

# tekmar® - Data Brochure

Universal Reset Control 364

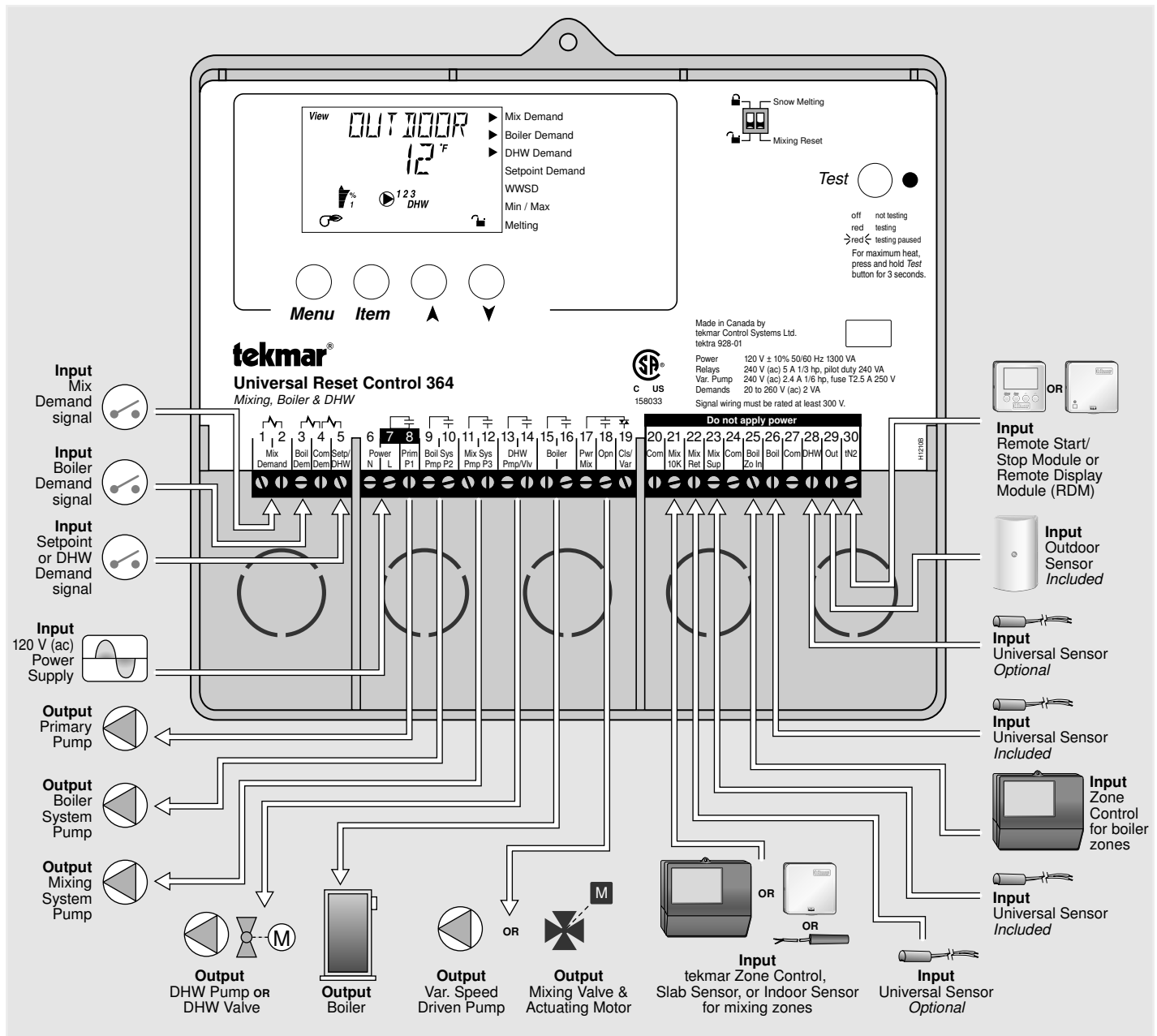
D 364

07/01

The Universal Reset Control 364 is designed to maximize the comfort and efficiency provided by a hydronic heating system. The control automatically adjusts the boiler and mixed loop water temperatures that are delivered to the heating system by using outdoor reset. For a mixing device, the 364 can use either a variable speed injection pump or a floating action mixing valve. The mixed water temperature can be used to supply either a space heating system or a single zone snow melting system. The 364 is capable of controlling an indirect Domestic Hot Water (DHW) storage tank and / or a setpoint load. The temperature of individual zones can be controlled by connecting either a conventional thermostat system or a tekmar zone control to the 364. A large Liquid Crystal Display (LCD) is incorporated in order to view system status and operating information.

Additional features include:

- Warm Weather Shut Down (WWSD)
- Manual Override
- Optional DHW Priority
- Remote Display and Adjustment Capabilities
- Test Sequence to Ensure Proper Component Operation
- 120 V (ac) Power Supply
- CSA C US Certified (approved to applicable UL standards)



## Introduction

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 six 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 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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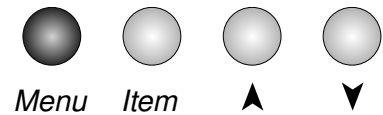
Reference Material:      Essay E 021: Mixing Methods and Sizing of Variable Speed Injection Pumps  
                                   Essay E 003: Characterized Heating Curves and Reset Ratios

## User Interface

The 364 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 364 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.

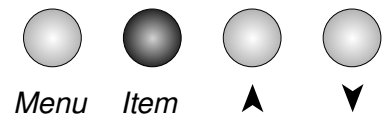
### Menu

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.



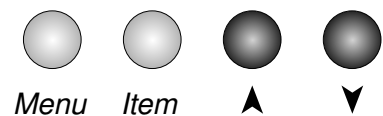
### Item

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.



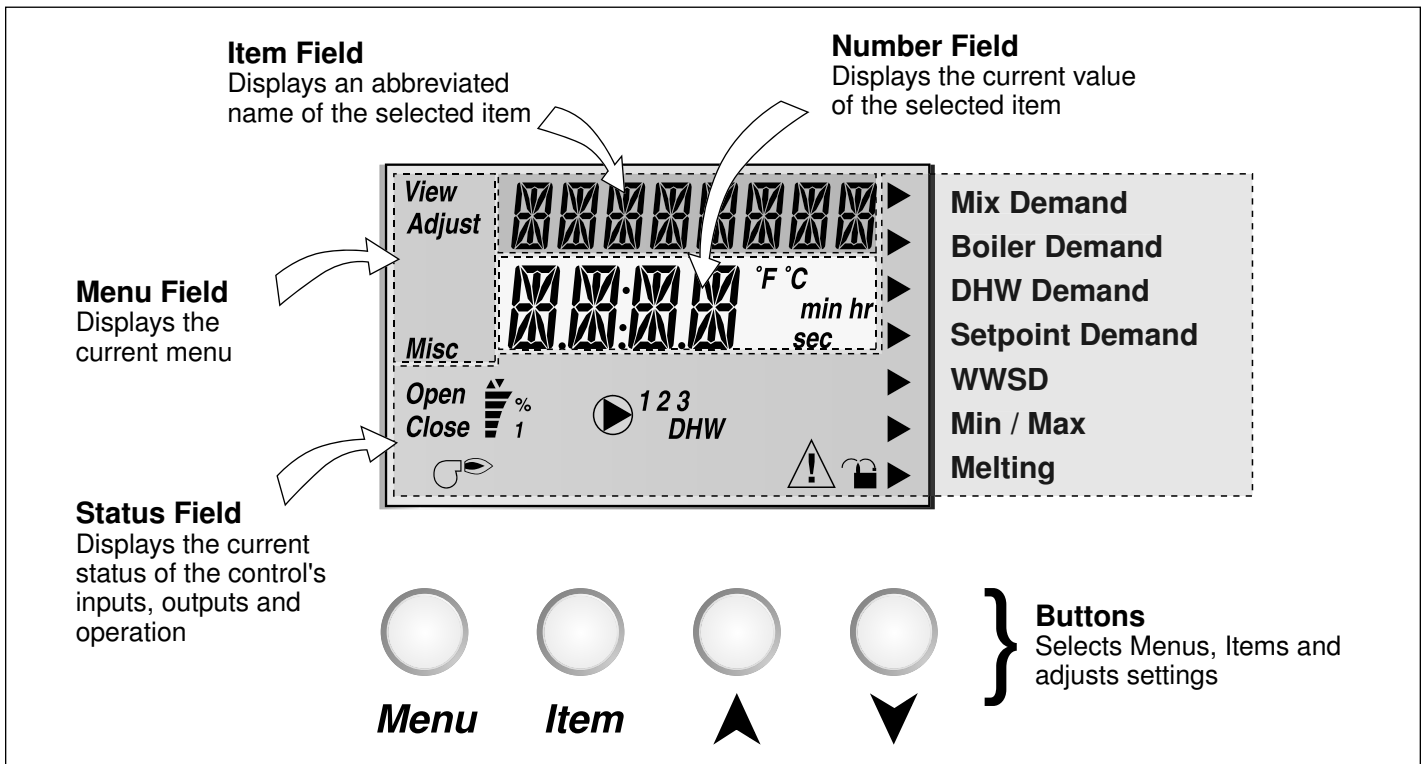
### Adjust

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

|                             |  |                         |  |
|-----------------------------|--|-------------------------|--|
| <i>Open</i><br><i>Close</i> | <b>Open / Close</b><br>Displays when the actuator is opening or closing the mixing valve.  |                         | <b>Warning</b><br>Displays when an error exists or when a limit has been reached.  |
|                             | <b>Mixing Device Output Scale</b><br>Shows output of injection pump or mixing valve. Arrows show whether the output is increasing or decreasing. |                         | <b>Lock / Unlock</b><br>Displays whether the access levels are locked or unlocked. |
|                             | <b>Burner</b><br>Displays when the boiler relay is turned on.  | °F, °C, sec,<br>min, hr | °F, °C, sec, min, hr<br>Units of measurement.                                      |
|                             | <b>Pump</b><br>Displays when the primary pump 1, boiler system pump 2 and / or mixing system pump 3 is operating.                                |                         | <b>Pointer</b><br>Displays the control operation as indicated by the text.         |
|                             | <b>DHW Pump / Valve</b><br>Displays when the DHW pump or valve is on.  |                         |  |

## 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  
Page 4-5

**Section B**  
Boiler Zones  
Page 5-6

**Section C**  
Domestic Hot  
Water/Setpoint  
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**Section D**  
Mixing Zones  
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**Section E**  
Snow  
Melting  
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**Section F**  
Boiler  
Operation  
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## Section A: General

### POWERING UP THE CONTROL

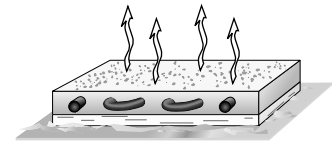
When the Universal Reset Control 364 is powered up, the control displays the control type number in the LCD for 2 seconds. Next, the software version is displayed for 2 seconds. Finally, the control enters into the normal operating mode and the LCD defaults to displaying the current outdoor air temperature.

### TERMINAL UNITS (MIX TERM / Boil TERM)

The 364 uses a *Characterized Heating Curve* for its outdoor reset calculations of the supply water temperature. When using a *Characterized Heating Curve*, the control requires the selection of a terminal unit. The terminal unit determines the shape of the *Characterized Heating Curve* according to how the terminal unit delivers heat into the building space. The 364 provides for selection between six different terminal unit types: High Mass Radiant, Low Mass Radiant, Fancoil, Fin-Tube Convector, Radiator and Baseboard.

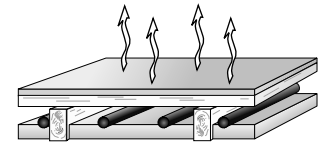
#### Hydronic Radiant Floor (HRF1)

HRF1 is a heavy, or high mass, hydronic radiant floor system. This type of a hydronic radiant floor is embedded in either a thick concrete or gypsum pour. This heating system has a large thermal mass and is slow acting.



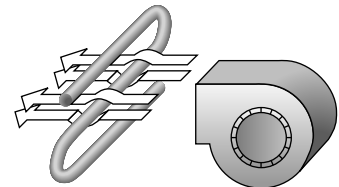
#### Hydronic Radiant Floor (HRF2)

HRF2 is a light, or low mass, hydronic radiant floor system. Most commonly, this type of radiant heating system is either attached to the bottom of a sub floor, suspended in the joist space, or sandwiched between the sub floor and surface. This type of radiant system has a relatively low thermal mass and responds faster than a high mass system.



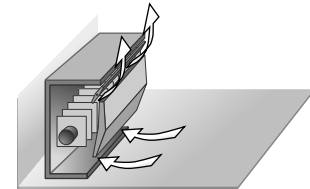
#### Fancoil (COIL)

A fancoil terminal unit or air handling unit (AHU) consists of a hydronic heating coil and either a fan or blower. Air is forced across the coil at a constant velocity by the fan or blower and is then delivered into the building space.



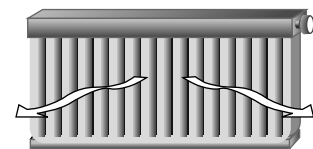
#### Fin-tube Convector (CONV)

A convector terminal unit is made up of a heating element encased in fins. This type of terminal unit relies on the natural convection of air across the heating element to deliver heated air into the space. The amount of natural convection is dependant on the supply water temperature to the heating element and the room air temperature.



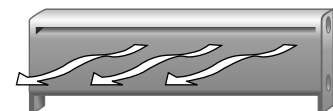
#### Radiator (RAD)

A radiator terminal unit has a large heated surface that is exposed to the room. A radiator provides heat to the room through radiant heat transfer and natural convection.



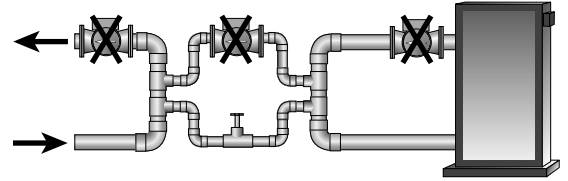
#### Baseboard (BASE)

A baseboard terminal unit is similar to a radiator, but has a low profile and is installed at the base of the wall. The proportion of heat transferred by radiation from a baseboard is greater than the proportion transferred by natural convection.



## WARM WEATHER SHUT DOWN (WWSD)

When the outdoor air temperature rises above the WWSD setting, the 364 turns on the *WWSD* pointer in the display. When the control is in Warm Weather Shut Down, the *Mix Demand* and *Boiler Demand* pointers are displayed if there is a demand. However, the control does not operate the heating system to satisfy these demands. The control does respond to a DHW demand and / or setpoint demand and operates as described in Section C.



## EXERCISING (EXERCISE)

The 364 has a built-in pump and valve exercising function. The exercising period is adjustable and comes factory set at 70 hours. If a pump or valve output on the control 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 364 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, pumps or valves is disconnected.

## Section B: Boiler Zones

**Section B1**  
General

**Section B2**  
Boiler  
Demands

### Section B1: General

The Universal Reset Control 364 is capable of providing a reset supply water temperature from the primary boiler loop to a secondary loop using the boiler system pump (P2). The boiler zones that are piped into the secondary loop receive the same water temperature as the current boiler supply temperature. The boiler supply temperature is determined using a *Characterized Heating Curve*. In order to set up a *Characterized Heating Curve*, the following information must be entered into the control using the Adjust menu.

## OUTDOOR DESIGN (OUT DSGN)

The OUT DSGN is the outdoor air temperature that is the typical coldest temperature of the year where the building is located. This temperature is used when doing heat loss calculations for the building.

## BOILER DESIGN (Boil DSGN)

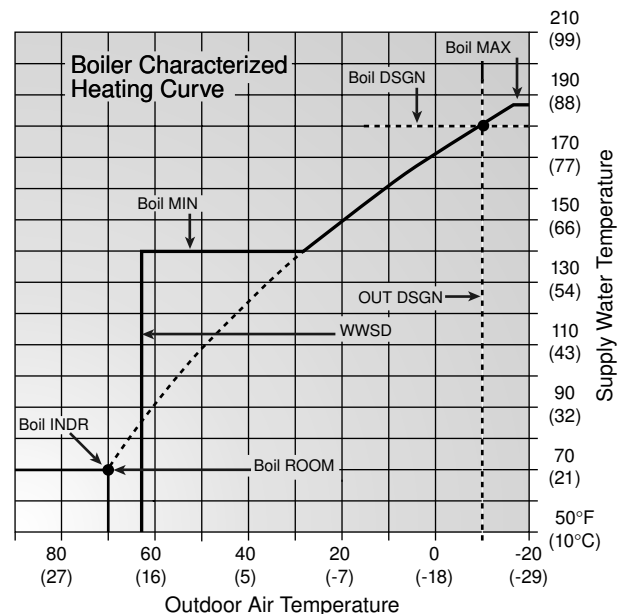
The Boil DSGN temperature is the supply water temperature required to heat the boiler zones when the outdoor air is as cold as the OUT DSGN temperature.

## BOILER MINIMUM (Boil MIN)

The Boil MIN is the lowest water temperature that the control is allowed to use as a boiler target (Boil TRG) temperature. During mild conditions, if the 364 calculates a Boil TRG temperature that is below the Boil MIN setting, the Boil TRG temperature is adjusted to at least the Boil MIN setting. During this condition, if the boiler is operating near the Boil MIN setting, the *Min / Max* pointer turns on in the LCD while the Boil TRG or Boil SUP temperature is viewed. If the installed boiler is designed for condensing operation, set the Boil MIN adjustment to OFF. This item is only available if the Boil SENS item is set to SUP or RET.

## BOILER MAXIMUM (Boil MAX)

The Boil MAX is the highest water temperature that the control is allowed to use as a Boil TRG temperature. If the control does target Boil MAX, and the Boil SUP temperature is near the Boil MAX temperature, the *Min / Max* pointer turns on in the LCD while the Boil TRG or the Boil SUP temperature is viewed. At no time does the control operate the boiler above 248°F (120°C). This item is only available if the Boil SENS item is set to SUP.



## WARM WEATHER SHUT DOWN (WWSD)

When the outdoor air temperature rises above the WWSD setting, the 364 turns on the *WWSD* pointer in the display. When the control is in Warm Weather Shut Down, the *Boiler Demand* pointer is displayed if there is a demand. However, the control does not operate the heating system to satisfy this demand. The control does respond to either a DHW demand or a setpoint demand and operates as described in section C.

## BOILER INDOOR (Boil INDR)

The Boil INDR is the room temperature used in the original heat loss calculations for the building. This setting establishes the beginning of the *Characterized Heating Curve* for the boiler zones.

## BOILER ROOM (Boil ROOM)

The Boil ROOM is the desired room temperature for the boiler zones. It provides a parallel shift of the *Characterized Heating Curve*. The room temperature desired by the occupants is often different from the designed indoor temperature (Boil INDR). If the room temperature is not correct, adjusting the Boil ROOM setting increases or decreases the amount of heat available to the building.

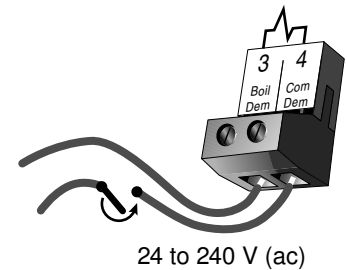
## BOILER SYSTEM PUMP (P2) OPERATION

The boiler system pump (*Boil Sys Pmp P2*) contact (terminals 9 and 10) closes whenever there is a boiler demand and the 364 is not in WWSD. After the boiler demand is removed, the boiler system pump continues to run for an additional 20 seconds. A boiler demand can either be an external demand or a boiler zone control as described in section B2.

## Section B2: Boiler Demands

### EXTERNAL BOILER DEMAND

An external boiler demand is generated by applying a voltage between 24 and 240 V (ac) across the *Boil Dem* (3) and *Com Dem* (4) terminals. Once voltage is applied, the *Boiler Demand* pointer is displayed in the LCD. If the 364 is not in WWSD, it closes the *Prim P1* contact which starts the primary pump and closes the *Boil Sys Pmp P2* contact which starts the boiler system pump. The control turns on the primary pump and boiler system pump segments in the LCD. If the Boil SENS item is set to SUP, the 364 calculates a Boil TRG supply temperature. The 364 then fires the boiler, if required, to achieve and / or maintain the target supply temperature. If the Boil SENS item is set to RET or NONE, the 364 closes the *Boiler* contact to enable the boiler control.



### BOILER ZONE CONTROL

A tekmar zone control can be used to control the temperature in the boiler zones that are connected to the boiler system pump (P2). The tekmar zone control is connected to the 364 using the *Boil Zo In* terminal and *Com* terminal (25 and 24). The zone control provides its own internal boiler demand to the 364. In this case, there is no need to provide an external boiler demand as described earlier. The zone control is also capable of adjusting the Boil TRG temperature, if required, to provide improved building occupant comfort and system performance.

## Section C: Domestic Hot Water / Setpoint

Section C1  
General

Section C2  
DHW Priority

Section C3  
Low  
Temperature  
Boilers

Section C4  
Setpoint

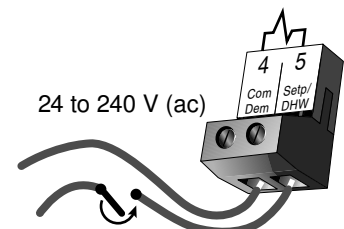
## Section C1: General

### DHW DEMAND

A DHW demand is generated on the 364 by one of two methods: either an external DHW demand from an aquastat or an internal demand from a tekmar sensor.

#### External Demand (Aquastat)

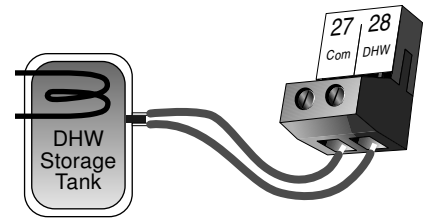
The 364 registers an external demand for DHW when a voltage between 24 and 240 V (ac) is applied across the *Setp/DHW* and the *Com Dem* terminals (5 and 4). Either a DHW aquastat or setpoint control is used as a switch in the DHW demand circuit. Once the 364 detects a DHW demand, the *DHW Demand* pointer turns on in the LCD and the control operates as described on the following page.



### Internal Demand (tekmar Sensor)

If the DHW SENS item is set to DHW, the 364 looks for a DHW sensor connected to the *DHW* and the *Com* terminals (28 and 27). The DHW TANK setting is used to set the desired indirect DHW tank temperature.

When the temperature at the DHW sensor drops 3°F (1.5°C) below the DHW TANK setting, The *DHW Demand* pointer turns on in the LCD and the control operates as described below. An advantage to using the DHW sensor is that the control can display the current DHW TANK temperature. Also, the 364 can control the DHW temperature with more accuracy than when using an aquastat.

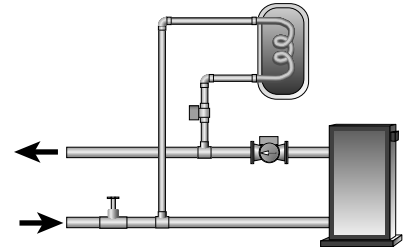


### DHW DEVICE (DHW THRU)

Once the 364 has received a DHW demand, the sequence of operation depends on the type of DHW device selected. The DHW device is selected using the DHW THRU item in the Adjust menu.

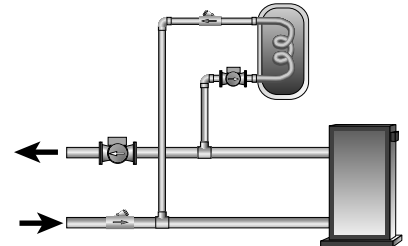
#### DHW Valve (VALV)

If VALV is selected as the DHW device and there is a DHW demand, the 364 closes the *DHW Pmp / Vlv* contact (13 and 14) and the *Prim P1* contact (7 and 8). The primary pump provides flow through the DHW tank's heat exchanger once the DHW valve is opened. If the Boil SENS item is set to SUP, the 364 operates the *Boiler* contact to provide a sufficient boiler supply temperature to the DHW tank. If the Boil SENS item is set to RET or NONE, the 364 closes the *Boiler* contact to provide heat to the DHW tank.



#### DHW Pump (PUMP)

If PUMP is selected as the DHW device, the 364 assumes that the DHW pump provides adequate flow through both the DHW tank heat exchanger and the boiler. To provide heat to the DHW tank, the 364 closes the *DHW Pmp / Vlv* contact (13 and 14). If the Boil SENS item is set to SUP, the 364 operates the *Boiler* contact to provide sufficient boiler supply temperature to the DHW tank. If the Boil SENS item is set to RET or NONE, the 364 closes the *Boiler* contact to provide heat to the DHW tank. If using a primary loop with the DHW tank piped in primary / secondary, select DHW valve.



### BOILER TARGET DURING DHW GENERATION (Boil TRG)

A boiler target temperature is calculated only if the Boil SENS item is set to SUP. The Boil TRG temperature during DHW operation depends on whether an external or internal demand is occurring. The DHW demand overrides the reset water temperature. If the Boil SENS item is set to RET or NONE, the boiler is simply enabled during a call for DHW. In this case, the boiler temperature is limited by the boiler's operating aquastat.

#### External Demand (Aquastat)

If the control receives a DHW demand through an external device such as an aquastat, the Boil TRG temperature is at least as hot as the DHW heat exchanger setting (DHW XCHG).

#### Internal Demand (tekmar Sensor)

If the control receives a DHW demand from a DHW sensor connected to the *DHW* and the *Com* terminals (28 and 27), the Boil TRG temperature is at least as hot as the DHW TANK setting plus 40°F (22°C).

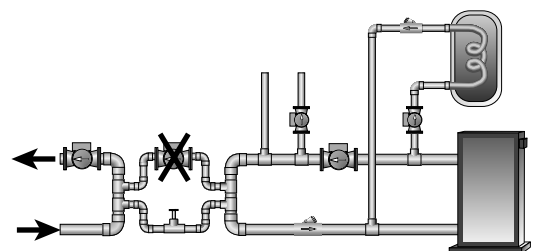
## Section C2: DHW PRIORITY

### DHW PRIORITY

It is often desirable to limit or even stop the flow of heat to the heating system when the DHW tank calls for heat. This allows for faster recovery of the DHW tank. The 364 has a number of features that it can use when dealing with DHW priority. The features available depend on the type of DHW device that is being used and the type of DHW demand the control receives.

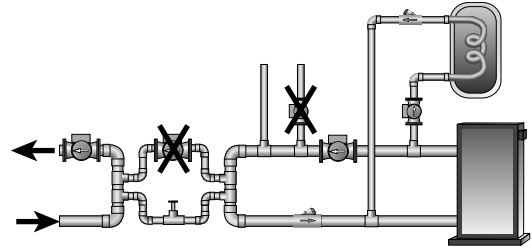
#### Mixing Priority (DHW PRI = MIX)

It can be selected that the DHW tank has priority over the mixing zones. If this option is chosen, the mixing device is throttled back on a call for DHW. The mixing system pump (P3) continues to operate based on the mix demand. By reducing the mixing device output, more heat is directed to the DHW tank. The boiler zones continue to operate without change.



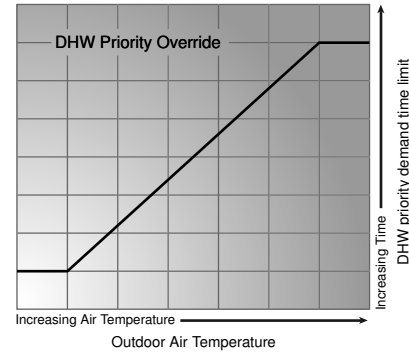
### Boiler and Mixing Priority (DHW PRI = B+M)

It can be selected that the DHW tank has priority over the boiler and mixing zones. If this option is chosen, the mixing device is throttled back and the boiler system pump (P2) turns off on a call for DHW.



### DHW PRIORITY OVERRIDE

To prevent the building from cooling off too much or the possibility of a potential freeze up during DHW priority, the 364 limits the amount of time for DHW priority. As the outdoor air temperature becomes colder, the length of time that the 364 provides DHW priority is reduced. Once the allowed time for priority has elapsed, the 364 overrides the DHW priority and operates DHW and heating simultaneously.

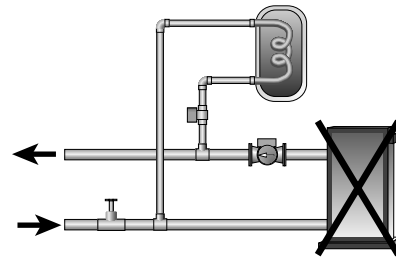


### CONDITIONAL DHW PRIORITY

If the boiler supply temperature is maintained at or above the required temperature during DHW generation, this indicates that the boiler has enough capacity for DHW and possibly heating as well. As long as the boiler supply temperature is maintained near its target, DHW and heating occurs simultaneously. This feature is only available if the Boil SENS item is set to SUP.

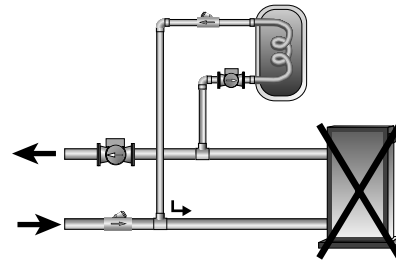
### DHW POST PURGE

After the DHW demand is removed, the 364 performs a purge on the boiler. This feature is only available if the Boil SENS item is set to SUP. The 364 shuts off the boiler and continues to operate either the DHW pump or the DHW valve and the primary pump (P1). This purges the residual heat from the boiler into the DHW tank. The 364 continues this purge for a maximum of four minutes or until the boiler supply temperature drops 20°F (11°C) below the DHW Boil TRG temperature. The 364 also stops the purge if the boiler supply temperature drops below the current Boil TRG temperature.



### DHW MIXING PURGE

After DHW operation, the boiler is extremely hot. At the same time, the heating zones may have cooled off considerably after being off for a period of time. To avoid thermally shocking the boiler after DHW priority, the 364 shuts off the boiler, but continues to operate the DHW while restarting the heating system. This allows some of the DHW return water to mix with the cool return water from the zones and temper the boiler return water.



## Section C3: Low Temperature Boilers

If DHW is to be incorporated into a low temperature system such as a radiant heating system, a mixing device is often installed to isolate the DHW supply temperature from the lower system supply temperature. If a mixing device is not installed, high temperature water could be supplied to the low temperature system while trying to satisfy the DHW demand. This may result in damage to the low temperature heating system. The 364 is capable of providing DHW in such a system while ensuring that the low temperature in the heating system does not exceed its allowed maximum setting.

To prevent high temperature water from being introduced into the heating system, the boiler system pump (P2) must be turned off during a call for DHW. To do this, the DHW PRI item must be set to B + M. If the Boil SENS item has been set to SUP, the Boil MIN item must be set to OFF.

**Note:** This feature is only available if the Boil SENS item is set to SUP. This feature is not available if the Boil SENS item is set to RET or NONE.

On a call for DHW, the 364 provides DHW priority by backing off the mixing device and by shutting off the boiler system pump (P2) for a period of time. This time is based on the outdoor air temperature as described in the DHW Priority Override section. If the DHW demand is not satisfied within the allotted time, the boiler shuts off and the boiler's heat is purged into the DHW tank.



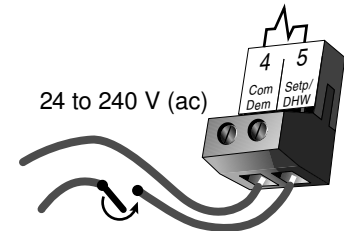
Once the boiler supply temperature is sufficiently reduced, the DHW device shuts off. Then the heating system is turned on for a period of time to prevent the building from cooling off excessively. After a period of heating, if the DHW demand is still present, the 364 shuts off the boiler system pump (P2) and provides heat to the DHW tank once again.

## Section C4: Setpoint

The 364 can handle loads which are high temperature loads connected to the boiler loop that are not heating loads or DHW. For this feature to be available, the Boil SENS item must be set to SUP and either a DHW sensor must be used or the DHW THRU item is set to NONE. If an external DHW demand is used as described in Section C1, you can not use the setpoint feature.

### SETPOINT DEMAND

A setpoint demand is required in order for the 364 to provide heat to the setpoint load. The 364 registers a setpoint demand when a voltage between 24 and 240 V (ac) is applied across the *Setp / DHW* and the *Com Dem* terminals (5 and 4). Once voltage is applied, the *Setpoint Demand* pointer turns on in the LCD. The control operates the boiler to maintain at least the boiler supply temperature as set by the SETPOINT setting. The setpoint demand does not turn on the primary pump (P1). If a setpoint load is used, the installer must make sure that the setpoint device provides its own flow through the boiler.



### BOILER TARGET DURING SETPOINT (Boil TRG)

The Boil TRG temperature during a setpoint demand is increased to at least the SETPOINT setting. This temperature is maintained as long as the 364 has a setpoint demand.

## Section D: Mixing Zones

**Section D1**  
General

**Section D2**  
Mixing  
Devices

**Section D3**  
Mixing  
Demands

### Section D1: General

The Universal Reset Control 364 is capable of providing a reset supply water temperature from the primary boiler loop to a secondary mixed loop using a mixing device. The mixing zones that are piped into the mixed loop and receive a mixed supply temperature. The mixing supply temperature is determined using a *Characterized Heating Curve*. In order to set up a *Characterized Heating Curve*, the following information must be entered into the control using the Adjust menu.

### OUTDOOR DESIGN (OUT DSGN)

The OUT DSGN is the outdoor air temperature that is the typical coldest temperature of the year where the building is located. This temperature is used when doing heat loss calculations for the building.

### MIXING DESIGN (MIX DSGN)

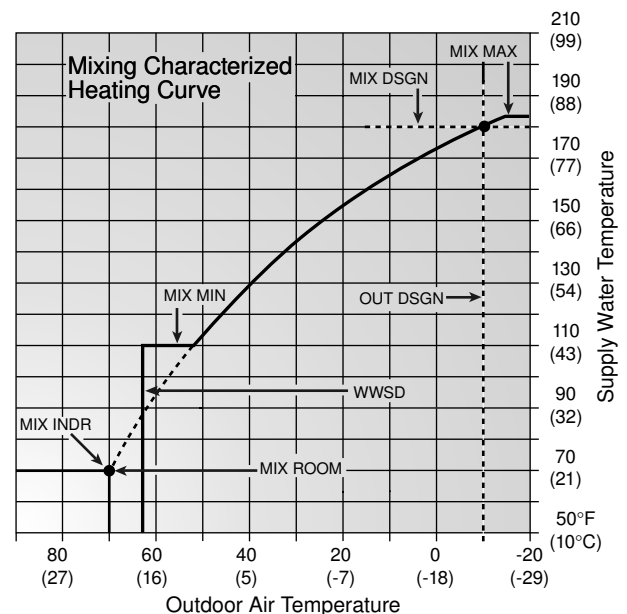
The MIX DSGN temperature is the supply water temperature required to heat the mixing zones when the outdoor air is as cold as the OUT DSGN temperature.

### MIXING MAXIMUM (MIX MAX)

The MIX MAX sets the highest water temperature that the control is allowed to use as a MIX TRG temperature. If the control does target the MIX MAX setting, and the MIX SUP temperature is near the MIX MAX temperature, the *Min / Max* pointer turns on in the LCD while either the MIX TRG temperature or the MIX SUP temperature is viewed.

### WARM WEATHER SHUT DOWN (WWSD)

When the outdoor air temperature rises above the WWSD setting, the 364 turns on the *WWSD* pointer in the display. When the control is in Warm Weather Shut Down, the *Mix Demand* pointer is displayed if there is a demand. However, the control does not operate the heating system to satisfy this demand. The control does respond to either a DHW demand or a setpoint demand and operates as described in Section C.



## MIXING INDOOR (MIX INDR)

The MIX INDR is the room temperature used in the original heat loss calculations for the building. This setting establishes the beginning of the *Characterized Heating Curve* for the mixing zones.

## MIXING MINIMUM (MIX MIN)

The MIX MIN is the lowest temperature that the control is allowed to use as a MIX TRG temperature. During mild conditions, if the 364 calculates a MIX TRG temperature that is below the MIX MIN setting, the MIX TRG temperature is adjusted to match the MIX MIN setting. During this condition, if the mixing supply temperature is near the MIX MIN setting, the *Min / Max* pointer turns on in the LCD when either the MIX TRG temperature or the MIX SUP temperature is being viewed.

If an indoor sensor is used and the 364 is operating at the MIX MIN temperature, the mixing system pump (P3) is cycled using Pulse Width Modulation (PWM) with a 15 minute cycle length. By cycling the mixing system pump (P3) and controlling the flow of supply water, the control provides an average supply water temperature to the mixing system. This average temperature is equal to the original MIX TRG. This minimizes overheating of the zone while the control is operating at the MIX MIN temperature.

## MIXING ROOM (MIX ROOM)

The MIX ROOM is the desired room temperature for the mixing zones and it provides a parallel shift of the *Characterized Heating Curve*. The room temperature desired by the occupants is often different from the designed indoor temperature (MIX INDR). If the room temperature is not correct, adjusting the MIX ROOM setting increases or decreases the amount of heat available to the building.

## MIXING TARGET TEMPERATURE (MIX TRG)

The MIX TRG temperature is determined from the *Characterized Heating Curve* settings and the outdoor air temperature. The control displays the temperature that it is currently trying to maintain as the mixing supply temperature. If the control does not presently have a requirement for heat, it displays “---” in the LCD.

## MIXING SYSTEM PUMP (P3) OPERATION

The mixing system pump (P3) contact (terminals 11 and 12) closes whenever there is mixing demand and the 364 is not in WWSD. After the mixing demand is removed, the *Mix Sys Pmp P3* contact remains closed for an additional 20 seconds. During WWSD, the mixing system pump (P3) is operated based on the EXERCISE setting in the Adjust menu.

## BOILER MINIMUM PROTECTION (Boil MIN)

The 364 is capable of providing boiler protection from cold mixing system return water temperatures. If the boiler water temperature is cooler than the Boil MIN setting while the boiler is firing, the 364 reduces the output from the mixing device. This limits the amount of cool return water to the boiler and allows the boiler water temperature to recover. This feature can only be used if the Boil SENS item is set to SUP or RET.

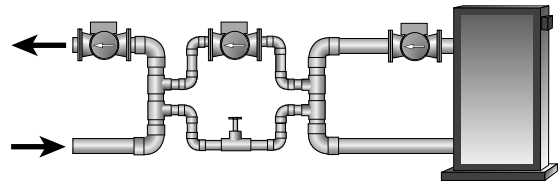
## Section D2: Mixing Devices

## MIXING DEVICE SELECTION (MIXING)

The 364 can supply a lower water temperature to part of the heating system by varying the speed of an injection pump or modulating a mixing valve. This selection is made under the MIXING item in the Adjust menu.

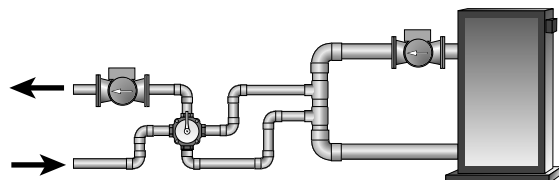
## VARIABLE SPEED INJECTION (VAR)

A standard wet rotor circulator is connected to the 364 on the *Cls / Var* terminal (19). The 364 increases or decreases the power output to the circulator when there is mix demand. The circulator speed varies to maintain the correct mixed supply water temperature at the mix supply sensor. For correct sizing and piping of the variable speed injection driven circulator, 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. Two small indicators at the top of the graph indicate whether the output is increasing or decreasing.



## FLOATING ACTION (FLOT)

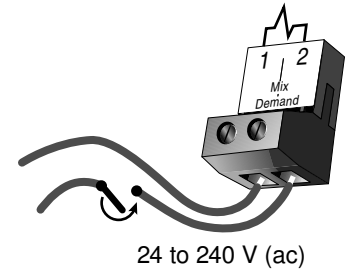
A floating action actuator motor is connected to the 364 on the *Opn* and *Cls / Var* terminals (18 and 19). The 364 pulses the actuator motor open or close to maintain the correct supply water temperature at the mix supply sensor when there is a mix demand. The mixing valve that the actuator is connected to can be either a 2-way, 3-way or 4-way valve. A visual indication as to whether the control is currently opening or closing the mixing valve is displayed in the LCD with the words **Open** and **Close**. Also, a visual indication of the current position of the valve is displayed in the LCD in the form of a segmented bar graph.



## Section D3: Mixing Demands

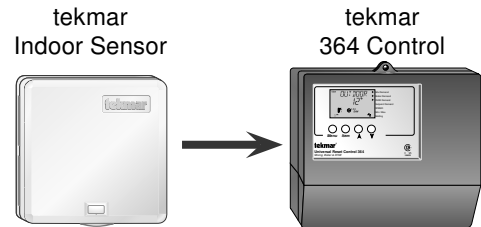
### EXTERNAL MIXING DEMAND

An external mixing demand allows for the use of a conventional thermostat system for zoning. An external mixing demand is generated by applying a voltage between 24 and 240 V (ac) across the *Mix Demand* terminals (1 and 2). Once voltage is applied, the *Mix Demand* pointer is displayed in the LCD. If the 364 is not in WWSD, the 364 closes the *Mix Sys Pmp P3* contact. The mixing system pump segment is displayed in the LCD. The 364 calculates a MIX TRG temperature based on the outdoor air temperature and settings. If required, the 364 operates the *Boiler* contact as described in section E in order to provide heat to the mixing device.



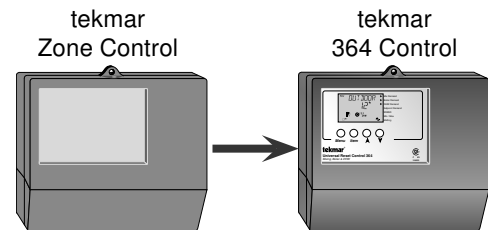
### 10K INDOOR SENSOR (MIX 10K = INDR)

Set the MIX 10K item to INDR to add an indoor sensor for temperature control of a single zone mixing system. The indoor sensor is connected to the *Com* and *Mix 10K* terminals (20 and 21). In addition, power must be applied to the *Mix Demand* terminals (1 and 2). With the indoor sensor connected, the 364 is able to sense the actual room temperature. With this information, the 364 provides more constant water flow through the mixing system. At the same time, indoor feedback fine tunes the supply water temperature in the mixing system to prevent over heating or under heating. To adjust the room temperature for the mixing zone, use the MIX ROOM setting in the Adjust menu at the control.



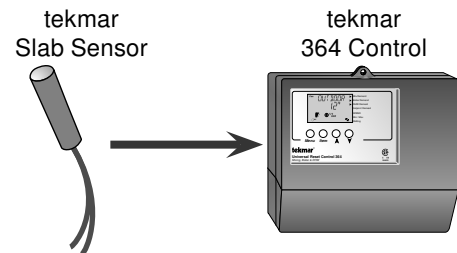
### 10K ZONE CONTROL (MIX 10K = ZOIN)

Set the MIX 10K item to ZOIN to add indoor temperature feedback control of multiple mixing zones. Control of mixing zones is provided by connecting a tekmar zone control to the 364. The zone control provides its own internal mix demand to the 364. In this case, there is no need to provide an external mix demand. The zone control is capable of automatically adjusting the MIX TRG temperature to improve building occupant comfort and system performance.



### 10K SLAB SENSOR (MIX 10K = SLAB)

Set the MIX 10K item to SLAB to add a slab sensor for temperature control of a single zone mixing system. The 364 can use a slab sensor to control the actual slab temperature. A slab sensor is placed in the slab and connected to the *Com* and *Mix 10K* terminals (20 and 21). Power must be applied to the *Mix Demand* terminals (1 and 2). With the slab sensor connected, the 364 will limit the mixing supply temperature in order to maintain the slab sensor between the SLAB MIN and SLAB MAX settings.



#### **Slab Minimum (SLAB MIN)**

The SLAB MIN sets the minimum allowed core temperature of the slab as long as the control is not in WWSD. Caution should be used when adjusting the SLAB MIN setting as this may lead to overheating of the zone during mild conditions.

#### **Slab Maximum (SLAB MAX)**

The SLAB MAX sets the maximum allowed core temperature of the slab. If the slab is to be maintained at a fixed core temperature, set the SLAB MAX and SLAB MIN items to the same setting.

## Section E: Snow Melting

**Section E**  
General

**Section E2**  
With Slab  
Sensor

**Section E3**  
Without Slab  
Sensor

**Section E4**  
Snow Melting  
Enable

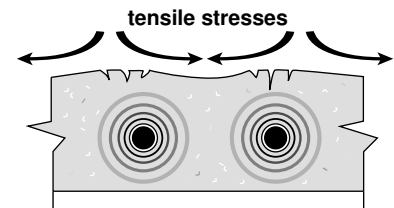
### Section E1: General

The Universal Reset Control 364 is capable of controlling a single zone snow melting system. In order to provide the best control of the snow melting system, the 364 should be equipped with an optional tekmar Slab Sensor and an optional Universal Sensor 071 that measures the slab return temperature. These can be purchased separately or as part of the Snow Melt Enable Kit 092. With both additional sensors installed, the 364 is capable of providing the features listed in the following section. Also described in this section are the different methods of starting and stopping the snow melting system.

**Note:** When operating in the snow melting mode, the *Snow Melting / Mixing Reset* DIP switch must be set to the *Snow Melting* position.

#### SLAB PROTECTION ( $\Delta T$ MAX)

A mixing device is installed between the snow melting slab and the boiler(s) in order to control the rate at which heat is transferred to the snow melting system and to protect the slab from damage due to thermal stresses. The control limits the rate at which heat is applied to the slab through the  $\Delta T$  MAX setting. The  $\Delta T$  (delta T) is the temperature difference between the slab supply temperature and the slab return temperature. By limiting this temperature difference, the rate at which heat is applied to the slab can be controlled and thermal stresses in the slab can be minimized. When the slab is operating, the control ensures that the slab supply temperature does not exceed the slab return temperature by more than the  $\Delta T$  MAX setting. When the control is operating and the actual  $\Delta T$  is near the  $\Delta T$  MAX, the *Maximum* pointer can be seen when viewing the MIX  $\Delta T$  item in the View menu.



#### VISCOSITY COMPENSATION (EXCEEDING $\Delta T$ MAX)

At low temperatures, the glycol solutions used in the 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 364 is allowed to exceed the  $\Delta T$  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 return temperature is below 30°F (-1°C). When the control exceeds the  $\Delta T$  MAX setting, the *Min / Max* pointer will flash when viewing the MIX  $\Delta T$  item in the View menu.

#### RAMPING OF THE $\Delta T$

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 maximum allowed  $\Delta T$ .

#### OPERATING STATUS (SNOWMELT)

While in the snow melting mode, an additional item is available in the View menu called SNOWMELT. This item displays the current operating status of the snow melting system.

- **STRT** The word STRT is displayed after the snow melting system has been enabled. It is displayed until the slab reaches the melting temperature. If the slab is at the melting 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 snow melting mode.
- **STOP** The word STOP is displayed for five seconds after the snow melting system has stopped. The word STOP is also displayed if either a Remote Start / Stop Module 039 has stopped the snow melting system or an external demand is still present.
- **IDLE** The word IDLE is displayed as long as the control is operating the slab at the idling temperature.
- **EXT** The word EXT is displayed when the RUN TIME has reached 0:00 and the control still has an external demand for melting. In this situation, the control continues melting until the snow melting demand is removed or the control is stopped.
- **0:00 to 17:00 hr** While the slab is up to temperature, and the control is melting, the remaining RUN TIME is displayed.
- **INF** If an infinite run time is selected and the control is melting, INF is displayed.
- **WWSD** When the control is in a Warm Weather Shut Down, WWSD is displayed.
- **CWCO** When the control is in a Cold Weather Cut Out, CWCO is displayed.



## RUNNING TIME (RUN TIME)

The run time is the length of time the snow melting system operates once the slab has reached the melting temperature. During the time that the slab is approaching the melting temperature, the run time does not decrease. Once the slab has reached the melting temperature, the run time begins counting down. When the run time reaches 0:00 as displayed by the SNOWMELT item in the View menu, the 364 has finished melting.

**Note:** If a slab sensor is not used, the run time begins counting down as soon as the melting mode is enabled.

## COLD WEATHER CUT OUT (CWCO)

Maintaining the slab at either the melting or idling temperature during extremely cold temperatures can be expensive or impossible. The control shuts off the snow melting system once the outdoor air temperature drops below the Cold Weather Cut Out (CWCO) setting. While the control is in CWCO, the word CWCO is displayed in the SNOWMELT item in the View menu. If the control had been started prior to the CWCO, it resumes the melting mode once the outdoor air temperature rises above the CWCO setting.

## BOILER OPERATION

Refer to Section F for a description of the boiler operation.

## BOILER PROTECTION

The 364 ensures that the boiler water temperature remains above the Boil MIN setting. If the boiler water temperature begins to drop due to slab return temperature, the mixing device is throttled back to allow the boiler to recover. This minimizes the time that the boiler operates below its condensing temperature and prolongs the life expectancy of the boiler. The 364 can only provide boiler protection if the Boil SENS item is set to SUP or RET. The 364 can not provide boiler protection if the Boil SENS item is set to NONE.

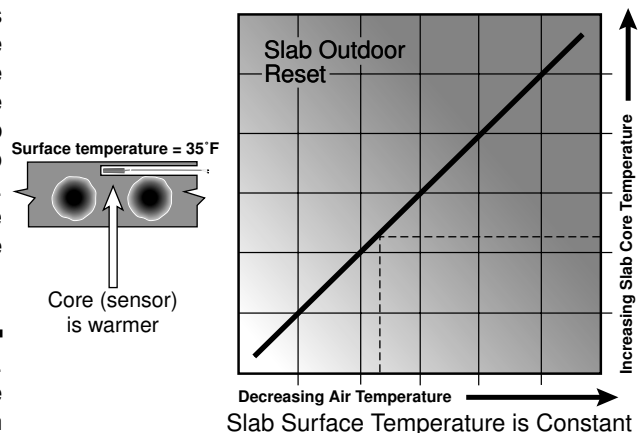
## MIXING SYSTEM PUMP (P3) OPERATION

The mixing system pump (*Mix Sys Pmp P3*) contact closes and remains closed as long as the control is either in the melting or idling mode. The mixing system pump contact shuts off if the control is in WWSD, CWCO or there is no call for melting or idling.

## Section E2: With Slab Sensor

### SLAB OUTDOOR RESET

When using a slab sensor, 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 the temperature difference between the surface of the slab and the slab sensor changes with the outdoor air temperature. Therefore, the slab core temperature is increased as the outdoor air temperature drops. The temperature displayed as the slab temperature is the temperature of the slab sensor. This sensor temperature is higher than the surface temperature of the slab.



### MELTING MODE (MELTING)

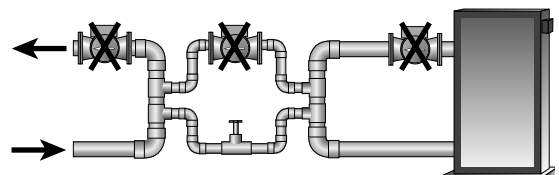
The Universal Reset Control 364 is a manual snow melting control. In order for the snow melting system to be started, one of the three methods described in section E4 must be used. When the control is in the melting mode, the *Melting* pointer is visible in the View menu and either EXT, INF or a running time can be read when viewing the SNOWMELT item in the View menu. The MELTING setting in the Adjust menu sets the slab surface temperature that is maintained while the control is in the melting mode.

### IDLING MODE (IDLING)

When the snow melting system starts from a cold temperature, the time required for the slab to reach the “Melting” temperature may be excessive. To decrease the start up time, the slab can be maintained at an “Idling” temperature. The Idle feature is also useful for preventing frost and light ice formation. When the control is in idling mode, the word IDLE can be read when looking at the SNOWMELT item in the View menu. The IDLING setting in the Adjust menu sets the slab surface temperature that is maintained while the control is in the idling mode.

### WARM WEATHER SHUT DOWN (WWSD)

When both the slab temperature and the outdoor temperature exceed the MELTING temperature by more than 1.5°F (1°C), the control enters into WWSD. In WWSD, the snow melting system is shut down in order to conserve energy.



## Section E3: Without Slab Sensor

In cases where a slab sensor has not been or cannot be installed in the snow melting slab, it is possible for the Universal Reset Control 364 to operate the snow melting system. This mode of operation is not recommended since the control can no longer regulate the slab temperature. Instead, the control supplies a calculated mixed supply water temperature to the slab. This method of operation can cause the slab to operate at surface temperatures that are either higher or lower than required. A higher surface temperature can lead to excessive energy usage and fuel costs. A lower surface temperature can cause the slab to freeze over.

### WARM WEATHER SHUT DOWN (WWSD)

Since a slab sensor is not in use, the Warm Weather Shut Down is determined only from the outdoor temperature. Once the outdoor temperature rises above the MELTING setting, the control goes into WWSD and ignores any demand for melting or idling.

### MELTING MODE (MELTING)

The Universal Reset Control 364 is a manual snow melting control. In order for the snow melting system to be started, one of the three methods described in section E4 must be used. When the control is in the melting mode, the *Melting* pointer is visible in the View menu and either EXT, INF or a running time can be read when viewing the SNOWMELT item in the View menu. The MELTING setting in the Adjust menu sets the theoretical slab surface temperature that is maintained while the control is in the melting mode.

### IDLING MODE (IDLING)

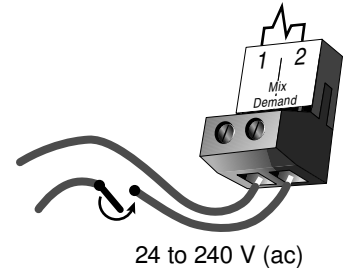
When the snow melting system starts from a cold temperature, the time required for the slab to reach the "Melting" temperature may be excessive. To decrease the start up time, the slab can be maintained at an "Idling" temperature. The Idle feature is also useful for preventing frost and light ice formation. When the control is in idling mode, the word IDLE can be read when looking at the SNOWMELT item in the View menu. The IDLING setting in the Adjust menu sets the theoretical slab surface temperature that is maintained while the control is in the idling mode.

## Section E4: Snow Melting Enable

There are three methods in which the snow melting system can be enabled on the Universal Reset Control 364. Either an external demand, Remote Start / Stop Module 039 or a Remote Display Module 040 can be used to start the snow melting system.

### EXTERNAL DEMAND

An external snow melting demand is generated when a voltage between 24 and 240 V (ac) is applied across the *Mix Demand* terminals (1 and 2). An external demand must be present for at least 4 seconds in order to start the snow melting system. Once started, the slab temperature is increased to the MELTING setting and maintained at the MELTING temperature until the RUN TIME reaches 0:00. If the RUN TIME reaches 0:00 and the external demand is still present, the control continues at the MELTING temperature until the external demand is removed or the system is otherwise stopped.



### REMOTE START / STOP MODULE 039

A Remote Start / Stop Module 039 can be used to start and stop the snow melting system. The snow melting system is enabled by pressing the button on the front of the 039. While the slab is coming up to temperature, a green indicator light flashes on the front of the 039. Once the slab is at the melting temperature and the RUN TIME is counting down, the green indicator light on the front of the 039 is on solid.



To disable the snow melting system when it is in melting mode, press 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 5 seconds. If the snow melting system is disabled while there is still an external 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 start and stop the snow melting system. The snow melting system is enabled by pressing the ▲ button on the 040 while in the View menu. Once the snow melting system is enabled, the word STRT is displayed in the LCD for at least five seconds. The 040 then displays the RUN TIME setting to allow the user to adjust it.



To disable the snow melting system when it is in the melting mode, press the ▼ button on the 040 while in the View menu. The word STOP is displayed for five seconds.

## Section F: Boiler Operation

### Section F1

Boiler  
Supply  
Sensor

### Section F2

Boiler  
Return  
Sensor

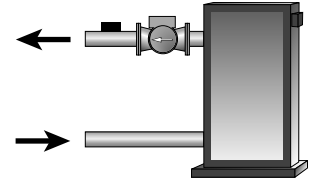
### Section F3

No  
Boiler  
Sensor

## Section F1: Boiler Supply Sensor

### BOILER SENSOR ON THE SUPPLY (Boil SENS = SUP)

The boiler sensor can be located on the boiler supply if the 364 is the only control that is operating the boiler. When in the supply mode, the 364 determines the required operating temperature for the boiler supply and cycles the *Boiler* contact to maintain the correct supply water temperature.



### BOILER TARGET TEMPERATURE (Boil TRG)

The Boil TRG temperature is determined from the demands that currently require heat. The boiler target temperature is set at least as high as the requirements of the highest temperature requirements of the current demands. The control displays the temperature that it is currently trying to maintain as the boiler supply temperature in the Boil TRG item in the View menu. If the control does not presently have a requirement for heat, it displays “---” in the LCD.

### BOILER MINIMUM (Boil MIN)

The Boil MIN is the lowest water temperature that the control is allowed to use as a Boil TRG temperature. During mild conditions, if the 364 calculates a Boil TRG temperature that is below the Boil MIN setting, the Boil TRG temperature is adjusted to at least the Boil MIN setting. During this condition, if the boiler is operating, and the boiler supply temperature is near the Boil MIN setting, the *Min / Max* pointer turns on in the LCD while the Boil TRG or the Boil SUP temperature is viewed. If the installed boiler is designed for low temperature operation, set the Boil MIN adjustment to OFF.

### BOILER MAXIMUM (Boil MAX)

The Boil MAX is the highest water temperature that the control is allowed to use as a Boil TRG temperature. If the control does target Boil MAX, and the Boil SUP temperature is near the Boil MAX temperature, the *Min / Max* pointer turns on in the LCD while the Boil TRG or the Boil SUP temperature is viewed. At no time does the control operate the boiler above 248°F (120°C).

### DIFFERENTIAL (Boil DIFF)

An on / off heat source such as a boiler must be operated with a differential to prevent short cycling. This differential is centered around the Boil TRG temperature. If the boiler supply temperature drops 1/2 of the differential setting below the Boil TRG temperature, the 364 closes the *Boiler* contact to fire the boiler. If the boiler supply temperature rises 1/2 of the differential setting above the Boil TRG temperature, the 364 opens the *Boiler* contact to turn off the boiler. With the 364, either a fixed or automatic differential setting is selected. If the AUTO differential is selected, the 364 automatically adjusts the boiler differential setting under the current load conditions to minimize short cycling.

### FIRE DELAY (FIRE DLY)

The FIRE DLY is the delay time that may happen between the time that the 364 closes the *Boiler* contact and the burner fires. This delay is usually the result of a 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 364 to adjust to different types of heat sources depending on their thermal mass.

#### **Light (LITE)**

The LITE setting is selected if the boiler that is being used has a low thermal mass. This means that the boiler 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. This is typical of many copper fin-tube boilers.

#### **Medium (MED)**

The MED setting is selected if the boiler that is being used has a medium thermal mass. This means that the boiler 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.

#### **Heavy (HEVY)**

The HEVY setting is selected if the boiler that is being used has a high thermal mass. This means that the boiler 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.

## BOILER OPERATION

When the 364 determines boiler operation is required, the *Boiler* contact terminals (15 and 16) close. While the *Boiler* contact is closed, the burner segment in the LCD is displayed.

## BOILER PURGE (PURGE P1)

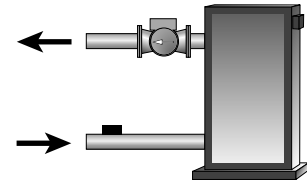
After all of the demands are satisfied, the 364 continues to operate the primary pump (P1, terminal 8) for a period of time. The length of time that the primary pump continues to run is adjustable (PURGE P1). This setting allows any excess heat to be purged out of the boiler after the burner is shut off. This also helps to prevent the water in the boiler from flashing into steam after the boiler is shut off. The primary pump (P1) continues to run either until the purging time has elapsed or the Boil SUP temperature has dropped more than a differential below the Boil MIN setting. However, there must not be any motorized valves that will restrict water flow through the pump and boiler.

## Section F2: Boiler Return Sensor

### BOILER SENSOR ON THE RETURN (RET)

The boiler sensor should be located on the boiler return if the 364 is one of many controls that can call for boiler operation. When in the return mode, the 364 provides a boiler enable. The 364 no longer tries to control the boiler supply water temperature directly, but allows the boiler to operate at the operating aquastat setting. If this mode of operation is selected, the primary pump should not be operated by the operating aquastat as this may lead to improper cycling of the boiler because of inconsistent flow past the boiler sensor.

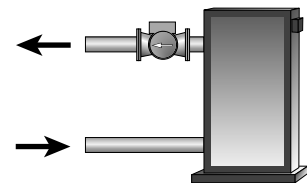
When the mixing device begins to ramp up or either a boiler demand, DHW demand or setpoint demand is present, the *Boiler* contact on the 364 closes. The *Boiler* contact remains closed until all the demands no longer require heat. With the sensor on the boiler return, the 364 is still capable of providing boiler protection as described in section D1.



## Section F3: No Boiler Sensor

### NO BOILER SENSOR (NONE)

The 364 is capable of operating without a boiler sensor if desired. Without a boiler sensor, the 364 is unable to provide boiler protection. The *Boiler* contact still functions without the boiler sensor. When the mixing device begins to ramp up or a boiler demand, DHW demand or setpoint demand is present, the *Boiler* contact on the 364 closes. The *Boiler* contact remains closed until all of the demands no longer require heat. This type of application is typical if the 364 is drawing heat from a heat source that already incorporates some form of boiler protection.



## 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.

### 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 364 includes:* One Universal Reset Control 364, One Outdoor Sensor 070, Two Universal Sensors 071, Data Brochures D 364, D 070, D 001, User Brochure U 364, Application Brochure A 364, Essays E 003, 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 in (9 mm) to ensure proper connection to the control.
- Install the Outdoor Sensor 070, Boiler Sensor 071 and Mixing Sensor 071 according to the installation instructions in the Data Brochure D 070 and run the wiring back to the control.
- If a DHW Sensor 071 is used, install the sensor according to the installation instructions in the Data Brochure D 070 and run the wiring back to the control.
- If a Mixing Return Sensor 071 is used, install the sensor according to the installation instructions in the Data Brochure D 070 and run the wiring back to the control.
- If a tekmar Slab Sensor is used, install the slab sensor according to the installation instructions in the Data Brochure D 070 and run the wiring back to the control.
- 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.
- If a tekmar Zone Control is used, run the wires from the Zone Control to the 364. Refer to instructions supplied with Zone Control.
- Run wire from other system components (pumps, boiler, actuating motors, etc.) to the control.
- Run wires from the 120 V (ac) power to the control. Use a clean power source to ensure proper operation. Multi-strand 16 AWG wire is recommended for all 120 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**

#### **120 V (ac) Power**

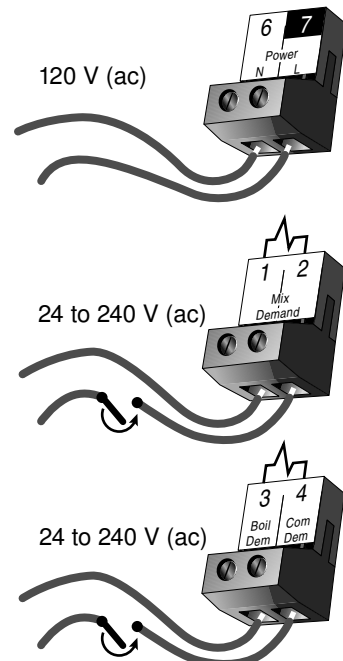
Connect the 120 V (ac) power supply to the *Power L* and *Power N* terminals (7 and 6). This connection provides power to the microprocessor and display of the control. As well, this connection provides power to the *Prim P1* terminal (8) from the *Power L* terminal (7).

#### **Mixing Demand**

To generate a mixing demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *Mix Demand* terminals (1 and 2).

#### **Boiler Demand**

To generate a boiler demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *Boil Dem* and *Com Dem* terminals (3 and 4).



## DHW Demand

To generate a DHW demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *Setp / DHW* and the *Com Dem* terminals (5 and 4).

## Setpoint Demand

To generate a setpoint demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *Setp / DHW* and the *Com Dem* terminals (5 and 4).

## ⚠ Output Connections

### Boiler Contact

The *Boiler* terminals (15 and 16) are an isolated output in the 364. 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 364 requires the boiler to fire, it closes the contact between terminals 15 and 16.

### DHW Pump / Valve Contact

The *DHW Pmp / Vlv* terminals (13 and 14) are an isolated output in the 364. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break power to the DHW pump or DHW valve. Since this is an isolated contact, it may switch a voltage between 24 V (ac) and 240 V (ac).

### Primary Pump Contact (Prim P1)

The *Prim P1* output terminal (8) on the 364 is a powered output. When the relay in the 364 closes, 120 V (ac) is provided to the *Prim P1* terminal (8) from the *Power L* terminal (7). To operate the primary pump, connect one side of the primary pump circuit to terminal 8 and the second side of the pump circuit to the neutral (N) side of the 120 V (ac) power supply.

### Boiler System Pump (Boil Sys Pmp P2)

The *Boil Sys Pmp P2* terminals (9 and 10) are an isolated output in the 364. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break power to the boiler system pump. Since this is an isolated contact, it may switch a voltage between 24 V (ac) and 240 V (ac).

### Mixing System Pump (Mix Sys Pmp P3)

The *Mix Sys Pmp P3* terminals (11 and 12) are an isolated output in the 364. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break power to the mixing system pump. Since this is an isolated contact, it may switch a voltage between 24 V (ac) and 240 V (ac).

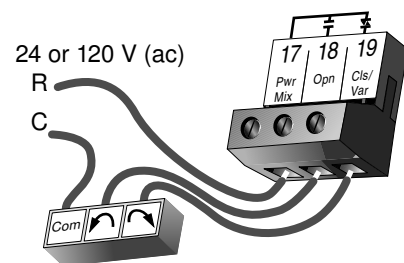
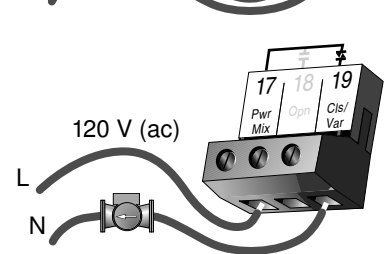
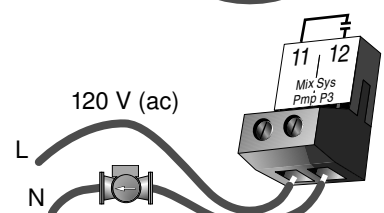
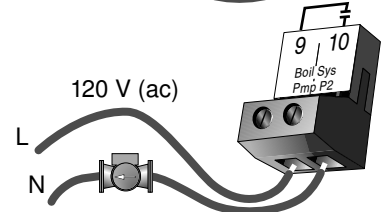
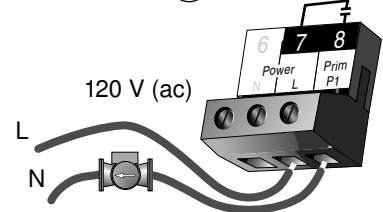
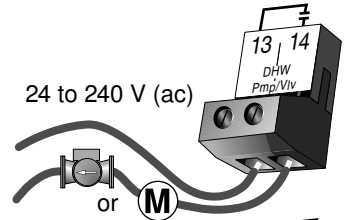
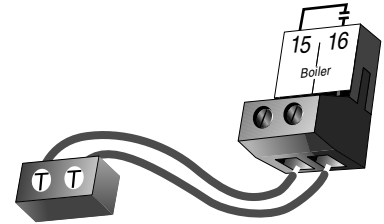
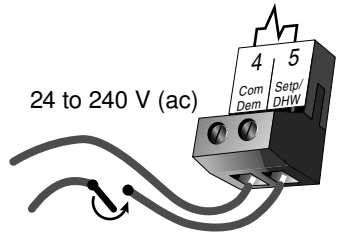
### Variable Speed Injection Pump

The 364 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 364 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 *Cls / Var* terminal (19) on the 364. Connect the *Pwr Mix* terminal (17) to the live (L) side of the 120 V (ac) power source. The other wire on the variable speed injection pump must be connected to the neutral (N) side of the 120 V (ac) power supply.

### Mixing Valve Actuator

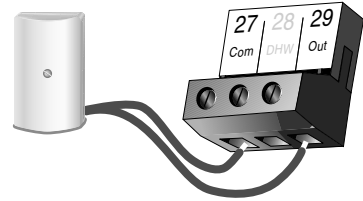
If a mixing valve is used, connect one side of the 24 V (ac) power to the *Pwr Mix* terminal (17) on the control. The output relay *Opn* (18) is then connected to the open terminal of the actuating motor and the output relay *Cls / Var* (19) is connected to the close terminal of the actuating motor. Connect the second side of the 24 V (ac) circuit to the common terminal of the actuating motor.



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

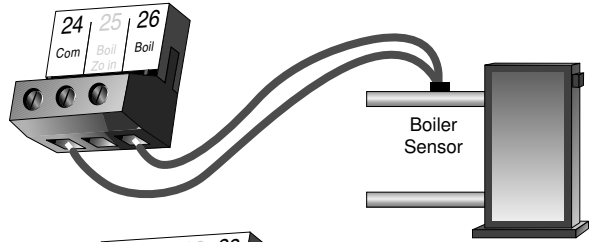
**Outdoor Sensor**

Connect the two wires from the Outdoor Sensor 070 to the *Com* and *Out* terminals (27 and 29). The outdoor sensor is used by the 364 to measure the outdoor air temperature.



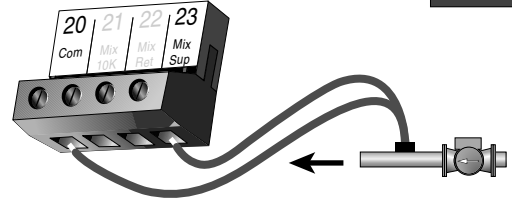
**Boiler Sensor**

Connect the two wires from the Boiler Sensor 071 to the *Com* and *Boil* terminals (24 and 26). The boiler sensor is used by the 364 to measure the water temperature of the boiler.



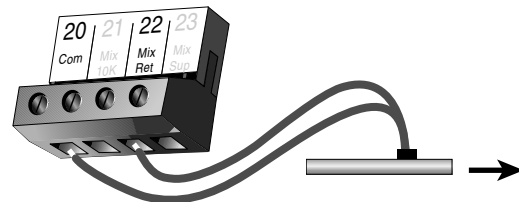
**Mixing Supply Sensor**

Connect the two wires from the Mixing Supply Sensor 071 to the *Com* and *Mix Sup* terminals (20 and 23). The mixing supply sensor is used by the 364 to measure the supply temperature after the mixing device. Normally the sensor is attached downstream of the mixing system pump (P3).



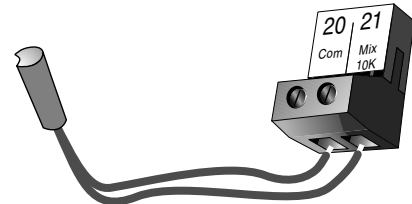
**Mixing Return Sensor**

Connect the two wires from the Mixing Return Sensor 071 to the *Com* and *Mix Ret* terminals (20 and 22). The mixing return sensor is used by the 364 to measure the fluid return temperature from the snow melting slab. A mixing return sensor is only used when the *Snow Melting / Mixing Reset* DIP switch is set to the *Snow Melting* position.



**Mix 10K Sensor**

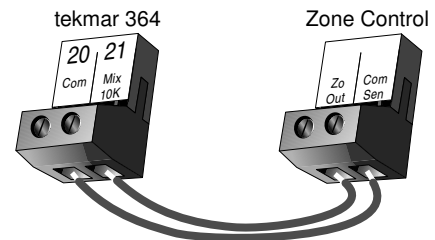
Either an indoor sensor, slab sensor, or zone control may be connected to the *Mix 10K* input. If a sensor is used, connect the two wires from the sensor to the *Com* and *Mix 10K* terminals (20 and 21).



**Mixing Zone Control Input**

If an external tekmar zone control is used for control of mixing zones, connect the wire from the *Com Sen* terminal on the zone control to the *Com* terminal (20) on the 364. Connect the *Zo Out* terminal on the zone control to the *Mix 10K* terminal (21) on the 364.

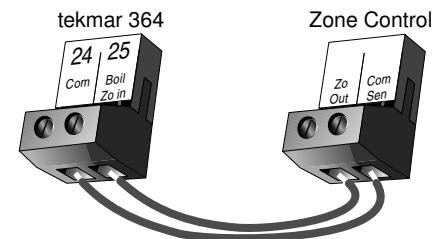
**Note:** The wires from the zone control are polarity sensitive. The communication does not operate correctly if the wires are reversed.



**Boiler Zone Control Input**

If an external tekmar zone control is used for control of boiler zones, connect the wire from the *Com Sen* terminal on the zone control to the *Com* terminal (24) on the 364. Connect the *Zo Out* terminal on the zone control to the *Boil Zo In* terminal (25) on the 364.

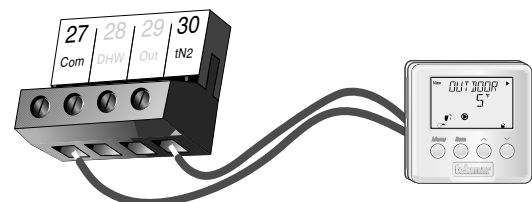
**Note:** The wires from the zone control are polarity sensitive. The communication does not operate correctly if the wires are reversed.



**tekmar Net tN2 Device**

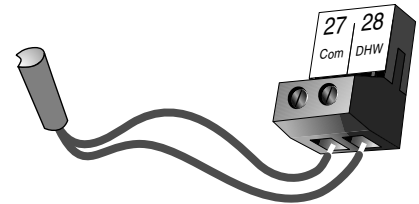
A Remote Display Module (RDM) 040 or Remote Start / Stop Module 039 may be connected to the tekmar Net tN2 input. Connect the *Com* terminal from the 040 or 039 to the *Com* terminal (27) on the 364. Connect the *tN2* terminal from the 040 or 039 to the *tN2* terminal (30) on the 364.

**Note:** The wires from the RDM and Remote Start / Stop Module are polarity sensitive. The 040 or 039 do not operate correctly if the wires are reversed.



## DHW Sensor

A DHW Sensor 071 can connect to the *DHW* input. Connect the two wires from the sensor to the *Com* and *DHW* terminals (27 and 28).



## STEP FIVE TESTING THE WIRING

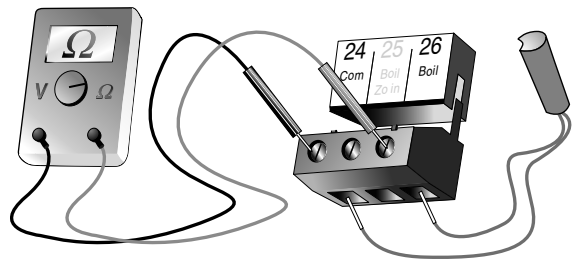
Each terminal block must be unplugged from its header on the control before power is applied for testing. To remove the terminal block, pull straight down from the control.

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 Ohms, is essential to properly test the wiring and sensors.

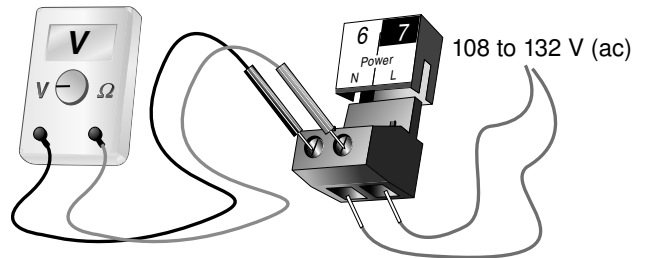
### ⚠ **Test The Sensors**

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**

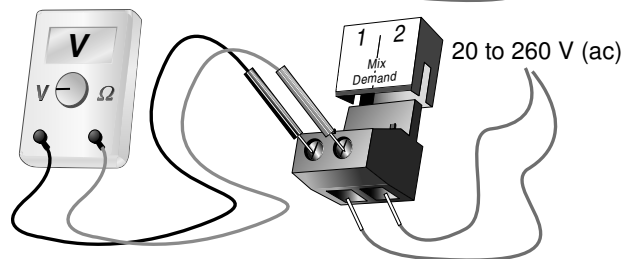
Make sure exposed wires and bare terminals are not in contact with other wires or grounded surfaces. Turn on the power and measure the voltage between the *Power L* and *Power N* terminals (7 and 6) using an AC voltmeter, the reading should be between 108 and 132 V (ac).



### ⚠ **Test The Powered Inputs**

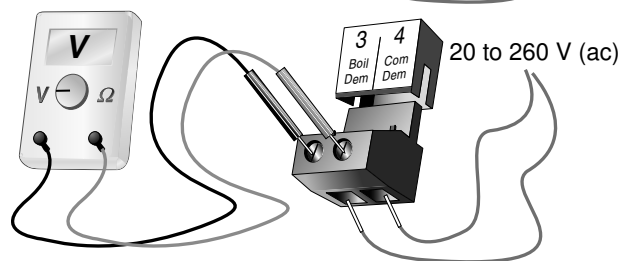
#### Mixing Demand

If a mixing demand is used, measure the voltage between the *Mix Demand* terminals (1 and 2). When the mixing demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the mixing demand device is off, you should measure less than 5 V (ac).



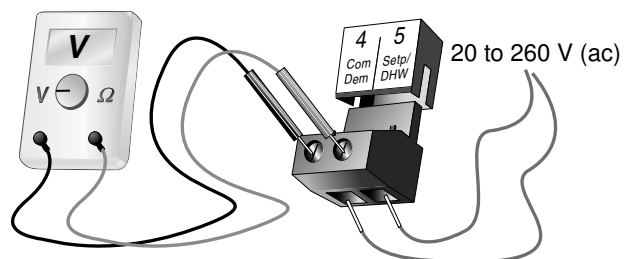
#### Boiler Demand

If a boiler demand is used, measure the voltage between the *Boil Dem* and the *Com Dem* terminals (3 and 4). When the boiler demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the boiler demand device is off, you should measure less than 5 V (ac).



#### DHW Demand

If a DHW demand is used, measure the voltage between the *Setp / DHW Dem* and the *Com Dem* terminals (5 and 4). When the DHW demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the DHW demand device is off, you should measure less than 5 V (ac).



#### Setpoint Demand

If a setpoint demand is used, measure the voltage between the *Setp / DHW Dem* and the *Com Dem* terminals (5 and 4). When the setpoint demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the setpoint demand device is off, you should measure less than 5 V (ac).

## Test The Outputs

### Primary Pump (Prim P1)

If a primary pump is connected to the *Prim P1* terminal (8), make sure that power to the terminal block is off and install a jumper between the *Power L* and *Prim P1* terminals (7 and 8). When power is applied to the *Power L* and *Power N* terminals (6 and 7), the primary 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.

### Boiler System Pump (Boil Sys Pmp P2)

If a boiler system pump is connected to the *Boil Sys Pmp P2* terminals (9 and 10), make sure power to the pump circuit is off and install a jumper between terminals (9 and 10). When the pump circuit is powered up, the boiler system pump should start. If the pump does not start, 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.

### Mixing System Pump (Mix Sys Pmp P3)

If a mixing system pump is connected to the *Mix Sys Pmp P3* terminals (11 and 12), make sure power to the pump circuit is off and install a jumper between terminals (11 and 12). When the pump circuit is powered up, the mixing system pump should start. If the pump does not start, 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.

### DHW Pump OR Valve (DHW Pmp/Vlv)

If a DHW pump or DHW valve is connected to the *DHW Pmp / Vlv* terminals (13 and 14), make sure power to the pump or valve circuit is off and install a jumper between terminals (13 and 14). When the DHW circuit is powered up, the DHW pump should turn on or the DHW valve should open completely. If the DHW pump or valve fails to operate, check the wiring between the terminals and the pump or valve and refer to any installation or troubleshooting information supplied with these devices. If the DHW pump or valve operates properly, disconnect the power and remove the jumper.

### Boiler

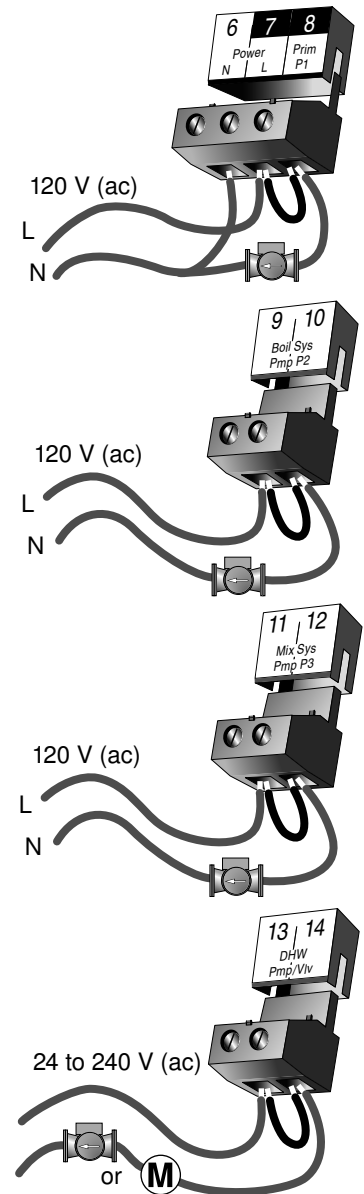
If the boiler is connected to the *Boiler* terminals (15 and 16), make sure power to the boiler circuit is off, and install a jumper between the terminals. When the boiler circuit is powered up, the boiler should fire. If the boiler does not turn on, refer to any installation or troubleshooting information supplied with the boiler. (The boiler may have a flow switch that prevents firing until the primary pump (P1) 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 *Cls / Var* terminals (17 and 19), make sure the power to the terminal block is off and install a jumper between the *Pwr Mix* and *Cls / Var* terminals (17 and 19). 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* and *Cls / Var* terminals (17, 18 and 19), make sure power to the motor circuit is off and install a jumper between the *Pwr Mix* and *Opn* terminals (17 and 18). 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 / Var* terminals (17 and 19). 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.



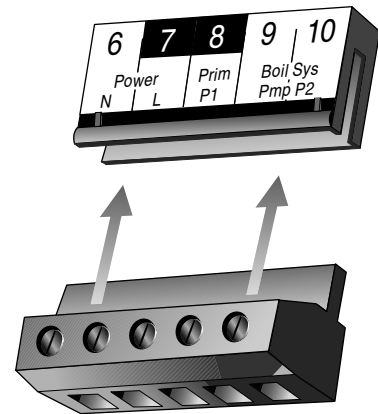
## ⚠ **Connecting The Control**

**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 or 120 V (ac) 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.



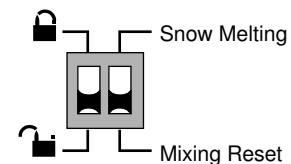
## **Cleaning**

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 any 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 cannot 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 ▼ buttons 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) menu 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.

### **SNOW MELTING / MIXING RESET (FACTORY SETTING IS MIXING RESET)**

The *Snow Melting / Mixing Reset* DIP switch determines the operating mode of the mixing system. When the DIP switch is set to the *Mixing Reset* setting, the mixing system is used to supply heat to a building heating system. The control uses a *Characterized Heating Curve* method of outdoor reset that matches the heating characteristics of the type of terminal unit that is being used. See Sequence of Operation, Section A for a description of terminal units. When this setting is used, a desired indoor air setting, design outdoor setting and a design supply setting must be entered into the control.

When the DIP switch is set to the *Snow Melting* setting, the mixing system is used to supply heat to a single zone snow melting system.

## Access Levels

The Universal Reset Control 364 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.



## Notes

| Item Field | Access Level |     |      |      |     | Description   | Range   |
|------------|--------------|-----|------|------|-----|---|---|
|            | Section      | LTD | USER | INST | ADV |   |   |
| OUTDOOR    |              | ●   | ●    | ●    | ●   | Current outdoor air temperature as measured by the outdoor sensor.  | -67 to 149°F<br>(-55 to 65°C)                                 |
| ROOM TRG   | D3           |     | ●    | ●    | ●   | Target room air temperature. "---" denotes no heat is required.<br><b>MIX 10K = INDR</b>  | ---, 35 to 100°F<br>(2 to 38°C)                               |
| ROOM       | D3           | ●   | ●    | ●    | ●   | Measured room air temperature at the indoor sensor.<br><b>MIX 10K = INDR</b>  | -58 to 167°F<br>(-50 to 75°C)                                 |
| MIX Zoin   | D3           |     |      |      | ●   | This is the signal that is being received from a tekmar Zone Control that is operating the mixing zones.<br><b>MIX 10K = ZOIN</b>                                     | ---, 35 to 110°F<br>(2 to 43°C)                               |
| SLAB TRG   | D3           |     |      |      | ●   | Target slab temperature. "---" denotes no heat is required.<br><b>DIP switch = Snow melting, MIX 10K = SLAB</b>   | ---, -58 to 167°F<br>(-50 to 75°C)                            |
| SLAB       | D3           |     |      | ●    | ●   | Current slab sensor temperature.<br><b>MIX 10K = SLAB</b>   | -58 to 167°F<br>(-50 to 75°C)                                 |
| SNOWMELT   | E1           | ●   | ●    | ●    | ●   | Current operating status of the snow melting system.<br><b>DIP switch = Snow melting</b>  | STRT, STOP, IDLE, EXT, 0:00 to 17:00 hr, ---, INF, WWSD, CWCO |
| MIX TRG    | D1           |     |      | ●    | ●   | Target mixed supply is the temperature the control is currently trying to maintain at the mixing sensor.  | ---, -25 to 230°F<br>(-32 to 110°C)                           |
| MIX SUP    | D1           |     | ●    | ●    | ●   | Current mixed supply water temperature as measured by the mixing sensor.  | -31 to 266°F<br>(-35 to 130°C)                                |
| MIX ΔT     | E1           |     |      | ●    | ●   | Current mixed ΔT. This is the current temperature difference between the mixed supply and the mixed return sensors.<br><b>DIP switch = Snow Melting, ΔT MAX ≠ OFF</b> | -85 to 170°F<br>(-47 to 94°C)                                 |
| Boil Zoin  | B2           |     |      |      | ●   | This is the signal that is being received from a tekmar Zone Control that is operating the boiler zones.  | ---, 35 to 110°F<br>(2 to 43°C)                               |



364 View Menu (2 of 2)

| Item Field | Access Level |     |      |      | Description   | Range                                     |
|------------|--------------|-----|------|------|---|---|
|            | Section      | LTD | USER | INST |   |   |
| Boil TRG   | F1           |     | ●    | ●    | Target boiler supply is the temperature the control is currently trying to maintain at the boiler sensor $\pm 1/2$ of the differential.<br><b>Boil SENS = SUP</b> | ---, 1 to 255°F (-17 to 124°C)            |
| Boil SUP   | F1           |     | ●    | ●    | Current boiler supply water temperature as measured by the boiler sensor.<br><b>Boil SENS = SUP</b>   | -31 to 266°F (-35 to 130°C)               |
| Boil RET   | F2           |     | ●    | ●    | Current boiler return water temperature as measured by the boiler sensor.<br><b>Boil SENS = RET</b>   | -31 to 266°F (-35 to 130°C)               |
| XCHG TRG   | C1           |     | ●    | ●    | Minimum boiler supply temperature during a DHW demand.<br><b>DHW SENS = NONE, DHW THRU <math>\neq</math> NONE, Boil SENS = SUP</b>                                | ---, OFF, 100 to 220°F (OFF, 38 to 104°C) |
| DHW TRG    | C1           |     | ●    | ●    | Target DHW tank temperature.<br><b>DHW SENS = DHW, DHW THRU <math>\neq</math> NONE</b>  | ---, OFF, 70 to 190°F (OFF, 21 to 88°C)   |
| DHW        | C1           | ●   | ●    | ●    | Current DHW tank temperature.<br><b>DHW SENS = DHW, DHW THRU <math>\neq</math> NONE</b>   | -31 to 266°F (-35 to 130°C)               |

364 Adjust Menu (1 of 5)

| Item Field | Access Level |     |      |      | Description  | Range  | Actual Setting |
|------------|--------------|-----|------|------|--|--|----------------|
|            | Section      | LTD | USER | INST |  |  |                |
| MELTING    | E2<br>E3     |     | ●    | ●    | If a slab sensor is used, this item is the desired slab surface temperature while in the melting mode. If no slab sensor is used, this item is the theoretical slab surface temperature while in the melting mode.<br><b>DIP switch = Snow Melting</b> | 32 to 95°F (0 to 35°C)<br>Default = 36°F (2°C)             |                |
| IDLING     | E2<br>E3     |     | ●    | ●    | This item is the desired slab surface temperature while in the idling mode.<br><b>DIP switch = Snow Melting</b>  | OFF, 20 to 95°F (OFF, -7 to 35°C)<br>Default = OFF         |                |
| RUN TIME   | E1           | ●   | ●    | ●    | This item is the time that the slab is operated for once it has reached the MELTING temperature. This item can only be viewed if a Remote Start / Stop Module 039 has not been connected.<br><b>DIP switch = Snow Melting</b>                          | OFF, 0:30 to 17:00 hr, INF (Infinite)<br>Default = 4:00 hr |                |

| Item Field     | Access Level |     |      |      | Description  | Range  | Actual Setting |
|----------------|--------------|-----|------|------|--|--|----------------|
|                | Section      | LTD | USER | INST |  |  |                |
| $\Delta T$ MAX | E1           |     | ●    | ●    | The maximum $\Delta T$ for the snow melting slab.<br><b>DIP switch = Snow Melting</b>  | 10 to 70°F, OFF<br>(-6 to 39°C, OFF)<br>Default = 40°F (22°C)    |                |
| CWCO           | E1           |     | ●    | ●    | The Cold Weather Cut Off temperature for the snow melting system.<br><b>DIP switch = Snow Melting</b>  | OFF, -30 to 50°F<br>(OFF, -34 to 10°C)<br>Default = 10°F (-12°C) |                |
| MIX ROOM       | D1           | ●   | ●    | ●    | The desired room air temperature for the mixing zones. Note: There is only a $\pm 3^\circ\text{F}$ ( $\pm 1^\circ\text{C}$ ) adjustment in the LTD access level.<br><b>DIP switch = Mixing Reset</b> | 35 to 100°F<br>(2 to 38°C)<br>Default = 70°F (21°C)              |                |
| MIX 10K        | D3           |     | ●    | ●    | The device that is connected to the Mix 10K input.<br><b>DIP switch = Mixing Reset</b>   | NONE, INDR, ZOIN, SLAB (only if MIX MIN = OFF)<br>Default = NONE |                |
| MIX 10K        | E2<br>E3     |     | ●    | ●    | Selects if a slab sensor is connected to the control.<br><b>DIP switch = Snow Melting</b>  | NONE, SLAB<br>Default = NONE                                     |                |
| SLAB MIN       | D3           |     | ●    | ●    | The minimum temperature at the slab sensor as long as the control is not in WWSD.<br><b>DIP switch = Mixing Reset, MIX 10K = SLAB</b>  | OFF, 35 to 120°F<br>(OFF, 2 to 49°C)<br>Default = 70°F (21°C)    |                |
| SLAB MAX       | D3           |     | ●    | ●    | The maximum temperature at the slab sensor.<br><b>DIP switch = Mixing Reset, MIX 10K = SLAB</b>  | 40 to 150°F<br>(4 to 66°C)<br>Default = 90°F (32°C)              |                |
| MIX TERM       | A            |     | ●    | ●    | The type of terminal units that are being used for the mixing side of the heating system.<br><b>DIP switch = Mixing Reset</b>  | HRF1, HRF2, COIL, CONV, RAD, BASE<br>Default = HRF1              |                |
| MIX MIN        | D1           |     | ●    |      | The minimum supply water temperature for the mixing system.<br><b>DIP switch = Mixing Reset</b>  | OFF, 35 to 150°F<br>(OFF, 2 to 66°C)<br>Default = OFF            |                |
| MIX INDR       | D1           |     | ●    | ●    | The design indoor air temperature used in the heat loss calculation for the mixing system.<br><b>DIP switch = Mixing Reset</b>   | 35 to 100°F<br>(2 to 38°C)<br>Default = 70°F (21°C)              |                |
| MIX DESGN      | D1           |     | ●    | ●    | The design supply temperature used in the heat loss calculation for the mixing system.<br><b>DIP switch = Mixing Reset</b>   | 70 to 220°F<br>(21 to 104°C)<br>Default = 120°F (49°C)           |                |

| Item Field | Access Level |     |      |      |     | Description  | Range   | Actual Setting |
|------------|--------------|-----|------|------|-----|--|---|----------------|
|            | Section      | LTD | USER | INST | ADV |  |   |                |
| MIX MAX    | D1           |     | ●    | ●    |     | The maximum supply temperature for the mixing system.  | 80 to 210°F, OFF<br>(27 to 99°C, OFF)<br>Default = 140°F (60°C)   |                |
| OUT DSGN   | B1<br>D1     |     | ●    | ●    |     | The design outdoor air temperature used in the heat loss calculation for the heating system.   | -60 to 50°F<br>(-51 to 10°C)<br>Default = 10°F (-12°C)            |                |
| MIXING     | D2           |     | ●    | ●    |     | The type of mixing device that is to be used in the heating system.  | FLOT (Floating),<br>VAR (Variable Speed)<br>Default = VAR         |                |
| MOTR SPI   | D2           |     | ●    | ●    |     | The time that the actuating motor requires to operate from fully closed to fully open.<br><b>MIXING = FLOT</b>   | 30 to 230 sec<br>Default = 160 sec                                |                |
| Boil SENS  | F            |     |      | ●    |     | The location for the boiler sensor. This affects operation of the boiler contact.  | SUP (Supply), RET (Return), NONE<br>Default = SUP                 |                |
| Boil ROOM  | B1           | ●   | ●    | ●    | ●   | The desired room air temperature for the boiler zones. Note: There is only a $\pm 3^\circ\text{F}$ ( $\pm 1^\circ\text{C}$ ) adjustment in the LTD access level.<br><b>Boil SENS = SUP</b> | 35 to 100°F<br>(2 to 38°C)<br>Default = 70°F (21°C)               |                |
| Boil TERM  | A            |     | ●    | ●    |     | The type of terminal units that are being used for the boiler side of the heating system.<br><b>Boil SENS = SUP</b>  | HRF1, HRF2,<br>COIL, CONV,<br>RAD, BASE<br>Default = CONV         |                |
| Boil INDR  | B1           |     | ●    | ●    |     | The design indoor air temperature used in the heat loss calculation for the boiler system.<br><b>Boil SENS = SUP</b>   | 35 to 100°F<br>(2 to 38°C)<br>Default = 70°F (21°C)               |                |
| Boil DSGN  | B1           |     | ●    | ●    |     | The design supply temperature used in the heat loss calculation for the boiler system.<br><b>Boil SENS = SUP</b>   | 70 to 220°F<br>(21 to 104°C)<br>Default = 190°F (88°C)            |                |
| Boil MAX   | B1<br>F1     |     |      | ●    |     | The maximum temperature allowed for the boiler target temperature.<br><b>Boil SENS = SUP</b>   | 120 to 225°F, OFF<br>(49 to 107°C, OFF)<br>Default = 210°F (99°C) |                |
| Boil MIN   | B1<br>F1     |     | ●    | ●    |     | The minimum temperature allowed for the boiler target temperature.<br><b>Boil SENS <math>\neq</math> NONE</b>  | OFF, 80 to 180°F<br>(OFF, 27 to 82°C)<br>Default = 140°F (60°C)   |                |

| Item Field | Access Level |     |      |      |     | Description  | Range   | Actual Setting |
|------------|--------------|-----|------|------|-----|--|---|----------------|
|            | Section      | LTD | USER | INST | ADV |  |   |                |
| FIRE DLY   | F1           |     | ●    | ●    |     | The time delay that the control can expect between the time the boiler contact closes and the burner fires.<br><b>Boil SENS = SUP</b>    | 0:00 to 3:00 min<br>Default = 0:10 min                            |                |
| Boil MASS  | F1           |     | ●    | ●    |     | The thermal mass characteristics of the boiler that is being used.<br><b>Boil SENS = SUP</b>   | LITE, MED, HEVY<br>Default = MED                                  |                |
| Boil DIFF  | F1           |     | ●    | ●    |     | The differential that the control is to use when it is operating the boiler.<br><b>Boil SENS = SUP</b>                                   | AUTO, 2 to 42°F<br>(AUTO, 1 to 23°C)<br>Default = AUTO            |                |
| DHW THRU   | C1           |     | ●    | ●    |     | The device that is being used to supply flow to the heat exchanger in the DHW storage tank.  | NONE, PUMP, VALV<br>Default = PUMP                                |                |
| DHW SENS   | C1           |     | ●    | ●    |     | Selects whether or not a DHW sensor is being used to measure the DHW tank temperature.<br><b>DHW THRU ≠ NONE</b>                         | NONE, DHW<br>Default = NONE                                       |                |
| DHW TANK   | C1           |     | ●    | ●    | ●   | The desired DHW storage tank temperature.<br><b>DHW THRU ≠ NONE, DHW SENS = DHW</b>  | OFF, 70 to 190°F<br>(OFF, 21 to 88°C)<br>Default = 140°F (60°C)   |                |
| DHW XCHG   | C1           |     | ●    | ●    |     | The minimum boiler supply temperature to the DHW storage tank.<br><b>DHW THRU ≠ NONE, DHW SENS = NONE, Boil SENS = SUP</b>               | OFF, 100 to 220°F<br>(OFF, 38 to 104°C)<br>Default = 180°F (82°C) |                |
| DHW PRI    | C2           |     | ●    | ●    |     | The portions of the heating system that the DHW will have priority over.<br><b>DHW THRU ≠ NONE</b>                                       | NONE, MIX, B+M<br>Default = NONE                                  |                |
| SETPOINT   | C4           |     | ●    | ●    |     | The minimum boiler supply temperature when a setpoint demand is present.<br><b>Boil SENS = SUP AND DHW SENS = DHW OR DHW THRU = NONE</b> | OFF, 70 to 220°F<br>(OFF, 21 to 104°C)<br>Default = 180°F (82°C)  |                |
| WWSI       | A            |     | ●    | ●    | ●   | The system's warm weather shut down temperature.   | 35 to 100°F, OFF<br>(2 to 38°C, OFF)<br>Default = 70°F (21°C)     |                |
| PURGE P1   | F1           |     |      | ●    |     | The maximum length of time that the primary pump will continue to run after all of the demands have been removed.                        | OFF,<br>0:10 to 40:00 min<br>Default = 0:20 min                   |                |

364 **Adjust** Menu (5 of 5)

| Item Field | Access Level |     |      |      | Description   | Range                           | Actual Setting |
|------------|--------------|-----|------|------|---|---------------------------------|----------------|
|            | Section      | LTD | USER | INST |   |                                 |                |
| EXERCISE   | A            |     |      |      | <ul style="list-style-type: none"> <li>The frequency with which the control will exercise the pumps and valves that are operated by the control.</li> </ul> | 30 to 240 hr<br>Default = 70 hr |                |

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

| Item Field | Access Level |      |      |     | Description  | Range                                  |
|------------|--------------|------|------|-----|--|--|
|            | LTD          | USER | INST | ADV |  |  |
| UNITS      |              |      |      |     | <ul style="list-style-type: none"> <li>The units of measure that all of the temperatures are to be displayed in by the control.</li> </ul>   | °F, °C<br>Default = °F                 |
| BACKLITE   |              |      |      |     | <ul style="list-style-type: none"> <li>The operating mode for the back lighting on the LCD as well as the time of keypad inactivity until the control automatically returns to the default display.</li> <li><b>BACKLITE = OFF (returns after 10 seconds),</b></li> <li><b>BACKLITE = 30 sec (returns after 30 seconds),</b></li> <li><b>BACKLITE = ON (returns after 90 seconds)</b></li> </ul> | OFF, 30 sec, ON<br>Default = ON        |
| ACCESS     |              |      |      |     | <ul style="list-style-type: none"> <li>The access level that is to be used by the control.</li> <li><b>DIP switch Unlock</b></li> </ul>  | ADV, INST, USER, LTD<br>Default = INST |

## Testing the Control

The Universal Reset Control 364 has a built-in test routine which is used to test the main control functions. The 364 continually monitors the sensors and displays an error message whenever a fault is found. See the following pages for a list of the 364'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.

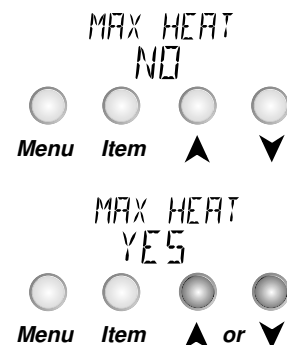
During the test routine, the test sequence is paused by pressing the **Test** button. While paused, the control displays the testing step as well as the word PAUS. If the **Test** button is not pressed again for 5 minutes while the test sequence is paused, the control exits the entire test routine. If 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. If VAR is selected in the MIXING item, the injection pump is ramped up over 10 seconds to 100%.
- Step 2** If FLOT is selected in the MIXING item, the mixing valve is run fully closed. If VAR is selected in the MIXING item, the injection pump is ramped down over 10 seconds.
- Step 3** The mixing system pump (P3) is turned on for 10 seconds and then shuts off.  
**Note:** Only if there is a mixing demand can the control be paused in step 3.
- Step 4** The boiler system pump (P2) is turned on for 10 seconds and then shuts off.  
**Note:** Only if there is a boiler demand can the control be paused in step 4.
- Step 5** The primary pump (P1) is turned on and remains on.
- Step 6** The *Boiler* contact is turned on for 10 seconds. After 10 seconds, the *Boiler* and *Prim P1* contacts are shut off.  
**Note:** Only if there is a boiler demand or a mixing demand can the control be paused in step 6.
- Step 7** If PUMP is selected in the DHW THRU item, the *DHW Pmp/Vlv* contact is closed for 10 seconds. If VLV is selected in the DHW THRU item, the *DHW Pmp/Vlv* and *Prim P1* contacts are closed for 10 seconds. If NONE is selected in the DHW THRU item, N/A is displayed in the LCD.  
**Note:** Only if there is DHW demand can the control be paused in step 7.
- Step 8** After the test sequence is completed, the word COMPLETE is displayed for 1 second and the control resumes its normal operation.

### MAX HEAT

The Universal Reset Control 364 has a function called Max Heat. In this mode, the 364 turns on and operates the system up to the maximum set temperatures, and the mixing device at the set percentage, as long as there is a demand for heat. 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 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 zone 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.

### Understand the Sequence of Operation

Understand the sequence of operation of the system. If a particular zone is not receiving enough heat, which pumps or valve 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 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 the 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 & 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 the 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 the information to help diagnose any remaining problems.

| Error Displayed  | Description of Error   |
|------------------|--|
| CTRL ERR<br>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 <b>Menu</b> or <b>Item</b> button will clear this error.  |
| CTRL ERR<br>ADJ5 | 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 set to ADV in order to clear the error.                                |
| CTRL ERR<br>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 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 Misc menu of the control have been checked by the user or installer. Note: Access level must be set to ADV in order to clear the error. |
| CTRL ERR<br>A/D  | The control was unable to read a piece of information from the A/D system. This is the system that the control used to read the sensor inputs. If this error occurs, it is an indication that the sensor wires have been run in a noisy electrical environment. To clear this error, press either the <b>Menu</b> or <b>Item</b> button. The control will stop operation until the A/D fault is corrected.   |
| tN2<br>TYPE      | An incorrect device has been connected to the tekmar Net (tN2) input terminal. To correct this error, ensure that the correct device is being used. Once the problem has been corrected, press either the <b>Menu</b> or <b>Item</b> button to clear the error message from the control.   |
| tN2<br>SHRT      | A short circuit has been read between the tekmar Net (tN2) and a Com terminal on the control. Either the wires leading to the tekmar Net (tN2) device are shorted or the polarity of the wires is reversed. Determine the cause and remove the short. The error message can be cleared by pressing either the <b>Menu</b> or <b>Item</b> button.   |
| OUT DOOR<br>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 <b>Menu</b> or <b>Item</b> button.   |
| OUT DOOR<br>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 <b>Menu</b> or <b>Item</b> button.   |
| MIX SUP<br>SHRT  | The control is no longer able to read the mix supply sensor due to a short circuit. In this case, the control operates the mixing device at a fixed output as long as there is a mixing demand. 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 <b>Menu</b> or <b>Item</b> button.   |
| MIX SUP<br>OPEN  | The control is no longer able to read the mix supply sensor due to an open circuit. In this case, the control operates the mixing device at a fixed output as long as there is a mixing demand. 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 <b>Menu</b> or <b>Item</b> button.   |



| Error Displayed   | Description of Error   |
|-------------------|--|
| MIX RET<br>SHRT   | The control is no longer able to read the mix return sensor due to a short circuit. The control continues to operate without $\Delta T$ protection of the slab. 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 <b>Menu</b> or <b>Item</b> button.   |
| MIX RET<br>OPEN   | The control is no longer able to read the mix return sensor due to an open circuit. The control continues to operate without $\Delta T$ protection of the slab. Locate and repair the problem as described in the Data Brochure D 070. If the mix return sensor was deliberately not installed, set the $\Delta T$ MAX item to OFF. To clear the error message from the control after the sensor has been repaired, press either the <b>Menu</b> or <b>Item</b> button.  |
| Boil SENS<br>SHRT | The control is no longer able to read the boiler sensor due to a short circuit. If the Boil MIN item is set higher than 100°F (38°C), the control closes the Boiler contact when there is a call for heat in the system. The boiler temperature is limited by the operating aquastat. If the Boil MIN is set lower than 100°F (38°C), the control does not operate the Boiler contact. 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 <b>Menu</b> or <b>Item</b> button.  |
| Boil SENS<br>OPEN | The control is no longer able to read the boiler sensor due to an open circuit. If the Boil MIN item is set higher than 100°F (38°C), the control closes the Boiler contact when there is a call for heat in the system. The boiler temperature is limited by the operating aquastat. If the Boil MIN is set lower than 100°F (38°C), the control does not operate the Boiler contact. 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 <b>Menu</b> or <b>Item</b> button. |
| MIX 10K<br>SHRT   | The control is no longer able to read the Mix 10K input because of a short circuit. The control continues to operate as if nothing is connected to the Mix 10K input. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the problem has been corrected, press either the <b>Menu</b> or <b>Item</b> button.   |
| MIX 10K<br>OPEN   | The control is no longer able to read the Mix 10K input because of an open circuit. The control continues to operate as if nothing is connected to the Mix 10K input. Locate and repair the problem as described in the Data Brochure D 070. If a 10K device was deliberately not installed, set the MIX 10K item to NONE. To clear the error message from the control after the problem has been corrected, press either the <b>Menu</b> or <b>Item</b> button.   |
| Boil Zoln<br>SHRT | The control is no longer able to read the boiler zone control input because of a short circuit. The control continues to operate as if nothing is connected to the Boil Zoln input. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the problem has been corrected, press either the <b>Menu</b> or <b>Item</b> button.   |
| Boil Zoln<br>OPEN | The control is no longer able to read the boiler zone control input because of an open circuit. The control continues to operate as if nothing is connected to the Boil Zoln input. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the problem has been corrected, press either the <b>Menu</b> or <b>Item</b> button. If the boiler zone control was deliberately removed from the control, remove power from the control and repower the control to clear the error message.   |

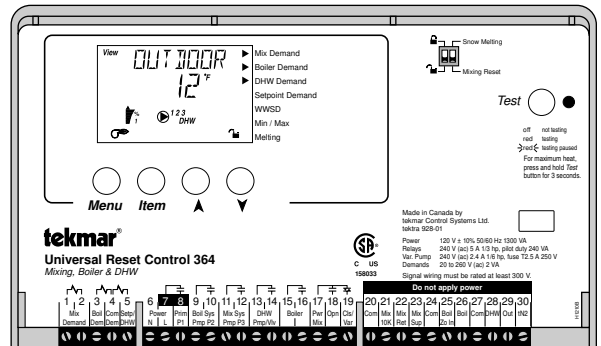
| Error Displayed   | Description of Error   |
|-------------------|--|
| DHW SENS<br>SHORT | The control is no longer able to read the DHW sensor due to a short circuit. In this case, the control ceases DHW operation. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press either the <b>Menu</b> or <b>Item</b> button.  |
| DHW SENS<br>OPEN  | The control is no longer able to read the DHW sensor due to an open circuit. In this case, the control ceases DHW operation. Locate and repair the problem as described in the Data Brochure D 070. If the DHW sensor was deliberately not installed, set the DHW SENS item to NONE. To clear the error message from the control after the sensor has been repaired, press either the <b>Menu</b> or <b>Item</b> button. |



## Technical Data

### Universal Reset Control 364 Mixing, Boiler & DHW

|                    |   |
|--------------------|---|
| Literature         | — D 364, A 364's, D 070, D 001, U 364, E 021, E 003   |
| Control            | — Microprocessor PID control; <b>This is not a safety (limit) control</b>                               |
| Packaged weight    | — 3.9 lb. (1760 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       | — 120 V ±10% 50/60 Hz 1300 VA   |
| Relays             | — 240 V (ac) 5 A 1/3 hp, pilot duty 240 VA  |
| Var. Pump          | — 240 V (ac) 2.4 A 1/6 hp, fuse T2.5 A 250 V  |
| Demands            | — 20 to 260 V (ac) 2 VA   |
| Sensors included   | — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892<br>Outdoor Sensor 070 and 2 of Universal Sensor 071 |
| Optional devices   | — tekmar type #: 039, 040, 071, 072, 073, 076, 077, 078, 079, 367, 368, 369                             |



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 non métallique 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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