SCC Inc.

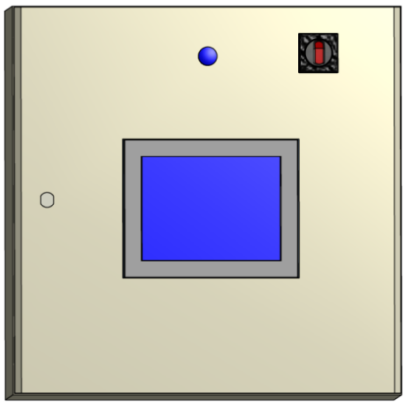
Installation Instructions

Document No. TS-2100

February 14, 2017

TS Series

TS-MS… Master Panels for Boiler Management, Lead/Lag, and Building Management System Interface



Description

A TS-MS… Series Master Lead/Lag Panel sequences and controls up to eight boilers equipped with TS... communication kits (see Document No. TS-1000 or TS-1050) or TS… complete combustion control enclosures (see Document No. TS-4000).

A master panel controls hot water or steam boilers with Siemens LMV series linkageless control systems. Each panel includes a 7.5”, 10” or 12" touchscreen with a programmable logic controller.

Flexible communication interface options to the building management system (BMS) provide streamlined data collection, monitoring and controls. Additional options include pump controls and programmable analog and digital outputs.

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Compatible Controls and Accessories

Controls

- LMV5... with internal load controller
- LMV5... with RWF40 or RWF55 external load controller
- LMV3... with RWF10, RWF40 or RWF55 external load controller

Accessories

- Feedwater control via RWF40 or RWF55 (steam boilers only)
- Connection to SCC-supplied variable speed drives (combustion air fan)
- SCC Inc. Expanded Annunciation system

Physical Connections

The Lead/Lag Master connects to individual Touchscreen Kits via Ethernet.

The Lead/Lag Master can also communicate with the connected equipment directly via Modbus. Connect any RS-485 devices in a daisy-chain with termination at the end of the chain (typically a 120-Ohm resistor). The following addresses are required for the connected equipment:

Table 1: Required Addressing of Controllers (x = Boiler Number)

Device	Required Address	Communication Type
LMV3x (via OCI412.10)	x1	Modbus RTU (RS-485)
LMV5x	x1	Modbus RTU (RS-232)
RWF10 (for load control)	x2	Modbus RTU (RS-485)
RWF40 (for load control)	x2	Modbus RTU (RS-485)
RWF55 (for load control)	x2	Modbus RTU (RS-485)
RWF40 (for feedwater)	x3	Modbus RTU (RS-485)
RWF55 (for feedwater)	x3	Modbus RTU (RS-485)

For example, boiler 1 LMV would be address 11 and boiler 4 feedwater would be address 43.

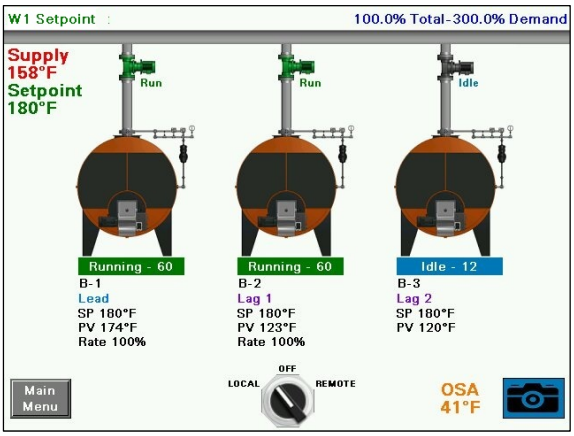
Communication via Modbus must be set with the following values:

- 19200 baud
- 8 stop bits
- 1 data bit
- no parity

See the appendices for Modbus configuration details for each device.

Logging In

When the Lead/Lag Master is powered up, the OVERVIEW screen will appear.



Press **MAIN MENU** in the lower left corner to go to the MAIN MENU screen.

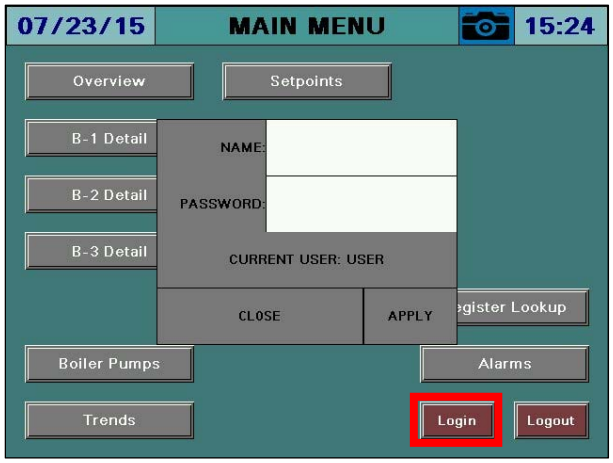
From here, different screens can be accessed depending on the access level. There are three access levels available:

- USER: Allows access to viewing data, changing setpoints, and manual operation. No username or password required.
- TECH: Same access as USER level as well as access to changing operational parameters. Username and password required. The username is TECH. The default password is 9876.
- SETUP: Same access as TECH level as well as access to programming touchscreen configuration settings. Username and password required. The username is SETUP. The default password is START.

NOTE: If the ACTIVATION screen appears instead of the OVERVIEW screen, see the *Activation* section for additional detail.

Logging In (continued)

In order to log in at the desired access level, press **LOG IN**. The LOGIN screen will appear.



Tap the area next to NAME and a keypad will appear.

Use the keypad to enter the username for the desired access level. When finished, press **ENTER**.

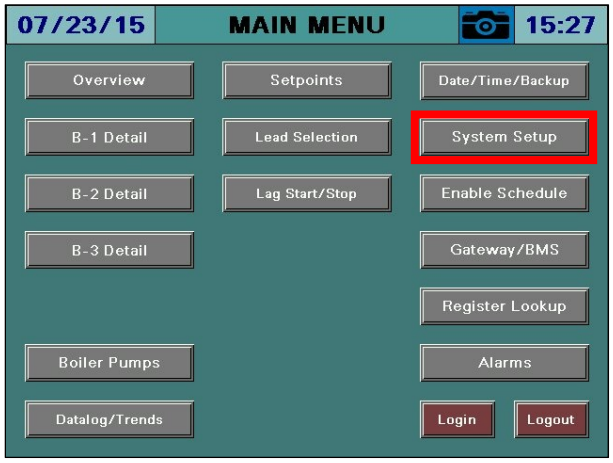
Next, tap the area next to PASSWORD and the same keypad will appear again. Enter the password and then press **ENTER**.

When both the username and password have been entered, press **APPLY**. If successful, the CURRENT USER will change from USER to TECH or SETUP depending on the username and password that were entered. Hit **CLOSE** to leave the login screen.

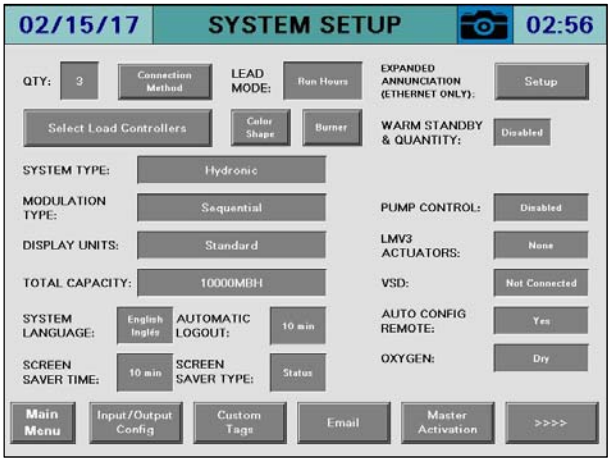
System Setup

Access level: **SETUP**

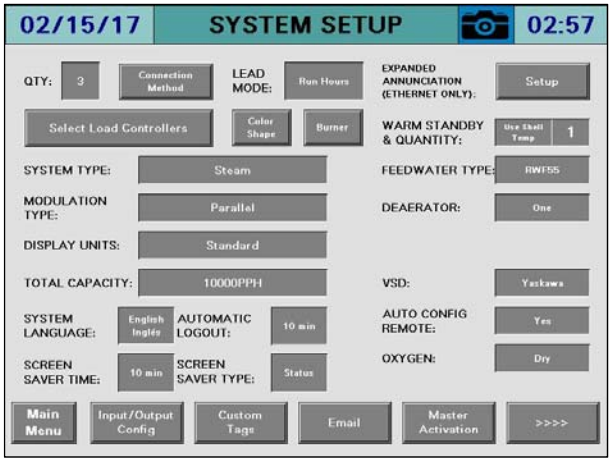
The Lead/Lag Master needs to be configured for the connected equipment. Press **SYSTEM SETUP** to display the SYSTEM SETUP screen.



HYDRONIC



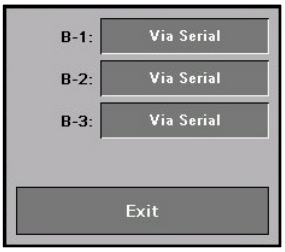
STEAM



QTY – Sets the total number of boilers connected to the system (1 to 8).

System Setup (continued)

CONNECTION METHOD – Displays a window used to select the connection method of each boiler.



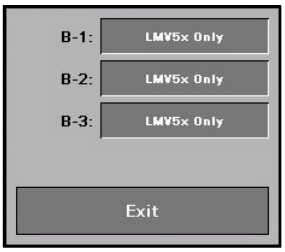
- **Via Serial:** Select this option if the boiler is connected using serial communication.
- **Via Serial/Ethernet:** Select this option if the boiler is connected using serial communication through an Ethernet adapter.
- **Via Ethernet:** Select this option if the boiler has a Touchscreen Kit.

LEAD MODE – Selects the desired lead rotation method.

- **Run Hours** - Choose this option to alternate the lead boiler by elapsed run hours as counted by the Lead/Lag Master.
- **By LMV Startups** - Choose this option to alternate the lead boiler to obtain even LMV accumulated startup cycles. This is the best option when there is greater than one startup per hour and the desired outcome is to balance the LMV run time.
- **By LMV Hours** - Choose this option to alternate the lead boiler to obtain even LMV accumulated run hours. This is the best option when there is fewer than one startup per hour and the desired outcome is to balance the LMV run time.
- **Force Lead** - Choose this option to disable alternation.

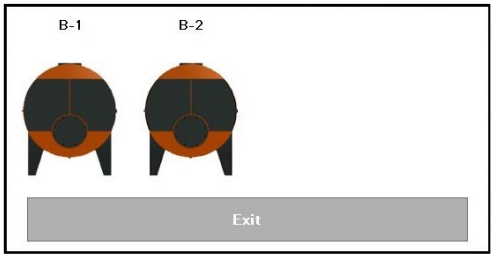
System Setup (continued)

SELECT LOAD CONTROLLERS – Displays a window used to select which Siemens controller(s) are connected to the Lead/Lag Master.

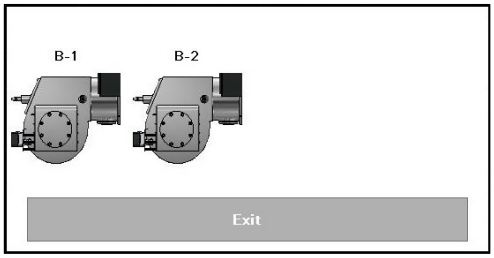


- **LMV5x Only:** Select this option when using an LMV5x and its internal load controller.
- **LMV5x/RWF40:** Select this option when using an LMV5x with an RWF40 as an external load controller.
- **LMV5x/RWF55:** Select this option when using an LMV5x with an RWF55 as an external load controller.
- **LMV3x Only:** Select this option when using an LMV3x with no load controller.
- **LMV3x/RWF10:** Select this option when using an LMV3x with an RWF10 as an external load controller.
- **LMV3x/RWF40:** Select this option when using an LMV3x with an RWF40 as an external load controller.
- **LMV3x/RWF55:** Select this option when using an LMV3x with an RWF55 as an external load controller.

COLOR/SHAPE – Displays a window used to select the graphical image for each boiler.



BURNER – Displays a window used to select the graphical image for each boiler.



System Setup (continued)

SYSTEM TYPE – Selects the type of system that the Lead/Lag Master is controlling.

- **Steam**
- **Hydronic**

MODULATION TYPE – Selects the type of modulation that the Lead/Lag Master will use.

- **Parallel:** The firing rates of the boilers are based upon one central load demand and each running boiler will fire to that load demand. See *Appendix - Parallel Modulation* for specific detail and examples.
- **Sequential:** The firing rates of each boiler are based upon one central load demand and each new running boiler will begin modulating when the previous boiler has reached the base firing rate. See *Appendix - Sequential Modulation* for specific detail and examples.

DISPLAY UNITS – Selects the type of units that the Lead/Lag Master will use.

- **Metric**
- **Standard**

TOTAL CAPACITY – Sets the total MBH or PPH of the system. If a value is entered, a scaled estimate of the current output will be displayed based upon the load demand.

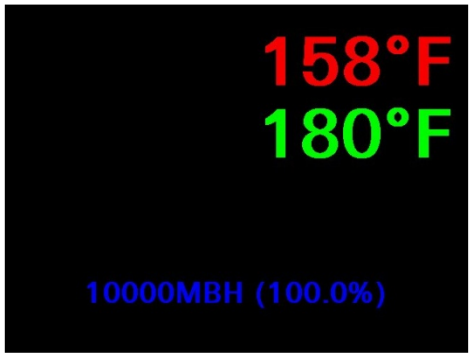
MASTER LANGUAGE – Selects the display language that the Lead/Lag Master will use.

- **English**
- **Spanish**

SCREEN SAVER – Select between off (no screen saver), 1m, 2m, 5m, 10m, 30m or 60m.

SAVER TYPE – Select the screen saver type.

- **Status:** Shows the process variable, setpoint and current status in a large font.



- **Blank:** Screen saver is a blank screen.

AUTO LOG OUT – Sets how long a user remains logged in. Select between 5m, 10m, 30m, 60m or 120m.

System Setup (continued)

EXPANDED ANNUNCIATOR SETUP – Displays a window used to enable the Expanded Annunciator and options in connected Touchscreen Kits.

- **EXPANDED ANNUNCIATOR:** Select whether the Expanded Annunciator option is present.
- **RTD CARD –** Select whether the RTD input option is enabled in the Expanded Annunciator (only shows up when EA optioned, requires RTD input option).
  - **Disabled**
  - **Enabled**
- **ANALOG CARD –** Select whether the analog input option is enabled in the Expanded Annunciator (only shows up when EA optioned, requires RTD input option).
  - **Disabled**
  - **Enabled**
- **ECONOMIZER –** Select whether the economizer option is enabled in the Expanded Annunciator (only shows up when EA optioned, requires RTD input option or economizer RTD input option).
  - **Disabled**
  - **Enabled:** Uses economizer RTD input option for temperature sensors. The LMV5x stack temperature sensor may be used for one of the inputs.
  - **Use RTD:** Same as above, but uses the regular RTD input option for the economizer. Setting this option will automatically set the **RTD CARD** option to **Enabled**.
- **DRAFT CONTROL –** Select whether the draft control option is enabled in the Expanded Annunciator (only shows up when EA optioned, requires analog input option and RTD input option).
  - **Disabled**
  - **Enabled:** Uses three EA digital inputs for status, one RTD input for resistance feedback and one analog input for the draft sensor. Setting this option will automatically set the **ANALOG CARD** and **RTD CARD** options to **Enabled**.
- **EXTRA RWF –** Select whether additional RWF55 controls are connected serially via RS-485 to the Expanded Annunciator (only shows up when EA optioned, standard EA feature).
  - **None**
  - **1x RWF55:** Use Modbus address 1, 19200 baud, 8 stop bits, 1 data bit, no parity.
  - **2x RWF55:** Use Modbus addresses 1 & 2, 19200 baud, 8 stop bits, 1 data bit, no parity.

System Setup (continued)

FEEDWATER – Choose whether a feedwater system is installed with a Siemens controller (only shows up for steam boilers).

- **Disabled**
- **RWF40:** Select this option if the feedwater is being controlled by an RWF40.
- **RWF55:** Select this option if the feedwater is being controlled by an RWF55.

PUMP CONTROL – Select whether the boiler circulating pump is controlled by the EA (only shows up for hydronic boilers with EA optioned).

- **Disabled**
- **Enabled:** The pump will be commanded on when the boiler is commanded on. The pump will remain on after the boiler command is removed for the duration of the off delay period.
- **Lead Run Continuous:** The pump will be commanded on as long as the HAND-OFF-AUTO switch is not in OFF on the REMOTE OPERATION screen.
- **Locally:** Select this option to command the pump from the Expanded Annunciator.

LMV3 ACTUATORS – Select the actuators being used on an LMV3x controller (only shows when LMV3 selected).

- **None**
- **Air Only:** Choose this option when only an air actuator is being used.
- **Fuel Only:** Choose this option when only a fuel actuator is being used.
- **Air & Fuel:** Choose this option when both air and fuel actuators are being used.

VSD – Select whether an SCC-supplied VSD system is installed on the combustion air fan.

- **Disabled**
- **Yaskawa:** Select this option if the SCC-supplied VSD system is manufactured by Yaskawa.

AUTO CONFIG REMOTE – Select whether configuration parameters are pushed to connected Touchscreen Kits.

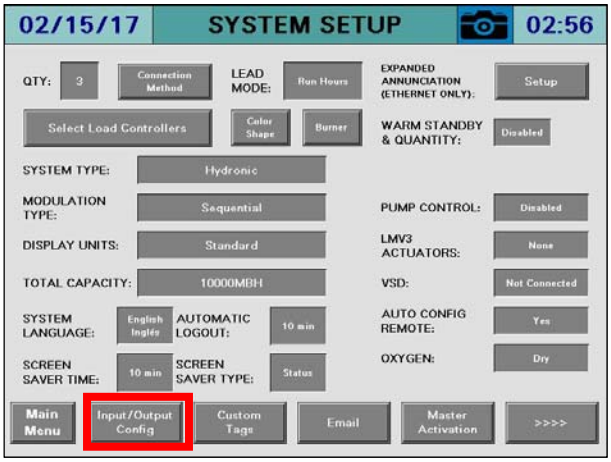
- **Yes:** Configuration at the Touchscreen Kits is locked out (use when universal configuration is present).
- **No:** Configuration must take place at the Touchscreen Kits individually (use when different configurations are desired by boiler).

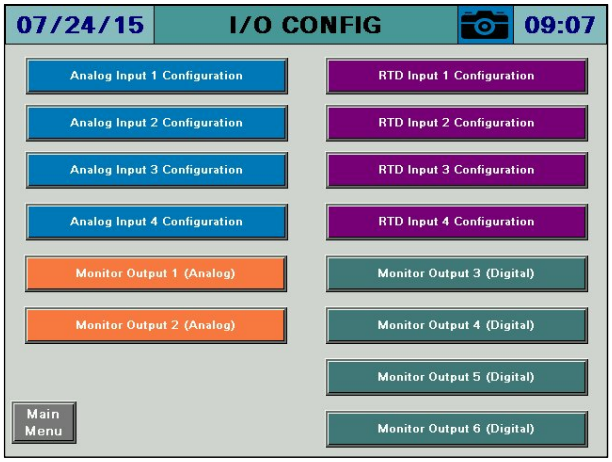
O_2 – Select whether the O_2 and efficiency are calculated using the dry or wet method (only shows when LMV5 selected).

- **Dry:** The dry basis O_2 trim data (efficiency, O_2) is calculated from the wet basis O_2 trim data supplied by the LMV52. CO_2 and excess air are also calculated.
- **Wet:** The wet basis O_2 trim data (efficiency, O_2) is supplied by the LMV52.

System Setup (Input / Output Config)

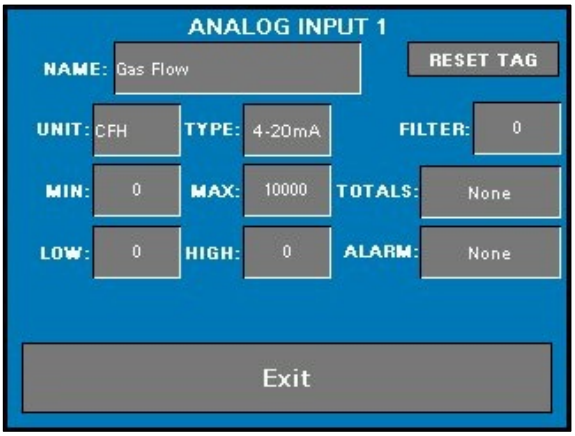
Press **INPUT/OUTPUT CONFIG** to configure analog and digital inputs and outputs.





System Setup (Input / Output Config continued)

Analog Input Configuration



NAME – Sets the user-configured name for each input. The name may be up to 20 characters long. Press **RESET TAG** to clear the name and reset input configuration (requires > 1s press).

Once a name is entered, the input is activated and the remaining configuration information will appear.

UNIT – Sets the user-configured unit tag. The name may be up to 4 characters long.

TYPE – Select between 0-10V, 2-10V, 0-20mA or 4-20mA.

FILTER – Sets the filter time used to average the incoming signal. This is useful when the signal is not steady (such as a draft sensor).

MIN, MAX – Sets the range of the input.

TOTALS – Sets the totalization for the input.

- **None**
- **Minute:** Totalization is calculated by the minute (i.e. gallons per minute).
- **Hour:** Totalization is calculated by the hour (i.e. gallons per hour).

System Setup (Input / Output Config continued)

LOW, HIGH – Sets the alarm setpoints for the input. When the input is below the low setpoint it generates a low alarm and when the input is above the high setpoint it generates a high alarm.

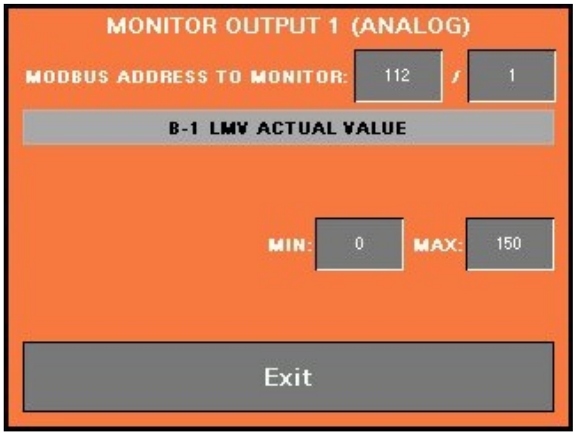
ALARM – Select the alarms generated by the input. Manual reset alarms may be reset by pressing **ALARM RESET** on the ALARMS page.

- **None**
- **Low Only:** Only an auto reset low alarm is generated.
- **LowMR:** Only a manual reset low alarm is generated.
- **High Only:** Only an auto reset high alarm is generated.
- **HighMR:** Only a manual reset high alarm is generated.
- **Low High:** Both an auto reset low alarm and auto reset high alarm are generated.
- **LowMR High:** Both a manual reset low alarm and auto reset high alarm are generated.
- **Low HighMR:** Both an auto reset low alarm and manual reset high alarm are generated.
- **LowMR HighMR:** Both a manual reset low alarm and manual reset high alarm are generated.

System Setup (Input / Output Config continued)

Monitored Outputs (Analog)

The monitored analog outputs can be configured to take an action based upon the value in any of the Modbus registers.

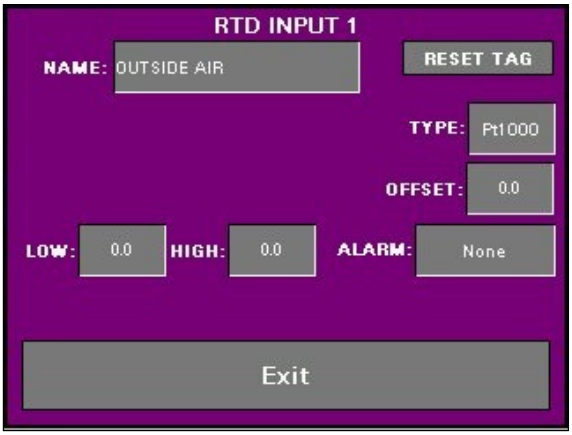


MODBUS ADDRESS TO MONITOR – Sets the Modbus register index to monitor and the divider to apply to it. The name of the chosen address will then be displayed.

MIN, MAX – Sets the scale for the analog output. If the actual value falls outside of the scaled range, the minimum or maximum value will be the output. For example, if address 112, 'B-1 LMV ACTUAL VALUE' is being monitored with a range of 0-150 (psi) and the actual is 160PSI, the output would be 100%. If it were 75PSI, the output would be 50%.

System Setup (Input / Output Config continued)

RTD Input Configuration



NAME – Sets the user-configured name for each input. The name may be up to 20 characters long. Press **RESET TAG** to clear the name and reset input configuration (requires > 1s press).

Once a name is entered, the input is activated and the remaining configuration information will appear.

TYPE – Select between Pt1000, Pt100 or LG-Ni1000.

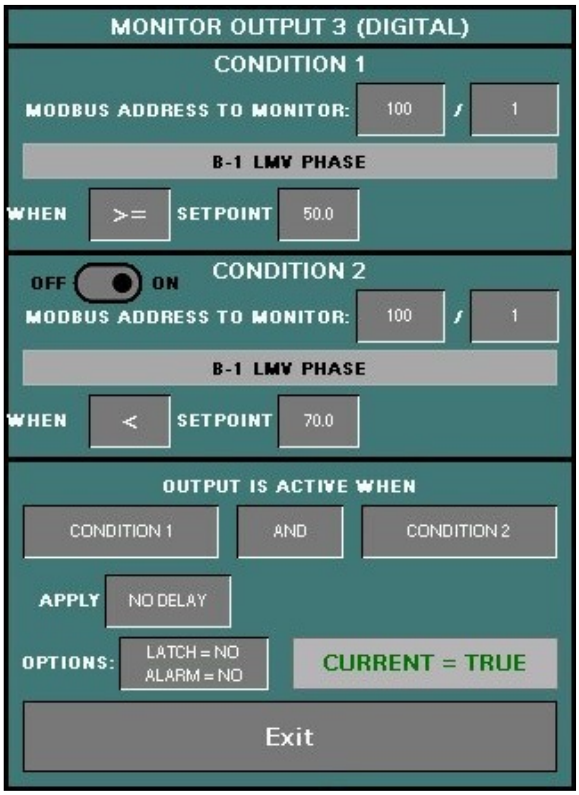
OFFSET – Sets the offset in degrees applied to the input. This may be used to compensate for errors introduced by long wire runs.

LOW, HIGH, ALARM – See the section *System Setup (Input / Output Config) → Analog Input Configuration* for additional detail.

System Setup (Input / Output Config continued)

Monitored Outputs (Digital)

The monitored digital outputs can be configured to take an action based upon the value in any of the Modbus registers. Each monitored digital output can consider two conditions using a logical function. To enable or disable the second condition, touch the slider switch.



Each monitored digital output can consider two conditions using a logical function.

Conditions

MODBUS ADDRESS TO MONITOR – Sets the Modbus register index to monitor and the divider to apply to it. The name of the chosen address will then be displayed.

WHEN – Select the logic applied to the value. Can be <, <=, >, >=, = or a BIT comparison.

SETPOINT – Select the setpoint that the logic will be used to compare against. For bit comparisons, setpoint must be the specific bit of the word (0-15) for the result to be accurate.

System Setup (Input / Output Config continued)

Logic

CONDITION – Select whether the condition is normal or inverted.

- **CONDITION:** Will apply the result of the condition.
- **INVERTED CONDITION:** Will apply the opposite of the result of the condition.

LOGIC – Select the logic applied between the conditions. See *Appendix - Logic Definitions* for additional detail.

- **AND:** Will apply AND gate (and) logic.
- **OR:** Will apply OR gate (or) logic.
- **NAND:** Will apply NAND gate (negative and) logic.
- **NOR:** Will apply NOR gate (negative or) logic.
- **XOR:** Will apply XOR gate (exclusive or) logic.
- **XNOR:** Will apply XNOR gate (negative exclusive or) logic.

APPLY – Select whether any delay is applied to the output.

- **NO DELAY:** Will turn the output on or off immediately.
- **DELAY ON:** Will turn the output on only after the specified delay.
- **DELAY OFF:** Will turn the output off only after the specified delay.

(DELAY TIME) OF – Sets the delay setpoint in seconds.

OPTIONS – Select the additional output options. Latched outputs may be reset by pressing **ALARM RESET** on the ALARMS page.

- **LATCH = NO, ALARM = NO:** Will not latch the output or generate an alarm with the output.
- **LATCH = YES, ALARM = NO:** Will latch the output but will not generate an alarm with the output.
- **LATCH = NO, ALARM = YES:** Will not latch the output but will generate an alarm with the output.
- **LATCH = YES, ALARM = YES:** Will latch the output and will generate an alarm with the output.

The current state of the logic is also displayed with true in green and false in red.

System Setup (Input / Output Config continued)

Assigning Inputs To System Variables

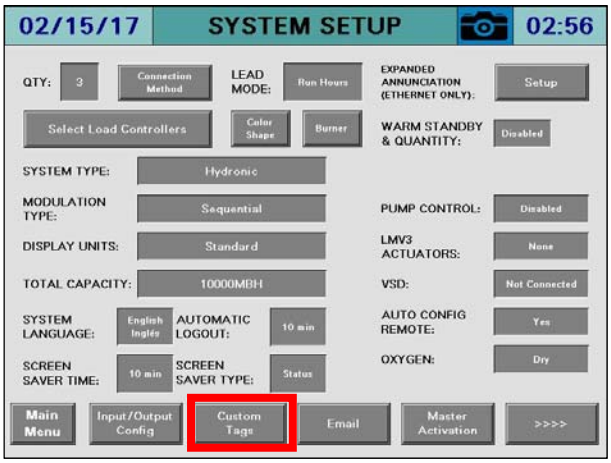
Any of the analog inputs or RTD inputs can be assigned to the required system variables by assigning the proper name. The list of names (case-sensitive) and permitted inputs are shown in **Table 1**.

Table 1: System Variables

Name	Description	Inputs Allowed
REMOTE SETPOINT REMOTE SP	Remote analog setpoint.	AI1-4
HEADER	Steam system header pressure (process variable).	AI1-4
LOOP SUPPLY	Hydronic system loop supply temperature (default process variable).	AI1-4, RTD1-4
LOOP RETURN	Hydronic system loop return temperature.	AI1-4, RTD1-4
LOOP RETURN PV	Hydronic system loop return temperature (use as process variable).	AI1-4, RTD1-4
OUTSIDE AIR	Hydronic system outside air temperature, used for setpoint reset.	AI1-4, RTD1-4

System Setup (Custom Tags)

Press **CUSTOM TAGS** to configure custom tags for the boilers and the fuels.



Boiler Tags

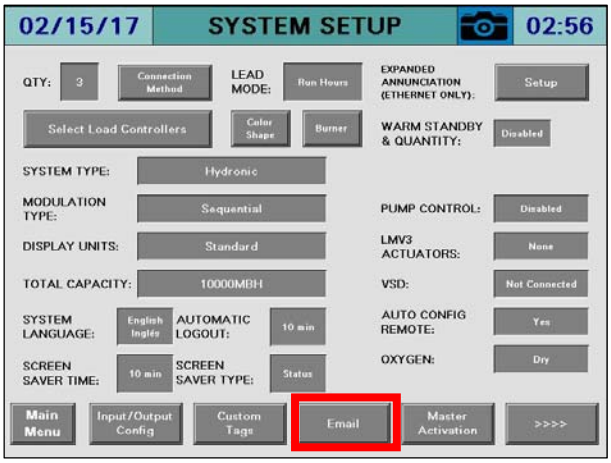
USE CUSTOM TAGS – Select whether to use custom or default tags.
BOILER x TAG – Sets the custom tag name for the boiler (up to six characters).

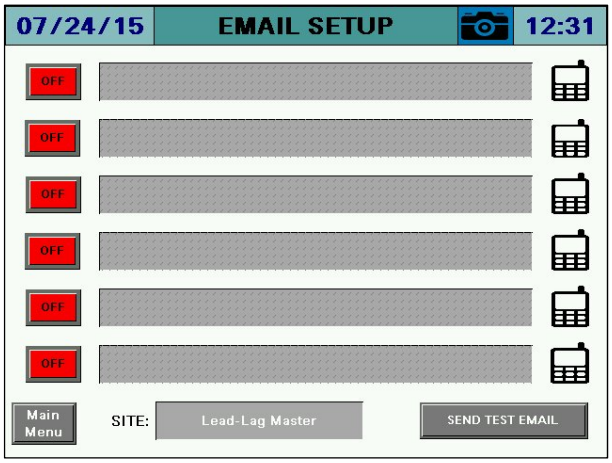
Fuel Tags

USE CUSTOM TAGS – Select whether to use custom or default tags.
FUEL x TAG – Sets the tag name for the fuel (up to six characters) and selects whether the fuel should represent a blue or an orange flame.

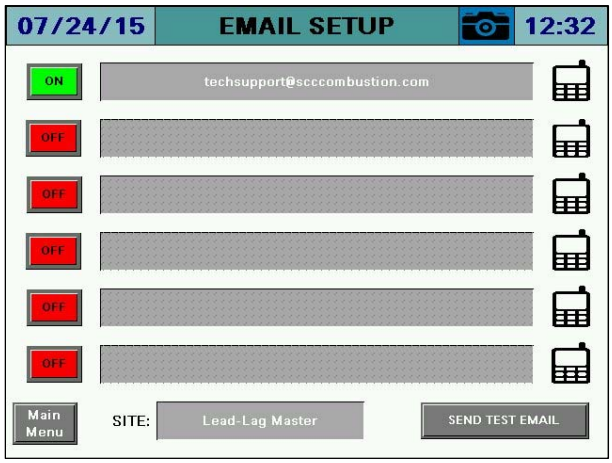
System Setup (Email)

Press **EMAIL** to configure email settings.



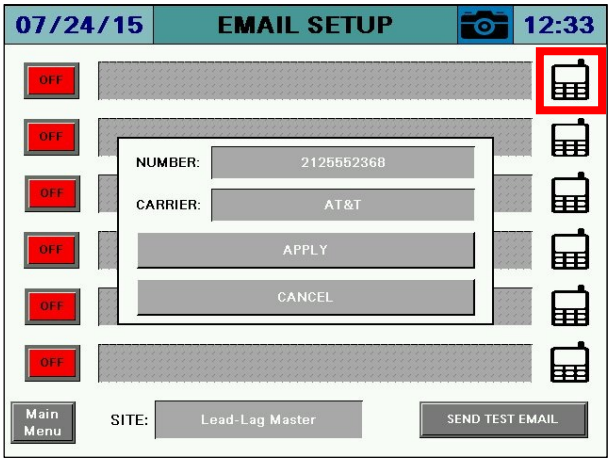


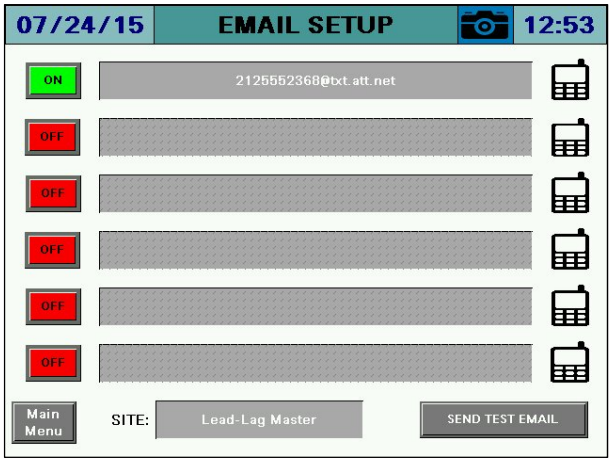
The touchscreen can be configured to send email to up to six addresses. This requires that the touchscreen is connected to a network with Internet access. Emails are sent automatically when alarms occur and may be sent manually to send screen captures and other data from the touchscreen. To configure an email address, press the **ON/OFF** button to the left of the address line, then enter the address.



System Setup (Email continued)

A template is provided to allow text messages to be sent via email. Press the phone icon on the right to bring up the template.

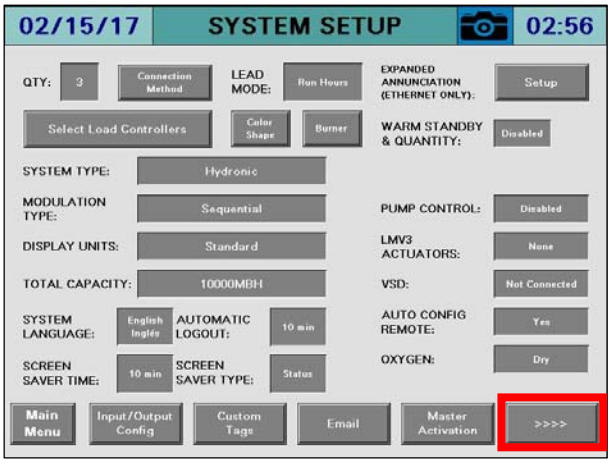


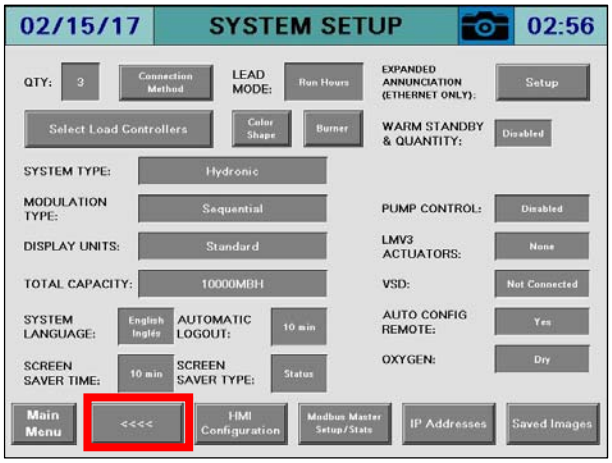


To check that the email addresses are valid and were entered correctly, press **SEND TEST EMAIL**.

System Setup (More Options)

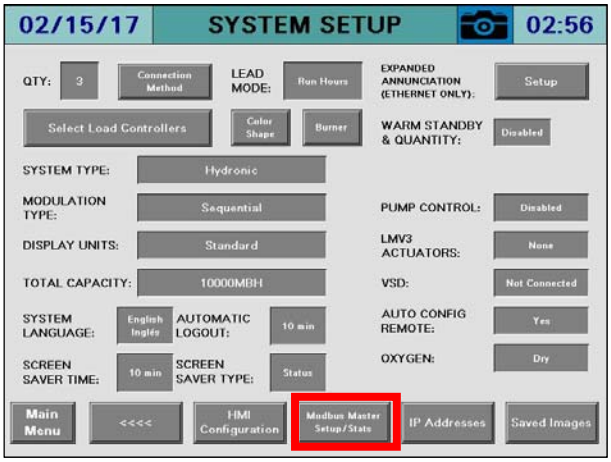
Press **>>>>** to display additional setup options and **<<<<** to return to initial options.

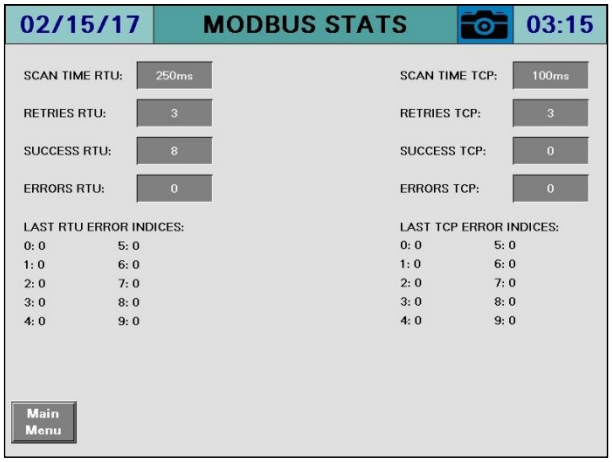




System Setup (Modbus Master Setup/Stats)

Press **MODBUS MASTER SETUP/STATS** to display Modbus master settings.



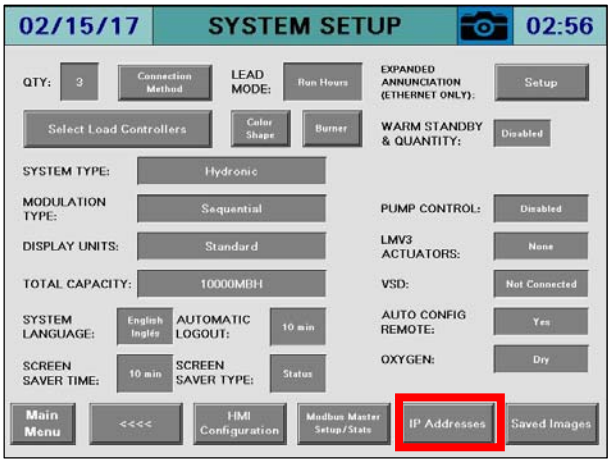


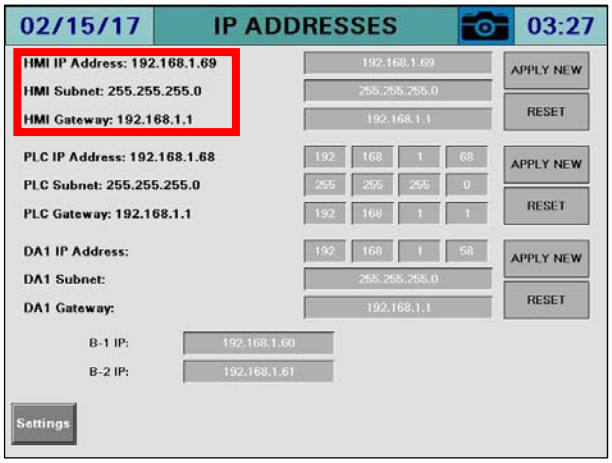
This allows adjustment to the Modbus master parameters for RTU and TCP as well as monitoring of the current communication statistics.

SCAN TIME RTU/TCP – Sets the delay between polls.
RETRIES RTU/TCP – Sets the number of retries when there is no response.
SUCCESS RTU/TCP – Displays successful communication statistics.
ERRORS RTU/TCP – Displays total communication error statistics. Touch to reset to zero (requires > 1s press).
LAST RTU/TCP ERROR INDICES – Diagnostic information on communication errors (internal SCC use).

System Setup (IP Addresses)

Press **IP ADDRESSES** to display IP address settings.

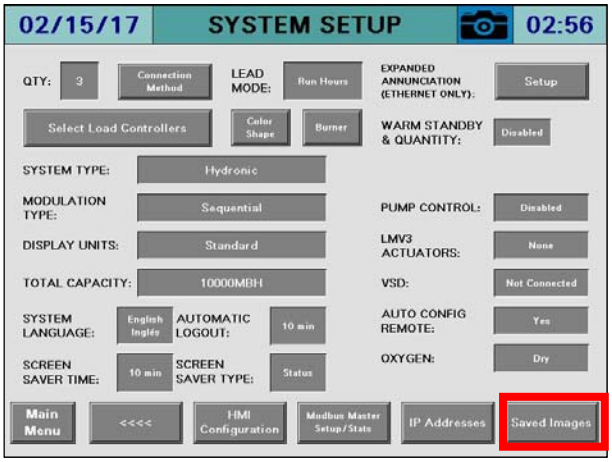


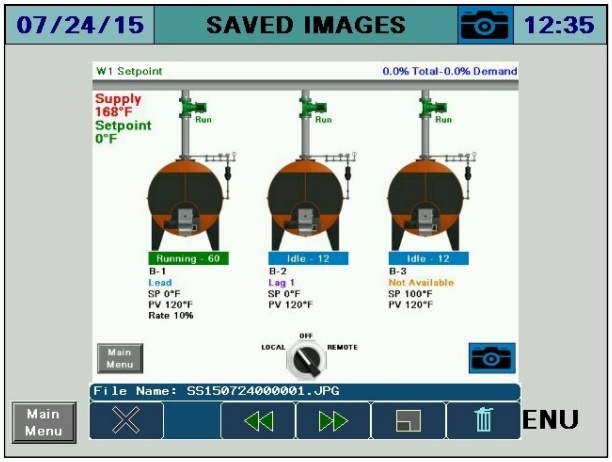


This allows adjustment to all of the IP addresses in the system. Touch the HMI IP address for >1s to toggle between the primary and secondary Ethernet port. For any device IP address, touch **APPLY NEW** for >1s to apply the entered setting. Touch **RESET** for >1s to return to the default IP address for that device. Changing the IP address for any touchscreen kit will take effect upon entry.

System Setup (Saved Images)

Press **SAVED IMAGES** to view screen captures stored on the USB drive.

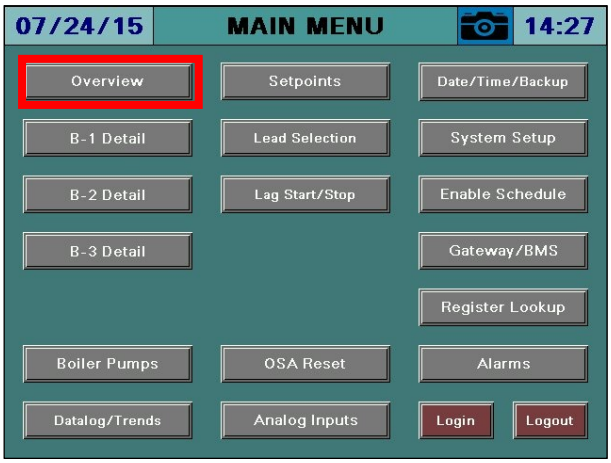


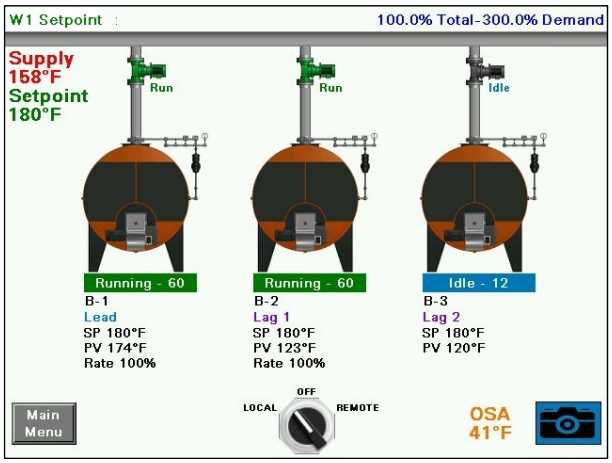


System Overview

Access level: **USER**

The system overview screen displays the real-time data for the boiler system. From the MAIN MENU screen, press **OVERVIEW**. The OVERVIEW screen will appear.





Only the parameters that are optioned and active are shown. Any others are hidden from the display for clarity. The following parameters may be shown on the overview screen:

SETPOINT TYPE – Displays the source of the current setpoint.

- **W1 Setpoint:** The system is using the W1 setpoint. Applies when the system is in LOCAL or is in REMOTE (with no remote setpoint present).
- **W2 Setpoint:** The system is using the W2 setpoint. Applies when the system is in LOCAL or is in REMOTE (system is not OFF). When activated, W2 overrides all other setpoints.
- **Remote Setpoint:** The system is using the remote setpoint. Applies when the system is in REMOTE (with a valid remote setpoint present).
- **OSA Setpoint:** The system is using the outside air reset setpoint (hydronic systems only). Applies when the system is in LOCAL and an outside air sensor is connected (with a valid signal).
- **W1 Setpoint (OSA Fault):** The system is using the W1 setpoint. Applies when the system is in LOCAL (with an invalid outside air sensor temperature).
- **System Disabled:** The system is commanded off. Applies when the system is in OFF or is in REMOTE (with a disable command).

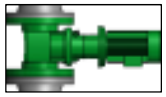
DEMAND – Displays the capacity demand (0-100%), total throughput in MBH or PPH (if configured) as well as the system demand (0-100% per boiler additive, i.e. three boilers = 300%).

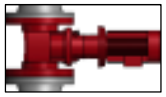
System Overview (continued)

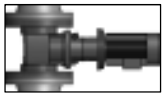
HEADER – Displays the header pressure (steam systems only).

SETPOINT – Displays the current setpoint as a pressure or temperature.

PUMP STATUS – Displays the pump status as running, fail or idle (hydronic systems only).

RUNNING 

FAIL 

IDLE 

STATUS BAR – Displays the current phase description and number as well as the status (running, fail or idle).

- **RUNNING:** The status is displayed in green text, i.e. Running - 60
- **FAIL:** The status is displayed in red text, i.e. Alarm - 0
- **IDLE:** The status is displayed in blue text, i.e. Idle - 12

BOILER TAG – Displays the programmed boiler tag.

LEAD/LAG STATUS – Displays the current lead/lag status.

- **Comm Fault:** The boiler is not communicating with the lead/lag master.
- **Lead:** The boiler is the lead boiler.
- **Lag 1-7:** The boiler is a lag boiler in the designated position.
- **Not Available:** The boiler is not available due to one of the following reasons (boiler control switch is off, boiler is not in automatic mode, boiler is in lockout, or boiler with LMV5x controller is not set for “IntLC Bus” or “ExtLC Bus”).

SP – Displays the current setpoint of the boiler.

PV – Displays the actual value of the boiler.

RATE – Displays the firing rate in percent if modulating, or number of stages active if staged.

OSA – Displays the outside air temperature if connected (hydronic systems only).

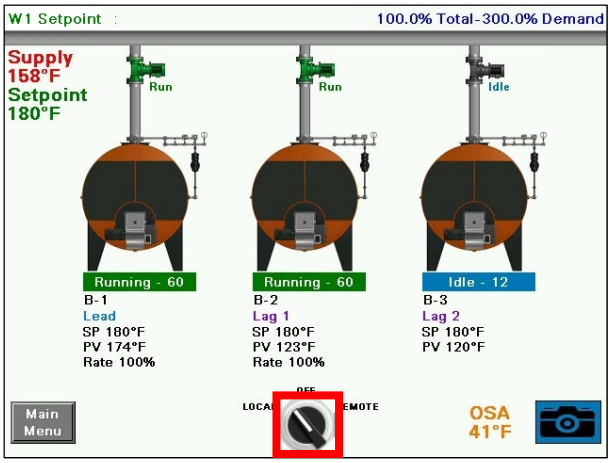
SYSTEM LOCAL-OFF-REMOTE – Sets the mode of the system.

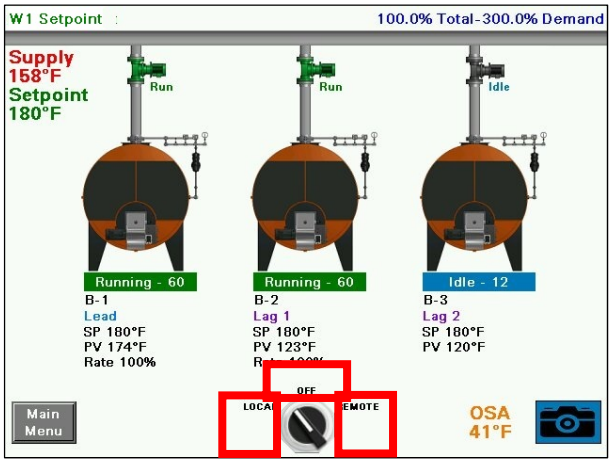
- **LOCAL:** The system is enabled.
- **OFF:** The system is disabled.
- **REMOTE:** The system enable/disable is provided by remote system. Defaults to enabled if no remote system is connected.

System Overview (continued)

System Local-Off-Remote Switch

There are two ways to change the position of the LOCAL-OFF-REMOTE switch. Touching the switch for > 1s will toggle the switch to the next position. Touching the 'LOCAL', 'OFF' or 'REMOTE' text for > 1s will switch to that position directly. See *Appendix - System Local-Off-Remote Flowchart* for additional detail.

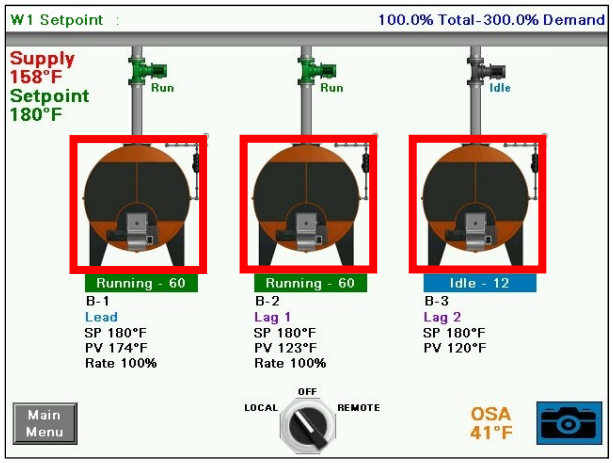




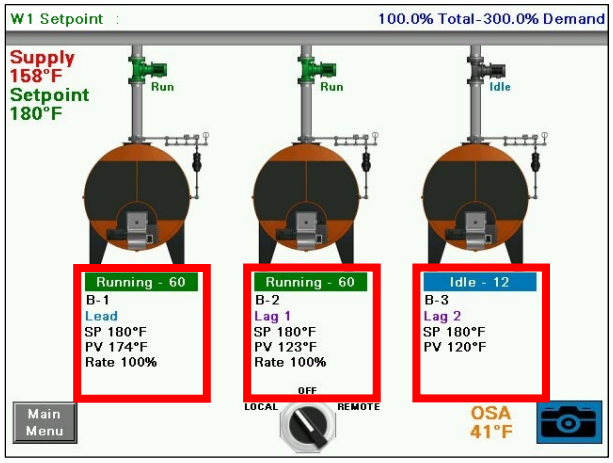
System Overview (continued)

Shortcut Navigation From Overview

Touching the boiler image will navigate to the BOILER OVERVIEW screen (see *Boiler Overview* section for additional detail).



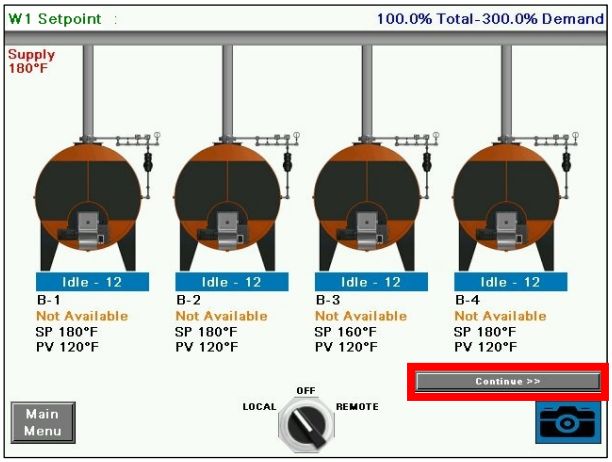
Touching the boiler information will display the boiler HAND-OFF-AUTO switch (see *Boiler Overview → Hand-Off-Auto* section for additional detail).

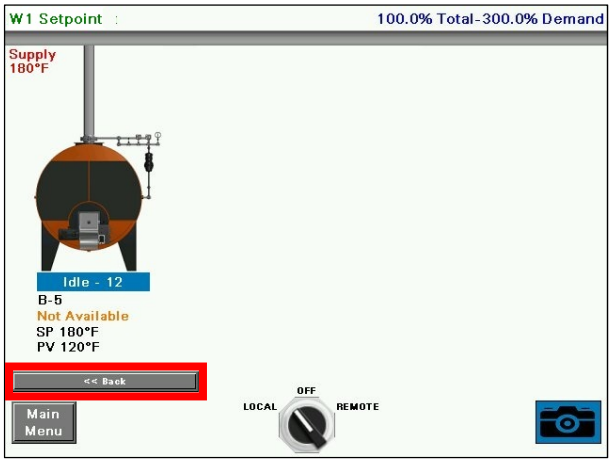


System Overview (continued)

Boilers 5-8

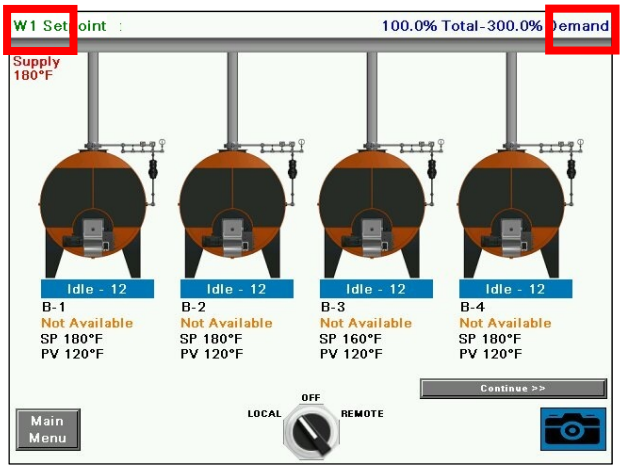
Systems with greater than four boilers connected will have a split overview screen. To see boilers 5-8, press **CONTINUE>>**. To return to boilers 1-4, press **<<BACK**.

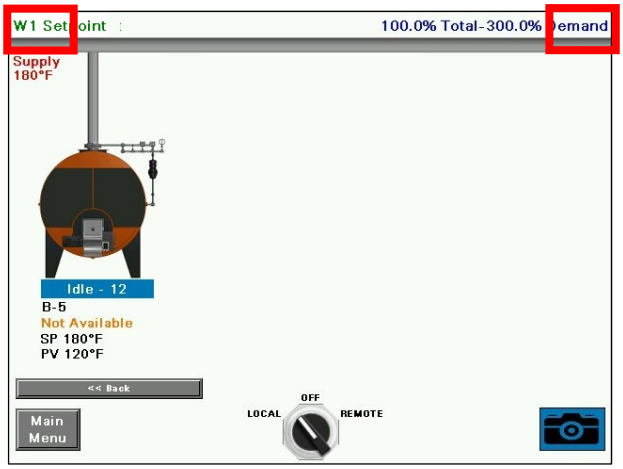




Forcing Screen Saver

To force the display of the screen saver, press one of the top corners from the SYSTEM OVERVIEW screen.

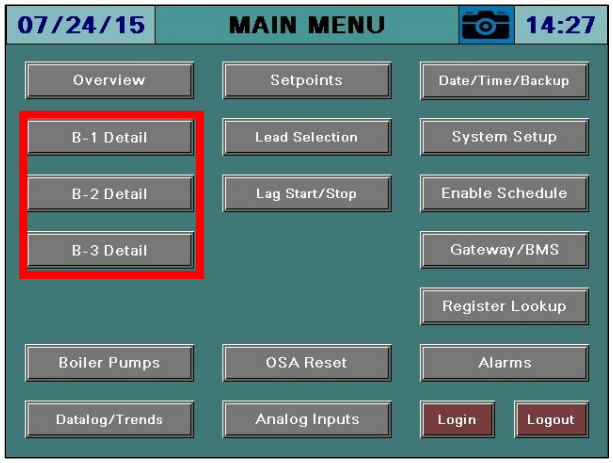




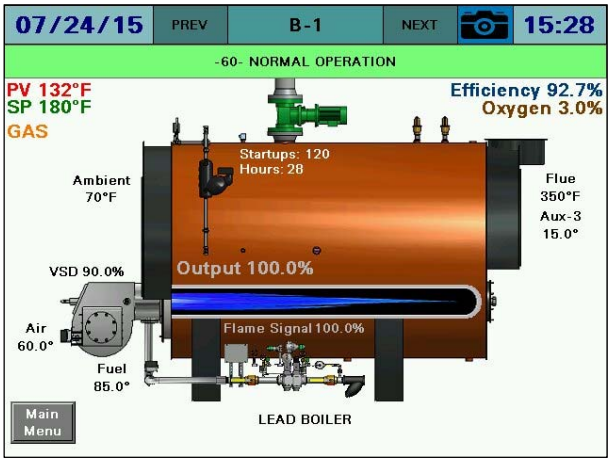
Boiler Overview

Access level: **USER**

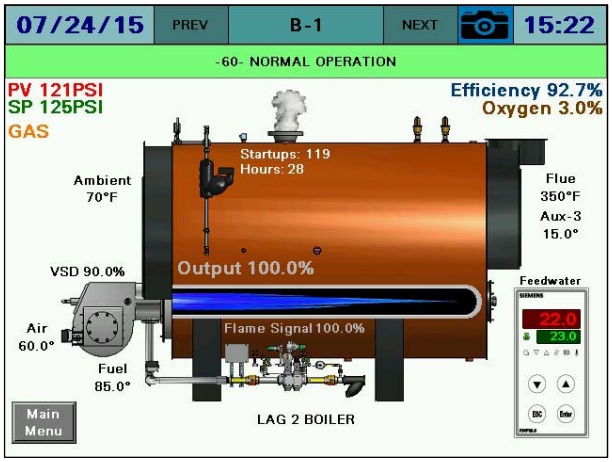
The boiler overview screen displays the real-time data for the specific boiler. From the MAIN MENU screen, press **B-x DETAIL**. The BOILER OVERVIEW screen will appear for the selected boiler.



HYDRONIC



STEAM



Use the **PREV** and **NEXT** buttons to navigate between boilers.

Boiler Overview (continued)

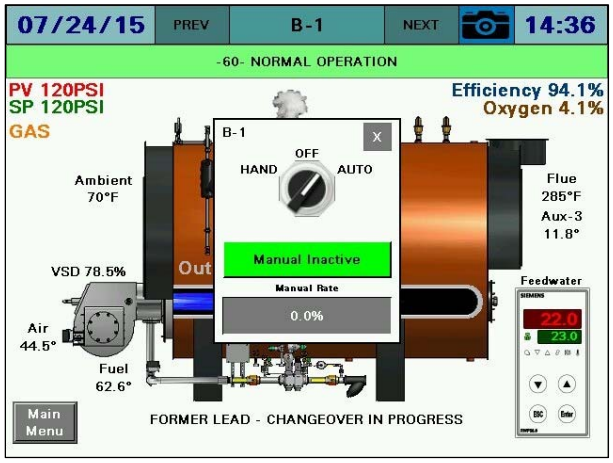
Phase: The phase of the boiler is always displayed in a horizontal bar at the top of the screen.
PV: Displays the actual value of the boiler.
SP: Displays the current setpoint of the boiler.
Fuel In Use: Displays the current fuel being used (uses fuel tags).
Firing Rate: Displays the firing rate of the boiler from 0-100%.
Manual Active: Displayed in red text if the boiler is in manual mode.
Air Actuator: Displays the position of the air actuator.
Fuel Actuator: Displays the position of the current fuel actuator.
Aux Actuators: Displays the position of the auxiliary actuators if equipped (LMV5x only).
VSD Output: Displays the speed of the VSD from 0-100%.
Shell Temp: Displays the current boiler shell temperature.
Startups: Displays the number of boiler startups on the selected fuel.
Hours: Displays the number of hours run on the selected fuel.
O_2: Displays the current O_2 percentage in the stack (LMV5x only).
Flue Temp: Displays the current flue gas temperature (LMV5x only).
Ambient: Displays the current ambient temperature (LMV5x only).
Efficiency: Displays the current combustion efficiency (LMV5x only).
Feedwater: Displays the current RWF data. The red display is the actual level and the green display is the setpoint (steam systems only).
Pump Status: Displays the current boiler pump status. A green pump indicates running, a red pump indicates pump alarm and a gray pump indicates idle (hydronic systems only).
Lead/Lag Status: Displays the current lead/lag status. See **Table 2** for a full list of messages.

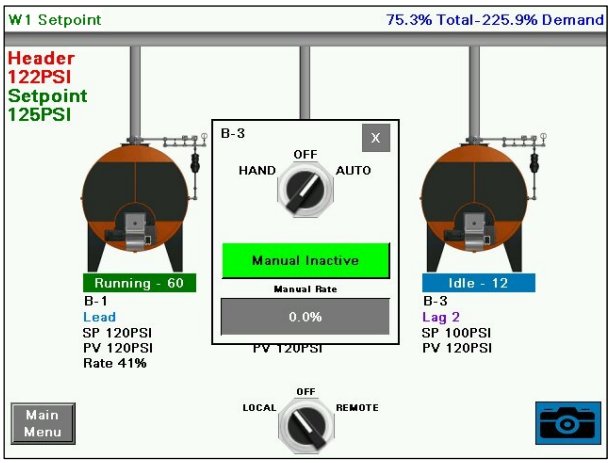
Table 2: Lead/Lag Status Messages

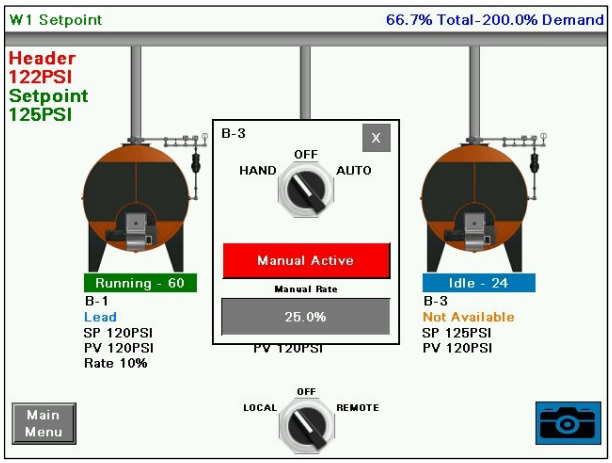
Message	Definition
LEAD/LAGx BOILER	The current boiler designation.
LEAD/LAGx BOILER - WSB ACTIVE ON TEMP	The current boiler designation, also indicates that warm standby is active due to temperature.
LEAD/LAGx BOILER - WSB MIN RUN	The current boiler designation, also indicates that warm standby is active due to unsatisfied minimum run timer after temperature satisfied.
FORMER LEAD – CHANGEOVER IN PROGRESS	The boiler is transitioning from a lead boiler to a lag boiler.
BOILER NOT AVAILABLE	The boiler is not available due to one of the following reasons (boiler control switch is off, boiler is not in automatic mode, boiler is in lockout, or boiler with LMV5x controller is not set for “IntLC Bus” or “ExtLC Bus”).
OVERRIDE MODE	The override input on the lead/lag master is activated and is the source of control.

Boiler Overview (continued)

Hand-Off-Auto







HAND-OFF-AUTO – Sets the mode of the boiler to manually on, manually off, or automatic. See **Table 3**, *Appendix - Boiler Hand-Off-Auto Flowchart (Serial Connection)* or *Appendix - Boiler Hand-Off-Auto Flowchart (Touchscreen Kit)* for additional detail. The position will synchronize with the HAND-OFF-AUTO switch located on the touchscreen kit, if applicable.

- **HAND:** The boiler is commanded to run.
- **OFF:** The boiler is commanded to remain off.
- **AUTO:** The boiler is commanded to operate via the Lead/Lag Master commands.

⚠ **Warning:** If the LMV5 is in firing rate control mode, an external automatic reset temperature control must be present on the boiler since the internal load control thermostat function is not active in this mode.

Boiler Overview (continued)

MANUAL ACTIVE/INACTIVE – Select manual forced operation when in **HAND**.

- **INACTIVE**
- **ACTIVE**

MANUAL RATE – Sets the firing rate when manual operation is enabled.

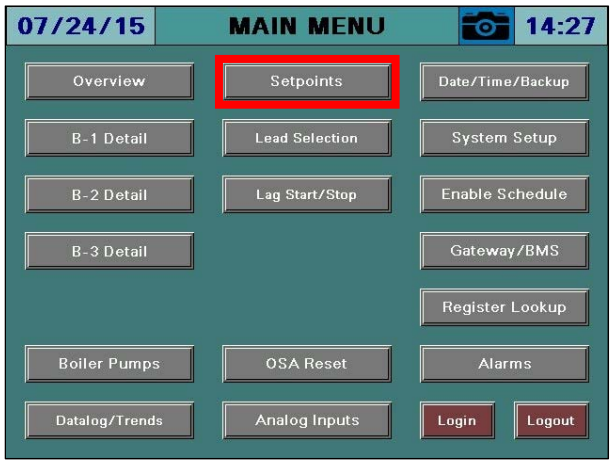
Table 3: LMV Actions in HAND/OFF/AUTO

Position	Local/Remote	Remote Mode	Setpoint Used	Firing Rate Used
HAND (Manual Inactive)	Local	n/a	W1/W2	Internal LC
HAND (Manual Active)	Remote	Burner On	W3	Remote
OFF	Remote	Burner Off	W3	n/a
AUTO (Commanded On)	Remote	Burner On	W3	Remote
AUTO (Commanded Off)	Remote	Burner Off	W3	n/a

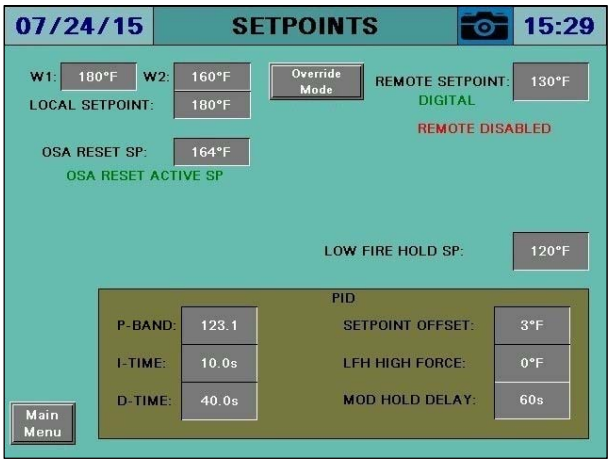
Setpoints

Access level: **USER / TECH / SETUP**

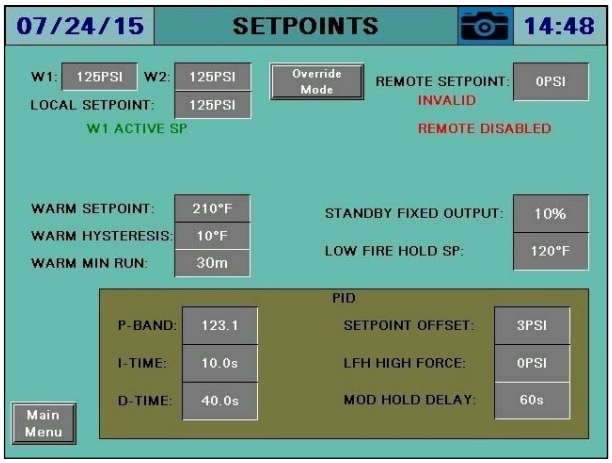
The setpoint setup screen displays system setpoint configuration. From the MAIN MENU screen, press **SETPOINTS**. The SETPOINTS screen will appear.



HYDRONIC



STEAM



⚠ **Warning:** The connected LMV must be commissioned using accurate fuel flow metering. Failure to do so may result in poor performance since the required firing rate will not correspond to a linear burner output. It may not be possible to find suitable PID settings to control with this condition since the feedback will not be relevant.

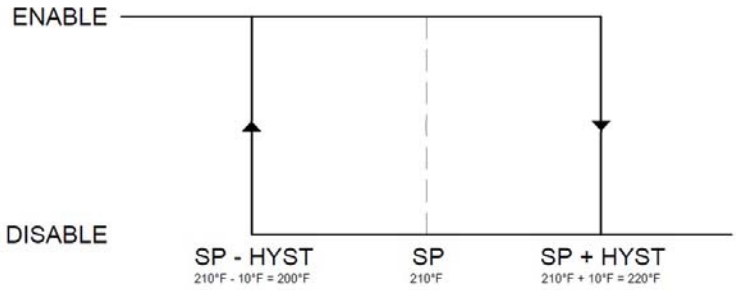
Setpoints (continued)

System Setpoints

W1, W2 SETPOINT – Sets the W1 or W2 setpoint (TECH required). In hydronic systems, W1 is used in the absence of a valid outside air setpoint. In steam systems W1 is the header setpoint. On all systems, W2 is the overriding setpoint when the 'W2' digital input is activated. Also indicates if W1 or W2 is active.
LOCAL SETPOINT – Sets the desired local boiler setpoint (TECH required). *This setpoint must be higher than the system setpoint to prevent local boiler cycling and to ensure proper system operation.* When an RWF40 or RWF55 is used as the load controller, the on hysteresis is fixed at -5 and the off hysteresis is fixed at 5.
REMOTE SETPOINT – Displays the remote setpoint. Also displays the status of the remote setpoint. 'INVALID' indicates inactive communication, 'REM OK' indicates active communication and 'DIGITAL' indicates a hardwired remote setpoint.
REMOTE STATUS – Displays the remote enable status. If the remote setpoint is 'REM OK' or 'DIGITAL', the remote status of 'REMOTE DISABLED' or 'REMOTE ENABLED' will be followed when the system is in remote control mode.
OSA RESET SP – Displays the calculated outside air reset setpoint when an outside air sensor is connected (hydronic systems only). Also indicates when the outside air reset setpoint is active.

Boiler Protection

WARM SETPOINT – Sets the warm standby setpoint (TECH required). This is the nominal temperature that the configured standby boilers will maintain while idle.
WARM HYSTERESIS – Sets the hysteresis band for the warm standby setpoint (TECH required). The off point will be (setpoint + hysteresis) and the on point will be (setpoint - hysteresis).



WARM MIN RUN – Sets the minimum run time for the warm standby enable (TECH required). Prevents short-cycling during warm standby operation.
STANDBY FIXED OUTPUT – Sets the firing rate used when warm standby is active (TECH required).
LOW FIRE HOLD SP – Sets the low fire hold setpoint (TECH required). Whenever the boiler shell (steam) or actual (hydronic) temperature is below this setpoint only low fire operation will be allowed.

Setpoints (continued)

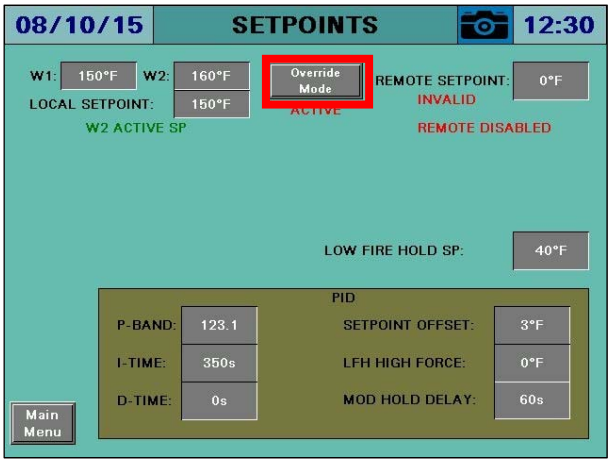
Demand (PID)

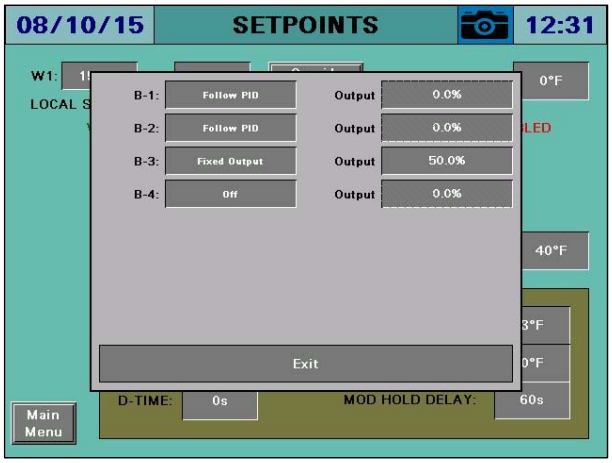
PROPORTIONAL – Sets the proportional band for PID control (TECH required). The proportional portion of the control output is generated by the actual value relative to the setpoint less the proportional band. A smaller proportional band has a larger impact upon the process. For example, if the actual value is 95, the setpoint is 100 and the proportional band is 20, the control output will be 25% of the PID scale (setpoint minus actual, divided by the proportional band). The control output will modulate whenever the actual value is within the effective proportional band (80 to 100 in example). If the actual value is above or below the proportional band limits the control output will be the PID maximum or PID minimum. Setting the proportional band to 0 effectively disables the PID control.
INTEGRAL – Sets the integral time for PID control (TECH required). The integral portion of the control output makes continuous adjustments based upon the error between the setpoint and the actual value. A shorter integral time has a larger impact upon the process. For example, if the output using the proportional band alone is 25% and the integral time is set to 15s, the control output will double to 50% in 15s if the control variables remain constant. This 'integral windup' will continue until the control output reaches the PID maximum or PID minimum. Setting the integral time to 0 disables the integral portion.
DERIVATIVE – Sets the derivative time for PID control (TECH required). The derivative portion of the control output makes periodic adjustments based upon the rate of change in the actual value. A larger derivative time has a larger impact upon the process. For example, if the output using the proportional band alone is 25%, the derivative time is set to 10s and the actual value decreases by 2, the control output will increase by 20% (10 x 2) in anticipation of how much the current rate of change would affect the process 10s into the future. Setting the derivative time to 0 disables the derivative portion. Derivative should be used with caution as it can create an unstable control loop. When used, it is recommended that derivative time not exceed 25% of the integral time.
SETPOINT OFFSET – Sets the setpoint offset for the PID control (TECH required). The setpoint offset is added to the desired setpoint to create the effective setpoint used by the PID control. For example, if the setpoint is 100 and the setpoint offset is 3, the setpoint used by the PID control would be 103.
LFH HIGH FORCE – Sets the setpoint for forcing modulation toward low fire at the individual boilers (TECH required). LFH high force is added to the local setpoint to create the effective high force setpoint. For example, if LFH high force is 3 and the local setpoint is 180, modulation toward low fire will be forced when the individual boiler pressure (steam) or temperature (hydronic) equals 180 and low fire will be achieved after 183. If LFH high force is -3 and the local setpoint is 180, modulation toward low fire will be forced when the individual boiler pressure (steam) or temperature (hydronic) equals 177 and low fire will be achieved after 180.
MOD HOLD DELAY – Sets the time that low fire operation will continue after being released to modulation (TECH required). This delay applies after any condition that calls for low fire (initial run, low fire hold on temperature or LFH high force).

Setpoints (continued)

Override Mode

An override mode is available that will force specific commands to each boiler when the 'Override' digital input is activated. This can be used for a manual warm-up or for a forced production output. In this mode, the PID will operate from 0% to 100% based on demand. From the SETPOINTS screen press **OVERRIDE MODE** to display the OVERRIDE MODE window (TECH required).





BOILER COMMAND – Selects the desired override action.

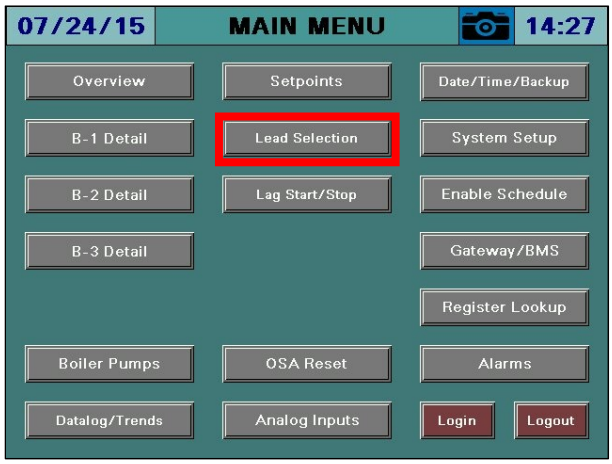
- **Local Operation:** The boiler will be commanded to run in local mode.
- **Fixed Output:** The boiler will be commanded to run using a fixed output. This is similar to manual operation (see *Boiler Overview → Hand-Off-Auto* section for additional detail).
- **Off:** The boiler will be commanded off.
- **Follow PID:** The boiler will be commanded to follow the PID output. There are no start/stop points in this mode, the boiler will always be commanded to run.

⚠ **Warning:** If the LMV5 is in firing rate control mode, an external automatic reset temperature control must be present on the boiler since the internal load control thermostat function is not active in this mode.

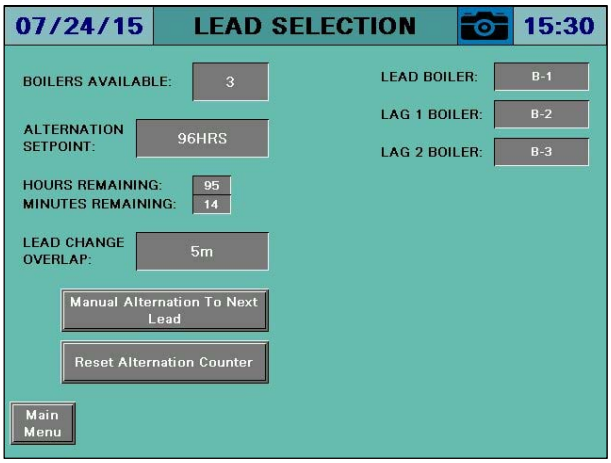
Lead Selection

Access level: **USER / TECH / SETUP**

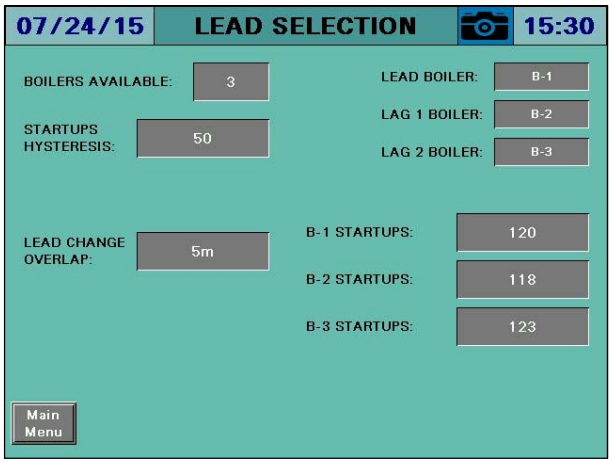
The lead selection setup screen displays lead boiler configuration. From the MAIN MENU screen, press **LEAD SELECTION**. The LEAD SELECTION screen will appear.



LEAD BY ALTERNATION



LEAD BY LMV STARTUPS OR LMV HOURS



Lead Selection (continued)

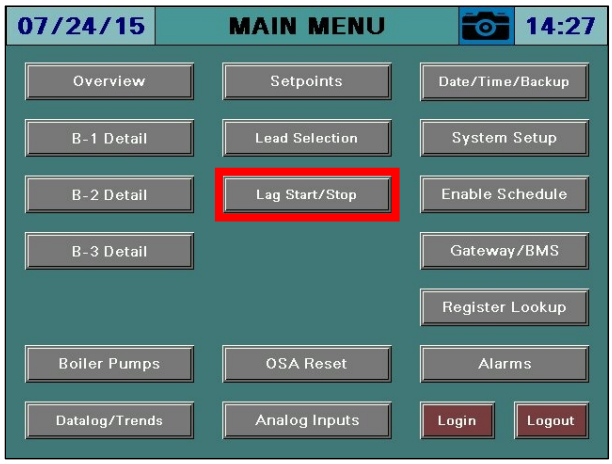
Two methods of lead alternation are provided. See *System Setup* for further information about selecting and configuring the lead mode.

BOILERS AVAILABLE – Displays the number of boilers that are available to the system.
ALTERNATION SETPOINT (ALTERNATION) – Sets the desired alternation setpoint (TECH required).
STARTUPS, HOURS HYSTERESIS (STARTUPS, HOURS) – Sets the desired hysteresis setpoint (TECH required). Whenever a lag boiler counter (startups or hours as selected) trails the lead counter by more than the hysteresis setpoint, that lag boiler will become the new lead.
HOURS, MINUTES REMAINING – Displays how many hours and minutes remain until automatic alternation occurs.
LEAD CHANGE OVERLAP – Sets the desired lead change overlap time (TECH required). This determines how long that the former lead boiler will continue to follow the lead boiler commands following a change in the lead boiler, ensuring no interruption in the system.
MANUAL ALTERNATION TO NEXT LEAD (ALTERNATION) – Press to manually change to the next available lead boiler (TECH required).
RESET ALTERNATION COUNTER (ALTERNATION) – Press to reset the alternation counter (TECH required).
LEAD, LAG BOILERS – Displays the current assignments of the lead and lag boilers.
BOILER STARTUPS, HOURS (STARTUPS, HOURS) – Displays the startups or hours of the boilers.

Lag Start / Stop

Access level: **USER / TECH / SETUP**

The lag start/stop setup screen displays lag boiler sequencing configuration. From the MAIN MENU screen, press **LAG START/STOP**. The LAG START/STOP screen will appear.



PARALLEL MODULATION

SEQUENTIAL MODULATION

Lag Start / Stop (continued)

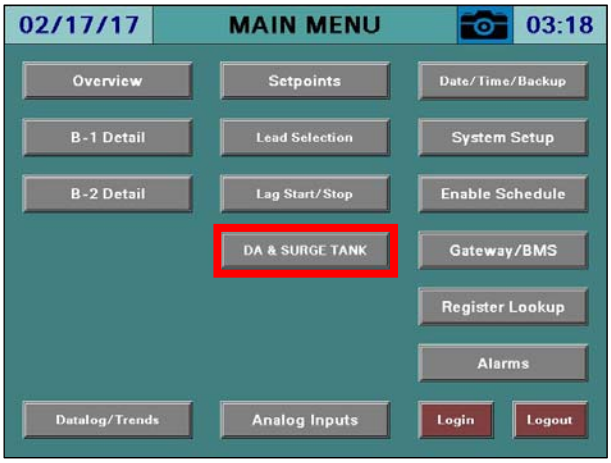
Two methods of modulation are provided. See *System Setup* for further information about configuring the modulation mode. Also see *Appendix - Parallel Modulation* and *Appendix - Sequential Modulation* for more specific detail and examples.

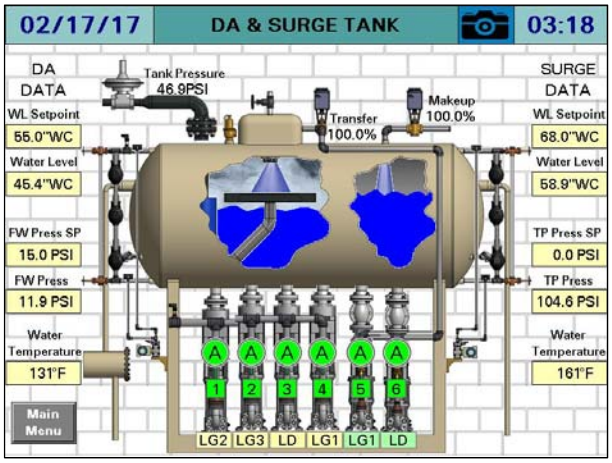
LAG STARTS (PERCENT AND TIME) – Sets the start point and delay time for each lag boiler (TECH required). When the load demand exceeds the start point for the time duration specified it will become enabled.
LAG STOPS (PERCENT AND TIME) – Sets the stop point and delay time for each lag boiler (TECH required). When the load demand falls below the stop point for the time duration specified it will become disabled. When sequential modulation is selected, the stop timer counts when the lag boiler is at low fire (stop percentage not used).
LAG ENABLE STATUS – Displays 'LAG x ENABLED' whenever a lag boiler is enabled.
LEAD SHUTDOWN DELAY – Sets the duration that the lead boiler must run at low fire (no demand) before shutting down (TECH required). Setting this value to 0 disables lead boiler shutdown.

Deaerator

Access level: **USER / TECH / SETUP**

Up to two connected SCC Inc. Deaerator Control Panels may be connected. From the MAIN MENU screen, press the name of the connected deaerator (in this example **DA & SURGE TANK**). The associated deaerator overview screen will appear.

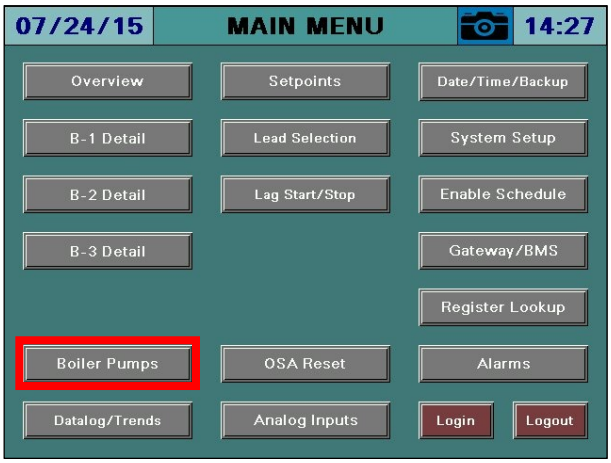


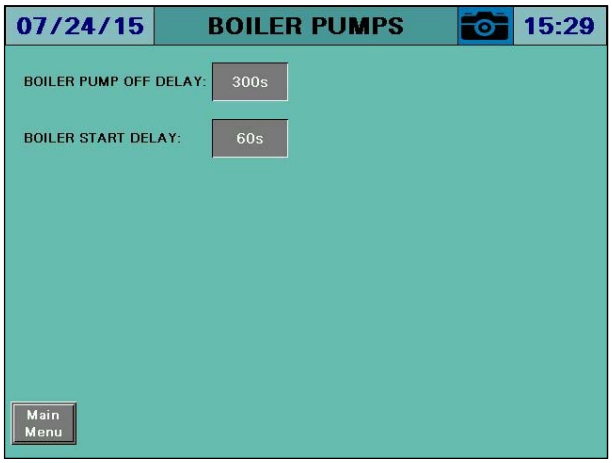


Boiler Pumps

Access level: **USER / TECH / SETUP**

The boiler pump setup screen displays boiler pump configuration. From the MAIN MENU screen, press **BOILER PUMPS**. The BOILER PUMPS screen will appear.





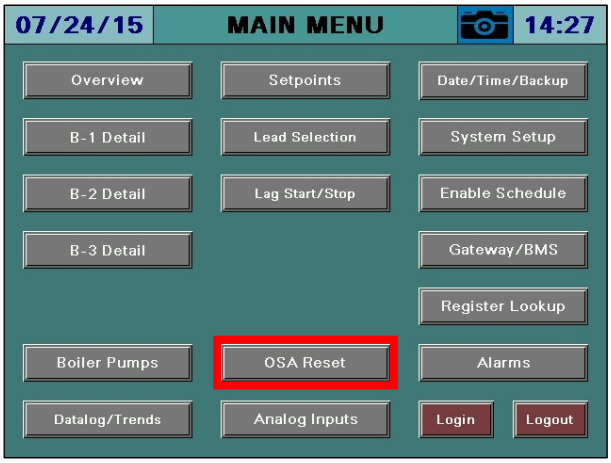
In a hydronic system, boiler circulating pumps or isolation valves can be cycled with the boiler.

BOILER PUMP OFF DELAY – Sets the duration that the boiler pump will continue to be enabled after the boiler has been disabled (TECH required). This is used to remove latent heat from the vessel.
BOILER START DELAY – Sets the duration that the boiler pump will be enabled prior to the boiler being enabled (TECH required). This is used to promote flow in the boiler and equalize the internal temperatures.

OSA Reset

Access level: **USER / TECH / SETUP**

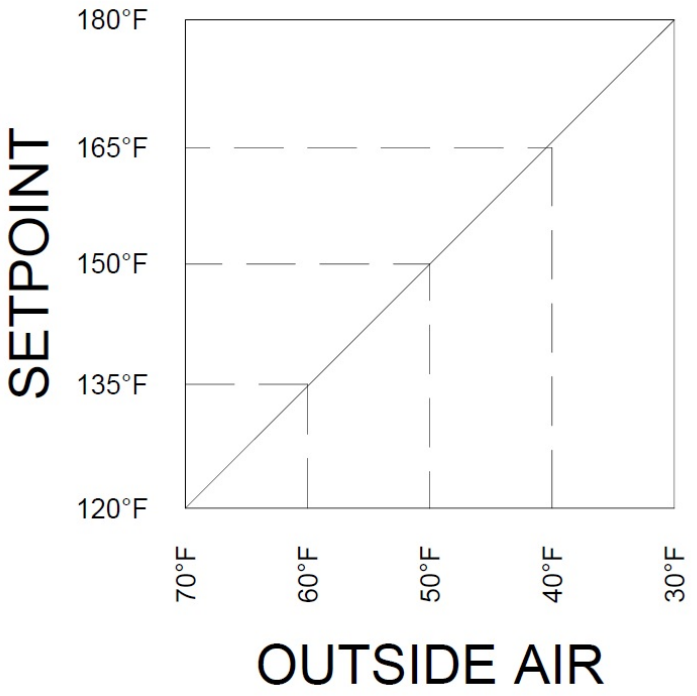
The outside air temperature reset setup screen displays outside air temperature reset configuration. From the MAIN MENU screen, press **OSA RESET**. The OSA RESET PUMPS screen will appear.



In a hydronic system, the setpoint can be generated based upon the outside air temperature. The outside air temperature sensor is polled once every five minutes to update the current setpoint (maximum 12 setpoint changes per hour). If the outside air temperature reading is invalid or the sensor becomes inoperative, the default setpoint will be used.

OSA Reset (continued)

MINIMUM, MAXIMUM SETPOINT – Sets the allowable range of the outside air reset setpoint (TECH required).
MINIMUM, MAXIMUM OSA TEMP – Sets the allowable range of the outside air temperatures used to calculate the outside air reset setpoint (TECH required).
OSA SETPOINT – Displays the calculated outside air setpoint. This is a linear calculation based upon the minimum and maximum setpoints and OSA temperatures entered. When the outside air temperature is outside of the minimum and maximum limits, the setpoint will stay at the minimum or maximum as applicable. It will never exceed the entered minimum or maximum.

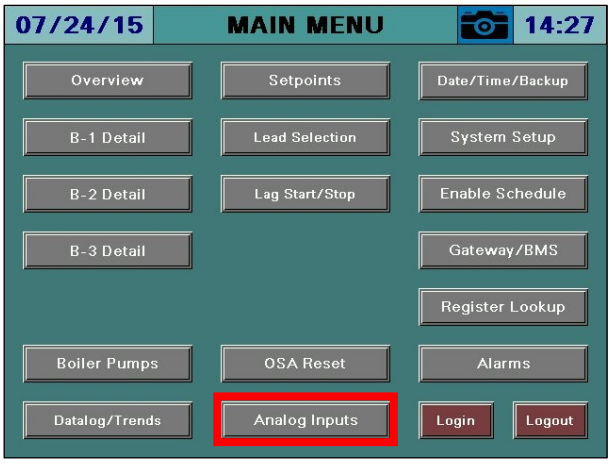


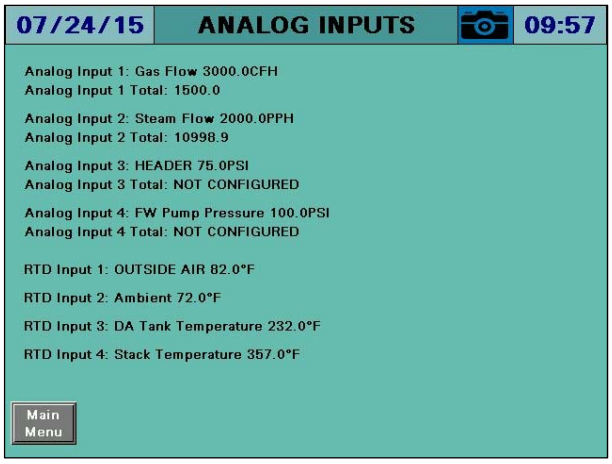
OSA TEMPERATURE – Displays the current outside air temperature.

Analog Inputs

Access level: **USER**

The analog inputs screen displays analog input information. From the MAIN MENU screen, press **ANALOG INPUTS**. The ANALOG INPUTS screen will appear.



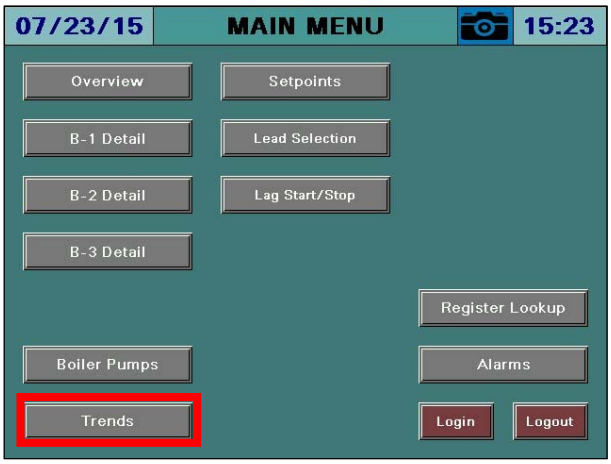


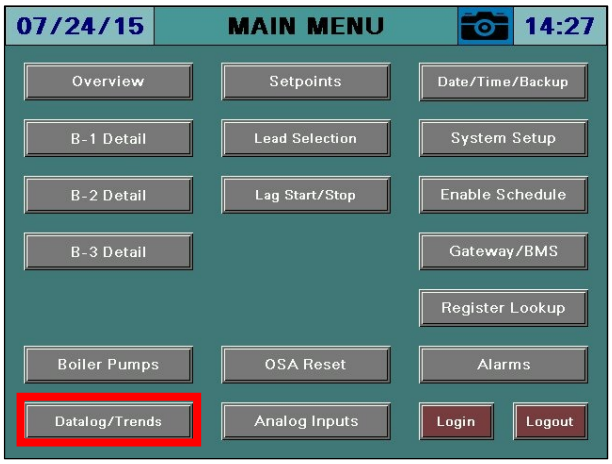
If totalization is enabled for any of the analog inputs, touching the totalized value > 1s will reset the value to 0 (TECH required).

Datalog / Trends

Access level: **USER / TECH / SETUP**

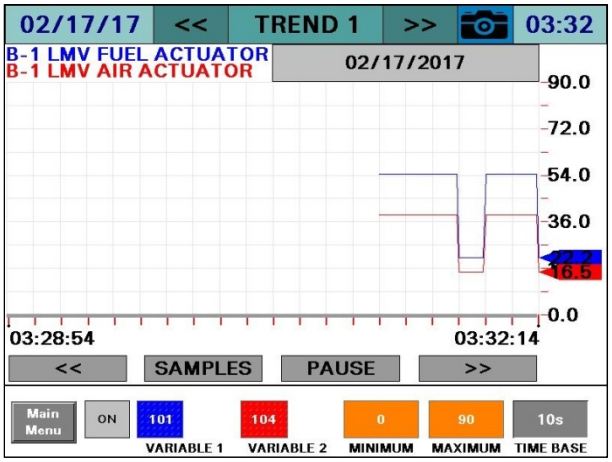
Six trends are available that can record two variables at user-defined intervals. Datalogging up to twelve variables to a USB drive is also available. From the MAIN MENU screen, press **TRENDS** (USER) or **DATALOG TRENDS** (TECH or SETUP). The TREND 1 or DATALOG screen will appear.





Datalog / Trends (continued)

Trends



The USB drive must be inserted to use the trend option. Data will be stored for the previous 7 days.

To scroll between the trends, press **<<** and **>>** beside the title bar.

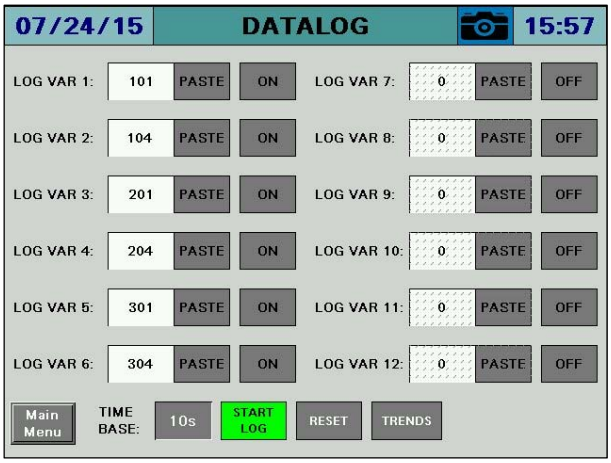
ON/OFF – Enables or disables the selected trend.
TREND NAVIGATION

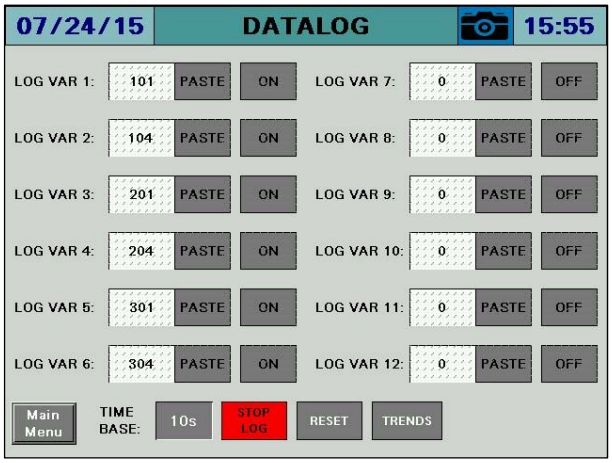
- **<<** – Scroll back to view previous trend data. The trend will scroll back by a sample, second, minute, hour or day depending upon the setting of the **SAMPLES/SECONDS/MINUTES/HOURS/DAYS** button. This will pause the trend display automatically.
- **SAMPLES/SECONDS/MINUTES/HOURS/DAYS –** Sets the scroll range for viewing recorded trend data.
- **PAUSE –** This will pause or play the trend display. 'PAUSED' will display in red text when paused and touching again will restore the trend to the current display.
- **>>** – Scroll forward when viewing previous trend data. The trend will scroll back by a minute, hour or day depending upon the setting of the **SAMPLES/SECONDS/MINUTES/HOURS/DAYS** button.

VARIABLES TO LOG (BLUE, RED) – Sets the Modbus register index to trend (TECH required).
MIN, MAX – Sets the range for the trend data (TECH required).
TIME BASE – Select a time base for trending. Choices are 10s, 20s, 30s, 1m, 2m, 5m, 10m, 15m, 30m, 60m (TECH required).

Datalog / Trends (continued)

Datalog





LOG VALUES – Sets the Modbus register index to log (TECH required).
ON/OFF – Enables or disables logging the selected value (TECH required).
TIME BASE – Select a time base for logging. Choices are 10s, 20s, 30s, 1m, 2m, 5m, 10m, 15m, 30m, 60m (TECH required).
START LOG/STOP LOG – Enables or disables all logging (TECH required).
RESET – Sets all log values to '0' (TECH required).
TRENDS – Navigates to the TREND 1 screen (TECH required).

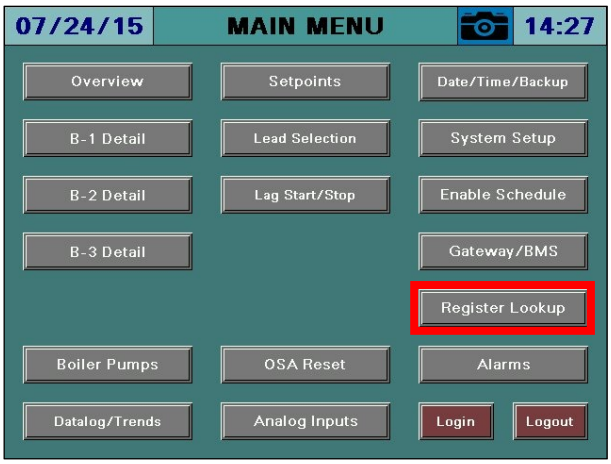
The resulting CSV file is in a tab-separated format and can be viewed with any text editor or spreadsheet application. On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\MASTERxx\DATA\TEXT, xx is 7 for 7", 10 for 10", 12 for 12"
Filename = DATALOG_mm_dd_yyyy.CSV, mmddyyyy are date

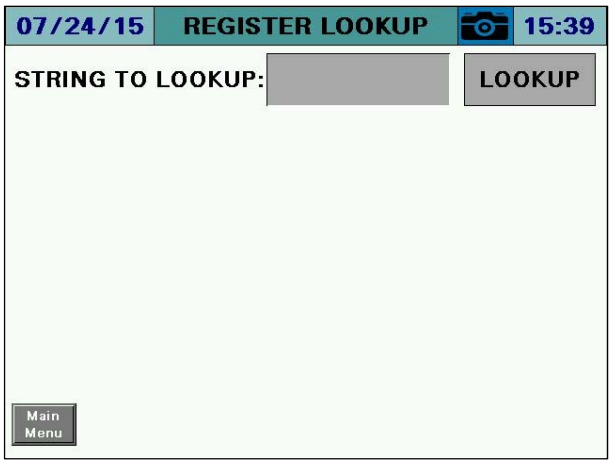
	A	B	C	D	E	F	G
1	SCC Inc. Lead/Lag Master Datalog						
2	LLM Model: TS-MS10S-U Rev. 15F1						
3	Site: Lead/Lag Master						
4							
5	Date	Time	B-1 LMV CURRENT OUTPUT	B-2 LMV CURRENT OUTPUT	B-3 LMV CURRENT OUTPUT	B-4 LMV CURRENT OUTPUT	B-5 LMV CURRENT OUTPUT
6	9/23/2015	11:02:21	57.9	57.9	57.9	57.9	57.9
7	9/23/2015	11:02:30	62.2	62.2	62.2	62.2	62.2

Register Lookup

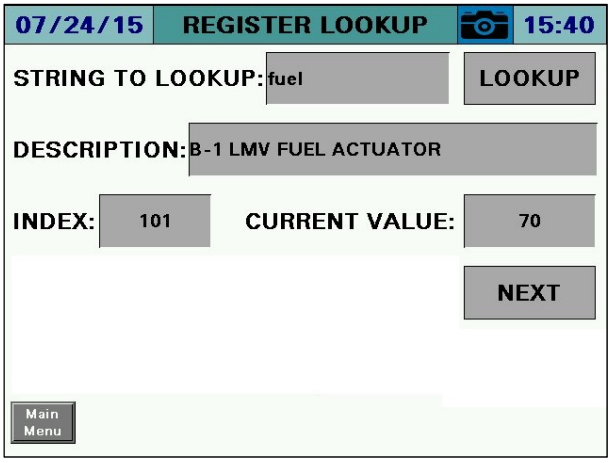
Access level: **USER / TECH / SETUP**

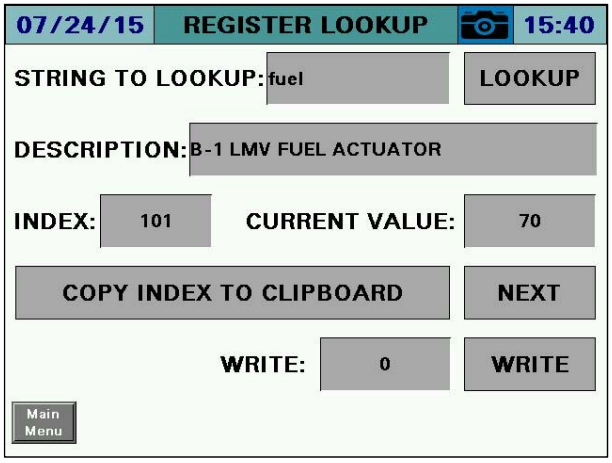
Modbus register indices can be looked up using text strings.





Enter a string or register index to search, then press **LOOKUP**.





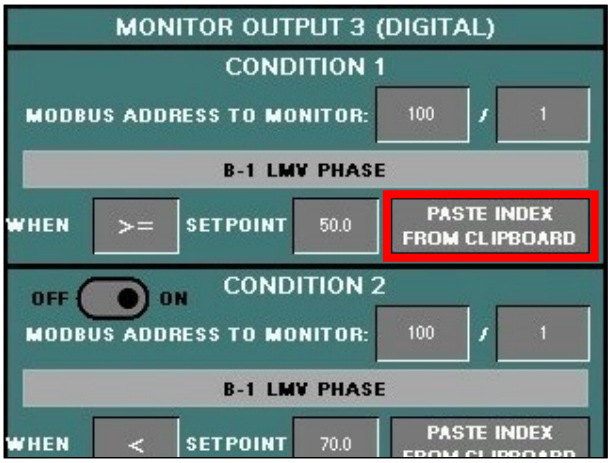
STRING TO LOOKUP – Input the string or register number to search for. Examples are 'FUEL' or '12' (would display the description of index 12).
DESCRIPTION – Displays the full name of the register containing the search string.
INDEX – Displays the index of the register that matches the description.
CURRENT VALUE – Displays the current value of the register. This is a raw value (not scaled).
COPY INDEX TO CLIPBOARD – Copies the register index and matching divider to the clipboard. This can be pasted into monitored output, trend or datalog configuration (TECH required).
NEXT – Scroll to the next register index matching the description. 'END OF LIST REACHED' will display if there are no more matching descriptions.

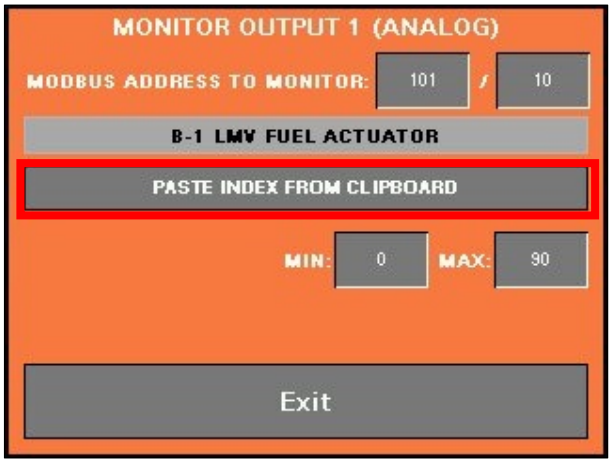
Register Lookup (continued)

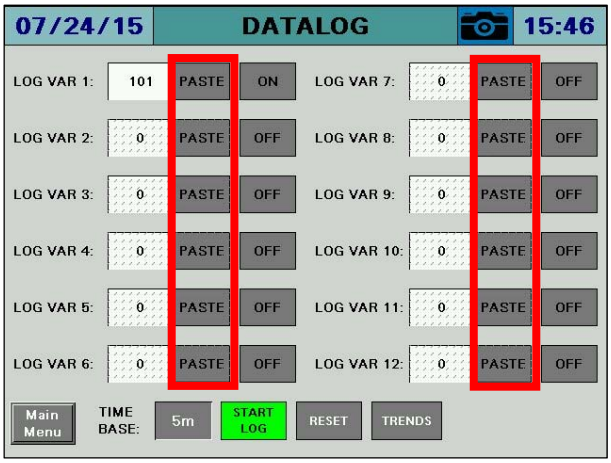
WRITE – Sets the value to manually write to a register. This can be used to test functionality such as remote setpoint or enables. Press **WRITE** to apply value (TECH required).

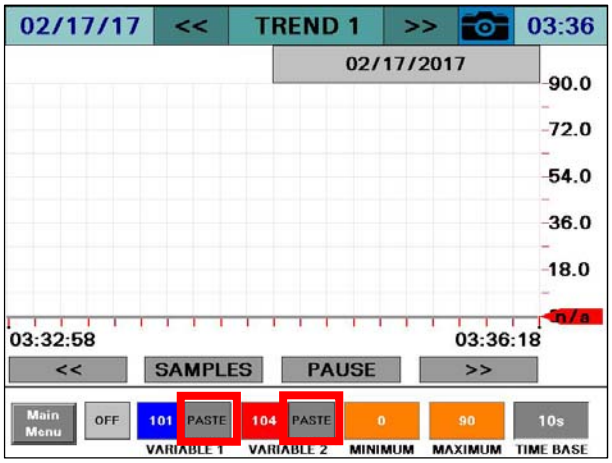
Using the Clipboard

If there is data in the clipboard, the configuration screens for the monitored outputs, trends and the datalog will have corresponding buttons that can be used to paste the data.







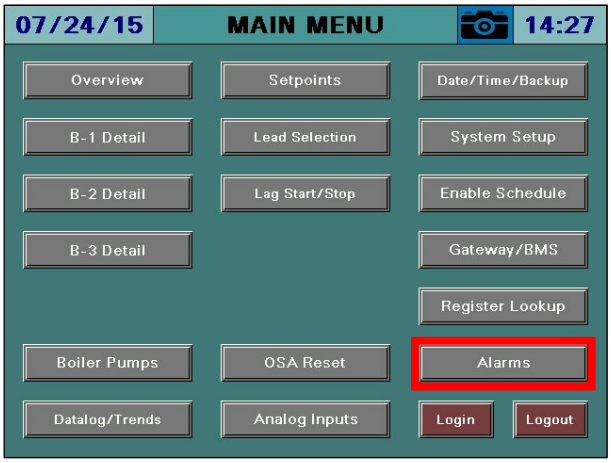


Alarms

Access level: **USER**

Alarms are displayed on a dedicated alarm screen. The last 250 alarms are stored in memory and time stamped. When an alarm is present, a link to the alarm screen will flash over the title bar of the OVERVIEW screen. Otherwise, this screen may be accessed from the main menu.

To access the alarm screen from the main menu, press **ALARMS**. The ALARMS screen will appear.



The ALARMS screen lists current alarms as well as older alarms. The color of the alarm indicates the category of the alarm.

Red – LMV lockouts. The text flashes when the alarm is currently active.
Orange – LMV faults.
Yellow/Green – Communication faults. The background is yellow when the alarm is currently active and green when communication is present.
Blue – All other alarms such as analog alarms, pump alarms, and expanded annunciator alarms. The text flashes when the alarm is currently active.

Information about the most recent 250 alarms will be displayed with the following information:

No. – Number of the alarm in the list (1 is most recent).
Date – Displays the date that the alarm occurred.
Active – Displays the time when the alarm became active.
Cleared – Displays the time when the alarm was cleared.

Alarms (continued)

The icons at the top of the screen may be used to navigate through the list of alarms:

 Move up one alarm on list.

 Move down one alarm on list.

 Navigate up one page on list.

 Navigate down one page on list.

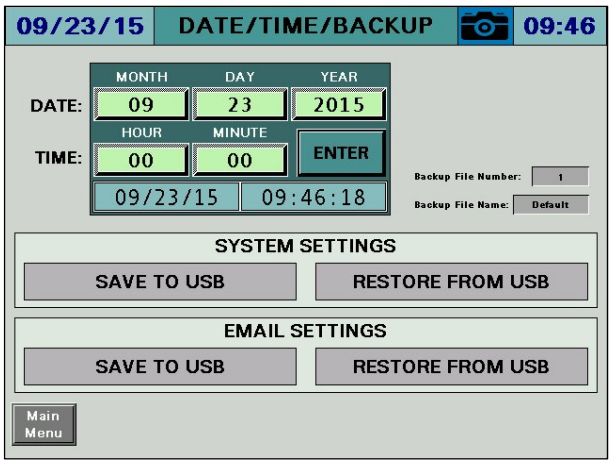
Date / Time / Defaults

Access level: **TECH / SETUP**

The Lead/Lag Master will automatically synchronize the date and time with any connected LMV5 controllers and/or Touchscreen Kits.

Setpoint, lead selection, lag start/stop and other operating data can be saved in profiles for backup or quick change purposes. For example, separate profiles for summer and winter could be created if needed.

To access the date/time/defaults screen from the main menu, press **DATE/TIME/DEFAULTS**. The DATE/TIME/DEFAULTS screen will appear.



Date and Time

To change the date and time, press **ENTER** after entering the desired new date and time. The system will then update the date and time. Any datalogging or trending that is currently in operation will reset whenever the date and time are changed.

Date / Time / Defaults (continued)

System Settings

System settings can be saved to a CSV file for archiving and migrating settings. Up to 999 backup files can be saved. To load a file, specify the file number in the **Backup File Number** field and then press **RESTORE FROM USB**. If a valid backup file is present with that number, it will load all of the system settings. To save a file, assign a backup file number and a backup file name in the **Backup File Name** field and then press **SAVE TO USB**. The save process may take a few seconds to complete and it is best to leave the USB inserted for an additional five seconds after the operation has completed to ensure that everything is successfully saved. An error will appear if the USB drive is not inserted or if the specified file is not present.

If an implausible value is specified for any parameter, an error message will appear to indicate that one or more values were invalid. Any remaining valid parameters will continue to load.

The resulting CSV file is in a tab-separated format and can be viewed with any text editor or spreadsheet application. On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\MASTERxx\DATA\TEXT, xx is 7 for 7", 10 for 10", 12 for 12"
Filename = LLMSETUP_xxx.CSV, xx is the backup file number

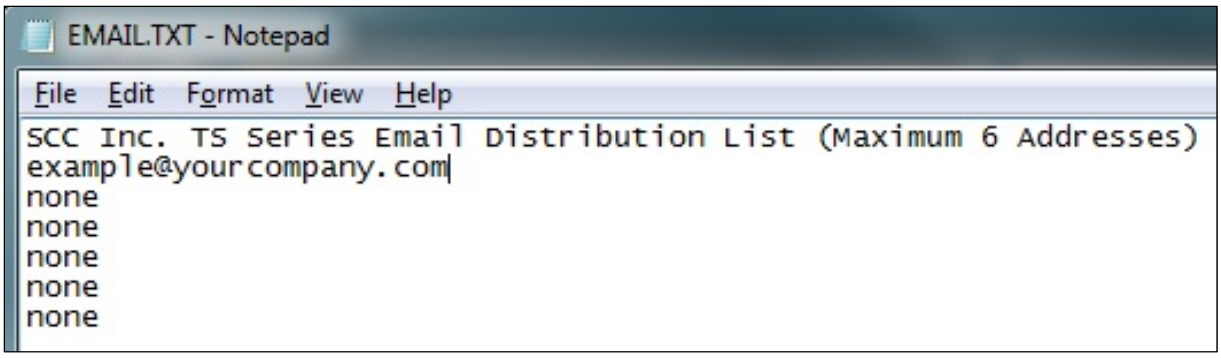
	A	B
1	SCC Lead/Lag Master System Configuration	
2	//Setup	
3	NUMBER	1
4	NAME	Default
5	SITE	Lead/Lag Master
6	SSTYPE	0
7	SSTIME	60
8	LOGOUTTIME	60
9	QUANTITY	5
10	CONNMETB1	0
11	CONNMETB2	1

Date / Time / Defaults (continued)

Email Settings

Email settings can be saved to a TXT file for archiving and migrating settings. Up to six email addresses can be entered. If an email address is not used, enter 'none'. Press **SAVE TO USB** to save the existing settings or press **RESTORE FROM USB** to restore the saved settings. Email will be automatically enabled for any valid entries.

The resulting TXT file is a text file and can be viewed with any text editor. On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\MASTERxx\DATA\TEXT, xx is 7 for 7", 10 for 10", 12 for 12"
Filename = EMAIL.TXT

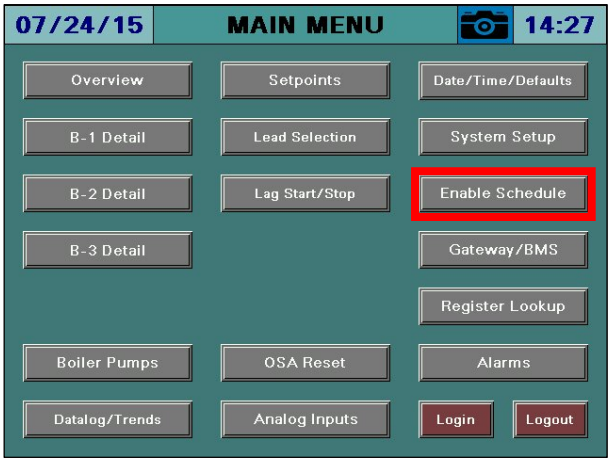


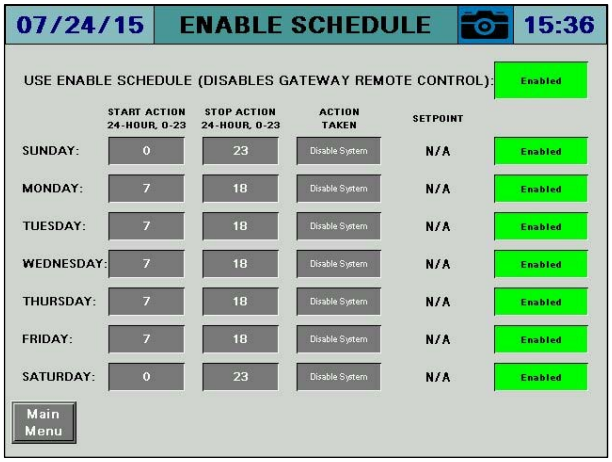
Enable Schedule

Access level: **TECH / SETUP**

The Lead/Lag Master can be programmed with a schedule to enable/disable the system or change setpoints as desired. When enabled, the system will use this schedule whenever the system is in remote mode (see *System Overview* for additional detail).

To access the enable schedule screen from the main menu, press **ENABLE SCHEDULE**. The ENABLE SCHEDULE screen will appear.





USE ENABLE SCHEDULE – Enables or disables the schedule function.
START ACTION BY DAY OF WEEK – Sets the starting hour for the action in 24-hour format.
STOP ACTION BY DAY OF WEEK – Sets the ending hour for the action in 24-hour format.

The action is active when the time is between the start (inclusive) and stop (inclusive). For example, if the start hour is 7 and the stop hour is 18, the action is active from 07:00 until 18:59.

ACTION TAKEN – Selects which action to take when active.

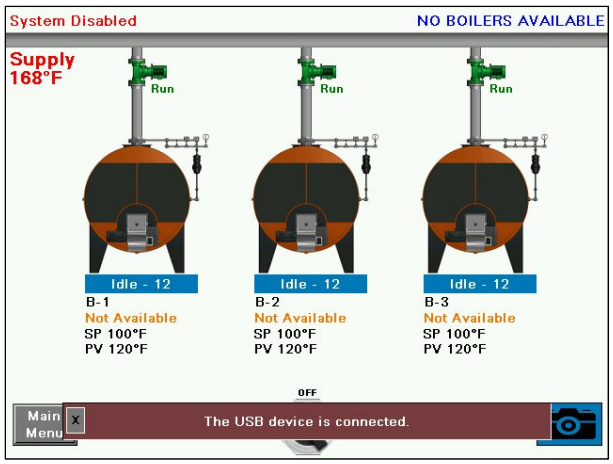
- **DISABLE SYSTEM –** Sets the system from enabled to disabled.
- **ENABLE SYSTEM –** Sets the system from disabled to enabled.
- **CHANGE SP DURING ACTION –** Sets the system to use the entered setpoint.
- **CHANGE SP OUTSIDE ACTION –** Sets the system to use the entered setpoint only when the action is not active.

SETPOINT – Sets the desired remote setpoint to use when a change setpoint action is selected.
ENABLE DAILY ACTION – Enables or disables the schedule function for the selected day of week.

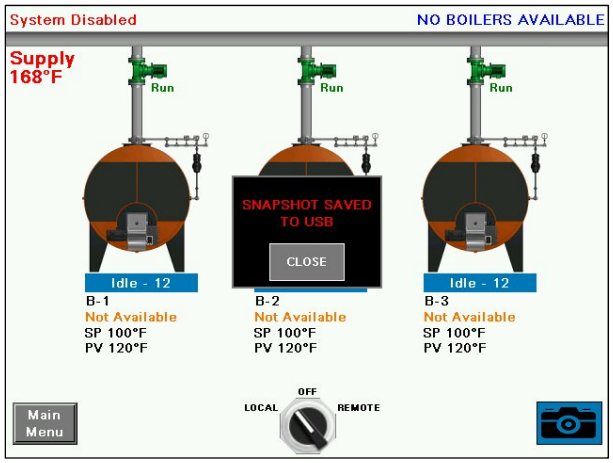
Screen Captures / USB

Access level: **USER**

A USB drive can be used to save screen captures, datalogs and to backup Expanded Annunciator configurations. A display reading 'The USB device is connected.' will appear to confirm that the USB drive is ready to use.

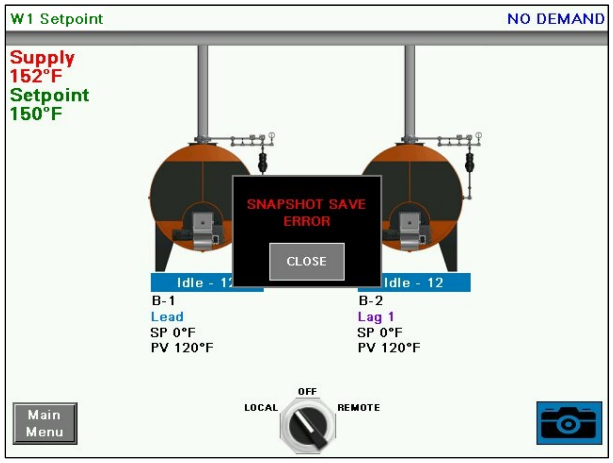


The current screen image may be copied to a USB drive. Any screen may be captured by pressing the camera icon > 5s until the screen displays 'SNAPSHOT SAVED TO USB'.

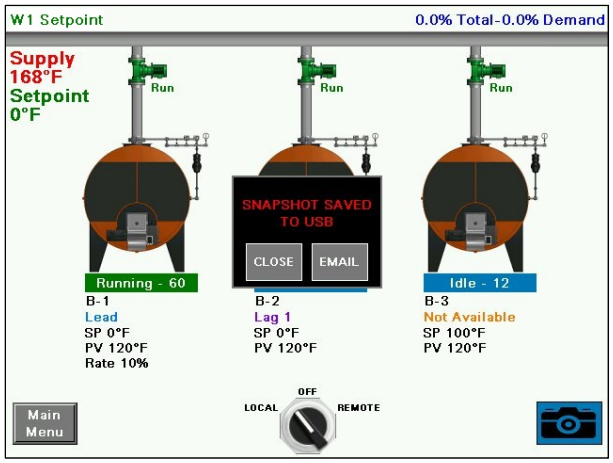


Screen Captures / USB (continued)

If there is no USB drive inserted or there is an error while trying to save the snapshot, a message will display saying 'SNAPSHOT SAVE ERROR'.



If email is configured, an email containing the screen capture as an attachment can be sent by pressing **EMAIL**. Note that screen captures always require a USB drive to be inserted, even to send an email.



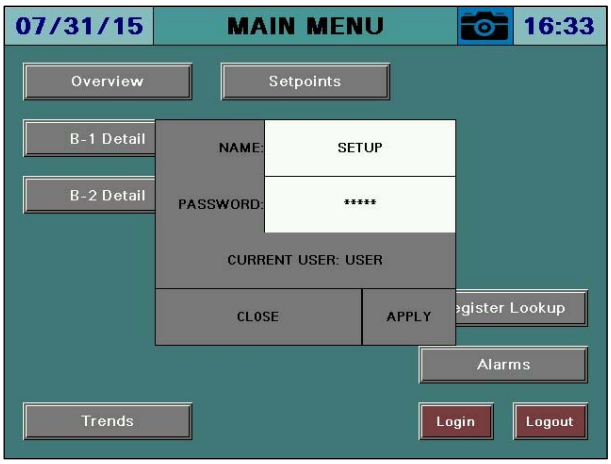
There is no limit to the number of screen captures that may be saved to the USB drive other than the capacity of the USB drive itself.

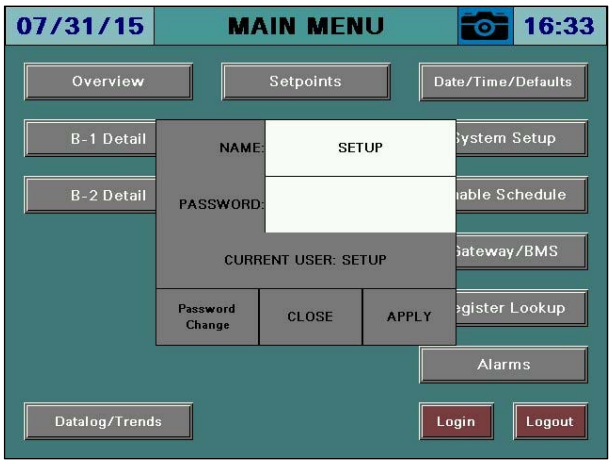
See the section *System Setup (Saved Images)* for additional detail on viewing or deleting images from the touchscreen.

Changing Passwords

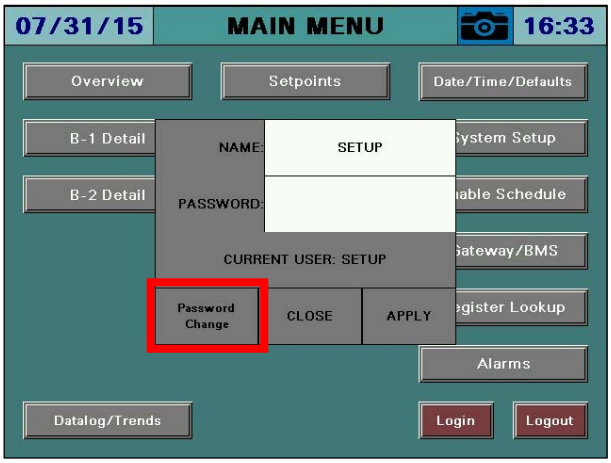
Access level: **SETUP**

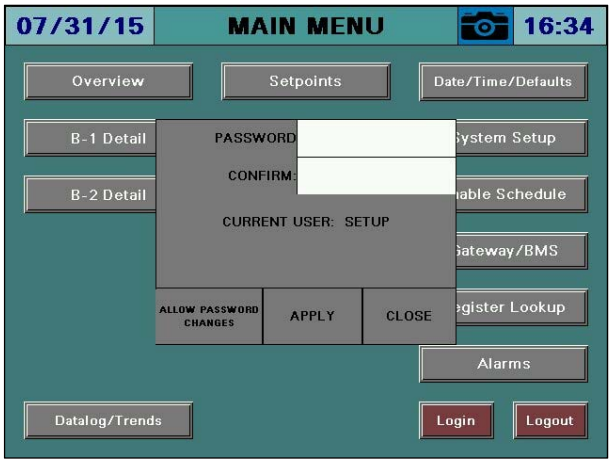
By default, the TECH access level password is 9876 and the SETUP access level password is START. These default passwords may be changed at any time. To change passwords, press **LOGIN** from the main menu. Enter the appropriate information to log in at the SETUP access level and press **APPLY**. The CURRENT USER will change to SETUP.





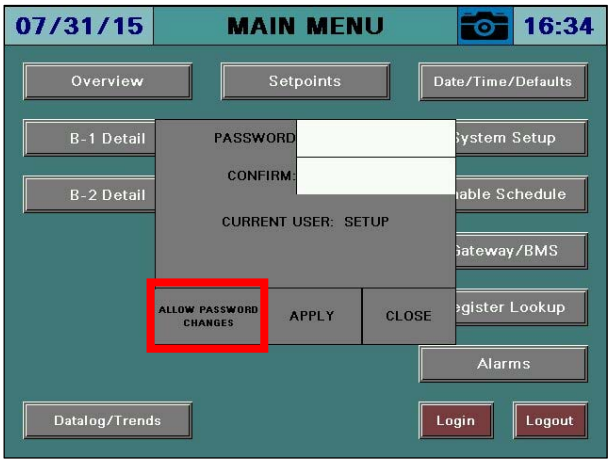
After that is done, press **PASSWORD CHANGE.**

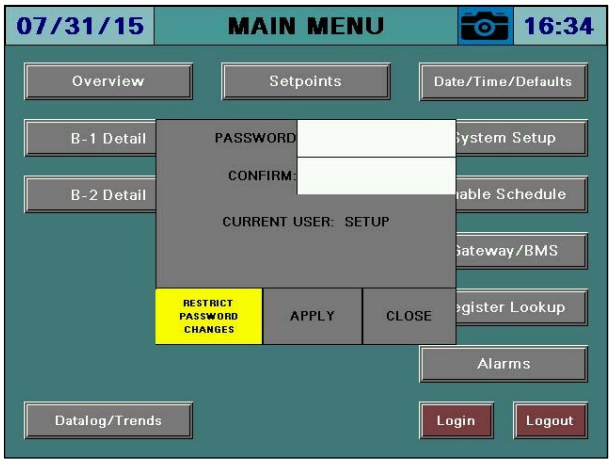




Changing Passwords (continued)

The SETUP password may be changed from this screen. Enter the new password twice and press **APPLY** to make the change. To allow the TECH user access to change the TECH password, press **ALLOW PASSWORD CHANGES.**





If password changes have been allowed, the TECH user may now change their password by following the same procedure as described above for the SETUP user. To disallow the TECH user from changing the TECH password, press **RESTRICT PASSWORD CHANGES**.

Gateway / BMS

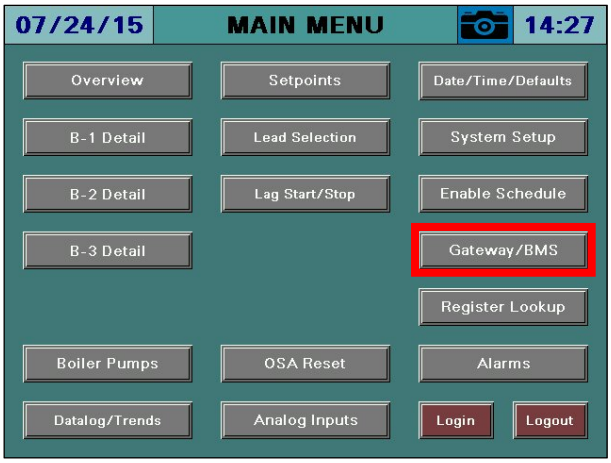
Access level: **TECH / SETUP**

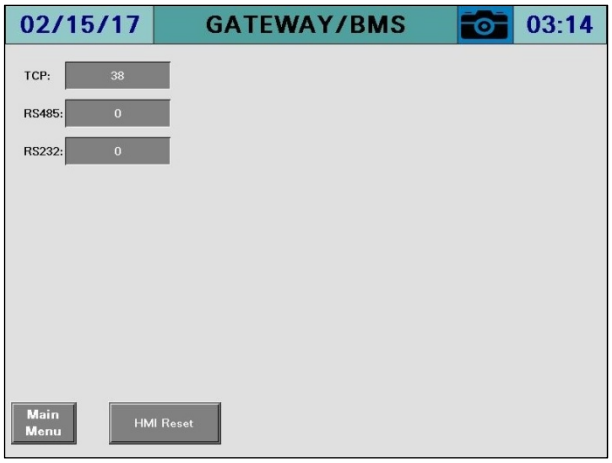
The Lead/Lag Master has three available ports (RS-232, RS-485 or Ethernet) that can be used for BMS communication via Modbus. Only one port can be configured as active.

The following additional protocols are available with an TS Series Protocol Converter (see Document No. TS-6100 for additional detail):

- BACnet/IP
- BACnetMS/TP
- Metasys N2
- Lonworks

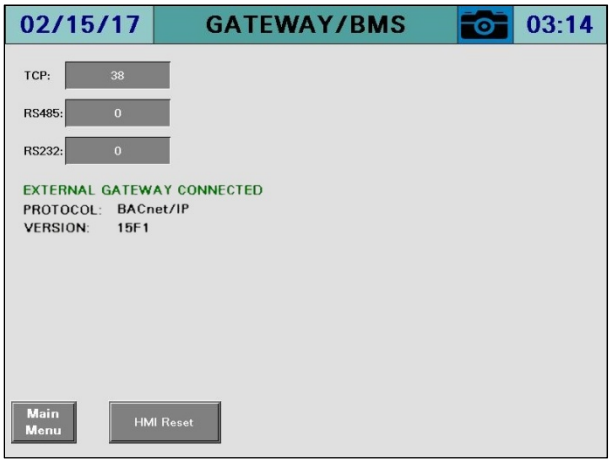
To access the gateway screen from the main menu, press **GATEWAY/BMS**. The GATEWAY/BMS screen will appear.





Incoming communication statistics for each of the interfaces are shown. Holding down the value for >1s will reset that interface's statistics to zero.

Gateway / BMS (continued)

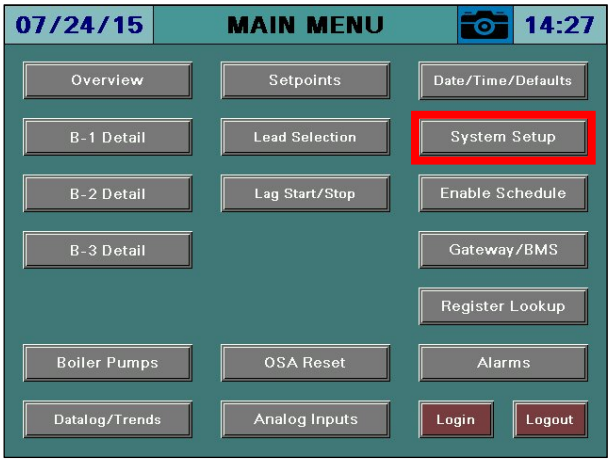


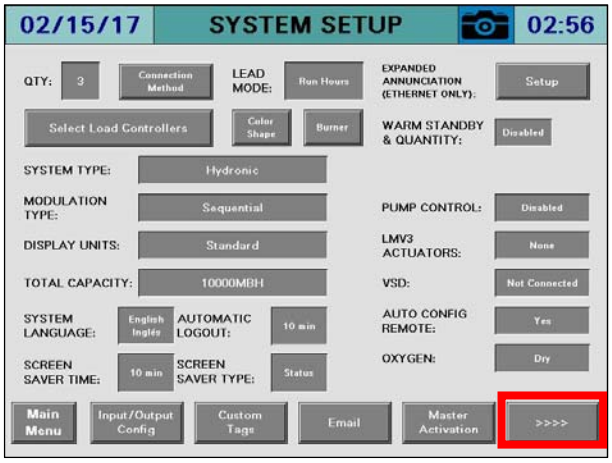
If a TS Series Protocol Converter is connected, 'EXTERNAL GATEWAY CONNECTED' will appear. The configured protocol and version is also displayed.

Gateway / BMS (continued)

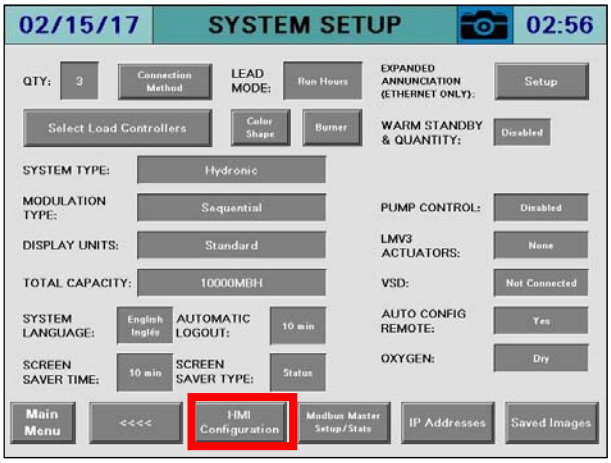
Changing Serial Port Parameters

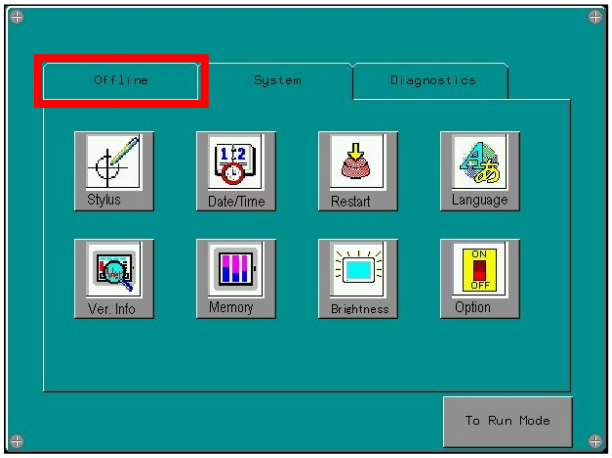
To change the serial port parameters, the HMI CONFIGURATION screen must first be accessed. Navigate to **MAIN MENU**, then **SYSTEM SETUP**.





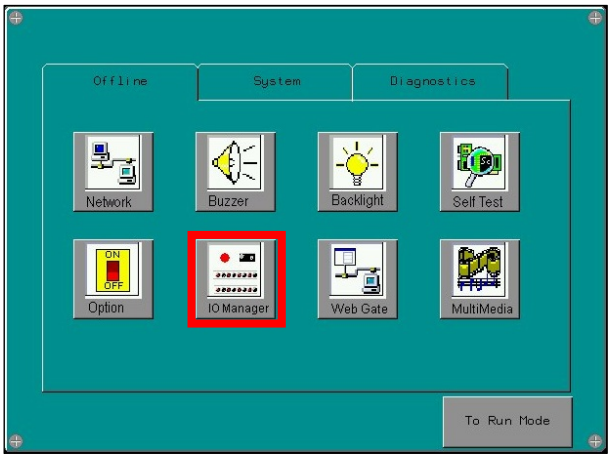
Press the **>>>>** then press the **HMI CONFIGURATION** button. Once the HMI CONFIGURATION screen is displayed, press the **OFFLINE** tab.

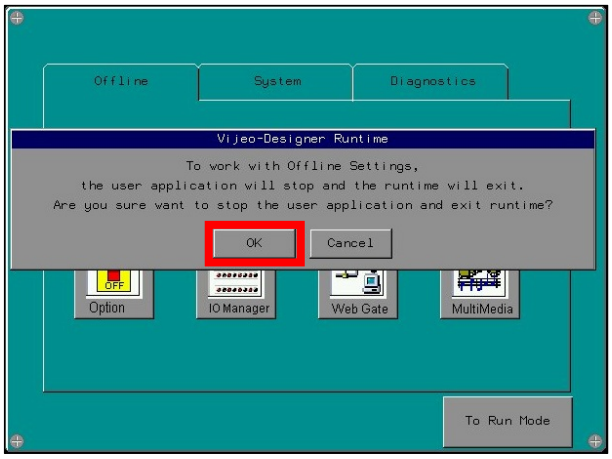




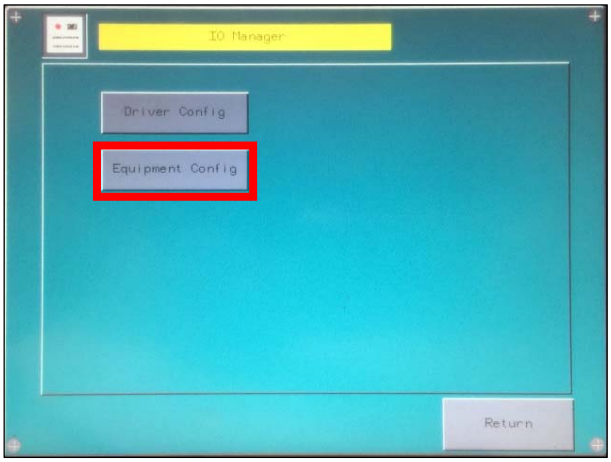
Gateway / BMS (continued)

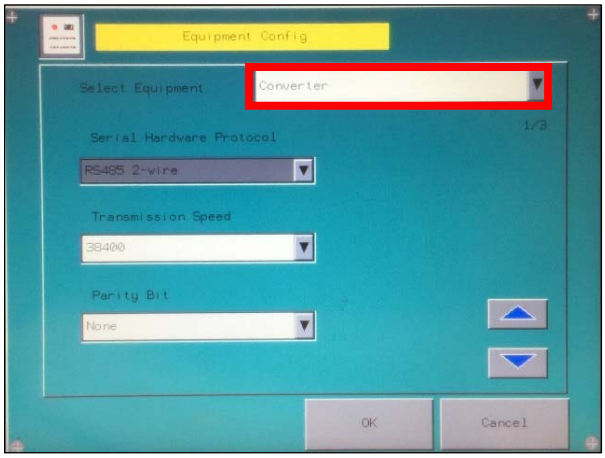
Once the OFFLINE tab is displayed, press **IO MANAGER**. A warning will appear that the application must pause while the IO MANAGER screen is accessed. Press **OK** to acknowledge this warning.





The screen will reboot into the IO MANAGER screen. Press **EQUIPMENT CONFIG** to change the serial port parameters. Choose the serial port desired from the dropdown menu. 'Converter' is COM2 (RS-485) and 'Converter2' is COM1 (RS-232). Use the up/down arrows to scroll between the three pages of configuration, then press **OK** when finished. From the IO MANAGER screen, press **RETURN**, then from the OFFLINE tab press **TO RUN MODE** to reboot the application.



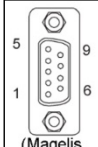


Gateway / BMS (continued)

Serial Port Wiring Interface

If the desired serial port is not broken out into a terminal strip interface, it can still be used if connected directly to the desired touchscreen COM port.

COM1 (RS-232)

Pin Connection	Pin No.	RS-232C		
		Signal Name	Direction	Meaning
 (Magelis GTO side)	1	CD	Input	Carrier Detect
	2	RD(RXD)	Input	Receive Data
	3	SD(TXD)	Output	Send Data
	4	ER(DTR)	Output	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DR(DSR)	Input	Data Set Ready
	7	RS(RTS)	Output	Request to Send
	8	CS(CTS)	Input	Send possible
	9	CI(RI)/VCC	Input/–	Called Status Display +5V±5% Output 0.25A*1
	Shell	FG	–	Frame Ground (Common with SG)

COM2 (RS-485)

Pin Connection	Pin No.	RS-485		
		Signal Name	Direction	Meaning
	1	NC	-	-
	2	NC	-	-
	3	NC	-	-
	4	Line A	Input/Output	Transfer Data (RS-485)
	5	Line B	Input/Output	Transfer Data (RS-485)
	6	RS(RTS)	Output	Request To Send
	7	NC	-	-
	8	SG	-	Signal Ground

To use COM1:

- Jumper pins 1, 4 and 6
- Jumper pins 7 and 8
- Receive on pin 2 (connect to transmit on client)
- Transmit on pin 3 (connect to receive on client)
- Common ground on pin 5 (must be connected)

To use COM2:

- Data+ / RS485+ / A on pin 4 (blue on typical Cat5 Ethernet cable)
- Data- / RS485- / B on pin 5 (white/blue on typical Cat5 Ethernet cable)
- Common ground on pin 8 (brown on typical Cat5 Ethernet cable, may be required)
- Some equipment refers to Data+ and Data- differently. Change the polarity of the connection as a first test if communication cannot be established.

Gateway / BMS (continued)

Modbus Mapping

The addresses shown are 0-based (begin at 0) and are in decimal format.

Supported function codes:
FC3 (read holding registers), address 0 = 40001.
FC4 (read input registers), address 0 = 30001.
FC6 (single register write), address 0 = 40001.
FC16 (multiple register write), address 0 = 40001.

Addresses with access R are read-only, access RW are read-write.

Modbus addresses designated as 'x00' through 'x99' are common to all connected boilers. Substitute the boiler number for the 'x'. For example, Modbus address 'x12' would equal Modbus address '112' for boiler 1, '212' for boiler 2, etc.

Gateway / BMS - Global System Data

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
0	RW	LLM REMOTE ENABLE	Unsigned Int 16	
1	RW	LLM REMOTE VALID	Unsigned Int 16	
2	RW	LLM REMOTE SETPOINT	Unsigned Int 16	
3	R	LLM LEAD BOILER	Unsigned Int 16	
4	R	LLM ALTERNATION SETPOINT	Unsigned Int 16	
5	R	LLM ALT HOURS REMAINING	Unsigned Int 16	
6	R	LLM CURRENT SETPOINT	Unsigned Int 16	
7	R	LLM TOTAL AVAILABLE	Unsigned Int 16	
8	R	LLM ACTUAL VALUE	Unsigned Int 16	
9	R	LLM RTD 1	Unsigned Int 16	x10
10	R	LLM RTD 2	Unsigned Int 16	x10
11	R	LLM RTD 3	Unsigned Int 16	x10
12	R	LLM RTD 4	Unsigned Int 16	x10
13	R	LLM ANALOG INPUT 1 U16	Unsigned Int 16	x10
14	R	LLM ANALOG INPUT 2 U16	Unsigned Int 16	x10
15	R	LLM ANALOG INPUT 3 U16	Unsigned Int 16	x10
16	R	LLM ANALOG INPUT 4 U16	Unsigned Int 16	x10
17	RW	LLM EXTRA INPUT	Unsigned Int 16	
18	R	LLM ANALOG INPUT 1 FLOAT	Float 32	
20	R	LLM ANALOG INPUT 2 FLOAT	Float 32	
22	R	LLM ANALOG INPUT 3 FLOAT	Float 32	
24	R	LLM ANALOG INPUT 4 FLOAT	Float 32	
26	R	LLM LOAD DEMAND	Unsigned Int 16	x10
27	RW	LLM EXTRA OPTIONS	Unsigned Int 16	
28	R	LLM ANALOG INPUT 1 TOTALIZED	Unsigned Int 32	x10
30	R	LLM ANALOG INPUT 2 TOTALIZED	Unsigned Int 32	x10
32	R	LLM ANALOG INPUT 3 TOTALIZED	Unsigned Int 32	x10
34	R	LLM ANALOG INPUT 4 TOTALIZED	Unsigned Int 32	x10
49	R	LLM WEEKDAY	Unsigned Int 16	0=Sun,1=Mon,2=Tue,etc.
50	R	LLM YEAR 2-DIGIT	Unsigned Int 16	
51	R	LLM MONTH	Unsigned Int 16	x10
52	R	LLM DAY	Unsigned Int 16	x10
53	R	LLM HOUR	Unsigned Int 16	x10
54	R	LLM MINUTE	Unsigned Int 16	x10
55	R	LLM SECOND	Unsigned Int 16	
990	R	LLM SOFTWARE MODEL STRING	String (5 words)	
995	R	LLM SOFTWARE VERSION STRING	String (2 words)	

Gateway / BMS - Data By Boiler (x: boiler number)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
x00	R	LMV PHASE	Unsigned Int 16	
x01	R	LMV FUEL ACTUATOR	Signed Int 16	x10
x02	R	LMV GAS ACTUATOR	Signed Int 16	x10
x03	R	LMV OIL ACTUATOR	Signed Int 16	x10
x04	R	LMV AIR ACTUATOR	Signed Int 16	x10
x05	R	LMV AUX1 ACTUATOR	Signed Int 16	x10
x06	R	LMV AUX2 ACTUATOR	Signed Int 16	x10
x07	R	LMV AUX3 ACTUATOR	Signed Int 16	x10
x08	R	LMV VSD OUTPUT	Unsigned Int 16	x10
x09	R	LMV CURRENT FUEL	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
x10	R	LMV CURRENT OUTPUT	Unsigned Int 16	x10, see Note 1 below
x11	R	LMV CURRENT SETPOINT	Unsigned Int 16	
x12	R	LMV ACTUAL VALUE	Unsigned Int 16	
x13	R	LMV FLAME SIGNAL	Unsigned Int 16	x10
x14	R	LMV FUEL THROUGHPUT	Unsigned Int 16	
x15	R	LMV CURRENT O_2	Unsigned Int 16	x10
x16	R	BOILER AUTO	Unsigned Int 16	0=no,1=yes
x17	R	BOILER AVAILABLE	Unsigned Int 16	0=no,1=yes
x18	R	BOILER PUMP RUNNING	Unsigned Int 16	0=no,1=yes
x19	R	BOILER PUMP ALARM	Unsigned Int 16	0=no,1=yes
x21	R	LMV STARTUP COUNTER	Unsigned Int 32	
x23	R	LMV HOUR COUNTER	Unsigned Int 32	
x25	R	LMV CURRENT ERROR CODE	Unsigned Int 16	
x26	R	LMV CURRENT DIAGNOSTIC CODE	Unsigned Int 16	
x27	R	LMV CURRENT ERROR CLASS	Unsigned Int 16	
x28	R	LMV CURRENT ERROR PHASE	Unsigned Int 16	
x29	R	LMV TEMP LIMIT OFF THRESHOLD	Unsigned Int 16	
x30	R	LMV SUPPLY AIR TEMPERATURE	Unsigned Int 16	
x31	R	LMV FLUE GAS TEMPERATURE	Unsigned Int 16	
x32	R	LMV COMBUSTION EFFICIENCY	Unsigned Int 16	x10
x33	R	LMV CURRENT CO_2	Unsigned Int 16	x10
x34	R	LMV CURRENT EXCESS AIR	Unsigned Int 16	x10
x35	R	LMV INPUT WORD	Unsigned Int 16	word of bits
x35 bit 0	R	LMV CONTROLLER SWITCH	Boolean	
x35 bit 1	R	LMV FAN CONTACTOR	Boolean	
x35 bit 2	R	LMV OIL SELECTED	Boolean	
x35 bit 3	R	LMV GAS SELECTED	Boolean	
x35 bit 5	R	LMV OIL PRESS SW MAX	Boolean	
x35 bit 6	R	LMV OIL PRESS SW MIN	Boolean	
x35 bit 7	R	LMV VALVE PROVING SW	Boolean	
x35 bit 8	R	LMV SAFETY LOOP	Boolean	
x35 bit 10	R	LMV GAS PRESS SW MIN	Boolean	
x35 bit 11	R	LMV GAS PRESS SW MAX	Boolean	
x35 bit 13	R	LMV AIR PRESSURE SW	Boolean	
x35 bit 14	R	LMV START RELEASE OIL	Boolean	
x35 bit 15	R	LMV HEAVY OIL START	Boolean	

Gateway / BMS - Data By Boiler (x: boiler number) (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
x37	R	LMV OUTPUT WORD	Unsigned Int 16	word of bits
x37 bit 0	R	LMV ALARM	Boolean	
x37 bit 4	R	LMV IGNITION	Boolean	
x37 bit 5	R	LMV START SIGNAL	Boolean	
x37 bit 6	R	LMV FAN OUTPUT	Boolean	
x37 bit 7	R	LMV OIL PUMP	Boolean	
x37 bit 8	R	LMV FUEL VALVE SV OIL	Boolean	
x37 bit 9	R	LMV FUEL VALVE V1 OIL	Boolean	
x37 bit 10	R	LMV FUEL VALVE V2 OIL	Boolean	
x37 bit 11	R	LMV FUEL VALVE V3 OIL	Boolean	
x37 bit 12	R	LMV FUEL VALVE SV GAS	Boolean	
x37 bit 13	R	LMV FUEL VALVE V1 GAS	Boolean	
x37 bit 14	R	LMV FUEL VALVE V2 GAS	Boolean	
x37 bit 15	R	LMV FUEL VALVE PV GAS	Boolean	
x38	R	LMV PROGRAM STOP	Unsigned Int 16	see Note 2 below
x39	R	LMV LOAD CONTROL MODE	Unsigned Int 16	see Note 3 below
x40	R	LMV MANUAL/AUTOMATIC	Unsigned Int 16	0=auto,1=on,2=off
x41	R	LMV MODBUS LOCAL/REMOTE	Unsigned Int 16	0=local,1=remote
x42	R	LMV MODBUS WATCHDOG	Unsigned Int 16	
x43	R	LMV MODBUS OPERATING MODE	Unsigned Int 16	0=auto,1=on,2=off
x44	R	LMV MODBUS SETPOINT W3	Unsigned Int 16	
x45	R	LMV MODBUS OUTPUT	Unsigned Int 16	x10, see Note 1 below
x46	R	LMV MODBUS FUEL SELECTION	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
x47	R	LMV SETPOINT W1	Unsigned Int 16	
x48	R	LMV SETPOINT W2	Unsigned Int 16	
x49	R	LMV WEEKDAY	Unsigned Int 16	
x50	R	LMV YEAR 2-DIGIT	Unsigned Int 16	
x51	R	LMV MONTH	Unsigned Int 16	
x52	R	LMV DAY	Unsigned Int 16	
x53	R	LMV HOUR	Unsigned Int 16	
x54	R	LMV MINUTE	Unsigned Int 16	
x55	R	LMV SECOND	Unsigned Int 16	
x60	R	RWF E1 U16	Unsigned Int 16	x10
x61	R	RWF E2 U16	Unsigned Int 16	x10
x62	R	RWF E3 U16	Unsigned Int 16	x10
x63	R	RWF WR CURRENT SP U16	Unsigned Int 16	x10
x64	R	RWF SP1 U16	Unsigned Int 16	x10
x65	R	RWF LC INPUT WORD	Unsigned Int 16	
x65 bit 12	R	RWF LC INPUT 1 FAULT	Boolean	
x65 bit 13	R	RWF LC INPUT 2 FAULT	Boolean	
x65 bit 14	R	RWF LC INPUT 3 FAULT	Boolean	
x66	R	RWF LC OUTPUT WORD	Unsigned Int 16	
x66 bit 0	R	RWF LC STAGE MODE	Boolean	
x66 bit 1	R	RWF LC MANUAL OPERATION	Boolean	
x66 bit 2	R	RWF LC BINARY INPUT 1	Boolean	
x66 bit 3	R	RWF LC BINARY INPUT 2	Boolean	

Gateway / BMS - Data By Boiler (x: boiler number) (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
x66 bit 4	R	RWF LC STAT ACTIVE	Boolean	
x66 bit 5	R	RWF LC UP ACTIVE	Boolean	
x66 bit 6	R	RWF LC DOWN ACTIVE	Boolean	
x66 bit 7	R	RWF LC K6 ACTIVE	Boolean	
x68	R	RWF LC E1 FLOAT	Float 32	
x70	R	RWF LC E2 FLOAT	Float 32	
x72	R	RWF LC E3 FLOAT	Float 32	
x74	R	RWF LC WR FLOAT CURRENT SP	Float 32	
x76	R	RWF LC SP1 FLOAT	Float 32	
x78	R	LMV TOTAL VOLUME GAS/FUEL0	Unsigned Int 32	
x80	R	LMV TOTAL VOLUME OIL/FUEL1	Unsigned Int 32	
x83	R	LMV EXTRA TEMPERATURE SENSOR	Unsigned Int 16	
x86	R	FW E1 U16	Unsigned Int 16	x10
x87	R	FW E2 U16	Unsigned Int 16	x10
x88	R	FW WR CURRENT SP U16	Unsigned Int 16	x10
x89	R	FW SP1 U16	Unsigned Int 16	x10
x90	R	FW E1 FLOAT	Float 32	
x92	R	FW E2 FLOAT	Float 32	
x94	R	FW WR CURRENT SP FLOAT	Float 32	
x96	R	FW SP1 FLOAT	Float 32	

Gateway / BMS - Data By Boiler (continued)

Notes

Note 1 – This value is a percent x10. If the value exceeds 1000, it indicates stages.

- **1001:** 1 stage
- **1002:** 2 stages
- **1003:** 3 stages

Note 2 –LMV program stop.

- **0:** deactivated (LMV5,LMV3)
- **1:** prepurge phase 24 (LMV5,LMV3)
- **2:** prepurge FGR phase 32 (LMV5), ignition position phase 36 (LMV3)
- **3:** ignition position phase 36 (LMV5), interval 1 phase 44 (LMV3)
- **4:** interval 1 phase 44 (LMV5), interval 2 phase 52 (LMV3)
- **5:** interval 2 phase 52 (LMV5)
- **6:** postpurge phase 72 (LMV5)
- **7:** postpurge FGR phase 76 (LMV5)

Note 3 –LMV5 operating mode.

- **0:** external load control X5-03
- **1:** internal load control
- **2:** internal load control bus
- **3:** internal load control X62
- **4:** external load control X62
- **5:** external load control bus

Gateway / BMS - Data By Deaerator (x: 9 = DA1, 10 = DA2)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
x00	R	PUMP 1 HAND-OFF-AUTO	Unsigned Int 16	2=hand,4=off,8=auto
x01	R	PUMP 2 HAND-OFF-AUTO	Unsigned Int 16	2=hand,4=off,8=auto
x02	R	PUMP 3 HAND-OFF-AUTO	Unsigned Int 16	2=hand,4=off,8=auto
x03	R	PUMP 4 HAND-OFF-AUTO	Unsigned Int 16	2=hand,4=off,8=auto
x04	R	PUMP 5 HAND-OFF-AUTO	Unsigned Int 16	2=hand,4=off,8=auto
x05	R	PUMP 6 HAND-OFF-AUTO	Unsigned Int 16	2=hand,4=off,8=auto
x07	R	RWF E1 ACTUAL	Float 32	
x09	R	RWF E2 ACTUAL	Float 32	
x11	R	RWF WR CURRENT SETPOINT	Float 32	
x13	R	RWF WATER LEVEL E1 ACTUAL	Float 32	
x15	R	RWF WATER LEVEL E2 ACTUAL	Float 32	
x17	R	RWF WATER LEVEL WR CURRENT SP	Float 32	
x25	R	PUMP 1 RUN HOURS	Unsigned Int 32	
x27	R	PUMP 2 RUN HOURS	Unsigned Int 32	
x29	R	PUMP 3 RUN HOURS	Unsigned Int 32	
x31	R	PUMP 4 RUN HOURS	Unsigned Int 32	
x33	R	PUMP 5 RUN HOURS	Unsigned Int 32	
x35	R	PUMP 6 RUN HOURS	Unsigned Int 32	
x37	R	RTD 1 WATER TEMPERATURE	Unsigned Int 16	
x38	R	RTD 2	Unsigned Int 16	
x39	R	RTD 3	Unsigned Int 16	
x40	R	RTD 4	Unsigned Int 16	
x41	R	ANALOG INPUT 1 FW PRESSURE	Float 32	
x43	R	ANALOG INPUT 2 TRANSFER PRESSURE	Float 32	
x45	R	ANALOG INPUT 3	Float 32	
x47	R	ANALOG INPUT 4	Float 32	
x49	R	ANALOG INPUT 5	Float 32	
x51	R	ANALOG INPUT 6	Float 32	
x53	R	ANALOG INPUT 7	Float 32	
x55	R	ANALOG INPUT 8	Float 32	
x57	R	ANALOG OUTPUT 1 PUMP 1 VSD CMD	Unsigned Int 16	
x58	R	ANALOG OUTPUT 2 PUMP 2 VSD CMD	Unsigned Int 16	
x59	R	ANALOG OUTPUT 3 PUMP 3 VSD CMD	Unsigned Int 16	
x61 bit 0	R	PUMP 1 PROVEN	Boolean	0=off,1=on
x61 bit 1	R	PUMP 2 PROVEN	Boolean	0=off,1=on
x61 bit 2	R	PUMP 3 PROVEN	Boolean	0=off,1=on
x61 bit 3	R	PUMP 4 PROVEN	Boolean	0=off,1=on
x61 bit 4	R	PUMP 5 PROVEN	Boolean	0=off,1=on
x61 bit 5	R	PUMP 6 PROVEN	Boolean	0=off,1=on
x61 bit 6	R	DA HIGH WATER	Boolean	0=alarm,1=normal
x61 bit 7	R	DA LOW WATER	Boolean	0=alarm,1=normal
x61 bit 8	R	DA LOW-LOW WATER	Boolean	0=alarm,1=normal
x61 bit 9	R	SURGE HIGH WATER	Boolean	0=alarm,1=normal
x61 bit 10	R	SURGE LOW WATER	Boolean	0=alarm,1=normal
x61 bit 11	R	SURGE LOW-LOW WATER	Boolean	0=alarm,1=normal
x61 bit 12	R	PUMP 1 FAIL	Boolean	0=normal,1=alarm

Gateway / BMS - Data By Deaerator (x: 9 = DA1, 10 = DA2) (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
x61 bit 13	R	PUMP 2 FAIL	Boolean	0=normal,1=alarm
x61 bit 14	R	PUMP 3 FAIL	Boolean	0=normal,1=alarm
x61 bit 15	R	PUMP 4 FAIL	Boolean	0=normal,1=alarm
x62 bit 0	R	PUMP 5 FAIL	Boolean	0=normal,1=alarm
x62 bit 1	R	PUMP 6 FAIL	Boolean	0=normal,1=alarm

Appendix -LMV Phases

NUMBER	DESCRIPTION
0	LOCKOUT PHASE
1	SAFETY PHASE
2	SAFETY PHASE
10	HOME RUN POSITION
12	STANDBY STATIONARY
20	SAFETY RELAY ON
21	RELEASE OF STARTUP
22	FAN MOTOR ON
24	DRIVE TO PURGE
30	PREPURGE
32	PREPURGE FGR
34	PREPURGE
36	DRIVE TO IGNITION
38	PREIGNITION SPARK ON
39	GAS VALVE TEST MINIMUM PRESSURE
40	PILOT VALVE OPEN
42	SPARK OFF
44	INTERVAL 1 PILOT STABILIZE
50	FUEL VALVE OPEN SAFETY TIME 2
52	PILOT VALVE CLOSED INTERVAL 2 MAIN FLAME
54	DRIVE TO LOW FIRE PRE
60	NORMAL OPERATION
62	DRIVE TO LOW FIRE POST
70	FV CLOSED AFTER BURN TIME
72	DRIVE TO POSTPURGE
74	MANDATORY POSTPURGE
76	MANDATORY POSTPURGE
78	OPTIONAL POSTPURGE
79	DIRECT START (APS CHECK)
80	GV TEST EVACUATION OF TEST SPACE
81	GV TEST ATMOSPHERIC PRESSURE TEST
82	GV TEST FILL TEST SPACE
83	GV TEST PRESSURE TEST
90	GAS SHORTAGE WAITING TIME
97	NO CONFIGURATION
98	WAITING TO ESTABLISH COMMUNICATION
99	COMMUNICATION FAULT

Appendix -LMV5 Lockout / Error Codes

CODE DECIMAL	CODE HEX	DESCRIPTION
0	0	NO ERROR
1	1	ROM ERROR
2	2	RAM ERROR
3	3	INTERNAL COMMUNICATION ERROR
4	4	UNSUCCESSFUL SYNC OF 2uCs
5	5	FAULT DURING FLAME AMP TEST
6	6	FAULT INTERNAL HARDWARE TEST
16	10	DIGITAL OUTPUT FAULT
17	11	SHORT CIRCUIT CONTACT FEEDBACK
21	15	ACTUATOR FAULT/VSD SPEED NOT REACHED
22	16	FAULT IN RATIO CONTROL SYSTEM
23	17	LMV5 INTERNAL COM ERROR
24	18	CORRUPTION IN COMBUSTION CURVE DATA
25	19	ACTUATOR POT ERROR
26	1A	ACTUATOR CURVE TOO STEEP
27	1B	ACT CURVE PROGRAMMING ACTIVE PHASE 62
28	1C	ACTUATOR IGNITION POSITION NOT SET
29	1D	RUNNING TIME FAULT ACTUATORS/VSD
30	1E	ACTUATOR/VSD NOT REACHED POSITION
31	1F	VSD MODULE CONNECTION ERROR
33	21	SAFETY LOOP OPEN
34	22	TEMP LIMITER OFF (CHECK SENSOR)
35	23	EXTRANEOUS LIGHT DURING STARTUP
36	24	EXTRANEOUS LIGHT DURING SHUTDOWN
37	25	NO FLAME AT END OF SAFETY TIME
38	26	LOSS OF FLAME PHASE 60-62
39	27	AIR PROVE SW ON SHOULD BE OFF
40	28	AIR PROVE SW OFF SHOULD BE ON
41	29	FAN CONTACT SIGNAL ON SHOULD BE OFF
42	2A	FAN CONTACT SIGNAL OFF SHOULD BE ON
43	2B	FGR PRESSURE SW ON SHOULD BE OFF
44	2C	FGR PRESSURE SW OFF SHOULD BE ON
45	2D	CPI (POC) ON SHOULD BE OFF
46	2E	CPI (POC) OFF SHOULD BE ON
47	2F	LOW GAS PRESSURE SWITCH OPEN
48	30	HIGH GAS PRESSURE SWITCH OPEN
49	31	VALVE PROVE - GAS SIDE LEAK
50	32	VALVE PROVE - BURNER SIDE LEAK
51	33	OIL PRESSURE WHEN OIL PUMP OFF
52	34	LOW OIL PRESSURE WHEN PUMP RUNNING
53	35	HIGH OIL PRESSURE SWITCH OPEN
54	36	NO START RELEASE FOR OIL
55	37	NO HEAVY OIL DIRECT START
56	38	SHORTAGE OF GAS PROGRAM IN PROGRESS
57	39	PARAMETER OF MAX SAFETY TIME FAULTY
58	3A	NO BURNER ID DEFINED

Appendix -LMV5 Lockout / Error Codes (continued)

CODE DECIMAL	CODE HEX	DESCRIPTION
59	3B	NO SERVICE PASSWORD DEFINED
64	40	WRONG CONTACT POSITION OF SAFETY TIME
65	41	WRONG CONTACT POSITION OF IGNITION
66	42	WRONG CONTACT POSITION OF FUEL RELAY
67	43	PLAUSIBILITY CHECK FAULT
68	44	FAULT AT DEACTIVATED INPUTS
69	45	SHUTDOWN VIA SAFETY LIMIT TEST
70	46	PROGRAM STOP ACTIVATED
71	47	START RELEASE GAS IS OFF
72	48	TWO FLAME SIGNALS WITH ONE PARMETERIZED
80	50	FAULT DURING KEY VALUE CHECK
81	51	TIME BLOCK OVERFLOW
82	52	STACK ERROR
83	53	FAULTY RESET STATE OCCURRED
88	58	INTERNAL COMMUNICATION (uC1<>uC2)
89	59	EEPROM PAGE IS ON ABORT
90	5A	CRC ERROR OF PARAMETER RANGE
91	5B	PAGE ON ABORT
92	5C	PAGE ON WR_RESTO (BACKUP RESTORE MADE)
93	5D	PAGE OPEN TOO LONG
94	5E	PAGE HAS UNDEFINED STATUS
95	5F	LAST BACKUP RESTORE INVALID (INTERRUPTED)
96	60	FAULT COPYING A PARAMETER PAGE
97	61	FAULT WITH EEPROM INITIALIZATION
112	70	FAULT DURING RESTORING LOCKOUT INFO
113	71	MANUAL LOCKOUT VIA CONTACT
114	72	PLAUSIBILITY FAULT WITH FAULT ENTRY
128	80	WRONG STATE OF AUX3 ACTUATOR
129	81	WRONG STATE OF AIR ACTUATOR
130	82	WRONG STATE OF GAS ACTUATOR
131	83	WRONG STATE OF OIL ACTUATOR
132	84	WRONG STATE OF AUX1 ACTUATOR
133	85	WRONG STATE OF AUX2 ACTUATOR
134	86	WRONG STATE OF INTERNAL LOAD CONTROLLER
135	87	WRONG STATE OF AZL
136	88	PLAUSIBILITY FAULT (NMT)
144	90	ROM-CRC ERROR ON AUX3 FEEDBACK
145	91	ROM-CRC ERROR ON AIR FEEDBACK
146	92	ROM-CRC ERROR ON GAS FEEDBACK
147	93	ROM-CRC ERROR ON OIL FEEDBACK
148	94	ROM-CRC ERROR ON AUX1 FEEDBACK
149	95	ROM-CRC ERROR ON AUX2 FEEDBACK
150	96	ROM-CRC ERROR ON LC FEEDBACK
151	97	ROM-CRC ERROR ON AZL FEEDBACK
152	98	CANBUS DEVICE WITH SAME ADDRESS CONFLICT
153	99	CANBUS IS OFF

Appendix -LMV5 Lockout / Error Codes (continued)

CODE DECIMAL	CODE HEX	DESCRIPTION
154	9A	CANBUS WARNING LEVEL
155	9B	CANBUS QUEUE OVERRUN
160	A0	AUX3 ACTUATOR DETECTED A FAULT
161	A1	AIR ACTUATOR DETECTED A FAULT
162	A2	GAS ACTUATOR DETECTED A FAULT
163	A3	OIL ACTUATOR DETECTED A FAULT
164	A4	AUX1 ACTUATOR DETECTED A FAULT
165	A5	AUX2 ACTUATOR DETECTED A FAULT
166	A6	LOAD CONTROL DETECTED A FAULT
167	A7	AZL DETECTED A FAULT
169	A9	VSD MODULE DETECTED A FAULT
171	AB	O_2 MODULE DETECTED A FAULT
176	B0	FAULT DURING TEST OF PORT OUTPUTS
177	B1	FAULT DURING SHORT CIRCUIT TEST
181	B5	O_2 MONITOR FAULT
186	BA	O_2 SENSOR TEST FAILED
191	BF	O_2 CONTROL AUTO DEACTIVATION
197	C5	AZL HAS DETECTED OLD UNIT VERSIONS
209	D1	WRONG STATE OF VSD MODULE
211	D3	WRONG STATE OF O_2 MODULE
225	E1	ROM-CRC ERROR ON VSD MODULE FEEDBACK
227	E3	ROM-CRC ERROR ON O_2 MODULE FEEDBACK
240	F0	PLAUSIBILITY FAULT (INTERPOLATION)
241	F1	FAULT CALCULATING PRECONTROL
242	F2	FAULTY TEMP VALUES FROM O_2 MODULE
87	57	INVALID PARAMETERIZATION
187	BB	O_2 TRIM CONTROL REMOVED
190	BE	INVALID PARAMETERIZATION O_2 CONTROL
243	F3	O_2 TRIM CONTROL FAULT
244	F4	O_2 MODULE FAULT (FGR)
245	F5	CANBUS FEEDBACK FAULT X60 TEMP INPUT
246	F6	FGR FAULT

Appendix -LMV3 Error Codes

CODE	DESCRIPTION
2	NO FLAME AT END OF SAFETY TIME
3	AIR PRESSURE FAILURE
4	EXTRANEOUS LIGHT
7	LOSS OF FLAME
12	VALVE PROVING
14	PROOF OF CLOSURE
19	COMBUSTION PRESSURE POC
20	PRESSURE SWITCH - MINIMUM
21	PRESSURE SWITCH - MAXIMUM
22	SAFETY LOOP / BURNER FLANGE
50	INTERNAL ERROR
51	INTERNAL ERROR
55	INTERNAL ERROR
56	INTERNAL ERROR
57	INTERNAL ERROR
58	INTERNAL ERROR
60	INTERNAL ERROR - NO VALID HEAT SOURCE
61	FUEL CHANGEOVER
62	INVALID FUEL SIGNALS OR INFORMATION
65	INTERNAL ERROR
66	INTERNAL ERROR
67	INTERNAL ERROR
70	INTERNAL ERROR - FUEL/AIR RATIO CONTROL
71	SPECIAL POSITION UNDEFINED
72	INTERNAL ERROR - FUEL/AIR RATIO CONTROL
73	INTERNAL ERROR - FUEL/AIR RATIO CONTROL
75	INTERNAL ERROR - FUEL/AIR RATIO CONTROL
76	INTERNAL ERROR - FUEL/AIR RATIO CONTROL
80	CONTROL RANGE LIMIT OF VSD
81	VSD ELECTROMAGNETIC INTERFERENCE
82	ERROR DURING VSD SPEED STANDARDIZATION
83	SPEED ERROR VSD
84	CURVE SLOPE ACTUATORS
85	ACTUATOR REFERENCING ERROR
86	ERROR FUEL ACTUATOR
87	ERROR AIR ACTUATOR
90	INTERNAL ERROR - BASIC UNIT
91	INTERNAL ERROR - BASIC UNIT
93	ERROR FLAME SIGNAL ACQUISITION
95	ERROR RELAY SUPERVISION
96	ERROR RELAY SUPERVISION
97	ERROR RELAY SUPERVISION
98	ERROR RELAY SUPERVISION
99	INTERNAL ERROR - RELAY CONTROL
100	INTERNAL ERROR - RELAY CONTROL
105	INTERNAL ERROR - CONTACT SAMPLING

Appendix -LMV3 Error Codes (continued)

CODE	DESCRIPTION
106	INTERNAL ERROR - CONTACT REQUEST
107	INTERNAL ERROR - CONTACT REQUEST
108	INTERNAL ERROR - CONTACT REQUEST
110	INTERNAL ERROR - VOLTAGE MONITOR TEST
111	POWER FAILURE
112	MAINS VOLTAGE RECOVERY
113	INTERNAL ERROR - MAINS VOLTAGE
115	INTERNAL ERROR - SYSTEM COUNTER
116	DESIGN THRESHOLD EXCEEDED
117	LIFETIME EXCEEDED - OPERATION NOT ALLOWED
120	FUEL METERING INTERFERENCE
121	INTERNAL ERROR - EEPROM ACCESS
122	INTERNAL ERROR - EEPROM ACCESS
123	INTERNAL ERROR - EEPROM ACCESS
124	INTERNAL ERROR - EEPROM ACCESS
125	INTERNAL ERROR - EEPROM READ ACCESS
126	INTERNAL ERROR - EEPROM WRITE ACCESS
127	INTERNAL ERROR - EEPROM ACCESS
128	INTERNAL ERROR - EEPROM ACCESS
129	INTERNAL ERROR - EEPROM ACCESS
130	INTERNAL ERROR - EEPROM ACCESS
131	INTERNAL ERROR - EEPROM ACCESS
132	INTERNAL ERROR - EEPROM REG INITIALIZATION
133	INTERNAL ERROR - EEPROM REQUEST SYNC
134	INTERNAL ERROR - EEPROM REQUEST SYNC
135	INTERNAL ERROR - EEPROM REQUEST SYNC
136	RESTORE STARTED
137	INTERNAL ERROR - BACKUP/RESTORE
146	TIMEOUT - BAS MODBUS
150	TUV TEST
165	INTERNAL ERROR
166	INTERNAL ERROR - WATCHDOG TEST
167	MANUAL LOCKING
168	INTERNAL ERROR - MANAGEMENT
169	INTERNAL ERROR - MANAGEMENT
170	INTERNAL ERROR - MANAGEMENT
171	INTERNAL ERROR - MANAGEMENT
200	NO ERROR
201	PREVENTION OF STARTUP
202	INTERNAL ERROR - OPERATING MODE SELECT
203	INTERNAL ERROR
204	PROGRAM STOP
205	INTERNAL ERROR
206	COMBINATION OF UNITS NOT ALLOWED
207	AZL VERSION COMPATIBILITY ERROR
208	INTERNAL ERROR

Appendix -LMV3 Error Codes (continued)

CODE	DESCRIPTION
209	INTERNAL ERROR
210	SELECTED MODE NOT RELEASED FOR BASIC UNIT
240	INTERNAL ERROR
245	INTERNAL ERROR
250	INTERNAL ERROR

Appendix - Parallel Modulation

Output

PID output ranges from 0% to (100% x number of boilers available). An available boiler is one that can be operated by the Lead/Lag Master. For example, if there are 5 boilers in a system but only 3 are available, the max PID output will be 300%. If none are available, PID will be disabled to avoid wind-up and the screen will display 'NO BOILERS AVAILABLE' instead of a PID output percent.

Enables

The start and stop percentages will be based upon this total output percentage. If lag 1 has a start percentage of 100%, the start timer will begin when the PID output exceeds 100% and the lead boiler is running. The effect of this would be to start lag 1 when the lead boiler is at 100% firing rate. The stop percentage must be lower than the start percentage, so that it will take effect when the demand begins to drop. To follow this, lag 2 would have a start percentage of 200%, lag 3 300%, etc. The start percentages can also be set lower as desired if parallel operation at lower firing rates is desired.

Firing Rates

The firing rates sent to the boilers will be the PID output divided by the number of boilers running, clipped at 100%. Each boiler is subject to a modulation delay once the fuel valve opens, and will hold at low fire until this is complete. Other situations that force low fire operation are when a boiler local actual value is greater than the local boiler setpoint plus the "low-fire hold force above setpoint" parameter ("software relief valve") or when the boiler actual (hydronic) or shell (steam) temperature are below the "low fire hold setpoint".

Example

A system is set up for 3 boilers and all 3 are available. Lag 1 is set to start at 80%, stop at 40% and lag 2 is set to start at 200%, stop at 150%. The lead starts when the demand first exceeds 2% (a fixed value) and modulates directly to the PID output. Once that exceeds 80%, the lag 1 timer starts. By the time lag 1 begins running the output is 90%, so the lead and lag boiler each are sent a firing rate of 45%. This causes the lead boiler to modulate down from 90% to 45%. The demand continues to increase, and once it exceeds 200% the process repeats for lag 2. The lead and lag 1 modulate down from 100% each to 67% each, and lag 2 joins with a firing rate of 67% as well. If demand increases to the max of 300%, all three will be at 100% firing rate. If it drops below 150% (each at 50%), lag 2 is shed and the lead and lag 1 now operate at 75% each. Once it drops below 40%, lag 1 is also shed and the lead boiler goes up to 40% from 20% and will be the only boiler until the load is gone or increases again and lag 1 rejoins.

Appendix - Sequential Modulation

Output

PID output ranges from 0% to (100% x number of boilers available). An available boiler is one that can be operated by the Lead/Lag Master, i.e. one that is in Auto, has the control switch input made, isn't locked out, and is in a bus control mode (LMV5). So, if there are 5 boilers in a system but only 3 are available, the max PID output will be 300%. If none are available, PID will be disabled to avoid wind-up and the screen will display 'NO BOILERS AVAILABLE' instead of a PID output percent.

Enables

The start percentage for lag boilers is common to all and will be based upon a 100% individual firing rate. If the start percentage is 80%, the start timer will begin when the PID output of the previous boiler is at 80% and the previous boiler is running. The stop percentage in sequential mode is when the boiler is at low fire for the stop duration.

Firing Rates / Example

The firing rates sent to the boilers will be the PID output, sectioned off per boiler. With 3 boilers, a max of 300% and a start percentage of 80%, the lead will modulate from 0%-80% from PID output 0-80%, then hold at 80%. Lag 1 will then start and modulate 0%-80% from PID output 81%-160%. If the PID output swings between 81% and 160%, only lag 1 will modulate while the lead will hold at 80%. Lag 2 will then start and modulate 0%-80% from PID output 161%-240%. Once the PID output reaches 240% and each boiler is running at 80%, the remaining 60% will be divided and added to each boiler in parallel. So, if the output increases to 270%, each will run at 90%, 80% plus 10% (270% minus 240% divided by 3).

Appendix - Sequence of Operation (Steam)

When the system is enabled in Local or Remote mode, the PID will begin by comparing the setpoint against the header pressure. The PID will generate a percentage demand. Once this demand exceeds 1%, the lead boiler will be commanded to fire. Once the lead boiler fires it will hold at low fire for at least the duration of the MOD HOLD DELAY parameter. If a shell temperature sensor is used, the firing rate is held at low fire until the temperature exceeds the LOW FIRE HOLD SP parameter, plus the duration of the MOD HOLD DELAY parameter. Once released to modulate, the lead boiler will fire at the PID demand percentage.

If the demand percentage exceeds the LAG START PERCENT completely for the duration of LAG START DELAY, the lag boiler will be commanded to fire with the same low fire hold restrictions as the described for the lead boiler. Once firing, the demand percentage will be divided among the firing boilers as described in *Appendix - Parallel Modulation* or *Appendix - Sequential Modulation* (as applicable). This procedure is repeated for each available lag boiler.

If the demand percentage drops below the LAG STOP PERCENT completely for the duration of LAG STOP DELAY, the lag boiler will be commanded off. The demand percentage will then be redistributed equally among the remaining firing boilers.

If the demand drops to zero completely for the duration of the LEAD SHUTDOWN (if enabled), the lead boiler will be commanded off. The lead boiler will remain off until the demand again exceeds 1%.

If the pressure locally at any individual boiler exceeds the LOCAL SETPOINT parameter it will be tapered down for that individual boiler so that it does not trip the local limits. The rate of taper is linear based upon the LFH HIGH FORCE parameter. See *Setpoints - Demand(PID)* for more detail.

When the lead boiler changes the former lead will continue to follow the command intended for the lead boiler for an overlapping period. This is so that the new lead boiler has time to begin firing before the former lead boiler shuts down.

If the system is disabled by being placed in Off or remotely disabled while in Remote, the demand will drop to zero and the boilers will shut down in sequence. Once all the lag boilers have shut down the lead boiler will shut down as well.

Appendix - Sequence of Operation (Hydronic)

When the system is enabled in Local or Remote mode, the PID will begin by comparing the setpoint against the controlling temperature sensor. This can be either the loop supply or loop return sensor. In Local the setpoint can be an Outside Air reset setpoint. The PID will generate a percentage demand. Once this demand exceeds 1%, the lead boiler pump will be commanded to run. Following the duration of the BOILER START DELAY parameter, the boiler will be commanded to fire. Once the lead boiler fires, it will hold at low fire for at least the duration of the MOD HOLD DELAY parameter. If a shell temperature sensor is used, the firing rate is held at low fire until the temperature exceeds the LOW FIRE HOLD SP parameter, plus the duration of the MOD HOLD DELAY parameter. Once released to modulate, the lead boiler will fire at the PID demand percentage.

If the demand percentage exceeds the LAG START PERCENT completely for the duration of LAG START DELAY, the lag boiler pump will be commanded run. Following the duration of the BOILER START DELAY parameter, the lag boiler will be commanded to fire with the same low fire hold restrictions as the described for the lead boiler. Once firing, the demand percentage will be divided among the firing boilers as described in *Appendix - Parallel Modulation* or *Appendix - Sequential Modulation* (as applicable). This procedure is repeated for each available lag boiler.

If the demand percentage drops below the LAG STOP PERCENT completely for the duration of LAG STOP DELAY, the lag boiler will be commanded off. The lag boiler pump will continue to run for the duration of the PUMP OFF DELAY parameter. The demand percentage will then be redistributed equally among the remaining firing boilers.

If the demand drops to zero completely for the duration of the LEAD SHUTDOWN (if enabled), the lead boiler will be commanded off. The lead boiler pump will continue to run for the duration of the PUMP OFF DELAY parameter. The lead boiler and pump will remain off until the demand again exceeds 1%.

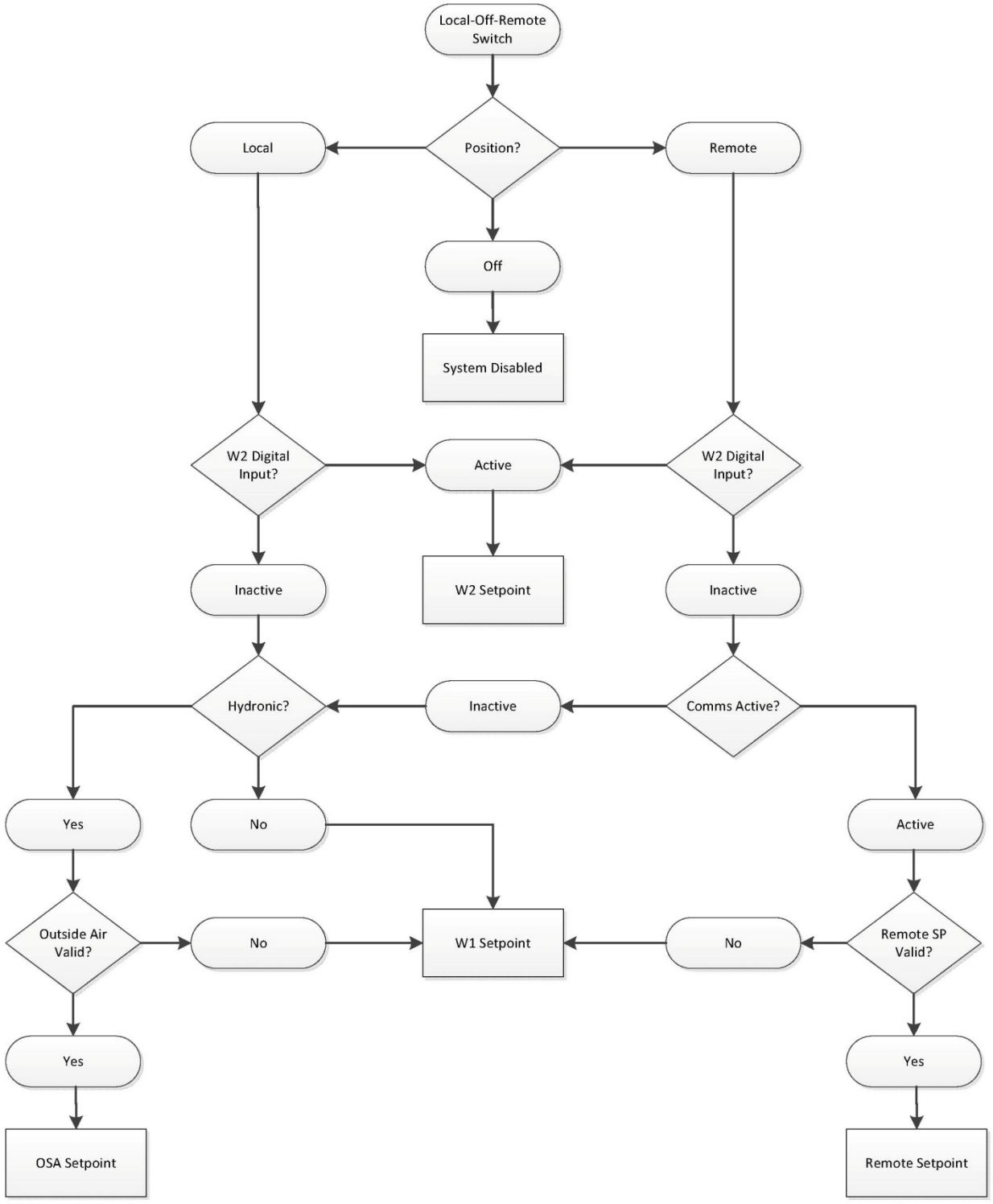
If the temperature locally at any individual boiler exceeds the LOCAL SETPOINT parameter it will be tapered down for that individual boiler so that it does not trip the local limits. The rate of taper is linear based upon the LFH HIGH FORCE parameter. See *Setpoints - Demand(PID)* for more detail.

When the lead boiler changes the former lead will continue to follow the command intended for the lead boiler for an overlapping period. This is so that the new lead boiler has time to begin firing before the former lead boiler shuts down.

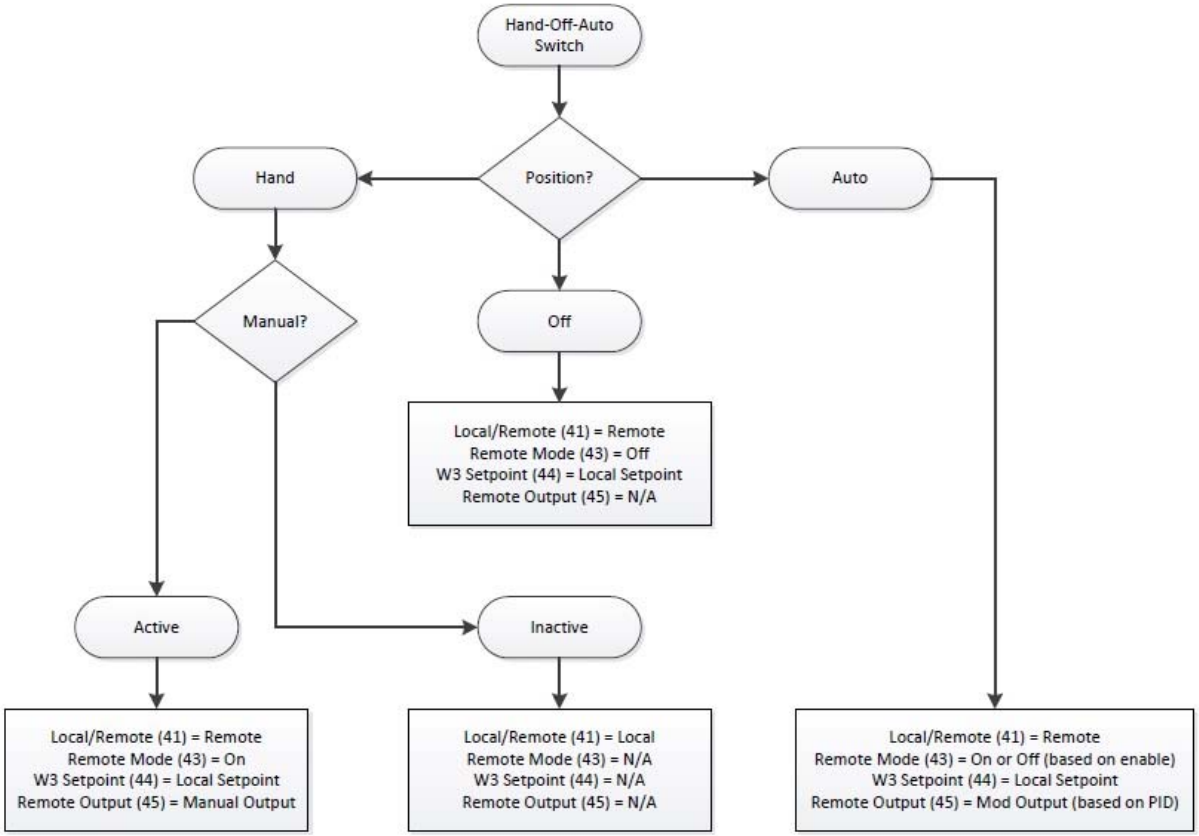
Appendix - Sequence of Operation (Hydronic) (continued)

If the system is disabled by being placed in Off or remotely disabled while in Remote, the demand will drop to zero and the boilers will shut down in sequence. Once all the lag boilers have shut down the lead boiler will shut down as well.

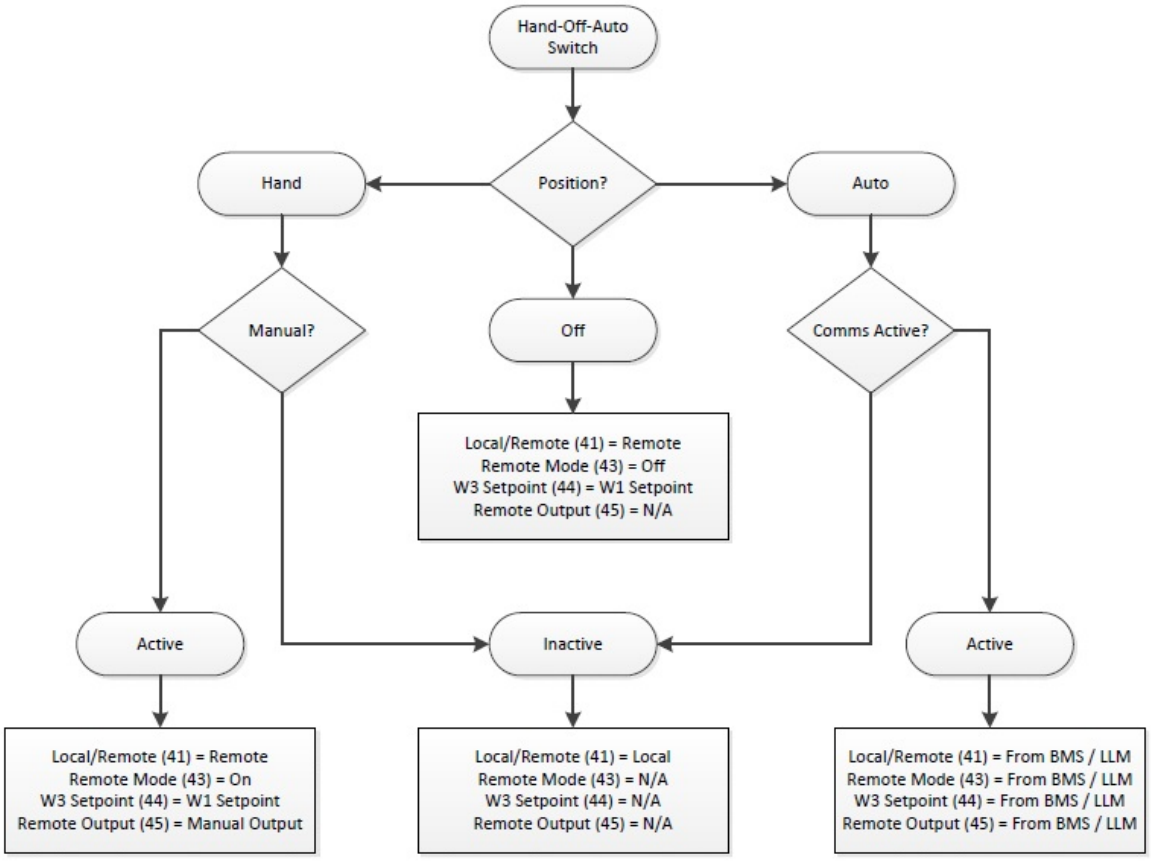
Appendix - System Local-Off-Remote Flowchart



Appendix - Boiler Hand-Off-Auto Flowchart (Serial Connection)



Appendix - Boiler Hand-Off-Auto Flowchart (Touchscreen Kit)



Appendix - Logic Definitions

AND

CONDITION 1	CONDITION 2	RESULT
FALSE	FALSE	FALSE
FALSE	TRUE	FALSE
TRUE	FALSE	FALSE
TRUE	TRUE	TRUE

OR

CONDITION 1	CONDITION 2	RESULT
FALSE	FALSE	FALSE
FALSE	TRUE	TRUE
TRUE	FALSE	TRUE
TRUE	TRUE	TRUE

NAND

CONDITION 1	CONDITION 2	RESULT
FALSE	FALSE	TRUE
FALSE	TRUE	TRUE
TRUE	FALSE	TRUE
TRUE	TRUE	FALSE

NOR

CONDITION 1	CONDITION 2	RESULT
FALSE	FALSE	TRUE
FALSE	TRUE	FALSE
TRUE	FALSE	FALSE
TRUE	TRUE	FALSE

XOR

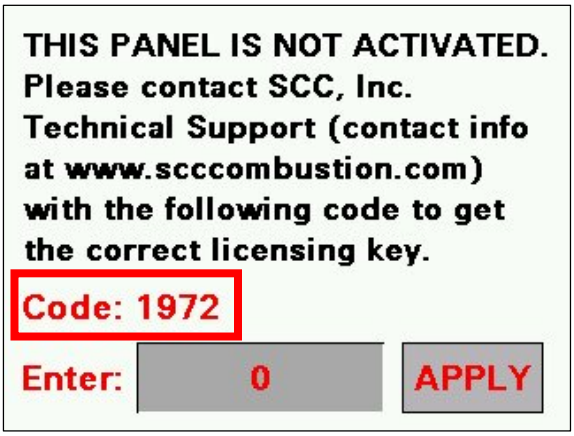
CONDITION 1	CONDITION 2	RESULT
FALSE	FALSE	FALSE
FALSE	TRUE	TRUE
TRUE	FALSE	TRUE
TRUE	TRUE	FALSE

XNOR

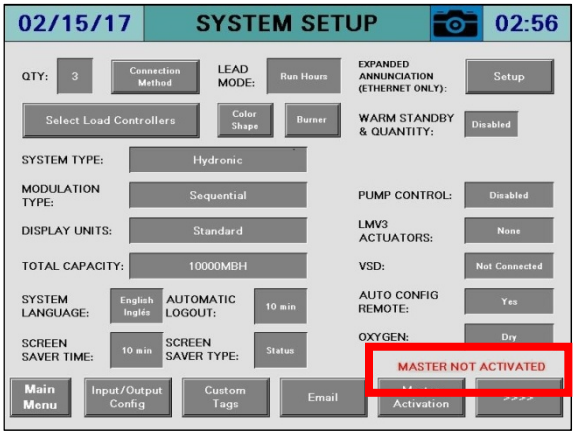
CONDITION 1	CONDITION 2	RESULT
FALSE	FALSE	TRUE
FALSE	TRUE	FALSE
TRUE	FALSE	FALSE
TRUE	TRUE	TRUE

Appendix - Activation

Software upgrades to the touchscreen and/or lead/lag controller may require that an activation code is entered following the download. If the touchscreen is started without activation, the activation screen will appear. The touchscreen will automatically proceed to the SYSTEM SETUP screen for configuration once activated (see *System Setup* section for additional detail).



If the lead/lag controller is not activated, 'MASTER NOT ACTIVATED' will appear on the SYSTEM SETUP screen. Press **Master Activation** to enter the activation code.



Contact SCC, Inc. technical support with the code listed and an activation key will be provided. Once it is entered, press **APPLY.**

Appendix - LMV5 Configuration for Modbus (Serial Connection)

The LMV5x controller must be properly configured for Modbus operation. Use the **Select <** and **Select >** buttons to navigate up and down the screen and the **Enter** button when the desired option is selected with the cursor. Use **Esc** to go back to the previous menu. When a parameter needs to be changed, the **Select <** and **Select >** buttons allow the value to be changed and **Enter** confirms the change. Press the **Esc** button to return after the change is made.

First, activate the Modbus port on the AZL (no password required):

1. Operation > OptgModeSelect > Type of Gateway = **Modbus**
2. Operation > OptgModeSelect > **GatewayBASon**

Note: Older AZL units may read 'GatewayDDCon' instead.

3. The AZL should now read 'Gateway Mode active'.

Next, set up the required parameters through the AZL (no password required):

1. Params & Display > Access w-out PW > AZL > Modbus > Address = **see note below**
2. Params & Display > Access w-out PW > AZL > Modbus > Baudrate = **19200 bit/s**
3. Params & Display > Access w-out PW > AZL > Modbus > Parity = **no**
4. Params & Display > Access w-out PW > AZL > Modbus > Timeout = **30s**

Last, change the controller mode to allow Modbus operation (no password required):
Params & Display > Access w-out PW > LoadController > Configuration > LC_OptgMode =
IntLC Bus

The changes take effect immediately (no reboot required).

NOTE: The address is the (boiler number x 10) + 1. Boiler 1 = 11, Boiler 2 = 21, etc.

Appendix - LMV3 Configuration for Modbus (Serial Connection)

The LMV3x controller must have the OCI412.10 option installed in order to communicate with the system via Modbus.

The service (heating engineer) password must be entered for these parameters to be accessed. The default service password is 9876. If the password has been changed, please consult the equipment OEM for the correct password.

To configure theLMV3x controller to communicate using Modbus, use the following procedure:

1. Hold down both the **F** and the **A** buttons until the display reads 'Code', followed by a string of seven underscores.
2. Use the **+** and **-** buttons to enter the password. Press **ENTER** (the button to the right of the display) after each entry, and again once the complete password is entered. If the password is incorrect, 'Error' will be displayed and the process will have to be restarted.
3. If the password is entered successfully, the screen will display 'Para' and then '400: Set' with the '400:' flashing.
4. Use the **-** button to navigate to '100: PArA', then press **ENTER**.
5. Use the **+** and **-** buttons to navigate to a flashing '141:'. If this value does not read '1', press **ENTER** and then use the **+** and **-** buttons to change it to '1', then press **ENTER** to confirm the change. This parameter activates Modbus. To return to the parameter navigation, press the **+** and **-** buttons simultaneously (**ESC**). The display should return to flashing '141:'. This procedure will be used to change all parameters.
6. Change '142:' to 120. This parameter sets the timeout.
7. Change '145:' to **see note below**. This parameter sets the Modbus address.
8. Change '146:' to 1. This parameter sets the baud rate to 19200 bit/s.
9. Change '147:' to 0. This parameter sets the parity to none.
10. When all the parameters are entered, press **ESC** in two successions to back up to the main screen. The changes take effect immediately (no reboot required).

NOTE: The address is the (boiler number x 10) + 1. Boiler 1 = 11, Boiler 2 = 21, etc.

Appendix - RWF55 Configuration for Modbus (Serial Connection)

The RWF55 must be properly configured for Modbus operation.

Use the up and down arrow buttons to navigate through the menus and the **Enter** button when the desired menu is selected. Use **Esc** to go back to the previous menu. When a parameter needs to be changed, the up and down arrow buttons allow the value to be changed and **Enter** confirms the change. The parameter name will flash on the green display when the parameter entry mode is entered. Press the **Esc** button to return after the change is made.

To configure theRWF55 controller to communicate using Modbus, use the following procedure:

1. Press **Enter** to go into the menu list. The green display should read 'OPr'.
2. ConF > IntF > r485 > bdrt = **2** (19200 bit/s baud rate)
3. ConF > IntF > r485 > dtt = **30** (timeout)
4. ConF > IntF > r485 > Adr = **see note below** (address for load control applications) **OR** ConF > IntF > r485 > Adr = **see note below** (address for feedwater applications)
5. Press **Esc** in four successions or until the parameter menus are completely exited. The changes take effect immediately (no reboot required).

NOTE: The address for load controllers is the (boiler number x 10) + 2. Boiler 1 = 12, Boiler 2 = 22, etc. The address for feedwater controllers is the (boiler number x 10) + 3. Boiler 1 = 13, Boiler 2 = 23, etc.

Appendix - RWF40 Configuration for Modbus (Serial Connection)

The RWF40 must have the Modbus option in order to communicate with the system. The last three characters of the part number must be 'B97' for Modbus to be optioned. If the last three characters of the part number are 'A97', Modbus is not optioned.

To activate Modbus on theRWF40, make the following and parameters:

1. Press and hold **PGM** until the green display shows 'AL'.
2. Press and hold **PGM** until the green display shows 'C111'.
3. Press **PGM** twice so that the green display shows 'C113'.
4. Press the down arrow until the second red digit from the right flashes. Use the up arrow to change this value to '7'. This parameter sets the baud rate at 19,200 bit/s.
5. Press the down arrow until the second red digit from the left flashes. Use the up arrow to change this value to **see note below** if theRWF40 is being used as a load controller or to **see note below** if theRWF40 is being used for a feedwater control. This parameter sets the Modbus address.
6. Press **PGM**. The red display should now read '0270' or '0370'. If it does not, use the down and up arrows to adjust the value and then press **PGM** to confirm and save the values.
7. Press **EXIT** to return to the normal display. The changes take effect immediately (no reboot required).

NOTE: The address for load controllers is the (boiler number x 10) + 2. Boiler 1 = 12, Boiler 2 = 22, etc. The address for feedwater controllers is the (boiler number x 10) + 3. Boiler 1 = 13, Boiler 2 = 23, etc.

Appendix - RWF10 Configuration for Modbus (Serial Connection)

The RWF10 must have the Modbus option in order to communicate with the system. This is an option card that is inserted into the controller when required.

To configure theRWF10 controller to communicate using Modbus, use the following procedure:

1. Press the **LEVEL** (left-most) button until the red display reads 'CN-t'.
2. Press the **LEVEL** button again; the red display should read 'PSEL'.
3. If the value of 'PSEL' does not read 'Mod', use the up and down arrow buttons to change the value.
4. Press the **MODE** (loop with arrow on end, second from left) button to move to the next parameter, 'U-No'. Change the value to **see note below** with the up and down arrow buttons and then press **MODE**. This parameter sets the Modbus address.
5. Change parameter 'bPS' to '19.2' and then press **MODE**. This parameter sets the baud rate to 19,200 bit/s.
6. Change parameter 'PRtY' to 'None' and then press **MODE**. This parameter sets the parity to none.
7. Change parameter 'SdWt' to '20' and then press **MODE**. This parameter sets the timeout.
8. Once 'PSEL' is displayed again, press and hold the **LEVEL** button to save the changes. The unit will reboot with the new parameters and the changes will take effect immediately.

NOTE: The address is the (boiler number x 10) + 2. Boiler 1 = 12, Boiler 2 = 22, etc.