tekmar® - Data Brochure

Boiler Control 260

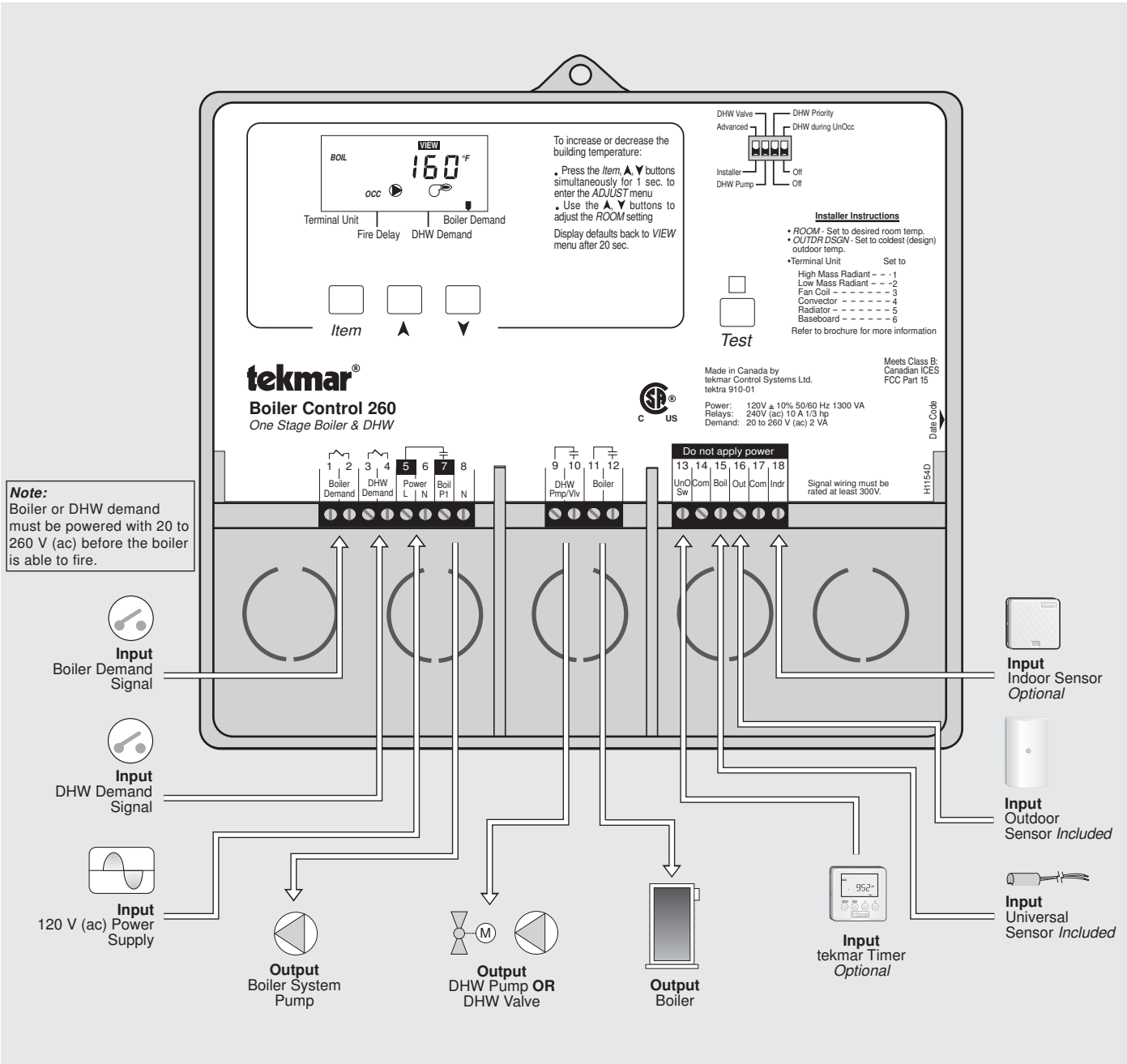
D 260

03/09

The Boiler Control 260 is designed to control a single stage heat source in order to provide outdoor reset or Domestic Hot Water (DHW) operation. The control has a Liquid Crystal Display (LCD) to view system status and operating information.

Additional functions include:

- Quick Setup for easy installation and programming of control
- User comfort adjustment to increase or decrease building space temperature
- Advanced settings to fine-tune building requirements
- Pump and valve exercising
- Optional indoor sensor for room air temperature control
- Powered boiler pump output
- DHW pump or valve operation
- Optional DHW priority
- Test sequence to ensure proper component operation
- Setback input for energy savings
- 120 V (ac) power supply
- CSA C US certified (approved to applicable UL standards)



How To Use The Data Brochure

This brochure is organized into four main sections. They are: 1) *Sequence of Operation*, 2) *Installation*, 3) *Control Settings*, and 4) *Troubleshooting*. The *Sequence of Operation* section has three sub-sections. We recommend reading Section A: *General Operation* 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. For quick installation and setup of the control, refer to the *Installation* section, *DIP Switch Settings* section, followed by the *Quick Setup* section.

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*.

Table of Contents

Reference Material: Essay E 003 “Characterized Heating Curve and Reset Ratio”

User Interface

The 260 uses a Liquid Crystal Display (LCD) as the method of supplying information. You use the LCD in order to set up and monitor the operation of your system. The 260 has three push buttons (***Item***, ▲, ▼) for selecting, viewing, 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.

Item

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

Adjust

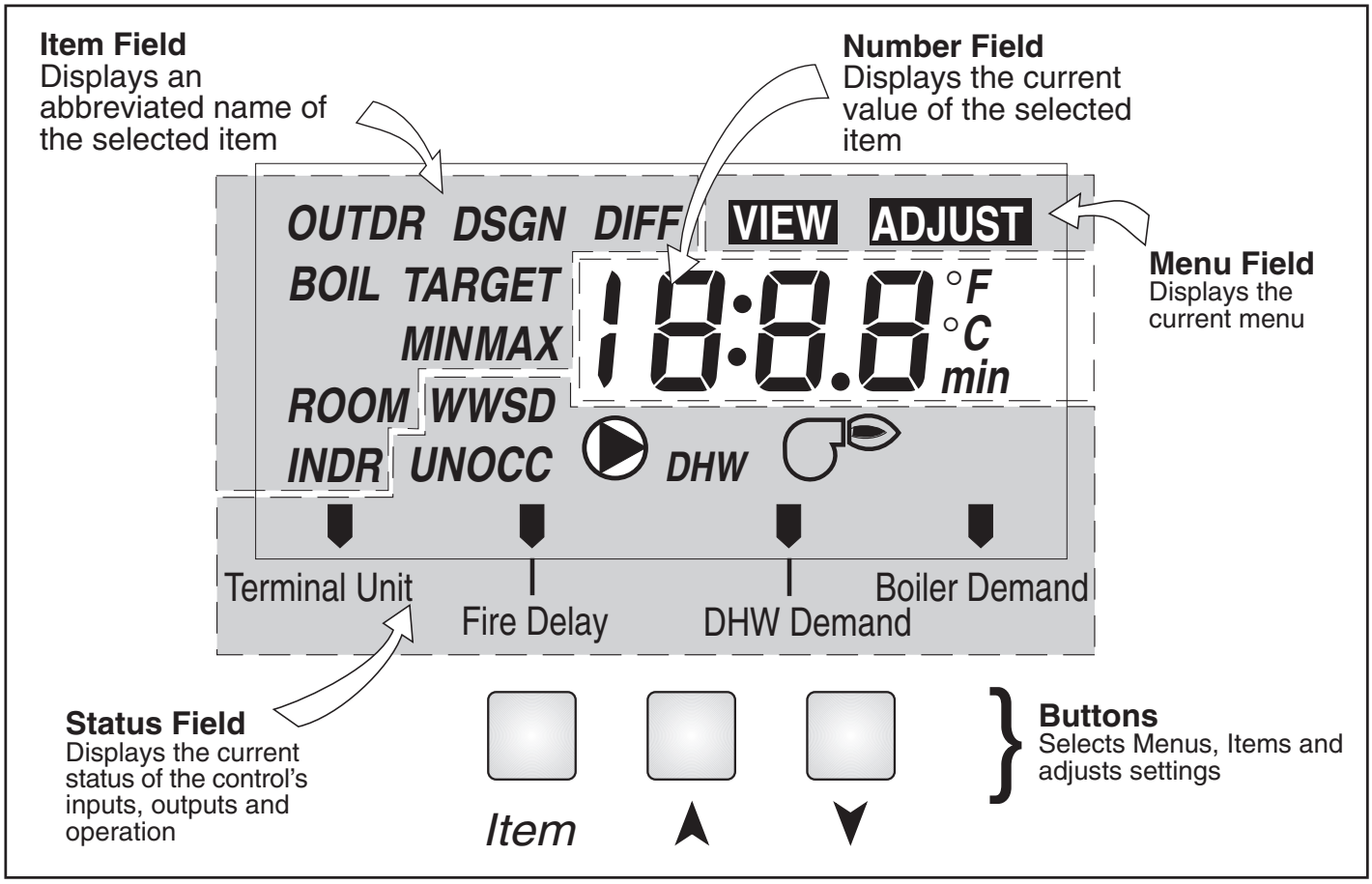
To make an adjustment to a setting in the control, press and hold simultaneously for 1 second, all three buttons. The display will then show the word ADJUST in the top right corner. Then select the desired item using the ***Item*** button. Finally, use the ▲ and / or ▼ button to make the adjustment.

To exit the ADJUST menu, either select the ESC item and press the ▲ or ▼ button, or leave the adjustment buttons alone for 20 seconds.

When the ***Item*** button is pressed and held in the VIEW menu, the display scrolls through all the adjust items in both access levels.

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

Display



Symbol Description

	Pump Displays when the boiler pump is in operation.	***UNOCC***	**Unoccupied Schedule** Displays when the control is in unoccupied (Night) mode.
DHW	**DHW** Displays when the DHW pump or valve is in operation.	***°F, °C***	**°F, °C** Displays the units of measure that all of the temperatures are to be displayed in the control.
	Burner Displays when the boiler relay is turned on.		**Pointer** Displays the control operation as indicated by the text.
OCC	**Occupied Schedule** Displays when the control is in occupied (Day) mode.		

Sequence of Operation

Section A
General Operation
Page 4

Section B
Boiler Reset
Page 5-8

Section C
DHW
Page 8-10

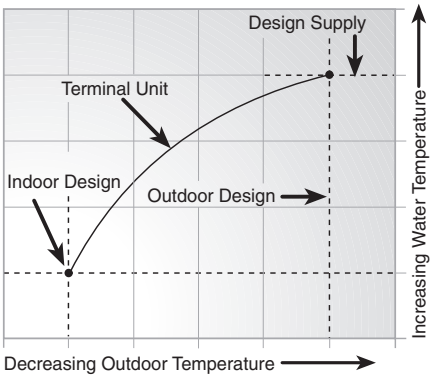
Section A —General Operation

POWERING UP THE CONTROL

When the Boiler Control 260 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.

OPERATION

The 260 operates a single on / off heat source to control the supply water temperature to a hydronic system. The supply water temperature is based on either the current outdoor temperature, or on a DHW target.



Outdoor Reset

The 260 calculates a supply temperature based on the outdoor air temperature. The 260 uses a *Characterized Heating Curve* and optionally indoor temperature feedback from an indoor sensor in this calculation.

DHW Control

When a demand signal from a Domestic Hot Water (DHW) system is present, the control will operate the boiler to maintain the supply water temperature at 180°F (82°C). Refer to section C.

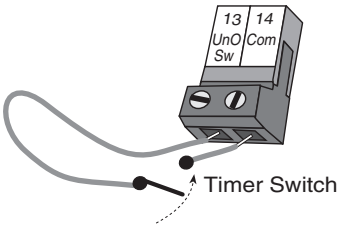
EXERCISING

The 260 has a built-in exercising function. If a pump or valve that is connected to the control has not been operated at least once every 3 days, 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. While the control is exercising, the *Test* LED flashes.

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

SETBACK (UNOCCUPIED)

To provide greater energy savings, the 260 has a setback capability. With setback, the supply water temperature in the system is reduced when the building is unoccupied. By reducing the supply water temperature, air temperature in the space may be reduced even when thermostat's are not turned down. Any time the *UnO Sw* (13) and the *Com* (14) terminals are shorted together, the control operates in the unoccupied (Night) mode. When in the unoccupied (Night) mode, the UNOCC segment is displayed in the LCD. The 260 adjusts the supply water temperature based on the UNOCC settings made in the control.



FACTORY DEFAULTS

The control comes preset with several factory defaults. These defaults are based on the terminal unit selection (see section B2). To fine-tune building requirements, these defaults may be changed. If a factory default value for a terminal unit is changed, the terminal unit number will flash when selected in the ADJUST menu.

To reload the factory defaults listed in section B2, power down the control and wait for 10 seconds. Power up the control while simultaneously holding the ***Item*** and ⮟ buttons. The terminal unit number should now be displayed constantly in the LCD rather than flashing.

Section B: Boiler Reset

Section B1
General

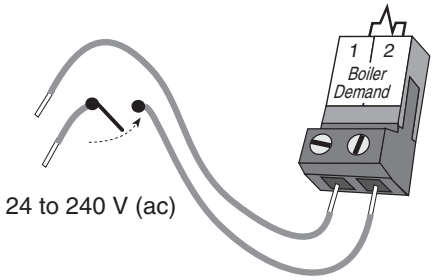
Section B2
Installer

Section B3
Advanced

Section B1: General

BOILER DEMAND

A boiler demand is required in order for the 260 to provide heat to the heating system. A boiler demand is generated by applying a voltage between 24 and 240 V (ac) across the *Boiler Demand* terminals (1 and 2). Once voltage is applied, the *Boiler Demand* pointer is displayed in the LCD. If the 260 is not in WWSD, the 260 closes the *Boil P1* contact. The 260 calculates a BOIL TARGET supply temperature based on the outdoor air temperature and settings. The 260 then fires the boiler, if required, to maintain the target supply temperature.



BOILER PUMP OPERATION (*Boil P1*)

The boiler pump contact (*Boil P1*, terminal 7) closes whenever there is a boiler demand and the 260 is not in WWSD. The boiler pump segment is displayed in the LCD. After the boiler demand has been satisfied, the 260 continues to operate the boiler pump for 20 seconds. This allows some residual heat to be purged out to the heating system. During WWSD, the boiler pump is operated based on the exercise function. For boiler pump contact operation during DHW operation, refer to section C.

BOILER OPERATION

When the 260 determines that boiler operation is required, the *Boiler* contact (11 and 12) closes. While the *Boiler* contact is closed, the burner segment in the LCD is displayed.

INDOOR SENSOR

The indoor sensor is connected to the *Com* and *Indr* terminals (17 and 18). In addition, power must be applied to the *Boiler Demand* terminals (1 and 2) as described in the BOILER DEMAND section. With the indoor sensor connected, the 260 is able to sense the actual room temperature. Indoor temperature feedback fine-tunes the supply water temperature in the heating system to maintain room temperature. To adjust the room temperature, use the ROOM OCC or ROOM UNOCC setting in the ADJUST menu at the control.

If a multiple zone system is used with an indoor sensor, proper placement of the indoor sensor is essential. The indoor sensor should be located in an area which best represents the average air temperature of the zones.

CHARACTERIZED HEATING CURVE

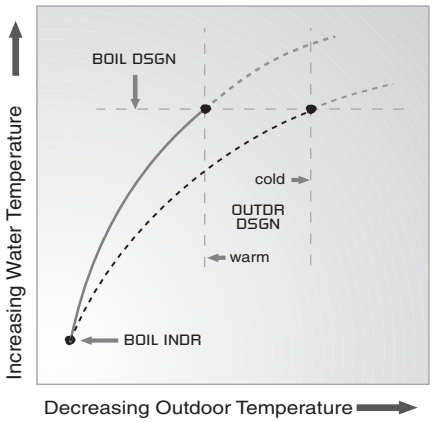
The 260 varies the supply water temperature based on the outdoor air temperature. The control takes into account the type of terminal unit that the system is using. Since different types of terminal units transfer heat to a space using different proportions of radiation, convection and conduction, the supply water temperature must be controlled differently. Once the control is told what type of terminal unit is used, the control varies the supply water temperature according to the type of terminal unit. This improves the control of the air temperature in the building.

BOILER TARGET TEMPERATURE (BOIL TARGET)

The BOIL TARGET temperature is determined from the *Characterized Heating Curve* settings, outdoor air temperature, and optionally, indoor air temperature. The control displays the temperature that it is currently trying to maintain as the boiler supply temperature. If the control does not presently have a requirement for heat, it does not show a boiler target temperature. Instead, "- - -" is displayed in the LCD.

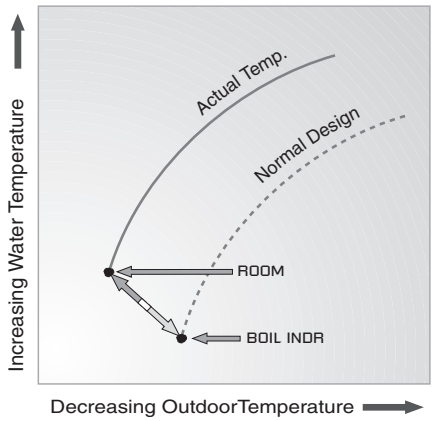
OUTDOOR DESIGN (OUTDR DSGN)

The OUTDR 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 the heat loss calculations for the building. If a cold outdoor design temperature is selected, the boiler supply temperature rises gradually as the outdoor temperature drops. If a warm outdoor design temperature is selected, the boiler supply temperature rises rapidly as the outdoor temperature drops.



ROOM OCC & UNOCC (ROOM)

The 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 design indoor temperature (BOIL INDR). If the room temperature is not correct, adjusting the ROOM setting increases or decreases the amount of heat available to the building. A ROOM setting is available for both the occupied (Day) and unoccupied (Night) modes.



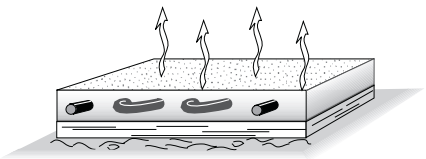
TERMINAL UNITS

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 (refer to Essay E 003). The 260 provides for selection between six different terminal unit types: two types of radiant floor heat, fancoil, fin-tube convector, radiator and baseboard. When a terminal unit is selected, the control automatically loads the design supply temperature (BOIL DSGN), maximum supply temperature (BOIL MAX), and minimum supply temperature (BOIL MIN). The factory defaults are listed below. To change defaults, refer to section B3. If a default has been changed, refer to section A to reload the factory defaults.

Terminal Unit	High Mass Radiant (1)	Low Mass Radiant (2)	Fancoil (3)	Fin-tube Convector (4)	Radiator (5)	Baseboard (6)
BOIL DSGN	120°F (49°C)	140°F (60°C)	190°F (88°C)	180°F (82°C)	160°F (71°C)	150°F (66°C)
BOIL MAX	140°F (60°C)	160°F (71°C)	210°F (99°C)	200°F (93°C)	180°F (82°C)	170°F (77°C)
BOIL MIN	OFF	OFF	140°F(60°C)	140°F (60°C)	140°F (60°C)	140°F (60°C)

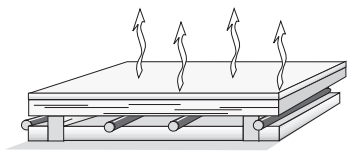
High Mass Radiant (1)

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.
Default values: BOIL DSGN = 120°F (49°C), BOIL MAX = 140°F (60°C), BOIL MIN = OFF

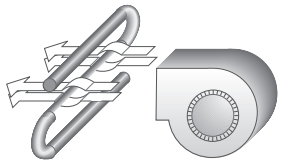


Low Mass Radiant (2)

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 sub-floor and the surface. This type of radiant system has a relatively low thermal mass and responds faster than a high mass system.
Default values: BOIL DSGN = 140°F (60°C), BOIL MAX = 160°F (71°C), BOIL MIN = OFF



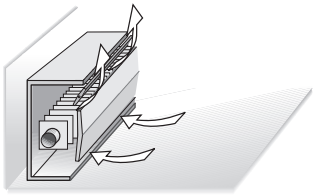
Fancoil (3)



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

Default values: BOIL DSGN = 190°F (88°C), BOIL MAX = 210°F (99°C), BOIL MIN = 140°F (60°C)

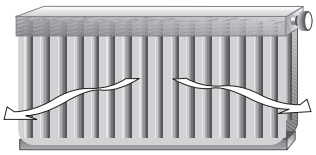
Fin–tube Convector (4)



A convector terminal unit is made up of a heating element with fins on it. 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 to the space is dependant on the supply water temperature to the heating element and the room air temperature.

Default values: BOIL DSGN = 180°F (82°C), BOIL MAX = 200°F (93°C), BOIL MIN = 140°F (60°C)

Radiator (5)



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.

Default values: BOIL DSGN = 160°F (71°C), BOIL MAX = 180°F (82°C), BOIL MIN = 140°F (60°C)

Baseboard (6)

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 that from a fin-tube convector.

Default values: BOIL DSGN = 150°F (66°C), BOIL MAX = 170°F (77°C), BOIL MIN = 140°F (60°C)

Section B3: Advanced

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 DESIGN (BOIL DSGN)

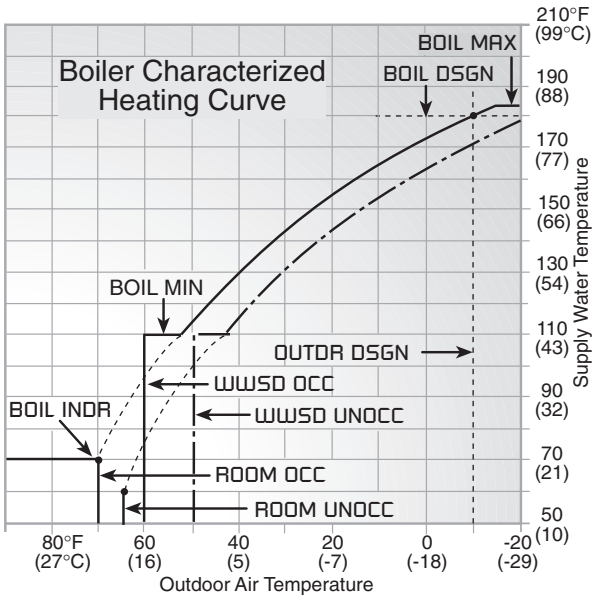
The BOIL DSGN temperature is the supply water temperature required to heat the boiler zones when the outdoor air temperature is as cold as the OUTDR DSGN setting.

BOILER MAXIMUM (BOIL MAX)

The BOIL MAX is the highest water temperature that the control is allowed to calculate as the BOIL TARGET temperature. If the control does target the BOIL MAX setting, and the BOIL temperature is near the BOIL MAX temperature, the MAX segment will be displayed in the LCD while either the BOIL TARGET temperature or the BOIL temperature is being viewed. At no time does the control operate the boiler above 248°F (120°C).

BOILER MINIMUM (BOIL MIN)

The BOIL MIN is the lowest water temperature that the control is allowed to use as the BOIL TARGET temperature. During mild conditions, if the 260 calculates a BOIL TARGET temperature that is below the BOIL MIN setting, the BOIL TARGET temperature is adjusted to at least the BOIL MIN setting. During this condition, if the boiler is operating, the MIN segment turns on in the LCD while the BOIL TARGET or BOIL temperature is being viewed. If the installed boiler is designed for low temperature operation, set the BOIL MIN adjustment to OFF.



FIRE DELAY (FIRE DELAY)

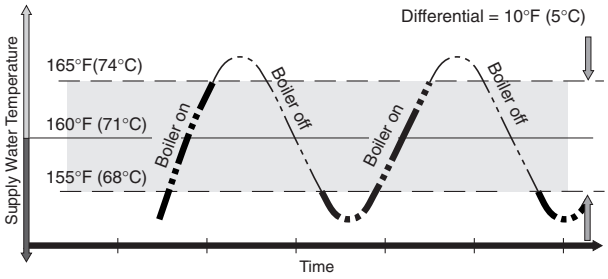
The Fire Delay is the delay time that occurs between the time that the 260 closes the *Boiler* contact and the burner fires. This delay is usually the result of burner pre-purge, or other forms of time delay built into the burner's safety circuits.

BOILER DIFFERENTIAL (BOIL DIFF)

An on / off heat source such as a boiler, must be operated with a differential in order to prevent short cycling. With the 260, either a fixed or an auto differential may be selected.

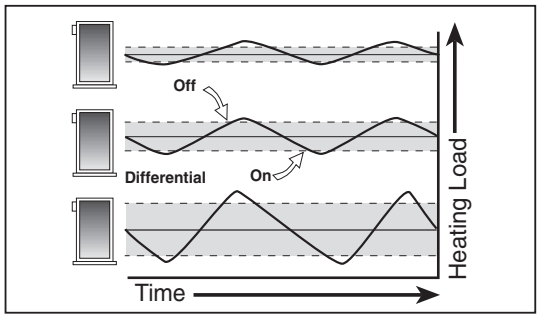
Fixed Differential

The boiler differential is divided around the BOIL TARGET temperature. The contact will close when the supply water temperature is 1/2 of the differential setting below the BOIL TARGET temperature, and will open when the supply water temperature is 1/2 of the differential setting above the BOIL TARGET temperature.



Auto Differential (Ad)

If the Auto Differential is selected, the 260 automatically determines the best differential as the load changes. This setting is recommended as it reduces potential short cycling during light loads.



WARM WEATHER SHUT DOWN (WWSD) OCC & UNOCC

When the outdoor air temperature rises above the WWSD setting, the 260 turns on the WWSD segment 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 section C.

Section C: Domestic Hot Water (DHW)

Section C1
General Domestic Hot Water (DHW) Operation

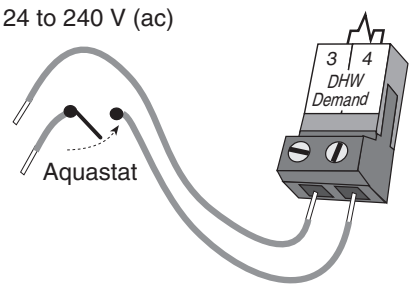
Section C2
DHW Priority

Section C3
DHW with Low Temperature Boiler

Section C1: General Domestic Hot Water (DHW) Operation

DHW DEMAND

A DHW demand is required in order for the 260 to provide heat to the DHW system. The 260 registers a DHW demand when a voltage between 24 and 240 V (ac) is applied across the *DHW Demand* terminals (3 and 4). A DHW aquastat or setpoint control is used as a switch in the DHW demand circuit. Once the 260 detects a DHW demand, the *DHW Demand* pointer turns on in the LCD and the control operates as described below.

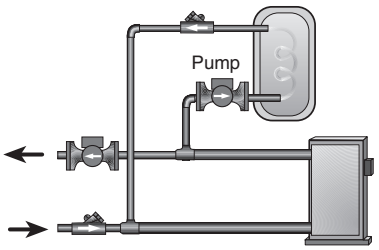


DHW DEVICE

Once the 260 receives a DHW demand, the sequence of operation depends on the type of DHW device selected. The DHW device is selected using the *DHW Valve / DHW Pump* DIP switch.

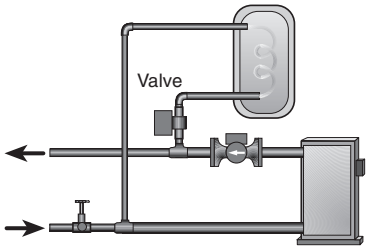
*DHW Pump (*DIP switch *= DHW Pump)*

If *DHW Pump* is selected, the 260 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 260 closes the *DHW Pmp / Vlv* contact (9 and 10) and operates the boiler to provide a sufficient boiler supply temperature to the DHW tank. If using a primary loop with the DHW tank piped in primary / secondary, set the DIP switch to *DHW Valve*.



*DHW Valve (*DIP switch *= DHW Valve)*

If *DHW Valve* is selected and there is a DHW demand, the 260 closes the *DHW Pmp / Vlv* contact (9 and 10) and the *Boil P1* contact (7). The boiler pump provides flow through the DHW's heat exchanger once the DHW valve is opened. The 260 operates the boiler to provide a sufficient boiler supply temperature to the DHW tank.



BOILER TARGET DURING DHW GENERATION (BOIL TARGET)

When the control receives a DHW demand, the BOIL TARGET is at least 180°F (82°C).

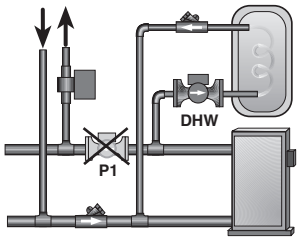
DHW DURING UNOCCUPIED

If a DHW demand is received during an unoccupied (Night) period, the control can either continue operation of the DHW system as it would during the occupied (Day) period, or the control can ignore a call for DHW as long as the control is in an unoccupied (Night) mode. This option is selected using the *DHW during UnOcc* DIP switch.

Section C2: DHW Priority

DHW PRIORITY

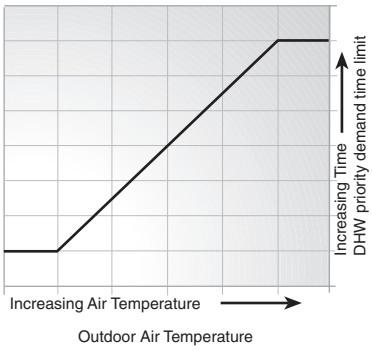
It is often desirable to limit or even stop the flow of heat to the heating system when the DHW tank calls for heat. This allows for a faster recovery of the DHW tank. If DHW priority is selected, the boiler pump (P1) is turned off on a call for DHW. This setting is available only if DHW pump is selected as the DHW device (DIP switch = *DHW Pump*). If a valve is used as the DHW device, DHW priority can not be used. Caution should be taken to ensure that the flow rate of the DHW pump is adequate for both the DHW tank and the boiler, as this will be the only pump providing flow through the boiler. This feature is selected using the *DHW Priority / Off* DIP switch.



Note: If *DHW Priority* is selected with a *DHW Valve*, the control will display an error message. Refer to the *Error Messages* section at the back of this brochure.

DHW PRIORITY OVERRIDE

To prevent the building from cooling off too much, or the possibility of a potential freeze up during DHW priority, the 260 limits the amount of time for DHW priority. As the outdoor air temperature becomes colder, the length of time that the 260 provides DHW priority is reduced. Once the allowed time for priority has elapsed, the 260 overrides the DHW priority and operates DHW and heating simultaneously.



CONDITIONAL DHW PRIORITY

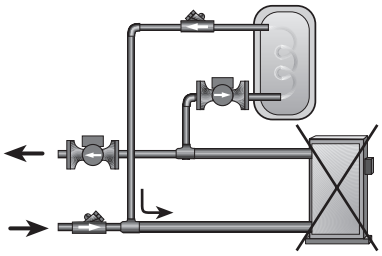
If the boiler supply temperature is maintained at or above the required temperature during DHW generation, this indicates that the boiler has enough capacity for DHW and possibly heating as well. As long as the boiler supply temperature is maintained near its target, DHW and heating occurs simultaneously.

DHW POST PURGE

After the DHW demand is removed, the 260 performs a purge on the boiler. The 260 shuts off the boiler and continues to operate either the DHW pump, or the DHW valve and the boiler pump. This purges the residual heat from the boiler into the DHW tank. The 260 continues this purge for a maximum of four minutes or until the boiler supply water temperature drops below 160°F (71°C). The 260 also stops the purge if the boiler supply temperature drops below the current BOIL TARGET temperature.

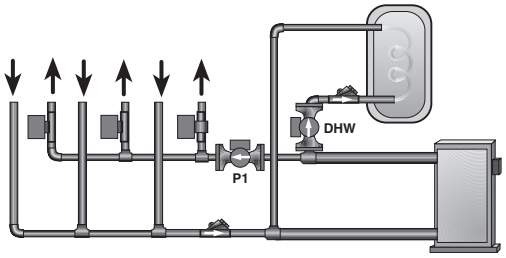
DHW MIXING PURGE

After DHW priority 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 260 shuts off the boiler, but continues to operate the DHW while restarting the heating system. This allows some of the DHW return water to mix with the cool return water from the zones and temper the boiler return water.



Section C3: DHW with Low Temperature Boiler

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 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 260 is capable of providing DHW in such a system while ensuring that the low temperature in the heating system does not exceed its allowed maximum setting.



To prevent high temperature water from being introduced into the heating system, the boiler pump P1 must be turned off during a call for DHW. To do this, the DHW device must be a DHW pump (DIP switch = *DHW Pump*), DHW priority must be selected (DIP switch = *DHW Priority*), and BOIL MIN must be set to OFF.

On a call for DHW, the 260 provides DHW priority by shutting off the boiler pump (P1) for a period of time. This time is based on the outdoor air temperature as described in the DHW PRIORITY OVERRIDE section. However, if the DHW demand is not satisfied within the allotted time, the boiler shuts off and the heat of the boiler is purged into the DHW tank.

Once the boiler supply temperature is sufficiently reduced, the DHW pump shuts off. The heating system is turned on for a period of time to prevent the building from cooling off. After a period of heating, if the DHW demand is still present, the 260 shuts off the heating system and provides heat to the DHW tank once again.

For correct operation, close attention must be paid to the mechanical layout of the system. When the 260 turns off the boiler pump (P1), flow to the heating system must stop. If flow is not stopped, the temperature in the heating system can exceed the maximum desired temperature, and can result in damage to the heating system.

Installation

CAUTION

Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury. It is your responsibility to ensure that this control is safely installed 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 tekmar sales representative for assistance.

Type 260 includes: One Boiler Control 260, One Outdoor Sensor 070, One Universal Sensor 082, Data Brochures D 260, D 070, D 001, Application Brochure A 260

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

STEP TWO — MOUNTING THE BASE

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

STEP THREE — ROUGH-IN WIRING

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

Power must not be applied to any of the wires during the rough-in wiring stage.

- Install the Outdoor Sensor 070 and Boiler Sensor 082 according to the instructions in the Data Brochure D 070, and run the wiring back to the control.
- If an Indoor Sensor 076 or 077 is used, install the indoor sensor according to the instructions in the Data Brochure D 074, and run the wiring back to the control.
- Run wire from other system components (pumps, valve, boiler, etc.) to the control.
- Run wires from the 120 V (ac) power to the control. Use a clean power source to ensure proper operation. Multi-strand 16 AWG wire is recommended for all 120 V (ac) wiring due to its superior flexibility and ease of installation into the terminals.

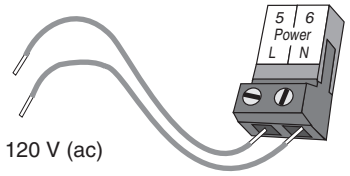
STEP FOUR — ELECTRICAL CONNECTIONS TO THE CONTROL

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

Powered Input Connections

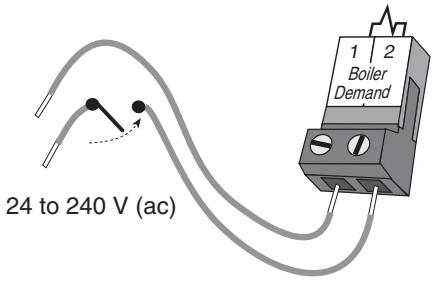
120 V (ac) Power

Connect the 120 V (ac) power supply to the *Power L* and *Power N* terminals (5 and 6). This connection provides power to the microprocessor and display of the control. As well, this connection provides power to the *Boil P1* terminal (7) from the *Power L* terminal (5).



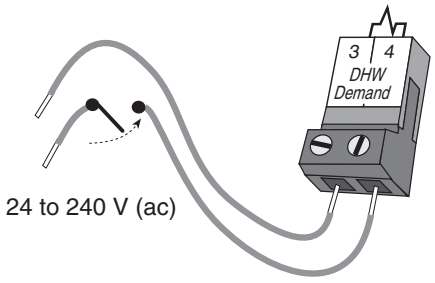
Boiler Demand

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



DHW Demand

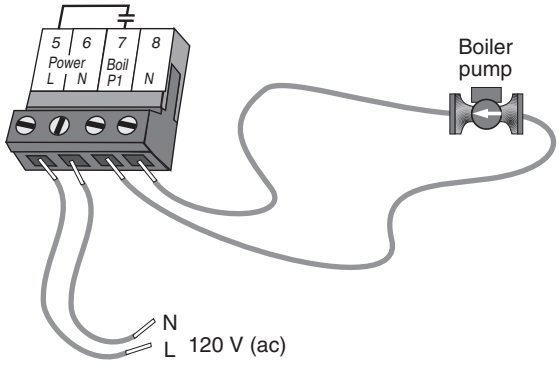
To generate a DHW demand, a voltage between 24 V (ac) and 240 V (ac) must be applied across the *DHW Demand* terminals (3 and 4).



Output Connections

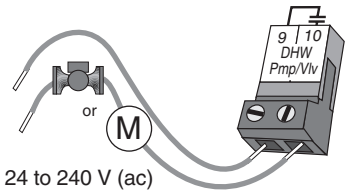
Boiler Pump Contact (*Boil P1*)

The boiler pump output terminal (7) on the 260 is a powered output. When the relay contact in the 260 closes, 120 V (ac) Line (L) is provided to the *Boil P1* terminal (7) from the *Power L* terminal (5). To operate the boiler pump, connect one side of the boiler pump circuit to terminal 7, and the second side of the pump circuit to the neutral (*N*) terminal 8.



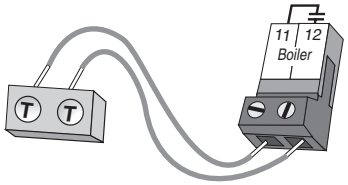
DHW Pump / Valve Contact

The *DHW Pmp / Vlv* terminals (9 and 10) are an isolated output in the 260. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break power to the DHW pump or DHW valve. Since this is an isolated contact, it may switch a voltage between 24 V (ac) and 240 V (ac).



Boiler Contact

The *Boiler* terminals (11 and 12) are an isolated output in the 260. 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 260 requires the boiler to fire, it closes the contact between terminals 11 and 12.

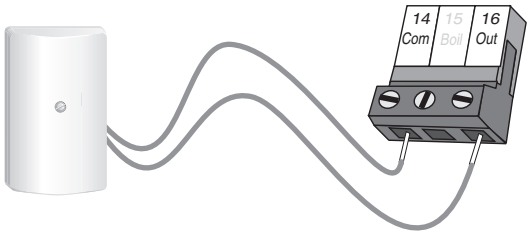


Sensor and Unpowered Input Connections

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

Outdoor Sensor

Connect the two wires from the Outdoor Sensor 070 to the *Com* and *Out* terminals (14 and 16). The outdoor sensor is used by the 260 to measure the outdoor air temperature.

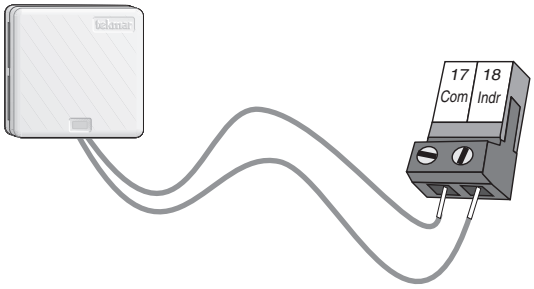


Boiler Sensor

Connect the two wires from the Boiler Sensor 082 to the *Com* and *Boil* terminals (14 and 15). The boiler sensor is used by the 260 to measure the supply (outlet) water temperature from the boiler.

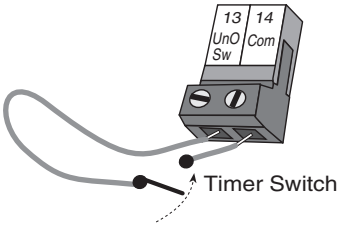
Indoor Sensor

If an indoor sensor is used, connect the two wires from the sensor to the *Com* and *Indr* terminals (17 and 18). The indoor sensor is used by the 260 to measure the room air temperature.



Unoccupied Switch

If an external timer (tekmar Timer 032) or switch is used, connect the two wires from the external switch to the *UnO Sw* and *Com* terminals (13 and 14). When these two terminals are shorted together, the control registers an unoccupied signal.



STEP FIVE — TESTING THE WIRING

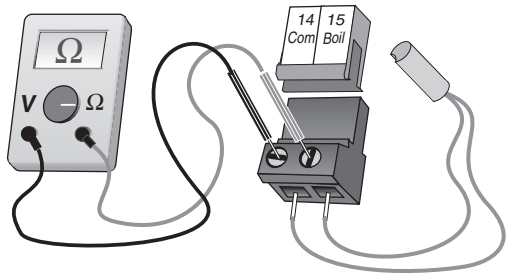
Each terminal block ***must be unplugged*** from its header on the control before power is applied for testing. To remove a terminal block, pull it straight down from the control.

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

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

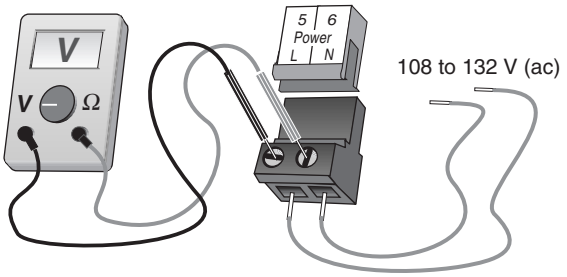
Test The Sensors

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



Test The Power Supply

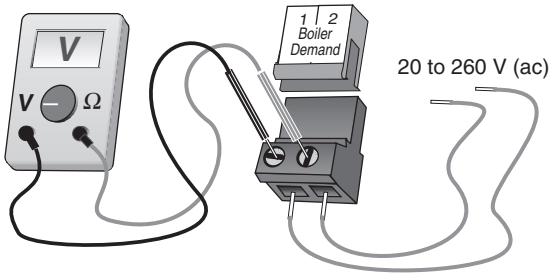
Make sure exposed wires and bare terminals are not in contact with other wires or grounded surfaces. Turn on the power and measure the voltage between the *Power L* and *Power N* terminals (5 and 6) using an AC voltmeter. The reading should be between 108 and 132 V (ac).



Test The Powered Inputs

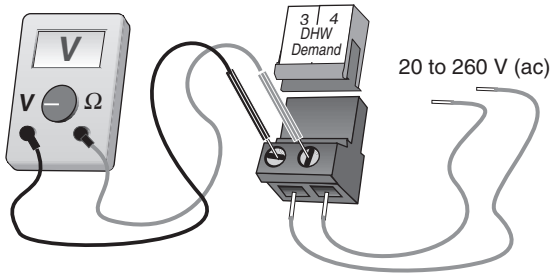
Boiler Demand

Measure the voltage between the *Boiler Demand* terminals (1 and 2). 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

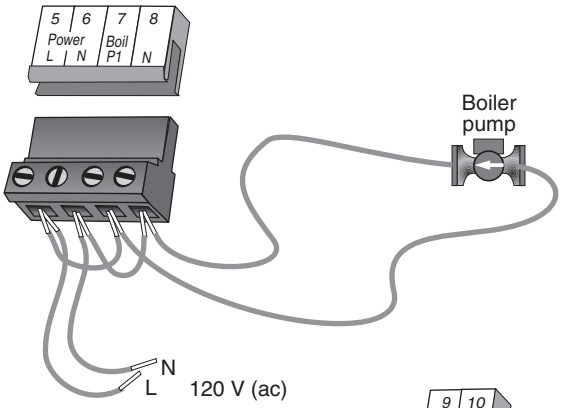
If a DHW demand is used, measure the voltage between the *DHW Demand* terminals (3 and 4). When the DHW demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the DHW demand device is off, you should measure less than 5 V (ac).



Test The Outputs

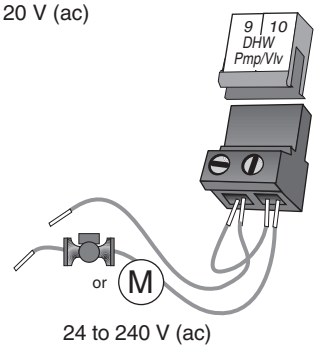
Boiler Pump (*Boil P1*)

If the boiler pump is connected to the *Boil P1* terminal (7) and *N* terminal (8), make sure power to the terminal block is off, and install a jumper between the *Power L* and the *Boil P1* terminals (5 and 7). Install a second jumper between *Power N* and *N* terminals (6 and 8). When power is applied to the *Power L* and *Power N* terminals (5 and 6), the boiler pump should start. If the pump does not turn on, check the wiring between 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 jumpers.



DHW Pump or Valve (*DHW Pmp / Vlv*)

If a DHW pump or DHW valve is connected to the *DHW Pmp / Vlv* terminals (9 and 10), make sure 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 operates properly, disconnect the power and remove the jumper.



Boiler

If the boiler circuit is connected to the *Boiler* terminals (11 and 12), 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.

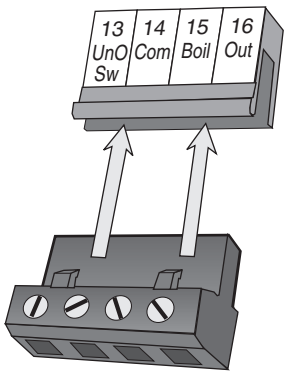
Connecting The Control

Make sure all power to the devices and terminal blocks is off, and remove any remaining jumpers from the terminals.

Reconnect the terminal blocks to the control by carefully aligning them with their respective headers on the control, and then pushing the terminal blocks into the headers. The terminal blocks should snap firmly into place.

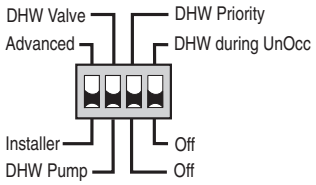
Install the supplied safety dividers between the unpowered sensor inputs, and the powered or 24 V (ac) wiring chambers.

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



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.



ADVANCED / INSTALLER

The *Advanced / Installer* DIP switch is used to select which items are available to be viewed and / or adjusted in the user interface.

DHW VALVE / DHW PUMP

The *DHW Valve / DHW Pump* DIP switch is used to select the type of device that is being used to control the flow of heat to the DHW tank.

Note: If the DHW tank is piped in primary / secondary, *DHW Valve* must be selected. Refer to section C1.

DHW PRIORITY / OFF

The *DHW Priority / Off* DIP switch is used to select DHW priority. If the DIP switch is set to *DHW Priority*, refer to section C2.

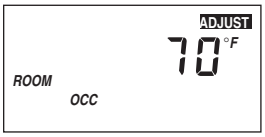
DHW DURING UNOCC / OFF

The *DHW during UnOcc / Off* DIP switch is used to select whether or not DHW will be generated during the unoccupied (Night) period. If *DHW during UnOcc* is selected, DHW operates normally. If *Off* is selected, a call for DHW during the unoccupied (Night) period is ignored.

Quick Setup

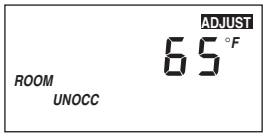
To enter the installer programming mode, set the *Advanced / Installer* DIP switch to *Installer*.

Access the ADJUST menu by pressing and holding simultaneously for 1 second, the ***Item***, ▲ and ▼ buttons. The display will now show the word ADJUST in the top right corner.



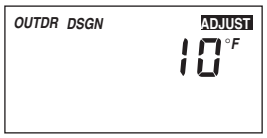
The ROOM OCC adjustment is the first item displayed. Use the ▲ or ▼ button to set the ROOM temperature. The ROOM OCC setting is set to the desired room air temperature during the occupied (Day) mode.

Note: To increase or decrease space temperature during the occupied (Day) mode, only adjust the ROOM OCC setting.

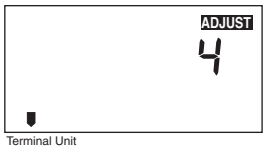


Press and release the ***Item*** button to advance to the ROOM UNOCC adjustment. Use the ▲ or ▼ button to set the desired temperature. The ROOM UNOCC setting is set to the desired room air temperature during the unoccupied (Night) mode.

Note: To increase or decrease space temperature during the unoccupied (Night) mode, only adjust the ROOM UNOCC setting.



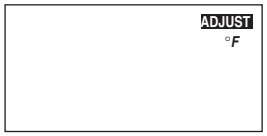
Press and release the ***Item*** button to advance to the OUTDR DSGN adjustment. Use the ▲ or ▼ button to set the outdoor design temperature. The OUTDR DSGN setting is set to the typical coldest temperature of the year.



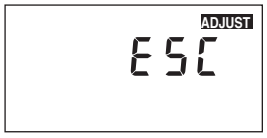
Terminal Unit

Press and release the ***Item*** button to advance to the *Terminal Unit* adjustment. Use the ▲ or ▼ button to select the desired terminal unit. The terminal unit number corresponds to the type of terminal that is being used. The table below lists the terminal units and their default values.

Terminal Unit	High Mass Radiant (1)	Low Mass Radiant (2)	Fancoil (3)	Fin-tube Convector (4)	Radiator (5)	Baseboard (6)
BOIL DSGN	120°F (49°C)	140°F (60°C)	190°F (88°C)	180°F (82°C)	160°F (71°C)	150°F (66°C)
BOIL MAX	140°F (60°C)	160°F (71°C)	210°F (99°C)	200°F (93°C)	180°F (82°C)	170°F (77°C)
BOIL MIN	OFF	OFF	140°F(60°C)	140°F (60°C)	140°F (60°C)	140°F (60°C)

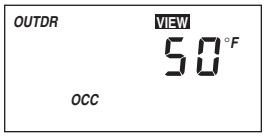
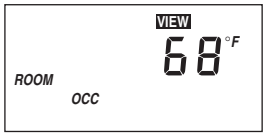
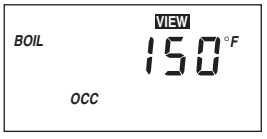
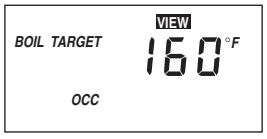


Press and release the ***Item*** button to advance to the units adjustment. Use the ▲ or ▼ button to set the scale to °F or °C.

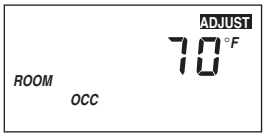
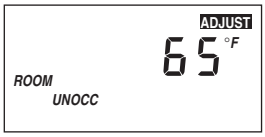
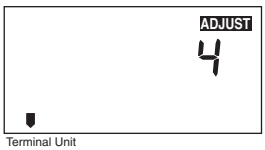
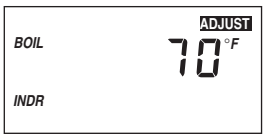
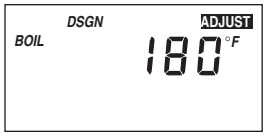
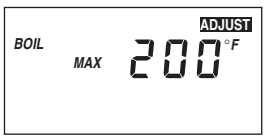
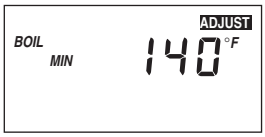
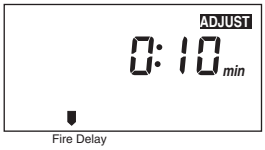
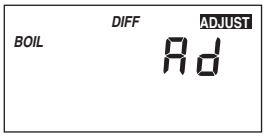
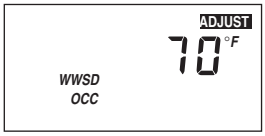


To exit the ADJUST menu, press and release the ***Item*** button to advance to the ESC item. Then either press the ▲ or ▼ button, or leave the buttons alone for 20 seconds.

View Menu (1 of 1)

Display	Section	Installer	Advanced	Description	Range
		○	●	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)
	B1	○	●	Current room air temperature as measured by the indoor sensor. **(Indoor sensor is present)**	23 to 113°F (-5 to 45°C)
	B3	○	●	Current boiler supply water temperature as measured by the boiler sensor.	14 to 266F (-10 to 130°C)
	B1 B3 C1 C2		●	Target boiler supply is the temperature the control is currently trying to maintain at the boiler sensor.	---, 14 to 266°F (---, -10 to 130°C)

Adjust Menu (1 of 2)

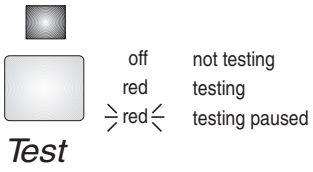
Display	Section	Installer	Advanced	Description	Range	Actual Setting
	B2	○	●	The desired room air temperature during an occupied (Day) period.	35 to 100°F (2 to 38°C)	
	B2	○	●	The desired room air temperature during an unoccupied (Night) period.	35 to 100°F (2 to 38°C)	
	B2	○	●	The design outdoor air temperature used in the heat loss calculation for the heating system.	-60 to 32°F (-51 to 0°C)	
	B2	○	●	The type of terminal units that are being used in the heating system.	1 (High Mass Radiant), 2 (Low Mass Radiant), 3 (Fancoil), 4 (Fin-tube Convector), 5 (Radiator), 6 (Baseboard)	
	B3		●	The design indoor air temperature used in the heat loss calculation for the heating system.	35 to 100°F (2 to 38°C)	
	B3		●	The design supply water temperature used in the heat loss calculation for the heating system.	70 to 220°F (21 to 104°C)	
	B3		●	The maximum boiler target supply water temperature.	120 to 225°F (49 to 107°C)	
	B3		●	The minimum temperature allowed for the boiler target temperature.	OFF, 80 to 180°F (OFF, 27 to 82°C)	
	B3		●	The time delay the control can expect between the time the boiler contact closes, and the burner fires.	0:00 to 3:00 min (1 sec. increments)	
	B3		●	The differential that the control is to use when it is operating the boiler.	Ad, 2 to 42°F (Ad, -17 to 6°C)	
	B3		●	The system's warm weather shut down during the occupied (Day) period.	35 to 100°F, OFF (2 to 38°C, OFF)	

Adjust Menu (2 of 2)

Display	Section	Installer	Advanced	Description	Range	Actual Setting
ADJUST 60 °F WWSD UNOCC	B3		●	The system's warm weather shut down during the unoccupied (Night) period.	35 to 100°F, OFF (2 to 38°C, OFF)	
ADJUST °F		○	●	The units of measurement that all of the temperatures are to be displayed in the control.	°F, °C	
ADJUST ESC		○	●	This item exits the ADJUST menu by pressing either the ▲ or ▼ button.		

Testing the Control

The Boiler Control 260 has a built-in test routine which is used to test the main control functions. The 260 continually monitors the sensors, and displays an error message whenever a fault is found. See the following pages for a list of the 260'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. Only if there is a boiler demand can the control be paused in a step. 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 - The boiler pump (*Boil P1*) is turned on for 10 seconds.

Step 2 - The *Boiler* contact is turned on for 10 seconds. After 10 seconds, the *Boiler* and *Boil P1* contacts are shut off.

Step 3 - If a DHW pump is selected as the DHW device, the *DHW Pmp / Vlv* contact is turned on for 10 seconds and is then shut off.
- If a DHW valve is selected as the DHW device, the *DHW Pmp / Vlv* and *Boil P1* contacts are turned on for 10 seconds and then shut off.

***Note*:** This step can only be paused if a DHW demand is present.

Step 4 - After the test sequence is completed, the control resumes its normal operation.

Troubleshooting

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

Establish the Problem

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

Understand the Sequence of Operation

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

Use the Test Routine

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

Sketch the Piping in the System

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

Document the Control

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

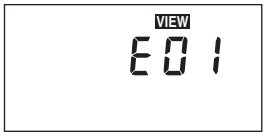
Isolate the Problem

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

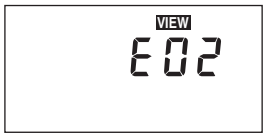
Test the Contacts Voltages & Sensors

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

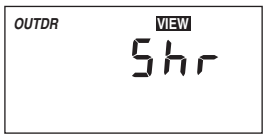
Error Messages



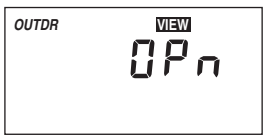
The control was unable to read a piece of information from its EEPROM. This error can be caused by a noisy power source. The control will load the factory defaults and stop operation until all the settings are verified.



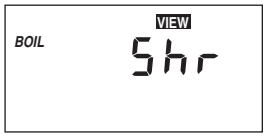
This error is caused by an illegal DHW DIP switch setting. When *DHW Priority* and *DHW Valve* are selected in the DIP switch settings, the control will flash the error message. In this case, the control will operate as if the *DHW Priority / Off* DIP switch is set to *Off*. To clear the error message from the control, set the *DHW Priority / Off* DIP switch to *Off* and press the ***Item*** button.



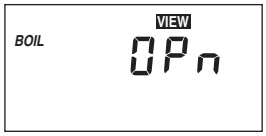
The control is no longer able to read the outdoor sensor due to a short circuit. In this case the control assumes an outdoor temperature of 32°F (0°C) and continues operation. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



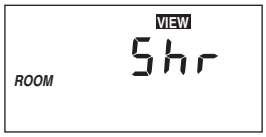
The control is no longer able to read the outdoor sensor due to an open circuit. In this case the control assumes an outdoor temperature of 32°F (0°C) and continues operation. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



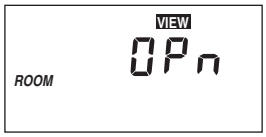
The control is no longer able to read the boiler sensor due to a short circuit. In this case the control does not operate the *Boiler* contact. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



The control is no longer able to read the boiler sensor due to an open circuit. In this case the control does not operate the *Boiler* contact. Locate and repair the problem as described in the Data Brochure D 070. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



The control is no longer able to read the indoor sensor due to a short circuit. The control will continue to operate as if there was nothing connected to the indoor sensor input. Locate and repair the problem as described in the Data Brochure D 074. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.

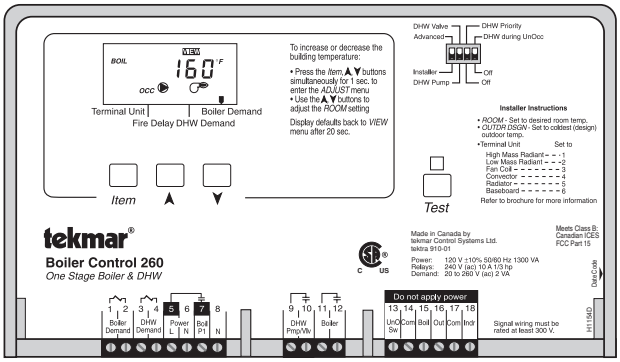


The control is no longer able to read the indoor sensor due to an open circuit. The control will continue to operate as if there was nothing connected to the indoor sensor input. Locate and repair the problem as described in the Data Brochure D 074. If the indoor sensor was deliberately removed, the control must be powered down, and then powered back up. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.

Technical Data

Boiler Control 260 *One Stage Boiler & DHW*

Literature	—	D 260, A 260's, D 001, D 070, E 003.
Control	—	Microprocessor PID control; This is **not a safety (limit) control**.
Packaged weight	—	3.0 lb. (1340 g), Enclosure A, blue PVC plastic
Dimensions	—	6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
Approvals	—	CSA C US, CSA 22.2 No 24 and UL 873, meets class B: ICES & FCC Part 15.
Ambient conditions	—	Indoor use only, 32 to 113°F (0 to 45°C), < 90% RH non-condensing.
Power supply	—	120 V (ac) ±10%, 50/60 Hz, 1300 VA
Relays	—	240 V (ac) 10 A 1/3 hp
Demands	—	20 to 260 V (ac) 2 VA
Sensors included	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892 Outdoor Sensor 070 and Universal Sensor 082.
Optional devices	—	tekmar type #: 032, 076, 077.



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

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

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

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

Limited Warranty and Product Return Procedure

Limited Warranty The liability of tekmar Control Systems Ltd. and tekmar Control Systems, Inc. ("tekmar") under this warranty is limited. The purchaser, by taking receipt of the tekmar product ("product"), acknowledges receipt of the terms of the warranty and acknowledges that it has read and understands same.

tekmar warrants each tekmar product against defects in workmanship and materials, if the product is installed and used in compliance with tekmar's instructions. The warranty period is for a period of twenty-four (24) months from the production date if the product is not installed during that period, or twelve (12) months from the documented date of installation if installed within twenty-four (24) months from the production date.

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

This warranty applies only to those products returned to tekmar during the warranty period. This warranty does not cover the cost of the parts or labor to remove or transport the defective product, or to reinstall the repaired or replacement product. Returned products that are not defective are not covered by this warranty.

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

This warranty is in lieu of all other warranties, express or implied, which the Governing Law (being the law of British Columbia) allows parties to contractually exclude, including, without limitation, warranties of merchantability, fitness for a particular purpose, durability or description of the product, its non-infringement of any relevant patents or trademarks, and its compliance with or non-violation of any applicable environmental, health or safety legislation; the term of any other warranty not hereby contractually excluded is limited such that it shall not extend beyond twenty-four (24) months from the production date, to the extent that such limitation is allowed by the Governing Law.

Product Return Procedure Products that are believed to have defects in workmanship or materials must be returned, together with a written description of the defect, to the tekmar representative for that territory. If the address of the representative is not known, please request it from tekmar at the telephone number listed below**.**

tekmar® Control Systems

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