by Heat-Timer Corporation will invalidate the warranty. Batteries are not included in this warranty. This warranty applies only to the original user and is not assignable or transferable. Heat-Timer Corporation shall not be responsible for any maladjustments of any control installed by Heat-Timer Corporation. It is the users responsibility to adjust the settings of the control to provide the proper amount of heat or cooling required in the premises and for proper operation of the heating or cooling system. Heat-Timer Corporation shall not be required to make any changes to any building systems, including but not limited to the heating system, boilers or electrical power system, that is required for proper operation of any controls or other equipment installed by Heat-Timer Corporation or any contractor. Third Party products and services are not covered by this Heat-Timer Corporation warranty and Heat-Timer Corporation makes no representations or warranties on behalf of such third parties. Any warranty on such products or services is from the supplier, manufacturer, or licensor of the product or service. See separate Terms and Conditions of Internet Control Management System (“ICMS”) services, including warranties and limitations of liability and damages, for ICMS services.

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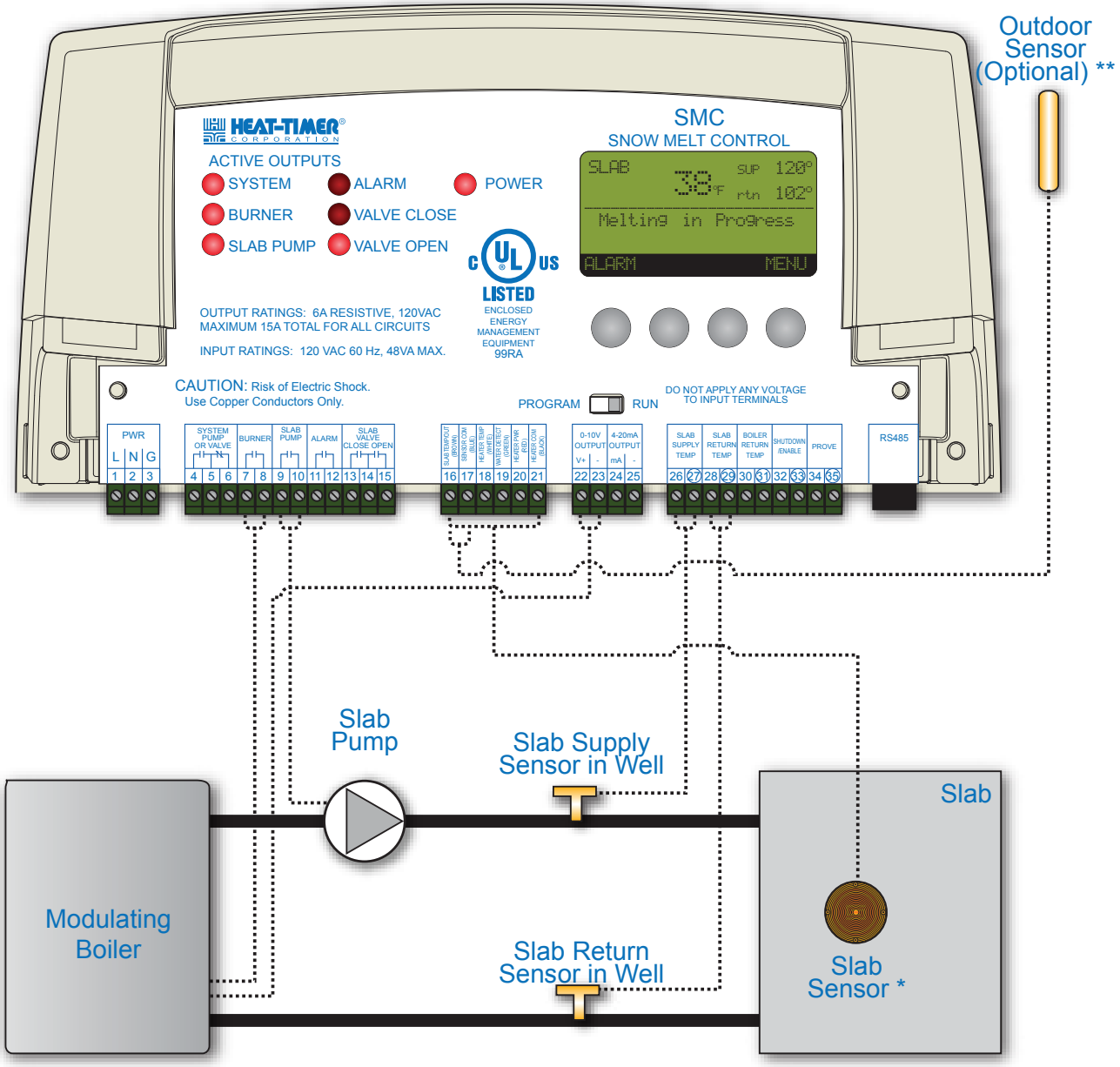
SLAB SENSOR DIAGRAMS

SMC CONTROLLING A MODULATING WATER BOILER - PIPING



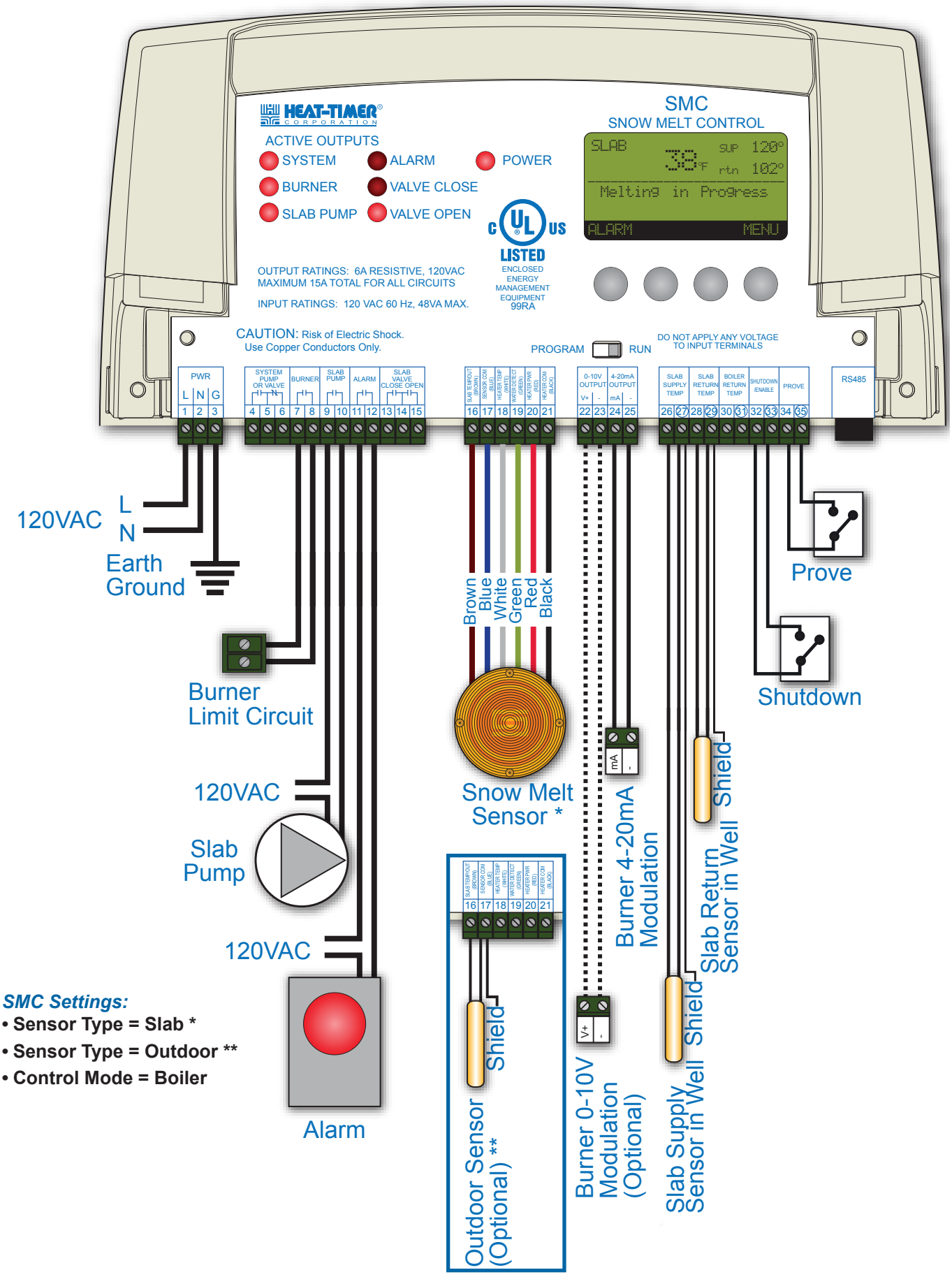
SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Boiler**

⚠ ALERT

Due to the uniqueness of each installation, Heat-Timer Corp. is not responsible for any installation that is based on any electrical or piping diagram generated. The provided illustrations are to demonstrate the control operating concept only.

SMC CONTROLLING A MODULATING WATER BOILER - WIRING



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Boiler**

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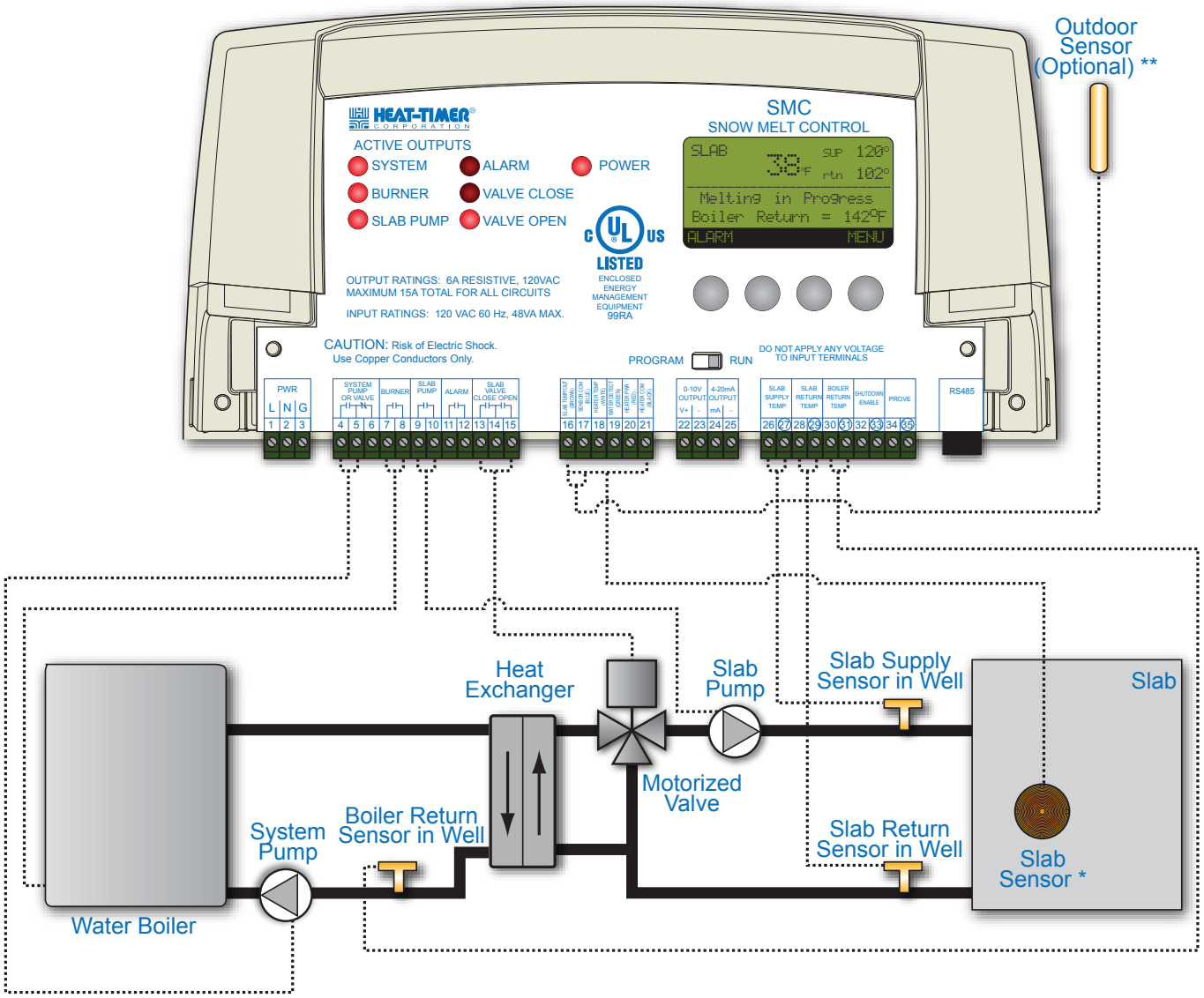
SMC MODULATING A 3-WAY MOTORIZED VALVE - PIPING
Using Water to Glycol Heat-Exchanger and System Pump



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Motorized Valve**

⚠ ALERT

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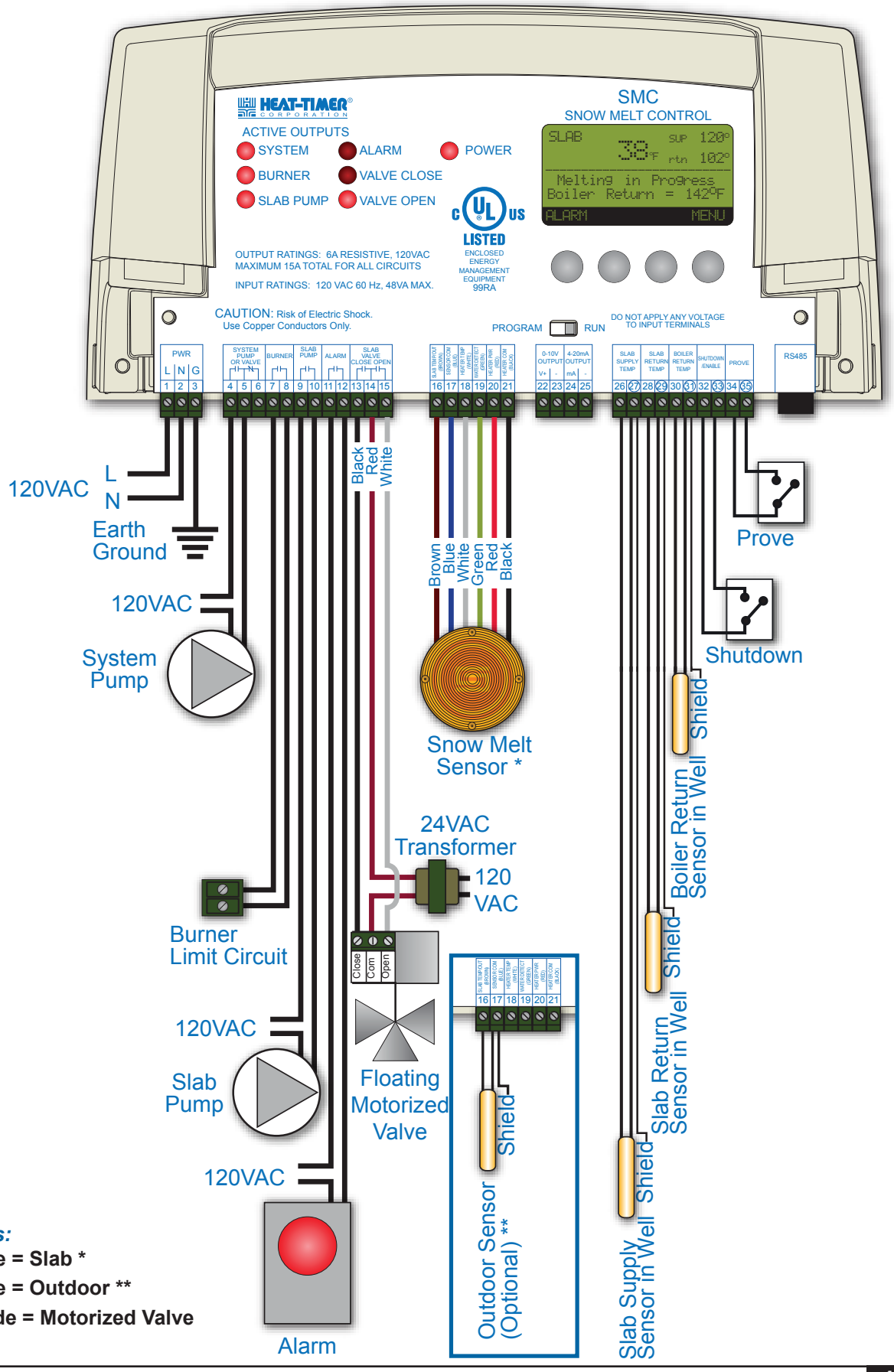
SMC MODULATING A 3-WAY MOTORIZED VALVE - WIRING
Using Water to Glycol Heat-Exchanger and System Pump



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Motorized Valve**

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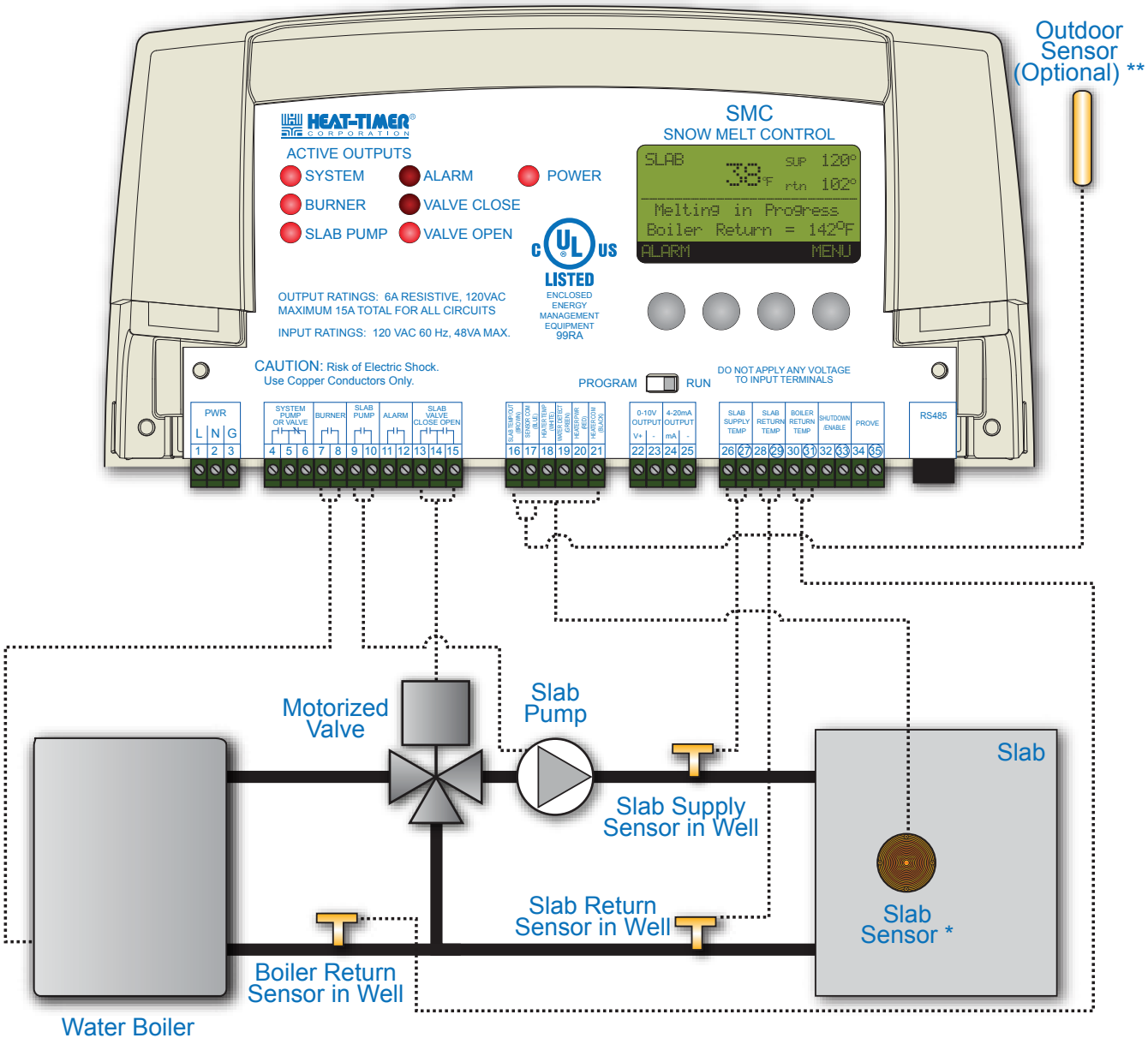
SMC MODULATING A 3-WAY MOTORIZED VALVE - PIPING
Using Water Boiler without a Heat-Exchanger



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Motorized Valve**

⚠ ALERT

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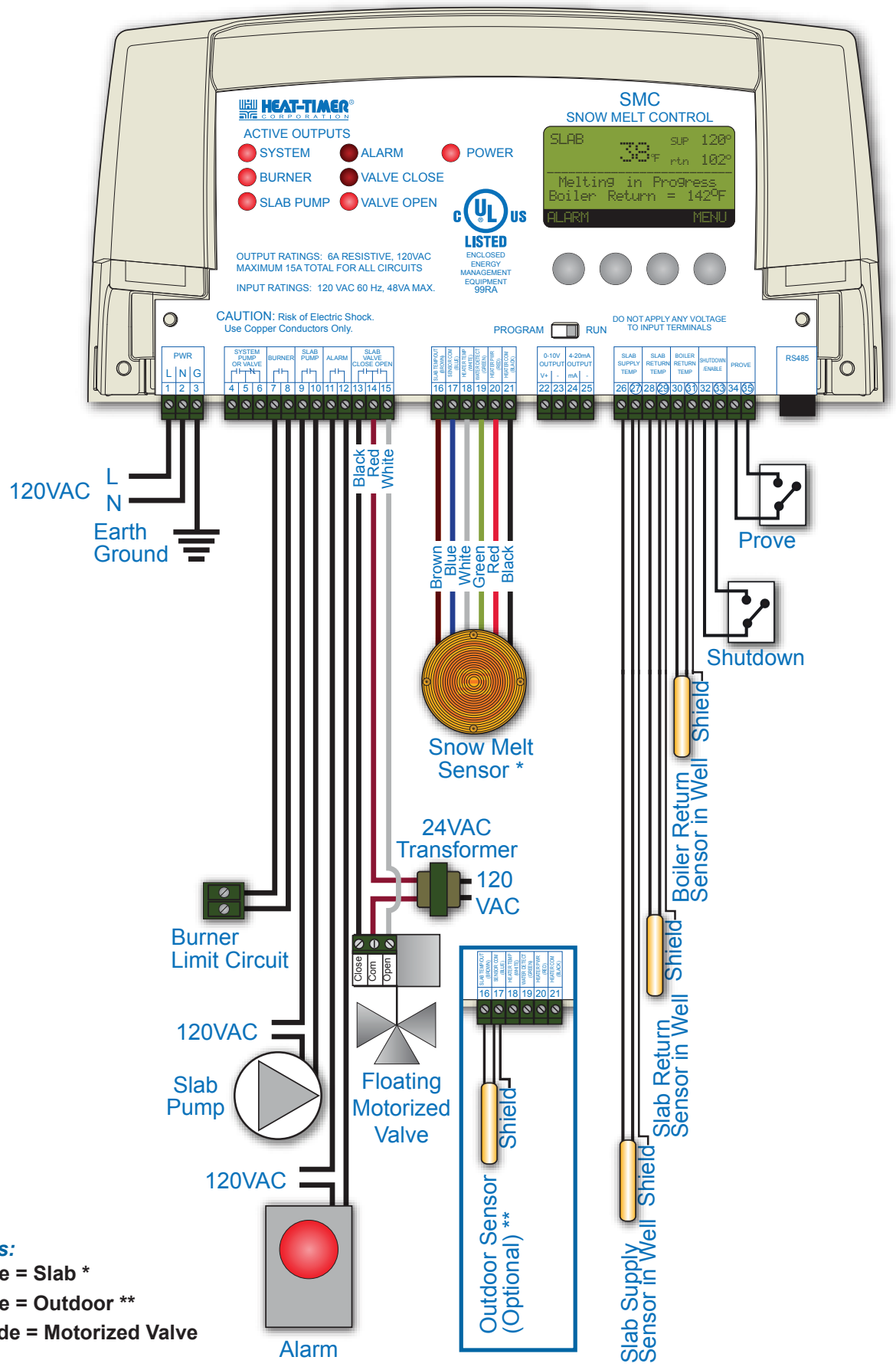
SMC MODULATING A 3-WAY MOTORIZED VALVE - WIRING
Using Water Boiler without a Heat-Exchanger



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Motorized Valve**

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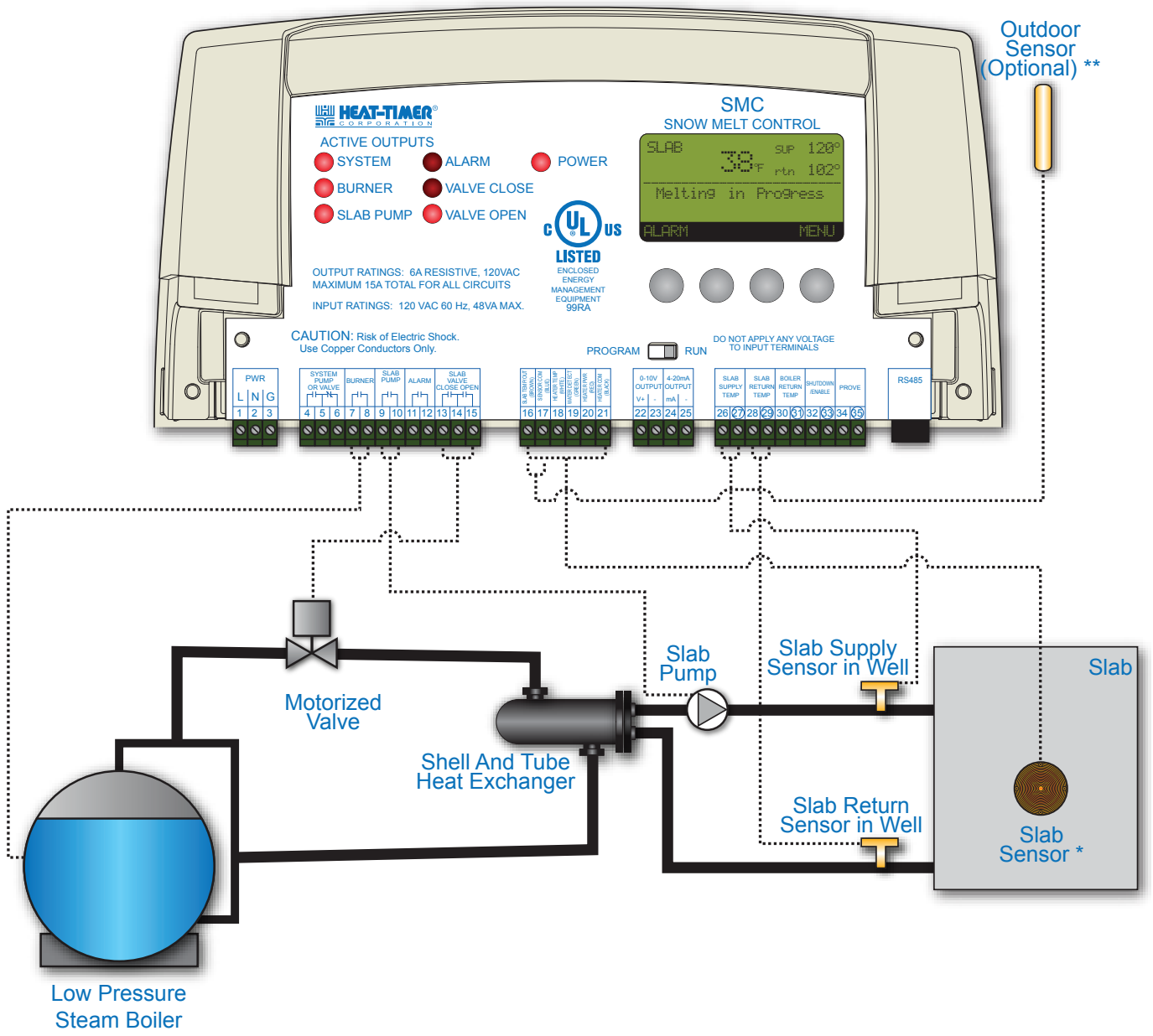
SMC MODULATING A 2-WAY MOTORIZED VALVE - PIPING
Using Steam to Water Heat-Exchanger



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Motorized Valve**

⚠ ALERT

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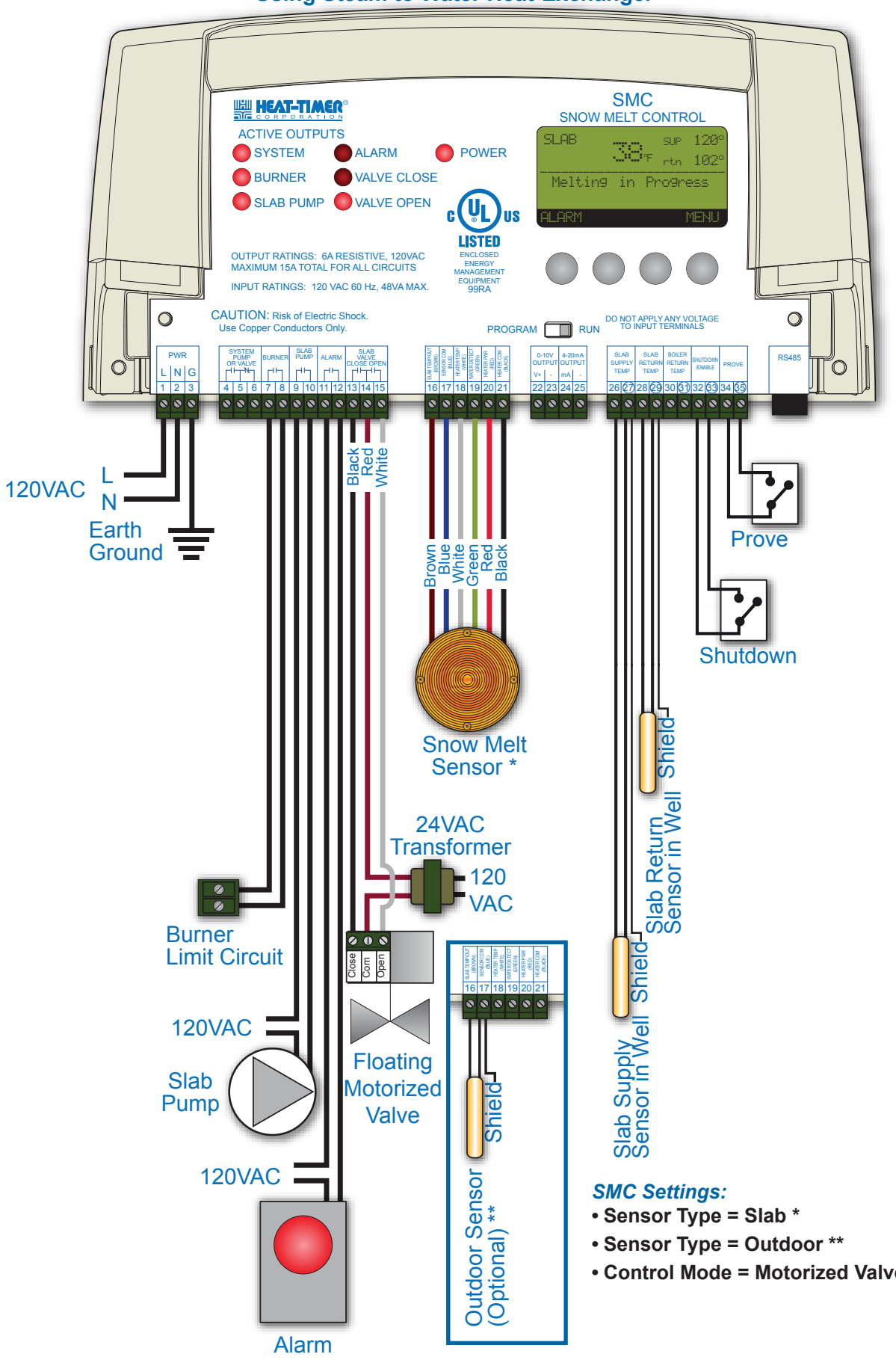
SMC MODULATING A 2-WAY MOTORIZED VALVE - WIRING

Using Steam to Water Heat-Exchanger



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Motorized Valve**

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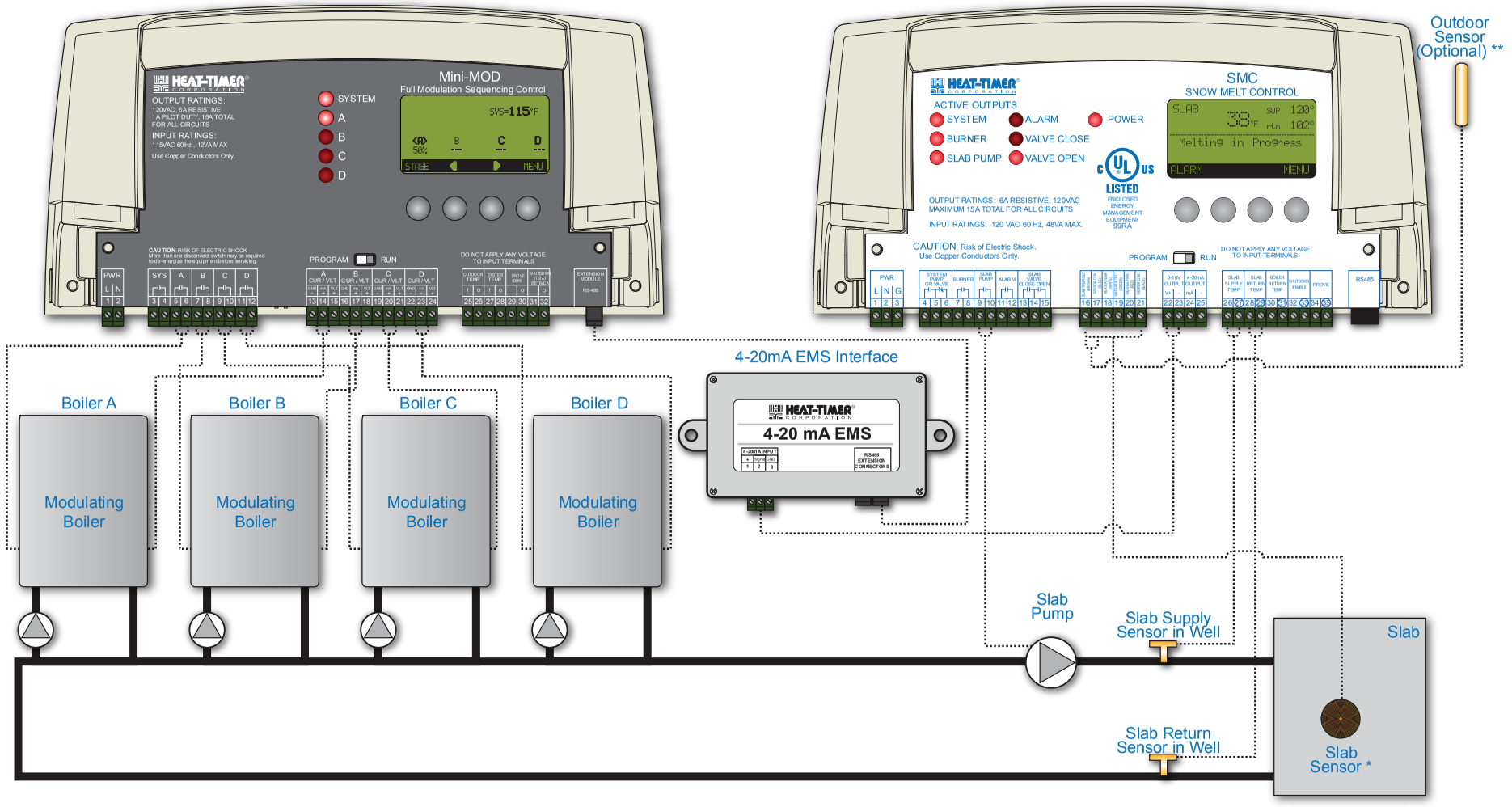
SMC CONTROLLING MULTI-BOILER CONTROL - PIPING



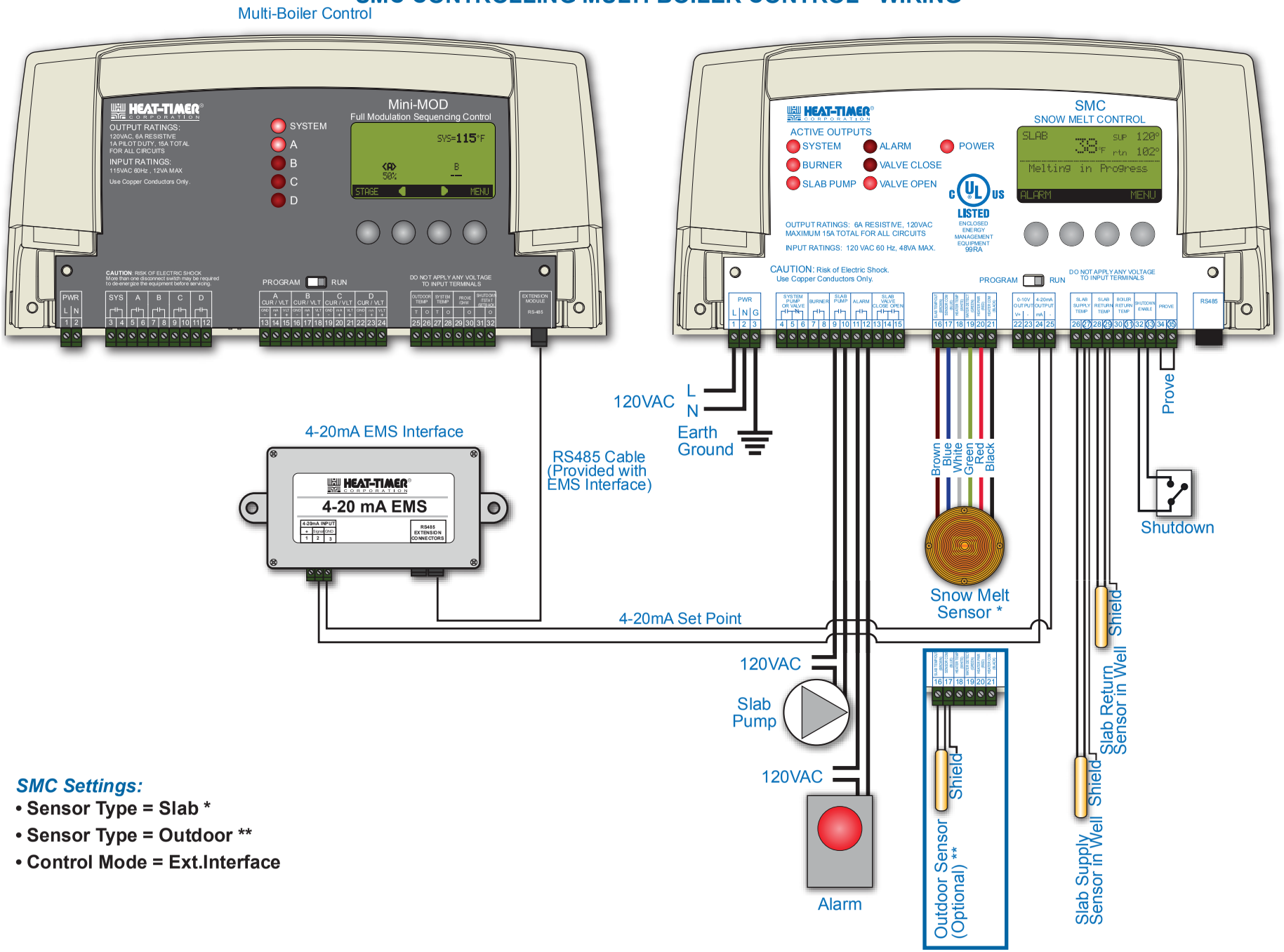
⚠ ALERT

Due to the uniqueness of each installation, Heat-Timer Corp. is not responsible for any installation that is based on any electrical or piping diagram generated. The provided illustrations are to demonstrate the control operating concept only.

SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Ext.Interface**

SMC CONTROLLING MULTI-BOILER CONTROL - WIRING



SMC Settings:

- **Sensor Type = Slab ***
- **Sensor Type = Outdoor ****
- **Control Mode = Ext.Interface**

SPECIFICATIONS

SMC SPECIFICATIONS

Operating Temperature: . . . . . 20°F/-6°C to 120°F/49°C
Voltage Input: . . . . . 120 VAC 60 Hz
Maximum Input Rating: . . . . . .48 VA Max
Output Built-in Relay Ratings: . . . . . 1 Amp inductive (Maximum of 1/4 HP) at 120 VAC 60 Hz
Output Built-in Relays: . . . . . 1 System Pump, 1 Burner, 1 Slab Pump, 1 Alarm, 2 Motorized Valve
Output LEDs: . . . . . .1 System Pump, 1 Burner, 1 Slab Pump, 1 Alarm, 2 Motorized Valve, and 1 Power
Inputs: . . . . . Dry Contact Inputs: Shutdown/Enable, Prove
Temperature Inputs: 1 Slab Sensor (Composite), Outdoor, Slab Supply and Slab Return Temps, Boiler Return Temp
Modulating Outputs . . . . . 0-10V, 4-20mA, or Floating (3-Point)
Seasons: . . . . . Winter and Summer
Operating Modes: . . . . . Slab Sensor or Outdoor Sensor
Control Mode: . . . . Motorized Valve, Boiler, or External Interface (sends a 4-20mA set point to an external control)
Warm Weather Cutoff (WWC): . . . . . .34°F/1°C to 44°F/7°C
Cold Weather Cutoff (CWC): . . . . . On, Off, and 0°F/-18°C to 20°F/-7°C
Idle Set Point (ISP): . . . . . .Off, and 20°F/-7°C to 44°F/7°C
Minimum Runtime: . . . . . .0 to 4 hours
Maximum Delta T (Max ΔT): . . . . . 10F°/6C° to 50F°/28C°
Minimum Boiler Return: . . . . . .Off, and 40°F/4°C to 140°F/60°C
Heating Curve: . . . . . from -10 to +10
Modulating Boiler Ignition %: . . . . . from 1% to 50%
Buttons: . . . . . .4 buttons each with multiple functions
Dimensions: . . . . . .7 ⅛" W x 9 ⅝" H x 3½"D
Weight: . . . . . 2 pounds
BACnet Communication: . . . . . .MSTP (RS485) requires BACnet Module Interface
BACnet Baud Rates: 9600, 19200, 38400

SLAB SENSOR SPECIFICATIONS:

Sensor Components: . . . . . Brass Sensor with 90 Feet of cable, Brass Base, Dummy Plastic Plug
Operating Temperature Range: . . . . . -30°F/-34°C to 250°F/121°C
Sensor Case Material: . . . . . Brass
Cable length Provided: . . . . . 90 Feet
Sensor and Housing Dimensions: . . . . . 3 7/16" Diameter x 3 3/4" H
Weight: . . . . . 5 pound