

# BARTEC



## *Process Analyzer* User Manual

**P-840LT POUR POINT ANALYZER**

February 6<sup>th</sup>, 2023  
Version 1.1

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## *Foreword*

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### **Warranty Policy**

Bartec Orb warrants its products to the original purchaser against any defects that are due to faulty material or workmanship for a period of 12 months after commissioning or 18 months after receipt of goods, whichever time period is shorter.

In the event that a defect is discovered during the warranty period, Bartec Orb agrees that, at its option, it will repair or replace the defective product or refund the purchase price, excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents, or consumable components of a product, such as, but not limited to, lamps and tubing.

Contact Bartec Orb or your distributor to initiate warranty support. Products may not be returned without authorization from Bartec Orb.

### **LIMITATIONS**

This warranty does not cover:

- Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction.
- Damage caused by misuse, neglect, accident or improper application or installation.
- Any product not used in accordance with the instructions furnished by Bartec Orb.
- Freight charges to return merchandise to Bartec Orb.
- Freight charges on expedited or express shipment of warranted parts or product.
- Travel fees associated with on-site warranty repair.

This warranty contains the sole express warranty made by Bartec Orb in connection with its products. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state, the above limitations may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.


This warranty constitutes the final, complete, and exclusive statement of warranty/terms and no person is authorized to make any other warranties or representations on behalf of Bartec Orb.


### **LIMITATION OF REMEDIES**


The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall Bartec Orb be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.


## Explanation of Symbols

Throughout the manual, the following symbols are used to inform the user about the safety and operation of the Analyzer:

	<b>WARNING:</b> Informs the user about hazards that will cause serious injury or death.
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	<b>CAUTION:</b> Informs the user about possible hazards that might cause injury or damages to the equipment.
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	<b>NOTE:</b> It emphasizes information about specific feature or function.
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	<b>LINK:</b> Directs to additional online content.
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## Revision History

Rev.	Description / Changes	Date
1.1	Spare parts list update	February 6th, 2023
1.0	First version of the new Manual	January 24th, 2023

## *Chapter I: Introduction*

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### **Analyzer Overview**

The Bartec Orb Model P-840LT Pour Point Analyzer is an on-line instrument designed for the continuous measurement of no flow point in hydrocarbon refining processes. The no flow point (correlating to pour point) is the temperature where a product (as it is cooled) stops flowing. Extremely rugged and simple to operate, the P-840LT Pour Point Analyzer combines exceptional measurement accuracy with unmatched operational dependability to deliver highly reliable and repeatable results.

- Superior repeatability:  $\pm 0.25^{\circ}\text{C}$  ( $0.45^{\circ}\text{F}$ ) or better.
- Measuring range  $-100$  to  $25^{\circ}\text{C}$  ( $-148$  to  $77^{\circ}\text{F}$ ).
- Internal cryogenic-engine cools to  $-100^{\circ}\text{C}$  without external chillers.
- High Pressure detection cell, no Sample Recovery System needed.
- Compliant with ASTM D7346.
- Correlates with ASTM D97.

For optimum installation and applications versatility, the P-840LT Pour Point Analyzer incorporates a wide variety of standard features, including:

- Isolated, self-powered 4-20 mA analog output (optional two extra outputs available).
- Three SPDT dry contact alarm relays.
- Optional Modbus output (Ethernet TCP/IP or RS-485 RTU).
- RS-232 serial output.
- Separate control and measurement enclosures.
- ATEX / IECEx: Ex db IIB T6 Gb or NEC: Class I Div 1 Group B, C + D hazardous area classification.

### **Principle of Operation**

The P-840LT Pour Point Analyzer is designed to provide no flow measurements in compliance with ASTM Method D7346 or pour point measurements in correlation with ASTM Method D97 and IP15. A precision differential pressure sensing system has been employed to monitor the loss of flow due to the formation of wax crystals during the measuring cycle cool down. The P-840LT's pressure sensor monitors the state of flow conditions through a high-pressure detection cell that allows measurements to be performed at process pressures, eliminating the need for atmospheric sample recovery. A state-of-the-art air or water-cooled cryogenic cooler provides cooling power to the detection cell down to  $-100^{\circ}\text{C}$  ( $-148^{\circ}\text{F}$ ). The use of the cryocooler eliminates the requirement of an external, explosion-proof re-circulating chiller system.

A typical measurement cycle takes between 10 and 45 minutes and is performed as follows:

1. The sample solenoid opens, and fresh sample is flushed through the detection cell to warm and dislodge any wax crystals which may have remained on the detection cell walls from the previous measurement. The duration of the flush cycle is user programmable.
2. The sample solenoid closes, locking fresh sample in the detection cell.
3. The cryocooler is activated. The power applied to the cryocooler is programmable, continuously monitored, and automatically adjusted to maintain consistent cooling times to pour point detection.

4. While the sample cools, both the sample temperature and the signal from the pressure transducer are monitored. The temperature at which the differential pressure in the detection cell changes is the pour point.
5. When pour point is detected, the temperature is displayed locally and output as an analog and/or digital signal.
6. The sample solenoid opens, and a new measurement cycle is initiated.

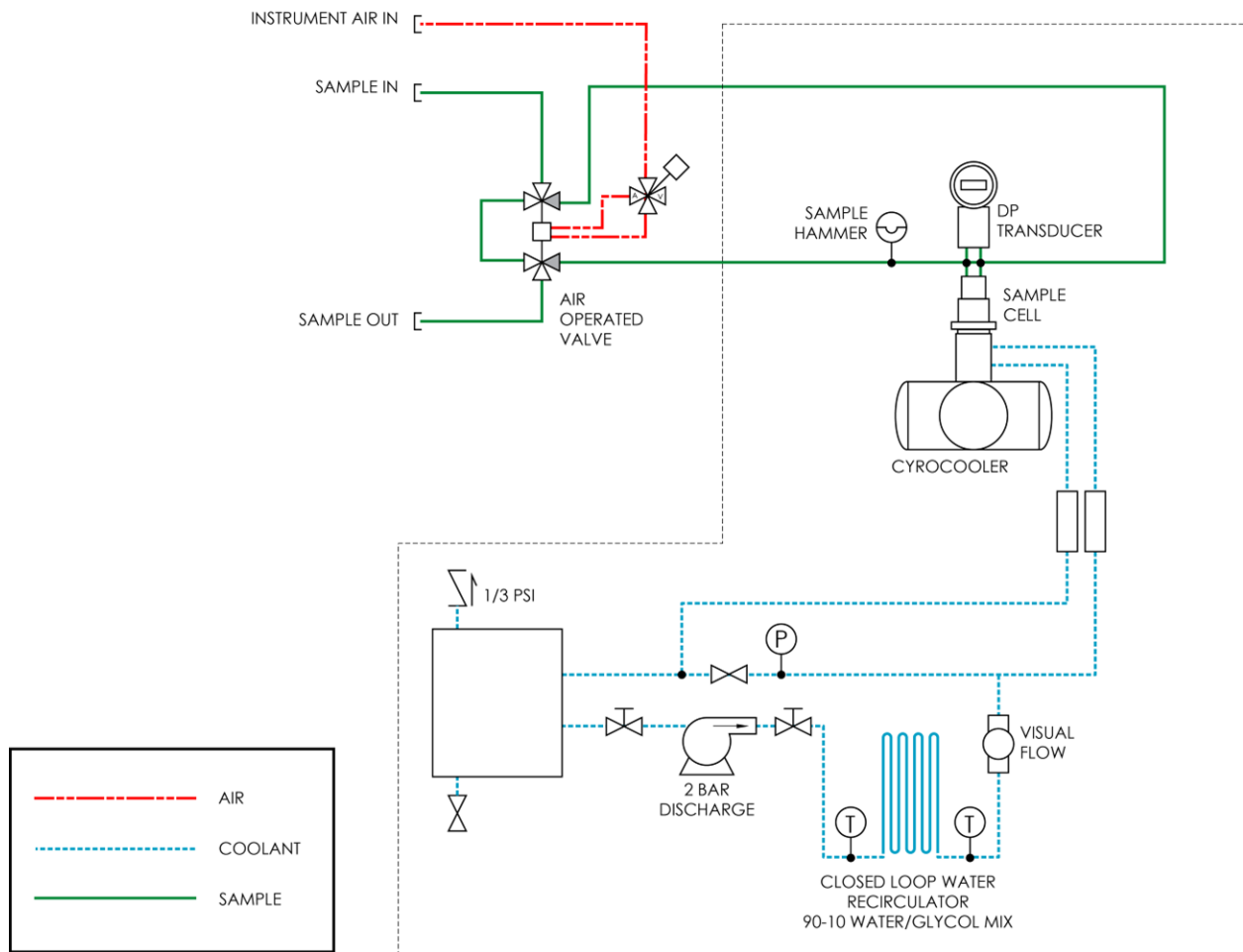


Figure 1-1: Analyzer Flow Schematic (Water-Cooled System)



## Component Identification

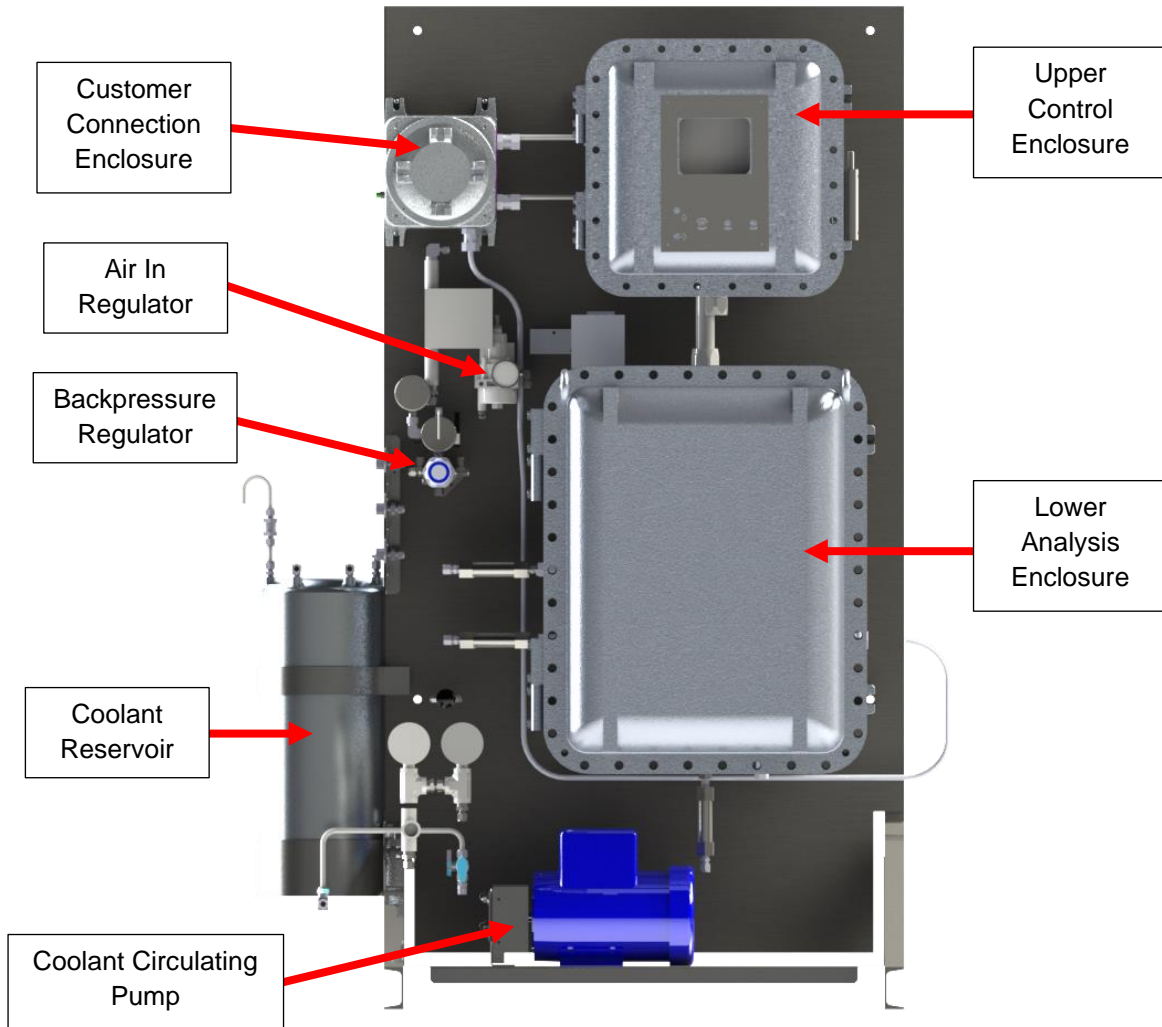


Figure 1-2: Front View (integrated Water-Cooled System)

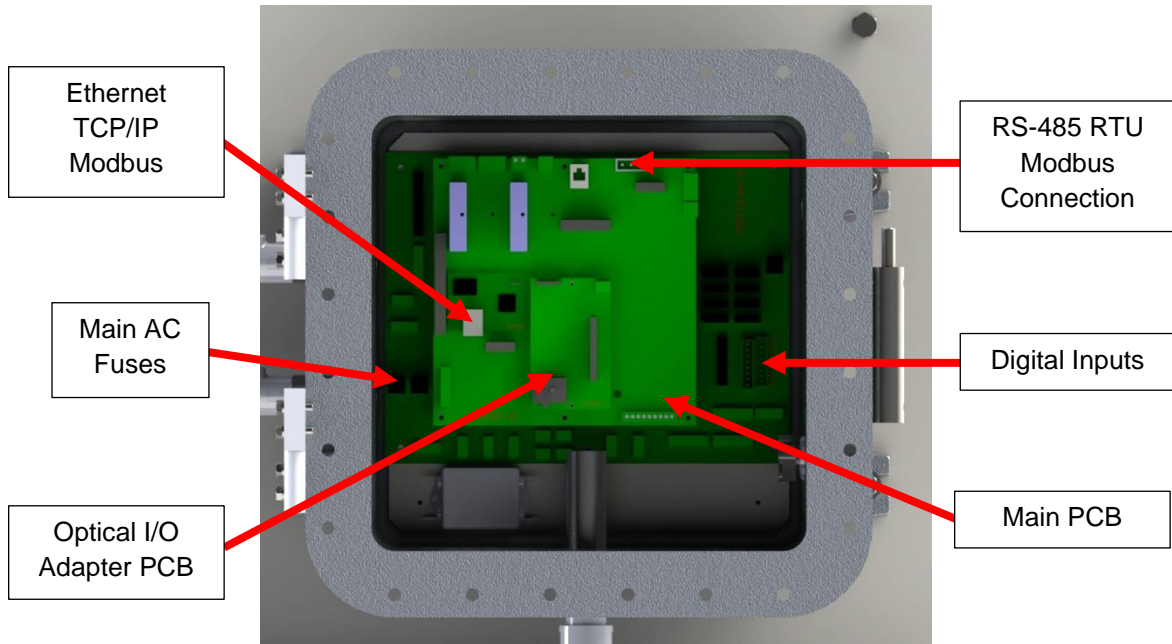


Figure 1-3: Upper Control Enclosure

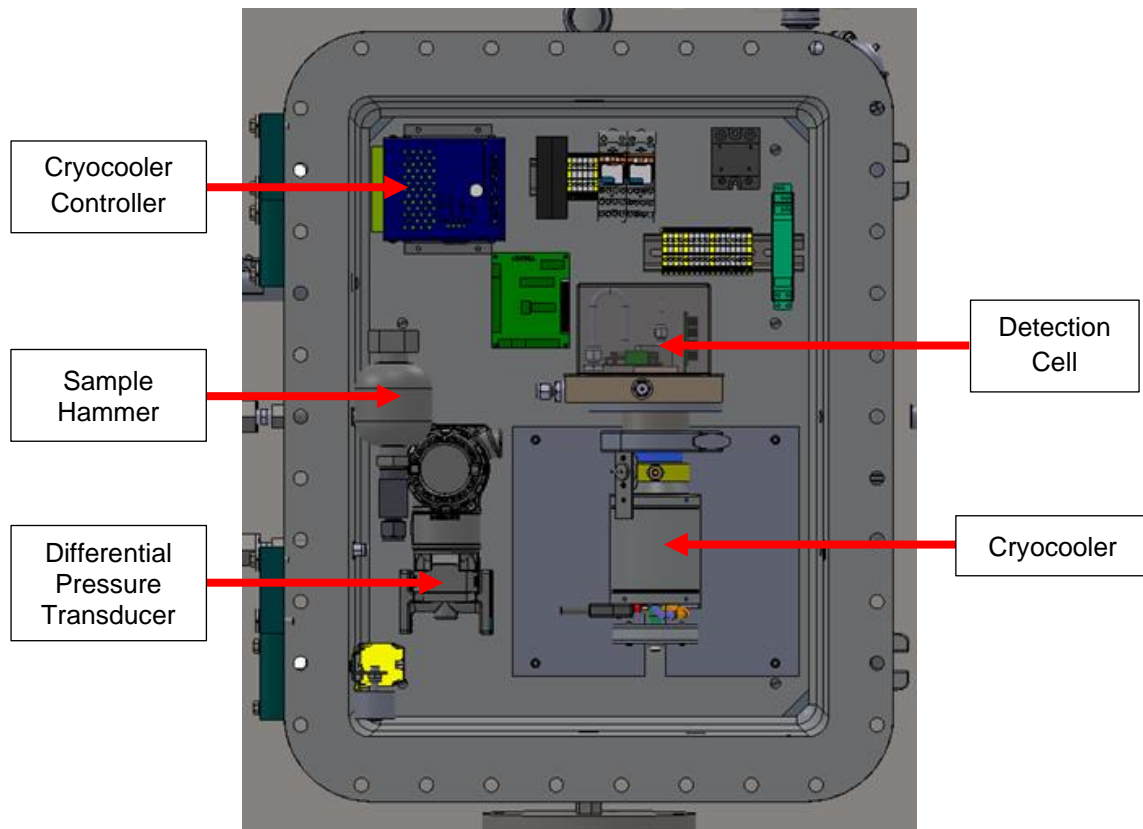


Figure 1-4: Lower Analysis Enclosure

### Menu Structure

Main Menu	Submenu	Items	Choices / Settings / Comments		
Analyzer Status	—	—	Online / Offline		
Alarm History	—	Reset	Reset Alarms log		
Validation History	—	Reset	Reset Validation log		
Service	—	Sys Temperatures T1 Sample Sensor	Display only items. Not used Sample temp. inside detection cell OPEN / CLOSE ; Thermostat status		
		Output Control Sample Solen. Validation Stream 1 Stream 2	Used to verify operation of various solenoids. ON / OFF ; Sample solenoid control ON / OFF ; Optional Validation solenoid control ON / OFF ; Optional Stream 1 solenoid control ON / OFF ; Optional Stream 2 solenoid control		
		4-20 Control Out 1 Out 2 Out 3	Used to check 4-20 mA signals. 4.0 – 20.0 ; Channel 1 4.0 – 20.0 ; Optional Channel 1 4.0 – 20.0 ; Optional Channel 1		
		Alarms R1 R2 R3	Used to check Alarm Relays. ON / OFF ; Relay 1 ON / OFF ; Relay 1 ON / OFF ; Relay 1		
		Cell Temp. Control PWM Load Heater Cooler	Used to check cell heater and cooler. 0 – 100% ; Heater power ON / OFF ; Heater control ON / OFF ; Cryocooler control.		
		Pressure System Pres	Display only item. 0 – 4095 ; 12-bit differential pressure signal.		
		Digital Inputs DI	Display only item. 1 / 0 ; Status of digital input ports		
		Setup	Output Settings	4-20 Out 1 Output  4mA 20mA Offset	Program 4-20 mA Channel 1. NC / PourPt 1 / PourPt 2 / Validation / Cell Temp. / Pressure Set 4 mA value for selected Output Set 20 mA value for selected Output Set 4-20 mA offset for selected Output
				4-20 Out 2 & 3	Program optional 4-20 mA Channel 2 & 3 (same items and settings as for Channel 1).
				Graphics Clear All Pour Point ON / OFF Clear Low High	Program graphs settings. Clear All graphs history Program Pour Point results graph. ON / OFF ; Disable or Enable the graph Clear the graph Set Low range for the graph. Set High range for the graph.
Alarm Settings	Cell Temp. & Pressure		Program Cell temperature & pressure graphs (same items and settings as for Pour Point graph).		
	PP Alarm 1 Low High		Stream 1 Pour Point results alarm settings. -200.0 – 200.0 ; Low result range -200.0 – 200.0 ; High result range		
		PP Alarm 2	Stream 2 Pour Point results alarm settings.		

Main Menu	Submenu	Items	Choices / Settings / Comments
Setup		Low High  No Detect Time Cycle  Cell Temp. Alarm Low High  R. Stdby	-200.0 – 200.0 ; Low result range -200.0 – 200.0 ; High result range  No detection settings for COOL cycles. 30 – 4000 ; Max. time (in seconds) for detection 1 – 5 ; Max. consecutive cycles for detection  Cell/Sample temp. alarm range. Set Low alarm range Set High alarm range  Disable / Enable ; Critical Alarm behavior for remote standby mode
	System Settings	General Temp Scale Standby Mode Strm Sel  Come Read Num Cycles Max Cycles ScreenSaver  Validation ValidEV ValidBW  Digital Inputs Cust Alarm Rem Stdby Strm Sel Valid  Mode Settings FlushHeat CellHeat Cool Drag Mode 1 Mode 2 PP1 Thresh PP2 Thresh Delta F.R.  Reload Defaults  Relay Choice  Condition	General Analyzer's settings. C / F ; Temperature units ON / OFF ; Analyzer status at boot-up STREAM 1 / STREAM 2 / ALTERNATE / AUTO (setting for optional stream switching) 0 – 300 ; Timer for Come Read relay (in seconds) Cycles counter (display or reset only) 10000 – 75000 ; Limit for Maintenance Alarm 0 – 60 ; Screen Saver timer (in minutes)  Validation results settings. Expected validation result Validation acceptable bandwidth / range  Digital inputs operation settings. Enable / Disable ; Customer Alarm Enable / Disable ; Remote Standby Enable / Disable ; Stream Select Enable / Disable ; Validation  Measurement parameters. 0 – 100 ; Heater power (%) during FlushHeat state 0 – 100 ; Heater power (%) during CellHeat state 0 – 75 ; Heater power (%) during COOL state Baseline / 1st Deriv. ; Stream 1 detection mode Baseline / 1st Deriv. ; Stream 2 detection mode 0 – 2500 ; Stream 1 detection threshold 0 – 2500 ; Stream 2 detection threshold Off / 10 / 15 / 20 / 25 / 30 / 35 / 40 / 45 / 50 (Delta for starting fixed rate cooling)  Loads default customer settings  Alarm relays programming (R1 / R2 / R3). OFF / Alarm Warning / Alarm Critical / Maintenance Come Read / Validation / In Validation Normal / Fail Safe
	Communications	Serial Port C Mode Rate  MODBUS ID Mode  Serial Port B Rate  Ethernet Setup Our IP Address Router Address Network Mask	Communication settings for RS-232 port None / Data / Result ; Output mode 9600 / 19200 / 38400 ; RS-232 baud rate  Modbus communication settings 1 – 250 ; Slave ID Ethernet / RTU ; Modbus mode  RS-485 RTU settings 9600 / 19200 / 38400 ; RS-485 baud rate  Modbus TCP/IP settings Analyzer's IP address Router Address Network Mask

Main Menu	Submenu	Items	Choices / Settings / Comments
	State Table Setup	Line	1 – 12 states
		State	CELLHEAT / FLUSH / FLUSHHEAT / COOL-F.R. / COOL / Wait / Repeat
		Data	seconds or temperature setting (depends on state)
	Time/Date Setup	Time/Date Setup	Time & Date settings
Time Format		12 / 24 Hr ; time format	
Date Format		US / EU ; date format	
		Date	Set current date
		Time	Set current time
	Factory Setup	–	For factory use only
Security	–	–	Disable / Enable ; setting for accessing submenus

## Chapter II: Specifications

### Models

P-840LT-1400	NEC: Class I Div 1 Group B, C + D
P-840LT-1500	ATEX: II 2G Ex db IIB T6 Gb
P-840LT-1600	IECEX: II 2G Ex db IIB T6 Gb

### Performance

Measurement Range	-100 to 25 °C (-148 to 77 °F)
Repeatability	±0.25°C (0.45°F)
Reproducibility	Meets or exceeds ASTM Method D97 or IP15.
Resolution (RTD sensor)	±0.05°C (0.09°F)
Measurement Accuracy	Meets or exceeds ASTM Methods D97 or IP15.
Temperature Accuracy	±0.1°C (±0.18°F)
Measurement Cycle Time	10 to 45 minutes or less
Operating Temperature Range	Minimum: 0°C (32°F) Maximum: 40°C (104°F)

### Sample Requirements

Sample Flow Rate	Minimum: 1000 cc/min (60 L/h) Maximum: 2000 cc/min (120 L/h)
Sample Pressure	Minimum: 1.4 bar (20 psi) Maximum: 14 bar (200 psi)
Sample Return Pressure	Atmospheric to 10 bar (145 psi) maximum
Sample Temperature	Minimum: 2°C (36°F) Maximum: 100°C (212°F)
Sample Composition	Homogeneous, single-phase sample. Must be free of water or water moisture; particulate matter must be smaller than 10µm.

### Signal Inputs/Outputs

Analog Output	One isolated 4-20 mA output standard. Optional two extra outputs available. Signal output information is programmable.
Serial Communication	RS-232 (output only) / RS-485 (Modbus)

Relay Output	Three SPDT relay contacts rated at 3A resistive load at 250 V a.c. May be programmed for normal or failsafe operation. The conditions activating these relays are programmable.
Modbus	Optional (Ethernet TCP/IP or RS-485 RTU) Consult Bartec Orb for details.

### Utility Requirements

Power	120/240 V a.c. ( $\pm 10\%$ ) 50/60 Hz; 5/2.5A; single phase
Instrument air	Clean, dry instrument air supplied at a pressure of 60 psi (4.1 bar) Consumption at approximately 10 L/h
Cryocooler Coolant	<u>Analyzers with Water-Cooled Cryocooler:</u> Clean, filtered plant cooling water or closed-loop chiller system. Maximum Temperature: 50°C (122°F) Flow Rate: 600 cc/min (36 L/h) at Pressure: 2 bar (30 psi) minimum.
Optional Detection Cell Purge Gas Supply	Clean, dry nitrogen (better than 98% pure) or other inert gas at 0.07 bar (1.0 psi).

### Environmental Conditions

Location	Indoor or outdoor (should be protected from direct sun, heavy rains, and strong winds)
Altitude	Max. 4000 m (13000 feet) above sea level
Ambient temperature	0 to 40°C (32 to 104°F)
Ambient humidity	up to 90%
Supply Voltage range	120/240 V a.c. ( $\pm 10\%$ )
Overvoltage Category	II
Pollution Degree	2

### Analyzer Frame and Enclosure

Dimensions (W x H x D)	940 x 1803 x 762 mm (37 x 71 x 30 in)
Weight	Approximately 270 kg (600 lbs)
Enclosure Rating / Material	Explosion-proof cast aluminum copper free alloy (meets NEMA 4X, IP66 requirements)
Certification	CE certified
Hazardous Classification	X-proof housing; NEC Class I, Division 1, Group B, C + D ATEX/IECEX: II 2G Ex db IIB+H2 T6 Gb

Due to Bartec Orb's commitment to continual product improvement, specifications subject to change without notice


## Chapter III: Safety

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P-840LT Pour Point Analyzer was designed and tested to be used in hazardous location. Range of safety requirements and instructions must be observed in order to protect the personnel and avoid potentially dangerous situation.

### Proper Use

This equipment is used to continuously monitor the pour point temperature of flowing hydrocarbons. It is intended for stationary use in hazardous locations and should be used only for the measurement of pour point. All the installation, service, and maintenance practices are described in this manual and must be followed.

	<p><b>WARNING:</b> Any modification to the Analyzer can affect and compromise the safety of the equipment and create dangerous conditions.</p>
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For correct use, only Bartec Orb supplied parts should be used as replacement spares.

### Improper Use


The following are deemed as improper usage of the equipment:

- introducing product outside of the temperature/pressure specifications of the system.
- introducing product in a gaseous state (i.e., steam).
- use of the equipment in the presence of oxygen vapors.
- opening live electrical housing without proper permitting.
- running the unit without flowing sample.
- running the unit in ambient temperatures outside specifications.

### Ergonomics

The Analyzer should be positioned in a way to easily operate and perform maintenance on the unit. Enclosure boxes as well as utility ports must be always accessible. The recommended minimum free space around the unit is:

Top, Left, Right: 458 mm (18 inches)  
Front: 914 mm (36 inches)

	<p><b>CAUTION:</b> Upper Control Enclosure with display and magnetic keypad is used for user interface. Therefore, the front of the Analyzer shouldn't be directed towards direct sunlight or should be protected from it.</p>
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## Operators and Maintenance Personnel

Operators must have been trained by local Analyzer specialist regarding normal operating hazards and visual inspections as well as auxiliary equipment effects based on parameter changes.

Maintenance personnel must have experience working on electrical equipment in hazardous environments and undergo preventative maintenance training from a factory authorized Analyzer specialist.

While working on the Analyzer, proper PPE (Personal Protective Equipment) should be worn for the corresponding tasks. It includes:



- gloves,
- goggles,
- hardhat,
- fire-retardant clothing,
- safety boots,
- hearing protection.


The following precautions should be observed in order to mitigate hazards:

- Gas detection should be utilized to monitor leaks.
- All necessary permits should be processed before opening the Analyzer's enclosures.
- When disconnecting lines, make sure unit is de-energized / locked out and utilize bleed valves to reduce stored pressure.

## Symbols and Signs

The following symbols might be used on the Analyzer to inform the user about safety and hazards:

Pictogram	Description
	<b>Exclamation Mark:</b> An immediate skin, eye or respiratory tract irritant, or narcotic.
	<b>Flame:</b> Flammable materials or substances liable to self-ignite when exposed to water or air (pyrophoric), or which emit flammable gas.

	<p><b>Health Hazard:</b> A cancer-causing agent (carcinogen) or substance with respiratory, reproductive or organ toxicity that causes damage over time (a chronic, or long-term, health hazard).</p>
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## Startup and Maintenance

During startup and maintenance of the Analyzer, special care must be observed when working inside and around the unit. Appropriate PPE should be used during opening the enclosures.


### **Overflow and Spillage**

In case of overflow and spillage of liquids outside the cell and sample lines, the Analyzer should be turned off and power disconnected. Ensure adequate ventilation around Analyzer if the unit is installed indoors. Keep personnel away from upwind of spill/leak. Remove all sources of ignition and take precautionary measures against static discharges.

In case of internal sample leak, the power will be removed from the Analyzer ([see page 41](#)). Lower Analysis enclosure has to be opened to access liquid spill. Use tray or bucket under the Lower enclosure to contain the leaked sample.

### **Cleaning**

Contain and collect spillage with non-combustible absorbent material, (e.g., sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.

	<p><b><u>WARNING:</u> Samples shouldn't be released into the environment.</b></p>
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Please refer to Safety Data Sheets for more information about used samples.

## Chapter IV: Installation and Startup

### Transportation

#### Packaging


The Analyzer is packaged in a wooden crate. All the hardwood materials are in full compliance with the ISPM 15 regulations. The following symbols may be found on the crate:

Symbol	Meaning	Description
	This way up	Indicates correct upright position of the crate.
	Keep away from rain / moisture	Indicates that the transport package shall be kept away from rain and be kept in dry conditions.
	Centre of gravity	Indicates the center of gravity of the Analyzer crate for moving and lifting.

#### Moving

In order to transport Analyzer's packaging crate, the appropriate forklift must be used. Please check shipping documentation for details about the total weight of the crate. Only authorized forklift driver should be moving the crate. Observe the following precautions during transportation:

- Always wear appropriate PPE including gloves, glasses, and head protection.
- Pay attention to the center of gravity, so the pallet won't tip over.
- Make sure the load is stable before you move it.
- Be alert for any dangers and know your surroundings.



**WARNING: Tipping over the Analyzer's crate while lifting or moving can lead to death, severe injuries and material damage.**

#### Unpackaging

Before beginning to disassemble the crate, wear necessary protective gear like glasses and gloves. All the packaging material should be only removed prior to installation. Inspect the content of the crate and check for any possible transport damages.

#### Lifting

The Analyzer's frame has two lifting points for suspension gear attachment. They are located on the upper sides (see Figure 4-1). The crane or lifting equipment should be appropriately sized for capacity load and working conditions, and only authorized personnel with protective gear should be operating them.

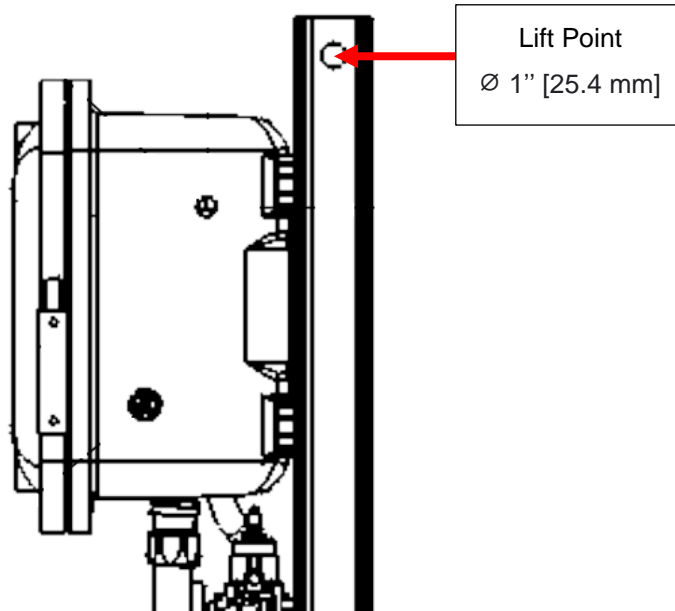


Figure 4-1: Lifting Point Location



**WARNING:** The lifting points are not the center of gravity and extreme caution should be used when moving the Analyzer. The unit can swing and tip causing death, severe injuries and material damage.

## Site Requirements

The particular site, application, and installed options will ultimately determine the need for any accessories or auxiliary equipment. This section defines the various parameters to be considered. Consult Bartec Orb for specific recommendations regarding your Analyzer.



**WARNING:** Installation or operation of this Analyzer outside of the parameters indicated in the Specifications could result in personal injury or damage to the Analyzer. Installation, operation, and maintenance should be performed only by fully qualified personnel.

### **Location**

For ease of operation, the Analyzer should be installed as close as possible to the process stream to be monitored. To optimize performance, it should be housed in an appropriate shelter and protected against direct sunlight, moisture, and other adverse conditions. The shelter's ambient temperature should remain between 0° and 40°C (32° and 104°F) at all times.

### **Mounting**

The Analyzer is either frame or shelter mounted and should be installed on a flat, level surface free from intense vibration. Frame legs or shelter feet are designed for use with 1/2-inch expansion bolts. See Chapter IX: Drawings & Schematics of this manual ([page 51](#)) for exact system dimensions.


The bottom of the enclosure should be located approximately 12 in (30.5 cm) above the floor of the

shelter. Adequate clearance, approximately 18 in (46 cm) should also be allowed on either side of the unit for sample, utility, and control room connections.

### Piping

The Analyzer incorporates fittings for connecting process sample, instrument air, and optional detection cell purge gas. Analyzers with a water-cooled cryocooler also have connections for plant cooling water. These fittings are located on the sides of the instrument (see Figure 4-2).

#### PROCESS SAMPLE LINES

	<p><b>NOTE:</b> It is the user's responsibility to assure that a representative sample, free of moisture and particulate matter, is presented to the instrument for analysis. Bartec Orb can assist in specifying sample conditioning requirements and the selection/development of an appropriate sample conditioning system.</p>
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Process sample lines are connected to the 1/4-inch FNPT fittings located on the left side of the lower analysis enclosure. Process samples should be provided at a pressure between 1.4 and 14 bar (20 and 200 psi) at a flow rate of 1000 to 2000 cc/min (60 to 120 L/h). The temperature of the sample should be between 2 and 100°C (36 and 212°F).

#### INSTRUMENT AIR

For the analyzers with a water-cooled cryocooler: clean, dry instrument air at a minimum pressure of 4.1 bar (60 psi) is required to operate the sample solenoid.

For the analyzers with an air-cooled cryocooler: the air is also used to provide cooling to the vortex cooler. Clean, dry instrument air at a pressure of 6 to 8 bar (87 to 116 psi) and capable of delivering at least 85 m<sup>3</sup>/hr (50 cfm) is required.


Instrument air connection is made on the left side of the Analyzer.

#### CRYOCOOLER COOLANT SUPPLY

For the Analyzers with a water-cooled cryocooler only: Clean, filtered plant cooling water (or a closed loop chiller system) is required for cooling of the cryocooler. Coolant should be supplied at a temperature below 50°C (122°F) at a flow rate of 600 cc/min (36 L/h) and a pressure of at least 2 bar (29psi). The cryocooler coolant supply connection is made on the left side of the lower analysis enclosure to the 1/4-inch FNPT fittings.

#### OPTIONAL CELL PURGE GAS SUPPLY

The P-840LT Pour Point Analyzer provides for an optional inert gas purge to prevent condensation from forming on the cryocooler. This optional purge, if supplied, requires clean, dry nitrogen (98% pure) or other inert gas at a pressure of 0.07 bar (1.0 psi). See Figure 4-2 for connection location.

	<p><b>CAUTION:</b> High concentrations of nitrogen gas can be harmful to human health. It can displace the oxygen in the area, leading to asphyxiation.</p>
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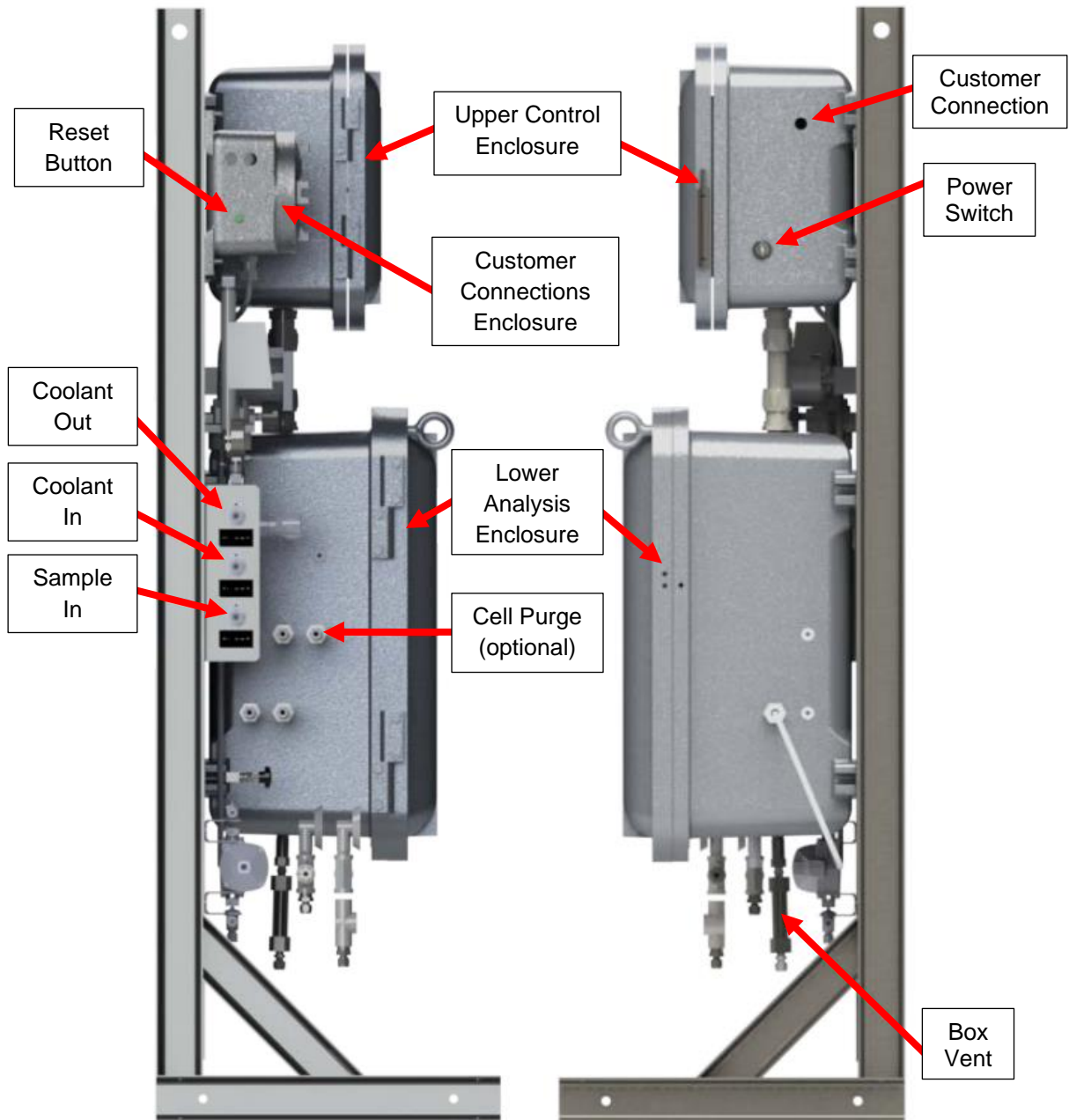


Figure 4-2: Left and Right Side Views

### Wiring

The P-840LT Pour Point Analyzer's power and customer connections are made in the Customer Connections enclosure located near the top left of the mounting rack (see Figure 4-2).

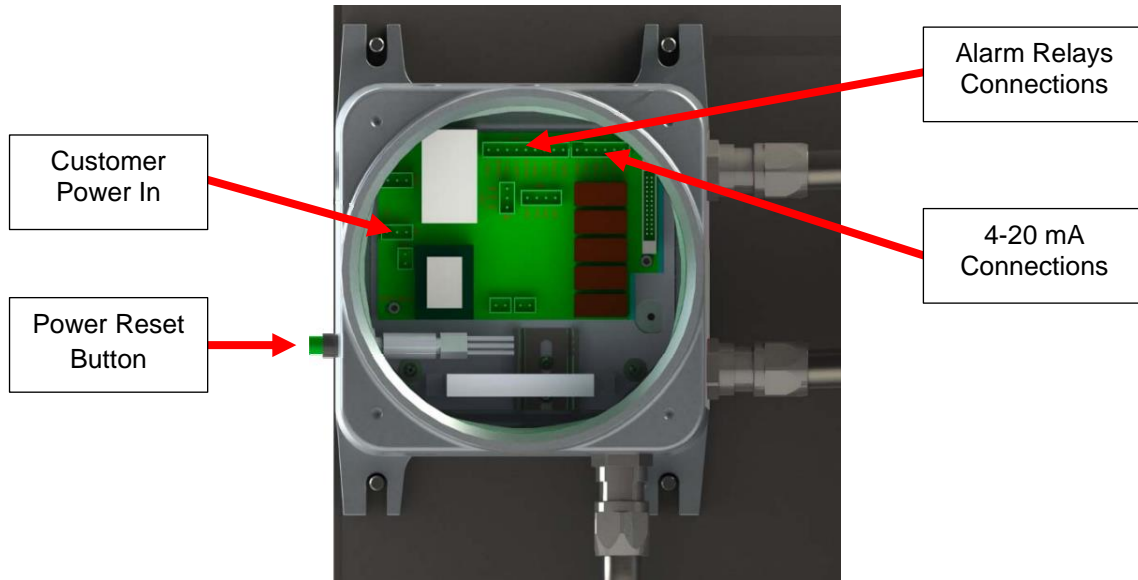


Figure 4-3: Customer Connections Enclosure

### ELECTRICAL POWER



**WARNING:** All electrical connections should be made by a licensed, qualified electrician. Proper building codes and safety regulations should be followed.

The P-840LT Analyzer requires an independent 120 or 240 V a.c. ( $\pm 10\%$ ) 50/60 Hz; 5/2.5A; single phase power supply. The system is jumper selectable for correct voltage supply. AC power connections are made through the Customer Connections enclosure mounted to the upper left of the instrument frame.



**CAUTION:** It is the installer's responsibility to verify that the jumpers on HD2 header (798112 Rev. B PCB) in Customer Connection Box are configured properly for the supply voltage (see Figure 4-4).



Figure 4-4: Voltage selection header (shown 240 V a.c., pin2-3)

### Customer Power In

The Analyzer is designed to operate at 120 or 240 V a.c. (50/60 Hz, single phase). Deviation from rated voltage shouldn't exceed  $\pm 10\%$ . The power connections are made in Customer Connection enclosure (see Figure 4-3 and 4-5) on the JP1 header with 3 position plug:

JP1 header pin position	Main Electricity Supply
1	L / L1
2	N / L2
3	PE

Recommended wiring: 14 AWG insulated copper wires, stranded or solid, voltage rating: 600V, max. temperature: 90°C or higher.

If required, external protective earthing connection will be made to a grounding lug mounted to the Analyzer frame leg.

It is recommended to use circuit breaker (min. 5A, max. 15A) on Analyzer's power in lines located near the unit.

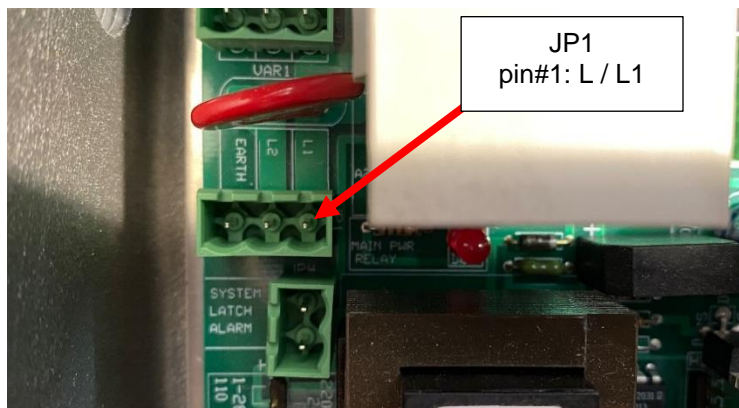


Figure 4-5: Customer Power In on JP1 header



### CONTROL ROOM SIGNALS

The Analyzer incorporates analog, serial, and relay output capability. Modbus output may be provided as a factory installed option.

The connections for these control room signals are made through the Customer Connections enclosure or Upper Control enclosure ports (see Figure 4-2 and 4-3).

#### Analog Output

One self-powered isolated 4-20 mA output is standard on the P-840LT Pour Point Analyzer. An optional second and third 4-20 mA output may be provided (see Figure 4-6).

Recommended wiring: one twisted pair, shielded, 22-24 AWG, voltage rating: 300V or higher, max. temperature: 60°C or higher.

#### Relay Output

The Analyzer incorporates three SPDT relay contacts rated at 3A resistive load at 250 V a.c. The relays may be programmed for either normal (non-energized) or failsafe (energized) operation and used to signal a variety of operational conditions. See Chapter V: Programming (page 30) for information on alarm programming. See Figure 4-6 for wiring details.

Recommended wiring: 18-22 AWG, insulated copper wires, stranded or solid, voltage rating: 600V, max. temperature: 90°C or higher.

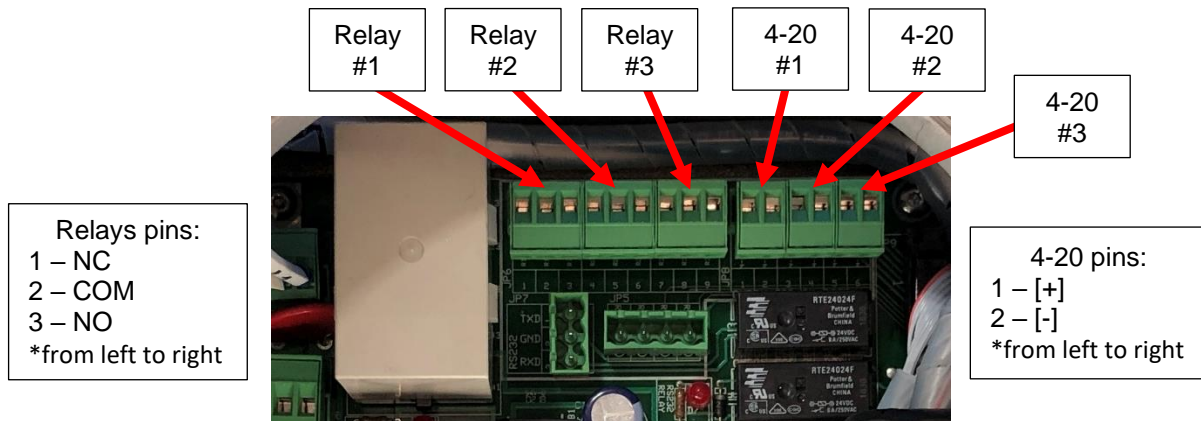


Figure 4-6: Analog 4-20 mA and Relays Output Connections

#### Serial Output

The P-840LT Pour Point Analyzer incorporates RS-232 serial output. The maximum allowable external cable length on the RS-232 output is 98 feet (30 meters). See Figure 4-7 for port wiring details.

Serial communication operates at a selectable baud (9600 / 19200 / 38400 bps), no parity, 8 start bits, 1 stop bit. Data is comma delimited and output in the following sequence:

Date (mm/dd/yy) or (dd/mm/yy)  
Time (hr/min/sec AM/PM) or (hr/min/sec 24hr)  
Pour Point Result  
Cell Temperature  
Stream Number

\*Serial output data format follows programmed settings (date, time, units)

A <CR> is used to designate the end of the data stream.

Recommended wiring: one twisted pair for the two data signals plus additional wire for common reference, shielded, 22-24 AWG, voltage rating: 300V or higher, max. temperature: 60°C or higher.

### Modbus

Modbus output is available as a factory installed option and uses the Analyzer's Ethernet TCP/IP (see Figure 4-8) or RS-485 RTU Serial interface (see Figure 4-7). Consult Bartec Orb for additional information.

Recommended wiring:

Ethernet TCP/IP: standard ethernet cable Cat5e or better.

RS-485: one twisted pair for the two data signals plus additional wire for common reference, shielded, 22-24 AWG, voltage rating: 300V or higher, max. temperature: 60°C or higher.

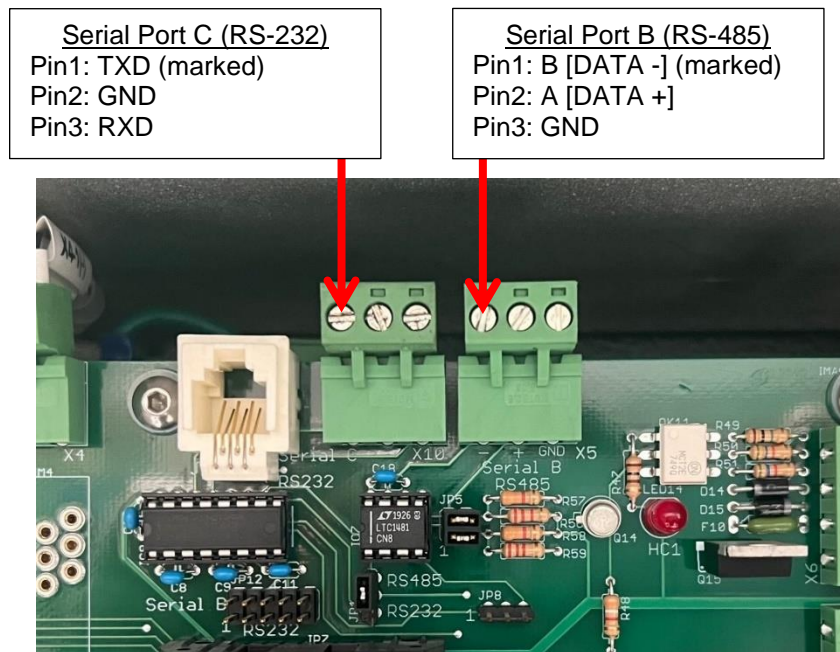


Figure 4-7: RS-232 (port C) and RS-485 (port B) Connections

### Digital Inputs

The Analyzer incorporates four sets of dry contacts that allow the control room to remotely activate selected functions. The connections for these digital inputs are made inside the Upper Control enclosure at JP2 terminal on Power Distribution PCB (see Figure 4-8). Wiring is brought into the enclosure through ports on the right-hand side of the enclosure.

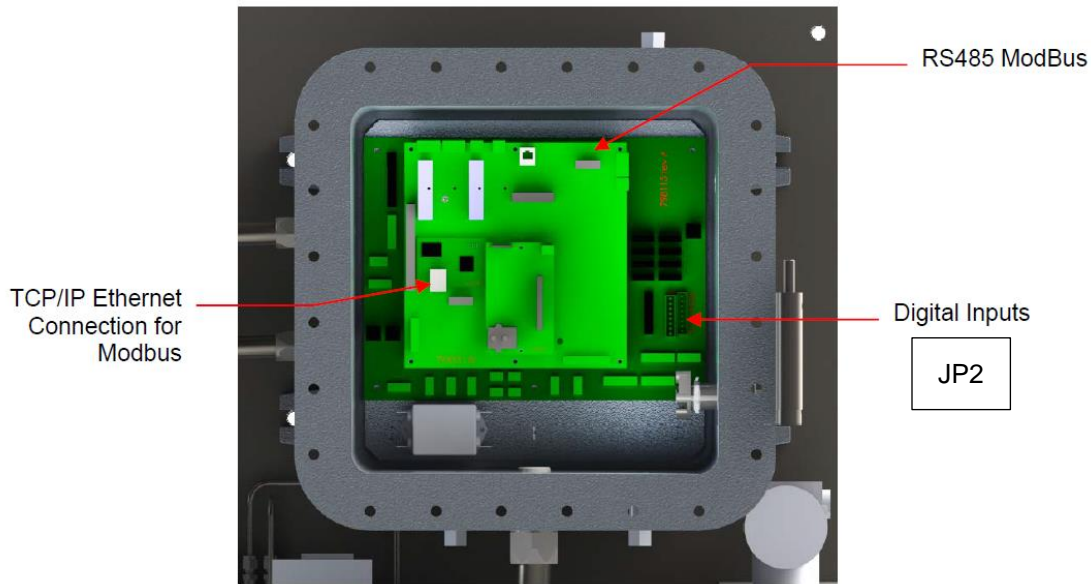


Figure 4-8: Upper Control Enclosure - Modbus and Digital Inputs

Digital inputs are as follows:

- **Customer Alarm** — This connection is used to stop the analysis, put the Analyzer Offline and activate Alarm Critical and Alarm Warning relays.
- **Remote Standby** — This connection is used to place the Analyzer in a Remote Standby Mode. Analysis will stop until the signal is removed.
- **Validation Request** — This connection is used to initiate a validation cycle.
- **Stream Select** — This connection is used to switch to Stream 2 sample.

The minimum external digital input signal pulse width should be 100ms.

Digital Input	Terminals (JP2)	Function
DI0	RCC1 – RCC2	Customer Alarm
DI1	RCC3 – RCC4	Remote Standby
DI2	RCC5 – RCC6	Validation Request
DI3	RCC7 – RCC8	Stream Select
DI4 – DI7	RCC9 – RCC16	Reserved for future use



**NOTE:** Although the Validation Request and Stream Select contacts may be present, these functions are only available on Analyzers which incorporate these options. Contact Bartec Orb for more details.

## Startup



**WARNING:** All necessary safety permits should be obtained, and the area checked for flammable vapors prior to opening the Analyzer's enclosure doors and applying power to the instrument.

The following points describe the default procedure to check the main components of the Analyzer and perform startup sequence:

1. Start the flow of process sample to the Analyzer and verify that the flow rate is between 1000 and 2000 cc/min. Check for sample line leaks outside and inside of the Lower Analysis enclosure.
2. Start the flow of instrument air and verify that it is regulated at 60 psi (4.1 bar).
3. For the analyzers with a water-cooled cryocooler: Turn the coolant supply ON and check for leaks.  
For the analyzers with an air-cooled cryocooler: Supply air to the vortex cooler.
4. Verify that the power switch on the right side of the Upper Control enclosure is in the OFF position.
5. Remove the cover of the Customer Connections enclosure and then apply mains power to the Analyzer.



**NOTE:** Upon initial application of external power to the Analyzer, only the Customer Connections enclosure is energized. Power will not be routed to other system components until the Power Reset button on the left side of the enclosure is pressed.

6. Press the reset button on the left side of the Customer Connections enclosure. A red LED adjacent to the electrical power connection should light up.
7. Place the power switch on the right side of the Upper Control enclosure in the ON position.
8. Access the Service menu (see Chapter VII: Maintenance & Service for information about that menu, [page 42](#)) and perform the following checks:
  - Cycle the sample solenoid output control. When switched ON, the air operated valve should open to the process line and flush the sample through the system. Pressure signal should go up to around 4000 bits. When turned OFF, the sample valve will close and isolate the system from the process. Pressure signal should drop to around 2300 bits.
  - Check for leaks in the Measurement Enclosure.
  - Conduct 4-20 mA loop and alarm relay checks from Service Screen as required.
  - Test detection cell heater and cooler.
9. Access the Setup Menu (Chapter V: Programming – Setup Submenu, [see page 25](#)) and enter each submenu to verify the Analyzer's settings match the QIR (Quality Inspection Report) you received with the instrument.
10. Place the Analyzer Online and observe operation for a few measurement cycles. Pay particular attention to the pressure signal, cooling and heating rates, no sample leaks inside and outside of the system etc.
11. Close the cover on the Customer Connections enclosure and bolt the Upper Control and Lower Analysis enclosure doors.
12. You are now ready to run analysis using the factory default settings or program the instrument with your desired operational parameters (Chapter V: Programming).

## Chapter V: Programming

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### Menu Navigation

The P-840LT Pour Point Analyzer is programmed and controlled via a magnetic keypad on the front of the Upper Control enclosure (see Figure 5-1). This eliminates the need for opening the enclosure to change operational settings. A magnetic pencil is supplied with the instrument for this purpose.

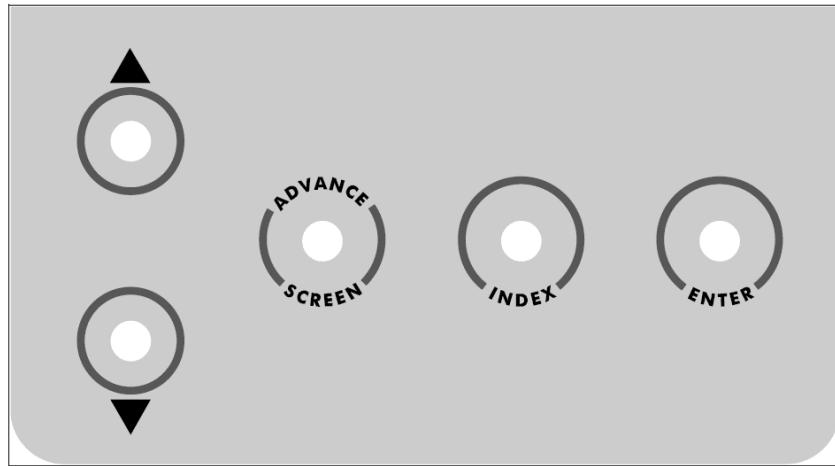


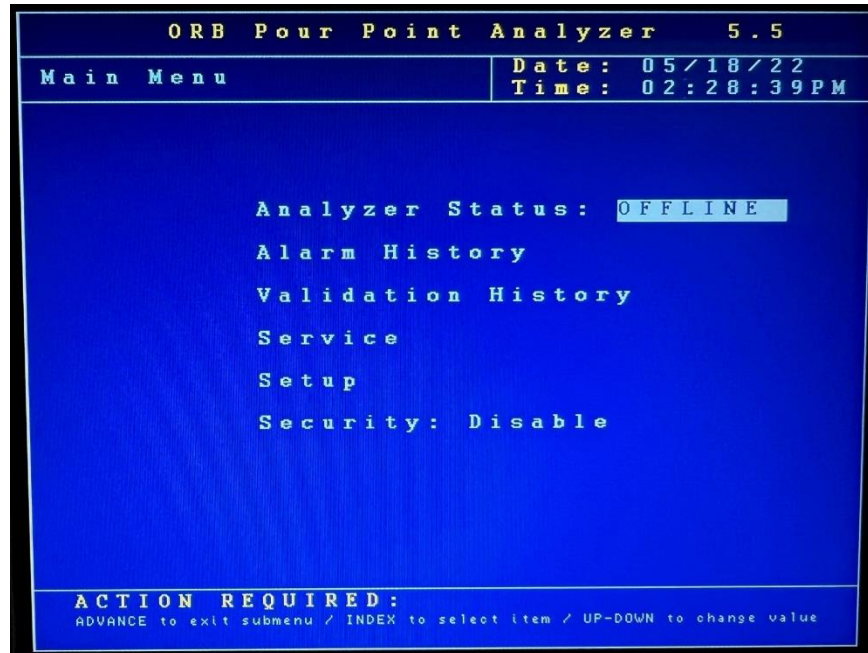
Figure 5-1: Magnetic Keypad

To enter or exit the analysis mode, to move to a new menu or within menu items, or to change a displayed value, the operator simply touches a magnet to the designated location on the keypad. These locations function as follows:

- **Advance Screen Key** — controls displayed screen. It moves out of the submenus (screen by screen) to the highest hierarchy screen, which is Main Run screen. From there, tapping Advance Screen Key will cycle between Main Menu and Main Run screen. It is also used to decline window messages.
- **Index Key** — scrolls through the various items available within a specific screen. The “active” menu line is highlighted (white bar) by reversing the background and foreground colors. Once you reach the last menu item, the indicator returns to the top of the menu.
- **Enter Key** — accesses submenu or runs a command associated with a selected menu item. It is also used to confirm window messages.
- **▲ ▼ (Up/Down Arrow) Keys** — change the displayed value for the indicated item. Depending on the specific item, it will either change the status of the selection, cycle through a list of available selections, or increase/decrease the value.

### Main Menu

This menu is used to place the Analyzer Online and Offline. It also provides access to various submenus. The Main Menu is displayed by touching the Advance Screen key when the Main Run screen is displayed ([see page 35](#)). Touch the Index key to advance to the next menu selection.



### ***Analyzer Status***

This field indicates the current status of the Analyzer. Touch the Up/Down Arrow keys to change the status. Window message will appear to confirm or decline your choice.

### ***Alarm History***

This menu item provides access to the Alarm History submenu that lists conditions which have activated one or more of the Analyzer's alarm functions. Alarms are described in further detail in Chapter VI: Normal Operation – Alarms ([see page 37](#)). Touch the Enter key to access this submenu and Advance Screen key to exit.

### ***Validation History***

This menu item provides access to the Validation History, which lists validation measurements that have been performed. Validation is described in further detail in Chapter VI: Normal Operation – Validation ([see page 39](#)). Touch the Enter key to access this submenu and Advance Screen key to exit.

### ***Service***

This menu item provides access to the Service submenu; entering it automatically takes the Analyzer Offline if it was running. The Service menu allows you to activate various measurement system components, test the analog outputs, and view sensors readings. It is described in detail in Chapter VII: Maintenance & Service ([see page 42](#)). Touch the Enter key to access this submenu. A screen will appear asking if you are sure to enter the Service menu; this is intended to prevent you from inadvertently taking the Analyzer Offline. Touch the Advance Screen key to exit Service menu.

### ***Setup***

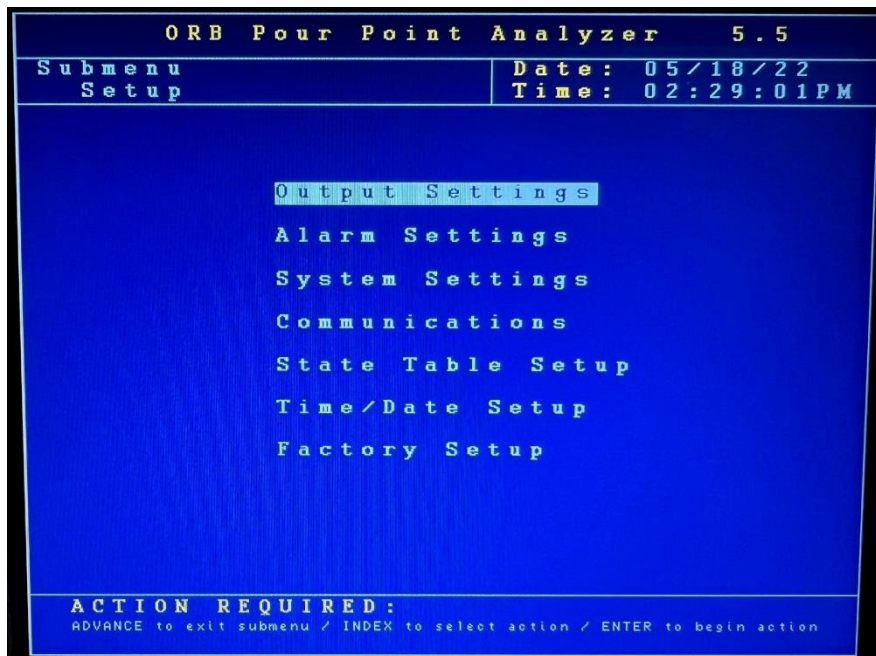
This menu provides access to the Analyzer's Setup submenus. It is accessed by touching the Enter key when this menu item is highlighted. Touch the Advance Screen key to return to the Main Menu.

### Security

This indicates the current status of the security setting. When Disabled, the operator has access to all Analyzer menus and submenus. When Enabled, a password must be entered to gain access to the various menus.

### Setup Submenu

The Setup submenu is used to enter the Analyzer's various settings screens.



Use the Index key to move to the desired (highlighted) menu selection. Touch the Enter key to access the selected submenu.

	<p><b>NOTE:</b> Changed settings are saved to microprocessor flash memory when the user exits to Main Menu. “PGM Save Delay...” message appears in top left corner until saving process is completed.</p>
--	---

### Output Settings

This submenu screen is used to program the Analyzer's 4-20 mA Analog Outputs and Graphics settings.

Use the Index key to move to the desired menu item. Use the Up/Down Arrow keys to change the displayed setting/value or use the Enter key to Clear the graphs.

#### 4-20 Out 1 / 4-20 Out 2 / 4-20 Out 3

The P-840LT Pour Point Analyzer's 4-20 mA analog outputs (Channel 1 standard; Channel 2 & 3 optional) can be programmed to output various types of information, as well as the range of the analog signal and an offset.

- **Output** — This menu item allows you to select the type of information that will be output using the selected analog signal. The choices are: NC (Not Connected), PourPt 1 (Stream 1 Pour Point results), PourPt 2 (Stream 2 Pour Point results), Validation, Cell Temp. and Pressure.
- **4 mA** — This menu item is used to set the value at which a 4mA signal will be output.
- **20 mA** — This menu item is used to set the value at which a 20mA signal will be output.
- **Offset** — This menu selection allows you to offset the analog output signal by the programmed value. For example, if the offset is set to +2.5 C, the Analyzer will generate an analog signal corresponding to -25.0 C when the actual measured and displayed pour point is -27.5 C.

```

ORB Pour Point Analyzer 5.5
-----
Submenu      Date: 05/18/22
Output Settings  Time: 02:29:46PM

4-20 Out 1   Clear All
Output: PourPt 1  Pour Point
4mA: -60.0C   ON Clear
20mA: -10.0C  Low: -75
Offset: 0.0C   High: 0
                Cell Temp.
                ON Clear
                Low: -75
                High: 75
                Period: 1Sec
                Pressure
                ON Clear
                Low: 0
                High: 4095
                Period: 1Sec

4-20 Out 2
Output: NC
4mA: 0.0
20mA: 0.0
Offset: 0.0

4-20 Out 3
Output: NC
4mA: 0.0
20mA: 0.0
Offset: 0.0

ACTION REQUIRED:
ADVANCE to exit submenu / INDEX to select item / UP-DOWN to change value
    
```

### Graphics

These menu items allow you to select the measurement information and set ranges which will be displayed in the graphical data display section of the Main Run screen. The categories and settings are:

- **Clear All** — Clears all graphs. Hit Enter key to initiate.
- **Pour Point** — Pour Point measurement results.
- **Cell Temp.** — Live cell temperature reading.
- **Pressure** — Live differential cell pressure reading (in bits, [see page 44](#) for details).
  - ON / OFF** — Turns graphing for each category on and off.
  - Clear** — Clears specific graph.
  - Low** — This establishes the bottom of the trend graph's scale.
  - High** — This establishes the top of the trend graph's scale.
  - Period** — Graph's plotted rate in seconds (doesn't apply to pour point results which are updated at the end of measurement cycle).



### Alarm Settings

This submenu screen is used to program the Analyzer's alarms.

Use the Index key to move to the desired menu item. Use the Up/Down Arrow keys to change the displayed setting or value. The unit of measure used for these values is set in the System Settings submenu.

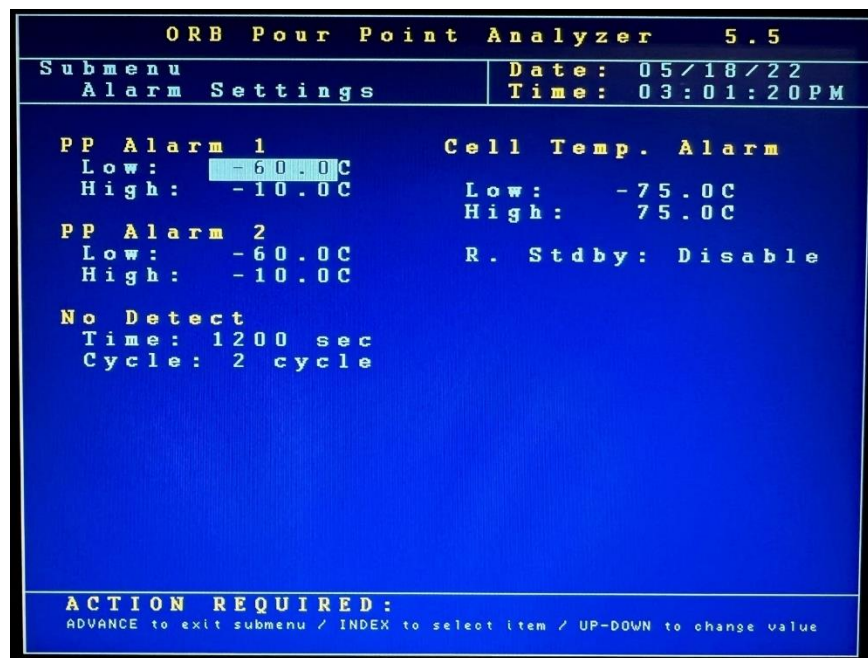
#### Warning Alarms

Those types of alarms do not stop the analysis. They will activate Alarm Warning relay if it was programmed ([see page 30](#)).

#### PP Alarm 1 & 2

"Result Out Of Range" warning alarm is activated when the pour point results exceeds the indicated value. For Stream 1 (PP Alarm 1) and Stream 2 (PP Alarm 2), the settings are:

- **Low** — This menu item allows you to establish a low alarm level. Pour Point measurements below this value generate a warning alarm signal/message. Analysis will continue.
- **High** — This menu item allows you to establish a high alarm level. Pour Point measurements above this value generate a warning alarm signal/message. Analysis will continue.



#### No Detect

These menu items set the maximum allowable time and number of cycles permitted to detect pour point during COOL or COOL-F.R. state.

- **Time** — This menu item allows you to establish the maximum allowable time (in seconds) to detect pour point. The warning alarm will be activated if there is no detection.
- **Cycle** — This menu item allows you to establish the maximum number of consecutive measurement cycles that can occur without detecting pour point before the critical alarm is activated.

### **Critical Alarms**

Those types of alarms stop the analysis. They will activate Alarm Critical relay if assigned ([see page 30](#)).

#### Cell Temp. Alarm

Those are minimum and maximum setpoints for cell temperature:

- **Low** — This menu item allows you to establish a low alarm level for cell temperature. Temperature below this value generates a critical alarm signal/message. Analysis will stop.
- **High** — This menu item allows you to establish a high alarm level for cell temperature. Temperature above this value generates a critical alarm signal/message. Analysis will stop.

#### Remote Standby

- **R. Stdby** — This is used to program the state (Disable / Enable) of the Alarm Critical relay whenever the unit is placed in remote standby mode.

## **System Settings**

The System Settings submenu allows you to establish global operating parameters for the Analyzer.

Use the Index key to move to the desired menu item. Use the Up/Down Arrow keys to change the displayed setting or value. Tap Enter key to reset cycle counter or reload defaults.

#### General

Those are general settings for Analyzer's operation.

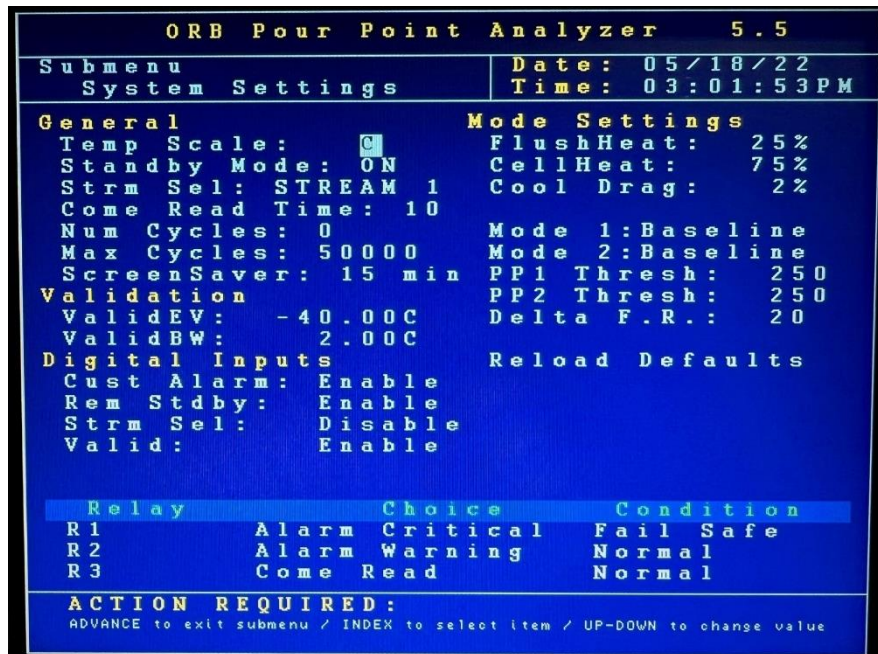
- **Temp Scale** – This menu selection allows you to select the temperature scale. The choices are °C or °F.
- **Standby Mode** — This controls how the Analyzer will operate upon application of power. When OFF is selected, the instrument will begin performing analysis automatically when power is applied. When ON is selected, the instrument will power up in the Offline mode and must be manually placed Online.



**NOTE:** The Power Reset button on the side of the Customer Connections enclosure must be pressed to re-initialize the Analyzer whenever power is disrupted, even if Standby is set to OFF.

- **Strm Select** — This menu item establishes selected sample stream (Stream 1 or Stream 2), alternates between streams (Alternate) or Auto (Stream selection is made via a digital input signal from the control room).
- **Come Read** — This menu item allows you to set the length of time (in seconds) the Analyzer's "Come Read" relay will be activated upon the completion of a measurement cycle.
- **Num Cycles** — This is the number of measurements which have been performed since the cycle counter was last reset. To reset the counter, touch the Enter key.
- **Max Cycles** — This menu item allows the operator to set the number of measurements which can be performed before the Analyzer's Maintenance Alarm is activated.

- **ScreenSaver** — This establishes how long (in minutes) the screen will remain lit without any keypad activity. Touching any of the magnetic keys re-activates the display. A value of zero disables the screen saver. Can be programmed between 0 – 60 minutes.




### Validation

- **ValidEV** — This is the expected value of the validation sample.
- **ValidBW** — This is the acceptable bandwidth of the validation. It is entered as a plus/minus number applied to Validation Value entered in the previous field to determine the range.

### Digital Inputs

These menu items allow you to Enable or Disable the Analyzer's customer controlled digital inputs. See Chapter IV: Installation and Startup – Digital Inputs ([page 20](#)) for port location and details.

- **Cust Alarm** — Customer Alarm is a critical alarm that stops the analysis. It can be used as an external event analysis shut down signal. It must be cleared in order to put the Analyzer Online.
- **Rem Stdby** — Remote Standby will pause the analysis until the signal is removed.
- **Strm Sel** — Stream Select signal sends a request for Stream 2 measurements (only for Auto Type Stream Select).
- **Validation** — It's a signal used to initiate validation sequence.

	<p><b>NOTE:</b> Although the Validation and Stream Select contacts may be present, these functions are only available on Analyzers which incorporate these options.</p>
---	---

### Mode Settings

These menu items are used to set operating and measurement parameters. They are related to different states programmed in State Table menu ([see page 32](#)).

- **FlushHeat** — This establishes how much power is applied to heat the cell during a FlushHeat state. It can be set between 0 – 100%.
- **CellHeat** — This establishes how much power is applied to heat the cell during a CellHeat state. It can be set between 0 – 100%.
- **Cool Drag** — This is the power applied to the cell heaters during the Cool state. It is intended to prevent the cryocooler from cooling the sample too rapidly. It can be set between 0 – 75%.
- **Mode 1** — This sets the method to detect Stream 1 Pour Point.
- **Mode 2** — This sets the method to detect Stream 2 Pour Point.

The mode analysis can be set to:

*Baseline* – The baseline average of the differential pressure signal is used as a reference starting point for the measurement. Taken from the beginning of a cooling state, that value is compared with the current differential pressure signal to determine pour point result. Threshold setting (see PP1 & PP2 Thresh below) is the signal change (delta) condition.

For example: If Baseline Avg. Pressure = 2250 and PP1 Thresh = 250, signal must drop below 2000 in order to detect pour point ( $2250 - 250 = 2000$ ).

*1st Deriv.* – The slope average of the differential pressure signal is used to determine No Flow Point result. Threshold setting (see PP1 & PP2 Thresh below) is the required signal slope condition for detection.

For example: If PP1 Thresh = 300, pressure signal slope must drop below -300 in order to detect pour point.

- **PP1 Thresh** — This is a threshold setting (sensitivity) for pour point detection for Stream 1.
- **PP2 Thresh** — This is a threshold setting (sensitivity) for pour point detection for Stream 2. Threshold values can be set between 0 – 2500 points.
- **Delta F.R.** — This is a setting for COOL-F.R. state (fixed rate cooling). It determines the starting point to control the fixed rate cooling (rate set in State Table) by adding Delta F.R. value to the last pour point result. It's used to shorten the cycle time for a COOL-F.R. state. For example: If last Pour Point =  $-21^{\circ}\text{C}$  and Delta F.R. = 20, the fixed rate cooling control will start when the sample temperature =  $-1^{\circ}\text{C}$  ( $-21 + 20 = -1$ ). That value can be set to: Off, 10, 15, 20, 25, 30, 35, 40, 45 and 50 in current temperature units.
- **Reload Defaults** — This menu item is used to restore the Analyzer's factory default settings.



**NOTE: When the Analyzer's default settings are restored, all user programming is lost. All operational parameters will have to be reentered.**

### Relay Setup

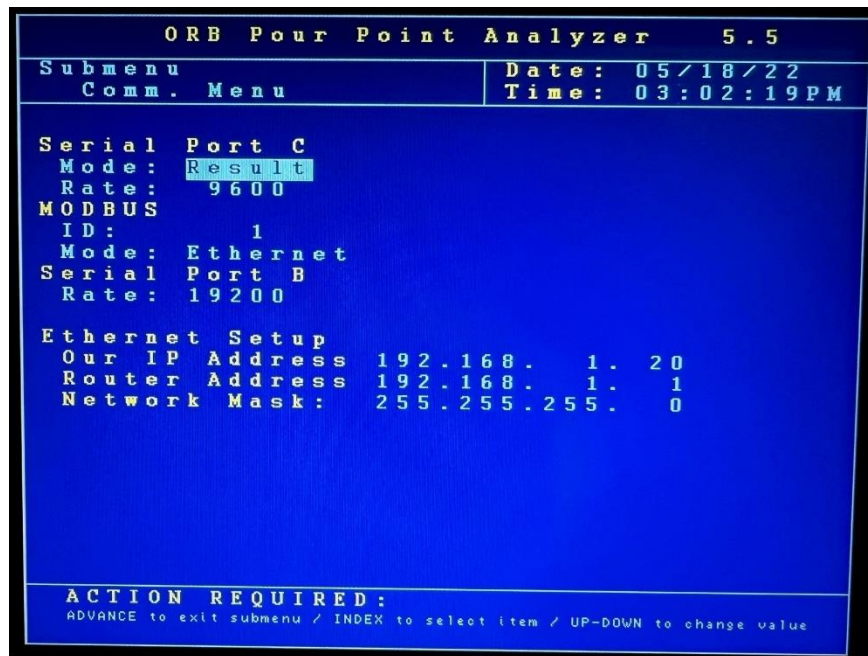
These menu items allow you to enable/disable the alarm relays, indicate the type of alarm the relay will signal, and how the relay will operate.

- **Relay** — This designates which alarm relay is being programmed. See Chapter IV: Installation and Startup – Relay Output ([page 19](#)) for alarm relay wiring information.

- Choice** — This designates the type of alarm ([see page 37](#) for detailed description).
  - OFF* – Alarm relay disabled.
  - Alarm Warning* – Activated when one of the warning alarm conditions has been detected. Warning alarms do not disrupt analysis.
  - Alarm Critical* – Activated when one of the critical alarm conditions has been detected. Critical alarms stop the analysis.
  - Maintenance* – Activated when the number of measurement cycles has exceeded the Max Cycles setting.
  - Come Read* – Activated for a programmed period of time (Come Read setting) upon the completion of a measurement cycle.
  - Validation* – Activated when Validation cycle passed.
  - In Validation* – Activated when Validation cycle is being performed.
- Conditions** — This designates whether the alarm relay will energize or de-energize when an alarm condition is detected. When *Normal* is selected, power will be applied to the relay when an alarm condition is detected; when *Failsafe* is selected, power will be removed from the relay when an alarm condition is detected.

## Communications

The Communications submenu allows you to configure the Analyzer's serial and Modbus settings.



### Serial Port C

This is the Analyzer's RS-232 serial communication port. For wiring details [see page 19](#).

- Mode** — This menu item determines how data will be output through the RS-232 port. The choices are *Result* (send at the end of measurement cycle), *Data* (send at specified rate under Period setting), and *None* (turned off).

- **Period** — This setting only appears when Data Mode is selected. It's a rate at which serial data stream will be output. Can be programmed between 1 – 3600 seconds.
- **Rate** — This is the baud rate used for serial communications through this port (9600 / 19200 / 38400 bps).

### Modbus

This configures the Analyzer's Modbus output.

- **ID** — This is the ID assigned to the Analyzer. The available range is 1 – 250.
- **Mode** — This allows you to select either Ethernet (Modbus TCP/IP) or RTU (serial Modbus RS-485) communication. When Ethernet is selected, the appropriate IP, router, and network mask addresses must be assigned.

### Serial Port B

- **Rate** — This is the baud rate used for Modbus RS-485 serial communications through this port (9600 / 19200 / 38400 bps).

### Ethernet Setup

This allows you to configure the Analyzer's IP, router, and network mask addresses when Ethernet Modbus communications is selected.

- **Our IP Address** — This is the IP address assigned to the Analyzer.
- **Router Address** — This is the address of the router the Analyzer is connected to.
- **Network Mask** — This is the network mask address.



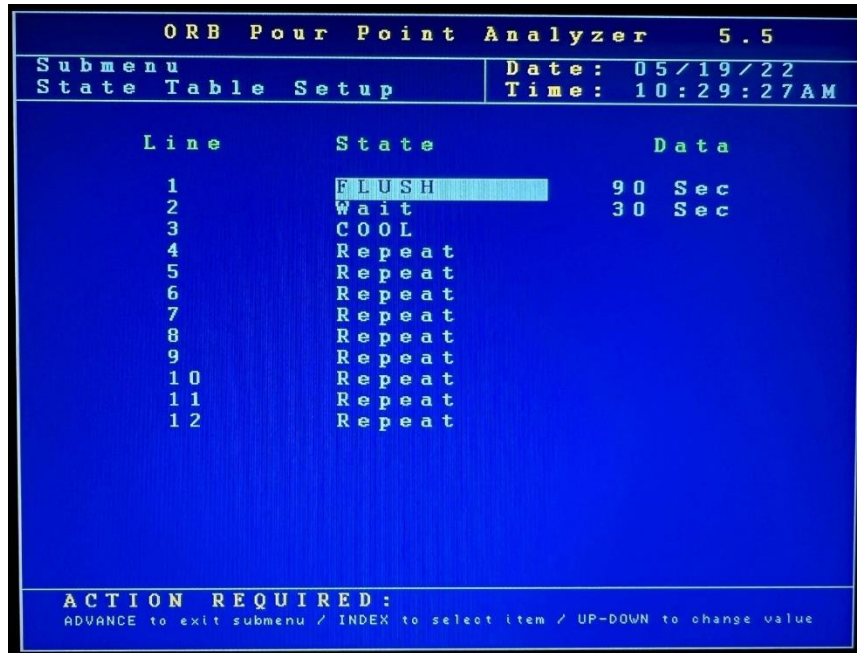
**NOTE:** After changing Ethernet address, exit Communications menu and restart the Analyzer in order to save and reconfigure the new settings.

## State Table Setup

The State Table setup allows the user to modify, add, or delete steps in the measurement process.



**CAUTION:** Any changes made will affect how the Analyzer performs a measurement. You should have a complete and thorough understanding of how the instrument performs measurements before making any changes to the State Table.



Any of the following steps may be included in a pour point measurement cycle. Steps that are **underlined** are required. The last step in any measurement cycle must be Repeat.

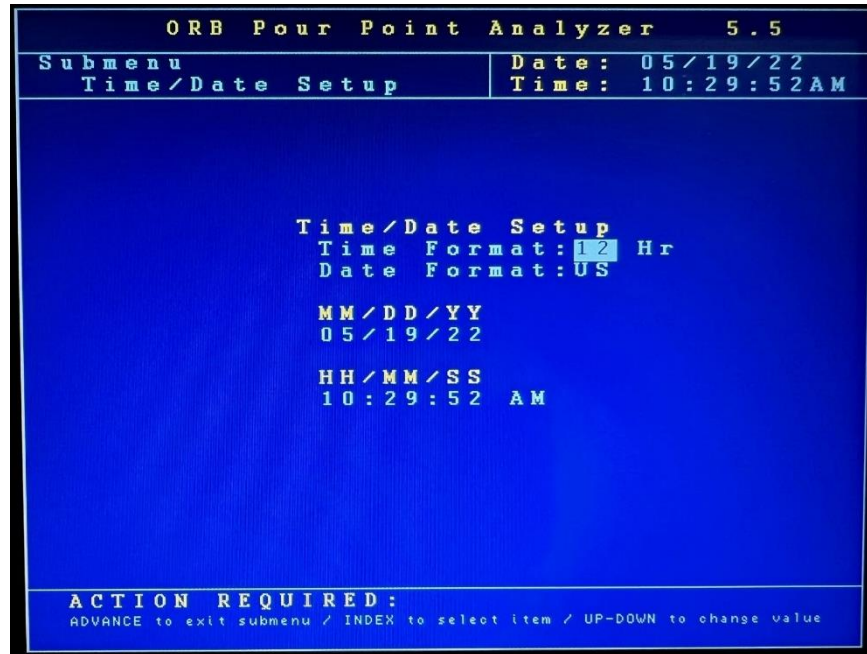
- **CELLHEAT** — This state is used to preheat the sample prior to cooling and/or warm the sample after cooling. The data setting is the target setpoint temperature in current units (1° – 100°). Cell heater power is programmed in System Settings menu (CellHeat setting).
- **FLUSH** — During this state the sample solenoid opens to process in order to flush the cell with a fresh product. It can be programmed between 1 – 400 seconds. FLUSHHEAT can be used in lieu of a FLUSH state.
- **FLUSHHEAT** — Similar to FLUSH state above with additional cell heating applied. Cell heater power is programmed in System Settings menu (FlushHeat setting).
- **COOL-F.R.** — This state is used to cool the detection cell at a fixed rate of degrees temperature (in current units) per minute until pour point detection. The rate can be set between 0.1 – 10.0.
- **COOL** — This state is used to cool the detection cell until pour point detection. COOL-F.R. can be used in lieu of a COOL state.
- **Wait** — This idles the Analyzer for a programmed period of time. It is required before cooling the cell to stabilize pressure signal. It can be programmed between 1 – 400 seconds.
- **Repeat** — This should always be the last step in the State table. It tells the Analyzer to return to step 1 to repeat the cycle sequence.

The default states are as follows:

Line	State	Data
1	FLUSH	90 sec
2	Wait	30 sec
3	COOL	
4	Repeat	

## Time/Date Setup

The Time/Date Setup submenu is used to set the Analyzer's internal calendar and clock.



- **Time Format** — This menu item allows you to select either a 12- or 24-hour time format. Touch the Up/Down Arrow keys to change the displayed value.
- **Date Format** — This menu item allows you to select the format in which the date will be displayed. The selections are US (month/day/year) or EU (day/month/year). Touch the Up/Down Arrow keys to change the displayed value.
- **Date** — This menu item allows you to program the Analyzer with the current date. To change the displayed date, use the Up/Down Arrow keys.
- **Time** — This menu item allows you to program the Analyzer with the current time. To change the displayed time, use the Up/Down Arrow keys.



**NOTE:** In order to keep current time and date when the unit is Off, the charged battery (CR1220) must be installed on the Main PCB.

## Factory Setup

This is a password protected submenu intended for factory use only.



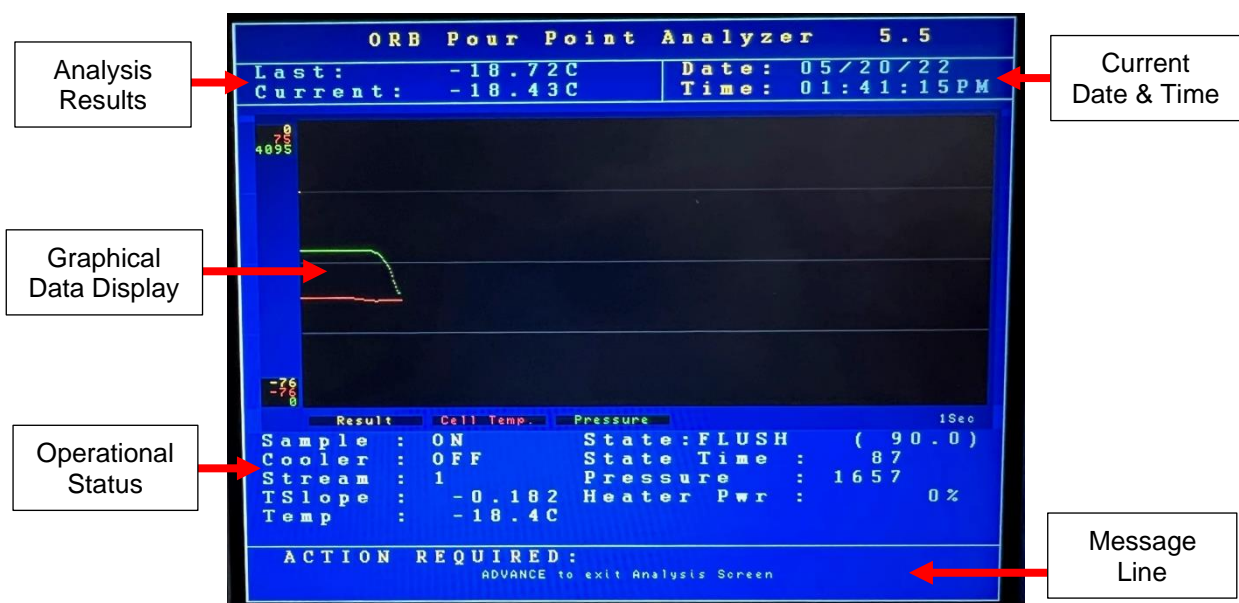
## Chapter VI: Normal Operation

The P-840LT Pour Point Analyzer is an on-line process instrument designed for the continuous measurement of no flow point (correlating to pour point) in hydrocarbon process streams.

In normal operation, these measurements and other pertinent monitoring information are displayed on the Analyzer's display. Measurement data is also output as analog and digital signals. Upon the application of power, the Analyzer runs a short initialization program and then displays either the Main Run screen or the Main Menu, depending on how the Standby mode has been set up (see Chapter V: Programming – System Settings, [page 28](#)). If the Main Run screen is displayed upon power up, the instrument is in the Online (analyzing) mode; if the Main Menu is displayed on power up, the instrument is in the Offline (idle) mode.

### Main Run Screen

The Analyzer's Main Run screen provides both measurement data and system operation information. A typical Main Run screen appears below:



**Analysis Results** — The two most recent pour point measurements. Measurement data are displayed in a user-selected unit of measure and updated at the end of each measurement cycle.

**Date & Time** — The current date and time as tracked by the Analyzer's internal calendar and clock.

**Graphical Data Display** — Displays user-selected measurement and operational data. If power is lost or disrupted, the displayed graph is lost. The graph can also be cleared/refreshed via the Output Settings menu.

**Operational Status** — Identifies the status and state of various Analyzer components and systems.

*Sample* — Status of the sample solenoid.

*Cooler* — Status of the cryocooler.

*Stream* — Identifies stream currently being analyzed (on Analyzers with the stream switching option).

*TSlope* — The degrees per minute change in the temperature of the sample.

*Temp* — Sample temperature live reading.

*State* — The current step in the measurement cycle. Value in parentheses displays the state’s setting data.

*State Time* — Indicates the operational counter for current state.

*Pressure* —The differential pressure across the detection cell. It is displayed as bits between 0 and 4095 ([see page 44](#) for details). This value will spike high (over ~ 4000) during flushing, be at about the mid-point of the range (~2457) during cooling, and decrease when pour point is reached.


*Heater Pwr* — Cell heater power. If highlighted in yellow, heating is applied.

**Message Line** — Important operational messages, such as the detection of an alarm condition, remote standby, etc. are displayed in this area.

## Signal Outputs

### 4-20 mA Analog Output

The Analyzer can output up to three 4-20 mA analog signals. The parameter being output, and its range is user-programmable (see Chapter V: Programming – Output Settings, [page 25](#)). The signal for results is updated at the end of measurement cycle, whereas cell temperature and pressure signals are updated when Analyzer is Online.

	<b><u>NOTE:</u> A second and third analog output is available as an option.</b>
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### RS-232 Serial Output

The Analyzer can output an RS-232 serial signal to capture and log measuring information. Data are output according to the following protocol settings:

Baud Rate	9600 / 19200 / 38400 (user-selectable)
Parity	No parity
Start Bits	8
Stop Bits	1
Field Delimiter	Comma
End of Data Indicator	<CR>

The information contained in the data stream is output in the following order and depends on the programmed settings:

Description	Format
Date	MM/DD/YY or DD/MM/YY
Time	HR/MIN/SEC AM/PM or 24hr
Pour Point Result	XXX.XX (in units selected)
Cell (Sample) Temperature	XXX.XX (in units selected)

Description	Format
Temperature Units	°F or °C
Stream Number	X

### Modbus Output

Modbus output is available as a factory installed option and uses the Analyzer's ethernet or serial interface. Consult Bartec Orb for additional information.


## Alarms

When an alarm condition is detected, a message might be displayed in the Message Line of the current screen and/or relay will be activated (depending on the type of alarm and the user-programming of the alarm relays). There are 3 types of alarms:

- **Informative** – doesn't stop the analysis. Informs about change or occurred event. Doesn't get recorder in Alarm History log.
- **Warning** — indicates less severe event. Analysis continues.
- **Critical** — indicates fatal/severe error. Analysis stops.

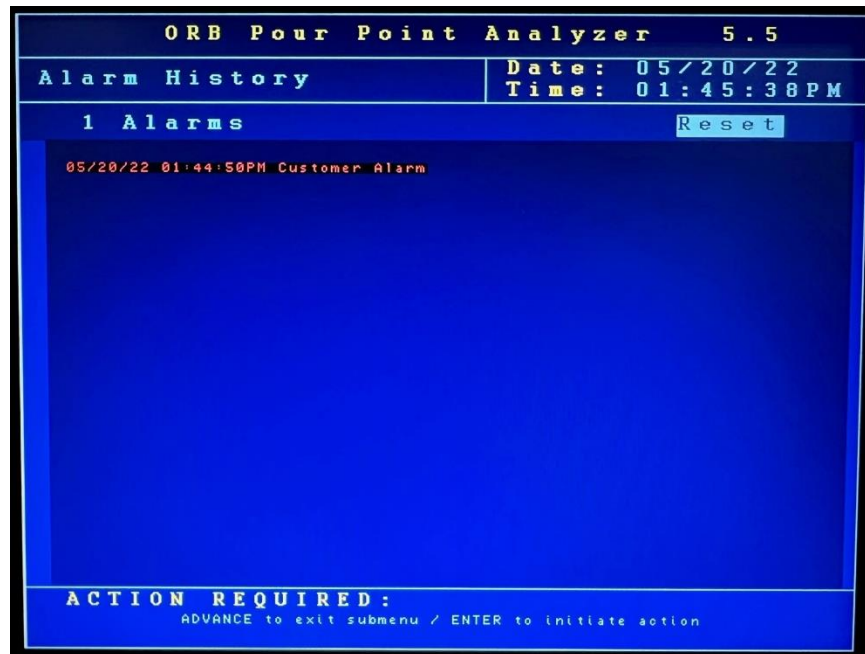
Alarm Type	Alarm Message	Description	Alarm Relay Choice
Informative	"Validation requested"	Validation cycle has been requested	Alarm Warning
Informative	"Validation in progress"	Analyzer is in validation cycle	Alarm Warning In Validation
Informative	"Maintenance Required"	Num Cycles counter in System Settings reached Max Cycles settings	Alarm Warning Maintenance
Informative	"Remote Standby Active"	Analyzer is in remote standby mode	Alarm Warning *Alarm Critical (*optional)
Informative	-	New result	Come Read
Informative	-	Validation passed	Validation
Warning	"Result Out Of Range"	Result is below or above the set range	Alarm Warning
Warning	"No Detection"	Pour Point was not detected within No Detect time setting in Alarm menu	Alarm Warning
Critical	"No Detection"	Pour Point was repeatedly not detected within No Detect cycle setting in Alarm menu	Alarm Warning Alarm Critical
Critical	"Temp. sensor fail"	Defective RTD	Alarm Warning Alarm Critical
Critical	"CryoCooler overheat"	Cryocooler thermostat is open which indicates overheat	Alarm Warning Alarm Critical

Alarm Type	Alarm Message	Description	Alarm Relay Choice
Critical	“Customer Alarm”	Digital Input signal for external alarm	Alarm Warning Alarm Critical
Critical	“High Cell Temperature”	Cell/Sample temperature is above high cell alarm setting in Alarm menu	Alarm Warning Alarm Critical
Critical	“Low Cell Temperature”	Cell/Sample temperature is below low cell alarm setting in Alarm menu	Alarm Warning Alarm Critical

	<p><b>NOTE:</b> Alarm Warning relay choice activates together with Alarm Critical.</p>
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### Alarm History

Operational (Alarm Warning and Alarm Critical) alarms are logged and may be viewed via the Alarm History submenu. To access this submenu, go to the Main Menu, index to Alarm History, and tap Enter key. The Alarm History screen will appear.



To clear the alarm history, touch the Enter key when Reset is highlighted.

### Taking The Analyzer Online/Offline

The P-840LT Pour Point Analyzer may be taken Online/Offline either locally or remotely.

#### Locally

To exit Main Run screen, touch the Advance Screen Key with the magnetic pencil. From the Main Menu,

under Analysis Status, tap the Up or Down Arrow key. When the message box appears, confirm your choice with Enter key to toggle the status to online or offline mode.

### Remotely

The Analyzer may also be taken Online/Offline via an optional remote dry contact digital input closure. The instrument will remain idle (in Remote Standby mode) until the signal is removed. A message indicating that the instrument has been remotely idled is displayed on the Main Run screen. Modbus communication can also be used to control analyzer status.

## Validation

If the Analyzer is equipped with the Validation, it will run a series of cycles (following hardcoded validation state table with programmable timers) on a known product when validation is requested. A passed validation is considered if the test results of two consecutive readings, within maximum numbers of five attempts, are within a programmable margin of a programmable expected value. Validation cycle is used to check the measurement accuracy.

### Example:

Programmed Validation Expected Value (In System Settings Screen): -18.00°C

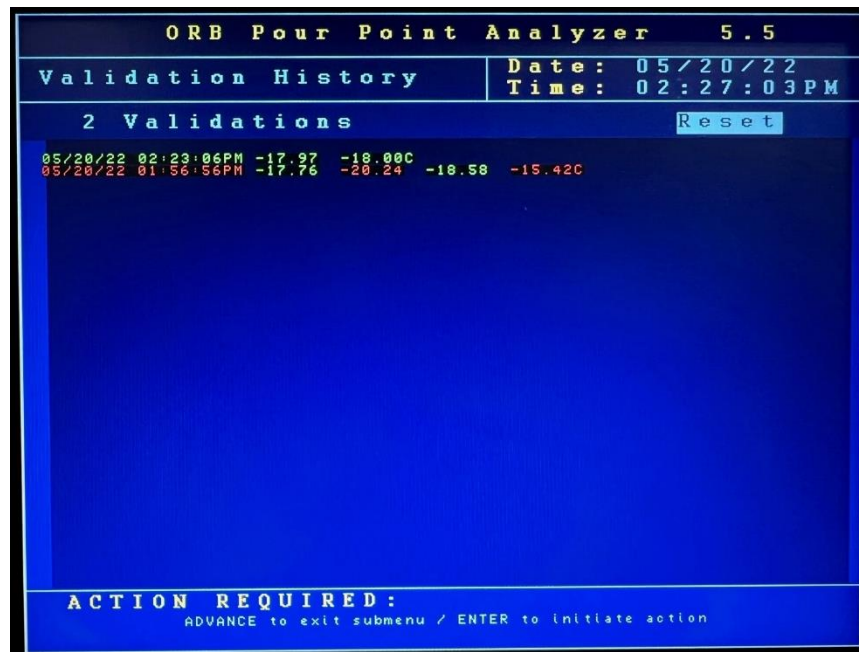
Programmed Bandwidth (In System Settings Screen): 2.00°C

Results from Validation Test #1: -15.48, -17.32, -20.56, -19.07, -20.11 = FAIL

Results from Validation Test #2: -20.43, -18.20, -17.97 = PASS

### Request of Validation

The validation protocol is a requested procedure which does not take precedence in the operational hierarchy. Therefore, the current cycle will always complete before moving to the validation protocol. Validation is requested by writing a command (value = 1) to the associated Modbus address (see current Modbus map for exact address) or sending digital input signal ([see page 20](#)).



### Validation Hardware

During FLUSH step in validation cycle, Validation signal output is activated instead of Sample Solenoid signal output. Its intention is to run a validation solenoid valve and/or validation sample pump in order to introduce a known product for analysis to the cell. Contact Bartec Orb for more details.

### Validation Results

Validation measurements are logged and may be accessed via the Validation History submenu. The results of the validation are listed and color coded:

RED = FAIL

GREEN = PASS

If the analog output channel is programmed as such, the last validation measured value will be transferred. If one of the three programmable relays are programmed to "Validation", the relay will energize upon the first successful validation protocol and will remain on until the system power is cycled or there is a failed validation protocol. There is also a Modbus register which will communicate a "PASS" or "FAIL" status (see current Modbus map for exact address).

## Sample Streams

On P-840LT Pour Point Analyzers equipped with the stream switching option, the sample stream being analyzed can be changed from Stream 1 to Stream 2 via one of the three methods selected in System Settings menu (*Strm Sel* setting, [see page 28](#)):

- **Manual** — The Stream for analysis is manually selected: "Stream 1" or "Stream 2".
- **Alternate** — Analysis alternates between Stream 1 and 2.
- **Autoselect** — Digital input contact closure activates Stream 2. When the signal is removed, the instrument goes back to analyzing Stream 1.

Additional Stream signal output, for Stream 1 and 2, will be activated to operate solenoid valve or relay. The identity of the stream being analyzed is displayed on the Main Run screen.



**NOTE: When the stream change is requested, the current stream must finished its measurement cycle.**

## Loss Of Power Restart

In the event of a power loss, the P-840LT Pour Point Analyzer can automatically begin monitoring when powered on. The Standby mode (see Chapter V: Programming – System Settings, [page 28](#)) has to be set to OFF for this feature to be active. If the Standby mode is set to ON, the Analyzer will have to be placed Online manually by accessing the Main Menu and then setting Analyzer Status to ONLINE.



**NOTE: In order to restart the Analyzer after external power has been lost, the Power Reset button on the side of the Customer Connections enclosure must be pressed — regardless of the Standby setting.**

## Internal Sample Leak


The Analyzer incorporates a sample leak detector mounted on the bottom of the Lower Analysis enclosure. Should an internal sample leak occur, accumulation of fluid in the bottom of the enclosure activates the leak detector and immediately removing power from the system.


To restore power once the leak has been corrected and fluid removed from the Lower Analysis enclosure, press the Power Reset Button on the side of the Customer Connections enclosure.




Figure 6-1: Leak Detect

## Chapter VII: Maintenance & Service

	<b>WARNING:</b> Service should only be performed by qualified service personnel. Before performing any of the following procedures, disconnect the unit from its electrical source. If electrical power is required, exercise extreme care as “LINE VOLTAGE” is present.
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	<b>WARNING:</b> Be sure to obtain all necessary permits and perform any required gas testing before opening the instrument’s enclosures.
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	<b>WARNING:</b> To prevent injury, the Analyzer must be shut off from the process. Personnel must avoid contact with hot equipment or sample.
---	---

### Recommended Routine Maintenance Schedule

Check sample pressure	Weekly
Cryocooler cooling medium	Weekly
Inspect for internal sample leaks	One week after startup, 30 days after startup, and then every six months
Check sample conditioning system & filter	Monthly

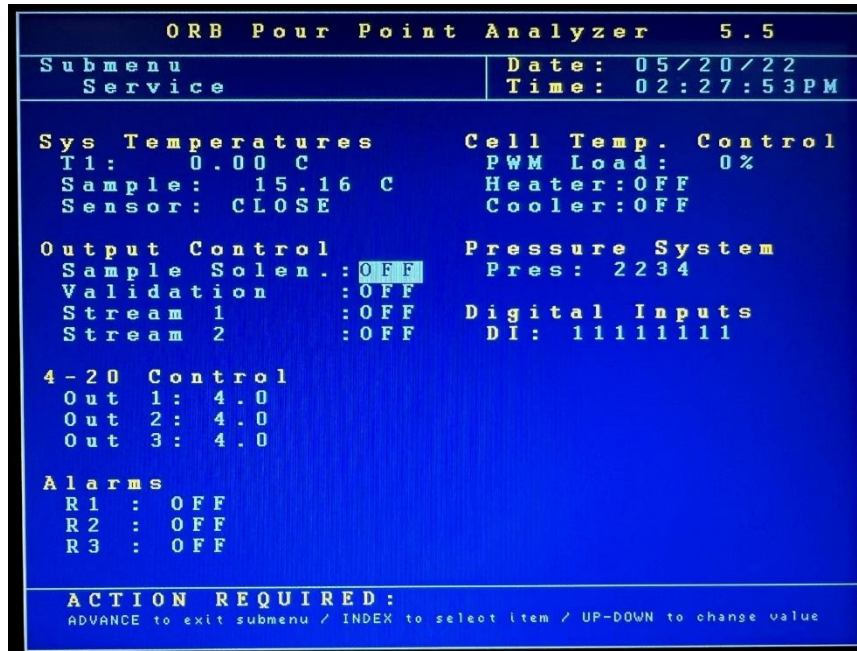
### Service and Operational Checks

The Analyzer incorporates a special Service screen from which the operator can perform a variety of verification and diagnostic functions, including:

- Exercise the Analyzer’s various components (outputs, alarm relays, digital inputs).
- Output a fixed analog signal to check/calibrate external devices.
- Check measurement cell temperature and pressure.
- Check heater and cryocooler operation.

The Service screen is accessed from the Main Menu by selecting Service and touching the Enter key with the magnetic pencil. Entering the Service Screen requires the Analyzer to be Offline. If it is Online, it will automatically be taken Offline when the Service menu is accessed. To prevent you from inadvertently taking the Analyzer Offline, a message box appears for confirmation.





The Service screen is divided into the following sections:

### Sys Temperatures

This is an information only display of the current sample temperature in selected units and the status of cryocooler thermostat.

- **T1** — channel 1 temperature (not used).
- **Sample** — the live reading of sample temperature inside the cell.
- **Sensor** — status of the cryocooler thermostat:  
CLOSE → cryocooler heat rejector below operating level.  
OPEN → cryocooler heat rejector above operating level.

### Output Control

The operation of the Analyzer's various solenoid valves can be checked via these menu items. The Up/Down Arrow keys are used to change the status (ON / OFF).

- **Sample Solen.** — controls sample solenoid valve.
- **Validation** — controls optional validation solenoid valve.
- **Stream 1** — controls optional Stream 1 solenoid valve.
- **Stream 2** — controls optional Stream 2 solenoid valve.

### 4-20 Control

In this section, the analog output 4-20 mA signals can be simulated. The Up/Down Arrow keys are used to increase/decrease the analog signal value.

- **Out 1** — standard channel I analog output.
- **Out 2** — optional channel II analog output.
- **Out 3** — optional channel III analog output.

### Alarms

The Analyzer's alarm relays will activate when these menu items are switched from OFF to ON.

- **R1** — controls alarm relay 1.
- **R2** — controls alarm relay 2.
- **R3** — controls alarm relay 3.

### Cell Temp. Control

These menu selections allow you to heat/cool the detection cell. The Up/Down Arrow keys are used to change the value or status of the highlighted selection.

- **PWM Load** — the percent of power setting for the cell heater.
- **Heater** — turns the cell heater ON at PWM Load set in the previous selection.
- **Cooler** — turns the cryocooler ON.

### Pressure System

This is an information only display of the current differential pressure across the detection cell. It is displayed in 12-bit value (0 – 4095) that represents 0-20 mA signal. The Rosemount Differential Pressure Transducer monitors the pressure between -2.0 and +2.0 inH<sub>2</sub>O across the cell and outputs that value as 4-20 mA signal. Therefore, 4 mA represents the differential pressure of -2.0 inH<sub>2</sub>O that gets converted to ~ 819 bits, and 20 mA represents +2.0 inH<sub>2</sub>O as ~ 4095 bits. Equal pressure across the cell is ~ 2457.

### Digital Inputs

Displays the status of the Analyzer's digital inputs. Starting from the DI8 (left) to DI1 (right, Customer Alarm) binary values will show open "1" or close "0" digital inputs contact.

## Taking the Analyzer Down for Service

Take the Analyzer Offline via the procedure outlined on [page 38](#) in Chapter VI: Normal Operation. Next, turn the power switch on the right-hand side of the Upper Control enclosure to OFF position. Remove power from the Customer Connection box (via external power switch or breaker panel) and lock out system supply voltage per local guidelines.

Close sample and instrument air supply valves and lock those valves closed as well.

Open instrument enclosures and allow the system at least thirty minutes to cool down from process temperatures. The system is now ready for periodic maintenance practices.



**WARNING: Never attempt to replace any consumables on the energized system. Double-check that power was removed before starting the service work.**

## Fuses

There are two main fuses (P/N: 600052, 10A, 250 V a.c. max, Fast-Acting, 3AB package, ceramic) for AC line input voltage located in Upper Control enclosure. They are mounted on the Main Power Distribution PCB (F1 & F2, left side) in the fuse holders. When the LEDs (D1 or D2) are illuminated, the fuse is blown.

There is one fuse (P/N: 600051, 15A, 250 V a.c max, Fast-Acting, 3AB package, ceramic) for TE 24VDC controller circuit located in Upper Control enclosure. It is mounted on the Main Power Distribution PCB (F3, right side) in the fuse holder. The illuminated LED (D7) on the board will indicate if the fuse is blown when the circuit is active.



**WARNING:** When replacing fuses, the power switch on the Upper Control enclosure must be switched to OFF position and power removed from the whole system.

## Sample Hammer

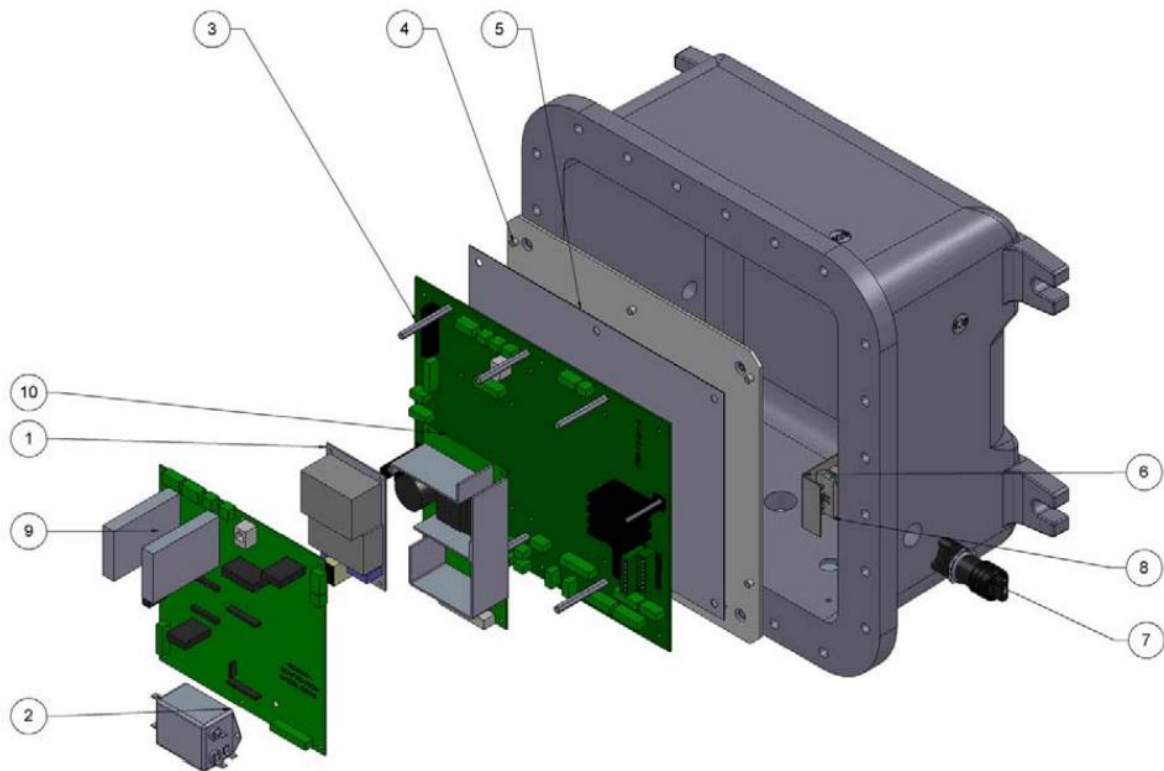
The Sample Hammer (Hydraulic Accumulator) is installed after differential pressure transducer on the sample out line. It is used to maintain line pressure during cooling measurement state. Once pour point is reached, the sample can no longer flow so the accumulator cannot equalize the cell pressure. The sample continues to contract causing a pressure differential. Sample Hammer should be replaced if the pressure signal is erratic, or pour point cannot be detected.

## Troubleshooting Chart

Problem / Symptom	Cause	Corrective Action
Display screen not working	No electrical power to the Analyzer.	Apply electrical power.
	Screen saver activated.	Touch keypad with magnetic pencil.
	Faulty display or display driver PCB.	Replace as required.
Keypad not working	Electronics problem.	Check wiring from keypad to Main PCB. Consult factory.
Pour Point reading high, low, or erratic	RTD sensor problem.	Check temperature offset. Replace RTD as required.
	Detection settings.	Check mode analysis settings in System Settings menu. Adjust as required.
	Sample Hammer problem.	Replace as required.
	Cell / Line leak.	Check for leaks.
"No Detection" alarm activated	Sample Hammer problem.	Replace as required.
	Cryocooler problem.	Check the cryocooler controller. Check cryocooler cooling medium (air or coolant) flow and temperatures.
	Sample flow or backpressure.	Inspect sample set points.
"CryoCooler overheat" alarm activated	Thermostat problem.	Check thermostat operation.
	Inadequate cooling medium.	Check cryocooler cooling medium (air or coolant) flow and temperatures.

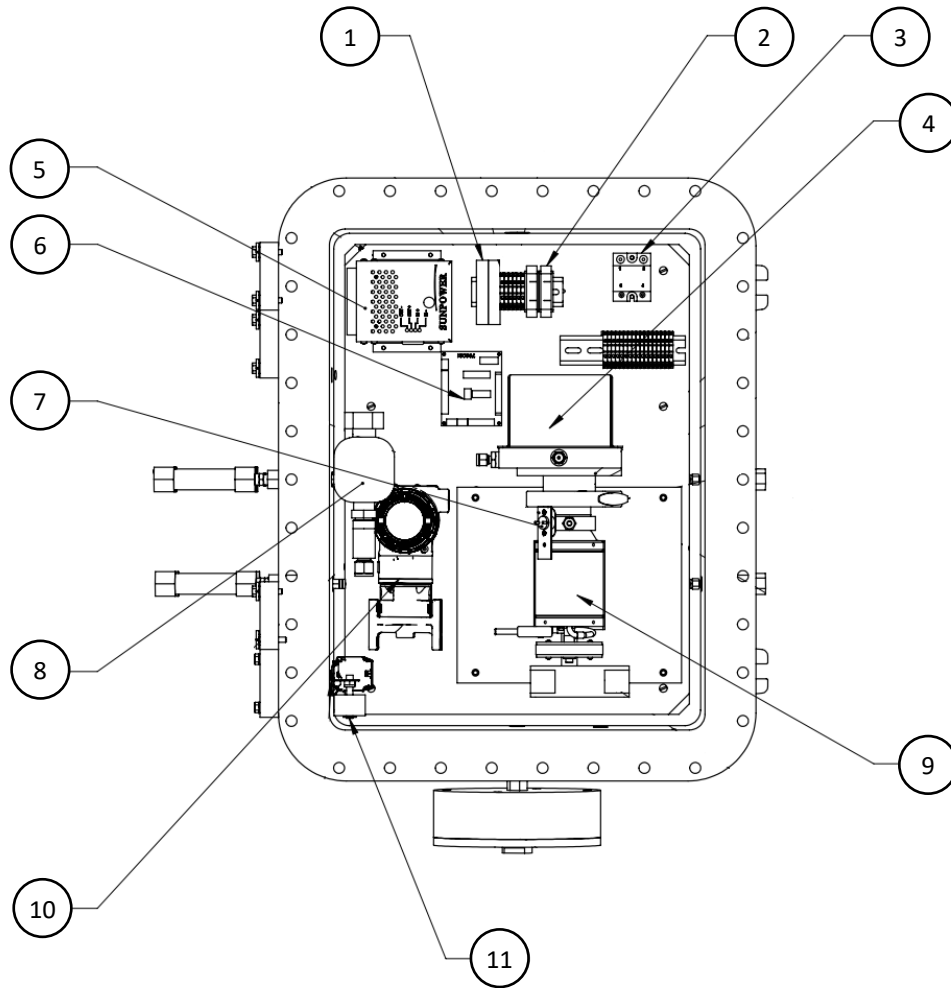
## Assembly Drawings

### Upper Control Enclosure



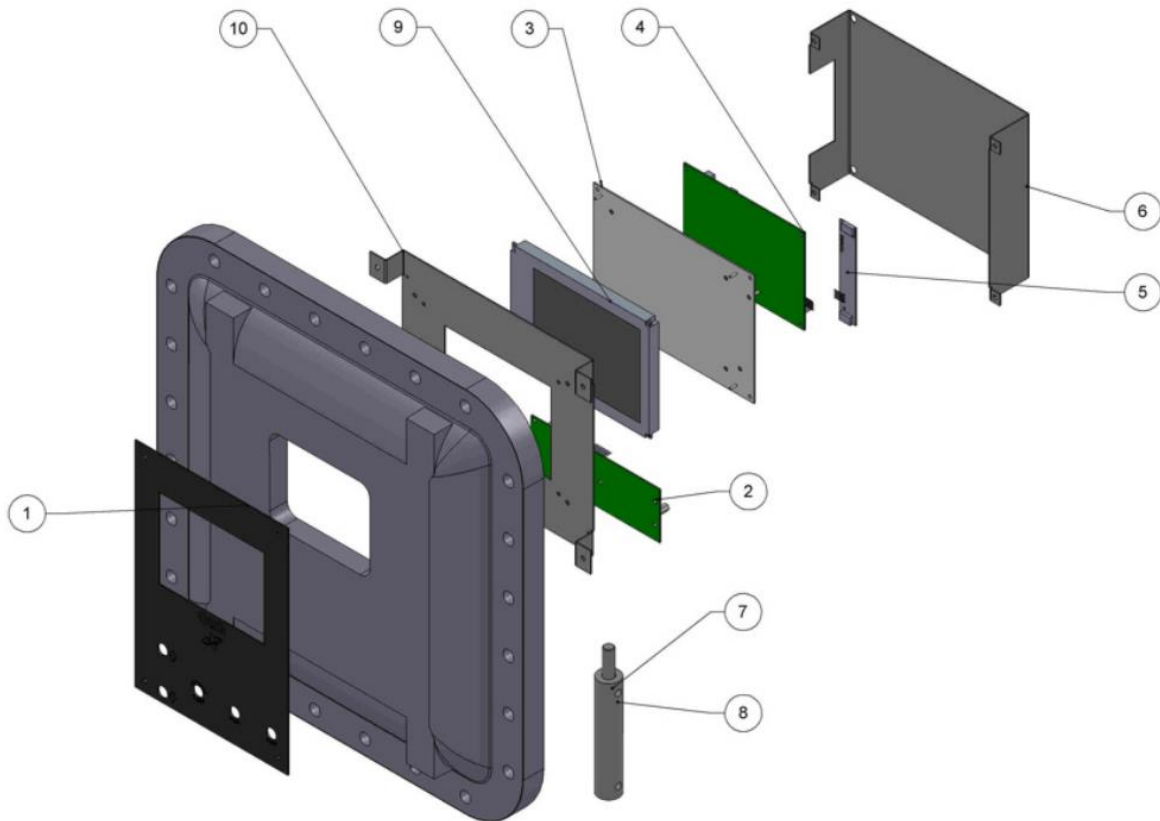
Item No.	Part Number	Description	Qty
1	620037	Power Supply (+5, +/- 12 VDC)	1
2	620076	Line Filter	1
3	798115	Main Power Distribution PCB	1
4	701910	Mounting Plate for Main PCB	1
5	701911	Fish Paper for Main PCB	1
6	700795	ADALET Switch Cover Plate	1
7	620149	Selector Switch	1
8	620150	Contact Block	1
9	700318	Main PCB	1
10	620038	Power Supply (+24 VDC)	1

## Lower Analysis Enclosure



Item No.	Part Number	Description	Qty
1	620201	Fused Terminal Block	2
2	620627	Relay, 24VDC Coil, 4PDT	2
3	620111	Solid State Relay	1
4	701822	Detection Cell	1
5	702939	Cryocooler Controller	1
6	798021	Optical I/O PCB	1
7	660030	Thermostat Overtemperature Switch	1
8	650044	Sample Hammer - Hydraulic Accumulator	1
9	702937	Cryotel CT Cryocooler	1
10	660075	Pressure Transmitter	1
11	660005	Float Switch	1

## Control Enclosure Door



Item No.	Part Number	Description	Qty
1	701231	Keypad Overlay	1
2	798030	Magnetic Keypad	1
3	700062	Display Mounting Plate	1
4	798063	Display Controller PCB	1
5	620600	Backlight LED Driver PCB	1
6	700793	Display Cover	1
7	700701	Magnetic Pencil Assembly	1
8	700348	Magnetic Pencil Holder	1
9	620583	Graphics Display	1
10	702972	Display Bracket	1

## Chapter VIII: Spare Parts

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### Spare Parts Kits

Description	Part Number
<b>1-YEAR PARTS KIT</b> .....	<b>702232</b>
Sample Hammer O-Ring (1 each).....	650045
Air Operated Bypass Valve (1 each).....	650321
4-way Air Solenoid Valve (1 each):	
for P-840LT-1400 model (NEC).....	650558
for P-840LT-1500/1600 model (ATEX/IECEX).....	650697
RTD Sensor (1 each).....	660001
<b>2-YEAR PARTS KIT</b> .....	<b>702233</b>
Sample Hammer - Hydraulic Accumulator (1 each).....	650044
Sample Hammer O-Ring (2 each).....	650045
Air Operated Bypass Valve (2 each).....	650321
4-way Air Solenoid Valve (2 each):	
for P-840LT-1400 model (NEC).....	650558
for P-840LT-1500/1600 model (ATEX/IECEX).....	650697
RTD Sensor (2 each).....	660001

### Replacement Parts

Description	Recommended Quantity	Part Number
Fuse (250VAC, 15A).....	1	600051
Fuse (250VAC, 10A).....	2	600052
Power Supply (+5, +/- 12VDC).....	1	620037
Power Supply (+24 VDC).....	1	620038
Sample Hammer - Hydraulic Accumulator.....	1	650044
Sample Hammer O-Ring.....	1	650045
Sample Hammer Cap.....	1	650046
Air Operated Bypass Valve.....	1	650321
4-way Air Solenoid Valve:		
for P-840LT-1400 model (NEC).....	1	650558
for P-840LT-1500/1600 model (ATEX/IECEX) ..	1	650697
Differential Pressure Transmitter.....	1	660075

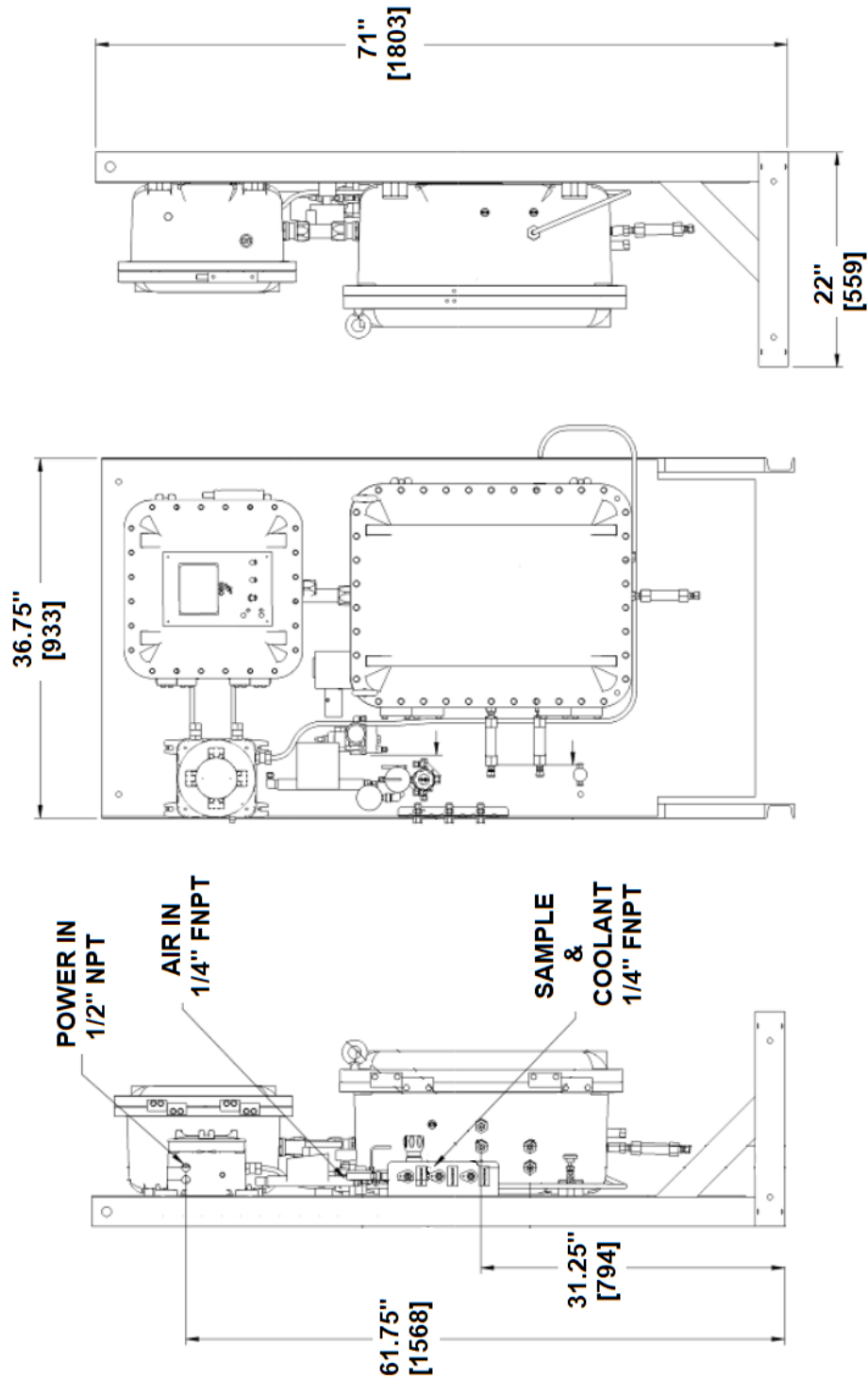
Thermostat Overtemperature Switch .....	1 .....	660030
RTD sensor .....	1 .....	660001
Magnetic Keypad .....	1 .....	798030
Graphics Display .....	1 .....	620583
Display Controller PCB .....	1 .....	798063
Backlight LED Driver PCB.....	1 .....	620600
Main PCB .....	1 .....	700318
Optical I/O PCB.....	1 .....	798021
Optical Converter PCB.....	1 .....	798024
Detection Cell PCB .....	1 .....	798087
Main Power Distribution PCB.....	1 .....	798115
Cryotel CT Cryocooler.....	1 .....	702937
CT Controller.....	1 .....	702939
Cryocooler Removable Water Jacket .....	1 .....	702942
Cryocooler Removable Cooling fins.....	1 .....	702997
Fused Terminal Block .....	2 .....	620201
Relay, 24VDC Coil, 4PDT .....	2 .....	620627
Solid State Relay.....	1 .....	620111
Float Switch.....	1 .....	660005

	<p><b>LINK:</b> Pour Point Analyzer spare parts can be found at  <b>BARTEC Shop website in Cold Property category:</b>  <a href="https://bartecshop.com/analyzers-and-sensors/">https://bartecshop.com/analyzers-and-sensors/</a>            Or e-mail requests to: <a href="mailto:shop@bartec.com">shop@bartec.com</a></p>	
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## Chapter IX: Drawings & Schematics

### Dimensional Drawing



### Flow Schematic

