

User Manual for Chart Recorder



HG-657

11-07-2023

MAN1489 R01

08 NOV 2023

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For more information about the warranty and limitation of liability, please contact the Horner Solutions Group Manager at 877-665-5666 or visit our website at www.hornersolution.com.

PREFACE

This manual explains how to use the Horner Chart Recorder Solution.

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Introduction to the Chart Recorder Solution



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Chapter 1: Introduction

The Horner Solutions Chart Recorder allows monitoring of up to four analog signals for trending, datalogging and alarming. The Chart Recorder is ready to go as-is without programming or software requirements..

The Chart Recorder monitors 4-20mA and/or PT100 RTD signals from the field, which can then be scaled into a displayed reading and data point. The data is presented in several manners ranging from graph-centric to numeral-centric.

Each signal is trended and is captured in files on MicroSD. Alarm setpoints allow for enunciation of Warning and Alarm levels, both high and low, for each signal.

Each display showing readings has four positions, one for each signal. Flexible configuration allows for any analog channel to be routed to any of the four positions. It allows for rearrangement of the order on the screen without re-wiring. And it allows for one signal to be used for multiple scales, e.g. both °C and °F temperatures from the same RTD input.

Continuous datalogging is optionally enabled. Data is written in spreadsheet-friendly comma separated value (CSV) format. When enabled, one file daily is made for each of up to 4 enabled signals. Additionally, all signals are logged to a single file if no Recording is active (see below).

Continuous Warning/Alarm condition datalogging is always enabled. Data is written to Excel-friendly files. One file daily is made for all enabled Warnings/Alarms that may occur. A daily file will not be made if no Warnings/Alarms are enabled, or if no Warnings/Alarms occur over the course of a day.

Specific recordings, or Records, can be made separately from the continuous recordings. Records may be started or stopped in several ways: manually, timed, and RTC scheduled. A Record takes over both the "all signals" and the Warning/Alarms datalog files. A Record file, either signal recordings or Warning/Alarm recordings, may span 2 or more days in one file.

Notification of a new Record can be sent via e-mail when the recording is done. Files are optionally attached if files remain under 1000 datalog entries. Record and all datalog files are retrievable via FTP.

Electrical Installation



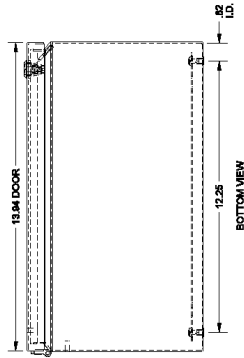
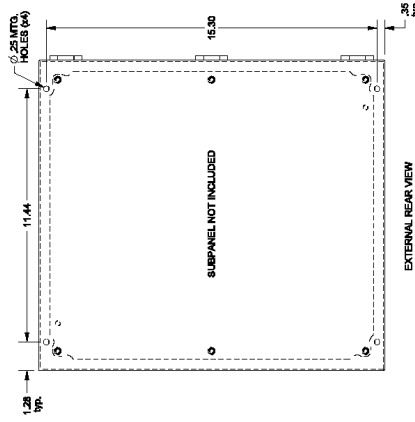
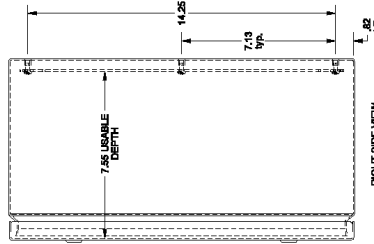
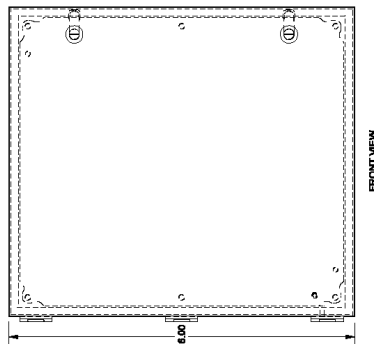
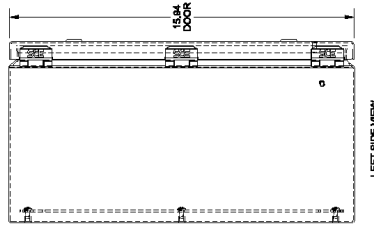
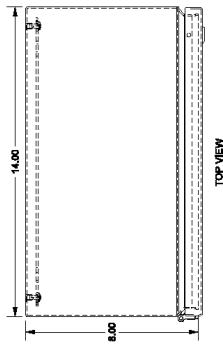
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2.1: Enclosure

**SAGINAW CONTROL & ENGINEERING
SCE-16148ELJ = SCE-09 GRAY
SCE-16148ELJLG = RAL 7035**

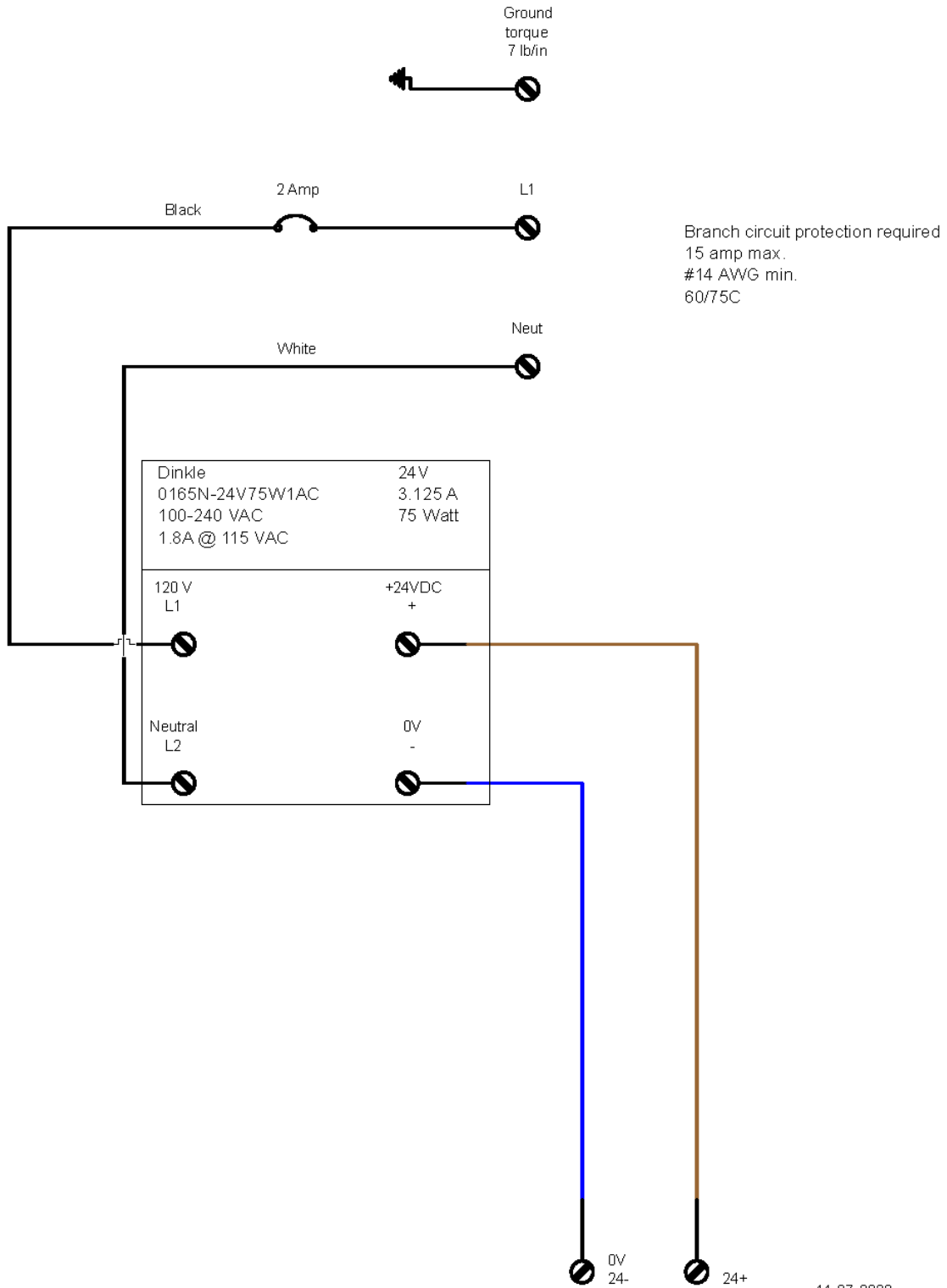


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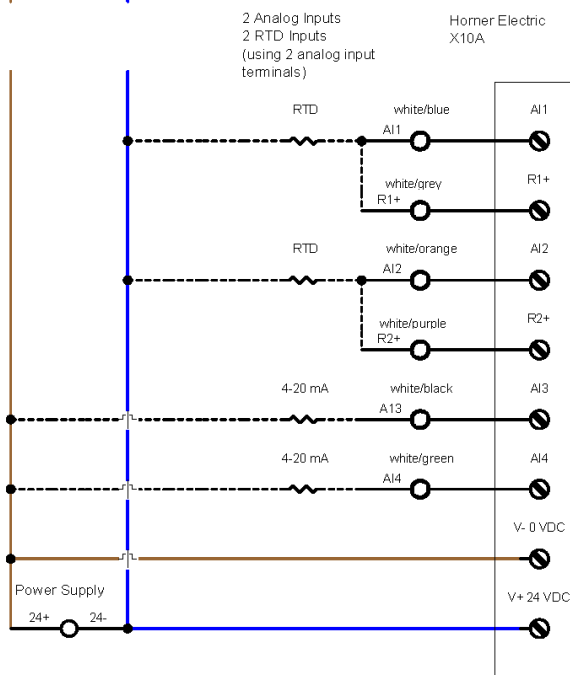
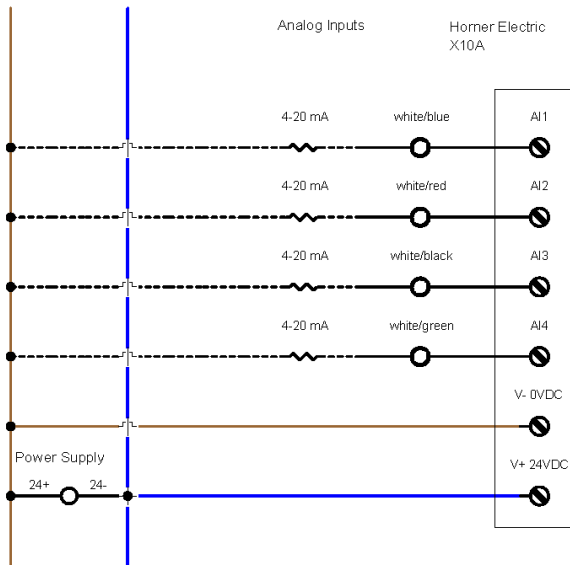
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DATA SUBJECT TO CHANGE WITHOUT NOTICE

2.2: Control Circuit

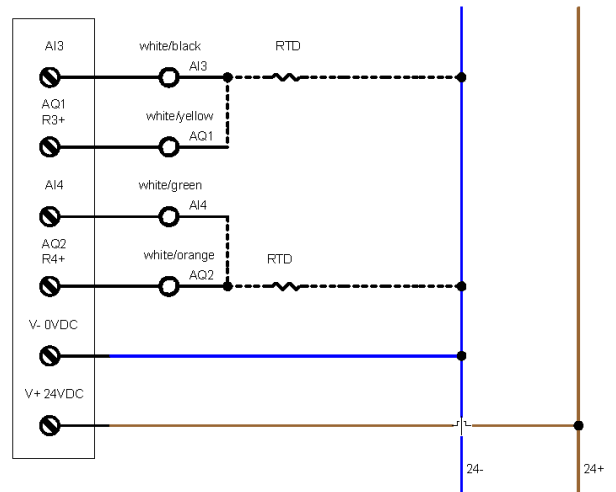


2.3: Analog

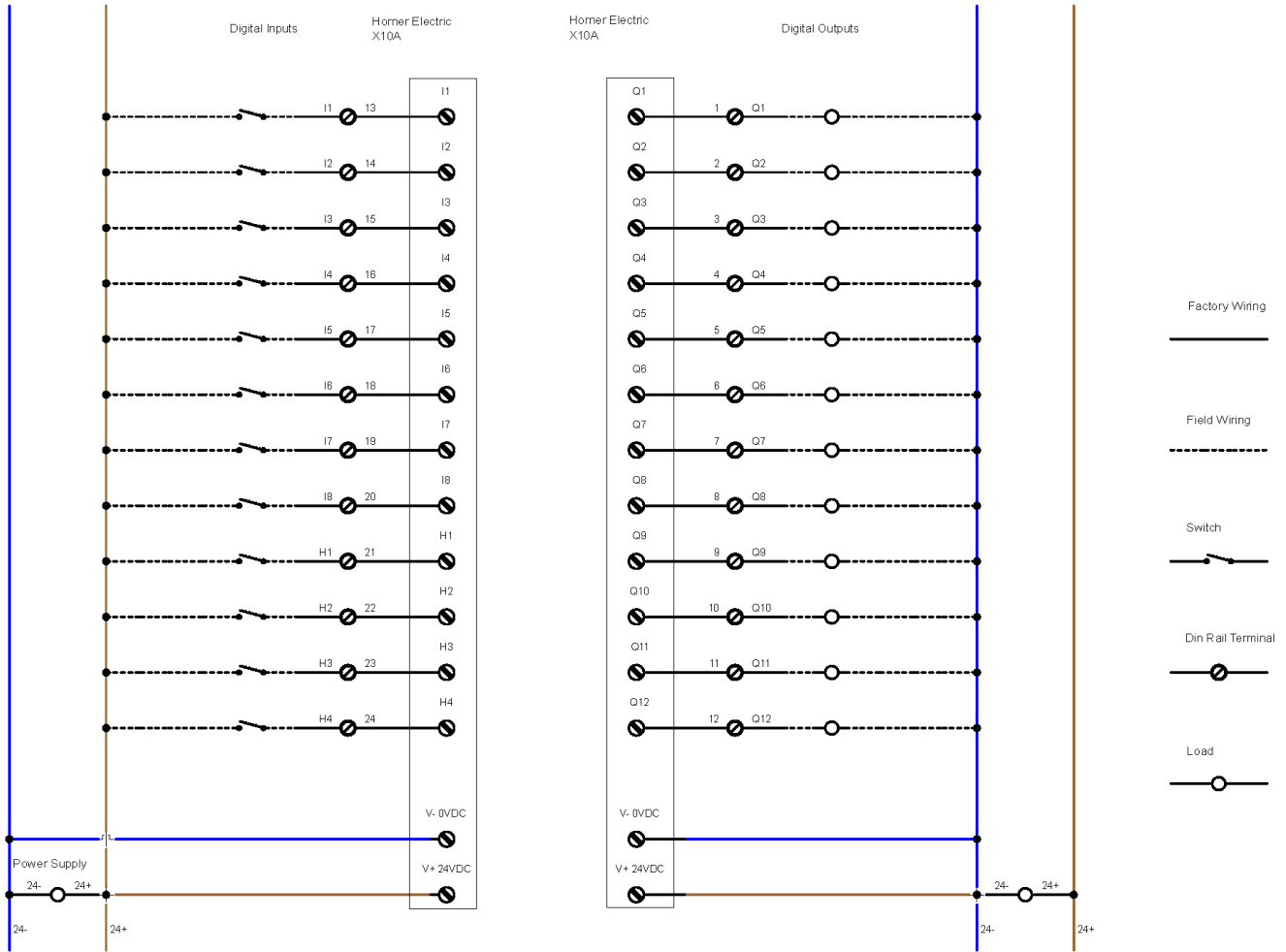


Horner Electric X10A

2 RTD Inputs
(using 2 analog output terminals)



2.4: Digital

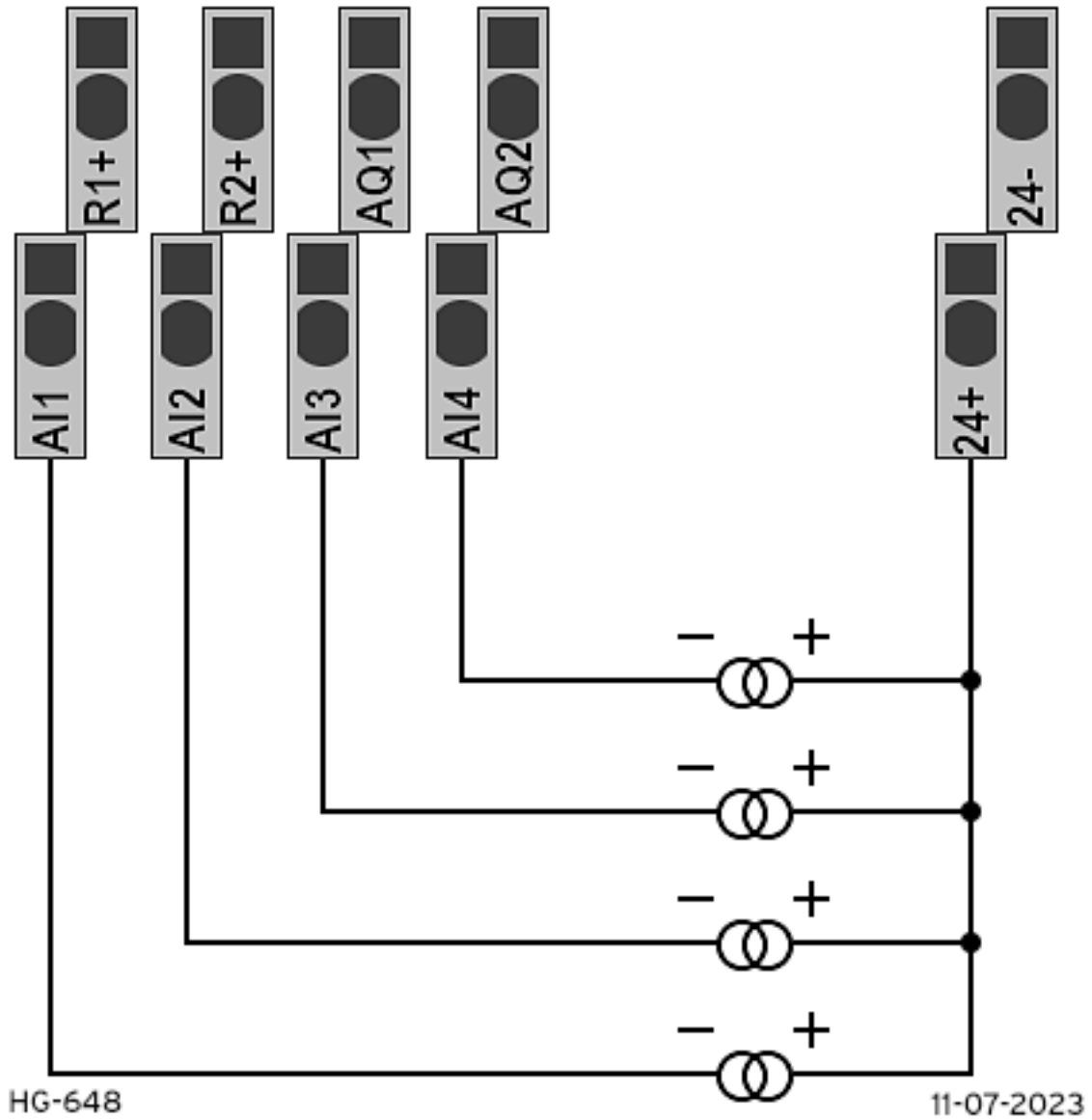


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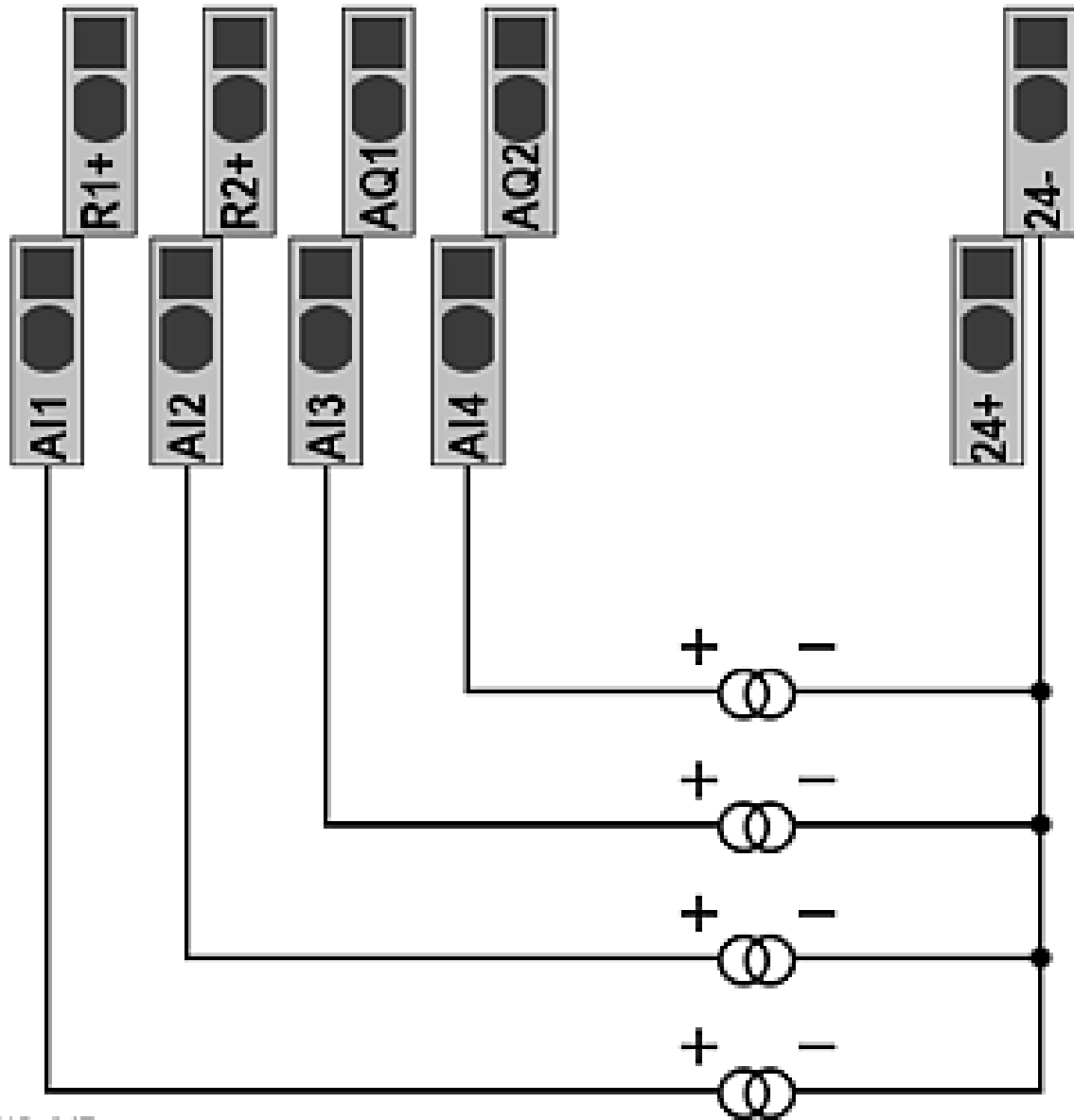
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2.5: Wiring Examples

2.5.1: 4-20mA Not Self-Powered



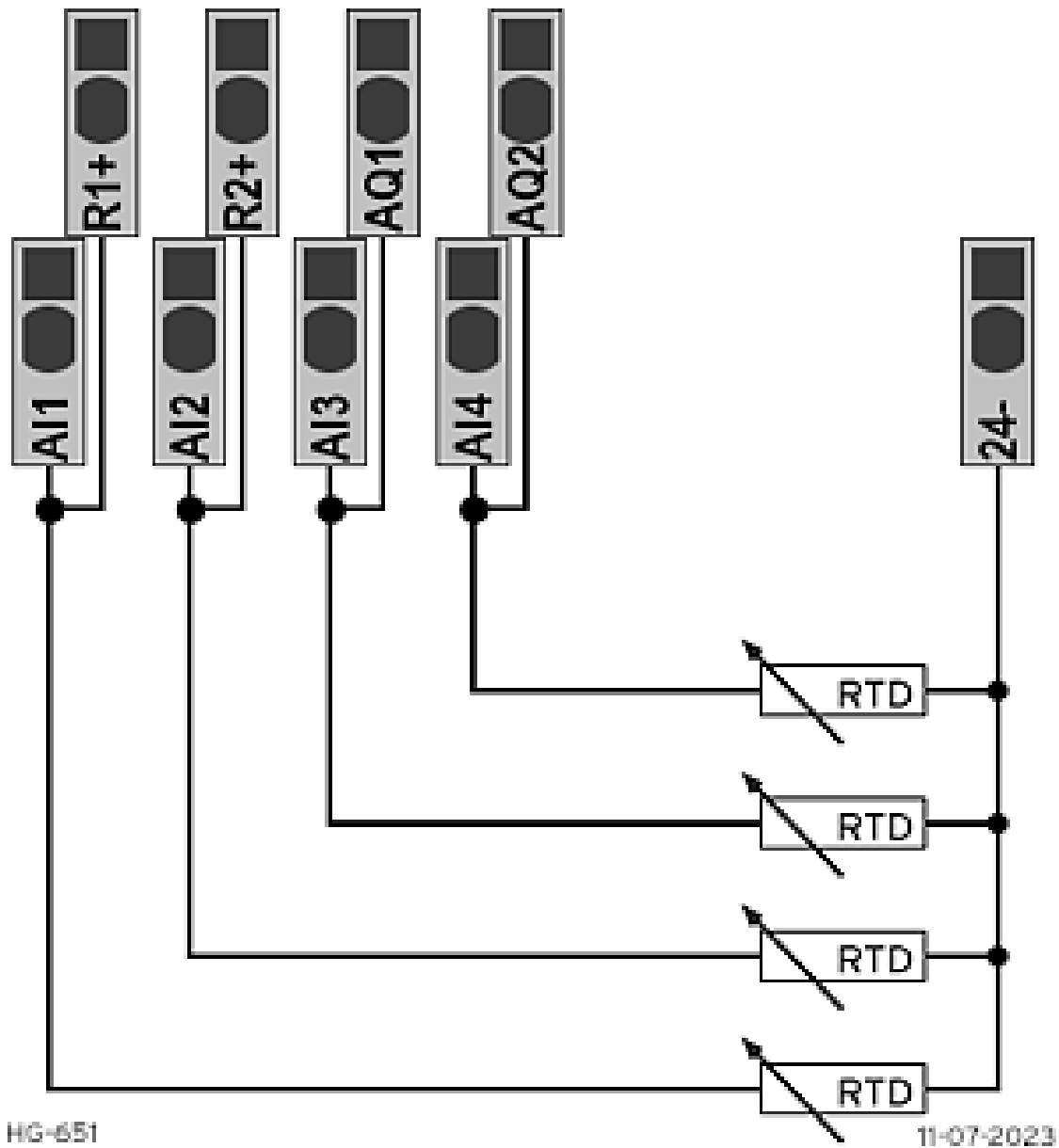
2.5.2: 4-20mA Self-Powered



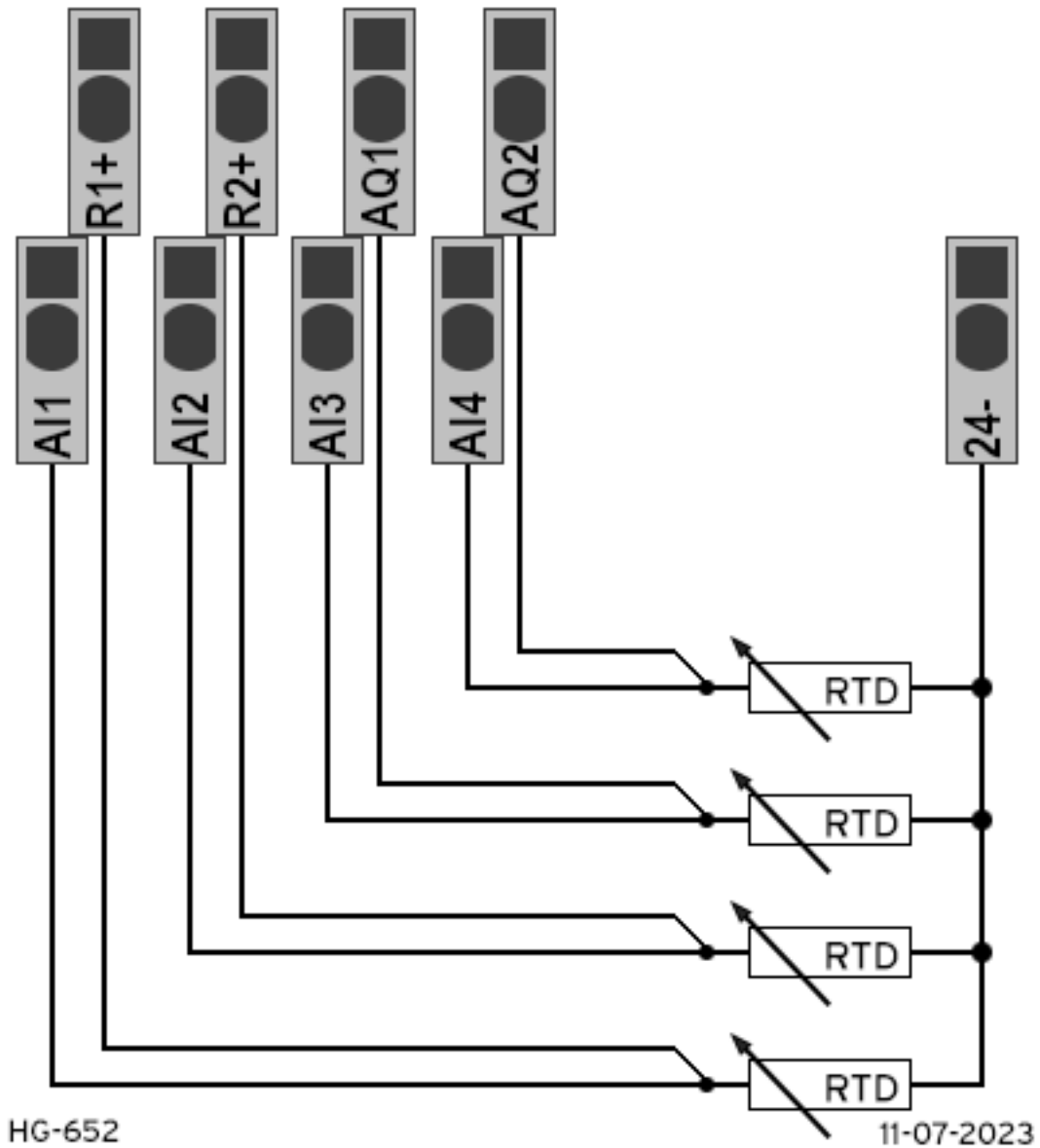
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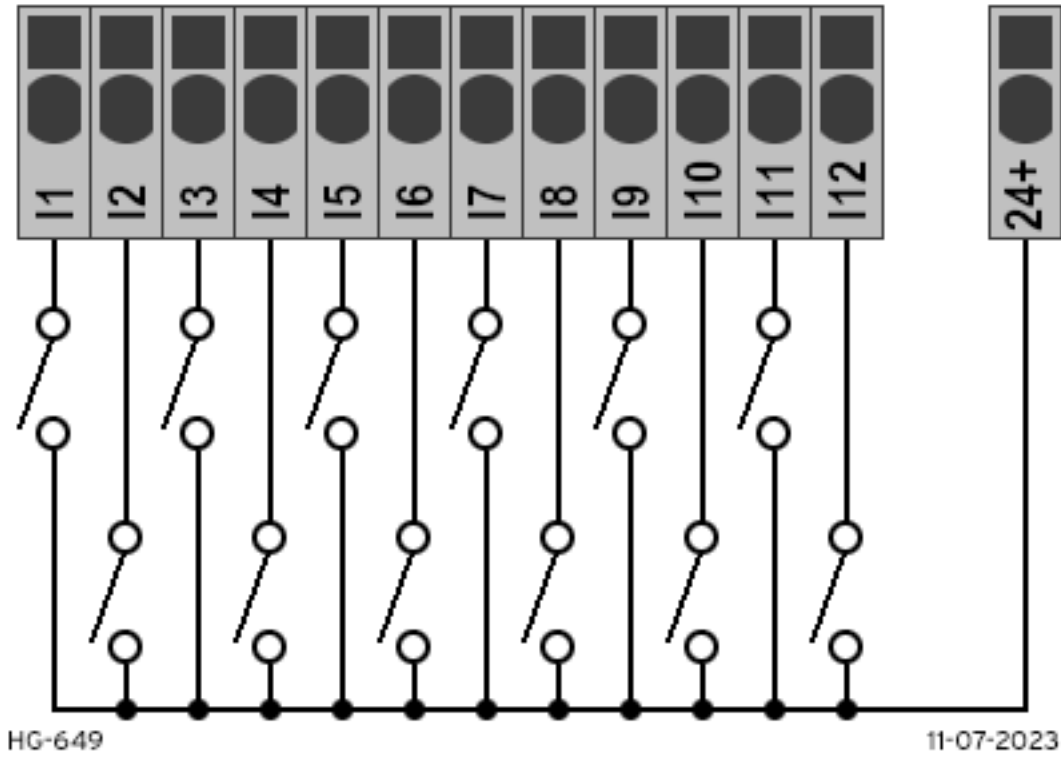
2.5.3: RTD 2-Wire



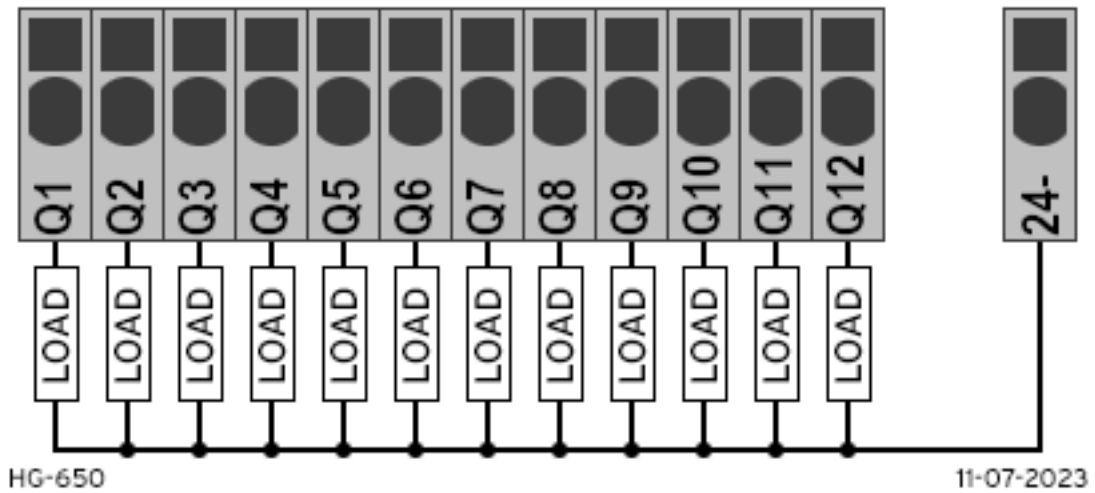
2.5.4: RTD 3-Wire



2.5.5: Digital Inputs



2.5.6: Digital Outputs



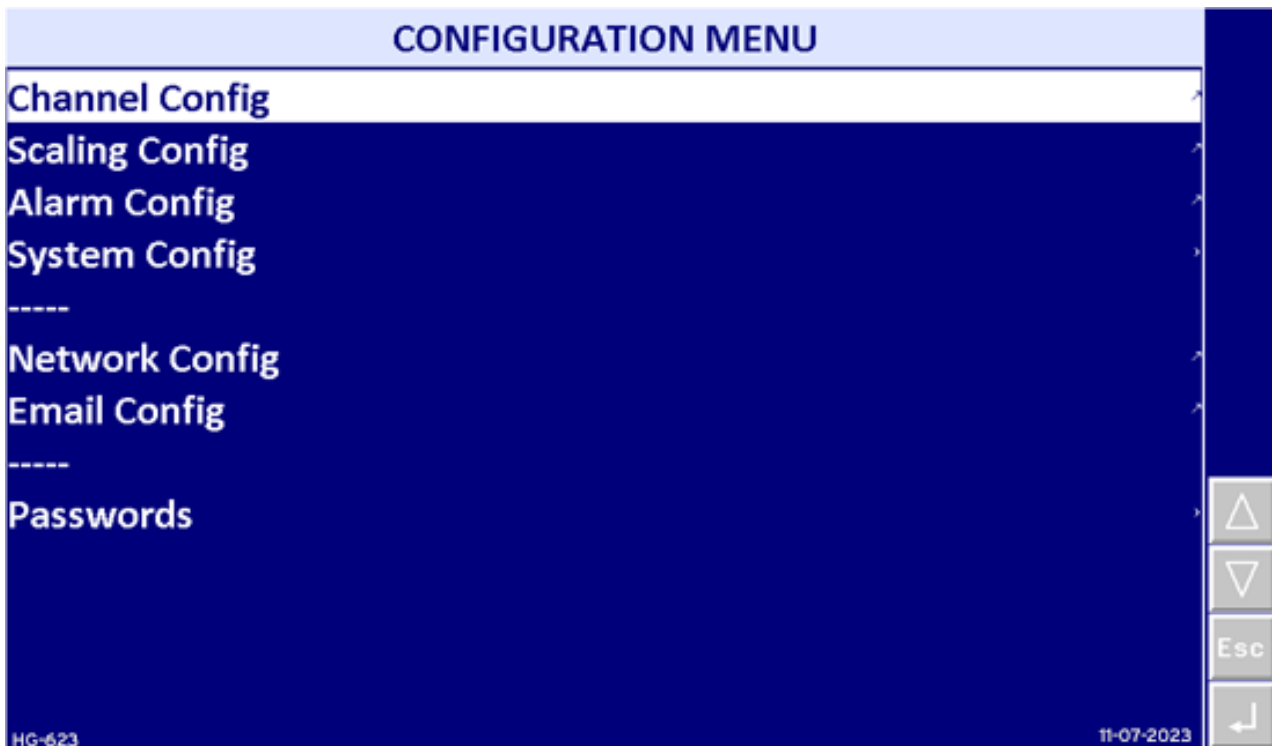
Configuration



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Initially, Chart Recorder configuration is not password protected until passwords are enabled. Pressing the gear icon from any screen where it is available brings up the main Configuration Menu. Touch the selection or use the up/down arrow keys to highlight the item, then press the ↵ button at the bottom-right corner.



3.1: Channel Configuration

DATA NAME:		TYPE	SOURCE	INTERVALS	CHANNELS
INLET PRESSURE		DISABLE 4-20mA PT100	ANALOG 1 ANALOG 2 ANALOG 3 ANALOG 4	DATALOG 30 sec	
°C °F	UNITS: PSI			AVERAGE 30 sec	
DATA NAME:		TYPE	SOURCE	INTERVALS	↑ ↓
TANK LEVEL		DISABLE 4-20mA PT100	ANALOG 1 ANALOG 2 ANALOG 3 ANALOG 4	DATALOG 30 sec	
°C °F	UNITS: %			AVERAGE 30 sec	
DATA NAME:		TYPE	SOURCE	INTERVALS	🔔
INLET TEMPERATURE		DISABLE 4-20mA PT100	ANALOG 1 ANALOG 2 ANALOG 3 ANALOG 4	DATALOG 30 sec	
	UNITS: °C			AVERAGE 30 sec	
DATA NAME:		TYPE	SOURCE	INTERVALS	↩
OUTLET TEMPERATURE		DISABLE 4-20mA PT100	ANALOG 1 ANALOG 2 ANALOG 3 ANALOG 4	DATALOG 30 sec	
	UNITS: °C			AVERAGE 30 sec	
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The channel configuration provides selection of the type of channel: Disabled, 4-20mA, or PT100 (RTD). Any selection other than 'Disabled' provides selection of the channel from which this data will come, Analog 1, Analog 2, Analog 3, or Analog 4. These numbers correspond to the actual wired input.

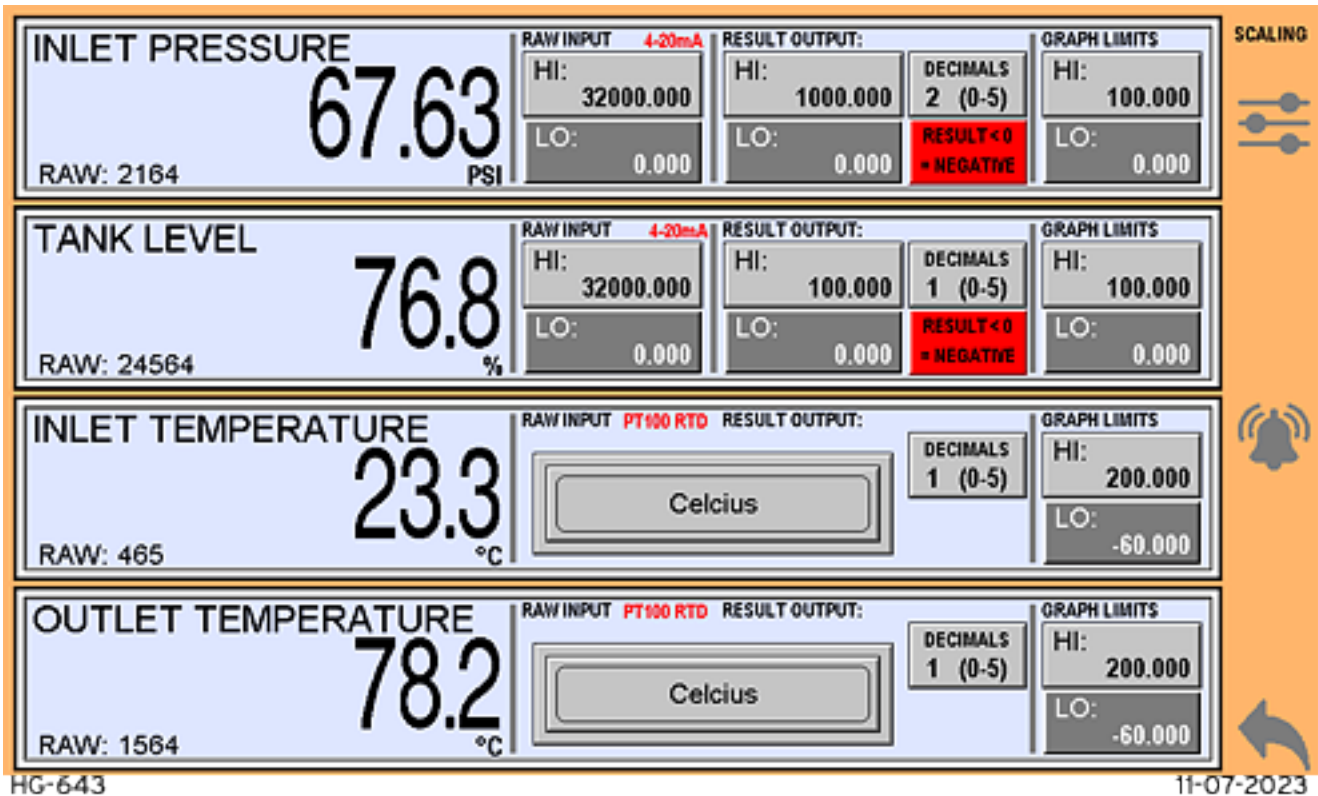
The data is given a name for display and datalogging, up to 19 characters. If the type is 4-20mA, the Units can be specified as up to 7 ASCII characters. Shortcut keys to enter either "°C" or "°F" are provided since there is not a degree character available from the built-in keyboard. If the type is PT100, the units become either "°C" or "°F" depending on the selection in the Scaling Config and is not further editable.

The datalog interval sets the interval at which a new entry will be made in this channel's datalog file. Each channel has a separate datalog file. Additionally, all channels are logged into a single datalog file. The interval of the "All Channels" datalog is that of the shortest interval of all enabled channels. The datalog interval minimum is 3 seconds, the maximum is 9999 seconds.

Each channel is averaged, both over the course of a calendar day and over the course of a Recording. The average interval sets the interval at which the data is sampled to be added into the average. Averaging can be done at intervals from 1 to 9999 seconds.

Navigation directly to the Scaling Config is done using the double-arrows icon on the righthand side. A return to the main Configuration Menu is available via the back arrow icon.

3.2: Scaling Configuration



Variable	Raw Input	Result Output	Decimals	Graph Limits
INLET PRESSURE (67.63 PSI)	4-20mA, HI: 32000.000, LO: 0.000	HI: 1000.000, LO: 0.000	2 (0-5)	HI: 100.000, LO: 0.000
TANK LEVEL (76.8 %)	4-20mA, HI: 32000.000, LO: 0.000	HI: 100.000, LO: 0.000	1 (0-5)	HI: 100.000, LO: 0.000
INLET TEMPERATURE (23.3 °C)	PT100 RTD	DECIMALS 1 (0-5)	HI: 200.000, LO: -60.000	Unit: Celcius
OUTLET TEMPERATURE (78.2 °C)	PT100 RTD	DECIMALS 1 (0-5)	HI: 200.000, LO: -60.000	Unit: Celcius

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The scaling configuration allows for the incoming raw signal to be scaled to the meaningful data displayed, trended, and datalogged. The data is shown on the left as defined by the scaling on the right. It is also shown in its raw format. For 4-20mA signals, the raw data is in the range from 0-32000; 0 = 4mA, 32000 = 20mA

By default, the scaling is set to take the raw 0-32000 data and scale it to 0-100 data. It is recommended to adjust the Result Output 'HI' and 'LO' settings to the sensor's high and low ranges. For example, if a pressure transducer has a range of 0-50psi, set the Result Output 'HI' to 50 and 'LO' to 0.

Adjusting the Raw Input 'HI' and 'LO' can be helpful in bringing a reading closer to actual field readings, especially in conjunction with the raw data value. For example, if it is known that there is no pressure in the system, yet the data reports something non-zero, adjust the Raw Input 'LO' to match the raw data to zero the data reading.

The 'HI' and 'LO' values do not act as data limits. The result will extend above the 'HI' setting and below the 'LO' setting if the raw data exceeds its 'HI' and 'LO' settings.

For PT100 RTD inputs, the only scaling selection is whether the result is in Celsius or Fahrenheit.

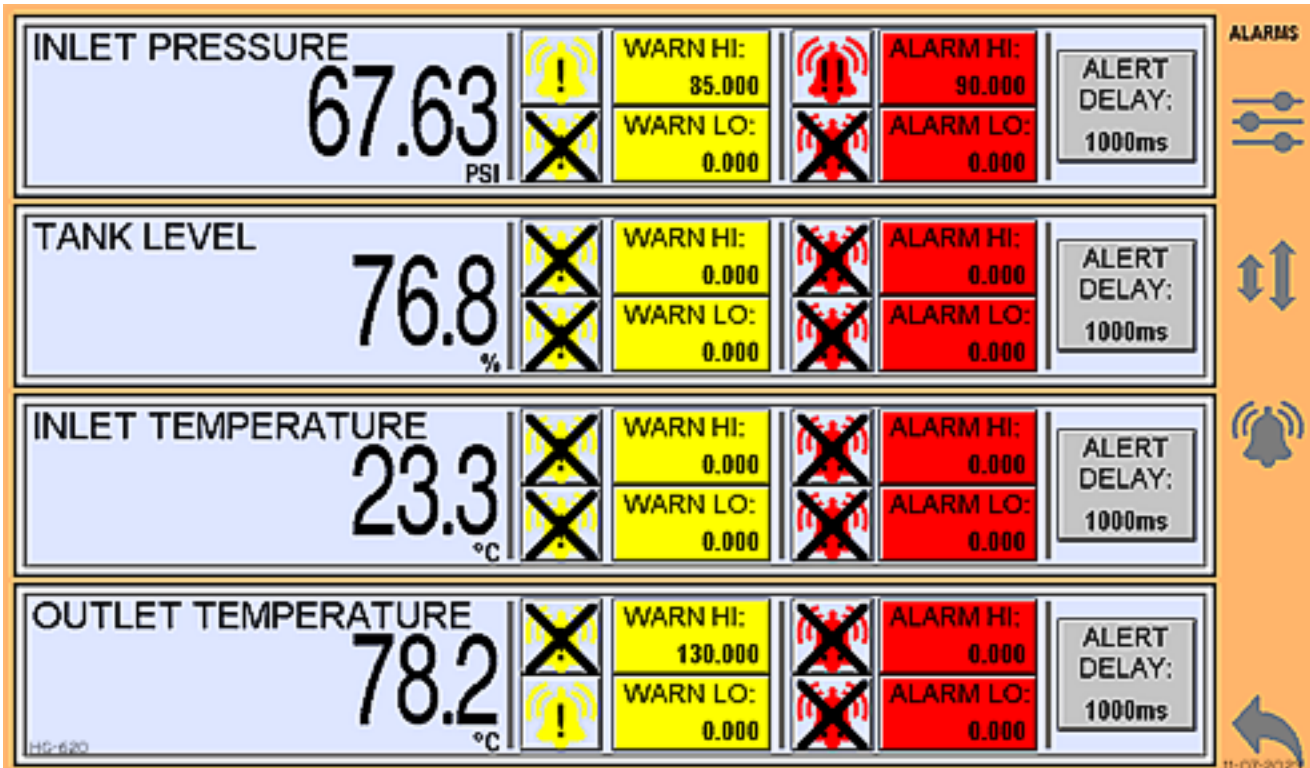
The number of decimals displayed can be specified from 0 to 5. This does not affect datalogging, which will always be in IEEE 754 Floating Point format. For display purposes, it is recommended to minimize decimal places to reduce perceived inaccuracies due to fluctuation in the numeric data displayed.

The 'Result < 0' option determines the result output when scaling settings cause a negative result. 'Result < 0 = Negative' will allow the result to remain negative as scaled. 'Result < 0 = Zero' will zero the reading output if the scaling result is negative.

The Graph Limits are the range shown on trends, bar graphs, and meters that are available as the main displays. Subdivisions are automatically calculated based on these limits.

Navigation directly to the Signal Config is done using the slider knobs icon on the righthand side. A return to the main Configuration Menu is available via the back arrow icon.

3.3: Alarm Configuration



The alarm configuration allows for up to 4 setpoints per data point that are then enunciated as either a warning or an alarm. The scaled data is shown to the left. Each of the 4 setpoints can be enabled or disabled with toggle buttons next to the setpoint, an “X” through the alarm bell icon being a disabled setpoint. A delay, in milliseconds, is configurable that applies to all setpoints for a given data point.

WARN HI and WARN LO are enunciated by a yellow alarm bell icon with a single exclamation point. Additionally, data points will be highlighted with a yellow surround and bar graph fills will become yellow instead of the default blue. If both the warning and alarm setpoints are exceeded by either a LO or HI setting, the warning is cancelled in favor of the alarm.

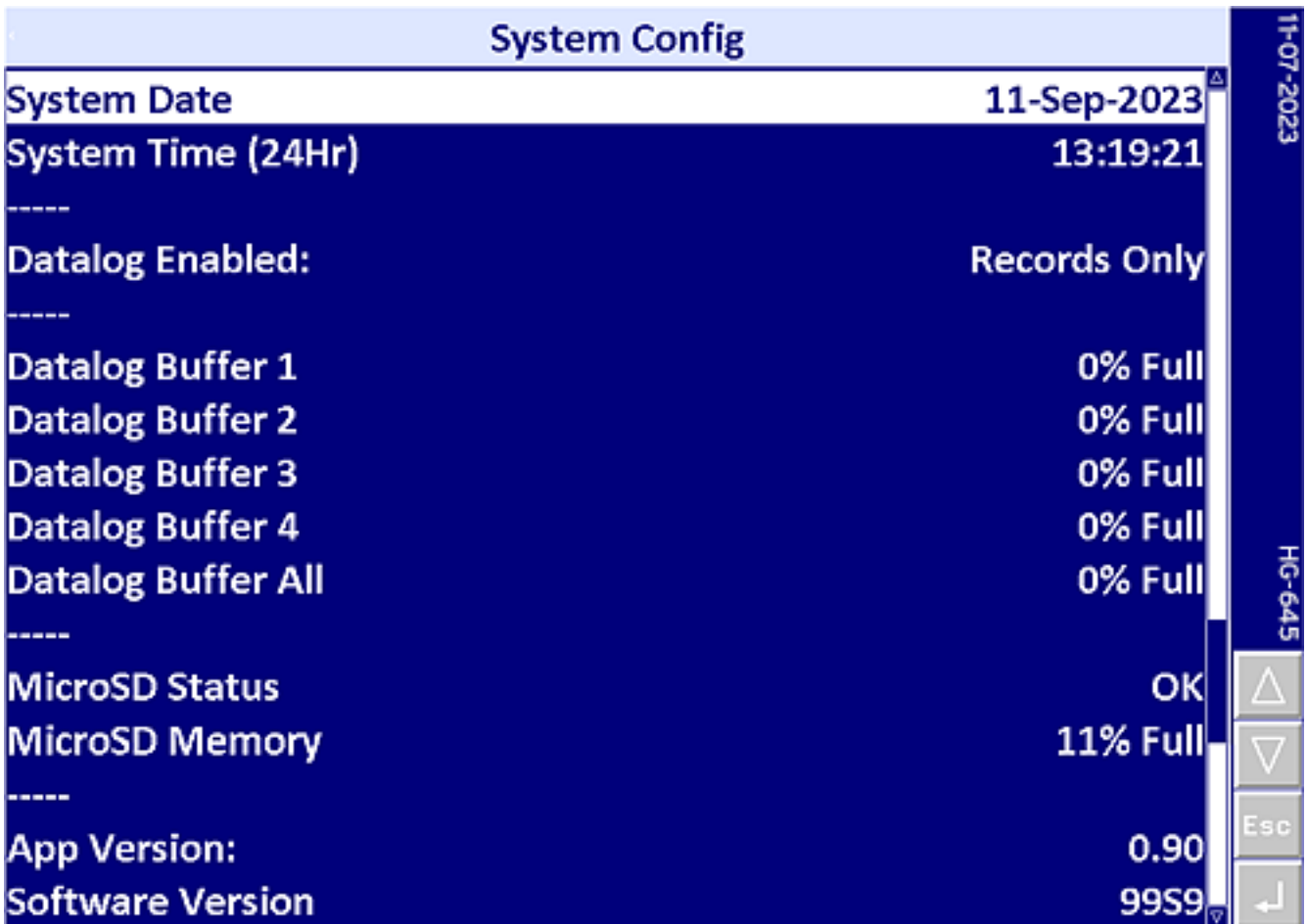
ALARM HI and ALARM LO are enunciated by a red alarm bell icon with double exclamation points. Additionally, data points will be highlighted with a red surround and bar graph fills will become red instead of the default blue. Alarms for any LO or HI setting take precedence over warnings.

The alarm bell is visible on most screens on the righthand side. When there are no warnings or alarms, it is a grey alarm bell icon. If a warning or alarm should become active, the icon changes color and appears as mentioned above. The alarm icon will flash until the warning or alarm has been acknowledged, at which point it will stay a solid warning/alarm color or return to the grey inactive state. Should both warnings and alarms be active at the same time, the icon will switch between the warning and alarm states.

The alarm bell icon also acts as touch navigation to the Events interface where warnings and alarms can be acknowledged, and a history of events can be accessed.

Alarms that are not configurable are system alarms having to do with the MicroSD card, which is integral to the operation of the Chart Recorder. Should the MicroSD card be removed or have any sort of error, an alarm occurs and a MicroSD icon with a red "X" through it appears at the top right of many screens. Additionally, should the MicroSD card become 80% full or more, or if any of the internal datalog buffers become 60% full or more, an alarm occurs.

3.4: System Configuration



The System Configuration allows for changing of the system Time and Date.

Non-Record datalogging can be enabled or disabled.

Status is shown for each of the internal datalog buffers that can hold roughly 100 entries each. These buffers are populated when a datalog interval occurs, then written to MicroSD and removed from the buffer. Buffer status should normally be at 0% full. Numbers higher than 0% can indicate a slow or missing MicroSD card. Replacing the MicroSD card will allow the buffers to eventually reduce back to 0% full.

Status of the MicroSD card itself is shown. "ERROR" includes missing, bad format, or any other error causing the MicroSD card not to be recognized.

The App version and Software version are noted for technical support purposes.

3.5: Network Configuration

Network and Time Configuration

Network Addresses

IP Address
192.168.254.1

Network Mask
255.255.255.0

Gateway Address
192.168.254.254

Network Test

Ping Address
0.0.0.0

Ping Response: **-1ms**

System Time and Date

Time
13:20:12

Date
11-Sep-2023

Network Status


● Link: 100Mbps, Full Duplex


● TX Connections: 0


● RX

11 SEP
13:20:13


●







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The Network Configuration is where the settings for an Ethernet connection are specified. DHCP automatic addressing is not available and facility IT personnel should be consulted for proper network settings.

The network can be used for the following operations:

Protocol	Use	Ports
FTP	Transfer datalog files from MicroSD	TCP 20/21
Modbus TCP Server	Monitor Readings remotely	TCP 502
Ethernet/IP Server	Monitor Readings remotely	UDP 2222 / TCP 44818
Web Server	Interface with Web Browser	TCP 80
Email SMTP	Email Notifications and Datalogs	TCP 25 / 465 / 587
Email DNS	Email server lookup	UDP 53




Network Connection Status is provided as well as a Ping function for a simple communications check.

The Mail icon navigates to the Email configuration, the back arrow to the main Configuration Menu.

3.6: Email Configuration

Email Server Configuration and Status

Email Account Address: ChartRec@some.server.com	Copy Email Address	Status and Troubleshooting Bad Cfg ● TX Error ● Bad IP/Port ● UDP Error ● Socket Err ● DNS Error ● Bind Err ● DNS Timeout ● Conn TO ● SMTP T.O. ● TX Buff Err ● SMTP Error ● SMTP Error Code: 0 SMTP Error State: --- Ping Address: 8.8.4.4 Ping Response: 23ms
Username: (Use Button to Copy Above) -----> ChartRec@some.server.com	to USERNAME	
Password: notthepassword	DNS IP Address 8.8.4.4	
SMTP Server: smtp.someco.com	SMTP Port 587	

EMAIL NOTIFICATION	<table style="width: 100%;"> <tr> <td style="width: 50%; padding: 2px;"> Email Records ENABLED </td> <td style="width: 50%; padding: 2px;"> Email Events ENABLED </td> </tr> <tr> <td style="padding: 2px;"> Attach Record Files (Less than 1000 Entries Only) <input type="button" value="DISABLED"/> </td> <td style="padding: 2px;"> <table style="width: 100%;"> <tr> <td style="padding: 2px;">Send Records to Address 1: jimmyt@bogstandard.com</td> <td style="padding: 2px;">Send Alerts to Address 1: billyg@bogstandard.com</td> </tr> <tr> <td style="padding: 2px;">Send Records to Address 2:</td> <td style="padding: 2px;">Send Alerts to Address 2:</td> </tr> <tr> <td style="padding: 2px;">Send Records to Address 3:</td> <td style="padding: 2px;">Send Alerts to Address 3:</td> </tr> </table> </td> </tr> </table>	Email Records ENABLED	Email Events ENABLED	Attach Record Files (Less than 1000 Entries Only) <input type="button" value="DISABLED"/>	<table style="width: 100%;"> <tr> <td style="padding: 2px;">Send Records to Address 1: jimmyt@bogstandard.com</td> <td style="padding: 2px;">Send Alerts to Address 1: billyg@bogstandard.com</td> </tr> <tr> <td style="padding: 2px;">Send Records to Address 2:</td> <td style="padding: 2px;">Send Alerts to Address 2:</td> </tr> <tr> <td style="padding: 2px;">Send Records to Address 3:</td> <td style="padding: 2px;">Send Alerts to Address 3:</td> </tr> </table>	Send Records to Address 1: jimmyt@bogstandard.com	Send Alerts to Address 1: billyg@bogstandard.com	Send Records to Address 2:	Send Alerts to Address 2:	Send Records to Address 3:	Send Alerts to Address 3:	  
Email Records ENABLED	Email Events ENABLED											
Attach Record Files (Less than 1000 Entries Only) <input type="button" value="DISABLED"/>	<table style="width: 100%;"> <tr> <td style="padding: 2px;">Send Records to Address 1: jimmyt@bogstandard.com</td> <td style="padding: 2px;">Send Alerts to Address 1: billyg@bogstandard.com</td> </tr> <tr> <td style="padding: 2px;">Send Records to Address 2:</td> <td style="padding: 2px;">Send Alerts to Address 2:</td> </tr> <tr> <td style="padding: 2px;">Send Records to Address 3:</td> <td style="padding: 2px;">Send Alerts to Address 3:</td> </tr> </table>	Send Records to Address 1: jimmyt@bogstandard.com	Send Alerts to Address 1: billyg@bogstandard.com	Send Records to Address 2:	Send Alerts to Address 2:	Send Records to Address 3:	Send Alerts to Address 3:					
Send Records to Address 1: jimmyt@bogstandard.com	Send Alerts to Address 1: billyg@bogstandard.com											
Send Records to Address 2:	Send Alerts to Address 2:											
Send Records to Address 3:	Send Alerts to Address 3:											

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The Email Configuration allows setup of a valid SMTP mail server. An email notification can be sent upon the completion of a Record or when any Warning or Alarm event occurs. A switch to enable either or both emails is provided.

In the case of Records, files can be attached to the e-mail if the number of entries during the Record did not exceed 1000. Files with greater than 1000 entries exceed the size of the controller’s ability to attach files. In this case, an e-mail will be sent with a note that files were not attached due to this limitation. Files remain available on the MicroSD card regardless of being sent or not.

Up to 3 addresses can be specified for each type of e-mail. Leave address fields blank if not filling them with a valid email address.

Status and troubleshooting is provided to help with e-mail setup. A Ping address can be entered to test access to devices or servers that should be available, such as SMTP servers. A Ping response of -1 indicates a timeout of 2500ms, meaning a response was not received within 2.5 seconds.

3.7: Password Configuration

The Password Configuration allows for password requirement to enter the configuration or to control recordings. The Record password cannot be enabled without also enabling the Config password.

The Change Password area allows the user to freely change the Records password to any numeric value up to 9 digits. Changing the Config password requires knowledge of the existing Config password and double-entry of the new password.

Default Config password: 12345

Default Record password: 789

Passwords

Config PW Required	DISABLED
Record PW Required	DISABLED

Change Passwords	>

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Navigation: Up, Down, Esc, Enter

Change Passwords

Records Password	*****

Change Admin PW:	
- Enter Admin PW	*****
- Enter New PW	*****
- Confirm New PW	*****
--- Change Admin PW	NO
--- Change PW Status	Waiting for YES...
View Passwords	>

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Navigation: Up, Down, Esc, Enter

Chart Recorder Operation



Chapter 4: Chart Recorder Operation

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4.1: Main Displays

Main displays allow a selection for the format in which to view the data points. Each of the main displays has a common bar along the righthand side of the screen.

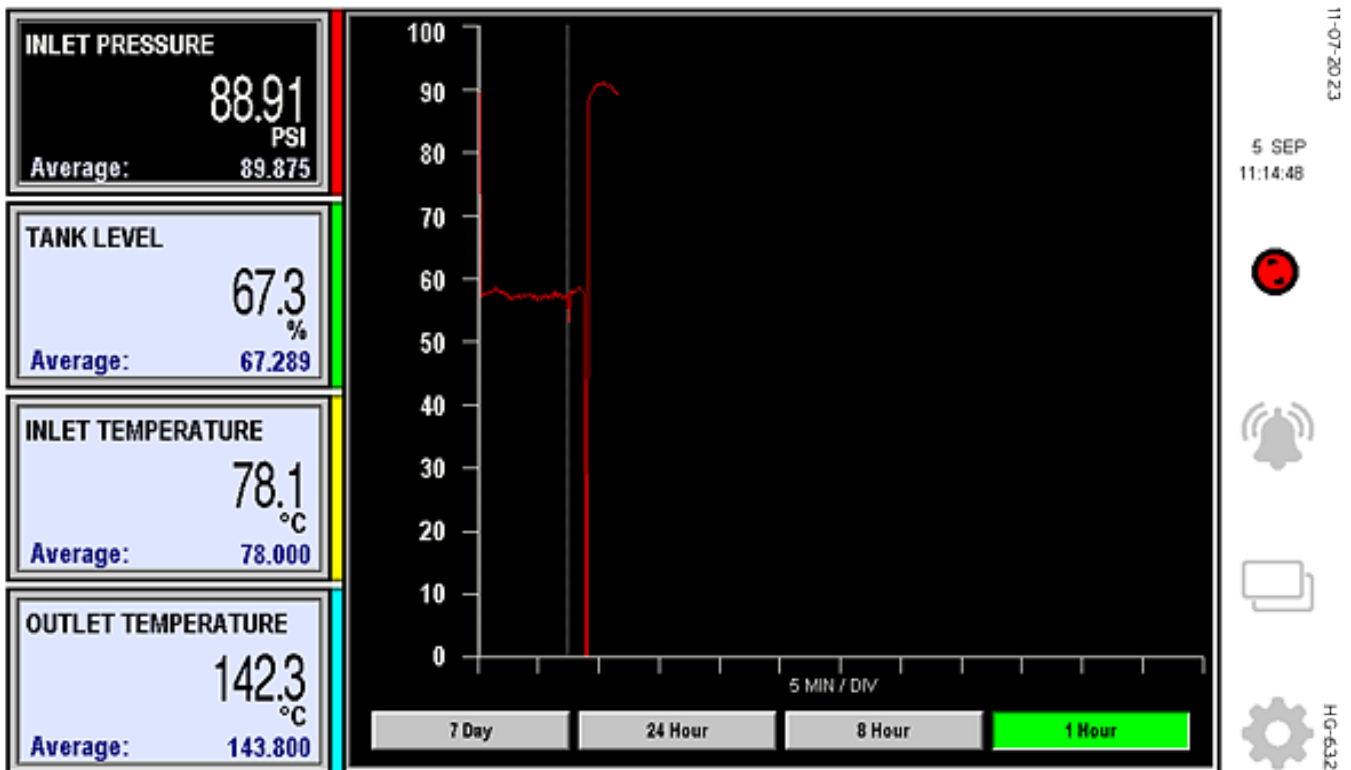
- Current Date and Time
- Record button
 - Starts or stops a recording or views the progress of the recording. If passwords are enabled, a password prompt precedes any access to recording control.
 - Shows dark red only if no recording is active and datalogging is set to Records Only.
 - Flashes between dark/bright red if no recording is active and datalogging is set to Always Plus Records to indicate logging.
 - Appears as a spinning tape reel if a recording is active.
 - A small clock icon and green or red timers or times may also display if delayed or time-based recordings are set.
 - Green highlights mean a recording is set to automatically start in the future.
 - Red highlights mean a recording is active and set to automatically end in the future.
- Warning/Alarm button
 - Accesses the Events screen where Warnings and Alarms can be viewed and acknowledged. A history of events is also available.
 - The Alarm bell icon will flash Yellow with 1 exclamation point for Warnings.
 - The Alarm bell icon will flash Red with 2 exclamation points for Alarms.
 - If both Warnings and Alarms are active, the Alarm bell icon will alternate between Yellow and Red.
 - By accessing the Events screen and Acknowledging all active Warnings and Alarms, the Alarm bell icon will stop flashing except when both Warnings and Alarms are active, in which case it will alternate between Yellow and Red.

- Display button
 - Cycles through the four types of main display
- Configuration button
 - Pressing this button will access the configuration. If passwords are enabled, a password prompt precedes the configuration menu.

Common data on all main displays is as follows:

- Data points; Name, Scaled Output, and Units
- Averages shown are daily averages unless a Recording becomes active.
- Recording averages are shown during recordings, though daily averages continue to calculate.
- Daily averages are reset at midnight.
- If a configured Warning or Alarm level has been exceeded, the corresponding signal will be highlighted in either Yellow or Red.

4.1.1: Trend



The Trend main display allows viewing of any of the configured signals on its own trend graph. All configured data points are shown down the left side of the screen. The data point currently being displayed as a trend is reverse-highlighted in black. Touching any of the rectangular data point areas results in a change in the trend displayed to the touched signal. The signal color swatch matches the trend pen color for that data.

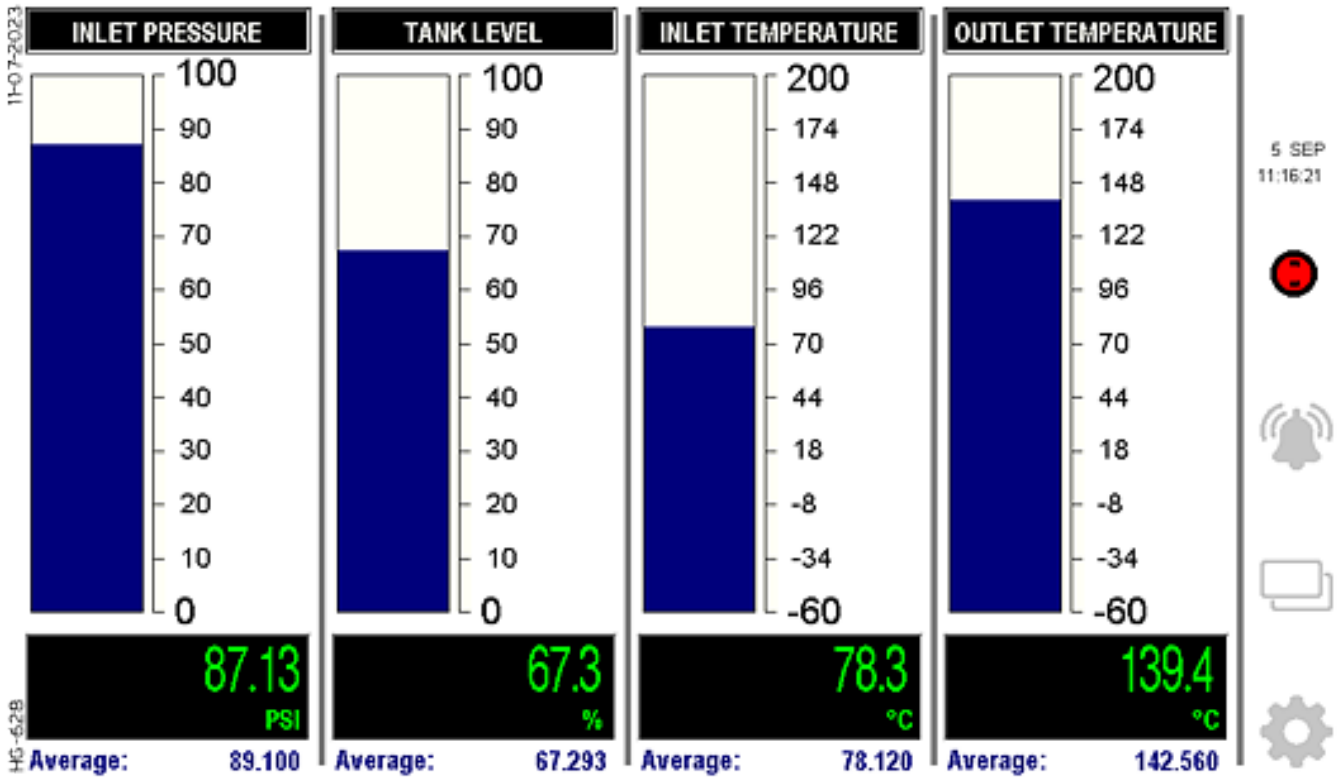
The Y-Axis legend shows the data point Graph Limits as configured in the Scaling Configuration. 9 even divisions between the configured HI and LO points are calculated and displayed.

The X-Axis legend area allows a choice between four time spans ranging from 1 hour to 7 days.

A vertical, grey dotted line in the trend area represents a power outage.

All Trend data is recorded to MicroSD, regardless of config options set. See the MicroSD Chapter for details on these files.

4.1.2: Bar Graph

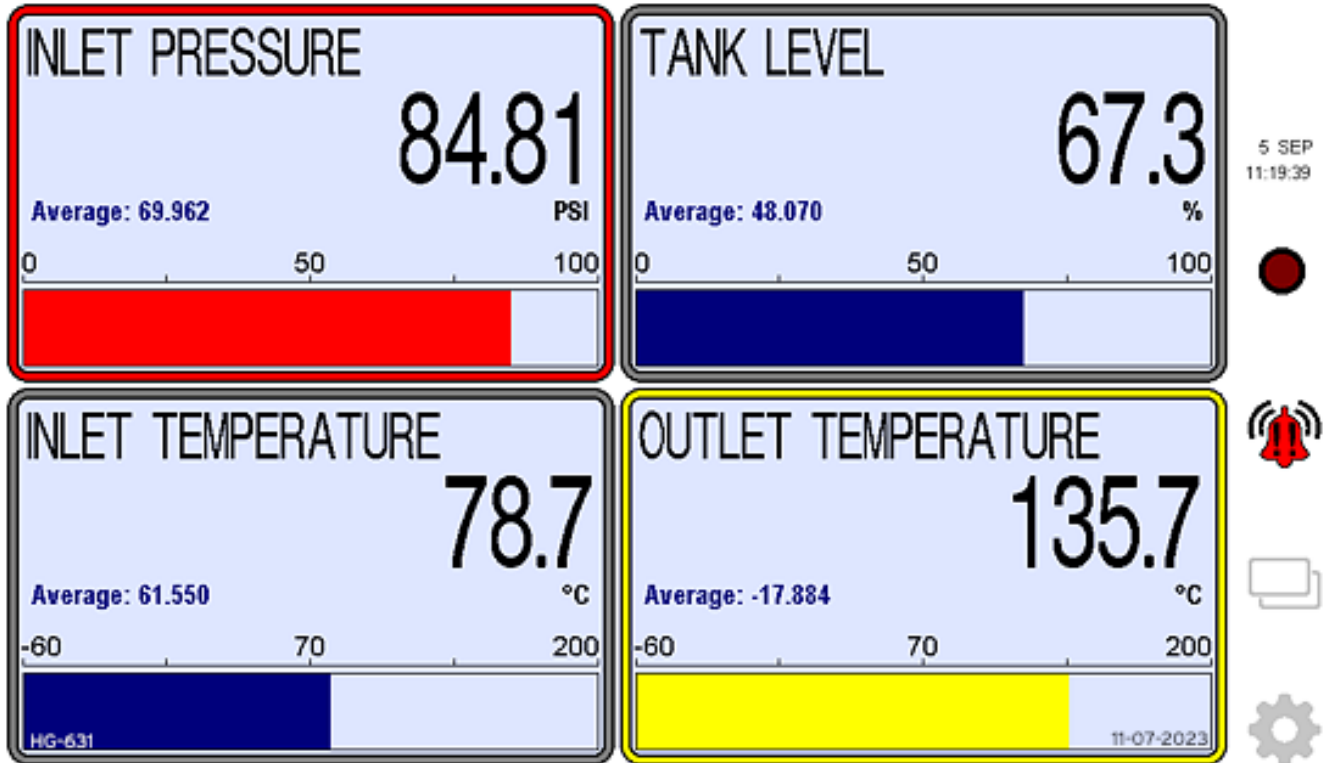


The Bar Graphs main display allows viewing of all signals both numerically and graphically. The Graph Limits of each data point are displayed, with 9 calculated subdivisions for each.

The bar graph fill color will change to reflect any active Warning or Alarm with any given data point, yellow for Warnings and red for Alarms.

Continued on Next Page

4.1.3: Quadrants

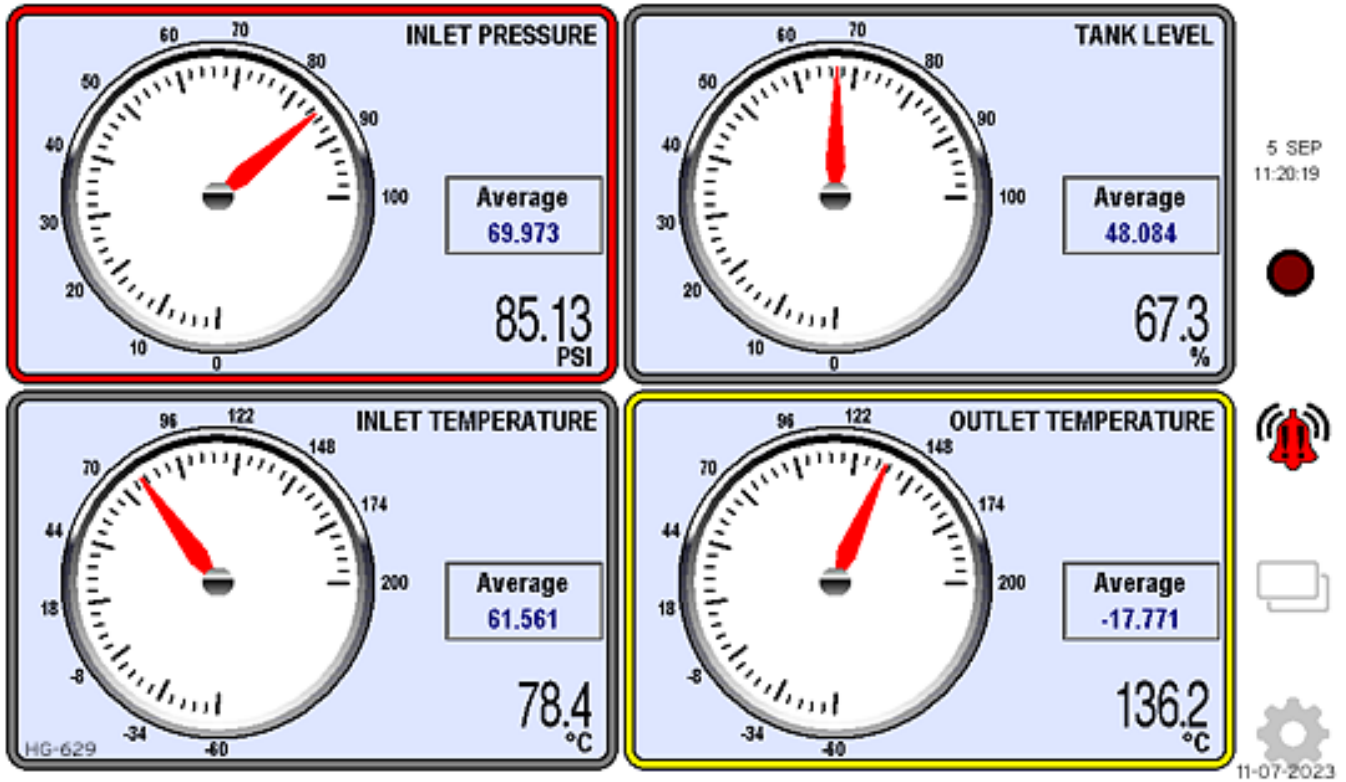


The Quadrants main display emphasizes the size of the scaled data points. Bar Graphs are displayed but smaller and with only Min, Max, and halfway divisions to reduce clutter.

In addition to a highlighted ring around the quadrant for any Warning or Alarm, the bar graph fill color will also change for the corresponding data point.

Continued on Next Page

4.1.4: Gauges



The Gauges main display is split into quadrants and shows a large gauge face with a red needle.

Continued on Next Page

4.2: Event Record Display

Pressing the Alarm Bell icon from any page accesses the Event Record.



EVENT RECORD

12 SEP 08:49:19

- 12-Sep 08:45:32 RTN MicroSD Card Missing
- 12-Sep 08:43:12 ALM ALARM: Data 1 High
- 12-Sep 08:43:12 RTN WARNING: Data 1 High
- 12-Sep 08:49:04 ACK ALARM: Data 4 High

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The Event Record display specifies the warnings and alarms that are currently active or unacknowledged. Items that are no longer active are automatically removed from the list if they have been acknowledged.

- Items shown in Red (ALM) are active alarms that have not been acknowledged.
- Items shown in Blue (ACK) are active alarms that have been acknowledged.
- Items shown in Green (RTN) are alarms that are no longer active but that have not yet been acknowledged.

Touching the list brings up an interface where alarms can be acknowledged.

A history of the Event Record is accessed by touching the “back in time” alarm bell icon at the top of the page. Items in the History are blocked from being erased.

All events are also recorded on MicroSD. A file is newly started after midnight of each day as soon as the first event occurs. The file includes timestamped entries of events:

- Becoming active
- Being acknowledged
- Becoming inactive

Pressing the Back arrow returns to the page from which the Alarm Bell icon was pressed.

4.3: Records

A Record is some amount of time that is recorded to specifically named files. A Record Name is assigned, which becomes part of the filename when the Record is finished and closed out. The filename contains the name and a timestamp of when the Record was started.

Records can be started and/or stopped in any of the following manners:

- Manually
- On a timed basis
- Scheduled by Time and Date

The result is a file for datalogged values and another file for Events if any occurred during the Record.


Pressing the red Record button on the right side of the screen will navigate to one of several places:

Record Active	Record PW Enabled	Record Button Destination
NO	NO	Start New Record
NO	YES	Password Prompt → Start New Record
YES	NO	Record Status, immediate End Record available
YES	YES	Record Status, End Record requires password

4.3.1: Start a New Record

START NEW RECORD

System Time: 05-Sep-2023 11:13:58

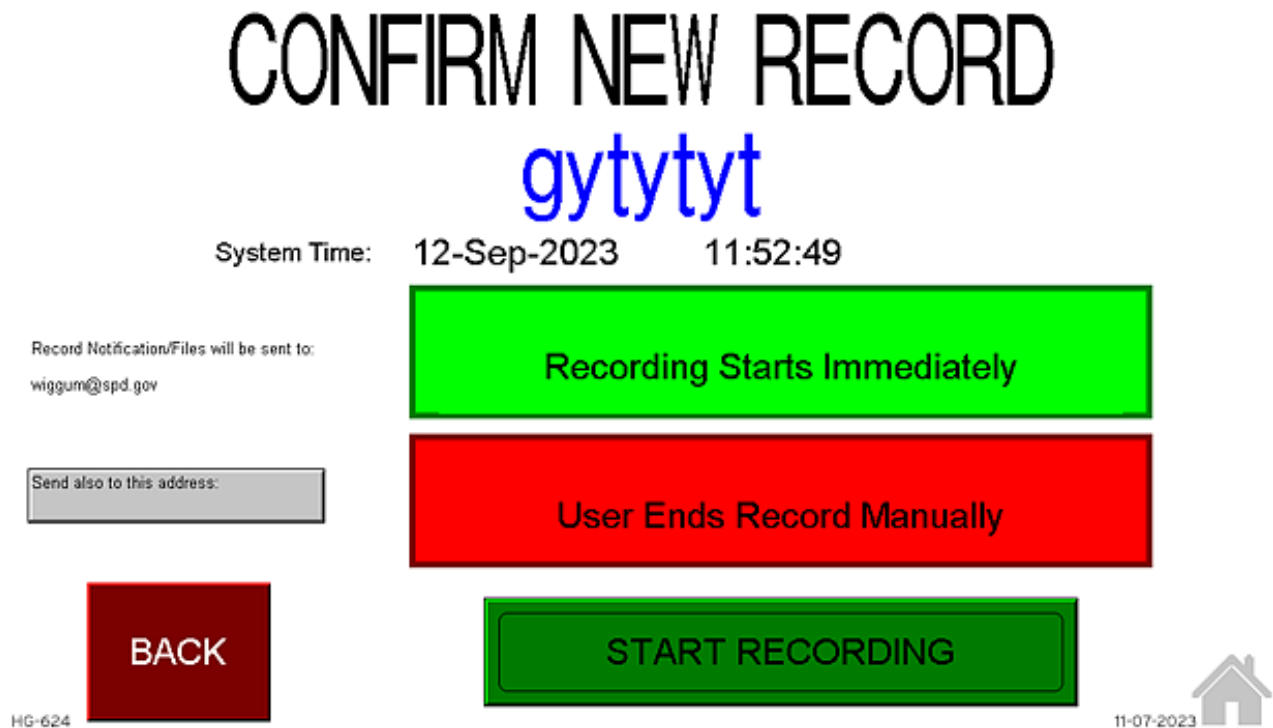
Record Name - Tap to edit or select History entry: <div style="text-align: center; font-size: 1.2em; color: blue; margin-top: 10px;">WB9PXI</div>	Start Recording: <div style="display: flex; justify-content: space-around; margin-top: 5px;"> IMMEDIATE TIMER TIME/DATE </div> <div style="background-color: green; color: white; text-align: center; padding: 5px; font-weight: bold; margin-top: 5px;">Record Starts Immediately</div>
<div style="text-align: center; margin-top: 5px;">beerplease</div>	End Recording: <div style="display: flex; justify-content: space-around; margin-top: 5px;"> MANUAL TIMER TIME/DATE </div> <div style="background-color: red; color: white; text-align: center; padding: 5px; font-weight: bold; margin-top: 5px;">User Ends Record</div>
<div style="text-align: center; margin-top: 5px;">blazinamazin</div>	<div style="background-color: green; color: white; text-align: center; padding: 10px; font-weight: bold; font-size: 1.2em;">CONFIRM RECORDING</div>
<div style="text-align: center; margin-top: 5px;">chichacheck</div>	
<div style="text-align: center; margin-top: 5px;">wdy</div>	
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To start a Record, give the Record a name by touching the 'Record Name' field and using the pop-up keyboard for entry. The last five names given are provided as a quick selection to make the new Record the same name. The result of a Record is files with this name but with a time and date appended to indicate when the Record was started. Therefore, Records given the same name will not overwrite each other.

Records can be started Immediately upon confirmation, can be delayed with a Timer, or can be started at any future Time and Date. Select the desired operation and specify valid parameters.

Records can be ended Manually, can be ended automatically after an amount of time passes after the start of the Record, or can be ended automatically at any future Time and Date as long as it is after the start of the Record. Ending a Record manually requires the user to press the Record button on any screen and confirm the end of the Record.

Once valid parameters have been entered, a confirmation screen reiterates the parameters and gives the opportunity to return to the Start New Record display to change parameters. If the option to Email records is enabled, the configured addresses are displayed to the left. An additional address can be entered for this record specifically.



When a Record starts, two of the standard datalog files are taken over. "DATAALL" files and "ALARMS" files that existed for the current day prior to the start of the Record, if any, are renamed as soon as the Record is started by adding a 2-digit running count to the filename. This 2-digit count is reset each day and allows for multiple recordings within the course of one day while keeping the non-Record files separate. Standard daily datalogging for "DATA1", "DATA2", "DATA3", and "DATA4", if enabled, continues separately during the recording process.

To keep from having multiple files split across days in cases where a Record might span the midnight hour, the standard file is renamed at midnight with the new day's standard filename so that datalogging will continue to append to the same file.

4.3.2: Record Status and End Record

Currently Recording:
gytytyt

System Time: 12-Sep-2023 13:13:20

Record Started Manually

User Ends Record Manually

Stop recording and finalize record file?

NO / EXIT

STOP RECORDING

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Currently Recording:
gytytyt

System Time: 12-Sep-2023 13:14:32

Record Started Manually

User Ends Record Manually

Password Required to End Record

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The Record Status display shows details about the Record currently running. The option is given to stop the recording process. If the Record Password is enabled, the bottom buttons shown above are replaced with a notice that a password is required to control records.

Recording Has Ended:

System Time: 05-Sep-2023 11:17:20

Data File:

[\CHARTREC\RECORDS\WB9PXI_230905-111427.csv](#)

Alarm File:

[\CHARTREC\RECORDS\WB9PXI_ALM_230905-111427.csv](#)

Recording Finished

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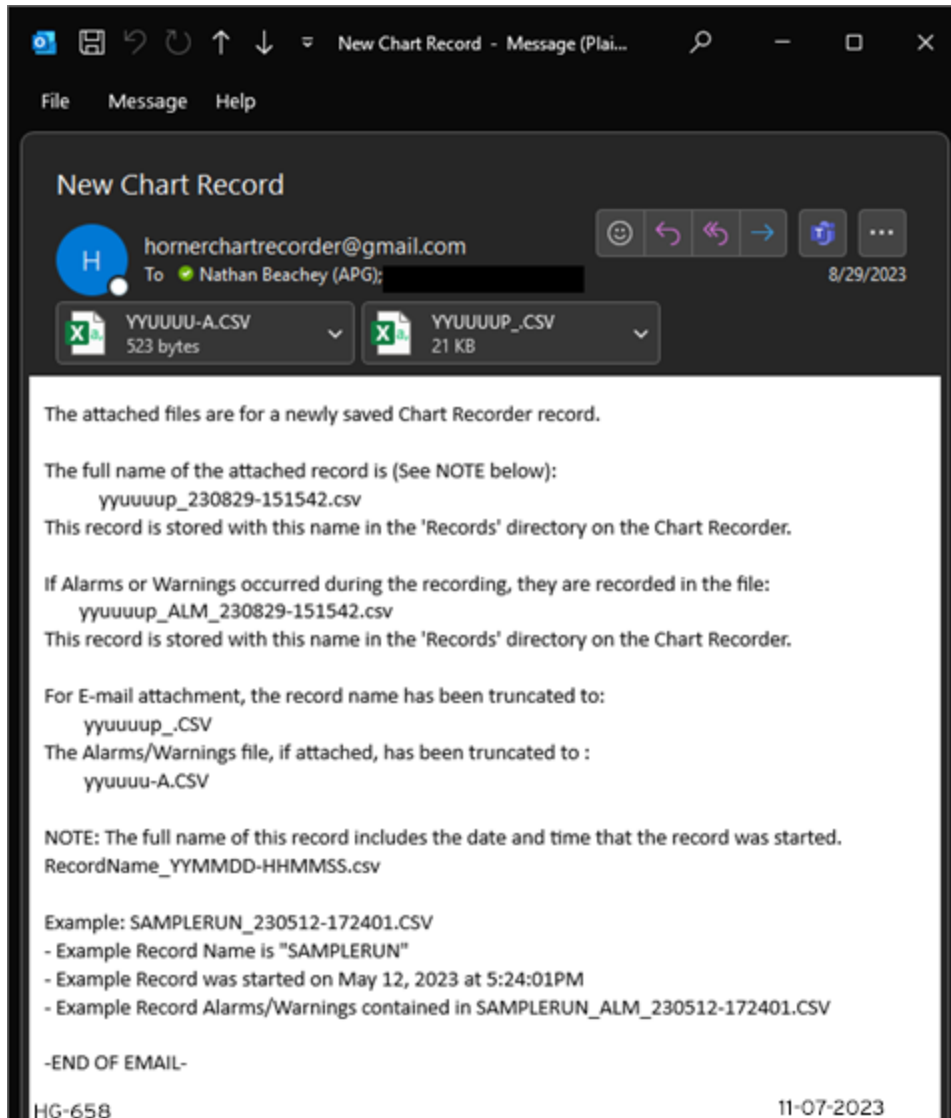


When a Record ends, the files that were populated during the recording process are renamed to include the Record Name and the date and time the Record was started. Files are placed in the "RECORDS" folder. If email is properly configured and the option to e-mail files is enabled, these files are copied to the "EMAIL" folder but the names truncated to the 8.3 file format for compliance to the controller abilities. Once e-mail status confirms a sent e-mail, the contents of the "EMAIL" folder are deleted. Any Events that occur after the Record is ended will be logged to a new daily file using the standard filename. If non-Record datalogging is enabled, the "DATAALL" file starts anew using the standard filename.

The "Recording Has Ended" display shows the filenames and locations on the MicroSD card as well as a status message. If records are to be e-mailed, the addresses to which files or notifications will be sent are shown and the status message includes e-mailing in progress.

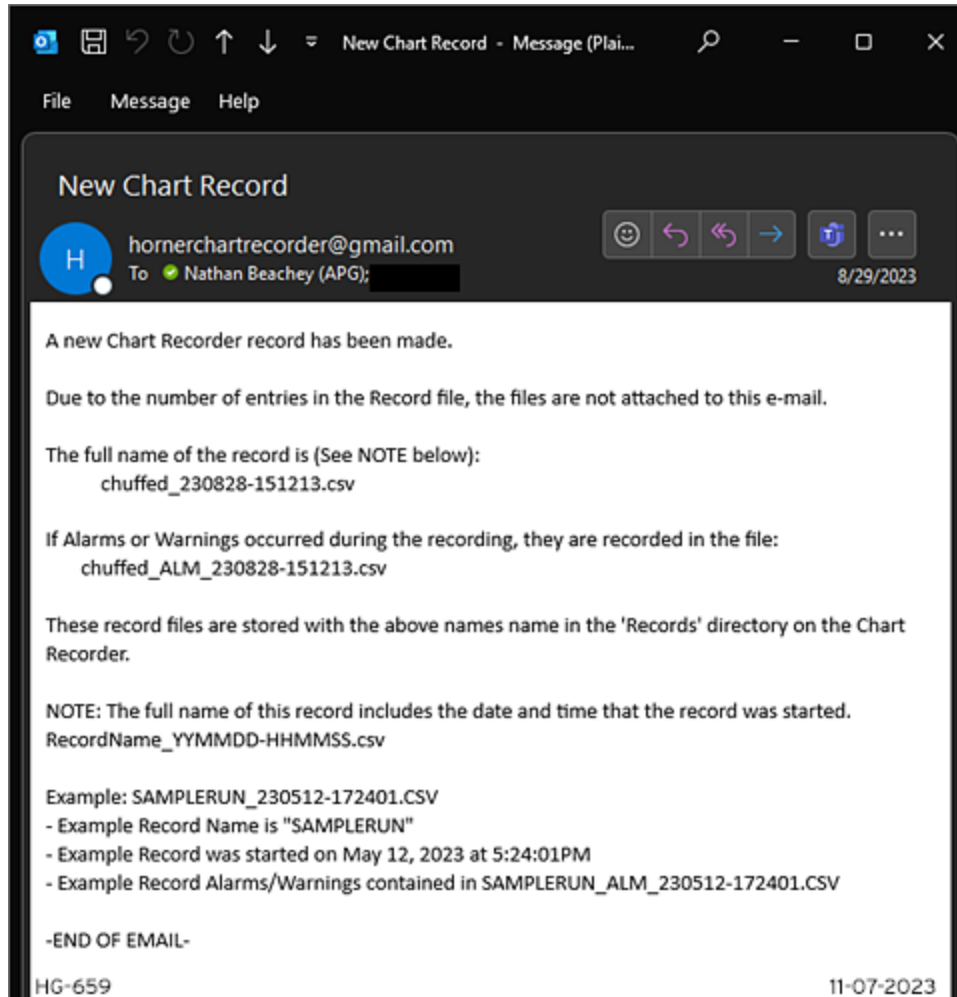
4.3.3: Emailing

When the option to Send Email Notifications and the option to Attach Files are both enabled when a record has ended, files are copied to an 'EMAIL' folder if the total number of datalog entries does not exceed 1000. An email with up to two attachments is sent, one for the datalog file and one for the Event log. If no events occurred during the recording, no Event log file is created.



Files that are e-mailed are truncated in name to fit the 8.3 file naming format. The datalog file is cut at 8 characters while the event file is cut at 6 characters and has "-A" appended to the filename to denote Alarms.

If the number of datalog entries exceeds 1000, files will not be attached to the e-mail notification. The e-mail includes file locations on the MicroSD card and a note that files are not attached due to the size of the files.



New Chart Record

hornerchartrecorder@gmail.com
To Nathan Beachey (APG); [REDACTED] 8/29/2023

A new Chart Recorder record has been made.

Due to the number of entries in the Record file, the files are not attached to this e-mail.

The full name of the record is (See NOTE below):
chuffed_230828-151213.csv

If Alarms or Warnings occurred during the recording, they are recorded in the file:
chuffed_ALM_230828-151213.csv

These record files are stored with the above names name in the 'Records' directory on the Chart Recorder.

NOTE: The full name of this record includes the date and time that the record was started.
RecordName_YYMMDD-HHMMSS.csv

Example: SAMPLERUN_230512-172401.CSV
- Example Record Name is "SAMPLERUN"
- Example Record was started on May 12, 2023 at 5:24:01PM
- Example Record Alarms/Warnings contained in SAMPLERUN_ALM_230512-172401.CSV

-END OF EMAIL-

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MicroSD Files



Chapter 5: MicroSD Files

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All datalog and warning/alarm event files are stored on a MicroSD card placed in the Chart Recorder. Files are created and manipulated between several directories. Additionally, a WebMI folder contains the web page hosted by the Chart Recorder for viewing live data remotely through any web browser.

5.1: Datalog Files

All Chart Recorder files are held in the 'CHARTREC' directory of the MicroSD card in one of several subdirectories.

Each data point has its own datalog file in the following folders:

- Data point 1 in 'CHARTREC\LOG\DATA1'
- Data point 2 in 'CHARTREC\LOG\DATA2'
- Data point 3 in 'CHARTREC\LOG\DATA3'
- Data point 4 in 'CHARTREC\LOG\DATA4'

These datalog files are populated if the option for Datalog Enabled (Configuration Menu → System Config) is set to 'Always Plus Records'. They are then only populated if the respective channel is anything other than 'Disabled' (Configuration Menu → Channel Config). They are populated at the rate specified by the Datalog Interval (Configuration Menu → Channel Config) for each channel.

The data logged in these files is as follows:

- Date and Time
- Data Name
- Scaled Data
- Data Units
- Daily Average
- Raw signal data
- Alarm Low, Warning Low, Warning High, and Alarm High setpoints

A	B	C	D	E	F	G	H	I	J	K	
1	Date	Time	Data0.CFG_NameX2	Data0.Data	Data0.CFG_UnitsX	Data0.DailyAvera	Data0.Data_RAW	Data0.Alarm_Low	Data0.Warn_Low_A	Data0.Warn_High	Data0.Alarm_High
2	5-Sep-23	10:50:24	INLET PRESSURE	56.5781	PSI	70.2963	18105	0	0	0	0
3	5-Sep-23	10:50:54	INLET PRESSURE	56.5781	PSI	70.2858	18107	0	0	0	0
4	5-Sep-23	10:51:24	INLET PRESSURE	56.6	PSI	70.2753	18107	0	0	0	0
5	5-Sep-23	10:51:54	INLET PRESSURE	56.675	PSI	70.2648	18138	0	0	0	0
6	5-Sep-23	10:52:24	INLET PRESSURE	56.675	PSI	70.2543	18143	0	0	0	0
7	5-Sep-23	10:52:54	INLET PRESSURE	56.675	PSI	70.2438	18160	0	0	0	0
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Additionally, when datalogging is enabled and no recording is active, all data points are logged to a single file in the 'CHARTREC\LOG\DATAALL' folder. The data logged in this file is as follows:

- Date and Time
- Data 1 Name
- Data 1 Scaled Data
- Data 1 Units
- Data 1 Record Average
- The above 4 items repeated for Data 2, Data 3, and Data4

A	B	C	D	E	F	G	H	I	J	
1	Date	Time	Data0.CFG_NameX2	Data0.Data	Data0.CFG_UnitsX	Data0.RecordAver	Data1.CFG_NameX2	Data1.Data	Data1.CFG_UnitsX	Data1.RecordAver
2	5-Sep-23	10:50:24	INLET PRESSURE	56.5781	PSI	70.2448	TANK LEVEL	11.7625	%	47.6344
3	5-Sep-23	10:50:54	INLET PRESSURE	56.5781	PSI	70.2448	TANK LEVEL	11.7531	%	47.6344
4	5-Sep-23	10:51:24	INLET PRESSURE	56.6	PSI	70.2448	TANK LEVEL	11.6938	%	47.6344
5	5-Sep-23	10:51:54	INLET PRESSURE	56.675	PSI	70.2448	TANK LEVEL	-3.4375	%	47.6344
6	5-Sep-23	10:52:24	INLET PRESSURE	56.675	PSI	70.2448	TANK LEVEL	13.125	%	47.6344
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K	L	M	N	O	P	Q	R
Data2.CFG_NameX2	Data2.Data	Data2.CFG_UnitsX	Data2.RecordAver	Data3.CFG_NameX2	Data3.Data	Data3.CFG_UnitsX	Data3.RecordAver
INLET TEMPERATUR	60.35	°C	59.9333	OUTLET TEMPERATU	188.2	°C	-24.8344
INLET TEMPERATUR	60.45	°C	59.9333	OUTLET TEMPERATU	188.05	°C	-24.8344
INLET TEMPERATUR	59.2	°C	59.9333	OUTLET TEMPERATU	187.1	°C	-24.8344
INLET TEMPERATUR	78.4	°C	59.9333	OUTLET TEMPERATU	-55	°C	-24.8344
INLET TEMPERATUR	75.8	°C	59.9333	OUTLET TEMPERATU	210	°C	-24.8344
INLET TEMPERATUR	76.6	°C	59.9333	OUTLET TEMPERATU	-55	°C	-24.8344
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5.1.1: Datalog Filenames

Within the directories as mentioned above, filenames are of the format YYMMDD.csv, where YY = 2-digit year, MM = zero-filled month, and DD = zero-filled date. The format is standard Comma Separated Value (CSV).

Within the 'DATAALL' datalog directory, There may also be filenames of the format YYMMDDXX.csv, where YY = 2-digit year, MM = zero-filled 2-digit month, DD = zero-filled 2-digit date, and XX = zero-filled 2-digit running count that increments over the course of the day if any recording becomes active. Files with an appended count contain non-Record data. The count allows for multiple recordings over the course of the day without losing non-Record data. The count is automatically incremented each time a Record is started and resets to 00 at midnight each day.

Example datalog file paths:

- CHARTREC\LOG\DATA1\230630.csv = Datalog file for data point 1 from June 30, 2023.
- CHARTREC\LOG\DATAALL\23020302.csv = All Data log from Feb 3, 2023, prior to the third recording made that day (only if Datalogging is set to 'Always Plus Records').

- There should also be a 23020300.csv and 23020301.csv file
- There is possibly a 230203.csv file covering the remainder of the day after the last recording was ended (only if Datalogging is set to 'Always Plus Records')

5.2: Event Log Files

Warnings and Alarms are logged to a daily file within the 'CHARTREC\ALARMS' directory. However, if no warnings or alarms are enabled, or if no warnings or alarms have occurred, a data file or entries may not exist.

Files are separated by day of the month (date) such that files may contain data from multiple months of the same date, e.g., ALARM-09.csv can contain events from May 9th, June 9th, July 9th, etc.

Each entry to the event log includes:

- Date and time
- ALM (became active), RTN (became inactive), or ACK (became acknowledged) event
- Group 1 (Alarm), Group 2 (Warning), or Group 16 (System, e.g., MicroSD missing)
- Event text enunciation (Alarm Name)

	A	B	C	D	E
1	Date	Time	Event	Group	Alarm Name
2	11-Sep-23	12:50:53	ALM	2	WARNING: Data 4 Low
3	11-Sep-23	12:52:56	ALM	2	WARNING: Data 1 High
4	11-Sep-23	12:52:56	RTN	2	WARNING: Data 4 Low
5	11-Sep-23	12:57:41	ALM	1	ALARM: Data 1 High
6	11-Sep-23	12:57:41	RTN	2	WARNING: Data 1 High
7	11-Sep-23	12:58:29	ALM	2	WARNING: Data 1 High
8	11-Sep-23	12:58:29	RTN	1	ALARM: Data 1 High
9	11-Sep-23	12:58:38	RTN	2	WARNING: Data 1 High
10	11-Sep-23	13:01:01	ALM	2	WARNING: Data 4 Low
11	11-Sep-23	13:11:04	ACK	2	WARNING: Data 4 Low

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5.2.1: Event Log Filenames

Within the 'CHARTREC' directory, the 'ALARMS' subdirectory contains event logs for each day of the month. Filenames are of the format ALARM_DD.csv, where DD = zero-filled 2-digit day of the month (date). New files are started at midnight each night.

The event log file is taken over by the recording process, in which case the normal filename becomes altered to include a running count that increments over the course of a day if any recording becomes active. The altered filenames have the format ALMDD-XX.csv where DD = the zero-filled 2-digit day of the month and XX = zero-filled 2-digit running count. These renamed files contain events logged prior to recordings being started.

Example event log file paths:

CHARTREC\LOG\ALARMS\ALARM-05.csv = Event file for the 5th of the month

CHARTREC\LOG\ALARMS\ALM05-01.csv = Event file from the 5th of the month prior to the second recording made that day (only if there were non-Record entries prior to second recording of the day)

- There may also be an ALM05-00.csv file (only if there were entries prior to the first recording of the day)
- There may also be an ALARM-05.csv file covering the remainder of the day after the last recording (only if there have been events since the end of the last recording of the day)

5.3: Record Files

Record files contain data captured during the recording process. One file will contain data from all data points with a sample interval equal to that of the data point with the lowest configured Datalog Interval. This file is created by taking over the DATAALL datalog file detailed above.

Additionally, a second file may or may not exist that contains any warnings and alarms that occurred during the recording. This file is created by taking over the Event Log file detailed above. No file will be created if no events of this nature occur.

5.3.1: Record Filenames

Within the 'CHARTREC' directory, the 'RECORDS' subdirectory contains Record files for both data and any events that occurred during the recording. Filenames for the data portion are of the format NNNNN_YMMMDD-HHmmSS.csv:

- NNNNN is the Data Name up to 19 characters
- YY is the 2-digit zero-filled year
- MM is the 2-digit zero-filled month
- DD is the 2-digit zero-filled date
- HH is the 2-digit zero-filled hour
- mm is the 2-digit zero-filled minute
- SS is the 2-digit zero-filled second.

The filename date and time stamp marks the point at which the recording was started.

Should events occur during the recording, a second file exists with the format NNNNN_ALM_YMMMDD-HHmmSS.csv, the only difference from above being the addition of '_ALM' to the filename to denote events.

5.4: Email Files and Filenames

Record files that are e-mailed are required by the Chart Recorder hardware to adhere to the 8.3 filename format. The Record filename for data as described above is simply shortened to 6 characters. The Record filename for events as described above, if it exists, is shortened to 6 characters and has "-A" added to the filename to denote events.

These files with shortened names are created in the 'CHARTREC\EMAIL' directory, from which the e-mail function attaches the files. Once the e-mail function status indicates a successfully sent e-mail, all files in the EMAIL directory are erased.

There is the possibility of email files from multiple records to accumulate in the EMAIL directory if the emailing process encounters errors such that a successful message is not reported.

5.5: Historic Trend Files

The Chart Recorder keeps an historic file for each trend available. The files are not necessarily meant to be user-friendly but they do make an exact history of the trend graphics.

There are 16 trends total as follows:

- Data 1, 1-Hour Trend (6-second sample rate)
- Data 1, 8-Hour Trend (50-second sample rate)
- Data 1, 24-Hour Trend (151-second sample rate)
- Data 1, 7-Day Trend (18 minute sample rate)
- The same 4 trends for Data 2, Data 3, and Data 4

The data contained in the Trend files consists only of the following:

- Date and Time
- 'Pen1' data (regardless of the data point 1, 2, 3, or 4), which is an integer value scaled between 0 and 1000, i.e. 0-100.0% of the scale defined by the scaling configuration

	A	B	C
1	Date	Time	Pen1
2	13-09-2023	5:02:00 AM	532
3	13-09-2023	5:04:31 AM	532
4	13-09-2023	5:07:03 AM	532
5	13-09-2023	5:09:34 AM	532
6	13-09-2023	5:12:05 AM	532
7	13-09-2023	5:14:36 AM	532
8	13-09-2023	5:17:07 AM	532
9	13-09-2023	5:19:38 AM	532
10	13-09-2023	5:22:09 AM	532

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5.5.1: Historic Trend Filenames

Within the 'CHARTREC' directory, the 'TREND' subdirectory contains several further subdirectories as follows:

- DATAX_1H_YY for 1-hour trends
- DATAX_8H_YY for 8-hour trends
- DATAX_1D_YY for 24-hour trends

- DATAX_7D_YY for 7-day trends
- For these folder names, X = the data point 1, 2, 3, or 4, and YY = 2-digit year

Within each of the directories for 1-hour, 8-hour, and 24-hour trends, filename format is MMDDHH.csv where MM = 2-digit zero-filled month, DD = 2-digit zero-filled date, and HH = 2-digit zero-filled hour. A new file is created each hour.

For the 7-day trend, filename format is YYMMDD.csv where YY = 2-digit year, MM = 2-digit zero-filled month, and DD = 2-digit zero-filled date. A new file is created each day.

Example trend file path:

CHARTREC\TREND\DATA3_1D_23\081410.csv = Trend file for data point 3 from August 14, 2023 during the 10AM hour on the 24-hour trend.

Web Access

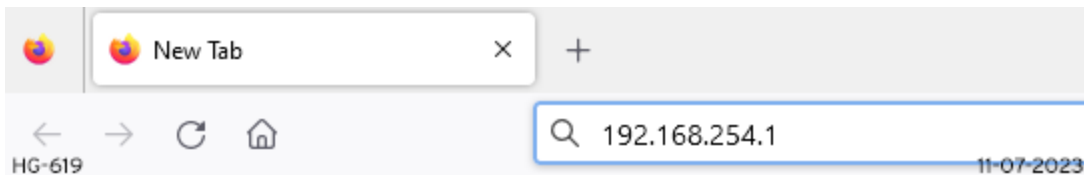


Chapter 6: Web Browser Access

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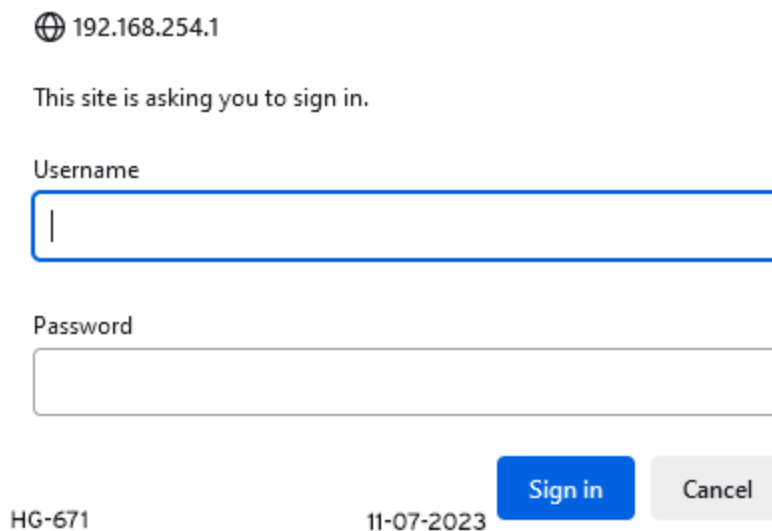
The Chart Recorder hosts an HTML page that can be opened with any web browser that has access to the network on which the Chart Recorder resides.

To access the web page, type the IP address into the web browser to match that of the IP address configured in Network Settings.

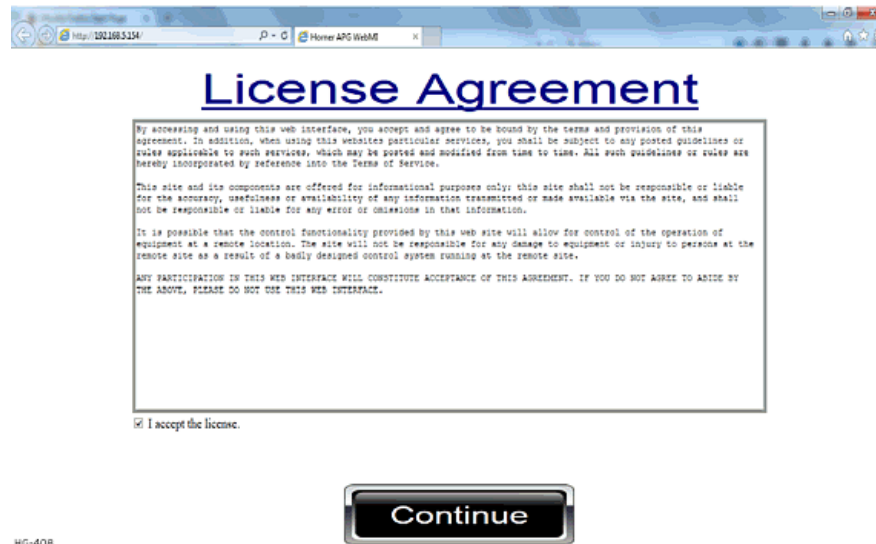


A username and password prompt appears:

- **Username:** ChartRec (case sensitive)
- **Password:** 12345

A screenshot of a sign-in prompt. At the top, it shows a globe icon followed by the IP address "192.168.254.1". Below this, the text "This site is asking you to sign in." is displayed. There are two input fields: "Username" and "Password". The "Username" field is currently empty. At the bottom right, there are two buttons: "Sign in" (blue) and "Cancel" (grey). The text "HG-671" is in the bottom left and "11-07-2023" is in the bottom center of the prompt.

Upon correct entry, a License Agreement prompt may occur the first time the page is loaded. Accept and continue to proceed to the Chart Recorder pages.



HG-40B

Upon acceptance of the License Agreement, the Bar Graph main display loads.

The web interface is like that of the Chart Recorder touchscreen but with the differences noted below:

- The Trend displays are not carried over to the web interface
- Record control is not available via the web interface.

6.1: Main Web Displays

Main displays allow a selection for the format in which to view the data points. Each of the main displays has a common bar along the righthand side of the screen.

- Current Date and Time
- Record status
 - Shows dark red only if no recording is active and datalogging is set to Records Only.
 - Flashes between dark/bright red if no recording is active and datalogging is set to Always Plus Records to indicate logging.
 - Appears as a spinning tape reel if a recording is active.
 - A small clock icon and green or red timers or times may also display if delayed or time-based recordings are set.
 - Green highlights mean a recording is set to automatically start in the future.
 - Red highlights mean a recording is active and set to automatically end in the future.

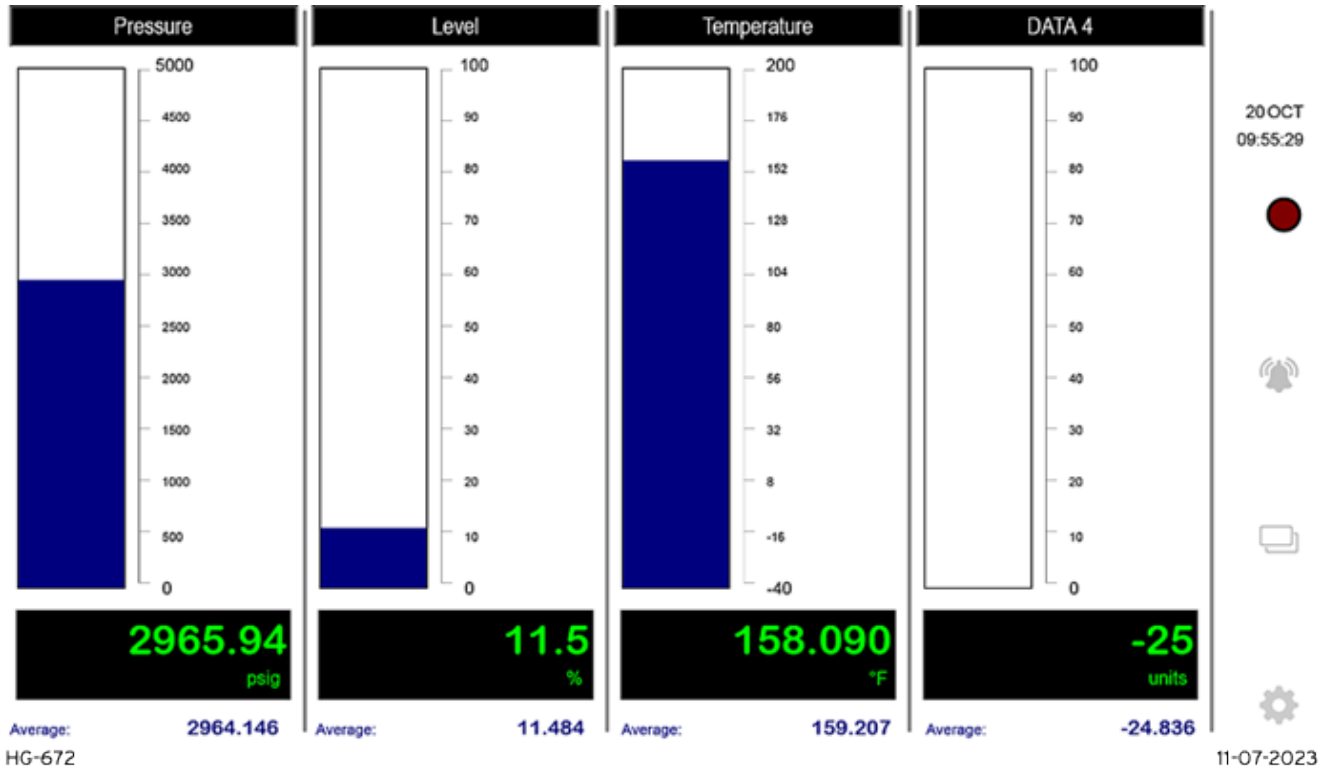
- Warning/Alarm button
 - Accesses the Events screen where Warnings and Alarms can be viewed and acknowledged. A history of events is also available.
 - The Alarm bell icon will flash Yellow with 1 exclamation point for Warnings.
 - The Alarm bell icon will flash Red with 2 exclamation points for Alarms.
 - If both Warnings and Alarms are active, the Alarm bell icon will alternate between Yellow and Red.
 - By accessing the Events screen and Acknowledging all active Warnings and Alarms, the Alarm bell icon will stop flashing except when both Warnings and Alarms are active, in which case it will alternate between Yellow and Red.
- Display button
 - Cycles through the main displays
- Configuration button
 - Pressing this button will access the configuration. Since a password is required to open the web interface, a password is not required to open the configuration from the web interface.

Common data on all main displays is as follows:

- Data points; Name, Scaled Output, and Units
- Averages shown are daily averages unless a Recording becomes active.
- Recording averages are shown during recordings, though daily averages continue to calculate.
- Daily averages are reset at midnight.
- If a configured Warning or Alarm level has been exceeded, the corresponding signal will be highlighted in either Yellow or Red.

Continued on Next Page

6.1.1: Bar Graphs

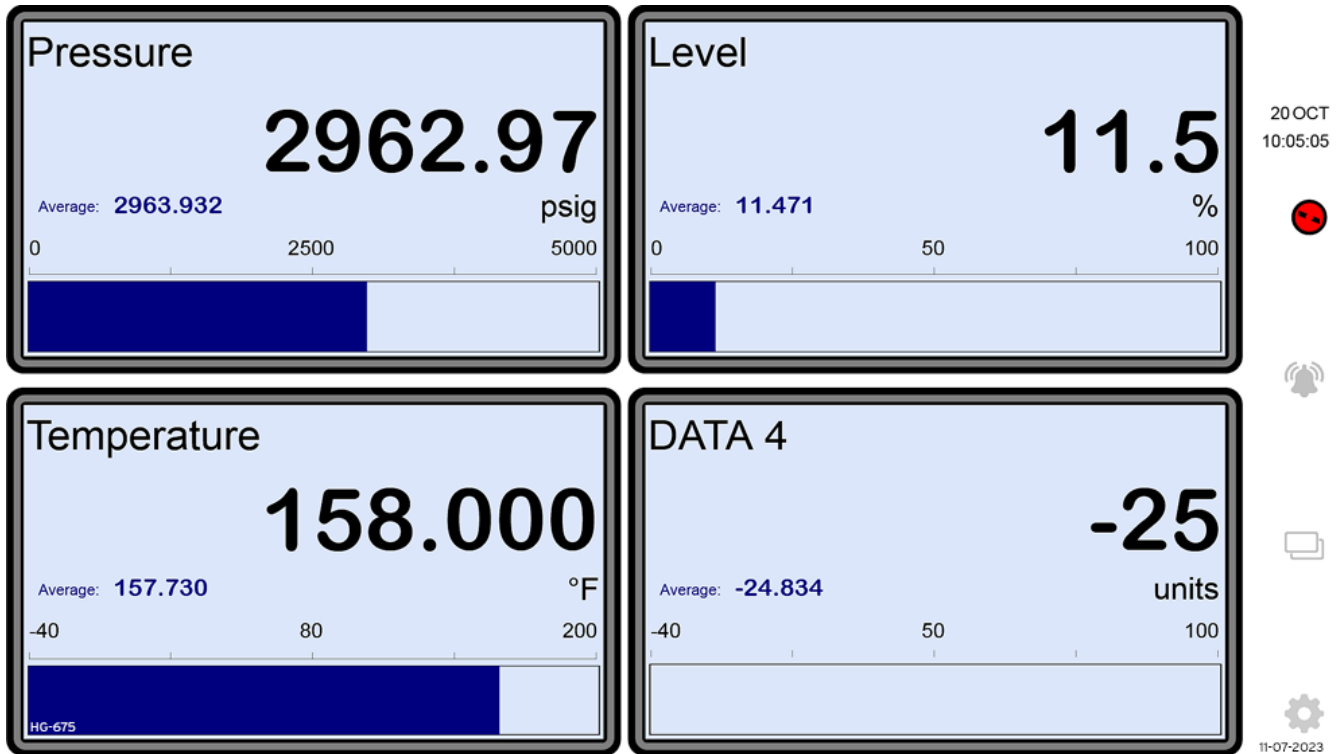


The Bar Graphs main display allows viewing of all signals both numerically and graphically. The Graph Limits of each data point are displayed, with 9 calculated subdivisions for each.

The bar graph fill color will change to reflect any active Warning or Alarm with any given data point, yellow for Warnings and red for Alarms.

Continued on Next Page

6.1.2: Quadrants

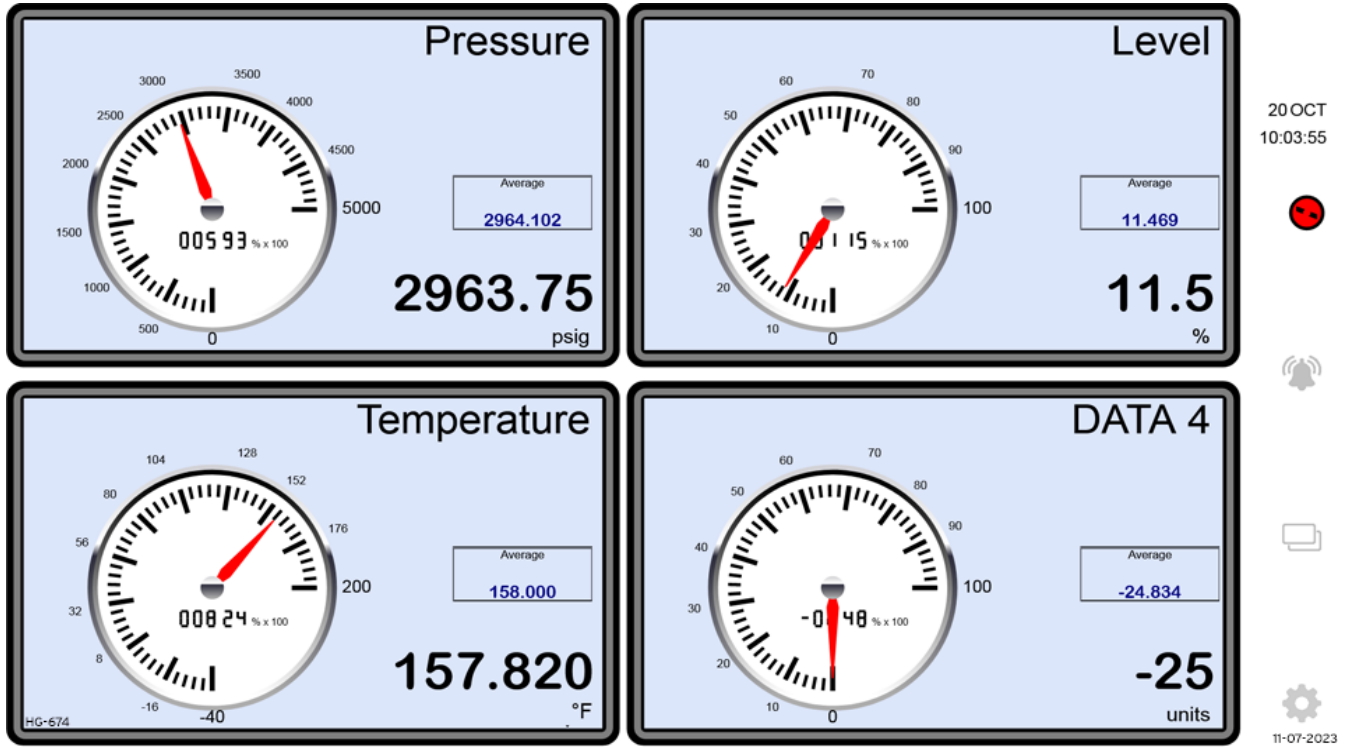


The Quadrants main display emphasizes the size of the scaled data points. Bar Graphs are displayed but smaller and with only Min, Max, and halfway divisions to reduce clutter.

In addition to a highlighted ring around the quadrant for any Warning or Alarm, the bar graph fill color will also change for the corresponding data point.

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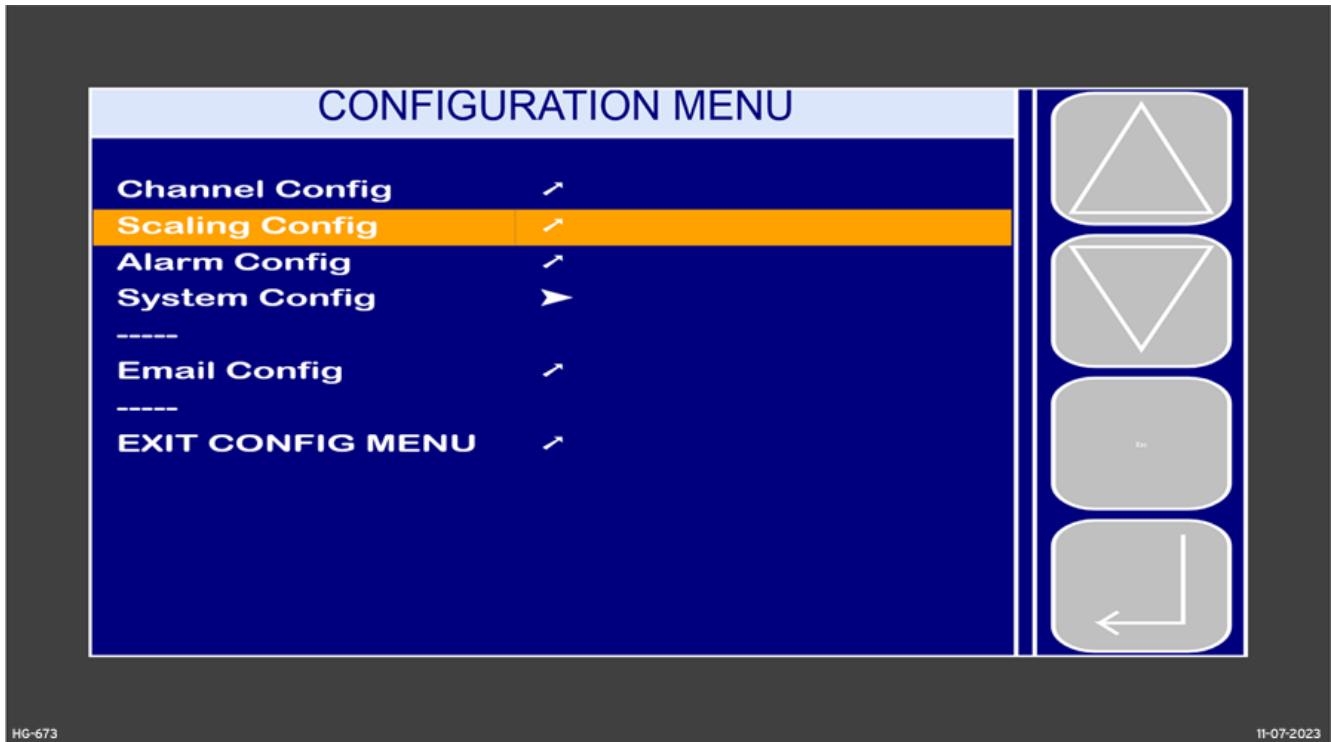
6.1.3: Gauges



The Gauges main display is split into quadrants and shows a large gauge face with a red needle.

Continued on Next Page

6.2: Configuration via Web



The operation of the configuration menu via the web interface is identical to that of the Chart Recorder touchscreen with the following exceptions:

- There is no Network Config as this is required to be in place for the web interface to be operational.
- To exit the Configuration Menu, it is required to select the "EXIT CONFIG MENU" item since the **ESC** key on the menu does not exit the menu.

Click any item, then click the ← button to confirm the choice. Refer to "Configuration" on page 19 for more information on configuration options.

Modbus Access



Chapter 7: Modbus Access

Real-time data from the Chart Recorder is available via Modbus TCP/IP over Ethernet. The Chart Recorder is addressed by its IP address, no additional ID is required.

Parameters available are as follows:

For Use with Modbus Command 4 (Read Input Register)				
Dec	Hex	Parameter	Format	Length/Notes
30050	7562	Data 1 Name	ASCII	10 Words/20 Chars
30060	756C	Data 2 Name	ASCII	10 Words/20 Chars
30070	7576	Data 3 Name	ASCII	10 Words/20 Chars
30080	7580	Data 4 Name	ASCII	10 Words/20 Chars
30090	758A	Data 1 Units	ASCII	4 Words/8 Chars
30094	758E	Data 2 Units	ASCII	4 Words/8 Chars
30098	7592	Data 3 Units	ASCII	4 Words/8 Chars
30102	7596	Data 4 Units	ASCII	4 Words/8 Chars
30106	759A	MicroSD Percent Full	INT	Percentage Full
30107	759B	Data 1 Datalog Buffer Percent Full	INT	Percentage Full
30108	759C	Data 2 Datalog Buffer Percent Full	INT	Percentage Full
30109	759D	Data 3 Datalog Buffer Percent Full	INT	Percentage Full
30110	759E	Data 4 Datalog Buffer Percent Full	INT	Percentage Full
30111	759F	Data ALL Datalog Buffer Percent Full	INT	Percentage Full
30112	75A0	Chart Recorder Time Seconds	INT	2-digit Seconds
30113	75A1	Chart Recorder Time Minutes	INT	2-digit Minutes
30114	75A2	Chart Recorder Time Hours	INT	2-digit Hour, 24Hr
30115	75A3	Chart Recorder Date Day	INT	2-digit Day
30116	75A4	Chart Recorder Date Month	INT	2-digit Month
30117	75A5	Chart Recorder Date Year	INT	4-digit Year
30118	75A6	Chart Recorder Version x 100	INT	e.g., 123=1.23

For Use with Modbus Command 4 (Read Input Register)				
Dec	Hex	Parameter	Format	Length/Notes
30150	75C6	Scaled Data 1	REAL	Floating Point
30152	75C8	Scaled Data 2	REAL	Floating Point
30154	75CA	Scaled Data 3	REAL	Floating Point
30156	75CC	Scaled Data 4	REAL	Floating Point
30158	75CE	Daily Average Data 1	REAL	Floating Point
30160	75D0	Daily Average Data 2	REAL	Floating Point
30162	75D2	Daily Average Data 3	REAL	Floating Point
30164	75D4	Daily Average Data 4	REAL	Floating Point
30166	75D6	Record Average Data 1	REAL	Floating Point
30168	75D8	Record Average Data 2	REAL	Floating Point
30170	75DA	Record Average Data 3	REAL	Floating Point
30172	75DC	Record Average Data 4	REAL	Floating Point
30174	75DE	Yesterday's Average Data 1	REAL	Floating Point
30176	75E0	Yesterday's Average Data 2	REAL	Floating Point
30178	75E2	Yesterday's Average Data 3	REAL	Floating Point
30180	75E4	Yesterday's Average Data 4	REAL	Floating Point

Continued on Next Page

For Use with Modbus Command 2 (Read Input Status)				
Dec	Hex	Parameter	Format	Length/Notes
10401	28A1	ALARM: Data 1 High	BOOL	1 Bit
10402	28A2	WARNING: Data 1 High	BOOL	1 Bit
10403	28A3	ALARM: Data 1 Low	BOOL	1 Bit
10404	28A4	WARNING: Data 1 Low	BOOL	1 Bit
10405	28A5	ALARM: Data 2 High	BOOL	1 Bit
10406	28A6	WARNING: Data 2 High	BOOL	1 Bit
10407	28A7	ALARM: Data 2 Low	BOOL	1 Bit
10408	28A8	WARNING: Data 2 Low	BOOL	1 Bit
10409	28A9	ALARM: Data 3 High	BOOL	1 Bit
10410	28AA	WARNING: Data 3 High	BOOL	1 Bit
10411	28AB	ALARM: Data 3 Low	BOOL	1 Bit
10412	28AC	WARNING: Data 3 Low	BOOL	1 Bit
10413	28AD	ALARM: Data 4 High	BOOL	1 Bit
10414	28AE	WARNING: Data 4 High	BOOL	1 Bit
10415	28AF	ALARM: Data 4 Low	BOOL	1 Bit
10416	28B0	WARNING: Data 4 Low	BOOL	1 Bit
10417	28B1	MicroSD Card Missing	BOOL	1 Bit
10418	28B2	MicroSD 80% Full	BOOL	1 Bit
10419	28B3	Datalog Buffer Usage	BOOL	1 Bit
10420	28B4	MicroSD OK	BOOL	1 Bit
10421	28B5	Record Active	BOOL	1 Bit

Ethernet/IP and CsCAN Access

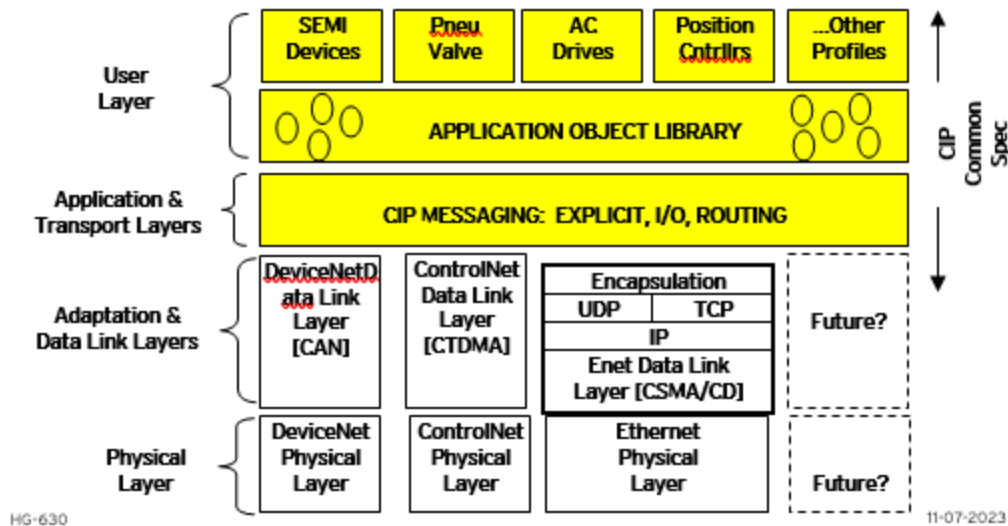


Chapter 8: Ethernet/IP Access

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8.1: Ethernet/IP Overview

Ethernet/IP protocol is ODVA's Common Industrial Protocol (CIP) over Ethernet. The image below illustrates the protocol layers. Ethernet/IP starts at the Ethernet Physical Layer, and moves up through the IP, TCP/UDP, and Encapsulation Layers. It is beyond the scope of this supplement to discuss the specifics of the Ethernet/IP protocol. See the Ethernet/IP specification at <http://www.odva.org> for more details of the Ethernet/IP protocol.



The Chart Recorder provides Ethernet/IP server capability, and implements the following CIP objects:

- Identity → Instance #1
- Connection Manager → Instance #1
- Message Router → Instance #1
- Assembly → Instance #100 (0x64) for Consumed data
- Assembly → Instance #101 (0x65) for Produced data
- TCP/IP → Instance #1
- Ethernet Link → Instance #1

The Chart Recorder has an Unconnected Message Manager (UCMM), which forwards the following services on to the addressed object:

- Forward Open (Connection Manager object service)
- Forward Close (Connection Manager object service)
- Get Attribute Single
- Set Attribute Single

It will forward the above services on to the addressed object, however the addressed object may or may not support the service.

The Chart Recorder supports Class 3 connections for explicit messaging, and Class 1 connections for I/O (Implicit) messaging.

- **Class 1** connections are periodic exchanges of data that are typically used by I/O modules. The OCS uses Class 1 implicit messaging to exchange register data on the EtherNet/IP network.
- **Class 3** connections are explicit messages that are sent to device nodes from the scanner and are generally used to configure or request connection or operation settings.

The Chart Recorder can be configured to produce and consume 0 bytes of data up to 256 bytes of data.

The TCP connections used for Ethernet/IP have an inactivity timeout of 60 seconds. In the event of an inactivity timeout, the TCP connection will automatically close.

8.2: Ethernet/IP Operation

Once the Chart Recorder is configured, it is ready to respond to Ethernet/IP requests. The Chart Recorder handles unconnected requests anytime.

To exchange I/O data with the Chart Recorder, a class 1 connection pair must be established. The connection pair consists of a class 1 originator-to-target connection and a class 1 target-to-originator connection, both of which should be set for point-to-point Transport Type. The data sizes must match the Chart Recorder's configured Consumed and Produced data sizes, respectively. The application path should be set as follows:

- The originator-to-target connection point should be set to 100 (0x64), which stands for the assembly class (4), instance 100 (0x64).
- The target-to-originator connection point should be set to 101 (0x65), which stands for the assembly class (4), instance 101 (0x65).

There is NO configuration assembly instance. All the class 1 connection pair setup data is transmitted through a forward open service to the connection manager.

Once the class 1 connection pair is established, I/O data is exchanged to/from the Chart Recorder through these connections. The Consumed data (data coming from the scanner) and Produced data (data going to the scanner) are available at the locations within the Chart Recorder register map as configured.

The TCP connections used for all encapsulated messages and explicit messages have an inactivity timeout of 60 seconds. If the TCP connections are required to stay open, a NOP encapsulated command can be used at a periodic rate to keep the TCP connection open.

When the Chart Recorder is not in RUN mode, Produced data is all zeros, and Consumed data is not written to the configured registers within the Chart Recorder. When the Chart Recorder is in RUN mode, the configured Produced Chart Recorder registers are read and sent as Produced data, while Consumed data is received and written to the configured Consumed Chart Recorder registers.

The Status word provides Ethernet/IP connection status. The upper byte of the word contains the Class 3 (Explicit) connection count and the lower byte contains the Class 1 (IO) connection count.

NOTE: When the Status word indicates no connections, the Consumed Chart Recorder registers contain old data.

8.3: EtherNet/IP Access

Real-time data from the Chart Recorder is available via EtherNet/IP. The Chart Recorder has 103 16-bit Words of Produced data as follows:

Ethernet/IP Produced Data			
Word Offset	Parameter	Format	Length/Notes
0	Data 1 Name	ASCII	10 Words/20 Chars
10	Data 2 Name	ASCII	10 Words/20 Chars
20	Data 3 Name	ASCII	10 Words/20 Chars
30	Data 4 Name	ASCII	10 Words/20 Chars
40	Data 1 Units	ASCII	4 Words/8 Chars
44	Data 2 Units	ASCII	4 Words/8 Chars
48	Data 3 Units	ASCII	4 Words/8 Chars
52	Data 4 Units	ASCII	4 Words/8 Chars
56	MicroSD Percent Full	INT	Percentage Full
57	Data 1 Datalog Buffer Percent Full	INT	Percentage Full
58	Data 2 Datalog Buffer Percent Full	INT	Percentage Full
59	Data 3 Datalog Buffer Percent Full	INT	Percentage Full
60	Data 4 Datalog Buffer Percent Full	INT	Percentage Full
61	Data ALL Datalog Buffer Percent Full	INT	Percentage Full

Ethernet/IP Produced Data			
Word Offset	Parameter	Format	Length/Notes
62	Chart Recorder Time Seconds	INT	2-digit Seconds
63	Chart Recorder Time Minutes	INT	2-digit Minutes
64	Chart Recorder Time Hours	INT	2-digit Hour, 24Hr
65	Chart Recorder Date Day	INT	2-digit Day
66	Chart Recorder Date Month	INT	2-digit Month
67	Chart Recorder Date Year	INT	4-digit Year
68	Chart Recorder Version x 100	INT	e.g., 123=1.23
69	Alarm Bits 1	INT	Bitmapped (See next table)
70	Alarm Bits 2	INT	Bitmapped (See next table)
71	Scaled Data 1	REAL	Floating Point
73	Scaled Data 2	REAL	Floating Point
75	Scaled Data 3	REAL	Floating Point
77	Scaled Data 4	REAL	Floating Point
79	Daily Average Data 1	REAL	Floating Point
81	Daily Average Data 2	REAL	Floating Point
83	Daily Average Data 3	REAL	Floating Point
85	Daily Average Data 4	REAL	Floating Point
87	Record Average Data 1	REAL	Floating Point
89	Record Average Data 2	REAL	Floating Point
91	Record Average Data 3	REAL	Floating Point
93	Record Average Data 4	REAL	Floating Point
95	Yesterday's Average Data 1	REAL	Floating Point
97	Yesterday's Average Data 2	REAL	Floating Point
99	Yesterday's Average Data 3	REAL	Floating Point
101	Yesterday's Average Data 4	REAL	Floating Point

Bitmapped Alarm Data			
Dec	Parameter	Format	Length/Notes
69.0	ALARM: Data 1 High	BOOL	1 Bit
69.1	WARNING: Data 1 High	BOOL	1 Bit
69.2	ALARM: Data 1 Low	BOOL	1 Bit
69.3	WARNING: Data 1 Low	BOOL	1 Bit
69.4	ALARM: Data 2 High	BOOL	1 Bit
69.5	WARNING: Data 2 High	BOOL	1 Bit
69.6	ALARM: Data 2 Low	BOOL	1 Bit
69.7	WARNING: Data 2 Low	BOOL	1 Bit
69.8	ALARM: Data 3 High	BOOL	1 Bit
69.9	WARNING: Data 3 High	BOOL	1 Bit
69.10	ALARM: Data 3 Low	BOOL	1 Bit
69.11	WARNING: Data 3 Low	BOOL	1 Bit
69.12	ALARM: Data 4 High	BOOL	1 Bit
69.13	WARNING: Data 4 High	BOOL	1 Bit
69.14	ALARM: Data 4 Low	BOOL	1 Bit
69.15	WARNING: Data 4 Low	BOOL	1 Bit
70.0	MicroSD Card Missing	BOOL	1 Bit
70.1	MicroSD 80% Full	BOOL	1 Bit
70.2	Datalog Buffer Usage	BOOL	1 Bit
70.3	MicroSD OK	BOOL	1 Bit
70.4	Record Active	BOOL	1 Bit

Connections



Chapter 9: Connections

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9.1: I/O Connections

I/O	Device	Function	Configurable	Scalable
I1	X10	Spare		
I2	X10	Spare		
I3	X10	Spare		
I4	X10	Spare		
I5	X10	Spare		
I6	X10	Spare		
I7	X10	Spare		
I8	X10	Spare		
I9	X10	Future Pulse Rate Input 1		
I10	X10	Future Pulse Rate Input 2		
I11	X10	Future Pulse Rate Input 3		
I12	X10	Future Pulse Rate Input 4		
Q1	X10	Future Alarm 1	Yes	No
Q2	X10	Future Alarm 2	Yes	No
Q3	X10	Future Alarm 3	Yes	No
Q4	X10	Future Alarm 4	Yes	No
Q5	X10	Future Alarm 5	Yes	No
Q6	X10	Future Alarm 6	Yes	No
Q7	X10	Future Alarm 7	Yes	No
Q8	X10	Future Alarm 8	Yes	No
Q9	X10	Future Alarm 9	Yes	No

I/O	Device	Function	Configurable	Scalable
Q10	X10	Future Alarm 10	Yes	No
Q11	X10	Future Alarm 11	Yes	No
Q12	X10	Future Alarm 12	Yes	No
AI1	X10	4-20mA/RTD Input 1	Yes	Yes
R1+	X10	RTD Input 1	Yes	Yes
AI2	X10	4-20mA/RTD Input 2	Yes	Yes
R2+	X10	RTD Input 2	Yes	Yes
AI3	X10	4-20mA/RTD Input 3	Yes	Yes
R3+/AQ1	X10	RTD Input 3	Yes	Yes
A14	X10	4-20mA/RTD Input 4	Yes	Yes
R4+/AQ2	X10	RTD Input 4	Yes	Yes

9.2: Communication Connections

Port	Function	Configurable
ETN1	Modbus TCP	No
ETN1	Ethernet/IP	No
ETN1	FTP	No
ETN1	WebMI	No
MJ1	Future Modbus RTU	No
CAN1	Future CsCAN	No