SCC Inc.

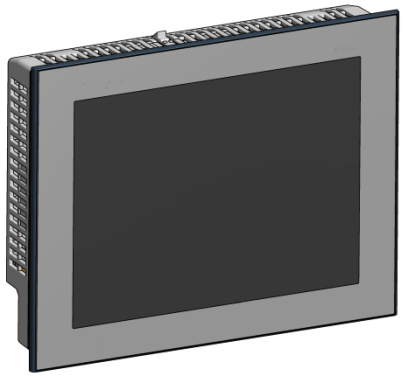
Installation Instructions

Document No. TS-1100

March 16, 2016

TS Series

TS… Touchscreen Kits
for use with LMV3, LMV5 and RWF… Controls



Touchscreen

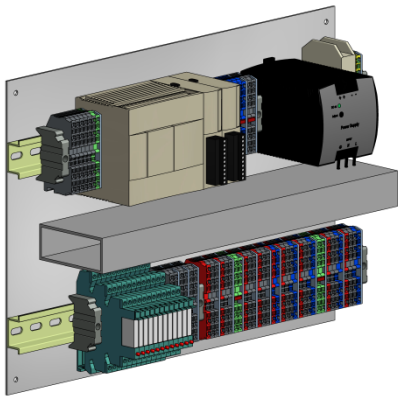


Plate Kit

Description

TS… series touchscreen kits provide a human machine interface (HMI) when used with a Siemens LMV3 or LMV5 linkageless control. Each kit provides boiler burner data collection and trending for a hydronic or steam boiler. An optional RWF… control for load or water level modulation easily interfaces with a TS… series touchscreen kit.

Each TS… touchscreen kit includes a 6” or 10” touchscreen along with a plate kit to be mounted inside a control panel (by others).

A PLC first-out annunciator option is available for additional analog, digital, and temperature inputs.

Flexible communication interface options to the building management system (BMS) provide streamlined data collection and monitoring.

Table of Contents

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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 touchscreen communicates with the connected equipment via Modbus. Use the supplied terminal connections provided with the plate kit to wire the touchscreen, plate kit, and controllers. 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

Device	Required Address	Communication Type
LMV3x (via OCI412.10)	1	Modbus RTU (RS-485)
LMV5x	1	Modbus RTU (RS-232)
RWF10 (for load control)	2	Modbus RTU (RS-485)
RWF40 (for load control)	2	Modbus RTU (RS-485)
RWF55 (for load control)	2	Modbus RTU (RS-485)
RWF40 (for feedwater)	3	Modbus RTU (RS-485)
RWF55 (for feedwater)	3	Modbus RTU (RS-485)
VSD	31	Modbus RTU (RS-485)
Expanded Annunciator	N/A	Modbus TCP/IP (Ethernet)

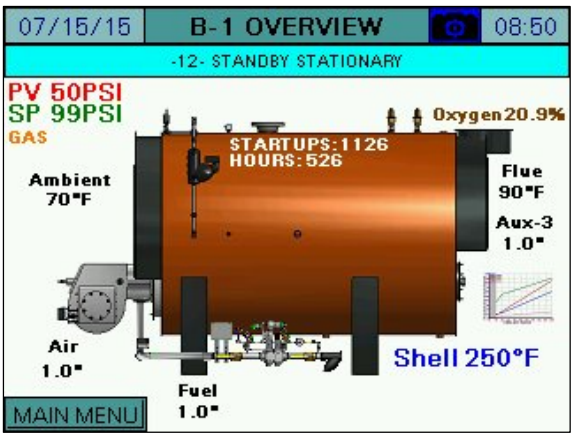
Communication via Modbus must be set with the following values:

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

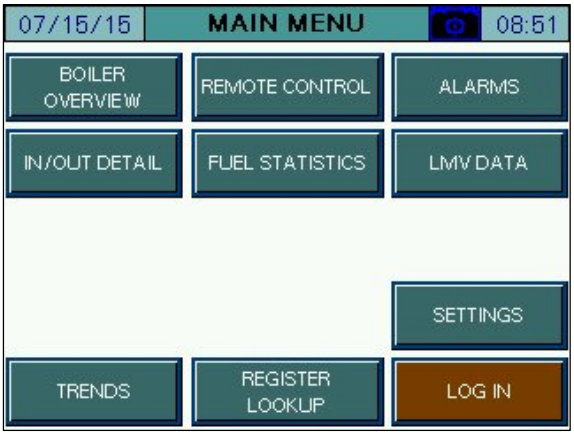
See the appendices for Modbus configuration details for each device.

Logging In

When the touchscreen is powered up, the OVERVIEW screen will appear.



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



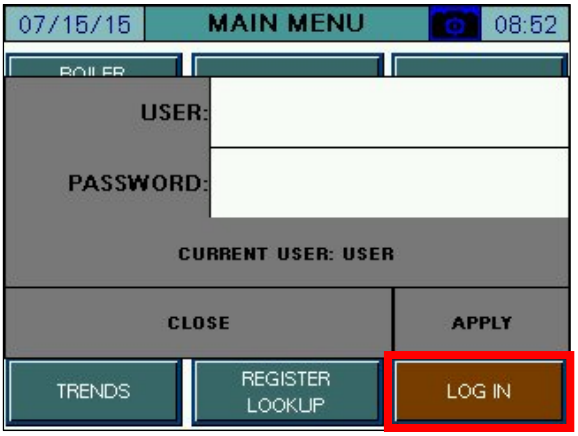
From here, different screens can be accessed depending on the access level. There are three access levels available:

- 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.

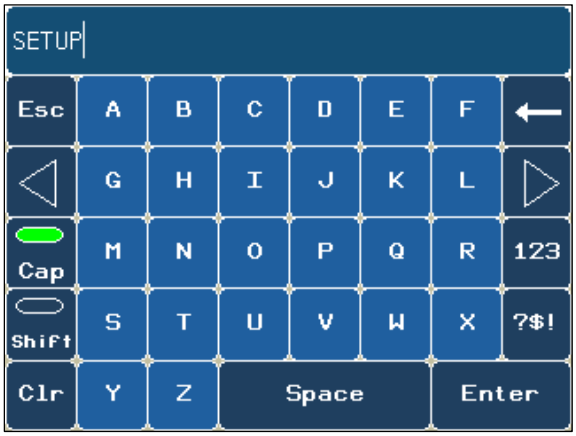
NOTE: If the ACTIVATION screen appears instead of the OVERVIEW screen, see the *Activation* section for additional detail.

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**.

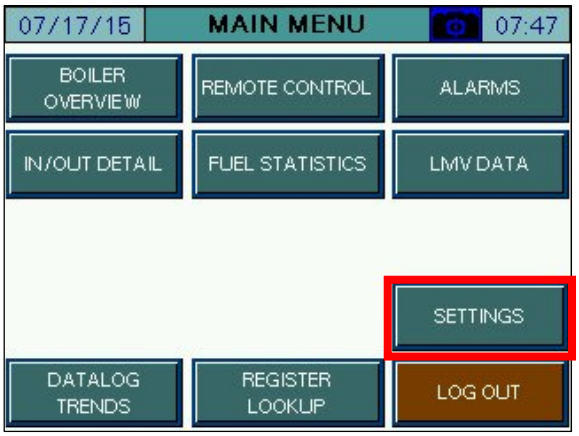
When both the username and password have been entered, press **APPLY**. If successful, the CURRENT USER will change from USER to TECH or SETUP depending on the username and password that were entered. Hit **CLOSE** to leave the login screen.

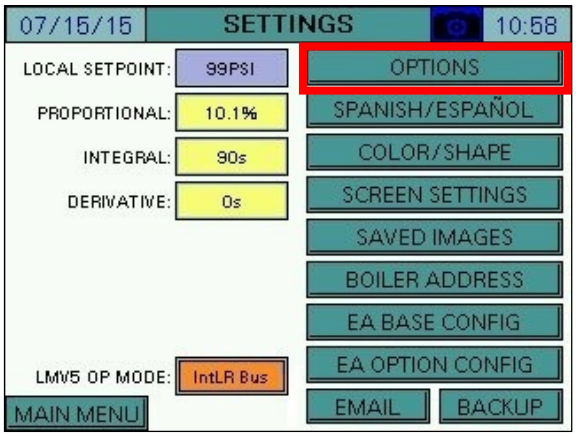
Configuration

Access level: **SETUP**

The touchscreen needs to be configured for the connected equipment. Once logged in at the SETUP level, the **LOG IN** button will now read **LOG OUT**.

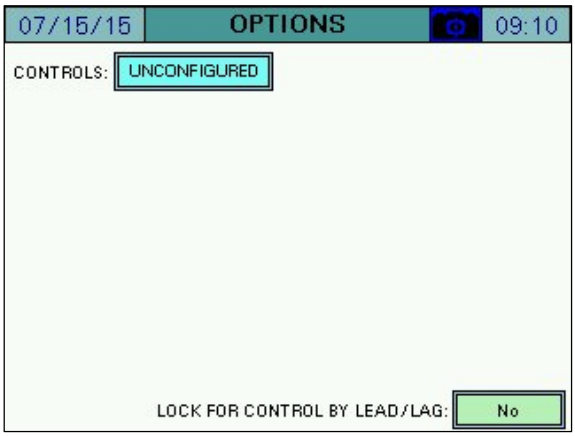
Press **SETTINGS** to display the SETTINGS screen, then press **OPTIONS** to display the OPTIONS screen.

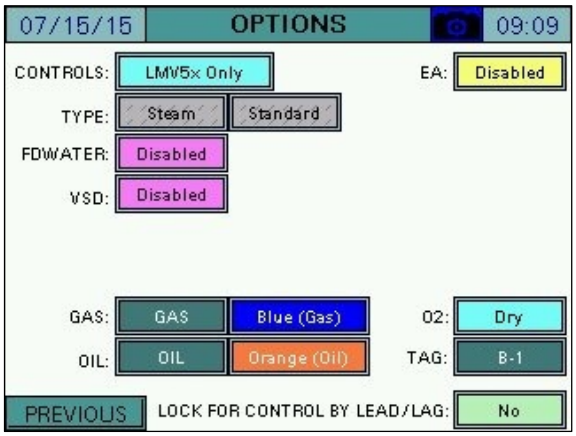


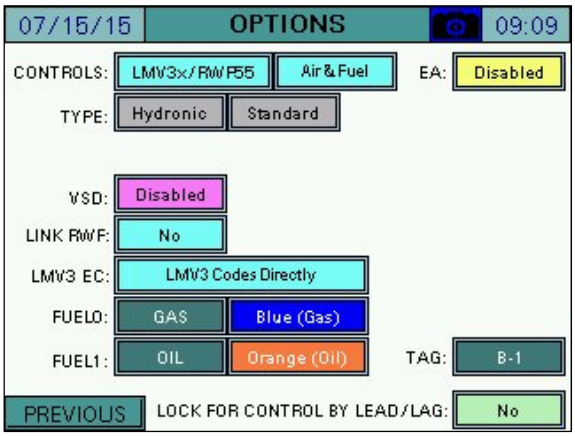


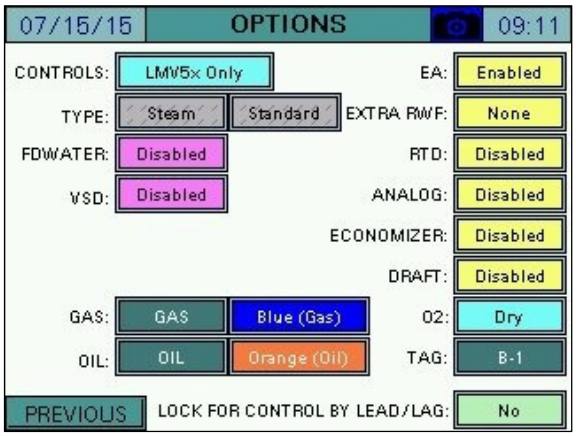
Configuration (Options)

On the OPTIONS screen, the touchscreen is configured for the components it is connected to, including the type of boiler, the controller(s), and more.









Different options will appear on the screen depending upon the controller selected.

Configuration (Options continued)

CONTROLS – Choose which Siemens controller(s) are connected to the touchscreen.

- **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.

CONTROLS (when LMV3x selected) – Select the actuators being used on an LMV3x controller.

- **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.

TYPE (1) – Choose the type of boiler that the touchscreen is connected to. This is configured automatically to match the local AZL when the control is an LMV5x.

- **Hydronic:** Select this option for a hot water boiler.
- **Steam:** Select this option for a steam boiler.

TYPE (2) – Choose the units.

- **Standard:** Process variables are shown in standard units (degrees Fahrenheit, PSI).
- **Metric:** Process variables are shown in metric units (degrees Celsius, BAR).

FDWATER – 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.

Configuration (Options continued)

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

- **Disabled**
- **Enabled**

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.

LINK RWF – Select whether Modbus commands to an LMV are redirected to the corresponding RWFxx load controller (requires > 1s press).

- **No**
- **Yes**

LMV3 EC (when LMV3x selected) – Select how LMV3x error codes are represented via Modbus (requires > 1s press).

- **LMV3 Codes Directly:** LMV3x codes are not manipulated.
- **LMV5 w/Embedded LMV3:** LMV3x codes are converted to corresponding LMV5x codes (when possible, otherwise code '43' is used) and the original LMV3x codes are transmitted as the diagnostic code.
- **LMV5 w/Diag Code 0:** Same as above, except '0' is transmitted as the diagnostic code.

GAS/OIL (FUEL0/FUEL1) – Sets the tag name for the fuel (up to six characters) and selects whether the fuel should represent a blue or an orange flame.

EA – Select whether the Expanded Annunciator option is present.

- **Disabled**
- **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.

RTD – Select whether the RTD input option is enabled in the Expanded Annunciator (only shows up when EA optioned, requires RTD input option).

- **Disabled**
- **Enabled**

Configuration (Options continued)

ANALOG – 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 Pt100/Pt1000 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** option to **Enabled**.

DRAFT – 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** and **RTD** options to **Enabled**.

O_2 (when LMV5x selected) – Select whether the O_2 and efficiency are calculated using the dry or wet method.

- **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.

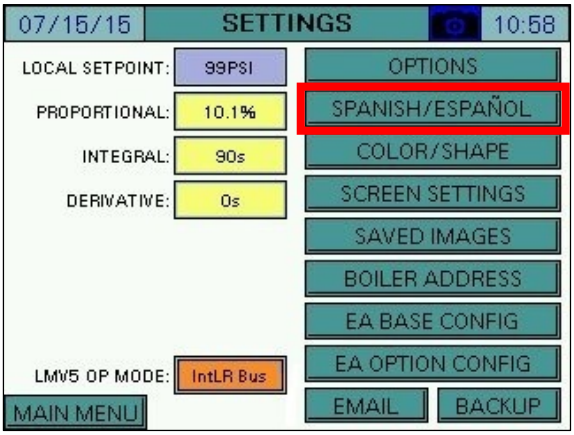
TAG – Sets the tag name for the boiler (up to six characters).

LOCK FOR CONTROL BY LEAD/LAG – Set automatically by the Lead/Lag Master to allow remote configuration when connected. Can be overridden when no longer connected to Lead/Lag Master (requires > 1s press).

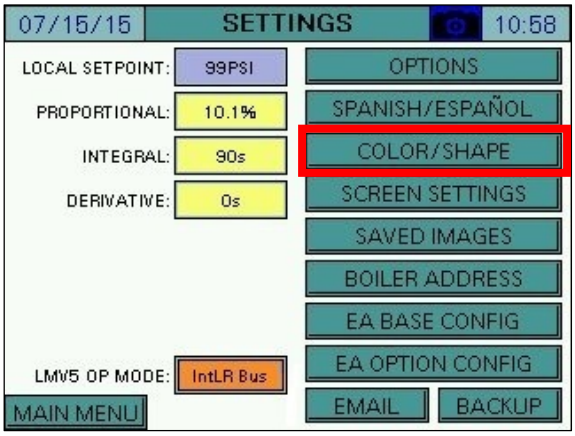
- **No**
- **Yes**

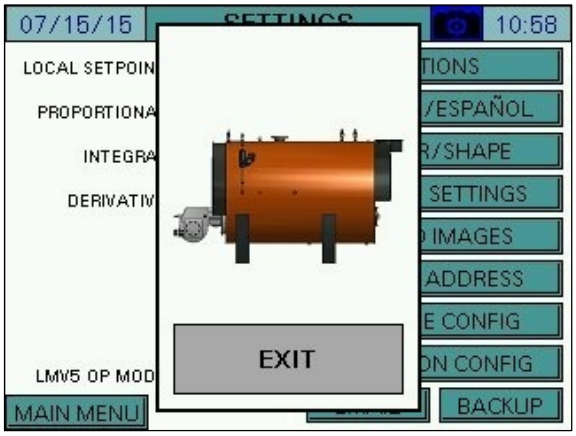
Configuration (Language, Color / Shape)

Press **SPANISH/ESPAÑOL** to change the language from English to Spanish.
Press **ENGLISH/INGLÉS** to change the language from Spanish to English.



Press **COLOR/SHAPE** to pull up the current image of the boiler. This sets the visual representation for the boiler vessel on the OVERVIEW screen.

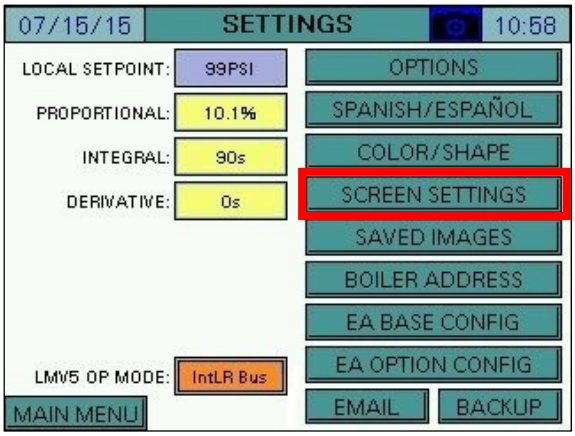


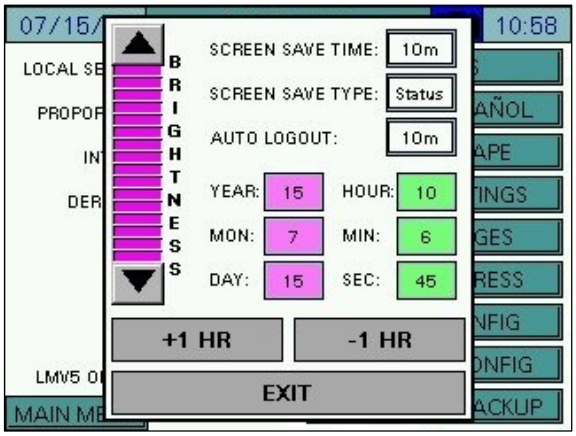


Tap the image to scroll through the available choices and press **EXIT** to confirm changes.

Configuration (Screen Settings)

Press **SCREEN SETTINGS** to adjust the touchscreen settings.

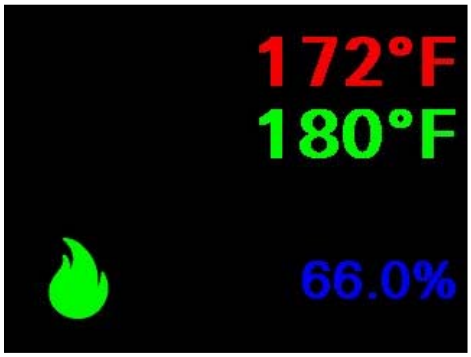




SCREEN SAVE TIME – Select between off (no screen saver), 1m, 2m, 5m, 10m, 30m or 60m.

SCREEN SAVE 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.

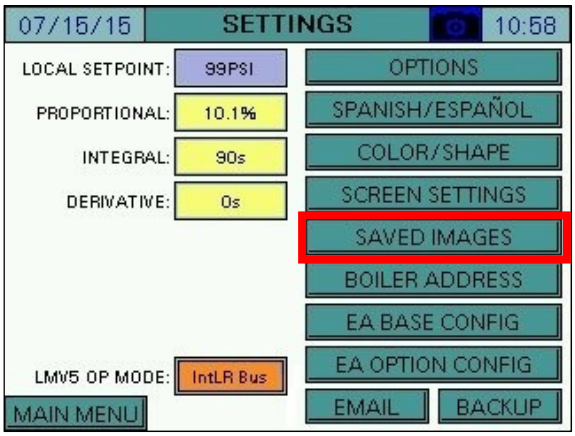
AUTO LOG OUT – Sets how long a user remains logged in. Select between 5m, 10m, 30m, 60m or 120m.

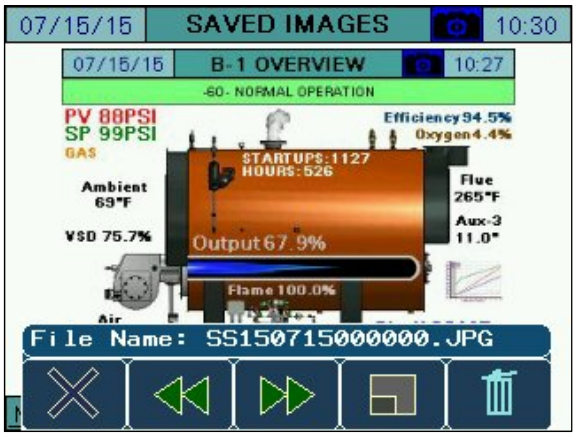
BRIGHTNESS – Sets the touchscreen brightness.

TIME – Sets the touchscreen time. **+1HR** and **-1HR** buttons are available for quick changes. Note that if the selected controller is an LMV5x, the time will automatically be set from the LMV5x.

Configuration (Saved Images)

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

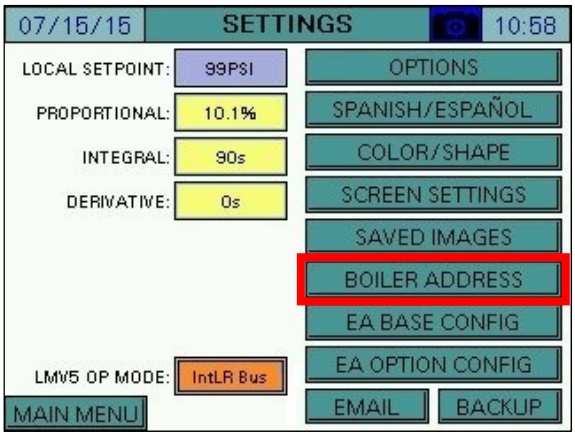


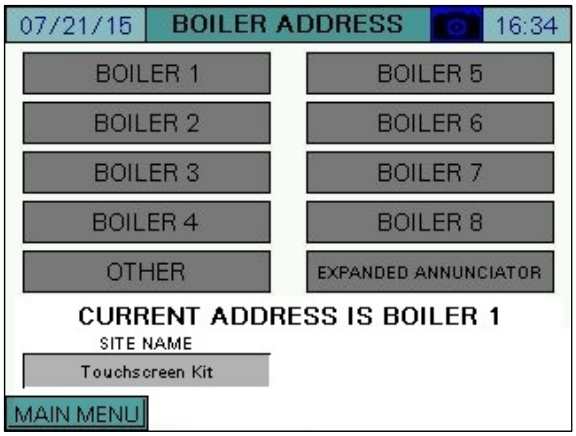


Configuration (Boiler Address)

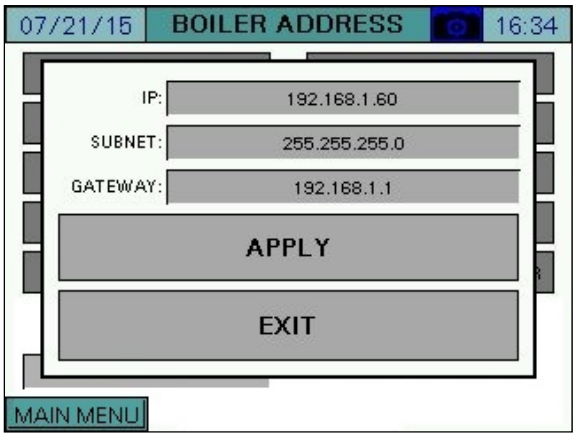
Press **BOILER ADDRESS** to adjust the boiler address settings.

The boiler address is used to give a unique identifier to each boiler. This must be set if the touchscreen is connected to a Lead/Lag Master or if multiple touchscreen kits are connected on the same Ethernet network.





Press **OTHER** when a user-specific IP address is desired in standalone applications.

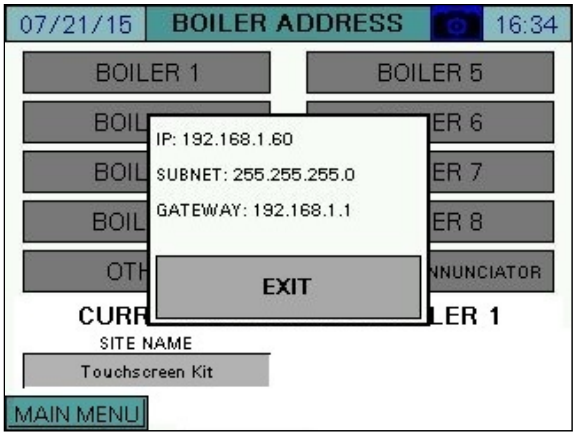


Press **APPLY** to confirm the changes.

SITE NAME – Sets the site name, which is used in the subject of email sent by the touchscreen (up to 20 characters).

Configuration (Boiler Address continued)

Press **CURRENT ADDRESS IS...** to see the current IP address.

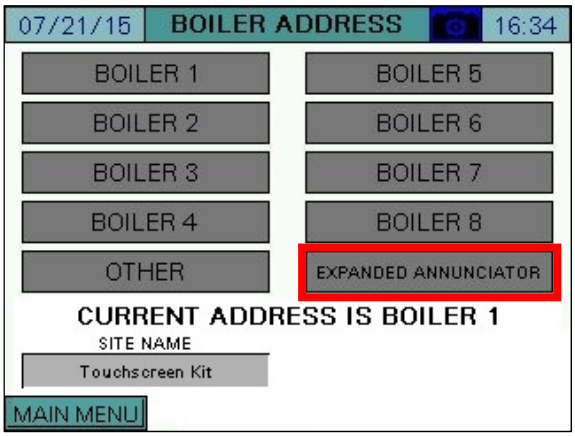


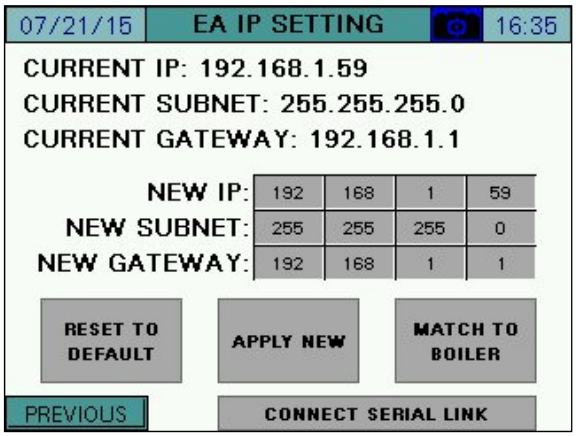
The default IP addresses for each device are listed below:

Boiler 1 - 192.168.1.60
Boiler 2 - 192.168.1.61
Boiler 3 - 192.168.1.62
Boiler 4 – 192.168.1.63
Boiler 5 - 192.168.1.64
Boiler 6 - 192.168.1.65
Boiler 7 - 192.168.1.66
Boiler 8 – 192.168.1.67
Subnet - 255.255.255.0

Configuration (Boiler Address continued)

The Expanded Annunciator comes with a default IP address 192.168.1.59. To change this, press **EXPANDED ANNUNCIATOR**.





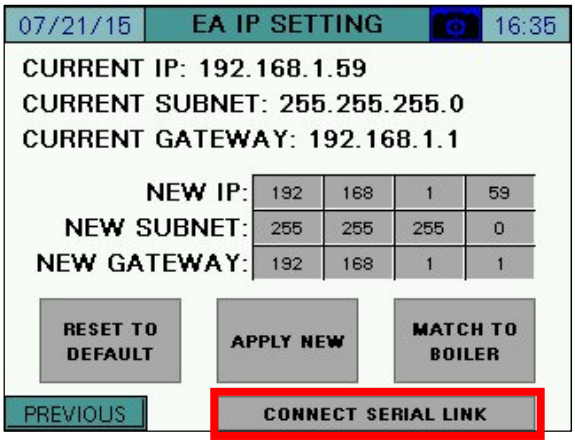
Enter the desired IP address, then press **APPLY NEW**.

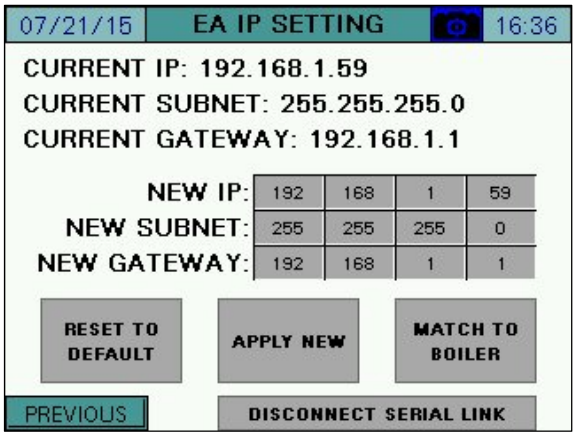
RESET TO DEFAULT – Sets the IP address back to 192.168.1.59. Once this is pressed it may take up to two minutes for the Expanded Annunciator to load the change and reboot.

MATCH TO BOILER – Sets the IP address 10 below the boiler IP address. For example, if the IP address of the boiler is 192.168.1.60, the Expanded Annunciator IP address will be 192.168.1.50. This is required when using Expanded Annunciators with a Lead/Lag Master. Once this is pressed it may take up to two minutes for the Expanded Annunciator to load the change and reboot.

Configuration (Boiler Address continued)

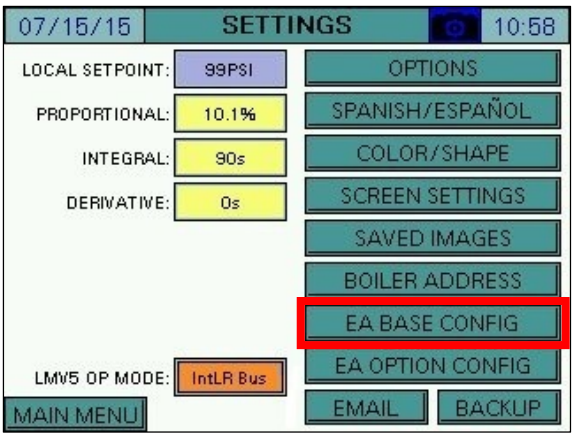
CONNECT SERIAL LINK – Use this when the communication to the Expanded Annunciator is not possible due to a mismatched IP configuration or the IP address is unknown. This establishes a temporary serial connection between the touchscreen and Expanded Annunciator for the sole purpose of setting and synchronizing the IP address. To make the serial connection, use an ordinary Cat5 or Cat6 Ethernet cable and connect it between 'COM1' on the touchscreen (disconnect existing cable) and 'RJ45 Serial 1' on the Expanded Annunciator. When finished, press **DISCONNECT SERIAL LINK** and reconnect existing cable to 'COM1' on the touchscreen.





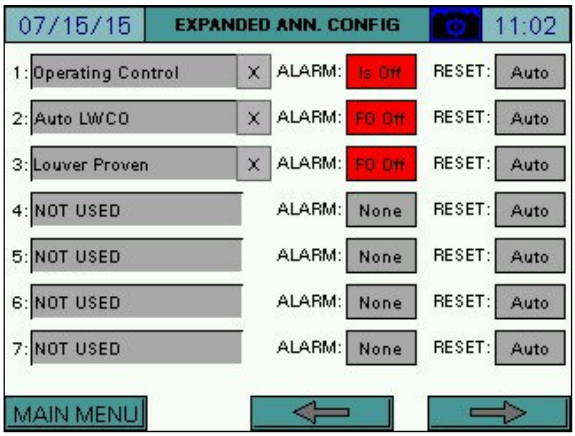
Configuration (Expanded Annunciator Base Config)

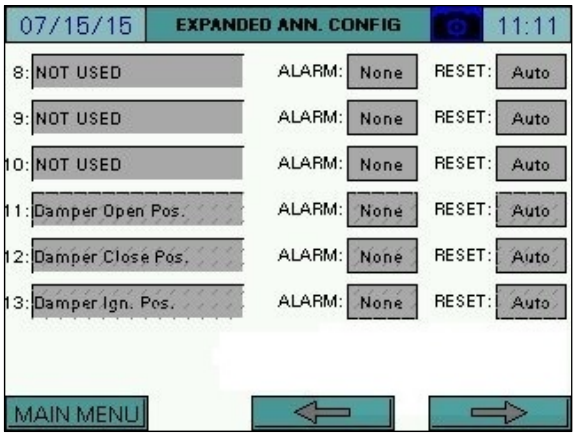
Press **EA BASE CONFIG** to configure basic Expanded Annunciator settings. Use the arrows to scroll between the configuration pages.



Configuration (Expanded Annunciator Base Config)

Digital Inputs





LIMIT 1-13 – Sets the user-configured name for each limit. The name may be up to 20 characters long. Press **X** to clear the name and reset input configuration (requires > 1s press).

Note that limits 11-13 are locked out since they are being reserved for use with the draft control option.

ALARM – Select how each individual limit will alarm. Alarms are subject to a short (five-second) delay to ensure the alarm condition is present.

- **None:** Will not alarm regardless of the position the input is in.
- **Is Off:** Will alarm when the input is deactivated.
- **Is On:** Will alarm when the input is activated.
- **FO Off:** For first-out applications, will alarm when the input is deactivated only if the previous input is activated (not available for limit 1).

RESET – Select the reset type for the alarm. Manual reset alarms may be reset by pressing **RESET EA ALARMS** on the ALARMS page.

- **Auto:** Alarm will automatically reset.
- **Manual:** Alarm will require a manual reset.

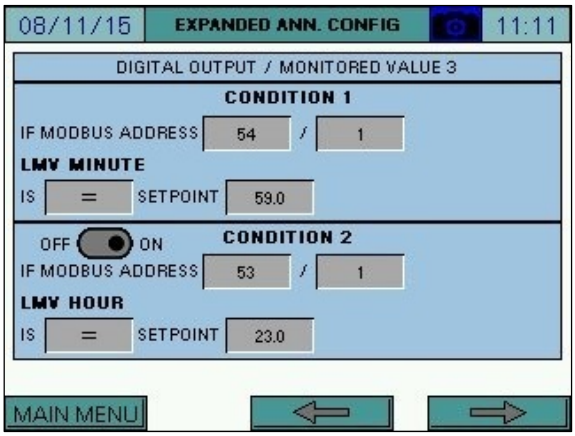
Additional Digital Input Options

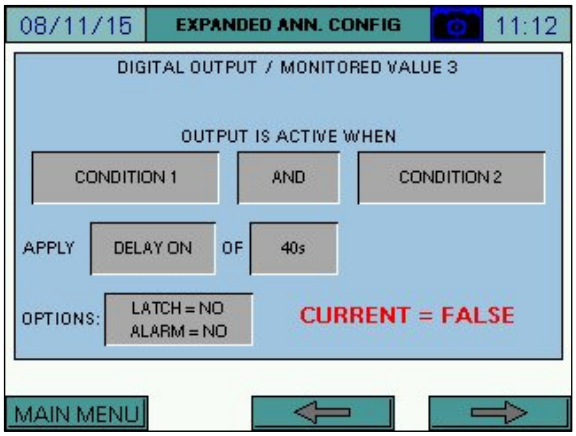
Assigning the name 'Alarm Reset PB' (case-sensitive) to any of the digital inputs will cause that input to act as a reset button for the Expanded Annunciator. Use this option when a hard-wired reset button is preferred.

Configuration (Expanded Annunciator Base Config continued)

Monitored Digital Outputs

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.





Conditions

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

IS – 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.

Configuration (Expanded Annunciator Base 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 – If two conditions are used, selects 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.

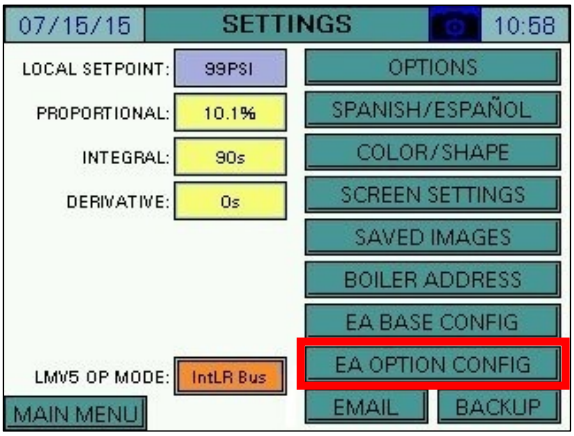
OPTIONS – Select the additional output options. Latched outputs may be reset by pressing **ALARM RESET** on the ALARMS page.

- **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.

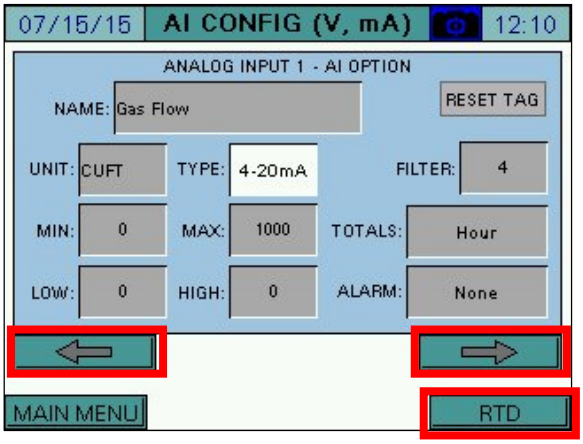
The current state of the logic is also displayed with true in green and false in red.

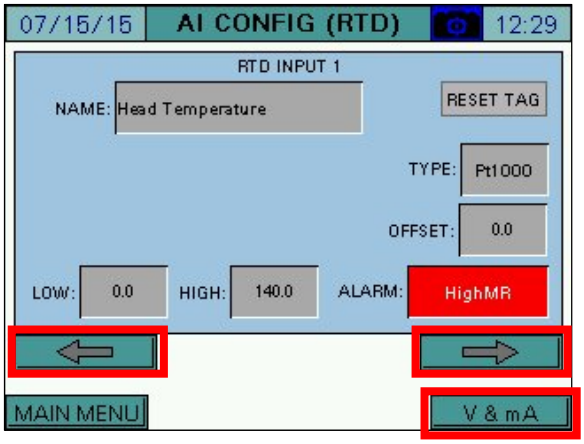
Configuration (Expanded Annunciator Option Config)

Press **EA OPTION CONFIG** to configure optional Expanded Annunciator settings.



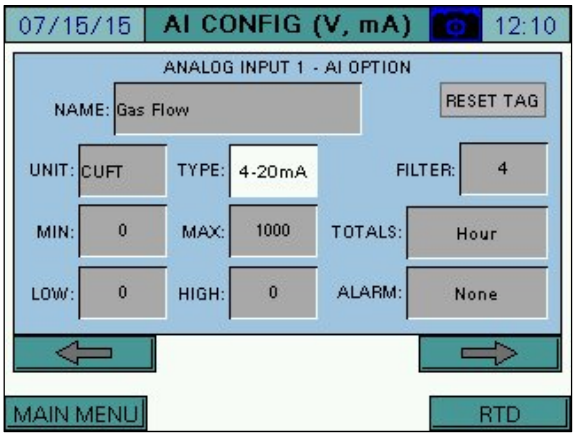
Press **V&mA** and **RTD** to switch between types, and the arrows to scroll between the configuration pages within the types.

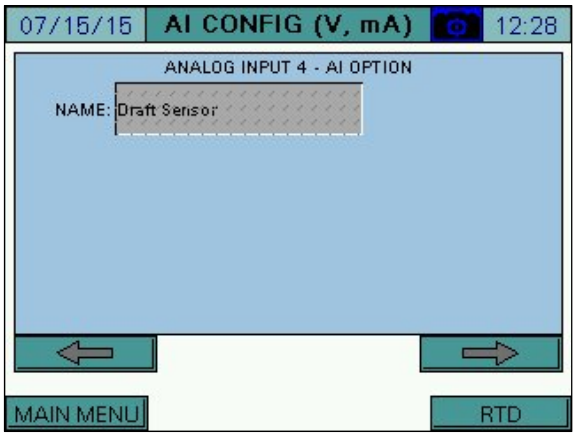




Configuration (Expanded Annunciator Option Config)

Analog Inputs (V&mA)





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. Note that Analog Input 4 is locked out since it is being reserved for use with the draft control option.

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).

Configuration (Expanded Annunciator Option 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.

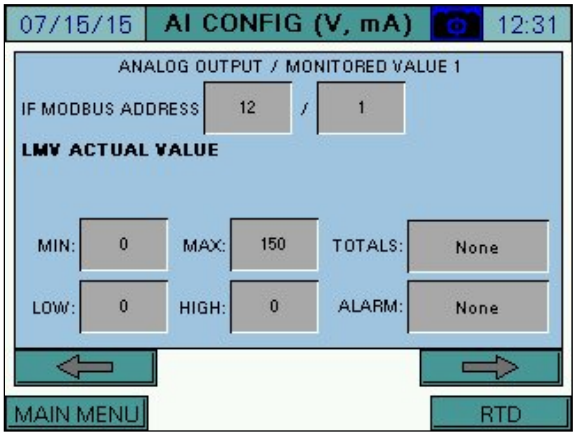
ALARM – Select the alarms generated by the input. Manual reset alarms may be reset by pressing **RESET EA ALARMS** on the ALARMS page.

- **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.

Configuration (Expanded Annunciator Base Config continued)

Monitored Analog Outputs

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



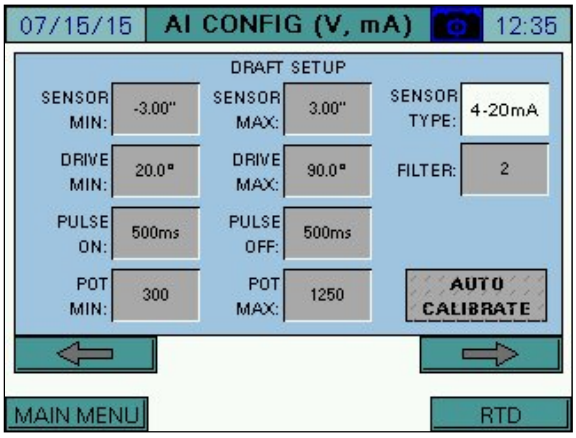
IF MODBUS ADDRESS – Sets the Modbus register index to monitor and the divider to apply to it. The name of the chosen address will then be displayed.

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 12, '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%.

TOTALS, LOW, HIGH, ALARM – See the section *Configuration (Expanded Annunciator Option Config) → Analog Input (V & mA)* for additional detail.

Configuration (Expanded Annunciator Option Config continued)

Draft Control (V&mA)



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.

SENSOR MIN, SENSOR MAX – Sets the range of the input. The minimum may be a negative number.

DRIVE MIN, DRIVE MAX – Sets the limits of the damper in angular degrees.

PULSE ON, PULSE OFF – Sets the duration of the on and off damper drive pulses.

POT MIN, POT MAX – Sets the range of the feedback pot to scale from 0 to 90 degrees.

AUTO CALIBRATE – Activates the potentiometer calibration. This can only be performed when the LMV is in phase 12 (idle). The damper is paced from open to closed and the potentiometer readings are recorded.

Configuration (Expanded Annunciator Option Config continued)

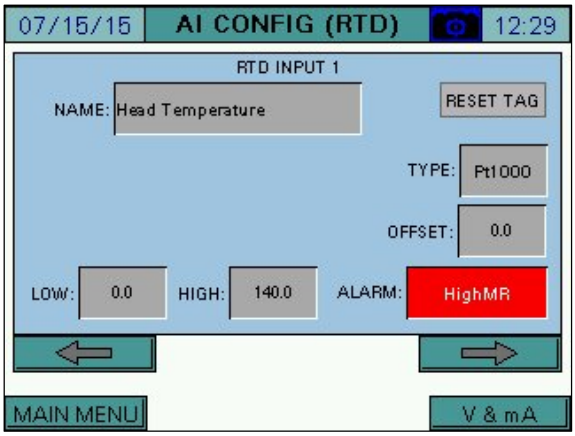
Additional Draft Options

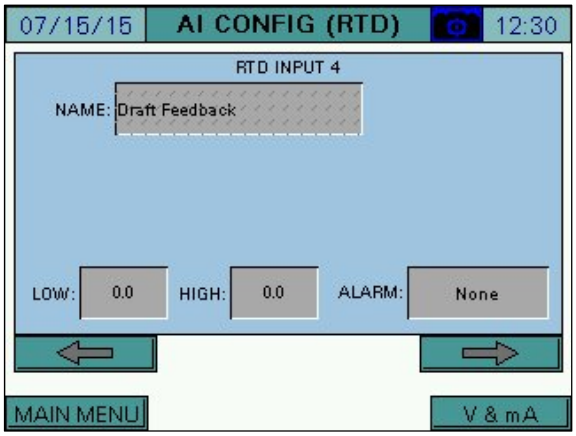
Assigning the name 'Draft Switch Auto' (case-sensitive) to any of the digital inputs will cause that input to replace the virtual OPEN-AUTO switch (activation = AUTO). Use this option when a hard-wired switch is preferred.

Assigning the name 'Draft Feedback' (case-sensitive) to Analog Input 3 will cause that input to be used for draft damper feedback. Use this option when an analog feedback signal (instead of resistive) is preferred. The feedback signal must represent 0-100% of the operating range. Using this option will also release RTD 4 for general use (normally it is reserved for draft damper feedback when draft control is optioned).

Configuration (Expanded Annunciator Option Config continued)

RTD Inputs (RTD)





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. Note that RTD Input 4 is locked out since it is being reserved for use with the draft control option, although the low and high alarms can still be set if desired.

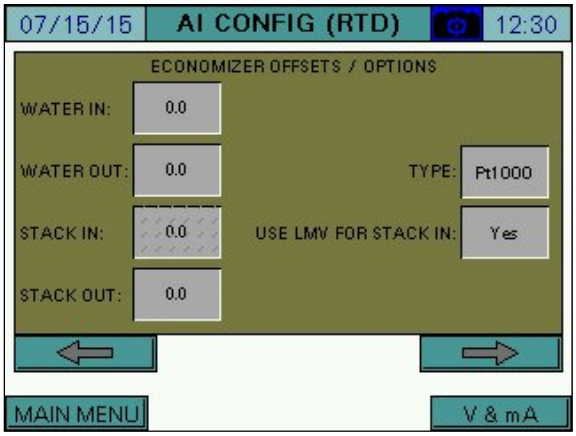
TYPE – Select between Pt1000 or Pt100.

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 *Configuration (Expanded Annunciator Option Config) → Analog Input (V & mA)* for additional detail.

Configuration (Expanded Annunciator Option Config continued)

Economizer (RTD)



WATER IN, WATER OUT, STACK IN, STACK OUT (OFFSETS) – Sets the offset in degrees applied to the input. This may be used to compensate for errors introduced by long wire runs.

TYPE – Select between Pt1000 or Pt100.

USE LMV FOR STACK IN – Select whether the stack temperature in is from the LMV input instead of the RTD input.

- **No**
- **Yes**

Configuration (Expanded Annunciator Option Config continued)

Expanded Annunciator As Load Controller

If the selected load controller is 'LMV3x Only', the Expanded Annunciator may be configured to operate as a load controller. To configure this option a process variable must be assigned to one of the analog or RTD inputs.

Assigning a name containing 'E1' (case-sensitive) to any of the analog or RTD inputs will cause that input to be assigned to E1 of the Expanded Annunciator load controller, which is the process variable.

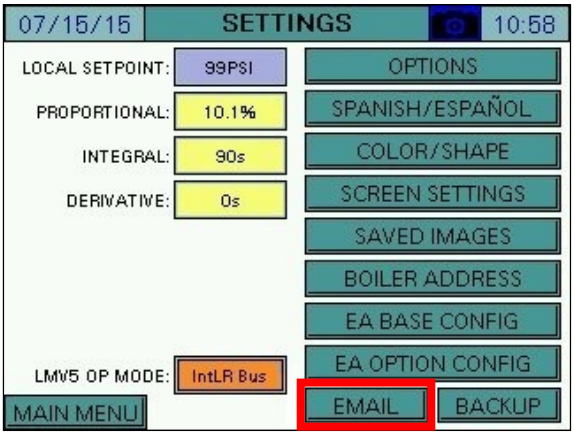
Assigning a name containing 'E3' (case-sensitive) to any of the analog or RTD inputs will cause that input to be assigned to E3 of the Expanded Annunciator load controller, which is the alarm variable.

Assigning a name containing both 'E1' and 'E3' (case-sensitive) to any of the analog or RTD inputs will cause that input to be assigned to both E1 and E3 of the Expanded Annunciator load controller simultaneously.

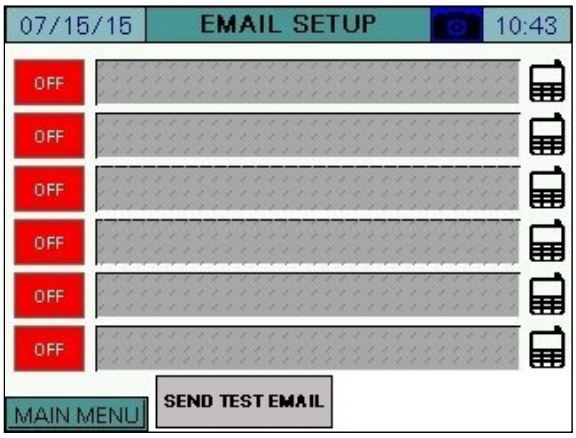
For further detail on using the Expanded Annunciator load controller, see the section *Expanded Annunciator → Load Controller.*

Configuration (Email)

Press **EMAIL** to configure email settings.

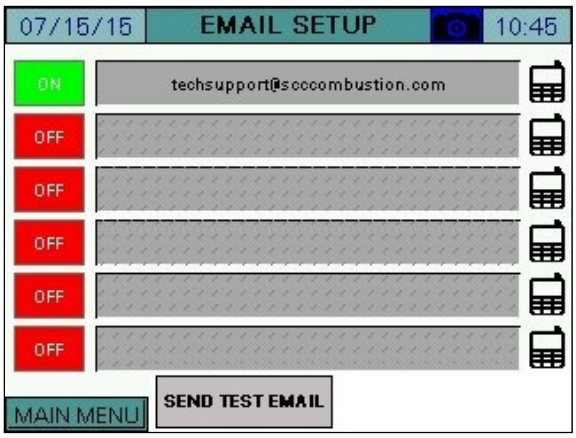


The touchscreen can be configured to send email to up to six addresses. This requires that the touchscreen is connected to a network with Internet access. The touchscreen comes configured to use a specific outgoing mail server but this can be changed if necessary (see *Appendix - Email Options* for additional detail). Emails are sent automatically when alarms occur and may be sent manually to send screen captures and other data from the touchscreen.

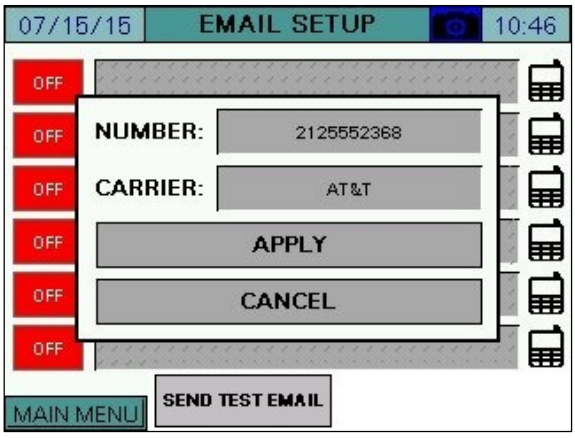


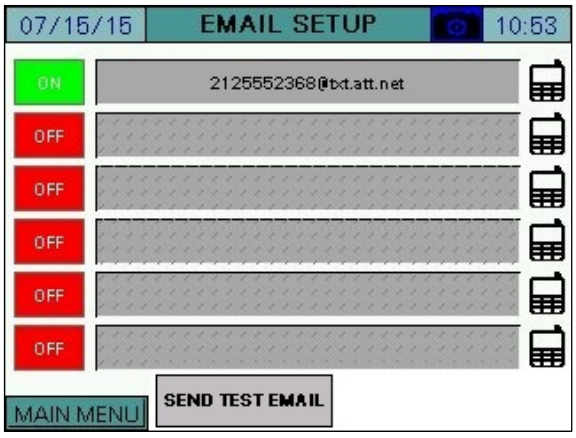
Configuration (Email continued)

To configure an email address, press the **ON/OFF** button to the left of the address line, then enter the address.



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.

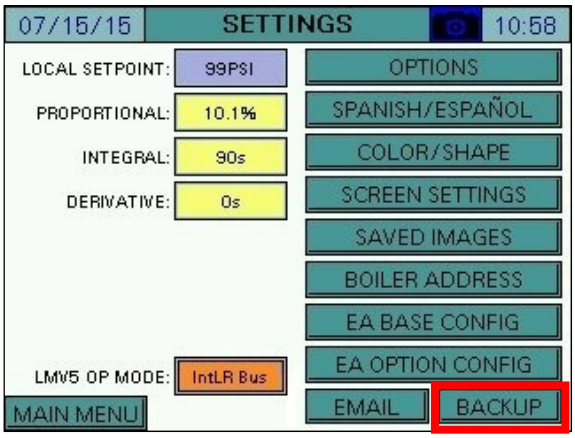




To check that the email addresses are valid and were entered correctly, press **SEND TEST EMAIL**.

Configuration (Backup)

Press **BACKUP** to backup or restore settings to the USB drive.



System settings, email settings or Expanded Annunciator settings can all be saved to the USB drive for backup and migration to other units. The data is saved in an editable .csv or .txt document and can be edited using a standard text editor or spreadsheet application. For the desired group, press **SAVE TO USB** to save the current settings and press **RESTORE FROM USB** to overwrite the current settings. If a backup file does not exist or invalid parameters are found, an error message will be displayed.

<u>System Settings</u>
System settings are the configuration options. This is the data found on the OPTIONS screen as well as some additional system data such as color/shape and screen settings.

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT\TSKSETUP.CSV, xx is 6 for 6", 10 for 10"

<u>Email Settings</u>
Email settings include the six configurable email addresses.

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT\EMAIL.TXT, xx is 6 for 6", 10 for 10"

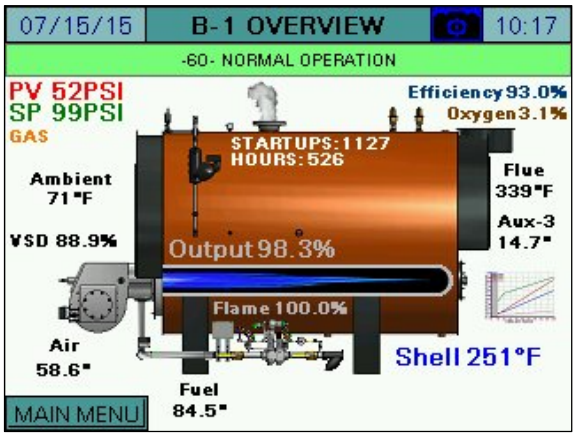
<u>Expanded Annunciator Settings</u>
Expanded Annunciator settings include all configuration data from the base and options.

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT\EASETUP.CSV, xx is 6 for 6", 10 for 10"

Boiler Overview

Access level: **USER**

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

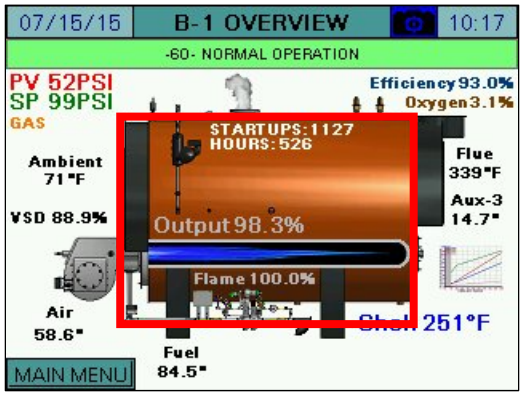


Only the parameters that are optioned and active are shown. Any others are hidden from the display for clarity. Touching the area displaying the O_2 trim data will display additional data. The following parameters may be shown on the overview screen:

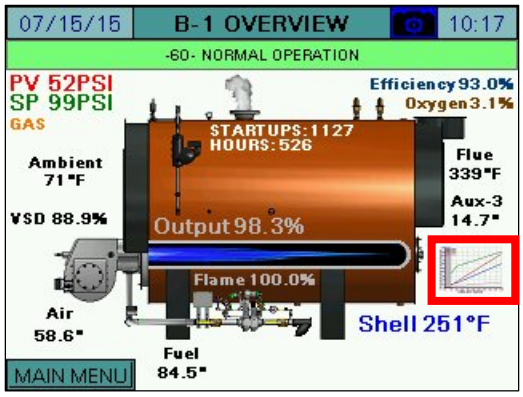
Phase: The phase of the boiler is always displayed in a horizontal bar at the top of the screen.
PV: Displays the actual value of the boiler.
SP: Displays the current setpoint of the boiler.
Fuel In Use: Displays the current fuel being used (uses fuel tags).
Firing Rate: Displays the firing rate of the boiler from 0-100%.
Manual Active: Displayed in red text if the boiler is in manual mode.
Air, Fuel Actuators: Displays the position of the air and/or 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.
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).
O_2: Displays the current O_2 percentage in the stack (LMV5x only).
Excess Air: Displays the current excess air percentage in the stack (LMV5x only).
CO_2: Displays the current CO_2 percentage in the stack (LMV5x only).
Lead/Lag Status: Displays the current lead/lag status (when connected to Lead/Lag Master, see section *Remote Control* for additional detail).

Boiler Overview (continued)

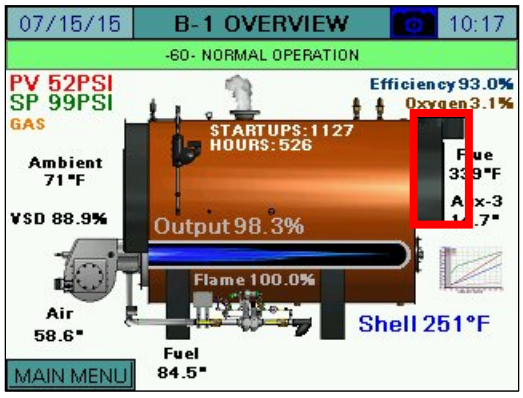
Touching the boiler image will navigate to the REMOTE CONTROL screen (see *Remote Control* section for additional detail).



Touching the graph will navigate to the CURVE DATA screen. Each fuel has a unique curve and must be commissioned separately (see *Curve Data* section for additional detail).

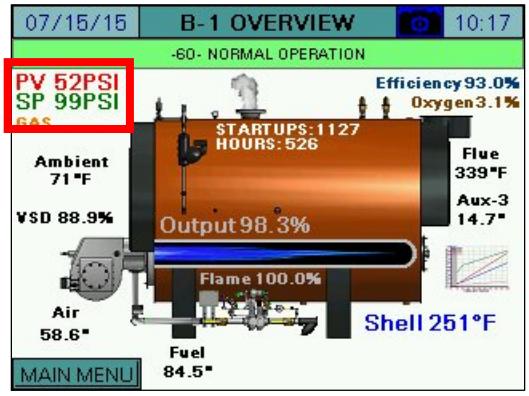


Touching the boiler stack will navigate to the DRAFT/ECONOMIZER screen. (see *Draft/Economizer* section for additional detail).



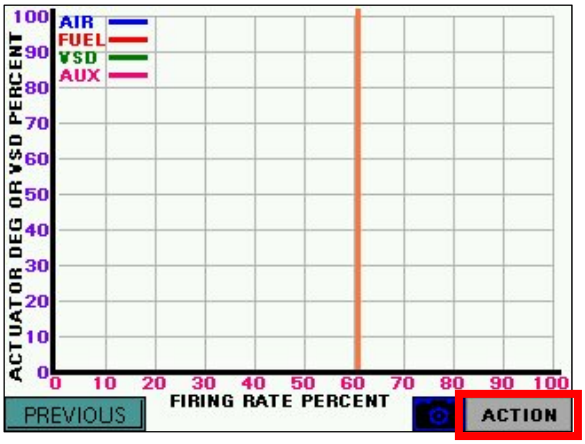
Boiler Overview (continued)

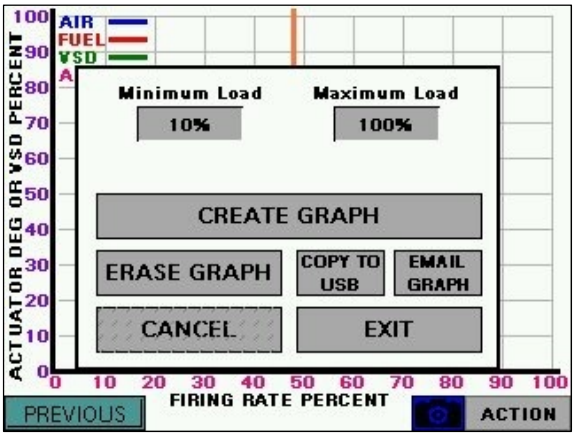
Touching the process data will navigate to the SETTINGS screen. (see *Settings* section for additional detail).



Curve Data

Pressing the **ACTION** button for >1s displays the option menu.

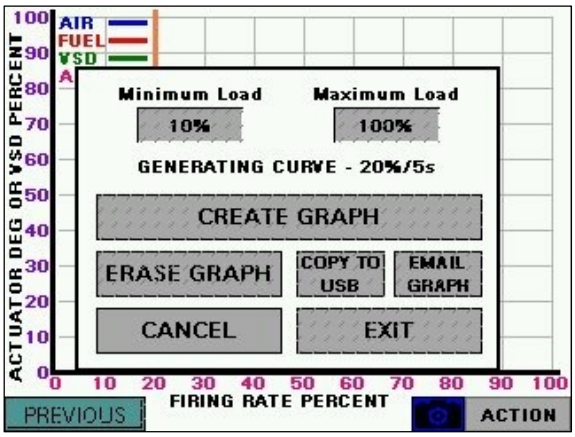


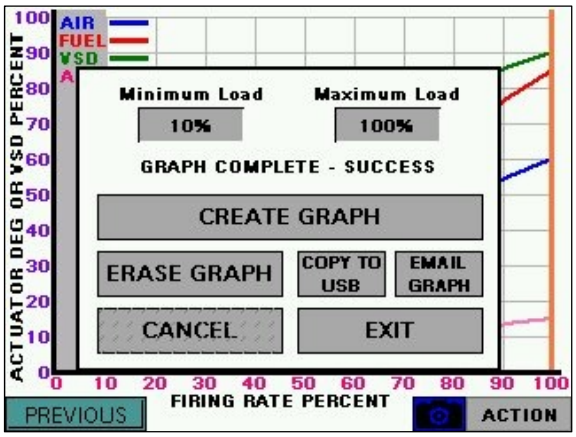


Minimum Load, Maximum Load – Sets the range of allowable modulation. These must be set to unlock the **CREATE GRAPH** button.

CREATE GRAPH – Activates the graph creation function. This commands the LMV to run at firing rates from the minimum to maximum incrementally and will record the data.

Boiler Overview (continued)





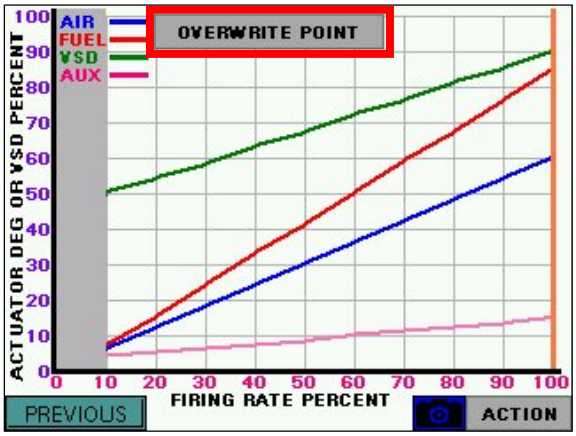
While the curve is being generated, the progress is shown. If it takes longer than 60 seconds to record any point (LMV shuts down for any reason), the function will be aborted with an error and may be restarted at another time. When the function is complete, the LMV will return to the state it was in when the function began, and the graph will display with an orange line indicating the current position on the graph where the LMV is operating. Pressing **ERASE GRAPH** will clear all stored graph data.

Press **COPY TO USB** to save the graph data to a .csv file. If email is configured, press **EMAIL GRAPH** to send an email with the graph data .csv file attached. Note that a USB drive must be inserted to send email since the attached file is first stored on the USB drive.

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 6", 10 for 10"
Filename = LMV_CURVE_DATA_mm_dd_yyyy.CSV, mmddyyyy are date

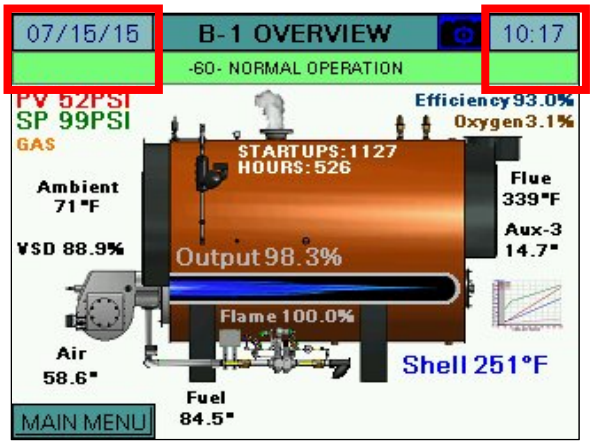
Boiler Overview (continued)

If the LMV is held at any even point on the graph (10%, 20%, 30%, etc.) the **OVERWRITE POINT** button will appear. If pressed (requires > 2s press) the current data at that point will overwrite the saved data. The 6" touchscreen kit will graph 10 points and the 10" touchscreen kit will graph 20 points.



Forcing Screen Saver

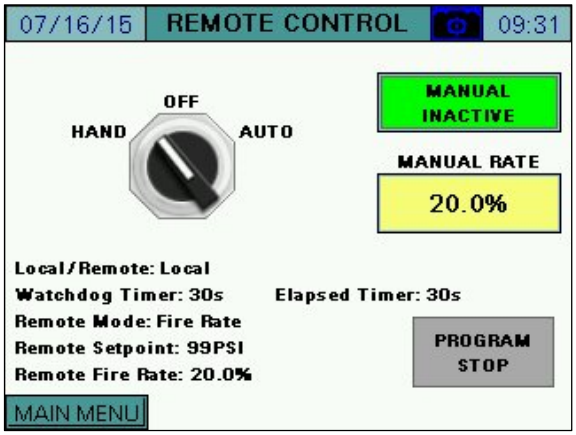
Touching either of the top corners for > 1s will force the screen saver to display if configured (See the section *Configuration (Screen Settings)* for additional detail).



Remote Control

Access level: **USER**

The HAND-OFF-AUTO mode of the boiler may be set at any time. From the MAIN MENU screen, press **REMOTE CONTROL**. The REMOTE CONTROL screen will appear.



HAND-OFF-AUTO – Sets the mode of the boiler to manually on, manually off, or automatic. See **Table 2** or *Appendix - Hand-Off-Auto Flowchart* for additional detail.

- **HAND:** The boiler is commanded to run.
- **OFF:** The boiler is commanded to remain off.
- **AUTO:** The boiler is commanded to operate off of the remote commands (if present). This is subject to the watchdog timer, which will revert to local if remote commands are invalid or not present.

⚠ **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.

Remote Control (continued)

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

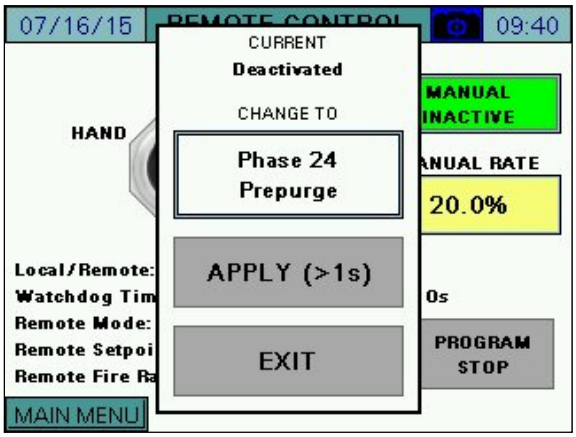
- **INACTIVE**
- **ACTIVE**

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

Table 2: 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 (Mode Auto)	Remote	Automatic	W3	Internal LC
AUTO (Mode On)	Remote	Burner On	W3	Remote
AUTO (Mode Off)	Remote	Burner Off	W3	n/a
AUTO (Watchdog Expired)	Local	n/a	W1/W2	Internal LC

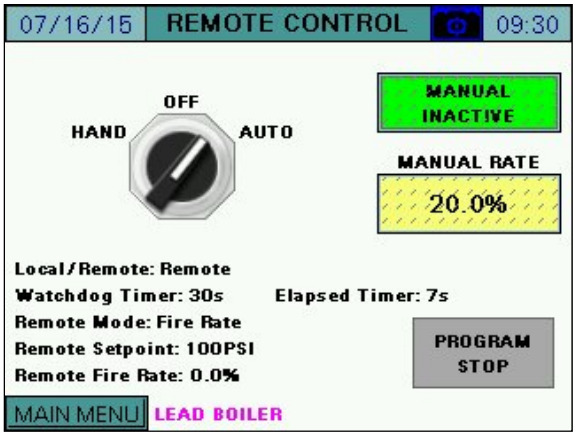
Pressing the **PROGRAM STOP** button displays the program stop menu.



After the new program stop is selected, hold **APPLY** for > 1s to save change. Press **EXIT** when finished.

Remote Control (continued)

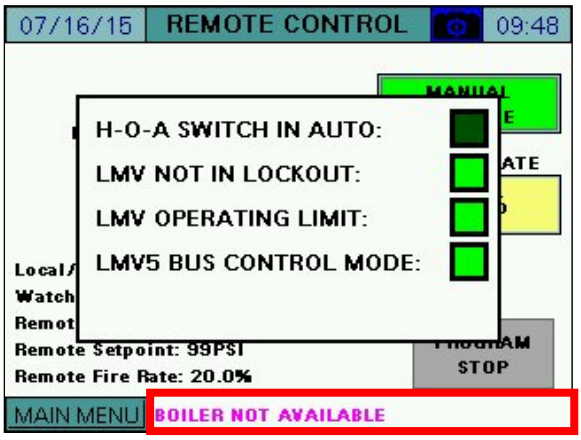
If connected to a Lead/Lag Master, the status of the boiler will be displayed as well.



All of the possible status messages are displayed in **Table 3**.

Table 3: 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). Touching the status message (shown below) will display the current status of these qualifiers.
OVERRIDE MODE	The override input on the lead/lag master is activated and is the source of control.



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:

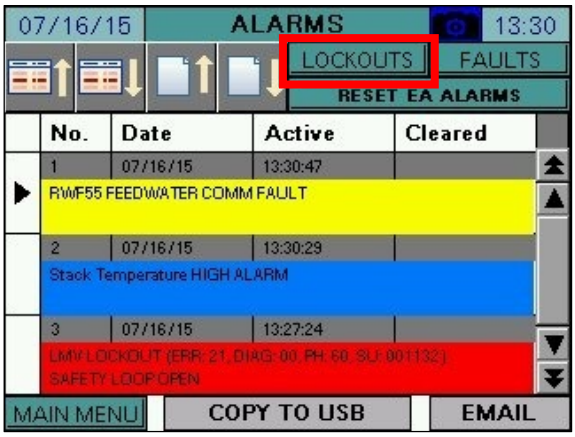
 Move up one alarm on list.

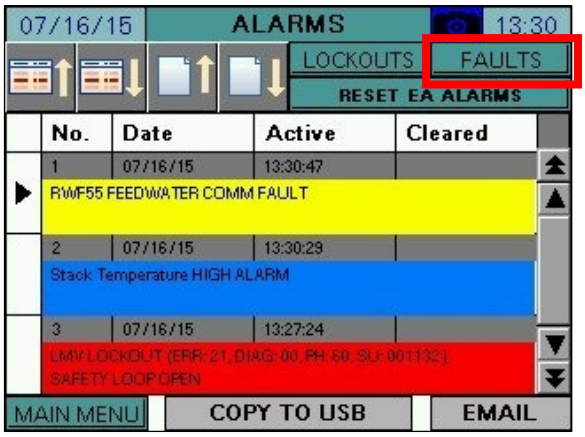
 Move down one alarm on list.

 Navigate up one page on list.

 Navigate down one page on list.

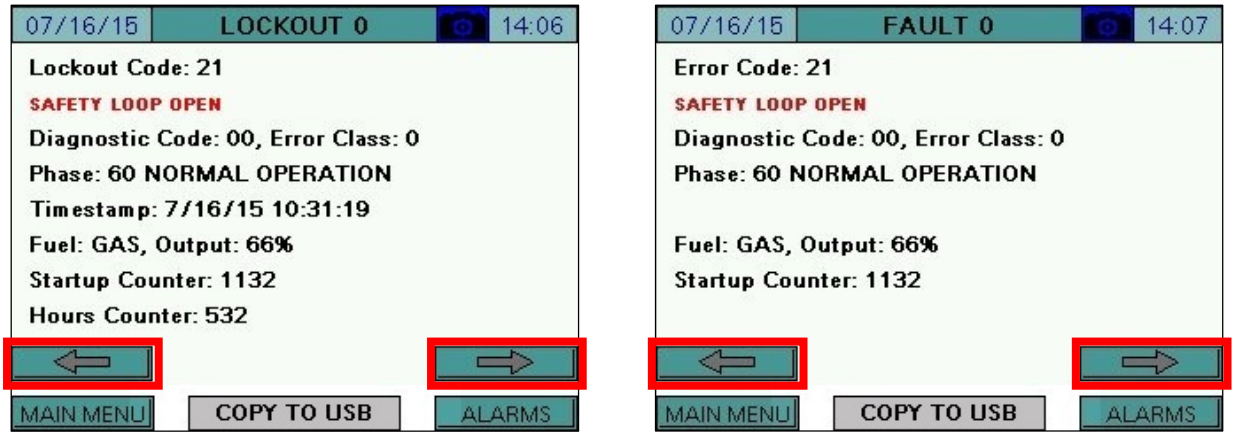
From the ALARMS screen, press **LOCKOUTS** to access the lockout history (only appears for LMV5x controllers) or press **FAULTS** to access the fault history. The 9 most recent lockouts are displayed and the 21 (LMV5x) or 25 (LMV3x) most recent faults are displayed with index 0 as the most recent and the number ascending as they get older.





Alarms (continued)

Press the left and right arrows at the bottom of the screen to toggle between lockouts/faults.



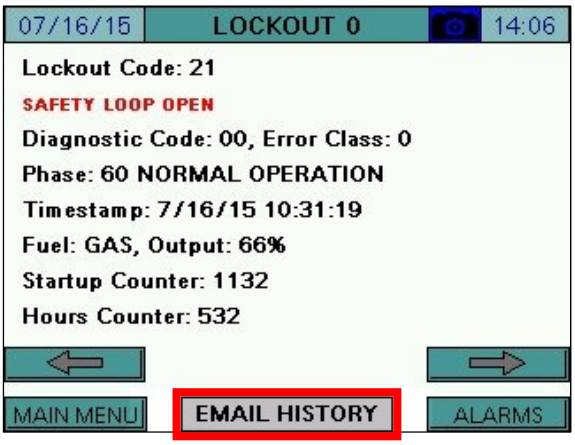
The following information is displayed on the screen for each lockout:

LOCKOUT/FAULT CODE – Displays the LMV lockout or fault code.
DESCRIPTION – Lists a description of the lockout or fault in red text.
DIAGNOSTIC CODE – Displays the LMV diagnostic code.
ERROR CLASS – Not used.
ERROR PHASE – Displays what phase the LMV was in when the lockout or fault occurred.
TIMESTAMP – Displays the date and time when the lockout occurred (lockouts only).
FUEL – Displays the fuel being used when the lockout or fault occurred.
OUTPUT – Displays the firing rate when the lockout or fault occurred.
STARTUP COUNTER – Displays the start number when the lockout or fault occurred.
HOURS COUNTER – Displays the total number of hours run when the lockout occurred (lockouts only).

Alarms (continued)

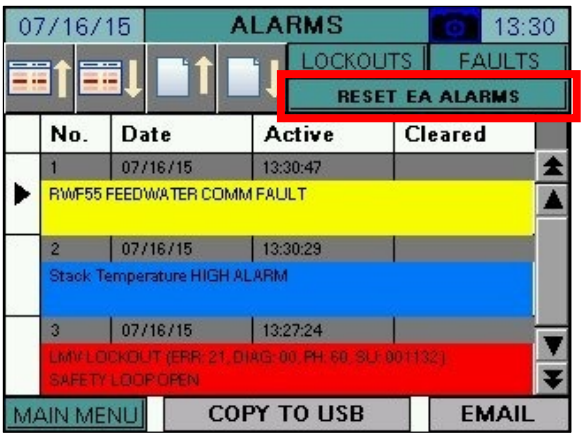
Press **COPY TO USB** to save the complete lockout or fault history to a .csv file. If email is configured, press **EMAIL HISTORY** to send an email with the lockout or fault history .csv file attached. Note that a USB drive must be inserted to send email since the attached file is first stored on the USB drive.

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 6", 10 for 10"
Filename (lockouts) = LMV_LOCKOUT_HISTORY_mm_dd_yyyy.CSV, mmddyyyy are date
Filename (faults) = LMV_FAULT_HISTORY_mm_dd_yyyy.CSV, mmddyyyy are date



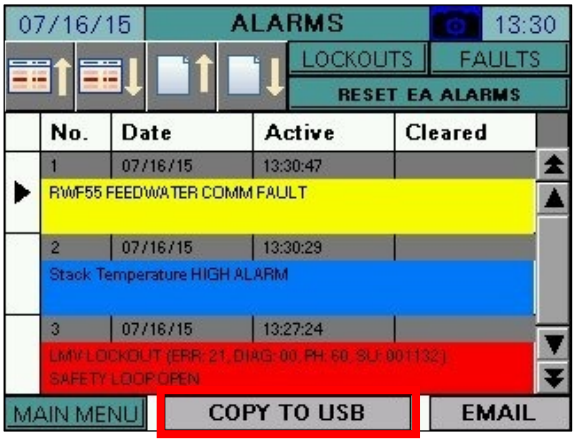
Alarms (continued)

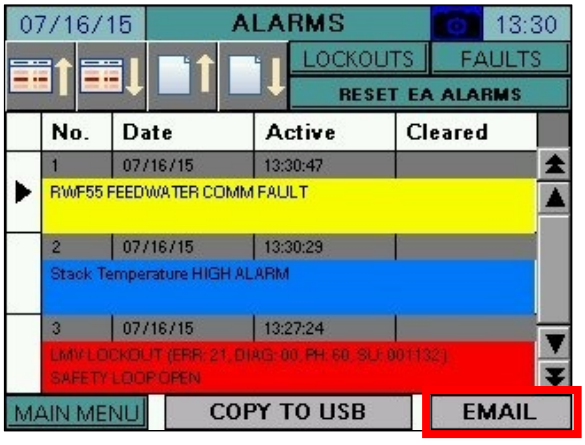
From the ALARMS screen, press the **RESET EA ALARMS** button to clear expanded annunciator alarms designated as manual reset or latched. This button has no effect on LMV alarms.



Press **COPY TO USB** to save the complete lockout or error history to a .csv file. If email is configured, press **EMAIL** to send an email with the lockout or error history .csv file attached. Note that a USB drive must be inserted to send email since the attached file is first stored on the USB drive.

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\KITxx\DATA\TEXT, xx is 6 for 6", 10 for 10"
Filename = ALARMS_mm_dd_yyyy.CSV, mmddyyyy are date





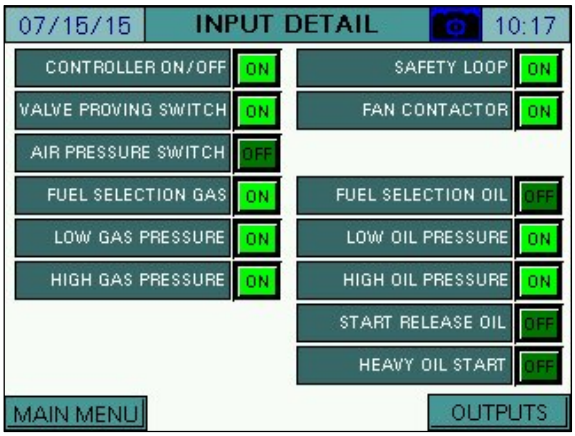
NOTE: If a boiler circulating pump is optioned with the Expanded Annunciator, an alarm is generated when feedback is not received within 20 seconds of the pump being commanded on. If this alarm appears, it must be reset using the **RESET EA ALARMS** button. The alarm will also automatically clear if pump feedback is received while an alarm is present.

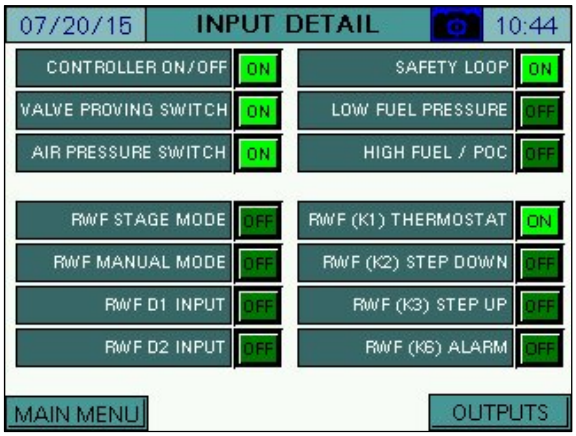
Input and Outputs

Access level: **USER**

The status of the LMV inputs and outputs may be viewed at any time. From the MAIN MENU screen, press **IN/OUT DETAIL**. The INPUT DETAIL screen will appear.

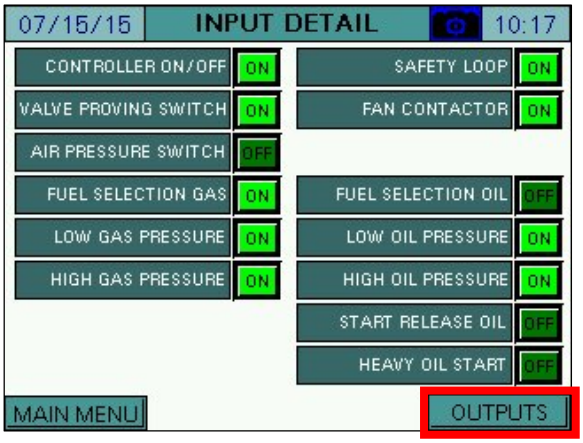
The information on the INPUT DETAIL screen will vary based upon the load controller chosen.

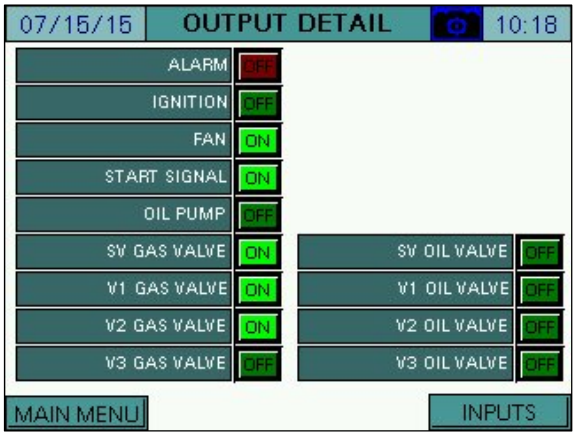




Input and Outputs (continued)

All inputs that are currently energized will display as ON with a bright green background. All inputs that are currently de-energized will display as OFF with a dull green background. To view the OUTPUT DETAIL screen, press **OUTPUTS**. The OUTPUT DETAIL screen will appear.



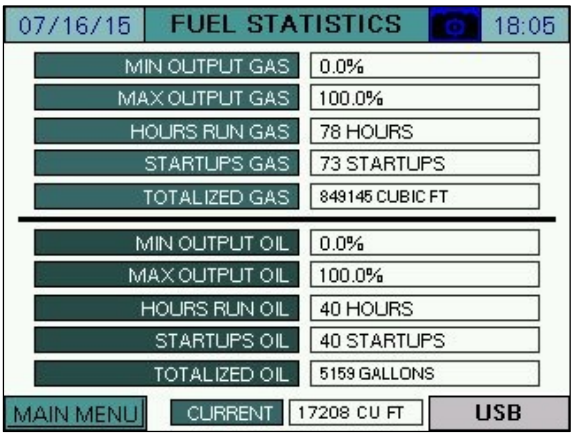


When the LMV controller is in alarm, the ALARM output will flash bright red. When the controller is not in alarm, the alarm output will be a dull red background. All other outputs that are currently energized will display as ON with a bright green background. All other outputs that are currently de-energized will display as OFF with a dull green background.

Fuel Statistics

Access level: **USER**

Both the LMV3x and LMV5x controllers keep track of certain fuel statistics. From the MAIN MENU screen, press **FUEL STATISTICS**. The FUEL STATISTICS screen will appear.

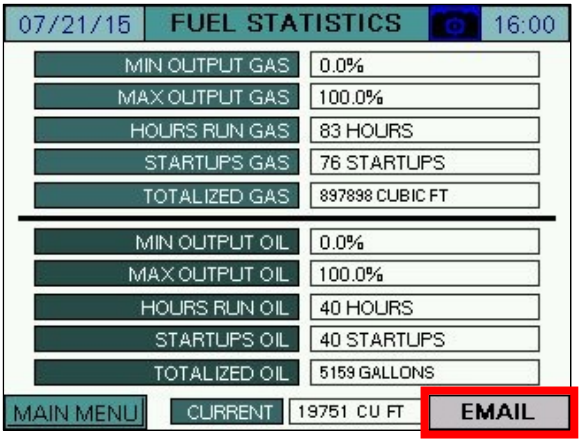


MIN OUTPUT GAS/OIL – Displays the minimum allowable load output programmed in the LMV controller.
MAX OUTPUT GAS/OIL – Displays the maximum allowable load output programmed in the LMV controller.
HOURS RUN GAS/OIL – Displays the hours that the LMV controller has run on gas or oil.
STARTUPS GAS/OIL – Displays the number of startups that the LMV controller has had on gas or oil.
TOTALIZED GAS/OIL – Displays the totalized volume of gas (in cubic feet) or oil (in gallons) that has been used.
CURRENT FLOW – Displays the current flow rate of gas or oil.

Fuel Statistics (continued)

Press **USB** to save a summary of the fuel statistics to a .txt text file. If email is configured, press **EMAIL** to send an email with the summary .txt text file attached. Note that a USB drive must be inserted to send email since the attached file is first stored on the USB drive.

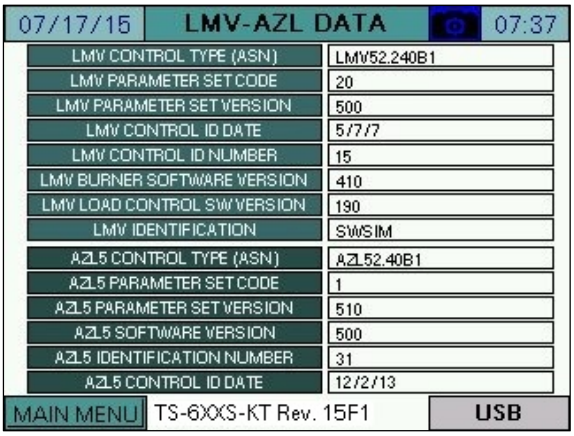
On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 6", 10 for 10"
Filename = LMV_FUEL_STATS_mm_dd_yyyy.TXT



LMV Controller Data

Access level: **USER**

The static details of the LMV controller may be viewed at any time. From the main menu, press **LMV DATA**. The software revision for the touchscreen is shown on this screen.

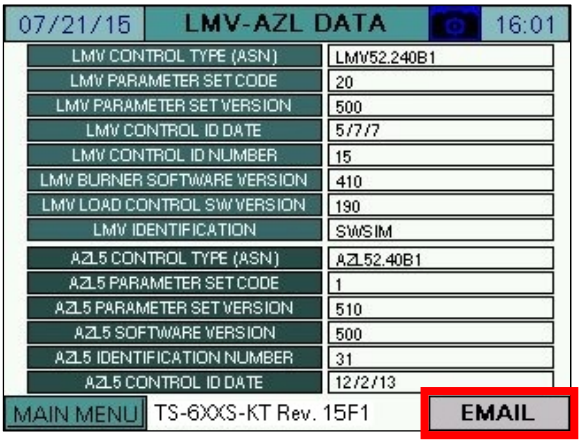


LMV CONTROL TYPE (ASN) – Displays the model number of the LMV controller.
LMV PARAMETER SET CODE – Displays the parameter set code of the LMV controller.
LMV PARAMETER SET VERSION – Displays the parameter set version of the LMV controller.
LMV CONTROL ID DATE – Displays the date of manufacture of the LMV controller (MM/DD/YY).
LMV CONTROL ID NUMBER – Displays the unit ID number of the LMV controller.
LMV BURNER SOFTWARE VERSION – Displays the software version of the LMV controller.
LMV LOAD CONTROL SW VERSION – Displays the load controller software version (LMV5x only).
LMV IDENTIFICATION – Displays the burner ID of the LMV controller.
AZL5 CONTROL TYPE (ASN) – Displays the model number of the AZL display (LMV5x only).
AZL5 PARAMETER SET CODE – Displays the parameter set code of the AZL display (LMV5x only).
AZL5 PARAMETER SET VERSION – Displays the parameter set version of the AZL display (LMV5x only).
AZL5 SOFTWARE VERSION – Displays the software version of the AZL display (LMV5x only).
AZL5 IDENTIFICATION NUMBER – Displays the unit ID number for the AZL display (LMV5x only).
AZL5 CONTROL ID DATE – Displays the date of manufacture of the AZL display (MM/DD/YY) (LMV5x only).

LMV Controller Data (continued)

Press **USB** to save a summary of the LMV controller data to a .txt text file. If email is configured, press **EMAIL** to send an email with the summary .txt text file attached. Note that a USB drive must be inserted to send email since the attached file is first stored on the USB drive.

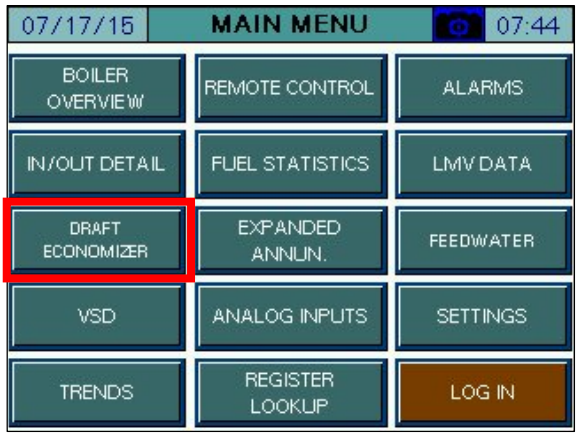
On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT\LMV_ID_DATA.TXT, xx is 6 for 6", 10 for 10"



Draft / Economizer

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

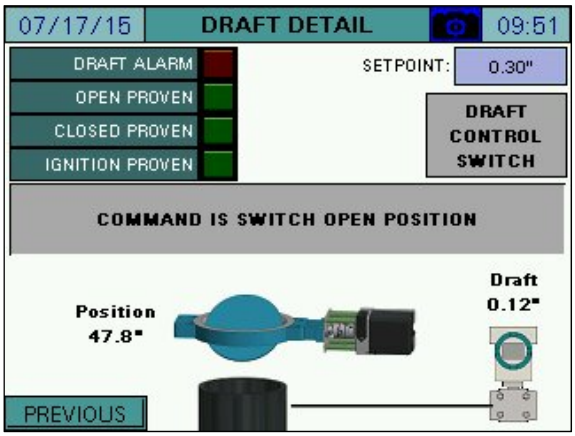
If the draft control or economizer option are configured with the Expanded Annunciator, press **DRAFT ECONOMIZER** to access these detail screens. If only one of the two are optioned, the button will link directly to the optioned screen. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels.

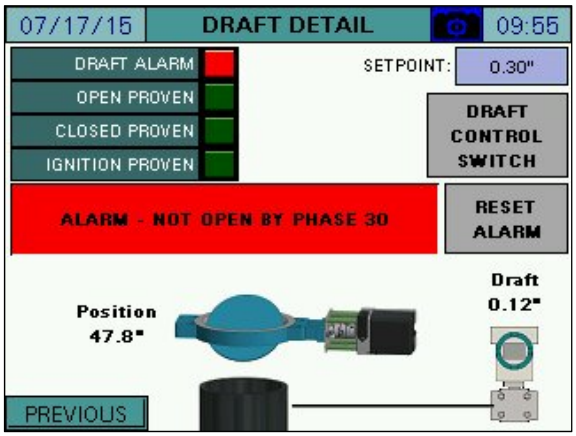


If both are optioned, touch the draft damper to access the DRAFT DETAIL screen or touch the economizer to access the ECONOMIZER DETAIL screen. See the specific sections for additional detail on the information shown.

Draft / Economizer (continued)

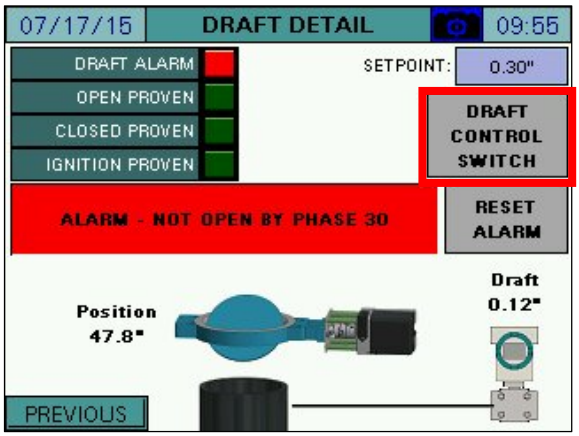
Draft Control





DRAFT ALARM – A draft alarm is currently active.
OPEN PROVEN – The draft damper has proven the open position switch.
CLOSED PROVEN – The draft damper has proven the closed position switch.
IGNITION PROVEN – The draft damper has proven the ignition position switch.
SETPOINT – Sets the desired draft setpoint (TECH or SETUP required).
DRAFT CONTROL SWITCH – Displays the draft control Open/Auto switch (see *Draft Control Switch* section for additional detail).
CURRENT STATUS – Displays the current status or alarm message (see *Draft Control Sequence / Messages* section for additional detail).
RESET ALARM – Draft alarms must be manually reset using this button.
POSITION – Displays the current position in angular degrees.
DRAFT – Displays the current draft reading.

Pressing **DRAFT CONTROL SWITCH** from either the DRAFT/ECONOMIZER or DRAFT DETAIL screen to access the draft control switch (see *Draft Control Switch* section for additional detail).



Draft / Economizer (continued)

Draft Control Switch

OPEN – Commands the draft damper open.

AUTO – Allows the draft damper to be controlled automatically to maintain the setpoint.

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

- **INACTIVE –** Auto commands will come from the automatic setpoint control.
- **ACTIVE –** Auto commands will come from the open and close buttons.

OPEN (MANUAL ACTIVE) – Commands the draft damper open while this button is touched.

CLOSE (MANUAL ACTIVE) – Commands the draft damper closed while this button is touched.

Draft / Economizer (continued)

Draft Control Sequence / Messages

If the draft control switch is in OPEN, the command to the draft damper will be a constant open. If the draft control switch is in AUTO, the command to the draft damper will follow the sequence of operation as shown in **Table 4**.

Table 4: Draft Control Sequence of Operation (Switch in AUTO)

Phase	Command	Note
Draft Alarm	Open	Requires manual reset.
0, 1, 2	Open	Lockout/safety state.
10, 12	Close	Idle state.
20 to 34	Open	Will alarm if open not proven before phase 30. (Alarm code 1)
36	Ignition	Will alarm if ignition not proven before phase 38. (Alarm code 2)
38 to 54	Ignition	Stays in ignition position.
60, 62	Modulate	Automatic open and close pulses to maintain the setpoint.
70 to 83	Open	Will alarm if open not proven before phase 74. (Alarm code 3)

The possible status messages are shown in **Table 5**.

Table 5: Draft Control Status Messages

Message	Definition
COMMAND IS MANUAL POSITION	The draft damper is being commanded manually open and closed.
COMMAND IS IDLE STATE	There is no command to the draft damper (stays as is).
COMMAND IS DRIVE TO OPEN	The draft damper is being commanded to open.
COMMAND IS SWITCH OPEN POSITION	The draft damper is being commanded to open by external input.
COMMAND IS DRIVE TO CLOSED	The draft damper is being commanded to close.
COMMAND IS DRIVE TO IGNITION	The draft damper is being commanded to the ignition position.
COMMAND IS MODULATING OPERATION	The draft damper is in modulation mode (open/close pulses).

The possible alarm messages are shown in **Table 6**.

Table 6: Draft Control Alarm Messages

Message	Code	Definition
NOT OPEN BY PHASE 30	1	Open position has not been proven by phase 30 (prepurge).
NOT TO IGN. BY PHASE 38	2	Ignition position has not been proven by phase 38 (preignition).
NOT OPEN BY PHASE 74	3	Open position has not been proven by phase 74 (postpurge).

Draft / Economizer (continued)

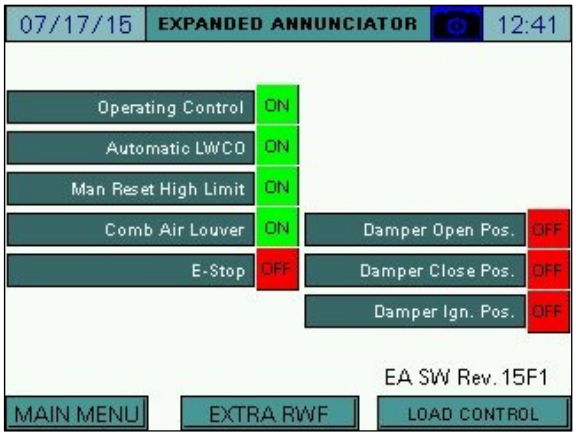
Economizer

Stack Inlet – The stack temperature as it enters the economizer.
Stack Outlet – The stack temperature as it leaves the economizer.
Inlet Water – The water temperature as it enters the economizer.
Outlet Water – The water temperature as it leaves the economizer.

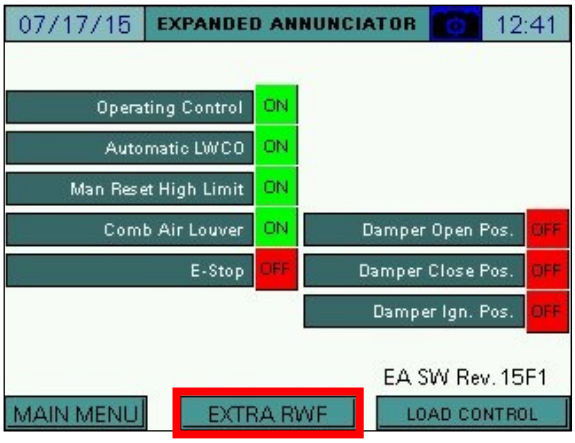
Expanded Annunciator

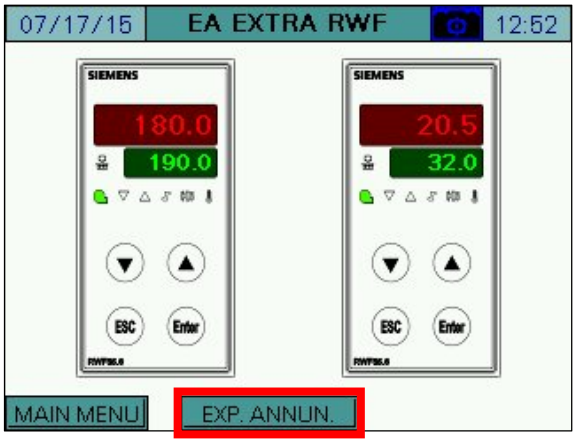
Access level: **USER / TECH / SETUP**

If the Expanded Annunciator is optioned, press **EXPANDED ANNUN.** to access the detail screen. The software revision for the Expanded Annunciator is show on this screen.



If extra RWF55 controls are optioned, press **EXTRA RWF** to access that screen. Press **EXP. ANNUN.** to return to the EXPANDED ANNUNCIATOR screen.

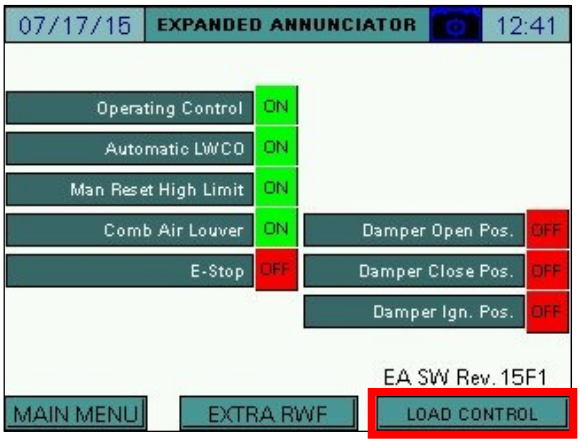


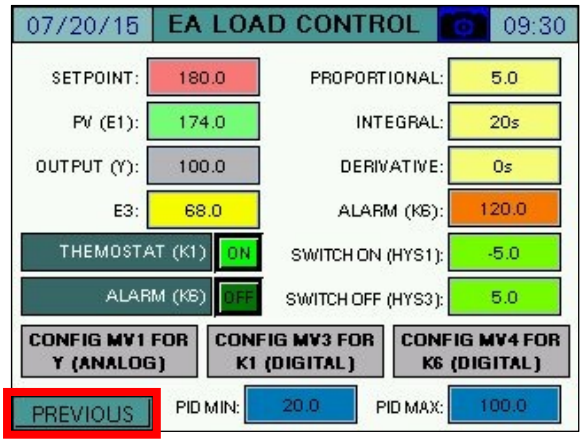


Expanded Annunciator (continued)

Load Controller

If the load controller is optioned, press **LOAD CONTROL** to access that screen. Press **PREVIOUS** to return to the EXPANDED ANNUNCIATOR screen.





The operation of the Expanded Annunciator load controller is modeled after the operation of the RWF load controller. Similar nomenclature is used for the inputs and outputs.

SETPOINT – Sets the desired setpoint (TECH required).
PV (E1) – Displays the current value of E1 (process variable).
OUTPUT (Y) – Displays the current output.
E3 – Displays the current value of E3 (alarm variable).
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.

Expanded Annunciator (continued)

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.

ALARM (K6) – Sets the desired alarm setpoint. When the alarm output (K6) is active, the output signal will be automatically restricted to the minimum. This is the automatic low-fire hold function. (TECH required).

SWITCH ON (HYS1) – Sets the switch-on setpoint. The output will switch on when the PV < SETPOINT + HYS1. This may be a negative or positive value. (TECH required).

SWITCH OFF (HYS3) – Sets the switch-off setpoint. The output will switch on when the PV > SETPOINT + HYS3. This may be a negative or positive value. (TECH required).

PID MIN, PID MAX – Sets the desired output limits from 0% to 100%. (TECH required).

STATUS INDICATORS – Displays the status of the thermostat (K1) output or alarm (K6) output.

CONFIG MV1 FOR Y (ANALOG) – Configures Monitored Analog Output 1 to transmit the load controller output. Use this option when a hard-wired analog output from the load controller is desired (see the section *Configuration (Expanded Annunciator Option Config) → Expanded Annunciator as Load Controller)* for additional detail).

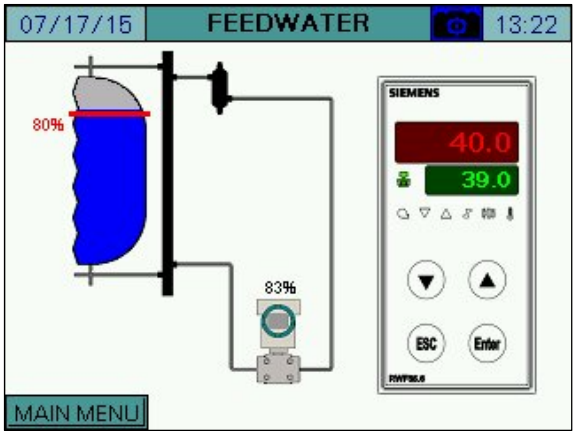
CONFIG MV3 FOR K1 (DIGITAL) – Configures Monitored Digital Output 3 to transmit the load controller thermostat output. Use this option when a hard-wired digital enable from the load controller is desired (see the section *Configuration (Expanded Annunciator Option Config) → Expanded Annunciator as Load Controller)* for additional detail).

CONFIG MV4 FOR K6 (DIGITAL) – Configures Monitored Digital Output 4 to transmit the load controller alarm output. Use this option when a hard-wired digital alarm from the load controller is desired (see the section *Configuration (Expanded Annunciator Option Config) → Expanded Annunciator as Load Controller)* for additional detail).

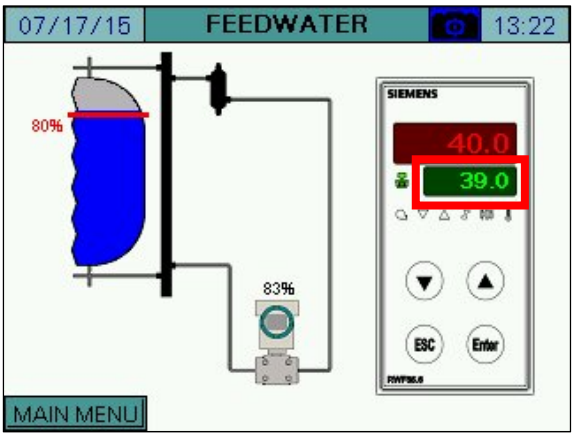
Feedwater

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

If the feedwater option is configured, press **FEEDWATER** to access the detail screen. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels.



The vessel will animate to show the level of fill based upon the scaling of the input in the RWF. The setpoint (in percent of fill) will appear as a red line. The actual fill percent will appear at the differential pressure transmitter graphic. Touching the setpoint on the RWF (green display) will allow the feedwater setpoint to be changed (TECH required).

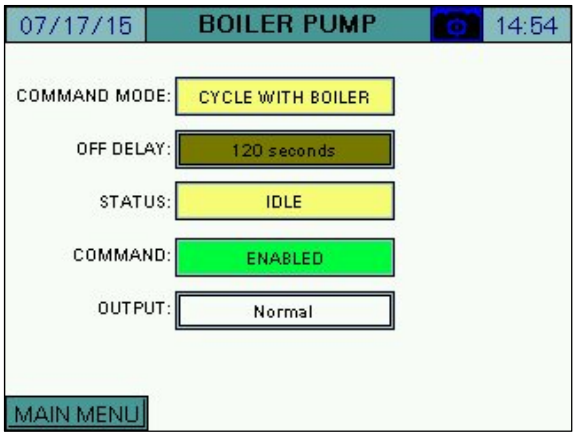


Note that the RWF must be configured as specified in document *RWF... Modulating Feedwater Control Valve Application Guide* for the graphical tank level to function correctly.

Boiler Circulating Pump

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

If the boiler pump (hydronic systems only) option is configured with the Expanded Annunciator, press **BOILER PUMP** to access the detail screen. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels.



COMMAND MODE – Selects the command mode is the method of pump control used. Setting may only be changed at the SETUP access level.

- **CYCLE WITH BOILER:** 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.
- **CONTINUOUS RUN:** The pump will be commanded on as long as the HAND-OFF-AUTO switch is not in OFF on the REMOTE OPERATION screen.

OFF DELAY – Sets the amount of time that the pump stays on after the boiler turns off when the pump is set to mode 'CYCLE WITH BOILER'. Setting may be changed at TECH access level.

STATUS – Displays the status of the pump is displayed.

- **RUNNING:** The pump is currently on.
- **IDLE:** The pump is currently off because it is commanded to be off.
- **ALARM:** The pump is currently off because it is in alarm.

COMMAND – Displays whether or not the pump is currently being commanded on.

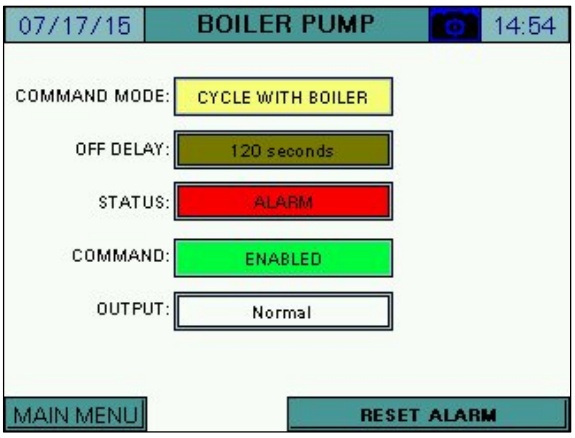
- **ENABLED:** The pump is being commanded on.
- **DISABLED:** The pump is being commanded off.

OUTPUT – Displays the logic of the pump output.

- **NORMAL:** The pump is output is normally open.
- **REVERSE:** The pump is output is normally closed.

Boiler Circulating Pump (continued)

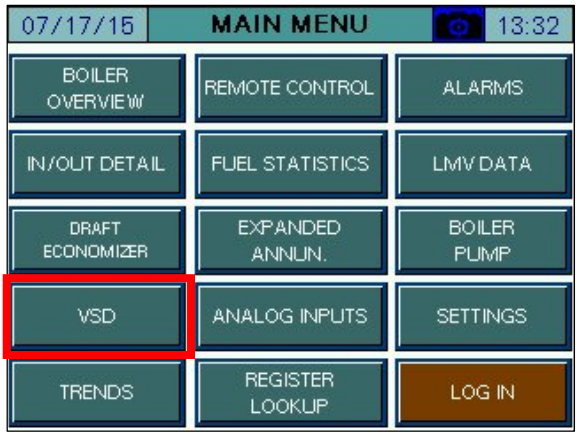
If the boiler pump is commanded on and operation is not proven within 30 seconds, a timed pump alarm will occur. To reset this, press **RESET ALARM** on the BOILER PUMP screen, or the pump will automatically reset once operation is proven.

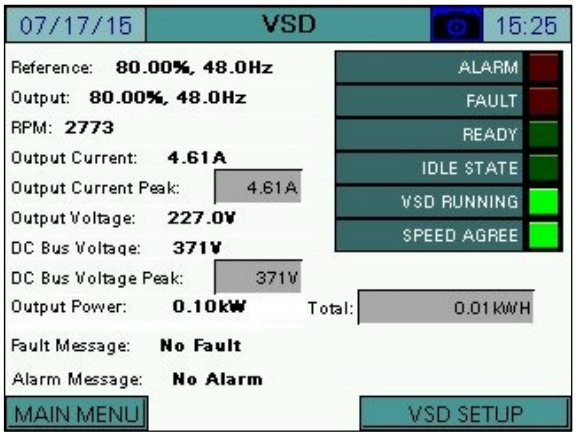


VSD

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

If the VSD option is configured, press **VSD** to access the detail screen. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels.

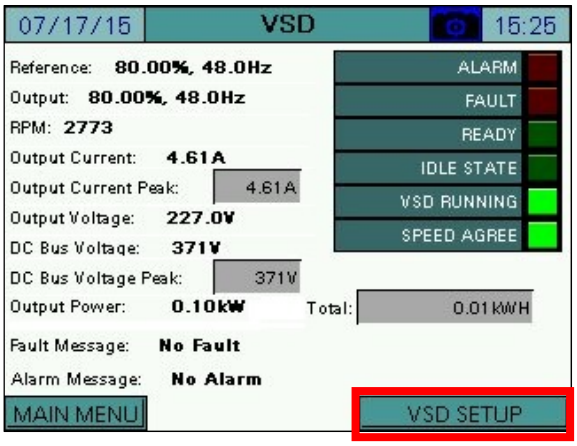


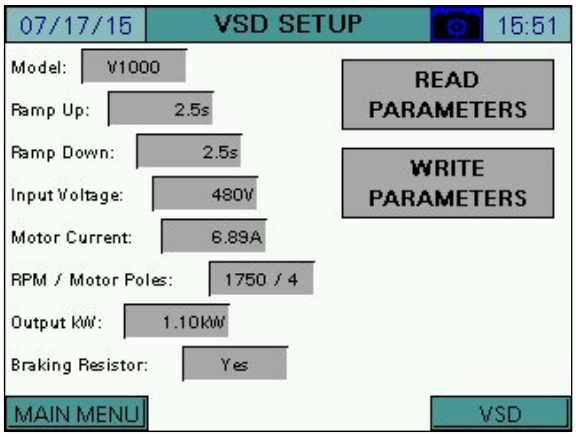


The peak output current and DC bus voltages are recorded during operation. To reset the peak readings, press the values for > 1s (TECH required).

VSD (continued)

Touch **VSD SETUP** to access the VSD SETUP screen.





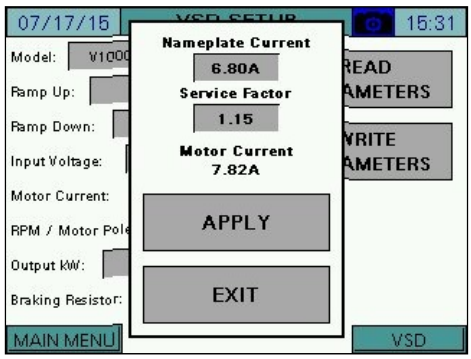
Model – Selects the model of VSD used (SETUP required).

- **V1000**
- **A1000**

Ramp Up/Down – Sets the ramp up or down time in the VSD (SETUP required).

Input Voltage – Sets the input voltage as per the motor nameplate (SETUP required).

Motor Current – Sets the current as per the motor nameplate (SETUP required). Touching this brings up a template to calculate current with service factor. Touch **APPLY** to calculate and enter the motor current.



VSD (continued)

RPM / Motor Poles – Selects the RPM and poles as per the motor nameplate (SETUP required).

- **1750 / 4**
- **3500 / 2**

Braking Resistor – Selects whether a braking resistor is connected to the VSD (SETUP required).

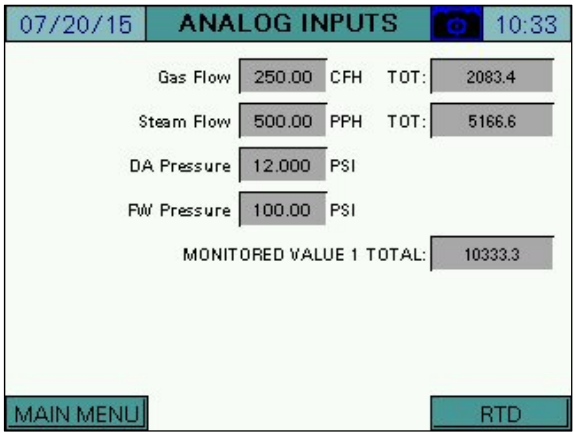
- **No**
- **Yes**

Touching **READ PARAMETERS** will read the current motor information as stored in the VSD. Touching **WRITE PARAMETERS** (SETUP required) will write the supplied motor information as well as the required LMV-specific parameters to the VSD. The screen will display 'WRITING TO VSD...' while the parameters are being written.

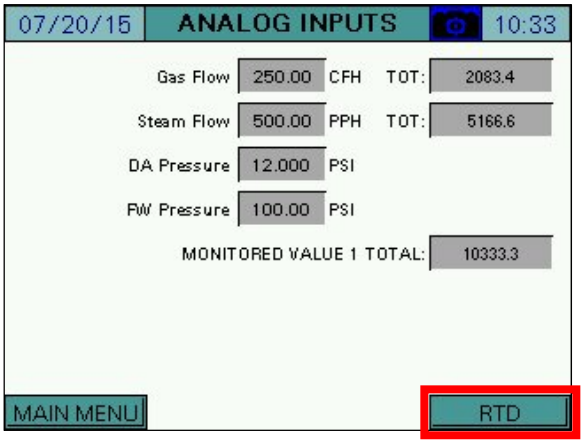
Analog Inputs

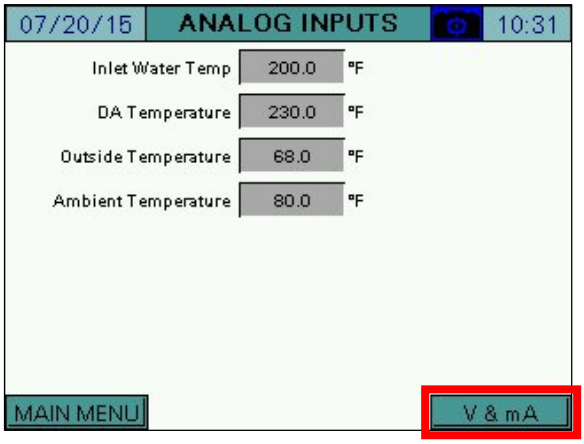
Access level: **USER**

If the analog or RTD options are configured with the Expanded Annunciator, press **ANALOG INPUTS** to access the detail screen.



If totalization is enabled for any of the analog inputs, touching the totalized value > 1s will reset the value to 0 (TECH required). Toggle between analog and RTD inputs with the **RTD** and **V&mA** buttons on the lower right.



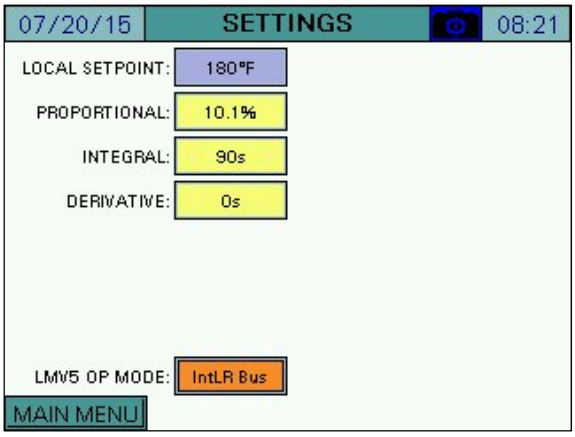


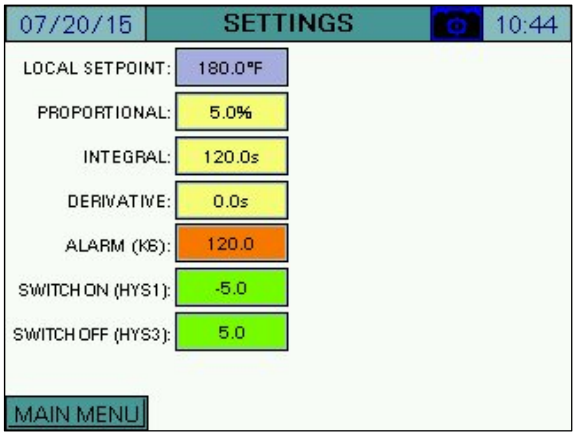
Settings

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

To access load controller settings (LMV, RWF, or EA internal), press **SETTINGS** to access the detail screen.

Depending upon the load controller, different input options will appear.





LOCAL SETPOINT – Sets the desired setpoint (TECH required). This parameter may be limited by *Ext MinSetpoint* and *Ext MaxSetpoint* on an LMV5x controller.

PROPORTIONAL – Sets the proportional band of the load controller (TECH required). A proportional band of 10 means that the firing rate of the boiler will be 100% when the actual value is 10 below the setpoint. On the LMV5x, the proportional band is a percentage of 14.5 PSI (for steam boilers) or 212°F (for hydronic boilers). On an RWF10, RWF40, or RWF55 load controller, the proportional band is an absolute number.

Settings (continued)

INTEGRAL – Sets the time of the integral component of the load controller (TECH required). The integral component corrects for steady state error between the setpoint and actual value. Shorter times are more aggressive. A setting of zero eliminates the integral component.

DERIVATIVE – Sets the time of the derivative component of the load controller (TECH required). The derivative component corrects for the rate of increase/decrease of the actual value. Longer times are more aggressive. A setting of zero eliminates the derivative component and typically works well on boilers.

ALARM (K6) – Sets the desired alarm setpoint (TECH required).

SWITCH ON (HYS1) – Sets the burner on setpoint for RWF load controllers (TECH required).

- **RWF40/RWF55:** Sets the burner on threshold additive with the setpoint. For example, a value of -5 means the burner will turn on when the actual value is 5 below setpoint.
- **RWF10:** Sets the burner on threshold subtractive with the setpoint. For example, a value of 5 means the burner will turn on when the actual value is 5 below setpoint.

SWITCH OFF (HYS3) – Sets the burner off setpoint for RWF load controllers (TECH required).

- **RWF40/RWF55:** Sets the burner off threshold additive with the setpoint. For example, a value of 5 means the burner will turn on when the actual value is 5 above setpoint.
- **RWF10:** This setting behaves differently for steam and hydronic boilers. For steam boilers, the span of the pressure transducer affects this setting. For example, if the span of the pressure transducer is 0-60 PSI, a value of 10 for ALH1 means the burner will turn off when the actual value is 6 (60*10%) above the burner on point. For hydronic boilers, a value of 10 means the burner will turn off when the actual value is 10 above the burner on point.

LMV5 OP MODE – Displays the LMV5x load controller operating mode (LMV5x only).

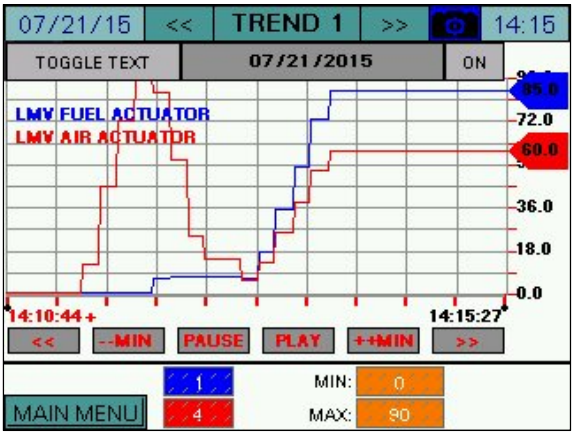
Datalog / Trends

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

Four trends available that can record two variables at user-defined intervals. Datalogging up to eight 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



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

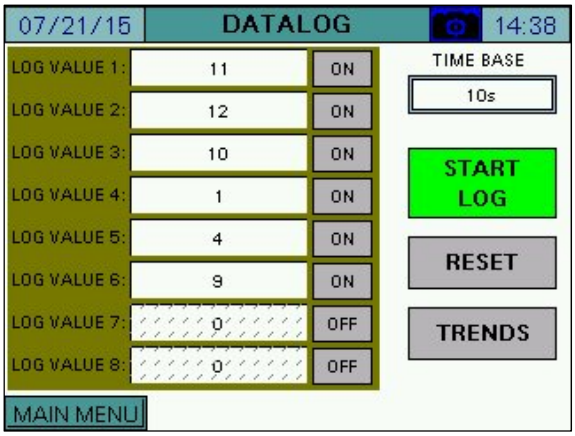
TOGGLE TEXT – Toggles the text display for the variables being trended.
ON/OFF – Enables or disables the selected trend.
TREND NAVIGATION

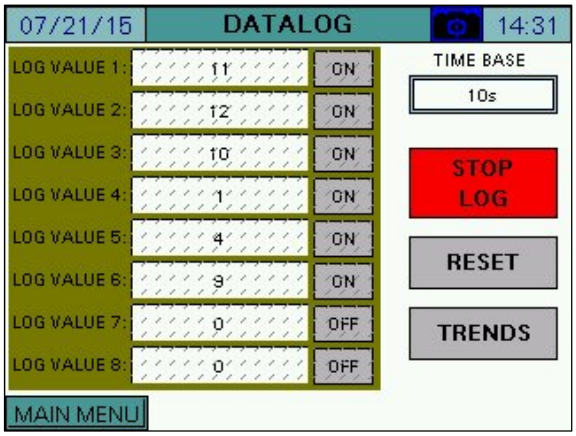
- **<< –** Scroll back to view previous trend data. The trend will scroll back by a minute, hour or day depending upon the setting of the **--MIN/--HOUR/--DAY** button. This will pause the trend display automatically.
- **--MIN, --HOUR, --DAY –** Sets the scroll back range for viewing previous trend data.
- **PAUSE –** This will pause the trend display. 'PAUSED' will display in the upper right corner above the variable text.
- **PLAY –** This will resume the trend display if it is paused.
- **++MIN, ++HOUR, ++DAY –** Sets the scroll forward range for viewing previous trend data.
- **>> –** Scroll forward when viewing previous trend data. The trend will scroll back by a minute, hour or day depending upon the setting of the **++MIN/++HOUR/++DAY** 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).

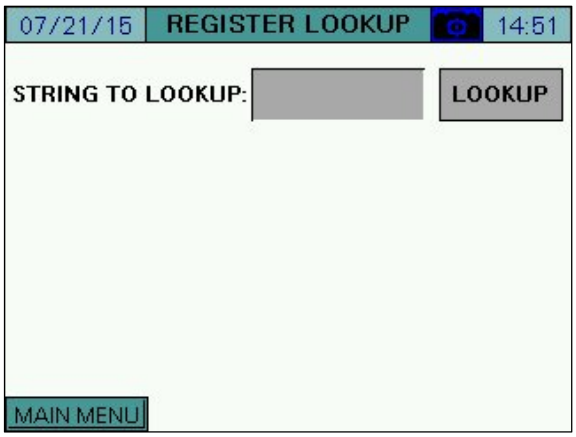
The resulting CSV file is in a tab-separated format and can be viewed with any text editor or spreadsheet application. On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 6", 10 for 10"
Filename = DATALOG_mm_dd_yyyy.CSV, mmddyyyy are date

	A	B	C	D	E	F
1	SCC Inc. Touchscreen Kit Alarm Summary					
2	TSK Model: TS-0XXS-KT Rev. 15F1					
3	Site: Touchscreen Kit					
4	Tag: B-1					
5						
6	Date	Time	LMV Phase	LMV Fuel Actuator	LMV Air Actuator	LMV Aux1 Actuator
7	9/18/2015	0:26:16	60	74.3	52.6	-12
8	9/18/2015	0:26:26	60	74.3	52.6	-12
9	9/18/2015	0:26:36	60	74.3	52.6	-12
10	9/18/2015	0:26:46	60	74.3	52.6	-12
11	9/18/2015	0:26:56	60	74.3	52.6	-12

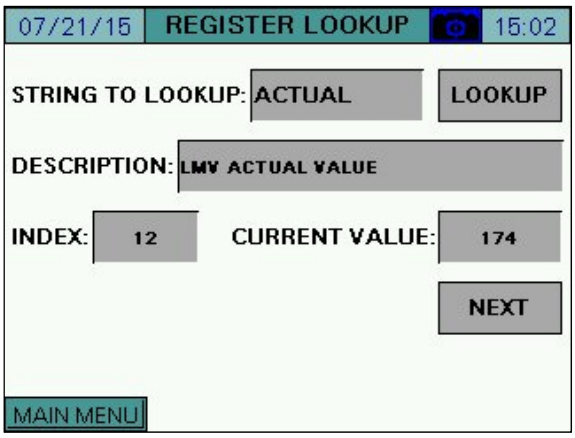
Register Lookup

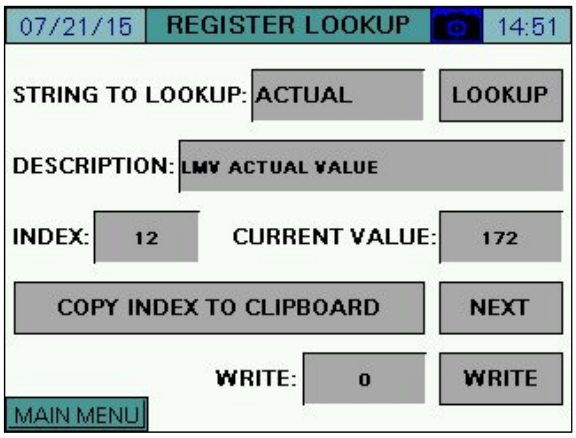
Access level: **USER / TECH / SETUP**

Modbus register indices can be looked up using text strings.



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



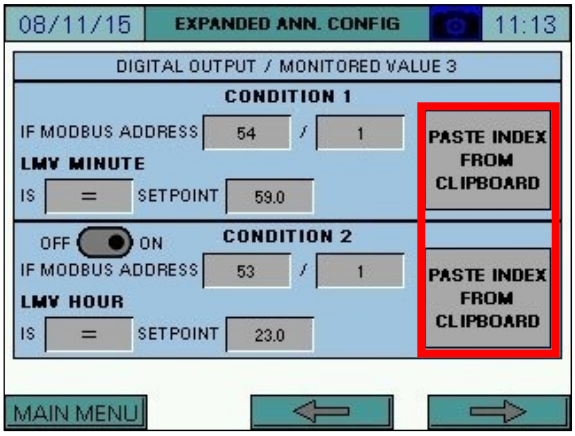


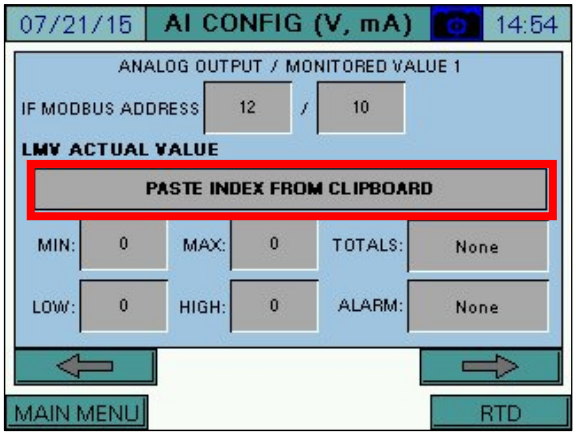
STRING TO LOOKUP – Input the string or register number to search for. Examples are 'FUEL' or '12' (would display the description of index 12).
DESCRIPTION – Displays the full name of the register containing the search string.
INDEX – Displays the index of the register that matches the description.
CURRENT 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.
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).

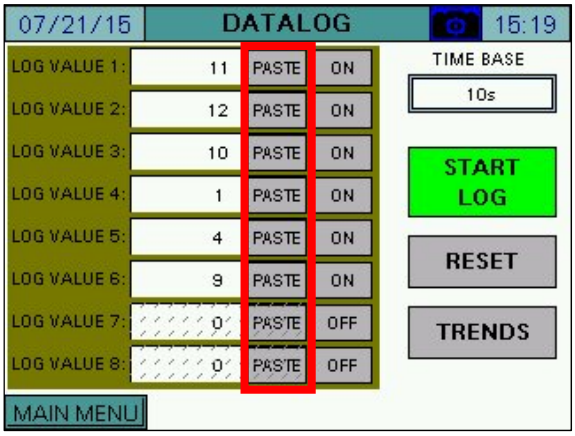
Register Lookup (continued)

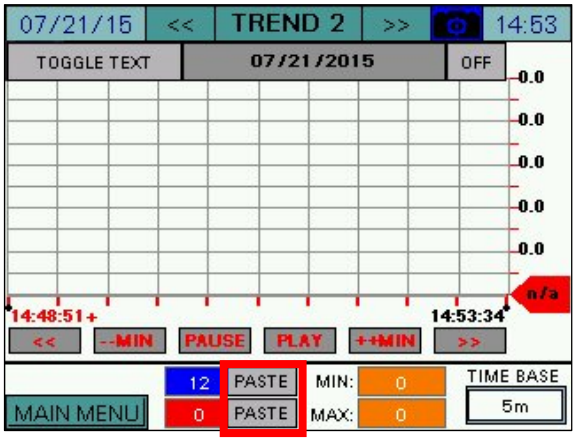
Using the Clipboard

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.





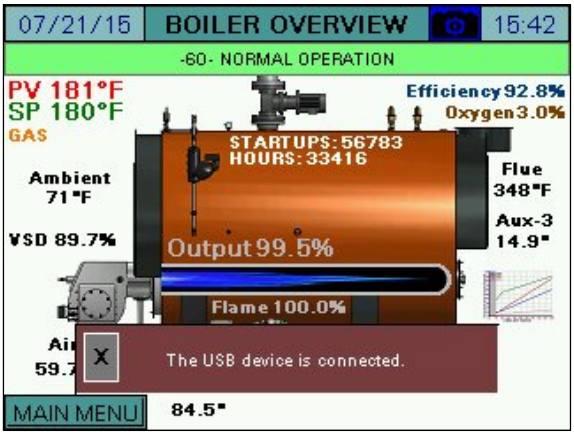




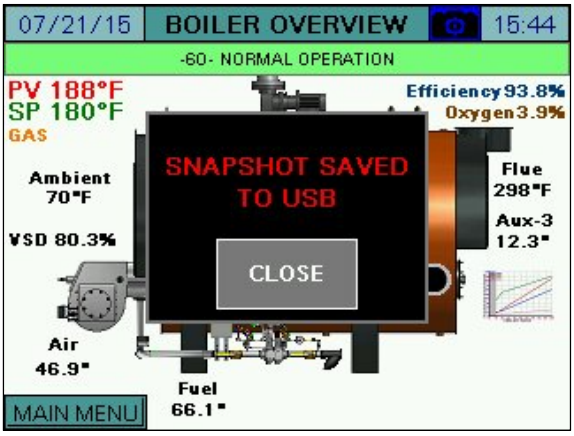
Screen Captures / USB

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.

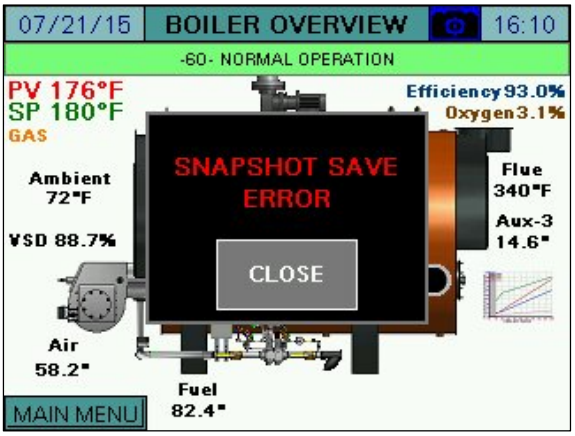


The current screen image may be copied to a USB drive. Any screen may be captured by pressing the camera icon > 5s until the screen displays 'SNAPSHOT SAVED TO USB'.



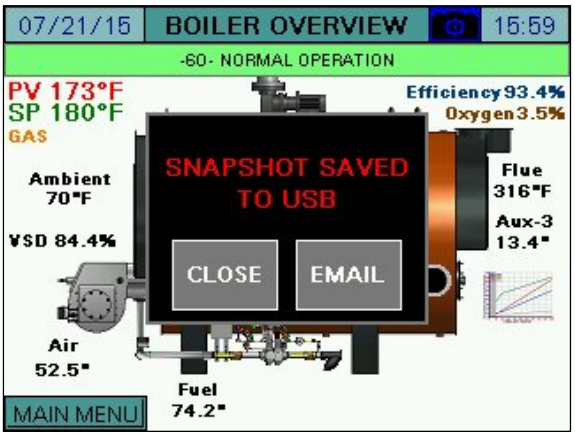
Screen Captures / USB (continued)

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 a USB drive must be inserted to send email since the attached file is first stored on the USB drive.

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\SNAPSHOT, xx is 6 for 6", 10 for 10"
Filename = SSmmddyyxxxxxx.JPG, mmddyy are date, xxxxxx is sequential number



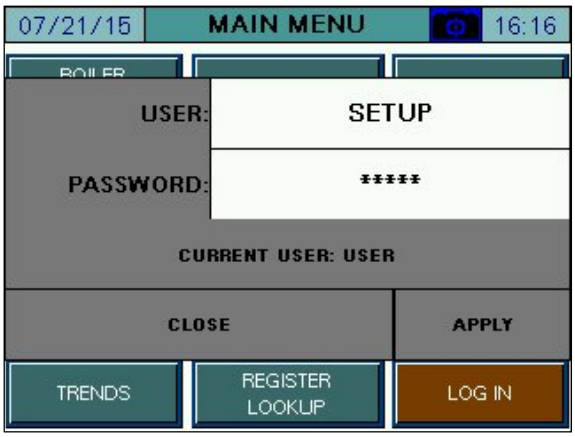
There is no limit to the number of screen captures that may be saved to the USB drive other than the capacity of the USB drive itself.

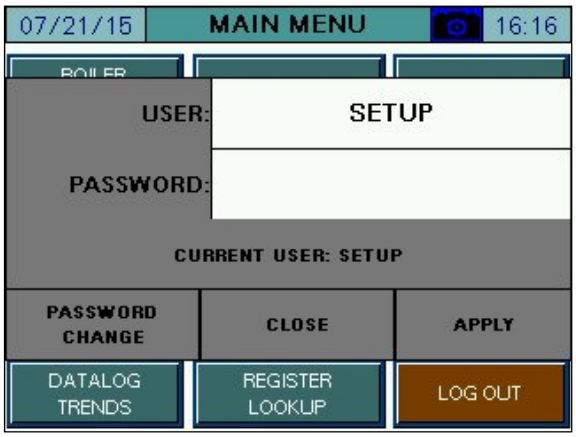
See the section *Configuration (Saved Images)* for additional detail on viewing or deleting images from the touchscreen.

Changing Passwords

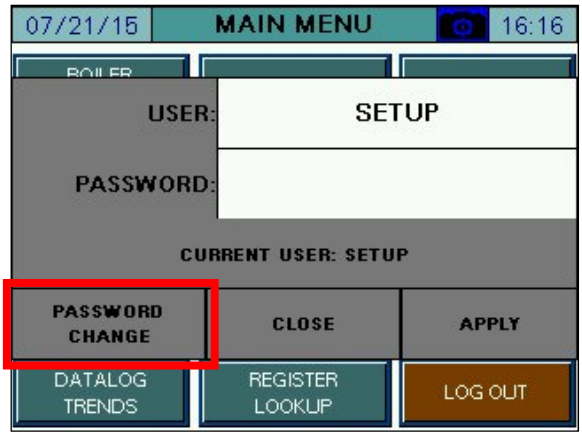
Access level: **SETUP**

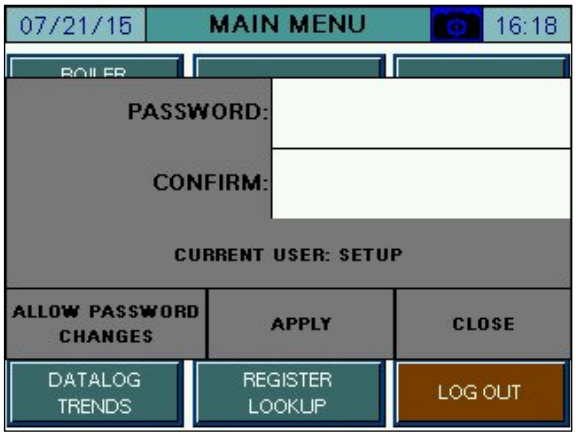
By default, the TECH access level password is 9876 and the SETUP access level password is START. These default passwords may be changed at any time. To change passwords, press **LOGIN** from the main menu. Enter the appropriate information to log in at the SETUP access level and press **APPLY**. The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





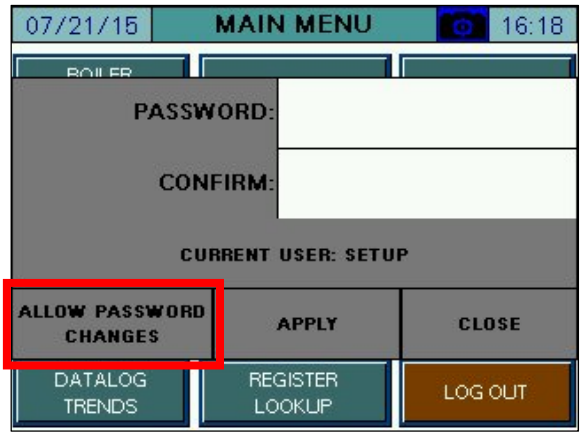
After that is done, press **PASSWORD CHANGE.**

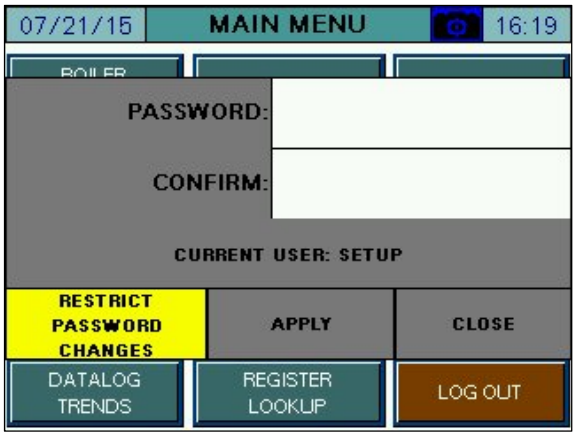




Changing Passwords (continued)

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 - Modbus TCP/IP

The standard BMS interface offered is via Modbus TCP/IP. The standard port 502 is used for this connection. The connection to the BMS is via the Ethernet port on the touchscreen. 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.

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

⚠ **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. Also note that the integrated thermal shock features do not operate in this mode, so these features must be duplicated if needed.

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
0	R	LMV PHASE	Unsigned Int 16	see **Appendix - LMV Phases**
1	R	LMV FUEL ACTUATOR	Signed Int 16	x10
2	R	LMV GAS ACTUATOR	Signed Int 16	x10
3	R	LMV OIL ACTUATOR	Signed Int 16	x10
4	R	LMV AIR ACTUATOR	Signed Int 16	x10
5	R	LMV AUX1 ACTUATOR	Signed Int 16	x10
6	R	LMV AUX2 ACTUATOR	Signed Int 16	x10
7	R	LMV AUX3 ACTUATOR	Signed Int 16	x10
8	R	LMV VSD OUTPUT	Unsigned Int 16	x10
9	R	LMV CURRENT FUEL	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
10	R	LMV CURRENT OUTPUT	Unsigned Int 16	x10, see Note 1 below
11	R	LMV CURRENT SETPOINT	Unsigned Int 16	
12	R	LMV ACTUAL VALUE	Unsigned Int 16	
13	R	LMV FLAME SIGNAL	Unsigned Int 16	x10
14	R	LMV FUEL THROUGHPUT	Unsigned Int 16	
15	R	LMV CURRENT O_2	Unsigned Int 16	x10
16	R	LMV GAS UNIT	Unsigned Int 16	0=metric,1=standard
17	R	LMV OIL UNIT	Unsigned Int 16	0=metric,1=standard
18	R	LMV TEMPERATURE UNIT	Unsigned Int 16	0=metric,1=standard
19	R	LMV PRESSURE UNIT	Unsigned Int 16	0=metric,1=standard
20	R	LMV SENSOR SELECTION	Unsigned Int 16	see Note 2 below
21	R	LMV STARTUP COUNTER	Unsigned Int 32	
23	R	LMV HOUR COUNTER	Unsigned Int 32	
25	R	LMV CURRENT ERROR CODE	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
26	R	LMV CURRENT DIAGNOSTIC CODE	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
27	R	LMV CURRENT ERROR CLASS	Unsigned Int 16	not used
28	R	LMV CURRENT ERROR PHASE	Unsigned Int 16	see **Appendix - LMV Phases**
29	R	LMV TEMP LIMIT OFF THRESHOLD	Unsigned Int 16	
30	R	LMV SUPPLY AIR TEMPERATURE	Unsigned Int 16	
31	R	LMV FLUE GAS TEMPERATURE	Unsigned Int 16	
32	R	LMV COMBUSTION EFFICIENCY	Unsigned Int 16	x10
33	R	LMV CURRENT CO_2	Unsigned Int 16	x10
34	R	LMV CURRENT EXCESS AIR	Unsigned Int 16	x10
35	R	LMV INPUT WORD	Unsigned Int 16	word of bits
35 bit 0	R	LMV CONTROLLER SWITCH	Boolean	
35 bit 1	R	LMV FAN CONTACTOR	Boolean	
35 bit 2	R	LMV OIL SELECTED	Boolean	
35 bit 3	R	LMV GAS SELECTED	Boolean	
35 bit 5	R	LMV OIL PRESS SW MAX	Boolean	
35 bit 6	R	LMV OIL PRESS SW MIN	Boolean	
35 bit 7	R	LMV VALVE PROVING SW	Boolean	
35 bit 8	R	LMV SAFETY LOOP	Boolean	
35 bit 10	R	LMV GAS PRESS SW MIN	Boolean	
35 bit 11	R	LMV GAS PRESS SW MAX	Boolean	
35 bit 13	R	LMV AIR PRESSURE SW	Boolean	
35 bit 14	R	LMV START RELEASE OIL	Boolean	
35 bit 15	R	LMV HEAVY OIL START	Boolean	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
37	R	LMV OUTPUT WORD	Unsigned Int 16	word of bits
37 bit 0	R	LMV ALARM	Boolean	
37 bit 4	R	LMV IGNITION	Boolean	
37 bit 5	R	LMV START SIGNAL	Boolean	
37 bit 6	R	LMV FAN OUTPUT	Boolean	
37 bit 7	R	LMV OIL PUMP	Boolean	
37 bit 8	R	LMV FUEL VALVE SV OIL	Boolean	
37 bit 9	R	LMV FUEL VALVE V1 OIL	Boolean	
37 bit 10	R	LMV FUEL VALVE V2 OIL	Boolean	
37 bit 11	R	LMV FUEL VALVE V3 OIL	Boolean	
37 bit 12	R	LMV FUEL VALVE SV GAS	Boolean	
37 bit 13	R	LMV FUEL VALVE V1 GAS	Boolean	
37 bit 14	R	LMV FUEL VALVE V2 GAS	Boolean	
37 bit 15	R	LMV FUEL VALVE PV GAS	Boolean	
38	RW	LMV PROGRAM STOP	Unsigned Int 16	see Note 3 below
39	RW	LMV LOAD CONTROL MODE	Unsigned Int 16	see Note 4 below
40	R	LMV MANUAL/AUTOMATIC	Unsigned Int 16	0=auto,1=on,2=off
41	RW	LMV MODBUS LOCAL/REMOTE	Unsigned Int 16	0=local,1=remote
42	RW	LMV MODBUS WATCHDOG	Unsigned Int 16	
43	RW	LMV MODBUS OPERATING MODE	Unsigned Int 16	0=auto,1=on,2=off
44	RW	LMV MODBUS SETPOINT W3	Unsigned Int 16	
45	RW	LMV MODBUS OUTPUT	Unsigned Int 16	x10, see Note 1 below
46	RW	LMV MODBUS FUEL SELECTION	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
47	RW	LMV SETPOINT W1	Unsigned Int 16	
48	RW	LMV SETPOINT W2	Unsigned Int 16	
49	RW	LMV WEEKDAY	Unsigned Int 16	0=Sun,1=Mon,2=Tue,etc.
50	RW	LMV YEAR 2-DIGIT	Unsigned Int 16	
51	RW	LMV MONTH	Unsigned Int 16	
52	RW	LMV DAY	Unsigned Int 16	
53	RW	LMV HOUR	Unsigned Int 16	
54	RW	LMV MINUTE	Unsigned Int 16	
55	RW	LMV SECOND	Unsigned Int 16	
56	RW	LMV HOURS RUN GAS RESET	Unsigned Int 32	
58	RW	LMV HOURS RUN OIL S1 RESET	Unsigned Int 32	
60	RW	LMV HOURS RUN OIL S2 RESET	Unsigned Int 32	
62	RW	LMV HOURS RUN OIL S3 RESET	Unsigned Int 32	
64	RW	LMV HOURS RUN TOTAL RESET	Unsigned Int 32	
66	R	LMV HOURS RUN TOTAL FIXED	Unsigned Int 32	
68	R	LMV HOURS CONNECTED TO POWER	Unsigned Int 32	
70	RW	LMV STARTUPS GAS RESET	Unsigned Int 32	
72	RW	LMV STARTUPS OIL RESET	Unsigned Int 32	
74	RW	LMV STARTUPS TOTAL RESET	Unsigned Int 32	
76	R	LMV STARTUPS TOTAL FIXED	Unsigned Int 32	
78	RW	LMV TOTAL VOLUME GAS/FUEL0	Unsigned Int 32	
80	RW	LMV TOTAL VOLUME OIL/FUEL1	Unsigned Int 32	
82	R	LMV NUMBER OF LOCKOUTS	Unsigned Int 16	
83	R	LMV EXTRA TEMPERATURE SENSOR	Unsigned Int 16	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
84	R	LMV AZL5 ASN STRING	String (8 words)	
92	R	LMV AZL5 PARAMETER SET CODE	Unsigned Int 16	
93	R	LMV AZL5 PARAMETER SET VER	Unsigned Int 16	
94	R	LMV AZL5 ID DATE YEAR 2-DIGIT	Unsigned Int 16	
95	R	LMV AZL5 ID DATE MONTH	Unsigned Int 16	
96	R	LMV AZL5 ID DATE DAY	Unsigned Int 16	
97	R	LMV AZL5 ID NUMBER	Unsigned Int 16	
98	R	LMV BURNER CONTROL STRING	String (8 words)	
106	R	LMV BC PARAMETER SET CODE	Unsigned Int 16	
107	R	LMV BC PARAMETER SET VER	Unsigned Int 16	
108	R	LMV BC ID DATE YEAR 2-DIGIT	Unsigned Int 16	
109	R	LMV BC ID DATE MONTH	Unsigned Int 16	
110	R	LMV BURNER CONTROL ID DATE DAY	Unsigned Int 16	
111	R	LMV BURNER CONTROL ID NUMBER	Unsigned Int 16	
112	R	LMV SOFTWARE VERSION AZL	Unsigned Int 16	read in hexadecimal
113	R	LMV SW VER BURNER CONTROL	Unsigned Int 16	read in hexadecimal
114	R	LMV SW VER LOAD CONTROL	Unsigned Int 16	read in hexadecimal
115	R	LMV BURNER ID STRING	String (8 words)	
123	R	LMV MINIMUM OUTPUT GAS	Unsigned Int 16	x10, see Note 1 below
124	R	LMV MAXIMUM OUTPUT GAS	Unsigned Int 16	x10, see Note 1 below
125	R	LMV MINIMUM OUTPUT OIL	Unsigned Int 16	x10, see Note 1 below
126	R	LMV MAXIMUM OUTPUT OIL	Unsigned Int 16	x10, see Note 1 below
127	RW	LMV LOAD LIMIT MODULATING	Unsigned Int 16	x10, see Note 1 below
128	RW	LMV LOAD LIMIT STAGING	Unsigned Int 16	0=S1,1=S2,2=S3
129	R	LMV TEMP LIMIT ON THRESHOLD	Signed Int 16	x10, -50% to 0%
130	R	LMV RANGE TEMPERATURE SENSOR	Unsigned Int 16	0=302F,1=752F,2=1562F
131	R	LMV ADAPTION ACTIVE	Unsigned Int 16	0=inactive,1=active
132	R	LMV ADAPTION STATE	Unsigned Int 16	see Note 5 below
133	RW	LMV START ADAPTION	Unsigned Int 16	0=reset,1=start,2=abort
134	RW	LMV ADAPTION OUTPUT	Unsigned Int 16	x10
135	RW	LMV P-VALUE	Unsigned Int 16	x10
136	RW	LMV I-VALUE	Unsigned Int 16	
137	RW	LMV D-VALUE	Unsigned Int 16	
138	R	EQUIPMENT FAULTS	Unsigned Int 16	word of bits
138 bit 0	R	EQUIPMENT FAULT LMV5	Boolean	
138 bit 1	R	EQUIPMENT FAULT LMV3	Boolean	
138 bit 2	R	EQUIPMENT FAULT RWF10 LC	Boolean	
138 bit 3	R	EQUIPMENT FAULT RWF40 LC	Boolean	
138 bit 4	R	EQUIPMENT FAULT RWF55 LC	Boolean	
138 bit 5	R	EQUIPMENT FAULT RWF40 FW	Boolean	
138 bit 6	R	EQUIPMENT FAULT RWF55 FW	Boolean	
138 bit 7	R	EQUIPMENT FAULT EA	Boolean	
138 bit 8	R	EQUIPMENT FAULT VSD	Boolean	
139	RW	LOCKOUT STRING CODE TO LOOKUP	Unsigned Int 16	see Note 6 below
140	R	LOOKUP LOCKOUT CODE STRING	String (40 words)	see Note 6 below
160	R	CURRENT LOCKOUT CODE STRING	String (40 words)	
180	R	CURRENT PHASE STRING	String (40 words)	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
200	R	LMV5 R40 UNMANIPULATED	Unsigned Int 16	0=auto,1=on,2=off
201	RW	REMOTE CONTROL HAND-OFF-AUTO	Unsigned Int 16	0=hand,1=off,2=auto
202	RW	REMOTE CONTROL MANUAL MODE	Unsigned Int 16	0=inactive,1=active
203	RW	REMOTE CONTROL MANUAL OUTPUT	Unsigned Int 16	x10
210	R	CURRENT FUEL AIR POINT 0	Unsigned Int 16	x10
211	R	CURRENT FUEL AIR POINT 1	Unsigned Int 16	x10
212	R	CURRENT FUEL AIR POINT 2	Unsigned Int 16	x10
213	R	CURRENT FUEL AIR POINT 3	Unsigned Int 16	x10
214	R	CURRENT FUEL AIR POINT 4	Unsigned Int 16	x10
215	R	CURRENT FUEL AIR POINT 5	Unsigned Int 16	x10
216	R	CURRENT FUEL AIR POINT 6	Unsigned Int 16	x10
217	R	CURRENT FUEL AIR POINT 7	Unsigned Int 16	x10
218	R	CURRENT FUEL AIR POINT 8	Unsigned Int 16	x10
219	R	CURRENT FUEL AIR POINT 9	Unsigned Int 16	x10
220	R	CURRENT FUEL AIR POINT 10	Unsigned Int 16	x10
221	R	CURRENT FUEL AIR POINT 11	Unsigned Int 16	x10
222	R	CURRENT FUEL AIR POINT 12	Unsigned Int 16	x10
223	R	CURRENT FUEL AIR POINT 13	Unsigned Int 16	x10
224	R	CURRENT FUEL AIR POINT 14	Unsigned Int 16	x10
225	R	CURRENT FUEL AIR POINT 15	Unsigned Int 16	x10
226	R	CURRENT FUEL AIR POINT 16	Unsigned Int 16	x10
227	R	CURRENT FUEL AIR POINT 17	Unsigned Int 16	x10
228	R	CURRENT FUEL AIR POINT 18	Unsigned Int 16	x10
229	R	CURRENT FUEL AIR POINT 19	Unsigned Int 16	x10
230	R	CURRENT FUEL AIR POINT 20	Unsigned Int 16	x10
231	R	CURRENT FUEL FUEL POINT 0	Unsigned Int 16	x10
232	R	CURRENT FUEL FUEL POINT 1	Unsigned Int 16	x10
233	R	CURRENT FUEL FUEL POINT 2	Unsigned Int 16	x10
234	R	CURRENT FUEL FUEL POINT 3	Unsigned Int 16	x10
235	R	CURRENT FUEL FUEL POINT 4	Unsigned Int 16	x10
236	R	CURRENT FUEL FUEL POINT 5	Unsigned Int 16	x10
237	R	CURRENT FUEL FUEL POINT 6	Unsigned Int 16	x10
238	R	CURRENT FUEL FUEL POINT 7	Unsigned Int 16	x10
239	R	CURRENT FUEL FUEL POINT 8	Unsigned Int 16	x10
240	R	CURRENT FUEL FUEL POINT 9	Unsigned Int 16	x10
241	R	CURRENT FUEL FUEL POINT 10	Unsigned Int 16	x10
242	R	CURRENT FUEL FUEL POINT 11	Unsigned Int 16	x10
243	R	CURRENT FUEL FUEL POINT 12	Unsigned Int 16	x10
244	R	CURRENT FUEL FUEL POINT 13	Unsigned Int 16	x10
245	R	CURRENT FUEL FUEL POINT 14	Unsigned Int 16	x10
246	R	CURRENT FUEL FUEL POINT 15	Unsigned Int 16	x10
247	R	CURRENT FUEL FUEL POINT 16	Unsigned Int 16	x10
248	R	CURRENT FUEL FUEL POINT 17	Unsigned Int 16	x10
249	R	CURRENT FUEL FUEL POINT 18	Unsigned Int 16	x10
250	R	CURRENT FUEL FUEL POINT 19	Unsigned Int 16	x10
251	R	CURRENT FUEL FUEL POINT 20	Unsigned Int 16	x10
252	R	CURRENT FUEL VSD POINT 0	Unsigned Int 16	x10

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
253	R	CURRENT FUEL VSD POINT 1	Unsigned Int 16	x10
254	R	CURRENT FUEL VSD POINT 2	Unsigned Int 16	x10
255	R	CURRENT FUEL VSD POINT 3	Unsigned Int 16	x10
256	R	CURRENT FUEL VSD POINT 4	Unsigned Int 16	x10
257	R	CURRENT FUEL VSD POINT 5	Unsigned Int 16	x10
258	R	CURRENT FUEL VSD POINT 6	Unsigned Int 16	x10
259	R	CURRENT FUEL VSD POINT 7	Unsigned Int 16	x10
260	R	CURRENT FUEL VSD POINT 8	Unsigned Int 16	x10
261	R	CURRENT FUEL VSD POINT 9	Unsigned Int 16	x10
262	R	CURRENT FUEL VSD POINT 10	Unsigned Int 16	x10
263	R	CURRENT FUEL VSD POINT 11	Unsigned Int 16	x10
264	R	CURRENT FUEL VSD POINT 12	Unsigned Int 16	x10
265	R	CURRENT FUEL VSD POINT 13	Unsigned Int 16	x10
266	R	CURRENT FUEL VSD POINT 14	Unsigned Int 16	x10
267	R	CURRENT FUEL VSD POINT 15	Unsigned Int 16	x10
268	R	CURRENT FUEL VSD POINT 16	Unsigned Int 16	x10
269	R	CURRENT FUEL VSD POINT 17	Unsigned Int 16	x10
270	R	CURRENT FUEL VSD POINT 18	Unsigned Int 16	x10
271	R	CURRENT FUEL VSD POINT 19	Unsigned Int 16	x10
272	R	CURRENT FUEL VSD POINT 20	Unsigned Int 16	x10
273	R	CURRENT FUEL AUX POINT 0	Unsigned Int 16	x10
274	R	CURRENT FUEL AUX POINT 1	Unsigned Int 16	x10
275	R	CURRENT FUEL AUX POINT 2	Unsigned Int 16	x10
276	R	CURRENT FUEL AUX POINT 3	Unsigned Int 16	x10
277	R	CURRENT FUEL AUX POINT 4	Unsigned Int 16	x10
278	R	CURRENT FUEL AUX POINT 5	Unsigned Int 16	x10
279	R	CURRENT FUEL AUX POINT 6	Unsigned Int 16	x10
280	R	CURRENT FUEL AUX POINT 7	Unsigned Int 16	x10
281	R	CURRENT FUEL AUX POINT 8	Unsigned Int 16	x10
282	R	CURRENT FUEL AUX POINT 9	Unsigned Int 16	x10
283	R	CURRENT FUEL AUX POINT 10	Unsigned Int 16	x10
284	R	CURRENT FUEL AUX POINT 11	Unsigned Int 16	x10
285	R	CURRENT FUEL AUX POINT 12	Unsigned Int 16	x10
286	R	CURRENT FUEL AUX POINT 13	Unsigned Int 16	x10
287	R	CURRENT FUEL AUX POINT 14	Unsigned Int 16	x10
288	R	CURRENT FUEL AUX POINT 15	Unsigned Int 16	x10
289	R	CURRENT FUEL AUX POINT 16	Unsigned Int 16	x10
290	R	CURRENT FUEL AUX POINT 17	Unsigned Int 16	x10
291	R	CURRENT FUEL AUX POINT 18	Unsigned Int 16	x10
292	R	CURRENT FUEL AUX POINT 19	Unsigned Int 16	x10
293	R	CURRENT FUEL AUX POINT 20	Unsigned Int 16	x10
294	R	CURRENT FUEL SHOW AIR	Unsigned Int 16	0=no,1=yes
295	R	CURRENT FUEL SHOW FUEL	Unsigned Int 16	0=no,1=yes
296	R	CURRENT FUEL SHOW VSD	Unsigned Int 16	0=no,1=yes
297	R	CURRENT FUEL SHOW AUX	Unsigned Int 16	0=no,1=yes
298	R	CURRENT FUEL MIN LOAD	Unsigned Int 16	
299	R	CURRENT FUEL MAX LOAD	Unsigned Int 16	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
300	R	RWF LC INPUT WORD	Unsigned Int 16	
300 bit 12	R	RWF LC INPUT 1 FAULT	Boolean	
300 bit 13	R	RWF LC INPUT 2 FAULT	Boolean	
300 bit 14	R	RWF LC INPUT 3 FAULT	Boolean	
301	R	RWF LC OUTPUT WORD	Unsigned Int 16	
301 bit 0	R	RWF LC STAGE MODE	Boolean	
301 bit 1	R	RWF LC MANUAL OPERATION	Boolean	
301 bit 2	R	RWF LC BINARY INPUT 1	Boolean	
301 bit 3	R	RWF LC BINARY INPUT 2	Boolean	
301 bit 4	R	RWF LC STAT ACTIVE	Boolean	
301 bit 5	R	RWF LC UP ACTIVE	Boolean	
301 bit 6	R	RWF LC DOWN ACTIVE	Boolean	
301 bit 7	R	RWF LC K6 ACTIVE	Boolean	
302	R	RWF LC E1 U16	Unsigned Int 16	x10
303	R	RWF LC E2 U16	Unsigned Int 16	x10
304	R	RWF LC E3 U16	Unsigned Int 16	x10
305	R	RWF LC WR U16 CURRENT SP	Unsigned Int 16	x10
306	RW	RWF LC SP1 U16	Unsigned Int 16	x10
307	RW	RWF LC SP2 U16	Unsigned Int 16	x10
308	RW	RWF LC AL U16 ALARM SP	Unsigned Int 16	x10
309	RW	RWF LC PB1 U16 PROPORTIONAL	Unsigned Int 16	x10
310	RW	RWF LC DT U16 DERIVATIVE	Unsigned Int 16	x10
311	RW	RWF LC RT U16 INTEGRAL	Unsigned Int 16	x10
312	RW	RWF LC HYS1 U16	Unsigned Int 16	x10
313	RW	RWF LC HYS3 U16	Unsigned Int 16	x10
314	RW	RWF LC DTT U16 WATCHDOG	Unsigned Int 16	x10
315	R	RWF LC E3 U16 UNFILTERED	Unsigned Int 16	x10
316	RW	RWF LC REM REMOTE OPERATION	Unsigned Int 16	0=local,1=SP,2=firing rate
317	RW	RWF LC ROFF REMOTE OFF	Unsigned Int 16	0=on,1=off
318	RW	RWF LC RK1 REM BURNER CONTROL	Unsigned Int 16	0=off,1-on
319	RW	RWF LC RK6 REMOTE K6 CONTROL	Unsigned Int 16	0=off,1-on
320	RW	RWF LC SPR U16 REMOTE SETPOINT	Unsigned Int 16	x10
321	RW	RWF LC RY U16 REMOTE OUTPUT	Unsigned Int 16	x10
322	R	RWF LC Y U16 OUTPUT	Unsigned Int 16	x10
330	R	RWF LC E1 FLOAT	Float 32	
332	R	RWF LC E2 FLOAT	Float 32	
334	R	RWF LC E3 FLOAT	Float 32	
336	R	RWF LC WR FLOAT CURRENT SP	Float 32	
338	RW	RWF LC SP1 FLOAT	Float 32	
340	RW	RWF LC SP2 FLOAT	Float 32	
342	RW	RWF LC AL FLOAT ALARM SP	Float 32	
344	RW	RWF LC PB1 FLOAT PROPORTIONAL	Float 32	
346	RW	RWF LC DT FLOAT DERIVATIVE	Float 32	
348	RW	RWF LC RT FLOAT INTEGRAL	Float 32	
350	RW	RWF LC HYS1 FLOAT	Float 32	
352	RW	RWF LC HYS3 FLOAT	Float 32	
354	RW	RWF LC DTT FLOAT WATCHDOG	Float 32	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
356	RW	RWF LC E3 FLOAT UNFILTERED	Float 32	
358	RW	RWF LC SPR FLOAT REMOTE SETPOINT	Float 32	
360	RW	RWF LC RY FLOAT REMOTE OUTPUT	Float 32	
362	R	RWF LC Y FLOAT OUTPUT	Float 32	
370	R	RWF FW INPUT WORD	Unsigned Int 16	
370 bit 12	R	RWF FW INPUT 1 FAULT	Boolean	
370 bit 13	R	RWF FW INPUT 2 FAULT	Boolean	
370 bit 14	R	RWF FW INPUT 3 FAULT	Boolean	
371	R	RWF FW OUTPUT WORD	Unsigned Int 16	
371 bit 0	R	RWF FW STAGE MODE	Boolean	
371 bit 1	R	RWF FW MANUAL OPERATION	Boolean	
371 bit 2	R	RWF FW BINARY INPUT 1	Boolean	
371 bit 3	R	RWF FW BINARY INPUT 2	Boolean	
371 bit 4	R	RWF FW STAT ACTIVE	Boolean	
371 bit 5	R	RWF FW UP ACTIVE	Boolean	
371 bit 6	R	RWF FW DOWN ACTIVE	Boolean	
371 bit 7	R	RWF FW K6 ACTIVE	Boolean	
372	R	RWF FW LEVEL PERCENT	Unsigned Int 16	
373	R	RWF FW SETPOINT PERCENT	Unsigned Int 16	
374	R	RWF FW E1 U16	Unsigned Int 16	x10
375	R	RWF FW E2 U16	Unsigned Int 16	x10
376	R	RWF FW E3 U16	Unsigned Int 16	x10
377	R	RWF FW WR U16 CURRENT SP	Unsigned Int 16	x10
378	RW	RWF FW SP1 U16	Unsigned Int 16	x10
379	R	RWF FW SP2 U16	Unsigned Int 16	x10
380	R	RWF FW Y U16	Unsigned Int 16	x10
382	R	RWF FW E1 FLOAT	Float 32	
384	R	RWF FW E2 FLOAT	Float 32	
386	R	RWF FW E3 FLOAT	Float 32	
388	R	RWF FW WR FLOAT CURRENT SP	Float 32	
390	RW	RWF FW SP1 FLOAT	Float 32	
392	R	RWF FW SP2 FLOAT	Float 32	
394	R	RWF FW Y FLOAT	Float 32	
400	R	LMV LOCKOUT ERROR CODE CURRENT	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
401	R	LMV LOCKOUT DIAG CODE CURRENT	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
402	R	LMV LOCKOUT ERR CLASS CURRENT	Unsigned Int 16	not used
403	R	LMV LOCKOUT ERR PHASE CURRENT	Unsigned Int 16	see **Appendix - LMV Phases**
404	R	LMV LOCKOUT FUEL CURRENT	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
405	R	LMV LOCKOUT OUTPUT CURRENT	Unsigned Int 16	x10, see Note 1 below
406	R	LMV LOCKOUT YEAR 2-DIG CURRENT	Unsigned Int 16	
407	R	LMV LOCKOUT MONTH CURRENT	Unsigned Int 16	
408	R	LMV LOCKOUT DAY CURRENT	Unsigned Int 16	
409	R	LMV LOCKOUT HOUR CURRENT	Unsigned Int 16	
410	R	LMV LOCKOUT MINUTE CURRENT	Unsigned Int 16	
411	R	LMV LOCKOUT SECOND CURRENT	Unsigned Int 16	
412	R	LMV LOCKOUT STARTUPS CURRENT	Unsigned Int 32	
414	R	LMV LOCKOUT HOURS CURRENT	Unsigned Int 32	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
416	R	LMV LOCKOUT ERROR CODE -1	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
417	R	LMV LOCKOUT DIAG CODE -1	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
418	R	LMV LOCKOUT ERROR CLASS -1	Unsigned Int 16	not used
419	R	LMV LOCKOUT ERROR PHASE -1	Unsigned Int 16	see **Appendix - LMV Phases**
420	R	LMV LOCKOUT FUEL -1	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
421	R	LMV LOCKOUT OUTPUT -1	Unsigned Int 16	x10, see Note 1 below
422	R	LMV LOCKOUT YEAR 2-DIG -1	Unsigned Int 16	
423	R	LMV LOCKOUT MONTH -1	Unsigned Int 16	
424	R	LMV LOCKOUT DAY -1	Unsigned Int 16	
425	R	LMV LOCKOUT HOUR -1	Unsigned Int 16	
426	R	LMV LOCKOUT MINUTE -1	Unsigned Int 16	
427	R	LMV LOCKOUT SECOND -1	Unsigned Int 16	
428	R	LMV LOCKOUT STARTUPS -1	Unsigned Int 32	
430	R	LMV LOCKOUT HOURS -1	Unsigned Int 32	
432	R	LMV LOCKOUT ERROR CODE -2	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
433	R	LMV LOCKOUT DIAG CODE -2	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
434	R	LMV LOCKOUT ERROR CLASS -2	Unsigned Int 16	not used
435	R	LMV LOCKOUT ERROR PHASE -2	Unsigned Int 16	see **Appendix - LMV Phases**
436	R	LMV LOCKOUT FUEL -2	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
437	R	LMV LOCKOUT OUTPUT -2	Unsigned Int 16	x10, see Note 1 below
438	R	LMV LOCKOUT YEAR 2-DIG -2	Unsigned Int 16	
439	R	LMV LOCKOUT MONTH -2	Unsigned Int 16	
440	R	LMV LOCKOUT DAY -2	Unsigned Int 16	
441	R	LMV LOCKOUT HOUR -2	Unsigned Int 16	
442	R	LMV LOCKOUT MINUTE -2	Unsigned Int 16	
443	R	LMV LOCKOUT SECOND -2	Unsigned Int 16	
444	R	LMV LOCKOUT STARTUPS -2	Unsigned Int 32	
446	R	LMV LOCKOUT HOURS -2	Unsigned Int 32	
448	R	LMV LOCKOUT ERROR CODE -3	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
449	R	LMV LOCKOUT DIAG CODE -3	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
450	R	LMV LOCKOUT ERROR CLASS -3	Unsigned Int 16	not used
451	R	LMV LOCKOUT ERROR PHASE -3	Unsigned Int 16	see **Appendix - LMV Phases**
452	R	LMV LOCKOUT FUEL -3	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
453	R	LMV LOCKOUT OUTPUT -3	Unsigned Int 16	x10, see Note 1 below
454	R	LMV LOCKOUT YEAR 2-DIG -3	Unsigned Int 16	
455	R	LMV LOCKOUT MONTH -3	Unsigned Int 16	
456	R	LMV LOCKOUT DAY -3	Unsigned Int 16	
457	R	LMV LOCKOUT HOUR -3	Unsigned Int 16	
458	R	LMV LOCKOUT MINUTE -3	Unsigned Int 16	
459	R	LMV LOCKOUT SECOND -3	Unsigned Int 16	
460	R	LMV LOCKOUT STARTUPS -3	Unsigned Int 32	
462	R	LMV LOCKOUT HOURS -3	Unsigned Int 32	
464	R	LMV LOCKOUT ERROR CODE -4	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
465	R	LMV LOCKOUT DIAG CODE -4	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
466	R	LMV LOCKOUT ERROR CLASS -4	Unsigned Int 16	not used
467	R	LMV LOCKOUT ERROR PHASE -4	Unsigned Int 16	see **Appendix - LMV Phases**
468	R	LMV LOCKOUT FUEL -4	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
469	R	LMV LOCKOUT OUTPUT -4	Unsigned Int 16	x10, see Note 1 below
470	R	LMV LOCKOUT YEAR 2-DIG -4	Unsigned Int 16	
471	R	LMV LOCKOUT MONTH -4	Unsigned Int 16	
472	R	LMV LOCKOUT DAY -4	Unsigned Int 16	
473	R	LMV LOCKOUT HOUR -4	Unsigned Int 16	
474	R	LMV LOCKOUT MINUTE -4	Unsigned Int 16	
475	R	LMV LOCKOUT SECOND -4	Unsigned Int 16	
476	R	LMV LOCKOUT STARTUPS -4	Unsigned Int 32	
478	R	LMV LOCKOUT HOURS -4	Unsigned Int 32	
480	R	LMV LOCKOUT ERROR CODE -5	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
481	R	LMV LOCKOUT DIAG CODE -5	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
482	R	LMV LOCKOUT ERROR CLASS -5	Unsigned Int 16	not used
483	R	LMV LOCKOUT ERROR PHASE -5	Unsigned Int 16	see **Appendix - LMV Phases**
484	R	LMV LOCKOUT FUEL -5	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
485	R	LMV LOCKOUT OUTPUT -5	Unsigned Int 16	x10, see Note 1 below
486	R	LMV LOCKOUT YEAR 2-DIG -5	Unsigned Int 16	
487	R	LMV LOCKOUT MONTH -5	Unsigned Int 16	
488	R	LMV LOCKOUT DAY -5	Unsigned Int 16	
489	R	LMV LOCKOUT HOUR -5	Unsigned Int 16	
490	R	LMV LOCKOUT MINUTE -5	Unsigned Int 16	
491	R	LMV LOCKOUT SECOND -5	Unsigned Int 16	
492	R	LMV LOCKOUT STARTUPS -5	Unsigned Int 32	
494	R	LMV LOCKOUT HOURS -5	Unsigned Int 32	
496	R	LMV LOCKOUT ERROR CODE -6	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
497	R	LMV LOCKOUT DIAG CODE -6	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
498	R	LMV LOCKOUT ERROR CLASS -6	Unsigned Int 16	not used
499	R	LMV LOCKOUT ERROR PHASE -6	Unsigned Int 16	see **Appendix - LMV Phases**
500	R	LMV LOCKOUT FUEL -6	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
501	R	LMV LOCKOUT OUTPUT -6	Unsigned Int 16	x10, see Note 1 below
502	R	LMV LOCKOUT YEAR 2-DIG -6	Unsigned Int 16	
503	R	LMV LOCKOUT MONTH -6	Unsigned Int 16	
504	R	LMV LOCKOUT DAY -6	Unsigned Int 16	
505	R	LMV LOCKOUT HOUR -6	Unsigned Int 16	
506	R	LMV LOCKOUT MINUTE -6	Unsigned Int 16	
507	R	LMV LOCKOUT SECOND -6	Unsigned Int 16	
508	R	LMV LOCKOUT STARTUPS -6	Unsigned Int 32	
510	R	LMV LOCKOUT HOURS -6	Unsigned Int 32	
512	R	LMV LOCKOUT ERROR CODE -7	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
513	R	LMV LOCKOUT DIAG CODE -7	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
514	R	LMV LOCKOUT ERROR CLASS -7	Unsigned Int 16	not used
515	R	LMV LOCKOUT ERROR PHASE -7	Unsigned Int 16	see **Appendix - LMV Phases**
516	R	LMV LOCKOUT FUEL -7	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
517	R	LMV LOCKOUT OUTPUT -7	Unsigned Int 16	x10, see Note 1 below
518	R	LMV LOCKOUT YEAR 2-DIG -7	Unsigned Int 16	
519	R	LMV LOCKOUT MONTH -7	Unsigned Int 16	
520	R	LMV LOCKOUT DAY -7	Unsigned Int 16	
521	R	LMV LOCKOUT HOUR -7	Unsigned Int 16	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
522	R	LMV LOCKOUT MINUTE -7	Unsigned Int 16	
523	R	LMV LOCKOUT SECOND -7	Unsigned Int 16	
524	R	LMV LOCKOUT STARTUPS -7	Unsigned Int 32	
526	R	LMV LOCKOUT HOURS -7	Unsigned Int 32	
528	R	LMV LOCKOUT ERROR CODE -8	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
529	R	LMV LOCKOUT DIAG CODE -8	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
530	R	LMV LOCKOUT ERROR CLASS -8	Unsigned Int 16	not used
531	R	LMV LOCKOUT ERROR PHASE -8	Unsigned Int 16	see **Appendix - LMV Phases**
532	R	LMV LOCKOUT FUEL -8	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
533	R	LMV LOCKOUT OUTPUT -8	Unsigned Int 16	x10, see Note 1 below
534	R	LMV LOCKOUT YEAR 2-DIG -8	Unsigned Int 16	
535	R	LMV LOCKOUT MONTH -8	Unsigned Int 16	
536	R	LMV LOCKOUT DAY -8	Unsigned Int 16	
537	R	LMV LOCKOUT HOUR -8	Unsigned Int 16	
538	R	LMV LOCKOUT MINUTE -8	Unsigned Int 16	
539	R	LMV LOCKOUT SECOND -8	Unsigned Int 16	
540	R	LMV LOCKOUT STARTUPS -8	Unsigned Int 32	
542	R	LMV LOCKOUT HOURS -8	Unsigned Int 32	
544	R	LMV ERROR ERROR CODE CURRENT	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
545	R	LMV ERROR DIAG CODE CURRENT	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
546	R	LMV ERROR ERROR CLASS CURRENT	Unsigned Int 16	not used
547	R	LMV ERROR ERROR PHASE CURRENT	Unsigned Int 16	see **Appendix - LMV Phases**
548	R	LMV ERROR FUEL CURRENT	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
549	R	LMV ERROR OUTPUT CURRENT	Unsigned Int 16	x10, see Note 1 below
550	R	LMV ERROR STARTUPS CURRENT	Unsigned Int 32	
552	R	LMV ERROR ERROR CODE -1	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
553	R	LMV ERROR DIAG CODE -1	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
554	R	LMV ERROR ERROR CLASS -1	Unsigned Int 16	not used
555	R	LMV ERROR ERROR PHASE -1	Unsigned Int 16	see **Appendix - LMV Phases**
556	R	LMV ERROR FUEL -1	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
557	R	LMV ERROR OUTPUT -1	Unsigned Int 16	x10, see Note 1 below
558	R	LMV ERROR STARTUPS -1	Unsigned Int 32	
560	R	LMV ERROR ERROR CODE -2	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
561	R	LMV ERROR DIAG CODE -2	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
562	R	LMV ERROR ERROR CLASS -2	Unsigned Int 16	not used
563	R	LMV ERROR ERROR PHASE -2	Unsigned Int 16	see **Appendix - LMV Phases**
564	R	LMV ERROR FUEL -2	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
565	R	LMV ERROR OUTPUT -2	Unsigned Int 16	x10, see Note 1 below
566	R	LMV ERROR STARTUPS -2	Unsigned Int 32	
568	R	LMV ERROR ERROR CODE -3	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
569	R	LMV ERROR DIAG CODE -3	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
570	R	LMV ERROR ERROR CLASS -3	Unsigned Int 16	not used
571	R	LMV ERROR ERROR PHASE -3	Unsigned Int 16	see **Appendix - LMV Phases**
572	R	LMV ERROR FUEL -3	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
573	R	LMV ERROR OUTPUT -3	Unsigned Int 16	x10, see Note 1 below
574	R	LMV ERROR STARTUPS -3	Unsigned Int 32	
576	R	LMV ERROR ERROR CODE -4	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
577	R	LMV ERROR DIAG CODE -4	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
578	R	LMV ERROR ERROR CLASS -4	Unsigned Int 16	not used
579	R	LMV ERROR ERROR PHASE -4	Unsigned Int 16	see **Appendix - LMV Phases**
580	R	LMV ERROR FUEL -4	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
581	R	LMV ERROR OUTPUT -4	Unsigned Int 16	x10, see Note 1 below
582	R	LMV ERROR STARTUPS -4	Unsigned Int 32	
584	R	LMV ERROR ERROR CODE -5	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
585	R	LMV ERROR DIAG CODE -5	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
586	R	LMV ERROR ERROR CLASS -5	Unsigned Int 16	not used
587	R	LMV ERROR ERROR PHASE -5	Unsigned Int 16	see **Appendix - LMV Phases**
588	R	LMV ERROR FUEL -5	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
589	R	LMV ERROR OUTPUT -5	Unsigned Int 16	x10, see Note 1 below
590	R	LMV ERROR STARTUPS -5	Unsigned Int 32	
592	R	LMV ERROR ERROR CODE -6	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
593	R	LMV ERROR DIAG CODE -6	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
594	R	LMV ERROR ERROR CLASS -6	Unsigned Int 16	not used
595	R	LMV ERROR ERROR PHASE -6	Unsigned Int 16	see **Appendix - LMV Phases**
596	R	LMV ERROR FUEL -6	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
597	R	LMV ERROR OUTPUT -6	Unsigned Int 16	x10, see Note 1 below
598	R	LMV ERROR STARTUPS -6	Unsigned Int 32	
600	R	LMV ERROR ERROR CODE -7	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
601	R	LMV ERROR DIAG CODE -7	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
602	R	LMV ERROR ERROR CLASS -7	Unsigned Int 16	not used
603	R	LMV ERROR ERROR PHASE -7	Unsigned Int 16	see **Appendix - LMV Phases**
604	R	LMV ERROR FUEL -7	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
605	R	LMV ERROR OUTPUT -7	Unsigned Int 16	x10, see Note 1 below
606	R	LMV ERROR STARTUPS -7	Unsigned Int 32	
608	R	LMV ERROR ERROR CODE -8	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
609	R	LMV ERROR DIAG CODE -8	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
610	R	LMV ERROR ERROR CLASS -8	Unsigned Int 16	not used
611	R	LMV ERROR ERROR PHASE -8	Unsigned Int 16	see **Appendix - LMV Phases**
612	R	LMV ERROR FUEL -8	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
613	R	LMV ERROR OUTPUT -8	Unsigned Int 16	x10, see Note 1 below
614	R	LMV ERROR STARTUPS -8	Unsigned Int 32	
616	R	LMV ERROR ERROR CODE -9	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
617	R	LMV ERROR DIAG CODE -9	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
618	R	LMV ERROR ERROR CLASS -9	Unsigned Int 16	not used
619	R	LMV ERROR ERROR PHASE -9	Unsigned Int 16	see **Appendix - LMV Phases**
620	R	LMV ERROR FUEL -9	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
621	R	LMV ERROR OUTPUT -9	Unsigned Int 16	x10, see Note 1 below
622	R	LMV ERROR STARTUPS -9	Unsigned Int 32	
624	R	LMV ERROR ERROR CODE -10	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
625	R	LMV ERROR DIAG CODE -10	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
626	R	LMV ERROR ERROR CLASS -10	Unsigned Int 16	not used
627	R	LMV ERROR ERROR PHASE -10	Unsigned Int 16	see **Appendix - LMV Phases**
628	R	LMV ERROR FUEL -10	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
629	R	LMV ERROR OUTPUT -10	Unsigned Int 16	x10, see Note 1 below

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
630	R	LMV ERROR STARTUPS -10	Unsigned Int 32	
632	R	LMV ERROR ERROR CODE -11	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
633	R	LMV ERROR DIAG CODE -11	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
634	R	LMV ERROR ERROR CLASS -11	Unsigned Int 16	not used
635	R	LMV ERROR ERROR PHASE -11	Unsigned Int 16	see **Appendix - LMV Phases**
636	R	LMV ERROR FUEL -11	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
637	R	LMV ERROR OUTPUT -11	Unsigned Int 16	x10, see Note 1 below
638	R	LMV ERROR STARTUPS -11	Unsigned Int 32	
640	R	LMV ERROR ERROR CODE -12	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
641	R	LMV ERROR DIAG CODE -12	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
642	R	LMV ERROR ERROR CLASS -12	Unsigned Int 16	not used
643	R	LMV ERROR ERROR PHASE -12	Unsigned Int 32	see **Appendix - LMV Phases**
644	R	LMV ERROR FUEL -12	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
645	R	LMV ERROR OUTPUT -12	Unsigned Int 16	x10, see Note 1 below
646	R	LMV ERROR STARTUPS -12	Unsigned Int 16	
648	R	LMV ERROR ERROR CODE -13	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
649	R	LMV ERROR DIAG CODE -13	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
650	R	LMV ERROR ERROR CLASS -13	Unsigned Int 16	not used
651	R	LMV ERROR ERROR PHASE -13	Unsigned Int 16	see **Appendix - LMV Phases**
652	R	LMV ERROR FUEL -13	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
653	R	LMV ERROR OUTPUT -13	Unsigned Int 16	x10, see Note 1 below
654	R	LMV ERROR STARTUPS -13	Unsigned Int 32	
656	R	LMV ERROR ERROR CODE -14	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
657	R	LMV ERROR DIAG CODE -14	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
658	R	LMV ERROR ERROR CLASS -14	Unsigned Int 16	not used
659	R	LMV ERROR ERROR PHASE -14	Unsigned Int 16	see **Appendix - LMV Phases**
660	R	LMV ERROR FUEL -14	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
661	R	LMV ERROR OUTPUT -14	Unsigned Int 16	x10, see Note 1 below
662	R	LMV ERROR STARTUPS -14	Unsigned Int 32	
664	R	LMV ERROR ERROR CODE -15	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
665	R	LMV ERROR DIAG CODE -15	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
666	R	LMV ERROR ERROR CLASS -15	Unsigned Int 16	not used
667	R	LMV ERROR ERROR PHASE -15	Unsigned Int 16	see **Appendix - LMV Phases**
668	R	LMV ERROR FUEL -15	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
669	R	LMV ERROR OUTPUT -15	Unsigned Int 16	x10, see Note 1 below
670	R	LMV ERROR STARTUPS -15	Unsigned Int 32	
672	R	LMV ERROR ERROR CODE -16	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
673	R	LMV ERROR DIAG CODE -16	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
674	R	LMV ERROR ERROR CLASS -16	Unsigned Int 16	not used
675	R	LMV ERROR ERROR PHASE -16	Unsigned Int 16	see **Appendix - LMV Phases**
676	R	LMV ERROR FUEL -16	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
677	R	LMV ERROR OUTPUT -16	Unsigned Int 16	x10, see Note 1 below
678	R	LMV ERROR STARTUPS -16	Unsigned Int 32	
680	R	LMV ERROR ERROR CODE -17	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
681	R	LMV ERROR DIAG CODE -17	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
682	R	LMV ERROR ERROR CLASS -17	Unsigned Int 16	not used
683	R	LMV ERROR ERROR PHASE -17	Unsigned Int 16	see **Appendix - LMV Phases**

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
684	R	LMV ERROR FUEL -17	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
685	R	LMV ERROR OUTPUT -17	Unsigned Int 16	x10, see Note 1 below
686	R	LMV ERROR STARTUPS -17	Unsigned Int 32	
688	R	LMV ERROR ERROR CODE -18	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
689	R	LMV ERROR DIAG CODE -18	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
690	R	LMV ERROR ERROR CLASS -18	Unsigned Int 16	not used
691	R	LMV ERROR ERROR PHASE -18	Unsigned Int 16	see **Appendix - LMV Phases**
692	R	LMV ERROR FUEL -18	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
693	R	LMV ERROR OUTPUT -18	Unsigned Int 16	x10, see Note 1 below
694	R	LMV ERROR STARTUPS -18	Unsigned Int 32	
696	R	LMV ERROR ERROR CODE -19	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
697	R	LMV ERROR DIAG CODE -19	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
698	R	LMV ERROR ERROR CLASS -19	Unsigned Int 16	not used
699	R	LMV ERROR ERROR PHASE -19	Unsigned Int 16	see **Appendix - LMV Phases**
700	R	LMV ERROR FUEL -19	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
701	R	LMV ERROR OUTPUT -19	Unsigned Int 16	x10, see Note 1 below
702	R	LMV ERROR STARTUPS -19	Unsigned Int 32	
704	R	LMV ERROR ERROR CODE -20	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
705	R	LMV ERROR DIAG CODE -20	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
706	R	LMV ERROR ERROR CLASS -20	Unsigned Int 16	not used
707	R	LMV ERROR ERROR PHASE -20	Unsigned Int 16	see **Appendix - LMV Phases**
708	R	LMV ERROR FUEL -20	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
709	R	LMV ERROR OUTPUT -20	Unsigned Int 16	x10, see Note 1 below
710	R	LMV ERROR STARTUPS -20	Unsigned Int 32	
712	R	LMV ERROR ERROR CODE -21	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
713	R	LMV ERROR DIAG CODE -21	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
714	R	LMV ERROR ERROR CLASS -21	Unsigned Int 16	not used
715	R	LMV ERROR ERROR PHASE -21	Unsigned Int 16	see **Appendix - LMV Phases**
716	R	LMV ERROR FUEL -21	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
717	R	LMV ERROR OUTPUT -21	Unsigned Int 16	x10, see Note 1 below
718	R	LMV ERROR STARTUPS -21	Unsigned Int 32	
720	R	LMV ERROR ERROR CODE -22	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
721	R	LMV ERROR DIAG CODE -22	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
722	R	LMV ERROR ERROR CLASS -22	Unsigned Int 16	not used
723	R	LMV ERROR ERROR PHASE -22	Unsigned Int 16	see **Appendix - LMV Phases**
724	R	LMV ERROR FUEL -22	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
725	R	LMV ERROR OUTPUT -22	Unsigned Int 16	x10, see Note 1 below
726	R	LMV ERROR STARTUPS -22	Unsigned Int 32	
728	R	LMV ERROR ERROR CODE -23	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
729	R	LMV ERROR DIAG CODE -23	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
730	R	LMV ERROR ERROR CLASS -23	Unsigned Int 16	not used
731	R	LMV ERROR ERROR PHASE -23	Unsigned Int 16	see **Appendix - LMV Phases**
732	R	LMV ERROR FUEL -23	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
733	R	LMV ERROR OUTPUT -23	Unsigned Int 16	x10, see Note 1 below
734	R	LMV ERROR STARTUPS -23	Unsigned Int 32	
736	R	LMV ERROR ERROR CODE -24	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**
737	R	LMV ERROR DIAG CODE -24	Unsigned Int 16	see **Appx. - LMVx LO/Err Codes**

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
738	R	LMV ERROR ERROR CLASS -24	Unsigned Int 16	not used
739	R	LMV ERROR ERROR PHASE -24	Unsigned Int 16	see **Appendix - LMV Phases**
740	R	LMV ERROR FUEL -24	Unsigned Int 16	0=gas/fuel0,1=oil/fuel1
741	R	LMV ERROR OUTPUT -24	Unsigned Int 16	x10, see Note 1 below
742	R	LMV ERROR STARTUPS -24	Unsigned Int 32	
760	R	RWF EA1 INPUT WORD	Unsigned Int 16	
760 bit 12	R	RWF EA1 INPUT 1 FAULT	Boolean	
760 bit 13	R	RWF EA1 INPUT 2 FAULT	Boolean	
760 bit 14	R	RWF EA1 INPUT 3 FAULT	Boolean	
761	R	RWF EA1 OUTPUT WORD	Unsigned Int 16	
761 bit 0	R	RWF EA1 STAGE MODE	Boolean	
761 bit 1	R	RWF EA1 MANUAL OPERATION	Boolean	
761 bit 2	R	RWF EA1 BINARY INPUT 1	Boolean	
761 bit 3	R	RWF EA1 BINARY INPUT 2	Boolean	
761 bit 4	R	RWF EA1 STAT ACTIVE	Boolean	
761 bit 5	R	RWF EA1 UP ACTIVE	Boolean	
761 bit 6	R	RWF EA1 DOWN ACTIVE	Boolean	
761 bit 7	R	RWF EA1 K6 ACTIVE	Boolean	
762	R	RWF EA1 E1 U16	Unsigned Int 16	x10
763	R	RWF EA1 E2 U16	Unsigned Int 16	x10
764	R	RWF EA1 E3 U16	Unsigned Int 16	x10
765	R	RWF EA1 WR U16 CURRENT SP	Unsigned Int 16	x10
766	R	RWF EA1 SP1 U16	Unsigned Int 16	x10
767	R	RWF EA1 SP2 U16	Unsigned Int 16	x10
768	R	RWF EA1 AL U16 ALARM SP	Unsigned Int 16	x10
769	R	RWF EA1 HYS1 U16	Unsigned Int 16	x10
770	R	RWF EA1 HYS3 U16	Unsigned Int 16	x10
771	R	RWF EA1 Y U16 OUTPUT	Unsigned Int 16	x10
780	R	RWF EA2 INPUT WORD	Unsigned Int 16	
780 bit 12	R	RWF EA2 INPUT 1 FAULT	Boolean	
780 bit 13	R	RWF EA2 INPUT 2 FAULT	Boolean	
780 bit 14	R	RWF EA2 INPUT 3 FAULT	Boolean	
781	R	RWF EA2 OUTPUT WORD	Unsigned Int 16	
781 bit 0	R	RWF EA2 STAGE MODE	Boolean	
781 bit 1	R	RWF EA2 MANUAL OPERATION	Boolean	
781 bit 2	R	RWF EA2 BINARY INPUT 1	Boolean	
781 bit 3	R	RWF EA2 BINARY INPUT 2	Boolean	
781 bit 4	R	RWF EA2 STAT ACTIVE	Boolean	
781 bit 5	R	RWF EA2 UP ACTIVE	Boolean	
781 bit 6	R	RWF EA2 DOWN ACTIVE	Boolean	
781 bit 7	R	RWF EA2 K6 ACTIVE	Boolean	
782	R	RWF EA2 E1 U16	Unsigned Int 16	x10
783	R	RWF EA2 E2 U16	Unsigned Int 16	x10
784	R	RWF EA2 E3 U16	Unsigned Int 16	x10
785	R	RWF EA2 WR U16 CURRENT SP	Unsigned Int 16	x10
786	R	RWF EA2 SP1 U16	Unsigned Int 16	x10
787	R	RWF EA2 SP2 U16	Unsigned Int 16	x10

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
788	R	RWF EA2 AL U16 ALARM SP	Unsigned Int 16	x10
789	R	RWF EA2 HYS1 U16	Unsigned Int 16	x10
790	R	RWF EA2 HYS3 U16	Unsigned Int 16	x10
791	R	RWF EA2 Y U16 OUTPUT	Unsigned Int 16	x10
800	R	EA DIGITAL INPUT WORD	Unsigned Int 16	
800 bit 0	R	EA INPUT 1	Boolean	
800 bit 1	R	EA INPUT 2	Boolean	
800 bit 2	R	EA INPUT 3	Boolean	
800 bit 3	R	EA INPUT 4	Boolean	
800 bit 4	R	EA INPUT 5	Boolean	
800 bit 5	R	EA INPUT 6	Boolean	
800 bit 6	R	EA INPUT 7	Boolean	
800 bit 7	R	EA INPUT 8	Boolean	
800 bit 8	R	EA INPUT 9	Boolean	
800 bit 9	R	EA INPUT 10	Boolean	
800 bit 10	R	EA INPUT 11	Boolean	
800 bit 11	R	EA INPUT 12	Boolean	
800 bit 12	R	EA INPUT 13	Boolean	
801	R	EA STATUS WORD	Unsigned Int 16	
801 bit 0	R	EA PUMP PROVEN	Boolean	
801 bit 1	R	EA PUMP ALARM	Boolean	
801 bit 2	R	EA AI1 HIGH ALARM	Boolean	
801 bit 3	R	EA AI1 LOW ALARM	Boolean	
801 bit 4	R	EA AI2 HIGH ALARM	Boolean	
801 bit 5	R	EA AI2 LOW ALARM	Boolean	
801 bit 6	R	EA AI3 HIGH ALARM	Boolean	
801 bit 7	R	EA AI3 LOW ALARM	Boolean	
801 bit 8	R	EA AI4 HIGH ALARM	Boolean	
801 bit 9	R	EA AI4 LOW ALARM	Boolean	
801 bit 10	R	EA AO1 HIGH ALARM	Boolean	
801 bit 11	R	EA AO1 LOW ALARM	Boolean	
801 bit 12	R	EA AO2 HIGH ALARM	Boolean	
801 bit 13	R	EA AO2 LOW ALARM	Boolean	
802	R	EA ALARM WORD	Unsigned Int 16	
802 bit 0	R	EA ALARM INPUT 1	Boolean	
802 bit 1	R	EA ALARM INPUT 2	Boolean	
802 bit 2	R	EA ALARM INPUT 3	Boolean	
802 bit 3	R	EA ALARM INPUT 4	Boolean	
802 bit 4	R	EA ALARM INPUT 5	Boolean	
802 bit 5	R	EA ALARM INPUT 6	Boolean	
802 bit 6	R	EA ALARM INPUT 7	Boolean	
802 bit 7	R	EA ALARM INPUT 8	Boolean	
802 bit 8	R	EA ALARM INPUT 9	Boolean	
802 bit 9	R	EA ALARM INPUT 10	Boolean	
802 bit 10	R	EA ALARM INPUT 11	Boolean	
802 bit 11	R	EA ALARM INPUT 12	Boolean	
802 bit 12	R	EA ALARM INPUT 13	Boolean	

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
803	R	EA RTD 1	Unsigned Int 16	x10
804	R	EA RTD 2	Unsigned Int 16	x10
805	R	EA RTD 3	Unsigned Int 16	x10
806	R	EA RTD 4	Unsigned Int 16	x10
807	R	EA ANALOG INPUT 1 U16	Unsigned Int 16	x10
808	R	EA ANALOG INPUT 2 U16	Unsigned Int 16	x10
809	R	EA ANALOG INPUT 3 U16	Unsigned Int 16	x10
810	R	EA ANALOG INPUT 4 U16	Unsigned Int 16	x10
811	R	EA ECONOMIZER WATER IN	Unsigned Int 16	x10
812	R	EA ECONOMIZER WATER OUT	Unsigned Int 16	x10
813	R	EA ECONOMIZER STACK IN	Unsigned Int 16	x10
814	R	EA ECONOMIZER STACK OUT	Unsigned Int 16	x10
815	R	EA DRAFT FEEDBACK	Unsigned Int 16	x10
816	R	EA DRAFT ALARM	Unsigned Int 16	
817	R	EA DRAFT ALARM CODE	Unsigned Int 16	
818	R	EA DRAFT ALARM PHASE	Unsigned Int 16	
819	R	EA DRAFT DRIVE WORD	Unsigned Int 16	
819 bit 0	R	EA DRAFT OPEN POSITION	Boolean	
819 bit 1	R	EA DRAFT CLOSE POSITION	Boolean	
819 bit 2	R	EA DRAFT START POSITION	Boolean	
819 bit 3	R	EA DRAFT MODULATE	Boolean	
820	R	EA DRAFT SWITCH	Unsigned Int 16	0=open,1=auto
821	R	EA DRAFT SENSOR U16	Unsigned Int 16	x10
828	R	EA ANALOG INPUT 1 FLOAT	Float 32	
830	R	EA ANALOG INPUT 2 FLOAT	Float 32	
832	R	EA ANALOG INPUT 3 FLOAT	Float 32	
834	R	EA ANALOG INPUT 4 FLOAT	Float 32	
836	R	EA DRAFT SENSOR FLOAT	Float 32	
838	R	EA ANALOG INPUT 1 TOTALIZED	Unsigned Int 32	x10
840	R	EA ANALOG INPUT 2 TOTALIZED	Unsigned Int 32	x10
842	R	EA ANALOG INPUT 3 TOTALIZED	Unsigned Int 32	x10
844	R	EA ANALOG INPUT 4 TOTALIZED	Unsigned Int 32	x10
846	R	EA MONITOR OUT 1 TOTALIZED	Unsigned Int 32	x10
848	R	EA MONITOR OUT 2 TOTALIZED	Unsigned Int 32	x10
850	R	EA LC INPUT WORD	Unsigned Int 16	
850 bit 0	R	EA LC STAT ACTIVE	Boolean	
850 bit 3	R	EA LC K6 ACTIVE	Boolean	
851	R	EA LC OUTPUT WORD	Unsigned Int 16	
851 bit 4	R	EA LC STAT ACTIVE	Boolean	
851 bit 7	R	EA LC K6 ACTIVE	Boolean	
852	R	EA LC E1 U16	Unsigned Int 16	x10
853	R	EA LC E3 U16	Unsigned Int 16	x10
854	R	EA LC WR U16 CURRENT SP	Unsigned Int 16	x10
855	RW	EA LC SP1 U16	Unsigned Int 16	x10
856	RW	EA LC AL U16 ALARM SP	Unsigned Int 16	x10
857	RW	EA LC PB1 U16 PROPORTIONAL	Unsigned Int 16	x10
858	RW	EA LC DT U16 DERIVATIVE	Unsigned Int 16	x10

Gateway / BMS - Modbus TCP/IP (continued)

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
859	RW	EA LC RT U16 INTEGRAL	Unsigned Int 16	x10
860	RW	EA LC HYS1 U16	Unsigned Int 16	x10
861	RW	EA LC HYS3 U16	Unsigned Int 16	x10
862	RW	EA LC REM REMOTE OPERATION	Unsigned Int 16	
863	RW	EA LC ROFF REMOTE OFF	Unsigned Int 16	
864	RW	EA LC RK1 REMOTE BURNER CONTROL	Unsigned Int 16	
865	RW	EA LC SPR U16 REMOTE SETPOINT	Unsigned Int 16	x10
866	RW	EA LC RY U16 REMOTE OUTPUT	Unsigned Int 16	x10
867	R	EA LC Y U16 OUTPUT	Unsigned Int 16	x10
868	R	EA LC E1 FLOAT	Float 32	
870	R	EA LC E3 FLOAT	Float 32	
872	R	EA LC WR FLOAT CURRENT SP	Float 32	
874	RW	EA LC SP1 FLOAT	Float 32	
876	RW	EA LC AL FLOAT ALARM SP	Float 32	
878	RW	EA LC PB1 FLOAT PROPORTIONAL	Float 32	
880	RW	EA LC DT FLOAT DERIVATIVE	Float 32	
882	RW	EA LC RT FLOAT INTEGRAL	Float 32	
884	RW	EA LC HYS1 FLOAT	Float 32	
886	RW	EA LC HYS3 FLOAT	Float 32	
888	RW	EA LC SPR FLOAT REMOTE SETPOINT	Float 32	
890	RW	EA LC RY FLOAT REMOTE OUTPUT	Float 32	
892	R	EA LC Y FLOAT OUTPUT	Float 32	
900	R	VSD FREQUENCY REF PERCENT	Unsigned Int 16	x100
901	R	VSD OUTPUT FREQUENCY PERCENT	Unsigned Int 16	x100
902	R	VSD OUTPUT VOLTAGE	Unsigned Int 16	x10
903	R	VSD DC BUS VOLTAGE	Unsigned Int 16	
904	R	VSD STATUS WORD	Unsigned Int 16	
904 bit 0	R	VSD RUNNING	Boolean	
904 bit 1	R	VSD ZERO SPEED	Boolean	
904 bit 4	R	VSD SPEED AGREE	Boolean	
904 bit 5	R	VSD READY STATE	Boolean	
904 bit 6	R	VSD ALARM STATE	Boolean	
904 bit 7	R	VSD FAULT STATE	Boolean	
905	R	VSD OUTPUT RPM	Unsigned Int 16	
906	R	VSD OUTPUT CURRENT	Unsigned Int 16	x100
907	R	VSD FREQUENCY REFERENCE HERTZ	Unsigned Int 16	x10
908	R	VSD OUTPUT FREQUENCY HERTZ	Unsigned Int 16	x10
909	R	VSD ALARM CODE	Unsigned Int 16	
910	R	VSD FAULT CODE	Unsigned Int 16	
911	R	VSD DC BUS PEAK	Unsigned Int 16	
912	R	VSD OUTPUT CURRENT PEAK	Unsigned Int 16	
913	R	VSD OUTPUT POWER	Unsigned Int 16	x1000
914	R	VSD TOTALIZED POWER	Unsigned Int 32	x100
990	R	TSK SOFTWARE MODEL STRING	String (5 words)	
995	R	TSK SOFTWARE VERSION STRING	String (2 words)	

Gateway / BMS - Modbus TCP/IP (continued)

Modbus 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 – LMV5 sensor selection.

- **0:** Pt100
- **1:** Pt1000
- **2:** Ni1000
- **3:** temperature sensor
- **4:** pressure sensor
- **5:** Pt100/Pt1000
- **6:** Pt100/Ni1000
- **7:** no sensor

Note 3 – 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 4 – 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 - Modbus TCP/IP (continued)

Note 5 – LMV5 adaption state.

- **0:** undefined
- **1:** identification completed, parameter determined
- **2:** undefined
- **3:** adaption aborted by user
- **4:** temperature difference too small, temperature will be lowered with low fire
- **5:** monitoring time running
- **6:** delivery of identification load set
- **7:** error during identification (path)
- **8:** error during identification (internal)
- **9:** monitoring time running
- **10:** changeover from modulating to multistage during an identification
- **11:** timeout monitoring time
- **12:** timeout heating output on path with monitoring

Note 6 – Lockout code string lookup. Write the lockout code to convert to register 139 as a decimal number and the string representation will be returned to register 140. For example, writing '33' to register 139 will result in register 140 returning 'SAFETY LOOP OPEN'.

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 PROG STILL 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 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

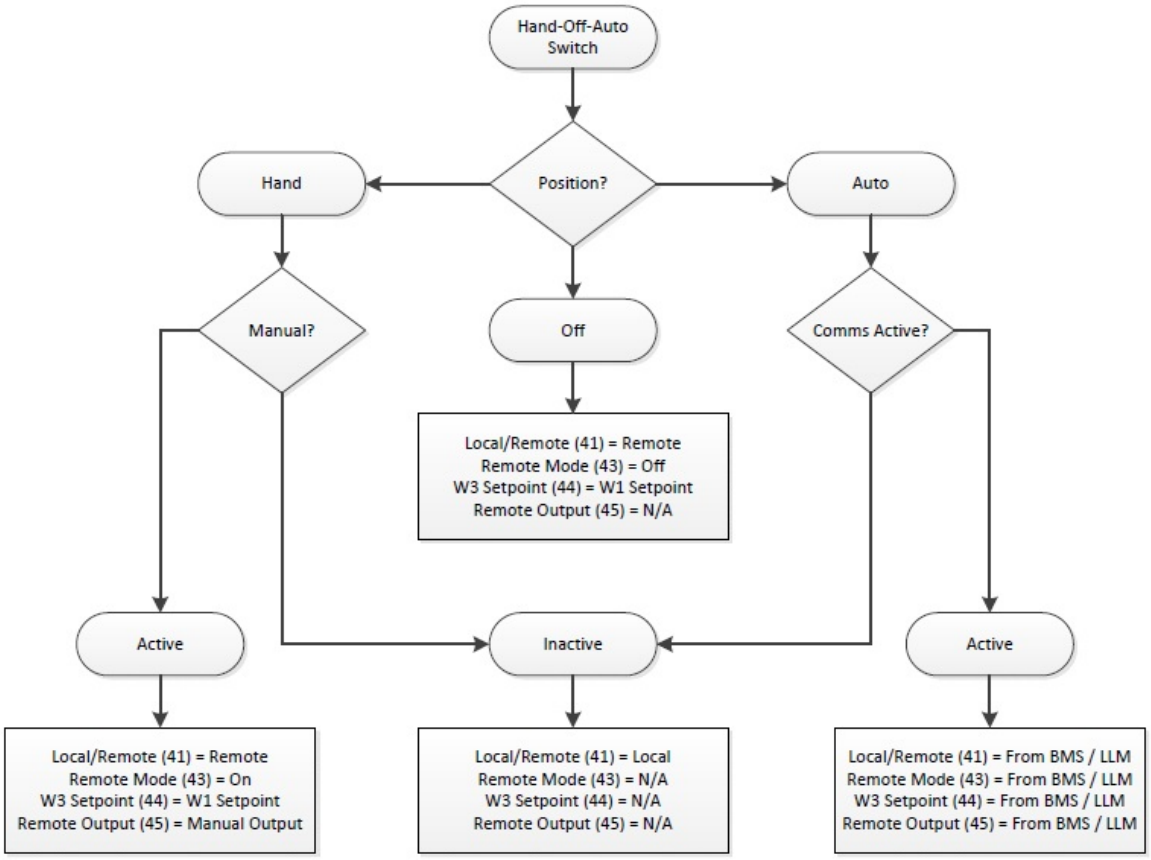
Appendix - Yaskawa VSD Alarm Codes

CODE	DESCRIPTION	CODE	DESCRIPTION
0	No Alarm	24	Drive Overload (oL2)
1	Undervoltage (Uv1)	26	Option Card Ext. Fault (EF0)
2	Overcurrent (oC)	27	Cmd. Input During Run (rUn)
3	Heatsink Overheat (oH)	29	Serial Comm. Error (CALL)
4	Drive Overheat (oH2)	30	Undertorque 1 (UL3)
5	Overtorque 1 (oL3)	31	Undertorque 2 (UL4)
6	Overtorque 2 (oL4)	32	Modbus Test Mode Fault (SE)
7	Run Cmd. Input Error (EF)	34	Motor Overheat (oH3)
8	Drive Baseblock (bb)	39	PID Feedback Loss (FbL)
9	Ext. Fault Input S3 (EF3)	40	PID Feedback Loss (FbH)
10	Ext. Fault Input S4 (EF4)	42	Drive Disabled (dnE)
11	Ext. Fault Input S5 (EF5)	43	PG Disconnected (PGo)
12	Ext. Fault Input S6 (EF6)	49	Watchdog Timer Error (E5)
13	Ext. Fault Input S7 (EF7)	50	Station Address Error (AEr)
15	Reserved	51	Comm. Cycle Error (CyC)
16	Overspeed (oS)	52	High Current Alarm (HCA)
17	Excessive Speed Dev. (dEv)	57	Ext. Fault Input S1 (EF1)
18	PG Disconnected (PGo)	58	Ext. Fault Input S2 (EF2)
19	Dig. Operator Connect (oPr)	59	Safe Disable Input (HbbF)
20	Modbus Error (CE)	60	Safe Disable Input (Hbb)
21	Option Comm. Error (bUS)	61	Mech. Weakening 1 (oL5)
22	Serial Comm. Error (CALL)	62	Mech. Weakening 2 (UL5)
23	Motor Overload (oL1)	73	DriveWorksEZ Alarm (dWAL)

Appendix - Yaskawa VSD Fault Codes

CODE	DESCRIPTION	CODE	DESCRIPTION
0	No Fault	29	Motor Overheat (oH3)
2	Undervoltage (Uv1)	30	Dig. Operator Connect (oPr)
3	PS Undervoltage (Uv2)	31	EEPROM Write Error (Err)
4	Soft Charge Fault (Uv3)	32	Motor Overheat (oH4)
5	IGBT Short Circuit (SC)	33	Modbus Error (CE)
6	Ground Fault (GF)	34	Option Comm. Error (bUS)
7	Overcurrent (oC)	37	Control Fault (CF)
8	Overvoltage (ov)	39	PROFIBUS-DP Fault (EF0)
9	Heatsink Overheat (oH)	40	PID Feedback Loss (FbL)
10	Heatsink Overheat (oH1)	41	Undertorque 1 (UL3)
11	Motor Overload (oL1)	42	Undertorque 2 (UL4)
12	Drive Overload (oL2)	43	High Slip Braking OL (oL7)
13	Overtorque 1 (oL3)	48	Hardware Fault (oFx)
14	Overtorque 2 (oL4)	54	Output Curr. Imbalance (LF2)
15	Dyn. Braking Transistor (rr)	55	Pullout Detection (Sto)
16	Braking Res. Overheat (rH)	56	PG Disconnect (PGo)
17	Ext. Fault Input S3 (EF3)	57	Watchdog Timer Error (E5)
18	Ext. Fault Input S4 (EF4)	59	Too Many Restarts (SEr)
19	Ext. Fault Input S5 (EF5)	65	PID Feedback Loss (FbH)
20	Ext. Fault Input S6 (EF6)	66	Ext. Fault Input S1 (EF1)
21	Ext. Fault Input S7 (EF7)	67	Ext. Fault Input S2 (EF2)
24	Overspeed (oS)	68	Mech. Weakening 1 (oL5)
25	Excessive Speed Dev. (dEv)	69	Mech. Weakening 2 (UL5)
26	PG Disconnect (PGo)	70	Current Offset Fault (CoF)
27	Input Phase Loss (PF)	73	DriveWorksEZ Fault (dWFL)
28	Output Phase Loss (LF)	131	A/D Conversion Error (CPF02)

Appendix - Hand-Off-Auto Flowchart



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

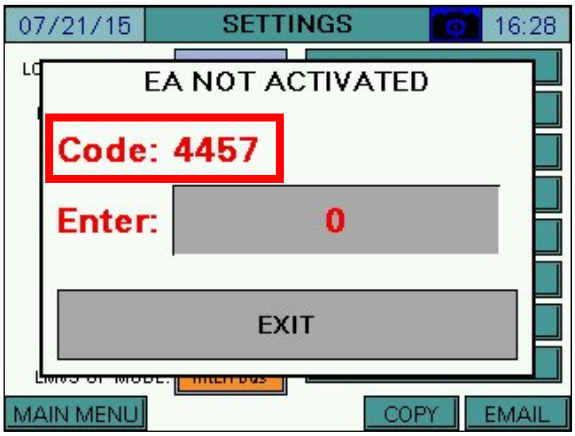
XNOR

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 Expanded Annunciator 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 OPTIONS screen for configuration once activated (see *Configuration* section for additional detail).

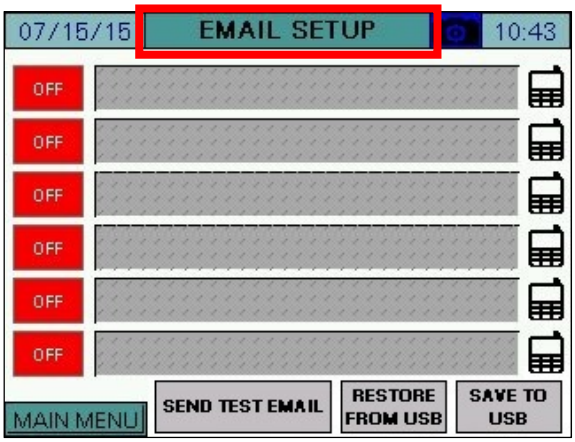
If the Expanded Annunciator is not activated, the activation screen will automatically appear when attempting to navigate to any Expanded Annunciator screen.

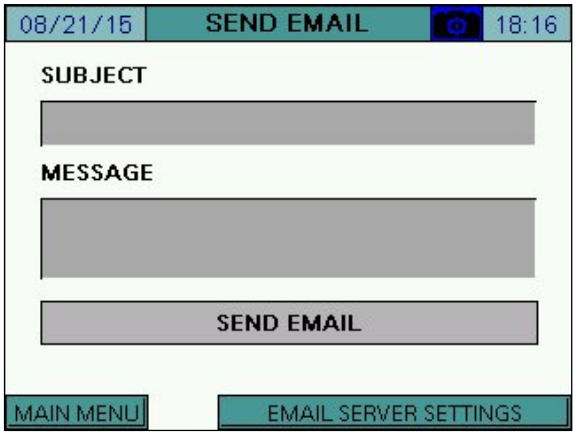


Contact SCC, Inc. technical support with the code listed and an activation key will be provided. Once it is entered, press **APPLY.**

Appendix - Email Options

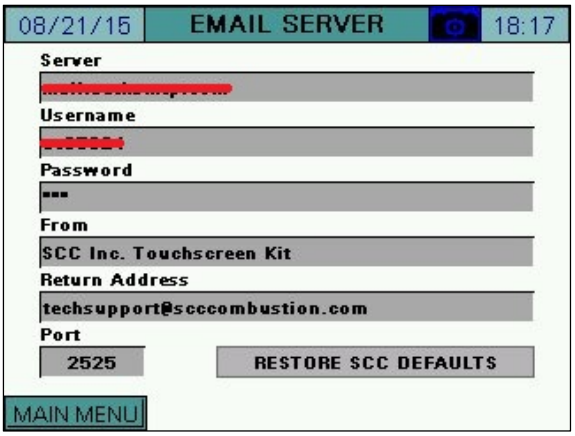
Additional email options are available by pressing **EMAIL SETUP** for >5s. This displays the EMAIL MANUAL screen.





A custom email message can be sent from this screen. Enter a subject and a message (100 characters or less). Press **SEND EMAIL** to send the message.

Press **EMAIL SERVER SETTINGS** to display the EMAIL SERVER screen. The default email server settings can be changed if required or directed. Press **RESTORE SCC DEFAULTS** to restore the server settings to the factory defaults. Note that if using the default settings, the return address cannot be changed or the mail server will reject the message.



Appendix - LMV5 Configuration for Modbus

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 = **1**
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).

Appendix - LMV3 Configuration for Modbus

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 the LMV3x 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 1. 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).

Appendix - RWF55 Configuration for Modbus

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 the RWF55 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 = **2** (address for load control applications) **OR**
   ConF > IntF > r485 > Adr = **3** (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).

Appendix - RWF40 Configuration for Modbus

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 the RWF40, 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 '2' if the RWF40 is being used as a load controller or to '3' if the RWF40 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).

Appendix - Yaskawa VSD (A1000 / V1000) Configuration for Modbus

The Yaskawa A1000 or V1000 VSD must be properly configured for Modbus operation.

To configure the Yaskawa A1000 or V1000 VSD controller to communicate using Modbus, use the following procedure:

1. Press the ↓ (down arrow) button until the red display reads 'PAr'.
2. Press the **ENTER** button again; the red display should read 'A1-01' with the 'A' flashing.
3. Press the ↑ (up arrow) button until the first digit in the red display flashes 'H', then press **ENTER**.
4. Press the ↑ (up arrow) button until the second digit in the red display flashes '5', then press **ENTER**.
5. The red display should read 'H5-01', then press **ENTER**.
   'H5-01' is the Modbus address. Enter '1F' using the arrow keys (→ moves to the next digit) then press **ENTER**. This sets the address to 31 but it is entered as a hexadecimal number.
6. Press **ESC** until 'H5-01' is displayed again. Press the ↑ (up arrow) button to navigate to parameter 'H5-02' then press enter.
7. 'H5-02' is the baud rate. Enter '04' using the arrow keys then press **ENTER**. This setting is 19,200 bit/s.
8. Press **ESC** until 'H5-02' is displayed again. Press the ↑ (up arrow) button to navigate to parameter 'H5-03' then press enter.
9. 'H5-03' is the parity. Enter '00' using the arrow keys then press **ENTER**. This setting is no parity.
10. Press **ESC** multiple times until the normal display appears.
11. Power cycle the VSD to apply the new settings.

Appendix - RWF10 Configuration for Modbus

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 the RWF10 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 '2' 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.