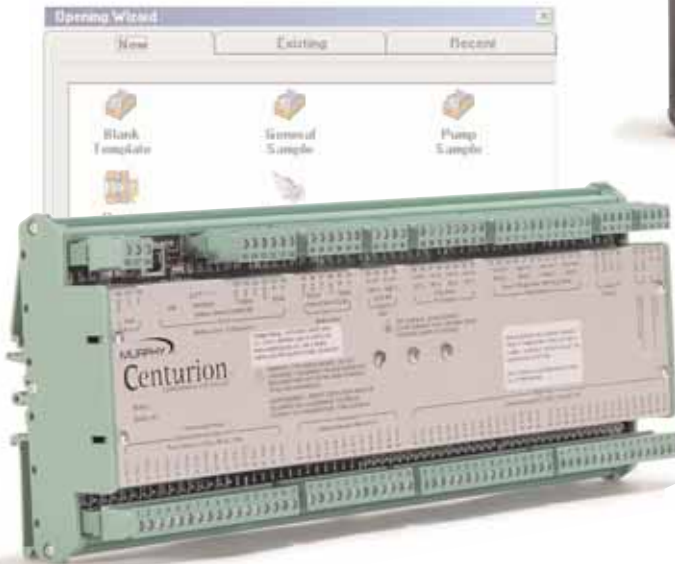
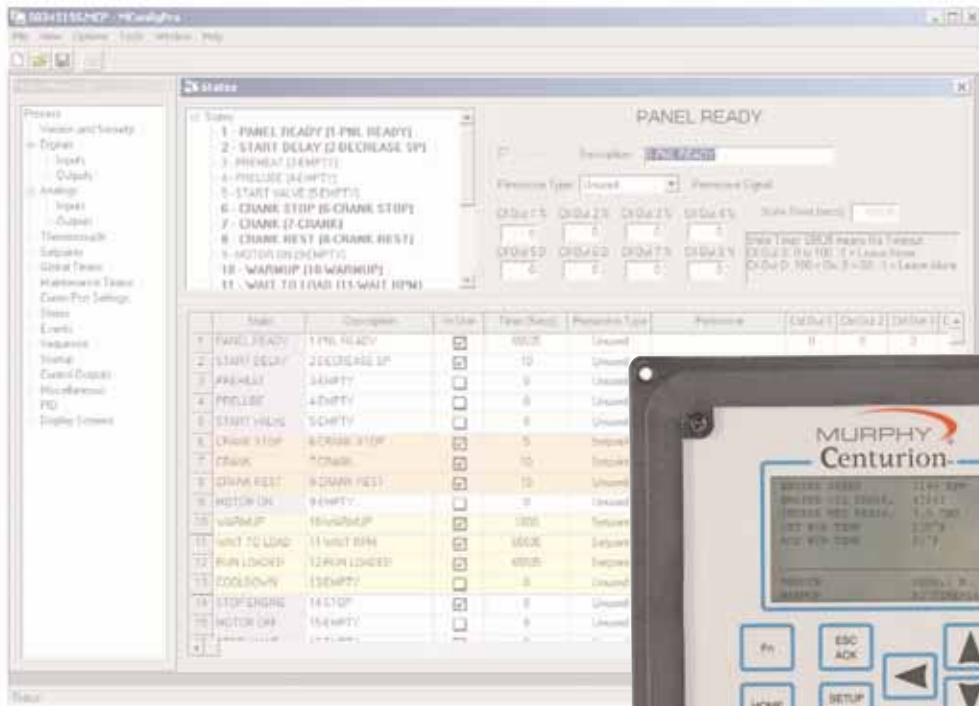


# CENTURION™

## Configurable Controller

## Installation and

## Operations Manual



**MURPHY**™

CE-05171N  
Effective 05-13-05  
Section 50  
(00-02-0590)

## 1.0 Warning and Limited Warranty



# WARNING!



FW MURPHY has made efforts to ensure the reliability of the Centurion Controller and to recommend safe usage practices in system applications. Please note that in any application, operation and controller failures can occur. These failures may result in full control outputs or other outputs which may cause damage to or unsafe conditions in the equipment or process connected to the Centurion Controller. Good engineering practices, electrical codes, and insurance regulations require that you use independent external protective devices to prevent potentially dangerous or unsafe conditions. Assume that the Centurion Controller can fail with outputs full on, outputs full off, or that other unexpected conditions can occur.

Please read the following information before installing the Centurion Controller. This installation information is intended for Centurion Controller. A visual inspection of this product before installation for any damage during shipping is recommended.

Disconnect all power and be sure machine is inoperative before beginning installation.

Installation is to be done only by qualified technician.

Observe all Warnings and Cautions at each section in these instructions.

Device shall be wired in accordance with Class I, Division 2 wiring methods.

This equipment is suitable for use in Class I, Division 2, Groups B, C, and D hazardous Areas.

WARNING—Explosion Hazard—Substitution of components may impair suitability for Class I, Division 2.

Please contact FW MURPHY immediately if you have any questions.

## 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  
[www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)

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Windows®, Modbus® and other third party product or trade names referenced herein are the property of their respective owners and are used for identification purposes only.

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## 2.0 Overview

The Centurion configurable controller is a control and monitoring system expressly designed to meet the requirements of three specific kinds of applications: Screw and Reciprocating Compressors, and Pumps. To that end, it is able to satisfy the particular needs and inevitable variations that exist in real world applications because the Centurion controller is enormously flexible and configurable within fixed parameters. The Centurion controller is a system designed to monitor, control, protect, and optimize small to medium sized gas operated compressors and pumps in the field by monitoring set points and digital, analog, and thermocouple input points and providing the logic to take corrective and/or proactive steps to maintain proper operation. The Centurion controller also allows for controlled shut down and no-flow monitoring as well as expanded and auto start up, and engine control capabilities, which are so critical to the systems the Centurion controller is designed to protect.

The Centurion 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 including HMI's, PLC's, PC's, and SCADA systems. The industry standard Modbus protocol means greater support for a wide variety of communication equipment including radio and satellite communications systems.

The heart of the Centurion system is the Main Input/Output (I/O) Module, known as C3-1, which can be mounted on a standard DIN rail. While it is designed to work with any Modbus (Master) compliant HMI (Human Machine Interface) or with no operator interface at all, it is optimally configured and field-configurable through MConfigPro, powerful software developed to configure the controller. Parameters can be modified through C3-3 Display, F W Murphy's specially programmed controller display, in the field without special need for laptop or software.

### Basic Components and Key Features of the C3™ Series

The C3 Series consists of a Display Module, a Main I/O Module, and optional Expansion I/O Module. No special cables are required. The Centurion system is designed for use within a weatherproof enclosure only.

- Display Module (C3-3 Head): 128 x 64 LCD graphic display; (-40 to 85) °C
- Main I/O Module (C3-1):
  - 32 Digital Inputs (DI)
  - 10 Digital Outputs (DO)
  - Separate direct input for Analog and Thermocouple inputs:
    - 12 AI on the Centurion C3-1
    - 8 TC on the Centurion C3-1
  - 1 Magnetic Pickup (MPU).
  - C3-1-A: Same as C3-1, plus two (2) Analog Output (AO).
- Expansion I/O Module (C3-2) as required: 8 AI, 8 TC, and 4 AO

### Optional Components:

The C3-1 hardware may be configured with 2 analog outputs and it may be augmented through an Expansion Module (C3-2) which provides analog outputs and additional analog and thermocouple inputs.

C3-1-A with Analog Outputs:

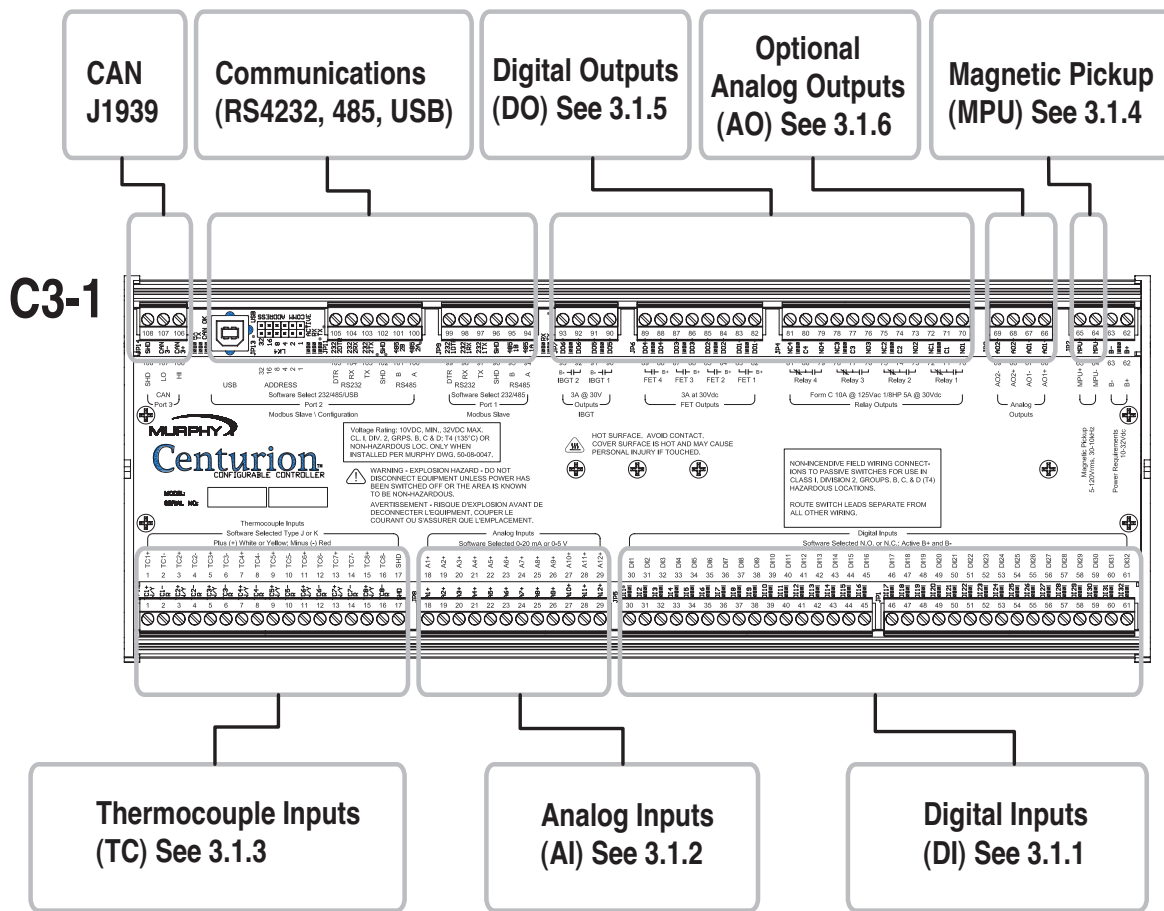
- 2 Analog Outputs

C3-2 Expansion:

- 8 Analog Inputs
- 8 Thermocouple Inputs
- 4 Analog Outputs

## 3.0 Input/Output Types

### 3.1 Input/Output Types and Specifications for the Centurion C3-1



#### 3.1.1 Digital Inputs (DI)

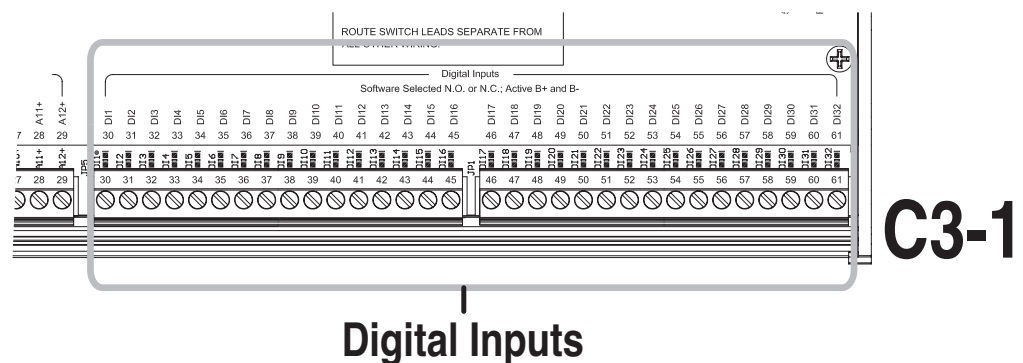
Number of Devices: 32

Device Types: Discrete Input, Normally Open (N/O) or Normally Closed (N/C), active high/active low, non-incendive.

There is one screw terminal connector for each digital input.

Terminals 30 to 61 are DI terminals.

Green LEDs give visual indication of active input signal.



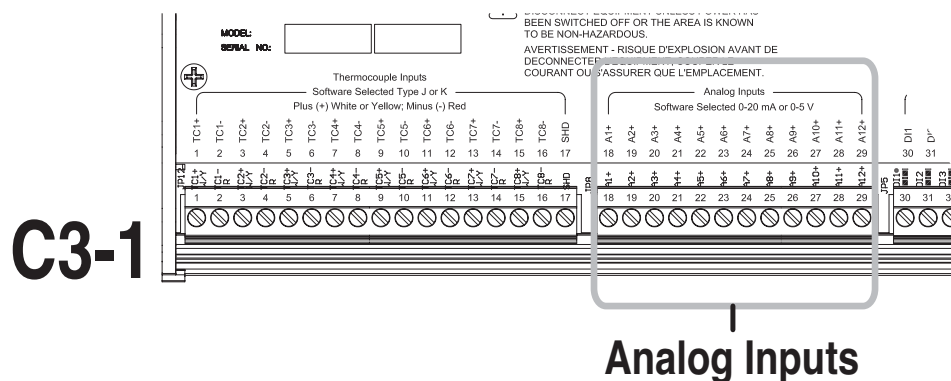
### 3.1.2 Analog Inputs (AI)

Number of Devices: 12

Device Types: Analog Input, (4 to 20) mA or (0 to 5) V, 10 bit hardware.

There is one screw terminal connector for each analog input.

Terminals 18 to 29 are AI terminals.



### 3.1.3 Thermocouple Inputs (TC)

Number of Devices: 8

Device Types: Thermocouple Input, Type J or K, 12 bit hardware.

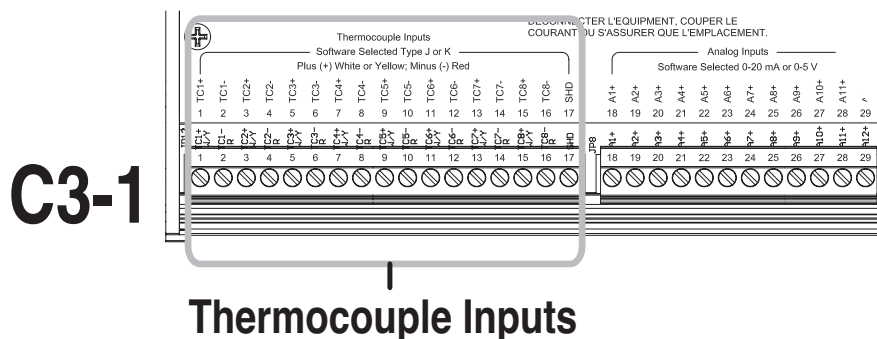
Open Thermocouple Detection: Drives terminal reading high (max of scale).

Automatic Cold Junction Compensation is built-in.

There are two screw terminal connectors for each thermocouple.

Terminals 1 to 16 are TC terminals where White or Yellow indicate positive inputs and Red indicates negative inputs.

An additional terminal connector is provided, identified as SHD, which isolates thermocouple shields. This connection, at terminal 17, is intended to be wired to an isolated bus bar for thermocouple shield wires. If grounded thermocouples are used, the shield terminal should not be connected.



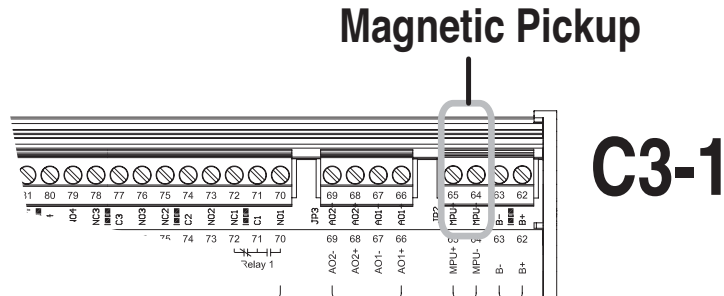
### 3.1.4 Magnetic Pickup (MPU)

Number of Devices: 1

Device Types: Magnetic Pickup or MPU, (5 to 120) Vrms, (30 to 10k) Hz.

There are two screw terminal connectors for the Magnetic Pickup .

Terminals 64 and 65 are MPU terminals.



### 3.1.5 Digital Outputs (DO)

Number of Devices: 10

Device Types: Discrete Output, Normally Open (N/O) or Normally Closed (N/C)

- Four (4) relay outputs, form C, dry contacts
- Four (4) FETs (high speed)
- Two (2) IGBTs (high power)

There are three screw terminal connectors for each relay output and two screw terminal connectors for each FET and IGBT output.

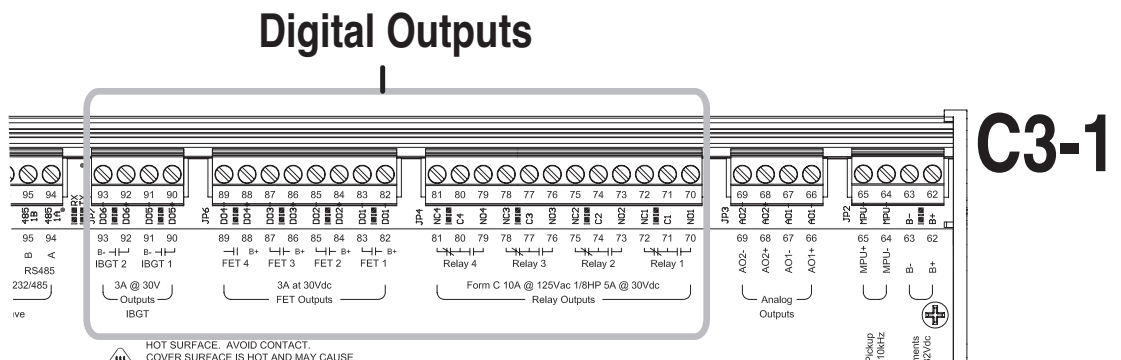
Terminals 70 to 81 are for the four relay terminals.

Terminals 82 to 89 are for the four FET terminals.

Terminals 90 to 93 are for the two IGBT terminals.

Green LEDs give a visual indication of active output signal.

**Warning:** *A heat sink is attached to the cover using acorn style nuts. The surface area around these fasteners can become very hot. Avoid contact.*



### 3.1.6 Types and Specifications for the Optional Analog Output on the Centurion C3-1 -A

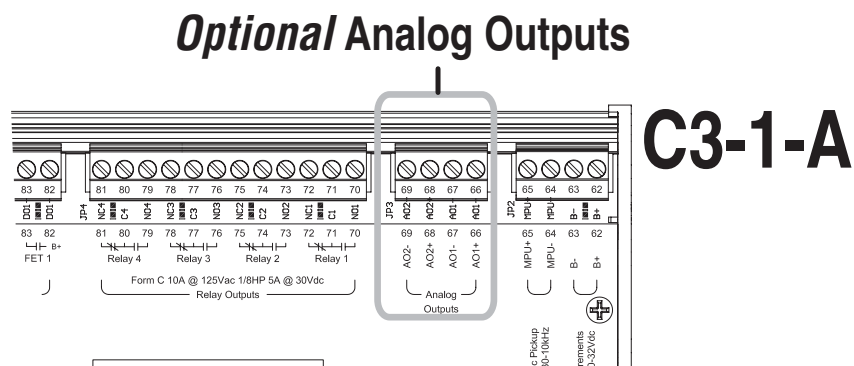
#### Analog Outputs (AO)

Number of Devices: 2

Device Types: Analog Output, (4 to 20) mA or (0-5)V, 16 bit hardware

There are two screw terminal connectors for each analog output.

The AO optional module is added to the C3-1 at the factory inside the DIN enclosure. While these terminals are present on all models the feature may not be installed.



### 3.2 Input/Output Types and Specifications for the Optional C3-2 Expansion Module to the Centurion C3-1

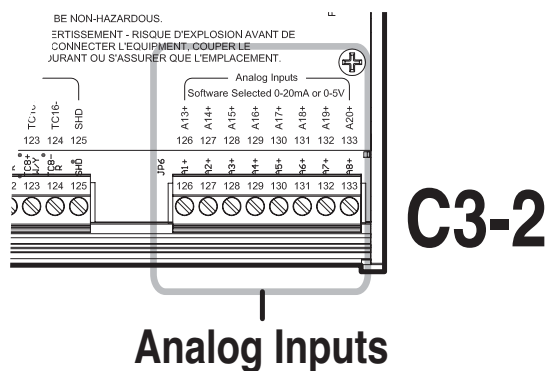
#### 3.2.1 Analog Inputs (AI)

Number of Devices: 8

Device Types: Analog Input, (4 to 20) mA or (0 to 5) V, 12 bit hardware.

There is one screw terminal connector for each analog input.

Terminals 126 to 133 are AI terminals.



### 3.2.2 Thermocouple Inputs (TC)

Number of Devices: 8

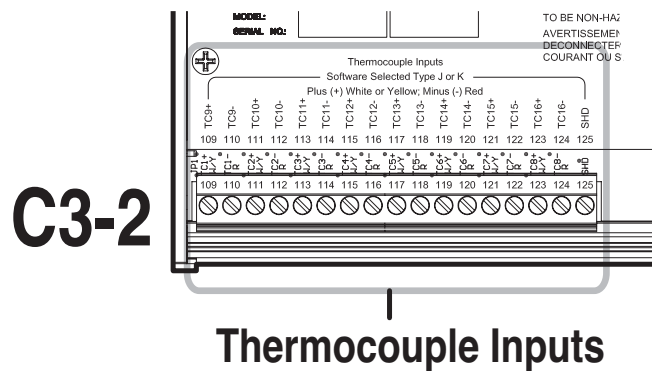
Device Types: Thermocouple Input, Type J or K, 12 bit hardware

Open Thermocouple Detection: Drives channel reading high (max of scale).

There are two screw terminal connectors for each thermocouple input.

Terminals 109 to 124 are TC channels where White or Yellow indicate positive inputs and Red indicates negative inputs.

An additional terminal connector is provided, identified as SHD, which isolates thermocouple shields. This connection, at terminal 125, is intended to be wired to an isolated bus bar for thermocouple shield wires. If grounded thermocouples are used, the shield terminal should not be connected.



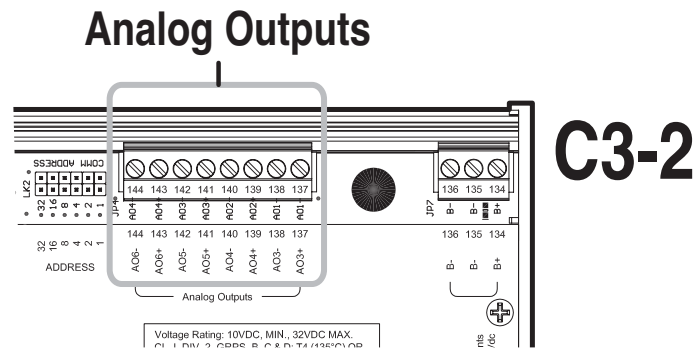
### 3.2.3 Analog Outputs (AO)

Number of Devices: 4

Device Types: Analog Output, (4 to 20) mA or (0-5) V, 16 bit hardware

There are two screw terminal connectors for each analog output.

Terminals 137 to 144 are AO terminals.



## 4.0 Hazardous Area Operation

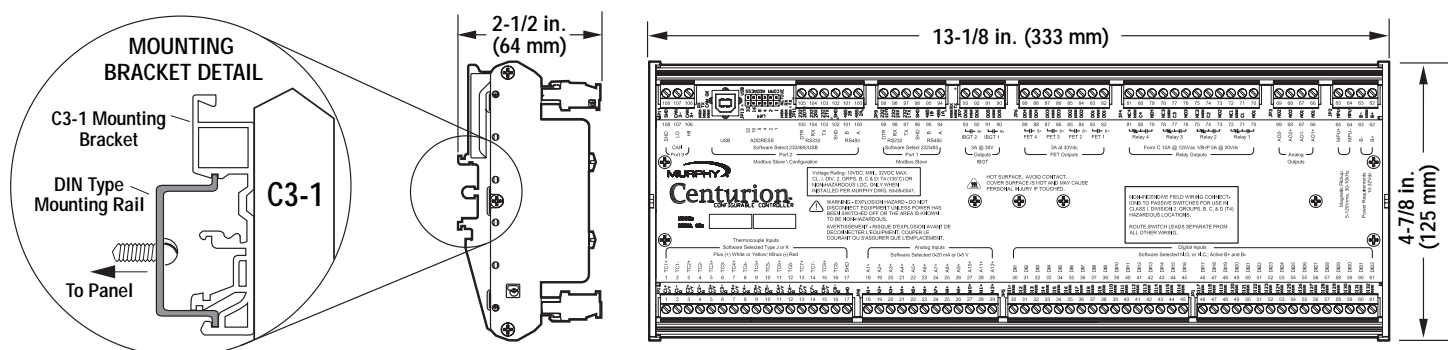
The Centurion approvals for CSA, CLASS 1, DIVISION 2, Groups B, C and D are pending.

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

## 5.0 Hardware Installation and Wiring

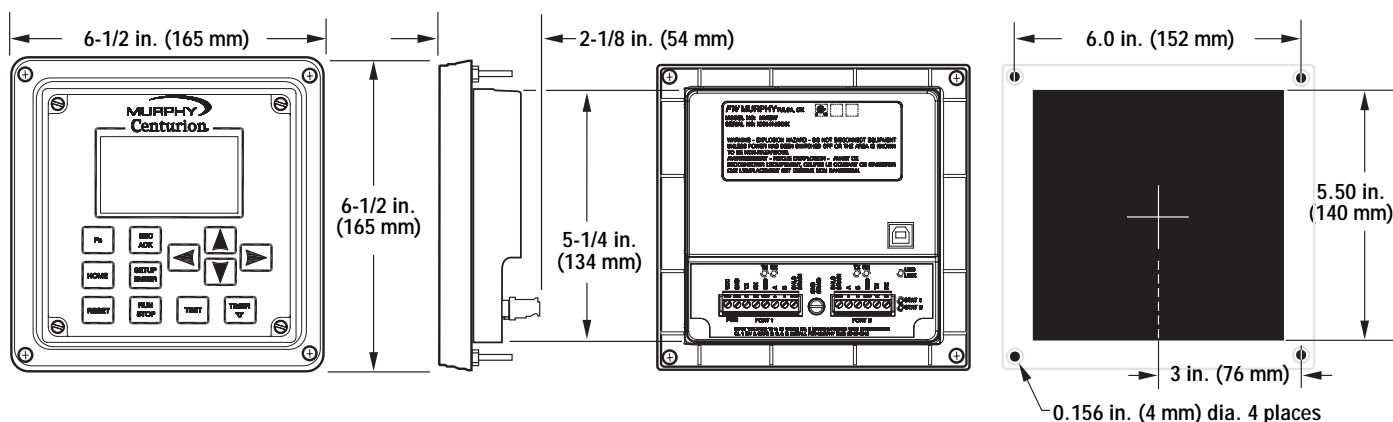
### 5.1 Mounting the Centurion Controller

The Centurion 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.



### 5.2 Mounting the Centurion C3-3 Display

The Centurion C3-3 Display can be mounted in the same hole cutout of other Murphy display modules. Four screws attached the display bezel to the mounting surface.



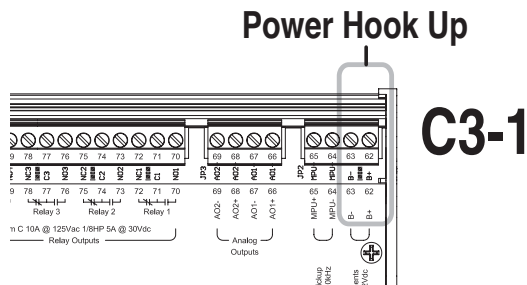
### 5.3 Power Supply Wiring

#### Power

#### Centurion C3-1 I/O Module

Requirements: (10 to 32) VDC: 30W (Max)

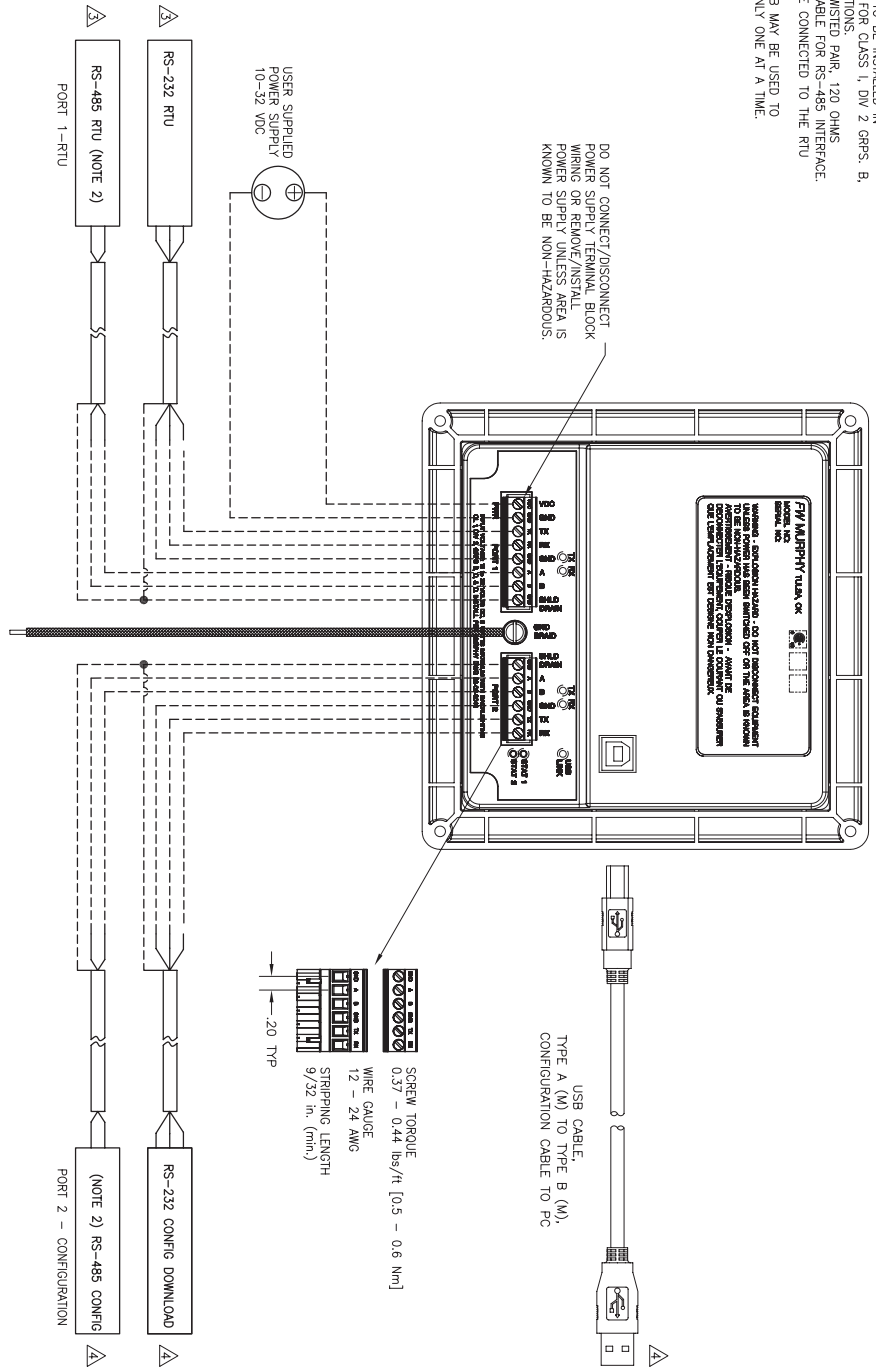
There are two screw terminal connectors for power hookup at terminals 62 and 63, labeled B+ and B- respectively.





## 5.4 Wiring the Centurion C3-3 Display

- NOTES:
1. FIELD WIRING CONNECTIONS TO BE INSTALLED IN ACCORDANCE WITH THE NEC FOR CLASS 1, DIV 2 GRPS. B, C, AND D, HAZARDOUS LOCATIONS.
  2. USE 14 AWG SHIELDED, TWISTED, PAIR, 120 OHMS CABLES FOR RS-232C INTERFACES.
  3. RS-232C OR RS-485 MAY BE CONNECTED TO THE RTU BUT NOT BOTH.
  4. RS-232 OR RS-485 OR USB MAY BE USED TO CONFIGURE THE UNIT BUT ONLY ONE AT A TIME.



1. REMOVE THE CAP FOR THE "GROUND BRAID" LUG BY UNSCREWING IT COUNTERCLOCKWISE.
2. SLIDE A 1/4 INCH BRAID INTO THE SLOT IN THE "GROUND BRAID" CONNECTION.
3. REATTACH THE "GROUND BRAID" LUG BY SCREWING IT CLOCKWISE. CONTINUE TIGHTENING UNTIL THE BRAID IS FIRMLY ATTACHED.
4. ROUTE THE LOOSE END OF THE 1/4 INCH BRAID TO THE PRIMARY GROUNDING POINT ON THE PANEL. THIS MUST BE A LOCATION THAT IS DESIGNED FOR SHIELD DRAINS, ON MURPHY PANELS, THE RECOMMENDED LOCATION IS THE FEED-THRU GROUNDING LUG LOCATED IN THE LOWER PORTION OF THE PANEL.
5. CUT THE 1/4 INCH BRAID TO LENGTH. DO NOT ADD SERVICE LOOPS, ETC.
6. USING CRIMPING TOOLS, ATTACH A LUG TO THE END OF THE 1/4 INCH BRAID.
7. ATTACH THE LUG TO THE FEED-THRU POST AND SECURE.

NOTE: BRAIDS LARGER THAN 1/4 INCH CAN BE USED AS LONG AS THE MATERIAL FITS INTO THE "GROUND BRAID" LUG ON THE VIEW.

**MURPHY**

DRAWN BY: JAD E.R.N.O. 3762  
DATE: 2-17-05 CHD. BY: AP APPD. BY: PLg  
MODEL: INSTALLATION  
DIAGRAM, C3-3

DRAWING NO. 50-08-0046 SIZE C REV. A

## 5.5 Wiring the Centurion C3-1/C3-2

### NOTES:

1. FIELD WIRING CONNECTIONS TO BE INSTALLED IN ACCORDANCE WITH THE NEC FOR CLASS I, DIV 2 GRPS. B, C, AND D: 14 (MAXIMUM AMBIENT TEMPERATURE 85 °C) HAZARDOUS LOCATIONS.
2. INSTALL A 1A, 600V PIV DIODE IN PARALLEL WITH FET AND IGBT OUTPUTS.  
(1N4005 - FWM P/N 36-16-1002).
3. USE TWO CONDUCTOR CABLE WITH FOIL SHIELD AND DRAIN WIRE FOR MPU INPUT.
4. 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.  
TO MAKE NETWORK RUGGED, A PULL-UP/PULL-DOWN MAY BE HELPFUL (FWM P/N 10-00-7607).
5. TO GROUND IGNITION USE PILOT RELAY WITH 100 OHM, 2W SERIES RESISTOR TO GROUND.
6. RELAYS MUST BE HERMETICALLY SEALED RELAYS, CSA OR UL APPROVED FOR USE IN CL. I, DIV. 2, GRPS. B, C, & D HAZARDOUS LOCATIONS.
7. NON-INCENDIVE FIELD WIRING CHARACTERISTICS:  
VOC = 16 VDC  
ISC = 10.8 UA  
Cmax = 0.2 uF  
Lmax = 100 nH
8. ANALOG OUTPUTS ARE ONLY AVAILABLE ON C3-1-A MODEL.

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.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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0.37 - 0.44 lbs/in (0.5 - 0.6 Nm)

SCREW TORQUE  
0.37 - 0.44 lbs/in (0.5 - 0.6 Nm)

WIRE GAUGE

12 - 24 AWG

STRIPPING LENGTH

9/32 in. (mm.)

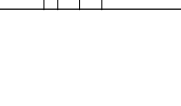
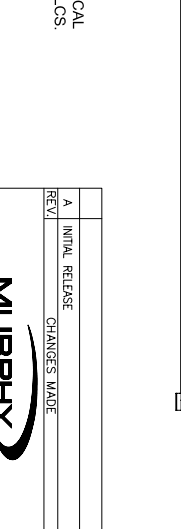
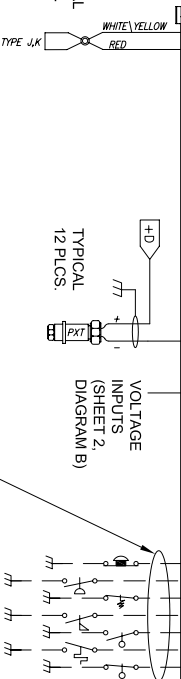
NON-INCENDIVE FIELD WIRING CONNECTIONS TO GENERAL PURPOSE ENCLOSURE PASSIVE MECHANICAL SWITCHES OR MURPHY SOLID STATE SWITCH DEVICES APPROVED FOR USE IN CL. I, DIV. 2 GRPS. B, C, AND D HAZARDOUS LOCATIONS.  
ROUTE SWITCH LEADS SEPARATE FROM ALL OTHER WIRING.

TYPICAL  
8 PLCS.

TYPICAL  
12 PLCS.

TYPICAL  
DIAGRAM B)

TYPICAL  
32 PLCS.

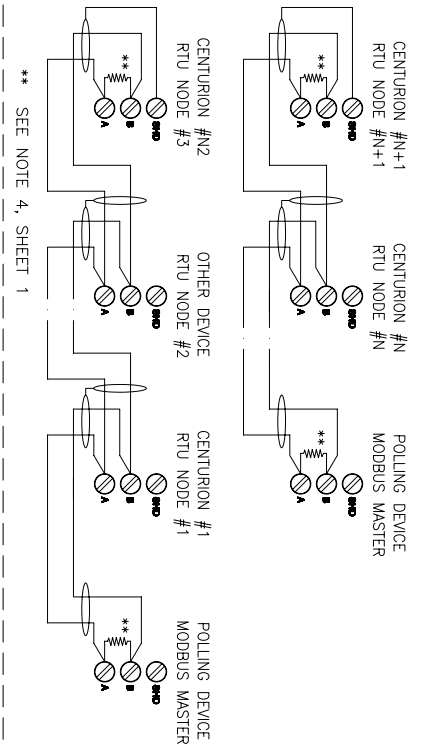


REV.	INITIAL RELEASE	CHANGES MADE
A	JAO	E.R.N.O. 3834
B	JAO	E.R.N.O. 3834
C	JAO	E.R.N.O. 3834
D	JAO	E.R.N.O. 3834
E	JAO	E.R.N.O. 3834
F	JAO	E.R.N.O. 3834
G	JAO	E.R.N.O. 3834
H	JAO	E.R.N.O. 3834
I	JAO	E.R.N.O. 3834
J	JAO	E.R.N.O. 3834
K	JAO	E.R.N.O. 3834
L	JAO	E.R.N.O. 3834
M	JAO	E.R.N.O. 3834
N	JAO	E.R.N.O. 3834
O	JAO	E.R.N.O. 3834
P	JAO	E.R.N.O. 3834
Q	JAO	E.R.N.O. 3834
R	JAO	E.R.N.O. 3834
S	JAO	E.R.N.O. 3834
T	JAO	E.R.N.O. 3834
U	JAO	E.R.N.O. 3834
V	JAO	E.R.N.O. 3834
W	JAO	E.R.N.O. 3834
X	JAO	E.R.N.O. 3834
Y	JAO	E.R.N.O. 3834
Z	JAO	E.R.N.O. 3834

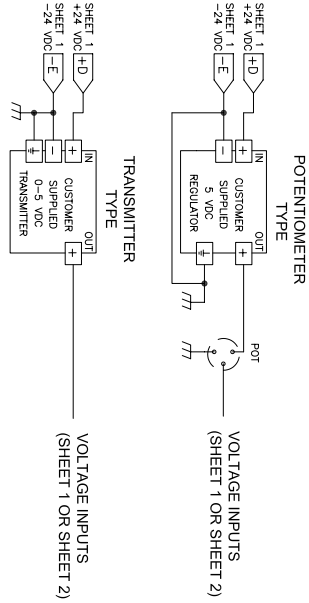
DATE:	3-12-05	CHKD. BY: AR	APPD. BY: PLE
MODEL:	INSTALLATION		
DRAWING NO.	50-08-0047		
SHEET 1 OF 2	C		
SIZE	A		
REV.	A		

## 5.5 Wiring the Centurion C3-1/C3-2 (continued)

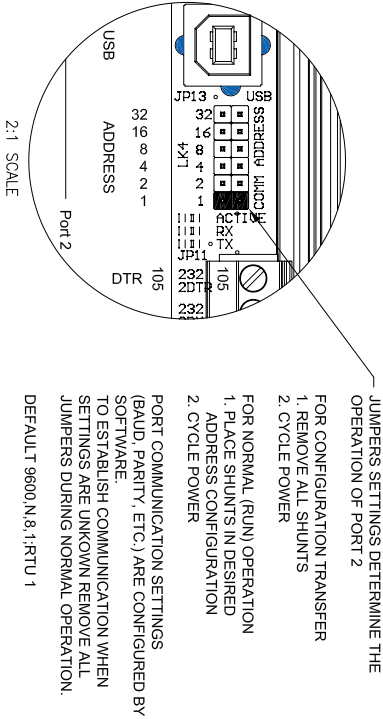
**DIAGRAM A - RS-485 TYPICAL CONNECTIONS**



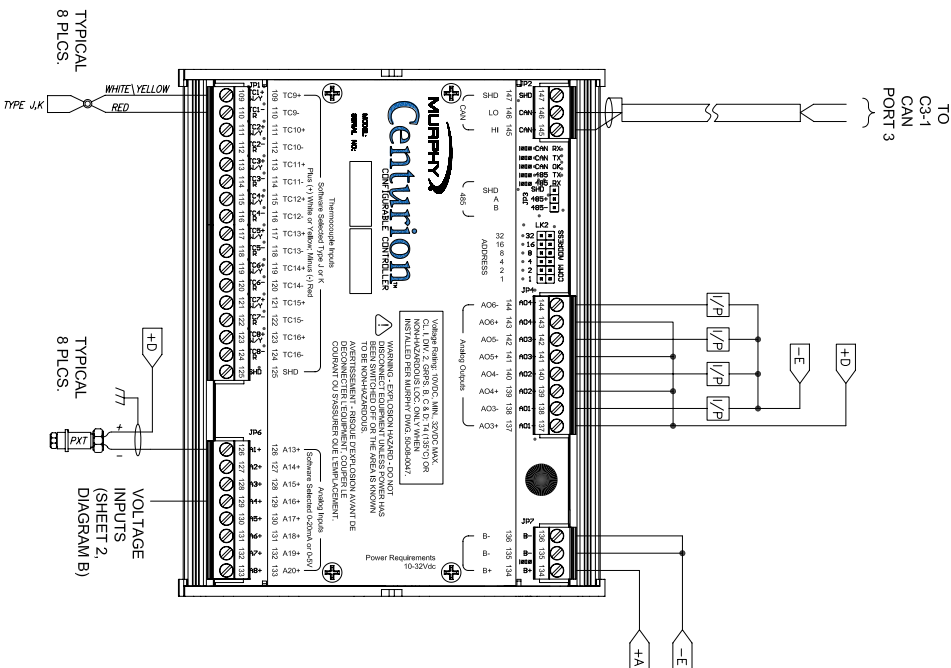
**DIAGRAM B - TYPICAL VOLTAGE INPUT WIRING**



**DIAGRAM C - PORT 2 ADDRESS JUMPER FUNCTION**



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.



## 6.0 Using the C3-3 Display to View and Configure the Centurion Controller Settings

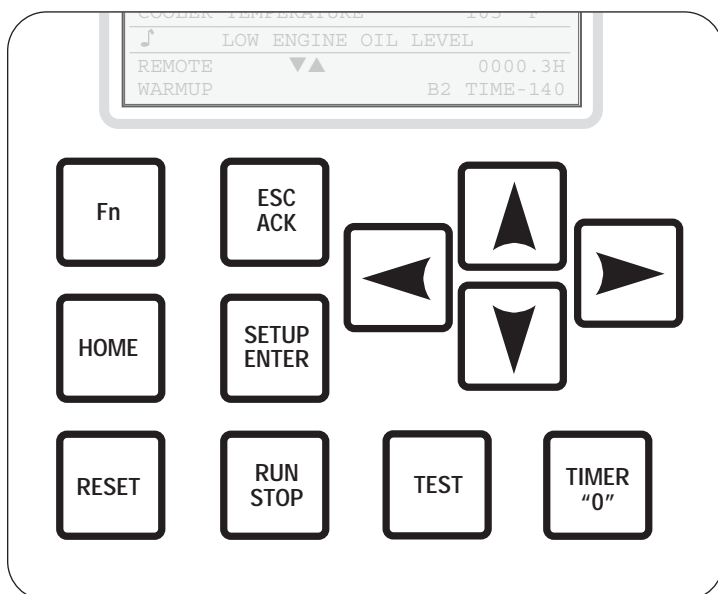
The Murphy C3-3 Display module is a highly integrated operator interface specially programmed to complement and support Centurion controller. The primary purpose of C3-3 Display is to display operational and configuration parameters and provide access to modify the configuration parameters stored in the Centurion controller.

### 6.1 Features

- Power
  - 10 - 32 VDC (LED active indication)
  - Storage power able to withstand 12V crank
- Package and Design
  - Same 5 x 5 design as annunciators
  - 12 key keypad
- Familiar annunciator keys
- Easy navigation keys
  - 128 x 64 graphic backlit display
  - Configurable using PC Software
  - Field Upgradeable (flash bootloader)
- Communications
  - LED active indication for each port
  - RS232/485 (Modbus Master)
  - RS232/485/USB 1.1 Compliant Port
- Download Configuration/Monitoring
- Approvals
  - Approvals for CSA, CLASS 1, DIVISION 2, Groups B, C and D are pending.



#### 6.1.1 Keypad Description and Navigation



The keypad for the C3-3 Display has 12 keys. The following table generally describes the keys and their function for each of the three screen types:

- Operating status screens
- Setup screens (Password required)
- Edit screens (Password required)

Many of the keys have a modified action relative to the current location of the cursor and the current page being displayed.

## HOME

### HOME

#### Operating Status Screen

Allows the user to get to the first line of the current screen, or if pressed again, to get to the default operating status screen.

#### Set Up Screen

Allows the user to get to the first line of the current screen

#### Edit Screen

No associated action.

## ESC ACK

### ESC/ACK

#### Operating Status Screen

Acknowledge the active message/alarm that is currently displayed in the Alarm Banner.

Acknowledges all active messages and alarms displayed in the Active Alarm Screen.

#### Set Up Screen

Exit Setup mode.

#### Edit Screen

Exit without saving changes to the current configuration.

## Fn

### Fn (Function Key)

#### Operating Status Screen

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.

#### Set Up Screen

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.

## SETUP ENTER

### SETUP/ENTER

#### Operating Status Screen

Enter Setup Mode.

#### Set Up Screen

Enter Edit mode or Sub-menu.

#### Edit Screen

Accept and save changes made to a current parameter before exiting Edit mode.

## RESET

### RESET

#### Operating Status Screen

Reset any active timers and alarms/faults.

#### Set Up Screen

No associated action.

#### Edit Screen

No associated action.



---

## **RUN/STOP**

### **Operating Status Screen**

Initiate or cancel a start sequence.

### **Set Up Screen**

No associated action in either Shutdown mode, or Remote mode on standby. Initiate stop sequence when held for two seconds, if equipment is running.

### **Edit Screen**

No associated action.



## **ARROW UP**

### **Operating Status Screen**

Scroll up one line. Automatically repeats if held down continuously until reaching the first line.

For history screens, scrolls up one history (for example: Shutdown or Event).

### **Set Up Screen**

Scroll up one line. Automatically repeats if held down continuously until reaching the first line.

### **Edit Screen**

Increment the digit selected by the cursor (from 0 to 9). The user will not be allowed to increment the selected digit if it would result in exceeding range limits.



---

## **ARROW DOWN**

### **Operating Status Screen**

Scroll down one line. Automatically repeats if held down continuously until reaching the final line.

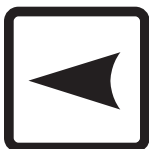
For history screens, scrolls down one history (i.e. Shutdown or Event).

### **Set Up Screen**

Scroll down one line. Automatically repeats if held down continuously until reaching the final line.

### **Edit Screen**

Decrement the digit selected by the cursor (from 0 to 9). The user will not be allowed to decrement the selected digit if it would result in exceeding range limits.



---

## **ARROW LEFT**

### **Operating Status Screen**

Display previous screen. Automatically repeats if held down continuously until reaching the first screen.

### **Set Up Screen**

Display previous screen. This key has no action when in a sub-menu.

### **Edit Screen**

Move the cursor to the previous digit.



### **ARROW RIGHT**

#### **Operating Status Screen**

Display next screen. Automatically repeats if held down continuously until reaching the final screen.

#### **Set Up Screen**

Display next screen. This key has no action when in a sub-menu.

#### **Edit Screen**

Move the cursor to the next digit.



---

### **TEST**

#### **Operating Status Screen**

Enter test mode and start test timer. This is not applicable in Shutdown mode.

#### **Set Up Screen**

No associated action.

#### **Edit Screen**

No associated action.



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### **TIMER "0"**

#### **Operating Status Screen**

Zero displayed timer (Global Timers, State Timers, etc.)

#### **Set Up Screen**

No associated action.

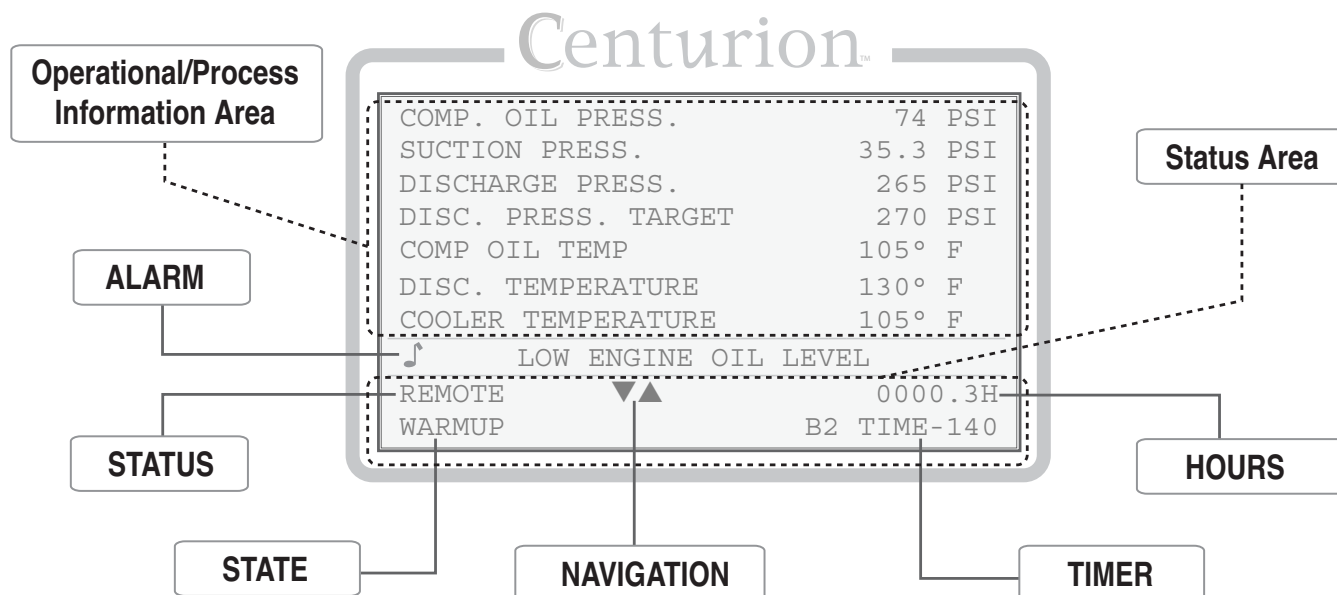
#### **Edit Screen**

No associated action.



### 6.1.2 Display Context

The graphic LCD displays are organized around operating status screens and setup screens. The actual number of status screens will be related to the total number of end devices configured for the controller. In either screen set, ten (10) lines are visible at a time; with up and down arrow characters indicating more lines are available on the page. Also, for both screen sets, navigation between screens is accomplished by pressing the left or right arrow keys.

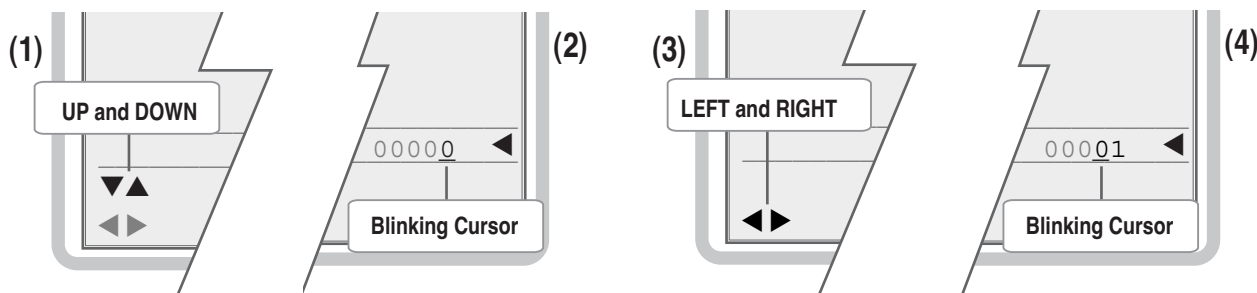


### 6.1.3 Numeric Entry

The C3-3 Display uses a different approach to enter values than previous Murphy controllers. Instead of holding in the arrow keys until the desired number is displayed, the Centurion display allows individual editing of each position of the desired number. This is accomplished by entering the Edit Mode and using the UP/DOWN arrow keys (1) to adjust the number above the blinking cursor (2) between 0 and 9. To edit another position, simply use the LEFT/RIGHT (3) arrow keys to move the cursor to that position (4) and repeat the edit process until the desired number is displayed.

In this way, values are "built" rather than "scrolled" through. Some digits may not be allowed to increment 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 simply move the cursor to the sign using the LEFT arrow key and "toggle" between + and - using the U 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 decrementing the left most digit by one or more and attempt to change the sign again.

In some instances, a word rather than a value is represented in the Edit Mode. This works like the sign value as an ON/OFF or YES/NO prompt where the value is "toggled" between choices using the UP/DOWN arrow keys. The value is not active in the controller until the ENTER key has been pressed to send the value to the controller. Pressing the ESC key will discard any changes and keep the original value prior to entering the Edit Mode.



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## 6.2 Operational Screens

In addition to the set up screens reviewed in Section 7.3, the C3-3 Display offers a number of operational displays. On the Operating Status screens, the two bottom lines display the state, hours, mode and active timer status. This information is key to understanding the “status” of the controller.

Mode refers to the Operating Mode of the controller and can be LOCAL or REMOTE. Depending on the configuration active in the controller, the operation may differ depending on what Mode the controller is currently displaying.

**NOTE:** 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 Fn before pressing RESET or RUN/STOP is a REMOTE function and will change the Mode to REMOTE if it is in LOCAL.

### 6.2.1 Default Operating Screen

After turning on the power, the user will view the F W Murphy logo screen for three seconds before the next screen displays, which is a software-configured default operating screen. The MConfigPro software allows users to configure up to five screens with controller I/O groupings. Possible custom screen types that may have been configured as a default operating screen, or which may be also displayed, include:

- a) Custom Line by Line allows process data to be displayed 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 PID up to 4 PID screens.

For more information on configuring the optional screens through the MConfigPro software, please refer to the Centurion Controller Programming Manual.

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### 6.2.2 F W Murphy Logo Screen

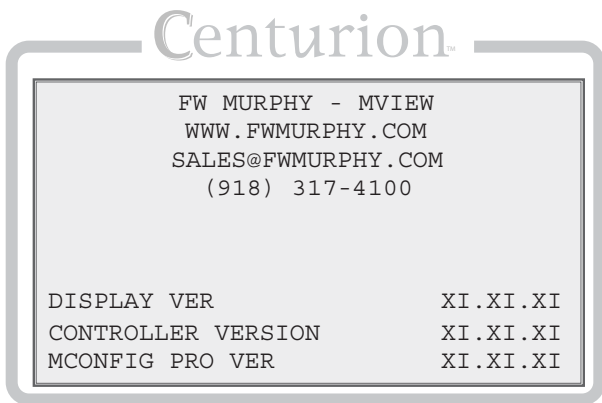


Logo Screen

The F W 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.

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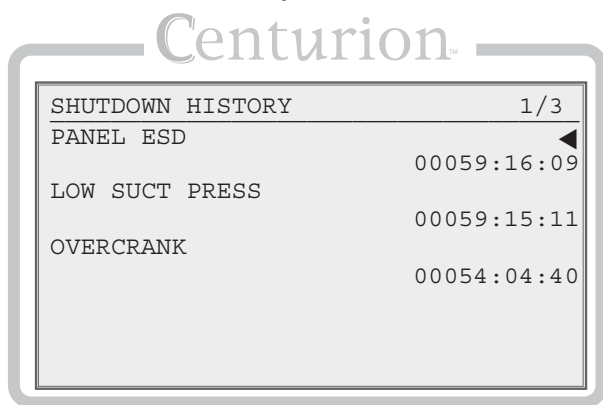
### 6.2.3. Corporate and Version Information Screen



Info Screen

Following the F W Murphy Logo screen is the F W Murphy corporate contact information which also lists firmware version information for the Centurion C3-3 Display, the C3-1 I/O Module and the MConfigPro Software.

#### 6.2.4. Shutdown History Screen



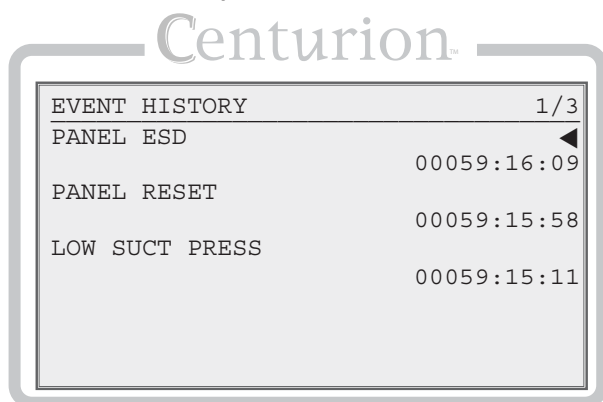
Shutdown History Screen

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

Each event is displayed with the shutdown label on one line and the hour meter reading on the following line. Pressing the up/down arrows will scroll up/down one shutdown at a time rather than one line at a time.

The "1 / 3" at the right end of the top line means the user is viewing shutdown one of a total of three stored. The newest shutdown will always be number one and it will push the older shutdowns further down the list.

#### 6.2.5 Event History Screen

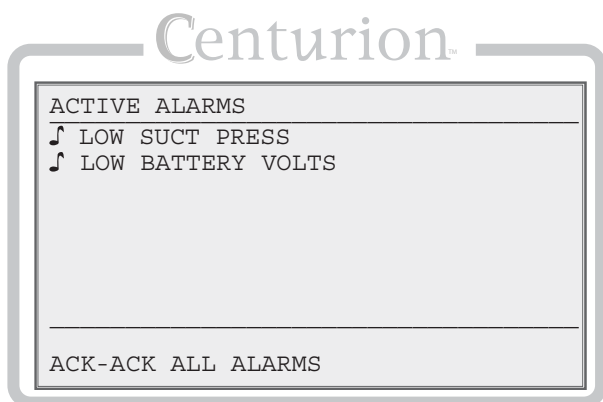


Event History Screen

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

There will be a maximum of thirty two events in this history and beyond that a new event will cause the oldest event to be discarded.

#### 6.2.4 Active Alarms Screen

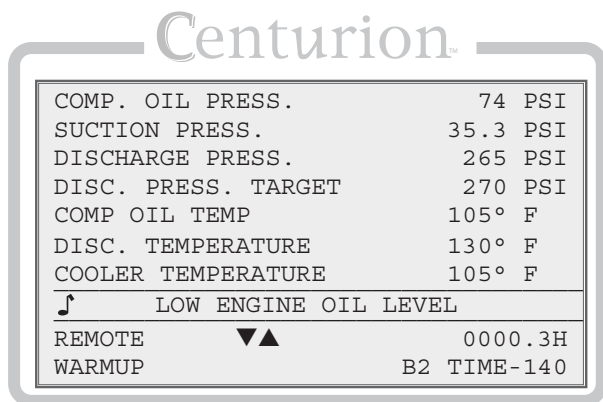


Alarms Screen

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

The top line is the screen heading and the next six lines display alarms. If there are more than six active alarms, there will be up/down arrow icons at the bottom of the screen and the user can press the up/down arrow keys to scroll up or down. Unacknowledged alarms will be preceded by a musical note character and acknowledged alarms will have a bar through the staff of the note.

Pressing ACK on this screen will acknowledge all active alarms.

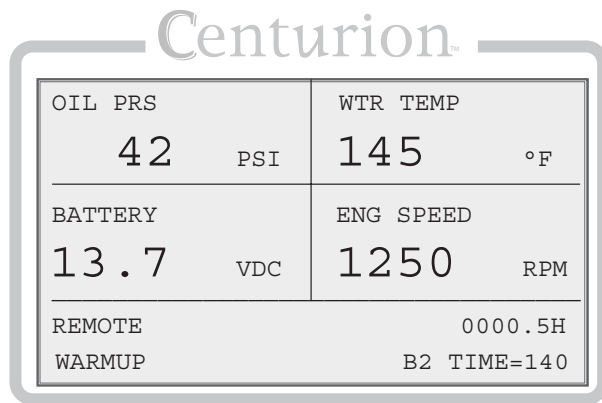


Operating Status Screen 3

This screen shows the alarm annunciation as it will appear on a status screen.

The alarm message(s) will overwrite the bottom line of the active screen area and then briefly clear once a second. This will continue until it is acknowledged with the ACK, key unless it is a self-clearing alarm. If there is more than one unacknowledged alarm active, each alarm will be displayed for one second each until acknowledged. The ACK key will acknowledge the alarm currently displayed. Pressing the Fn key followed by the ACK key will switch to the Alarms screen.

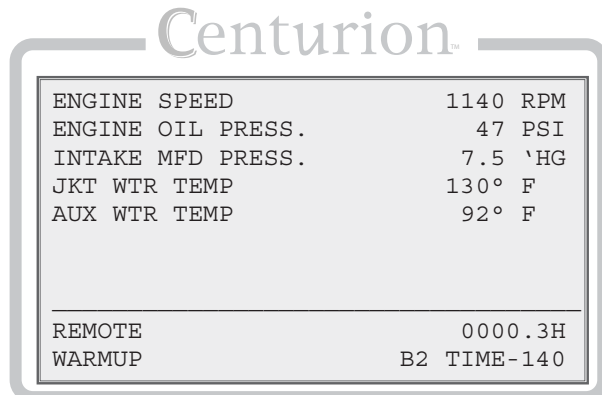
### 6.2.5 Gage Display



Custom Gage Screen

This is an example of a custom gage display. Configured software orders the data as needed. This display provides larger characters for easier viewing as well as a means to prominently display items of interest. Unacknowledged alarms will overwrite the bottom half of the lower two gage boxes. The two bottom lines are used to display the mode, hours, state and active timer status.

### 6.2.6 Line By Line

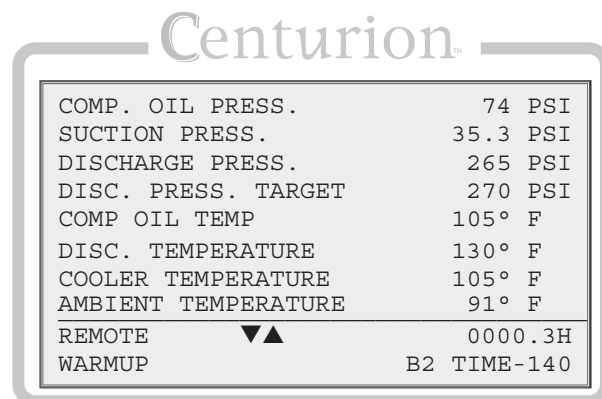


Operating Status Screen 1

This is an example of a line by line status screen for engine parameters.

The MConfigPro software orders the available data as needed.

Notice that there are no up/down arrows at the bottom of the screen because there are no additional lines to be displayed on this screen.

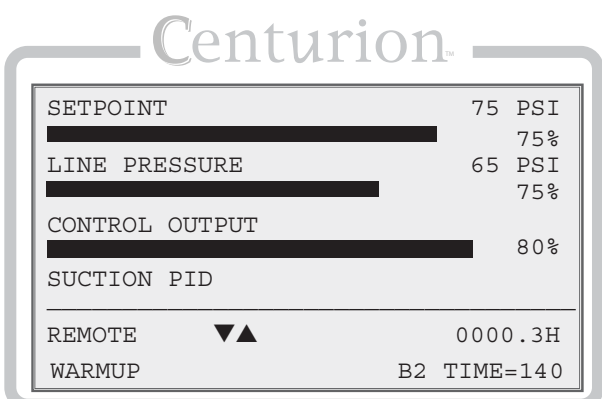


Operating Status Screen 2

This is an example of a line by line status screen with more parameters.

If the parameters do not fit on a single screen, up/down arrow icons at the bottom of the screen can be used to scroll up or down. The two bottom lines are used to display the mode, hours, state and active timer status.

### 6.2.7 Custom PID Screen

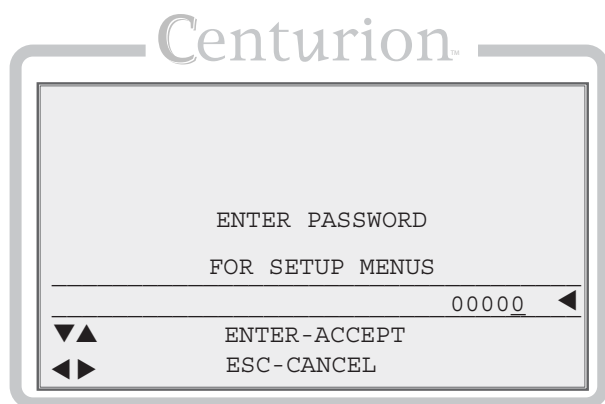


CUSTOM PID Screen

The user may choose to display any configured PID functions in this convenient format. The control output will be displayed as a percentage of the range. The bottom two lines are used to display the mode, hours, state and active timer status.

## 6.3 Setup Screens and Menus

### 6.3.1 Password Screen



Password Screen

Some settings are password protected, including the setup screens. This is the first screen seen when the SETUP/ENTER key is pressed.

The password need only be entered once during any editing session. The password will reset when the editing session is exited, or is timed-out due to keyboard inactivity.

The cursor begins at the last digit on the right. The user can adjust the value of each digit with the up/down arrows while the left/right arrows are used to select the digit to edit.

Passwords are assigned using the MConfigPro software and each digit can range from zero to nine (except the first digit on the left) for a total range of 00000 to 65535 for the complete password.

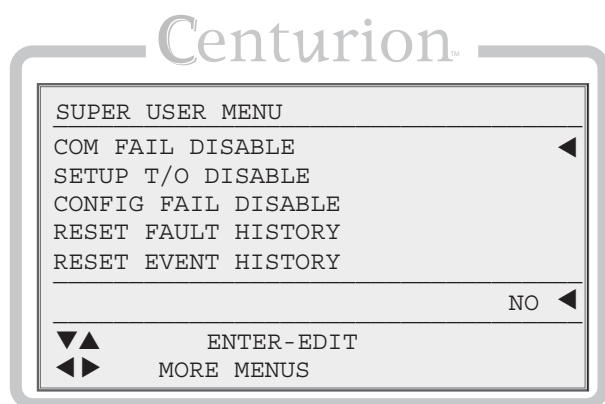
The user will not be allowed to increment the selected digit if it would result in exceeding range limits.

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

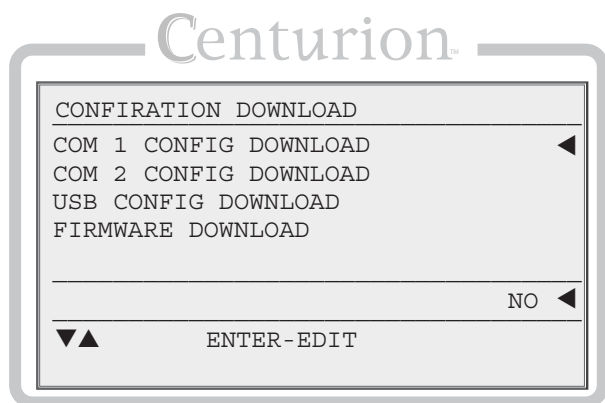
- “Standard” password – Allows access to every feature except the Super User menu. Valid Standard passwords can be zero or any number between 100 and 65535. If the Standard password is set to zero, the result is that anyone can have read/write access to setup menus.
- “Super User” password – Adds the Super User menu to the Standard menus. Valid Super User passwords can be in the range of 100 to 65535. The Super User password can not be the same as the Standard password.
- “Download Only” password – This Special 35 Jump Code allows access to a download menu and is set to a fixed value of 35. This allows a configuration to be downloaded in the event that the current passwords are lost or no initial configuration has been downloaded.

If the Standard password is not zero and a password of all zeroes is entered, the user will have “view only” access.

Inactivity Timeout: Setup procedures must be started and completed in a timely manner. Note that after 3 minutes without activity, the keypad returns the default operational screen and a password must be re-entered to return to the setup and edit menus.




Super User Menu Screen




Download Only Screen

### 6.3.2 Digital Input



DIGITAL INPUTS	
DIGITAL INPUT 1	◀
DIGITAL INPUT 2	
DIGITAL INPUT 3	
DIGITAL INPUT 4	
DIGITAL INPUT 5	
D_IN_01	N/O ▶
▼▲ ENTER-EDIT	
▶ MORE MENUS	

Digital Inputs Setup Screen 1




DIGITAL INPUTS	
DIGITAL INPUT 1	◀
DIGITAL INPUT 2	
DIGITAL INPUT 3	
DIGITAL INPUT 4	
DIGITAL INPUT 5	
D_IN_01	N/O ▶
ENTER-ACCEPT	
▼▲ MODIFY SELECTION	

Digital Inputs Setup Screen 2

Digital Input: For up to 32 configured Digital Input devices, the user may select whether an input is normally open (N/O), or normally closed (N/C).

### 6.3.3 Digital Output




DIGITAL OUTPUTS SETUP	
DIGITAL OUTPUT 1	◀
DIGITAL OUTPUT 2	
DIGITAL OUTPUT 3	
DIGITAL OUTPUT 4	
DIGITAL OUTPUT 5	
R_OUT_01	N/O ▶
▼▲ ENTER-EDIT	
◀▶ MORE MENUS	

Digital Outputs Setup Screen 1

Digital Output: For up to 10 configured Digital Output devices, the user may select whether an output is normally open (N/O), or normally closed (N/C).

### 6.3.4 Analog Input



ANALOG INPUTS SETUP	
ANALOG INPUT 1	◀
ANALOG INPUT 2	
ANALOG INPUT 3	
ANALOG INPUT 4	
ANALOG INPUT 5	
AN_IN_01	◀
▼▲ ENTER-SUBMENU	
◀▶ MORE MENUS	

Analog Inputs Setup Screen 1

For up to 20 configured Analog Input devices, the user may edit

- Moving Average Samples. (1, 2, 4).
- Determine Raw Count Offset, the lowest reading expected from the device.
- Determine Raw Count Span, the span from the lowest to highest reading expected from the device.
- Apply the appropriate Minimum engineering scale. In most cases, 0% addresses a typical application and it is the Centurion's default value.
- Apply the appropriate Maximum engineering scale. In most cases, 100% addresses a typical application and it is the Centurion's default value.

## Centurion™

ANALOG INPUT 1 SETUP	
MOVING AVERAGE SAMPLES	◀
RAW COUNT OFFSET	
RAW COUNT SPAN	
MINIMUM	
MAXIMUM	
(1,2,OR 4)	1 ◀
▼▲	ENTER-EDIT
ESC EXIT THIS MENU	

Analog Input 1 Setup Screen

## Centurion™

ANALOG INPUT 1 SETUP	
MOVING AVERAGE SAMPLES	◀
RAW COUNT OFFSET	
RAW COUNT SPAN	
MINIMUM	
MAXIMUM	
(1,2,OR 4)	1 ◀
▼▲	ENTER-ACCEPT
◀▶	ESC-CANCEL

Analog Input 1 Setup Screen

### 6.3.5 Analog Output

## Centurion™

ANALOG OUTPUTS SETUP	
ANALOG OUTPUT 1	◀
ANALOG OUTPUT 2	
ANALOG OUTPUT 3	
ANALOG OUTPUT 4	
ANALOG OUTPUT 5	
AN_OUT_01	◀
▼▲	ENTER-SUBMENU
◀▶	MORE MENUS

Analog Output Setup Screen

## Centurion™

ANALOG OUTPUTS 1 SETUP	
RAW COUNT OFFSET	◀
RAW COUNT SPAN	
MINIMUM	
MAXIMUM	
	00000 ◀
▼▲	ENTER-EDIT
ESC-EXIT THIS MENU	

Analog Output 1 Setup Screen

User may edit:

- a) Raw Count Offset, the lowest reading expected from the device.
- b) Determine Raw Count Span, the span from the lowest to highest reading expected from the device.
- c) Apply the appropriate Minimum engineering scale. In most cases, 0% addresses a typical application and it is the Centurion's default value.
- d) Apply the appropriate Maximum engineering scale. In most cases, 100% addresses a typical application and it is the Centurion's default value.



Centurion™

ANALOG OUTPUTS 1 SETUP

RAW COUNT OFFSET ◀  
RAW COUNT SPAN  
MINIMUM  
MAXIMUM

00000 ◀

▼▲ ENTER-ACCEPT  
◀▶ ESC-CANCEL

Analog Output 1 Setup Screen 1

### 6.3.6 Thermocouple Input

Centurion™

THERMOCOUPLE SETUP

THERMOCOUPLE 1 ◀  
THERMOCOUPLE 2  
THERMOCOUPLE 3  
THERMOCOUPLE 4  
THERMOCOUPLE 5  
TC1 ◀

▼▲ ENTER-SUBMENU  
◀▶ MOORE MENUS

Thermocouple Setup Screen

User may:

- a) Identify whether the calibration Type should be set to J or K.
- b) Assign the Offset value.

Centurion™

THERMOCOUPLE 1 SETUP

THERMOCOUPLE TYPE ◀  
THERMOCOUPLE OFFSET

(J OR K) J ◀

▼▲ ENTER-EDIT  
ESC-EXIT THIS MENU

Thermocouple 1 Setup Screen

Centurion™

THERMOCOUPLE 1 SETUP

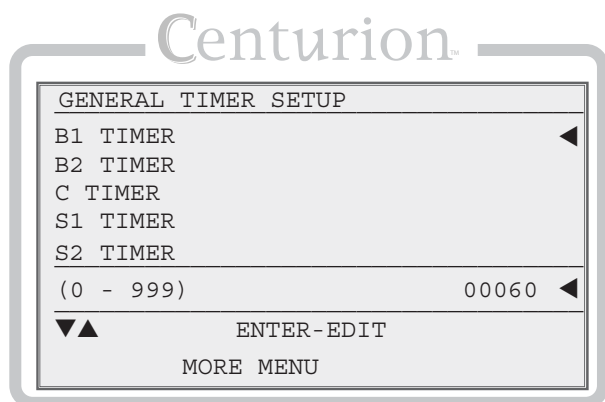
THERMOCOUPLE OFFSET

- 00015 ◀

▼▲ ENTER-ACCEPT  
◀▶ ESC-CANCEL

Thermocouple 1 Setup Screen 1

### 6.3.7 General Timer Setup

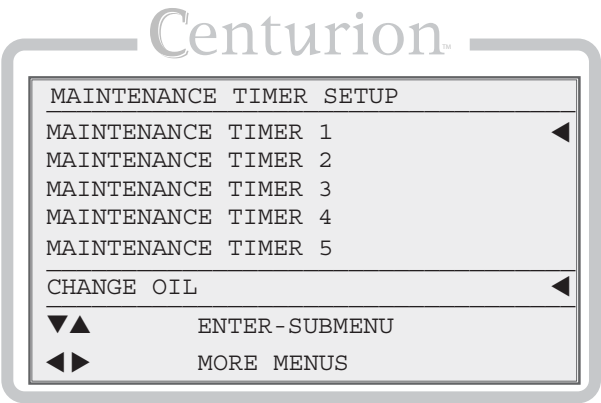


General Timer Setup Screen

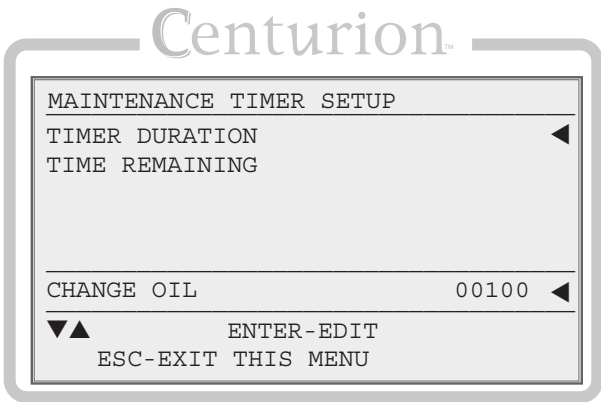
User may edit all general purpose timers. Generally, global timers affect engine operation. They also help define an event.

- a) 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 in a running State (10 – 13) depending on which have been marked 'In Use'. B1 is also known as the "Lockout Timer."
- b) B2: The second global timer used for delaying an event condition detection. B2 is also known as a secondary "Lockout Timer."
- c) C: The delay allowing a clear reading before beginning testing for the arming of Class C events. The default and typical time for most applications is 2 seconds.
- d) S: Users have up to five (5) options to assign additional special global timers to signals. The Sx timers begin concurrently with the Bx timers.
- e) 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 no flow transition times configured in the digital input dialog expires.
- f) 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.
- g) 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.
- h) Ignition On Delay: Time delay before the assigned ignition output turns on. This is typically used to delay ignition until engine crank rollover can occur.
- i) Fuel On Delay: Time delay before the assigned fuel valve output is turns on. This is typically used to delay fuel until ignition has been turned on.

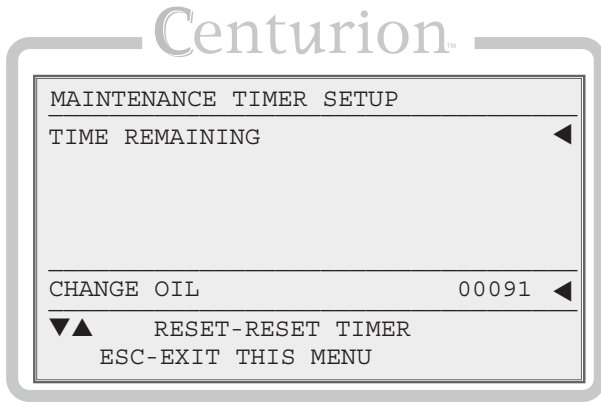
6.3.8 Maintenance Timer Setup



Maintenance Timer Setup Screen



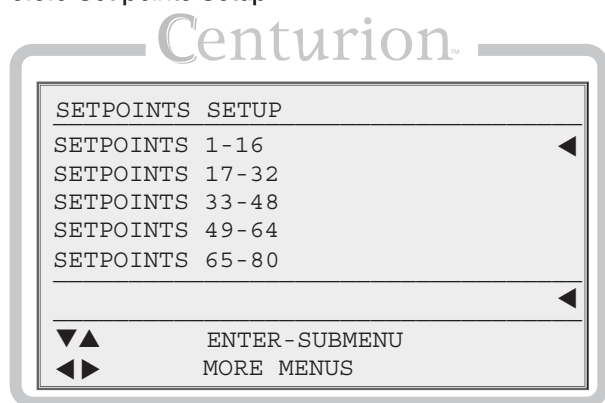
Maint\_1 Setup Screen



Maint\_1 Setup Screen 1

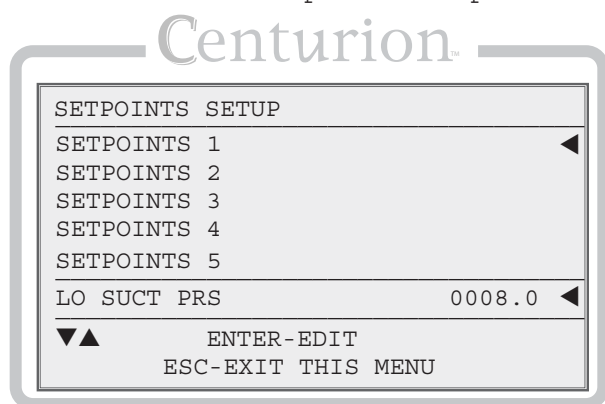
The user may access and edit the ten (10) maintenance settings for timer duration. The user may also access and reset all timer duration and time remaining settings. Note that while these are configured through MConfigPro, they must be manually initiated, or restarted, in C3-3 Display. All maintenance timer units are in hours.

### 6.3.9 Set points Setup



The screen displays the 'SETPOINTS SETUP' menu. It lists five ranges of setpoints: 1-16, 17-32, 33-48, 49-64, and 65-80. At the bottom, there are two navigation options: 'ENTER-SUBMENU' and 'MORE MENUS'.

Setpoints Setup Screen



The screen displays the 'SETPOINTS SETUP' menu for a specific setpoint. It shows five setpoints (1 through 5) and a 'LO SUCT PRS' value of 0008.0. At the bottom, there are two navigation options: 'ENTER-EDIT' and 'ESC-EXIT THIS MENU'.

Setpoint Setup Screen 1

User can edit any of the 128 set points that are configured. Set points further configure analog inputs and thermocouple inputs by defining a threshold, exception or any other out-of-limit event that may require action. Multiple set points are often applied to a process and they may be configured as often as needed to meet changing conditions.

Common alarm and shutdown set points a user might have configured include:

- High Shutdown
- Low warning
- Open Warning
- High Warning
- Low Shutdown

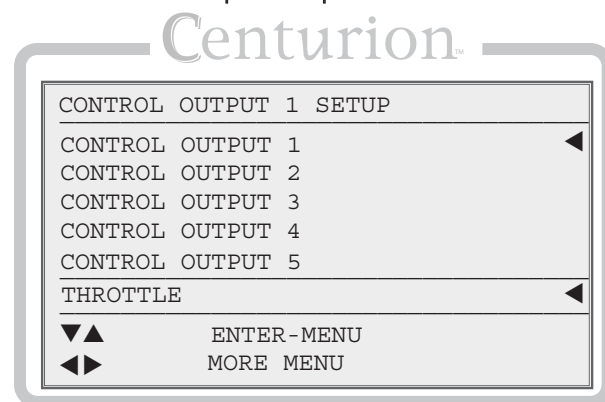
A user might also have configured other set point settings which are not used to indicate alarm or shutdown. For example, a set point provides a less flexible, but simpler alternative to controlling the pump's start and stop functions.

To edit a configured set point:

- a) Assign numeric threshold that if crossed, triggers the set point.
- 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.

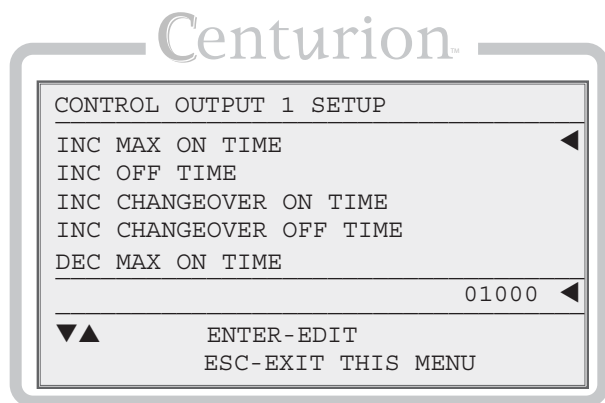
For more on Set Points, please refer to the Centurion Configurable Controller Programming Manual.

### 6.3.10 Control Output Setup



The screen displays the 'CONTROL OUTPUT 1 SETUP' menu. It lists five control outputs (1 through 5) and a 'THROTTLE' option. At the bottom, there are two navigation options: 'ENTER-MENU' and 'MORE MENU'.

Control Output Setup Screen



The screen displays the 'CONTROL OUTPUT 1 SETUP' menu for a specific control output. It shows five options: 'INC MAX ON TIME', 'INC OFF TIME', 'INC CHANGEOVER ON TIME', 'INC CHANGEOVER OFF TIME', and 'DEC MAX ON TIME'. The 'DEC MAX ON TIME' value is 01000. At the bottom, there are two navigation options: 'ENTER-EDIT' and 'ESC-EXIT THIS MENU'.

Control Output 1 Setup Screen

The Centurion controller allows users to define up to eight (8) outputs to augment control not otherwise defined.

The Centurion controller can be configured through MConfigPro software to define an analog output, a digital output, a single pulsed digital output, or two pulsed digital outputs.

Note that Control Outputs 1 through 4, are directly related to Proportional Integral Derivative (PID) calculation loops and are further defined in the PID dialog screens described in Section 6.3.11. For example, PID 1 is assigned its control from Control Output 1, PID 2 from Control Output 2, and so on.

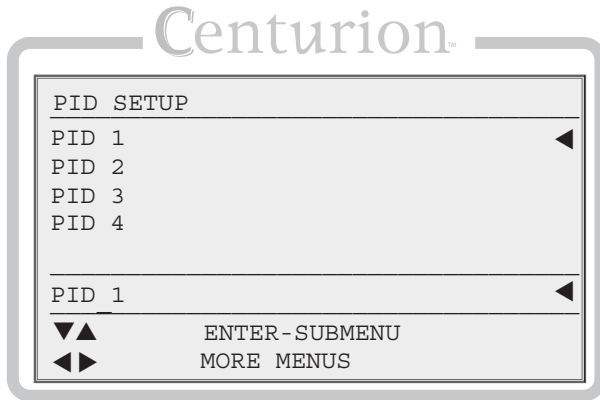
If the configured output is a pulsed cycle, the user may edit those behaviors by following the available steps:

- a) Assign value to Increase Max On Time. (Set limit of maximum on-time for Increase pulses.)
- b) Assign value to Increase Off Time. (Set fixed off-time for Increase pulses.)
- c) Assign value to Increase Changeover On Time. (Set fixed on-time for single pulse on direction change for Increase.)
- d) Assign value to Increase Changeover Off Time. (Set fixed off-time for single pulse on direction change for Increase.)
- e) Assign value to Decrease Max On Time. (Set limit of maximum on-time for Decrease pulses.)
- f) Assign value to Decrease Off Time. (Set fixed off-time for Decrease pulses.)
- g) Assign value to Decrease Changeover On Time. (Set fixed on-time for single pulse on direction change for Decrease.)

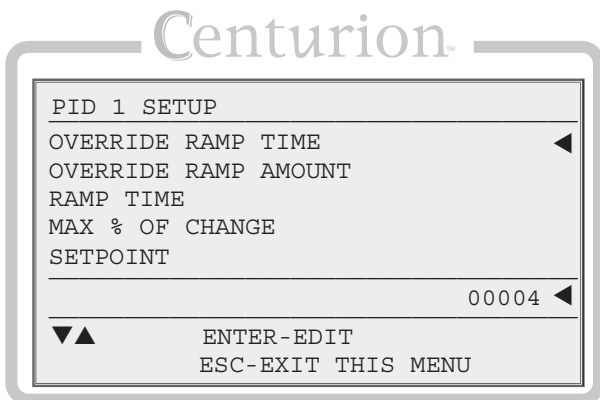
- h) Assign value to Decrease Changeover Off Time. (Set fixed off-time for single pulse on direction change for Decrease).

For more on Control Output, please refer to the Centurion Configurable Controller Programming Manual.

### 6.3.11 PID Setup



PID Setup Screen



PID 1 Setup Screen

Users may view and edit up to four (4) MConfigPro software configured Proportional Integral Derivative (PID) calculation loops. A PID provides a constant feed back loop, in which the PID can correct for a measured process variable against a desired set point, output the corrective action to the process and wait for and recalculate the next measurement.

The ultimate goal of the PID is to reduce the error to zero.

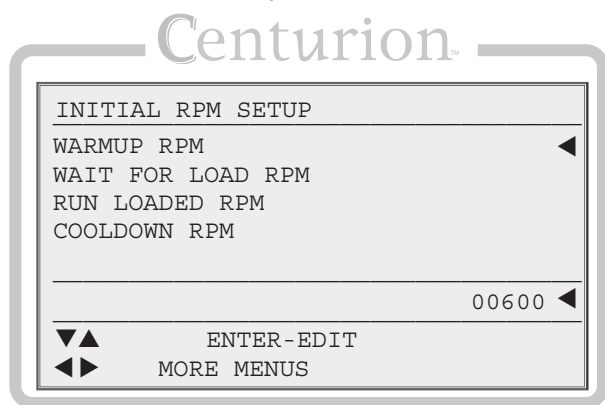
During the time a PID is enabled, the PID always overrides a control output. Recall that PID 1 is assigned its control from control output 1, PID 2 from control output 2, and so on.

To View and Edit PID Settings:

- 1) Over Ride Ramp Time: Assign a time interval value to wait before making the next adjustment.
- 2) Over Rid Ramp Amount: Determine the increments in a given direction (positive or negative) that the set point should be altered to regain balanced processes. In the example of the discharge and suction pressure application, this value would indicate how much the PID should resist its goal in reaching the set point.
- 3) Ramp Time: Assign a time interval for the PID to calculate error.
- 4) Over Ride Max Change: Assign a maximum allowed change. This represents the total amount of change allowed into or out of the ramp amount from the set point. The maximum change value should be large enough to effect change.
- 5) Set Point: Assign the desired goal—the target feedback base value.
- 6) DeadBand: Assign a value around the set point during which the PID will not calculate error.
- 7) Minimum Output: Assign a percentage as minimum output.
- 8) Maximum Output: Assign a percentage as maximum output.
- 9) Proportional: Adjust the output by a value that is proportional to the change of error.
- 10) Integral: To prevent the PID from oscillating or overshooting the set point, assign a value to “reset” the system to produce zero error, or nudge the process variable to the set point. This value is typically set to zero.
- 11) Derivative: Assign a value to the rate of change of error. This value is typically set to zero.
- 12) Max Override Change: Assign a percentage rate of change over which would cause harm to the system.

For more on PID, please refer to the Centurion Configurable Controller Programming Manual.

### 6.3.12 Initial RPM Setup

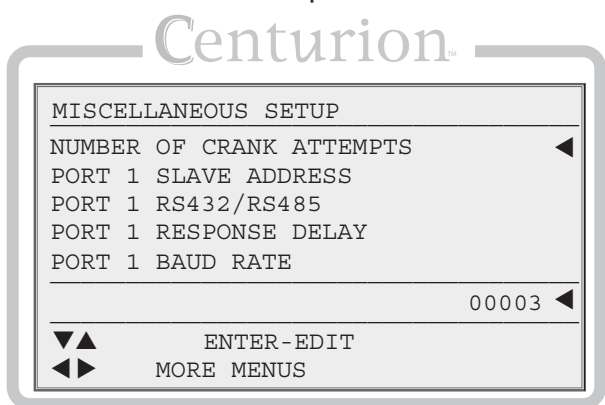


The image shows a screen titled "Centurion" with a sub-header "INITIAL RPM SETUP". Below the header, there are four menu items: "WARMUP RPM", "WAIT FOR LOAD RPM", "RUN LOADED RPM", and "COOLDOWN RPM". At the bottom right, there is a numerical display showing "00600" with a left-pointing arrow. At the bottom left, there are two sets of navigation arrows: up/down and left/right. In the center, there are two text labels: "ENTER-EDIT" and "MORE MENUS".

Initial RPM Setup Screen

- a) Assign value for Warmup RPM.
- b) Assign value for Wait to Load RPM.
- c) Assign value for Run Loaded RPM.
- d) Assign value for Cooldown RPM.

### 6.3.13 Miscellaneous Setup



The image shows a screen titled "Centurion" with a sub-header "MISCELLANEOUS SETUP". Below the header, there are four menu items: "NUMBER OF CRANK ATTEMPTS", "PORT 1 SLAVE ADDRESS", "PORT 1 RS432/RS485", and "PORT 1 RESPONSE DELAY". At the bottom right, there is a numerical display showing "00003" with a left-pointing arrow. At the bottom left, there are two sets of navigation arrows: up/down and left/right. In the center, there are two text labels: "ENTER-EDIT" and "MORE MENUS".

Miscellaneous Setup Screen


User can access and edit the miscellaneous settings.

- a) Crank Attempts: Define a value for number of crank attempts after which an over-crank sequence will be triggered in the Event logic.
- b) Controller Slave Address: Provide the value for the Modbus Address Port. The factory default is 1.
- c) Port 1 Mode: Select Communication Port 1 as RS232, or RS485.
- d) Port 1 Reply Delay: To ensure sufficient time for the Modbus reply, assign appropriate time value for Delay Modbus Reply Port 1.
- e) Port 1 Baud Rate: Select appropriate transmission baud rate
- f) Port 2 Mode: Select Communication Port 2 as RS232, or RS485.
- g) Port 2 Reply Delay: To ensure sufficient time for the Modbus reply, assign appropriate time value for Delay Modbus Reply Port 2.
- h) Port 2 Baud Rate: Select appropriate transmission baud rate
- i) Flywheel Teeth: Define a value for Flywheel Teeth used to calculate RPM.

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.


- j) Core Cold Temp Offset: Enter a non-zero Value for Core Temperature Adjustment (in tenths) to adjust the temperature readings for all Thermocouple inputs on both the Main I/O Module (C3-1). Entering a non-zero value will adjust the Cold Junction Compensation reading used to calculate temperature.
- k) Exp Cold Temp Offset: Enter a non-zero Value for Expansion Board Temperature Adjustment (in tenths) to adjust the temperature readings for all Thermocouple inputs on Expansion I/O (C3-2). Entering a non-zero value will adjust the Cold Junction Compensation reading used to calculate temperature.
- l) Hour Meter: The user may make hour meter adjustments. The range is 0 – 65535 hours.

#### 6.3.14 Lube No Flow Set Up

LUBE NO-FLOW SETUP	
NO-FLOW INPUT # 1	◀
NO-FLOW INPUT # 2	
NO-FLOW INPUT # 3	
NO-FLOW INPUT # 4	
NO-FLOW INPUT # 5	
DI_1 NF	◀
▼▲	ENTER-SUBMENU
◀▶	MORE MENUS

Lube No-Flow Setup Screen


  

NO-FLOW INPUT # 1 SETUP	
CYCLE TIME (SEC)	◀
TOTAL CYCLES (X100)	
	00010 ◀
▼▲	ENTER-EDIT
	ESC-EXIT THIS MENU

No-Flow # 1 Setup Screen

User can view and edit Lube No Flow set up. There are two levels to this menu as there are two possible adjustments per No-Flow input. The user will select an input from the first menu and press Setup/Enter. This will display the submenu for the selected digital input if it is used for No-Flow monitoring. Otherwise, the text label on the left side of the edit box will display "NOT IN USE", and pressing Enter will have no effect. At the submenu level, the user may adjust the expected transition frequency and the total cycles count (which relates to the wear rate of the sensor).

#### 6.3.15 Lube No Flow Status


  

LUBE NO-FLOW STATUS	
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 TIMER (SEC)
◀▶	MORE MENUS

Lube No-Flow Status Screen

The user may view information about the No-Flow inputs. If a digital input is designated for use as a No-Flow 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 No-Flow input, there will be zeros displayed. Both values have a maximum value of 999.

#### 6.3.16 Super User Menu

SUPER USER MENU	
COM FAIL DISABLE	◀
SETUP T/O DISABLE	
CONFIG FAIL DISABLE	
RESET FAULT HISTORY	
RESET EVENT HISTORY	
	NO ◀
▼▲	ENTER-EDIT
◀▶	MORE MENUS

Super User Menu Screen

The Super User menu will only be visible if the Super User password has been entered.

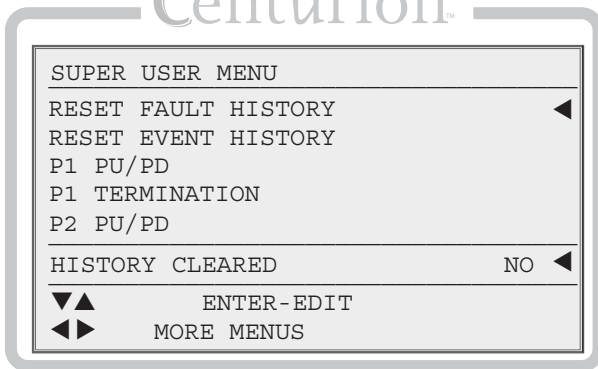
The first three selections (a – c) allow the user to temporarily override the default behavior of the display. It may be helpful to turn off a fault annunciation screen that prevents the viewing of information on operating status screens.

- a) Com Fail Disable
- b) Set up T/O Disable
- c) Config Fail disable

Note that 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.



## Centurion

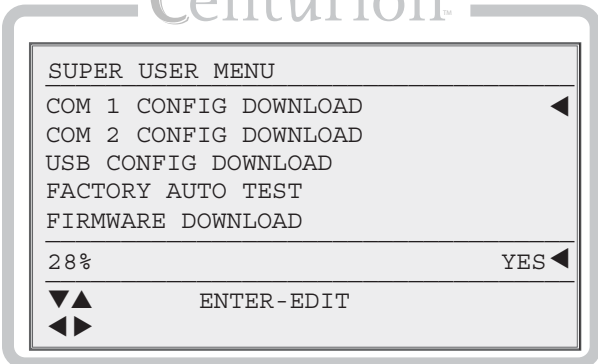


SCREEN 2: SUPER USER MENU

RESET FAULT HISTORY	◀
RESET EVENT HISTORY	
P1 PU/PD	
P1 TERMINATION	
P2 PU/PD	
HISTORY CLEARED	NO ◀
▼▲ ENTER-EDIT	
◀▶ MORE MENUS	

Super User Menu Screen 2

## Centurion



SCREEN 3: SUPER USER MENU

COM 1 CONFIG DOWNLOAD	◀
COM 2 CONFIG DOWNLOAD	
USB CONFIG DOWNLOAD	
FACTORY AUTO TEST	
FIRMWARE DOWNLOAD	
28%	YES ◀
▼▲ ENTER-EDIT	

Super User Menu Screen 3

Also, the message “History Cleared” will be displayed until another key is pressed.

- d) Reset Fault History
- e) Reset Event History

The P1 and P2 signify Communication Port 1 and Communication Port 2 and are for setting up the RS485 interfaces on the display’s serial ports. PU/PD designates the pull-up and pull-down resistors.

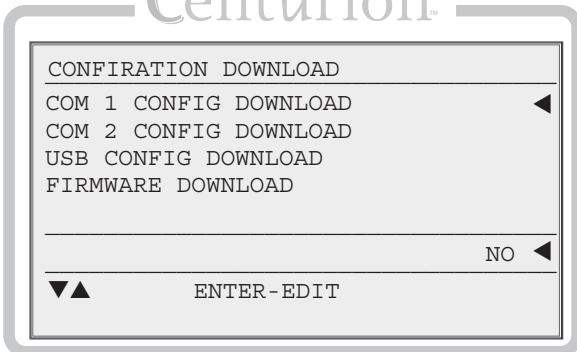
- f) P1 PU/PD
- g) P2 Termination
- h) P2 PU/PD
- i) P2 Termination

New configurations can be downloaded to the display by selecting the desired connection here. After enabling the download, download progress is indicated on the left side of the edit box as a percentage complete. After selecting Yes for download, and until No is selected after download is complete, only the Enter key will be active. See Section 6.2 for further details about downloading configurations.

- j) Com 1 Config Download
- k) Com2 Config Download
- l) USB Config Download
- m) Factory Auto Test: For factory use ONLY.
- n) Firmware Download: A firmware update mode screen will remain until the unit has been reset by remote command or a power cycle. See Section 7.2.5 for downloading new firmware.

### 6.3.17 Configuration Download (Download Only Screen)

## Centurion



SCREEN 4: CONFIGURATION DOWNLOAD

COM 1 CONFIG DOWNLOAD	◀
COM 2 CONFIG DOWNLOAD	
USB CONFIG DOWNLOAD	
FIRMWARE DOWNLOAD	
	NO ◀
▼▲ ENTER-EDIT	

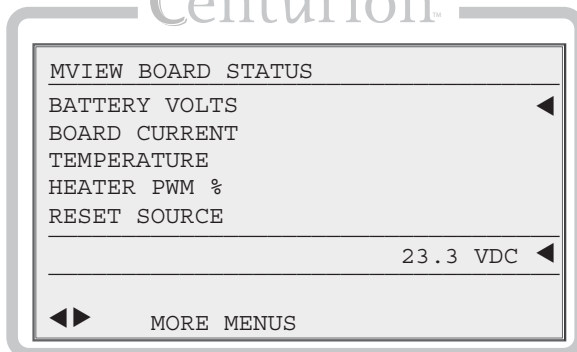
Download Only Screen

This menu allows for download only and can be accessed through the Special Jump Code 35. It is the only screen available by entering the password 35.

- a) Com 1 Config Download: Selecting Yes initiates configuration download through Communication Port 1.
- b) Com2 Config Download: Selecting Yes initiates configuration download through Communication Port 2.
- c) USB Config Download: Selecting Yes initiates configuration download through USB port.
- d) Firmware Download: Selecting Yes Initiates the download.

### 6.3.18 Display Board Status

## Centurion



SCREEN 5: MVIEW BOARD STATUS

BATTERY VOLTS	◀
BOARD CURRENT	
TEMPERATURE	
HEATER PWM %	
RESET SOURCE	
	23.3 VDC ◀
◀▶ MORE MENUS	

MView Board Status Screen

The user may view diagnostic information that reflects the operating conditions of the C3-3 Display only. The Heater PWM% refers to the LCD heater which only operates in cold temperature conditions. The reset source indicates the cause of the last reset. Possible causes for reset include external reset, power-up, brown-out and watch dog.

- a) Battery Volts
- b) Board Current
- c) Temperature
- d) Heater PWM %
- e) Reset Source

### 6.3.19 Digital Input Status

**Centurion™**

DIGITAL INPUT STATUS										
X=CLOSED						O=OPEN				
1	X	0	0	X	X	X	0	0	8	
9	0	0	0	X	X	X	X	X	16	
17	0	0	0	0	0	0	0	0	24	
25	0	0	0	0	0	0	0	0	32	

◀▶ MORE MENUS

Diagnostico-Digital Inputs Screen

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

### 6.3.20 Digital Output Status

**Centurion™**

DIGITAL OUTPUT STATUS	
DIGITAL OUTPUT 1	◀
DIGITAL OUTPUT 2	
DIGITAL OUTPUT 3	
DIGITAL OUTPUT 4	
DIGITAL OUTPUT 5	
DO 1 FLT LAMP	OFF ▶

▼▲ ENTER-EDIT  
◀▶ MORE MENUS

Diagnostic-Digital Outputs State Screen

For each of the devices configured as In Use, the user can see the state of each output and has the ability to Force an output for the purpose of testing. A force is associated with a timeout so that it will be automatically cancelled when returning to normal operation.

### 6.3.21 Analog Input Status

**Centurion™**

ANALOG INPUT STATUS	
ANALOG INPUT 1	◀
ANALOG INPUT 2	
ANALOG INPUT 3	
ANALOG INPUT 4	
ANALOG INPUT 5	
AI 1 SUCT PRS	00000 ▶

▼▲ MORE MENUS

Diagnostic-Analog Inputs Screen

The user can view the raw counts of the analog inputs for troubleshooting.

### 6.3.22 Analog Output Status

**Centurion™**

ANALOG OUTPUT STATUS	
ANALOG OUTPUT 1	◀
ANALOG OUTPUT 2	
ANALOG OUTPUT 3	
ANALOG OUTPUT 4	
ANALOG OUTPUT 5	
AI 1 ENG SPEED	030.00 ▶

▼▲ ENTER-EDIT  
◀▶ MORE MENUS

Diagnostic Analog-Outputs Status Screen

The user can see the state of each output, and if in Test mode, has the ability to Force an output for the purpose of testing. Analog outputs under the control of PID or other Control Output settings cannot be forced. To force a PID controlled output, place the PID in Manual mode and operate the manual output value.

## Centurion™

ANALOG OUTPUT STATUS	
ANALOG OUTPUT 1	◀
ANALOG OUTPUT 2	
ANALOG OUTPUT 3	
ANALOG OUTPUT 4	
ANALOG OUTPUT 5	
AI 1 ENG SPEED	030.00 ▶
MUST BE IN TEST MODE ESC-CANCEL	

Diagnostic Analog-Outputs Status Screen 2

## Centurion™

ANALOG OUTPUT STATUS	
ANALOG OUTPUT 1	◀
ANALOG OUTPUT 2	
ANALOG OUTPUT 3	
ANALOG OUTPUT 4	
ANALOG OUTPUT 5	
AI 1 ENG SPEED	030.00 ▶
▲▼	ENTER-EDIT
◀▶	MORE MENUS (TEST MODE)

Diagnostic Analog-Outputs Status Screen 3

### 6.3.23 Thermocouple Status

## Centurion™

THERMOCOUPLE STATUS	
THERMOCOUPLE 1	◀
THERMOCOUPLE 2	
THERMOCOUPLE 3	
THERMOCOUPLE 4	
THERMOCOUPLE 5	
TH 1	00000 ▶
▲▼	
◀▶	MORE MENUS

Diagnostic Thermocouples Screen

The user may view the raw counts of the thermocouple inputs for troubleshooting.

### 6.3.24 Communication Status

## Centurion™

COMMUNICATION STATUS	
P1 RECEIVE COUNT	◀
P1 TRANSMIT COUNT	
P1 FRAME ERRORS	
P1 HW OVERRUNS	
P1 SW OVERRUNS	
	02340 ▶
▲▼	
◀▶	MORE MENUS

Communication Status Screen 1

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

- a) P1 Receive Count
- b) P1 Transmit Count
- c) P1 Frame Errors
- d) P1 HW Overruns
- e) P2 SW Overruns
- f) P2 Receive Count
- g) P2 Transmit Count
- h) P2 Frame Errors
- i) P2 HW Overruns
- j) P2 SW Overruns



- Communication Status Screen 3

## Diagnostic PIDs Screen

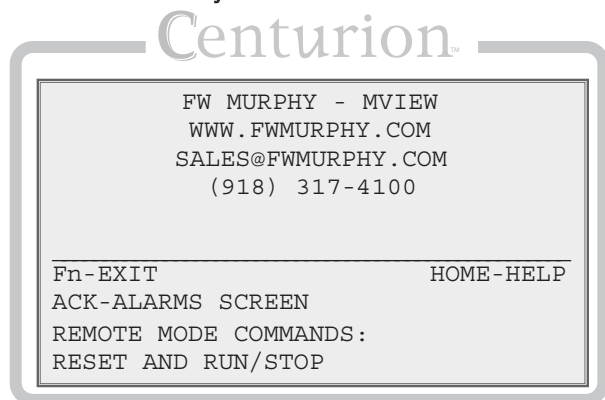
- a) Display PID Bar Graph: To monitor the results of modifying the PID components.
- b) Proportional: To modify the proportional component.
- c) Integral: To modify the integral component.
- d) Derivative: To modify the derivative component.
- e) Auto/Manual: To set to manual mode to allow the corresponding Control Output setting to be adjusted.
- f) Set Output (Manual):



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## 6.4 Additional Navigational Aids

### 6.4.1 Function Key



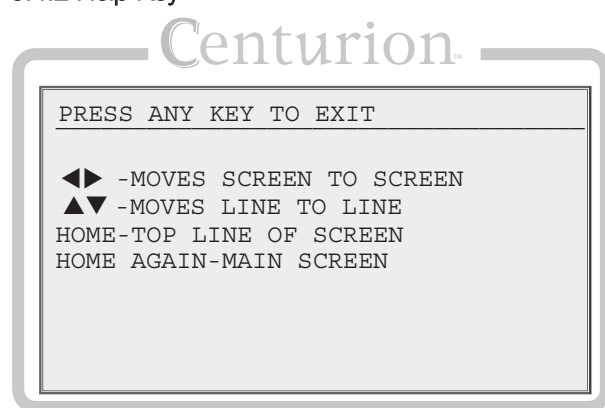
Fn Key Dialog Box Screen

Pressing the Function (Fn) key from any screen will display a dialog box on the bottom half of the screen. All available function key commands will be displayed there. The user can then press a single key for the available commands.

In this case, the user can select from a help screen, the alarms screen or issue a remote mode command. If the Fn key is not followed by another key press in five seconds, function mode will time out and the dialog box will go away restoring the previous screen.

Note: In all cases the Fn key options will be context sensitive. Some options will only be available from certain screens or under certain conditions.

### 6.4.2 Help Key



Help Screen

This is the help screen the user will see by pressing the HOME key from the Fn dialog box or by pressing the Fn key followed by the HOME key from a normal screen.

## 7.0 Communications

### 7.1 Communication Ports

#### Port 1 (SERIAL)

Port 1 is intended as the primary port for the local device, the C3-3 Display, and should be utilized for C3-3 Display in order for the boot loader mode to properly execute in pass-thru mode.

Interface: Refer to the Sequence of Operations to determine how the communication port has been configured.

Protocol: Modbus (Slave)

Connection: There are three (3) screw terminal connectors for RS485.

These are identified as A, B, and SHD.

There are three (3) screw terminal connectors for RS232.

These are identified as RX, TX, and DTR.

SHD is common for both ports.

#### Port 2 (SERIAL)

Interface: Refer to the Sequence of Operations to determine how the communication port has been configured.

INSERT DIAGRAM? RICK NOTES ON PREVIOUS MARKUP

Protocol: Modbus (Slave), Proprietary (Binary)

Connection: There are three (3) screw terminal connectors for RS485.

These are identified as A, B, and SHD.

There are three (3) screw terminal connectors for RS232.

These are identified as RX, TX, and DTR.

SHD is common for both ports.

Modbus Slave Address Configuration: The operator may assign a unique Modbus address to each controller (slave) unit that may be in the system. This allows the master controller to differentiate between the modules. For example, to name the controller address 21, place the shunts on LK1, LK4, and LK16 ( $1 + 4 + 16 = 21$ ). Typically, this configuration is set to (1) by the factory.

### Port 2 (USB)

Interface: USB 1.1 Compliant Port capable of emulating RS232 communications via royalty free PC driver.

Protocol/Services: Modbus (Slave), Proprietary (Binary)

Connection: There is a USB Type B connector (see graphic).

Automatic selection of USB is provided when a signal is detected on the USB Type B connector.

### Port 3 (CAN)

Protocol/Services: Proprietary (Binary)

Connection: There are three (3) screw terminal connectors for CAN. These are identified as HI, LOW, and SHD.

#### On C3-1 Main I/O Module

Located next to the USB connector is the CAN OK (COP). When in the boot loader the COP LED does not flash.

When the program is running properly the COP LED will flash on and off every 0.5 seconds.

If the checksum in the configuration file does not match the calculated checksum of the file, then the program will flash the COP LED 3 times at 0.5 second intervals and then stay off for 1.5 seconds.

#### On the C3-2 Expansion I/O Module

When the program is running properly the COP LED will flash on and off every 0.5 seconds.

## 7.2 Downloading Configurations and Firmware Updates

Users will need to download configurations from the controller, as well as be able to receive occasional firmware version updates from Murphy.

### 7.2.1 Boot Loader

It is necessary for the Centurion controller to enter boot loader mode in order to receive downloads for a firmware update, and if configuration between the devices needs to be synchronized. During boot loader mode the Centurion is able to transmit and receive configuration updates to and from the MConfigPro software and transmit configuration updates to C3-3 Display through Pass Through.

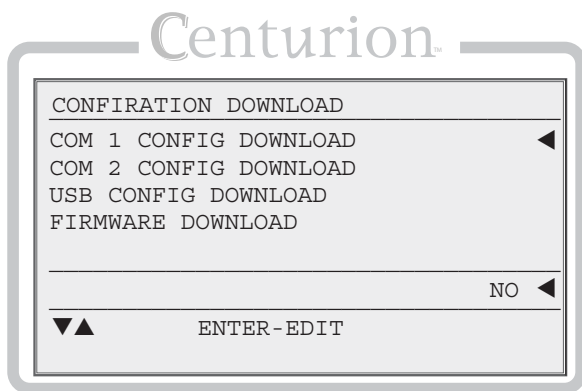
Communications will operate according to default state parameters for configuration transfers. During boot loader mode, the transfer rate is 9600, N, 8, 1 and assumes a serial communication port setting of RS485 or a USB connection.

Due to the Modbus strings of code, the controller recognizes whether the bootloader is for a configuration, or firmware update.

In order for the Centurion configurable controller to enter boot loader mode, the jumpers are removed during power up (power cycled). The C3-3 Display and third party HMI devices will not receive a response to polls on Port 1 while the boot loader is active.

Power on the Centurion must be cycled with the jumper installed to resume normal operation, or run mode.

### 7.2.2 Downloading Configurations Via C3-3 Display



Download Only Screen

All configuration downloads will use a baud rate of 9600. The Com 1 selection will use the hardware setup of the current configuration. The Com 2 selection is a fixed hardware setup for RS485. Selecting USB for configuration download connects the USB adapter to Com 2 internally.

All normal communication with the controller is stopped while in download mode.

The display will indicate the transfer is complete by displaying 100%.

#### Special 35 Jump Code

In the case that no configuration has been downloaded, or a password has been lost, C3-3 Display allows a "Download Only" password that will allow access to the download menu.

The password is set to a fixed value of 35.

### 7.2.3 Downloading Configurations Via MConfigPro Software

The Centurion makes it easy for a user to download a configuration through the MConfigPro software.

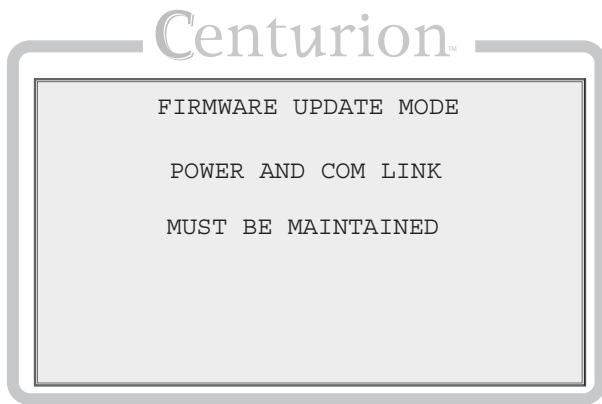
1. From the Options menu of the MConfigPro software, choose the Options tab to identify the ports that the users PC can detect, and select the appropriate port that the user's PC will use to communicate with the C3-3 Display or Centurion controller. Set the individual port parameters.
2. Through the Tools menu the user may choose to upload, or download as needed.

### 7.2.4 Pass Through

During boot loader, the Centurion controller allows users to remain connected to both the PC and the C3-3 Display and update the two devices with a single connection.

During a download from the MConfigPro software, the user downloads to the C3-3 Display without entering boot loader mode and upon transferring the message, the Centurion controller is directed to accept the message through one port (Port 2) and pass it through another port (Port 1) directly to the C3-3 Display, as if the PC and C3-3 Display were directly connected.

### 7.2.5 Downloading Firmware Updates to the C3-3 Display



Firmware Download Screen

Firmware updates for the C3-3 Display require a USB connection. While boot loader mode for the display is not required for configuration downloads, it is required for firmware updates.

The bootloader can be entered by menu selection if the USB cable is currently connected, otherwise the C3-3 Display will reset and restart the current application firmware. Optionally, the bootloader can be entered by connecting the USB cable and cycling power. (This method will leave the display blank while in the bootloader.)

Upon entry to the bootloader, all communication to the controller will stop. There is a red status LED below the USB connector that will blink three times and then remain on while the bootloader is active.

While a file is being transferred, the Com 2 transmit LED will appear to be lit continuously. A successful download should complete in approximately five minutes.

#### Special 35 Jump Code

C3-3 Display allows a "Download Only" password that will allow access to the download menu. The password is set to a fixed value of 35. Once at the Download Only screen on the C3-3 Display, the user will select to download a firmware update.

#### Super User Menu

Super users will use the super user menu to download firmware updates.

All normal communication with the controller is stopped while in download mode.

The display will indicate the transfer is complete by displaying 100%.

## 7.2.6 Error Messages

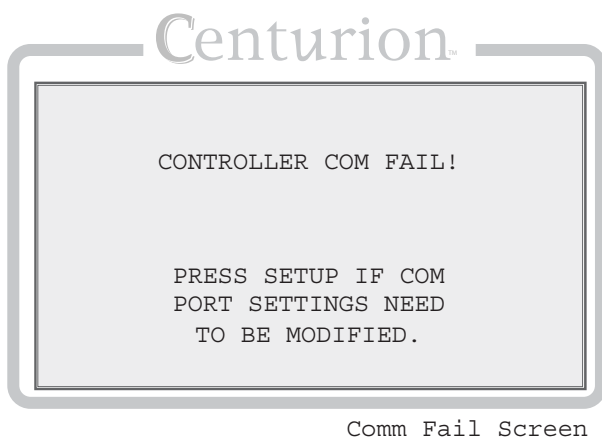
There may be occasion when an invalid configuration error might display because the configuration between the Centurion controller and its devices are out of synch--that is to say the checksums do not match. In fact, the invalid configuration screen will appear briefly after downloading configurations until comparisons are made.

Field testers may decide to ignore the message, if the user knows that the changes are not critical. The user may direct the error message to be ignored through a setting at the super user (password protected) menu. At CONFIG FAIL DISABLE, the user would select Yes to ignore the data mismatch.

The setting is temporary as once power is cycled on the Display, the error message will continue until comparisons between the devices yield no configuration mismatch.

However, if the user knows of changes that might have resulted from changes made fine tuning in the field and wants to synchronize the data, he may choose to do so and there are a couple of options available.

- A super user could choose to also download the configuration from the super user menu on C3-3 Display.
- A user who without access to the super user menu could activate the download through the Special Jump Code 35.

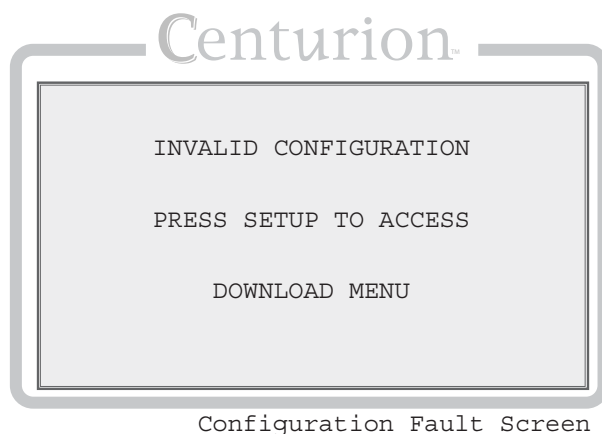


Comm Fail Screen

This screen indicates that the controller is not responding to poll requests. There are only two ways to exit this screen, either by normal responses resuming or if the SETUP/ENTER key is pressed.

This screen will be displayed when a configuration fault is detected.

Possible sources of the fault include a corrupt or missing configuration in the display, a corrupt or missing configuration in the controller or a mismatch of configurations in the display and controller.



Configuration Fault Screen

Note that this error message does not always indicate a problem, but may only signify that initial comparisons between devices do not match. This screen will appear briefly after configuration downloads and may appear briefly after initial communication is established until comparisons are complete.

The fault can be resolved by downloading the proper configuration to one or both devices.



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### 7.3 Modbus Protocol

The Centurion configurable controller was programmed with the Modbus protocol which is a system is based on a “master” and “slave” relationship. With Modbus protocol, the master and slave are able to continue to communicate with each other through defined messages over a variety of network types. The master initiates the queries or commands, and the slave responds to the query with a message or takes action based on the query. In this case, the master is either MConfig (or another Modbus client software), or C3-3 Display, but never both simultaneously as there can only ever be a single Modbus master.

The Centurion system communicates through Modbus using Remote Terminal Unit (RTU) transmission mode to maximize data processing.

As with all numeric data defined within Modbus, the programming is limited to accepting integers (whole numbers only, no decimals). This is important whenever a decimal point is defined for analog inputs.

For example, for the controller to properly read “100.0” with an implied decimal point of 1, the user would need to enter “1000” and 1000 would be stored in the appropriate Modbus register. From the C3-3 Display, the value will be represented with a decimal in the fixed position.

For additional information, please refer to the Centurion Configurable Controller Programming Manual.

### 7.4 Features of Transferring Data in Modbus

Note that text visible in the MConfigPro software and on the C3-3 Display is not stored in the Centurion controller. Except for the version description in the Version and Security dialog for each configuration file, descriptions assigned in the configuration are not stored in the Centurion controller. Descriptions for various I/O and processes are downloaded to the C3-3 Display and reside as a configuration in that device only. Configurations of the C3-3 are one way only.

Parameter changes made in the C3-3 Display are actually communicated to the Centurion controller where the logic resides. No changes made through the C3-3 Display affect the C3-3 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.

### 7.5 Modbus Register Address Listings

For a complete MODBUS address map, please refer to The Centurion MODBUS reference document.

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## 8.0 Glossary

<b>Analog Input</b>	Terminals A18 to A29 are analog inputs on the C3-1 Centurion main I/O module. Accepts voltage signals within the range of (0 to 5) VDC or (4 to 20) mA and are compared to controller set points or events.
<b>Boot loader</b>	Means by which the Centurion controller communicates with C3-3 Display and MConfigPro to receive and transfer new or updated configurations and firmware; and ensure data and configuration synchronization.
<b>Controller Set points</b>	User defines normal operating range for the controller to optimize the equipment. Set points can also define some other threshold, exception or event that may require action. Multiple set points are often applied to a process and they may be manipulated as needed to meet changing conditions.
<b>Dead band</b>	The user set range at which input may fluctuate without the controller taking any action. The range may be fixed or variable.
<b>Digital Input</b>	Terminals 30 to 61 are the digital input channels. 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.
<b>Event</b>	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).
<b>Magnetic Pick Up</b>	Terminals 64 to 65 are for magnetic pick up.
<b>Maximum</b>	Maximum of engineering applied scale to the Offset and Span.
<b>Minimum</b>	Minimum of engineering applied scale to the Offset and Span.
<b>No-Flow</b>	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.
<b>Offset</b>	User defined value to correct for known variance in the raw data.
<b>Panel Ready</b>	In States, the first logical step in start up.
<b>Permissive</b>	A process condition, (Digital Input or Analog Set point), that must be met in order for the engine to start.
<b>Signal</b>	An electrical quantity of voltage or current that is used to represent or signify some other physical quantity.
<b>Span</b>	The difference between the full scale output and the offset as raw data.
<b>Start Delay</b>	A time delay function to prevent premature start up.
<b>State</b>	Predefined parameter of logical steps needed to successfully start and maintain an engine.
<b>Terminal Emulator</b>	Allows a user to modify the firmware to allow upload or download of a record to either the C3-3 display or the controller. Always download a configuration after a firmware change.
<b>Thermocouple</b>	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.

---

## 9.0 Appendices

### 9.1 Back Panel LED Description

There are a total of seven (7) LED indicators on the back panel, labeled as follows:

**(Port 1)**

**TX** – Turned on while Port 1 is transmitting data.

**RX** – Turned on while Port 1 is receiving data.

**(Port 2)**

**TX** – Turned on while Port 2 is transmitting data.

**RX** – Turned on while Port 2 is receiving data.

**USB LINK** – Turns on while there is a USB connection to a computer.

**STAT 1** – Turns on for one half second and then turns off for one half second, repeating as long as there is a valid configuration running.

Note: This indicator is not active while the bootloader is running.

**STAT 2** – This LED is only active while the bootloader is running. It flashes briefly three times when the bootloader starts up and then stays on until leaving the bootloader.

### 9.2 Controller Accuracies, and Tolerances

Refer to the Centurion Configurable Controller Specification Sheet for a detailed breakdown of specifications.

### 9.3 Restrictions on Numeric Values in Gage and PID Monitor Screens

Due to a combination of the limited space and the spirit of the design objectives, there are certain restrictions imposed upon the formatted size of numbers in C3-3 Display screens.

- Positive numbers with no decimals can be displayed with up to four digits.
- Negative numbers are limited to three digits.
- Numbers of either sign with a decimal place are limited to three digits.
- Numbers with more than two decimal places will not be displayed at all, but will be replaced with dashes.

If a number with decimals is larger than the imposed limits, the display algorithm will attempt to adjust the precision so as to display as many of the most significant digits as possible.

### 9.4 Set Up Sheet

Refer to The Centurion Configuration Worksheet for a detailed workbook to document field changes to configuration parameters.

# How To Order

## Selecting a Centurion Configurable Controller C3 Series Model:

### 1. Specify one **C3-1** Main I/O Module from **Table A**

Main I/O Module  
Model: C3-1

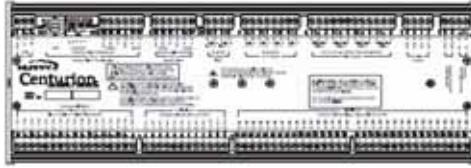
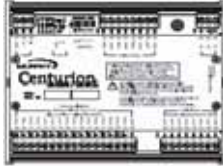


Table A: C3-1 Main module Options	
Model	Specifications
<b>C3-1</b>	no analog outputs
<b>C3-1-A</b>	two analog outputs

### 2. Specify one (optional) **C3-2** Expansion I/O Module

Expansion I/O Module  
Model: C3-2  
(optional)



### 3. Specify one (optional) **C3-3** Display Module

Display Module  
Model: C3-3  
(optional)



The minimum system requirements:

**C3-1** Main I/O Module

*Display capable of Modbus communications*

The Murphy **C3-3** Display Module is a highly integrated HMI for use with the C3 Series system and is recommended for most customers.

Some systems may require additional I/O which is available on the **C3-2** Expansion I/O Module.\*

\* Only one C3-2 Expansion I/O Module can be used with each C3 System.

## Accessories

### Configuration Software

**MConfig Pro** - Configuration software for modifying sequence of operation, set points, timers, faults, and \*displays for Centurion. Includes file transfer utilities for configuration and firmware upgrades.

\* Display configuration and other settings for display are only for use with the C3-3 Display Module

## Replacement Parts and Assemblies

<b>C3-1 Plug Kit</b>	<b>(00000504)</b>	Printed Replacement Terminal Plugs for Centurion (C3-1) Main I/O Module
<b>C3-2 Plug Kit</b>	<b>(00000505)</b>	Printed Replacement Terminal Plugs for Centurion (C3-2) Expansion I/O Module
<b>C3-3 Plug Kit</b>	<b>(00000543)</b>	Printed Replacement Terminal Plugs for Centurion (C3-3) Display Module
<b>Choke</b>	<b>(50000774)</b>	Ignition Noise (Choke) Filter

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