IBC ®

Better Boilers

V-10 TOUCHSCREEN BOILER CONTROLLER

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Contents

CHAPTER 1 Concepts & Features

This chapter describes features and concepts relating to the V-10 Touchscreen Boiler Controller.

All VFC and SL series condensing boilers have an IBC V-10 boiler touchscreen controller. The touchscreen controller is engineered to be backward compatible with previous IBC 5-button boiler controllers.

The controller provides:	Advanced features:
• Control of up to 5 pumps – 1 boiler pump + 4 separate load pumps	• Express Setup menu for simple, quick programming
• Outdoor Reset control	• Software that can be updated in the field with an SD card, USB stick, or via the Internet
• Set Point temperature regulation	• Set up configuration back-up and cloning using an SD card, USB stick, or via the Internet
• Domestic Hot Water (DHW)	• Advanced error messages with visual display on the Home Screen
• External control via 0-10VDC or 4-20mA signaling	• Internet/LAN connectivity
• Alarm dry contacts	• BACnet (with activation)
• Zoning of up to 4 loads	• Portal
• Load Combining – simultaneous operation of 2 loads with similar or different water temperature	
• The ability to manage and/or operate in a network of up to 24 IBC VFC or SL boilers	

Handling the Touchscreen

The touchscreen responds to a light finger touch on the screen.

If the touchscreen is:

• Left unattended, the screens will step back one screen at a time in 10-minute intervals. The pop-up windows will also step back automatically in 2-minute intervals.

• Not activated for a user-defined period (10 minutes by default), the Home screen dims to save power.

> ⚠️ **Caution**
> Do not use a sharp or metallic object (e.g., screw driver) on the touchscreen as this will cause damage. Use only a Stylus or your clean finger.

Getting to Know the Controller's Interface

1	The slide bar (left side) allows the viewing of a list that is longer than the active display area. For example, while editing a load in the installer menu, the list of items is longer than the screen size. Simply touch and hold the slide bar until it turns blue, and slowly drag it down to scroll down the list of items. You can also tap the arrows at either end of the slide bar to move the bar up or down.
2	View button is available only in the Error Log to display minor errors, major errors, or system faults associated with the logged error event.
3	The **Up** and **Down** arrows are available in the Error Log menu and enable you to scroll through the list of event records, one at a time.

Left and **Right** arrows are available in the **Load Profiles** screen to scroll through the four separate loads plus the remote load if the boiler is operating as part of a multi boiler network. |
4	Typically the Save button saves the displayed settings and returns you to the previous screen. However, in the Error Log screen, it gives you the ability to save the error logs (e.g., to a USB).
5	Returns you to the previous screen without saving any changes. This button is found at the bottom right on all Setting Screens and all menu screens.
6	Boiler Status Bar - Indicates if the boiler is in a normal, warning or alarm state. When no warning or alarm state is present, the bar is green and the time is displayed inside the green area. The bar can also display as yellow or red, corresponding to a warning or to an alarm state. Text inside the bar indicates the specific warning or alarm present. If more than one alarm is present, the text display slowly rotates though the various alarm states.

Screen Types

There are three screen types: menu screens, settings screens, and status display screens.

Menu Screen

Menu screens provide a list of choices that lead to other screens. At the bottom of an active screen, there is a **Back** button to return to the previous page.
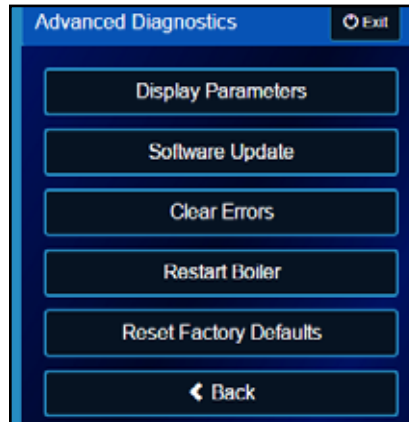
Settings Screen
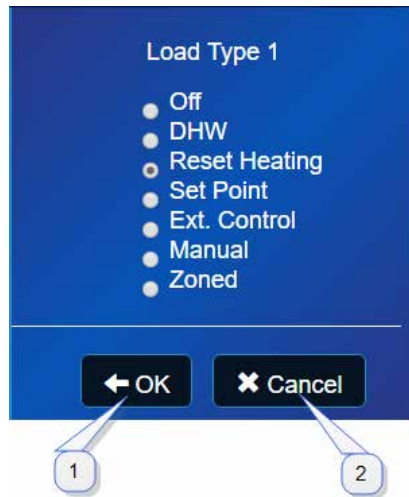
①	Accepts the settings displayed in a pop-up window and closes the window.	
②	Ignores the settings displayed in a pop-up window and close the window.	

①	Is only available in the **Installer Settings** menu and active only on loads that have been defined. Pressing **Edit** enters the Settings screen for the corresponding load or setting.

Status Display Screen

Text describing various parameters is listed along with the current value for each. Information cannot be entered or values changed on these screens. If there are no buttons on the screen, touching the screen anywhere in the active area exits the screen.

Home Screen

The Home screen includes basic boiler status information such as:

- The Title bar showing the boiler model number and boiler ID number.

- The current operating state (just below the title bar).

- The Load currently being serviced, if any.

- A list of up to eight of the current operating values.

Main Menu

The Main Menu provides five options that access operational and diagnostic information, and allow the adjustment of control settings. To enter the Main Menu screen, tap anywhere on the Home screen. If the display is dimmed, tap the screen twice.

Main Menu

Express Setup — 1

Load Status — 2

User Settings — 3

Installer Settings — 4

Diagnostics — 5

‹ Back

IBC   18:07
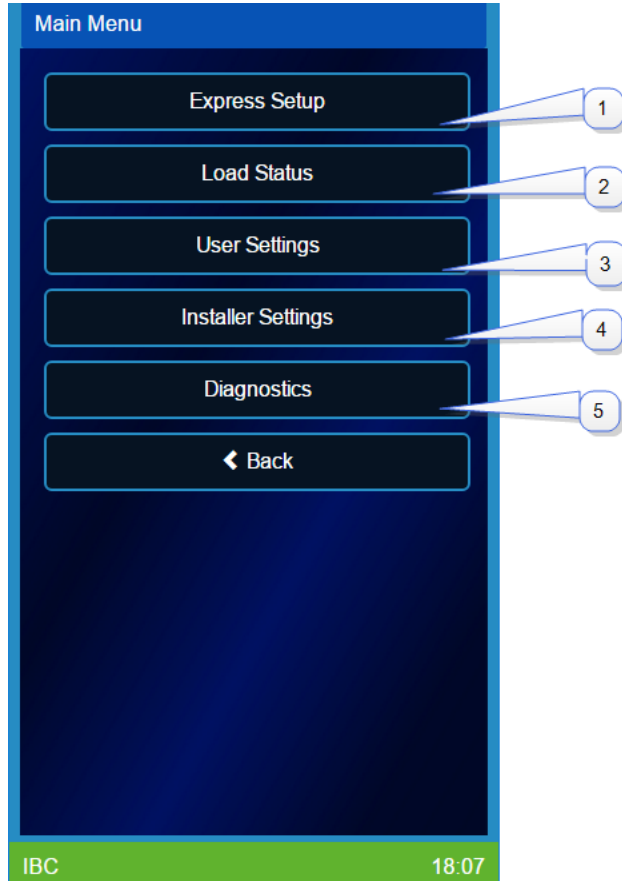
1	Express Setup walks you through a basic setup of the controller. You can select default values that will work for the selected load type. If you wish, you can change these default settings later.
2	Load Status displays a menu screen with six possible selections to display the current status details for the four individual loads, operating load statistics, and operational load profiles (graphs) for each load.
3	User Settings enables the user (installer or homeowner) to set or adjust the time and date, overrides, screen brightness, hot water tank temperature, occupied status as well as choose Imperial or Metric units.
4	Installer Settings provides access to the full functionality of the system for the appropriately trained heating professional.
5	Diagnostics displays mostly information screens; for example, displays error logs.

Express Setup

Express Setup enables you to configure a boiler's parameters using default values including all the appropriate values to operate each load type under most operating conditions.

Load Status

Load Status provides informational screens. For example, if you select:

- One of the Load 1 to 4 buttons:

  - The status display screen lists specific operational information about that load in real time.

  - If a sensor is not connected to the controller (for example, a DHW sensor or the Outdoor sensor), the screen shows n/c (Not Connected).

  - Cycles/Day shows a running tally of the number of calls for heat that a load has received in the last 24 hours. In general, fewer cycles per day equal better efficiency and usually better comfort.

- **The Load Statistics** button, a status screen lists the run time statistics for the boiler including specifics for each load.

- **The Load Profiles** button, a screen displays each load, showing a bar graph profile of the time the boiler is firing at various throttle levels.

User Settings

The **User Settings** screen is a combination menu and settings screen. **Date & Time, Overrides** and **Backlight** are the three available menu buttons. The water **Tank Temperature** is changed by touching the entry box.

Date and Time Settings

On the **Time and Date** settings screen, you can choose **NTP Server** or **Internal.** The controller must be connected to the Internet for the **NTP Server** selection to work properly.

For instructions, see "Setting the Date and Time" on page 37.

Temperature Overrides for a Load

In the **Overrides** screen, you can enable the override program set for each load. When you select the **Edit** button you can set the override temperatures with corresponding start and end times for each load by day of the week. There are two override programs for each day of the week.

For instructions on configuring overrides, see "Setting Overrides" on page 34.

The Screen Backlight

The **Backlight** setting is a power saving feature. The **Backlight Settings** screen provides a slide bar to set the screen backlight level (brightness). Also, the **Dim Time** setting controls the length of time there is no interaction with the touchscreen before the screen is dimmed.

Installer Settings

The advanced installer can access:

- Settings for assigning load types to four Loads.

- **Multi-Boiler** to set parameters in a boiler to operate as part of a group of boilers at a site. For instructions on how to set up multiple boilers, see "Networking Multiple Boilers" on page 26.

- **Load Combining** to set parameters to enable the boiler's **Load Combining** (previously known as Load Pairing) feature. For instructions on how to combine loads, see "Combining Loads" on page 30.

- **System Settings** to perform security- and backup-related tasks such as:

  - Restricting access to areas in the controller with password protection.

  - Changing the default venting material.

Diagnostics

The **Diagnostics** menu is a valuable tool for the installer and service provider. It provides mostly information such as error logs to help identify problems.

Error Logs

Errors are logged and stored in the controller memory. An error record includes the date, time, classification, type(s) and the state of key boiler operating parameters at the time the error event occurred. The controller can store a practically unlimited number of error records.

The **Error Log** screen title bar shows "**Error Log**: (record no) (total no. of error records)". If there are no error records logged the title bar shows "**Error Log**: 1/0" and the **Date** shows as **End of Log**. An Error record includes all the errors present at the time of the error event.

Error Conditions

If the sensors indicate that the boiler is operating outside its limits, an error condition occurs. The controller records any or all errors dating back to the original power-up, including the date and time of the error.

There are three types of error conditions:

- **Minor Errors**

  Minor errors result when an abnormal condition exists that does not present an immediate safety hazard. The boiler shuts off the fuel and enters an extended purge, followed by the error cycle of 5 minutes for all conditions other than maximum ignition trials (a modified Major error which locks out for 1 hour after 3 unsuccessful ignition attempts). Following the purge, the fan and pump are stopped until the end of the error cycle. Normal operation then resumes.

OPERATING INSTRUCTIONS
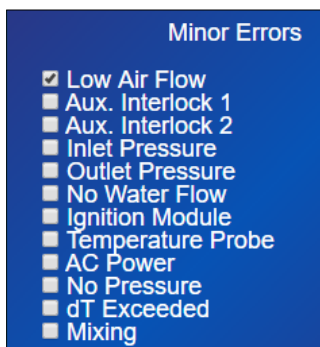
• **Major Errors**

Major errors result when a condition exists that may be a safety hazard. The boiler enters an extended purge then the fan and pump are stopped. The boiler is in a lockout, and must be checked and restarted by a service technician.

Exception: The Ign. Trials Exceeded error will time-out for one hour before the system attempts re-ignition.
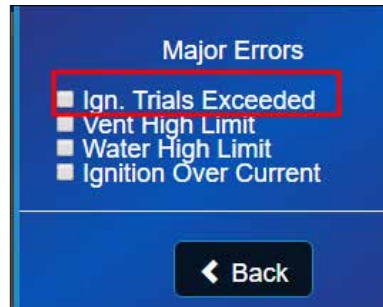
• **System Errors** typically relate to the touchscreen controller.
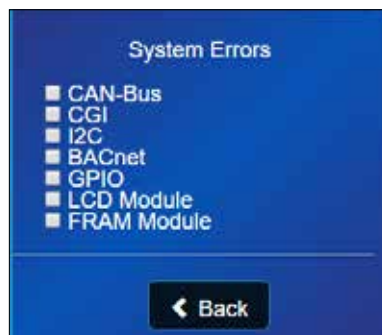
Users can:

• Display the error(s) present at the time of the error event.

• Clear (delete) all error log entries.

• Save an error log to an SD card or USB flash memory, inserted into the controller.

For a list of errors and their fixes, see "CHAPTER 5 Troubleshooting" on page 49.

Sensors Status Screen

The **Sensors** status screen displays the current active value for each of the temperature and pressure (e.g., water **Flow Rate, VS Load Duty Cycle** and the **Altitude)** sensors.

If a:

• Temperature sensor is not connected to the controller the text 'n/c' is displayed.

• Pressure sensor is not connected to the controller '0' is displayed.

Safety and Ignition Module (SIM)

The SIM is a safety control used in certain models (SL 26-260 G3 and SL 40-399 G3). It is certified to conform to the UL 60730-5-5 and ANSI Z21.20-2014 • CAN/CSA-C22.2 No. 60730-2-5-14 standards.

The SIM is available only in the 3rd-generation models. The module controls the boiler's gas valve, including:

- Direct spark automatic ignition

- Flame detection and current measurement

- Supply water temperature sensing

- Flue gas temperature sensing

- Supply water maximum temperature shutdown

- Flue gas maximum temperature shutdown

- Low water cut-off.

Users can perform:

- A LWCO test and reset.

- A hi-limit temperature test and reset.

For instructions on using the LWCO feature, see "Low Water Cutoff: Resetting and Testing" on page 35.

For instructions on using the hi-limit feature, see "Hi-Limit Temperature: Resetting and Testing" on page 36.

Safety and Ignition Module Plus (SIM+)

The SIM+ is a safety control used in certain models (SL 14-115 G3 and SL 20-160 G3). It is certified to conform to the UL 60730-5-5 and ANSI Z21.20-2014 • CAN/CSA-C22.2 No. 60730-2-5-14 standards.

The SIM+ controls the boiler's gas valve and provides:

- Direct spark automatic ignition

- Flame detection and current measurement

- Supply water temperature sensing

- Flue gas temperature sensing

- Supply water maximum temperature shutdown

- Flue gas maximum temperature shutdown

- Low water cut-off

- VDC gas valve operation

- Combustion fan operation.

Users can perform:

- A LWCO test and reset.

- A hi-limit temperature test and reset.

For instructions on using the LWCO feature, see "Low Water Cutoff: Resetting and Testing" on page 35.

For instructions on using the hi-limit feature, see "Hi-Limit Temperature: Resetting and Testing" on page 36.

Users can also test fan operation performance and check vents for blocks or leaks. For instructions on fan testing, see "Testing Fan Operation" on page 37.

The SIM+ continuously communicates with the boiler's main controller reporting sensor readings and status. The sensor readings and error status (if any) are displayed on the boiler's touchscreen controller.

SIM's Status Indicators

The SIM's two status LEDs indicate the operating status as shown in the table below.

LED 1	LED 2	STATE	DESCRIPTION, LED STATUS INDICATION
Rapid Flash	Rapid Flash	Power up or Resetting	Startup checks and initialization
Off	Off	Standby	LED1 Off = No Flame or Sparking LED 2 = Burner-On Call state
Off	On	Pre-Purge or Inter-Purge	LED1 Off = No Flame or Sparking LED 2 = Burner-On Call state
On	On	Heating	LED 1 On = Flame detected LED 2 = Burner-On Call state
Rapid Flash	On	Igniting	LED 1 flashing = Electrode Sparking, LED 2 = Burner-On Call state
Off	Flashing	Lockout	An operating limit was exceeded or a sequence failed or an external sensor fault was detected.
Flash Alternately with LED 2	Flash Alternately with LED 1	Fail-Safe	A critical internal fault was detected.

Fan Operation

The **Fan Operation** screen displays specific information related to the current fan operation.

The **Fan Test Heat Out** entry box allows the fan to be activated independently and set to speeds corresponding to the entered Heat Out value. For example, for all models (excluding the G3 models) the fan heat output MBtu should be close to the heat output.

You can use the Fan Test Heat Out feature when a boiler is not heating. If the boiler is heating, you can check that the heat output values correspond. For instructions, see "Testing Fan Operation" on page 37.

Network Information

The **Network Information** screen displays information related to the web interface and BACnet settings of the boiler. Also available here is the Multi Boiler network information.

To set up an internet connection to register the boiler and to control and monitor the boiler through the IBC Portal, see *"Connecting a Boiler's Controller to an IP Network" on page 39.*

Boiler Information

Boiler Information lists basic information such as the controller software version and the boiler model.

Clean the Screen

Clean the Screen enables the touchscreen to be de-activated (will not respond to touch) for 60 seconds while the screen is being cleaned.

> **Note**
>
> Care must be taken not to scratch the screen while cleaning. Use a damp soft cloth and do not spray cleaner directly onto the screen.

Advanced Diagnostics Screen

The **Advanced Diagnostics** menu screen includes the following advanced level selections for the experienced installer.

• The Display Parameters screen lists key operational parameters and their current readings.

• The **ATD Channels** screen lists the raw, unfiltered input values from the analog inputs.

> **Note**
>
> The **Edit Parameters** button is password protected, for use by IBC personnel.

Users can:

• Clear Errors. This function clears any currently latched error states and forces the controller to reassess the boiler's error status and determine if any error state is still present. We recommend using this method to clear errors because it is faster than a power cycle.

• Perform an update to the controller's software via an SD memory card, a USB memory stick, or the Internet. For instructions on updating software, see "CHAPTER 4 Updating the Software Version" on page 45.

• Initiate a full boiler controller restart. A restart takes approximately two minutes to complete.

• Reset factory defaults. This function returns all boiler operating parameters to their factory default settings except for the Network and Date & Time settings. The error log and operating history are not cleared. Reset Factory Defaults will take approximately two minutes to complete.

• Calibrate the touchscreen. Over time the touch pad calibration can drift slightly resulting in the touch locations being out of line with the displayed touch points such as buttons or entry boxes. Touchpad calibration resolves these alignment issues.

System Settings

System Settings contains:

- **Site Settings**. Use to access boiler operating parameters that are not specific to any load. Included are the load control type, primary pump purge time, manual pump purge, venting material, and the variable speed output control settings.

- **Network Settings**. Use to assign the boiler its ID, address and network configuration to support multi-boiler operation and to connect to internet data networks.

- **A security** control setting that allows the Security mode to be set **On** or **Off**. When On is selected the **User Password** and **Installer Password** are displayed until **OK** or **Back** are pressed.

- **Licensing. Use** to activate special add-on software packages such as BACnet.

- **Advanced Settings. This setting** is available only for IBC's technical support staff for troubleshooting.

- **Backup & Restore. Use** to back up or restore the boiler's complete controller configuration and settings to/from a USB memory stick or SD-Card inserted into the controller.

  The **Backup/Restore Type** can be **This Boiler** or **Boiler Model**:

  * "This Boiler" creates or loads a copy of the configuration for the specific single boiler.

  * "Boiler Model" creates or loads a copy/clone of the configuration. This feature facilitates the creation of a standard boiler configuration that can quickly be loaded into another boiler of the same model.

Other Operating Features

Prioritizing Loads

When more than one load is defined, you can prioritize a scheduling routine to manage the boiler's operation. Typically, loads declared as DHW receive significant - but not absolute - priority. Multiple heating loads - with varying temperature targets - are run sequentially as opposed to simultaneously (with a mixing valve).

The objective is to serve each load at the minimum possible temperature, as opposed to running hot then mixing down (with hardware), saving the related hardware and fuel cost. The approach optimizes the low temperature combustion benefits of direct cool running of a radiant floor. The large throttle turndown range coupled with outdoor reset means that several loads can receive heat in turn, with less on/ off duty cycling than would occur with other heat sources.

Default Values for Defined Loads

The boiler is shipped with default values for each type of declarable load (e.g., DHW, radiant floor). The preset variables for DHW (a value of 85-87 on a 20-90 scale) give it substantial priority, which declines over time if another load is calling. Spacing heating loads (with Outdoor Reset) are given default values starting at a low of 28, while other Set Point loads start with 62. Over time, such points are transferred between the loads in accordance with the system rules.

The boiler automatically shifts between loads once the points totals reach an upset value. Upon a load transfer, the burner modulates down to its base level and will then throttle up as required for the new load. If competing loads have not been satisfied at the load switch stage, the controller registers the firing rate and returns rapidly to the rate on the next rotation.

Heat-apportioning can be changed in the Installer Settings input section.

Example: If baseboards (set up with Outdoor Reset as Load 3) are not providing the desired heat, the on-time of the baseboards can be increased by increasing the Priority value relative to the other declared channels (e.g., moving the Load 3 preset value from 43 to 50 or reducing another load's value). Temperature targets for the under-served load can also be raised in this example.

The basic function is that the difference between settings equals the run time (in minutes, for the initial cycle) of the higher load setting before switch-over to the simultaneously calling load, e.g., DHW with priority set to 80 will run for about 35 minutes before switching to a clashing load set with priority 45. Following the initial cycle, the competing loads will switch back and forth after a further 10-minute interval pending satisfaction of one or both loads.

To cause repeated unequal run times (for example, constant 35 vs 5 minute runs) you need to integrate an external load removing relay or timer on one of the heat calls (contact the Factory for details). Do not set each load to the top value, and in general, avoid equal ratings.

> The priority scale values do not need to add up to 100 – they are relative only to each other.
>
> **Note**

Reset Heating

The boiler offers reset heating or outdoor reset control as standard equipment. Reset heating coordinates the control of boiler supply/outlet water temperature for space heating with the outdoor temperature.

> **Note**
> If there is no outdoor temperature sensor the controller assumes 32°F/0°C to determine the heating curve.

Reset Heating uses variable supply water temperatures to compensate for the differing rates of heat loss that a building experiences as the outdoor temperature changes. For any outdoor temperature above the coldest day expected, reset heating automatically uses lower heating temperatures than would otherwise be used. This saves energy without sacrificing comfort.
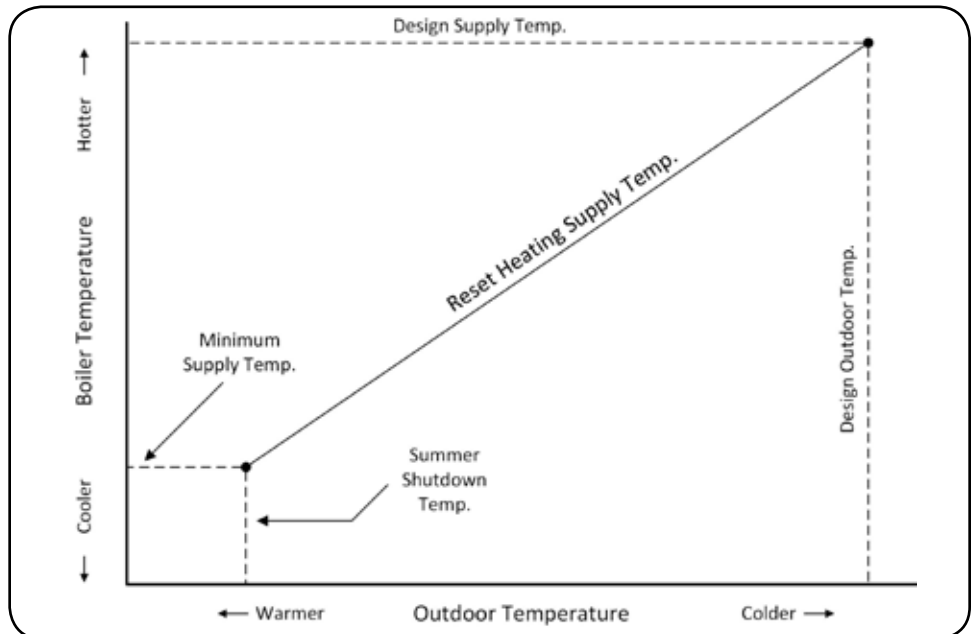
When applied within a condensing boiler, outdoor reset control offers direct and significant combustion efficiency benefits by allowing generally lower circulating water temperature. This provides cooler return water to the boiler, promoting more condensation (= energy capture).

Contacts are provided for connection of an outdoor sensor (shipped with each boiler) to be placed in an appropriate outdoor position (typically on the north face of the building away from any heat source). The temperature management algorithm flexes the boiler supply temperature according to heating curves that are automatically called up through the load declaration process.

Open Loop Reset System

In an "open loop" reset system, a room or zone thermostat is used to send a call for heat over a 24VAC lead. This opens the respective zone valve, and signals the boiler to fire using onward leads to the boiler's dry contacts (use one of the connections marked "Therm 1, 2, 3 or 4" on the TB2 terminal strip). Gang such leads in parallel from multiple zone valves for single connection to the boiler. Note that typical room thermostats simply provide a call for heat. They do not control the circulating water temperature from the boiler in an open loop reset system. Adjustment of a room thermostat from 72°F/22°C to 86° F/30°C will make no further difference to the delivered temperature if the floor slab has stabilized at the boiler temperature determined by the reset curve.

Outdoor Reset

Where outdoor reset is applied without the indoor sensor feedback option, some manual adjustment may be required to achieve the desired comfort level.

> **Note**   Location of the indoor temperature sensor is very important. Typically the sensor needs to be installed in the coolest area of the space being heated.

Fine adjustment can be made by editing the Indoor Setpoint ° variable, on the Reset Heating settings screen. To increase heat (e.g., from 72°F/22°C to 74°/23°C) move the Indoor Setpoint ° value upward (warmer) from the level otherwise chosen. This shifts the position of the reset curve, and adjusts the boiler water temperature by a similar amount. Do not adjust the Design Indoor ° value. Moving the Design Indoor ° value upwards with the Indoor Setpoint ° adjustment will be ineffective.

Optional Indoor Temperature Sensor

An optional indoor temperature feedback routine can be activated with the installation of an indoor sensor, connected to the designated TB2 contacts to automate adjustment of the outdoor reset routine.

> **Note**   We do not recommend for single and multi-fan installations.

The key inputs on initial setup are:

1. **Design Outdoor °** – the coldest expected outdoor temperature typically experienced at the installation site.

2. **Design Supply °** – the desired boiler outlet temperature to occur on the coldest day.

3. **Design Indoor °** - the temperature value that anchors the reset curve. The **Indoor Setpoint °** setting is the primary means for the user to "bias" the outdoor reset routine to add or reduce heat.

4. **Summer Shutdown** - this value is essential for the reset curve to calculate the correct water temperature.

If Reset Heating is selected and there is no signal received from the Outdoor Sensor, the controller assigns a provisional 32°F/0°C value and adopts the appropriate temperature target from the relevant reset curve.

Low Mass Loads

Use the **Minimum Supply °** entry to optimize boiler run times on low mass loads. Finned tube baseboards sink very little heat when operated below 90° F/32°C. Application of a "full reset curve" (e.g.,160°F/71°C right down to a 70° F/21°C room target) causes boiler cycling in light-to-moderate heating conditions. Set baseboard minimums at 90-120°F (32-49°C) and aim for 4 or less cycles/hr.

Use a minimum setting to enhance home comfort with single or excessive speed air handlers to avoid the cool blast effect. Set to the lowest possible level for combustion efficiency.

Temperature Differential Settings

For all loads, check the **Maximum Supply °** and the on/ off **Supply Diff'l °** temperature settings to ensure the Maximum takes account of the construction and safety requirements of each application (e.g., 140°F/60°C maximum for typical in-slab radiant floor to avoid thermal stress).

Set the **Supply Diff'l °** to offer a reasonable temperature control range (suggested values: 20°F/11°C for high mass radiant // 10°F/6°C for DHW). Ensure that the spread between the target and maximum temperatures is greater than one half of the Supply Differential temperature. For example, for a radiant floor, a Design Supply temperature of 125°F and a High Limit or Maximum Supply of 140°F, and a differential (**Supply Diff'l °**) setting of 20°F (half of which is 10°F) works well.

Daily Temperature Overrides

This feature provides the ability to override setpoint temperatures for each load for specific programmable time periods for each day of the week. Normally this feature is used to reduce temperatures during night-or-away hours to achieve fuel savings. The feature can also increase temperatures for defined time periods in a day. This may be of use for certain commercial applications where short-term high temperature DHW service is desired.

For Reset Heating loads:

• The **Indoor Setpoint** temperature setting is overridden for the programmed time periods.

• In setpoint loads, the **Boiler Supply** temperature setting is overridden.

• In DHW loads, the **DHW Tank Setpoint** is overridden. The DHW Boiler Supply temperature is also overridden to keep the difference between the **Boiler Supply** and the **DHW Tank Setpoint** temperature the same when the override is in effect.

> The automated override feature will not work for DHW with simple aquastat control where the DHW Tank Setpoint temperature has no effect.
>
> **Note**

Unoccupied Mode

You can reduce energy consumption by switching the boiler to the unoccupied mode during holidays or other away periods.

In **Unoccupied** mode, the DHW load is turned off and the circulating water temperature of a Reset Heating load is lowered by reducing the Indoor Setpoint° to 50°F / 10°C. Setpoint controlled loads are not adjusted through this process to avoid the potential for boiler cycling as there is no linkage with the relevant thermostat.

For instructions on using this setting, see "Switching a Boiler to Unoccupied "Away" Mode" on page 35.

Summer Shutdown

Each space heating load, except DHW, has a **Summer Shutdown°** setting that is used as a cut-off level for outdoor temperature to prevent any further space heating. This is typically used to turn off Reset Heating loads once the outdoor temperature exceeds a certain level e.g., 65°F/18°C.

> **Note**
>
> If the outdoor sensor is not connected the controller assigns 32°C / 0°F as the current outdoor temperature.

The load automatically reactivates once the weather returns to levels at/or below the selected threshold. We strongly recommend using this feature with a value 5°-10°F/3°-6°C below the **Indoor Setpoint °** to avoid short cycling of the boiler during very marginal heating conditions.

You can access the **Summer Shutdown °** setting through Express Setup as well as through the Installer Settings screen (select **Edit** for the desired load). The controller must receive a valid signal from the outdoor sensor, supplied with the boiler, for **Summer Shutdown** to operate correctly.

External Control

Installers can place the control of a load under an external electronic controller (such as a tekmarNET © control). Connections are provided (TB2 Ext. Cont.) to receive a 0-10VDC or 4-20 mA signal for throttle management. The default configuration is 0-10VDC (JPA01A installed).

> **Warning**
>
> Disconnect electrical power to the boiler before removing the circuit board cover.

JPA01B
RELOCATE JUMPER FROM
JPA01A TO JPA01B FOR
4-20mA EXTERNAL
CONTROL   JA02

JPA01A
JUMPER INSTALLED FOR
0-10VDC EXTERNAL CONTROL
(DEFAULT)
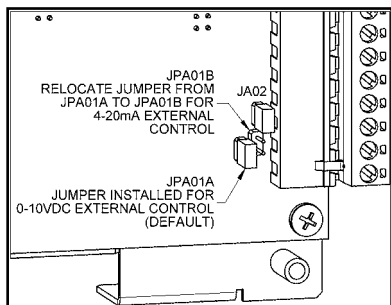
To switch over to 4-20 mA (JPA01B installed):

1. Remove the electrical box corner cover and the circuit board cover to access the jumpers on the lower right corner of the control circuit board.

2. Use needle-nose pliers to place the plastic jumper tabs as pictured in the adjacent drawing.

3. Reinstall the cover, and then restore power to the boiler.

When the controller senses a signal on the remote connections, it automatically subordinates its internal throttle logic, and adopts the external signal. The burner on/off, or the call for heat, can be set to the thermostat input or the Ext. Control input.

In remote mode, temperature management is controlled by the controller's external sensors. When installers enter the maximum boiler supply and on/off differential temperatures, the boiler treats these as high limit switches.

From the Installer Settings screen, select the Entry Button corresponding to the desired load and select Ext. Control. Then configure the load with the maximum and differential temperature values. Externally controlled loads work with other loads with the same priority, logic and sequencing.

Multiple Boiler Networking: Boiler "Opt-out" to Serve Call for DHW

You can set up a single (subordinate) boiler, networked with other boilers, to opt-out of the heating load to serve a call for heat on its own. For instructions on networking multiple boilers, see "Networking Multiple Boilers" on page 26.

The boiler opt-out feature enables individual indirect storage water heaters to call up a single boiler to turn on a DHW boiler pump, and divert its fluid flow and heat production directly to the tank. At the same time, it turns off the boiler pump that injects heat into the heating mains; therefore, bypassing the system piping. This process eliminates piping losses.

As a further benefit, when a boiler plant is operating in heating mode, one or more DHW boilers (dedicated to serve calls for DHW) can opt out of the heating load, enabling the remaining boilers to continue heating uninterrupted. This means if opt-out boilers are in the process of making DHW when the master boiler receives a setpoint or heating call, the remaining subordinate boilers will switch to that load.

> **Note**
> If a DDC system or other external control is used to operate individual boilers, the DHW opt-out feature is unavailable.

What to Consider for DHW Opt-out Boilers

- DHW opt out is still available when external (remote) setpoint control is used.

- Good design practice for an opt-out system is that the heat exchanger for the indirect tank is able to transfer the full output of the boiler at high fire. This will result in:

    * The fast recovery of the tank, so that the boiler can return to the heating load quickly.

    * Allowing the boiler to heat up the tank at lower delivery temperatures, enhancing condensation of flue products for maximum efficiency.

- DHW "opt-out" boilers cannot be configured as the master boiler without DHW operation disrupting the boiler network.

- Opt-out loads are programmed on the opt-out boilers only. When the opt-out load is active, the boiler is not available to the network. The boiler will switch on the opt-out pump directly.

    Any pump being directly switched by an IBC control board must draw less than 4A. On setup of the opt-out load, select Off for the Boiler Pump. The screen prompts for confirmation that a pump will provide flow through the heat exchanger.

- Use a DHW sensor or aquastat to generate calls for DHW for an opt-out boiler. The call for DHW goes to each opt-out boiler.

Setting up a boiler for DHW 'opt-out' priority involves specific piping configuration. For more information, contact IBC's technical support.

Alarm Contacts

The controller provides a relay dry contact connection to indicate the boiler's alarm state externally. This can be used, for example, to connect to an external alarm panel or to an indicator light. The terminals on TB3 supply the wiring connection. Disconnect electrical power to the boiler, and remove the controller front cover to access the TB3 connection.

The alarm contacts will normally be open indicating that there is no alarm present. The contacts will be closed any time an alarm state is present and boiler operation has been disabled. This corresponds to when the boiler status bar on the display is red. The error that was detected creating the alarm state is recorded in the Error Log and displayed in the boiler status bar.

Controller's Operational States/ Cycles

The controller has five states during normal operation as well as an error mode for problem detection:

1. Standby
2. Purging: Prepurge, Interpurge, Postpurge
3. Ignition
4. Heating
5. Circulating
6. Error mode

To view a flow chart of the controller's sequence of operation, see "Sequence of Operation Diagram" on page 54.

CHAPTER 2 Usage

This chapter contains various tasks to help you use the touchscreen controller.

Powering Up a Boiler

When a boiler is first energized, the controller runs through a power-up sequence that takes approximately 90 seconds. During this time, the controller completes a self-diagnostic, and loads all previous settings. When power is restored after a power interruption, the boiler automatically resumes operation with all the previously stored values.

The controller provides overall management of the boiler operations including:

- Power-up, self-diagnostics, easy load parameter adjustments
- Burner operation, safety management systems, call for heat management and load priority
- Real time boiler data
- Temperature and throttle operation
- Maintenance of operational and error service logs
- Two-way communication between other IBC boilers and controls

Operational and historical data can be accessed at any time using the System Status and Load Profiles sections of the controller.

Programming a New Touchscreen Controller

After powering up a new touchscreen controller, you need to enter the correct boiler number details. You can find the correct model number on the boiler's rating plate.

1. On the touchscreen controller, tap the **Boiler Model** box, and from the dropdown list, carefully select the correct boiler model number.

> **Important: This is the only chance to enter the correct model number.** If you save an incorrect model number the board will be unusable. In this case, you will have to buy another controller.
>
> **Note**

2. Tap the **Save** button.

> Do not select the "Start" button to run the Self Test. This is for IBC staff use only.
>
> **Note**

3. Program the settings that were configured in the old controller. Alternatively, select Express Setup to set up the boiler.

4. Check that the boiler has registered the thermostat connections correctly along with the correct load types and settings.

5. Check that all pumps operate according to the previous controller.

6. On the **Diagnostics** screen, check the temperature sensor and pressure sensor readings.

Setting Loads

Setting loads is possible using:

- **Express Setup** which is a fast track method for setting all the necessary parameters for most single boiler installations.

- Installer Settings. We recommend this method for the advanced installer.

Setting Loads Using the Express Setup

If you set incompatible values, the system displays an error prompt for you to correct an incompatible entry.

Setting up Loads on a New Boiler

To set up a boiler for the first time:

1. On the **Main Menu**, tap the **Express Setup** button.

   If the boiler has never been programmed, or if all loads are set to **Off**, the **Express - Site Settings** screen is displayed. This screen allows you to choose Imperial or Metric units, enter the Design Outdoor Temperature, view your altitude and set the clock.

2. On the **Express - Site Settings** screen, to choose Metric tap the **Metric** option.

3. In the **Enter the Design Outdoor Temperature** box, enter a temperature.

   If Reset Heating is used for any of the loads, you must set the Design Outdoor Air temperature correctly for your geographic location. This temperature is available:

   - From the local IBC wholesaler.

   - In the heat loss calculation documentation used in the design of the heating system.

4. To set the time, select the **Set Clock** button.

   If the boiler has access to the Internet or to a computer (e.g., a server set up on an internal network that acts as the NTP time source), the NTP server option will be selected. When NTP server is selected, the time in the controller synchronizes daily with the NTP server.

    "Internal" refers to an internal clock used for time keeping.

   As the boiler controller is equipped to automatically detect altitude this value will be set for you.

5. Once you have the desired entries, tap the **Save** button.

   The Express – Loads menu screen appears displaying four possible loads. All loads are set to OFF from the factory allowing the system to be programmed to correspond to the installation's specific wiring connections.

6. If Load 1 is piped and wired (Load 1 = P/V1 & Therm.1) to heat a load type, tap the **Load 1** button.

   There are four different load types: **Reset Heating, Setpoint, DHW** (Domestic Hot Water), and **External control.**

- If Setpoint, DHW or External Control is selected a settings screen displays the values pre-programmed appropriately for typical residential applications. You can change these values, if necessary.

- If Reset Heating is selected, you must select the emitter type before the Settings screen is displayed. Check the pre-programmed values carefully to ensure that they will work for the intended application. You can change these values, if necessary.

7. On the **Load Type** screen, tap the type of load being heated with Load 1.

   We recommend that you choose default values, but you can change these if necessary.

8. When all the values are set as required, tap the **Save** button.

   The system saves the settings for the load, and displays the **Select a Load** Screen.

9. Repeat steps 6-8 for other loads connected to the boiler.

Changing Settings in a Load

After programming a controller, you can change the current settings of a load or add settings for a programmed load.

> **Note** You can adjust the Outdoor design temperature in the Installer Settings menu.

To change a load setting:

1. On the **Main Menu**, tap the **Express Setup** button.

2. On the **Select a Load** screen, tap a load that you want to change.

3. Tap the **Alter Current Settings** button.

4. Make your changes.

5. Tap the **Save** button.

Resetting a Load

After programming a controller, you can reset a load type to factory defaults.

To reset a load:

1. On the **Main Menu**, tap the **Express Setup** button.

2. On the **Select a Load** screen, tap a load (e.g., Load 1) that you want to reset with factory settings.

3. Tap the **Reset to Defaults** button.

4. Select the load type (e.g., Reset Heating) that you are heating with the load (e.g., Load 1).

5. Select the emitter type (e.g., High Mass Radiant).

   Current settings for the emitter are shown on the screen.

6. Tap the **Save** button to reset the settings to factory defaults.

Setting a Zone to Match the Settings of Another Zone

After you have configured one or more active loads in the system, you can set up other loads to act as zones. Setting up a zone means that you are synchronizing (matching) a load with the properties of another load (matching load priority number, target temperatures, and differentials). These zoned loads can operate independently or simultaneously.

You can use this method of zone control to save energy costs. For example, you can zone bedrooms that need lower room temperatures to match another area in the house that is set at a low temperature.

Let's say that Load 1 is the main heating source, and you want Load 3 to have the same properties as Load 1.

To syncronize the zone of Load 3 to match the zone of Load 1:

1. Set the parameters for Load 1."Fonctionnement à chaudières multiples" on page 21

2. On the Main Menu, tap the **Express Setup** button.

3. Tap **Load 3 - Off**.

4. Tap the **Zone Of** button.

5. Tap **1 - Reset Heating** (for example).

6. Tap the **Saved** button, and then tap the **Back** button.

Load 3 is displayed as Zoned (synchronized with Load 1).

Setting Loads Using the Installer Settings

When you set up a load, you are assigning a load type to one of four settings. Loads set to "Off" are disabled. All load types are configured with factory default settings that you can change. The settings for each load type vary depending on the load type selected. Always check that the load settings are appropriate for your system.

Alternatively, you can set loads in the Express Setup area. For instructions, see "Setting Loads Using the Express Setup" on page 22.

Setting Up Loads

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap a load set to Off (e.g., Load 1).

   Experienced installers will be familiar with most of the terms on the screen. For a definition of some of the unfamiliar terms, see "Definition of Terms" on page 55.

3. Tap one of the options (e.g., Reset Heating).

4. Tap **OK**.

   In this example, the Reset Heating screen is populated with default settings.

5. To change any of the default settings, tap a box, and enter your desired setting.

> You can reset the load with the factory settings by tapping the Defaults button.
>
> **Note**

6. After entering all the desired settings, tap the **Save** button.

Once a type is assigned, all the load's parameters can be edited independently.

Changing a Load Type for a Load

When you change a load type for a load, some of the values may change back to the system default values.

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap the load type that you want to change.

3. Tap the new load type that you want for the load.

4. Tap **OK**.

5. Change any setting values that may have been lost when you changed the load type.

6. Tap the **Save** button.

Changing Settings in a Load Type

If you are changing a load type for a load, change the load type first before you change any setting values. Otherwise, when you change the load type, the values may be reset to the system default values, and the values you changed may be lost.

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap the **Edit** button next to a Load type.

3. Make your changes.

4. Tap the **Save** button.

Removing an Assigned Load Type from a Load

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap a load (e.g., Reset Heating).

3. Tap the **Off** option.

4. Tap **OK**.

Managing Errors

If an error (e.g., Ignition Failure) shows on the status bar (displays text on a red background), you can view the error, and then clear it. For more information on errors, see "Error Conditions" on page 8.

The controller continually checks that the sensors are operating within normal parameters. See "CHAPTER 5 Troubleshooting" on page 49 for a list of errors and their likely causes. Note that other problems such as disconnected wires or defective sensors may be the cause of the error. Always check connections and wiring first.

Clearing System Errors

Clears any currently latched error states and forces the controller to reassess the boiler's error status and determine if any error state is still present. This method to clear errors is preferred and much faster than a power cycle.

To clear one or more system errors:

1. On the **Main Menu**, tap the **Diagnostics** button.

2. Tap the **Advanced Diagnostics** button.

3. Tap the **Clear Errors** button.

4. Select the **Yes** option.

5.   Tap **OK**.

Viewing Errors

To view one or more errors:

1.   On the **Main Menu**, tap the **Diagnostics** button.

2.   Tap the **Advanced Diagnostics** button.

3.   Tap the **Error Log** button.

     Error types will display a View button. If an error type has no error a "None" button is displayed.

4.   Tap a **View** button.

     A pop-up screen displays a list with a check mark next to the error(s).

Now you can clear the errors in the error log.

Clearing Entries in the Error Log

To clear one or more errors in the error log:

1.   On the **Error Log** screen, tap **Yes**.

2.   Tap **OK**.

All error types are grayed out to indicate that all errors have been cleared.

Networking Multiple Boilers

Networking multiple IBC modulating condensing boilers at a plant site offers tangible energy savings. The reason being that these networked boilers produce exceptional "turn down" capability that matches any building load demands.

IBC boiler networks are designed for single load applications and certain two-load systems. Single boilers set up with three- or four-load sequences (typically for residential scenarios) are generally not suitable for larger multi-boiler applications. You can connect up to 24 IBC boilers to operate as a single heating plant.

Other benefits of networking multiple boilers include:

•   Enabling you to program and monitor the group remotely through IBC's portal.

•   Removing a single boiler off-line for servicing without affecting the operation of the other boilers on the network.

•   "Opting out" a single boiler from the heating load when called upon for DHW by an individual indirect storage water heater. For more information, see "Multiple Boiler Networking: Boiler "Opt-out" to Serve Call for DHW" on page 19.

The two methods used for networking a group of boilers are:

1.   An Ethernet Switch device .

2.   BoilerNet two-wire CAN-bus daisy chain cabling.

>
>
> We recommend using an Ethernet switch device.
>
> **Note**

Consult IBC's latest technical notes on multi-boiler operation before implementing any multiboiler, multi-load application.

⚠️ **Warning** Disconnect electrical power to the boiler before removing the circuit board cover.

BOILER NETWORK TERMINATION JUMPER — JA02
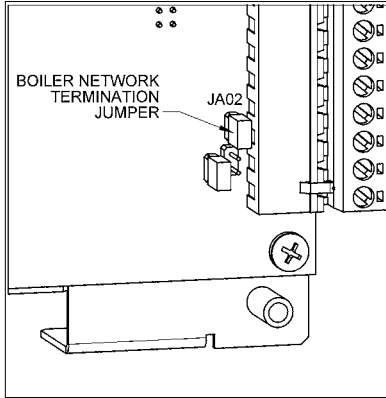
Ethernet Switch Device

Networking switch devices, purchased from any office supply or computer store, contain multiple ports that enable you to connect multiple boilers via a network (Ethernet) cable. The cable plugs into each boiler's Ethernet jack located at the back of the controller (see "Controller Board Layout" on page 53).

BoilerNet Two-Wire CAN-bus Daisy Chain Cabling

The boilers are configured in a daisy chain networked, for communication and control, via a proprietary network called BoilerNet.

📝 **Note** **Important**: The BoilerNet Interface controller must be configured before it is put into use on your network.

BoilerNet Setup	Requirements
BoilerNet uses a CAN-bus interface for communicating between the boilers.	The wire type and installation must comply with CAN-bus standards such as ISO 11898 and/or SAE J2284.
Cable - Use polarity-sensitive twisted 2-wire leads (CAN-bus standard) to join one boiler to the next (to a maximum of 24 boilers). Connection is made between the "Boiler Net" terminals near the base of the TB2 terminal strip. See connection points #19 and #20.	The general specifications for the cable are: • 24 AWG shielded twisted pair • 9 twists / ft • Capacitance 12.5pF/ft (cond./cond.) • Resistance 25.5 ohms/1000 ft

BoilerNet Setup	Requirements
Network Wiring	• Power down all boilers prior to connecting or disconnecting. • The "Boiler Net +" and "Boiler Net –" are polarity sensitive and must not be crossed. • The Boiler Network wiring must only be installed in a "Daisy Chain" format where the network wiring goes from the first boiler to the second to the third to the fourth, and so on. • When using shielded pair wire, ensure the shielding is only grounded at one end of the "Daisy Chain". If the shielding is grounded in multiple locations (i.e. at each boiler or at the first and last boiler,) the shielding becomes ineffective and in some cases increases the electromagnetic interference affecting the communication signal. The termination jumper (JA02) needs to be removed from the boiler controller boards that are NOT the first or last boiler in the BoilerNet chain. For example, in a two-boiler network, JA02 must be left installed in both controls, and in a three-boiler network, the JA02 must be removed on the middle boiler only. Please contact IBC if any additional information is required. **Note**: Network wiring should not run in parallel to any nearby line voltage wiring.
Terminators	The terminators must be removed from the middle boilers, and the wire polarity must be correct at all the boilers and the BIC II. The BIC II must be on the end of a BoilerNet communications chain
Before powering up	All boilers must be powered on and have a unique Boiler ID assigned to them.
Master boiler	Make sure there is only one boiler configured as the master (typically boiler #1). The boilers will not function correctly if there is more than one boiler assigned as the master, and the BIC II will not properly recognize the boilers.

Configuring a Boiler as the Master Boiler

You can assign a boiler among a group of boilers as the "master" boiler.

When you configure a boiler as the master boiler, it receives all sensor and dry contact call-for-heat signals, manages the secondary (pumps), and coordinates the firing of all boilers in the group.

To configure a boiler as the master boiler:

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap the **Multi-Boiler** button.

   On the **Multi-Boiler Settings** screen, you will need to set specific settings.

   Each boiler must have a unique boiler ID number.

3. Tap the **Boiler ID** box, and enter a unique ID number (e.g., 01), and then tap **OK**.

4. Tap the **Master Boiler** box, select the **Yes** option, and then tap **OK**.

The Staging Delay option is the length of time before the next boiler is brought online once the current firing boiler has passed its add boiler firing rate level. It must be at minimum equal to time for closed-loop water to complete one full circuit of system. For large mass systems, allow for two or more loop times.

5. (If required) To set the staging delay, tap the **Staging Delay** box, and set the staging delay in minutes.

    Rotation is turned to "On" to balance the run time on each of the boilers. When Fixed Lead is turned to "On", the master boiler will always be the first to answer a call for heat. If left to "Off", the boiler on the network with the least run time will be the first respond to a call for heat. Note that when Rotation is set to "On", Fixed Lead is treated as "Off".

6. If you want:

    •   Different boilers to start up at different times:

        a. Tap the **Rotation** box, and then select **On**.

        b. Tap **OK**.

        c. Tap the **Fixed Lead** box, and then select **Off**.

        d. Tap **OK**.

    •   The master boiler to always fire first:

        a. Tap the **Rotation** box, and then select **Off**.

        b. Tap **OK**.

        c. Tap the **Fixed Lead** box, and then select **On**.

        d. Tap **OK**.

    The Add boiler level is for a boiler to be added to a network. One or more boilers have to be firing at or above the Add Boiler %. For example, an SL 40-399 boiler with an add boiler level of 60% means the boiler needs to fire at or above 260 Btu for the delay staging timer to start.

    The Drop Boiler is best left at 25%.

7. Tap the **Save** button.

    The system prompts you to restart.

8. Tap **OK** to restart the system.

9. To check that the boiler is now the designated master, on the **Multi-Boiler Settings** screen, scroll down to **Boilers Online** to ensure that multiple boilers are shown.

    If the number does not match the number of boilers on site, check that you have assigned a boiler ID to each boiler and also check the wiring.

Configuring a Subordinate Boiler

Each subordinate boiler that will be controlled by the master boiler requires some basic configuration.

To configure a subordinate boiler:

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap the **Multi-Boiler** button.

3. Tap the **Boiler ID** box, and enter a unique ID number (e.g. 02, 03 etc. - 01 is typically reserved for the master boiler, but it can be assigned any number 1-24), and then tap **OK**.

Subordinate boilers only require a unique ID and the "Master Boiler" option must be set to "No". You do not need to set any other settings.

Combining Loads

The touchscreen controller allows two loads of compatible temperature settings to run together.

In load combining there are two modes:

*   Basic mode

*   Full mode

Basic mode should cover most of the load combining applications. However, if you do not have a mixing valve, you may need to suppress the higher temperature rather than overshoot the lower temperature. In this case, we recommend that you use the full mode.

Basic (simple) mode

Basic mode allows any two loads to be combined together. The boiler supplies a target water temperature based on the highest water temperature required between both loads. Let's say a radiant floor is set at 120°F and a fan coil is set at 160°F. When both load types call for heat, the boiler will supply 160°F. If only the radiant is calling, the boiler will supply 120°F.

> In Basic mode, you must set the Primary Load with the highest water temperature.
>
> **Note**

Full mode

In Full mode load combining, there are six default parameter settings:

Parameter	Default	Minimum	Maximum
Primary Load	Disabled	Load 1	Load 4
Secondary Load	Disabled	Load 1	Load 4
Initial Delay	5	2	15
Off Delay	5	2	15
Retry Delay	10	5	60
Maximum Throttle %	75	50	90

1	**Primary Load - Highest temperature**	Set to the load that will control the boiler operation while Load Combining is active. This load must have a higher initial priority than the **Secondary Load** and should have a higher water temperature requirement. The Load Combining feature is disabled when this parameter is set to **Disabled**.
2	**Secondary Load - Lowest temperature**	Set to the load that will be serviced simultaneously, in combination with the Primary Load, if the conditions for Load Combining are met. Load Combining conditions are met if the: • Supply temperature requirements for the Primary Load are being met, • Supply temperature is within the temperature range requirements of the Secondary Load and, • Boiler has the capacity to service the Secondary Load as determined by the Maximum Throttle % setting. The Load Combining feature is disabled when this parameter is set to **Disabled**.
3	**Initial Delay**	The number of minutes after the Primary load must initially be serviced before the boiler can add a Secondary load. A sufficient amount of time should be allowed for the Primary load to stabilize before the boiler adds the Secondary load.
4	**Off Delay**	When the secondary load is added into combination service it is expected that the supply temperature will briefly go below the normally allowed temperature range for the Primary load. The **Off Delay** is the number of minutes after the loads have been initially combined that the loads will continue to be combined regardless of an under-temperature condition. The **Off Delay** setting should be reasonably long enough to allow the boiler to drive the supply temperature up within the Primary load's target supply temperature range. The loads will be uncombined if the under temperature condition persists after the **Off Delay** time. If the supply temperature exceeds the requirements for either the Primary or Secondary load the loads will be uncombined immediately.
5	**Retry Delay**	If the boiler has to remove the Secondary load from combined service because Load Combining conditions have been violated the Retry Delay is the number of minutes the boiler will wait before attempting to add the Secondary load back into combination service.
6	**Maximum Throttle**	Maximum Throttle % is the percentage of the boiler's maximum heat output for which Load Combining will be allowed to begin. The Secondary Load will not be added into combined service if the boiler's output is higher than this value. The **Maximum Throttle** % has no effect once the loads have been combined.

What to Consider for Combining Loads

The Primary and Secondary loads must have compatible temperature parameter settings, or the Secondary load cannot be combined for service. The type of load generally doesn't matter, as long as the target temperature requirements for the loads to be combined are similar.

Load Priority

Load Combining does not interfere with the boiler's Load Priority scheme. Therefore, you must configure the Secondary load with a lower initial priority than the Primary load (a priority difference of at least 15 is recommended). If the Secondary load's running priority becomes higher than the Primary load, then it is serviced in the normal priority rotation, just as if the load were not combined.

The Primary load will be dropped, and the Secondary load will be serviced in the normal priority rotation. The priority scheme also means that the Load Combining occurs only while the Primary Load is the active load. The same applies if an uncombined load's priority becomes higher than the Primary's. The Primary load, and therefore the Secondary load if in combination service at the time, would be dropped and the uncombined load serviced in the normal priority rotation.

Target Temperature

Compatibility temperature ranges are the load's target temperature, +/- the differential temperature (the load's minimum and maximum supply temperatures). Note that any system or load temperature limits will still be in effect.

> **Note**
>
> For Reset Heating or External Control loads, the target temperature is dynamic. So it is possible that as outdoor and/or indoor temperatures change, reset and external control heating loads could drift in and out of compatibility for Load Combining. See IBC Technical Note: Load Combining for further details.

Combining Two Loads

To combine two loads:

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap the **Load Combining** button.

3. Tap the **Primary Load** box, and select a load type for the primary load, and then tap **OK**.

4. Tap the **Secondary Load** box, and select a load type for the secondary load, and then tap **OK**.

   Check the Status field. If the field indicates that it is out of temperature range, you may need to adjust the temperature of one of the loads.

5. Tap the **Save** button.

Restricting Access to Areas in the Controller

You can restrict access to areas that allow changes to operational parameters by requiring that a password be entered. When you turn on password protection, the system provides a user password and an installer password.

Installers can give users (e.g., homeowners) the user password to enable them to access areas such as the DHW temperature control.

Turning On Password Control

To turn on password control:

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap the **System Settings** button.

3. Tap the **Security** button.

4. On the **Security Control** screen, tap the **On** option.

   Note the user password and installer password.

5. Tap **OK**.

When security mode is set to on, and a button is selected that accesses a restricted area, a password pop-up window appears.

> If you forget the password, contact IBC Technologies. You cannot change the password.
>
> **Note**

Turning Off Password Control

To turn off password control:

1. On the **Main Menu**, tap the **Installer Settings** button.

2. Tap the **System Settings** button.

3. Tap the **Security** button.

   The password window shows four digits with an up arrow and down arrow button above and below the digit. The password graphic looks similar to some combinations locks. Touching the arrow button above or below the digit causes the digit to increment up or down respectively.

4. Tap the appropriate buttons until the desired password is displayed.

5. Tap **OK**.

6. On the **Security Control** screen, tap the **Off** option.

7. Tap **OK**.

Pressing **OK** closes the popup and then grants the user access. Access to secure areas remains available for 15 minutes before password re-entry is required.

Setting the Venting Material

The default setting for venting material in the control is PVC. If you change the venting setting, you are solely liable and responsible for selecting the correct venting type.

To select a different venting type:

1. On the **Main Menu**, tap **Installer Settings**.

2. Tap **System Settings**.

3. Tap **Site Settings**.

4. Tap the **Venting Material** box.

5. Select one of the options.

6. Tap **OK**.

Setting Overrides

To access the temperature overrides settings:

1. On the **Main Menu**, tap the **User Settings** button.

2. Tap the **Overrides** button.

   Each load can have two automated programs per day of the week: Prog 1 and Prog 2. Each program includes one override temperature that can be applied during two separate programmable time periods.

3. To set an override temperature for a program, tap the **Edit** button.

4. Tap either **Prog 1** or **Prog 2** next to a day of the week.

   Each period is defined by a start and a stop time in 24 hour clock format. If the programmed times overlap, Prog 1 will supersede Prog 2.

5. Tap the **Indoor Setpoint** box:

   a. Using the number buttons, enter a temperature within the range shown below the number buttons.
      The boiler's current indoor setpoint is displayed above the number button.
   b. Tap **OK**.

6. Tap a **Start Time** box:

   a. Enter the hour and minutes, using the 24- hour format (e.g., 16:30).
   b. Tap **OK**.

7. Tap an **End Time** box:

   a. Enter the hour and minutes, using the 24- hour format (e.g., 16:30).
   b. Tap **OK**.

8. Tap the **Save** button to save the settings in the selected program.

9. Repeat steps 4-8 to configure program settings for the other days of the week.

10. When you have finished entering the necessary settings for the required program(s), tap the **Back** button.

    Temperature Override programming can be enabled or disabled for each load independently, without affecting the temperature and time settings for each day of the week.

11. Tap the **Enable** box next to a load with a temperature override, so that it has a check mark in the box.

12. Tap the **Save** button, and then tap the **Back** button until you return to the Main Menu.

Switching a Boiler to Unoccupied "Away" Mode

You can use the 'Unoccupied' energy-saving mode when you go away for a period of time (e.g., holiday). For more information about how this mode affects the boiler, see "Unoccupied Mode" on page 17.

Turning On Unoccupied Mode

To switch the boiler to unoccupied mode:

1. On the **Main Menu**, tap the **User Settings** button.

2. Tap the **Occupied check** box **to** remove the check mark.

3. Tap the **Save** button.

Removing a Boiler's Unoccupied Mode

To remove a boiler's unoccupied mode:

1. On the **Main Menu**, tap the **User Settings** button.

2. Tap the **Occupied check** box **to** display the check mark.

3. Tap the **Save** button.

Low Water Cutoff: Resetting and Testing

The low water cutoff (LWCO) function provides continuous protection against a low water incident.

If the SIM detects a low water incident, the boiler goes into a lockout condition. Here, you will need to reset the boiler. To test the LWCO on the boiler, you can also manually place the boiler in a lockout condition.

Resetting the Boiler after a LWCO Lockout

Before you reset the boiler, ensure that the boiler is pressurized and that the air has been removed.

1. On the touchscreen controller, tap the Home screen.

2. On the **Main Menu**, tap the **Diagnostics** button.

3. Tap the **Advanced Diagnostics** button.

4. Tap the **Clear Errors** button.

5. Tap the **Yes** radio button, and then tap **OK**.

The system clears the errors, and resets the boiler.

Testing the LWCO Function

1. On the touchscreen controller, tap the Home screen.

2. On the **Main Menu**, tap the **Diagnostics** button.

3. Tap the **SIM Module** button.

4. Tap the **LWCO Test** button.

5. Disconnect the yellow wire from the LWCO function.

    A message on the screen indicates that the boiler is in lockout mode.

6. To reset the boiler, reconnect the yellow wire to the LWCO function.

7. On the touchscreen controller, tap the **Reset** button.

    The message: "The SIM Module has been reset" is displayed.

8. Tap the **Close** button, and then tap the **Back** button until you return to the Home screen.

Hi-Limit Temperature: Resetting and Testing

The hi-limit temperature function monitors the hi-limit temperature set in the SIM. If the water temperature exceeds the hi-limit temperature, the boiler goes into a lockout condition, requiring a manual reset. You can test the hi-limit cutoff temperature function on the boiler.

Resetting the Boiler after a Hi-Limit Lockout

Before you reset the boiler, ensure that the boiler is pressurized and that the air has been removed.

1. On the touchscreen controller, tap the Home screen.

2. On the **Main Menu**, tap the **Diagnostics** button.

3. Tap the **Advanced Diagnostics** button.

4. Tap the **Clear Errors** button.

5. Tap the **Yes** radio button, and then tap **OK**.

The system clears the errors, and resets the boiler.

Testing the Hi-Limit Cutoff Temperature Function

1. On the touchscreen controller, tap the Home screen.

2. On the **Main Menu,** tap the **Diagnostics** button.

3. Tap the **SIM Module** button.

4. Tap the **Hi-Limit Test** button.

    You will need to enter a cutoff temperature below the Supply Temp. value currently displayed. For example, if the Supply Temp. value is 180°F, enter 170°F in the Cut Off Temp. box.

5. Tap inside the **Cut-Off Temp.** box, and then tap a number value.

6. Tap the **OK** button.

    The message: "Hi-Limit Detected" is displayed.

7. To reset the boiler, select the **Reset** button.

   The message: "The SIM module has been reset" is displayed.

8. Tap the **Close** button, and then tap the **Back** button until you return to the Home screen.

Testing Fan Operation

When a boiler is not heating, you can test its fan heat output. For all models (excluding the G3 models), the fan heat output MBtu value should match closely the heat output MBtu value.

The test also includes the vent factor. A lower vent factor value indicates a shorter vent while a higher vent factor value indicates a longer vent. These values are useful for troubleshooting issues such as a blocked vent.

Testing Fan Heat Output

To test the fan's heat output:

1. Tap the **Diagnostics** button, and then tap **Fan Operation** button.

2. Tap the **Fan Test Heat Out** box, and enter a MBtu value within the range indicated.

3. Tap **OK**.

The test stops when you exit the screen. Now, you can check if the heat output and fan heat output values closely correspond.
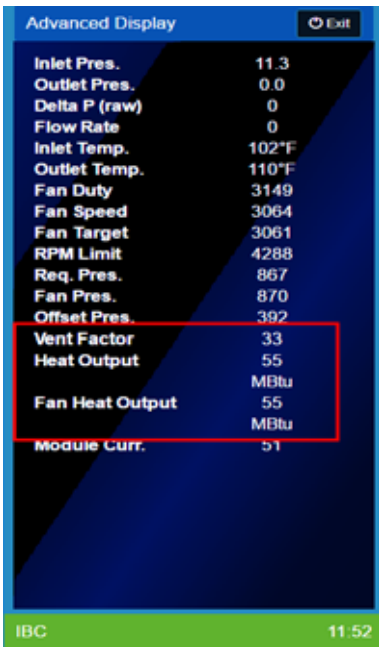
Checking the Heat Output Values

To check if the heat output value and the fan heat output value correspond:

1. Tap the **Diagnostics** button, and then the **Advanced Diagnostics** button.

2. Tap the **Display Parameters** button.

The boiler's current Heat Output and Fan Heat Output values are displayed.

Advanced Display	⏻ Exit
Inlet Pres.	11.3
Outlet Pres.	0.0
Delta P (raw)	0
Flow Rate	0
Inlet Temp.	102°F
Outlet Temp.	110°F
Fan Duty	3149
Fan Speed	3064
Fan Target	3061
RPM Limit	4288
Req. Pres.	867
Fan Pres.	870
Offset Pres.	392
Vent Factor	33
Heat Output	55 MBtu
Fan Heat Output	55 MBtu
Module Curr.	51
IBC	11:52

Setting the Date and Time

Setting the date and time in a boiler is necessary for programming overrides.

If the boiler is:

• Connected to the internet, you can set the Date and Time to automatically update.

• Not connected to the internet, you will need to set it manually. For example, when there is a daylight saving time change.

Setting the Date and Time in a Boiler Connected to the Internet

When the boiler is connected to the internet, you can set up the date and time to automatically update its internal clock from an Internet time service.

1. On the **Main Menu**, tap the **User Settings** button.

2. Tap the **Date & Time** button.

3. Ensure that the **NTP Server** option is selected.

   The Time and Date boxes are disabled, and cannot be selected.

4. If required, tap the **Time Zone** box, and select a time zone option, and then tap **OK**.

5. Ensure that the **Auto DST** check box is selected.

6. Tap the **Save** button.

Setting the Date and Time in a Boiler Not Connected to the Internet

If the boiler is not connected to the internet, there will be times when you need to manually set/reset a boiler's date and time. For example, if the boiler has been shutoff, or if there has been a daylight saving time change.

To set the date and time manually:

1. On the **Main Menu**, tap the **User Settings** button.

2. Ensure that the **Internal** option is selected.

3. Set the **Date & Time** boxes, using the keypad.

4. If required, tap the **Time Zone** box, and select an option.

5. Tap the **Save** button.

CHAPTER 3 Setup for Internet Access

At a site, you can set up internet access to enable you to monitor and control one or more boilers remotely through IBC's Portal website. Then at your convenience, you can control a boiler's heating controls from a computer, tablet, or smart phone.

Benefits

For domestic households: Let's say you are away on holidays during Christmas, and you are returning earlier than expected. Now, you can change the heating temperature online, so that you return to a warm house.

For installers/contractors: A customer contacts you about a boiler you installed for them that has shutoff. If the boiler is registered under your IBC Portal user profile, you can quickly go online to view the boiler's errors or diagnostics to help with troubleshooting.

Most of the settings, status information and control capabilities available on a boiler's touchscreen controller are also available via IBC's Portal. BACnet support is also available.

To set up remote access:

1. Connect the boiler's controller to an Internet Protocol (IP) network.

2. Set up access to IBC's Portal: Register the boiler and then register as a user of the IBC Portal.

Connecting a Boiler's Controller to an IP Network

The boiler must be properly connected to an IP network to enable web browser capability. You can do this by using a router to connect the boiler's local area network to the internet. The connection for the boiler's controller to an IP network is through the Ethernet jack located at the back of the controller unit (see section "Controller Board Layout" on page 53). The controller supports standard 100 Base T data rates over typical CAT5 or CAT6 wiring.

> **Note** Remote access via the Internet typically requires that the router have its port forwarding settings configured to forward port 80 to the boiler's local IP address. In this case the IBC Portal will access the boiler's web pages via the real Internet address of the router.

When connecting to the boiler within the local area network, the boiler's IP address will be the same as listed on the controller's Network Information screen.

There are two methods for connecting the boiler to an IP network:

1. Install an Ethernet cable that connects from the boiler (RJ 45 Ethernet Jack) to the router.

2. Purchase and install a wireless access point device connected to the Ethernet jack. The wireless access point device must be configured to operate in client mode (to enable the router to function as a wireless client).

   There are many wireless access point devices on the market such as the TP-LINK AV500 Nano Powerline Adapter Starter Kit. The adapter plugs into an electrical wall socket, and connects to a router via an Ethernet cable.

Once you establish an IP network connection, the router automatically requests and receives an IP packet containing the IP address, the gateway, DNS server, and Net Mask. The boiler is set up with default basic settings required to connect to an IP network.

On the Network Settings screen, the **TCP/IP** group of parameters includes the basic settings required to connect to an IP network. By default **DHCP** is selected. When **DHCP** is activated the other four entries are not required and their entry boxes are disabled. When the particular installation requires that the boiler be assigned a fixed IP address then Manual must be selected and the boiler's **IP Address**, the **Net Mask, DNS Server** address and **Gateway** address must be entered manually.

Setup to Access the IBC Portal

Now that you have set up the boiler's connection to an IP network, you can register the boiler via the Portal to enable you or another representative to monitor and control settings for a particular boiler (or a group of boilers).

To complete the setup, you need to:

1. Register a boiler with IBC.

2. Register as a user to access IBC's Portal website.

3. Access the IBC Portal with a username and password.

Registering a Boiler with IBC

You can register a boiler:

1. From a boiler's touchscreen controller.

2. On the IBC Portal.

### *Registering a Boiler from the Touchscreen Controller*

When you register a boiler, you are granting IBC access to the boiler and its settings and diagnostics.

To register the boiler:

1. On the touchscreen controller's Main Menu, tap the **Installer Settings** button.

2. Tap the **System Settings** button.

3. Tap the **Network Settings** button.

Best Practice: Take a photo of the screen with the boiler's MAC address now to avoid transposing digits or incorrectly inputting the incorrect digit when you later register on the IBC Portal.

4. In the **Internet Portal** area, tap the **Register** button.

5. To confirm, tap the **Yes** option, and then tap **OK**.
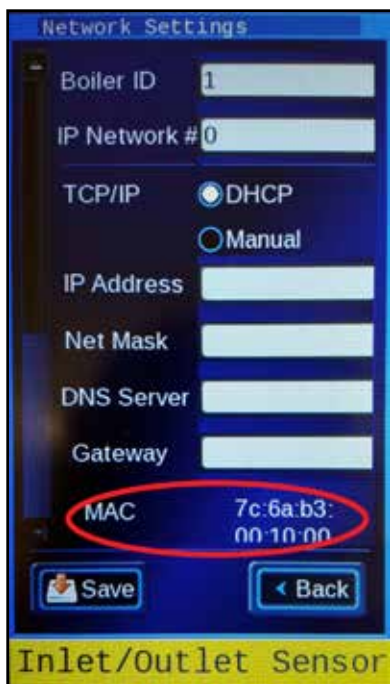
> After submitting the registration request, there is a small delay. Registration may take a few moments. Registration is complete only when the "Register" button displays as "Unregister" on the Network Settings screen.
>
> **Note**

Registering a Boiler on the IBC Portal

Before you can register a boiler on the IBC Portal, you must be registered with IBC as a user of the IBC Portal. For more information, see the next section "Registering for access to the IBC's Portal website".

From the IBC Portal, you can download an installer key that contains your user profile (e.g., your contact information) to a USB stick. Then you can insert the USB stick with the installer key into a newly installed boiler to assign the boiler to you (user profile). This is useful for installers who install multiple boilers (e.g., contractors). On the Portal, a contractor can view and manage all the boilers that they are responsible for in the one area.

To download an installer key:

1. Select the Welcome user drop-down arrow (beside the Username) in the top right corner of the IBC Portal page.

2. Select **Profile**.

3. Select the **Setup Installer Key** button.

> **Note**
> You will need to download the key to the main top-level directory (e.g., USB DISK (D:)) because the touchscreen controller is unable to find an installer key installed in subfolders/subdirectories. Also, ensure that the file name is **installer.key.**

4. Select the **Download Key** button to download the key to your system.

5. Download the **installer.key** file to a USB stick. There may be a small delay before the key is downloaded to the USB.

    Now, when a boiler is installed and connected to an IP network, an installer can insert the USB with the installer key into the boiler's touchscreen controller.

6. With the USB inserted in the touchscreen controller, tap the **Installer Settings** button.

7. Tap the **System Settings** button.

8. Tap the **Network Settings** button.

9. In the **Internet Portal** area, tap the **Register** button.

10. To confirm, tap the **Yes** option, and then tap **OK**.

The boiler is now associated with the user's profile.

Registering for Access to the IBC's Portal Website

After registering the boiler, you can apply for access to IBC's Portal to enable you to manage one or more boilers remotely. The registration form requires user information, for example, information about the homeowner and the installer that enables IBC to set up user and boiler profiles. For security reasons, users are assigned different levels of access based on roles. The following describes the various access roles:

• A homeowner, who wants to be responsible for their own boiler is assigned "Provider Monitor" user access. On the Portal, this user can only view and manage their own boiler.

• When a homeowner grants permission to an installer as the "Primary Contact", the installer is assigned "Provider Installer" status. This means that the installer can access the IBC portal to manage the homeowner's boiler.

> **Note** Installers who are managing a boiler via the IBC Portal on behalf of a homeowner must obtain permission from the homeowner. In the lower part of the Portal Registration area, the homeowner must select the "Yes" option and then select the "I Agree" box.

• An installer or contractor, who is responsible for a group of boilers, is assigned a "Provider Manager" role. As an example, for an apartment block, a Boiler Group would be created for the boilers and assigned to the Provider Manager. This role allows the user to view, edit, delete any of the boilers in the boiler group as well as configure alert e-mail lists.

To register for access to the IBC Portal:

1. Go to www.ibcboiler.com.

2. Select the **RESOURCES** tab.

3. Choose **V-10 PORTAL**, and then choose **V-10 PORTAL REGISTRATION**.

4. On the **V-10 Portal Registration** page, from the **Select a Model** drop-down list, choose a model.

5. In the **Serial Number** box, enter the boiler's serial number.

6. In the **MAC address** box, enter the address.

> **Note**
>
> If you took a photo of the MAC address when you registered the boiler, refer to it to avoid inputting the MAC address incorrectly.

To locate the boiler's MAC address:

- On the boiler's touchscreen controller, in the Main Menu, tap the **Diagnostics** button.

- Tap the **Network Information** button.

- In the **Email where Confirmation is to be sent** box, enter an e-mail address.

7. In the **HOME OWNER CONTACT INFORMATION** area, complete all of the boxes.

HOME OWNER CONTACT INFORMATION

Home Owner Name*

Email*

Phone Number*

Address of Installation*

City*

8. In the **Contractor/Installer Contact Information** boxes, complete the required fields.

CONTRACTOR/INSTALLER CONTACT INFORMATION

Company Name*

Primary Contact Name*
The primary contact will be assigned "Provider Manager" status on the IBC V-10 Portal if you choose to allow them access (see selection below). They can create/edit/delete new users, assign boiler groups, delete boilers, assign message alerts and act as the main monitor for the group.

Email

Phone Number*

Installer Address*

City*

State / Province / Region*

> **Note**   If you complete the Primary Contact Name box, that is, the homeowner has granted you permission to manage their boiler via the IBC portal, the homeowner needs to confirm this by completing the PORTAL REGISTRATION area.

9. (If relevant) In the **PORTAL REGISTRATION** area, the homeowner:

   •   Selects the **Yes** option.

   •   Selects the **I Agree** check box.

10. When the necessary information on the form is complete, select the **Send** button.

You will receive an e-mail from IBC with your Portal password. Your username is your e-mail address.

Accessing the IBC Portal

When IBC has set up your access to the IBC Portal, you will receive an automated message with your password.

To log in to the Portal:

1. Go to portal.ibcboiler.com.
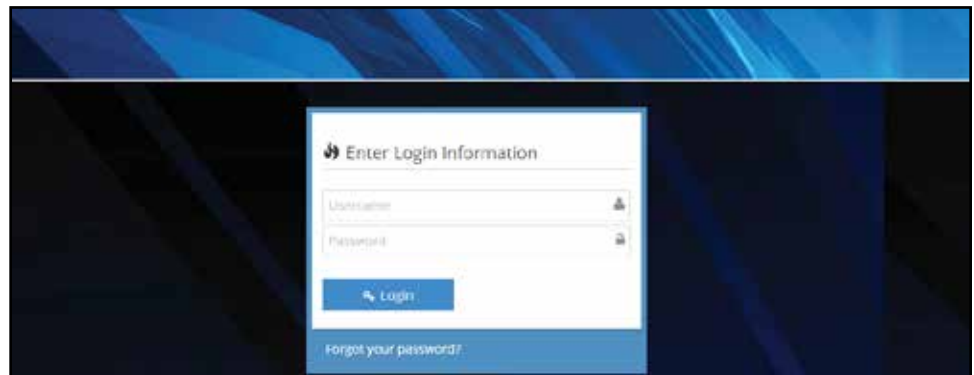
2. In the **Username** box, enter your username. This is your e-mail address.

3. In the **Password** box, enter the password.

4. Select the **Login** button.

You can change your password by going to the Welcome drop-down list>Profile.

BACnet Support

The V-10 Touchscreen Boiler Controller can include complete BACnet/IP functionality including all the features supported by IBC's BIC II module without needing the BIC II device.

You must apply for a separate license to enable this capability. The license can be obtained and activated using the capabilities available by selecting Licensing on the System Settings menu screen. Contact IBC Technologies for information on how to obtain the BACnet licenses. Refer to separate BACnet documentation for complete details on BACnet capabilities and how to use them.

CHAPTER 4 Updating the Software Version

You can install software updates in a boiler's touchscreen controller. When you install software updates, the system checks if the boiler has the latest software version.

If the system detects that the boiler requires more than one software release update, the system installs each software release update, from the oldest to the latest.

Updating Software in a Boiler Connected to the Internet

If the boiler is connected to the internet, you can download the latest software updates through the touchscreen controller. For instructions on connecting a boiler to the internet, see "Connecting a Boiler's Controller to an IP Network" on page 39.

To install the latest software update:

1. On the touchscreen controller **Main Menu**, tap the **Diagnostics** button.

2. Tap the **Advanced Diagnostics** button.

3. Tap the **Software Update** button.

4. Tap the **Internet** button.

Updating Software in a Boiler Without Internet Access

The following steps assume that the boiler does not have an internet connection. If the boiler has an internet connection, see "3.2 Updating software in a boiler connected to the internet".

IBC's technical support can send you a link to the software update. The link provides you with a self-extracting archive zip file. You need to download the zip file to your computer, and extract the files directly to a USB stick or SD-Card that will be   inserted in the touchscreen controller to begin the software update.

### Saving the Latest Software to a USB Using Windows

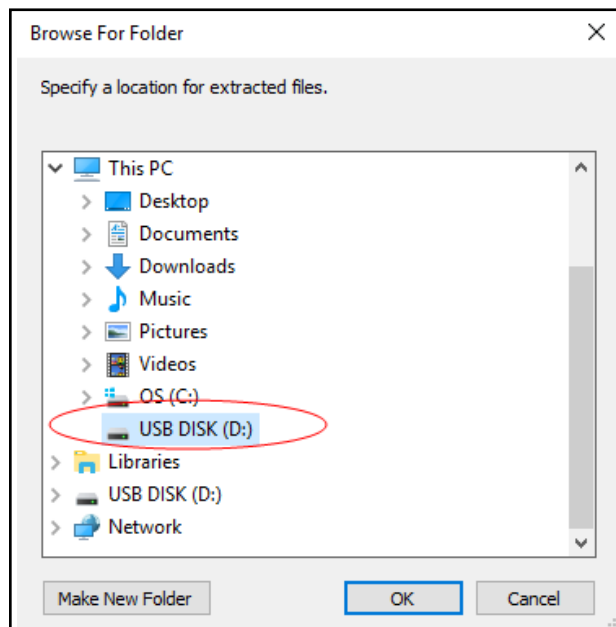This is for Windows-based systems only.

Note

To update the touchscreen controller with the latest software update:

1. Insert a new or empty USB stick into the computer's USB drive, and note the location of the USB (e.g., D:\).

2. In the e-mail sent by IBC's technical support, select the first link.

    A .exe file is displayed.

3.   Select the **Download** dropdown list, and select **Direct download**.

      On the lower left of the screen, select the .exe file, and then select **Open**.
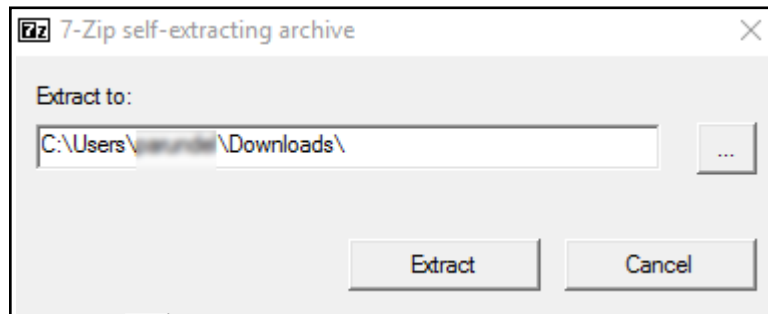
4.   Select the [...] (ellipsis), and then select the USB drive.

5.   Select **OK**.
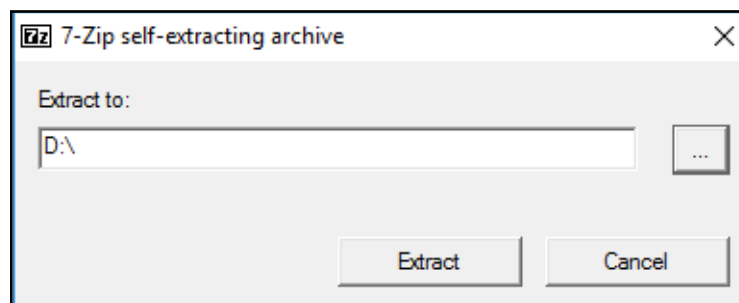
6.   Select the [Extract] button.

      The Progress window disappears when the extraction is complete, that is, the files are extracted directly to the USB stick.

7.   Insert the USB stick into the boiler's touchscreen controller.

8. Tap the **Diagnostics** button.

9. Tap the **Advanced Diagnostics** button.

10. Tap the **Software Update** button.

11. Tap the **USB** button.

12. Follow the instructions on the screen until you receive a confirmation message that the software has been installed.

Saving the Latest Software to a USB Using a Mac Computer

On a Mac Computer:

1. Insert a new or empty USB stick into the computer's USB drive, and note the USB drive.

2. In a Web Browser, enter the following web address: "ftp://update.ibcboiler.com@ftp.ibcboiler.com".

   This will bring up a Log On window. The Username may already be filled in with "update.ibcboiler.com". If not, you will need to make the entry from your keyboard.

3. Enter the password (case sensitive) "GetTheUpdate" and Log On.

4. Go to the /V10/updates folder.

5. Create the following folder in the USB: /ibc/v10/update.

6. Copy all the "zip" files from the V10/updates folder to the "/ibc/v10/update" folder you just created.

7. Insert the USB stick into the boiler's touchscreen controller.

8. Tap the **Diagnostics** button.

9. Tap the **Advanced Diagnostics** button.

10. Tap the **Software Update** button.

11. Tap the **USB** button.

12. Follow the instructions on the screen until you receive a confirmation message that the software has been installed.

Viewing a Controller's Software Version

To check a boiler's software version:

1. On the touchscreen controller's Main Menu, tap the **Diagnostics** button.

2. Tap the **Boiler Information** button.

3. Go to **Software Release** to view the software version.

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CHAPTER 5 Troubleshooting

⚠️ **Warning**
Do not attempt to repair the control module (circuit board). If the control module is defective, replace it immediately.

ISSUE	DIAGNOSIS	FIX
Maximum Ignition Trials Error **Touch Screen Message:** *Error – Ignition Failure after 3 tries* *Boiler has failed to ignite on 3 successive attempts. Boiler in lockout for 1 hour, then repeats 3-try seq. Consult service technician if error recurs.*	**No spark when igniting. Igniter probe/flame sensor disconnected.**	Check that igniter lead is secure at the control module and at the probe.
	Manual gas shutoff is closed or gas line not fully purged.	Check for gas flow. Open manual gas shutoff and reset boiler.
	Gap between igniter probe rods is too large or too small.	Adjust ignitor probe rod gap between 1/8th and 3/16th (3.2-4.7mm).
	Spark, but no ignition.	Check spark module is sending power to gas valve – close gas supply, then disconnect (black) electric housing from face of gas valve, gently spread plastic tabs to open, and look for 24vac voltage during an ignition cycle. Replace module if no current detected
	Boiler ignites, but shuts off at the end of the ignition trial. Improperly grounded pressure vessel/ burner or unserviceable ignition lead or spark module.	• Ensure the pressure vessel is grounded. • Check the igniter probe/flame sensor is electrically isolated from the vessel, and its ceramic insulator is intact. • Replace ignition lead • Replace spark module
Hi Limit cutoff temperature Error **Touchscreen message:** **Error – Water High-Limit Exceeded**	**Water temperature exceeds hi-limit. Boiler is in hard lockout mode.**	See "Hi-Limit Temperature: Resetting and Testing" on page 36.

ISSUE	DIAGNOSIS	FIX
Low Water Cutoff Error **Touchscreen message:** **Error - Low Water Cutoff**	**The Safety and Ignition module has detected a low water condition.**	See "Low Water Cutoff: Resetting and Testing" on page 35.
Error: Water High Limit / Low Water Cut-Off won't clear	**Boiler is in 1 hour safety lockout.**	Reset safety device and clear the error in the Advanced Diagnostics menu.
Error: **" Loop/Indoor Sensor"** **"Insufficient Air Flow"** **"Insufficient Water Pressure"** **"Unknown Error"**	**The sensor plug is not engaged.**	Check the P501 plug is fully engaged in the back of the controller board.
Aux. Interlock 1 or 2 **Interlock 1 or 2 terminals are open.**	**Jumper lead is loose or compromised.**	Replace the jumper lead.
	External safety is in an alarm state.	Inspect the external safety devices.

CHAPTER 6 Diagrams

Electrical Wiring Diagram
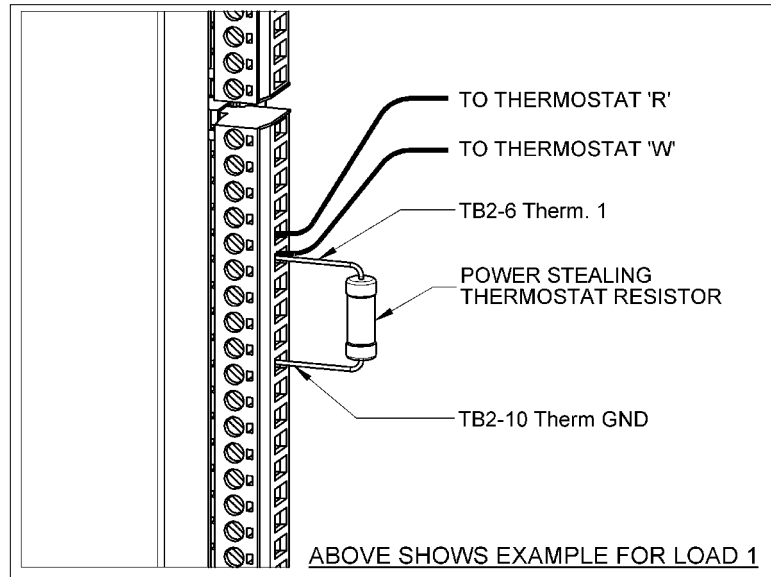

IBC Controller V10.0 - Electrical Ladder Diagram
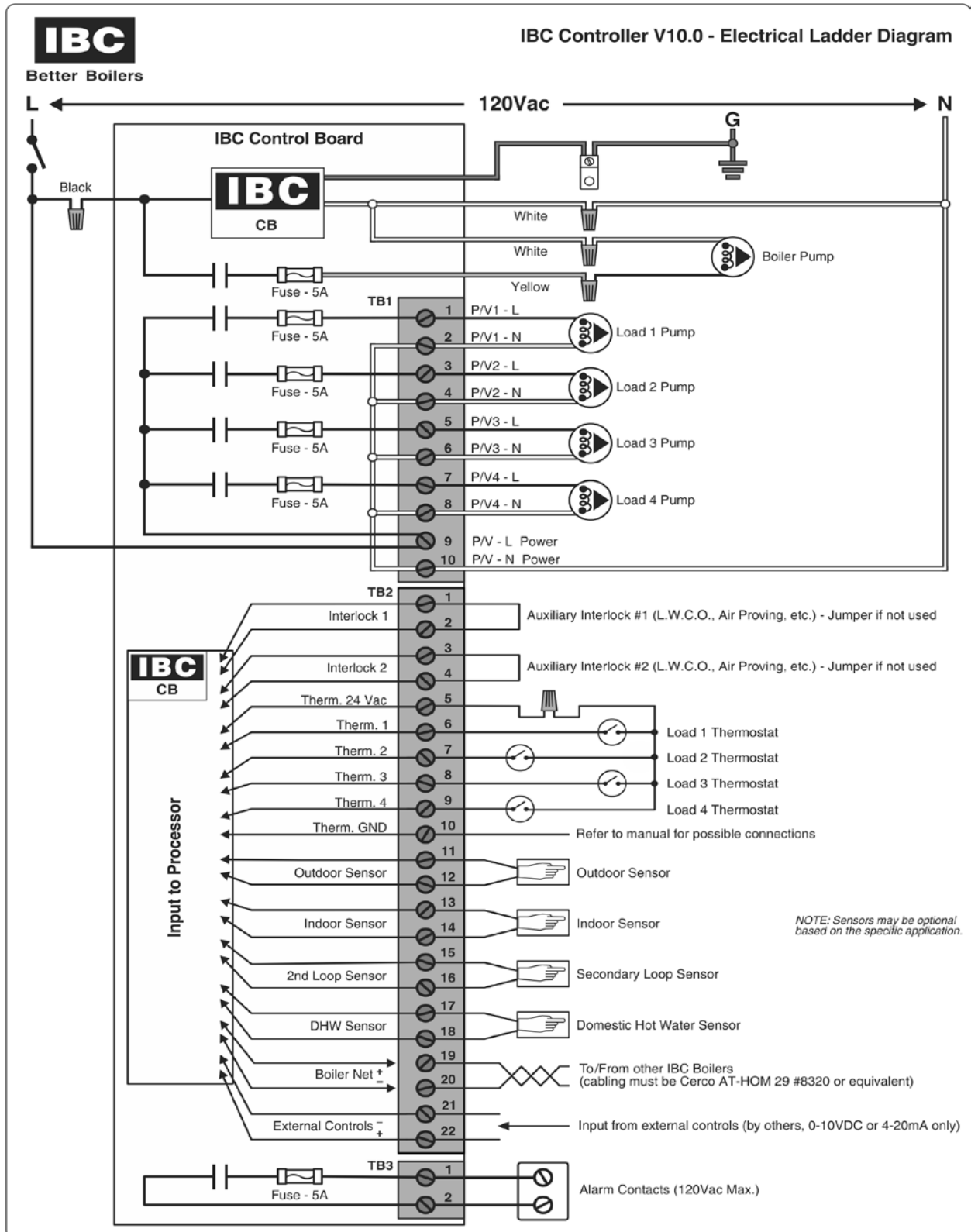
Thermostat Connections

The controller is designed to be compatible with most common thermostats including simple single contact (mercury switch) types as well as most power stealing type thermostats.

The standard connection for common thermostats that provides a simple contact closer for the boiler is shown in the Electrical Wiring Diagram on the previous page.
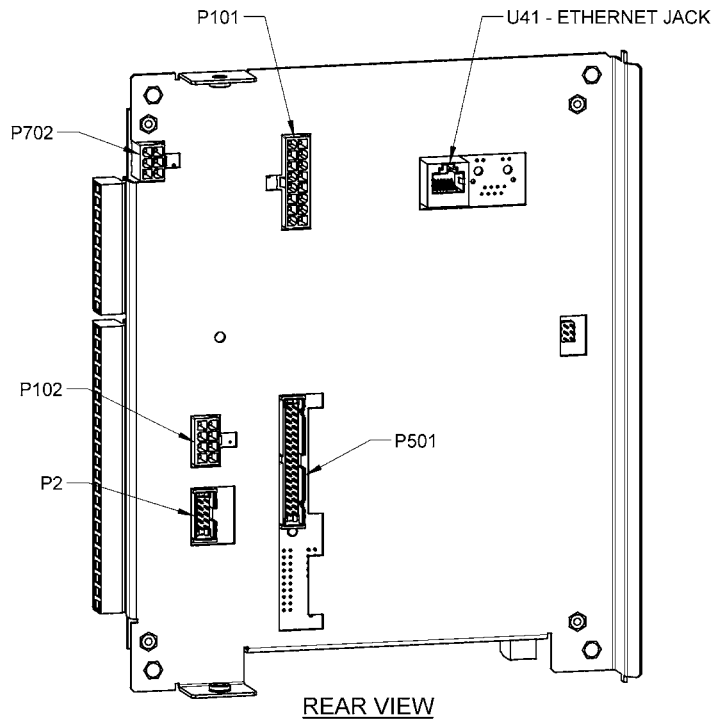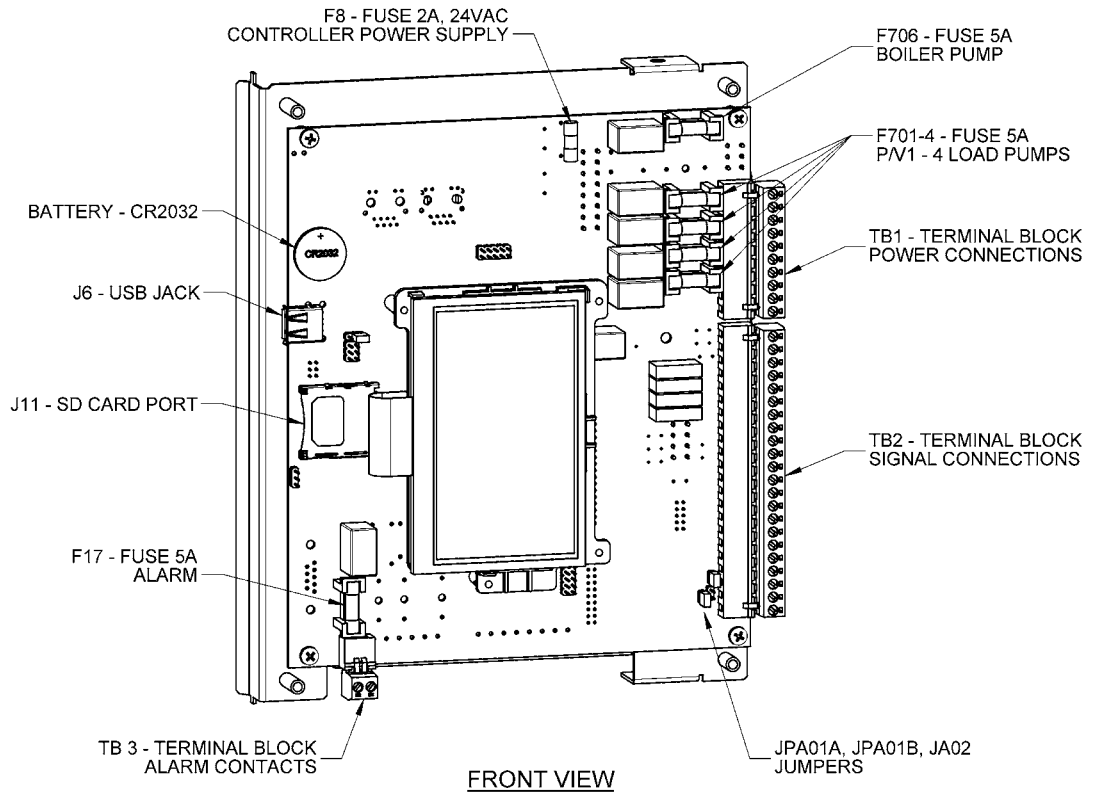
The Therm. 24Vac (TB2 terminal 5) provides 24 volts AC to all thermostats (up to four). This will connect to the "R" terminal on the thermostat. Each individual thermostat's "W" terminal connects separately to one of the controller input terminals Therm. 1 (TB2-6), Therm. 2 (TB2-7), Therm. 3 (TB2-8) or Therm. 4 (TB2-9) depending on the load it is intended to control.

Power stealing thermostats take a small amount of current from the 24 VAC to operate their internal electronics. To complete the 24 VAC circuit required to operate power stealing thermostats the controller includes an internal 2740 ohm resistor from the thermostat input to ground. This internal resistor limits the power available to the thermostat and for some models additional power is required for proper operation. Thermostats that require this extra amount of power (for example the Honeywell T8775) will have a resistor available from the manufacturer capable of supplying the required power. The controller's Therm GND terminal (TB2-10) is provided to allow simple installation of the power resistor. Connect the resistor from the thermostat's input terminal to the Therm. GND (TB2-10) terminal.

TO THERMOSTAT 'R'
TO THERMOSTAT 'W'
TB2-6 Therm. 1
POWER STEALING THERMOSTAT RESISTOR
TB2-10 Therm GND
ABOVE SHOWS EXAMPLE FOR LOAD 1

Controller Board Layout

F8 - FUSE 2A, 24VAC
CONTROLLER POWER SUPPLY

F706 - FUSE 5A
BOILER PUMP

F701-4 - FUSE 5A
P/V1 - 4 LOAD PUMPS

BATTERY - CR2032

TB1 - TERMINAL BLOCK
POWER CONNECTIONS

J6 - USB JACK

J11 - SD CARD PORT

TB2 - TERMINAL BLOCK
SIGNAL CONNECTIONS

F17 - FUSE 5A
ALARM

TB 3 - TERMINAL BLOCK
ALARM CONTACTS

JPA01A, JPA01B, JA02
JUMPERS

FRONT VIEW

P101

U41 - ETHERNET JACK

P702

P102

P501

P2

REAR VIEW

Sequence of Operation Diagram

NOTES:

Heating Enabled: Occurs with a call for heat and heat is required.

Heat Required: Heat is required as long as the controller senses a requirement to raise or maintain the current water temperature.

Call for Heat: There is a dry contact closure across either of the "Therm.1, Therm. 2, or Term. 3" thermostat terminals on the control module OR the controller reads that a mapped sensor (DHW, Setpoint, etc.) is 1/2 Differential below its setpoint.

Definition of Terms

Term	Definition
Aquastat Control	A device used in hydronic heating systems for controlling water temperature. Typically used to manage domestic hot water temperature in a Indirect Water Heater.
BACnet	A Data Communication Protocol for Building Automation and Control Networks - A protocol that provides information about a boiler's heating, ventilating, and air conditioning control (HVAC), lighting control, access control, and fire detection.
Boiler Pump	This feature enables you to shut off the Boiler Pump (primary loop pump) while a load is running. The load pump must be piped (series piping) to ensure adequate flow through the boiler without needing the Boiler Pump to provide flow through the heat exchanger. When you set the Boiler Pump to **Off** a warning message appears as a reminder. If the load is a radiant floor, we strongly recommend using primary/secondary piping and leaving the Boiler Pump set to **On**.
Boiler Pump Purge Time (Site Settings)	This feature is adjustable independently of the 4 load pumps. Many installations will use a primary (boiler) loop and we recommend that the boiler pump operate for 3 – 5 minutes after all calls for heat have been satisfied.
Burner On From	This feature is found on a load set to **External Control**. The setting can be **Therm.** or **Ext. Control** so that the load responds to a call for heat from either the Thermostat or External Control. • If set as Therm. then the boiler will wait for a call for heat on the Thermostat terminal associated with the load and then look at the Ext. Cont. terminals for the target water temperature signal. • If set to **Ext.Cont.**, the controller only uses the Ext. Cont. terminals to determine a call for heat. If the voltage at the Ext. Cont. terminals is below 2.1VDC there is no call for heat. If the voltage is at or above 2.1VDC, then there is a call for heat.
Boiler Turndown	A ratio that compares the full maximum boiler heat output (high fire) to the minimum level of heat output (low fire).

Term	Definition
Call for Heat	A call for heat could be: • The thermostat is indicating that room temperature is below the thermostat setting. • An Aquastat calling for DHW. • The tank sensor calling for DHW.
Cycles	Running tally of the number of calls for heat that a load has received in the last 24 hours. Fewer cycles per day = better efficiency.
DHW	Domestic Hot Water
Differential	To prevent short cycling, boilers operate with a differential. A differential is based on a boiler's target temperature. The boiler will shutoff when the supply water temperature is half the differential setting below the target temperature and will open when the supply water temperature is half the differential setting above the boiler target. For example, A boiler that has a target temperature of 150°F will have a differential of 20°F (160°F being the half differential above the target temperature and 140°F being the half differential below the target temperature). For DHW, there is only one differential setting below the target temperature. For example, if the target temperature for the DHW is 135°F, the differential below the target temperature will be 125°F,
DSP	Daylight Standard Pacific - time zone update.
Fail Safe Enable	Fail Safe Enable is available only in External Control and only if the **Burner On From** is set to **External Control**. If this feature is active and the External Control voltage drops below 0.25Vdc, the boiler automatically turns on the Boiler Pump (if selected "ON"), the load pump, and operates the boiler to the Fail Safe Set Point temperature. This temperature set point is adjustable.
Fixed Lead	A boiler that is always the first to fire up.
Heating Enabled	The boiler is powered and there is a Call for Heat, Heat is Required. The boiler will start and enter the Heating Cycle unless it is in an error mode.
Heat Required	Temperature sensors on the boiler indicate that water temperature is below the water temperature target or setpoint.

Term	Definition
Indoor ° From	The default setting is **Indoor**. If an indoor temperature sensor is being used the sensor will normally be connected to the TB2 Indoor Sensor terminals on the controller board. Alternatively the TB2 2nd Loop Sensor input terminals can be wired to the indoor temperature sensor. To support this alternate connection the **Indoor ° From** setting must be **Sec. Loop**.

Use for shop or warehouse, but not for residential properties. |
HVAC	heating, ventilation and air conditioning system
n/c	Not connected
NTP Server	Network Time Protocol
Outdoor ° From	The Default setting is **Outdoor**. If an outdoor temperature sensor is being used the sensor will normally be connected to the TB2 Outdoor Sensor terminals on the controller board. Alternatively the TB2 2nd Loop Sensor or the DHW Sensor input terminals can be wired to the outdoor temperature sensor. To support these alternate wiring options the Outdoor ° From setting must be set to **Sec. Loop** or **DHW** to correspond with the wiring.
Priority	A load has a priority value between 20 and 90.

Note: The Priority Value has to be different for each load. A higher numerical value means a higher priority. Consider these values as minutes. The difference between 2 load priority values is the number of minutes the higher priority load will be allowed to operate before switching back to the lower priority load. For example, if DHW has a priority of 80 and the Set Point load has a priority of 50, the DHW load will operate for (80-50) 30 minutes while the Set Point load is temporarily turned off. |

Term	Definition
Pump Post Purge (sec)	Each load pump can be operated for a period of time after the call for heat has ended. This feature takes the heat left-over in the heat exchanger and nearby boiler piping after the burner has turned off and pumps it into the load. A good example of this is the indirect water heater DHW load. After the tank has reached its target temperature, the boiler shuts down, but allows the load pump to operate for a period of time to transfer heat that is stored in the boiler's heat exchanger into the hot water tank. You can adjust this feature in seconds from 0 to 900 (15 min). If the load has zone valves that close off the flow to the load as the boiler shuts down, this can be set to 0 sec. You can set each load independently to provide maximum flexibility.
Pump Post Purge (sec)	How long a load pump operates after the call for heat has ended.
Ramp Speed	How fast the boiler tries to raise the water temperature flowing through the heat emitters. With a fin tube baseboard radiator, you may want the water temperature to rise quickly to provide heat as quickly as possible. This type of heat emitter has very little mass, so it can heat up quickly. When the call for heat is removed, it cools down quickly. Generally this requires a higher (faster) ramp speed. A radiant floor, on the other hand, has significant mass, and therefore takes a long time to heat up. When the call for heat is removed, the floor is still warm and continues to add heat to the space for a significant period of time. If the indoor temperature overshoots the desired indoor temperature, we recommend reducing the Ramp Speed value. Generally this requires a lower (slower) ramp speed. The factory Ramp Speed setting is Auto. While set to Auto the controller uses the selected heat emitter type to automatically determine an appropriate ramp speed. You can manually set the Ramp Speed by choosing a value from 1 to 10. A setting of 1 will raise the water temperature very slowly and 10 will raise the water temperature very quickly. Best Practice: Auto, the factory setting, is generally the best setting to choose.

Term	Definition
Rotation	Rotation setting is used to balance the run time on each boiler on a network. There is a maximum allowable runtime difference between boilers.
Short Cycling	The rapid firing - on and off - of a boiler's burner. Generally this condition should be avoided. A cycle on/off time typically should be 10 minutes or longer.
Setpoint Temperature	Desired or target value at which a thermostat has been set, as for optimum efficiency.
Water ° From	The Default setting is Outlet. When set to Outlet the controller will determine the supply water temperature from the outlet temperature sensor on the boiler. Alternatively the 2nd Loop Sensor or the DHW Sensor input terminals can be wired to a water temperature sensor. To support these alternate wiring options the Water ° From setting must be set to Sec. Loop on DHW to correspond with the wiring. Multi-boiler: Most have an external sensor mounted on the building supply water.

Notes

Revision History

R1 (JULY 2014)   Initial release

R2 (JULY 2015)   Address update

R3 (APRIL 2017)   New content:

- Setup for Internet access.
- Registering on the IBC Portal to control and monitor boilers remotely.
- Updating a boiler with the latest software.
- The ability to change the default venting type.
- Using zone control.
- Networking multiple boilers.
- Testing fan operation.

R4 (APRIL 2017)   Low water cutoff function: reset and test.

Water temperature function: reset and test.

Troubleshooting chapter.

R5 (June 2017)   Minor revisions ("Registering a Boiler from the Touchscreen Controller").