

tekmar® Application Brochure

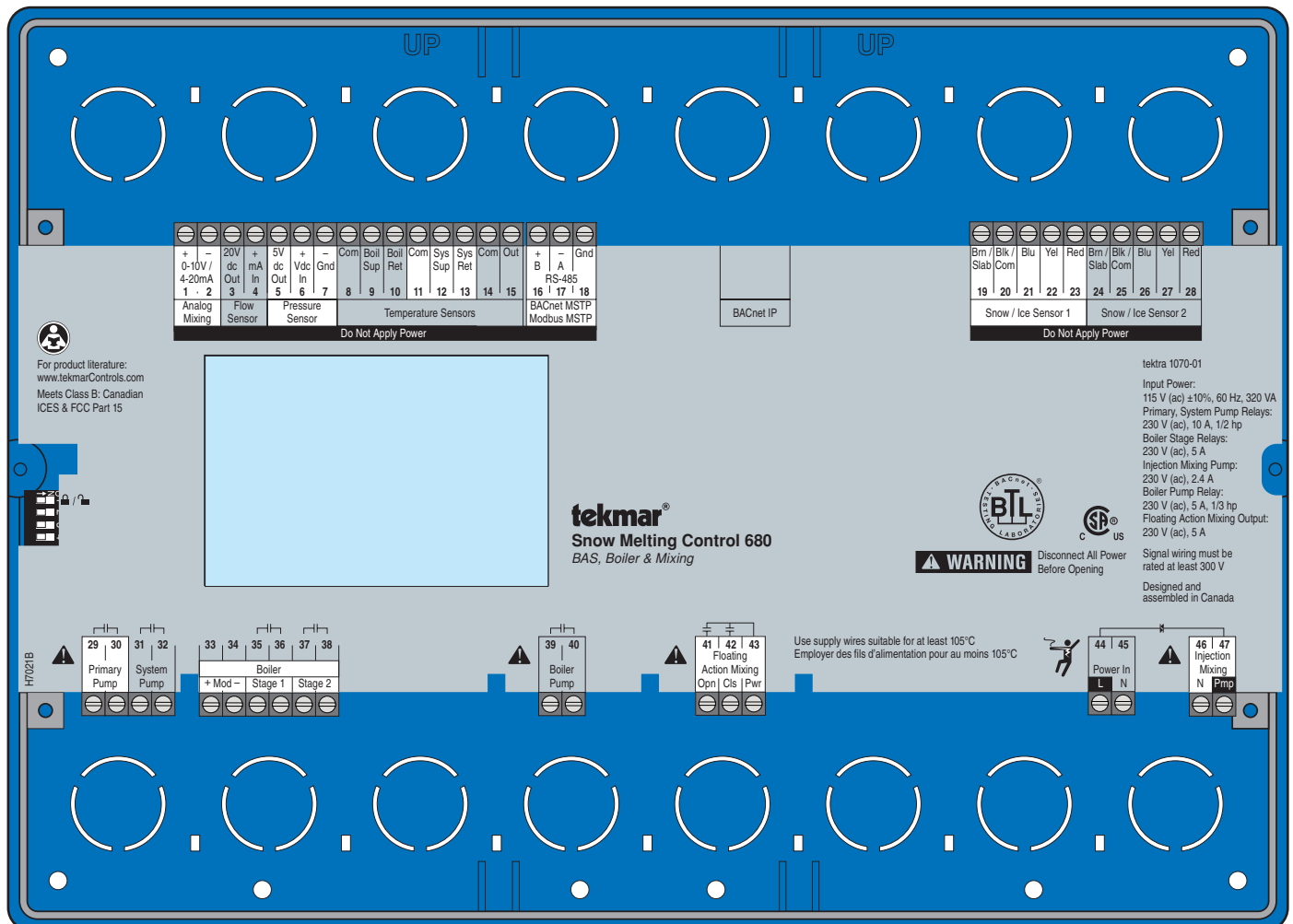
Snow Melting Control 680



680_A
10/15

Snow Melting Replaces: 05/15

The Snow Melting Control 680 is designed to operate electric or hydronic equipment to melt snow or ice from any surface including driveways, walkways, business entrances, parking ramps, loading docks, hospital entrances, helipads and car wash bays. It communicates with Building Automation Systems using BACnet® or Modbus® for alert notification, remote monitoring and adjustment capability. The 680 uses a tekmar Snow/Ice Sensor 090 or a Snow Sensor 095 to automatically detect snow or ice on the snow melting slab. Up to two snow/ice sensors can be installed, thereby increasing the detection area and providing backup redundancy in the case of sensor failure. Upon detection of snow or ice, the 680 operates electric heating cable, a single hydronic condensing or non-condensing boiler, or a steam valve to provide heat to the snow melt load. The 680 provides boiler return protection by operating a mixing valve or variable speed injection mixing. Monitoring of energy consumption is possible when it is connected to an optional flow sensor.



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Description

The Snow Melting Control 680 heats a hydronic snow melting system. The boiler and snow melt system are filled with glycol solution. The primary pump operates continuously when the system is in melting, idling or storm modes of operation. The boiler is fired to heat the melting surface to the slab target temperature. The boiler pump operates when the boiler is firing. Concrete slabs are protected from thermal expansion stress by limiting the thermal rate of rise between the boiler supply and the slab sensors. An optional flow sensor and boiler supply and return sensors are used to monitor the energy used by the snow melting system. An optional Building Automation System (BAS) can monitor and control the snow melting system remotely using the BACnet or Modbus communication protocol.

When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed with a Slab Sensor 072 or 073, 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 the built-in timer.

Snow or Ice Detector

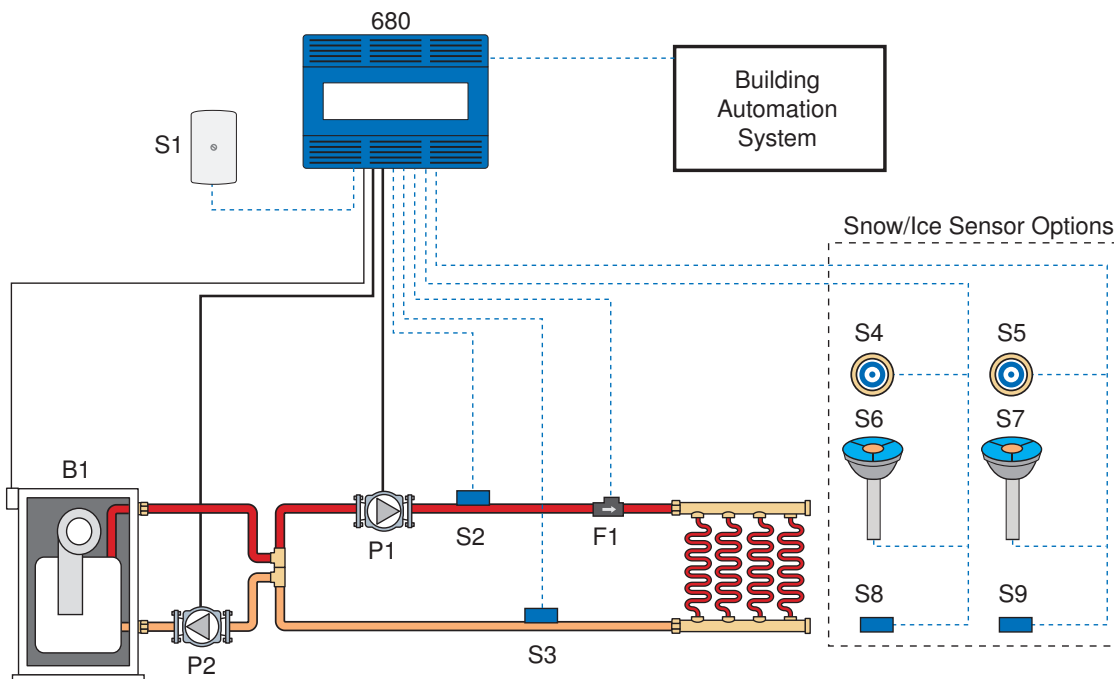
| Option | Start and Stop Sequence | Sensors Required (sold separately) |
|--------|-------------------------|---|
| 1 | Auto start/Auto stop | One or Two Snow/Ice Sensor 090 or 094 |
| 2 | Auto start/Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start/Timed stop | One or Two Slab Sensor 072 or 073 |

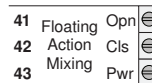
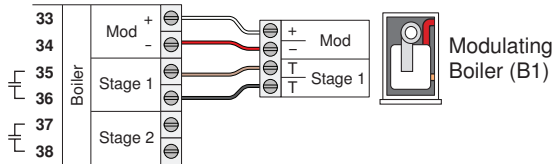
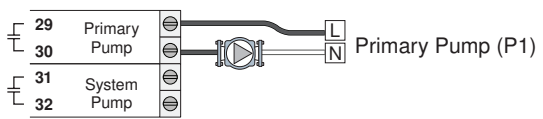
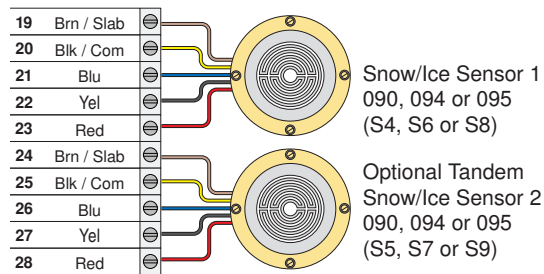
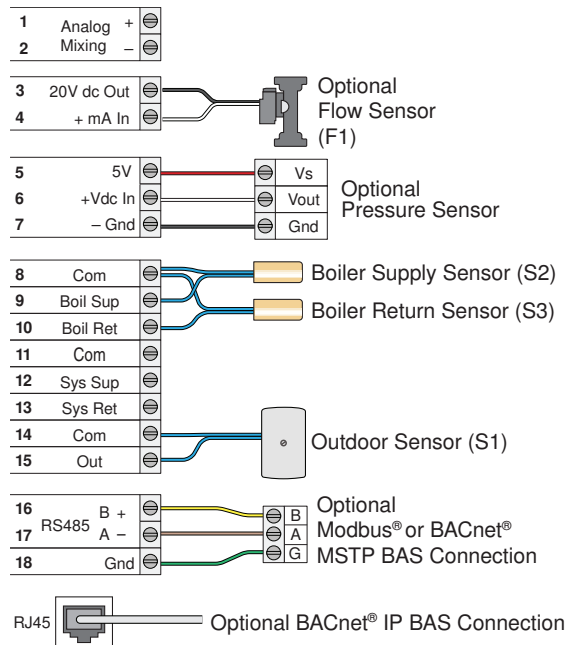
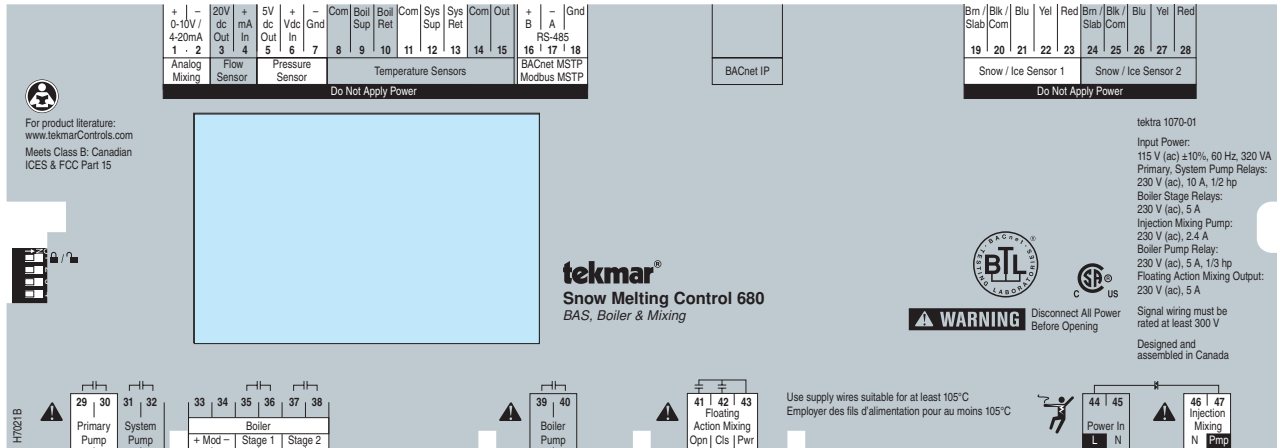
Legend

B1 = Modulating Boiler
 F1 = Flow Sensor (optional)
 P1 = Primary Pump
 P2 = Boiler Pump
 S1 = Outdoor Sensor 070
 S2 = Boiler Supply Sensor 082
 S3 = Boiler Return Sensor 082 (optional)
 S4, S5 = Snow/Ice Sensor 090 or 094
 S6, S7 = Snow Sensor 095
 S8, S9 = Slab Sensor 072 or 073

Application Settings

| Setting Name | Value |
|------------------|--------|
| Application Mode | Boiler |





Description

The Snow Melting Control 680 heats a hydronic snow melting system. The boiler and snow melt system are filled with glycol solution. The system and primary pumps operate continuously when the system is in melting, idling or storm modes of operation. The mixing valve position is adjusted to heat the melting surface to the slab target temperature. The mixing valve is closed when the boiler return sensor falls below the boiler minimum setting to protect the boiler. The boiler is fired to heat the system loop as required. Concrete slabs are protected from thermal expansion stress by limiting the thermal rate of rise between the system supply and the slab sensors. An optional flow sensor and the system supply and return sensors are used to monitor the energy used by the snow melting system. An optional Building Automation System (BAS) can monitor and control the snow melting system remotely using BACnet or Modbus communication protocol.

When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed together with a Slab Sensor 072 or 073, 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 the built-in timer.

Snow or Ice Detector**Option Start and Stop Sequence Sensors Required (sold separately)**

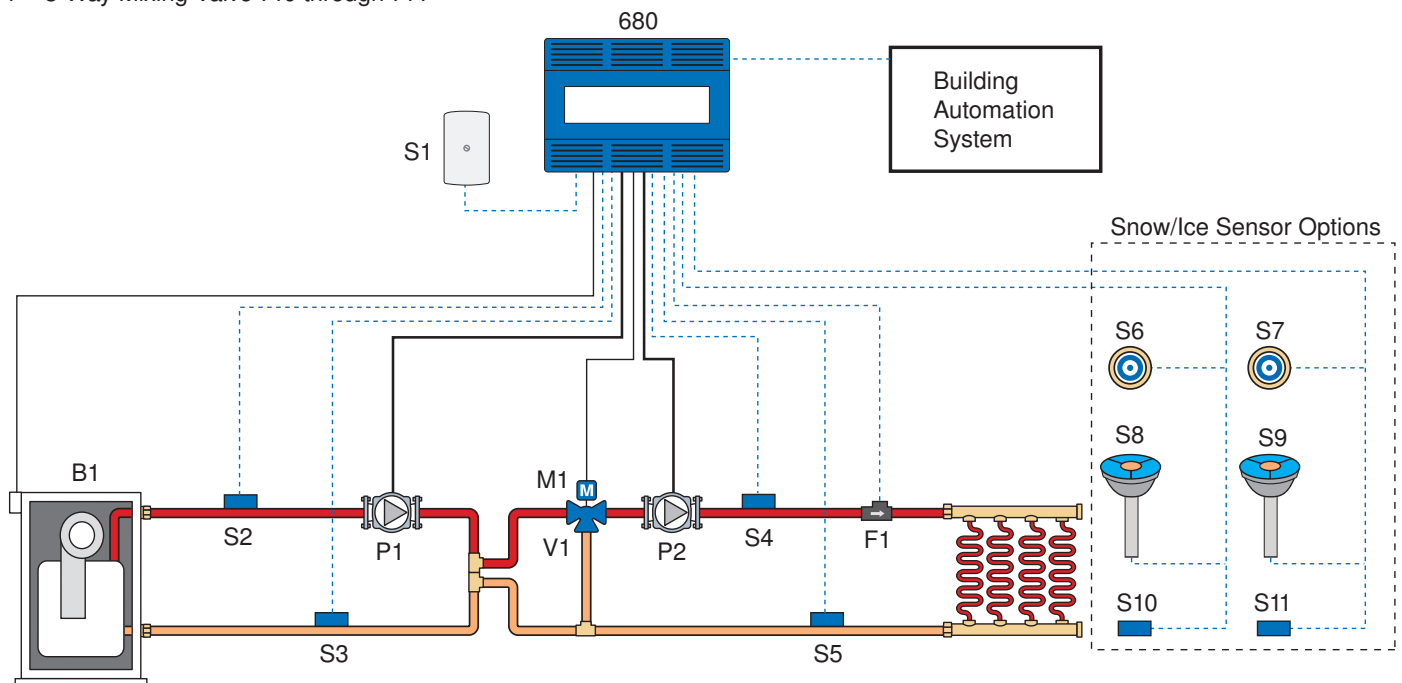
| | | |
|---|---------------------------|---|
| 1 | Auto start / Auto stop | One or Two Snow / Ice Sensor 090 or 094 |
| 2 | Auto start / Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start / Timed stop | One or Two Slab Sensor 072 or 073 |

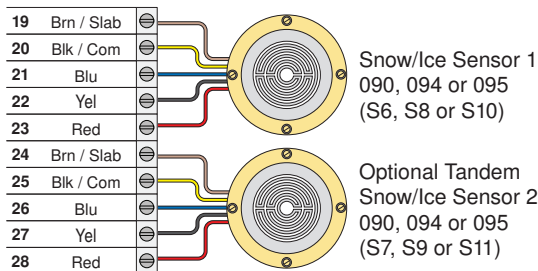
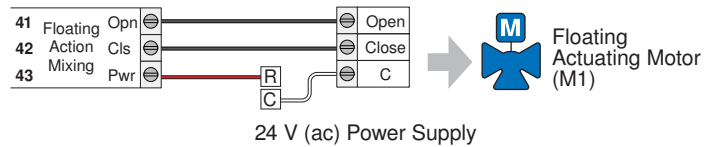
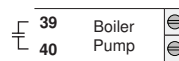
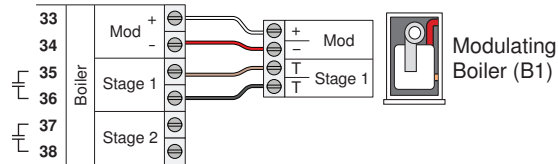
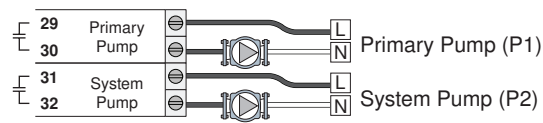
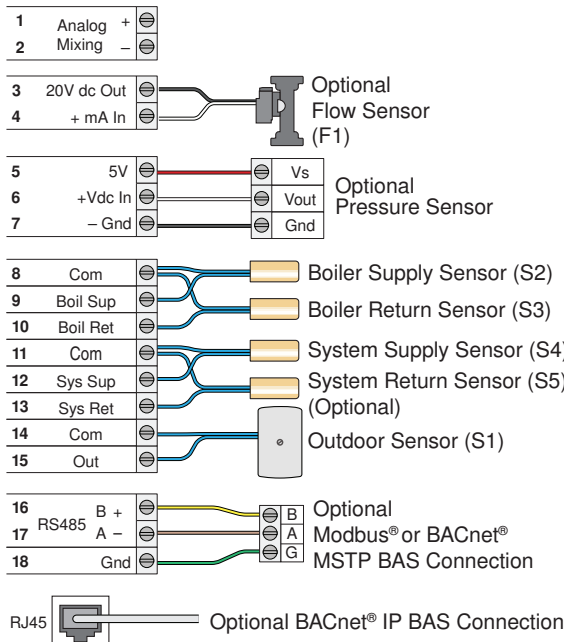
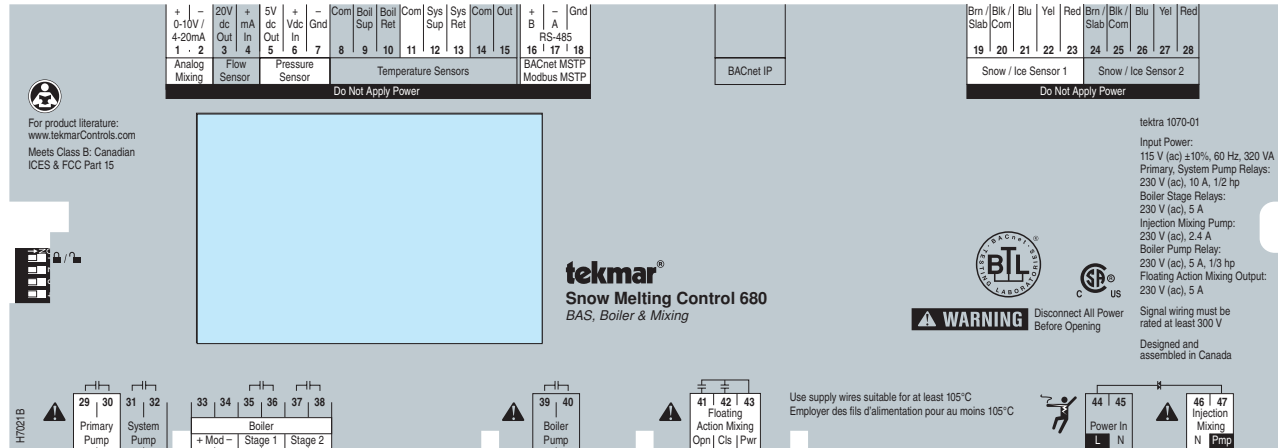
Legend

B1 = Modulating Boiler
 F1 = Flow Sensor (optional)
 M1 = Actuating Motor 741
 P1 = Primary Pump
 P2 = System Pump
 S1 = Outdoor Sensor 070
 S2 = Boiler Supply Sensor 082
 S3 = Boiler Return Sensor 082
 S4 = System Supply Sensor 082
 S5 = System Return Sensor 082 (optional)
 S6, S7 = Snow/Ice Sensor 090 or 094
 S8, S9 = Snow Sensor 095
 S10, S11 = Slab Sensor 072 or 073
 V1 = 3-Way Mixing Valve 710 through 714

Application Settings

| Setting Name | Value |
|------------------|------------|
| Application Mode | Boiler+Mix |





Description

The Snow Melting Control 680 heats a hydronic snow melting system. The system loop is filled with glycol solution and is isolated from a water heat source using a heat exchanger. The system pump operates continuously during melting, idling and storm modes of operation. The on/off injection pump is cycled on and off as required to heat the melting surface to the slab target temperature. Concrete slabs are protected from thermal expansion stress by limiting the thermal rate of rise between the system supply and the slab sensors. An optional flow sensor and the system supply and return sensors are used to monitor the energy used by the snow melting system. An optional Building Automation System (BAS) can monitor and control the snow melting system remotely using the BACnet or Modbus communication protocol.

When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed with a Slab Sensor 072 or 073, 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 the built-in timer.

Snow or Ice Detector

Option Start and Stop Sequence Sensors Required (sold separately)

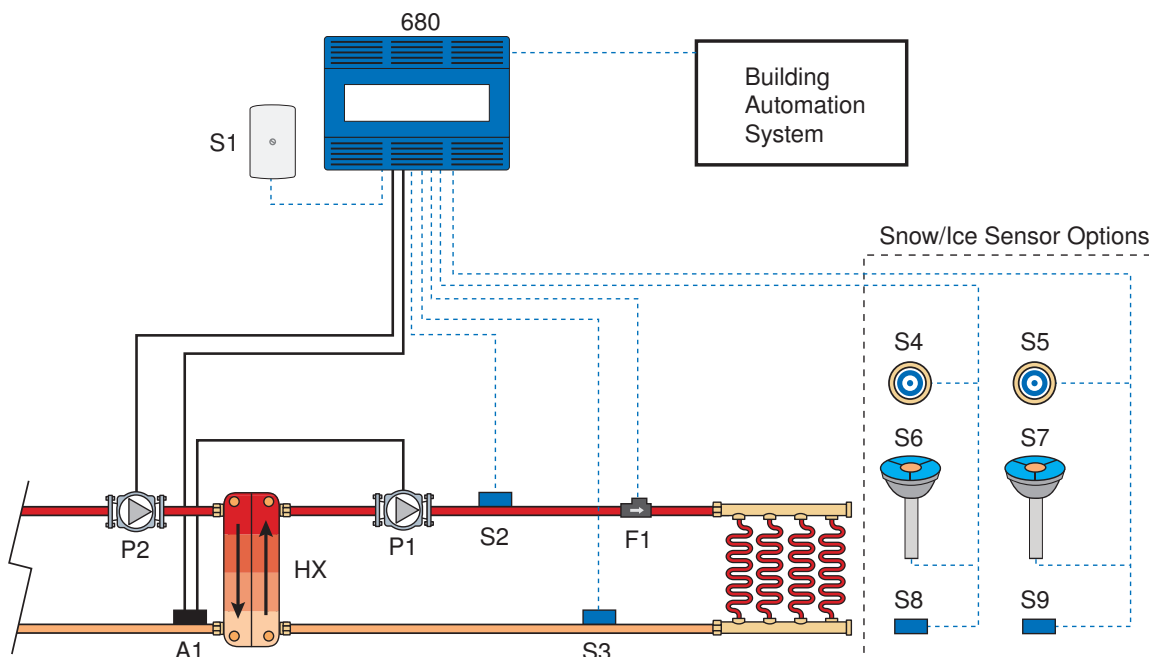
| | | |
|---|-------------------------|---|
| 1 | Auto start/Auto stop | One or Two Snow/Ice Sensor 090 or 094 |
| 2 | Auto start/Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start/Timed stop | One or Two Slab Sensor 072 or 073 |

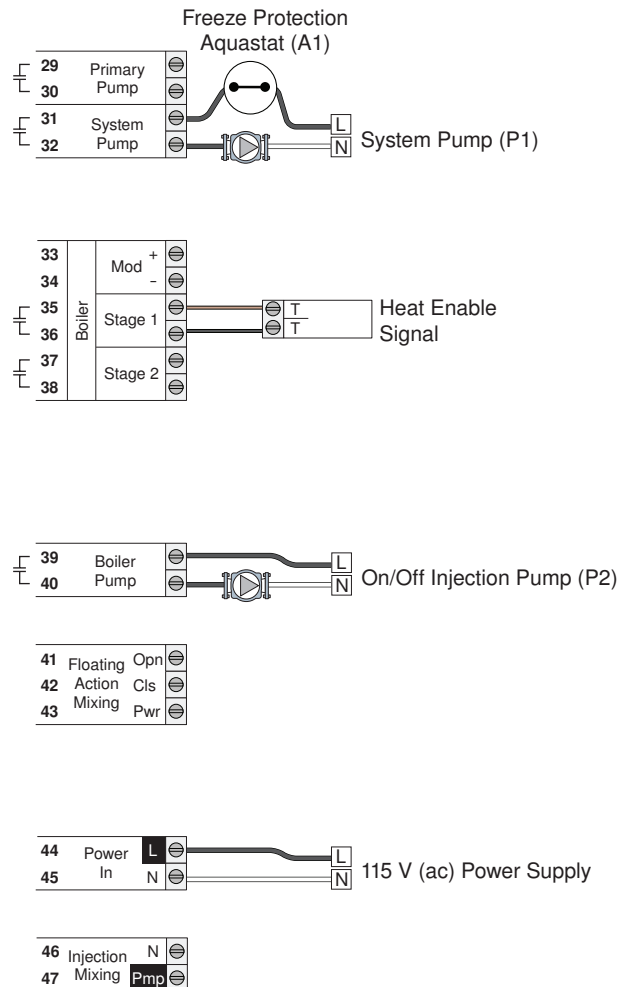
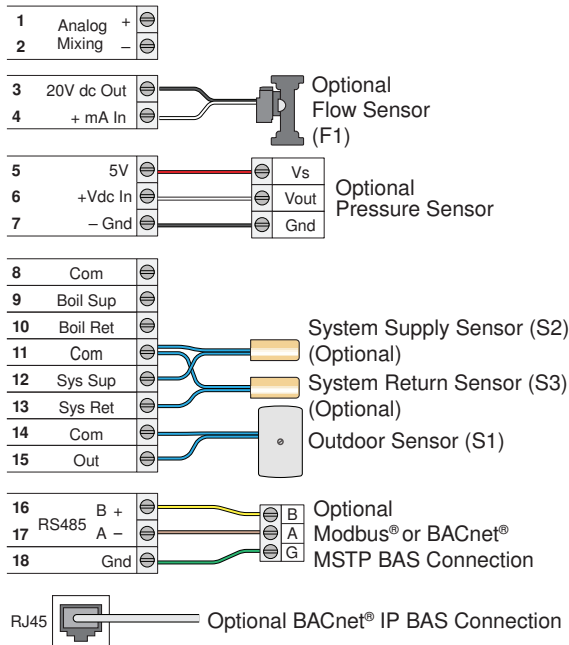
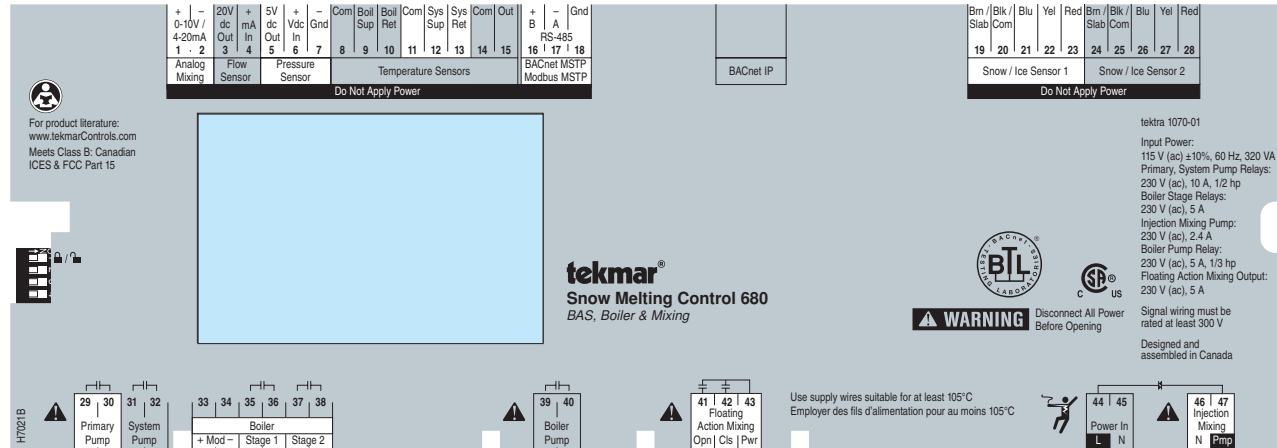
Legend

A1 = Freeze Protection Aquastat
 F1 = Flow Sensor (optional)
 HX = Heat Exchanger
 P1 = System Pump
 P2 = On/Off Injection Pump
 S1 = Outdoor Sensor 070
 S2 = System Supply Sensor 082 (optional)
 S3 = System Return Sensor 082 (optional)
 S4, S5 = Snow/Ice Sensor 090 or 094
 S6, S7 = Snow Sensor 095
 S8, S9 = Slab Sensor 072 or 073

Application Settings

| Setting Name | Value |
|------------------|----------|
| Application Mode | PWM Zone |





Description

The Snow Melting Control 680 heats a hydronic snow melting system. The snow melt system is filled with glycol solution. The system and primary pumps operate continuously when the system is in melting, idling or storm modes of operation. The mixing valve position is adjusted to heat the melting surface to the slab target temperature. The mixing valve is closed when the boiler return sensor falls below the boiler minimum setting to protect the boiler. The boiler stage 1 contact closes when the mixing valve is opened to signal that heat is required from the shared boiler. Concrete slabs are protected from thermal expansion stress by limiting the thermal rate of rise between the system supply and the slab sensors. An optional flow sensor and the system supply and return sensors are used to monitor the energy used by the snow melting system. An optional Building Automation System (BAS) can monitor and control the snow melting system remotely using the BACnet or Modbus communication protocol.

When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed together with a Slab Sensor 072 or 073, 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 the built-in timer.

Snow or Ice Detector

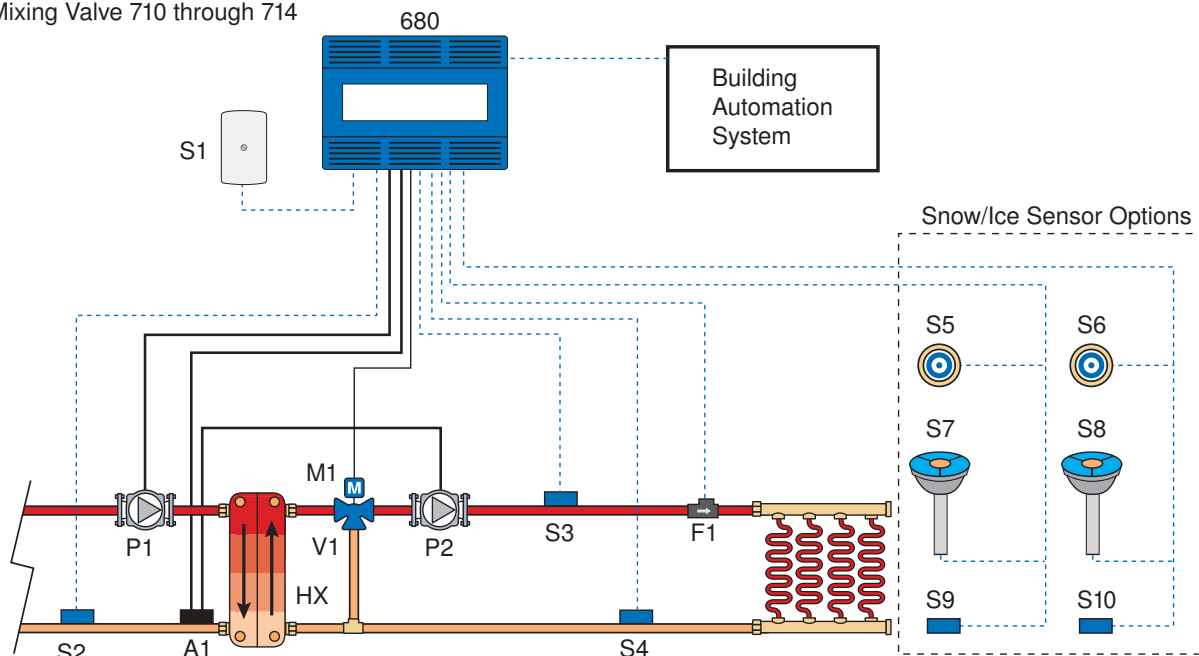
| Option | Start and Stop Sequence | Sensors Required (sold separately) |
|--------|-------------------------|---|
| 1 | Auto start/Auto stop | One or Two Snow/Ice Sensor 090 or 094 |
| 2 | Auto start/Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start/Timed stop | One or Two Slab Sensor 072 or 073 |

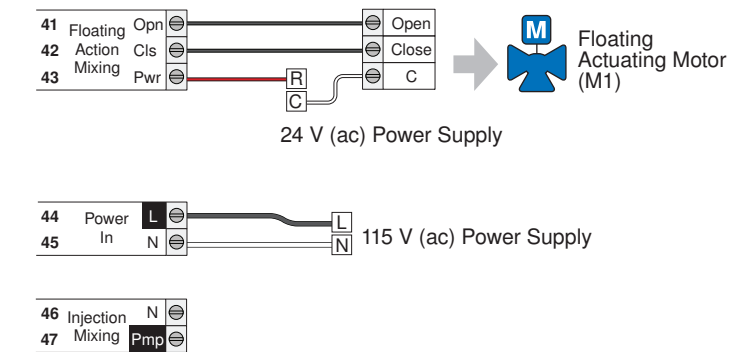
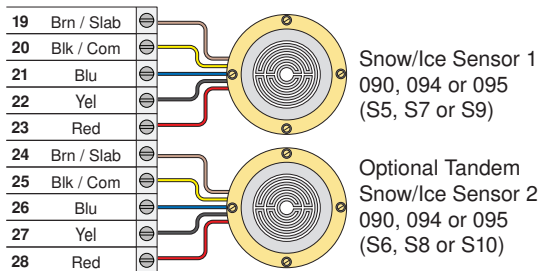
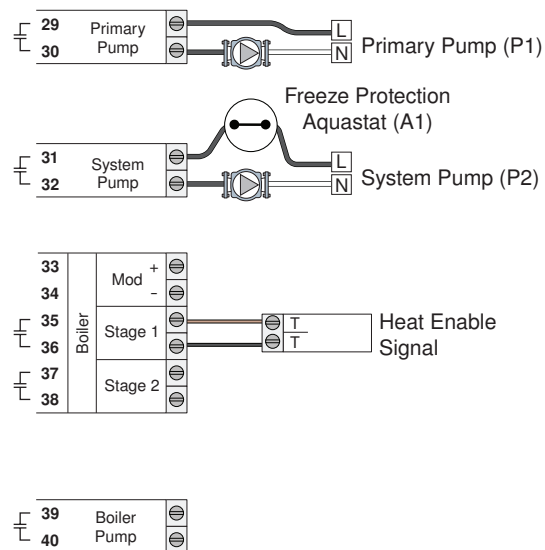
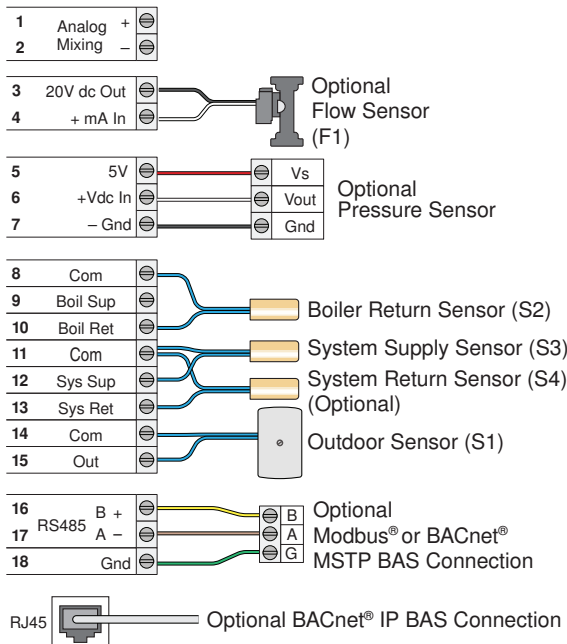
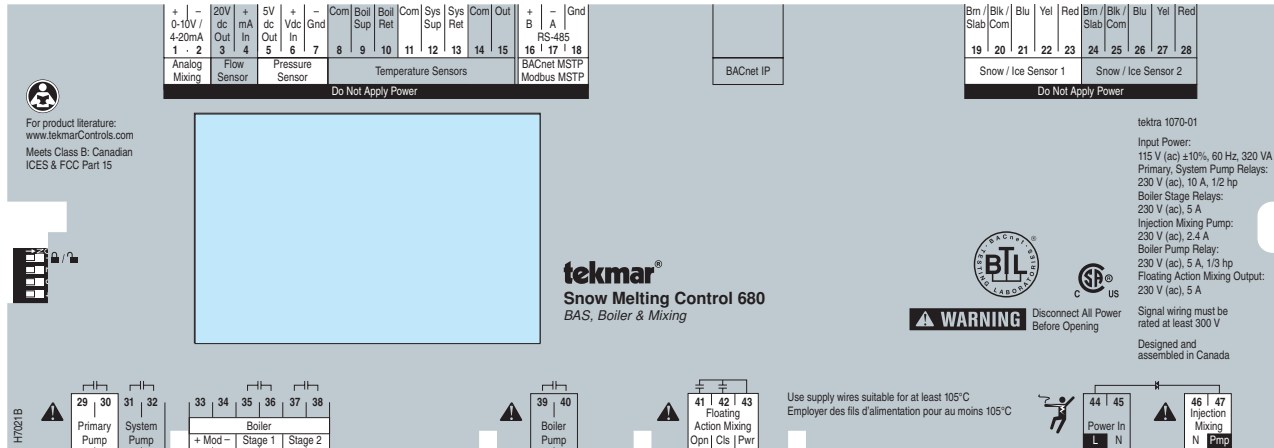
Legend

A1 = Freeze Protection Aquastat
 F1 = Flow Sensor (optional)
 HX = Heat Exchanger
 M1 = Actuating Motor 741
 P1 = Primary Pump
 P2 = System Pump
 S1 = Outdoor Sensor 070
 S2 = Boiler Return Sensor 082
 S3 = System Supply Sensor 082
 S4 = System Return Sensor 082 (optional)
 S5, S6 = Snow/Ice Sensor 090 or 094
 S7, S8 = Snow Sensor 095
 S9, S10 = Slab Sensor 072 or 073
 V1 = 3-Way Mixing Valve 710 through 714

Application Settings

| Setting Name | Value |
|------------------|----------|
| Application Mode | Mixing |
| Mixing Type | Floating |





Description

The Snow Melting Control 680 heats a hydronic snow melting system. The snow melt system is filled with glycol solution. The system and primary pumps operate continuously when the system is in melting, idling or storm modes of operation. The variable speed injection mixing pump rate is adjusted to heat the melting surface to the slab target temperature. The variable speed injection pump slows down when the boiler return sensor falls below the boiler minimum setting to protect the boiler. The boiler stage 1 contact closes when the variable speed injection pump is operated to signal that heat is required from the shared boiler. Concrete slabs are protected from thermal expansion stress by limiting the thermal rate of rise between the system supply and the slab sensors. An optional flow sensor and the system supply and return sensors are used to monitor the energy used by the snow melting system. An optional Building Automation System (BAS) can monitor and control the snow melting system remotely using the BACnet or Modbus communication protocol.

When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed together with a Slab Sensor 072 or 073, 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 the built-in timer.

Snow or Ice Detector

Option Start and Stop Sequence Sensors Required (sold separately)

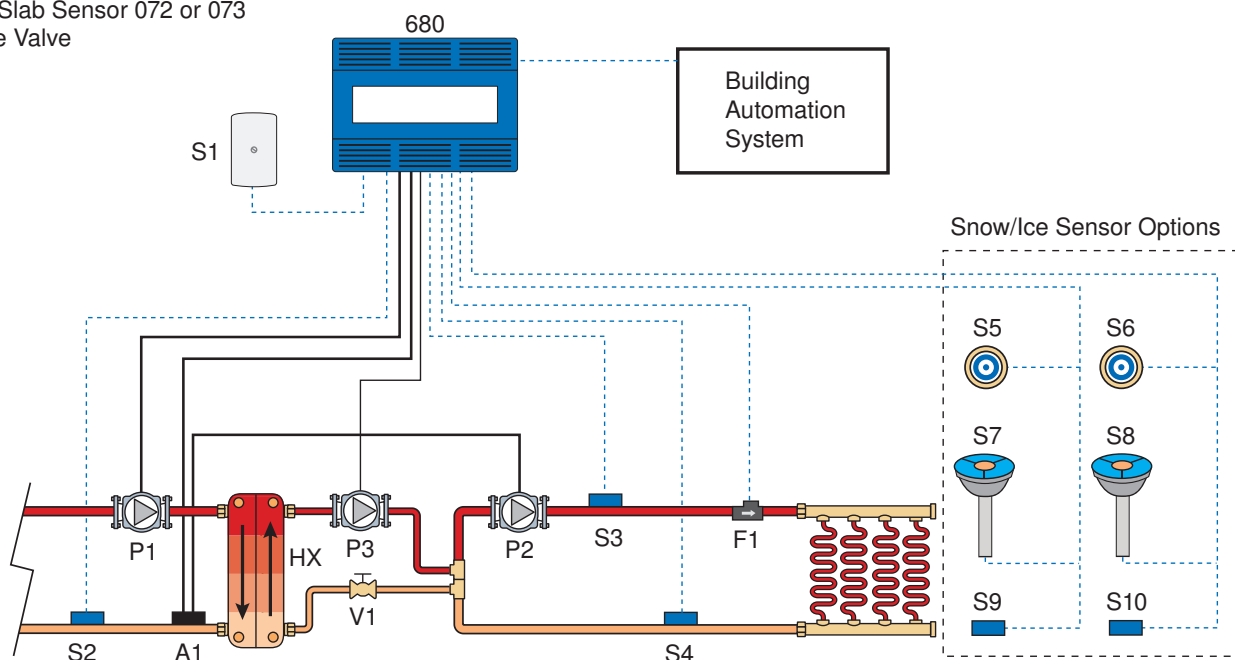
| Option | Start and Stop Sequence | Sensors Required (sold separately) |
|--------|-------------------------|---|
| 1 | Auto start/Auto stop | One or Two Snow/Ice Sensor 090 or 094 |
| 2 | Auto start/Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start/Timed stop | One or Two Slab Sensor 072 or 073 |

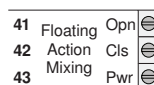
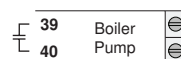
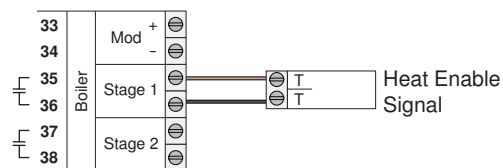
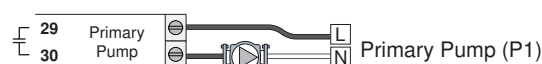
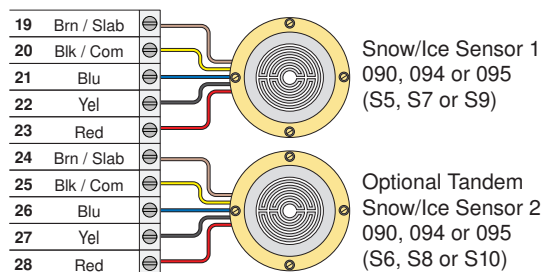
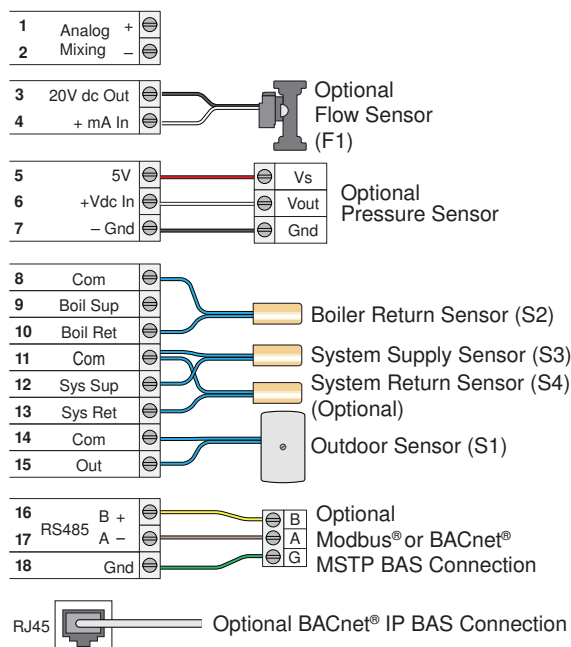
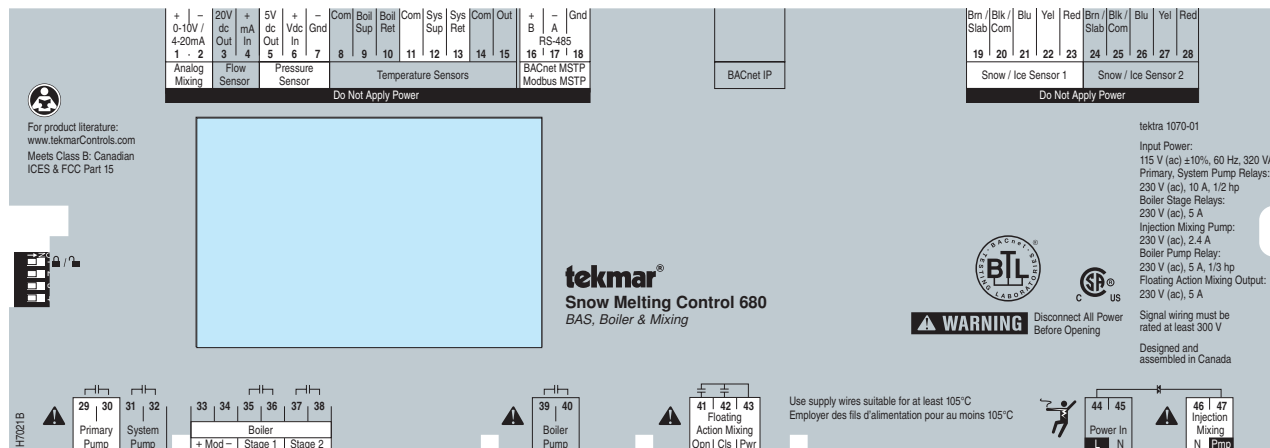
Legend

A1 = Freeze Protection Aquastat
 F1 = Flow Sensor (optional)
 HX = Heat Exchanger
 P1 = Primary Pump
 P2 = System Pump
 P3 = Variable Speed Injection Mixing Pump
 S1 = Outdoor Sensor 070
 S2 = Boiler Return Sensor 082
 S3 = System Supply Sensor 082
 S4 = System Return Sensor 082 (optional)
 S5, S6 = Snow/Ice Sensor 090 or 094
 S7, S8 = Snow Sensor 095
 S9, S10 = Slab Sensor 072 or 073
 V1 = Globe Valve

Application Settings

| Setting Name | Value |
|------------------|-----------|
| Application Mode | Mixing |
| Mixing Type | Injection |





Description

The Snow Melting Control 680 heats a hydronic snow melting system. The system loop is filled with glycol solution and is isolated from a steam heat source using a steam-to-glycol heat exchanger. The system pump operates continuously during melting, idling and storm modes of operation. The modulating steam valve position is adjusted as required to heat the melting surface to the slab target temperature. The boiler stage 1 contact closes when the steam valve is opened to signal that heat is required from the steam heat source. Concrete slabs are protected from thermal expansion stress by limiting the thermal rate of rise between the system supply and the slab sensors. An optional flow sensor and the system supply and return sensors are used to monitor the energy used by the snow melting system. An optional Building Automation System (BAS) can monitor and control the snow melting system remotely using the BACnet or Modbus communication protocol.

When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed together with a Slab Sensor 072 or 073, 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 the built-in timer.

Snow or Ice Detector

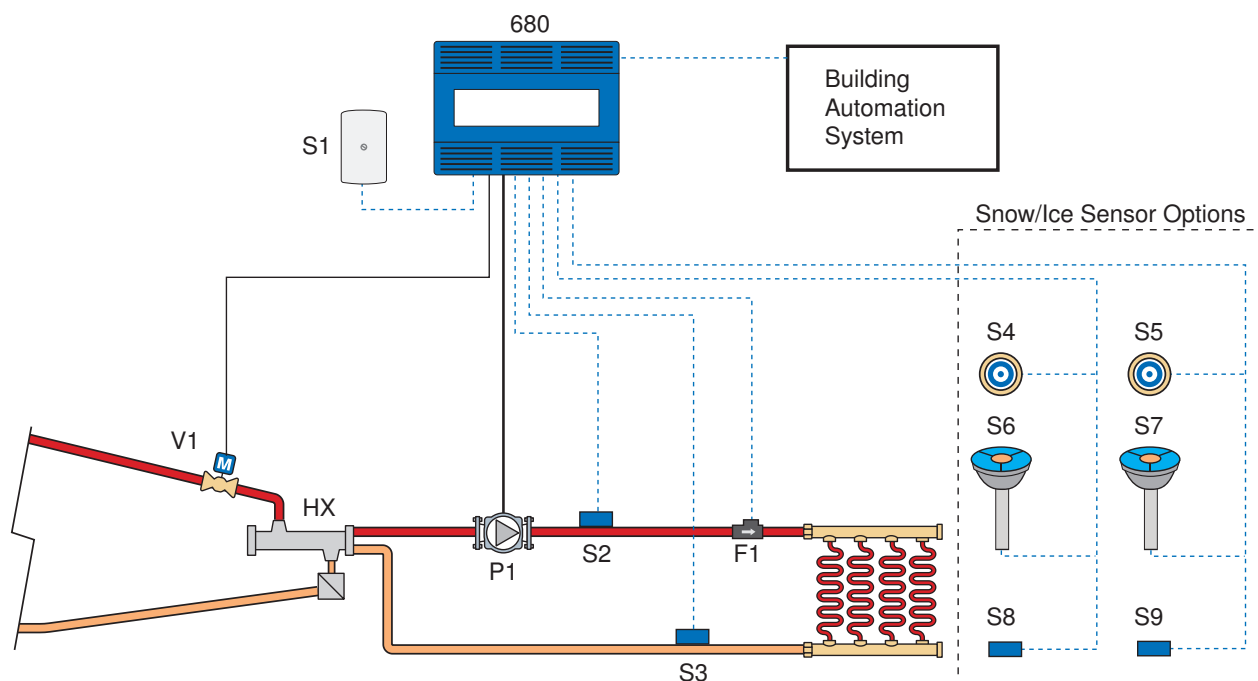
| Option | Start and Stop Sequence | Sensors Required (sold separately) |
|--------|-------------------------|---|
| 1 | Auto start/Auto stop | One or Two Snow/Ice Sensor 090 or 094 |
| 2 | Auto start/Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start/Timed stop | One or Two Slab Sensor 072 or 073 |

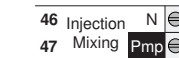
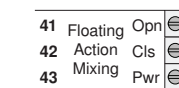
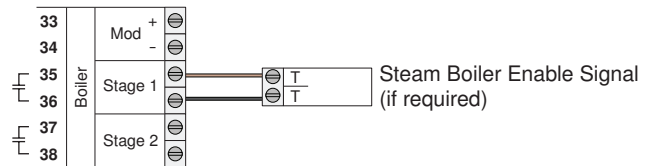
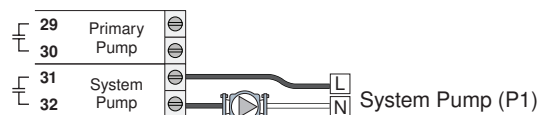
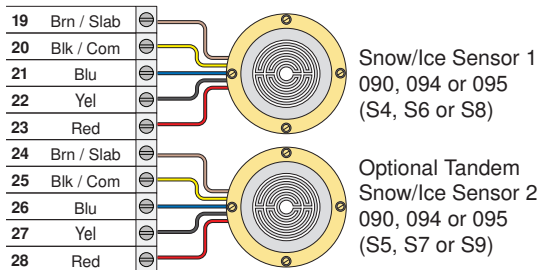
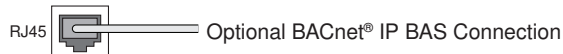
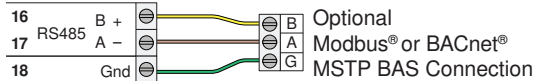
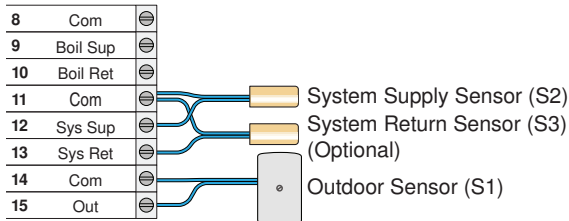
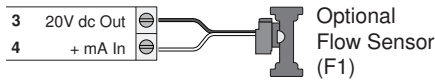
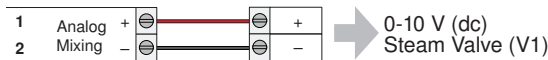
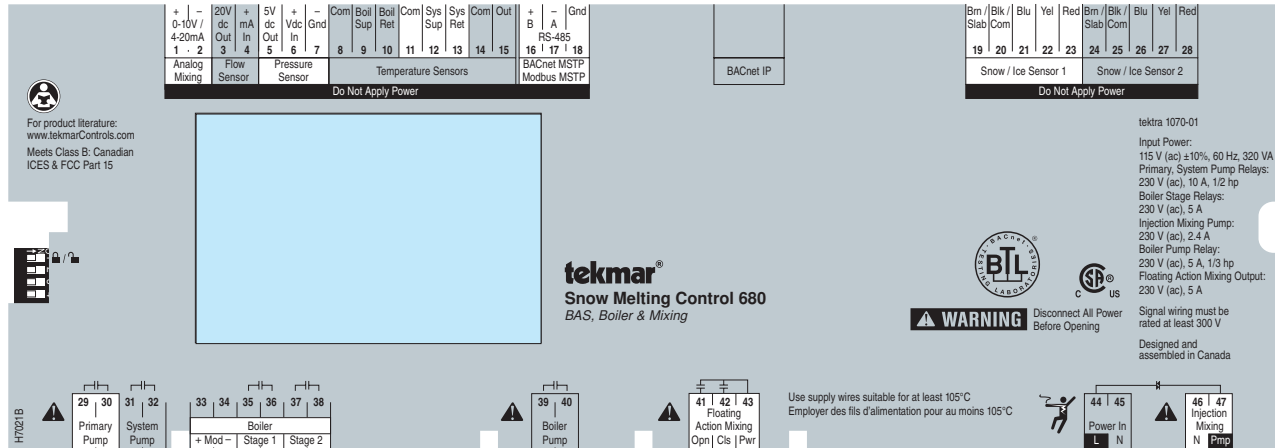
Legend

F1 = Flow Sensor (optional)
 HX = Steam-to-Glycol Heat Exchanger
 P1 = System Pump
 S1 = Outdoor Sensor 070
 S2 = System Supply Sensor 082
 S3 = System Return Sensor 082 (optional)
 S4, S5 = Snow/Ice Sensor 090 or 094
 S6, S7 = Snow Sensor 095
 S8, S9 = Slab Sensor 072 or 073
 V1 = Modulating Steam Valve

Application Settings

| Setting Name | Value |
|------------------|--------|
| Application Mode | Mixing |
| Mixing Type | 0-10 V |





Description

The Snow Melting Control 680 heats an electric snow melting system. The control operates an electrical contactor to make or break power to the electric cable. The control monitors the contactor run time and records the electrical energy used. An optional Building Automation System (BAS) can monitor and control the snow melting system remotely using the BACnet or Modbus communication protocol.

When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed together with a Slab Sensor 072 or 073, 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 the built-in timer.

Snow or Ice Detector

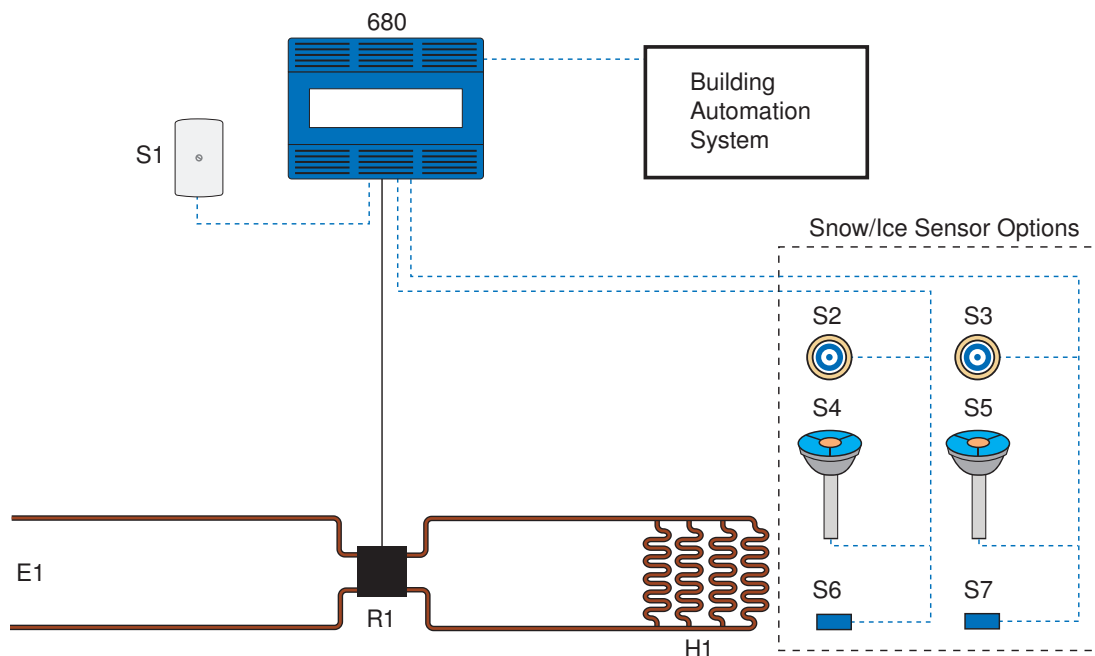
| Option | Start and Stop Sequence | Sensors Required (sold separately) |
|--------|-------------------------|---|
| 1 | Auto start/Auto stop | One or Two Snow/Ice Sensor 090 or 094 |
| 2 | Auto start/Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start/Timed stop | One or Two Slab Sensor 072 or 073 |

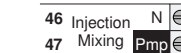
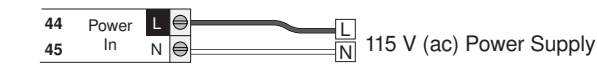
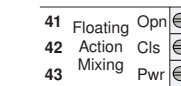
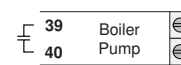
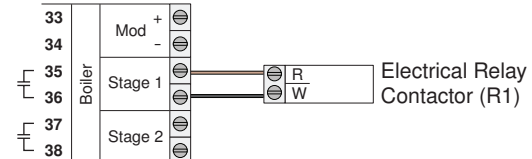
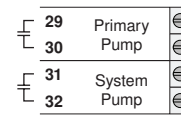
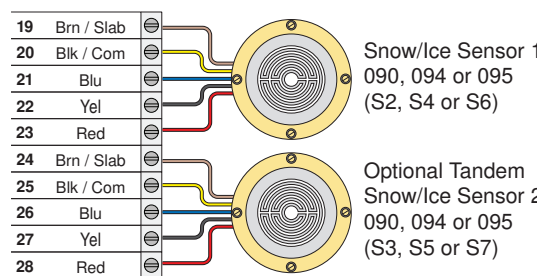
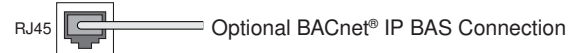
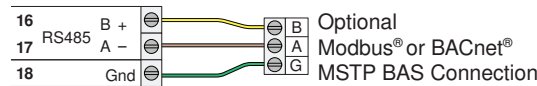
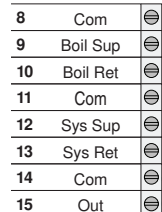
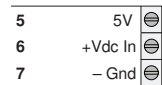
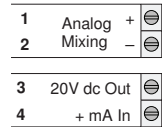
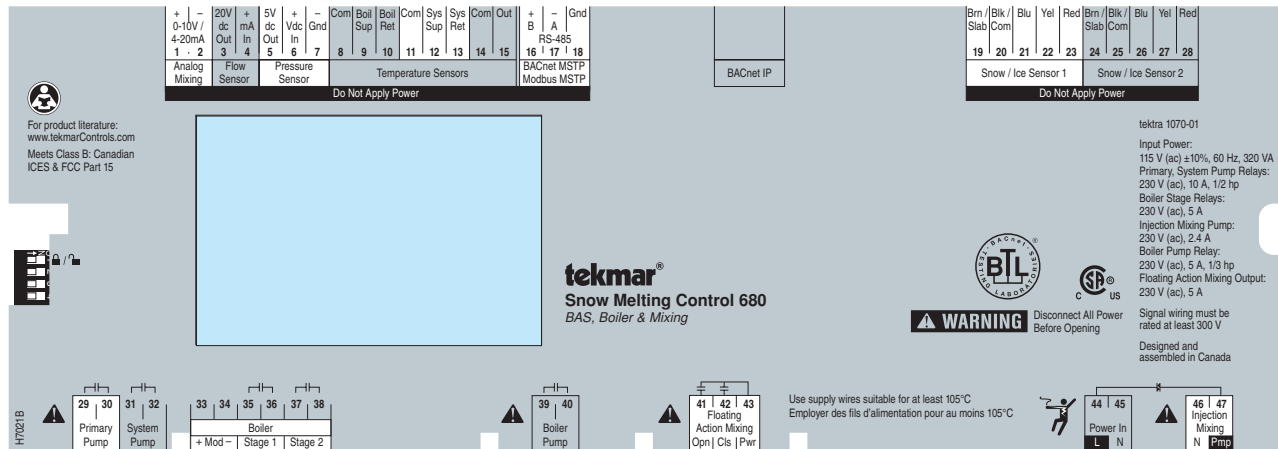
Legend

E1 = Electric Power Supply
H1 = Electric Heating Cable
R1 = Electric Relay Contactor
S1 = Outdoor Sensor 070
S2, S3 = Snow/Ice Sensor 090 or 094
S4, S5 = Snow Sensor 095
S6, S7 = Slab Sensor 072 or 073

Application Settings

| Setting Name | Value |
|------------------|----------|
| Application Mode | Electric |





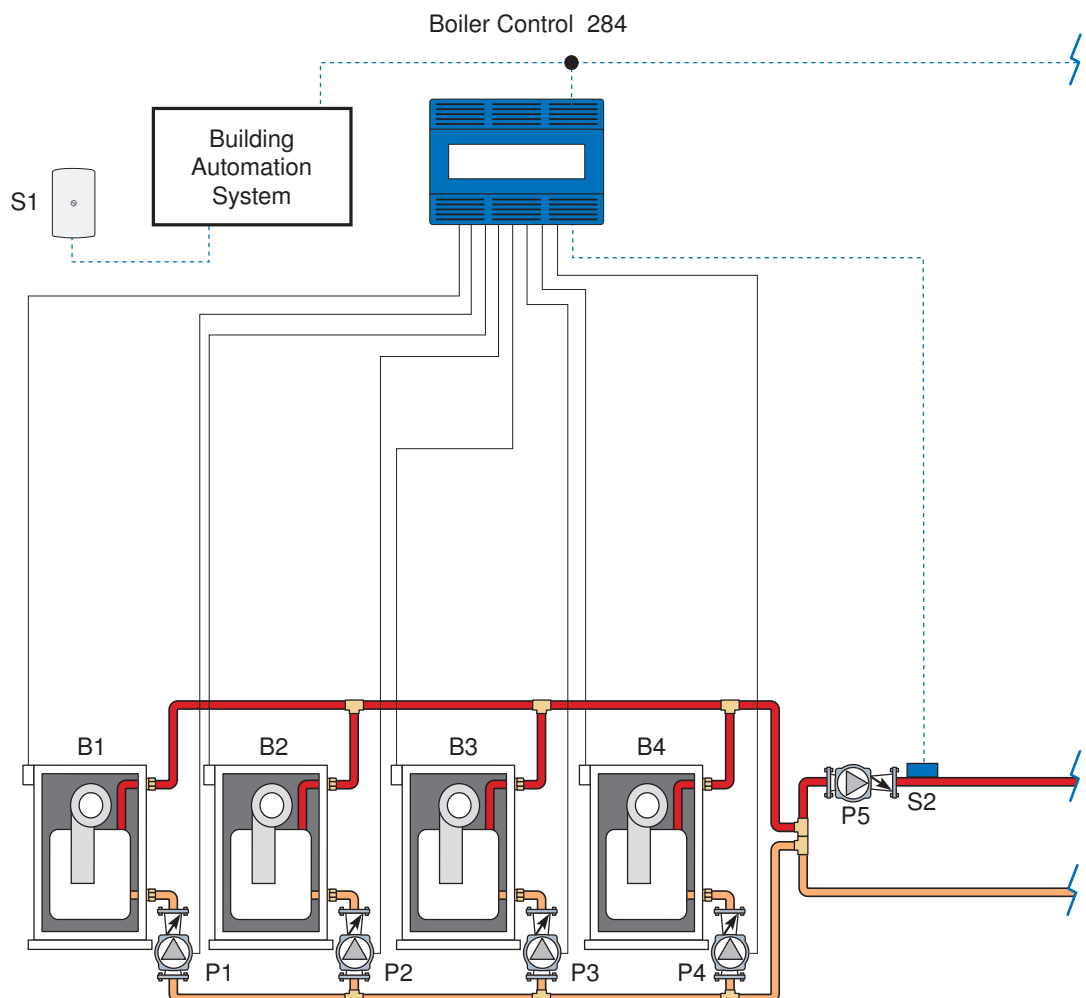
Description

A multi-zone snow melting system is operated by a Building Management System (BAS) using the BACnet or Modbus communication protocol. The BAS is the system master and the Boiler Control 284 and Snow Melting Control 680 are slaves. The boiler and snow melt system are filled with glycol solution.

Each snow melting zone is operated by a Snow Melting Control 680. When a Snow/Ice Sensor 090 or 094 is installed, the system automatically starts when snow or ice is detected and continues to run until the slab is dry. When a Snow Sensor 095 is installed together with a Slab Sensor 072 or 073, 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 the built-in timer.

The 680 operates the system pump continuously when the system is in melting, idling or storm modes of operation. The mixing valve position is adjusted to heat the melting surface to the slab target temperature. The 680 communicates the required boiler target to the BAS. The mixing valve is closed when the boiler return sensor falls below the boiler minimum setting to protect the boiler. Concrete slabs are protected from thermal expansion stress by limiting the thermal rate of rise between the system supply and the slab sensors. An optional flow sensor and the system supply and return sensors are used to monitor the energy used by the snow melting system.

The BAS controls the boiler target and prioritizes the snow melt zones. The 680 boiler target is communicated to the BAS system. The BAS system determines its own boiler target based on the system load and then communicates the boiler target to the 284 to operate four modulating boilers. If prioritization of the snow melting zones is required, the BAS will send a message to the 680 operating zone 2 to stop melting. Once zone 1 has stopped melting, then the BAS system provides a message to the 680 operating zone 2 to resume melting.



Snow or Ice Detector

| Option | Start and Stop Sequence | Sensors Required (sold separately) |
|--------|-------------------------|---|
| 1 | Auto start/Auto stop | One or Two Snow/Ice Sensor 090 or 094 |
| 2 | Auto start/Timed stop | One or Two Snow Sensor 095 & Slab Sensor 072 or 073 |
| 3 | Manual start/Timed stop | One or Two Slab Sensor 072 or 073 |

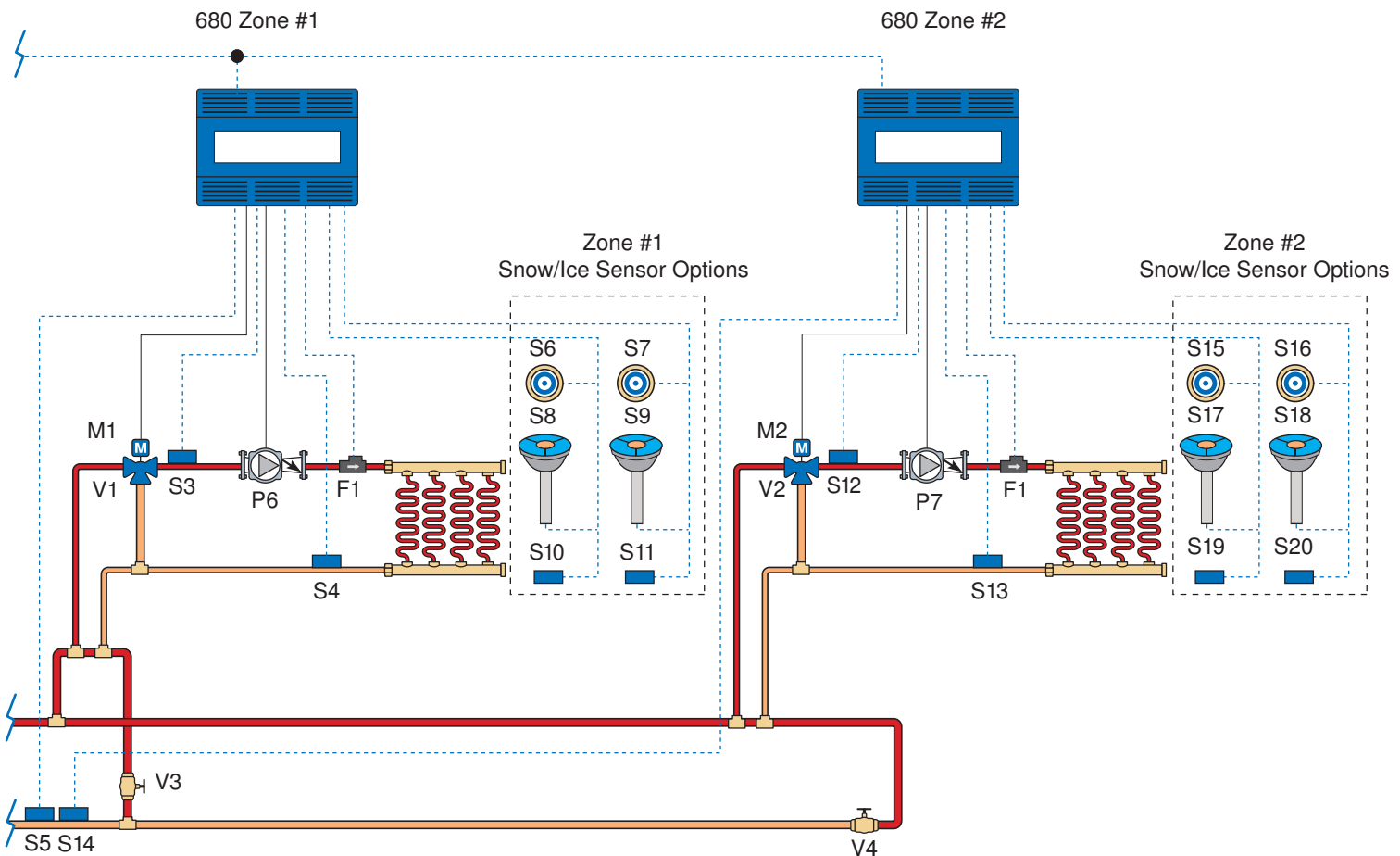
Application Settings

| Setting Name | Value |
|------------------|----------|
| Application Mode | Mixing |
| Mixing Type | Floating |

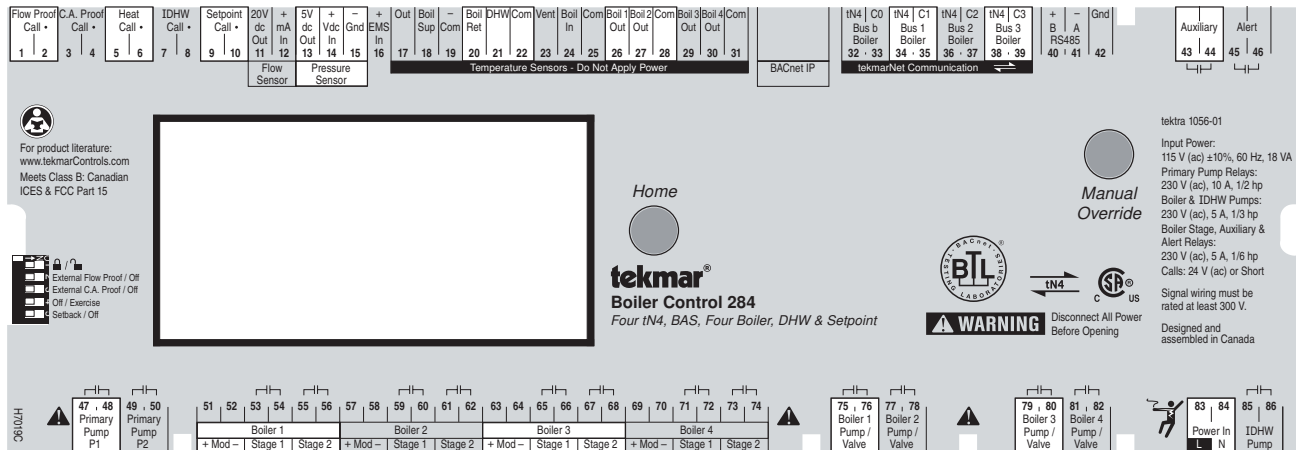
Legend

B1 to B4 = Modulating Boilers
 F1, F2 = Flow Sensor (optional)
 M1, M2 = Actuator Motor 742
 P1 to P4 = Boiler Pumps
 P5 = Primary Pump
 P6, P7 = System Pumps
 S1 = Outdoor Sensor 070
 S2 = 284 Boiler Supply Sensor 082

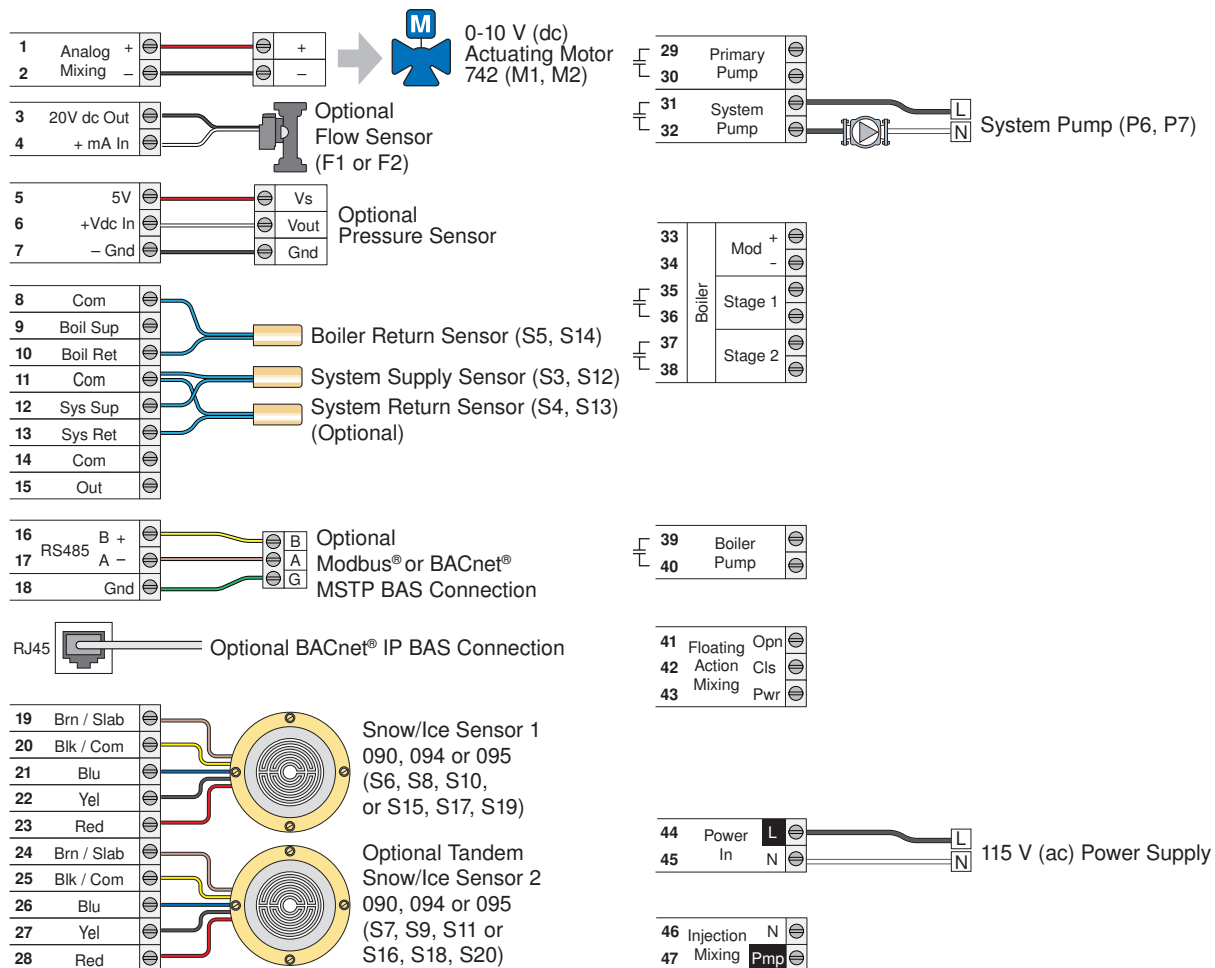
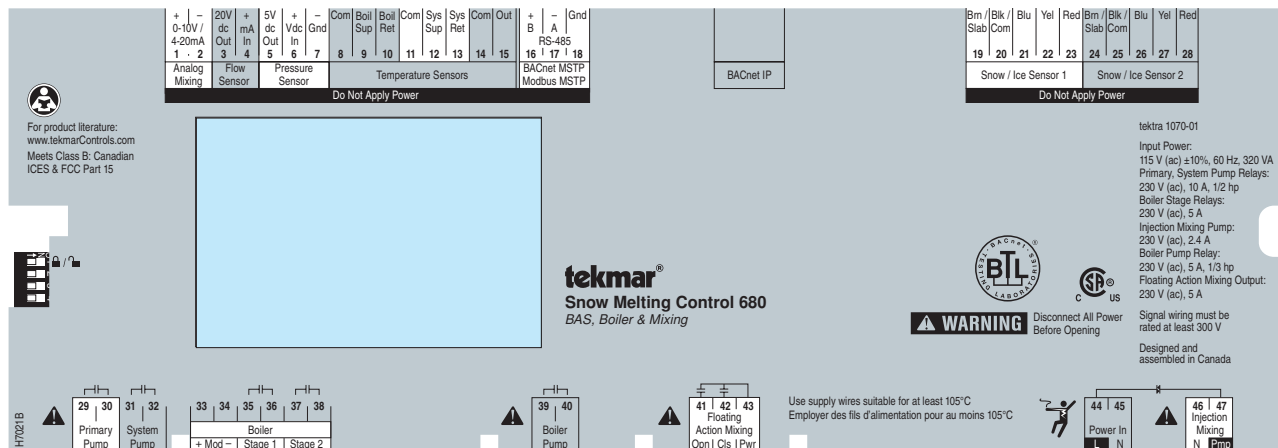
S3, S12 = System Supply Sensor 082
 S4, S13 = System Return Sensor 082 (optional)
 S5, S14 = Boiler Return Sensor 082
 S6, S7, S15, S16 = Snow/Ice Sensor 090 or 094
 S8, S9, S17, S18 = Snow Sensor 095
 S10, S11, S19, S20 = Slab Sensor 072 or 073
 V1, V2 = 3-Way Mixing Valve 710 through 714
 V3, V4 = Balancing Valves



Boiler Control 284 Electrical Schematic



Snow Melting Control 680 Electrical Schematic (typical)



Legend

B1 to B4 = Modulating Boilers
F1, F2 = Flow Sensor (optional)
M1, M2 = Actuator Motor 742
P1 to P4 = Boiler Pumps
P5 = Primary Pump
P6, P7 = System Pumps
S1 = Outdoor Sensor 070
S2 = 284 Boiler Supply Sensor 082

S3, S12 = System Supply Sensor 082
S4, S13 = System Return Sensor 082 (optional)
S5, S14 = Boiler Return Sensor 082
S6, S7, S15, S16 = Snow/Ice Sensor 090 or 094
S8, S9, S17, S18 = Snow Sensor 095
S10, S11, S19, S20 = Slab Sensor 072 or 073
V1, V2 = 3-Way Mixing Valve 710 through 714
V3, V4 = Balancing Valves

Specifications

The following are the recommended specifications for the Snow Melting Control 680.

- The control shall communicate with BACnet® IP, BACnet® MS/TP and Modbus® MS/TP systems to provide remote monitoring and adjustment.
- The control shall have the ability to use a snow/ice sensor in order to automatically detect snow or ice and begin operation of the system. The system shall continue to run until the sensor is dry or the control is manually stopped.
- The control shall have the ability to be manually started with an adjustable running time that counts down and automatically stops the system.
- The control shall not operate the system to provide heat to the snow melting zones when it enters into either a Warm Weather Shut Down (WWSD) or a Cold Weather Cut Off (CWCO) mode.
- The system water temperature shall be based on the outdoor temperature and feedback from sensors located in the snow melting slabs.
- The control shall have the option to mix the supply water temperature using a mixing valve with a floating action, 0-10 V (dc) or a 4-20 mA actuator motor, or using a variable-speed injection mixing pump.
- The control shall have an adjustable minimum return water temperature setting to help prevent condensation of flue gases and subsequent corrosion and blockage of the boiler's heat exchanger and chimney.
- The control shall have the ability to limit the amount of cool water being returned to the boiler through the mixing device in order to prevent low boiler operating temperatures and flue gas condensation.
- The control shall have the ability to directly control the supply temperature of a modulating boiler, a one or two-stage boiler, or to send a boiler enable signal to another boiler operating control to allow for a staging control to be connected.
- The control shall have the option of an automatic differential calculation for the operation of one or two boiler stages in order to prevent short cycling.
- The control shall use proportional, integral and derivative (PID) logic when modulating or staging boiler stages.
- The control shall have the option to limit the heat up rate of the slab to help prevent cracking the concrete.
- The control shall have two separate lockable access levels to limit the number of adjustments available to various users.
- The control shall have a manual override that allows each output to be manually turned on or off.
- The control shall continuously monitor its temperature sensors and provide an error message upon a control or sensor failure.
- The control shall record and display boiler and pump running hours and minimum and maximum temperatures depending on the access level that has been selected.
- During extended periods of inactivity, the pumps and valves that are operated by the control shall be periodically exercised to prevent seizure during long idle periods.
- The control shall have the option to measure fluid flow rates.
- The control shall have the option to record, display and communicate the amount of energy used to heat the snow melting surface.
- The control shall have the option to measure fluid pressure.