PULSAtrol®

MICROPROCESSOR-BASED WATER TREATMENT CONTROLLER

MBC100 SERIES

MODEL MBC110

INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTION

CONTROLLER DATA

For your future reference, complete the following information which is provided on your controller's data label.

MODEL # _____

SERIAL # _____

INSTALLATION NOTES: _____

Contents

1. INTRODUCTION

The microprocessor based controllers have been designed to control and monitor a wide range of parameters, both analog and digital.

This instruction manual covers the Series 100 controllers. Refer to Table 1 for the specific standard features and options for the model number of your controller. All standard features are covered in this manual and most options have instructions where applicable.

IMPORTANT! While using this manual, if you see instructions for a feature that does not display on your controller, check the following:

- Consult Table 1 to see if that feature is available for your controller either as standard or option.
- Refer to the model number of your controller found on the enclosure of the unit. The letters after the model number are the options installed (i.e. 110CM3).
- After the above steps, if feature does not display, reinitialize the unit. If that fails, consult the factory.

For your convenience, there is an abbreviated instruction and software "MENU MAP" laminated card supplied with all manuals to be kept with the controller. This card is not a substitute for this instruction manual. It is supplied as a quick reference only and should be used in conjunction with the instruction manual.

DESCRIPTION

The controller is designed to monitor and control Total Dissolved Solids (TDS) in steam boiler systems in terms of electrical conductivity measured in microsiemens/cm (µS/cm). The controller allows you to choose sample methods, either continuous sample or timed sample. A set point of the acceptable conductivity limit is entered into the controller through the front keypad. If the maximum limit is exceeded in the continuous sample mode, a blowdown valve is opened. The system water with higher levels of TDS is blown down while fresh make-up water is added. This results in reduced TDS levels in the boiler. In the timed sample mode, the controller opens the blowdown valve on a timed interval for a preset length of sample time. If TDS is below the set point, the valve will close until the next timed sample. If the TDS is above the maximum limit, the valve will remain open until the solids are reduced to below the set point.

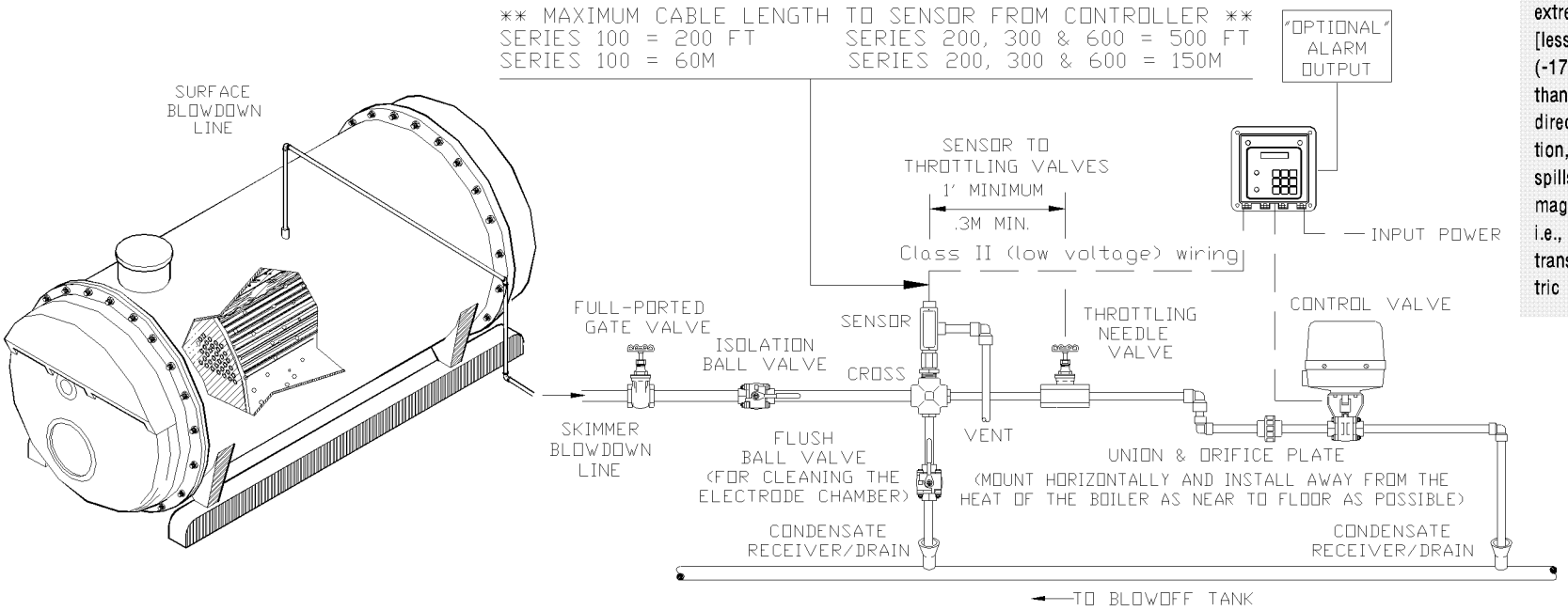
The design also includes a high/low conductivity alarm indicator which is available with optional relay output and/or dry contacts. The alarms can be operated in one of two modes. In trak set point, an alarm offset is entered and the alarms automatically adjust themselves around the set point. The other mode is independently set. This allows the user to independently set both the high and low alarms.

The design allows the controller to accept options such as selectable inhibitor feed timers, analog output and alarm relay. The EEPROM protects operating parameters during power outages. Hand/Off/Auto keys are provided on the keypad for immediate control of pumps, solenoid valves, etc., without scrolling through menus.

TABLE 1 The 100 Series Boiler Controller

STANDARD FEATURES	OPTIONS
Conductivity Control	**A** 04-750-11 Stainless Steel Sensor
Selectable Sample Mode (Continuous or Timed)	**C** Selectable Inhibitor Timer
	D Alarm Output Relay
	K Dry Alarm Contact
	M3 4-20 mA Isolated Programmable Proportional Output

2. INSTALLATION



!!WARNING!!
CONTROLLER COULD BE DAMAGED AND VOID WARRANTY!

Avoid locations where the controller would be subjected to extreme cold or heat [less than 0°F (-17.8°C) or greater than 122°F (50°C)], direct sunlight, vibration, vapors, liquid spills or EMI (electromagnetic interference; i.e., strong radio transmission and electric motors).

INSTALLATION NOTES

1. Assure skimmer line is 4 to 6 inches (101.6 to 152.4 mm) below the surface and yet not below the first row of tubes.
2. DO NOT use a column to automate blowdown.
3. DO NOT automate bottom blowdown.
4. Measuring surfaces of the sensors must be continuously immersed in system water.
5. Valves installed between the sensor and the boiler must be full port.
6. A throttling device must be installed in the blowdown and sample line(s) on the system side of the blowdown valve and after the sensor. This will be used for throttling the blowdown.

LOCATION

Select a mounting location convenient to grounded electrical and plumbing connections. Mount controller on a wall or other vertical surface. Position so operator has access to the unit and a clear view of front panel display. Avoid locations where the controller would be subjected to extreme cold or heat (See Warning at above!) Installation should comply with all national, state and local codes. Refer to Section 6 Diagrams, Diagram 1, pg. 21 for mounting details and dimensions of our standard enclosure.

7. Install water meters horizontally with meter face up and observe temperature and pressure ratings.

8. Sensor should be installed with a gate valve on the bottom of the cross for flushing and cleaning the sensor.

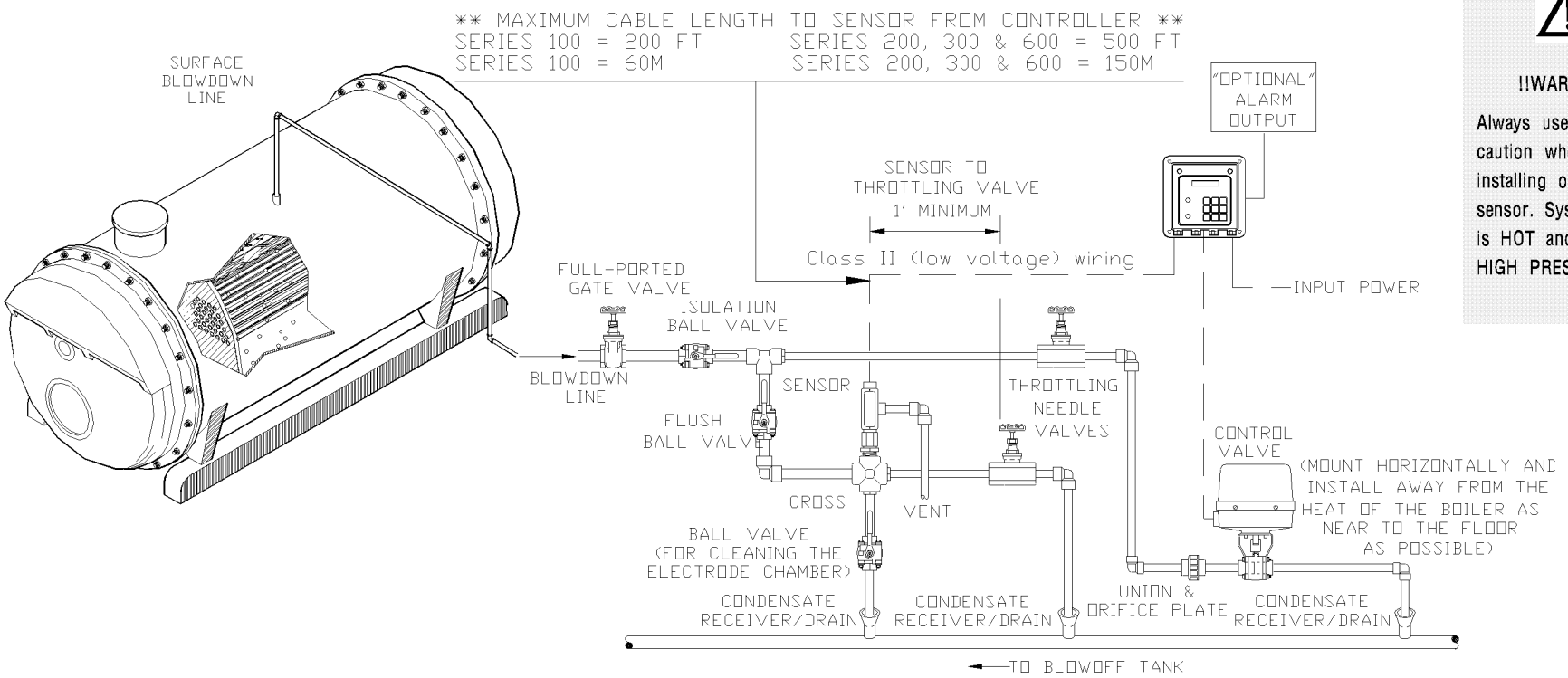
9. Blowdown valves should be mounted horizontally and installed away from heat of the boiler and near to the floor.

10. When installing sampling assembly and blowdown assembly, distances specified in Figure 1 should be adhered to as closely as possible.

11. Sensor wiring is to be run in a dedicated conduit. Do NOT run in conduit with 120 VAC wiring. Connect conduit to top hole on access union - NOT side vent hole.

12. Flow arrows on sensor should be parallel with the piping run.

FIGURE 1



NOTE:

For proper rejection of AC line voltage spikes, sensor EMI noise rejection and personal safety. Controller ground connection must be to a dedicated true earth ground If there is ANY doubt, consult a qualified electrician.

!!WARNING!!

Always use extreme caution when installing or removing sensor. System water is HOT and under HIGH PRESSURE!

!!WARNING!!

Always use extreme caution when installing or removing sensor. System water is HOT and under HIGH PRESSURE!

SENSOR INSTALLATION

Controller should be per installation diagram (see Figure 1). Make sure all fittings and connections are secure:

1. Remove power from the controller.
2. Close isolation valve located before the sensor (Figure 1).
3. Open the flush valve to drain water from sensor housing; to insure no water or pressure is present in this part of the assembly (Figure 1).
4. Apply at least six wraps of pipe tape to threads of sensor. Install nipple and adapter if not already installed (Figure 2).
5. Install sensor into cross housing. Make sure that flow arrows marked on sensor are lined up parallel with the piping run and point in direction of flow (Figure 3).
6. Pass wires to the controller through threaded nipples, union and access tee. Leave vent open on access tee. Refer to Section 6, Diagram 2, pg. 22. (Figure 4)
7. Tighten all connections. Do not over tighten.
8. Close flush valve. Open isolation valve up-line from sensor slowly to prevent water hammer. Carefully inspect for leaks.

Refer to Section 6, Diagram 2, pg. 22, for information and specifications for the sensor supplied with your system.

9. Adjust throttling needle valve to assure stream is not flashing across the sensor. If you are in doubt, install a pressure guage on the boiler side of the throttling valve and adjust the valve so that there is flow across the probe and the guage pressure matches the boiler pressure.

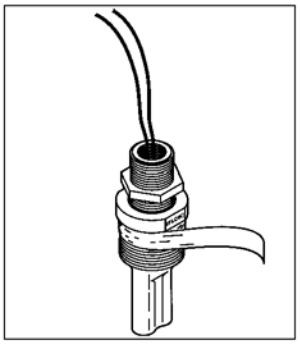


FIGURE 2
Apply at least 6 wraps of pipe tape to sensor threads.

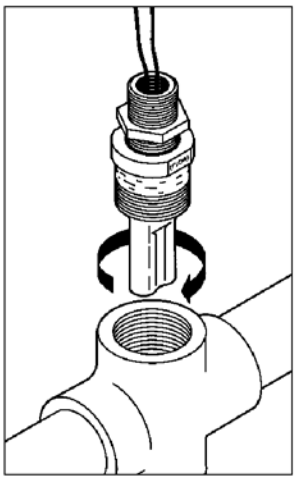


FIGURE 3
Install sensor into cross housing. Make sure the "<-->" or the word "Flow" is parallel to piping run.

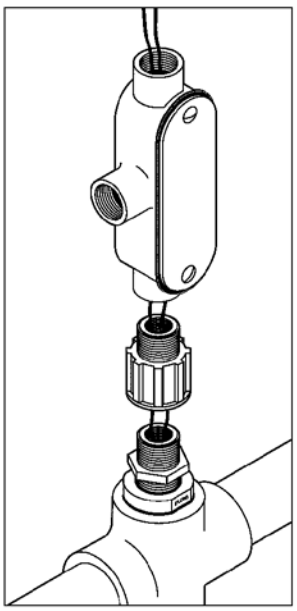


FIGURE 4
Complete sensor assembly installation.

ACCESSORIES

(Available through your distributor or sales representative, but not included as standard)

Boiler Conductivity Timed Sample

1. Blowdown valve, solenoid with Y strainer or motor operated ball valve.
2. Needle valve or orifice union and plates for throttling blowdown flow rate.
3. A full-port gate valve for isolation of blowdown assembly for cleaning and calibration.
4. A flush valve for sensor to empty sensor line for cleaning and calibration.
5. Chemical metering pumps as required.
6. Contact head water meter, if controller incorporates as pulse timer (option C).
7. External alarm, if controller incorporates alarm relay. Refer to Figure 1, Typical Installation, pg. 6.

Boiler Conductivity Continuous Sample

1. Blowdown valve, solenoid and strainer or motor operated ball valve.
2. Two needle valves or two orifice unions and plates for throttling blowdown.
3. A full-port gate valve for isolation of blowdown assembly.
4. A flush valve for sensor.
5. Chemical metering pumps as required.
6. Contact head water meter, if controller incorporates as pulse timer (option C).
7. External alarm, if controller incorporates alarm relay. Refer to Figure 1, Typical Installation.

!!WARNING!!

Line voltage is present on the relay board located in the bottom of enclosure.

POWER MUST BE DISCONNECTED WHILE CONNECTIONS ARE BEING MADE!

ELECTRICAL WIRING

The controllers electronic circuitry is protected with a 2 amp 250V fuse (little fuse 313.250), located on the power supply board (in previous versions, Bussman BK/PCE-5 or S504-2 were used).

Units are factory predrilled with easily accessible terminals for hard wiring. See Diagram 3, Relay Board, pg. 23, and Diagram 4, Daughter Board, pg. 24 for input and output power connections.

The controller should be connected to its own 15 amp power branch (i.e., its own wiring, circuit breaker, etc.).

NOTE: Use only 16 (1.5 mm) or 18 (1.2 mm) AWG wire for conduit power and load connections. Never run power and signal wiring (Example: Sensor, proportional or recorder outputs) together in the same conduit.

NOTE: Liquid tight fittings are provided for all low voltage signal leads. When connections are required by the end user, follow the instructions below:

NOTE:

For proper rejection of AC line voltage spikes, sensor EMI noise rejection and personal safety. Controller ground connection must be to a dedicated true earth ground If there is ANY doubt, consult a qualified electrician.

Open Enclosure

Remove the captive screws from upper control panel and open panel. NOTE: the screws are retained and will not fall out.

Power

The power source connection is made on J7 (Refer to Diagram 3, Relay Board, pg. 23). Terminals: 1= return (neutral), 2 = true earth ground, and 3 = line (hot). This controller requires its own dedicated 15 ampere branch circuit. This connection supplies power for both the controller and the relay controlled devices. Use only 16 AWG or 18 AWG wire.

IMPORTANT: The power supplied to your controller should be dedicated. Power outages, line spikes and improper grounding can result in damage to microprocessor based products, if not properly protected. Surge suppression and line filtering is an important part of controller installation. The device you choose to protect this controller should meet the following minimum requirements:

Response Time . . . . . .< 1 nS
Energy Dissipation . . . . . .400 Joules
EMI/RFI Noise Attenuation . . . . . .5 - 35 dB

Sensor Connections

Refer to Diagram 4, Daughter Board, pg. 24, for location of connections. For standard temperature compensated sensors, three-wire shielded cable should be used with the shield being connected at the controller only.

Water Meter/Pulse Timer

Refer to Diagram 4, Daughter Board, pg. 24. If a Selectable Inhibitor Feed Mode (Option C) is present in your model number and the Pulse Timer Mode is chosen, connect the water meter on the daughter board connector JP16; connections are pins 7 and 8. **The water meter input is a dry contact input, do not apply any power to this input or damage will occur**.

Alarm Dry Contact

Alarm dry contacts are provided with the controller when Option K is in your model number.. Refer to Diagram 3, Relay Board, pg. 23. The connections for the dry contacts are on JP5; pin 1 is normally closed, pin 2 is normally open and pin 3 is the common. The dry contacts are rated for 500mA.

Relay Connections

Refer to Diagram 3, Relay Board, pg. 23 for the location of connections. The relay connections are made on J2A, J2B and J2C. Refer to Diagram 3, Relay Board, pg. 23 for the relay assignment specific to your controller's model number. Diagram 3 also illustrates how a motorized ball valve is wired into J2A or J2B. Each relay output is protected by a replaceable plug in 5 amp fuse located on the relay board (refer to Diagram 3, pg. 23). There are four connections provided with each relay. They are: 1 - normally closed, 2 - normally open, 3 - earth ground, and 4 - neutral. Typically On/Off devices, such as a pump or a solenoid valve, are wired into numbers 2, 3 and 4. When wired this way, the device will turn on when the relay turns on. Some devices, such as a motorized ball valve, require the use of all four connections as indicated in Diagram 3 on pg. 23. If in doubt of any electrical connection, always consult a qualified electrician.

4-20 mA Analog Output (Option M3)

Refer to Diagram 4, Daughter Board, pg. 24. The 4-20 mA output connections are made on JP16 pin 9+ and 10-. The analog output on the controller is a self powered, direct signal. Do not apply external loop power to the output or damage will occur and void the warranty.

3. Start Up Instructions

!!WARNING!!

When power is supplied to the unit, line voltage is present on the Relay Board located in the bottom of the enclosure.

NOTE:

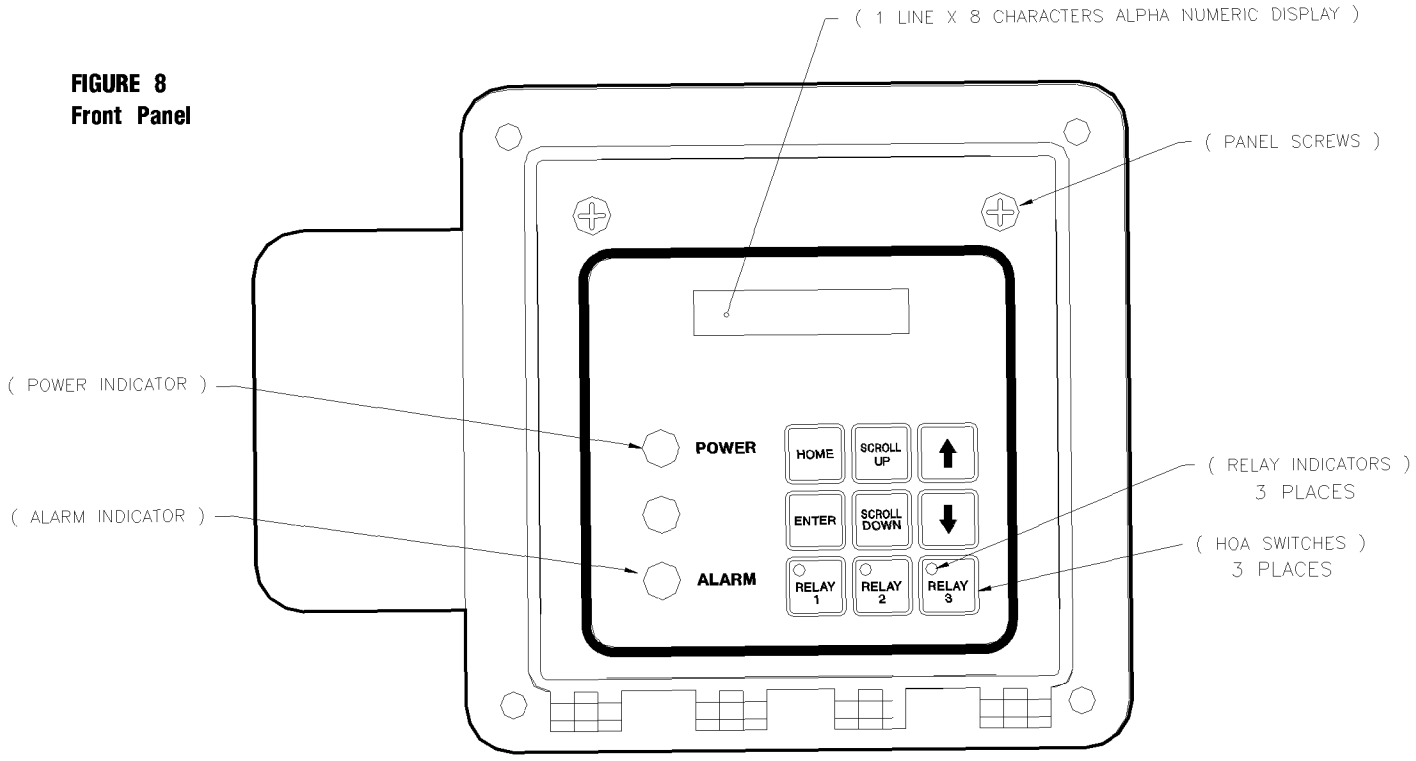
When Initializing or Re-Initializing your controller, all of the system settings will overwritten by original factory default settings. The controller must be re-configured to your specifications.

READ THE FOLLOWING BEFORE PROCEEDING ANY FURTHER!!

INITIALIZATION

This unit requires initialization upon start-up. Before applying power, insure that devices being controlled are not in a position to cause harm or damage if activated upon initial start-up. With the controller now installed in a convenient location, we will INITIALIZE the controller. With the controller turned off, remove the two front panel phillips head screws. Refer to Diagram 5, Motherboard, pg. 25. Set the S1 #8 dip switch to the on position as indicated by the arrow on the dip switch box. Power the controller up for 25 seconds, turn the controller off and return the S1 #8 dip switch to the off position. Restore power to the controller, close the front panel and the unit is reinitialized.

FIGURE 8
Front Panel



TIP:

For help with menu locations, please refer to the "Menu Map" supplied with your controller.

MENU STRUCTURE

The controller menu structure as well as the hardware were designed with you in mind. The menu structure diagram supplied with the controller was generated to reflect a Series 110 with all options.

Configure This should be the first selection made at start up. In this menu you are prompted to configure the system parameters and options to your specific application. This menu will include the high and low alarm configuration, the set point configuration (Rising/Falling), the 4-20mA output settings (Option M3), the software version number, the sample mode configuration (Timed/ Continuous), the display sensitivity and the inhibitor feed mode selection screen (Option C).

Sys Data This menu displays the system parameters only. No settings or adjustments can be made from this menu. The present conductivity reading, current conductivity scale and any alarms will be displayed.

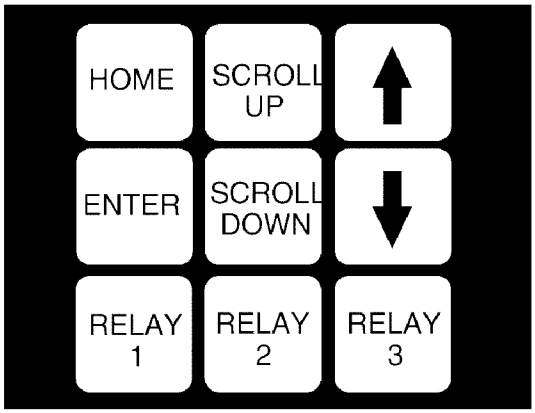
Calibrate Sensor This menu is for calibration of the conductivity boiler sensor. In this menu you are prompted to enter either a one (1) point or two (2) point calibration..

Set Points and Alarms In this menu, you are prompted to enter settings for the system alarms and the set points that control the system operation.

Inhibitor Feed Set In this menu, you are prompted to enter settings pertaining to the inhibitor feed mode selected in the System Configure menu.

NOTE:

After five minutes of no keypad activity, the controller will display system conductivity.



KEY PAD OPERATION

The Key Pad on the Series 110 is easy to use and will guide you through all the sub menus and functions of the controller. Feel free to try out these keys as you read about them. You will not hurt the controller and the values will need to be reprogrammed later anyway.

Home Press this key to return to previously displayed menu.

Scroll Up/Scroll Down Use these keys to move up and down the menu structure and to change any non-numeric value.

Arrows The Arrow Keys are used to change the numerical values associated with the various settings you will be entering. Use "down" arrow to select lower numbers and the "up" arrow to select higher numbers.

Enter This key has two functions:

FIRST, in the main menus and in the sub menus, pressing the Enter Key allows you to enter the menu or setting being displayed.

SECOND, pressing the Enter Key allows you to accept the settings you have programmed in the sub menus.

TIP:

When using the Arrow Keys, press once to change numbers by one unit. Continuously holding down either Arrow Key will change numbers more rapidly.

!!WARNING!!

NEVER leave a screen with choices still "flashing"! Controller accuracy may be affected, and/or controller may not operate properly.
If you forget, simply return to that menu and complete your programming.

Relays (1-3) These Hand/Off/Auto (HOA) keys allow immediate control of pumps, solenoid valves, etc. affected by the controller without scrolling through the menus. Press a Relay Key once to force relay on for 5 minutes (an amber light will appear on that key). Press Relay Key again to force relay off (a red light will appear on that key, relay will be forced off until key is pressed again). Press a Relay Key a third time to return relay to auto control (green light will indicate that relay is on, no light indicates that relay is not activated).

SAMPLE PROGRAMMING

The following is a detailed example of how to program your controller. Once you have mastered this exercise, you will be ready to set up the controller to your specifications.

IMPORTANT! Please note that in all programming instructions, *keypad instructions* are presented as all capitals—"ENTER," items as they *appear in the display* are presented as all capitals and bold face—"**DISPLAY DATA**."

For this exercise, you will program the controller for the continuous sample mode and you will set your display sensitivity to ten (10). Follow along with the provided menu map.

TIP:

Be sure to press keys firmly until you feel or hear a faint click, then pause before you try again. There is a very slight delay for the controller to react to your command. This is normal.

1. If not already displayed on the controller screen, press HOME until **SYS DATA** is displayed.

2. Press SCROLL DOWN repeatedly through the main menu until **CONFIGUR** is displayed and press ENTER.

3. **HI/LO AL** will be displayed. Press SCROLL DOWN through the configure menu until **SAMPLE?** is displayed and press ENTER.

4. **TIMED** will be displayed. Press SCROLL DOWN and **CONSTANT** will be displayed, then press ENTER.

5. **SENSITIV** will be displayed. Press ENTER.

6. **1** will be displayed. Press ARROW UP to increase the value to **10** and then press ENTER.

TIP:

If at any time, while programming your controller, you get lost or confused, press the HOME key repeatedly until you get back to the Main Menu and start again.

9. At this point **HI/LO AL** will be displayed.

or


Option C

10. Now, press HOME repeatedly until **SYS DATA** is displayed.

Congratulations, you've done it! All menu programming functions operate in this manner. Feel free to repeat this exercise as often as you like until you are comfortable with the programming procedure.

4. CONTROLLER SET UP

PROGRAMMING

Insure that all output devices being controlled are not in a position to cause harm or damage. Reinitialize the controller using the procedure outlined on pg. 11. When the controller is powered up it will show **SYS DATA** on the display.

This is a flexible yet powerful controller. The default values for all control features have been factory set, but you will want to fine tune the controller to meet your specific application.

NOTE:

When Initializing or Re-Initializing your controller, all of the system settings will overwritten by original factory default settings. The controller must be re-configured to your specifications.

SYSTEM CONFIGURE

To configure the controller, press the HOME key repeatedly until **SYS DATA** is displayed. Press the SCROLL DOWN key until **CONFIGURE** is displayed, then proceed with the following. Follow along with the provided menu map.

A) Set HI/LO ALARMS:

You have the choice to select Track Set Point or Independent alarms. **TRAK SET** triggers the Hi or Low alarm based on an alarm offset range under or over the system set point. The **AL OFFST** is programmed in the **SET PTS** menu. For example, if you select **TRAK SET** and you program the **AL OFFST** to 200 µS/cm with the default set point of 1500 µS/cm, your high alarm would be 1700 µS/cm and the low alarm would be 1300 µS/cm, automatically. **INDEPEND** will allow you to set the high and low alarms to any value, regardless of the set point that's entered. For example, the high alarm could be set to a value of 2000 µS/cm and the low alarm could be set to 500 µS/cm. The **HI ALARM** and **LO ALARM**, or the **AL OFFST** are programmed in the **SET PTS** menu.

1. With **CONFIGURE** displayed, press ENTER and **HI/LO AL** will be displayed, press ENTER and **TRAK SET** will be displayed and flash, SCROLL DOWN and **INDEPEND** will be displayed and flash, press the ENTER key when your choice is displayed and **SET PT** will be displayed.

TIP:

After pressing ENTER at the end of a setting proceedure, if the next item to be set within a submenu does not display, press the HOME key to return to the submenu title then press SCROLL UP or SCROLL DOWN until you see the item to be set next.

B) Set RISING or FALLING Set Point:

This is the basis on which the controller will activate the solenoid or motorized ball valve. If you set the set point to **RISING** the valve

will open when the solids exceed the set point. If you set the set point to **FALLING** it will activate the valve when the solids drop below the set point. Most applications call for a rising set point.

1. With **SET PT** displayed on the screen press ENTER and **RISING** will be displayed and flashing. Press SCROLL DOWN and **FALLING** will be displayed and flashing. Press ENTER on your choice of set points and **VERSION** will be display.

C) VERSION:

The software version number indicates what revision level of software your controller has installed. Have your software version number and the controller's serial number ready if you need to call the factory for assistance.

VERSION

2.10

1. With **VERSION** displayed, press ENTER and your software version number will appear. Press ENTER again and **SAMPLE?** will be displayed.

D) Set SAMPLE MODE:

The Sample Mode determines whether your controller will monitor the solids on a timed or continuous basis. The Timed Sample Mode allows you to program an interval time and a sample time. For example, if you programed the interval time for one hour and the sample time for one minute, every hour the controller will open the blowdown valve for one minute. If during this one minute the solids exceed the set point, the valve will remain open until the set point and differential are satisfied. If the solids remain below the set point, the valve will simply close after one minute, until the next sample time in one hour. In the Constant Sample Mode the controller will activate the valve at any time the solids exceed the set point, the valve will then remain open until the set point and differential is satisfied.

SAMPLE?

TIMED

CONSTANT

1. With **SAMPLE?** displayed, press ENTER and then **TIMED** will be displayed and flashing, press SCROLL DOWN and **CONSTANT** will be displayed and flashing. When your choice is shown and flashing press ENTER and **SENSITIV** will be displayed.

E) Set SENSITIVITY:

This setting determines the number of samples that are averaged together and the number of seconds before the display is updated. For example, if you set the sensitivity to 5, the controllers display will only change every five (5) seconds and will display the average of the last five seconds of readings. This is for reducing the typical fluctuations of digital displays.

1. With **SENSITIV** displayed, press ENTER and the number **1** will be displayed, use the ARROW UP key to increase the value to the desired setting and then press ENTER. It is advisable to set this value to 1 before calibrating the controller for faster sensor response time. After pressing ENTER **FEED SEL** will be displayed.

FEED SEL

F) Set SELECTABLE INHIBITOR TIMER (Option C)

The method of feeding the inhibitor is selectable. There are four different types of timers to choose from. The selection of the Timer Mode you require is made here. The parameters for the timer such as run times, pulses and percent are made in the **INH FEED** menu. The following are the four available modes:

NOTE:

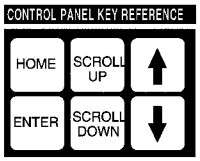
When configuring Inhibitor Feed Timer in System Configure menu, you may select only one of the modes present.

TIP:

After pressing ENTER at the end of a setting proceedure, if the next item to be set within a submenu does not display, press the HOME key to return to the submenu title then press SCROLL UP or SCROLL DOWN until you see the item to be set next.

!!WARNING!!
CONTROLLER COULD BE DAMAGED AND VOID WARRANTY!

Analog outputs are self powered. Do not try to externally loop power. Externally powering outputs will damage your controller!



LIMIT TIMER

The **LIMIT** timer, also referred to as a lockout timer, allows for the chemical feed pump to be turned on at the same time as the blowdown valve. The timer limits the amount of time the pump can run during a bleed cycle. This prevents the possibility of over feeding due to a clogged blowdown valve. The timer is adjustable in one minute increments up to 23 hours and 59 minutes.

PERCENT TIMER

Also referred to as a cycle timer. The timer runs continuously on a 10 minute cycle time. The chemical feed pump runs for a percent of that cycle time. For example, if the percent run time is set to 50%, the chemical pump will run for five minutes and turn off for five minutes. The timer is adjustable between 1% and 100% of 10 minutes.

POST BLOWDOWN PERCENT TIMER

Displayed as **% BLEED**. The timer is adjustable in increments of 1% up to 100% of the blowdown time. The timer keeps track of the total blowdown time and turns on the chemical pump after the blowdown has stopped for a percent of the total blowdown time. For example, if you set the percent time to 50% and the blowdown comes on for 20 minutes, the chemical pump will run for 10 minutes after the blowdown turns off.

PULSE TIMER

Also referred to as a water meter timer. The timer accepts pulses from a water meter to activate a chemical feed pump. The timer has an adjustable feed time (**DURATION**) in 1 second increments up to 59 minutes and 59 seconds. The timer has a built in accumulator set point (**ACC SET**) that counts pulses up to 255 before activating the chemical pump. The timer also incorporates a pulse totalizer (**TOTAL CT**) that keeps an ongoing count of the number of pulses received. The totalizer is reset by turning the controller off and then back on. The **DURATION**, **ACC SET** and the **TOTAL CT** are located under the **INH FEED** menu.

1. Now that we have covered all four timers, with **FEED SEL** displayed, press ENTER and **LIMIT** will be displayed and flashing. Press SCROLL DOWN and **PERCENT** will be displayed and flashing. Press SCROLL DOWN again and **% BLEED** will be displayed and flashing. Press SCROLL DOWN again and **PULSE** will be displayed and flashing. Press ENTER when your choice is displayed and flashing and **ANLOGOUT** (option M3) will be displayed.

LIMIT

PERCENT

% BLEED

PULSE

G) 4-20mA ANALOG OUTPUT (Option M3)

The M3 Option allows for an isolated proportional analog signal to be sent to a chemical pump, chart recorder or a computer. The analog signal is self powered, do not attempt to externally loop power. Externally powering the output will damage the controller and void the warranty. The 4-20mA signal is programmable; for example, the output could be programmed to provide 4mA at 100 µS/cm as the **MIN** set point and 20mA at 3000 µS/cm as the **MAX** set point. The output must also be calibrated under the **SYS CAL** menu, covered later in this manual.

1. With **ANLOGOUT** displayed, press ENTER and **MIN** will be displayed. Press ENTER and **0** will be displayed. Use the ARROW UP key to the desired conductivity value that will represent the minimum analog output and then press ENTER and **MAX** will be displayed. Press ENTER and **1400** will be displayed. Use the ARROW UP/DOWN keys to enter the conductivity value that will represent the maximum analog output and then press ENTER and

ANLOGOUT

MIN

0

MAX

1400

MIN will be displayed. Press HOME repeatedly until **SYS DATA** is displayed.

TIP:

For help with menu locations, please refer to the "Menu Map" supplied with your controller.

SET POINTS AND ALARMS

SYS DATA

With **SYS DATA** displayed on the screen, press the SCROLL DOWN key until **SET PTS** is displayed. In this menu we are going to program all of the system set points. Follow along with the provided menu map.

SET PTS

Set Point

The Set Point is the conductivity value at which the controller will activate the blowdown. Previously we selected what type of set point we required, either falling or rising, and now we must program the specific value the valve will activate at.

COND RSP

COND FSP

1. With **SET PTS** displayed, press ENTER and **COND RSP** or **COND FSP** will be displayed. Press ENTER and **1500** will be displayed. Use the ARROW UP/DOWN keys to select the conductivity value the blowdown should begin at, press ENTER and **AL OFFST** or **HIGH ALARM** will be displayed.

High and Low Alarms

AL OFFST

HIGH ALARM

LO ALARM

The high and low alarms are the two points where the controllers alarm indicator will begin flashing and, if Option D or K are in your model number, the alarm output relay (D) or dry contact (K) will come on.

NOTE:

Set "Trak" or "Independent" Set in the CONFIGURE menu. See A), pg. 14.

1. **TRAK SET PROGRAMMING** - With **AL OFFST** displayed, press ENTER and **200** will be displayed. Use the ARROW UP/DOWN keys until you reach the amount of offset you require. For example, with a set point of 1500, an offset of 200 will make the high alarm1700 and the low alarm 1300. Then press ENTER.

2. **INDEPENDENT SET** - With **HIGH ALARM** displayed, press ENTER and **1000** will be displayed. Use the ARROW UP/DOWN keys to select your choice, press ENTER and **LO ALARM** will be displayed. Press ENTER and **100** will displayed. Use the ARROW UP/DOWN keys to select your choice and press ENTER. **SAMP INT** or **SPT DIF** will be displayed. If **SPT DIFF** is displayed skip ahead to set point differential.

Timed Sample Mode Set Points

SAMPLE INT

SPT DIFF

SAMP DUR

The Timed Sample Mode consists of two major settings, the interval time (**SAMP INT**) and the sample duration (**SAMP DUR**). The interval time is the amount of time between samples and the sample duration is length of time the controller will sample the solids for. If the solids are above the set point during the sample time, the blowdown valve will remain open until the set point is satisfied. If the solids are below the set point during the sample time, the valve will stay open only for the amount of time in the **SAMP DUR** setting. Note: The controller will not activate the valve automatically during the interval time, even if the solids exceed the set point.

1. With **SAMP INT** displayed, press the ENTER key and **01HR00MN** will be displayed with the minutes flashing. Use the ARROW UP/DOWN keys to set the desired number of minutes, press ENTER and the hours will begin flashing. Use the ARROW UP/DOWN keys to set the desired number of hours, press ENTER and **SAMP DUR** will be displayed. Press ENTER again and

TIP:

For help with menu locations, please refer to the "MENU MAP" supplied with your controller.

01MN00S will be displayed with the seconds flashing. Using the ARROW UP/DOWN keys, enter the desired number of seconds, press ENTER and the minutes will begin to flash. Enter the desired number of minutes, press ENTER and **SPT DIF** will be displayed.

Set Point Differential

Also referred to as dead band or hysteresis. This is the offset for the set point to prevent the blow down valve from chattering. For example, on a rising set point of 1500 and a set point differential of 200, the valve will open at 1500 and remain open until the solids drop below 1300.

SPT DIFF

1. With **SPT DIF** displayed press ENTER and **100** will be displayed and flashing. Use the ARROW UP/DOWN keys to select the differential you require and then press ENTER. The set point programming is complete, press the HOME key repeatedly until **SYS DATA** is displayed.

SELECTABLE INHIBITOR FEED TIMER (Option C)

The inhibitor feed timer is selectable. Previously in the **CONFIGURE** programming we selected the type of inhibitor timer we needed. The **INH FEED** menu is where we will enter the parameters of the timer we have selected.

1. With SYS DATA displayed, press the SCROLL UP or SCROLL DOWN keys until **INH FEED** is displayed and press ENTER. One of the following will now be displayed.

INH FEED

Limit Timer

!!WARNING!!

If "ACC SET" is entered as zero (0), the pulse timer will run continuously.

With **LIMIT** displayed, press ENTER and **01HR01MN** will be displayed with the miutes flashing. Use the ARROW UP/DOWN keys until the desired minutes is displayed and press ENTER. Now the hours will begin to flash. Use the ARROW UP/DOWN keys until the desired hours are displayed and press ENTER. Press the HOME key repeatedly until **SYS DATA** is displayed.

LIMIT

Percent Timer (10 minute cycle timer)

With **PERCENT** displayed, press ENTER and **5** wll be displayed and flashing. Use the ARROW UP/DOWN keys until the desired percent is displayed and press ENTER. Press the HOME key repeatedly until **SYS DATA** is displayed.

PERCENT

Percent Post Blowdown Timer

With **% BLEED** displayed, press ENTER and **5** will be displayed and flashing. Use the ARROW UP/DOWN keys until the desired percent of blowdown is displayed and press ENTER. Press the HOME key repeatedly until **SYS DATA** is displayed

% BLEED

NOTE:

Pulse count may be read in the INH FEED main menu if system is configured for pulse timer.

Percent Timer (Water Meter Timer)

With **PULSE T** displayed, press ENTER and **DURATION** (the amount of time the chemical pump will be on for) will be displayed. Press ENTER and **00MN01S** will be displayed with the seconds flashing. Use the ARROW UP/DOWN keys until the desired seconds are displayed and press ENTER. Now the minutes will begin to flash. Use the ARROW UP/DOWN keys until the desired minutes are displayed, press ENTER and **ACC SET** (the number of pulses from the water meter that it will take to activate the chemical pump) will be displayed. Press ENTER again and **1** will be displayed and flashing. Use the ARROW UP/DOWN keys until the desired setting is displayed, press ENTER and **TOTAL CT** (the total number of pulses received from the water meter since the last time you reset it) will be displayed. To reset the **TOTAL CT** , turn the controller off and then turn it back on. Press ENTER again and **0** will be displayed. Press the HOME key repeatedly until **SYS DATA** is displayed.

PULSE T

TOTAL CT

0

SYS DATA

TIP:

For help with menu locations, please refer to the "Menu Map" supplied with your controller.

!!WARNING!!

Boiler system water is extremely hot and under pressure. Use extreme care when removing or installing conductivity sensor!

NOTE:

Recalibrate conductivity sensor after changing scale.

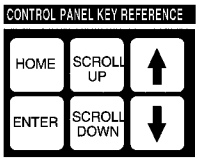
NOTE:

If you are using the timed sample mode, you must manually activate the number one relay (amber position) in order for there to be flow across the sensor.

NOTE:

LO µS/CM is displayed only if 2 point calibration is chosen. This step is not required for 1 point calibration.

5. SYSTEM CALIBRATION



Important: Verify calibration before proceeding with final system start-up. Make sure sensors are clean (refer to Section 10, Maintenance, pg. 30) before proceeding with system calibration.

SELECTING THE CONDUCTIVITY SCALE

First determine what scale best suits your application. For best results choose a scale that is about twice your set point. For example, if your set point is 1800 µS/cm you should use the 5000 scale (Refer to Diagram 4, pg. 24, Daughter Board). Turn the controller power off before changing scales. The jumper locations JP1 through JP5 select the conductivity scale. Use care when moving the scale jumpers. If you change the scale jumper, you must also change dip switch settings on the motherboard (refer to Diagram 5, pg. 25).

BOILER CONDUCTIVITY CALIBRATION NOTES

1. When reading or calibrating the conductivity of a boiler controller there must be an active sample flowing by the sensor. In the case of a timed sample system, the blowdown valve must be open long enough to have raised the temperature of the sensor to that of the sample.

2. Always compare an un-neutralized sample to the boiler controller, because changes in pH will affect the conductivity; a neutralized sample will not reflect this change due to pH, but the conductivity controller will reflect this change as it is an un-neutralized sample.

3. One point calibration assumes "zero" for the low calibration solution.

4. Two point calibration can be accomplished by opening the flush valve located below the sensor and then closing the full-port gate valve upstream of the sampling sensor (refer to Figure 1, pg. 6 & 7). This should prevent the flow of water across the sensor creating zero (0) conductivity for low cal setting.

5. Obtain a sample of system water from the surface blowdown line and test the sample with a reliable tester. If a non-temperature compensated tester is used, manually compensate or cool the sample to 25°C (77°F) and read the conductivity of the sample. If the tester and the controller agree, proceed with programming parameters; if not, proceed with system calibration.

Conductivity Sensor Calibration Procedure

1. With SYS DATA displayed, press the SCROLL UP or SCROLL DOWN until **SYS CAL** is displayed and press ENTER.

2. **1/2 PT** will be displayed. Press the SCROLL UP or SCROLL DOWN key until **2 POINT** is displayed and press ENTER.

3. **LO CAL** will be displayed. Open the flush valve installed at the electrode cross and close the full port gate valve (refer to Figure 1, pg. 6). Allow the sensor two minutes to stabilize and then press ENTER. A conductivity value less than 100 µS/cm should be displayed. If not, then the sensor is not dry. Use the ARROW DOWN key to adjust the displayed value to zero (0) and then press ENTER.

4. Now **HI CAL** is being displayed. Open the full port gate valve and close the flush valve while **HI CAL** is being displayed. Open the blowdown valve with the HOA control and take a sample of the system water with a reliable hand held conductivity tester, allow at least two (2) minutes for the sensor to stabilize and then press ENTER. A conductivity value relatively close to your sample will be displayed. Use the ARROW UP/DOWN keys to display the same value as your held tester and then press ENTER.

SYS CAL

1/2 PT

LO CAL

HI CAL

TIP:

For help with menu locations, please refer to the "Menu Map" supplied with your controller.

!!WARNING!!

Boiler system water is extremely hot and under pressure. Use extreme care when removing or installing conductivity sensor!

!!WARNING!!

CONTROLLER COULD BE DAMAGED AND VOID WARRANTY!

Analog outputs are self powered. Do not try to externally loop power. Externally powering outputs will damage your controller!

5. **LO CAL** will now be displayed. Press the HOME key repeatedly until **SYS DATA** is displayed, press ENTER and **SYS COND** will be displayed. Press SCROLL DOWN and the current conductivity value will be displayed. This value should match the hand held testers value. If the value does not match, review the calibration procedure.

6. The **1 POINT** calibration is similar to the above except the **LO CAL** step does not appear and the controller assumes a low calibration value of zero (0).

4-20mA Analog Output Calibration (Option M3)

The analog output can be calibrated to provide a proportional signal between the **MIN** and **MAX** conductivity values as indicated in the **CONFIGURE** menu. This procedure requires the use of an ammeter or a multi meter with the ability to measure D.C. mA. If you do not have an ammeter or have any doubts as to its proper use, consult a qualified electrician. The analog output of the controller is a direct signal, do not attempt to externally loop the power! Set the ammeter to measure D.C. mA and insert the positive lead from your ammeter into JP16, pin 9; insert the negative lead from your ammeter into JP16, pin 10, and then proceed with the following (refer to Diagram 4, pg. 24, Daughter Board):

1. Press the HOME key repeatedly until **SYS DATA** is displayed. Press the SCROLL UP or SCROLL DOWN keys until **SYS CAL** is displayed and press ENTER. Use the SCROLL UP or SCROLL DOWN keys until **OUTPUT** is displayed and press ENTER.

2. **MIN** will now be displayed. Press ENTER and **READ-VAL** will be displayed. Use the ARROW UP/DOWN keys until the ammeter displays the desired D.C. mA output and then press ENTER.

3. **MAX** will now be displayed. Press ENTER and **READ-VAL** will be displayed. Use the ARROW UP/DOWN keys until the ammeter displays the desired D.C. mA output and then press ENTER.

4. The output is now calibrated, press the HOME key repeatedly until **SYS DATA** is displayed.

LO CAL

SYS DATA

SYS COND

SYS DATA

SYS CAL

OUTPUT

MIN

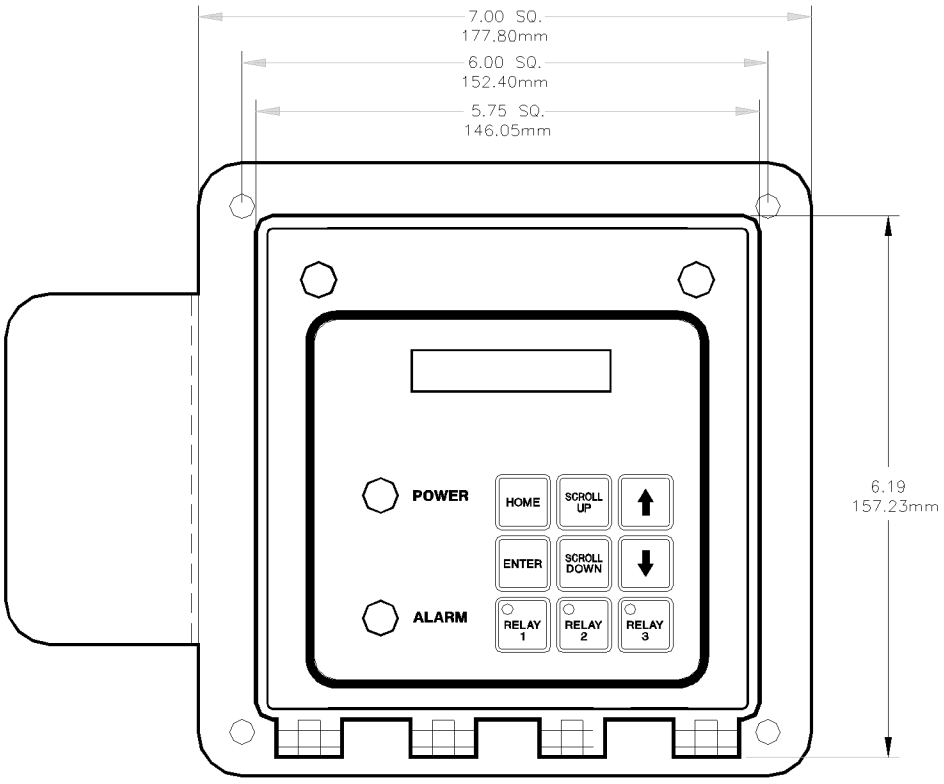
READ-VAL

MAX

READ-VAL

SYS DATA

6. DIAGRAMS: INSTALLATION, COMPONENT, AND ELECTRICAL



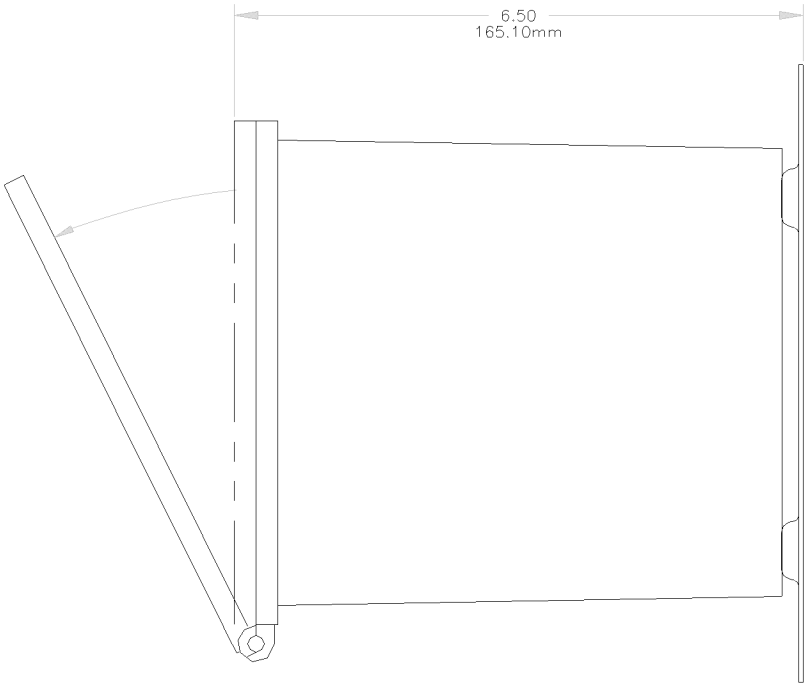
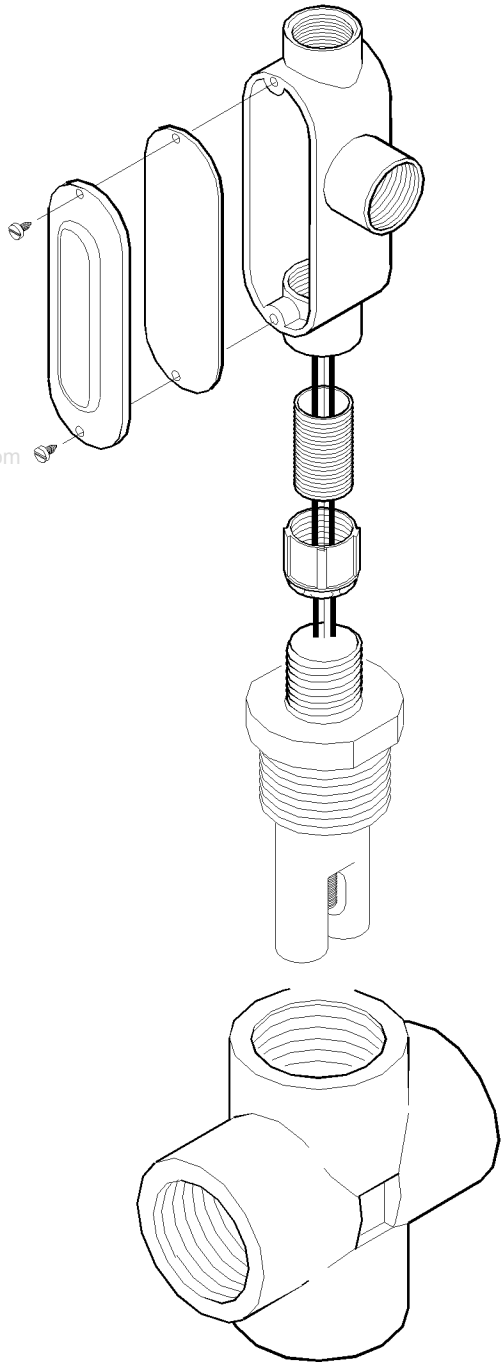
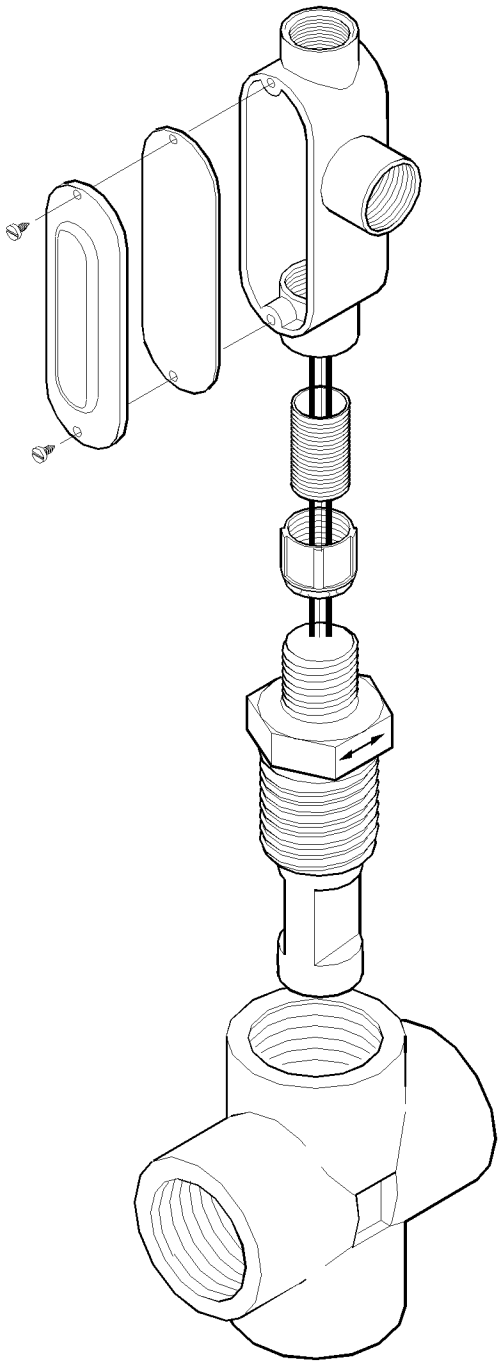


DIAGRAM 1 ENCLOSURE DIMENSIONAL DATA



Standard Sensor



Optional Stainless Steel Sensor

SPECIFICATIONS

Pressure Rating .....250PSI (17.3 BAR)

Temperature Rating .....400°F (204°C)

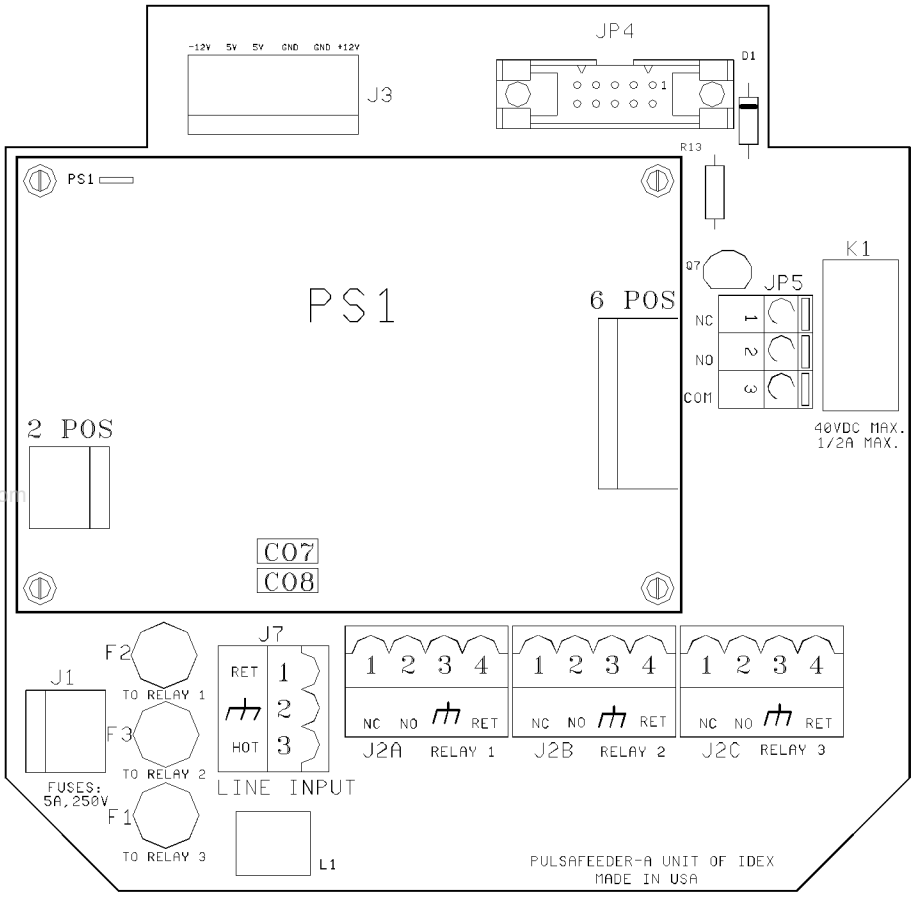
Thread Size.....1" (2.5 cm) NPT

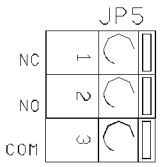
Construction .....Stainless Steel, Ryton

Cell Constant 1.5

Wiring.....Fitting for 1/2" (1.3 cm) Conduit

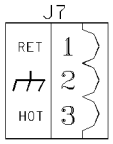
DIAGRAM 2 STAINLESS STEEL CONDUCTIVITY SENSOR



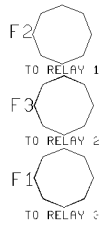


OPTION "K"
DRY CONTACT

J2A RELAY 1
J2B RELAY 2
J2C RELAY 3



LINE INPUT

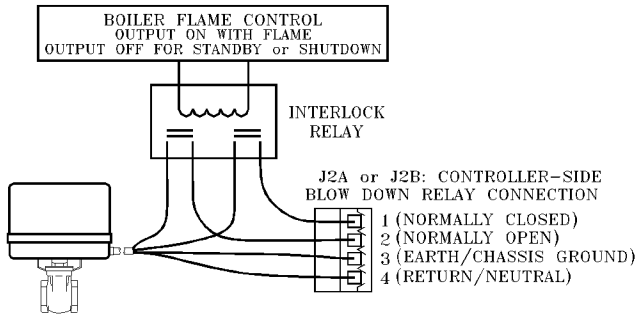


FUSE - 5A, 250V
05-051-82

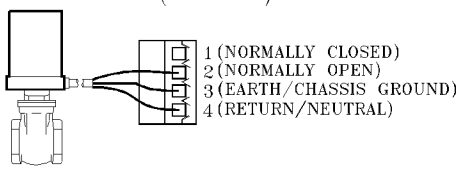
RELAY CHART			
MODEL	RELAY #1	RELAY #2	RELAY #3
MBC110	BLOWDOWN	** BLOWDOWN	-
MBC110C	BLOWDOWN	** BLOWDOWN	TIMER OUT 1
MBC110D	BLOWDOWN	** BLOWDOWN	ALARM

** NOTE: WHEN RELAY #1 IS ON RELAY #2 IS OFF AND VICE VERSA

MOTORIZED BALL VALVE
(4 WIRE)



SOLENOID VALVE
(3 WIRE)



PUMP
(3 WIRE)

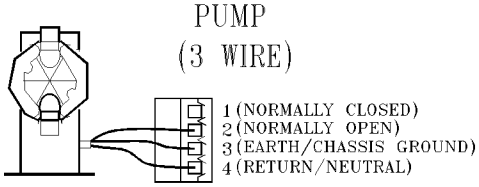
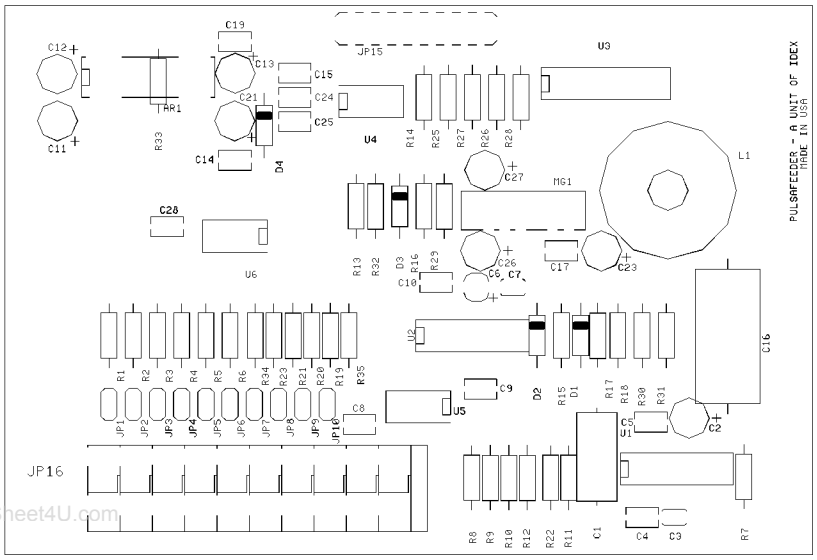


DIAGRAM 3 POWER SUPPLY/RELAY BOARD

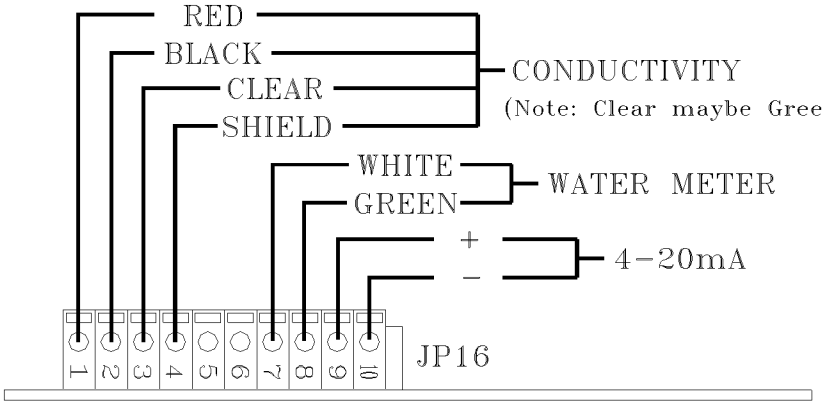


SCALE SETTINGS
0 – 500 uS/cm = Install Jumper JP1
0 – 2000 uS/cm = Install Jumper JP2
0 – 5000 uS/cm = Install Jumper JP3
0 – 10000 uS/cm = Install Jumper JP4
0 – 20000 uS/cm = Install Jumper JP5

SENSOR TYPE
- Sensor WITHOUT temperature compensation
  Install Jumper JP6
- Sensor WITH temperature compensation
  Install Jumper JP7

CELL CONSTANT
- For Cooling Tower Conductivity Sensors
  Install jumper JP8
- JP9 NOT USED
- For Boiler Sensors
  Install jumper JP10

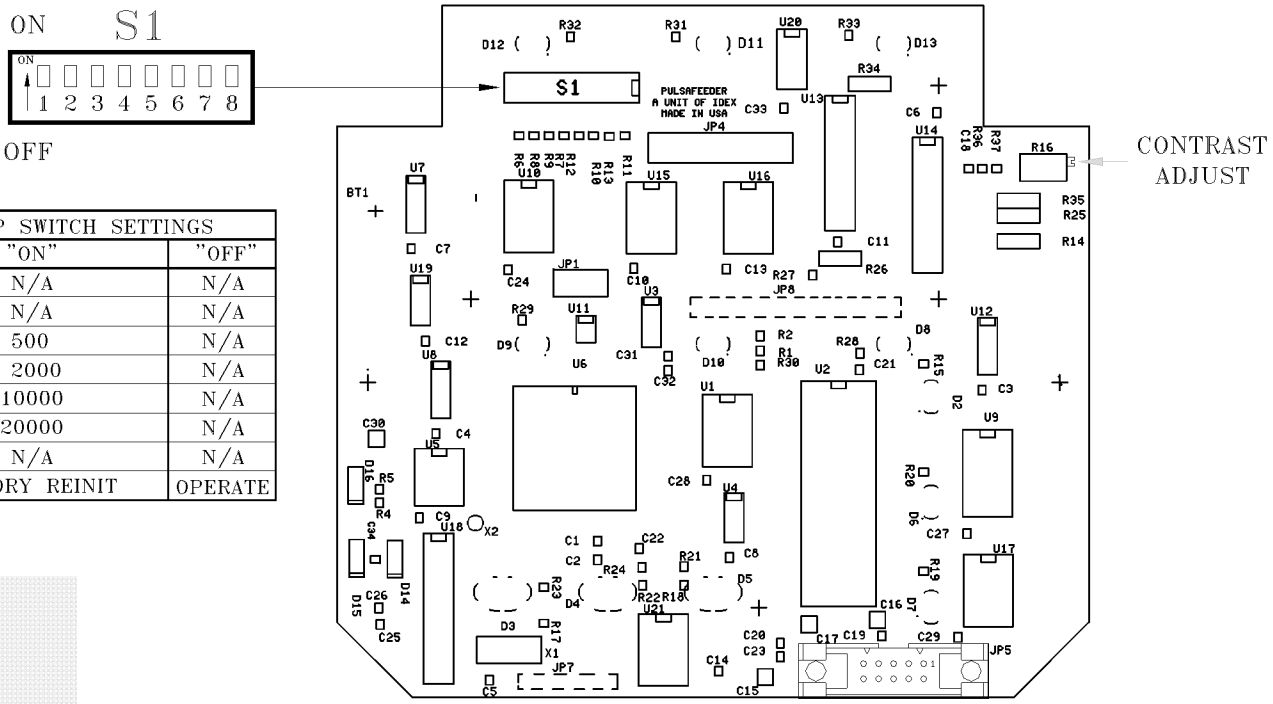
NOTE: USE CARE WHEN MOVING JUMPERS. DO NOT DAMAGE PLASTIC INSULATOR OR BEND PINS.



NOTE:

Recalibrate conductivity sensor after changing scale.

DIAGRAM 4 DAUGHTER BOARD



"S1" DIP SWITCH SETTINGS		
POS	"ON"	"OFF"
1	N/A	N/A
2	N/A	N/A
3	500	N/A
4	2000	N/A
5	10000	N/A
6	20000	N/A
7	N/A	N/A
8	FACTORY REINIT	OPERATE

NOTE:

Recalibrate conductivity sensor after changing scale.

NOTICE: SERIES 100

THIS UNIT REQUIRES INITIALIZATION UPON START-UP

CAUTION: WHEN POWER IS SUPPLIED TO THE UNIT, 115 VAC IS PRESENT ON THE POWER SUPPLY/RELAY BOARD LOCATED IN THE BOTTOM OF THE ENCLOSURE.

1. BEFORE POWER IS SUPPLIED, REMOVE THE TWO SCREWS HOLDING THE FRONT COVER CLOSED WITH A PHILLIPS SCREWDRIVER. SEE PAGE 10.
2. LOCATE SWITCH S1 ON THE MOTHERBOARD, ASSURE SWITCH S1-"8" IS IN THE "ON" POSITION. SEE ABOVE.
3. WITH THE FRONT COVER CLOSED, POWER UNIT UP FOR 15 SECONDS, REMOVE POWER, OPEN FRONT COVER AND TURN S1-"8" OFF.
4. CLOSE FRONT COVER, TURN POWER ON AND CONFIGURE THE CONTROLLER PER THE USER'S MANUAL.

DIAGRAM 5 MOTHERBOARD

7. SPECIFICATIONS (Factory settings are default values)

GENERAL

Power Input. . . . . 90/250VAC @ 50/60 Hz 100 VA.
Control Output . . . . . Line voltage @ 600 VA (5 amps @ 115 VAC) per relay.
Enclosure Conduit . . . . . High impact resistant polystyrene designed to NEMA 4X, factory predrilled with easily accessible terminals for hard wiring.
Display . . . . . Alphanumeric 1 line by 8 character lighted LCD display.
Environment . . . . . Ambient temp. 0°F (-17.8°C) to 122°F (50°C); relative humidity 0 to 100%.
Dimensions Width 7" (17.78cm) X height 7" (17.78cm) X depth 6.50" (16.51cm)
Controller Weight . . . . . 6 lbs (2.72 kgs)
Shipping Weight . . . . . 8 lbs (3.63 kgs)
Inputs . . . . . 1 analog and 1 digital
Outputs . . . . . 1 analog and 3 relays

BOILER CONDUCTIVITY

Sensor. . . . . Rated @ 250 psi (17.3 BAR) @ 400°F (205°C).
Set Point . . . . . Rising set point. Factory setting @ 1500 µS/cm.
Range . . . . . Selectable 0 to 500, 2000, 5000, 10,000 & 20,000. Factory set @ 5000 µS/cm.
Accuracy. . . . . +/- 1% of full scale, at point of measurement, excluding sensor.
Differential . . . . . Adjustable. Factory setting @ 100 µS/cm.
High/Low Alarm . . . . . Adjustable. Select follow set point or independent set of HIGH and LOW, factory set track set point @ +/- 200 µS/cm.
Selectable Sample Mode . . . Continuous or timed sample, factory set timed sample mode.
Adjustable interval between samples (1 min. to 23 hr. 59 min.), factory set @ 1 hour.
Adjustable duration of sample (00 to 59 min.), factory set @ 1 minute.

SUMMARY OF KEYPAD

Home . . . . . When pushed, returns display back one level in menu structure.
Enter. . . . . When pushed, enters displayed variable or value.
Scroll Up . . . . . Used to scroll-up through (view) menu and to display variables.
Scroll Down . . . . . Used to scroll-down through (view) menu structure.
Arrow Keys. . . . . Used to increase/decrease numerical settings.
Relay Keys . . . . . Hand/Off/Auto (HOA) switches, depressing key:
ONCE - Forces corresponding output relay on for five minutes; LED color amber.
TWICE - Forces corresponding output relay off indefinitely; LED color red.
THREE times - Returns control to automatic; LED off if within set point, green if out of set point.

SUMMARY OF LED INDICATOR LIGHTS

Power Indicator. . . . . Illuminates when power is supplied to unit.
Alarm Indicator. . . . . Flashes red when an alarm condition is present.
Relay Indicators AMBER if forced on. RED if forced off. OFF if in auto mode and control function is not automatically activated. GREEN if activated automatically.

8. FACTORY DEFAULT VALUES

NOTE: Your controller may not include all of these features

	SERIES 100
SYSTEM CONDUCTIVITY SCALE	5000 µS/cm
High Alarm	1700 µS/cm
Low Alarm	1300 µS/cm
Set Point	1500 µS/cm rising
Set Point Differential	100 µS/cm
Alarm Offset	200 µS/cm
INHIBITOR TIMER	Limit
Feed Timer	10:00 HH:MM
BOILERS	
Interval Time	01:00 HH:MM
Duration Timer	01:00 MM:SS
Sample Mode	Timed Sample
MISCELLANEOUS	
Hi/Low Alarms	Tracking Set Point
Display Dampener	1 Second
POSSIBLE ALARMS	
All High Alarms	X
All Low Alarms	X
Inhibitor Limit Timers	X
OTHER INHIBITOR FEED MODES	
PULSE TIMER	
Run Time	00:30 MM:SS
Accumulator Set	10
Count Totalizer	1
PERCENT TIMER	
Percent On	5%
% of Minutes	10
% OF POST BLOWDOWN	
% of Blowdown Feed	5%
ANALOG OUTPUT	
Minimum	0 µS/cm
Maximum	1400 µS/cm

OTHER SCALES	**Max Range**	**High Alarm**	**Low Alarm**	**Set Point**	**Set Pt. Diff.**	**Alarm Offset**
0-500	500	200	100	150	20	50
0-2000	2000	700	500	600	40	100
0-10000	10000	3300	2700	3000	150	300
0-20000	20000	6600	5400	6000	200	600

9. TROUBLESHOOTING GUIDE

If your controller is not operating properly, proceed through the troubleshooting instructions below.

MOTHERBOARD

Symptom	Probable Cause	Possible Solution
Keypad Locked Up	Keypad ribbon cable loose	Check connection.
No Display (See Power Supply first)	Improper contrast	Adjust contrast on motherboard. See Diagram 5, pg. 25.
	Environment exceeds122°F (50°C)	Relocate controller.
Erratic Readings	Improperly grounded power	Assure power and ground integrity. Shields of all sensors should be connected at controller end only.

POWER SUPPLY BOARD

Symptom	Probable Cause	Possible Solution
No Power Light	Blown fuse	Replace fuse.
	Interconnecting cables loose	Check connections.
	No power supplied	Check power source.

RELAY BOARD

Symptom	Probable Cause	Possible Solution
No Outputs Each relay, on the Relay Board, has a fuse and a red LED	If the Output front panel LED is lit and the Relay is not on: • ribbon cable.	Check ribbon cable connection or replace.
	If the Output front panel LED is lit and the Relay is not on: • blown fuse • bad relay	Replace the relayboard.

BOILER CONDUCTIVITY

Symptom	Probable Cause	Possible Solution
Display Erratic with Solids High and Increasing	Steam in sample line; check the following	
	• Surface skimmer not 4 to 6 inches (101.6 to 152.4 mm) below surface	Lower skimmer 4 to 6 inches (101.6 to 152.4 mm) below surface.
	• Sample line not throttled	Throttle sample line.
Front Panel Blowdown LED Cycles On and Off	Steam in sample line; check the following	
	• Surface skimmer not 4 to 6 inches (101.6 to 152.4 mm) below surface	Lower skimmer 4 to 6 inches (101.6 to 152.4 mm) below surface.
	• Sample line not throttled	Throttle sample line.
Controller Stays In Blowdown and Solids Continue To Increase	Blowdown line throttled too much	Increase blowdown rate.
Conductivity of System Stays Lower Than Set Point, Never Or Rarely Blows Down	Uncontrolled blowdown	Blowdown valve leaking. Try the following: • Realign ball valve. • Clean solenoid valve. • Close manual blowdown valve.
	If timed sampling:	
	• Interval between samples too frequent for load	
	• Duration too long for load	Shorten sample period.
Conductivity of Controller Decreases While System Conductivity Increases	Fouled sensor	Clean sensor.

NOTE: Re-initialization returns all scales to defaults. Don't forget to change switches on conductivity card or scales after re-initialization

Check a conductivity sensor using a volt meter readings ohms:

Red Lead ↔ Black Lead — Should read an open circuit

Black Lead ↔ White/Clear Lead — Should read 10K (Temp. comp.)

Short across conductivity electrode → display should read full scale for cooling towers

REINITIALIZATION

If the above troubleshooting steps fail to explain or solve condition, perform a factory reinitialization (see Initialization, pg. 11, and Diagram 5, pg. 25, Motherboard). If condition still exists, contact factory for customer service assistance at (1-800-333-6677). A Return Material Authorization (RMA) number is required for any return.

10. MAINTENANCE

Maintenance on the controller requires only that the operator periodically clean the sensor. It is recommended that you establish a regular maintenance schedule designed to meet the needs of your particular application. All other service should be performed by factory authorized personnel only. Modifications to or tampering with the circuit level components makes all warranties, written or implied, and/or manufacturer's responsibility for this controller null and void.

SENSOR INFORMATION

To remove a sensor from the skimmer blowdown line for cleaning and for reinstallation, keep the following in mind:

1. Remove power from the system.
2. Remove pressure from the system prior to unscrewing the sensor; to remove pressure, close isolation valve located before the sensor.
3. Open the flush valve to drain water from sensor. This will facilitate removal of sensor.
4. Remove sensor.
5. Reinstall sensor, paying attention to arrows on the sensor and direction of flow.
6. Close flush valve.
7. Reapply pressure and flow by opening isolation valve slowly to avoid water hammer.
8. Reapply power to the system.
9. You may want to recalibrate sensor at this time.

Refer to Diagram 2, pg. 22, for information and specifications for sensors supplied with your system.

!!WARNING!!

Boiler system water is extremely hot and under pressure. Use extreme care when removing or installing conductivity sensor!

CLEANING THE SENSOR

1. Wipe the sensors clean with a clean cloth.
2. Use a fine grain emery cloth for stubborn stains.
3. Oils can affect sensor performance. Do not touch sensor surface. The sensor can be agitated in a mild solution of dish washing soap and water to remove oils transferred during handling.
4. Some fouled sensors might require dipping in a mild solution of muriatic acid in order to remove fouling.

!!WARNING!!

Use proper handling procedures including rubber gloves, eye protection and protective clothing, when handling any acid solution.

11. GLOSSARY

Alarm Relay an electric circuit when triggered by a predetermined signal will activate an externally connected alarm

Analog a device that represents in terms of physical variables, i.e. conductivity, pH, ORP

Analog Recorder a device such as a plotter that physically stores or presents quantities of data in a physical manner

Biocide an agent used to control the growth of algae and other organic substances

Bleed (or blowdown) to release cooling tower water from the system, used to control conductivity

Blowdown see Bleed

Blowdown Valve the valve that opens or closes to release water from the system activated by a signal from the Controller

Calibration a procedure to match values "read" by sensors to actual real world values

Caustic burning, corrosive, a characteristic of some chemicals especially strong alkalis

Chattering a situation that occurs when relay controlled device repeatedly turns off and on

Chemical Feed Pump a relay or proportionally controlled pump that disperses chemical into the system

Chemical Metering Pump see Chemical Feed Pump

Conductivity the ability of a substance to conduct electrical current, concentrations of dissolved and suspended matter in cooling tower water directly determine the conductivity of the water

Conduit hard wired

Configure procedure to set up basic functions of the controller, i.e. date, time, set point control, etc.

Contacting head water meter a water meter that outputs a dry contact signal every time it pulses

Contrast difference in brightness between adjacent objects, i.e., darkness of text in screen display versus lightness of the screen background

Cycle Timer a timing device that can be preset to turn off and on at specific intervals

Daughter Board an auxiliary circuit board within the controller dedicated to a specific function(s) of the controller

Differential also referred to as dead band or hysteresis, this is a range or offset applied to a set point value (see chattering)

Dip Switch very small switches located on the circuit boards usually used in combination with other dip switch settings

Display Sensitivity a setting in the System Configure menu that determines the number of samples that are averaged and the number of seconds before a new reading is displayed on the screen

Dry Contact relay contacts without power

EEPROM Electrically Erasable Programmable Only Memory

Electrodes the metal protrusions that measure conductivity in the conductivity sensor assembly

Flow refers to the movement of water through the system

Flow Assembly a PULSAfeeder option which attaches to the controller and incorporates a flow switch, sensor/probe ports, and sample valve

Gate Valve a type of on/off valve for controlling the flow of liquid

Ground Loops unwanted stray electrical signals that adversely affect controller

HCl Hydrochloric Acid

Hi Lo Alarm a function of the controller that signals you when conditions exceed a predetermined high or low value

HOA abbreviation for Hands Off Auto

HOA Switches manual relay switches or keys (relay 1 - 3) located on the control panel of the controller

Home this key when pressed returns user to the previous menu displayed on the viewing screen, press repeatedly to return to the main menu

Independent Set Point this feature, when selected under HI LO ALARM in the System Configure menu, allows user to independently set the high and low alarm values

Inhibitor a chemical or compound used to aid the control of corrosion or scaling in the cooling tower system

Inhibitor Feed term referring to the dispersement of inhibitor in to the system

Inhibitor Timer a function of the controller which regulates the amount of time inhibitor is introduced to the system

Initialization a procedure to set up the starting condition of the controller

Inputs receptacles or hookups for signals delivered to the controller

(ISO) Isolation Valves general term which refers to valves in the system used to isolate various components of the system from the main flow

Jumper a wire connector (shunt) that connects two points

KCl Potassium Chloride

LED abbreviation for Light Emitting Diode

Limit Timer also referred to as lockout timer or feed limit timer, it limits the amount of time output is activated

Line Voltage voltage equivalent to outside source voltage to the controller

Lockout intentionally preventing blowdown or other functions of the system

Menu Map printed document supplied with controller illustrating all menu item locations

Metering Pump see chemical feed pump

Microsiemens unit of measure of conductivity expressed as µS/cm

Motherboard main circuit board located in controller

NaOH Sodium Hydroxide

Outputs receptacles or hookups for signals originated at the controller

Overfeed a condition in which the quantity of an ingredient dispersed into the system exceeds the amount desired

Percent Post Blowdown refers to the amount of time as a percentage of blowdown time that chemical feed pumps are activated when blowdown is deactivated

Percent Timer also referred to as a cycle timer that runs continuously that activates an output to run as a percent of total cycle time

Probeless Calibration a calibration procedure used to test and verify operation of the controller

Program Parameters the user programmed settings that determine how the controller responds to the conditions of the cooling tower water

Pulse the action of a water meter that when equipped with a contact head, can generate a signal sent to the controller

Pulse Timer a feature of the controller in which a timer accepts pulses from a water meter to actuate a chemical feed pump

Relay Board a circuit board in the controller for relay outputs, water meter hookups, flow switch, etc.

Relay Indicators lights (LEDs) located beneath the relay keys on the face of the control panel that indicates the status of individual relays

Sample Line a line within the cooling tower flow where probes and other monitoring devices are located controlled with isolation valves

Sample Valve small valve on the flow assembly that provides user a means to drain small quantities of water from the system for testing

Scale/Range the adjustable monitoring range of the controller in reference to conductivity levels in the system

Sensors a device connected to the controller which monitors or measures a value in the cooling tower flow stream

Set Point the user determined value within a monitored range at which the controller initiates action

Set Point Differential also referred to as dead band or hysteresis; the offset applied to a set point to prevent chattering of an output relay around a set point

Solenoid an electromagnetically controlled switch

System Overfeed usually a malfunction condition where a feed pump fails shut off

System Parameters see program parameters

TDS abbreviation for Total Dissolved Solids, measured in terms of electrical conductivity(µS/cm)

Temperature Compensation displays conductivity as if measured at 77°F (25°C)

Throttling the act of adjusting a valve or other flow control device to vary flow volume

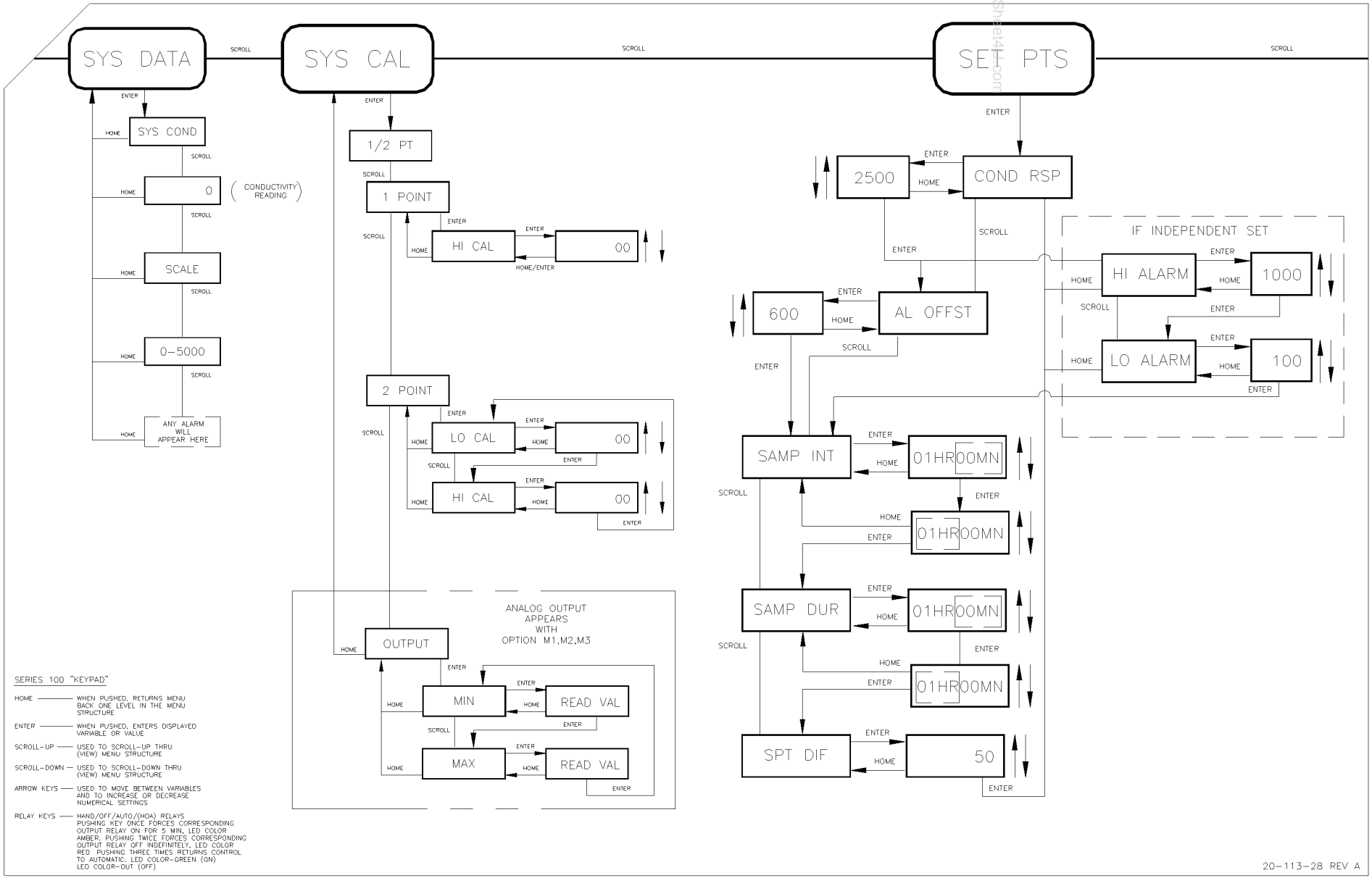
Totalizer a resetable function of the controller which keeps count of the number of water meter pulses

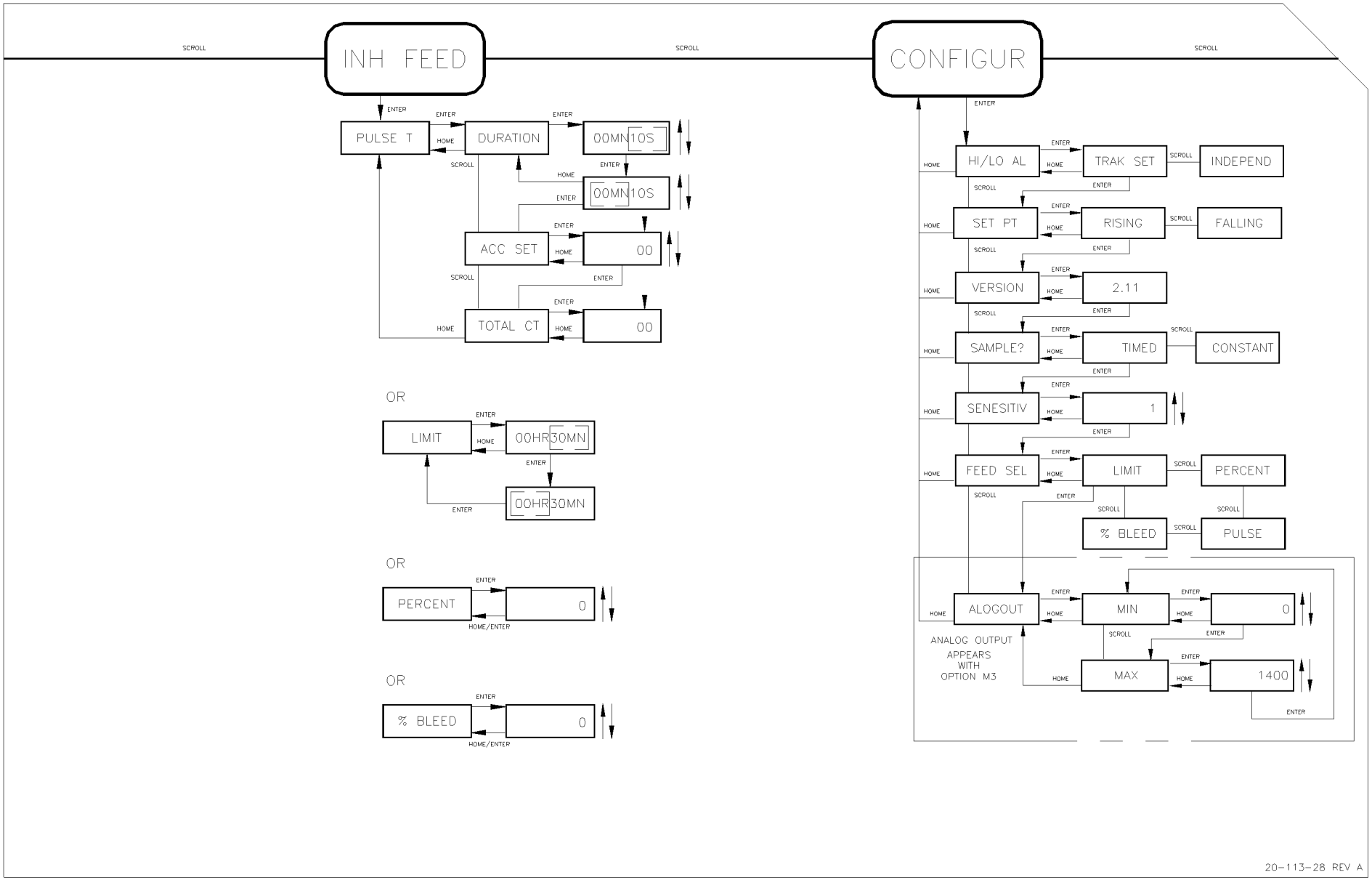
Track Set Point a function of the controller in which set point offset range is determined by set point value

uS/cm micro Siemens

Water Hammer a potentially damaging situation that occurs if a valve in the system is opened to quickly, where the action results in a "hammering" effect throughout the system water lines

This page intentionally left blank.





20-113-28 REV A

PULSAFEEDER®

Standard Products Operations
27101 Airport Rd.
Punta Gorda, FL 33982
941-575-3800 Fax: 941-575-4085
800-333-6677
Fax Orders 800-274-6677