tekmar® - Data Brochure Addendum

Boiler Control 268 - Addition of DHW Modes and Setpoint Modes

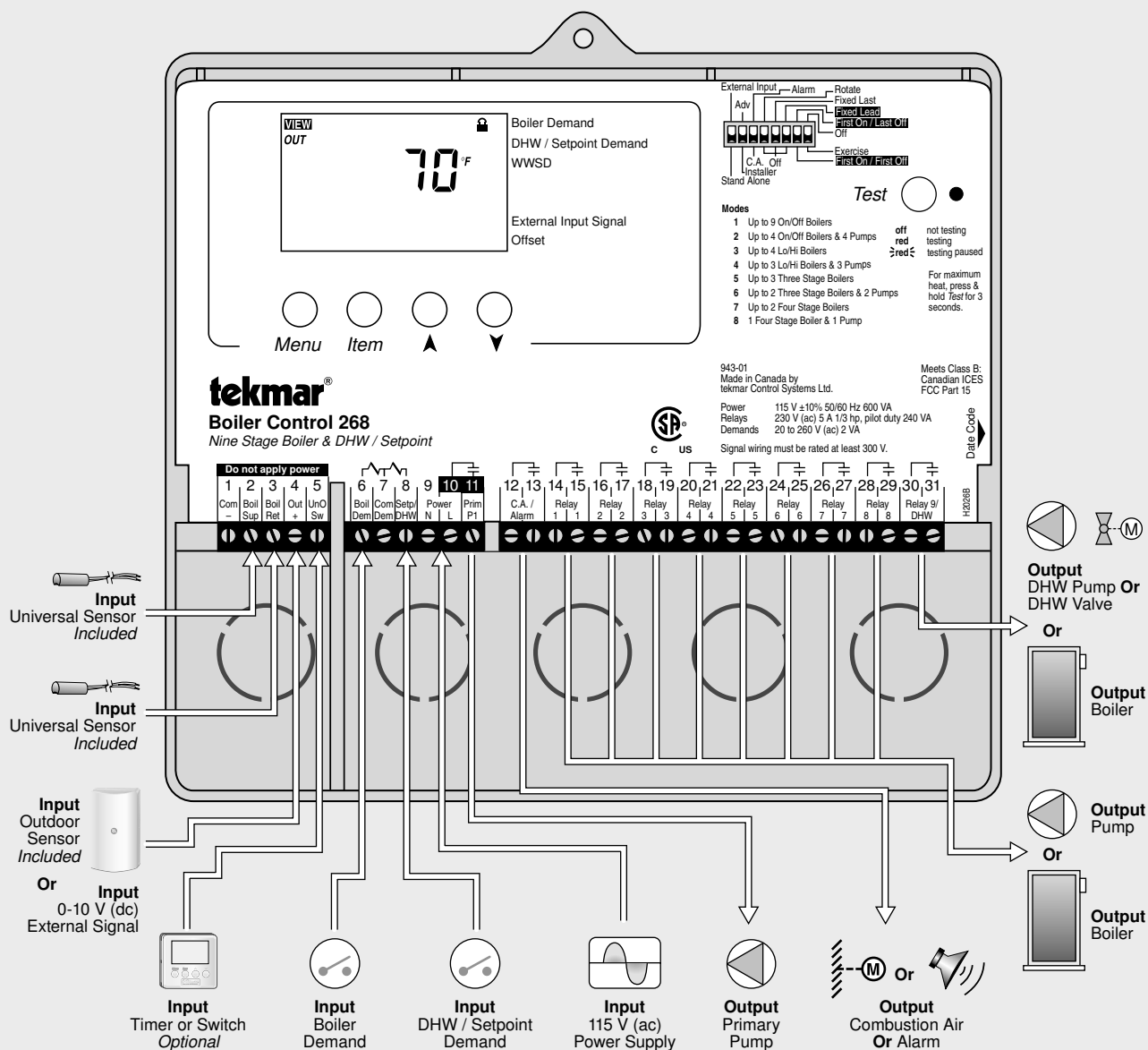**D 268A**
10/03

The tekmar Boiler Control 268 has been modified to include the following features:

- DHW demand for DHW loads
- Boiler alarm

- New Setpoint operation
- Relay 9 can be used for DHW operation

The changes are included in controls starting with Lot 10. The date code and lot number are listed on the right hand side of the 268.

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Added Features

Features listed below have been added to the 268 Boiler Control. The sections in this addendum now supersede the appropriate sections in the D268 brochure dated 11/02.

Section A: Domestic Hot Water (DHW)

DHW operation is available during Boiler Reset (Stand Alone) and External Input operation.

The DHW operation requires the use of the *Relay 9 / DHW* contact; therefore, the last boiler in MODE's 1, 4 and 5 must be set to *OFF* before the DHW MODE item will be available.

DHW DEMAND

A *DHW Demand* is required in order for the control to provide heat to the DHW system. A DHW aquastat or setpoint control is used as a switch in the DHW demand circuit. Once the control detects a DHW demand, the *DHW Demand* pointer turns on in the LCD and the control operates the boiler to provide a sufficient boiler supply water temperature to the DHW tank. The control operates the pumps as described below.
The control registers a *DHW Demand* when a voltage between 24 and 230 V (ac) is applied across the *Setp / DHW* and *Com Dem* terminals (8 and 7).

BOILER TARGET DURING DHW GENERATION

The boiler target temperature is at least as hot as the DHW exchange setting (*DHW XCHG*). The DHW demand overrides the boiler reset target temperature, except when the boiler reset target is higher than that of the DHW exchange setting.

DHW MODE & PRIORITY OPERATION

The control has five different settings available for DHW MODE. The required DHW MODE setting will depend on the piping arrangement of the DHW tank.

It is often desirable to have a priority for the DHW allowing for quick recovery of the DHW tank temperature. This is achieved by limiting or even stopping the flow of heat to the heating system when the DHW tank calls for heat.
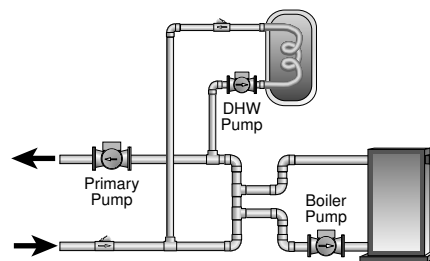
DHW MODE OFF – No DHW

The DHW feature is not selected. This allows for Setpoint operation as described in section B.

DHW MODE 1 – DHW in Parallel no Priority

When a *DHW Demand* is present, the *Relay 9 / DHW* contact (terminals 30 and 31) closes with the DHW demand. The primary pump does not turn on, but may operate based on a Boiler Demand. Refer to section C.
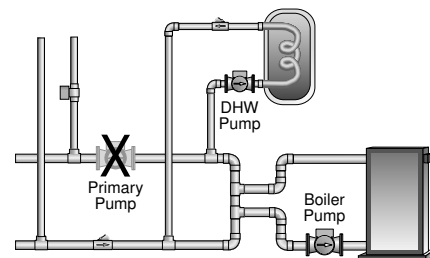**It is assumed that the DHW pump will provide adequate flow through the heat exchanger and the boiler.**

DHW MODE 2 – DHW in Parallel with Priority

When a *DHW Demand* is present, the *Relay 9 / DHW* contact (terminals 30 and 31) closes and the primary pump contact is opened.
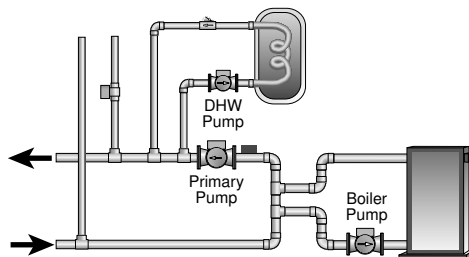**It is assumed that the DHW pump will provide adequate flow through the heat exchanger and the boiler.**

DHW MODE 3 - DHW in Primary / Secondary no Priority

When a *DHW Demand* is present, the *Relay 9 / DHW* contact (terminals 30 and 31) is closed and the primary pump contact is closed.
This mode can be used if a DHW tank is piped in direct return and a DHW valve is installed.
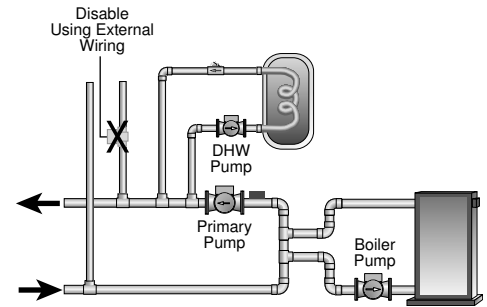
DHW MODE 4 – DHW in Primary / Secondary with Priority —

When a *DHW Demand* is present, the *Relay 9 / DHW* contact (terminals 30 and 31) is closed and the primary pump contact is closed. Priority can only be obtained using external wiring. During a priority override, the *Relay 9 / DHW* contact is opened until the heating system has recovered before returning to DHW operation.
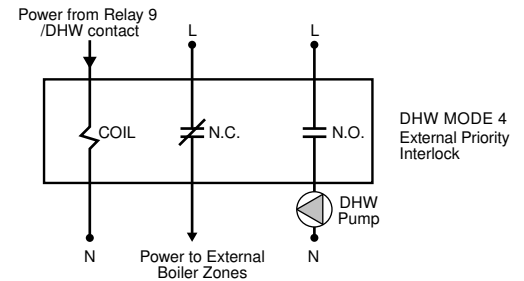
This mode can be used if a DHW tank is piped in direct return and a DHW valve is installed.

DHW PRIORITY OVERRIDE

The DHW *Priority Override* applies to *DHW MODE 2* and *4*. To prevent the building from cooling off too much or the possibility of a potential freeze up during DHW priority, the control limits the amount of time for DHW priority. The length of DHW priority time is determined using the *Priority Override* setting. Once the allowed time for priority has elapsed, the control overrides the DHW priority and resumes space heating.

To provide external DHW priority in DHW Mode 4, the space heating zones must be interlocked with the *Relay 9 / DHW* contact. During DHW demands, the *Relay 9 / DHW* contact must remove any power to all space heating zone valves or zone pumps.
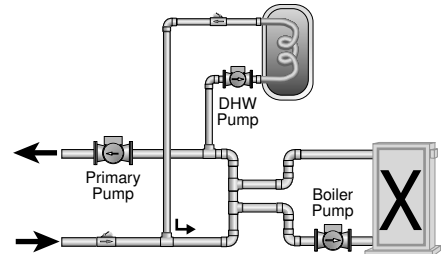
CONDITIONAL DHW PRIORITY

The *Conditional DHW Priority Override* applies to *DHW MODE 2* and *4*. If the boiler supply temperature is maintained at or above the required temperature during DHW generation, this indicates that the boiler(s) has enough capacity for DHW and possibly heating as well. As long as the boiler supply temperature is maintained near its target and the heating and DHW targets are similar, DHW and heating occurs simultaneously.

DHW POST PURGE

After the *DHW Demand* is removed, the control performs a purge on the boiler(s). The control shuts off the boiler(s) and continues to operate either the DHW pump or the DHW valve and the system and boiler pump if applicable. This purges the residual heat from the boiler(s) into the DHW tank. The control continues this purge for a maximum of two minutes or until the boiler supply water temperature drops 20°F (11°C) below the boiler target temperature during the DHW operation. The control also stops the purge if the boiler supply temperature is close to the current boiler target temperature.

DHW MIXING PURGE

After DHW operation, the boiler(s) 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(s) after DHW in parallel with priority (DHW MODE 2), the control shuts off the boiler(s), 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.

DHW DURING UNOCCUPIED

If the control receives a *DHW Demand* during an unoccupied period, the control can either continue operation of the DHW system as it would during the occupied period or the control can ignore a *DHW Demand* for the duration of the unoccupied period.
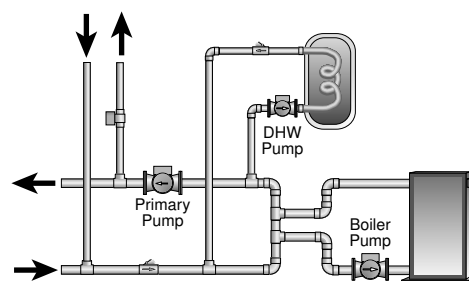
NUMBER OF BOILERS USED FOR DHW GENERATION

The number of boilers used for DHW generation can be selected from one to the maximum number of boilers using the BOIL DHW setting. This applies when only a DHW Demand is present. If there are other demands present, the control does not limit the number of boilers operated.

Section A2: DHW with 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 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 control is capable of providing DHW in such a system while maximizing the chance that the 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 primary pump (*Prim P1)* must be turned off during a call for DHW. To do this, the control must be set to DHW *MODE 2 or DHW MODE 4* and *Boil MIN* must be set to *OFF*.

DHW MODE 2 OPERATION

On a call for DHW, the control provides DHW priority by shutting off the primary pump (*Prim P1*) for a period of time. This time is based on the DHW Priority Override setting. However, if the *DHW Demand* is not satisfied within the allotted time, the boiler(s) shuts off and the heat of the boiler is purged into the DHW tank.

Once the boiler supply temperature is sufficiently reduced, the *Relay 9 / DHW* contact 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, and if the *DHW Demand* is still present, the control 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 control turns off the primary pump (*Prim 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.

DHW MODE 4 OPERATION

In DHW MODE 4, the space heating zones must be prevented from coming on during DHW demands using external wiring. This can be done using an external relay to remove power from zone pumps or zone valves while a DHW Demand is present.
During a DHW Demand, the control closes the primary pump (Prim P1) contact and the *Relay 9 / DHW* contact. Once the DHW Demand is removed, or during a DHW Priority Override, the *Relay 9 / DHW* contact is opened, and the external wiring should allow the space heating zones to operate.

There is no mixing purge available in DHW MODE 4. After DHW priority, the boiler supply water temperature may exceed the design water temperature of the space heating system and can result in damage to the heating system.

Section B: Setpoint

Note: This replaces Section E on page 12 of the D 268 brochure dated 11/02.

Setpoint operation is only available when DHW MODE is set to OFF.

SETPOINT

The control can operate to satisfy the requirements of a setpoint load in addition to a space heating load. A setpoint load overrides the current outdoor reset temperature and WWSD setting in order to provide heat to the setpoint load.

SETPOINT DEMAND

A setpoint demand is required in order for the control to provide heat to the setpoint load. The control registers a setpoint demand when a voltage between 24 and 230 V (ac) is applied across the *Setp / DHW* and *Com Dem* terminals (8 and 7). Once voltage is applied, the Setpoint Demand pointer turns on in the LCD. The control operates the boiler(s) to maintain at least the setpoint setting.

BOILER TARGET DURING SETPOINT

The boiler target temperature during a setpoint demand is increased to at least the Setpoint setting. This temperature is maintained as long as the control has a setpoint demand.

SETPOINT MODE

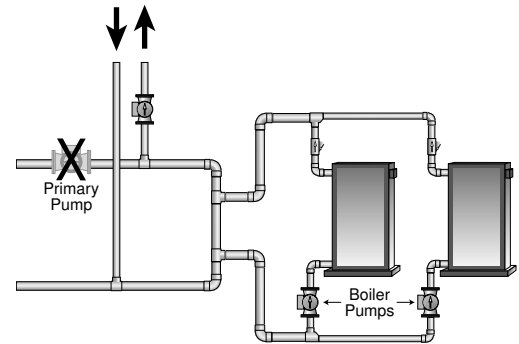### SETP MODE 1 - Setpoint in Parallel

Whenever a setpoint demand is present, the boiler(s) is operated to maintain the setpoint target. The primary pump does not turn on, but may operate based on a Boiler Demand or an External Input Signal. **It is assumed that the Setpoint pump will provide adequate flow through the heat exchanger and the boiler.**

SETP MODE 2 - Setpoint in Parallel with Priority

Whenever a setpoint demand is present, the boiler(s) is operated to maintain the setpoint target and the primary pump (*Prim P1*) contact is opened. **It is assumed that the Setpoint pump will provide adequate flow through the heat exchanger and the boiler.**

SETP MODE 3 – Primary Pump during Setpoint

Whenever a setpoint demand is present, the primary pump (*Prim P1*) is turned on and the boiler(s) is operated to maintain the setpoint target.

Primary Pump

Boiler Pumps

SETPOINT PRIORITY OVERRIDE

The setpoint has a *Priority Override* while in *SETP MODE 2*. In order to prevent the building from cooling off too much or the possibility of a potential freeze up during setpoint priority, the control limits the amount of time for setpoint priority. The length of Setpoint priority is determined by the *Priority Override* setting. Once the allowed time for priority has elapsed, the control overrides the setpoint priority and operates setpoint and heating simultaneously by turning on the primary pump (*Prim P1*).

CONDITIONAL SETPOINT PRIORITY

If the boiler(s) supply temperature is maintained at or above the required temperature during setpoint generation, this indicates that the boiler(s) has enough capacity for setpoint and possibly heating as well. As long as the boiler target temperature is maintained and the heating and setpoint targets are similar, setpoint and heating occur at the same time.

Section C: Pump Operation

Note: This replaces the Pump Operation Section on page 8 and page 9 in the D 268 brochure dated 11/02.

PRIMARY PUMP OPERATION

The primary pump operates under the following conditions:
- The control receives a boiler demand and is not in warm weather shut down (WWSD).
- The control receives a DHW demand when DHW MODE is set to 3 or 4.
- The control receives a setpoint demand and setpoint MODE is set to 3.
- The control receives an external input signal.

PRIMARY PUMP PURGE

After a demand is removed, the control continues to operate the primary pump for a period of time. The maximum length of time that the primary pump continues to run is adjustable using the Purge setting. The primary pump continues to run until either the purging time has elapsed or the boiler supply temperature drops more than a differential below the boiler minimum setting.

Section D: Alarm Operation

ALARM

When the DIP switch is set to Alarm, terminals 12 and 13 can be used as a switch to operate an alarm circuit. This contact closes whenever an error message is present on the control. When the alarm contact is activated, refer to the Error Messages section of this brochure to determine the cause of the alarm. Once the fault has been fixed, the alarm can be cleared by pressing either the Menu, Item, ▲ or ▼ button.

Boiler Alarm

The control can monitor the boiler supply temperature and provide an alarm if the temperature does not increase within a certain amount of time. The amount of time can be set using the Boiler Alarm setting. This alarm can be used to determine if the boilers have failed to fire. To reset the alarm, press and hold the ▲ and ▼ buttons for 5 seconds while in the VIEW menu.

STEP FOUR ━━━━ ELECTRICAL CONNECTIONS TO THE CONTROL ━━━━

Powered Input Connections ─────────

DHW Demand

To generate a *DHW Demand*, a voltage between 24 V (ac) and 230 V (ac) must be applied across the *Setp / DHW* and *Com Dem* terminals (8 and 7). If using DHW, the last boiler in *MODE 1, 4* or *5* must be set to *OFF* and *DHW MODE* must also be set to *1* through *4*.
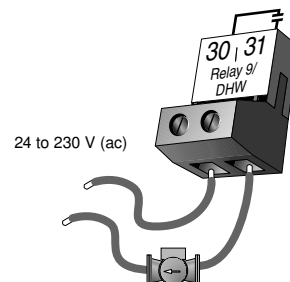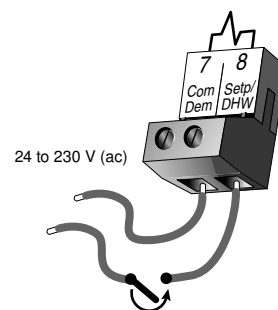
Setpoint Demand

To generate a setpoint demand, a voltage between 24 V (ac) and 230 V (ac) must be applied across the *Setp / DHW* and *Com Dem* terminals (8 and 7). The *DHW MODE* must be set to *OFF*.

Output Connections ─────────

Relay 9 / DHW

The *Relay 9 / DHW* terminals (30 and 31) are isolated outputs in the control. 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 a DHW pump or valve. Since this is an isolated contact, it may switch a voltage between 24 V (ac) and 230 V (ac).
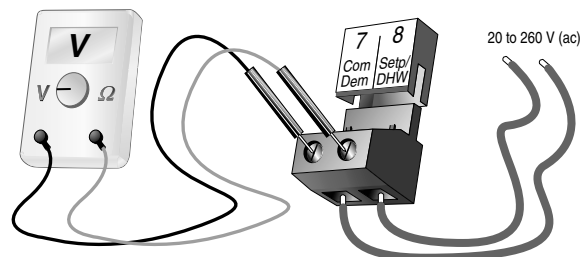
STEP FIVE ━━━━ TESTING THE WIRING ━━━━

Test the Powered Inputs ─────────

DHW Demand

If a DHW demand is used, measure the voltage between the *Setp / DHW* and the *Com Dem* terminals (8 and 7). When the DHW demand device calls for heat, a voltage between 20 and 260 V (ac) should be measured at the terminals. When the DHW demand device is off, less than 5 V (ac) should be measured.
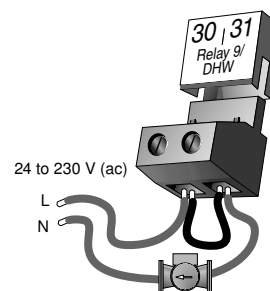
Setpoint Demand

If a setpoint demand is used, measure the voltage between the *Setp / DHW* and the *Com Dem* terminals (8 and 7). When the setpoint demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the setpoint demand device is off, you should measure less than 5 V (ac).

Test the Outputs ─────────

Relay 9 / DHW

If a DHW pump or DHW valve is connected to the *Relay 9 / DHW* contact (30 and 31), 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 operates correctly, disconnect the power and remove the jumper.

Note: The Adjust Menu items on page 24 of the D268 dated 11/02 are now replaced by the following items.

Display	Section	Installer	Adv	Description	Range	Actual Setting
ADJUST MODE DHW **OFF**	A		●	**DHW Mode** Selects the DHW mode of operation. This item is only available when the last boiler in MODES 1, 4 and 5 is set to *OFF*.	**OFF** **1** (parallel, no priority), **2** (parallel, priority), **3** (pri-sec, no priority), **4** (pri-sec, priority) Default = OFF	
ADJUST DHW **180** °F XCHG OCC	A		●	**DHW Exchange Occupied** The minimum boiler supply temperature to the DHW heat exchanger during the Occupied period. *(This item is only available when the last boiler in MODES 1, 4, and 5 is set to OFF and DHW MODE is set to 1 through 4.)*	OFF, 100 to 220°F (OFF, 38 to 104°C) Default = 180°F	
ADJUST DHW **OFF** XCHG UNOCC	A		●	**DHW Exchange Unoccupied** The minimum boiler supply temperature to the DHW heat exchanger during the Unoccupied period. *(This item is only available when the last boiler in MODES 1, 4, and 5 is set to OFF and DHW MODE is set to 1 through 4.)*	OFF, On Default = OFF	
ADJUST BOIL DHW **8**	A		●	**DHW Boilers** Selects how many boilers are to be operated during DHW generation. *(This item is only available when the last boiler in MODES 1, 4, and 5 is set to OFF and DHW MODE is set to 1 through 4.)*	1 to Max number of boilers Default = Maximum number of boilers	
ADJUST MODE SETP **1**	B		●	**Setpoint Mode** Selects the Setpoint Mode of operation. *(This item is only available when DHW MODE is set to OFF.)*	**1** (parallel, no priority), **2** (parallel, priority), **3** (primary pump), Default = 1	
ADJUST SETP **180** °F OCC	B		●	**Setpoint Occupied** The minimum supply temperature when a setpoint demand is present during the Occupied period. *(This item is only available when DHW MODE is set to OFF.)*	OFF, 60 to 220°F (OFF, 16 to 104°C) Default = 180°F	
ADJUST SETP **OFF** UNOCC	B		●	**Setpoint Unoccupied** Selects whether or not a setpoint demand will be responded to during the Unoccupied period. *(This item is only available when DHW MODE is set to OFF.)*	OFF, On Default = OFF	
ADJUST **OFF** ▸	A B		●	**Priority Override** Sets the maximum amount of time the control provides DHW or Setpoint priority before resuming space heating. *(This item is only available when Setpoint MODE is set to 2, or when DHW MODE is set to 2 or 4 and the last boiler in MODES 1, 4, and 5 are set to OFF.)*	OFF, 0:20 to 4:00 hr (10 minute increments) Default = OFF	
ADJUST **70** °F ▸ OCC			●	**WWSD Occupied** The system's warm weather shut down temperature during the Occupied period. *(This item is only available if the External Input / Stand Alone DIP switch is set to Stand Alone.)*	OFF, 35 to 100°F (OFF, 2 to 38°C) Default = 70°F	
ADJUST **60** °F ▸ UNOCC			●	**WWSD UnOccupied** The system's warm weather shut down temperature during the UnOccupied period. *(This item is only available if the External Input / Stand Alone DIP switch is set to Stand Alone.)*	OFF, 35 to 100°F (OFF, 2 to 38°C) Default = 60°F	
ADJUST **0:20** min PURG	C		●	**Primary Pump Purge** The maximum length of time that the primary pump will continue to operate after the boiler demand has been removed.	OFF, 0:10 to 19:55 min Default = 0:20 min	

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ADJUST **0:20** min PURG Boil Pmp		●	**Boiler Pump Purge** The length of time that the boiler pump will continue to run after the last stage in the boiler has turned off. *(This item is only available in modes 2, 4, 6 and 8.)*	OFF, 0:10 to 19:55 min Default = 0:20 min	
ADJUST BOIL **20** ⚠ min	D	●	**Boiler Alarm** The alarm signal will be activated if the boiler supply temperature does not increase within the selected time. *(This item is only available when the Alarm / C.A. DIP switch is set to Alarm.)*	OFF, 3 to 40 min (1 minute increments) Default = 20 min	
ADJUST °F		○ ●	**Units** The units of measure that all of the temperatures are to be displayed in by the control.	°F, °C Default = °F	

Testing the Control

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

off not testing
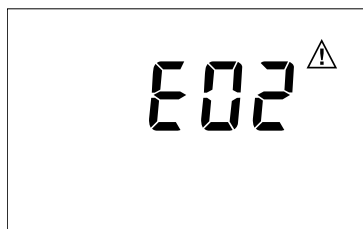**red** testing
⚡**red**⚡ testing paused

TEST SEQUENCE ━━━━━━━━━

Each step in the test sequence lasts 10 seconds.

During the test routine, if a demand from the system is present, the test sequence may be paused by pressing the *Test* button. 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 primary pump is turned on and remains on for the entire test routine.

Step 2   If the Alarm / C.A. DIP switch is set to Alarm, the Alarm contact is turned on for 10 seconds and then shuts off. If the Alarm / C.A. DIP switch is set to C.A, the Combustion Air Damper contact is turned on and remains on for the entire test routine.

Step 3   For each boiler that is set to Auto, the following test sequence is used.
If the mode indicates that a boiler pump is used, the boiler pump is turned on and remains on. Next, the first stage of the boiler is turned on and remains on. If a second stage is present, the second stage is turned on and remains on. If a third stage is present, the third stage is turned on and remains on. If a fourth stage is present, the fourth stage is turned on. After ten seconds, all stages and the boiler pump are turned off.
This step is repeated for each additional boiler that is set to Auto.

Step 4   If DHW MODE is set to 1 or 2 and the last boiler in modes 1, 4, and 5 are set to OFF, the primary pump is shut off and the DHW contact is closed.

Step 5   If DHW MODE is set to 3 or 4 and the last boiler in modes 1, 4, and 5 are set to OFF, the primary pump stays on and the DHW contact is closed.

Step 6   All contacts are turned off.

Error Messages

E02 ⚠   The control has detected no increase in the supply water temperature within the BOIL Alarm time setting. Check to see if the boilers are operating properly using the Test button. To reset the alarm, press and hold the ▲ and ▼ buttons for 5 seconds while in the *VIEW* menu.