

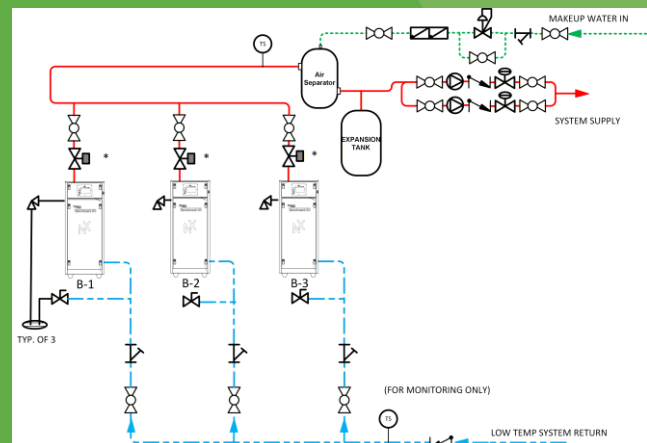
Application Design Guide

Benchmark® NX Boilers with Edge X Controller

Models 399 and 500

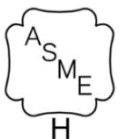
Other documents for this product include:

OMM-0183 BMK NX Installation & Operation Manual
OMM-0170 Edge X Controller Manual
OMM-0184 BMK NX 399-500 Edge Reference Manual
TAG-0119 Benchmark NX Gas Guide
TAG-0120 Benchmark NX Electrical Power Guide
TAG-0121 Benchmark NX Piping Guide
TAG-0122 Benchmark NX Venting and Combustion Air Design Guide



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1. GENERAL

AERCO Benchmark NX (BMK NX) condensing boilers optimizes hydronic system for peak performance and efficiency. They operate with high turndown to match the changing requirements of the energy input, minimize cycling and maximize seasonal efficiency. Their compact footprint allows flexibility and reduce total project installation costs. This guide helps designers apply the BMK NX boilers to the most common types of systems. If a special application is needed, please call your local AERCO Representative or the AERCO factory for specific application information.

Installation, wiring, startup, and service must be performed by qualified personnel in accordance with applicable electrical, mechanical, and building codes.

2. SINGLE AND MULTIPLE APPLICATIONS

Benchmark NX boilers can be used = as stand-alone single units or in multiple batteries with unlimited input. Actual boiler sizing and selection are the responsibility of the designer. ASHRAE standards recommend sizing equipment with minimum of oversizing for maximum efficiency.

3. PIPING

3.1 Pressure and Temperature Ratings

The maximum allowable working pressure (MAWP) for BMK NX boilers is 160 psig (1103 kPa).

Individual ASME pressure relief valves are supplied on each boiler in setpoints of 30, 50, 60, 75, 100, 125, 150, or 160 psig (207, 414, 517, 689, 862, 1034, or 1103 kPa), as specified.

BMK NX units are applicable to systems with temperatures of 50 °F to 190 °F (10 °C to 88 °C). Due to their condensing design, normal low temperature restrictions do not apply. While most heating applications are designed with a 20 °F (11 °C) temperature drop, BMK NX boilers are capable of 50 °F (28 °C) temperature drop through the heat exchanger without thermal stress.

3.2 Flow Rate Specifications

AERCO BMK NX boilers require the following minimum flow rate per boiler for proper and stable boiler temperature control operation. To prevent erosion of construction materials, maximum flow per boiler are limited as shown below.

BMK NX Model	Minimum Flow Rate	Maximum Flow Rate
BMK NX 399	19 gpm (72 lpm)	75 gpm (284 lpm)
BMK NX 500	23 gpm (87 lpm)	91 gpm (344 lpm)

3.3 Pipe Design Provisions

Minimum flow must be observed in piping design. Ancillary flow devices must provide minimum flow. Controls (internal boiler controls and/or building automation system) must be configured to operate pumps and valves to allow flow through BMK NX boilers in operation.

For multiple boiler installations, the piping must be designed to ensure balanced flow through all boilers by using reverse-return piping or a balancing valve at the outlet of each boiler. Failure to balance flow evenly through the boilers will prevent full delivery of boiler capability at design conditions and may cause over-cycling and unnecessary stress on the boilers.

The BMK NX boiler is approved for zero-side clearance in two-unit pairs where space is at a premium. Piping should be located to allow free access between boilers. For maintenance purposes, each BMK NX boiler shall have individual valves on supply and return from the system.

When used with a refrigeration (chiller) system, the boilers must be installed to prevent the chilled medium from entering the boiler.

4. TYPICAL APPLICATIONS

BMK NX boilers can be used in any closed-loop heating system within their design limitations. The following typical piping and wiring schematic diagrams represent the most common types of installation detail. These diagrams are not intended for any particular system but are rather composites of how AERCO boilers interface with heating applications in the real world. The designer should incorporate BMK NX boilers in each system so as to achieve maximum operating efficiency. With ultimate control over the energy transfer process under a broad range of temperatures, the designer should first consider how the system best needs the supplied energy. The boilers should then be applied in the manner that best enables them to use their finite control and capability to supplement the system, using minimum applied energy. The following examples illustrate typical piping and wiring diagrams with brief description of the application and its features:

IMPORTANT!

For all applications, the header sensor (S-1) must be located 2-10 ft from the nearest boiler.

- Diagram 4-1 – Space Heating
- Diagram 4-2 – Space Heating (Primary-Secondary Piping)

NOTE: For Essential System Setting parameters see Edge X Controller Manual, OMM-0170.

See Section 5 for complete Input/Output Reference diagram.

Concept Drawings: The following illustrations are only concept drawings, not engineered drawings. They are not intended to describe a complete system, nor any particular system. It is up to the system designer to determine the necessary components for and configuration of the particular system being designed, including ancillary mechanical and control components, and any safety devices which in the judgement of the designer are appropriate, in order to properly size, configure and design that system and to ensure compliance with building and safety code requirements.

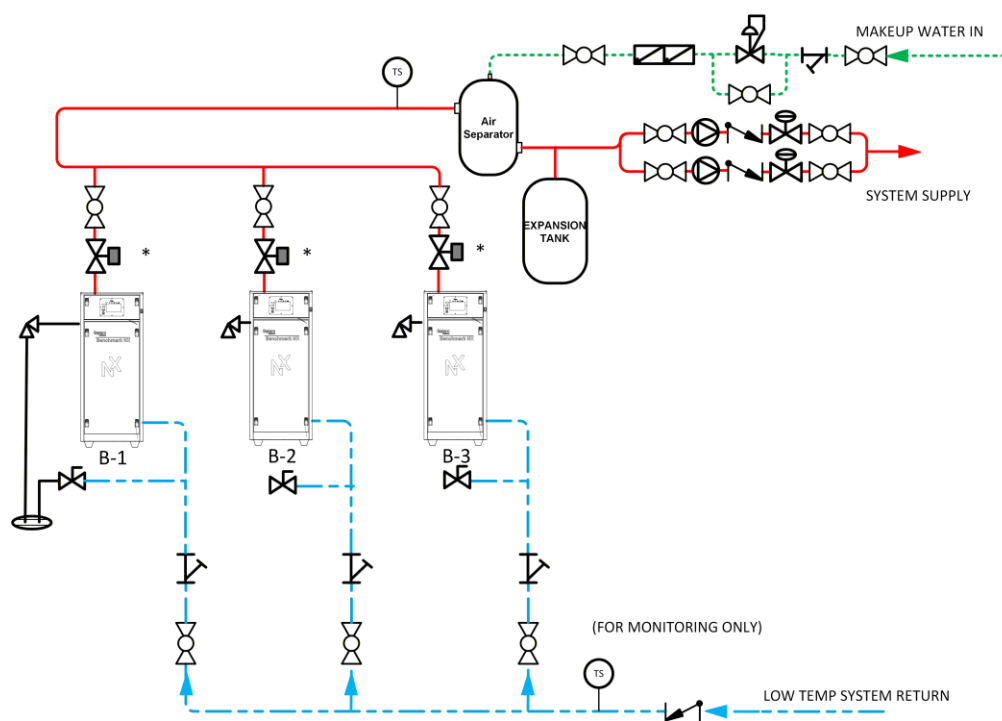
4.1 Space Heating

Application Description & Features: AERCO Benchmark NX boilers are operated via Boiler Sequencing Technology (BST) to provide space heating. Supply temperature is maintained via constant setpoint, outdoor air reset or remote setpoint command (from building automation system or remote analog signal). Application utilizes AERCO supplied header sensor, sequencing valves and outdoor air sensor; return header sensor is optional. Alternatively, instead of controlling to a header temperature, since this application in this paragraph is primary-variable, an average outlet temperature of available unit shall be considered to determine demand.

- The AERCO Edge controller sequences the boiler plant for maximum system efficiency by running as many boilers as available, each operating at its most efficient firing rate.
- Sequencing valves isolate standby boilers, reducing minimum flow requirement.
- Edge controller supports integration with BAS via BACnet MSTP, BACnet IP, Modbus RTU and Modbus TCP.

Essential System Settings:

Parameter	Setting
Cascade Mode	Toggle ON
Operating Mode	Constant Setpoint, Outdoor Air Reset or Remote Setpoint
System HDR Temp Sensor	Direct or BAS
Outside Air Temp Sensor Source (<i>If Operating Mode = Outdoor Air Reset</i>)	Direct or BAS
Isolation Valve RLY Ctrl Function	Isolation Valve RLY Ctrl
Isolation Valve Feedback	Toggle ON



Pipe Temp.	Line Type
CWR	Blue dashed line
HWS	Red solid line
BWS	Green dashed line

	Ball Valve
	Check Valve
	Drain Valve
	Strainer
	Pump
	Backflow Preventer
	Pressure Reducing Valve
	Pressure Relief Valve
	Floor Drain
	Temperature Sensor
	Balancing Valve
	Motorized/Sequencing Valve

WARNING: Hazardous voltage can cause severe injury, death, or property damage.

- Disconnect all electrical power before installing, servicing, or maintaining boiler.
- Lockout and tagout all power sources before performing work.
- Verify power is disconnected before touching electrical components.

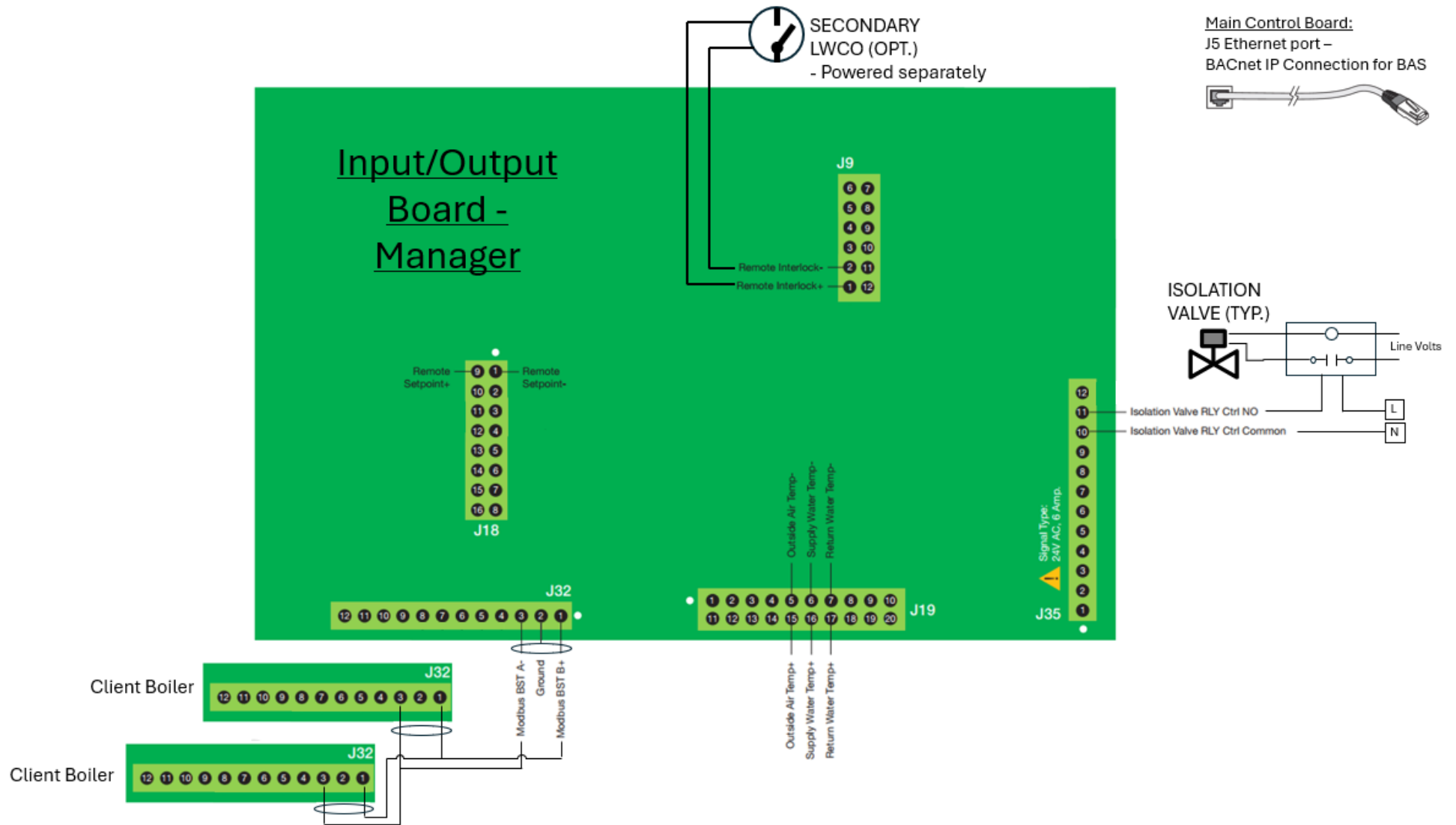


Diagram 4-1b: Space Heating Wiring

4.2 Space Heating (Primary-Secondary Piping)

Application Description & Features: Boiler plant is piped in primary-secondary method with individual boiler pumps. Benchmark NX boilers are operated via Boiler Sequencing Technology (BST) to provide space heating. Supply temperature is maintained via constant setpoint, outdoor air reset or remote setpoint command (from building automation system or remote analog signal). Application utilizes AERCO supplied header sensor and outdoor air sensor; return header sensor is optional.

- The AERCO Edge controller sequences the boiler plant for maximum system efficiency by running as many boilers as available, each operating at its most efficient firing rate.
- Use of variable speed boiler pumps prevents hot water recirculation at the low loss header, resulting to increased efficiency.
- Edge controller supports integration with BAS via BACnet MSTP, BACnet IP, Modbus RTU and Modbus TCP.

Note: For more information on variable speed pump control modes, consult Edge X Controls Manual OMM-xxxx.

Essential System Settings:

Parameter	Setting
Cascade Mode	Toggle ON
Operating Mode	Constant Setpoint, Outdoor Air Reset or Remote Setpoint
System HDR Temp Sensor	Direct or BAS
Outside Air Temp Sensor Source (<i>If Operating Mode = Outdoor Air Reset</i>)	Direct or BAS
Isolation Valve RLY Ctrl Function	Pri Pump SW Ctrl
Isolation Valve Feedback	Toggle ON

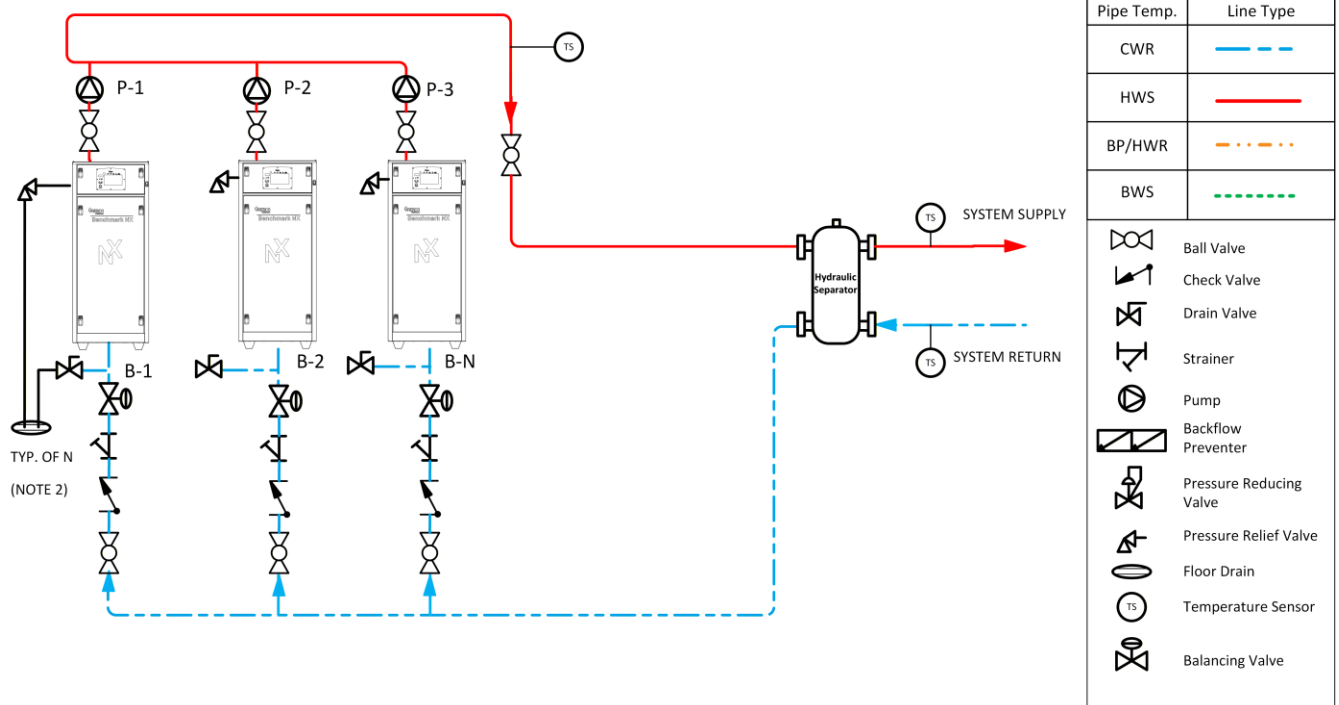


Diagram 4-2a: Space Heating (Primary-Secondary) Piping

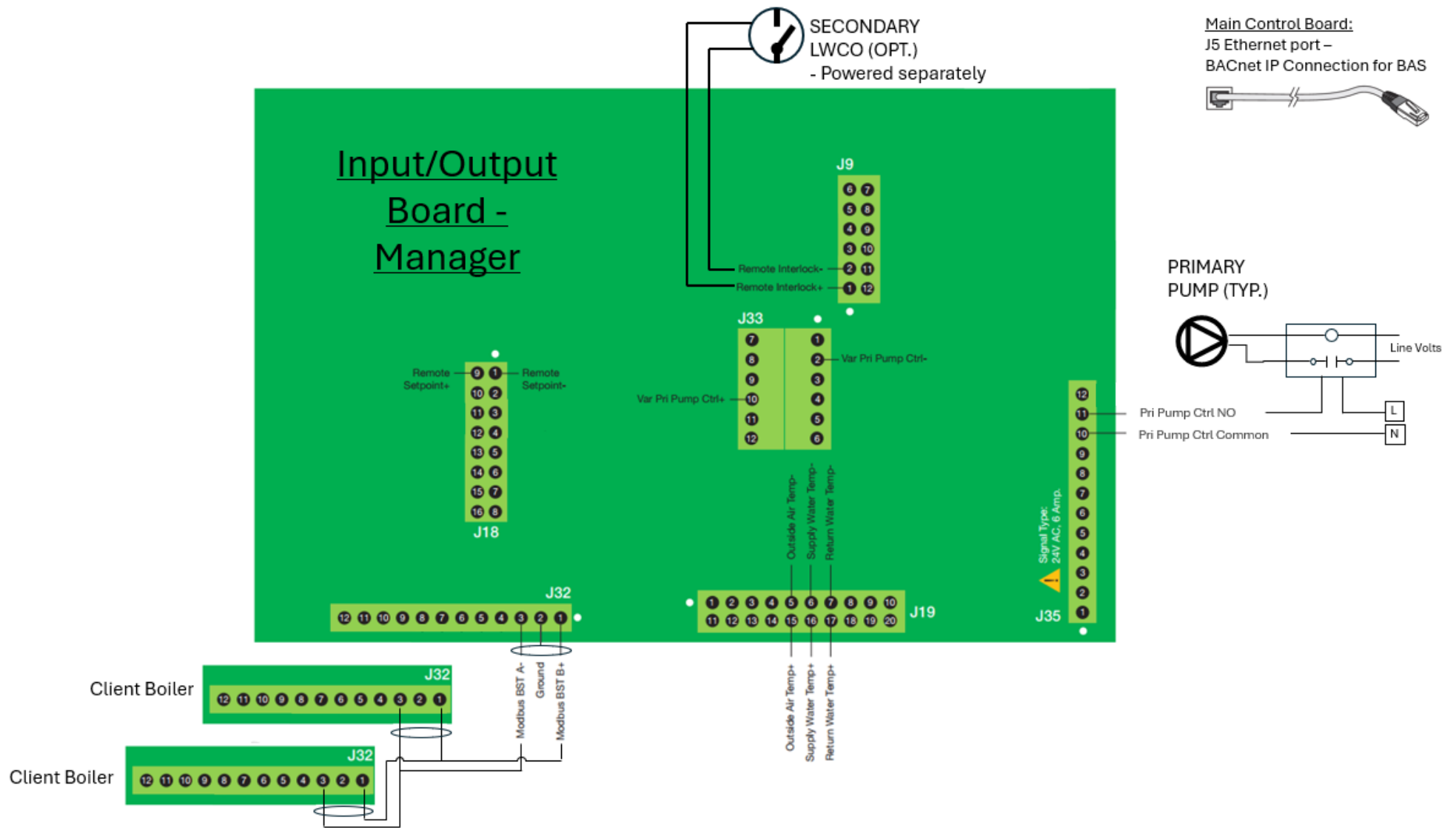


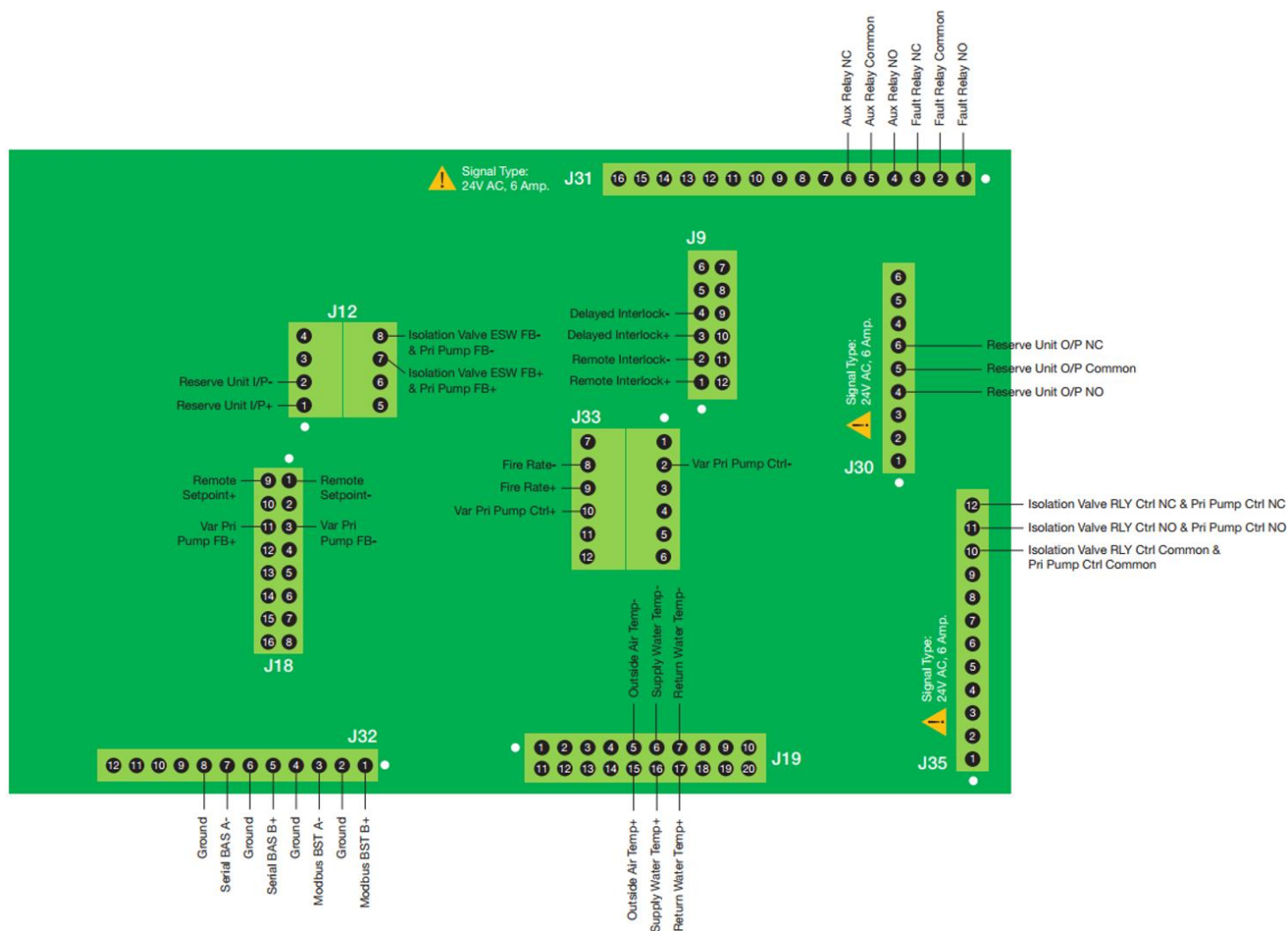
Diagram 4-2b: Space Heating (Primary-Secondary) Wiring

5. INPUT/OUTPUT REFERENCE DIAGRAM

Wiring connections for temperature sensors, control signals, interlocks and auxiliary equipment are made on the Input/Output board. See Benchmark NX Operation and Maintenance Manual, OMM-0183 for details.

The following relays are rated 24VAC, 6A:

- Aux Relay
- Fault Relay
- Isolation Valve Relay / Primary Pump Control
- Reserve Unit Relay





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