AERCO
A WATTS Brand

Boiler Application Guide

MFC II Series Boiler Application Guide

Models 4000 to 12000

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1. GENERAL

AERCO Multi-Fuel Condensing (MFC II) boilers can be used in any hydronic closed-loop heating system application, within the limitations of temperature and pressure ratings. Because of their extreme flexibility and precise control, they can be used to supplement any hot water system. This guide is intended to help designers apply the MFC II 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.

IMPORTANT: This document is intended for informational purposes only and does not replace the official installation manual. Review the full installation and operation manual, including all safety information, before installation.

2. SINGLE AND MULTIPLE

AERCO MFC II boilers can be applied as stand-alone single units or in multiple batteries of boilers with unlimited input. Actual boiler sizing and selection are the responsibility of the designer. ASHRAE standards recommend sizing equipment APPLICATIONS with a minimum of over sizing for maximum system efficiency.

3. PIPING

3.1 Pressure, Operating Temperatures

All MFC II Series units are ASME certified for working pressures of 160 psig (1103 kPa). Individual ASME pressure relief valves are supplied on each boiler in one of the following setpoints, as specified: 100, 125, 150 or 160 psig (689, 862, 1034 or 1103 kPa).

MFC II Series units are applicable to systems with temperatures of 90°F to 190°F. Due to their condensing design, normal low temperature restrictions do not apply. While most common heating applications are designed with a 20°F (11°C) temperature drop, MFC II Series boilers are capable of 100°F (55°C) temperature drop through the heat exchanger without thermal stress.

When firing on backup #2 fuel oil, boiler return temperatures must be maintained above 140°F (60°C) to prevent flue gas condensation. Operating below 140°F (60°C) while firing #2 fuel oil risks damaging the heat exchanger due to excessively acidic (<2 pH) condensate and particulates. Heat Exchanger damage due to condensing while firing on #2 fuel will void heat exchanger warranty. However, if the fuel oil utilized is certified to be ultra-low sulfur (<15 ppm sulfur content), the boiler return temperature may be no less than 100°F (38°C), thus allowing the boiler to condense when firing #2 fuel oil as backup. MFC II Series boilers, when operating on #2 fuel oil as back-up, require visual inspection for any deposits or soot in the tubes every 5 days or 120 hours. If deposits or soot are present, follow the MFC II OMM-xxxx.for cleaning procedures.

3.2 Flow Rate Specifications

MFC II Series boilers have no minimum flow and the heat exchanger will not be harmed by low flow or zero flow conditions. However, it is not recommended to operate the boiler in this manner for more than 5 minutes to prevent over-temperature faults. The following minimum flows are recommended for optimal performance.

TABLE 3-1: Recommended Minimum Flows (at Full Fire, 100°F ΔT)

MFC 4000	76 gpm	(288 L/min)
MFC 5000	95 gpm	(360 L/min)
MFC 6000	114 gpm	(432 L/min)
MFC 8000	152 gpm	(575 L/min)
MFC 10000	190 gpm	(719 L/min)
MFC 12000	228 gpm	(863 L/min)

To prevent erosion of construction materials, maximum flows are limited to the following:

TABLE 3-2: Maximum Flow Limits		
MFC 4000	500 gpm	(1893 L/min)
MFC 5000	630 gpm	(2385 L/min)
MFC 6000	760 gpm	(2877 L/min)
MFC 8000	1010 gpm	(3823 L/min)
MFC 10000	1260 gpm	(4770 L/min)
MFC 12000	1520 gpm	(5754 L/min)

3.3 Water Quality

3.3.1 Make-up or Feed Water Quality

Make-up or feed water is water added to a closed hydronic system to replenish water lost through evaporation, maintenance, or leakage. The quality of make-up or feed water, which may contain dissolved oxygen, minerals and other dissolved contaminants, is extremely important. Such introduced water must be chemically treated or strictly limited when ensuring neutral chemical conditions in boiler system water. Generally, any closed hydronic heating system should be restricted from receiving untreated makeup water of no more than 5% of the total volume of system water per year.

3.3.2 Boiler Water Chemistry Requirements

System water chemistry requirements are as follows. Water in the installation should be checked, monitored, and treated for the following conditions and characteristics.

TABLE 3-3: **Water Quality Requirements**	
Characteristics	**Value**
pH Range	7-11
Oxygen	100 ppb
Iron/Copper	100 ppb
Chloride	150 m

3.3.3 Water Treatment Certification

When using chemical treatments in hydronic systems, it is necessary to ensure that the chosen treatment is appropriate and certified by the manufacturer for such environments. The manufacturer should also guarantee that the treatment, when applied according to the manufacturer's recommendations, will not cause harm to the boiler, pumps, piping, and other components of the hydronic boiler system.

3.3.4 Water Quality Maintenance and Boiler Warranty

Heat exchanger failures due to improperly cleaned/treated and poorly maintained water are not covered under warranty. Scheduled system/boiler water maintenance is required to maintain the heat exchanger warranty. AERCO shall reserve the right to require maintenance records when evaluating warranty claims.

3.4 Piping Design Provisions

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

For multiple boiler installations, the piping must be designed to ensure balanced flow through all the boilers. This can be accomplished 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.

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

3.5 Service Provisions

For maintenance, each MFC II Series boiler should be individually valved on supply and return from the system. The MFC II is approved for 18" side clearance in two-unit pairs in applications where space is at a premium. Piping should be located to allow free access between boilers. Each unit has an individual factory-installed drain in the boiler shell.

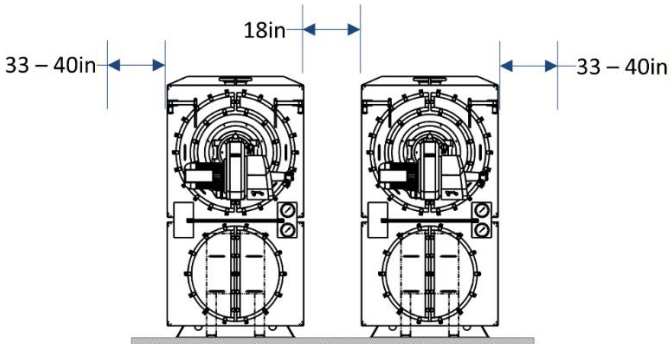


Diagram 2: Approved Minimum Side Clearance Dimensions for Each Two-Unit Pair

3.6 Dual Returns

Optional dual return connections are available for the MFC II series. Utilizing this feature can boost seasonal efficiency by up to 6%. Installations with space heating or process heating along with the following applications that can take advantage of this feature include:

- Domestic hot water applications
- Higher ΔT zones with lower return temperatures
- Air preheat
- Heat pump injection

Rather than blend the separate zones, the lower return temperature zones/systems could be piped separately to the primary water connection, raising the overall thermal efficiency and allowing the boiler to be in condensing zone for longer periods throughout the year.

SECTION 4: CONTROLS

4.1 Safety Control

MFC II Series boilers are equipped with a manual reset high-limit aquastat. Each MFC II Series boiler has ASME Section IV compliant safety controls that are factory supplied and installed during field installation. An external, electric, probe-type, low water cutoff and a manual-reset high-limit temperature device comply with ASME standards. Other locally required external safety devices (flow switches, pressure controls, etc.) should be provided and installed locally. Designers should check with local authorities having jurisdiction to assure compliance with all applicable codes.

4.2 Boiler Operating Control Options

MFC II Series boilers can be shipped with a Weishaupt power burner complete with both combustion safeguard controls and operating controls:

TABLE 4-1: Boiler Control Modes

DESCRIPTION	OUTPUT
Internal Setpoint	Constant Discharge Temp
External Setpoint	Outdoor Reset
Modbus	*Fire Rate Response to Modbus signal
Remote Signal	*Fire Rate Response to BAS/EMS signal (0–10V signal)

For MFC II boilers packaged with Weishaupt burner from AERCO, see OMM-0180 for wiring diagrams. For other burners, refer to the wiring diagrams provided by the manufacturer.

* For Fire Rate Response control modes in Table 4-1, below is the suggested sequence of operation:

1. Consult AERCO for the **Minimum Firing Rate** of the installed MFC II + Weishaupt burner configuration.
2. In steps 3 to 6 below, if isolation valves are employed, ensure a boiler's valve is opened prior to firing.
3. When the first boiler reaches a firing rate of ≥ [Minimum Firing Rate x 2], bring on the next boiler and modulate the firing rates of the two boilers to maintain the system setpoint temperature. For example, for a boiler with 25% Minimum Firing Rate, bring on the next boiler when the operating boiler is at or just over 50% firing rate.
4. As the heating load increases, and each boiler reaches ≥ [Minimum Firing Rate x 2], bring on the third boiler and modulate the firing rates of the three boilers to maintain the system setpoint temperature.
5. As the heating load continues to increase, bring on subsequent boilers following the above logic.
6. In steps 8 to 9 below, if isolation valves are employed, after a boiler is dropped off from the sequence, it is recommended to keep its isolation valve open a minimum of 2 minutes before closing.
7. As the heating load decreases, when the firing rates of the boilers decrease to the Minimum Firing Rate, drop off one of the boilers, and increase the firing rates of the remaining boilers to maintain the system setpoint temperature. For example, for boilers with 25% Minimum Firing Rate and three boilers were firing, when the firing rates decrease to 25% each, drop off one of the boilers and increase the firing rates of the remaining two boilers to maintain the system setpoint temperature. To equalize run times, consider dropping off boilers based on run hours, or dropping the first boiler fired in the last sequence (first on/first off).
8. As the heating load continues to decrease, perform the above logic when the firing rates of the two boilers decrease to the Minimum Firing Rate and fire only one boiler, increasing its firing rate to maintain the system setpoint temperature. When the last boiler's firing rate decreases to the Minimum Firing Rate, put all boilers in standby; if the system pump is constant speed – avoid a dead head condition by opening the isolation valves for all the boilers.

4.3 Field Sensor Location

When a single MFC II Series boiler is used, all water sensors are internal to the boiler unit and are field installed in the designated boiler ports as per the MFC II Series O&M manual. When multiple boilers are used and therefore have a common sensor such as a Header Sensor, the sensor must be located in the field piping. **It should be placed in the common supply at least 2 to 10 feet downstream of the point where the last boiler connects into the supply header.**

All outdoor air sensors should be positioned on the North wall of the building served, and not in direct sunlight. The outdoor air sensor should not be placed inside the boiler air inlet duct, or near the boiler exhaust outlet connection. A sunshield is provided as part of the outdoor air sensor kit.

4.4 Multiple Boiler Control

An optional Master Lead/Lag Panel is available from AERCO. Depending on selected panel configuration, it can control up to eight boilers, as well as auxiliary equipment such as circulating pumps.

5. TYPICAL APPLICATIONS

MFC II boilers can be used in any closed-loop system within 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 MFC II Series boiler(s) in each system 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 description of the application and its features:

- Diagram 5-1 – Space Heating
- Diagram 5-2 – Space Heating (Primary-Secondary Piping)
- Diagram 5-3 – Space Heating with Domestic Hot Water Priority/SmartPlate EV
- Diagram 5-4 – Space Heating with Domestic Hot Water Priority/SmartPlate EV (Primary-Secondary Piping)
- Diagram 5-5 – Space Heating with Domestic Hot Water Priority/Domestic Hot Water Tank
- Diagram 5-6 – Benchmark Space Heating Plant with MFC II backup

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 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.

5.1 Space Heating

Application Description & Features: When an optional Master Lead/Lag Panel is sourced from AERCO, the panel sequences the MFC II boilers. Supply temperature is maintained via constant setpoint, outdoor air reset or remote setpoint command (from building automation system or remote analog signal). Application utilizes header sensor supplied with the panel, sequencing valves and outdoor air sensor; return header sensor is optional.

- The Master Lead/Lag Panel sequences the boiler plant for maximum system efficiency by running as many boilers as available, each operating at its most efficient firing rate.
- Isolation valves may be used to reduce minimum flow requirement.
- The Master Lead/Lag Panel supports integration with BMS via Modbus TCP/IP or RTU.

NOTE: For more information on Master Lead/Lag Panel operation, consult SCC Technical Instructions TS-2000 and Installation Instructions TS-2100.

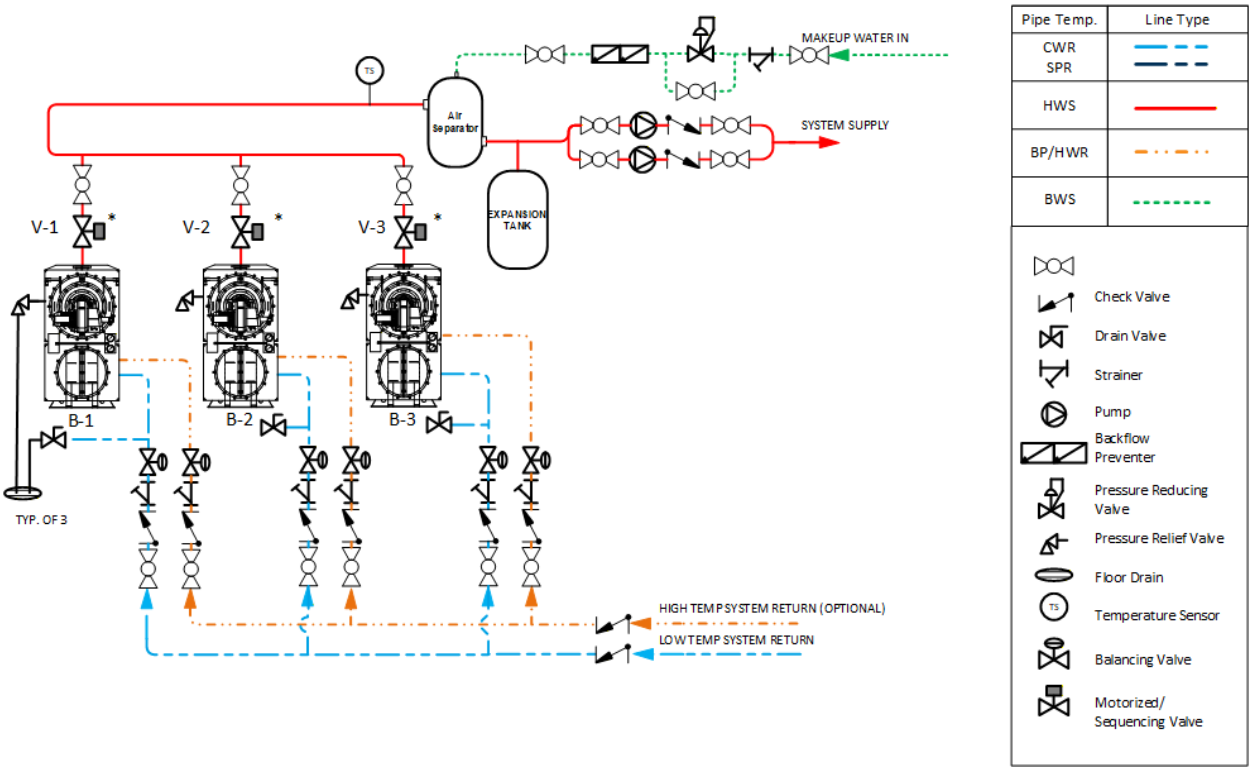
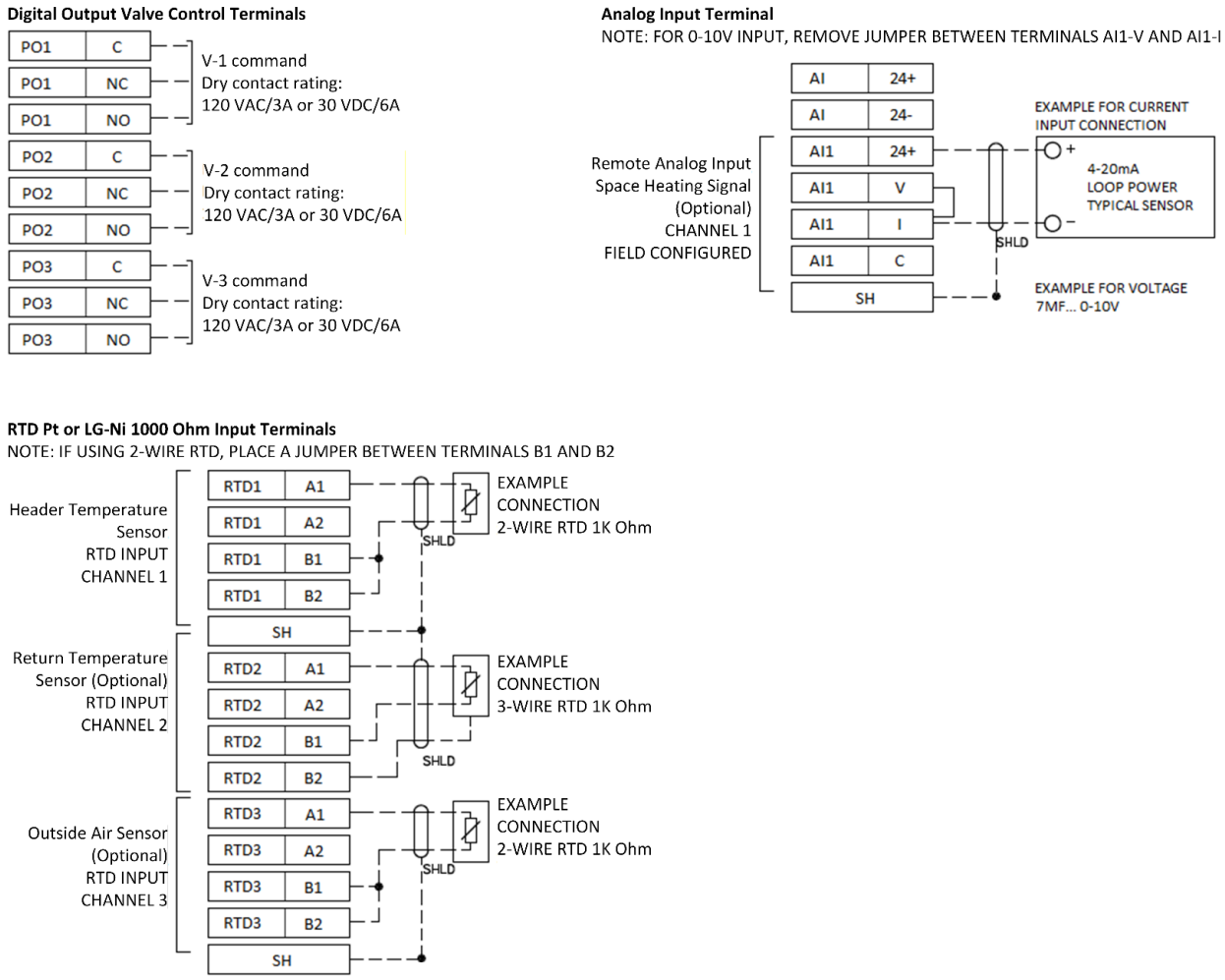


Diagram 5-1a: Space Heating - Piping



[For wiring diagrams to the Building Management System (BMS) and to the MFC II boilers, see diagrams 5-7a to 5-7d]

Diagram 5-1b: Space Heating – Wiring (Shown: Optional Master Panel from AERCO)

5.2 Space Heating (Primary-Secondary Piping)

Application Description & Features: Boiler plant is piped in primary-secondary method with individual boiler pumps. When an optional Master Lead/Lag Panel is sourced from AERCO, the panel sequences the MFC II boilers. Supply temperature is maintained via constant setpoint, outdoor air reset or remote setpoint command (from building automation system or remote analog signal). Application utilizes header sensor supplied with the panel, sequencing valves and outdoor air sensor; return header sensor is optional.

- The Master Lead/Lag Panel sequences the boiler plant for maximum system efficiency by running as many boilers as available, each operating at its most efficient firing rate.
- Isolation valves may be used to reduce minimum flow requirement.
- The Master Lead/Lag Panel supports integration with BMS via Modbus TCP/IP or RTU.

NOTE: For more information on Master Lead/Lag Panel operation, consult SCC Instructions TS-2000 and TS-2100.

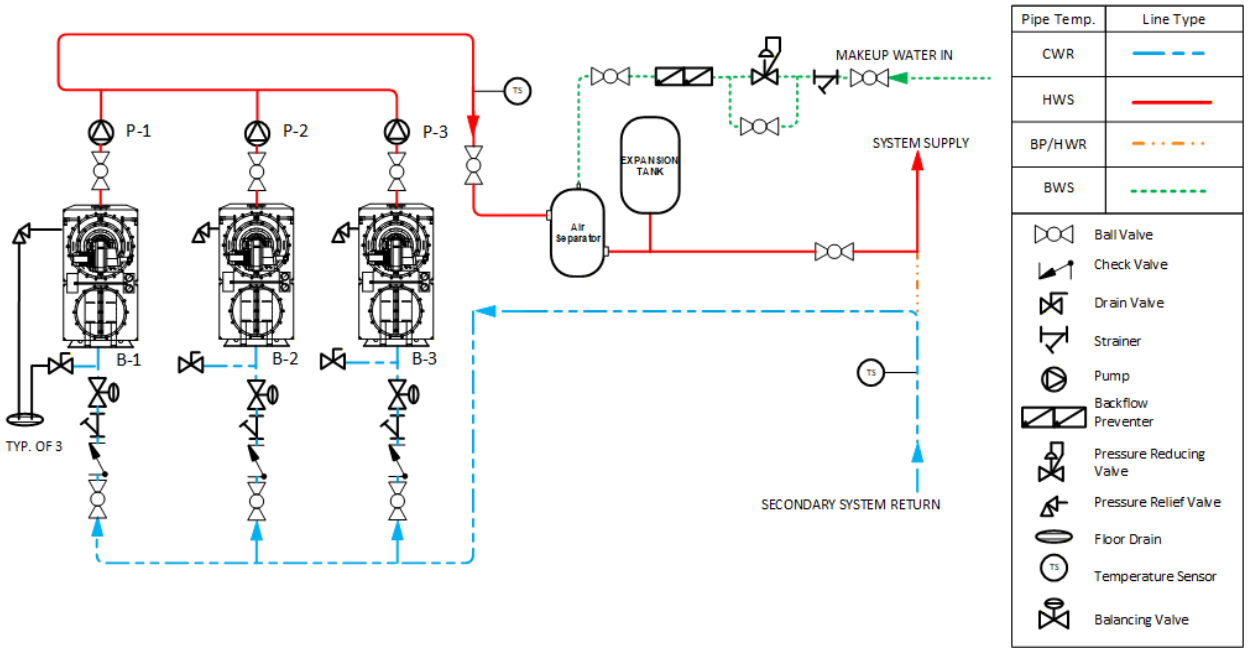
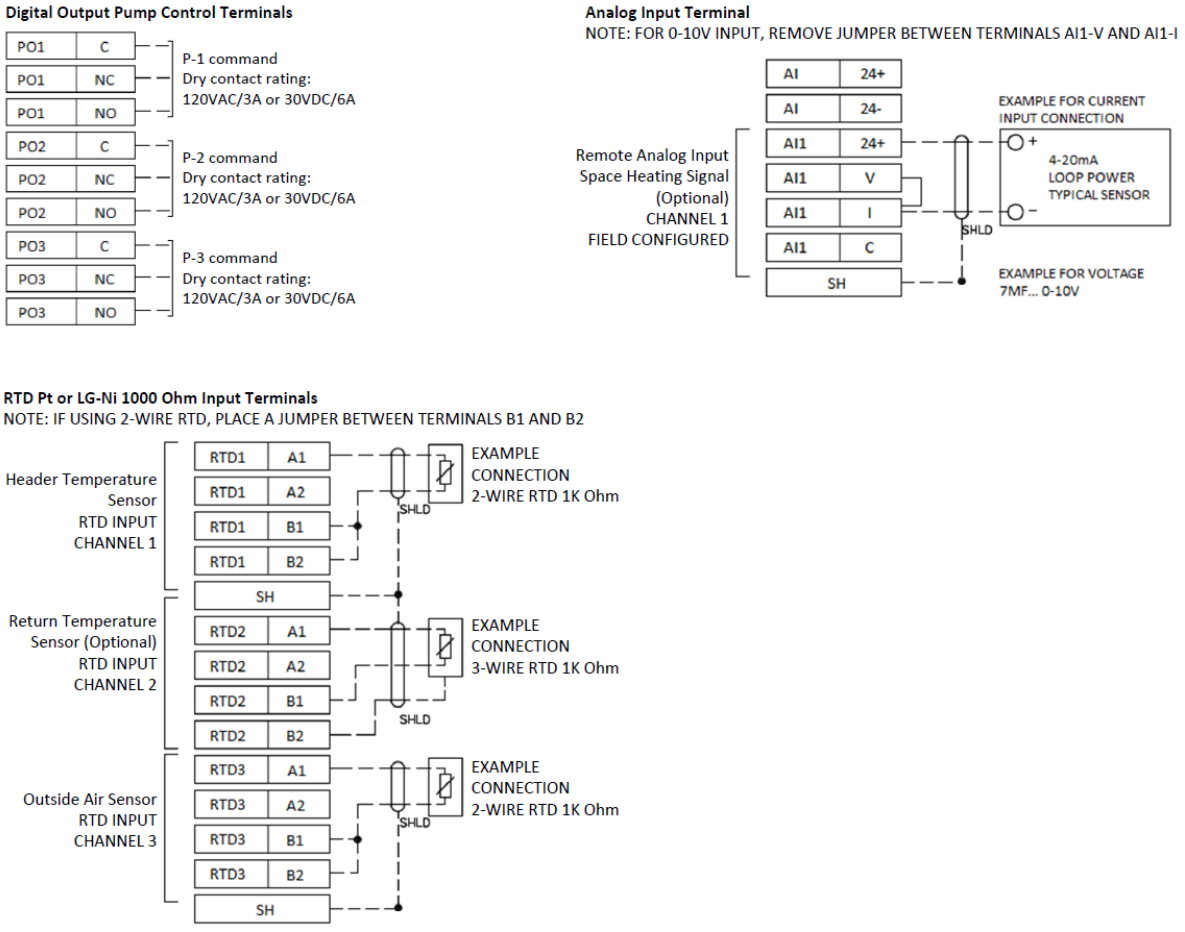


Diagram 5-2a: Space Heating (Primary-Secondary)



[For wiring diagrams to the Building Management System (BMS) and to the MFC II boilers, see diagrams 5-7a to 5-7d]

Diagram 5-2b: Space Heating (Primary-Secondary) Wiring

5.3 Space Heating with Domestic Hot Water Priority/SmartPlate EV

Application Description & Features: AERCO MFC II boilers provide space heating and SmartPlate EV water heaters provide domestic hot water generation. When an optional Master Lead/Lag Panel is sourced from AERCO, the panel sequences the MFC II boilers. Supply temperature is maintained via constant setpoint, outdoor air reset or remote setpoint command (from building automation system or remote analog signal). Application utilizes header sensor supplied with the panel, sequencing valves and outdoor air sensor; return header sensor is optional. DHW boiler water sensor is used for controlling domestic boiler loop temperature. Domestic hot water generation is a priority: an overriding boiler water setpoint is activated when header temperature falls below DHW boiler water setpoint. DHW boiler pump runs continuously to provide boiler water to the water heaters.

- The Master Lead/Lag Panel sequences the boiler plant for maximum system efficiency by running as many boilers as available, each operating at its most efficient firing rate.
- Isolation valves may be used to reduce minimum flow requirement.
- The Master Lead/Lag Panel supports integration with BMS via Modbus TCP/IP or RTU.

NOTE: For more information on Master Lead/Lag Panel operation, consult SCC Technical Instructions TS-2000 and Installation Instructions TS-2100.

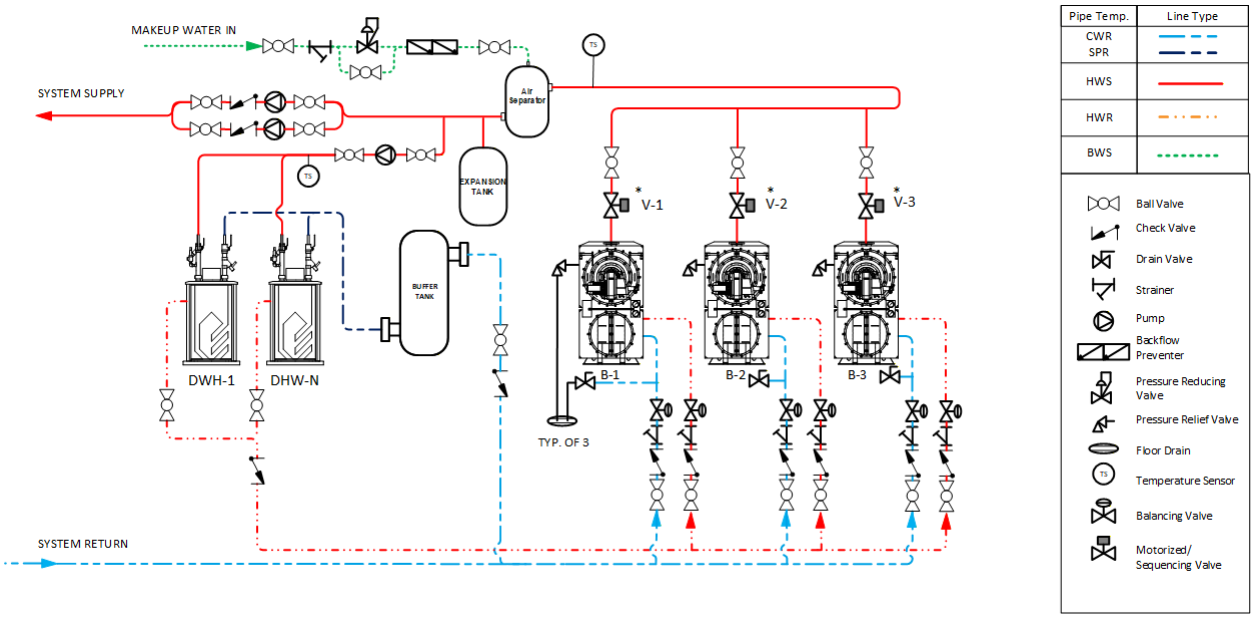
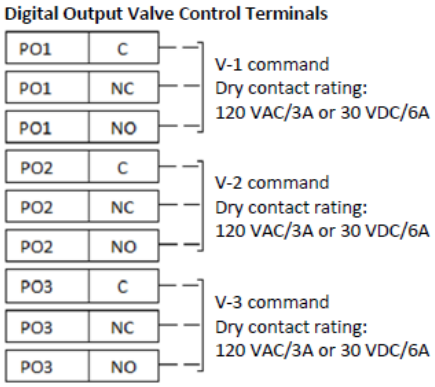
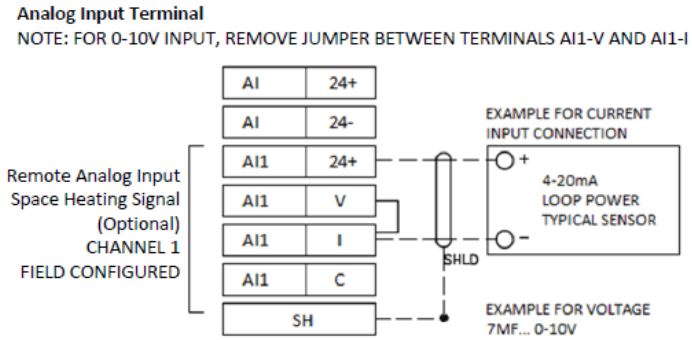
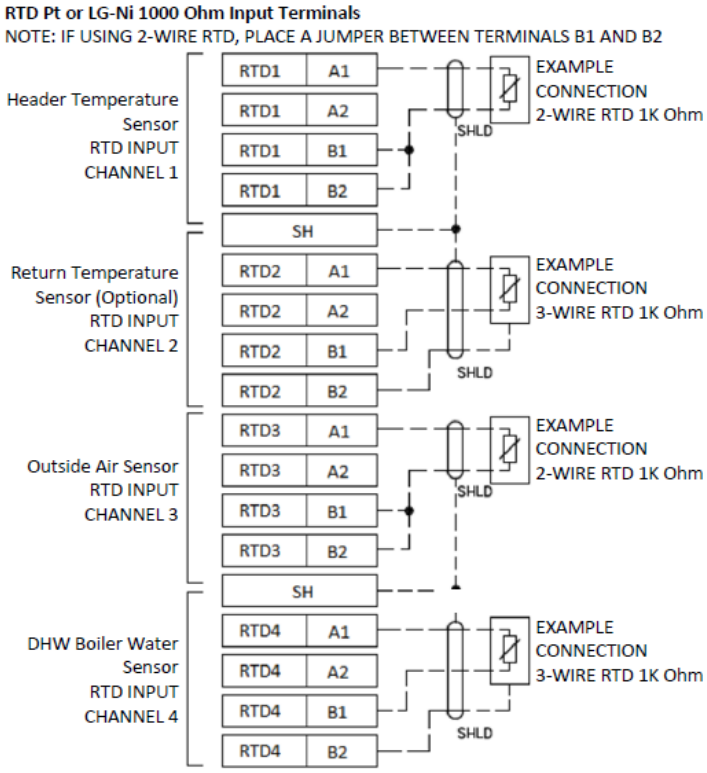


Diagram 5-3a: Space Heating with Domestic Hot Water Priority/SmartPlate EV







[For wiring diagrams to the Building Management System (BMS) and to the MFC II boilers, see diagrams 5-7a to 5-7d]

Diagram 5-3b: Space Heating with Domestic Hot Water Priority/SmartPlate EV Wiring

5.4 Space Heating with Domestic Hot Water Priority/SmartPlate EV (Primary-Secondary Piping)

Application Description & Features: Boiler plant is piped in primary-secondary method with individual boiler pumps. AERCO MFC II boilers provide space heating and SmartPlate EV water heaters provide domestic hot water generation. When an optional Master Lead/Lag Panel is sourced from AERCO, the panel sequences the MFC II boilers. Supply temperature is maintained via constant setpoint, outdoor air reset or remote setpoint command (from building automation system or remote analog signal). Application utilizes header sensor supplied with the panel, sequencing valves and outdoor air sensor; return header sensor is optional. DHW boiler water sensor is used for controlling domestic boiler loop temperature. Domestic hot water generation is a priority: an overriding boiler water setpoint is activated when header temperature falls below DHW boiler water setpoint. DHW boiler pump runs continuously to provide boiler water to the water heaters.

- The Master Lead/Lag Panel sequences the boiler plant for maximum system efficiency by running as many boilers as available, each operating at its most efficient firing rate.
- Isolation valves may be used to reduce minimum flow requirement.
- The Master Lead/Lag Panel supports integration with BMS via Modbus TCP/IP or RTU.

NOTE: For more information on Master Lead/Lag Panel operation, consult SCC Technical Instructions TS-2000 and Installation Instructions TS-2100.

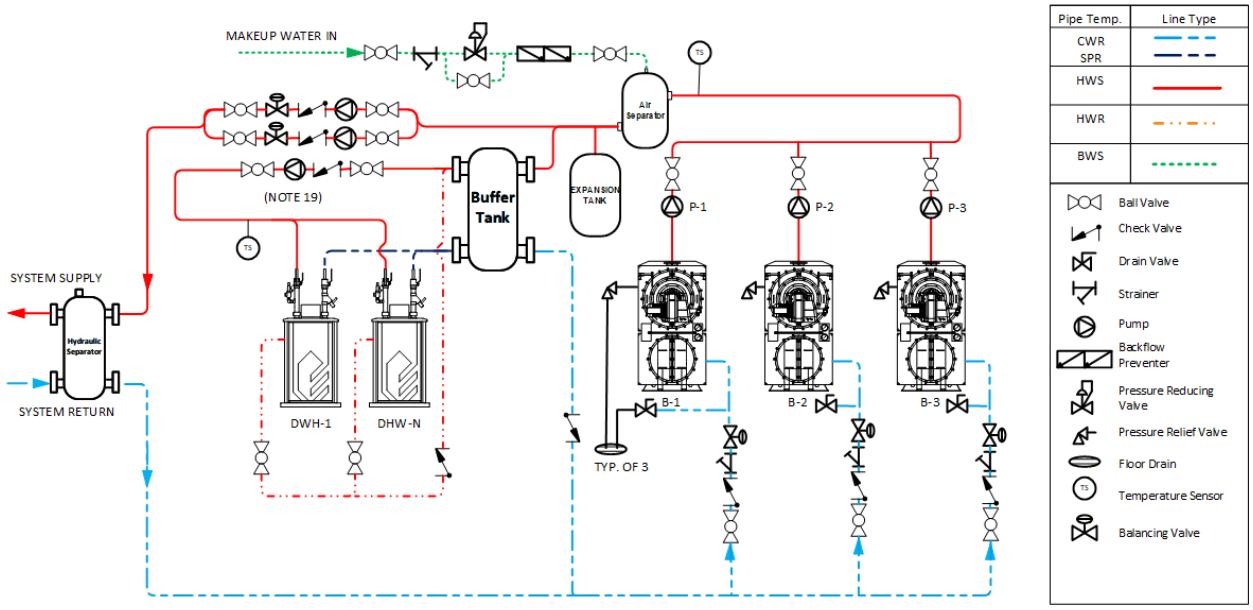
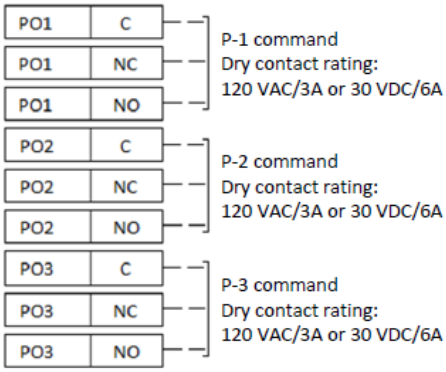


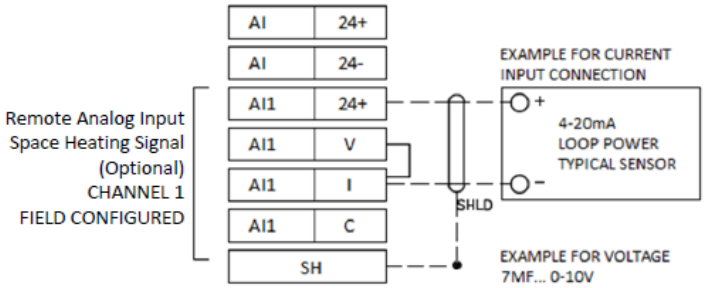
Diagram 5-4a: Space Heating with Domestic Hot Water Priority/SmartPlate EV (Primary-Secondary Piping)

Digital Output Valve Control Terminals



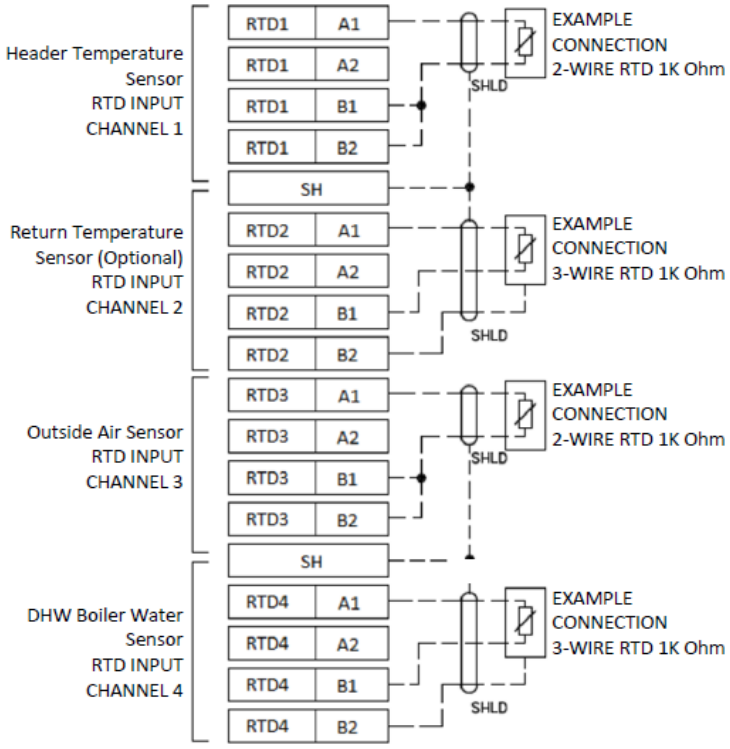
Analog Input Terminal

NOTE: FOR 0-10V INPUT, REMOVE JUMPER BETWEEN TERMINALS AI1-V AND AI1-I



RTD Pt or LG-Ni 1000 Ohm Input Terminals

NOTE: IF USING 2-WIRE RTD, PLACE A JUMPER BETWEEN TERMINALS B1 AND B2



[For wiring diagrams to the Building Management System (BMS) and to the MFC II boilers, see diagrams 5-7a to 5-7d]

Diagram 5-4b: Space Heating with Domestic Hot Water Priority/SmartPlate EV (Primary-Secondary Piping) Wiring

5.5 Space Heating with Domestic Hot Water Priority/Domestic Hot Water Tank

Application Description & Features: AERCO MFC II boilers provide space heating and indirect storage tank water heater provides domestic hot water generation. When an optional Master Lead/Lag Panel is sourced from AERCO, the panel sequences the MFC II boilers. Supply temperature is maintained via constant setpoint, outdoor air reset or remote setpoint command (from building automation system or remote analog signal). Application utilizes header sensor supplied with the panel, sequencing valves and outdoor air sensor; return header sensor is optional. Domestic hot water generation is a priority: an overriding boiler water setpoint is activated when DHW tank temperature falls below a desired value. DHW boiler pump runs continuously to provide boiler water to the indirect storage tank water heater.

- The Master Lead/Lag Panel sequences the boiler plant for maximum system efficiency by running as many boilers as available, each operating at its most efficient firing rate.
- Isolation valves may be used to reduce minimum flow requirement.
- The Master Lead/Lag Panel supports integration with BMS via Modbus TCP/IP or RTU.

NOTE: For more information on Master Lead/Lag Panel operation, consult SCC Technical Instructions TS-2000 and Installation Instructions TS-2100.

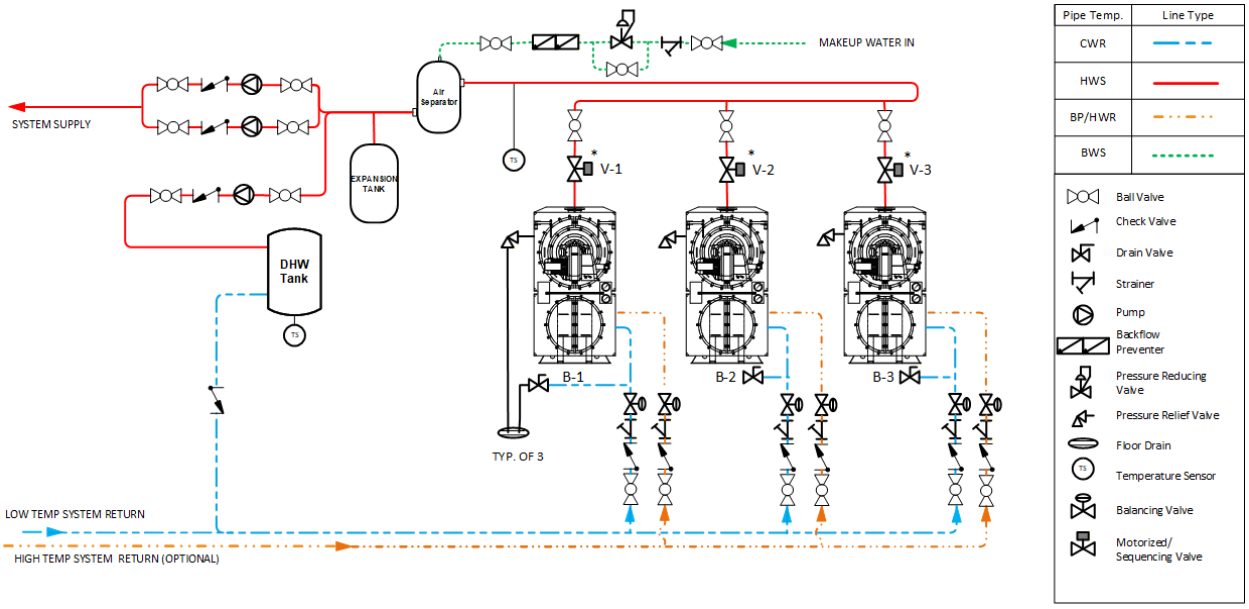
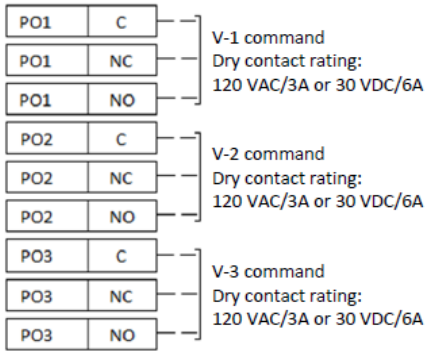


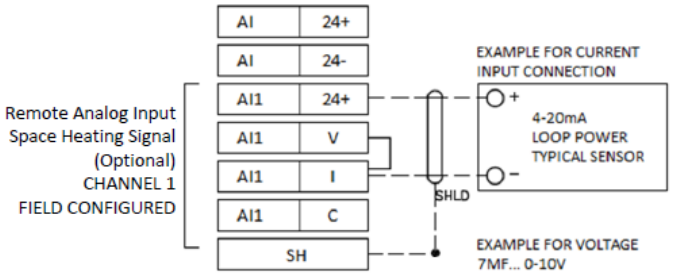
Diagram 5-5a: Space Heating with Domestic Hot Water Priority/Domestic Hot Water Tank

Digital Output Valve Control Terminals



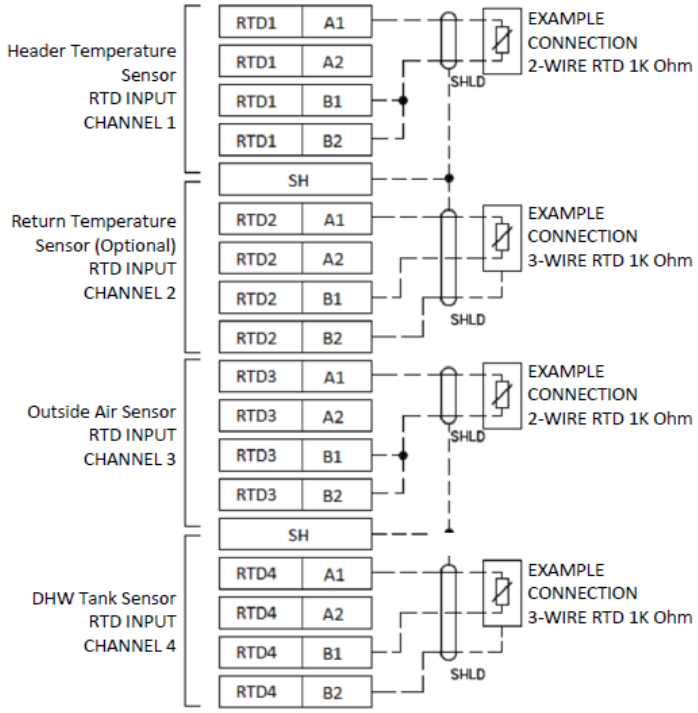
Analog Input Terminal

NOTE: FOR 0-10V INPUT, REMOVE JUMPER BETWEEN TERMINALS AI1-V AND AI1-I



RTD Pt or LG-Ni 1000 Ohm Input Terminals

NOTE: IF USING 2-WIRE RTD, PLACE A JUMPER BETWEEN TERMINALS B1 AND B2



[For wiring diagrams to the Building Management System (BMS) and to the MFC II boilers, see diagrams 5-7a to 5-7d]

Diagram 5-5b: Space Heating with Domestic Hot Water Priority/Domestic Hot Water Tank Wiring

5.6 Benchmark Space Heating Plant with MFC II backup

Application Description & Features: AERCO Benchmark boilers provide space heating. The MFC II boiler serves as a backup when the Benchmark boilers are operating at close to maximum capacity and need additional heat to meet the demand; in the event all the Benchmark boilers have faulted, the MFC II boiler is activated. This system also provides uninterruptible heat upon loss of natural gas by operating the MFC II boiler. This system utilizes the Reserve Unit Control of the Benchmark Edge Controller to activate the MFC II boiler.

NOTE: For more information on Reserve Unit Control, consult Edge [ii] Controls Manual OMM-0139.

NOTE: Power outage disrupts the Reserve Unit Control's ability to activate a backup boiler. Field controls system shall be designed to allow the building generator to operate the MFC II boiler in the event of a power outage.

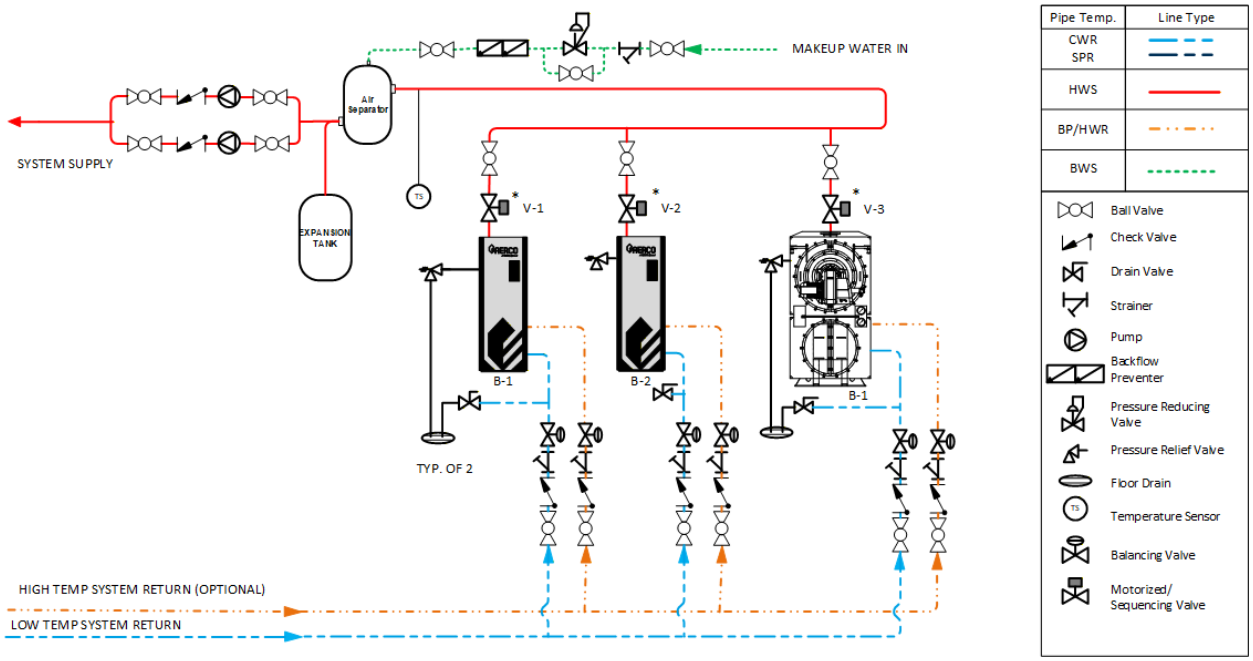
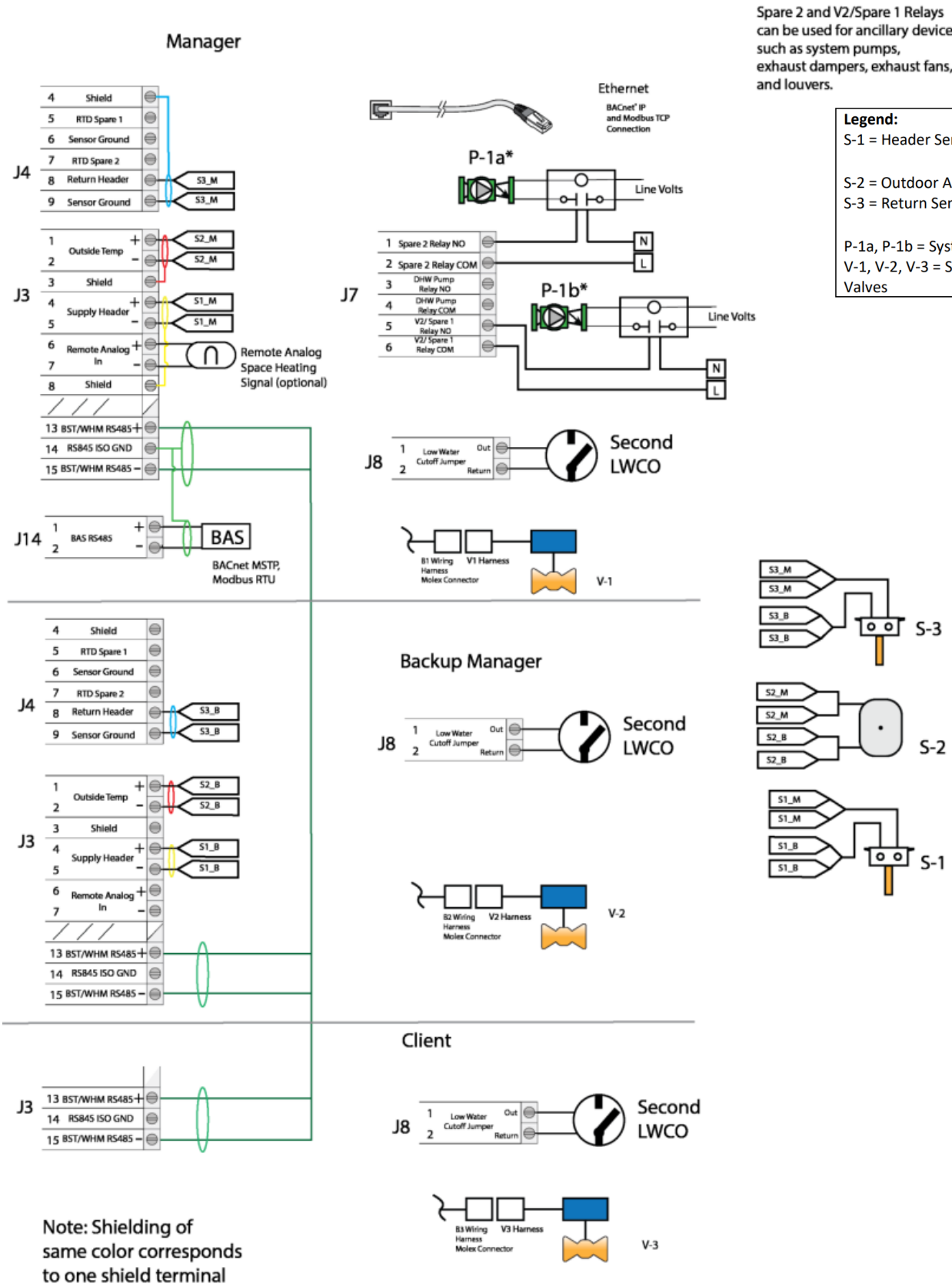


Diagram 5-6a: Benchmark Space Heating Plant with MFC II backup


Manager
J4
4 Shield
5 RTD Spare 1
6 Sensor Ground
7 RTD Spare 2
8 Return Header
9 Sensor Ground
S3_M
S3_M
J3
1 Outside Temp
2
3 Shield
4 Supply Header
5
6 Remote Analog In
7
8 Shield
S2_M
S2_M
S1_M
S1_M
Remote Analog Space Heating Signal (optional)
13 BST/WHM RS485+
14 RS845 ISO GND
15 BST/WHM RS485 –
J14
1 BAS RS485
2
BAS
BACnet MSTP, Modbus RTU
Ethernet
BACnet® IP and Modbus TCP Connection
P-1a*
Line Volts
J7
1 Spare 2 Relay NO
2 Spare 2 Relay COM
3 DHW Pump Relay NO
4 DHW Pump Relay COM
5 V2/ Spare 1 Relay NO
6 V2/ Spare 1 Relay COM
N
L
P-1b*
Line Volts
N
L
J8
1 Low Water Cutoff Jumper
2
Out
Return
Second LWCO
B1 Wiring Harness Molex Connector
V1 Harness
V-1
Spare 2 and V2/Spare 1 Relays can be used for ancillary devices such as system pumps, exhaust dampers, exhaust fans, and louvers.
Legend:
S-1 = Header Sensor
S-2 = Outdoor Air Sensor
S-3 = Return Sensor
P-1a, P-1b = System Pump(s)
V-1, V-2, V-3 = Sequencing Valves
S3_M
S3_M
S3_B
S3_B
S-3
S2_M
S2_M
S2_B
S2_B
S-2
S1_M
S1_M
S1_B
S1_B
S-1
Backup Manager
J4
4 Shield
5 RTD Spare 1
6 Sensor Ground
7 RTD Spare 2
8 Return Header
9 Sensor Ground
S3_B
S3_B
J3
1 Outside Temp
2
3 Shield
4 Supply Header
5
6 Remote Analog In
7
S2_B
S2_B
S1_B
S1_B
13 BST/WHM RS485+
14 RS845 ISO GND
15 BST/WHM RS485 –
J8
1 Low Water Cutoff Jumper
2
Out
Return
Second LWCO
B2 Wiring Harness Molex Connector
V2 Harness
V-2
Client
J3
13 BST/WHM RS485+
14 RS845 ISO GND
15 BST/WHM RS485 –
J8
1 Low Water Cutoff Jumper
2
Out
Return
Second LWCO
B3 Wiring Harness Molex Connector
V3 Harness
V-3
Note: Shielding of same color corresponds to one shield terminal

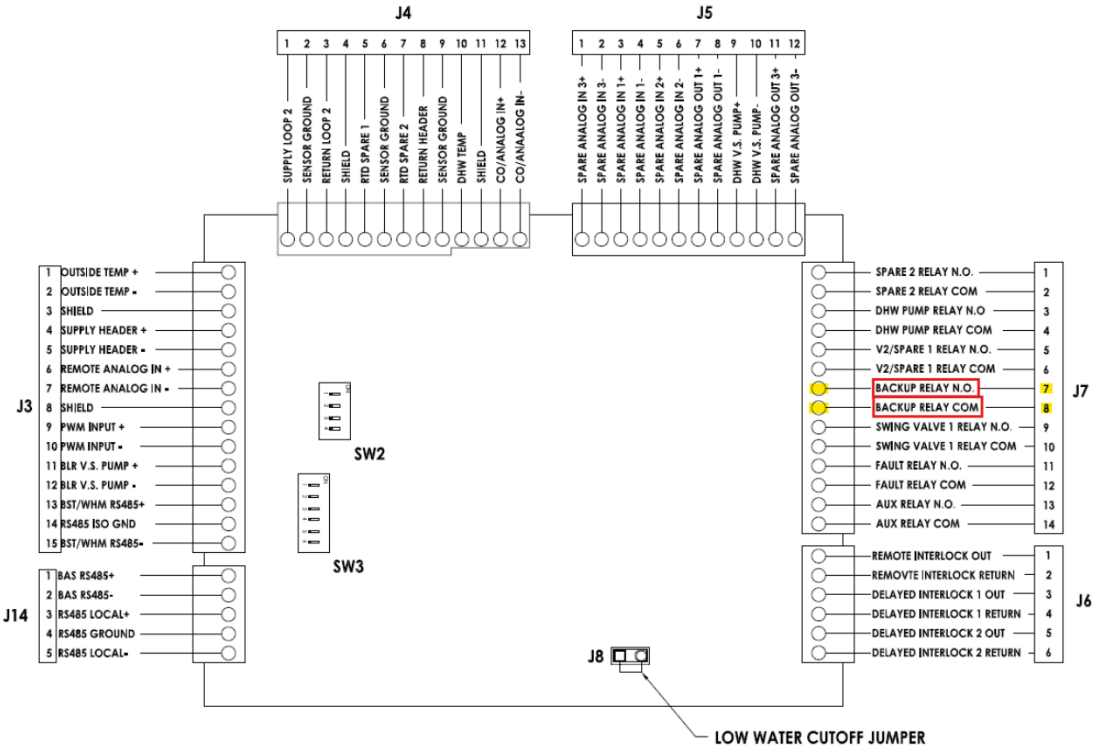
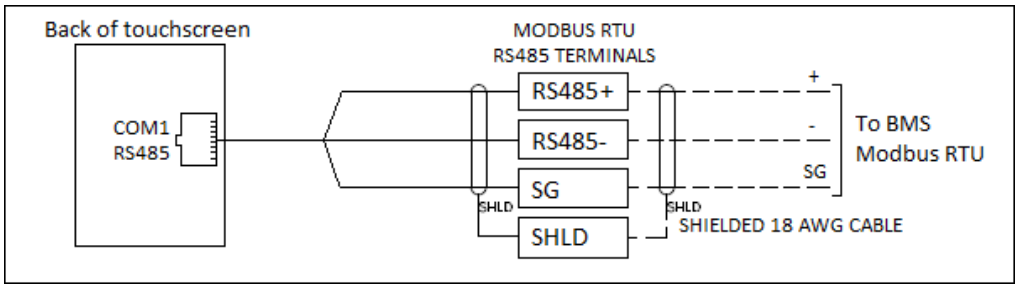


Diagram 5-6b: Benchmark Space Heating Plant with MFC II backup Wiring

5.7 Master Lead/Lag Panel Modbus RS485 Serial Wiring Connections

When an optional Master Lead/Lag Panel is sourced from AERCO, the panel supports integration with BMS via Modbus TCP/IP or RTU. The diagrams below illustrate how the panel is wired to the Building Management System (BMS) and to the MFC II boilers.

Standard Modbus TCP/IP



Standard Modbus RTU RS485

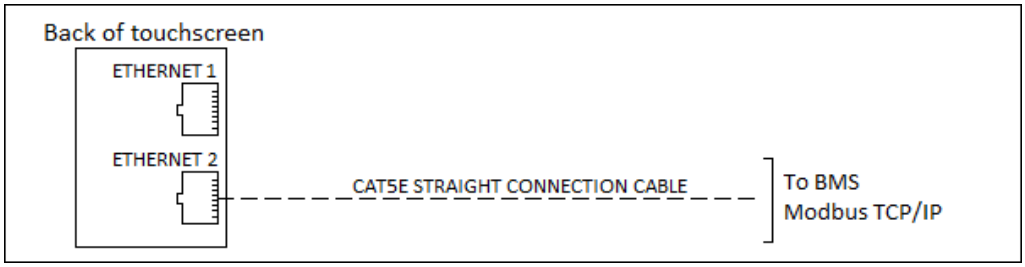


Diagram 5-7a: BMS Communications Wiring

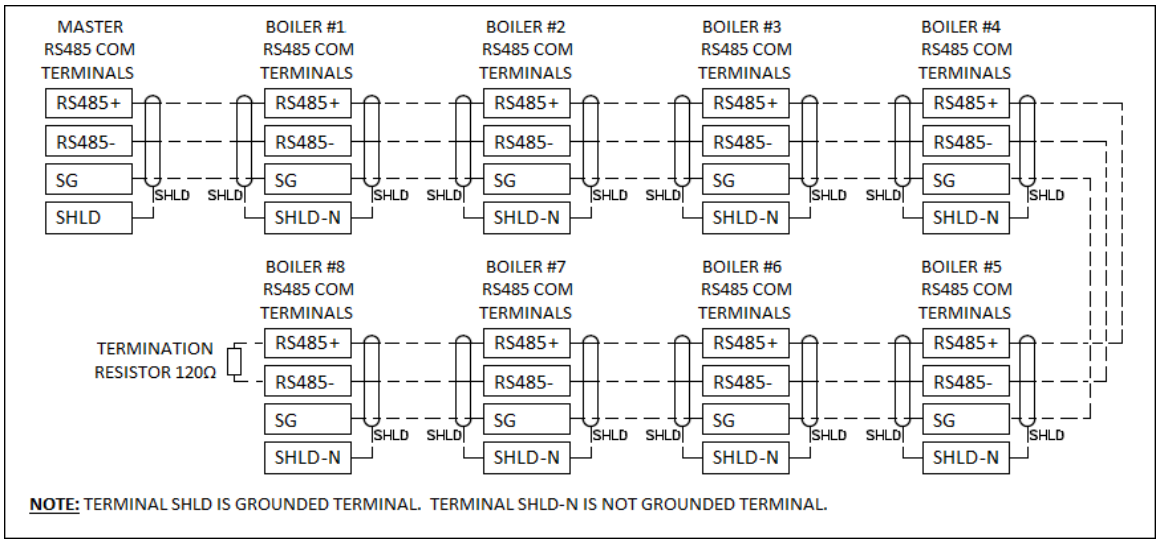


Diagram 5-7b: Master Lead/Lag Panel RS485 to MFC II Boiler Wiring. Applies to burners with LMV52 serial kits (no touchscreen at each boiler).

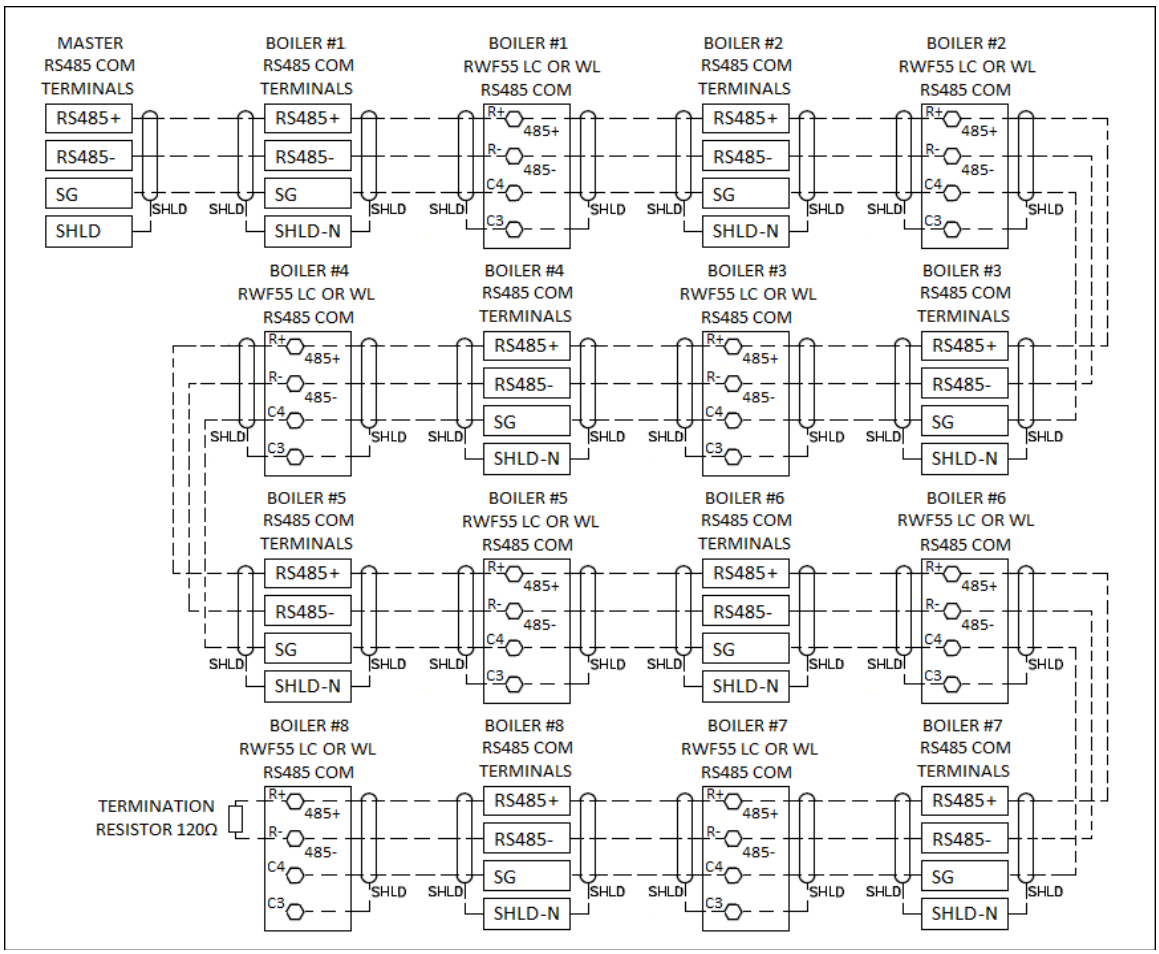


Diagram 5-7c: Master Lead/Lag Panel RS485 to MFC II Boiler Wiring. Applies to burners with LMV51 serial kits (no touchscreen at each boiler), and with RWF55 as load controller (LC).

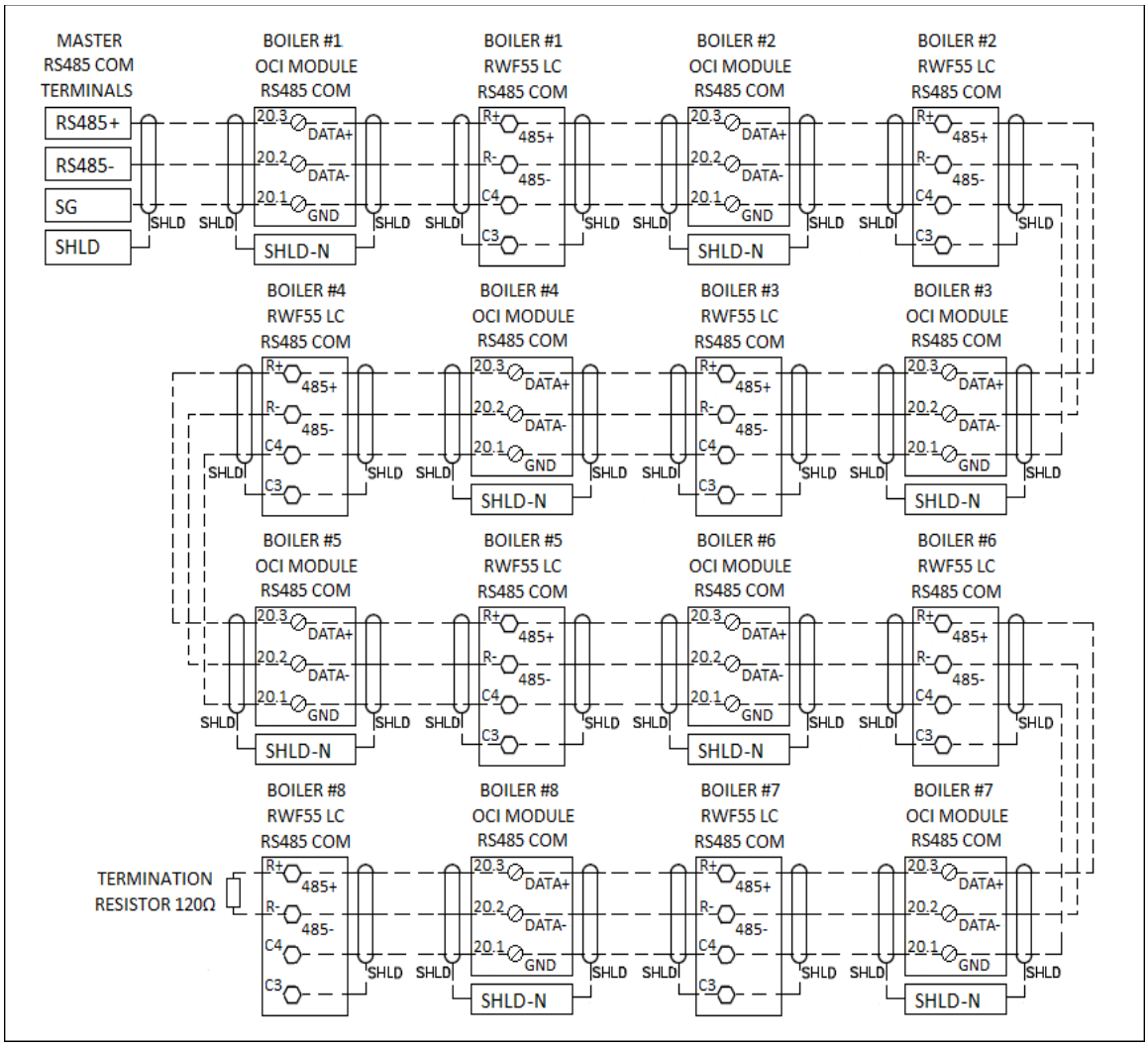


Diagram 5-7d: Master Lead/Lag Panel RS485 to MFC II Boiler Wiring. Applies to burners with LMV3x serial kits (no touchscreen at each boiler), and with RWF55 as load controller (LC).