Original Instructions

Installation, Operation & Maintenance Manual

Sentry Sample Sequencer 6 Controller

Sample Conditioning Automation

S-SW-IOM-00375-0 04-23

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV GL = ISO 9001 =

SENTRY

Do not install, maintain, or operate this equipment without reading, understanding, and following the appropriate Sentry Equipment Corp instructions. Otherwise, injury, damage, or both may result.

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Limit of Liability

Sentry Equipment Corp, its employees, agents, and the authors and contributors to this document specifically disclaim all liabilities and warranties, express or implied (including warranties of merchantability and fitness for a particular purpose), for the accuracy, currency, completeness, and/or reliability of the information contained herein and/or for the fitness for any particular use and/or for the performance of any material and/or equipment selected in whole or part with the user of/or in reliance upon information contained herein. Selection of materials and/or equipment is at the sole risk of the user of this publication.

Compliance Statement (Part 15.19)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement (Part 15.105 (b))

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the manufacturer for help.

Note

The information contained in this document is subject to change without notice.

Table of Contents

Safety Information

Please read the entire manual before attempting to unpack, set up, or operate this product. Pay careful attention to all Warnings, Cautions, and Notes. Failure to do so could result in serious personal injury and/or equipment damage.

Use of Hazard Information

If multiple hazards exist, the signal word corresponding to the greatest hazard shall be used.

Definitions

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

➲ NOTE

Information that requires special emphasis.

➲ TIP

Alternate techniques or clarifying information.

SHALL: This word is understood to be mandatory.

SHOULD: This word is understood to be advisory.

General Safety Precautions

Product Selection, Installation, and Use

⚠ WARNING

Improper selection, installation, or use can cause personal injury or property damage. It is solely the responsibility of users, through their own analysis and testing, to select products suitable for their specific application requirements, ensure they are properly maintained, and limit their use to their intended purpose.

Follow proper local, state, and federal regulations for proper installation and operational requirements.

Always use caution and common sense when working with any chemical. Read the product label and Material Safety Data Sheets (MSDS) carefully and follow the instructions exactly.

Specifications

Specifications are subject to change without notice.

Applications: The Sentry® Sample Sequencer® 6 is designed to support sample stream switching in *Batch* or *Continuous* modes.

SPECIFICATIONS			
	Standard (7-06362C) (12V) (7-06362K) (24V)	**IO Extender 4 Point (7-06362D) (12V) (7-06362P) (24V)**	**IO Extender 8 Point (7-06362E) (12V) (7-06362N) (24V)**
samples	8	4	8
analyzers	2	1	2
AC input power (24V)	0.52A/115VAC, 0.26A/230VAC, 0.21A/277VAC Frequency: 50-60 Hz		
AC input power (12V)	1.5A/115VAC, 0.9A/230VAC, 0.75A/277VAC Frequency: 50-60 Hz		
DC power (24V)	1.9A/24VDC		
DC power (12V)	3.8A/12VDC		
analyzer inputs	Two (2) AI: 4-20mA (154.5 Ohm load) +- 1% full scale (max) 6 Digital Inputs for end-of-analysis indication and system alarm indication max 28VDC	One (1) AI: 4-20mA (154.5 Ohm load) +- 1% full scale (max) 3 Digital Inputs for end-of-analysis indication and system alarm indication max 28VDC	Two (2) AI: 4-20mA (154.5 Ohm load) +- 1% full scale (max) 6 Digital Inputs for end-of-analysis indication and system alarm indication max 28VDC
outputs	DO: 16 AO: 8 (4-20mA; 550 Ohm max load) +- 1% full scale (max) SOL Out: 8 (12VDC) handling up to 2A*	DO: 8 AO: 4 (4-20mA; 550 Ohm max load) +- 1% full scale (max) SOL Out: 4 (12VDC) handling up to 2A*	DO: 16 AO: 8 (4-20mA; 550 Ohm max load) +- 1% full scale (max) SOL Out: 8 (12VDC) handling up to 2A*
resolution	AI:5.37uA/LSB AO:5.306761 uA/LSB		
user interface	Wireless 802.11b/g/n, Ethernet	N/A	
enclosure	IP 66		
dimensions	8.88" H x 12.36" W x 4.72" D (226 mm H x 314 mm W x 196 mm D)		
mounting	surface		
ambient temperature	23 to 113 deg F (-5 -to 45 deg C), 5-95% Relative Humidity		
shipping weight	5 lbs (2.3 kg)		
agency approvals	(Approvals still pending) CE, FCC, Intertek, RoHS		

*Solenoid voltage must match DC voltage

SPECIFICATIONS		
	Touch Screen with Power Supply (7-06362M)	**Touch Screen without Power Supply (7-06362L)**
AC input power	1.5A/115VAC, 0.9A/230VAC, 0.75A/277VAC Frequency: 50-60 Hz	-
DC power	-	0.43A/24VDC
user interface	10.1" Touchscreen	
enclosure	IP 65	
dimensions	14.3" H x 11.81" W x 5" D (363 mm H x 300 mm W x 127 mm D)	
mounting	surface	
ambient temperature	-20 to 70 deg C, 5-90% Relative Humidity	
shipping weight	7.5 lbs (3.4 kg)	
agency approvals	CE, UL	

Environmental: Indoor use only

Operating Altitude: 0–2000 m (0–6562 ft) (Consult factory for other altitudes.)

Mains supply fluctuation: -10% and +10%

Transient overvoltage: 1500 VAC

Pollution degree: 2

Shipping Weight: 5 lb (2.27 kg)

General Description

The Sentry Sample Sequencer 6 reduces the number of required analyzers while maintaining equivalent data accuracy.

- Electronically switches up to eight sample streams, one at a time, to a shared analyzer and provides signals to recorders.
- If eight sample streams are not needed for one process, four to eight points may be assigned to one.
- Track and hold outputs provide independent outputs for each sample point to remote data acquisition devices (DCS, recorder, etc.).
- Digital outputs provide channel number indication and/or replicate analyzer alarms for remote data.
- Measures the analyzer analog output signal and converts the analog signal to digital data.

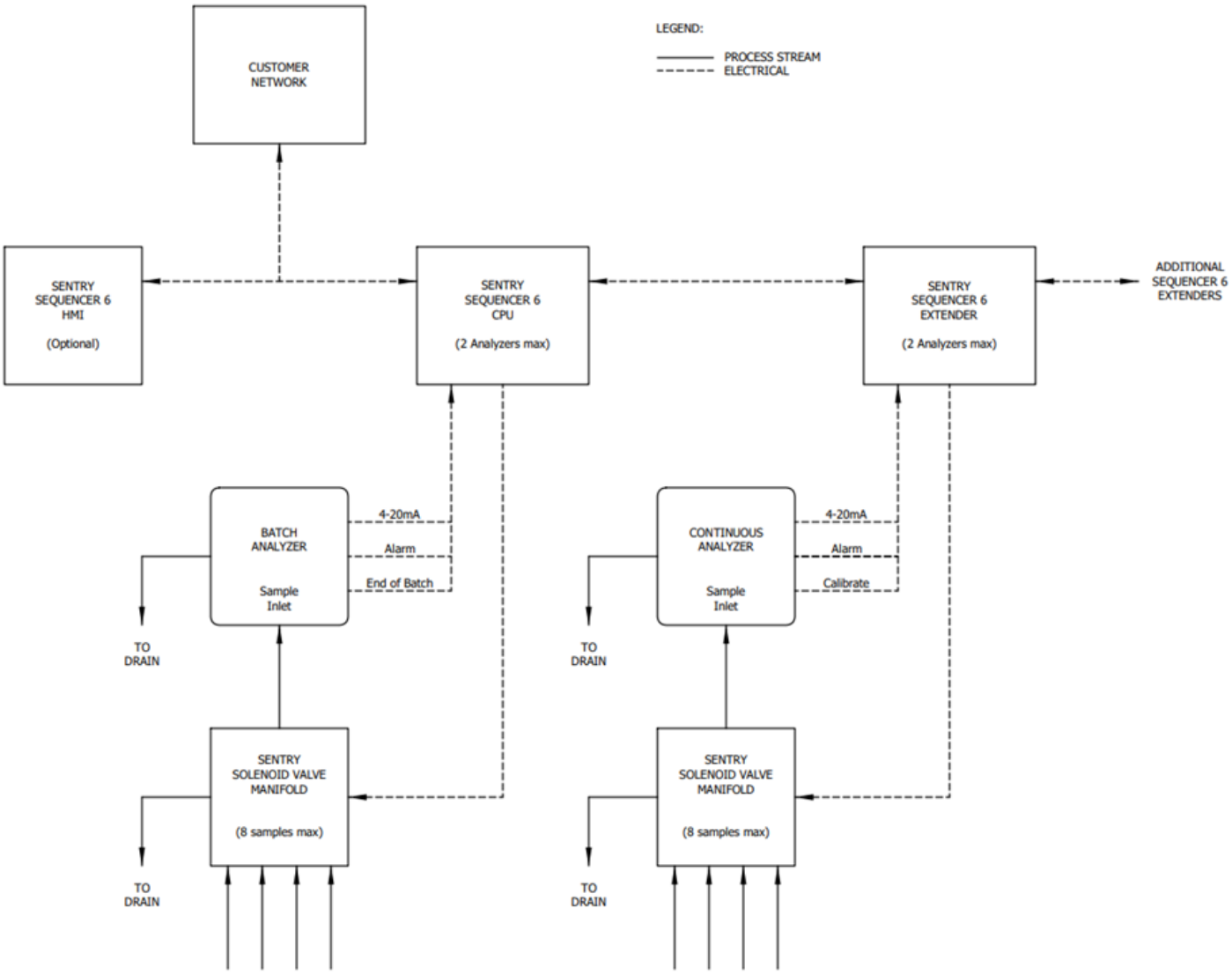
Modes of Operation

The Sample Sequencer 6 has two programmable modes of operation:

- **Continuous** mode is used for analyzers that continuously produce an analytical result.
- **Batch** mode is used for analyzers that take a sample "bite" (or batch), produce an analytical result, and then provide a contact signal output, typically in 1-20 minutes.

Figure 1 illustrate typical system arrangements for sample stream switching with the Sample Sequencer 6. Customer-supplied equipment is shown for clarification.

Figure 1. Sample Sequencer 6 with Continuous and Batch Analyzers



➲ NOTE

See Appendix C on page 37 for interface protocols and wiring for a number of typical analyzers. If using the Sample Sequencer 6 with a Hach analyzer, see Appendix B on page 33.

Inputs and Outputs

A variety of inputs and outputs are available on the Sample Sequencer 6. The Sample Sequencer 6 is a modular design utilizing dedicated IO boards. Up to two IO boards can be fitted into each enclosure. Up to eight IO boards can be equipped with one Sample Sequencer 6. This solution would utilize 4 enclosures, one with the CPU and communication board and 3 IO extender enclosures. In general one IO board corresponds to one four output manifold.

Analog Inputs

- Up to two analog inputs are located in the sequencer enclosure for reading 4–20 mA signals from up to two different analyzers.

- The sequencer converts 4–20 mA signals into engineering units for display, and outputs the same signals for the track and hold analog outputs.

Analyzer Alarm Inputs

- Alarm inputs are typically used to indicate a loss of sample flow to the analyzer.
- Two analyzer alarm inputs are located in the sequencer enclosure.
- Alarm inputs cause the digital alarm output for that sequencer to be set.
- In *Continuous* mode:

  1. An alarm immediately closes the active sample valve and opens the next sample valve.

  2. The next sample valve remains open until one of the following occurs:

  a. the alarm clears

  b. one minute elapses

  c. the timer expires

  3. After the sample valve closes, the sequencer opens the next sample valve.

  4. The sequencer continues trying to establish flow until the analyzer alarm clears.

- In *Batch* mode:

  1. An alarm starts a timeout timer. (The operator can adjust the timeout timer for all samples simultaneously by setting the sample timer.)

  2. If the sequencer does not receive an end-of-batch indication from the analyzer, or if the alarm does not clear before the timer expires, the sequencer closes the current sample valve and opens the next valve in the sequence.

  3. If the end-of-batch indication is received before the timer expires, the sequencer assumes the alarm is not a loss of flow and continues with normal operation.

Calibration Hold and End-of-Batch Inputs

A calibration hold input indicates that the analyzer is performing a calibration.

- Two calibration hold inputs are located in the sequencer enclosure.
- In *Continuous* mode, when a calibration hold input is received:
  - The sequencer waits at the active sample with the valve open.
  - Once the calibration hold clears, the sequencer resumes operation, entering the *Flush* state for the sample that was active before the calibration hold was received.
- In *Batch* mode, calibration hold inputs do not perform a function.
- Two end-of-batch inputs are located in the sequencer enclosure.
- Without this input connected, the Sample Sequencer 6 does not advance to the next sample when the sequencer is in *Batch* mode.
- End-of-batch inputs are not used in *Continuous* mode.

Valve Outputs

Valve outputs supply 12 or 24 VDC to operate the sample valves.

- Up to eight valve outputs are located in the sequencer enclosure.
- The eight valves may be divided between two analyzers sequentially.

Track and Hold Outputs

- Eight analog outputs (4–20 mA) are provided in the sequencer enclosure.
- When a valid reading is taken from the analyzer for a given sample, the Sample Sequencer 6 *tracks* (updates) the corresponding signal on the appropriate output.
- When the sample is not currently being analyzed, the sequencer *holds* the corresponding signal on the appropriate output at its last known value.

Digital Outputs

A total of eight digital outputs are available per IO board:

- Four outputs are used to replicate the four analyzer alarm inputs
- Four outputs are used for sample point indication.
- An LED above the output indicates that the point is currently being sampled and the analyzer reading corresponds to that sample point.

Ethernet Communications

- The Sample Sequencer 6 is capable of connecting to a network for communicating to a PC or dedicate terminal screen via a webpage.
- Modbus communication protocol is available on request. Please contact Sentry for further information.

- For more information on these features, refer to Appendix D on page 39.

Optional Manifold Switching Valve

The Sample Sequencer 6 may be used to control most manifold valve arrangements; however, the Sentry Manifold Switching Valve is a convenient optional accessory for obtaining representative samples.

The patented Sentry Manifold Switching Valve

- incorporates block and bleed design
- provides continuously flowing samples
- eliminates areas where cross contamination can occur
- available in either four or eight sample line models

Contact Sentry Equipment for more information about this optional sampling valve.

Installation

⚠ WARNING

This instrument should be installed by qualified technical personnel to ensure adherence to all applicable electrical codes.

To ensure the protection provided by this equipment is not impaired, this equipment must not be installed or used in any manner other than that which is specified in this manual.

Unpacking

1. Carefully remove the Sample Sequencer 6 from its shipping carton.
2. Inspect it for any damage.
3. Report any damages to the shipper at once.

Mounting

Mount the Sample Sequencer 6 close to the analyzer to permit viewing of both devices at the same time.

- The sample sequencer mounts to a flat surface.
- Mounting method must be capable of supporting at least 5lbs (2.27kg).

Figure 2. Enclosure Dimensions: Bottom View

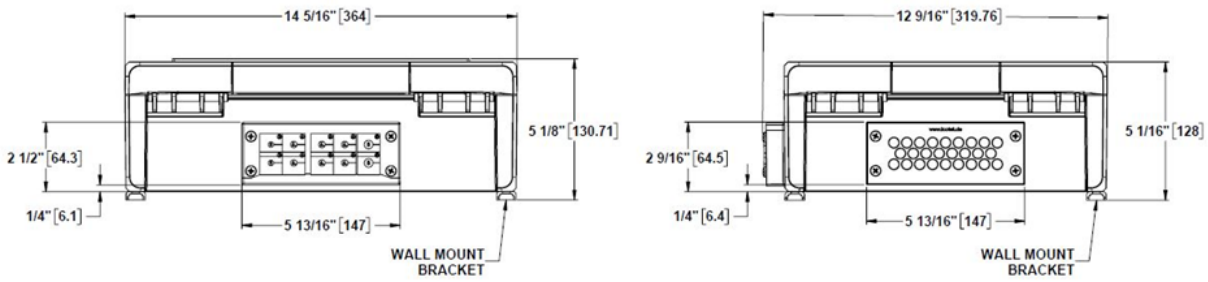
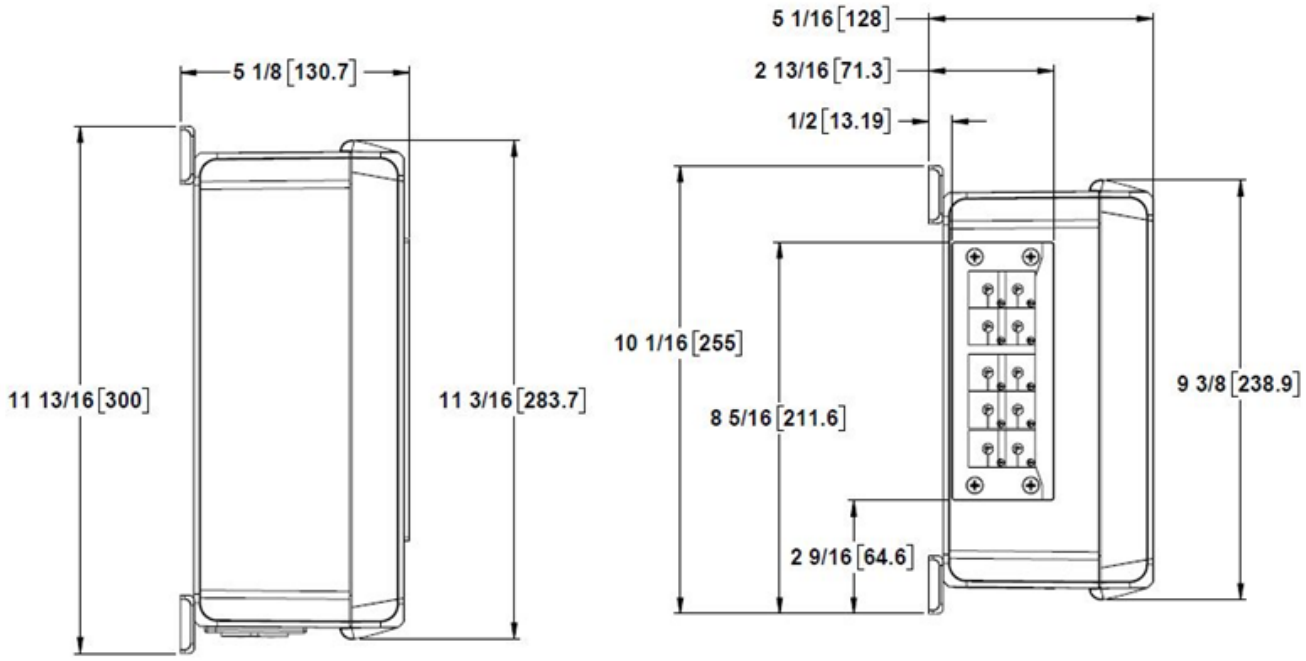


Figure 3. Enclosure Dimensions: Side View



Mounting-Display Screen

1. The Display Screen mounts to a flat surface
2. Mounting method must be capable of supporting at least 5 lbs.

Mounting-IO Extender

1. The IO Extender mounts to a flat surface.
2. Mounting method must be capable of supporting at least 5 lbs.

Panel Mounting

1. Turn off all power to the Sample Sequencer 6 and disconnect all cables.
2. Use the dimension information shown in Figure 8 to mark positions on the panel for four mounting holes.
3. If replacing the Sequencer 5 with a Sequencer 6, the Sequencer 6 Display Screen must sit above the bottom edge of the Sequencer 6 panel cut-out hole, as shown in 7.
4. Drill pilot holes in the marked positions for four #10 bolts.
5. Use four #10 bolts, lock washers, washer and nuts to secure the device to the panel, as shown in Figure 8.
6. Make electrical connections as described in the "Electrical Connections" section beginning on page 15.

Figure 4. Panel Mount Dimensions

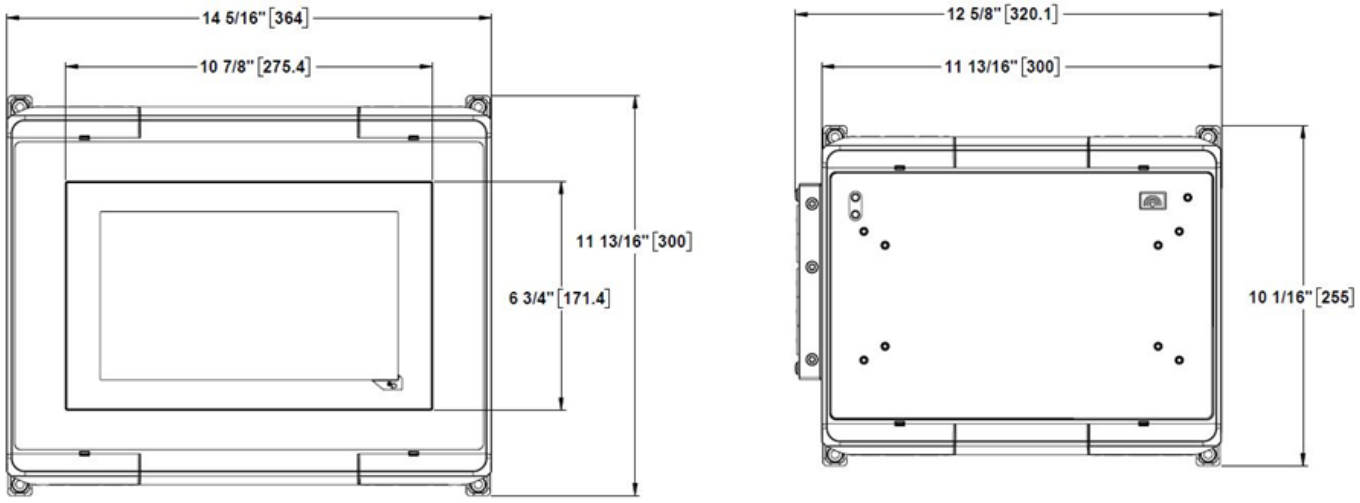


Figure 5. Replacing Sample Sequencer 5 with Sample Sequencer 6

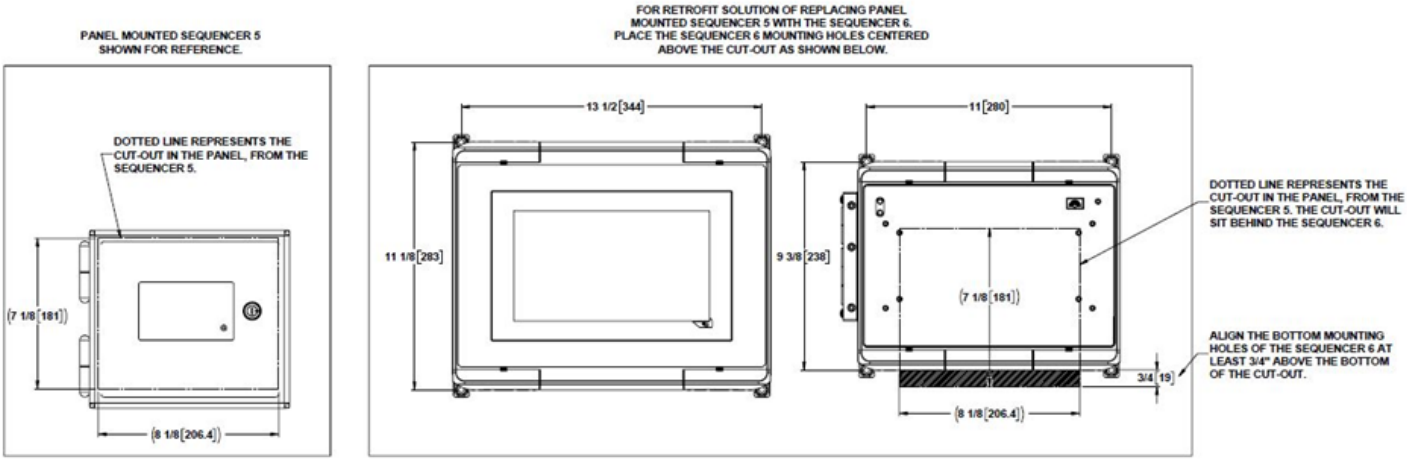
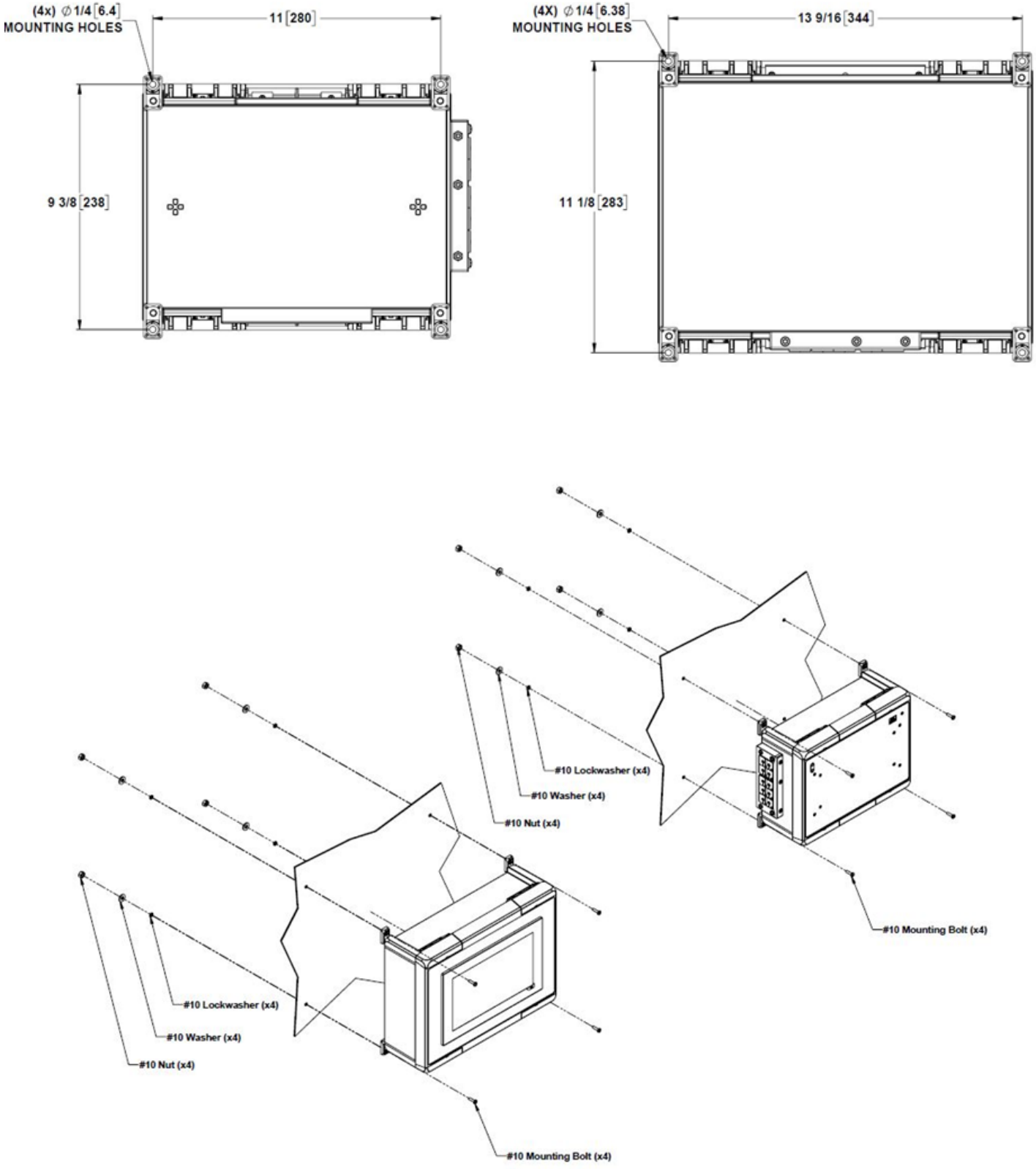


Figure 6. Panel Mounting



Electrical Connections

⚠ WARNING

Electrical Shock Hazard – All input and output wiring should be installed in such a manner that access to bare copper is prohibited during normal operation.

- IcoTek KEL-DPZ 24/26 and KEL-ER 24/10 multi-membrane cable entry plates are provided on the bottom and right side of the enclosure for up to 26 cables with 5 - 10.2mm cable diameter.
- On the left side of the enclosure, cable entries are provided for the ethernet connection.
- Figure 9 (board view) and Figure 10 (schematic view) show the power connections on the board.

Power Connection

The Sample Sequencer 6 uses a universal power supply that accepts an input voltage range of 85-305 VAC and frequency of 47-440 Hz. A power supply lead of 12-24 AWG (4-0.25 mm2) copper wire is recommended.

- Connect the sample sequencer to an electrical outlet or outlet strip with surge suppression and filtering. Using this method, the plug serves as the disconnect device.
- A 12-24 AWG, 60°C, VW-1, 600V, type SJT cord is recommended for non-detachable connections.
- For permanent connections, use a flexible SOW cable or better. Sizing must be in accordance to the CEC.
- A suitable external over-current protection device such as a fuse (Class CC, 2A, Time delay) or circuit breaker (C trip curve, 2 A) is recommended for both the hot (L) and neutral (N) leads.

The mains and output terminal are rated within the following condition:

- **Mains terminals** rated up to 300V, 17.5A, 12-30 AWG, PA insulating material, Inflammability class V0, Type: Plug, 8 position, and screw connection.
- **Output terminals** rated up to 300V, 17.5A, 12-30 AWG, PA insulating material, Inflammability class V0, Type: Plug, 8 position, and screw connection.

For permanently connected installations:

- A switch or circuit breaker shall be included in the building installation.
- It shall be in close proximity to the equipment and within easy reach of the operator.
- It shall be marked as the disconnecting device for the equipment.

The cord and plug shall comply with the following standards:

Table 1. Power Cord Requirements

Location	Cord	Plug
United States	ANSI/UL 817	ANSI/UL 498
Canada	CSA C22.2 No. 21 or C22.2 No. 49	CSA C22.2 No. 21 and C22.2 No. 42
European Community	IEC 60227 or 60245	Appropriate IEC standard

If desired, the Sample Sequencer 6 may also be hard wired to instrument-quality power using appropriate certified fittings, and wiring.

- A suitable external over-current protection device, such as a fuse (Class CC, 2A, Time delay) or circuit breaker (C trip curve, 2 A), and disconnect device is recommended.
- The over-current protection and disconnect devices shall be installed on both the hot (L) and neutral (N) leads.
- The disconnect device shall be located near the equipment and marked with appropriate ON(|) OFF(O) markings as specified by local codes.
- For fixed wiring methods, the ground conductor shall have insulation with a continuous outer finish that is either green, or green with one or more yellow stripes.
- During connection of the power wire, the grounding lead must be suitably routed and long enough so that it is the last conductor to take the strain.
- Installation should be performed by qualified personal in accordance with local codes and procedures.

Grounding and EMC Considerations

Power

To properly ground the Sample Sequencer 6:

- Use an insulated ground conductor that has a green or green with one or more yellow stripes and is the same size as the mains conductor, and land the conductor on the "EGND" terminal on the power board.

I/O Cables

To maintain SGS and CE ratings for EMC:

- All I/O cables must be shielded and grounded.
- The shield (drain) wire for the analyzer inputs must be tied to an isolated ground located near the opposite cable end (analyzer) from the sequencer, and not connected to the sequencer.

Sequencer Board Connections

⚠ CAUTION

Make sure all leads are lugged prior to wiring to the terminal blocks. This avoids the potential for miswiring and placing transients on the analyzer(s) and sequencer. Be sure to ground the shield in the analyzer as detailed in "Grounding and EMC Considerations" on page 16.

Connections from the Analyzer(s)

Referencing Figure 10, analyzer connections include:

- 4–20mA output signals
- analyzer alarm (typically a loss of flow or system failure alarm)
- end-of-batch signal for batch analyzers
- calibration signal for continuous analyzers

Use a 22 AWG multiple twisted pair shielded cable similar to Belden 9512 for each analyzer connected. This allows the signals to be connected from each analyzer to the sequencer with one cable (see Figure 9).

Analog Outputs from the Sequencer (Track and Hold)

Analog outputs (Track and Hold, 4–20 mA) are created for each sample being sequenced through the analyzer(s).

- Outputs provide individual sample line data acquisition for local or remote indication.
- Connections may be used with a recorder or in situations where analog I/O at the receiving device is limited.

Use a 22 AWG 4 pair twisted pair shielded cable similar to Belden 9514 for wiring to each removable terminal block. Maximum load is 400 ohms. (See "Specifications" on page 6 for additional details.)

Digital Outputs from the Sequencer

The Sample Sequencer 6 has 16 sinking digital outputs to provide point indication for sample being analyzed:

- eight (8) per I/O board
  - four (4) replicated analyzer alarms
  - four (4) point indication

Use a 22 AWG multi-conductor shielded cable similar to Belden 9423 for wiring to each removable terminal block.

Valve Output Connections

The valve outputs of the Sample Sequencer 6 output 12 or 24VDC, and are intended for use with the Sentry Manifold Sample Valve. Other manifold valves may be used; however, additional hardware such as interposing relays may be required.

Use an 18 AWG multi-conductor shielded cable similar to Belden 9409 for wiring to each solenoid valve used. Typical valve connections are shown in Figure 10.

Summary of Wiring Recommendations

Power cable	Volex 19348 or equivalent
Connections from the analyzers	Belden 1033A or equivalent
Valve output connections	Belden 9316 or equivalent
Analog outputs from the Sample Sequencer 6	Belden 1033A or equivalent
Digital outputs from the Sample Sequencer 6	Belden 9316 or equivalent

Figure 7. Sequencer board connections

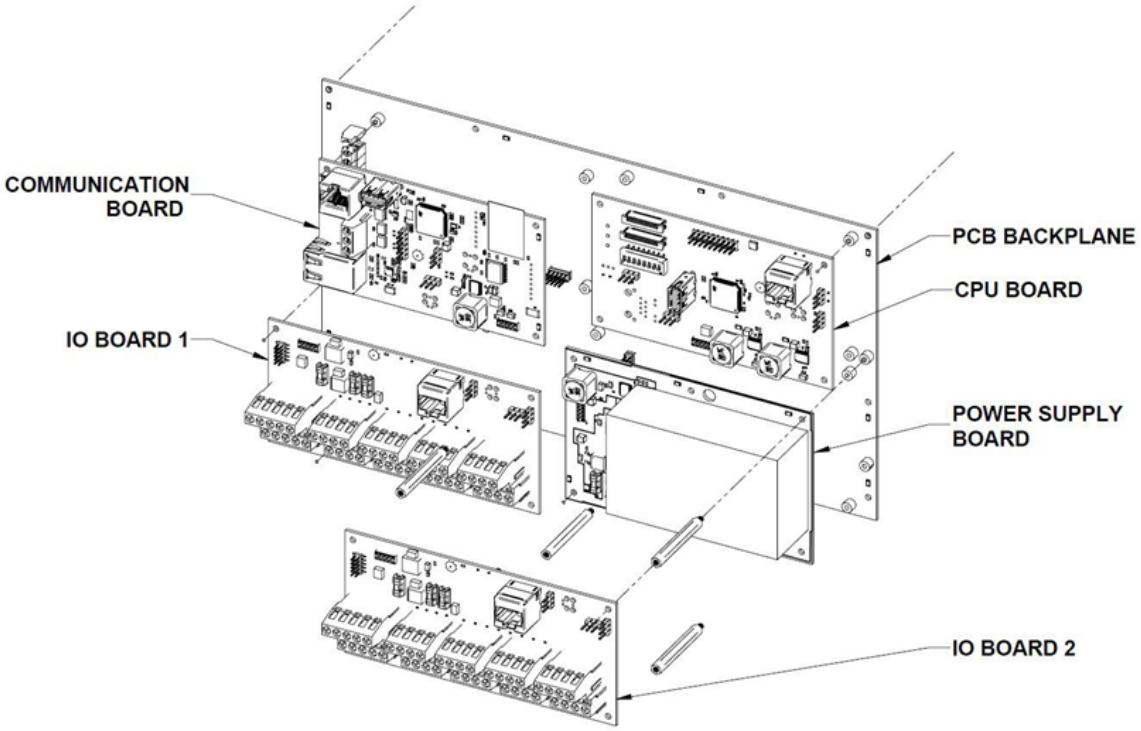
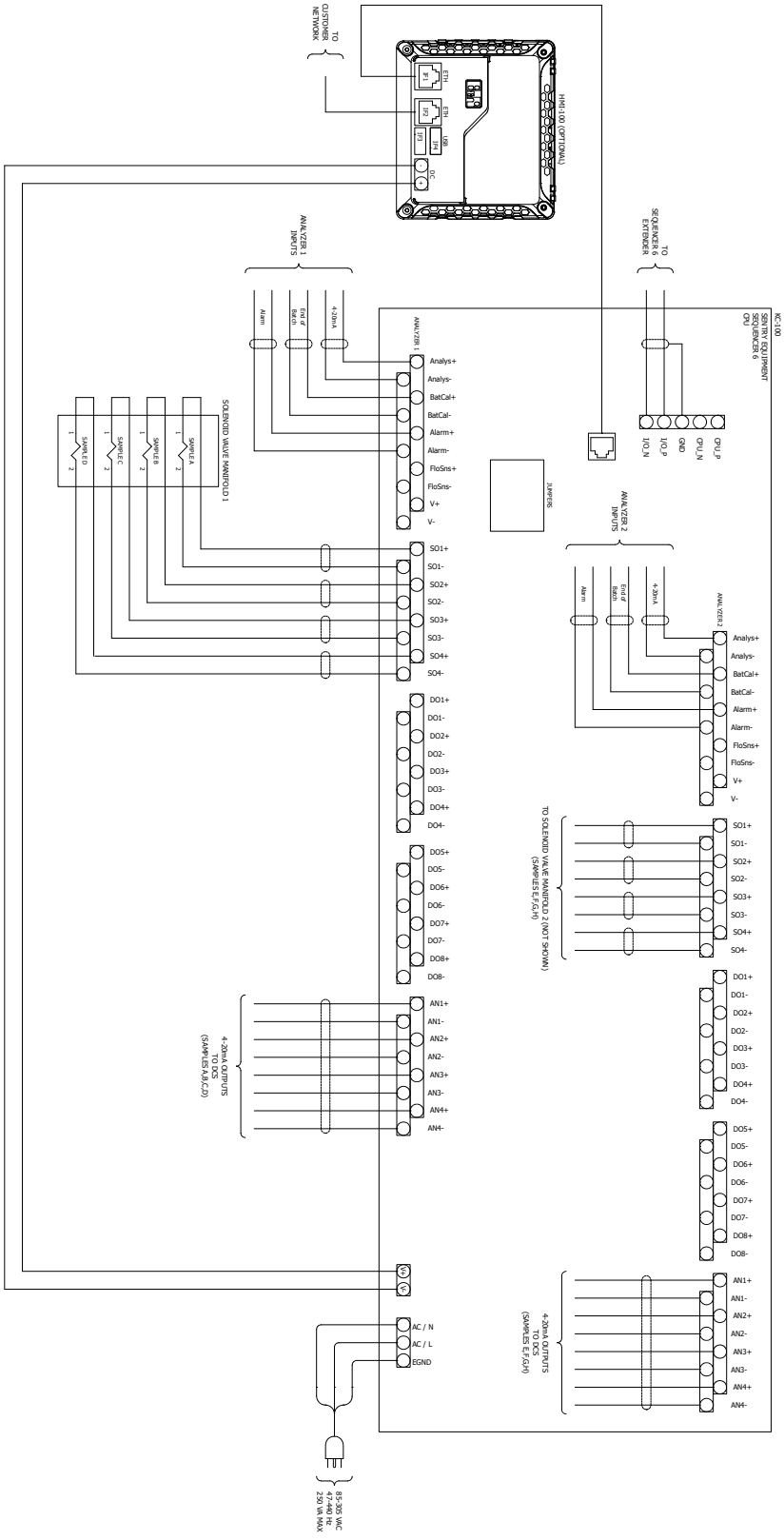
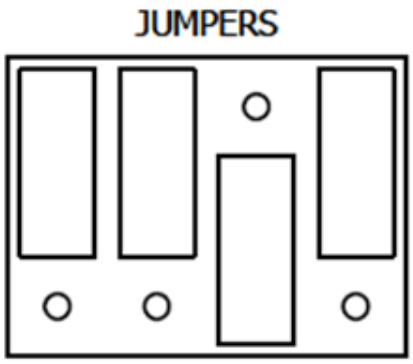


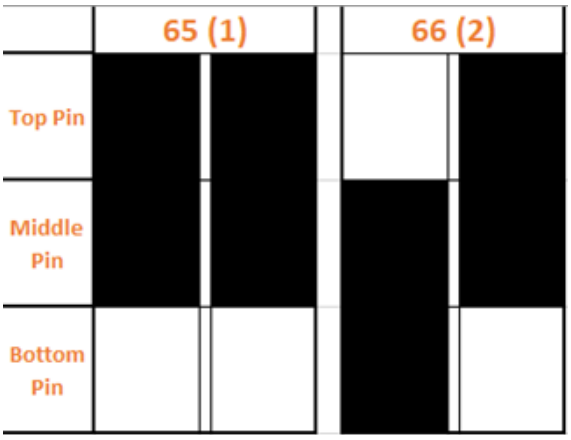
Figure 8. Electrical Wiring Diagram



Jumpers and Addressing

All IO Boards in the Sequencer 6 have jumpers to indicate to the CPU which IO board they are. Each jumper position presents 3 options to the board; connect top and middle pins, middle and bottom pins, or no connection. Together the jumpers form an address for each IO board. It is important for all IO boards to be sequentially numbered. Analyzer 1 must be paired with IO board 1 which will contain the address 65. Figures below show the four jumpers on a sequencer backplane and how they would be configured for the first two IO boards.





Operation

⚠ WARNING

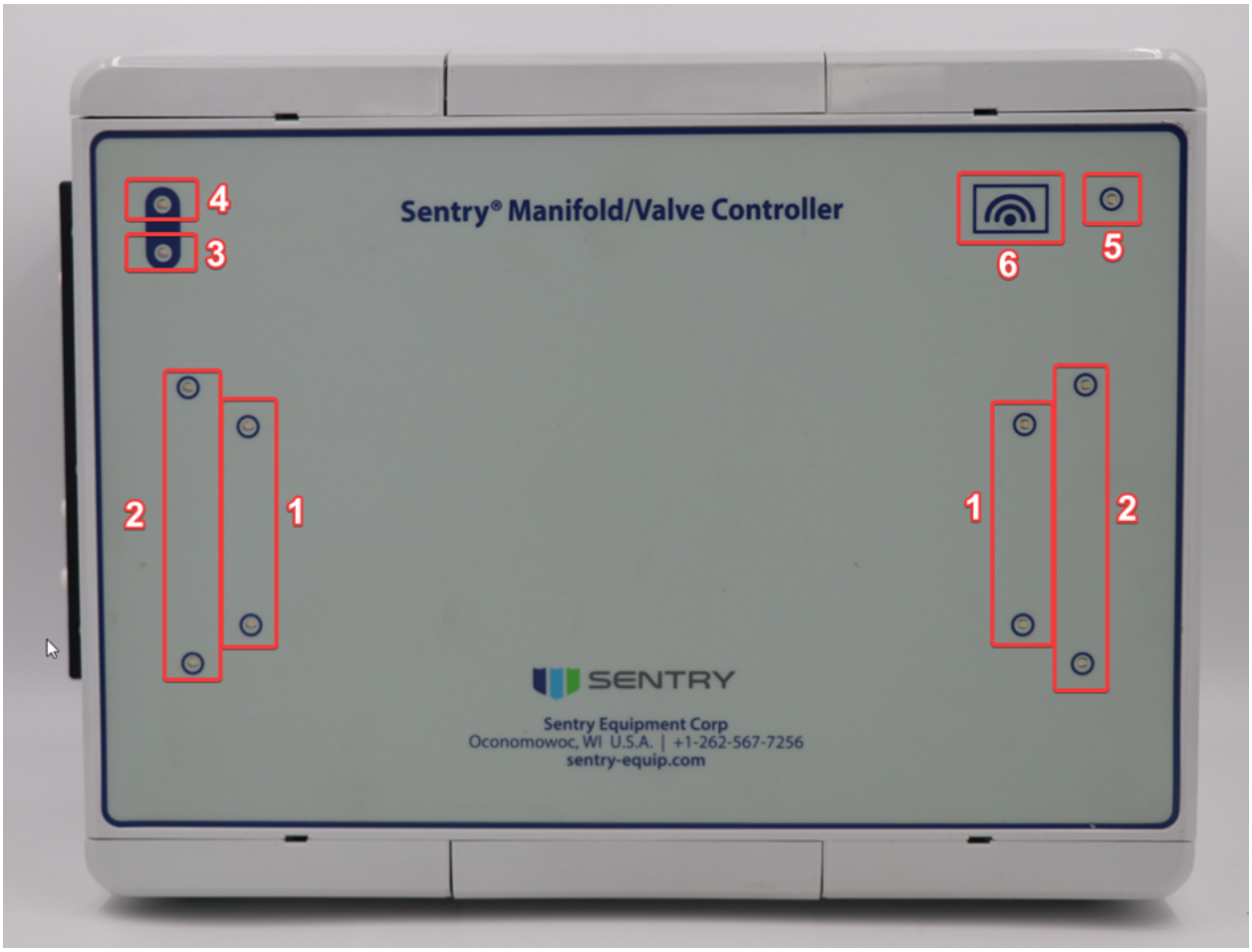
To ensure the protection provided by this equipment is not impaired, this equipment must not be installed or used in any manner other than that which is specified in this manual.

Operating LEDs

The front of the Sequencer 6 main unit houses several LEDs to indicate the status of the unit at a glance.

1. Indicates which output of the first manifold is active.
2. Indicates which output of the second manifold is active.

   NOTE: only the first 8 points being analyzed will be indicated by the LEDs.
3. Indicates an alarm is present in the system.
4. Functions as a heartbeat to show the system is active. Will flash on and off.
5. Indicates whether the WiFi is active (ON), inactive (OFF), or in the process of becoming active (Blinking).
6. Button to turn the WiFi on and off.



Wireless

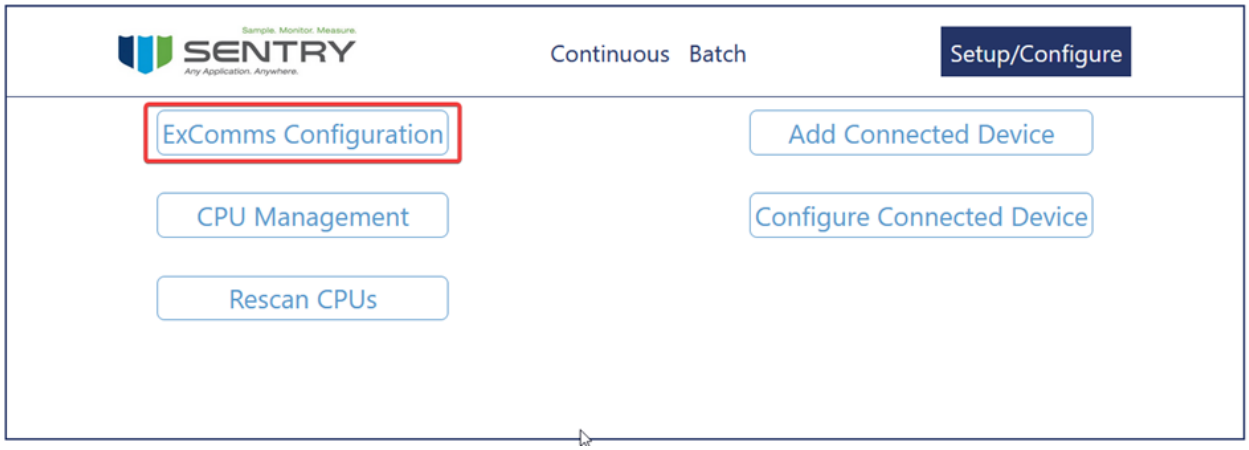
The Sample Sequencer 6 is equipped with a wireless connection to facilitate configuration. A laptop or tablet can be connected to the wireless network in order to access the embedded webpage. This webpage allows for monitoring and configuration of the Sample Sequencer 6. The wireless connection can also be used intermittently to monitor the system. Use the button on the face of the sequencer to turn on the wireless connection. This button is in the upper right hand corner along with a status LED. Configuration of the wireless SSID and password can be done through the website.

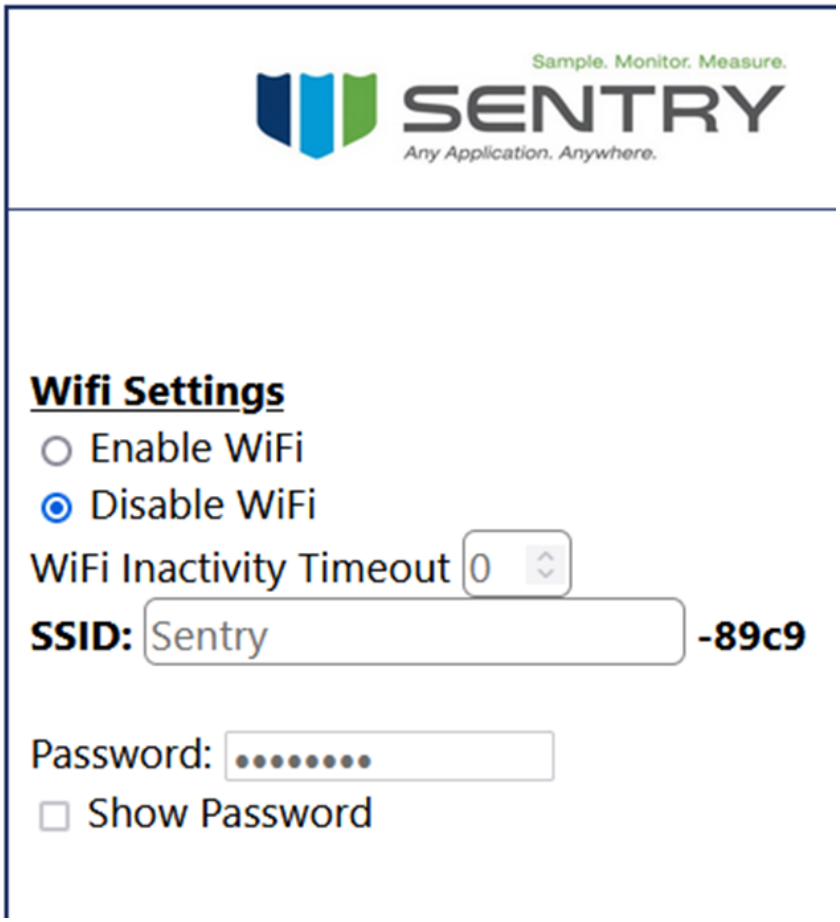
Default SSID: Sentry-XXXX

XXXX is a representation of the MAC Address of your system

Default Password: Equipment

Configuration through the website can be done by selecting 'Setup/Configure' then 'ExComms Configuration' On this page the Wireless interface can be turned on and off. The Wireless interface name, or SSID, can also be changed along with the password.





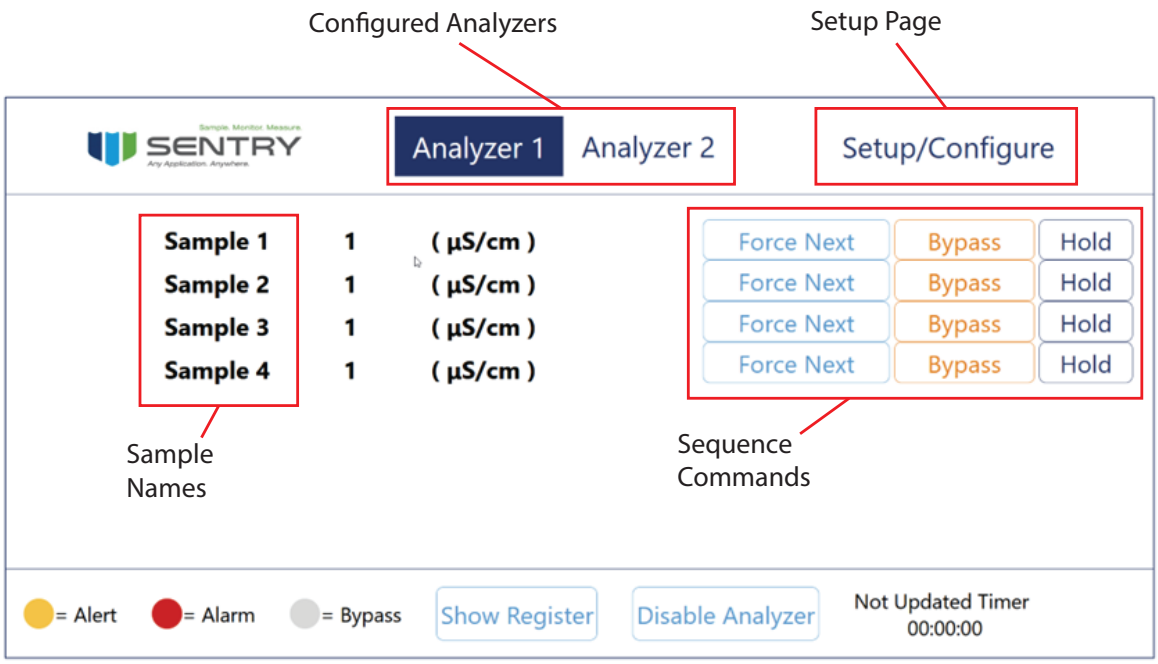
NOTE

Settings must be saved using the 'Save' button in the lower right hand corner

Operation Screen

The Operation screen is the main screen on the Sample Sequencer 6. This screen contains all the information indicating the state of the sequencer and current Analyzer values. No system changes can be made on this screen.

Figure 9. Operation screen



⚠ CAUTION

Make sure that the Sample Sequencer 6 is properly wired (see "Installation" on page 11) and all analyzers are OFF before applying power to the system.

1. Apply power to the Sample Sequencer 6 screen. The Information screen appears.
2. Select one of the configured Analyzers to enter the Operation Screen.

Additional Features

- **Additional Analyzers:** Depending on the settings, there are one or two analyzers available for display on the Operation screen. Select the desired analyzer to display the corresponding information.
- **Sequence Commands:** Several commands are available for active samples. Select any of the commands and they will take effect after the active sequence is completed.
  - o Force Next – All other samples in the sequence will be skipped to run this sample next. Sequence resumes after the sample is taken
  - o Bypass – Will skip this sample until the bypass command is turned off again
  - o Hold – System will continually analyze this sample until the hold command is turned off again

Sample time is the amount of time the analyzer reading is considered valid as sample flows through the analyzer. See "Operating Modes" on page 26 for timing considerations for Batch and Continuous modes.

Configuration

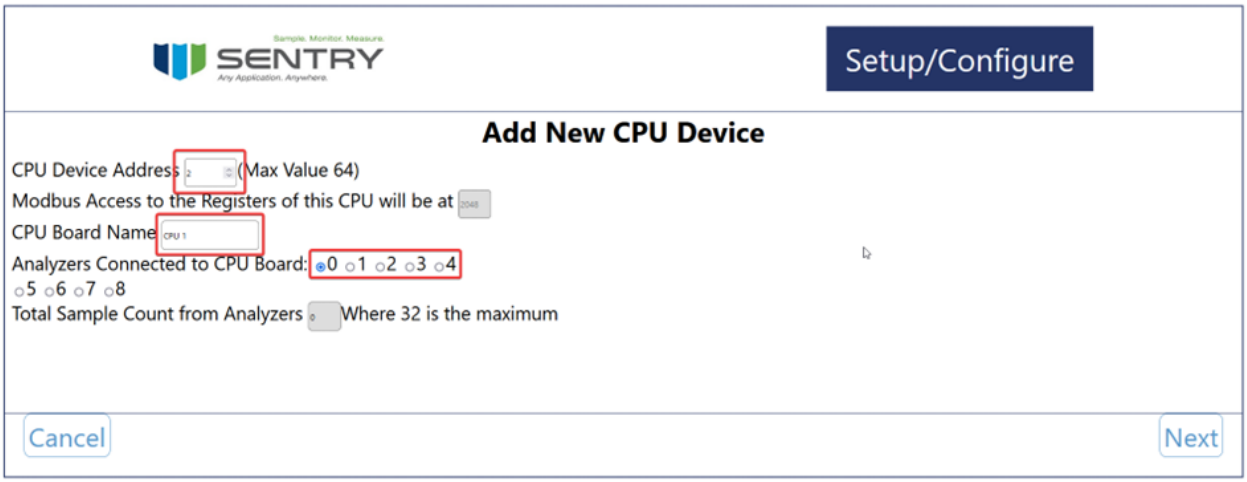
Selecting 'Setup/Configure' from the top menu takes you to the Configuration Page. From here all configuration options for the sequencer are laid out.

Add Connected Device

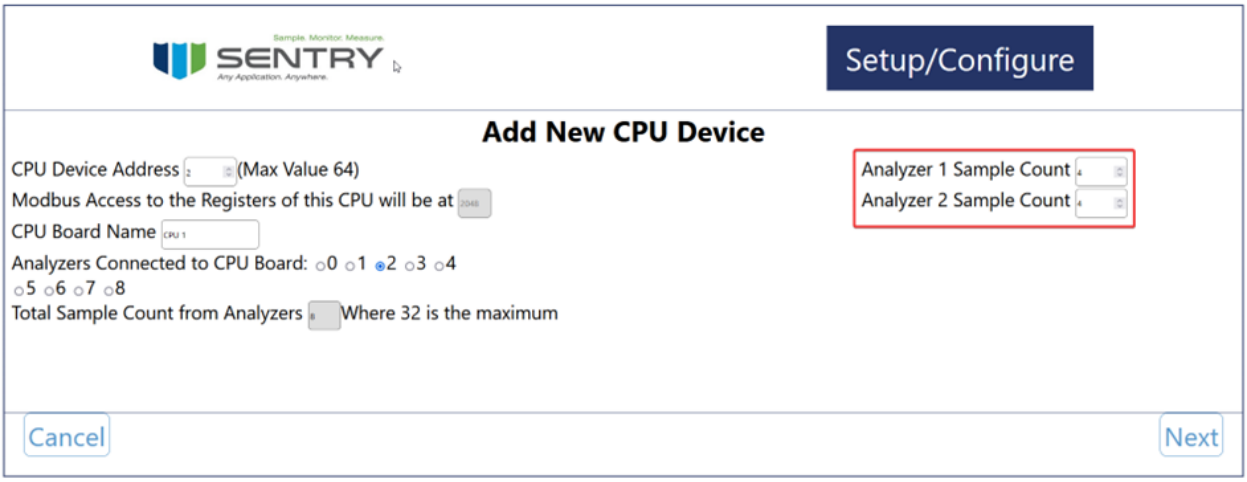
When no devices are configured select Add Connected Device to configure new analyzers

If a CPU is properly connected the CPU address should fill in automatically. The CPU Address is based on the jumpers located on the CPU board. For more information visit Jumpers on page 20.

Enter a name for your CPU and select the number of analyzers connected to that CPU. Note that IO Extender boards still work off of one central CPU.



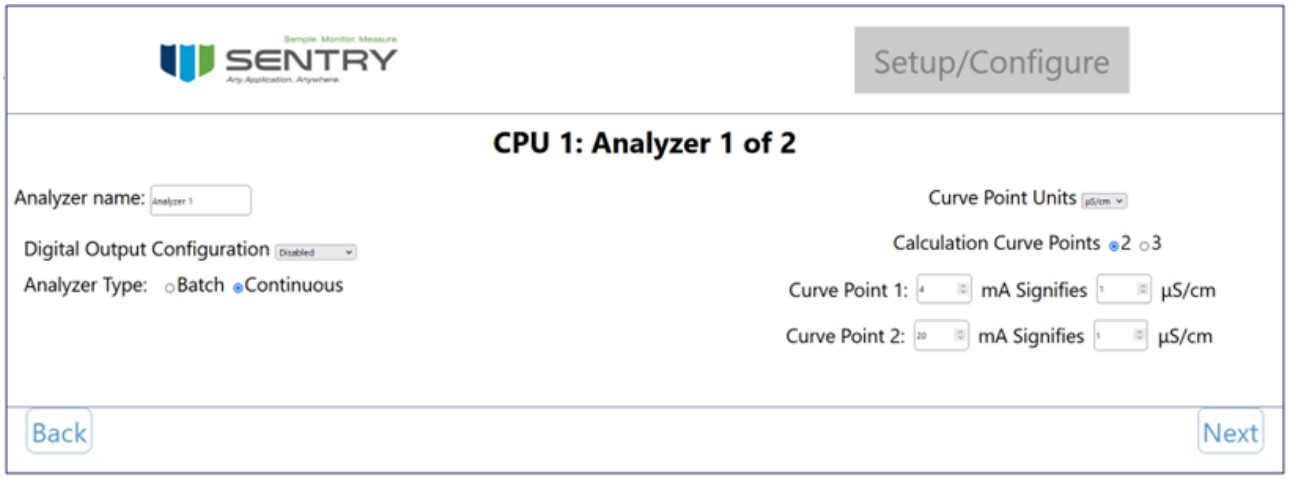
After selecting the number of analyzers new fields will appear to the right. Enter the number of samples for each of your analyzers and press 'Next'



The next page allows configuration of the first Analyzer. Set a name, type, and curve points in order to advance to the next page. Configuration of the digital outputs is also set here. The options are Disabled, Point Indication, Alarm Indication, or both Alarm and Point Indication.

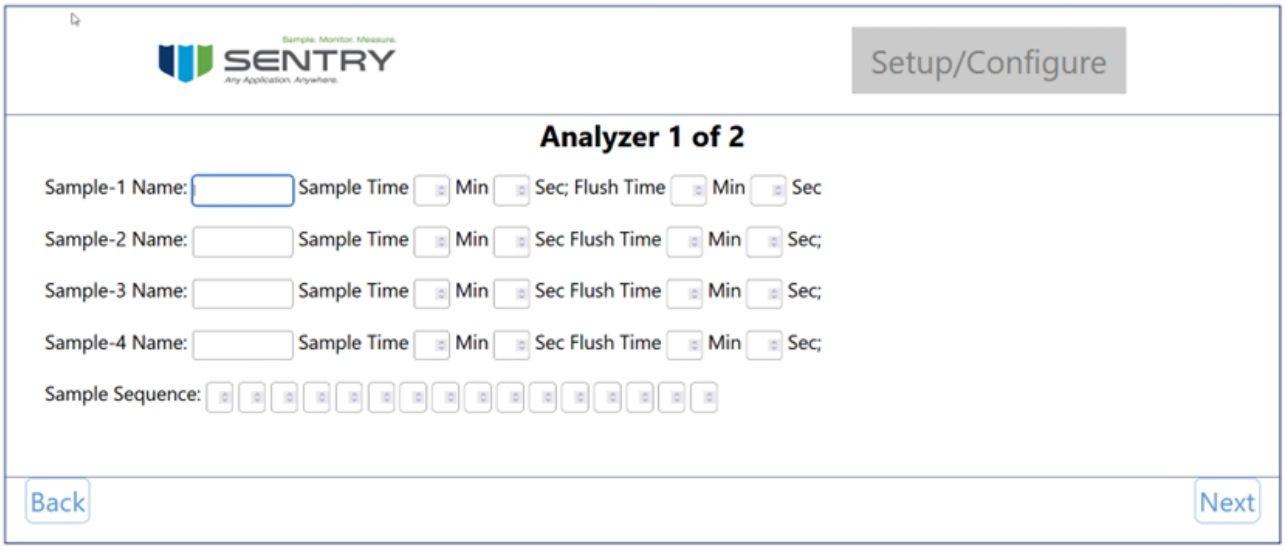
- Disabled will keep all the digital outputs off

- Point indication will indicate which sample is actively being measured
- Alarm Indication will indicate any samples that caused the analyzer to set an alarm output
- Both Alarm and Point indication will indicate the active and any alarmed samples



The next page is for configuration of the samples and sequence that will be followed. The sample name, sample time, and flush time are configured on this page. For more information on sample and flush time visit timing on page 26

Press the up and down arrows to set the Sample Sequence. Note that all samples must be in the sequence in order to complete the configuration. It is possible to sample one point several times in the sequence.



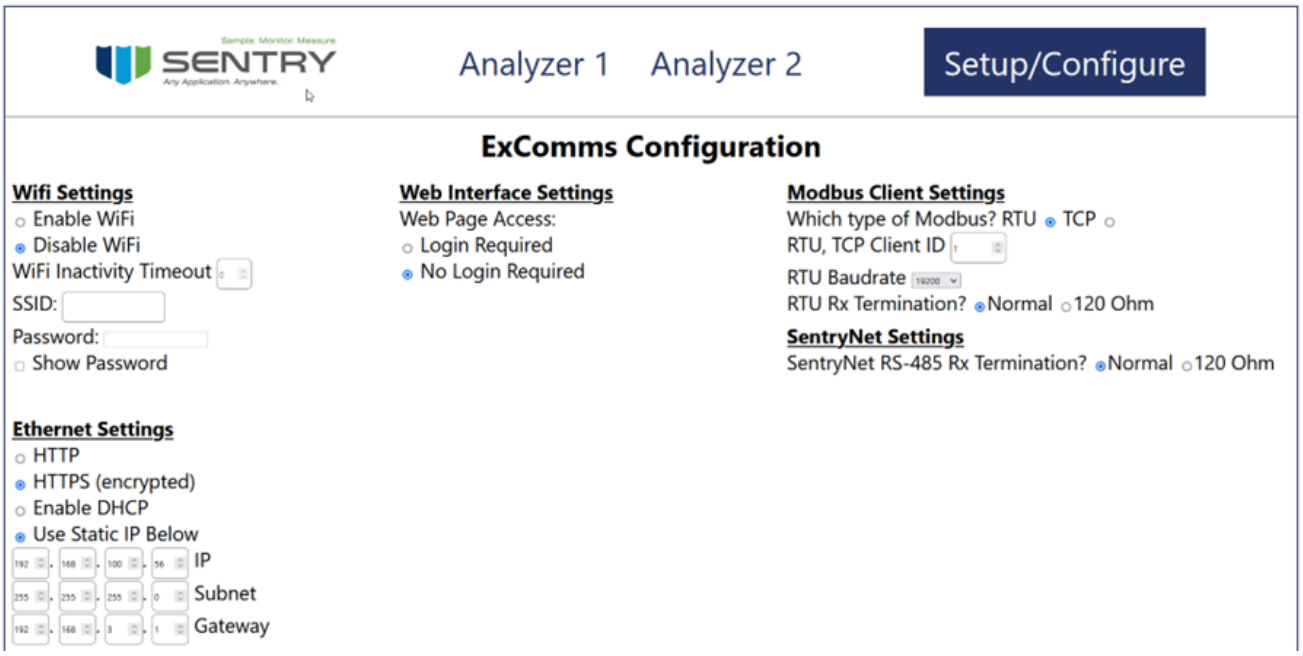
Once all analyzers are configured the next button will change to finish indicating the end of configuration.

Configure Connected Device

When a device is already configured use the 'Configure Connected Device' menu to edit the configuration

ExComms Configuration

ExComms Configuration allows the user to change settings for the web interface. Note that the unit must be rebooted for these changes to take effect.



Operating Modes

Continuous Mode

Continuous mode is for continuous output analyzers such as sodium, conductivity, pH, O_2, some colorimetric, and many others.

Timing considerations for Continuous mode

Figure 12 illustrates the timing diagram for *Continuous* mode. The following considerations should be made when determining the timing for your system.

- **Analyzer Alarm:** An analyzer alarm immediately closes the active sample valve and opens the next sample valve. That sample valve remains open until the analyzer alarm clears or one minute elapses. After one minute, the sample sequencer opens the next sample valve. The sequencer continues trying to establish flow every minute until the analyzer alarm clears.
- **Calibration Hold:** A calibration hold signal causes the sample sequencer to wait at the active sample with the valve open. Once the calibration indication clears, the sequencer resumes operation, entering the Flush state for the sample that was active before the calibration hold indication was received.
- **Flush Time:** After switching to a successive stream, the analyzer needs a settling time to stabilize to the new sample. The analyzer analog output signal is ignored during this time. The necessary flush time depends on the valve manifold design, sample line length from the manifold arrangement, sample velocity, and analyzer response time.
- **Sample Time:** Sample time is the time period during which a valid analyzer signal is read. Analog outputs are updated and point identification relay contacts are closed during this time. The necessary sample time should be set long enough to recognize stable readings and to provide recording devices time to capture the data.

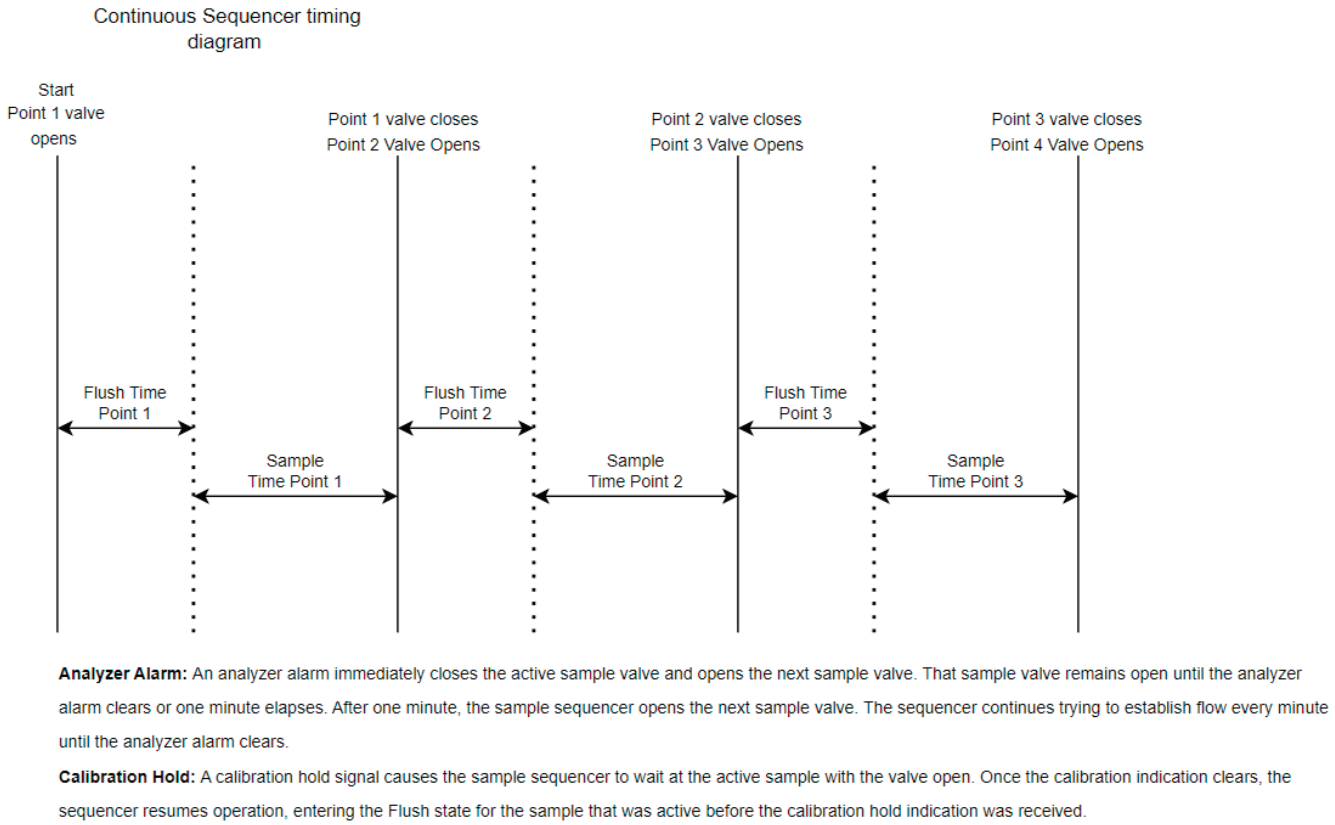
NOTE

The Track and Hold value and Point Identification are active during the sample time . The valve for this sample point is open during both the sample time and the flush time .

In Batch mode, sample time serves as a timeout timer that operates only when the analyzer is in alarm . While in alarm, if an end-of-batch signal is not received before sample time expires, the Sample Sequencer 6 closes the current sample point and proceeds to the next sample point .

Since the analyzer alarm input may serve to indicate more than a loss of sample flow, sample time should be set to give the analyzer sufficient time to attempt to complete an analysis and output an end-of-batch indication.

Figure 10. Continuous Mode Timing Diagram



Analyzer Alarm: An analyzer alarm immediately closes the active sample valve and opens the next sample valve. That sample valve remains open until the analyzer alarm clears or one minute elapses. After one minute, the sample sequencer opens the next sample valve. The sequencer continues trying to establish flow every minute until the analyzer alarm clears.

Calibration Hold: A calibration hold signal causes the sample sequencer to wait at the active sample with the valve open. Once the calibration indication clears, the sequencer resumes operation, entering the Flush state for the sample that was active before the calibration hold indication was received.

Batch Mode

Batch mode is for analyzers that take a "bite" or batch of sample and then spend some time analyzing it before outputting a new fixed analog signal. Typical types are reagent additive, chromatographs, etc. When these analyzers have completed an analysis, there is just one output value until the analyzer's next cycle is completed. An end-of-batch contact closure signal must be provided at the conclusion of a batch by the batch type analyzers. The Hach Series 5000 analyzer operates in this manner.

Timing Considerations for Batch Mode

Figure 13 illustrates the timing diagram for *Batch* mode, showing how each sample stream is switched when the

analyzer outputs an end-of-batch signal to the Sample Sequencer 6. If the sequencer does not receive an end-of-batch signal, it does not advance to the next sample. Upon receiving an end-of-batch signal from the analyzer, the sequencer reads the analyzer value, updates the Track and Hold output, and closes the point identification relay.

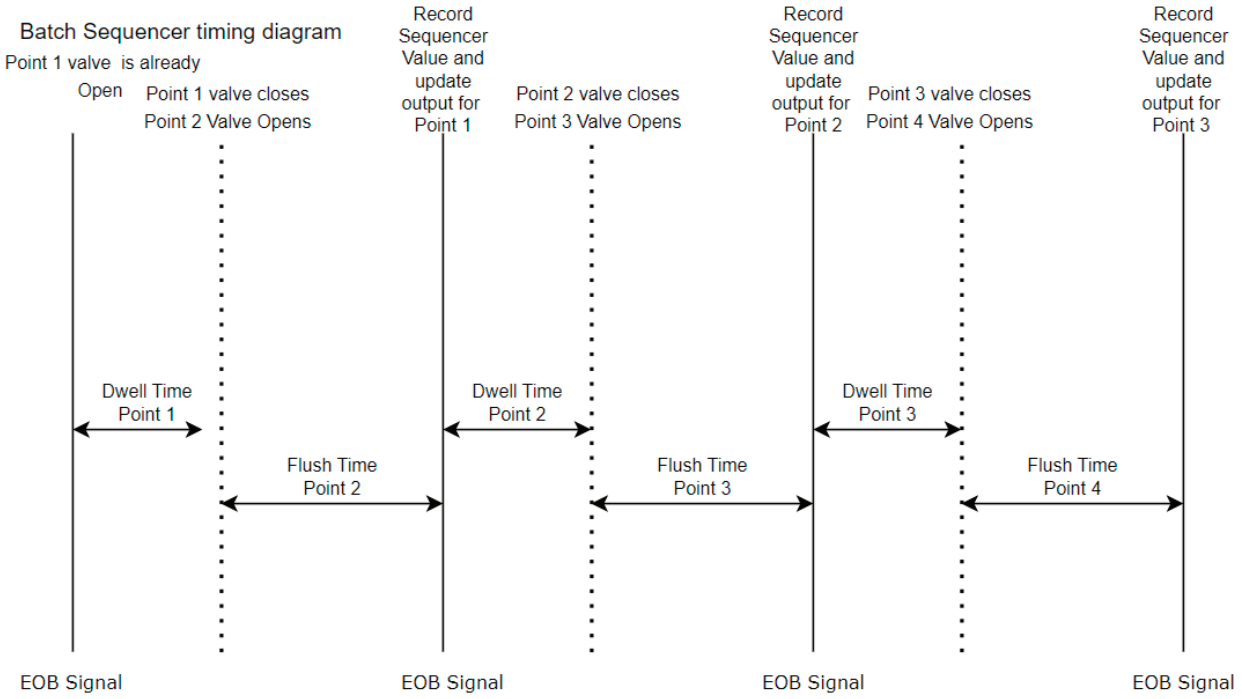
NOTE

The updated Track and Hold output and point identification relay are for the previous sample point. The open valve number never matches the closed relay point identification in *Batch* mode.

The following considerations should be made when determining the timing for your *Batch* mode system:

- **End-of-Batch:** The sequencer receives this signal when the analysis is completed and the analyzer is ready to begin a new analysis.
- **Analyzer Alarm:** The sequencer receives this signal when the analyzer is in alarm, such as a loss of sample flow condition. Once the analyzer alarm signal is received, the sequencer starts the sample timer and replicates the analyzer alarm for use by external recorders and control systems.
- **Sample Time:** The sample time in *Batch* mode is a timeout timer that operates only when the analyzer is in alarm. While in alarm, if an end-of-batch signal is not received before the sample time expires, the sequencer closes the current sample point and proceeds with the next sample point. Since the analyzer alarm input may serve to indicate more than a loss of sample flow, the sample time should be set to give the analyzer sufficient time to attempt to complete an analysis and output an end-of-batch indication.

Figure 11. Batch Mode Timing Diagram



Alarm Time: The Alarm time in *Batch* mode is a timeout timer that operates only when the analyzer is in alarm. While in alarm, if an end-of-batch signal is not received before the alarm time expires, the sequencer closes the current sample point and proceeds with the next sample point. Since the analyzer alarm input may serve to indicate more than a loss of sample flow, the Alarm time should be set to give the analyzer sufficient time to attempt to complete an analysis and output an end-of-batch (EOB) indication.

Valve Outputs

The Sample Sequencer 6 switches sample streams to an analyzer using the valve outputs on the board. These outputs provide 12 or 24 VDC to control solenoid valves. Sentry Equipment offers a manifold switching valve for use with the Sample Sequencer 6. With additional hardware, other solenoid valve operating voltages may be used.

Maintenance

Cleaning

The Sample Sequencer 6 is constructed of rugged materials that do not require cleaning. If cleaning the external surfaces is desired, a soft cloth and water is recommended.

Disassembly

⚠ WARNING

Electrical Shock Hazard – Disconnect all power, including voltages connected to relays, before servicing or replacing fuses.

Use the following steps to replace any user serviceable parts:

1. Open the door of the enclosure.
2. Disconnect all terminal blocks on the circuit board. Remove the circuit board by removing the mounting screws.
3. Disconnect the power supply cable from the power supply board.
4. Replace desired part, such as fuse, circuit board, or cable assembly.
5. Replace the circuit board. Secure the board in place using the screws removed in step 2. Reconnect all terminal blocks.
6. Close door.

Troubleshooting Guide

Symptom	Possible Problem(s)	Remedy
Incorrect analyzer value	Scale Calibration	1. Verify the scaled output of the analyzer matches the scaled input of the sequencer. Does the problem persist? **YES:** Proceed to step 2. 2. Perform an analog input calibration. Does the problem persist? **YES:** Proceed to step 3. 3. There could be noise on the ground. Remove shield (drain) wires from sequencer as referenced in section "I/O Cables" on page 16. Does the problem persist? **YES:** Contact Service Department.
Sequencer doesn't recognize end-of-batch signal from analyzer	Mode Wiring	1. Verify the sequencer is in *Batch* mode. (See "Mode" on page 26.) Correct Mode? **NO:** Change to *Batch* mode. **YES:** Proceed to step 2. 2. Verify an end-of-batch indication is correctly wired between the analyzer and sequencer. Does the problem persist? **YES:** Contact Service Department.

List of Components

Description	Sentry P/N
Sample Sequencer boards: • I/O Board • CPU • Communication board • Power board (12V) • Power board (24V)	 2-09675M 2-09675L 2-09675N 2-09675K 2-09675W
Sample Sequencer cable assemblies: • Cable- connector	 4-08045A
Sample Sequencer Enclosure: • Complete Enclosure Assembly Standard	 2-09675U
Sample Sequencer Screen Enclosure: • With Power Supply • Without Power Supply	 7-06362M 7-06362L
Fuse, 4 A 250 V Fast Acting (for power supply)	4-02055F
Terminal Blocks: • PLC Interface Relay • PLC Interface Relay Power Bridge	 4-06084N 4-06084W

Accessories

Description	Sentry P/N
Sentry Manifold Switching Valve (12 VDC)	7-04171A/B
Sentry Manifold Switching Valve (24VDC)	7-04171E/F
Sentry Flow Indicator with control valve (FICV), 580 cc/min	6-02671D
Sentry VREL (Variable Pressure Reducing Element valve)	7-00744A
Filter, 40 Micron, 1/4" Tube Fitting	4-00484K
Replacement Filter Element, 40 mesh	4-00361L
PLC Interface Relay (one required per point)	4-06084N
PLC Interface Relay Power Bridge (can connect up to 8 relays)	4-06084W

Standard Warranty

Sentry Equipment Corp ("Seller") warrants products manufactured by it and supplied hereunder ("Products") to be free from defects in workmanship and, to the extent materials are selected by Seller, to be free from defects in materials, in each case for a period as defined in the table below:

Product Line	Product Category	Warranty Period
Sentry®	1. Automatic Sampling 2. Corrosion Monitoring 3. Manual Sampling 4. Sample Conditioning 5. Sampling & Analysis Systems 6. Replacement Parts (without expiration dates)	Eighteen months from date of shipment or twelve months from startup, whichever occurs first
Waters Equipment	1. Sampling & Analysis Systems 2. Replacement Parts (without expiration dates)	Twelve months from date of shipment

To view the full warranty, go to www.sentry-equip.com/warranty.

Customer Support

With proven sampling expertise since 1924, Sentry products and services provide business operations the critical insights to optimize process control and product quality. We deliver true representative sampling and analysis techniques to customers around the globe, empowering them to accurately monitor and measure processes for improved production efficiency, output, and safety. Standing behind our commitments, we are determined to tackle any application, anywhere.

We know that running an efficient operation isn't easy. It requires thorough, careful analysis of controlled, real-time data achieved through reliable, accurate, and repeatable process monitoring, and measuring. By effectively conditioning, sampling, and measuring gas, liquid, slurry, powder, solids, steam, or water within their production environments, our customers obtain the critical insights they need to control and optimize their processes.

Yet, controlling your processes also means reliable customer support throughout the life cycle of your equipment.

- Customer Service—General information, warranty claims, order management.
- Installation Service—For systems that require specialized expertise upon installation.
- Technical Support—Troubleshooting, training, and technical manuals.
- Field Service & Retrofits—When a problem needs immediate attention.
- Replacements Parts & Consumables—Order your replacement parts and consumables.
- Sentry ProShield Services—Select from four ProShield Guardian service plans providing different levels of support to protect your large system investments with regularly scheduled maintenance.

To learn more, go to www.sentry-equip.com/support.

Appendix A: Recommended Piping

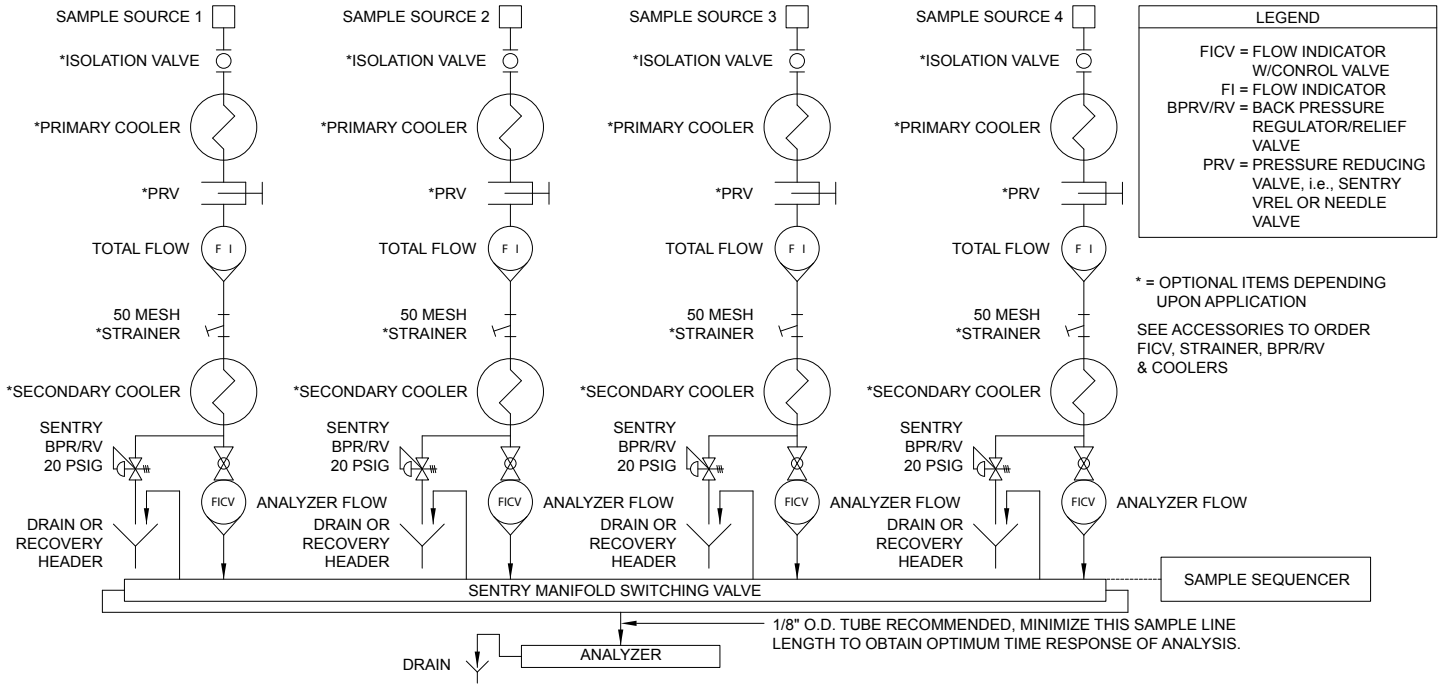
Maintain proper sample conditioning and flow control in order to obtain representative samples. The Electric Power Research Institute (EPRI) guidelines for representative sampling recommend maintaining constant and continuous sample flow in sample lines. In addition, it is recommended that the sample be cooled to a temperature of 77 °F (25 °C) prior to analysis.

NOTE

Some analyzers may recommend a different sample temperature be used to accelerate the analysis process.

Appropriate sample coolers or heaters may be required. Consult the pressure and temperature specifications for your specific analyzer and sampling system. Figure A-1 shows the recommended sample conditioning piping and instrumentation diagram (P&ID) when switching streams with the Sample Sequencer 6.

Figure A-1. Recommended Sample Conditioning



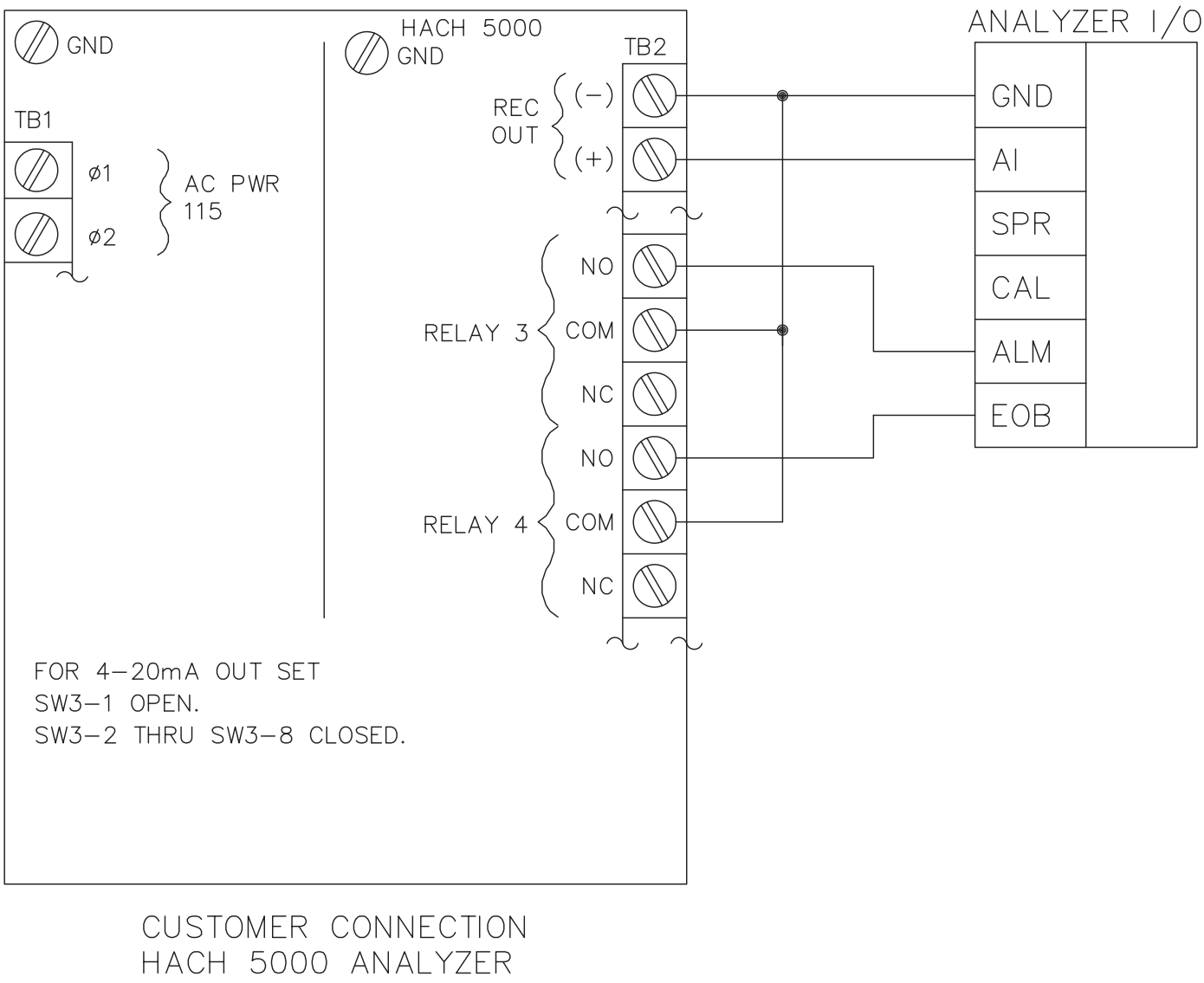
Appendix B: Typical Batch Type Analyzer Wiring

The Sample Sequencer 6 may operate with a Hach Series 5000 analyzer. The Series 5000 instruments operate in *Batch*-mode style and require the appropriate configuration for use with the Sample Sequencer 6. Hach 5000 analyzers have special features that provide a contact closure at the end of the batch. This is called the "Mark End of Measurement" contact closure. The contact closure causes the sample sequencer to advance to the next sample point. See "Batch Mode" on page 27 for more information.

Figure B-1 illustrates how to connect the Sample Sequencer 6 to a Hach Series 5000 analyzer. The Hach 5000 analyzer must be configured properly to operate with the sequencer. The analyzer must be programmed to use relay #3 and relay #4 for System Alarm and End-of-Measurement contact closure indications, respectively. Consult the Hach analyzer manual for information about configuring the System Alarm to relay 3. The following procedure describes how to

configure the End-of-Measurement contact closure on the Hach 5000.

Figure B-1. Wiring to a Hach Series 5000 Analyzer



Configuring the Series 5000 (Catalog No. 60000-XX through 60004-XX) for MARK END OF MEASURE on Relay 4

1. Remove the front cover of the control module. Move the No. 1 DIP switch on SW1 to the ON position. This enables the Extended Diagnostic menu. (Switch SW1 is an 8-switch DIP located near the center of the circuit board.)

2. Return to the front of the control panel and press the TEST key. Using the NEXT key, scroll through the diagnostic menu to MARK END OF MEAS. Press ENTER and select ENABLE with the NEXT key. Then, press ENTER. This activates the MARK END OF MEASURE contact closure.

3. Turn OFF switch No. 1 on switch bank SW1 of the circuit board. This returns the analyzer to normal operation but leaves the MARK END OF MEASURE function enabled.

NOTE

This procedure has to be repeated if a cold start is performed.

4. Reassign the System Alarm to relay 3: Press the SET UP key. ALARMS appears. Press ENTER. Scroll with the NEXT key to RELAY CONFIG and press ENTER. Scroll to SYS ALRM with the NEXT key and then press ENTER. Scroll with the NEXT key to RLY 3 and press ENTER.

5. Reassign Alarm 2 to No Relay: Press the SETUP key on the control module. ALARMS appears. Press ENTER. Scroll with the NEXT key to RELAY CONFIG and press ENTER. Scroll to ALARM2 and press ENTER. Scroll with the NEXT key to NO RLY and press ENTER.

6. Assign relay 4 to Mark End of Measure: Press the SETUP key on the control module. ALARMS appears. Press ENTER. Scroll with the NEXT key to RELAY CONFIG and press ENTER. Scroll to MARK END OF MEAS and press ENTER.

NOTE

MARK END OF MEAS does not appear unless it has been properly activated per the above steps.

Scroll with the NEXT key to RLY 4 and press ENTER. This assigns the alarm 4 relay to mark the end of measurement with a contact closure. The contact closure makes the Sample Sequencer 6 advance to the next sample point.

7. Verify the Sample Sequencer 6 is operating in *Batch* mode.

Older Hach Series 5000 Analyzers

If you have an analyzer with a catalog model number 5000X-XX, contact Hach Service Department at 1-800-227-4224 regarding the use of the Sample Sequencer 6 with your analyzer. Updated software EEPROM may be required to operate correctly with the Sample Sequencer 6.

If you have an analyzer with a catalog model number 5500X-XX, configure your unit as follows:

Recommended Sequencer Timer Settings

It is recommended the following times be programmed into the Sample Sequencer 6 when using the Hach Series 5000 analyzers:

Sample Time..... 20:00 minutes

Reference the "Operation" section beginning on page 20 for instructions on programming the sample timers.

Model 5500X-XX Configuration

NOTE

Software Version 1.03 or later is required to enable the "Marked End of Measure" Feature.

1. Verify the analyzer software version.
   a. From the Main Menu go to SETUP SYSTEM > INSTRUMENT INFORMATION> ANALYZER INFO. The third line should be "S/W VERS:1.03". The sixth and seventh lines will indicate the current script versions.
   b. IF THE SOFTWARE VERSION IS EARLIER THAN 1.03 CONTACT SENTRY EQUIPMENT or REQUEST A SOFTWARE UPGRADE FROM HACH!
2. Enter the SYSTEM SETUP / SETUP OUTPUTS / RELAY SETUP Screen:
   a. Setup Relay B:
      - Source = Analyzer
      - Function = Process Event

- Activation / Events / MARK END OF MEASURE

b. Setup Relay A:
- Source = Analyzer
- Function = Warning
- Failsafe = Yes
- Warning Levels = determined by specific needs

3. The wiring is different for the model 5500X-XX than shown in Figure B-2. The changes are:

a. Connect the Sample Sequencer 6 End-of-Batch terminals to the Hach terminals labeled NO and COM on OUTPUT 2.

b. Connect the Sample Sequencer 6 Analyzer Alarm terminals to the Hach terminals labeled NO and COM on OUTPUT 1.

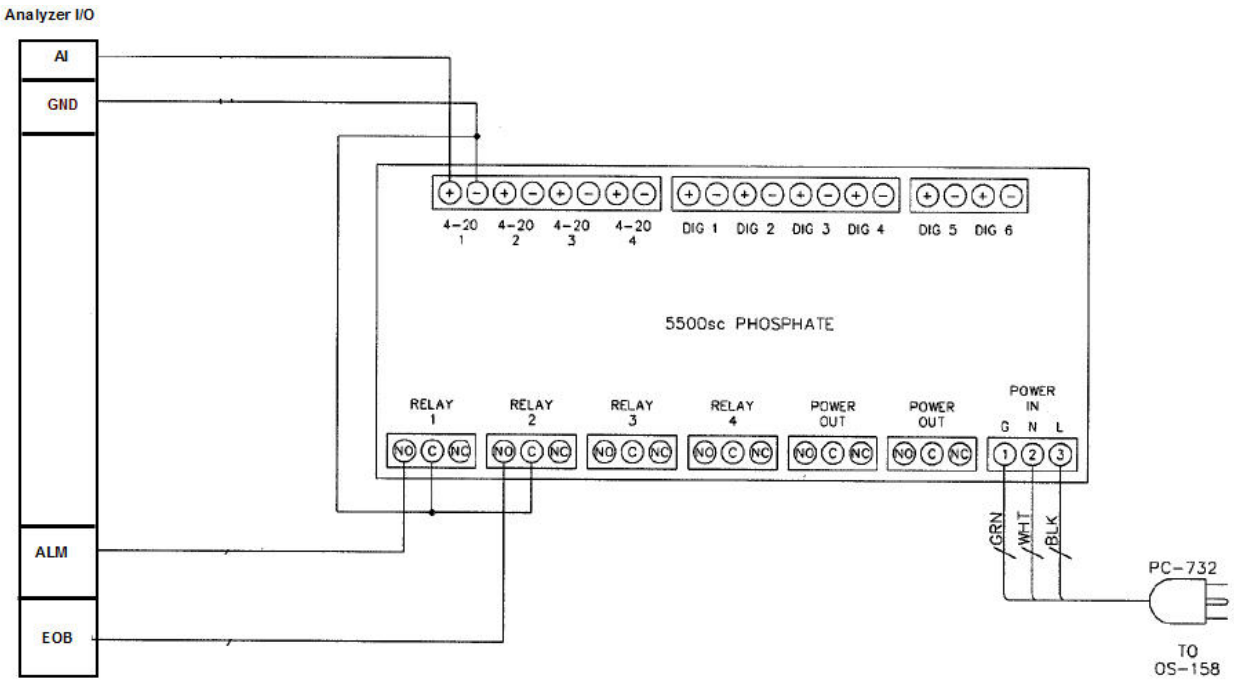
Recommended Sequencer Timer Settings

It is recommended the following times be programmed into the Sample Sequencer 6 when using the Hach Series 5500 analyzers:

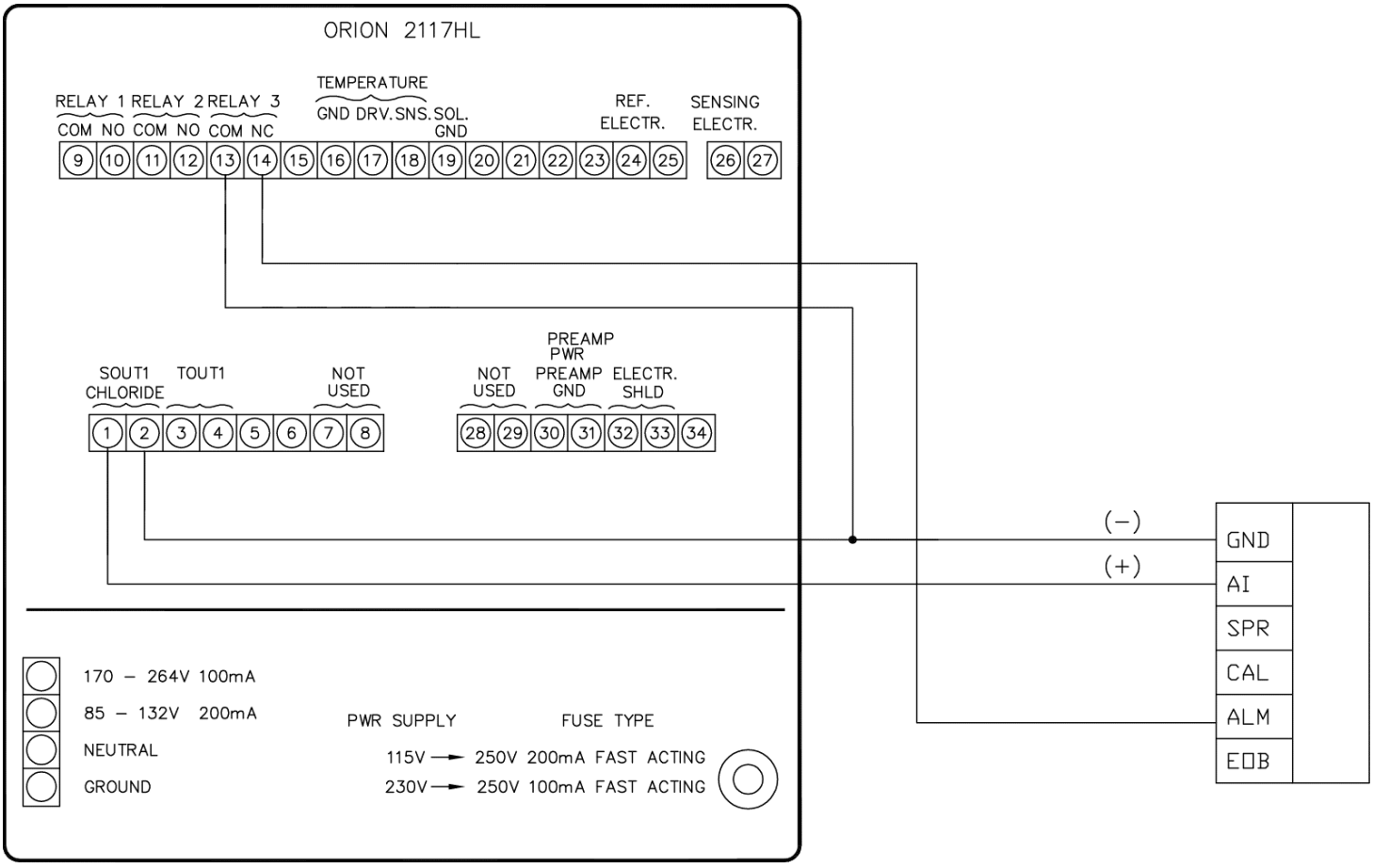
Sample Time..... 20:00 minutes

Reference the "Operation" section beginning on page 20 for instructions on programming the sample timers.

Figure B-2.



Appendix C: Typical Continuous Analyzer Wiring, Reference Orion 2117LL, 2117HL, 2118XP, 2111LL, and 2111XP

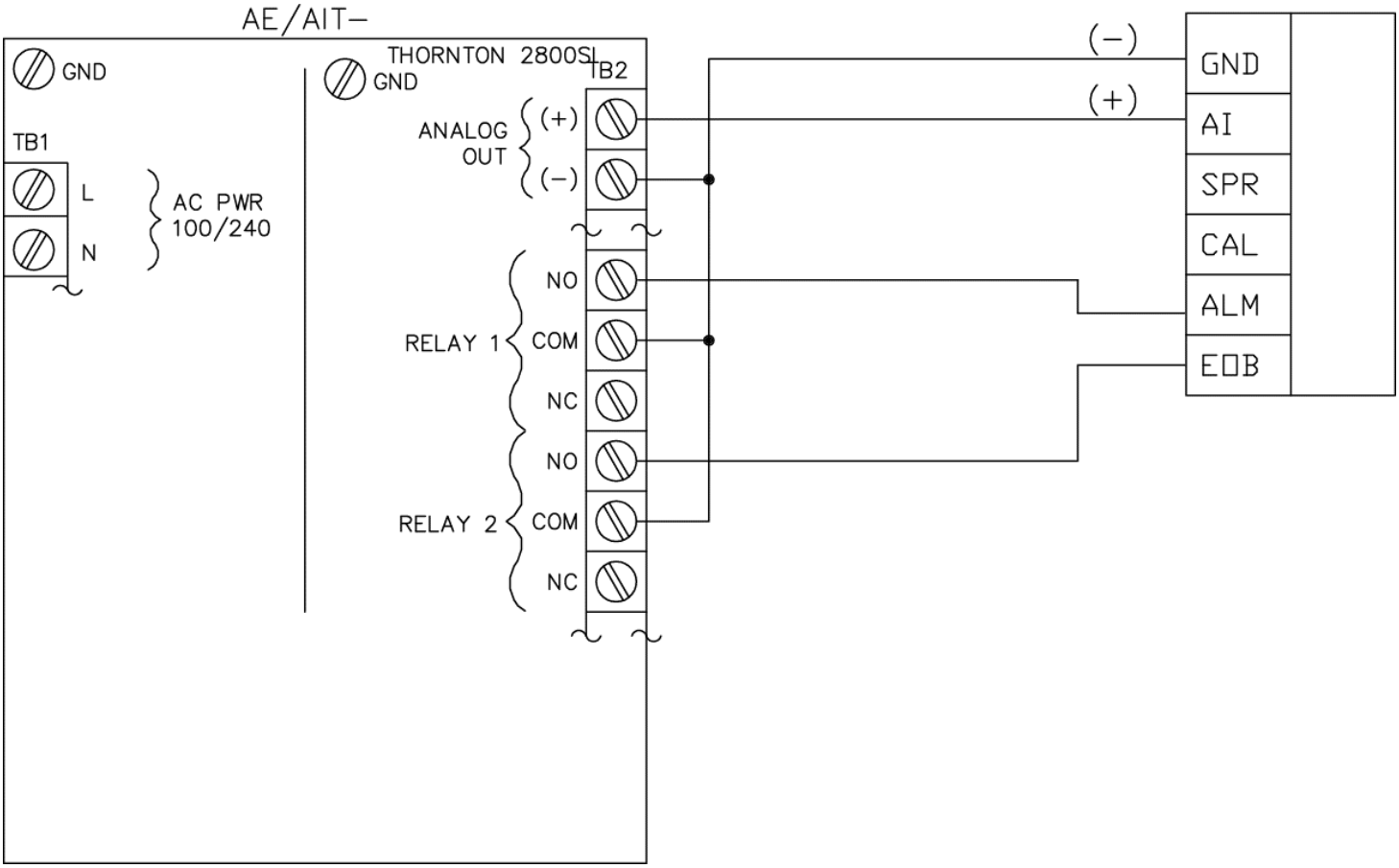


NOTE

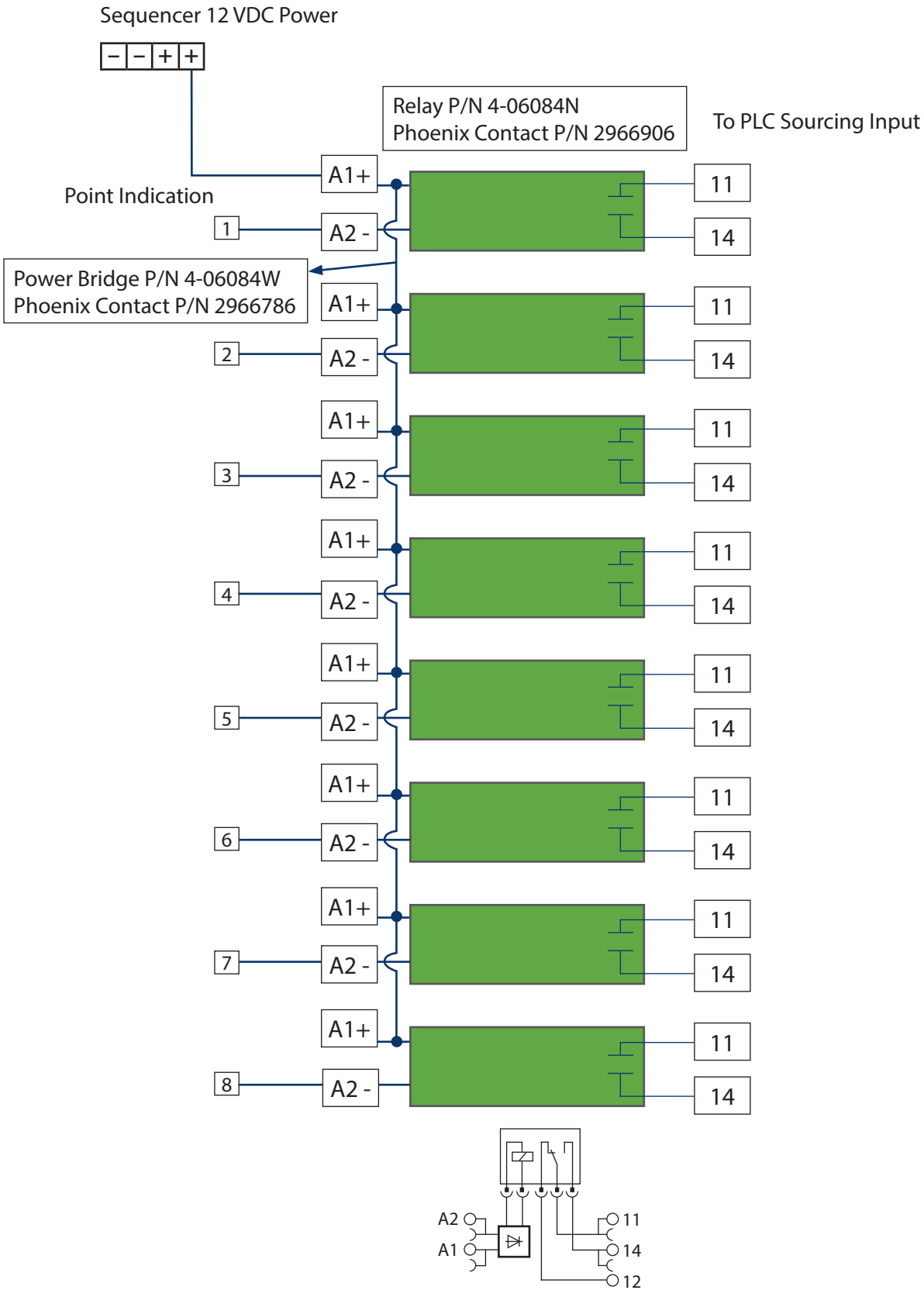
Linear output function must be enabled. The factory default is Logrithmic.

2117HL shown in above example.

Thornton 2800Si Silica Analyzer



Appendix D: Connection to PLC that requires a contact closure for point identification

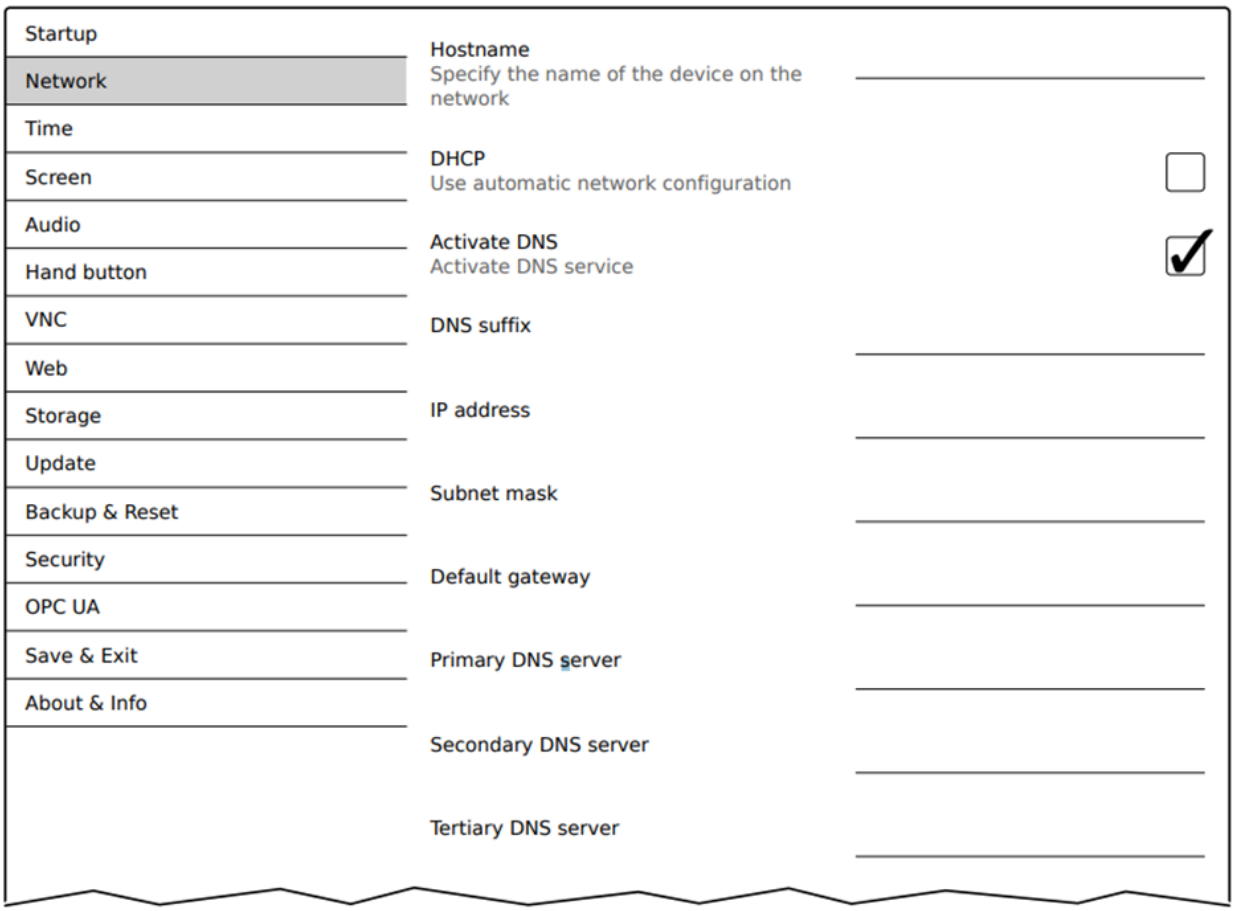


Appendix E: Configuration of Web Panel

IP Parameters

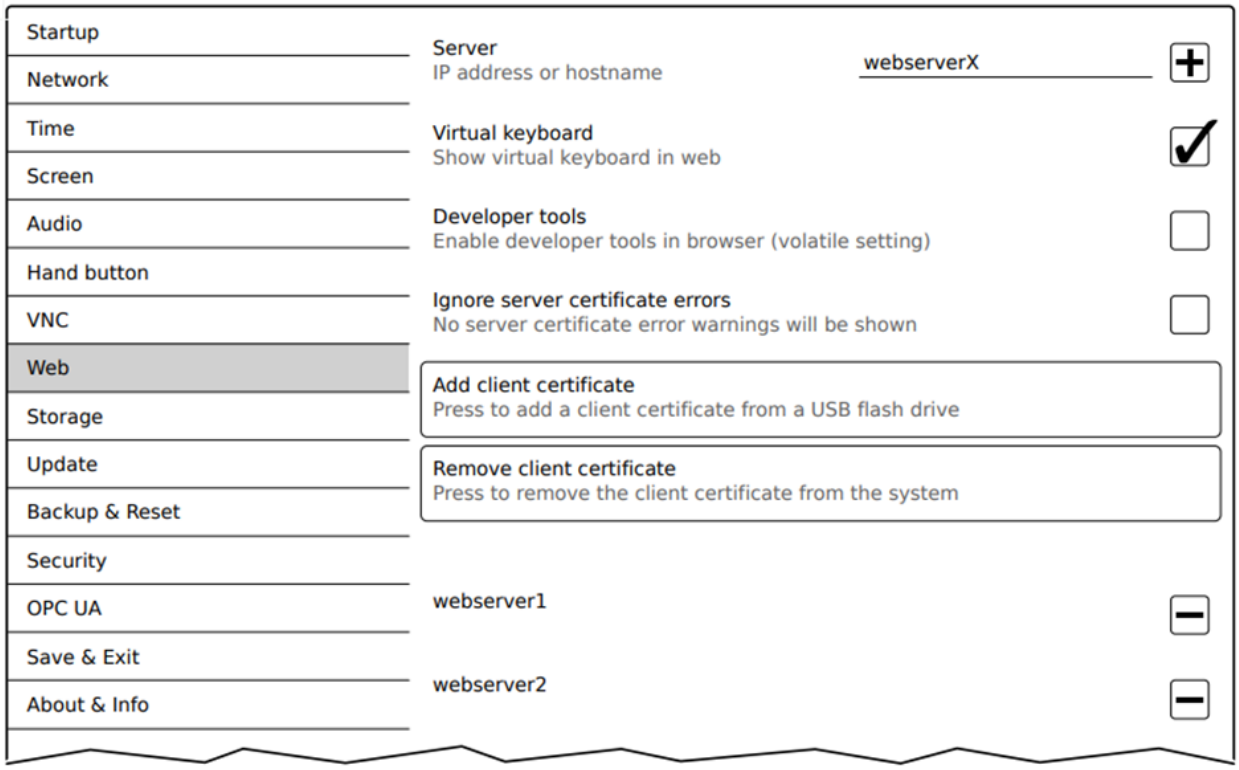
Select the 'Network' tab from the left hand menu

- Uncheck 'DHCP'
- Enter '192.168.3.15' for the IP Address
- Enter '255.255.255.0' for the Subnet Mask
- Enter '192.168.3.1' for the Default Gateway



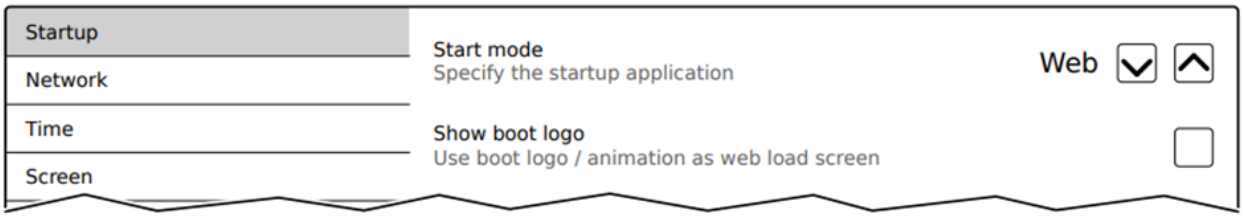
Web Parameters

- Set Server to 'http://192.168.3.2'
- Ensure 'Virtual keyboard' is checked



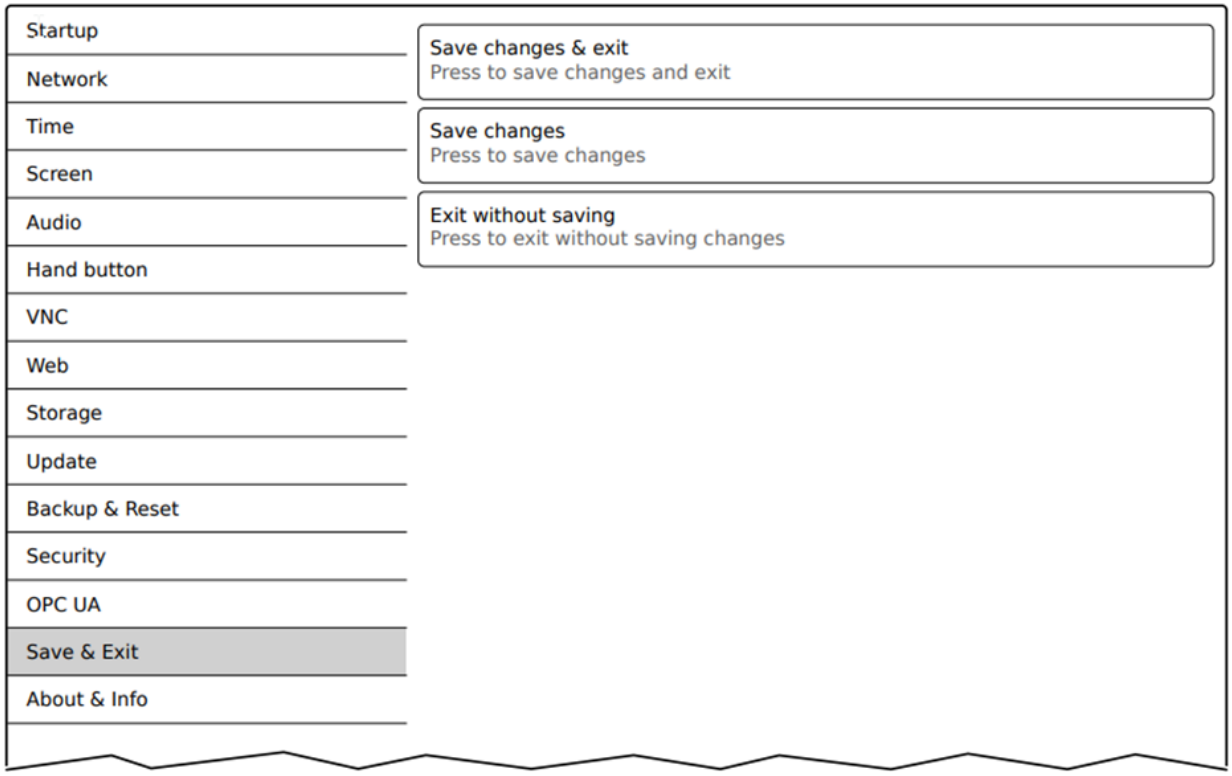
Startup Parameters

- Set Start Mode to 'Web'



Save and Exit

- Select 'Save changes & exit' to save changed settings and allow the panel to boot



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