boiler manager™

Installation

johnson burners

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Installation

General

This document provides guidance for the installation of the Boiler Manager.

Warnings

The burner and burner management system must be installed, serviced and operated only by qualified personnel fully trained in the system, following generally accepted industry practices and in accordance with manufacturer's instructions. Lack of extensive knowledge of these systems and the failure to explicitly follow manufacturer's instructions provided for all components in this system, can result in damage to property, personal injury or death.

Qualified personnel must follow all manufacturers' instructions before proceeding with the initial firing of this equipment. Failure to do so can result in improper air/fuel ratios in the burner, which can create hazardous burner conditions, fuel buildup and the risk of explosion and damage to property, personal injury or death.

These instructions should be read thoroughly and carefully. Failure to follow them correctly can lead to equipment damage, personal injury or death.

The suitability of this product for a particular application should be confirmed by the end user prior to installing and placing into service. The Overview document provides a list of features and uses and also includes a complete list of specifications for the Boiler Manager.

Location

Environmental Exposure

The Boiler Manager is constructed to meet Nema 4 environmental protection. The Nema 4 rating specifies a degree of protection from rain, sleet, snow and splashing or hose-directed water. The Nema 4 rating also specifies a degree of protection from falling dirt or windblown dust. The Nema 4 rating also applies to the operator display which is exposed on the front of the panel.

The Boiler Manager is also available in a Nema 4X version which utilizes stainless steel for the enclosure material. The Nema 4X provides an additional degree of protection from certain solvents, alkalis and acids. For a complete compatibility list, consult a knowledgeable technical resource such as those available from any of the major enclosure manufacturers.

Temperature

The Boiler manager must not be exposed to external ambient temperatures higher than approximately 105 ° F (40° C) unless some method of cooling the panel interior is added. The maximum internal temperature that the components within the panel can be exposed to is 140 ° F (60° C).

The panel should also not be mounted in a location that is subject to direct solar radiation for any significant amount of time as this can contribute to a significant increase in the internal cabinet temperature. If the panel must be mounted in a location that will be exposed to direct sunlight, an engineering analysis must be performed by the end user or a designated party to assure that the sum of the heat input from the solar radiation plus the maximum heat produced by the internal components does not contribute to a temperature in excess of 140 ° F (60° C) when consideration for maximum external ambient temperature is taken.

Note that direct sunlight on the operator display will render the display unreadable to personnel.

The lower ambient temperature limit for the location of the Boiler Manager is 32° F (0° C). One of the first components that will suffer damage when exposed to a prolonged temperature below this is the LCD within the display since it has direct exposure to the outside.

Humidity

The Boiler manager is suitable for installations where the humidity will not exceed 85%. This limit includes avoiding situations where the humidity can exceed this limit such that moisture condenses in the interior of the cabinet when the interior temperature drops to minimum daily values. If the Boiler Manager has been exposed to high levels of humidity while energized and in operation (but still below the safe limit) but then will be left in an un-energized state, steps must be taken to prevent moisture condensation with the cabinet as the internal temperature drops to ambient. Such protection could be to place a desiccant inside the cabinet or to leave the cabinet door open.

Mounting

Wall Mount

The Boiler Manager is intended for mounting on a vertical surface such as a wall. Alternatively it can be mounted to a frame for example if it is to be installed on a boiler piping rack or a free-standing structure.

While it is possible to mount the unit on the boiler itself, it is not recommended unless it is known that boiler vibration will be limited to the maximum allowed for the Boiler Manager (0.5g). Since it is difficult to measure and quantify this value, best practices suggest that the panel not be boiler mounted. The value 0.5g represents the maximum acceleration that any part of the panel or any internal component can experience. If the equipment is exposed to forces such that its experiences more that this value, then a safety shutdown of the burner may occur. In more severe cases, damage to internal components may occur.

The panel overall dimensions are 30 inches wide x 30 inches tall x 8.8 inches deep. Four ½ inch mounting holes are provided on the back side, one in each corner and spaced 28.5 inches apart, center-to-center.

Wiring

General

Wiring must comply with all codes, ordinances and regulations as applicable for the installation site. Line voltage carrying wiring must comply with NEC Class 1 (line voltage) wiring requirements.

Disconnect the power supply to all system equipment before beginning the installation or whenever attempting to service the equipment to reduce the possibility of electric shock or the unintentional operation of any of the connected equipment. There may be more than one power supply to the equipment. Verify that there is no voltage present on any of the wires entering the Boiler Manager panel prior to servicing.

Each interlock and limit switch must be listed or recognized for its intended function by authorities having jurisdiction over this type of equipment. Interlock and limit switches must be rated to simultaneously carry and break current to the ignition transformer, the pilot and main fuel shutoff valves and the starters and contactors for the fan motor, air compressor, oil pump and oil heaters as applicable.

Terminal Blocks

All field wiring from external equipment terminates on dedicated terminals in the Boiler Manger panel. It is not intended that any field wiring be connected directly to other components within the panel.

Terminals are of the spring clamp type. To insert or release a wire in these terminals, insert a small flat blade screwdriver into the square slot adjacent to the corresponding round wire entry hole. With the screwdriver fully inserted, the spring clamp is fully released and the wire can be inserted or removed. Remove the screwdriver to finish the connection. These terminals accept wires in the range of 24 to 10 gauge and of either solid or stranded conductors.

Each terminal accepts four wires. A dedicated hole is provided for each wire. Do not attempt to install two or more wires into a single wire entry hole. The panel wiring has been designed so that two wire holes on one side are available for field wiring and the wiring itself then routed in the wiring duct on that side. The two other wire entry holes are generally used for internal wiring. However, field wiring can use any available entry hole on a terminal as needed.

The field wiring terminals are arranged in two groups. The group on the left side is for line voltage wiring and includes terminals for connection of equipment such as the ignition transformer primary, fuel shutoff valves and limit switches. The group on the right side is for low voltage (24VDC) and analog signal wiring. These terminals are for connection of transmitters and the signal wiring to the boiler and burner actuators.

Wire Type

All wiring should be copper, rated a minimum of 150 V and 60° C. Copper wire may be tin coated. Do not use aluminum wiring. Care should be taken to route wires and conduits away from hot surfaces of the boiler. Wires that must be routed in close proximity to the boiler should incorporate high temperature insulation such as PTFE insulation.

Analog signal wires to transmitters and actuators should be minimum 20 gauge with 100% foil shield and utilize twisted pairs. The shield should be connected at one end only. The unused shield at the other end should be cut back flush to the outer cable jacket and then either tape or heat shrink tubing used to cover over the section. Do not connect shields at both ends of any signal wire as this can induce interference rather than minimize it.

Routing

The high voltage ignition transformer wiring must be installed in a separate conduit from all other wiring. There should be a good solid grounding connection between the ignition transformer casing

and the burner's igniter either via the boiler's metal structure or a dedicated heavy gauge grounding wire.

The flame scanner wiring must not be installed in a conduit that also carries line voltage wiring. A separate, dedicated conduit just for scanner wiring is the best approach. Scanners that are equipped with an outer jacket specifically intended for direct exposure may be routed without conduit but should be routed in a way that operators and service personnel are not likely to disturb the cable during operation and servicing.

Low voltage and analog signal wiring must not be installed in a conduit that also carries line voltage wiring.

When line and low voltage wiring must cross whether in junction boxes or conduit runs, route them at a 90 degree angle to each other to minimize interference.

Wiring lengths from the Boiler manager panel to external equipment should be kept to a maximum of 200 feet. Flame scanners should be connected using only their integral lead length if possible.

Grounding

A good equipment grounding system is paramount to safe and reliable operation of the Boiler manager and its connected equipment. Good grounding will help to minimize the effects of AC line noise such as from surges and spikes by providing a low impedance path to ground.

Inadequate grounding can not only lead to erratic and unsafe operation but can also result in equipment damage and injury to personnel.

The Boiler Manager panel includes a dedicated grounding terminal adjacent the line power input terminals. A green grounding wire no smaller than 8 gauge and as short as possible should be connected between this terminal and a solid grounding point at the installation site.

The boiler structure itself should also have a dedicated grounding wire connected to a common metal surface on the boiler with the other end connected to the grounding point at the installation site.

Special Requirements for Combustion Air Fan VFD

Variable frequency drives can produce significant radiated and conducted electrical noise that can adversely affect the operation of other equipment especially sensitive electronic equipment. Therefore the following precautions are recommended to help reduce the chance of problems associated with VFD operation.

First, follow all recommended installation and wiring procedures as directed by the manufacturer of the VFD. This will often recommend maximum motor lead length, minimum wire size and other special wiring procedures.

The signal wiring between the Boiler manager and the VFD should be in a dedicated conduit by itself with no other wiring including the power or motor leads. Use only metal conduit for this run and use metal conduit connectors at the ends and junctions. Assure that good grounding is maintained over the entire length of the conduit and that one end of the conduit is then solidly grounded to the grounding system at the installation site.

In the event that excessive noise from the VFD is still causing problems with the Boiler Manager, isolating analog signal conditioners may need to be installed on the signals between the Boiler Manager and the VFD. Note that two are required, one for the "drive" signal that is the setpoint for fan speed and one for the "feedback" signal that monitors actual VFD speed output.

Connections

Power Source

The Boiler Manager requires a 120VAC, 50/60Hz nominal source of power. For facilities that only have some other voltage available such as 220/240VAC, a step down transformer will be required to provide 120VAC to the Boiler Manager. Often, this transformer can be installed in a panel that also contains the various starters and contactors for the boiler equipment.

The power source should not be tapped from the power source that feeds the combustion air fan such that opening the disconnect switch for the fan also cuts power to the Boiler Manager. Although this is common practice in many control panels that contain a BMS with or without an integrated combustion control, it is not recommended practice for PLC based controls. Removing power to the Boiler Manager under these conditions prevents it from controlling and monitoring the shutdown process and also eliminates all ways for the operator to go back and review the status of the system at the time of shutdown.

The Boiler manager requires a 15A branch circuit. The conductors used for the power source must be minimum 14 gauge but may need to be larger depending on the length of the wire run back to the source panel. Refer to the NEC for proper power wire sizes.

The power source for the Boiler Manager connects to a dedicated 3 pole power distribution block located near the bottom of the panel. The line voltage conductors connect to L1 and L1. For power sources where one line is grounded, connect the grounded conductor to L2. The power source grounding conductor connects to the GND terminal. The terminal blocks accept a wire range from 14 to 4 gauge. Use only copper conductors when connecting to this terminal block.

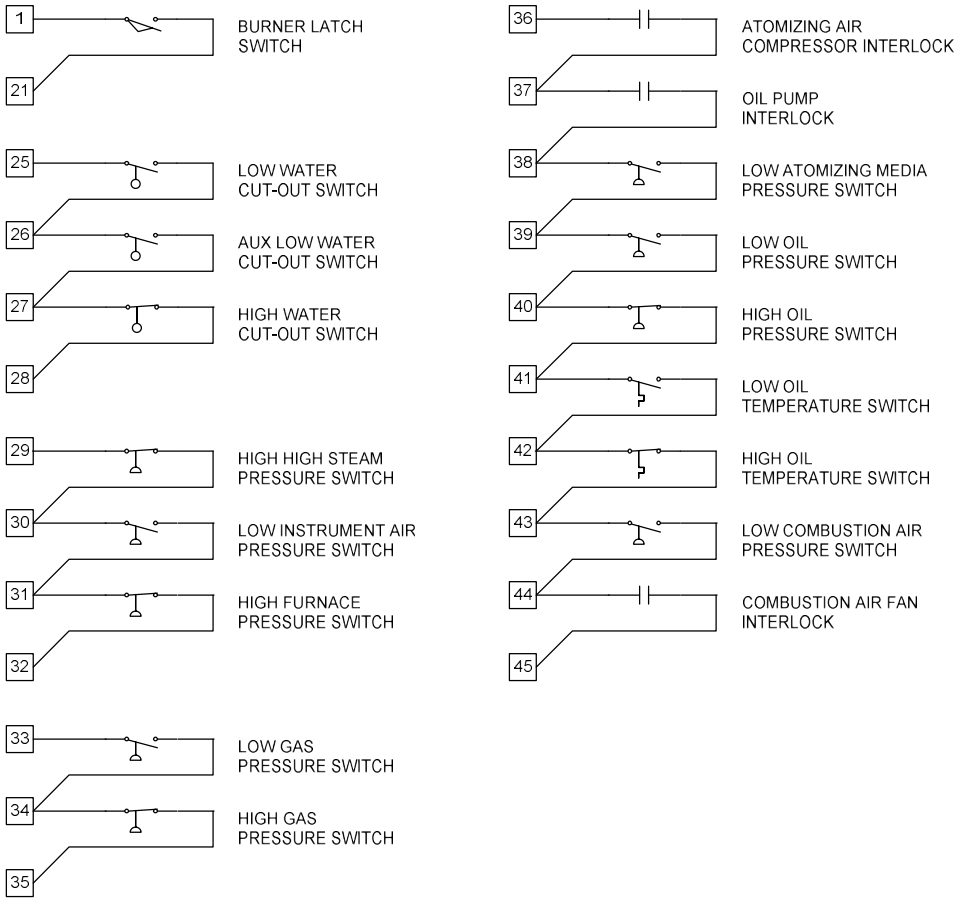
Interlock and Limit Switches

The interlock and limits switches are those that allow burner operation when closed and perform a safety shutdown of the burner when open. These switches are wired in series. Each switch has two dedicated terminals for it although most of these terminals will have one wire from two adjacent switches in the series string connected to it.

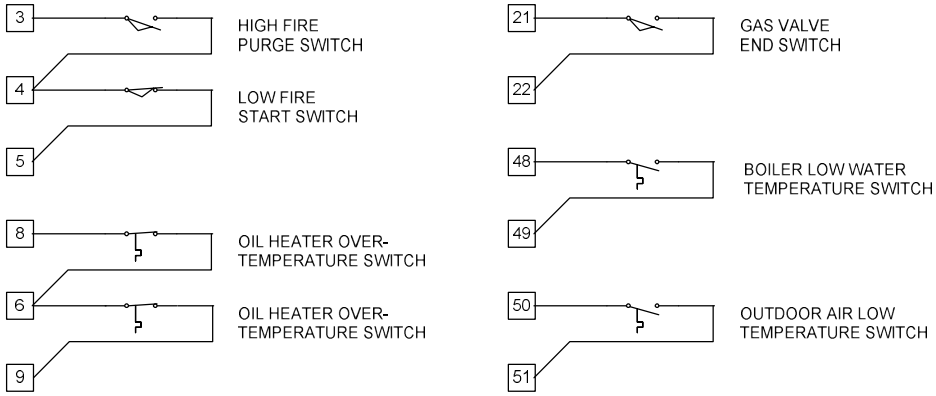
The Boiler Manager is designed for the wide range of boiler installations and so has connection terminals for switches that may be used in as many cases as possible. For the specific boiler application, one or more of these switches may not be applicable or not required and so a wire jumper must be placed across the pair of terminals that would provide the connection point for the switch wires.

Under no circumstances should a switch that is required for safe operation of the boiler or burner be replaced with a wire jumper across its designated terminals. Doing so will prevent the Boiler Manager from performing a safety shutdown under a condition which may warrant it and can result in damage to property, personal injury or death.

The diagram below shows the connection for these switches.



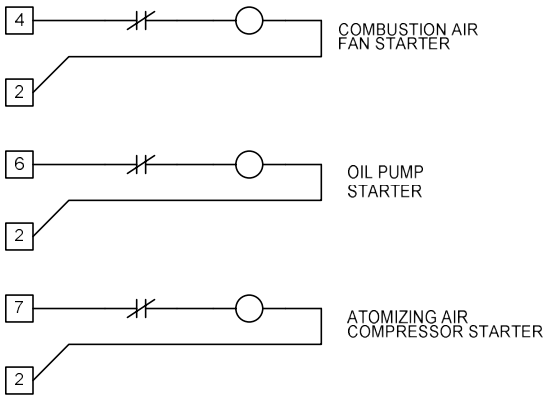
The remaining switches (that are not used to cause a safety shutdown) are wired to the terminals as shown below. Most of these switches are provided with a dedicated pair of terminals so that each terminal will only have one field wire connected to it.



Starters and Contactors

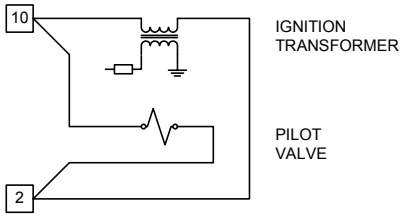
Terminals are provided for connection of starters for the combustion air fan, atomizing air compressor and oil pump. Terminals are also provided for up to two oil heater contactors. These connections are shown below.

All of these starters and contactors together are powered by a circuit from the BMS/Flame Safeguard which imposes a limit of 9.8 full load amps and 58 locked rotor amps. The sum of all of these loads should not exceed this limit.



Ignition Transformer and Pilot Valve

The primary of the ignition transformer and pilot shutoff valve connect to the terminals as shown below. The BMS/Flame Safeguard imposes a limit of 4.5 amps for the transformer and 50VA for the valve. The high voltage output of the transformer should always be directly connected to the igniter using a suitable type of high voltage ignition style cable. Never route the high voltage conductor back through the Boiler Manager panel.

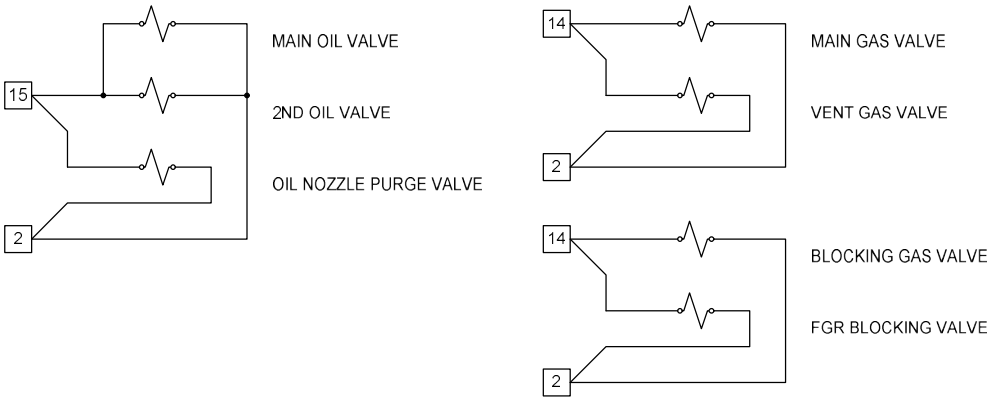


Main Fuel Shutoff Valves

The fuel shutoff valves connect to the terminals as shown below. For the main gas and oil valves, the BMS/Flame Safeguard imposes a limit of 3850VA inrush, 700VA opening, and 250VA holding.

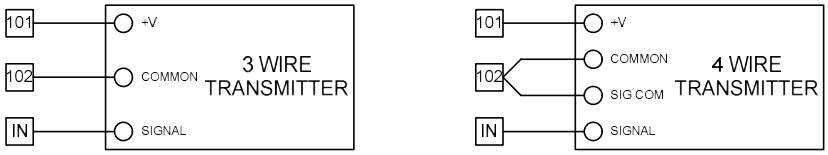
Terminal connections are also shown below for an optional gas vent valve, FGR blocking valve or oil nozzle purge valve.

For burners that utilize two oil shutoff valves, the two valves are simply wired in parallel as shown. For burners that utilize two gas shutoff valves, two separate terminals are provided for each of the two valves. This accommodates the Boiler Manager version that uses the Honeywell BMS/Flame Safeguard which includes a valve proving feature.

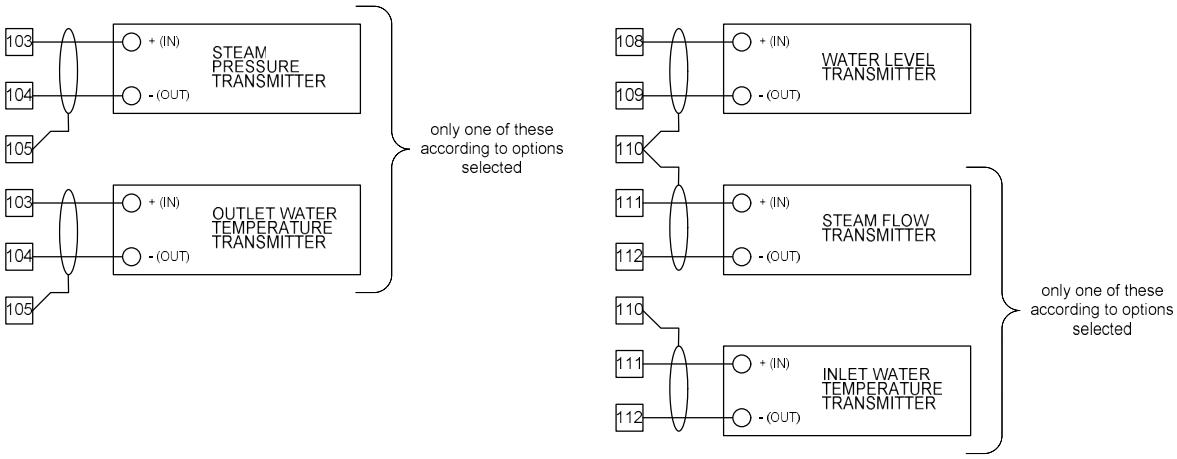


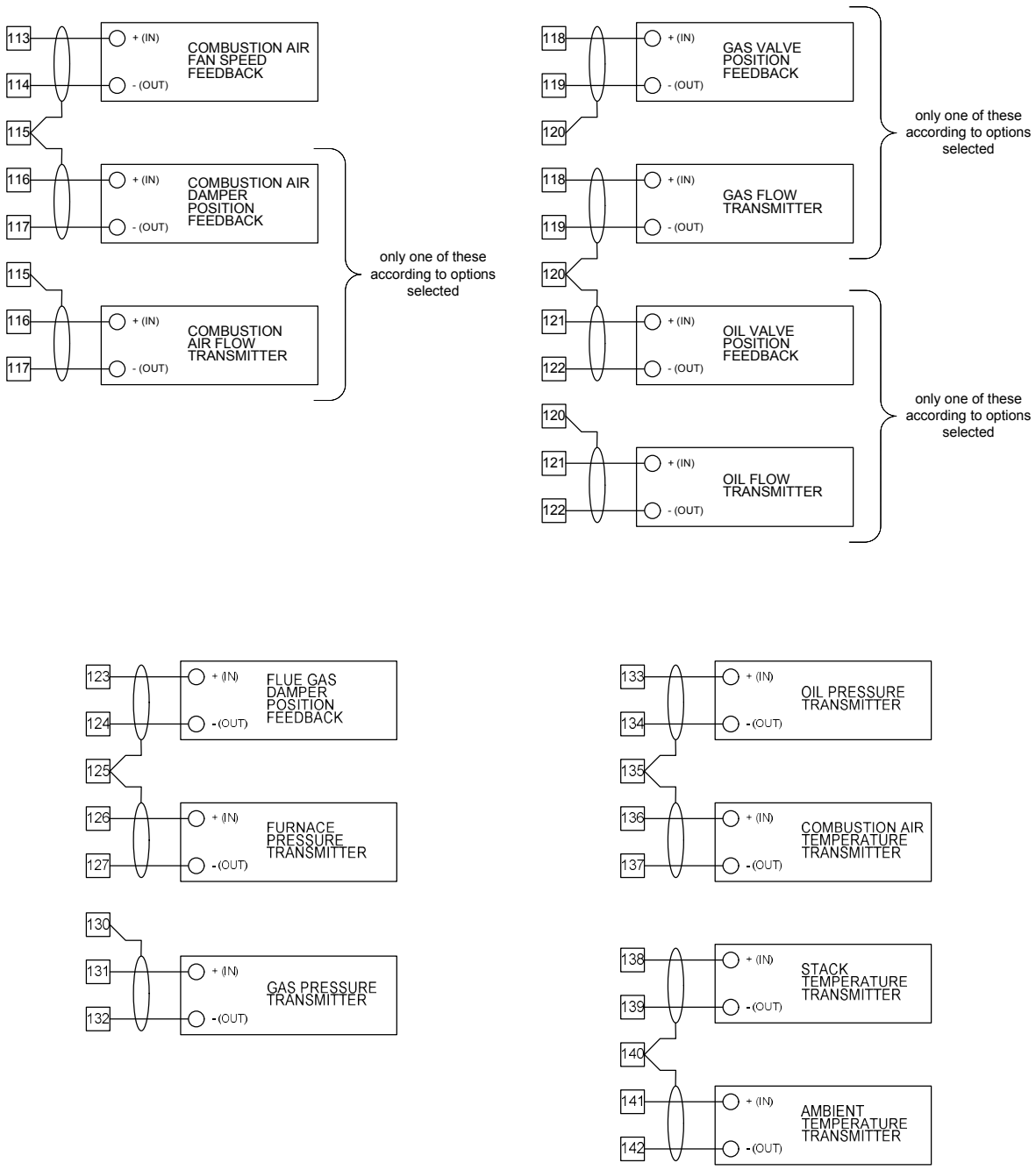
Transmitters

The Boiler Manager accepts 4-20mA analog inputs and so transmitters must be of the type that can output a current signal in this range rather than sending a voltage signal. The Boiler Manager's terminal arrangement is designed around the 2-wire, loop powered style of transmitters. It is possible to connect 3-wire and 4-wire style transmitters using the corresponding wiring connections as shown below. However, 3-wire and 4-wire transmitters usually require more power to operate. The total 24VDC power available from the Boiler Manager to power all transmitters including the loop powered ones is limited to 30W.



The diagram below shows terminal connections for all of the transmitters that the Boiler Manager accepts. Some of these may not be applicable on a specific boiler.

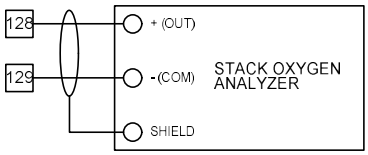




Any where that a transmitter is not used for a specific boiler installation, the "input" terminal should be connected to the 24VDC common (terminal 102) using a jumper wire. This will help reduce noise into the system from unconnected inputs.

Oxygen Analyzer

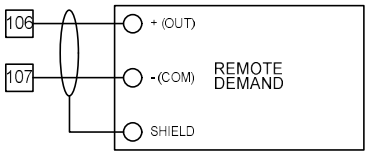
The oxygen analyzer usually provides a self-powered rather than a loop-powered milliamp output. The diagram below shows the terminal connections for this special case.



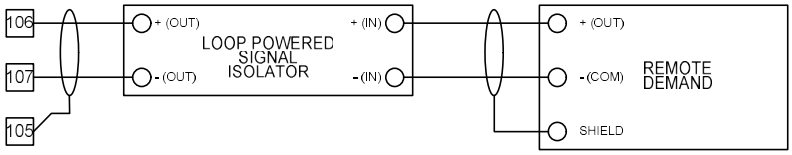
Oxygen analyzers require additional line level power to operate the electronics and a heater in the probe. The Boiler Manager does not include dedicated terminals for connection of the supply voltage for the analyzer. Although it is possible to provide the analyzer power by connecting to terminals 1 and 2 (120VAC hot and neutral respectively), it is recommended to provide a dedicated branch circuit for the analyzer separate from the Boiler Manager. If the analyzer power is drawn from the Boiler Manager, the total combined load of all burner valves, starters, contactors, etc and the analyzer must not exceed the 15A rating of the Boiler Manager's main circuit breaker and internal wiring.

Remote Demand

The remote demand signal to the Boiler manager usually comes from a physically separate Plant Master or Boiler Sequencer type of system. The Boiler Manager provides a 4-20mA input for connection of this signal. This signal is usually self-powered by the host system. The diagram below shows how to connect this type of signal.

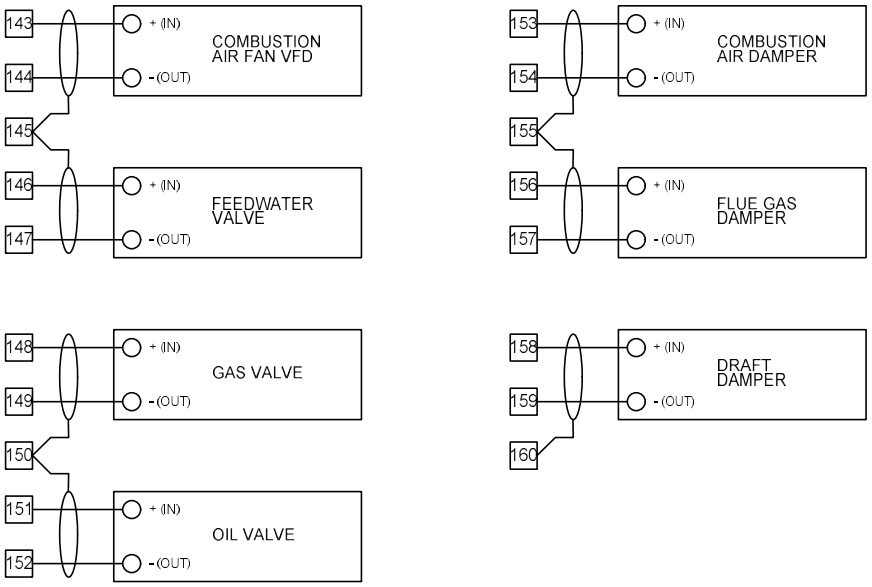


In some cases it may be desirable to place an isolating signal conditioner in the remote demand signal between the source and the Boiler Manager. The diagram below shows a typical connection of this type.



Actuators

The Boiler Manager provides 4-20mA analog outputs to control the position of the burner and boiler valve and damper actuators and to set the speed of the combustion air fan VFD. Connection of these controls signals between the Boiler Manager terminals and each actuator is shown below. The milliamp signals from the Boiler Manager are self-powered and so loop power from the actuator is not needed or used.



Final Wiring Check

Upon completion of installation and wiring but prior to first applying power to the panel and connected equipment, a final wiring check is recommended. This should include verification of the following.

1. Perform a basic visual verification that all connection are per the wiring diagrams and directions in this document

2. Check for proper supply voltage and correct branch circuit protection.

3. Check for adequate grounding by measuring for a continuity of less than 0.1Ω from the Boiler Manager's grounding terminal to the installation site's common grounding point.

4. Visually check for potential shorts between wires on different circuits at terminal strips. Occasionally a stray wire strand may not enter a terminal and can create the potential for a short to an adjacent terminal or component.

5. Confirm that each wire entering a terminal is secure. This can be done by simply applying a slight tug on each wire to see if it pulls free of the terminal.

6. Using an ohmmeter, check the resistance of each line voltage output circuit (ignition transformer, shutoff valves, and motor starters) to see that they do not read 0Ω indicating a short to ground.

Applying Power

This section describes the steps suggested when preparing to apply power to the Boiler Manager for the first time. Before applying power, verify that all manual fuel shutoff valves to burner are closed.

Supply power to the fan should be disconnected. Then follow the steps listed below. A voltmeter capable of measuring up to 150VAC and 30VDC is required to perform many of these steps.

1. Starting with main circuit breaker **CB-1** and all fuses (**FS-1** through **FS-6**) open, connect the source of 120VAC power to Boiler Manager panel.

2. Using the voltmeter, confirm that the supply voltage is 120VAC nominal.

3. Close circuit breaker **CB-1**.

4. Confirm that the BMS/Flame Safeguard (either Fireye or Honeywell) powers up. For some burner installations, the burner may have a latch switch that assures that the burner assembly is closed and in the ready-to-fire position. This switch also needs to be closed for the BMS to power up.

5. Confirm that 120VAC exists across the line input of EMI filter **FLT**.

6. Close fuse **FS-2**.

7. Confirm that 120VAC exists across line input of PLC power supply **PS-1**.

8. Confirm that the following LEDs are illuminated:

    a. The green 'OK' LED on PLC power supply.
    b. The green '24V' LED on PLC power supply.

9. Confirm power and operation of the PLC's CPU module by checking that the following LED is illuminated.

    a. The green 'RUN' LED.

    Note: If the red 'ERR' LED is illuminated steady or flashing then a configuration problem exists. In this case, consult Johnson Burners as the PLC's program may have become corrupted and will need to be reloaded.

10. Close fuse **FS-3**.

11. Confirm that 120VAC exists across the line input of power supply **PS-2.**

12. Confirm that 24VDC exists across the DC output of power supply **PS-2**.

13. Close fuse **FS-4.**

14. Confirm that the display powers up and boots.

15. Close fuse **FS-5**.

16. Confirm that 120VAC exists across the line input of power supply **PS-3.**

17. Confirm that 24VDC exists across the DC output of power supply **PS-3**.

18. Close fuse **FS-6**.

19. Confirm that 24VDC exists across terminals 101 and 102.

Limit Testing

Prior to placing the burner into actual service and proceeding with commissioning, the wiring to each safety limit should be tested to ensure that each causes a safety shutdown and that the corresponding alarm message appears on the display. This process does not ensure that the safety limits themselves are functioning correctly but checks that the switches are connected correctly and detected by the Boiler Manager.

First assure that all manual fuel shutoff valves to the burner are closed. Also place the fan disconnect switch into the off position.

In order to proceed with this test, each limit switch must be in its normal safe operating state such that the switch is electrically closed. Some switches typically will naturally be in this state with the burner shut down. This usually includes the high pressure and high level switches. The remainder of the switches will need to be bypassed but only during this test. This is best done using a temporary wire jumper (minimum 16 gauge and no longer than 2 feet) with insulated alligator type clamps on each end, attaching the jumper wire across the two applicable terminals of the switch.

Do not leave any jumper wires installed on any limit switches once this part of testing is completed. Good practice dictates placing lockout tags on the closed fuel shutoff valves and the fan disconnect switch while this testing is in progress and the jumpers are in place to warn other personnel not to attempt to operate the equipment.

The text display that is part of the Flame Safeguard provides messages that are used to confirm steps during this procedure. The Boiler Manager front door will need to be open in order to see the text display inside the panel.

Hazardous voltages are present within the panel during this testing. Avoid placing hands within the cabinet or touching any internal components while testing.

With each of the limit switches in the normal safe operating (electrically closed) state, proceed to test each switch one by one using the following method.

1. Place the **BURNER** switch located on the front door of the Boiler Manager panel into the **ON** position.

2. Observe that the Flame Safeguard indicates that the firing sequence is started by checking for the corresponding message on the text display provided with the Flame Safeguard.

    a. For Fireye systems, the message will indicate either **HOLD M-8 LIMIT OPEN-PURGE** or **HIGH FIRE PURGE** depending on the state of various proving switches.
    b. For Honeywell systems, the message will indicate either **PURGE HOLD: T19 HIGH FIRE SWITCH** or **PURGE** depending on the state of various proving switches.

3. Either remove the wire jumper on the switch under test or remove one of the leads to the switch. This needs to be done only for a second or two. Therefore, replace the jumper or wire before proceeding.

Use caution as these switches are energized with line voltage. When removing a wire from a terminal, use a screwdriver that has a well insulated handle. Be sure not to touch the screwdriver shaft to any other surfaces while it is in contact with the live terminal. Do not let the loose end of the removed wire come in contact with any surface.

4. Observe that the Flame Safeguard indicates a lockout condition. Generally the first line message will indicate **LOCKOUT** and the second line message will indicate the lockout condition.

5. Observe that the graphical operator display on the front panel indicates the correct alarm condition that matches the limit switch under test.

6. Place the **BURNER** switch located on the front door of the Boiler Manager panel back into the **OFF** position.

7. Press the **BURNER RESET** button on the front door of the Boiler Manager panel to clear the Flame safeguard lockout.

8. Press the Alarm Reset button on the Primary Safety Control page of the graphical display to clear the indicated alarm message if desired.

9. Repeat all of the above steps for each limit to confirm proper operation.

Loop Checks

Prior to commissioning the burner, loop checks should be performed as described below. Loop checks confirm that each analog signal to or from the Boiler Manager is correctly connected to its corresponding field device.

Transmitters

The complete list of transmitters that the Boiler Manager accommodates is shown in the table below. The transmitters that exist on the specific installation will be a subset of these. Each applicable transmitter should be checked. For the purposes of this procedure, the oxygen analyzer is considered a transmitter and included here.

To verify the signal from each transmitter, navigate to the PLC Inputs/Outputs page on the graphical operator display. The right column of the table shows where to find the corresponding transmitter reading on that page.

Transmitter	Display Page
Steam pressure	Analog Inputs – IOM3
Outlet water temperature	
Inlet water temperature	
Water level	
Steam flow	
Combustion air flow	Analog Inputs – IOM4
Gas flow	
Oil flow	
Furnace pressure	Analog Inputs – IOM5
Stack oxygen	

Gas pressure	
Oil pressure	Analog Inputs – IOM6
Comb air temperature	
Stack temperature	
Ambient temperature	

The steps are as follows.

1. For each transmitter, confirm power is applied. In most cases transmitter power comes from the Boiler Manager. Circuit breaker CB-1 and fuses FS-5 and FS-6 must all be closed in the panel for transmitter power to be available. The oxygen analyzer may be energized by an external line voltage source.

2. Transmitters that have a local display can be verified simply by observing that there is visible indication on the display. In other words a blank display probably means lack of power. Transmitter with no display can be verified by checking for voltage across the output signal terminals of the transmitter using a voltmeter set to a range of at least 30VDC. A minimum of 1VDC should be observed when the transmitter is operating correctly. A reading of 24VDC generally means a wiring problem exists.

3. Confirm that there is a reading on the Boiler Manager display that appears to be in agreement with the process parameter the transmitter should be sensing at the moment. For flow transmitters, this will likely be zero. Refer to the transmitter table above to determine where on the display the transmitter reading can be viewed.

4. Repeat these steps for each transmitter.

Actuators

Loop checks of the actuators involve stroking each actuator and confirming movement to verify that the output signal to the actuator is functioning. For actuators that also provide position or speed feedback, an additional step involves verifying that a feedback signal is received at the Boiler Manager. At this step of the installation process it is not important that the feedback signal of an actuator match up with the output signal. Later during the commissioning process, actuator calibration is performed where the output and feedback signals are aligned.

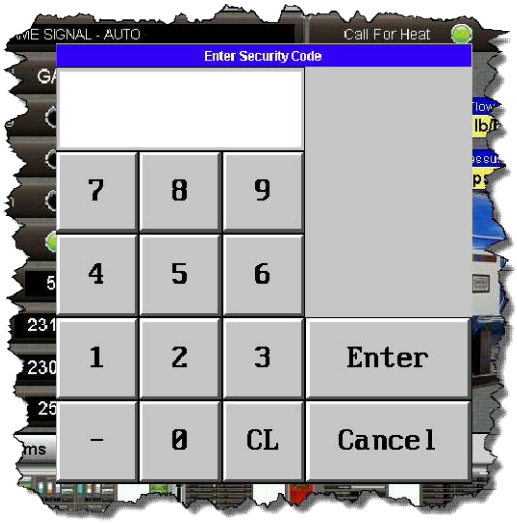
The Boiler Manager provides control of the seven actuators shown in the table below. Some of these may not exist on the specific installation. Each applicable actuator should be checked. For the purposes of this procedure, the combustion air fan VFD is considered an actuator and included here.

- Combustion air fan VFD
- Combustion air damper
- Gas control valve
- Oil control valve
- Flue gas damper
- Draft outlet damper
- Feedwater control valve

The following procedure describes the actuator process sequence step by step.

1. Press the SETUP button from any page in the Operation section to navigate to the Setup section.

2. Enter a valid password for the OEM, Engineer or Supervisor user on the pop-up keypad that opens.



3. Press either the Disagree or Agree button as appropriate on the End User's License Agreement that opens. Pressing the Disagree button returns to the Operation section.

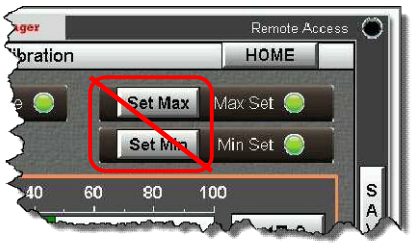
4. The first Calibration page for the combustion air fan appears as shown below.

5. Press the Calibrate button to switch from the OFF state 

to the ON state 

as shown below. Calibration will not be done but this mode is needed to access direct control of the actuators.

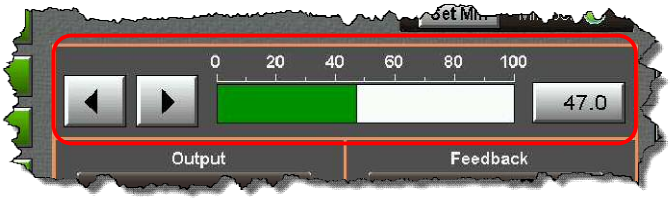
Do NOT press the Set Max or Set Min buttons as shown below on any Calibration page at any time during this procedure. Doing so will change any existing calibration data for the actuator. Refer to the Calibration section of the Setup document for additional information.



6. Press the page select button along the left column to open the page for the actuator to stroke.

7. For each actuator, confirm power is applied. For electrically powered actuators, check that the supply voltage is connected and energized. For pneumatically powered actuators, check that the instrument air supply is connected and turned on. For the combustion air fan VFD, the drive will need to be powered. Note that the fan will need to operate for this procedure.

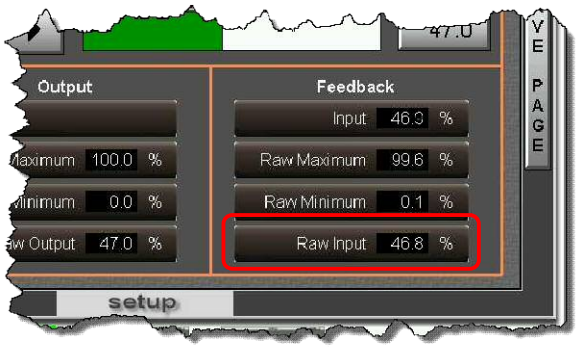
8. Adjust the output to the actuator to move it through the normal range of operation. Avoid driving the actuator beyond any point where valves, dampers, linkages or other mechanical components could be damaged. A typical actuator adjustment area is shown below.



Use the arrow buttons  for incremental changes.

Use the setting entry  for entering a specific value.

To verify the feedback signal from each actuator that has feedback, the measured feedback signal is also displayed on the Calibration page as shown below.



9. Repeat steps 6, 7 and 8 for each actuator.

Completion of Installation

Upon completion of all of the above installation and testing steps, the Boiler Manager panel is ready to have power applied for normal operation. Proceed to commissioning the burner as described in the ***SETUP*** document.

Terminal Descriptions and Ratings

The following table provides a summary of the function and rating of each field wiring terminal within the Boiler Manager panel.

Line Voltage Signals

Terminal	Function	Rating
L1	Incoming 120VAC supply, hot	n/a
L2	Incoming 120VAC supply, neutral	n/a
GND	Panel grounding terminal	n/a
1	120VAC hot within panel after main circuit breaker	15A
2	120VAC neutral within panel	15A
3,5	High fire & low fire proving switches	5mA
4	Combustion blower	9.8A, note 1
6	Oil pump starter	9.8A, note 1
7	Atomizing air compressor starter	9.8A, note 1
8, 9	Oil heater contactors	9.8A, note 1
10	Ignition transformer	4.5A
11, 12	Flame scanner	n/a
14	Oil shutoff valve(s) & oil nozzle purge valve	9.8A, note 1
15	Upstream or sole gas shutoff valve & gas vent valve	9.8A, note 1
16	Downstream gas shutoff valve & FGR blocking valve	9.8A, note 1
17	Pilot gas shutoff valve(s)	50VA
21, 22	Gas valve end switch	5mA
25 thru 45	Interlock & limit switches, series wired	9.8A
46	Atomizing air valve	9.8A
47	Atomizing steam valve	9.8A
48, 49	Boiler low water temperature switch	5mA
50, 51	Outdoor air low temperature switch	5mA

Note 1: Total load capacity for all these loads is 9.8A.

Low Voltage Signals

Terminal	Function	Rating
101	Instrumentation 24VDC power	30W
102	Instrumentation 24VDC return	n/a
103, 104	Steam pressure or outlet water temperature transmitter	20mA
106, 107	Remote demand	20mA
108, 109	Water level transmitter	20mA
111, 112	Steam flow or inlet water temperature transmitter	20mA
113, 114	Combustion air fan speed feedback	20mA
116, 117	Comb air damper position feedback or comb air flow transmitter	20mA
118, 119	Gas control valve position feedback or gas flow transmitter	20mA
121, 122	Oil control valve position feedback or oil flow transmitter	20mA
123, 124	Flue gas damper position feedback	20mA
126, 127	Furnace draft pressure transmitter	20mA
128, 129	Stack oxygen analyzer	20mA
131, 132	Gas pressure transmitter	20mA
133, 134	Oil pressure transmitter	20mA
136, 137	Combustion air temperature transmitter	20mA
138, 139	Stack temperature transmitter	20mA
141, 142	Ambient air temperature transmitter	20mA
143, 144	Output to combustion air fan VFD	20mA
146, 147	Output to feed water control valve	20mA
148, 149	Output to gas control valve	20mA
151, 152	Output to oil control valve	20mA
153, 154	Output to combustion air damper	20mA
156, 157	Output to flue gas damper	20mA
158, 159	Output to draft damper	20mA

Wiring Diagrams

Wiring diagrams are subject to occasional changes and so are not included here. For the complete wiring diagram of the Boiler Manager, refer to one of the two drawings listed below. These are available from Johnson Burners.

Fireye based system, drawing B-9574
Honeywell based system, drawing B-9###

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S.T. Johnson Company
925 Stanford Ave. • Oakland, CA 94608 • USA
Phone (510) 652-6000 • Fax (510) 652-4302
www.johnsonburners.com