BARTEC

Process Analyzer

User Manual

P-700 REID VAPOR PRESSURE ANALYZER

October 10th, 2022
Version 1.0

Table of Contents

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Foreword

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:

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

Revision History

Rev.	Description / Changes	Date
1.0	First version of the new Manual	October 8th, 2022

Chapter I: Introduction

Analyzer Overview

The Bartec Orb Model P-700 RVP Analyzer is on-line instrument designed for the continuous measurement of Reid Vapor Pressure in hydrocarbon product streams such as gasoline, crude oil, and petroleum condensate.

Extremely rugged and simple to operate, this compact Analyzer combines rapid analysis, exceptional measurement accuracy, and unmatched operational dependability to deliver highly reliable and repeatable vapor pressure measurements.

- Rapid analysis – 5 minutes or less typical cycle time.
- Superior repeatability – RVP +/- 0.05 psi (0.0035 bar) or better.
- Exceptional uptime – 99% or better.

For optimum installation and applications versatility, the P-700 RVP 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+H2 T6 Gb or NEC: Class I Div 1 Group B, C + D hazardous area classification.

Principle of Operation

The P-700 RVP Analyzer's measurement cycle is based on ASTM D323, D4953, D5482 and correlates to D5191. It utilizes a digitally controlled syringe sampling system, micro-volume solenoid valves, and an angled, temperature-controlled measurement cell with magnetic stirrer and high-resolution pressure sensor to precisely meter sample and measure vapor pressure. As with the ASTM methods, the P-700 RVP Analyzer uses a 4:1 vapor to liquid ratio and a 100°F (37.8°C) test temperature.

A typical measurement cycle takes about five minutes and is performed as follows:

1. During the whole cycle, cell temperature is controlled at 100°F (37.8°C) with Peltier TE modules and PID regulation.
2. The drain solenoid valve is opened to reference atmospheric pressure. During Autozero an accurate pressure measurement baseline is established.
3. To ensure the complete evacuation of the cell, drain and purge solenoid valves are opened together.
4. Next, the sample syringe draws a fixed gas volume from the measurement cell, thus creating a partial vacuum.
5. The sample lines are flushed with the fresh sample right before the injection phase.
6. The sample syringe injects a known volume (0.5 mL) of sample into the measurement cell, establishing the required 4:1 ratio of gas to liquid.
7. To achieve sample equilibrium, the agitator is activated.

8. The final pressure measurement is taken at the end of Reading state to output the RVP result.
9. Drain and purge solenoid valves are opened to remove spent sample from the measurement cell.

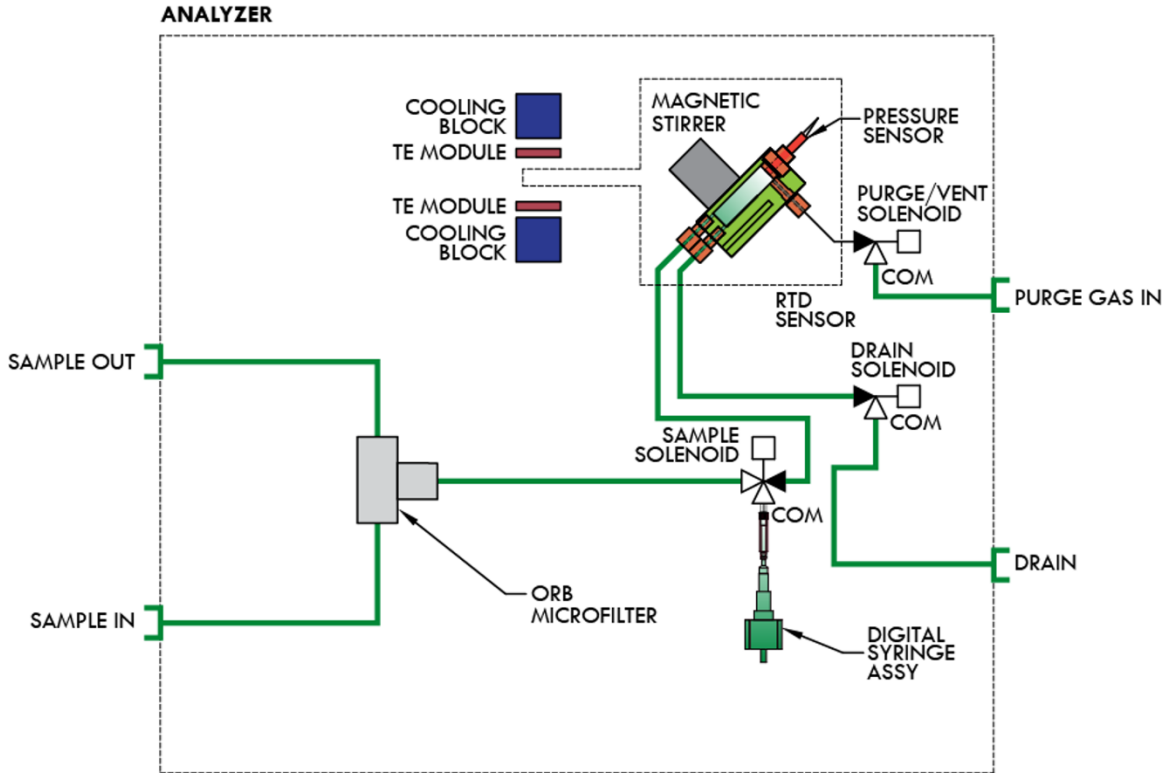


Figure 1-1: Analyzer Flow Schematic

True Vapor Pressure

The P-700 RVP Analyzer is capable of calculating TVP (True Vapor Pressure) value of crude oils and refined petroleum stocks. The equations used are based on an EPA document: *Compilation of Air Pollutant Emission Factors* (AP-42). Since TVP is measured as a function of temperature, the stock temperature of the sample needs to be known and can be input via:

- RTD probe.
- Signal from 4-20 mA temperature transmitter.
- Fixed programmable value.

Contact Bartec Orb for more information and details.

Component Identification

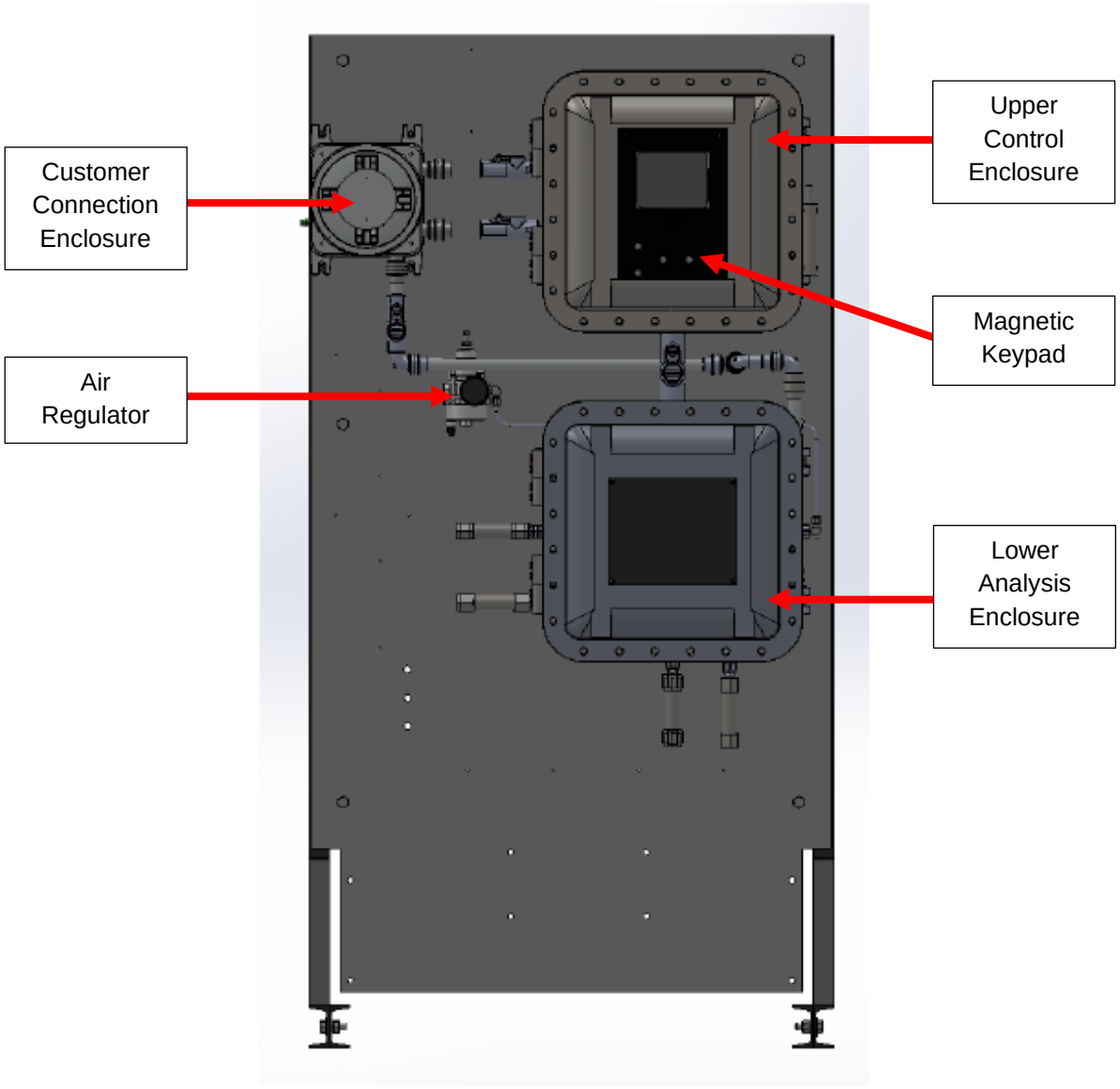


Figure 1-2: Front View

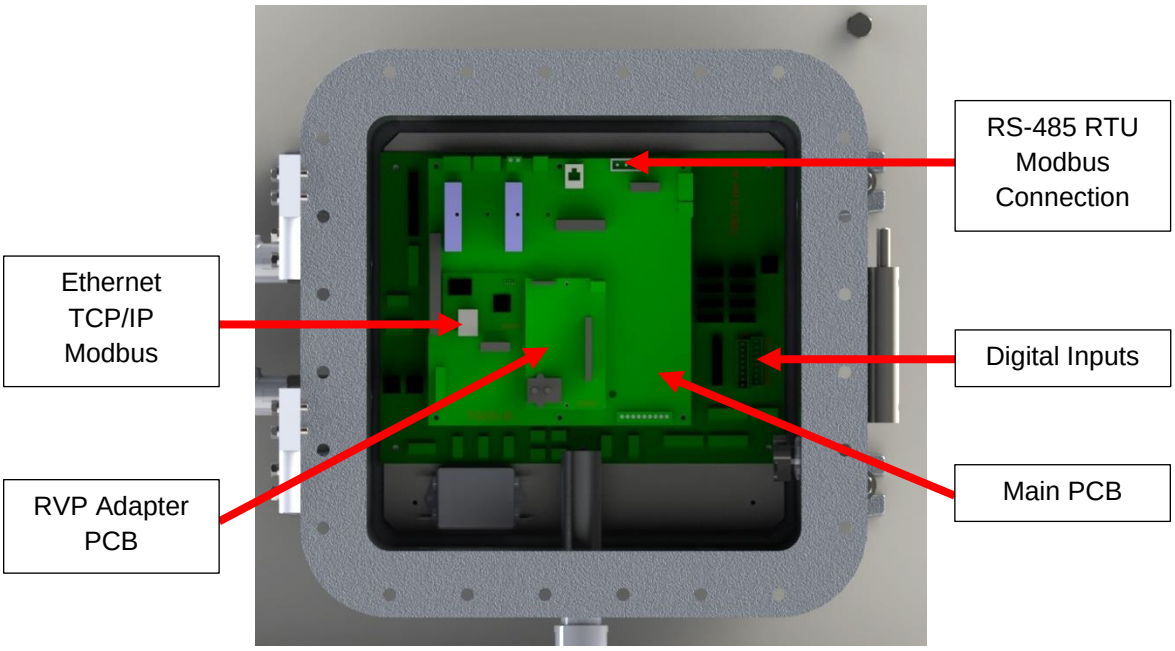


Figure 1-3: Upper Control Enclosure

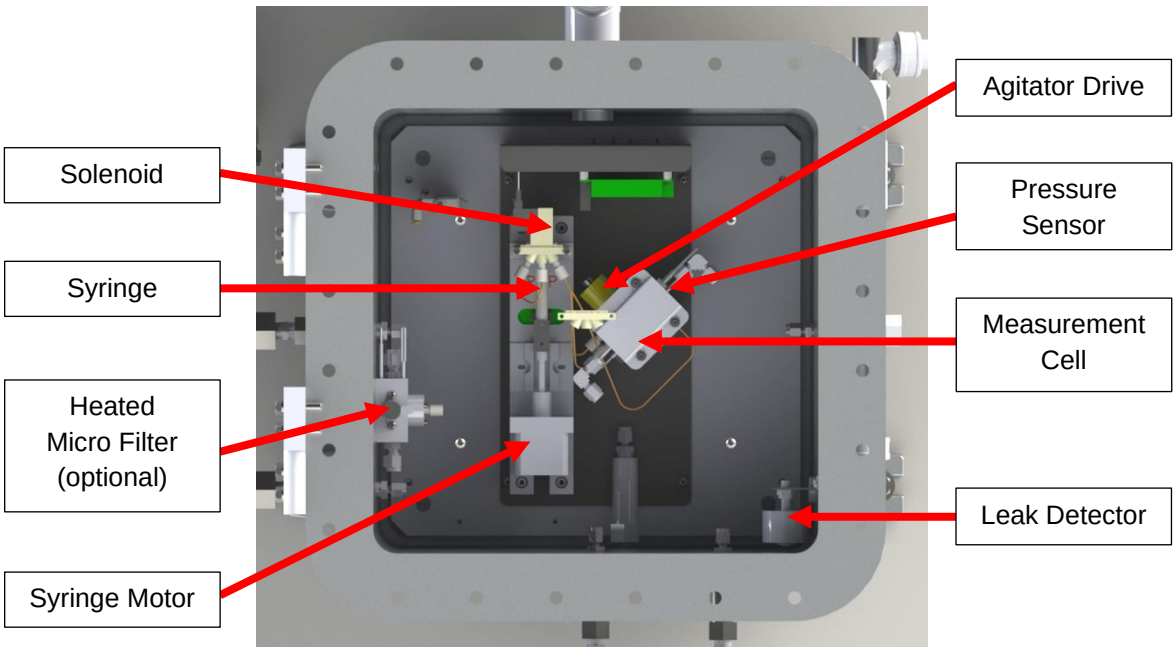


Figure 1-3: Lower Analysis Enclosure

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	—	Output Control Functions Cell Pressure Cell Temp. Heater Temp. TVP Temp. Digital Inputs 4-20 Control Injector Cell Temp. Control Heater Temp. Control	Used to verify operation of various solenoids and alarm relays Used to initiate tasks: Cell Rinse, Cell Clean, Filter Clean Displays pressure sensor reading Displays cell RTD reading Displays micro filter RTD reading (optional) Displays TVP temperature (optional) Displays status of the digital inputs Used to check 4-20 mA signals Used to verify stepper motor operation Used to check TE modules Used to check micro filter heaters (optional)
Setup	Output Settings	4-20 Out 1, 2, 3 Graphics Clear All Period Abs. Cell Pres / RVP History / Validation / Cell Temp. / TVP History	Program 4-20 mA channels Off / Cell Temp / Cell Pres / RVP1 / RVP2 / TVP1 / TVP2 / Validation 4mA value, 20mA value, Offset value Program graphs settings Clear All graphs history Set graphs update frequency Disable / Enable Low and High range
	Alarm Settings	Warning Alarms Stream 1 Stream 2 Critical Alarms Remote Standby	Warning alarms settings Low and High values for stream 1 Low and High values for stream 2 Critical Alarm settings Disable / Enable (Critical when in remote standby)
	System Settings	General OP Mode Pressure Units Temp. Units Stdby Mode Come Read Num Cycles Max Cycles Heater SP Validation Value Margin Pressure Factors Slope Stream Select Type Rinse Time Stream 1 Reps. Stream 2 Reps. Digital Inputs Customer Alarm	 RVP-323 PSI / hPa / KPa / KgCm / BAR / mmHg °F / °C On / Off 0 – 300 seconds Cycles counter 10000 – 75000 limit for maintenance alarm 0 – 200 (optional micro filter heater set point) Validation target Validation range (+/-) Calibration value STREAM 1 / STREAM 2 / ALT. / AUTO 0 – 200 seconds 1 – 100 (only for alt.) 1 – 100 (only for alt.) OFF / ON

Main Menu	Submenu	Items	Choices / Settings / Comments
Setup	System Settings	Remote Standby Stream Select Validation Miscellaneous Screen Saver Reload Defaults Relay Choice Condition	OFF / ON OFF / ON OFF / ON 0 – 60 minutes Loads default customer settings R1 / R2 / R3 OFF / Alarm Warning / Alarm Critical / Maintenance / Stream 1 / Stream 2 / Filter / Come Read / In Validation / Valid. Pass 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 None / Data / Result 9600 / 19200 / 38400 Modbus comm communication settings 1 – 250 Ethernet / RTU RS-485 RTU settings 9600 / 19200 / 38400 Modbus TCP/IP settings Analyzer's IP address Router Address Network Mask
	State Table Setup	Reset Defaults Line State Data	Loads default state table 1 – 16 states Agitate / Autozero / Purge/Drain / Reading / Vent / Cell Evac / Injecting / Charging / Wait / PD Agitate / Stop / FilterWash / Rinse / Drain / Purge / Repeat seconds or counter (depends on state)
	Time/Date Setup	Time Format Date Format Date Time	12 / 24 Hr US / EU Set current date Set current time
	Factory Setup	–	For factory use only
Security	–	–	Disable / Enable

Chapter II: Specifications

Models

P-700-1400	NEC: Class I Div 1 Group B, C + D
P-700-1500	ATEX: II 2G Ex db IIB+H2 T6 Gb
P-700-1600	IECEX: II 2G Ex db IIB+H2 T6 Gb

Performance

RVP Measurement Range	0 to 35 psi (0 to 2.4 bar)
Repeatability	±0.05 psi (±0.0035 bar)
Reproducibility	±0.1 psi (±0.007 bar)
Resolution (pressure sensor)	±0.01 psi (±0.0007 bar)
Measurement Accuracy	Meets or exceeds ASTM Methods D323, D4953, D5482, and D-5191.
Temperature Accuracy	±0.1°C (±0.18°F)
Measurement Cycle Time	5 minutes or less
Operating Temperature Range	Minimum: 5°C (41°F) Maximum: 40°C (104°F)

Sample Requirements

Sample Pressure	Minimum: 1.4 bar (20 psi) Maximum: 2.4 bar (35 psi) (optional Sample Conditioning System available)
Sample Return Pressure	Atmospheric to 2.4 bar (35 psi) maximum (optional high-pressure Sample Recovery System available)
Sample Temperature	Minimum: 2°C (36°F) Maximum: 70°C (158°F)
Sample Bypass Flow Rate	Minimum: 25 cc/min (1.5 L/h) Maximum: 100 cc/min (6.0 L/h)
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. (±10%) 50/60 Hz; 2/1A; single phase
Instrument air	Clean, dry instrument air supplied at a pressure of 25 psi (1.72 bar) Consumption at approximately 10 L/h (166.7 cc/min)

Environmental Conditions

Location	Indoor or outdoor (should be protected from direct sun, heavy rains and strong winds)
Altitude	Max. 2000 m (6562 feet) above sea level
Ambient temperature	-20 to 40°C (-4 to 104°F)
Ambient humidity	up to 90%
Supply Voltage range	120/240 V a.c. (±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 227 kg (500 lbs)
Enclosure Rating / Material	Explosion-proof cast aluminum copper free alloy (meets NEMA 4X, IP65 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

P-700 RVP 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 vapor pressure of flowing hydrocarbons. It is intended for stationary use in hazardous locations and should be used only for the measurement of RVP. All the installation, service, and maintenance practices are described in this manual and must be followed.

WARNING: Any modification to the Analyzer can affect and compromise the safety of the equipment and create dangerous conditions.

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 position 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)

CAUTION: 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.

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

	**Health Hazard:** 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).

Startup and Maintenance

During startup and maintenance of the Analyzer, if validation or cleaning solvent tank is installed on the unit, special care must be observed when handling the liquids.
Appropriate PPE should be used during filling and emptying the tanks including respiratory protection against hazardous gases and vapors.

Overflow and Spillage

In case of overflow and spillage of liquids outside the tanks the Analyzer should be turned off and power disconnected. Ensure adequate ventilation around Analyzer if the unit is installed indoors. Keep personnel away from and 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 40). 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.

	**WARNING: Solvents and samples shouldn't be released into the environment.**

Please refer to Safety Data Sheets for more information about used solvents.

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 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 palette 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 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.

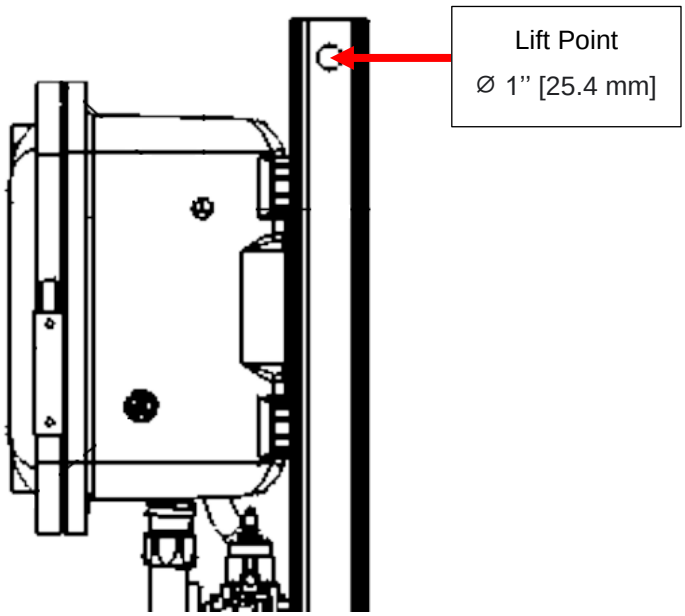


Figure 4-1: Lifting Point Location

	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 -20° and 40°C (-4° and 104°F) at all times.

Mounting

The Analyzer is housed in a dual-chamber enclosure designed for wall mounting. It should be located on a flat, vertical surface and isolated from intense vibration. The cabinet incorporates mounting ears to facilitate installation.

	**NOTE: An optional free-standing mounting rack is available.**

The bottom of the enclosure should be located approximately 12 in (30.5 cm) above the floor of the shelter. Adequate clearance, approximately 12 in (30.5 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, purge gas lines, and an atmospheric drain. There is also a fitting for connecting a validation sample line if this option has been installed on the Analyzer. These fittings are located on the sides of the instrument (see Figure 4-2).

PROCESS SAMPLE LINES

	**NOTE: 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.**

The Analyzer is designed to analyze samples from up to two different process streams. These lines are connected to the 1/4-inch NPT fittings labeled "Sample 1 In" and "Sample 2 In" located on the left side of the lower enclosure. For single stream, only "Sample In" port is used. Process samples should be provided at a pressure between 20 and 35 psi (1.4 and 2.4 bar) and a bypass flow rate 25 to 100 cc/min (1.5 to 6.0 L/h). The temperature of the sample should be between 2° and 70°C (36° and 158°F). Higher sample temperatures are possible (consult factory).

	**NOTE: If the Analyzer is equipped with the optional Sample Conditioning Panel, the fittings for connecting Stream 1 and Stream 2 are located on this panel.**

VALIDATION SAMPLE LINE

The optional connection for the validation sample line is also located on the left side of the lower enclosure (see Figure 4-2). A 1/4-inch NPT fitting, labeled "Validation In", is provided for this connection.

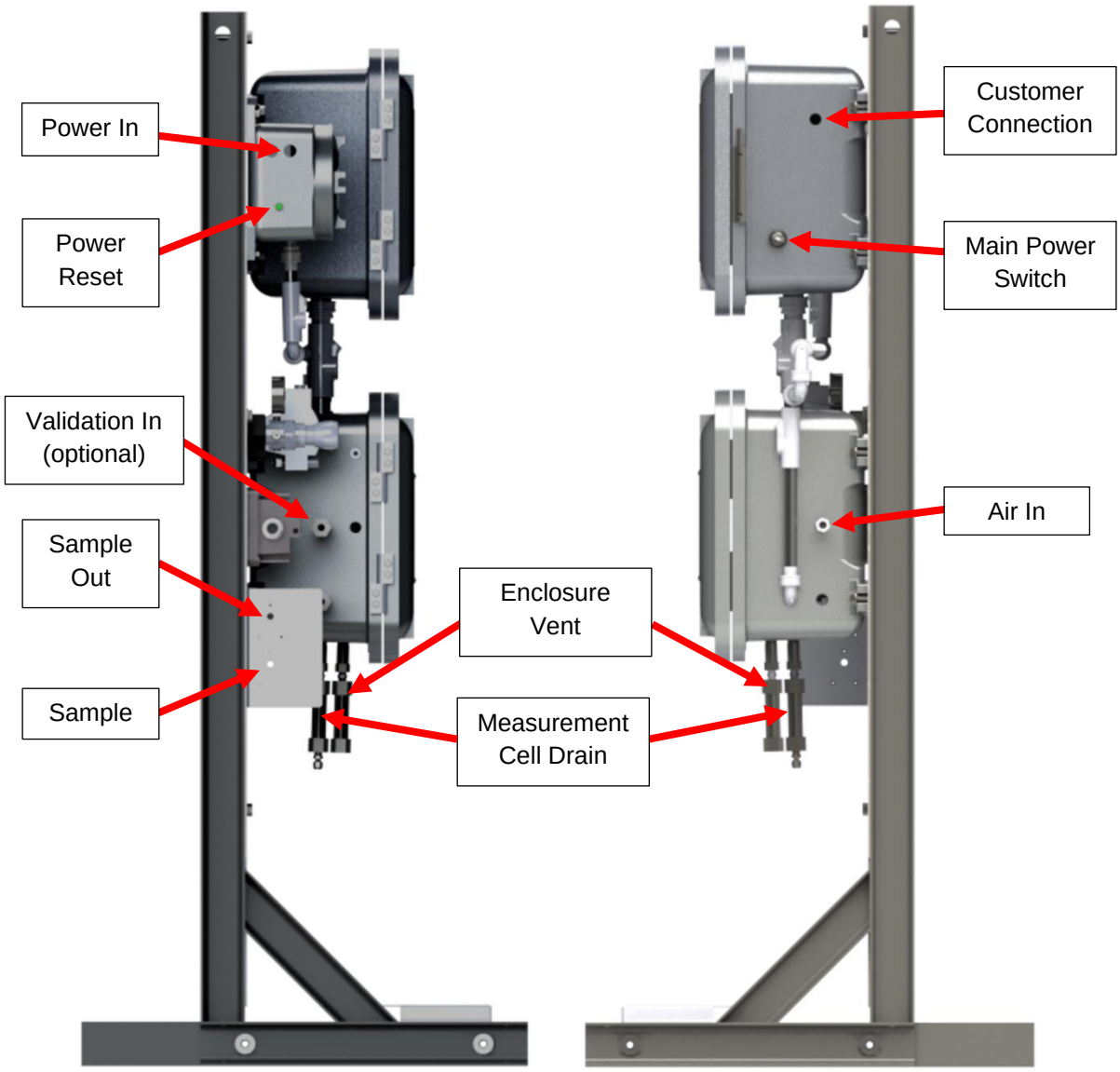


Figure 4-2: Left and Right Side Views

Measurement Cell Purge Air Line

Instrument air is required to maintain the 4:1 air/liquid ratio needed for RVP measurements and purging of spent sample from the measurement system. The gas should be supplied at a pressure of 25 psi (1.72 bar). The measurement cell purge gas connection is made at the 1/4-inch NPT fitting labeled “Air In” on the right side of the lower enclosure (see Figure 4-2).

Measurement Cell Drain

The Analyzer includes an atmospheric drain for the removal and collection of spent sample. The 1/4-inch NPT fitting for this connection is located at the bottom of Lower Analysis enclosure.

⚠	**CAUTION: The drain should not contain any traps, dips, or depressions in which liquid can accumulate. For optimum performance, it should pitch straight downhill from the Analyzer into an appropriate collection device.**

❗	**NOTE: If the Analyzer is equipped with the optional High Pressure Sample Recovery System, the measurement cell drain should be connected to a vent and piped outside the instrument shelter.**

Wiring

The P-700 RVP 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).

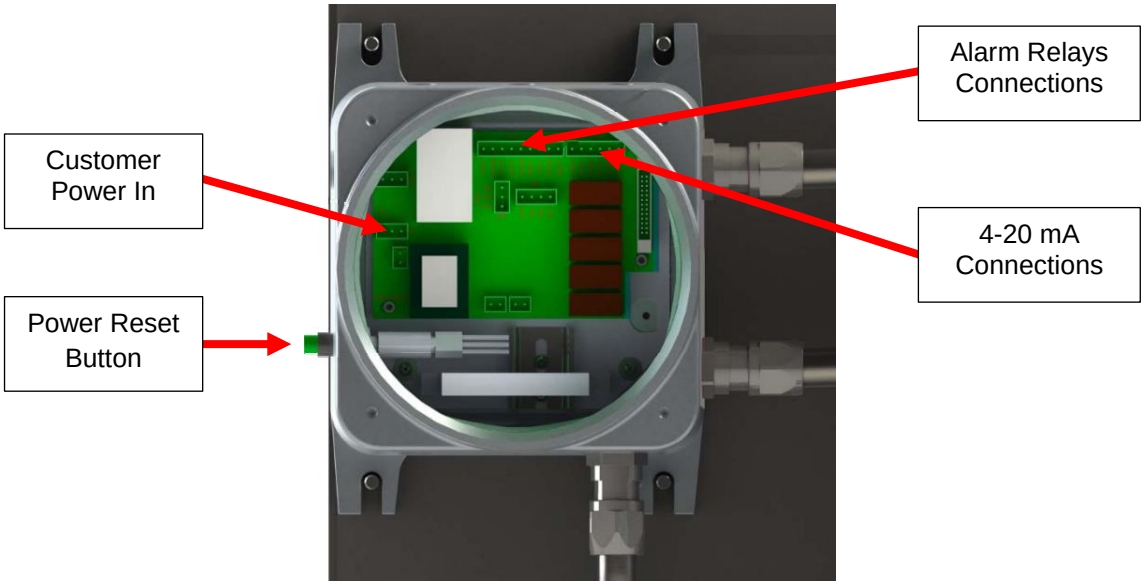


Figure 4-3: Customer Connections Enclosure

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-700 RVP Analyzer requires an independent 120 or 240 V a.c. (±10%) 50/60 Hz; 2/1A; 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 Upper Control enclosure.

⚠	**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).**

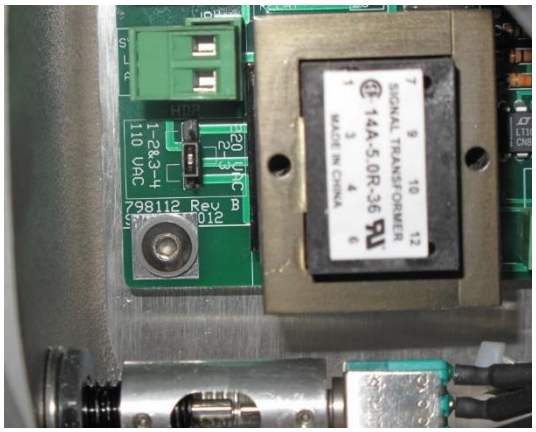


Figure 4-4: Voltage selection header (shown 240 V a.c., pin2-3)

Customer Power In

The Analyzer is designed to operate from 120 or 240 V a.c. (50/60 Hz, single phase). Deviation from rated voltage shouldn't exceed ±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.

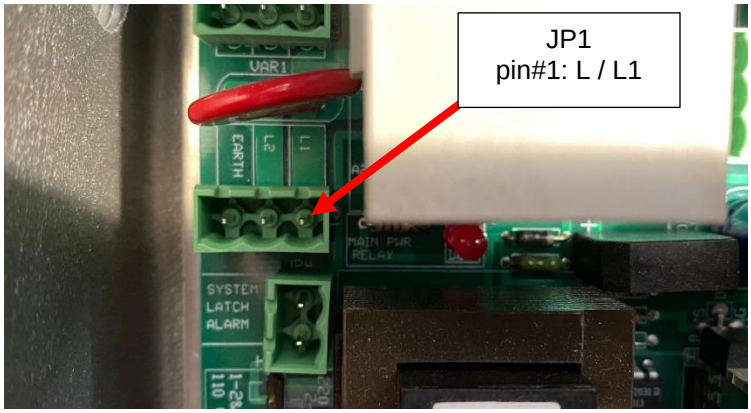


Figure 4-5: Customer Power In on JP1 header

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 Figures 4-2 and 4-3).

Analog Output

One isolated 4-20 mA output is standard on the P-700 RVP 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, page 29 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.

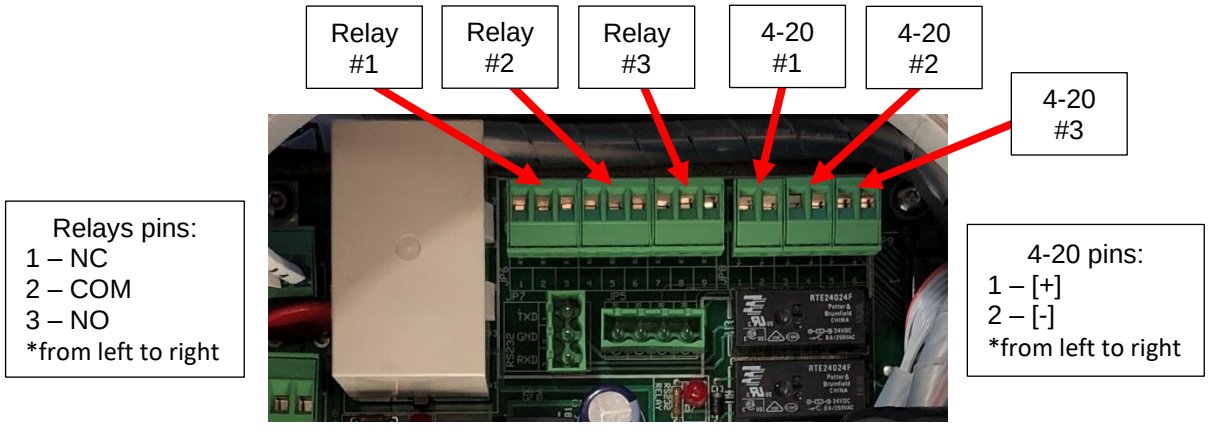


Figure 4-6: Analog 4-20 mA and Relays Output Connections

Serial Output

The P-700 RVP 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)
RVP Result
Pressure Units
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.

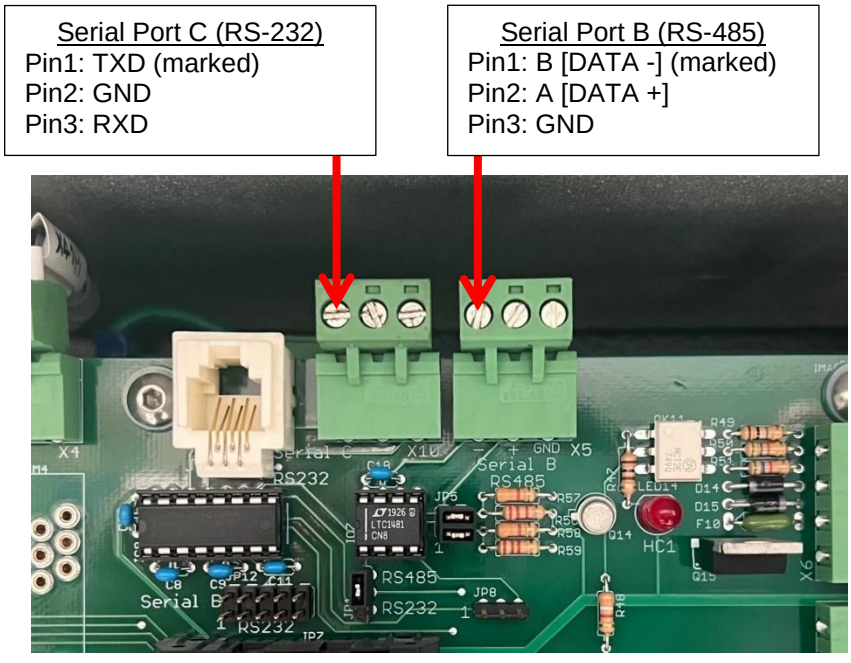


Figure 4-7: RS-232 (port C) and RS-485 (port B) Connections

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.

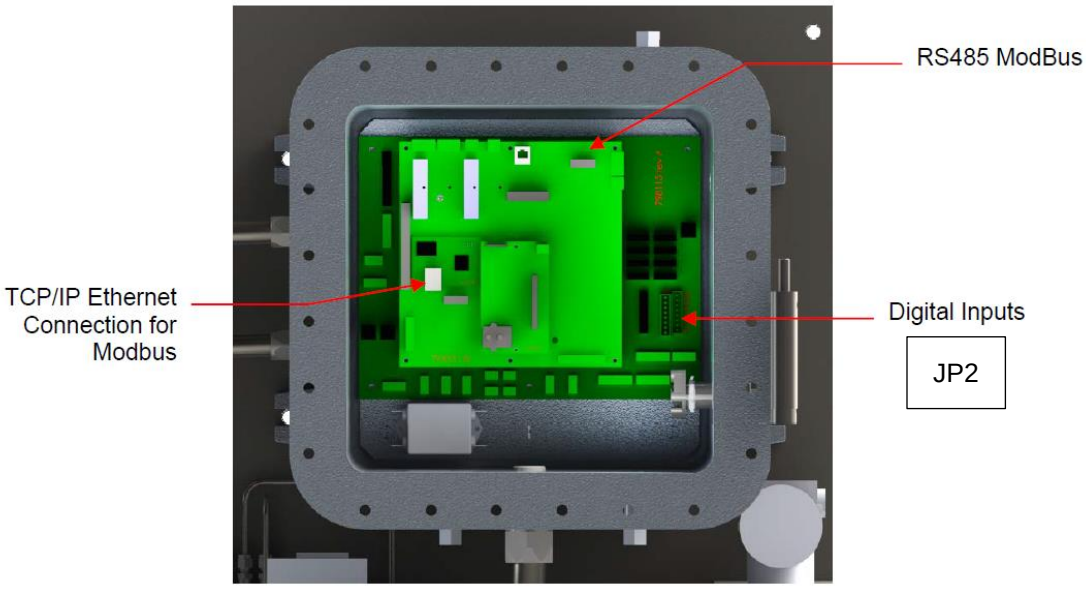


Figure 4-8: Upper Control Enclosure - Modbus and Digital Inputs

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 measurement cell purge air and verify that it is regulated at 25 psi (1.72 bar).
2. Set the process supply pressure regulator at 20-30 psi (1.38 to 2.07 bar).
3. Verify that the flow meter valve is fully open.
4. Adjust the process supply back pressure regulator until the sample flow is about 50 cc/min. This will be about half scale on Bartec Orb supplied flow meters. Sample flow must be between 20 cc/min minimum and 200 cc/min maximum; consult factory if flow is outside of this range.
5. Check the interior of the Lower Analysis enclosure for leaks.
6. Verify that the power switch on the right side of the Upper Control enclosure is in the OFF position.
7. 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.**

8. 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.
9. Place the power switch on the right side of the Upper Control enclosure in the ON position.
10. Access the Setup Menu (Chapter V: Programming, see page 25) and enter each submenu to verify the Analyzer's settings match the QIR (Quality Inspection Report) you received with the instrument.
11. Conduct 4-20 mA loop and alarm relay checks from Service Screen as required (see page 41).
12. Place the Analyzer Online and observe operation for a few measurement cycles. Pay particular attention to the injector system (see Figure 4-9), watching for bubbles in the sample, smooth piston operation, etc.

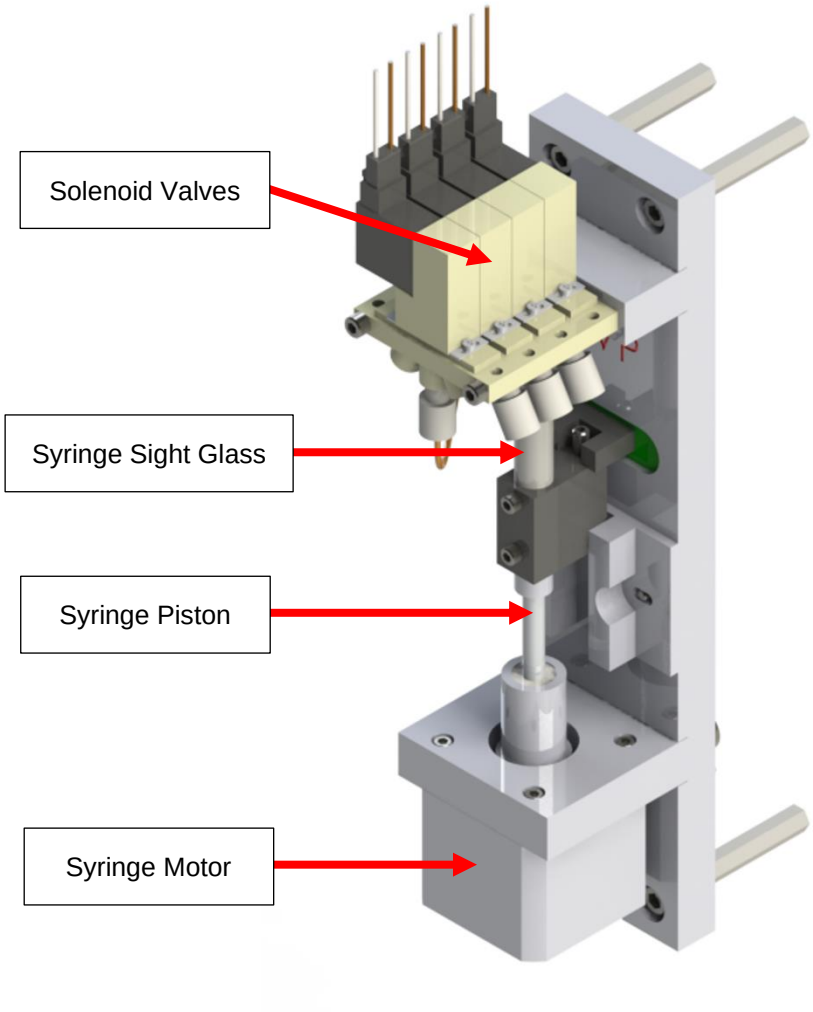


Figure 4-9: Injector System

13. Close the cover on the Customer Connections enclosure and bolt the Upper Control and Lower Analysis enclosure doors.
14. You are now ready to run analysis using the factory default settings or program the instrument with your desired operational parameters (see Chapter V: Programming, page 23).

Chapter V: Programming

Menu Navigation

The P-700 RVP 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.

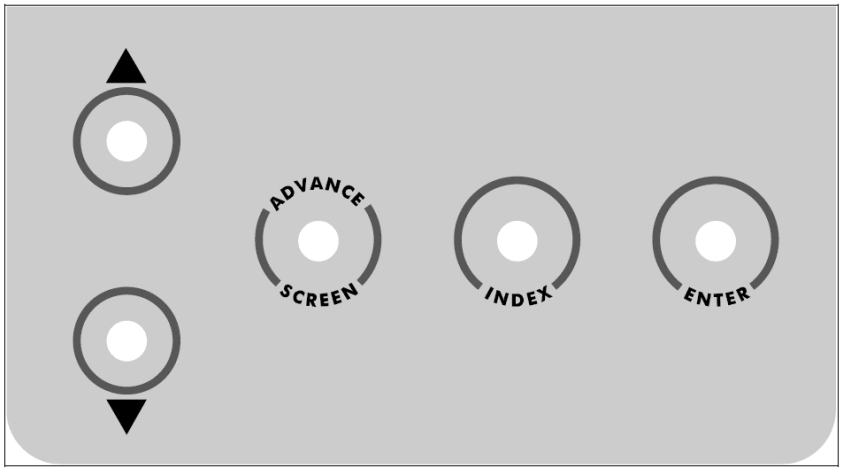


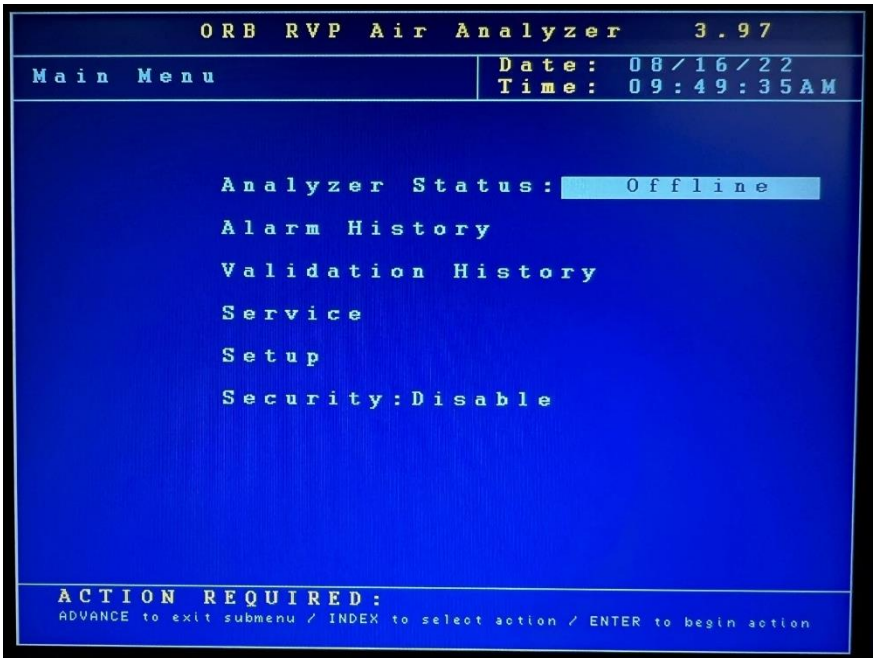
Figure 5-1: Magnetic Keypad

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. It is described in further detail in Chapter VI: Normal Operation, 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, see page 39. Normal Operation. 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, page 41. 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

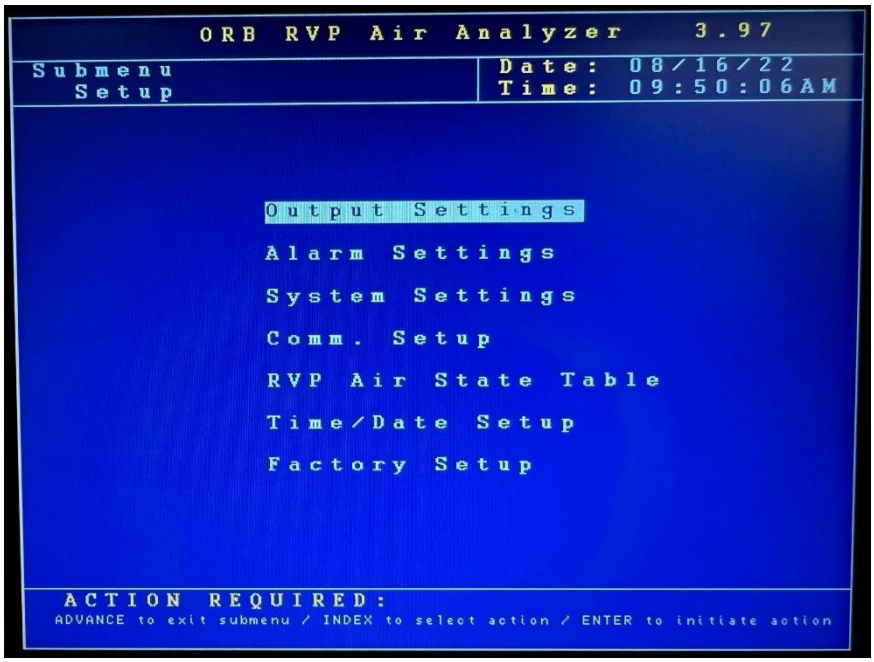
This menu provides access to the Analyzer's Setup submenus. It is accessed by touching the Enter key when this menu item is highlighted. Touch the Advance Screen key to return to the Main Menu.

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.

	**NOTE: 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.**

Output Settings

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

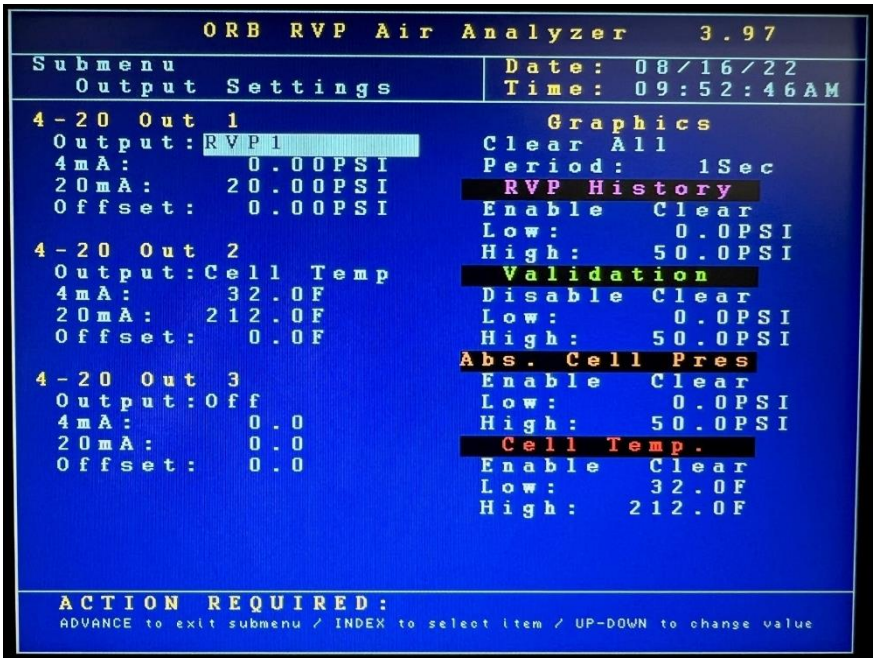
Use the Index key to move to the desired menu item. Use the Up/Down Arrow keys to change the displayed setting/value or use the Enter key to Clear the graphs.

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

The P-700 RVP 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: Off, Cell Temperature, Cell Pressure, RVP1 (Stream 1 RVP results), RVP2 (Stream 2 RVP results), TVP1 (Stream 1 TVP results), TVP2 (Stream 2 TVP results), and Validation.
- **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 +2.75 psi, the Analyzer will generate an analog signal corresponding to 18.25 psi when the actual measured and displayed RVP value is 15.5 psi.



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.
Period — Graphs' plotted rate (doesn't apply to RVP History and Validation).

- **RVP History —** RVP measurement results.
- **Validation —** Validation measurement results.
- **Absolute Cell Pressure —** Live absolute cell pressure reading.
- **Cell Temperature —** Live cell temperature reading.

Enable/Disable — 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.

Alarm Settings

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

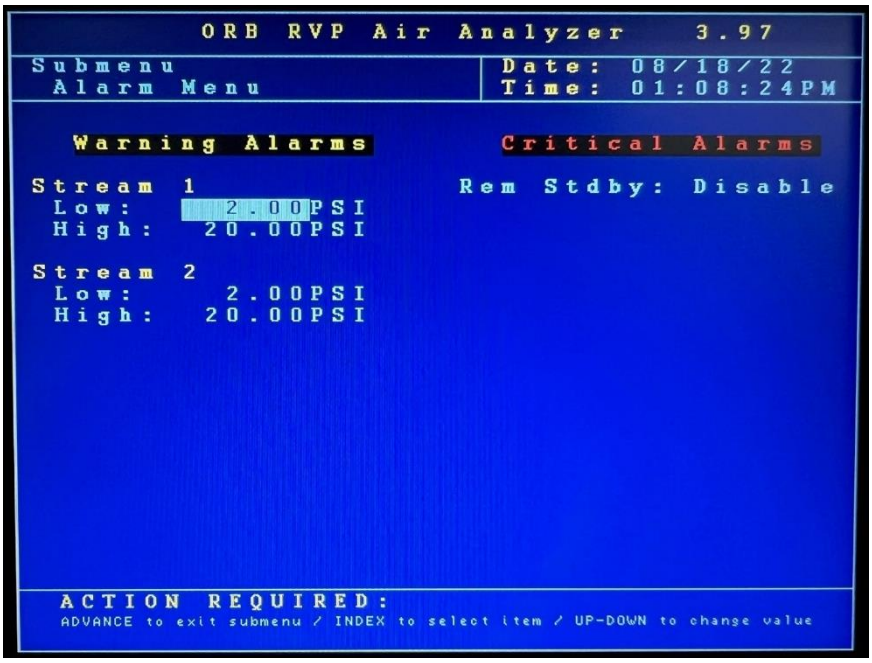
Use the Index key to move to the desired menu item. Use the Up/Down Arrow keys to change the displayed setting or value. The unit of measure used for these values is set in the System Settings submenu.

Warning Alarms

Those types of alarms do not stop the analysis. They will activate Alarm Warning relay if it was programmed (see page 29).

"Result Out Of Range" warning alarm is activated when the RVP results exceeds the indicated value. For Stream 1 and Stream 2, the settings are:

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



Critical Alarms

Those types of alarms stop the analysis. They will activate Alarm Critical relay if assigned (see page 29).

- **Rem 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 setting for Analyzer's operation.

- **OP Mode —** This menu setting establishes how RVP measurements will be performed. The only operational mode for the P-700 RVP Analyzer is RVP-323.
- **Pres Units –** This menu item establishes the unit of measure for the Analyzer's RVP results and pressure readings. The choices are: psi, hPa, kPa, kg/cm², bar and mmHg.
- **Temp Units –** 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.**

- **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.

Validation

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

Pressure Factors

- **Slope —** This is a calibration factor applied to the Analyzer's pressure readings. It's a multiplier for pressure signal used during "Reading" state. It should not be changed unless the results of a calibration measurement indicate that adjustment is required (see Calibration, page 43).

Stream Select

If the Analyzer is equipped with the Stream Switching option, these menu items allow you to select how the measurements will be made performed between streams.

- **Type —** The Analyzer performs measurements only on the 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).
- **Rinse Time —** It's a delay (in seconds) between stream switching, applied before starting new analysis to make sure the new stream sample reached the Analyzer, and the sample line has been fully flushed. Can be programmed between 0 – 200 seconds.
- **Str. 1 Reps —** Number of measurements for Stream 1 before switching to Stream 2 (only for Alternate Type Stream Select).
- **Str. 2 Reps —** Number of measurements for Stream 2 before switching to Stream 1 (only for Alternate Type Stream Select).

Digital Inputs

These menu items allow you to enable (ON) and disable (OFF) the Analyzer's customer controlled digital inputs. See Chapter IV: Installation and Startup, 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.

	**NOTE: Although the Validation and Stream Select contacts may be present, these functions are only available on Analyzers which incorporate these options.**

Miscellaneous

- **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.
- **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.

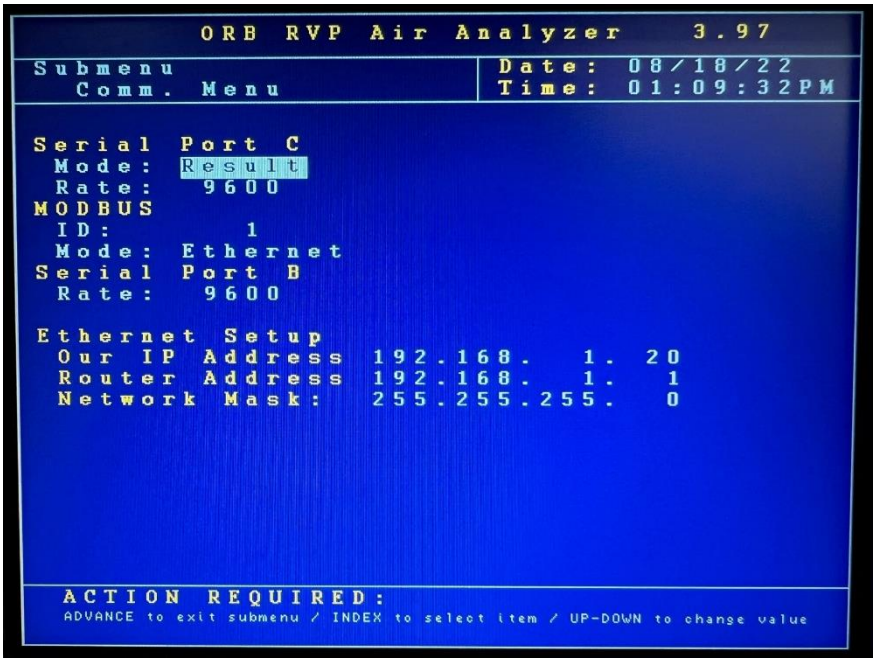
- **Relay —** This designates which alarm is being programmed. See Chapter IV: Installation and Startup, page 16 for alarm relay wiring information.
- **Choice —** This designates the type of alarm (see page 37 for detailed description).

Off –	Alarm relay disabled.
Alarm Warning –	Activated when one of the warning alarms conditions has been detected. Warning alarms do not disrupt analysis.
Alarm Critical –	This type of alarm indicates Analysis has stopped because one of the critical conditions has been detected.
Maintenance –	Activated when the number of measurement cycles has exceeded the Max Cycles setting.
Stream 1 –	Stream 1 is being measured.
Stream 2 –	Stream 2 is being measured.
Come Read –	Activated for a programmed period of time (Come Read setting) upon the completion of a measurement cycle.
In Validation –	Validation cycle is being performed.
Valid. Pass –	Validation cycle passed.

- **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 Setup

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 / Read state), 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.

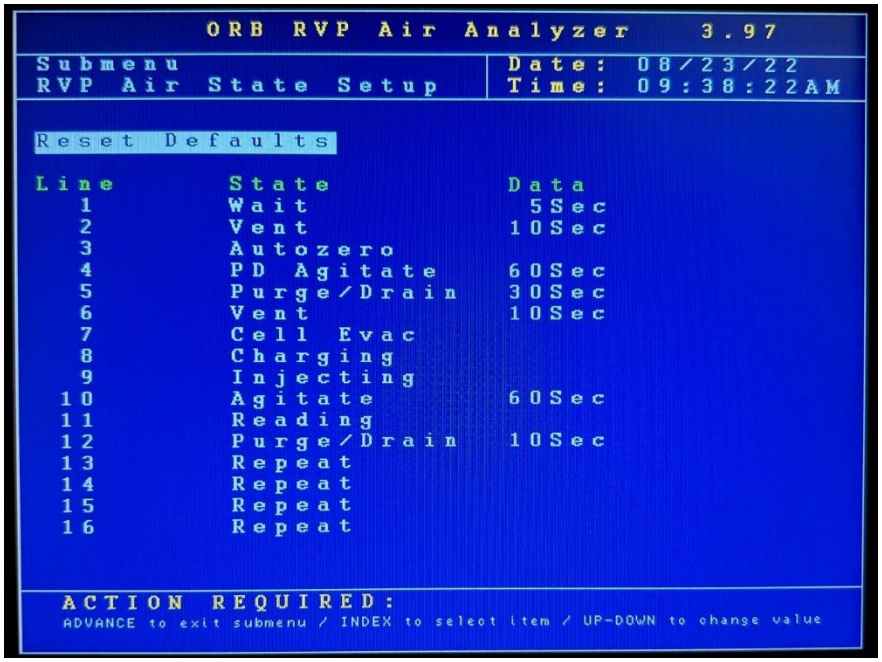
- **Our IP Address —** This is the IP address assigned to the Analyzer.
- **Router Address —** This is the address of the router the Analyzer is connected to.
- **Network Mask —** This is the network mask address.

	**NOTE: When changing Ethernet address, the Analyzer has to be restarted in order to save the new settings to the microprocessor flash memory.**

RVP Air State Table

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 an RVP measurement cycle. Steps that are **underlined** are required. The last step in any measurement cycle must be Repeat.

- **Wait —** This idles the Analyzer for a programmed period of time. It is generally used to allow for the flushing of sample lines in multi-stream applications and/or extend cycle times.
- **Vent —** This state opens the drain valve and vents the cell to atmosphere.
- **Autozero —** During this state, the drain valve opens for pressure sensor to reference atmospheric pressure reading. It's needed to set the accurate baseline for every cycle.
- **PD Agitate —** This activates the magnetic pellet inside the cell to ensure that any entrapped liquid is removed; it also opens both the purge and drain valves.
- **Purge/Drain** — This opens the purge and drain valves to ensure that all volatile vapors are removed from the measurement cell. It is
- **Cell Evac** — This state opens the sample solenoid and removes a fixed air volume from cell.
- **Charging** — This cycles the syringe up and down to remove any bubbles and flush the sample lines.
- **Injecting —** This injects the proper amount of sample into the measurement cell.
- **Agitate —** This activates the magnetic driver to speed up equilibrium before Reading state.
- **Reading —** This state is used to record RVP result. Slope value from System Setting submenu is applied to pressure sensor reading.
- **Stop —** This state aborts the analysis, puts the Analyzer Offline and prevents it from proceeding. It is intended as a troubleshooting step only and should never be included as part of a normal measurement cycle.
- **FilterWash —** This state cleans sample lines and measurement cell. It can only be used on Analyzers equipped with the optional micro filter with cleaning fluid. The entered value indicates the interval at which it will be performed (number of measurements between cleanings) and can be programmed. By default, Filter Wash state is using 6 mL of cleaning solvent. This can be adjusted (consult factory).
- **Rinse —** This is used to flush the sample lines and measurement cell with sample product. It is useful for applications where more than one stream is being analyzed. The entered value

indicates the number of times this state will repeat in a loop.

- **Drain —** This removes any liquids left in the cell by using syringe and opens drain valve.
- **Purge —** This opens the purge valve and pressurizes the cell for specified amount of time.
- **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.

Wait, Vent, PD Agitate, Purge/Drain, Agitate, Drain, and Purge states are timed and can be programmed between 1 – 400 seconds.

The default states are as follows:

Line	State	Data
1	Wait	5 sec
2	Vent	10 sec
3	Autozero	
4	PD Agitate	60 sec
5	Purge/Drain	30 sec
6	Vent	10 sec
7	Cell Evac	
8	Charging	
9	Injecting	
10	Agitate	60 sec
11	Reading	
12	Purge/Drain	10 sec
13	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.

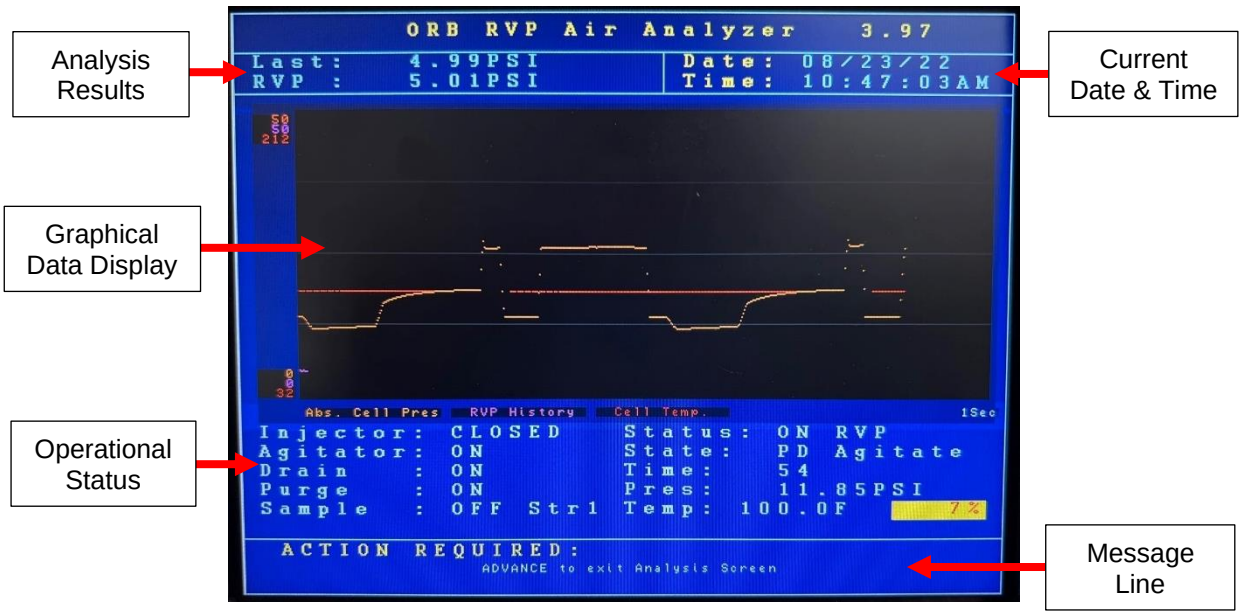
Chapter VI: Normal Operation

The P-700 RVP Analyzer is an on-line process instrument designed for the continuous measurement of Reid Vapor Pressure in hydrocarbon process streams, such as gasoline, crude oil, and petroleum condensate.

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 System Settings, page 27). 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 RVP 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.

Injector — Indicates the position/movement of stepper motor syringe:
CLOSED → home position ; UP → moving up / to home position ; DOWN → moving down
Agitator — Indicates the status of magnetic driver.
Drain — Indicates the status of drain valve.

Purge — Indicates the status of purge valve.
Sample — Indicates the status of sample valve and displays current stream number.
Status — Shows the current Analyzer status.
State — Indicates the Analyzer's current activity.
Time — Indicates the operational counter for current state.
Pres — Displays live reading of relative cell pressure.
Temp — Displays live reading of cell temperature and shows TE modules power:
highlighted in yellow → heating ; highlighted in white → cooling

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 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.

	**NOTE: A second and third analog output is available as an option.**

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
RVP Result	XXX.XX
Pressure Units	XXX (units selected)
Cell Temperature	XXX.X

Temperature Units	°F or °C (units selected)
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	"Cell clean in process"	Cell cleaning is activated (Application specific)	Alarm Warning
Informative	"Cell rinse in process"	Cell rinse is activated (Only from Service Screen)	Alarm Warning
Informative	"Filter Cleaning in process"	Filter cleaning is activated (Only from Service Screen)	Alarm Warning
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	-	Stream 1 active	Stream 1
Informative	-	Stream 2 active	Stream 2
Informative	-	New result	Come Read
Informative	-	Validation passed	Valid. Pass
Warning	"Result Out Of Range"	Result is below or above the set range	Alarm Warning
Critical	"No Autozero"	Analyzer failed autozero state	Alarm Warning Alarm Critical
Critical	"Temp. sensor fail"	Defective RTD	Alarm Warning Alarm Critical

Critical	"Temp. control fail"	PID control unable to maintain cell temperature	Alarm Warning Alarm Critical
Critical	"Step motor sensor fail"	Stepper motor unable to reach its home position	Alarm Warning Alarm Critical
Critical	"Customer Alarm"	Digital Input signal for external alarm	Alarm Critical

	NOTE: Alarm Warning relay choice activates together with Alarm Critical.

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-700 Reid Vapor Pressure 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

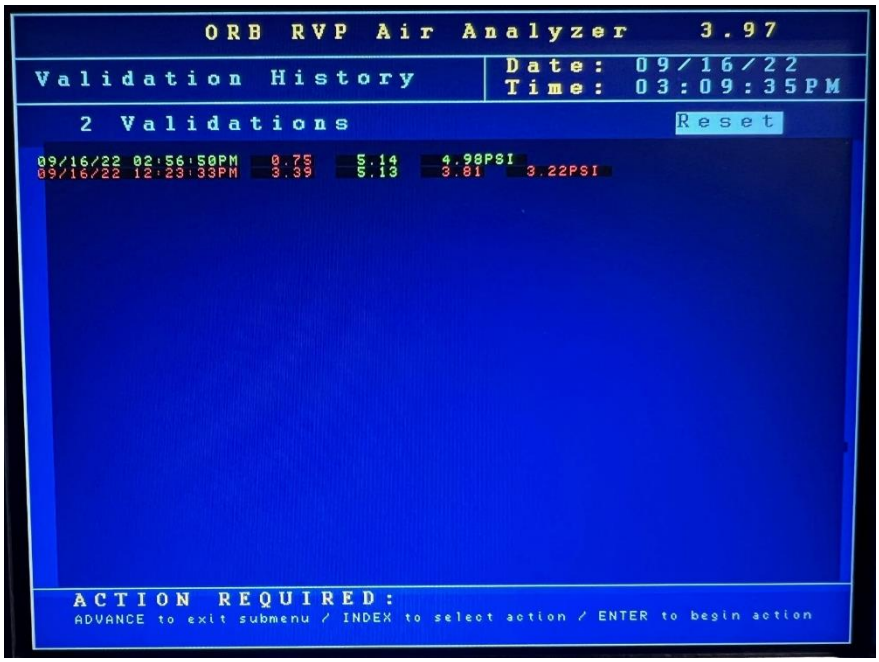
If the Analyzer is equipped with the Validation, it will run a series of cycles (following state table) on a known product when validation is requested. A passed validation is considered if the test results of two consecutive readings, within maximum numbers of five attempts, are within a programmable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

Example:

Programmed Validation Expected Value (In System Settings Screen): 5.20 psi
Programmed Bandwidth (In System Settings Screen): 0.20 psi
Results from Validation Test #1: 4.95, 5.12, 5.47, 5.32, 5.51 = FAIL
Results from Validation Test #2: 5.43, 5.20, 5.07 = 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 sending a digital input signal to the appropriate input (see page 20).



Validation Rinse

Before starting validation measurement analysis, the analyzer will execute “Valid Rinse” state. This pre-rinse sequence will allow to flush the cell and sample lines with validation sample. It will use 2 full syringes of validation sample (~ 1.0 mL) for that process.

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 Analyzers equipped with the stream switching option, the sample stream being analyzed can be changed from 1 to 2 via a control room digital input contact closure (see page 20). When the signal is removed, the instrument goes back to analyzing stream 1. The Analyzer can also be programmed to alternate between two streams (see page 29). Modbus write command can also be used to switch between streams.

Loss Of Power Restart

In the event of a power loss, the P-700 RVP Analyzer will automatically begin monitoring when power is restored If the Standby mode (see System Settings, page 27) is set to OFF. 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 Status to ON.

	**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 Detector

Chapter VII: Maintenance & Service

	**WARNING: Service should only be performed by qualified service personnel. Before performing any of the following procedures, disconnect unit from its electrical source. If electrical power is required, exercise extreme care as "LINE VOLTAGE" is present.**
	**WARNING: Be sure to obtain all necessary permits and perform any required gas testing before opening the instrument's enclosures.**
	**WARNING: 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 measurement cell purge gas pressure	Weekly
Check sample pressure	Weekly
Inspect for internal sample leaks	Monthly
Inspect sample conditioning system	Monthly
Replace syringe	Every six months
Replace internal tubing	Every six months

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 alarm relays, agitator, injector, dry contacts, and solenoid valves.
- Output a fixed analog signal to check/calibrate external devices.
- Check the PID control.
- Check measurement cell temperature and pressure.

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, the message box appears for confirmation.

The Service screen is divided into the following sections:

Output Control

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

- **Agitator —** activates agitator in the measurement cell.
- **Drain Valve —** controls drain solenoid valve.
- **Purge Valve —** controls purge solenoid valve.
- **Sample Valve —** controls sample solenoid valve.
- **Stream Valve —** controls optional relay for stream switching.
- **Valid. Valve —** controls optional validation solenoid valve.
- **Wash Valve —** controls optional wash solenoid valve.
- **Relay 1 —** controls alarm relay 1.
- **Relay 2 —** controls alarm relay 2.
- **Relay 3 —** controls alarm relay 3.

Functions

Those items initiate the selected function. To start, highlight the desired function and touch Enter.

- **Cell Rinse —** This function flushes the sample lines and measurement cell with sample product.
- **Cell Clean —** This function performs a thorough cleaning of the cell with cleaning solvent. It can only be used on Analyzers equipped with that option.
- **Filter Clean —** This function cleans sample lines and measurement cell with cleaning solvent. It can only be used on Analyzers equipped with that option.

Cell Pres

This is an information only display of the current cell pressure in selected pressure units from System Settings submenu.

Cell Temp

This is an information only display of the current cell temperature in selected temperature units from System Settings submenu.

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.

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.

- **4-20 Out 1 —** standard channel I analog output.
- **4-20 Out 2 —** optional channel II analog output.
- **4-20 Out 3 —** optional channel III analog output.

Injector

These menu selections allow you to test the operation of the Analyzer's sample injector. Use Up/Down Arrow keys to control each item.

- **Command —** moves injector syringe UP and DOWN.
- **Sensor —** this is for information display only. It shows the current position of the injector:
  ON → home position / syringe is up ; OFF → moving down / syringe down
- **Stp1, 2, 3, 4 —** individual stepper motor outputs can be tested here.

Cell Temp. Control

This section is used to test the heating/cooling capabilities of the TE modules on the measurement cell. The Up/Down Arrow keys are used to change the status of the highlighted selection.

- **PID Control —** activates PID temperature control to target cell setpoint, default = 100°F (37.8°C).
- **Heat —** turns constant cell heat at 50%.
- **Cool —** turns constant cell cool at 50%.

Htr. Temp. Control

This is an optional section for micro filter heaters.

Calibration

Should the P-700 RVP Analyzer require a calibration shift to match a Lab value (expected reading), the following procedure should be used:

1. Allow the Analyzer to read and stabilize on the current sample (3 – 5 cycles).
2. When pulling a sample to compare the Analyzer against the Lab, watch the Main Run screen (see page 35).
3. In the lower right-hand corner of the Main Run screen, watch the "State" of the analysis. You want to pull the sample during "Inject" state to ensure that you are comparing the same sample.
4. Watch the Analyzer finish its cycle and write down the RVP reading. You will use this to calculate the new calibration slope.

5. Deliver the pulled sample to the Lab for analysis.
6. Once you receive the Lab result, compare it with the Analyzer result. If they are outside site excepted tolerances, go to System Settings menu to adjust the slope under pressure factors category (see page 28).
7. Use the following formula to calculate the new slope:

$$Current\ RVP\ Slope\ \ x\ \ \frac{Lab\ (expected)\ RVP\ reading}{Analyzer\ RVP\ reading}\ =\ \ New\ RVP\ Slope$$

Syringe Replacement

The following steps describe the procedure to replace the syringe (P/N 690023) in the lower analysis enclosure:

1. Place the Analyzer in the Offline mode and stop the flow of sample to the Analyzer.
2. Open the Lower Analysis enclosure.

WARNING: Be sure to obtain all necessary permits and perform any required gas testing before opening the instrument's enclosures.

3. Loosen the screw on the syringe adapter and remove the tubing out of the way.
4. Access the Service screen and place the Injector in the DOWN position (via Injector Command). This will disengage the syringe motor from the syringe.
5. Unscrew the glass syringe from the solenoid valve to remove it together with the plunger.
6. Remove the two screws on the valve manifold to take out the solenoid valves.
7. Unplug the cable from the rear sample valve and remove the old sealing washer from the middle valve's port. You might have to use a tool to pick it out.
8. Insert a new sealing washer into the valve's port and screw the new replacement syringe with a plunger until it is hand tight. Do not overtighten it.
9. Plug the solenoid valve cable back and install the valves into the manifold.
10. Manually pull the syringe plunger down and into the syringe adapter, making certain that the hole on the syringe plunger aligns with the hole on the syringe adapter.
11. Tighten the screw on the syringe adapter.
12. Place the Injector in the UP position (via Service screen Injector Command) and make sure the motor moves the plunger up to the home position.
13. Change the status of the Sample Solenoid to OFF and start the flow of sample to the Analyzer.
14. Check for leaks around the syringe assembly.
15. Place the Purge Valve in the ON position. The measurement cell pressure should increase until it equals the incoming purge pressure.
16. Place the Purge Solenoid in the OFF position. The measurement cell pressure should hold at its previous value.
17. Change the status of the Sample Valve to ON and observe pressure. This will check for additional leaks around the plunger.
18. Exit the Service screen and put the Analyzer Online to start analysis.
19. It is recommended to observe one full cycle and check for leaks around the syringe.

20. Close the Lower Analysis enclosure and leave Analyzer Online.

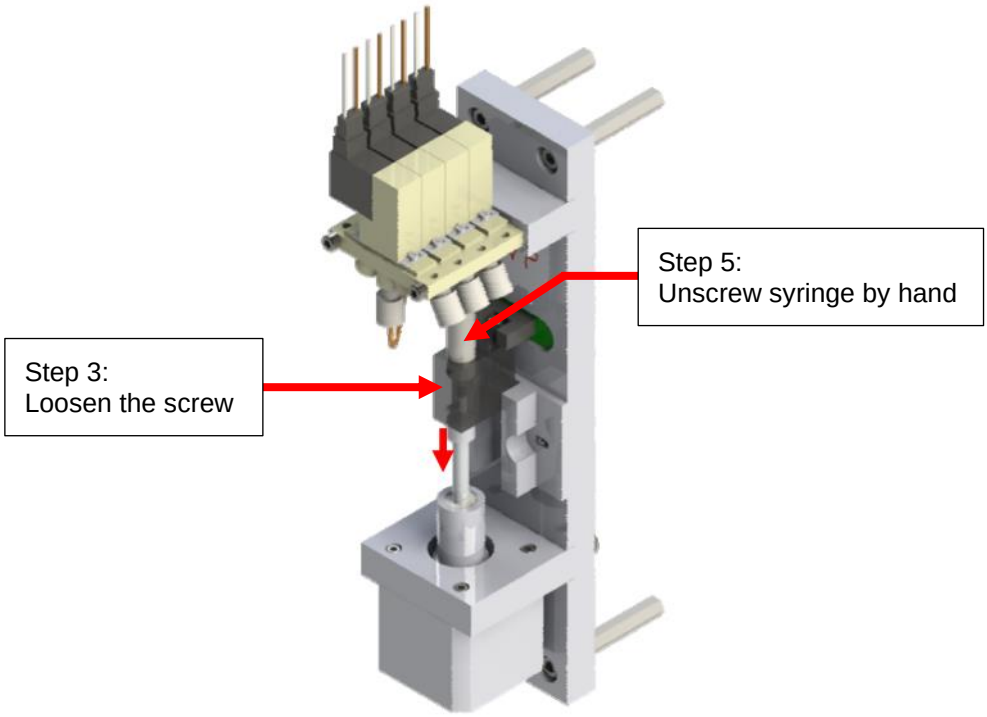


Figure 7-1: Syringe replacement steps

	LINK: "BARTEC Orb RVP Syringe Replacement" video can be found at BARTEC US Corporation YouTube channel: https://www.youtube.com/watch?v=MKWdpZJBkUs

Adjusting the syringe zero-point

The following steps describe the procedure to adjust the syringe gap:

1. Place the Analyzer in the Offline mode and stop the flow of sample to the Analyzer.
2. Open the Lower Analysis enclosure and access the Service screen.

	WARNING: Be sure to obtain all necessary permits and perform any required gas testing before opening the instrument's enclosures.

3. Place the syringe in the DOWN position (Injector Command).
4. Rotate the adjustment set screw on the syringe adapter as needed to increase/decrease the range of Injector travel. A clockwise rotation of the screw allows for further upward travel. A counterclockwise rotation of the screw reduces the travel distance of the injector (stops the injector before it reaches the sensor / zero position).

5. Set the Injector Command UP to move syringe to the home position and observe the Injector's final resting point.
6. Repeat steps 3, 4 and 5 as required until the Injector reaches the zero position with little or no air gap at the top.

	**CAUTION: The Injector should be adjusted so that it just reaches the zero point, with little or no gap. Ideal gap size after the syringe travels to the zero position is about 1/32" or less but must not cause the stepper motor to continue to run once it reaches the zero position.**

7. Turn the flow of sample to the Analyzer back on.
8. Exit the Service screen and put the Analyzer Online to start analysis.
9. Observe full cycle and check for leaks around the syringe assembly.
10. Close the Lower Analysis enclosure and leave Analyzer Online.

Tubing Replacement

The standard RVP Analyzer's measurement system incorporates the following tubes:

Tubing Name	Type & Material	Connections	Part Number
Purge gas inlet	1/16'' stainless steel	compression fitting – ferrule	available at request
Sample inlet	1/16'' Teflon	ferrule – ferrule	702992
Drain outlet	1/8'' Teflon	ferrule – compression fitting	690026
Cell purge	1/16'' PEEK	ferrule – ferrule	690003 (part of kit)
Cell drain	1/16'' PEEK	ferrule – ferrule	690003 (part of kit)
Cell sample	1/16'' PEEK	ferrule – ferrule	690003 (part of kit)
Extra	1/16'' PEEK	ferrule – ferrule	690003 (part of kit)

The following steps describe tubing replacement procedure for RVP Cell tubing kit (P/N 690003):

1. Place the Analyzer in the Offline mode and stop the flow of sample to the Analyzer.
2. Open the Lower Analysis enclosure.
3. Remove the old cell tubing (3 brown 1/16'' PEEK plastic tubes).
4. Install the replacement tubes according to the following table:

Tubing Length	Solenoid Valve	Solenoid Connection		
		Left	Middle	Right
10-inch	Purge valve (front solenoid)	Not used (plugged)	To purge gas inlet	To purge gas inlet on the cell
5-inch	Drain valve (middle solenoid)	Not used (plugged)	To atmospheric drain	To drain outlet on the cell (lowest port)

5-inch	Sample valve (rear solenoid)	To sample inlet	Syringe connection	To sample inlet on the cell

All the tubes in the kit will connect to the right side of the solenoid valves. Refer to Figure 7-1 and 7-2 for valves and port's location. Hand tight ferrules and make sure they're not bent.

	**NOTE: Bartec Orb recommends that tubing replacement be performed at six-month intervals in conjunction with syringe replacement.**

5. Turn the flow of sample to the Analyzer back on.
6. Perform Cell Leak Test (see page 48).
7. Close the Lower Analysis enclosure, exit the Service screen and put the Analyzer Online to start analysis.

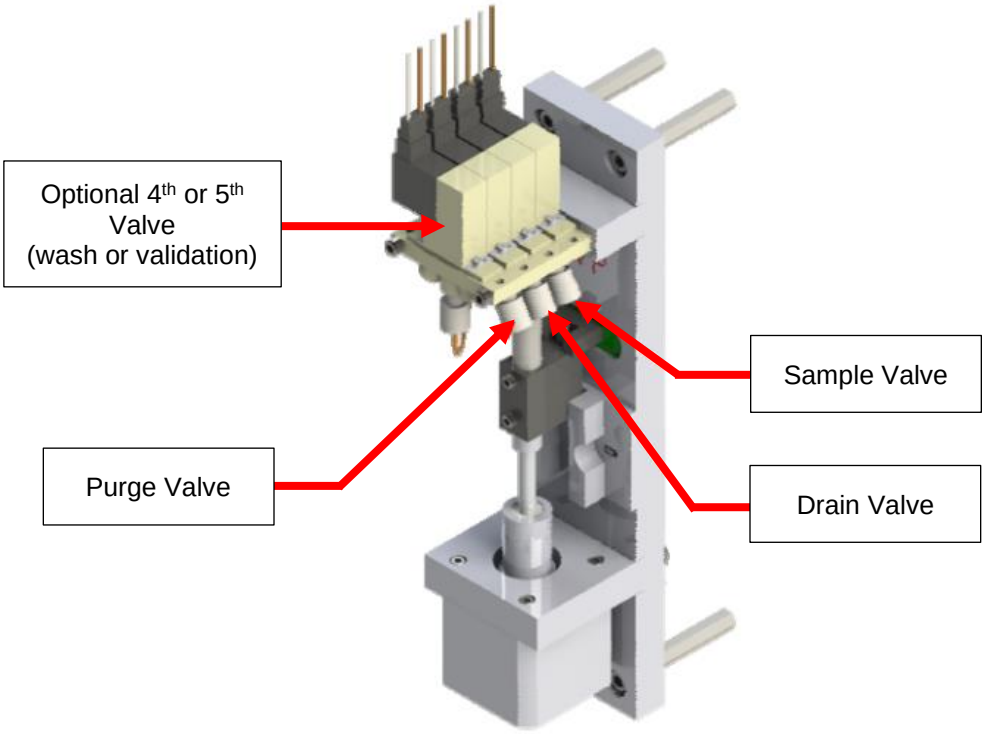


Figure 7-2: Solenoid valves location

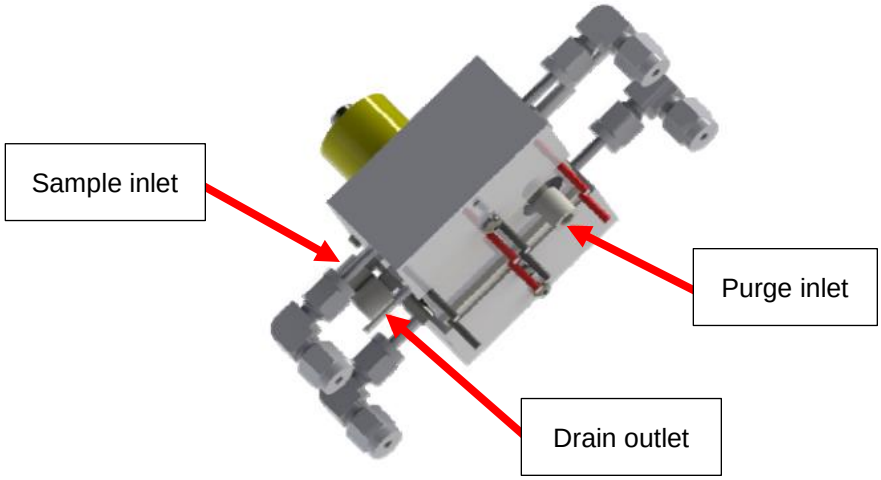


Figure 7-3: Cell ports location

Cell Leak Test

1. Enter Service screen.
2. Navigate to Drain Valve and turn it ON for at least 15 seconds. Your reading should be close to standard atmospheric pressure (~ 14.7 psi).
3. Next, turn Drain Valve OFF and make sure that pressure doesn't increase.

   If the cell pressure increases substantially, there may be a leak in the purge valve. To test further, detach the cell purge tubing from the cell (right side). Place the open end of the tube in a beaker with water and check to see if air bubbles appear when the solenoid is closed. Toggle purge valve a couple times. Replace it if it's leaking.

4. Navigate to Purge Valve and turn it ON for at least 15 seconds. Your pressure reading should be equal to atmosphere + purge gas supply (~ 14.7 + 20-25 psi = 34.7-39.7 psi or similar).
5. Lastly, turn OFF the Purge Valve and make sure the pressure holds.

   If the cell pressure drops, there may be a leak in the drain valve. To test further, detach the drain outlet tube (coming from middle port) where it connects to the bottom of the enclosure. Apply pressure to the detection cell (turn purge valve ON) and place the open end of the tube in a beaker with water and check for air bubbles. Replace it if it's leaking.

Additional steps can be taken to troubleshoot cell leak:

- Remove and then install again all the tubing ferrules on the cell and solenoid valves.
- Make sure the drain line is not plugged and you can reference atmospheric pressure.
- Navigate to Sample Valve, turn it ON, and pressurize the cell by turning purge valve ON for at least 15 seconds. Turn purge valve OFF and observe the pressure reading. It should remain constant. This will test the seal around syringe plunger.
- Pressurize the cell and check all the ports and pressure sensor plug with leak detection liquid.

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.

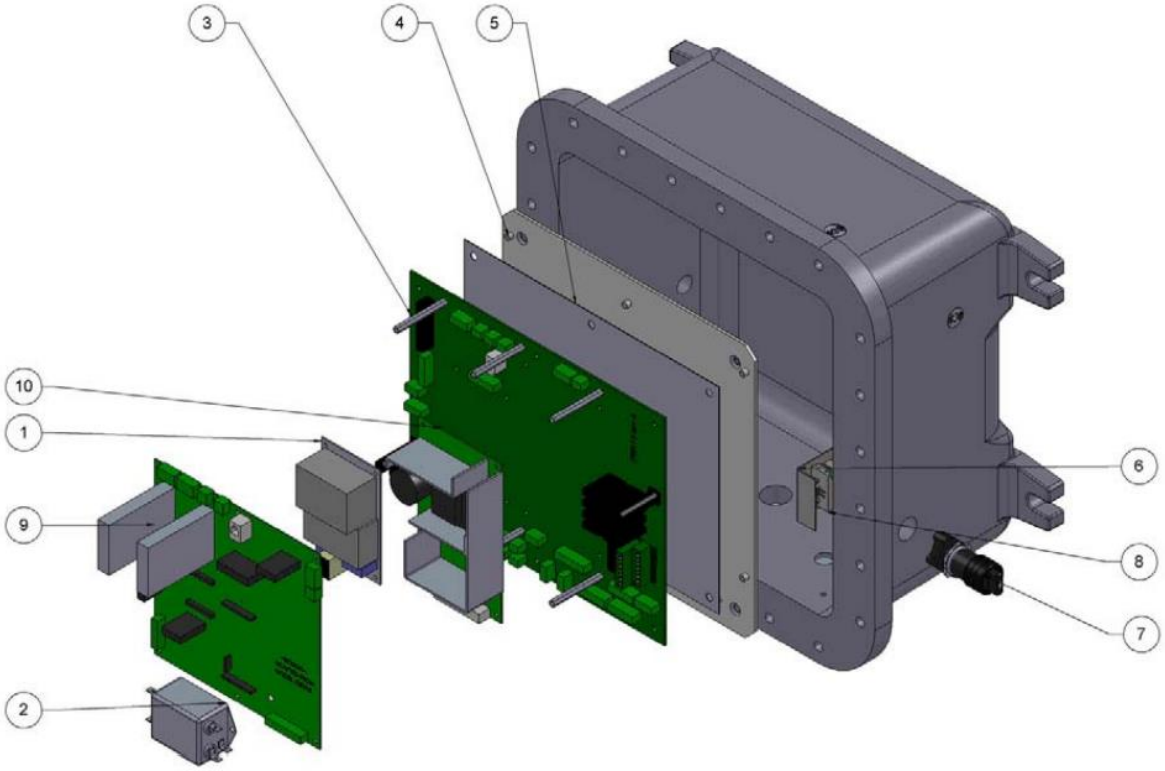
Troubleshooting Chart

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.
RVP reading high	High cell or ambient temperature, faulty RTD.	Increase sample flow. Replace RTD as required.
	Calibration/pressure issue.	Replace pressure transducer as required. Recalibrate as required.
	Solenoid problems.	Check purge gas pressure (reduce as required). Perform cell leak test (replace purge valve as required).
	Delivery volumes.	Confirm that syringe draws sample. Consult factory.
RVP reading low	Low cell temperature, faulty RTD.	Replace RTD as required.
	Calibration/pressure issue.	Replace pressure transducer as required. Recalibrate as required.
	Solenoid problems.	Perform cell leak test (replace drain valve as required).
RVP reading low	Delivery volumes.	Confirm that syringe draws sample. Consult factory.

Problem / Symptom	Cause	Corrective Action
RVP reading erratic	Solenoid problems.	Perform cell leak test (replace drain or purge valve as required).
	Clogged drain line.	Check drain line for clogs and atmospheric pressure reference.
Agitator not working	Varnish build-up inside the cell.	Clean cell as required.
	Electronics problem, faulty output or magnet.	Consult factory.
Syringe drive not working “Step motor sensor fail”	Faulty syringe motor.	Replace syringe assembly or motor as required.
	Problem with optical sensor.	Replace optical sensor board as required.
Bubbles in syringe	Supply pressure too low.	Check for proper supply pressure (correct as required).
	Wide syringe gap.	Adjust syringe zero-point.
Cell temperature control not working “Temp. control fail”	Electronics problem.	Check TE driver fuse (replace as required). Check control signals.
	RTD sensor problem.	Replace as required.
	TE modules faulty.	Consult factory.
	High ambient temperature.	Increase sample flow. Check lower analysis enclosure vent.
“No Autozero” alarm.	Leaking purge valve.	Perform cell leak test (replace purge valve as required).
	Clogged drain line.	Check drain line for clogs and atmospheric pressure reference.

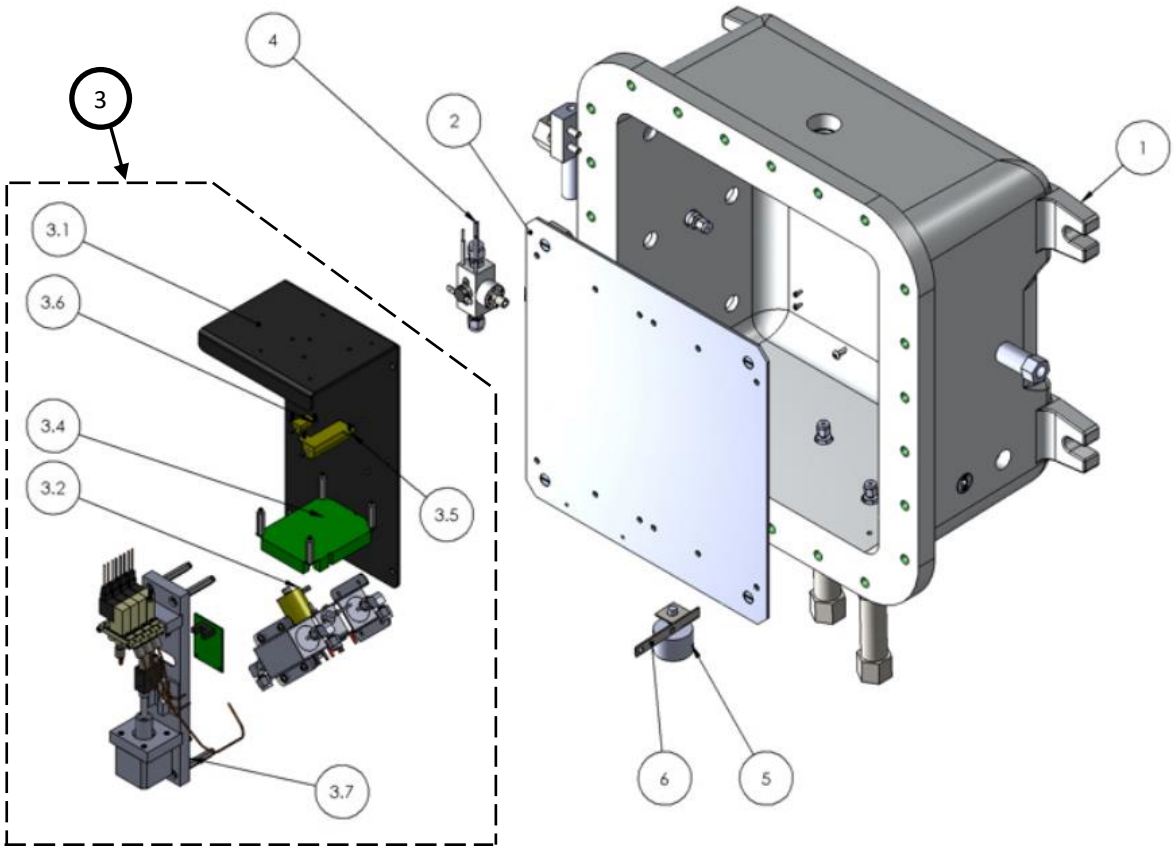
Assembly Drawings

Upper Control Enclosure



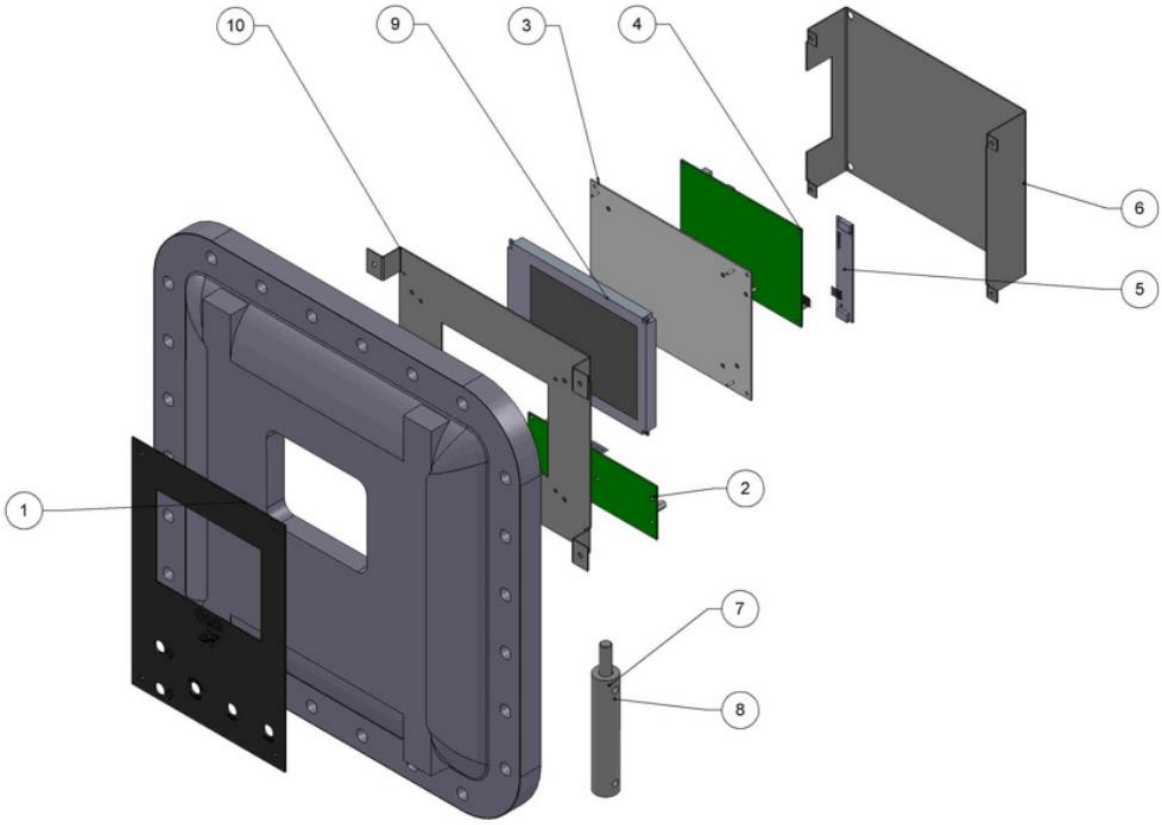
Item No.	Part Number	Description	Qty
1	620037	Power Supply (+5, +/- 12 VDC)	1
2	620076	Line Filter	1
3	798115	Main Power Distribution PCB	1
4	701910	Mounting Plate for Main PCB	1
5	701911	Fish Paper for Main PCB	1
6	700795	ADALET Switch Cover Plate	1
7	620149	Selector Switch	1
8	620150	Contact Block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

Lower Analysis Enclosure



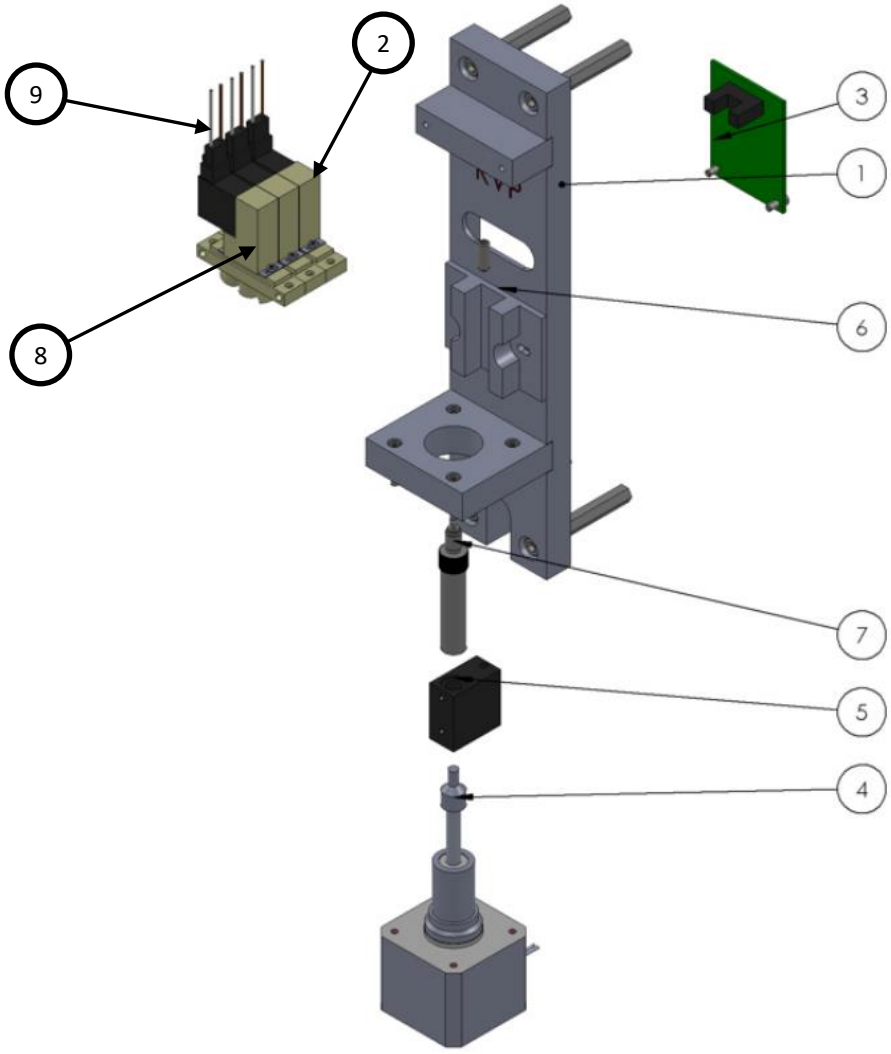
Item No.	Part Number	Description	Qty
1	680009	Lower Explosion Proof Enclosure	1
2	700524	Lower Enclosure Mounting Plate	1
3	700406	RVP/VL20 Analysis Module	1
3.1	700329	Mounting Plate	1
3.2	700402	Detection Cell Assembly	1
3.4	700115	RVP Interface PCB	1
3.5	600001	5 Ohm / 50 Watt Resistor	1
3.6	600002	33 Ohm / 10 Watt Resistor	1
3.7	701474	Syringe & Valve Assembly	1
4	700819	Micro Filter	1
5	660005	Float Switch	1
6	701289	Float Bracket	1

Control Enclosure Door



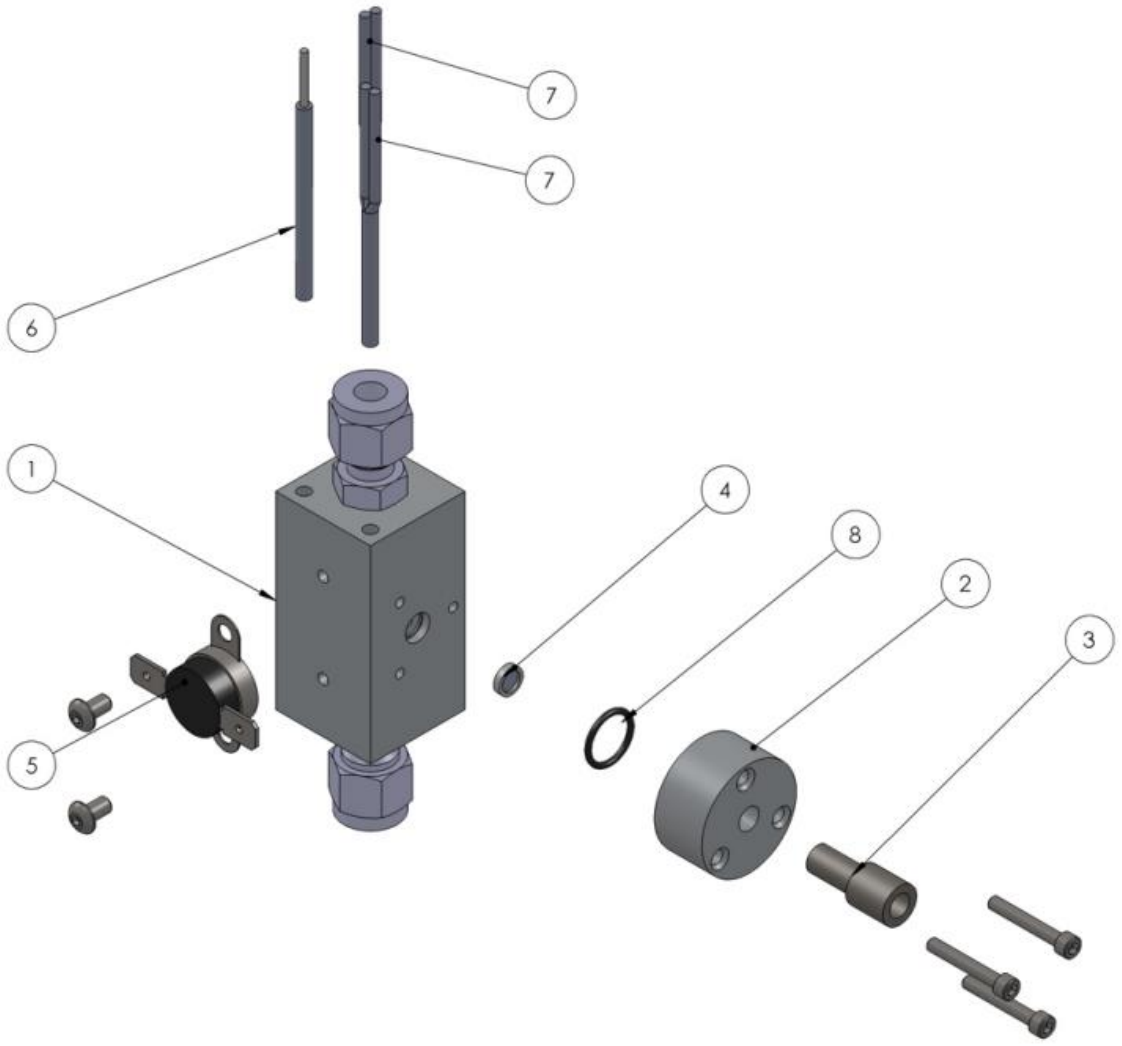
Item No.	Part Number	Description	Qty
1	701231	Keypad Overlay	1
2	798030	Magnetic Keypad	1
3	700062	Display Mounting Plate	1
4	798063	Display Controller PCB	1
5	620600	Backlight LED Driver PCB	1
6	700793	Display Cover	1
7	700701	Magnetic Pencil Assembly	1
8	700348	Magnetic Pencil Holder	1
9	620583	Graphics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

Syringe Assembly



Item No.	Part Number	Description	Qty
1	701049	Stepper Motor Mounting Assembly	1
2	651139	3-way solenoid valve	1
3	700100	Optical Sensor PCB	1
4	640001	Syringe Stepper Motor	1
5	700338	Syringe Adapter	1
6	702202	Syringe Guide, Teflon Support	1
7	690023	1 mL Syringe	1
8	651138	2-way solenoid valve	2
9	651140	Solenoid Cable	3

Micro Filter Assembly



Item No.	Part Number	Description	Qty
1	700807	Micro Filter Body Weldment	1
2	700818	Cap / Micro Filter	1
3	690102	14-28 Super Flangeless Nut	1
4	650159	20 Micron SS Frit	1
5	701288	Heated Micro Filter Thermostat	1
6	660001	RTD Sensor	1
7	620123	Micro Filter Heater	2
8	650166	Micro Filter O-Ring	1

Chapter VIII: Spare Parts

Spare Parts Kits

Description	Part Number
1-YEAR PARTS KIT	***700175***
Kalrez O-ring (1 each)	650003
1 mL Sample Syringe (2 each)	690023
RVP Cell Tubing Kit (2 each)	690003
2-YEAR PARTS KIT	***700176***
2-way Solenoid Valve (1 each)	651138
3-way Solenoid Valve (1 each)	651139
Kalrez O-ring (2 each)	650003
1 mL Sample Syringe (4 each)	690023
RVP Cell Tubing Kit (4 each)	690003
2-way & 3-way Solenoid Cable (2 each)	651140

Replacement Parts

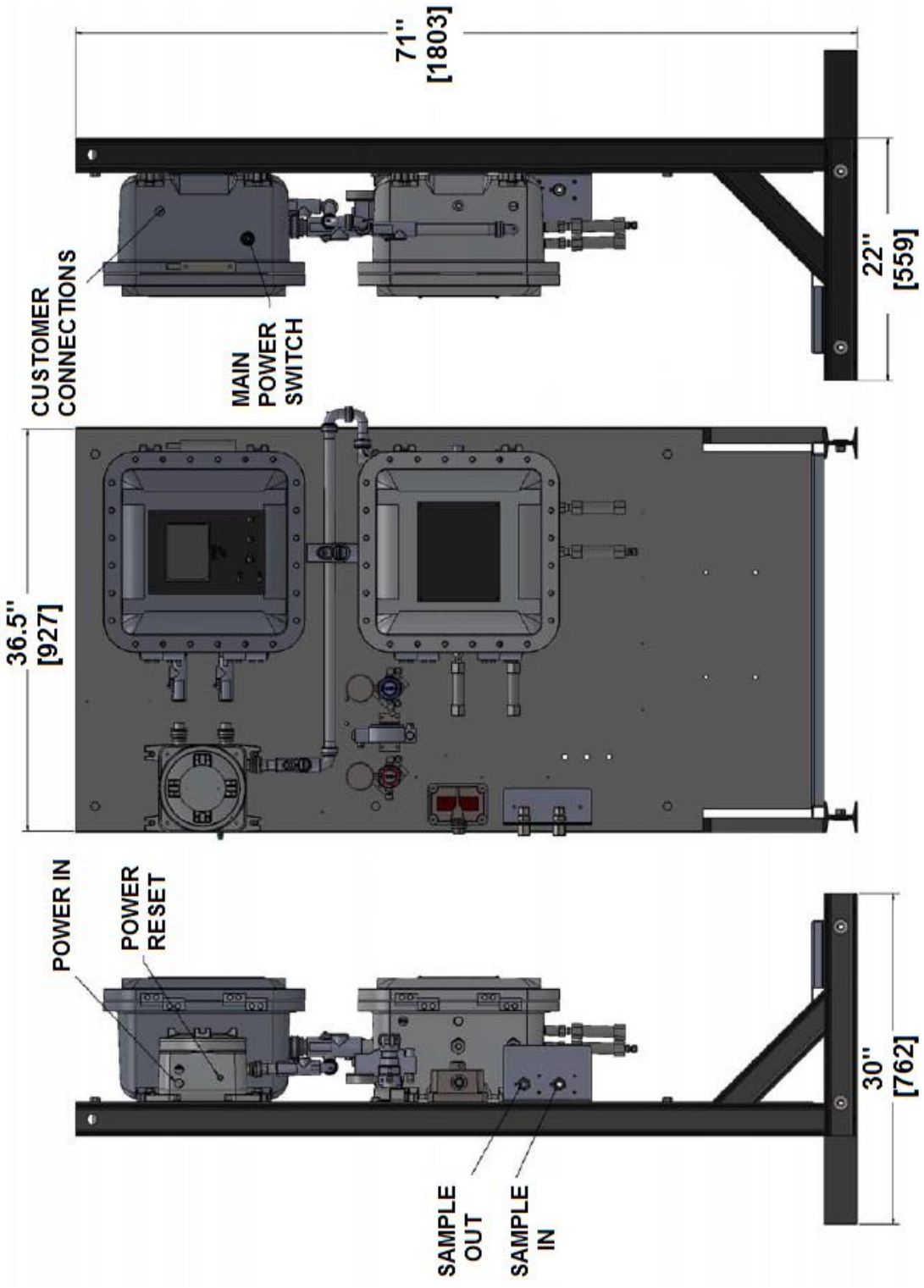
Description	Recommended Quantity	Part Number
Fuse (250VAC, 15A)	1	600051
Fuse (250VAC, 10A)	2	600052
Power Supply (+5, +/- 12VDC)	1	620037
Power Supply (+24 VDC)	1	620038
Magnetic plug agitator	1	630001
Syringe stepper motor	1	640001
Agitator drive magnet	1	650002
Kalrez O-ring	1	650003
2-way solenoid valve	1	651138
3-way solenoid valve	1	651139
Solenoid Cable	1	651140
RTD sensor	1	660001
1 mL sample syringe	1	690023
RVP cell tubing kit	1	690003
Absolute pressure sensor	1	700311
Optical Sensor PCB	1	700100

RVP Interface PCB	1	700115
Magnetic Keypad	1	798030
Graphics Display	1	620583
Display Controller PCB	1	798063
Backlight LED Driver PCB	1	620600
Main PCB	1	700318
RVP Adapter PCB	1	700321
Main Power Distribution PCB	1	798115
RVP/VL20 Analysis Module	1	700406

	**LINK: RVP Analyzer spare parts can be found at BARTEC Shop website in Vapor Pressure category:** **https://bartecshop.com/analyzers-and-sensors/**

Chapter IX: Drawings & Schematics

Dimensional Drawing



Flow Schematic