

### Introduction to Draft Control

A TS... touchscreen kit base package with or without annunciation inputs and outputs, with draft control is suited for Firetube and Watertube boilers, controlled with Siemens linkageless control systems, such as, LMV3, or LMV5.

- Dynamic graphical display of stack draft pressures provides the operators with visual aid for operation monitoring.
- Continuous display of actual stack pressure and setpoint provides monitoring the difference to identify potential stack draft issues.
- PID control provides accurate draft pressures for any firing rates or stack pressures.
- Continuous stack pressure monitoring plus actuator position feedback provides an accurate control and monitoring process.
- SCC differential pressure transmitter can cover any draft pressure measurement range, and each pre-spanned for fixed range, -3.00 to 3.0 IWC. -5.00 to 5.00 IWC, and -10 to 10 IWC.
- Stack damper position monitoring and display and positions alarm for, damper open, ignition, and closed.
- Modbus communication to Siemens LMV linkageless control provides minimum field wiring.
- Modbus TCP/IP for BMS communication.
- UL372 listed, for gas and oil fired appliances.

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## Draft Control Main Parts



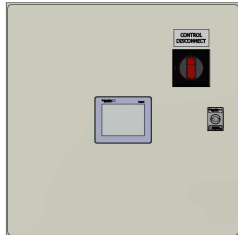
Name	Related Documents
Touchscreen and control panels	TS-1000, TS-4000, TS-5000
SQM5 actuator	155.517P25
SQM5 coupling	CPBK-1000
SQM5 mounting bracket	CPBK-2000

## Draft Control Panel Builder

The touchscreen control panel with draft control is comprised of few components in addition to the TS control panel itself. Use the following pages to choose the components needed for your specific application. See TS-1000, TS-4000, or TS-5000-part number selection charts for your complete application.

### Auxiliary Components

Draft Control Packages (See TS-1000 for all available options)

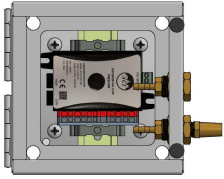
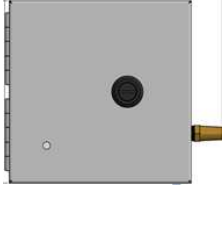

	<p><b>TS-KT3XDX-XS1-XXXX</b></p>	<p>Draft control panel PLC based, and 3” touchscreen with LMV communication, and no burner boiler annunciation or analog inputs</p>
	<p><b>TS-KT6XDX-XS1-XXXX</b></p>	<p>Draft control panel PLC based and 6” touchscreen with LMV communication, and no burner boiler annunciation or analog inputs</p>

## Auxiliary Components (continued)

### Differential Pressure Transmitter – Qty (1) Required

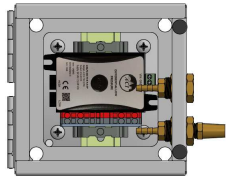
One differential pressure transmitter is required per draft control system. Refer to TS-1000/TS-4000/TS-5000 for electrical connections.

#### SCC Differential Pressure Transmitter w/o Display

	<p><b>TS-DPA-030X</b></p>	<p>4-20 mA, no display                      -3.0 to 3.0 IWC</p>
	<p><b>TS-DPA-050X</b></p>	<p>4-20 mA, no display                      -5.00 to 5.00 IWC</p>
	<p><b>TS-DPA-100X</b></p>	<p>4-20 mA, no display                      -10.0 to 10.0 IWC</p>

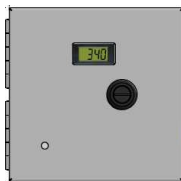
## Auxiliary Components (continued)

### SCC Differential Pressure Transmitter w/ Display



**TS-DPA-030D**

4-20 mA, with display  
-3.0 to 3.0 IWC



**TS-DPA-050D**

4-20 mA, with display  
-5.00 to 5.00 IWC



**TS-DPA-100D**

4-20 mA, with display  
-10.0 to 10.0 IWC

### SCC Differential Pressure Switch



**TS-1910-1**

0.4 to 1.6 IWC



**TS-1910-5**

1.4 to 5.5 IWC

**TS-1910-10**

3.0 to 11.75 IWC

## Auxiliary Components (continued)

### Coupling – Qty (1) Required

Zero-lash, flexible couplings are available for each SQM5 actuator. Refer to document No. CPBK-1000 for details. Select the characters from the included part number tree to replace the “x’s” as appropriate for your damper and actuator.



**CxE6SCA-xxRSA**

Flexible couplings for SQM5... actuators

### SQM5 Damper Rotary Actuator

SQM5 rotary actuator. Refer to document No. 155.517P25 for complete SQM5 part number legend. Select the characters from the tree below to replace the “x’s” as appropriate for your actuator.

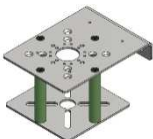


**SQM5xx64R1A3x**

SQM5 rotary actuator

### SQM5 Damper Rotary Actuator bracket

SQM5 bracket. Refer to document No. CPBK-2000 for details. Select the characters from the included part number tree below to replace the “x’s” as appropriate for your bracket.



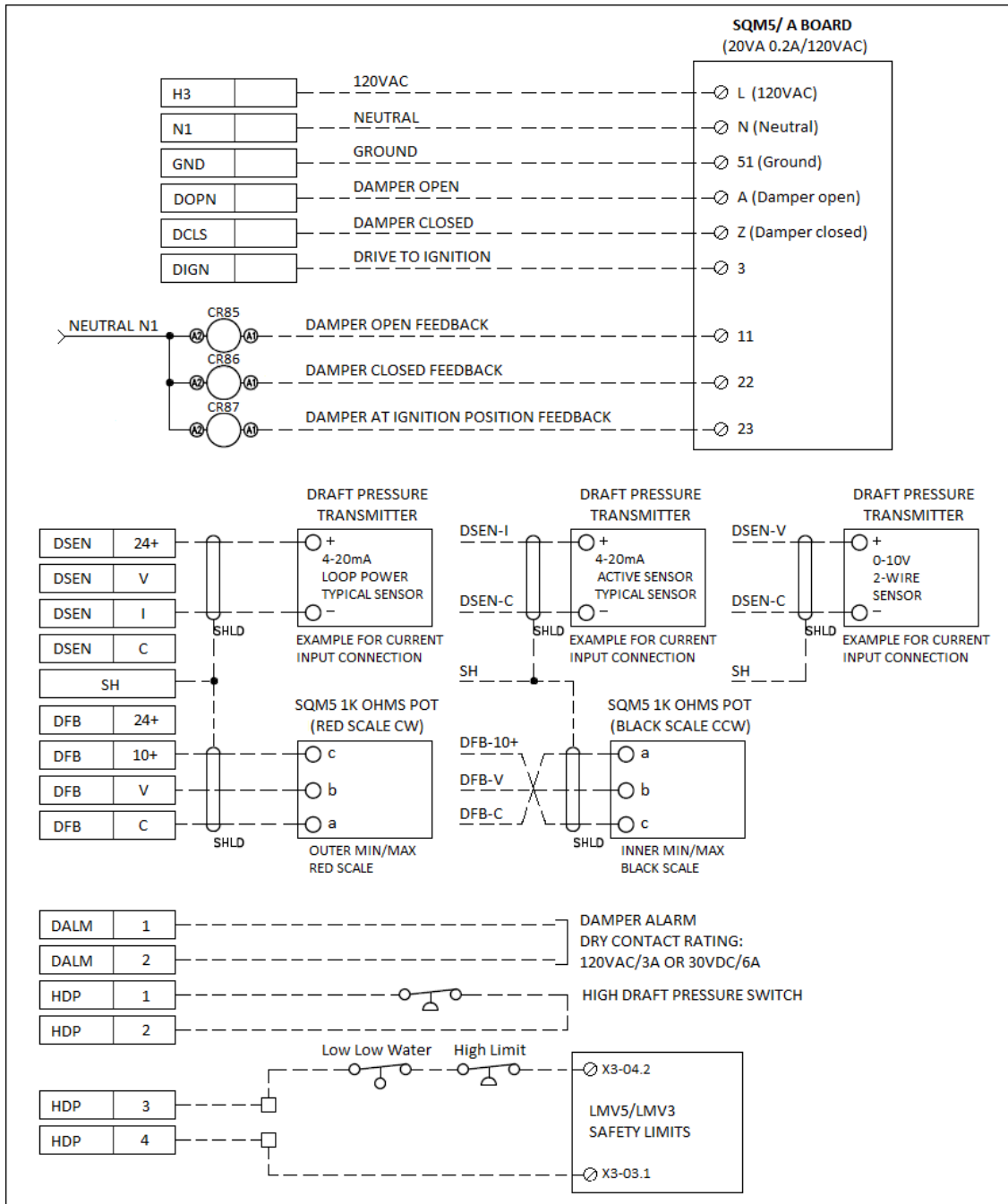
**BR-AS21-x4-x-HT**

SQM5 bracket assembly



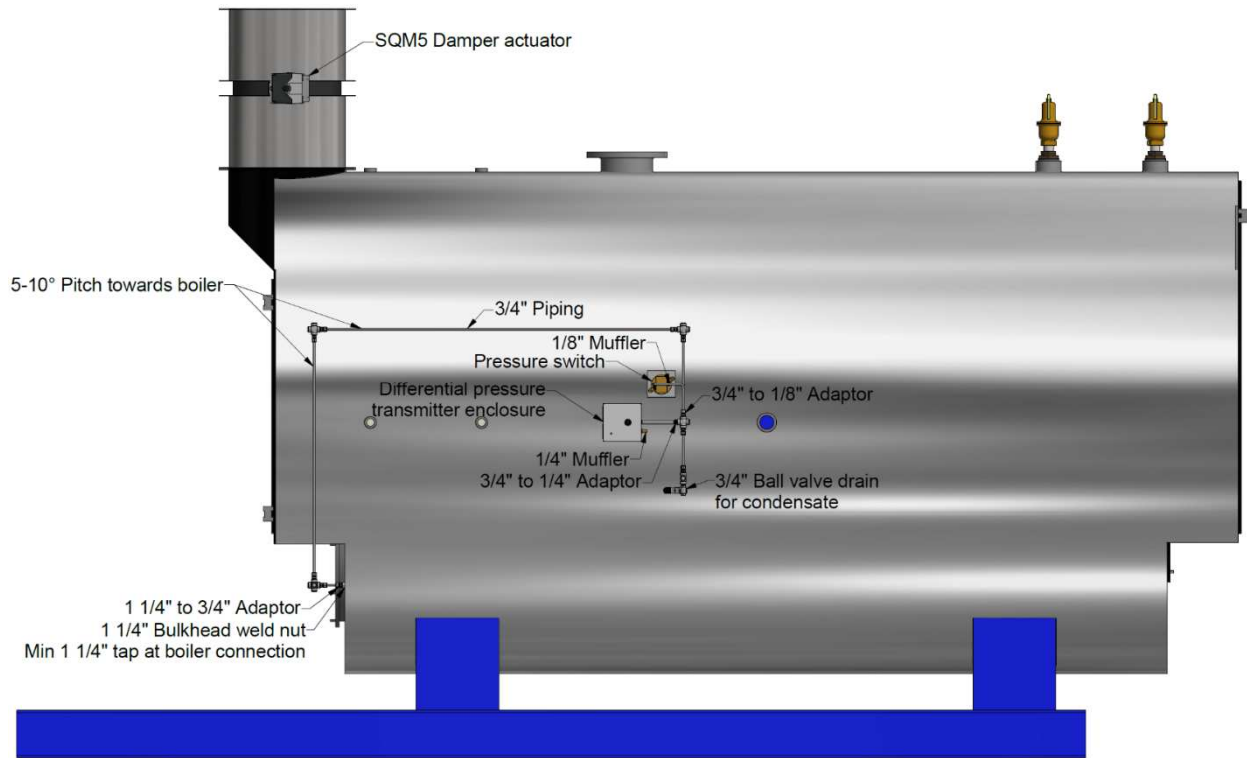
## Typical Electrical Field Connections

### SQM5 connections with "A" board

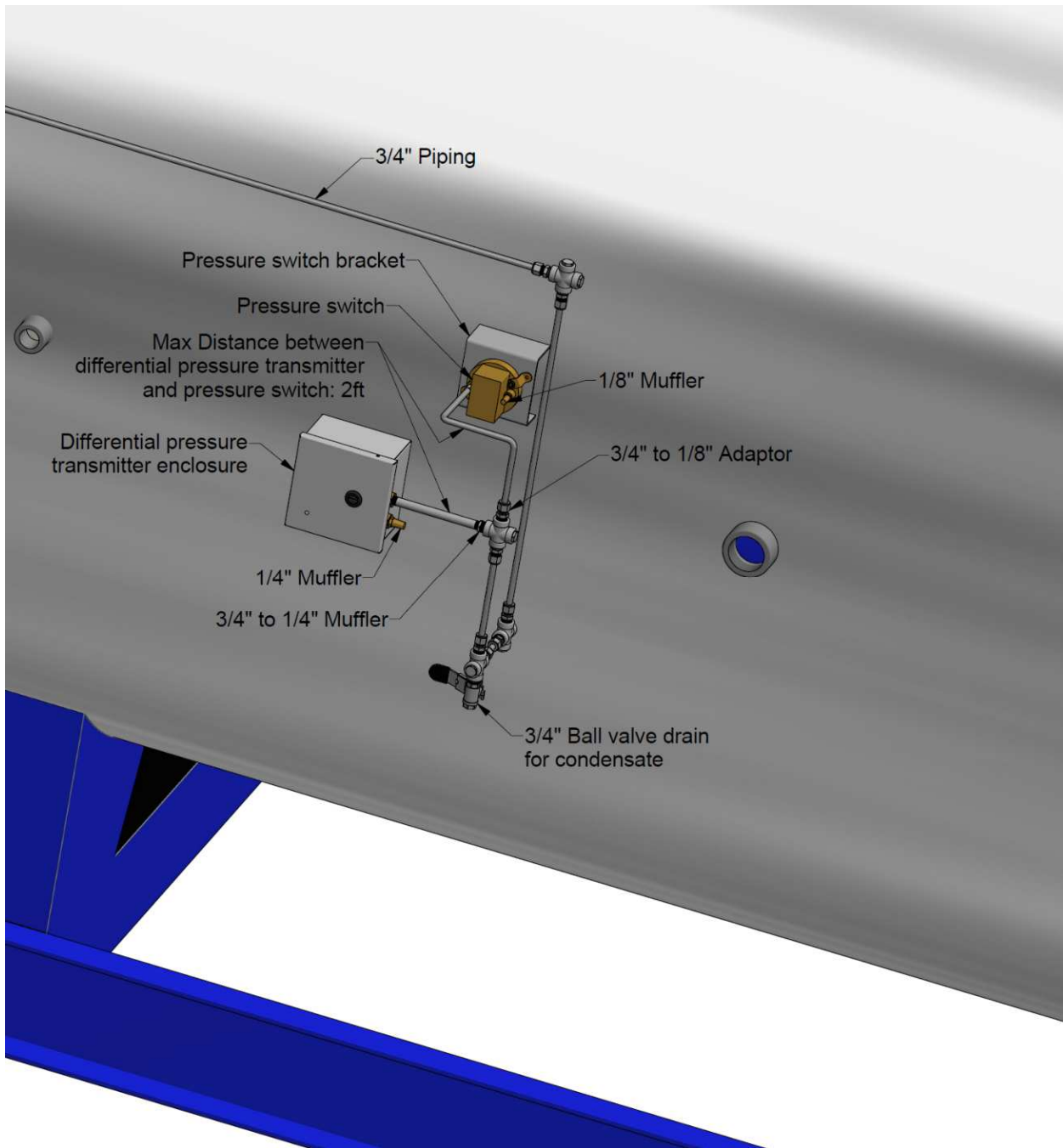


**Note:** See TS-1000 for all LMV Siemens linkageless control system communication connections

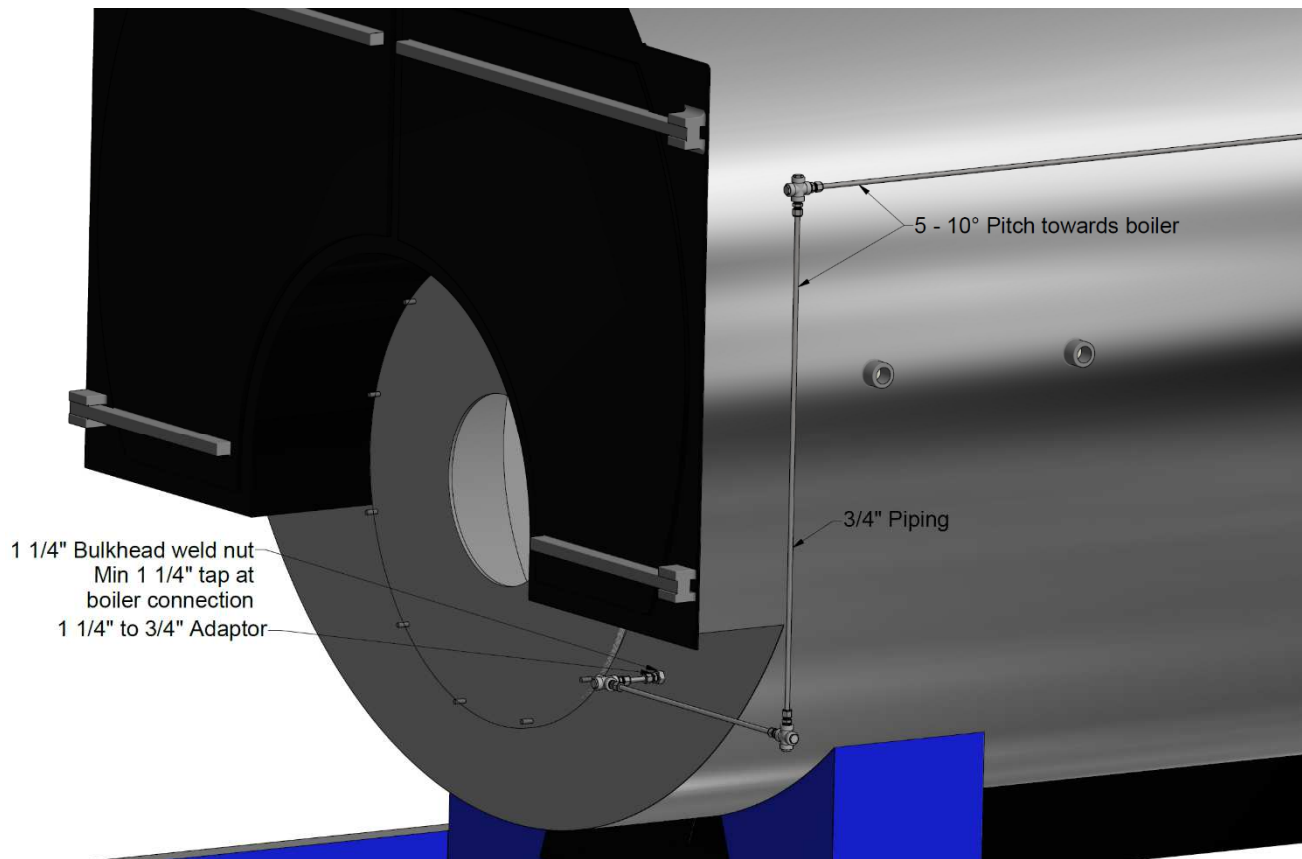
## Typical Piping and Installation



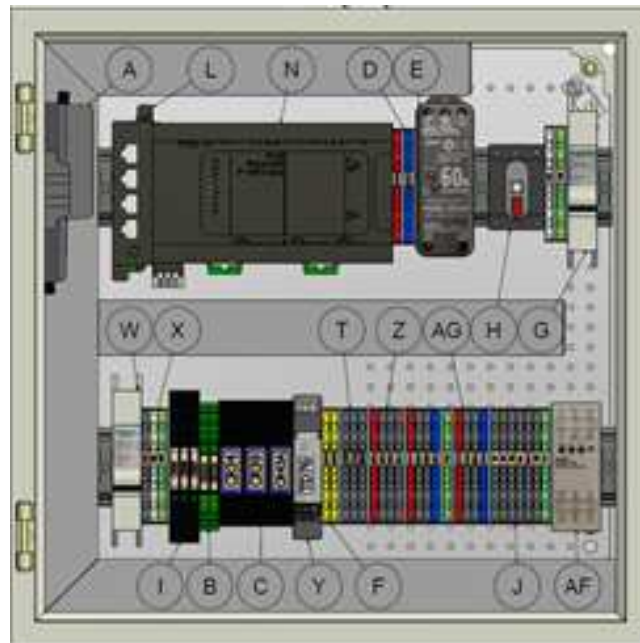
## Typical Piping and Installation (continued)



## Typical Piping and Installation (continued)



## Base Package Parts Description



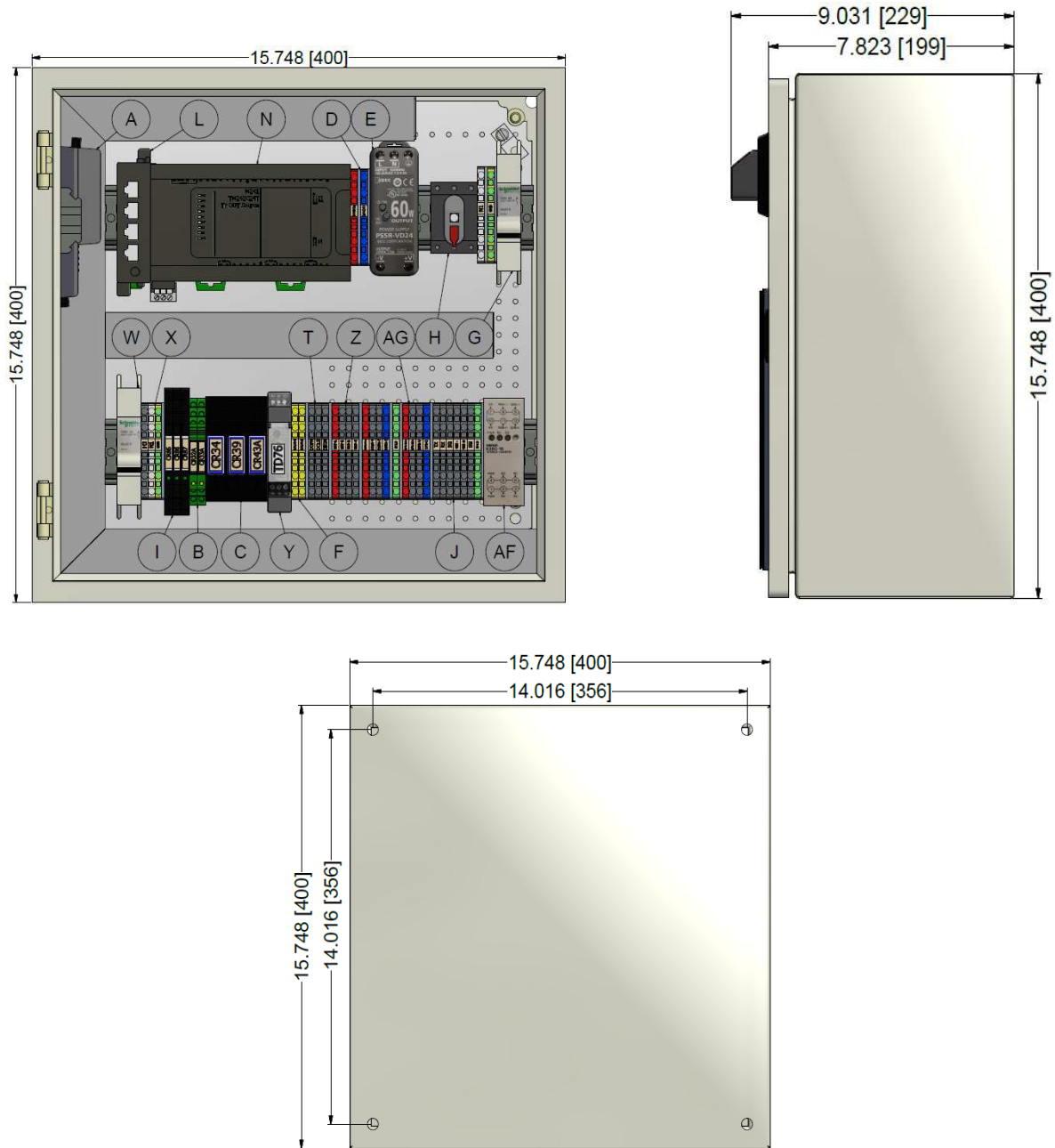
A	BMS Communication BACnet/LON/N2/RTU	BMS communication other than Modbus TCP/IP	I	120 VAC SPDT Relays	Burner / Boiler alarms ,13 annunciation relays, 3 relays for draft(optional), first in first out.
B	Solid State Relays (Draft Control Option)	Draft damper open and close relays	J	Modbus RS232 and RS485 Terminals	Field Modbus connections to LMV5/LMV3/RWF55/ RWF10
C	DPDT Relays (Draft Control Option Only)	Draft control ignition permissive Draft control damper drive open on failure Draft control alarm	AG	Analog Input Terminals	Field wiring terminals for flow, pressure, temperature, DP pressure, 4-20mA, or 0-10 Volt inputs.
D	24 VDC Terminals	24 VDC connections	T	Draft Mod Motor Field Terminals	Ignition permissive
E	24 VDC Power Supply	24VDC source	W	1 Amp Circuit Breaker	Draft control 120 VAC power isolation
F	Field Terminals (Yellow)	Field outputs and control terminals	X	120VAC Power Terminals	SQM5 actuator 120VAC power terminals
G	3 Amps Circuit Breaker	120 VAC power isolation	Y	Off Delay Timer	Draft control, high pressure boiler shutoff, delay timer
H	16 Amp Non-Fused Disconnect	120 VAC disconnect, only when installed in SCC enclosure	Z	Draft Control Terminals	LMV interconnect safety loop and high-pressure switch terminals

**Note: AF Module only used when the AZL is installed more than 15 feet from the Touchscreen.**

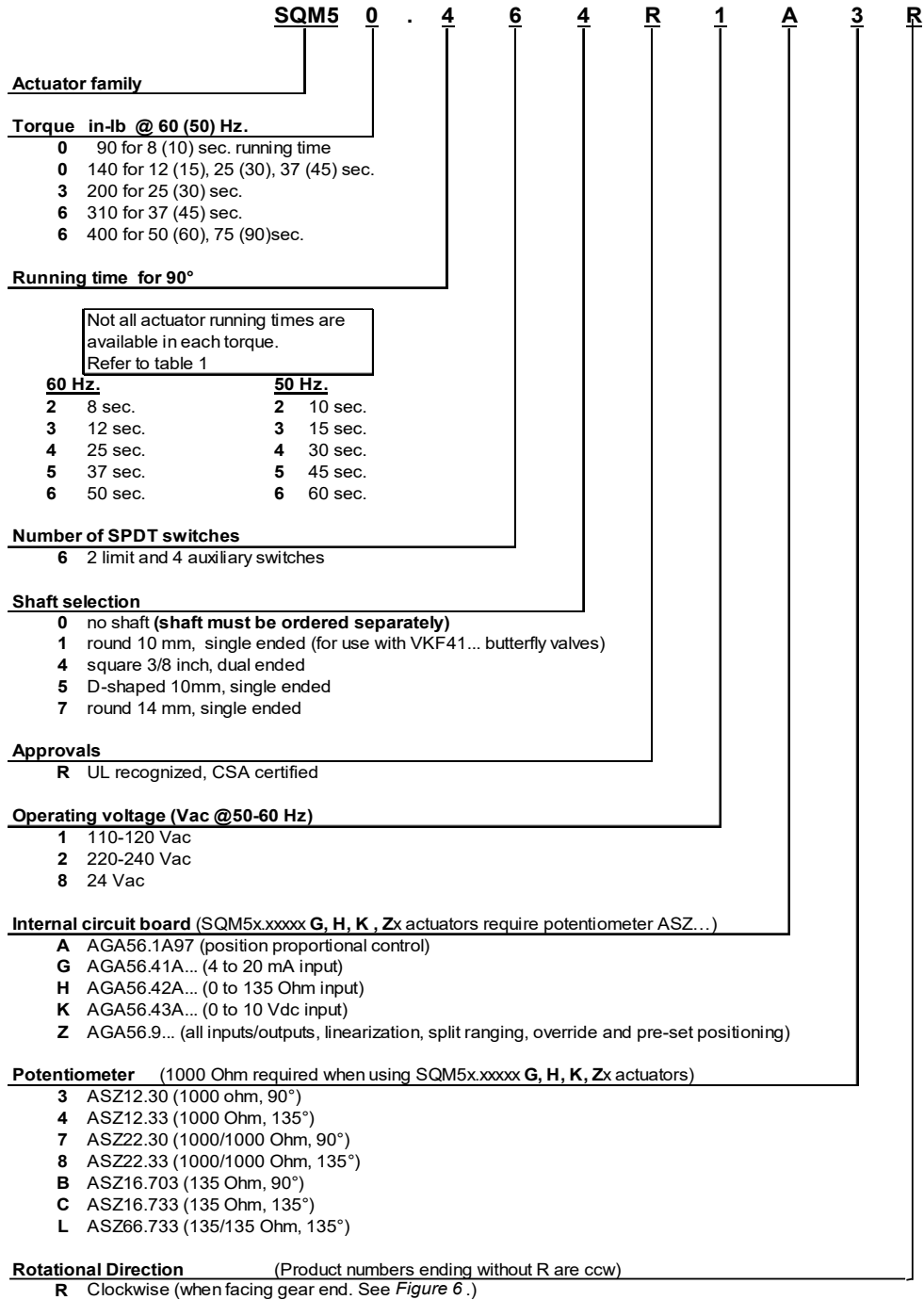
## Dimensions

Dimensions in inches; millimeters in brackets

### 16" X 16" X 8" Stack Draft Enclosure (Base Package)



# SQM5 Product Number Identification Legend



## Touchscreen Kit with Draft control part number legend

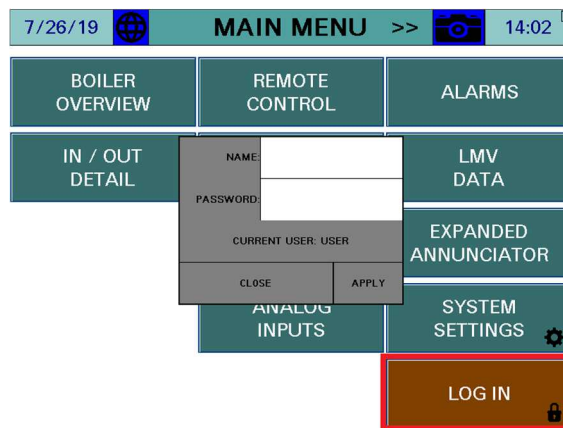
	TS	-	KT	0	X	D	6	-	H	B	1	-	X	Y	X	X
<b>Touchscreen Kit</b>																
<b>Touchscreen Size</b>																
3 = 3" touchscreen																
6 = 6" touchscreen																
0 = 10" touchscreen																
2 = 12" touchscreen																
5 = 15" touchscreen																
A = 6" touchscreen w/bezel for future 10" TS (10" TS ordered separately)																
B = No touchscreen, bezel for future 10" TS (10" TS ordered separately)																
<b>Touchscreen is 15 Feet or More Away from AZL/LMV5 Only</b>																
X = No																
Y = Yes																
<b>Draft Control</b>																
X = No draft control included																
D = Draft control																
<b>PLC Circulating Pump VFD/Water Level Control/Additional Digital Inputs Outputs (Touchscreen/Annunciation Selection Required)</b>																
X = No feedwater or circulating pump VFD control included																
3 = PLC three elements feedwater and level control (Steam boilers only)																
4 = PLC single element feedwater and level control (Steam boilers only)																
5 = PLC circulating pump VFD, and water level control																
6 = PLC circulating pump VFD/Water level control, and additional 2 digital inputs/8 digital outputs																
7 = Additional (2) digital Inputs and (8) digital outputs																
<b>Annunciations and Monitoring (Touchscreen Selection Required)</b>																
X = No annunciation inputs																
A = Standard annunciation, (14) 120 VAC inputs																
B = (14) 120 VAC inputs, (4) analog inputs with totalization, and (2) analog outputs																
C = (14) 120 VAC inputs and (4) universal inputs* (AI, RTD, or TC)																
D = (14) 120 VAC inputs and (8) universal inputs* (AI, RTD, or TC)																
E = (14) 120 VAC inputs and (12) universal inputs* (AI, RTD, or TC)																
F = (14) 120 VAC inputs, (4) analog inputs with totalization, (4) universal inputs* (AI, RTD, or TC), and (2) analog outputs																
G = (14) 120 VAC inputs, (4) analog inputs with totalization, (8) universal inputs* (AI, RTD, or TC)*, and (2) analog outputs																
H = (14) 120 VAC inputs, (4) analog inputs with totalization, (12) universal inputs* (AI, RTD, or TC)*, and (2) analog outputs																
<b>Building Management Interface (BMS)</b>																
S = Standard, Modbus TCP/IP																
B = BACnet / IP, or Ethernet / IP																
M = BACnet MS/TP, Modbus RTU, or Metasys N2																
N = Profinet																
P = Profibus																
<b>Enclosure Option</b>																
X = None - din rail kit on plate to be mounted into enclosure (Mounted by others)																
1 = NEMA 1																
2 = NEMA 12, includes cover over touchscreen and AZL/RWF																
4 = NEMA 4X (indoor), includes cover over touchscreen and AZL/RWF (if applicable) Cover will not be included if an AZL/RWF option is not selected																
<b>Cooling Fan (Option with enclosure)</b>																
X = No cooling fan																
Y = Yes cooling fan (Stainless Steel cover for NEMA 4X selection above) filters only for NEMA 12 no cover																
<b>Warrick Manual Reset Relay (Option with enclosure)</b>																
X = No manual reset Warrick relay																
Y = Yes manual reset Warrick relay																
<b>AZL (Option with enclosure)</b>																
X = No AZL included (Must be selected with din rail kit on plate)																
3 = AZL23.00A9 mounted to front of enclosure																
5 = AZL52.40B1 mounted to front of enclosure																
<b>RWF (Option with enclosure)</b>																
X = No RWF included																
L = RWF55.50A9 for external load control																
W = RWF55.50A9 for water level control with transformer																
2 = (2) RWF55.50A9 for external load control and water level control - includes 1 transformer																

Date: 10/23/2023



## Touchscreen Logging In

(Pages from the TS-1100 Installation Instructions)

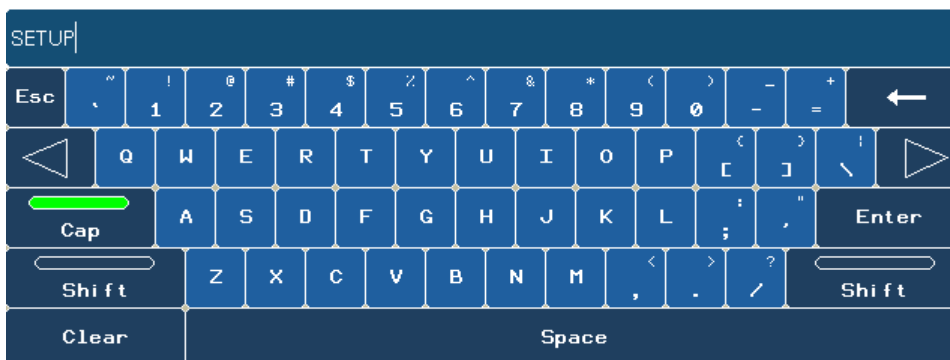


In order to log in at the desired access level,

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.

## 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, data logs 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.



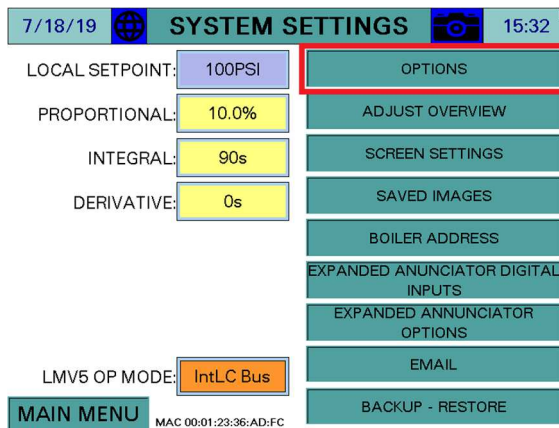
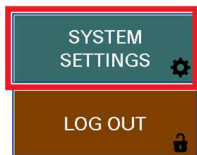
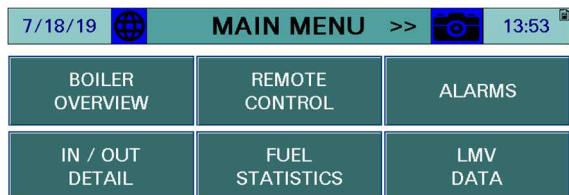
An SD or USB icon will display next to the time to indicate that the respective drive has been inserted.

## 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.

**EA** – Select whether the Expanded Annunciator option is present.

- Disabled
- Enabled

## Configuration (continued)

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

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

**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).

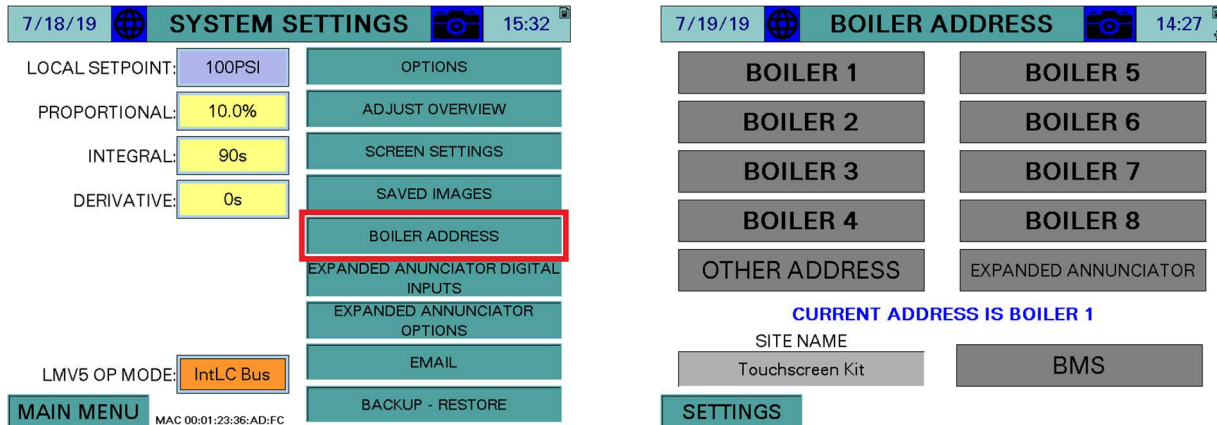
- **No**
- **Yes**

## Configuration (continued)

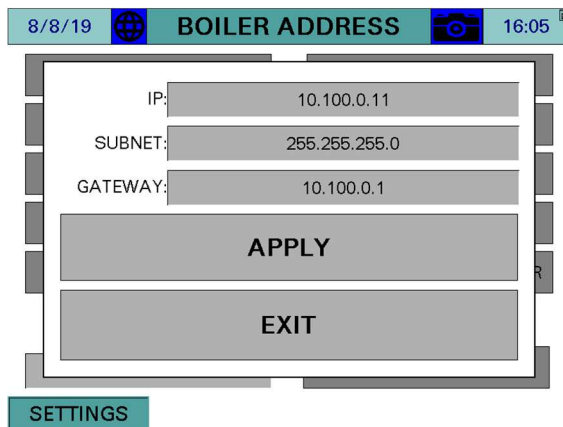
### Boiler IP Addresses

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.

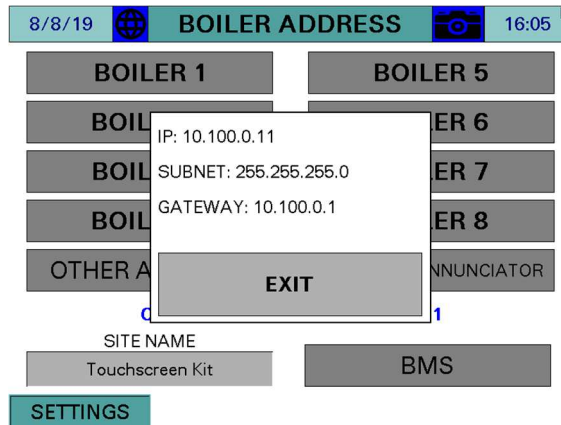


touch **APPLY** to confirm the changes.

**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 the IP addresses must be changed to unique addresses to avoid duplication.*

7/19/19 BOILER ADDRESS 14:27

BOILER 1 BOILER 5  
BOILER 2 BOILER 6  
BOILER 3 BOILER 7  
BOILER 4 BOILER 8  
OTHER ADDRESS EXPANDED ANNUNCIATOR

CURRENT ADDRESS IS BOILER 1

SITE NAME  
Touchscreen Kit BMS

SETTINGS PREVIOUS CONNECT SERIAL LINK

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.

8/8/19 EA IP SETTING 16:07

CURRENT IP: 10.100.0.19  
CURRENT SUBNET: 255.255.255.0  
CURRENT GATEWAY: 10.100.0.1

NEW IP: 10 100 0 19  
NEW SUBNET: 255 255 255 0  
NEW GATEWAY: 10 100 0 1

RESET TO DEFAULT APPLY NEW MATCH TO BOILER

PREVIOUS CONNECT SERIAL LINK PREVIOUS DISCONNECT SERIAL LINK

**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

## Configuration (continued)

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.

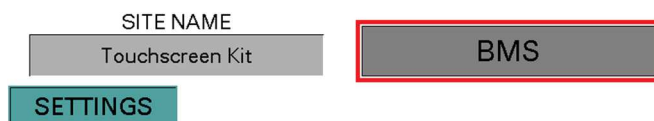
### Reset to Default IP

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.

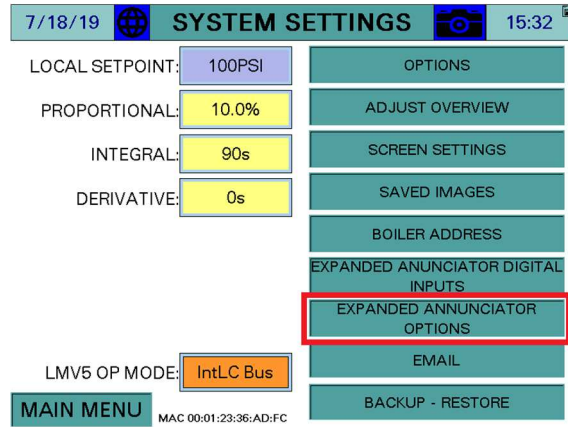




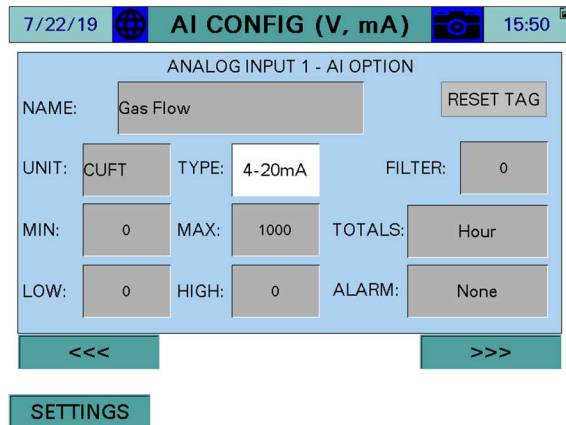
## Configuration (continued)

### 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)

### Draft Control

The screenshot shows a control interface titled "AI CONFIG (V, mA)" with a date of 7/22/19 and a time of 15:58. The main screen is labeled "DRAFT SETUP" and contains the following parameters:

SENSOR MIN:	-3.00"	SENSOR MAX:	3.00"	SENSOR TYPE:	0-10V
DRIVE MIN:	20.0°	DRIVE MAX:	90.0°	FILTER:	2
PULSE ON:	500ms	PULSE OFF:	500ms	HYSTERESIS:	0.10"
POT MIN:	300	POT MAX:	1250	<b>AUTO CALIBRATE</b>	

Navigation buttons include "<<<" and ">>>" at the bottom of the main screen, and a "SETTINGS" button below it.

**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.

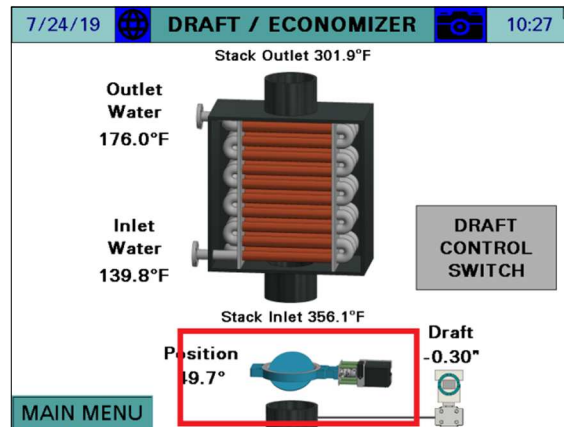
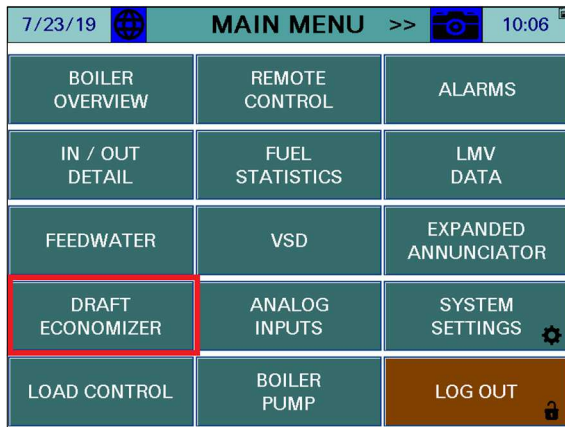
#### Additional Draft Options

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.

## Draft Control (Pages from the TS-1100 Installation Instructions)

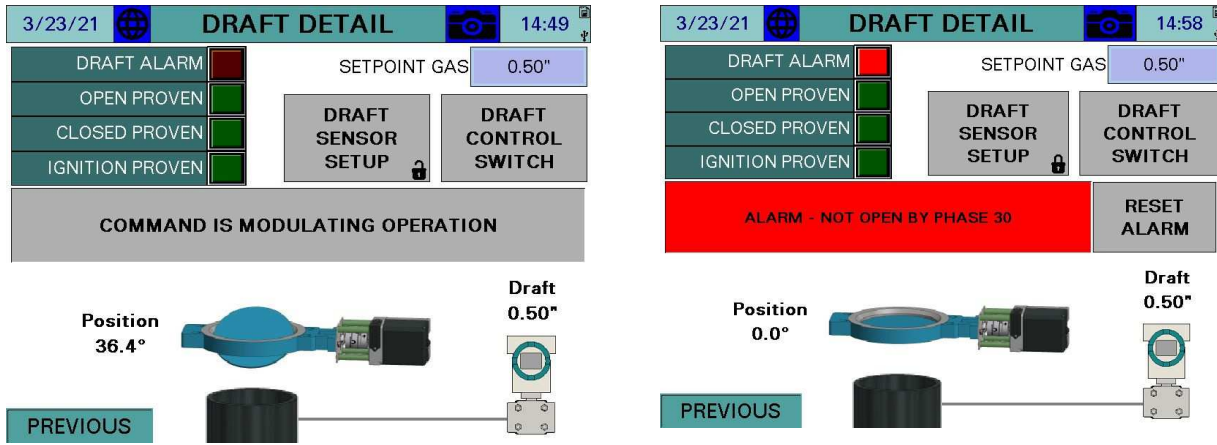
Access level: **USER/TECH/SETUP**

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 SENSOR SETUP** – Changes the screen to the draft sensor setup screen. (See page 40)\*\*

**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.

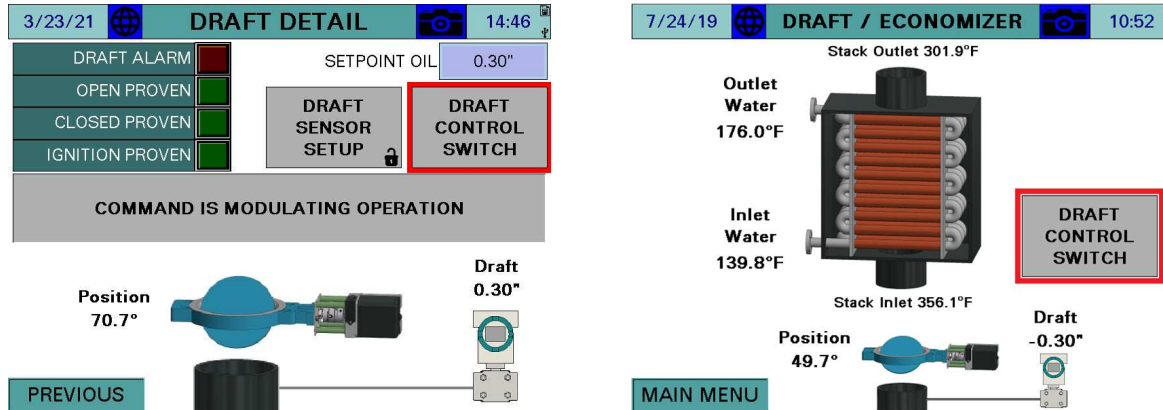


**\*\*Note** – O EM level password required to access

## 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**.

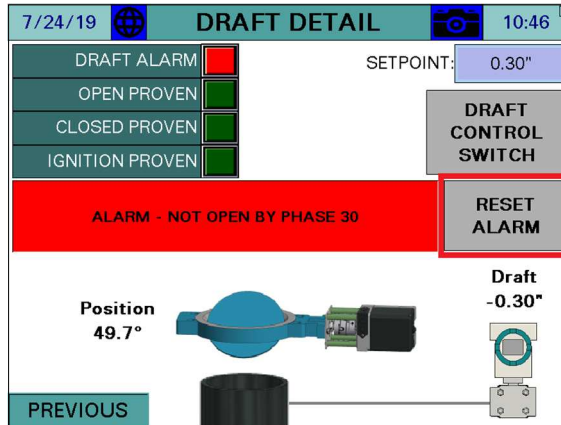
**Table 5: Draft Control Status Messages**

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).
PRESSURE SENSOR FAULT	4	Draft disconnected or out of range.
HIGH DRAFT PRESSURE	5	High draft pressure switch open.

## Draft System Setup

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

### Sensor Location and Connections

(Refer to pages 10-11 above for typical piping diagram)

The draft pressure sensor tapping can be located below the draft damper. 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.

Keep tubing as short as possible for the least static delay in updating the value. Use a maximum of 5 feet of tubing at ¼", and up to 250 feet at ⅜" (black pipe).

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.



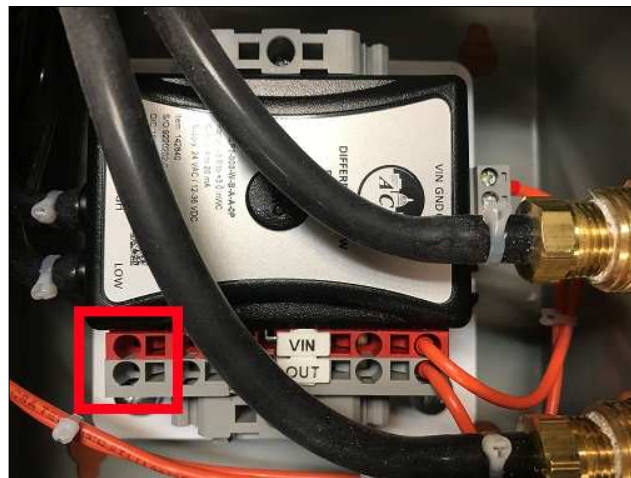


## Sensor Configuration (Type TS-DPA...)

The TS-DPA... differential pressure sensor is available with or without an LCD display, in ranges from  $\pm 2$  to  $\pm 10$  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'.



## 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.

## 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:

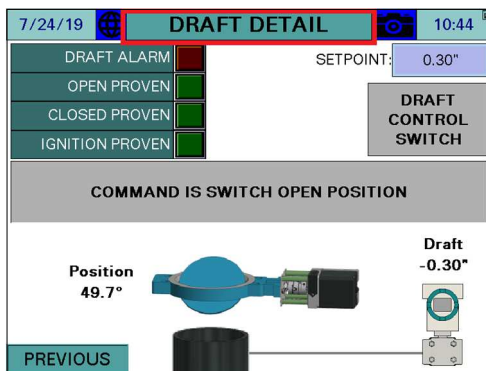
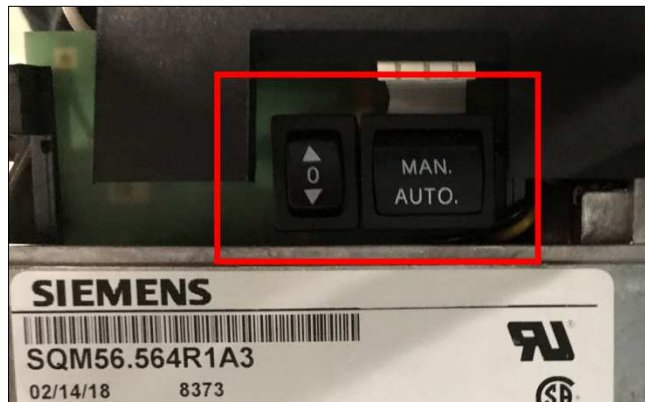
7. Params & Display > RatioControl > Oil Settings > SpecialPositions > PrepurgePos > PrepurgePosAir > **90.0°**
8. Params & Display > RatioControl > Oil Settings > SpecialPositions > PostpurgePos > PostpurgePosAir > **90.0°**
9. Params & Display > RatioControl > Oil Settings > SpecialPositions > HomePos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

## 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. Set the switch back to "AUTO" when done. 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):

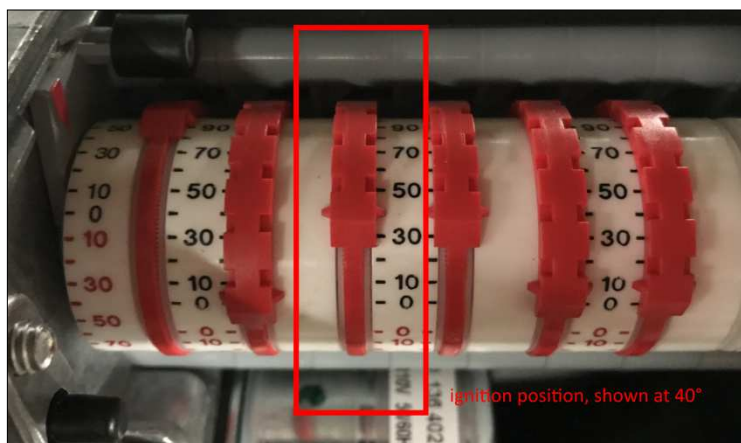


This allows the damper to be moved to the open, closed or ignition position easily during commissioning.

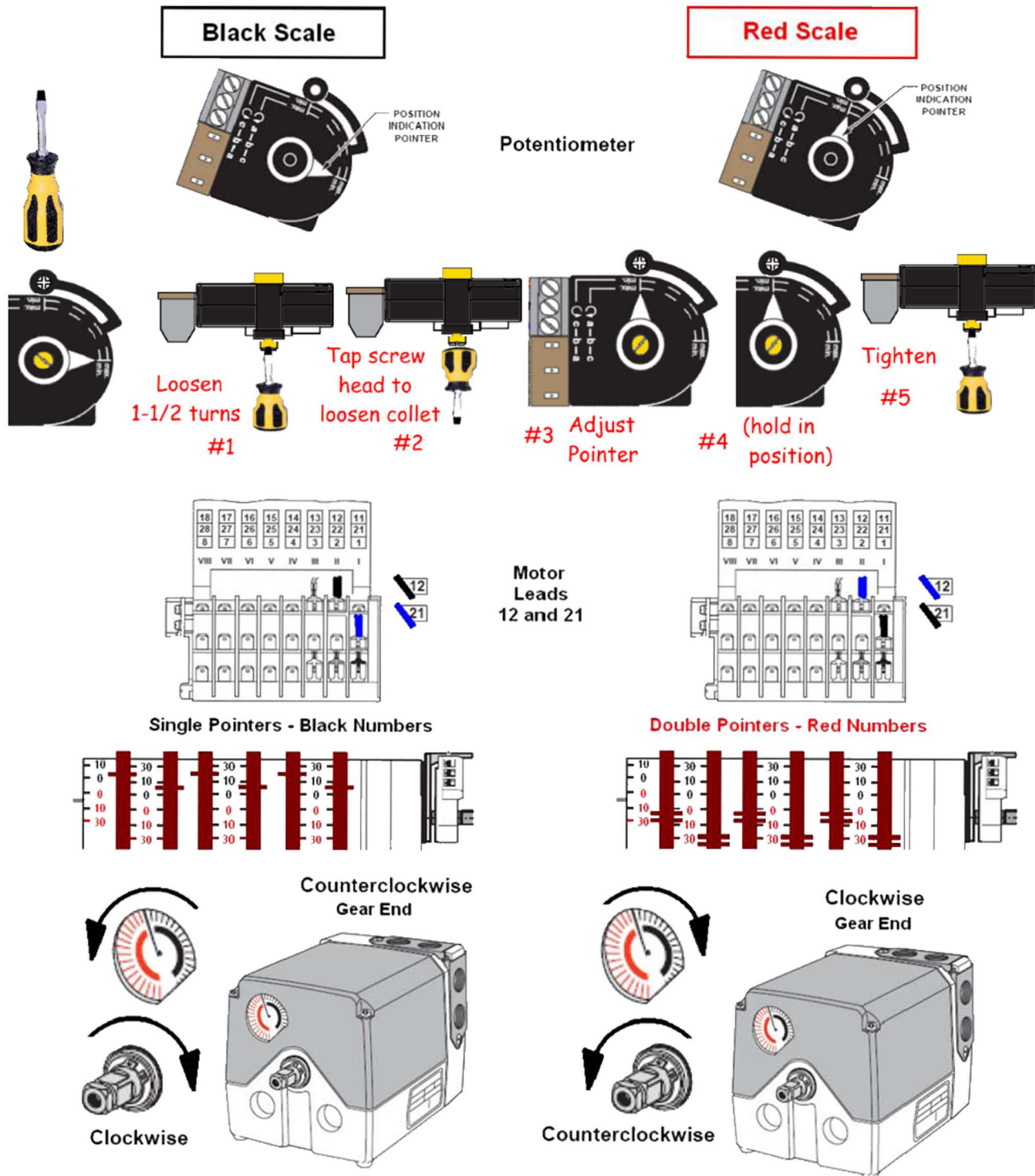
## Setting Ignition Position

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.

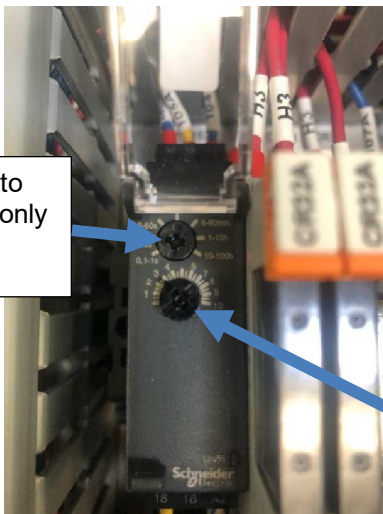


## SQM5 Actuator Settings



## High pressure shut down switch and timer

Time delay timer RE17RCMU settings:



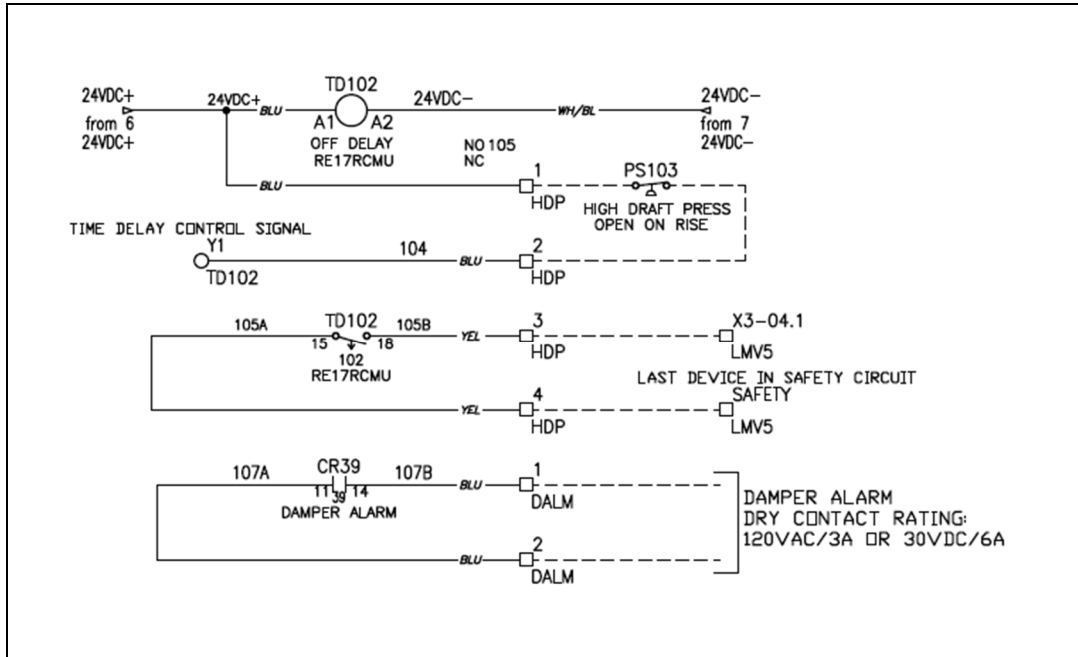
Time delay timer RE17RCMU settings:  
Timer upper dial should be set to the 1 -10s scale only.  
Timer lower dial must be set between 1 and 5 seconds only,  
Default timer is set for 0.1 to 1S scale, and 0.1 second for shutdown

Must be set to 1-10s scale only

Must be set between 1 - 5 s maximum, or maximum allowed by boiler manufacturer or local authorities

## High draft pressure switch boiler shutdown

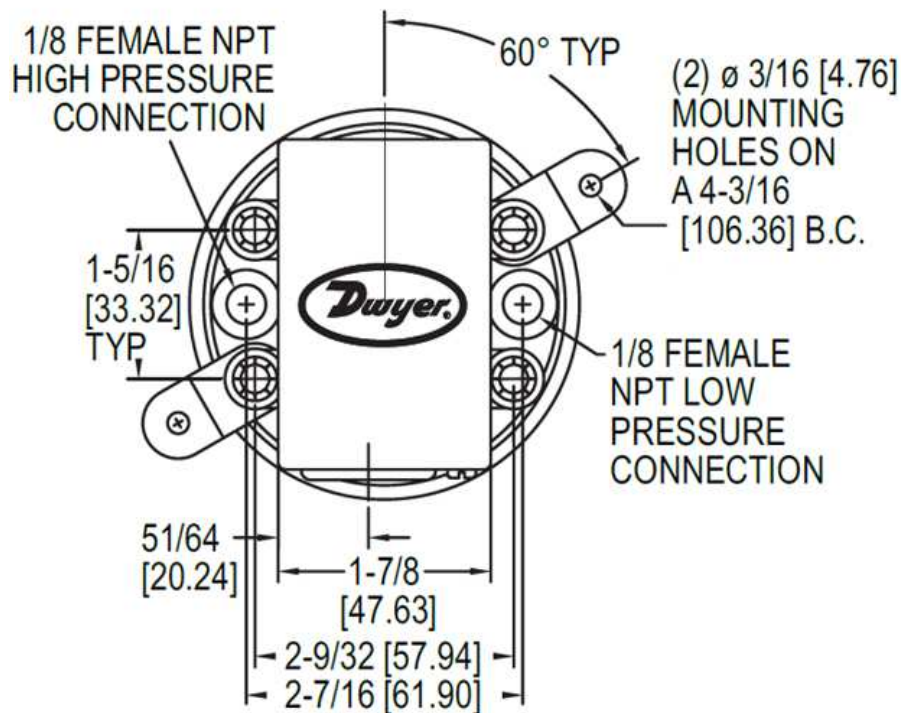
(Software revision levels 19F1-19F4).







## Differential Pressure Switch



**NOTE:** The timer setting and the setting of the differential pressure switch (Page 36) work in combination to ensure the safety of the draft control system. Both of these safety devices must be set as low as possible for the given application. It is highly recommended the boiler trip test for draft high pressure to be conducted periodically to keep insuring a proper operation.

## Differential Pressure Switch (continued)

### Installation

(From Dwyer Instruments Bulletin E-56)

1. Select a location that is free from excessive vibration, corrosive atmosphere and where the ambient temperature is within the limits for these switches.
2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical.
3. Connect switch to source of pressure, vacuum, or differential pressure. Metal tubing with 1/4" O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8" female NPT pressure ports as noted below:
  - Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HI-PR and from source of lower pressure to low pressure port marked LO-PR.
  - Pressure only (above atmospheric) - connect tube from source of pressure to high pressure port. The low-pressure port is left open to atmosphere.
  - Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high-pressure port is left open to atmosphere.

**CAUTION:** Power must be off while wiring connections are being made.

4. Electrical connections to the standard single pole, double throw snap switch are provided by means of screw terminals marked "common", "norm open", and "norm closed". The normally open contacts close, and the normally closed contacts open when pressure increases beyond the set point.

**CAUTION:** Do not exceed the specified voltage rating. Permanent damage not covered by warranty may result.

5. Switch loads should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with high load inductance or rapid cycle rates. Whenever an application involves either of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

### OPERATION

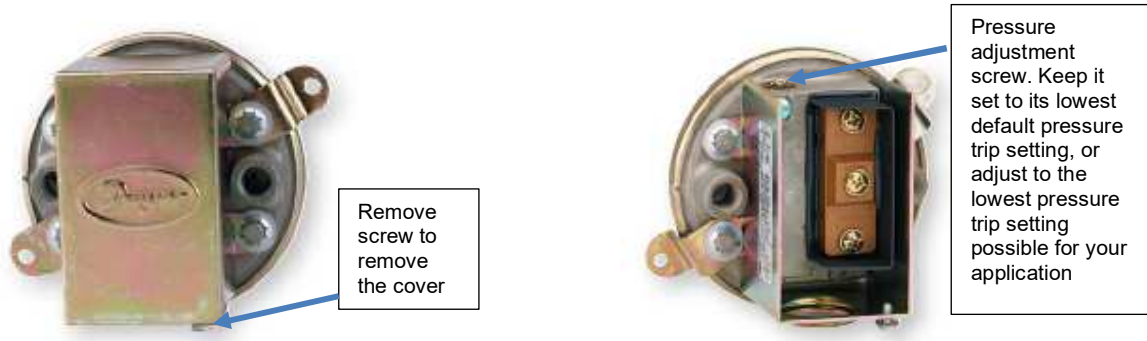
Pressure acting on the power diaphragm rotates the amplifying lever, which in turn extends the range spring and rotates the snap switch input lever. When the set point is reached, the snap switch is actuated, and the electrical contacts make or break.

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## Differential Pressure Switch (continued)

### Pressure adjustment

To change the mechanical set point, proceed as follows:



A. Remove the snap-on cover from the conduit enclosure by loosening its retaining screw and pulling firmly at its bottom end. Turn the slotted adjustment screw at the top of range spring housing clockwise to raise the set point pressure and counterclockwise to lower the set point.

B. The recommended procedure for calibrating or checking calibration is to use a "T" assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to the manometer of known accuracy and appropriate range and apply pressure through the third tube. Make a final approach to the set point very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage etc. Be certain the switch is checked in the position it will assume in use, i.e., with diaphragm in a vertical plane and switch lettering and nameplate in an upright position.

C. For highly critical applications it is a good idea to check the set point adjustment and reset it as necessary once or twice in the first few months of operation. This will compensate for

any change in initial tension which may occur in the spring and diaphragm. For most applications this change will not be significant and no resetting will be required.

## Differential Pressure Switch (continued)

### Maintenance

The moving parts of these switches are sealed in and are permanently tamper proof. The single adjustment is that of the set point. Care should be taken to keep the switch reasonably dry and free from dust or dirt. No lubrication or unusual precautions are required for normal use.

### Approvals



**Standard:** UL 372 Burner Management Systems (XAAF,XAAF7)  
**UL File:** E518305

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