



# **Centurion™ C5 Series Panel Booklet**



We would like to take this opportunity to thank you for purchasing your new Control System. This system was designed and built by qualified engineers and technicians with your control requirements in mind. We use the best materials and equipment in fabricating your control systems.

We continually strive to provide defect-free products and services on time. This dedication allows us to maintain ISO9001:2008 registration.

Whatever your instrumentation and automation control application needs, we provide quality products and services. We are able to define your requirements, provide design solutions and assist with customer support.

#### **DOMESTIC SALES & SUPPORT**

FW MURPHY CONTROL SYSTEMS AND SERVICES  
2151 RANDON DYER RD, ROSENBERG, TX 77471  
PHONE: 281 633 4500  
EMAIL: [CSS-SOLUTIONS@FWMURPHY.COM](mailto:CSS-SOLUTIONS@FWMURPHY.COM)

#### **TECHNICAL SUPPORT**

FW MURPHY PRODUCTION CONTROLS  
4646 S. HARVARD AVE. TULSA, OK 74135  
PHONE: 918 957 1000  
EMAIL: [TECHSUPPORT@FWMURPHY.COM](mailto:TECHSUPPORT@FWMURPHY.COM)

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## **Welding Precautions:**

FW Murphy Production Controls recommends that **no** welding takes place directly on the equipment or on the equipment that is physically connected to equipment where solid state electronics are used. If welding **must** be performed on this equipment, we recommend that the following precautions are taken to reduce the chance of the solid-state electronics being permanently damaged or damaged enough to fail at some later time. FW Murphy Production Controls will not warrant any device that has been subjected to damage caused by welding.

Open the control panel and any associated subpanels or swing panels. Disconnect power and ground connections and all ribbon and other cable types leading to or from any solid-state devices (i.e., TTD™, TDXM, Centurion™, VRU Pro™, etc.). Note: Most cables should have a keyed connector for ease of reconnection or have removable terminal blocks. Even if this is an outdoor field repair, wires should be removed from screw terminals where necessary to prevent any possibility of damage.

Attach the welder's ground clamp as close as possible to the area where the welding will occur and use the lowest feasible setting of the welding machine output. These precautions will lessen the chance that a high electrical potential will pass through or across the control panel and/or its components.

## **Wiring Precautions:**

There are several precautions you can take on initial installation to reduce chances of failure over time. Many of these steps may take a few extra minutes to do at the time of installation; however, they can also save many headaches in the future. We strongly recommend that you follow these precautionary steps.

### **1. DC Power Connection Source**

FW Murphy Production Controls recommends that the power source (+ and -) connection points of any panel containing any solid-state device (i.e., TTD, TDXM, Centurion, VRU Pro, etc.) be made directly to the terminals of the battery (+ and -). This will allow the battery to act as a filter and absorb any voltage spikes or noise generated by the alternator or other devices located on the equipment being controlled by the solid-state device. The preferred method is to tie the negative battery terminal to proper earth ground (i.e., earth ground rod) and tie any needed frame/chassis grounds to that same point as well. Connection of power and DC common at any other point will cause increased noise susceptibility in the system. Depending on the actual configuration of the end application, this can cause various control problems, such as erratic

operation, inaccurate sender/transducer readings, remote communication problems, etc.

Standby battery charger must be wired directly to the battery. Failing to do this may result in erratic operation due to electronics noise coupled into the microprocessor.

## 2. Inductive Loads

FW Murphy Production Controls recommends that any inductive load tied to a solid-state output (relays, solenoids, incandescent lamps, etc.) has a reverse biased diode across the coil to snub the inductive kickback. This prevents the field collapse of the coil from damaging the solid-state output devices and keeps the DC power clean from spikes.

## 3. Shielded Cable

Shielded cable is recommended for connecting the magnetic pickup and analog inputs/outputs to the control panel. This helps prevent signal loss and the possible coupling of electrical interference into the circuits. The drain wire (shielded) should only be grounded at one end.

## 4. Wiring Separation

Please try to ensure the following separation of wiring by using multiple runs of conduits. Here are the levels of separation from noisiest to the weakest victim. Some of this separation is required by codes and recommended practices.

- I. Ignition wiring, the G lead, and CD ignition fuel valve wiring;
- II. AC wiring;
- III. DC power wiring (magnetic pickup can be run with this, but it must be in shielded cable);
- IV. Analog signals, like 4-20 mA and sender signals (magnetic pickup can be run with this, but it must be in shielded cable);
- V. Thermocouple wiring (must use shielded thermocouple grade extension wire for the proper type, typically J or K);
- VI. Sensor wires that are neither nonincendive for Class I, Div. 2 or intrinsically safe for Class I, Div. 1.

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## Centurion™ C5 Quick Start Guide

If the Centurion Controller and Display Modules are already installed, skip the Installation section and go to the section titled **Before Starting the Equipment for the First Time**.

### Installation

The following instructions will guide you through installing the Centurion C5 controller, display and additional communication modules.

For wiring connections, please open the appropriate Installation Manual file on the white thumb drive provided.

No special cables are required. The Centurion system is designed for use within a weatherproof enclosure only.

Basic Components Include:

- Centurion C5 Controller Module
- M-View™ Display Module

Optional Components Include:

- MX4-R2 (Interchange Communication Control Module)
- MX5-R2 (Interchange Communication Control Module)

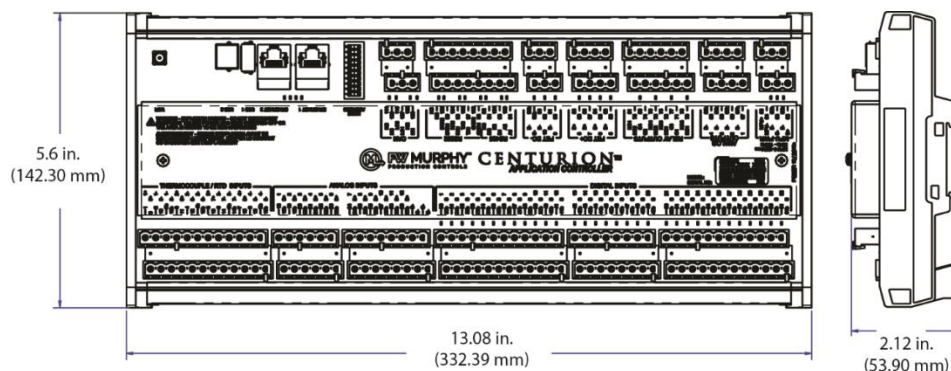
Before installing the product, inspect each item for damage which sometimes occurs during shipping.

### Centurion C5 Controller Module

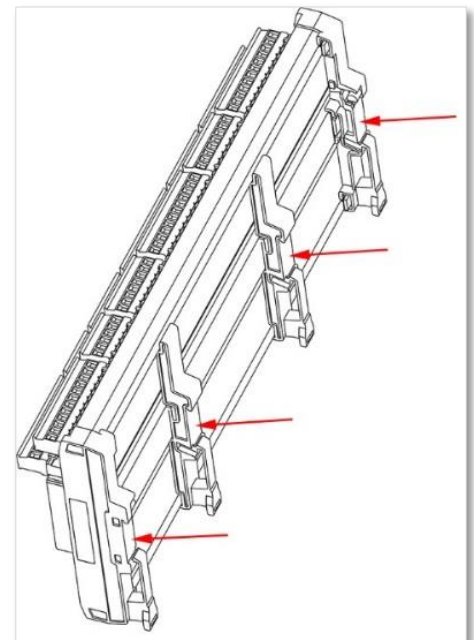
The Centurion Module Controller must be mounted in an enclosure meeting the requirements of IP54 or greater according to the intended use and environmental conditions in accordance with standard UL 60529 and only accessible by use of a tool.

- Operating Temperature 40° to 185° F (-40° to +85° C)
- Pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar)
- Air with normal oxygen content, typically 21% v/v
- Temperature Class T4
- "ic": intrinsic safety, (for EPL Gc)
- Increased safety, (for EPL Gc)

The Centurion Controller can be mounted vertically or horizontally on a standard DIN rail.



Attach the four clamp-type feet along the bottom of the controller to the DIN rail. We recommend installing rail stops to prevent sliding.



## Optional: MX4-R2 / MX5-R2 Modules

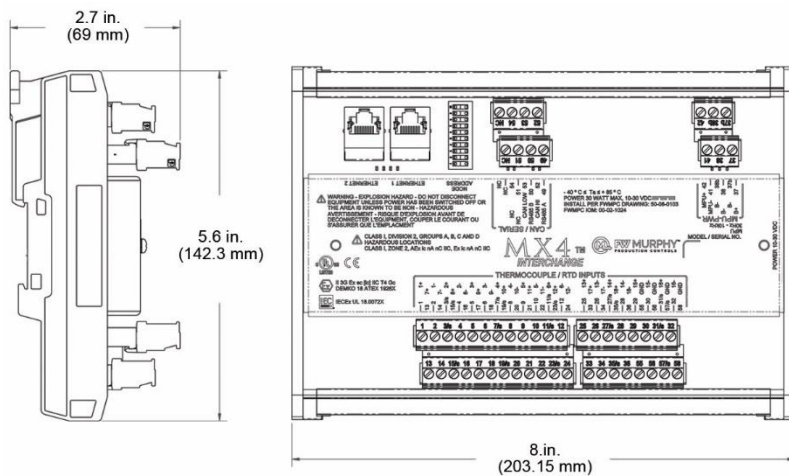
The module must be mounted in an enclosure meeting the requirements of IP54 or greater according to its intended use and environmental conditions in accordance with standard UL 60529 and only accessible by the use of a tool.

- Pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar)
- Air with normal oxygen content, typically 21% v/v
- Temperature Class T4
- "ic": intrinsic safety (for EPL Gc)
- Increased safety (for EPL Gc)

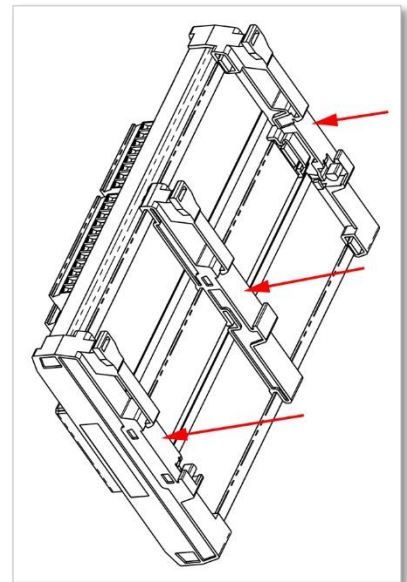
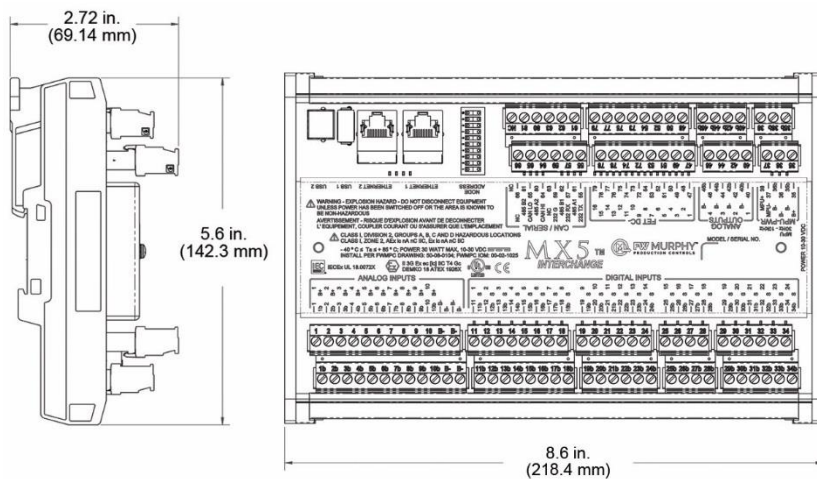
The modules can be mounted vertically or horizontally on a standard DIN rail.

Attach the three clamp-type feet along the bottom of the controller to the DIN rail. We recommend installing rail stops to prevent sliding.

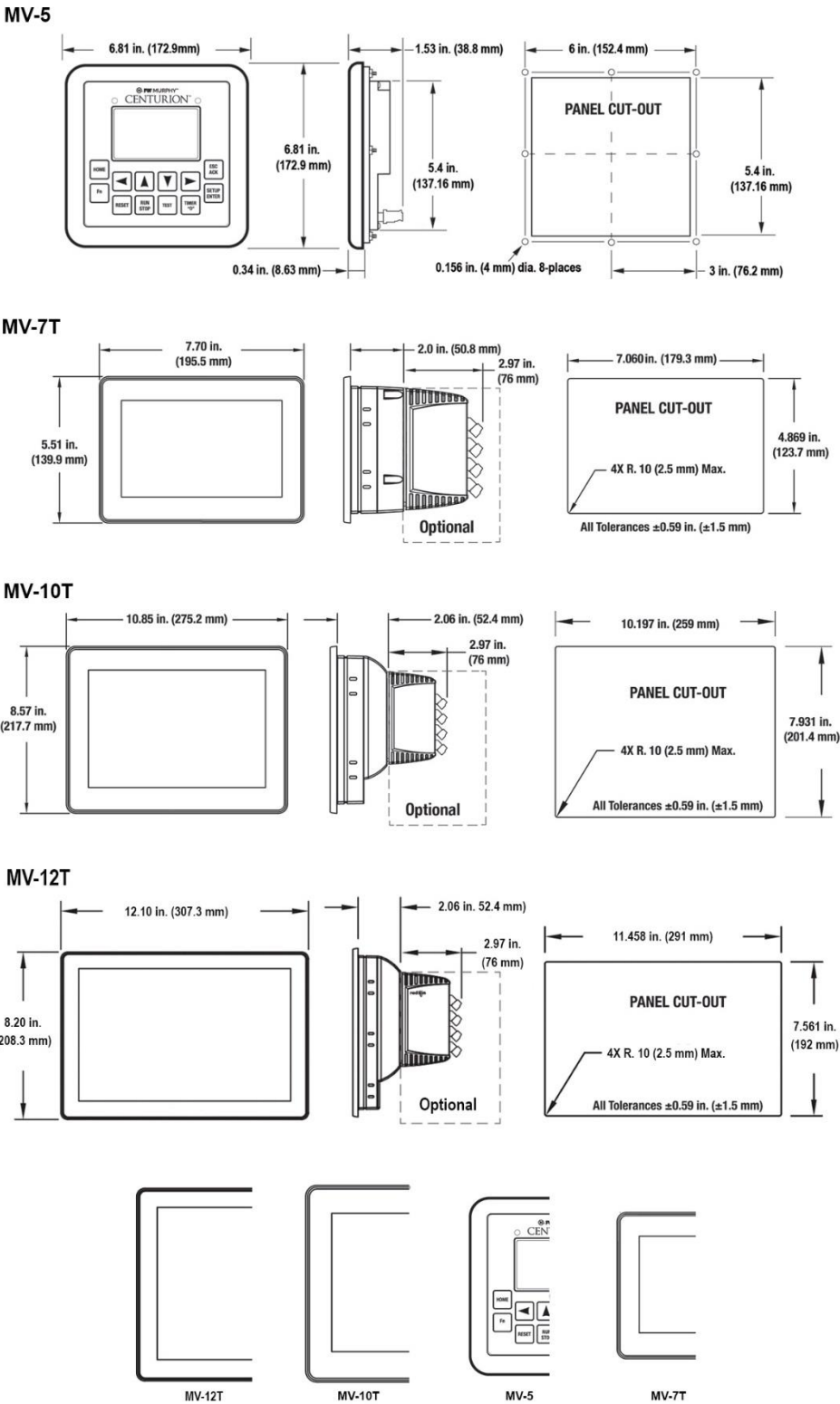
### Dimensions MX4-R2



### Dimensions MX5-R2



# M-View Display Dimensions



## Install the Display

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### Prepare the Panel – All M-View Models

The suitability of the enclosure is subject to investigation by the local authority having jurisdiction at the time of the installation.

1. Determine the location of the display on the customer-supplied flat or enclosed panel. Plan the display mounting for easy wiring and access.
2. Measure the specified dimensions shown in the diagram of the screen side. Doing so will ensure there is adequate real estate to provide clearance for the front edges of the housing to mount flush against the outside surface of your panel. The cut-out measurement will be smaller.
3. Use the diagram to measure and mark the specified dimensions shown in the panel cut-out diagram. This is your cut-out measurement.
4. Cut the hole in the panel following your marks matching the diagram as a guideline.

**NOTE:** Check for clearance fit of controller in the cutout before proceeding with drilling mounting holes.

5. If applicable, drill holes where indicated for the mounting screws.

### MV-5-C Display

**NOTE:** The Centurion MV-5-C display can be mounted in the same fastener holes and cutout as the Centurion C4 display.

1. Inspect the gasket on the back side of the display making sure it's secured to the display and aligned with the mounting studs.
2. Insert the MV-5-C display back side first, from the front side of the panel.



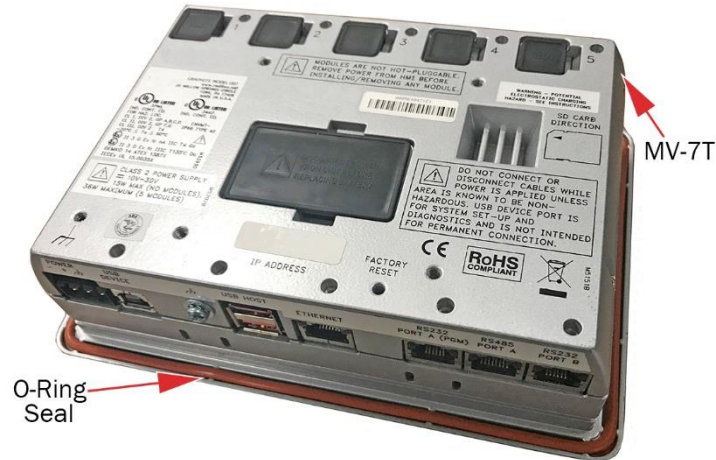
3. Ensure there is adequate clearance for the edges of the display housing and the back of the case is flush against the outside surface of your panel.
4. If thread lock is desired for your application, apply blue polycarbonate compatible thread lock to the threads of the mounting studs. It is not a requirement of installing Centurion C5.
5. Install the locknuts to each mounting stud from the back side of the panel to secure the MV-5-C housing.
6. Use an x-pattern to evenly tighten the locknuts to 8 in. lbs. (0.9 Nm). Do not overtighten.
7. Ensure there is a good seal between the controller, the gasket and the mounting panel.

## M-View Touch Series Displays

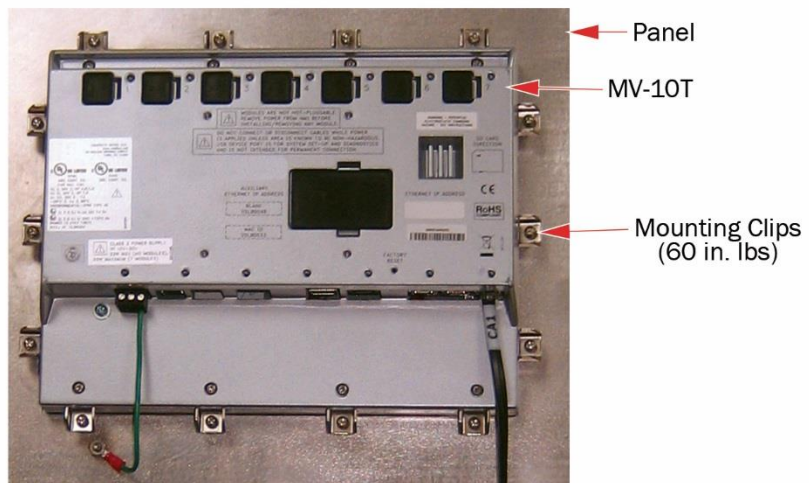
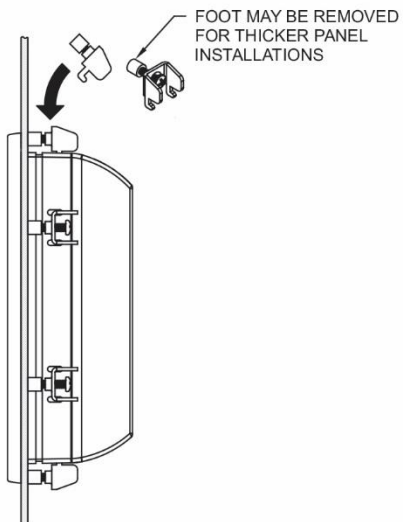
### Through-Panel Mount

Once the cutout is prepared in the panel, the display can be mounted in the cutout and secured with mounting clips.

1. Inspect the O-ring on the display and ensure it is free from any nicks and properly secured in position.



2. Insert the display back side first from the front side of the panel.
3. Ensure that there is adequate clearance for the edges of the display housing and the back of the case is flush against the outside surface of your panel.
4. Install the mounting clips with screws from the back side of the panel to the display housing and panel.
5. Tighten the mounting clips to 60 in. lbs. (10.5 Nm) evenly for uniform gasket compression. Do not overtighten.

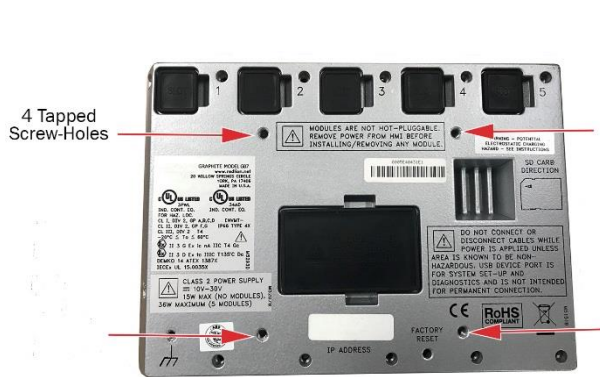


6. Ensure there is a good seal between the controller and the mounting panel.



## Stand Mount

Four mount-tapped screw holes (M4 x 0.7, 5 mm deep) are located on the rear of the panels for stand or wall mounting.

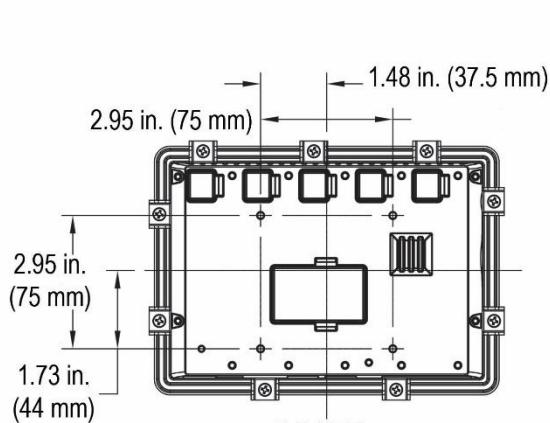


MV-7T

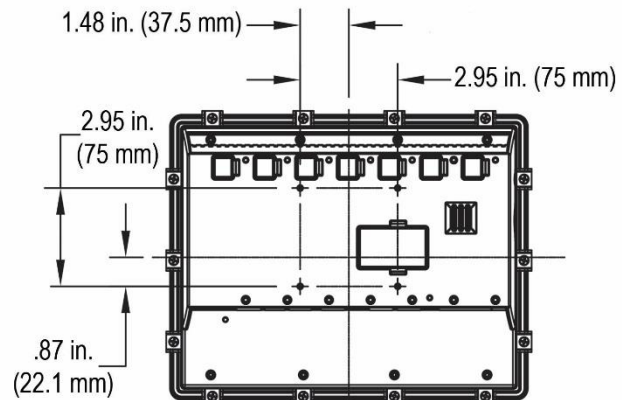


MV-12T with stand mount

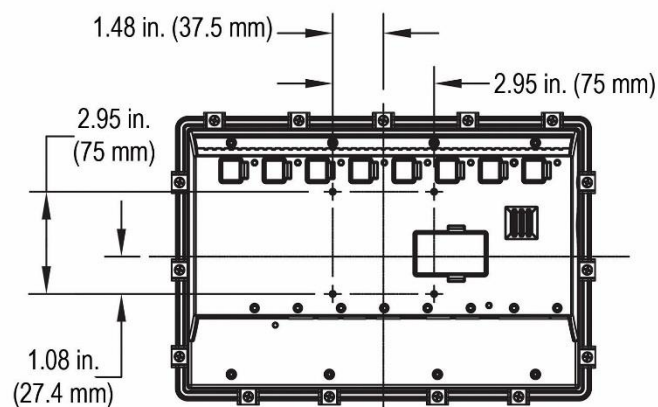
## Tapped Screw Hole Locations



MV-7T



MV-10T



MV-12T

## Communications and Security Access

The display module is a highly integrated operator interface specially programmed to complement and support the Centurion controller. The primary purpose of the display is to:

- View controller operational information
- View/edit controller operational parameters
- Send commands to controller, such as stop, edit and reset

### Display Passwords – All M-View Models

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Once you have entered using the default password, we recommend you change passwords for better security. Refer to your M-View Operators Manual if further details are needed.

There are two separate levels of passwords to accommodate security needs.

- Operator / Standard password - includes access and some editing except the Super User Menu.
- Super User password - includes access and editing to the Super User Menu in addition to the Standard password features.
- Default passwords are Operator-164; Super User-133.
- Your password access times out three minutes after the editing session is exited.

**NOTE:** If a pop-up message or password screen for login is displayed asking for security access, you may log in from there.

#### Log In – MV-5-C Display

1. From the Home Screen / Landing Page, press the Setup / Enter key to access the Password screen. The edit cursor rests on the far right digit. Example 00000.
2. Press the Up / Down arrows to add a number value.
3. Press the Left / Right arrow to move the edit cursor to the next digit and so on.
4. Press Setup / Enter to save, once all numbers are placed. Example 00164.

#### Log In – MVIEW Touch Displays

1. Touch the Setup / Enter icon to access the Setup Menu. Touch the Log On icon.
2. Touch the green arrow to enter the User Name screens.
3. Use the keyboard to enter a user name (op or super). Touch the green arrow to enter the password screen.
4. Use the keyboard to enter a password Touch the green arrow to enter.

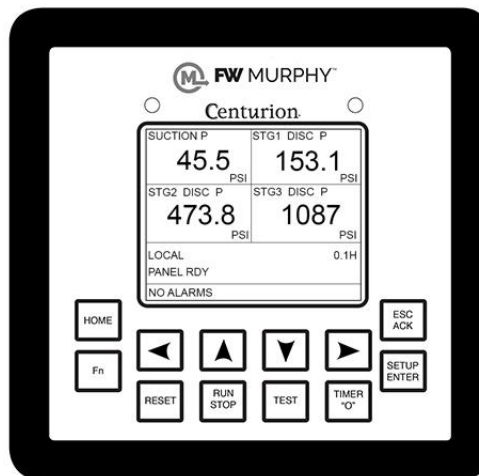
## Before Starting the Equipment for the First Time

If you are using an M-View Touch Series Display, skip this procedure and go to the next procedure titled **Setup – M-View-Touch Series Display**.

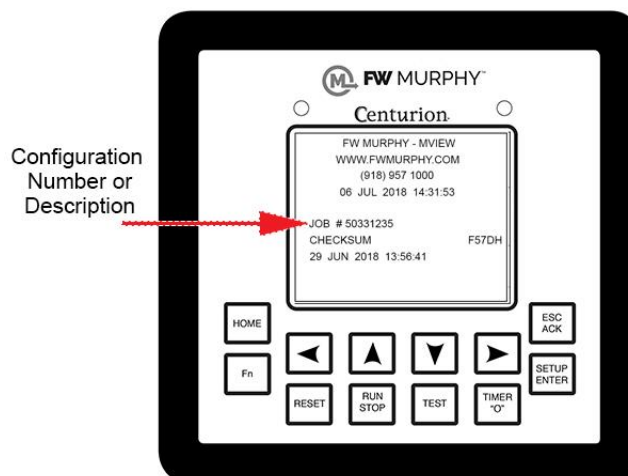
### Setup – MV-5-C Display

Read and follow steps in the order listed.

1. Locate the system drawing inside the panel and verify its drawing number matches the sticker on the lower front panel.
2. Locate the legend of the drawing and find the configuration description. Record this description.
3. Power up the Centurion System.
  - a. Allow time for the display to boot up and land on the Home Screen / Landing Page, approximately 15 seconds.



- b. From the Centurion Home Screen / Landing Page, touch the Arrow key to scroll left until you find the screen FW Murphy – MVIEW screen.
- c. Verify that the configuration description matches the one you previously recorded from the drawing legend.

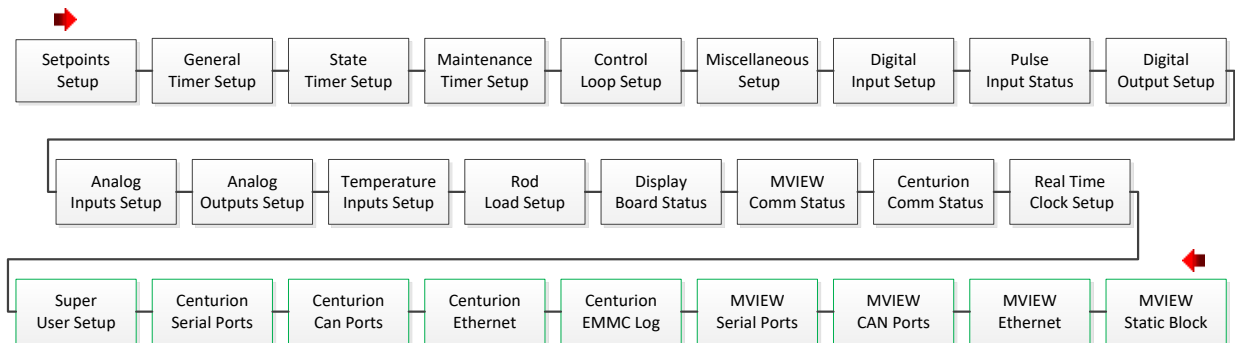




4. Press the Setup Enter key to open the Password screen.
  - a. Use the Arrow keys to enter your password. Default passwords are: Operator-164; Super User-133. If further details are needed, see Display Passwords.
5. Once the password is entered, the display opens the Setpoints Setup screen. Use the right and left Arrow keys to find the screen you want to view / edit.

#### Map of the Setup Screens for MV-5-C Display

>Home/Setup Enter Key/Password/Setpoints Setup/Arrow Key scroll to screen<



6. Open the following list of screens to verify or change the factory settings as needed for your site location.
  - a. We suggest you record these values in the Sequence of Operation. This gives you a reference of any changed settings from the factory default.
  - b. Select and enter each active item on the screen and verify its set values.
    - i. Edit values as needed using the active Arrow keys.
    - ii. Press the Setup / Enter key to change or accept the value.
    - iii. Press the ESC / ACK key to go back one page without change.
    - iv. Record any changes.
    - v. Repeat these steps until all screens listed below are verified for your site location.
      - Setpoints Setup
      - Control Loop Setup
      - Analog Input Setup
      - General Timer Setup
      - State Timer Setup
      - Temperature Inputs Setup
      - Rod Load Setup

7. Start the unit.
  - a. Clear any Alarms Class A (always armed) faults from the system. On the display, the Unit State will read Panel Ready if no Class A shutdown condition exist.
  - b. Press and hold the Run/Stop key on the display for 2 seconds. This will initiate the start cycle. Depending on your configuration, the Centurion will send signals to possibly prelube the equipment, check pre-starting permissives and then signal the driver to start the equipment. Confirmation of running may be in the form of RPM signal or digital switch input feedback. Once running signal is confirmed, the Centurion will be in a running condition. Class B and S lockout timers will begin timing to faults that require time lockout. Additional warmup and load permissives will be monitored as configured for the package prior to enabling any load control.
  - c. After all preload permissives have been achieved, such as oil or water temperatures, and possible minimum warmup times, the Unit State will read Loaded and will continue until the stop button is pressed, RPM is lost or a fault condition exist.

## **Faults, Stops and Alarms**

### **Normal Stop**

When a normal stop is issued and the unit is running, the system will start a normal shut-down sequence.

1. To issue a normal stop, press and hold the Run Stop key on the display for 2 seconds.
2. On the display, the Unit State will read Cooldown, and the Cooldown state delay will begin timing (if configured).
3. After the Cooldown is completed, the Unit State will read Stopping.
4. When everything has been recognized as back to normal the Unit State will read Panel Ready.

### **Fault Shutdown**

The Centurion will continually monitor for Fault or ESD shutdown events which require the equipment to stop immediately or prevent it to start.

On the display, the Unit State will read Shutdown and the Alarm/Shutdown banner on the bottom of the screen shows the shutdown message in a firstout fashion, and the LED on the upper part of the display will illuminate red.

The cause of the event is recorded and can be viewed on the Shutdown History screen with time and date of occurrence.

1. The Shutdown History screen displays information of the fault.
  - a. <Centurion Home Screen / FN / Shutdown History>
2. The Shutdown Snapshot screen displays the values of the unit running at the time a fault occurred.
  - a. <Centurion Home Screen / FN / Shutdown History / Right Arrow to scroll >
3. Once the corrections are made, clear the Shutdown condition by pressing the Reset key on the display.
4. Always make corrections on the unit before attempting to restart the equipment.

### **Alarms**

- If an alarm condition is detected, the Alarm/Shutdown banner on the bottom of the screen shows the active alarm messages in the system, and the LED on the upper part of the display will illuminate amber. Alarms may be configured as self-clearing or as requiring acknowledgement. Self-clearing alarms will auto clear if no longer present. Alarms requiring acknowledgement will persist until the ACK key is pressed.
- You can view up to 20 active alarms on the Active Alarms screen.
  - <Centurion Home Screen / FN / Active Alarms>
- Press the ESC ACK key to acknowledge the Active Alarm.

## User-Configurable Screens

The Centurion has (9) user-configurable pages of (4) types. The Centurion Configuration Tool software allows users to configure up to nine (9) screens with controller input signal groupings. Possible custom screen types may include:

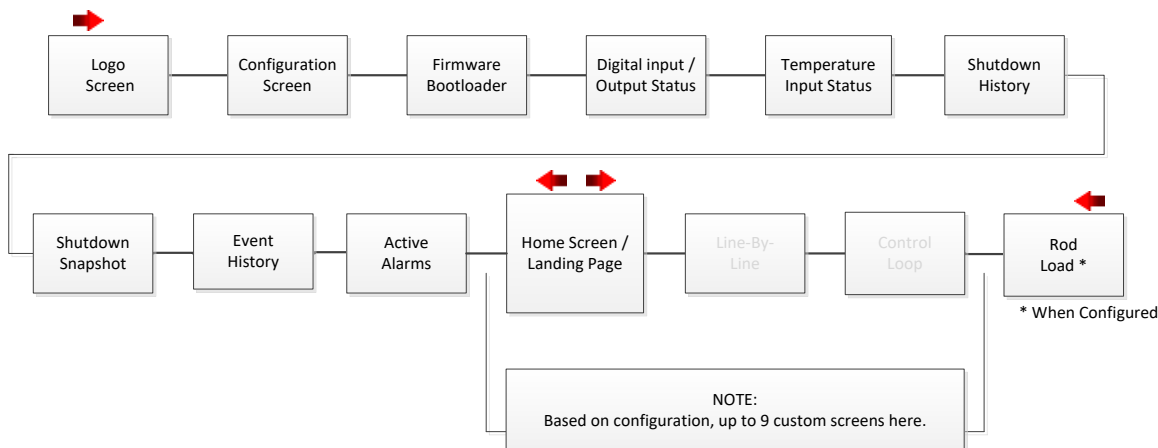
- Custom Line by Line allows users to display process data in a list format with description and value.
- Custom Gage allows user to display four (4) most important pieces of data on a 2 x 2 table in larger font.
- Custom Control Loop allows user to display Control Loop functions. The control output will be displayed as a percentage of the range.
- Custom Generic Register allows user to display up to 20 items on a page that can be mapped to the Centurion Modbus map and given a label.

For more information on configuring the optional screens through the Centurion Configuration Tool, please refer to the Configuration Tool Quick Start Guide.

### Map of Operational Screens, MV-5-C Display

From the Home Screen/ Landing Page, use the left and right arrows to view the Operating Screens. A password is not required to view these screens.

Some screens are application specific and may not be used.



## Setup – M-View Touch Series Displays

Read and follow steps in the order listed.

1. Locate the system drawing inside the panel and verify its drawing number matches the sticker on the lower front panel.
2. Locate the legend of the drawing and find the configuration description. Record this description.
3. Power up the Centurion System.
  - a. Allow time for the display to boot up and land on the Home Screen / Landing Page, approximately 15 seconds.
  - b. If Centurion has integrated EICS displays enabled, the System View will be the initial power up view. Touch the screen on the Centurion side to open its Home screen in full-screen view with active icons.

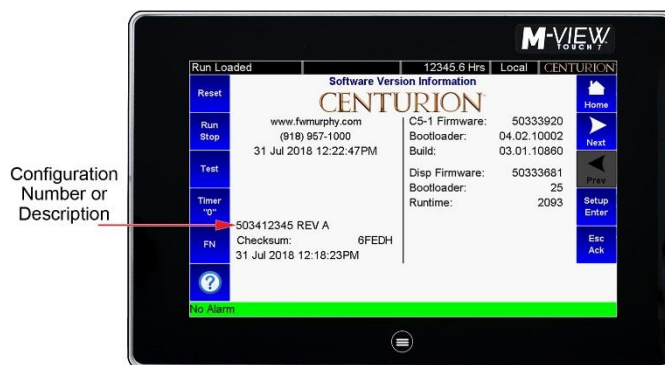


System View as the Home Screen / Landing Page



Centurion Home Screen / Landing Page

- c. From the Centurion Home screen, touch the Arrow icon to scroll left until you find the Software Version Information screen.
- d. Verify that the configuration description matches the one you previously recorded from the drawing legend.




- e. Touch the Home icon to return or touch the Setup Enter icon and continue to the next step.

4. Open the following list of screens to verify or change the factory settings as needed for your site location.
  - a. We suggest you record these values in the Sequence of Operation. This gives you a reference of any changed settings from the factory default.
  - b. From the Home screen, touch the Setup Enter icon to open the Setup Menu screen.



- c. From Setup Menu screen, touch the Setpoints icon to open it. Open and verify the set values under the Blue (active) icons. Touch a value to change it. Touch X to go back one page or the Menu icon to go back to Setup Menu screen.
  - i. Once verification and changes are made and recorded, return to the Setup Menu screen and open another screen from the list below. Repeat these steps to verify the set values under the remaining screens listed.
    - Setpoints
    - Control Loop
    - Analog Inputs
    - General Timer
    - State Timer
    - Temperature Inputs
    - Rod Load Setup

**NOTE:** For screen specific help, press the  Information icon to view information about the items and settings available on the displayed page.

5. Start the unit.
  - a. Clear any Alarms Class A (always armed) faults from the system. On the display the Unit State will read Panel Rdy if no Class A shutdown condition exist.
  - b. Touch and hold the Run Stop icon on the display for 2 seconds. This will initiate the start cycle. Depending on your configuration, the Centurion will send signals to possibly prelube the equipment, check pre-starting permissives and then signal the driver to start the equipment. Confirmation of running may be in the form of RPM signal or digital switch input feedback. Once running signal is confirmed, the Centurion will be in a running condition. Class B and S lockout timers will begin timing to faults that require time lockout. Additional warmup and load permissives will be monitored as configured for the package prior to enabling any load control.
  - c. After all preload permissives have been achieved, such as oil or water temperatures, and possible minimum warmup times, the Unit State will read Loaded and will continue until the stop button is pressed, RPM is lost or a fault condition exist.

## **Faults, Stops and Alarms**

### **Normal Stop**

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1. To issue a normal stop, touch and hold the Run Stop icon on the display for 2 seconds.
2. On the display, the Unit State will read Cooldown, and the Cooldown state delay will begin timing (if configured).
3. After the Cooldown is completed, the Unit State will read Stopping.
4. When everything has been recognized as back to normal, the Unit State will read Panel Ready.

### **Fault Shutdown**

The Centurion will continually monitor for Fault or ESD shutdown events which require the equipment to stop immediately or prevent it to start.

On the display, the Unit State will read Shutdown, and the Alarm Shutdown banner will appear on most operating screens.

The cause of the event is recorded and can be viewed on the Shutdown History screen with time and date of occurrence.

1. The Shutdown History screen displays information of the fault. Touch the Book icon for troubleshooting.
  - a. <Centurion Home Screen / FN / Shutdown History>
2. The Shutdown Snapshot screen displays the values of the unit running at the time a fault occurred.
  - a. <Centurion Home Screen / FN / Shutdown History / Right Arrow to scroll >
3. Once the corrections are made, clear the Shutdown condition by touching the Reset icon on the screen.
4. Always make corrections on the unit before attempting to restart the equipment.

### **Alarms**

If an alarm condition is detected the Alarm Shutdown banner on the bottom of the screen shows the active alarm messages in the system. Alarms may be configured as self-clearing or as requiring acknowledgement. Self-clearing alarms will auto clear if it's no longer present. Alarms requiring acknowledgement will persist until the ACK key is pressed.

1. Select Alarms from the Active Alarms screen. (This screen displays up to 20 active alarms.)
  - a. <Centurion Home Screen / FN / Active Alarms>
2. Touch the ESC ACK icon to acknowledge the Active Alarm.

The Centurion has (9) user-configurable pages of (4) types. The Centurion Configuration Tool software allows users to configure up to nine (9) screens with controller input signal groupings. Possible custom screen types may include:

- For more information on configuring the optional screens through the Centurion Configuration Tool, please refer to the Configuration Tool Quick Start Guide.

From the Home Screen/ Landing Page, use the left and right arrows to view the Operating Screens. A password is not required to view these screens.

```

graph LR
    A[Powerup Logo Screen] --> B[Software Version Information]
    B --> C[Firmware Bootloader]
    C --> D[Digital input / Output Status]
    D --> E[Temperature Input Status]
    E --> F[Shutdown History]
    F --> G[Shutdown Snapshot]
    G --> H[Event History]
    H --> I[Active Alarms]
    I --> J[Home Screen / Landing Page]
    J --> K[Line-By-Line]
    K --> L[Control Loop]
    L --> M[Rod Load *]
    M --> J
    
```

\* When Configured

**NOTE:**  
Based on configuration, up to 9 custom screens here.

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# Centurion™ - C5 Series

## Application Controller

### *Installation Manual*

**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product.  
A copy of the warranty may be viewed or printed by going to <http://www.fwmurphy.com/warranty>



**BEFORE BEGINNING INSTALLATION OF THIS FW MURPHY  
PRODUCT:**

- Please read the following information before installing the Centurion controller. This installation information is intended for Centurion controller only.
- Visually inspect the product for any damage during shipping.
- Before proceeding please visit our website and review our support documentation including Wiring the Murphy Way.  
[www.fwmurphy.com/uploaded/WIR\\_Murphy\\_Way.pdf](http://www.fwmurphy.com/uploaded/WIR_Murphy_Way.pdf)
- Disconnect all power and be sure machine is inoperative before beginning installation.
- Installation is to be done only by a qualified technician of the Responsible Body.
- Observe all Warnings and Cautions at each section in these instructions.
- Device shall be wired in accordance with NEC, CEC or other local code, as applicable.
- Please contact FW Murphy immediately if you have any questions.

**For Class I, Division 2:**

THIS EQUIPMENT IS AN OPEN-TYPE DEVICE AND IS MEANT TO BE INSTALLED IN AN ENCLOSURE SUITABLE FOR THE ENVIRONMENT SUCH THAT THE EQUIPMENT IS ONLY ACCESSIBLE WITH THE USE OF A TOOL.

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D OR NON-HAZARDOUS LOCATIONS ONLY.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN REMOVED OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

WARNING – EXPLOSION HAZARD – DO NOT REPLACE BATTERIES UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.

TEMPERATURE CODE OF T4 FOR ALL MODELS.

PROVIDES NONINCENDIVE FIELD WIRING OUTPUTS/INPUTS WHEN WIRED ACCORDING TO DRAWINGS 50-08-0102 (C5-1-X, C5-2-X) and 50-08-0093 (MV-5-X).

**For AEX/EX Class I, Zone 2:**

THE EQUIPMENT SHALL ONLY BE USED IN AN AREA OF POLLUTION DEGREE 2.

THE EQUIPMENT SHALL BE INSTALLED COMPLETELY WITHIN AN ENCLOSURE THAT PROVIDES A MINIMUM INGRESS PROTECTION OF IP 54 IN ACCORDANCE WITH UL60079-0 AND ONLY ACCESSIBLE BY THE USE OF A TOOL.

THE WIRE SIZE, TORQUE RATING OF 12-24 AWG, 0.37-0.44 ft. lbs. (0.4-0.5 Nm), AND SUITABLE SUPPLY WIRE TEMPERATURE RATING OF 97°C MINIMUM SHALL BE PROVIDED FOR THE INPUT POWER TERMINAL BLOCK.

ALL MARKING INFORMATION EXCEPT FOR SERIAL NUMBER/DATE CODES SHALL BE REPEATED.

PROVIDES NONINCENDIVE FIELD WIRING OUTPUTS/INPUTS WHEN WIRED ACCORDING TO DRAWINGS 50-08-0102 (C5-1-X, C5-2-X) and 50-08-0093 (MV-5-X).

**SPECIAL CONDITIONS FOR USE IECEx/ATEX Zone 2:**

THE EQUIPMENT SHALL ONLY BE USED IN AN AREA OF NOT MORE THAN POLLUTION DEGREE 2, AS DEFINED IN IEC/EN 60664-1.

THE EQUIPMENT SHALL BE INSTALLED IN AN ENCLOSURE THAT PROVIDES A DEGREE OF PROTECTION NOT LESS THAN IP 54 IN ACCORDANCE WITH IEC/EN 60079-0 AND ONLY ACCESSIBLE BY THE USE OF A TOOL.

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## Installation Manual

This manual applies to Centurion C5-1 and C5-2 Application Controllers. C5 and C5 Series refers to both application controllers.

## Operation Manual Location

After installation, please review the Centurion C5 Operations Manual prior to placing the controller into service. In order to access the Centurion C5 Operation Manual, please visit the product page to download or print a copy located under the literature tab.

[www.fwmurphy.com/Centurion\\_C5](http://www.fwmurphy.com/Centurion_C5)

## Centurion™ C5 Controller Kit and Tools

The following instructions will guide you through installing the Centurion C5 controller.

### Inspecting Package Contents

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Before attempting to install the product, ensure all parts are accounted for and inspect each item for damage (which sometimes occurs during shipping).

Centurion C5 Controller kit includes:

- Centurion C5 Controller
- Centurion C5 Installation Manual (this document) p/n 00-02-0963.

### Tools Needed

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- Use a 1/4 in. drill bit to make the approximately sized 0.250 in. mounting holes.
- Use a 5/16 in. nut driver to secure star nuts.
- Use a cutout tool (i.e. saw, punch press or cutting wheel) to create the mounting hole according to the dimensions.

## Installation

### Enclosure / Environmental Requirements

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The Centurion Main Module and all M-View displays must be mounted in an enclosure meeting the requirements of IP54 or greater according to the intended use and environmental conditions and in accordance with UL standards and accessible only by use of a tool.

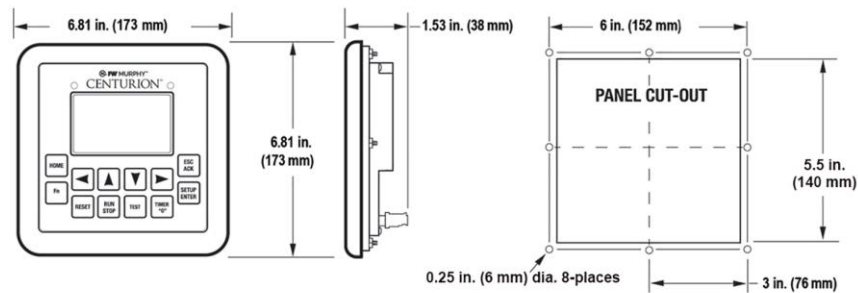
NOTE: IP requirement is ONLY for North America and IECEx/ATEX  
Zones UL 60079, IEC/EN 60079-0

- Operating temperature -40° to 85°C (-40° to 185°F)
- Altitudes up to 2,000m (6,500ft) (air pressure 0.8/1.1 bar)
- Air with normal oxygen content (typical 21% v/v)
- Maximum relative humidity 95% non-condensing for temperatures up to 85°C (185°F)
- Temperature Class T4
- ic: intrinsic safety (for EPL Gc)
- Increased safety (for EPL Gc)

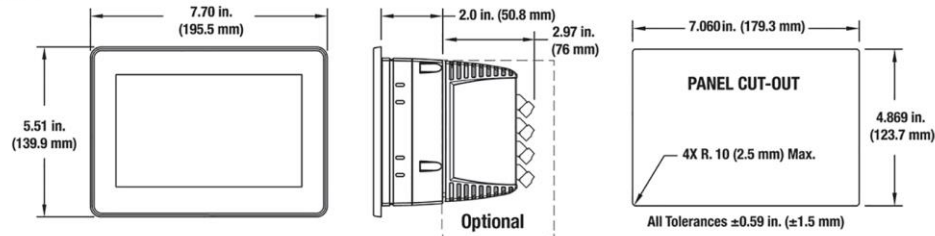


# M-View® Display Dimensions

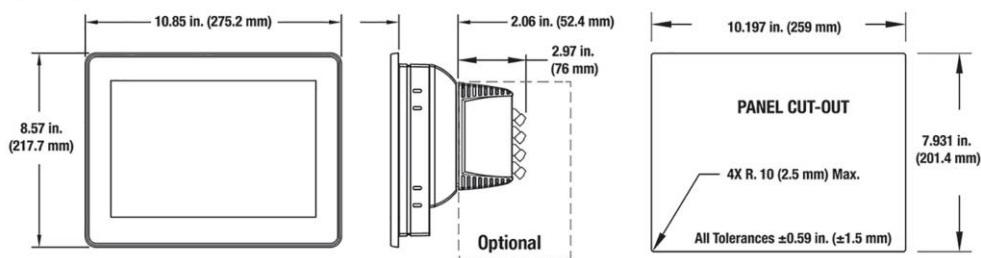
MV-5



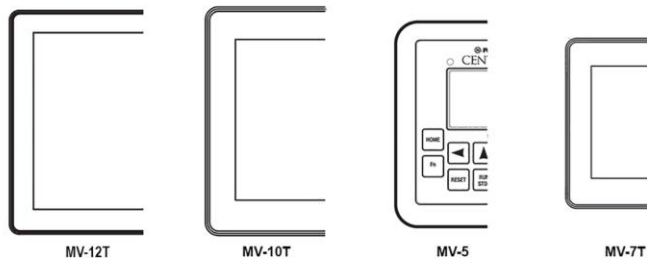
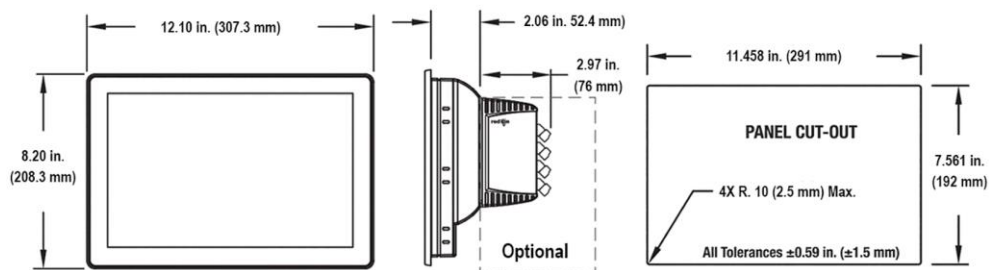
MV-7T



MV-10T



MV-12T



## Install the Display

### Prepare the Panel – All M-View Models

1. Determine the location of the display on the customer-supplied flat or enclosed panel. Plan the display mounting for easy wiring and access.
2. Measure the specified measurements shown in the diagram of the screen side. Doing so will ensure there is adequate real estate to provide clearance for the front edges of the housing to mount flush against the outside surface of your panel. The cut-out measurement will be smaller.
3. Use the diagram to measure and mark the specified dimensions shown in the panel cut-out diagram. This is your cut-out measurement.
4. Cut the hole in the panel following your marks matching the diagram as a guideline.

**NOTE:** Check for clearance fit of controller in the cutout before proceeding with drilling mounting holes.

5. If applicable, drill holes as indicated for the mounting screws.

### MV-5-C Display

The Centurion display can be mounted in the same hole cutouts as the Centurion C4 display. Eight studs and star nuts secure the display bezel to the mounting surface.



Backside of MV-5-C showing gasket, studs and tightening sequence

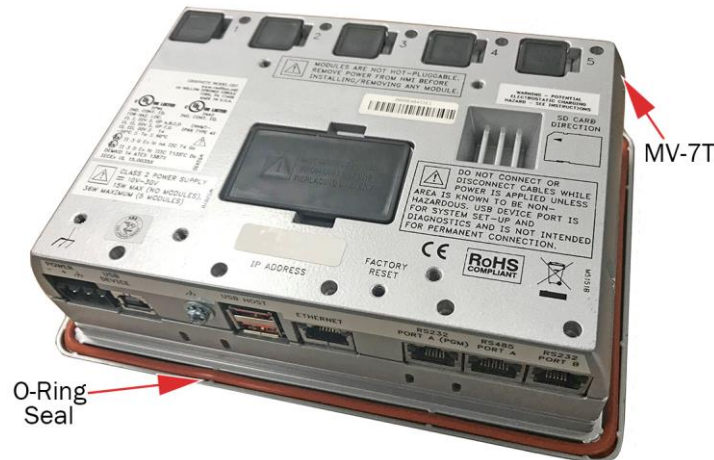
1. Insert the display backside first, from the front side of the panel.
2. Ensure that there is adequate clearance for the edges of the display housing and the back of the case is flush against the outside surface of your panel.
3. Install eight star nuts to the studs from the backside of the panel.
4. Tighten the 5/16" star nuts in sequence to 9 in. lbs. (1 Nm). Do not overtighten.

## MV-7T, MV-10T and MV12T Displays

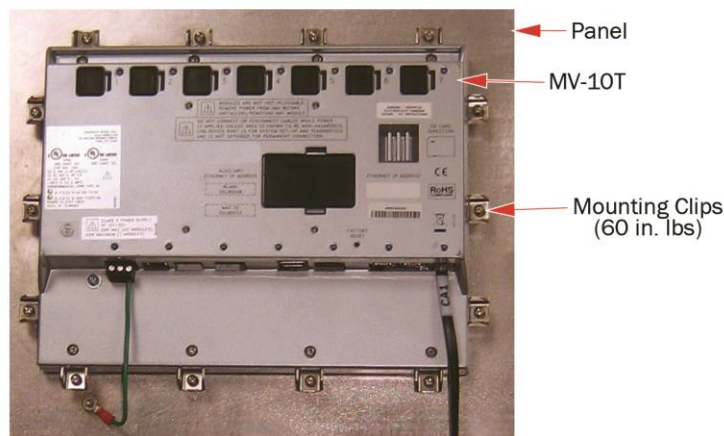
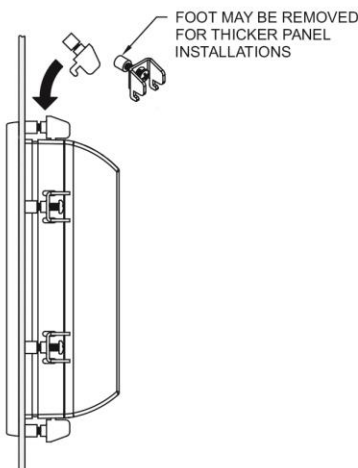
### Through-Panel Mount

Once the cutout is prepared in the panel, the M-View Touch can be mounted in the cutout and secured with mounting clips.

1. An O-ring is provided to enable sealing. Inspect the O-ring on the display and ensure it is free from any nicks and properly secured in position.



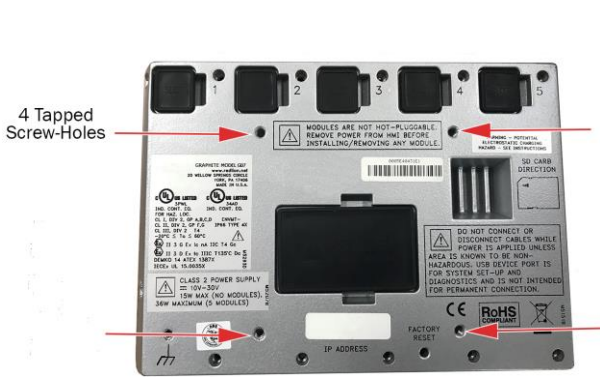
2. Insert the M-View Touch display back side first, from the front side of the panel.
3. Ensure that there is adequate clearance for the edges of the display housing and the back of the case is flush against the outside surface of your panel.
4. Install the mounting clips with screws from the back side of the panel to the display housing and panel.
5. Tighten the mounting clips to 60 in. lbs. (10.5 Nm) evenly for uniform gasket compression. Do not overtighten.



6. Ensure there is a good seal between the controller and the mounting panel.

# Stand Mount

Four mount-tapped screw holes (M4 x 0.7, 5 mm deep) are located on the rear of the panels for stand or wall mounting.

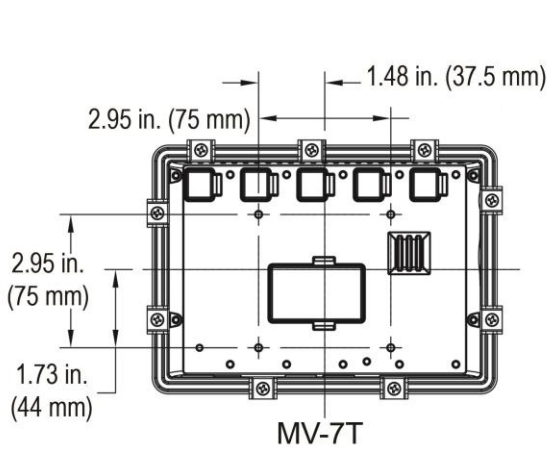


MV-7T

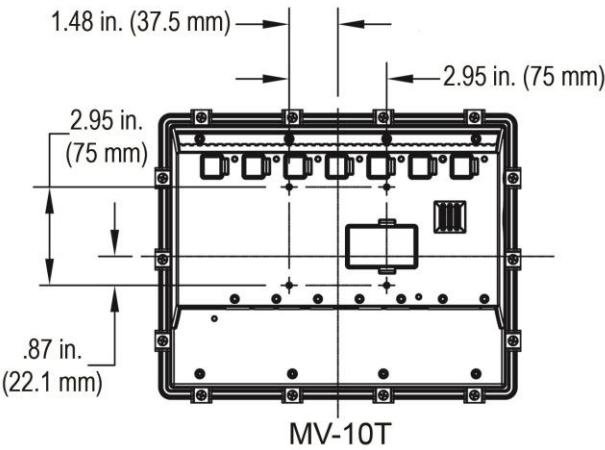


MV-12T with stand mount

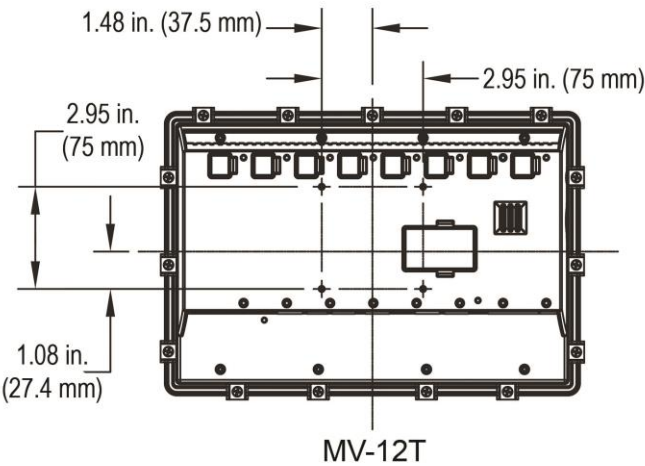
# Tapped Screw Hole Locations



MV-7T



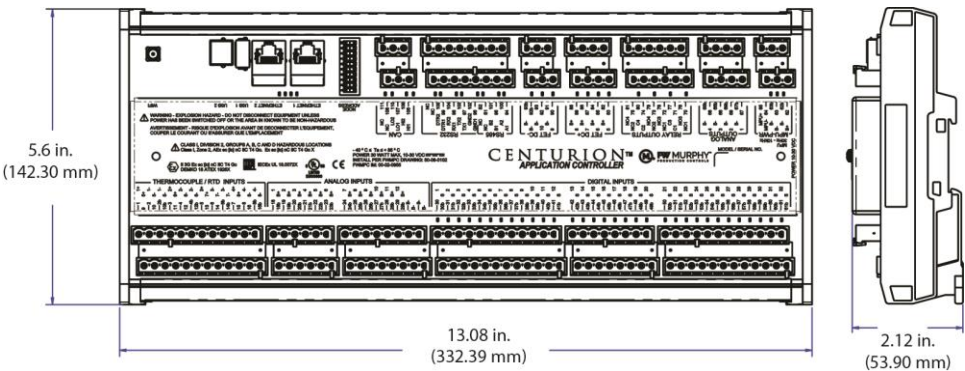
MV-10T



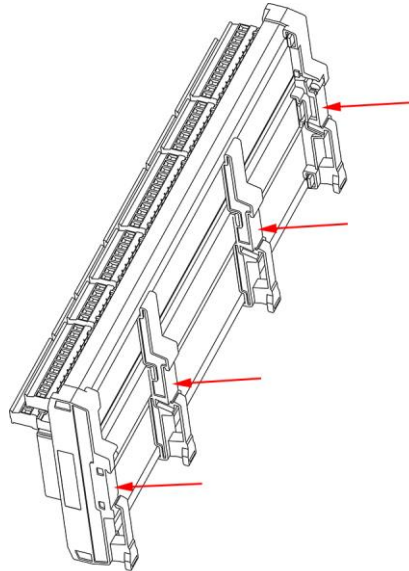
MV-12T

# Install the Main Module Controller

The Centurion C5 controller can be mounted vertically or horizontally on a standard DIN rail.



Four clamp-type feet along the bottom of the controller attach to the DIN rail; however, rail stops are recommended to prevent sliding.



## Wire Diagram — MV-5-C Display





## Entity Parameters — MV-5-C Display

RS232 J6										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J6 RS232 Transmit/Recieve Pins 1, 2, 3, 4	±15.0	±60	-	22.2	2.99	±30	±60	-	0	0.001
Pin 5	Ground Reference Non-ic									

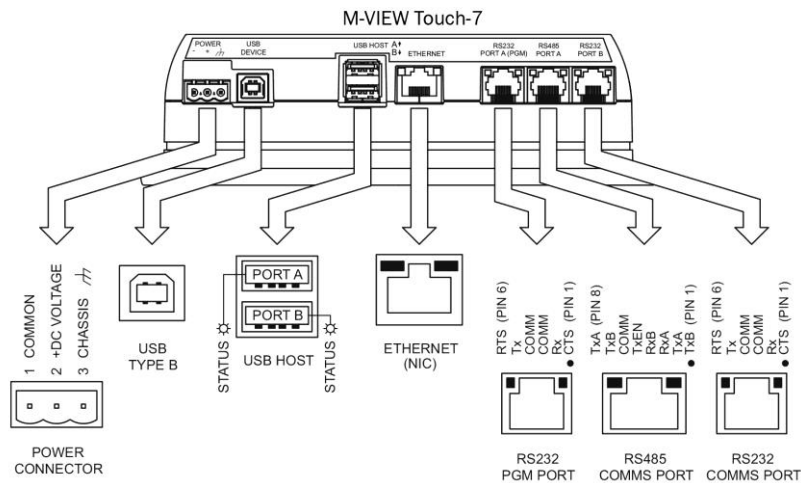
RS485 J11										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
Pins 1, 2	±5.0	±60	-	22.2	999.9	±12.0	±60	-	0	0.01
Pin 3	Ground Reference Non-ic									
Pins 4, 5	±5.0	±60	-	22.2	999.9	±12.0	±60	-	0	0.01
DC-	Ground Pin									

USB										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J7 Type A Pin 1	5.04	±25	-	128	889.8	±5	±500	-	0	110.2
J7 Pin 4	Ground Non-ic									
Pin Tab1, Tab2	Ground Non-ic									
J8 Type B Pin 1	5.04	±25	-	128	889.8	±5	±500	-	0	110.2
J8 Pin 4	Ground Non-ic									
J8 Pins 5, 6	Shield Ground Reference Non-ic									

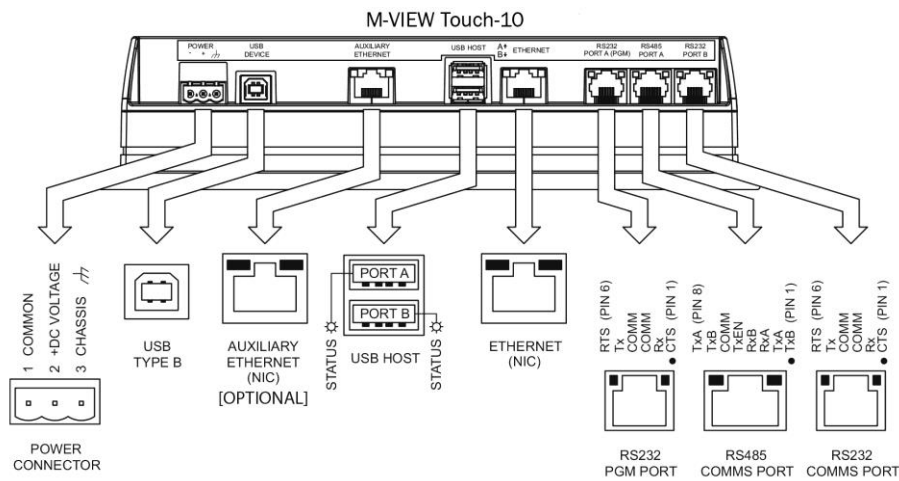
CAN Per Channel										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[pF]
J9 Pins 1, 2, 3, 4	4.5	100	-	8	999.9	±24	100	-	51	267
5	Ground Reference Non-ic									

Ethernet Per Port										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J10	3.3	±61.5	-	21.2	999.9	3.3	±60	-	0	0.04

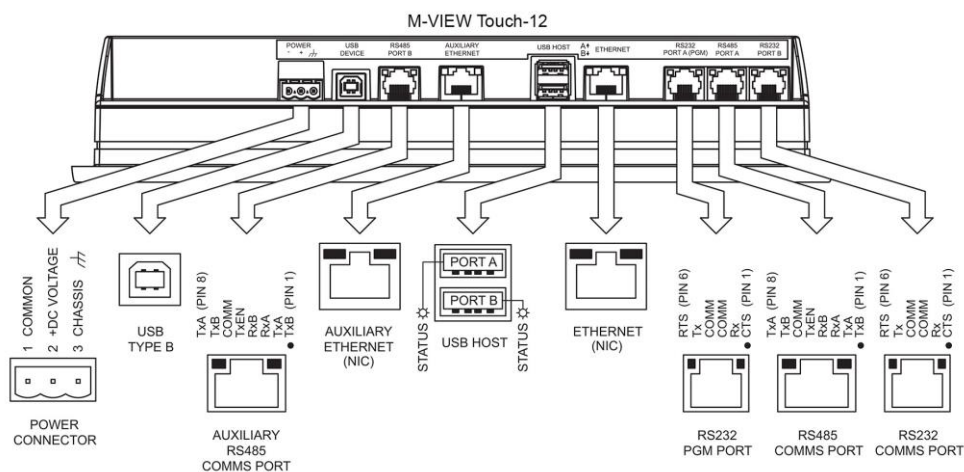
# Wire Diagram — MV-7T Display



# Wire Diagram — MV-10T Display



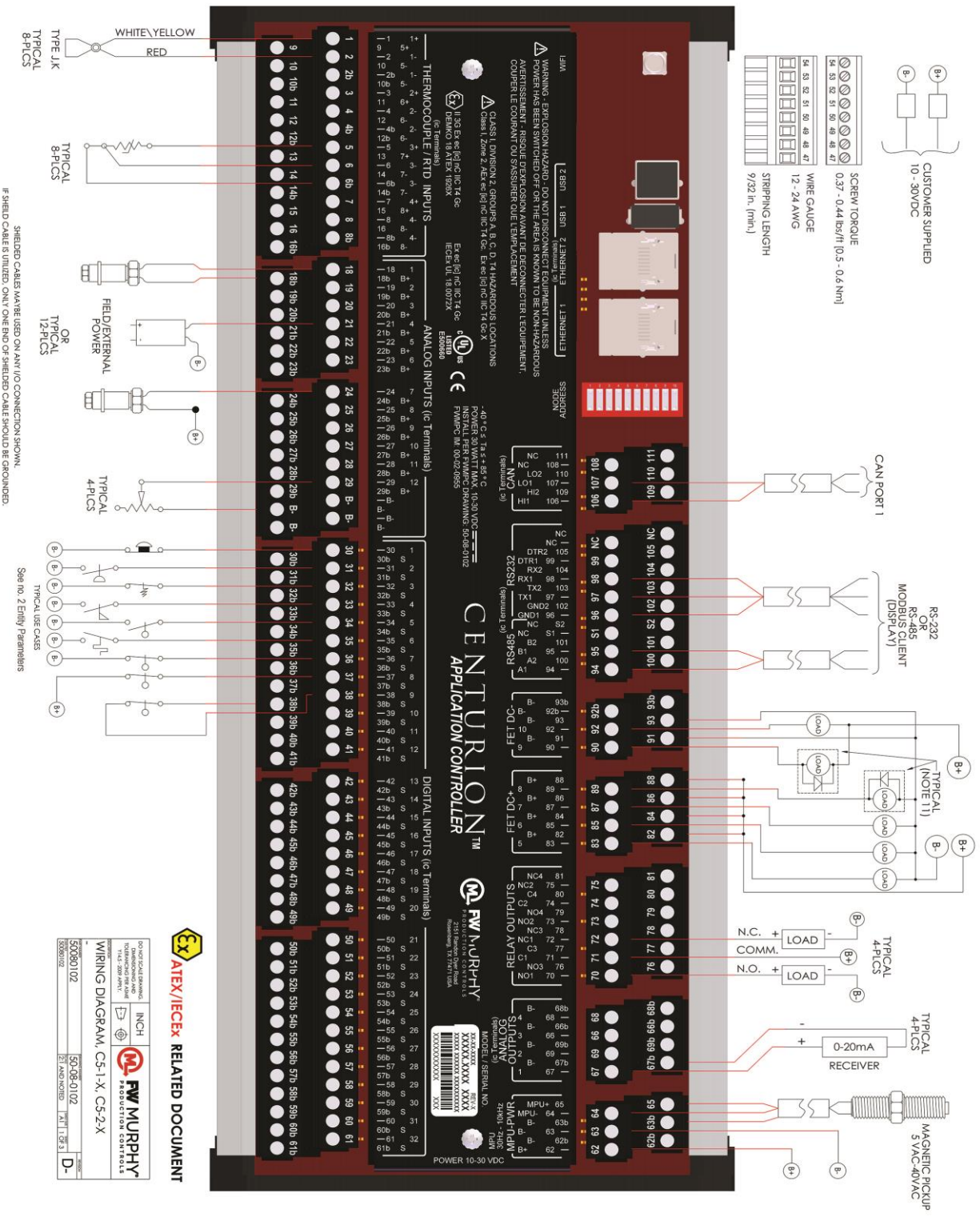
# Wire Diagram — MV-12T Display





# Wire Diagram — Centurion C5 Controller

When applicable, shielded cables may be used on any I/O connection shown. If shielded cable is utilized, only one end of the shielded cable should be grounded.

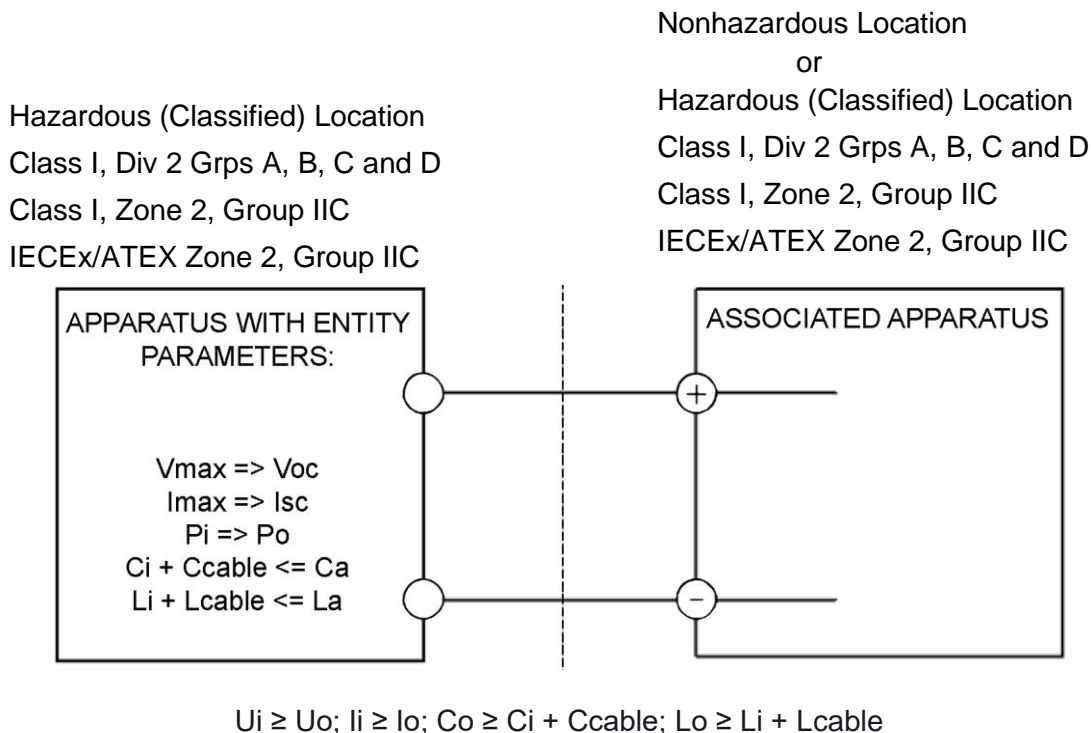


# Entity Parameters — Centurion C5 Controller

Inputs/Outputs are only for connections for devices located in Class I, Division 2, Groups A, B, C, D or Class I, Zone 2, Group IIC Hazardous location or ordinary Nonhazardous location or IECEX/ATEX Zone 2, Group IIC with Non-incendive. Simple Apparatus, Intrinsically Safe or approved device with entity concept parameters ( $U_o$ ,  $I_o$ ,  $P_o$ ,  $C_o$ ,  $L_o$ ,  $U_i$ ,  $I_i$ ,  $P_i$ ,  $C_i$ ,  $L_i$ ) appropriate for connection to associated apparatus with entity concept parameters as listed in the tables.

## NOTES:

1. The output current of this associated apparatus is limited by a resistor such that the output voltage-current plot is a straight line drawn between open-circuit voltage and short-circuit current. The entity concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved vales of  $V_{oc}$  (or  $U_o$ ) and  $I_{sc}$  (or  $I_o$ ) for the associated apparatus are less than or equal to  $V_{max}$  ( $U_i$ ) and  $I_{max}$  ( $I_i$ ) for the intrinsically safe apparatus. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations. Cable capacitance,  $C_{cable}$ , plus intrinsically safe equipment capacitance,  $C_i$  must be less than the marked capacitance,  $C_a$  (or  $C_o$ ), shown on any associated apparatus used. The same applies for inductance ( $L_{cable}$ ,  $L_i$  and  $L_a$  or  $L_o$ , respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used:  $C_{cable} = 60 \text{ pF/ft.}$ ,  $L_{cable} = 0.2 \text{ }\mu\text{H/ft.}$



2. This associated apparatus may also be connected to non-incendive or simple apparatus as defined in Article 504.2 and installed and temperature classified in accordance with Article 504.10 (B) of the National Electrical Code (ANSI/NFPA 70) or other local codes, as applicable. Examples of simple apparatus are general-purpose contact/switch, thermocouple and RTD.

3. For intrinsically safe devices selected associated apparatus must be third-party listed as providing intrinsically safe circuits for the application or have  $V_{oc}$  or  $V_t$  not exceeding  $V_{max}$  (or  $U_o$  not exceeding  $U_i$ ),  $I_{sc}$  or  $I_t$  not exceeding  $I_{max}$  (or  $I_o$  not exceeding  $I_i$ ), and the  $P_o$  of the associated apparatus must be less than or equal to the  $P_{max}$  or  $P_i$  of the intrinsically safe equipment. Examples of “simple apparatus” are general-purpose contact/switch, thermocouple and RTD.
4. For intrinsically safe devices selected associated apparatus must be third party listed as providing intrinsically safe circuits for application, and have  $V_{oc}$  or  $V_t$  not exceeding  $V_{max}$  (or  $U_o$  not exceeding  $U_i$ ),  $I_{sc}$  or  $I_t$  not exceeding  $I_{max}$  (or  $I_o$  not exceeding  $I_i$ ), and the  $P_o$  of the associated apparatus must be less than or equal to the  $P_{max}$  or  $P_i$  of the intrinsically safe equipment.
5. Where multiple circuits extend from the same piece of associated apparatus, they must be installed in separate cables or in one cable having suitable insulation. Refer to Article 504.30(B) of the National Electrical Code (ANSI/NFPA 70) and Instrument Society of America Recommended Practice ISA RP12.6 for installing intrinsically safe equipment.
6. Intrinsically safe circuits must be wired and separated in accordance with Article 504.20 of the National Electrical Code (ANSI/NFPA 70) or other local codes, as applicable.
7. This associated apparatus has not been evaluated for use in combination with another associated apparatus.
8. Control equipment must not use or generate more than 250 V rms or dc with respect to earth.
9. For installations in which both the  $C_i$  and  $L_i$  of the intrinsically safe apparatus exceeds 1% of the  $C_o$  and  $L_o$  parameters of the associated apparatus (excluding the cable), then 50% of  $C_o$  and  $L_o$  parameters are applicable and shall not be exceeded.
10. This equipment is suitable for use in non-hazardous locations and hazardous locations Zone 2, Group IIC T4 or Class I, Division 2, Groups A, B, C, D Temperature Code T4 Installations.
11. If an inductive load does not have an internal flyback diode, it is recommended you install a 1A 600V diode in parallel with the load (1N4005 – EC P/N 36-16-1002).
12. Use two conductor cable with foil shield and drain wire for MPU input.
13. This equipment must be mounted in an enclosure meeting the requirements of IP54 or greater according to the intended use and environmental conditions.
14. Installation is to be done only by a qualified technician of the responsible body.
15. Device shall be wired in accordance with NEC, CEC or other local code, as applicable.

**WARNING:**

EXPLOSION HAZARD - DO NOT DISCONNECT THE EQUIPMENT OR ACTUATE SWITCHES WHEN THE EQUIPMENT IS ENERGIZED AND AN EXPLOSIVE ATMOSPHERE IS PRESENT.  
EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

## Entity Parameters — Centurion C5 Controller (continued)

Thermocouple/RTD Inputs (Per Pin)										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[H]	Co[μF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[μF]
J1 Pins 2, 4, 6, 8, 10, 12, 14, 16	4.4	1.0	4.4	80	999.9	30.0	17.0	-	0	0.1
J1 Pins 1, 2b, 3, 4b, 5, 6b, 7, 8b, 9, 10b, 11, 12b, 13, 14b, 15, 16b	4.4	1.0	4.4	80	995.1	30.0	17.0	-	0.022	4.9

Analog Inputs (Per Pin)										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[mF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[μF]
J2-J3 AI1-AI8 Pins 18-25	-	-	-	-	-	10.3	51.6	-	0	0.1
J3 AI9-AI12 Pins 26-29	4.4	1.0	-	80	995.1	10.3	51.6	-	0.022	4.9
J2-J3 AB+ Pins 18b-29b	-	-	-	-	-	-	-	-	-	-
B-	Ground Pin									

Digital Inputs (Per Pin)										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[μF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[μF]
J4-J6 DI1-DI32  Pins 30-31	30	5.2	-	2.95	0.120	30	17	-	0	0.1
J4-J6 B+1 to B+32 Pins 30b-61b	30	12.66	-	500	0.120	-	-	-	0	0.1

Analog Outputs (Per Pin)										
Designation	Uo[mV]	Io[mA]	Po[mW]	Lo[mH]	Co[μF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[μF]
J8 Pins 66-69	30	38.5	-	54	0.120	-	-	-	0	0.1
J8 Pins 66b-69b	Analog Output Ground									

## Entity Parameters — Centurion C5 Controller (continued)

RS485/RS232										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J12 RS485 Pins 94, 95 100, 101	±5.0	±60	-	22.2	999.9	±12.0	±60	-	0	0.01
J12 Pins S1, S2	Shield Connection Ground									
J12 RS232 Pins 96,102	Shield Reference Ground									
J12 RS232 Transmit/Receive Pins 97-99 103-105	±15.0	±60	-	22.2	2.99	±30	±60	-	0	0.001

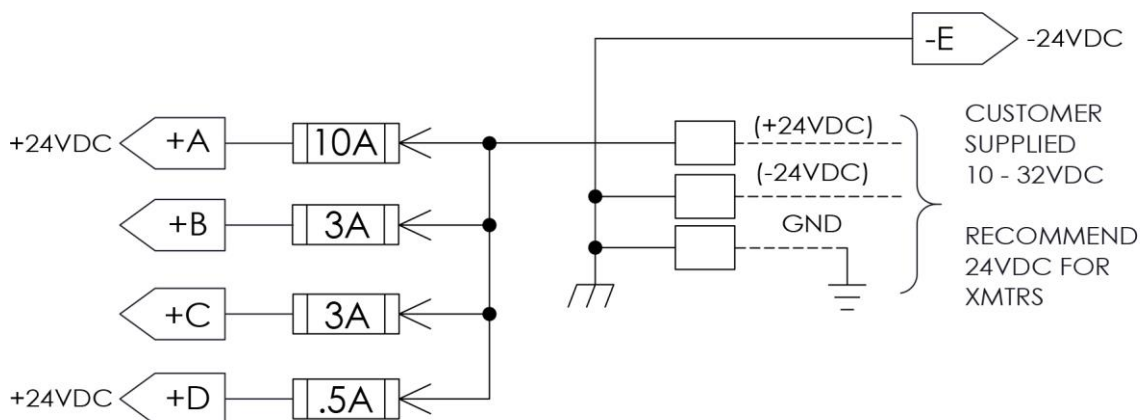
CAN Per Channel										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[H]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[pF]
J13 Pins 106-111	±4.5	±5	-	3.2	999.9	±24	100	-	0	267

USB										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J16 Type A	±5.19	±25	-	128	889.8	±5	±500	-	0	110.2
J17 Type B	±3.3	±25	-	128	999.8	±5	±500	-	0	0.200

Ethernet Per Port										
Designation	Uo[mV]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J14-J15	3.3	±61.5	-	21.2	999.9	3.3	±60	-	0	0.1

## Power Supply and Grounding

Please refer to the Wire Diagram — Centurion C5 Controller for grounding requirements.



**NOTE:** Follow the instructions for protective earthing.

## General Wiring Recommendation

It is essential that the following practices be adhered to.

### Terminals for Safe Circuits

Terminals for intrinsically safe circuits shall be separated from terminals for non-intrinsically safe circuits by one or more of the methods given. These methods of separation shall also be applied where intrinsic safety can be impaired by external wiring which, if disconnected from the terminal, can come in contact with conductors or components.

When separation is accomplished by distance then the clearance between bare conducting parts and terminals shall be at least 50 mm.

Care should be exercised in the layout of terminals and in the wiring method used so that contact between circuits is unlikely if a wire becomes dislodged.

## Terminal Separation

When separation is accomplished by locating terminals for intrinsically safe and non-intrinsically safe circuits in separate enclosures or by use of either an insulating partition or an earthed metal partition between terminals with common cover, the following applies:

- Partitions used to separate terminals shall be within 1.5 mm of the enclosure walls or alternatively shall provide a minimum distance of 50 mm between bare conduction parts of terminals when measured in any direction around the partition.
- Metal partitions shall be earthed and shall have sufficient strength and rigidity to ensure that they are not likely to be damaged during field wiring. Such partitions shall be at least 0.45 mm thick or shall conform to 10.6.3 of Standard 60079-11 if of lesser thickness. In addition, metal partitions shall have sufficient current-carrying capacity to prevent burn-through or loss of earth connection under fault conditions.
- Non-metallic insulating partitions shall have an appropriate CTI, sufficient thickness and shall be so supported that they cannot readily be deformed in a manner that would defeat their purpose. Such partitions shall be at least 0.9 mm thick or shall conform to 10.6.3 of Standard 60079-11 if of lesser thickness.

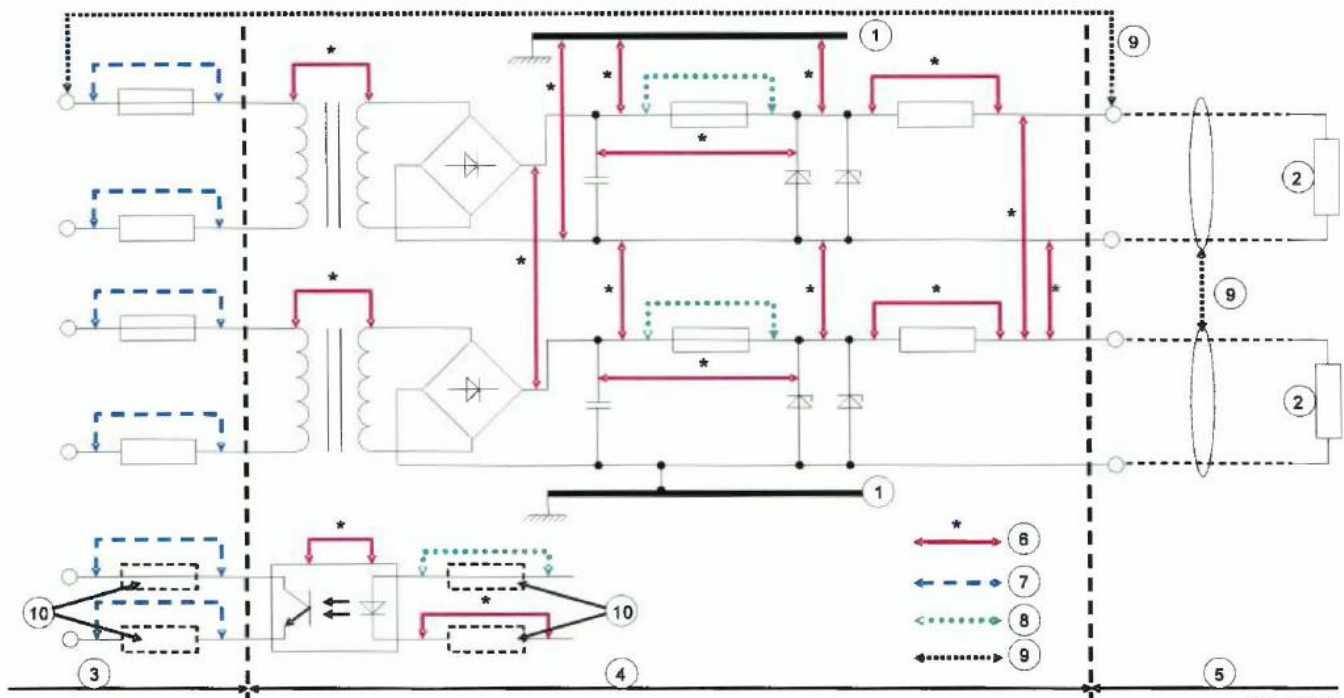
The clearances and creepage distances between the bare conducting parts of terminals of separate intrinsically safe circuits and to earthed or potential-free conducting parts shall be equal to 0.8 mm (for 32V “ic” clearance).

Where separate intrinsically safe circuits are being considered, the clearance between bare conducting parts of external connection facilities shall meet the following:

- At least 6 mm between the separate intrinsically safe circuits.
- At least 3 mm from earthed parts, if connection has not been considered in the safety analysis.



## Terminal Separation Schematic

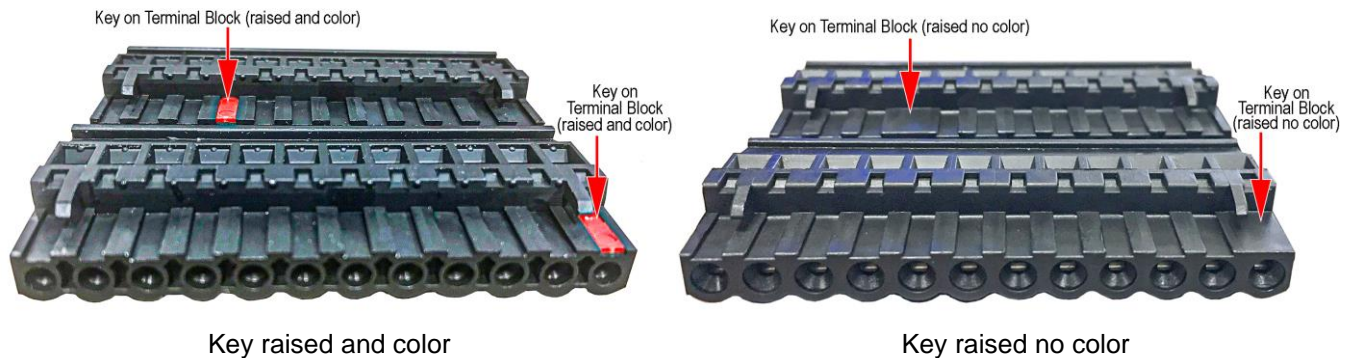


Callout	Description
1	Chassis
2	Load
3	Non-intrinsically safe circuits defined by $U_m$
4	Part of intrinsically safe circuit not itself intrinsically safe
5	Intrinsically safe circuit
6	Dimensions of separation in the apparatus
7	Dimensions to which general industrial standards are applicable
8	Dimensions to separation in the apparatus
9	Dimensions to 6.2.1 for output terminals between separate intrinsically safe circuits and between intrinsically safe to non intrinsically safe circuits
10	Protective components as applicable in accordance with 8.9



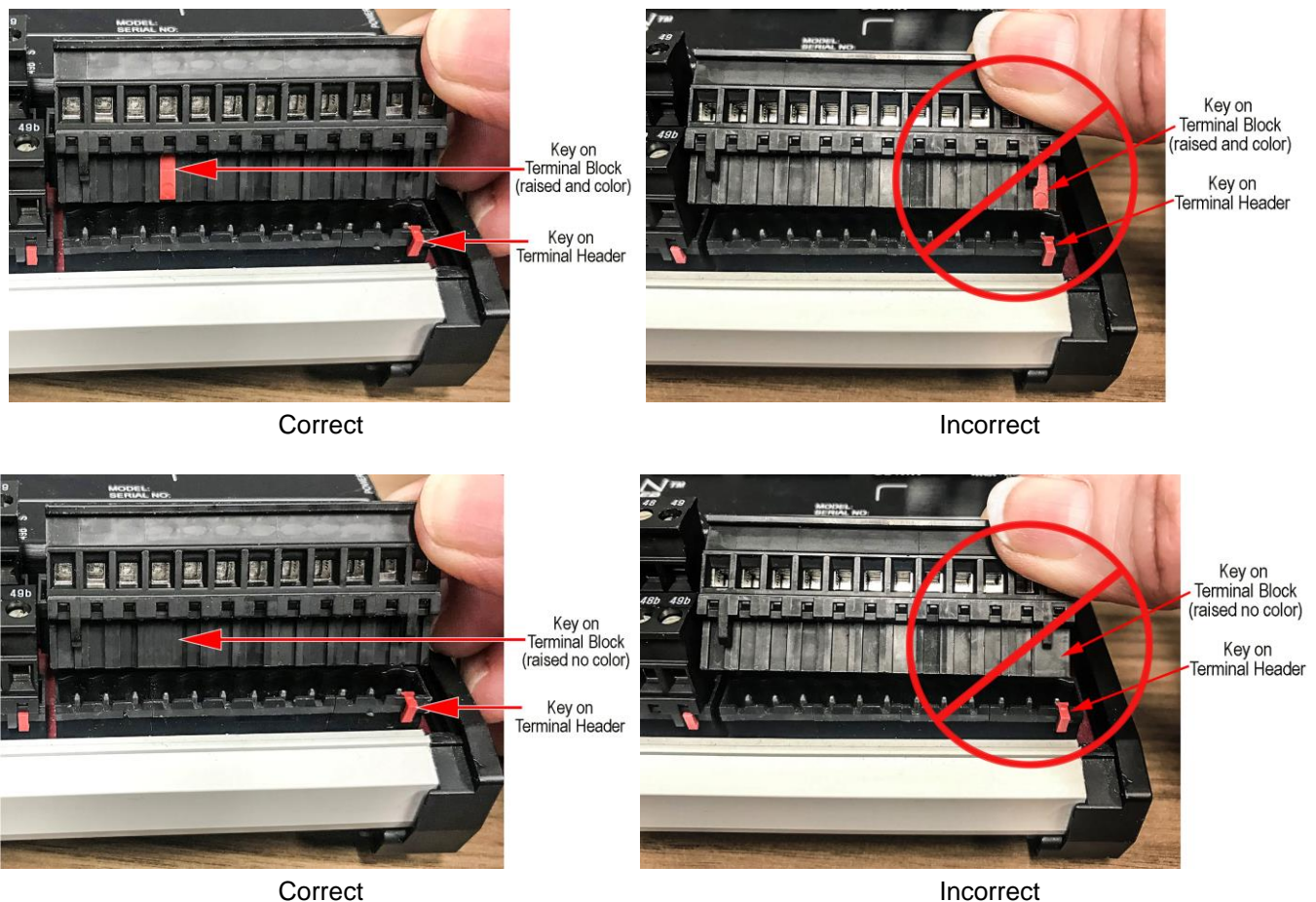
## Terminal Keys, Blocks and Headers

Some keys on the terminal block are visible by the raised area and color, while others may only have the raised area. This is an example of the keys on four terminal blocks.



**IMPORTANT: Never align the Terminal keys, doing so will block proper mating of the terminal block to header.**

Terminal blocks and headers are equipped with blocking-type keys. When connecting, Do Not align the key on the terminal block with the key on the header. Doing so will block proper mating of the terminals. This example shows the correct and incorrect connection.



## Recommended Wiring Practice for Centurion C5 Terminal Blocks

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**NOTE:** The terminal block must be removed from the headers on the control and any expansion modules before attempting any maintenance on the wired system or any job requiring a hot work permit. Please ensure that the work area is non-hazardous before removing or installing any terminal block. The system should also be powered off in jobs involving hot work permits, and any such instructions established by safety standards at the job site must be complied with at all times.

Use a wire size between 12 AWG (max.) and 24 AWG (min.) to connect to the terminal strip connector. Strip the insulation back 9/32 inches and twist the exposed wires tightly together. Insert the exposed wire completely into the terminal strip and securely tighten the clamping screw. Wires must be in good condition or replaced with new wires. When running wires, take care not to damage the insulation and take precautions against later damage from vibration, abrasion or liquids in conduits. An explosion-proof conduit is not required; however, wires should be protected from damage by running them in a protective conduit or in sheaths where appropriate.

Pitch	0.200 in. [5.08mm]
Screw Torque	0.37 - 0.44 ft. lbs [0.5 – 0.6 Nm]
Stripping Length	9/32 in. (min.) [7 mm]
Wire Gauge	24 – 12 AWG/kcmil
Nominal voltage UN	300 V
Nominal current IN	10 A
Conductor cross section solid or stranded	0.2 – 2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with or without plastic sleeve	0.25 – 2.5 mm <sup>2</sup>
2 conductors with same cross section, solid	0.2 – 1 mm <sup>2</sup>
2 conductors with same cross section, stranded	0.2 – 1.5 mm <sup>2</sup>
2 conductors with same cross section, stranded, ferrules without plastic sleeve	0.25 – 1 mm <sup>2</sup>
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve	0.5 – 1.5 mm <sup>2</sup>

## Thermocouple / RTD Inputs (Pins 1 – 16b)

The Centurion is equipped with 8 two-wire thermocouple and /or three-wire RTD inputs.

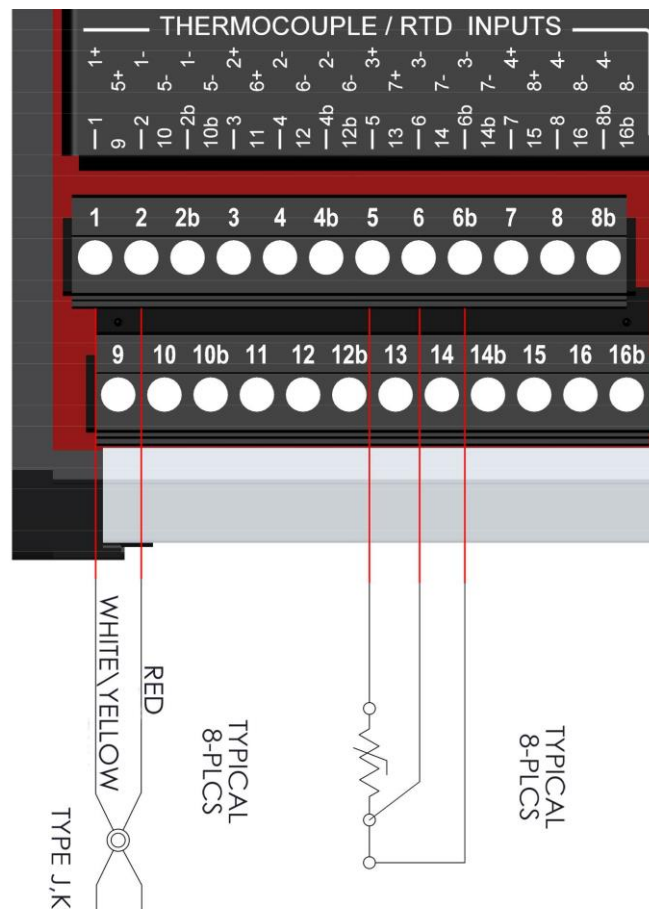
Thermocouples are wired using cover artwork labeled as + and -, such as 1+ and 1-. Thermocouple terminals can be seen labeled as 1 and 2 for TC 1 channel and 3 and 4 for TC 2 channel and so on. Use ungrounded thermocouples only, grounded thermocouples are not supported.

When RTD is selected for the channel, 3 terminals are required. RTDs are wired using cover artwork labeled with the same + and - but also includes an additional - (minus) for the sense lead.

RTDs terminals can be seen labeled as 1, 2, 2b for the first channel and 3, 4, 4b for the next channel and so on.

**NOTE:** This wiring differs from the MX4-R2 module wiring of RTDs.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.

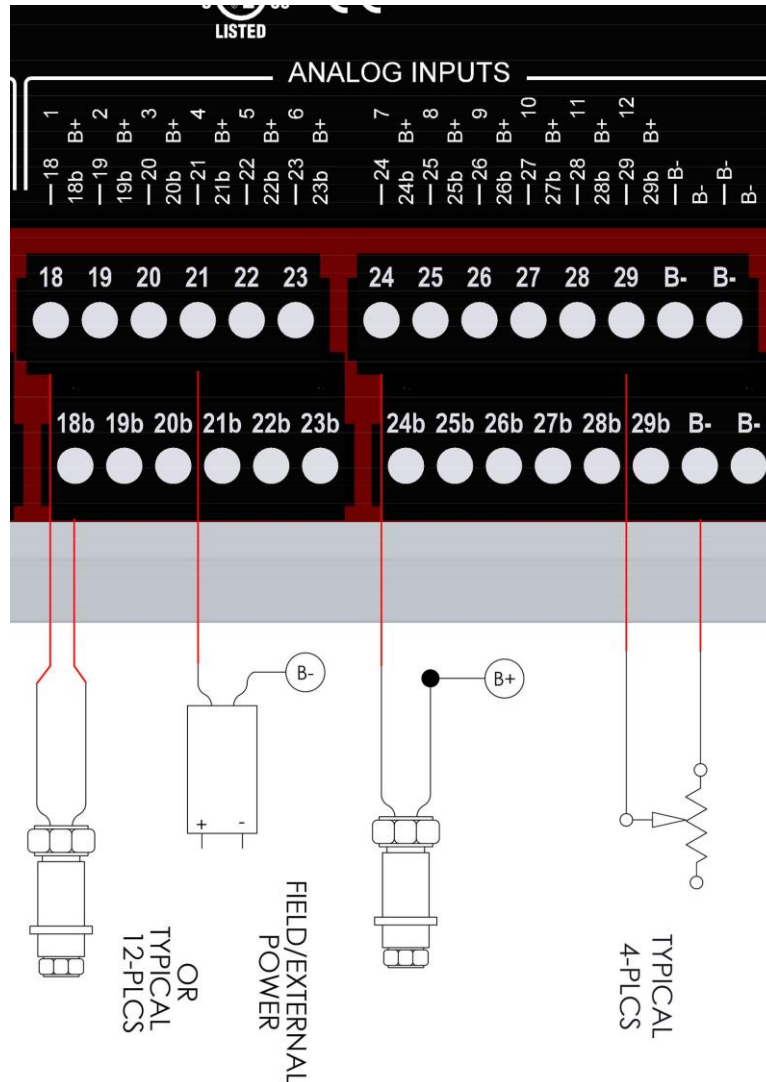


**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## Analog Inputs (Pins 18 – 23b)

The Centurion is equipped with 12 analog inputs marked 18 through 23b. Analog inputs 9 through 12 will supply 1mA for connection to resistive senders. 0 to 5Vdc or 4 to 20 mA.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

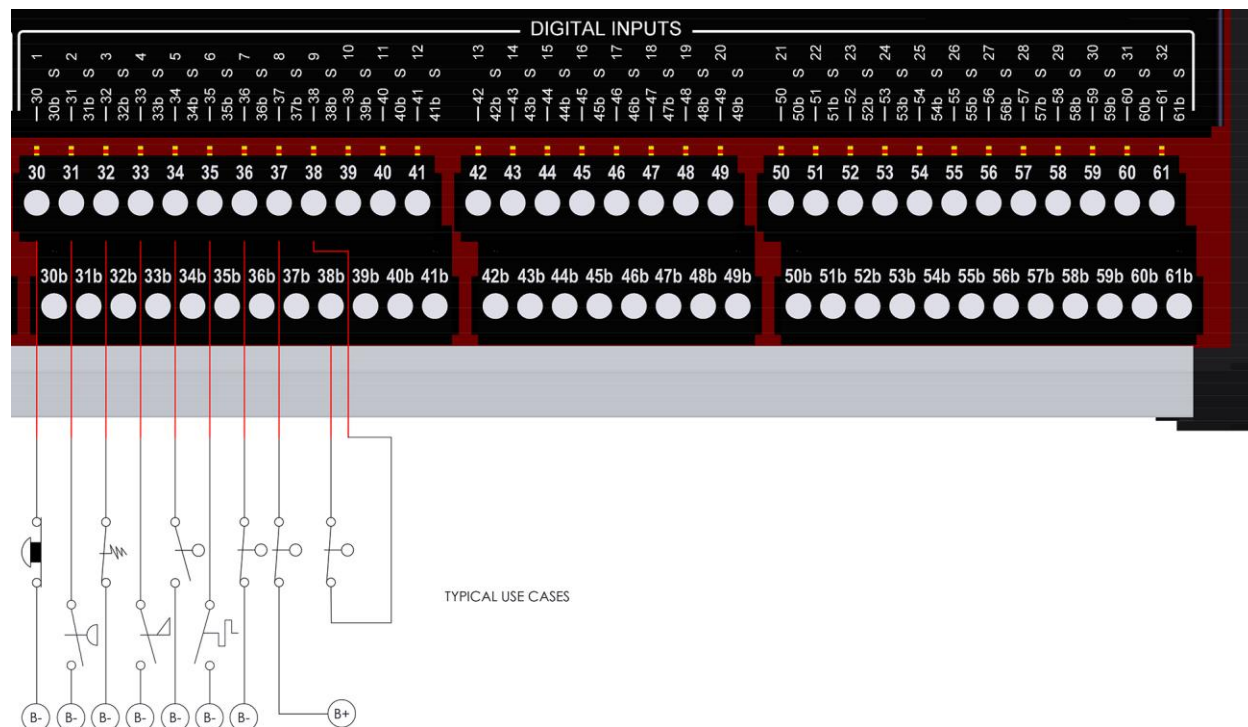
Devices that are self-powered, 4-wire devices, such as flowmeters and VFD drives, do not receive power from the panel and offer a pure current loop.

## Digital Inputs (Pins 30 – 61b)

The Centurion is equipped with 32 digital inputs marked 30 through 61 for the input and 30b through 61b for ic protected power to loop through the external switch back to the input.

Alternately the external switch may use B+ or B- to activate the digital input. An LED lights when the digital input is active. Inputs 31 and 32 can alternately be used as pulse counters.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** This associated apparatus may also be connected to non-incendive or simple apparatus as defined in Article 504.2 and installed and temperature classified in accordance with Article 504.10(B) of the National Electrical Code (ANSI/NFPA 70), or other local codes, as applicable. Examples of “simple apparatus” are general-purpose contact/switch, thermocouples and RTD.

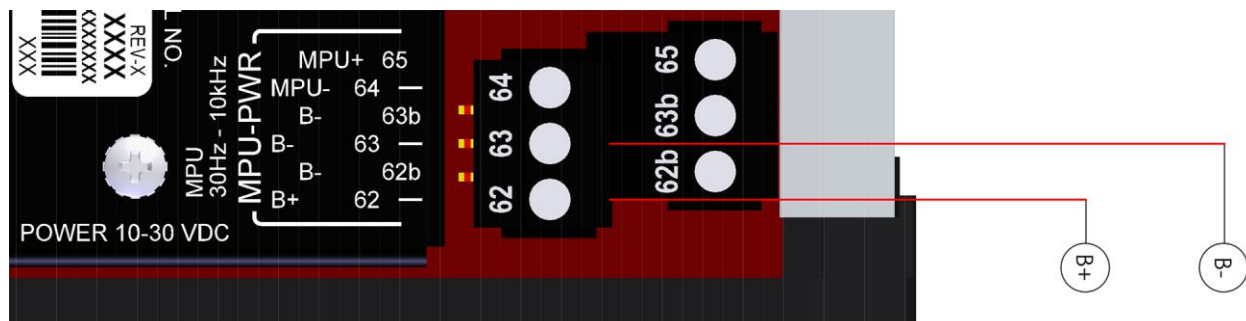
**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.



## Power (Pins 62 – 63)

The 10-30 VDC power for the Centurion C5 is applied to the power supply terminals marked 62 B+ and 63 B-. An external 10 amp replaceable fuse protects the system from over-currents. The power LED lights when power is applied to the system. Please refer the section Power Supply and Grounding for illustrations.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** Run power directly from battery posts to controller power terminals when battery is the power supply.

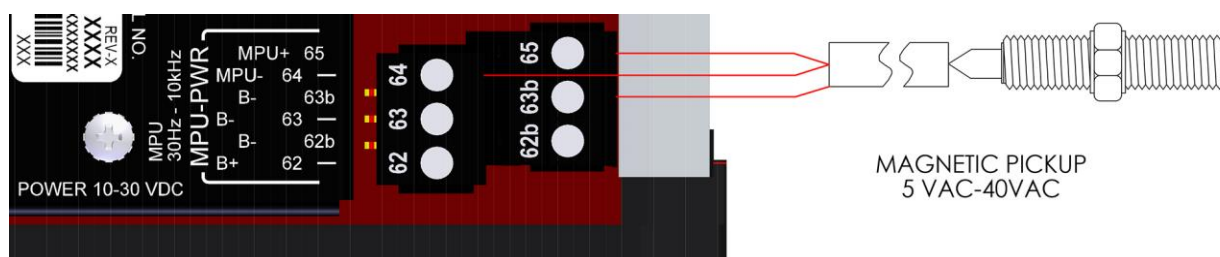
Maximum power ratings based on all I/O operating in the ON position with 10V supply. Typical based on 24V supply.

## Magnetic Pickup, MPU (Pins 62b – 65)

The MPU for the Centurion is applied to the magnetic pickup terminals marked 64 MPU- and 65 MPU+, MPU 5-40Vrms 30-10 kHz. If used, the foil shield and drain wire of the cable assembly may be terminated at 62b- or 63b-. The MPU sends the pulses to the controller, which calculates the engine speed.

FW Murphy recommends using 00031022 Magnetic Pickup 4 in. Length and 00031023 Magnetic Pickup Cable 50 ft.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.

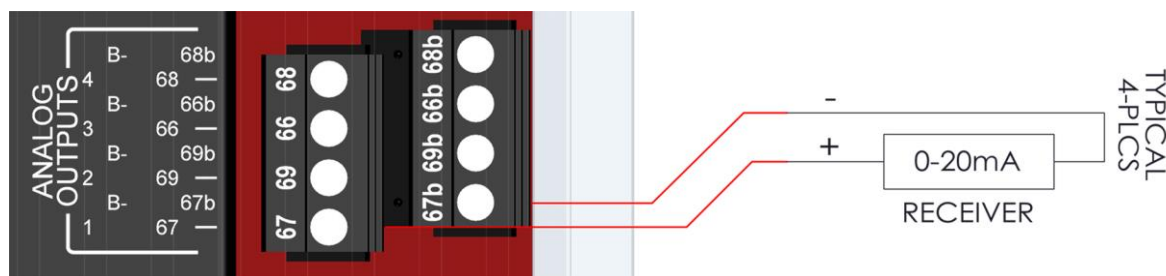


**NOTE:** The MPU input requires a minimum signal of 2 Vrms when connected.

## Analog Outputs (Pins 66 – 659b)

The Centurion is equipped with four 2-wire current transmitters for controlling various processes. The supply voltage and measuring currents are supplied by the Centurion over the same two wires. These transmitters are used to convert various process signals representing flow, speed, position, level, temperature, pressure, etc., to 4-20mA DC for the purpose of transmitting the signal over some distance with little or no loss of signal.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** The Centurion provides all operating power (~B+) to the transmitter and receiver and any other loop components.

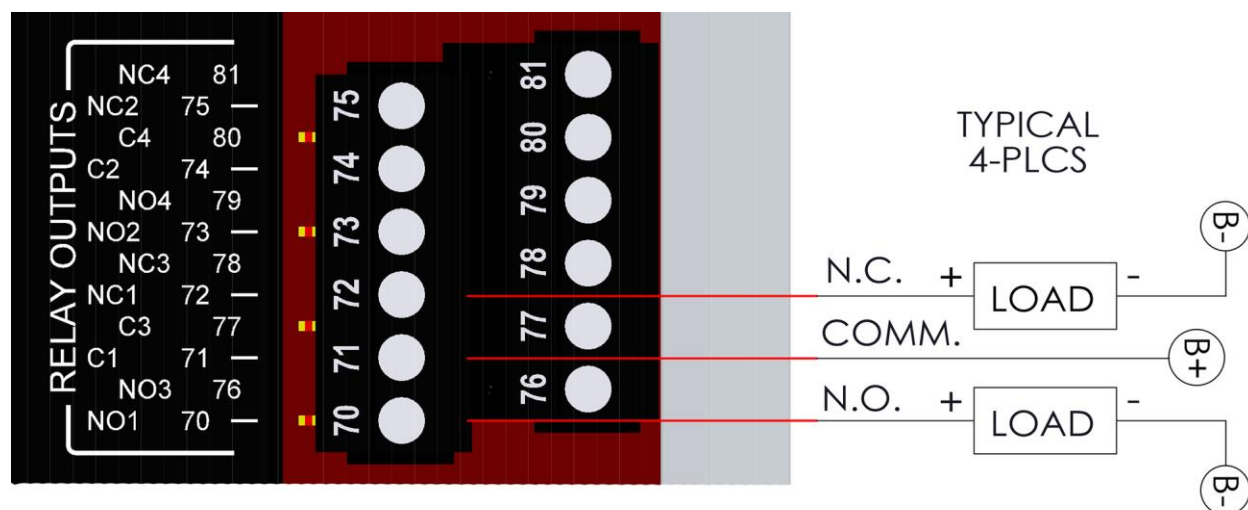
An important aspect of building a current loop system is avoiding ground loops by wiring the return signal to the associate B- terminal.

These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## Relay Outputs (Pins 70 – 81)

The Centurion is equipped with four SPDT (1 Form C) relays with 5A 30Vdc dry contacts. The four relay contacts are marked 70 NO1 71 C1 72 NC1; 73 NO2 74 C2 75 NC2; 76 NO3 77 C3 78 NC3; and 79 NO4 80 C4 81 NC4. An LED lights when the relay is active.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** If an inductive load does not have an internal flyback diode, it is recommended you install a 1A 600V PIV diode in parallel with the load. (1N4005 – EC P/N 36-16-1002)

To ground ignition use pilot relay with 25  $\Omega$  3 W series resistor to ground.

Interposing relays are recommended to interface with end devices that require high current ratings or alternative voltage supplies.

Consult General Cautions for Solid-State Devices for best practices when connecting to external inductive load devices such as relays or solenoids.

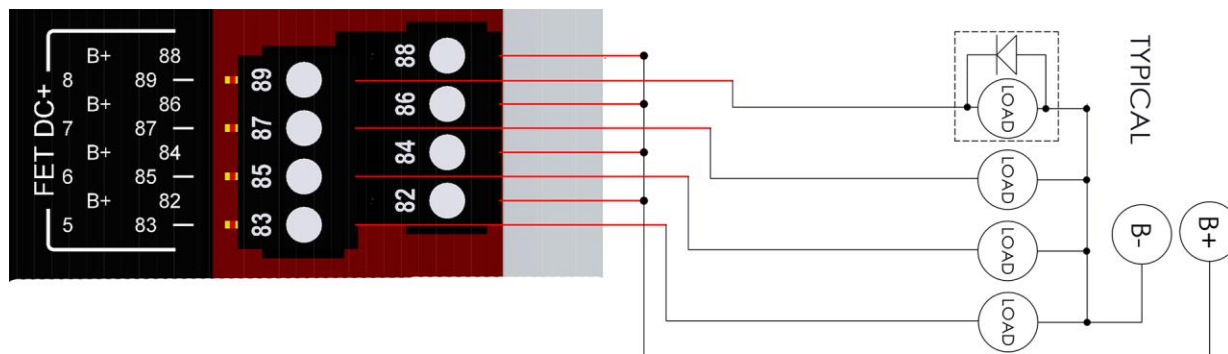
[www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices](http://www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices)



## FET DC+ (Pins 83 – 89)

The Centurion is equipped with four High Side 100 mΩ max Switches. The four switches are marked 82-83; 84-85; 86-87 and 88-89. An LED lights when the switch is active.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** If an inductive load does not have an internal flyback diode, it is recommended you install a 1A 600V PIV diode in parallel with the load. (1N4005 – EC P/N 36-16-1002)

To ground ignition, use pilot relay with 25 Ω 3 W series resistor to ground.

Interposing relays are recommended to interface with end devices that require high current ratings or alternative voltage supplies.

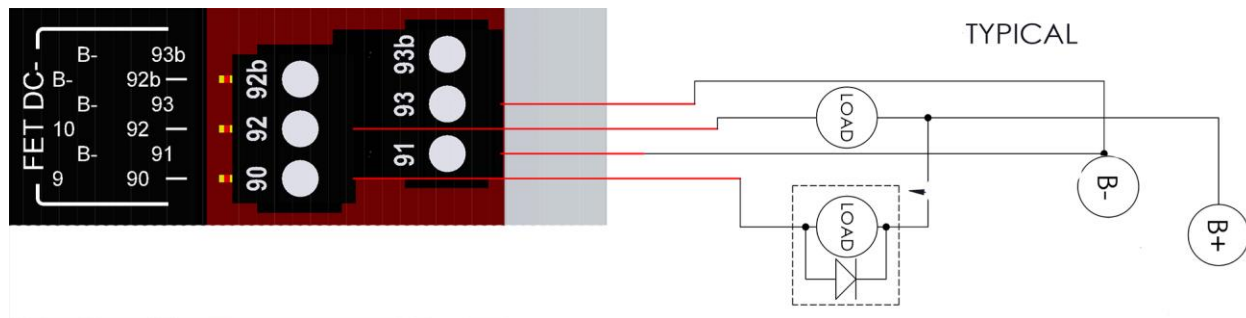
Consult General Cautions for Solid-State Devices for best practices when connecting to external inductive load devices such as relays or solenoids.

[www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices](http://www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices)

## FET DC- (Pins 90 – 93b)

The Centurion is equipped with two Low Side 250 mΩ max Switches. The two switches are marked 90-91 and 92-93. There are also two terminals, 92b- and 93b-, for shield termination. The LED lights when the switch is active.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** If an inductive load does not have an internal flyback diode, it is recommend you install a 1A 600V PIV diode in parallel with the load. (1N4005 – EC P/N 36-16-1002)

To ground ignition use pilot relay with 25 Ω 3 W series resistor to ground.

Interposing relays are recommended to interface with end devices that require high current ratings or alternative voltage supplies.

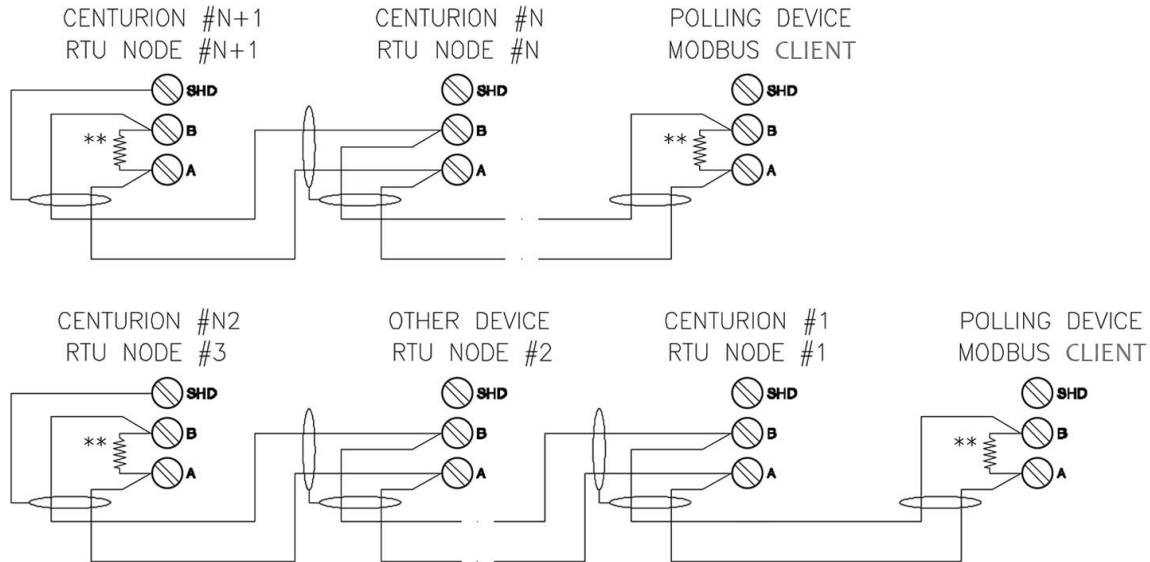
Consult General Cautions for Solid-State Devices for best practices when connecting to external inductive load devices such as relays or solenoids.

[www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices](http://www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices)

## RS485 (Pins 94 – 101)

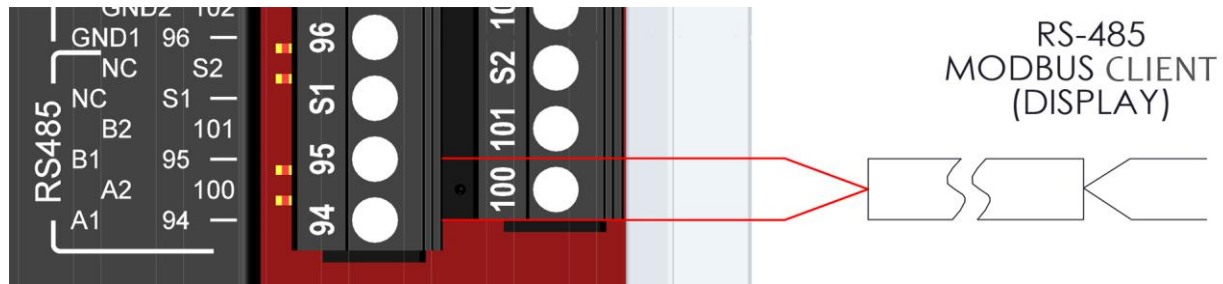
The Centurion is equipped with two RS485 communications ports. The ports are marked 94 A1 95 B1 and 100 A2 101 B2 S2. There are also two terminals, S1 SHD1 and S2 SHD2, for shield termination. The TX LED lights when the port is transmitting. The RX LED lights when the port is receiving.

The recommended arrangement of the wires is as a connected series of point-to-point (multidropped) nodes, i.e. a line or bus, not a star, ring or multiply connected network.



\*\* USE EIA RS485 SHIELDED, TWISTED PAIR, 120 OHMS CHARACTERISTIC IMPEDANCE.  
INSTALL 120 OHMS TERMINATING RESISTOR ON FIRST AND LAST NODE ON RS-485 NETWORK.  
ALL RS-485 DEVICES MUST SHARE DC COMMON GROUND.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** A is the non-inverting pin and should have a single pull-up physically placed anywhere on the network. B is the inverting pin and should have a single pull-down physically placed anywhere on the network.

These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

Consult RS-485 the Murphy Way for information on best practices for connecting and communicating on RS-485.

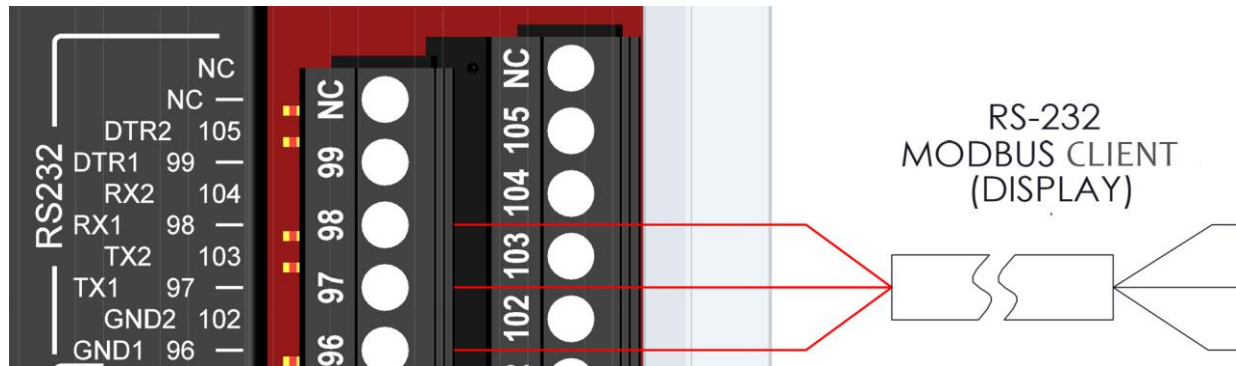
[www.fwmurphy.com/uploaded/documents/pdfs/rs-485murphyway.pdf](http://www.fwmurphy.com/uploaded/documents/pdfs/rs-485murphyway.pdf)

## RS232 (Pins 96 – 105)

The Centurion is equipped with two RS232 communications ports. The ports are marked 96 GND1; 97 TX1; 98 RX1; 99 DTR1 and 102 GND2; 103 TX2; 104 RX2; 105 DTR2. There are also two terminals, NC and NC, that may be left unconnected or for shield termination. The LED lights when the port is active transmitting and when the port is active receiving.

Because both ends of the RS-232 circuit depend on the ground pin being zero volts, problems will occur where the voltage between the ground pin on one end and the ground pin on the other is not zero. This may also cause a hazardous ground loop. Use of a common ground limits RS-232 to applications with relatively short cables. If the two devices are far enough apart or on separate power systems, the local ground connections at either end of the cable will have differing voltages; this difference will reduce the noise margin of the signals.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.

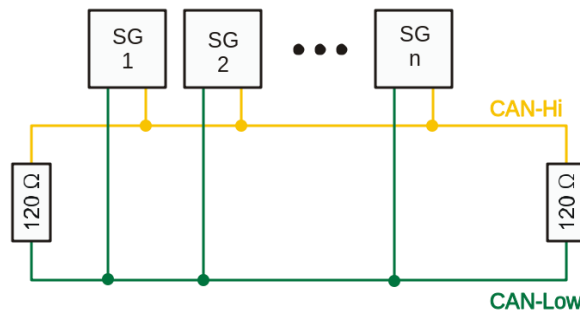


**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

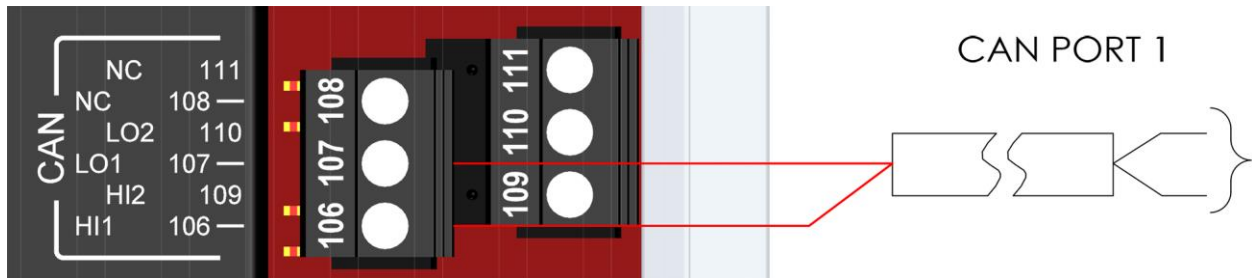
## CAN (Pins 106 – 111)

The Centurion is equipped with two CAN communications ports. The terminals marked 106 HI1; 107 LO1 and 109 HI2; 110 LO2. There are also two terminals, 108 SHD1 and 111 SHD2 that may be used for shield termination. The LED lights when the port is active transmitting and when the port is active receiving.

The recommended arrangement of the wires is as a connected series of point-to-point (multidropped) nodes, i.e. a line or bus, not a star, ring or multiply connected network. It is recommended to use CAN bus Cable J1939/11 SAE Shielded, twisted pair, with 120  $\Omega$  characteristic impedance. Install a 120  $\Omega$  terminating resistor (software selectable on the Centurion) on the physical first and last node of the CAN network. All nodes must share a common DC ground.



**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## Modbus Address

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With the Modbus RTU Server Address Configuration, the operator may assign a unique Modbus address to each controller (server) unit that may be in the system. This allows the client controller to differentiate between the modules. For example, to name the controller address 21, enable the switches labeled SW1: 1, 4, and 16 ( $1 + 4 + 16 = 21$ ).

**NOTE:** The subsequent address (Address + 1) is also reserved by Centurion, and must not be used by any other device on the Modbus network, or communication failures to devices using that address will occur due to this conflict. Counting by 2's is necessary for additional Centurion controllers present in the system.



C5-1 Shown

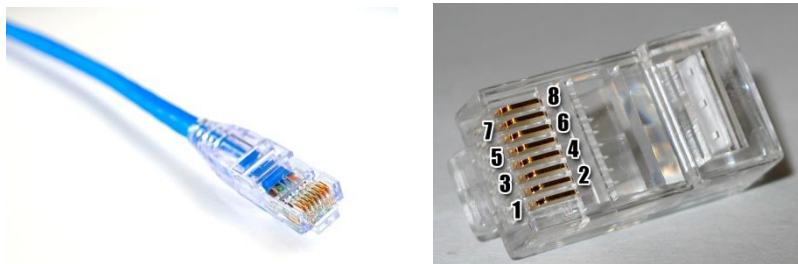
**NOTE:** Typically, this configuration is set to (1) by the factory.

# Ethernet



**WARNING:** Explosion hazard – Do not disconnect the Ethernet port unless the power has been switched off or the area is known to be non-hazardous.

The Centurion is equipped with two Ethernet communications ports. The ports are marked Ethernet 1 and Ethernet 2. An LED lights when the port is active transmitting or receiving a message, and an LED lights to indicate Network and Module status.



An 8P8C modular connector (often called RJ45) is commonly used on Cat 5 cables in Ethernet networks.

Twisted-pair Ethernet standards are such that the majority of cables can be wired straight-through (pin 1 to pin 1, pin 2 to pin 2 and so on), but others may need to be wired in the crossover form (receive to transmit and transmit to receive). The Centurion can automatically detect another computer connected with a straight-through cable and then automatically introduce the required crossover, if needed with no intervention by the installer. 10BASE-T and 100BASE-TX only require two pairs (pins 1-2, 3-6) to operate. Since Category 5 cable has four pairs, the spare pairs (pins 4-5, 7-8) in 10- and 100-Mbit/s configurations are not used.

TIA/EIA-568 T568A termination				TIA/EIA-568 T568B termination			
Pin	Pair	Wire	Color	Pin	Pair	Wire	Color
1	3	tip	white/green	1	2	tip	white/orange
2	3	ring	green	2	2	ring	orange
3	2	tip	white/orange	3	3	tip	white/green
4	1	ring	blue	4	1	ring	blue
5	1	tip	white/blue	5	1	tip	white/blue
6	2	ring	orange	6	3	ring	green
7	4	tip	white/brown	7	4	tip	white/brown
8	4	ring	brown	8	4	ring	brown



The Centurion uses auto negotiation, an Ethernet procedure by which two connected devices choose common transmission parameters, such as speed, duplex mode and flow control. In this process, the connected devices first share their capabilities regarding these parameters and then choose the highest performance transmission mode they both support. The Centurion supports 10 and 100 Mbit/s over two-pair Cat5 or better cable.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



C5-1 Shown

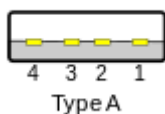
**NOTE:** These circuits are not required to be in conduit if all requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

# USB 1 Host



**WARNING:** Explosion hazard – Do not disconnect the USB port unless the power has been switched off or the area is known to be non-hazardous.

The Centurion is equipped with a USB 2.0 standard communications port. The port is marked USB 1.



USB 1.x/2.0 standard pinout

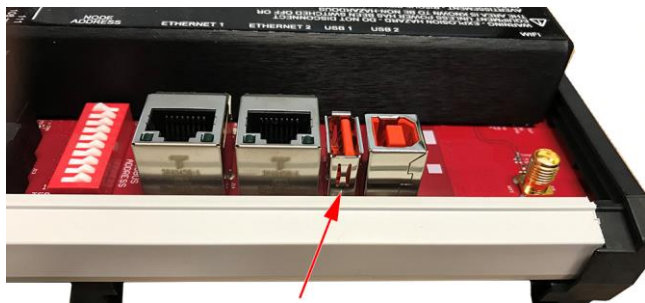
Pin	Name	Wire color	Description
1	V <sub>BUS</sub>	Red (or orange)	+5 V
2	D-	White (or gold)	Data-
3	D+	Green	Data+
4	GND	Black (or blue)	Ground

The USB 2.0 standard-A type of USB plug is a flattened rectangle that inserts into a receptacle on the USB host. The host controller directs traffic flow to devices, so no USB device can transfer any data on the bus without an explicit request from the host controller. The throughput of each USB port is determined by the slower speed of either the USB port or the USB device connected to the port.



The Centurion connects to storage devices using a set of standards called the USB mass storage device class (MSC or UMS).

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



C5-1 Shown



**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

# USB 2 Device



**WARNING:** Explosion hazard – Do not disconnect the USB port unless the power has been switched off or the area is known to be non-hazardous.

The Centurion is equipped with a USB 2.0 standard communications port. The ports is marked USB 2.

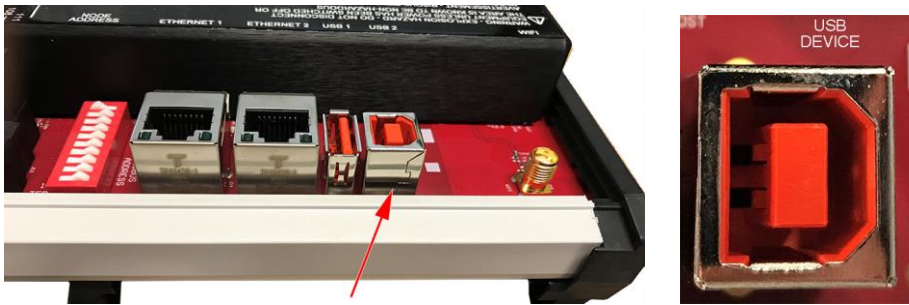


USB 1.x/2.0 standard pinout			
Pin	Name	Wire color	Description
1	V <sub>BUS</sub>	Red (or orange)	+5 V
2	D-	White (or gold)	Data-
3	D+	Green	Data+
4	GND	Black (or blue)	Ground

The USB 2.0 standard-B type of USB plug has a square shape with beveled exterior corners

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.

When the Centurion is first connected to a USB host, the USB device enumeration process is started. The connected host controller directs traffic flow to the Centurion. There is no transfer of any data on the bus without an explicit request from the host controller.



C5-1 Shown

**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## Wi-Fi (C5-1)

The Centurion C5-1 (only) is equipped with a Wi-Fi communications port. The port is marked WIFI. The Centurion allows communications directly from one computer to another without an access-point intermediary. The Wi-Fi signal range depends on the frequency band, power output, antenna gain and type. Line-of-sight is the thumbnail guide, but reflection and refraction can have a significant impact. An access point compliant with either 802.11b or 802.11g, using the stock antenna might have a range of 100 m (330 ft). Due to the complex nature of radio propagation at typical Wi-Fi frequencies, particularly the effects of signal reflection off trees and buildings, range can only be approximated for any given area in relation to a transmitter. Wi-Fi connections can be disrupted or the internet speed lowered by having other devices in the same area. Many 2.4 GHz 802.11b and 802.11g access points default to the same channel on initial startup, contributing to congestion. Wi-Fi pollution, or an excessive number of access points in the area especially on the neighboring channel, can prevent access and interfere with other devices use of other access points, caused by overlapping channels in the 802.11g/b spectrum, as well as with decreased signal-to-noise ratio (SNR) between access points.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



C5-1 Shown

**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## Accessories

### Replacement Parts and Assemblies

Part Number	Description	Notes
Specify Model	C5-1 Centurion Controller (Main Module)	Centurion Configurable – Standard Centurion Custom – Option
	C5-2 Centurion Controller (Main Module)	Centurion Configurable – Standard Centurion Custom – Option
	MV-5-C display	Standard, Auto sync to C5
	MV-7T display	Optional, Auto sync to C5
	MV-10T display	
	MV-12T display	
50703852	MX4-R2 expansion I/O module	Optional
50703853	MX5-R2 expansion I/O module	
50000774	Ignition noise (choke) filter	
00032696	C5 Plug kit	Printed replacement terminal plugs for main I/O module
00032656	MX4-R2 Plug kit	Printed replacement terminal plugs for MX4-R2 expansion I/O module
00032657	MX5-R2 Plug kit	Printed replacement terminal plugs for MX5-R2 expansion I/O module
50702313	Centurion configuration tool for user application setup	Centurion configuration tool is software for modifying sequence of operation, set points, timers, faults and displays for Centurion. Includes file transfer utilities for configuration and upgrades.

### Software Configuration Tool

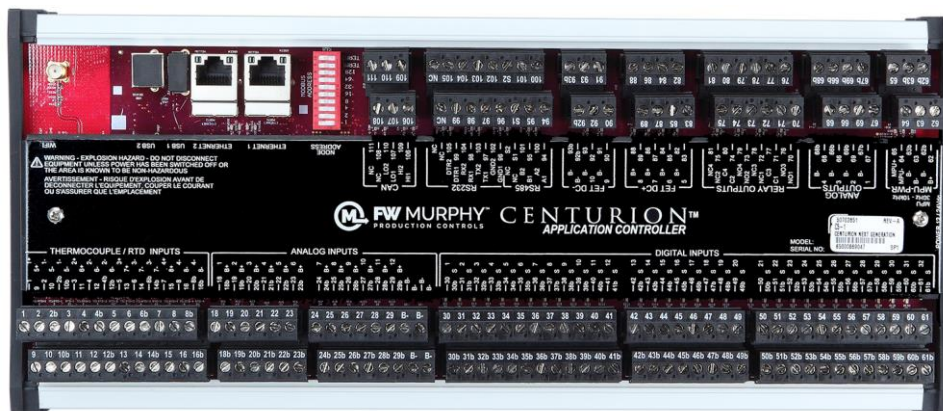
The Centurion Configuration Tool is the configuration software for modifying sequence of operation, set points, timers, faults and displays\* for Centurion C5. This tool can be downloaded from the Centurion Forum at <http://forum.fwmurphy.com>. The forum also hosts knowledge base articles and quick troubleshooting steps including those exchanged by other users. Please contact your sales personnel to gain access to the forum. In case the Centurion C5 has been custom programmed from the factory, please contact your sales channel for any modifications to the sequence of operations.

\*Display configuration and other settings for display are only for use with the display Module.

# Specifications

## C5 Series Main I/O Module


- Operating temperature: -40° to 185° F (-40° to 85° C)
  - Power input: 30 W max 10-30 VDC
  - Configuration: PC-based Centurion Configuration Software
  - Application firmware:
    - Standard offers a user-configurable experience
    - Centurion Custom option offers highly customized applicationsIntegrate with Rockwell Automation Processors as I/O module to write IEC 61131-3 logic (Ladder Logic, Structured Text, Function Block Diagram).
  - All I/O options individually software selectable: No jumper required.
  - Clock: Battery backed internal real-time clock, approximately 10 years unpowered service life
  - 12 Analog inputs\*:
    - 0-24 mA or 0-5 VDC, 15-bit hardware
    - 4 resistive potentiometer measurement
  - 32 Digital inputs\*:
    - NO or NC (active high/active low) intrinsically safe
    - Optically isolated DC digital inputs (active high/active low) with LED indicators
    - Polarity sense / wire fault detection on normally closed systems
    - Approved for use with general purpose switches in hazardous areas
  - Eight temperature inputs\*:
    - J or K Type Thermocouples (ungrounded)
    - 3-wire 100Ω Pt RTD temperature inputs\*\*\*
    - Open, short DC-, short DC+ wire fault detection
    - Cold junction compensation
  - One magnetic pickup input/AC run signal:
    - 30 to 10 kHz, 4.5 VAC rms min, 40 VAC rms max.
  - 10 digital outputs:
    - LED indicators:
    - 4 relay outputs, form C, dry contacts
    - 4 FET outputs (source)
    - 2 FET outputs (sink)
  - Four analog outputs:
    - 4-20 mA, 16-bit hardware
  - 11 Communication ports:
    - Two SERIAL RS232:
      - > Protocol: MODBUS RTU (server)
    - Two SERIAL RS485:
      - > Protocol: MODBUS RTU (server)
    - One USB: Host Type A (data log access, firmware updates)
    - One USB: Server Type B (firmware updates)
    - Two CAN:
      - > One proprietary for FW Murphy hardware
      - > One reserved for J1939 Engine ECU
    - Two Ethernet 10/100 (DLR):
      - > Protocol: Modbus TCP/IP (server)
      - > EtherNet/IP (CIP)
    - One WiFi: Optional C5-1 only
  - Third-party approvals:
    - North America:
      - Class I, Div 2, Grps A,B,C,D Haz. Loc, T4
      - Class I, Zone 2, AEx ec [ic] nC IIC T4 Gc Ex ec [ic] nC IIC T4 Gc X
    - ATEX Zone 2:
      - II 3G Ex ec [ic] nC IIC T4 Gc
      - DEMKO 18 ATEX 1926X
      - 40°C ≤ Tamb ≤ +85°C
    - IECEX Zone 2:
      - Ex ec [ic] nC IIC T4 Gc
      - IECEX UL 18.0072X
      - 40°C ≤ Tamb ≤ +85°C
- \* Non-incendive.  
\*\* Applies only to Centurion™ Custom Applications and Rockwell Automation® Processor configurations.  
\*\*\* RTD=Resistive Temperature Device, American RTD Standard, TCR 0.00392, units Ohms/Ohm / deg. between 0-100 C.

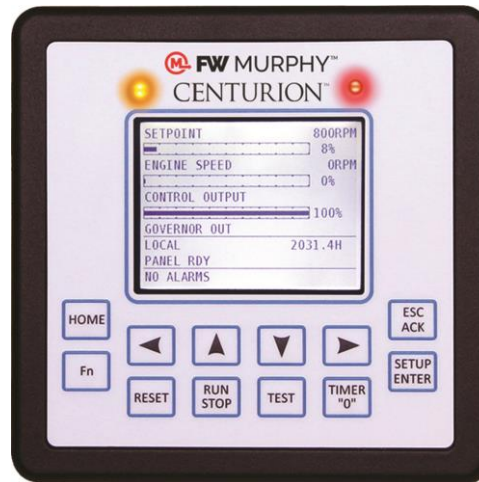


C5-1 Shown



## M-View® Monochrome LCD Display

- Operating temperature: -40° to 185° F (-40° to 85° C)
- Power input: 11 W max 10-30 VDC
- Screen: 320 x 240 pixels, LCD display with backlight
- User interface: 12-key keypad set point entry, alarm acknowledgment, start, stop, reset, etc.
- Communications:
  - RS232-1/RS485-1 (MODBUS RTU client)
  - RS485-2 (MODBUS RTU server)
  - 1 USB Server Type B (firmware updates)
  - 1 USB Host Type A (reserved)
  - CAN x 2
    - >1 proprietary for FW Murphy Hardware
    - >1 reserved for J1939 engine ECU
- Customizable process screens (up to nine):
  - Line by line
  - Gage
  - Control loop
  - Generic register
- Built-in screens (examples):
  - Digital input status and polarity
  - Digital output status
  - Temperature input status/fault
  - Fault snapshot (mirror of line-by-line)
  - Alarm log
- Third-party approvals for MV-5-C Display:
  - North America:
    - Class I, Div 2, Grps A,B,C,D Haz. Loc. T4
    - Class I, Zone 2, AEx ec ic [ic] IIC T4 Gc Ex ec ic [ic] IIC T4 Gc X
  - ATEX Zone 2:
    -  II 3G Ex ec ic [ic] IIC T4 Gc
    - DEMKO 18 ATEX 1926X
    - 40°C ≤ Tamb ≤ +85°C
  - IECEx Zone 2:
    - Ex ec ic [ic] IIC T4 Gc
    - IECEx UL 18.0072X
    - 40°C ≤ Tamb ≤ +85°C



## M-View® Touch Series Displays

- Operating temperature: -4° to 140° F (-20° to 60° C)
- Power input:
  - MV-7T, 15 W max 10-30 VDC (36 W max with modules)
  - MV-10T, 22 W max 10-30 VDC (52 W max with modules)
  - MV-12T, 23 W max 10-30 VDC (57 W max with modules)
- Screen (sunlight readable):
  - MV-7T, 800x480 pixels, 7" widescreen  
Brightness 1000 cd/m2
  - MV-10T, 640x480 pixels, 10.4" screen  
Brightness 2500 cd/m2
  - MV-12T, 1280x800 pixels, 12" widescreen  
Brightness 1600 cd/m2
- User interface: resistive analog touchscreen
- Communication interface
  - 2x RS232
  - 1x RS485
  - 2x USB host type A (file transfer, data logging, USB device)
  - 1x USB server (program/firmware updates)
  - 2 Ethernet 10/100 Base TX (RJ45)
- Communication protocols:
  - EtherNet/IP (CIP)
  - Modbus TCP/IP
  - Modbus RTU standard
  - 300 plus available, web server

### Third-party approvals:

CE approved

- EN 61326-1 immunity to industrial

Locations emission CISPR 11 Class A

- IEC/EN 61010-1

- RoHS compliant

ATEX approved

- II 3 G Ex ic nA IIC T4 Gc
- II 3 D Ex tc IIIC T135°C Dc
- DEMKO 14 ATEX 1387X
- EN 60079-0, -11, -15, -31

IECEx approved

- Ex ic nA IIC T4 Gc
- Ex tc IIIC T135°C Dc
- IECEx UL 15.0035X
- IEC 60079-0, -11, -15, -31

UL approved

cULus listed for ordinary location:

File #E302106

- UL 61010-1, -2-201

cULus listed for hazardous location:

File #E317425

- Class I, Division 2, Groups A, B, C and D
- Class II, Division 2, Groups F and G
- Class III, Division 2 ANSI/ISA 12.12.01, C22.2 No. 213-M1987, 157-92

IP66 Enclosure rating (Face only)

Type 4X outdoor enclosure rating (face only)

ABS type approval for shipboard applications





[illegible]

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# Centurion™ C5 Series

## M-View® Monochrome LCD (MV-5-C)

### Operations Manual

**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product.  
A copy of the warranty may be viewed or printed by going to <http://www.fwmurphy.com/warranty>



**BEFORE BEGINNING INSTALLATION OF THIS FW MURPHY PRODUCT:**

- Please read the following information before operating the Centurion controller. This installation information is intended for Centurion controller only.
- Visually inspect the product for any damage during shipping.
- Before proceeding please visit our website and review our support documentation including Wiring the Murphy Way.  
[www.fwmurphy.com/uploaded/WIR\\_Murphy\\_Way.pdf](http://www.fwmurphy.com/uploaded/WIR_Murphy_Way.pdf)
- Disconnect all power and be sure machine is inoperative before beginning installation.
- Installation is to be done only by a qualified technician of the Responsible Body.
- Observe all Warnings and Cautions at each section in these instructions.
- Device shall be wired in accordance with NEC, CEC or other local code, as applicable.
- Please contact FW Murphy immediately if you have any questions.

**For Class I, Division 2:**

This equipment is an open-type device and is meant to be installed in an enclosure suitable for the environment such that the equipment is only accessible with the use of a tool.

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

Warning – Explosion Hazard – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

Warning – Explosion Hazard – Do not replace batteries unless the area is known to be free of ignitable concentrations.

**For AEx/Ex Zone 2:**

The equipment shall only be used in an area of pollution degree 2, as defined in IEC 60664-1.

The equipment shall be installed completely within an enclosure that provides a minimum ingress protection of IP 54 in accordance with UL 60079-0 and only accessible by the use of a tool.

Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment. This protection is supplied internal to the equipment. No additional protection is required.

The wire size, torque rating of 12-24 AWG, 0.37-0.44 ft.-lbs. and suitable supply wire temperature rating of 96°C minimum shall be provided for the input power terminal block.

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## Introduction

### Product Description

The Centurion configurable controller is a display and controller combination expressly designed to meet the requirements of three specific kinds of applications:

- Screw Compressors
- Reciprocating Compressors
- Pumps

The heart of the Centurion system is the main input/output (I/O) module or controller, which can be mounted on a standard DIN rail. While it is designed to work with any Modbus (Client) compliant HMI (Human Machine Interface) or with no operator interface at all, it is optimally configured and field-configurable using the Centurion Configuration Tool, powerful software developed to configure the controller. Parameters can be modified in the field without special need for laptop or software by utilizing FW Murphy's specially programmed M-View controller display.

The controller is designed to monitor, control, protect and optimize small-to medium-sized gas operated compressors and pumps in the field. Proper operation is maintained by monitoring setpoints and digital, analog and temperature input points and providing the logic to take corrective and/or proactive steps.

The controller also allows for controlled shutdown and no-flow monitoring as well as auto start up and engine control capabilities.

The controller provides real-time data via communications ports to a connected display and/or supervisory system. This advanced system offers multiple options for remote communications and operation. The industry standard Modbus RTU or Modbus TCP/IP protocol means greater support for a wide variety of communication equipment including radio and satellite communications systems.

### Led Indicators and Blink Codes

#### MV-5-C Display – Front Side

Please be aware of the following conditions and the resulting LED appearances:

- If the unit has an invalid application or needs to sync (M-View Replacement only), the Red LED is Off and the Amber LED will Flash.



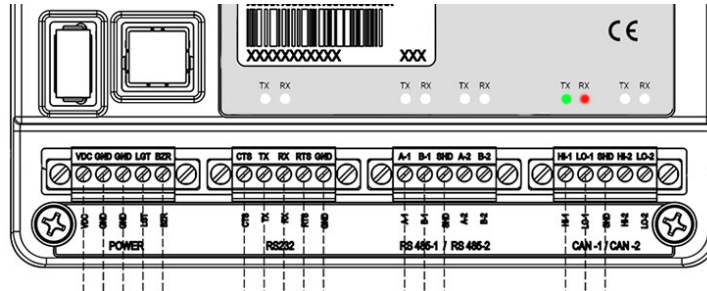
- When the bootloader exits to run the application, the Red and Amber LEDs are turned Off.

## MV-5-C Display – Back Side

The LEDs are located next to the serial port connections.

All Ports RX/TX LEDs include:

- The serial activity LEDs blink with every transmitted or received message.
  - The RX LED blinks Red when a packet is received by the display.
  - The TX LED blinks Green when a packet is transmitted by the display.



## C5 Controller

**NOTE:** The Expansion modules have the same 2 Power LEDs and COP blink codes as the C5. They are located next to the power plug on all modules.

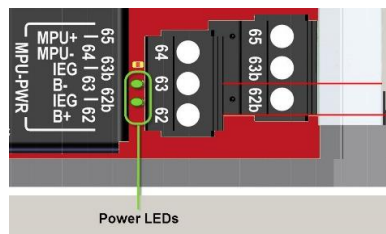
**C5 Power LED Indicators** – Power is always two green LEDs

### 2 Green LEDs:

2 on - Unit is powered normally

1 on - Internal power failure. Needs service

Off - No DC power to unit



## C5 Controller (continued)

### C5 COP LED Indicators – Controller Operating Properly

#### Green LED:

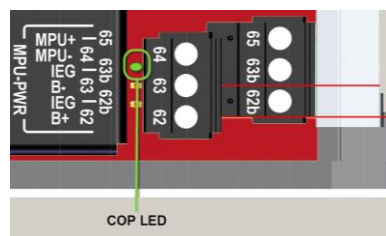
#### 2-Digit Blink Codes – used on date code T4 and newer

Blink codes will be 2 digits separated by pauses with each blink code further separated by a rapid blink event.

Blink codes will be ¼ second ON and ¼ second OFF.

Pauses will be ¾ second OFF.

The separator will be a 2 1/2 seconds pause.



2-Digit Blink Codes		
Blink Code		Description
1 <sup>st</sup> Digit	2 <sup>nd</sup> Digit	
1	1	Startup Error, contact factory
2	1	Missing configuration file – Configurable 50333921 application running
2	2	Good configuration – Configurable 50333921 application running
2	4	Running with recovery application (firmware load needed, contact factory)
3	1	Missing configuration file, C4-1 Configurable Emulation 50333950 application running
3	2	Good configuration file, C4-1 Configurable Emulation 50333950 application running
4	1	Rockwell Automation IO module firmware running
4	2	MX3 IO module firmware running
4	3	C5 Custom firmware running
Fast Flash (100 mS)		Bootloader Mode, only used for switching applications or module reprogramming via external CAN tools.
Off		Controller not operating

### Legacy Blink Codes – used on date code T3 and earlier

Legacy Blink Codes	
Blink Code	Description
1-Blink/sec	Good configuration - 50333920 firmware (SR 0.5) or Custom application running
3-Rapid Blinks	Missing configuration file - 50333920 firmware running (SR 0.5)
4-Blinks	Running in Recovery Mode
Fast Flash (100 mS)	Bootloader Mode, only used for switching applications or module reprogramming via external CAN tools.
Off	Controller not operating

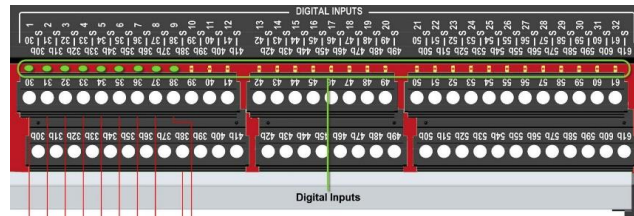
## C5 Digital Input LED Indicators – Digital Inputs

### Green LED:

On - Input active (DC+ or -)

Off - Input active (open)

Flashing – Wire fault detected, >= SR1.0 only

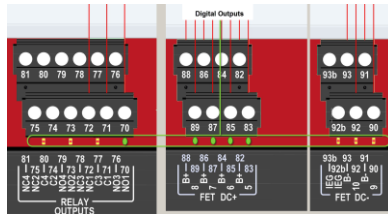


## C5 Digital Output LED Indicators – Relay Outputs, FET DC+, FET DC-

### Green LED:

On - Output on

Off - Output off



## C5 Communication LED Indicators - RS232, RS485, CAN bus

### RED LED:

Flash - Unit is transmitting data to device

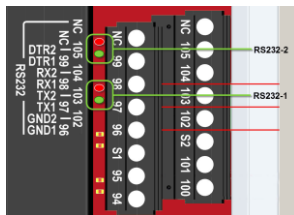
Off - No communication active

### GREEN LED:

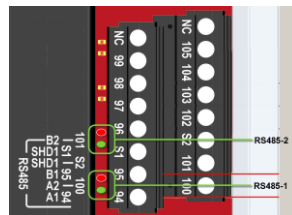
Flash - Unit is receiving data

Off - No communication active

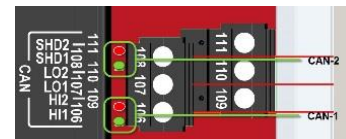
### RS232



### RS485



### CAN bus



## C5 Series DIP Switch Configuration

---

### Node Address:

- **DIP1-8:** These switches allow you to assign a unique address to each Centurion that may be in the system using Modbus communication to RS485-2 and RS232-2. This allows the client controller to differentiate between the modules. Addressing is done in binary format, with each switch increasing value by factor of 2. For example, to name the controller address 5, set switch DIP1 and DIP4 to the CLOSED position. Valid settings are from 1 to 239. Addresses 240 thru 255 are for power-up functions only as detailed below.
- **If set to 0:** The RS485-2 and RS232-2 ports will change to 9600 baud.

### Can Termination:

- **DIP9:** This switch provides a 120Ω termination resistor for the CAN 1 communication chain. CAN must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation
- **DIP10:** This switch provides a 120Ω termination resistor for the CAN 2 communication chain. CAN must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation

### Switch Positions:

Set these switches to the open or closed position for your application.



### For T4 Date Code and Newer:

These DIP functions will not work in legacy modules before Date Code T4.

**DIP Power-up Functions:** There is a special feature for switching module operation mode that is activated by setting specific switch positions at power up. Change will only occur if the following switches are set CLOSED at power up. All other times, these switches behave as address selections.

- DIP switches 5-8 CLOSED at power up activates special mode to change the module behavior based on switches 1-4 position.



5-8 CLOSED

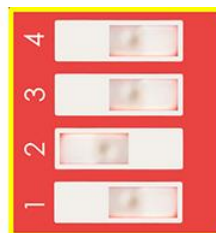
- 1-4 CLOSED: Load factory defaults to non-volatile settings – restores Ethernet address to default values. Default setting is 192.168.0.100 IP, 255.255.255.0 network mask, 0.0.0.0 Gateway.
- 1 OPEN, 2-4 CLOSED: Load Rockwell IO Application.
- 2 OPEN, 1, 3, 4 CLOSED: Load Standard Configurable Controller Application.



1-4 CLOSED



1 OPEN, 2-4 CLOSED



2 OPEN, 1, 3, 4 CLOSED

- 3 OPEN, 1, 2, 4 CLOSED: Load C5e Program 50333950 (C4 emulation).
- 1, 2 OPEN, 3, 4 CLOSED: Load Recovery Program. Not normally used. (*Only for USB cable download in the event application is unable to run.*)
- 1, 3 OPEN, 2, 4 CLOSED: Load MX3 program (C5 as I/O Expansion Module).
- 2, 3 OPEN, 1, 4 CLOSED: Set Ethernet port to DHCP mode



3 OPEN, 1, 2, 4 CLOSED



1, 2 OPEN, 3, 4 CLOSED



1, 3 OPEN, 2, 4 CLOSED



2, 3 OPEN, 1, 4 CLOSED

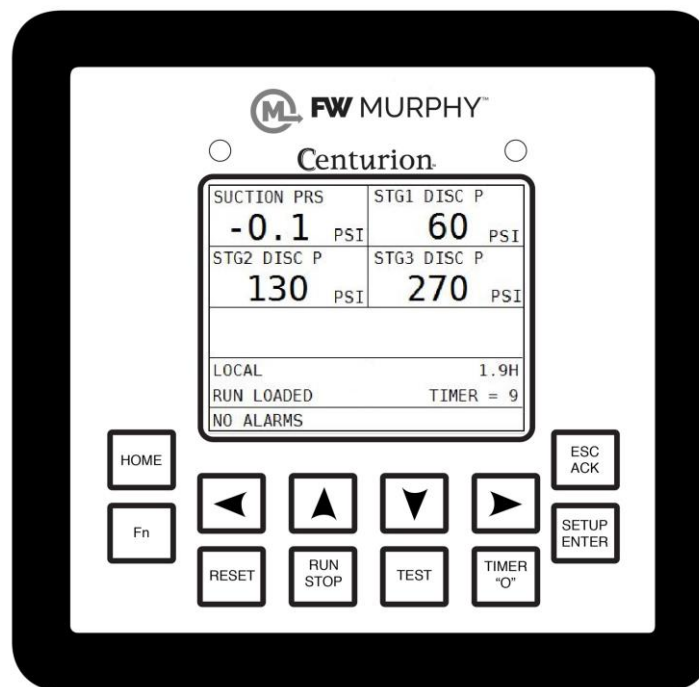
## Display Features

The display module is a highly integrated operator interface specially programmed to complement and support the Centurion controller. The primary purpose of the display is to:

- view controller operational information
- view/edit controller operational parameters
- send commands to controller, such as stop, edit and reset

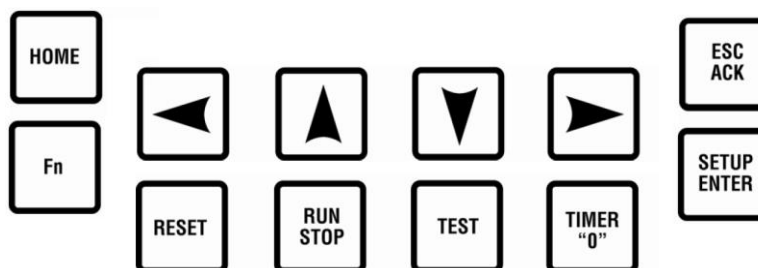
### Home Screen / Landing Page

Your default Home Screen / Landing Page is determined by the first page configured in the Centurion configuration, and may look similar to this example.



## Navigation Keys

The keys actions are relative to the location of the cursor and the screen being displayed.









The following table describes the keys and their function for each screen type:

- Operating Status screens
- Setup screens (password required)
- Edit screens (password required)

Key	ID	Description
	HOME	<b>Operating Status Screen</b> - Allows the user to get to the first line of the current screen, if pressed again, to get to the default operating status screen. <b>Set Up Screen</b> - -Allows the user to get to the first line of the current screen, if pressed again, to get to the first setup screen. <b>Edit Screen</b> - No associated action.
	ESC/ACK	<b>Operating Status Screen</b> - Acknowledges all active messages and alarms displayed in the active alarm screen. <b>Set Up Screen</b> - Exit Setup mode. <b>Edit Screen</b> - Exit without saving changes to the current configuration.
	Fn (Function Key)	<b>Operating Status Screen</b> - Enter "Function mode" and display a dialog box with additional available functions. Automatically cancels upon moving to the next mode or if no subsequent function is chosen within five seconds. <b>Set Up Screen</b> - No associated action. <b>Edit Screen</b> - No associated action. <b>Control Loop Screens</b> - Press FN to toggle Control Loop mode between Auto and Manual.
	SETUP/ ENTER	<b>Operating Status Screen</b> - Enter Setup Mode. <b>Set Up Screen</b> - Enter Edit mode or Submenu. <b>Edit Screen</b> - Accept and save changes made to a current parameter before exiting edit mode.
	RESET	<b>Operating Status Screen</b> - Reset any active timers and alarms/faults. <b>Set Up Screen</b> - No associated action. <b>Edit Screen</b> - No associated action.
	RUN/STOP	<b>Operating Status Screen</b> - Initiate or cancel a start sequence. <b>Set Up Screen</b> - Cancel a start sequence. <b>Edit Screen</b> - Cancel a start sequence.



Key	ID	Description
	ARROW UP	<p><b>Operating Status Screen</b> - Scroll up one line. Automatically repeats if held down continuously until reaching the first line.</p> <p>For history screens, scrolls up one history (for example: shutdown or event).</p> <p><b>Set Up Screen</b> - Scroll up one line. Automatically repeats if held down continuously until reaching the first line.</p> <p><b>Edit Screen</b> - Increase the digit selected by the cursor (from 0 to 9). The user will not be allowed to increase the selected digit if it would result in exceeding range limits. Toggle the value in a list of options if editing a non-numeric value.</p> <p><b>Control Loop Screens</b> - Press this in Manual mode to increment the output manually.</p>
	ARROW DOWN	<p><b>Operating Status Screen</b> - Scroll down one line. Automatically repeats if held down continuously until reaching the final line.</p> <p>For history screens, scrolls down one history (i.e. shutdown or event).</p> <p><b>Set Up Screen</b> - Scroll down one line. Automatically repeats if held down continuously until reaching the final line.</p> <p><b>Edit Screen</b> - Decrease the digit selected by the cursor (from 0 to 9). The user will not be allowed to decrease the selected digit if it would result in exceeding range limits. Toggle the value in a list of options if editing a non-numeric value.</p> <p><b>Control Loop Screens</b> - Press this in Manual mode to decrement the output manually.</p>
	ARROW LEFT	<p><b>Operating Status Screen</b> - Display previous screen. Automatically repeats if held down continuously until reaching the first screen.</p> <p><b>Set Up Screen</b> - Display previous screen. This key has no action when in a submenu.</p> <p><b>Edit Screen</b> - Move the cursor left one position when a numeric value is displayed.</p>
	ARROW RIGHT	<p><b>Operating Status Screen</b> - Display next screen. Automatically repeats if held down continuously until reaching the final screen.</p> <p><b>Set Up Screen</b> - Display next screen. This key has no action when in a submenu.</p> <p><b>Edit Screen</b> - Move the cursor right one position when a numeric value is displayed.</p>
	TEST	<p><b>Operating Status Screen</b> - Enter test mode and start test timer. This is not applicable in shutdown mode.</p> <p><b>Set Up Screen</b> - No associated action.</p> <p><b>Edit Screen</b> - No associated action.</p>
	TIMER "0"	<p><b>Operating Status Screen</b> - Zero displayed timer (global timers, state timers, etc.)</p> <p><b>Set Up Screen</b> - No associated action.</p> <p><b>Edit Screen</b> - No associated action.</p>

# Reading the Screen

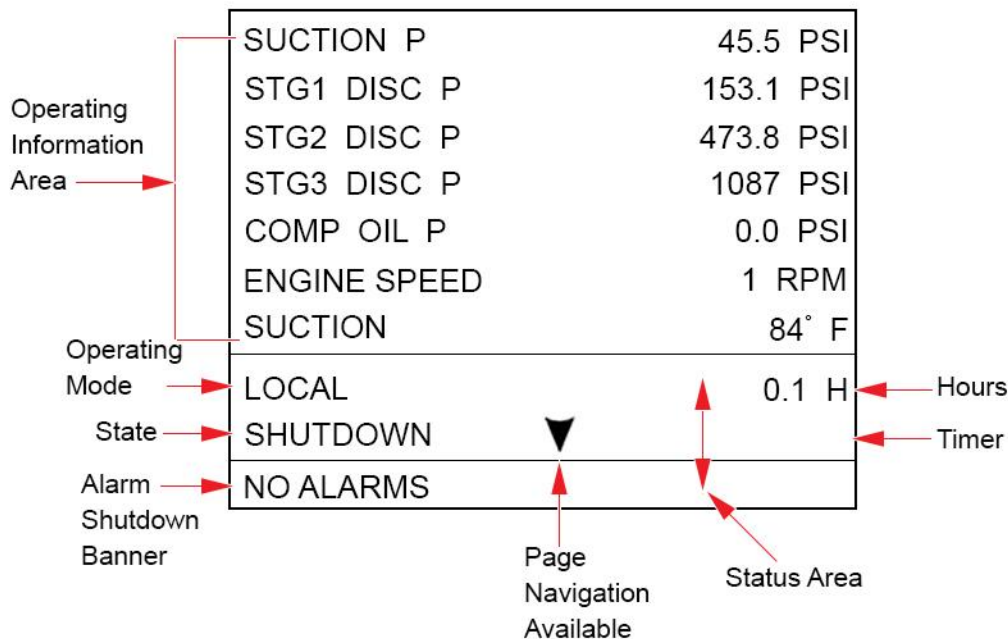
The actual number of Operating Status screens is set by the controller configuration.

Operating Status screens of the Line-by-Line type have seven (7) lines visible at a time.

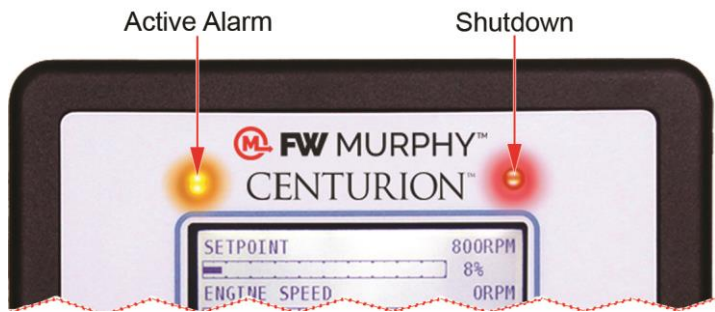
Setup screens have five (5) lines visible at a time.

Seeing the Up and Down Arrows on the screen indicate that more lines are available on the page.

Use the Left or Right Arrows to navigate between screens.



LEDs on the keypad overlay are used to indicate status also. The AMBER LED (left corner) indicates active alarms. The RED LED (right corner) indicates a shutdown.



## Maneuvering in Edit Mode

In the edit mode you may see the cursor blinking where it's being edited. In some instances, a word rather than a value is represented and you may choose one or the other, such as Yes or No, On or Off in the Edit Mode.

- The edit cursor rest on the far right digit. Example 00000.
- Press the Up / Down Arrows to add a number value.
- Press the Left / Right Arrow to move the edit cursor to the next digit and so on.
- Press Setup / Enter to save, once all numbers are placed. Example 00164.
- Some digits may not be allowed to increase if it would result in exceeding range limits.
- Values which can be positive or negative, will have a sign ( $\pm$ ) to the left of the number.
  - To change the sign value, move the cursor to the sign using the Left Arrow key and toggle between + and – using the Up and Down Arrow keys.
  - If the range of the value will exceed range limits, the sign may not be allowed to change. In this case, try reducing the number by decreasing the left most digit by one or more and attempt to change the sign again.
- Press the Up / Down Arrows to toggle between choices, such as On/Off or Yes/No.
- Press Setup / Enter to save, once all choices are placed. Example Yes/No.
- Press the ESC key to discard any changes and keep the original value prior to entering the Edit Mode.

**NOTE:** A select few menu parameters change in real-time when the value is changed. These will be noted in this document.

### Setup Screen Example

On this Setup Screen, Action is selected, it's set at Normally Open, however, 2 choices are available in edit mode.

1. Press Setup/Enter, the words Normally Open are now underlined, meaning it's in edit mode.
2. Press Up and Down Arrow keys to toggle between choices available. Normally Closed or Normally Open
3. Press ESC to make no changes. Normally Open is still set and the screen is out of edit mode.
4. Press Enter to save the change. Normally Closed is set and the screen is out of edit mode.

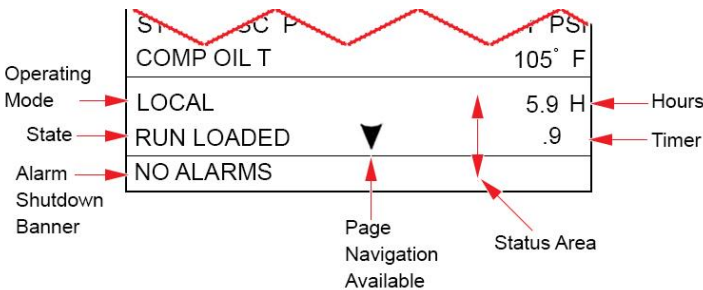
RUN STATUS	L1
ACTION	◀
RAW STATUS	
	NORMALLY OPEN ◀
2 CHOICES	
▼	ENTER - EDIT MORE MENUS

# Status and Mode of the Controller

Local and Remote are the two Operating Modes of the controller. The operation may differ depending on what Mode the controller is currently displaying.

The Mode can be changed by pressing certain keys, if the configuration allows for Remote mode.

- Pressing Reset or Run/Stop is a Local function and will change the Mode to Local if it is in Remote.
- Pressing the Fn key before pressing Reset or Run/Stop is a Remote function and will change the Mode to Remote if it is in Local.



# FN Screen

FUNCTION MENU (FN - EXIT)	L1
SHUTDOWN HISTORY	◀
EVENT HISTORY	
DIGITAL TO STATUS	
TEMPERATURE INPUT STATUS	
VERSION INFORMATION	
SHUTDOWN HISTORY	◀
REMOTE: RUN - STOP - RESET	
▼ ALARM SCREENS - ACK	
MORE MENUS	

Pressing the Function (Fn) key from any Operational screen will display the Function Menu screen momentarily to gain quick access to other pages.

Press the down arrow to select a screen and press enter to open it. Only available function key commands will be displayed. A prompt to enter a password may appear for some screens to open.

Remote mode commands are available only while the Fn key is pressed.

If the Fn key is not followed by another key press in five seconds, function mode will time out, and the screen will return to the previous screen.

# Password

## Passwords and Screen Access

Some settings are password protected, including the setup screens.

There are two separate levels of passwords to accommodate several security needs:

Standard password – Allows access to some features except the super user menu and setup editing.

Super User password – Adds the super user menu and setup editing to the standard menus.

### Where to Log ON and OFF


The password screen is displayed whenever security access is required for an action, and you may log in from there. Default passwords are 164 for operator or 133 for super.

1. To access the password screen anytime, from the Home Screen / Landing Page, press the Setup / Enter key to open the Password screen. The edit cursor rest on the far right digit. Example 00000.
2. Press the Up / Down arrows to add a number value.
3. Press the Left / Right arrow to move the edit cursor to the next digit and so on.
4. Press Setup / Enter to save, once all numbers are placed. Example 00164.


**NOTE:** After three minutes without activity, the keypad returns to the default operational screen, and a password must be re-entered to return to the setup and edit menus.

Once you have entered with the default password, we recommend you change passwords for better security. See the explanation on the Super User Menu page.

Standard Password Example

ENTER PASSWORD FOR SETUP MENUS	
0013 <u>1</u> ◀	
	ENTER - ACCEPT MORE MENUS

Super User Password Example

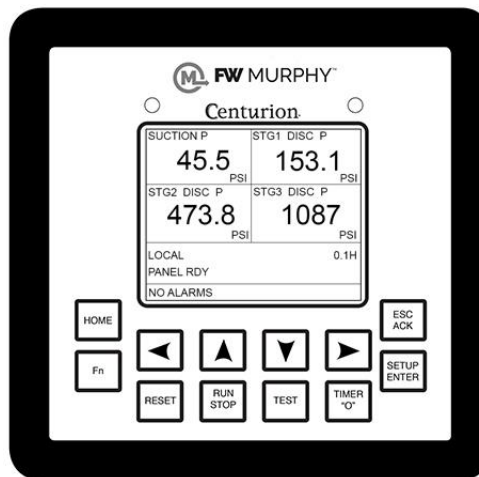
ENTER PASSWORD FOR SETUP MENUS	
2213 <u>1</u> ◀	
	ENTER - ACCEPT MORE MENUS

## Before Starting the Equipment for the First Time

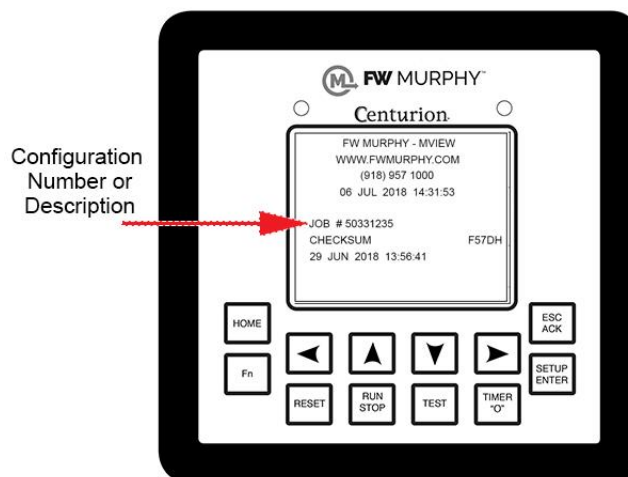
### Setup – MV-5-C Display

Read and follow steps in the order listed.

1. Locate the system drawing inside the panel and verify its drawing number matches the sticker on the lower front panel.
2. Locate the legend of the drawing and find the configuration description. Record this description.
3. Power up the Centurion System.
  - a. Allow time for the display to boot up and land on the Home Screen / Landing Page, approximately 15 seconds.



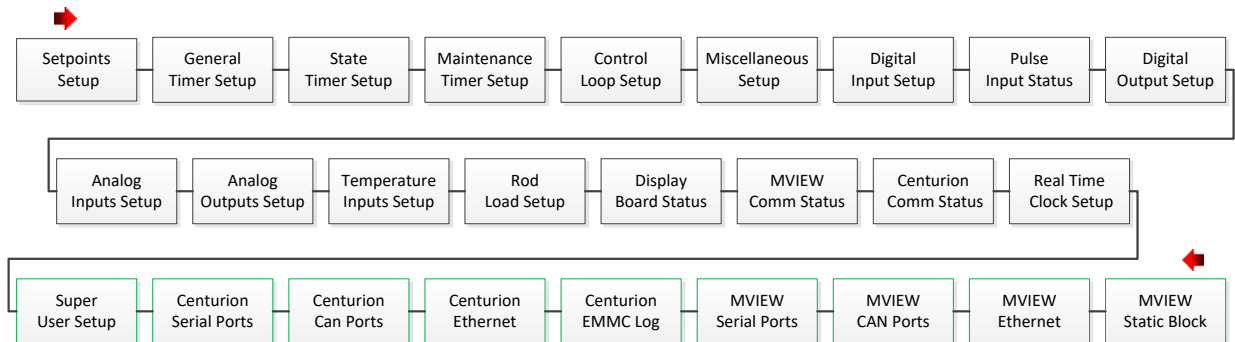
- b. From the Centurion Home Screen / Landing Page, touch the Arrow key to scroll left until you find the screen FW Murphy – MVIEW screen.
- c. Verify that the configuration description matches the one you previously recorded from the drawing legend.



4. Press the Setup Enter key to open the Password screen.
  - a. Use the Arrow keys to enter your password. Default passwords are Operator 164, Super User 133. If further details are needed, see Display Passwords.
5. Once the password is entered, the display opens the Setpoints Setup screen. Use the right and left Arrow keys to find the screen you want to view / edit.

#### Map of the Setup Screens for MV-5-C Display

>Home/Setup Enter Key/Password/Setpoints Setup/Arrow Key scroll to screen<



6. Open the following list of screens to verify or change the factory settings as needed for your site location.
  - a. We suggest you record these values in the Sequence of Operation. This gives you a reference of any changed settings from the factory default.
  - b. Select and enter each active item on the screen and verify its set values.
    - i. Edit values as needed using the active Arrow keys.
    - ii. Press the Setup / Enter key to change or accept the value.
    - iii. Press the ESC / ACK key to go back one page without change.
    - iv. Record any changes.
    - v. Repeat these steps until all screens listed below are verified for your site location.
      - Setpoints Setup
      - Control Loop Setup
      - Analog Input Setup
      - General Timer Setup
      - State Timer Setup
      - Temperature Inputs Setup
      - Rod Load Setup



7. Start the unit.
  - a. Clear any Alarms Class A (always armed) faults from the system. On the display, the Unit State will read Panel Ready if no Class A shutdown condition exist.
  - b. Press and hold the Run Stop key on the display for 2 seconds. This will initiate the start cycle. Depending on your configuration, the Centurion will send signals to possibly prelube the equipment, check pre-starting permissives, and then signal the driver to start the equipment. Confirmation of running may be in the form of RPM signal or digital switch input feedback. Once running signal is confirmed, the Centurion will be in a running condition. Class B and S lockout timers will begin timing to faults that require time lockout. Additional warmup and load permissives will be monitored as configured for the package prior to enabling any load control.
  - c. After all preload permissives have been achieved, such as oil or water temperatures, and possible minimum warmup times, the Unit State will read Loaded and will continue until the stop button is pressed, RPM is lost or a fault condition exist.

## Faults, Stops and Alarms

### Normal Stop

When a normal stop is issued and the unit is running, the system will start a normal shut-down sequence.

1. To issue a normal stop, press and hold the Run Stop key on the display for 2 seconds.
2. On the display, the Unit State will read Cooldown, and the Cooldown state delay will begin timing (if configured).
3. After the Cooldown is completed, the Unit State will read Stopping.
4. When everything has been recognized as back to normal the Unit State will read Panel Ready.

### Fault Shutdown

The Centurion will continually monitor for Fault or ESD shutdown events which require the equipment to stop immediately or prevent it to start.

On the display, the Unit State will read Shutdown and the Alarm Shutdown banner on the bottom of the screen shows the shutdown message in a firstout fashion, and the LED on the upper part of the display will illuminate Red.

The cause of the event is recorded and can be viewed on the Shutdown History screen with time and date of occurrence.

1. The Shutdown History screen displays information of the fault.
  - a. <Centurion Home Screen / FN / Shutdown History>
2. The Shutdown Snapshot screen displays the values of the unit running at the time a fault occurred.
  - a. <Centurion Home Screen / FN / Shutdown History / Right Arrow to scroll >
3. Once the corrections are made, clear the Shutdown condition by pressing the Reset key on the display.
4. Always make corrections on the unit before attempting to restart the equipment.

### Alarms

- If an alarm condition is detected, the Alarm Shutdown banner on the bottom of the screen shows the active alarm messages in the system, and the LED on the upper part of the display will illuminate Amber. Alarms may be configured as self-clearing or as requiring acknowledgement. Self-clearing alarms will auto clear if no longer present. Alarms requiring acknowledgement will persist until the ACK key is pressed.
- You can view up to 20 active alarms on the Active Alarms screen.
  - <Centurion Home Screen / FN / Active Alarms>
- Press the ESC ACK key to acknowledge the Active Alarm.

## Operational Screens

### User-Configurable Screens

The Centurion has (9) user-configurable pages of (4) types. The Centurion Configuration Tool software allows users to configure up to nine (9) screens with controller input signal groupings. Possible custom screen types may include:

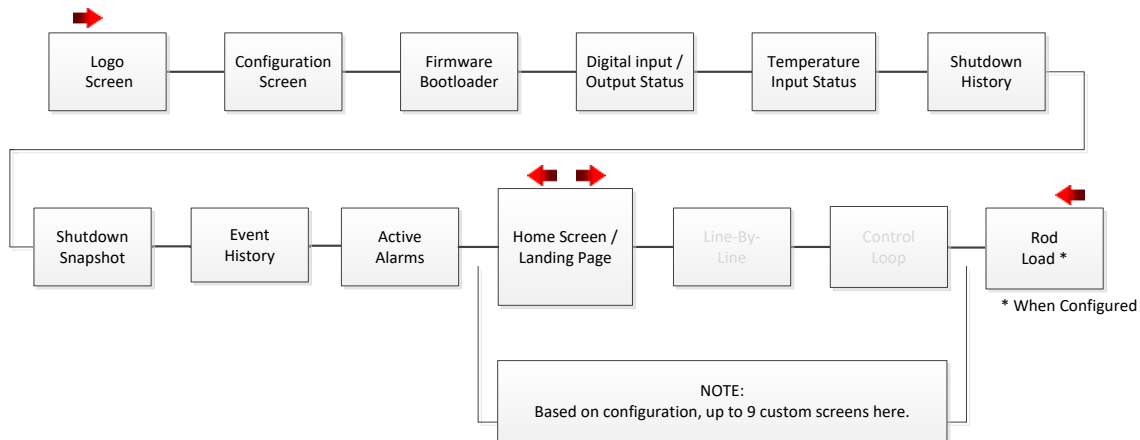
- Custom Line by Line allows user to display process data in a list format with description and value.
- Custom Gage allows user to display four (4) most important pieces of data on a 2 x 2 table in larger font.
- Custom Control Loop allows user to display Control Loop functions. The control output will be displayed as a percentage of the range.
- Custom Generic Register allows user to display up to 20 items on a page that can be mapped to the Centurion Modbus map and given a label.

For more information on configuring the optional screens through the Centurion Configuration Tool, please refer to the Configuration Tool Quick Start Guide.

### Map of Operational Screens

From the Home Screen / Landing Page, use the left and right arrows to view the Operating Screens. A password is not required to view these screens.

Some screens are application specific and may not be used.



### FW Murphy Logo Screen



The FW Murphy logo is the first screen in the sequence of display screens and can be viewed by holding down the left arrow until scrolling left ceases.

## Corporate and Configuration Information Screen

---

FW MURPHY - MVIEW  
WWW.FWMURPHY.COM  
(918) 957 1000  
06 JUL 2018 14:31:53

JOB # 50331235  
CHECKSUM F57DH  
29 JUN 2018 13:56:41

The Corporate and Configuration Information screen displays the FW Murphy corporate contact information, the configuration description, checksum and date/timestamp for the configuration loaded in the controller. Any configuration changes subsequent to the factory shipment will be indicated by a unique checksum and new date/timestamp.

## Bootloader and Firmware Information Screen

---

C5 - 1 FIRMWARE	50333920
BOOTLOADER	04.01.10001
BUILD	03.01.10834
MV - 5 FIRMWARE	50333681
BOOTLOADER	04.01.10006
BUILD	04.01.10171

The Bootloader and Firmware Information screen provides information for you to give our FW Murphy Technical Support staff should you need to call them. Such as, the bootloader and firmware versions for the core module, the MView display and the expansion module (if used).

## Digital Input Status Screen

---

DIGITAL INPUT STATUS									
P=DC+ N=DC- X=OK O=OPEN/OFF									
1	O	O	O	O	O	O	O	O	8
9	O	O	O	O	O	O	O	O	16
17	O	O	O	O	O	O	O	O	24
25	O	O	O	O	O	O	O	O	32
DIGITAL OUTPUT STATUS									
1	O	X	O	O	X	O	O	O	8
9	O	O	O	O	O	O	O	O	16
NO ALARMS									

The user can see the state of each digital input/output in a table—whether it is open or closed.

O = Digital Input Open / Digital Output Off

X = Digital Output On

P = Digital Input Closed to DC+

N = Digital Input Closed to DC-

## Temp Input Status Screen

TEMPERATURE INPUT STATUS										
P=DC+			N=DC-			X=OK			O=OPEN	
1	X	X	X	X	X	X	X	X	X	8
NO ALARMS										

The user can see the state of each temperature input in a table—whether it is OK or has a wiring fault.

X = OK

p = Wire Fault Leaking to DC+ (input still able to be read, but some error is being introduced)

n = Wire Fault Leaking to DC- (input still able to be read, but some error is being introduced)

P = Wire Fault Short to DC+ (input not able to be read)

N = Wire Fault Short to DC- (input not able to be read)

## Shutdown History Screen

SHUTDOWN HISTORY	7
SUCTION T WIREFLT 27JUN18 14:34:19 0.1H	1
SUCTION T WIREFLT 27JUN18 14:27:30 0.1H	2
CMP OIL P XMTR 00R 27JUN18 14:22:36 0.1H	3
EICS SPEED XMTR 00R 27JUN18 14:21:44 0.1H	4
NO ALARMS	

The history of the shutdowns are displayed on this screen, with the most recent at the top of the list and the oldest at the bottom.

The number displayed in the top right corner indicates how many entries are in the list.

Each event is displayed with the event label on one line and the real time clock and hour meter reading on the following line.

## Shutdown Snapshot Screen

SHUTDOWN SNAPSHOT	
SUCTION P	-- PSI
STG1 DISC P	-- PSI
STG2 DISC P	-- PSI
STG3 DISC P	-- PSI
COMP OIL P	-- PSI
ENGINE SPEED	-- RPM
SUCTION	-- ° F
STG1 DSC DE	-- ° F
NO ALARMS	

The shutdown snapshot screen is a capture of the values displayed on the line-by-line custom screen at the time of a Fault SD or ESD event. These values will be retained and display on the shutdown snapshot screen until the next Fault SD or ESD event occurs. A "---" displayed instead of a value indicates the shutdown snapshot has not captured any data. Fault snapshots are taken only while the equipment has been called to start/run. This behavior ensures that repeated attempts to reset a fault will not "clear" a previous run cycle's fault snapshot.

**NOTE:** Only the first two line-by-line screens configured will be captured on the fault snapshot page. If no line-by-line custom screens are configured, the shutdown snapshot will not function.

## Event History Screen

EVENT HISTORY	32
RESET 27JUL18 12:28:11 0.1H	1
RESET 27JUL18 12:28:09 0.1H	2
POWER UP 27JUL18 10:19:48 0.1H	3
RESET 27JUL18 10:19:44 0.1H	4
NO ALARMS	

The history of the last 32 events is displayed on this screen, with the most recent at the top of the list and the oldest at the bottom.

The number displayed in the top right corner indicates how many entries are in the list.

Events include shutdowns, starts, stops, resets, etc.

The user easily can view the events (alarms, etc.) logged before and after a shutdown.

Each event is displayed with the event label on one line and the real time clock and hour meter reading on the following line.

## Active Alarm Screen

ACTIVE ALARMS	1 / 1
* MX5 COMM FAILURE	
ACK - ACK ALL ALARMS	
MX5 COMM FAILURE	

All active alarms and warnings will be displayed on this screen.

Unacknowledged alarms will be preceded by an asterisk, and acknowledged alarms will clear the asterisk.

Pressing ACK on this screen will acknowledge all active alarms.

The top right corner will indicate the number of alarms and which line the cursor is currently on. Example: 3/10 indicates 10 alarms, and the cursor is on line 3 of the list. A maximum of twenty (20) active alarms will be displayed.

**NOTE:** Alarms are warnings based on setpoints and/or digital inputs which are separate from shutdowns that allow the equipment to continue to run.

ACTIVE ALARMS	1 / 1
* MX5 COMM FAILURE	
ACK - ACK ALL ALARMS	
MX5 COMM FAILURE	

### Alarm / Shutdown Banner

This screen shows the alarm / shutdown annunciation as it will appear on most Operating Status screens.

The message(s) will be visible at the bottom line of the status screen area and then briefly clear once a second.

This will continue until alarms are acknowledged and/or shutdowns are cleared.

If there is more than one unacknowledged alarm active, each alarm will be displayed for one second each until acknowledged.

Pressing the Fn key followed by the ACK key will switch to the active alarms screen.

## Gage Display Screen

SUCTION P <b>45.5</b> PSI	STG1 DISC P <b>153.1</b> PSI
STG2 DISC P <b>473.8</b> PSI	STG3 DISC P <b>1087</b> PSI
LOCAL 0.1H	
PANEL RDY	
NO ALARMS	

This is an example of a custom gage display.

This display provides larger characters for easier viewing as well as a means to prominently display items of interest.

## Line-by-Line Screen

SUCTION P	45.5 PSI
STG1 DISC P	153.1 PSI
STG2 DISC P	473.8 PSI
STG3 DISC P	1087 PSI
COMP OIL P	0.0 PSI
ENGINE SPEED	1 RPM
SUCTION	84° F
LOCAL	0.1 H
SHUTDOWN	▼
NO ALARMS	

This is an example of a custom line-by-line status screen.

If the parameters do not fit in the viewable area of the screen, up/down arrow icons will appear at the bottom of the screen to indicate the ability to scroll up or down to see additional parameters.

## Custom Control Loop Screen

SETPOINT	3.0 PSI
	0 %
SUCTION P	45.5 PSI
	9 %
CONTROL OUTPUT	
	80 %
DESIRED SPEED	NOT ENABLED
LOCAL	0.1H
SHUTDOWN	
NO ALARMS	

The user may choose to display any configured Control Loop functions in this convenient format. The control output will be displayed as a percentage of the range.

Press the Fn key on this page to toggle the mode between AUTO and MANUAL modes of control loop operation.

If the Control Loop is in MANUAL, the UP and DOWN arrow keys will adjust the output directly to manually make adjustments to the desired setting.

## Rod Load Screen

---

THROW 1 TEN	20692 LBS
THROW 1 CMP	22742 LBS
THROW 2 TEN	14634 LBS
THROW 2 CMP	15285 LBS
THROW 3 TEN	23313 LBS
THROW 3 CMP	28370 LBS
THROW 4 TEN	14634 LBS
THROW 4 CMP	15285 LBS
NO ALARMS	

If Rod Load calculations have been enabled on the Centurion Configuration, the last page to the right will contain the Compressor Rod Load information.

The calculated tension and compression forces on the rod are displayed in Imperial or Metric units as configured by the user.

There is support for 1 through 6 throws of rod load calculation.

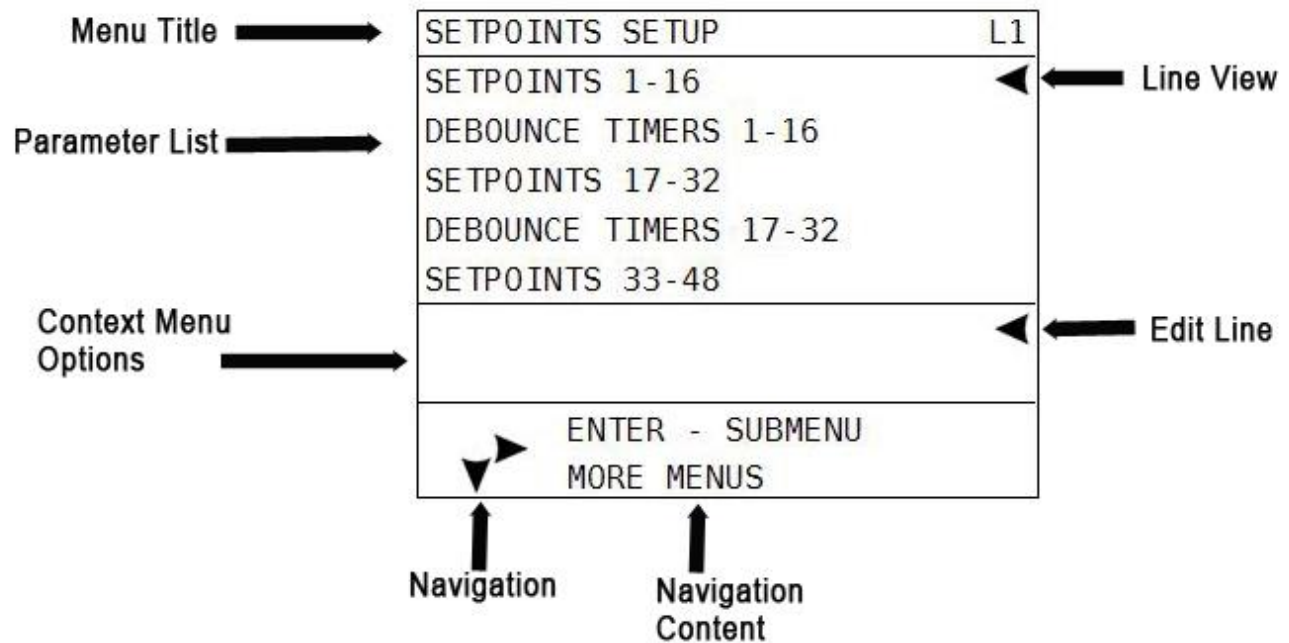
## Setup Screens and Menus

After entering your password, use the right and left arrow to view the Setup Screens available at your security level.

The setup screens provide access to system parameters. These settings can be modified with appropriate password access.

The two bottom lines in the setup screens list navigation and command options that are available with the selected item.

- READ ONLY
- ENTER – EDIT
- ENTER – ACCEPT
- ESC – CANCEL
- MORE MENUS
- ENTER - SUBMENU





## Setpoints Setup Screen

Up to 192 setpoints may be configured in the system by the Centurion Configuration Tool software. The values for the setpoints are user editable.

Setpoints are data entries used in greater than or less than comparisons of signals based on variable input types such as MPU, analog or thermocouples. The setpoint is a threshold, exception or any other out-of-limit event that can be configured to take a required action. Multiple setpoints are often applied to a process, and they may be configured as often as needed to meet changing conditions.

Common alarm and shutdown setpoints a user might have configured include:

- High shutdown (High-High)
- High warning (High)
- Low warning (Low)
- Low shutdown (Low-Low)

SETPOINTS SETUP	L1
SETPOINTS 1 - 16	◀
DEBOUNCE TIMERS 1 - 16	
SETPOINTS 17 - 32	
DEBOUNCE TIMERS 17 - 32	
SETPOINTS 33 - 48	
SETPOINTS 1 - 16	◀
ENTER - SUBMENU	
MORE MENUS	

SETPOINTS 1-16	L1
LO SUCTION PRS	◀
HI SUCTION PRS	
LO STG1 DISC P	
HI STG1 DISC P	
LO STG2 DISC P	
22.0	◀
MIN -3276.7	MAX 3276.7
ENTER - EDIT	
MORE MENUS	

To edit a configured setpoint:


a) Select the setpoint group submenu that requires editing. The configuration listing provided will include a listing of all setpoints and their respective number.

b) Assign numeric threshold that if crossed, triggers the setpoint.

b) Adjust the sign of the threshold value as plus (+) or minus (-) by moving the cursor to the sign symbol position and use the up and down keys to toggle the sign.

**NOTE:** Setpoints 1-16 and 17-32 can also have debounce timing applied as a signal filter. The setpoint comparison must be sustained through this time delay to see the setpoint as true. This time filter can be used to ignore transients of short duration.

## General Timer Setup Screen

GENERAL TIMER SETUP		L1
B1 TIMER		◀
B2 TIMER		
C2 TIMER		
S1 TIMER		
S2 TIMER		
SECONDS	60	◀
MIN 0	MAX 999	
 ENTER - EDIT MORE MENUS		

User may edit all general purpose timers. Generally, global timers affect driver operation. They also help define an event arming condition.

**B1:** All event types can be associated with, and locked out by, a Bx timer. B1 is the first global timer used for delaying an event condition detection. The timer starts and runs in the running States of the controller operation. B1 is also known as the Lockout Timer, start bypass or start/run timer.

**B2:** The second global timer used for delaying event condition detection. B2 is also known as a secondary Lockout Timer.

**C2:** The delay after reaching the Run Loaded State that allows Class C2 events to arm. Class C events require a clear reading sustained for 2 seconds to arm. This time used as stabilization time for any manual loading to be operated and the load to stabilize on the machine.

**S1-4:** Users have up to four (4) options to assign additional special global timers to signals. The Sx timers begin concurrently with the Bx timers.

**No Flow:** The global delay used for delaying the triggering of a no-flow event. This global no flow timer is enabled after B1 expires and begins timing after any of the pulse transition times configured in the digital input dialog expires.

**Test:** Time given to allow for maintenance testing of end devices without triggering a fault or shutdown condition. The timer initiates when switched to test mode.


**Ignition On Delay:** Time delay before the assigned ignition output turns on. This is typically used to delay ignition until engine has started cranking (also known as a purge delay).

**Fuel On Delay:** Time delay before the assigned fuel valve output is turned on. This is typically used to delay fuel until ignition has been turned on.

**Ignition Off Delay:** Time delay before the assigned ignition output turns off. This is typically used to burn remaining fuel vapors after the fuel valve is turned off.

**Power Save Timer:** Time delay that begins timing upon shutdown or stopping of the equipment, and will turn off a configurable Power Save digital output that can be used to remove power to the controller or other equipment to save batteries.


## State Timer Setup Screen

STATE TIMER SETUP	L1
PANEL RDY	◀
COT PERM	
C PRLB PRM	
C PRLB DUR	
START VALV	
SECONDS	0 ▶
 READ ONLY MORE MENUS	

User may edit all state timers if marked in use. State 1 – Panel Ready and 23 – Shutdown are Read Only and cannot be edited. The states used for a given application are configured by the Centurion Configuration Tool software.

When the state timeout value is reached, the state logic proceeds to the next In Use state. A state timeout may also be configured to trigger a fault event such as a prelube permissive failure; however, the operation depends on the configuration.

## Maintenance Timer Setup Screen

MAINTENCE TIMER SETUP	L1
CHANGE OIL	◀
SERVICE PLUGS	
ADJUST VALVES	
TAKE OIL SMPL	
CHECK BATTERY	
	◀
 ENTER - SUBMENU MORE MENUS	


The user may access and edit the ten (10) maintenance duration presets and time remaining settings, if used by the configuration. All maintenance timer units are in hours.

**NOTE:** These are configured by the Centurion configuration tool software and must be manually initialized in Centurion display.

When the timer reaches 0 hours an event may be configured to alarm or generate a message event that maintenance is required.

### Start / Restart Maintenance Timers

To initialize or restart the timers, position cursor on TIME REMAINING and press the reset key.

CHANGE OIL	L1
TIMER DURATION	◀
TIME REMAINING	
HOURS	750 ▶
MIN 0	MAX 65535
 ENTER - EDIT MORE MENUS	

## Control Loop Setup Screen

---

Users may view and edit up to eight (8) configured control loops. The settings on this page will differ depending on the type of control configured for the system. The control loops all operate on the principle of a 0-100% calculated output with special considerations for the Digital loop types. Four control loop types are possible.

- a) Analog and Digital types use a closed loop PID calculation to calculate the output value, in which a process variable is maintained at a desired setpoint with the PID generating a 0-100% corrective action to the process. The ultimate goal of the PID is to reduce the error to zero effectively maintaining the control setpoint (e.g. speed, load, pressure). PID calculations attempt to model the process being controlled by allowing tuning for the dynamics of the process based on the present (Proportional), past (Integral) and future (Derivative) error of the loop. The controller uses the parallel form of the PID equation as follows:

$$\% \text{ Output} = K_p(\text{Error}) + K_i \int (\text{Error}) dt + K_d \times d\text{Error}/dt$$

- b) 2 Pulsed Digital type uses a closed loop pulse equation that calculates the On time for either the increase or decrease digital output based on the control error.

$$\% \text{ Output} = (\text{Error} \times K_p) + 50\%$$

The ultimate goal of the loop is to reduce the error to zero effectively maintaining the control setpoint (e.g. speed, load, pressure). The control algorithm is centered at 50% output. At 50% output, neither digital output is on. The control loop will either add to 50% or subtract from 50% to pulse the increase or the decrease outputs. Larger deviation from 50% will result in longer output pulses.

- c) 4-Step Load turns on 4 digital outputs in a 4-step staggered loading scheme with time delays in between the loading steps. The ultimate goal of the loop is to reduce the error to zero while maintaining the control setpoint (e.g. speed, load, pressure). The control loop will turn on the outputs in succession, and the 0-100% control value will step up from 0 to 20%, 40%, 60% and 80% as the time delays expire. If the deadband is reached, the time delays will reset, and no change in control will occur.
- d) Open Loop calculates an analog output value using a linear scaling based on a feedback input. In this case, there is no closed feedback and no setpoint to maintain. There are 2 coordinates specified in engineering units for the process being controlled, one for minimum % output and one for maximum % output. A linear scaling function will be applied using these 2 values to range the output between the specified minimum and maximum % settings.
- e) Common setpoints to Analog/Digital, 2 Pulsed Digital and 4-Step Load loop types. Open Loop Ramp loop type shares only those setpoints marked with (\*).
  - 1. Auto/Manual Mode\*: Set the loop to Auto to enable the control. Set to Manual to allow user entry for the control output as a 0.00-100.00% value.
  - 2. Setpoint: Assign the desired value that is to be maintained by the loop. Depending on configuration this may be a variable setpoint based on analog input, not user editable from the display.
  - 3. Deadband: Assign a value around the setpoint during which the loop will not take any corrective action.
  - 4. Minimum Output\*: Set the minimum limit on the calculated value during auto control
  - 5. Maximum Output\*: Set the maximum limit on the calculated value during auto control.
  - 6. Loop Update time: Loop calculation frequency. This time should be set no shorter than the update rate for the feedback reading.

7. Max Rate of Decrease/Increase: This is a maximum slew rate setting for the output change per loop update time.

8. Set Output % (Manual) \*: This is the control output value data entry for manual mode.

9. Override 1-3 Ramp time\*: Set the interval used to modify the calculated output when a configured override signal is active.

10. Override 1-3 Change %: Set the amount of change either positive or negative required to the calculated output while a configured override signal is active.

**NOTE:** Override settings are only used when there is a configuration for overriding the control loop with another process variable. Each control loop may have up to 3 control loop override settings based on setpoint or digital inputs signals going true and false.

11. Display Loop Bar Graph\*: Set to yes to show a bar graph page for the control loop as it operates.

12. Ref Line Select\*: Setting to select any value to be shown on the Display Loop Bar Graph in addition to the setpoint, feedback and control output values. This setting is useful for showing the process value of a different analog, thermocouple or speed input that may be affected by changes to the PID output. Select from available analog, thermocouple or speed inputs or None to disable the Reference Line Select feature.

## Control Loop Setup Screen (continued)

CONTROL LOOP SETUP	L1
LOUVER % OPEN	◀
DESIRED SPEED	
CTL_LOOP_3	
CTL_LOOP_4	
CTL_LOOP_5	
	◀
ENTER - SUBMENU MORE MENUS	

LOUVER % OPEN	L1
AUTO/MANUAL MODE	◀
SETPOINT	
DEADBAND	
PROPORTIONAL	
INTEGRAL %/SECONDS	
	AUTO ◀
2 CHOICES	
ENTER - EDIT MORE MENUS	

### a) Analog/Digital PID loop specific setpoints:

- 1. Proportional:** Proportional gain tuning for the control process.
- 2. Integral:** Integral time constant (%/sec) tuning for the control process. Integration adjusts the output value on the accumulated of the error over time.
- 3. Derivative:** Derivative time (% seconds) tuning for the control process. Derivative adjusts the output value based on the rate of change of the error over time.

### b) 2 Pulse Digital loop specific setpoints:

- 1. Proportional:** Proportional number multiplied by the error to result in the on time for the pulse. Larger numbers here will result in longer on times for the pulse at a given error.
- 2. Inc/Dec Max On Time 1/20s:** Set the maximum on times for the calculated on time of the pulse. This is a clipping value applied to the calculated result.
- 3. Inc/Dec Sample Time 1/20s:** Set the fixed off time between pulses. This should be set long enough to allow the results of the previous pulse to have effect on the process before a new pulse is generated.
- 4. Inc/Dec Xover On Time 1/20s:** Set the fixed on pulse that is generated when the control changes from increasing to decreasing or vice versa. This is optional and typically used to prime hydraulic controls to reverse direction.
- 5. Inc/Dec Xover Off Time 1/20s:** Set the fixed off pulse that is generated when the control changes from increasing to decreasing or vice versa. This is optional and typically used to prime hydraulic controls to reverse direction.

### C) 4. Step Load loop specific setpoints:

- 1. Input For Min % Out:** This is the engineering unit value for the loop input that will cause the Minimum % output to be calculated. This value will be a pressure, temperature, RPM or other variable signal that controls the output directly.
- 2. Input For Max % Out:** This is the engineering unit value for the loop input that will cause the Maximum % output to be calculated. This value will be a pressure, temperature, RPM or other variable signal that controls the output directly.

## Miscellaneous Setup Screen

MISCELLANEOUS SETUP	L1
CORE FLYWHEEL TEETH	◀
EXP FLYWHEEL TEEETH	
HOUR METER	
CRANK ATTEMPTS	
CORE CJ TEMP	
	1 ▶
MIN 0	MAX 65535
◀▶	ENTER - EDIT MORE MENUS

### a) Core/Expansion Flywheel Teeth:

**Engine:** Define a value for flywheel teeth (Pulses Per Revolution) used to calculate RPM.

**Motor:** When setpoint set to zero, crank attempts becomes # of starts per hour (Short cycle limit) for electric motor applications.

**b) Hour Meter (0.0-499999.9):** Reset or preset the internal hour meter.

### c) Crank Attempts (1-16):

**Engine:** Define a value for number of crank attempts after which an over-crank sequence signal will be triggered in the system. If the configuration includes an Overcrank event, it will be triggered by this signal.

**Motor:** Define a value for number of motor start attempts per hour after (Short cycle) which an excess start attempts will be triggered in the system. If the configuration includes an Overcrank/Excess starts event, it will be triggered by this signal.

**WARNING:** The following cold temperature offset values should only be adjusted by personnel with a full working knowledge of the Centurion in conjunction with calibrated reference equipment.

**h) Core CJ Temp:** Enter a non-zero value for temperature adjustment in tenths of a degree to offset the temperature readings.

**i) Exp CJ Temp Offset:** Enter a non-zero value for temperature adjustment in tenths of a degree to offset the temperature readings.

## Digital Input Setup Screen

DIGITAL INPUT SETUP	L1
PANEL ESD	◀
ENG REQUEST SD	
SPARE D103	
LB LUBE NO FLOW	
LB LUBE NO FLOW	
	◀
ENTER - SUBMENU MORE MENUS	

PANEL ESD	L1
SIGNAL TYPE	◀
SIGNAL FILTER	
FILTER TIMING	
RAW STATUS	
	◀
NORMALLY OPEN	◀
3 CHOICES	
ENTER - EDIT MORE MENUS	

For all configured digital inputs, the user may edit:

**a) Signal Type** - Select one of three choices; normally open, normally closed DC+ or normally closed DC-.

**b) Signal Filter** - Select None to disable filter function for the digital input. This will not disable the digital input for normal operation.

Select Pulse for lubricator divider blocks with a proximity switch output.

Select DB to debounce or delay input detection for unstable inputs such as surge tank level.

**c) Filter Timing** - Delay time in seconds for the selected filter type.

For Pulse, this delay is the transition time for the lubricator divider block to cycle.

For DB, this is the duration the digital input must remain either ON or OFF before the input will be recognized and accepted as ON or OFF by the sequence. If the input does not remain ON or OFF for the duration of the delay, the timer will reset.

**d) Raw Status:** The actual measured sensor state.

**e) Total Pulsed** - Total number of pulses counted when the filter type is set to Pulse. The value is expressed in hundreds of pulses. A displayed reading of 1 is equal to 100 pulses. (\*only visible on pulse filter types) It may be reset on this display line as well.

## Pulse Input Status Screen


PULSE INPUT STATUS	L1
CYCLE TIME- INPUT #1	◀
CYCLE TIME- INPUT #2	
CYCLE TIME- INPUT #3	
CYCLE TIME- INPUT #4	
CYCLE TIME- INPUT #5	
PREV 0	CURR 0
CYCLE TIME (SEC)	◀
READ ONLY MORE MENUS	

Pulsed inputs are designed to accept a cycling digital output from a lubricator divider block, typically from a general purpose proximity switch.

The user may view information about the pulsed inputs. If a digital input is designated for use as a pulsed input, it will display how much time elapsed before the last transition and how much time has elapsed since that transition. If the input is not designated as a pulsed input, there will be zeros displayed. Both have a maximum value of 999.



## Digital Output Setup Screen

DIGITAL OUTPUT SETUP	L1
RUN STATUS	◀
FAULT SD INDIC	
CORE_DO_3	
CORE_DO_4	
ENGINE RUN / STOP	
	▶
 ENTER - SUBMENU MORE MENUS	

**Digital output:** For all configured digital outputs, the user may edit:

RUN STATUS	L1	
ACTION		◀
RAW STATUS		
	NORMALLY OPEN	◀
2 CHOICES		
▼	ENTER - EDIT MORE MENUS	

**a) Action** - Select normally open or normally closed.  
Normally closed inverts the logic associated with the output if desired.

**b) Raw Status:** The actual output state.

To force the output, toggling the normally open to normally closed will cause it to invert state.

## Analog Inputs Setup Screen

ANALOG INPUTS SETUP	L1
SUCTION P	◀
STG1 DISC P	
STG2 DISC P	
STG3 DISC P	
CORE_AI_5	
	◀
ENTER - SUBMENU MORE MENUS	

SUCTION P	L1
SCALED MINIMUM	◀
SCALED MAXIMUM	
MOVING AVERAGE SAMPLES	
RAW COUNT OFFSET	
RAW COUNT SPAN	
	45.5 ◀
MIN -3276.7	MAX 3276.7
ENTER - EDIT MORE MENUS	

For all configured analog input devices, the user may edit:

**a) Scaled Minimum** - Minimum engineering scale for the input when the raw counts are at the raw count offset reading.

Example: 0 PSI for a 0-100 PSI transmitter.

**b) Scaled Maximum** - Maximum engineering scale for the input when the raw counts are at the raw count offset + raw count max (total raw counts).

Example: 100 PSI for a 0-100 PSI transmitter.

**NOTE:** To calibrate an analog input, change the raw offset and max settings. The scaled minimum and maximum settings should match the engineering unit range for the device.

**c) Moving Average Samples.** (1, 2, 4). Apply averaging filter to the input.

**d) Raw Count Offset.** Set the lowest raw analog input counts seen from the device.

**e) Raw Count Span.** Set the highest raw analog input counts span seen from the device. This number is added to the raw count offset to equal the actual raw count reading.


The user can view the raw counts of the analog inputs to calibrate the input by adjusting the offset and max raw count readings.

**NOTE:** Typical approximate raw readings for 4-20mA input:

4mA = 5243 counts

20mA = 26214 counts (5243 + 20971)

## Analog Outputs Setup Screen

ANALOG OUTPUTS SETUP		L1
LOUVER OPEN		◀
DESIRED SPEED		
CORE_AO_3		
CORE_AO_4		
		◀
	ENTER - SUBMENU MORE MENUS	

LOUVER OPEN		L1
ANALOG OUTPUT		◀
SCALED MINIMUM		
SCALED MAXIMUM		
		0.0 ◀
▼	READ ONLY MORE MENUS	

Centurion analog output hardware is ranged to 4-20mA. The actual analog output % will be shown for each channel.


For all configured analog output devices, the user may edit:


**a) Minimum** - Minimum % output. In most cases, 0% addresses a typical application (4mA).

**b) Maximum** – Maximum % output. In most cases, 100% (100.00) addresses a typical application (20mA).

To force the output, enter a value from 0.00% = 4mA to 100.00% = 20mA in the minimum setting.

## Temperature Inputs Setup Screen

TEMPERATURE INPUTS SETUP L1	
SUCTION	◀
STG1 DSC DE	
STG1 DSC NDE	
STG2 DISCH	
STG2 DISCH	
	◀
	ENTER - SUBMENU MORE MENUS


SUCTION	L1
TEMPERATURE	◀
STATUS	
LAST STATUS ERROR	
TYPE	
OFFSET	
	77 ◀
	READ ONLY MORE MENUS


The actual temperature reading in degrees will be shown per channel.


For all configured temperature devices, the user may edit:

- a) **Temperature:** The actual measured sensor reading.
- b) **Status:** Real-time display of any wire faults that may exist for the sensor.
- c) **Last Status Error:** The last detected wire fault for the sensor, use this record to troubleshoot intermittent faults, this line will hold the last recorded error.
- d) **Type.** Identify whether the input type should be set to one of three types: J thermocouple, K thermocouple or 100 OHM Pt RTD.  
**NOTE:** for MX4-R2 even channels can only be selected as J thermocouple or K thermocouple
- e) **Offset.** Assign an optional thermocouple reading offset value.

## Rod load Setup Screen

ROD LOAD SETUP	L1
THROW 1	◀
THROW 2	
THROW 3	
THROW 4	
THROW 1	◀
 ENTER - SUBMENU MORE MENUS	

THROW 1	L1
THROW TYPE	◀
SUCTION PRESSURE	
SUCTION PRS DROP	
DISCHARGE PRESSURE	
DISCHARGE PRS DROP	
DOUBLE ACTION	◀
 READ ONLY MORE MENUS	

THROW 1	L6
CYLINDER SIZE	◀
RODSIZE	
HI COMPRESSION	
HI HI COMPRESSION	
HI TENSION	
8.750 INCHES MIN 0.000      MAX 65.535	◀
 ENTER - EDIT MORE MENUS	

THROW 1	L16
HI HI TENSION	◀

Rod Load setup screen is visible if Compressor Rod Load is configured in the Centurion. For each throw setup in the configuration, the user can view and set these parameters.

- Throw Type: Display for the set action of the compressor throw. If set to Single or Double by the configuration tool, the user may change the action back and forth if the compressor geometry is changed. Blank or Tandem options are Read Only
- Rod Size: Setpoint displayed in inches or centimeters, depending on the configured Rod Load Units, for the rod size.
- Suction Pressure: Display for the input channel used as suction pressure for the throw.
- Suction Pressure Drop: Setpoint in Percent for the pressure drop from the measurement point to the internal cylinder pressures. This is aggregate of valve and piping pressure losses.
- Discharge Pressure: Display for the input channel used as suction pressure for the throw.
- Discharge Pressure Drop: Setpoint in Percent for the pressure drop from the internal cylinder pressures to the measurement point. This is aggregate of valve and piping pressure losses.
- Cylinder Size: Setpoint displayed in inches or centimeters, depending on the configured Rod Load Units, for the cylinder size.
- Hi Compression: Setpoint in lbs-force or Newtons, depending on the configured Rod Load Units, for the rod load alarm event.
- Hi Hi Compression: Setpoint in lbs-force or Newtons, depending on the configured Rod Load Units, for the rod load shutdown event.
- Hi Tension: Setpoint in lbs-force or Newtons, depending on the configured Rod Load Units, for the rod load alarm event.
- Hi Hi Tension: Setpoint in lbs-force or Newtons, depending on the configured Rod Load Units, for the rod load shutdown event.

**NOTE:** These are the options shown for single or double acting options. If the throw is a tandem type, it will have twice the settings, (a low pressure (LP) and high pressure (HP) set of setpoints.

## Display Board Status Screen

DISPLAY BOARD STATUS	L1
BACKLIGHT	◀
DSP CONTRAST	
SYSTEM VOLTS	
PCB TEMPERATURE	
HEATER PWM %	
	100 ▶
MIN 0	MAX 100
◀▶	ENTER - EDIT MORE MENUS

The user may view diagnostic information that reflects the operating conditions of the display only.

**a) Backlight** - Adjust the value from 0 (OFF) to 100 (Full ON) percent to modify the intensity of the backlight. NOTE: This value changes in real-time as adjustment are being made. Pressing ESC will NOT discard the changes made to this value. A password is not required to change this setting.

**b) DSP Contrast** - Adjust the value from 150 to 180 to modify the LCD contrast. As the number is increased the active pixels of the display will become darker. Increasing the contrast too much may also increase the darkness of the background. NOTE: This value changes in real-time as adjustment are being made. Pressing ESC will NOT discard the changes made to this value. A password is not required to change this setting.

**c) System Volts** - Indicates internal voltage measurement of display VDC input.


**d) PCB Temperature** - Indicates internal temperature measurement of display. This is used primarily to monitor ambient temperature to operate LCD heater.

**e) Heater PWM %** - Refers to the LCD heater which only operates in cold temperature conditions.

**f) Reset Source** - Indicates the cause of the last reset. Possible causes include external reset, power-up, brown-out and watch dog.

## MVIEW Communication Status Screen

---

MVIEW COMM STATUS	L1
485 - 1 BUS LOAD	◀
485 - 1 RECIEVE COUNT	
485 - 1 TRANSMIT COUNT	
485 - 1 FRAME ERRORS	
485 - 1 HW OVERRUNS	
485 - 1 BUS LOAD	0.0% ▶
 READ ONLY MORE MENUS	

This menu is used for diagnostic statistics for the display's communication ports. Note that communication ports may or may not be used for a specific application.

- a) Bus Load: % measurement of relative loading of the communication bus.
- b) Receive count: total number of received packets
- c) Transmit Count: total number of transmitted packets
- d) Frame Errors: total number of packets with frame errors detected.
- e) HW Overruns: total number of hardware overruns
- f) MB Exceptions: total number of Modbus packets with exception codes
- g) MB No Response: total number of Modbus packets with no response
- h) MB Bad Packet: total number Modbus bad packets detected

## Centurion Communication Status Screen

CENTURION COMM STATUS	L1
485 - 1 BUS LOAD	◀
485 - 1 RECIEVE COUNT	
485 - 1 TRANSMIT COUNT	
485 - 1 FRAME ERRORS	
485 - 1 HW OVERRUNS	
485 - 1 BUS LOAD	0.0% ◀
◀▶	READ ONLY MORE MENUS

Users may view the statistics for both of the display unit serial ports, including Modbus requests and responses.

Note: **a), b), c), d)** and **e)** settings are all common to the 485-1, 232 and 485-2 ports.

- a) Bus Load: % measurement of relative loading of the communication bus.
- b) Receive count: total number of received packets
- c) Transmit Count: total number of transmitted packets
- d) Frame Errors: total number of packets with frame errors detected.
- e) HW Overruns: total number of hardware overruns
- f) MB Exceptions: total number of Modbus packets with exception codes
- g) MB No Response: total number of Modbus packets with no response
- h) MB Bad Packet: total number Modbus bad packets detected

## Real Time Clock Setup Screen

REAL TIME CLOCK SETUP	L1
SET MINUTES	◀
SET HOURS	
SET DAY	
SET MONTH	
SET YEAR	
	14:35:26 ◀
2 CHOICES	
◀▶	ENTER - EDIT MORE MENUS

This menu is used to set the real-time clock in the Centurion controller. This clock will be used to synchronize the Centurion display and EICS if present in the system.

- a) Set Minutes
- b) Set Hours
- c) Set Day
- d) Set Month
- e) Set Year
- f) Set Day of Week



## Super User Menu Screen (Super User Password Protected)

---

SUPER USER SETUP	L1
RESET FAULT HISTORY	◀
RESET EVENT HISTORY	
USER CODE	
SUPER USER CODE	
DISPLAY FACTORY SETUP	
2 CHOICES	NO ◀
◀▶	ENTER - EDIT MORE MENUS

The super user menu will only be visible if the super user password has been entered.

- a) **Reset Fault History:** Set to Yes to clear the Shutdown History screen.
- b) **Reset Event History:** Set to Yes to clear the Event History screen.



**NOTE:** The Reset History commands do not permanently switch to Yes when entered but instead toggle back to No after sending the command to the controller.

- c) **User Code:** Press ENTER key to change the Standard user Password. The current password is displayed and can be changed to zero or any number between 100 and 65535. If it's set to zero, the result is that anyone can have read/write access to setup menus.
- d) **Super User Code:** Press the ENTER key to change the Super user Password. The current password is displayed and can be changed to any number between 100 and 65535. It cannot be the same as the standard password and cannot be set to zero.
- e) **Display Factory Setups:** Set to Yes to overwrite passwords, LCD contrast, and communication settings for the MVIEW to default settings and password settings from the last downloaded configuration file.

**NOTE:** The Restore Defaults command does not permanently switch to Yes when entered but instead toggles back to No after sending the command to the controller.

- f) **Centurion Factory Setup:** Set to Yes to overwrite all settings changed through the display to the original configuration settings from the last downloaded configuration file.
- g) **Key Press Counter:** total keypress diagnostic counter.
- h) **Outputs:** 1 – 2
- i) **LED:** 1 – 2 (Force menus for display outputs including LEDs located on the front of the display.)
- j) **Language Set:** Options include English or Spanish

## Centurion Serial Ports Screen (Super User Password Protected)

CENTURION SERIAL PORTS	L1
485 - 1 FS BIAS	◀
485 - 1 TERM RES	
485 - 1 MODBUS ADDRESS	
485 - 1 REPLAY DELAY	
485 - 1 BAUD RATE	
ENABLED	NO ▶
2 CHOICES	
 ENTER - EDIT  MORE MENUS	



Setup menu for the Centurion serial ports.

- 485 – 1 / 2, FS BIAS:** Choose YES to enable RS485 line fail-safe biasing. This should only be done in one location on the RS485 network.
- 485 – 1 / 2, Term RES:** Choose YES to enable a 120 ohm termination resistor on the bus. This should be done at each end of the RS485 networks.
- 485 – 1 / 2, Modbus Address:** Display/Set the Modbus RTU server address for the serial port.
- 485 – 1 / 2, Reply Delay (0 - 65535mS):** Optional time delay for the Modbus response.
- 485 – 1 / 2, Baud Rate:** Select the appropriate transmission baud rate from these six choices (9600, 19200, 38400, 57600, 115200)
- 232 – 1 / 2, Modbus Address:** Display/Set the Modbus RTU server address for the serial port.
- 232 – 1 / 2, Reply Delay (0 - 65535mS):** Optional time delay for the Modbus response.
- 232 – 1 / 2, Baud Rate:** Select the appropriate transmission baud rate from these six choices (9600, 19200, 38400, 57600, 115200)

**NOTE:** The port 2 is set by the DIP switch and is read only from the display.

**NOTE:** All ports use no parity, 8 data bits, 1 stop bit:

## Centurion CAN Ports Screen (Super User Password Protected)

CENTURION CAN PORTS	L1
CAN - 1 ADDRESS	◀
CAN - 1 ARBITRARY	
CAN - 1 TERM RES	
CAN - 2 ADDRESS	
CAN - 2 ARBITRARY	
	2 ▶
CLAIMED	2
 ENTER - EDIT  MORE MENUS	

Setup menu for the Centurion CANBUS ports

**CAN0 / 1 Address:** Set the CAN address for the Centurion


**CAN0 / 1 Arbitrary:** Set to YES to allow the port to be Arbitrary address capable

**CAN0 / 1 Term RES:** Displays the status of the 120 ohm termination resistor on the bus. This is set by DIP switch 9 and 10. This should be done at each end of the CAN networks.

**Lost CAN0 DLY:** Time delay for configuring the loss of comm detection for devices on the CAN port.

## Centurion Ethernet Screen (Super User Password Protected)

---

CENTURION ETHERNET	L1
IP ADDRESS	◀
GATEWAY	
NETMASK	
SET IP ADDRESS	
SET IP ADDRESS	
IP:	192.168.0.2 ▶
 READ ONLY MORE MENUS	

Setup menu for the Centurion Ethernet ports.


IP Address: View/Set the IP address for the Centurion.

Gateway: View/Set the default gateway IP address to be used by the Centurion.

Netmask: View/Set the IP network mask for the Centurion.

## Centurion EMMC Log Files Screen (Super User Password Protected)

---

CENTURION EMMC LOG FILES	L1
EMMC TOTAL FILE SIZE	▶
EMMC TOTAL FILE COUNT	
EMMC TRANSFER TIME	
	2975628 BYTES ▶
 READ ONLY MORE MENUS	

Diagnostic menu for the Centurion filesystem. Used by the Factory.

EMMC Total File Size:

EMMC Total File Count:

EMMC Transfer Time:

## MVIEW Serial Ports Screen (Super User Password Protected)

MVIEW SERIAL PORTS	L1
485 - 1 FS BIAS	◀
485 - 1 TERM RES	
485 - 1 MODBUS ADDRESS	
485 - 1 BAUD RATE	
485 - 1 MODE	
ENABLE	NO ▶
2 CHOICES	
◀▶	ENTER - EDIT MORE MENUS

Setup menu for the Centurion serial ports.

- 485 – 1 / 2, FS BIAS:** Choose YES to enable RS485 line fail-safe biasing. This should only be done in one location on the RS485 network.
- 485 – 1 / 2, Term RES:** Choose YES to enable a 120 ohm termination resistor on the bus. This should be done at each end of the RS485 networks.
- 485 – 1 / 2, Modbus Address:** Display/Set the Modbus RTU server address for the serial port.
- 485 – 1 / 2, Reply Delay (0 - 65535mS):** Optional time delay for the Modbus response.
- 485 – 1 / 2, Baud Rate:** Select the appropriate transmission baud rate from these six choices (9600, 19200, 38400, 57600, 115200)
- 485 – 1 / 2, Mode:**

## MVIEW CAN Ports Screen (Super User Password Protected)

MVIEW CAN PORTS	L1
CAN-1 ADDRESS	▶
CAN-1 ARBITRARY	
CAN-1 TERM RES	
LOST CAN-1 DLY	
CAN-2 ADDRESS	
	3 ▶
CLAIMED	1
◀▶	ENTER - EDIT MORE MENUS

CANbus is used for long distance high speed communication. Distances up to 100 feet are possible depending on data rates, and multiple devices can be on the network.

CAN – 1 Adress: Source Address is displayed for the address that was negotiated.

CAN – 1 Arbitrary: Arbitrary Address Capable is yes if other devices support address arbitration.

CAN – 1 Term Res: (set by DIP sw) is enabled. Line termination should be turned on at the ends of the network.


Lost CAN 1 DLY: Lost CAN Communication Delay.

120 ohm twisted shielded pair cable should be used for proper line integrity, wired in a daisy-chain fashion.

Star networks should be avoided.

## MVIEW Ethernet Screen (Super User Password Protected)


---

MVIEW ETHERNET	L1
IP ADDRESS	◀
GATEWAY	
NETMASK	
SET IP ADDRESS	
SET IP ADDRESS	
IP:	192.168.0.2 ▶
 READ ONLY MORE MENUS	

Future use.

## MVIEW Static Block Screen (Super User Password Protected)

---

MVIEW STATIC BLOCK	L1
MAC ADDRESS	◀
SB LENGTH, CRC, VER	
SERIAL NUMBER	
PART NUMBER	
PRODUCT NAME	
2C.00.33.00.01.8F	◀
 READ ONLY MORE MENUS	

Diagnostic menu for the M-View manufacturing information.  
Used by the Factory.

Mac Address

SB Length, CRC, VER

Serial Number

Product Name

## Communications

### Display Communication Ports

---

**RS232 – Not used with C5.**

**RS485-1 Not used with C5.**

**RS485-2 Available for optional server port.**

**Protocol:** Modbus RTU server

**Connection:** RS485-1/RS485-2 shared terminal block. RS485-2 uses A-2, B-2 and common SHD (shield).

**NOTE:** Shields should only be terminated on one side of the communication cable connection.

### USB – Used for firmware updates

**Interface:** USB 1.1 compliant port.

**Protocol/Services:** Proprietary (for firmware transfer).

**Connection:** USB type B connector.

**USB-A (Not Used)**

**CAN 1 Primary connection to C5 Centurion with configuration synchronization.**

**Protocol:** Proprietary/binary

**Connection:** CAN-1/CAN-2 shared terminal block. CAN-1 uses HI-1, LO-1 and common SHD (shield).

**CAN 2 (Not Used)**

### Downloading Configurations and Firmware Updates

---

The Centurion controller and display are configured and upgradeable through software transfers using a PC or laptop computer.

Configuration files are generated by the Centurion Configuration Tool software and provide the application specific personality to the controller and display.

Firmware defines the available set of features that can be configured in the controller and display that the configuration file uses to operate.

FW Murphy can provide future enhancements and support changes to process requirement for customers using simple email and obtaining the required transfer utilities from [www.fwmurphy.com](http://www.fwmurphy.com).

Refer to the Centurion Transfer Guide to obtain step-by-step instruction on file transfer operations.

## Display to Controller Data Transfer

Parameter changes made in the display are actually communicated to the Centurion controller where the logic resides. No changes made through the display affect the display configuration as the display merely reads from and writes to the Centurion main I/O module. As such, the display can write numeric parameters to the controller.

## Replacement Parts and Assemblies

<b>M-View Plug Kit</b>	50001150	Printed replacement terminal plugs for Centurion display module.
<b>Choke</b>	50000774	Ignition noise (choke) filter

## Accessories

### Centurion Configuration Tool Software

The Centurion Configuration Tool software generates and modifies the properties of the system specific to the hardware connected to the controller, the sequence of operation, defined setpoints, timers, faults and displays\* for the Centurion system. The software includes file transfer utilities for configuration and firmware upgrades.

CD, Centurion Configuration Tool software. (50-70-2313)

\*Display configuration and other settings for display are only for use with the M-View Display Module.

## Glossary

Analog Input	Terminals 18 to 29 are analog inputs on the Centurion Main I/O module. Accepts voltage signals within the range of (0 to 5) VDC or (0 to 24) mA and are compared to controller setpoints and/or displayed.
Boot Loader	Means by which the Centurion controller communicates with Centurion Configuration Tool to transfer new or updated configurations and firmware and ensures data and configuration synchronization.
Controller Setpoints	User defines normal operating range for the controller to optimize the equipment. Setpoints can also define some other threshold, exception or event that may require action. Multiple setpoints are often applied to a process, and they may be manipulated as needed to meet changing conditions.
DeadBand	The user set range at which input may fluctuate without the controller taking any action. The range may be fixed or variable.
Digital Input	Terminals 30 to 61 are the digital input channels, activated by either a ground or supply voltage level. User selects whether digital input is normally open (N/O) or normally closed (N/C). Users may also associate these inputs with transition times for indicating no-flow conditions on divider blocks.
Event	Defines the action required by the controller in response to any number of parameters. Event actions range from simple alarm message to emergency shutdown (ESD).

No-flow	Designed to protect against compressor or engine failures, the controller monitors the cycle time of lubrication system cycles, and if that cycle time falls under a user assigned value, the controller will activate a defined associated action such as an alarm or shutdown.
Offset	User-defined value to correct for known variance in the raw data.
Panel Ready	In states, the first logical step in startup.
Permissive	A process condition (digital input or analog setpoint) that must be met in order for the sequence to proceed to the next state.
RTD	A device for measuring temperature consisting of a device that changes resistance according to temperature.
Signal	An electrical quantity of voltage or current that is used to represent or signify some other physical quantity such as the state of a switch (ON/OFF) or the status of a device (SHUTDOWN/OK).
Span	The difference between the full scale output and the offset as raw data.
Start Delay	A time delay function to prevent premature start up.
State	Predefined step of multiple logical steps (or states) needed to successfully start and operate a compressor.
Thermocouple	<p>A device for measuring temperature consisting of two dissimilar metals of high purity for an accurate temperature/voltage relationship. User defines whether the calibration is J or K. Terminals 1 to 17 are for thermocouple inputs.</p> <p>Type J uses Red (-) and White (+) insulation. Type K uses Red (-) and Yellow (+) insulation.</p>



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# Centurion™ C5 Series

## M-View® Touch Series

### Operations Manual

**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product.  
A copy of the warranty may be viewed or printed by going to <http://www.fwmurphy.com/warranty>



**BEFORE BEGINNING INSTALLATION OF THIS FW MURPHY  
PRODUCT:**

- Please read the following information before operating the Centurion controller. This installation information is intended for Centurion controller only.
- Visually inspect the product for any damage during shipping.
- Before proceeding please visit our website and review our support documentation including Wiring the Murphy Way.  
[www.fwmurphy.com/uploaded/WIR\\_Murphy\\_Way.pdf](http://www.fwmurphy.com/uploaded/WIR_Murphy_Way.pdf)
- Disconnect all power and be sure machine is inoperative before beginning installation.
- Installation is to be done only by a qualified technician of the Responsible Body.
- Observe all Warnings and Cautions at each section in these instructions.
- Device shall be wired in accordance with NEC, CEC or other local code, as applicable.
- Please contact FW Murphy immediately if you have any questions.

**For Class I, Division 2:**

This equipment is an open-type device and is meant to be installed in an enclosure suitable for the environment such that the equipment is only accessible with the use of a tool.

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

Warning – Explosion Hazard – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

Warning – Explosion Hazard – Do not replace batteries unless the area is known to be free of ignitable concentrations.

**For AEx/Ex Zone 2:**

The equipment shall only be used in an area of pollution degree 2, as defined in IEC 60664-1.

The equipment shall be installed completely within an enclosure that provides a minimum ingress protection of IP 54 in accordance with UL 60079-0 and only accessible by the use of a tool.

Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment. This protection is supplied internal to the equipment. No additional protection is required.

The wire size, torque rating of 12-24 AWG, 0.37-0.44 ft.-lbs. and suitable supply wire temperature rating of 96°C minimum shall be provided for the input power terminal block.

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## Introduction

### Product Description

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The Centurion configurable controller is a display and controller combination expressly designed to meet the requirements of three specific kinds of applications:

- Screw Compressors
- Reciprocating Compressors
- Pumps

The heart of the Centurion system is the main input/output (I/O) module or controller, which can be mounted on a standard DIN rail. While it is designed to work with any Modbus (Client) compliant HMI (Human Machine Interface) or with no operator interface at all, it is optimally configured and field-configurable using the Centurion Configuration Tool, powerful software developed to configure the controller. Parameters can be modified in the field without special need for laptop or software by utilizing FW Murphy's specially programmed M-View controller display.

The controller is designed to monitor, control, protect and optimize small- to medium-sized gas operated compressors and pumps in the field. Proper operation is maintained by monitoring set points and digital, analog and temperature input points and providing the logic to take corrective and/or proactive steps.

The controller also allows for controlled shutdown and no-flow monitoring as well as auto startup and engine control capabilities.

The controller provides real-time data via communications ports to a connected display and/or supervisory system. This advanced system offers multiple options for remote communications and operation. The industry standard Modbus RTU or Modbus TCP/IP protocol means greater support for a wide variety of communication equipment including radio and satellite communications systems.

### Modbus RTU Register Map

---

Application-specific map is contained in the panel sequence of operation documentation. Contact factory representative to obtain documents if needed or see [www.fwmurphy.com](http://www.fwmurphy.com) for the Centurion C5 Controller Modbus Application Guide and Map.



## LED Indicators and Blink Codes

---

### M-View Touch Display

#### M-View Touch Display LED Indicators - Connected to C5 Controller RS232 Port 1

##### RED LED:

Fast blink (normal) – Display is receiving data from C5

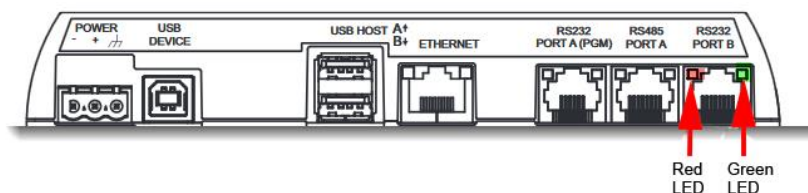
Off - No response from C5

##### GREEN LED:

Fast blink (normal) - Display is requesting data from the C5

Slow blink - Display requesting data from C5, no responses

Off - Display is not requesting data, not running the application



### C5 Controller

**NOTE:** The Expansion modules have the same 2 Power LEDs and COP blink codes as the C5 Controller. They are located next to the power plug on all modules.

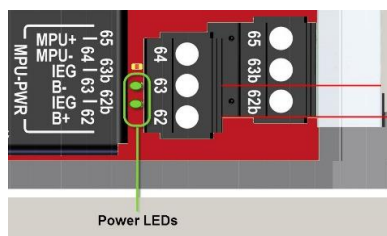
#### C5 Power LED Indicators – Power is always two green LEDs

##### 2 Green LEDs:

2 on - Unit is powered normally

1 on - Internal power failure. Needs service

Off - No DC power to unit



## C5 Controller (continued)

### C5 COP LED Indicators – Controller Operating Properly

#### Green LED:

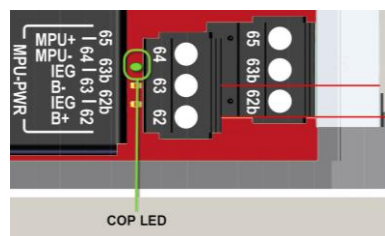
#### 2-Digit Blink Codes - used on date code T4 and newer

Blink codes will be 2 digits separated by pauses with each blink code further separated by a rapid blink event.

Blink codes will be ¼ second ON and ¼ second OFF.

Pauses will be ¾ second OFF.

The separator will be a 2 1/2 seconds pause.



2-Digit Blink Codes		
Blink Code		Description
1 <sup>st</sup> Digit	2 <sup>nd</sup> Digit	
1	1	Startup Error, contact factory
2	1	Missing configuration file – Configurable 50333921 application running
2	2	Good configuration – Configurable 50333921 application running
2	4	Running with recovery application (firmware load needed, contact factory)
3	1	Missing configuration file, C4-1 Configurable Emulation 50333950 application running
3	2	Good configuration file, C4-1 Configurable Emulation 50333950 application running
4	1	Rockwell Automation IO module firmware running
4	2	MX3 IO module firmware running
4	3	C5 Custom firmware running
Fast Flash (100 mS)		Bootloader Mode, only used for switching applications or module reprogramming via external CAN tools.
Off		Controller not operating

#### Legacy Blink Codes - used on date code T3 and earlier

Legacy Blink Codes	
Blink Code	Description
1-Blink/sec	Good configuration - 50333920 firmware (SR 0.5) or Custom application running
3-Rapid Blinks	Missing configuration file - 50333920 firmware running (SR 0.5)
4-Blinks	Running in Recovery Mode
Fast Flash (100 mS)	Bootloader Mode, only used for switching applications or module reprogramming via external CAN tools.
Off	Controller not operating

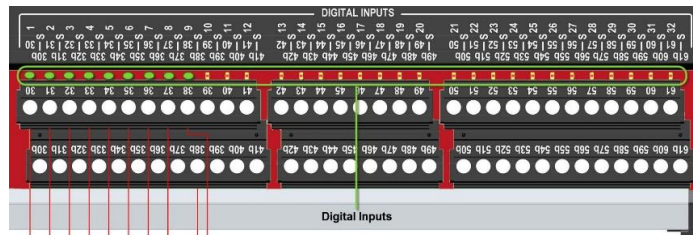
## C5 Digital Input LED Indicators – Digital Inputs

### Green LED:

On - Input active (DC+ or -)

Off - Input active (open)

Flashing – Wire fault detected, >= SR1.0 only

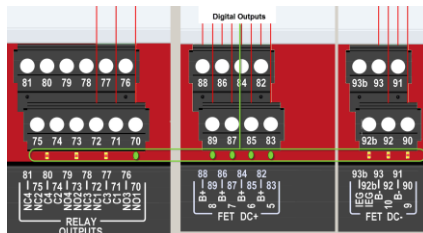


## C5 Digital Output LED Indicators – Relay Outputs, FET DC+, FET DC-

### Green LED:

On - Output on

Off - Output off



## C5 Communication LED Indicators - RS232, RS485, CAN bus

### Red LED:

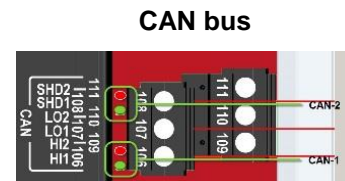
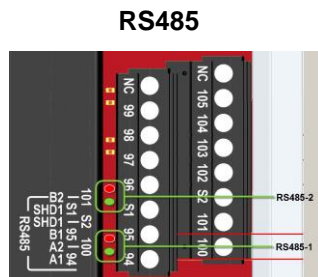
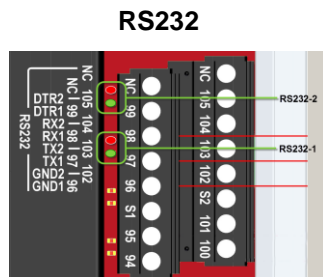
Flash - Unit is transmitting data to device

Off - No communication active

### Green LED:

Flash - Unit is receiving data

Off - No communication active



## C5 Series DIP Switch Configuration

---

### Node Address:

- **DIP1-8:** These switches allow you to assign a unique address to each Centurion that may be in the system using Modbus communication to RS485-2 and RS232-2. This allows the client controller to differentiate between the modules. Addressing is done in binary format, with each switch increasing value by factor of 2. For example, to name the controller address 5, set switch DIP1 and DIP4 to the CLOSED position. Valid settings are from 1 to 239. Addresses 240 thru 255 are for power-up functions only as detailed below.
- **If set to 0:** The RS485-2 and RS232-2 ports will change to 9600 band.

### Can Termination:

- **DIP9:** This switch provides a 120 $\Omega$  termination resistor for the CAN 1 communication chain. CAN must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation
- **DIP10:** This switch provides a 120 $\Omega$  termination resistor for the CAN 2 communication chain. CAN must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation

### Switch Positions:

Set these switches to the open or closed position for your application.

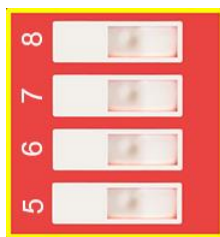


## For T4 Date Code and Newer:

These DIP functions will not work in legacy modules before Date Code T4.

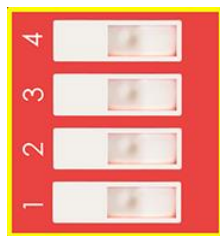
**DIP Power-up Functions:** There is a special feature for switching module operation mode that is activated by setting specific switch positions at power up. Change will only occur if the following switches are set CLOSED at power up. All other times, these switches behave as address selections.

- DIP switches 5-8 CLOSED at power up activates special mode to change the module behavior based on switches 1-4 position.

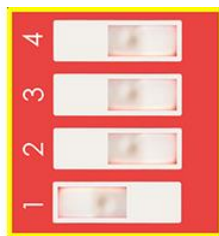


5-8 CLOSED

- 1-4 CLOSED: Load factory defaults to non-volatile settings – restores Ethernet address to default values. Default setting is 192.168.0.100 IP, 255.255.255.0 network mask, 0.0.0.0 Gateway.
- 1 OPEN, 2-4 CLOSED: Load Rockwell IO Application.
- 2 OPEN, 1, 3, 4 CLOSED: Load Standard Configurable Controller Application.



1-4 CLOSED



1 OPEN, 2-4 CLOSED



2 OPEN, 1, 3, 4 CLOSED

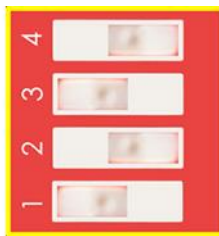
- 3 OPEN, 1, 2, 4 CLOSED: Load C5e Program 50333950 (C4 emulation).
- 1, 2 OPEN, 3, 4 CLOSED: Load Recovery Program. Not normally used. (*Only for USB cable download in the event application is unable to run.*)
- 1, 3 OPEN, 2, 4 CLOSED: Load MX3 program (C5 as I/O Expansion Module).
- 2, 3 OPEN, 1, 4 CLOSED: Set Ethernet port to DHCP mode



3 OPEN, 1, 2, 4 CLOSED



1, 2 OPEN, 3, 4 CLOSED



1, 3 OPEN, 2, 4 CLOSED



2, 3 OPEN, 1, 4 CLOSED

## M-View Touch Series Display Features

The display module is a highly integrated operator interface specially programmed to complement and support the Centurion controller. The primary purpose of the display is to:

- view controller operational information
- view/edit controller operational parameters
- send commands to controller, such as stop, edit and reset

### State and Mode of the Controller

Depending on the configuration active in the controller, the operation may differ depending on what Mode the controller is currently displaying.

The Mode can be changed by touching certain icons if the configuration allows for Remote mode.

- Touching Reset or Run/Stop is a Local function and will change the Mode to Local if in Remote Mode.
- Touching the Fn icon before touching Reset or Run/Stop is a Remote function and will change the Mode to Remote if in Local Mode.



The top left of the screen displays the Centurion operating state. Displayed next on the top line are active timers, the run hour meter and the panel starting mode as Local or Remote. The top right displays the system (Centurion) being displayed. This information is key to understanding the status of the controller.

### FN Screen

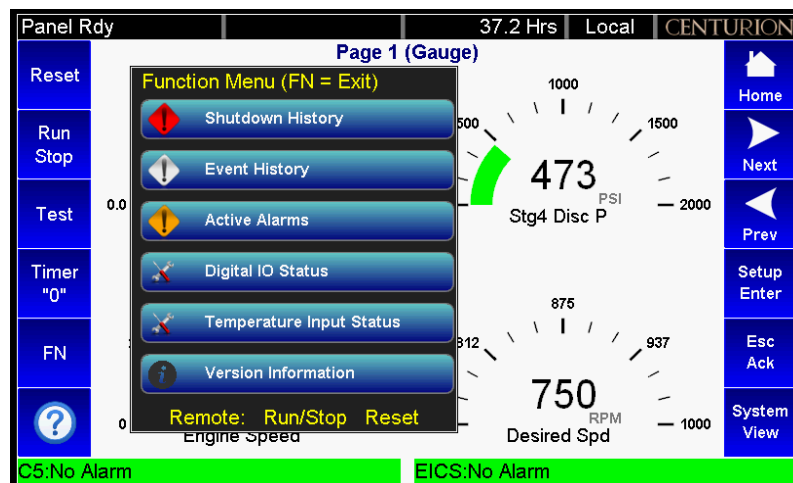
Touch the Function (Fn) icon to display the Function Menu pop-up with available function command screens.

Touch a function command screen from the menu to open it.

The function menu will time out in 5 seconds if a selection is not made.

A prompt to enter a password may appear for some screens to open.

**When in Remote Mode:** Remote mode commands are available only while the Fn icon is pressed.

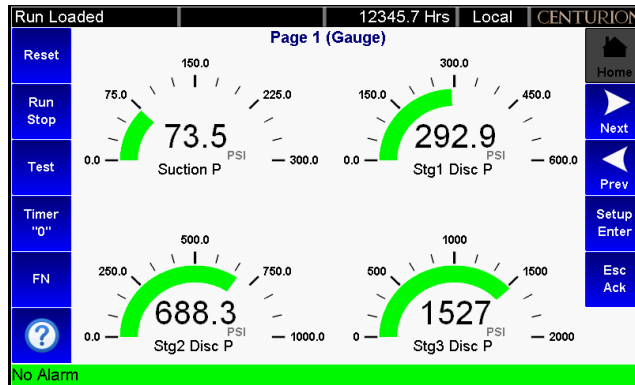


## Default Home Screen / Landing Page

Your default Home Screen / Landing Page is determined by the first page configured in the Centurion configuration and may look similar to these examples.

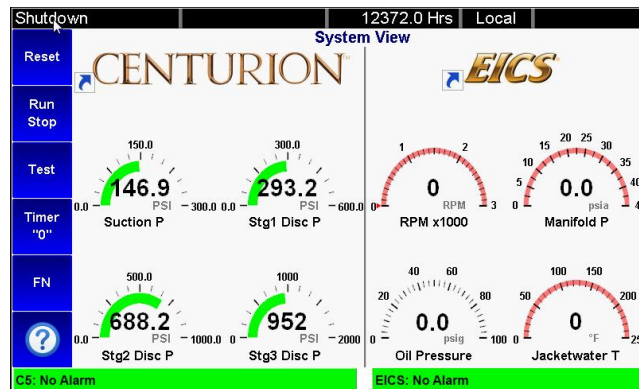
### Centurion Home Screen / Landing Page

An example of your default Home Screen / Landing Page if you are running the Centurion.



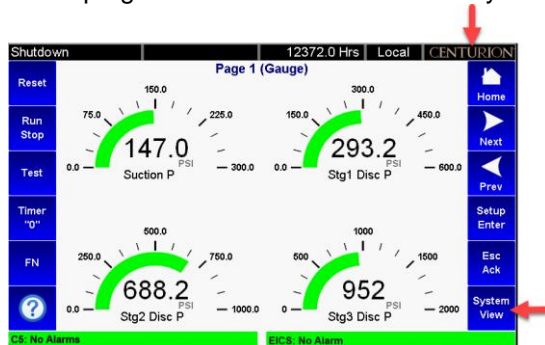
### System View Home Screen / Landing Page

An example of your default Home Screen / Landing Page if you are running the Centurion and EICS.

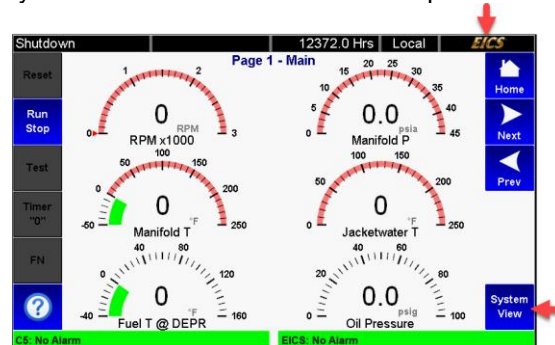


Touch the Centurion screen and open the Centurion full screen view, or touch the EICS screen to open the EICS full screen view. To go back, touch the System View icon.

The top right corner is the name of the System being displayed. Use the arrows to scroll the Operator screens.



Centurion Screen with System View as Home Screen / Landing Page




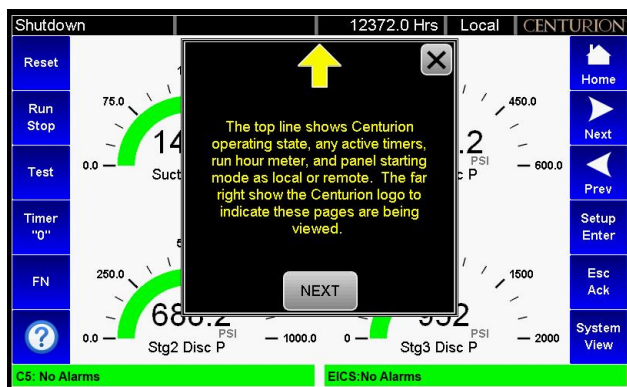
EICS Screen with System View as Home Screen / Landing Page















## Navigation

### The Best Way to Navigate

Press the information  icon and review the tutorial of the Home Screen / Landing Page. We recommend you use this icon to view information on all available screens.



	Reset any active timers and alarms/faults.
	Initiate or cancel a start sequence.
	Enter Test mode and start the test timers. Not applicable in shut-down mode.
	Zero displayed timer (global timers, state timers, etc.).
	Enter the Function mode pop-up menu with additional available functions. Automatically cancels upon moving to the next mode or within 5 seconds if no choice is made from the menu.
	Information icon helps explain the screens at point of use.
	Takes you to the Home Screen / Landing Page.
	Scroll right for the next page.
	Scroll left for the previous page.
	Setup is the page you need to edit or view the set-up details. Enter is used to enter a page or to save.
	Acknowledges all active messages and alarms displayed in the Active Alarm screen. Exit set-up mode. Exit edit mode without saving changes to the current configuration.
	Used to split the Home Screen / Landing Page when running two FW Murphy systems.



## Passwords

### Passwords and Security Access

Some settings are password protected, including the setup screens.

#### Where to log ON and OFF

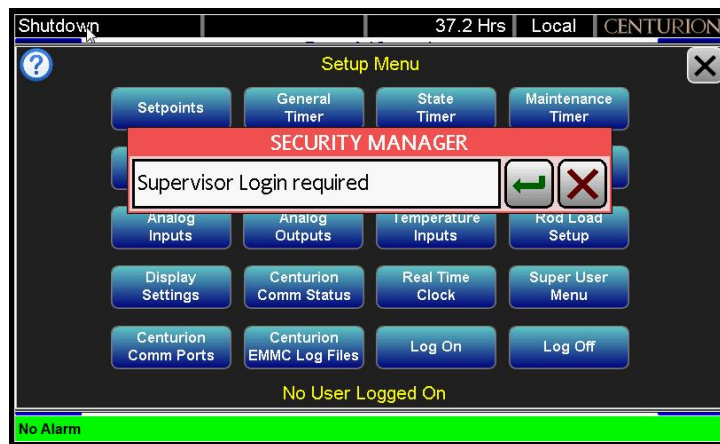
A pop-up message for login is displayed when security access is required and you may log in from that pop-up.

To log in anytime, touch the Setup Enter icon to open the Setup Menu and touch the Log On icon. You may log in from that pop-up.

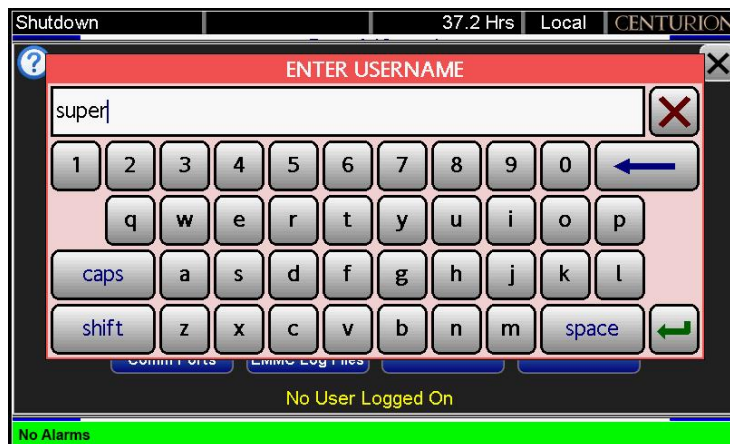
Always remember to touch the Log Off icon to deactivate your security access before you leave the premises. Touch the Setup Enter icon to open the Setup Menu and touch the Log Off icon.

#### How to log ON

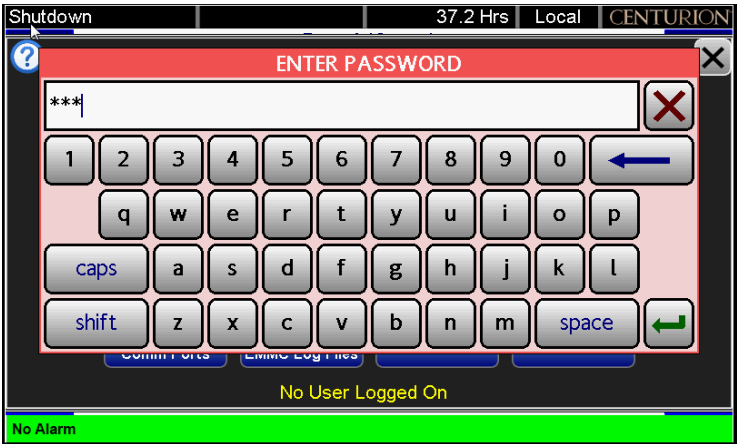
On the Security Manager pop-up, touch the green arrow to enter the password page.



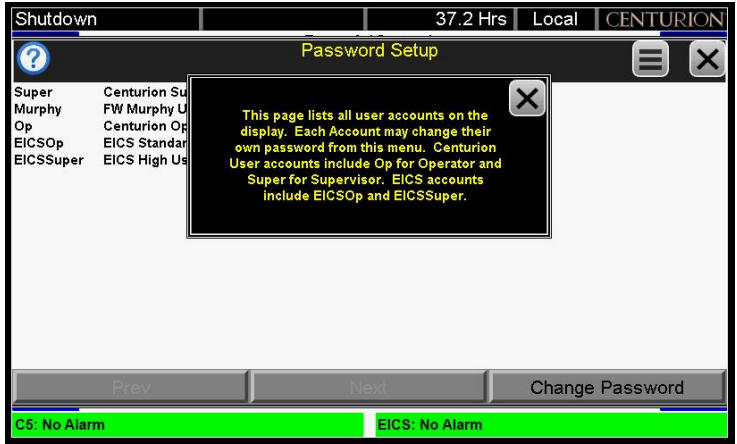
On the Enter Username pop-up, enter super for supervisor access or op for operator access.



On the Enter Password pop-up, enter the password. Default passwords are 164 for operator or 133 for super.



Once you have entered using the default password, we recommend you change passwords for better security. See Display Settings for further details on how to set the passwords.

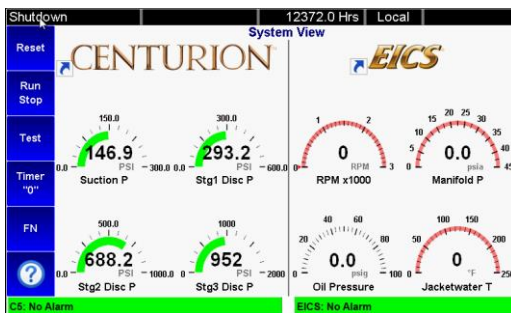


## Before Starting the Equipment for the First Time

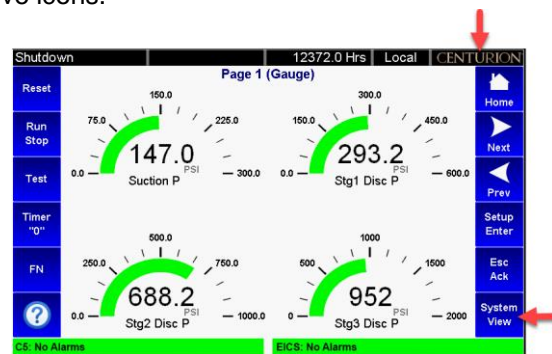
### Setup with M-View Touch Series Display

Read and follow steps in order listed.

1. Locate the system drawing inside the panel and verify its drawing number matches the sticker on the lower front panel.
2. Locate the legend of the drawing and find the configuration description in the list. Record this description.
3. Power up the M-View Touch display.
  - a. Allow time for the display to boot up and land on the Home Screen / Landing Page, approximately 15 seconds.
  - b. If you are running System View as your Home Screen / Landing Page, touch the screen on the Centurion side to view it full screen with active icons.

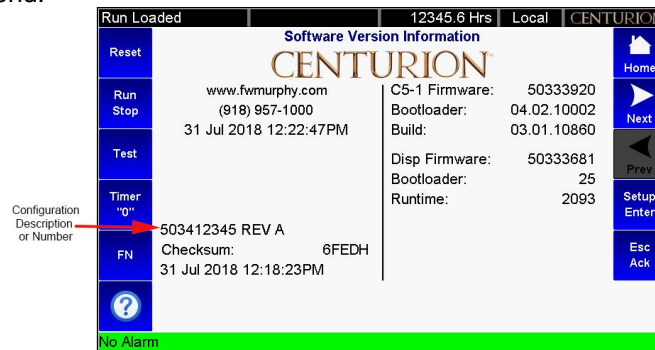


System View Home Screen / Landing Page



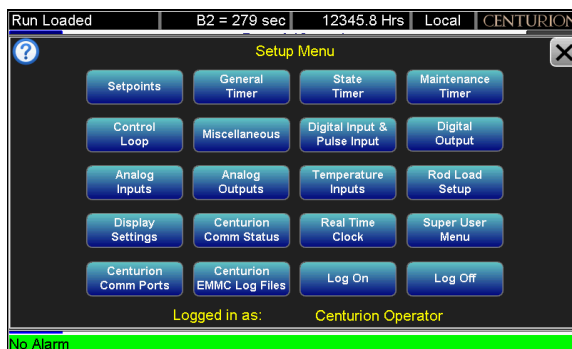
Centurion Home Screen / Landing Page

- c. From the Centurion Home Screen / Landing Page, touch the Arrow icon to scroll left until you find the Software Version Information screen.
- d. Verify that the configuration description matches the one you previously recorded from the drawing legend.




- e. Touch the Home icon to return to the Home Screen / Landing Page.

4. Open the following list of screens to verify or change the factory settings as needed for your site location.
  - a. We suggest you record these values in the manual Sequence of Operation under Field Settings Section 8. This gives you a reference of any changed settings from the factory default.
  - b. From the Home Screen / Landing Page, touch the Setup / Enter icon to open the Setup Menu screen.
  - c. Touch the Log On icon and enter the Super Password as shown in the previous section, Passwords.



- d. From Setup Menu screen, touch the Setpoints icon to open it. Open and verify all the set values under the Blue (active) icons. Touch a value to change it.
  - i. Touch X to go back one page or touch the Menu icon to go back to the Setup Menu screen.
  - ii. Once the Setpoints verification and changes are made and recorded, return to the Setup Menu screen and touch the next icon in the list below. Repeat these steps to verify the set values under the remaining screens listed.
    - Setpoints
    - Control Loop
    - Analog Input
    - General Timer
    - State Timer
    - Temperature Inputs
    - Rod Load Setup

**NOTE:** Press the  Information icon to view information on available screens.

5. Start the unit.
  - a. Clear any Alarms Class A faults from the system. On the display, the unit state will read Panel Ready if no Class A shutdown condition exist.
  - b. Touch and hold the Run Stop icon on the display for 2 seconds. This will initiate the start cycle. Depending on your configuration, the Centurion will send signals to possibly prelube the equipment, check pre-starting permissives and then signal the driver to start the equipment. Confirmation of running may be in the form of RPM signal or digital switch input feedback. Once running signal is confirmed, the Centurion will be in a running condition. Class B and S lockout timers will begin timing to faults that require time lockout. Additional warmup and load permissives will be monitored as configured for the package prior to enabling any load control.
  - c. After all preload permissives have been achieved, such as oil or water temperatures, and possible minimum warmup times, the Unit State will read Loaded and will continue until the stop button is pressed, RPM is lost or a fault condition exist.

## Stops, Faults and Alarms

### Normal Stop

When a normal stop is issued and the unit is running, the system will start a normal shut-down sequence.

1. To issue a normal stop, touch and hold the Run Stop icon on the display for 2 seconds.
2. On the display, the Unit State will read Cooldown, and the Cooldown state delay will begin timing (if configured).
3. After the Cooldown is completed, the Unit State will read Stopping.
4. When everything has been recognized as back to normal, the Unit State will read Panel Ready.

### Fault Shutdown

The Centurion will continually monitor for Fault or ESD shutdown events which require the equipment to stop immediately or prevent it to start.

On the display, the Unit State will read Shutdown, and an Alarm Shutdown Banner will appear on most Operating screens.

The cause of the event is recorded and can be viewed on the Shutdown History screen with time and date of occurrence.

1. The Shutdown History screen displays information of the fault, touch the Book icon for troubleshooting.
  - a. <Centurion Home Screen / FN / Shutdown History>
2. The Shutdown Snapshot screen displays the values of the unit running at the time a fault occurred.
  - a. <Centurion Home Screen / FN / Shutdown History/ Right Arrow to scroll >
3. Once the corrections are made, clear the Shutdown condition by touching the Reset icon on the screen.
4. Always make corrections on the unit before attempting to restart the equipment.

### Alarms

If an alarm condition is detected, the Alarm/Shutdown banner on the bottom of the screen shows the active alarm messages in the system. Alarms may be configured as self-clearing or as requiring acknowledgement. Self-clearing alarms will auto clear if they're no longer present. Alarms requiring acknowledgement will persist until the ACK key is pressed.

1. Select alarm from the Active Alarms screen. (This screen displays up to 20 active alarms.)
  - a. <Centurion Home Screen / FN /Active Alarms>
2. Touch the ESC ACK icon to acknowledge the Active Alarm.

## Operational Screens

### User-Configurable Screens

The Centurion has (9) user-configurable pages of (4) types. The Centurion Configuration Tool software allows users to configure up to nine (9) screens with controller input signal groupings. Possible custom screen types may include:

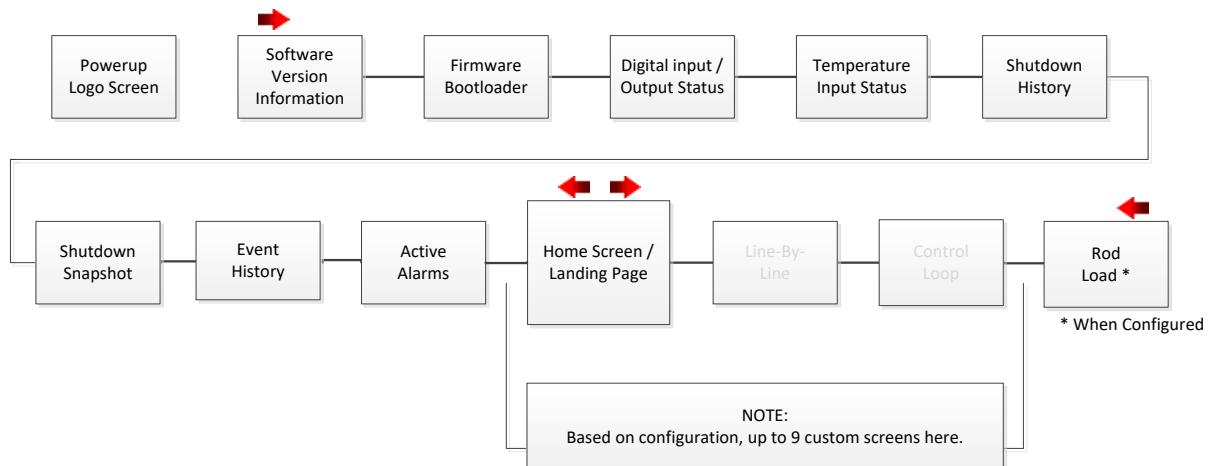
- a) Custom Line by Line allows users to display process data in a list format with description and value.
- b) Custom Gage allows user to display four (4) most important pieces of data on a 2 x 2 table in larger font.
- c) Custom Control Loop allows user to display Control Loop functions. The control output will be displayed as a percentage of the range.
- d) Custom Generic Register allows user to display up to 20 items on a page that can be mapped to the Centurion Modbus map and given a label.

For more information on configuring the optional screens through the Centurion Configuration Tool, please refer to the Configuration Tool Quick Start Guide.

### Map of Operational Screens

From the Home Screen / Landing Page, use the left and right arrows to view the Operating Screens. A password is not required to view these screens.

Some screens shown below are application specific and may not be used.



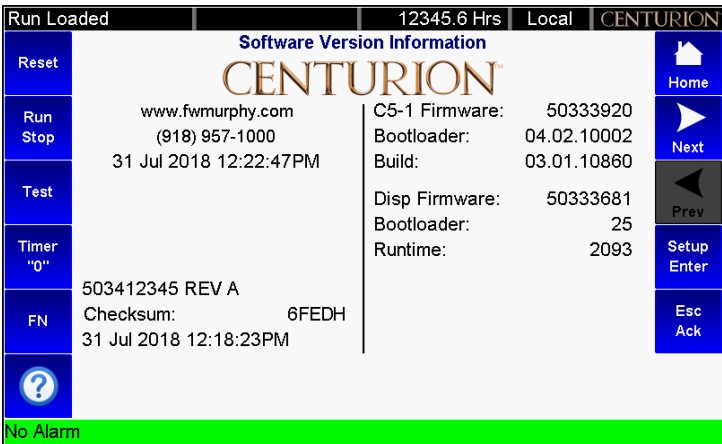
# Powerup Logo

Once power is turned on and the system is booting up, the user will view the FW Murphy Centurion logo screen for two seconds then switch to the default operating Home Screen / Landing Page configured for the system.



# Software Version Information

This screen has the FW Murphy corporate contact information, configuration description, checksum and date/timestamp for the configuration loaded in the controller.

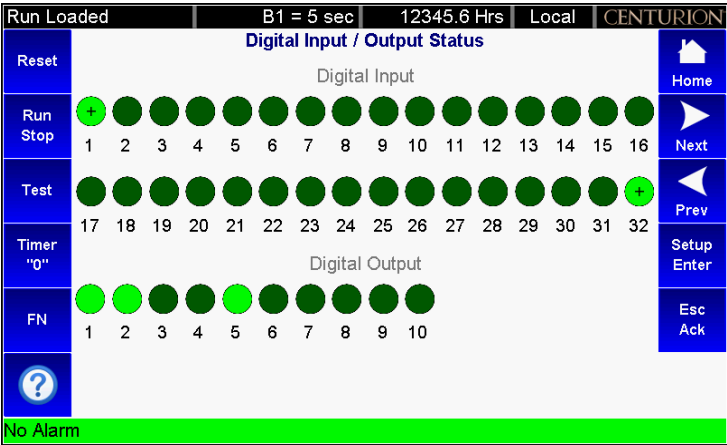


Any configuration changes subsequent to the factory shipment will be indicated by a unique checksum and new date/time stamp.

This screen also provides information such as the bootloader and firmware versions for the core module, the MV display and the expansion module (if used) to FW Murphy Technical Support staff.

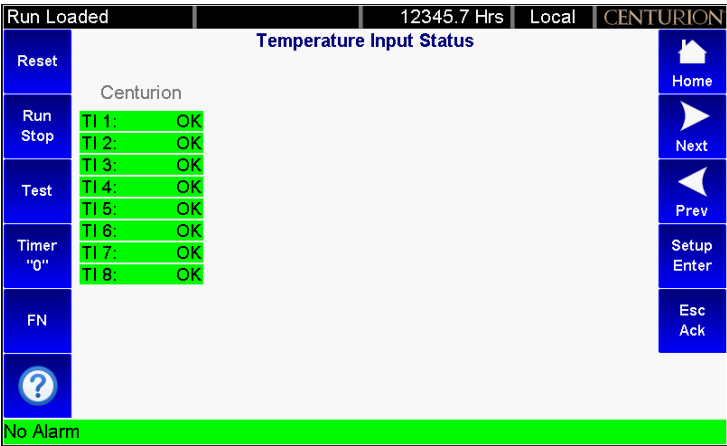
# Digital Input / Output Status

The user can see the state of each digital input/output in a table—whether it is open or closed. The plus + or minus - sign will be shown on digital inputs to show whether the input is receiving power or is grounded to DC common.



# Temperature Input Status

The user can see the state of each temperature input in a table—whether it is OK or has a wiring fault.



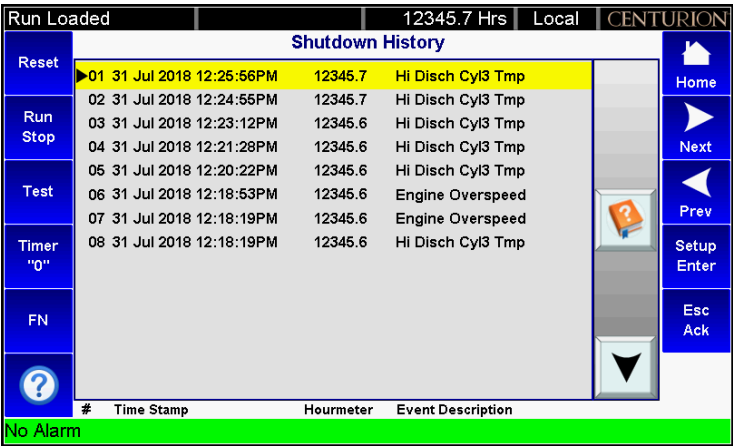


# Shutdown History

The history of the shutdown is displayed on this screen with the most recent at the top of the list and the oldest at the bottom.

The first number displayed in the line indicates how many entries are in the list.






Each event is displayed with the event label, the real-time clock and hour meter reading.



Press the Book icon to get a troubleshooting message to help find an issue.



The shutdown snapshot screen is a capture of the values displayed at the time of a Fault SD or ESD event.


Run Loaded		12345.7 Hrs		Local	CENTURION
<b>Shutdown Snapshot</b>					
Reset	Engine Speed:	3860 RPM	Compress Oil:	172 °F	 Home
	Suction P :	73.6 PSI	PreCatalyst :	1115 °F	
Run Stop	Stg1 Disc P :	293.0 PSI	PostCatalyst:	1072 °F	 Next
	Stg2 Disc P :	688.6 PSI	System Volts:	23.9 V	
Test	Stg3 Disc P :	1528 PSI	Rcy % Open :	100.00 %	 Prev
	Comp Oil P :	60.4 PSI	Desired Spd :	900 RPM	
Timer "0"	Disch Cyl1 T:	270 °F			 Setup Enter
	Disch Cyl2 T:	272 °F			
	Disch Cyl3 T:	303 °F			
FN	Disch Cyl4 T:	89 °F			 Esc Ack
?					
No Alarm					

These values are retained and displayed on the Shutdown Snapshot screen until the next Fault SD or ESD event occurs. If a “---“ is displayed instead of a value, it indicates the shutdown snapshot has not captured any data. Fault snapshots are taken only while the equipment has been called to start/run. This behavior ensures that repeated attempts to reset a fault will not clear a previous run cycle’s fault snapshot.

**NOTE:** Only the first two line-by-line screens configured will be captured on the fault snapshot page. If no line-by-line custom screens are configured, the shutdown snapshot will not function.

## Event History

The history of the last 32 events is displayed on this screen with the most recent at the top of the list and the oldest at the bottom.

Run Loaded		12345.7 Hrs		Local		CENTURIUM	
Event History							
Reset	01	31 Jul 2018 12:26:13PM	12345.7	Start Command	 Home  Next  Prev  Setup Enter  Esc Ack 		
Run Stop	02	31 Jul 2018 12:26:10PM	12345.7	Reset Command			
	03	31 Jul 2018 12:25:56PM	12345.7	Hi Disch Cyl3 Tmp			
Test	04	31 Jul 2018 12:25:39PM	12345.7	Start Command			
	05	31 Jul 2018 12:25:33PM	12345.7	Reset Command			
Timer "0"	06	31 Jul 2018 12:24:55PM	12345.7	Hi Disch Cyl3 Tmp			
	07	31 Jul 2018 12:23:51PM	12345.6	Start Command			
FN	08	31 Jul 2018 12:23:40PM	12345.6	Reset Command			
	09	31 Jul 2018 12:23:12PM	12345.6	Hi Disch Cyl3 Tmp			
?	10	31 Jul 2018 12:21:55PM	12345.6	Start Command			
	11	31 Jul 2018 12:21:50PM	12345.6	Reset Command			
	12	31 Jul 2018 12:21:28PM	12345.6	Hi Disch Cyl3 Tmp			
	13	31 Jul 2018 12:21:04PM	12345.6	Start Command			
	14	31 Jul 2018 12:20:39PM	12345.6	Reset Command			
#		Time Stamp	Hourmeter	Event Description			

The first number displayed indicates how many entries are in the list.

Events include shutdowns, starts, stops, resets, etc. The user easily can view the events (alarms, etc.) logged before and after a shutdown.

Each event is displayed with the event label, real time-clock and hour meter reading.

## Active Alarms

All active alarms and warnings will be displayed on the Active Alarms screen.



Unacknowledged alarms will be preceded by an asterisk, and acknowledged alarms will clear the asterisk.

Pressing ACK on this screen will acknowledge all active alarms.

The top right corner will indicate the number of alarms and which line the cursor is currently on. Example: 3/10 indicates 10 alarms, and the cursor is on line 3 of the list. A maximum of 20 active alarms will be displayed.

**NOTE:** Alarms are warnings based on setpoints and/or digital inputs which are separate from shutdowns that allow the equipment to continue to run.

## Alarm / Shutdown Banner

This screen shows the alarm / shutdown annunciation as it will appear on most Operating Status screens.

The message(s) will be visible at the bottom line of the status screen area and then briefly clear once a second.

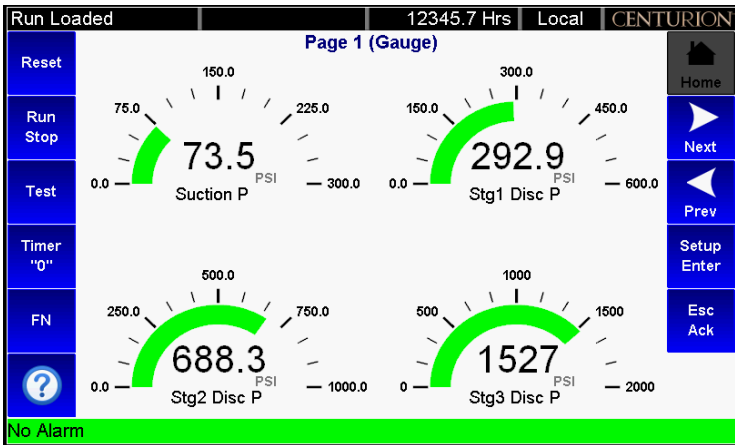
This will continue until alarms are acknowledged and/or shutdowns are cleared.

If there is more than one unacknowledged alarm active, each alarm will be displayed for one second each until acknowledged.

Pressing the Fn key followed by the ACK key will switch to the active alarms screen.

# Gage

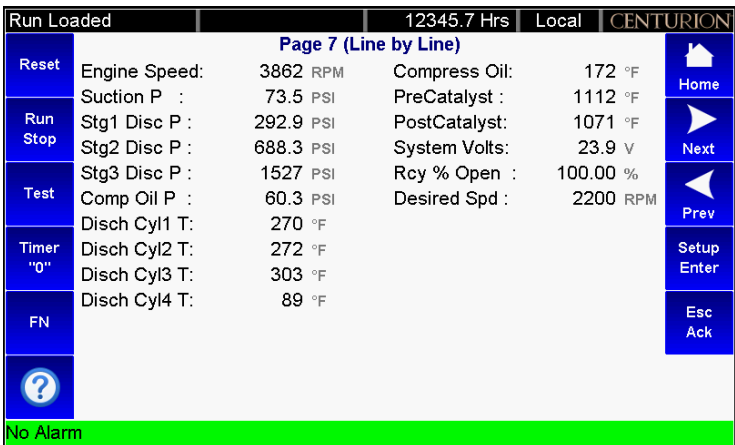
This is an example of a custom-built Home Screen / Landing Page. This display provides larger characters for easier viewing as well as a means to prominently display items of interest.



# Line-by-Line

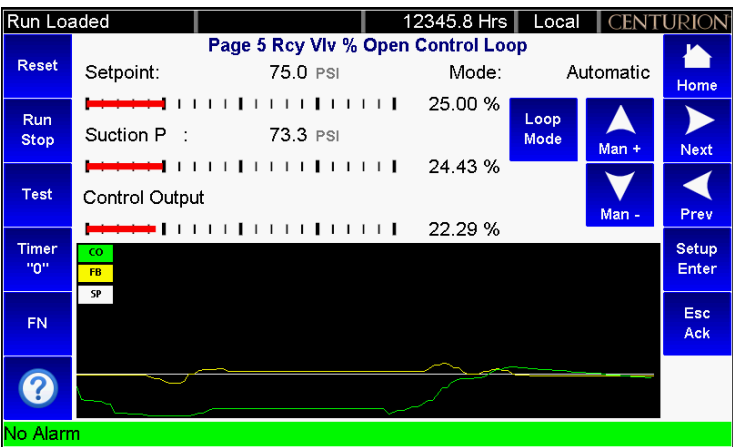
This is an example of a custom-built Line-by-Line Status screen.

If the parameters do not fit in the viewable area of the screen, up/down arrow icons will appear to indicate the ability to scroll up or down to see additional parameters.



# Control Loop

The user may choose to display any configured Control Loop functions in this convenient format. The control output will be displayed as a percentage of the range.

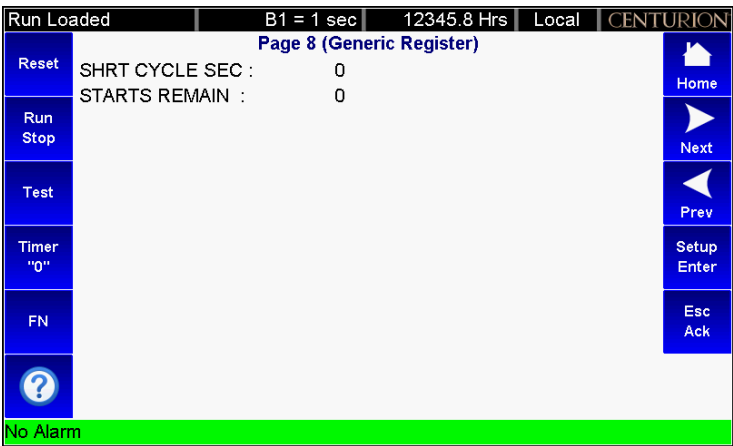


Touch the Loop Mode icon on this page to toggle the mode between Auto and Manual modes of control loop operation.

If the Control Loop is in Manual, touch the Man + and Man - arrow icons to adjust the output directly to make adjustments to the desired setting.

# Generic Register

The Centurion has 9 user-configurable pages of 4 types. This Generic Register screen shows up to 20 items in a list that can be mapped to the Centurion Modbus map and given a label.

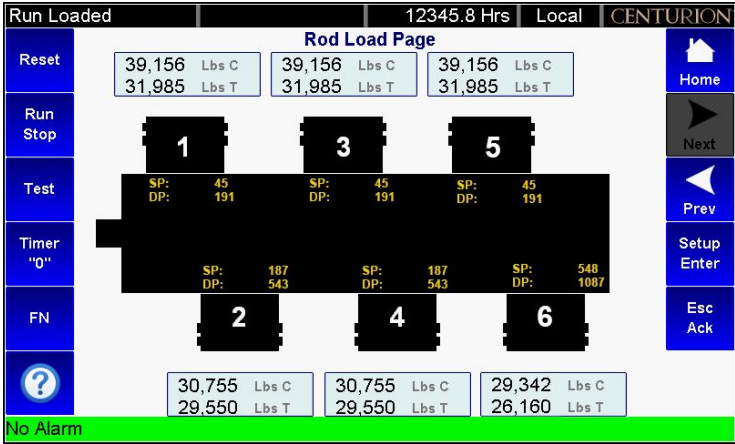


Data is shown as a signed 16-bit integer with fixed decimal place. The data on this page can be changed using the Centurion Configuration Software.

# Rod Load

If Rod Load calculations have been enabled on the Centurion Configuration, the calculated tension and compression forces on the rod are displayed in Imperial or Metric units as configured by the user.

There is support for 1 through 6 throws of rod load calculation.



## Setup Menu

The Setup Menu screens provide access to system parameters. These settings can be modified with appropriate password access.



This example shows Centurion Operator as the security level and is listed on the bottom of screen.

Depending on your security access level, you may be able to view the screens but not make any edits, or you may be prompted to enter a password to open the screen. See the section Passwords for detailed password information.

Touch on your selection.

# Setpoints Setup

The Setpoints Setup screen can display up to 192 setpoints that may be configured in the system by the Centurion Configuration Tool software. The values for the setpoints are user-editable.



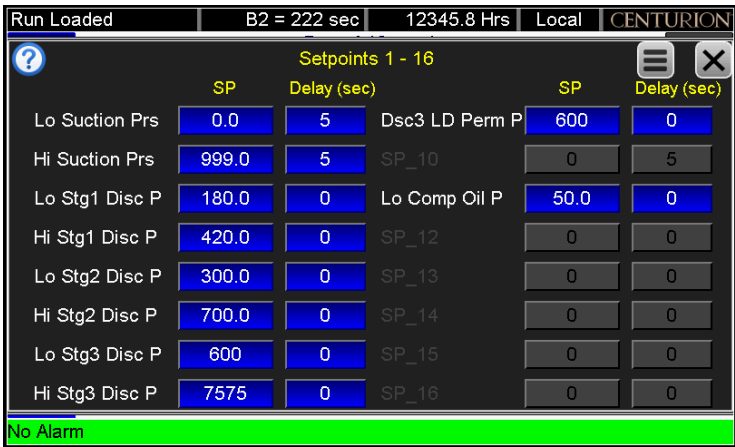
Setpoints are thresholds which can be configured as  $\geq$  or  $\leq$  and analog, temperature, speed or voltage input used for alarms, shutdowns and permissive signals for operating states.

Multiple setpoints are often applied to a process. Groups which are not highlighted have no setpoints used in them.

Touch a setpoint group to view and edit items in that group.

## Setpoints 1 – 16 page

Click on blue icon to make edits. Gray icons are not active.





# General Timer

General timers affect driver operation and also help define an event arming condition.

Run Loaded		B2 = 198 sec	12345.8 Hrs	Local	CENTURION
<b>General Timer Setup (sec)</b>					
	<b>Preset</b>			<b>Preset</b>	
B1 Timer	30	No-Flow Timer	60		
B2 Timer	300	Test Timer	300		
C2 Timer	30	Ign On Timer	0		
S1 Timer	0	Fuel On Timer	0		
S2 Timer	0	Ign Off Timer	0		
S3 Timer	0	Power Save	0		
S4 Timer	0				
No Alarm					

B1, B2 and S1-4 Timers are start-run lockout timers. Events configured to these class types do not arm for a specified time at start up.

C4 Timer is lockout until time after reaching a loaded condition.

No-Flow Timer is for class NF faults and enabled after the B1 expires.

Test Timer is time given to allow for maintenance testing of end devices without triggering a fault or shutdown condition.

Ignition On Timer and Fuel On Timer staggers the engines outputs at startup for engine fuel purge.

Ignition Off Timer allows unspent fuel to burn off after a stop.

# State Timer

User may edit all state timers (except Panel Ready/Shutdown) if marked in use. When a state timeout value is reached, the state logic proceeds to the next in-use state.

Run Loaded		B2 = 168 sec	12345.8 Hrs	Local	CENTURION
<b>State Timer Setup (sec)</b>					
	<b>Preset</b>			<b>Preset</b>	
Panel Rdy	0	Motor On	0	Cooldown	120
COT Perm	60	Warmup	65535	Stop Engin	5
C Prib Prm	60	Load Seq 1	0	Motor Off	0
C Prib Dur	120	Load Seq 2	0	Stop Vlv	0
Start Valv	0	Load Seq 3	0	PostLube	45
Crank Stop	60	Load Seq 4	0	Restrt Dly	0
Crank	15	Wait To Ld	0	Shutdown	65535
Crank Rest	15	Run Loaded	65535		
No Alarm					

A state timeout may also be configured to trigger a fault event, such as a prelube permissive failure; however, the operation depends on the configuration.

A setting of 65535 disables the timeout event.

# Maintenance Timers

User may access and edit the maintenance interval presets and view the time remaining settings, if used by configuration.

Run Loaded

B2 = 138 sec

12345.8 Hrs

Local

CENTURION

?

Maintanance Timer Setup (hours)

☰

✕

Time Remaining	Duration		Time Remaining	Duration	
Change Oil	9999	9999 Rst	MT_6	0	0 Rst
Service Plugs	750	750 Rst	MT_7	0	0 Rst
Adjust Valves	750	750 Rst	MT_8	0	0 Rst
Take Oil Smpl	750	750 Rst	MT_9	0	0 Rst
Check Battery	4400	4400 Rst	MT_10	0	0 Rst

No Alarm

If an interval time has elapsed, a message event is typically used to indicate maintenance is due. Reset the timer after maintenance is performed by pressing the RST icon on this page.

# Control Loop Setup

User may edit up to 8 configured control loop settings.

Run Loaded

B2 = 115 sec

12345.8 Hrs

Local

CENTURION

?

Control Loop Setup

☰

✕

Rcy Vlv % Open

Desired Speed

Ctl\_Loop\_3

Ctl\_Loop\_4

Ctl\_Loop\_5

Ctl\_Loop\_6

Ctl\_Loop\_7

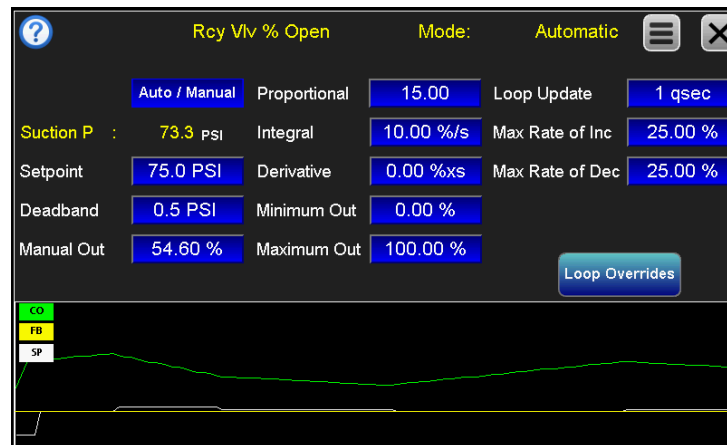
Ctl\_Loop\_8

No Alarm

The settings on these pages differ depending on the type of control loop configured. The control loops operate on the principle of a 0-100% output with special considerations for digital output loop types.

## Control Loop Typical

The pen chart shows the PID output (CO), Feedback (FB) and Setpoint over the last 2 minutes. Use this to help tune the closed loop control.



Press the Auto/Manual button change modes. In automatic, the control loop will try to maintain the setpoint +/- the deadband using calculation against the error (how far away from setpoint) of the loop.

Press the Manual Out edit box to set a desired output in manual if desired.

**P** = tunes for the Error at present condition.

**I** = adjust the output value on the accumulated error over time.

**D** = affects the output value based on the rate of change of the error.

Bigger numbers will result in larger changes in output %. General tuning guidelines start with **I** and **D** at low numbers, using only proportional. Once ringing is seen, reduce **P** slightly and increase **I** slowly. **D** may be introduced as a predictive measure, derivative adjust the output based on how much the error is changing in a given calculation loop.

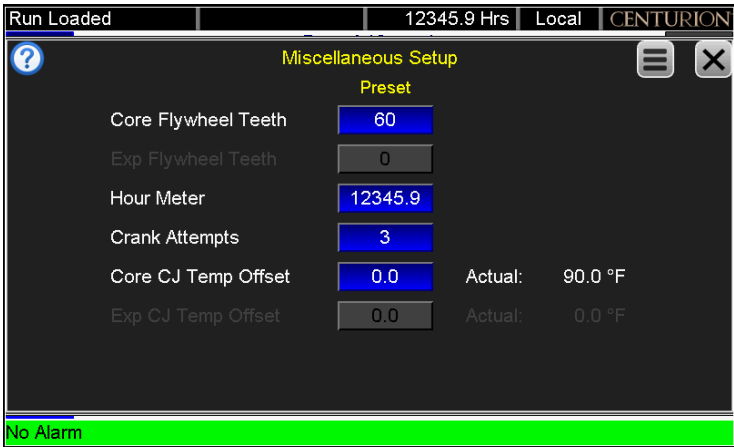
Output ramp rates and min/max calculation limits are adjustable. Press loop overrides to adjust any possible control loop override factors.

The controller uses the parallel form of the PID equation as follows:

$$\% \text{ Output} = K_p(\text{Error}) + K_i \int (\text{Error}) dt + K_d \times d\text{Error}/dt$$

# Miscellaneous Setup

Set the Flywheel Teeth to calibrate the magnetic pickup input RPM calculations.



Set/Rest the run Hour Meter which accumulates run time.

Crank Attempts Setpoint is the limit for crank cycles before overcrank faults.

Electric motor short cycle fault is set by the Maximum starts per hour limit.

Core junction offset is used to globally shift the internal temperature sensor.

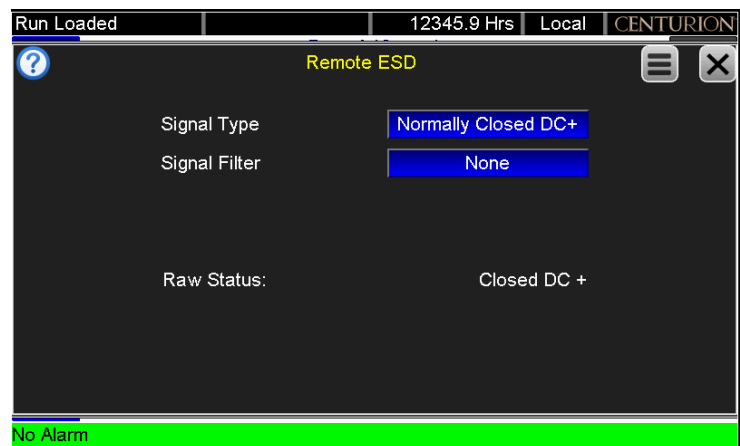
# Digital Input Setup/Pulse Status

Touch the desired output to view output status and modify output setup. Only outputs in use by the configuration are settable.

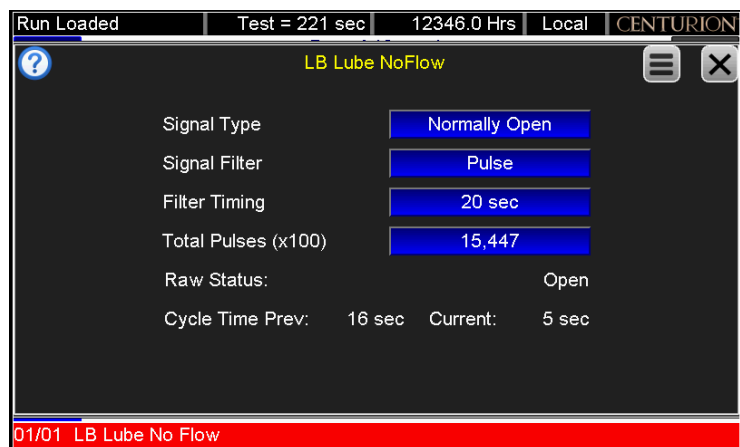
Pulse cycle input times and totals can be viewed and reset for each input.



## Digital Input (Typical)



## Pulse Input...An Input Configured For Pulse (Typical)



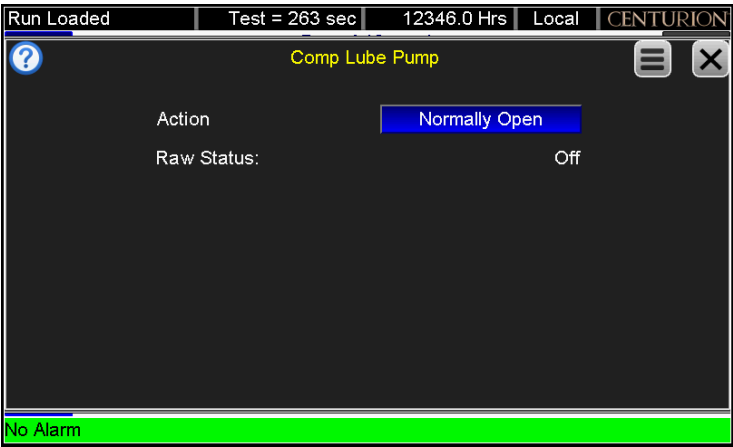
## Digital Output Setup

Touch the desired output to view output status and modify output setup. Only outputs in use by the configuration are settable.



# Digital Output (Typical)

Select normally open or normally closed. Normally closed inverts the logic associated with the output if desired.  
The actual status of the output is shown as OFF or ON.



# Analog Input Setup

Touch the desired input to view input status and modify input scaling. Only input in use by the configuration are settable.



## Analog Input (Typical)

Run Loaded | Test = 214 sec | 12346.0 Hrs | Local | CENTURION

? Comp Oil P : 60.3 PSI

Scaled Minimum	0.0 PSI
Scaled Maximum	100.0 PSI
Moving Average Samples	4
Raw Count Offset	5243
Raw Count Span	20971
Raw Input:	17909 Counts

No Alarm

## Analog Output Setup

Touch the desired output to view output status and modify output scaling. Only outputs in use by the configuration are settable.

Run Loaded | Test = 185 sec | 12346.1 Hrs | Local | CENTURION

? Analog Outputs Setup

1-4

Rcy % Open

Desired Spd

Core\_AO\_3

Core\_AO\_4

No Alarm

## Analog Output (Typical)

Run Loaded | Test = 153 sec | 12346.1 Hrs | Local | CENTURION

? Desired Spd

Scaled Minimum	0.00 %
Scaled Maximum	100.00 %
Analog Output:	100.00 %

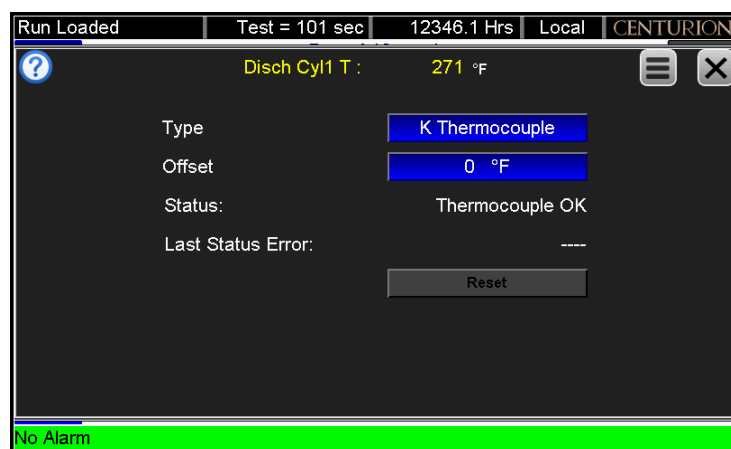
No Alarm

## Temperature Input Setup

Touch the desired input to view input status and modify input type. Only inputs in use by the configuration are settable.



## Temperature Input Typical





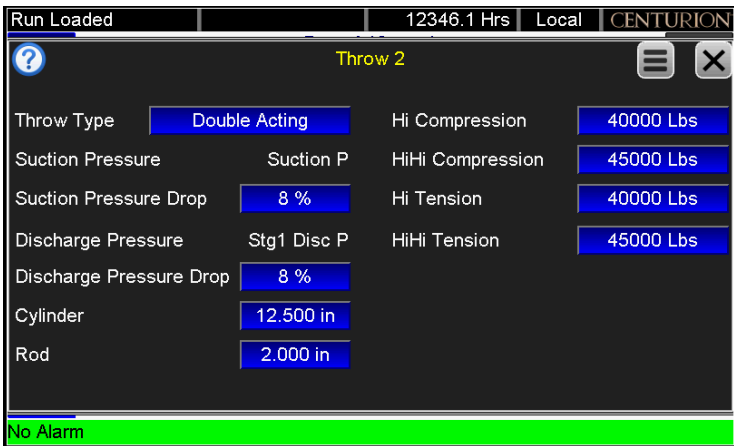
# Rod Load Setup

Touch the desired throw number to view and modify rod load configuration. Only throws in use by the configuration will be settable.



## Rod Load (Typical)

Set the configuration for the compressor throw. The compressor performance run sheet will have this information.



Action may be changed from single to double throw. Set the pressure drop values to approximate internal gas pressures.

The drop includes piping and valve losses from the measurement point.

Tandem cylinder options have additional settings for the low and high pressure cylinder.

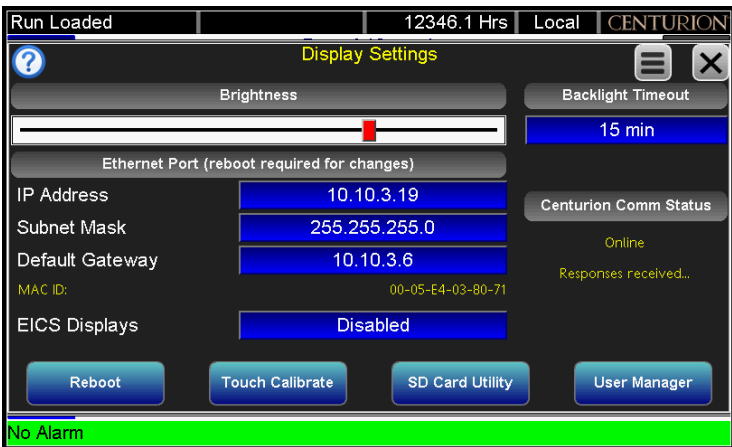
High setpoints are for the Alarms only.

HiHi setpoints are for shutdown fault event thresholds.

Some values, such as reassignment of pressure channels, are modified using the Centurion configuration tool.

# Display Settings

Use this page to modify setpoints specific to the display and communication parameters on the display.



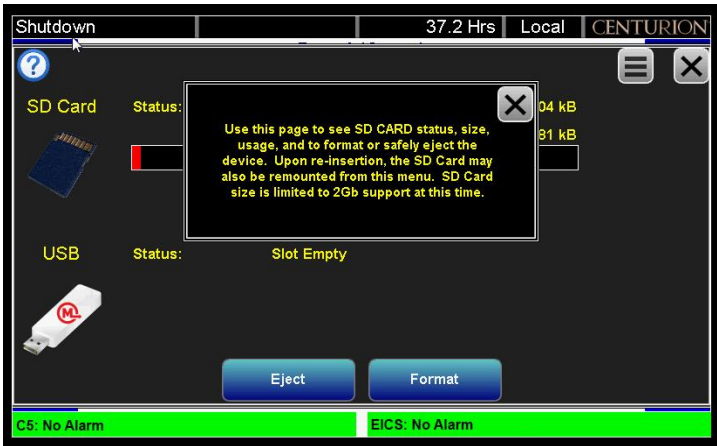
The communication status to the Centurion may be monitored on this page and used for troubleshooting purposes.

Tap on the icons to open.

## SD Card Utility

From the Display Settings screen, touch the SD Card Utility to open the SD Card Status.

This SD page displays the SD Card status, size and usage. SD Card size is limited to 2Gb support at this time.



Touch the Format icon to format the card

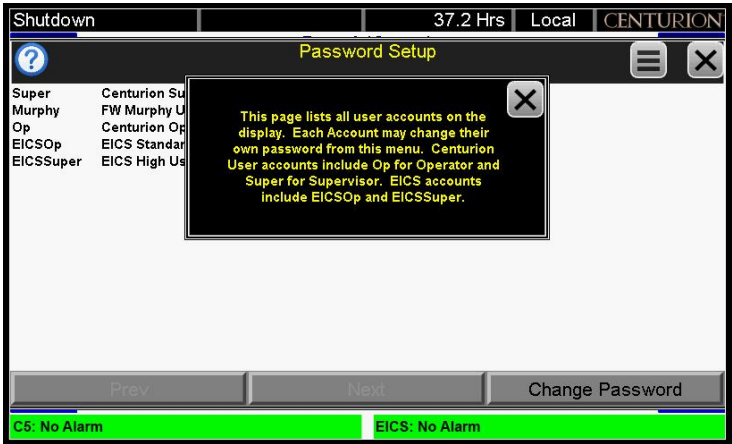
Touch the Eject icon to safely eject the SD Card.

The SD Card may also be remounted from this menu.

# Password Setup Page

From the Display Settings screen, touch the User Manager icon for the Password Setup page.

The Password Setup page lists the security access accounts with password protection. Each account may change their own password from this menu.



## Setting Password Rules

Any alphanumeric password may be used on each user account.

Centurion user names include Op for operator and Super for supervisor.

EICS user names include EICSOp for operator and EICSSuper for supervisor.

**NOTE:** The screen will time out after 10 minutes without activity, and a password must be re-entered to return to the setup and edit menus.

Always remember to touch the Log Off icon to deactivate your security access before you leave the premises.

# Centurion Comm Status

Users may view the status for all the Centurion communication ports since last power up.

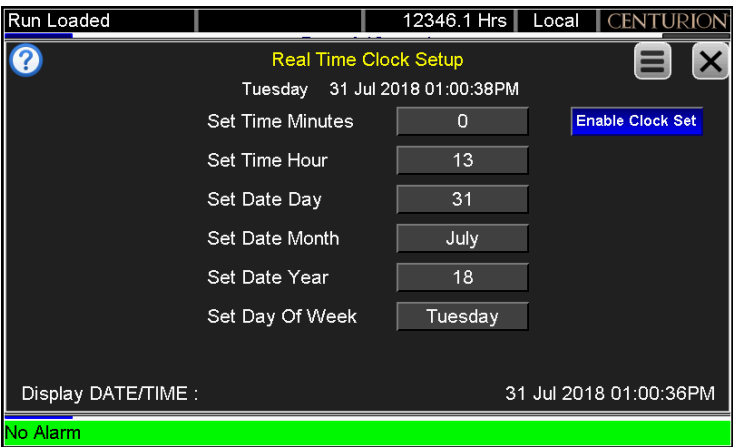


This page can assist with diagnosing connections to the Centurion from outside devices.

Touch Reset Statistics icon to reset the counters.

# Real-Time Clock Setup

Touch Enable Clock Set icon to enter the edit mode.

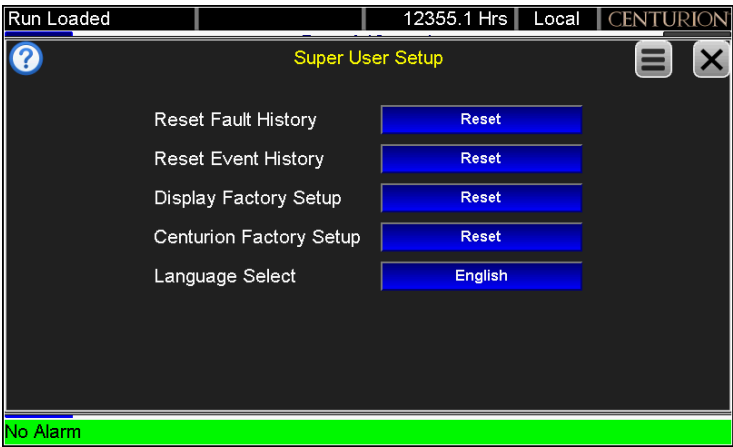


This setting is on the Centurion; however, the display clock and Centurion clock automatically synchronize.

When the settings are complete, touch the Press to Set icon to enter the new clock setting.

# Super User Menu (Super User Passcode Required)

The Reset Fault History will clear the stored faults.



The Reset Event History will clear the events.

The Display Factory Setup will restore language, backlight timeout, brightness and other settings stored in the display.

The Centurion Factory Setup will restore all setpoints to what was set up in the Configuration that was used.

The Language Select will change the language from English or Spanish.

For electric motor short cycle start per hour limiting, the fault may be set on this page to allow for a restart before the minimum time of 1 hour wait time to restart.

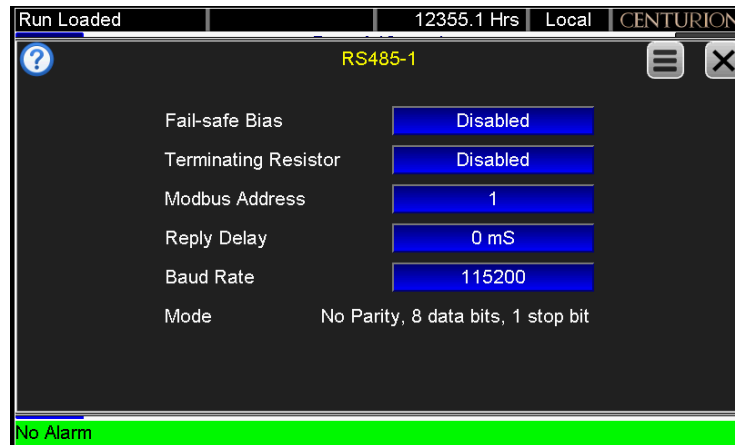
# Centurion Comm Port Setup (Super User Passcode Required)

Touch the desired communication port to view and edit port setup.



## RS485-1

The RS485 is used for long distance serial communication. Distances up to 4000 feet are possible and multiple devices can be on the network.



120 ohm twisted shielded pair cable should be used for proper line integrity, wired in a daisy-chain fashion. Star networks should be avoided.

**Fail-safe Biasing** should be turned on only once. Typically done by the Client device.

Line termination should be turned on at the ends of the network.

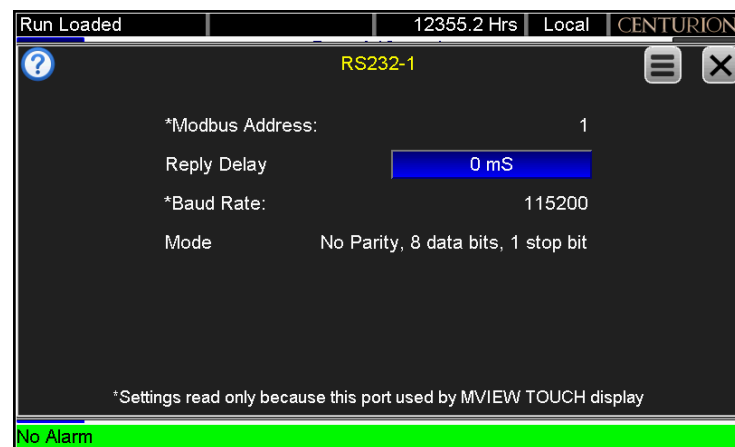
**Modbus Address** is for this Centurion on the Network. The Centurion is a Modbus RTU server.

Set the communication parameters to match the Modbus RTU Client device.

**Reply Delay** is only used to slow down the port if the Client requires additional time.

## RS232-1

RS232 is used for short distance serial communication. Distances less than 35 feet are ideal in a point-to-point communication.



Low capacitance, shielded 3 conductor cable should be used, with adequate gage wire to reduce voltage losses. Devices must share a DC common reference.

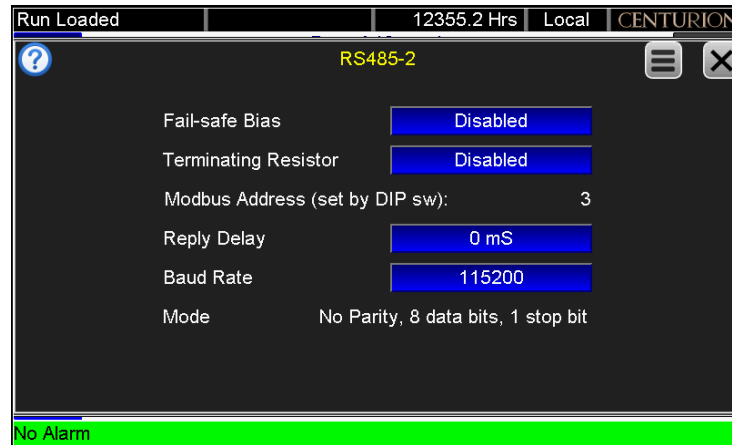
**Modbus Address** is for this Centurion on the Network. The Centurion is a Modbus RTU server.

Set the communication parameters to match the Modbus RTU Client device.

**Reply Delay** is only used to slow down the port of the Client requires additional time.

## RS485-2

The RS485 is used for long distance serial communication. Distances up to 4000 feet are possible and multiple devices can be on the network.



120 ohm twisted shielded pair cable should be used for proper line integrity, wired in a daisy-chain fashion. Star networks should be avoided.

**Fail-safe Biasing** should be turned on only once. Typically done by the Client device.

Line termination should be turned on at the ends of the network.

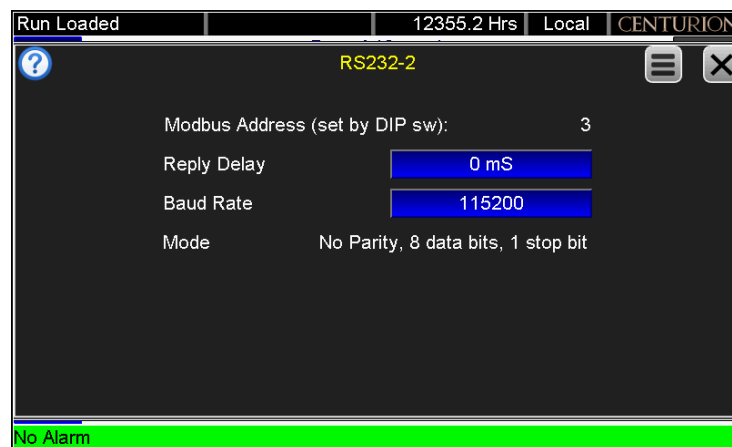
**Modbus Address** is for this Centurion on the Network. The Centurion is a Modbus RTU server.

Set the communication parameters to match the Modbus RTU Client device.

**Reply Delay** is only used to slow down the port of the Client requires additional time.

## RS232-2

RS232 is used for short distance serial communication. Distances less than 35 feet are ideal in a point-to-point communication.



Low capacitance, shielded 3 conductor cable should be used, with adequate gauge wire to reduce voltage losses. Devices must share a DC common reference.

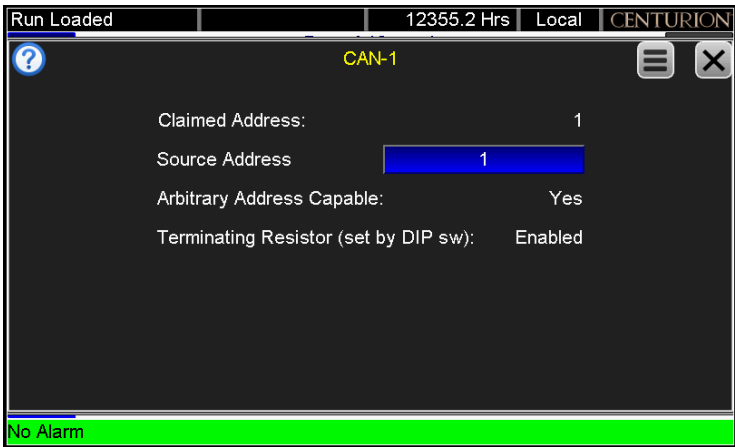
**Modbus Address** is for this Centurion on the Network. The Centurion is a Modbus RTU server.

Set the communication parameters to match the Modbus RTU Client device.

**Reply Delay** is only used to slow down the port of the Client requires additional time.

# Can Port Settings – Can-1

CAN bus is used for long distance high speed communication. Distances up to 100 feet are possible depending on data rates, and multiple devices can be on the network.



120 ohm twisted shielded pair cable should be used for proper line integrity, wired in a daisy-chain fashion. Star networks should be avoided.

**Claimed Address** is displayed for the address that was negotiated.

**Source Address** is for this Centurion on the network.

**Arbitrary Address Capable** is yes if other devices support address arbitration.

**Terminating Resistor** (set by DIP sw) is enabled. Line termination should be turned on at the ends of the network.



## Can Port Settings – Can-2

CAN bus is used for long distance high speed communication. Distances up to 100 feet are possible depending on data rates, and multiple devices can be on the network.

Run Loaded | 12355.2 Hrs | Local | CENTURION

?

CAN-2

Claimed Address: 249

Source Address: 249

Arbitrary Address Capable: Yes

Terminating Resistor (set by DIP sw): Enabled

Lost CAN Comm Delay: 3 sec

ECU Address: 0

No Alarm

120 ohm twisted shielded pair cable should be used for proper line integrity, wired in a daisy-chain fashion. Star networks should be avoided.

**Claimed Address** is displayed for the address that was negotiated.

**Source Address** is for this Centurion on the network.

**Arbitrary Address Capable** is enable/yes if other devices support address arbitration.

**Terminating Resistor** (set by DIP sw) is enabled. Line termination should be turned on at the ends of the network.

**ECU Address** is the engine ECU source address. Some engine ECUs require a specific source address to respond to data request. Refer to engine documentation.

## Ethernet Settings for the C5

The Ethernet port settings are for the Centurion. The two ports share the same connection and act as a 2-port switch.

Run Loaded | 12355.2 Hrs | Local | CENTURION

?

Ethernet

IP Address: 10.10.3.24    Netmask: 255.255.255.0    Gateway: 10.10.3.6

IP Address: 10 10 3 24

Subnet Mask: 255 255 255 0

Gateway Address: 10 10 3 6

IP Port: 0

IP Mode Select: Static

MAC Address: 2C.00.33.00.00.C6

No Alarm

# Centurion EMMC Log File Menu (Super User Passcode Required)

---

The Centurion ENNC Log Files page displays the number of files on the internal EMMC memory storage on the Centurion.



In order to consistently bring you the highest quality, full-featured products, we reserve the right to change our specifications and designs at any time. FW MURPHY product names and the FW MURPHY logo are proprietary trademarks. This document, including textual matter and illustrations, is copyright protected with all rights reserved. (c) 2022 FW MURPHY. A copy of our typical warranty may be viewed or printed by going to [www.fwmurphy.com/warranty](http://www.fwmurphy.com/warranty).

# Centurion™ C5 Series Configurable Controller

The Centurion Configurable Controller is a control and monitoring system. Primarily designed for engine/electric motor-driven compressors, the Centurion is well suited for many control applications using standard configurations to save money and reduce training. Additionally, we can custom design a control package to meet exact specifications for a variety of applications.

The Centurion continuously monitors input signals and set points and commands outputs to maintain proper operation. When an out-of-limits event occurs, the controller will stop, shut down or control equipment to change conditions. The auto-start capabilities of the Centurion allow for start/stop based on parameters such as pressure set points or by digital signals.

The Centurion provides real-time data via communication ports to a connected display and/or supervisory system. This advanced system offers multiple options for remote communications and operation including HMIs, PLCs, PCs and SCADA systems. The industry-standard MODBUS RTU protocol means greater support for a wide variety of communication equipment including radio and satellite communications systems.



## Features

- Fully configurable control and monitoring system. Applications include reciprocating/screw compressors and pump systems.
- Expandable system to meet most three-to four-stage compressor applications.
- User configurability with Windows-based software allows the operator to point and click to implement standard processes. All I/O points can be custom configured.
- No programming experience required.
- Local and remote communications, MODBUS RTU via RS485/232/Ethernet.
- USB 1.1/2.0 support for laptops without a serial port.
- Upload/download capabilities for configurations and set points.
- Shut-down history list (Last 20 events).
- Event history list (Last 32 events).
- Active alarm list.
- 10 configurable maintenance timers.
- Run hourmeter.
- Support for no-flow totalization using lubricator pulses.
- Short cycle start protection / starts per hour (electric motor).
- Eight control loops, closed loop PID / open loop linear.
- Configuration templates provided for simple use.
- Configurations stored in non-volatile Flash memory.
- Set points stored in non-volatile EEPROM memory.
- CAN capable, to support electronic engines.
- Same core module for Centurion Configurable and Centurion Custom applications.
- View EICS® and Centurion systems on one M-View® Touch screen display.
- Diagnostics that reduce troubleshooting.
- World-class certifications and harmonized international standards.
- Future-proof and backward compatible.
- All non-incendive inputs.
- Compressor Rod Load calculation, alarm and shutdown.

## Basic Components

The Centurion consists of a display module, a main I/O module and optional expansion I/O module and choice of M-View Series displays. No special cables are required. The Centurion is designed for use within a weatherproof enclosure only.

### C5, Main I/O Module:

Centurion C5 Configurable Controller

### (Optional) MX4-R2 Expansion I/O Module:

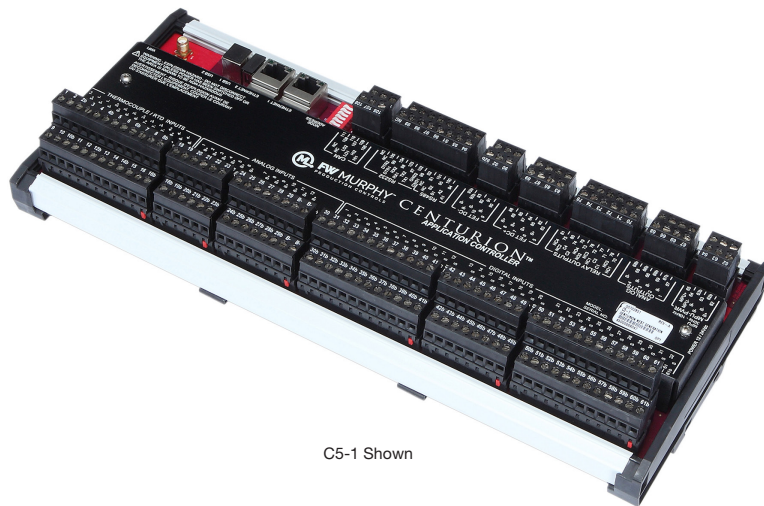
### (Optional) MX5-R2 Expansion I/O Module:

**Display:** Choose from

MV-5-C, MV-7T, MV-10T or MV-12T

## C5 Series Main I/O Module

- Operating temperature: -40° to 185° F (-40° to 85° C)
  - Power input: 30 W max 10-30 VDC
  - Configuration: PC-based Centurion Configuration Software
  - Application firmware:
    - Standard offers a user-configurable experience
  - All I/O options individually software selectable. No jumpers required.
  - 12 Analog inputs\*:
    - 0-24 mA or 0-5 VDC, 15-bit hardware
    - 4 configurable for resistive potentiometer measurement
  - 32 Digital inputs\*:
    - NO or NC (active high/active low) intrinsically safe
    - Optically isolated DC digital inputs (active high/active low) with LED indicators
    - Polarity sense / wire fault detection on normally closed systems
    - Approved for use with general purpose switches in hazardous areas
  - Eight temperature inputs\*:
    - J or K Type Thermocouples
    - 3-wire 100Ω Pt RTD temperature inputs\*\*\*
    - Open, short DC-, short DC+ wire fault detection
    - Cold junction compensation
  - One magnetic pickup input/AC run signal:
    - 30 to 10 kHz, 4.5 VAC rms min, 120 VAC rms max.
  - 10 digital outputs:
    - LED indicators:
    - 4 relay outputs, form C, dry contacts
    - 4 FET outputs (source)
    - 2 FET outputs (sink)
  - Four analog outputs:
    - 4-20 mA, 16-bit hardware
  - 11 Communication ports:
    - Two SERIAL RS232:
      - > Protocol: MODBUS RTU (server)
    - Two SERIAL RS485:
      - > Protocol: MODBUS RTU (server)
    - One USB: Host Type A (data log access, firmware updates)
    - One USB: Server Type B (configuration/firmware updates)
    - Two CAN:
      - > One proprietary for FW Murphy hardware
      - > One reserved for J1939 Engine ECU
  - Two Ethernet 10/100 (DLR), Single MAC ID:
    - > Protocol: Modbus TCP/IP (server)
    - > EtherNet/IP (CIP)
  - One WiFi: Optional C5-1 only
- Third-party approvals:
- North America:
    - Class 1, Div 2, Grps A, B, C, D Haz. Loc. T4
    - Class I, Zone 2, AEx ec [ic] nC IIC T4 Gc Ex ec [ic] nC IIC T4 Gc X
    - ATEX Zone 2
      - II 3G Ex ec [ic] nC IIC T4 Gc
      - DEMKO 18 ATEX 1926X
      - 40°C ≤ Tamb ≤ +85°C
  - IECEx Zone 2
    - Ex ec [ic] nC IIC T4 Gc
    - IECEx UL 18.0072X
    - 40°C ≤ Tamb ≤ +85°C

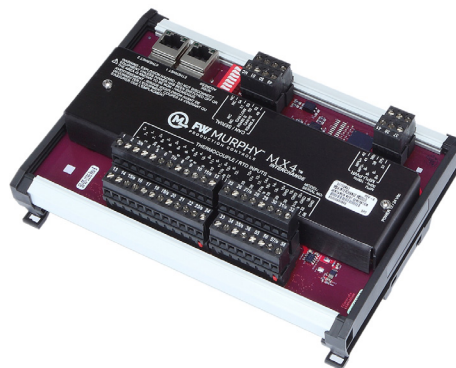


C5-1 Shown

## Expansion I/O Modules

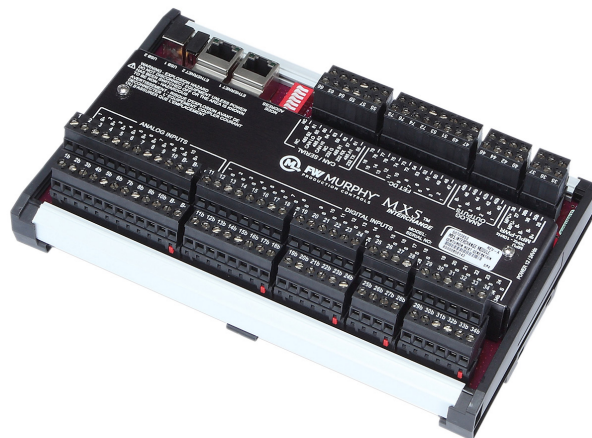
### MX4-R2 Expansion I/O Module

- Operating Temperature: -40° to 185° F (-40° to 85° C)
- Power input: 14.1 W max 10-30 VDC
- Configuration: PC-based Centurion Configuration Software
- 18<sup>†</sup> thermocouple inputs\*: J or K Type thermocouples
- 9<sup>†</sup> 3-wire 100Ω Pt RTD temperature inputs\*\*\*\*\*
  - Open, short DC-, short DC+ wire fault detection
  - Cold junction compensation
- One magnetic pickup input\* / AC Run Signal: 4.5 VAC – 120 VAC, 30 Hz – 10 kHz
- Third-party approvals:
  - Class 1, Div 2, Grps A, B, C, D Haz. Loc. T4
  - Class I, Zone 2, AEx ec [ic] IIC T4 Gc Ex ec [ic] IIC T4 Gc X
  - ATEX Zone 2
    - II 3G Ex ec [ic] IIC T4 Gc
    - DEMKO 18 ATEX 1926X
    - 40°C ≤ Tamb ≤ +85°C
  - IECEx Zone 2
    - Ex ec [ic] IIC T4 Gc
    - IECEx UL 18.0072X
    - 40°C ≤ Tamb ≤ +85°C



### MX5-R2 Expansion I/O Module

- Operating temperature: -40° to 185° F (-40° to 85° C)
- Power input: 16.5 W max 10-30 VDC
- Configuration: PC-based Centurion Configuration Software
- 10 analog inputs\*: 0-24 mA or 0-5 VDC, 15 bit hardware
- 16 digital outputs: FET (sink)
- 4 analog outputs: 4-20 mA, 16 bit hardware
- 1 magnetic pickup input\* / AC Run Signal: 4.5 VAC -120 VAC, 30 Hz to 10 kHz
- Third-party approvals:
  - Class 1, Div 2, Grps A, B, C, D Haz. Loc. T4
  - Class I, Zone 2, AEx ec [ic] IIC T4 Gc Ex ec [ic] IIC T4 Gc X
  - ATEX Zone 2
    - II 3G Ex ec [ic] IIC T4 Gc
    - DEMKO 18 ATEX 1926X
    - 40°C ≤ Tamb ≤ +85°C
  - IECEx Zone 2
    - Ex ec [ic] IIC T4 Gc X
    - IECEx UL 18.0072X
    - 40°C ≤ Tamb ≤ +85°C



\* Non-incendive. (Digital Inputs, Analog Inputs and Temperature Inputs are intrinsically safe and non-incendive.)

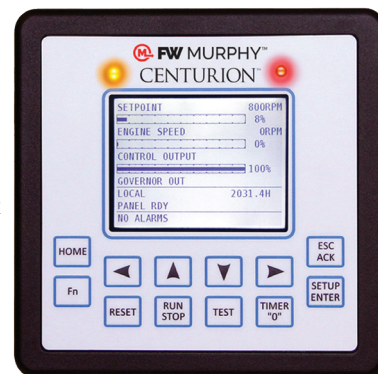
\*\*\* RTD—Resistive Temperature Device, American RTD Standard, TCR 0.00392, units Ohms/Ohm / deg. between 0-100 C.

<sup>†</sup> When configured for an RTD channel, two consecutive odd/even T/C channels are consumed.



## MV-5-C, M-View® Monochrome LCD Display

- Operating temperature: -40° to 185° F (-40° to 85° C)
- Power input: 11 W max 10-30 VDC
- Screen: 320 x 240 pixels, LCD display with backlight
- User interface: 12-key keypad set point entry, alarm acknowledgment, start, stop, reset, etc.
- Communications:
  - RS232-1/RS485-1 (MODBUS RTU client)
  - RS485-2 (MODBUS RTU server)
  - 1 USB Server Type B (firmware updates)
  - 1 USB Host Type A (reserved)
  - CAN x 2
    - >1 proprietary for FW Murphy Hardware
    - >1 reserved for J1939 engine ECU
- Customizable process screens (up to nine):
  - Line by line
  - Gage
  - Control loop
  - Generic register
- Built-in screens (examples):
  - Digital input status and polarity
  - Digital output status
  - Temperature input status/fault
  - Fault snapshot (mirror of line by line)
  - Alarm log
- Event Log
- Third-party approvals:
  - North America:
    - Class 1, Div 2, Grps A, B, C, D Haz. Loc. T4
    - Class I, Zone 2, AEx ec ic [ic] IIC T4 Gc Ex ec ic [ic] IIC T4 Gc X
    - ATEX Zone 2
      - II 3G Ex ec ic [ic] IIC T4 Gc
      - DEMKO 18 ATEX 1926X
      - 40°C ≤ Tamb ≤ +85°C
    - IECEX Zone 2
      - Ex ec ic [ic] IIC T4 Gc
      - IECEX UL 18.0072X
      - 40°C ≤ Tamb ≤ +85°C



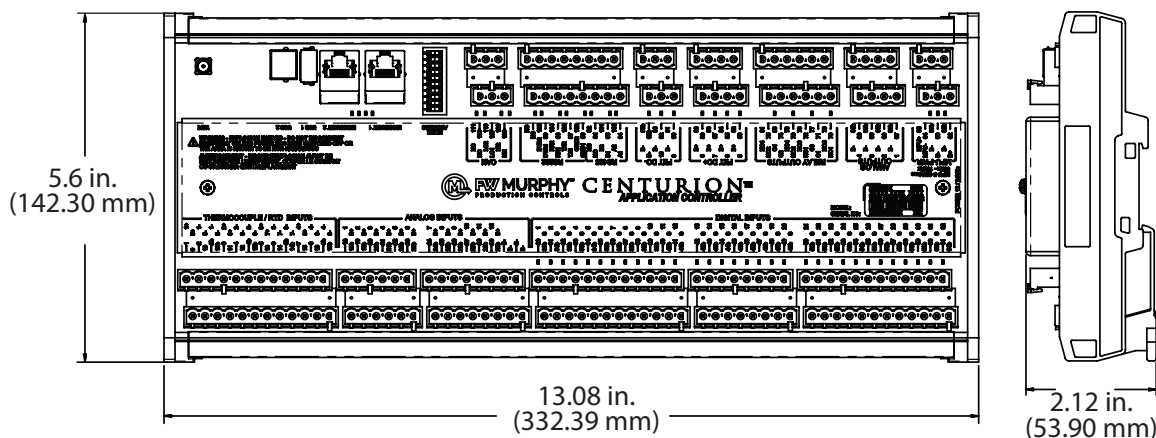
## MV-7T, MV-10T and MV-12T, M-View® Touch Series Displays

- Operating temperature: -4° to 140° F (-20° to 60° C)
- Power input:
  - MV-7T, 15 W max 10-30 VDC (36 W max with modules)
  - MV-10T, 22 W max 10-30 VDC (52 W max with modules)
  - MV-12T, 23 W max 10-30 VDC (57 W max with modules)
- Screen (sunlight readable):
  - MV-7T, 800x480 pixels, 7" widescreen, brightness 1000 cd/m2
  - MV-10T, 640x480 pixels, 10.4" screen, brightness 2500 cd/m2
  - MV-12T, 1280x800 pixels, 12" widescreen, brightness 1600 cd/m2
- User interface: resistive analog touchscreen
- Communication interface
  - 2x RS232
  - 1x RS485
  - 2x USB host type A (file transfer, datalogging, USB device)
  - 1x USB server (program/firmware updates)
  - 2 Ethernet 10/100 Base TX (RJ45)
- Communication protocols:
  - EtherNet/IP (CIP)
  - Modbus TCP/IP
  - Modbus RTU standard
  - 300 plus available, web server
- Third-party approvals:
  - CE Approved
    - EN 61326-1 Immunity to Industrial Locations Emission CISPR 11 Class A
    - IEC/EN 61010-1
    - RoHS Compliant
  - ATEX Approved
    - II 3 G Ex ic nA IIC T4 Gc
    - II 3 D Ex tc IIIC T135°C Dc
    - DEMKO 14 ATEX 1387X
    - EN 60079-0, -11, -15, -31
  - IECEX Approved
    - Ex ic nA IIC T4 Gc
    - Ex tc IIIC T135°C Dc
    - IECEX UL 15.0035X
    - IEC 60079-0, -11, -15, -31
  - UL Approved
    - cULus Listed for Ordinary Location: File #E302106
      - UL 61010-1, -2-201
    - cULus Listed for Hazardous Location: File #E317425
      - Class I, Division 2, Groups A, B, C and D
      - Class II, Division 2, Groups F and G
      - Class III, Division 2 ANSI/ISA 12.12.01, C22.2 No. 213-M1987, 157-92
  - IP66 Enclosure rating (Face only)
  - Type 4X Outdoor Enclosure rating (Face only)
  - ABS Type Approval for Shipboard Applications



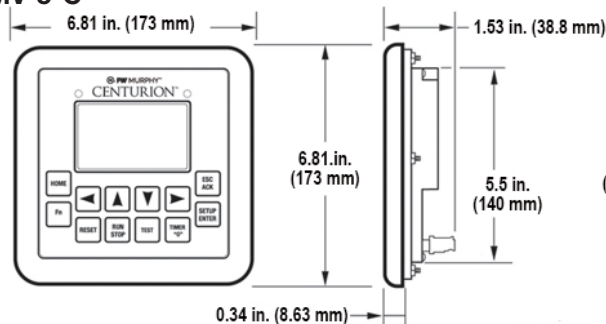
## Dimensions

### C5 Series

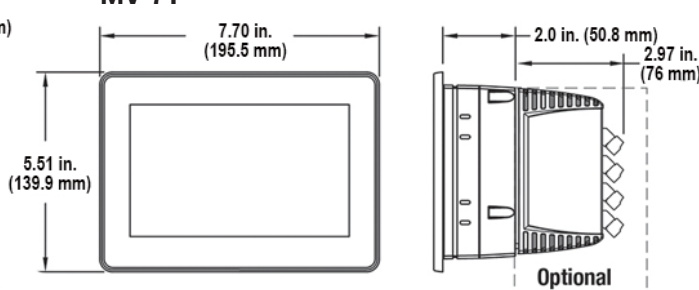


## Dimensions (continued)

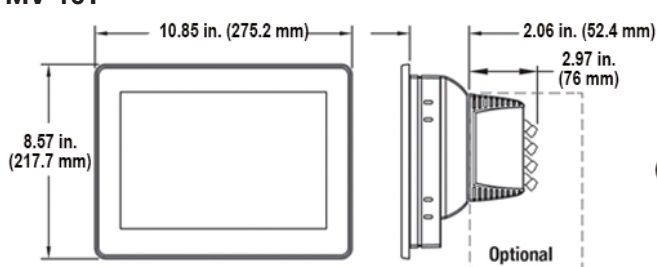
### MV-5-C



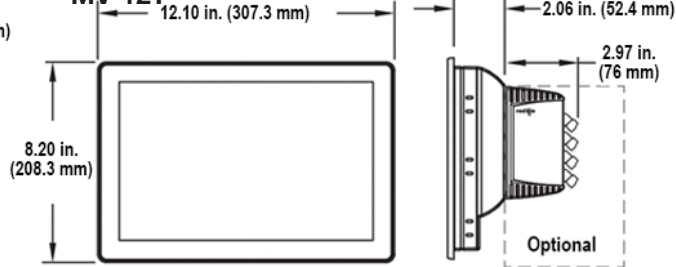
### MV-7T



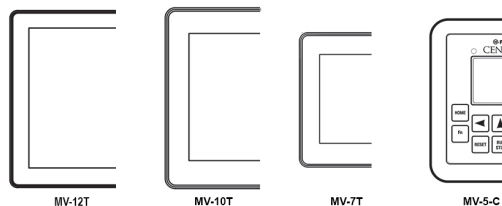
### MV-10T



### MV-12T



### Side-by-Side Screen Approximate Sizes



## How to Order

Select a Centurion Configurable Controller.  
- C5

Specify expansion I/O modules (optional).  
- MX4-R2 or MX5-R2

Specify a display.  
- MV-5-C, MV-7T, MV-10T or MV-12T

The minimum system requirements:

- C5 Main I/O Module
- Display capable of MODBUS communications

The FW Murphy M-View Series displays are highly integrated HMIs for use with the Centurion system and are recommended for most customers.

Some systems may require additional I/O which is available on the MX4-R2 or MX5-R2 expansion I/O modules.

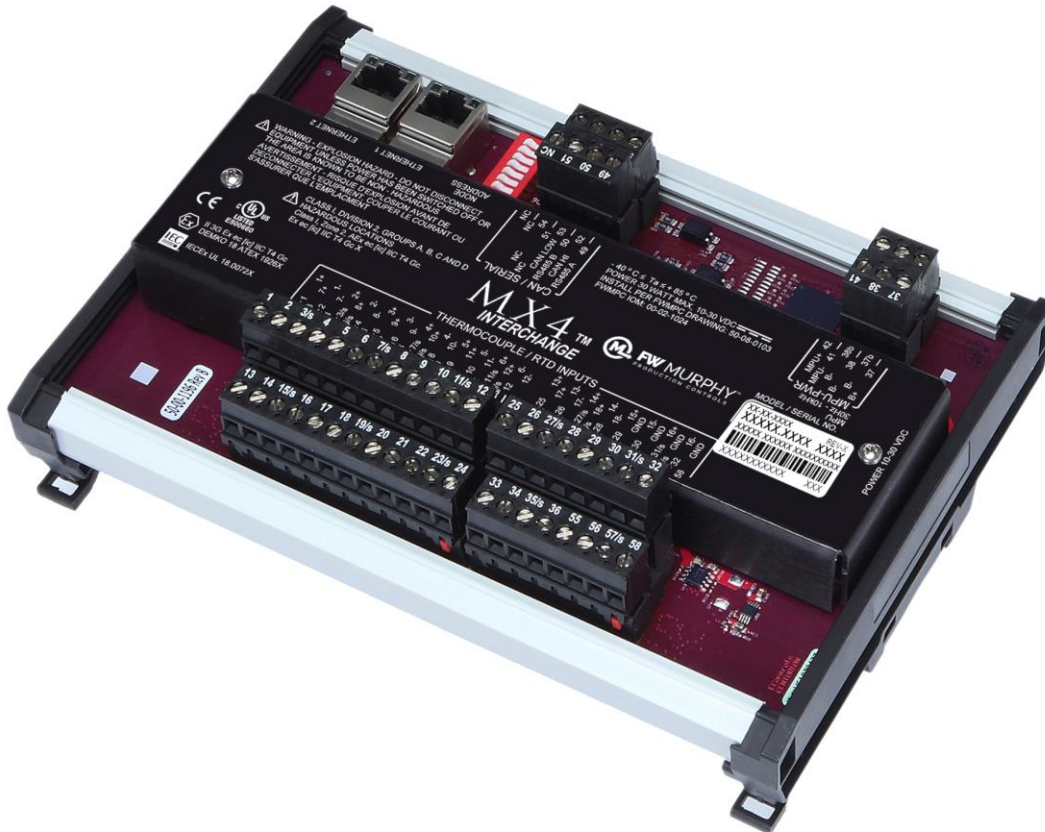
Part Number	Description	Notes
Specify Model	C5, Centurion Controller (Main Module)	Centurion C5 Configurable Controller
	MV-5-C, (5 in. monochrome LCD display)	Standard, Auto sync to C5
	MV-7T, (7 in. touchscreen full-color display)	Optional, Auto sync to C5
	MV-10T, (10 in. touchscreen full-color display)	
	MV-12T, (12 in. touchscreen full-color display)	
50703852	MX4-R2 expansion I/O module	Optional
50703853	MX5-R2 expansion I/O module	
50000774	Ignition noise (choke) filter	
00032696	C5 Plug kit	Printed replacement terminal plugs for main I/O module
00032656	MX4-R2 Plug kit	Printed replacement terminal plugs for MX4-R2 expansion I/O module
00032657	MX5-R2 Plug kit	Printed replacement terminal plugs for MX5-R2 expansion I/O module
50702313	Centurion configuration tool for user application setup	Centurion configuration tool is software for modifying sequence of operation, set points, timers, faults and displays for Centurion. Includes file transfer utilities for configuration and upgrades.

#### Approximate Shipping Weight and Dimensions

Model	Weight	Dimension
C5 Controller	2 lb. 7 oz.	16 x 11 x 5 in.
MV-5-C Display	2 lb. 4 oz.	8 x 8 x 6 in.
MV-7T Display	3 lb. 4 oz.	10 x 10 x 6 in.
MV-10T Display	6 lb. 1 oz.	13 x 12 x 6 in.
MV-12T Display	5 lb. 1 oz.	10 x 12 x 12-1/4

#### Approximate Shipping Weight and Dimensions

Model	Weight	Dimension
MX4-R2 expansion I/O module	1 lb. 6 oz.	12 x 7 x 5 in.
MX5-R2 expansion I/O module	1 lb. 6 oz.	12 x 7 x 5 in.
C5 Plug kit	0 lb. 5 oz.	5 x 5 x 5
MX4-R2 Plug kit	0 lb. 3 oz.	5 x 5 x 5
MX5-R2 Plug kit	0 lb. 3 oz.	5 x 5 x 5



# Interchange™ Comm Control Module, MX4-R2 Series

## Installation and Operations Manual

For Models with Date Codes S8 or Higher



**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product.  
A copy of the warranty may be viewed or printed by going to <http://www.fwmurphy.com/warranty>



**BEFORE BEGINNING INSTALLATION OF THIS FW MURPHY  
PRODUCT:**

- Please read the following information before installing the MX4-R2 Module. This installation information is intended for MX4-R2 Module only.
- Visually inspect the product for any damage during shipping.
- Before proceeding please visit our website and review our support documentation including Wiring the Murphy Way  
[www.fwmurphy.com/uploaded/WIR\\_Murphy\\_Way.pdf](http://www.fwmurphy.com/uploaded/WIR_Murphy_Way.pdf)
- Disconnect all power and be sure machine is inoperative before beginning installation.
- Installation is to be done only by a qualified technician of the Responsible Body.
- Observe all Warnings and Cautions at each section in these instructions.
- Device shall be wired in accordance with NEC, CEC or other local code, as applicable.
- Please contact FW Murphy immediately if you have any questions.

**For Class I, Division 2:**

THIS EQUIPMENT IS AN OPEN-TYPE DEVICE AND IS MEANT TO BE INSTALLED IN AN ENCLOSURE SUITABLE FOR THE ENVIRONMENT SUCH THAT THE EQUIPMENT IS ONLY ACCESSIBLE WITH THE USE OF A TOOL.

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D OR NON-HAZARDOUS LOCATIONS ONLY.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN REMOVED OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

WARNING – EXPLOSION HAZARD – DO NOT REPLACE BATTERIES UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.

TEMPERATURE CODE OF T4 FOR ALL MODELS.

PROVIDES NONINCENDIVE FIELD WIRING OUTPUTS/INPUTS WHEN WIRED ACCORDING TO DRAWING 50-08-0103 (MX4-R2-X).

**For AEX/EX Class I, Zone 2:**

THE EQUIPMENT SHALL ONLY BE USED IN AN AREA OF POLLUTION DEGREE 2.

THE EQUIPMENT SHALL BE INSTALLED COMPLETELY WITHIN AN ENCLOSURE THAT PROVIDES A MINIMUM INGRESS PROTECTION OF IP 54 IN ACCORDANCE WITH UL60079-0 AND ONLY ACCESSIBLE BY THE USE OF A TOOL.

THE WIRE SIZE, TORQUE RATING OF 12-24 AWG, 0.37-0.44 ft. lbs.(0.4-0.5 Nm), AND SUITABLE SUPPLY WIRE TEMPERATURE RATING OF 97°C MINIMUM SHALL BE PROVIDED FOR THE INPUT POWER TERMINAL BLOCK.

ALL MARKING INFORMATION EXCEPT FOR SERIAL NUMBER/DATE CODES SHALL BE REPEATED.

PROVIDES NONINCENDIVE FIELD WIRING OUTPUTS/INPUTS WHEN WIRED ACCORDING TO DRAWING 50-08-0103 (MX4-R2-X).

**SPECIAL CONDITIONS FOR USE IECEx/ATEX Zone 2:**

THE EQUIPMENT SHALL ONLY BE USED IN AN AREA OF NOT MORE THAN POLLUTION DEGREE 2, AS DEFINED IN IEC/EN 60664-1.

THE EQUIPMENT SHALL BE INSTALLED IN AN ENCLOSURE THAT PROVIDES A DEGREE OF PROTECTION NOT LESS THAN IP 54 IN ACCORDANCE WITH IEC/EN 60079-0 AND ONLY ACCESSIBLE BY THE USE OF A TOOL.

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## FW Murphy Interchange Comm Control Module Series

The MX4-R2 expansion module provides temperature and frequency input capability to the Centurion and future generations of FW Murphy Controllers using CAN proprietary communication with enhanced diagnostics. A serial RS485 port and 2 Ethernet ports also provide communication methods to work with any Modbus RTU or TCP/IP client device. MX4-R2 is backward compatible to MX4. Load Rockwell IO Application for EtherNet/IP (CIP) Protocol function.


### Accessories

**MX4-R2 Plug Kit (00032656)** Printed Terminal Plugs for MX4-R2 Expansion I/O Module

### Specifications

- Operating temperature: -40° to 185° F (-40° to 85° C)

### Power input: 14.1 W max 10-30 VDC

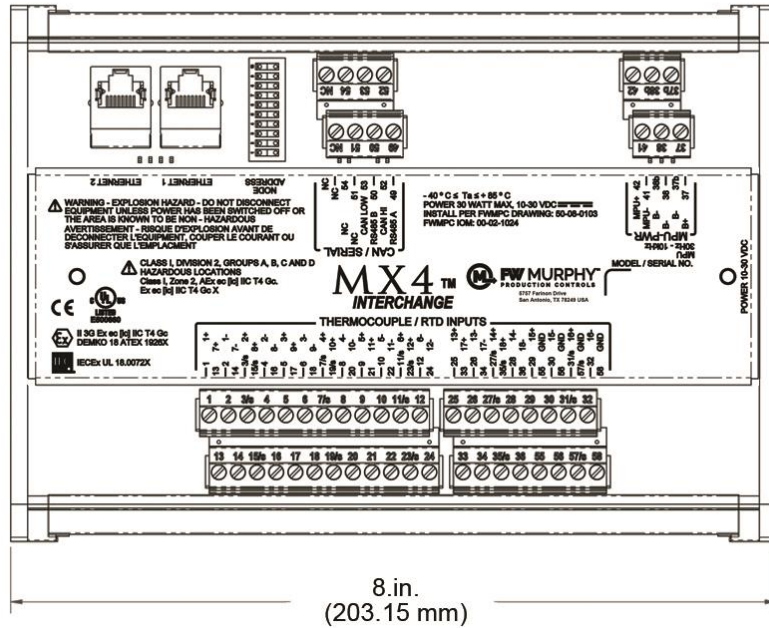
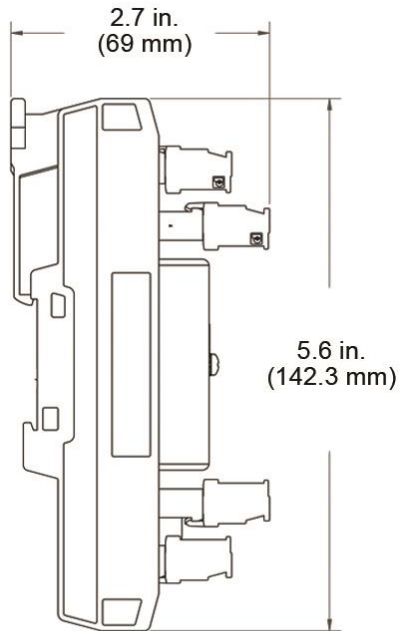
- All input options individually software selectable. No jumpers required.
- 18\* Thermocouple temperature inputs:
  - J or K Type Thermocouples (ungrounded)
  - 9\* 3-wire 100Ω Pt RTD temperature inputs\*\*
  - Cold junction compensation
  - Open, short DC-, short DC+ wire fault detection
- One magnetic pickup input\*/AC run signal
  - 30 to 10 kHz
- 4 Communication ports:
  - SERIAL RS485
    - Protocol: MODBUS RTU (server)
  - CAN
    - Protocol: Proprietary for FW Murphy hardware
  - Two Ethernet 10/100 (DLR), Single MAC ID:
    - Protocol: Modbus TCP/IP (server) standard or Ethernet/IP (CIP) in Rockwell IO Application Mode
- Third-party approvals for MX4-R2:
  - Class I, Div 2, Grps A,B,C,D Haz. Loc. T4
  - Class I, Zone 2, AEx ec [ic] IIC T4 Gc  
Ex ec [ic] IIC T4 Gc X
  - ATEX Zone 2:
    -  II 3G Ex ec [ic] IIC T4 Gc
    - DEMKO 18 ATEX 1926X
      - -40°C ≤ Tamb ≤ +85°C
  - IECEX Zone 2:
    - Ex ec [ic] IIC T4 Gc
    - IECEX UL 18.0072X
      - -40°C ≤ Tamb ≤ +85°C

\* Non-incendive. Temperature Inputs are intrinsically safe and non-incendive.

\*\* RTD=Resistive Temperature Device, American RTD Standard, TCR 0.00392, units Ohms/Ohm / deg. between 0-100 C.

**NOTE:** For each channel that is selected as RTD, 2 thermocouple channels are used and no longer available as thermocouple channels.

## Dimensions



## Install MX4-R2 Module

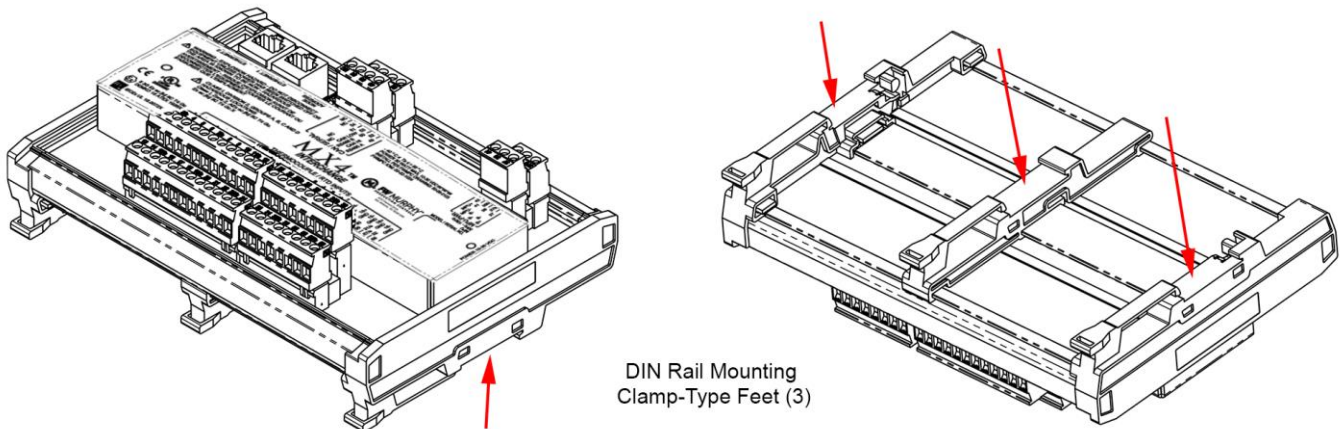
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The MX4-R2 must be mounted in an enclosure meeting the requirements of IP54 or greater according to the intended use and environmental conditions in accordance with standard UL and only accessible by use of a tool.

**NOTE:** IP requirement is ONLY for North America and IECEx/ATEX Zones UL 60079, IEC/EN 60079-0.

- Operating Temperature -40° to 185° F (-40° C to +85° C)
- Pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar)
- Air with normal oxygen content, typically 21% v/v
- Temperature Class T4
- “ic”: intrinsic safety (for EPL Gc)
- Increased safety (for EPL Gc)

The MX4-R2 can be mounted vertically or horizontally on a standard DIN rail. Three clamp-type feet along the bottom of the controller attach to the DIN rail; however, rail stops are recommended to prevent sliding.



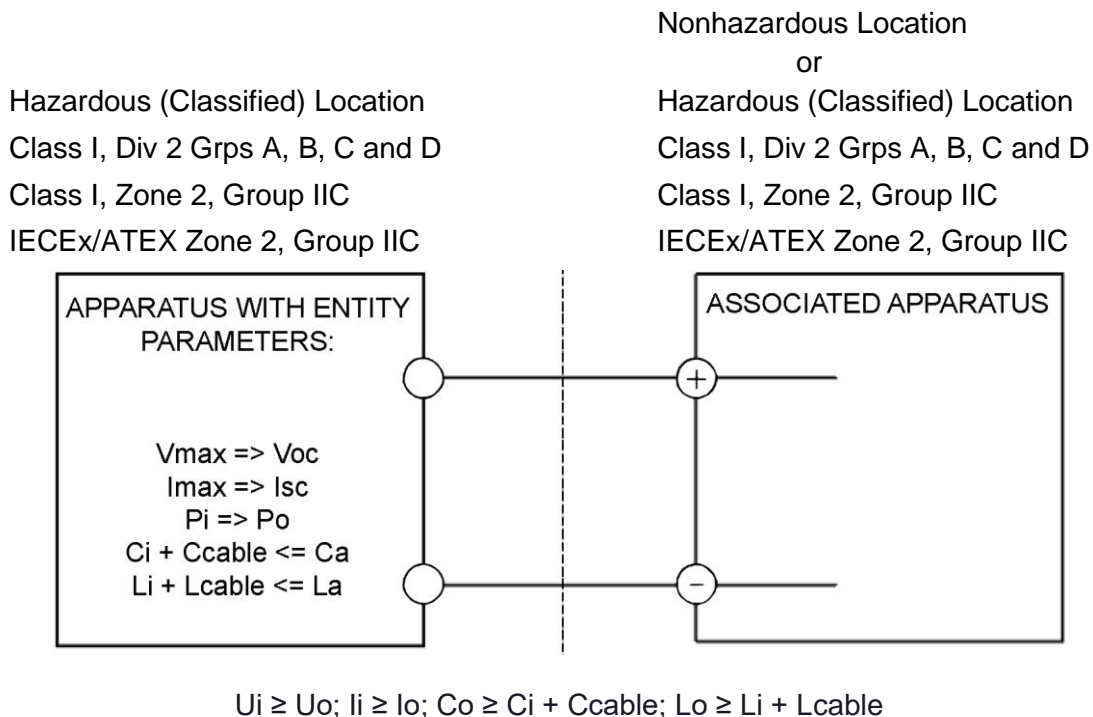


## Wire Diagram — MX4-R2 Module



## Entity Parameters

1. The output current of this associated apparatus is limited by a resistor such that the output voltage-current plot is a straight line drawn between open-circuit voltage and short-circuit current. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of  $V_{oc}$  (or  $U_o$ ) and  $I_{sc}$  (or  $I_o$ ) for the associated apparatus are less than or equal to  $V_{max}$  ( $U_i$ ) and  $I_{max}$  ( $I_i$ ) for the intrinsically safe apparatus. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations. Cable capacitance,  $C_{cable}$ , plus intrinsically safe equipment capacitance,  $C_i$  must be less than the marked capacitance,  $C_a$  (or  $C_o$ ), shown on any associated apparatus used. The same applies for inductance ( $L_{cable}$ ,  $L_i$  and  $L_a$  or  $L_o$ , respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used:  $C_{cable} = 60 \text{ pF/ft.}$ ,  $L_{cable} = 0.2 \text{ μH/ft.}$



2. This associated apparatus may also be connected to non-incendive or simple apparatus as defined in Article 504.2 and installed and temperature classified in accordance with Article 504.10 (B) of the National Electrical Code (ANSI/NFPA 70) or other local codes, as applicable. Examples of "simple apparatus" are general-purpose contact/switch, thermocouples and RTD.

3. For Intrinsically Safe devices selected associated apparatus must be third-party listed as providing intrinsically safe circuits for the application or have  $V_{oc}$  or  $V_t$  not exceeding  $V_{max}$  (or  $U_o$  not exceeding  $U_i$ ),  $I_{sc}$  or  $I_t$  not exceeding  $I_{max}$  (or  $I_o$  not exceeding  $I_i$ ), and the  $P_o$  of the associated apparatus must be less than or equal to the  $P_{max}$  or  $P_i$  of the intrinsically safe equipment. Examples of “simple apparatus” are general-purpose contact/switch, thermocouples and RTD.
4. Where multiple circuits extend from the same piece of associated apparatus, they must be installed in separate cables or in one cable having suitable insulation. Refer to Article 504.30(B) of the National Electrical Code (ANSI/NFPA 70) and Instrument Society of America Recommended Practice ISA RP12.6 for installing intrinsically safe equipment.
5. Intrinsically safe circuits must be wired and separated in accordance with Article 504.20 of the National Electrical Code (ANSI/NFPA 70) or other local codes, as applicable.
6. This associated apparatus has not been evaluated for use in combination with another associated apparatus.
7. Control equipment must not use or generate more than 250 V rms or dc with respect to earth.
8. For installations in which both the  $C_i$  and  $L_i$  of the intrinsically safe apparatus exceeds 1% of the  $C_o$  and  $L_o$  parameters of the associated apparatus (excluding the cable), then 50% of  $C_o$  and  $L_o$  parameters are applicable and shall not be exceeded.

**WARNING:**

EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON DANGEREUX.

## Entity Parameters (continued)

Thermocouple/RTD Inputs (Per Pin) J1-J2										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[H]	Co[μF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[μF]
Pins 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 34, 36,	4.4	1.0	4.4	80	999.9	30	17.0	-	0	0.1
Pins 1, 3/s, 5, 7/s, 9, 11/s, 13, 15, 17, 19/s, 21, 23/s, 25, 27/s, 29, 31/s, 32, 33, 35/s	4.4	1.0	4.4	80	995.1	30	17.0	-	0.022	4.9
J2 Pin 55, 56, 57, 58	Thermocouple/RTD Inputs Ground									

RS485/CAN											
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]	Ci[pF]
J4 RS485 Pins 49, 50	±5.0	±60	-	22.2	999.9	±12.0	±60	-	0	0.01	-
J4 RS485 Pin 51	Shield Connection Ground										
J4 CAN Pins 52, 653	±4.5	±5	-	3.2	999.9	±24	100	-	0	-	267
J4 CAN Pin 54	Shield Connection Ground										
Ethernet Per Port											
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]	
J5-J6	3.3	±61.5	-	21.2	999.9	3.3	±60	-	0	0.1	

## Thermocouple / RTD Inputs (Pins 1 – 36 and 55 – 58)

The MX4-R2 is equipped with 18 two-wire thermocouple and/or 9 three-wire RTD inputs.

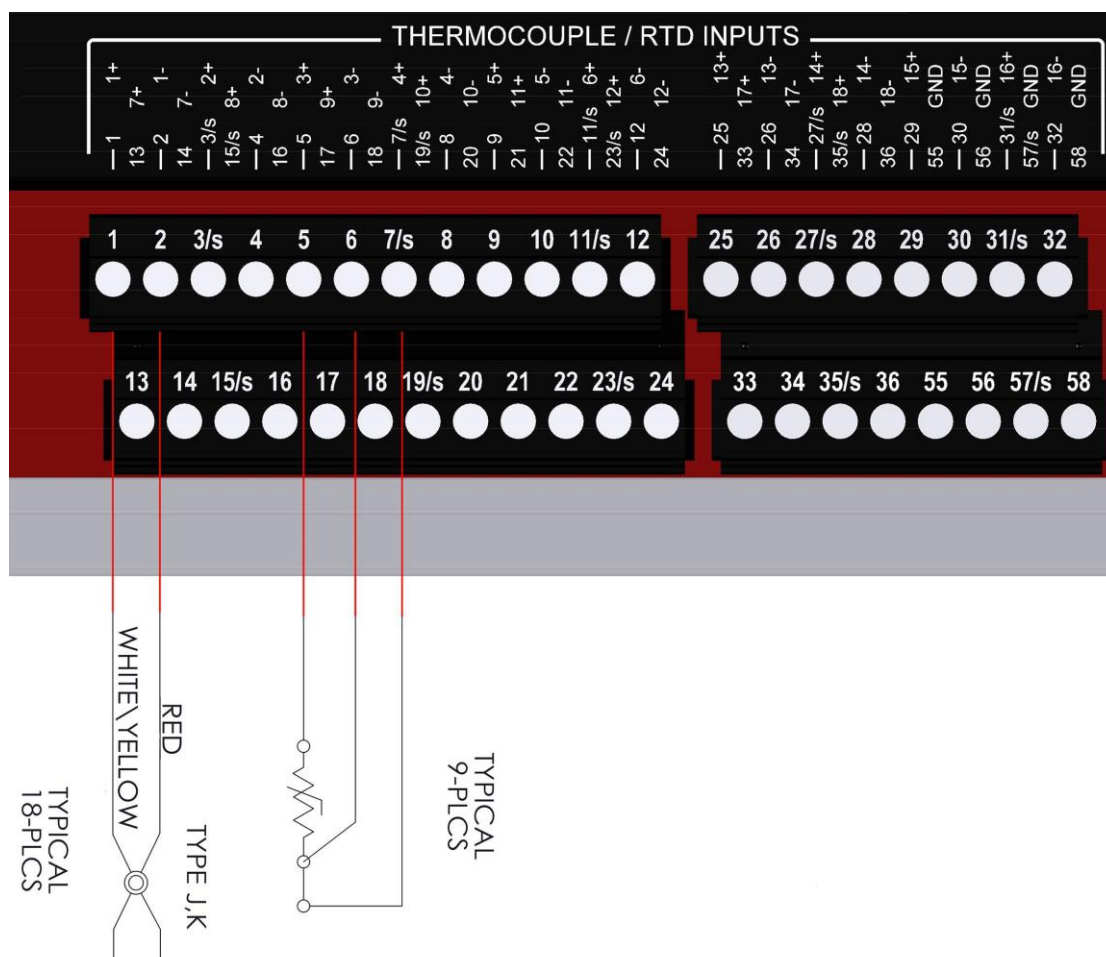
Thermocouples are wired using cover artwork labeled as + and -, such as 1+ and 1-. Thermocouples terminals can be seen labeled as 1 and 2 for TC 1 channel and 3 and 4 for TC 2 channel and so on. Use ungrounded thermocouples only, grounded thermocouples are not supported.

When RTD is selected for the channel, 3 terminals are required. RTDs are wired using cover artwork labeled with the same + and -, but also includes a /s for the sense lead. This terminal is also the + (plus) for the adjacent channel.

Therefore, the adjacent channel is no longer available as thermocouple and is disable.

RTD's terminals can be seen labeled in the as 1,2,3/s for the first channel and 5,6,7/s for the next channel and so on skipping the - (minus) terminal from the adjacent channel.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.

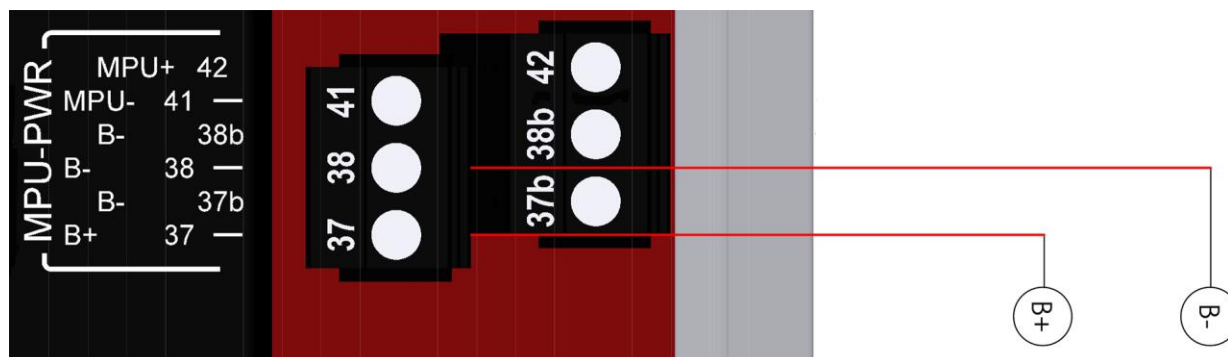


**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## Power (Pins 37 – 38)

The 10-30 VDC power for the MX4-R2 is applied to the power supply terminals marked 37 B+ and 38 B-. An external 10-amp replaceable fuse protects the system from over-currents, and a power LED lights when power is applied to the system.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



NOTE: Run power directly from battery posts to controller power terminals when battery is the power supply.

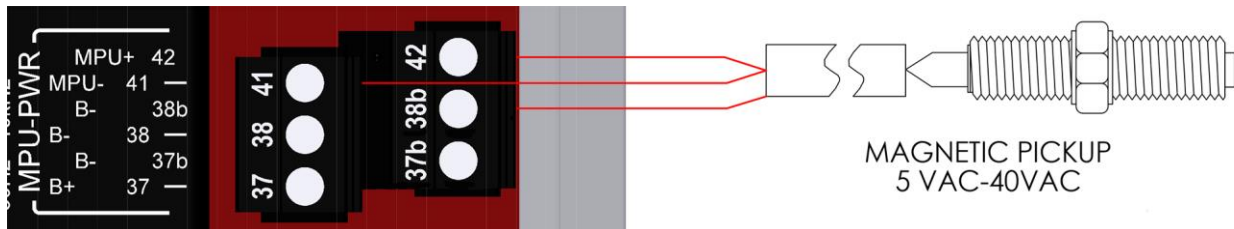
Maximum power ratings based on all I/O operating in the ON position with 10V supply. Typically based on 24V supply.

## Magnetic Pickup, MPU (Pins 41 – 42)

The MPU for the MX4-R2 is applied to the magnetic pickup terminals marked 41 MPU- and 42 MPU+, MPU 5-40 Vrms 30-10 kHz. If used, the foil shield and drain wire of the cable assembly may be terminated at 37b- or 38b-. The MPU sends the pulses to the controller, which calculates the engine speed.

FW Murphy recommends using 00031022 Magnetic Pickup 4 in. Length and 00031023 Magnetic Pickup Cable 50 ft.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



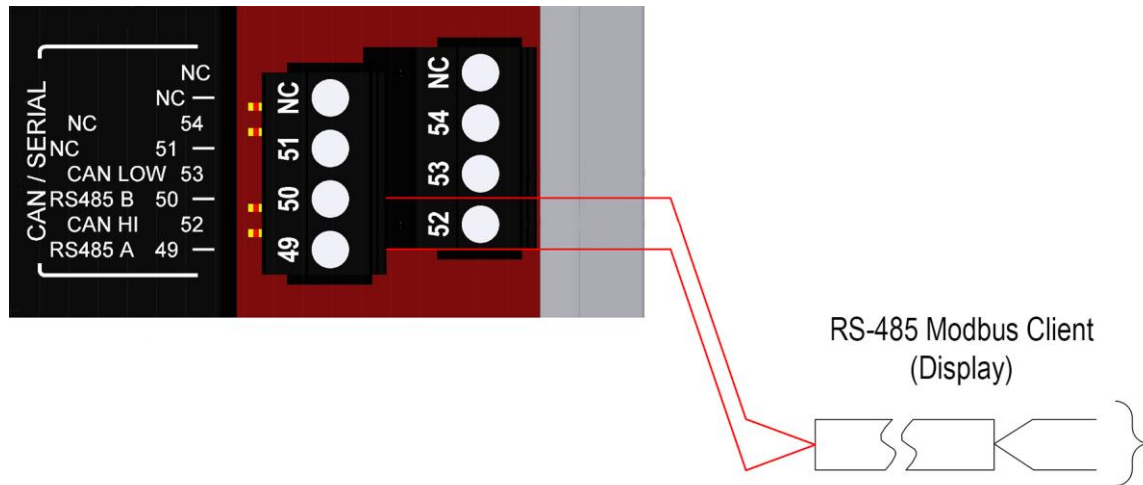
**NOTE:** The MPU input requires a minimum signal of 2 Vrms when connected.

## RS485 (Pins 49 – 50)

The MX4-R2 is equipped with RS485 communications ports 49 A / 50 B.

The TX LED lights when the port is transmitting. The RX LED lights when the port is receiving.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** A is the non-inverting pin and should have a single pull-up physically placed anywhere on the network. B is the inverting pin and should have a single pull-down physically placed anywhere on the network.

These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

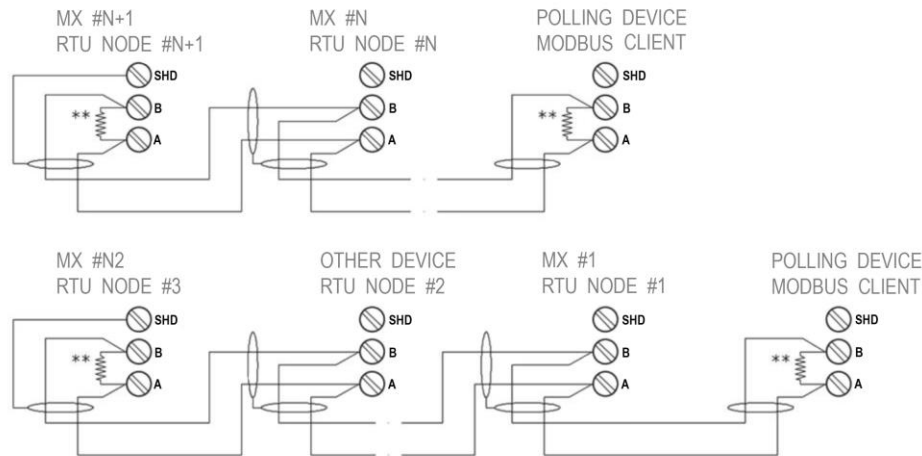
Consult RS-485 the Murphy Way for information on best practices for connecting and communicating on RS-485.

[www.fwmurphy.com/uploaded/documents/pdfs/rs-485murphyway.pdf](http://www.fwmurphy.com/uploaded/documents/pdfs/rs-485murphyway.pdf)



The recommended arrangement of the wires is as a connected series of point-to-point (multidropped) nodes, i.e. a line or bus, not a star, ring or multiply connected network.

## RS-485 Typical Connections



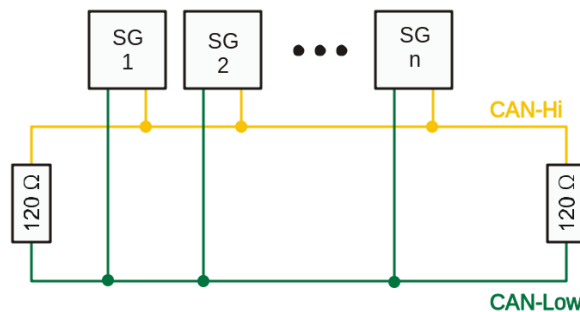
\*\* USE EIA RS485 SHIELDED, TWISTED PAIR, 120 OHMS CHARACTERISTIC IMPEDANCE.  
 INSTALL 120 OHMS TERMINATING RESISTOR ON FIRST AND LAST NODE ON RS-485 NETWORK.  
 ALL RS-485 DEVICES MUST SHARE DC COMMON GROUND.

## CAN (Pins 52 – 53)

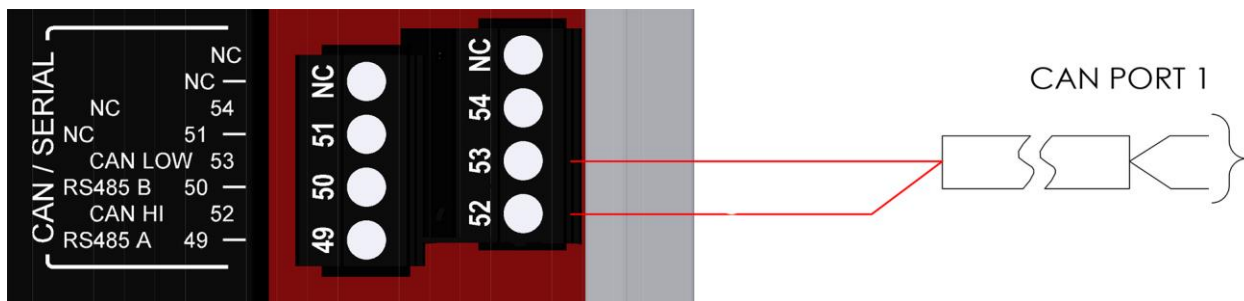
The MX4-R2 is equipped with a CAN communication port. The port is marked pin 52 CAN HI and pin 53 CAN LOW.

The LED lights when the port is active transmitting and when the port is active receiving.

The recommended arrangement of the wires is as a connected series of point-to-point (multidropped) nodes, i.e. a line or bus, not a star, ring or multiply connected network. We recommend using CAN-Bus Cable J1939/11 SAE Shielded, twisted pair with 120  $\Omega$  characteristic impedance. Install a 120  $\Omega$  terminating resistor (DIP switch controls this on the MX4-R2) on the physical first and last node of the CAN network. All nodes must share a common DC ground



**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## DIP Switch Configuration

Set these switches to the open or closed position for your application.



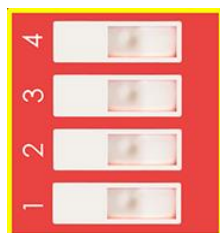
Node Address:

- **DIP1-8:** These switches allow you to assign a unique address to each MX4-R2 that may be in the system using either Modbus or CAN communication. This allows the client controller to differentiate between the modules. Addressing is done in binary format, with each switch increasing value by factor of 2. For example, to name the controller address 5, set switch DIP1 and DIP4 to the CLOSED position. Valid settings are from 1 to 239. Addresses 240 thru 255 are for power-up functions only as detailed below.
- **DIP Power-up Functions:** There is a special feature for switching module operation mode that is activated by setting specific switch positions at power up. Change will only occur if the following switches are set CLOSED at power up. All other times, these switches behave as address selections.
  - DIP switches 5-8 CLOSED at power up activates special mode to change the module behavior based on switches 1-4 position.

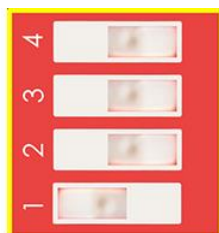


5-8 CLOSED

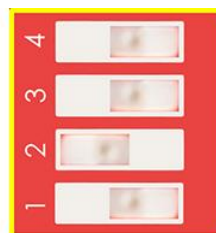
- 1-4 CLOSED: Load factory defaults to non-volatile settings – restores serial baud rate, Ethernet address and channel configurations to default values.
- 1 OPEN, 2-4 CLOSED: Load Rockwell IO Application.
- 2 OPEN, 1, 3, 4 CLOSED: Load Standard IO Application.



1-4 CLOSED



1 OPEN, 2-4 CLOSED



2 OPEN, 1, 3, 4 CLOSED

- **Stop Bits:** For addresses < 31, the RS485 port will use 1 stop bit. For addresses > 31, the RS485 port will use 2 stop bits.

## CAN Termination:

- **DIP9:** This switch provides a 120Ω termination resistor for the CAN communication chain. CAN must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation.

## RS485 Termination:

- **DIP10:** This switch provides a 120Ω termination resistor for the RS485 communication chain. RS485 must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation.

## Ethernet

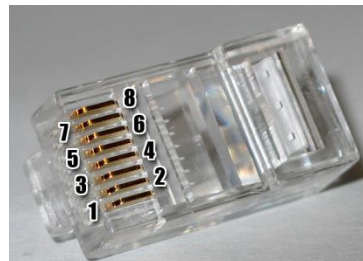
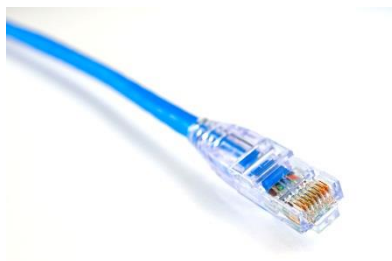
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The MX4-R2 is equipped with two Ethernet communication ports. The ports are marked ETHERNET 1 and ETHERNET 2. An LED flashes when the port is active — transmitting or receiving a message, and an LED lights to indicate the link is active when connected to another device. LED closest to the DIP switch illuminates for 100Mbit connections. LED furthest from the DIP switch illuminates for 10Mbit connections.











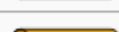






**WARNING:** Explosion hazard – Do not disconnect the Ethernet port unless the power has been switched off or the area is known to be non-hazardous.

Below is an 8P8C modular connector (often called RJ45) commonly used on Cat 5 cables in Ethernet networks.



Twisted-pair Ethernet standards are such that the majority of cables can be wired "straight-through" (pin 1 to pin 1, pin 2 to pin 2 and so on), but others may need to be wired in the "crossover" form (receive to transmit and transmit to receive). The MX4-R2 can automatically detect another computer connected with a straight-through cable and then automatically introduce the required crossover, if needed with no intervention by the installer. 10BASE-T and 100BASE-TX only require two pairs (pins 1-2, 3-6) to operate. Since Category 5 cable has four pairs, the spare pairs (pins 4–5, 7–8) in 10- and 100-Mbit/s configurations are not used.

TIA/EIA-568 T568A termination				TIA/EIA-568 T568B termination			
Pin	Pair	Wire	Color	Pin	Pair	Wire	Color
1	3	tip	 white/green	1	2	tip	 white/orange
2	3	ring	 green	2	2	ring	 orange
3	2	tip	 white/orange	3	3	tip	 white/green
4	1	ring	 blue	4	1	ring	 blue
5	1	tip	 white/blue	5	1	tip	 white/blue
6	2	ring	 orange	6	3	ring	 green
7	4	tip	 white/brown	7	4	tip	 white/brown
8	4	ring	 brown	8	4	ring	 brown

The MX4-R2 uses autonegotiation, an Ethernet procedure by which two connected devices choose common transmission parameters, such as speed, duplex mode and flow control. In this process, the connected devices first share their capabilities regarding these parameters and then choose the highest performance transmission mode they both support. The MX4-R2 supports 10 and 100 Mbit/s over two-pair Cat5 or better cable.

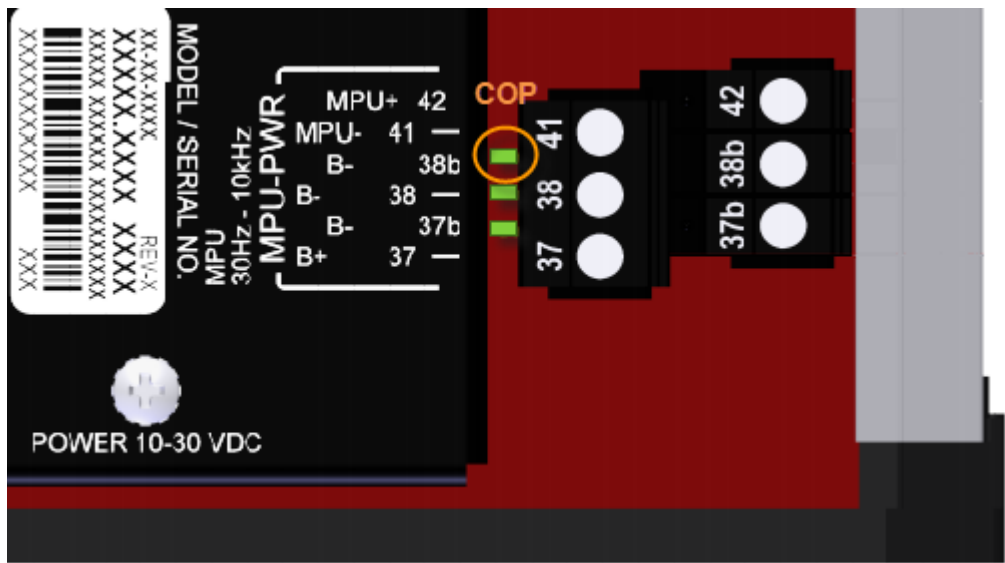
**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.

**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

# Controller Operating Properly (COP) LED Codes

Blink codes will be 2 digits separated by pauses with each blink code further separated by a rapid blink event.

- Blink codes will be ¼ second ON and ¼ second OFF.
- Pauses will be ¾ second OFF.
- The separator will be a 2 1/2 seconds pause.



Blink Codes *	Code Description
1, 1	Startup Error
4, 1	Rockwell Automation IO Application Mode
4, 2	Standard IO Application Mode
4, 3	Custom Application Mode
* There will be a ¾ second pause between the digits.	

**NOTE:** A fast flash (100ms on/off) = Running in bootloader mode. Bootloader is the mode used for switching applications or module reprogramming via external CAN tools.

## Communications for Standard IO Application Mode (default)

**Physical Layer:** The MX4-R2 module features two Ethernet ports, one RS485 serial communication port and one CAN bus 2.0B communication port.

**Ethernet Interconnect:** Two RJ45 jacks with single MAC ID. This connection may require setting the IP address of the module to the desired network configuration. Ethernet port settings can be changed by modifying Modbus registers. Default setting is 192.168.0.100 IP, 255.255.255.0 network mask, 0.0.0.0 Gateway.

**Ethernet Protocol:** Modbus TCP/IP server. Refer to the Modbus RTU map provided in this manual for a detailed mapping of the available data and data scaling.

**Serial RS485 Interconnect:** Screw terminals. Typically, this connection uses twisted shielded pair cable with 120-ohm impedance. RS485 networks are 2-wire, half-duplex and feature an “A” terminal 49 and “B” terminal 50. The A terminal is the + or non-inverting signal, and the B terminal is the – or inverting signal. These signal lines will take turns transmitting and receiving depending on the device using the RS485 network at any given instant.

**Serial Baud Rate:** Default 9600, adjustable up to 115.2k.

**Serial Stop Bits:** The module will respond with 1 stop bit for Modbus RTU addresses 1 through 31 and 2 stop bits for addresses 32 through 239. This maintains flexibility for systems requiring 2 stop bits.

**Serial Protocol:** Modbus RTU server. The module may be polled by the Modbus RTU Client without any additional timing delays and response times will be < 100mS. This may vary depending on the amount of data requested. Modbus RTU timeout settings should be set to >= 400mS.

Refer to the Modbus RTU map provided in this manual for a detailed mapping of the available data and data scaling.

**CAN bus Interconnect:** Screw terminals. Typically, this connection uses twisted pair cable with 120-ohm impedance to connect to a FW Murphy Controller. CAN bus networks are 2-wire with a “HI” terminal 52 and “LOW” terminal 53.

**CAN bus Baud Rate:** 250kbit/500kbit/1000kbit auto sense.

**CAN bus Protocol:** Proprietary for FW Murphy Controllers.

**PC Connection:** Reading data from the module into a PC may be done with an Ethernet connection and Modbus TCP/IP client software or RS485 connection and Modbus RTU client software. A serial interface converter that can convert USB to RS485 would be needed for a serial connection. (FW Murphy MConfig™ Software and P/N 53702325 may be used for this purpose.)

## Communications for Rockwell Automation IO Mode

**Physical Layer:** The MX4-R2 module features two Ethernet ports.

**Ethernet Interconnect:** Two RJ45 jacks with Single MAC ID. This connection may require setting the IP address of the module to the desired network configuration. Ethernet port settings can be changed by modifying Modbus registers. Default setting is 192.168.0.100 IP, 255.255.255.0 network mask, 0.0.0.0 Gateway.

**Ethernet Protocol:** CIP for use with Rockwell Automation IO.



## Modbus Holding Register Description (Standard IO Application Mode)

All data will be contained in 16-bit Modbus Holding Registers. Following the Modbus RTU and Modbus TCP/IP specification, the Most Significant Byte in a 16-bit word is broadcast first, followed by the Least Significant Byte. The module responds to Modbus Function Code 03 (Read Holding Registers), Function Code 06 (Preset Single Holding Register) and Function Code 16 (Preset Multiple Holding Register). Polling invalid/non-existent data will result in Modbus Exception Code response from the module.

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400001	Hardware Type	R	32	ID	Module name
400002 – 400004	Factory Use	R			
400005	Bootloader Build Version	R	0 – 65535		Version number
400006	Not Used	R			
400007	Firmware Number	R	0 – 65535		Version number
400008	Firmware Build Version	R	0 – 65535		Version number
400009	Firmware Checksum MSW	R	0 – 65535		
400010	Firmware Checksum LSW	R	0 – 65535		
400011	Firmware Major Version	R	0 – 65535		Version number
400012	Firmware Minor Version	R	0 – 65535		Version number
400013	Bootloader Major Version	R	0 – 65535		Version number
400014	Bootloader Minor Version	R	0 – 65535		Version number
400015 – 400020	Factory Use	R			
400021	System Voltage	R	0-65535	Vdc x10	0 = 0.0 VDC, 320 = 32.0 VDC
400022	Raw Channel 1	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400023	Raw Channel 2	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400024	Raw Channel 3	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400025	Raw Channel 4	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400026	Raw Channel 5	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400027	Raw Channel 6	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400028	Raw Channel 7	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400029	Raw Channel 8	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400030	Raw Channel 9	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400031	Raw Channel 10	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400032	Raw Channel 11	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400033	Raw Channel 12	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400034	Raw Channel 13	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400035	Raw Channel 14	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400036	Raw Channel 15	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400037	Raw Channel 16	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400038	Raw Channel 17	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400039	Raw Channel 18	R	-32767 – 32768	mV x100	0 = 0.00 mV, 7500 = 75.00 mV
400040	Raw Cold Junction Input	R	0 – 65535	A/D count	
400041	Not Used	R			
400042	Frequency input	R	0 – 10,000	Hz	
400043	Factory Use	R			
400044	Not Used	R			
400045	Filtered Temperature Channel 1	R	-2000 to +25000	deg F X10	
400046	Filtered Temperature Channel 2	R	-2000 to +25000	deg F X10	
400047	Filtered Temperature Channel 3	R	-2000 to +25000	deg F X10	
400048	Filtered Temperature Channel 4	R	-2000 to +25000	deg F X10	
400049	Filtered Temperature Channel 5	R	-2000 to +25000	deg F X10	
400050	Filtered Temperature Channel 6	R	-2000 to +25000	deg F X10	
400051	Filtered Temperature Channel 7	R	-2000 to +25000	deg F X10	
400052	Filtered Temperature Channel 8	R	-2000 to +25000	deg F X10	
400053	Filtered Temperature Channel 9	R	-2000 to +25000	deg F X10	
400054	Filtered Temperature Channel 10	R	-2000 to +25000	deg F X10	
400055	Filtered Temperature Channel 11	R	-2000 to +25000	deg F X10	
400056	Filtered Temperature Channel 12	R	-2000 to +25000	deg F X10	
400057	Filtered Temperature Channel 13	R	-2000 to +25000	deg F X10	
400058	Filtered Temperature Channel 14	R	-2000 to +25000	deg F X10	
400059	Filtered Temperature Channel 15	R	-2000 to +25000	deg F X10	
400060	Filtered Temperature Channel 16	R	-2000 to +25000	deg F X10	
400061	Filtered Temperature Channel 17	R	-2000 to +25000	deg F X10	
400062	Filtered Temperature Channel 18	R	-2000 to +25000	deg F X10	
400063	Cold Junction Temperature	R	-400 to +1850 F	deg F X10	
400064	Factory Use	R			
400065	Factory Use	R			
400066	Factory Use	R			
400067	Unfiltered Temperature Channel 1	R	-2000 to +25000	deg F X10	
400068	Unfiltered Temperature Channel 2	R	-2000 to +25000	deg F X10	
400069	Unfiltered Temperature Channel 3	R	-2000 to +25000	deg F X10	
400070	Unfiltered Temperature Channel 4	R	-2000 to +25000	deg F X10	
400071	Unfiltered Temperature Channel 5	R	-2000 to +25000	deg F X10	

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400072	Unfiltered Temperature Channel 6	R	-2000 to +25000	deg F X10	
400073	Unfiltered Temperature Channel 7	R	-2000 to +25000	deg F X10	
400074	Unfiltered Temperature Channel 8	R	-2000 to +25000	deg F X10	
400075	Unfiltered Temperature Channel 9	R	-2000 to +25000	deg F X10	
400076	Unfiltered Temperature Channel 10	R	-2000 to +25000	deg F X10	
400077	Unfiltered Temperature Channel 11	R	-2000 to +25000	deg F X10	
400078	Unfiltered Temperature Channel 12	R	-2000 to +25000	deg F X10	
400079	Unfiltered Temperature Channel 13	R	-2000 to +25000	deg F X10	
400080	Unfiltered Temperature Channel 14	R	-2000 to +25000	deg F X10	
400081	Unfiltered Temperature Channel 15	R	-2000 to +25000	deg F X10	
400082	Unfiltered Temperature Channel 16	R	-2000 to +25000	deg F X10	
400083	Unfiltered Temperature Channel 17	R	-2000 to +25000	deg F X10	
400084	Unfiltered Temperature Channel 18	R	-2000 to +25000	deg F X10	
400085 - 400087	Factory Use	R			
400088	Channel 1 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	Strict option enables advanced wire fault detection for DC-/DC+ mV leak/temperature shift.
400089	Channel 2 type	R/W	0 - 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400090	Channel 3 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	
400091	Channel 4 type	R/W	0 - 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400092	Channel 5 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	
400093	Channel 6 type	R/W	0 - 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400094	Channel 7 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	
400095	Channel 8 type	R/W	0 - 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400096	Channel 9 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	
400097	Channel 10 type	R/W	0 - 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400098	Channel 11 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400099	Channel 12 type	R/W	0 – 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400100	Channel 13 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	
400101	Channel 14 type	R/W	0 – 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400102	Channel 15 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	
400103	Channel 16 type	R/W	0 – 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400104	Channel 17 type	R/W	0 - 9	0 = J, 1 = K, 2 = 100Ω Pt RTD, 8 = J Strict, 9 = k Strict	
400105	Channel 18 type	R/W	0 – 9	0 = J, 1 = K, 8 = J Strict, 9 = k Strict	
400106	Cold junction offset	R/W	-32768 to +32767	deg F	Modify this value to offset the cold junction reading
400107	Not Used	R			
400108	Not Used	R			
400109	Communication Timeout	R/W	0 – 65535	time in seconds	
400110	Serial Port Baud Rate	R/W	1-5	Enumeration	1=9600, 2=19.2k, 3=38.4k, 4=57.6k, 5=115.2k
400111-400140	Factory Use	R			
400141	Channel 1 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400142	Channel 2 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400143	Channel 3 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400144	Channel 4 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400145	Channel 5 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400146	Channel 6 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400147	Channel 7 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400148	Channel 8 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400149	Channel 9 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400150	Channel 10 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400151	Channel 11 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400152	Channel 12 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400153	Channel 13 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400154	Channel 14 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400155	Channel 15 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400156	Channel 16 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
400157	Channel 17 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400158	Channel 18 Status	R	1 –7	enumeration	1 = TC OK, 2 = RTD OK, 3 = OPEN, 4 = MINOR SHORT DC-, 5= MAJOR SHORT DC-, 6 = MINOR SHORT DC+, 7 = MAJOR SHORT DC+
465197	IP Address Part 1	R/W	0-255	octet	Ethernet setting
465198	IP Address Part 2	R/W	0-255	octet	Ethernet setting
465199	IP Address Part 3	R/W	0-255	octet	Ethernet setting
465200	IP Address Part 4	R/W	0-255	octet	Ethernet setting
465201	Network Mask Part 1	R/W	0-255	octet	Ethernet setting
465202	Network Mask Part 2	R/W	0-255	octet	Ethernet setting
465203	Network Mask Part 3	R/W	0-255	octet	Ethernet setting
465204	Network Mask Part 4	R/W	0-255	octet	Ethernet setting
465205	Gateway Address Part 1	R/W	0-255	octet	Ethernet setting
465206	Gateway Address Part 2	R/W	0-255	octet	Ethernet setting
465207	Gateway Address Part 3	R/W	0-255	octet	Ethernet setting
465208	Gateway Address Part 4	R/W	0-255	octet	Ethernet setting
465209	DNS1 Address Part 1	R/W	0-255	octet	Ethernet setting
465210	DNS1 Address Part 2	R/W	0-255	octet	Ethernet setting
465211	DNS1 Address Part 3	R/W	0-255	octet	Ethernet setting
465212	DNS1 Address Part 4	R/W	0-255	octet	Ethernet setting
465213	DNS2 Address Part 1	R/W	0-255	octet	Ethernet setting
465214	DNS2 Address Part 2	R/W	0-255	octet	Ethernet setting
465215	DNS2 Address Part 3	R/W	0-255	octet	Ethernet setting
465216	DNS2 Address Part 4	R/W	0-255	octet	Ethernet setting
465217	Ethernet IP Options	R/W	0-4	Bitmap	0=static ip / no auto IP 1= DHCP enabled / no auto IP 2 = static ip / use Auto IP if no DHCP or IP 3 = DHCP enabled / use Auto IP if no DCHP or IP
465218	MAC Address word 1	R	0 – 65535		
465219	MAC Address word 2	R	0 – 65535		
465220	MAC Address word 3	R	0 – 65535		

## Register 400001 Value Description

Register 400001 is a read-only register. This register holds the model number of the hardware. If you are using multiple Comm modules, it is sometimes helpful to confirm that you are communicating with the expected module type. In this case, it will return 32.

## Unfiltered Temperature Readings (400045 – 400064)

Registers 400045 – 400064 are read-only registers. The values returned in these registers are signed 16-bit data. These channels are the actual readings from the connected sensor. Channels are shown in degrees F x 10. For example, a read value of 1200 means 120°F is being read.

**NOTE:** These values are not averaged. The device reading these values may need additional software filtering to remove noise in the readings.

## Filtered Temperature Readings (400067 – 400084)

Registers 400067 – 400084 are read-only registers. The values returned in these registers are signed 16-bit data. These channels are filtered internally with a median value of 3 samples and then running average of last 4 readings. This will require approximately 400ms for an accurate reading on initial powerup. Thermocouple channels are shown in deg F x 10. For example, a read value of 1200 means 120°F is being read.

**NOTE:** These values are generally more desirable to use by a controller. Software filtering has been internally applied by the module and no additional filtering is necessary by the controller.

## Channel Type (400088 – 400105)

Registers 400088 – 400105 are read/write registers. This will allow you to configure what type of sensor is attached to each channel. \*Only odd-numbered channels may be configured as RTD type. When configured as RTD, the adjacent even-numbered channel is not available for use, and the type data will be ignored. Use the list below to determine what value you should write based on the sensor installed.

- 0 – Type J thermocouple
- 1 – Type K thermocouple
- 2 – 100Ω Pt 3-wire RTD
- 8 – \*Type J thermocouple with advanced (strict) wire fault detection enabled.
- 9 – \*Type K thermocouple with advanced (strict) wire fault detection enabled
- \*Applies to firmware version 3.1.10113 or higher.

## Channel Status (400141 – 400158)

Registers 400141 – 400158 are read-only registers. The values between 1-7 show channel status. The MX4-R2 can detect shorts to DC-, shorts to DC+ and open circuit for the thermocouple and RTD wiring.

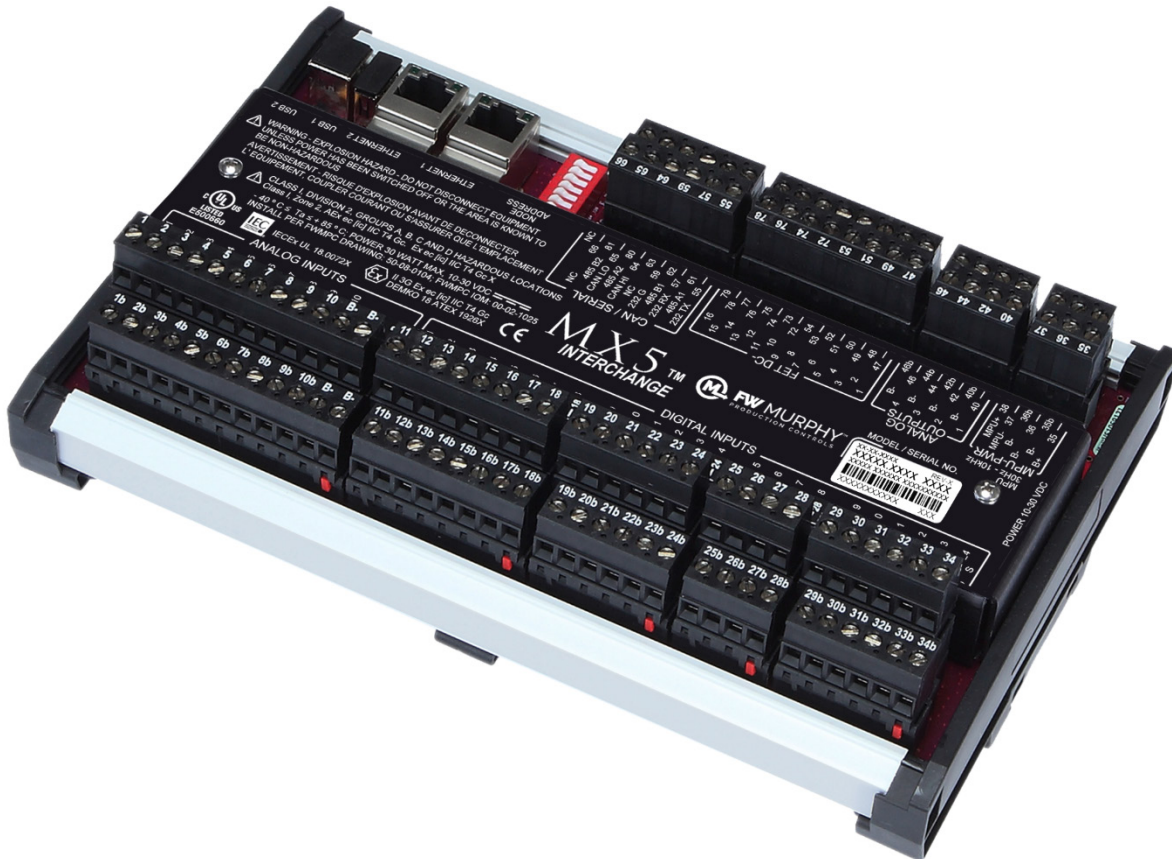
It also detects leaking current to DC- or DC+ which will start causing errors in readings. This is generally due to breakdown of insulation. As this condition worsens, the status may change to indicate a short.

## Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.



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# Interchange™ Comm Control Module MX5-R2 Series

## Installation and Operations Manual

For Models with Date Codes S8 or Higher

**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product.  
A copy of the warranty may be viewed or printed by going to <http://www.fwmurphy.com/warranty>



**BEFORE BEGINNING INSTALLATION OF THIS FW MURPHY  
PRODUCT:**

- Please read the following information before installing the MX5-R2 Module. This installation information is intended for MX5-R2 Module only.
- Visually inspect the product for any damage during shipping.
- Before proceeding please visit our website and review our support documentation including Wiring the Murphy Way [www.fwmurphy.com/uploaded/WIR\\_Murphy\\_Way.pdf](http://www.fwmurphy.com/uploaded/WIR_Murphy_Way.pdf)
- Disconnect all power and be sure machine is inoperative before beginning installation.
- Installation is to be done only by a qualified technician of the Responsible Body.
- Observe all Warnings and Cautions at each section in these instructions.
- Device shall be wired in accordance with NEC, CEC or other local code, as applicable.
- Please contact FW Murphy immediately if you have any questions.

**For Class I, Division 2:**

THIS EQUIPMENT IS AN OPEN-TYPE DEVICE AND IS MEANT TO BE INSTALLED IN AN ENCLOSURE SUITABLE FOR THE ENVIRONMENT SUCH THAT THE EQUIPMENT IS ONLY ACCESSIBLE WITH THE USE OF A TOOL.

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D OR NON-HAZARDOUS LOCATIONS ONLY.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN REMOVED OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

WARNING – EXPLOSION HAZARD – DO NOT REPLACE BATTERIES UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.

TEMPERATURE CODE OF T4 FOR ALL MODELS.

PROVIDES NONINCENDIVE FIELD WIRING OUTPUTS/INPUTS WHEN WIRED ACCORDING TO DRAWING 50-08-0104 (MX5-R2-X).

**For AEX/EX Class I, Zone 2:**

THE EQUIPMENT SHALL ONLY BE USED IN AN AREA OF POLLUTION DEGREE 2.

THE EQUIPMENT SHALL BE INSTALLED COMPLETELY WITHIN AN ENCLOSURE THAT PROVIDES A MINIMUM INGRESS PROTECTION OF IP 54 IN ACCORDANCE WITH UL60079-0 AND ONLY ACCESSIBLE BY THE USE OF A TOOL.

THE WIRE SIZE, TORQUE RATING OF 12-24 AWG, 0.37-0.44 ft. lbs.(0.4-0.5 Nm), AND SUITABLE SUPPLY WIRE TEMPERATURE RATING OF 97°C MINIMUM SHALL BE PROVIDED FOR THE INPUT POWER TERMINAL BLOCK.

ALL MARKING INFORMATION EXCEPT FOR SERIAL NUMBER/DATE CODES SHALL BE REPEATED.

PROVIDES NONINCENDIVE FIELD WIRING OUTPUTS/INPUTS WHEN WIRED ACCORDING TO DRAWING 50-08-0104 (MX5-R2-X).

**SPECIAL CONDITIONS FOR USE IECEx/ATEX Zone 2:**

THE EQUIPMENT SHALL ONLY BE USED IN AN AREA OF NOT MORE THAN POLLUTION DEGREE 2, AS DEFINED IN IEC/EN 60664-1.

THE EQUIPMENT SHALL BE INSTALLED IN AN ENCLOSURE THAT PROVIDES A DEGREE OF PROTECTION NOT LESS THAN IP 54 IN ACCORDANCE WITH IEC/EN 60079-0 AND ONLY ACCESSIBLE BY THE USE OF A TOOL.

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## FW Murphy Interchange Comm Control Module Series

The MX5-R2 expansion module provides input/output capability to the Centurion and future generations of FW Murphy Controllers using CAN proprietary communication with enhanced diagnostics. Two serial RS485 ports, an RS232 port and 2 Ethernet ports also provide communication methods to work with any Modbus RTU or TCP/IP client device. MX5-R2 is backward compatible to the MX5, MX5-A and MX5-D. Load Rockwell IO Application for EtherNet/IP (CIP) Protocol function.

### Accessories

#### MX5-R2 Plug Kit (00032657) Printed Terminal Plugs for MX5-R2 Expansion I/O Module

### Specifications

- Operating temperature: -40° to 185° F (-40° to 85° C)
- Power input: 16.5 W max 10-30 VDC
- 10\* Analog inputs:
  - 0-24 mA or 0 – 5 VDC, 15-bit hardware
  - 4 channels may be selected to read linear resistive sensor (3kΩ to 30kΩ selectable range )
- 24\* Digital inputs<sup>++</sup>:
  - NO or NC (active high/active low) intrinsically safe
  - Optically isolated with LED indicators
  - Polarity sense / wire fault detection on normally closed systems
  - Approved for use with general purpose switches in hazardous areas
- One magnetic pickup input\*:
  - 30 to 10 kHz
- 16 Digital outputs<sup>++</sup>:
  - LED indicators
  - FET (sink)
- 4 Analog outputs:
  - 4-20 mA, 16-bit hardware
- 6 Communication ports
  - Two SERIAL RS485:
    - Protocol: Modbus RTU (server)
  - One SERIAL RS232:
    - Protocol: Modbus RTU (server)
  - One CAN:
    - Protocol: Proprietary for FW Murphy hardware
  - Two Ethernet 10/100 (DLR), Single MAC ID:
    - Protocol: Modbus TCP/IP (server) standard or EtherNet/IP (CIP) in Rockwell IO Application Mode
- Third-party approvals for MX5-R2:
  - Class I, Div 2, Grps A, B, C, D Haz. Loc. T4
  - Class I, Zone 2, AEx ec [ic] IIC T4 Gc  
Ex ec [ic] IIC T4 Gc X
  - ATEX Zone 2:
    -  II 3G Ex ec [ic] IIC T4 Gc
    - DEMKO 18 ATEX 1926X
      - -40°C ≤ Tamb ≤ +85°C
  - IECEx Zone 2:
    - Ex ec [ic] IIC T4 Gc X
    - IECEx UL 18.0072X
      - -40°C ≤ Tamb ≤ +85°C

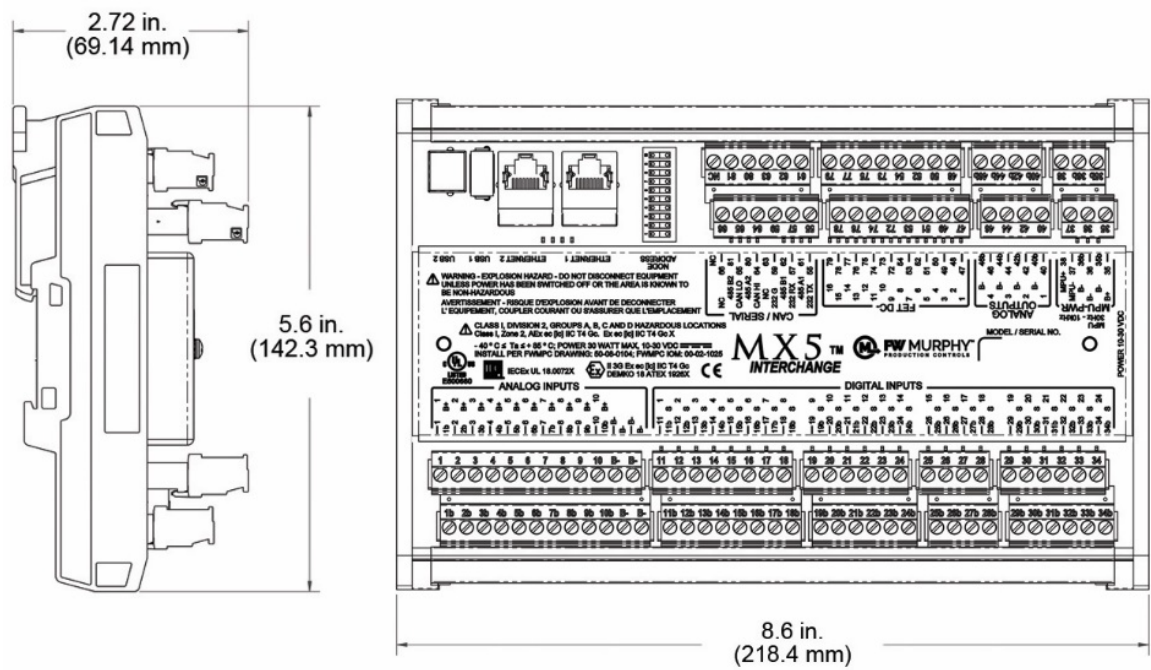
\* Non-incendive. (Digital Inputs and Analog Inputs are intrinsically safe and non-incendive.)

<sup>++</sup> Applies only to Centurion™ Custom and Rockwell Automation® Processor Configurations.



# Installation

## Dimensions



## Install MX5-R2 Module

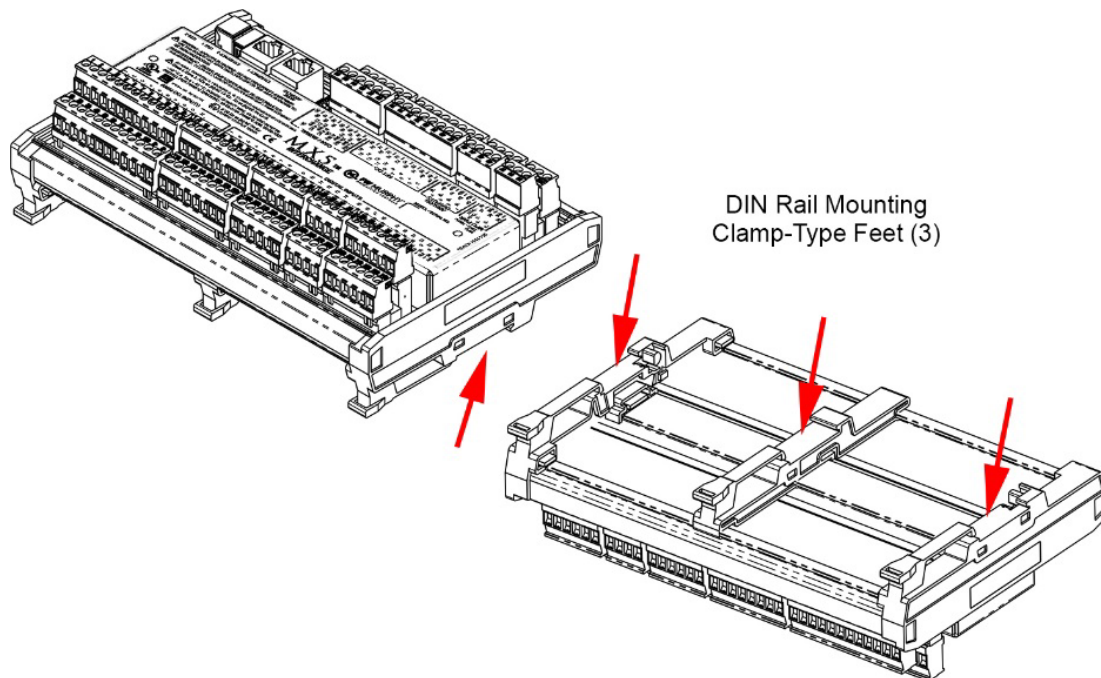
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The MX5-R2 must be mounted in an enclosure meeting the requirements of IP54 or greater according to the intended use and environmental conditions in accordance with standard UL and only accessible by use of a tool.

**NOTE:** IP requirement is ONLY for North America and IECEx/ATEX Zones UL 60079, IEC/EN 60079-0.

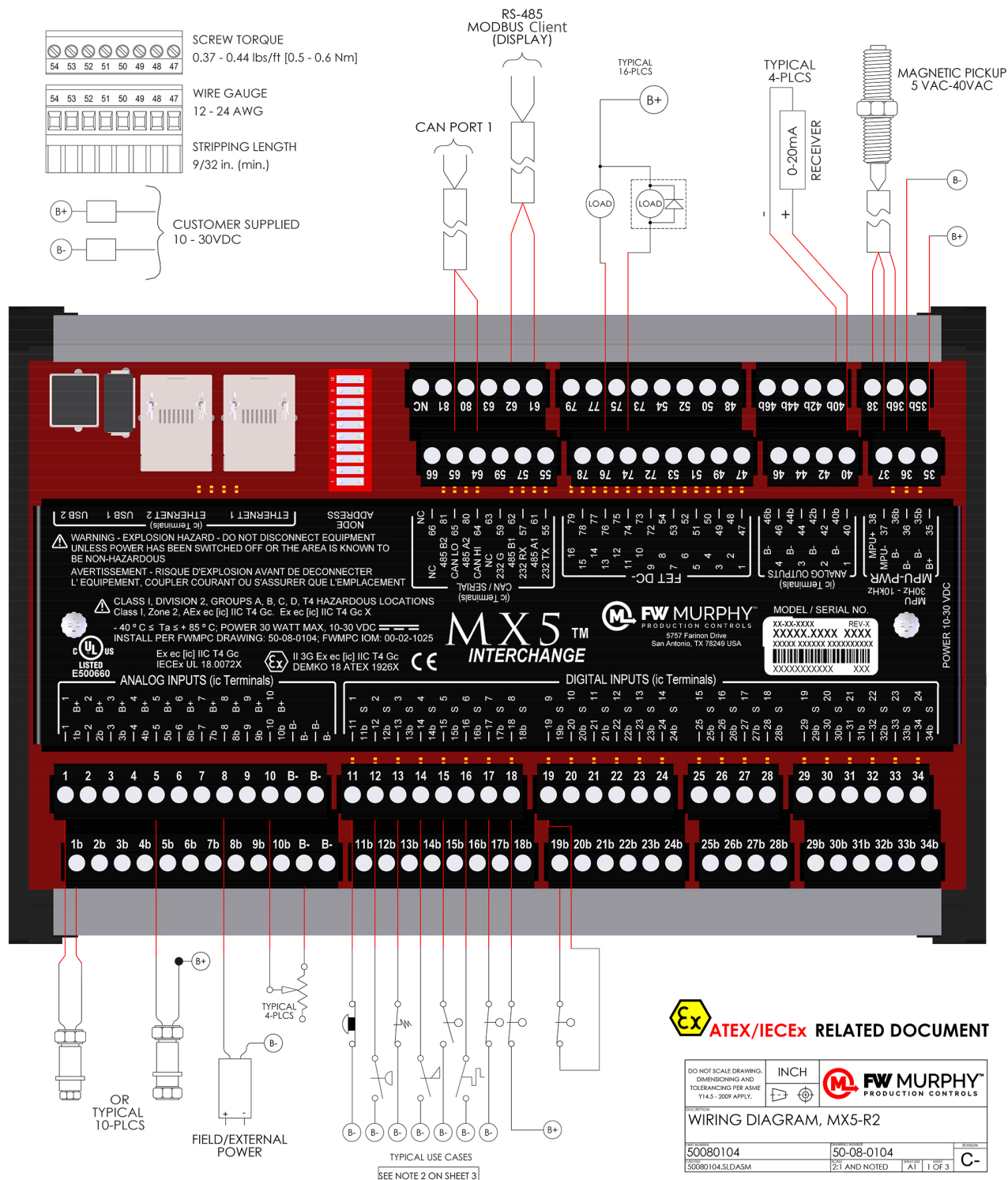
- Operating Temperature -40° to 185° F (-40° C to +85° C)
- Pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar)
- Air with normal oxygen content, typically 21% v/v
- Temperature Class T4
- “ic”: intrinsic safety (for EPL Gc)
- Increased safety (for EPL Gc)

The MX5-R2 can be mounted vertically or horizontally on a standard DIN rail. Three clamp-type feet along the bottom of the controller attach to the DIN rail; however, rail stops are recommended to prevent sliding.



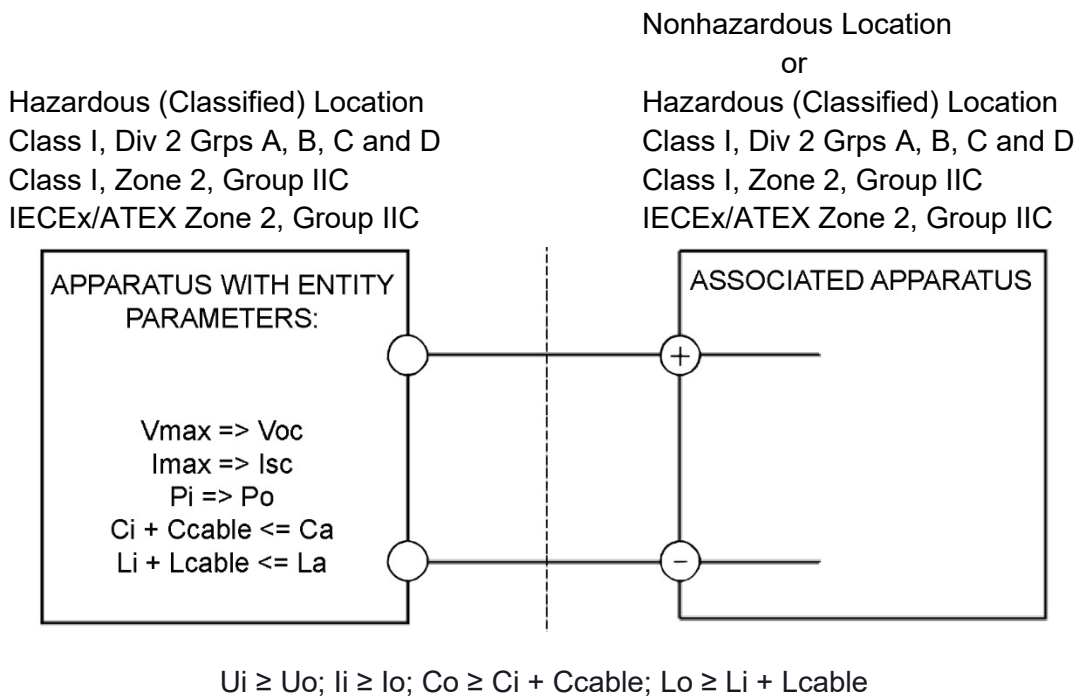
# Wire Connections

## Wire Diagram — MX5-R2 Module



## Entity Parameters

1. The output current of this associated apparatus is limited by a resistor such that the output voltage-current plot is a straight line drawn between open-circuit voltage and short-circuit current. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of  $V_{oc}$  (or  $U_o$ ) and  $I_{sc}$  (or  $I_o$ ) for the associated apparatus are less than or equal to  $V_{max}$  ( $U_i$ ) and  $I_{max}$  ( $I_i$ ) for the intrinsically safe apparatus. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations. Cable capacitance,  $C_{cable}$ , plus intrinsically safe equipment capacitance,  $C_i$  must be less than the marked capacitance,  $C_a$  (or  $C_o$ ), shown on any associated apparatus used. The same applies for inductance ( $L_{cable}$ ,  $L_i$  and  $L_a$  or  $L_o$ , respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used:  $C_{cable} = 60 \text{ pF/ft.}$ ,  $L_{cable} = 0.2 \text{ } \mu\text{H/ft.}$



2. This associated apparatus may also be connected to non-incendive or simple apparatus as defined in Article 504.2 and installed and temperature classified in accordance with Article 504.10 (B) of the National Electrical Code (ANSI/NFPA 70) or other local codes, as applicable. Examples of “simple apparatus” are general-purpose contact/switch, thermocouples and RTD.
3. For Intrinsically Safe devices selected associated apparatus must be third-party listed as providing intrinsically safe circuits for the application or have  $V_{oc}$  or  $V_t$  not exceeding  $V_{max}$  (or  $U_o$  not exceeding  $U_i$ ),  $I_{sc}$  or  $I_t$  not exceeding  $I_{max}$  (or  $I_o$  not exceeding  $I_i$ ), and the  $P_o$  of the associated apparatus must be less than or equal to the  $P_{max}$  or  $P_i$  of the intrinsically safe equipment. Examples of “simple apparatus” are general-purpose contact/switch, thermocouples and RTD.

4. Where multiple circuits extend from the same piece of associated apparatus, they must be installed in separate cables or in one cable having suitable insulation. Refer to Article 504.30 (B) of the National Electrical Code (ANSI/NFPA 70) and Instrument Society of America Recommended Practice ISA RP12.6 for installing intrinsically safe equipment.
5. Intrinsically safe circuits must be wired and separated in accordance with Article 504.20 of the National Electrical Code (ANSI/NFPA 70) or other local codes, as applicable.
6. This associated apparatus has not been evaluated for use in combination with another associated apparatus.
7. Control equipment must not use or generate more than 250 V rms or dc with respect to earth.
8. For installations in which both the Ci and Li of the intrinsically safe apparatus exceeds 1% of the Co and Lo parameters of the associated apparatus (excluding the cable), then 50% of Co and Lo parameters are applicable and shall not be exceeded.



**WARNING:**

EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON DANGEREUX.

Analog Inputs (Per Pin)										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[H]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J1 AI1-AI6 Pins 1-6	-	-	-	-	-	10.3	51.6	-	0	0.1
J1 AI7-AI10 Pins 7-10	4.4	1.0	-	80	995.1	10.3	51.6	-	0.022	4.9
J1 AB+ Pins 1b-10b	-	-	-	-	-	-	-	-	-	-
DC-	Ground Pin									

Digital Inputs (Per Pin)										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[H]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J2-J5 DI1-DI24 Pins 11-34	30	5.2	-	2.95	0.120	30	17	-	0	0.1
J2-J5 B+1 to B+32 Pins 11b-34b	30	12.66	-	0.500	0.120	-	-	-	0	0.1

Analog Outputs (Per Pin)										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J7 Pins 40,42,44,46	30	38.5	-	54	0.120	-	-	-	0	0.1
J7 Pins 40b,42b,44b,46b	Analog Output Ground									

RS485/RS232/CAN										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J9 RS485 Pins 61, 62, 80, 81	±5.0	±60	-	22.2	999.9	±12.0	±60	-	0	0.01
J9 RS485 Pin 63	Shield Connection Ground									
J9 RS232 Pin 59	Shield Reference Ground									
J9 RS232 Transmit/Receive Pins 55,57	±15.0	±60	-	22.2	2.99	±30	±60	-	0	0.001
J9 CAN Pins 64, 65	±4.5	±5	-	3.2	999.9	±24	100	-	0	0.000267
J9 CAN Pin 66	Shield Connection Ground									

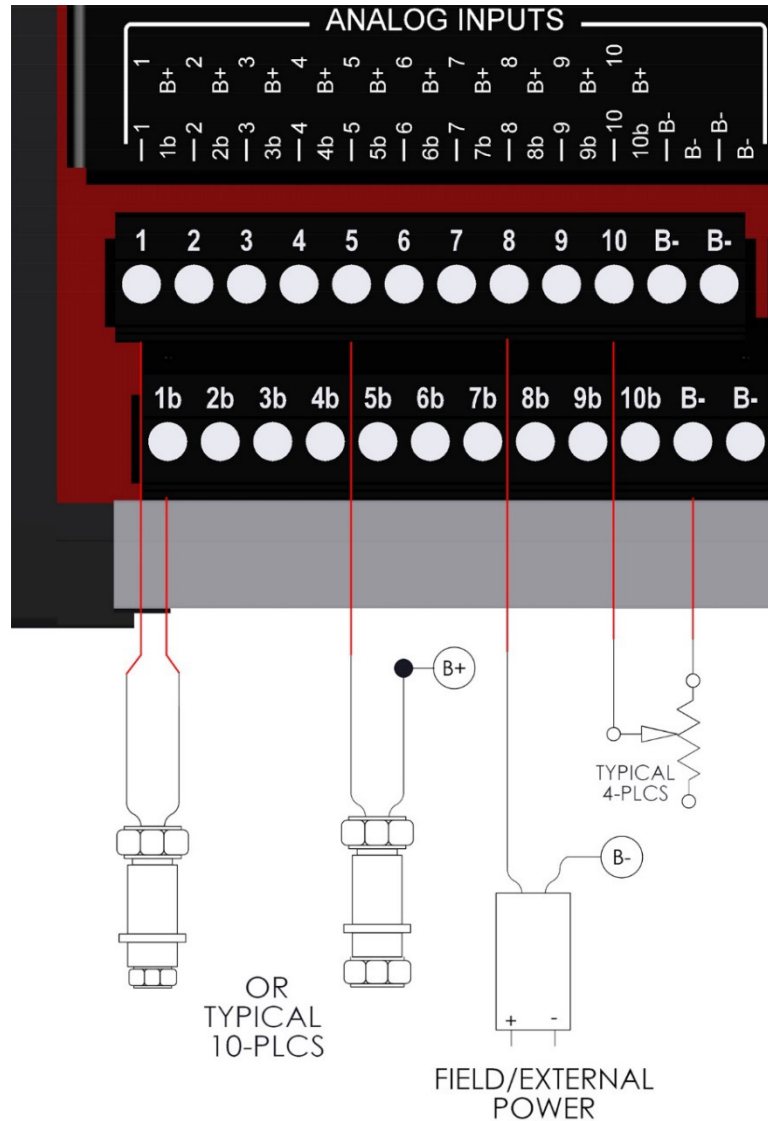
USB										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J10 Type A	±5.19	±25	-	128	889.9	±5	±500	-	0	110.2
J11 Type B	3.3	±25	-	128	999.8	±5	±500	-	0	0.200

Ethernet Per Port										
Designation	Uo[V]	Io[mA]	Po[mW]	Lo[mH]	Co[uF]	Ui[V]	Ii[mA]	Pi[mW]	Li[mH]	Ci[uF]
J12-J13	3.3	±61.5	-	21.2	999.9	3.3	±60	-	0	0.1

## Analog Inputs (Pins 1 – 10b)

The MX5-R2 is equipped with 10 analog inputs marked 1 through 10b. Analog inputs 7 through 10 may be optionally set to read a linear resistive device up to 5k $\Omega$ .

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

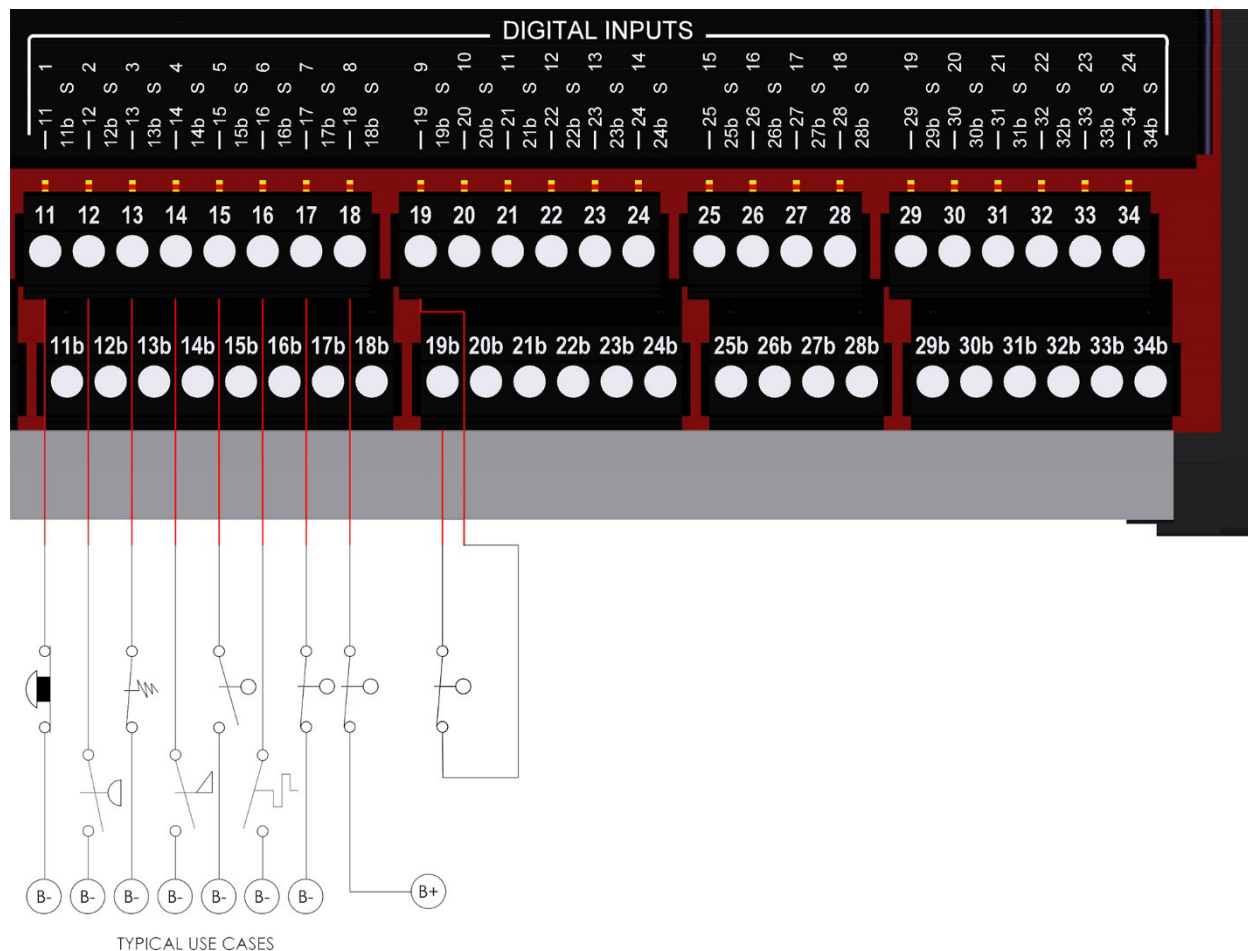
Devices that are self-powered 4-wire devices, such as flowmeters and VFD drives, do not receive power from the panel and offer a pure current loop.



## Digital Inputs (Pins 11 – 34b)

The MX5-R2 is equipped with 24 digital inputs marked 11 through 34 for the input and 11b through 34b for ic protected power to loop through the external switch back to the input. Alternately the external switch may use B+ or B- to activate the digital input. An LED lights when the digital input is active.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



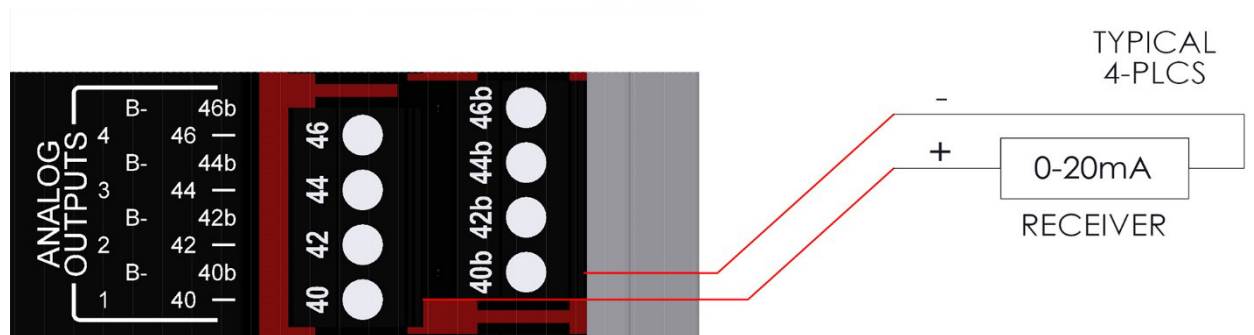
**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.



## Analog Outputs (Pins 40 – 46b)

The MX5-R2 is equipped with four 2-wire current transmitters for controlling various processes. The supply voltage and measuring currents are supplied by the MX5-R2 over the same two wires. These transmitters are used to convert various process signals representing flow, speed, position, level, temperature, pressure, etc., to 4-20mA DC for the purpose of transmitting the signal over some distance with little or no loss of signal.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



NOTE: The MX5-R2 provides all operating power (~B+) to the transmitter and receiver and any other loop components.

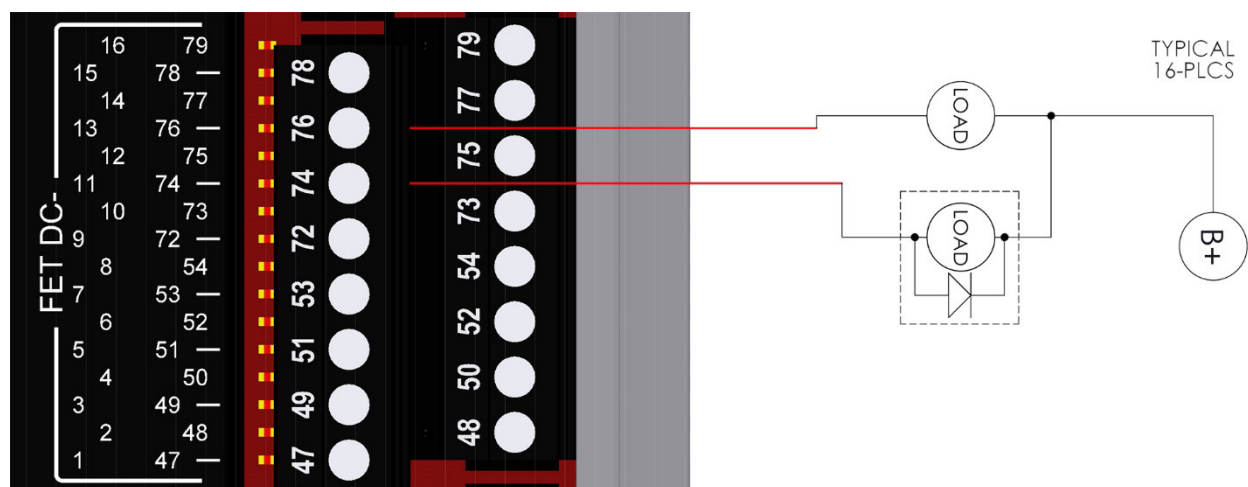
An important aspect of building a current loop system is avoiding ground loops by wiring the return signal to the associate B- terminal.

These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## FET DC- (Pins 47 – 79b)

The MX5-R2 is equipped with 16 Low Side 250 mA max Switches. The LED lights when the switch is active.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** If an inductive load does not have an internal flyback diode, it is recommend you install a 1A 600V PIV diode in parallel with the load. (1N4005 – EC P/N 36-16-1002)

To ground ignition, use pilot relay with 25  $\Omega$  3 W series resistor to ground.

Interposing relays are recommended to interface with end devices that require high current ratings or alternative voltage supplies.

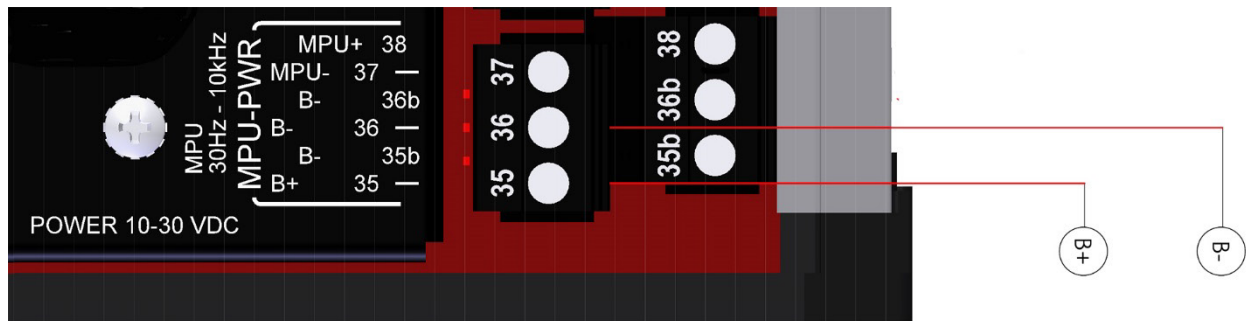
Consult General Cautions for Solid-State Devices for best practices when connecting to external inductive load devices such as relays or solenoids.

[www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices](http://www.fwmurphy.com/other-support-resources/general-cautions-solid-state-devices)

## Power (Pins 35 – 36)

The 10-30 VDC power for the MX5-R2 is applied to the power supply terminals marked 35 B+ and 36 B-. An external 10 amp replaceable fuse protects the system from over-currents. The power LED lights when power is applied to the system.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



NOTE: Run power directly from battery posts to controller power terminals when battery is the power supply.

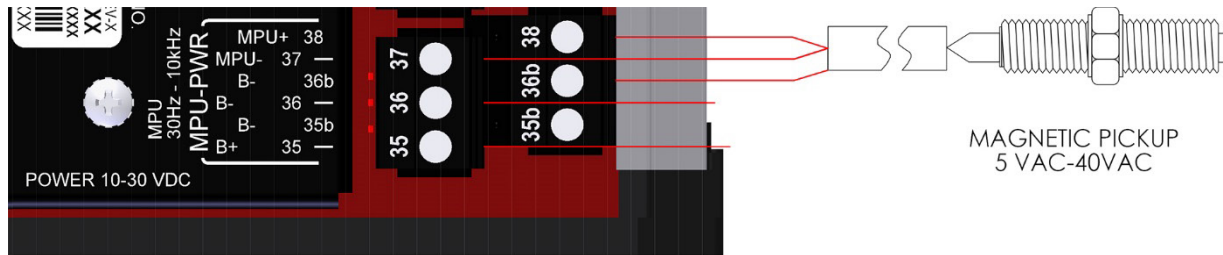
Maximum power ratings based on all I/O operating in the ON position with 10V supply. Typical based on 24V supply.

## Magnetic Pickup, MPU (Pins 36 – 38)

The MPU for the MX5-R2 is applied to the magnetic pickup terminals marked 37 MPU- and 38 MPU+, MPU 5-40 Vrms 30-10 kHz. If used, the foil shield and drain wire of the cable assembly may be terminated at 35b- or 36b-. The MPU sends the pulses to the controller, which calculates the engine speed.

FW Murphy recommends using 00031022 Magnetic Pickup 4 in. Length and 00031023 Magnetic Pickup Cable 50 ft.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** The MPU input requires a minimum signal of 2 Vrms when connected.

## RS485 (Pins 60 – 62, 80 – 81)

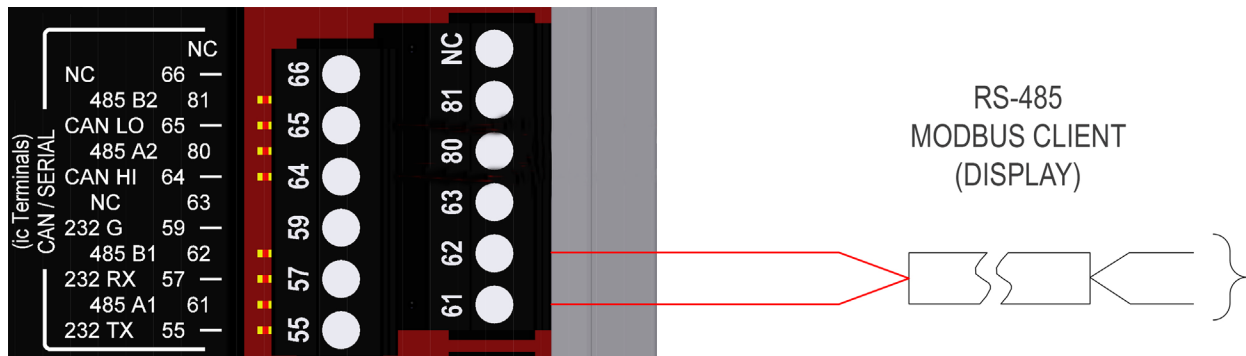
The MX5-R2 is equipped with two RS485 communications ports.

RS485 1 uses 61 A1 / 62 B1.

RS485 2 used 80 A2 / 81 B2.

The TX LED lights when the port is transmitting. The RX LED lights when the port is receiving.

**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** A is the non-inverting pin and should have a single pull-up physically placed anywhere on the network. B is the inverting pin and should have a single pull-down physically placed anywhere on the network.

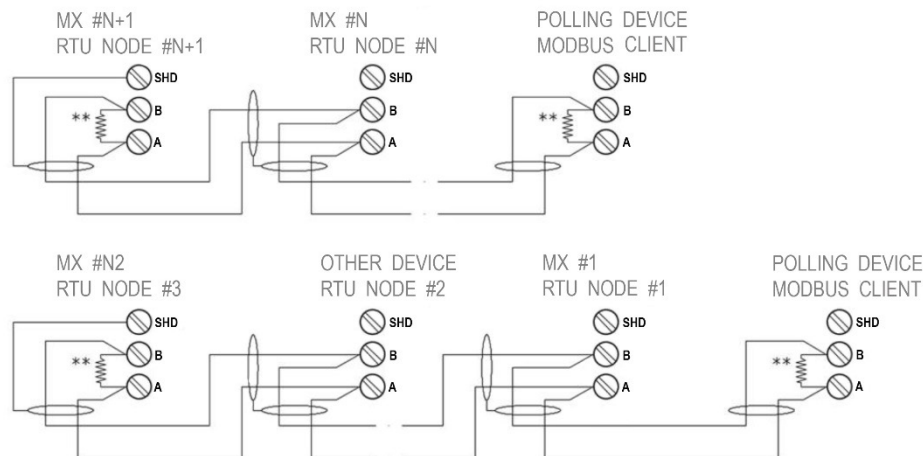
These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

Consult RS-485 the Murphy Way for information on best practices for connecting and communicating on RS-485.

[www.fwmurphy.com/uploaded/documents/pdfs/rs-485murphyway.pdf](http://www.fwmurphy.com/uploaded/documents/pdfs/rs-485murphyway.pdf)

The recommended arrangement of the wires is as a connected series of point-to-point (multidropped) nodes, i.e. a line or bus, not a star, ring or multiply connected network.

## RS-485 Typical Connections



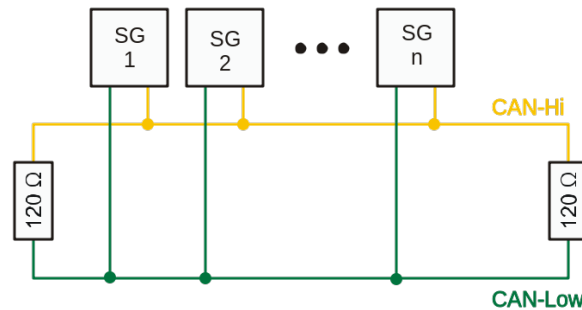
\*\* USE EIA RS485 SHIELDED, TWISTED PAIR, 120 OHMS CHARACTERISTIC IMPEDANCE.  
 INSTALL 120 OHMS TERMINATING RESISTOR ON FIRST AND LAST NODE ON RS-485 NETWORK.  
 ALL RS-485 DEVICES MUST SHARE DC COMMON GROUND.

## CAN (Pins 64 – 65)

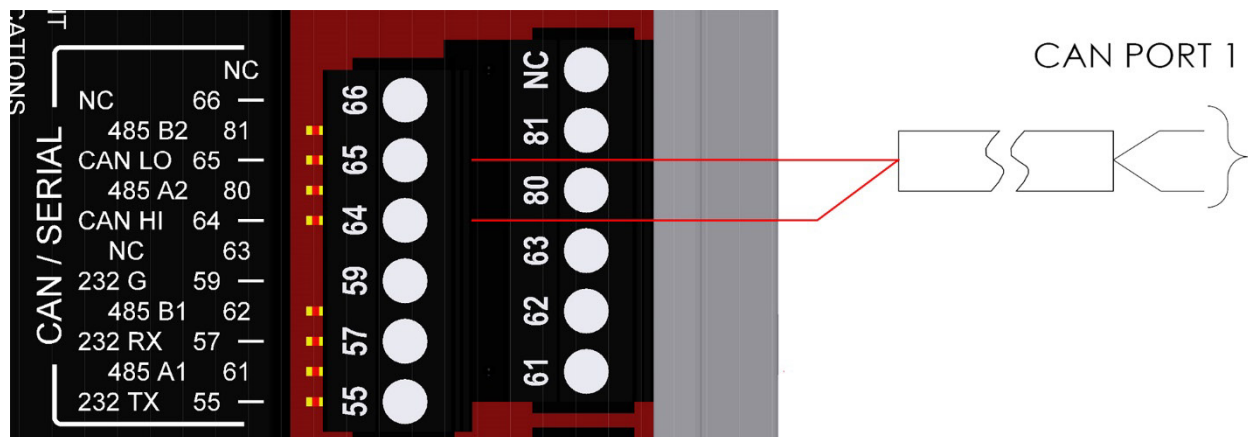
The MX5-R2 is equipped with one CAN communication port. The port is marked pin 64 CAN HI and pin 65 CAN LOW.

The LED lights when the port is active transmitting and when the port is active receiving.

The recommended arrangement of the wires is as a connected series of point-to-point (multidropped) nodes, i.e. a line or bus, not a star, ring or multiply connected network. It is recommended to use CAN-Bus Cable J1939/11 SAE Shielded, twisted pair with 120  $\Omega$  characteristic impedance. Install a 120  $\Omega$  terminating resistor (software selectable on the MX5-R2) on the physical first and last node of the CAN network. All nodes must share a common DC ground.



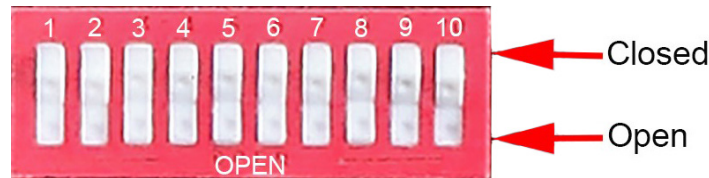
**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.



**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## DIP Switch Configuration

Set these switches to the open or closed position for your application.



Node Address:

- **DIP1-8:** These switches allow you to assign a unique address to each MX5-R2 that may be in the system using either Modbus or CAN communication. This allows the client controller to differentiate between the modules. Addressing is done in binary format, with each switch increasing value by factor of 2. For example, to name the controller address 5, set switch DIP1 and DIP4 to the CLOSED position. Valid settings are from 1 to 239. Addresses 240 thru 255 are for power-up functions only as detailed below.
- **DIP Power-up Functions:** There is a special feature for switching module operation mode that is activated by setting specific switch positions at power up. Change will only occur if the following switches are set CLOSED at power up. All other times, these switches behave as address selections.
  - DIP switches 5-8 CLOSED at power up activates special mode to change the module behavior based on switches 1-4 position.



5-8 CLOSED

- 1-4 CLOSED: Load factory defaults to non-volatile settings – restores serial baud rate, Ethernet address and channel configurations to default values.
- 1 OPEN, 2-4 CLOSED: Load Rockwell IO Application.
- 2 OPEN, 1, 3, 4 CLOSED: Load Standard IO Application.



1-4 CLOSED



1 OPEN, 2-4 CLOSED



2 OPEN, 1, 3, 4 CLOSED

- **Stop Bits:** For addresses < 31, the RS485 port will use 1 stop bit. For addresses > 31, the RS485 port will use 2 stop bits.



### CAN Termination:

- **DIP9:** This switch provides a 120Ω termination resistor for the CAN communication chain. CAN must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation.

### RS485-1 Termination:

- **DIP10:** This switch provides a 120Ω termination resistor for the RS485-1 communication chain. RS485 must be wired in a daisy chain configuration. Set this switch to CLOSED only when the module is the end of the network. See control panel drawings for designation.

## Ethernet

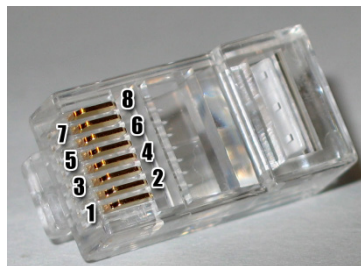
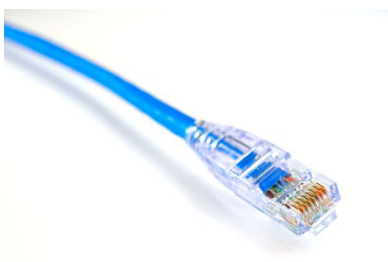
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The MX5-R2 is equipped with two Ethernet communication ports. The ports are marked ETHERNET 1 and ETHERNET 2. An LED flashes when the port is active — transmitting or receiving a message, and an LED lights to indicate the link is active when connected to another device. LED closest to the DIP switch illuminates for 100Mbit connections. LED furthest from the DIP switch illuminates for 10Mbit connections.



**WARNING:** Explosion hazard – Do not disconnect the Ethernet port unless the power has been switched off or the area is known to be non-hazardous.

Below is an 8P8C modular connector (often called RJ45) commonly used on Cat 5 cables in Ethernet networks.



Twisted-pair Ethernet standards are such that the majority of cables can be wired "straight-through" (pin 1 to pin 1, pin 2 to pin 2 and so on), but others may need to be wired in the "crossover" form (receive to transmit and transmit to receive). The MX5-R2 can automatically detect another computer connected with a straight-through cable and then automatically introduce the required crossover, if needed with no intervention by the installer. 10BASE-T and 100BASE-TX only require two pairs (pins 1-2, 3-6) to operate. Since Category 5 cable has four pairs, the spare pairs (pins 4-5, 7-8) in 10- and 100-Mbit/s configurations are not used.

**TIA/EIA-568 T568A termination**

Pin	Pair	Wire	Color
1	3	tip	 white/green
2	3	ring	 green
3	2	tip	 white/orange
4	1	ring	 blue
5	1	tip	 white/blue
6	2	ring	 orange
7	4	tip	 white/brown
8	4	ring	 brown

**TIA/EIA-568 T568B termination**

Pin	Pair	Wire	Color
1	2	tip	 white/orange
2	2	ring	 orange
3	3	tip	 white/green
4	1	ring	 blue
5	1	tip	 white/blue
6	3	ring	 green
7	4	tip	 white/brown
8	4	ring	 brown

The MX5-R2 uses autonegotiation, an Ethernet procedure by which two connected devices choose common transmission parameters, such as speed, duplex mode and flow control. In this process, the connected devices first share their capabilities regarding these parameters and then choose the highest performance transmission mode they both support. The MX5-R2 supports 10 and 100 Mbit/s over two-pair Cat5 or better cable.

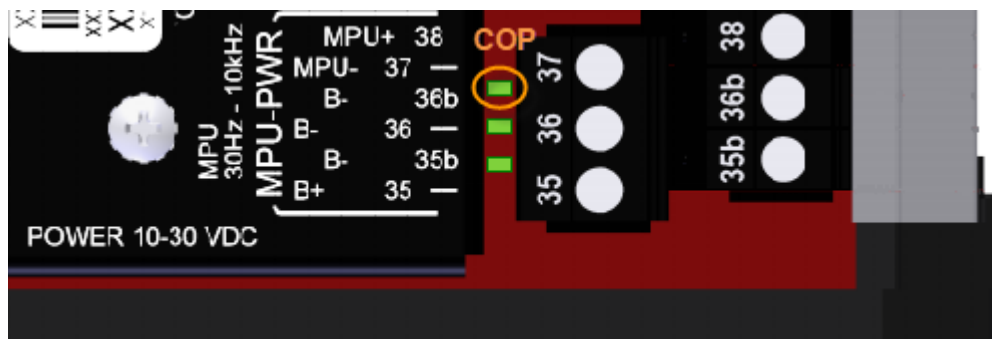
**Important:** For Entity Parameters or Power Supply and Grounding, refer to Wire Connections.

**NOTE:** These circuits are not required to be in conduit if all the requirements for ic protection are met and Authority Having Jurisdiction (AHJ) allows.

## Controller Operating Properly (COP) LED Codes

Blink codes will be 2 digits separated by pauses with each blink code further separated by a rapid blink event.

- Blink codes will be  $\frac{1}{4}$  second ON and  $\frac{1}{4}$  second OFF.
- Pauses will be  $\frac{3}{4}$  second OFF.
- The separator will be a 2 1/2 seconds pause.



Blink Codes *	Code Description
1, 1	Startup Error
4, 1	Rockwell Automation IO Application Mode
4, 2	Standard IO Application Mode
4, 3	Custom Application Mode
* There will be a $\frac{3}{4}$ second pause between the digits.	

**NOTE:** A fast flash (100ms on/off) = Running in bootloader mode. Bootloader is the mode used for switching applications or module reprogramming via external CAN tools.

## Communications For Standard IO Applications (default)

**Physical Layer:** The MX5-R2 module features two Ethernet ports, two RS485 serial communication ports, one RS232 serial port, and one CAN bus 2.0B communication port.

**Ethernet Interconnect:** Two RJ45 jacks with single MAC ID. This connection may require setting the IP address of the module to the desired network configuration. Ethernet port settings can be changed by modifying Modbus registers. Default setting is 192.168.0.100 IP, 255.255.255.0 network mask, 0.0.0.0 Gateway.

**Ethernet Protocol:** Modbus TCP/IP server. Refer to the Modbus RTU map provided in this manual for a detailed mapping of the available data and data scaling.

**Serial RS485 Interconnects:** Screw terminals. Typically this connection uses twisted shielded pair cable with 120 ohm impedance. RS485 networks are 2-wire, half-duplex, and feature an “A” terminal 61/62, and “B” terminal 80/81. The A terminal is the + or non-inverting signal, and the B terminal is the – or inverting signal. These signal lines will take turns transmitting and receiving depending on the device using the RS485 network at any given instant.

**Serial Baud Rate:** default 9600, adjustable up to 115.2k

**Serial Stop Bits:** The module will respond with 1 stop bit for Modbus RTU addresses 1 through 31 and 2 stop bits for addresses 32 through 239. This maintains flexibility for systems requiring 2 stop bits.

**Serial Protocol:** Modbus RTU server. The module may be polled by the Modbus RTU Client at without any additional timing delays and response times will be < 100mS. This may vary depending on the amount of data requested. Modbus RTU timeout settings should be set to >= 400mS.

Refer to the Modbus RTU map provided in this manual for a detailed mapping of the available data and data scaling.

**CAN bus Interconnect:** Screw terminals. Typically this connection uses twisted pair cable with 120 ohm impedance to connect to a FW Murphy Controller. CAN bus networks are 2-wire, with a “HI” terminal 64, and “LOW” terminal 65.

**CAN bus Baud Rate:** 250kbit/500kbit/1000kbit auto sense.

**CAN bus Protocol:** Proprietary for FW Murphy Controllers.

**PC Connection:** Reading data from the module into a PC may be done with an Ethernet connection and Modbus TCP/IP client software or serial RS485 or RS232 connection and Modbus RTU client software. A serial interface converter that can convert USB to RS485 would be needed for a RS485 serial connection. (FW Murphy MConfig™ Software and P/N 53702325 may be used for this purpose)

## Communications For Rockwell Automation IO Mode

**Physical Layer:** The MX5-R2 module features two Ethernet ports.

**Ethernet Interconnect:** Two RJ45 jacks with Single MAC ID. This connection may require setting the IP address of the module to the desired network configuration. Ethernet port settings can be changed by modifying Modbus registers. Default setting is 192.168.0.100 IP, 255.255.255.0 network mask, 0.0.0.0 Gateway.

**Ethernet Protocol:** CIP for use with Rockwell Automation IO.

## Modbus Holding Register Description (Standard IO Application Mode)

All data will be contained in 16-bit Modbus Holding Registers. Following the Modbus RTU and Modbus TCP/IP specification, the Most Significant Byte in a 16-bit word is broadcast first, followed by the Least Significant Byte. The module responds to Modbus Function Code 03 (Read Holding Registers), Function Code 06 (Preset Single Holding Register), and Function Code 16 (Preset Multiple Holding Register). Polling invalid/non-existent data will result in Modbus Exception Code response from the module.

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400001	Hardware Type	R	33	ID	Module name
400002 – 400004	Factory Use	R			
400005	Bootloader Build Version	R	0 – 65535		Version number
400006	Not Used	R			
400007	Firmware Number	R	0 – 65535		Version number
400008	Firmware Build Version	R	0 – 65535		Version number
400009	Firmware Checksum MSW	R	0 – 65535		
400010	Firmware Checksum LSW	R	0 – 65535		
400011	Firmware Major Version	R	0 – 65535		Version number
400012	Firmware Minor Version	R	0 – 65535		Version number
400013	Bootloader Major Version	R	0 – 65535		Version number
400014	Bootloader Minor Version	R	0 – 65535		Version number
400021	Digital Input 1-16 Boolean Status	R	0 - 65535	Bitmap	0=Open, 1=Closed Bit 0 = DI1, Bit 15= DI16
400022	Digital Input 17-24 Boolean Status	R	0 – 255	Bitmap	0=Open, 1=Closed Bit 0 = DI17, Bit 7= DI24
400023	System Voltage	R	0 - 65535	Vdc x10	0 = 0.0 VDC, 320 = 32.0 VDC
400024	Analog input 1	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA
400025	Analog input 2	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA
400026	Analog input 3	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA
400027	Analog input 4	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA
400028	Analog input 5	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA
400029	Analog input 6	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA
400030	Analog input 7	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA 0 = 0%, 19660 ≈ 100% resistance range
400031	Analog input 8	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA 0 = 0%, 19660 ≈ 100% resistance range
400032	Analog input 9	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
					0 = 0mA, 32768 = 25mA 0 = 0%, 19660 ≈ 100% resistance range
400033	Analog input 10	R	0 – 32768	A/D count	0 = 0Vdc, 32768 = 5Vdc 0 = 0mA, 32768 = 25mA 0 = 0%, 19660 ≈ 100% resistance range
400034-400037	Not used				
400038	Frequency input	R	0 – 10,000	Hz	
400039-400046	Not used				
400047	Analog output 1 signal	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400048	Analog output 2 signal	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400049	Analog output 3 signal	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400050	Analog output 4 signal	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400051-400052	Factory Use-Legacy AO range	R/W			
400053	RTC Time - seconds	R/W	0 - 59	Seconds	
400054	RTC Time - minutes	R/W	0 - 59	Minutes	
400055	RTC Time - hours	R/W	0 - 23	Hours	
400056	RTC Day of week	R/W	1 - 7	Day Of Week	
400057	RTC Date - day	R/W	1 - 31	Day	
400058	RTC Date - month	R/W	1 - 12	Month	
400059	RTC Date - year	R/W	2000 - 3000	Year	
400060	Clock set enable	R/W	0 - 1	Enable/Disable	1 = set above values into the real-time clock
400061	Digital outputs 1-16	R/W	0 - 65535	Bitmap	Bit 0 = DO1, Bit 15 = DO16
400062	Not Used	R			
400063	Digital output 1-16 status on power-up	R/W	0 - 65535	Bitmap	Bit 0 = DO1, Bit 15 = DO16
400064	Digital output 1-16 status on comm. failure	R/W	0 - 65535	Bitmap	Bit 0 = DO1, Bit 15 = DO16
400065	Analog output 1 status on power-up	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400066	Analog output 2 status on power-up	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400067	Analog output 3 status on power-up	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400068	Analog output 4 status on power-up	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400069	Analog output 1 status on comm. failure	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400070	Analog output 2 status on comm. failure	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400071	Analog output 3 status on comm. failure	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400072	Analog output 4 status on comm. failure	R/W	0 - 65535	D/A count	0=0mA, 65535=24mA 4mA=10485 20mA=52428
400073	Communication timeout	R/W	0 – 65535	Seconds	Lost comm for this duration will revert outputs to comm fail configuration
400074	Analog input 1 type	R/W	0 - 1	mA enable	0 = 0-5VDC , 1=0-25mA

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
400075	Analog input 2 type	R/W	0 -1	mA enable	0 = 0-5VDC , 1=0-25mA
400076	Analog input 3 type	R/W	0 -1	mA enable	0 = 0-5VDC , 1=0-25mA
400077	Analog input 4 type	R/W	0 -1	mA enable	0 = 0-5VDC , 1=0-25mA
400078	Analog input 5 type	R/W	0 -1	mA enable	0 = 0-5VDC , 1=0-25mA
400079	Analog input 6 type	R/W	0 -1	mA enable	0 = 0-5VDC , 1=0-25mA,
400080	Analog input 7 type	R/W	0 -2	mA enable	0 = 0-5VDC , 1=0-25mA, 2=5k $\Omega$ Resistive, *3=3k $\Omega$ Resistive, *4=10k $\Omega$ Resistive, *5=30k $\Omega$ Resistive,
400081	Analog input 8 type	R/W	0 -2	mA enable	0 = 0-5VDC , 1=0-25mA, 2=5k $\Omega$ Resistive, *3=3k $\Omega$ Resistive, *4=10k $\Omega$ Resistive, *5=30k $\Omega$ Resistive,
400082	Analog input 9 type	R/W	0 -2	mA enable	0 = 0-5VDC , 1=0-25mA, 2=5k $\Omega$ Resistive, *3=3k $\Omega$ Resistive, *4=10k $\Omega$ Resistive, *5=30k $\Omega$ Resistive,
400083	Analog input 10 type	R/W	0 -2	mA enable	0 = 0-5VDC , 1=0-25mA, 2=5k $\Omega$ Resistive, *3=3k $\Omega$ Resistive, *4=10k $\Omega$ Resistive, *5=30k $\Omega$ Resistive,
400084	Factory use	R/W	1/3		
400085	Serial port baud rate	R/W	1-5	Enumeration	1=9600, 2=19.2k, 3=38.4k, 4=57.6k, 5=115.2k
400086	Digital Input 1-2 Polarity	R	0 - 65565	2 bytes	MSB = DI1,LSB =DI2 0 = Closed DC- 1 = Closed DC+ 2 = Open
400087	Digital Input 3-4 Polarity	R	0 - 65565	2 bytes	MSB = DI3,LSB =DI4 0 = Closed DC- 1 = Closed DC+ 2 = Open
400088	Digital Input 5-6 Polarity	R	0 - 65565	2 bytes	MSB = DI5,LSB =DI6 0 = Closed DC- 1 = Closed DC+ 2 = Open
400089	Digital Input 7-8 Polarity	R	0 - 65565	2 bytes	MSB = DI7,LSB =DI8 0 = Closed DC- 1 = Closed DC+ 2 = Open
400090	Digital Input 9-10 Polarity	R	0 - 65565	2 bytes	MSB = DI1,LSB =DI2 0 = Closed DC- 1 = Closed DC+ 2 = Open
400091	Digital Input 11-12 Polarity	R	0 - 65565	2 bytes	MSB = DI3,LSB =DI4 0 = Closed DC- 1 = Closed DC+ 2 = Open
400092	Digital Input 13-14 Polarity	R	0 - 65565	2 bytes	MSB = DI5,LSB =DI6 0 = Closed DC- 1 = Closed DC+ 2 = Open
400093	Digital Input 15-16 Polarity	R	0 - 65565	2 bytes	MSB = DI7,LSB =DI8 0 = Closed DC-



Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
					1 = Closed DC+ 2 = Open
400094	Digital Input 17-18 Polarity	R	0 - 65565	2 bytes	MSB = DI1,LSB =DI2 0 = Closed DC- 1 = Closed DC+ 2 = Open
400095	Digital Input 19-20 Polarity	R	0 - 65565	2 bytes	MSB = DI3,LSB =DI4 0 = Closed DC- 1 = Closed DC+ 2 = Open
400096	Digital Input 21-22 Polarity	R	0 - 65565	2 bytes	MSB = DI5,LSB =DI6 0 = Closed DC- 1 = Closed DC+ 2 = Open
400097	Digital Input 23-24 Polarity	R	0 - 65565	2 bytes	MSB = DI7,LSB =DI8 0 = Closed DC- 1 = Closed DC+ 2 = Open
400098 - 400115	Factory use				
*400116	Digital Outputs High Resolution Pulse Enable	R/W	0 - 65565	Bitmap	Bit 0 = DO1, Bit 15 = DO16
*400117	Digital Output 1 Pulse On Time	R/W	0 – 255	x50mS	Time on w/ pulse enabled
*400118	Digital Output 1 Pulse Off Time	R/W	5 – 255	x50mS	Minimum off time w/ pulse enabled, rounded to nearest 250mS, use multiples of 5
*400119	Digital Output 2 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400120	Digital Output 2 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400121	Digital Output 3 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400122	Digital Output 3 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400123	Digital Output 4 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400124	Digital Output 4 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400125	Digital Output 5 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400126	Digital Output 5 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400127	Digital Output 6 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400128	Digital Output 6 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400129	Digital Output 7 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400130	Digital Output 7 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400131	Digital Output 8 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400132	Digital Output 8 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400133	Digital Output 9 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400134	Digital Output 9 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400135	Digital Output 10 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400136	Digital Output 10 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400137	Digital Output 11 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400138	Digital Output 11 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400139	Digital Output 12 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400140	Digital Output 12 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400141	Digital Output 13 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400142	Digital Output 13 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400143	Digital Output 14 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400144	Digital Output 14 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400145	Digital Output 15 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400146	Digital Output 15 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above
*400147	Digital Output 16 Pulse On Time	R/W	0 – 255	x50mS	See #1 above
*400148	Digital Output 16 Pulse Off Time	R/W	5 – 255	x50mS	See #1 above

Modbus Holding Register Description Used With Standard IO Application Mode					
Modbus Register	Description	Read/Write	Data Range	Data Units	Definitions / Sample Data
465197	IP Address Part 1	R/W	0-255	octet	Ethernet setting
465198	IP Address Part 2	R/W	0-255	octet	Ethernet setting
465199	IP Address Part 3	R/W	0-255	octet	Ethernet setting
465200	IP Address Part 4	R/W	0-255	octet	Ethernet setting
465201	Network Mask Part 1	R/W	0-255	octet	Ethernet setting
465202	Network Mask Part 2	R/W	0-255	octet	Ethernet setting
465203	Network Mask Part 3	R/W	0-255	octet	Ethernet setting
465204	Network Mask Part 4	R/W	0-255	octet	Ethernet setting
465205	Gateway Address Part 1	R/W	0-255	octet	Ethernet setting
465206	Gateway Address Part 2	R/W	0-255	octet	Ethernet setting
465207	Gateway Address Part 3	R/W	0-255	octet	Ethernet setting
465208	Gateway Address Part 4	R/W	0-255	octet	Ethernet setting
465209	DNS1 Address Part 1	R/W	0-255	octet	Ethernet setting
465210	DNS1 Address Part 2	R/W	0-255	octet	Ethernet setting
465211	DNS1 Address Part 3	R/W	0-255	octet	Ethernet setting
465212	DNS1 Address Part 4	R/W	0-255	octet	Ethernet setting
465213	DNS2 Address Part 1	R/W	0-255	octet	Ethernet setting
465214	DNS2 Address Part 2	R/W	0-255	octet	Ethernet setting
465215	DNS2 Address Part 3	R/W	0-255	octet	Ethernet setting
465216	DNS2 Address Part 4	R/W	0-255	octet	Ethernet setting
465217	Ethernet IP Options	R/W	0-4	Bitmap	0=static ip / no auto IP 1= DHCP enabled / no auto IP 2 = static ip / use Auto IP if no DHCP or IP 3 = DHCP enabled / use Auto IP if no DCHP or IP
465218	MAC Address word 1	R	0 – 65535		
465219	MAC Address word 2	R	0 – 65535		
465220	MAC Address word 3	R	0 – 65535		
*requires firmware 4.4.10111 or newer (date code U10 or newer)					

## Register 400001 Value Description

Register 400001 is a read-only register. This register holds the model number of the hardware. If you are using multiple Comm modules, it is sometimes helpful to confirm that you are communicating with the expected module type. In this case, it will return 33.

## Digital Input 1-16 Status (400021)

Register 400021 is a read-only register. The value returned in this register is unsigned 16-bit data, assigned to digital inputs 1-16. The channel's bit position is 1 input bitmapped where bit 0 = digital input 1.

## **Digital Input 17-32 Status (400022)**

Register 400022 is a read-only register. The value returned in this register is unsigned 8-bit data, assigned to digital inputs 17-24. The channel's bit position is 1 input bitmapped where bit 0 = digital input 1. The additional upper bits for digital inputs 17-24 will remain at 0 and serve as padding to make a proper 16-bit word to comply with Modbus RTU specifications.

## **Analog Input Status (400024 - 400033)**

Registers 400024 – 400033 are read-only registers. The values returned in these registers are signed 16-bit raw data counts for analog inputs from 0 - 32768 for a full 0VDC to 5VDC input reading. Enabling the mA option (Registers 400074-400083) converts the input to a 0-24mA range where 0 = 0mA, and 32767 = 24mA. Typical expected counts for 4-20mA input would be 4mA=5243 counts and 20mA=26214 counts. For channels 7 thru 10, resistance ranges offer relative range of the selected resistance. 0 = zero ohms, 19660 will be approximately full selected resistance range.

## **Analog Output (400047 - 400050)**

Registers 400047 – 400050 are read/write registers. The values returned in these registers are unsigned 16-bit data, assigned to analog outputs driver. The output can drive from 0-24mA where 0=0mA and 65535=24mA. For example to set the output at 4mA, write 10485. For 20mA, write 52428.

## **Digital Output (400061)**

Register 400061 is a read/write register. The values returned in these registers are unsigned 16-bit data, assigned to digital outputs 1 through 16. The channel's bit position is 1 input bitmapped where bit 0 = digital output 1.

## **Digital Outputs at Powerup (400063)**

Register 400063 is a read/write register. Set the digital outputs, 1-16 state as on or off on initial powerup of the module — before it receives any communication from the client controller. This setting is stored on the module and retained on power loss.

## **Digital Outputs at Communication Failure (400064)**

Register 400064 is a read/write register. Set the digital outputs 1-16 state as on or off if communication to the client controller is lost based on the communication timeout setting in register 400073. This setting is stored on the module and retained on power loss.

## **Analog Outputs at Powerup (400065 - 400068)**

Registers 400065 – 400068 are read/write registers. Set the analog output values on initial powerup of the module, before it has received any communication from the client controller. This setting is stored on the module and retained on power loss.

## **Analog Outputs at Communication Failure (400069 - 400072)**

Registers 400069 – 400072 are read/write registers. Set the analog output values on if communication to the client controller is lost based on the communication timeout setting in register 400073. This setting is stored on the module and retained on power loss.

## **Communication Timeout (400073)**

Registers 400073 is a read/write register. Set the timeout to signal communication lost from the client controller, and this will set the outputs to their communication failure state. All ports are sensed for communication timeout. So, any client talking on any port will reset the communication timer and keep normal operation.

## **Analog Input Channel Type (400074 - 400083)**

Registers 400074 – 400083 are read/write registers. Choose the input type as 4-20mA if this setting is written to “1”. If it is left at “0”, the input will be a 0-5VDC input. This setting is stored on the module and retained on power loss. For channels 7 thru 10, a value of 2 = 5kΩ max resistance, 3 = 3kΩ max resistance, 4 = 10kΩ max resistance, 5 = 30kΩ max resistance,

## **Digital Input 1-24 Polarity Status (400086 - 400097)**

Registers 400086 – 400097 are read-only registers. Each register contains a pair of digital input polarity status information stored as 2 bytes of information. The status can be DC-, DC+, or OPEN for each digital input. The most significant byte in each register is the odd-numbered channel. The least significant is the even-numbered channel.

## **\*High Resolution Digital Output Pulse Enable (400116)**

Register 400116 is a read/write register. Use high resolution pulsing when the ON time of a pulse must be less than 250mS, and when communication latency would not guarantee ON time duration. For pulse times not needing this resolution, the pulse engine should not be used, and use writes to digital outputs register 400061. Bit 0 is pulse enable for digital output 1, bit 1 is output 2, etc. Once enabled, the ON and OFF time registers below are used to govern the pulse characteristics overriding the value in 400061. Upon communication loss, the pulsing will be automatically disabled.

## **\*High Resolution Digital Output ON Time (400117, 400119, 400121, 400123, 400125, 400127, 400129, 400131, 400133, 400135, 400137, 400139, 400141, 400143, 400145, 400147)**

Registers listed are read/write registers. Set the ON time in 50mS intervals for the desired output. A value of 0 will leave output OFF. 1 will pulse ON for 50mS then turn OFF for minimum time of the OFF time before turning ON again.

**\*High Resolution Digital Output OFF Time (400118, 400120, 400122, 400124, 400126, 400128, 400130, 400132, 400134, 400136, 400138, 400140, 400142, 400144, 400146, 400148)**

Registers listed are read/write registers. Set the minimum OFF time in 50mS intervals for the desired output. This will be rounded to the nearest 250mS. Settings of 0-5 = 250mS. 6-10 = 500mS, etc. The output will be turned back ON once this time is reached.

## This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings present.

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# Thermocouple, Stainless Steel Tube Type 1/4 Inch Diameter

The thermocouples are encased in a 1/4-inch diameter 316 stainless steel tubing sheath with stainless steel Bell Spring for strain relief. The initial offerings are K type thermocouples with 6-inch and 10-inch long 1/4-inch diameter probes. The thermocouples are shipped straight but can be bent with standard tubing benders anywhere along its length to a 90° angle to minimize clearance required and help prevent damage due to personnel working on the unit. The thermocouple is tip sensitive to minimize ambient temperature influence and should be inserted between 25% and 75% of the piping inside diameter or enough to minimize any skin temperature affect on the tip of the probe when installed in vessels.

The thermocouples are built to comply with ASTM E608 as well as IEC 60584.

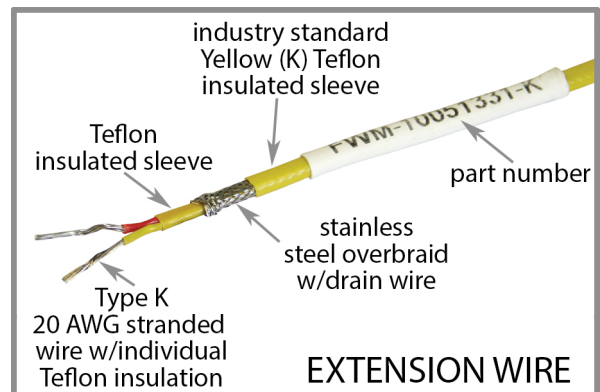


## Features

- Stainless steel transition sealing gland with a stainless steel Bell Spring for strain relief.
- Standard bore through stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth.
- Can be inserted directly into a low-pressure application process through a standard 1/4-inch stainless steel bore through tubing compression fitting.
- Enables a run from the point of measurement to the nearest conduit entry, junction box or all the way to the panel housing the readout and monitoring instrument. Can also be installed in a cable tray.
- The thermowell assembly comes with a stainless steel bore through compression fitting and ferrule saving installation time and money.

## Extension Wire

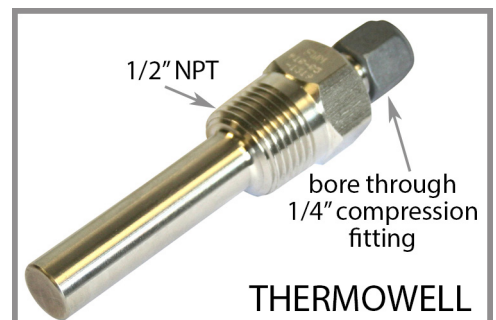
The Type K, 20 AWG stranded extension wire encased in a rugged cable meets demanding environments. The industry-standard yellow Teflon allows easy identification of K type thermocouple wires so they can be separated from high voltage wires following good installation practices.



## Thermowell

Thermowells are available in 2-inch, 4-1/2 inch or 7-1/2 inch lengths for insertion depth and have a 1/2-inch NPT process connection. They are supplied with a standard stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth. In low pressure applications, the thermocouple can be inserted directly into the process through a standard 1/4-inch SS tubing compression fitting.

Material	Temperature vs PSIG				
304SS	400° F	600° F	800° F	1000° F	1200° F
	5600 PSIG	5400 PSIG	5200 PSIG	4500 PSIG	1650 PSIG





## How to Order

Part Number	Description	Notes
10051331	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/5 ft. Thermocouple Extension Wire
10051325	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/15 ft. Thermocouple Extension Wire
10051326	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/30 ft. Thermocouple Extension Wire
10051327	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/50 ft. Thermocouple Extension Wire
10051328	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/100 ft. Thermocouple Extension Wire
10051332	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/5 ft. Thermocouple Extension Wire
10051323	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/15 ft. Thermocouple Extension Wire
10051317	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/30 ft. Thermocouple Extension Wire
10051322	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/50 ft. Thermocouple Extension Wire
10051321	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/100 ft. Thermocouple Extension Wire
10707436	Thermowell, 1/2 in. NPT, 1/4 in. T, 2.0 in. L	Assembly 304SS
10707437	Thermowell, 1/2 in. NPT, 1/4 in. T, 4.5 in. L	Assembly 304SS
10707438	Thermowell, 1/2 in. NPT, 1/4 in. T, 7.5 in. L	Assembly 304SS

# Thermocouple, RTD and RTD Transmitter With Thermowell – TC, RTD and RTDT Series

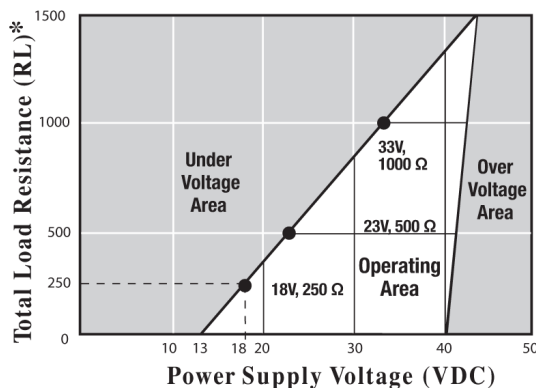
FW Murphy offers a variety of highly reliable thermocouple and RTD (Resistance Temperature Detector) assemblies and 4-20 mA DC output RTD transmitters.

Their innovative features include a 304 stainless steel thermowell that provides protection to the spring-loaded element.

The cast aluminum connecting head meets NEMA 4 requirements and includes an RTD transmitter or a thermocouple/ RTD terminal block mounted on ceramic Steatite and rated NEC Class 2.

The complete assemblies are offered in 2-1/2, 4-1/2 or 7-1/2 in. (63, 114 or 191 mm) thermowell insertion lengths.

## Loop Resistance Graph



Supply voltage for RTDT must be within 13-40 VDC. The graph shows the minimum supply voltage (VDC) required for a given load resistance (RL).

### Thermocouple Assemblies with Thermowell

Available in types J or K, the thermocouple assemblies have ungrounded elements in a 304 stainless steel spring-loaded sheath. For product compatibility see next page (replacement parts and thermocouple extension wire are available).

### RTD Assemblies with Thermowell

Resistance temperature detector (RTD) assemblies are available with a 100 ohm platinum element, 3-wire leads and spring-loaded 316L stainless steel element sheath.

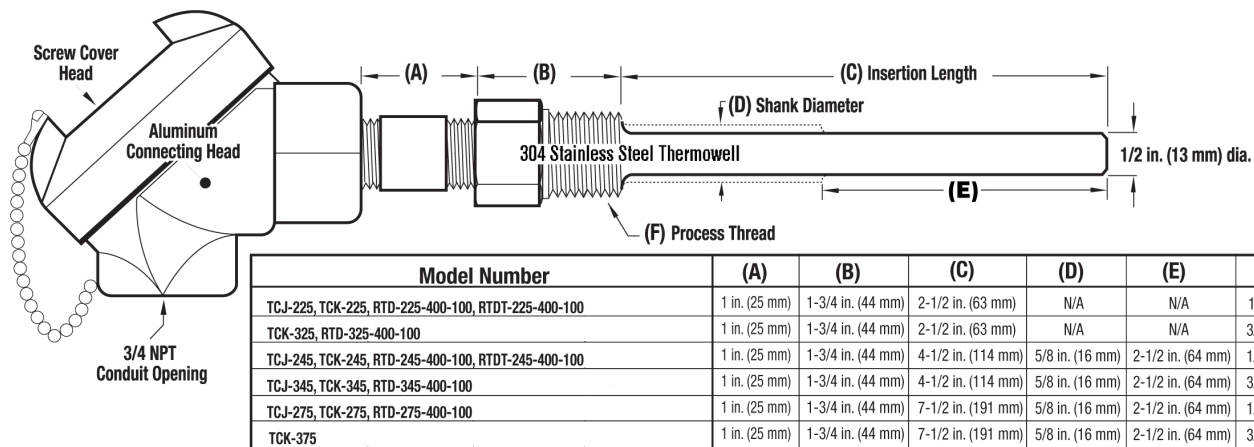
### RTD Transmitter Assemblies with Thermowell

RTDT assemblies transmit process variable temperatures. Available as part of the temperature sensor assemblies or as separate units, the RTDTs accept 2- or 3-wire, 100 ohm RTDs. The RTD transmitters are loop powered. They feature linearized 4-20 mA DC outputs and have reversed polarity protection.



Refer to document 00-02-0849 for specific details on RTDTs at <https://www.fwmurphy.com/products>.

## Dimensions



## Specifications

**Thermowell:** 304 SS; 7000 psi (48.2 MPa) [482 bar] max @ 70° F

**Connecting Head:** Cast Aluminum; 400° F (204° C) max operating temp

**Thermocouple:** Ungrounded, magnesium oxide (MgO) insulated 96% purity; element sheath of 304 SS (stainless steel)

**Type J operating temp.:** 900° F (482° C) max

**Type K operating temp.:** 1800° F (982° C) max

**RTD:** 100 ohm @ 0° C platinum element; 3-wire; 400° F maximum; 0.00385 temperature coefficient; 316L stainless steel element sheath

**RTD Transmitter:** 100 ohms platinum RTD; 400°F maximum; Ranges: 0° to 400° F and -60° to 140° F. Linearized 4-20 mA DC output. Loop powered typically 24 VDC, when using the Loop Resistance Graph, 13-40 VDC. For use with 100 ohms platinum RTD elements, 0.00385 temp coefficient

**Thermocouple Accuracy (J/K):** 0.5%

**RTD Accuracy:** ±0.12%

**RTD Transmitter Accuracy:** ±0.1%

**Terminal block:** Ceramic Steatite; thermocouples have: 4 terminals; RTDs: 6 terminals. 28 to 14 AWG wire size, (8-32 SS screws)

**Optional Thermocouple Extension Wire:**

Sold separately—see How to Order section

**Individual Conductor Insulation:** Extruded PFA

**Duplex Conductor Insulation:** Twisted; Extruded PFA overall

**Temperature Rating:** Continuous -450° to 500° F (-267° to 260° C)

**Abrasion Resistance:** Good

**Moisture Resistance:** Excellent

**Shielding:** Metallic shield

**Gage:** 20 AWG (0.5 mm<sup>2</sup>),

Ohms per Double Foot Type J: 0.357

Ohms per Double Foot Type K: 0.586

## How to Order

Model Number	Model and Description	Notes
<b>Thermocouple Assemblies (thermowell included)</b>		
TCJ-225	J Type ungrounded thermocouple, 1/2 NPT	2-1/2 in. (63 mm) insertion length
TCK-225	K Type ungrounded thermocouple, 1/2 NPT	
TCK-325	K Type ungrounded thermocouple, 3/4 NPT	4-1/2 in. (114 mm) insertion length
TCJ-245	J Type ungrounded thermocouple, 1/2 NPT	
TCK-245	K Type ungrounded thermocouple, 1/2 NPT	
TCJ-345	J Type ungrounded thermocouple, 3/4 NPT	7-1/2 in. (191 mm) insertion length
TCK-345	K Type ungrounded thermocouple, 3/4 NPT	
TCJ-275	J Type ungrounded thermocouple, 1/2 NPT	
TCK-275	K Type ungrounded thermocouple, 1/2 NPT	
TCK-375	K Type ungrounded thermocouple, 3/4 NPT	
<b>RTD Assemblies (thermowell included)</b>		
RTD-225-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	2-1/2 in. (63 mm) insertion length
RTD-245-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	4-1/2 in. (114 mm) insertion length
RTD-275-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	7-1/2 in. (191 mm) insertion length
<b>RTD Transmitter Assemblies (thermowell included)</b>		
RTDT-225-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	2-1/2 in. (63 mm) insertion length
RTDT-225-400-100-EX	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	
RTDT-325-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	4-1/2 in. (114 mm) insertion length
RTDT-245-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	
RTDT-345-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	

Model Number	Model and Description	Notes
<b>Replacement Parts (order separately)</b>		
TCKE-25	Type K elements only for 2-1/2 in wells*	
TCKE-45	Type K elements only for 4-1/2 in wells*	
TCKE-75	Type K elements only for 7-1/2 in wells*	
RTDE-25	100 ohm Pt RTD element only for 2-1/2 in. wells	all elements are spring loaded
RTDE-45	100 ohm Pt RTD element only for 4-1/2 in. wells	
RTDE-75	100 ohm Pt RTD element only for 7-1/2 in. wells	
RTDTX-400-100	100 ohm Pt RTD Transmitter only 0-400°F (-17.8-204°C)	
<b>Thermocouple Extension Wire</b>		
00003272	Type K 100 ft. roll	

Product Compatibility		
Model	Power Source	Temp Sensor
MDTM89 (not available)	CD Ign. 12/24 VDC, 120 VAC	J/K ungrounded thermocouples
TDX6	CD Ign. 12/24 VDC, 120 VAC	J/K grounded/ungrounded tc.
TDXM	12/24 VDC	J/K grounded/ungrounded tc.

Approximate Shipping Weight and Dimensions		
Model	Weight	Dimension
2-1/2 in. (63 mm)	2 lb. (0.907 kg)	12 x 7 x 5-1/2 in. (305 x 178 x 140 mm)
4-1/2 in. (114 mm)	2 lb. 8oz. (1.24 kg)	12 x 7 x 5-1/2 in. (305 x 178 x 140 mm)
7-1/2 in. (191 mm)	3 lb. 6oz. (1.67 kg)	16 x 11 x 5-1/2 in. (406 x 280 x 144 mm)

# Pressure Transmitters

## PXT-K Series

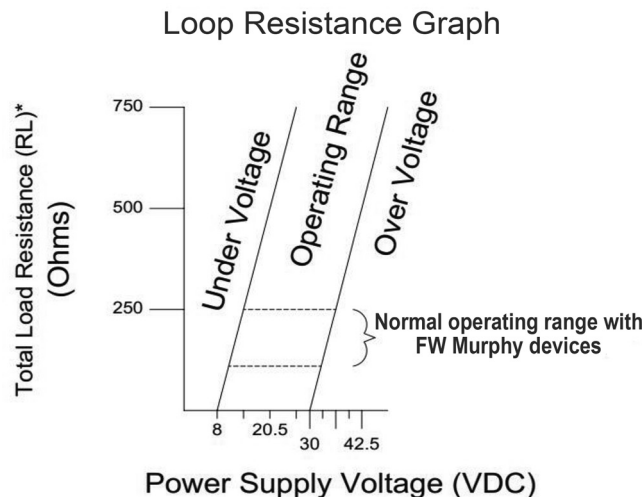
The PXT-K Series pressure transmitters are state-of-the-art instruments providing 4-20 mA output. Each piezoresistive pressure transmitter contains a transducer comprised of a piezoresistive silicon chip mounted on a glass-metal feed-through header welded into a stainless steel housing and filled with silicone oil. The very thin laser-welded stainless steel isolation-diaphragm completes the front side. Media pressure is transferred from the stainless steel isolation-diaphragm via the oil inside the cell to the silicon measuring chip. This construction, combined with the advanced internal signal conditioning circuitry, results in a rugged instrument with extremely small temperature error and class-leading EMI/RFI resistance.

The enclosure and all wetted parts are made of 316L stainless steel.

PXT-K Series Pressure Transmitters can be used in applications such as compressors, engines, process control, liquid level and pumps.

### Operating Range

Supply voltage for the PXT-K must be within range of 8-30 VDC. The graph below shows the minimum supply voltage (VDC) required for a given load resistance (R).



\*Note: Cable resistance effect included in RL.

Minimum Voltage for Common Input Modules		
Model	Input Impedance	Vmin
Centurion C4-1	231 Ω	13.62
MX5	221 Ω	13.42
Centurion C5	200 Ω	13.00
MX5-R2		
Third-Party PLC (typical)	249 Ω	13.98



### Specifications

**Operating Pressure Range:** See How to Order under the PXT-K Series Model Number Matrix.

**Operating Temperature:** -22 to 176° F (-30 to 80° C)

**Compensated Temp Range:** -20 to 160° F (-29 to 71° C)

**Process Connection:**

1/4"-18 NPT female with 7/8" hex nut (2000 psig and below) or 1-3/16" hex nut (3000 psig and above) models

**Electrical Connection:**

PXT-K: 1/2" NPT male conduit connection, 60" long cable, vented PXT-KM: M12 connector

**Enclosure Rating:** IP65

**Body:** 316L stainless steel

**Wetted Parts:** 316L stainless steel

**Environmental Effect (Humidity):**

No effect for 0-95%, non-condensing

**Mounting:** All axis positions, has negligible effect on performance as long as it is perpendicular to the flow being monitored

**Shock Resistance:**

800g per IEC 60068-2-27 (Mechanical Shock)

**Vibration Resistance:**

20G per IEC 60068-2-6 (Vibration under resonance)

**Wiring Protection:** Protected against reverse polarity and short circuit, 48 VDC Maximum

**Supply Voltage:** 8 - 30 VDC (Typically 24 VDC)

**Transmitter Output:**

4-20 mA, two wire configurations with load characteristics

**Insulation:** Greater than 10 MΩ @ 300 VDC

**Electromagnetic Compatibility (EMC):** Standards; EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61326-2-3:2006

**Voltage Surge/Spike Protection:**

Protection against a 600 volt spike per IEC 60-2

**Applicable Standards**

**CSA (c/us):** Class I / II / III, Div 1, Groups A-F T4

Class I / II / III, Div 2, Groups A-D,F,G T4

**ATEX:** IBEU 10 ATEX 1124 X

II 1G Ex ia IIC T6-T4

II 3G Ex nA IIC T6

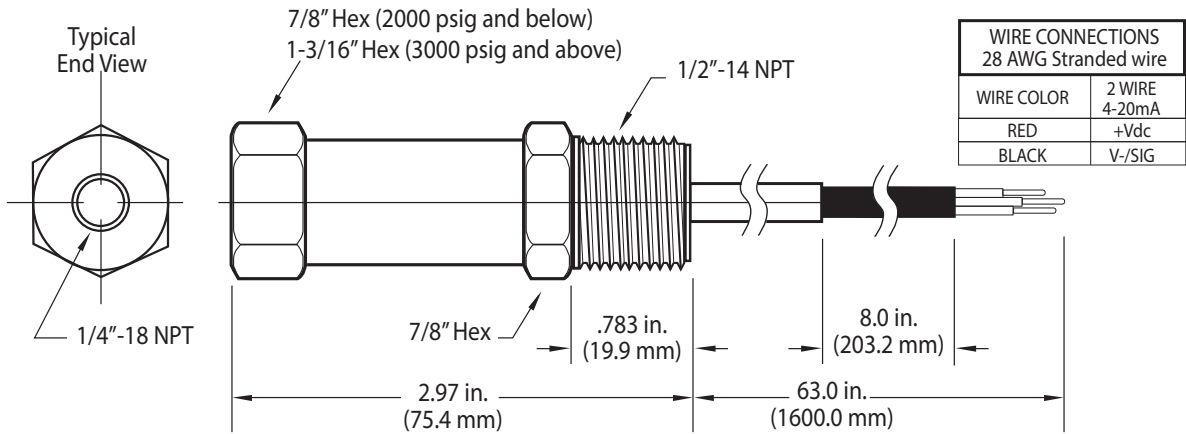
**Canadian Registration Number:** OF15236.2 (all providences and territories)

Specifications (continued)

Accuracy:	
% of Span (BFSL)	+/- 0.25% of span*
Zero/Span Setting Tolerance	+/- 2.5% of full scale* max. (30V30WC only)
	+/- 0.25% of span* typical,
	+/-0.5% of span* max (all other ranges)
Operating Temperature	+/- 2.5% of span T.E.B.
Compensated Temperature	+/- 1.7% of span T.E.B.
Response Time	<5mS
* Accuracy tolerance to be applied at 25° C.	

Dimensions

The Hex is for tightening process threads only. The 7/8” Hex is on the 2000 psig and below models. The 1 3/16” Hex is on the 3000 psig and above models.



How to Order

NOTE: Installation Manual 00-02-0840 and Installation Diagram 05-08-0763 are available at fwmurphy.com.

Options listed below. All configurations may not be available. Call your sales representative or FW Murphy for more information.

Example: PXT-K-600 = FW Murphy two wire Pressure Transmitter with Flying Lead Connection, 0-600 psig range.

PXT	-	K	-	600
Connector				
K = PXT (Flying Lead)				
KM = PXM (M12 x 1 Connector)				
Pressure Range				
30V30WC	= (-30" H2O to +30" H2O)	400	= 0-400 (psig)	
30V30	= (-30" HG to +30 psig)	600	= 0-600 (psig)	
30V100	= (-30" HG to +100 psig)	1000	= 0-1000 (psig)	
15	= 0-15 (psig)	2000	= 0-2000 (psig)	
60	= 0-60 (psig)	3000	= 0-3000 (psig)	
100	= 0-100 (psig)	5000	= 0-5000 (psig)	
200	= 0-200 (psig)	6000	= 0-6000 (psig)	
300	= 0-300 (psig)	10000	= 0-10000 (psig)	

Approximate Shipping Weight and Dimensions		
Model	Weight	Dimension
PXT-K	6.5 ounces	4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)
PXT-KM	6.5 ounces	4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

Part Number	Model and Description	Notes
86031205	Adapter 1/4" x 1/4 NPT 316	
40051047	Cable, PXT-KM, M12 X 3 ft.	
40051048	Cable, PXT-KM, M12 X 6 ft.	
40051082	Cable, PXT-KM, M12 X 30 ft.	
40051049	Cable, PXT-KM, M12 X 50 ft.	
40051050	Cable, PXT-KM, M12 X 100 ft.	



# General Recommendations for Solid-State Devices

FW Murphy Production Controls would like to take this opportunity to thank you for purchasing your new Control System. This system was designed and built by qualified engineers and technicians with your control requirements in mind. We use the best materials and equipment in fabricating your controls systems. We continually strive to provide defect-free products and services on time. This dedication allows us to maintain ISO 9001 registration. Whatever your instrumentation and automation control application needs, FW Murphy Production Controls provides quality products and services. We are available to define your requirements, provide design solutions and customer support.

**Notice:**

The information in this guide is subject to change without notice. FW Murphy Production Controls shall not be liable for technical or editorial errors or omission contained herein, nor for incidental or consequential damages resulting from the furnishing of or performance of these materials. This manual contains information on the components and operation of those components supplied as part of the control systems.

**Welding Precautions:**

FW Murphy Production Controls recommends that no welding takes place directly on the equipment or on the equipment that is physically connected to equipment where solid-state electronics are used. If welding must be performed on this equipment, FW Murphy Production Controls recommends that the following precautions are taken to reduce the chance of the solid-state electronics being permanently damaged or damaged enough to fail at some later time. FW Murphy Production Controls will not warrant any device that has been subjected to damage caused by welding.

Open the control panel and any associated subpanels or swing panels. Disconnect power and ground connections and all ribbon and other cable types leading to or from any solid-state devices. Note: Most cables should have a keyed connector for ease of reconnection or have removable terminal blocks. Even if this is an outdoor field repair, wires should be removed from screw terminals where necessary to prevent any possibility of damage. Attach the welder's ground clamp as close as possible to the area where the welding will occur and use the lowest feasible setting of the welding machine output. These precautions will lessen the chance that a high electrical potential will pass through or across the control panel and/or its components.

**Wiring Precautions:**

There are several precautions you can take on initial installation to reduce chances of failure over time. Many of these steps may take a few extra minutes to do at the time of installation; however, they can also save many headaches in the future. We strongly recommend that you follow these precautionary steps.

**DC Power Connection Source**

FW Murphy Production Controls recommends that the power source (+ and -) connection points of any control panel containing any solid-state device be made directly to the terminals of the battery (+ and -). This will allow the battery to act as a filter and absorb any voltage spikes or noise generated by the alternator or other devices located on the equipment being controlled by the solid-state device. The preferred method is to tie the negative battery terminal to proper earth ground (i.e., earth ground rod) and tie any needed frame/chassis grounds to the same point as well. Connection of power and common at any other point will cause increased noise susceptibility in the system. Depending on the actual configuration of the end application, this can cause various control problems, such as erratic operation, inaccurate sender/transducer readings, remote communication problems, etc. Any standby battery charger must be wired directly to the battery. Failing to do this may result in erratic operation due to electronics noise coupled into the microprocessor.

**Inductive Loads**

FW Murphy Production Controls recommends that any inductive load tied to a solid-state output (relays, solenoids, etc.) has a reverse biased diode across the coil to snub the inductive kickback. This prevents the field collapse of the coil from damaging the solid-state output devices and keeps the DC power clean from spikes.

**Shielded Cable**

Shielded cable is recommended for connecting the magnetic pickup and analog inputs/outputs to the control panel. This helps prevent signal loss and the possible coupling of electrical interference into the circuits. The drain wire of the shielded cable should only be grounded at one end.

**Wiring Separation**

Please try to ensure the following separation of wiring by using multiple runs of conduits. Here are the levels of separation from the wiring emitting the greatest noise (noise source) to the wiring most susceptible to being affected (victim). Some of this separation is required by codes and recommended practices.

1. Ignition wiring, the G lead and CD ignition fuel valve wiring
2. AC wiring
3. DC power wiring (magnetic pickup can be run with this, but it must be in shielded cable)
4. Analog signals, like 4-20 mA and sender signals (magnetic pickup can be run with this, but it must be in shielded cable)
5. Thermocouple wiring (must use shielded thermocouple grade extension wire for the proper type, typically J or K)
6. Sensor wires that are either nonincendive for Class I, Div. 2 or intrinsically safe for Class I, Div. 1.

**Maintenance and Life of the System**

Please see our standard warranty statement about the care and life of this control panel as a manufactured product. It must be properly maintained in regards to the degree of protection it provides from weather. Internal wiring connections should be routinely inspected for fraying or wear or bad connections. If any components or surfaces show wear or corrosion, they should be replaced. The lifetime of these systems is approximate to the overhaul period of the equipment for which they are used or not to exceed 10 years. These systems should be routinely tested as a part of regular maintenance to ensure their proper functions and intended operation.

# Warranties and Terms

FW Murphy Production Controls warrants all FW Murphy manufactured products that it determines to be defective in materials and/or workmanship, under normal use, for a period of TWO years, unless otherwise stated. For full warranty terms and terms of conditions of sale, please refer to the following online information.

## **Product Warranty Limitations and Returns Policy**

<https://www.fwmurphy.com/warranty/product>

## **EICS Catalyst Warranty**

<https://www.fwmurphy.com/warranty/catalyst>

## **Important Notice Regarding Product Repairs and Warranty Claims**

<https://www.fwmurphy.com/warranty/notice>

## **Terms and Conditions of Sale**

<https://www.fwmurphy.com/warranty/terms>

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**MANUFACTURING, SALES & ENGINEERING**  
2151 RANDON DYER ROAD  
ROSENBERG, TX 77471

**SALES, SERVICES & SUPPORT**  
4646 S HARVARD AVE  
TULSA, OK 74135

**DOMESTIC SALES & SUPPORT**  
**FW MURPHY PRODUCTS**  
PHONE: 918 957 1000  
EMAIL: [INFO@FWMURPHY.COM](mailto:INFO@FWMURPHY.COM)  
[WWW.FWMURPHY.COM](http://WWW.FWMURPHY.COM)

**FW MURPHY CONTROL SYSTEMS & SERVICES**  
PHONE: 281 633 4500  
EMAIL: [CSS-SOLUTIONS@DOVERPRECISION.COM](mailto:CSS-SOLUTIONS@DOVERPRECISION.COM)

**INTERNATIONAL SALES & SUPPORT**  
**LATIN AMERICA & CARIBBEAN**  
PHONE: +1 918 770 8775  
EMAIL: [INTERNATIONAL@FWMURPHY.COM](mailto:INTERNATIONAL@FWMURPHY.COM)



FM 668933 (Rosenberg, TX - USA)



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