Universal Monitoring System

Operation and Maintenance Manual

750-351

TABLE OF CONTENTS

INTRODUCTION

The Cleaver-Brooks Universal Monitoring System is a communications based product that provides data logging and remote monitoring functions. This product is designed to provide a means of collecting and sharing fuel usage and run time data on boiler systems that are not equipped with Cleaver-Brooks Hawk controls.

The data are stored in .csv file format, which in turn can be imported into spreadsheet programs that the end user can then use to generate reports for EPA Area Source Rule compliance.

Features

The controller has a built in web server that is used for configuring the system, monitoring the boiler activity and transferring the data log files. Those files are stored on the SD memory card located on the front of the controller. The Ethernet port is the bottom connection on the front of the controller.

The controller also has a built in FTP server that can be custom configured, (not standard) to automatically transfer the data log files from the memory card to a user defined location on a customer PC or server located on the same network.

The controller connects to additional cards for 4-20 mA inputs and 24 vdc discrete inputs and outputs.The system has the ability to accept up to four 4-20 mA signals per boiler from a variety of flow, temperature, pressure or level sensors. The Channel description is selected from a predefined list, the transmitter 0 and span are user defined and the Engineering units are selected from a predefined list.

The discrete inputs are set up for a maximum of up to two fuel selected inputs, and a boiler running signal per boiler. There is also an alarm silence button mounted on the face of the control panel.

The discrete outputs are used for the alarm light and audible device. The audible device will sound upon any alarm, or if the processor faults.

See Appendix for wiring, panel layout, and parts information.

The Analog inputs can be set up to be used with flow meters to provide fuel flow values as well as totalized values. These values are written and used to generate data logs on the controller's SD memory card.

A typical example of data tags collected and logged is as follows:

Analog inputs 1 through a maximum of 4 per boiler, each identified as to its function, engineering units, and zero / span values.

The list of choices for the analog channel descriptions is as follows.

Analog 1	Analog 2	Analog 3	Analog 4
B1 Fuel1 Type	**B1 Fuel2 Type**	**B1 Flow**	**B1 Wat Rate**
Gas	Gas	Steam	Water Flow
Oil	Oil	Hot Water	Firing Rate
Propane	Propane	Make Up Water	Gas Pressure
Digester Gas	Digester Gas	Blow Down	Oil Pressure
Town Gas	Town Gas	Chemical 1	Conductivity
Other 1	Other 2	Chemical 2	Stack Draft
		Water Level	Stack Tem
		Other 3	Opacity
			O2
			Nox
			Outdoor Temp
			Other 4

The choices for the engineering units that can be selected for the analog channels are as follows.

Analog 1 and 2 Engineering Units:

Engineering Units	CFH	SCFM	GPH	L/Hr	M3/Hr
	CFM	SCFH	GPM	L/Min	NM3/Hr
	CFS	SCFS	GPS	L/S	

Analog 3 Engineering units:

Engineering Units	CFH	SCFH	GPH	L/Hr	LBS/Hr	NM3/Hr
	CFM	SCFM	GPM	L/Min	LBS/Min	IWC
	CFS	SCFS	GPS	L/S	M3/Hr	Inches

Analog 4 Engineering Units

Engineering Units	CFH	SCFH	GPH	L/Hr	LBS/Hr	NM3/ Hr	C	%
	CFM	SCFM	GPM	L/Min	LBS/ Min	IWC	F	PPM
	CFS	SCFS	GPS	L/S	M3/Hr	PSI	mhos	

Benefits

Monitor and Log fuel consumption as follows:

Monitor each Fuel Flow maximum of 2 fuels per boiler

Optionally Monitor Steam pressure or Hot Water flow

Optionally Monitor Firing Rate, Water Level, or O2 level

Monitor Run Time Hours per fuel

Monitor Fuel Selected to burn

Separate log to include alarms

Trend all analog signals. Trending is limited to current or active log file Analog inputs,

Totalize based on input engineering units IE. Steam is in lbs/hr, water is in GPM

Totalize and log run time per fuel and total hours

Data logs are all written in CSV format which can be viewed and modified in programs like Microsoft Excel

A separate configuration screen displays the current IP address of the Web server and allows the user to set a new IP address, subnet mask, and gate way.

From the first screen or top level screen, the user can drill down to the data log files, select and download them to the user's PC. The data logs are time and date stamped and are CSV format, which can be opened and manipulated in programs like Microsoft Excel.

Complete EPA Compliant systems will include all transmitters, controller, preloaded application, SD memory card and manual with wiring and configuration instructions.

System Requirements

120 vac power and Ethernet connection to a local user PC.

INSTALLATION

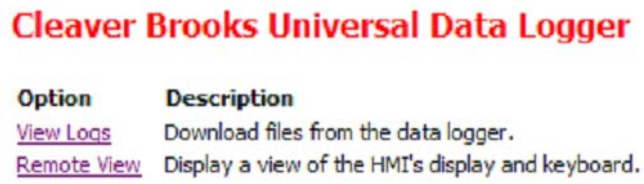
TRANSMITTERS

Note that the transmitters required to capture the data are to be connected to the local controller. Wiring Diagram shows loop powered methods. Meters must be 4-20 mA.

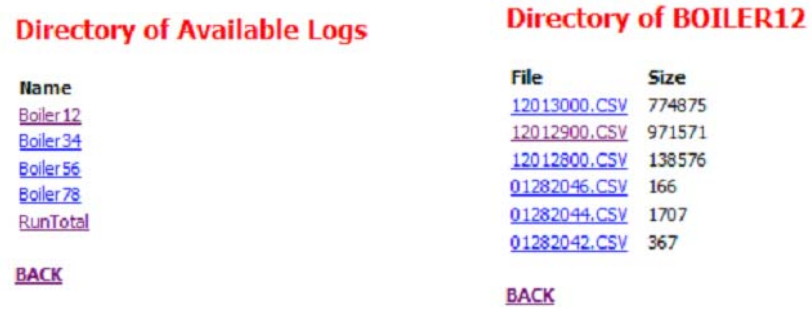
SPAN settings are limited to 64,000. See Appendix A for standard wiring diagram.

DATA LOGS

When first accessing the webserver, you are presented with the following display.



To access the logs click on View Logs.

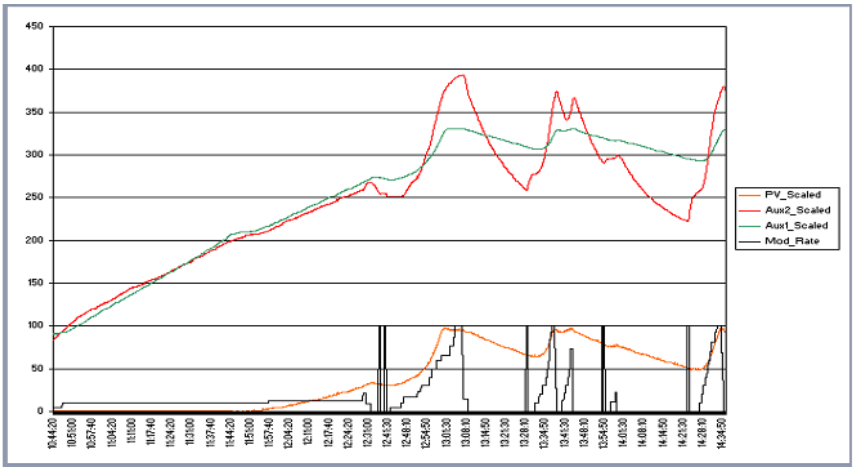


From there select either the boiler log or run time log which will allow you to either download or open the log file. As they are in CSV format, they can be opened in spread sheet or database programs such as Microsoft Excel or Access.

Typical values written to the data logs (this is an example of the boiler log sampled every 5 seconds):

	A	B	C	D	E	F	G	H	I	J
1	Date	Time	Current Flow Rate	B1Fuelflow2	B1Steam	B1WaterFlow	Current Flow Rate	B2Fuelflow2	B2Steam	B2WaterFlow
2	1/29/2012	0:00:00	1000	61.7	84.2	1000	86.1	1000	0	0
3	1/29/2012	0:00:05	1000	61.7	84.2	1000	86.1	1000	0	0
4	1/29/2012	0:00:10	1000	61.7	84.2	1000	86.1	1000	0	0
5	1/29/2012	0:00:15	1000	61.7	84.2	1000	86.1	1000	0	0
6	1/29/2012	0:00:20	1000	61.7	84.2	1000	86.1	1000	0	0

Using the Chart Wizard in a program like Microsoft Excel you can create trends for the data range you are looking at. See example below.



This is an example of the Run Totals log sampled every 2 hours:

	A	B	C	D	E	F	G	H	I	J
1	Date	Time	B1Fuel1Total	B1Fuel1Acum	B1Fuel2Total	B1Fuel2Acum	B1FlowTotal	B1FlowAccum	B1RateTotal	B1RateAccum
2	1/30/2012	0:00:00	1306.3	1306.3	18848.5	18848.5	49320	49320	400844224	400844288
3	1/30/2012	2:00:00	1306.3	1306.3	20011.8	20011.8	50504.4	50504.4	404064064	404064128
4	1/30/2012	4:00:00	1306.3	1306.3	21174.7	21174.7	51759	51759	407310784	407310848
5	1/30/2012	6:00:00	1306.3	1306.3	22348.1	22348.1	53035.5	53035.5	410585344	410585408
6	1/30/2012	10:00:00	1306.3	1306.3	23928	23928	55049.1	55049.1	415050208	415050272
7	1/30/2012	12:00:00	1306.3	1306.3	24953.9	24953.9	56841.7	56841.7	418068928	418068992
8	1/30/2012	14:00:00	1306.3	1306.3	26085.7	26085.7	58815.7	58815.7	421343008	421343072
9	1/30/2012	16:00:00	1306.3	1306.3	27217.6	27217.6	60839.2	60839.2	424591168	424591232
10	1/30/2012	18:00:00	1306.3	1306.3	28364.6	28364.6	62855.1	62855.1	427883488	427883552

All data log files are time and date stamped and are in CSV format.

CONFIGURATION

Prior to operation the system must be configured. The following table of data will need to be completed and entered into the web server.

Transmitter Span	Max value meter is calibrated at
Transmitter zero	Min value meter is calibrated at
Engineering Units	Units meter is set for, e.g. GPM or GPH

Also prior to operation, ascertain which meters are connected to which inputs.

In addition, it will be necessary to wire the following discrete signals from each boiler.

- Boiler running
- Fuel one selected
- Fuel two selected

All discrete signals are 24 VDC. Interposing relays are provided in the standard panel. See wiring diagrams for more information.

IP Address Set up Display

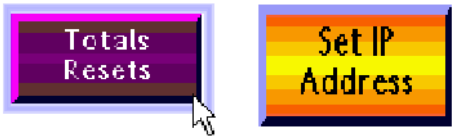
This display is password protected and is used in the initial set up of the system to define the IP address, Subnet Mask, and Gateway.

The factory default for you to connect your PC to is IP address 192.168.1.160 Subnet 255.255.255.0

To access the web server, the web server and customer PC used to access the web server must be on the same Ethernet network. The Web Server IP address can be changed by accessing that configuration screen from a connected PC or by an Authorized Cleaver Brooks Representative.

Password protected Displays

Clicking either of these buttons on the main screen will require the user to enter an ID and password. (available from your Cleaver-Brooks representative).



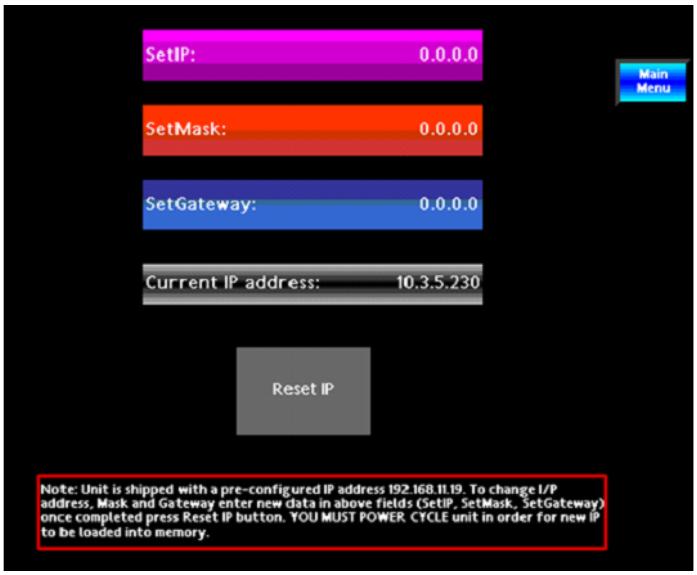
Click on the enter key and the next pop up will appear

This screen has an alphanumeric keypad - you must click on each letter, then the enter key.

Next, click on the numbers to key in the password, then click on the enter key.

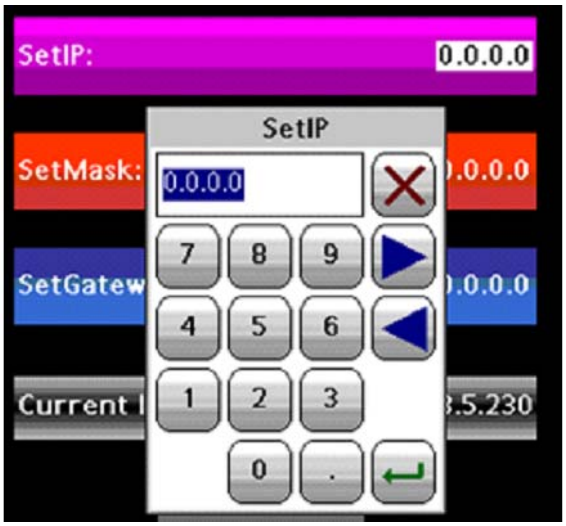
The security will automatically reset after 30 minutes, forcing you to log in again to make any other changes.

The user ID and password are available from your local Cleaver Brooks representative.



To change the IP address, use the pop up key pad to input ALL the data required then click on the "Set IP Address" button. Simply click on the digits and use the pop up keypad to enter then new data, then click on the enter key.

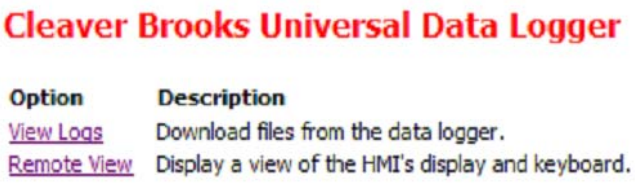
Note: you will lose communications with the web server until you have your PC set up on the same IP Address range again. Note that ALL devices on a network MUST have unique IP addresses.



Sample Screens

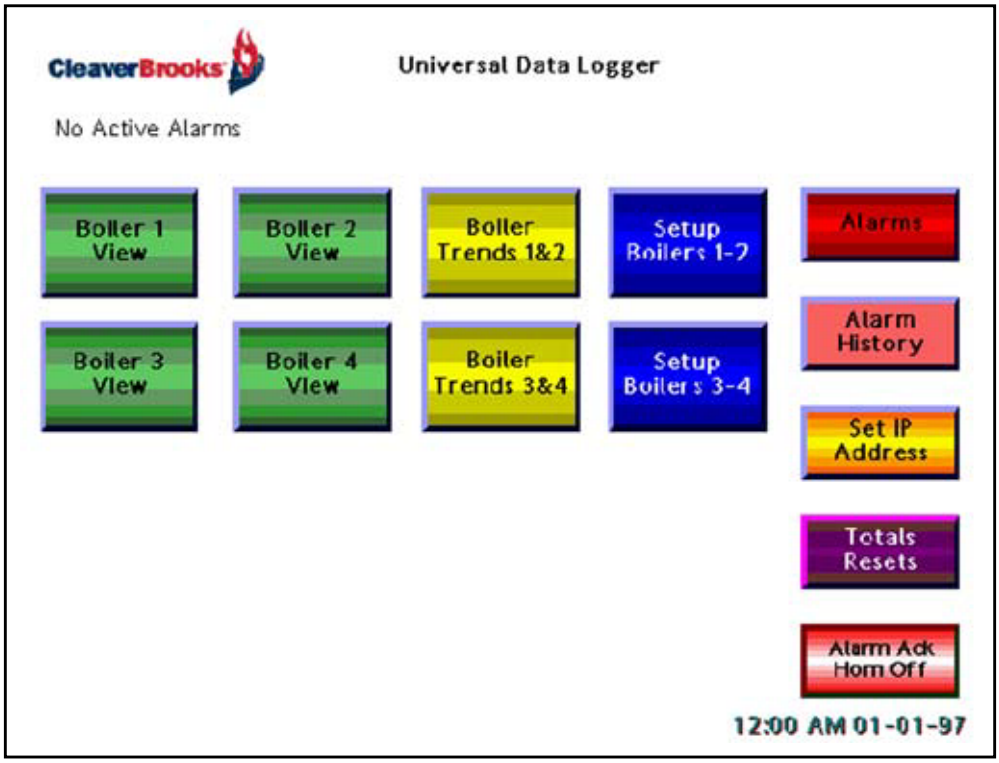
Top Menu

From this screen you can access the data logs or the remote visual display screens. To return to this screen from any screen, press the back button in your browser.



Main Menu Screen

This screen allows you to navigate to the various displays.



Buttons on this screen allow you to access each boiler data screen, trends, setup, active alarms, alarm history, IP address, resets, and alarm acknowledge.

At the top of the display where it currently shows "No Active Alarms", is the alarm tickler where any active alarms will appear. Each display is explained in detail on the following pages.

To access the secured or password protected screens see the procedure earlier in this manual. Secured screens are the Setup and Total Reset displays.

Boiler Set up Screen

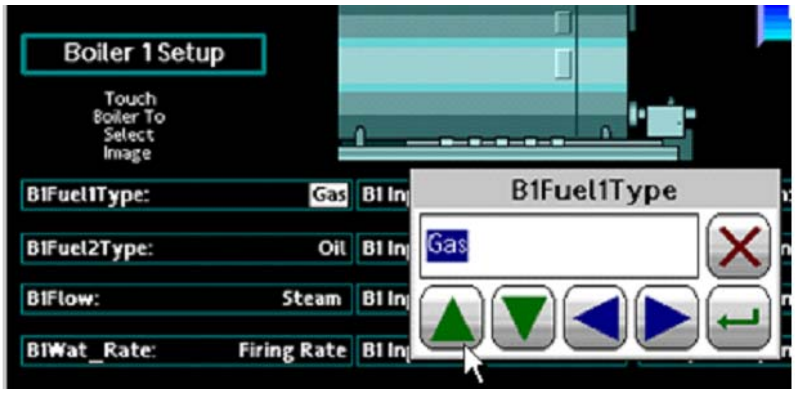
This display is used to configure the transmitter type, zero, span, and engineering units for each of the 4 analog inputs per boiler.

Channels can be enabled / disabled from this screen. To prevent nuisance alarms, a channel should be disabled if it has no device connected to it. Click on the button on the far left of each channel to toggle it on or off.

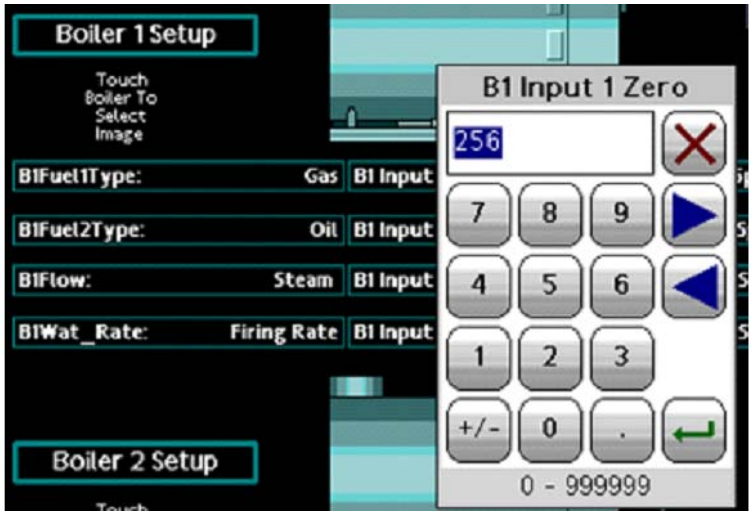
Each channel has a totalizing enable / disable button at the far right of the screen. Enable this function when a running total is desired for the measured quantity (on fuel flow, for example - but not on firing rate, pressure, etc.).

When totalizing is disabled it will not show up on the boiler overview screen.

To change the transmitter type and engineering units, click on the desired item, use the pop up window to scroll up or down until you find the transmitter type or engineering units you need, and then click on the enter key to accept your choice.

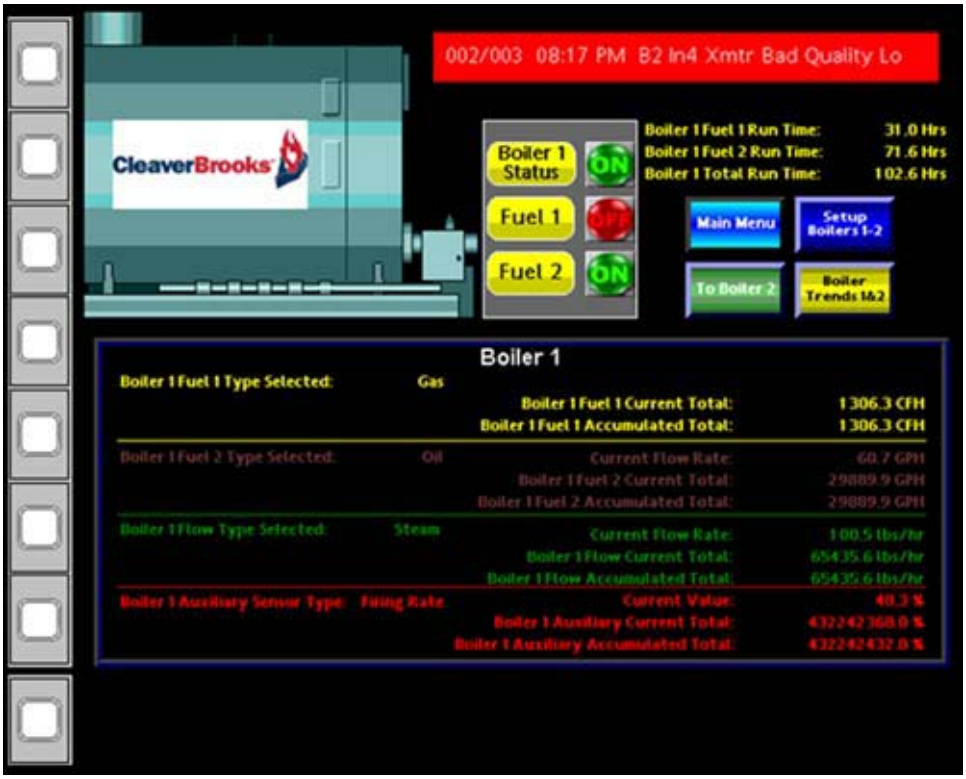


For Zero and span, simply click on the digits and use the pop up keypad to enter then new data, then click on the enter key.



Boiler Overview Screen

This display provides an overview of the boiler data and status



The red banner displays any active alarm and cycles through the list. The numbers tell you the position of the current alarm and the total number of active alarms.

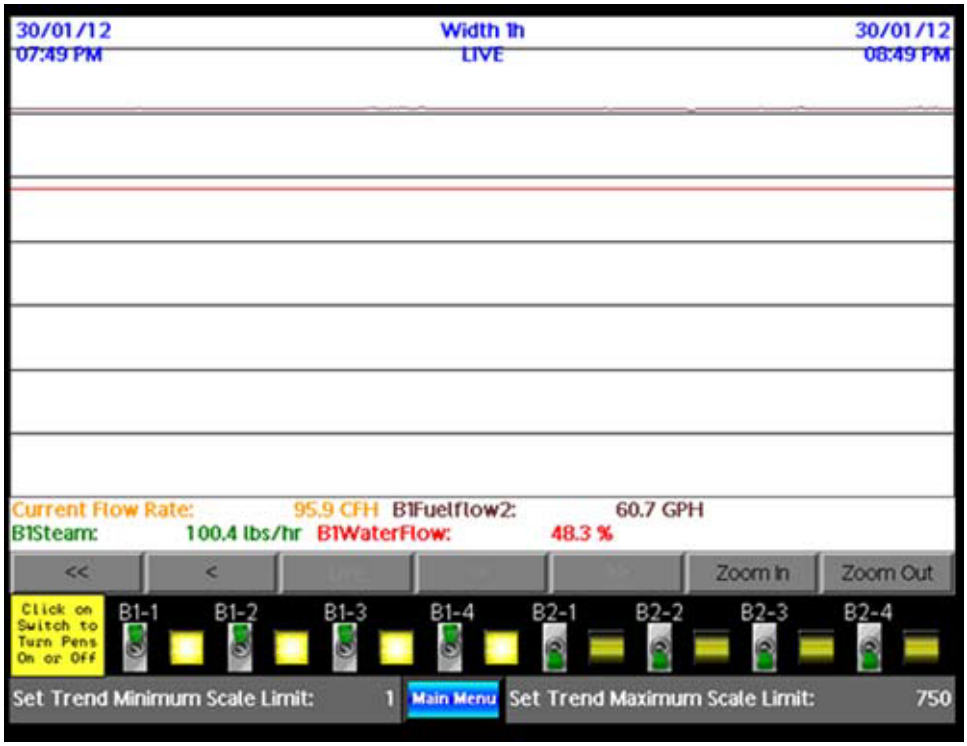
The boiler status display tells you if the boiler is on or off, and which fuel is active.

To the right of that are shown the run time for each fuel and the total run time.

Below that are the navigation buttons to the other screens, and finally the defined fuel, the current total, and the accumulated total. These values are independently resettable from the password protected Totals Reset screen.

Trend Screen

This display provides a trend of the current live data, and historical data contained within the active data log file only.



The following functions are available on this screen.

First you must set the Y axis scale. Click on the number near the bottom right of the screen, shown here as 750, enter a number on the pop up keypad to set the Maximum Scale Limit. Note that the value you desire must be multiplied by 10. For example, if you want the scale maximum to be 75, enter 750.

You can also set the trend minimum scale limit in the same manner.

For the X axis, which represents time, the default is one hour. To shorten the time window displayed, click on the Zoom In button, to lengthen the time window displayed click on the Zoom Out button.

You can also navigate backwards and forward in time by using the <<, <, >, and >> buttons. To return to the current time, click on the LIVE button.

Next, the toggle switches along the bottom turn the pen traces on and off. Even with the pen turned off, data are still collected and logged.

Alarm Screen

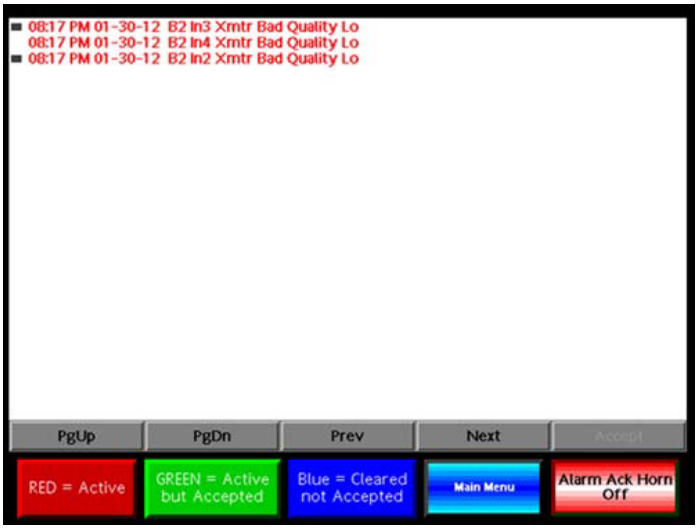
This screen shows only the ACTIVE alarms. They are color coded as follows.

Red indicates an active alarm

Green indicates an active alarm that has been acknowledged.

Blue means the alarm has cleared itself or the condition has returned to normal, but has not been accepted (acknowledged) by the operator. Once an alarm is cleared and acknowledged, it will disappear from this screen and the other display "ticklers".

Alarms are currently limited to analog input signal quality between 2.5 and 25 mA.



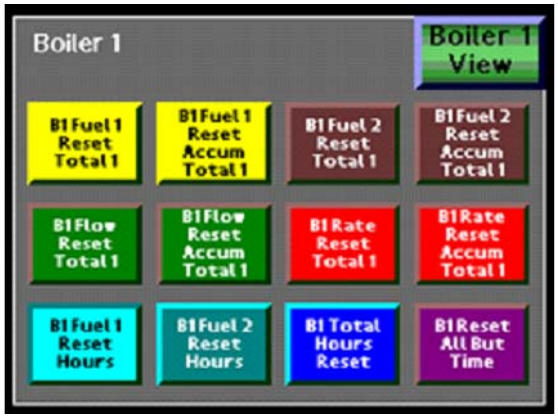
Alarm History Screen

This display provides a history of all the alarms with time and date stamps and an English text description of the alarm itself.

Total Resets

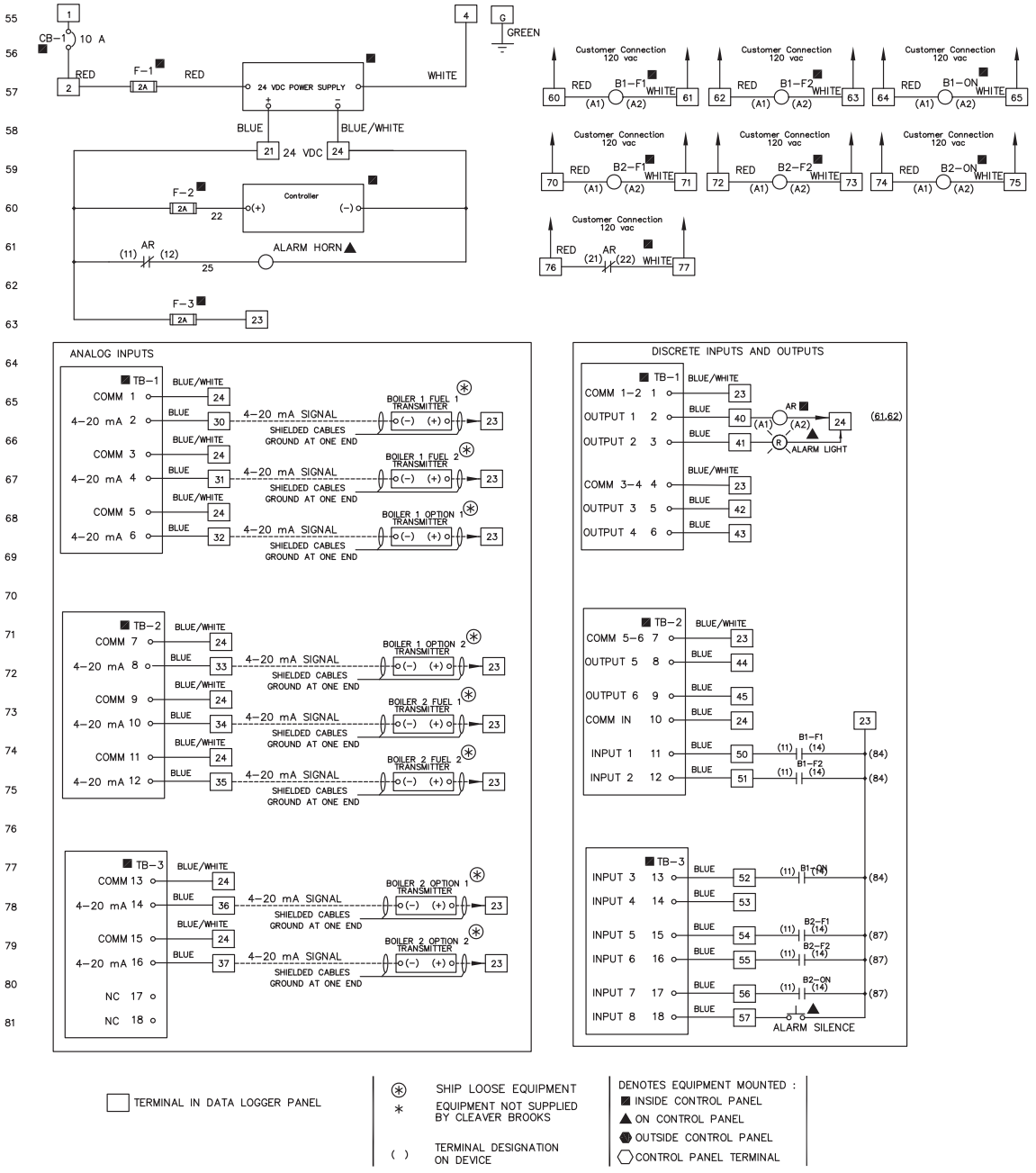
Clicking this button on the main screen will require the user to enter an ID and password (available from your Cleaver Brooks representative).

This display has buttons allowing you to reset each individual total values and hours, or the button in the bottom right allows you to reset all the values for that boiler except the hours. There is one complete set of these resets for each individual boiler.

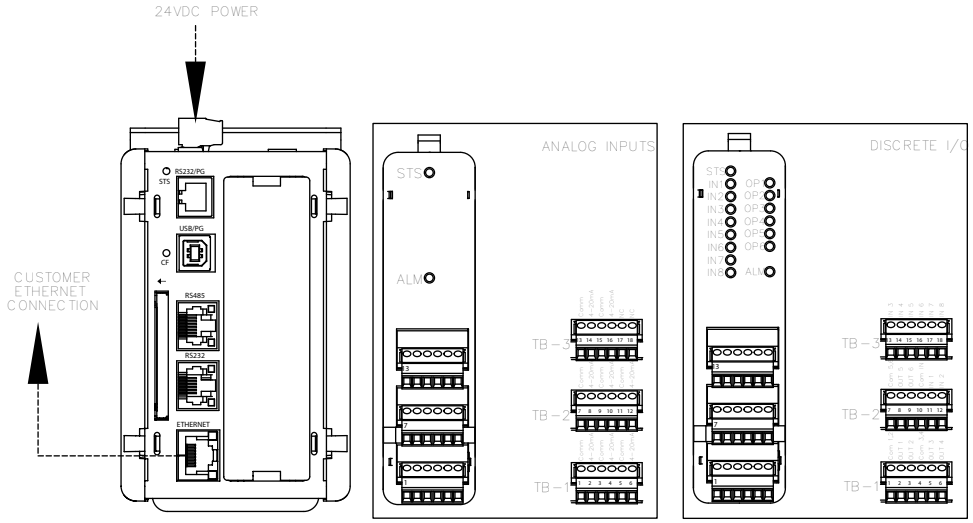


APPENDIX - Wiring, Panel Layouts, Parts

Wiring, 2 Boilers

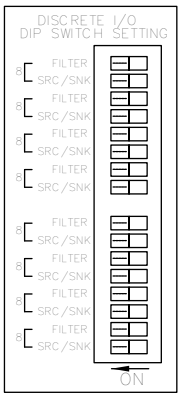


Panel Layout, 2 boiler system



EXTERNAL CONNECTIONS

DEVICE	TERMINALS
MAIN POWER SUPPLY	1,4
BOILER 1 FUEL 1 SELECTED	60,61
BOILER 1 FUEL 2 SELECTED	62,63
BOILER 1 ON	64,65
BOILER 2 FUEL 1 SELECTED	70,71
BOILER 2 FUEL 2 SELECTED	72,73
BOILER 2 ON	74,75
REMOTE ALARM STATUS*	76,77
BOILER 1 FUEL 1 TRANSMITTER	23,30
BOILER 1 FUEL 2 TRANSMITTER	23,31
BOILER 1 OPTION 1 SIGNAL	23,32
BOILER 1 OPTION 2 SIGNAL	23,33
BOILER 2 FUEL 1 TRANSMITTER	23,34
BOILER 2 FUEL 2 TRANSMITTER	23,35
BOILER 2 OPTION 1 SIGNAL	23,36
BOILER 2 OPTION 2 SIGNAL	23,37



CONTROL TERMINALS GR,GR,GR,GR,GR

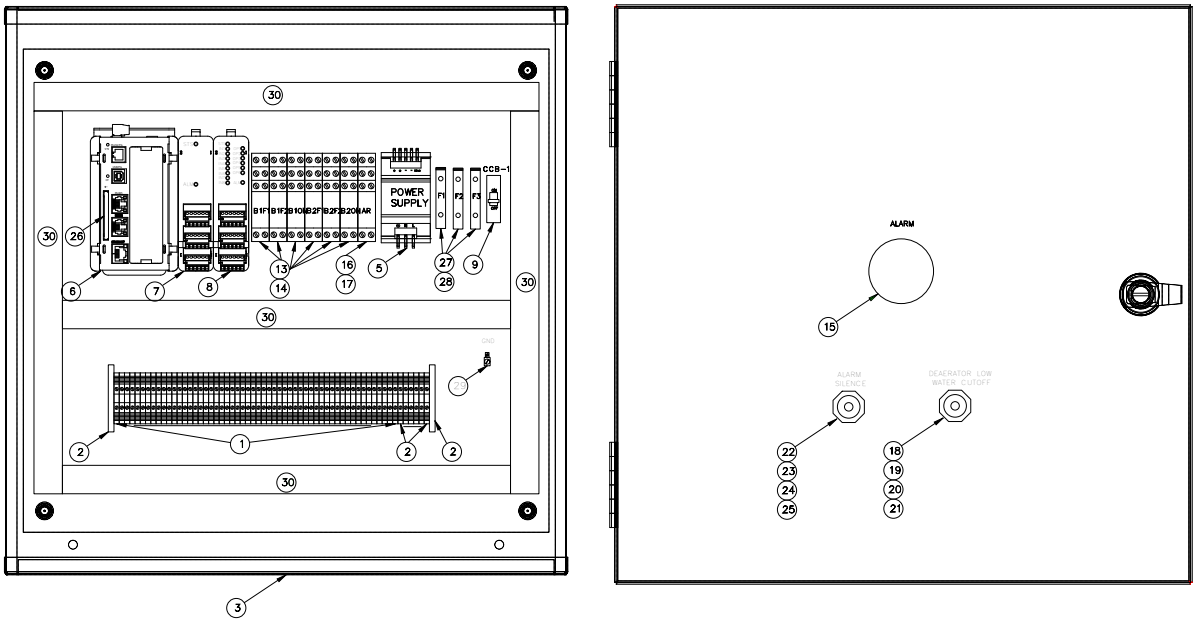
1,2,3,4,21,22,23,23,23,23,23,23,24,24,24,24,24,25,30,31,32,33,34,35
36,37,40,41,42,43,44,45,50,51,52,53,54,55,56,57,60,61,62,63,64,65
70,71,72,73,74,75,76,77
JUMPERS: 23–23,24–24

115 V. WIRE IS #16 AWG UNLESS OTHERWISE NOTED
ALL SHIELDED WIRE TO RUN IN SEPARATE CONDUIT
SEE FORM C23–3862 FOR MEANING OF ABBREVIATED DEVICES

NOTE 1–CUSTOMER CONNECTIONS
NOTE 2–UL LABEL REQUIRED ON PANEL
NOTE 3–GROUND SHIELD AT PANEL END

------- WIRING NOT SUPPLIED BY CLEAVER BROOKS

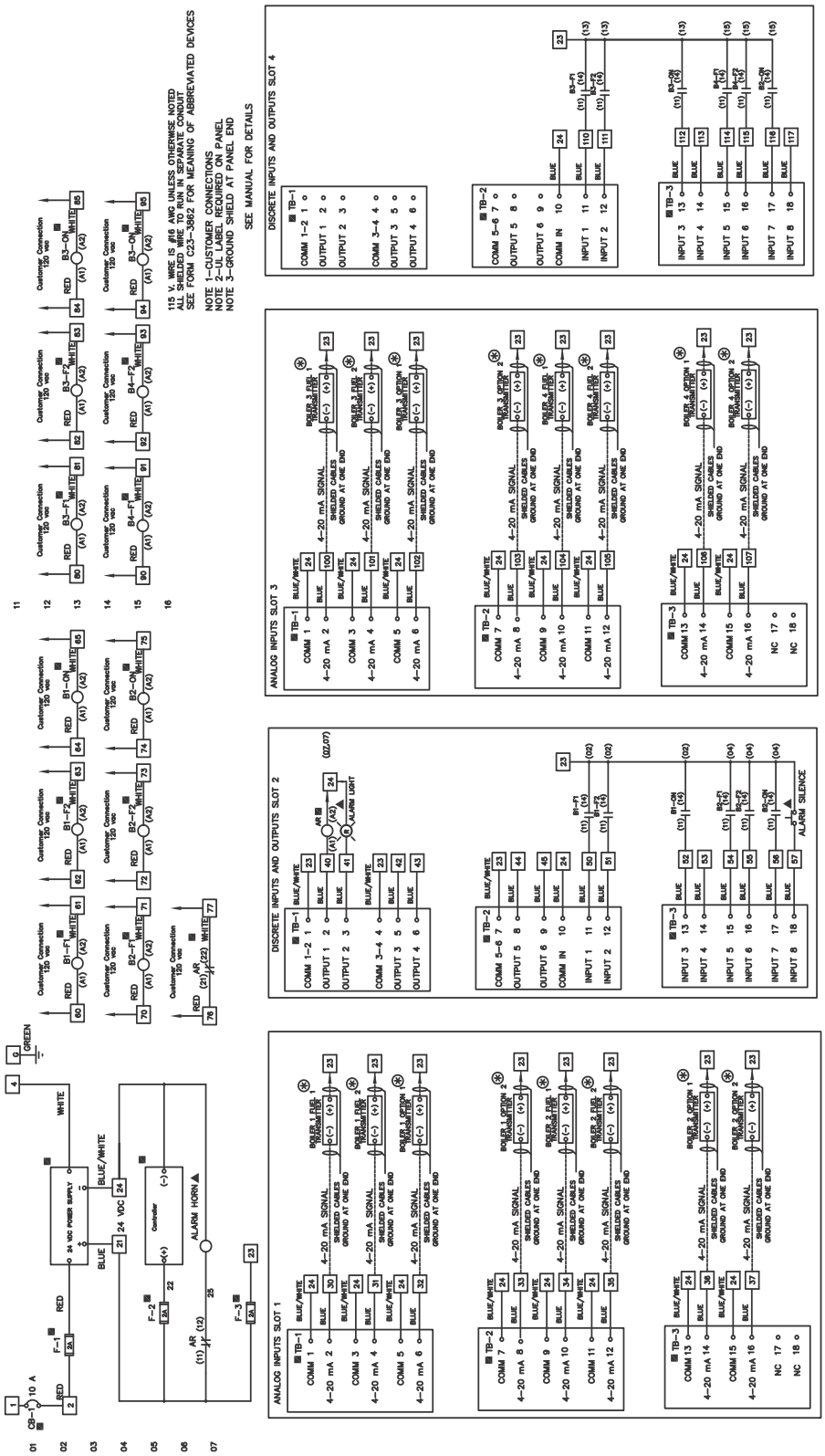
Parts, 2 boiler system



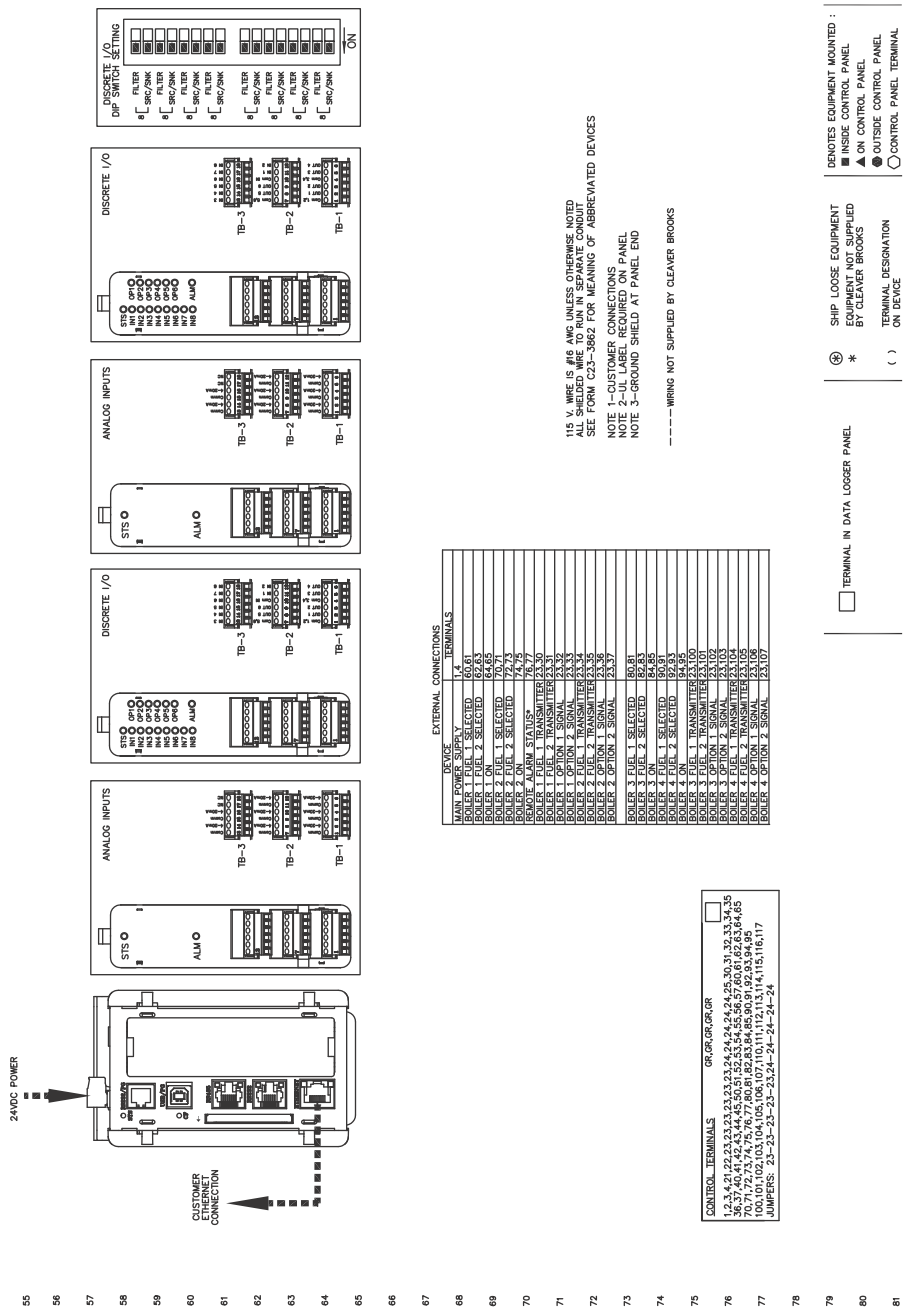
ITEM	PART DESCRIPTION	CB PN	QTY
1	TERMINAL BLOCK	832-02247-000	55
2	TERMINAL BLOCK END ANCHOR	832-02248-000	2
3	ENCLOSURE 20"X20"X6"	848-00482-000	1
4	DIN RAIL *	832-01951-000	1
5	24VDC POWER SUPPLY	832-02037-000	1
6	MASTER CONTROLLER	833-09843-000	1
7	8 CHANNEL ANLOG INPUT	833-09844-000	1
8	8 IN 6 RELAY OUTPUT	833-09845-000	1
9	10 A CIRCUIT BREAKER	983-00097-000	1
10	TERMINAL MARKER * **	832-02327-000	2
11	TERMINAL JUMPERS * **	832-02250-000	4
12	GROUND TERMINAL BLOCK	832-02259-000	5
13	RELAY DPDT 115 VAC COIL	833-03532-000	6
14	RELAY BASE 8 PIN	833-03534-000	6
15	ALARM SOUNDER	817-03773-000	1
16	RELAY DPDT 24VDC COIL	833-04040-000	1
17	RELAY BASE 8 PIN	833-03534-000	1
18	LATCH, PLASTIC *	881-00348-000	1
19	LEGEND PLATE	879-00995-000	1
20	PILOT LIGHT LENS RED	881-00350-000	1
21	LED LIGHT MODULE 24VDC	881-00412-000	1
22	ALARM SILENCE BUTTON	836-01142-000	1
23	LATCH PLASTIC *	881-00348-000	1
24	CONTACT BLOCK N.O.	836-01136-000	1
25	LEGEND PLATE	879-00995-000	1
26	COMPACT FLASH CARD *	996-25633-000	1
27	2 A FUSE	832-02051-000	1
28	FUSE HOLDER	848-01321-000	1
29	GROUND LUG	884-00078-000	1
30	WIRE WAY	848-00967-000	1

* – NOT SHOWN
** – AS NEEDED

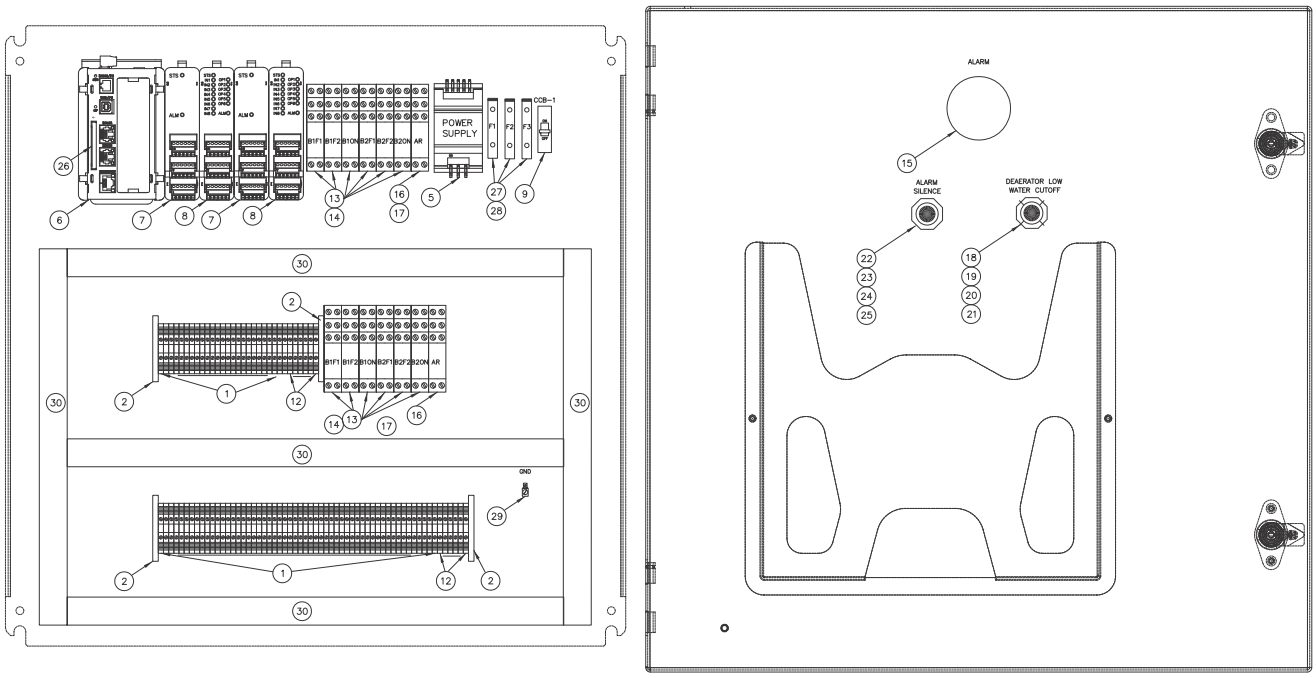
Wiring, 4 Boilers



Panel Layout, 4 boiler system



Parts, 4 boiler system



PANEL BILL OF MATERIAL

ITEM	PART DESCRIPTION	CB PN	QTY
1	TERMINAL BLOCK	832-02247-000	75
2	TERMINAL BLOCK END ANCHOR	832-02248-000	2
3	ENCLOSURE 24"X24"X8"	848-00464-000	1
4	DIN RAIL *	832-01951-000	1
5	24VDC POWER SUPPLY	832-02037-000	1
6	MASTER CONTROLLER	833-09843-000	1
7	8 CHANNEL ANLOG INPUT	833-09844-000	2
8	8 IN 6 RELAY OUTPUT	833-09845-000	2
9	10 A CIRCUIT BREAKER	983-00097-000	1
10	TERMINAL MARKER * **	832-02327-000	3
11	TERMINAL JUMPERS * **	832-02250-000	6
12	GROUND TERMINAL BLOCK	832-02259-000	5
13	RELAY DPDT 115 VAC COIL	833-03532-000	12
14	RELAY BASE 8 PIN	833-03534-000	12
15	ALARM SOUNDER	817-03773-000	1
16	RELAY DPDT 24VDC COIL	833-04040-000	1
17	RELAY BASE 8 PIN	833-03534-000	1
18	LATCH, PLASTIC *	881-00348-000	1
19	LEGEND PLATE	879-00995-000	1
20	PILOT LIGHT LENS RED	881-00350-000	1
21	LED LIGHT MODULE 24VDC	881-00412-000	1
22	ALARM SILENCE BUTTON	836-01142-000	1
23	LATCH PLASTIC *	881-00348-000	1
24	CONTACT BLOCK N.O.	836-01136-000	1
25	LEGEND PLATE	879-00995-000	1
26	COMPACT FLASH CARD *	996-25633-000	1
27	2 A FUSE	832-02051-000	1
28	FUSE HOLDER	848-01321-000	1
29	GROUND LUG	884-00078-000	1
30	WIRE WAY	848-00967-000	1

* – NOT SHOWN
** – AS NEEDED

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