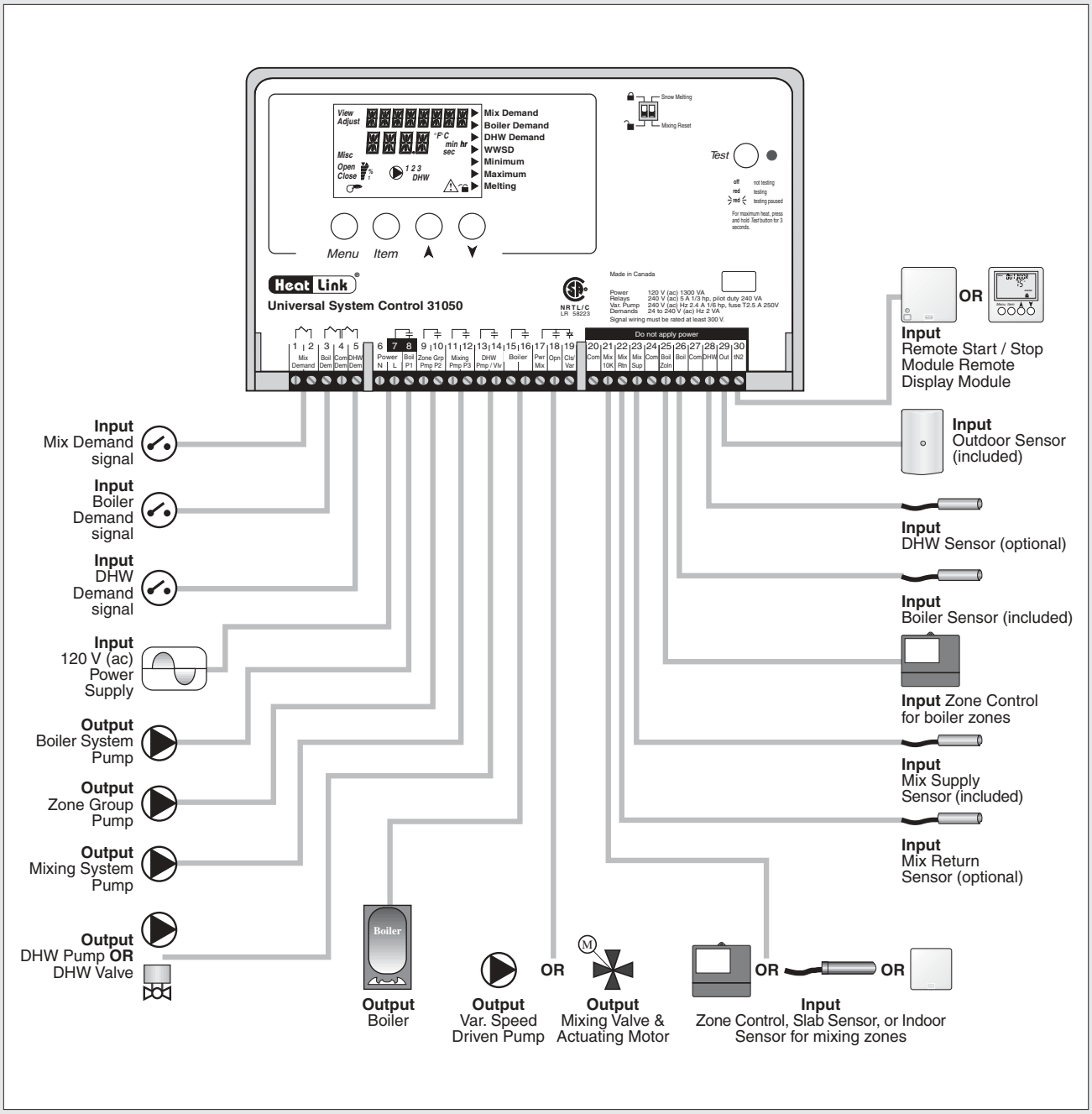
Heat Link® The Floor Heat System

Universal System Control (#31050) Application & Installation Guide



This brochure is organized into four main sections. They are: 1) Sequence *of Operation*, 2) *Control Settings*, 3) *Installation*, and 4) *Testing & Troubleshooting*. The *Sequence of Operation* section has five sub sections. We recommend reading the *General* sub section 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

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Introduction

The Universal System Control 31050 is a general purpose reset control for hydronic systems. The 31050 incorporates a boiler reset control, a DHW control and a mixing control into a single unit. The control is designed to operate a two temperature hydronic system using either conventional thermostats or Zone Controls. In both instances, a Characterized Heating Curve is used to match the system supply temperature to the type of terminal units used in the heating system. The control has output contacts for operation of a primary loop pump, a secondary loop pump, a DHW pump or valve, a mixing device, a mixing system pump, and a single boiler.

When used in a single boiler application, the 31050 operates the boiler at a temperature that is sufficient to satisfy the loads that are currently calling for heat and ensures that the boiler operates above the minimum boiler supply temperature. If used in a multiple boiler application, the 31050 can be used in conjunction with a boiler staging control for multiple boiler reset.

The 31050 is capable of providing intelligent DHW operation and priority when using either a DHW valve or a DHW pump. Either a conventional DHW aquastat can be used to control the DHW tank temperature or a Universal Sensor 30071 can be connected directly to the 31050 to control the DHW tank temperature.

For a mixing device, the 31050 is capable of using 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 31050 is also capable of utilizing either a Remote Display Module or a Remote Start / Stop Module. The Remote Display Module allows for remote monitoring and / or adjustment of the 31050 from up to 500 ft. away. The Remote Start / Stop Module is used only in conjunction with the snow melting mode of operation and allows the user to remotely start and / or stop the snow melting system.

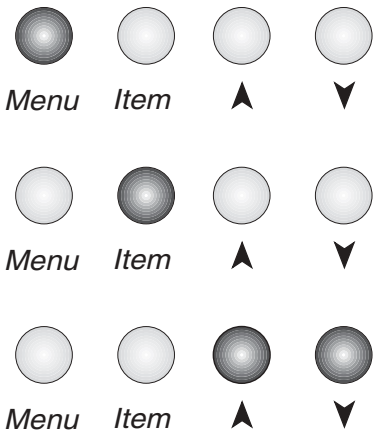
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User Interface

The 31050 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 31050 has four push buttons (Menu, Item, UP, DOWN) 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 advances to the next available menu. Once a menu is selected, there is a group of items that can be viewed within that menu.



Item

The abbreviated name of the selected item is 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 returns the display to the first item in the selected menu.

While pressing and holding the item button down, press the **UP** key to move backwards through the items.

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 **Up** and/or **Down** buttons to make the adjustment.

Additional information is gained by observing the Status and Pointer fields of the LCD. The status field indicate which of the control's outputs are currently activate. Most symbols in the status field are only visible when the View Menu is selected.

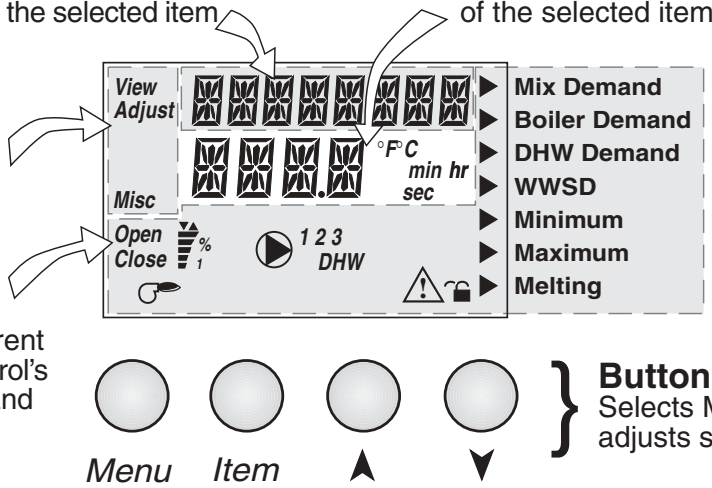
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Item Field
Displays an abbreviated name of the selected item

Number Field
Displays the current value of the selected item

Menu Field
Displays the current menu

Status Field
Displays the current status of the control's inputs, outputs and operation



Buttons
Selects Menus, Items and adjusts settings

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

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General

Powering Up The Control

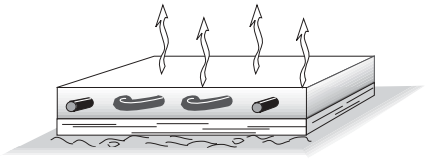
When the Universal System Control 31050 is powered up, the control displays the control type number in the LCD for 2 seconds. Next, the software version is displayed for 2 seconds. Finally, the control enters into the normal operating mode and the LCD defaults to displaying the current outdoor air temperature.

Terminal Units (TERMINAL)

The 31050 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 31050 has six different types of terminal units settings that are selectable. These six terminal unit types are: HRF1, HRF2, Fancoil, Fin-Tube Convector, Radiator, and Baseboard.

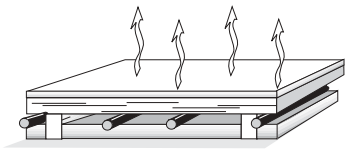
Hydronic Radiant Floor (HRF 1)

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.



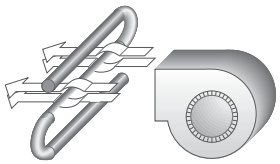
Hydronic Radiant Floor (HRF 2)

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 wood sub floor, suspended in the joist space, or sandwiched between the subfloor and the surface. This type of radiant system has a relatively low thermal mass and responds faster than a high mass system.



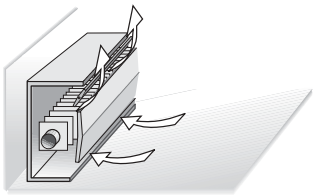
Fancoil (COIL)

A fancoil terminal unit or air handling unit (AHU) consists of an 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.

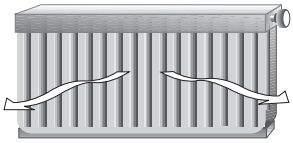


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Radiator (RAD)

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.



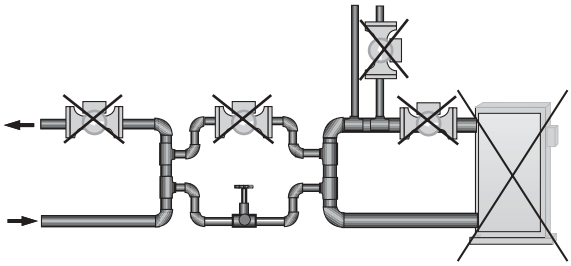
Baseboard (BASE)

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 31050 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 operates as described in the DHW section (pages 10-12).



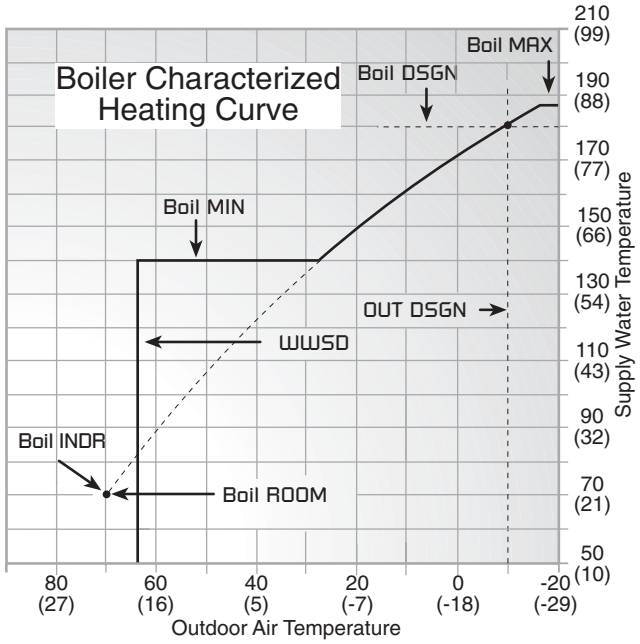
Exercising (Exercise)

The 31050 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 31050 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.

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General

The Universal System Control 31050 is capable of providing a reset supply water temperature from the primary boiler loop to a secondary loop using the Zone Group Pump (P2). The zones connected to the Zone Group Pump receive the same 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 Outdoor Design 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 31050 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 *Minimum* pointer turns on in the LCD while the Boil TRG or the 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 not set to NONE.

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 *Maximum* 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 31050 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 a *DHW Demand* and operates as described in the DHW section (pages 10-12).

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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 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 (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.

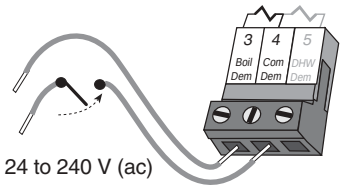
Zone Group Pump (P2) OPERATION

The zone group pump *(Zone Grp Pmp P2)* contact (terminals 9 and 10) closes whenever there is a boiler demand and the 31050 is not in WWSD. After the boiler demand is removed, the zone group 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 the Boiler Demands section below.

Boiler Demands

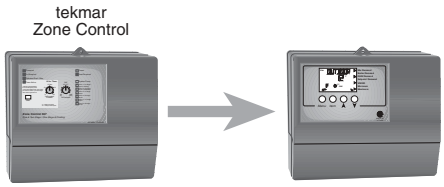
External Boiler Demand

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 31050 is not in WWSD, it closes the Boil P1 contact which starts the boiler pump and closes the Zone Grp Pmp P2 contact which starts the zone group pump. The control turns on the boiler pump and zone group pump segments in the LCD. If the Boil SENS item is set to SUP, the 31050 calculates a Boil TRG supply temperature. The 31050 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 31050 closes the Boiler contact to enable the boiler control.



Boiler Zone Control

A Zone Control can be used to control the temperature in the boiler zones that are connected to the zone group pump (P2). The Zone Control is connected to the 31050 using the Boil ZoIn terminal and a Com terminal (25 and 24). The Zone Control provides its own internal boiler demand to the 31050. 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.



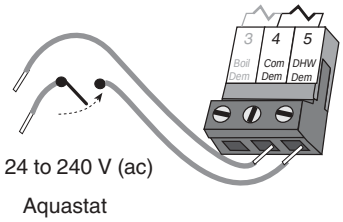
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General

DHW Demand

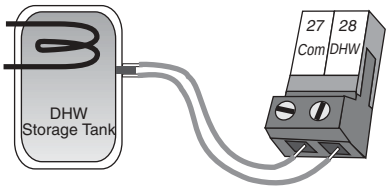
A *DHW demand* is generated on the 31050 by one of two methods: either an external DHW demand from an aquastat or an internal demand from a universal sensor.

External Demand (Aquastat)



*T*he 31050 registers an external demand for DHW when a voltage between 24 and 240 V (ac) is applied across the *DHW Dem* 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 31050 detects a DHW demand, the *DHW Demand* pointer turns on in the LCD and the control operates as described below.

Internal Demand (Universal Sensor)

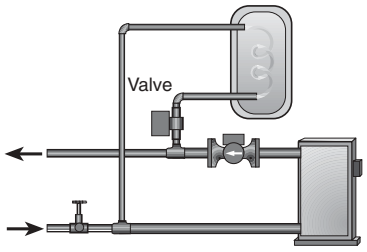


If the DHW SENS item is set to DHW, the 31050 looks for a DHW sensor connected to the *DHW* and the *Com Sen* terminals (28 and 27). The DHW TANK setting is used to set the desired indirect DHW tank temperature. When the temperature at the DHW sensor drops 3˚F (1.5˚C) below the DHW TANK setting, the *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 31050 can control the DHW temperature with more accuracy than when using an aquastat.

DHW Device (DHW THRU)

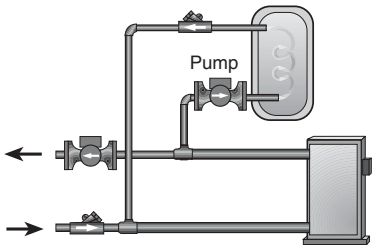
Once the 31050 has received a *DHW demand*, the sequence of operation depends on the type of DHW device selected. The DHW device is selected using the DHW THRU item in the *Adjust* menu.

DHW Valve (VALV)



If VALV is selected as the DHW device and there is a DHW demand, the 31050 closes the *DHW Pmp / Vlv* contact (13 and 14) and the *Boil P1* contact (7 and 8). The boiler 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 31050 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 31050 closes the boiler contact to provide heat to the DHW tank.

DHW Pump (PUMP)



If PUMP is selected as the DHW device, the 31050 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 31050 closes the *DHW Pmp / Vlv* contact (13 and 14). If the Boil SENS item is set to SUP, the 31050 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 31050 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.

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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 (Universal Sensor)

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

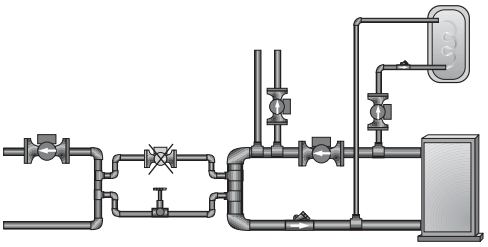
DHW Priority

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 faster recovery of the DHW tank. The 31050 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.

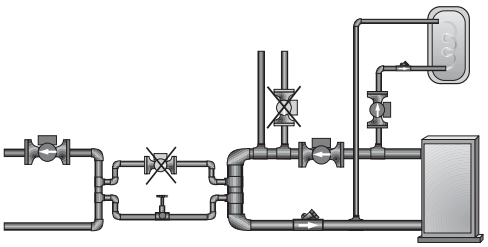
Mixing Priority (DHW PRI = MIX)

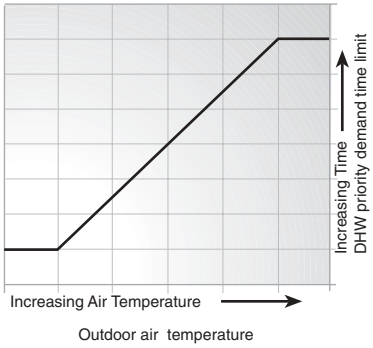
It can be selected that the DHW tank has priority over the mixing zones. If this option is chosen, the mixing device is throttled back on a call for DHW. The *Mix P2* pump continues to operate based on the *Mix Demand*. By reducing the mixing device output, more heat is directed to the DHW tank. The 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 zone group pump (P2) turns off on a call for DHW.





DHW Priority Overide

To prevent the building from cooling off too much or the possibility of a potential freeze up during DHW priority, the 31050 limits the amount of time for DHW priority. As the outdoor air temperature becomes colder, the length of time that the 31050 provides DHW priority is reduced. Once the allowed time for priority has elapsed, the 31050 overrides the DHW priority and operates DHW and heating simultaneously.

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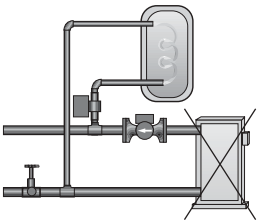
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Conditional DHW Priority

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.

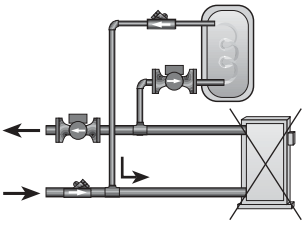
DHW Post Purge

After the *DHW Demand* is removed, the 31050 performs a purge on the boiler. This feature is only available if the Boil SENS item is set to SUP. The 31050 shuts off the boiler and continues to operate either the DHW pump or the DHW valve and the boiler pump (P1). This purges the residual heat from the boiler into the DHW tank. The 31050 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 31050 also stops the purge if the boiler supply temperature drops below the current Boil TRG temperature.



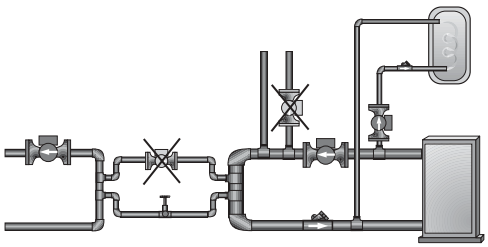
DHW Mixing Purge

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 31050 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.



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 high 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 31050 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 zone group pump (P2) must be turned off during a call for DHW. To do this, DHW PRI must be set to B + M. If the Boil SENS item has been set to SUP, the Boil MIN must also 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.

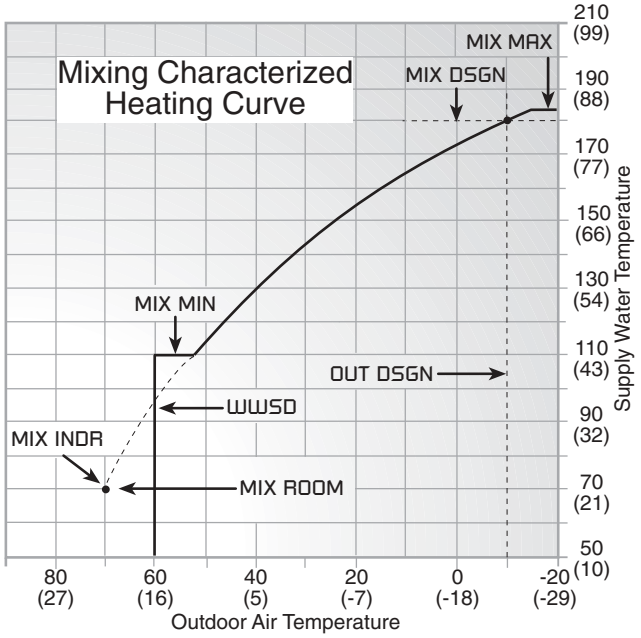
On a call for DHW, the 31050 provides DHW priority by backing off the mixing device and by shutting off the zone group pump (P2) for a period of time. This time is based on the outdoor air temperature as described in the DHW Priority Override section. If the *DHW Demand* is not satisfied within the allotted 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 31050 shuts off the zone group pump and provides heat to the DHW tank once again.

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General

The Universal System Control 31050 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 are connected to the mixing pump P3 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 day of the year where the building is located. This temperature is used when doing heat loss calculations for the building.

Mix 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 Outdoor Design temperature.

Mixing Maximum (MIX MAX)

The MIX MAX sets the highest water temperature that the control is allowed to calculate as the MIX TRG temperature. If the control does target the MIX MAX setting, and the MIX SUP temperature is near the MIX MAX, the *Maximum* pointer is displayed in the LCD while either the MIX TRG temperature or the MIX SUP temperature is being viewed.

Warm Weather Shut Down (WWSD)

When the outdoor air temperature rises above the WWSD setting, the 31050 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 a DHW Demand and operates as described in the DHW section (pages 10-12).

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 31050 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 *Minimum* 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 31050 is operating at the MIX MIN temperature, the mixing pump is cycled using Pulse Width Modulation (PWM) with a 15 minute cycle length. By cycling the mixing 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.

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Mix Room (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 Pump (P3) Operation

The mixing pump contact (*Mixing Pmp P3*, terminals 11 and 12) closes whenever there is a *Mixing Demand* and the 31050 is not in WWSD. After the *Mixing Demand* is removed, the *Mixing Pmp P3* contact remains closed for an additional 20 seconds. During WWSD, the mixing pump is operated based on the EXERCISE setting in the *Adjust* Menu.

Boiler Minimum Protection (Boil MIN)

The 31050 is capable of providing Boil MIN protection from cold mixing system return water temperatures. If the boiler supply temperature is cooler than the Boil MIN setting while the boiler is firing, the 31050 reduces the output from the mixing device. This limits the amount of cool return water to the boiler and allows the boiler temperature to recover. This feature can only be used if the Boil SENS item is not set to NONE.

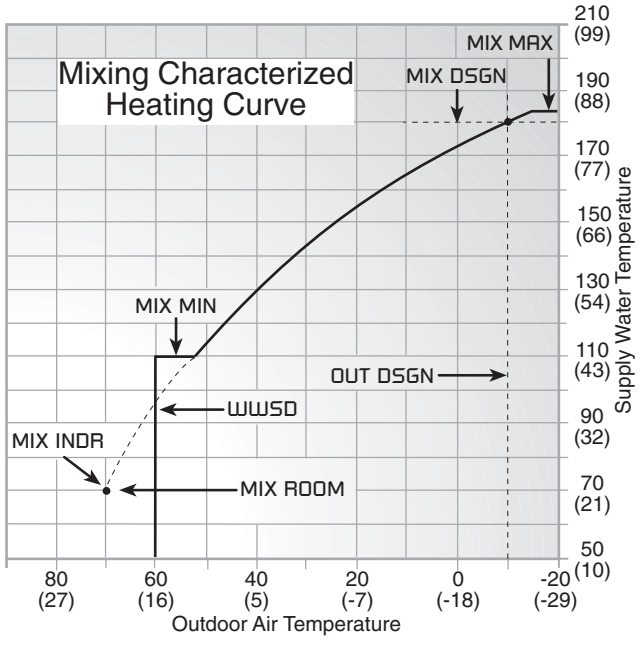
Mixing Devices

Mixing (MIXING) Device selection

The 31050 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)

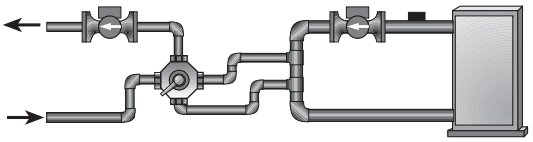
A standard wet rotor circulator is connected to the 31050 on the *Cls / Var* terminal (19). The 31050 increases or decreases the power output to the circulator when there is a *Mix Demand*. The circulator speed varies to maintain the correct mixed supply water temperature at the mix sensor. For correct 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.



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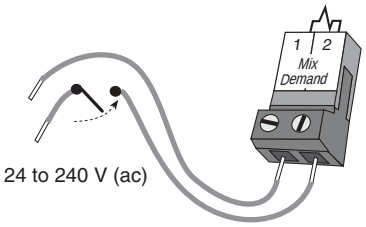
Floating Action (FLOT)



A floating action actuator motor is connected to the 31050 on the *Opn*, and *Cls / Var* terminals (18 and 19). The 31050 pulses the actuator motor open or close to maintain the correct supply water temperature at the mix 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** in the display. Also, a visual indication of the current position of the valve is displayed in the LCD in the form of a segmented bar graph.

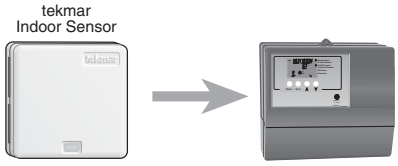
Mixing Demands

External Mixing Demand



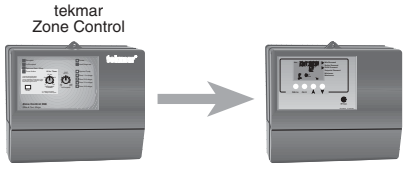
An *External Mixing Demand* is generated by applying a voltage between 24 and 240 V (ac) across the *Mix Demand* terminals (1 and 2). Once voltage is applied, the *Mix Demand* pointer is displayed in the LCD. If the 31050 is not in WWSD, the 31050 closes the *Mixing Pmp P3* contact. The *Mixing Pump* segment is displayed in the LCD. The 31050 calculates a MIX SUP temperature based on the outdoor air temperature and settings. If required, the 31050 operates the boiler contact as described in the Boiler Operation section (pages 20-21) in order to provide heat to the mixing device. An external mixing demand allows for the use of a conventional thermostat system for zoning.

10K Indoor Sensor (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 31050 is able to sense the actual room temperature. With this information, the 31050 provides a more constant water flow through the mixing system. At the same time, indoor temperature 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 (Zoln)



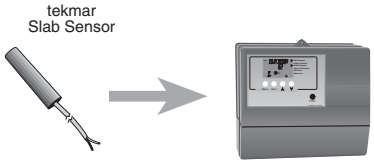
Set the MIX 10K item to Zoln to add indoor temperature feedback control of multiple mixing zones. Control of mixing zones is provided by connecting a zone control to the 31050. The zone control provides its own internal *Mixing Demand* to the 31050. In this case, there is no need to provide an external *Mixing Demand*. The zone control is capable of automatically adjusting the MIX TRG temperature to improve building occupant comfort and system performance.

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10K Slab Sensor (Slab)

Set the MIX 10K item to SLAB to add a slab sensor for temperature control of a single zone mixing system. The 31050 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 the *Mix 10K* terminals (20 and 21). Power must be applied to the *Mix Demand* terminals (1 and 2). With the slab sensor connected, the 31050 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.

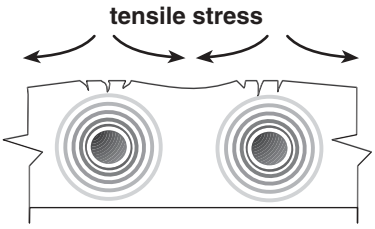
Slab Maximum (SLAB MAX)

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 SLAB MAX and SLAB MIN items to the same setting.

Snow Melting

The Universal System Control 31050 is capable of controlling a single zone snow melting system. In order to control the snow melting system, the 31050 must be equipped with an optional Slab Sensor 30072 or 30073 and an optional Universal Sensor 30071 that measures the slab return temperature. These can be purchased separately or as part of the Snow Melt Enable Kit 30092. With both additional sensors installed, the 31050 is capable of providing the features listed in the following section. Also described in this section are two different methods of starting and stopping the snow melting system.
NOTE: When operating in the Snow Melting mode, the *Mixing Reset / Snow Melting* DIP switch must be set to the *Snow Melting* position.

Slab Protection (ΔT MAX)



When a snow melting system is one of several loads on a boiler or boiler plant, the amount of heat available to the snow melting system can potentially damage the snow melting slab. 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 can be applied to the slab through the ΔT MAX setting. The ΔT 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 ΔT MAX setting. When the control is operating at the ΔT MAX and the actual ΔT is near the ΔT MAX, the *Maximum* pointer can be seen when viewing the MIX ΔT item in the *View* menu.

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Viscosity Compensation (Exceeding ΔT MAX)

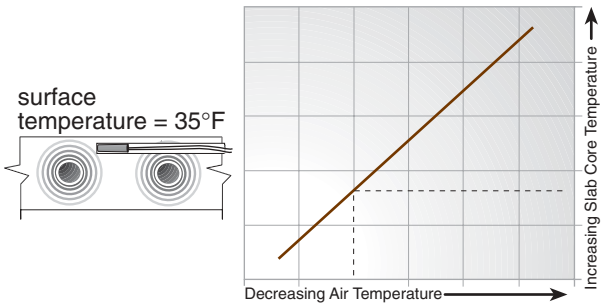
At low temperatures, the glycol solutions used in snow melting systems becomes very viscous and difficult to pump. In order to overcome this condition during a cold start of a snow melting system, the 31050 is allowed to exceed the ΔT MAX setting for a period of time in order to warm the glycol solution. This allows the control to compensate for the high viscosity of the glycol solution and is used when the supply temperature is below 30˚F (-1˚C). When the control exceeds the ΔT MAX setting, the *Maximum* pointer will flash when viewing the MIX ΔT item in the *View* menu.

Ramping of the ΔT

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 ΔT.

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 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.



Slab surface temperature is constant.

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 this 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 *Idling* pointer is visible in the *View* menu and 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.

Melting Mode (MELTING)

The Universal System Control 31050 is a manual snow melting control. In order for the snow melting system to be started, one of the two methods described in the Snow Melting Enable section on the next page 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.

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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 if a Remote Start/Stop Module 30092 stops the snow melting system. The word STOP is also displayed if a Remote Start/Stop Module 30092 has stopped the snow melting system and an external demand is still present.



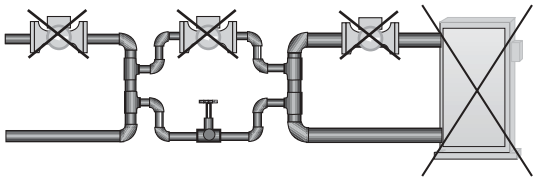
- •IDLE — The word IDLE is displayed as long as the control is operating the slab at the idling temperature.
- •EXT — The word EXT is displayed when the RUN TIME has reached 0:00 and the control still has an external demand for melting. In this situation, the control continues melting until the snow 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 Off, CWCO is displayed

Running Time (RUN TIME)

The run time is the length of time that 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 31050 has finished Melting.

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.



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) temperature. While the control is in a *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 temperature.

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Boiler Operation

Refer to the Boiler Operation section (pages 20-21) for a description of the boiler operation.

Boiler Protection

The 31050 ensures that the boiler supply water temperature remains above the Boil MIN setting. If the boiler supply water temperature begins to drop due to the 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 31050 can only provide boiler protection if the Boil SENS item is set to SUP or RET. The 31050 can not provide boiler protection if the Boil SENS item is set to NONE.

Mixing Pump Operation (Mixing Pmp P2)

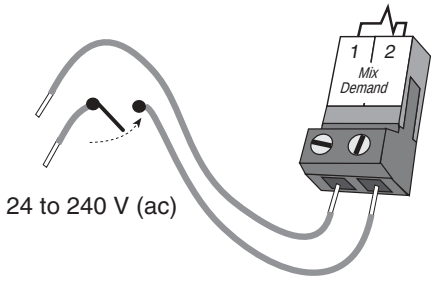
The mixing pump (*Mixing Pmp P2*) contact closes and remain closed as long as the control is either in the melting or idling mode. The mixing pump contact shuts off if the control is in WWSD, CWCO or there is no call for melting or idling.

Snow Melting Enable

There are two methods in which the snow melting system can be enabled on the Universal System Control 31050. Either an External Demand or a Remote Start / Stop Module 30092 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 30092

A Remote Start / Stop Module 30092 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 30092. While the slab is coming up to temperature, a green indicator light flashes on the front of the 30092. Once the slab is at temperature and the RUN TIME is counting down, the green indicator light on the front of the 30092 is on solid.

To disable the snow melting system when it is in a melting mode, press the button on the face of the 30092. When the system is stopped, a solid red indicator light is displayed on the face of the 30092 for five seconds. If the snow melting system is disabled while there is still an external demand for snow melting, the 30092 displays a solid red indicator light until the external demand is removed.

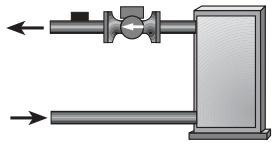


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Boiler Supply Sensor

Boiler Sensor on the Supply (SUP)

The boiler sensor can be located on the boiler supply if the 31050 is the only control that is operating the boiler. When in the supply mode, the 31050 determines the required operating temperature for the boiler supply and cycles the *Boiler* contact in order to maintain the correct boiler 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 of 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 31050 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 *Minimum* pointer turns on in the LCD while the Boil TRG or the Boil SUP temperature is viewed. If the installed boiler is designed for condensing 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 *Maximum* 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 31050 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 31050 opens the boiler contact to turn off the boiler. With the 31050, either a fixed or automatic differential setting is selected. If the AUTO differential is selected, the 31050 automatically adjusts the boiler differential setting under the current load conditions to minimize short cycling.

Fire Delay (FIRE DLY)

The FIRE DLY sets any delay time that may happen between the time that the 31050 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 Operation

When the 31050 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.

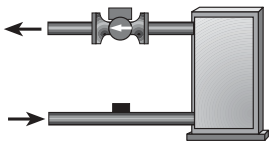
Boiler Purge (PURGE P1)

After all of the demands are satisfied, the 31050 continues to operate the *Boiler Pump* (P1, terminal 8) for a period of time. The length of time that the boiler 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 boiler pump 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.

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Boiler Return Sensor

Boiler Sensor on the Return (RET)

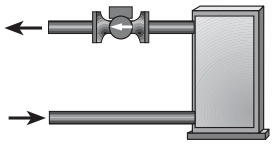


The boiler sensor should be located on the boiler return if the 31050 is one of many controls that can call for boiler operation. When in the return mode, the 31050 provides a boiler enable. The 31050 no longer tries to control the boiler supply water temperature directly, but allows the boiler to operate at the operating aquastat setting. If this mode of operation is selected, the boiler 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 a boiler demand or a DHW demand is present, the boiler contact on the 31050 closes. The boiler contact remains closed until all of the demands no longer require heat. With the sensor on the boiler return, the 31050 is still capable of providing boiler return protection as described in the Mixing Zones:General section (pages 13-14).

No Boiler Sensor

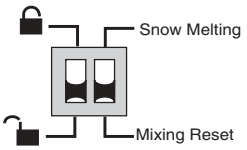
No Boiler Sensor (NONE)



The 31050 is capable of operating without a boiler sensor if desired. Without a boiler sensor, the 31050 is unable to provide boiler return protection. The boiler contact still functions without the boiler sensor. When the mixing device begins to ramp up or a boiler demand or DHW demand is present, the boiler contact on the 31050 closes. The boiler contact remains closed until all of the demands no longer require heat. This type of application is typical if the 31050 is drawing heat from a heat source that already incorporates some form of boiler return protection.

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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 of 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 the 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 tN2 device is viewed in its Miscellaneous (*Misc*) menu. While viewing the access level, use the up and down keys to select between the Limited (LTD), User (USER), Installer (INST), or Advanced (ADV) access levels.

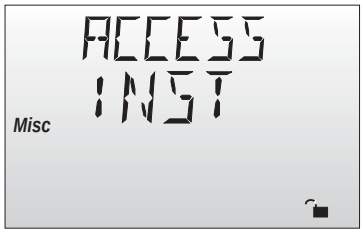
To lock the access level, select the appropriate access level in the Miscellaneous (*Misc*) menu and move the DIP switch from the unlocked position to the locked position. As long as the DIP switch is in the locked position, the access level of the control or tN2 device can no longer be viewed or adjusted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

Mixing Reset / Snow Melting (FACTORY SETTING IS MIXING RESET)

The *Mixing Reset / Snow Melting* 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 System Control 31050 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 set up of the control. Once the control is setup, the appropriate access level should be selected for the people that deal with the control on a regular basis.

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View Menu

Item	Access Level LTD	USER	INST	ADV	Description	Adjustment	When Active
OUTDOOR	●	●	●	●	Current outdoor air temperature as measured by the outdoor sensor. This is also the default display for the control.	-67 to 149˚ F (-55 to 65˚ C)	Always
ROOM TRG		●	●	●	Target room air temperature. "---" denotes no heat is required.	---, 35 to 100˚ F (2 to 38˚ C)	MIX 10K = INDR
ROOM	●	●	●	●	Measured room air temperature at the indoor sensor.	-58 to 167˚ F (-50 to 75˚ C)	MIX 10K = INDR
MIX Zoln				●	This is the signal that is being received from a Zone Control that is operating the mixing zones.	---, 35 to 110˚ F (2 to 43˚ C)	MIX 10K = Zoln
SLAB TRG				●	Slab sensor target temperature. This is the temperature that the control is trying to maintain at the slab sensor.	---, -58 to 167˚ F (-50 to 75˚ C)	DIP switch = Snow Melting MIX 10K = SLAB
SLAB			●	●	Current slab sensor temperature.	-58 to 167˚ F (-50 to 75˚ C)	MIX 10K = SLAB MIX MIN = OFF
SNOWMELT	●	●	●	●	Current operating status of the snow melting system	STRT, STOP, IDLE, EXT, 0:00 TO 17:00 hr, ---, INF, WWSD, CWCO	DIP switch = Snow Melting
MIX TRG			●	●	Target mixed supply is the temperature the control is currently trying to maintain at the mixing sensor.	---, -25 TO 248 ˚ F (-32 to 120˚ C)	Always
MIX SUP		●	●	●	Current mixed supply water temperature as measured by the mixing sensor.	-31 to 266˚ F (-35 to 130˚ C)	Always
MIX ΔT			●	●	Current mixed ΔT. This is the current temperature difference between the mixed supply and the mixed return sensors.	-85 to 170˚ F (-47 to 94˚ C)	DIP switch = Snow Melting ΔT MAX OFF
Boil Zoln				●	This is the signal that is being received from a Zone Control that is operating the boiler zones.	---, 35 to 110˚ F (2 to 43˚ C)	Always
Boil TRG			●	●	Target boiler supply is the temperature the control is currently trying to maintain at the boiler sensor ±1/2 of the differential.	---, 35 to 248˚ F (2 to 120˚ C)	Boil SENS = SUP
Boil SUP		●	●	●	Current boiler supply water temperature as measured by the boiler sensor.	-31 to 266˚ F (-35 to 130˚ C)	Boil SENS = SUP
Boil RET		●	●	●	Current boiler return water temperature as measeured by the boiler sensor.	-31 to 266˚ F (-35 to 130˚ C)	Boil SENS = RET
XCHG TRG			●	●	Minimum boiler supply temperature during a DHW demand.	---, OFF, 100 to 220˚ F (38 to 104˚ C)	DHW SENS = NONE DHW THRU NONE Boil SENS = SUP
DHW TRG		●	●	●	Target DHW tank temperature.	---, OFF, 70 to 190˚ F (21 to 88˚ C)	DHW SENS = DHW DHW THRU NONE
DHW	●	●	●	●	Current DHW tank temperature.	-31 to 266˚ F (-35 to 130˚ C)	DHW SENS = DHW DHW THRU NONE

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Adjust Menu

Item	Access Level LTD	USER	INST	ADV	Description	Adjustment	Default	When Active
MELTING		●	●	●	This item is the desired slab surface temperature while in the melting mode.	32 to 95˚ F (0 to 35˚ C)	36˚ F (2˚ C)	DIP switch = Snow Melting
IDLING			●	●	This item is the desired slab surface temperature while in the idling mode.	OFF, 20 to 95˚ F (-7 to 35˚ C)	OFF	DIP switch = Snow Melting
RUN TIME	●	●	●	●	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 has not been connected.	OFF, 0:30 to 17:00 hrs, INF (Infinity)	4:00 hr	DIP switch = Snow Melting
ΔT MAX			●	●	The maximum ΔT for the snow melting slab.	OFF, 10 to 70˚ F (6 to 39˚ C)	40˚ F (22˚ C)	DIP switch = Snow Melting
CWCO			●	●	The Cold Weather Cut Off temperature for the snow melting system.	OFF, -30 to 50˚ F (-34 to 10˚ C)	10˚ F (-12˚ C)	DIP switch = Snow Melting
MIX ROOM	●	●	●	●	The desired room air temperature for the mixing zones.	35 to 100˚ F (2 to 38˚ C)	70˚ F (21˚ C)	DIP switch = Mixing Reset
MIX 10K			●	●	The device that is connected to the mix 10K input.	NONE, INDR (Indoor), Zoln (mixing zone control), SLAB (only if MIX MIN = OFF)	NONE	DIP switch = Mixing Reset
SLAB MIN		●	●	●	The minimum temperature at the slab sensor.	OFF, 35 to 120˚ F (2 to 49˚ C)	70˚ F (21˚ C)	DIP switch = Mixing Reset MIX 10K = SLAB
SLAB MAX			●	●	The maximum temperature at the slab sensor.	40 to 150˚ F (4 to 66˚ C)	90˚ F (32˚ C)	DIP switch = Mixing Reset MIX 10K = SLAB
MIX TERM			●	●	The type of terminal units that are being used for the mixing side of the system.	HRF1 (heavy), HRF2 (light), (fan-) COIL, CONV (ector), RAD (iators) BASE, (board)	HRF1	DIP switch = Mixing Reset
MIX MIN				●	The minimum supply water temperature for the mixing system.	OFF, 35 to 150˚ F (2 to 66˚ C)	OFF	DIP switch = Mixing Reset
MIX INDR			●	●	The design indoor air temperature used in the heat loss calculations for the mixing system.	35 to 100˚ F (2 to 38˚ C)	70˚ F (21˚ C)	DIP switch = Mixing Reset
MIX DSGN			●	●	The design supply temperature used in the heat loss calculation for the mixing system.	70 to 220˚ F (21 to 104˚ C)	120˚ F (49˚ C)	DIP switch = Mixing Reset
MIX MAX			●	●	The maximum supply temperature for the mixing system.	OFF, 80 to 210˚ F (27 to 99˚ C)	140˚ F (60˚ C)	Always
OUT DSGN			●	●	The design outdoor air temperature used in the heat loss calculations for the heating system.	-60 to 32˚ F (-51 to 0˚ C)	10˚ F (-12˚ C)	Always
MIXING			●	●	The type of mixing device that is to be used in the heating system.	FLOT (floating) VAR (variable speed)	VAR	Always
MOTR SPD			●	●	The time that the actuating motor requires to operate from fully closed to fully open.	30 to 230 seconds	160 SEC	MIXING = FLOT
Boil SENS				●	The location for the boiler sensor. This affects the operation of the boiler contact.	SUP, RET, NONE	SUP	Always
Boil ROOM	●	●	●	●	The desired room air temperature for the boiler zones.	35 to 100˚ F (2 to 38˚ C)	70˚ F (21˚ C)	Boil SENS = SUP
Boil TERM			●	●	The type of terminal units that are being used for the boiler side of the system.	HRF1 (heavy), HRF2 (light), (fan-) COIL, CONV (ector), RAD (iators), BASE (board)	CONV	Boil SENS = SUP

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Adjust Menu cont'd

Item	Access Level LTD	USER	INST	ADV	Description	Adjustment	Default	When Active
Boil INDR			●	●	The design indoor air temperature used in the heat loss calculation for the boiler system.	35 to 100˚ F (2 to 38˚ C)	70˚ F (21˚ C)	Boil SENS = SUP
Boil DSGN			●	●	The design supply temperature used in the heat loss calculation for the boiler system.	70 to 220˚ F (21 to 104˚ C)	190˚ F (88˚ C)	Boil SENS = SUP
Boil MAX				●	The maximum temperature allowed for the boiler target temperature.	OFF, 120 to 225˚ F (49 to 107˚ C)	210˚ F (99˚ C)	Boil SENS = SUP
Boil MIN			●	●	The minimum temperature allowed for the boiler target temperature.	OFF, 80 to 180˚ F (27 to 82˚ C)	140˚ F (60˚ C)	Boil SENS NONE
FIRE DLY			●	●	The time delay that the control can expect between the time that the boiler contact closes and the burner fires.	0:00 to 3:00 min	0:10	Boil SENS = SUP
Boil DIFF			●	●	The differential that the control is to use when it is operating the boiler.	AUTO, 2 to 42˚ F (1 to 23˚ C)	AUTO	Boil SENS = SUP
DHW THRU			●	●	The device that is being used to supply flow to the heat exchanger in the DHW storage tank.	NONE, PUMP, VALV	PUMP	Always
DHW SENS			●	●	Selects whether or not a DHW sensor is being used to measure the DHW tank temperature.	NONE, DHW	NONE	Always
DHW TANK		●	●	●	The desired DHW storage tank temperature.	OFF, 70 to 190˚ F (21 to 88˚ C)	140˚ F (60˚ C)	DHW SENS = DHW DHW THRU NONE
DHW XCHG			●	●	The minimum boiler supply temperature to the DHW storage tank on a demand for DHW.	OFF, 100 to 220 ˚ F (38 to 104˚ C)	180˚ F (82˚ C)	DHW SENS = NONE DHW THRU NONE Boil SENS = SUP
DHW PR1			●	●	The portions of the heating system that the DHW will have priority over.	NONE, MIX, B + M (boiler and mixing)	NONE	DHW THRU NONE
WWSD		●	●	●	The system's warm weather shut down temperature.	OFF, 35 to 100˚ F (2 to 28˚ C)	70˚ F (21˚ C)	Always
PURGE P1				●	The maximum length of time that the boiler pump will continue to run after all of the demands have been removed.	OFF, 0:10 to 40:00 min	0:20 min	Always
EXERCISE				●	The frequency with which the control will exercise the pumps and valves connected to the control.	30 to 240 hours, OFF	70 hr	Always

Miscellaneous Menu

Item	Access Level LTD	USER	INST	ADV	Description	Adjustment	Default	When Active
UNITS		●	●	●	The type of units that all of the temperatures are to be displayed in by the control.	˚ F, ˚ C	˚ F	Always
BACKLITE		●	●	●	The operating mode for the back lighting on the LCD as well as the time of keypad inactivity until the control returns to the default display. BACKLITE = OFF (returns after 10 seconds) BACKLITE = 30 sec (returns after 30 seconds) BACKLITE = ON (returns after 90 seconds)	OFF, 30s, ON	ON	Always
ACCESS	●	●	●	●	The access level that is to be used by the control.	ADV, INST, USER, LTD	INST	DIP switch = Unlock

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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 according 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 HeatLink sales representative for assistance.

Type 31050 includes: ***One Universal System Control 31050, One Outdoor Sensor 30070, Two Universal Sensors 30071***
Application & Installation Guide L6420, Data Brochures D 001, D 070
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 upwards. The base is then mounted in accordance with theinstructions in 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 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.

- Install the Outdoor Sensor 30070, Boiler Sensor 30071, and Mixing Sensor 30071 according to the instructions in the Data Brochure D 070 and run the wiring back to the control.
- If a DHW Sensor 30071 is used, install the DHW 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 30071 is used, install the Mixing Return Sensor according to the installation instructions in the Data Brochure D 070 and run the wiring back to the control.
- If a Slab Sensor 30072 or 30073 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) 30040 or Remote Start / Stop Module 30092 is used, install the RDM or Remote Start / Stop Module according to the installation instructions in the Data Brochure D 040 or D 092 and run the wiring back to the control.
- If a Zone Control is used, run the wires from the Zone Control to the 31050. Refer to the instructions supplied with the Zone Control.
- Run wire from other system components (pumps, boiler, actuator 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.

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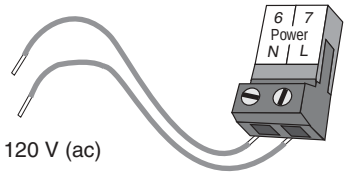
Step Four Electrical Connections to the Control

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

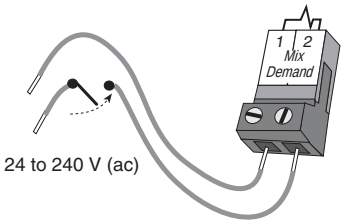
120 V (ac) Power

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



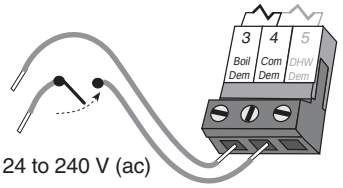
Mixing Demand

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).



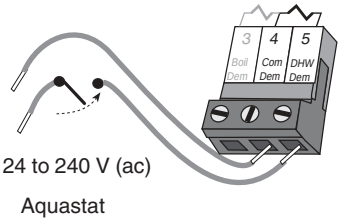
Boiler Demand

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



DHW Demand

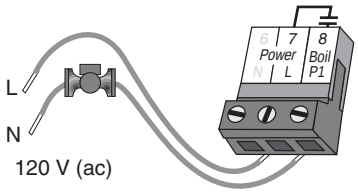
To generate an external DHW Demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *DHW Dem* and the *Com Dem* terminals (5 and 4).



Output Connections

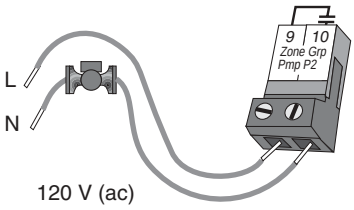
Boiler Pump Contact (Boil P1)

The boiler pump output terminal (8) on the 31050 is a powered output. When the relay contact in the 31050 closes, 120 V (ac) line (L) is provided to the *Boil P1* terminal (8) from the *Power L* terminal (7). To operate the boiler pump, connect one side of the boiler 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.



Zone Group Pump (Zone Grp Pmp P2)

The *Zone Grp Pmp P2* terminals (9 and 10) are an isolated output in the 31050. 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 zone group pump. Since this is an isolated contact, it may switch 24 V (ac) to 240 V (ac).

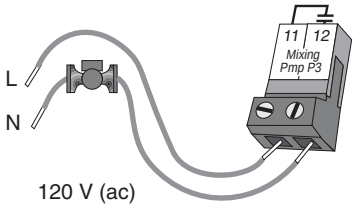


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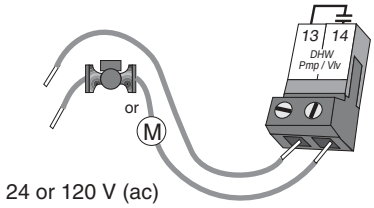
Mixing Pump (Mixing Pmp P3)

The *Mixing Pmp P3* terminals (11 and 12) are an isolated output in the 31050. 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 pump. Since this is an isolated contact, it may switch 24 V (ac) to 240 V (ac).



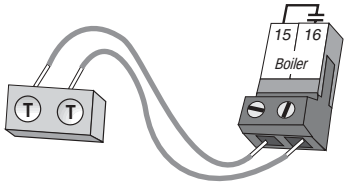
DHW Pump / Valve Contact

The *DHW Pump / Valve* terminals (13 and 14) are an isolated output in the 31050. 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 the DHW valve. Since this is an isolated contact, it may switch 24 V (ac) to 240 V (ac).



Boiler Contact

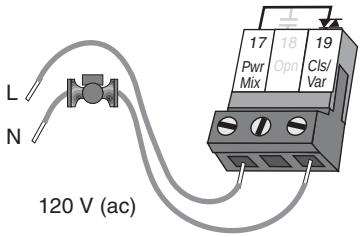
The *Boiler* terminals (15 and 16) are an isolated output in the 31050. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break the boiler circuit. When the 31050 requires the boiler to fire, it closes the contact between terminals 15 and 16.



Variable Speed Injection Pump

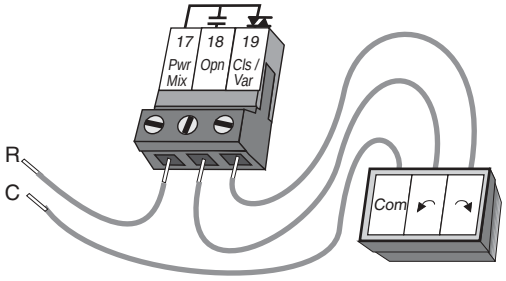
The 31050 can vary the speed of a permanent capacitor, impedance protected or equivalent pump motor that has a locked rotor current of less than 2.4 A. Most small wet rotor circulators are suitable as described in Essay E 021. The 31050 has an internal overload protection fuse which is rated at 2.5 A 250 V (ac).

Connect one of the wires from the variable speed injection pump to the *Cls/Var* terminal (19) on the 31050. 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

Connect one side of the 24 V (ac) power to the *Pwr Mix* terminal (17) on the control. The *Opn terminal* (18) is then connected to the open terminal of the actuating motor and the *Cls/Var* terminal (19) is connected to the close terminal of the actuating motor. Connect the second side of the 24 V (ac) power to the common terminal of the actuating motor.



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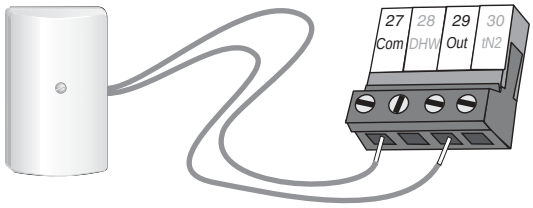
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Sensor and Unpowered Input Connections

Do not apply power to these terminals as this damages the control.

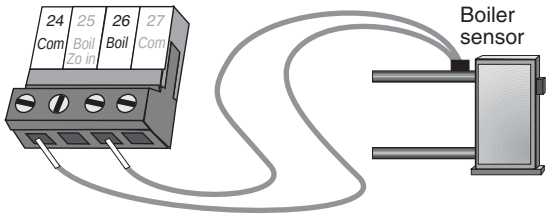
Outdoor Sensor

Connect the two wires from the Outdoor Sensor 30070 to the *Com* and *Out* terminals (27 and 29). The Outdoor Sensor is used by the 31050 to measure the outdoor air temperature.



Boiler Sensor

Connect the two wires from the Boiler Sensor 30071 to the *Com* and *Boil* terminals (24 and 26). The Boiler Sensor is used by the 31050 to measure the supply (outlet) water temperature from the boiler.



Mixing Supply Sensor

Connect the two wires from the Mixing Supply Sensor 30071 to the *Com* and *Mix Sup* terminals (20 and 23). The Mixing Supply Sensor is used by the 31050 to measure the supply water temperature after the mixing device. Normally the sensor is attached to the pipe downstream of the mixing pump (P3).



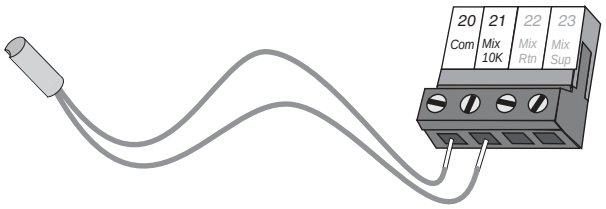
Mixing Return Sensor

Connect the two wires from the Mixing Return Sensor 30071 to the *Com* and *Mix Ret* terminals (20 and 22). The Mixing Return Sensor is used by the 31050 to measure the return water temperature from the mixing system. A Mixing Return Sensor is only used when the *Mixing Reset / Snow Melting* DIP switch is set to *Snow Melting*.



Mix 10K Sensor

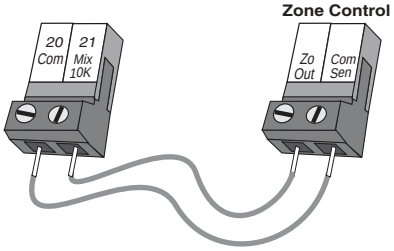
Either an Indoor Sensor, Slab Sensor, or Zone Control may be connected to the *Mix 10K* input. If a sensor is used, connect the two wires from the sensor to the *Com* and *Mix 10K* terminals (20 and 21).



Mixing Zone Control Input

If an external 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 31050. Connect the *Zo Out* terminal on the Zone Control to the *Mix 10K* terminal (21) on the 31050.

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



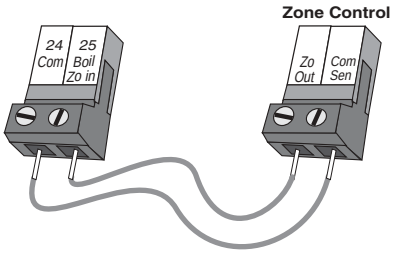
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Boiler Zone Control Input

If an external 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 31050. Connect the *Zo Out* terminal on the Zone Control to the *Boil Zo in* terminal (25) on the 31050.

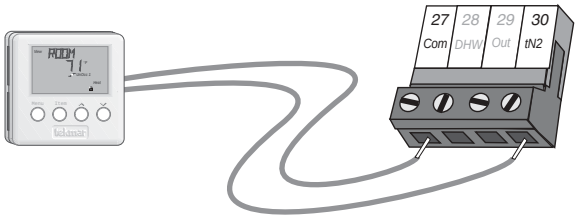
***Note*:** *The wires from the Zone Control are polarity sensitive. The communication does not operate correctly if the wires are reversed.*



tN2 Device

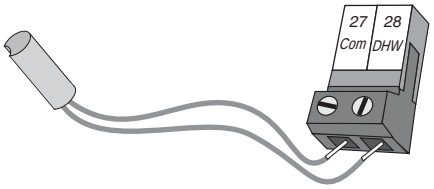
A Remote Display Module (RDM) 30040 or Remote Start / Stop Module 30092 may be connected to the *tN2* input. Connect the *Com* terminal from the 30040 or 30092 to the *Com* terminal (27) on the 31050. Connect the tN2 terminal from the 30040 or 30092 to the *tN2* terminal (30) on the 31050.

***Note*:** *The wires from the 30040 and 30092 are polarity sensitive. The 30040 and 30092 do not operate correctly if the wires are reversed.*



DHW Sensor

A DHW Sensor 30071 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

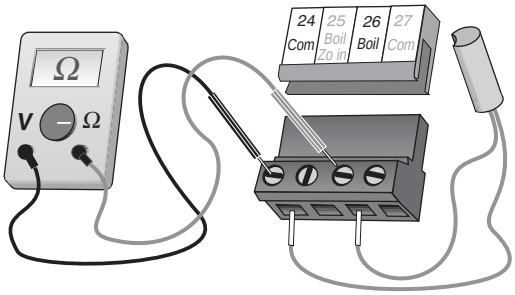
Each terminal block ***must be unplugged*** from its header on the control before power is applied for testing. To remove the terminal block, pull straight down from the control.

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.

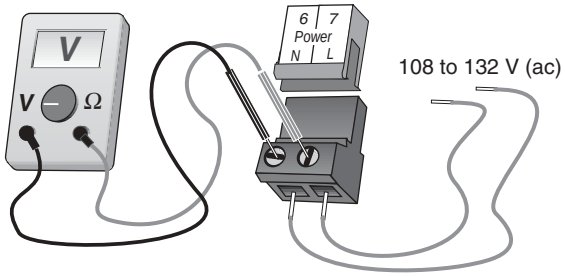
Test the Sensors

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 N and L terminals (6 and 7) using an AC voltmeter, the reading should be between 108 and 132 V (ac).



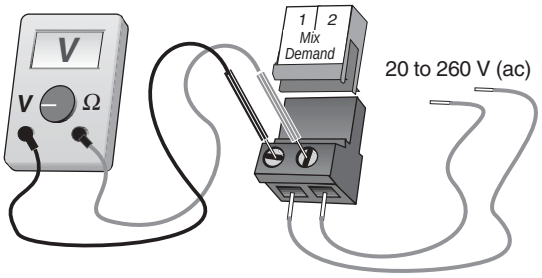
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Test the Powered Inputs

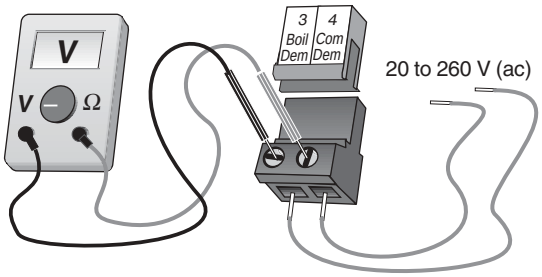
Mixing Demand

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).



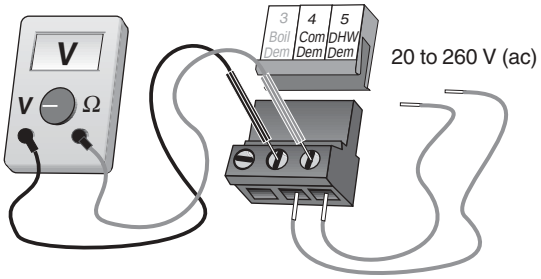
Boiler Demand

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

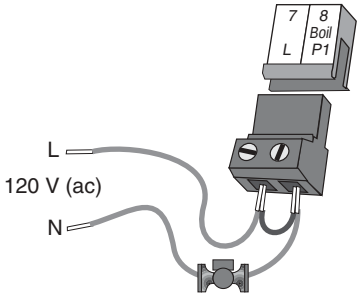
If a *DHW Demand* is used, measure the voltage between the *DHW Dem* and the *Com Dem* terminals (5 and 4). When the *DHW Demand* device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the *DHW Demand* device is off, you should measure less than 5 V (ac).



Testing the Outputs

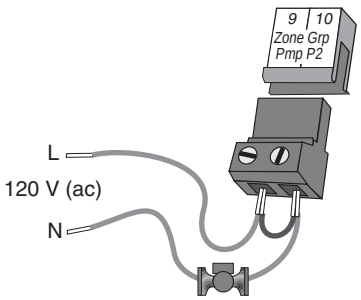
Boiler Pump (Boil P1)

If a boiler pump is connected to the *Boil P1* terminal (8), make sure that power to the terminal block is off and install a jumper between the *Power L* and the *Boil P1* terminals (7 and 8). When power is applied to the *Power N* and *Power L* terminals (6 and 7), the boiler pump should start. If the pump does not turn on, check the wiring between the terminal block and pump and refer to any installation or troubleshooting information supplied with the pump. If the pump operates properly, disconnect the power and remove the jumper.



Zone Group Pump (Zone Grp Pmp P2)

If a zone group pump is connected to the *Zone Grp Pmp P2* terminals (9 and 10), make sure the power to the pump circuit is off and install a jumper between terminals 9 and 10. When the pump circuit is powered up, the Zone Group 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.

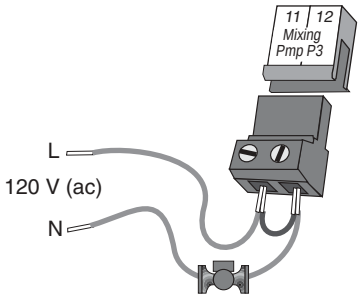


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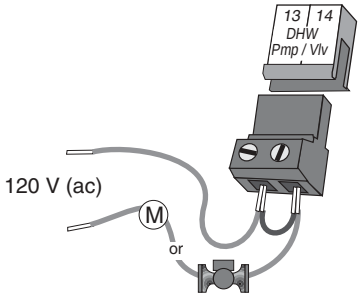
Mixing Pump (Mix P3)

If a mixing pump is connected to the *Mixing Pmp P3* terminals (11 and 12), make sure the 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 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 the power to the pump or valve circuit is off and install a jumper between those terminals. 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 operate correctly, 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 boiler 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 valve 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.

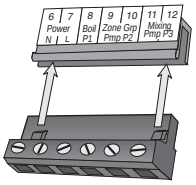
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Connecting the Control

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.

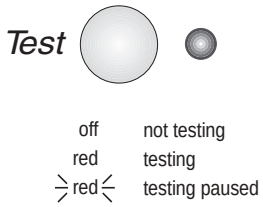


Install the supplied safety dividers between the unpowered sensor inputs and the powered 120 V (ac) or 24 V (ac) wiring chambers.

Apply power to the control. The operation of the control on power up is described in the Sequence of Operation section of this brochure.

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Testing



The Universal System Control 31050 has a built in test routine which is used to test the main control functions. The 31050 continually monitors the sensors and displays an error message whenever a fault is found. See the following pages for a list of the 31050'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 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 zone group 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 boiler 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 *Boil 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.

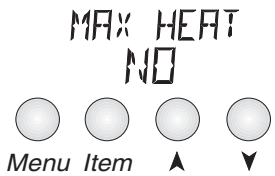
Step 7 - If PUMP is selected in the DHW THRU item, the *DHW Pmp/Vlv* contact is closed for 10 seconds. If VALV is selected in the DHW THRU item, the *DHW Pmp/Vlv* and *Boil P1* contacts are closed for 10 seconds. If NONE is selected in the DHW THRU item, N/A is displayed in the LCD.
***NOTE*:** Only if there is a DHW demand can the control be paused in step 7.

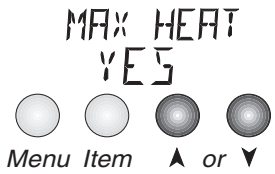
Step 8 - After the test sequence is completed, the word COMPLETE is displayed for 1 second and the control resumes its normal operation.

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Max Heat (MAX HEAT)

The Universal System Control 31050 has a function called *Max Heat*. In this mode, the 31050 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 *Up* or *Down* 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 *Up* and / or *Down* 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.

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Error Displayed	Description of Error
CTRL ERR EE W	The control was unable to store a piece of information to the EEPROM. This error can be caused by a noisy power source. The control will display the error message and will continue to operate as normal. Pressing either the Menu or Item button will clear this error.
CTRL ERR ADJS	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 at the control have been checked by the user or installer. Note: Access level must be set to Advanced in order to clear the error.
CTRL ERR MISC	The control was unable to read a piece of information stored in the Miscellaneous menu. Because of this, the control was required to load the factory settings into all of the items in the Miscellaneous menu. The control will continue to display the error message until all of the items available in the Miscellaneous menu of the control have been checked by the user or installer. Note: Access level must be set to Advanced in order to clear the error.
CTRL ERR A/D	The control was unable to read a piece of information from the A/D hardware. This is the system that the control uses to read the sensor inputs. If this error occurs, it is an indication that the sensor wires may have been run in a noisy electrical environment. To clear this error, press either the Menu or Item buttons. The control will stop operation until the A/D fault is corrected
OUTDOOR SHRT	The control is no longer able to read the Outdoor sensor due to a short circuit. In this case, the control assumes an outdoor temperature of 32˚F (0˚C) and continues operation. Locate and repair the problem as described in the Data Brochure D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
OUTDOOR OPEN	The control is no longer able to read the Outdoor sensor 30070 due to an open circuit. In this case, the control assumes an outdoor temperature of 32˚F (0˚C) and continues operation. Locate and repair the problem as described in the Data Brochure D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
MIX SUP SHRT	The control is no longer able to read the Mix Supply sensor 30071 due to a short circuit. In this case, if the boil SENS item is set to SUP, the control operates the mixing device at a fixed 15% of output as long as there is a Mixing Demand. If the boil SENS item is set to RET or NONE, the control operates the mixing device at a fixed 30% of output as long as there is a Mixing Demand. Locate and repair the problem as described in the Data Brochure D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
MIX SUP OPEN	The control is no longer able to read the Mix Supply sensor 30071 due to an open circuit. In this case, if the boil SENS item is set to SUP, the control operates the mixing device at a fixed 15% of output as long as there is a Mixing Demand. If the boil SENS item is set to RET or NONE, the control operates the mixing device at a fixed 30% of output as long as there is a Mixing Demand. Locate and repair the problem as described in the Data Brochure D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
MIX RET SHRT	The control is no longer able to read the Mix Return sensor 30071 due to a short circuit. If the MIXING item is set to FLOT, the control continues to operate without ΔT protection of the slab. If the MIXING item is set to VAR, the control continues to operate the snow melting system as required. In order to provide ΔT protection, the control periodically shuts off the injection pump and uses the Mix Supply sensor to determine the Mix Return temperature. Locate and repair the problem as described in the Data Brochure D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
MIX RET OPEN	The control is no longer able to read the Mix Return sensor 30071 due to an open circuit. If the MIXING item is set to FLOT, the control continues to operate without ΔT protection of the slab. If the MIXING item is set to VAR, the control continues to operate the snow melting system as required. In order to provide ΔT protection, the control periodically shuts off the injection pump and uses the Mix Supply sensor to determine the Mix Return temperature. Locate and repair the problem as described in the Data Brochure D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
Boil SENS SHRT	The control is not able to read the Boiler sensor due to a short circuit. If the Boiler Minimum setting is 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 Boiler Minimum setting is 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 D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.

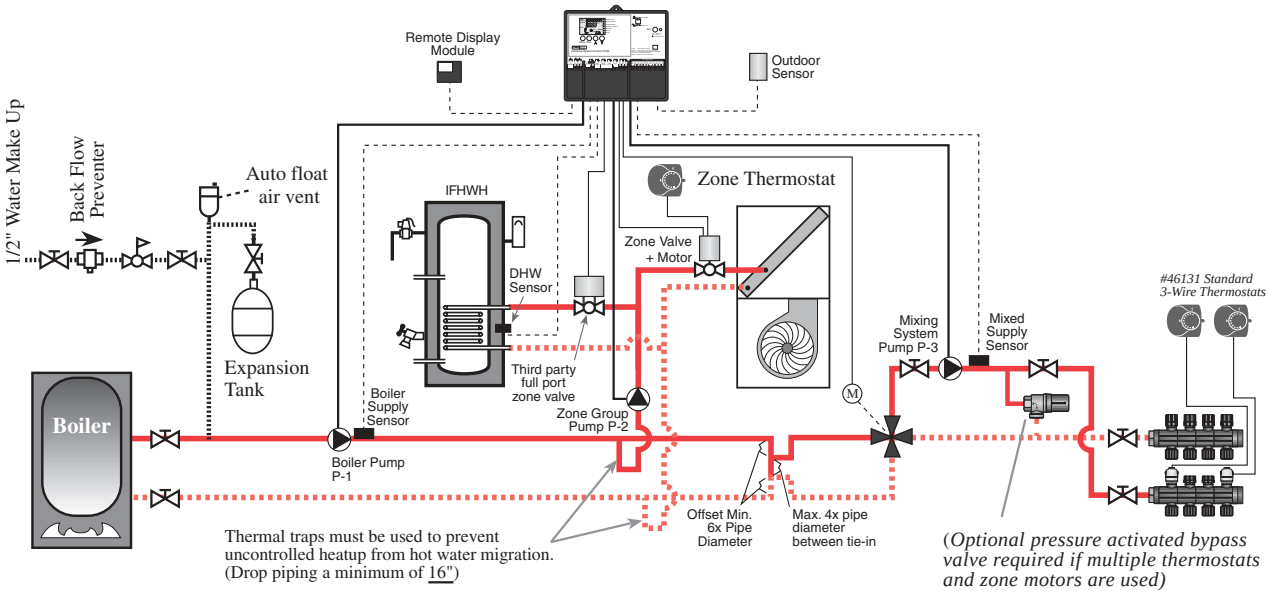
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Error Displayed	Description of Error
Boil SENS OPEN	The control is not able to read the Boiler sensor due to an open circuit. If the Boiler Minimum setting is higher than 100˚F (38˚C) the control closes the boiler contact when there is a call for heat in the system. The boiler temperature is limited by the operating aquastat. If the Boiler Minimum setting is 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 D070. If the Boiler Sensor was deliberately not installed, set the Boil SENS item to NONE. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
10K SHRT	The control is not 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 D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
10K OPEN	The control is not 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 D070. If a 10K sensor was deliberately not installed, set the Mix 10K item to NONE. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
Boil ZONE SHRT	The control is not 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 D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
Boil ZONE 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 D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item 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.
DHW SENS SHRT	The control is no longer able to read the DHW sensor because of a short circuit. In this case, the control ceases DHW operation. Locate and repair the problem as described in the Data Brochure D070. To clear the error message from the control after the sensor has been repaired, press either the Menu or Item button.
DHW SENS OPEN	The control is no longer able to read the DHW sensor because of an open circuit. In this case, the control ceases operation. Locate and repair the problem as described in the Data Brochure D070. 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 Menu or Item button.

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Application: 4-Way Mixing

Cast iron high mass boiler and 3 circuits.
(One low temp. - fully modulating)
(Two high temp. - fan coil plus IFHWH with optional hot water tank priority)



NOTE:

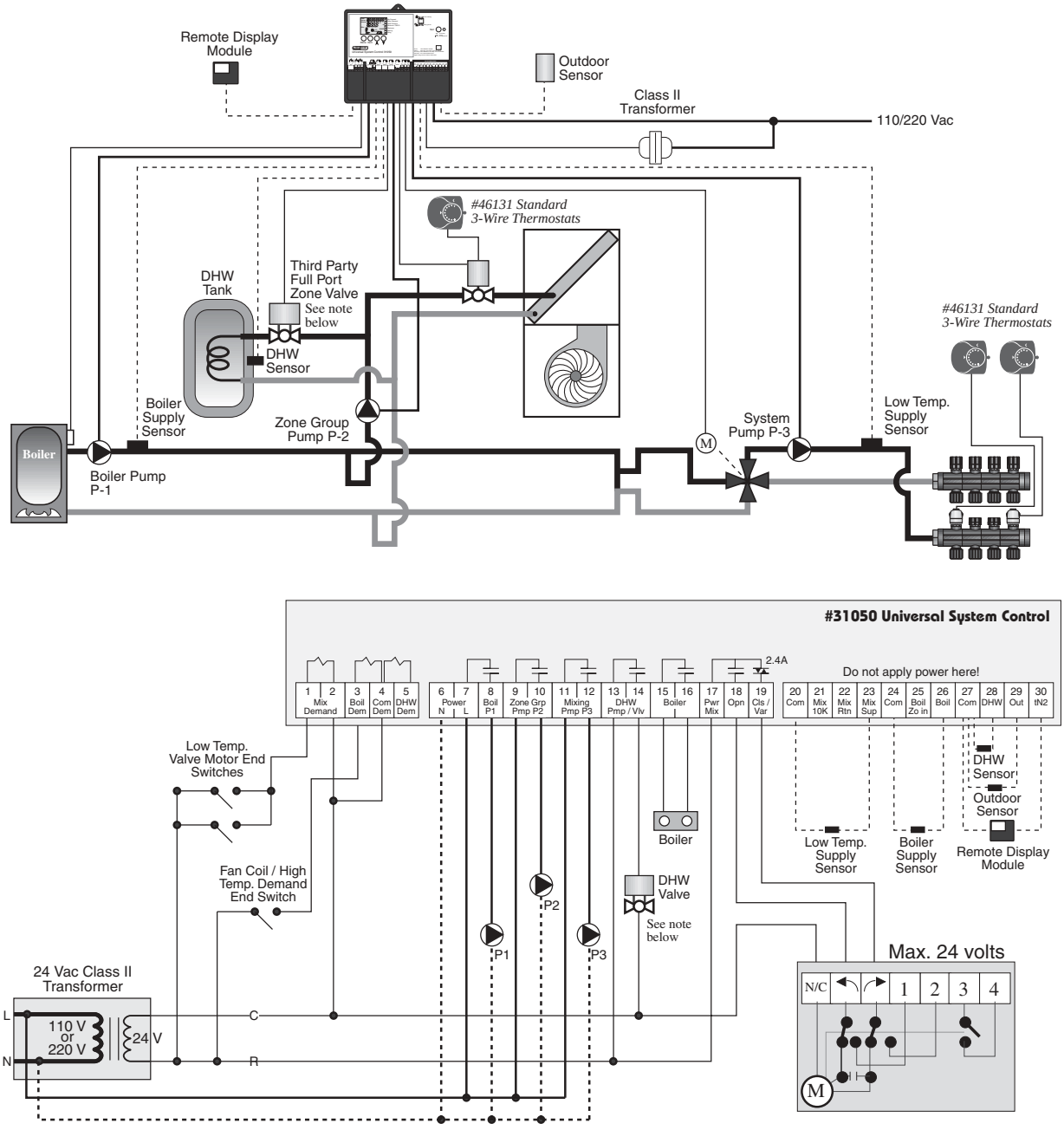
- ❑ AIR VENTS, EXPANSION TANKS, PRESSURE RELIEF VALVES etc. FOR BOILER AS PER LOCAL CODES.
- ❑ DRAWINGS ARE FOR HeatLink® SUGGESTED SYSTEM LAYOUT ONLY. USER MUST DETERMINE IF SYSTEM LAYOUT WILL WORK FOR THEIR PARTICULAR APPLICATION!
- ❑ USE ISOLATION BALL VALVES FOR ALL CIRCUITS AND COMPONENTS.

CONTROL SEQUENCE:

- ❑ Indoor/outdoor controller has two heat curve settings plus domestic hot water tank control. By correlating outside air temperature & supply water temp. the control unit then activates the 4-way mixing valve motor which in turn modulates the supply water temperature to the floors/slabs. (See ELECT 1.8 - 1.9 for wiring specifications). The fan coil supply water will be regulated by an independent heat curve setting. Upon DHW heat demand, the boiler is fired to its operating limit setting.
- ❑ Boiler to fire by activation through a relay of the controller (see ELECT 5.7).
- ❑ Pumps (P-1 to P-3) to be activated by controller (see ELECT 5.7).
- ❑ All pumps to be wired with their own disconnect switches.

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Application: Automatic indoor/outdoor controller modulating boiler supply water temp., low temp. floor heating, & domestic hot water (with optional DHW priority).



Note: For DHW tank use third party full port zone valve. Consult supplier instructions for wiring details.

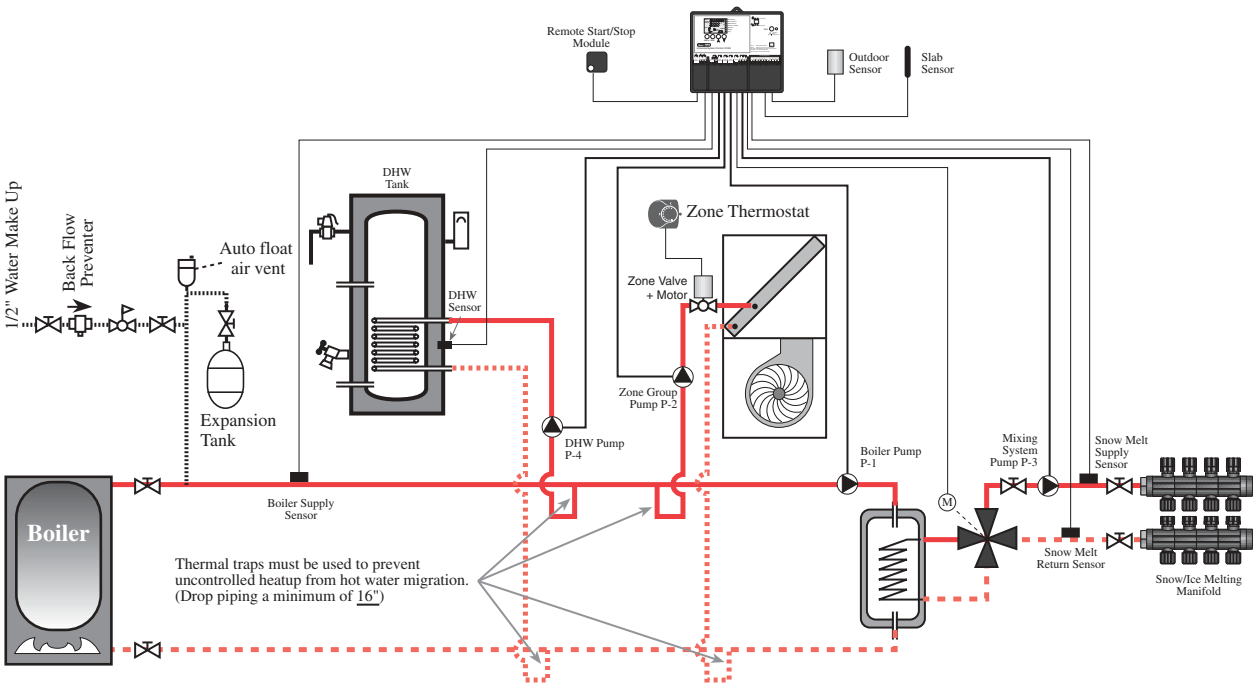
NOTE:

- ❑ DRAWINGS ARE FOR HeatLink® SUGGESTED ELECTRICAL DIAGRAMS ONLY! USER MUST DETERMINE IF ELECTRICAL DIAGRAM WILL WORK FOR THEIR PARTICULAR APPLICATION. USER MUST ALSO CONFIRM ALL HeatLink® DIAGRAMS WITH MANUFACTURER DIAGRAMS OF EACH PARTICULAR CONTROL CHOSEN.
- ❑ IN ALL CASES MANUFACTURER EQUIPMENT DIAGRAMS WILL TAKE PRECEDENCE OVER HeatLink® ELECTRICAL DIAGRAMS.
- ❑ ALL WIRING AS PER APPLICABLE ELECTRICAL CODES!

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Application:

Cast iron high mass boiler c/w 3 circuits
(one low temp. circuit - semi-automatic modulating water temp. for snow melting)
(two high temp. circuits; indirect fired hot water heater plus fan coil)



NOTE:

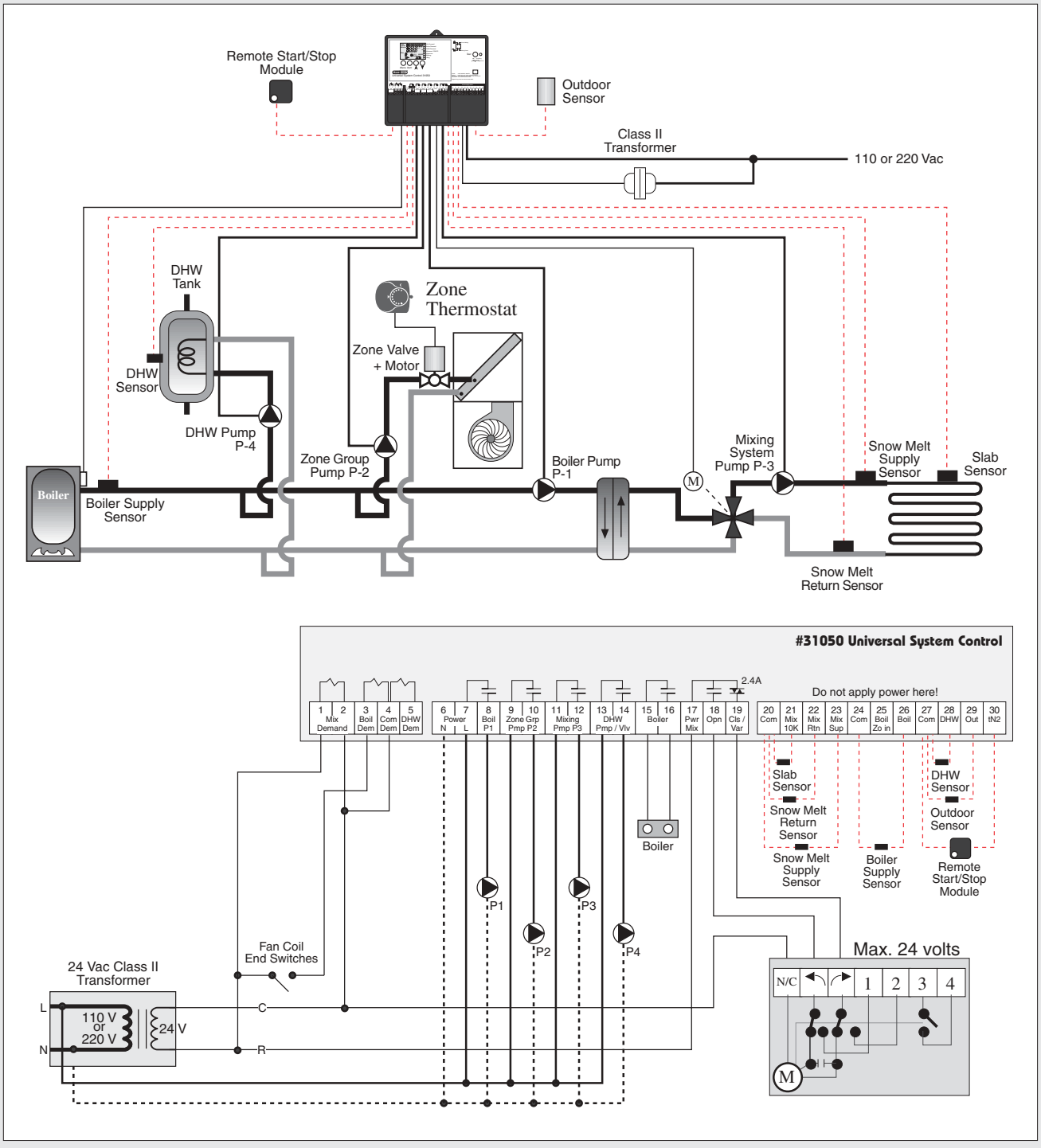
- ❑ AIR VENTS, EXPANSION TANKS, PRESSURE RELIEF VALVES etc. FOR BOILER AS PER LOCAL CODES.
- ❑ DRAWINGS ARE FOR HeatLink® SUGGESTED SYSTEM LAYOUT ONLY. USER MUST DETERMINE IF SYSTEM LAYOUT WILL WORK FOR THEIR PARTICULAR APPLICATION!
- ❑ USE ISOLATION BALL VALVES FOR ALL CIRCUITS AND COMPONENTS.
- ❑ EXPANSION TANK SIZING FOR THE SNOW MELTING CIRCUIT TO TAKE INTO ACCOUNT THE RATIO OF GLYCOL FREEZE PROTECTION IN THE SYSTEM.

CONTROL SEQUENCE:

- ❑ Indoor/outdoor controller has two heat curve settings plus domestic hot water tank control. By correlating outside air temperature, snow melt supply water temp., & snow melt return sensor the control unit then activates the 4-way mixing valve motor which in turn modulates the supply water temperature to the floors/slabs. (See ELECT 1.8 - 1.9 & 1.12-1.13 for wiring specifications). The fan coil supply water will be regulated by an independent heat curve setting. Upon DHW heat demand, the boiler is fired to its operating limit setting.
- ❑ Boiler to fire by activation through a relay of the controller (see ELECT 2.6).
- ❑ Pumps (P-1 to P-4) to be activated by controller (see ELECT 2.6).
- ❑ All pumps to be wired with their own disconnect switches.

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Application: Semi-automatic snow melt plus high temp system controller c/w slab sensor only activating a 4-way mixing valve motor, plus high temp system pumps. (High mass boiler c/w heat exchanger plus mixing & system pumps)



NOTE:

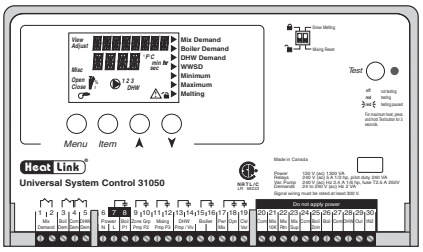
- ❑ DRAWINGS ARE FOR HeatLink® SUGGESTED ELECTRICAL SCHEMATICS ONLY! USER MUST DETERMINE IF ELECTRICAL SCHEMATIC WILL WORK FOR THEIR PARTICULAR APPLICATION. USER MUST ALSO CONFIRM ALL HeatLink® SCHEMATICS WITH MANUFACTURER SCHEMATICS OF EACH PARTICULAR CONTROL CHOSEN.
- ❑ IN ALL CASES MANUFACTURER EQUIPMENT SCHEMATICS WILL TAKE PRECEDENCE OVER HeatLink® ELECTRICAL SCHEMATICS.
- ❑ ALL WIRING AS PER APPLICABLE ELECTRICAL CODES!

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Technical Data



Control	- Microprocessor PID control; This is not a safety limit control.
Packaged weight	- 3.0 lb. (1350 g), Enclosure A, red 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 NRTL, meets DOC & FCC regulations for EMI/RFI.
Ambient condition	- Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
Power supply	- 120 V 50/60 Hz 1300 VA
Relays	- 240 V (ac) 5 A 1/3 hp, pilot duty 240 VA
Var. Pump	- 240 V 50/60 Hz 2.4 A 1/6 hp, fuse: T2.5 A 250 VA
Demands	- 24 to 240 V 50/60 Hz 2 VA
Sensors:	- NTC thermistor, 10 kΩ @ 77°F (25°C ± 0.2°C) ß=3892
Included:	- Outdoor Sensor 30070 and 2 Universal Sensors 30071.

This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as limit controls must be placed into the control circuit where required.

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 can be determined by turning the control off and on, the is encouraged to try to correct the interference by reorienting 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.

Limited Warranty and Product Return Procedure

Limited Warranty: HeatLink® warrants to the original purchaser each HeatLink® product against defects in workmanship and materials when the product is installed and used in compliance with HeatLink's instructions. This limited warranty covers the cost of parts and labour provided by HeatLink® to correct defects in the materials and/or workmanship. Returned products that are fully operational are not considered warranty cases. HeatLink® also does not cover parts and labour to remove, transport or reinstall a defective product. HeatLink® will not be liable for any damage other than repair or replacement of the defective part or parts and such repairs or replacement shall be deemed to be the sole remedy from HeatLink®. This warranty shall not apply to any defects caused or repairs required as a result of unreasonable or negligent use, neglect, accident, improper installation, or unauthorised repair or alterations. In case of defect, malfunction or failure to conform to warranty, HeatLink® will for a warranty period of 18 months from the date of invoice to the original purchaser or 12 months from the date of installation of the product, whichever occurs first, repair, exchange or give credit for the defective product. Any express or implied warranty which the purchaser may have, including merchantability and fitness for a particular purpose, shall not extend beyond 18 months from date of invoice or 12 months from the date of installation of the product, which ever occurs first.

Replacements: HeatLink® can send replacement product if requested. All replacements are invoiced. Any possible credit for the replacement will only be issued once the replaced product has been returned to HeatLink®.

Product Return Procedure: Product that are believed to have failed must be returned to HeatLink®. When agreed to by HeatLink®. The installer or other qualified service person must, at the owners expense, determine which component has failed. The product must be returned complete with all of its components (sensors, base, etc.) Products must be returned together with the proof of purchase to the original purchaser who then returns the product to HeatLink® After receiving a returned goods authorisation (RGA) number from HeatLink®.

Please include the following information with the product: The full address of the original purchaser, the RGA number and description of the problem.

For returns in the U.S.A., please have product returned to HeatLink® 1000-100 Street, Suite B, Grand Rapids, Michigan, 49315, Ph. 1-800-661-5332.
For returns in Canada, please have product returned to ***polytech PRODUCTS Inc***, 4603E 13th Street N.E., Calgary, Alberta, T2E 6M3, Ph. 1-800-661-5332.
For returns in Ireland, please have product returned to HeatLink® Ireland, Cappincur, Tullamore, Co. Offaly., Ph. (0506) 4062.

- If returned during the warranty period and the product is defective, HeatLink® will issue full credit for the returned product less cost of missing parts.
- If returned during the warranty period and the product is fully operational, HeatLink® will return the product to the original purchaser for a testing cost of $40.00 plus shipping.
- If returned during the warranty period and the product is not damaged and is fully operational, HeatLink® can take back the product for a return charge of 50% of the product's net value. This request has to be specified otherwise the product will be returned with a testing cost of $40.00 plus shipping.
- If returned after the warranty period and the product needs repair, HeatLink® will repair and return the product. Repair and shipping costs will be invoiced. HeatLink's repair costs are calculated at $40.00 / hour plus the cost of parts. If the repair costs will be more than $60.00 a repair estimate will be sent to the original purchaser.

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