MODEL 168
PRODUCT SPECIFICATION

BMS

AERCO Boiler Management System

- ✔ **Increase System Turndown to Maximize Operating Efficiency**
- ✔ **Control Up to 40 Boilers**
  - **Eight units via PWM**
  - **32 units via Modbus interface**
- ✔ **Automatic Load Matching Precisely Meets Demand Changes**
- ✔ **"Bumpless" Energy Transfer**
- ✔ **Multiple Configuration Options**
- ✔ **User-Friendly Software Makes Programming Easy**
- ✔ **Full Information LCD Display**
- ✔ **Complete Control of Auxiliary Boiler Equipment**
- ✔ **Easy Integration to BAS or EMS via Modbus Open Protocol**
- ✔ **Single Point BAS or EMS Data Gathering for up to 35 Operating Parameters of Each Boiler Module**

Load Sharing Strategy Maximizes Energy Efficiency

It requires less energy for a group of modulating boilers, each firing at "part load," to heat a building, than for a single boiler operating a "full fire" to carry the entire workload. To meet building demand, the BMS will employ as many modules as available, each operating at its lowest (but most efficient) firing rate. Importantly, because the BMS reacts in real-time to changes in the number of boilers available, users can take a unit offline for maintenance at any time or bring on back-up modules for extremely cold conditions without changes to the BMS. And as individual modules are added or deleted, the energy delivered is automatically adjusted to prevent fluctuations in the header temperature of the plant.

Typical Staging Example Demonstrates "Part Load" Efficiency

The first boiler unit comes online and will gradually increase its firing rate to meet demand. When it reaches 50% – a second unit is called into service.

The two boilers will split the load – each firing at 25% to meet demand. If additional heat is required, a third unit is called into service.

Three boilers, each firing at 33%, satisfies the demand more efficiently than either two units at 50% or one unit at 100%. This same principle applies to much larger plants.

State-of-the-Art Control System Supports Efficient Boiler Plant Operation!

The AERCO Boiler Management System (BMS) Model 168 is a flexible controller designed to maximize energy savings in modular boiler plants. The BMS can stage and coordinate the operations of up to 40 boilers and is uniquely designed to maximize the operating efficiency of condensing equipment capable of unmatched modulation. With individual unit turndown as high as 20:1, a five-boiler plant delivers 100:1 system turndown when staged to operate sequentially.

Able to regulate overall plant output with precise accuracy, a boiler plant with ±2°F header temperature variation is assured under normal load conditions. It offers sequential or parallel operation flexibility, 100% control of auxiliary equipment, and user programmable modes of operation that can be changed in the field. The BMS automatically rotates the lead boiler to help equalize module runtime.

The rugged controller is designed for easy installation with low voltage, twisted pair, shielded wire between the panel and boiler modules. Fault alarm contacts, automatic system start, two interlock circuits and the ability to start an auxiliary piece of equipment (at both start and 100% load) combine all critical functions of the boiler plant into one reliable control center.

Fully Compatible with BAS or EMS Systems via Modbus Open Protocol

For facilities that have taken a building-wide approach to energy efficiency, the BMS supports easy integration with Building Automation Software (BAS) or Energy Management Software (EMS) programs via Modbus protocol and RS-232 interface. A standards-based open protocol used throughout the buildings controls market, Modbus integration will enable facility managers to drive all BMS operations from any building control platform. BAS or EMS integration also offers a communications gateway to poll up to 35 operating parameters from individual boiler modules through a single connection to the BMS, including: (consult AERCO Modbus Communications Manual GF-114 for complete list)

- Unit Type
- Unit Size
- Unit Status
- Default Message Codes
- Outlet Temperature
- Run Cycles
- Run Hours
- Flame Strength
- Active Set Point
- High/Low Limits
- Mode of Operation
- Outdoor Temperature
- Valve Position
- Time
- Date

Configuration Options	Typical Applications
Indoor/Outdoor Reset A change in the outside air condition results in a proportionate change in header temperature – a function of the adjustable reset ratio (0.3 – 3.0:1).	**Indoor/Outdoor Reset Hydronic Heating** **Process Application** **Snow Melting**
Constant Setpoint Delivers fixed supply water temperature at set points of 50°F-220°F.	**Water Source Heat Pump** **Domestic Water Generation** **Supplemental Heat Recovery Equipment** **Swimming Pool Heating**
4-20mA Signal Header temperature responds linearly to an external 4-20mA control signal.	**Computer Controlled Building Management** **Industrial Process** **Greenhouse Application**
Network Communications Enables EMS or BAS system to drive boiler plant setting for header set point temperature via Modbus connection to BMS. Also provides communication gateway to query and capture faults of BMS and up to 35 operating parameters of individual boiler modules.	**Computer Controlled Building Management** **EMS Data Logging & Trend Analysis**

Combination Domestic Water/Boiler Plant

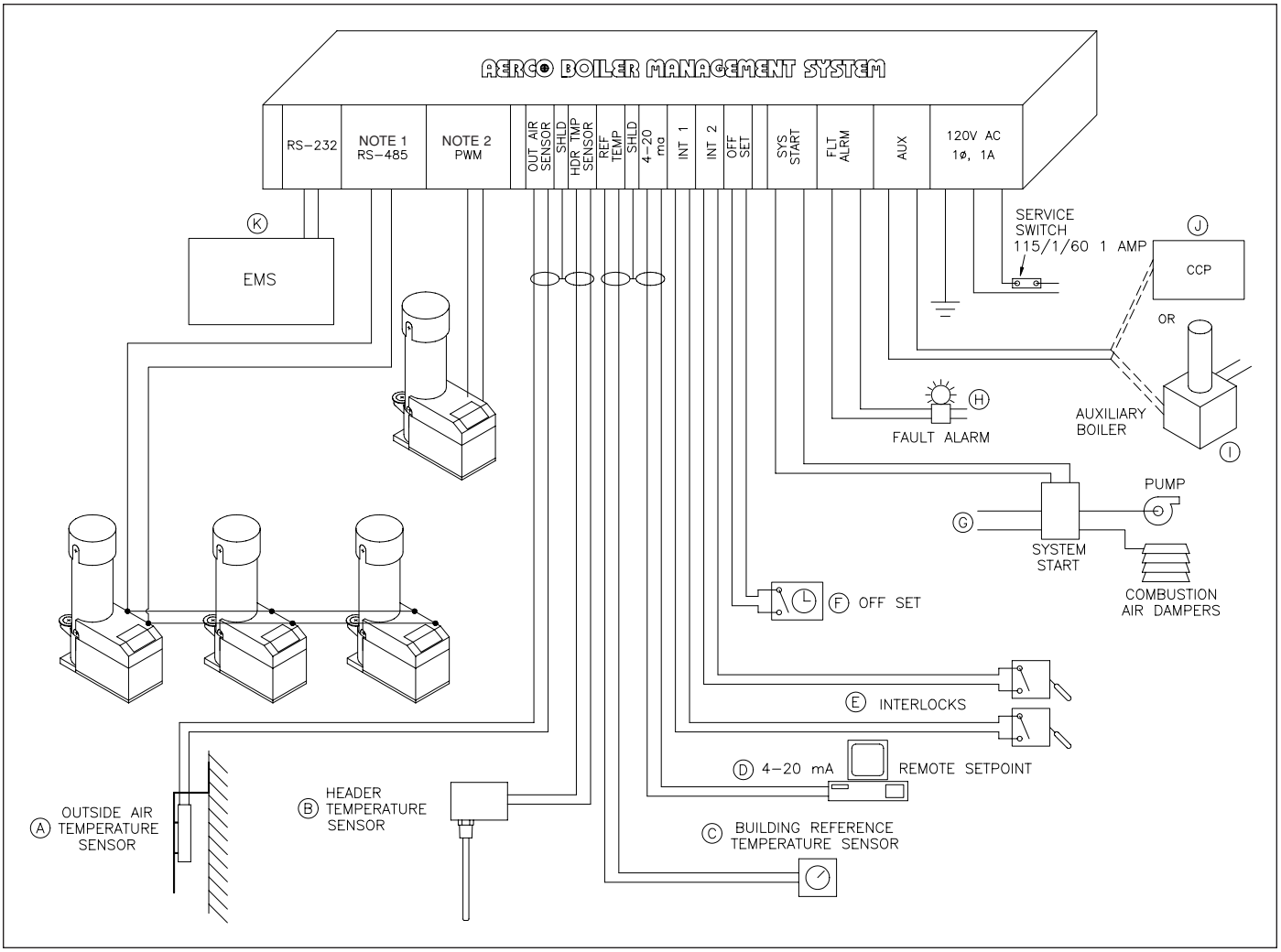
In addition to the standard configuration options listed above, the BMS can be used in conjunction with AERCO Combination Control Panel (CCP) in combination domestic water/space heating plants. Demand for domestic hot water will activate an isolated boiler module to deliver constant supply temperature though a closed loop coil to external hot water storage generator. Please refer to CCP Tech Data sheet for plant sizing, piping and sequencing details.

NOTE: BMS package includes Supply Header Temperature Sensor (GM-122790)

Robust Features Simplify Control

- **Application Flexibility** – Four different configuration options meet the needs of any closed loop system and can be changed in the field.
- **Sequential or Parallel Operation** – Choose to sequence individual modules or run all in parallel. Mode of operation can be changed by a simple keyboard selection.
- **Automatic System Start** – The BMS can bring auxiliary equipment or boilers online based on outside air temperature. Auto Start Contacts which can be set to close at outside air temperatures between 32°F-100°F eliminate the need for plant operator to turn auxiliary equipment on and off.
- **Time Delay Between Module Start** – A fixed, thirty-second time delay between module starts allows for a smooth energy input without spikes in electrical, gas or venting conditions.
- **Random Lead Module** – Random lead module ensures that all modules are in operating condition and helps equalize runtime.
- **Equalize Module Runtime** – First On-First Off unit sequencing helps to equalize run time and does not overtax any one unit.
- **Automatic Allowance for Maintenance** – By continuously monitoring the number of modules available for operation, the panel will automatically operate the next module needed to meet demand if a unit malfunctions or is taken off-line for maintenance.
- **Auxiliary Boiler Capability** – Contacts are available to operate stand-by or back-up boiler equipment when the plant is at 100% load. These can be used to control an auxiliary boiler or notify building management system. Contacts turn-off is adjustable though the keyboard to any percentage of plant input.
- **Adjustable Off Set** – The BMS includes a 7-day programmable clock to support night setback and/or daily setback periods. The BMS will shift from the original set point to a higher or lower temperature.
- **Two Interlock Circuits** – Monitor pumps, combustion air dampers, or other equipment using two interlock circuits that must be completed before plant operations begin.
- **Power Off Memory** – By using non-volatile memory, programs are retained through a shut down of more than two years. No batteries required.
- **Continuous Communication** – Via PWM and Modbus, the BMS continually sends information to all modules in operation and receives information from sensors in the supply header, outdoor air, or other inputs. Eliminating external electrical noise, the response to changes in operating conditions or loads is instantaneous to maximize plant performance.
- **Simple Installation** – The BMS control system operates on standard 115/1/60 power supply. Twisted pair, shielded wire connections to the BMS and individual boilers are required to support communications. An RS-232 interface is required to link an EMS or laptop to the BMS. RS-232 communications wiring between the EMS and the BMS cannot exceed 50 feet. An RS-485 interface or Pulse Width Modulation can be used to connect the BMS to the boilers. RS-485 communications wiring supports a distance of up to 4,000 feet between BMS and boilers. It is possible to use a converter (RS232 to RS485) between the BMS and a BAS/EMS equipped with an RS485 interface. Pulse Width Modulation (PWM) lead wiring to the boilers can be up to 200 feet away from the panel.
- **Rugged & Reliable** – Built to withstand the normal conditions of a commercial boiler room, the BMS is encased in a NEMA 13 grade enclosure and can operate in an ambient temperature up to 55°C (131°F).
- **Flexible & Expandable** – The BMS can support up to 40 AERCO boilers – 32 of which can be fully integrated with any EMS or BAS software via the Modbus protocol.
- **Fault Alarm Surveillance** – In the absence of a BAS/EMS system to poll individual boiler modules for faults, an alarm closure contact is provided for the BMS only. It can be used to notify facility managers of faults associated with the BMS.
- **Building Reference Temperature Inputs** – The BMS can accept reference temperatures from a sensor, and external 4-20 signal or via Modbus feed to a BAS/EMS system and will adjust plant operations to accommodate varying conditions.
- **Programmable Minimum/Maximum Setpoints & Building Reference Temperature** – Boilers can be clamped at minimum and maximum temperatures, and the building reference temperature adjusted to drive plant header temperature. This allows a wide range of boiler responses to outside air changes for maximum comfort.
- **Accuracy** – BMS uses PID (Proportional & Integral + Derivative) control algorithm to provide a dynamic response to all changes in plant operation. Header temperatures, as well as percentage module input, are precisely controlled with virtual no overshoot or short cycling of equipment. A header temperature of ±2°F is assured during continual plant operation.
- **"Bumpless" Energy Transfer** – When staging boilers sequentially, the BMS can bring additional modules online at an adjustable percentage of input selected by the user.

Typical Installation



NOTES

1. The RS-485 communications port can interface with up to 32 boilers.
2. Up to eight boilers can be hard wired to the PWM connections.

		Required	Recommended	Optional
Main Mode Selection	Indoor/Outdoor Reset	B A	H	E F G I
	Constant Set Point	B	H	E F G I
	4-20mA Signal	B D	H	E F G I
	Network Temp Setpoint	B K	H	E F G I
	Combination Boiler/DHW Plant	B J	H	A E F G C

SPECIFICATIONS

Dimensions ..... 10" x 11.6" x 4.7"
Weight ..... 12 lbs.
Electrical Requirements ..... 115/1/60 1 AMP
Enclosure ..... NEMA 13

Accessories Available:

- Outdoor Air Sensor Kit GM-122781
- Combination Control Panel GM-122876
- RS-232 to RS-485 Converter Kit GM-124955
- Supply Header Sensor Replacement GM-122790

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Specifications subject to change.
Consult website or contact AERCO.
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AERCO
HOT WATER SYSTEMS