FUTERA III
FUTERA XLF
FUTERA FUSION

Finned copper tube Gas boilers & Water heaters

500 to 4,000 Btuh Input

HeatNet® manual

Control adjustment and operation instructions

Also read and follow:

Futera III Boiler manual *or*
Futera Fusion Boiler manual *or*
Futera XLF Boiler manual

HeatNet On Board™

WARNING This manual is intended only for use by a qualified heating installer/technician. Read and follow this manual, all supplements and related instructional information provided with the boiler. Install, start and service the boiler only in the sequence and methods given in these instructions. Failure to do so can result in severe personal injury, death or substantial property damage.

WARNING **Do not use the boiler during construction.** Construction dust and particulate, particularly drywall dust, will cause contamination of the burner, resulting in possible severe personal injury, death or substantial property damage. The boiler can only be operated with a dust-free air supply. Follow the instruction manual procedures to duct air to the boiler air intake. If the boiler has been contaminated by operation with contaminated air, follow the instruction manual guidelines to clean, repair or replace the boiler if necessary.

CAUTION Affix these instructions near to the boiler. Instruct the building owner to retain the instructions for future use by a qualified service technician, and to follow all guidelines in the User's Information Manual.

RBI Futera III/XLF/FUSION-Series boilers — HeatNet™ control

Control overview

The HeatNet control monitors boiler temperature and limit circuit inputs, modulating boiler firing rate to meet demand. The control uses microprocessor electronics, watching time-average response from the system to anticipate how much heat the system needs. Coupled with the five-to-one turndown of the boiler, this results in maximum operating efficiency. The boiler will provide unmatched seasonal efficiency.

The HeatNet platform

HeatNet controls are designed to provide an integrated boiler management system on every boiler. The platform provides multiple levels of selectivity. HeatNet electronics can be operated as a simple single-boiler control, while still providing intelligent regulation of boiler firing rate to match system demand. With a few key strokes on the key pad, the HeatNet control can operate as a sophisticated multiple-boiler controller, using simple RJ45 cable interfacing between units. The control can even accept external control commands from building managements systems (Modbus standard, with optional bridge for BACnet or LonWorks) or 20-milliamp analog input from an external controller.

The control method used by the HeatNet control is based on digital communications, which eliminates the need for analog control signals. Analog signal inputs are supported, but a higher level of control precision, repeatability and feedback is gained with digital communications.

The HeatNet control can be versatile, providing for operation in multiple ways:

- As a stand-alone boiler, either modulating, two-stage or ON/OFF.
- As a boiler in a boiler network, using the on-board HeatNet protocol.
- As a member boiler in a boiler management system (either directly managed by BMS or managed by a MASTER HeatNet boiler that communicates with the BMS).
- As a member of a remotely-controlled boiler network (4 – 20-milliamp regulation).
- Setpoint can be determined by the HeatNet control or by a 4 – 20-milliamp input signal.
- Network boilers can be operated by override commands for increased versatility.

This manual is arranged so the instructions for each of the methods above is self-contained. See the Table of contents for selection and location.

PID response

The HeatNet control uses proportional-integral-derivative calculations to determine the response to boiler water temperature changes. This means it not only looks at how far away the water temperature is from the setpoint temperature, but how fast the temperature is changing and how it has responded over time. This ensures the boiler won't make sudden unnecessary changes in firing rate.

External limit monitoring & annunciation

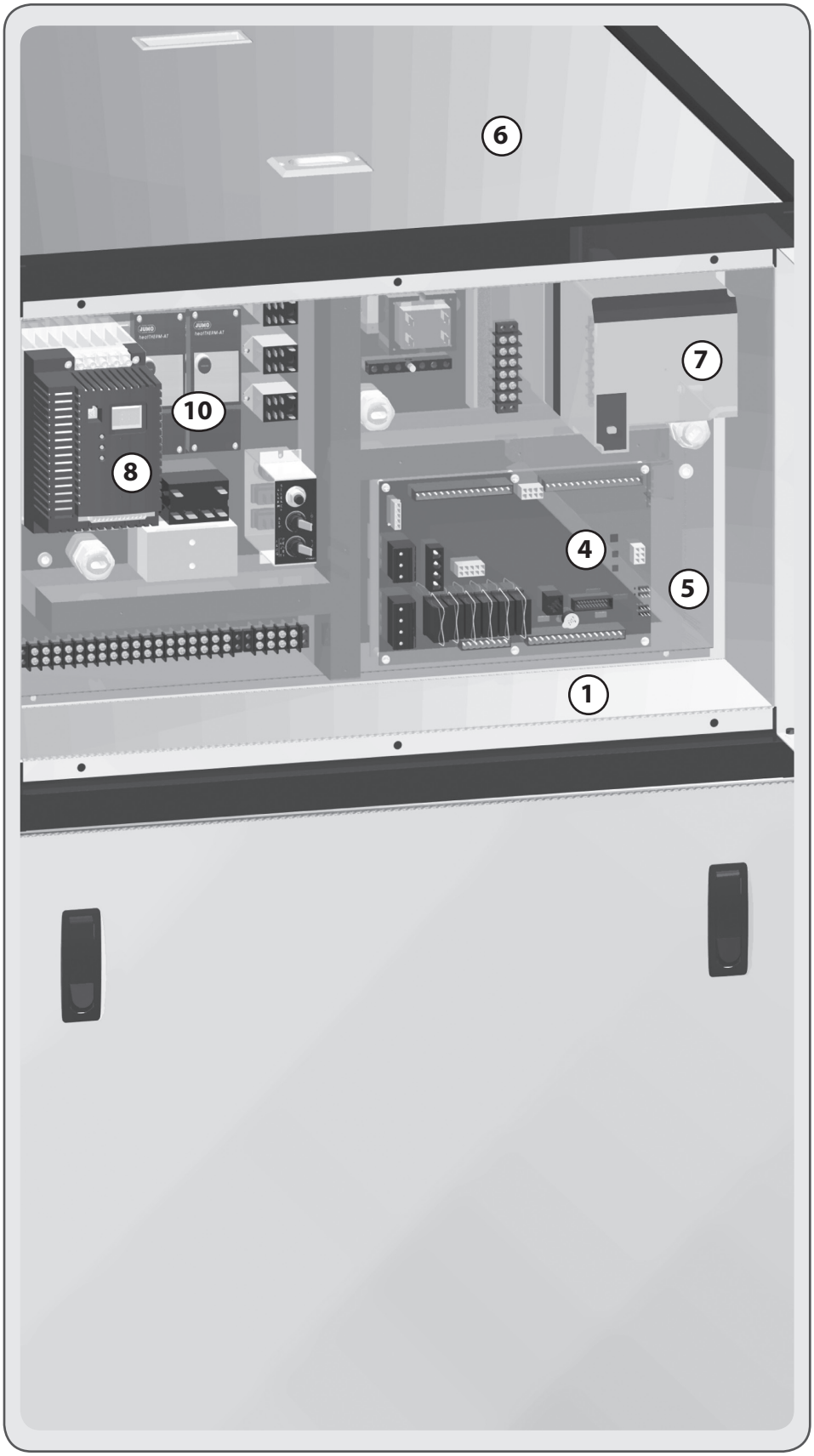
In addition to controlling the boiler, the HeatNet control monitors external limits wired into the limit circuit connections. The control shuts down the boiler if a limit opens, and the digital display shows which limit failed. Monitored limits include high limit aquastat, low water cutoff, flow, ignition control fault, gas valve alarm and other optional or user-selectable limits.

Multiple boiler operation

The HeatNet control easily interfaces with other HeatNet controls. Multiple boiler operation using HeatNet protocol only requires RJ45 cables daisy-chained from boiler to boiler and a few key strokes setting up control behavior. The master boiler is automatically selected by connecting a sensor lead to its SYSTEM HEADER sensor terminals. The HeatNet control recognizes the sensor and configures the boiler as the master. Other boilers only need to have an address assigned.

Among the advanced design features of the HeatNet control is the MOD-MAX setting. This limits the firing rate of all boilers to a pre-set maximum (70% by default). This means all of the boilers will be run at a very efficient level until all boilers are on. Only then can firing rate increase above this setting. Boiler rotation can be first-on/first-off, first-on/last-off, or true rotation (the HeatNet control monitors the total on time of all boilers, and rotates their usage so the total on time is the same for all).

RBI Futera III/XLF/FUSION-Series boilers — HeatNet™ control



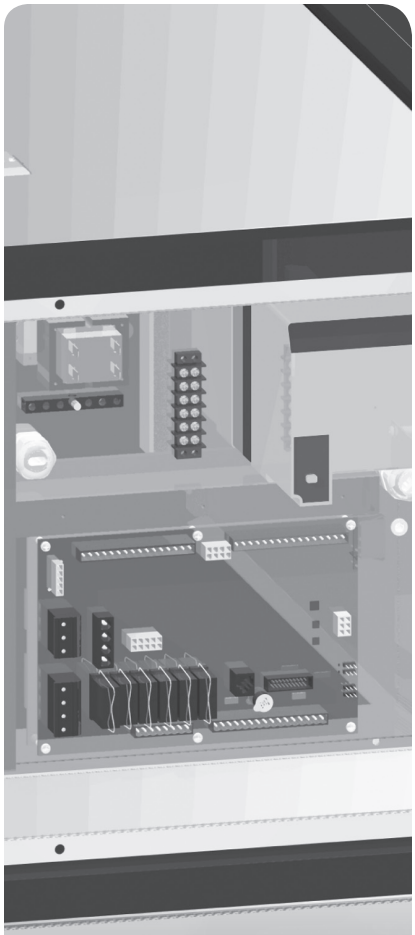
Electrical components

1. Electrical enclosure
2. Control panel — 4-line digital display and navigation buttons (on front of control panel door — see opposite page)
3. On/off switch — on control panel (see opposite page)
4. HeatNet electrical connection panel
5. Electrical subpanel
6. Air chamber access panel (access to differential pressure switches, pilot valve, etc.)
7. Honeywell R7800 flame safeguard
8. VFD blower speed controller
9. Power entrance box (not shown) — located on rear of boiler
10. Temperature limit controls (manual reset and automatic reset) — FuteraIII uses one automatic reset control only

Futera
HeatNet
Electrical enclosure

RBI Futera III/XLF/FUSION-Series boilers — HeatNet™ control

Contents



Futera
HeatNet
Electrical connection
panel & subpanel

1 Stand-alone boiler

WARNING **Electrical shock hazard —** Disconnect all electrical power sources to the boiler before making any electrical connections.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

WARNING **Close the external manual gas valve on every boiler** before proceeding. DO NOT open any gas valve, or attempt to fire the boiler, until the boilers has been set up and verified following the instructions in the Boiler Installation & Operating Instructions.

Failure to comply could cause a boiler failure, leading to possible severe personal injury, death or substantial property damage.

NOTICE The electrical connections to this boiler must be made in accordance with all applicable local codes and the latest revision of the National Electrical Code, ANSI /NFPA-70. Installation should also conform to CSA C22.1 Canadian Electrical Code Part I if installed in Canada. Install a separate 120 volt 15 amp circuit for the boiler. A properly rated shut-off switch should be located at the boiler. The boiler must be grounded in accordance with the authority having jurisdiction, or if none, the latest revision of the National Electrical Code, ANSI/NFPA-70.

Line voltage field wiring of any controls or other devices must use copper conductors with a minimum size of #14 awg. Use appropriate wiring materials for units installed outdoors.

Control setup sequence

CAUTION Install the boilers according to the Boiler Installation & Operating Instructions before attempting to set up the control system.

1. Close the external gas valve.
2. Wire the boiler following the guidelines in this manual.
3. Attach sensors as required, including a HEADER sensor if needed for primary/secondary circuits or DHW tank heating.
4. Set the boiler control parameters using its display/keypad.

Wiring

WARNING **PUMPS REQUIRE RELAYS OR STARTERS — DO NOT** directly operate a pump using the HeatNet contacts. Use these contacts only to operate pump relay or starter coils.

1. See page 20 for wiring information and wiring diagrams.
2. Note that the boiler can be wired for override operation. The wiring section provides information on override priorities and options.
3. The boiler can be activated by the HEAT DEMAND input, and allowed to modulate based on the HeatNet control. It can also be activated by either:
   - ON/OFF full input operation by closing the AA terminals.
   - Operation via remote 4-20mA signal by closing the 4-20mA ENABLE terminals and providing the 4-20mA signal.
   - Two-stage fired by using the T1 and T2 terminals. Closing one of these brings the boiler on at MIN firing rate. Closing the other brings the boiler to MAX input.

Set control parameters

NOTICE Before turning boilers on to set parameters, disconnect all call for heat wiring at the electrical connection boards. This will prevent the boiler from attempting to cycle during the setup process.

1. See Table 1 for a list of parameters that should be set for a stand-alone boiler.
2. See "Control menus and adjustments," beginning on page 29 for a complete list of control parameters and explanations (Table 7, page 30 and Table 8, page 33).
3. Carefully read the parameter explanations in Table 9, page 35.
4. When adjusting the limit band, operating limit (OP LIMIT), local setpoint (LOC SETPOINT), system header or DHW setpoint, make sure the operating temperature bands do not overlap or cause potential for nuisance cycling.
5. System clock — Set the system clock to ensure the time stamps will be accurate in the data logs.
6. Turn on the power to the boiler and set the on/off switch to ON as you set its parameters.
7. Use the boiler's keypad to enter the parameters as described on page 29.
8. After setting a boiler's parameters, turn off the power to the boiler until you are ready to start the boiler up following the Boiler manual instructions.

Domestic hot water options

1. Read the options and explanations given on page 16 through page 19 to determine the best configuration for the system.

Pump options

1. Summer pump jog — enable to operate the circulator pump once per week (at 12:01 AM on any specified day) when the heater is shut down for summer shutdown.
2. System pump options:
   a. Constant circulation — pump remains on at all times unless outdoor reset is enabled and the outdoor temperature is above WWS SETPOINT.
   b. Operation on call for heat — pump is on only during heat calls and during pump postpurge time.
3. Local pump options:
   a. Constant circulation — pump remains on at all times unless outdoor reset is enabled and the outdoor temperature is above WWS SETPOINT.
   b. Operation on call for heat — pump is on only during heat calls and during pump postpurge time.

1 Stand-alone boiler *(cont.)*

c. Call for heat operation PLUS delta temp mode — pump is on during heat calls, during pump postpurge time, and the pump will continue to run after the postpurge timing until the temperature difference across the boiler is less than DELTA TEMP.

4. Flow proving — Flow proving time is adjustable (from 10 to 240 seconds), with factory default setting of 10 seconds. Adjust this time if necessary to compensate for slow-opening valves or other factors that would delay flow start.

Start up boiler

1. Follow all instructions in the Boiler Installation & Operating Instructions to start up the boiler and verify operation.

2. After setting up the boiler per the I & OM Instructions, you can set MIN, MAX and IGNITION firing rates using the CALIBRATION procedure in this manual.

Table 1 Control parameters — stand-alone boiler

Parameter	Requirement
BOILERS	
HEAT BAND	Set
SETPOINTS	
LOCAL SETPT	Set if control will regulate boiler supply temp
SYSTEM SETPT	Set if control will regulate header or DHW tank temp (requires header sensor)
OPERATE LIMIT	Set
OP LIMIT BAND	Set
SETPT SOURCE	Specify AUTO or 4-20mA remote control (AUTO uses the HeatNet control setup values for setpoint temperature; 4-20mA uses a 4-20mA signal to determine setpoint temperature as described in the parameters tables)
OUTDOOR RESET, IF USED	
OA RESET	Enable if used
WARM WEATHER SD	Enable if used
WWS SETPOINT	Set if used
OA SETPTS	Set if used (requires outdoor sensor)
SYSTEM PUMP	Applies ONLY if the control will cycle a system pump as well as the boiler pump
POST PRG TIME	Set or keep default
ALWAYS ENABLE	Enable if desired
SUMMER PUMP JOG	Enable if desired
LOCAL PUMP	Settings for boiler pump
DELTA TEMP ENABLE	Enable if desired (requires installing a return water temp sensor)
DELTA TEMP	Set value if enabled
POST PRG TIME	Set or keep default
ALWAYS ENABLED	Enable if desired
PUMP/VALVE OPTION	Enable constant pump if desired
FLOW PROVE	Enable if used (connect flow switch)
NIGHT SETBACK	Set if desired
OPTIONS (all)	Set

Parameter	Requirement
AUX FUNCTIONS	
COMBUST AIR DAMPER	Select IN USE = YES to enable; select proof time or keep default (connect wires to damper and end switch)
ALARM SILENCE	Enable remote alarm silence if desired (connect terminals to remote switch)
FAILSAFE MODES	Enable LOW TEMP if desired for freeze protection; set temp as desired
HEAT EXCHANGER	
ALARM TYPE	Select WARNING (continue running) or FAULT (shutdown)
EXCHR DELTA T	Set maximum allowable temperature rise through boiler
LIM->HALF RATE	Enable if boiler is to be limited to 50% input when DELTA T is exceeded
DOMESTIC HOT WATER	
DHW BOILER?	Select YES if boiler/system is for DHW
DHW SETPOINT	Set
DHW DIFF	Set
USE SENSOR?	YES for sensor in DHW tank; NO for tank aquastat
DHW PRIORITY	Set
POST PURGE	Set
DEMAND STARTS?	Set
SYSTEM CLOCK	Set to ensure accuracy of time stamping
SENSORS	Select type or accept defaults; make sure installed sensors are listed and are the correct type
4-20mA INPUT	Set values for 4-20mA parameters if using either as primary control source or as an override
PASSWORD	Set if desired
COMMUNICATIONS	Set if desired
LOAD DEFAULTS	Restore defaults if desired
SYSTEM	
FIRMWARE	Load firmware if necessary to bring up to date
OPTION:	Set
APPLICATION	Select HEAT or DHW

2 Multiple boilers: HeatNet modulation

WARNING **Electrical shock hazard —** Disconnect all electrical power sources to the boiler before making any electrical connections.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

NOTICE The electrical connections to this boiler must be made in accordance with all applicable local codes and the latest revision of the National Electrical Code, ANSI /NFPA-70. Installation should also conform to CSA C22.1 Canadian Electrical Code Part I if installed in Canada. Install power supplies to the boiler as indicated on the boiler wiring diagram, making sure to provide the correct voltage, phase and amperage capacity specified. A properly rated shut-off switch should be located at the boiler. The boiler must be grounded in accordance with the authority having jurisdiction, or if none, the latest revision of the National Electrical Code, ANSI/NFPA-70.

Line voltage field wiring of any controls or other devices must use copper conductors with a minimum size of #14 awg. Use appropriate wiring materials for units installed outdoors.

Control setup sequence

CAUTION **Follow the Boiler manual** — Install the boilers according to the Boiler Installation & Operating Instructions manual before attempting to set up the control system.

1. Close the external gas valve on every boiler.
2. Wire all boilers following the guidelines in this manual.
3. Attach a header sensor (SYSTEM HEADER terminals) to the master boiler ONLY. The HeatNet control automatically configures the boiler with a header sensor as the master.
4. Set the master boiler control parameters using its display/keypad.
5. Set the master boiler's termination DIP switches.
6. Set the termination DIP switches on the member boilers.
7. Set the member boilers' control parameters using their display/keypads.
8. Follow the instructions in the Boiler Installation & Operating Instructions to start up each boiler before proceeding further.
9. Finish by connecting cables between the communications boards of all of the boilers and verifying network operation.

Wiring

WARNING **PUMPS REQUIRE RELAYS OR STARTERS — DO NOT** directly operate a pump using the HeatNet contacts. Use these contacts only to operate pump relay or starter coils.

1. See page page 20 for wiring information and wiring diagrams.
2. Note that the boilers can be wired for override operation. The wiring section provides information on override priorities.

Set termination DIP switches

1. The HeatNet network needs to recognize the beginning and end of the network. This requires setting the four DIP switches on each boiler's electrical connection board.
2. See Figure 1 for location of the switches.
3. See Table 2 for required settings. The table gives settings for HeatNet modulation — local control and for remote control from a building management system (MODBUS protocol).
4. DO NOT connect the communications cables (or shielded wires) between boilers until all boilers have had parameters set and then been started up following all instructions in the Boiler manual.

Figure 1 Termination DIP switches (located at lower left corner of control board) (component details are omitted for clarity)

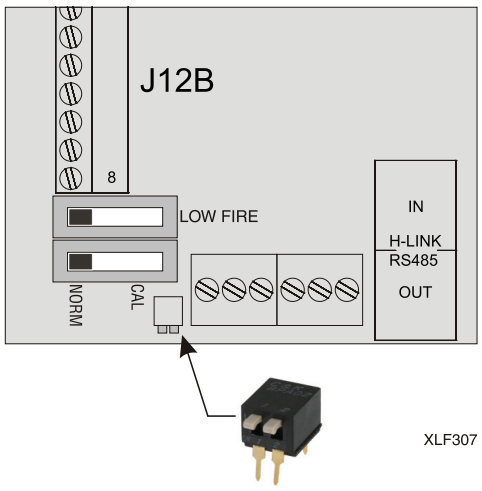


Table 2 Termination DIP switch settings (HeatNet switches are on left, MODBUS switches are on right) (DOWN = ON; UP = OFF)

Boiler	HeatNet	MODBUS (see note)
Master	Switch 1: ON Switch 2: ON	Switch 1: ON Switch 2: ON
Last member	Switch 1: ON Switch 2: ON	Switch 1: ON Switch 2: ON
Other members	Switch 1: OFF Switch 2: OFF	Switch 1: OFF Switch 2: OFF

Note: MODBUS setup is for applications controlled by a building management system. For systems using BACnet or LonWorks, a bridge board is used to interface with the HeatNet control. If each boiler is directly controlled by the BMS, set the DIP switches for each boiler the same as for a master boiler (both switches on).

Multiple boilers: HeatNet modulation *(cont.)*

WARNING **Close the external manual gas valve on every boiler** before proceeding. DO NOT open any gas valve, or attempt to fire any boiler, until the boilers have been set up and verified following the instructions in the Boiler Installation & Operating Instructions.

Failure to comply could cause a boiler failure, leading to possible severe personal injury, death or substantial property damage.

Set control parameters

NOTICE Before turning boilers on to set parameters, disconnect all call for heat wiring at the electrical connection boards. This will prevent the boiler from attempting to cycle during the setup process.

1. See "Control menus and adjustments," beginning on page 29 for a complete list of control parameters and explanations (Table 7, page 30 and Table 8, page 33).
2. Carefully read the parameter explanations in Table 9, page 35.
3. When adjusting the limit band, operating limit (OP LIMIT), local setpoint (LOC SETPOINT) and DHW setpoint, make sure the operating temperature bands do not overlap or cause potential for nuisance cycling.
4. System clock — Set the system clock on the master boiler ONLY, to ensure the time stamps will be accurate in the data logs.
5. Turn on the power to each boiler and set the on/off switch to ON as you set its parameters.
6. Use the boiler's keypad to enter the parameters as described on page 29.
7. After setting a boiler's parameters, turn off the power to the boiler until you are ready to start the boiler, following the Boiler manual instructions.
8. Set the master boiler and each member boiler, following the guidelines given in Table 3.

Domestic hot water options

1. Read the options and explanations given on page 16 through page 19 to determine the best configuration for the system.

Pump options

1. Summer pump jog — enable to operate the circulator pump once per week (at 12:01 AM on any specified day) when the heater is shut down for summer shutdown.
2. System pump options:
   a. Constant circulation — pump remains on at all times unless outdoor reset is enabled and the outdoor temperature is above WWS SETPOINT.
   b. Operation on call for heat — pump is on only during heat calls and during pump postpurge time.
3. Local pump options:
   a. Constant circulation — pump remains on at all times unless outdoor reset is enabled and the outdoor temperature is above WWS SETPOINT.
   b. Operation on call for heat — pump is on only during heat calls and during pump postpurge time.
   c. Call for heat operation PLUS delta temp mode — pump is on during heat calls, during pump postpurge time, and the pump will continue to run after the postpurge timing until the temperature difference across the boiler is less than DELTA TEMP.
4. Flow proving — Flow proving time is adjustable (from 10 to 240 seconds), with factory default setting of 10 seconds. Adjust this time if necessary to compensate for slow-opening valves or other factors that would delay flow start.

Start up boilers per boiler I & OM

1. Turn off power to all boilers.
2. Follow all instructions in the Boiler Installation & Operating Instructions to start up each boiler and verify operation.

Connect network cables

WARNING **Electrical shock hazard —** Turn off power to each boiler before attempting to connect the network cables.

NOTICE Before turning boilers on to check network operation, disconnect all call for heat wiring at the electrical connection boards. This will prevent the boiler from attempting to cycle during the setup process.

Master boiler cable

1. Connect an RJ45 cable to the master boiler H-Link OUT block (Figure 3, page 22) or 3-wire shielded cable to the H-Link terminal strip (Figure 3, page 22). The other end of this cable will be attached to the first member boiler in following steps.
2. Turn on power to the master boiler and set its on/off switch to ON.
3. You should hear at least 2 beeps.

2 Multiple boilers: HeatNet modulation *(cont.)*

Table 3 Control parameters for HeatNet networks

Parameter	Requirement — MASTER boiler	Requirement — MEMBER boiler
BOILERS		
LEAD STAGE #	Set	
HEAT BAND	Set	Heat band setting is not applicable to MEMBER boiler unless boiler will operate in override mode
SETPOINTS		
LOCAL SETPT	Set if control will regulate boiler supply temp	Set
SYSTEM SETPT	Set if control will regulate header or DHW tank temp (requires header sensor)	Set if needed for override operation
OPERATE LIMIT	Set	Not needed
OP LIMIT BAND	Set	Set
SETPT SOURCE	Specify AUTO or 4-20mA remote control (AUTO uses the HeatNet control setup values for setpoint temperature; 4-20mA uses a 4-20mA signal to determine setpoint temperature as described in Table 9, page 35)	Set only if boiler will operate in override mode with 4-20mA input
OUTDOOR RESET, IF USED		
OA RESET	Enable if used	Not applicable to member boiler unless boiler is to operate in override mode
WARM WEATHER SD	Enable if used	
WWS SETPOINT	Set if used	
OA SETPTS	Set if used (requires outdoor sensor)	
SYSTEM PUMP	Applies ONLY if the control will cycle a system pump as well as the boiler pump	Not applicable to member boiler
POST PRG TIME	Set or keep default	
ALWAYS ENABLE	Enable if desired	
SUMMER PUMP JOG	Enable if desired	
OVR ENAB IN WWS	Enable if desired	
LOCAL PUMP	Settings for boiler pump	
DELTA TEMP ENABLE	Enable if desired (requires installing a return water temp sensor)	Enable if desired (requires installing a return water temp sensor)
DELTA TEMP	Set value if enabled	Set value if enabled
POST PRG TIME	Set or keep default	Set or keep default
ALWAYS ENABLED	Enable if desired	Enable if desired
PUMP/VALVE OPTION	Enable constant pump if desired	Enable constant pump if desired
FLOW PROVE	Enable if used (connect flow switch)	Enable if used (connect flow switch)
NIGHT SETBACK	Set if desired	Not applicable to member boiler
OPTIONS (all)	Set	Set
AUX FUNCTIONS		
COMBUST AIR DAMPER	Select IN USE = YES to enable; select proof time or keep default (connect wires to damper and end switch); select COMMON or INDEPENDENT	Same as MASTER
ALARM SILENCE	Enable remote alarm silence if desired (connect terminals to remote switch)	Enable remote alarm silence if desired (connect terminals to remote switch)
FAILSAFE MODES	Enable LOW TEMP if desired for freeze protection; set temp as desired	Enable LOW TEMP if desired for freeze protection; set temp as desired; enable run in local if desired
HEAT EXCHANGER		
ALARM TYPE	Select WARNING (continue running) or FAULT (shutdown)	Set if boiler is enabled to run on local on loss of signal from MASTER
EXCHR DELTA T	Set maximum allowable temperature rise through boiler	
LIM->HALF RATE	Enable if boiler is to be limited to 50% input when DELTA T is exceeded	

2 Multiple boilers: HeatNet modulation *(cont.)*

Table 3 Control parameters for HeatNet networks *(continued)*

Parameter	Requirement — MASTER boiler	Requirement — MEMBER boiler
DOMESTIC HOT WATER		
DHW BOILER?	Select YES if boiler/system is for DHW	Set if boiler is enabled to run on local on loss of signal from MASTER
DHW SETPOINT	Set	
DHW DIFF	Set	
USE SENSOR?	YES for sensor in DHW tank; NO for tank aquastat	
DHW PRIORITY	Set	
POST PURGE	Set	
DEMAND STARTS?	Set	
SYSTEM CLOCK	Set to ensure accuracy of time stamping	NO — set only on master boiler (master automatically updates all member boilers
DISTRIBUTED CTRL		
H-NET ADDRESS	HeatNet address is automatic for MASTER = 255	Set from 2 to 16; unique address for each boiler
MODBUS ADDRESS	Set only if using BMS operation	Set only if using BMS operation
MODULAR BOILER SET		
ADD DELAY TIME	Adjust timings as needed to match control operation to system response	Not applicable to member boilers
SHED DELAY TIME		
MODULATE DELAY TIME		
MOD MAX-LAST FIRE		
ADAPTIVE MODE		
MOD MODE	Select ADAPTIVE if the Master boiler is to lower the modulating rate of running boilers when a new boiler starts. Set DROP DOWN and DELAY RELEASE as needed.	Not applicable to member boilers
DROP DOWN		
DELAY RELEASE		
FIRING MODE		
FIRING MODE	Select rotation method preferred	Not applicable to member boilers
MASTER FIRST	Enable if desired	
SENSORS	Select type or accept defaults; make sure installed sensors are listed and are the correct type; make sure HEADER sensor is connected to MASTER boiler only	ONLY return sensor would apply with member boiler, and ONLY if using DELTA TEMP or HEAT EXCHGER parameters
4-20mA INPUT	Set values for 4-20mA parameters if using either as primary control source or as an override	Set values for 4-20mA parameters if using as an override
PASSWORD	Set if desired	Set if desired
COMMUNICATIONS	Set if desired	Set if desired
LOAD DEFAULTS	Restore defaults if desired	Restore defaults if desired
SYSTEM		
FIRMWARE	Load firmware if necessary to bring up to date	Load firmware if necessary to bring up to date
OPTION:	Set	Set if boiler is enabled to run on local on loss of signal from MASTER
APPLICATION.	Select HEAT or DHW	Set if boiler is enabled to run on local on loss of signal from MASTER

2

Multiple boilers: HeatNet modulation *(cont.)*

4. The control's firmware version number will display. Make sure the firmware of all boilers is compatible. All boilers in a multiple boiler application should preferably have the same firmware version to ensure consistency. If versions are different, all versions must be either version 2.0 or greater, or version 1.x.
5. After the control's timer finishes, the display will show STANDBY and SYSTEM. This verifies that the master boiler is setup correctly as the master. The same display will show on member boilers when there is a call for heat from the master boiler. When there is no call for heat at a member boiler, the display will show LOCAL instead.
6. If the master is functioning correctly, the yellow LED's on the H-Link jack ports will blink. The blinking indicates that the master is trying to communicate with member boilers.
7. If a FAULT message is displayed, clear the faults until the STANDBY message is displayed. Refer to troubleshooting suggestions in this manual if you cannot resolve the issue.

Member boiler cables

1. Begin with the first member boiler.
2. Plug one end of the RJ45 or shielded cable into the master boiler's output port. Plug the other end of the master boiler's communications cable to a member boiler's input port, using either RJ45 cable or shielded cable (Figure 3, page 22).
3. Connect cables to all of the member boilers by cabling from one to the next.

Check the network

1. Turn the power on and the on/off switch to ON for all of the member boilers.
2. Allow time for each boiler to initialize.
3. After about 30 seconds, the master boiler should recognize the member boilers.
4. Navigate to the BOILERS menu, then to HEATNET BOILERS display. The master control will show the boilers it recognizes.
5. If the display shows a blank space, such as "123_56789," the control does not detect the missing boiler (boiler 4). Check the yellow LED on the communication port of the missing boiler.
6. NORMAL connection — LED should flash steadily, about twice per second.
7. TERMINATION incorrect — LED will flash rapidly and stay on.
8. OPEN connection — LED does not flash at all.
9. If a FAULT message is displayed, clear the faults until the STANDBY message is displayed. Refer to troubleshooting suggestions at the end of this manual if you cannot resolve the issue.

Start the system

1. Turn off power to all boilers.
2. Connect all call for heat wiring to the boilers.
3. Turn on power to all boilers and turn the on/off switches to ON.
4. The boilers should now operate normally, as described in the Boiler manual.
5. The master boiler will sequence and modulate boilers as necessary to control the water temperature.
6. The master boiler will show the number of boilers firing as well as the temperature and heat band display. Use the UP/DOWN keys to scroll through the displays to watch the process of starting and stopping boilers.

3 Multiple boilers: BMS operation

Option 1: Combined BMS/HeatNet

1. This method uses an RS485 digital communications cable with the MODBUS protocol to control a boiler or HeatNet network.
2. The boiler or boiler network will operate as in the HeatNet local control method (Section 1 of this manual). But, instead of the HEAT DEMAND input, a software form of the HEAT DEMAND input is used (address 40001 — Boiler/System Enable/Disable).
3. The System Setpoint Timer needs to be loaded periodically to allow the HeatNet system to revert to local control from the master boiler in the event communications is lost.
4. The MODBUS protocol allows writing and reading registers using MODBUS commands. An optional BACNet or LONWorks bridge module can be used to connect the MODBUS network to a BACNet or LonWorks network.
5. This method allows enabling and disabling the boiler or HeatNet system; changing setpoints; and reading boiler status or temperatures remotely, using digital commands from a Building Management System.
6. The master boiler assumes the role of MEMBER, RTU, 19.2Kb, 8 bits, Even Parity, 1 stop bit, when connected to a BMS.
7. The Member Boilers should not be connected to a BMS system other than to view read-only addresses.

Option 2: Total MBS control

1. This option uses direct control of each boiler (and requires a BACnet or LonWorks bridge on each boiler if not using MODBUS). The BMS controls each boiler directly, except when the boiler is wired and activated for override operation.
2. Consult the website for address configuration information, at **info.www.rbiwaterheaters.com**. Click the "HeatNet On Board" icon.

MODBUS registers

1. See Table 4, page 13; Table 5, page 13; and Table 6, page 14 for register requirements.
2. The system setpoint timer and system setpoint work in tandem to externally control the operating setpoint.
3. The setpoint (countdown) timer should be loaded with a timeout value (in seconds) prior to writing the system setpoint.
4. When the timer reaches zero, the control assumes that the BMS is no longer operating and the local setpoint (saved on the master control) is reloaded.
5. This is a fail-safe feature used to help safeguard the system in case of BMS failure.
6. If the setpoint timer is not written, a default timeout value of 60 seconds is assumed.
7. To write the system clock, registers 40009 – 40015 must first be loaded with the correct date and time. Then, a 1 must be written to register 16 to write the date and time to the system clock.

Table 4 MODBUS holding (read/write) registers

Address	Data Type	Description	Valid Values/Range
40001	Unsigned	Boiler/System Enable/Disable	0 = Disabled/Off 1 = Enabled/On
40002	Unsigned	System Setpoint Timer (1)	0 – 65535 seconds
40003	Unsigned	System Setpoint (1)	40°F – 220 °F
40004	Unsigned	Outdoor Air Reset Enable/Disable	0 = Disabled/Off 1 = Enabled/On
40005	Unsigned	Outdoor Air Setpoint	40°F -100 °F
40006	Unsigned	Water Temperature at High Outside Air	60°F -150 °F
40007	Unsigned	High Outside Air Temperature	50°F -90 °F
40008	Unsigned	Water Temperature at Low Outside Air	70°F -220 °F
40009	Signed	Low Outside Air Temperature	-35°F -40 °F
40010	Unsigned	Set Clock – Month (2)	0 – 11
40011	Unsigned	Set Clock – Day of Month (2)	1 – 31
40012	Unsigned	Set Clock – Year (2)	0 – 99
40013	Unsigned	Set Clock – Hours (2)	0 – 23
40014	Unsigned	Set Clock – Minutes (2)	0 – 59
40015	Unsigned	Set Clock – Seconds (2)	0 – 59
40016	Unsigned	Set Clock – Day of Week (2)	1 – Monday 7 – Sunday
40017	Unsigned	Set Clock – After the Set Clock Registers listed above have been written, a 1 must be written to this location to set the clock. (2)	1
Note (1)	The system setpoint timer and system setpoint work in tandem to externally control (i.e. a BMS - building management system) the operating setpoint. The System Setpoint (countdown) timer should be loaded with a timeout value (in seconds) prior to writing the system setpoint. When the timer reaches zero, the control assumes that the BMS is no longer operating and the local setpoint (saved on the control) is reloaded. This is a failsafe feature used to help safeguard the system in case of BMS failure. If the setpoint timer is not written, a default timeout value of 60 seconds is assumed.		
Note (2)	To write the system clock, registers 40010 – 40015 must first be loaded with the correct date and time. Then, a 1 must be written to register 17 to write the date and time to the system clock.		

Table 5 Boiler status flags

Bit	Description	Bit	Description
0	Disabled	16	Pilot Valve
1	Local Override	17	Blower
2	Alarm	18	Ignition Alarm
3	Failed	19	Valve Alarm
4	Member Error	20	High Limit
5	Boiler Running	21	Air Prove Switch
6	Pump Running	22	XS Factory
7	Spare 3 Interlock	23	Software Operator
8	LWCO Interlock	24	Header (SYS/DHW) Sensor not Present
9	VFD Interlock	25	Supply Sensor not Present
10	Gas Prove	26	Return Sensor not Present
11	Spare 4	27	Outside Air Sensor not Present
12	Operator Interlock	28	— —
13	Water Prove (Flow) Interlock	29	— —
14	Air Prove UV Sensor Interlock	30	Master Boiler
15	Main Valve	31	Present (Boiler Detected)

3 Multiple boilers: BMS operation *(cont.)*

BACnet or LonWorks protocols

1. Install the correct protocessor to adapt to building management systems using BACnet or LonWorks protocols. Each boiler must have a protocessor if the BMS is to operate with direct control of each boiler (option 2, page 13).
2. The protocessor translates the BACnet or LonWorks input to the MODBUS protocol for compatibility with the HeatNet controls.

Wiring and set-up

WARNING **PUMPS REQUIRE RELAYS OR STARTERS — DO NOT** directly operate a pump using the HeatNet contacts. Use these contacts only to operate pump relay or starter coils.

1. Wire and set up the master boiler and member boilers exactly as for HeatNet modulation — local control applications. See section beginning on page 8.
2. ALL control parameters must be set up just as for the local control method.
3. The ONLY difference in setup is the termination DIP switch settings. Use the settings for MODBUS communications given in Table 2, page 8.
4. Connect communications cables (RJ45 or shield-wire cables) between the control communications boards as for the local control method.
5. Verify network operation BEFORE connecting the building management system.

Connect the BMS cable

1. DO NOT connect the building management system cable until the boiler network has been proven to operate independently. The system is designed to revert to local control by the master boiler should communications with the building management system be lost.
2. Turn off power to the master boiler.
3. See Figure 9, page 28. Connect an RJ45 cable or shielded cable to the corresponding input port on the MASTER boiler HeatNet board.

Verify BMS/HeatNet operation

1. Turn on power to the master boiler.
2. Allow the master boiler to initialize.
3. Verify operation with the building management system.

Table 6 MODBUS input (read-only) registers

Address	Data Type	Description	Valid Values/Range
30001	Unsigned	Boilers Running	0 – 16
30002	Unsigned	Modulation (% BTU Load)	0 – 100
30003	Signed	Header / System Temperature	32 – 250 °F
30004	Signed	Supply Temperature	32 – 250 °F
30005	Signed	Return Temperature	32 – 250 °F
30006	Signed	Outside Air Temperature	-40 – 250 °F
30007	Signed	Spare Input 1	-32768 to 32767
30008	Signed	Spare Input 2	-32768 to 32767
30009	Unsigned	Clock – Month	0 – 11
30010	Unsigned	Clock – Day	1 – 31
30011	Unsigned	Clock – Year	0 – 99
30012	Unsigned	Clock – Hours	0 – 23
30013	Unsigned	Clock – Minutes	0 – 59
30014	Unsigned	Clock – Seconds	0 – 59
30015	Unsigned	Clock – Day of Week	1 – Monday 7 – Sunday
30016 – 30047	Unsigned	Boilers 1 – 16 status flag (32-bit) registers. The upper 16-bits of each 32-bit register is stored at odd numbered addresses 30016 –30046. The lower 16-bits of each 32-bit register is stored at even numbered addresses 30017 – 30047.	See the Boiler Status Flags Table Below
30048 – 30079	Unsigned	Boilers 1 – 16 runtime (32-bit) registers. The upper 16-bits of each 32-bit register is stored at odd numbered addresses 30048 – 30078. The lower 16-bits of each 32-bit register is stored at even numbered addresses 30049 – 30079. When the upper and lower registers are combined they form a 32-bit unsigned integer that is the number of seconds that the boiler has been running. For instance: (((Register 29) * 65536) + Register 30) = Boiler 1 runtime in seconds. Boiler 1 is the master boiler. Boilers 2 – 16 are member boilers.	0 – 4294967295 seconds

4 External 4-20ma control

WARNING **Electrical shock hazard —** Disconnect all electrical power sources to the boiler before making any electrical connections.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

NOTICE The electrical connections to this boiler must be made in accordance with all applicable local codes and the latest revision of the National Electrical Code, ANSI /NFPA-70. Installation should also conform to CSA C22.1 Canadian Electrical Code Part I if installed in Canada. Install power supplies to the boiler as indicated on the boiler wiring diagram, making sure to provide the correct voltage, phase and amperage capacity specified. A properly rated shut-off switch should be located at the boiler. The boiler must be grounded in accordance with the authority having jurisdiction, or if none, the latest revision of the National Electrical Code, ANSI/NFPA-70.

Line voltage field wiring of any controls or other devices must use copper conductors with a minimum size of #14 awg. Use appropriate wiring materials for units installed outdoors.

CAUTION **Follow the Boiler manual** — Install the boilers according to the Boiler Installation & Operating Instructions manual before attempting to set up the control system.

NOTICE If using a 0-10 VDC signal multiply any references to current in the manual by 0.5. Example: 5ma / 0.5 = 2.5 VDC.

Option 1: Modulation using HeatNet control

1. Set up the boilers following the instructions for a HeatNet modulated system, beginning on page 8.
2. See Figure 7, page 26 for wiring from the 4-20mA external controller. The controller must provide the 4-20mA signal and a contact for each boiler to enable its operation by closing across the Remote Enable contact.
3. Set parameters as for the HeatNet modulated system.
4. Closing the 4-20mA enable contact will cause the master boiler to modulate all boilers at a level proportional to the 4-20mA signal.
5. Make sure to set the 4-20mA parameters for compatible boiler start current.

Option 2: Direct modulation, up to 5 boilers

1. Set up parameters as for a stand-alone boiler, beginning on page 6.
2. The 4-20mA input is daisy-chained (connected in series) from boiler to boiler. Connect the 4-20mA input signal with its "+" input on boiler 1, and its "-" input on the last boiler. Then connect the 4-20mA input terminals from boiler to boiler in series; i.e., the - from boiler 1 goes to + on boiler 2, etc.
3. Close the external gas valve on every boiler.
4. Wire all boilers following the guidelines in this manual.
5. DO NOT install a system header sensor or DHW sensor on any of the boilers.
6. Disconnect the wires to the boilers' Remote Enable terminals (and any override wiring to Heat Demand or DHW Demand terminals) to ensure there will be no call for heat while proceeding.
7. Set the boilers' control parameters using their display/keypads.
8. Follow the instructions in the Boiler manual to start up each boiler before proceeding further.
9. Finish by reconnecting call-for-heat wiring, then operating the complete system to verify operation in all modes.

Option 3: Remote setpoint operation

1. A HeatNet system or an individual boiler can be operated using remote setpoint by providing a 4-20mA input and enable. Set the 4-20mA parameters for compatible boiler start current and correct temperature range.
2. See Figure 7, page 26 for wiring from the 4-20mA controller.

Wiring

1. See page 20 for wiring information and wiring diagrams.
2. Note that the boilers can be wired for override operation. The wiring section provides information on override priorities.

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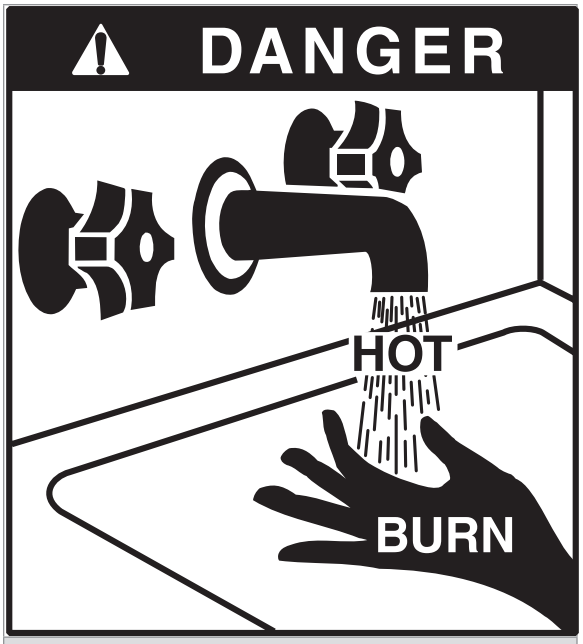
Configuring for DHW applications



WARNING **SCALD HAZARD — Water over 125°F can cause severe burns or death.**

Provide temperature regulating, anti-scald devices in DHW supply piping to fixtures to prevent possibility of severe injury or death due to scalding.

DHW options

The HeatNet control allows four options for providing DHW heating. These are:

- ❑ Method 1 — **A tank-temperature sensor**, connected to the DHW Sensor input allows direct control of tank temperature. Method 1 can be used for combined space heating/DHW systems.

  This control method is designed to limit tank temperature to a specified maximum. It can cause short cycling in some cases. If the tank temperature can be allowed to vary above and below a setpoint temperature and the application is DHW heating only, you can use method 3 instead.

- ❑ Method 2 — A **tank temperature aquastat** in the tank turns one boiler on and off on demand. Method 2 can be used on combined space heating/DHW systems.

- ❑ Method 3 — **A tank-temperature sensor**, connected to the Header sensor input of the master boiler allows direct control of the tank temperature. The firing and sequencing of boilers operates just as when used space heating applications. This method is limited to dedicated DHW systems.

- ❑ Method 4 — **4–20 ma remote controller**. This can be applied for a single boiler (or single member boilers) or for all boilers of a network.

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Configuring for DHW applications *(continued)*

DHW Method 1 —

DHW tank sensor (on DHW Sensor terminals)

- ❑ **DHW tank temperature controlled directly** — tank temperature sensor (10k thermistor) in tank connected to DHW TEMPERATURE SENSOR input (J10B 1/2) — see Figure 4, page 23 for location.
- ❑ **Single or multiple boiler application**.
- ❑ **Dedicated water heating or combined space heating and DHW**.

WARNING **Limiting maximum boiler temperature when applying for DHW applications —** When the boiler is to be used for domestic water heating, jumper JPS1 must be clipped. This limits the maximum water outlet temperature. Failure to comply could result in overly hot water being delivered to the system. See Figure 3, page 22 for location of JPS1.

Method 1 operation

Method 1 regulates 1 or more boilers using three parameters that are set in the DHW Setup menus — DHW SETPOINT and DHW DIFF, and ADD BOILER DELAY.

DHW SETPOINT — This is the target tank water temperature (usually the maximum allowable temperature in the tank).

DHW DIFF — This is the control range for firing the boiler or boilers (typically set at 5 °F for this method). NOTE that a narrow differential setting may cause frequent cycling.

OFF TEMP (= SETPOINT)

- ❑ All boilers are off when tank temperature is at or above SETPOINT temperature.

ON TEMP (= SETPOINT minus DIFF)

- ❑ Boilers are brought on one at a time, and only when the tank temperature is below ON TEMP.
- ❑ Boilers are added if temperature remains below ON TEMP. The HeatNet control waits for the ADD BOILER DELAY time between each boiler.
- ❑ When temperature reaches ON TEMP or above, no more boilers are added.

OPERATING BAND

- ❑ Active boilers remain on until the temperature reaches the SETPOINT.

Method 1 post purge option

When tank temperature reaches OFF TEMP, all active boilers turn off. The master boiler DHW relay will remain on for the POST PURGE time set in the DHW Setup menu.

DHW post purge allows dumping the residual heat in the boiler to the DHW tank.

WARNING **Post purge will increase tank temperature above SETPOINT —** Adding additional heat to the DHW tank after the setpoint temperature is reached will increase tank temperature ABOVE setpoint. Ensure that this is acceptable. IF NOT, then the pump post purge must be disabled (set to zero).

Method 1 setup procedure

- ❑ **Tank sensor** — Install a 10k tank temperature sensor in the tank. Wire the sensor to master boiler DHW SENSOR terminals, J10B terminals 1/2 (Figure 4, page 23).
- ❑ **Clip jumper JPS1**(see Figure 3, page 22 for location) on all boilers that will be used for DHW.
- ❑ **Header sensor** — For **combined** space heating/water heating — Install a header sensor and wire it to the master boiler HEADER SENSOR terminals, J10A terminals 7/8 (Figure 4, page 23).
- ❑ **DHW pump** — Wire the DHW pump relay or valve to the normally-open contact, DHW PUMP/AUX. STATUS terminals, J13 terminals 9/10 (Figure 3, page 22).
- ❑ **Master boiler setup** — Navigate to the SETUP / DOMESTIC HOT WATER menu.

  a. For DHW BOILER? enter NO (will be changed to YES only after other parameters are set).

  b. Set the desired values for DHW SETPOINT, DHW DIFF and ADD BOILER DELAY.

  c. Enter YES for USE SENSOR?

  d. For DHW PRIORITY?, select YES if the space heating system pump is to be turned off during DHW heating. Select NO if the space heating pump is to continue running during DHW.

  e. Select the desired POST PURGE time (how long the DHW pump or valve will remain open after the boilers have shut down). See previous WARNING regarding pump post purge operation.

  f. DHW MASTER?

  Dedicated DHW — select YES so the master boiler will control itself plus HeatNet member boilers.

  Combined space heating/DHW — Select NO for combined space heating/DHW systems. The master boiler for a combined system will have a header sensor connected for space heating. This will automatically make it the master for both space heating and DHW.

  g. Go to DHW BOILER? and select YES. Note that, if jumper JPS1 has not been cut, the display will show a message to do so.

WARNING If DHW operation is to be handled by a single member boiler of a multiple boiler system, install necessary piping, including diverting valve if needed, and set up the boiler's control settings to switch to DHW on call from the tank sensor.

Configuring for DHW applications *(continued)*

DHW Method 2 — *Tank thermostat control*

- ❑ Tank thermostat located in tank.
- ❑ One boiler, master or member if in a network, operated by thermostat closure (across boiler's OA OVR terminals, J12A terminals 7/8 — see Figure 4, page 23 for location).
- ❑ Dedicated water heating or combined space heating and DHW.
- ❑ For multiple-boiler applications, it is preferable to use a member boiler for this purpose. If the master boiler is used, the system cannot operate both space heating and DHW concurrently.

WARNING **Limiting maximum boiler temperature when applying for DHW applications —** When the boiler is to be used for domestic water heating, jumper JPS1 must be clipped. This limits the maximum water outlet temperature. Failure to comply could result in overly hot water being delivered to the system. See Figure 3, page 22 for location of JPS1.

Method 2 operation

When the tank thermostat calls for heat, closing its contact across J12A terminals 7/8, the boiler enters DHW heating mode.

- ❑ The boiler fires to 100% of maximum input.
- ❑ The HeatNet control senses boiler temperature, shutting the boiler off if temperature reaches the OPERATE LIM setting (in setup menus, SETUP / SETPOINTS). (See Table 7, page 30 and Table 9, page 35 for information.)
- ❑ While boiler temperature is below OPERATE LIM minus OP LIM BAND, the boiler is at 100% of input. (See Table 7, page 30 and Table 9, page 35 for information.)
- ❑ While boiler temperature is in the OP LIM BAND, the maximum firing rate decreases as the temperature rises, until it reaches minimum input at OPERATE LIM temperature, where the boiler shuts off.
- ❑ Set the OP LIM BAND as wide as possible to reduce likelihood of short cycling.

Method 2 post purge option

When the tank thermostat opens, the boiler stops firing, but the DHW relay will remain on for the POST PURGE time set in the DHW Setup menu.

DHW post purge allows dumping the residual heat in the boiler to the DHW tank.

WARNING **Post purge will increase tank temperature above SETPOINT —** Adding additional heat to the DHW tank after the tank thermostat setpoint temperature is reached will increase tank temperature ABOVE setpoint. Ensure that this is acceptable. IF NOT, then the pump post purge must be disabled (set to zero).

Method 2 setup procedure

- ❑ Wire the tank thermostat DRY CONTACT across the input on J12A terminals 7/8 (Figure 4, page 23).
- ❑ Clip jumper JPS1 (see Figure 3, page 22 for location) on the boiler that will be used for DHW.
- ❑ Wire the DHW pump relay or valve to the normally-open contact, DHW PUMP/AUX. STATUS terminals, J13 terminals 9/10 (Figure 3, page 22).
- ❑ On the DHW boiler, navigate to the SETUP / DOMESTIC HOT WATER menu.
  a. For DHW BOILER? enter NO (will be changed to YES only after other parameters are set).
  b. Skip the values for DHW SETPOINT, DHW DIFF and ADD BOILER DELAY. Just leave set at defaults.
  c. Enter NO for USE SENSOR?
  d. For DHW PRIORITY?, select YES.
  e. Select the desired POST PURGE time (how long the DHW pump or valve will remain open after the boilers have shut down). See previous WARNING regarding pump post purge operation.
  f. For DHW MASTER?, select NO.
  g. Go to DHW BOILER? and select YES. Note that, if jumper JPS1 has not been cut, the display will show a message to do so.

5 Configuring for DHW applications *(continued)*

DHW Method 3 —

DHW tank sensor (on HEADER Sensor terminals)

DHW tank temperature controlled directly — tank temperature sensor (10k thermistor) in tank connected to DHW TEMPERATURE SENSOR input (J10B 1/2) — see Figure 4, page 23 for location.

- ❑ **Single or multiple boiler application**.
- ❑ **Dedicated water heating ONLY if using HeatNet** *(boilers could be operated for space heating by BMS, 4-20 ma remote controller or relay mode for space heating, though piping and valves will have to be designed to isolate from the DHW tank)*.

WARNING **Limiting maximum boiler temperature when applying for DHW applications —** When the boiler is to be used for domestic water heating, jumper JPS1 must be clipped. This limits the maximum water outlet temperature. Failure to comply could result in overly hot water being delivered to the system. See Figure 3, page 22 for location of JPS1.

Method 3 operation

Set up the HeatNet control as for space heating, with the tank temperature sensor connected to the master boiler Header sensor terminals. See Table 7, page 30, Table 8, page 33 and Table 9, page 35 for set up and explanation of parameters.

HEAT BAND

The HeatNet control will regulated boilers and firing rates to control temperature within one half of the Heat Band above and below the Setpoint temperature.

SHED BOILER DELAY

Set Shed Boiler Delay to 0 to prevent tank temperature from going above Setpoint + ½ HeatBand. With this parameter set to 0, all boilers will shut off at Setpoint + ½ HeatBand. If temperature excursions above Setpoint + ½ HeatBand are acceptable, Shed Boiler Delay can be adjusted to reduce cycling if necessary.

SETPOINT (LOCAL SETPT)

Setpoint is the design temperature for controlling the tank. The HeatNet control will regulated boilers on and off, adjusting firing rates as necessary, to control the tank temperature within the range of Setpoint – ½ HeatBand to Setpoint + ½ HeatBand.

Example

- ❑ Tank temperature setpoint = 135 °F | Heat band = 10 °F | Shed Boiler Delay = 0.
- ❑ This means the operating range is (135 – 5) to (135 + 5), or from 130 °F to 140 °F. All boilers will be on below 130 °F and all boilers off above 140 °F, and boilers cycled on/off and modulating in between, based on the HeatNet control's PID methodology.

Method 3 post purge option

When tank temperature reaches OFF TEMP, all active boilers turn off. The pump relay will remain on for the POST PURGE time set in the Setup menu.

Post purge allows dumping the residual heat in the boilers to the DHW tank.

WARNING **Post purge will increase tank temperature above SETPOINT —** Adding additional heat to the DHW tank after boilers are shut off will increase tank temperature. Ensure that this is acceptable. IF NOT, then the pump post purge must be disabled (set to zero).

Method 3 setup procedure

- ❑ **Tank sensor** — Install a 10k tank temperature sensor in the tank. Wire it to the master boiler HEADER SENSOR terminals, J10A terminals 7/8 (Figure 4, page 23).
- ❑ **Clip jumper JPS1**(see Figure 3, page 22 for location) on all boilers that will be used for DHW.
- ❑ **DHW pump** — Wire the DHW pump relay or valve to the normally-open contact, LOCAL PUMP terminals, J13 terminals 5/6 (Figure 3, page 22).
- ❑ **Master boiler setup** — Set up the boilers as for space heating, but with the setpoint and heat band set as needed for the DHW tank.

DHW Method 4 —

4–20 ma control (by remote controller)

- ❑ **DHW tank temperature controlled directly** — tank temperature sensor (10k thermistor) in tank connected to DHW TEMPERATURE SENSOR input (J10B 1/2) — see Figure 4, page 23 for location.
- ❑ **Single or multiple boiler application**.
- ❑ **Dedicated water heating or combined space heating/DHW**.

WARNING **Limiting maximum boiler temperature when applying for DHW applications —** When the boiler is to be used for domestic water heating, jumper JPS1 must be clipped. This limits the maximum water outlet temperature. Failure to comply could result in overly hot water being delivered to the system. See Figure 3, page 22 for location of JPS1.

Method 4 setup — controlling master boiler

- ❑ Set the master boiler's HeatNet control with 4–20 ma set to HIGH PRIORITY in the ADVANCED Setup menu.
- ❑ This will allow the remote controller to take over operation of the boilers when DHW is required.

Method 4 setup — controlling individual boiler

- ❑ Set the member boiler's HeatNet control with 4–20 ma set to HIGH PRIORITY in the ADVANCED Setup menu.
- ❑ When the remote DHW controller calls for DHW, this boiler will be taken offline and controlled by the remote 4–20 ma signal.
- ❑ Piping and valves must provide for automatic switching from space heating to DHW.

6 Wiring

Power supply

1. Refer to the Boiler Manual/wiring diagram and rating plate for required voltage and amperage.
2. Connect minimum 14 awg copper wire to the power connection. See Figure 3, page 22.
3. Install a fused service switch, mounted and installed in accordance with all applicable codes.

Circulator wiring

CAUTION All circulators operated by the HeatNet control require a motor starter or relay to handle the power load of the circulator. Use the output terminals of the HeatNet control ONLY to operate the starter or relay coil.

Boiler circulator

- If the boiler circulator is to be controlled by the boiler's HeatNet control, power the boiler circulator starter or relay coil through the local pump or valve terminals provided on J13 (see Figure 3, page 22).

System circulator

- If the system circulator is operated by one of the HeatNet controls (by the MASTER boiler control for HeatNet multiple boiler systems), power the boiler circulator starter or relay coil through the system pump terminals provided on J13 (see Figure 3, page 22).

Sensor wiring

- **Factory-installed sensors —** boilers are provided with a factory-installed supply sensor (boiler outlet water temperature) and return sensor (boiler return water temperature), connected to the terminals on J10.
  - Parameters that require the supply water temperature sensor are OP LIMIT and LOCAL SETPOINT.
  - Parameters that require the return water temperature sensor are DELTA TEMP (under PUMP OPTIONS) and EXCHGR DELTA (under AUX FUNCTIONS).
- **Header (SYSTEM HEADER) sensor is required** — A header sensor (SYSTEM HEADER) must be installed in the system supply piping for HeatNet controlled systems.
  - **Connect the header sensor ONLY to the master boiler**.
  - Install the header sensor in an immersion well.
  - Locate the sensor where it will accurately sense the system water supply temperature.
  - Connect the sensor leads to the MASTER boiler electrical connection board terminals on J10 as shown in Figure 4, page 23.
  - The header sensor can be used with a stand-alone boiler to allow regulation of a primary/secondary system.
- **Domestic hot water (DHW) sensor** —
  - A DHW sensor must be installed in the tank for HeatNet-controlled systems if providing domestic hot water.
  - **Connect the DHW sensor ONLY to the master boiler**.
  - Install the DHW sensor in an immersion well.
  - Locate the sensor where it will properly control tank temperature, in accordance with tank manufacturer's instructions.
  - Connect the sensor leads to the MASTER boiler electrical connection board terminals on J10 as shown in Figure 4, page 23.
  - The DHW sensor can also be connected to a stand-alone boiler connection board.
  - The DHW sensor can be connected to a MASTER boiler control, in addition to a space heating SYSTEM HEADER sensor, for combined space heating/domestic water heating applications.
- **Outdoor reset application** — To operate with outdoor reset, purchase and install an optional outdoor sensor.
  - Mount the sensor such that it is shielded from direct sunlight if possible and not likely to be covered by snow drifts or debris.
  - Connect the outdoor air sensor leads to the electrical connection board terminals on J10 as shown in Figure 4, page 23.
  - The sensor must be connected to the MASTER boiler for a HeatNet system.
  - A member boiler could have its own outdoor sensor if it is to be activated in override mode by closing the Heat Demand terminals.
  - The outdoor sensor can also be connected to a stand-alone boiler connection board.

6 Wiring *(continued)*

DHW wiring

- To operate the boiler for domestic water heating with a storage tank, install and pipe the tank according to the tank manufacturer's instructions and the recommended piping diagrams in the Boiler Installation & Operating Instructions manual. Consult the factory for applications not covered.
- Read the options and explanations given on page 16 through page 19 to determine the best configuration for the system.

External interlocks

1. If used, wire external limits and flow switch, as shown in Figure 5, page 24.
2. If wiring to and from a motorized combustion air damper (or dampers), follow the guidelines given in Figure 5, page 24. Connect only to the master boiler. Make sure the AUX FUNCTION options are set correctly.

CAUTION If any of the member boilers is to operate in override mode, and the system is equipped with a single, master combustion air damper, you must provide special wiring in order to ensure the damper opens and proves when the boiler fires. This must be done without compromising the wiring between the master boiler and the damper.

Overrides — Control priorities

1. The HeatNet control can provide override operation for any or all boilers in a HeatNet network. This requires the boilers be piped with appropriate isolation piping and controls as needed for isolation.

CAUTION Do not wire boilers for override operation unless the piping design provides automatic isolation of the overriding boilers. The master boiler would be unable to properly control system water temperature if member boilers were to input heat to the system without control from the master. DHW operation, in particular, would raise the supply temperature from overriding boilers to the DHW Setpoint.

NOTICE Override operation control setup — MEMBER boilers must be set up with operating parameters necessary during their override (local) operation.

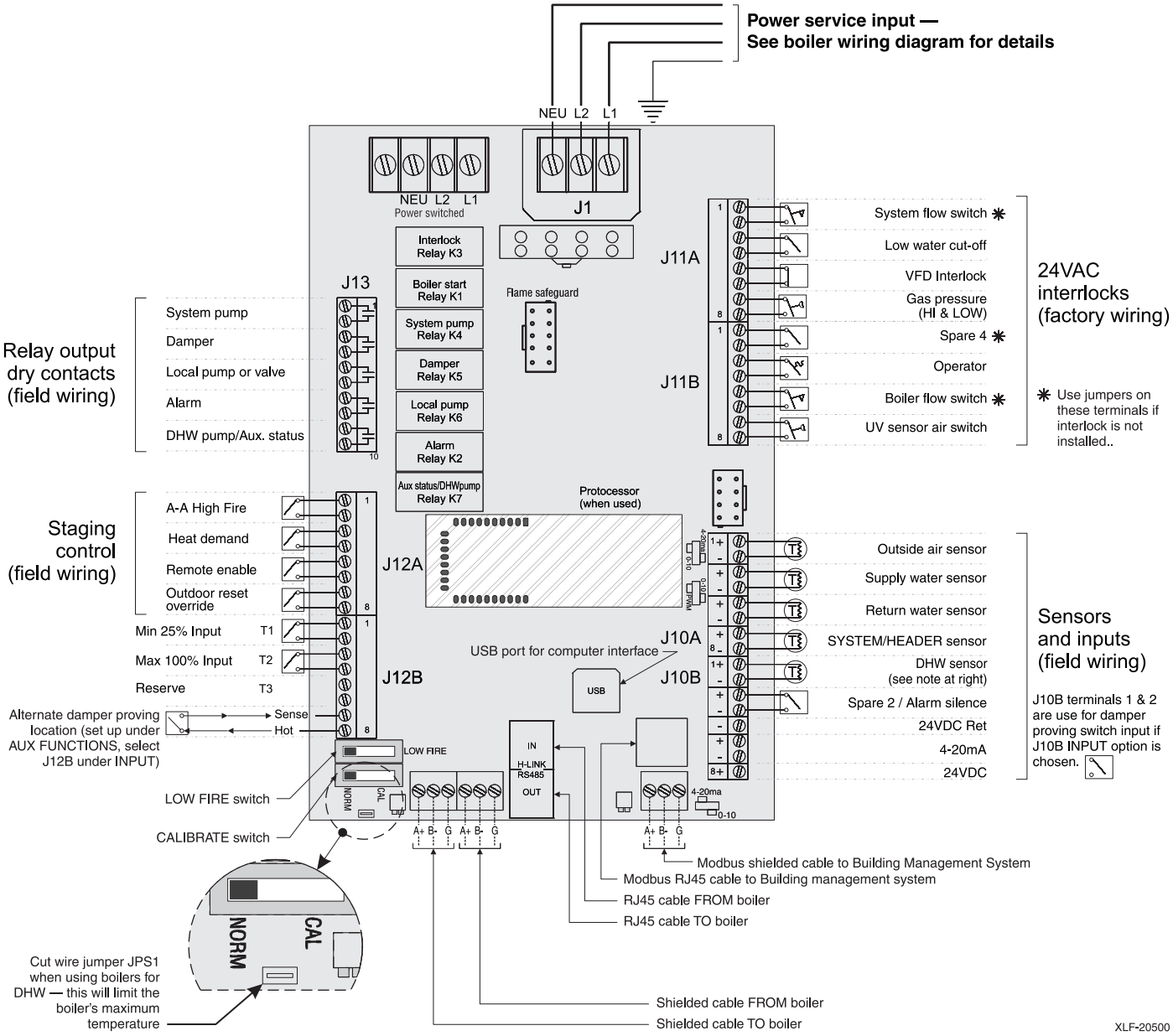
2. A HeatNet boiler will respond to overrides in the following order. The modes listed will override any other activation function listed below it.

Figure 2 Boiler input priorities

MASTER BOILER	***MEMBER BOILER***
Priority 1 ***AA terminals*** ***ON/OFF operation*** *Master boiler operates in ON/OFF and fires all member boilers ON/OFF together based on system settings.* *See Figure 8, page 27 for wiring connections.*	***Priority 1*** ***AA terminals*** ***ON/OFF operation*** *Member boiler switches to local control in ON/OFF operation, using the boiler's settings.* *See Figure 8, page 27 for wiring connections.*
Priority 2 ***HEAT DEMAND*** *Master boiler operates in full modulation and fires/modulates member boilers based on system settings.*	***Priority 2*** ***HEAT DEMAND*** *Member boiler switches to local control, using the boiler's settings for operation and modulation.*
	Priority 3 ***HeatNet input*** *Member boiler receives operating commands from the master boiler through the cable or shielded wires between HeatNet boilers.*
Priority 3 ***4-20mA/0-10VDC input*** *Requires closure across the 4-20mA ENABLE terminals.* *Master boiler operates and controls member boilers based on 4-20mA signal received at master.*	***Priority 4*** ***4-20mA/0-10VDC input*** *Requires closure across the 4-20mA ENABLE terminals.* *Member boiler operates on local control based on 4-20mA signal received at member.*
NOTICE Setting the 4-20mA parameter to HIGHEST in the ADVANCED SETUP menu will cause 4-20mA ENABLE to move to priority 1.	
Priority 4 ***T1/T2 stage control*** *Master boiler operates based on closure of T1 and T2 terminals on master, firing member boilers at the same rate.* *See Figure 8, page 27 for wiring connections.*	***Priority 4*** ***T1/T2 stage control*** *Member boiler operates on local control based on closure of T1 and T2 on member boiler.* *See Figure 8, page 27 for wiring connections.*

6 Wiring *(continued)*

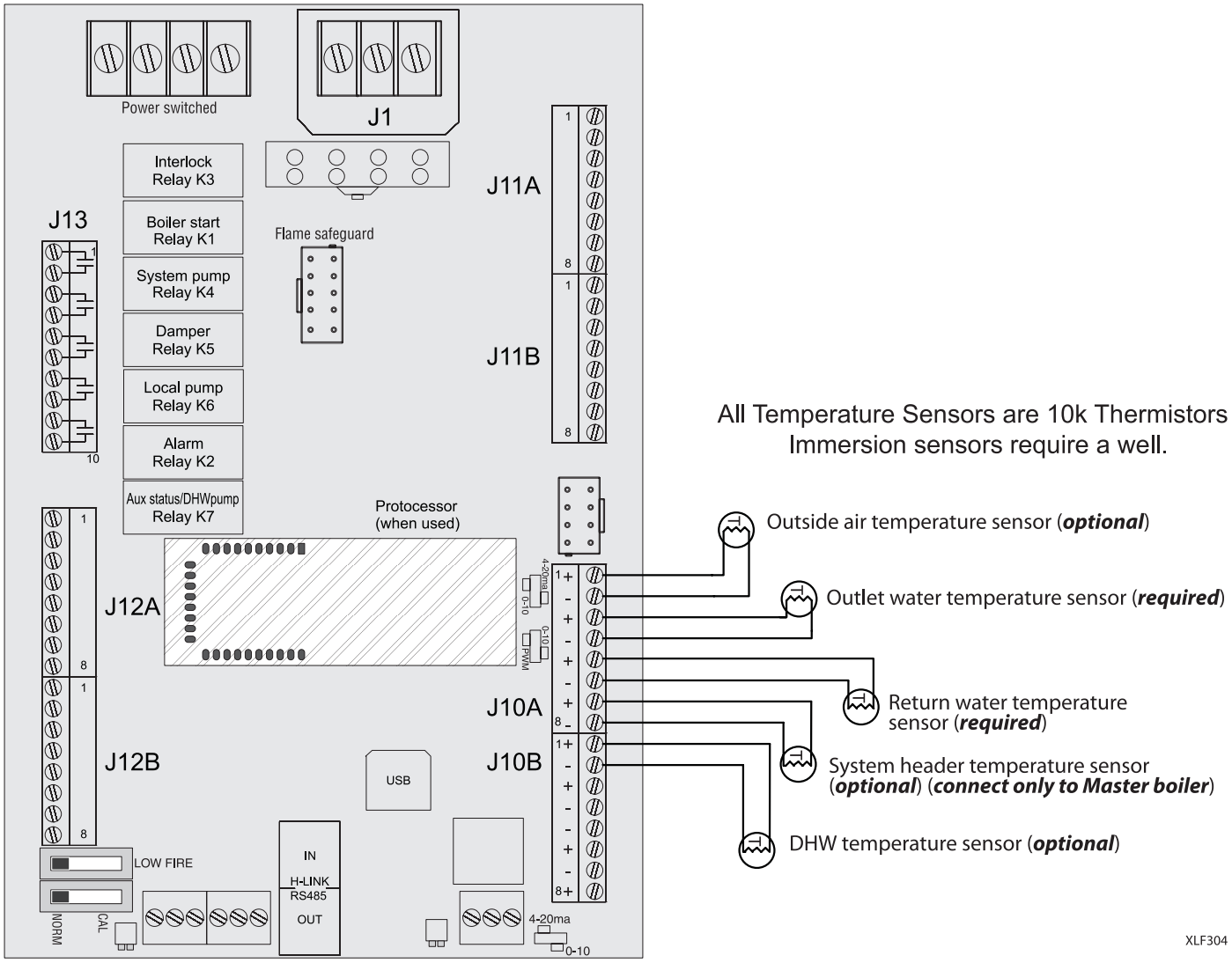
Figure 3 HeatNet control field wiring (also see Boiler Installation & Operation Instructions) — Verify against wiring diagram supplied with boiler



WARNING **PUMPS REQUIRE RELAYS OR STARTERS — DO NOT** directly operate a pump using the HeatNet contacts. Use these contacts only to operate pump relay or starter coils.

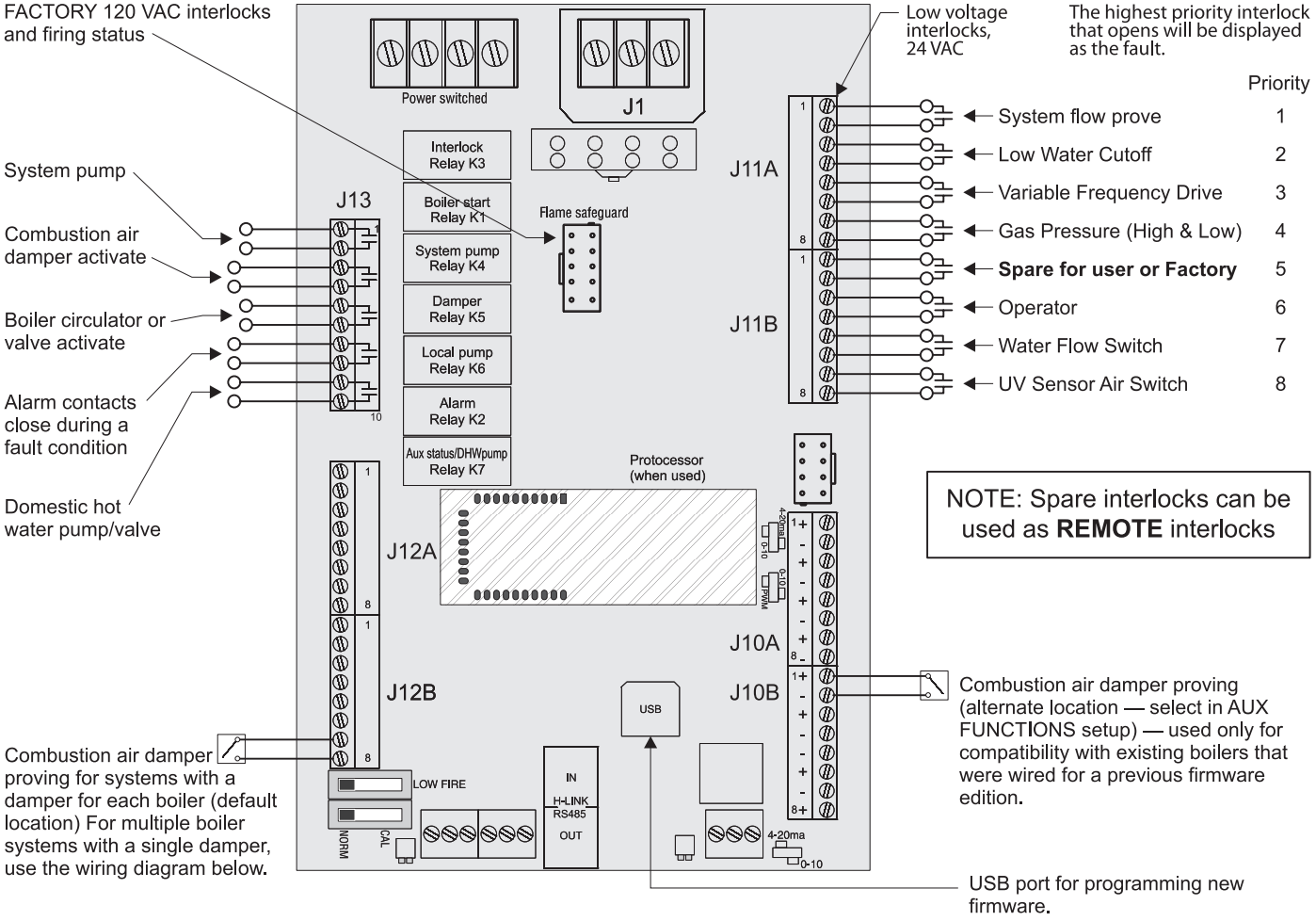
6 Wiring *(continued)*

Figure 4 HeatNet temperature sensors



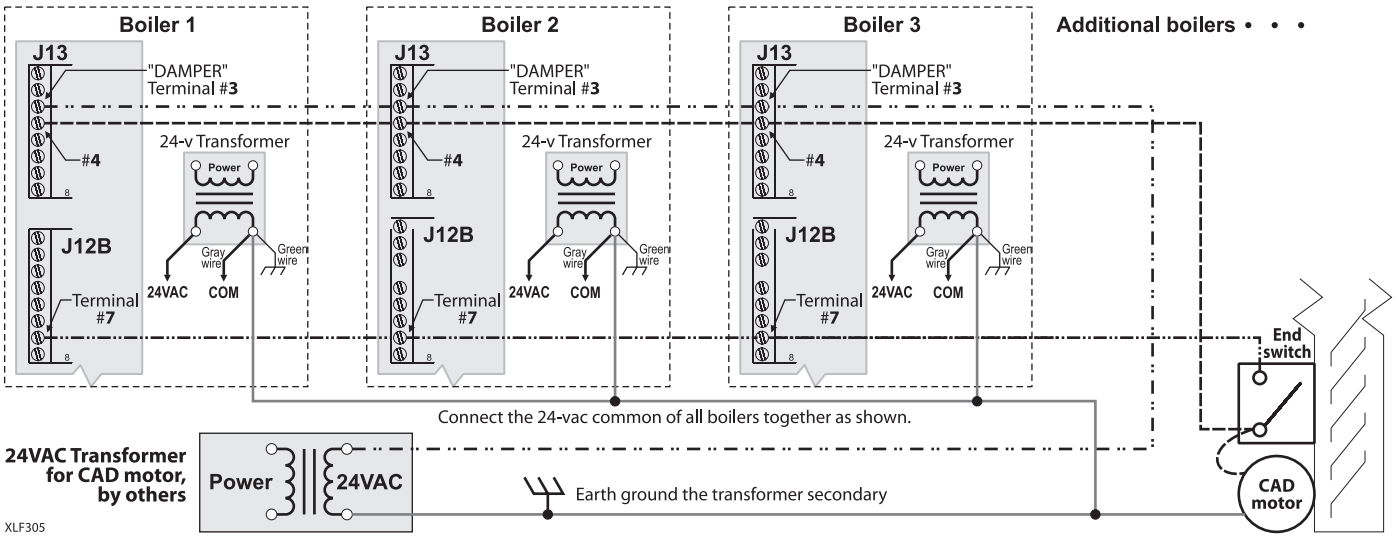
6 Wiring *(continued)*

Figure 5 Field wiring — relays, interlocks and boiler status



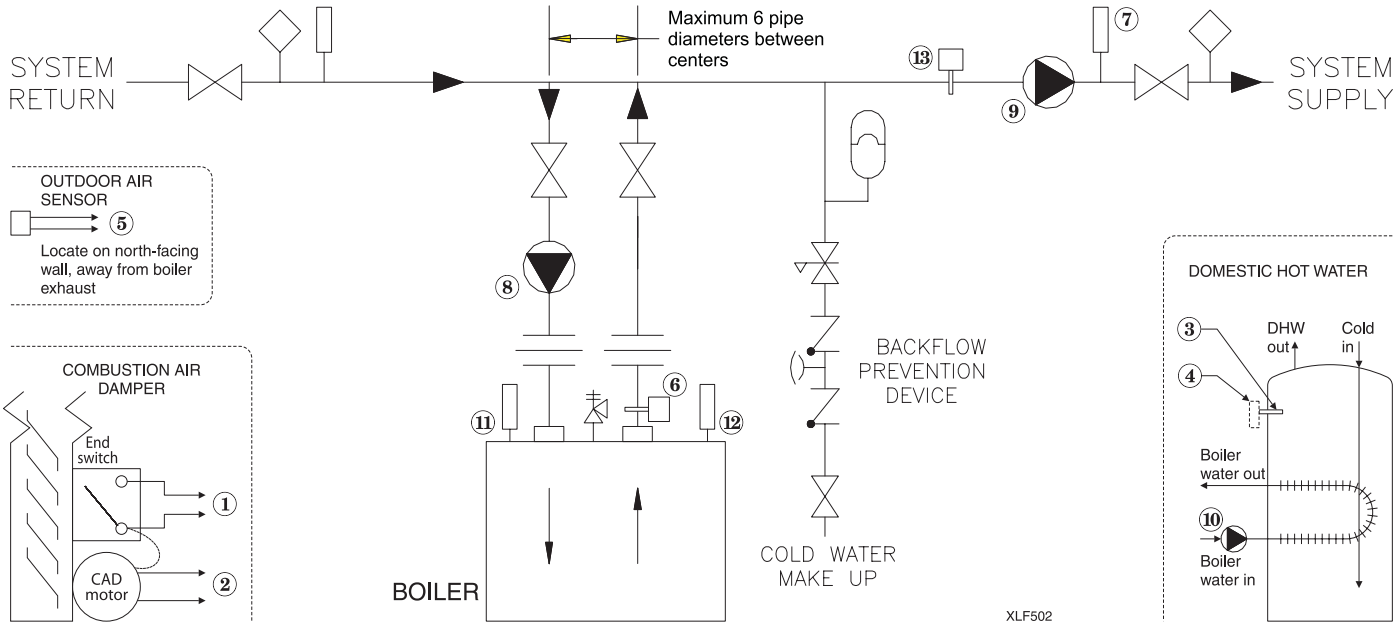
NOTE: Apply the following wiring when connecting **multiple boilers with a single combustion air damper**. Member boilers set up for Failsafe mode (boiler starts if signal from master boiler is lost) must be able to activate the combustion air damper when operating. The following wiring will allow that. All member boilers set up for Failsafe operation must be wired as shown.

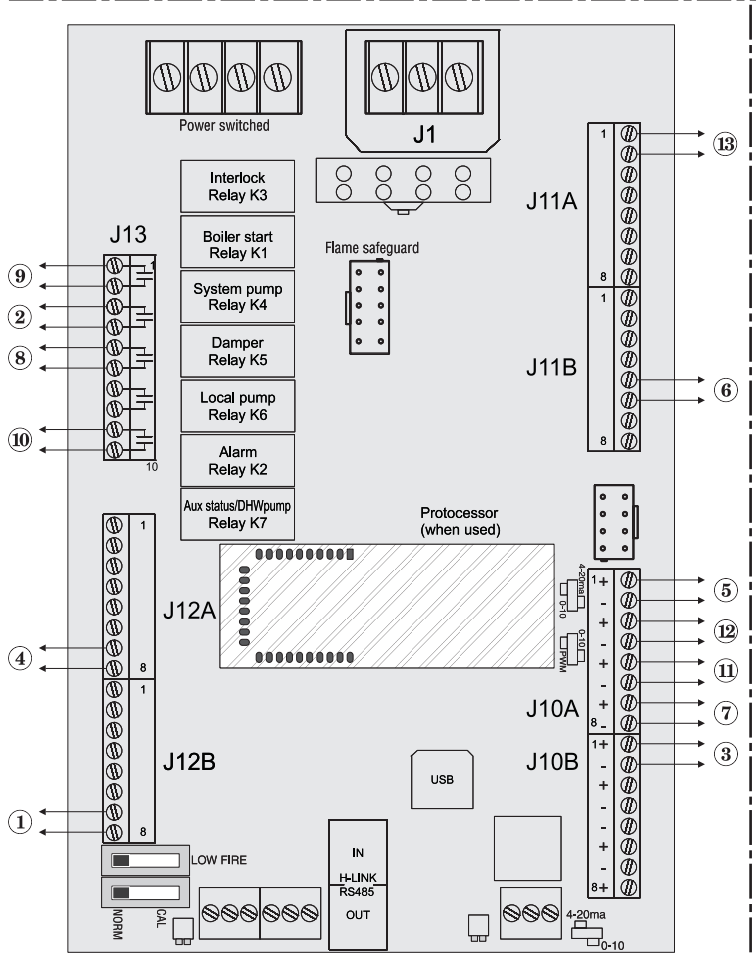
NOTE: ***You must install a separate 24 VAC transformer*** to power the combustion air damper in order for this wiring to work correctly.



6 Wiring *(continued)*

Figure 6 Primary/secondary piping — component electrical connections





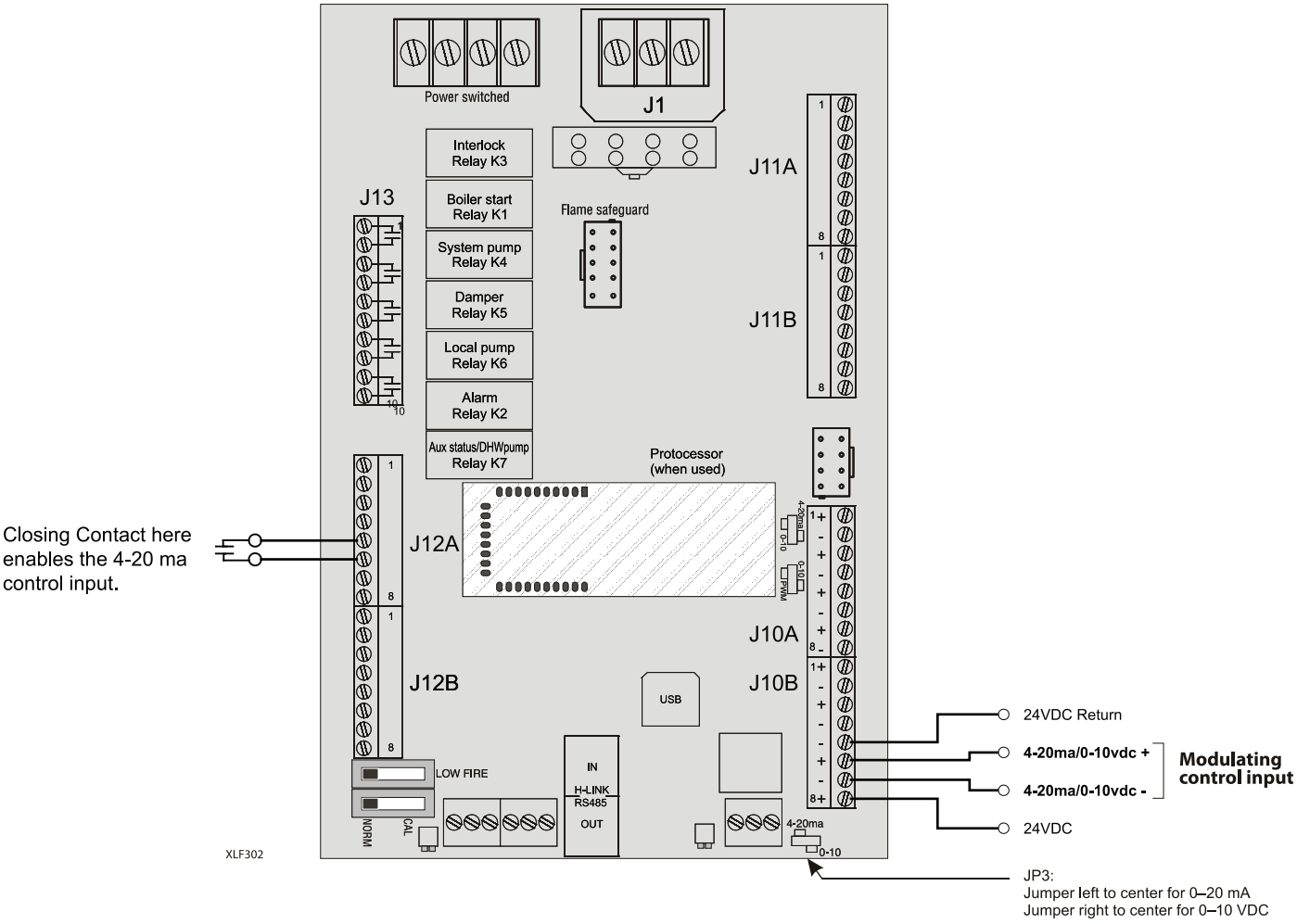
Component electrical connections

1. Combustion air damper proving switch
2. Combustion air damper motor enable
3. DHW tank sensor (when used in lieu of DHW aquastat)
4. DHW tank aquastat (when used in lieu of DHW sensor)
5. Outdoor air temperature sensor
6. Local flow proving switch
7. System/header temperature sensor
8. Local pump enable
9. System pump enable
10. DHW pump enable
11. Return temperature sensor
12. Supply temperature sensor
13. System flow proving switch

WARNING **PUMPS REQUIRE RELAYS OR STARTERS — DO NOT** directly operate a pump using the HeatNet contacts. Use these contacts only to operate pump relay or starter coils.

6 Wiring *(continued)*

Figure 7 Field wiring connections for 4-20mA remote operation



NOTICE If using a 0–10VDC signal, multiply any references to current in the manual by 0.5. For example: 5ma x 0.5 = 2.5 VDC.

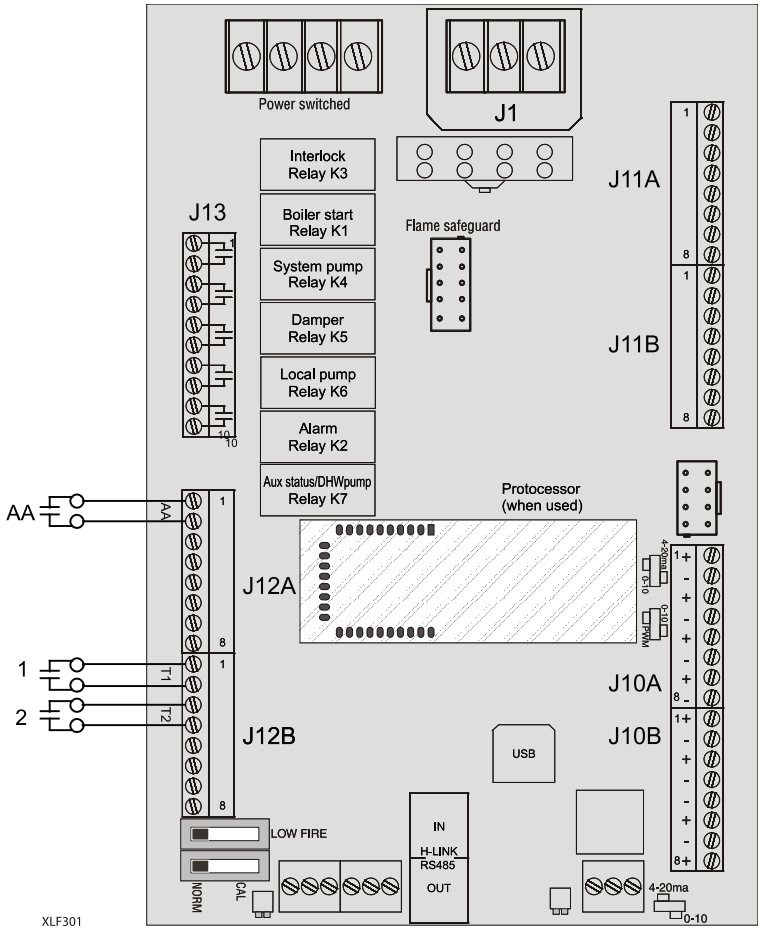
6

Wiring *(continued)*

Figure 8 Field wiring connections for on/off and two-stage firing options

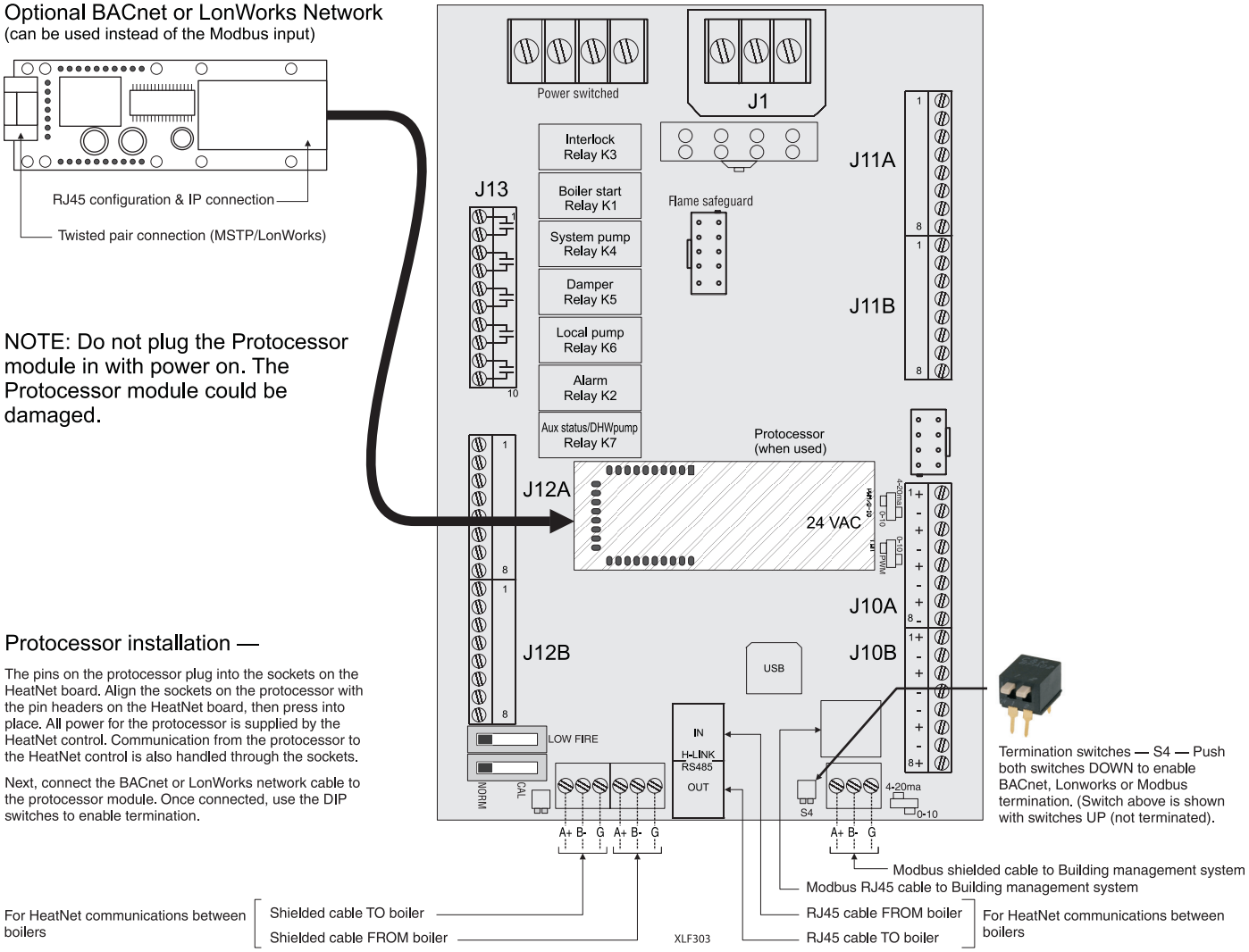
ON/OFF firing: Close this contact to run boiler at High Fire

Stage firing: Close these contacts to run boiler at MIN 25% (stage 1) or MAX 100% (stage 2)



6 Wiring *(continued)*

Figure 9 Installation of optional BACnet or LonWorks bridge — Protocessor (for MODBUS operation)



7 Control menus and adjustments

The HEATNET control display

Starting the display

1. Check all wiring to make sure it is complete and all wires are securely connected.
2. Verify that the HEAT DEMAND and DHW DEMAND wires are removed.
3. Close the external gas valve on every boiler.
4. Turn on power to the boiler and then turn the boiler on/off switch ON.
5. The control will beep at least twice and the display will show the first STANDBY display in Figure 10. Note that pushing the DOWN button on the keypad will change the right side of the display as shown, providing information on various setpoints and parameters.
6. The display, LOCAL SET, means the setpoint temperature for a single boiler application. Figure 10 shows the factory default values.

Adjusting setpoint temperature while in Standby

1. The local setpoint temperature (LOCAL SET) or system setpoint temperature (SYSTEM SET) can be adjusted using the SETUP menus or by pressing down the SELECT key for one second while in Standby.
2. The setpoint will begin to flash. Use the arrow keys to increase or decrease the setpoint.
3. When satisfied, press SELECT to keep the new number. To cancel and return to Standby, press the BACK button.

Accessing setup menus

1. With the display in STANDBY, press and hold the BACK key for 5 seconds.
2. The display will change to:

```
▸ SETUP
  ADVANCED SETUP
  VIEW LOG
```

3. Press the SELECT key to select setup. (Note that pressing the DOWN key would change the selection to ADVANCED SETUP or VIEW LOG.)
4. The display will now show the first options in the setup menus:

```
▸ FUTERA SER V 3.X
  BOILERS
  SETPOINTS
  OUTDOOR AIR RESET
```

NOTICE All boilers on a network must have firmware revisions of 2.0 or above, or all can have revision 1.x. Do not mix 2.x firmware boilers with 1.x firmware boilers. Follow the procedure in this manual (Table 9, page 35) to install a firmware update on each boiler as necessary. To ensure consistent setup, all boilers should preferably have the SAME firmware edition.

5. Press the DOWN key to access additional menu options. Pressing the DOWN button once will change the display to:

```
  FUTERA SER V 3.X
▸ BOILERS
  SETPOINTS
  OUTDOOR AIR RESET
```

6. The cursor moves to the second line, indicating this option could now be selected with the SELECT key.
7. Continuing to press the DOWN key will access the menu options listed on the following pages. Table 7, page 30 lists the sequence of menu items found under the SETUP menu. Table 8, page 33 lists the sequence of menu items found under the ADVANCED SETUP menu. For an explanation of the parameters, see Table 9, page 35.

Figure 10 HeatNet display during Standby (no call for heat) — pressing the DOWN key on the keypad changes the display as shown. LOCAL SET or SYSTEM SET can be adjusted while in Standby as described in this section.

```
STANDBY      LOCAL SET
             180°F
```

NOTICE The above display occurs on single-boiler installations only (no header sensor installed).

— OR —

```
STANDBY    SYSTEM SET
             180°F
```

NOTICE The above display occurs when boilers are connected to a HeatNet network.

⬇

```
STANDBY       *STATUS
            START    0
            STOP     0
```

⬇

```
STANDBY        RETURN
             180°F
```

⬇

```
STANDBY       OUTSIDE
             180°F
```

⬇

```
STANDBY       SUPPLY
             180°F
```

⬇

```
STANDBY       HEADER
               NA
```

NOTICE The "NA" appears if a sensor is not connected to the SYSTEM HEADER sensor terminals. The master boiler (where the SYSTEM HEADER sensor is attached) will show the SYSTEM HEADER temperature in lieu of NA.

⬇

```
STANDBY      LOCAL SET
             180°F
```

7

Control menus and adjustments *(continued)*

Table 7 **SETUP** menus (*see Table 9, page 35 for explanations*)

To enter Setup: From STANDBY, hold BACK for 5 seconds. (If SKIP PASSWORD is set to OFF, you will have to enter the password.)
Then press SELECT with cursor on **SETUP**.
Make sure there is no call for heat at the boiler before attempting to perform setup adjustments.
To return to STANDBY, press/release BACK until the display returns to standby, or turn boiler ON/OFF switch off, then on.

Level 1 ▲▼ next item SELECT to select	Level 2 ▲▼ next item SELECT to select BACK back one level	Level 3 ▲▼ next item SELECT to select BACK back one level	Default {Range} ▲▼ to change value BACK to accept value and return to previous menu level	Typical line (Display shows four lines at a time; cursor indicates active line)
FUTERA V X.X			Shows firmware version number	FUTERA SER V3.xx
BOILERS	# OF BOILERS		1 {1 to 16} — display only — gives the number of boilers on a HeatNet network	# OF BOILERS 1 LEAD BOILER # 1 HEAT BAND 30°F HNT 123456789
	LEAD STAGE #		Select the boiler that is to start first in multiple boiler operation.	
	HEAT BAND		30 °F {10 to 50°F}	
	HEATNET BOILERS 123 . . .		Display only, on MASTER boiler only — shows the H-NET ADDRESS of each boiler detected on the HeatNet network (from 1 to 16) NOTE that the MASTER address, actually 255, is shown as 1 in this display	
SETPOINTS	LOCAL SETPT or SYSTEM SETPT		160°F {40 to 220°F} SYSTEM SETPT will appear if a sensor is connected to the SYS/DHW HEADER terminals. Otherwise, the display will show LOCAL SETPT.	LOCAL SETPT 180°F OPERATE LIM 10°F OP LIM BAND 215°F SETPT SOURCE AUTO
	OPERATE LIMIT		215°F {45 to 230°F}	
	OP LIM BAND		20°F {1 to 50°F}	
	SETPT SOURCE		AUTO {AUTO, 4-20MA} (NOTE: If 4-20MA is selected, the control setup menu will automatically open the ADVANCED SETUP | 4-20MA INPUT menu to allow setting the operating levels to match the 4-20MA remote signal controller requirements.)	
OUTDOOR AIR	OA RESET		OFF {ON or OFF}	OA RESET OFF WARMWEATHER SD NO OA SETPOINT 68°F SET OA SETPOINTS
	WARM WEATHER SD		NO {YES or NO}	
	WWS SETPOINT		68°F {40 to 100°F} If the OA OVR input is closed, outdoor reset and warm weather shutdown are overridden. The boiler will run at LOCAL/SYSTEM SETPOINT.	
	SET OA SETPOINTS	WATER TEMP AT HIGH OA TEMP	140°F {60 to 150°F} 70°F {50 to 90°F}	WATER TEMP 140°F AT HIGH OA TEMP 70°F NEXT
		WATER TEMP AT LOW OA TEMP	180°F {70 to 220°F} 10°F {-35 to +40°F}	WATER TEMP 180°F AT LOW OA TEMP 10°F BACK

7 Control menus and adjustments *(continued)*

Table 7 SETUP menus *(continued)* (*see Table 9, page 35 for explanations*)

Level 1 next item to select	Level 2 next item to select back one level	Level 3 next item to select back one level	Default {Range} to change value to accept value and return to previous menu level	Typical line (Display shows four lines at a time; cursor indicates active line)
PUMP OPTIONS	SYSTEM PUMP	POST PRG TIME	2 minutes {1 to 60 minutes}	POST PRG TIME 2M ALWAYS ENABLED OFF SUMMER PUMP JOG:OFF OVR ENAB IN WWS:OFF
		ALWAYS ENABLED	OFF {ON or OFF}	
		SUMMER PUMP JOG:	OFF {Day of week, MON , TUE, etc.}	
		OVR ENAB IN WWS	OFF {ON or OFF}	
	LOCAL PUMP	DELTA TEMP ENAB	OFF {ON or OFF}	DELTA TEMP ENAB OFF DELTA TEMP 10° POST PRG TIME 2M ALWAYS ENABLED OFF
		DELTA TEMP	10°F {0 to 50°F}	
		POST PRGE TIME	2 minutes {1 to 60 minutes}	
		ALWAYS ENABLED	OFF {ON or OFF}	
	PUMP/VALVE OPTION	MASTER PUMP/VALVE REMAINS ON:	OFF {ON or OFF}	MASTER PUMP/VALVE REMAINS ON: OFF
	FLOW PROVE:		10 seconds {10 to 240 seconds)	FLOW PROVE: 10S
NIGHT SETBACK	SETBACK ENTRY		1 {1 through 4}	SETBACK ENTRY 1 ENTRY IS OFF SETBACK 20°F SETBACK TIME
	ENTRY IS		OFF {ON of OFF}	
	SETBACK		20 °F {0 to 50°F}	
	SETBACK TIME	START DAY	MON {SUN, MON, TUE, WED, THU, FRI, SAT}	START DAY MON TIME 10:00 PM END DAY FRI TIME 9:00 PM
		TIME	12:00 AM {Time, AM or PM}	
		END DAY	MON {SUN, MON, TUE, WED, THU, FRI, SAT}	
		TIME	12:00 AM {Time, AM or PM}	
OPTIONS	TEMP SCALE		°F {°F or °C}	TEMP SCALE °F KEY CLICK ON SKIP PASSW ON BRIGHTNESS 50%
	KEY CLICK		ON {ON or OFF}	
	SKIP PASSWORD		ON {ON or OFF}	
	BRIGHTNESS		50% {12, 25, 37, 50, 62, 75, 87, 100%}	
LOG/RUNTIME	RUN HOURS		Total time gas valve has been open	RUN HOURS 1240 DATA LOG ENTRY 327 SIZE 1000 BOILER CYCLES 5021
	DATA LOG ENTRY		Current entry in the log (see Table 9, page 35)	
	SIZE		The size of the data log	
	BOILER CYCLES		Number of times gas valve has been cycled on/off	

7

Control menus and adjustments *(continued)*

Table 7 SETUP menus *(continued)* (*see Table 9, page 35 for explanations*)

Level 1 next item to select	Level 2 next item to select back one level	Level 3 next item to select back one level	Default {Range} to change value to accept value and return to previous menu level	Typical line (Display shows four lines at a time; cursor indicates active line)
AUX FUNCTIONS	COMBUST AIR DAMPER	TYPE	LINKED/COMMON {LINKED/COMMON or INDEPENDENT}	TYPE: LINKED/COMMON IN USE? NO INPUT: J12B DAMPER PROOF TIME 2:00
		IN USE?	NO {YES or NO}	
		INPUT:	J10B "DAMPER" {J10B DAMPER or J12B terminal 7} Change only when required to maintain existing wiring on boilers with an older edition of the firmware that used J10 B instead of J12 for this interlock.	
		PROOF TIME	2:00 minutes {0 to 4 minutes}	
	ALARM SILENCE	IN USE?	YES {YES or NO}	ALARM SILENCE SWITCH IN USE? YES INPUT=J10B SPARE 2
		INPUT=	J10B SPARE 2 {see explanation, Table 9, page 35}	
	FAILSAFE MODES	RUN IN LOCAL IF: H-NET COMM LOST: LOW TEMP: TEMP < 40F	 ON {ON or OFF} OFF {SUPPLY, SYS/DHW HEADER, RETURN, N/A, or OFF} 40°F {35 to 200°F}	RUN IN LOCAL IF: H-NET COMM LOST:OFF LOW TEMP: OFF TEMP< 40°F
	HEAT EXCHANGER	ALARM TYPE:	WARNING {WARNING or FAULT}	ADAPTIVE INPUT EXCHGR DELTA 40°F LIM->HALF RATE NO
		EXCHGR DELTA T	40°F {1 to 120°F} (Not selectable — preset based on boiler size)	
		LIM->HALF RATE	NO {YES or NO}	
DOMESTIC HOT WATER	DHW BOILER?		NO {YES or NO}	
	DHW SETPOINT		160°F {10 to 200°F}	
	DHW DIFF		5°F {1 to 30°F}	
	USER SENSOR?		NO {YES or NO}	
	DHW PRIORITY		NO {YES or NO}	
	POST PURGE		120 seconds {0 to 600 seconds}	
	DEMAND STARTS?		YES {YES or NO}	
SYSTEM CLOCK	TIME		See explanation, Table 9, page 35	TIME 11:20AM DAY OF WEEK MON MONTH JAN NEXT
	DAY OF WEEK			
	MONTH			
	DAY			DAY FRI YEAR 2008 PRESS SEL TO SAVE
	YEAR			

7

Control menus and adjustments *(continued)*

Table 8 **ADVANCED SETUP** menus (*see Table 9, page 35 for explanations*)

To enter Setup: From STANDBY, hold BACK for 5 seconds. (If SKIP PASSWORD is set to OFF, you will have to enter the password.)
Then press SELECT with cursor on **SETUP**.
Make sure there is no call for heat at the boiler before attempting to perform setup adjustments.
To return to STANDBY, press/release BACK until the display returns to standby, or turn boiler ON/OFF switch off, then on.

Level 1 ▲▼ next item SELECT to select	Level 2 ▲▼ next item SELECT to select BACK back one level	Level 3 ▲▼ next item SELECT to select BACK back one level	Default {Range} ▲▼ to change value BACK to accept value and return to previous menu level	Typical line (Display shows four lines at a time; cursor indicates active line)
DISTRIBUTED CTRL	CONTROL		HNET	CONTROL H-NET H-NET MASTER YES LOCAL ADDRESS 255 MODBUS ADDRESS 1
	H-NET MASTER		YES (Display only, not changeable here) (MEMBER boilers will show NO, and addresses must be set from 2 to 16.)	
	H-NET ADDRESS		Master default = 255 (not changeable); Member default = 2 (Range = 2 to 16)	
	MODBUS ADDRESS		Default = 1; Range = 1 to 247	
MODULAR BOILER SET	ADD BOILER DELAY		10 minutes {0 to 15 minutes}	ADD DELAY TIME 10 MINUTES 0 SECONDS
	SHED BOILER DELAY		2 minutes {0 to 15 minutes}	SHED DELAY TIME 2 MINUTES 0 SECONDS
	MODULATE DELAY TIME		10 seconds {0 to 60 minutes}	MODULATE DELAY TIME 0 MINUTES 10 SECONDS
	MOD MAX - LAST FIRE		50% {25 to 100%}	STOP MOD MAX % 50
ADAPTIVE MOD	MOD MODE		ADAPTIVE {ADAPTIVE or ORIG KN}	
	DROP DOWN		ON PILOT {ON PILOT or IMMEDIATELY}	
	DELAY RELEASE		0 seconds {0 to 600 seconds}	
PID (FACTORY)			Factory set, not adjustable	PID (FACTORY)
FIRING MODE	FIRING MODE MASTER FIRST		TRUE ROTATION {TRUE ROTATION, LAST ON FIRST OFF, FIRST ON FIRST OFF} OFF {ON or OFF}	FIRING MODE TRUE ROTATION MASTER FIRST OFF
SENSORS	SENSOR # TYPE CALIBRATE		OUTSIDE {OUTSIDE, SUPPLY, RETURN, HEADER, 5, 6} TYPE Z {TYPE Z (10K), ON/OFF, NONE} NO {YES or NO}	SENSOR ASSIGNMENTS SENSOR # OUTSIDE TYPE TYPEZ CALIBRATE? NO
	CALIBRATE		If YES is selected: (See explanation, Table 9, page 35)	PLACE A PRECISION 1K OR 10K RESISTOR ON CHANNEL # 1 TRIM OHMS = 120

7

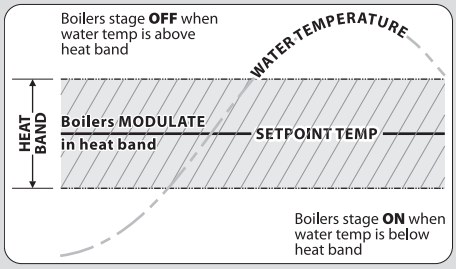
Control menus and adjustments *(continued)*

Table 8 ADVANCED SETUP menus *(continued)* (*see Table 9, page 35 for explanations*)

Level 1 ▲▼ next item SELECT to select	Level 2 ▲▼ next item SELECT to select BACK back one level	Level 3 ▲▼ next item SELECT to select BACK back one level	Default {Range} ▲▼ to change value BACK to accept value and return to previous menu level	Typical line (Display shows four lines at a time; cursor indicates active line)
4-20MA INPUT	4MA SETPOINT		50°F {50 to 220°F} (Not applied unless SETPOINT SOURCE is set to 4-20MA)	4MA SETPOINT 50°F 20MA SETPOINT 220°F BOILER START 4.11MA PRIORITY NORMAL
	20MA SETPOINT		220°F {50 to 220°F} (Not applied unless SETPOINT SOURCE is set to 4-20MA)	
	BOILER START		4.11 MA {3.7 to 4.3 MA} (Applies to either 4-20ma setpoint or modulation)	
	PRIORITY		Default = NORMAL {NORMAL or HIGH} NOTE: HIGH will cause the 4-20MA input to take control when a contact closes across the 4-20MA ENABLE terminals (J12A). To set to HIGH, make sure SETUP | SETPOINTS | SETPOINT SOURCE is set to AUTO.	
PASSWORD			Default = AAAAAA (Restore to default by pressing BACK while turning ON/OFF switch to ON.) Password ***must be 6 characters long*** — the control will not accept blank characters.	
	CHANGE PASSWORD OLD:>?_____		Enter current password Press SELECT, enter old password using arrow keys and SELECT for each character.	CHANGE PASSWORD OLD: >?_____
	CHANGE PASSWORD NEW:>?_____		Enter new password Press SELECT, enter new password using arrow keys and SELECT for each character. Once all six places are filled, the display changes as shown below.	CHANGE PASSWORD OLD: AAAAAA NEW: >?_____
	ACCEPT PASSWORD		Once new password is entered, press SELECT to save or press BACK to cancel.	CHANGE PASSWORD OLD: AAAAAA NEW: XXXXXX ACCEPT PASSWORD?
COMMUNICATIONS	BAUD		19200	COMMUNICATIONS BAUD 19200 PARITY EVEN MODEM NO
	PARITY		EVEN {EVEN or ODD}	
	MODEM INSTALLED		NO {YES or NO}	
LOAD DEFAULTS	FACTORY CAL?		NO {YES or NO}	FACTORY CAL? NO FACTORY RESET? NO
	FACTORY RESET?		NO {YES or NO}	
SYSTEM	FACTORY TEST		Press SELECT and the test will proceed.	FACTORY TEST LOAD FIRMWARE NO
	LOAD FIRMWARE		NO {YES or NO}	
	OPTION:		NO OPTION {DUAL FUEL or NO OPTION}	
	APPLICATION		HEAT {HEAT or DHW}	

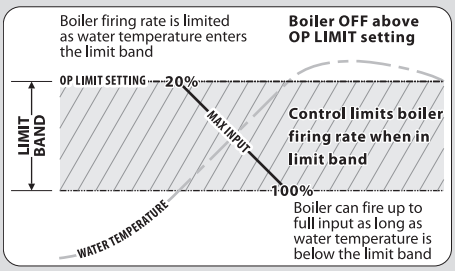
7 Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations

Menu item	*Under . . .*	*Explanation*
FIRMWARE VERSION	V X.XX	All boilers in a multiple boiler application should preferably have the same firmware version to ensure consistency. If versions are different, they must all have the same first digit in the version number (i.e., 3.x).
# OF BOILERS	BOILERS	Display only — shows the number of boilers detected on the network for a HeatNet network only; displays the total number only on the Master boiler; displays "1" for MEMBER boilers or for any boiler not on a HeatNet network. The maximum number of boilers on a HeatNet network is 16.
LEAD BOILER #	BOILERS	Sets the boiler that starts first in multiple-boiler systems.
HEAT BAND	BOILERS	 The heat band is the height of the modulating band. When the water temperature is between ½ the heat band above or below the setpoint temperature, boiler firing rate modulates. Boilers are at minimum input at the upper end of the band and maximum input at the lower end of the band. Boilers come on only if the water temperature is below the band. Boilers stage off when the water temperature is above the band.
HEATNET BOILERS	BOILERS	This line appears on the display only for a HeatNet Master boiler (boiler with a sensor connected to the SYSTEM HEADER sensor input terminals). The line is *blank* on MEMBER boilers. If the number of boilers shown is less than the number of boilers on the HeatNet network, check the yellow light on the HeatNet connection port of each boiler. The yellow light will be ON if the communications port is successfully connected to the Master. The address of each recognized MEMBER boilers (addresses 2 up to 16), and begins with "1," the address of the Master boiler.
LOCAL SETPT OR SYSTEM SETPT	SETPOINTS	Setpoint temperature controlled by the HeatNet control. Local setpoint refers to boiler supply temperature. System setpoint appears if there is a sensor connected to the SYSTEM HEADER sensor terminals. System setpoint refers to the header temperature. NOTE: If the boiler is operated by a Master control or by a remote control (building management system, 4-20ma control, etc.), this setpoint temperature only comes into play when the HeatNet control is in override mode (such as by closing its Heat Demand, AA or T1, T2 terminals; or by the 4-20mA Enable if 4-20mA is set to Highest Priority).
OPERATE LIMIT	SETPOINTS	This is for boilers regulating header temperature instead of boiler supply temperature, or boilers operated by an external source, such as by a Master boiler on a HeatNet network or by external 4-20mA signal or closure on T1,T2 or AA. OPERATE LIMIT is the temperature at the boiler outlet that will cause the boiler control to shut down on high temperature limit. It must be high enough above the upper end of the heat band to avoid nuisance cycling. For boilers operating as stand-alone and regulating boiler supply temperature, this setting is not necessary, because the boiler shuts off when the SUPPLY temperature exceeds the top of the HEAT BAND. The maximum setting is 220°F. Example: If the boiler setpoint is 180°F, and the heat band is 30°F, the upper end of the heat band is 180 + 30/2 = 195°F. The limit band (see below) must be set at 10°F so the OP LIMIT setting can be: 195 + 10 = 205°F. The OP LIMIT cannot be higher than 220°F. The operating limit setting (OPERATE LIMIT) always limits boiler outlet water temperature, regardless of how the boiler is controlled (HeatNet member, 4-20ma control, stand-alone or other). The OP LIMIT BAND (see below) determines when the boiler begins to be forced to reduce input as the outlet temperature rises toward the limit setting.

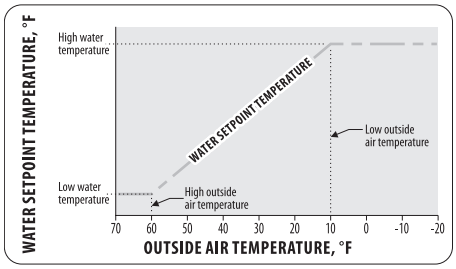
Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations (continued)

Menu item	*Under . . .*	*Explanation*
OP LIM BAND	SETPOINTS	 If the boiler outlet water temperature rises toward the OPERATE LIMIT setting, the HeatNet control will begin to reduce the boiler's firing rate when the temperature gets within the limit band degrees F below the operating limit setting. At the lower end of the limit band, the boiler can fire up to maximum input (100%). By the time the temperature reaches the upper end of the band (the OP LIMIT setting), the boiler is limited to minimum input (20%). Example: If OPERATE LIMIT is set to 220°F and OP LIM BAND is set to 30°F, the boiler will begin to reduce firing rate when the SUPPLY temperature in the boiler exceeds 220° – 30° = 190°F. The boiler firing rate will be reduced to minimum when SUPPLY temperature reaches 220°F. The boiler will shut off if the SUPPLY temperature rises above 220°F. Restart — The boiler will not fire again until the SUPPLY temperature drops below the bottom of the OP LIM BAND. For the example above, the boiler will be allowed to come on again below 190°F. The limit band reduces the likelihood of short cycling on boilers controlled by a master control or a remote control by reducing boiler maximum allowable firing rate as the temperature rises toward the limit setting. Make sure the lower end of the limit band is above the upper end of the heat band.
SETPOINT SOURCE	SETPOINTS	Specifies where the space heating setpoint temperature comes from: **AUTO:** With AUTO selected, the HeatNet control determines the setpoint (using local setpoint, outdoor reset or SYS/DHW HEADER temperature setpoint). **4-20mA:** If 4-20mA is selected, the HeatNet control determines setpoint based on the signal it receives at the 4-20ma terminals on the connection board. There must be a contact closure across the 4-20mA ENABLE terminals (J12A) for the boiler to respond to the 4-20mA signal. The temperature and boiler start settings are set in the ADVANCED SETUP | 4-20mA INPUT menus. (The menu will automatically transfer to the 4-20mA INPUT menus if 4-20mA is selected for SETPOINT SOURCE.) If the HEAT DEMAND input is closed, the H-NET control will use the SYSTEM SETPT or LOCAL SETPT temperature to control the boiler(s) if the 4-20ma signal is below 5ma. Once the current exceeds 5ma, the setpoint is determined from the ma signal value. (This method may be thought of as a backup in the event the 4-20ma signal is lost.) If the HEAT DEMAND input is open, the 4-20ma signal will start the H-NET system once the current exceeds 5ma. Temperature is controlled to the setpoint determined by the milliamp signal value.
OA RESET	OUTDOOR AIR	Set to "ON" to enable resetting the SUPPLY temperature (or SYSTEM HEADER temperature) based on outside air temperature. This requires an outdoor sensor when enabled. Set to "OFF" to disable outdoor reset.
WARM WEATHER SD	OUTDOOR AIR	When this setting is YES, the boiler will shut down when outdoor temperature is at or above WWS SETPOINT. The outside temperature must drop at least 2°F below the WWS SETPOINT for the boiler to come on again. Set to NO to disable.

7 Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations (continued)

Menu item	*Under . . .*	*Explanation*
WWS SETPOINT	OUTDOOR AIR	The boiler and its circulator shut down when the outside air temperature is above WWS SETPOINT if outdoor air reset is enabled (ON). This requires an outdoor sensor when enabled. The differential is 2°F; i.e., the boiler will shut off if the outdoor temperature is equal to or greater than OUTDOOR AIR setting. The outdoor temperature must drop 2°F below OUTDOOR AIR setting for the boiler to turn back on. If the OA OVR input is closed, outdoor reset and warm weather shutdown are overridden. The boiler will run at LOCAL/SYSTEM SETPOINT. This function can be used to operate the HeatNet system at a fixed temperature (equal to the LOCAL SETPT or SYSTEM SETPT), for applications such as DHW heating.
LOW WATER AT HIGH OA TEMP **HI WATER AT LOW OA TEMP**	OUTDOOR AIR SET OA SETPTS	 These temperatures determine the reset curve for supply water temperature. High water at low outside air means the design water temperature for maximum load (at ODT, or outside design temperature for the installation). The other end of the reset curve is the low water temperature at high outside air temperature. The low water temperature is generally equal to room temperature, meaning no heat input to the space would occur below this outside air temperature.
POST PRG TIME	PUMP OPTIONS SYSTEM PUMP	SYSTEM PUMP settings apply to a system pump if it is to be cycled by the HeatNet control. Connect a relay or starter for the system pump to the SYSTEM PUMP terminals (J13). DO NOT directly connect the pump motor with these terminals. They are for pilot duty only. To prove system flow before boiler operation, install a flow proving switch across SYSTEM WTR FLOW terminals (J11A). Place a jumper on these terminals if system flow proving is not used. POST PRG TIME keeps the pump running for the specified time after call for heat is completed, allowing distribution of residual heat to the system. WARNING — The system must be equipped with a bypass pressure regulator or other means to prevent dead-heading if system valves close when call for heat is completed.
ALWAYS ENABLED	PUMP OPTIONS SYSTEM PUMP	If enabled, the system pump remains on constantly. If pump is constant, DELTA TEMP and POST PRG TIME have not effect. NOTE: If the option is enabled, the system pump will shut down if outdoor air reset is enabled and the outside temperature is above OA SETPOINT (summer mode operation). WARNING — The system must be equipped with a bypass pressure regulator or other means to prevent dead-heading if system valves close when call for heat is completed.
SUMMER PUMP JOG:	PUMP OPTIONS SYSTEM PUMP	This option is available to prevent the pump from seizing during long idle periods. Enable the option to have the system pump operated once per week (specify the day in setup). The pump will cycle on at 12:00 AM on the day specified. It will operate for a time equal to the time set for POST PRG TIME. WARNING — The system must be equipped with a bypass pressure regulator or other means to prevent dead-heading if system valves close when call for heat is completed or during summer or outdoor air shutdown.
DELTA TEMP ENAB	PUMP OPTIONS LOCAL PUMP	The boiler pump can be set to run after boiler shutdown to distribute residual heat to the heating system. Delta enable causes the boiler pump to run until the temperature difference between boiler inlet and outlet is less than DELTA TEMP (see below). The pump will continue to run an additional period after this for the amount of time specified in PURGE TIME (below).
DELTA TEMP	PUMP OPTIONS LOCAL PUMP	When DELTA ENABLE (above) is set to "ON," the boiler pump will run until the temperature difference across the boiler is less than DELTA TEMP. (The pump will run an additional time equal to the PURGE TIME.) An inlet temperature sensor is required.

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Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations (continued)

Menu item	*Under . . .*	*Explanation*
POST PRGE TIME	PUMP OPTIONS LOCAL PUMP	The boiler pump can run after boiler shutdown to distribute heat remaining in the boiler water. POST PRGE TIME sets how long the boiler pump will run. (Also see DELTA TEMP, above.) NOTICE: For systems that shut off flow valves (such as zone valve systems) when the call for heat is satisfied, this option must be set to "0" to prevent dead-heading the pump.
ALWAYS ENABLED	PUMP OPTIONS LOCAL PUMP	If ALWAYS ENABLED is set to "YES," the boiler circulator never turns off.
MASTER PUMP/VALVE REMAINS ON:	PUMP OPTIONS PUMP/VALVE OPTION	If set to "ON," the master control in the network will keep its pump contacts closed (running its pump and/or control valve) if no other boilers are operating. This is used to prevent dead-heading system flow.
FLOW PROVE	PUMP OPTIONS FLOW PROVE	This is the time allowed for flow to prove (closure across the J11B "WTR FLW" terminals. It can be increased to allow time for slow-opening valves to open. The flow proving switch must remain closed for at least 2 seconds for the control to accept the proving signal to prevent nuisance problems caused by fluttering flow switches.
SETBACK ENTRY	NIGHT SETBACK	Setback entry is the designator for the setback operation. Up to four (4) setback operations can be programmed.
ENTRY IS	NIGHT SETBACK	Select "ON" to enable a setback operation. Then program the times, days and setpoint. The setpoint assigned will override the HeatNet control's setpoint when setpoint is controlled locally. It will not override 4-20ma control or building management control.
SETBACK	NIGHT SETBACK	This is the reduction in local (or system) setpoint temperature during the specified period.
SETBACK TIME	NIGHT SETBACK	Enter the start and end days and the times for start/end.
TEMP SCALE	OPTIONS	Select Fahrenheit or Centigrade.
KEY CLICK	OPTIONS	If activated, the control beeps when a key is pressed.
SKIP PASSWORD	OPTIONS	The control can be programmed such that a password is required to change settings. Setting this to "ON" disables the password. If SKIP PASSWORD is OFF, then a password is required to enter the setup menus. Default password = AAAAAA (Restore to default by pressing BACK while turning ON/OFF switch to ON.) Password must be 6 characters long — the control will not accept blank characters.
BRIGHTNESS	OPTIONS	Adjust the brightness of the display.
RUN HRS	LOG/RUNTIME	Displays the total time the boiler gas valve has been open.
DATA LOG ENTRY	LOG/RUNTIME	Displays the current entry in the data log (see Figure 12, page 46).
SIZE	LOG/RUNTIME	Displays the current number of entries in the data log.
BOILER CYCLES	LOG/RUNTIME	Displays the number of times the boiler gas valve has been cycled on, then off. It does not include failed ignition attempts.
TYPE	AUX FNCTIONS COMBUSTION AIR DAMPER	This option allows selecting either a single, master combustion air damper or an individual, independent damper for each boiler. Select LINKED/COMMON if only one damper is present. If the damper fails to prove, all boilers in the system are disabled. The control will re-attempt to prove the damper every 10 minutes. Select INDEPENDENT to operate an independent damper with each boiler. If a boiler's damper fails to prove, the control will shut down only that boiler, and will retry proving every 10 minutes.
IN USE?	AUX FNCTIONS COMBUSTION AIR DAMPER	Enter YES to enable the combustion air damper interlock. If ***not*** using the combustion air damper, make sure the damper proving terminals on the HeatNet control board are jumpered. NOTE: If the damper is not proven, the HeatHet control will retry proving every 10 minutes.
INPUT	AUX FNCTIONS COMBUSTION AIR DAMPER	This indicates which terminals are connected to the combustion air damper proving switch.

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Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations (continued)

Menu item	*Under . . .*	*Explanation*
PROOF TIME	AUX FUNCTIONS COMBUSTION AIR DAMPER	Set proof time long enough to be sure the combustion air damper can open and activate its end switch.
RUN IN LOCAL IF: **H-NET COMM LOST**	AUX FUNCTIONS FAILSAFE MODES	When set to NO, the boiler will only operate if activated by an override input (AA, 4-20mA enable, or T1/T2). When set to YES, the boiler will revert to LOCAL operation, controlling its outlet water temperature to the LOCAL SETPOINT setting. The LOCAL PUMP relay will be set to always ON during failsafe operation. NOTE: The control will wait 10 minutes after losing communications with the HeatNet master before switching to local operation.
RUN IN LOCAL IF: **LOW TEMP:**	AUX FUNCTIONS FAILSAFE MODES	This function can automatically start the boiler (or boilers, via the Master) if water temperature drops below the value set for TEMP LESS THAN. This function can be used to provide automatic freeze protection. The LOCAL PUMP relay will be set to always ON during failsafe operation. Once the temperature (TEMP LESS THAN value) is reached, the boiler (or boilers) will shut off. Select which sensor to monitor: SUPPLY, RETURN or HEADER.
RUN IN LOCAL IF: **TEMP LESS THAN**	AUX FUNCTIONS FAILSAFE MODES	Set the minimum allowable temperature for the location selected in LOW TEMP, above. The LOCAL PUMP relay will be set to always ON during failsafe operation.
ALARM TYPE	AUX FUNCTIONS HEAT EXCHANGER	This setting determines the way in which the control reacts when the differential temperature across the heat exchanger exceed the specified maximum differential temperature. The default alarm condition is a WARNING. The WARNING state will allow the boiler to keep functioning and display a warning message a a timestamp in the status screen when the maximum differential temperature is exceeded. If FAULT is selected, the boiler will shut down and act as if an interlock has tripped. After the Delta T has dropped by 10°F, the boiler will restart if the demand is still present.
EXCHGR DELTA	AUX FUNCTIONS HEAT EXCHANGER	This feature is active if LIM->HALF RATE is set to YES (see following explanation). When the temperature rise through the boiler (SUPPLY minus RETURN temperatures) rises higher than the value of EXCHGR DELTA, the control immediately begins limiting the boiler firing rate to one half of the called for rate. This quickly reduces the boiler output to avoid short cycling on limit. The control will return to normal operation once the boiler temperature rise reduces to 10°F less than the value set for EXCHGR DELTA.
LIM->HALF RATE	AUX FUNCTIONS HEAT EXCHANGER	Set this feature to YES to cause the control to automatically reduce the boiler firing rate to one half the called for value if the temperature rise through the boiler exceeds the maximum value desired. This maximum temperature rise is EXCHGR DELTA. NOTE: This function can be used to prevent short cycling if the header temperature can drop quickly, causing the boiler to try increasing boiler supply temperature to meet the apparent demand increase. Quick header temperature drop can occur, for example, when boilers are equipped with slow-opening valves — the valve begin to allow flow as they open, but the boiler can't fire until they are fully open and make their end switches. NOTE: DISPLAY — When this feature is enabled, the display will be differently from normal. In RUN mode, the display will show "1/2 INPUT *" instead of RUN %. The "*STATUS" screen will show "ADAPTIVE IN" over the START and STOP times.
DHW BOILER?	DOMESTIC HOT WATER	Setting this value to YES enables the boiler/system for DHW operation. DHW settings are only looked at if this is set to YES.
DHW SETPOINT	DOMESTIC HOT WATER	The setpoint that the boiler/system will target. The boiler shuts off when this temperature is reached.
DHW DIFF	DOMESTIC HOT WATER	This is the amount the temperature must drop below the DHW SETPOINT to start the boiler.
USE SENSOR?	DOMESTIC HOT WATER	If this entry is set to YES, the HeatNet control monitors the DHW 10k sensor and regulates the boiler to achieve the DHW SETPOINT.
DHW PRIORITY?	DOMESTIC HOT WATER	If the DHW PRIORITY is set to YES, then when there is a call for DHW, the system pump shuts off. If set to NO, the system pump stays on.

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Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations (continued)

Menu item	*Under . . .*	*Explanation*
POST PURGE	DOMESTIC HOT WATER	This is the time that the DHW relay remains on after the DHW call ends.
DHW MASTER?	DOMESTIC HOT WATER	If set to YES, this boiler becomes the MASTER boiler and will use HeatNet to control MEMBER boilers without the use of a header sensor. If set to NO, only this boiler will run in DHW mode. This setting is only for stand-alone boilers, NOT for a boiler in a HeatNet network.
SYSTEM CLOCK		Set the system clock (time, day of week, month, day and year) on start-up and after any power outage to ensure the data log time stamp information will be accurate. On HeatNet multiple boiler systems, you only have to set the MASTER boiler clock. The MASTER boiler will automatically update all MEMBER boiler clocks.
CONTROL	ADVANCED SETUP DISTRIBUTED CTRL	This is not adjustable. It only displays that the control is a HeatNet (H-Net) control.
H-NET Master	ADVANCED SETUP DISTRIBUTED CTRL	This is not adjustable. It will automatically say YES for the Master boiler and NO for a MEMBER boiler. (The Master boiler is the boiler with a sensor connected to the SYS/DHW HEADER terminals.)
H-NET ADDRESS	ADVANCED SETUP DISTRIBUTED CTRL	Assign each MEMBER boiler a unique address, any value from 2 through 16. The Master boiler H-NET address is automatically set to 255. (The master boiler is automatically recognized because it is the one with a sensor wired to its SYS/DHW HEADER terminals.)
MODBUS ADDRESS	ADVANCED SETUP DISTRIBUTED CTRL	This is used only when the boilers are regulated by a building management system, using MODBUS, BACNET or LonWorks. Assign each member boiler AND the HEATNET master boiler a unique address, any value from 1 to 247.
ADD BOILER DELAY	ADVANCED SETUP MODULAR BOILER	This is the minimum wait time before an additional boiler can fire when called on by the master boiler control.
MODULATE DELAY TIME	ADVANCED SETUP MODULAR BOILER	The boiler will remain at minimum fire when first starting until this amount of time has elapsed.
MOD MAX - LAST FIRE	ADVANCED SETUP MODULAR BOILER	This sets the maximum firing percentage for boilers during times that some boilers are not firing. It limits input of the boilers to keep them as efficient as possible. Once all boilers are started (during high heat demand periods), this restriction is removed, and all boilers can fire up to maximum input. Once any boiler is dropped offline, the restriction is applied again.
MOD MODE	ADVANCED SETUP ADAPTIVE MOD	ADAPTIVE — the Master boiler lowers the modulation rate of all currently-operating boilers before a newly-added boiler enters "main valve" state. After the new boiler main valve starts, the Master boiler waits the DELAY RELEASE time (see below) before allowing return to normal modulation. ORIG KN — the Master boiler allows the HeatNet system to modulate normally as additional boilers start.
DROP DOWN	ADVANCED SETUP ADAPTIVE MOD	ON PILOT — the Master boiler (if MOD MODE is set to ADAPTIVE) waits until the newly-added boiler reaches its PILOT state before lowering the modulation rate of running boilers. IMMEDIATE — the Master boiler (if MOD MODE is set to ADAPTIVE) drops the modulating rate of running boilers immediately when an additional boiler is started.
DELAY RELEASE	ADVANCED SETUP ADAPTIVE MOD	When MOD MODE is set to ADAPTIVE, the Master boiler waits this amount of time before allowing the system to return to normal modulation. This delay allows time for the newly-added heat to impact the system.
ROTATION	ADVANCED SETUP FIRING MODE	Select the rotation method. NOTE: The boiler setup as LEAD BOILER under [SETUP/BOILERS/LEAD STAGE #] will always start first, regardless of rotation method selected. For boilers on a common vent system, this allows specifying the boiler closest to the vertical vent to start first to establish draft in the vent system. TRUE ROTATION (or TRUE RUNTIME ROTATION) attempts to fire all boilers an equal amount of time. FIRST ON FIRST OFF jogs between boilers to balance usage. LAST ON FIRST OFF maintains the same rotation sequence at all times.

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Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations (continued)

Menu item	*Under . . .*	*Explanation*
Master FIRST	ADVANCED SETUP FIRING MODE	Set this to "ON" to always start the master boiler first, regardless of the rotation scheme selected.
SENSOR#	ADVANCED SETUP SENSORS	The HeatNet control can be connected to up to six sensors: OUTSIDE, SUPPLY, RETURN HEADER, and two user-selectable inputs (number 5 or number 6).
TYPE	ADVANCED SETUP SENSORS	For each sensor, select either TYPE Z (10K), ON/OFF, or NONE. Type Z is a thermistors sensor (as supplied by RBI). Type Z sensors are NTC thermistors, 10Kohms at 77 °F, 335.67 Kohms at -40 °F, 185 Kohms at 150 °F, +/- 1 °F, -40 to 140 °F. ON/OFF looks for an external dry contact closure. NONE means no sensor is connected to the terminals.
CALIBRATE ?	ADVANCED SETUP SENSORS	Use this function only if the response to a sensor indicates the control calibration may be off. Calibrate Type Z sensors inputs by attaching a 10Kohm precision resistor across the sensor terminals. Select "YES" after "CALIBRATE." The control will measure the resistance and establish a trim value (in ohms) for the sensor input. The control display will show the trim value setting. The trim value must not exceed +/- 200 ohms. If it does, verify that the resistor is correctly connected. If so, the sensor input is bad. Contact RBI for recommended action. If the trim setting is acceptable, press the SELECT key to accept. The display will show, "TRIM VALUE SET!" After a slight delay, the display will return to the sensors menu.
4mA SETPOINT **20mA SETPOINT**	ADVANCED SETUP 4-20mA INPUT ADVANCED SETUP 4-20mA INPUT	The 4mA SETPOINT and 20mA SETPOINT establish the temperature range when the boiler/system is operated with a remote 4-20mA setpoint. Set the 4mA SETPOINT to the starting temperature. Set the 20mA SETPOINT to the maximum desired temperature (at max signal of 20 mA). Any signal between 4 and 20 mA will change the setpoint proportionally between the upper and lower temperature values. Example: 4mA SETPOINT = 140 °F / 20mA SETPOINT = 200 °F — If the signal is at 4 mA, the setpoint temperature will be 140 °F; at 20 mA, the setpoint temperate will be 200 °F. At 12 mA, the setpoint temperature will be: 140° + (200° – 140°) x (12mA – 4 mA)/16mA = 140° + (60° x 8/16) = 140° + 30° = 170 °F. At 15 mA, the setpoint temperature will be: 140° + (200° – 140°) x (15mA – 4 mA)/16mA = 140° + (60° x 11/16) = 140° + 41° = 181 °F. NOTE: Under SETUP | SETPOINTS, the SETPT SOURCE must be set to 4-20mA. The current must be above the BOILER START value, the 4-20mA ENABLE contact must be closed for remote setpoint operation to function.
BOILER START	ADVANCED SETUP 4-20mA INPUT	This sets the signal current at which the boiler will start/shut off. The boiler will start when the current is approximately 0.10 mA above the setting. The boiler will shut off if the current falls below the setting. Example: 4mA SETPOINT = 3.8 mA — the boiler will start at 3.9 mA and shut at or below 3.7 mA.

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Control menus and adjustments *(continued)*

Table 9 Setup menus — parameter explanations (continued)

Menu item	*Under . . .*	*Explanation*
PRIORITY	ADVANCED SETUP 4-20mA INPUT	When this is set to NORMAL, the priority of a 4-20mA input (when enabled by closure across the 4-20mA enable terminals) is in the normal order: AA (high fire), HEAT DEMAND, HeatNet, 4-20mA, T1/T2. When set to HIGHEST, the priority sequence is changed to give 4-20mA the highest priority (above AA). NOTE: The SETPOINT SOURCE (under SETUP | SETPOINTS) must be set to AUTO for HIGHEST priority to work. The control cannot be placed in LOCAL mode if this PRIORITY is enabled and active.
CHANGE PASSWORD	ADVANCED SETUP PASSWORD	Use to set/change a password. NOTE: You can ***reset the password*** to the default value (AAAAAA) by turning the ON/OFF switch to OFF. Then hold down the BACK key as you turn the ON/OFF switch to ON. The password is only required if the control is setup with SKIP PASSWORD set to NO, found under: ***SETUP*** | ***OPTIONS*** | ***SKIP PASSWORD***.
BAUD	ADVANCED SETUP COMMUNICATIONS	9600
PARITY	ADVANCED SETUP COMMUNICATIONS	Select even or odd as required by communications port used.
MODEM	ADVANCED SETUP COMMUNICATIONS	Select "YES" only if a modem is installed.
LOAD DEFAULTS	ADVANCED SETUP	Load the factory defaults when you want to be sure nothing has been changed or after you have loaded new firmware. 1. Disconnect wires to the Heat Demand terminals and any other remote operation wiring. There must be no call for heat during the process. 2. Navigate the control display to "LOAD DEFAULTS." 3. To restore factory calibration settings or factory settings, section either of the options and select "YES" for the prompt, "ARE YOUR SURE?"
FIRMWARE VERSION (UPDATE CONTROL?)	ADVANCED SETUP SYSTEM	The firmware version in the control must match the version in this manual in order to ensure accuracy of the installation/operation information. The control displays the firmware version number when SETUP is accessed. To update the control's firmware, obtain a disk from RBI or download the current file from the RBI website. **NOTICE** See instructions on the following page for the procedure to load firmware to the HeatNet control, either from a PC or from a flash drive, as explained.
APPLICATION		This is the type of heating application that the boiler will perform. Select HEAT if the boiler is to be used for building heating. Select DHW if the boiler is to heat domestic hot water. This setting makes sure the HeatNet control display displays the correct terms on its status screens.

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Control menus and adjustments *(continued)*

Downloading HeatNet firmware

Firmware can be downloaded to the control through the USB port (J6) on the HeatNet control board. You can use either a PC or a flash drive, as explained below.

NOTICE If power is lost (or cycled) while downloading from a flash drive, the download will be corrupted. Should this happen, the control can only be operated by using a PC and HeatNet software to download the firmware correctly.

Downloading firmware using a PC

1. Disconnect wires to the Heat Demand terminals and any other remote operation wiring. There must be no call for heat during the process.
2. Record all setup information for the application before proceeding (use SETUP WORKSHEET, page 55).
3. Insert the Firmware Update Program disk (or download executable file) into the computer. The program will auto-start if on disk (manually execute the program if working from a file on the computer).
4. Follow the instructions as the program progresses. (If a separate option is provided to install USB drivers, do so before running the firmware update program.)
5. Plug a USB cable into the control connection board, with the other connected to the computer. THE CABLE MUST BE CONNECTED BEFORE STARTING THE FIRMWARE UPDATE PROGRAM.
6. Follow the program instructions for selecting the correct com port and firmware file.
7. Navigate to the HeatNet control ADVANCED SETUP menu, to "SYSTEM."
8. Move the cursor to "LOAD FIRMWARE."
9. NOTICE: The firmware must be downloaded now for the HeatNet control to function again.
10. Return to the computer. Follow the firmware program instructions to begin downloading the firmware to the HeatNet control.
11. If the download is interrupted or fails, turn the boiler ON/OFF switch OFF, then ON. Restart the firmware download program to start the download. (The boiler will appear unresponsive during this time because it is waiting for the download to take place.)
12. When the download is complete, the boiler will power cycle. The display should show STANDBY.
13. If the firmware does not load correctly, the display will remain blank. Try running the firmware program again.
14. Check that the boiler performs properly.

Downloading firmware from a flash drive

1. Disconnect wires to the Heat Demand terminals and any other remote operation wiring. There must be no call for heat during the process.
2. Record all setup information for the application before proceeding (use SETUP WORKSHEET, page 55).
3. Directory
   a. Create a directory in the root directory of the flash drive. Name the directory, "Firmware."
   b. Copy the firmware file to the flash drive under this directory.
4. Enter setup mode on HeatNet control:
   a. Press and hold the BACK key for 5 seconds.
   b. Navigate to ADVANCED SETUP / SYSTEM: LOAD FIRMWARE.
   c. Select YES using the arrow keys.
   d. Press the SELECT key to proceed.
   e. Select YES when prompted, "ARE YOU SURE?"
   f. When SOURCE is displayed, select USB DRIVE.
5. Downloading procedure
   a. After SOURCE is selected, the HeatNet control will display REMOVE USB CABLE.
   b. Remove any cable connected to the USB port (J6) on the HeatNet control board.
   c. The control will display PLEASE WAIT while checking to ensure there is no cable connected.
   d. The control will next display INSERT USB DRIVE.
   e. Plug the flash drive into the USB port (J6).
   f. Press the SELECT key.
   g. The control will display PLEASE WAIT.
   h. The file names in the flash drive FIRMWARE directory will display on the first line of the HeatNet control display.
   i. Use the arrow keys to cycle through the files until the correct file name is listed on the HeatNet control display.
   j. Press the SELECT key to select the firmware file.
   k. LOADING: xxxxxx will appear on the display, and the number will increase as the file is loaded.
   l. Once the file download is complete, the control will emit a series of beeps to acknowledge the download is finished.
   m. The control will no begin burning the new firmware code, indicated by a chirping sound.
   n. DO NOT interrupt power during this time or the firmware will be corrupted. Should this happen, you will have to use a PC and HeatNet software to download the firmware.

NOTICE If power is lost (or cycled) while downloading from a flash drive, the download will be corrupted. Should this happen, the control can only be operated by using a PC and HeatNet software to download the firmware correctly.

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Control menus and adjustments *(continued)*

Calibration of firing rates (blower speeds)

This section describes use of the HeatNet control to set blower speeds for minimum input (MIN OUTPUT), maximum input (MAX OUTPUT) and pilot ignition period (IGNITION).

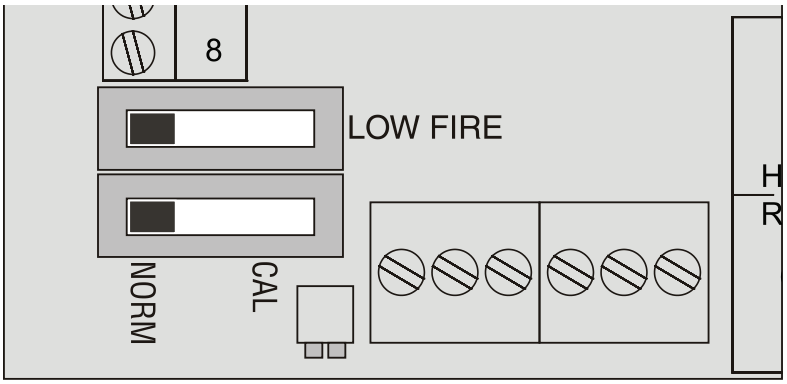
WARNING Follow all of the instructions in the Boiler Installation and Operation Instructions manual to install and adjust the boiler before proceeding with any of the procedures below. Failure to comply could result in severe personal injury, death or substantial property damage.

Entering calibration mode

WARNING Electrical shock hazard — Use caution when working around electrical components in the boiler. Exposed line voltage electrical connections could cause a severe shock. Failure to comply could result in severe personal injury or death.

1. Turn off all call for heat inputs or disconnect wires, if necessary, to ensure there are not heat calls during the procedures.
2. Disconnect the HeatNet cable from the boiler if necessary to ensure there is no call for heat from the MASTER boiler.
3. Turn the boiler ON/OFF switch to ON.
4. Open the boiler front door and locate the control board.
5. Find the calibration switch, located on the lower left corner of the control board. It is labeled, "NORM" and "CAL."

Figure 11 Calibration switch (on lower left corner of control board) — shown with reduced board component detail for clarity



6. Slide the calibration switch to the right to "CAL."

Calibration mode display

1. The HeatNet control is now in calibration mode, and will show "CALIBRATE" on the display.
2. The first screen will show the following. The value shown for temperature is the SYSTEM (or LOCAL) setpoint. MEMBER boilers will show LOCAL SET instead of SYSTEM SET.

3. Press the DOWN key to navigate through the following displays.

This screen is for display only, and shows the setting for DELTA TEMP (see SETUP instructions on previous pages).

This screen is for display only.

Press SELECT to change the value. The number will begin flashing. Use the arrow keys to change. Then press SELECT to save the setting. The value is saved when the number stops flashing.

Press SELECT to change the value (IGNITION rate must be between 20% and 40%.). The number will begin flashing. Use the arrow keys to change. Then press SELECT to save the setting. The value is saved when the number stops flashing.

Press SELECT to change the value. (Minimum must be at least 20%.) The number will begin flashing. Use the arrow keys to change. Then press SELECT to save the setting. The value is saved when the number stops flashing.

Additional screens follow, and show information only for: SUPPLY (supply temperature value) and HEADER (header temperature value).

NOTICE When a setting is blinking, you have 5 minutes to change the value with the arrow keys, or the control will restore the original value and stop blinking.

4. Slide the calibration to NORM to return the boiler to normal operation. Reconnect wires as needed.

8 Boiler operation and status display

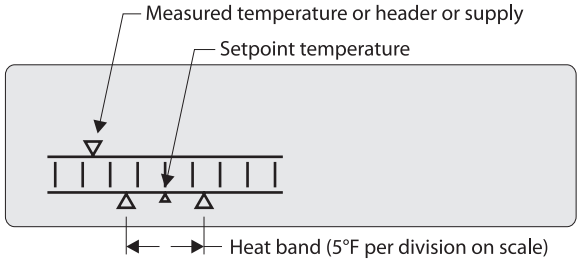
Starting the system

WARNING **Follow the Boiler manual** — Install the boilers according to the Boiler Installation & Operating Instructions manual before attempting to set up the control system. Perform the start-up and adjustment procedures in the manual before proceeding. Failure to comply could result in severe personal injury, death or substantial property damage.

NOTICE **FAULTS** — Clear any faults that appear on the display and make sure to correct the cause before proceeding. You can silence the alarm by applying a jumper across J10B SPARE terminals.

1. Place the LOCAL/REMOTE switch on the MASTER boiler (or stand-alone boiler) to LOCAL.
2. Place MEMBER boiler LOCAL/REMOTE switches to REMOTE.
3. Start the MASTER boiler first. Turn the MASTER boiler ON/OFF switch to ON.
4. The HeatNet control will initialize and show the standby screen unless there is a call for heat.
5. Start a call for heat. As soon as the control receives a call for heat, it will show the setpoint temperature bar, as below:

6. The graphic below explains the temperature bar. You will see the header or supply temperature change as boilers add heat to the system or demand changes.



7. The upper left of the display will show boiler condition (prepurge, etc.) as the boiler begins its cycle. After the boiler begins firing, the screen will show RUN % as above.
8. After the ADD BOILER DELAY time has elapsed, the next boiler will fire. The MASTER boiler display will show the START and STOP times. The START time counts down on the display. When the next boiler starts, a 2 will shown in the BLRS FIRING list. If this doesn't happen, the water temperature may have entered the HEAT BAND, so no additional heat is needed.
9. Watch the temperature response as boilers are added. The HeatNet control will attempt to bring the controlled temperature to the setpoint by modulating boilers to meet the demand.
10. If temperature tends to overshoot too much, adjust the ADD BOILER DELAY, STOP BOILER DELAY, and MODULATE DELAY settings in the ADVANCED SETUP menu to adapt behavior to the system.
11. Member boiler displays will show RUN % in the upper left of the display.

NOTICE The AA terminals are the high fire override. If closed on a MEMBER boiler, the boiler runs independently of the MASTER, because AA takes priority. If AA is closed on the MASTER boiler, the HeatNet network shuts down, and only the master boiler fires (at high fire). If using a diverter valve for a DHW tank, it is recommended that you use a MEMBER boiler, activated with its AA terminals. This way, the HeatNet and heating loop will still be under control.

9 Troubleshooting

Accessing the data log

1. The log stores major events that have occurred during the operation of the boiler. These events include:
   - Faults
   - Boilers starting and stopping
   - Pump activity
   - Valve activity (main and pilot)
   - Input (Type of call for heat)
2. Additional information recorded includes:
   - Time of event (Time stamp)
   - The # of the event in the log
   - The supply water temperature
   - The setpoint
   - The outside air temperature
   - The actual PWM % of modulation
   - All of the boilers that are firing (Master)
3. See Figure 12 for an explanation of the data on the screen.
4. Notice the snapshot #. This is a log entry, of which there are up to 1,000. As soon as you enter the view log screen, it displays the last log entry the boiler recorded.
5. To view previous entries, press the DOWN arrow key.
6. If you pressed the UP arrow key instead, you would have been taken to the very first entry. The log entries form a continuous ring of entries. You can verify this by observing the time stamp as you cycle through the entries.
7. Once the log is full (1,000 entries), pressing the UP arrow key will show the oldest entry and no longer take you to the first entry. The log cannot be cleared and is a continuous record of 1000 entries. Older entries are overwritten.
8. To exit the log, press the BACK key.

NOTICE Boiler (x) on display — The display can only show up to 7 boilers, and this information only appears on the MASTER boiler display. To view boilers above number 7, you will need the Boiler Control Pro software.

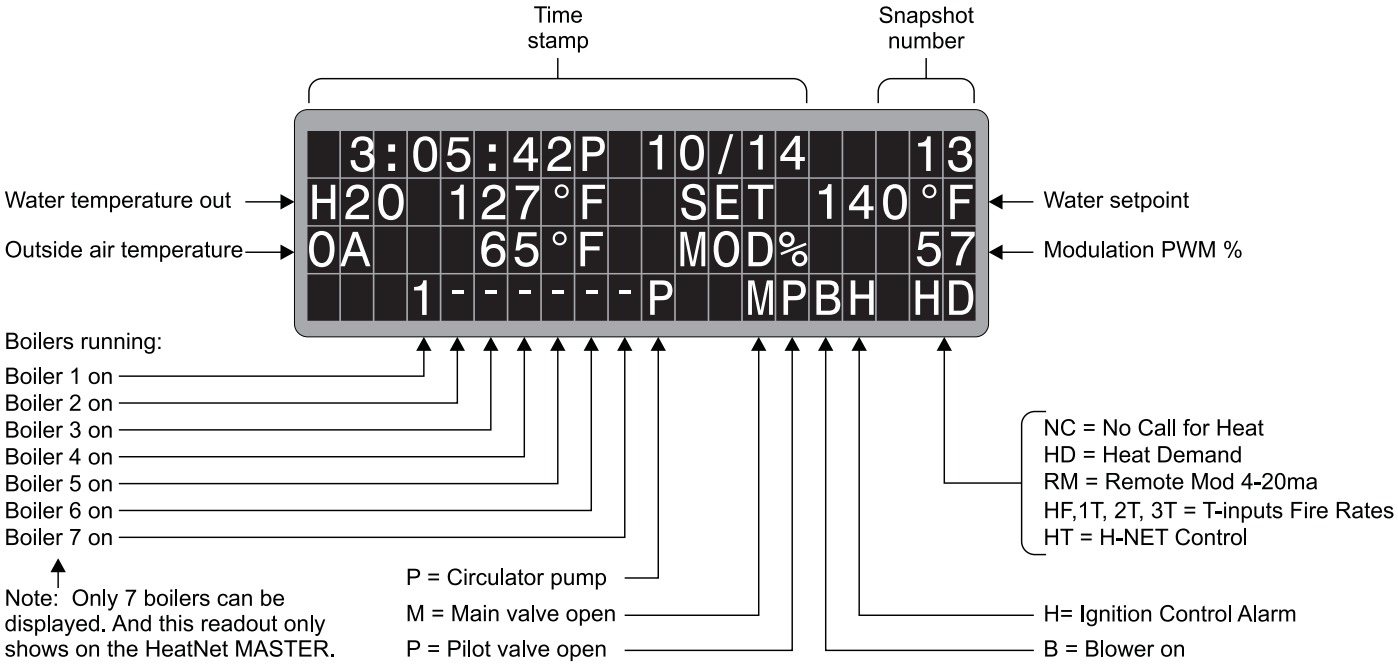
Figure 12 Accessing and using the Log

Enter Setup: From STANDBY, hold BACK for 5 seconds. Then press ⬇ until the cursor points to VIEW LOG.

Press SELECT with the cursor on VIEW LOG.

The screen will now show the most recent entry in the log.

Use the arrow keys to scroll through the log entries.



9 Troubleshooting *(continued)*

Table 10 Line #4 log entries

Line #4 entry	Explanation
SETBACK#1 IS ACTIVE **SETBACK#2 IS ACTIVE** **SETBACK#3 IS ACTIVE** **SETBACK#4 IS ACTIVE** **SETBACK#1 IS EXPIRED** **SETBACK#2 IS EXPIRED** **SETBACK#3 IS EXPIRED** **SETBACK#4 IS EXPIRED**	If one or more of the setbacks is enabled, these entries will occur when the setback is started or ended.
NO LOCAL SYSTEM FLOW **NO SYSTEM FLOW**	This indicates failure of flow proving (switches wired to J11A and J11B).
COMBUSTION AIR FAIL	Logs if the combustion air damper is used and does not prove across J10B DAMPER or J12B DAMPER
SYSTEM RESET -- ---	Records the type of reset the control board experienced — O: stack overflow; U: stack underflow; (both of these are software faults) R: reset instruction (firmware or default load) W: Watchdog (firmware code ran erroneous code and rebooted) P: Power-ON (Power switch toggled) B: Brown-out (Microcontroller saw a voltagle less than 4.5 VDC)
OUTDOOR RESET	This message indicates that warm weather shutdown is in effect.
HIGH DELTA TEMP	This message occurs when the temperature across the heat exchanger is greater than 40 °F.
LOW RETURN TEMP	If the return temperature is less than 130 °F, condensation may occur.
SHUTDOWN UV TEST	After 24 hours of continuous operation, the ignition control module must check its UV detector. The boiler will shutdown and restart, allowing the self-check to occur on start-up. This message indicates this sequence has occurred.
HIGH LIMIT EXCEEDED	This indicates the limit control has exceeded it limit.
IGNITION CTRL ALARM	This indicates the ignition control module faulted while performing an ignition sequence or while monitoring during flame operation.
IRI ALARM	This indicates the gas valve proving circuit detected a gas pressure problem.
DOMESTIC HOT WATER	This indicates the occurrence of a DHW call for heat from a DHW sensor or external DHW aquastat.
LOW WATER CUT-OFF **VAR FREQ DRIVE** **GAS PRESSURE** **SPARE 4** **OP LIMIT MECH**	These are faults due to interlocks connected to 24VAC interlock inputs on J11A and J11B.
OP LIMIT REMOTE	This indicates the software operating temperature limit was exceeded.

9 Troubleshooting *(continued)*

Table 10 Status screen fault displays *(continued)*

Line #4 entry	Explanation
OPEN OUTSIDE SENSOR, SUPPLY SENSOR, RETURN SENSOR, HEADER SENSOR, DHW SENSOR	This indicates a sensor was detected open or not connected.
SHORT OUTSIDE SENSOR, SUPPLY SENSOR, RETURN SENSOR, HEADER SENSOR, DHW SENSOR	This indicates a sensor was detected to be shorted.
AIR SWITCH BLOWER	If the ignition control is called to start and the HeatNet control detects blower operation, but no pilot within two minutes, the boiler locks out. This condition indicates the boiler was stuck on with no flame in the boiler. Causing a lockout provides freeze-up protection.
LOST BOILER # FOUND BOILER #	This indicates the HeatNet control has discovered a boiler or lost a boiler during its auto-detection process.
FAIL SAFE H-NET LOST FAIL SAFE LOW TEMP	This occurs if Failsafe mode is activated and a failsafe condition occurs.

9 Troubleshooting *(continued)*

Fault indications

The HeatNet control monitors both boiler and external interlocks, and will shut down the boiler and display a fault code when a problem occurs. See Table 11 for details.

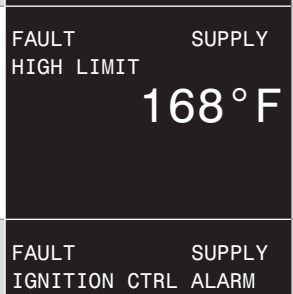
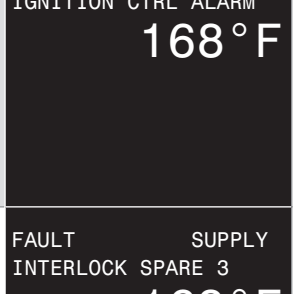
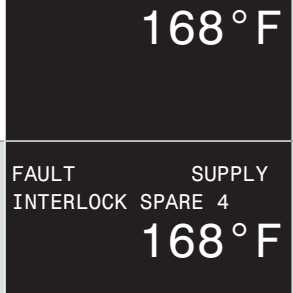
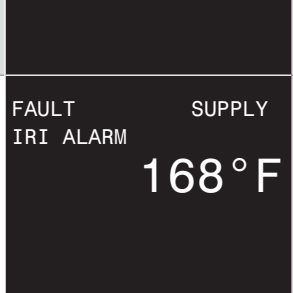
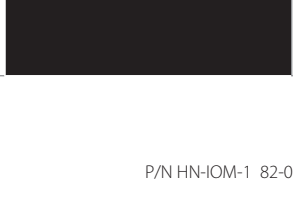
WARNING Some faults will cause the control to shut down the boiler or system and display the message. **CALL FACTORY**. Should this message appear, immediately contact RBI for assistance. DO NOT attempt to correct the condition without discussing the issue with the factory. Failure to comply could result in severe personal injury, death or substantial property damage.

Table 11 Status screen fault displays — when fault is tripped, display will show fault message, beep and close the alarm contact (for remote alarm); the fault displays for a second, then is followed by the time the fault occurred. The fault and time toggle once per second until the condition is corrected. NOTE: Momentary closure across J10B terminals ALARM SILENCE will silence the alarm.

FAULT EVENT & INTERLOCK TERMINALS	CAUSE/Discussion	DISPLAY	Action required to reset from fault
AIR SWITCH (BLOWER)	Occurs if the blower remains in prepurge longer than two minutes. The boiler is shut down until the fault is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.	FAULT SUPPLY AIR SWITCH (BLOWER) 168 °F	Automatically resets control after external limit closes
COMBUST AIR DAMPER (J12B, terminals 7 & 8)	Occurs if closure isn't detected across J12B terminals 7 and 8 within the allowable time after the damper is activated via the J13 BOILER3/DAMPER contact. LINKED/COMMON damper operation (single, common damper): The system is shut down until the fault is corrected, but attempts a restart every 10 minutes. INDEPENDENT damper operation (a damper for each boiler): The individual boiler is shut down until the fault is corrected and the ON/OFF switch is cycled. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.	FAULT SUPPLY COMBUSTION AIR DAMPER 168 °F	MASTER boiler — Automatically resets control after external limit closes MEMBER boiler or stand-alone boiler — Requires cycling of the boiler ON/OFF switch
FLOW SWITCH ERROR (J11B, WTR FLW)	Occurs on failure to close of a flow switch connected to J11B WTR FLW terminals. The boiler will restart every 10 minutes, attempting to prove flow. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.	FAULT SUPPLY WATER FLOW SWITCH 168 °F	Automatically corrects if flow is proven

9 Troubleshooting *(continued)*

Table 11 Status screen fault displays *(continued)*

FAULT EVENT & INTERLOCK TERMINALS	CAUSE/Discussion	DISPLAY	Action required to reset from fault
GAS PRESSURE (J11A, GAS PR)	Occurs on opening of gas pressure switches connected to J11A GAS PR terminals. The high and low gas pressure switches are wired in series. Opening of either switch will cause this fault. The boiler is shut down until the fault is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.		Automatically resets control after condition is corrected
HIGH LIMIT (J5, HIGH LIMIT)	Occurs on opening of an external limit connected to J5 HIGH LIMIT terminals. The boiler is shut down until the fault is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.		Automatically resets control after external limit closes
IGNITION CTRL ALARM	Occurs when the HeatNet control receives an alarm signal from the ignition control. This could occur on ignition failure, air proving switch error, or any other fault that triggers the ignition control's alarm circuit. The boiler is shut down until the fault is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.		Automatically resets control after external signal ends
INTERLOCK SPARE 3 (J11A, SPARE 3)	Occurs on opening of an external device connected to J11A SPARE 3 terminals. The boiler is shut down until the fault is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.		Automatically resets control after condition is corrected
INTERLOCK SPARE 4 (J11B, SPARE 4)	Occurs on opening of an external device connected to J11B SPARE 4 terminals. The boiler is shut down until the fault is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.		Automatically resets control after condition is corrected
IRI ALARM	Occurs when the HeatNet control receives an alarm signal from the gas valve. The boiler is shut down. If the condition isn't corrected within one minute, CALL FACTORY appears on the display. Check the gas valve if this fault appears. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.		Requires cycling the boiler ON/OFF switch to reset after condition is corrected

9 Troubleshooting *(continued)*

Table 11 Status screen fault displays *(continued)*

FAULT EVENT & INTERLOCK TERMINALS	CAUSE/Discussion	DISPLAY	Action required to reset from fault
LOW WATER CUTOFF (J1, LWCO)	Occurs on opening of a low water cutoff switch connected to J11 LWCO terminals. The boiler is shut down until the fault is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.	FAULT SUPPLY LOW WATER CUTOFF 168 °F	Automatically resets control after temperature drops
OPEN ____ SENSOR (ANY SENSOR)	Occurs when the HeatNet control detects an open circuit on any sensor that should be in operation. The boiler will shut down on the failure of any sensor except the OUTDOOR sensor. If the OUTDOOR circuit is open, and the boiler is set for outdoor reset operation, the control reverts to fixed setpoint operation, controlling to either the LOCAL or SYSTEM setpoint, until the condition is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.	FAULT SUPPLY OPEN _____ SENSOR 168 °F (The name of the sensor appears where the _____ is above)	Automatically resets control after external limit closes
SHORTED ____ SENSOR (ANY SENSOR)	Occurs when the HeatNet control detects a short circuit on any sensor that should be in operation. The boiler will shut down on the failure of any sensor except the OUTDOOR sensor. If the OUTDOOR circuit is open, and the boiler is set for outdoor reset operation, the control reverts to fixed setpoint operation, controlling to either the LOCAL or SYSTEM setpoint, until the condition is corrected. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.	FAULT SUPPLY SHORTED _____ SENSOR 168 °F (The name of the sensor appears where the _____ is above)	Automatically resets control after external limit closes
VAR FREQ DRIVE (J11A, VFD)	Occurs when the variable frequency drive sends a fault signal to the HeatNet control VFD terminals on J11A. The display continues showing the SUPPLY, HEADER or other temperature, whichever had been selected for display. The temperature shown is the value detected at the sensor listed.	FAULT SUPPLY VAR FREQ DRIVE 168 °F	Automatically resets control after temperature drops

9 Troubleshooting *(continued)*

Table 12 Troubleshooting suggestions

Situation	Suggested procedure
Nothing happens when the power switch is turned on.	❑ Check 120VAC power on the service connector, J1. Verify power is connected per wiring diagrams. ❑ The Power switch light (ON -Position) should illuminate if power is wired correctly. If the light does not illuminate on the power switch, ensure that J7 is connected to the main board and the power switch. ❑ If the Ignition Control is active, but the front panel display is inactive check: 1. Cable and cable polarity from the control board to the display. 2. J14 on the control board. 120VAC is routed from here to the transformer. The transformer returns 24VAC to power the control. 3. Check for 120vac on the primary of the transformer and 24vac on the secondary. If one of the 24vac interlocks has been shorted to ground or the 24vac output is low, the transformer may be damaged or a 24vac circuit may be miswired. ❑ The HeatNet control is equipped with resettable fuses on the power input circuit. Wiring power incorrectly to the unit will cause these fuses to open. Once the incorrect wiring is corrected, the fuses should reset themselves in less than 5 minutes.
The display shows combustion air damper failure.	❑ If you are not using the combustion air damper then it needs to be disabled in the AUX FUNCTIONS menu. ❑ The prove switch for the combustion air damper is not closing. Check to make sure the dampers are being controlled by the output relay you specified when programming for the damper. Also check to make sure the prove switch is working properly. ❑ If you are using SPARE 1 and you continue to get the error message after the steps above, check the sensor TYPE specified in the SENSORS menu for sensor 5. If it is set to NONE, the controller will not recognize the closed circuit. Set the Sensor type to ON/OFF.
The display is displaying random characters or the control keeps resetting.	❑ There may exist a grounding problem with the controller or one of the boilers, pumps, contactors or other devices connected to it. ❑ If all grounding is correct, there may be an issue with radiated or induced electrical noise (interference). This may be caused by arcing across a contactor's contacts when starting a pump motor or a large electrical load. It may also be caused by the ignition transformer being improperly grounded or the spark gap being out of adjustment. ❑ Attempt to identify the noise source: a. What is the boiler/controller trying to do at the time of the failure? b. Is the boiler on the same circuit as the noise source? (The boiler should have isolated power.) c. Are shielded sensor wires used? (Ensure the shields are grounded only at the boiler control end.) d. Are any sensors or sensor wires located near a transmitting antenna? (Move sensor)
There are no heating boilers on.	❑ Check the settings for WWS SETPOINT and WARM WEATHER SHUTDOWN. a. If the outdoor air temperature is above the WWS SETPOINT and WARM WEATHER SHUTDOWN is set to YES, the circulator pump relay will be locked out and the heating boilers will not fire. b. If the water temperature is within the heating band around the setpoint, boilers will not come on. c. The water temperature must fall below the lower band limit to begin firing boilers.

9 Troubleshooting *(continued)*

Table 12 Troubleshooting suggestions *(continued)*

Situation	Suggested procedure
Unable to change the # of Boilers in the BOILERS menu.	❑ In H-Net method, the control auto-detects the boilers in the system and adjusts the number of boilers accordingly. ❑ Using H-NET, if the number of boilers is not being detected properly as the actual number of boilers in the system, check each boiler. There can only be (1) master boiler, but there can be up to 15 member boilers. ❑ Make sure only the master boiler has a Header Sensor (SYSTEM HEADER) connected. ❑ Verify that each boiler's HeatNet cable is in place. ❑ Verify that each boiler has a unique address assigned (ADVANCED SETUP | DISTRIBUTED CTRL | H-NET ADDRESS).
The BOILERS menu only indicates one boiler, but there are member boilers connected. The amber light blinks on all of the boilers' communications jacks.	❑ Verify that the latest version of firmware is installed on all boilers. ❑ All boilers in a system must have the same firmware revision (version). ❑ Verify the proper termination is set on the Master and the last Member boiler.
H-Net boilers are detected but then lost and then detected again.	❑ The H-Net communications cable may be receiving interference from the blower, ignition, or other form of radiated electrical noise. The communications cable must be run separate from other wires. ❑ Termination of the jumpers may not be correct or there is more than one master. a. Ensure that the termination dip switches are set on the MASTER boiler and only the LAST MEMBER boiler. All of the other member boilers should have their termination dip switches OFF. b. There may be two or more MASTER boilers. Ensure that only one header sensor is present and connected to the SYSTEM HEADER input. There should be no wires or sensors connected to the SYSTEM HEADER input if the boiler is operating as a member. c. Verify that the HNet cables are of a shielded or twisted pair type. Shielding of the cable is required. d. Minimize possible electrical interference by routing the communications cables away from electrical noise sources, such as motors, ignition controls, contactors, etc.
Only the MASTER boiler Fires, but the system has many boilers and is using H-Net.	❑ In order for the MASTER boiler to act as a MASTER, the header sensor must be set to TYPEZ, and there must be a header sensor present. ❑ At power-up, the header sensor is auto detected. If the temperature of the header sensor at power-up is greater than –25 °F and less than 240 °F it is considered a valid sensor. The boiler will default to the MEMBER mode if the temperature is not in this range, and can only be run locally or by external inputs. ❑ If the LOAD FACTORY DEFAULTS has been used to restore all the default settings, the header sensor has been set to NONE. This needs to be set as stated above (TYPEZ). The header sensor will need to be replaced or the temperature brought into a valid range. Power cycle the boiler and the HeatNet control will detect the sensor (if temperature is in the range listed above). ❑ The HNet needs a communications cable daisy-chained between boilers. Ensure that a good connection is made on the communications board and that the lights on the dual RJ45 jacks flash (roughly twice a second). The MASTER is the only one that should flash with no communications cables plugged in.
You get the error message – WATER FLOW SWITCH or WAITING FOR FLOW.	❑ If the control does not sense a closed circuit at input connection, FLOW SWITCH, check to make sure the circuit for the circulator pump is correct, that the pump is being energized, and that the flow prove switch is working properly. ❑ If there is no flow prove switch, check to make sure that a jumper wire has been connected across J11B, WTR FLW interlock.

9 Troubleshooting *(continued)*

Table 12 Troubleshooting suggestions *(continued)*

Situation	Suggested procedure
You have forgotten the password.	❑ Turn the ON/OFF switch off. Then depress and hold the ESC key while turning it back on. This will load the default password "AAAAAA".
Firmware update program starts to load, but then stops.	❑ Ensure that the USB driver for your PC/Laptop computer is properly installed.
H-Net boilers are detected but then lost and then detected again.	❑ The H-Net communications cable may be receiving interference from the blower, ignition, or other forms of radiated electrical noise. ❑ Termination of the jumpers may not be correct or there is more than one master. a. Ensure that the termination dip switches are set on the MASTER boiler and only the LAST MEMBER boiler. All of the other member boilers should have their termination dip switches OFF. b. There may be two or more MASTER boilers. Ensure that only one header sensor is present and connected to the HEADER input. There should be no wires or sensors connected to the HEADER input if the boiler is operating as a member. c. Verify that the HNet cables are of a shielded or twisted pair type. Shielding of the cable is required. d. Minimize possible electrical interference by routing the communications cables away from electrical noise sources, such as motors, ignition controls, contactors, etc.
Only the MASTER boiler Fires, but the system has many boilers and is using H-Net.	❑ In order for the MASTER boiler to act as a MASTER, the header sensor must be set to TYPEZ, and there must be a header sensor present. ❑ At power-up, the header sensor is auto detected. If the temperature of the header sensor at power-up is greater than –25 °F and less than 240 °F it is considered a valid sensor. The boiler will default to the MEMBER mode if the temperature is not in this range, and can only be run locally or by external inputs. ❑ The HNet needs a communications cable daisy-chained between boilers. Ensure that a good connection is made on the communications board and that the lights on the dual RJ45 jacks flash (roughly twice a second). The MASTER is the only one that should flash with no communications cables plugged in.
You have forgotten the password.	❑ Turn the ON/OFF switch off. Then depress and hold the ESC key while turning it back on. This will load the default password "AAAAAA".
Firmware update program starts to load, but then stops, or does not load at all.	❑ Check that the termination switches, J3 and J6, are not in the termination position. If they are, switch them back temporarily while updating. Restore the switch positions afterwards for proper communication with a building management system. ❑ Ensure that the USB driver for your PC/Laptop computer is properly installed.

10

Setup worksheet *(record all parameters here)*

SETUP MENU		
Menu item	**Default**	**Value**
BOILERS		
# OF BOILERS		
LEAD STAGE #	1	
HEAT BAND	30°F	
SETPOINTS		
LOCAL SETPOINT	180°F	
OPERATE LIMIT	205°F	
OP LIM BAND	10°F	
SETPOINT SOURCE	AUTO	
OUTDOOR AIR RESET		
OA RESET	OFF	
WARM WEATHER SD	NO	
WWS SETPOINT	68°F	
SET OA SETPOINTS		
WATER TEMP AT HIGH OA TEMP	140°F	
	70°F	
WATER TEMP AT LOW OA TEMP	180°F	
	10°F	
PUMP OPTIONS		
SYSTEM PUMP		
POST PURGE TIME	2 minutes	
ALWAYS ENABLED	OFF	
SUMMER PUMP JOG	OFF	
OVR ENAB IN WWS	OFF	
LOCAL PUMP		
DELTA TEMP ENAB	OFF	
DELTA TEMP	10°F	
POST PRGE TIME	2 minutes	
ALWAYS ENABLED	OFF	

SETUP MENU		
Menu item	**Default**	**Value**
PUMP/VALVE OPTION		
REMAINS ON:	OFF	
FLOW PROVE	10 seconds	
NIGHT SETBACK		
SETBACK ENTRY	**1**	
ENTRY IS		
SETBACK		
SETBACK TIME		
START DAY		
TIME		
END DAY		
TIME		
SETBACK ENTRY	**2**	
ENTRY IS		
SETBACK		
SETBACK TIME		
START DAY		
TIME		
END DAY		
TIME		
SETBACK ENTRY	**3**	
ENTRY IS		
SETBACK		
SETBACK TIME		
START DAY		
TIME		
END DAY		
TIME		
SETBACK ENTRY	**4**	
ENTRY IS		

10 Setup worksheet *(record all parameters here)* *(continued)*

SETUP MENU		
Menu item	**Default**	**Value**
SETBACK		
SETBACK TIME		
START DAY		
TIME		
END DAY		
TIME		
OPTIONS		
TEMP SCALE	°F	
KEY CLICK	ON	
SKIP PASSWORD	ON	
BRIGHTNESS	50%	
LOG/ RUNTIME		
RUN HOURS		
DATA LOG ENTRY		
SIZE		
BOILER CYCLES		
AUX FUNCTIONS		
COMBUST AIR DAMPER		
TYPE		
IN USE?	NO	
OUTPUT RELAY #	J10B DAMPER	
PROOF TIME		
ALARM SILENCE		
ALARM SILENCE IN USE?	YES	
INPUT=	J10B SPARE 2	
FAILSAFE MODES		
RUN IN LOCAL IF:		
H-NET COMM LOST:	ON	

SETUP MENU		
Menu item	**Default**	**Value**
LOW TEMP:	OFF	
TEMP LESS THAN	40°F	
HEAT EXCHANGER		
ALARM TYPE	WARNING	
EXCHR DELTA T	40°F	
LIM->HALF RATE	YES	
DOMESTIC HOT WATER		
DHW BOILER	NO	
DHW SETPOINT	160°F	
DHW DIFF	5°F	
USE SENSOR?	NO	
DHW PRIORITY	NO	
POST PURGE	120s	
DEMAND STARTS?	YES	
SYSTEM CLOCK	Verified/updated? _____	

ADVANCED SETUP MENU		
Menu item	**Default**	**Value**
DISTRIBUTED CTRL		
CONTROL	H-NET	
H-NET MASTER	YES	
H-NET ADDRESS	255	
MODBUS ADDRESS	1	
MODULAR BOILER SET		
ADD BOILER DELAY	10 MINUTES 0 SECONDS	MINUTES SECONDS
SHED BOILER DELAY	2 MINUTES 0 SECONDS	MINUTES SECONDS

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Setup worksheet *(record all parameters here)* *(continued)*

ADVANCED SETUP MENU		
Menu item	**Default**	**Value**
MODULATE DELAY TIME	0 MINUTES 10 SECONDS	MINUTES SECONDS
MOD MAX – LAST FIRE	50%	
STOP BAND OFFSET	5°F	
BOILER START TIME	50 SECONDS	
ADAPTIVE MOD		
ADD MODE	ADAPTIVE	
DROP DOWN	ON PILOT	
DELAY RELEASE	0 SECONDS	
MODULATION PID		
Factory set — not adjustable		
FIRING MODE		
FIRING MODE	TRUE ROTATION	
MASTER FIRST	OFF	
SENSORS		
SENSOR #	OUTSIDE	
TYPE	TYPE Z	
CALIBRATED?		
SENSOR #	SUPPLY	
TYPE	TYPE Z	
CALIBRATED?		
SENSOR #	RETURN	
TYPE	TYPE Z	
CALIBRATED?		
SENSOR #	HEADER	
TYPE	TYPE Z	

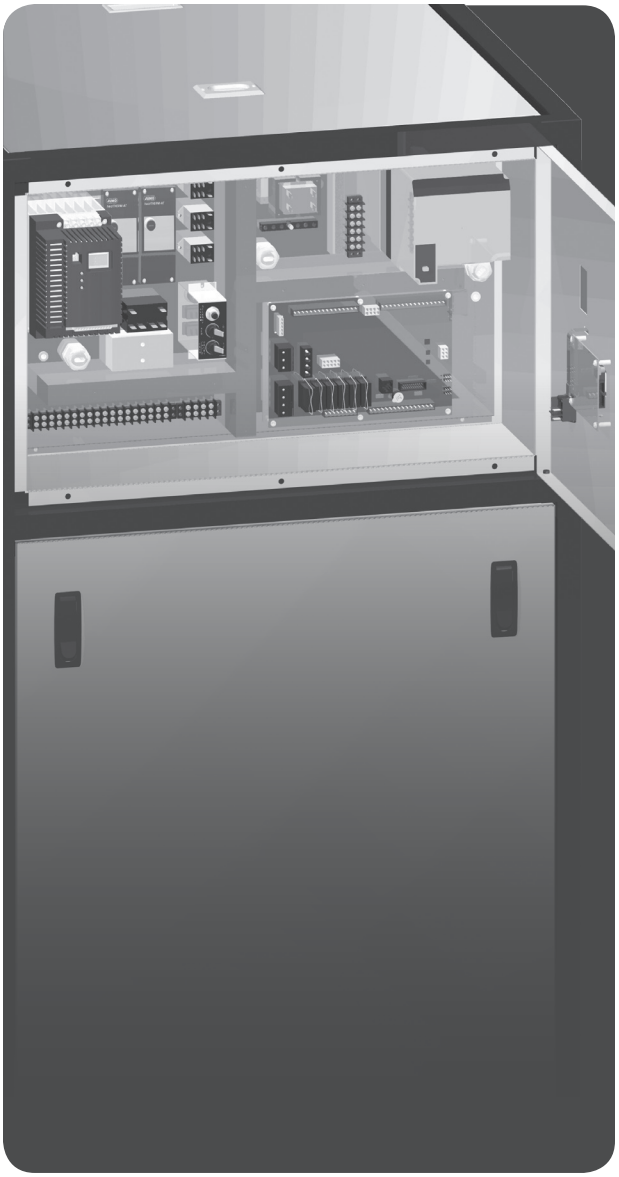
ADVANCED SETUP MENU		
Menu item	**Default**	**Value**
CALIBRATED?		
SENSOR #	5	
TYPE	TYPE Z	
CALIBRATED?		
SENSOR #	6	
TYPE	TYPE Z	
CALIBRATED?		
4-20MA INPUT		
4MA SETPOINT	50°F	
20MA SETPOINT	220°F	
BOILER START	4.11 MA	
PRIORITY	NORMAL	
PASSWORD		
PASSWORD	AAAAAA	
COMMUNICATIONS		
BAUD	19200	
PARITY	EVEN	
MODEM INSTALLED	NO	
LOAD DEFAULTS		
FACTORY CAL?	NO	
FACTORY RESET?	NO	
SYSTEM		
FACTORY TEST		
LOAD FIRMWARE	NO	
OPTION:	NO OPTION	
APPLICATION	HEAT	

Notes

Notes


FUTERA XLF
IGNITION STATUS
HeatNet
OPERATION STATUS
POWER
ON
OFF
RBI
FUTERA III
MODULATION
FUTERA FUSION

11 Control specifications



Control	Microprocessor based PID modulating control (NOT a safety limit)
Environment	–40 °F to 140 °F < 90% RH non-condensing
Input Power	24 VAC, 250 ma
Switched Line	120 VAC single phase (120 VAC models only)
Relays	Stage, Circulator, Alarm 8A 250 VAC
AC Interlocks	24 VAC – 120 VAC input
Control Inputs	AA, Heat Demand, 4-20ma Enable, OA override, T1-T2 (dry contact inputs)
Dimensions	9" wide: 6" high : 2" deep
Temperature Sensors	NTC thermistor, 10K @ 77 °F, 335.67K @ -40 F, 185 @ 150 °F ,+/- 1 °F
Environment	–40 °F to 140 °F < 90% RH non-condensing
USB	1.0
RS485 Console	Modbus RTU, 19200 baud default (9600 baud selectable), 8 bits, Even Parity, 1 Stop Bit
Boiler-to-Boiler	HEATNET
Network	Optional LonWorks, BACnet available

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