SCC Inc.

Installation Instructions

Document No. TS-1100

October 27, 2021 (Rev. 19F4)

TS Series

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

Touchscreen

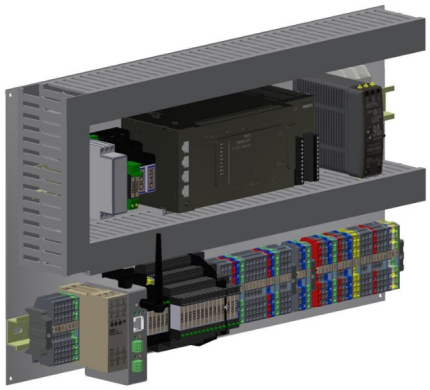


Plate Kit

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 3.5", 6", 10", 12" or 15" touchscreen along with a plate kit to be mounted inside a control panel (by others), or installed in SCC Inc. Combustion enclosures with LMV5 or LMV3, see TS-4000 or TS-5000 respectively.

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

Compatible Controls and Accessories

Controls

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

Accessories

- Feedwater control via RWF55 (steam boilers only)
- Connection to certain 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 or OCI413.20)	1	Modbus RTU (RS-485)
LMV5x	1	Modbus RTU (RS-232)
RWF10 (for load control)	2	Modbus RTU (RS-485)
RWF55 (for load control)	2	Modbus RTU (RS-485)
RWF55 (for feedwater)	3	Modbus RTU (RS-485)
VSD (Danfoss FC Series)	11	Modbus RTU (RS-485)
VSD (Allen-Bradley PowerFlex 40/400)	12	Modbus RTU (RS-485)
VSD (ABB ACH/ACS550)	13	Modbus RTU (RS-485)
VSD (Delta C2000)	14	Modbus RTU (RS-485)
VSD (Yaskawa A1000/V1000)	31	Modbus RTU (RS-485)
Expanded Annunciator	N/A	Modbus TCP/IP (Ethernet)

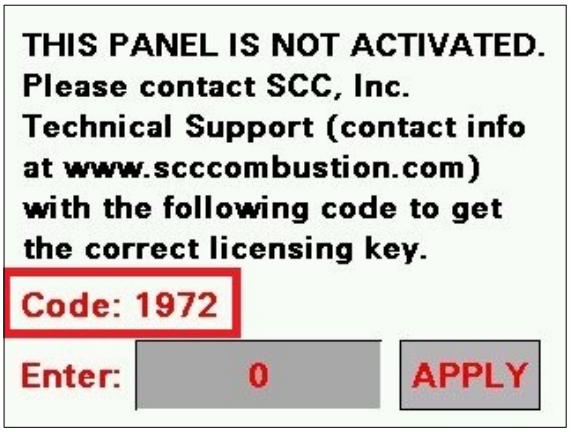
Communication via Modbus must be set with the following values:

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

See the appendixes for Modbus configuration details for each device.

Activation

Software upgrades 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, touch **APPLY.**

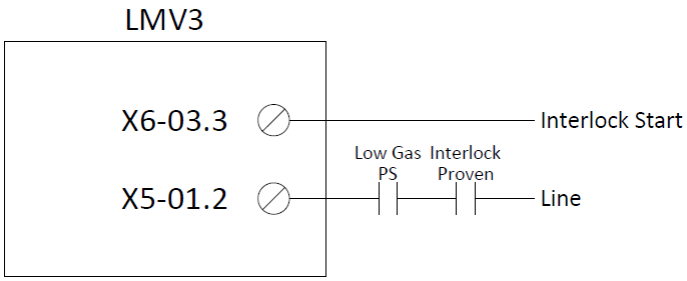
Connecting External Devices to LMV...

Connection to LMV3...

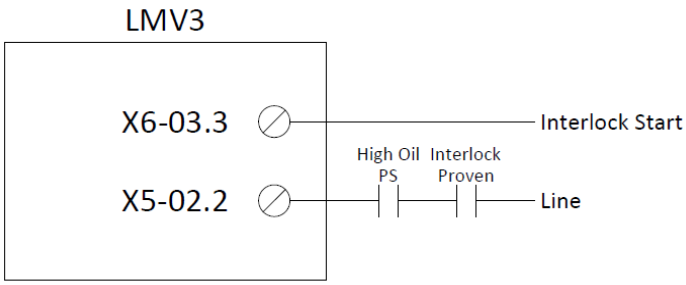
External devices such as draft controls or combustion air dampers must be placed in the low gas pressure switch and/or high oil pressure switch limit for remote control of the burner to be possible. This is because the limit string does not lose voltage upon a remote disable.

Connect the signal to activate the external device to terminal X6-03.3.

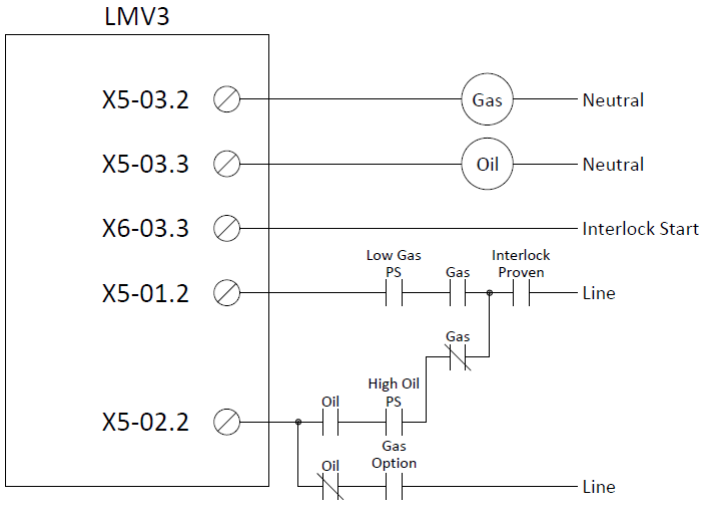
For gas fuel trains, connect the proven limits in series with the low gas pressure switch to terminal X5-01.2.



For oil fuel trains, connect the proven limits in series with the high oil pressure switch to terminal X5-02.2. For this feature to work, parameter 277 or 377 (High Oil PS) must be set to 1 (high oil pressure switch).



If the unit uses both fuels, wire relays to X5-03.2 (fuel 0 selected) and X5-03.3 (fuel 1 selected). These relays are necessary to prevent back feeding voltage and to bypass other gas options required to connect to X5-02.2 such as high gas pressure, POC or valve proving (shown as "Gas Option").



Set parameter 214 (Max Time Start Release) to a value long enough to ensure that the external device will prove open at every start. This parameter holds the LMV3... in phase 22 until terminal X5-01.2 or X5-02.2 has proven.

Note that using this method will result in lockout code 20 (low gas pressure switch) or 21 (high oil pressure switch) if the external device fails to prove.

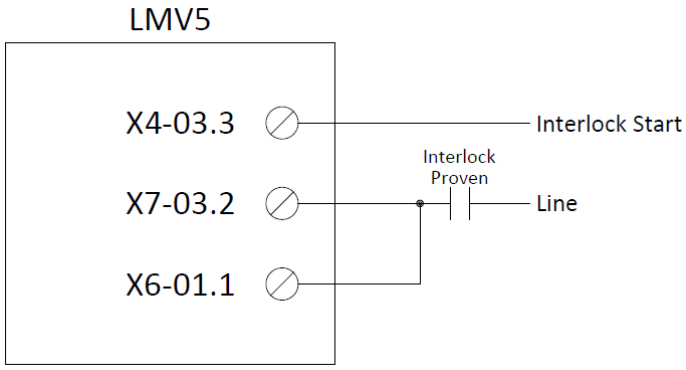
Connecting External Devices to LMV...(continued)

Connection to LMV5...

External devices such as draft controls or combustion air dampers must be placed in the start release circuit for gas and/or oil for remote control of the burner to be possible. This is because the limit string does not lose voltage upon a remote disable.

Connect the signal to activate the external device to terminal X4-03.3.

Connect line voltage through the proven limits to terminal X7-03.2 (gas) and/or terminal X6-01.1 (oil). Note that these terminals can both be connected simultaneously.



Set the start release time to a value long enough to ensure that the external device will prove open at every start. This parameter holds the LMV5... in phase 21 until the appropriate start release has proven.

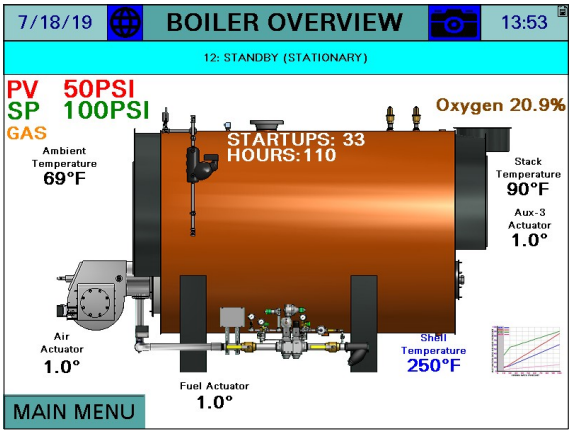
Set the following parameters:

- Params & Display > BurnerControl > Configuration > ConfigIn/Output > StartReleaseGas = **StartRelGas**
- Params & Display > BurnerControl > Configuration > ConfigIn/Output > StartReleaseOil = **activated**
- Params & Display > BurnerControl > Times > TimesGeneral > MaxTmeStartRel = **<allowable time for external limits to prove>**

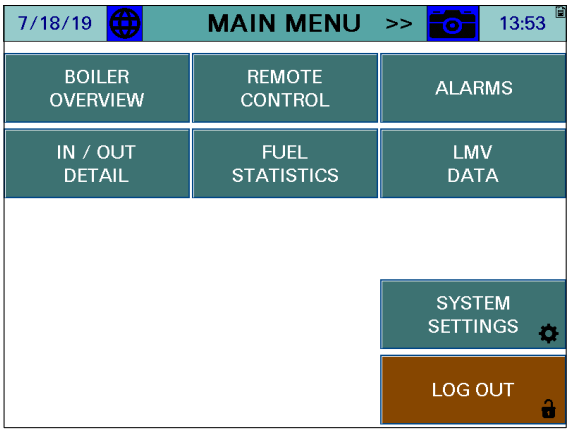
Note that using this method will result in lockout code 47 (no start release gas) or lockout code 36 (no start release oil) if the external device fails to prove.

Logging In

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



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



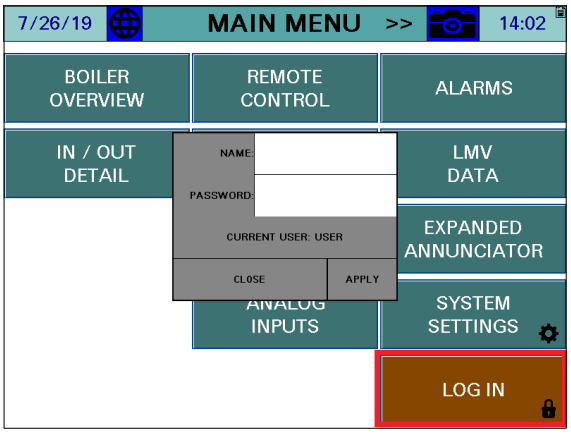
From here, different screens can be accessed depending on the access level. There are three access levels available:

- **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.

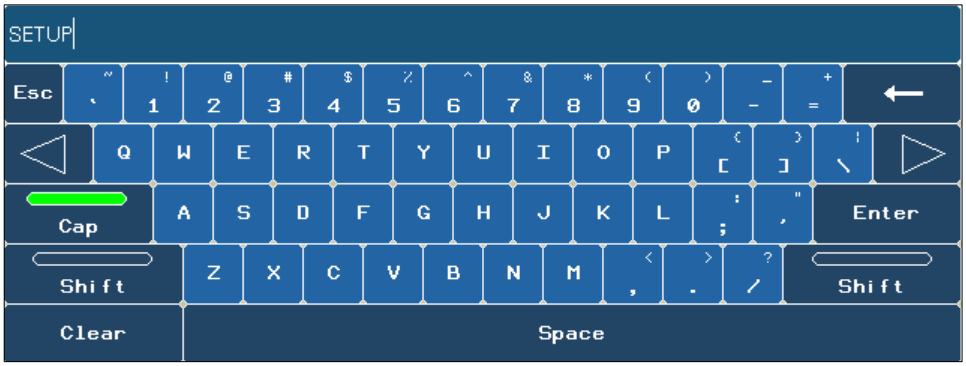
The ACTIVATION screen may appear instead of the OVERVIEW screen following a software update. Refer to page 8 for activation instructions.

Logging In (continued)

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



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



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

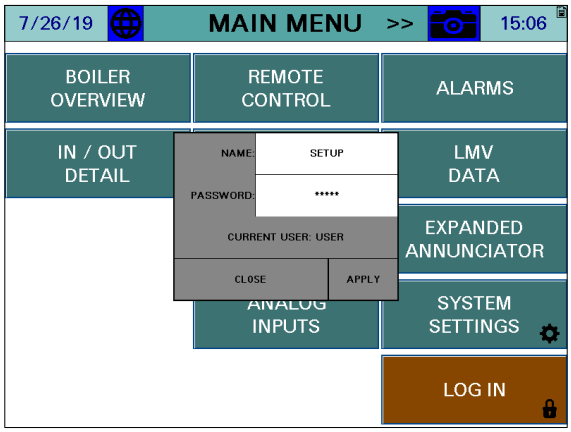
Next, tap the field next to PASSWORD and the same keypad will appear again. Enter the password and then touch **ENTER**.

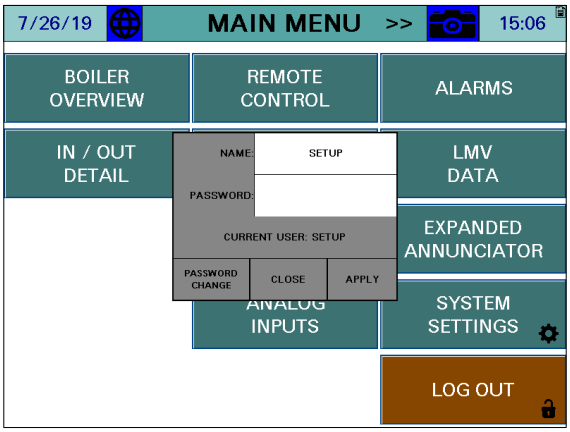
When both the username and password have been entered, touch **APPLY**. If successful, the CURRENT USER will change from USER to TECH or SETUP depending on the username and password that were entered. Touch **CLOSE** to leave the login screen.

Changing Passwords

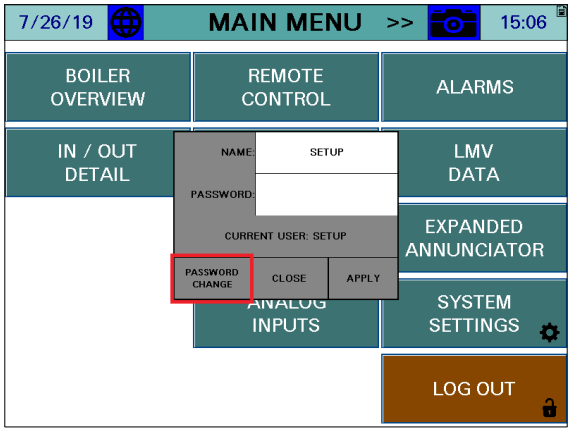
Access level: **SETUP**

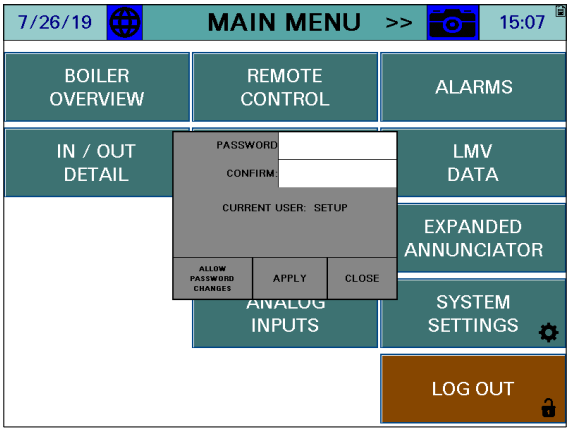
By default, the TECH access level password is 9876 and the SETUP access level password is START. These default passwords may be changed at any time. To change passwords, touch **LOGIN** from the main menu. Enter the appropriate information to log in at the SETUP access level and touch **APPLY**. The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





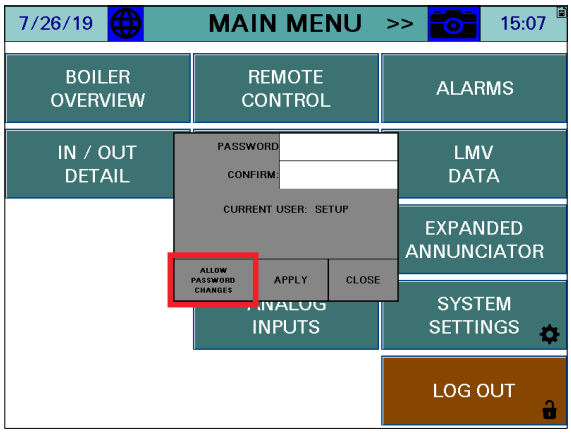
After that is done, touch **PASSWORD CHANGE**.

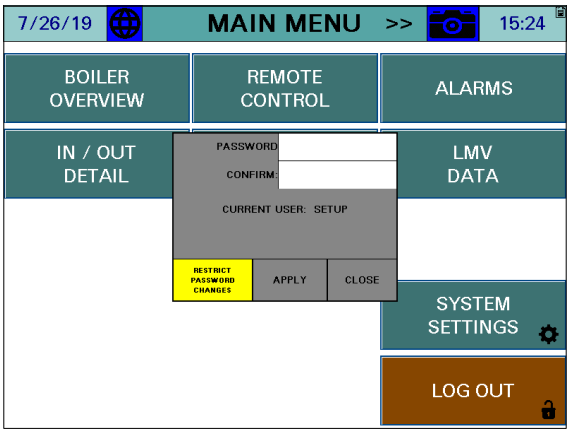




Changing Passwords (continued)

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

External Drives

The 10", 12", and 15" touchscreens have an external SD card which is shipped already inserted. The SD card is used for backups as well as executing user scripts. All touchscreens have USB ports that can accept drives, keyboards or pointing devices. There is a USB port for 10", 12", and 15" touchscreens accessible from the face of the panels.

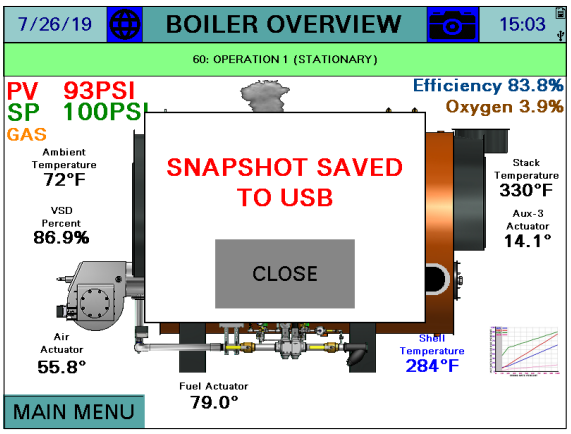
Backups, screen captures, datalogs and most other text files can be saved to an inserted USB drive. Note that the USB drive should be removed if it is not actively being used.

An SD or USB icon will display next to the time to indicate that the respective drive has been inserted.

Saving Screen Captures

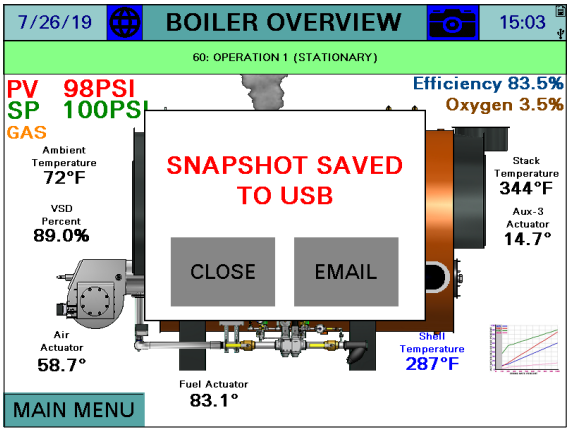
Access level: **USER**

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



If there is no USB drive inserted, there will be a message indicating that the USB drive is not inserted. If there is any other 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 touching **EMAIL**. Note that screen captures always require a USB drive to be inserted, even to send an email.

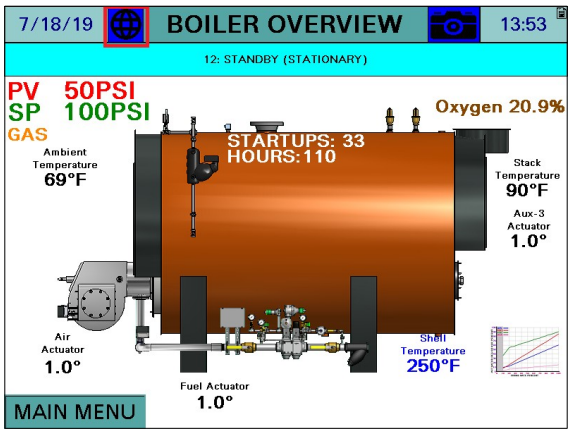


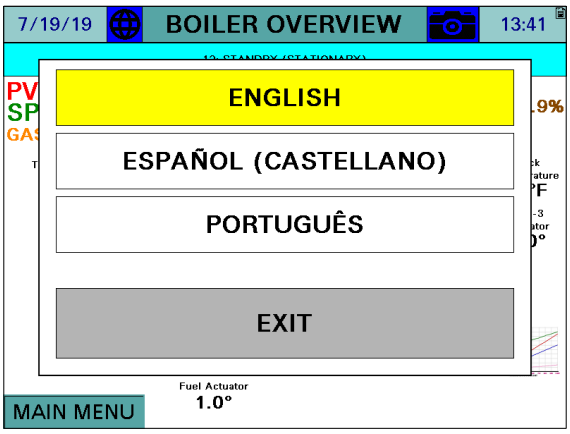
There is no limit to the number of screen captures that may be saved to the USB drive other than the capacity of the USB drive itself. Saved images may be viewed or deleted by going to the SAVED IMAGES screen accessible from the SYSTEM SETUP screen.

Changing Language

Access level: **USER**

To change the language, touch the globe icon for > 2s (hold down). The choices are English, Spanish or Portuguese. For Spanish, there will be a second prompt to choose the specific country for other localization changes (date format and decimal separation).



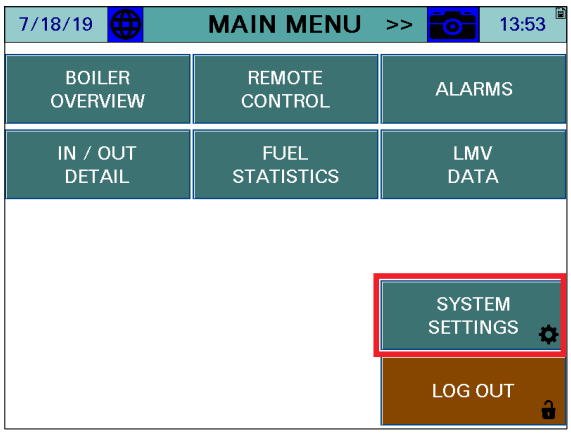


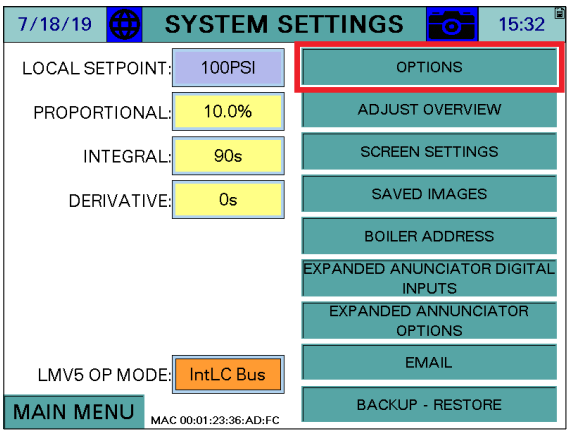
Configuration

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**.

Touch **SYSTEM SETTINGS** to display the SYSTEM SETTINGS screen, then touch **OPTIONS** to display the OPTIONS screen.

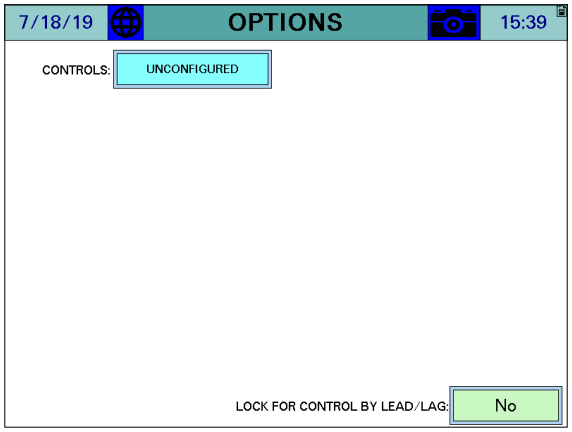




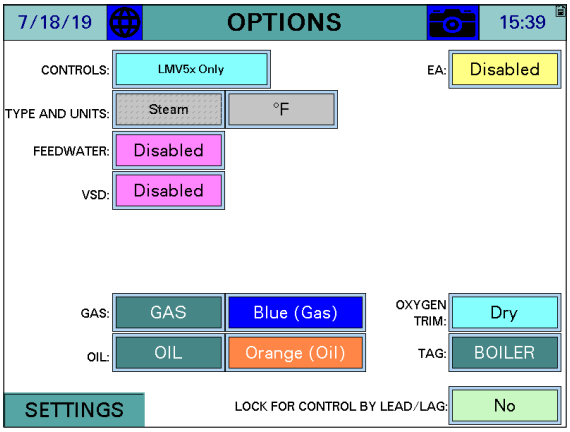
Configuration (continued)

On the OPTIONS screen, the touchscreen is configured for the components it is connected to.

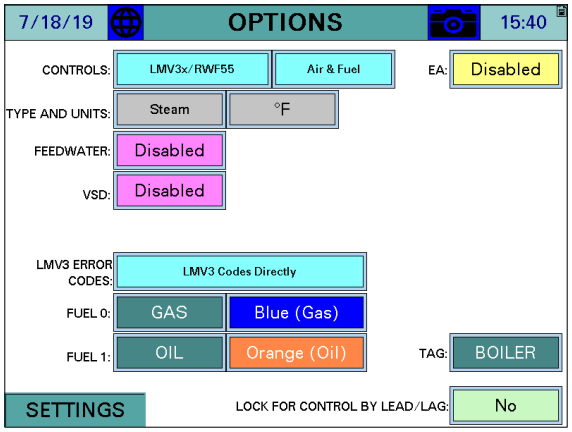
UNCONFIGURED



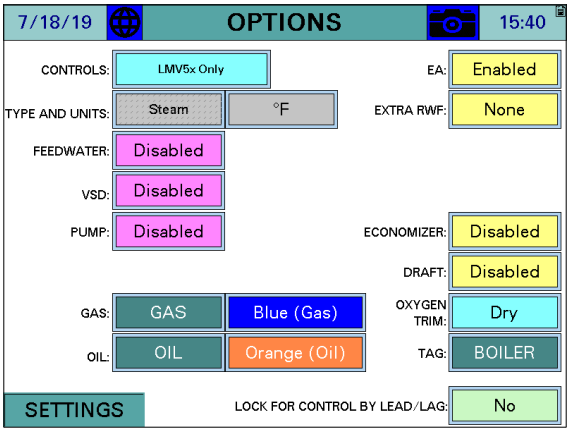
LMV5… WITHOUT EXPANDED ANNUNCIATION



LMV3… WITH RWF55 LOAD CONTROLLER



LMV5… WITH EXPANDED ANNUNCIATION



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

Configuration (continued)

General Setup Options

CONTROLS – Select which Siemens controller(s) are connected to the touchscreen. *Note that if an RWF… controller is mounted on the boiler or burner that it may actually be a feedwater controller. Do not select the RWF… as part of the load controller combination if it is a feedwater controller.*

- **LMV5x Only:** Select this option to connect a LMV5... and its internal load controller.
- **LMV5x/RWF55:** Select this option to connect a LMV5... with an RWF55 as an external load controller.
- **LMV3x Only:** Select this option to connect a LMV3... with no load controller.
- **LMV3x/RWF10:** Select this option to connect a LMV3... with an RWF10 as an external load controller.
- **LMV3x/RWF55:** Select this option to connect a LMV3... with an RWF55 as an external load controller.

CONTROLS (when LMV3x selected and software version is V3.30 or older) – Select the actuators being used on a LMV3... 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 (first selection) – Select the type of boiler that the touchscreen is connected to. This is configured automatically to match the local AZL when the control is an LMV5....

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

TYPE (second selection) – Select the temperature units.

- **°C:** Select this option to display temperatures in degrees Celsius.
- **°F:** Select this option to display temperatures in degrees Fahrenheit.

FDWATER – Select whether a feedwater system with a Siemens controller is connected.

- **Disabled**
- **RWF55:** Select this option if the feedwater is controlled by an RWF55.
- **Single-Element/1E:** Select this option for single-element feedwater control via the Expanded Annunciator (extra output option required).
- **Three-Element/3E:** Select this option for three-element feedwater control via the Expanded Annunciator (extra output option required).

PUMP – Select whether the boiler circulation pump should be controlled by the Expanded Annunciator.

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

Configuration (continued)

VSD – Select whether a compatible VSD system is installed on the combustion air fan. *The VSD must also be connected via Modbus.*

- **Disabled**
- **Yaskawa:** Tested models are A1000 and V1000.
- **Danfoss:** Tested models are the FC Series.
- **PowerFlex:** Tested models are the PowerFlex 40 and PowerFlex 400.
- **ABB:** Tested models are the ACS550 and ACH550.
- **Delta:** Tested models are the C2000.

LMV3 EC – Select how LMV3… error codes are represented on the screen and via Modbus. To change touch for > 1s (hold down).

- **LMV3 Codes Directly:** LMV3… codes are not manipulated.
- **LMV5 w/Embedded LMV3:** LMV3... codes are converted to corresponding LMV5... codes (when possible, otherwise code '43' is used) and the original LMV3... 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.

- **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.

Configuration (continued)

ECONOMIZER – Select whether the economizer option is enabled in the Expanded Annunciator.

- **Disabled**
- **5-8:** Uses first input card inputs for all economizer temperature sensors.
- **5-7:** Uses first input card inputs for all economizer temperature sensors except that the LMV52 stack temperature sensor is used for the stack temperature input.
- **9-12:** Uses second input card inputs for all economizer temperature sensors.
- **9-11:** Uses second input card inputs for all economizer temperature sensors except that the LMV52 stack temperature sensor is used for the stack temperature input.

DRAFT – Select whether the draft control option is enabled in the Expanded Annunciator.

- **Disabled**
- **Enabled:** Uses three Expanded Annunciator digital inputs for status.

O_2 – 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) are calculated from the wet basis O_2 trim data reported 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 directly and CO_2 and excess air are not calculated.

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

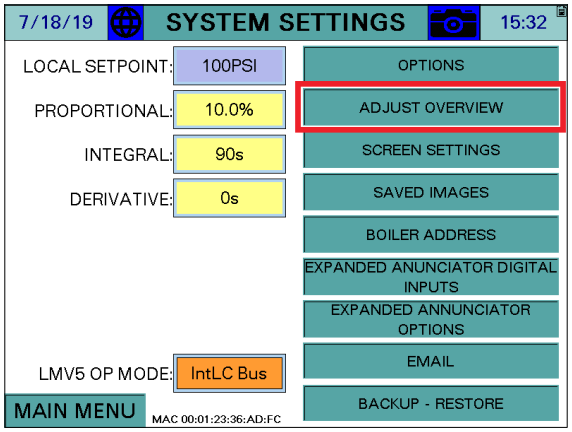
LOCK FOR CONTROL BY LEAD/LAG – Set automatically by the Lead/Lag Master to allow remote configuration when connected. This may be overridden when no longer connected to a Lead/Lag Master. To change touch for > 1s (hold down).

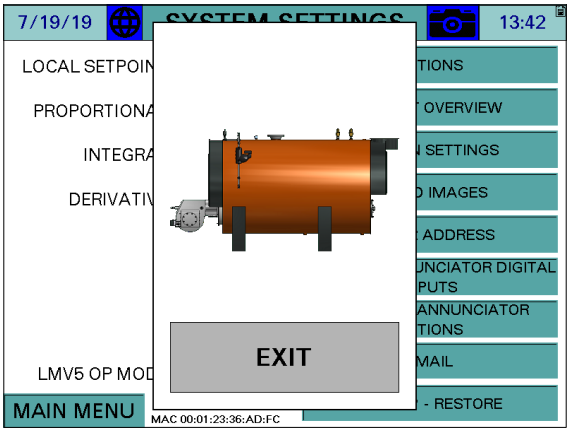
- **No**
- **Yes**

Configuration (continued)

Changing Boiler/Burner Graphic

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



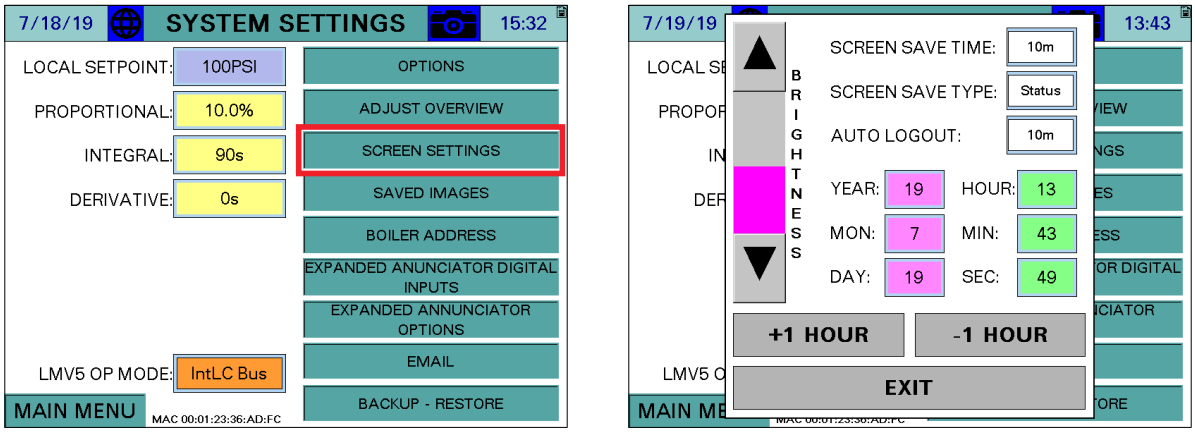


Touch the boiler vessel portion of the image to scroll through the available choices boiler choices. Touch the burner portion of the image to scroll through the available burner choices. When complete touch **EXIT** to confirm changes.

Configuration (continued)

Screen Settings

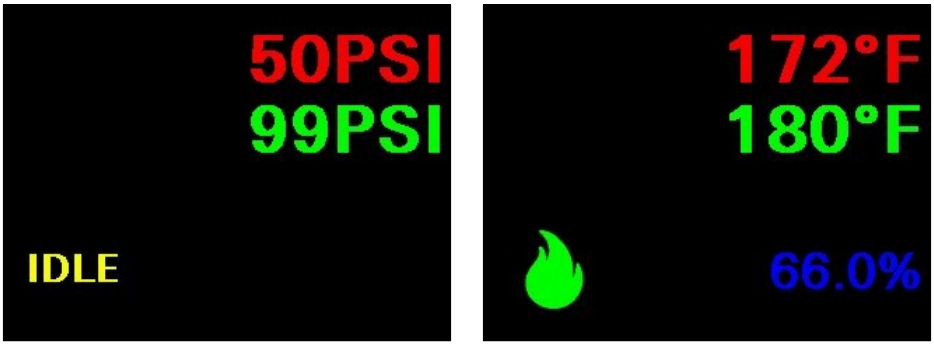
Touch **SCREEN SETTINGS** to adjust the touchscreen settings.



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

SCREEN SAVE TYPE – Selects 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.

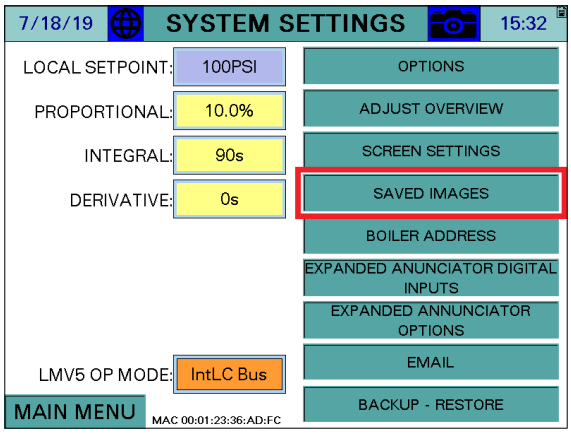
BRIGHTNESS – Sets the touchscreen brightness.

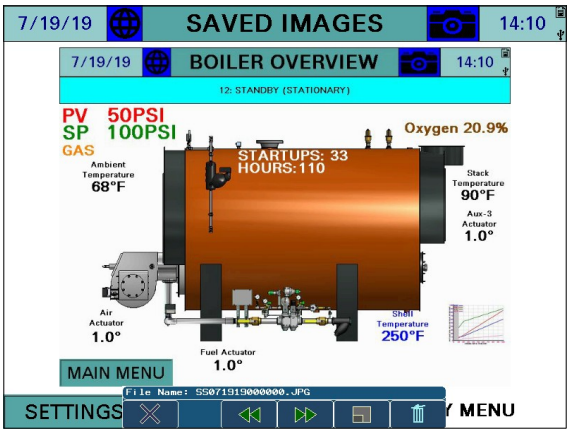
TIME – Sets the touchscreen time. **+1HR** and **-1HR** buttons are available for quick changes. Note that if the selected controller is an LMV5..., the time will automatically be set from the LMV5....

Configuration (continued)

Saved Images

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



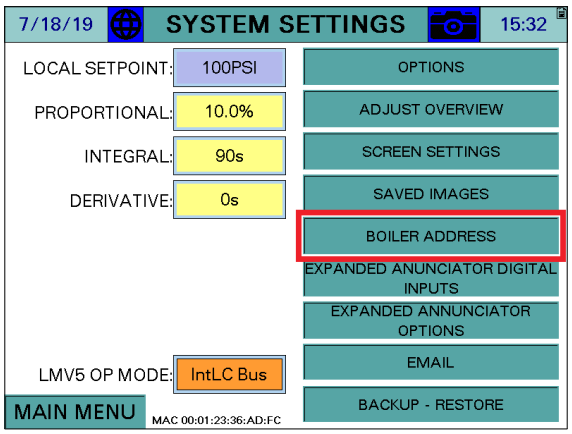


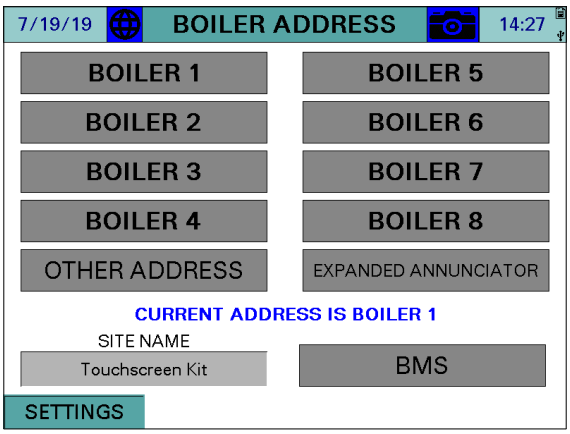
Configuration (continued)

Boiler IP Addresses

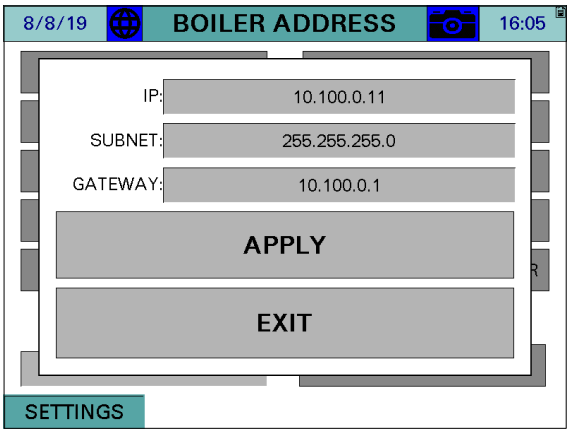
Touch **BOILER ADDRESS** to adjust the boiler address settings.

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.





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

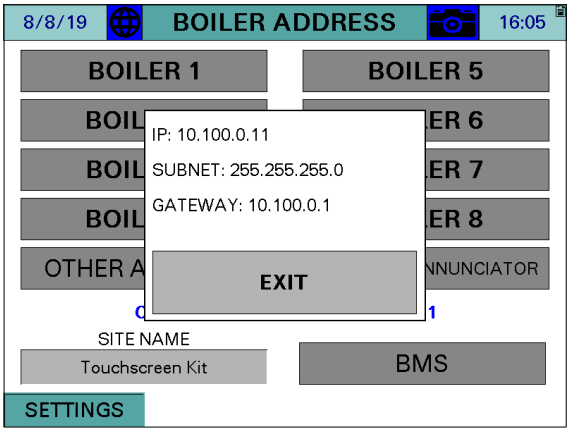


touch **APPLY** to confirm the changes.

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

Configuration (continued)

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



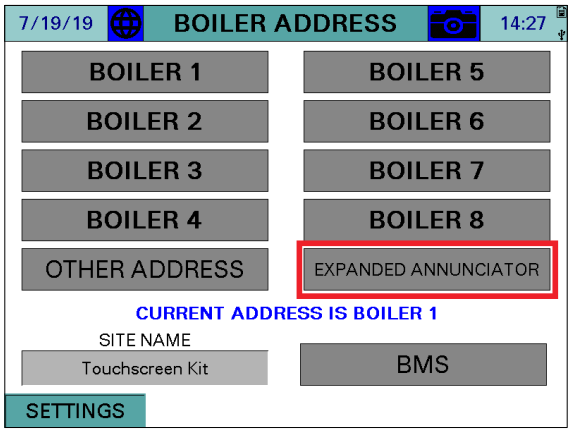
Default IP Addresses

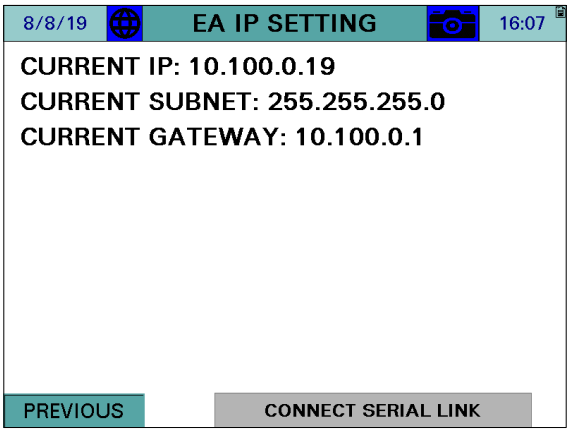
Boiler 1: 10.100.0.11
Boiler 2: 10.100.0.12
Boiler 3: 10.100.0.13
Boiler 4: 10.100.0.14
Boiler 5: 10.100.0.15
Boiler 6: 10.100.0.16
Boiler 7: 10.100.0.17
Boiler 8: 10.100.0.18
Subnet: 255.255.255.0
Default Gateway: 10.100.0.1

Configuration (continued)

Expanded Annunciator IP Address

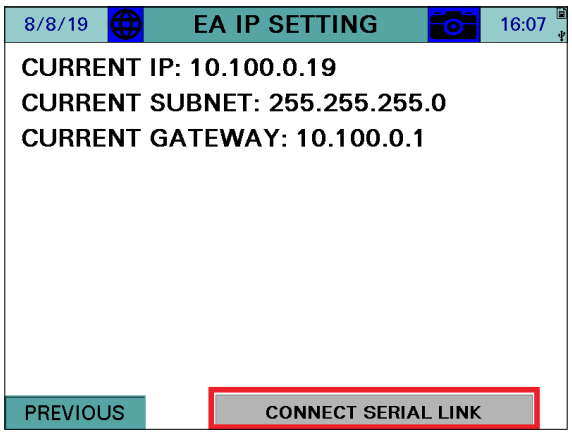
The Expanded Annunciator comes with a default IP address 10.100.0.19. To change this, touch **EXPANDED ANNUNCIATOR**. *If more than one Expanded Annunciator is connected in the same network, all of the IP addresses must be changed to unique addresses to avoid duplication.*

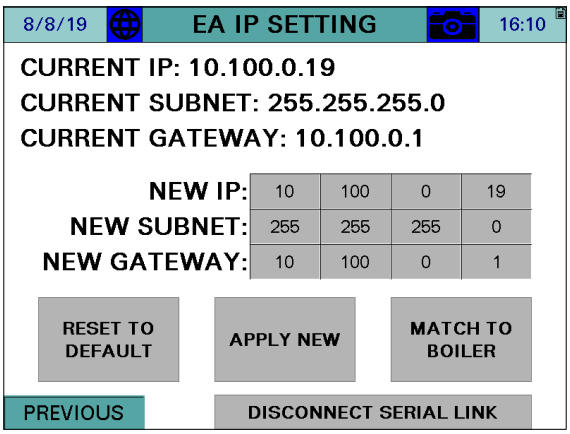




Configuration (continued)

To change the Expanded Annunciator IP address a temporary serial connection between the touchscreen and Expanded Annunciator controller must be established. To make the serial connection, use a standard Ethernet cable and connect it between 'COM1' on the touchscreen (disconnect existing cable) and 'RJ45 Serial 1' on the Expanded Annunciator. Once this connection is made, touch **CONNECT SERIAL LINK** to display the settings screen.





RESET TO DEFAULT – Sets the IP address back to 10.100.0.19. Once this is touched wait for the Expanded Annunciator to load the change and reboot to see the new settings.

MATCH TO BOILER – Sets the last octet of the IP address 10 higher than that of the boiler IP address. For example, if the IP address of the boiler is 10.100.0.11, the Expanded Annunciator IP address will be 10.100.0.21. This is required when multiple Expanded Annunciator units are connected in the same network.

Once the desired new IP address has been entered, touch **APPLY NEW** to send the changes to the Expanded Annunciator. The unit will reboot with the new IP address. Remove the temporary serial connection and touch **DISCONNECT SERIAL LINK**. The new IP address should be shown and communication with the Expanded Annunciator should be established.

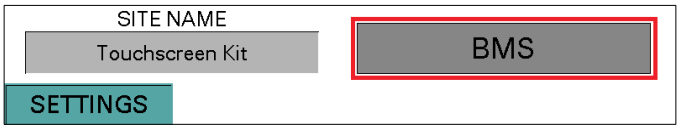
Reset to Default IP

If communication with the PLC cannot be established due to the IP address being unknown, there is an alternative to the serial link method to restore the default. The IP address can be reset to the default by pulsing 24VDC power through a push button to inputs **I11** and **I12** at least 30 times within 10 seconds. This can be applied directly to the PLC terminal or through the annunciation relays. The PLC will erase any stored IP (returning to the default), followed with a reboot.

Configuration (continued)

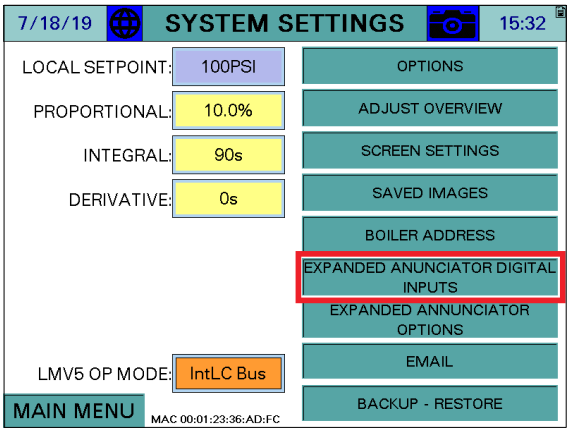
BMS Network Ethernet Port

The 10", 12," and 15" touchscreens have a second Ethernet port that can be addressed by touching **BMS**. This port allows the BMS to connect with Ethernet without having to change the IP addresses of other networked devices. The default BMS IP address is 192.168.1.11.



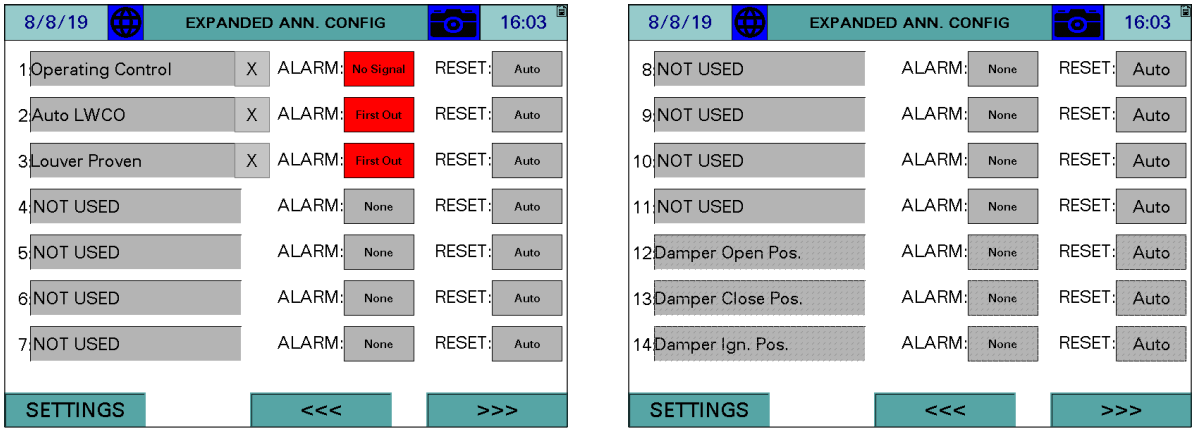
Expanded Annunciator Base Setup

touch **EXPANDED ANNUNCIATOR DIGITAL INPUTS** to configure base Expanded Annunciator settings. Use the arrows to scroll between the configuration pages.



Configuration (continued)

Digital Inputs



LIMIT 1-14 – Sets the user-configured name for each limit. The name may be up to 20 characters long. touch **X** for > 1s (hold down) to clear the name and reset input configuration. *Note that in the screen shown limits 12-14 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.
- **No Signal/Is Off:** Will alarm when the input is deactivated.
- **With Signal/Is On:** Will alarm when the input is activated.
- **First Out/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 touching **RESET EA ALARMS** on the ALARMS page.

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

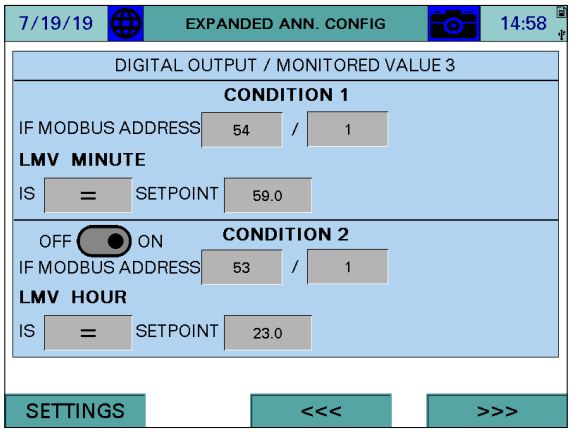
Additional Digital Input Options

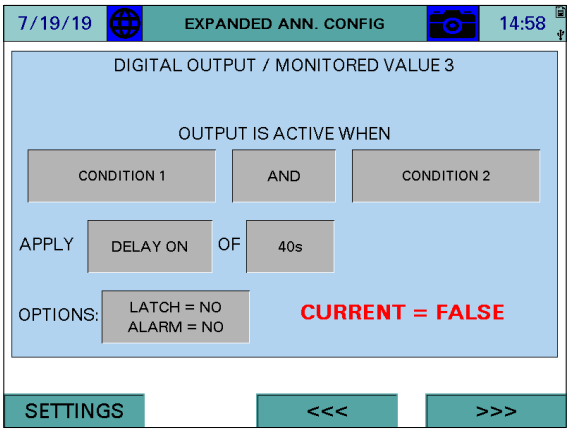
Assigning the name 'Alarm Reset PB' (case-sensitive) to any of the digital inputs will cause that input to act as a reset button for the Expanded Annunciator. Use this option when a hard-wired reset button is preferred.

Configuration (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.





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. Modbus regsters list could be found starting on page 104.

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.

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.

Configuration (continued)

LOGIC – Select the logic applied between the conditions.

- **AND:** Will apply AND gate (and) logic.

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

- **OR:** Will apply OR gate (or) logic.

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

- **NAND:** Will apply NAND gate (negative and) logic.

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

- **NOR:** Will apply NOR gate (negative or) logic.

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

- **XOR:** Will apply XOR gate (exclusive or) logic.

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

- **XNOR:** Will apply XNOR gate (negative exclusive or) logic.

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

Configuration (continued)

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 touching **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.

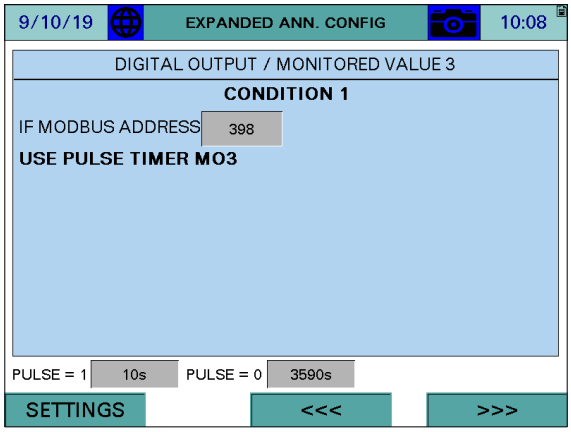
The current state of the logic is also displayed with true in green and false in red.

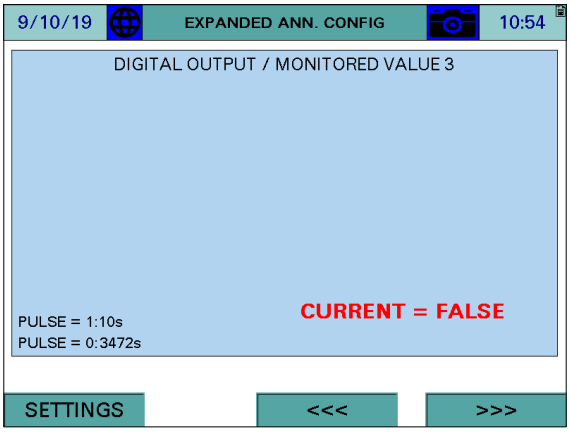
Configuration (continued)

Monitored Digital Outputs (Recycling Pulse Output)

The monitored digital outputs can be configured to provide an asymmetrical recycling pulse output. This is an output that is continuously on and off for fixed time periods. This output can be used for a process that must occur periodically throughout a day. Using the pulse output overrides all logic and doesn't use two conditions.

To activate the pulse output for monitored digital output 3, use Modbus address **398**. For monitored digital output 4, use Modbus address **399**.





PULSE = 1 – Sets the duration that the output will be on (in seconds). The maximum duration is 65535s (18 hours, 12 minutes, 15 seconds). The current countdown for the timer is shown on the second (status) screen.

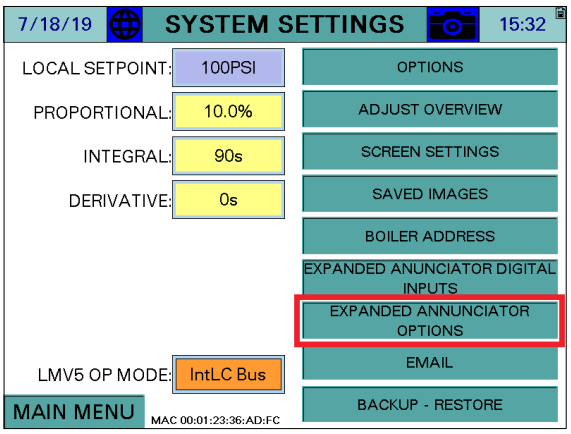
PULSE = 0 – Sets the duration that the output will be off (in seconds). The maximum duration is 65535s (18 hours, 12 minutes, 15 seconds). The current countdown for the timer is shown on the second (status) screen.

In the above example, the output would be on for ten seconds and then off for just under an hour. Effectively, the output will be on for ten seconds every hour. To calibrate the on and off pulses to a specific time, set the on pulse to 0s (output will always be off) and only set to the desired time when you want the on pulse to begin.

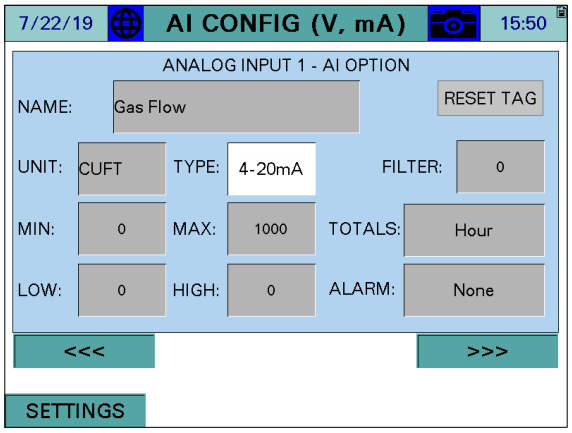
Configuration (continued)

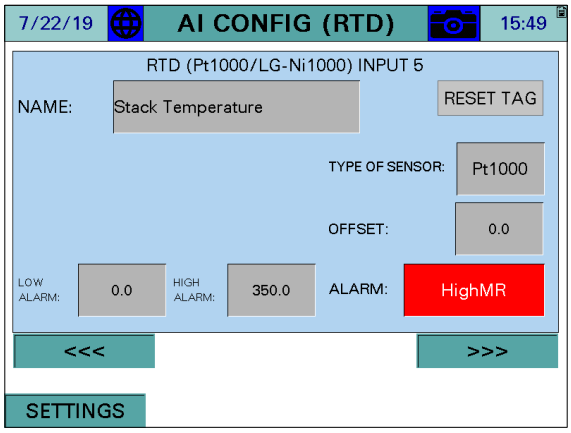
Expanded Annunciator Options Setup

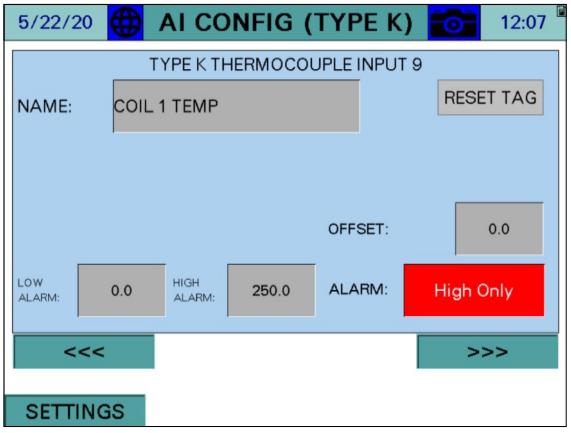
touch **EXPANDED ANNUNCIATOR OPTIONS** to configure optional Expanded Annunciator settings.



touch the arrows to scroll between the configuration pages.







Configuration (continued)

Analog Inputs

The first four inputs numbered 1-4 can be configured for voltage or current.

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

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

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

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

FILTER – Sets the filter time used to average the incoming signal. This is useful when the signal is not steady.

MIN, MAX – Sets the range of the input. The minimum value is -5000 and the maximum value is 60000. If the range of a connected input is greater than 60000 (such as a flow scaled from 0-100000), scale the sensor maximum as 10000 and label 'Flow x10'.

TOTALS – Sets the totalization for the input.

- **None**
- **Minute:** Totalization is calculated by the minute.
- **Hour:** Totalization is calculated by the hour.

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.

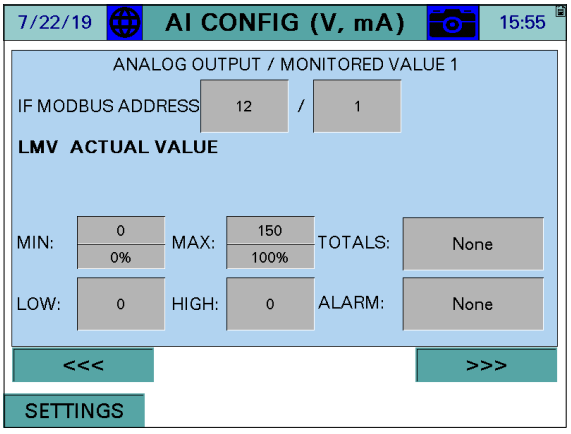
Configuration (continued)

ALARM – Select the alarms generated by the input. Manual reset alarms may be reset by touching **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.

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.

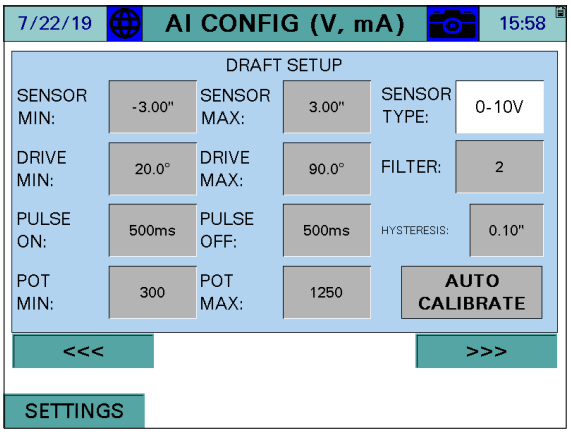
MIN, MAX – Sets the monitored range for the analog output. If the actual value falls outside of this range, the minimum or maximum value will be the output. The percentages shown set the scale of the physical analog output. If the minimum is more than the maximum, the output will be reverse-acting (maximum output indicates low range, minimum output indicates high range).

Example: Address 12, 'LMV ACTUAL VALUE' is being monitored with a range of 0-150 (psi). If the physical scale is set from 0% to 100% (full range for 0-10V or 0-20mA), a reading of 75psi would yield an output of 5V or 10mA. If that scale was set from 20% to 100% (full range for 2-10V or 4-20mA), the output would be 6V or 12mA.

TOTALS, LOW, HIGH, ALARM – These options are identical to and configured the same way as the analog input options of the same names.

Configuration (continued)

Draft Control



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.

HYSTERESIS – Sets allowable discrepancy between the setpoint and draft sensor. Used to lower the duty cycle on the draft actuator.

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 – Manually 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. The potentiometer will automatically re-calibrate each end position with every cycle of the damper.

Additional Draft Options

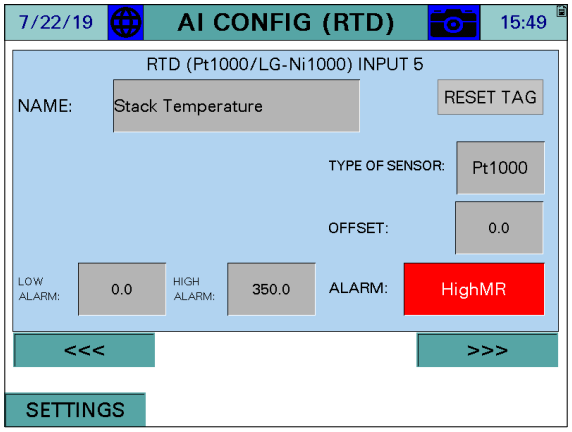
Assigning the name 'Draft Switch Auto' (case-sensitive) to any of the digital inputs will cause that input to replace the virtual OPEN-AUTO switch (activation = AUTO). Use this option when a hard-wired switch is preferred.

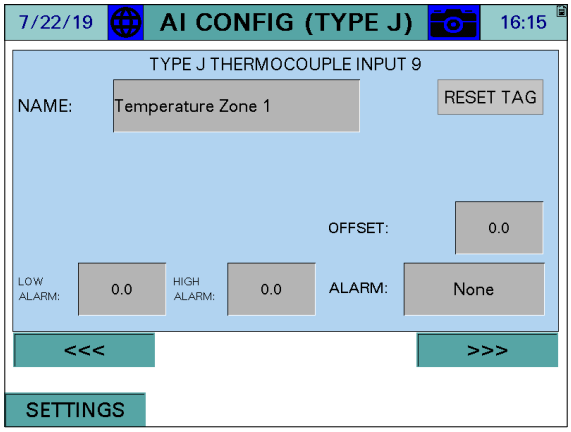
Configuration (continued)

Universal Inputs

Up to three universal input modules can be added, each with four inputs. These are numbered in groups as inputs 5-8, 9-12 and 13-16. There are five choices available for each module. The second and third modules must be of the same type.

- Pt1000/LG-Ni1000
- Pt100
- Type J thermocouples
- Type K thermocouples
- 4-20mA





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

Once a name is entered, the input is activated and the remaining configuration information will appear. If the card is configured for 4-20mA, separate the name of the input from the suffix using a comma, such as "Steam Flow,PPH".

TYPE – Select between Pt1000 or LG-Ni1000. This only applies when configured for Pt1000/LG-Ni1000. To change, touch for > 1s (hold down).

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

SENSOR RANGE – Sets the upper range for a 4-20mA input. If this number is positive, the minimum range is fixed to 0. If negative, the input is bidirectional (for example, entering a range of 50.0 would make the input scaled from -50.0 to 50.0). Applies to 4-20mA inputs only. The limits of the range are -3276.8 to 3276.7 (all readings have 0.1 accuracy). For higher ranges, use the analog input option.

LOW, HIGH, ALARM – These options are identical to and configured the same way as the analog input options of the same names.

Configuration (continued)

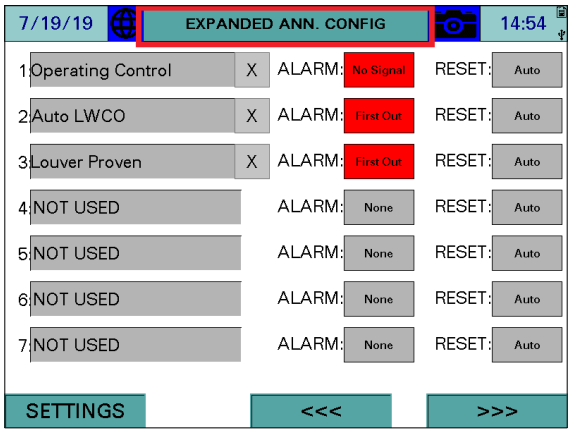
Changing Universal Input Type

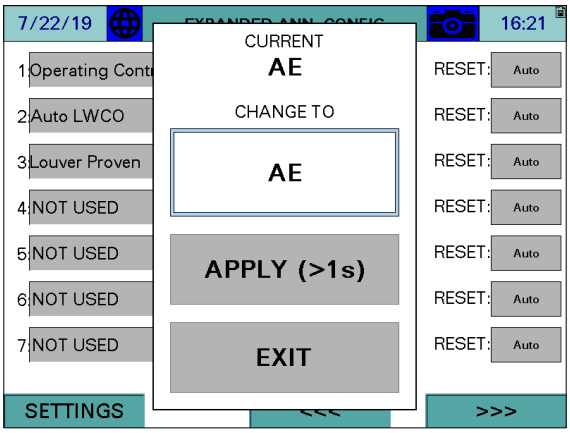
The assignment of the universal inputs is determined by the firmware that is running in the expanded annunciator. The firmware can be changed but doing so will erase all of the current settings in the expanded annunciator. It is recommended that all settings are backed up to USB before proceeding.

The firmware name consists of two letters, each from A-E. The first letter indicates the setting of the first universal module, while the second letter indicates the setting of the second and third universal modules. If there is only one such module, the second letter can be set to any value. The following are the letter assignments.

- A = Pt1000/LG-Ni1000
- B = Pt100
- C = Type J thermocouples
- D = Type K thermocouples
- E = 4-20mA

To change the firmware, touch the title bar of the "Expanded Annunciator Base Configuration" page for > 2s (hold down). This will display the current firmware and bring up a prompt that allows this to be changed. Once changed, the expanded annunciator will reboot into the new firmware, **erasing all current settings.**

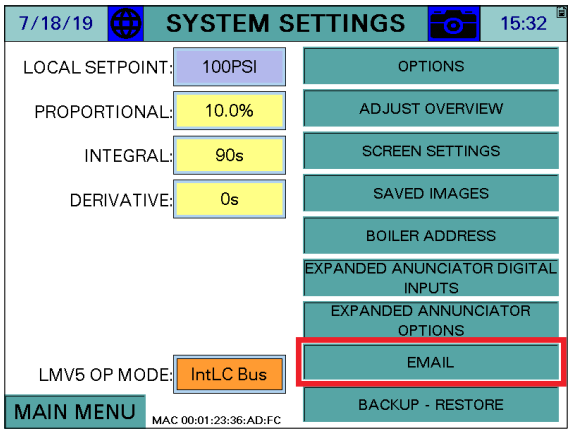


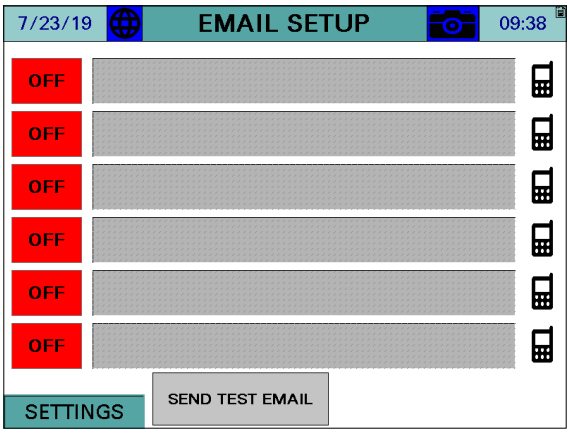


Configuration (continued)

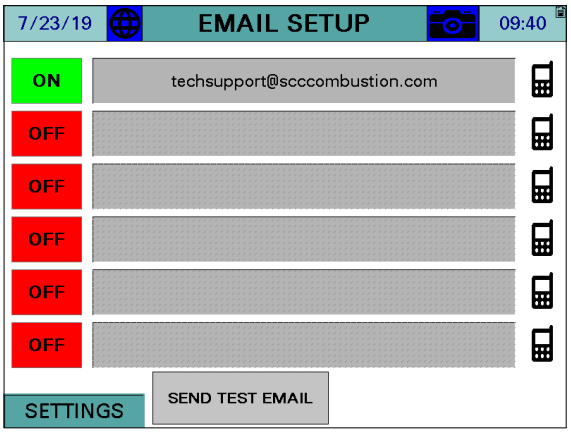
Email

touch **EMAIL** to configure email settings.





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



To check that the email addresses are valid and were entered correctly, make sure that the LAN connection is made, touch **SEND TEST EMAIL**.

Configuration (continued)

Shortcuts/Special Characters

Special character sequences can be used to generate commonly-used strings or characters that don't exist on the keyboard (such as an underscore). To use these, start with a space (" ", denoted in the example as **<sp>**) or a backslash ("\") followed by one of the shortcut commands. End the shortcut with an additional space or backslash (unless it is the last command, then it is optional). The following shortcut commands are available:

- u = underscore ("_")
- d = dot (".")
- a = at ("@")
- h = hyphen ("-")
- c = .com
- e = .edu
- g = .gov
- o = .org
- on = 1
- tw = 2
- th = 3
- fo = 4
- fi = 5
- si = 6
- se = 7
- ei = 8
- ni = 9
- ze = 0
- gm = @gmail.com
- hm = @hotmail.com
- y = @yahoo.com
- ol = @outlook.com
- aol = @aol.com

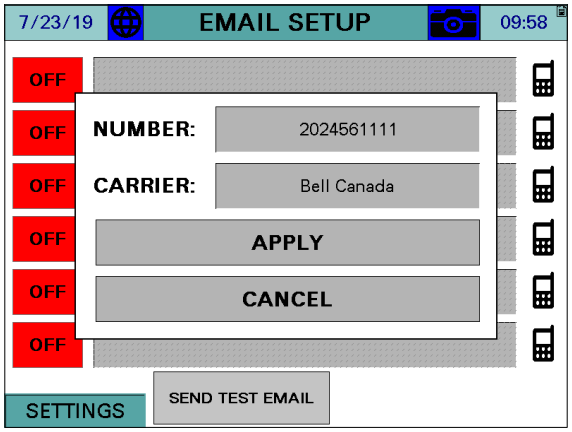
The case of the text is not important. Uppercase characters will also work but the whole shortcut must be in one case (all lower or upper). Using these shortcuts makes it possible to type an entire email address without having to switch pages on the keyboard. For example, to type in example123@gmail.com using shortcuts, you'd type "example**<sp>**on**<sp><sp>**tw**<sp><sp>**th**<sp><sp>**gm". Notice that since each command requires a space both before and after, there are two spaces between each command. The space at the end is also omitted since it is the last command.

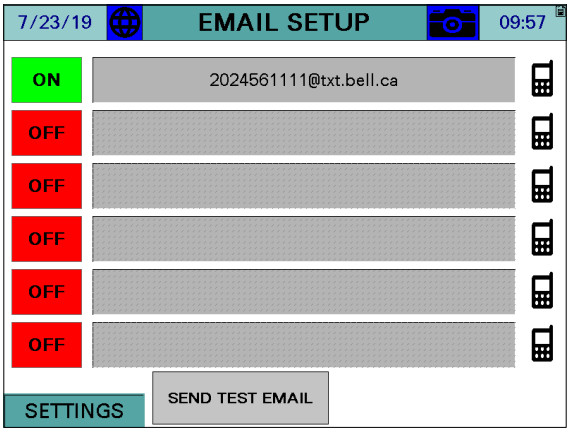
After the short version is entered the correct version will automatically replace it so it can be checked for accuracy.

Configuration (continued)

Text Messages

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



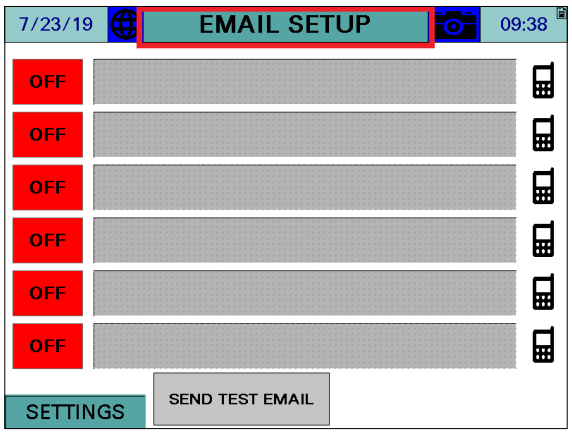


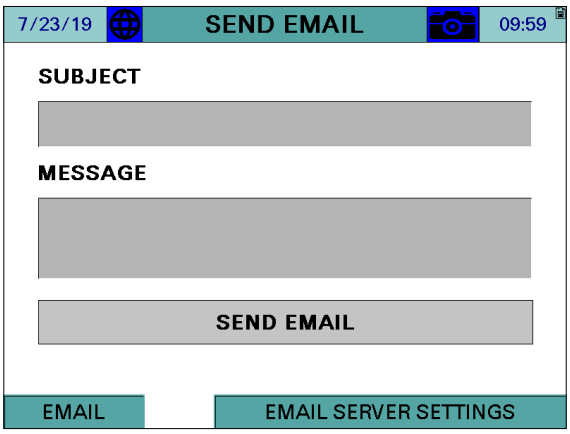
To check that the email addresses are valid and were entered correctly, and the text massages are getting emailed correctly touch **SEND TEST EMAIL**.

Configuration (continued)

Other Options

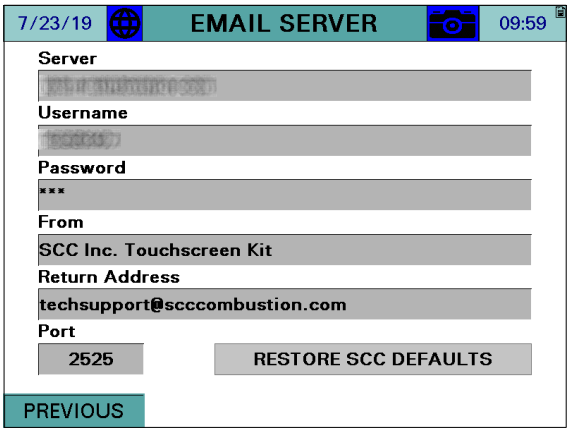
Additional email options are available by touching **EMAIL SETUP** for > 5s (hold down). This displays the EMAIL MANUAL screen.





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

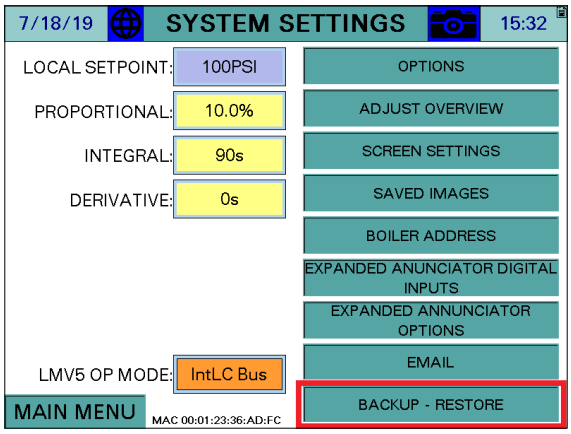
Touch **EMAIL SERVER SETTINGS** to display the EMAIL SERVER screen. The default email server settings can be changed if necessary. touch **RESTORE SCC DEFAULTS** to restore the server settings to the factory defaults. Note that if using the default settings, the return address cannot be changed or the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

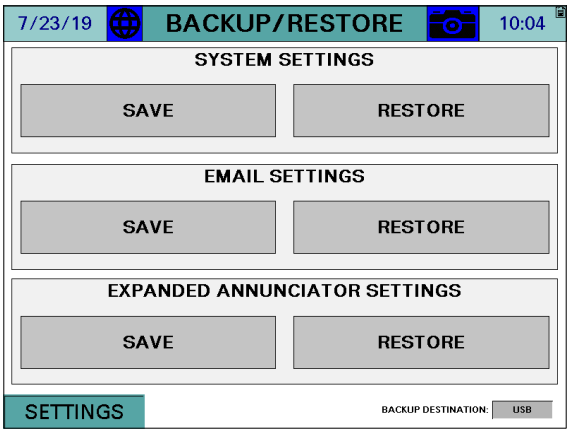


Configuration (continued)

Backup/Restore

touch **BACKUP-RESTORE** to backup or restore settings.





System settings, email settings or Expanded Annunciator settings can all be saved to an external USB drive or internal SD card (10", 12," and 15" only, selected from **Backup Destination**) for backup and migration to other units. The data is saved in a file (.csv or .txt) and can be edited using a standard text editor or spreadsheet application. For the desired group, touch **SAVE** to save the current settings and touch **RESTORE** to overwrite the current settings. If a backup file does not exist or invalid parameters are found, an error message will be displayed.

System Settings

System settings are the configuration options. This is the data found on “OPTIONS” screen, “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 3.5"/6", 10” for 10"/12"/15"

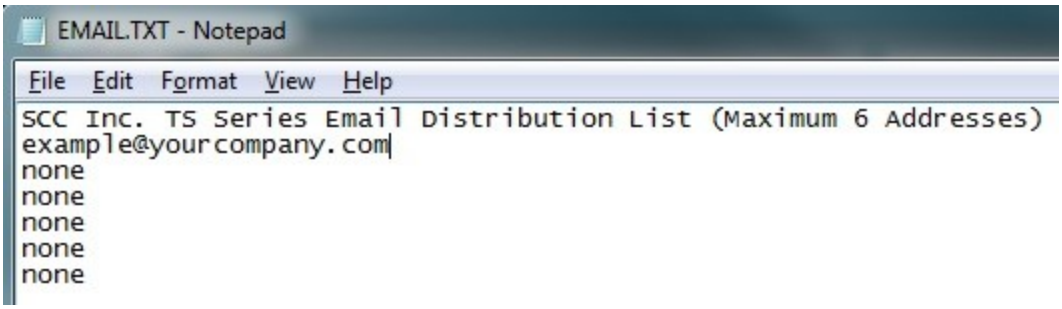
	A	B	C	D
1	SCC Inc. Touchscreen Kit System Configuration			
2	TAG	BOILER		
3	F0TAG	GAS		
4	F0FLAME	0		
5	F1TAG	OIL		
6	F1FLAME	1		
7	SITE	Touchscreen Kit		

Configuration (continued)

Email Settings

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 3.5"/6", 10 for 10"/12"/15"



Expanded Annunciator Settings

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 3.5"/6", 10 for 10"/12"/15"

	A	B	C	D	E
1	SCC Inc. Touchscreen Kit Expanded Annunciator Configuration				
2	//Digital Annunciation Input 1				
3	EA1_TAG	Op Control			
4	EA1_TYPE	0			
5	EA1_LATCH	0			

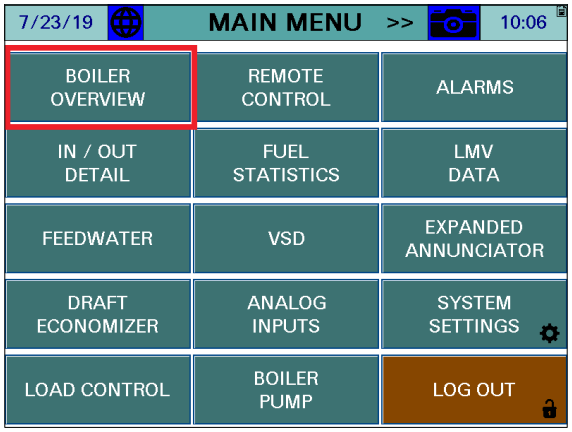
Restore Factory Defaults

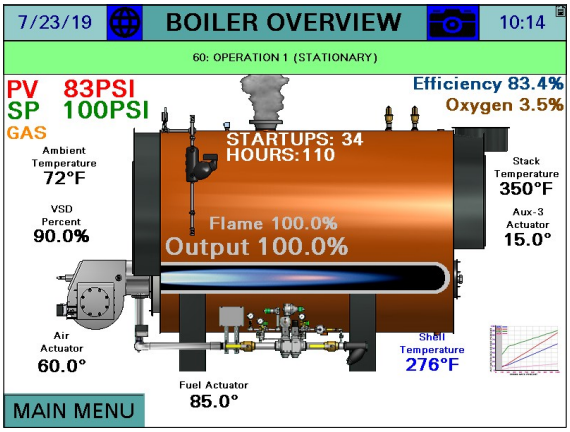
System settings or Expanded Annunciator settings can individually be restored to the factory defaults. This is without site configuration (as the panel was shipped). Choose **Default** in the **Backup Destination** field, then touch **RESTORE** for the desired settings group.

Boiler Overview

Access level: **USER**

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





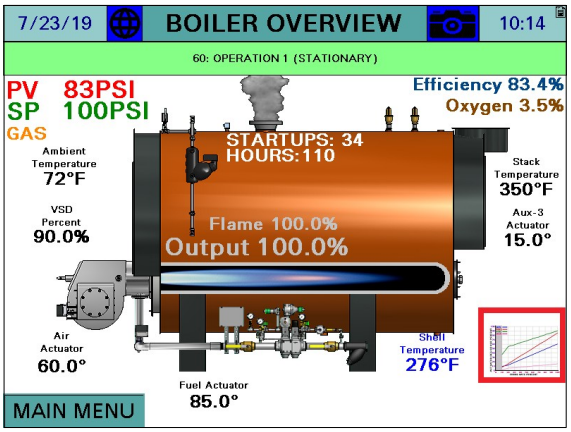
Only the parameters that are optioned and active are shown. Any others are hidden from the display for clarity. Touching the field displaying the O_2 trim data will display additional data. The following parameters may be shown on the overview screen:

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 (LMV5... 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 (LMV52 only).
Ambient: Displays the current ambient temperature (LMV52 only).
Efficiency: Displays the current combustion efficiency (LMV52 only).
O_2: Displays the current O_2 percentage in the stack (LMV52 only).
Excess Air: Displays the current excess air percentage in the stack (LMV52 only).
CO_2: Displays the current CO_2 percentage in the stack (LMV52 only).
Lead/Lag Status: Displays the current lead/lag status when connected to a Lead/Lag Master (option **LOCK FOR CONTROL BY LEAD/LAG** must also be set to **Yes**).

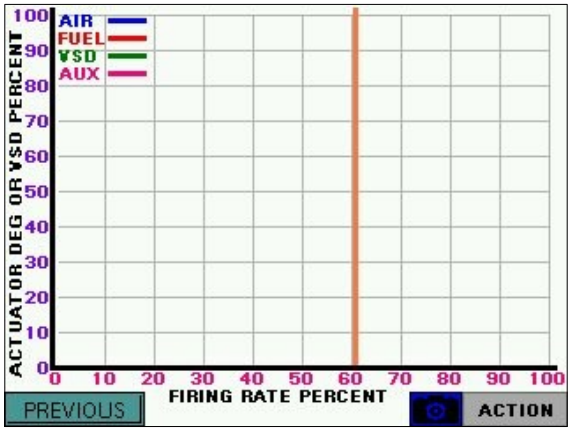
Boiler Overview (continued)

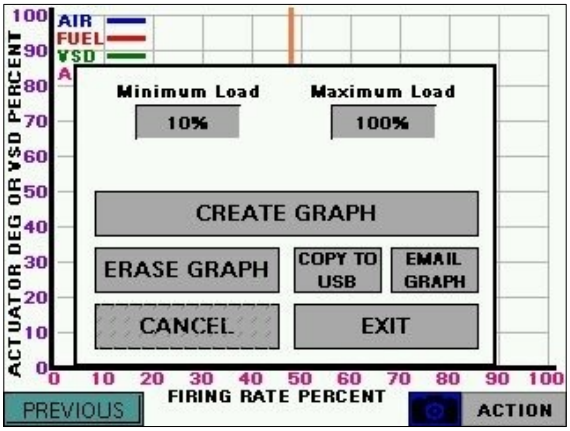
Curve Data

After commissioning the LMV…, a graphical curve of the actuator and VSD positioning can be generated. touch the image of the curve graph to generate a new curve graph or to view the existing.



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



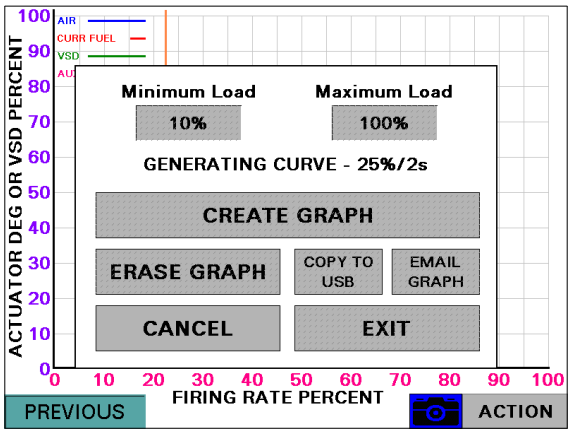


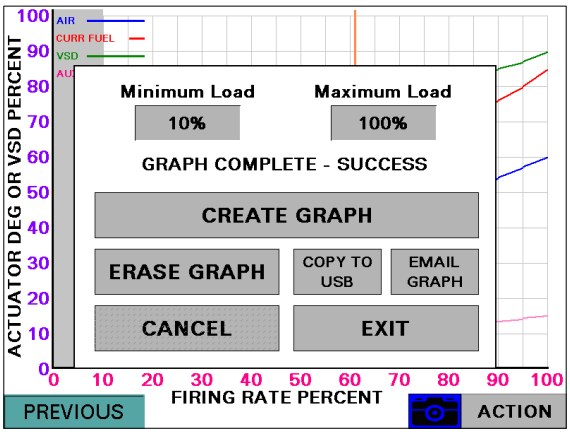
Minimum Load, Maximum Load – Sets the range of allowable modulation. These must be set to unlock the **CREATE GRAPH** button. *These settings must be within the range of allowable modulation or the curve generation will not be successful.*

CREATE GRAPH – Activates the curve generation. This commands the LMV... to run at firing rates from the minimum to maximum incrementally and will record the data. *There must be sufficient load for the curve generation process to be completed or it will have to be restarted. Make sure to generate the graph when there is no load demand for the related boiler.*

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 or the point is out of the allowable modulation range), 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. touching **ERASE GRAPH** will clear all stored graph data.

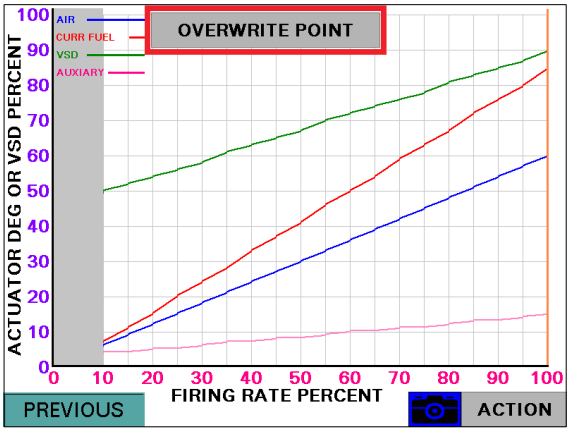




Touch **COPY TO USB** to save the graph data to a .csv file. If email is configured, touch **EMAIL GRAPH** to send an email with the graph data .csv file attached. Note that a USB drive must be inserted to send email since the attached file is first stored on the USB drive.

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 3.5"/6", 10 for 10"/12"/15"
Filename = LMV_CURVE_DATA_mm_dd_yyyy.CSV, mmddyyyy are date

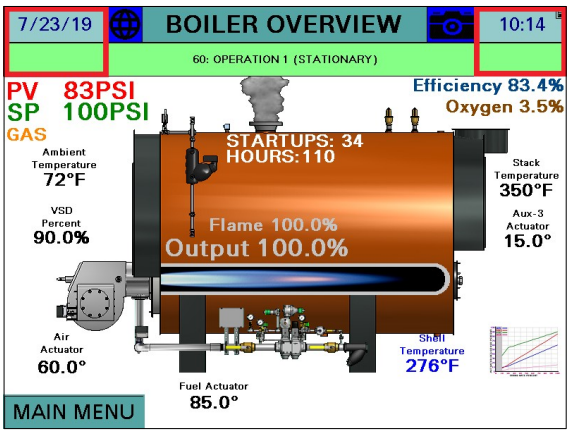
If the LMV is held at any even point on the graph (10%, 20%, 30%, etc.) the **OVERWRITE POINT** button will appear. To overwrite the saved data with the current data, touch for > 2s (hold down). The 3.5"/6" touchscreen kits will graph 10 points and the 10"/12"/15" touchscreen kits will graph 20 points.



Boiler Overview (continued)

Forcing Screen Saver

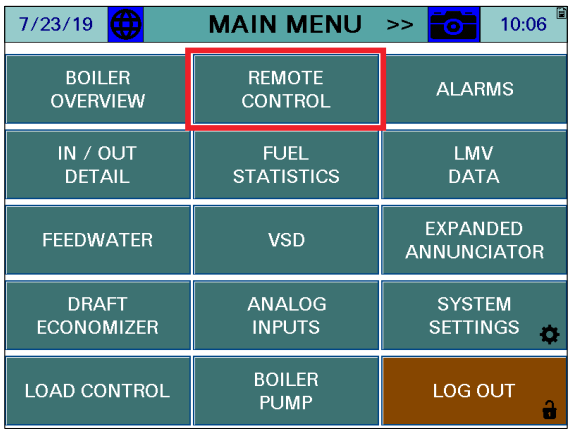
Touching either of the top corners for > 1s (hold down) will force the screen saver to display (if configured).

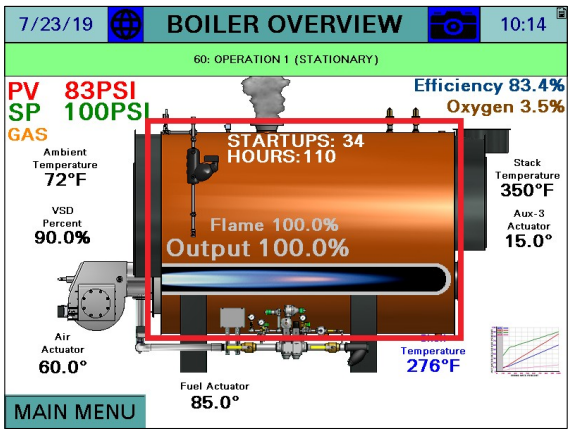


Remote Control

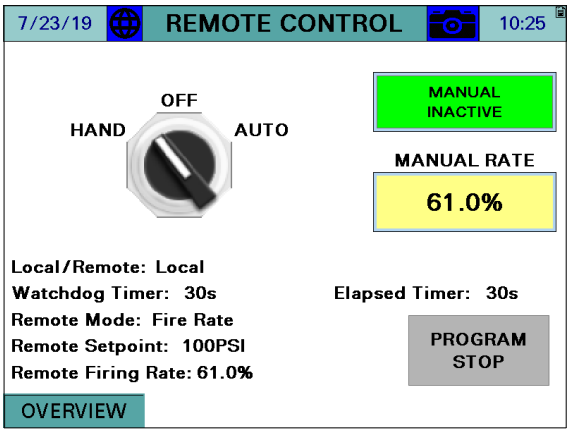
Access level: **USER**

The HAND-OFF-AUTO mode of the boiler may be set at any time. The REMOTE CONTROL screen can be accessed from either the MAIN MENU or from the BOILER OVERVIEW screen. From the MAIN MENU screen, touch **REMOTE CONTROL**. From the BOILER OVERVIEW screen, touch the boiler image in the field shown. For the LMV5, the “HAND OFF AUTO” switch appears when the LMV5 internal load controller is set for “IntLC Bus”.





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** for additional detail.

- **HAND:** The boiler is commanded to run off of its local LMV or RWF setpoint.
- **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 hand “local setpoint” if remote commands are invalid or not present.

Warning: If the LMV5 is in remote firing rate control mode, an external automatic reset temperature or pressure control must be present on the boiler since the internal load control thermostat function is not active in this mode “SD Mod-Off will not be active”.

Remote Control (continued)

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

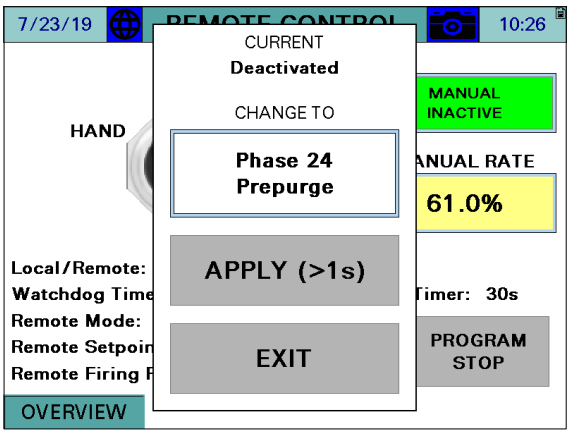
- **INACTIVE**
- **ACTIVE**

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 On	W3	n/a
AUTO (Watchdog Expired)	Local	n/a	W1/W2	Internal LC

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

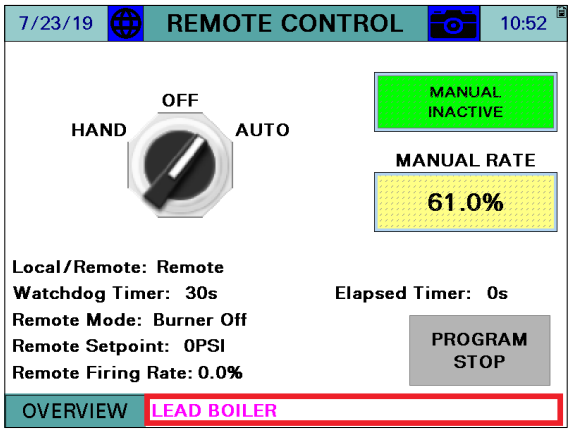


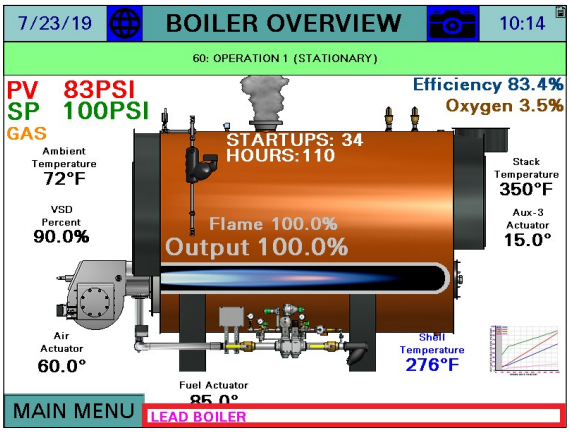
After the new program stop is selected, touch **APPLY** for > 1s (hold down) to save change. touch **EXIT** when finished. **PROGRAM STOP** when activated, it will stop the boiler start sequence at the selected phase, to proceed with the boiler start sequence, deactivate the **PROGRAM STOP** feature.

Remote Control (continued)

Boiler Available Status

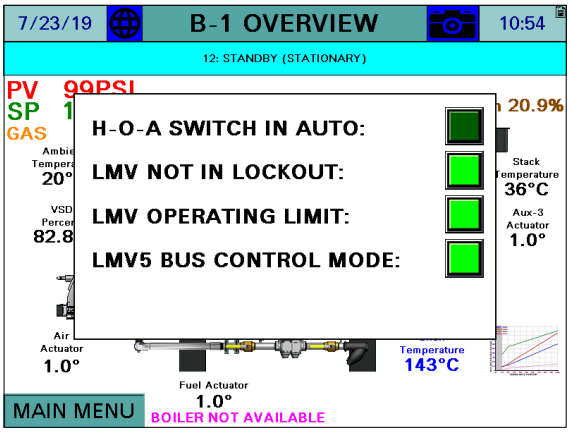
If connected to a Lead/Lag Master, touching the lead/lag status message from the **OVERVIEW** or **REMOTE CONTROL** screen will display the BOILER AVAILABLE detail screen. Note that a status of 'BOILER NOT AVAILABLE' does not mean that a boiler can't be operated, only that the Lead/Lag Master is not allowed to control it due to a requirement not being satisfied.





The criteria for a boiler to be available are listed. Criteria that are currently active will display with a bright green background. Criteria that are currently inactive will display with a dull green background. This helps determine why a boiler is not available to the Lead/Lag Master.

If any of the condition below is not in green, the related boiler will not be available for the lead/Lag Master, but the boiler could be running on local setpoint, or turned off for maintenance or else.



Remote Control (continued)

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

Table 3: Lead/Lag Status Messages

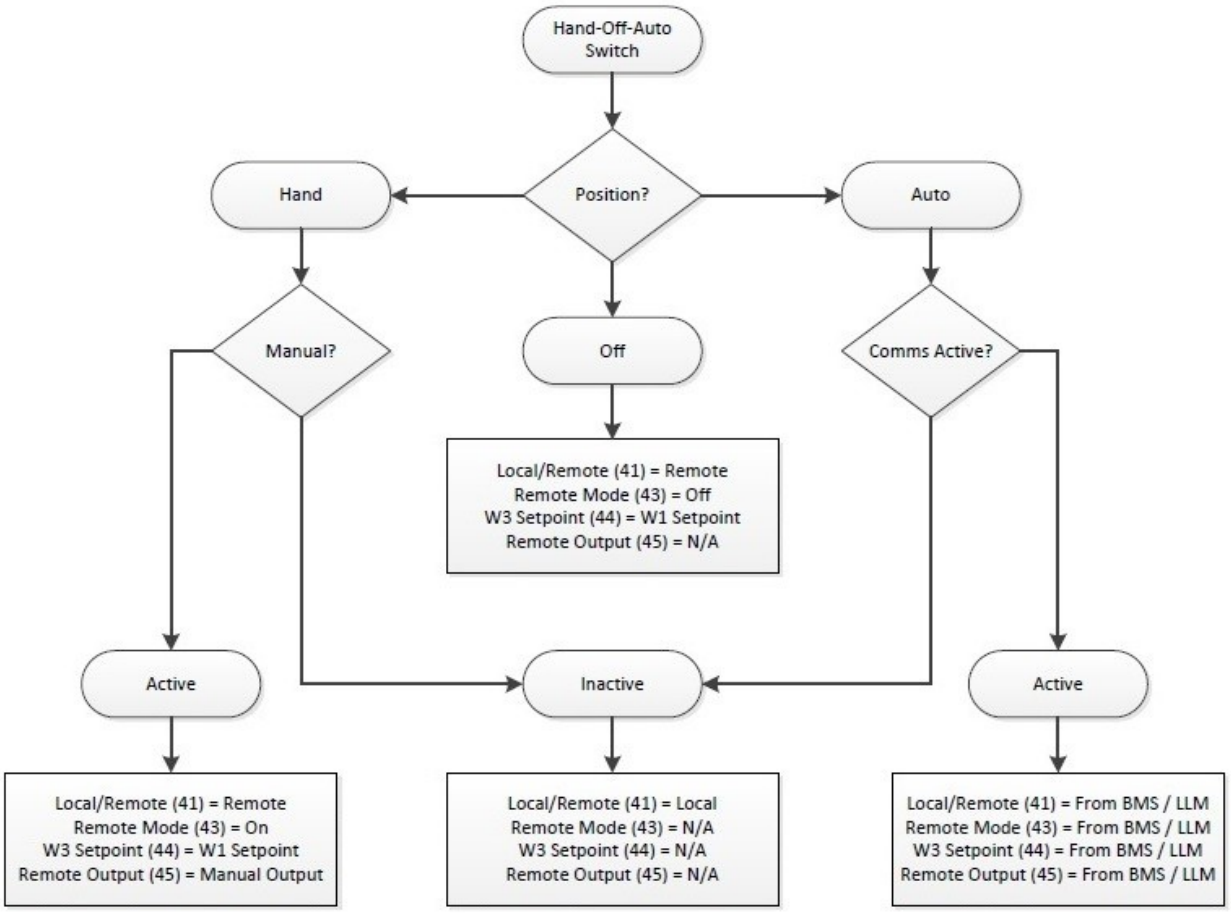
Message	Definition
LEAD/LAGx BOILER	The current boiler designation.
LEAD/LAGx BOILER – WSB ACTIVE ON TEMP	The current boiler designation, also indicates that warm standby is active due to temperature.
LEAD/LAGx BOILER – WSB MIN RUN	The current boiler designation, also indicates that warm standby is active 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.

Dual-fuel With Staged Oil

If the burner is dual-fuel with modulating gas and staged oil, the burner must be manually operated to the maximum number of stages while connected. Doing so sets staged mode for oil as well as the number of stages. This allows for the manual fire output to display as stages.

Remote Control (continued)

Hand-Off-Auto Flowchart (Serial Connection)

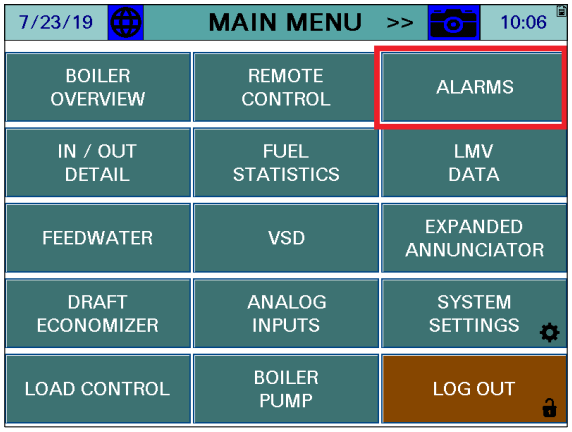


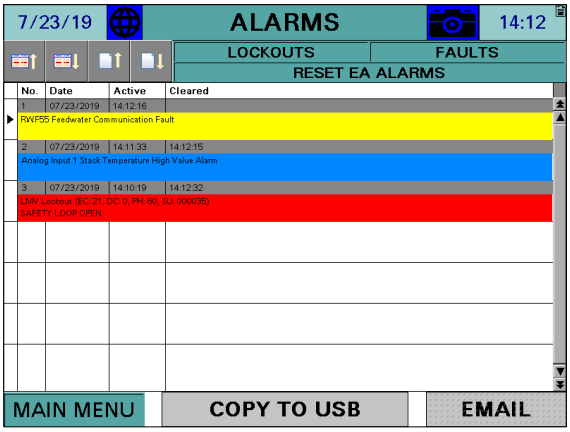
Alarms

Access level: **USER**

Alarms are displayed on a dedicated alarm screen. The last 100 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, touch **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 alarms will be displayed with the following information:

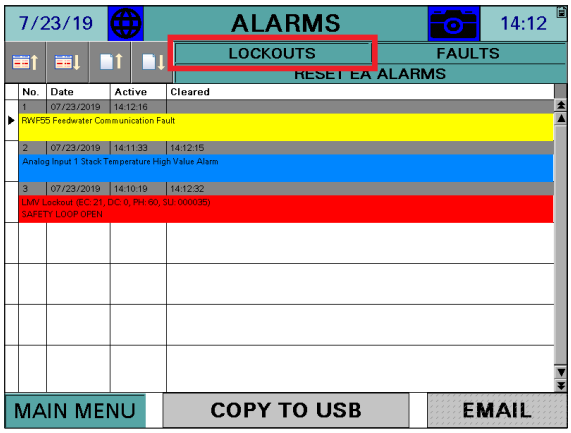
- **No. –** Number of the alarm in the list (1 is most recent).
- **Date –** Displays the date that the alarm occurred.
- **Active –** Displays the time when the alarm became active.
- **Cleared –** Displays the time when the alarm was cleared.

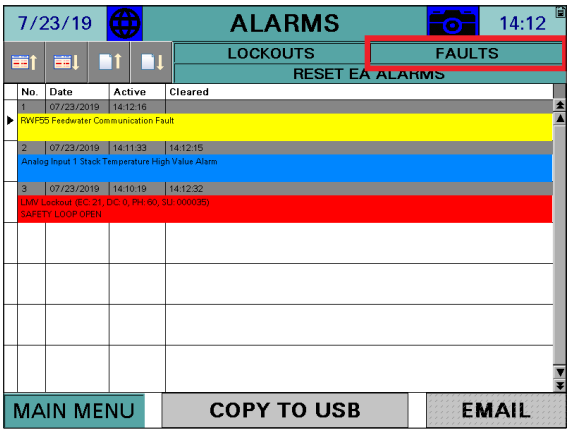
The icons at the top of the screen may be used to navigate through the list of alarms:

- Move up one alarm on the list.
- Move down one alarm on the list.
- Navigate up one page on the list.
- Navigate down one page on the list.

Alarms (continued)

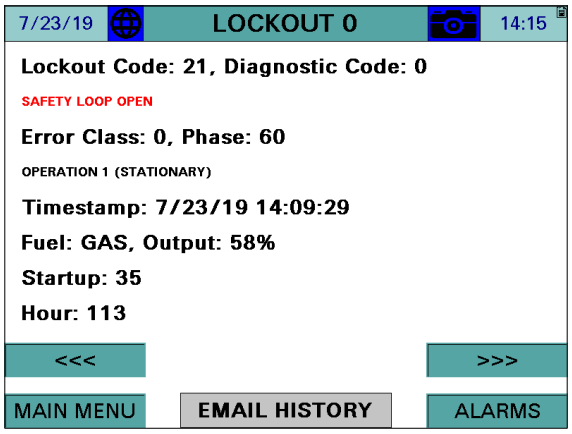
From the ALARMS screen, touch **LOCKOUTS** to access the lockout history (only appears for LMV5… controllers) or touch **FAULTS** to access the fault history. The 9 most recent lockouts are displayed and the 21 (LMV5…) or 25 (LMV3…) most recent faults are displayed. Index 0 is the most recent and higher numbers are older entries.

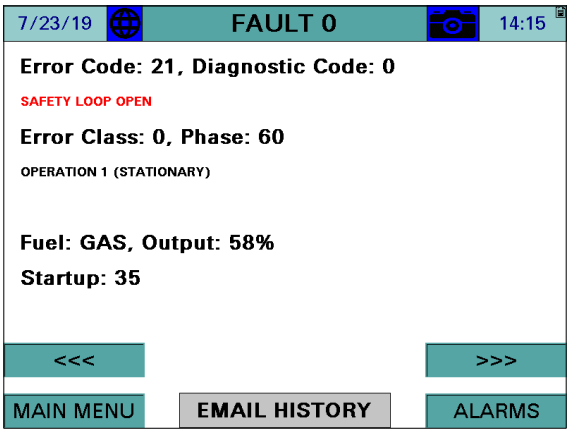




Alarms (continued)

touch 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.

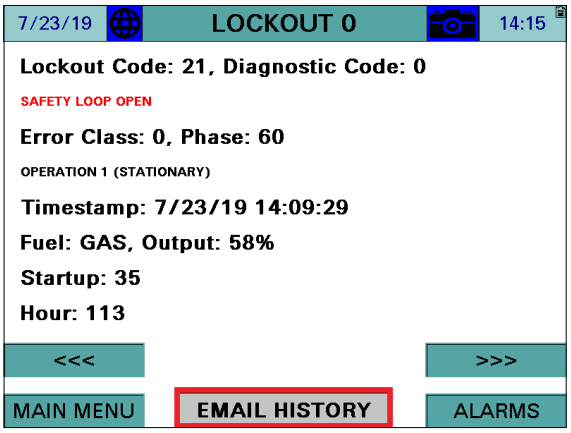
STARTUP COUNTER – Displays the start number when the lockout or fault occurred.

HOURS COUNTER – Displays the total number of hours run when the lockout occurred (lockouts only).

Alarms (continued)

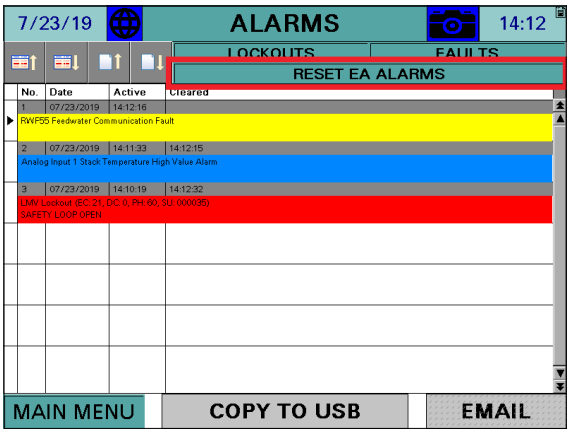
Touch **COPY TO USB** to save the complete lockout or fault history to a file (.csv). If email is configured, touch **EMAIL HISTORY** to send an email with the lockout or fault history file attached. Note that a USB drive must be inserted to send email since the attached file is first stored on the USB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

On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 3.5"/6", 10 for 10"/12"/15"
Filename (lockouts) = LMV_LOCKOUT_HISTORY_mm_dd_yyyy.CSV, mmddyyyy are date
Filename (faults) = LMV_FAULT_HISTORY_mm_dd_yyyy.CSV, mmddyyyy are date



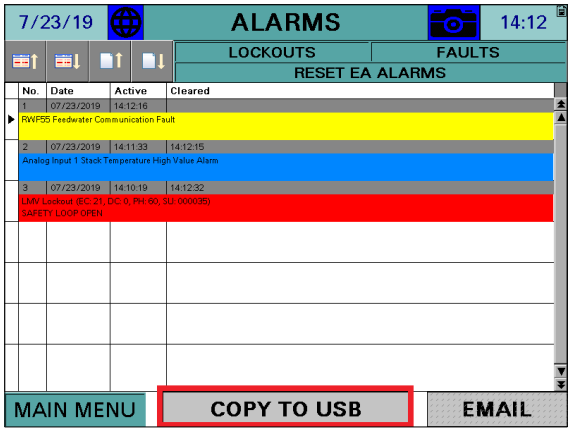
Alarms (continued)

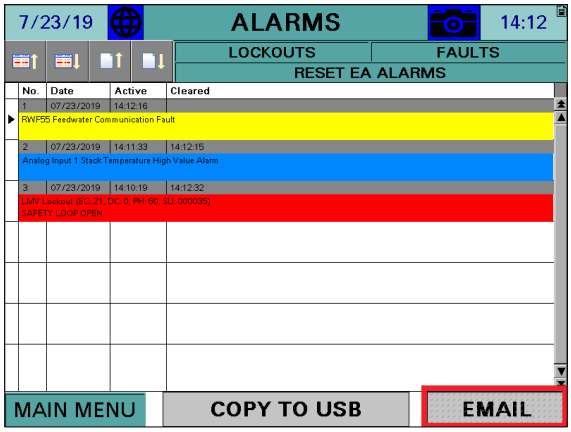
From the ALARMS screen, touch the **RESET EA ALARMS** button to clear expanded annunciator alarms designated as manual reset or latched. This button has no effect on LMV alarms. LMV alarms will reset automatically when the alarms clears, or LMV manual reset takes place.



Touch **COPY TO USB** to save the complete lockout or error history to a file (.csv). If email is configured, touch **EMAIL** to send an email with the lockout or error history 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 3.5"/6", 10 for 10"/12"/15"
Filename = ALARMS_mm_dd_yyyy.CSV, mmddyyyy are date



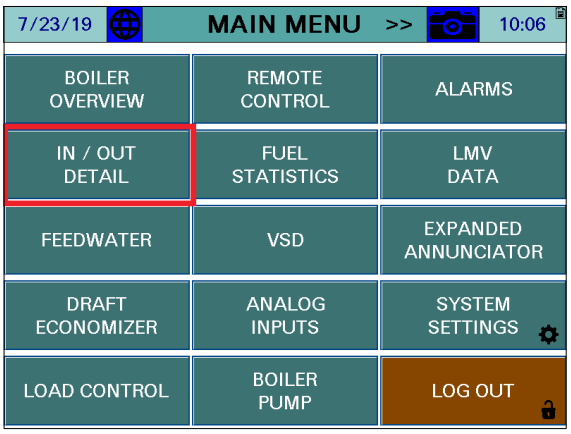


NOTE: If a boiler circulating pump is optioned with the Expanded Annunciator, an alarm is generated when feedback is not received within 20 seconds of the pump being commanded on. If this alarm appears, it must be reset using the **RESET EA ALARMS** button. The alarm will also automatically clear if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

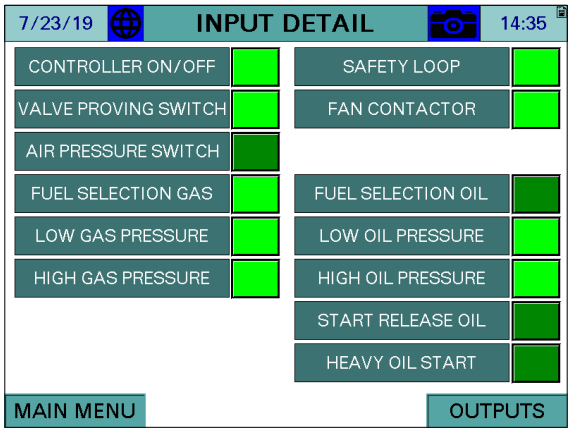
Inputs and Outputs

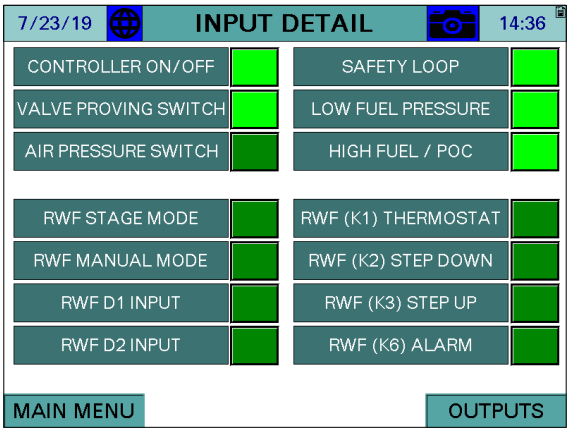
Access level: **USER**

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



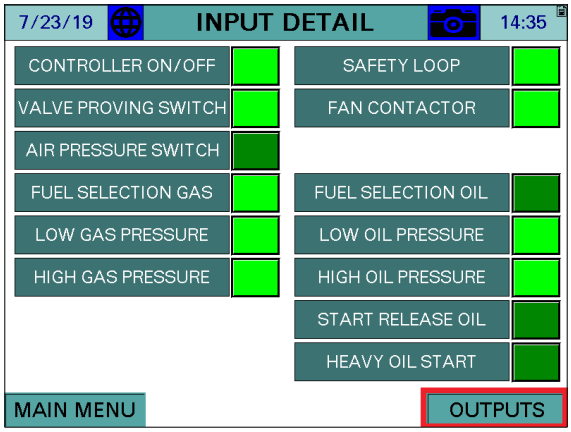
The information on the INPUT DETAIL screen will vary based upon the load controller chosen.

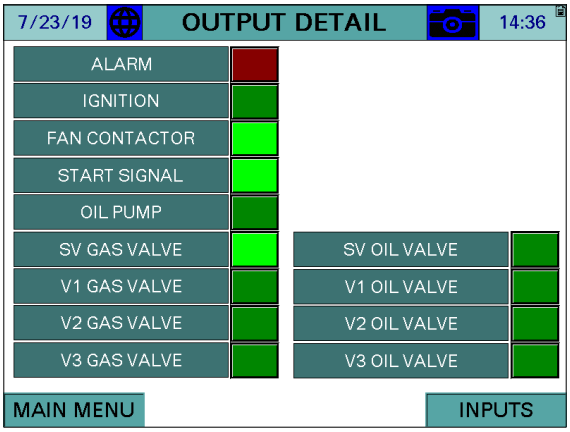




Inputs and Outputs (continued)

All inputs that are currently active will display with a bright green background. All inputs that are currently inactive will display with a dull green background. To view the OUTPUT DETAIL screen, touch **OUTPUTS**. The OUTPUT DETAIL screen will appear.



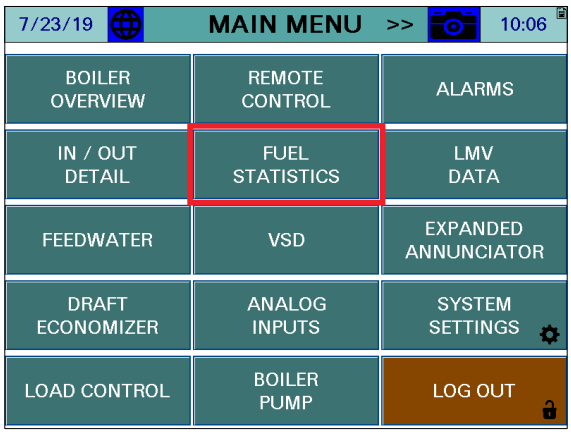


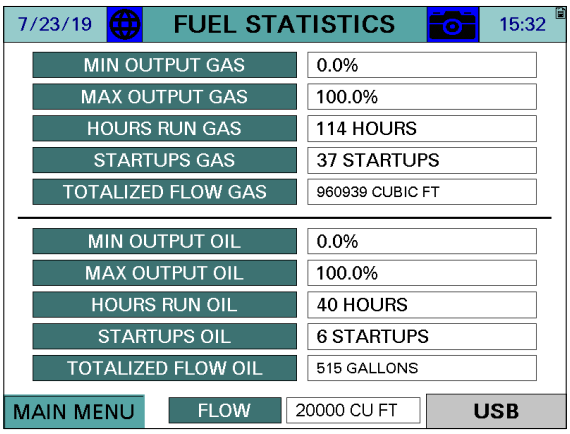
When the LMV controller is in alarm, the ALARM output will flash bright red. When the controller is not in alarm, the alarm output will be a dull red background. All other outputs that are currently active will display with a bright green background. All other outputs that are currently inactive will display with a dull green background.

Fuel Statistics

Access level: **USER**

Both the LMV3... and LMV5… controllers keep track of certain fuel statistics. From the MAIN MENU screen, touch **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.

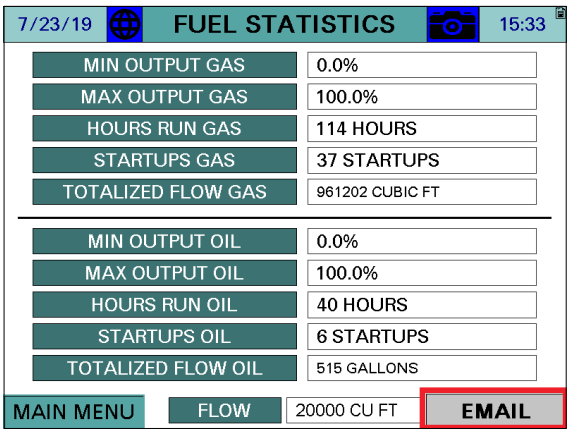
TOTALIZED GAS/OIL – Displays the totalized volume of gas (in cubic feet) or oil (in gallons) that has been used.

CURRENT FLOW – Displays the current flow rate of gas or oil.

Fuel Statistics (continued)

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

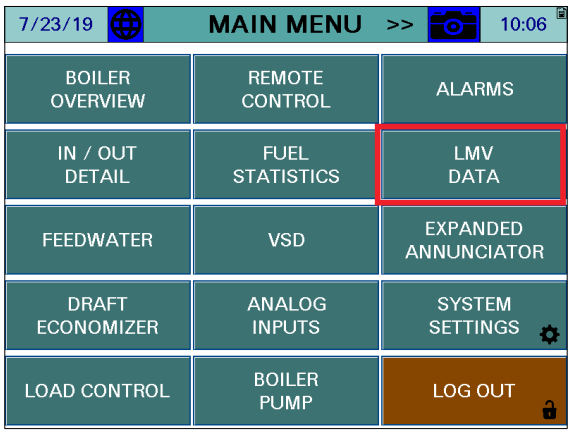
On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 3.5"/6", 10 for 10"/12"/15"
Filename = LMV_FUEL_STATS_mm_dd_yyyy.TXT

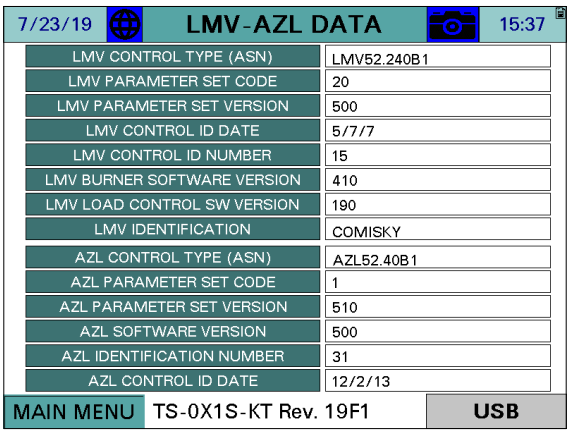


LMV Controller Data

Access level: **USER**

The static details of the LMV controller may be viewed at any time. From the main menu, touch **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 (LMV5... only).

LMV IDENTIFICATION – Displays the burner ID of the LMV controller.

AZL5 CONTROL TYPE (ASN) – Displays the model number of the AZL display (LMV5… only).

AZL5 PARAMETER SET CODE – Displays the parameter set code of the AZL display (LMV5... only).

AZL5 PARAMETER SET VERSION – Displays the parameter set version of the AZL display (LMV5... only).

AZL5 SOFTWARE VERSION – Displays the software version of the AZL display (LMV5... only).

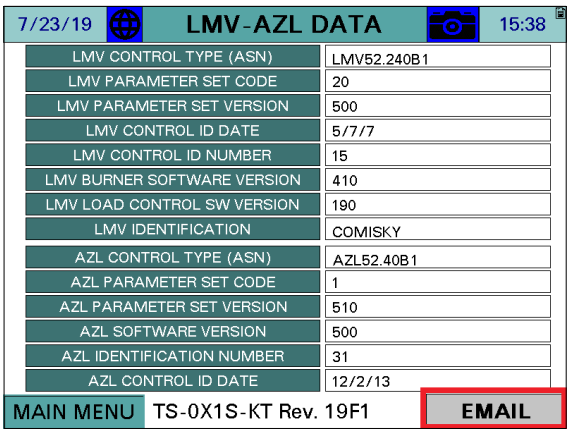
AZL5 IDENTIFICATION NUMBER – Displays the unit ID number for the AZL display (LMV5... only).

AZL5 CONTROL ID DATE – Displays the date of manufacture of the AZL display (MM/DD/YY) (LMV5... only).

LMV Controller Data (continued)

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

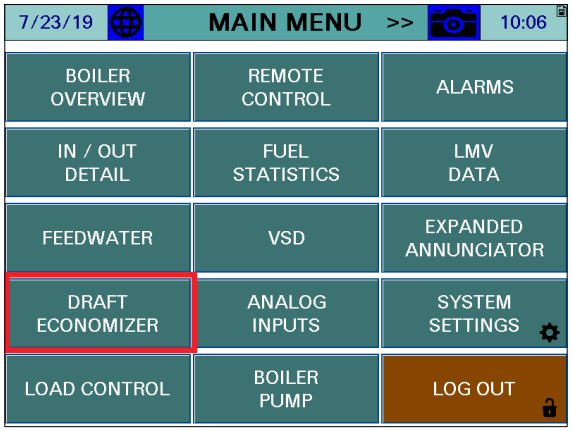
On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT\LMV_ID_DATA.TXT, xx is 6 for 3.5"/6", 10 for 10"/12"/15"

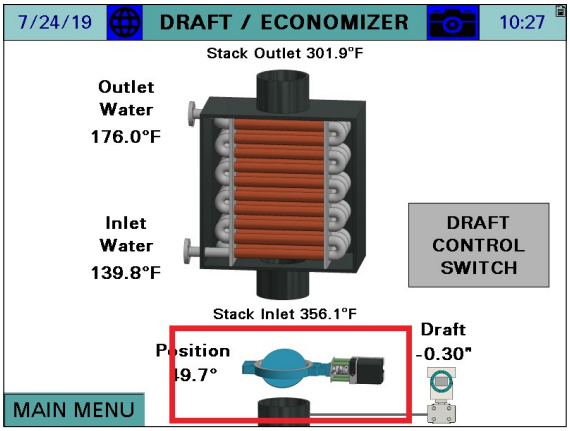


Draft Control

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

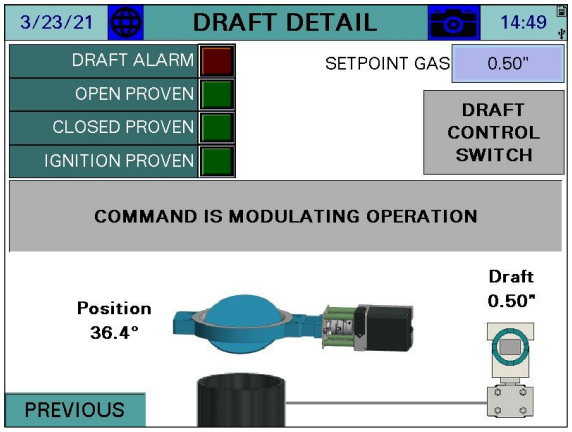
If the draft control option is configured with the Expanded Annunciator, touch **DRAFT** or **DRAFT ECONOMIZER** to access the detail screen. If only draft control is optioned, the button will link directly to the DRAFT DETAIL screen, if not it will link to the DRAFT/ECONOMIZER overview. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels.

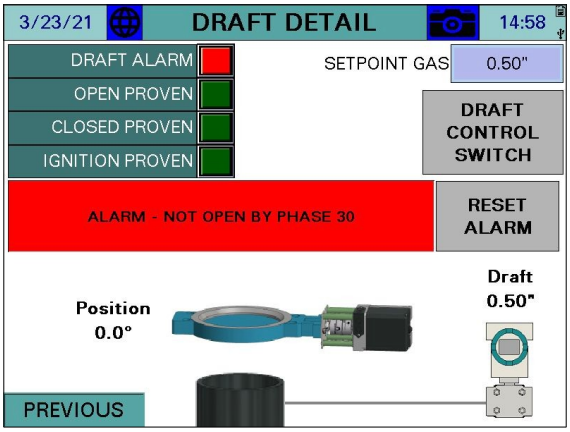




Draft Control (continued)

Overview





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 GAS/OIL – Sets the desired draft setpoint for gas or oil (TECH or SETUP required).*****

DRAFT CONTROL SWITCH – Displays the draft control Open/Auto switch.

CURRENT STATUS – Displays the current status or alarm message.

RESET ALARM – Draft alarms must be manually reset using this button, or **RESET EA ALARMS** at the alarms screen.

POSITION – Displays the current position in angular degrees.

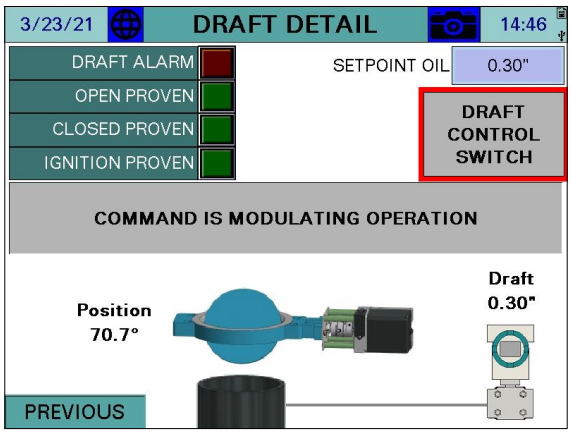
DRAFT – Displays the current draft reading.

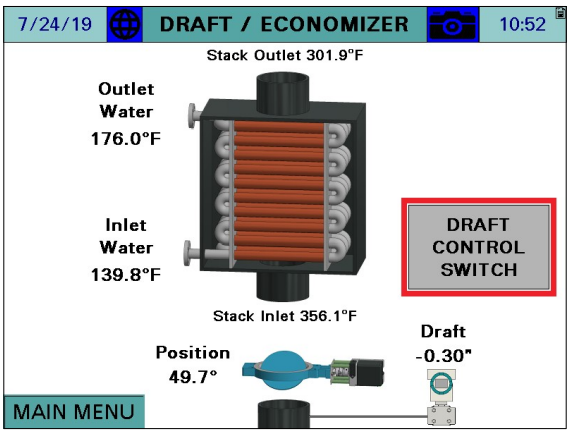
***Note** – When LMV3/5 current fuel is fuel 0 (Gas) or fuel 1 (Oil), only that setpoint will be visible. The type of fuel in “SETPOINT GAS” or “SETPOINT OIL” can be changed from the OPTIONS screen. Refer to page 19.

Draft Control (continued)

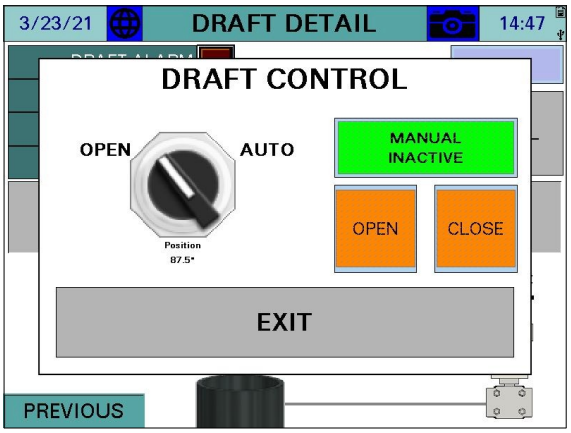
Draft Control Switch

touch **DRAFT CONTROL SWITCH** from either the DRAFT/ECONOMIZER or DRAFT DETAIL screen to access the draft control switch.





This will display the draft control Open/Auto 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 Control (continued)

Draft Control Sequence

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 to 54	Ignition	Will alarm if ignition not proven before phase 40. (Alarm code 2)
60, 62	Modulate	Automatic open and close pulses to maintain the setpoint.
70 to 78	Open	Will alarm if open not proven before phase 74. (Alarm code 3)
80 to 83	Open	Valve proving test.

Draft Status Messages

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

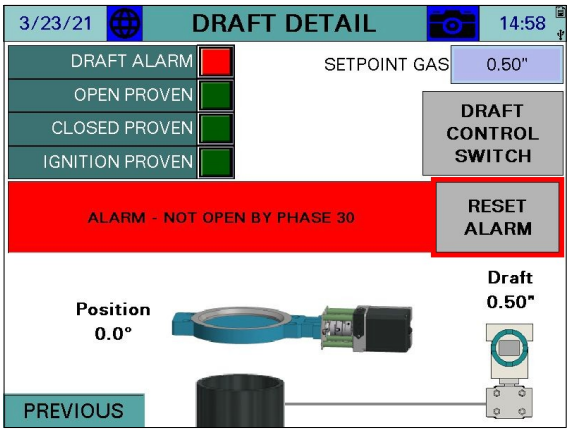
Table 5: Draft Control Status Messages

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).

Draft Control (continued)

Draft Alarms

If the required draft damper positioning has not been proven by the specified phase a draft alarm will occur. The draft damper will go to the open position when a draft alarm is present. Draft alarms are reset by touching RESET ALARM on the DRAFT DETAIL screen.



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 40	2	Ignition position has not been proven by phase 40 (preignition).
NOT OPEN BY PHASE 74	3	Open position has not been proven by phase 74 (postpurge).

Draft Control (continued)

Draft System Setup

The draft control system can be setup up to rotate either clockwise or counter-clockwise and to operate with a positive or a negative setpoint.

Sensor Location and Connections (Refer to TS-7400 for typical piping diagram)

The draft pressure sensor tapping can be located either above or below the draft damper. If it is located above the draft damper, the setpoint will be negative and the sensor reading will be more prone to fluctuation. If it is located below the damper, the setpoint will be positive and the sensor reading should be more stable as there is more air volume in the furnace of the boiler. The sensor can also be located at the rear of the furnace at the area of the sight port. If there is no tapping near the sight port, extend the sight port with a coupling, close nipple and a reducing tee.

The best location for the draft pressure sensor is at least 12 inches above the tapping with a minimum pipe slope of 16.7% (2 inches per foot). This will prevent condensate from entering the sensor by allowing it to cool to ambient temperature and drain back into the stack. If the sensor is to be mounted lower than the tapping, first raise the outlet pipe at least 12 inches with the same minimum slope of 16.7%. Confirm that the temperature of the sample is at ambient before the down run of the tubing or pipe. If it is not, continue raising the tubing or pipe upward before turning it down to run to the sensor. No drip leg is required because all of the moisture should be condensing and draining back into the stack if the connection is made properly. This allows tubing to be used for the entire run.

Keep tubing as short as possible for the least static delay in updating the value. Use a maximum of 100 feet of tubing at ¼", and up to 250 feet at ⅜".

Connect the stack pressure tubing or pipe to the high pressure port on the sensor (applies to all sensor types). All connections are ¼" NPT female. Use a muffler on the low pressure port to dampen the ambient pressure as well as to keep debris from entering.

Draft Control (continued)

Sensor Wiring and Configuration (Type 7MF4433)

The sensor is a two-wire 4-20mA type. Wire the 7MF… terminal marked '+' to the panel terminal marked 'DSEN-24+'. Wire the 7MF… terminal marked '-' to the panel terminal marked 'DSEN-I'.

To configure the desired range, open the access cover to expose the programming buttons.

Touch **Mode** repeatedly until parameter 5 is displayed. This is the minimum scaling. Enter a number that matches what was entered during the draft sensor setup using the **Up** and **Down** buttons, paying attention to the polarity as this should be a negative value.

Touch **Mode** again until parameter 6 is displayed. This is the maximum scaling. Enter a number that matches what was entered during the draft sensor setup using the **Up** and **Down** buttons. This should be a positive value.

Touch **Mode** repeatedly until parameter 14 is displayed. This is the display units. Choose "in H2O" using the **Up** and **Down** buttons. Close the access cover and the normal display screen will automatically return after 30 seconds.

Draft Control (continued)

Sensor Wiring and Configuration (Type 7MF0340)

The sensor is a two-wire 4-20mA type. Wire the 7MF… terminal marked '+' to the panel terminal marked 'DSEN-24+'. Wire the 7MF… terminal marked '-' to the panel terminal marked 'DSEN-I'.

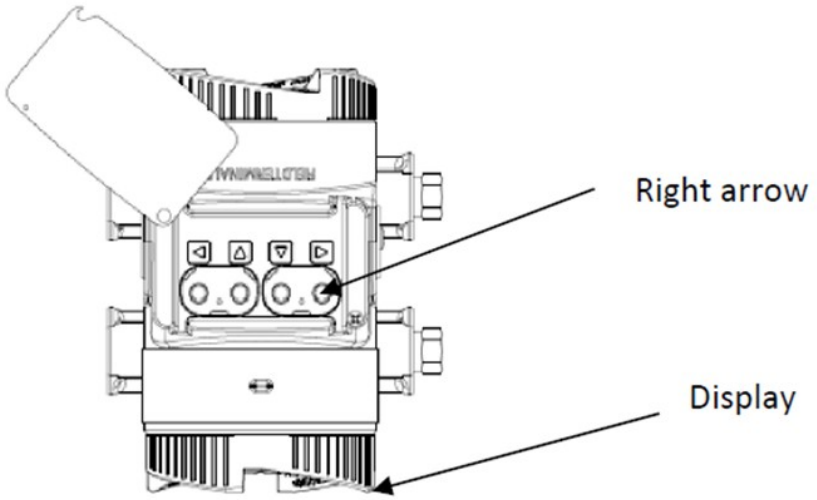
To configure the desired range, loosen a screw and then rotate the nameplate to expose the programming buttons. touch the **Right** arrow to access the parameters.

Touch the **Right** arrow again to edit parameter **1**. This is the display units. Use the **Up** and **Down** arrows to set the parameter to "**inW68**", then touch the **Right** arrow.

Touch the **Up** and **Down** arrows to move to parameter **2**. touch the **Right** arrow to edit it. This is the minimum scaling. Enter a number that matches what was entered during the draft sensor setup using the up and down arrows, then touch the right arrow. Pay attention to the polarity as this should be a negative value.

Touch the **Up** and **Down** arrows to move to parameter **3**. touch the **Right** arrow to edit it. This is the maximum scaling. Enter a number that matches what was entered during the draft sensor setup using the up and down arrows, then touch the right arrow. This should be a positive value.

touch the **Left** arrow until the home screen is displayed again. Rotate the nameplate back to its original position and secure it by tightening the screw again.

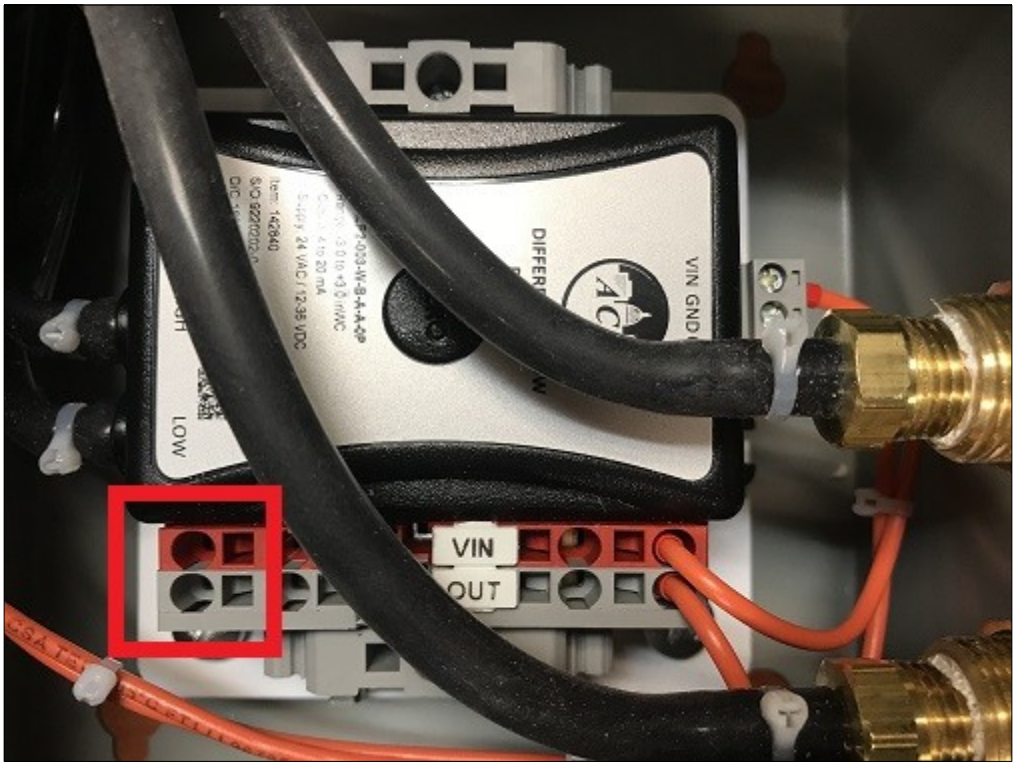


Draft Control (continued)

Sensor Configuration (Type TS-DPA...)

The TS-DPA… differential pressure sensor is available with or without an LCD display, in ranges from ±2 to ±10 inches.

The sensor is a two-wire 4-20mA type. Wire the TS-DPA… terminal marked 'VIN' to the panel terminal marked 'DSEN-24+'. Wire the TS-DPA… terminal marked 'OUT' to the panel terminal marked 'DSEN-I'.



Draft Control (continued)

LMV3… Required Parameters

Parameters must be set to allow the draft damper to have enough time to reach the required positions.

Identify the model of draft damper to determine how long it will take to travel fully:

- **SQM50.26:** 8 seconds
- **SQM50.36:** 12 seconds
- **SQM50.46:** 25 seconds
- **SQM53.46:** 25 seconds
- **SQM56.56:** 37 seconds
- **SQM56.66:** 50 seconds

Identify the LMV3… actuators used to determine how long they will take to travel fully:

- **SQM33.5:** 5 seconds
- **SQM33.7:** 17 seconds

Subtract the LMV3… actuator travel time from the draft damper travel time to determine the required time (referred to as **delta time** below). If the result is zero or less no parameter changes are necessary.

Set up the required parameters through the AZL (OEM password required):

1. Parameter 211 **(Fan Ramp Up Time)**: **<delta time>**

If fuel 0 is a gas fuel, also change the following:

2. Parameter 226 **(Pre-Ignition Time)**: **<delta time>**
3. Parameter 233 **(Afterburn Time)**: **<delta time>**

If fuel 0 is an oil fuel, also change the following:

4. Parameter 266 **(Pre-Ignition Time)**: **<delta time>**
5. Parameter 273 **(Afterburn Time)**: **<delta time>**

If fuel 1 is a gas fuel, also change the following:

6. Parameter 326 **(Pre-Ignition Time)**: **<delta time>**
7. Parameter 333 **(Afterburn Time)**: **<delta time>**

If fuel 1 is an oil fuel, also change the following:

8. Parameter 366 **(Pre-Ignition Time)**: **<delta time>**
9. Parameter 373 **(Afterburn Time)**: **<delta time>**

The end goal is to have the draft damper reach the required positions 2-4 seconds before the alarm point. The **delta time** value for each point can be increased or decreased as necessary to stay in this range. Reaching the position earlier than needed will not cause any nuisance alarms but will unnecessarily extend the start time of the burner.

Draft Control (continued)

LMV5… Required Parameters

Parameters must be set to allow the draft damper to have enough time to reach the required positions. This is done by matching the air damper travel time and distance traveled to slightly exceed that of the damper.

Identify the model of draft damper to determine how long it will take to travel fully (referred to as **damper travel** below):

- **SQM50.26:** 8 seconds
- **SQM50.36:** 12 seconds
- **SQM50.46:** 25 seconds
- **SQM53.46:** 25 seconds
- **SQM56.56:** 37 seconds
- **SQM56.66:** 50 seconds

Set up the required parameters through the AZL (OEM password required):

1. Params & Display > RatioControl > Times > OperationRampMod > **<damper travel>**
2. Params & Display > RatioControl > Times > TimeNoFlame > **<damper travel>**
3. Params & Display > BurnerControl > Times > TimesShutdown > AfterburnTime > **<half of damper travel>**
4. Params & Display > RatioControl > Gas Settings > SpecialPositions > PrepurgePos > PrepurgePosAir > **90.0°**
5. Params & Display > RatioControl > Gas Settings > SpecialPositions > PostpurgePos > PostpurgePosAir > **90.0°**
6. Params & Display > RatioControl > Gas Settings > SpecialPositions > HomePos > HomePosAir > **1.0°**

If oil or a second fuel is used, also change the following:

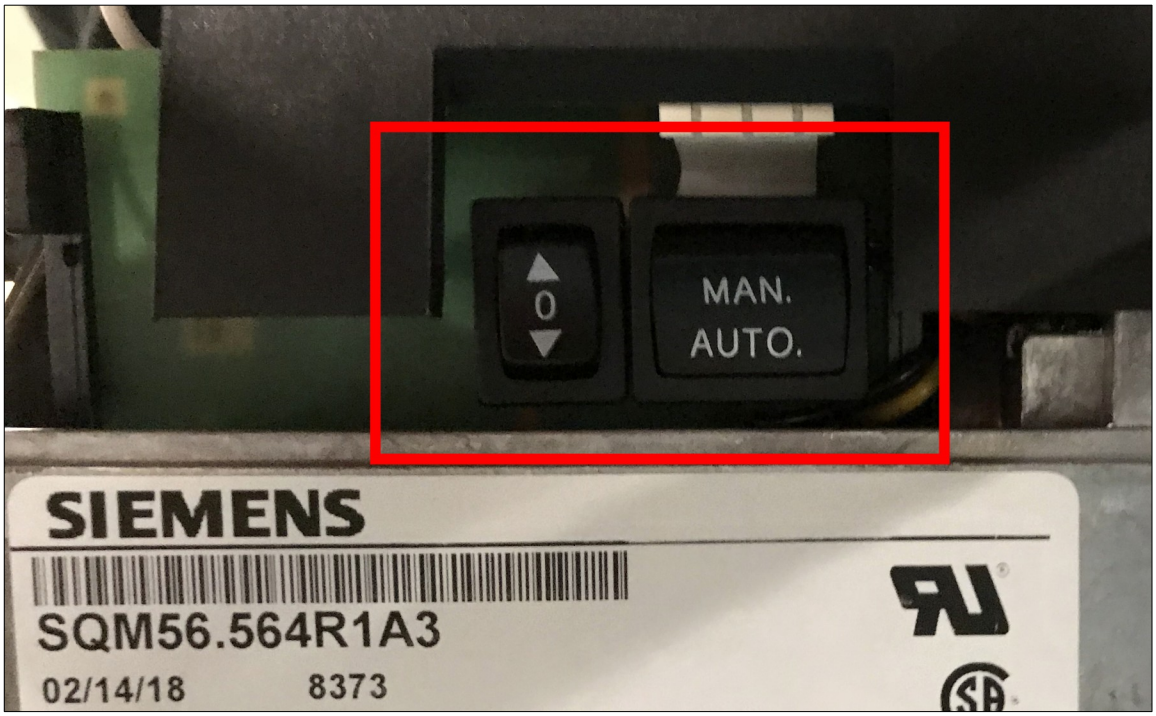
7. Params & Display > RatioControl > Oil Settings > SpecialPositions > PrepurgePos > PrepurgePosAir > **90.0°**
8. Params & Display > RatioControl > Oil Settings > SpecialPositions > PostpurgePos > PostpurgePosAir > **90.0°**
9. Params & Display > RatioControl > Oil Settings > SpecialPositions > HomePos > HomePosAir > **1.0°**

The end goal is to have the draft damper reach the required positions 2-4 seconds before the alarm point. Parameters OperationRampMod, TimeNoFlame and AfterburnTime can be increased or decreased as necessary to streamline operation while staying in this range. Reaching the position earlier than needed will not cause any nuisance alarms but will unnecessarily extend the start time of the burner.

Draft Control (continued)

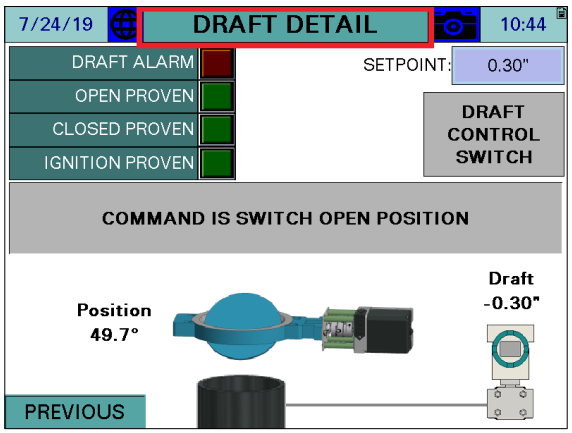
Checking Draft Damper Travel

It is important to position the damper to the actuator and to ensure that the actuator can travel freely throughout the range. At the damper this can be done by using the "MAN/AUTO" switch on the actuator, adhere to the red or black scale utilization of the SQM5 actuator:



Set the switch to "MAN" and use the up/down arrows to move the actuator.

This can also be done from the touchscreen by using the setup switch panel. This is accessed on the DRAFT DETAIL page by touching on the title bar for > 2s (hold down):

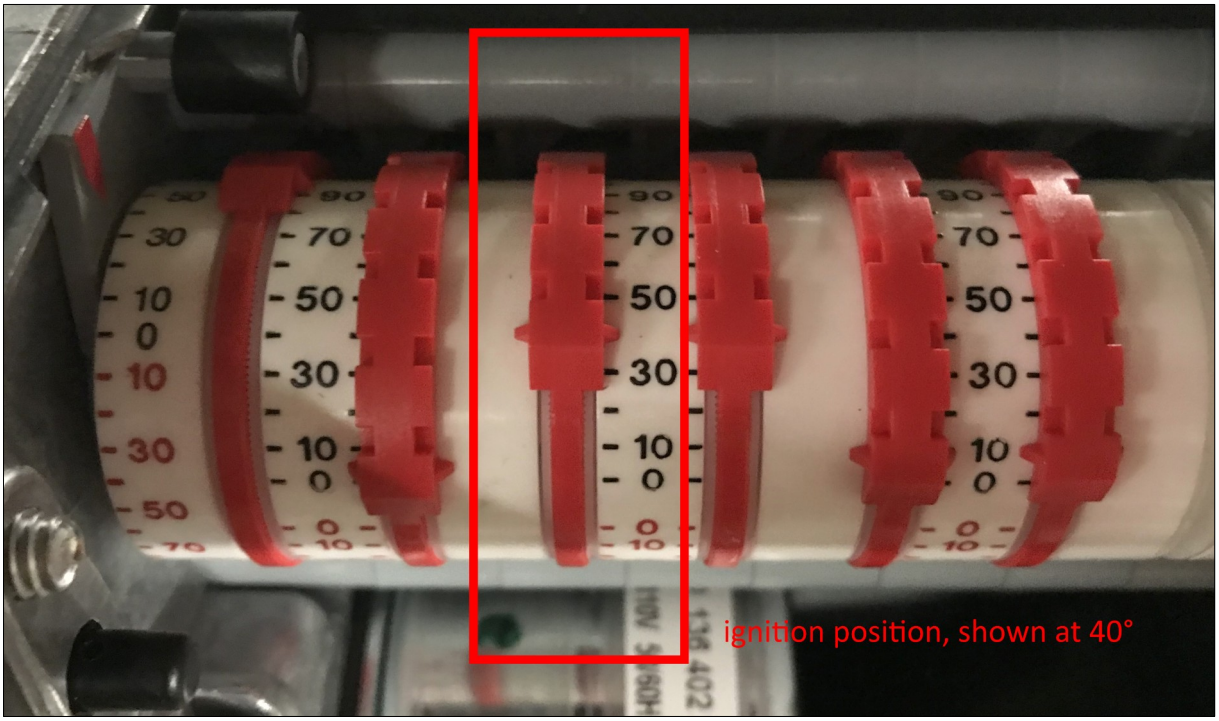


This allows the damper to be moved to the open, closed or ignition position easily during commissioning.

Draft Control (continued)

Setting Ignition Position

Use the ignition position cam to set the desired damper opening for ignition. The arrow on the cam will point at the angular degree mark for the opening. Black scale shown.

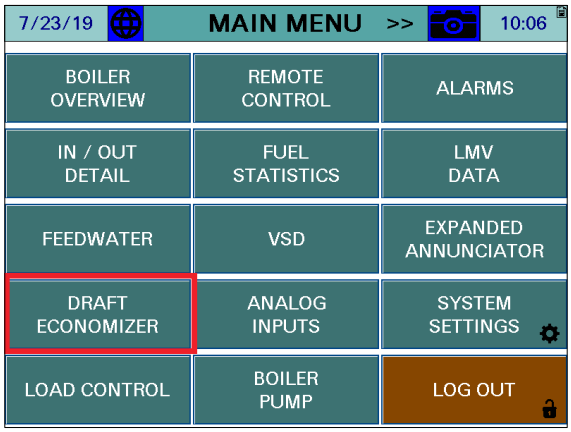


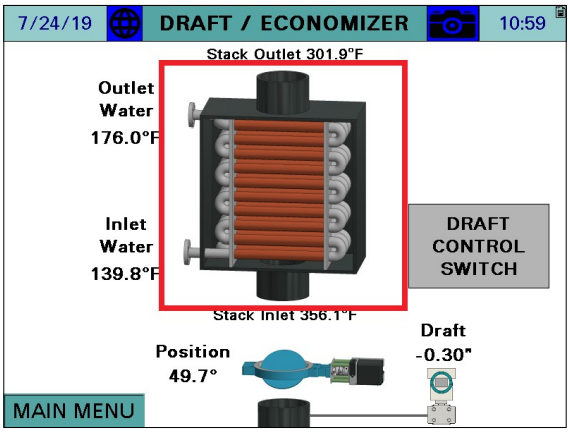
Test the position using the setup switch panel to move the damper to the ignition position. Note that this can only be done from the open position. If the damper is in the closed position and the switch calls for the ignition position, it will not move. If the position is adjusted toward closed while in the ignition position, the damper will move as it is adjusted. If the position is adjusted toward open, the damper will have to be moved back to open and then ignition again to test the new position.

Economizer

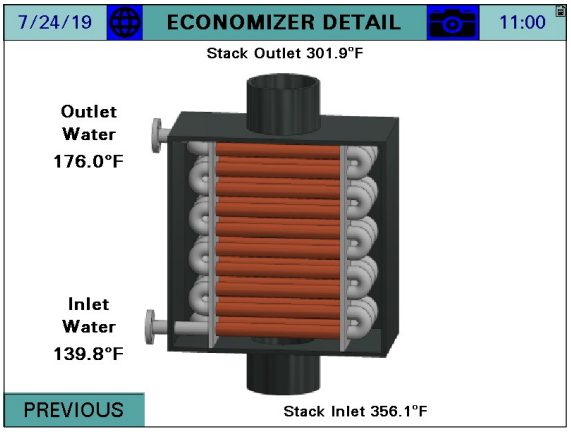
Access level: **USER**

If the economizer option is configured with the Expanded Annunciator, touch **ECONOMIZER** or **DRAFT ECONOMIZER** to access the detail screen. If only the economizer is optioned, the button will link directly to the ECONOMIZER DETAIL screen, if not it will link to the DRAFT/ECONOMIZER overview.





The ECONOMIZER DETAIL page shows the current connected economizer temperatures.



Stack Inlet – The stack temperature as it enters the economizer.

Stack Outlet – The stack temperature as it leaves the economizer.

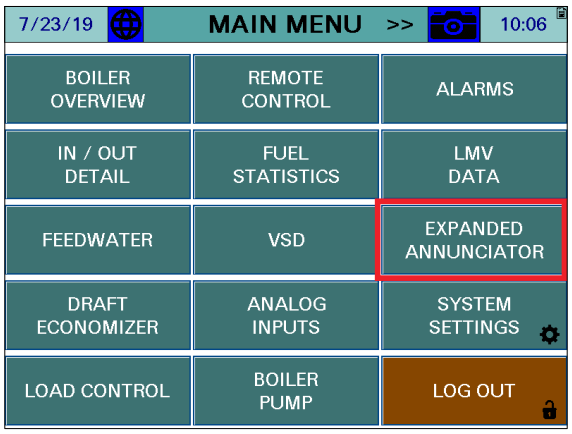
Inlet Water – The water temperature as it enters the economizer.

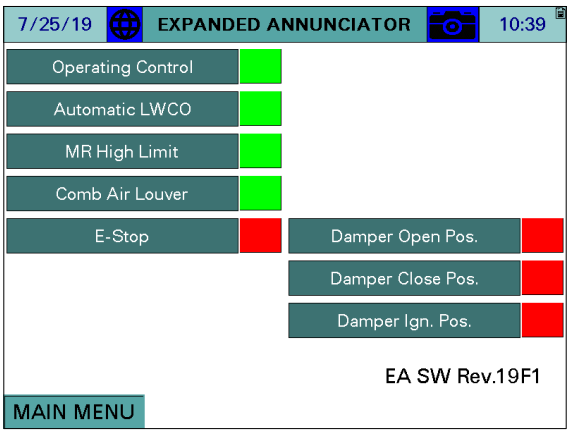
Outlet Water – The water temperature as it leaves the economizer.

Expanded Annunciator

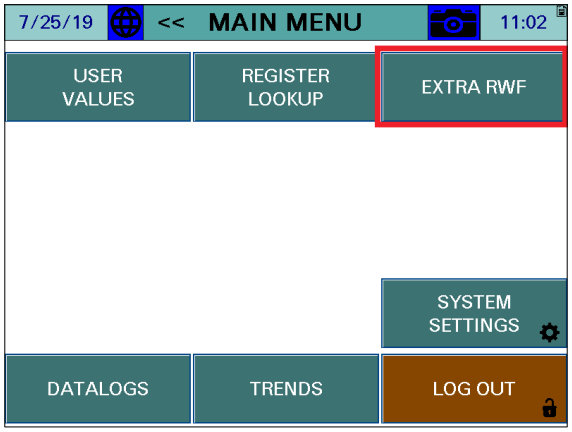
Access level: **USER/TECH/SETUP**

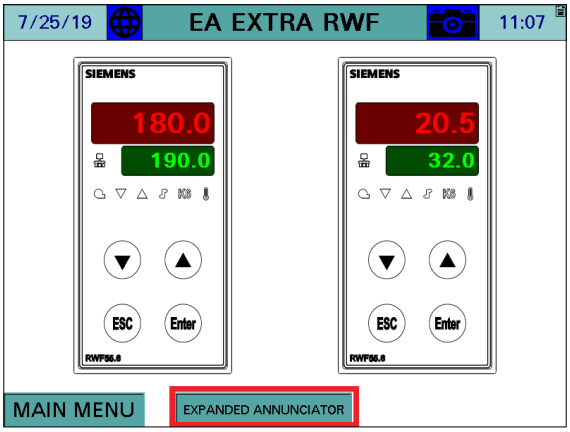
If the Expanded Annunciator is optioned, touch **EXPANDED ANNUNCIATOR** to access the detail screen. The software revision for the Expanded Annunciator is shown on this screen.





If extra RWF55 controls are optioned, touch **EXTRA RWF** on the second page of the main menu to access that screen.



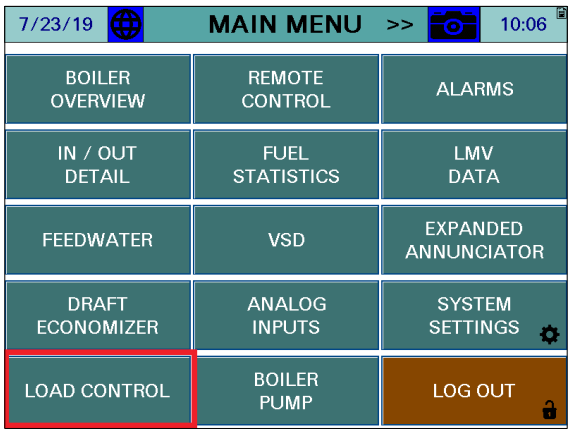


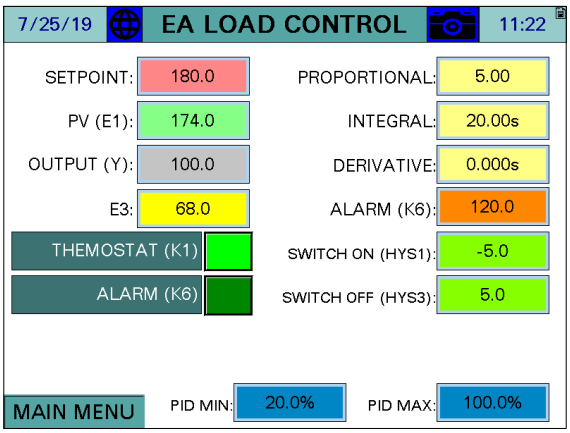
Expanded Annunciator (continued)

Load Controller

If the load controller is optioned, touch **LOAD CONTROL** on the second page of the main menu to access that 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. To option the load controller, one of the analog or RTD input names must contain the string "E1". This is the process variable. A second input can be used for shell temperature if it contains the string "E3". The alarm output (K6) can be used if "LFH" or "HIF" are included in the name string of "E3". "LFH" will alarm when the process variable is below the ALARM (K6) setpoint and "HIF" will alarm when the process variable is above the ALARM (K6) setpoint. If either alarm is used, the output will automatically go to the minimum when the alarm condition is present. Note that both "E1" and "E3" can be applied to the same input, meaning low-fire hold could be used from the same outlet water temperature sensor if desired. A delta between two inputs can also be used as the process variable if the input to be subtracted from "E1" contains the string "DL".

Note that using the load controller option will displace monitored output 1 (analog) which will be the source of the modulating signal. It will also displace monitored output 3 (digital) as the K1 relay, and monitored output 4 (digital) as the K6 relay. If "E3" is not used then monitored output 4 will still be available for general use.





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).

Expanded Annunciator (continued)

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. If the proportional band is set to a negative number, the output will be reverse-acting (output will increase when process variable is above the setpoint).

INTEGRAL – Sets the integral time for PID control (TECH required). The integral portion of the control output makes continuous adjustments based upon the error between the setpoint and the actual value. A shorter integral time has a larger impact upon the process. For example, if the output using the proportional band alone is 25% and the integral time is set to 15s, the control output will double to 50% in 15s if the control variables remain constant. This 'integral windup' will continue until the control output reaches the PID maximum or PID minimum. Setting the integral time to 0 disables the integral portion.

DERIVATIVE – Sets the derivative time for PID control (TECH required). The derivative portion of the control output makes periodic adjustments based upon the rate of change in the actual value. A larger derivative time has a larger impact upon the process. For example, if the output using the proportional band alone is 25%, the derivative time is set to 10s and the actual value decreases by 2, the control output will increase by 20% (10×2) 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.

Expanded Annunciator (continued)

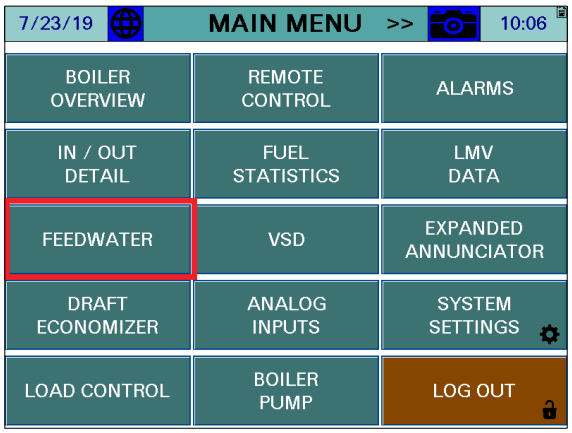
Feedwater

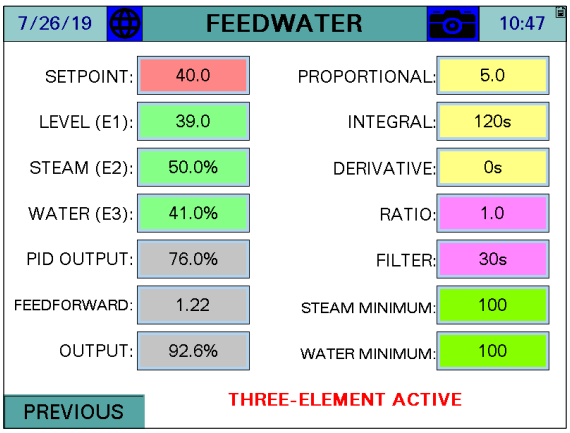
If the single- or three-element feedwater control is optioned, touch **FEEDWATER** on the main menu to access that screen. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels. Single-element feedwater control requires that a level sensor is connected and that the additional analog outputs are optioned. This is usually accomplished using a Siemens 7MF differential pressure transducer. To option, one of the analog input names must contain the string "FW1". This will assign that input as the water level.

To use three-element control, a steam flow and a feedwater flow transmitter must be connected in addition to what is required for single-element above. To option, the steam flow analog input name must contain "FW2" and the feedwater flow analog input name must contain "FW3". This will assign the respective inputs as the steam flow and feedwater flow.

In single-element mode, PID (modeled after the RWF55, see *Load Controller* section for additional detail) control is used to set the measured water level to the setpoint. In three-element control, a feedforward multiplier is applied to that PID output to compensate for the difference between the steam flow and the feedwater flow. If the flows are equal, a multiplier of 1.0 is applied. If the steam flow is greater than the feedwater flow, the output is increased by a multiplier greater than 1.0. If the steam flow is less than the feedwater flow, the output is decreased by a multiplier less than 1.0. The default multiplier of 1.0 can be adjusted if desired to better tune the process.

In order for three-element control to work properly, it is important that the steam flow and feedwater flow are measuring properly. If they are not, operation will changeover to single-element (level only). Minimum flows are entered for the steam flow and feedwater flow and if either is below the respective minimum for the duration of the filter time, that reading will be disregarded and single-element control will occur until the reading is above the minimum.





SETPOINT – Sets the desired setpoint (TECH required).

LEVEL (E1) – Displays the current water level.

Expanded Annunciator (continued)

STEAM (E2) – Displays the current steam flow in percent. This is relative to the maximum span of the flow transmitter.

WATER (E3) – Displays the current feedwater flow in percent. This is relative to the maximum span of the flow transmitter.

PID OUTPUT – Displays the desired output calculated by the PID in percent. This is the single-element output using only the water level.

FEEDFORWARD – Displays the feedforward that will be applied to the PID output. This is calculated by dividing the steam flow percent by the feedwater flow percent, and multiplying by the adjustment ratio. In single-element mode, this always has a value of 1.0.

OUTPUT – Displays the actual output sent to the feedwater valve in percent. This is calculated by multiplying the PID output with the feedforward.

PROPORTIONAL – See *Load Controller* section for additional detail (TECH required).

INTEGRAL – See *Load Controller* section for additional detail (TECH required).

DERIVATIVE – See *Load Controller* section for additional detail (TECH required).

RATIO – Sets the adjustment ratio that is multiplied to the feedforward calculation. Setting this less than 1.0 reduces the feedforward impact while setting this greater than 1.0 will increase the feedforward impact. The default is 1.0 which does not change the initial feedforward calculation (TECH required).

FILTER – Sets the time that the steam or feedwater flow transmitter must read below the minimum before reverting to single-element control (TECH required).

STEAM MINIMUM – Sets the value (in flow units) that the steam flow transmitter must read below the minimum before reverting to single-element control, subject to the filter time (TECH required).

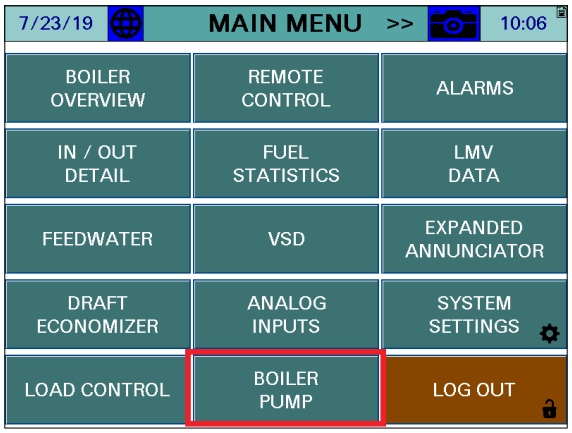
WATER MINIMUM – Sets the value (in flow units) that the feedwater flow transmitter must read below the minimum before reverting to single-element control, subject to the filter time (TECH required).

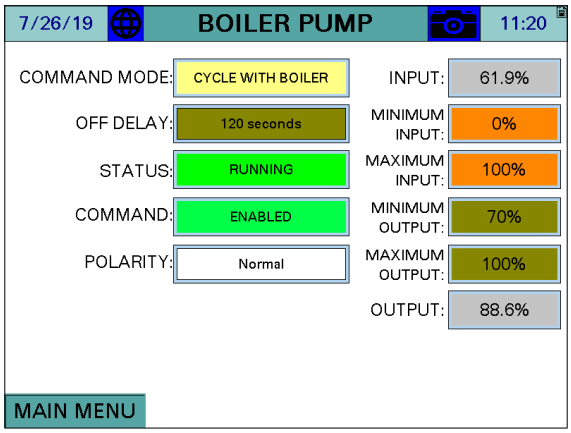
Expanded Annunciator (continued)

Boiler Circulating Pump

If the boiler pump option is configured with the Expanded Annunciator, touch **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. One of the digital inputs must be named "Pump Proven" for connection to the flow, differential pressure or current switch that proves pump operation. Failure to prove pump operation within 30 seconds of being commanded on will result in a pump alarm.

If the additional analog outputs are optioned, an analog output is also provided that can provide an output that is in ratio with the firing rate or an external input. If an analog input name contains the string "CP", that input will replace the firing rate for scaling the analog output. This ratio is set up by specifying the minimum and maximum input signal which will linearly equate to a minimum and maximum output signal.





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

- **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' (TECH required).

STATUS – Displays the status of the pump.

- **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.

Expanded Annunciator (continued)

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 – Sets the logic of the pump output (TECH required).

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

INPUT – Displays the current input percent. This may be the current firing rate or from an external analog input.

MINIMUM INPUT – Sets the minimum input signal to apply to the output ratio calculation. This will normally equal the minimum firing rate or the minimum span of the external input (TECH required).

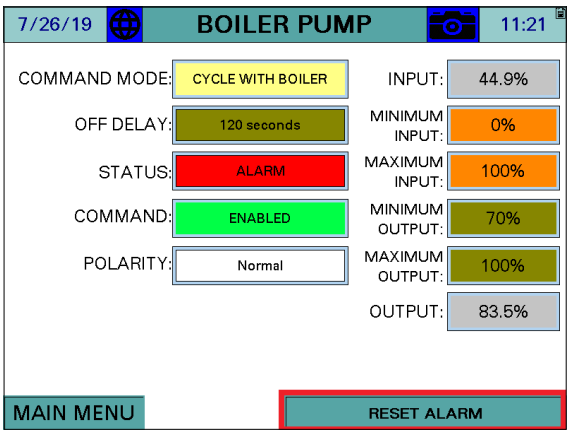
MAXIMUM INPUT – Sets the maximum input signal to apply to the output ratio calculation. This will normally equal the maximum firing rate or the maximum span of the external input (TECH required).

MINIMUM OUTPUT – Sets the minimum output signal that the output ratio calculation will provide. This will normally equal the minimum speed in percent at which that the circulating pump VSD should operate (TECH required).

MAXIMUM OUTPUT – Sets the maximum output signal that the output ratio calculation will provide. This will normally equal the maximum speed in percent at which that the circulating pump VSD should operate (TECH required).

OUTPUT – Displays the applied analog output in percent.

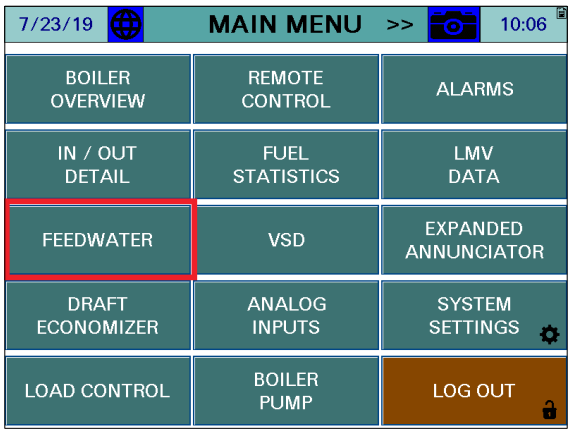
To reset a pump alarm, touch **RESET ALARM** on the BOILER PUMP screen. The pump will automatically reset if operation is proven while an alarm is present.

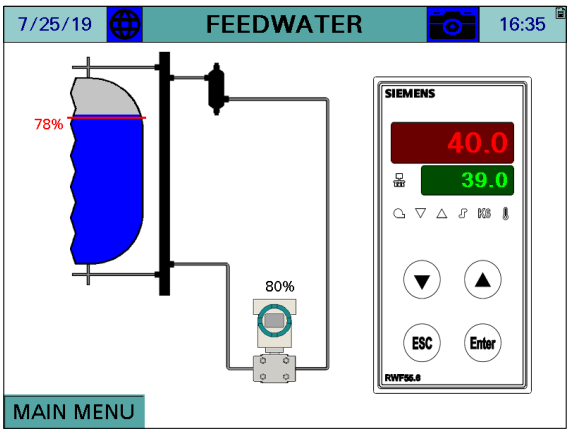


Feedwater via RWF55

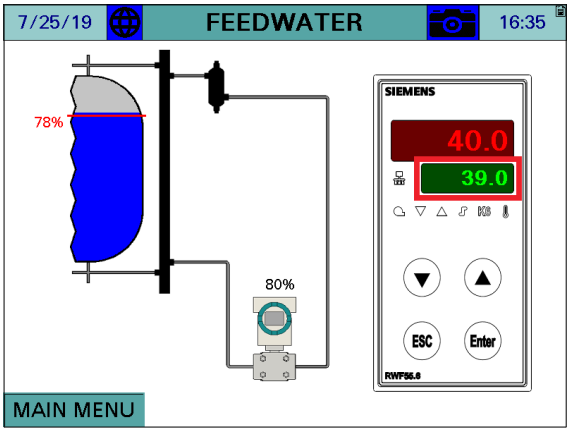
Access level: **USER/TECH/SETUP**

If the feedwater option is configured, touch **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).

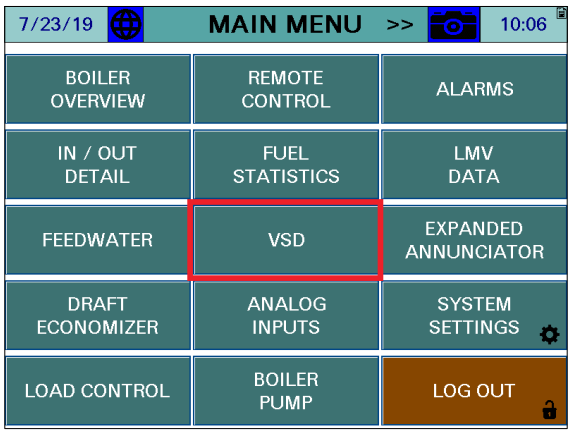


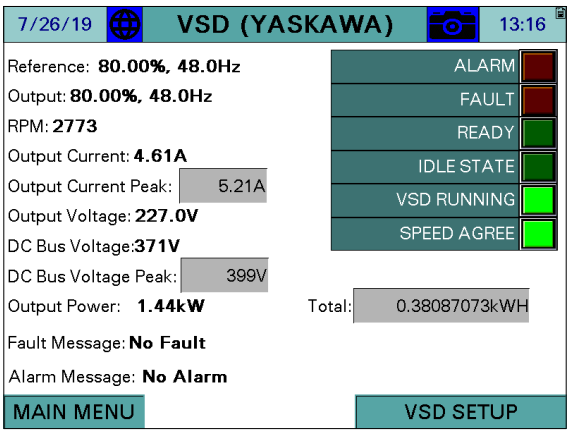
Note that the RWF must be configured as specified in document *RWF55 Modulating Feedwater Control Valve Application Guide* for the graphical tank level to function correctly.

VSD

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

If the VSD option is configured, touch **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.



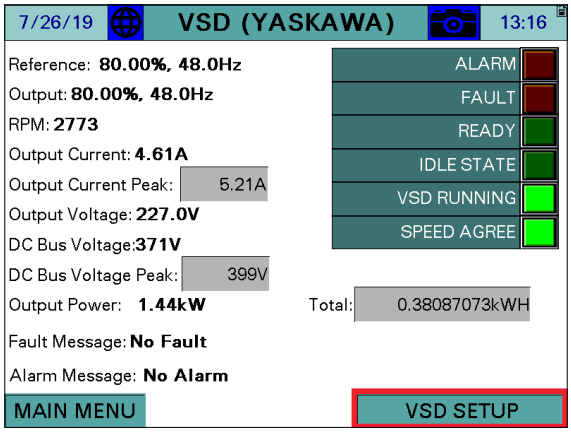


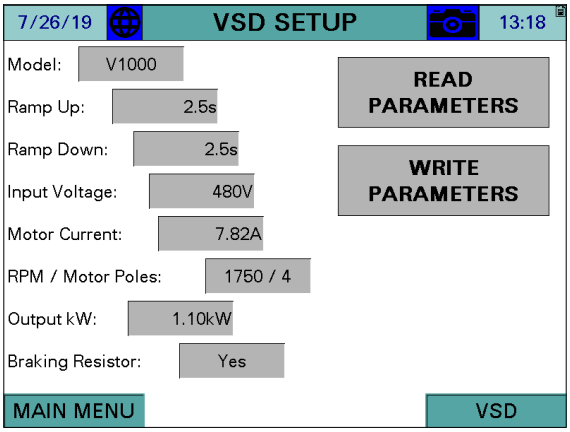
The peak output current and DC bus voltages are recorded during operation. To reset the peak readings, touch the values for > 1s (hold down, TECH required).

VSD (continued)

Yaskawa Setup

If a Yaskawa VSD (available from SCC) is used, touch **VSD SETUP** to access the VSD SETUP screen.





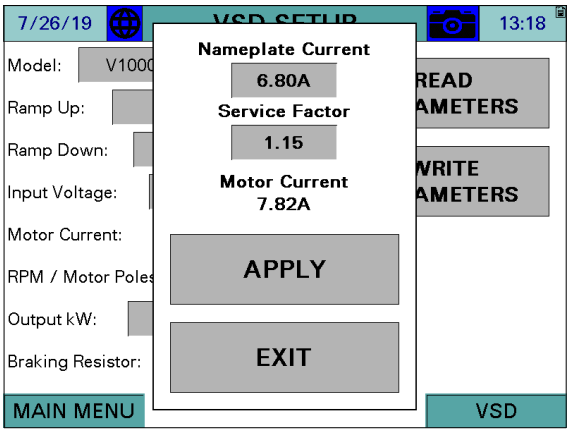
Model – Selects the model of VSD used (SETUP required).

- **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)

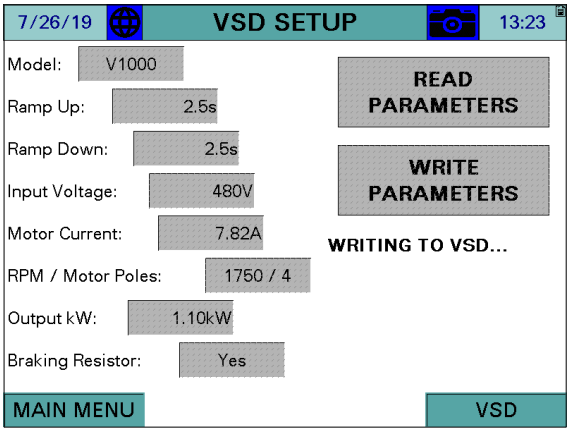
RPM / Motor Poles – Selects the RPM and poles as per the motor nameplate (SETUP required).

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

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

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

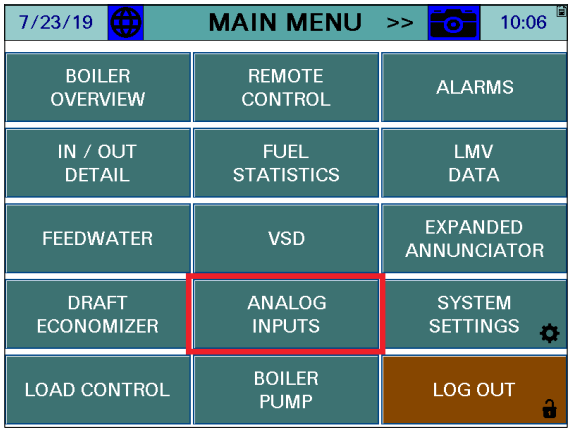
Touching **READ PARAMETERS** will read the current motor information as stored in the VSD. Touching **WRITE PARAMETERS** (SETUP required) will write the supplied motor information as well as the parameters required by the LMV… to the VSD. The screen will display 'WRITING TO VSD...' while the parameters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

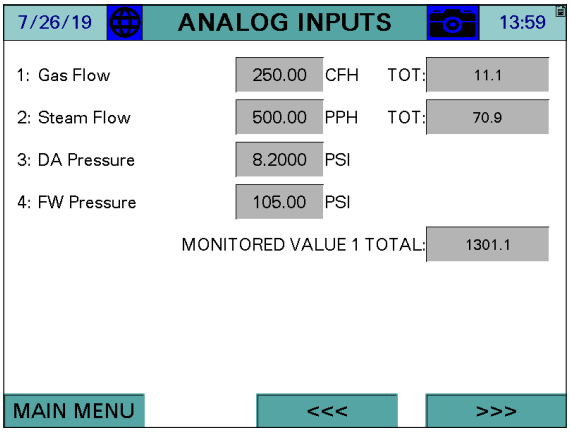


Analog Inputs

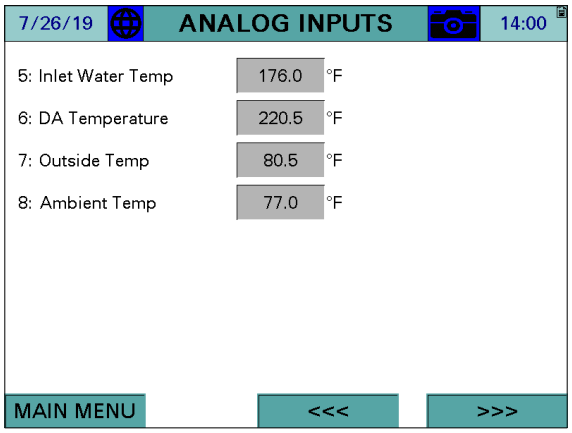
Access level: **USER**

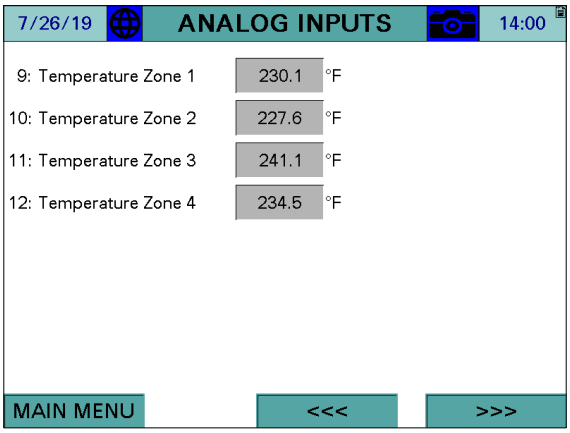
If analog or universal input cards are configured with the Expanded Annunciator, touch **ANALOG INPUTS** to access the detail screen.





If totalization is enabled for any of the analog inputs, touching the totalized value > 1s (hold down) will reset the value to 0 (TECH required). Toggle between analog and universal input cards with the arrow buttons on the lower right. The universal analog inputs could not be totalized.

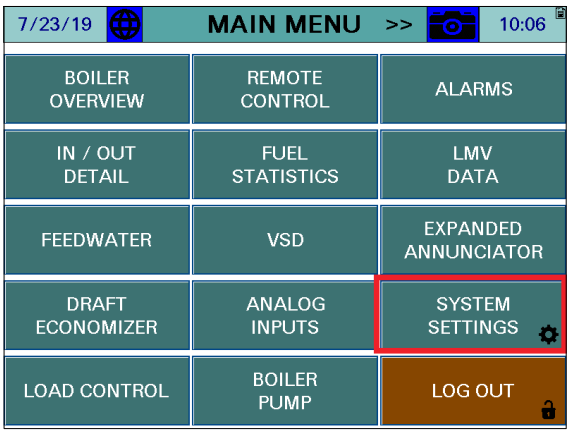




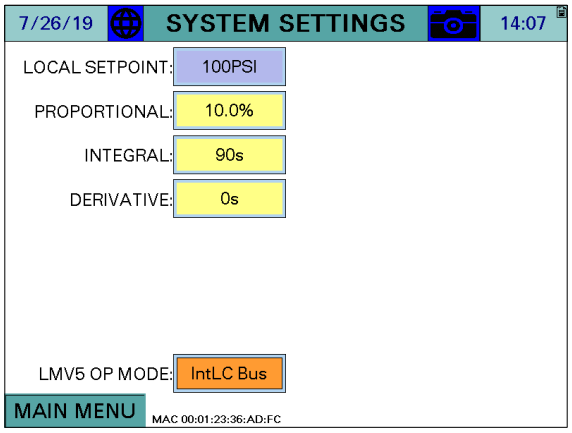
System Settings

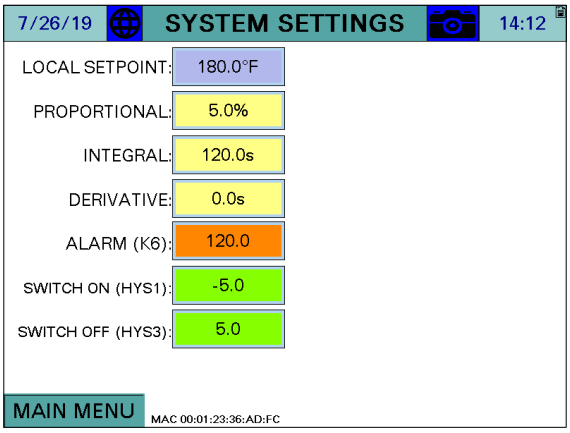
Access level: **USER/TECH/SETUP**

To access load controller settings (LMV, RWF, or EA internal), touch **SYSTEM 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 a LMV5... 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 or RWF55 load controller, the proportional band is an absolute number.

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.

System Settings (continued)

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).

- **RWF55:** Sets the burner on threshold (added to 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 (subtracted from 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).

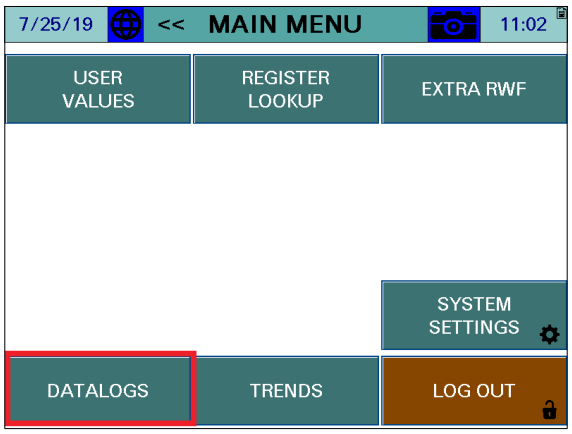
- **RWF55:** Sets the burner off threshold (added to the setpoint). For example, a value of 5 means the burner will turn on when the actual value is 5 above setpoint.
- **RWF10:** This setting behaves differently for steam and hydronic boilers. For steam boilers, the span of the pressure transducer affects 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.

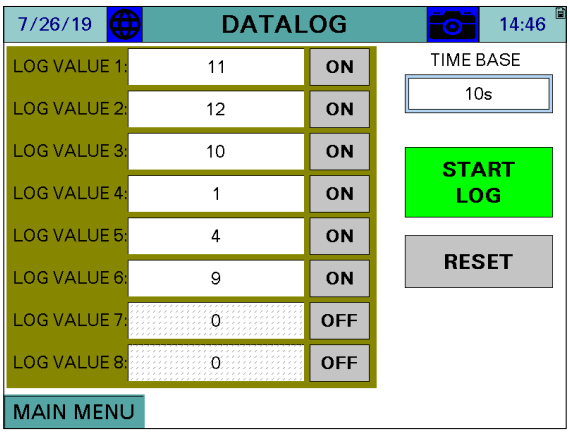
LMV5 OP MODE – Displays the LMV5... load controller operating mode (LMV5... only).

Datalogs

Access level: **TECH/SETUP**

Datalogging up to eight variables to a USB drive is available. From the second page of the MAIN MENU screen, touch **DATALOGS**. The DATALOG screen will appear.





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).

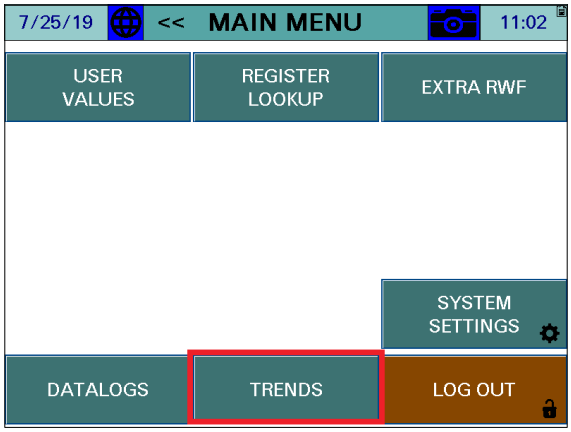
The resulting file is in a tab-separated format (.csv) and can be viewed with any text editor or spreadsheet application. On the USB drive, data can be found at:
Path = \PUBLIC\PROJECTS\KITxx\DATA\TEXT, xx is 6 for 3.5"/6", 10 for 10"/12"/15"
Filename = DATALOG_mm_dd_yyyy.CSV, mmddyyyy are date

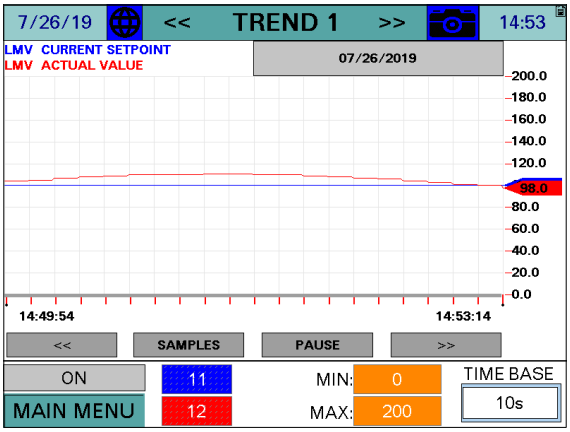
	A	B	C	D	E	F
1	SCC Inc. Touchscreen Kit Alarm Summary					
2	TSK Model: TS-0XXS-KT Rev. 15F1					
3	Site: Touchscreen Kit					
4	Tag: B-1					
5						
6	Date	Time	LMV Phase	LMV Fuel Actuator	LMV Air Actuator	LMV Aux1 Actuator
7	9/18/2015	0:26:16	60	74.3	52.6	-12
8	9/18/2015	0:26:26	60	74.3	52.6	-12
9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

Trends

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

Four trends available that can record two variables at user-defined intervals. From the second page of the MAIN MENU screen, touch **TRENDS**. The TREND 1 screen will appear.





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

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

ON/OFF – Enables or disables the selected trend.

TREND NAVIGATION

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

VARIABLES TO LOG (BLUE, RED) – Sets the Modbus register index to trend (TECH required).

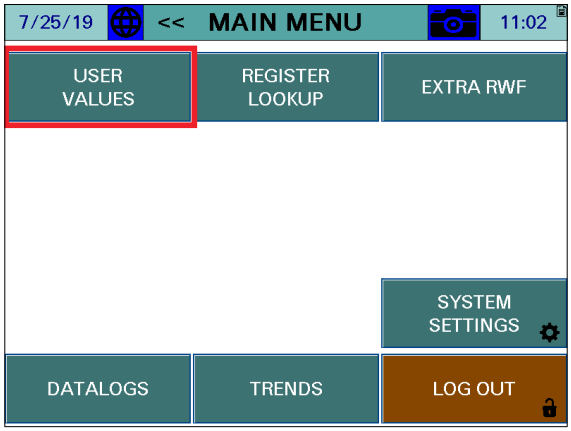
MIN, MAX – Sets the range for the trend data (TECH required).

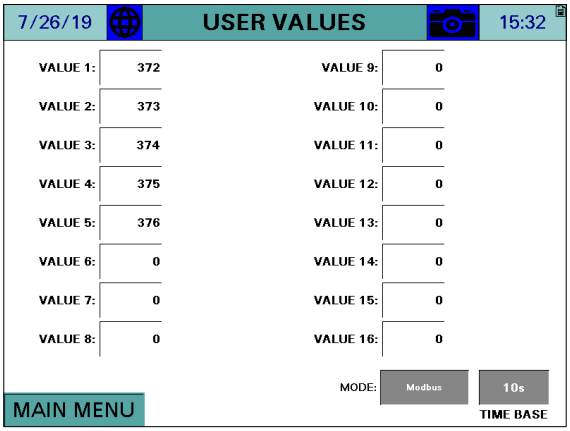
TIME BASE – Select a time base for trending. Choices are 10s, 20s, 30s, 1m, 2m, 5m, 10m, 15m, 30m, 60m (TECH required).

User Values

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

User values allows Modbus data to be redirected to one of 16 16-bit registers. This can be used to consolidate data collection or to include additional data in the exchange to the Lead/Lag Master. On 10", 12", and 15" touchscreens, an additional mode exists that allows custom scripts to be executed. This allows for custom calculations as well as redirection of data. See *Creating User Value Scripts* section for additional detail on how to create these scripts.





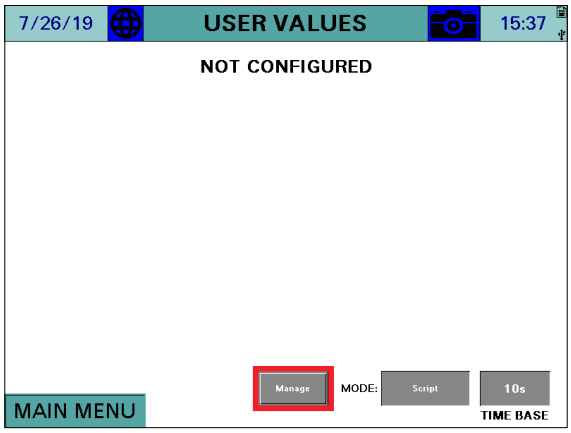
MODE – Selects the source of the user values. This only applies to 10", 12" and 15" touchscreens, on 3.5" and 6" touchscreens the mode is fixed to Modbus (TECH required).

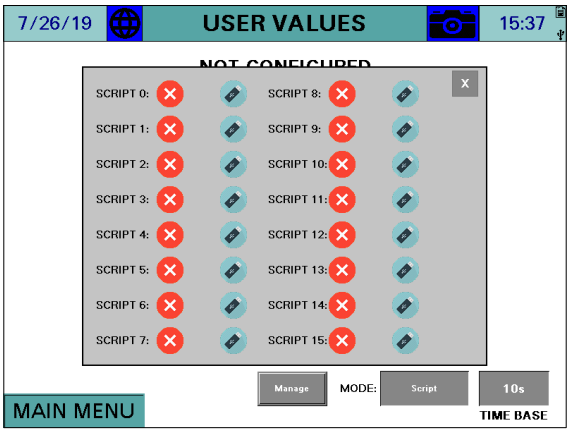
- **Modbus:** Sets the user value mode to redirect the indicated Modbus register.
- **Script:** Sets the user value mode to execute any loaded user scripts.

TIME BASE – Sets the desired refresh time in seconds. This is how often the redirection or script execution will occur (TECH required).

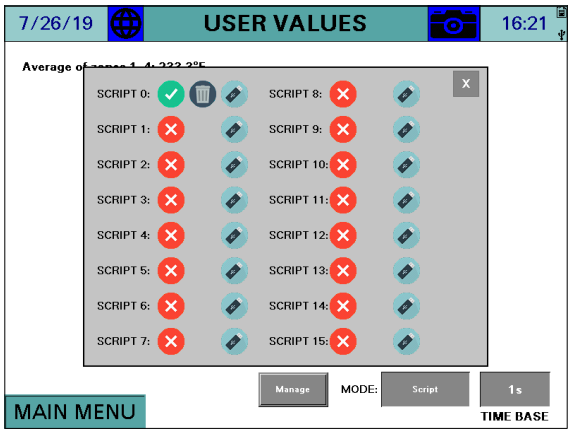
VALUE 1-16 – Selects the Modbus register that will be redirected (TECH required).

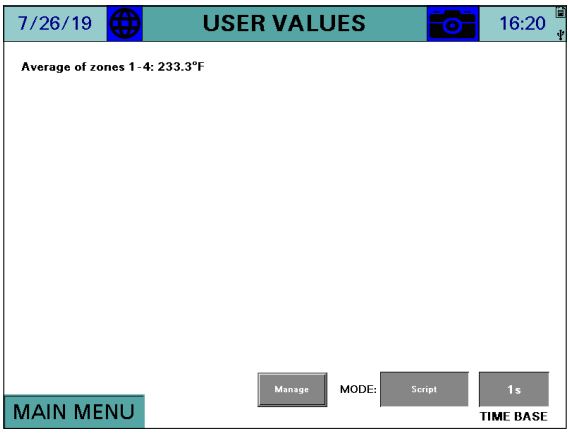
User Values (continued)



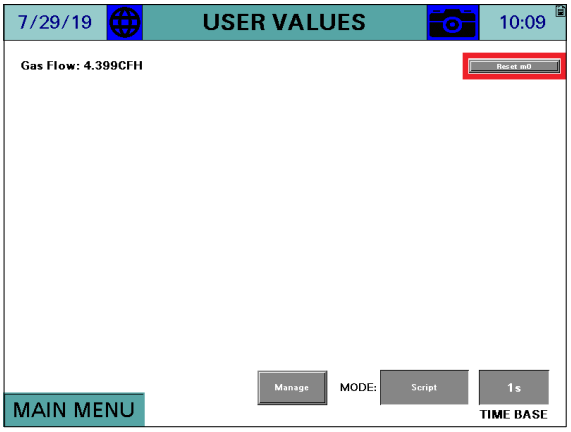


MANAGE – Allows loading and deleting user scripts. Up to 16 scripts can be loaded. If a script is not loaded into position 0-15, it is indicated by a red "X". If loaded, that is indicated by a green check mark. To load a script from the inserted USB drive, touch the USB drive icon. To delete, touch the garbage can icon.





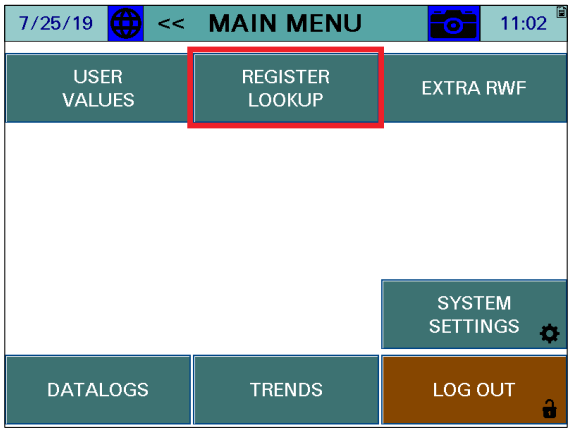
If a retentive user value is used (for totalization or non-volatile applications), it can be reset by touching the reset button > 1s (hold down) for the applicable memory variable from m0-m15.

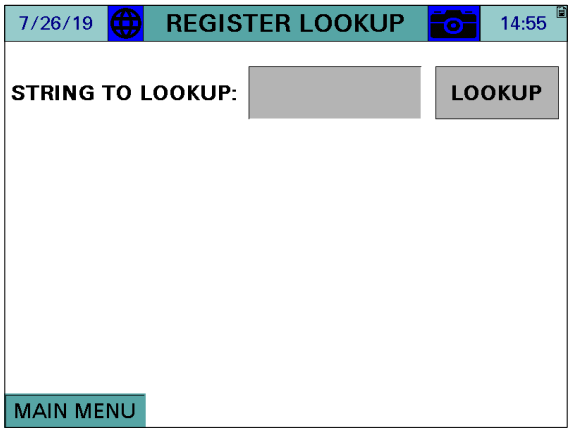


Register Lookup

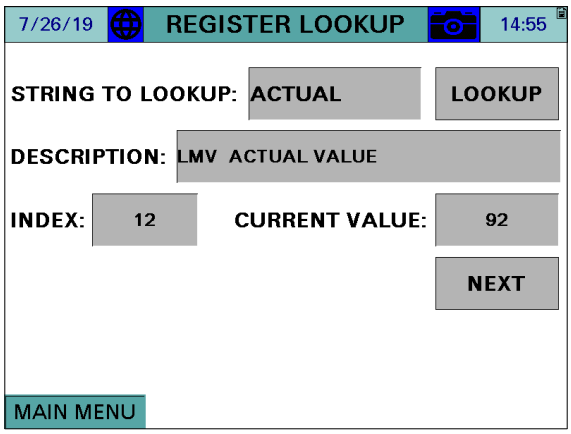
Access level: **USER/TECH/SETUP**

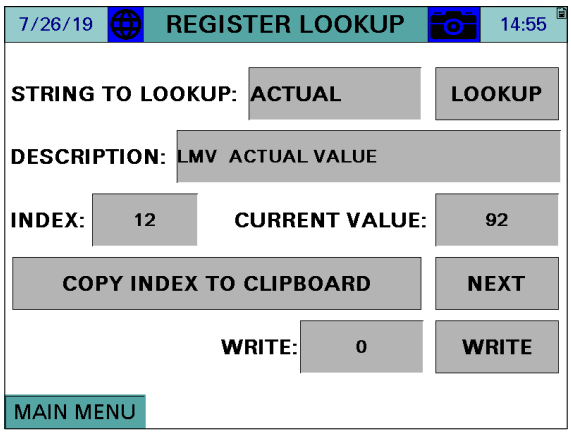
Modbus register indices can be looked up using text strings.





Enter a string or register index to search, then touch **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).

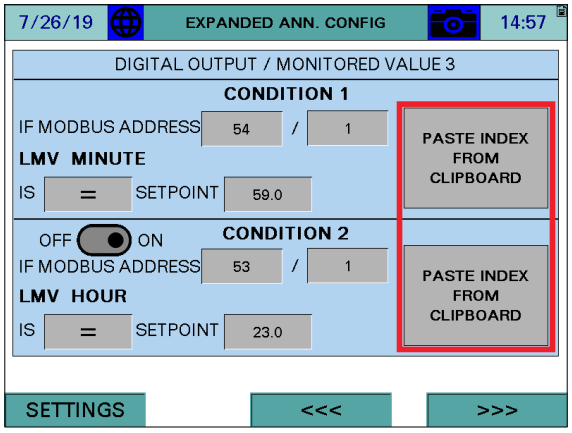
NEXT – Scroll to the next register index matching the description. 'END OF LIST REACHED' will display if there are no more matching descriptions.

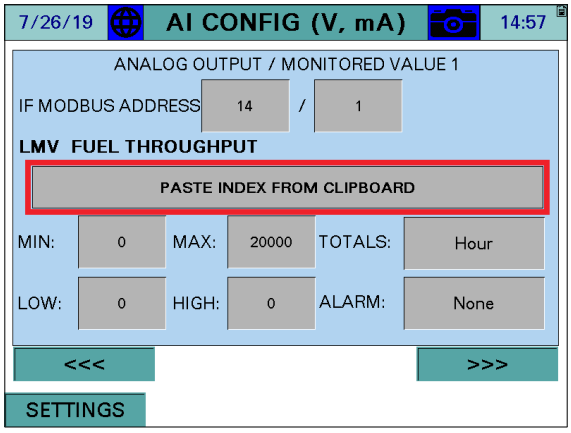
WRITE – Sets the value to manually write to a register. This can be used to test functionality such as remote setpoint or enables. touch **WRITE** to apply value (TECH required).

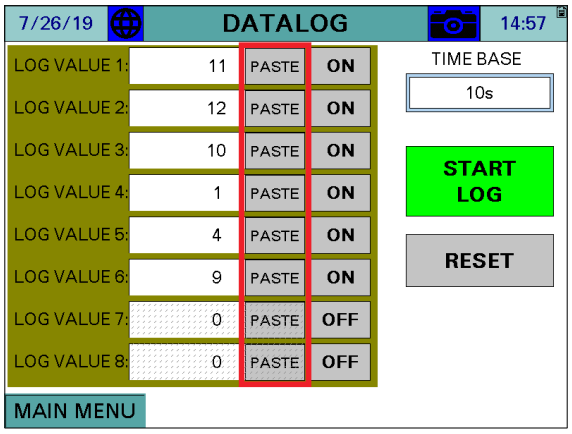
Register Lookup (continued)

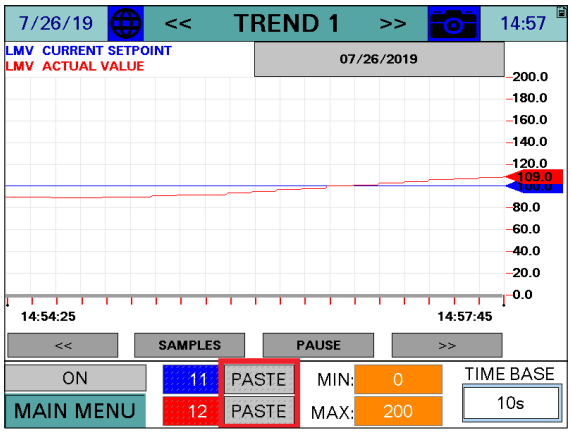
Using the Clipboard

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.









Gateway/BMS

Access level: **TECH/SETUP**

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(s) 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 a TS Series Protocol Converter (see *Document No. TS-6100* for additional detail):

- BACnet/IP
- BACnet MS/TP
- Metasys N2
- Ethernet/IP
- 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 – Mapping

LMV = LMV3… or LMV5… controller data
RWF LC = RWF10 or RWF55 load controller data
FEEDWATER = RWF55 feedwater controller data
EA = Expanded Annunciator data

Access marked with an asterisk (*) are EEPROM backed and should not be continuously written.

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
0	R	LMV PHASE	Unsigned Int 16	see **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 **LMV... Lockout/Error Codes**
26	R	LMV CURRENT DIAGNOSTIC CODE	Unsigned Int 16	see **LMV... Lockout/Error Codes**
27	R	LMV CURRENT ERROR CLASS	Unsigned Int 16	not used
28	R	LMV CURRENT ERROR PHASE	Unsigned Int 16	see **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 touch SW MAX	Boolean	
35 bit 6	R	LMV OIL touch SW MIN	Boolean	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
35 bit 7	R	LMV VALVE PROVING SW	Boolean	
35 bit 8	R	LMV SAFETY LOOP	Boolean	
35 bit 10	R	LMV GAS touch SW MIN	Boolean	
35 bit 11	R	LMV GAS touch 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	
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,…,6=Sat
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	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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	
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	
140	R	OPERATION MODE FUEL 0	Unsigned Int 16	see **Note 9** below
141	R	OPERATION MODE FUEL 1	Unsigned Int 16	see **Note 9** below
142	R	CYCLES REVERT TO PILOT	Unsigned Int 32	
144	R	LOW RANGE TRIM FUEL 0	Signed Int 16	x10
145	R	HIGH RANGE TRIM FUEL 0	Signed Int 16	x10
146	R	LOW RANGE TRIM FUEL 1	Signed Int 16	x10
147	R	HIGH RANGE TRIM FUEL 1	Signed Int 16	x10
148	R	ANALOG INPUT TRIM	Signed Int 16	x10
149	R	CURRENT TRIM CORRECTION	Signed Int 16	x10
150	R	ABSOLUTE SPEED RPM	Unsigned Int 16	
151	R	MAINS VOLTAGE	Unsigned Int 16	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
158	R	EQUIPMENT FAULTS	Unsigned Int 16	word of bits
158 bit 0	R	EQUIPMENT FAULT LMV5	Boolean	
158 bit 1	R	EQUIPMENT FAULT LMV3	Boolean	
158 bit 2	R	EQUIPMENT FAULT RWF10 LC	Boolean	
158 bit 4	R	EQUIPMENT FAULT RWF55 LC	Boolean	
158 bit 6	R	EQUIPMENT FAULT RWF55 FW	Boolean	
158 bit 7	R	EQUIPMENT FAULT EA	Boolean	
158 bit 8	R	EQUIPMENT FAULT VSD	Boolean	
159	RW	LOCKOUT STRING CODE TO LOOKUP	Unsigned Int 16	see **Note 6** below
160	R	LOOKUP LOCKOUT CODE STRING	String (40 words)	see **Note 6** below
180	R	CURRENT PHASE STRING	String (40 words)	
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

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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
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

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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	
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	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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	
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	
368	R	CIRC PUMP CONTROL SIGNAL U16	Unsigned Int 16	x10
369	R	CIRC PUMP OUTPUT SIGNAL U16	Unsigned Int 16	x10
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 FW OPTION E1 LEVEL U16	Unsigned Int 16	x10
375	R	RWF FW E2 U16 FW OPTION E2 STEAM FLOW U16	Unsigned Int 16	x10
376	R	RWF FW E3 U16 FW OPTION E3 WATER FLOW U16	Unsigned Int 16	x10
377	R	RWF FW WR U16 CURRENT SP FW OPTION SETPOINT U16	Unsigned Int 16	x10
378	RW	RWF FW SP1 U16 FW OPTION SETPOINT U16	Unsigned Int 16	x10
379	R	RWF FW SP2 U16	Unsigned Int 16	x10
380	R	RWF FW Y U16 FW OPTION OUTPUT PERCENT U16	Unsigned Int 16	x10
382	R	RWF FW E1 FLOAT FW OPTION E1 LEVEL FLOAT	Float 32	
384	R	RWF FW E2 FLOAT FW OPTION E2 STEAM FLOW FLOAT	Float 32	
386	R	RWF FW E3 FLOAT FW OPTION E3 WATER FLOW FLOAT	Float 32	
388	R	RWF FW WR FLOAT CURRENT SP FW OPTION SETPOINT FLOAT	Float 32	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
390	RW	RWF FW SP1 FLOAT FW OPTION SETPOINT FLOAT	Float 32	
392	R	RWF FW SP2 FLOAT	Float 32	
394	R	RWF FW Y FLOAT FW OPTION SETPOINT FLOAT	Float 32	
396	R	MINUTE OF THE DAY	Unsigned Int 16	used for monitored outputs
397	R	MINUTE OF THE WEEK	Unsigned Int 16	see **Note 8** below
398	R	USE PULSE FOR MO3	Unsigned Int 16	used for monitored outputs
399	R	USE PULSE FOR MO4	Unsigned Int 16	used for monitored outputs
400	R	LMV LOCKOUT ERROR CODE CURRENT	Unsigned Int 16	see **LMV... Lockout/Error Codes**
401	R	LMV LOCKOUT DIAG CODE CURRENT	Unsigned Int 16	see **LMV... Lockout/Error Codes**
402	R	LMV LOCKOUT ERR CLASS CURRENT	Unsigned Int 16	not used
403	R	LMV LOCKOUT ERR PHASE CURRENT	Unsigned Int 16	see **LMV Phases**
404	R	LMV LOCKOUT FUEL CURRENT	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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	
416	R	LMV LOCKOUT ERROR CODE -1	Unsigned Int 16	see **LMV... Lockout/Error Codes**
417	R	LMV LOCKOUT DIAG CODE -1	Unsigned Int 16	see **LMV... Lockout/Error Codes**
418	R	LMV LOCKOUT ERROR CLASS -1	Unsigned Int 16	not used
419	R	LMV LOCKOUT ERROR PHASE -1	Unsigned Int 16	see **LMV Phases**
420	R	LMV LOCKOUT FUEL -1	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
433	R	LMV LOCKOUT DIAG CODE -2	Unsigned Int 16	see **LMV... Lockout/Error Codes**
434	R	LMV LOCKOUT ERROR CLASS -2	Unsigned Int 16	not used
435	R	LMV LOCKOUT ERROR PHASE -2	Unsigned Int 16	see **LMV Phases**
436	R	LMV LOCKOUT FUEL -2	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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 **LMV... Lockout/Error Codes**
449	R	LMV LOCKOUT DIAG CODE -3	Unsigned Int 16	see **LMV... Lockout/Error Codes**
450	R	LMV LOCKOUT ERROR CLASS -3	Unsigned Int 16	not used
451	R	LMV LOCKOUT ERROR PHASE -3	Unsigned Int 16	see **LMV Phases**
452	R	LMV LOCKOUT FUEL -3	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
465	R	LMV LOCKOUT DIAG CODE -4	Unsigned Int 16	see **LMV... Lockout/Error Codes**
466	R	LMV LOCKOUT ERROR CLASS -4	Unsigned Int 16	not used
467	R	LMV LOCKOUT ERROR PHASE -4	Unsigned Int 16	see **LMV Phases**
468	R	LMV LOCKOUT FUEL -4	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
481	R	LMV LOCKOUT DIAG CODE -5	Unsigned Int 16	see **LMV... Lockout/Error Codes**
482	R	LMV LOCKOUT ERROR CLASS -5	Unsigned Int 16	not used
483	R	LMV LOCKOUT ERROR PHASE -5	Unsigned Int 16	see **LMV Phases**
484	R	LMV LOCKOUT FUEL -5	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
497	R	LMV LOCKOUT DIAG CODE -6	Unsigned Int 16	see **LMV... Lockout/Error Codes**
498	R	LMV LOCKOUT ERROR CLASS -6	Unsigned Int 16	not used
499	R	LMV LOCKOUT ERROR PHASE -6	Unsigned Int 16	see **LMV Phases**
500	R	LMV LOCKOUT FUEL -6	Unsigned Int 16	0=gas/fuel0,1=oil/fuel

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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 **LMV... Lockout/Error Codes**
513	R	LMV LOCKOUT DIAG CODE -7	Unsigned Int 16	see **LMV... Lockout/Error Codes**
514	R	LMV LOCKOUT ERROR CLASS -7	Unsigned Int 16	not used
515	R	LMV LOCKOUT ERROR PHASE -7	Unsigned Int 16	see **LMV Phases**
516	R	LMV LOCKOUT FUEL -7	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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	
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 **LMV... Lockout/Error Codes**
529	R	LMV LOCKOUT DIAG CODE -8	Unsigned Int 16	see **LMV... Lockout/Error Codes**
530	R	LMV LOCKOUT ERROR CLASS -8	Unsigned Int 16	not used
531	R	LMV LOCKOUT ERROR PHASE -8	Unsigned Int 16	see **LMV Phases**
532	R	LMV LOCKOUT FUEL -8	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
545	R	LMV ERROR DIAG CODE CURRENT	Unsigned Int 16	see **LMV... Lockout/Error Codes**
546	R	LMV ERROR ERROR CLASS CURRENT	Unsigned Int 16	not used
547	R	LMV ERROR ERROR PHASE CURRENT	Unsigned Int 16	see **LMV Phases**
548	R	LMV ERROR FUEL CURRENT	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
553	R	LMV ERROR DIAG CODE -1	Unsigned Int 16	see **LMV... Lockout/Error Codes**
554	R	LMV ERROR ERROR CLASS -1	Unsigned Int 16	not used
555	R	LMV ERROR ERROR PHASE -1	Unsigned Int 16	see **LMV Phases**
556	R	LMV ERROR FUEL -1	Unsigned Int 16	0=gas/fuel0,1=oil/fuel

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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 **LMV... Lockout/Error Codes**
561	R	LMV ERROR DIAG CODE -2	Unsigned Int 16	see **LMV... Lockout/Error Codes**
562	R	LMV ERROR ERROR CLASS -2	Unsigned Int 16	not used
563	R	LMV ERROR ERROR PHASE -2	Unsigned Int 16	see **LMV Phases**
564	R	LMV ERROR FUEL -2	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
569	R	LMV ERROR DIAG CODE -3	Unsigned Int 16	see **LMV... Lockout/Error Codes**
570	R	LMV ERROR ERROR CLASS -3	Unsigned Int 16	not used
571	R	LMV ERROR ERROR PHASE -3	Unsigned Int 16	see **LMV Phases**
572	R	LMV ERROR FUEL -3	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
577	R	LMV ERROR DIAG CODE -4	Unsigned Int 16	see **LMV... Lockout/Error Codes**
578	R	LMV ERROR ERROR CLASS -4	Unsigned Int 16	not used
579	R	LMV ERROR ERROR PHASE -4	Unsigned Int 16	see **LMV Phases**
580	R	LMV ERROR FUEL -4	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
585	R	LMV ERROR DIAG CODE -5	Unsigned Int 16	see **LMV... Lockout/Error Codes**
586	R	LMV ERROR ERROR CLASS -5	Unsigned Int 16	not used
587	R	LMV ERROR ERROR PHASE -5	Unsigned Int 16	see **LMV Phases**
588	R	LMV ERROR FUEL -5	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
593	R	LMV ERROR DIAG CODE -6	Unsigned Int 16	see **LMV... Lockout/Error Codes**
594	R	LMV ERROR ERROR CLASS -6	Unsigned Int 16	not used
595	R	LMV ERROR ERROR PHASE -6	Unsigned Int 16	see **LMV Phases**
596	R	LMV ERROR FUEL -6	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
601	R	LMV ERROR DIAG CODE -7	Unsigned Int 16	see **LMV... Lockout/Error Codes**
602	R	LMV ERROR ERROR CLASS -7	Unsigned Int 16	not used
603	R	LMV ERROR ERROR PHASE -7	Unsigned Int 16	see **LMV Phases**
604	R	LMV ERROR FUEL -7	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
609	R	LMV ERROR DIAG CODE -8	Unsigned Int 16	see **LMV... Lockout/Error Codes**
610	R	LMV ERROR ERROR CLASS -8	Unsigned Int 16	not used
611	R	LMV ERROR ERROR PHASE -8	Unsigned Int 16	see **LMV Phases**
612	R	LMV ERROR FUEL -8	Unsigned Int 16	0=gas/fuel0,1=oil/fuel

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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 **LMV... Lockout/Error Codes**
617	R	LMV ERROR DIAG CODE -9	Unsigned Int 16	see **LMV... Lockout/Error Codes**
618	R	LMV ERROR ERROR CLASS -9	Unsigned Int 16	not used
619	R	LMV ERROR ERROR PHASE -9	Unsigned Int 16	see **LMV Phases**
620	R	LMV ERROR FUEL -9	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
625	R	LMV ERROR DIAG CODE -10	Unsigned Int 16	see **LMV... Lockout/Error Codes**
626	R	LMV ERROR ERROR CLASS -10	Unsigned Int 16	not used
627	R	LMV ERROR ERROR PHASE -10	Unsigned Int 16	see **LMV Phases**
628	R	LMV ERROR FUEL -10	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
629	R	LMV ERROR OUTPUT -10	Unsigned Int 16	x10, see **Note 1** below
630	R	LMV ERROR STARTUPS -10	Unsigned Int 32	
632	R	LMV ERROR ERROR CODE -11	Unsigned Int 16	see **LMV... Lockout/Error Codes**
633	R	LMV ERROR DIAG CODE -11	Unsigned Int 16	see **LMV... Lockout/Error Codes**
634	R	LMV ERROR ERROR CLASS -11	Unsigned Int 16	not used
635	R	LMV ERROR ERROR PHASE -11	Unsigned Int 16	see **LMV Phases**
636	R	LMV ERROR FUEL -11	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
641	R	LMV ERROR DIAG CODE -12	Unsigned Int 16	see **LMV... Lockout/Error Codes**
642	R	LMV ERROR ERROR CLASS -12	Unsigned Int 16	not used
643	R	LMV ERROR ERROR PHASE -12	Unsigned Int 32	see **LMV Phases**
644	R	LMV ERROR FUEL -12	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
649	R	LMV ERROR DIAG CODE -13	Unsigned Int 16	see **LMV... Lockout/Error Codes**
650	R	LMV ERROR ERROR CLASS -13	Unsigned Int 16	not used
651	R	LMV ERROR ERROR PHASE -13	Unsigned Int 16	see **LMV Phases**
652	R	LMV ERROR FUEL -13	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
657	R	LMV ERROR DIAG CODE -14	Unsigned Int 16	see **LMV... Lockout/Error Codes**
658	R	LMV ERROR ERROR CLASS -14	Unsigned Int 16	not used
659	R	LMV ERROR ERROR PHASE -14	Unsigned Int 16	see **LMV Phases**
660	R	LMV ERROR FUEL -14	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
665	R	LMV ERROR DIAG CODE -15	Unsigned Int 16	see **LMV... Lockout/Error Codes**
666	R	LMV ERROR ERROR CLASS -15	Unsigned Int 16	not used
667	R	LMV ERROR ERROR PHASE -15	Unsigned Int 16	see **LMV Phases**
668	R	LMV ERROR FUEL -15	Unsigned Int 16	0=gas/fuel0,1=oil/fuel

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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 **LMV... Lockout/Error Codes**
673	R	LMV ERROR DIAG CODE -16	Unsigned Int 16	see **LMV... Lockout/Error Codes**
674	R	LMV ERROR ERROR CLASS -16	Unsigned Int 16	not used
675	R	LMV ERROR ERROR PHASE -16	Unsigned Int 16	see **LMV Phases**
676	R	LMV ERROR FUEL -16	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
681	R	LMV ERROR DIAG CODE -17	Unsigned Int 16	see **LMV... Lockout/Error Codes**
682	R	LMV ERROR ERROR CLASS -17	Unsigned Int 16	not used
683	R	LMV ERROR ERROR PHASE -17	Unsigned Int 16	see **LMV Phases**
684	R	LMV ERROR FUEL -17	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
689	R	LMV ERROR DIAG CODE -18	Unsigned Int 16	see **LMV... Lockout/Error Codes**
690	R	LMV ERROR ERROR CLASS -18	Unsigned Int 16	not used
691	R	LMV ERROR ERROR PHASE -18	Unsigned Int 16	see **LMV Phases**
692	R	LMV ERROR FUEL -18	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
697	R	LMV ERROR DIAG CODE -19	Unsigned Int 16	see **LMV... Lockout/Error Codes**
698	R	LMV ERROR ERROR CLASS -19	Unsigned Int 16	not used
699	R	LMV ERROR ERROR PHASE -19	Unsigned Int 16	see **LMV Phases**
700	R	LMV ERROR FUEL -19	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
705	R	LMV ERROR DIAG CODE -20	Unsigned Int 16	see **LMV... Lockout/Error Codes**
706	R	LMV ERROR ERROR CLASS -20	Unsigned Int 16	not used
707	R	LMV ERROR ERROR PHASE -20	Unsigned Int 16	see **LMV Phases**
708	R	LMV ERROR FUEL -20	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
713	R	LMV ERROR DIAG CODE -21	Unsigned Int 16	see **LMV... Lockout/Error Codes**
714	R	LMV ERROR ERROR CLASS -21	Unsigned Int 16	not used
715	R	LMV ERROR ERROR PHASE -21	Unsigned Int 16	see **LMV Phases**
716	R	LMV ERROR FUEL -21	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
721	R	LMV ERROR DIAG CODE -22	Unsigned Int 16	see **LMV... Lockout/Error Codes**
722	R	LMV ERROR ERROR CLASS -22	Unsigned Int 16	not used
723	R	LMV ERROR ERROR PHASE -22	Unsigned Int 16	see **LMV Phases**
724	R	LMV ERROR FUEL -22	Unsigned Int 16	0=gas/fuel0,1=oil/fuel

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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 **LMV... Lockout/Error Codes**
729	R	LMV ERROR DIAG CODE -23	Unsigned Int 16	see **LMV... Lockout/Error Codes**
730	R	LMV ERROR ERROR CLASS -23	Unsigned Int 16	not used
731	R	LMV ERROR ERROR PHASE -23	Unsigned Int 16	see **LMV Phases**
732	R	LMV ERROR FUEL -23	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
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 **LMV... Lockout/Error Codes**
737	R	LMV ERROR DIAG CODE -24	Unsigned Int 16	see **LMV... Lockout/Error Codes**
738	R	LMV ERROR ERROR CLASS -24	Unsigned Int 16	not used
739	R	LMV ERROR ERROR PHASE -24	Unsigned Int 16	see **LMV Phases**
740	R	LMV ERROR FUEL -24	Unsigned Int 16	0=gas/fuel0,1=oil/fuel
741	R	LMV ERROR OUTPUT -24	Unsigned Int 16	x10, see **Note 1** below
742	R	LMV ERROR STARTUPS -24	Unsigned Int 32	
744	R	USER VALUE 1	Unsigned Int 16	see **Note 7** below
745	R	USER VALUE 2	Unsigned Int 16	see **Note 7** below
746	R	USER VALUE 3	Unsigned Int 16	see **Note 7** below
747	R	USER VALUE 4	Unsigned Int 16	see **Note 7** below
748	R	USER VALUE 5	Unsigned Int 16	see **Note 7** below
749	R	USER VALUE 6	Unsigned Int 16	see **Note 7** below
750	R	USER VALUE 7	Unsigned Int 16	see **Note 7** below
751	R	USER VALUE 8	Unsigned Int 16	see **Note 7** below
752	R	USER VALUE 9	Unsigned Int 16	see **Note 7** below
753	R	USER VALUE 10	Unsigned Int 16	see **Note 7** below
754	R	USER VALUE 11	Unsigned Int 16	see **Note 7** below
755	R	USER VALUE 12	Unsigned Int 16	see **Note 7** below
756	R	USER VALUE 13	Unsigned Int 16	see **Note 7** below
757	R	USER VALUE 14	Unsigned Int 16	see **Note 7** below
758	R	USER VALUE 15	Unsigned Int 16	see **Note 7** below
759	R	USER VALUE 16	Unsigned Int 16	see **Note 7** below
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

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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
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
797	R	EA UNIVERSAL INPUTS 5-8 STATUS WORD	Unsigned Int 16	
797 bit 0	R	EA UNIVERSAL INPUT 5 HIGH ALARM	Boolean	
797 bit 1	R	EA UNIVERSAL INPUT 5 LOW ALARM	Boolean	
797 bit 2	R	EA UNIVERSAL INPUT 6 HIGH ALARM	Boolean	
797 bit 3	R	EA UNIVERSAL INPUT 6 LOW ALARM	Boolean	
797 bit 4	R	EA UNIVERSAL INPUT 7 HIGH ALARM	Boolean	
797 bit 5	R	EA UNIVERSAL INPUT 7 LOW ALARM	Boolean	
797 bit 6	R	EA UNIVERSAL INPUT 8 HIGH ALARM	Boolean	
797 bit 7	R	EA UNIVERSAL INPUT 8 LOW ALARM	Boolean	
798	R	EA UNIVERSAL INPUTS 9-12 STATUS WORD	Unsigned Int 16	
798 bit 0	R	EA UNIVERSAL INPUT 9 HIGH ALARM	Boolean	
798 bit 1	R	EA UNIVERSAL INPUT 9 LOW ALARM	Boolean	
798 bit 2	R	EA UNIVERSAL INPUT 10 HIGH ALARM	Boolean	
798 bit 3	R	EA UNIVERSAL INPUT 10 LOW ALARM	Boolean	
798 bit 4	R	EA UNIVERSAL INPUT 11 HIGH ALARM	Boolean	
798 bit 5	R	EA UNIVERSAL INPUT 11 LOW ALARM	Boolean	
798 bit 6	R	EA UNIVERSAL INPUT 12 HIGH ALARM	Boolean	
798 bit 7	R	EA UNIVERSAL INPUT 12 LOW ALARM	Boolean	
799	R	EA UNIVERSAL INPUTS 13-16 STATUS WD	Unsigned Int 16	
799 bit 0	R	EA UNIVERSAL INPUT 13 HIGH ALARM	Boolean	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
799 bit 1	R	EA UNIVERSAL INPUT 13 LOW ALARM	Boolean	
799 bit 2	R	EA UNIVERSAL INPUT 14 HIGH ALARM	Boolean	
799 bit 3	R	EA UNIVERSAL INPUT 14 LOW ALARM	Boolean	
799 bit 4	R	EA UNIVERSAL INPUT 15 HIGH ALARM	Boolean	
799 bit 5	R	EA UNIVERSAL INPUT 15 LOW ALARM	Boolean	
799 bit 6	R	EA UNIVERSAL INPUT 16 HIGH ALARM	Boolean	
799 bit 7	R	EA UNIVERSAL INPUT 16 LOW ALARM	Boolean	
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	
800 bit 13	R	EA INPUT 14	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	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
802 bit 11	R	EA ALARM INPUT 12	Boolean	
802 bit 12	R	EA ALARM INPUT 13	Boolean	
802 bit 13	R	EA ALARM INPUT 14	Boolean	
803	R	EA ANALOG INPUT 1 U16	Signed Int 16 Unsigned Int 16	Signed if bidirectional (+ or -)
804	R	EA ANALOG INPUT 2 U16	Signed Int 16 Unsigned Int 16	Signed if bidirectional (+ or -)
805	R	EA ANALOG INPUT 3 U16	Signed Int 16 Unsigned Int 16	Signed if bidirectional (+ or -)
806	R	EA ANALOG INPUT 4 U16	Signed Int 16 Unsigned Int 16	Signed if bidirectional (+ or -)
807	R	EA UNIVERSAL INPUT 5 U16	Signed Int 16	x10
808	R	EA UNIVERSAL INPUT 6 U16	Signed Int 16	x10
809	R	EA UNIVERSAL INPUT 7 U16	Signed Int 16	x10
810	R	EA UNIVERSAL INPUT 8 U16	Signed Int 16	x10
811	R	EA UNIVERSAL INPUT 9 U16	Signed Int 16	x10
812	R	EA UNIVERSAL INPUT 10 U16	Signed Int 16	x10
813	R	EA UNIVERSAL INPUT 11 U16	Signed Int 16	x10
814	R	EA UNIVERSAL INPUT 12 U16	Signed Int 16	x10
815	R	EA UNIVERSAL INPUT 13 U16	Signed Int 16	x10
816	R	EA UNIVERSAL INPUT 14 U16	Signed Int 16	x10
817	R	EA UNIVERSAL INPUT 15 U16	Signed Int 16	x10
818	R	EA UNIVERSAL INPUT 16 U16	Signed Int 16	x10
819	R	EA DRAFT FEEDBACK	Unsigned Int 16	x10
820	R	EA DRAFT ALARM	Unsigned Int 16	
821	R	EA DRAFT ALARM CODE	Unsigned Int 16	
822	R	EA DRAFT ALARM PHASE	Unsigned Int 16	
823	R	EA DRAFT DRIVE WORD	Unsigned Int 16	
823 bit 0	R	EA DRAFT OPEN POSITION	Boolean	
823 bit 1	R	EA DRAFT CLOSE POSITION	Boolean	
823 bit 2	R	EA DRAFT START POSITION	Boolean	
823 bit 3	R	EA DRAFT MODULATE	Boolean	
824	R	EA DRAFT SWITCH	Unsigned Int 16	0=open,1=auto
825	R	EA DRAFT SENSOR U16	Signed Int 16	x100
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	

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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
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	
894	R	EA MONITORED OUT 1	Unsigned Int 16	x10
895	R	EA MONITORED OUT 2	Unsigned Int 16	x10
896	R	EA MONITORED ALARMS	Unsigned Int 16	
896 bit 0	R	EA MONITOR 3 ALARM	Boolean	
896 bit 1	R	EA MONITOR 4 ALARM	Boolean	
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

Modbus Mapping

ADDRESS	ACCESS	DESCRIPTION	FORMAT	NOTES
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 – Mapping (continued)

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 – Mapping (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 159 as a decimal number and the string representation will be returned to register 160. For example, writing '33' to register 159 will result in register 160 returning 'SAFETY LOOP OPEN'. Writing '0' to register 159 will result in the current lockout string being returned.

Note 7 – If the user values are based upon Modbus addresses, the multiplier will be the same as the Modbus address represented. If the user values are based upon scripts, the multiplier will be x10.

Note 8 – This value is used for setting monitored outputs. Indicates which minute of the week it is. This can be used to set a weekly action.

- **0 to 1439:** Sunday (0 is 00:00, 1439 is 23:59)
- **1440 to 2879:** Monday (1440 is 00:00, 2879 is 23:59)
- **2880 to 4319:** Tuesday (2880 is 00:00, 4319 is 23:59)
- **4320 to 5759:** Wednesday (4320 is 00:00, 5759 is 23:59)
- **5760 to 7199:** Thursday (5760 is 00:00, 7199 is 23:59)
- **7200 to 8639:** Friday (7200 is 00:00, 8639 is 23:59)
- **8640 to 10079:** Saturday (8640 is 00:00, 10079 is 23:59)

Gateway – Mapping (continued)

Note 9 – LMV3 fuel train.

Mode	Fuel Train	Fuel-Air Ratio Control	Ignition	Fuel Act.	Air Act.	Monitored VSD
1	G mod	modulating electronic	direct spark	x	x	x
2	Gp1 mod	modulating electronic	pilot between V1/V2	x	x	x
3	Gp2 mod	modulating electronic	pilot before V1/V2	x	x	x
4	Lo mod	modulating electronic	direct spark	x	x	x
5	Lo 2-stage	2-stage electronic	direct spark		x	x
6	Lo 3-stage	3-stage electronic	direct spark		x	x
7	G mod pneu	modulating pneumatic	direct spark		x	
8	Gp1 mod pneu	modulating pneumatic	pilot between V1/V2		x	
9	Gp2 mod pneu	modulating pneumatic	pilot before V1/V2		x	
10	LoGp mod	modulating electronic	gas pilot	x	x	x
11	LoGp 2-stage	2-stage electronic	gas pilot		x	x
12	Lo mod (2 valves)	modulating electronic	direct spark	x	x	x
13	LoGp mod (2 valves)	modulating electronic	gas pilot	x	x	x
14	G mod pneu	modulating pneumatic	direct spark			
15	Gp1 mod pneu	modulating pneumatic	pilot between V1/V2			
16	Gp2 mod pneu	modulating pneumatic	pilot before V1/V2			
17	Lo 2-stage	2-stage electronic	direct spark			x
18	Lo 3-stage	3-stage electronic	direct spark			x
19	G mod pneu	modulating pneumatic	direct spark	x		x
20	Gp1 mod pneu	modulating pneumatic	pilot between V1/V2	x		x
21	Gp2 mod pneu	modulating pneumatic	pilot before V1/V2	x		x
22	Lo mod	modulating electronic	direct spark	x		x
23	Ho mod circ	mod. electronic, pump control	direct spark	x	x	x
24	Ho 2-stage circ	2-st. electronic, pump control	direct spark		x	x
25	Ho mod	modulating electronic	direct spark	x	x	x
26	Ho 2-stage	2-stage electronic	direct spark		x	x
27	Ho 3-stage	3-stage electronic	direct spark		x	x
28	G mod mech	modulating mechanical	direct spark		x	x
29	Gp2 mod mech	modulating mechanical	pilot before V1/V2		x	x
255	not defined	---	---			

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
35	VSD DRIVE TO IGNITION
36	DRIVE TO IGNITION
38	PREIGNITION SPARK ON
39	GAS VALVE TEST MINIMUM pressure
40	PILOT VALVE OPEN
42	SPARK OFF
44	FLAME STABILIZATION
50	FUEL VALVE OPEN SAFETY TIME
52	FLAME STABILIZATION
54	DRIVE TO LOW FIRE
60	NORMAL OPERATION
62	DRIVE TO LOW FIRE POST
64	DRIVE TO IGNITION
65	FLAME STABILIZATION
66	IGNITION/PILOT ON
67	MAIN VALVE OFF
68	PILOT WAITING TIME
69	PILOT WAITING - STARTUP
70	FUEL VALVE 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

LMV5 Lockout/Error Codes

LMV5 Lockout/Error Codes

CODE DECIMAL	CODE HEX	DESCRIPTION
0	0	NO ERROR
1	1	ROM ERROR
2	2	RAM ERROR
3	3	INTERNAL COMMUNICATION ERROR
4	4	UNSUCCESSFUL SYNC OF 2uCs
5	5	FAULT DURING FLAME AMP TEST
6	6	FAULT INTERNAL HARDWARE TEST
16	10	DIGITAL OUTPUT FAULT
17	11	SHORT CIRCUIT CONTACT FEEDBACK
21	15	ACTUATOR FAULT/VSD SPEED NOT REACHED
22	16	FAULT IN RATIO CONTROL SYSTEM
23	17	LMV5 INTERNAL COM ERROR
24	18	CORRUPTION IN COMBUSTION CURVE DATA
25	19	ACTUATOR POT ERROR
26	1A	ACTUATOR CURVE TOO STEEP
27	1B	ACT CURVE PROGRAMMING ACTIVE PHASE 62
28	1C	ACTUATOR IGNITION POSITION NOT SET
29	1D	RUNNING TIME FAULT ACTUATORS/VSD
30	1E	ACTUATOR/VSD NOT REACHED POSITION
31	1F	VSD MODULE CONNECTION ERROR
33	21	SAFETY LOOP OPEN
34	22	TEMP LIMITER OFF (CHECK SENSOR)
35	23	EXTRANEOUS LIGHT DURING STARTUP
36	24	EXTRANEOUS LIGHT DURING SHUTDOWN
37	25	NO FLAME AT END OF SAFETY TIME
38	26	LOSS OF FLAME PHASE 60-62
39	27	AIR PROVE SW ON SHOULD BE OFF
40	28	AIR PROVE SW OFF SHOULD BE ON
41	29	FAN CONTACT SIGNAL ON SHOULD BE OFF
42	2A	FAN CONTACT SIGNAL OFF SHOULD BE ON
43	2B	FGR pressure SW ON SHOULD BE OFF
44	2C	FGR pressure SW OFF SHOULD BE ON
45	2D	CPI (POC) ON SHOULD BE OFF
46	2E	CPI (POC) OFF SHOULD BE ON
47	2F	LOW GAS pressure SWITCH OPEN
48	30	HIGH GAS pressure SWITCH OPEN
49	31	VALVE PROVE – GAS SIDE LEAK
50	32	VALVE PROVE – BURNER SIDE LEAK
51	33	OIL pressure WHEN OIL PUMP OFF
52	34	LOW OIL pressure WHEN PUMP RUNNING
53	35	HIGH OIL pressure SWITCH OPEN
54	36	NO START RELEASE FOR OIL
55	37	NO HEAVY OIL DIRECT START
56	38	SHORTAGE OF GAS PROGRAM IN PROGRESS
57	39	PARAMETER OF MAX SAFETY TIME FAULTY
58	3A	NO BURNER ID DEFINED
59	3B	NO SERVICE PASSWORD DEFINED
64	40	WRONG CONTACT POSITION OF SAFETY TIME

LMV5 Lockout/Error Codes

CODE DECIMAL	CODE HEX	DESCRIPTION
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
87	57	INVALID PARAMETERIZATION
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
154	9A	CANBUS WARNING LEVEL
155	9B	CANBUS QUEUE OVERRUN
160	A0	AUX3 ACTUATOR DETECTED A FAULT
161	A1	AIR ACTUATOR DETECTED A FAULT

LMV5 Lockout/Error Codes

CODE DECIMAL	CODE HEX	DESCRIPTION
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
187	BB	O_2 TRIM CONTROL REMOVED
190	BE	INVALID PARAMETERIZATION O_2 CONTROL
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
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

LMV3 Error Codes

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
18	AIR pressure SWITCH SPEED DEPENDENT
19	COMBUSTION pressure POC
20	pressure SWITCH – MINIMUM
21	pressure SWITCH – MAXIMUM
22	SAFETY LOOP / BURNER FLANGE
23	LOW GAS / HEAVY OIL DIRECT START
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

LMV3 Error Codes

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
154	TRIM FUNCTION – INVALID ANALOG
155	TRIM FUNCTION – INVALID CURVE
156	TRIM FUNCTION – TIMEOUT
157	TRIM FUNCTION – TEST FAIL
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

LMV3 Error Codes

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

Assigning Inputs to System Variables

Assigning specific strings or names to digital/analog inputs is required for certain options. Each is specifically described in further detail in the relevant section (*Load Control*, *Feedwater*, *Boiler Circulating Pump,* etc.).

Digital Inputs

Assigning specific names to digital inputs can allow some additional options to be used. The names must be entered exactly as shown with the same case. Names shown in italics are automatically assigned depending upon chosen options.

Name	Description	Inputs Allowed
Pump Proven	Flow switch, differential pressure or current switch proving boiler circulating pump operation (boiler circulating pump option).	DI1-14
Alarm Reset PB	Physical button may be used in lieu of touchscreen button for resetting timed and limit alarms.	DI1-14
Draft Switch Auto	Physical switch may be used in lieu of touchscreen switch for Draft Open/Auto (draft control option).	DI1-11
Damper Open Pos.	Draft damper open position status (draft control option).	Automatically assigned to DI12 when draft optioned
Damper Close Pos.	Draft damper closed position status (draft control option).	Automatically assigned to DI13 when draft optioned
Damper Ign. Pos.	Draft damper ignition position status (draft control option).	Automatically assigned to DI14 when draft optioned

Assigning Inputs to System Variables (continued)

Analog Inputs

Assigning specific strings to the analog input or UNIVERSAL input tags can allow some additional options to be used. Multiple strings can be used on one input when desired. The names must be entered exactly as shown with the same case. Names shown in italics are automatically assigned depending upon chosen options.

Name	Description	Inputs Allowed
E1	Process variable E1 for load control option (load control option).	AI1-4, GI5-16
DL	Delta process variable for load control option. Subtracted from the E1 value (load control option).	AI1-4, GI5-16
E3	Alarm variable E3 for load control option (load control option).	AI1-4, GI5-16
LFH	Alarm output K6 is enabled when the alarm variable E3 is below the alarm setpoint (load control option).	AI1-4, GI5-16
HIF	Alarm output K6 is enabled when the alarm variable E3 is above the alarm setpoint (load control option).	AI1-4, GI5-16
FW1	Water level variable for feedwater option (single-element feedwater option).	AI1-4, GI5-16
FW2	Steam flow variable for feedwater option (three-element feedwater option).	AI1-4, GI5-16
FW3	Feedwater flow variable for feedwater option (three-element feedwater option).	AI1-4, GI5-16
CP	Circulating pump output is linear to this input in ratio (boiler circulating pump option).	AI1-4, GI5-16
Econo Water Out	Economizer outlet water temperature (economizer option).	Automatically assigned to GI5 or GI9
Econo Water In	Economizer inlet water temperature (economizer option).	Automatically assigned to GI6 or GI10
Econo Stack Out	Economizer outlet stack temperature (economizer option).	Automatically assigned to GI7 or GI11
Econo Stack In	Economizer inlet stack temperature (economizer option).	Automatically assigned to GI8 or GI12

Sample Monitored Value Applications

Soft Limits

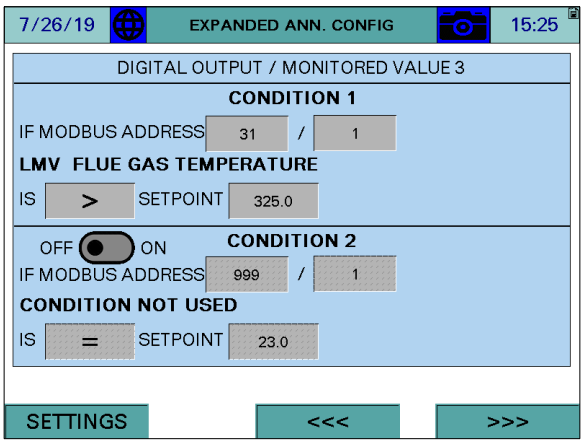
Monitored digital outputs can be configured to provide soft (non safety-related) limits.

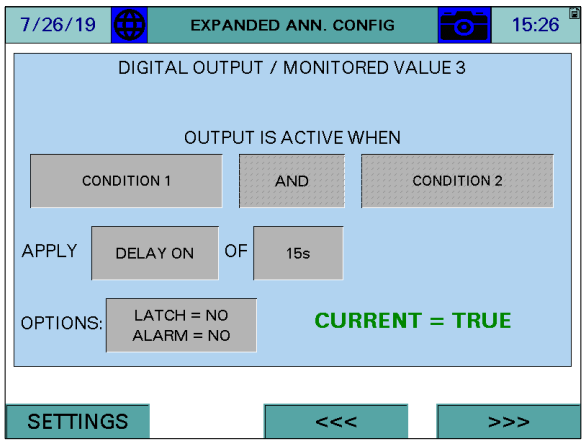
Procedure

An example of a soft limit is a high flue temperature shutdown on the operating limits (control switch input).

Configure the monitored digital output to activate when the flue temperature is above the desired shutdown setpoint. This is shown under 'CONDITION 1'. The flue temperature is available from the LMV5 via Modbus. From the Modbus mapping, it is known that this value is represented without a divider, so a divider of 1 is entered. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value is above the setpoint, choose **>** as the function.

'CONDITION 2' will not be used, so set the slider switch to **OFF**. Apply a short on delay to provide a filter time to verify a steady signal.



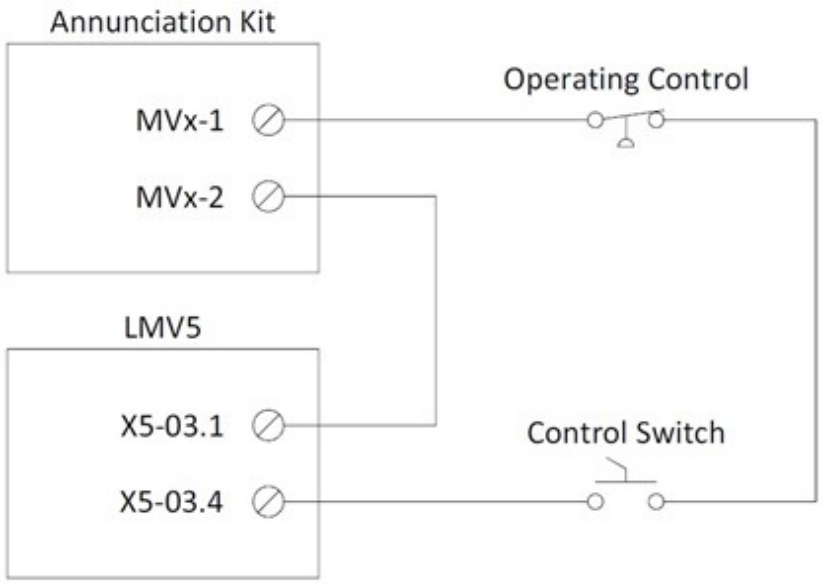


If desired, the action can be latched and/or create an alarm when true. Latching would require a manual reset via the ALARMS screen to clear the condition.

Sample Monitored Value Applications (continued)

Wiring

Wire the monitored digital output into the control switch string in series with the existing limits to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (for example, monitored output 3 would use terminals MV3-1 and MV3-2).



Sample Monitored Value Applications (continued)

Time-Based Actions

Monitored digital outputs can be configured to provide a time-based action such as a valve opening.

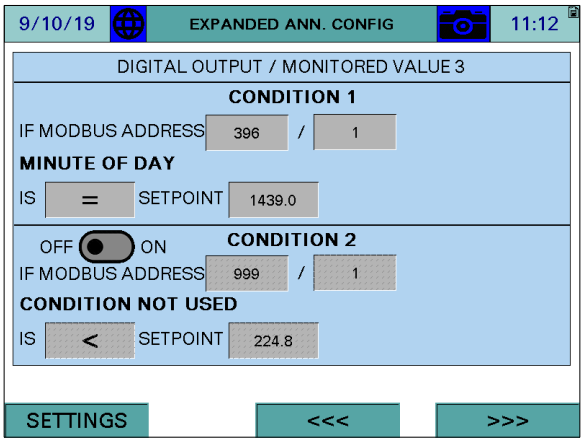
Procedure

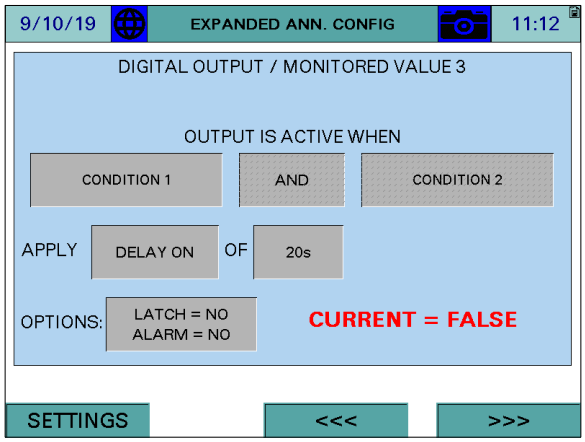
An example of a time-based action could be a blow-down valve that opens once a day for 30 seconds. The time selected for this action will be 23:59.

Configure 'CONDITION 1' of the monitored digital output to activate when the minute of the day is equal to the time 23:59. This is calculated by multiplying the hour by 60 (1380) and then adding the minutes. This equates to a setpoint of 1439. From the Modbus mapping for 'MINUTE OF DAY', it is known that this value is represented without a divider, so a divider of 1 is entered. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value equals the setpoint, choose **=** as the function.

Deactivate 'CONDITION 2' by setting the slider switch to **OFF**. This condition could be used if the action should occur for more than one minute or more than once a day.

There is no logic applied between the conditions since only one is used. If two conditions were used, the appropriate logic would be chosen (such as **AND** for a time range or **OR** for two different times). Apply a 20 second on delay to keep the output inactive for the first 20 seconds of the condition being true. This is done since the action is only desired for 30 seconds instead of the full minute. Allow some extra time for communication of the data.

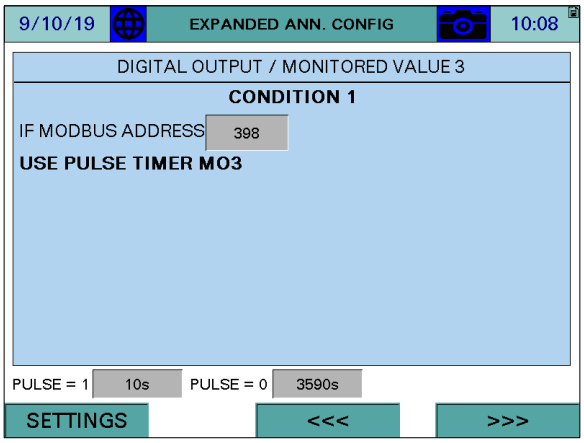


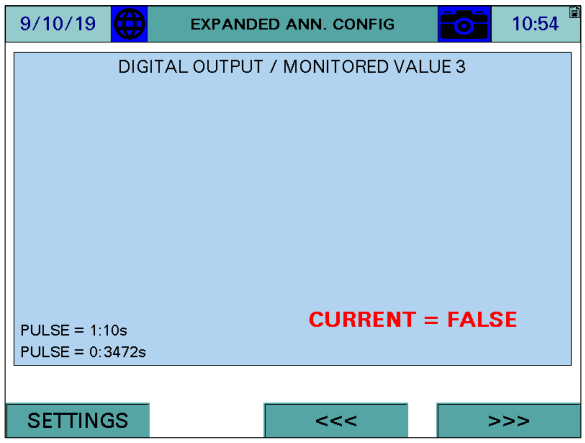


If desired, the action can be latched and/or create an alarm when true. Latching would require a manual reset via the ALARMS screen to clear the condition.

Sample Monitored Value Applications (continued)

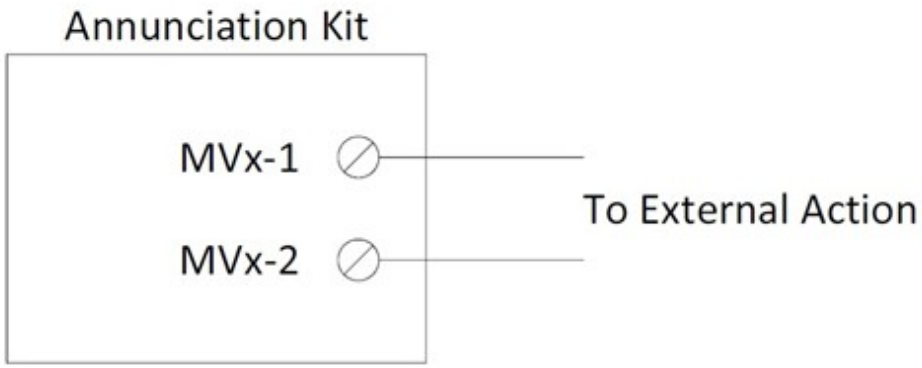
If the specific time of day is not critical, this can also be done using the recycling pulse output option. This sets the monitored digital output open and closed for specific time periods. Since the maximum duration of the pulses is less than 24 hours, this option cannot be used for a daily action. It does not offer the option to alarm or latch the output.





Wiring

Wire the monitored digital output into the external action to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (for example, monitored output 3 would use terminals MV3-1 and MV3-2).



Sample Monitored Value Applications (continued)

Pump Control

Monitored digital outputs can be configured to provide basic pump control for feedwater pumps or blend pumps based on the current LMV phase. This could also be used for controlling a different auxiliary device. Note that advanced pump and feedwater control are available as specific options.

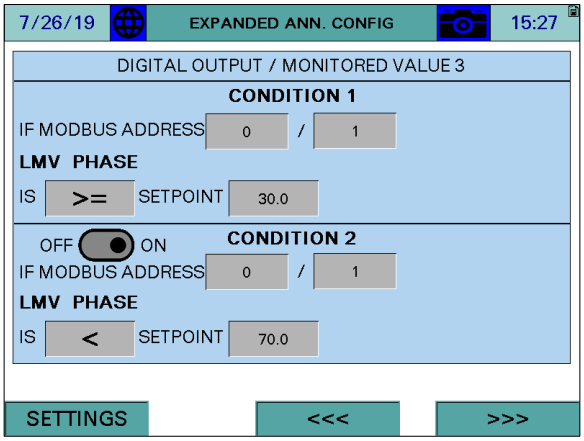
Procedure

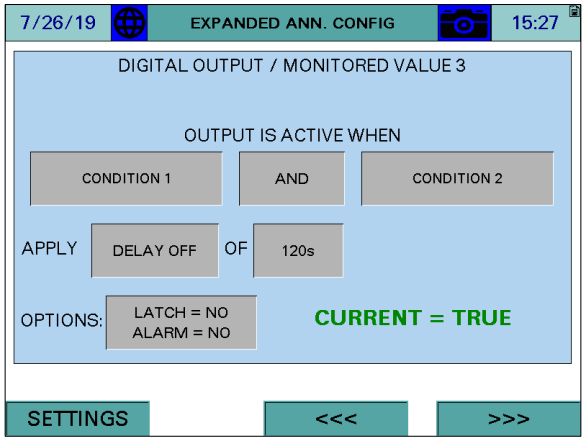
An example could be a blend pump that needs to circulate when a boiler is operating, with an off delay to allow for extra circulation after the boiler shuts down.

Configure 'CONDITION 1' of the monitored digital output to activate when the phase is greater than or equal to '30' (prepurge begins). The phase data is available from the LMV5 via Modbus. From the Modbus mapping, it is known that this value is represented without a divider, so a divider of 1 is entered. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value is greater than or equal to the setpoint, choose **>=** as the function.

Activate 'CONDITION 2' by setting the slider switch to **ON**, then configure the monitored digital output to activate when the phase is greater than '70' (afterburn begins), following the above guidelines.

Choose **AND** as the logic applied between the conditions. Apply a 120 second off delay to keep the output active for an additional 120 seconds.



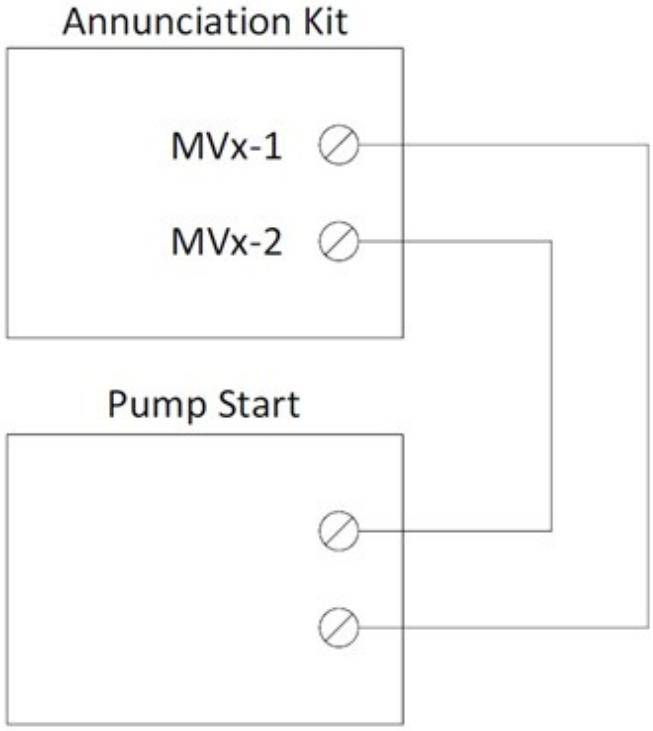


If desired, the action can be latched and/or create an alarm when true. Latching would require a manual reset via the ALARMS screen to clear the condition.

Sample Monitored Value Applications (continued)

Wiring

Wire the monitored digital output into the pump start contact to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (for example, monitored output 3 would use terminals MV3-1 and MV3-2).



Sample Monitored Value Applications (continued)

Proportional Analog Output

Monitored analog outputs can be configured to provide a proportional analog output based upon an operating value.

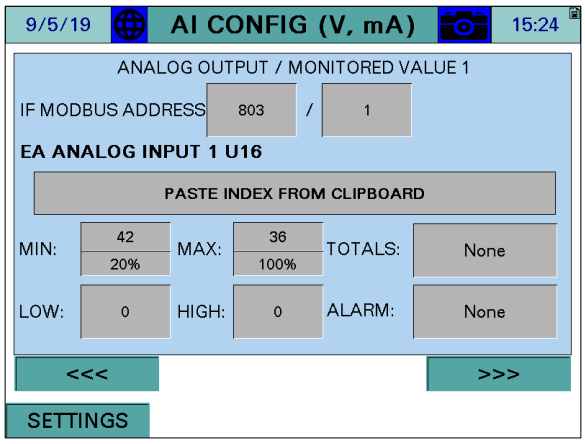
Procedure

An example could be a feedwater valve operating on a proportional scale to a water level transmitter.

Connect the water level transmitter to analog input 1 and scale appropriately. In this case, the units may be inches of water, indicating the water level. Monitor this Modbus address and set the proper division unit.

Since the output of the value should be at the maximum when the water level is low, set up the range to be reverse-acting by setting the minimum higher than the maximum. Set the minimum at the level where the valve should be fully closed, and the maximum at the level where the valve should be fully open. Any water level in between will result in a proportional output.

Since the valve requires a 4-20mA signal, set the minimum percent to 20%. This is based upon 4mA being 20% of the 0-20mA range that is available for use with the monitored analog outputs.

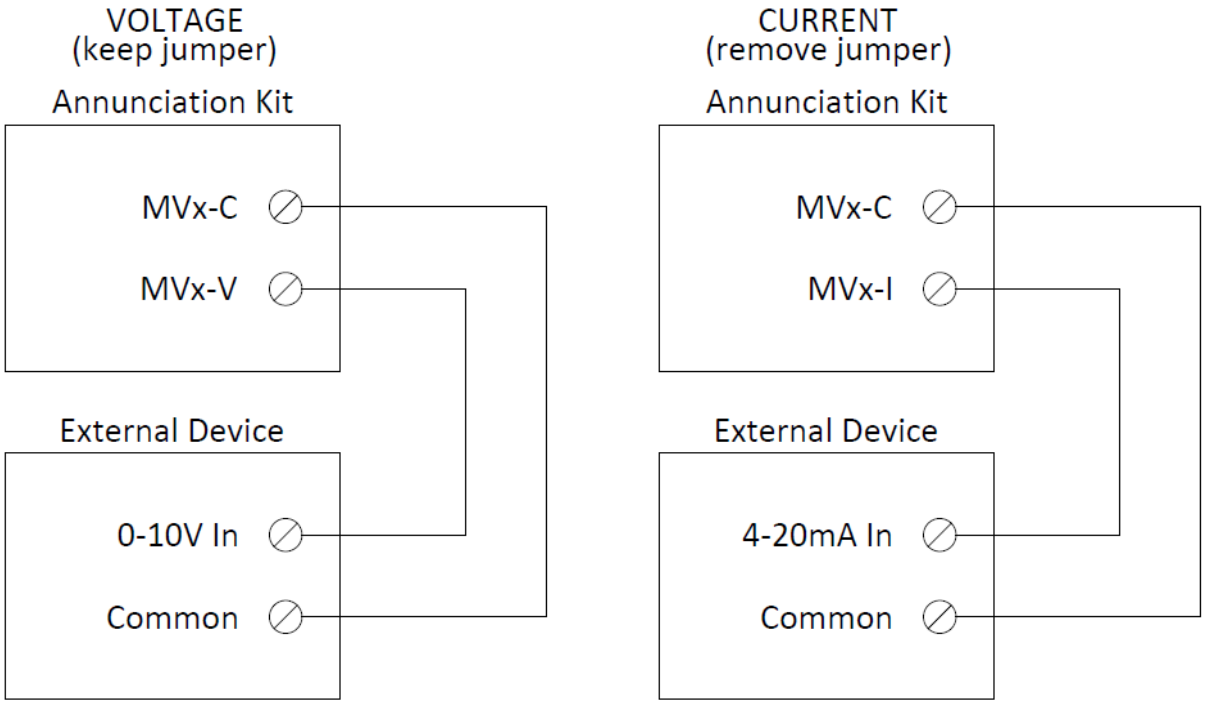


Sample Monitored Value Applications (continued)

Wiring

Wire the monitored analog output to the external device to complete the process. Note that the terminals MVx-V, MVx-I and MVx-C refer to the specific monitored output used (for example, monitored output 1 would use terminals MV1-V, MV1-I and/or MV1-C).

The “jumper” that’s referred to below, is part of the touchscreen kit electrical drawing.



Creating User Value Scripts

User value scripts will only work on revision 17M1 and newer. Up to 16 user scripts can be added for additional value calculations. This feature is only available with the 10” touchscreen selection.

Purpose

User scripts allow additional data to be monitored, processed or displayed. This is useful when non-standard annunciation is required on the touchscreen or via BMS. The resulting data can also be used with monitored values to expand upon the logic that triggers them.

Format

User scripts are simple text (.txt) files. To be recognized, the file must be named "displayX.txt", where the X represents the script number from 0 to 15 (such as display0.txt). These files must be placed in the "userval" folder of the SD card. They can also be loaded from a USB drive (also place in the "userval" folder) using the "Manage" popup (see *User Value Scripts* for additional detail).

Variables

There are 16 retentive and 16 non-retentive variables available to use for writing scripts. The retentive variables are m0-m15 and the non-retentive variables are v0-v15.

Comments

"#" is used to indicate that the line contains a comment. Any content after the "#" is ignored as long as it is on the same line.

Breaks

Each command must be on a new line. There are no end of line characters such as ";".

Length

The maximum number of lines per script is 100.

Creating User Value Scripts (continued)

Syntax Summary

Keyword	Description	Example
name=	The name for the value.	name=Temperature
suffix=	The suffix (units) for the value.	suffix=PSI
state=	Indicates the value is discrete/binary and supplies the true/false text.	state=On,Off
show=	Indicates whether the value should be displayed on a boiler overview screen.	show=int:1,0,v0:2
math=	Math function to be applied to data.	math=index:100,int:2,add,v0
logic=	Logic function to be applied to data.	logic=index:112,int:200,gt,v0
ret=	Returns the specified variable to the "User Values" screen.	ret=v0:2
v0= v1= ... v15=	Assigns a value to the indicated non-retentive variable.	v0=12.5
m0= m1= ... m15=	Assigns a value to the indicated retentive variable.	m0=12.5

Syntax Detail: name=
Any text after "name=" is acceptable (including spaces). The total length of the user value display is 60 characters including the value and suffix.

Syntax Detail: suffix=
Any text after "suffix=" is acceptable (including spaces). The total length of the user value display is 60 characters including the value and name.

Syntax Detail: state=
Any text after "state=" is acceptable (including spaces). The total length of the user value display is 60 characters including the name and suffix. The text must contain the true and false annunciations (in that order) separated by a comma. This keyword should only be included if the output is intended to be discrete/binary.

Creating User Value Scripts (continued)

Syntax Detail: show=
This keyword is used to indicate that a variable should be displayed on one of the boiler overview screens.

Required parameters, separated by a comma:

Visibility
The data will be visible on the overview screen when the value of the visibility data is greater than zero. The format is the type of data followed by the value/address, separated by a colon.

Keyword	Description	Example
int	The value is an integer. Any value greater than zero will force visibility to true.	int:1
index	A Modbus register is used to supply the visibility. The number indicates the Modbus index.	index:112
var	An internal non-retentive variable is used to supply the visibility. Use 0-15 (not v0-v15).	var:0
mem	An internal retentive variable is used to supply the visibility. Use 0-15 (not m0-m15).	mem:0

Position
Indicates which overview screen position the data should appear on.
0: Overview, line 1
1: Overview, line 2

Variable
Indicates which variable is to be displayed ("v0:x"…"v15:x" or "m0:x"…"m15:x"). The value after ":" indicates how many decimal places to show. Using "iv0:0"…"iv15:0" or "im0:0"…"im15:0" will show the result as a rounded integer without regard for decimal places. Using "rv0:0"…"rv15:0" or "rm0:0"…"rm15:0" will show the result as a raw floating point number without rounding. Use the value "0" after ":" for iv, im, rv and rm.

Examples:
```
#shows v0 on overview, line 1 continuously as an integer
show=int:1,0,iv0:0
#shows v1 on overview, line 2 continuously with one decimal
show=int:1,1,v1:1
```

Creating User Value Scripts (continued)

Syntax Detail: math=
This keyword is used to indicate that math should be performed.

Required parameters, separated by a comma:

Variable X
The data used for the first variable (indicated as "x" in function descriptions).

Variable Y
The data used for the second variable (indicated as "y" in function descriptions).

Variable X and Variable Y assignments:

Keyword	Description	Example
int	The value is an integer.	int:1
float	The value is a float.	float:12.5
index	A Modbus register is used to supply the value. The number indicates the Modbus index.	index:112
var	An internal non-retentive variable is used to supply the value. Use 0-15 (not v0-v15).	var:0
mem	An internal retentive variable is used to supply the value. Use 0-15 (not m0-m15).	mem:0

Functions:

Keyword	Description
add +	Addition of the two variables. output = x + y
sub -	Subtraction of the two variables. output = x - y
mult *	Multiplication of the two variables. output = x * y
div /	Division of the two variables. output = x / y
mod %	Modulo of the two variables (modulo is remainder of division operation). output = x % y
pow ^	Exponent of the two variables, x to the power of y. output = x^y
root	Root of the two variables, y root of x. output = $x^{1/y}$
min	Output is the lower of the two variables.
max	Output is the higher of the two variables.
abs	The absolute value of the x is returned (y is ignored).

Creating User Value Scripts (continued)

Return

Indicates which variable the result is returned to ("v0"…"v15" or "m0"…"m15").

Examples:

```
#calculate 10 * 2 and put the result in v0
math=int:10,int:2,mult,v0
#calculate Modbus[12] * 0.8 and put the result in v0
math=index:12,float:0.8,mult,v0
```

Compound Example (convert Modbus[12] from Fahrenheit to Celsius):

```
#subtracts 32 from Modbus[12] and stores in v0
math=index:12,int:32,sub,v0
#divide v0 by 9 and store in v0 again
math=var:0,int:9,div,v0
#multiply v0 by 5 and store in v0 again
math=var:0,int:5,mult,v0
```

Creating User Value Scripts (continued)

Syntax Detail: logic=
This keyword is used to indicate that logic should be performed. Unlike math, with logic either a "1" or a "0" are returned to the indicated variable (except for functions "lsh", "rsh" and "flip").

Required parameters, separated by a comma:

Variable X
The data used for the first variable (indicated as "x" in function descriptions).

Variable Y
The data used for the second variable (indicated as "y" in function descriptions).

Variable X and Variable Y assignments:

Keyword	Description	Example
int	The value is an integer.	int:1
float	The value is a float.	float:12.5
index	A Modbus register is used to supply the value. The number indicates the Modbus index.	index:12
var	An internal non-retentive variable is used to supply the value. Use 0-15 (not v0-v15).	var:0
mem	An internal retentive variable is used to supply the value. Use 0-15 (not m0-m15).	mem:0

Creating User Value Scripts (continued)

Functions:

Keyword	Description
ge >=	True if x is greater than or equal y, else false.
gt >	True if x is greater than y, else false.
le <=	True if x is less than or equal to y, else false.
lt <	True if x is less than y, else false.
ne <> !=	True if x is not equal to y, else false.
eq == =	True if x is equal to y, else false.
or ||	True is either x or y are true, else false.
and &&	True if both x and y are true, else false.
bit	Status of bit y of word x.
bor |	Boolean OR (x OR y).
band &	Boolean AND (x AND y).
bxor ^	Boolean XOR (x XOR y).
not !	The opposite of x is returned (y is ignored).
lsh <<	Left shifts bits of word x by y positions.
rsh >>	Right shifts bits of word x by y positions.
flip ~	Inverts bits of x (y is ignored).

Return

Indicates which variable the result is returned to. Specifying "xv0"..."xv15" or "xm0"..."xm15" will set the selected variable to 0. Specifying "sv0=xxx"..."sv15=xxx" or "sm0=xxx"..."sm15=xxx" will set the selected variable to the value xxx.

Creating User Value Scripts (continued)

Examples:

```
#returns Modbus[60] > 2000 and put result in v0
logic=index:60,int:2000,gt,v0
#returns Modbus[0] = 60 and put result in v0
logic=index:0,int:60,eq,v0
```

Syntax Detail: ret=

Indicates which variable is to be returned to the "User Values" screen as well as the corresponding Modbus register ("v0:x"…"v15:x" or "m0:x"…"m15:x"). The value after ":" indicates how many decimal places to show on the "User Values" screen. Using "iv0:0"…"iv15:0" or "im0:0"…"im15:0" will show the result as a rounded integer without regard for decimal places. Using "rv0:0"…"rv15:0" or "rm0:0"…"rm15:0" will show the result as a raw floating point number without rounding. Use the value "0" after ":" for iv, im, rv and rm. Regardless of the display format chosen the Modbus representation will be x10.

Example Scripts

Monitors temperature and displays "Temperature: High" when it is above 200 on the "User Values" screen and on the "Overview" screen.

```
#script 1
name=Temperature
state=High,Normal
logic=index:12,int:200,gt,v0
ret=iv0:0
show=int:1,0,iv0:0
```

Averages the temperatures of EA RTD1-RTD4 for display on the "User Values" screen.

```
#script 2
name=Average
suffix=°F
math=index:803,index:804,add,v0
math=var:0,index:805,add,v0
math=var:0,index:806,add,v0
math=var:0,int:4,div,v0
ret=v0:1
```

LMV5 Configuration for Modbus

The LMV5... 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. touch 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** (older units **GatewayDDCon**)
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):

1. Params & Display > Access w-out PW > LoadController > Configuration >
   LC_OptgMode = **IntLC Bus**

The changes take effect immediately (no reboot required).

Log in to the AZL at the Service level (default password 9876) and change the following:

1. Params & Display > Access Serv > LoadController > Configuration >
   Ext MaxSetpoint = **100%**

If X62.1 and X62.2 are switched with a Local/Remote switch or similar as part of a remote enable package, disconnect the wires from these terminals. Failing to do so may result in the control not accepting a remote setpoint properly.

LMV3 Configuration for Modbus

The LMV3.. controller must have a compatible OCI option installed (OCI412.10 or OCI413.20) 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 LMV3... 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. touch **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 touch **ENTER**.
5. Use the **+** and **-** buttons to navigate to a flashing '141:'. If this value does not read **1**, touch **ENTER** and then use the **+** and **-** buttons to change it to **1**, then touch **ENTER** to confirm the change. This parameter activates Modbus. To return to the parameter navigation, touch 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, touch **ESC** in two successions to back up to the main screen. The changes take effect immediately (no reboot required).

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. touch the **Esc** button to return after the change is made.

To configure the RWF55 controller to communicate using Modbus, use the following procedure:

1. Touch **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. For load controller applications:
   ConF > IntF > r485 > Adr = **2**
5. For feedwater applications:
   ConF > IntF > r485 > Adr = **3**
6. Touch **Esc** in four successions or until the parameter menus are completely exited. The changes take effect immediately (no reboot required).

If either the shell or inlet temperature sensor is connected to the RWF55 via analog input 3:

1. ConF > InP > InP3 > dF3 = **0** (analog input filter)

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. touch the **LEVEL** (left-most) button until the red display reads 'CN-t'.
2. touch 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. Touch 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 touch **MODE**. This parameter sets the Modbus address.
5. Change parameter 'bPS' to **19.2** and then touch **MODE**. This parameter sets the baud rate to 19,200 bit/s.
6. Change parameter 'PRtY' to **None** and then touch **MODE**. This parameter sets the parity to none.
7. Change parameter 'SdWt' to **20** and then touch **MODE**. This parameter sets the timeout.
8. Once 'PSEL' is displayed again, touch and hold the **LEVEL** button to save the changes. The unit will reboot with the new parameters and the changes will take effect immediately.

If an analog transmitter is being used for steam pressure or water temperature the unit must be configured to display one decimal point:

1. touch the **LEVEL** (left-most) button until the red display reads 'CN-t'.
2. Touch the **MODE** (loop with arrow on end, second from left) button three times to display parameter 'dP'. Change the value to **1**.
3. Touch and hold the **LEVEL** button to save the changes. The unit will reboot with the new parameters and the changes will take effect immediately.

Yaskawa VSD Configuration for Modbus

Supported Models

The following are tested and supported:

- A1000
- V1000

Procedure

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

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

Consult the VSD literature for further details on how to configure parameters, enumerated fault/alarm code listings and connection terminal information.

Danfoss VSD Configuration for Modbus

Supported Models

The following are tested and supported:

- FC Series

Procedure

Change the following parameters:

1. 8-30 Protocol: **[2] Modbus RTU**
2. 8-31 Address: **11**
3. 8-32 Baud Rate: **[3] 19200 Baud**
4. 8-33 Parity / Stop Bits: **[2] No Parity, 1 Stop Bits**
5. Power cycle the VSD to apply the new settings.

Consult the VSD literature for further details on how to configure parameters, enumerated fault/alarm code listings and connection terminal information.

Allen-Bradley VSD Configuration for Modbus

Supported Models

The following are tested and supported:

- PowerFlex 40
- PowerFlex 400

Procedure

Change the following parameters:

1. A103 (Comm Data Rate): **4 (19200)**
2. A104 (Comm Node Address): **12**
3. A107 (Comm Format): **0 = (8 data bits, no parity, 1 stop bit)**
4. Power cycle the VSD to apply the new settings.

Consult the VSD literature for further details on how to configure parameters, enumerated fault/alarm code listings and connection terminal information.

ABB VSD Configuration for Modbus

Supported Models

The following are tested and supported:

- ACH550
- ACS550

Procedure

Change the following parameters:

1. 9802 COMM PROT SEL: **STD MODBUS**
2. 5302 EFB STATION ID: **13**
3. 5303 EFB BAUD RATE: **19.2 kb/s**
4. 5304 PARITY: **8 NONE 1**
5. 5305 EFB CTRL PROFILE: **DCU PROFILE**
6. 5310 EFB PAR 10: **102**
7. 5311 EFB PAR 11: **103**
8. 5312 EFB PAR 12: **104**
9. 5313 EFB PAR 13: **106**
10. 5314 EFB PAR 14: **107**
11. 5315 EFB PAR 15: **109**
12. 5316 EFB PAR 16: **111**
13. Power cycle the VSD to apply the new settings.

Consult the VSD literature for further details on how to configure parameters, enumerated fault/alarm code listings and connection terminal information.

Delta VSD Configuration for Modbus

Supported Models

The following are tested and supported:

- C2000

Procedure

Change the following parameters:

1. 09-00 (COM1 Communication Address): **14**
2. 09-01 (COM1 Transmission Speed): **19.2Kbps**
3. 09-04 (COM1 Communication Protocol): **12: 8, N, 1 for RTU**

Consult the VSD literature for further details on how to configure parameters, enumerated fault/alarm code listings and connection terminal information.

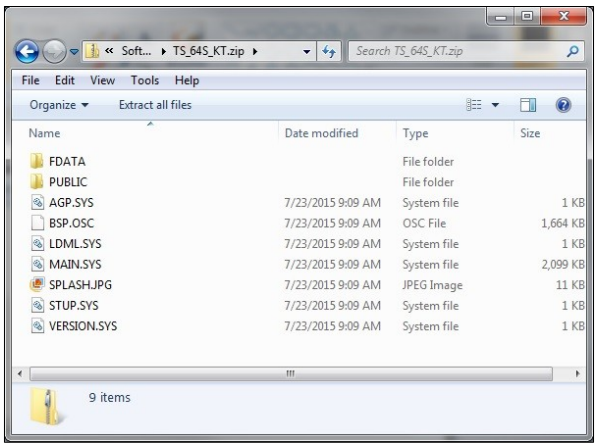
Loading Software Updates

Software updates can be field-applied using a USB drive (touchscreens) or an SD card (PLCs).

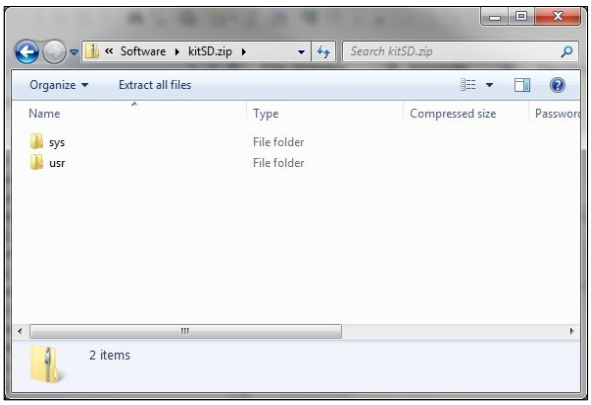
Preparing Media

If a software update is necessary, the files will be distributed in a ZIP folder. To load the contents to the device, the contents of the ZIP folder must be copied to the root directory of a USB drive or SD card.

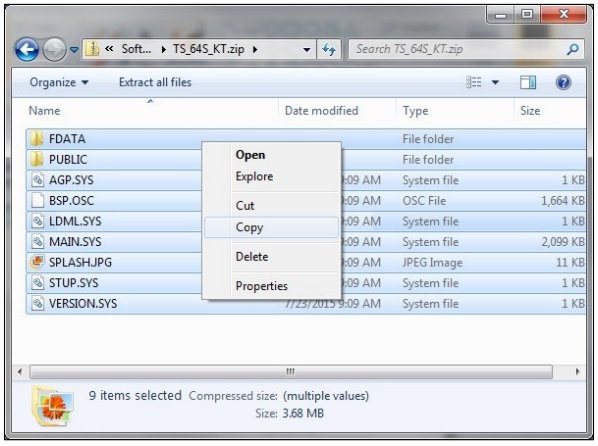
TOUCHSCREEN



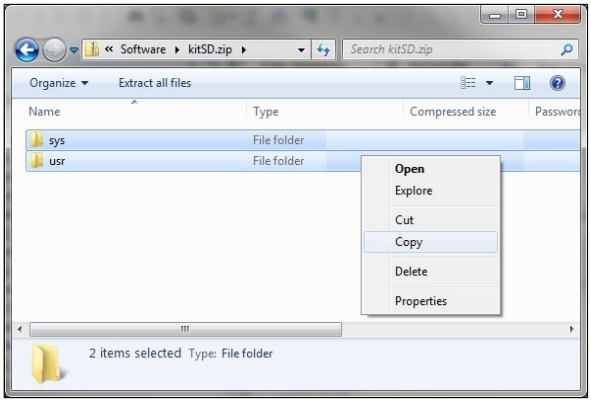
PLC



TOUCHSCREEN



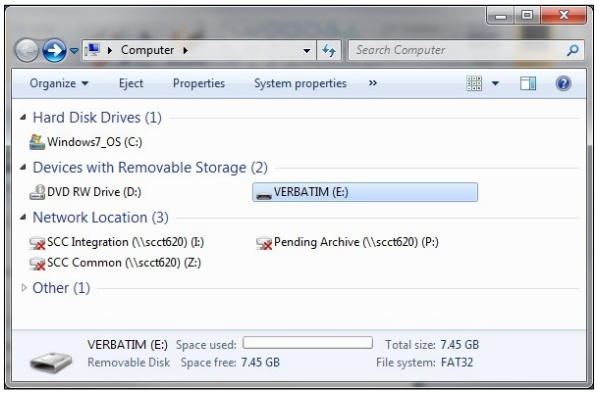
PLC



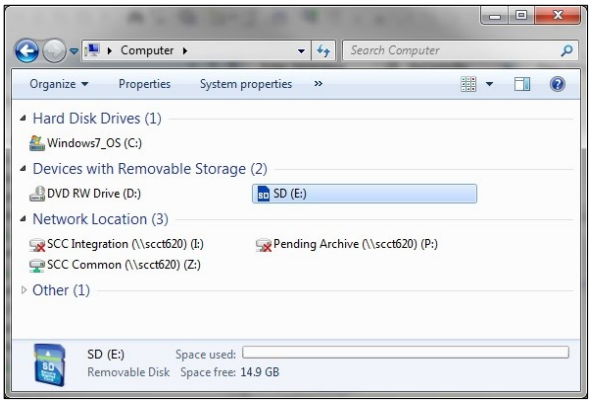
Loading Software Updates (continued)

Ensure that the USB drive or SD card is completely empty, then paste the contents.

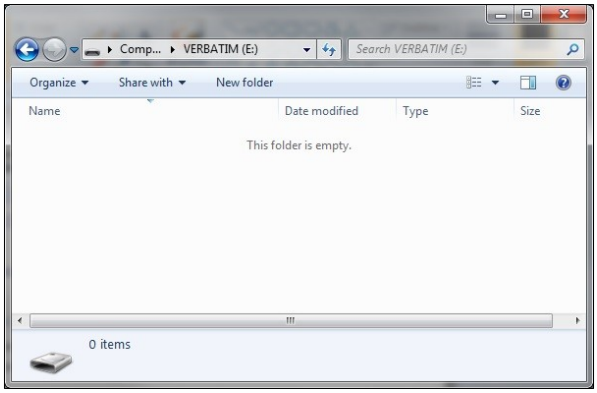
TOUCHSCREEN



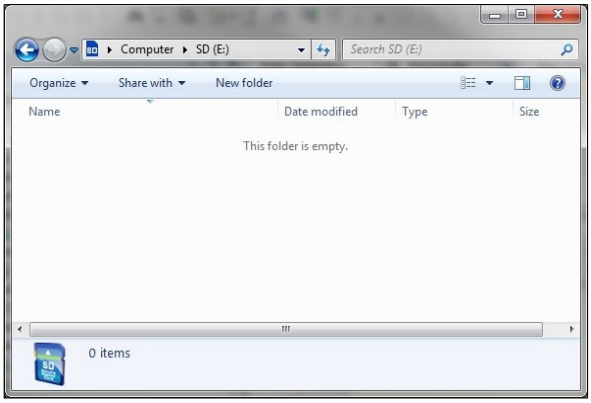
PLC



TOUCHSCREEN

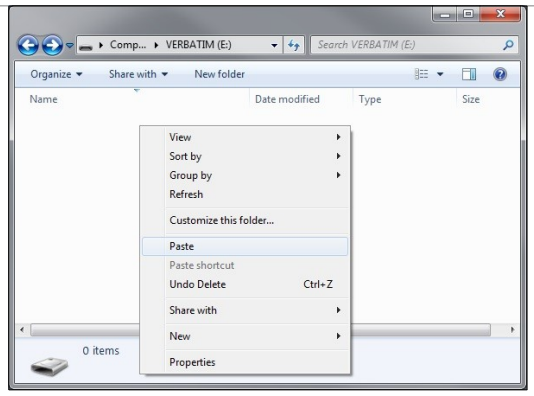


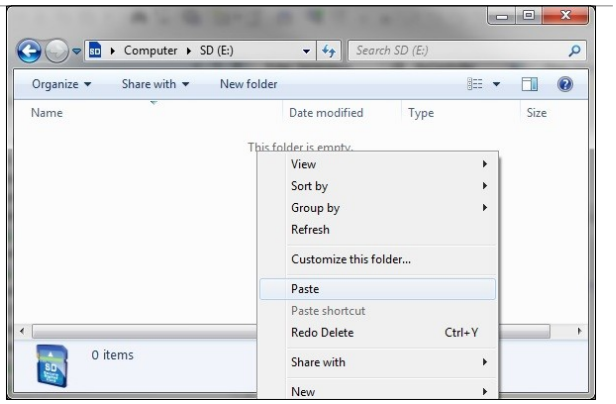
PLC



TOUCHSCREEN

PLC

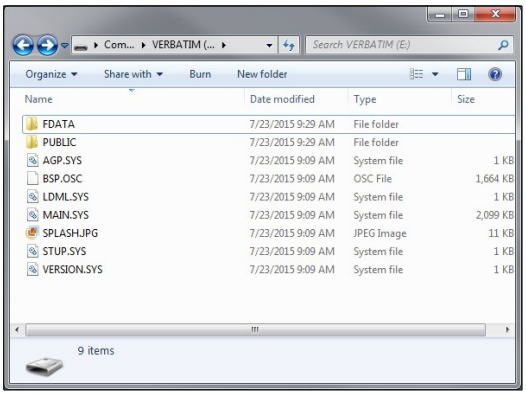

Comp... ▸ VERBATIM (E:)
Search VERBATIM (E:)
Organize
Share with
New folder
Name
Date modified
Type
Size
View
Sort by
Group by
Refresh
Customize this folder...
Paste
Paste shortcut
Undo Delete Ctrl+Z
Share with
New
Properties
0 items


Computer ▸ SD (E:)
Search SD (E:)
Organize
Share with
New folder
Name
Date modified
Type
Size
This folder is empty.
View
Sort by
Group by
Refresh
Customize this folder...
Paste
Paste shortcut
Redo Delete Ctrl+Y
Share with
New
0 items

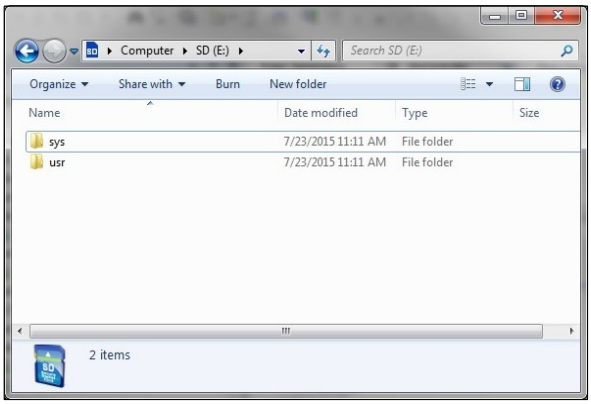
Loading Software Updates (continued)

Check that the contents are as follows before proceeding. This should match the contents of the ZIP folder.

TOUCHSCREEN



PLC



Loading Files to Touchscreen

To copy the files into a touchscreen, insert the USB drive, then touch **YES** when asked if you want to proceed with the installation.

Loading Software Updates (continued)

When the installation is complete, remove the USB drive and touch **Restart**.

The device will then reboot with the new software and the process is complete. If an activation is necessary, contact SCC Inc. technical support with the activation code displayed and enter the key given to complete the activation process, refer to page 8 for activation detail.

Loading Software Updates (continued)

Loading Files to PLC

To copy the files into a PLC, first power the device off. Once it is powered off, insert the SD card. When the device is powered on, the 'SD' LED will flash as the device loads the software. When it is finished loading, the 'SD' LED will be a steady green and the 'ERR' LED will be flashing red. Eject the SD card and the PLC will reboot with the new software (no power cycle required).

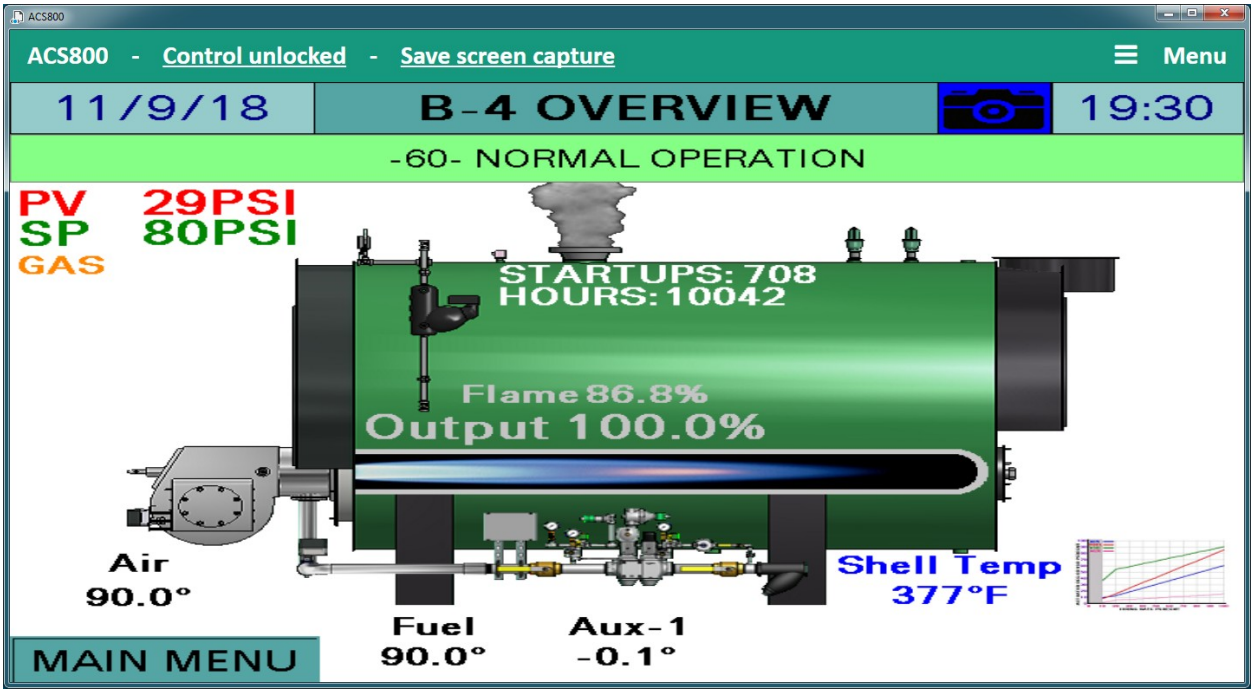
The PLC may require activation when the updates are complete. If an activation is necessary, contact SCC Inc. technical support with the activation code displayed and enter the key given to complete the activation process, refer to page 8 for activation detail. If the default IP address of the PLC had been changed, it will be necessary to establish a serial link and perform that procedure again.

ACS800 Software

ACS800 software allows remote monitoring, screen control and data logging when connected to any TS series touchscreen. ACS800 software requires a 64-bit version of Windows 7 or newer. Only one instance of ACS800 can be opened.

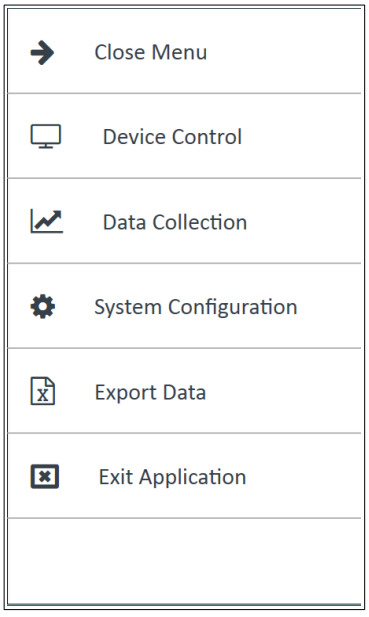
Once started, ACS800 will begin on the Device Control screen, attempting to connect to the last connected device.

The computer must be connected to the same network and have a compatible IP address to establish a connection with a touchscreen.



To navigate, expand the Main Menu in the upper right corner of the screen. The menu options are:

- **Device Control** – Remote viewer used to monitor or control the touchscreen.
- **Data Collection** – Allows data trend collection of up to eight channels.
- **System Configuration** – Used to specify the device to connect as well as other diagnostics.
- **Export Data** – Used to export data trends to Microsoft Excel formatted files.
- **Exit Application –** Exits ACS800.

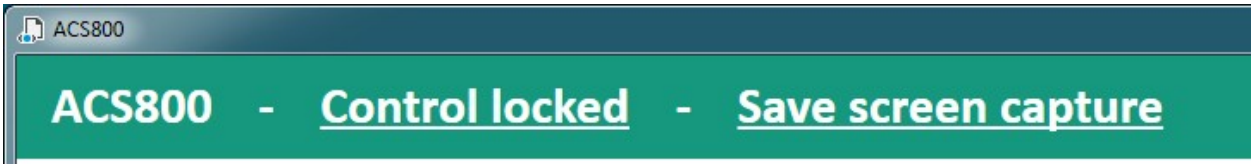


ACS800 Software (continued)

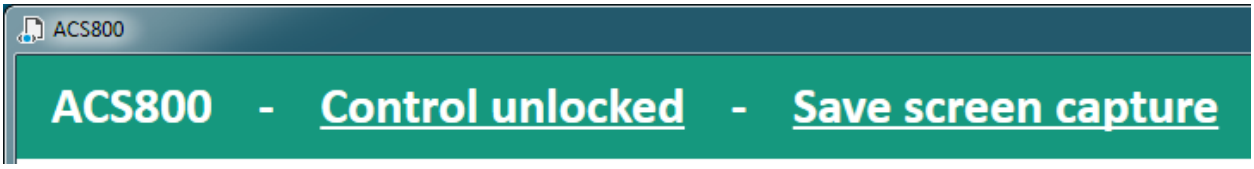
Device Control

This screen allows viewing of the connected touchscreen. The screen can be resized by dragging the lower right hand corner to the desired size.

Remote control of the connected touchscreen is allowed with a password. The default password is "SCC". Click **Control locked** to enter the password and allow remote control.



Once unlocked, the button will change to read **Control unlocked**. Click again to disable remote control.

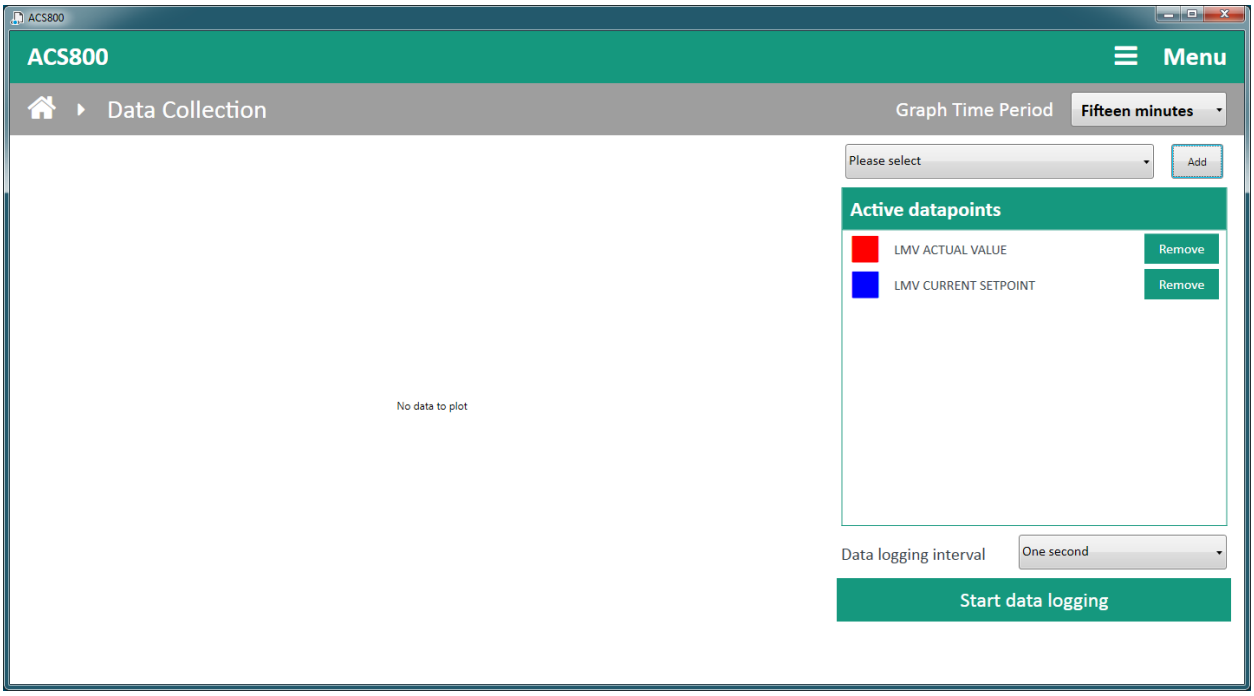


A screen capture of the current screen can be saved in the native resolution by clicking **Save screen capture**. The file format of the screen capture is png.

ACS800 Software (continued)

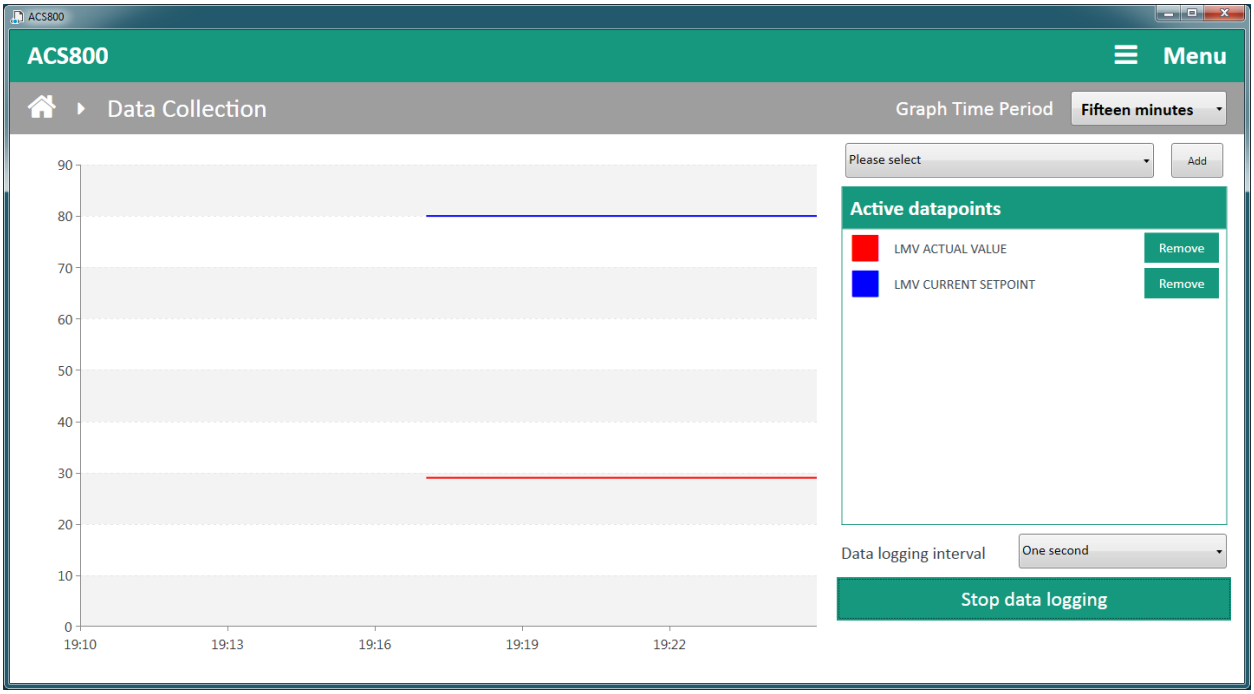
Data Collection

This screen allows data trend collection of up to eight channels. All of the available data points for the connected device will be presented in a drop-down menu. Choose the desired data point and click **Add** to add a channel with that point.



ACS800 Software (continued)

To remove a data point, click **Remove**. Choose the time period to display on the graph and the data logging interval desired, then click **Start data logging**.

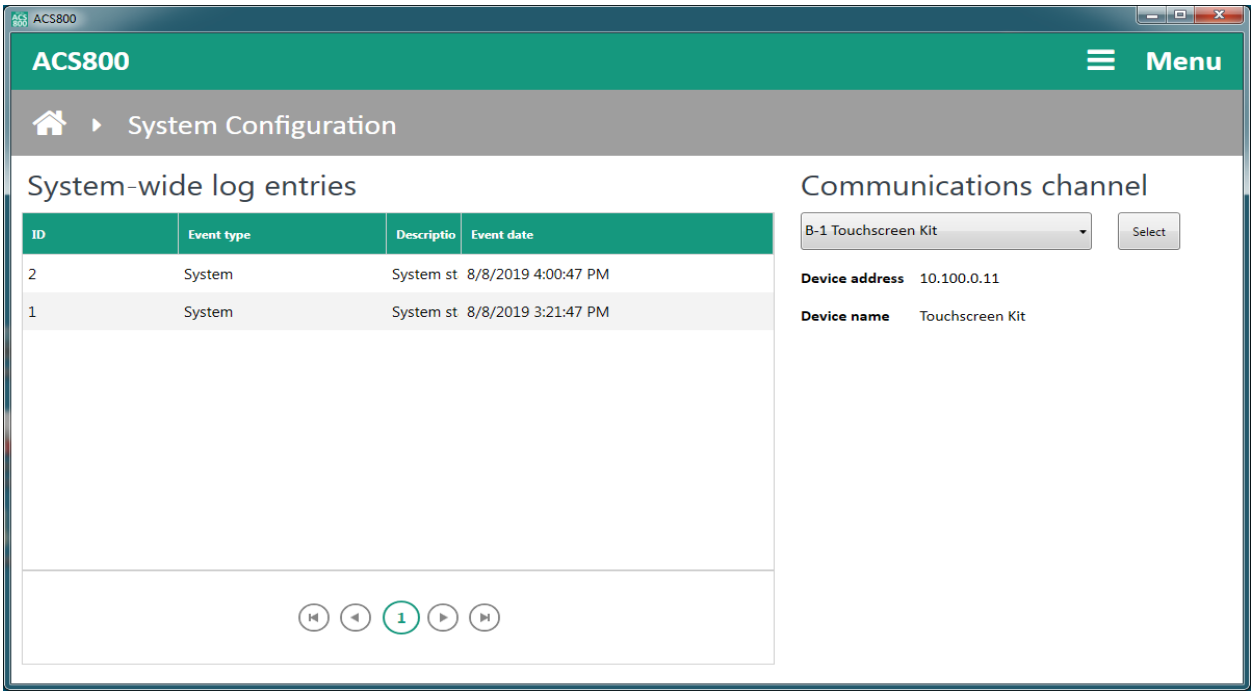


To stop the data logging, click **Stop data logging**. The data will be available for export until another data log is initiated. A data log will only continue logging if the ACS800 software is running and the log is active.

ACS800 Software (continued)

System Configuration

Specify the device to connect from this screen. Diagnostic information for the software is also shown on this screen. A password is required to access this screen. The default password is "SCC".

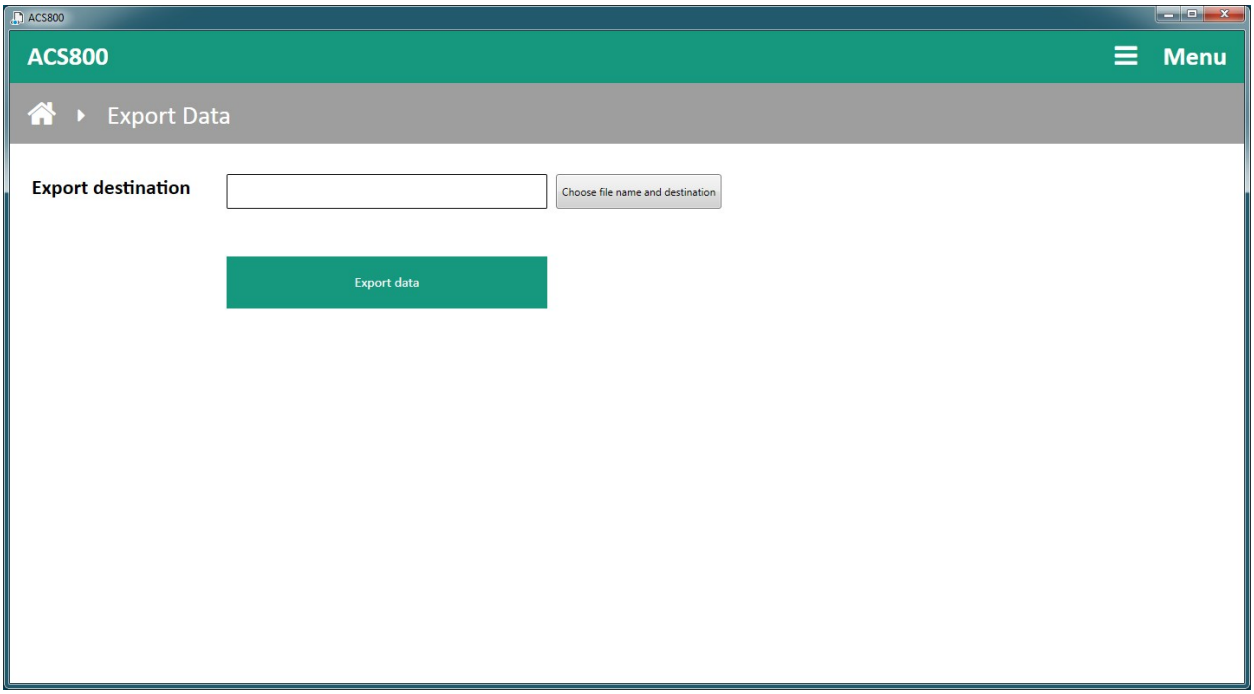


Choose the device to connect in the drop-down menu under the **Communications channel** tab. Choose **B-x Touchscreen Kit** to connect a device that uses the default IP address of 10.100.0.11 through 10.100.0.18. If the device uses a different IP address, choose **Other** from the menu and enter the IP address desired. Click **Update** to identify the remote device. Once the device is connected, click **Submit** to complete the connection.

ACS800 Software (continued)

Export Data

Data collected during data logging can be exported. To export, click **Choose file name and destination** to select the file location to save to, then click **Export data** to write the file. The number of records exported will be displayed.



The format of the file is xlsx, which is a Microsoft Excel file format. Use a spreadsheet application that can open this type of file to view the data. Use the spreadsheet application to organize or graph this data as needed.

	A	B	C	D
1	**SCC Inc. Datalog**			
2				
3				
4				
5				
6	**Date**	**Time**	**LMV ACTUAL VALUE**	**LMV CURRENT SETPOINT**
7	11/10/2018	12:36:51	29	80
8	11/10/2018	12:36:52	29	80
9	11/10/2018	12:36:53	29	80
10	11/10/2018	12:36:54	29	80
11	11/10/2018	12:36:55	29	80

ACS800 Software (continued)

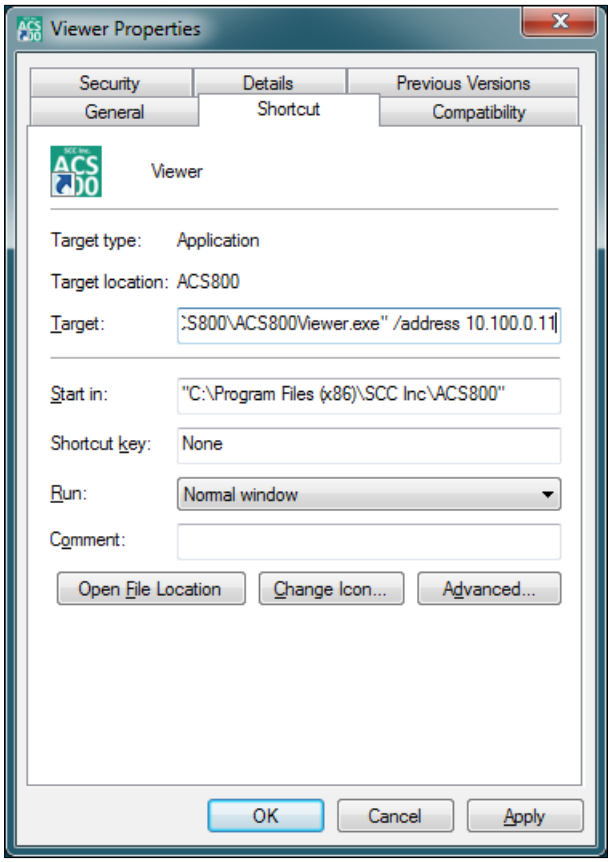
Starting From Command Line

A viewer-only version can be started from a shortcut or the command line. This allows having an icon that will open a dedicated viewer when opened. This can also be linked from another external application or batch file. Multiple viewers can be opened simultaneously using this method.

To use, locate the viewer-only version of the software in the installed folder (normally located at C:\Program Files (x86)\SCC Inc\ACS800). The name of the file is ACS800Viewer.exe. The command line switch for opening the viewer is "ACS800Viewer /address xxx.xxx.xxx.xxx", where xxx.xxx.xxx.xxx denotes the IP address.

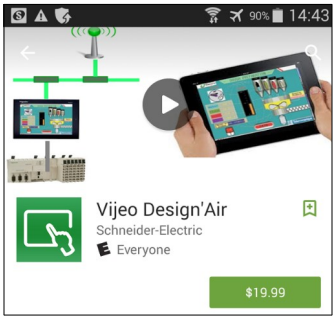
To create a shortcut, navigate to the ACS800Viewer.exe icon and right-click. Choose **Create shortcut**. The shortcut can be renamed by right-clicking and choosing **Rename**. To add the command line options to the shortcut, right-click and choose **Properties**.

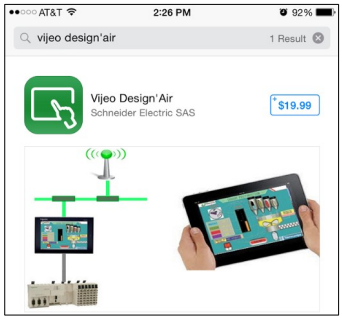
Once created, the icon can be moved to the Desktop or any other desired location. The shortcut itself can be copied, renamed and edited to change the IP address for creating shortcuts to other touchscreens.



Remote Monitoring via Android or iOS Devices

Remote monitoring of a touchscreen is possible using an Android or iOS device (phone or tablet). The touchscreen display can be viewed or manipulated as if the user was at the actual touchscreen (in real time). To establish a connection, the phone or tablet must be connected to the same network as the touchscreen. This requires that the network for the touchscreen contain a wireless access point.





To download the app, search for **Vijeo Design'Air** in the Google Play Store or Apple App Store. Once downloaded, open the app.

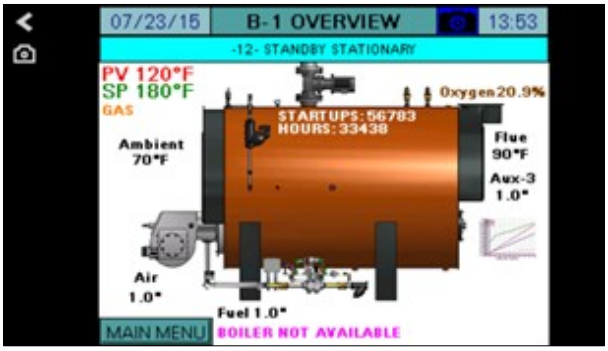
Once open, the app will automatically search for available devices. Touching 'Add Device' will allow the IP address of the desired touchscreen to be manually entered.

Navigate to the gear icon to change settings. Note that when 'View-Only' is selected, an icon appears on the top right corner of the screen. Selecting 'Keep awake while connected' will keep the screen lock from activating.

Touch the device to connect to. Acknowledge the warning shown if remote control is desired, then touch 'OK'. If view-only access is desired, touch 'View-Only'.

The remote device is now connected. If remote control was enabled, touching the display will manipulate the touchscreen remotely, otherwise a message will appear stating that 'View-Only' mode was selected.

REMOTE CONTROL



VIEW-ONLY

Touching the camera icon will allow the screen image to be saved.

Change Log

Revision 18D1

- New Modbus points for LMV3 software V3.70 and higher added.
- LMV3 software V3.40 and higher automatically configure actuators based on fuel train selected.
- Option for internal storage of backup (does not survive reprogramming – use USB or SD).
- User values can be custom scripts (10") or redirection of selected Modbus points (all sizes).
- Draft has new configuration switch for direct travel to open, close or ignition to ease setup.
- ADP-RTC3 now available to connect via Modbus and supply real-time clock (for use with LMV3… and 6").

Revision 18J1

- Added 3.5" touchscreen kit (functionally equivalent to 6").
- Added 12" touchscreen kit (functionally equivalent to 10").
- RWF40 removed as option for load control and feedwater.
- Email shortcuts and special characters now supported.
- Totalization accuracy improved.
- The expanded annunciator load controller supports using the delta between two inputs as the process variable.
- A process has been added to the expanded annunciator to force the default IP address to be restored using the digital inputs.
- Added Delta (model C2000 tested) VSD as option for VSD display.
- Added dedicated draft sensor and feedback inputs to remove requirement for adding/using analog and RTD inputs.
- Added ACS800 software instructions.

Revision 18J2

- Pt100 removed as RTD option.
- Open safety limit annunciates as lockout on LMV3.
- Error code 200 (No Error) parsed from fault annunciation.

Change Log (continued)

Revision 19F1

- Expanded annunciator has an additional input (14 inputs).
- Added 15" touchscreen kit (functionally equivalent to 10").
- RTD option replaced with universal first input card option. Economizer option replaced with universal second input card option. Economizer function can be used from either the first or second input card option. Program can be changed for the first and second input card options in any combination (this is in addition to the analog input/output card option). Available options for each card are:
  - (4) Pt1000 or LG-Ni1000 RTD inputs
  - (4) Pt100 RTD inputs
  - (4) Type J thermocouples
  - (4) Type K thermocouples
  - (4) 4-20mA inputs (scalable from -3276 to 3276, no totalization)
- Optional third input card can be fitted (same configuration as second input card).
- Analog input (inputs 1-4) range limits are now -5000 to 60000.
- Spanish and Portuguese language options with decimal/comma and date format localization.
- Email and HMI system menus/prompts in the selected language.
- Touch keypad changed to QWERTY configuration for 10", 12", and 15" touchscreen kits.
- Additional North/South American telephone operators added to text feature.
- Alarm annunciation replaces general error code information with full diagnostic code information.
- Monitored digital outputs revised to add asymmetrical recycling pulse outputs and minute-of-day/minute-of-week monitoring.
- Monitored analog outputs revised to allow full scale adjustments either forward- or reverse-acting.
- One- or three-element feedwater control possible via expanded annunciator with additional outputs.
- Circulating pump speed control possible via expanded annunciator with additional outputs.
- ADP-RTC3 removed as option.
- New IP addresses for all devices (10.100.0.x) to replace old scheme (192.168.1.x).

Revision 19F4

- Added separate gas and oil setpoints for draft control.
- Economizer selections redefined.

Your feedback is important to us. If you have comments about this document, please sent them to techsupport@scccombustion.com

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