

CPA 3.xxx.x Digital Panel User Manual

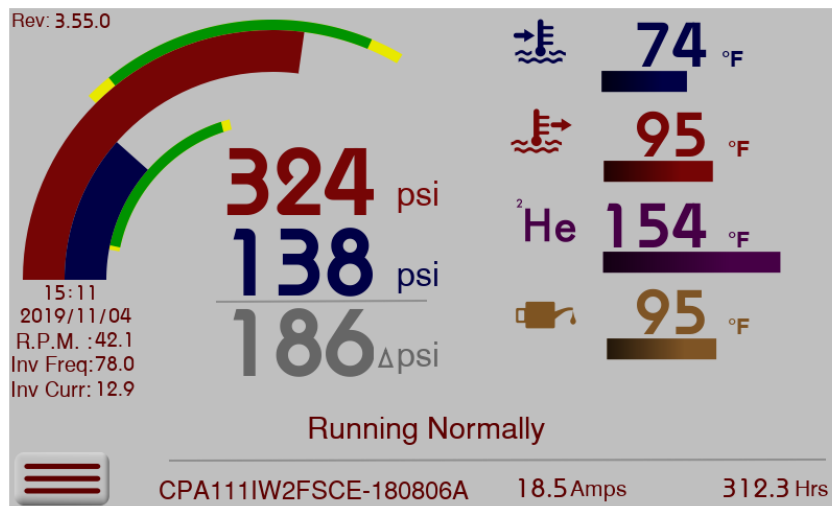
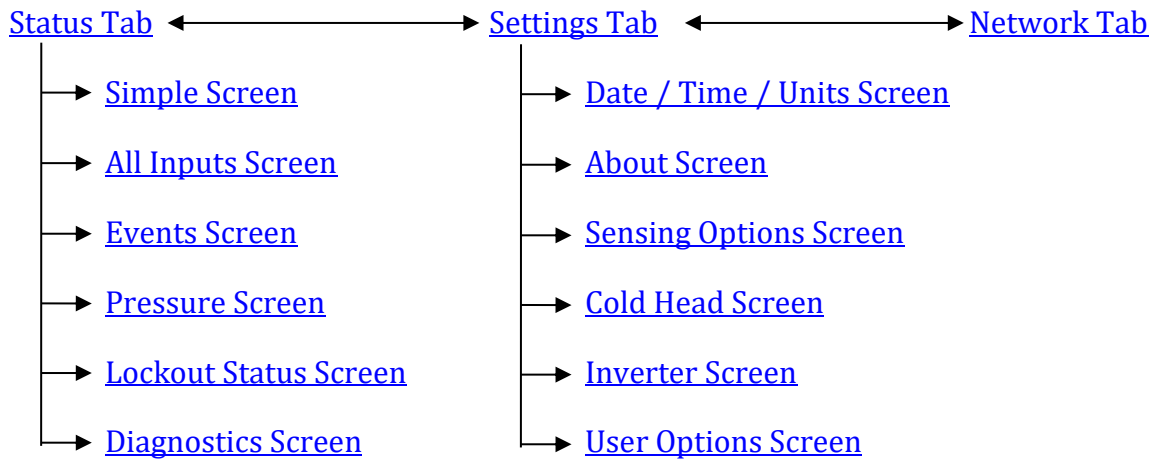


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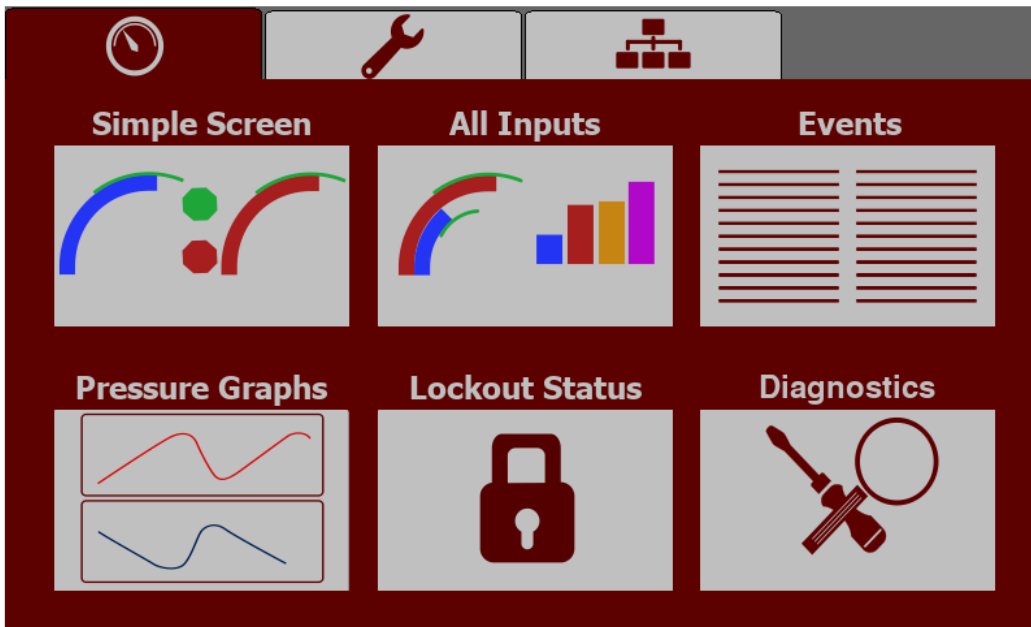
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Screen Flow Diagram

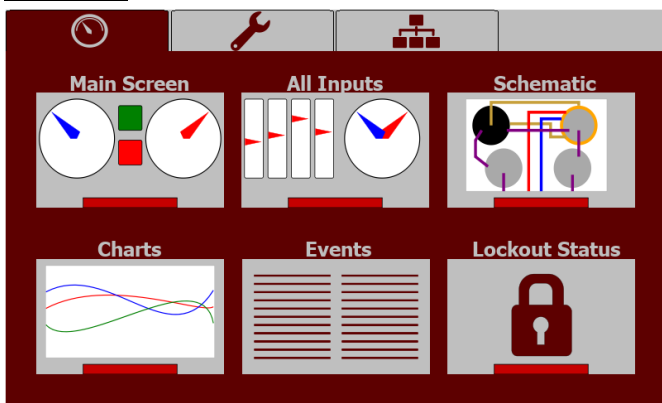
This is a general flow diagram of the screens available. The "All Inputs Screen" is the default starting screen.



Status Menu Tab

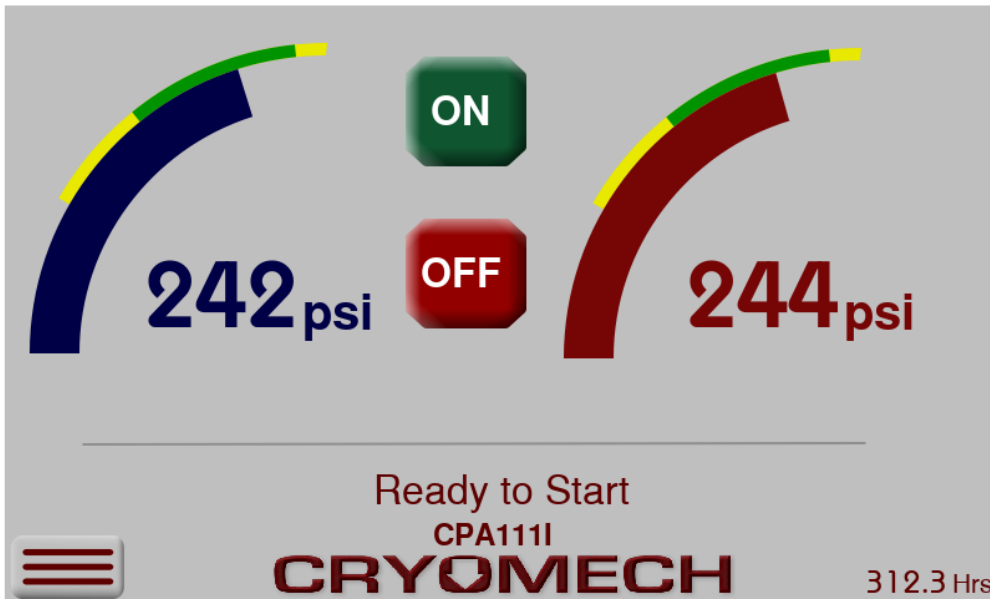


Legacy UI



This screen allows the operator to navigate between various status screens or to adjacent menu screens.

Status / Simple

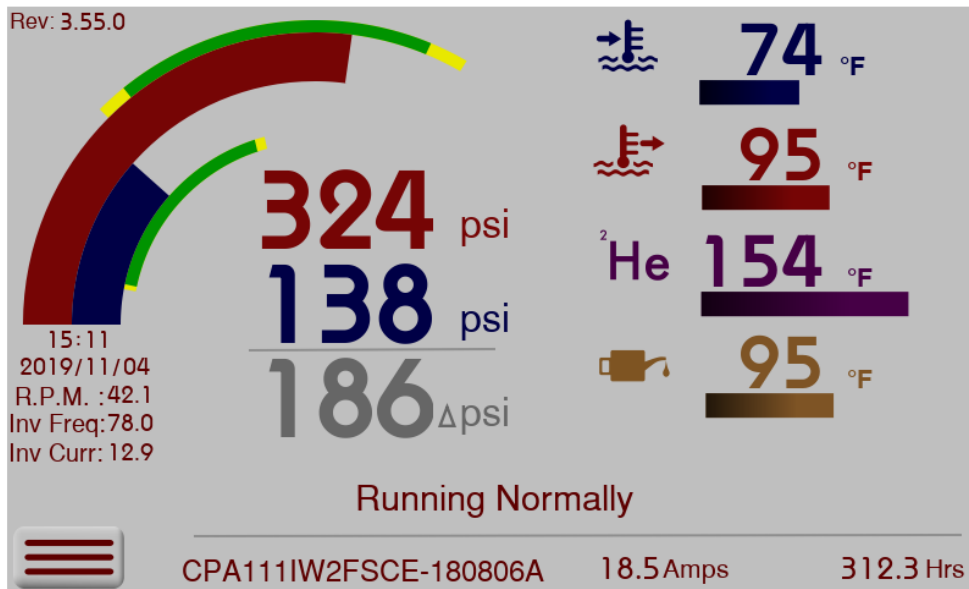


Legacy UI

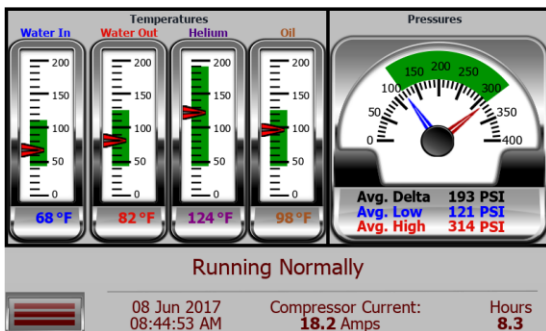


The left dial indicates the low or gas input pressure and the right dial indicates the high or output pressure. Status about the running state of the compressor will be displayed on the Feedback Label. The bottom right Hours number tracks the total hours of operation the compressor has been running.

Status / All Inputs




Legacy UI



The "All Inputs" screen is designed to give the user a complete picture of all the temperatures and pressures being monitored by the system. The Coolant In & Out icons will change depending on the system attached. The pressure readings are a result of averaging data over a 20 second period. If the compressor has an inverter, inverter current and frequency information is also displayed on the left of the screen along with detected cryocooler RPM. This RPM is detected via gas pulses.

Status / Events

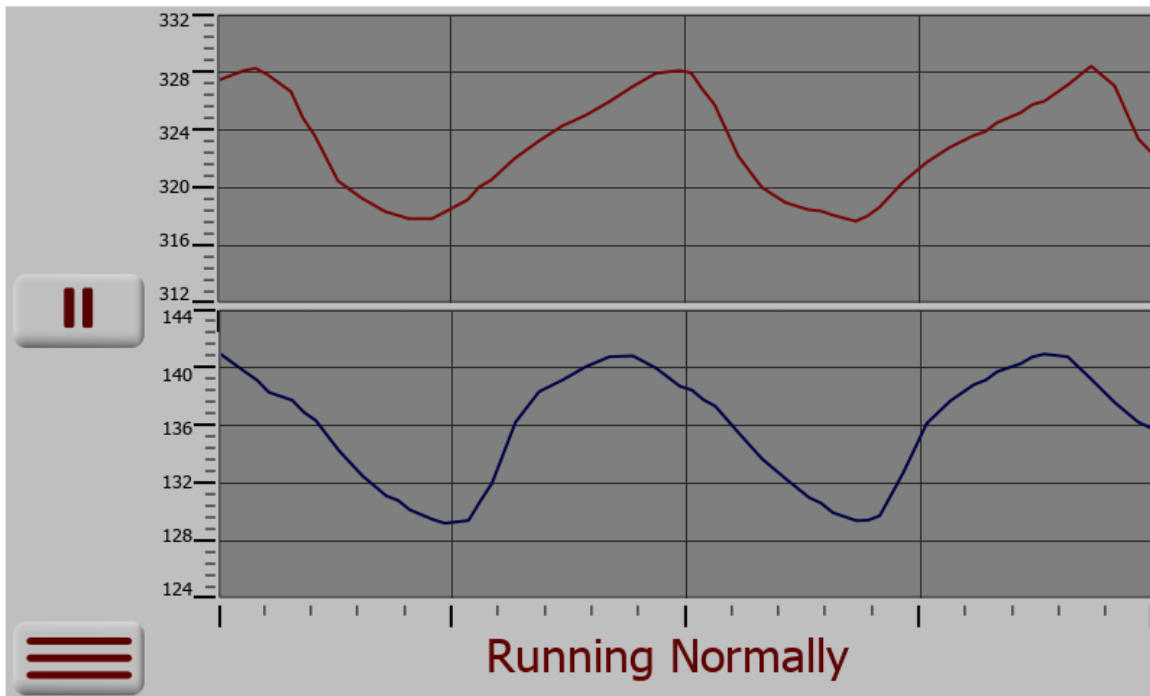
0	NOV 04 - 15:14:39	Running Normally	↑
1	NOV 04 - 15:14:24	Starting...	
2	NOV 04 - 15:14:24	Local ON Button Pressed	
3	NOV 04 - 15:13:55	Idling	
4	NOV 04 - 15:13:35	Stopping...	
5	NOV 04 - 15:13:35	Local OFF Button Pressed	
6	NOV 04 - 15:12:58	Running Normally	↓
7	NOV 04 - 15:12:43	Starting...	
8	NOV 04 - 15:12:43	Local ON Button Pressed	
9	NOV 04 - 15:12:20	Idling	
10	NOV 04 - 15:11:59	Stopping...	
11	NOV 04 - 15:11:59	Local OFF Button Pressed	
12	NOV 04 - 11:54:06	Running Normally	



Running Normally
CRYOMECH

The "Events" is an event logging window. It will hold up to 200 events. The format of the time stamping is Day - Time.


Status / Pressures



The pressure monitoring mode has a time span of 2 seconds. The high and low pressures scales are independent and auto adjust based on captured data. A pause button is provided to allow closer examination of the charts.

Status / Locked Outs

Lockouts	
24 Supply:	<input type="text" value="0"/>
3 Phase Power:	<input type="text" value="0"/>
Low Motor Current:	<input type="text" value="0"/>
Low Pressure - High:	<input type="text" value="0"/>
Low Pressure - Low:	<input type="text" value="0"/>
High Pressure - High:	<input type="text" value="0"/>
High Pressure - Low:	<input type="text" value="0"/>
Delta Pressure - High:	<input type="text" value="0"/>
Delta Pressure - Low:	<input type="text" value="0"/>
Coolant In - High:	<input type="text" value="0"/>
Coolant In - Low:	<input type="text" value="0"/>
Coolant Out - High:	<input type="text" value="0"/>
Coolant Out - Low:	<input type="text" value="0"/>
Oil Temp - High:	<input type="text" value="0"/>
Oil Temp - Low:	<input type="text" value="0"/>
Helium Temp - High:	<input type="text" value="0"/>
Helium Temp - Low:	<input type="text" value="0"/>



If the compressor experiences 6 or more errors in under an hour, it will shut down and begin a cooling timer. This screen will show you what issues have occurred over the last hour.

Status / Diagnostics

15 Pin Connection In	Inputs	Outputs
SLVL: <input type="text" value="Open"/>	High Press: <input type="text" value="314"/>	Cold Head Relay: <input type="text" value="Closed"/>
On: <input type="text" value="Open"/>	Low Press: <input type="text" value="121"/>	Compressor Enable: <input type="text" value="Closed"/>
Off: <input type="text" value="Open"/>	Coolant In: <input type="text" value="68"/>	Inverter Enable: <input type="text" value="Open"/>
Interlock: <input type="text" value="Open"/>	Coolant Out: <input type="text" value="82"/>	Local Buttons
State: <input type="text" value="Disconnected"/>	Helium: <input type="text" value="124"/>	On Button: <input type="text" value="Open"/>
15 Pin Connection Out	Oil: <input type="text" value="98"/>	Off Button: <input type="text" value="Open"/>
Unit Good: <input type="text" value="Closed"/>	Power: <input type="text" value="Good"/>	Cold Head
High Temp: <input type="text" value="Open"/>	3 Phase: <input type="text" value="Good"/>	<input type="text" value="Spin The Cold Head"/>
High Press: <input type="text" value="Open"/>	Amps: <input type="text" value="18.2"/>	Cold Head RPM: <input type="text" value="0.0"/>
Running: <input type="text" value="Closed"/>	<input type="text" value="Review Trip Points"/>	

Running Normally
Testbox

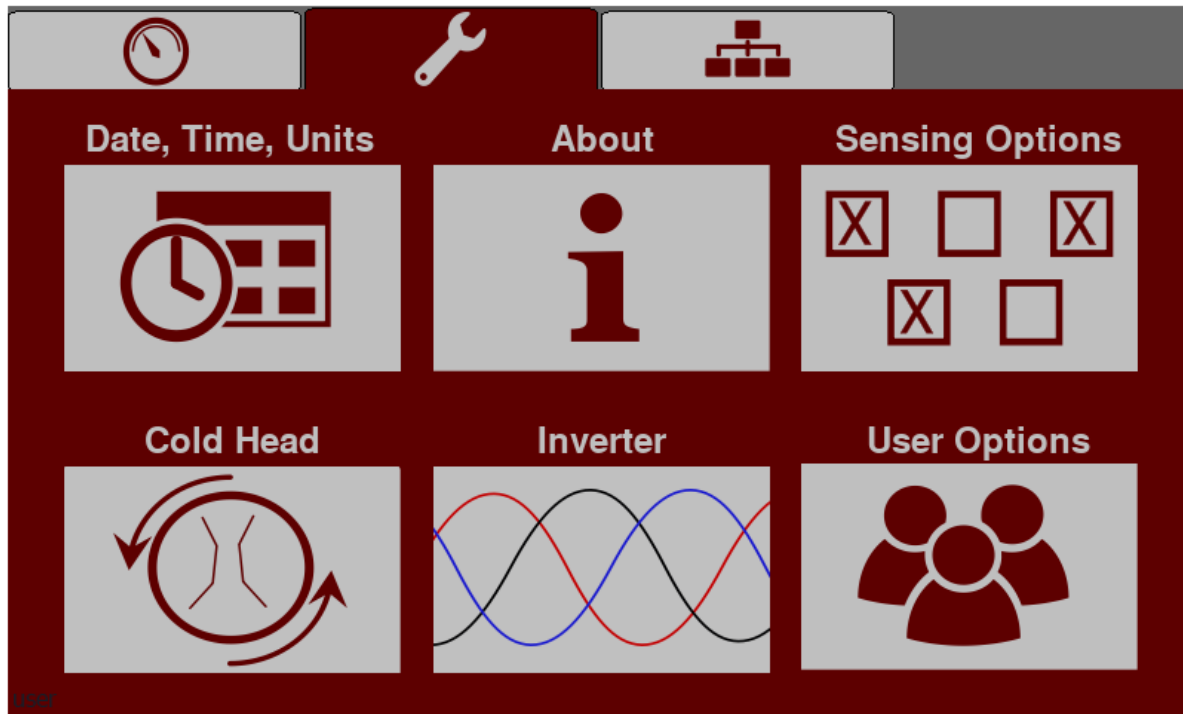
CRYOMECH

DATE 08 Jun 2017
TIME 09:03:52 AM

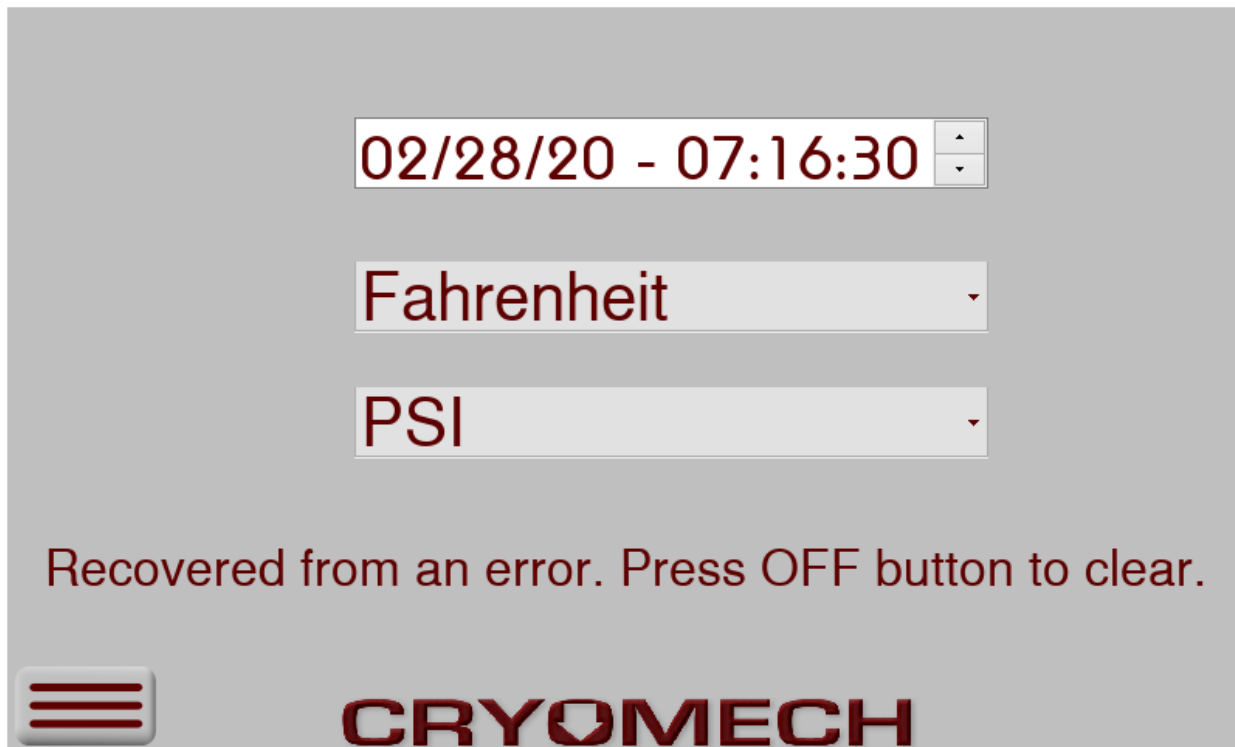
The diagnostics screen is used to indicate the status of the different digital inputs and outputs. This screen is useful for diagnosing running issues if they arise. If you click on the Review Trip Points button the next screen will appear allowing the operator to review what temperatures and pressures this system will alarm at.

Coolant In Temp °F	Coolant Out Temp °F	Low Pressure Line psi
High Alarm: <input type="text" value="90"/>	High Alarm: <input type="text" value="125"/>	High Alarm: <input type="text" value="250"/>
High Warn: <input type="text" value="85"/>	High Warn: <input type="text" value="120"/>	High Warn: <input type="text" value="240"/>
Low Warn: <input type="text" value="45"/>	Low Warn: <input type="text" value="45"/>	Low Warn: <input type="text" value="40"/>
Low Alarm: <input type="text" value="40"/>	Low Alarm: <input type="text" value="40"/>	Low Alarm: <input type="text" value="35"/>
Oil Temp °F	Helium Temp °F	High Pressure Line psi
High Alarm: <input type="text" value="125"/>	High Alarm: <input type="text" value="190"/>	High Alarm: <input type="text" value="400"/>
High Warn: <input type="text" value="120"/>	High Warn: <input type="text" value="185"/>	High Warn: <input type="text" value="375"/>
Low Warn: <input type="text" value="45"/>	Low Warn: <input type="text" value="45"/>	Low Warn: <input type="text" value="170"/>
Low Alarm: <input type="text" value="40"/>	Low Alarm: <input type="text" value="40"/>	Low Alarm: <input type="text" value="150"/>
Motor Current Amps		Delta Pressure Line psi
High Alarm: <input type="text" value="60"/>		High Alarm: <input type="text" value="300"/>
Low Alarm: <input type="text" value="5"/>		High Warn: <input type="text" value="290"/>
		Low Warn: <input type="text" value="75"/>
		Low Alarm: <input type="text" value="50"/>

Settings Menu Tab



Settings / Date, Time, Units



The screenshot shows a settings interface with a light gray background. At the top, there is a date and time display showing '02/28/20 - 07:16:30' with up and down arrows on the right. Below this are two dropdown menus: the first is set to 'Fahrenheit' and the second is set to 'PSI'. A message in red text states 'Recovered from an error. Press OFF button to clear.' At the bottom left is a hamburger menu icon, and at the bottom center is the 'CRYOMECH' logo.

To adjust the time and date, click on the section you wish to change then use the up and down arrows to make the changes. The segment may not highlight even though you click on it. Just try changing the value after you have clicked on the item you wish to change.

Settings / About



CRYOMECH	
315 - 455 - 2555 support@cryomech.com	
Cryomech Software Version:	3.66.0
Compressor SN:	CPA1114W2FN-780105A
Panel SN:	30000
Hours Of Operation:	100.0
Build Order:	50123
Head Driver Version:	100G179P
Ready to start drying.	

All pertinent version info is stored here.

Settings / Sensing Options

Linear Driver Signal Disabled

Driver Warning Enabled

High Pressure Monitor Enabled

Low Pressure Monitor Enabled

D15-3,4 Coolant In Temp Error ▾

☰

Coolant In Monitor Enabled

Coolant Out Monitor Enabled

Helium Monitor Enabled

Oil Monitor Enabled

☒ Good Range Indicators

☐ Use Legacy UI

Power Monitor Enabled


3 Phase Monitor Enabled

Motor Current Monitor Enabled

This screen allows the operator to disable a single sensor, the sensor may be ignored allowing the compressor to run until such time that the sensor can be replaced. This is also where the use of Legacy UI can be enabled. The Good Range Indicators only applies to temperature scales in the Legacy UI format.

Settings / Cold Head

Cryocooler Motor Circuit	AMP Driver Parameters	Comms: Good
F - PT415, PT815, PT420, PT415RM, PT815RM, PT420RM		
Measured RPM: 0.00 ** Note: RPM calculated from detected gas pulses.		
<div> <div>Spin The Motor</div> <div>See Driver Errors</div> </div>		
<div> <div>(JA) Jog Acceleration: 10.00</div> <div>(JS) Jog Speed: 0.70</div> <div>(MC) Rated Current: 3.82</div> <div>(CI) Idle Current: 0.00</div> <div>(CD) Idle Current Delay: 0.40</div> <div>(CC) Running Current: 3.82</div> <div>(HG) Harmonics Gain: 0.00</div> <div>(HP) Harmonics Phase: 0.00</div> <div> <input type="checkbox"/> Enable Smoothing </div> </div>		


Ready to Start

This screen allows inspection of the parameters used to operate the cryocooler. Note the Amp Driver Parameters only properly update while the system is not running. Smoothing can be used to try and reduce the amount of motor vibration in the cryocooler.

Settings / Inverter – (if applicable)

Inverter Status		Comms: Good	
Output Frequency:	0.0	Output Power:	0.0 kW
Output Current:	0.0	DC Bus Voltage:	680

Set new output frequency

Enable PID Functionality		0.074
Sensor Properties		PID Values
Scale Range	Signal Range	<input checked="" type="checkbox"/> Inversion
Min: <input type="text" value="0.0"/>	<input type="text" value="0.0"/>	P: <input type="text" value="4.0"/>
Target: <input type="text" value="10.0"/>	2.00	I: <input type="text" value="30.0"/>
Max: <input type="text" value="50.0"/>	<input type="text" value="10.0"/>	D: <input type="text" value="1.0"/>

This screen allows inspection of the parameters used to operate the inverter. Different controls will become active when you are allowed to change them. To help in configuring PID functionality, there are input boxes that you can enter properties of the sensor being used to provide feedback. You enter the range of the sensor and the desired target value in the Scale Range column, then enter the output signal range in the Signal Range column. The See Inverter Errors button will bring of the screen below. Any errors detected will illuminate.

Detected Errors		Reset
Under Voltage (Uv1)	Dynamic Break Transistor Fault (rr)	Modbus Comm Error (CE)
Control Supply Undervoltage (Uv2)	Breaking Resister Overheat (rH)	Option Comms Error (bUS)
Soft Charge Circuit Fault (Uv3)	Cooling Fan Error (FAn)	Control Fault (CF)
Ground Fault (GF)	Overspeed (os)	Zero Servo Fault (SvE)
Overcurrent (oC)	Excessive Speed Deviation (dEv)	Option External Fault (EF0)
Overvoltage (ov)	PG Disconnected (PGo)	PID Feedback Loss (FbL)
Heatsink Overheat (oH)	Input Phase Loss (PF)	Undertorque Detection (UL3)
Heatsink Overheat (oH1)	Output Phase Loss (LF)	Undertorque Detection (UL4)
Motor Overload (oL1)	Motor Overheat (oH3)	High Slip Break Overload (oL7)
Drive Overload (oL2)	Digital Operation Connection (oPr)	Hardware Fault (oFo)
Overtorque 1 (oL3)	EEPROM Write Error (Err)	
Overtorque 2 (oL4)	Motor Overheat Fault (oH4)	



Settings / User Options

User name:

Password:

☐ Show password




Back

Sign In

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Different operator levels provide access to special features. The general user should be logged in as "user" with no password.

Networking Tab

					
Use DHCP:	No	Mac ID: 00:30:D8:04:D4:29			
IP Address:	192.168.0.10	<input type="button" value="Cancel"/> <input type="button" value="Apply"/>			
Subnet Mask:	255.255.255.0				
Gateway:	192.168.0.1				
COM1: RS-232 Baud: 115200 Parity: None Stop Bits: 1 <input type="button" value="Click To Save New Settings"/>		COM2: RS-485 Baud: 115200 Parity: None Stop Bits: 1 <input type="button" value="Click To Save New Settings"/>			
Node ID: 16		Node ID: 16			

This page shows the IP data that gets assigned to the device by its network. By connecting to the compressor via serial port or by Ethernet it is possible to remotely monitor and operate the compressor. Compressors with a single DB-9 port only support RS-232. Compressors with two DB-9 ports also provide an RS-485 port.

Communications Protocols

The serial port uses Modbus RTU protocol and the Ethernet port uses ModbusTCP. More information about these protocols can be found here:

http://modbus.org/docs/PI_MBUS_300.pdf

The registers used for this protocol are as follows:

- 30,001 - Operating State (int)
- 30,002 - Compressor Running (int)
- 30,029 - Pressure Scale (int)
- 30,030 - Temp Scale (int)
- 30,031 - Panel Serial Number (int)
- 30,032 - Model Major + Minor Numbers (int)
- 30,033 - Software Rev (int)
- 30,034 - Detected RPM in 1/100th Scale (int)
- 30,035 - Software Variant (int)
- 30,036 - Inverter Frequency in 1/10th Hz (int)
- 30,037 - Inverter Current in 1/10th Amps (int)
- 30,038...039 - Build Order Number (int32)
- 30,040 - Coolant In Temp in 1/10th Scale (int)
- 30,041 - Coolant Out Temp in 1/10th Scale (int)
- 30,042 - Oil Temp in 1/10th Scale (int)
- 30,043 - Helium Temp in 1/10th Scale (int)
- 30,044 - Low Pressure in 1/10th Scale (int)
- 30,045 - Low Pressure Average in 1/10th Scale (int)
- 30,046 - High Pressure in 1/10th Scale (int)
- 30,047 - High Pressure Average in 1/10th Scale (int)
- 30,048 - Delta Pressure Average in 1/10th Scale (int)
- 30,049 - Motor Current in 1/10th Scale (int)
- 30,050...051 - Hours Of Operation in 1/10th Scale (int32)
- 30,052...053 - Warning State (int32)
- 30,054...055 - Alarm State (int32)
-
- 40,001 - Enable / Disable the compressor (int)

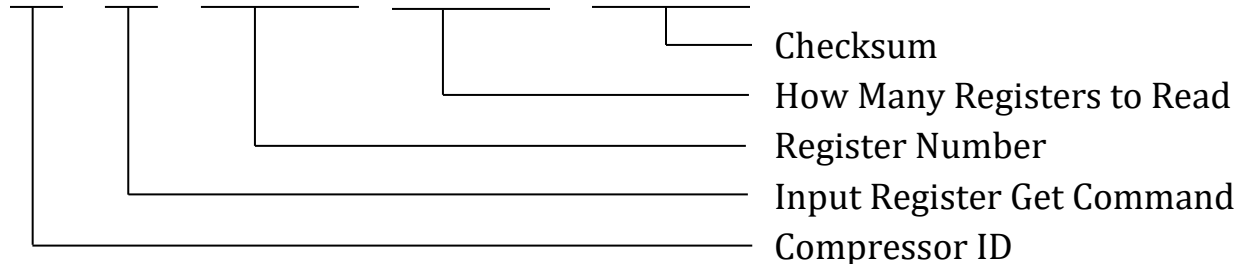
The 'Input' registers give the data in integer format but in 1/10 scale size. For example, a temperature of 65.8 will be multiplied by 10 then placed in the register. This is an effort to send fractional information in an easy to extract format. Simply read the input registers and converter the integer into a format that can handle decimal points then divide by 10.

The Holding register 40,001 is used to signal the compressor to turn on and off.

Note: All Modbus registers used in the previous generation of panel as well as SMDP are still supported for backwards compatibility.

Developers Note: When introducing Modbus to our compressors it was found that there is a conflict as to how to refer to registers depending on who implemented it. 0 indexed based or 1 indexed based. This document refers to the registers by the literal number you send when doing a query. For example, to get input registers 30001 on a compressor with the ID of 16 you will send the bytes:

0x10, 0x04, 0x00, 0x01, 0x00, 0x01, 0x63, 0x4B



Values To Use

Holding register 40001:

0x00FF - turn the compressor OFF

0x0001-Turn the compressor ON

Input Register 30001: (operating state)

0: Idling - ready to start

2: Starting

3: Running

5: Stopping

6: Error Lockout

7: Error

8: Helium Cool Down

9: Power related Error

16: Recovered from Error

Input Register 30002: (Compressor Energized)

0: Off

1: On

Input Register 30029: (Pressure)

0: PSI

1: Bar

2: KPA

Input Register 30030: (Temperature)

0: Fahrenheit

1: Celsius

2: Kelvin

Input Register 30032: Model Numbers

The upper 8 bits contain the Major model number and the lower 8 bits contain the Minor model number.

Major Model Numbers consist of

- 1: 800 Series
- 2: 900 Series
- 3: 1000 Series
- 4: 1100 Series
- 5: 2800 Series

Minor Model Numbers consist of:

- | | |
|--------|--------|
| 1: A1 | 13: 07 |
| 2: 01 | 14: H7 |
| 3: 02 | 15: I7 |
| 4: 03 | 16: 08 |
| 5: H3 | 17: 09 |
| 6: I3 | 18: 9C |
| 7: 04 | 19: 10 |
| 8: H4 | 20: 1I |
| 9: 05 | 21: 11 |
| 10: H5 | 22: 12 |
| 11: I6 | 23: 13 |
| 12: 06 | 24: 14 |

Example: A 289C compressor will give a Major of 5 and a Minor of 18.

Input Register 30052 - 30053: (Warnings)

0: No warnings

1: Coolant IN running High

2: Coolant IN running Low

4: Coolant OUT running High

8: Coolant OUT running Low

16: Oil running High

32: Oil running Low

64: Helium running High

128: Helium running Low

256: Low Pressure running High

512: Low Pressure running Low

1024: High Pressure running High

2048: High Pressure running Low

4096: Delta Pressure running High

8192: Delta Pressure running Low

131072: Static Pressure running High

262144: Static Pressure running Low

524288: Cold head motor Stall

Input Register 30054 - 30055: (Errors)

0: No Errors

1: Coolant IN High

2: Coolant IN Low

4: Coolant OUT High

8: Coolant OUT Low

16: Oil High

32: Oil Low

64: Helium High

128: Helium Low

256: Low Pressure High

512: Low Pressure Low

1024: High Pressure High

2048: High Pressure Low

4096: Delta Pressure High

8192: Delta Pressure Low

16384: Motor Current Low

32768: Three Phase Error

65536: Power Supply Error

131072: Static Pressure High

262144: Static Pressure Low

15 Pin Remote Control

The 15-pin control port documentation is available on request.

RS-232 Pinout (Comm 1)

- 1.
2. Rx.
3. Tx.
- 4.
5. Gnd.
- 6.
- 7.
- 8.
- 9.

RS-485 Pinout (Comm 2)

- 1.
2. D+.
3. D-
- 4.
5. Gnd.
- 6.
- 7.
- 8.
- 9.