

tekmar® - Data Brochure

Snow Detector & Melting Control 664

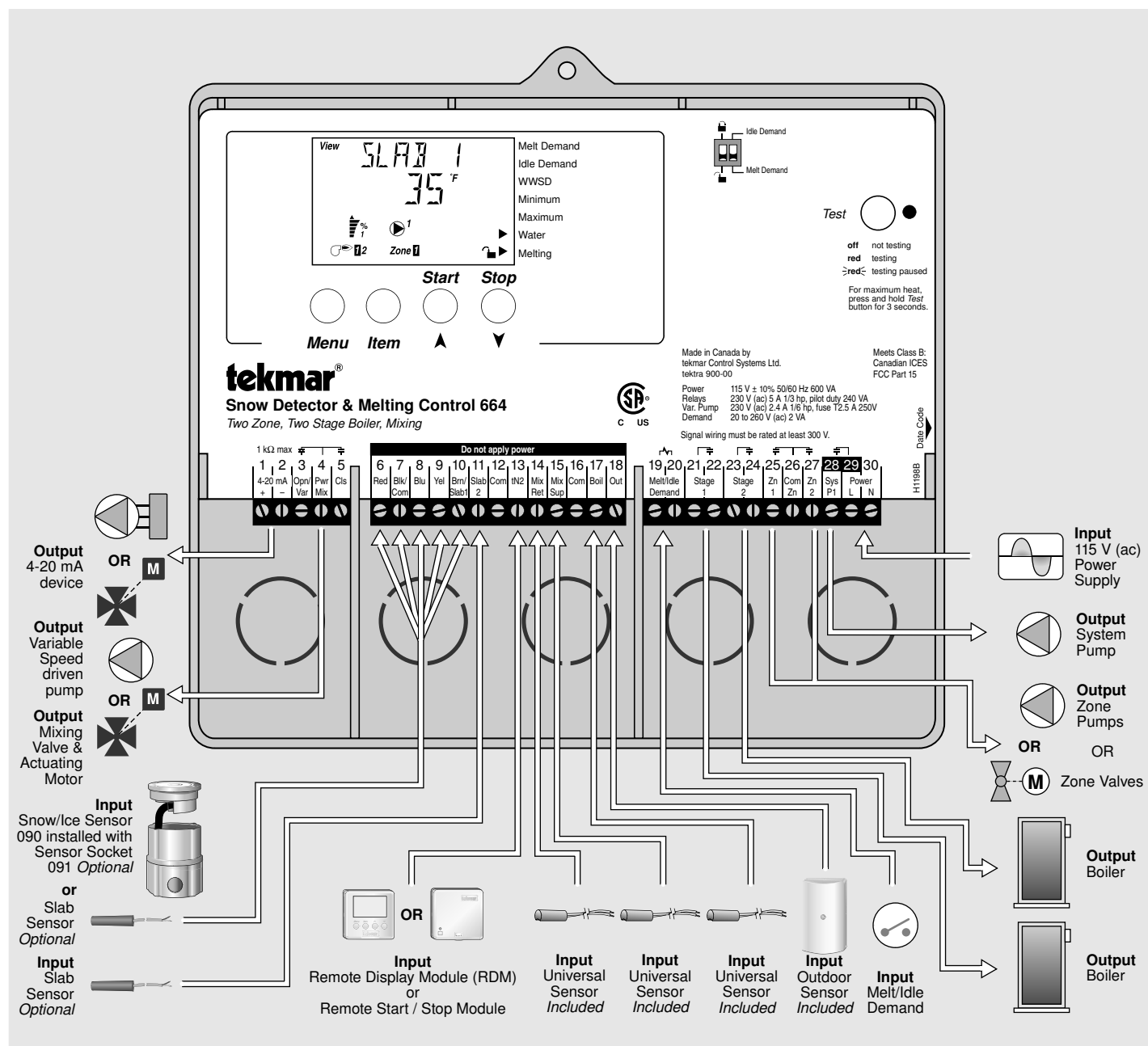
D 664

06/04

The Snow Detector and Melting Control 664 is designed to control up to two zones in a snow melting system. The control automatically adjusts the mixed supply water to the snow melting system by controlling up to two boilers and a single mixing device. For mixing, the 664 can use a variable speed injection pump, a floating action mixing valve or a 4-20 mA device. The snow melting system may be started manually or automatically through the use of a Snow / Ice Sensor 090. The 664 control includes a large Liquid Crystal Display (LCD) in order to view system status and operating information.

Additional features include:

- Temporary Idle
- Optional priority zoning operation
- Slab protection for the snow melting system
- Boiler protection
- Manual Override
- Adjustable Warm Weather Shut Down (WWSD)
- Cold Weather Cut Out (CWCO)
- Remote display and adjustment capabilities
- Test sequence to ensure proper component operation
- Pump and valve exercising
- CSA C US Certified (approved to applicable UL standards)



How To Use The Data Brochure

This brochure is organized into four main sections. They are: 1) *Sequence of Operation*, 2) *Installation*, 3) *Control Settings*, and 4) *Troubleshooting*. The Sequence of Operation section has 6 sub-sections. We recommend reading Section A: General of the *Sequence of Operation*, as this contains important information on the overall operation of the control. Then read to the sub-sections that apply to your installation.

The *Control Settings* section (starting at DIP Switch Settings) of this brochure describes the various items that are adjusted and displayed by the control. The control functions of each adjustable item are described in the *Sequence of Operation*.

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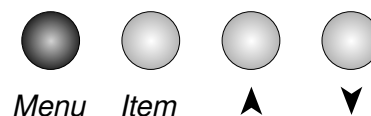
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User Interface

The 664 uses a Liquid Crystal Display (LCD) as the method of supplying information. You use the LCD in order to setup and monitor the operation of your system. The 664 has four push buttons (**Menu**, **Item**, **▲**, **▼**) for selecting and adjusting settings. As you program your control, record your settings in the ADJUST Menu table which is found in the second half of this brochure.

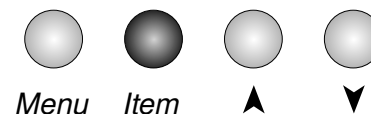
Menu

All of the items displayed by the control are organized into various menus. These menus are listed on the left hand side of the display (Menu Field). To select a menu, use the **Menu** button. By pressing and releasing the **Menu** button, the display will advance to the next available menu. Once a menu is selected, there will be a group of items that can be viewed within the menu.



Item

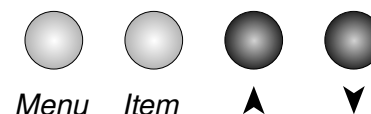
The abbreviated name of the selected item will be displayed in the item field of the display. To view the next available item, press and release the **Item** button. Once you have reached the last available item in a menu, pressing and releasing the **Item** button will return the display to the first item in the selected menu.



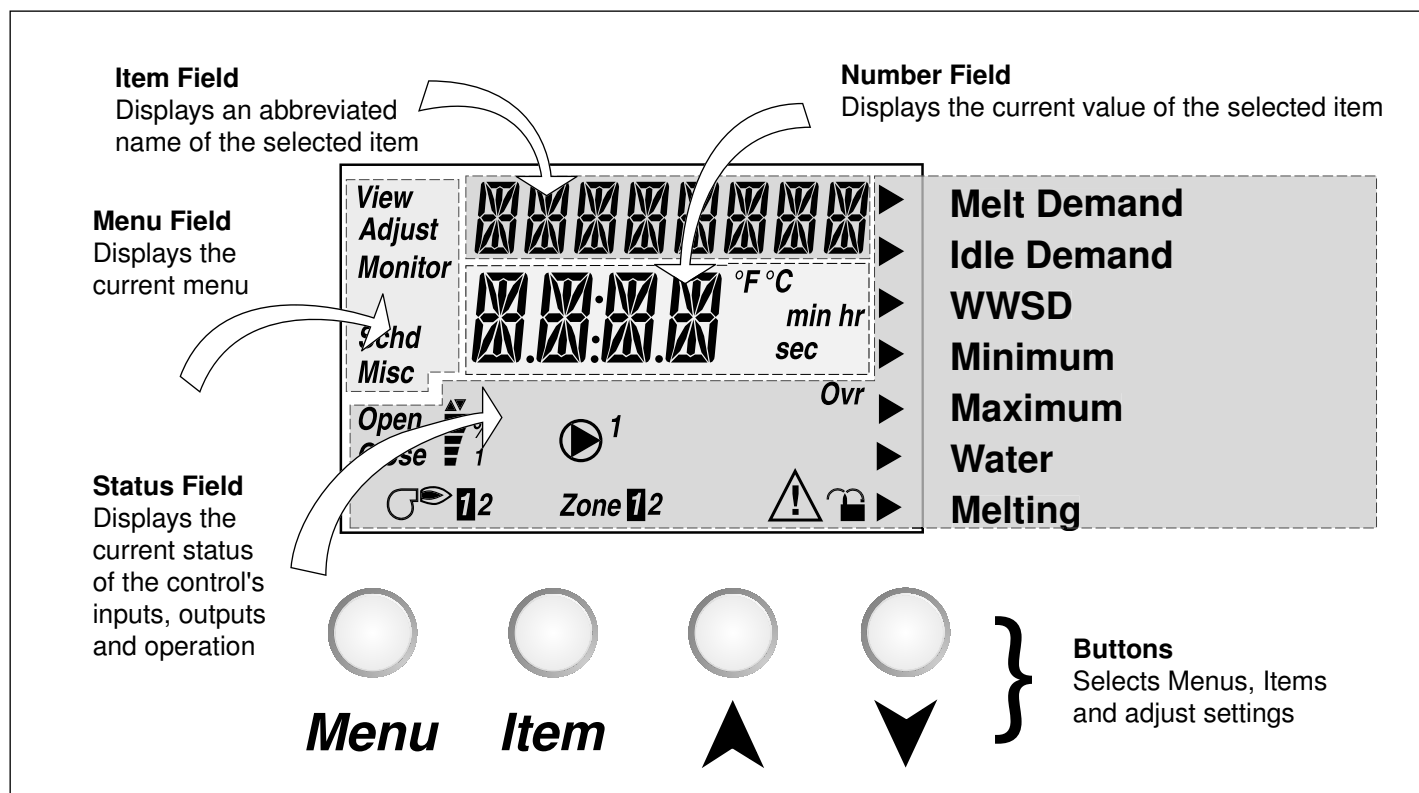
Adjust

To make an adjustment to a setting in the control, begin by selecting the appropriate menu using the **Menu** button. Then select the desired item using the **Item** button. Finally, use the **▲** and / or **▼** button to make the adjustment.

Additional information can be gained by observing the Status field of the LCD. The status field will indicate which of the control's outputs are currently active. Most symbols in the status field are only visible when the VIEW Menu is selected.



Display



Symbol Description

Open / Close	Open / Close Displays when the actuator is opening or closing the mixing valve.		Lock / Unlock Displays when the access levels are locked or unlocked.
	Mixing Device Output Scale Shows output of injection pump, mixing valve or 4-20 mA device. Arrows show whether the output is increasing or decreasing.		Burner Displays when the Stage 1 and / or Stage 2 relay is turned on.
	Pump Displays when the system pump is operating.		Pointer Displays the control operation as indicated by the text.
Ovr	Override Displays when the control is in override mode.	°F °C min hr sec	°F, °C, min, hr, sec Units of measurement.
	Warning Displays when an error exists or when a limit has been reached.	Zone 12	Zone Displays when a zone is in operation.

Definitions

The following defined terms and symbols are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.



- Warning Symbol: Indicates presence of hazards which can cause severe personal injury, death or substantial property damage if ignored.



- Double insulated

INSTALLATION CATEGORY II

- Local level, appliances

Sequence of Operation

Section A

General
Operation
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Section B

Snow
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Melting
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Section A: General Operation

POWERING UP THE CONTROL

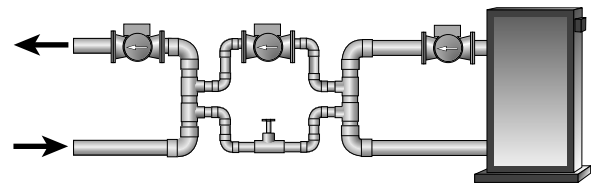
When the Snow Detector and Melting Control 664 is powered up, the control displays all LCD segments for 2 seconds, then the control type number in the LCD for 2 seconds. Next, the software version is displayed for 2 seconds. Finally, the control enters into the normal Operating mode and the LCD defaults to displaying the current outdoor air temperature.

MIXING DEVICE SELECTION (MIXING)

The 664 can supply a lower fluid temperature to the snow melting system by using a variable speed injection pump, a floating action mixing valve or a modulating 4-20 mA device. The selection is made under the Mixing item in the ADJUST menu.

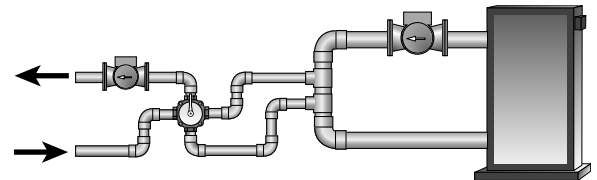
Variable Speed Injection (VAR)

A standard wet rotor circulator is connected to the 664 on the *Pwr Mix* and *Opn / Var* terminals (4 and 3). The 664 increases or decreases the power output to the circulator based on the system requirements. For correct sizing and piping of the variable speed injection pump, refer to Essay E 021. A visual indication of the current variable speed output is displayed in the LCD in the form of a segmented bar graph.



Floating Action (FLOT)

A floating action motor is connected to the 664 on the *Pwr Mix*, *Opn / Var* and *Cls* terminals (4, 3 and 5). The 664 pulses the actuator motor open or close based on the system requirements. The mixing valve that the actuator is connected to can be either a 2-way, 3-way or 4-way valve. A visual indication of the current position of the valve is displayed in the LCD in the form of a segmented bar graph.



4-20 mA Output (4-20)

A 4-20 mA device is connected to the 664 on the *4-20 mA +* and *4-20 mA -* terminals (1 and 2). The 664 increases or decreases the modulating output to the 4-20 mA device based on the system requirements. The 4-20 mA output can be used to operate a variety of actuating motors for mixing valves and motor drives for larger pumps. A visual indication of the current output of the 4-20 mA device is displayed in the LCD in the form of a segmented bar graph.

MIXING TARGET (MIX TRG)

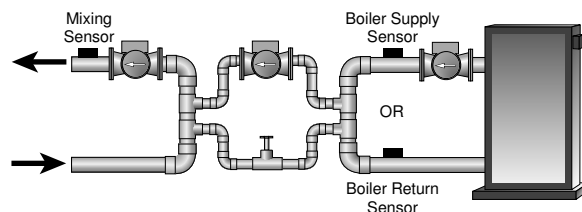
The mixing target temperature is the supply fluid temperature calculated by the control. The control will operate the snow melt system so that the mix supply temperature reaches the mixing target except while providing boiler return protection for the boiler.

MIXING MAXIMUM (MIX MAX)

The *Mix Max* sets the highest fluid temperature that the control is allowed to calculate as the mixing target temperature. If the control does target the *Mix Max* setting, and the mix supply temperature is near the MIX MAX, the Maximum pointer is displayed in the LCD while the MIX SUP temperature is being viewed.

BOILER PROTECTION (Boil MIN)

The 664 is capable of providing boiler protection from cold mixing system return fluid temperatures. If the boiler sensor temperature is cooler than the *Boil Min* setting while the boiler(s) is firing, the 664 reduces the output from the mixing device. This limits the amount of cool return water to the boiler(s) and allows the boiler temperature to recover. This feature can only be used if the Boil Sens item is set to *Sup* or *Ret*. The 664 can not provide boiler protection if the Boil Sens item is set to *None*.



EXERCISING (EXERCISE)

The 664 has a built in pump and valve exercising function. The exercising period is adjustable and is factory set at 70 hours. If a pump or valve output has not been operated at least once during every exercising period, the control turns on the output for 10 seconds. This minimizes the possibility of a pump or valve seizing during a long period of inactivity. In the case where a mixing valve is being used as the mixing device, the 664 ensures that the valve operates over its entire range at least once each exercising period.

Note: The exercising function does not work if power to the control, valves or pumps is disconnected.

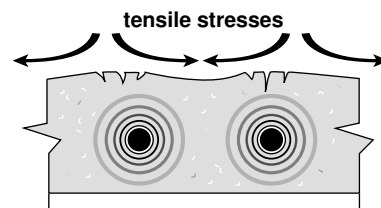
Section B: Snow Melting

Section B1 General Snow Melting

Section B1: General Snow Melting

SLAB PROTECTION (ΔT MAX)

The control can limit the rate at which heat is applied to the currently operating zone through the ΔT Max setting. The ΔT (delta T) is the temperature difference between the snow melting supply temperature and the snow melting return temperature. By limiting this temperature difference, the rate at which heat is applied to the currently operating zone can be controlled and thermal stresses in the slab can be minimized. When the control is operating at the ΔT MAX, the *Maximum* pointer can be seen when viewing the ΔT item in the VIEW menu. The control provides slab protection differently based on boiler sensor placement.



Note: The ΔT MAX function is only available if the PRIORITY item is set to *COND* or *FULL*.

VISCOSITY COMPENSATION (EXCEEDING ΔT MAX)

At low temperatures, the glycol solutions used in snow melting systems become very viscous and difficult to pump. In order to overcome this condition during a cold start of a snow melting system, the 664 is allowed to exceed the ΔT Max setting for a period of time in order to warm the glycol solution. This allows the control to compensate for the high viscosity of the glycol solution and is used when the mixing return temperature is below 30°F (-1°C). When the control exceeds the ΔT Max setting, the *Maximum* pointer will flash when viewing the ΔT item in the VIEW menu.

Note: This operation only occurs if the PRIORITY item is set to *COND* or *FULL*.

SOFT START

When the control starts applying heat to the slab, the supply temperature to the snow melting system is ramped up over a period of time until it reaches the target mixed supply temperature. This feature helps reduce thermal stresses in the slab.

Note: This operation only occurs if the Boil SENS item is set to *RET* or *NONE*.

RUNNING TIME (RUN TIME)

The running time is the length of time that a zone operates once it has reached its slab target temperature. During the time that a zone is approaching its slab target temperature, the Run Time does not decrease. Once a zone reaches its slab target temperature the Run Time begins counting down. When the Run Time reaches 0:00 as displayed in the Status item of the appropriate zone in the VIEW menu, the zone has finished melting.

Note: The running time is only applicable when a manual melting enable signal starts the snow melting system. Refer to Section D1 for a description of a manual melting enable.

WARM WEATHER SHUT DOWN (WWSD)

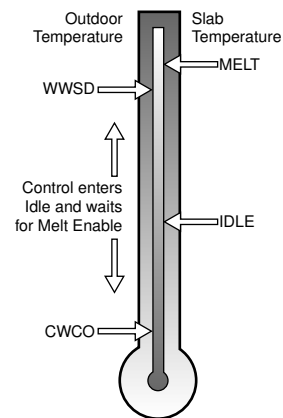
The control has a warm weather shut down for each zone that prevents the control from entering the Melt or Idle modes in order to conserve energy. While a zone is in WWSD, the word WWSD is displayed in the STATUS 1 or STATUS 2 items in the VIEW menu. When both zones enter WWSD, the 664 turns on the WWSD pointer in the display.

Automatic (Auto)

There is a warm weather shut down for each zone. When both the slab temperature of a zone and the outdoor temperature exceed the zone's *Melt Temperature* setting by more than 2°F (1°C), the zone enters into WWSD. While a zone is in WWSD, the word WWSD is displayed in the STATUS item of the appropriate zone in the VIEW menu. When both zones enter WWSD, the 664 turns on the WWSD pointer in the display.

Adjustable WWSD

When the WWSD is set to a temperature, the WWSD occurs when the outdoor air temperature exceeds the WWSD setting by 1°F (0.5°C) and when the slab temperature of a zone exceeds 34°F (1°C). The zone exits WWSD when the outdoor air temperature falls 1°F (0.5°C) below the WWSD setting or if the slab temperature of the zone falls below 34°F (1°C). This allows the *Melting Temperature* setting to be set higher than the WWSD. This is useful where high slab temperatures are required to melt the snow or ice. A good example of this is installations using paving bricks on top of sand and concrete layers.



COLD WEATHER CUT OUT (CWCO)

Maintaining the zone(s) at either the melting or idling temperature during extremely cold temperatures can be expensive or impossible. The control turns the snow melting system off when the outdoor air temperature drops below the Cold Weather Cut Out (CWCO) temperature. While the control is in CWCO, the word CWCO is displayed in the STATUS 1 and STATUS 2 item in the VIEW menu. If a Snow / Ice Sensor 090 is used, the heater in the sensor is kept on during CWCO until the control detects moisture. If water is detected, the heater is turned off but the control retains the moisture detected information. When the outdoor temperature rises above the CWCO temperature, the control exits CWCO and if the Snow / Ice Sensor 090 detected moisture during CWCO, the control initiates Melting mode. If the control has been started prior to the CWCO, it resumes the Melting mode once the outdoor air temperature rises above the CWCO temperature.

STATUS 1 and 2 (STATUS)

While in the VIEW menu there are a number of items available to determine the current status of zone 1 and zone 2. To view the current status of zone 1, select the STATUS 1 item in the VIEW menu. To view the current status of zone 2, select the STATUS 2 item in the VIEW menu.

- **STRT** The word STRT is displayed after the snow melting system has been manually enabled. It is displayed until the zone reaches its slab target temperature. If the zone is at its slab target temperature, STRT is displayed for five seconds after the snow melting system has started operation. This is to verify that the control has entered into the Melting mode.
- **STOP** The word STOP is displayed for five seconds after the snow melting system has been manually disabled. The word STOP is also displayed if either a Remote Start / Stop Module 039, Remote Display Module 040 or the **Stop** on the control stops the snow melting system and an external melt demand is still present.
- **IDLE** The word IDLE is displayed as long as the zone is operating at its idling temperature.
- **"IDLE"** The word IDLE is flashed on the display as long as the zone is operating in temporary idle.
- **EXT** The word EXT is displayed when the RUN TIME has reached 0:00 and the control still has an external melt demand. In this situation, the zone continues melting until the melt demand is removed or the control is stopped.

- **DET** The word DET is displayed after the snow melting system has been automatically enabled by the Snow / Ice Sensor 090 and the zone is at its slab target temperature. DET is also displayed once the control is manually enabled after automatic detection by the 090 and the running time has counted down to 0:00.
- **0:00 to 23:59 hr** While the zone is up to temperature and melting, the remaining RUN TIME is displayed.
- **INF** If an infinite RUN TIME is selected and the zone is melting, INF is displayed.
- **WWSD** When the zone is in Warm Weather Shut Down, WWSD is displayed.
- **CWCO** When the control is in Cold Weather Cut Out, CWCO is displayed.

BOILER PROTECTION

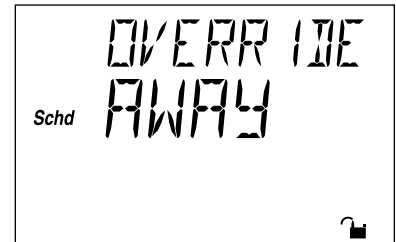
Refer to Section A for a description of boiler protection.

BOILER OPERATION

Refer to Section C for a description of boiler operation.

SNOW MELTING OVERRIDE

If the *Away* setting is selected in the SCHEDULE menu, the snow melting system is shut down. Both the Melting and Idling temperatures are ignored as long as the control remains in the *Away* mode.



SYSTEM PUMP OPERATION (Sys P1)

The *System Pump (Sys P1)* contact closes and remains closed as long as at least one of the zones is either in the Melting or Idling mode. The *System Pump* contact shuts off if the control is in CWCO, if both zones are in WWSD, or if there is no call for Melting or Idling.

ZONE OUTPUTS (Zn 1 and Zn 2)

The *Zone 1 (Zn 1)* contact and the *Zone 2 (Zn 2)* contact operate based on the Melting and / or Idling operation. Refer to Melting Section E and / or Idling Section F for a description of how the zone contact(s) operate. The *Zone Pump* contact(s) shuts off if the control is in CWCO, if the corresponding zone(s) is in WWSD, or if there is no call for Melting or Idling.

PURGE

The system pump (Sys P1) and zoning device(s) (Zn 1 and Zn 2) continue to operate for up to 2 minutes after the last demand is removed. This purges the residual heat from the boiler(s) into the snow melting slab. If the boiler temperature drops below the *Boil Min* setting after 20 seconds, the purge is aborted and the system pump and zoning device(s) are turned off.

Section C: Boiler Operation

Section C1
Boiler Supply
Sensor

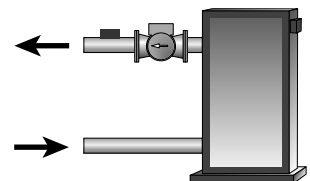
Section C2
Boiler Return
Sensor

Section C3
No Boiler
Sensor

Section C1: Boiler Supply Sensor

BOILER SENSOR ON THE SUPPLY (Boil SENS = SUP)

When operating a boiler or boiler plant that is dedicated to a snow melting system, the 664 is designed to operate the boiler(s) as efficiently as possible. The boiler(s) are cycled based on the mixing supply fluid temperature. This is to provide longer and more efficient boiler cycles. This mode of operation only works if the Boil SENS item is set to *SUP*.



BOILER MINIMUM (Boil MIN)

The Boil MIN is the lowest water temperature that the control is allowed to use as a boiler target temperature. If the boiler(s) is operating, and the boiler supply temperature is near the *Boil Min* setting, the Minimum pointer turns on in the LCD while the *Boil SUP* temperature is being viewed. If the installed boiler(s) is designed for condensing or low temperature operation, set the *Boil MIN* adjustment to *OFF*.

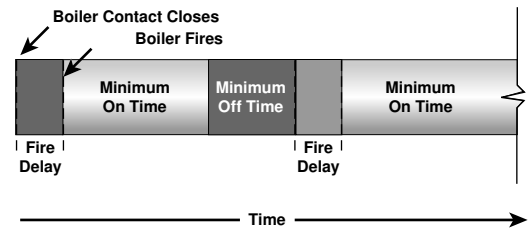
STAGING

The 664 controls up to two stages in order to supply the required temperature. After the first stage is turned on in the firing sequence, the control waits a minimum amount of time before turning on the next stage. After the minimum time delay between stages has expired, the 664 examines the control error to determine when the next stage is to fire. The control error is determined using Proportional, Integral and Derivative (PID) logic.

- Proportional** – compares the actual temperature to the target temperature. The colder the temperature, the sooner the next stage is turned on.
- Integral** – compares the actual temperature to the target temperature over a period of time.
- Derivative** – determines how fast or slow the actual temperature is changing. If the temperature is increasing slowly, the next stage is turned on sooner. If the temperature is increasing quickly, the next stage is turned on later, if at all.
- Each stage has a minimum on time, and a minimum off time.

FIRE DELAY (FIRE DLY)

The FIRE DLY is the delay time that may occur between the time that the 664 closes a stage contact and the burner fires for that stage. This delay is usually the result of burner pre-purge or other forms of time delay built into the burner's safety circuits.



BOILER MASS (Boil MASS)

The *Boil MASS* setting allows the 664 to adjust to different types of heat sources depending on their thermal mass.

Light (LITE)

The *LITE* setting is selected if the boiler(s) that is used has a low thermal mass. This means that the boiler(s) has a very small water content and has very little metal in the heat exchanger. A boiler that has a low thermal mass comes up to temperature quite rapidly when fired. This is typical of many copper fin-tube boilers.

Medium (MED)

The *MED* setting is selected if the boiler(s) that is used has a medium thermal mass. This means that the boiler(s) either has a large water content and a low metal content or a low water content and a high metal content. This is typical of many modern residential cast iron boilers or steel tube boilers.

Heavy (HEVY)

The *HEVY* setting is selected if the boiler(s) that is used has a high thermal mass. This means that the boiler(s) has both a large water content and a large metal content. A boiler that has a high thermal mass is relatively slow in coming up to temperature. This is typical of many commercial cast iron and steel tube boilers.

DIFFERENTIAL (DIFF)

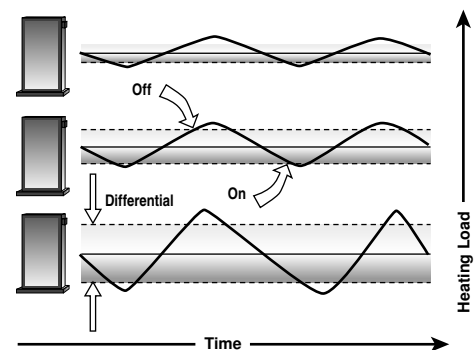
An on / off heat source such as a boiler must be operated with a differential in order to prevent short cycling. With the 664, either a fixed or an automatic differential may be selected.

Fixed Differential

The differential is centered around the target temperature. If the temperature drops 1/2 the differential below the target temperature, the 664 closes the *Boiler* contact(s) to fire the boiler(s). If the temperature rises 1/2 of the differential above the target temperature, the 664 opens the *Boiler* contact(s) to turn off the boiler(s).

Auto Differential (AUTO)

If the *AUTO Differential* is selected, the 664 automatically adjusts the *Differential* setting under the current load conditions to avoid short cycling.



STAGE 1 AND 2 (STAGE)

The *Stage 1* and *2* setting may be selected to AUTO or OFF. When AUTO is selected, the stage is activated and the control operates the appropriate boiler. When OFF is selected, the control does not fire the stage.

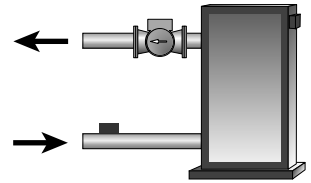
ROTATION (ROTATE)

The ROTATE item is an adjustable setting that is factory set at 48 hours. The firing order of the boiler changes whenever one stage's accumulated running time exceeds the other stage's accumulated running time by more than the *ROTATE* setting. After each rotation, the stage with the least running hours is the first to fire and the stage with the most running hours is the last to fire. This function ensures that both stages receive equal amounts of use. When this item is set to the *OFF* setting, Stage 1 is always the first to fire.

Section C2: Boiler Return Sensor

BOILER SENSOR ON THE RETURN (Boil SENS = RET)

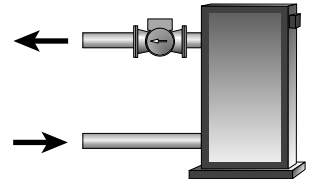
The boiler sensor should be located on the boiler return if the 664 is one of many controls that can call for boiler operation. When in the Return mode, the 664 provides a boiler enable through the *Stage 1* contact. The 664 no longer tries to control the boiler supply water temperature directly, but allows the boiler to operate at its operating aquastat setting when required. If this mode of operation is selected, the boiler pump should either operate continuously, or be operated in parallel with the *System Pump* contact (*Sys P1*). When the mixing device begins to ramp up, the *Stage 1* contact closes on the 664. The *Stage 1* contact remains closed until the mixing device no longer requires heat. With the sensor on the boiler return, the 664 is still capable of providing boiler protection as described in Section A.



Section C3: No Boiler Sensor

NO BOILER SENSOR (Boil SENS = NONE)

The 664 is capable of operating without a boiler sensor if desired. Without a boiler sensor, the 664 is unable to provide boiler protection. In this mode of operation, the *Stage 1* contact is used to provide a boiler enable. When the mixing device begins to ramp up, the *Stage 1* contact on the 664 closes. The *Stage 1* contact remains closed until the mixing device no longer requires heat. This type of application is typical if the 664 is drawing heat from a source that already incorporates some form of boiler protection.



Section D: Melting Enable / Disable

Section D1
Snow Melting
Enable

Section D2
Snow Melting
Disable

Section D1: Snow Melting Enable

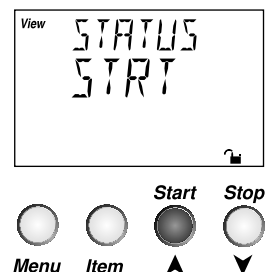
The snow melting system can be enabled manually or automatically. A melting enable signal applied to the control places both zones into the Melting mode. If a melting enable signal is applied once the system is already in the Melting mode, the control responds to the last command received.

MANUAL MELTING ENABLE

A manual melting enable signal requires the user to manually start the snow melting system and can be provided from the Start button on the control, Remote Start / Stop Module 039, Remote Display Module 040, or an external melt demand.

Start Button on the Control

The snow melting system is enabled by pressing the **Start** button on the control while in the VIEW menu. The control then displays the *RUN TIME* setting to allow the user to adjust it. Once the snow melting system is enabled, the word **STRT** is displayed for at least 5 seconds in the STATUS item of the appropriate zone while in the VIEW menu. If the **Start** button on the control is pressed while the zone(s) is already melting and up to temperature, the running time counter is reset to the *RUN TIME* setting.



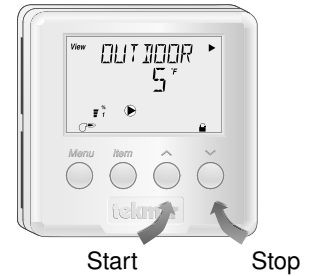
Remote Start / Stop Module 039

The snow melting system is enabled by pressing the button on the front of the 039. While the zone(s) is coming up to temperature, a green indicator light flashes on the front of the 039. Once the zone(s) is up to temperature and the RUN TIME is counting down, the green indicator light on the front of the 039 is on solid.



Remote Display Module 040

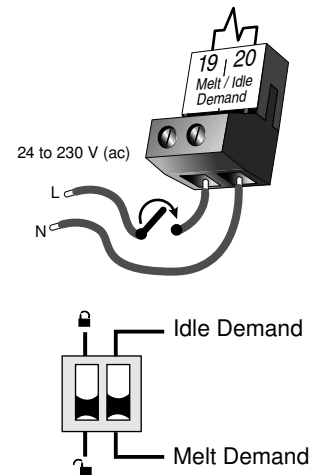
The snow melting system is enabled by pressing the ▲ button on the 040 while in the VIEW menu. The 040 then displays the *RUN TIME* setting to allow the user to adjust it. Once the snow melting system is enabled, the word *STRT* is displayed for at least 5 seconds in the Status item of the appropriate zone while in the VIEW menu.



External Melt Demand (DIP switch set to Melt Demand)

The snow melting system is enabled when a voltage between 24 and 240 V (ac) is applied across the *Melt / Idle Demand* terminals (19 and 20). An external melt demand must be present for at least 4 seconds in order to start the snow melting system. If the RUN TIME reaches 0:00 and the external melt demand is still present, the control continues melting until the external melt demand is removed or the system is otherwise stopped.

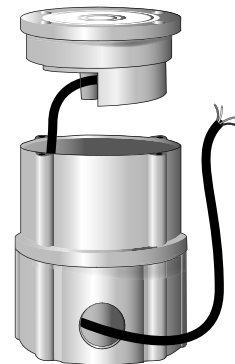
Note: This operation only occurs if the Idle Demand / Melt Demand DIP switch is set to the Melt Demand position.



AUTOMATIC MELTING ENABLE (Snow / Ice Sensor 090)

The 664 can use the Snow / Ice Sensor 090 to provide an automatic melting enable signal to start the snow melting system. The control continually monitors the 090 for the presence of moisture. Once moisture is detected, the *Water* pointer is displayed in the LCD and the snow melting system is enabled.

Note: In addition to the Snow / Ice Sensor 090 connected to the 664, the Zone 1 item in the ADJUST menu must be set to *AUTO* in order for the automatic melting enable function to work. Therefore, if zone 1 is turned off, the 090 can not provide a melting enable signal to start the Melting mode for zone 2.



Water Detection Sensitivity (SENSTVTY)

The 664 has a *Sensitivity* setting which compensates for varying outdoor conditions which could affect how the moisture detector in the 090 interprets the presence of moisture. This adjustable setting is available through the *SENSTVTY* item in the ADJUST menu of the control. As snow becomes contaminated with dirt, and as the sensor itself becomes dirty, the control may incorrectly indicate the presence of water. If this condition occurs, clean the surface of the sensor and / or turn down the *SENSTVTY* setting. If the snow in your area is very clean, the *SENSTVTY* setting may need to be increased before snow is detected. If *AUTO* is selected, the control automatically adjusts the sensitivity level used to detect moisture.

Section D2: Snow Melting Disable

The snow melting system can be disabled manually or automatically. A melting disable signal applied to the control takes both zones out of the Melting mode. Once the snow melting system is disabled, the zone(s) operates in the Idling mode. The Idling mode allows the zone(s) to be either operated at a lower temperature or turned off.

MANUAL MELTING DISABLE

A manual melting disable signal requires the user to manually stop the snow melting system and can be provided from the **Stop** button on the control, Remote Start / Stop Module 039, Remote Display Module 040, or an external idle demand.

Stop Button on the Control

The **Stop** button on the control can be used to stop the snow melting system. The snow melting system is disabled by pressing the **Stop** button on the control while in the VIEW menu. Once the snow melting system is disabled, the word STOP is displayed for 5 seconds in the STATUS item of the appropriate zone while in the VIEW menu.

Remote Start / Stop Module 039

A Remote Start / Stop Module 039 can be used to stop the snow melting system. The snow melting system is disabled by pressing the button on the face of the 039. When the system is stopped, a solid red indicator light is displayed on the face of the 039 for five seconds. If the snow melting system is disabled while there is still an external melt demand for snow melting, the 039 displays a solid red indicator light until the external demand is removed.

Remote Display Module 040

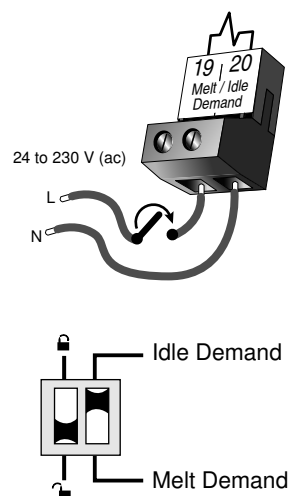
A Remote Display Module 040 can be used to stop the snow melting system. The snow melting system is disabled by pressing the ▼ button on the 040 while in the VIEW menu. Once the snow melting system is disabled, the word STOP is displayed for 5 seconds in the STATUS item of the appropriate zone while in the VIEW menu.

External Idle Demand (DIP switch set to Idle Demand)

The snow melting system is disabled when a voltage between 24 and 230 V (ac) is applied across the *Melt / Idle Demand* terminals (19 and 20). An external idle demand must be present for at least 4 seconds in order to stop the snow melting system.

Note: This operation only occurs if the Idle Demand / Melt Demand DIP switch is set to the *Idle Demand* position.

If the snow melting system is placed into Idling mode by an external idle demand, then a manual melting enable signal is applied, the idle demand is overridden until either the running time has expired, a stop signal is given, or the external idle demand is removed and reapplied.



AUTOMATIC MELTING DISABLE (Snow / Ice Sensor 090)

The Snow / Ice Sensor 090 can be used to automatically disable the snow melting system. Once the 090 is dry, the *Water* pointer turns off in the LCD. The zone 1 slab temperature has to be at least the zone 1 slab target temperature for a minimum of thirty minutes in order for zone 1 to turn off. If a manual melting disable signal is applied and the 090 is dry, the snow melting system turns off immediately.

Section E: Melting Operation

Section E1 General Melting Operation

Section E1: General Melting Operation

The Snow Detector and Melting Control 664 provides up to two zones of snow melting. In order for the snow melting system to be started, one of the methods described in Section D1 must be used. Once a melting enable signal is applied and the zone(s) is not in WWSD or the system is not in CWCO, the Melting mode begins. When the control is in the Melting mode, the *Melting* pointer is visible in the VIEW menu. The *MELT 1* and the *MELT 2* settings in the ADJUST menu sets the slab surface temperatures of zone 1 and zone 2 respectively. When the zone(s) is melting and its slab temperature is warming up to its slab target temperature, STRT is displayed in the STATUS item of the appropriate zone while in the VIEW menu. The zone(s) finishes melting when its slab temperature has been at least its slab target temperature for a period of time. This period of time is based on whether an automatic or manual melting enable signal starts the snow melting system.

If an automatic melting enable signal starts the snow melting system, DET is displayed in the STATUS item of the appropriate zone while in the VIEW menu once the slab temperature of the currently operating zone(s) reaches its slab target temperature. The currently operating zone(s) continues to melt either until the 090 becomes dry, or any additional running time has expired. Once the Melting mode is complete, the zone(s) operates in the Idling mode.

If a manual melting enable signal starts the snow melting system, the running time is displayed in the STATUS item of the appropriate zone while in the VIEW menu and begins counting down once the slab temperature of the currently operating zone(s) reaches its slab target temperature. The currently operating zone(s) continues to melt until the running time counts down to 0:00. Once the Melting mode is complete, the zone(s) operates in the Idling mode. The table on page 14 describes how the control responds to enable and disable signals.

ZONE 1 and 2 (ZONE)

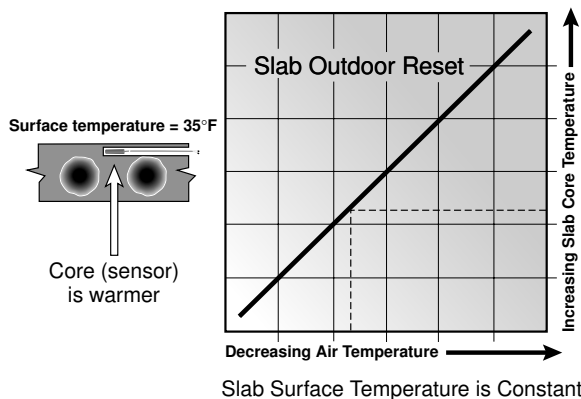
The *Zone 1* and *2* setting may be selected to AUTO or OFF. When AUTO is selected, the zone is activated and the control operates the appropriate zone. When OFF is selected, the control does not operate the zone.

SLAB TEMPERATURE CONTROL

The 664 uses a sensor in zone 1 and zone 2 to provide slab temperature control. Zone 1 has the option to use either the Snow / Ice Sensor 090 or the Slab Sensor. Zone 2 can only use the Slab Sensor.

Slab Sensor

If a Slab Sensor is used, the control assumes that the sensor is approximately 1 inch below the surface of the snow melting slab. Since this point is closer to the source of the heat, this point is warmer than the surface of the slab. Therefore, the sensor must be maintained at a higher temperature in order to ensure that the surface of the slab is maintained at the correct temperature. The amount of temperature difference between the surface of the slab and the slab sensor changes with the outdoor temperature. Therefore, the slab core temperature is increased as the outdoor air temperature drops. The temperature displayed as the slab temperature (SLAB 1 and / or SLAB 2) is the temperature of the slab sensor.



Snow / Ice Sensor 090

The temperature displayed as the slab temperature (SLAB 1) is the slab temperature of zone 1. This temperature is calculated from the edge sensor and the center sensor built into the 090.

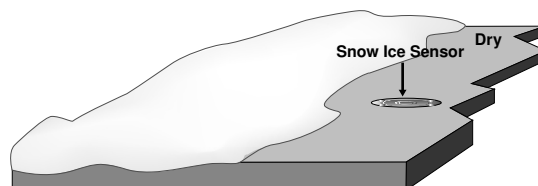
SLAB TARGET TEMPERATURE (SLB TRG)

The SLB1 TRG and the SLB2 TRG temperatures are determined from the *Melting* settings (MELT 1 and MELT 2 respectively), or *Idle* settings (IDLE 1 and IDLE 2 respectively) and the outdoor air temperature. The control displays the temperature(s) that it is currently trying to maintain at the slab sensors of zone 1 and zone 2. If the control does not presently have a requirement for heat, it displays “— —” in the STATUS item of the appropriate zone while in the VIEW menu.

ADDITIONAL MELTING TIME (ADD MELT)

In cases where areas of the snow melting system haven't completely melted after the Melting mode has finished and the 090 is dry, the 664 has a function in which additional time can be added to melt the zone(s). This is an adjustable time through the ADD MELT item in the ADJUST menu of the control. The ADD MELT time is calculated into a running time and is displayed in the STATUS item of the appropriate zone while in the VIEW menu. Once the 090 becomes dry and the currently operating zone(s) slab temperature is at least its slab target temperature, the running time starts counting down.

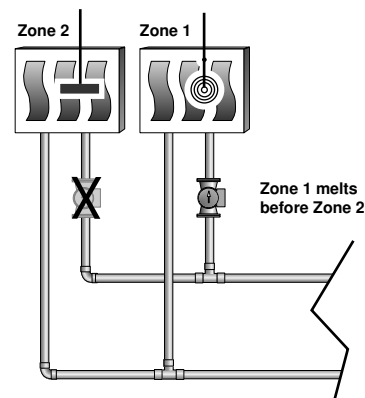
Note: This function is only available if the Snow / Ice Sensor 090 is used in zone 1.



PRIORITY OPERATION

In a multiple zone system where the zones have different heat requirements, or the total combined heat requirement of the snow melting system exceeds that of the heat source, the 664 has a function which can provide priority of zone 1 over zone 2. The 664 allows for full priority, conditional priority or no priority. This is a selectable item through the PRIORITY item in the ADJUST menu.

Note: If either *Full Priority* or *Conditional Priority* is selected, there is the potential for the non-priority zone to freeze over.



Full Priority (PRIORITY = FULL)

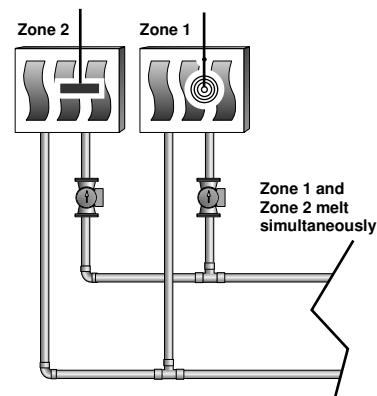
It can be selected that zone 1 has full priority over zone 2. Zone 1 begins melting first when the Melting mode is initiated. While zone 1 is melting, the control keeps track of how long zone 1 operates at its melting temperature. Once zone 1 finishes melting, the control turns off zone 1 and starts melting zone 2. Zone 2 then operates at its melting temperature for the same amount of melting time as zone 1. If at any time while zone 2 is melting and the system is restarted either manually or automatically, the control turns off zone 2 and begins melting zone 1. If the slab temperature of zone 2 is warm enough when the system is restarted, the control provides any extra heat to zone 2 that zone 1 is not using. If the slab temperature of zone 2 is not warm enough when the system is restarted, the control only provides heat to zone 1. Zone 2 then only receives heat when zone 1 finishes melting.

Conditional Priority (PRIORITY = COND)

It can be selected that zone 1 has conditional priority over zone 2. Zone 1 begins melting first when the Melting mode is initiated. While zone 1 is melting and up to temperature, the control provides any extra heat to zone 2 that zone 1 is not using. While zone 1 is melting, the control keeps track of how long zone 1 operates at its melting temperature. Once zone 1 finishes melting, the control turns off zone 1 and provides all available heat to zone 2. Zone 2 then operates at its melting temperature for the same amount of melting time as zone 1. If at any time while zone 2 is melting and the system is restarted either automatically or manually, the control turns off zone 2 and begins melting zone 1 again. The control then operates zone 1 and zone 2 as described above.

NON-PRIORITY OPERATION (PRIORITY = NONE)

If the PRIORITY item is set to *NONE*, zone 1 and zone 2 begin melting simultaneously when the Melting mode is initiated. The 664 operates based on the mixing fluid temperature requirement of each zone. The mixing target temperature is calculated for the zone with the highest heat requirement, and that zone output runs continuously. The zone output with the lower heat requirement is cycled using Pulse Width Modulation (PWM) with a 20 minute cycle length.



Section F: Idling Operation

Section F1 General Idling Operation

Section F2 Temporary Idle

Section F1: General Idling Operation

When the snow melting system starts from a cold temperature, the time required for the zone(s) to reach its melting temperature may be excessive. To decrease this start up time, the 664 has an idling feature which can maintain the zone(s) at a lower temperature. This feature is also useful for preventing frost and light ice formation. The *IDLE 1* and the *IDLE 2* settings in the ADJUST menu sets the slab surface temperatures of zone 1 and zone 2 respectively while the control is in the Idling mode. When in the Idling mode, *IDLE 1* and / or *IDLE 2* is displayed in the STATUS item of the appropriate zone while in the VIEW menu. If idling is not desirable, the *IDLE 1* and / or *IDLE 2* settings may be set to *OFF*.

IDLING WITHOUT PRIORITY

If the *PRIORITY* item is set to *NONE*, both zone 1 and zone 2 can utilize the idling feature.

IDLING WITH PRIORITY

If the *PRIORITY* item is set to *COND* or *FULL*, only zone 1 can utilize the idling feature. Therefore, the *IDLE 2* item in the ADJUST menu is not available.

Section F2: Temporary Idle (TMPY IDL)

The temporary idle allows the control to enter the idle state for a set amount of time. If the snow ice detector does not detect snow during the temporary idle period, the control then leaves the idle state and returns to the *OFF* state. This is useful in applications where there is the possibility of snow and the slab can be pre-heated in order to have a short heat up time if snow is detected.

To enable a temporary idle, the *Temporary Idle* setting in the ADJUST menu must be set from *OFF* to the length of the temporary idle. The DIP Switch must be set to *IDLE DEMAND* and the *IDLE 1* or *IDLE 2* settings must be set to a temperature. To activate a temporary idle, a voltage between 24 and 240 V (ac) must be applied across the *Melt/Idle Demand* terminals for at least 4 seconds.

When a *Temporary Idle time* is selected, the control has three available states: *OFF*, *Temporary Idle*, and *Melting*. The table below describes the action of the control:

Control State	Action	Result
OFF	External Idle Demand	Temporary Idle
OFF	Manual or Auto Melt Start	Melting
Melting	External Idle Demand	Melting
Melting	Manual or Auto Melt Start	Melting
Melting	Manual or Auto Melt Stop	OFF
Temporary Idle	Temporary Idle Expires	OFF
Temporary Idle	Manual or Auto Melt Start	Melting
Temporary Idle	Manual Melt Stop	OFF

Installation

CAUTION

Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury. It is your responsibility to ensure that this control is safely installed to all applicable codes and standards. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit. Do not open the control. Refer to qualified personnel for servicing. Opening voids warranty and can result in damage to the equipment and possibly even personal injury.

STEP ONE — GETTING READY

Check the contents of this package. If any of the contents listed are missing or damaged, please contact your wholesaler or tekmar sales representative for assistance.

Type 664 includes: One Snow Detector and Melting Control 664, One Outdoor Sensor 070, Three Universal Sensors 071, Data Brochures D 664, D 070, D 001, User Brochure U 664, Application Brochure A 664, Essay E 021.

Note: Carefully read the details of the Sequence of Operation to ensure that you have chosen the proper control for your application.

STEP TWO — MOUNTING THE BASE

Remove the control from its base by pressing down on the release clip in the wiring chamber and sliding the control away from it. The base is then mounted in accordance with the instructions in the Data Brochure D 001.

STEP THREE — ROUGH-IN WIRING

All electrical wiring terminates in the control base wiring chamber. The base has standard 7/8" (22 mm) knockouts which accept common wiring hardware and conduit fittings. Before removing the knockouts, check the wiring diagram and select those sections of the chamber with common voltages. Do not allow the wiring to cross between sections as the wires will interfere with safety dividers which should be installed at a later time.

- Power must not be applied to any of the wires during the rough-in wiring stage.
- All wires are to be stripped to a length of 3/8" (9mm) to ensure proper connection to the control.
- Install the Outdoor Sensor 070, Boiler Sensor 071 and Mixing Sensor(s) 071 according to the installation instructions in the Data Brochure D 070 and run the wiring back to the control.
- Install the Snow / Ice Sensor 090 according to the installation instructions in the Data Brochure D 090 and run the wiring back to the control. See Data Brochure D 090 for very important details on sensor location and installation.
- If a Slab Sensor is used, install the slab sensor according to the installation instructions in the Data Brochure D 079 and run the wiring back to the control. See page 12 for very important details on sensor location and installation.
- If a Remote Display Module (RDM) 040 is used, install the RDM according to the installation instructions in the Data Brochure D 040 and run the wiring back to the control.
- If a Remote Start / Stop Module 039 is used, install the module according to the installation instructions in the Data Brochure D 039 and run the wiring back to the control.
- Run wire from other system components (pumps, boiler, etc.) to the control.
- Run wires from the 115 V (ac) power to the control. Use a clean power source with a minimum 15 A circuit to ensure proper operation. Multi-strand 16 AWG wire is recommended for all 115 V (ac) wiring due to its superior flexibility and ease of installation into the terminals.

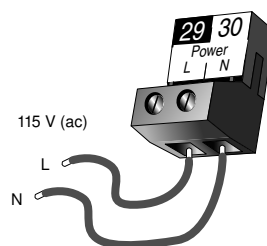
STEP FOUR — ELECTRICAL CONNECTIONS TO THE CONTROL

The installer should test to confirm that no voltage is present at any of the wires. Push the control into the base and slide it down until it snaps firmly into place.

Powered Input Connections

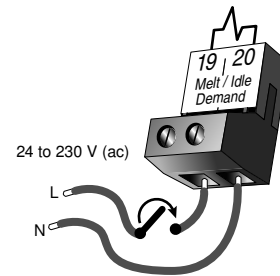
115 V (ac) Power

Connect the 115 V (ac) power supply to the *Power L* and *Power N* terminals (29 and 30). This connection provides power to the microprocessor and display of the control. As well, this connection provides power to the *Sys P1* terminal (28) from the *Power L* terminal (29).



Melt / Idle Demand

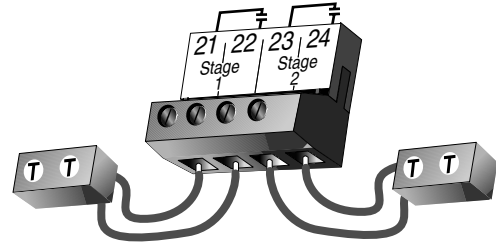
To generate a melt demand or idle demand, a voltage between 24 V (ac) and 230 V (ac) must be applied across the *Melt / Idle Demand* terminals (19 and 20).



! Output Connections

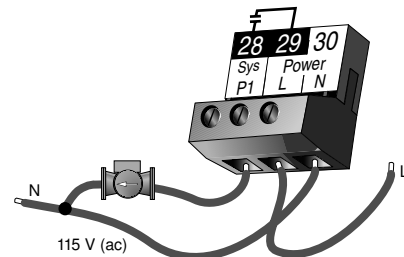
Boiler Contacts

The *Stage 1* and *Stage 2* terminals (21, 22 and 23, 24) are isolated outputs in the 664. There is no power available on these terminals from the control. These terminals are used as a switch to either make or break the boiler circuit. When the 664 requires the boiler(s) to fire, it closes the contact between terminals 21 and 22 and / or 23 and 24.



System Pump Contact (Sys P1)

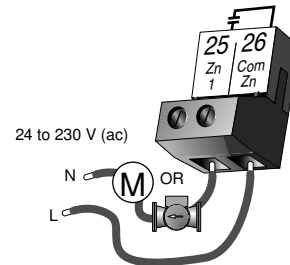
The *Sys P1* output terminal (28) on the 664 is a powered output. When the relay in the 664 closes, 115 V (ac) is provided to the *Sys P1* terminal (28) from the *Power L* terminal (29). To operate the system pump, connect one side of the system pump circuit to terminal 28 and the second side of the pump circuit to the neutral (N) side of the 115 V (ac) power supply.



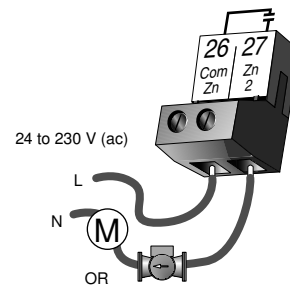
Zone Pumps and Zone Valves

The zoning outputs are isolated terminals in the 664. There is no power available on these terminals from the control.

If zone 1 is used, connect the zone pump or zone valve circuit to the *Com Zn* and *Zn 1* terminals (26 and 25).



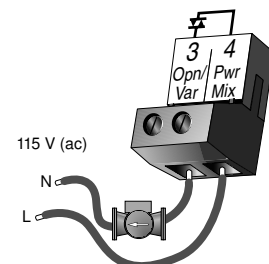
If zone 2 is used, connect the zone pump or zone valve circuit to the *Com Zn* and *Zn 2* terminals (26 and 27).



Variable Speed Injection Pump

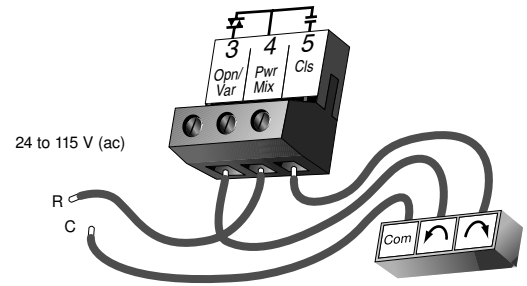
The 664 can vary the speed of a permanent capacitor, impedance protected or equivalent pump motor that has a locked rotor current of less than 2.4 A. Most small wet rotor circulators are suitable as described in Essay E 021. The 664 has an internal overload fuse which is rated at 2.5 A 250 V (ac). Contact your tekmar sales representative for details on the repair procedures if the fuse is blown.

If a variable speed injection pump is used, connect one of the wires from the variable speed injection pump to the *Opn / Var* terminal (3) on the 664. Connect the *Pwr Mix* terminal (4) to the live (L) side of the 115 V (ac) power source. The other wire on the variable speed injection pump must be connected to the neutral (N) side of the 115 V (ac) power supply.



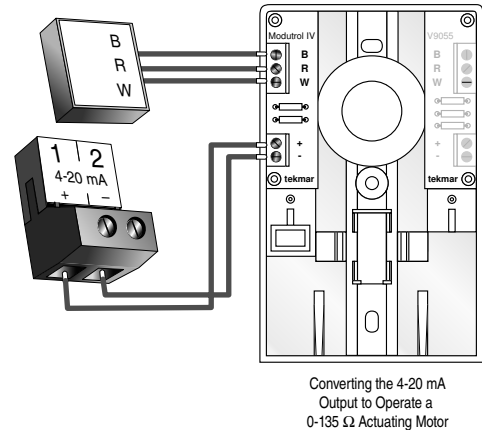
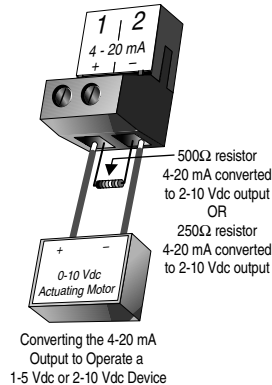
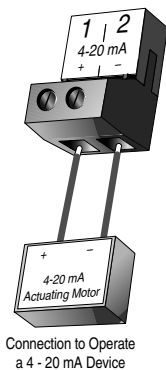
Mixing Valve Actuator

If a mixing valve is used, connect one side of the 24 V (ac) power to the *Pwr Mix* terminal (4) on the control. The output relay *Opn / Var* (3) is then connected to the open terminal of the actuating motor and the output relay *Cls* (5) is connected to the close terminal of the actuating motor. Connect the second side of the 24 V (ac) circuit to the common terminal of the actuating motor.



4-20 mA Device

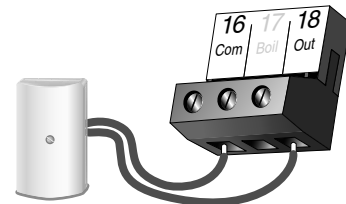
If a 4-20 mA device is used, connect the positive 4-20 mA lead to the 4-20 mA + terminal (1) and the negative 4-20 mA lead to the 4-20 mA - terminal (2). Maximum resistance allowed in the 4-20 mA circuit is 1000 Ω . The 4-20 mA output can be converted to either a 2-10 V (dc) or 1-5 V (dc) output by connecting resistor(s). A 0-135 Ω Converter 005 can be used to convert the 4-20 mA signal to 0-135 Ω .



⚠ Sensor and Unpowered Input Connections
Do not apply power to these terminals as this will damage the control.

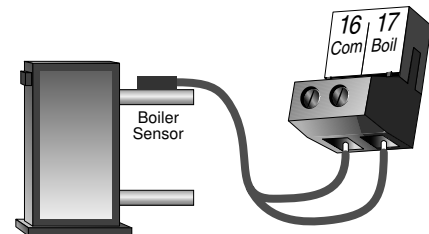
Outdoor Sensor

Connect the two wires from the Outdoor Sensor 070 to the *Com* and *Out* terminals (16 and 18). The outdoor sensor is used by the 664 to measure the outdoor air temperature.



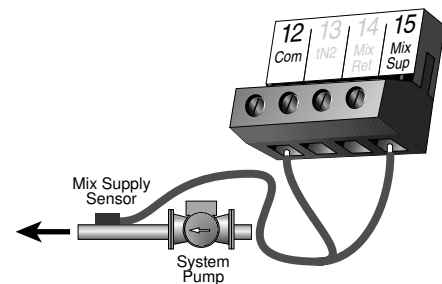
Boiler Sensor

Connect the two wires from the Boiler Sensor 071 to the *Com* and *Boil* terminals (16 and 17). The boiler sensor is used by the 664 to measure the water temperature of the boiler.



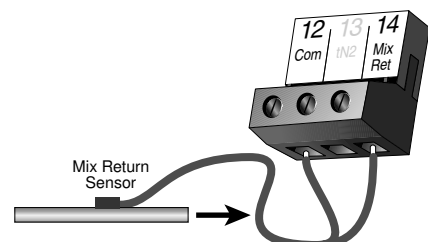
Mixing Supply Sensor

Connect the two wires from the Mixing Supply Sensor 071 to the *Com* and *Mix Sup* terminals (12 and 15). The mixing supply sensor is used by the 664 to measure the fluid supply temperature after the mixing device. Normally the sensor is attached downstream of the mixing pump.



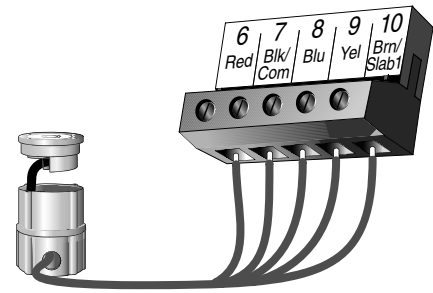
Mixing Return Sensor

Connect the two wires from the Mixing Return Sensor 071 to the *Com* and *Mix Ret* terminals (12 and 14). The mixing return sensor is used by the 664 to measure the fluid return temperature from the snow melting slab.



EITHER: Snow / Ice Sensor 090 (Zone 1)

If a Snow / Ice Sensor 090 is used, connect the red wire from the sensor cable to the *Red* terminal (6), connect the black wire from the sensor cable to the *Blk / Com* terminal (7), connect the blue wire from the sensor cable to the *Blu* terminal (8), connect the yellow wire from the sensor cable to the *Yel* terminal (9) and connect the brown wire from the sensor cable to the *Brn / Slab1* terminal (10). The snow / ice sensor is used by the 664 to measure the slab surface temperature of zone 1. This sensor must be installed flush with the slab surface and 1/2 way between the heating pipes. See Data Brochure D 090 for installation instructions regarding the Snow / Ice Sensor 090 and Sensor Socket 091.

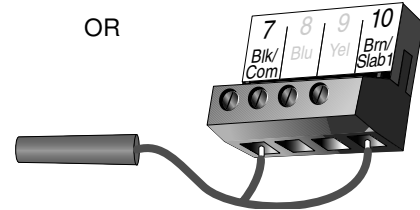


OR: Slab Sensor (Zone 1)

If a Snow / Ice Sensor 090 is not used for zone 1, a slab sensor can be used. If a slab sensor is used, connect the two wires from the slab sensor to the *Blk / Com* and *Brn / SLAB 1* terminals (7 and 10). The slab sensor is used by the 664 to measure the slab temperature of zone 1.

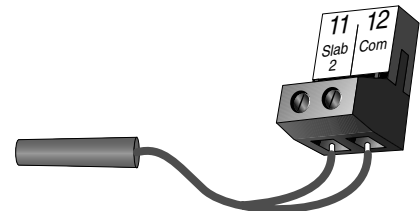
Note: Proper sensor placement is critical for correct operation of the 664 control. The slab sensor must be installed 1/2 way between the heating pipes and 1" (25 mm) below the surface of the slab. Although the sensor can be installed directly into the slab, we recommend that the sensor be installed in tubing or conduit in such a manner that the sensor can be removed and replaced in case of failure.

OR



Slab Sensor (Zone 2)

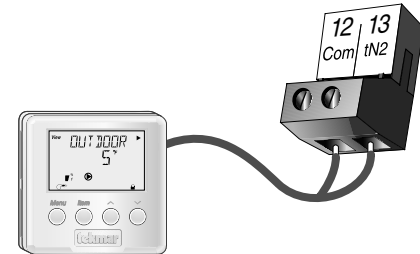
If a slab sensor is used, connect the two wires from the slab sensor to the *Slab 2* and *Com* terminals (11 and 12). The slab sensor is used by the 664 to measure the slab temperature of zone 2.



tekmar Net™ (tN2) Device

A Remote Display Module (RDM) 040 or Remote Start / Stop Module 039 can be connected to the tekmar Net™ (tN2) input. Connect the *Com* terminal from the appropriate tN2 device to the *Com* terminal (12) on the 664. Connect the *tN2* terminal from the appropriate tN2 device to the *tN2* terminal (13) on the 664.

Note: The wires from the RDM and Remote Start / Stop Module are polarity sensitive. The tN2 device does not operate correctly if the wires are reversed.



STEP FIVE — TESTING THE WIRING

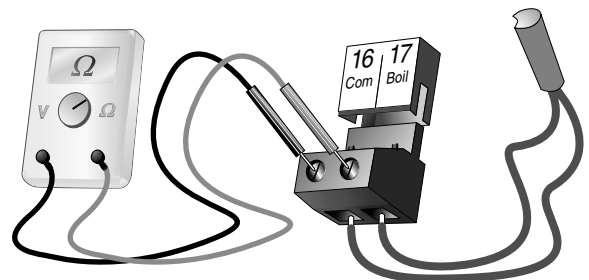
Each terminal block must be unplugged from its header on the control before power is applied for testing. To remove the terminal block, pull straight down from the control.

The following tests are to be performed using standard testing practices and procedures and should only be carried out by properly trained and experienced persons.

A good quality electrical test meter, capable of reading from at least 0 – 300 V (ac) and at least 0 – 2,000,000 Ω , is essential to properly test the wiring and sensors.

⚠ Test The Sensors

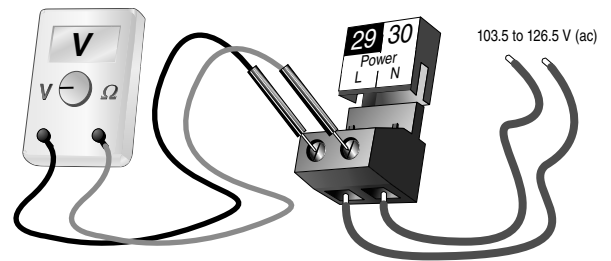
In order to test the sensors, the actual temperature at each sensor location must be measured. A good quality digital thermometer with a surface temperature probe is recommended for ease of use and accuracy. Where a digital thermometer is not available, a spare sensor can be strapped alongside the one to be tested and the readings compared. Test the sensors according to the instructions in the Data Brochure D 070.





Test The Power Supply

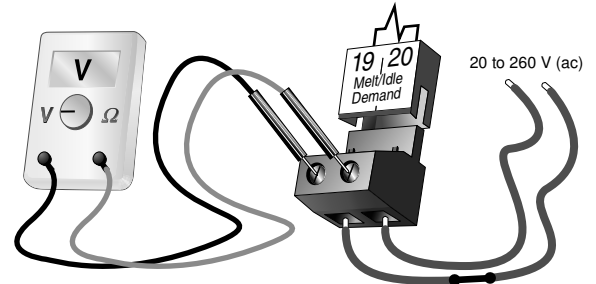
Make sure exposed wires and bare terminals are not in contact with other wires or grounded surfaces. Turn on the power and measure the voltage between the *Power L* and *Power N* terminals (29 and 30) using an AC voltmeter, the reading should be between 103.5 and 126.5 V (ac).



Test The Powered Inputs

Melt / Idle Demand

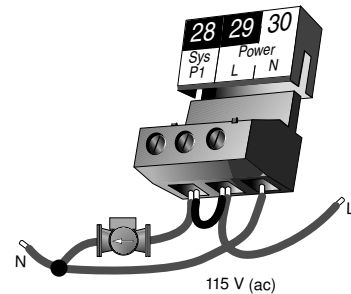
If a melt / idle demand is used, measure the voltage between the *Melt / Idle Demand* terminals (19 and 20). When the melting or idling device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the melting or idling device is off, you should measure less than 5 V (ac).



Test The Outputs

System Pump (Sys P1)

If a system pump is connected to the *Sys P1* terminal (28), make sure that power to the terminal block is off and install a jumper between the *Sys P1* and *Power L* terminals (28 and 29). When power is applied to the *Power L* and *Power N* terminals (29 and 30), the system pump should start. If the pump does not turn on, check the wiring between the terminal block and pump and refer to any installation or troubleshooting information supplied with the pump. If the pump operates properly, disconnect the power and remove the jumper.



Zone Pump or Zone Valve

If a zone pump or zone valve is connected to the *Com Zn* and *Zn 1* terminals (26 and 25), make sure power to the pump or valve circuit is off and install a jumper between the *Com Zn* and *Zn 1* terminals (26 and 25). When the circuit is powered up, the zone pump should turn on or the valve should open completely. If no response occurs, check the wiring between the terminal and the pump or valve and refer to any installation or troubleshooting information supplied with these devices. If a zone pump or zone valve is connected to the *Com Zn* and *Zn 2* terminals (26 and 27), follow a similar procedure as described for the zone 1 relay.

Stage 1 and 2

If the boiler circuit is connected to the *Stage 1* terminals (21 and 22) and / or *Stage 2* terminals (23 and 24), make sure power to the boiler circuit is off, and install a jumper between the terminals. When the boiler circuit is powered up, the boiler should fire. If the boiler does not turn on, refer to any installation or troubleshooting information supplied with the boiler. (The boiler may have a flow switch that prevents firing until the boiler pump is running). If the boiler operates properly, disconnect the power and remove the jumper.

Variable Speed Injection Pump

If a variable speed injection pump circuit is connected to the *Pwr Mix* and *Opn / Var* terminals (4 and 3), make sure the power to the terminal block is off and install a jumper between the *Pwr Mix* and *Opn / Var* terminals (4 and 3). When the variable speed pump circuit is powered up, the variable speed pump should operate at full speed. If the pump does not operate, check the wiring between the terminal block and the pump and refer to any installation or troubleshooting information supplied with the pump. If the pump operates properly, disconnect the power and remove the jumper.

Mixing Valve Actuator

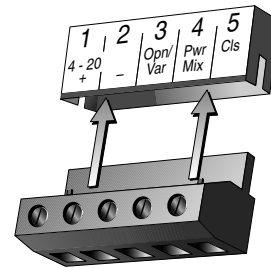
If a floating action actuating motor circuit is connected to the *Pwr Mix*, *Opn / Var* and *Cls* terminals (4, 3 and 5), make sure power to the motor circuit is off and install a jumper between the *Pwr Mix* and *Opn / Var* terminals (4 and 3). When the circuit is powered up, the actuator should move in the opening direction. If it does not, check the wiring between the terminals and the actuating motor. Refer to any installation or troubleshooting information supplied with the motor. If the motor closes instead of opening, the wiring of the actuating motor must be reversed. If the valve opens correctly, turn off the power to the circuit and remove the jumper. Install a jumper between the *Pwr Mix* and *Cls* terminals (4 and 5). When the circuit is powered up, the actuator should move in the closing direction. If it does not, check the wiring between the terminals and the actuating motor. Refer to any installation or troubleshooting information supplied with the motor. If the motor closes correctly, turn off the power to the circuit and remove the jumper.

4–20 mA Device

The 4–20 mA output terminals (1 and 2) can not be tested without power applied to the control. Since no power is supplied to the control at this point, the 4–20 mA output cannot be tested. Please refer to the operation test below.

⚠ **Connecting The Control**

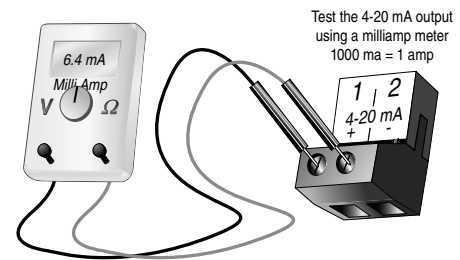
Make sure all power to the devices and terminal blocks is off, and remove any remaining jumpers from the terminals. Reconnect the terminal blocks to the control by carefully aligning them with their respective headers on the control, and then pushing the terminal blocks into the headers. The terminal blocks should snap firmly into place. Install the supplied safety dividers between the unpowered sensor inputs and the powered wiring chambers. Apply power to the control. The operation of the control on power up is described in the Sequence of Operation section of the brochure.



⚠ **Test the 4-20 mA Output**

If a 4-20 mA device is used, connect an ammeter to the 4-20 mA output terminals (1 and 2) and observe the current reading during operation. When the 4-20 mA modulation increases, the initial percentage output is zero and the meter should read 4 mA. As the % Output increases, the meter reading should increase until 100% Output is reached at which point the meter should read 20 mA. When the 4-20 mA modulation decreases, the meter should start at 20 mA and eventually reach 4 mA when the display shows 0% Output.

Note: The 4-20 mA output can only be tested if 4-20 is selected in the Mixing item of the ADJUST menu.



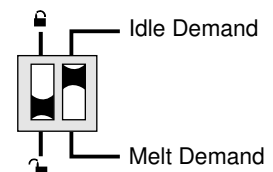
Cleaning

The control's exterior can be cleaned using a damp cloth. Moisten cloth with water and wring out prior to wiping control. Do not use solvents or cleaning solutions.

DIP Switch Settings

The DIP switch settings on the control are very important and should be set to the appropriate settings prior to making an adjustments to the control through the User Interface. The DIP switch settings change the items that are available to be viewed and / or adjusted in the User Interface.

If a DIP switch is changed while the control is powered up, the control responds to the change in setting by returning the display to the VIEW menu. This is true for all the DIP switches except for the Lock / Unlock DIP switch.



LOCK / UNLOCK (FACTORY SETTING IS UNLOCK)

The Lock / Unlock DIP switch is used to lock and unlock the access level of the control and tekmar Net™ tN2 device. Once locked, access levels can not be changed. To determine if the control is currently locked or unlocked, a small segment representing a padlock is viewed in the bottom right hand corner of the display. When the padlock is closed, the access level cannot be changed.

To change the access level, set the DIP switch to the unlocked, or down position. The current access level of the control or tekmar Net™ tN2 device is viewed in its Miscellaneous (*Misc*) menu. While viewing the access level, use the ▲ and ▼ keys to select between the Limited (LTD), User (USER), Installer (INST) or Advanced (ADV) access levels.

To lock the access level, select the appropriate access level in the Miscellaneous (*Misc*) and move the DIP switch from the unlocked position to the locked position. As long as the DIP switch is in the locked position, the access level of the control or tekmar Net™ tN2 device can no longer be viewed or adjusted in its Miscellaneous (*Misc*) menu.

IDLE DEMAND / MELT DEMAND (FACTORY SETTING IS MELT DEMAND)

The Idle Demand / Melt Demand DIP switch is used for melting and idling operation. The position of the DIP switch determines what the *Melt / Idle Demand* terminals (19 and 20) are used for. When the DIP switch is set to the *Melt Demand* position, the *Melt / Idle Demand* terminals (19 and 20) are used to place the snow melting system into Melting mode. When the DIP switch is set to the *Idle Demand* position, the *Melt / Idle Demand* terminals (19 and 20) are used to force the snow melting system into Idling mode.

Access Levels

The tekmar Snow Detector and Melting Control 664 comes with four *Access Level* settings. These Access Levels restrict the number of Menus, Items and Adjustments that can be accessed by the user. The four access levels are Limited (LTD), User (USER), Installer (INST) and Advanced (ADV).

The access level of the control is found in the Miscellaneous (*Misc*) menu when the Lock / Unlock DIP switch is set to the *Unlocked* position. In the Advanced access level, all of the control settings are available to the user. In the User access level, only a few of the menus and items are available. The Limited access level is the most restricted of them all. The control's factory setting is *Installer* (INST). This access level is sufficient for the normal set up of the control. Once the control is set up, the appropriate access level should be selected for the people that deal with the control on a regular basis.



Item Field	Section	Access Level				Description	Range
		LTD	USER	INST	ADV		
OUT DOOR		•	•	•	•	Outdoor Current outdoor air temperature as measured by the outdoor sensor.	-67 to 149°F (-55 to 65°C)
SLAB 1 TRG	E1		•	•		Slab 1 Target Slab sensor target temperature of zone 1. ZONE 1 = AUTO	---, -58 to 167°F (---, -50 to 75°C)
SLAB 1	E1	•	•	•		Slab 1 Current slab sensor temperature of zone 1. ZONE 1 = AUTO	-58 to 167°F (-50 to 75°C)
STATUS 1	B1	•	•	•	•	Status 1 Operating status of Zone 1.	STRT, STOP, IDLE, EXT, 0:00 to 23:59 hr, ---, INF, WWSD, CWCO, DET, IDLE
SLAB 2 TRG	E1		•	•		Slab 2 Target Slab sensor target temperature of zone 2. ZONE 2 = AUTO	---, -58 to 167°F (---, -50 to 75°C)
SLAB 2	E1	•	•	•		Slab 2 Current slab sensor temperature of zone 2. ZONE 2 = AUTO	-58 to 167°F (-50 to 75°C)
STATUS 2	B1	•	•	•	•	Status 2 Operating status of zone 2.	STRT, STOP, IDLE, EXT, 0:00 to 23:59 hr, ---, INF, WWSD, CWCO, DET, IDLE
MIX TRG	A			•		Mix Target The current mix target temperature as calculated by the control.	---, -25 to 248°F (---, -32 to 120°C)
MIX SUP	B1	•	•	•		Mix Supply Current mixed supply water temperature as measured by the mixing supply sensor.	-31 to 266°F (-35 to 130°C)
MIX RET	B1	•	•	•		Mix Return Current mixed return water temperature as measured by the mixing return sensor. Mix Ret Sensor present	-31 to 266°F (-35 to 130°C)
ΔT	B1		•	•		ΔT Current mixed ΔT difference between the mixed supply sensor and the mixed return sensor. ΔT MAX \neq OFF	-85 to 170°F (-47 to 94°C)

664 View Menu (2 of 2)

Item Field	Access Level					Description	Range
	Section	LTD	USER	INST	ADV		
Boil SUP	A C1	•	•	•		Boil Supply Current boiler supply water temperature as measured by the boiler sensor. Boil SENS = SUP	-31 to 266°F (-35 to 130°C)
Boil RET	A C2	•	•	•		Boil Return Current boiler return water temperature as measured by the boiler sensor. Boil SENS = RET	-31 to 266°F (-35 to 130°C)

664 Adjust Menu (1 of 3)

Item Field	Access Level					Description	Range	Actual Setting
	Section	LTD	USER	INST	ADV			
RUN TIME	B1	•	•	•	•	Run Time The time for which a zone is operated once it has reached its melting temperature. This item cannot be viewed if a Remote Start / Stop Module 039 has been connected.	0:30 to 17:00 hr, INF (Infinity) Default = 4:00 hr	
ADD MELT	E1			•		Add Melt The additional time for which a zone is operated once the Snow / Ice Sensor 090 becomes dry. 090 is present	0:00 to 6:00 hr Default = 0:30 hr	
SENSITVITY	D1	•	•	•		Sensitivity Sensitivity of water detection of the Snow / Ice Sensor 090. 090 is present	AUTO, 20 to 80% Default = AUTO	
ZONE 1	E1		•	•		Zone 1 Selects zone 1 as operational or not.	OFF, AUTO Default = AUTO	
MELT 1	E1	•	•	•		Melt 1 The desired slab surface temperature of zone 1 while in the Melting mode. Zone 1 = AUTO	32 to 95°F (0 to 35°C) Default = 36°F (2°C)	
IDLE 1	F1		•	•		Idle 1 The desired slab surface temperature of zone 1 while in the Idling mode. Zone 1 = AUTO	OFF, 20 to 95°F (OFF, -7 to 35°C) Default = OFF	
ZONE 2	E1		•	•		Zone 2 Selects zone 2 as operational or not.	OFF, AUTO Default = OFF	

Item Field	Access Level					Description	Range	Actual Setting
	Section	LTD	USER	INST	ADV			
MELT 2	E1	●	●	●		Melt 2 The desired slab surface temperature of zone 2 while in the Melting mode. Zone 2 = AUTO	32 to 95°F (0 to 35°C) Default = 36°F (2°C)	
IDLE 2	F1		●	●		Idle 2 The desired slab surface temperature of zone 2 while in the Idling Mode. Zone 2 = AUTO, PRIORITY = NONE	OFF, 20 to 95°F (OFF, -7 to 35°C) Default = OFF	
TMPLY IDL				●		Temporary Idle Time for which the temporary idle is active.	OFF, 0:30 to 40:00 hr Default = OFF	
WWSD	B		●	●		WWSD Warm Weather Shut Down. Slab must exceed 34°F to enter WWSD.	AUTO, 32 to 95°F (AUTO, 0 to 36°C) Default = AUTO	
CWCO	B1		●	●		CWCO The Cold Weather Cut Out temperature for the snow melting system.	OFF, -30 to 50°F (OFF, -34 to 10°C) Default = 10°F (-12°C)	
PRIORITY	E1		●	●		Priority Selects priority of zone 1 over zone 2. ΔT MAX = OFF	NONE, COND, FULL Default = COND	
PRIORITY	E1		●	●		Priority Selects priority of zone 1 over zone 2. ΔT MAX ≠ OFF	COND, FULL Default = COND	
MIX MAX	A		●	●		Mix Maximum The maximum supply water temperature for the mixing system.	80 to 210°F, OFF (27 to 99°C, OFF) Default = 150°F (66°C)	
MIXING	A		●	●		Mixing The type of mixing device that is to be used.	FLOT (Floating), VAR (Variable Speed), 4 – 20 (4-20 mA) Default = VAR	
MOTR SPD	A		●	●		Motor Speed The time the actuating motor requires to operate from fully closed to fully open. MIXING = FLOT or MIXING = 4 – 20	30 to 230 seconds Default = 150 sec	
Boil SENS	C		●	●		Boiler Sensor The location of the boiler sensor. This affects operation of the <i>Boiler</i> contact.	SUP, RET, NONE Default = SUP	

Item Field	Access Level					Description	Range	Actual Setting
	Section	LTD	USER	INST	ADV			
ΔT MAX	B1		●	●		ΔT Maximum The maximum ΔT for the snow melting system. PRIORITY \neq NONE	10 to 70°F, OFF (5 to 39°C, OFF) Default = OFF	
DIFF	C1			●		Differential The differential for the snow melting system. Boil SENS = SUP	Differential The differential for the snow melting system. Boil SENS = SUP	
Boil MIN	A C1		●	●		Boiler Minimum The minimum temperature allowed for the boiler target temperature. Boil SENS \neq NONE	OFF, 80 to 180°F (OFF, 27 to 82°C) Default = 140° (60°C)	
FIRE DLY	C1		●	●		Fire Delay The time delay the control can expect between the time the <i>Boiler</i> contact closes and the boiler fires. Boil SENS = SUP	0:00 to 3:00 minutes Default = 0:10 min	
Boil MASS	C1		●	●		Boiler Mass The thermal mass characteristics of the boiler(s) that is being used. Boil SENS = SUP	LITE, MED, HEVY Default = MED	
STAGE 1	C1	●	●	●		Stage 1 Selects stage 1 as operational or not. Boil SENS = SUP	AUTO, OFF Default = AUTO	
STAGE 2	C1	●	●	●		Stage 2 Selects Stage 2 as operational or not. Boil SENS = SUP	AUTO, OFF Default = OFF	
ROTATE	C1		●	●		Rotate Sets the rotation time for the stages. This item is used by the Equal Run Time Rotation function. Boil SENS = SUP	10 to 72 hours, OFF Default = 48 hr	
EXERCISE	A			●		Exercise The frequency with which the control exercises the pumps and valves that are operated by the control.	30 to 240 hours, (in 10 hour steps) Default = 70 hr	

664 Monitor Menu (1 of 2)

Note: To clear the recorded information in the specific item field, press and hold ▲ and ▼.

Item Field	Access Level				Description	Range
	LTD	USER	INST	ADV		
OUT HI	•	•	•	•	Outdoor High The highest recorded outdoor air temperature since this item was last cleared.	-85 to 170°F (-65 to 77°C)
OUT LO	•	•	•	•	Outdoor Low The lowest recorded outdoor air temperature since this item was last cleared.	-85 to 170°F (-65 to 77°C)
SLAB1 HI	•	•	•	•	Slab 1 High The highest recorded temperature at the slab sensor of zone 1 since this item was last cleared. Zone 1 = Auto	-85 to 170°F (-65 to 77°C)
SLAB1 LO	•	•	•	•	Slab 1 Low The lowest recorded temperature at the slab sensor of zone 1 since this item was last cleared. Zone 1 = Auto	-85 to 170°F (-65 to 77°C)
SLAB2 HI	•	•	•	•	Slab 2 High The highest recorded temperature at the slab sensor of zone 2 since this item was last cleared. Zone 2 = Auto	-85 to 170°F (-65 to 77°C)
SLAB2 LO	•	•	•	•	Slab 2 Low The lowest recorded temperature at the slab sensor of zone 2 since this item was last cleared. Zone 2 = Auto	-85 to 170°F (-65 to 77°C)
MIX HI	•	•	•	•	Mix High The highest recorded temperature at the mixing supply sensor since this item was last cleared.	-25 to 230°F (-32 to 110°C)
MIX LO	•	•	•	•	Mix Low The lowest recorded temperature at the mixing supply sensor since this item was last cleared.	-25 to 230°F (-32 to 110°C)
ZN1 P/V	•	•	•	•	Zone 1 Pump or Valve The total number of zone 1 pump or valve running hours since this item was last cleared. Zone 1 = Auto	0 to 9999 hr
ZN2 P/V	•	•	•	•	Zone 2 Pump or Valve The total number of zone 2 pump or valve running hours since this item was last cleared. Zone 2 = Auto	0 to 9999 hr
SYS PUMP	•	•	•	•	System Pump The total number of system pump (Sys P1) running hours since this item was last cleared.	0 to 9999 hr

Note: To clear the recorded information in the specific item field, press and hold ▲ and ▼.

Item Field	Access Level				Description	Range
	LTD	USER	INST	ADV		
B1 FIRE			●	●	Boiler 1 Fire The total number of running hours for Stage 1 since this item was last cleared. This total time does not include the Fire Dly time set in the ADJUST menu. Boil SENS = SUP	0 to 9999 hr
B1 CYCLE			●		Boiler 1 Cycle The total number of firing cycles that Stage 1 has had since this item was last cleared. This item can be used in conjunction with the B1 Fire item to determine the average cycle length of Stage 1. If the cycle length is too short, a larger differential will allow for a longer cycle length. Boil SENS = SUP	0 to 9999 hr
B2 FIRE			●	●	Boiler 2 Fire The total number of running hours for Stage 2 since this item was last cleared. This total time does not include the Fire Dly time set in the ADJUST menu Boil SENS = SUP	0 to 9999 hr
B2 CYCLE			●		Boiler 2 Cycle The total number of firing cycles that Stage 2 has had since this item was last cleared. This item can be used in conjunction with the B2 Fire item to determine the average cycle length of Stage 2. Boil SENS = SUP	0 to 9999 hr
Boil HI			●	●	Boiler High The highest temperature recorded at the boiler sensor since this item was last cleared. Boil SENS ≠ NONE	-25 to 230°F (-32 to 110°C)
Boil LO			●	●	Boiler Low The lowest temperature recorded at the boiler sensor since this item was last cleared. Boil SENS ≠ NONE	-25 to 230°F (-32 to 110°C)
NO HEAT			●		No Heat This item is an adjustable warning. If a zone's slab temperature does not reach its slab target temperature within the set time, the control displays a warning message.	1 to 24 hr, OFF Default = OFF
COP			●		Cop The number of times that the microprocessor in the control has reset since this item was last cleared. The control will reset itself if it has experienced some form of interference that has disrupted its operation. This can be used to give an indication of the quality of the electrical environment that the control has been installed in.	0 to 255
NON-COP			●		Non-Cop The number of times that the control has been powered up since this item was last cleared. This number will increase if there is a lowering of the input voltage beyond the control's usable range. This item can be used as an indication of the quality of the power source.	0 to 255
tN2 COMM			●		tN2 Communication The number of times that a communication error has been detected between the control and either an RDM or Remote Start/Stop Module since this item was last cleared. If the wires between the control and the tekmar Net™ tN2 device are run in a noisy electrical environment, this can cause interference in the communication between the control and the tN2 device.	0 to 255

664 **Schd** (Schedule) Menu (1 of 1)

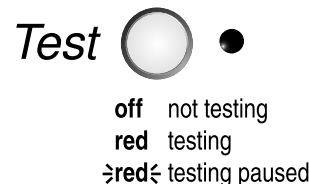
Item Field	Access Level				Description	Range
	LTD	USER	INST	ADV		
OVERRI DE	•	•	•	•	Override The setback override that is in effect for the snow melting system.	NONE, AWAY (Ovr) Default = NONE

664 **Misc** (Miscellaneous) Menu (1 of 1)

Item Field	Access Level				Description	Range
	LTD	USER	INST	ADV		
UNITS	•	•	•	•	Units The units of measure that all of the temperatures are to be displayed in by the control.	°F, °C Default = °F
BACKLITE	•	•	•	•	Backlite The operating mode for the back lighting on the LCD as well as time of keypad inactivity until the control automatically returns to the default display.	OFF, 30 sec, ON Default = ON
ACCESS	•	•	•	•	Access The access level that is to be used by the control. DIP switch = <i>Unlock</i>	ADV, INST, USER, LTD Default = INST

Testing the Control

The Snow Detector and Melting Control 664 has a built-in test routine which is used to test the main control functions. The 664 continually monitors the sensors and displays an error message whenever a fault is found. See the following pages for a list of the 664's error messages and possible causes. When the **Test** button is pressed, the test light is turned on. The individual outputs and relays are tested in the following test sequence.



TEST SEQUENCE

Each step in the test sequence lasts 10 seconds.

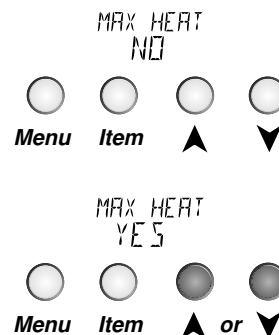
During the test routine, the test sequence is paused by pressing the **Test** button. While paused, the control displays the testing step as well as the word PAUS. If the **Test** button is not pressed again for 5 minutes while the test sequence is paused, the control exits the entire test routine. If the test sequence is paused, the **Test** button can be pressed again to advance to the next step. This can also be used to rapidly advance through the test sequence. To reach the desired step, repeatedly press and release the **Test** button until the appropriate device and segment in the display turn on.

- Step 1 If FLOT is selected in the MIXING item, the mixing valve is run fully open in the time set by the MOTR SPD item. If VAR is selected in the MIXING item, the injection pump is ramped up over 10 seconds. If 4-20 is selected in the MIXING item, the 4-20 mA device is modulated up in the time set by the MOTR SPD item.
- Step 2 If FLOT is selected in the MIXING item, the mixing valve is run fully closed in the time set by the MOTR SPD item. If VAR is selected in the MIXING item, the injection pump is ramped down over 10 seconds. If 4-20 is selected in the MIXING item, the 4-20 mA device is modulated down in the time set by the MOTR SPD item.
- Step 3 If the Zone 1 item is set to *AUTO*, the *Zone 1* contact (Zn 1) is turned on for 10 seconds. After 10 seconds the *Zone 1* contact (Zn 1) is turned off.
- Step 4 If the Zone 2 item is set to *AUTO*, the *Zone 2* contact (Zn 2) is turned on for 10 seconds. After 10 seconds the *Zone 2* contact (Zn 2) is turned off.
- Step 5 The *System Pump* contact (Sys P1) is turned on for 10 seconds.
- Step 6 The *Stage 1* contact is turned on for 10 seconds
- Step 7 If SUP is selected in the Boil SENS item, the *Stage 2* contact is turned on for 10 seconds. After 10 seconds, the Stage 1, Stage 2 and Sys P1 contacts are shut off.

MAX HEAT

The Snow Detector and Melting Control 664 has a function called Max Heat. In this mode, the 664 turns on and operates the system up to the maximum set temperatures, and the mixing device at the set percentage. The control continues to operate in this mode for up to 24 hours or until either the **Item**, **Menu** or **Test** button is pressed. This mode may be used for running all circulators during system start-up in order to purge air from the piping. To enable the Max Heat feature, use the following procedure.

- 1) Press and hold the **Test** button for more than 3 seconds. At this point, the control displays the words MAX HEAT and the word NO.
- 2) Using the ▲ or ▼ buttons, select the word YES. After 3 seconds, the control flashes the word MANUAL and the number 100. This number represents the desired output from the mixing device.
- 3) Set the desired output of the mixing device by using the ▲ and / or ▼ buttons on the control.
- 4) To cancel the Max Heat mode, press either the **Item**, **Menu**, or **Test** button.
- 5) Once the Max Heat mode has either ended or is cancelled, the control resumes normal operation.



Troubleshooting

When troubleshooting any heating system, it is always a good idea to establish a set routine to follow. By following a consistent routine, many hours of potential headaches can be avoided. Below is an example of a sequence that can be used when diagnosing or troubleshooting problems in a hydronic heating system.

Establish the Problem

Establish the problem. Get as much information from the customer as possible about the problem. Is there too much heat, not enough heat, or no heat? Is the problem only in one particular zone or area of the building or does the problem affect the entire system? Is this a consistent problem or only intermittent? How long has the problem existed for? This information is critical in correctly diagnosing the problem.

Understanding the Sequence of Operation

Understand the sequence of operation of the system. If a particular zone is not receiving enough heat, which pumps or valves in the system must operate in order to deliver heat to the affected zone? If the zone is receiving too much heat, which pumps, valves or check valves must operate in order to stop the delivery of heat?

Use the Test Routine

Press the **Test** button on the control and follow the control through the test sequence as described in the Testing section. Pause the control as necessary to ensure that the correct device is operating as it should.

Sketch the Piping in the System

Sketch the piping of the system. This is a relatively simple step that tends to be overlooked, however it can often save hours of time in troubleshooting a system. Note flow directions in the system paying close attention to the location of pumps, check valves, pressure bypass valves and mixing valves. Ensure correct flow direction on all pumps. This is also a very useful step if additional assistance is required.

Document the Control

Document the control for future reference. Before making any adjustments to the control, note down all of the items that the control is currently displaying. This includes items such as error messages, current temperatures and settings, and which devices should be operating as indicated by the LCD. This information is an essential step if additional assistance is required to diagnose the problem.

Isolate the Problem

Isolate the problem between the control and the system. Now that the sequence of operation is known and the system is sketched, is the control operating the proper pumps and valves at the correct times? Is the control receiving the correct signals from the system as to when it should be operating? Are the proper items selected in the menus of the control for the device that is to be operated?

Test the Contacts, Voltages and Sensors

Test the contacts, voltages and sensors. Using a multimeter, ensure that the control is receiving adequate voltage to the power terminals and the demand terminals as noted in the technical data. Use the multimeter to determine if the internal contacts on the control are opening and closing correctly. Follow the instructions in the Testing the Wiring section to simulate closed contacts on the terminal blocks as required. Test the sensors and their wiring as described in the sensor Data Brochures.

Monitor the System

Monitor the system over a period of time. Select the applicable items in the MONITOR menu of the control and reset them to zero. Allow the system and the control to operate over a known period of time and then record the Monitor items. Use this information to help diagnose any remaining problems.

Error Displayed	Description of Error
CTRL ERR EE W	The control was unable to store a piece of information into its EEPROM. This error can be caused by a noisy power source. The control will display the error message and will continue to operate as normal. Pressing either the Menu or Item button will clear this error.
CTRL ERR ADJUS	The control was unable to read a piece of information stored in the ADJUST menu. Because of this, the control was required to load the factory settings into all of the items in the ADJUST menu. The control will stop operation until all of the items available in the ADJUST menu of the control have been checked by the user or installer. Note: Access level must be ADV in order to clear the error.
CTRL ERR MNTR	The control was unable to read a piece of information stored in the MONITOR menu. Because of this, the control was required to load the factory settings into all of the items in the MONITOR menu. The control will continue to display the error message until all of the items available in the MONITOR menu of the control have been checked by the user or installer. Note: Access level must be ADV in order to clear the error.
CTRL ERR SCHD	The control was unable to read a piece of information stored in the SCHEDULE menu. Because of this, the control was required to load the factory settings into all of the items in the SCHEDULE menu. The control will continue to display the error message until all of the items available in the SCHEDULE menu of the control have been checked by the user or installer. Note: Access level must be ADV in order to clear the error.
CTRL ERR MISC	The control was unable to read a piece of information stored in the MISCELLANEOUS menu. Because of this, the control was required to load the factory settings into all of the items in the MISCELLANEOUS menu. The control will continue to display the error message until all of the items available in the MISCELLANEOUS menu of the control have been checked by the user or installer. Note: Access level must be ADV in order to clear the error.
tN2 TYPE	An incorrect device has been connected to the <i>tekmar Net™</i> tN2 input terminal. Once the problem has been corrected, press either the Menu or Item button to clear the error message from the control.
tN2 SHRT	A short circuit has been read between the tN2 terminal and a Com terminal on the control. Either the wires leading to the tN2 device are shorted or the polarity of the wires is reversed. Determine the cause and remove the short. To clear this error, press either the Menu or Item button.
OUTDOOR SHRT	The control is no longer able to read the outdoor sensor due to a short circuit. In this case the control assumes an outdoor temperature of 32°F and continues operation. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
OUTDOOR OPEN	The control is no longer able to read the outdoor sensor due to an open circuit. In this case the control assumes an outdoor temperature of 32°F and continues operation. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
MIX SUP SHRT	The control is no longer able to read the mixing supply sensor due to a short circuit. In this case, the control does not operate the snow melting system. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.

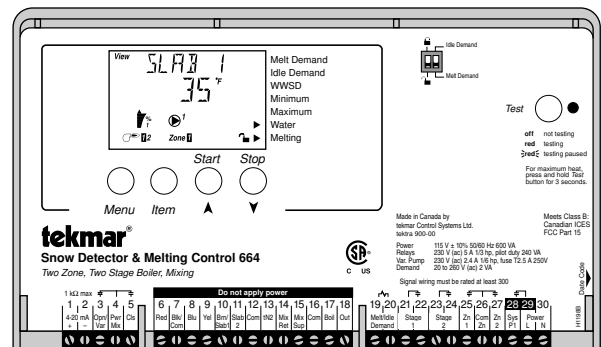
Error Displayed	Description of Error
MIX SUP OPEN	The control is no longer able to read the mixing supply sensor due to an open circuit. In this case, the control does not operate the snow melting system. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
MIX RET SHRT	The control is no longer able to read the mixing return sensor due to a short circuit. If the ΔT MAX item is set to OFF , the control will continue to operate as if the as if the mixing return sensor was not connected to the control. If the ΔT MAX item is not set to OFF , the control does not operate the snow melting system. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
MIX RET OPEN	The control is no longer able to read the mixing return sensor due to an open circuit. If the ΔT MAX item is set to OFF , the control will continue to operate as if the mixing return sensor was not connected to the control. If the ΔT MAX item is not set to OFF , the control does not operate the snow melting system. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
Boil SENS SHRT	The control is no longer able to read the boiler sensor due to a short circuit. If the Boil MIN item is set to OFF , the control operates the <i>Boiler</i> contact when the mixing device starts to operate. If the Boil MIN is not set to OFF , the control does not operate the snow melting system. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
Boil SENS OPEN	The control is no longer able to read the boiler sensor due to an open circuit. If the Boil MIN item is set to OFF , the control operates the <i>Boiler</i> contact when the mixing device starts to operate. If the Boil MIN is not set to OFF , the control does not operate the snow melting system. Locate and repair the problem as described in the Data Brochure D 070. If the boiler sensor was deliberately not installed, set the Boil SENS item to NONE . To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
SLAB 1 SHRT	The control is no longer able to read the slab sensor of zone 1 due to a short circuit. In this case, if the control is currently in the Melting mode, the control will target a fixed mixing water temperature until the melting cycle is finished. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
SLAB 1 OPEN	The control is no longer able to read the slab sensor of zone 1 due to an open circuit. In this case, if the control is currently in the Melting mode, the control will target a fixed mixing water temperature until the melting cycle is finished. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
YELLOW SHRT	The control is no longer able to read the yellow sensor due to a short circuit. In this case, the control will turn off the heater in the Snow / Ice Sensor 090. Check the 090 yellow temperature sensor (black and yellow wires, terminals 7 and 9), and the wiring from the terminal plug to the sensor. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
YELLOW OPEN	The control is no longer able to read the yellow sensor due to an open circuit. In this case, the control will turn off the heater in the Snow / Ice Sensor 090. Check the 090 yellow temperature sensor (black and yellow wires, terminals 7 and 9), and the wiring from the terminal plug to the sensor. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
BLUE SHRT	The control is no longer able to read the water detection circuit due to a short circuit. In this case, if the control is currently in the Melting mode, the control will finish the snow melting cycle. The snow melting system can only be operated using an external melt demand, Remote Display Module 040, Remote Start / Stop Module 039 or the Start button on the control. Otherwise, the control will operate as if the Snow / Ice Sensor 090 is dry. Check the 090 water detection circuit (black and blue wires, terminals 7 and 8) according to the Data Brochure D 090. To clear the error message from the control after the error has been repaired, press either the Menu or Item button.

Error Displayed	Description of Error
BLUE OPEN	The control is no longer able to read the water detection circuit due to an open circuit. In this case, if the control is currently in the Melting mode, the control will finish the snow melting cycle. The snow melting system can only be operated using an external melt demand, Remote Display Module 040, Remote Start / Stop Module 039 or the Start button on the control. Otherwise, the control will operate as if the Snow / Ice Sensor 090 is dry. Check the 090 water detection circuit (black and blue wires, terminals 7 and 8) according to the Data Brochure D 090. To clear the error message from the control after the error has been repaired, press either the Menu or Item button.
RED ERR	The control is reading a heater malfunction. In this case, unless the yellow sensor becomes too hot, the heater continues to try to operate. The snow melting system can only be operated using an external melt demand, Remote Display Module 040, Remote Start / Stop Module 039 or the Start button on the control. Check the 090 heater circuit (red and black wires, terminals 6 and 7) according to the Data Brochure D 090. Make sure the yellow and brown wires are not reversed. To clear the error message from the control after the error has been repaired, press either the Menu or Item button.
SLAB 2 SHORT	The control is no longer able to read the slab sensor of zone 2 due to a short circuit. In this case, if the control is currently in the Melting mode, the control will target a fixed mixing water temperature until the melting cycle is finished. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
SLAB 2 OPEN	The control is no longer able to read the slab sensor of zone 2 due to an open circuit. In this case, if the control is currently in the Melting mode, the control will target a fixed mixing water temperature until the melting cycle is finished. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
CTRL ERR HOT	The control's internal sensor is too hot (above 160°F (71°C)). In this case, the control will turn off the heater in the Snow / Ice Sensor 090 until the control cools off. To clear the error message from the control after the error has been repaired, press either the Menu or Item button.
NO HEAT SLAB 1	This warning message will be displayed if the Slab 1 temperature does not increase to the SLB1 TRG temperature while zone 1 is melting within a set time. The time limit is set using the NO HEAT item in the MONITOR menu. To clear this warning, press either the Menu or Item button.
NO HEAT SLAB 2	This warning message will be displayed if the Slab 2 temperature does not increase to the SLB2 TRG temperature while zone 2 is melting within a set time. The time limit is set using the NO HEAT item in the MONITOR menu. To clear this warning, press either the Menu or Item button.

Technical Data

Snow Detector & Melting Control 664 Two Zone, Two Stage Boiler, Mixing

Literature	— D 664, A 664's, D 001, D 070, E 021, U 664.
Control	— Microprocessor PID control; This is not a safety (limit) control .
Packaged weight	— 3.5 lb. (1600 g), Enclosure A, blue PVC plastic
Dimensions	— 6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
Approvals	— CSA C US, meets ICES & FCC regulations for EMI/RFI.
Ambient conditions	— Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
Power supply	— 115 V \pm 10% 50/60 Hz 600 VA
Relays	— 230 V (ac) 5 A 1/3 hp, pilot duty 240 VA
Var. Pump	— 230 V (ac) 2.4 A 1/6 hp, fuse T2.5 A 250 V
Demand	— 20 to 260 V (ac) 2 VA
Sensors included	— NTC thermistor, 10 k Ω @ 77°F (25°C \pm 0.2°C) β =3892 Outdoor Sensor 070 and 3 of Universal Sensor 071
Optional devices	— tekmar type #: 011, 039, 040, 072, 073, 090, 091.



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

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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

Attention Un boîtier nonmétallique n'assure pas la continuité électrique des conduits. Utiliser des manchons ou des fils de accord spécialement conçus pour la mise à la terre.

Limited Warranty and Product Return Procedure

Limited Warranty *The liability of tekmar under this warranty is limited. The Purchaser, by taking receipt of any tekmar product ("Product"), acknowledges the terms of the Limited Warranty in effect at the time of such Product sale and acknowledges that it has read and understands same.*

The tekmar Limited Warranty to the Purchaser on the Products sold hereunder is a manufacturer's pass-through warranty which the Purchaser is authorized to pass through to its customers. Under the Limited Warranty, each tekmar Product is warranted against defects in workmanship and materials if the Product is installed and used in compliance with tekmar's instructions, ordinary wear and tear excepted. The pass-through warranty period is for a period of twenty-four (24) months from the production date if the Product is not installed during that period, or twelve (12) months from the documented date of installation if installed within twenty-four (24) months from the production date.

The liability of tekmar under the Limited Warranty shall be limited to, at tekmar's sole discretion: the cost of parts and labor provided by tekmar to repair defects in materials and/or workmanship of the defective product; or to the exchange of the defective product for a warranty replacement product; or to the granting of credit limited to the original cost of the defective product, and such repair, exchange or credit shall be the sole remedy available from tekmar, and, without limiting the foregoing in any way, tekmar is not responsible, in contract, tort or strict product liability, for any other losses, costs, expenses, inconveniences, or damages, whether direct, indirect, special, secondary, incidental or consequential, arising from ownership or use of the product, or from defects in workmanship or materials, including any liability for fundamental breach of contract.

The pass-through Limited Warranty applies only to those defective Products returned to tekmar during the warranty period. This Limited Warranty does not cover the cost of the parts or labor to remove or transport the defective Product, or to reinstall the repaired or replacement Product, all such costs and expenses being subject to Purchaser's agreement and warranty with its customers.

Any representations or warranties about the Products made by Purchaser to its customers which are different from or in excess of the tekmar Limited Warranty are

the Purchaser's sole responsibility and obligation. Purchaser shall indemnify and hold tekmar harmless from and against any and all claims, liabilities and damages of any kind or nature which arise out of or are related to any such representations or warranties by Purchaser to its customers.

The pass-through Limited Warranty does not apply if the returned Product has been damaged by negligence by persons other than tekmar, accident, fire, Act of God, abuse or misuse; or has been damaged by modifications, alterations or attachments made subsequent to purchase which have not been authorized by tekmar; or if the Product was not installed in compliance with tekmar's instructions and/or the local codes and ordinances; or if due to defective installation of the Product; or if the Product was not used in compliance with tekmar's instructions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH THE GOVERNING LAW ALLOWS PARTIES TO CONTRACTUALLY EXCLUDE, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, DURABILITY OR DESCRIPTION OF THE PRODUCT, ITS NON-INFRINGEMENT OF ANY RELEVANT PATENTS OR TRADEMARKS, AND ITS COMPLIANCE WITH OR NON-VIOLATION OF ANY APPLICABLE ENVIRONMENTAL, HEALTH OR SAFETY LEGISLATION; THE TERM OF ANY OTHER WARRANTY NOT HEREBY CONTRACTUALLY EXCLUDED IS LIMITED SUCH THAT IT SHALL NOT EXTEND BEYOND TWENTY-FOUR (24) MONTHS FROM THE PRODUCTION DATE, TO THE EXTENT THAT SUCH LIMITATION IS ALLOWED BY THE GOVERNING LAW.

Product Warranty Return Procedure All Products that are believed to have defects in workmanship or materials must be returned, together with a written description of the defect, to the tekmar Representative assigned to the territory in which such Product is located. If tekmar receives an inquiry from someone other than a tekmar Representative, including an inquiry from Purchaser (if not a tekmar Representative) or Purchaser's customers, regarding a potential warranty claim, tekmar's sole obligation shall be to provide the address and other contact information regarding the appropriate Representative.



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