SMP-654 Series Snow Melt Panels

Installation, Operation, and Maintenance Manual

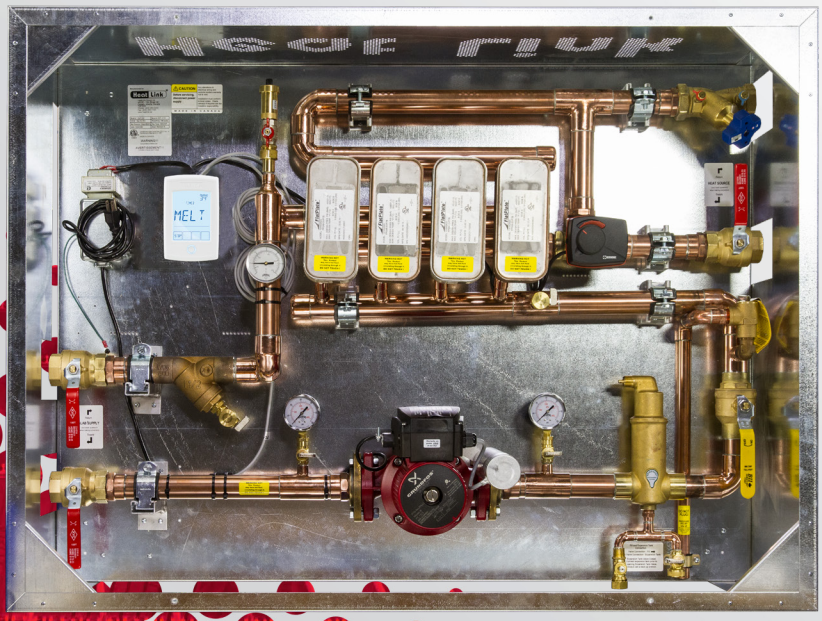




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Product Safety Information

Warnings

The zone control panel is for indoor use only and must be installed by a qualified installer/service technician. This product must be installed and operated in strict accordance with the terms set out in this manual and in accordance with the relevant requirements of the Local Authority Having Jurisdiction. Failure to comply will result in a void of warranty, and may also result in property damage, serious injury, or death.

Servicing

Prior to commencing installation of this panel it is necessary to read and understand all sections of this manual. The symbols below are used throughout this document to ensure proper operation of the panel, and your safety. Please pay attention to these symbols.



Warning
Possible Hazard



Warning
Live Power



Warning
Hot Pipes



Warning
Treated Water



In order to avoid injury or death, switch off the power to the panel prior to inspecting or making connections to the terminal strip.

Function

This zone control panel can provide mixing, distribution, and zoning for a wide variety of hydronic heating applications.
The effectiveness of the system is dependant on the system being designed and installed correctly. Proper consideration of factors such as BTU loads, outdoor design temperature, indoor design temperature, room set-point temperature(s), differential fluid temperatures, head loss, flow rates, and transfer capacities of the heat emitters is critical.
Once these factors have been considered and the system requirements determined, these can then be evaluated and compared to the panel capabilities.

Unpacking

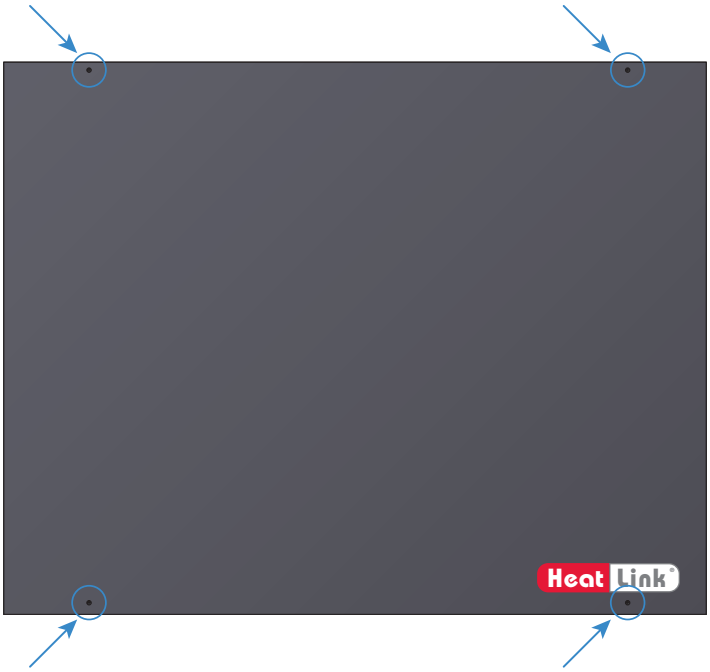
Step 1 Examine carton for any damage that may have occurred during shipping. If damage is visible notify your courier and supplier immediately.

Step 2 Open the carton by removing the staples.

Step 3 Remove the cardboard spacers from the carton, then remove the panel from the carton. Lift the panel by the base, not the enclosure.

Step 4 There are 4 screws holding the cover in place. They are located at the top left & right, and the bottom left & right of the cover. Remove and **keep** these 4 screws - they will be needed after installation is complete to re-secure the cover.

Step 5 Remove the cover and place to one side.

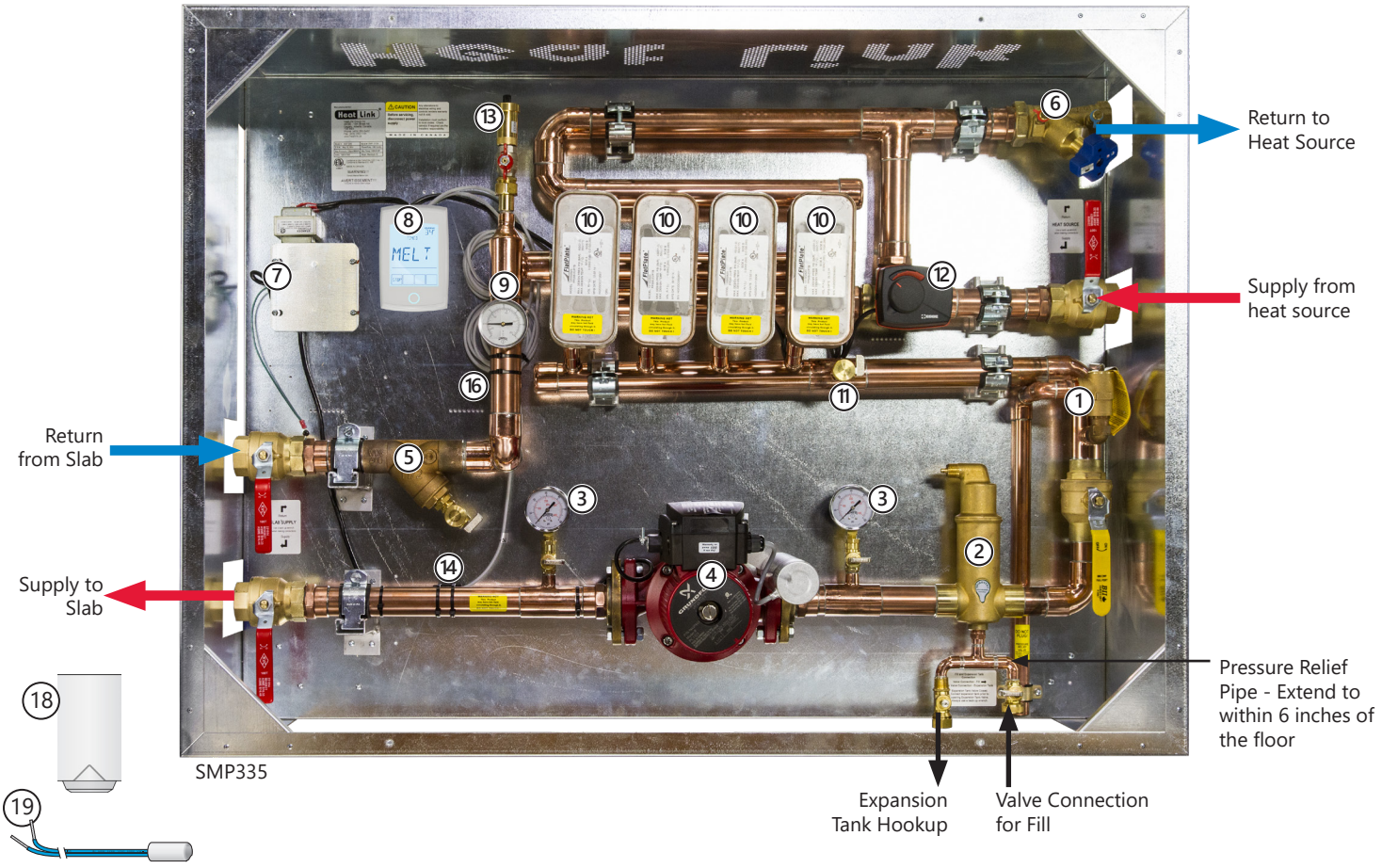


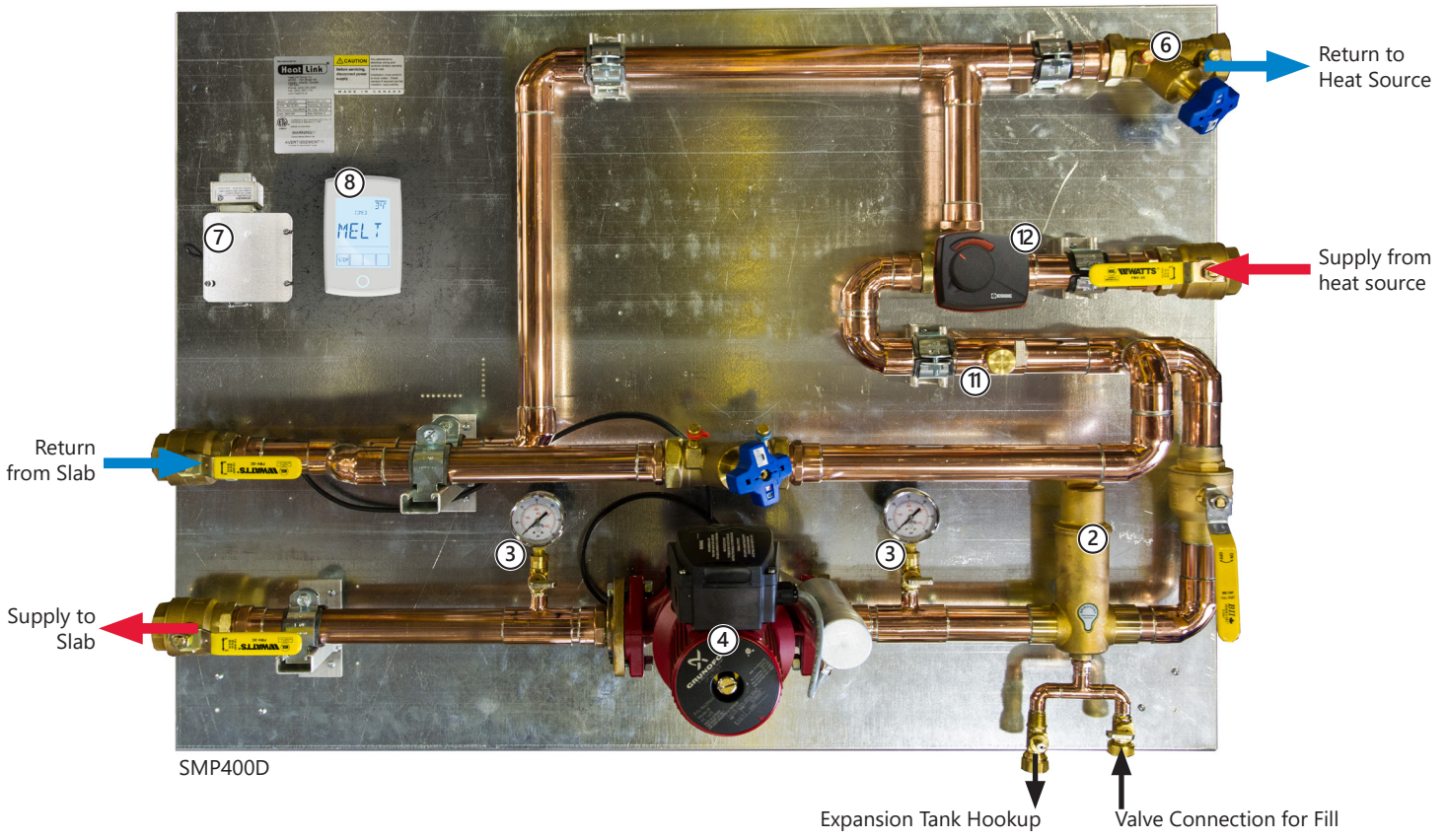
Installation Tools Needed

- Level
- Screwdriver or power drill
- Flat head bit of Robertson Square Drive #2
- Phillips head bit # 2
- 2 adjustable wrenches (or 2 × 40mm wrenches)

Panel Components

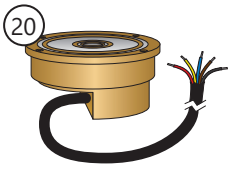
Note: When making piping hookups always be sure to use a backup wrench.





#	Components	Part Number SMP335	SMP425	SM400D
1	Pressure relief valve	-	-	-
2	Air eliminator	-	-	-
3	Pressure gauge	PG14NPT25160	PG14NPT25160	PG14NPT25160
4	Pump	UP 43-110	UP 43-110	UP 43-110
5	Strainer/Drain valve	-	-	-
6	Balancing Valve	-	-	-
7	115V power plug	-	-	-
8	System Controller		30654	
9	Temperature gauge		76940	
10	Heat exchanger	HTEX3820	HTEX3820	n/a
11	Drain Valve	-	-	-
12	3-way valve	63539	63539	63539
13	Motorized actuator	58132	58132	58132
14	Air vent w/cap	79932	79932	79932
15	Supply sensor		30070	
16	Return sensor		30070	
17	Panel Enclosure & Cover	-	-	-
18	Outdoor Sensor		30070	
19	Boiler Sensor (optional)		30071	
20	Snow Sensor (sold separately)		30090	
21	Aerial mount snow sensor (optional, sold separately)		30095	
22	Slab sensor (optional, sold separately)		30072 / 30073	

20



30090 Snow/ice sensor sold separately

21



30095 Snow/ice sensor sold separately

22



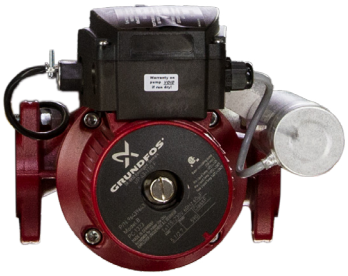
30072/30073 Slab sensor sold separately

SMP Panel Specifications

Headings	SMP335-654	SMP425-654	SMP400D-654
Listing	cETLus		
Conforms to	CAN/CSA-C22 No.14, UL508		
Dimensions	36"H × 48"W ×16"D		
Weight	500lbs		480lbs
Nominal panel output			400,000 BTU/hr
Nominal flow	*See conditions in table below*		32 US gpm @ 25°F ΔT
Nominal pressure drop outside of panel			25 ft
Max ambient temperature	120°F		
Max water temperature	200°F		
Max allowable operating pressure on secondary side	100 psi		
Power supply	15 Amp, 120V, 60Hz, single phase		
Pump	Grundfos UP43-110		
Temperature control method	1½" 3-way diverting valve and motorized actuator, controlled by snowmelt control		
Mixing valve Cv	18.6		
Heat Exchanger Size	4× 3×8-20	4× 3×8-30	n/a
Auxiliary terminal	Yes, max 16A		
Piping	1½" Copper		
Piping connections	1½" FNPT		
Expansion tank fitting	½" FNPT		
Cold water fill	¾" Hose bib		
Backplate and side	Galvanized steel		
Cover	Powder coated steel		

Panel Output Conditions	SMP335-654		SMP425-654	
	Primary	Secondary	Primary	Secondary
Fluid type	Water	50% glycol	Water	50% glycol
Entering fluid temp (°F)	180	100	180	100
Exiting fluid temp (°F)	150	130	140	130
Flow rate (US gpm)	17	22	21	28
Headloss	14.3	–	16.8	–
Pressure drop (ft head)	–	22	–	21

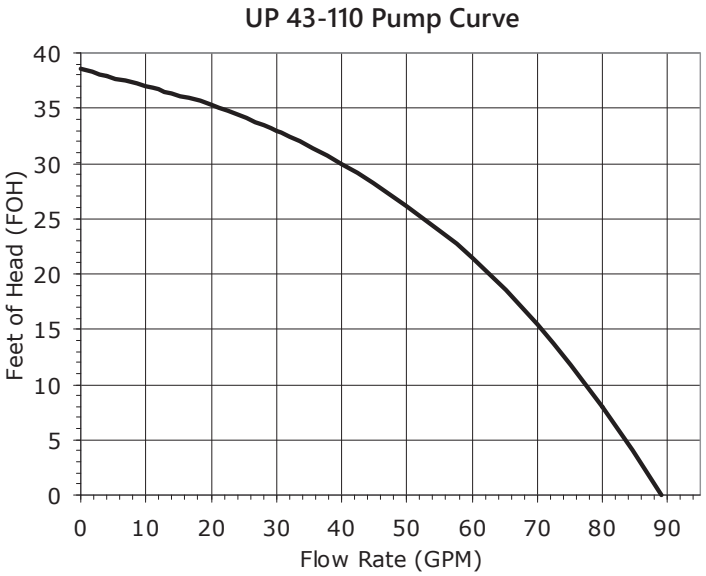
Panel Component Specifications



Circulator

The circulator moves the heated fluid through the system when there is a call for heat from the system controller.

The addition of glycol to the system will result in higher demand from the circulator due to the change in viscosity of the fluid.



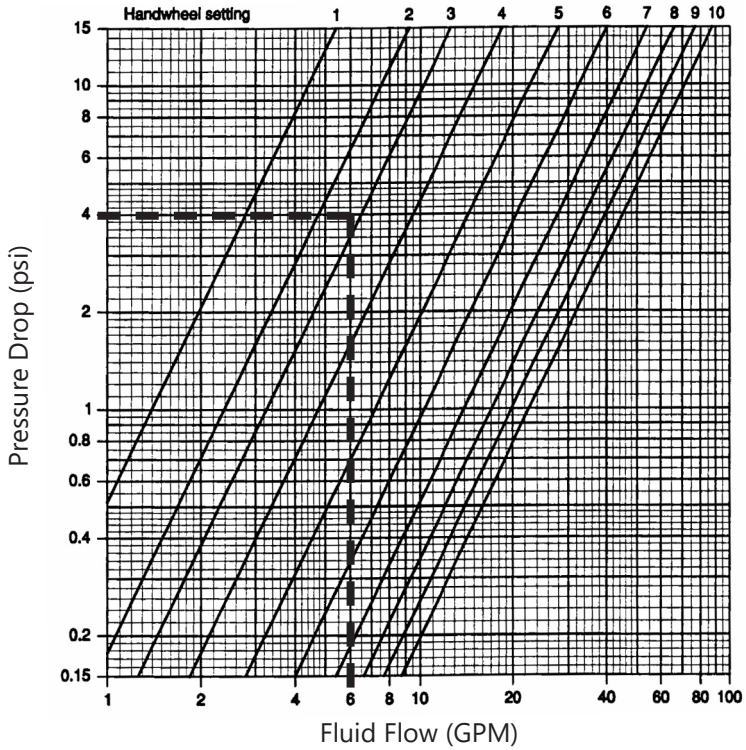


Balancing Valve

Located on the primary return (and secondary supply for SMP400D) is 1-½" balancing valve that provides flow regulation based on load requirements.

Setting of Return Balancing Valve

Certain system information is required to properly set the balancing valve:



Note: Diagram above based upon 100% water.

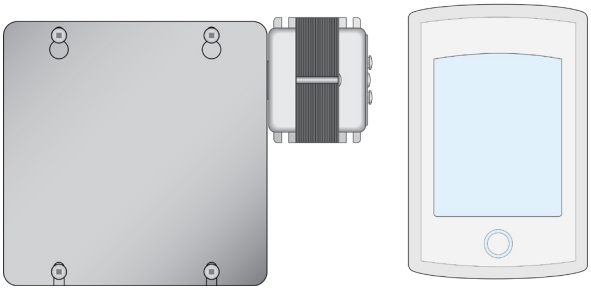
1) Total pressure drop across the supply and return for both the primary and secondary systems.
2) Flow requirements for both the primary and secondary sides of the system.

Taking this information and the graph to the left, the appropriate valve setting would then be set and read on the valve handle.

For example:
Pressure drop across the panel is 4 psi and the flow requirement is 6 GPM.
Following the dashed lines, seen on the graph to the left, the valve setting would be approximately 2.8. The blue knob would be turned clockwise until digits 2.8 appear (8 being red).

Available on the valve are two test ports. Appropriate test equipment can be utilized for verification of the required load requirements.

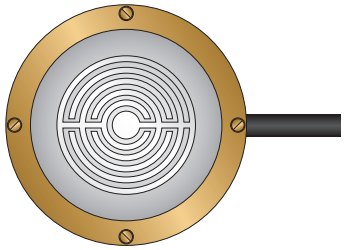
Panel Component Specifications



System Controller

Based upon the feedback from the sensors for the system the controller will regulate the necessary supply fluid temperature that is required for the snow melt system by adjusting the control valve via motor actuator.

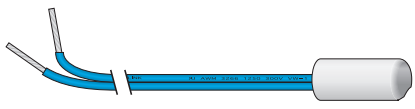
Refer to page 15 for instructions.



#30090 Snow/Ice Sensor (sold separately)

The SMP panel uses a snow/ice sensor in conjunction with the 330654, which activates and controls a snow melting system based on moisture (snow/ice) and slab temperature. The sensor measures the slab temperature, sensor surface temperature, and sensor surface moisture level. This control is not designed as a simple detection device and will not operate properly in an unheated slab.

Sensor Ambient Temp.:.....-30 to 170°F (34 to 77°C)
Sensor Material:.....Silicon brass
Sensor:.....NTC thermistor, 10kΩ @ 77°F (25°C ± 0.2°C), β =3892
Cable Material:.....5 conductor stranded wire with polyethylene jacket
Cable Length:.....65' (20 m)
Load Rating:.....15,000 lb (66,723 N) distributed load, non-impact, installed in concrete according to the manual



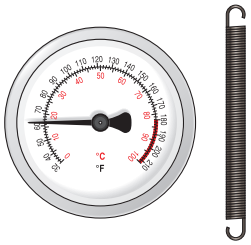
#30071 Universal Sensor

One sensor is installed on the panel as a supply sensor.

An optional boiler return sensor (sold separately) can be used instead of an outdoor sensor. If used, the mixing valve will provide boiler return protection to the boiler inlet by closing the valve when the boiler return temperature falls below the Boiler Minimum setting. Boiler return protection requires the installation of the boiler return sensor on the inlet to the boiler and the Outdoor/Boiler Return Sensor setting must be set to Boiler Return.

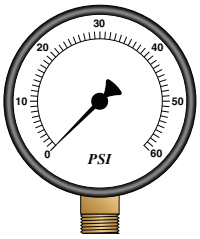
Operating Temperature:..... -58°F to 140°F (-50°C to 60°C)
Sensor:.....NTC thermistor, 10 k @ 77°F (25°C±0.2°C), B=3892

Panel Component Specifications



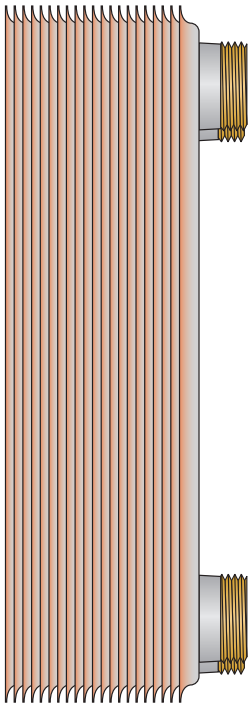
Thermometer (76940)
The pipe mounted thermometer reads the supply fluid temperature.

Specifications:
• Temperature range of 32-210°F (0-100°C).



Pressure Gauge
The two pressure gauges are mounted on the inlet and outlet ports of the circulator providing a reading of the system pressure drop.

Specifications:
• Pressure range, 0-60psi

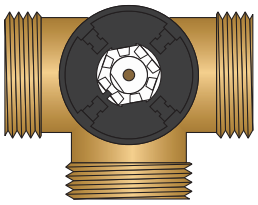


Heat Exchanger (SMP175-HEX, SMP300SS-HEX and SMP300SS-HEX-H only)
The brazed plate heat exchanger allows the transfer of heat from fluid on one side to fluid on the other side of the heat exchanger. This component also provides a separation between the two fluids so mixing does not occur.

Specification:
• Stainless steel plates copper brazed together
• Single-wall brazed plate

Fluid pH should be maintained within a range of 6.8-8.0

Panel Component Specifications



Control Valve
3-way brass mixing valve regulates the temperature in the hydronic system with the help of the electric motor actuator and system controller. May not be exactly as shown.

Specifications:
• Cv=11.6



Motorized Actuator
The motor actuator is mounted to the control valve and moves the valve appropriately to allow the heated fluid to enter. This actuator works in conjunction with the system controller.
Specifications:
• 0-10V/0-20mA, 45-120s
• 24Vac/dc, 6Nm

Manual Operation of Motorized Actuator
NOTE: Motorized actuator should not be placed in manual mode for an extended period of time.
• Pull knob out on motorized actuator.
• Rotate knob clockwise or counter-clockwise.
• To return to automatic mode, push the knob in.



Air Eliminator
The air eliminator removes entrapped air from the hydronic system by screening the fluid as it flows through the valve. The air is then released out of the system via the incorporated air vent.
Specifications:
• Stainless steel lattice
• Removable internal air vent assembly for ease of maintenance

Panel Mounting

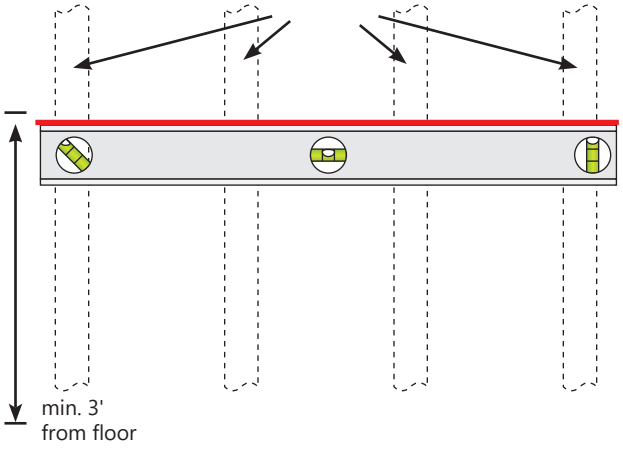
Prior to mounting the panel, ensure the wall is capable of supporting the weight of the panel, and that a 115V receptacle is within reach of the 6 foot cord and plug.
The bottom of the panel should be a minimum of 3 feet from the floor to allow for piping hookup.

Step 1 Determine the locations and distance of the studs within the walls.

Step 2 Recommended: Use a 2×4 secured to the wall to rest the panel on during installation.

Step 3 With a level draw a straight line on the wall at least 3 feet from the floor.

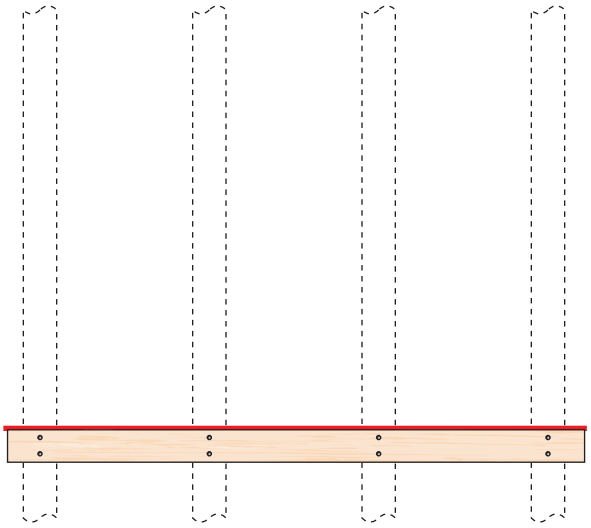
Step 4 Align the 2×4 to the line and secure it to the wall studs.





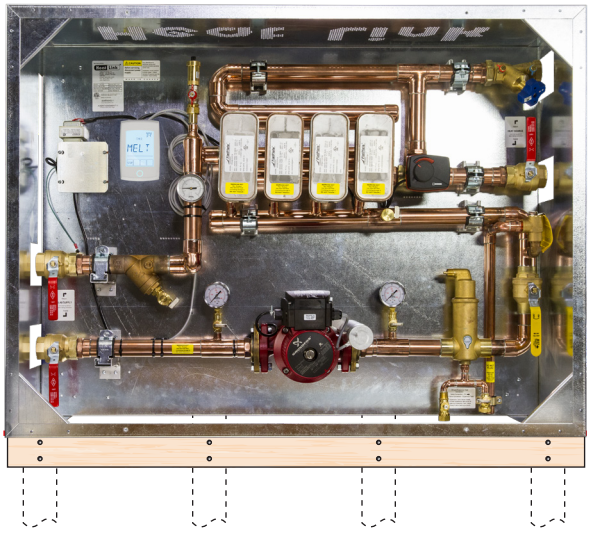
This panel is heavy; 2-3 person lift is required.

Step 5 Lift and place the panel onto the 2×4 and using the mounting screws secure the panel to the wall studs.
To ensure the panel is properly secured it may be necessary to screw through the backplate.



Step 6 Refer to pages 12-14 to connect the piping and wiring to the panel.

Step 7 Replace the cover.



Fill & Purge

The following steps are recommended in order to fill the system side of the snow-melting panel prior to commissioning of the panel.

Note: *Additional purging steps may be required for the rest of the hydronic system.*

The discharged system fluid from the fill and purge process is not for consumption or washing.

Step 1 Ensure the panel is not plugged in.

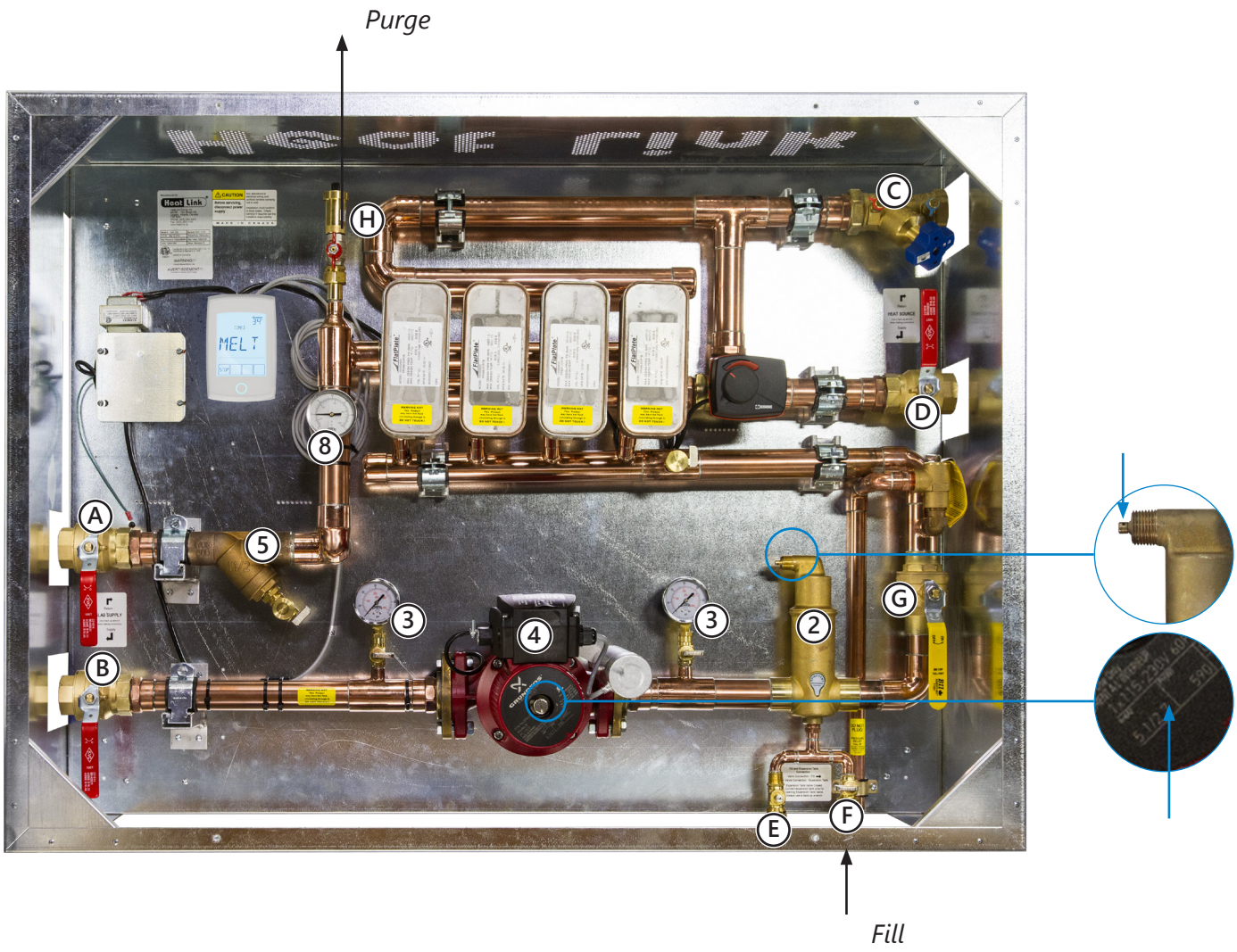
Step 2 Fully close valves Ⓐ, Ⓑ, Ⓕ, Ⓖ, ⑤, and ③.

Step 3 Remove air vent assembly from Ⓗ and attach the purge hose to the valve.

Step 4 With an appropriate expansion tank connected fully open Ⓔ.

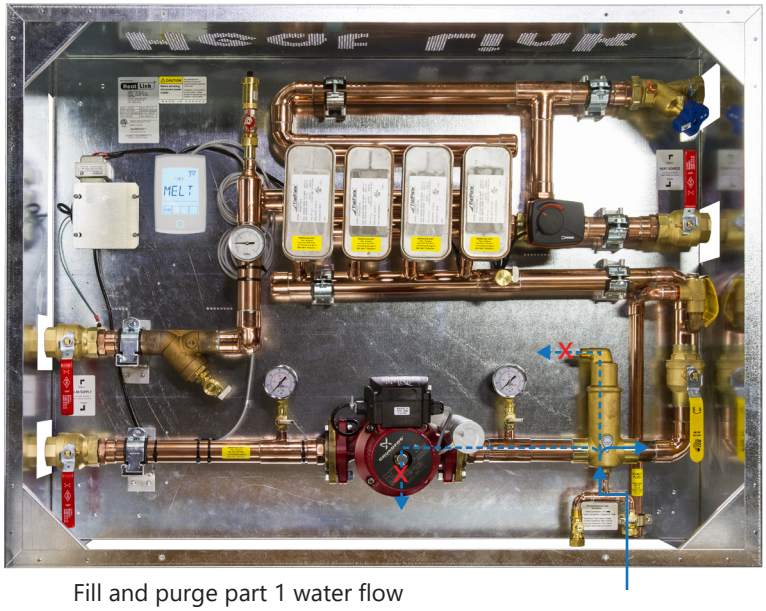
Step 5 Loosen the pump ④ vent screw with a large flat head screwdriver.

Step 6 Loosen the air vent knob on the air eliminator ②.



Step 7 Connect the antifreeze solution charger to Ⓕ and slowly open the valve. Reduce the flow if the solution sprays out from ②.

Step 8 After a minute, or when the fluid comes out of the circulator, tighten the screw.



Fill and purge part 1 water flow direction

Reduce flow if solution exits the vent head of the air eliminator

Close the vent screw on the pump once the solution exits the pump vent.

Step 9 Tighten the air vent on the air eliminator.

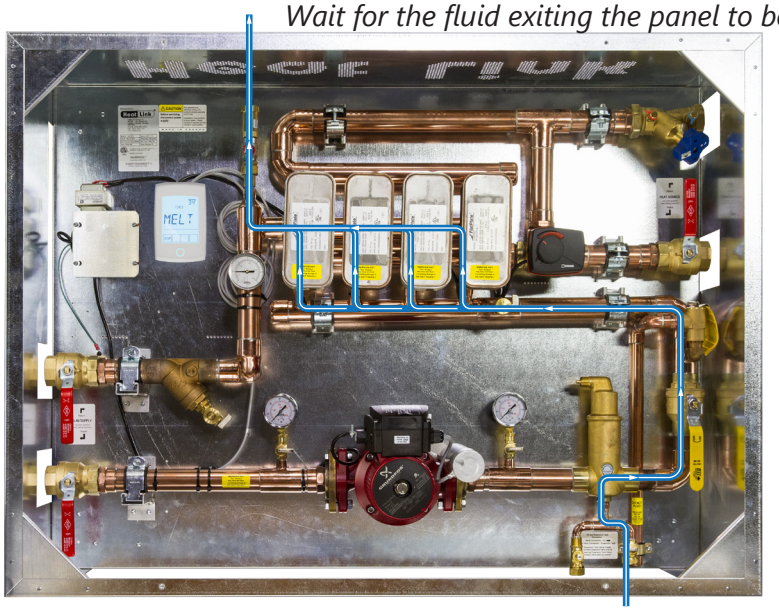
Step 10 Fully open valve Ⓖ and allow the water to fill through the heat exchangers and purge through Ⓗ.

Step 11 When the water exiting from Ⓗ is free of bubbles close valves Ⓗ and Ⓕ.

Step 12 Remove the purge hose from valve H and reattach the air vent assembly. Loosen the air vent knob on ②.

Step 13 Prior to fully opening valves Ⓐ and Ⓑ the rest of the snow melt system should be properly filled and purged.

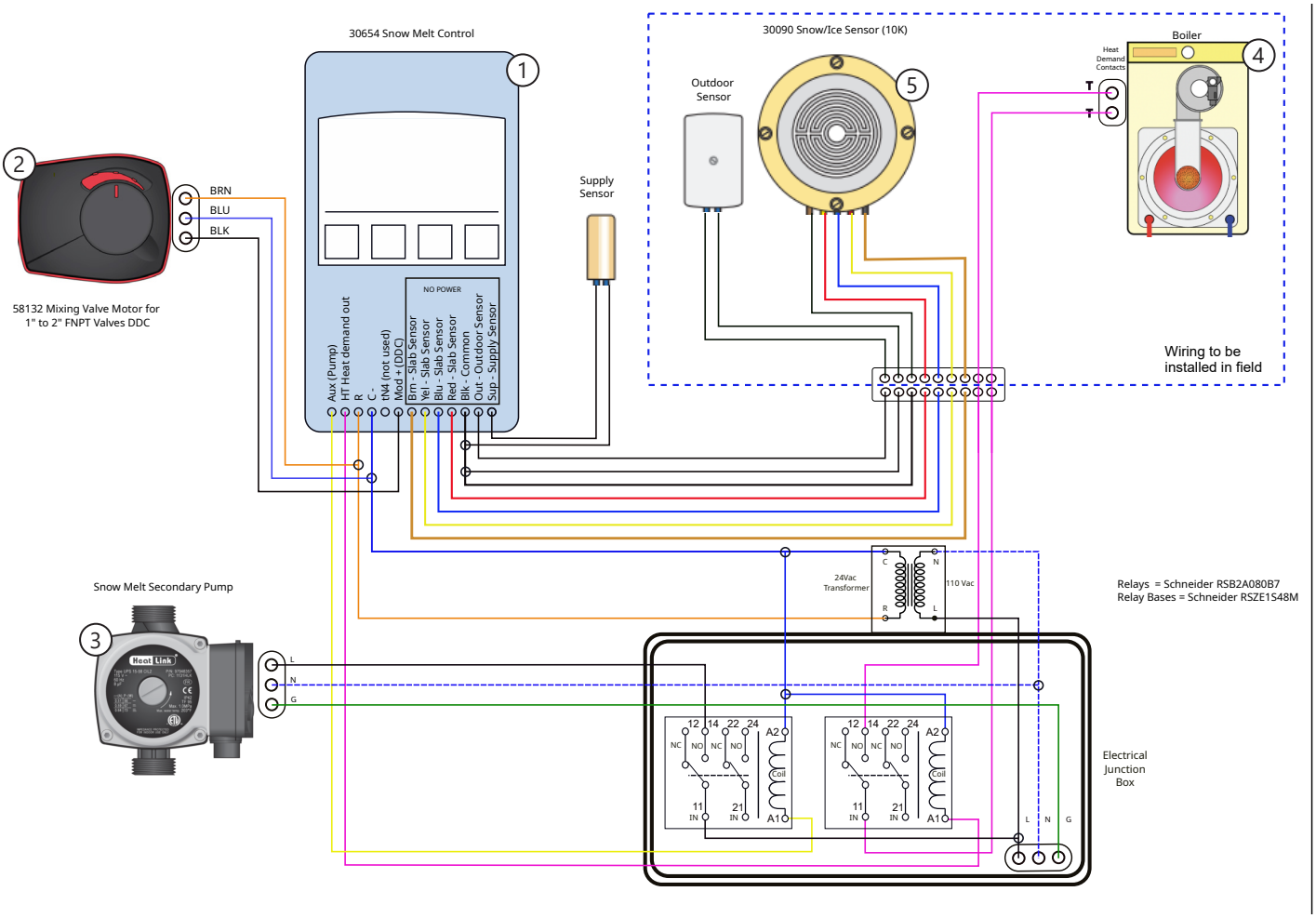
Wait for the fluid exiting the panel to be free of bubbles.



Tighten the air vent on the air eliminator.

Wiring Diagram

- Wiring should be done by a qualified electrician and should meet local codes and jurisdictions.

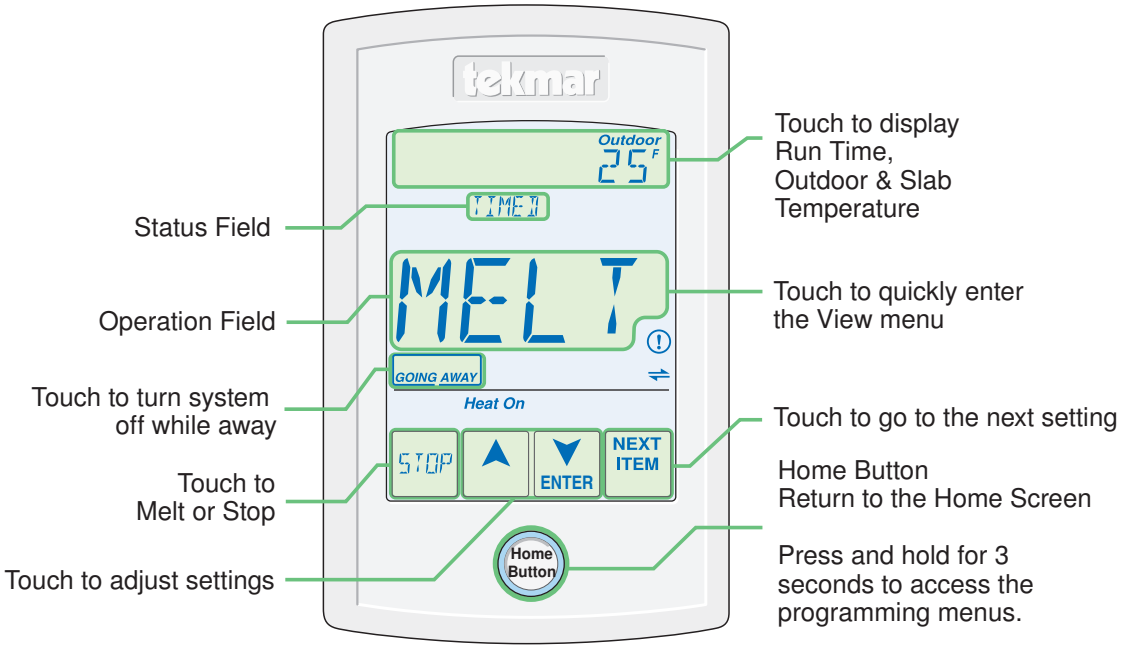


Panel Control Sequence

1) The 30654 Snow Melt Control ① operates a Modulating Mixing Valve (or DDC Actuator) ② and a System Pump ③. The heat source is hot water/glycol from a boiler ④.
2) The slab temperature is controlled by adjusting the mixing valve position using an analog 0 to 10V (dc) signal. The slab is heated to maintain the slab target temperature. When a Snow/Ice Sensor 30090 is installed, the system automatically starts when a snow or ice is detected and continues to run until the slab is dry.
3) When a Snow Sensor 30095 ⑤ is installed together with a slab sensor 30072 or 30073 the system automatically starts when snow is detected and runs on a timer before shutting off. All systems can be manually started and shut off using a timer when either a Snow/Ice Sensor 30090 or 30094 or a Slab Sensor 30072 or 30073 is installed.

System Controller Instructions

Display



Operation Field

MELT	System is melting snow or ice.	STRM	System is in storm operation.
IDLE	System is idling.	OFF	System is off.

Status Field

WWSD	Warm Weather Shut Down. The slab is naturally warm enough to melt snow or ice.	PEND	Pending. The system has detected water but it is too cold to operate or the schedule is in Idle or Off.
CWCO	Cold Weather Cut Out. Too cold to melt.	WAIT	Zone priority in effect. Zone must wait until higher priority zone finishes melting.
TIMED	Timed melting operation. System operates until time has elapsed.	SENSOR	Tandem 090 sensor.
WARM	Slab is warming up to the melting temperature.	TRACK	This zone tracks the melting operation of zone 1.
AWAY	Away scene. No melting until the away scene is exited.		

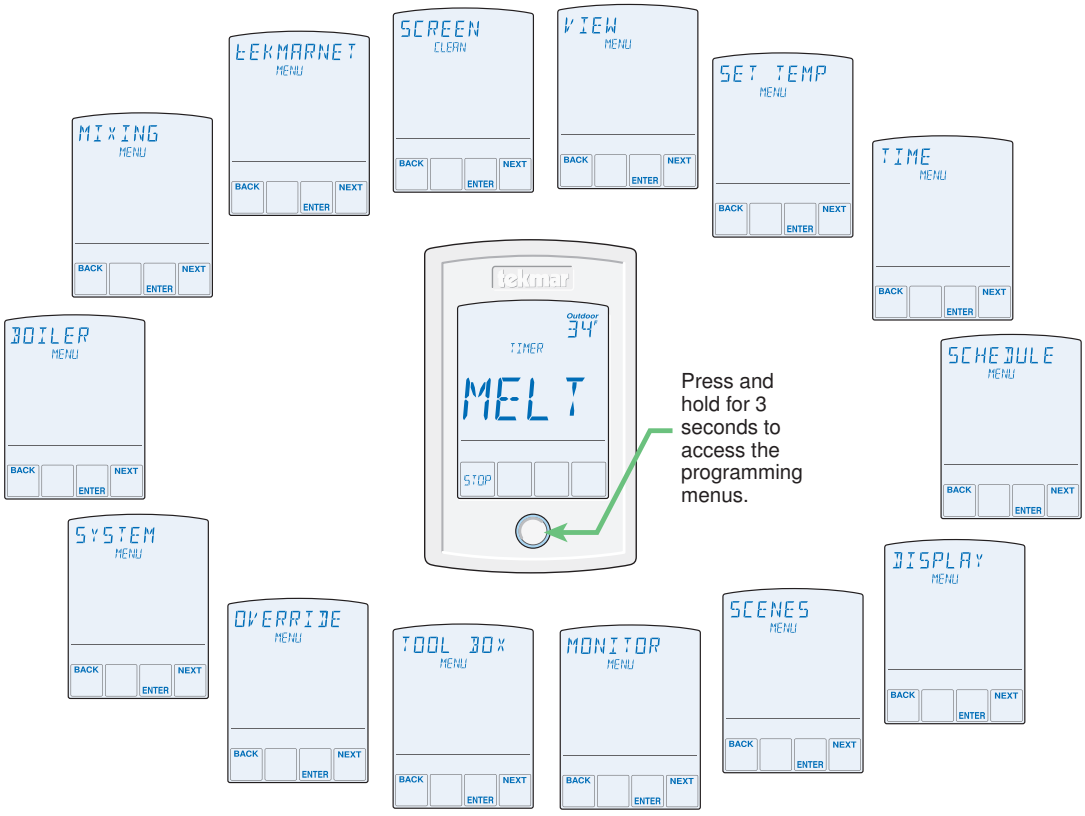
Symbols

Heat On	**HEAT ON** Heat is turned on.	ⓘ	**WARNING SYMBOL** Indicates an error is present.
⇌	**tekmarNet®** Communication is present.	▲▼	**ARROWS** Adjust the displayed setting.

Programmable Settings

Programming Menus

Press and hold the Home button for 3 seconds to enter the programming menus. The control returns to the last programming menu previously used.



Select a Programming Menu

- Touch “NEXT” to advance (clockwise in above illustration) to the next menu.
- Touch “BACK” to go backwards (counterclockwise in above illustration) through the menus.
- Touch “ENTER” to enter a menu.

Setting Items

- Touch ▲ or ▼ arrow to adjust the setting if required.
- Touch “NEXT ITEM” to advance to the next item within the menu.
- Touch “BACK ITEM” to go backwards to the previous item within the menu.
- To return to the parent menu after changing a setting, press and release the Home button.
- To return to the Home screen, press and release the Home button twice or wait 30 seconds to automatically return to the Home screen.

Access Levels and Access Level Lock

The control is shipped pre-programmed with common settings. The control has an “Installer” access level that allows full access to all settings and a “User” access level that restricts the number of settings available. The control defaults to the “User” access level after 12 hours of operation.

Notice: tekmarNet® system controls include a Global Lock that locks all connected snow melting controls and thermostats. Set the tekmarNet® system control to unlock to allow access level adjustment on all connected devices.

To change to the “Installer” access level:

- In the Toolbox menu, locate Access
- Adjust the access level to “Installer” by pressing the up or down button. This will permit setting changes to the control.

View Menu (1 of 2)

The View menu items display the current operating temperatures and status information of the system.

Item Field	Range	Access	Description	Set to
SNOW ZONE	1 to 12	User Installer	**SNOW ZONE** The snow melt zone number on the tekmarNet® system. Conditions: tekmarNet® communication available.	
OUTDOOR	– – –, -76 to 149°F (-60 to 65°C)	User Installer	**OUTDOOR** Current outdoor air temperature as measured by the local or remote outdoor sensor. The outdoor air temperature is shared to all devices in the tekmarNet® system. "– – –" is displayed when no outdoor sensor is available. Conditions: Application Mode is set to PWM, Boil, Mix or Elec.	
SLAB TARG	– – –, -76 to 149°F (-60 to 65°C)	Installer	**SLAB TARGET** The calculated slab target of the snow melting system. "– – –" is displayed when the snow melt control is off. Conditions: Application Mode is set to PWM, Boil, Mix or Elec and a snow/ice sensor or slab sensor is installed.	
SLAB	-76 to 149°F (-60 to 65°C)	User Installer	**SLAB** Current slab temperature as measured by the control. Conditions: Application Mode is set to PWM, Boil, Mix or Elec and a snow/ice sensor or slab sensor is installed.	
SENSOR WATER	DRY or WET	User Installer	**WATER SENSOR** Current status of the water detection sensor. Conditions: A snow/ice sensor or snow sensor is installed.	
BoilTARGET	---, 70 to 200°F (21.0 to 93.5°C)	Installer	**BOILER TARGET** The calculated boiler target of the snow melt system. "– – –" is displayed when the snow melt control is not operating the boiler. Conditions: Application Mode is set to Boil.	
MixTARGET	---, 70 to 200°F (21.0 to 93.5°C)	Installer	**MIX TARGET** The calculated mix target of the snow melt system. "– – –" is displayed when the snow melt control is not operating the mixing valve or mixing injection pump. Conditions: Application Mode is set to Mix.	
SUPPLY	-58 to 212°F (50.0 to 100.5°C)	Installer	**SUPPLY** Current system supply temperature as measured by the control. Conditions: Application Mode is set to PWM, Boil or Mix.	
BoilRETURN	-58 to 212°F (50.0 to 100.5°C)	Installer	**BOILER RETURN** Current boiler return temperature as measured by the control. Conditions: Application Mode is set to PWM, Boil or Mix and Out/Bret Sensor is set to Bret (boiler return sensor).	
Mix RATE	0 to 100%	Installer	**MIX RATE** Current position of the mixing valve or mixing injection pump speed. Conditions: Application Mode is set to Mix.	
Boil RATE	0 to 100%	Installer	**BOILER RATE** Current firing rate of the modulating boiler. Conditions: Application Mode is set to Boil and Boiler Type is set to Mod (modulating boiler).	

View Menu (2 of 2)

Item Field	Range	Access	Description	Set to
HEAT RELAY	OFF or ON	User Installer	**HEAT RELAY** Current status of the heat relay. The boiler, pump or electric cable is on when ON is displayed. The boiler, pump or electric cable is off when OFF is displayed. Conditions: Application Mode is set to PWM, Boil, Mix, or Elec.	
PWM RATE	0 to 100%	Installer	**PWM RATE** Current duty cycle rate of the zone or boiler for each 20 minute cycle. Conditions: Application Mode is set to PWM or Elec. Not visible when Manual Override is not Auto.	
SYS PUMP RELAY	OFF or ON	User Installer	**SYSTEM PUMP RELAY** Current status of the system pump relay. Conditions: Application Mode is set to PWM, Boil or Mix and Auxiliary Relay is set to SYS (system pump).	
ALERT RELAY	OFF or ON	User Installer	**ALERT RELAY** Current status of the alert relay. Conditions: Application Mode is set to PWM, Boil or Mix and Auxiliary Relay is set to ALRT (alert) or Application Mode is set to Elec.	
MAN MELT HOURS	00:00 to 24:00 hours	User Installer	**MANUAL MELT TIME** When manually started, the display shows the remaining run time before shutting off. Conditions: Application Mode is set to PWM, Boil, Mix or Elec.	
ADD MELT HOURS	00:00 to 6:00 hours	User Installer	**ADDITIONAL MELT TIME** When automatically started by a Snow/Ice Sensor 090 or 094, the display shows the remaining run time before shutting off. Conditions: Application Mode is set to PWM, Boil, Mix or Elec and a snow / ice sensor 090 or 094 is installed.	

Display Menu

The Display menu items select the temperature units and backlight options.

Item Field	Range	Access	Description	Set to
UNITS IN	°F or °C Default = °F	User Installer	**UNITS** Select Fahrenheit or Celsius as the temperature units.	°C
BACKLIGHT	ON, ON MELT, OFF Default = ON MELT	User Installer	**BACKLIGHT** Select how the display backlight operates. ON = Always on. ON MELT = On when melting, off when not melting. This provides a visual indicator to occupants that the snow melting system is currently melting. OFF = Always off.	ON

Set Temp Menu

The Set Temp menu items select the operating temperatures of the snow melt system.

Item Field	Range	Access	Description	Set to
MELTING	32 to 95°F (0.0 to 35.0°C) Default = 36°F (2.0°C)	User Installer	**MELTING** Select the desired surface temperature of the snow melt surface when melting. Conditions: Application Mode is set to PWM, Boil, Mix or Elec.	5 °C
IDLING	OFF, 20 to 95°F (-6.5 to 35.0°C) Default = OFF	Installer	**IDLING** Select the desired surface temperature of the snow melt surface when idling. Idling pre-heats the slab when the slab is dry but cold and allows faster reaction time to reach the melting temperature. Recommended for commercial use only. Conditions: Application Mode is set to PWM, Boil, Mix or Elec.	OFF
STORM	OFF, 20 to 95°F (-6.5 to 35.0°C) Default = 28°F (-2.0°C)	Installer	**STORM** Select the desired surface temperature of the snow melt surface while operating in the storm operation. Storm operation temporarily pre-heats the slab to allow faster reaction time to reach the melting temperature. Conditions: Application Mode is set to PWM, Boil, Mix or Elec.	-2.0 °C
MAN MELT HOURS	0:30 to 24:00 hours Default = 4:00 hours	User Installer	**MANUAL MELT RUN TIME** Select the amount of running time when manually starting the system. Conditions: Application Mode is set to PWM, Boil, Mix or Elec.	4:00
ADD MELT HOURS	0:00 to 6:00 hours Default = 0:00 hours	Installer	**ADDITIONAL MELT TIME** Select the amount of additional melting time after the Snow / Ice Sensor 090 or 094 is dry. This allows low spots on the slab to fully dry before the snow melting system is shut off. Conditions: Application Mode is set to PWM, Boil, Mix or Elec and a 090 or 094 Snow / Ice Sensor is installed or Track Zone is set to On.	0:00
STORM RUN HOURS	0:30 to 24:00 hours Default = 8:00 hours	Installer	**STORM RUN TIME** Select the amount of storm run time to pre-heat the slab when advised of a winter storm warning. Conditions: Application Mode is set to PWM, Boil, Mix or Elec and Storm is set to a temperature.	8:00
SENSITVTY WATER	AUTO, MIN, -2, -1, MID, +1, +2, MAX Default = AUTO	Installer	**WATER SENSITIVITY** Select how sensitive the Snow / Ice Sensor 090 or 094, or the Snow Sensor 095 is to water detection. Conditions: Snow / Ice Sensor is set to 090 or 095.	AUTO
WWSD	AUTO, 32 to 95°F (0.0 to 35.0°C) Default = AUTO	Installer	**WARM WEATHER SHUT DOWN** Select the temperature at which to shut down the snow melting system during warm weather. This allows the snow or ice to melt off the slab naturally. Conditions: Application Mode is set to PWM, Boil, Mix or Elec.	AUTO
CWCO	OFF, -30 to 50°F (-34.5 to 10.0°C) Default = 10°F (-12.0°C)	Installer	**COLD WEATHER CUT OUT** Select the temperature at which to shut down the snow melting system during extremely cold weather. Below this temperature, the heat loss of the slab exceeds the capacity of the boiler or heating appliance.	OFF

System Menu

The System Menu provides settings on how to configure and operate the mechanical equipment.

Item Field	Range	Access	Description	Set to
APP MODE	PWM, BOIL, MIX, ELEC, 090 Default = PWM	Installer	**APPLICATION MODE** Select the control application mode. PWM = Hydronic Pulse Width Modulation. BOIL = Hydronic boiler heats snow melting system. MIX = Hydronic mixing valve or injection pump heats snow melting system. ELEC = Electric snow melt. 090 = Tandem Snow/ Ice Detection using 090 or 094	MIX
SNOW/ICE SENSOR	NONE, 090 (or 094), 095 Default = 090	Installer	**SNOW / ICE SENSOR** Select if a Snow / Ice Sensor 090 or 094, or Snow Sensor 095 is installed.	090
SLAB SENSOR	OFF or ON Default = ON	Installer	**SLAB SENSOR** Select if a Slab Sensor 072 or 073 is installed to measure the slab temperature. Conditions: Application Mode is set to PWM, Boil, Mix or Elec and Snow / Ice Sensor is set to None or 095.	ON
PROTECT SLAB	OFF or ON Default = ON	Installer	**SLAB PROTECTION** Select if the slab should be protected from large temperature differentials to avoid cracking the concrete due to high tensile stress. Conditions: Application Mode is set to Boil or Mix and Snow / Ice Sensor is set to 090 or Slab Sensor is set to On.	ON
OUT/BRET SENSOR	OFF, OUT (Outdoor) or BRET (Boiler Return) Default = OUT	Installer	**OUTDOOR OR BOILER RETURN SENSOR** Select if the Out/Bret wiring terminal is connected to an outdoor sensor or a boiler return sensor. Conditions: Application Mode is set to PWM, Boil or Mix or Elec.	OUT
ECONOMELT	OFF or ON Default = OFF	Installer	**ECONOMELT** EconoMelt allows the user to mechanically remove snow then manually start the system to melt the thin snow layer or ice. Conditions: Application Mode is set to PWM, Boil or Mix or Elec.	OFF
AUXILIARY RELAY	SYS (System Pump) or ALRT (Alert) Default = SYS	Installer	**AUXILIARY RELAY** Select if the auxiliary relay should function as system pump or as an alert. Conditions: Application Mode is set to PWM, Boil or Mix.	SYS
MAX MELT DAYS	0.5 to 7.0 days, OFF Default = 3.0 days	Installer	**MAXIMUM MELT TIME** Select to limit the amount of melting run time after snow is automatically detected by a Snow / Ice Sensor 090 or 094, or a Snow Sensor 095. Conditions: Application Mode is set to PWM, Boil or Mix or Elec.	3.0

Boiler Menu

The Boiler Menu provides settings on how to configure and operate the boiler.

Item Field	Range	Access	Description	Set to
Boil TYPE	*App Mode = Boil* MOD, 1STG, EMS1, EMS2 Default = MOD *App Mode = Mix* OFF, ENBL, CTRL Default = OFF *App Mode = PWM* OFF, CTRL Default = OFF	Installer	**BOILER TYPE** The type of boiler connected to the control. MOD = Modulating boiler. 1STG = Single one-stage on-off boiler. EMS1 = tekmar boiler staging controls. EMS2 = Viessmann modulating boilers with 0-10 V OpenTherm Module. CTRL = tekmarNet® System Control operates boiler. The control must be connected to tekmarNet® to support this option. ENBL = When operating a mixing valve or mixing injection pump, the heat relay is closed to fire the boiler.	ENBL

Mix Menu

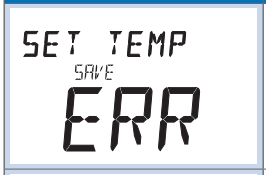
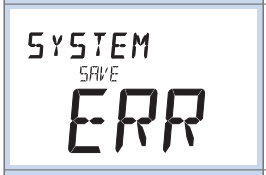
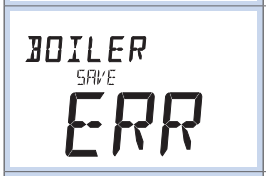
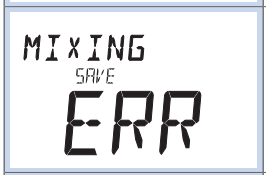
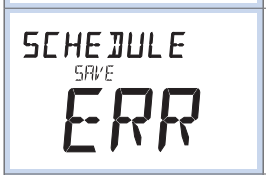
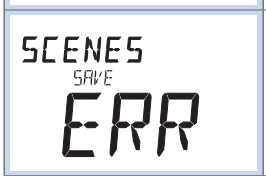
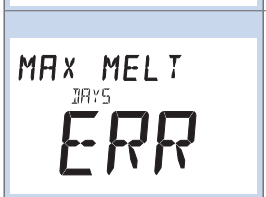
The Mix Menu provides settings on how to configure and operate the mixing valve or mixing injection pump. The Mix menu is only available when the Application Mode is set to Mix.

Item Field	Range	Access	Description	Set to
Mix TYPE	0-10 or 4-20 Default = 0-10	Installer	**MIX TYPE** Select the type of mixing analog signal. 0-10 = 0 to 10 V (dc) 4-20 = 4 to 20 mA	0-10
MOTOR SPD SEC	30 to 230 seconds Default = 105 seconds	Installer	**MIX MOTOR SPEED** The time that the mix actuating motor requires to operate from fully closed to fully open. Mixing Injection Pump = 30 seconds tekmar Actuator Motor 742 = 105 seconds Refer to actuating motor for correct setting.	120
Mix MAX	80 to 180°F (26.5°C to 82.0°C), OFF Default = 140°F (60°C)	Installer	**MIX MAXIMUM** Select the maximum operating temperature of the system supply water.	60 °C

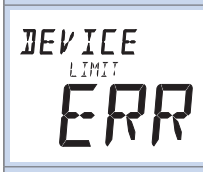
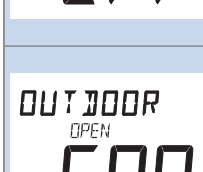
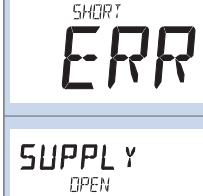
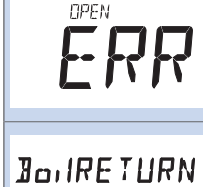
It is recommended to complete all wiring to ensure trouble free operation. Should an error occur, simply follow these steps:

1. **Find:** If the control flashes ⓘ on the screen, it is indicating a problem on the system.
2. **Identify:** Hold the Home button for 3 seconds, touch the NEXT key to locate the Toolbox Menu, then touch the ENTER key. The error code should appear as the first item.
3. **Solve:** Use the chart below to match the error code to the one on the control. Use the description to solve the problem.

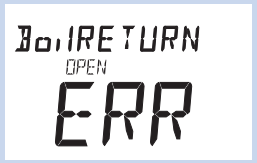
Error Messages (1 of 4)

Error Message	Description
	**SET TEMP MENU SAVE ERROR** The control failed to read the Set Temp menu settings from memory and has reloaded the factory default settings. The control stops operation until all settings in the Set Temp menu are checked. To clear the error, set the access level to Installer and check all settings in the Set Temp menu.
	**SYSTEM MENU SAVE ERROR** The control failed to read the System menu settings from memory and has reloaded the factory default settings. The control stops operation until all settings in the System menu are checked. To clear the error, set the access level to Installer and check all settings in the System menu.
	**BOILER MENU SAVE ERROR** The control failed to read the Boiler menu settings from memory and has reloaded the factory default settings. The control stops operation until all settings in the Boiler menu are checked. To clear the error, set the access level to Installer and check all settings in the Boiler menu.
	**MIXING MENU SAVE ERROR** The control failed to read the Mixing menu settings from memory and has reloaded the factory default settings. The control stops operation until all settings in the Mixing menu are checked. To clear the error, set the access level to Installer and check all settings in the Mixing menu.
	**tekmarNet® MENU SAVE ERROR** The control failed to read the tekmarNet® menu settings from memory and has reloaded the factory default settings. The control continues to operate but does not provide any tekmarNet® features until all settings in the tekmarNet® menu are checked. To clear the error, set the access level to Installer and check all settings in the tekmarNet® menu.
	**SCHEDULE MENU SAVE ERROR** The control failed to read the Schedule menu settings from memory and has reloaded the factory default settings. The control operates with the programmable schedule disabled until all settings in the Schedule menu are checked. To clear the error, set the access level to Installer and check all settings in the Schedule menu.
	**SCENES MENU SAVE ERROR** The control failed to read the Scenes menu settings from memory and has reloaded the factory default settings. The control operates with the away scene disabled until all settings in the Scenes menu are checked. To clear the error, set the access level to Installer and check all settings in the Scenes menu.
	**MAXIMUM MELT TIME ERROR** The control has operated in melting for the time set by Maximum Melt Days setting located in the System menu. This error is usually created when there is a mechanical system failure resulting in the snow melt slab not heating correctly. Clear the error message by touching the Cancel key while viewing the error message. Use the Manual Override menu to manually check that each component of the mechanical system is operating correctly. If necessary, change the Maximum Melt Days setting to a longer time period or to Off.
	**tekmarNet® COMMUNICATION ERROR** The tekmarNet® communication bus has either an open or a short circuit. The result is that there are no communications. Check for loose wires between tN4 and C. Check for short circuits between the tN4 and C wires on the House Control, Wiring Center, or Zone Manager. Check for correct polarity between the C and R wires. The error clears automatically once the wiring fault has been corrected. To force the error to clear while allowing a short or open circuit to continue, touch the Cancel key.

Error Messages (2 of 4)

Error Message	Description
	**ADDRESS TAKEN ERROR** Two devices (thermostats, setpoint controls, snow melting controls) have been manually set to the same address. The device continues to operate with this error but does not communicate with the tekmarNet® system. To clear this error, select an unused tekmarNet® address or select automatic addressing.
	**SNOW ZONE TAKEN ERROR** Two snow melting controls have been manually set to the same snow zone number and one of the controls is NOT set to App Mode 090. The control continues to operate with this error. To clear this error, select an unused snow zone number or set the App Mode to 090. Once the error has been corrected, press the "Cancel" key to clear the error message.
	**APP MODE 090 ERROR** Two snow melting controls have been manually set to the same snow zone number and both of the controls are set to App Mode 090. To clear this error, select an unused snow zone number or set the App Mode to anything other than 090.
	**TANDEM 090 ERROR** There are two Snow / Ice Sensors 090 or 094 installed in the zone and the other snow melting control's 090 or 094 has a sensor problem. Locate the other snow melting control and navigate to the Toolbox menu to determine and correct the problem. The control continues to operate with this error.
	**DEVICE LIMIT** More than 24 devices (thermostats or setpoint controls) have been connected to the tekmarNet® communication bus. To clear the error, remove and relocate devices to other available buses until the device count is 24 or less.
	**OUTDOOR SENSOR SHORT CIRCUIT ERROR** Due to a short circuit, the control is unable to read the Outdoor Sensor 070. The control continues to operate and assumes an outdoor temperature of 32°F (0°C). Energy saving features such as Warm Weather Shut Down (WWSD) and Cold Weather Cut Out (CWCO) are disabled. Check the outdoor sensor wire for short circuits according to the sensor installation manual. It may be necessary to replace the outdoor sensor. Once the error has been corrected, the error message automatically clears.
	**OUTDOOR SENSOR OPEN CIRCUIT ERROR** Due to an open circuit, the control is unable to read the Outdoor Sensor 070. The control continues to operate and assumes an outdoor temperature of 32°F (0°C). Energy saving features such as Warm Weather Shut Down (WWSD) and Cold Weather Cut Out (CWCO) are disabled. Check the outdoor sensor wire for open circuits according to the sensor installation manual. It may be necessary to replace the outdoor sensor. Once the error has been corrected, the error message automatically clears.
	**SUPPLY SENSOR SHORT CIRCUIT ERROR** Due to a short circuit, the control is unable to read the Supply Sensor 082. When set to App Mode Boiler or Mixing the control stops operation and does not provide any heat. Check the supply sensor wire for short circuits according to the sensor installation manual. It may be necessary to replace the supply sensor. Once the error has been corrected, the error message automatically clears.
	**SUPPLY SENSOR OPEN CIRCUIT ERROR** Due to an open circuit, the control is unable to read the Supply Sensor 082. When set to App Mode Boiler or Mixing the control stops operation and does not provide any heat. Check the supply sensor wire for open circuits according to the sensor installation manual. It may be necessary to replace the supply sensor. Once the error has been corrected, the error message automatically clears.
	**BOILER RETURN SENSOR SHORT CIRCUIT ERROR** Due to a short circuit, the control is unable to read the Boiler Return Sensor 082. The control continues operation but does not provide any boiler return protection. Check the boiler return sensor wire for short circuits according to the sensor installation manual. It may be necessary to replace the boiler return sensor. Once the error has been corrected, the error message automatically clears.

Error Messages (3 of 4)

Error Message	Description
	**BOILER RETURN SENSOR OPEN CIRCUIT ERROR** Due to an open circuit, the control is unable to read the Boiler Return Sensor 082. The control continues operation but does not provide any boiler return protection. Check the boiler return sensor wire for open circuits according to the sensor installation manual. It may be necessary to replace the boiler return sensor. Once the error has been corrected, the error message automatically clears.
	**SLAB SENSOR SHORT CIRCUIT ERROR** Due to a short circuit, the control is unable to read the Slab Sensor 072 or 073. Idling and Storm are disabled and energy saving features such as Warm Weather Shut Down (WWSD) and Cold Weather Cut Out (CWCO) are operate using the outdoor temperature only. Check the slab sensor wire for short circuits according to the sensor installation manual. It may be necessary to replace the slab sensor. Once the error has been corrected, the error message automatically clears.
	**SLAB SENSOR OPEN CIRCUIT ERROR** Due to an open circuit, the control is unable to read the Slab Sensor 072 or 073. Idling and Storm are disabled and energy saving features such as Warm Weather Shut Down (WWSD) and Cold Weather Cut Out (CWCO) are operate using the outdoor temperature only. Check the slab sensor wire for open circuits according to the sensor installation manual. It may be necessary to replace the slab sensor. Once the error has been corrected, the error message automatically clears. If the slab sensor has been intentionally removed, set the slab sensor setting in the System menu to Off.
	**YELLOW WIRE OPEN CIRCUIT ERROR** Due to an open circuit, the control is unable to read the yellow wire connected to the Snow / Ice Sensor 090 or 094, or the Snow Sensor 095. The control can no longer automatically detect snow or ice but manual start of the snow melting system is still available. Check the Snow / Ice Sensor or Snow Sensor yellow and black wires and any wire splices for open circuits according to the sensor installation manual. It may be necessary to replace the sensor. Once the error has been corrected, the error message automatically clears.
	**BLUE WIRE SHORT CIRCUIT ERROR** Due to a short circuit, the control is unable to read the blue wire connected to the Snow / Ice Sensor 090 or 094, or the Snow Sensor 095. The control can no longer automatically detect snow or ice but manual start of the snow melting system is still available. First check the Snow / Ice Sensor or Snow Sensor for dirt or debris. The ring structure of the sensor may need cleaning with hot soapy water and a nylon brush. Rinse with water. Secondly, check the Snow / Ice Sensor or Snow Sensor blue and black wires and any wire splices for short circuits according to the sensor installation manual. It may be necessary to replace the sensor. Once the error has been corrected, the error message automatically clears.
	**BLUE WIRE OPEN CIRCUIT ERROR** Due to an open circuit, the control is unable to read the blue wire connected to the Snow / Ice Sensor 090 or 094, or the Snow Sensor 095. The control can no longer automatically detect snow or ice but manual start of the snow melting system is still available. Check the Snow / Ice Sensor or Snow Sensor blue and black wires and any wire splices for open circuits according to the sensor installation manual. It may be necessary to replace the sensor. Once the error has been corrected, the error message automatically clears.
	**BROWN WIRE SENSOR OPEN CIRCUIT ERROR** Due to an open circuit, the control is unable to read the brown wire connected to the Snow / Ice Sensor 090 or 094. Idling and Storm is disabled and energy saving features such as Warm Weather Shut Down (WWSD) and Cold Weather Cut Out (CWCO) are operate using the outdoor temperature only. Check the Snow / Ice Sensor brown and black wires for open circuits according to the sensor installation manual. It may be necessary to replace the sensor. Once the error has been corrected, the error message automatically clears.
	**SNOW / ICE SENSOR ERROR** The control is unable to properly detect the Snow / Ice Sensor 090 or 094. The control can no longer automatically detect snow or ice but manual start of the snow melting system is still available. Check the Snow / Ice Sensor brown, yellow, red and black wires according to the sensor installation manual. It is important to check any cable splices for loose wiring connections. It may be necessary to replace the sensor. Once the error has been corrected, the error message automatically clears.

Error Messages (4 of 4)

Error Message	Description
SNOW SENSOR ERR	**SNOW SENSOR ERROR** The control is unable to properly detect the Snow Sensor 095. The control can no longer automatically detect snow but manual start of the snow melting system is still available. Check the Snow Sensor yellow, red and black wires according to the sensor installation manual. It may be necessary to replace the sensor. Once the error has been corrected, the error message automatically clears.
SCHEDULE MASTER ERR	**SCHEDULE MASTER ERROR** Two devices on the tekmarNet® system have been set to the same Schedule Master number. The control operates according to the local programmable schedule while this error is present. To clear the error, select a different Schedule Master number, set a different Schedule Member number, set the Schedule to Zone, or set the Schedule to None.
SCHEDULE MEMBER ERR	**SCHEDULE MEMBER ERROR** The control can no longer detect its schedule master. The control operates as if the programmable schedule is in idle or off operation while this error is present. To clear the error, select a different Schedule Member number, set the Schedule to Zone, or set the Schedule to None.
ERROR AT TSTAT 01	**ERROR AT THERMOSTAT** There is an error on a different thermostat or setpoint control connected to the tekmarNet® system and not on this control. 01 to 24 = There is an error on a thermostat or setpoint control with this tekmarNet® address.
ERROR AT TSTAT b:01	**ERROR AT THERMOSTAT** There is an error on a different thermostat or setpoint control connected to the tekmarNet® system and not on this control. b:01 to b:24 = There is an error on a thermostat or setpoint control wired to the boiler communication bus with this tekmarNet® address.
ERROR AT TSTAT 1:01	**ERROR AT THERMOSTAT** There is an error on a different thermostat or setpoint control connected to the tekmarNet® system and not on this control. 1:01 to 1:24 = There is an error on a thermostat or setpoint control wired to communication bus 1 with this tekmarNet® address.
ERROR AT TSTAT 2:01	**ERROR AT THERMOSTAT** There is an error on a different thermostat or setpoint control connected to the tekmarNet® system and not on this control. 2:01 to 2:24 = There is an error on a thermostat or setpoint control wired to communication bus 2 with this tekmarNet® address.
ERROR AT TSTAT 3:01	**ERROR AT THERMOSTAT** There is an error on a different thermostat or setpoint control connected to the tekmarNet® system and not on this control. 3:01 to 3:24 = There is an error on a thermostat or setpoint control wired to the mix 3 bus with this tekmarNet® address.
ERROR AT SYSTM CTRL	**ERROR AT SYSTEM CONTROL** There is an error on the tekmarNet® system control connected to the tekmarNet® system and not on this control.
INTERNAL FAULT	**INTERNAL FAULT** To determine and clear the error, go to the Toolbox menu 1. Hold the Home button for 3 seconds 2. Press Next Item until Toolbox Menu is found 3. Press Enter There are four conditions that will generate an "Internal Fault" message: Max Melt Days Error, System Save Error, Boiler Save Error or Mixing Save Error Go to the respective error message in this manual to correct the error condition

Troubleshooting

Problem	Check / Verify	Possible Cause
LCD Display is Off	Control has power	Use electrical meter to measure 24V (ac)voltage on input power R and C terminals.
System pump is always on	Display shows idle	Idle operation requires that the system pump operate continuously while below the melting temperature setting.
Blue short	Dirt or salt on snow/ice sensor	The snow/ice sensor requires regular cleaning. Avoid using road salt on the snow melting slab.
Slab is above melt temperature	Slab target temperature	The slab is heated to the slab target temperature.
	Heat On not shown	Check wiring of the system pump. The system pump operates continuously during melt, idle or storm operation. The heat source must be wired to operate together with the heat relay.
System running with no snow	Idle	Idling heats the slab when the temperature falls below the Idle temperature.
	Melt	During Cold Weather Cut Out (CWCO), the system is shut off. If shut off during a melt cycle, the system resumes melting once the outdoor temperature is above CWCO.
	Timed Melt	System manually started.
	Scheduled Melt	System started on a programmable schedule.
Snow on slab but system did not start	Off	System has a programmable schedule and is in event 2 or 4 (unoccupied).
	Off	System has been manually stopped and the automatic snow/ice sensor never dried, thereby preventing the system from automatically starting.

Testing the Sensors

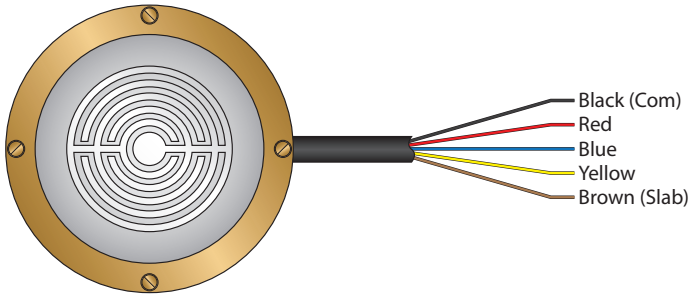
30090 Snow/Ice Sensor

Measure resistance between the Snow/Ice Sensor wires.

Note: Ensure wires are disconnected from the control before testing.

Measure resistance between

- the yellow and black sensor wires (sensor temperature), and
- the brown and black sensor wires (slab temperature)



Use the table below to measure against the expected resistance values.

Temperature		Resistance	Temperature		Resistance
°F	°C	Ω	°F	°C	Ω
-50	-46	490,813	30	-1	34,558
-45	-43	405,710	35	2	29,996
-40	-40	336,606	40	4	26,099
-35	-37	280,279	45	7	22,763
-30	-34	234,196	50	10	19,900
-25	-32	196,358	55	13	17,436
-20	-29	165,180	60	16	15,311
-15	-26	139,402	65	18	13,474
-10	-23	118,018	70	21	11,883
-5	-21	100,221	75	24	10,501
0	-18	85,362	80	27	9,299
5	-15	72,918	85	29	8,250
10	-12	62,465	90	32	7,334
15	-9	53,658	95	35	6,532
20	-7	46,218	100	38	5,828
25	-4	39,913	105	41	5,210



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