ABB MEASUREMENT & ANALYTICS | 2101510MNAH

# Gas Chromatograph User Manual
## NGC8200/PGC1000


Measurement made easy

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# Additional information

Additional free publications are available for download at www.abb.com/analytical.

**Table 0-1: Related documentation**

| Document | Document number |
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| NGC8206 | **2101164** |
| PGC1000 | **2101183** |
| **User drawings** | |
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| NGC8200 Power Option 12 VDC solar power | **2104133** |
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| Return Material Authorization (RMA) request form | **2108308** |

# Compliance

## Cyber security

This product is designed to be connected, and communicate information and data, via a network interface. All ABB products should be connected to a secure network. It is the customer's sole responsibility to provide, and continuously ensure, a secure connection between the product(s) and the customer network as well as a secured and controlled physical access to the hardware equipment, or any other network (as the case may be). The customer shall establish and maintain appropriate measures (such as, but not limited to, the installation of firewalls, the application of authentication measures, encryption of data, installation of antivirus programs, etc.) to protect the products, the network, its system and its interfaces against any kind of security breaches, unauthorized access,

interference, intrusion, leakage and/or theft of data or information. ABB Inc. and its affiliates are not liable for damages and/or losses related to security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

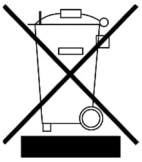
Although ABB provides functionality testing on the products and updates it releases, the customer should institute its own testing program for any product updates or other major system updates (to include, but not limited to, code changes, configuration file changes, third party software updates or patches, hardware change-out, etc.) to ensure that the security measures the customer has implemented have not been compromised and that the system functions in the customer's environment as expected.

## Malware prevention

Recommendation: As with any downloaded software, scan ABB embedded software packages using a malware prevention solution.

## Waste Electrical and Electronic Equipment (WEEE)

EU Directive 2012/19/EU
ABB Industrial Automation, Measurement and Analytics is committed to actively protecting the environment. Do not dispose of WEEE as unsorted municipal waste. Collect WEEE separately. Participation in the management of WEEE is critical to the success of WEEE collection.



Electrical and electronic equipment marked using the crossed-out wheeled bin symbol shall not be mixed with general household waste. Correct disposal at a recycling facility will help save valuable resources and prevent potential negative effects on health and the environment. These steps ensure compliance with the Waste Electrical and Electronic Equipment (WEEE) Directive.

Waste electrical and electronic equipment (WEEE) shall be treated separately using the national collection framework available to customers for the return, recycling, and treatment of WEEE.

# Safety

Read these instructions carefully before installation and commissioning. These instructions do not contain all details on all types of devices and do not explain all assembly, operating, or maintenance scenarios. Ask the manufacturer for further information.

Observe warning signs on packaging and on the device. Safety symbols are in accordance with IEC 60417 or ISO 7000.

Assign only qualified and authorized specialists for the assembly, electrical connection, commissioning, and maintenance of the equipment. Specialist qualifications include:

- Training, instruction, and authorization to operate and maintain devices or systems according to safety engineering standards for electrical circuits, high pressures, and aggressive media
- Training in accordance with safety engineering standards regarding maintenance and use of adequate safety systems

**WARNING:** According to ISO 9996, use only sufficiently insulated tools for electrical connection.

Also consider the following regulations:

- The applicable standards and safety regulations concerning the construction and operation of electrical installations
- The regulation on technical working materials (safety guidelines for tools)
- The regulations and recommendations relating to explosion protection
- The recommendations for safe working in the case of installation in a Safety Integrity Level (SIL) loop.
- The regulations and codes that apply in the country of use

# Potential safety hazards

**WARNING – Bodily injury.** Read and follow instructions contained in this guide before and during equipment installation. Failure to do so could result in bodily injury or equipment damage.

**WARNING – Bodily injury**. A grounding conductor may or may not be required depending on the hazardous classification. If required, any interruption of the grounding conductor inside or outside the equipment, or a loose connection of the grounding conductor, can result in a dangerous device. Intentional interruption of the grounding conductor is not permitted. If a grounding conductor is required, it should be connected to the grounding terminal before any other connections are made.

Before applying the power, check that the operating voltage listed on the equipment agrees with the power being connected to the equipment.

**WARNING – Bodily injury.** Apply power only after the procedures are complete. Technicians must perform the procedures in order: plan, install, wire, verify the power-on sequence, and configure. Do not open the equipment to perform any adjustments, measurements, maintenance, parts replacement or repairs until all external power supplies have been disconnected. When opening covers or removing parts, exercise extreme care as live parts or connections can be exposed. Capacitors in the equipment can still be charged even after the device has been disconnected from all power supplies.

**WARNING – Bodily injury.** The device can be operated at high levels of pressure and with aggressive media. Serious injury and/or considerable material damage can be caused if this device is handled incorrectly.

**DANGER – Explosion risk. Serious damage to health / risk to life**. Ensure there is no hazardous atmosphere present when performing maintenance on the device. Do not separate components when energized. This applies to all connectors and connections, cabling, and wiring. If the device is installed or to be installed in a hazardous location, the technician must follow the guidelines stipulated in the certification drawings shipped with this device.

**NOTICE – Equipment damage or loss of data.** Potential electrostatic charging hazard: clean only with a damp cloth.

# 1. Product description

## 1.1 Overview

The ABB Natural Gas Chromatograph (NGC) and Process Gas Chromatograph (PGC) continually analyze natural gas or process gas streams on-site, determine composition and calorific value, and store the analysis information.

## 1.2 System components

This compact device requires minimal installation time and is configured and calibrated at the factory.

A typical installation has the following components:

- Analyzer: a single analyzer supports a single or multiple streams (up to 4)
- Sample probe: captures the gas sample from the pipeline
- Sample conditioning module(s): prepares the sample before it enters the analyzer
- Carrier gas: assists the flow of the gas sample
- Calibration gas: gas blend with detectable components to determine baseline analysis
- Tubing: gas lines to deliver and vent gas to and from the analyzer.

Figure 1-1 shows the analyzer in a typical single stream pipeline installation. This scenario includes a sample probe, an optional sample conditioning module, and carrier and calibration gas. Lines for the entry of the gas sample, carrier gas, and calibration gas are installed into the analyzer's feedthrough inlets. The sample probe captures the gas sample which is fed to the sample conditioning module for processing before it enters the analyzer. Carrier gas assists the gas sample flow through the device.

**Figure 1-1: Typical single stream installation**

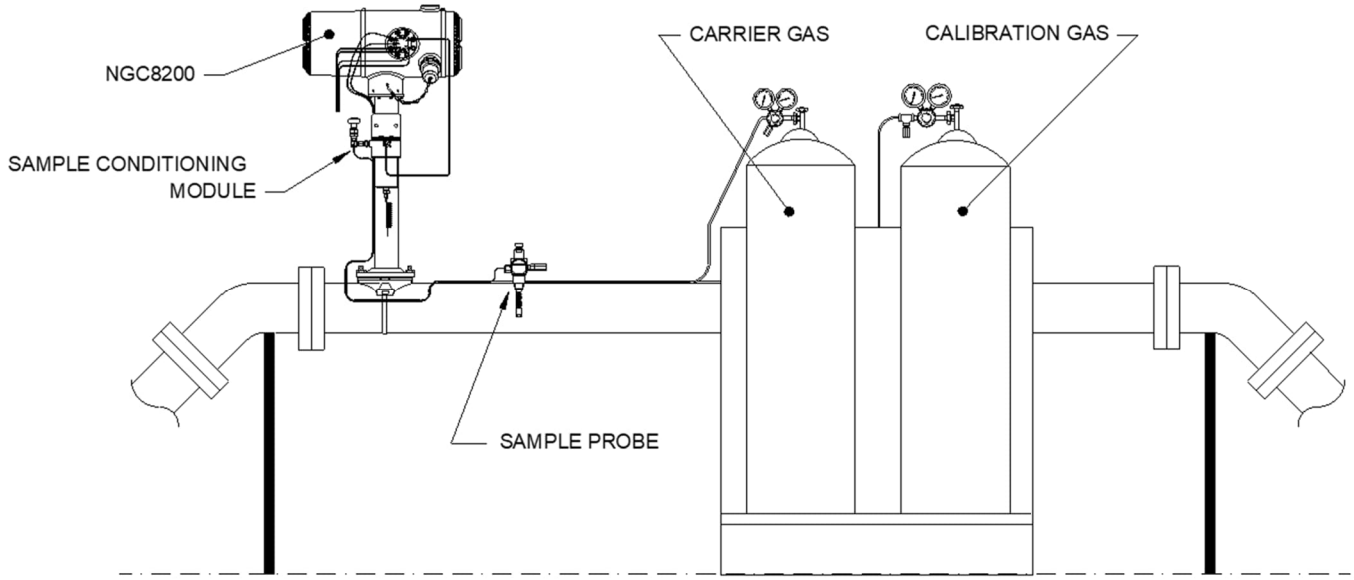
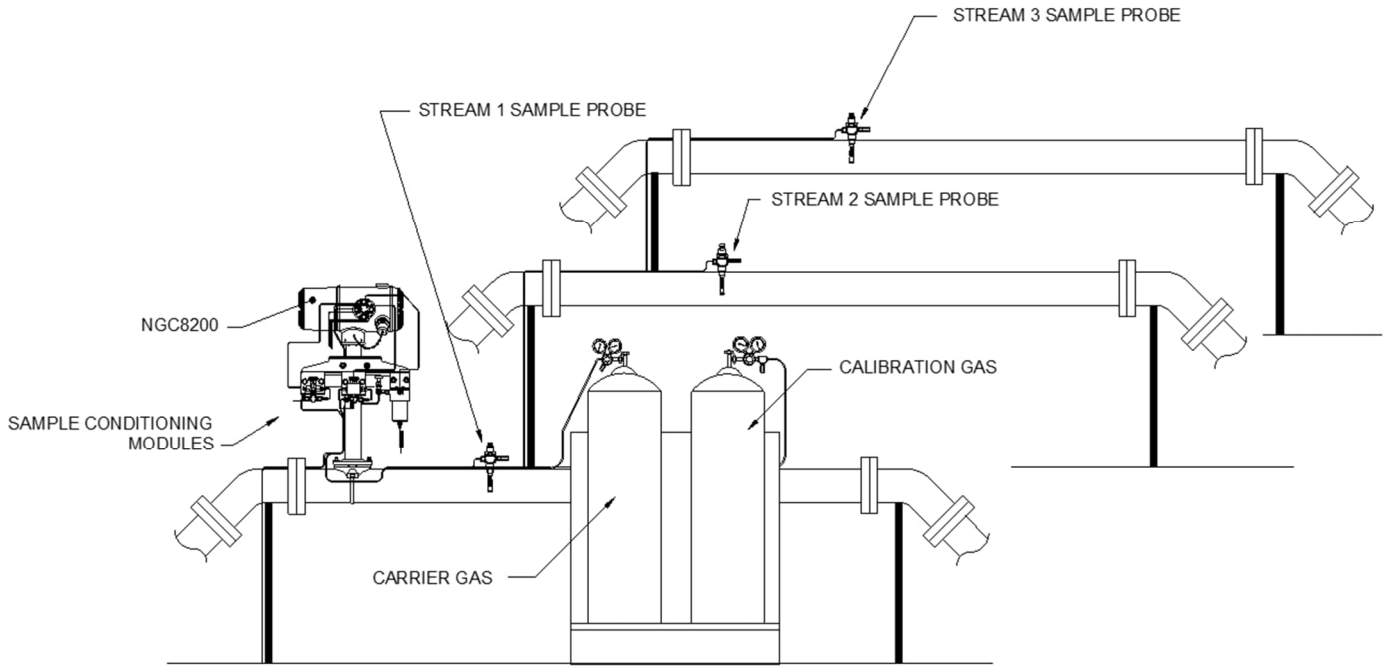



Figure 1-2 shows the analyzer in a multiple stream pipeline installation. Note that this illustration shows the analyzer mounted on the first pipeline. It could be mounted on the middle pipe run. The mounting location of the analyzer depends on the distance to each of the sample probes. Consider tubing length requirements to determine appropriate mounting location in a multi-stream system.

**Figure 1-2: Typical multi-stream installation**




## 1.3 Principle of operation: sample processing

To process a sample, a gas sample is extracted from the pipeline. The sample conditioning module removes any particulates or liquids entrained in the sample. The sample conditioning module also acts as a bypass loop to ensure that sample lag time is minimized. The sample is then transported to the analyzer and analyzed using gas chromatography.

Analysis results provide mole percent values for each gas component. These values are used to perform energy calculations. Calculated values include: gas compressibility, real relative density, Btu/CV value, liquid GPM, Wobbe index, methane number and several other optional calculated values. Gas compressibility selections include NX-19, AGA-8 detail, single virial summation factor, ISO summation factor and none (a factor of one is used).

Analysis results are stored in the analyzer. Once a sample processing cycle is completed, the sample is vented from the analyzer. Analysis results can be collected directly from the analyzer using the operator interface (PCCU) or the analyzer can be configured to transmit results to other systems using any of the supported communication protocols.

# 2 Hardware description

**Table 2-1: Analyzer specifications**

| | | 12 VDC | | 24 VDC |
|---|---|---|---|---|
| | **No. aux. heater** | **With aux. heater** | **No aux. heater** | **With aux. heater** |
| **Supply Voltage** | 10.5–16 VDC | 10.5–16 VDC | 21–28 VDC | 21–28 VDC |
| **Recommended AC Power Supply** | 14.5 V | 14.5 V | 25 V | 25 V |
| **Maximum Instantaneous Current** (see note 1) | 7 Amp | 8.2 Amp | 3.5 Amp | 5.2 Amp |
| **Avg. Power Consumption After Startup** (see note 2) | Up to 7 Watts | Up to 53 Watts | Up to 7 Watts | Up to 64 Watts |
| **Environment Temperature** | Storage | | -22 °F to 140 °F (-30 °C to 60 °C) | |
| | Normal Operation | | 0 °F to 131 °F (-18 °C to 55 °C) | |
| | With environmental enclosure | | -40 °F to 131 °F (-40 °C to 55 °C) | |
| **Repeatability** | ±0.125 Btu at 1,000 Btu (±0.0125%) ambient;<br>±0.25 Btu at 1,000 Btu (±0.025%) over temperature range of 0 °F to 131 °F (-18 °C to 55 °C) | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Helium Carrier** | Consumption rate: 12 ml/minute typical to 20 ml/minute maximum | | | | |
| **Medium** | 800 to 1500 Btu per standard Cubic Foot (29.8 to 44.6 megajoules/meter$^3$) with less than 100 PPM H2S | | | | |
| **Analysis time** | Approx. 5 minutes; interval between cycles is adjustable | | | | |
| **Calibration/validation streams** | Up to 2 dedicated (reduces sample stream for each dedicated calibration streams). Must use dedicated stream(s) for Auto-Cal feature. | | | | |
| **Sample streams** | Up to 4 (with manual calibration streams) | | | | |
| **Construction** | NEMA/Type 4X (IP56)<br>Aluminum Alloy with white polyester powder coating.<br>Explosion-Proof, see specification sheet for certifications. | | | | |
| **Installation time** | Requires 2-3 hours for installation, minimum 8 hours run time for repeatability. | | | | |
| **Mounting** | Pipe run, free-standing pipe, shelf, and environmental enclosure | | | | |
| **NGC8200 and PGC1000 dimensions** | | **Width** | **Height** | **Depth** | **Weight** |
| | US | 9.5 inches | 8.82 inches | 15.64 inches | 29 lbs. |
| | Metric | 241.3 mm | 224.0 mm | 397.3 mm | 10.8 kg |

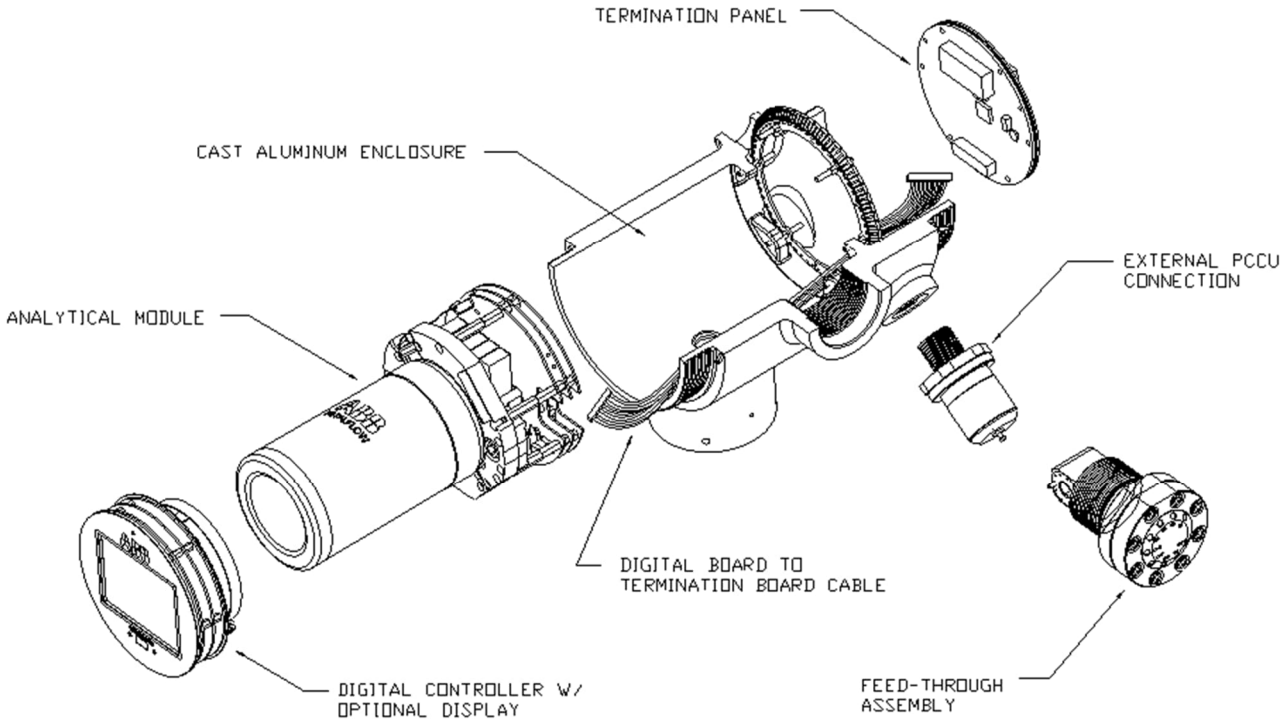
**Notes:**
1. Usually experienced at startup. Use this for power supply sizing requirements (includes approx. 20% buffer and is calculated for maximum allowable power supply voltages).
2. At recommended AC power supply voltage. Highly temperature dependent, with feed-through heater operating continuously. Usually occurs at only the coldest ambient operating temperature, i.e., 0 °F (-18 °C).

## 2.1 Analyzer standard hardware features

The analyzer features a rugged, field-ready design. Hardware features include:

- Enclosure
  - Cast aluminum housing with six exterior hubs
  - Powder coating
  - Weatherproof construction
- Modular design (see Figure 2-1)
  - Digital controller assembly
  - Analytical module with compact design and single bolt replacement
  - Feed-through assembly with flame path arrestors
  - Termination panel
- Electronics
  - 32-bit digital controlling electronics (no analog control loops)
  - Low power operation
  - Dual digital carrier pressure regulation
  - Digital temperature control
  - Digital detector electronics
  - Low EMI/RFI design
  - Operates on Windows CE
- Auto-start with diagnostics
- Factory calibrated

**Figure 2-1: Analyzer modular design**




The analyzer's modular design is suited for quick repair. All modules are easily replaced in the field in minimal time. See section 10.4.3 for a recommended spare parts list.

## 2.2 Cast aluminum enclosure

The explosion-proof enclosure consists of a cylindrical shaped cast aluminum housing, powder coated, with front and rear end caps for access to internal components. Figure 2-2 through Figure 2-5 show the outline dimensions of the NGC8200 and PGC1000.

The end caps have precision-engineered threading. The enclosure and all fittings, including feed-through, MMI connection, and breather, are tested to Nema/Type 4X. Unauthorized removal of the end caps is protected with a 1/16" hex socket set screw on each end cap.

Entries in the explosion-proof enclosure constitute a flameproof joint. Flameproof joints, including threaded entries in the explosion-proof enclosure, are not intended to be repaired.

This enclosure may be pipe-mounted on a meter run using a pipe saddle, stand-alone pipe-mounted, shelf-mounted, or optionally mounted in an environmental enclosure. The device may be directionally positioned using 1/8" hex socket set screws located in the neck of the enclosure.

## 2.2.1 Exterior enclosure dimensions

**Figure 2-2: NGC8200 and PGC1000 enclosure face**

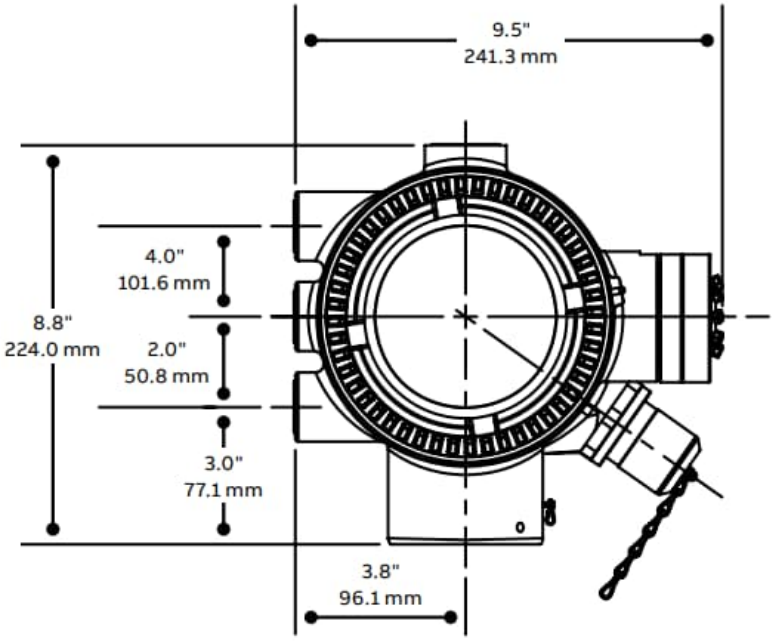



**Figure 2-3: NGC8200 and PGC1000 enclosure left side**

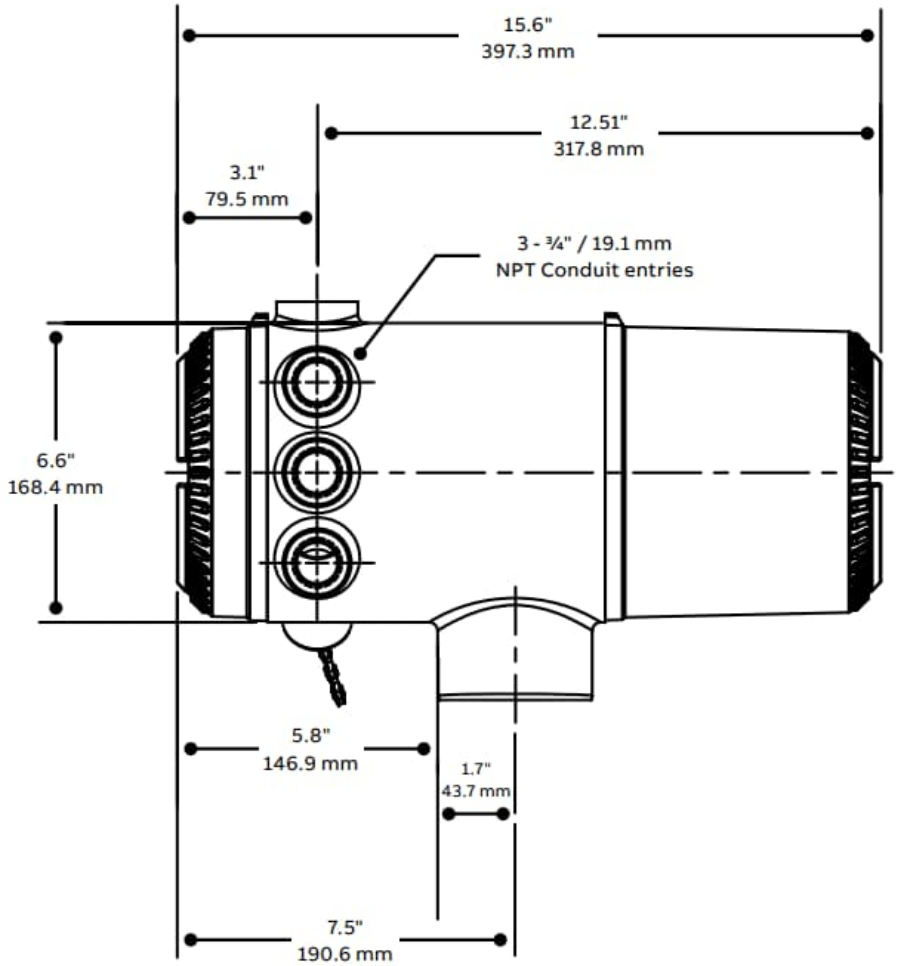


**Figure 2-4: NGC8200 and PGC1000 enclosure right side**

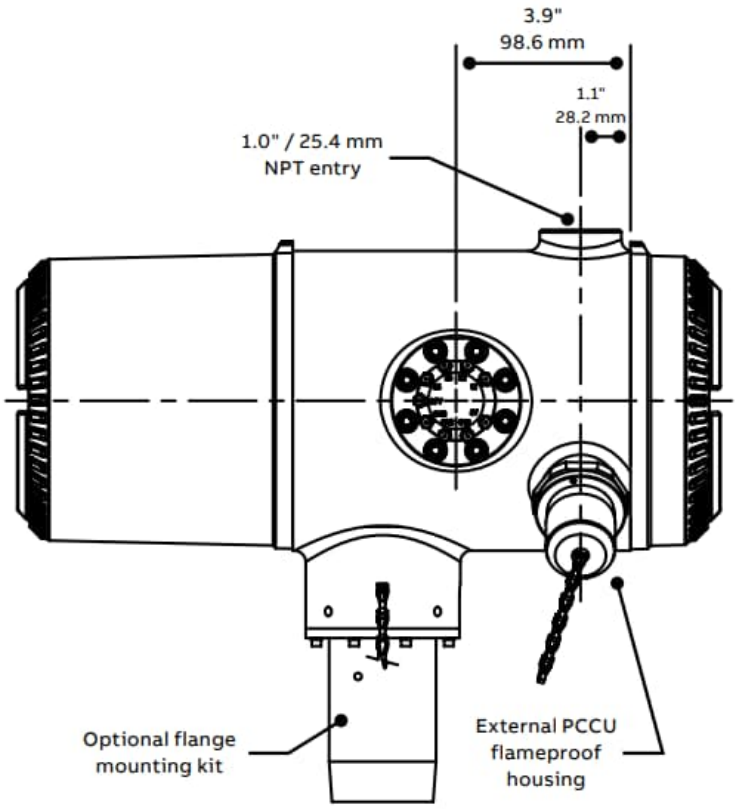
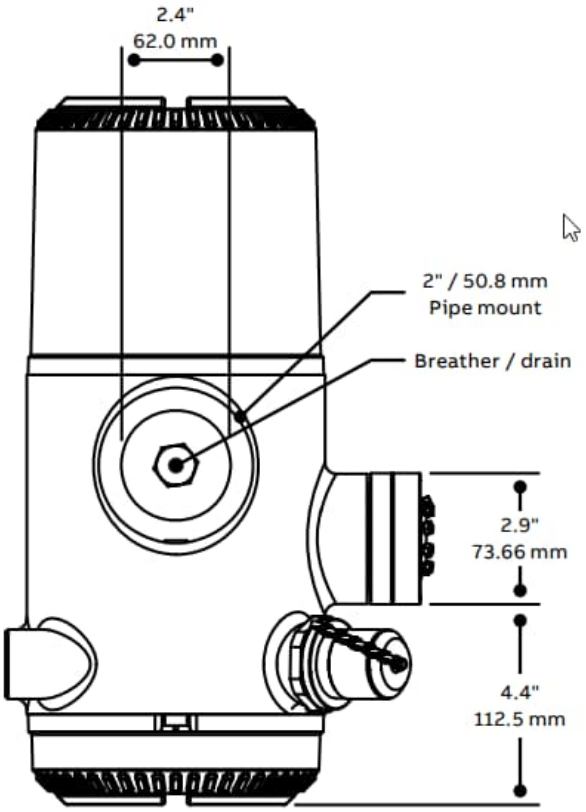


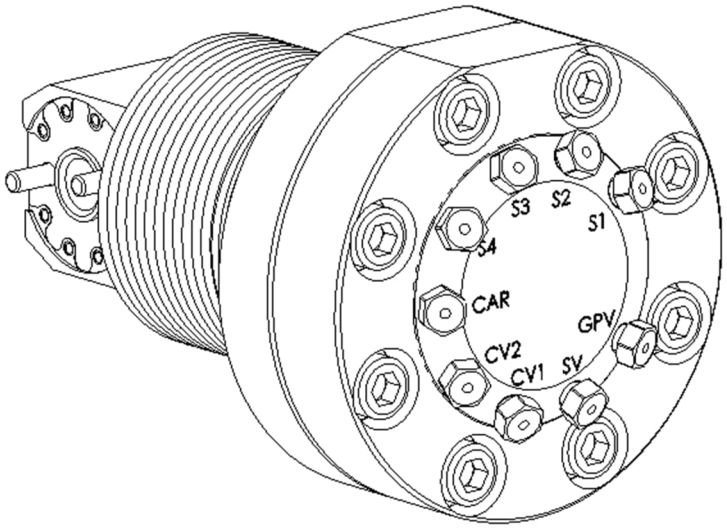

**Figure 2-5: NGC8200 and PGC1000 enclosure underside**



## 2.3 Feed-through assembly

Independent sample streams are connected to the analyzer directly to the feed-through assembly (see Figure 2-6), or through an optionally installed sample conditioning module. The feed-through assembly also serves as the connection for carrier gas and calibration streams.

**Figure 2-6: Analyzer feed-through assembly**




**NOTICE – Equipment damage risk.** The 0.5 micron filters should not be considered a replacement for the primary filtering system. Optional sample conditioning modules are designed for this purpose.

### 2.3.1 Configurations

The feed-through assembly comes in three configurations:

- Without auxiliary heater
- With 12 VDC auxiliary heater
- With 24 VDC auxiliary heater

The auxiliary heater has a replaceable temperature sensor cable which connects to the analytical module. Note that this cable comes in two configurations: 12 VDC and 24 VDC.

### 2.3.2 Inlets

Feed-through assembly inlets take in the stream gas samples and carrier gas. They all have internal, replaceable 0.5 micron filters. The inlets are:

- 4 process stream inputs (S1, S2, S3, and S4)
- 1 carrier gas input (CAR)

**NOTICE – Equipment damage risk.** The 0.5 micron filters should not be considered a replacement for the primary filtering system. Optional sample conditioning modules are designed for this purpose.

### 2.3.3 Vents

Feed-through assembly vents are outlets from which processed samples and used carrier gas exit the analyzer. They do not have filters but require vent tubing to be attached and routed accordingly. The vents are:

- 2 column vents (CV1 and CV2)
- 1 sample vent (SV)
- 1 gauge port vent (GPV)

## 2.4 Analytical module

The analytical module assembly is comprised of a manifold, the analytical processor assembly, and the GC module. The entire analytical module can be removed and/or replaced by loosening a single bolt.

The analytical module comes in two configurations: 12 VDC and 24 VDC.

**Figure 2-7: Analytical module**


## 2.4.1 GC module

Figure 2-8 shows the GC module with the oven wall removed. The module has the following components: columns, chromatographic valve, and GC module circuit board. The valve controls the flow of gas within the system. The columns perform the separation of the gas into component parts for analysis. The GC module circuit board contains the sensors for the carrier pressure regulators, the sample pressure sensor, and the thermal conductivity detectors (TCDs) which detect the different gas components as they leave the GC columns. It also contains an EEPROM or FLASH memory for storage of calibration and characterization information of the module and its sensors.

Replacement of this component is by single bolt removal.

**Figure 2-8: GC module**


## 2.4.2 Analytical processor/manifold assembly

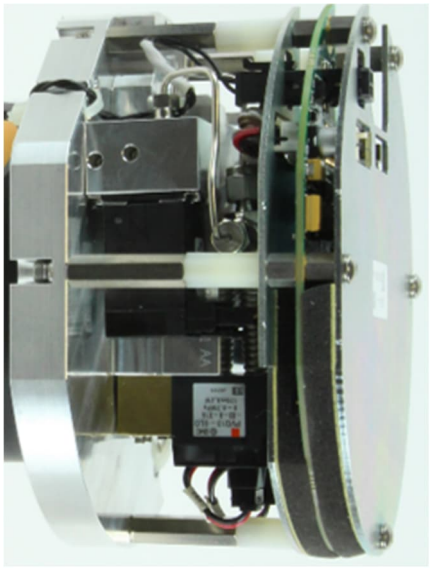
Figure 2-9 shows the analytical processor/manifold assembly. This assembly is equivalent to a complete analytical module without a GC module. The manifold portion of the assembly is comprised of the manifold plate, heater, valves, and various cables to other major components. The manifold plate and heater maintain constant temperature for the GC module and columns. The valves control the stream processing, carrier, and calibration gases. The cables complete the information chain from the GC module to the analytical processor and the digital controller assembly.

On the bottom of the assembly is the analytical processor assembly. The assembly contains the analytical processor board, shield and mounting plates, and mounting standoffs. The analytical processor board provides real-time system control and measurement of the processes within the analyzer. It does this by interfacing with the sensors in the GC module (and optional feed-through temperature sensor) as well as controlling the carrier pressure regulator valves, sample stream valves, the pilot valve, and the heaters. The data generated by the analytical processor is passed to the digital controller board via a high-speed serial interface.

The analytical processor board has two status LEDs used for troubleshooting. The red LED indicates that the board is powered on. If the board is powered down by the digital controller, or has no power, this LED is off. The yellow LED indicates that the analytical processor's CPU has initiated its program successfully and is controlling its processes as directed by the digital controller. This LED should be flashing at a frequency of 20 to 40 Hz during normal operation. If this LED is off or is on solid with no flashing, then the software in the analytical processor is not running properly.

This is a field-replaceable part.

**Figure 2-9: Analytical processor/manifold assembly**



## 2.5 Digital controller assembly with VGA display

The Digital Controller assembly (Figure 2-10) contains the digital electronic board, mounting assembly and a VGA display.

The digital controller provides control parameters to the analytical processor board and stores and processes the data sent from the analytical processor board. The digital controller also processes communication with other devices.

The digital electronic board features:

- 16 MB Pseudo Static Ram (Application) with lithium battery
- 32 MB NAND Flash Memory (Boot/Application/Storage)
- 4 MB Static CMOS Memory (Storage)
- 1 secure digital card socket (with up to 4 GB removable storage optional)

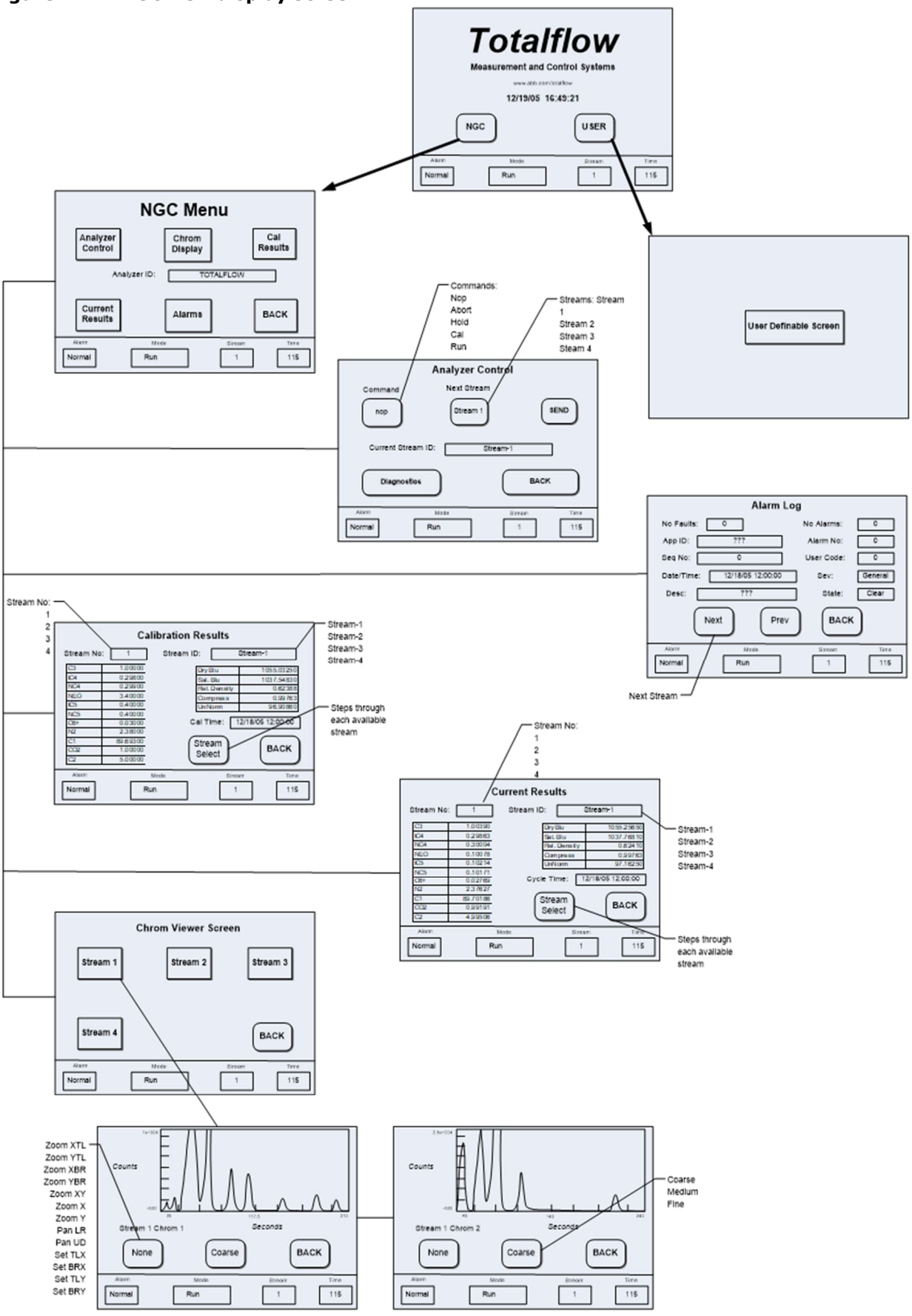
**Figure 2-10: Digital controller assembly with display**

The display board provides a VGA monochromatic display to monitor the process and results. It also provides six magnetic switches to allow a user to navigate through various screens of data and control the processes (stop operation, start operation, and calibrate). Navigate screens using the display magnet.

The VGA display features:

- VGA display circuit board
- Two LED status indicators, user-programmable. The default left LED flashing light indicates a fault alarm, and a solid light indicates a warning alarm. Right LED solid light indicates device is not in auto run mode.
- User interface, with hall-effect magnet navigation, for monitoring the analyzer's operation.

**Figure 2-11: NGC VGA display screen**



## 2.6 Termination board

The termination board provides ports or terminals for power, internal or external communication, and I/O connections (Figure 2-12). It features transient protection, a voltage regulator for the digital controller, positive temperature co-efficient fuses (PTC) and many other safeguards to protect the remainder of the system from electrical damage. This board supports all outside communications and I/Os. The termination board is low cost and field-replaceable. It operates on either 12 VDC or 24 VDC. Figure 2-12 shows board components on the primary and secondary sides.

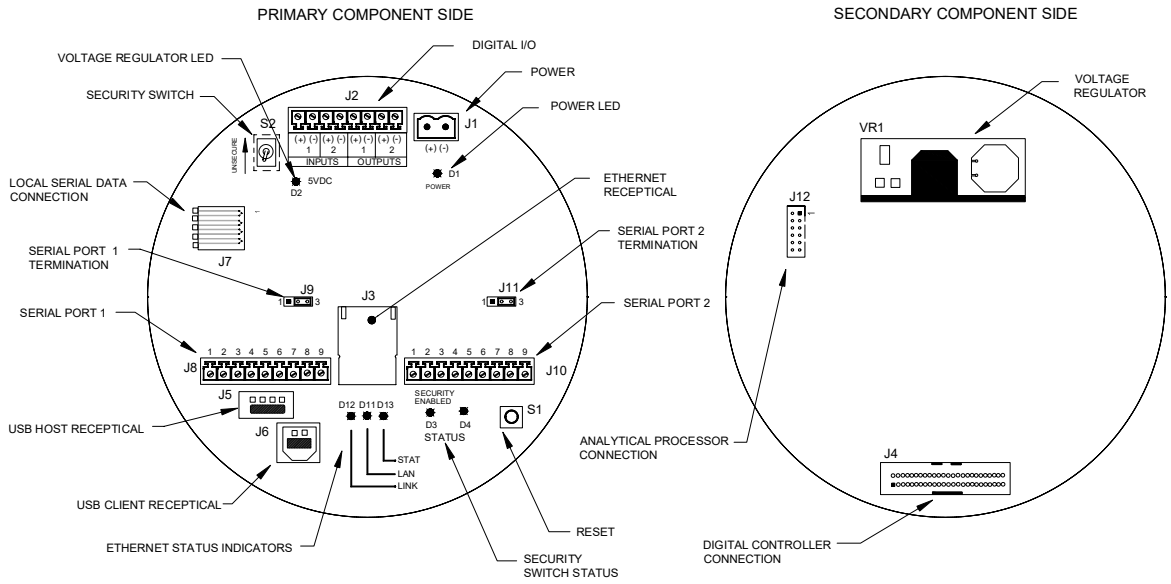
The primary component side (left on Figure 2-12) is accessible at the back of the analyzer after removal of the rear cap. It provides interfaces for power, I/O, external communication connections, and local communication options. This side features:

- Power connection and indicators:
  - Power terminal connector (J1)
  - 1 Power monitor status indicator LED (D1)
  - 1 Voltage Regulator (5 VDC) status indicator LED (D2)
- I/O connections:
  - 2 DIs and 2 DOs (J2)
- Local communication interface (MMI) for operator access (depending on purchased option, onboard interface connects internally to external explosion-proof port):
  - USB host interface (J5) or
  - Optional RS-232 (J7)
- Communications:
  - Ethernet interface (J3) with 3 LED status indicators (D11, D12, D13)
  - 2 serial ports (RS-232/RS-422/RS-485 software selectable) (J8 and J10)
- Onboard security:
  - 1 Security Toggle Switch (S2)
  - 1 Security Switch Status indicator LED (D3), software programmable
- 1 status indicator LED (software programmable, D4)
- Reset button (S1)

The secondary component side (right on Figure 2-12) faces the interior of the analyzer and provides interfaces for internal connections.

- Transient protection
- EMI/RFI protection
- PTC fuses
- Voltage regulator for digital controller (VR1)
- Connector for the Analytical Processor Board (J12, internal connection)
- Connector for the Digital Controller Board (J4, internal connection)

**Figure 2-12: Termination board**



## 2.7 Local communication options

The analyzer supports local communication for operator access through an explosion-proof port MMI port. The available standard option is a USB port. An RS-232 port is optional (note that this is considered a legacy interface with a lower communication speed; additional adapters may be needed for connection).

Local connection during initial installation is also available through the Ethernet port, but this requires access to the terminal board inside of the analyzer (removal of the enclosure's rear cap is required). It is recommended that initial connection for commissioning is made through the USB port.

All port types are supported by the user interface (PCCU32).

# 3 Embedded software and user interface

The embedded software and host-based user interface (UI) provide options to configure, operate, and collect data from the analyzer.

## 3.1 Embedded software

The analyzer's embedded software consists of the operating system (OS) and the Flash (Application) components. The flash compiles all applications required for the operation of the analyzer. The analyzer supports upgrades of either or both components depending on the features or fixes introduced with periodically released update software packages.

The software supports the following:

- Audit quality historical data
- Multiple calculation options
- Selectable engineering units
- Analysis reporting
- Operational alarms
- Communication protocol selection
- Bi-level security (access to analyzer is protected by pass code or Role Based Access Control [RBAC] admin-defined user credentials)

Options for configuration, access, control, reporting and data communications are available on the user interface (PCCU).

## 3.2 User interface (PCCU32)

PCCU32 is the host-based user interface to the analyzer. It runs in a Windows® environment and offers options for access, configuration, control, reporting, and data communications. It supports the following:

- Communication to the analyzer through local or remote connections. It supports standard serial, USB, and Ethernet connections.
- Several device operation and maintenance utility functions such as a loader for embedded software updates, device configuration and data backup, and historical data collection. All functions are available through local or remote connections.
- Provides online help. Context sensitive help topics display by clicking **Help** on each operation or configuration screen associated with the analyzer.

For instructions to download the latest version of PCCU32, see section 6.1 Download PCCU32 from the ABB website.

## 3.3 Audit quality data

The embedded software supports an historically accurate file system that uses date- and time-stamped events to create an audit quality data structure. The analyzer compiles historical data that can be used for custody transfer needs, verify analyzer operation over time and provide a limited amount of historical data as a backup for communication failures.

The device can collect, analyze, and retain (default) stream data for the last 480 analysis cycles, retain the last 35 days of daily stream averages, the last 480 diagnostics reports, the last 480 alarms and the last 480 events. This default can be reconfigured by the user from PCCU32. The default configuration is as follows:

- Analysis cycles for the last 480 analysis cycles (default):

- Normalized components
- Un-normalized total
- Ideal Btu/CV
- Real Btu/CV: wet (inferior CV) and dry (superior CV)
- Relative density (specific gravity)
- Density
- GPM
- Wobble index: dry Btu (superior CV)
- Alarms

— Stream averages
- Last 840 hour averages
- Last 35 daily averages
- 14 monthly average records

— Diagnostic reports for the last 480 analysis cycles:
- Selected peak times
- Selected peak areas
- Ideal Btu/CV
- Carrier regulator pressure
- Oven temperature
- Enclosure temperature
- Sample pressure
- Detector noise values
- Detector balance values

— Audit Logs
- Last 100 alarms
- Last 100 events

## 3.4 Compressibility options

User-selectable measurement calculations may be defined individually per stream and include:

— AGA-5
— AGA-8 detail
— ISO summation factor
— ISO mass
— JIS
— GPA summation factor
— NX-19

## 3.5 Calculation options

During stream setup, the user may select from several calculation files. Selection of a suitable file automatically sets up other factors such as concentration/Btu basis and saturated gas treatment. For additional information refer to the PCCU help topics.

## 3.6 Engineering units

User-selectable engineering units may be defined. These include most metric system units as well as US units. Access to this capability requires instantiation of the unit conversion application and may be applied to data reporting and visual readings on the VGA screen. For additional information, refer to the PCCU help topics.

## 3.7 Supported communication protocols

The analyzer supports standard communication interfaces:

— Totalflow Local
— Totalflow Remote
— Modbus Slave (ASCII)
— Modbus Slave (RTU)
— Modbus Host (ASCII)
— Modbus Host (RTU)
— Totalflow TCP
— Modbus TCP Server
— Modbus TCP Client
— LevelMaster

Supported serial protocols operate at 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 baud rates.

The TCP/IP protocol is supported on the Ethernet interface at 10/100 Mbps.

## 3.8 Security

The analyzer supports security options to prevent unauthorized access. Security can be configured by enabling the hardware security switch and by configuring the user interface (PPCU32) with access codes. Administrators can use Role Base Access Control (RBAC) to define user accounts and privileges. See section 9 Configure security for details.

# 4 Installation

This chapter provides information for field installation of the analyzer. After completing the procedures within this chapter, the analyzer is ready for startup.

The following procedures, unless otherwise stated, are applicable to all analyzers. The analyzer is designed to be pipe-mounted (see Figure 4-1). Optionally, a shelf mounting kit (see Figure 4-2) may be purchased for mounting the device on a wall inside or outside of a building, or in an optional environmental enclosure.

**DANGER – Serious damage to health / risk to life**. The installation instructions in this chapter are to be performed only when the area is known to be non-hazardous.

**Figure 4-1: Basic meter run installation**

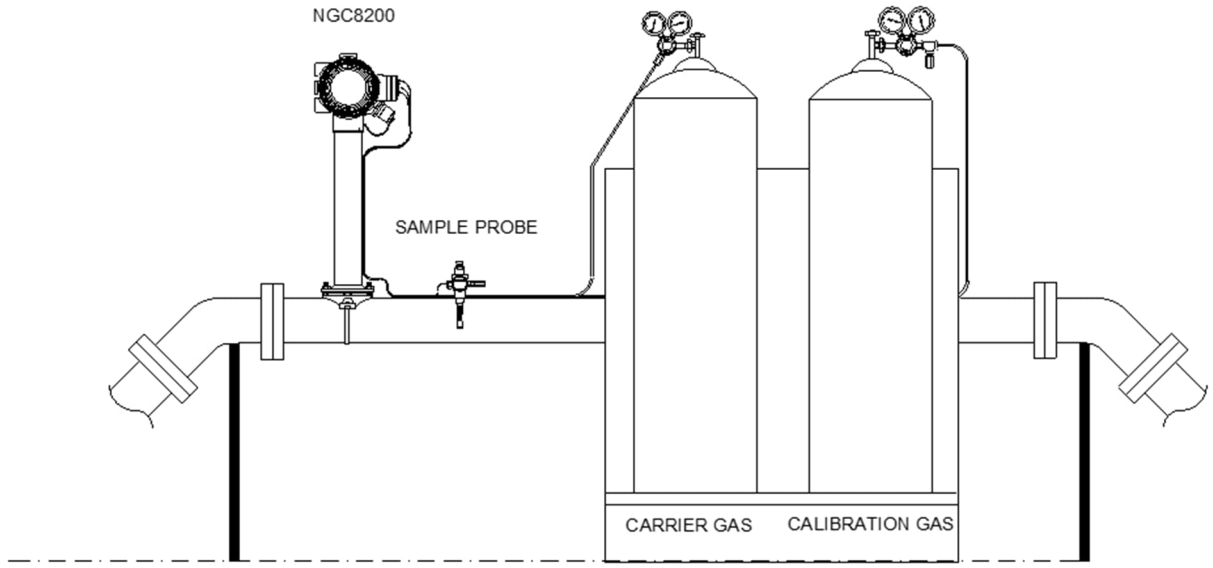
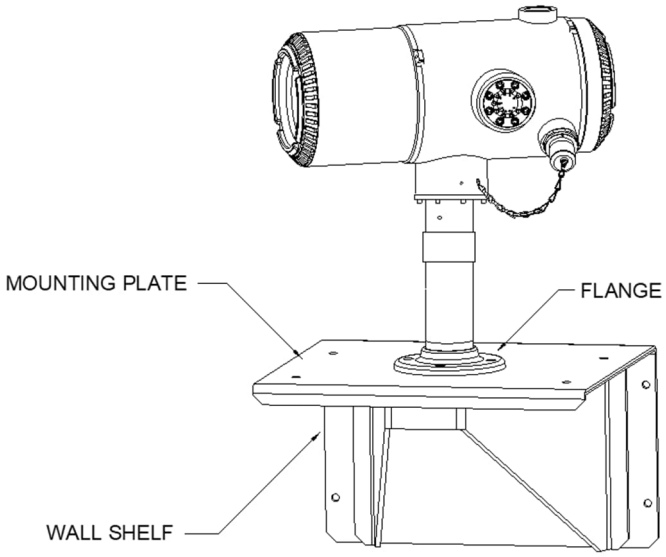


**Figure 4-2: Typical wall shelf mount installation**




# 4.1 Plan for installation

The analyzer is designed for mounting on main gas lines with 2-inch to 12-inch pipe sizes.

Ensure the installation site is clean and free of debris that could affect operation.

The analyzer should be located as close as possible to the sample probe installation point. This prevents the need for high gas flow rates through sample lines to assure the analysis accuracy of the current sample.

If there is more than one stream being analyzed, locate the analyzer in a central location to all sample probe points.

# 4.2 Unpack and inspect

Ensure that there is no external damage to the shipping container. If there is visible external damage, contact the receiving group and report the damage to the trucking company for a freight damage claim.

The analyzer is shipped in a specially designed shipping carton which contains the device, mounting brackets, parts list and wiring and interconnect diagrams. Optional equipment is shipped in a separate carton.

Carefully remove all internal and external packing material. Carefully remove all items from the box.

After removing the protective shipping cover from the analyzer, compare shipped contents with those listed on the bill of lading. All items should match those on bill of lading.

Examine internal components for evidence of damage:

- Visually inspect exterior of device for dents, chipped paint, scratches, damaged threads or broken glass plate, etc.
- If applicable, inspect calibration and carrier gas cylinders to be certain they are correct for the installation.

If there is any damage, or if there are noticeable defects, notify a local ABB representative. Keep all shipping materials as evidence of damage for the carrier's inspection. ABB will arrange for immediate repair or replacement.

# 4.3 Analyzer installation

There are several options to install the analyzer in the field, depending on your field requirements. This section describes how to install the different components required for each of the mounting options available.

## 4.3.1 Pipe installation for stand-alone mounting

If installing an analyzer using a free-standing pipe, use this procedure to install the pipe. Before beginning, review the procedure and the materials required for installation.

Materials:

- One 2 inch pipe with flange
- One 2 inch pipe coupling

or

- One 2 inch mounting pipe (installed). Length is dependent upon final desired analyzer height.

To install a mounting pipe:

1. Select a location to install the mounting pipe that allows easy access and is close to the sample probe. Lines should be as short as possible.
2. Install a mounting pipe, and ensure the pipe is vertically aligned.
3. Screw 2 inch pipe coupling onto the top of the mounting pipe.
4. Screw optional mounting flange pipe into the top of the pipe coupling.
5. Proceed to mount the analyzer (see section 4.3.4)

## 4.3.2 Pipe saddle installation for pipe saddle mounting

If installing an analyzer using the pipe saddle mounting kit, use this procedure to install the pipe saddle. Before beginning, review the procedure and the materials required for installation. The optional pipe with flange may be used in installations requiring additional stability.

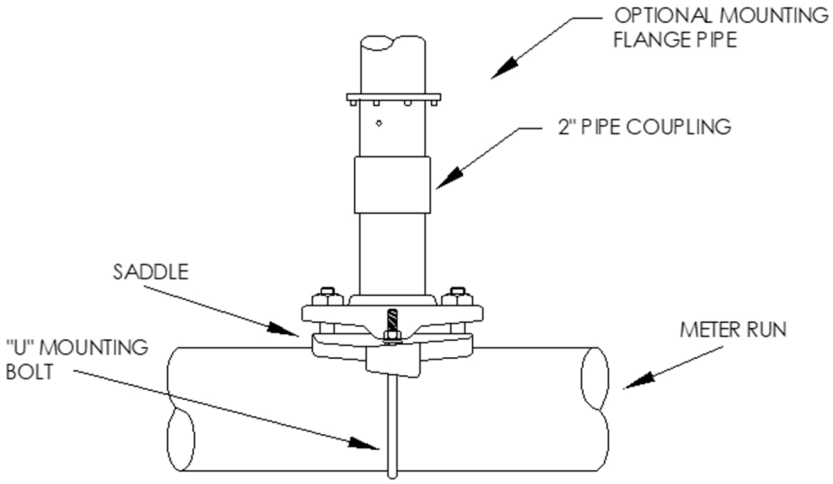
Materials:

- One pipe saddle
- One 2 inch mounting pipe. Length is dependent upon final desired analyzer height.
- One 2 inch pipe with flange kit. (Optional kit comes with flange, screws, washers, and coupling.)

To install the pipe saddle:

1. Position the pipe saddle on the meter run. Select a location that allows easy access and is close to the sample probe. Lines should be as short as possible.
2. Temporarily attach the saddle on the meter run pipe using the U-bolt and associated hardware (see Figure 4-3).
3. Screw one end of the 2 inch pipe into the saddle flange on the pipe saddle until wrench-tight. Place a level against the pipe and vertically align, adjusting the saddle until vertical alignment is achieved.
4. After vertical alignment, securely tighten saddle mounting bolts.
5. If the configuration includes the optional pipe with flange, screw the 2 inch pipe coupling onto the top of the mounting pipe using supplied hardware.
6. Screw the optional mounting pipe with flange into the top of the pipe coupling.
7. Proceed to mount the analyzer (see section 4.3.4)

**Figure 4-3: Typical pipe saddle installation**




## 4.3.3 Shelf installation

If the installation calls for the analyzer shelf mounting kit, use this procedure to mount the shelf. Before beginning, review the procedure and the materials required for installation.

Materials:

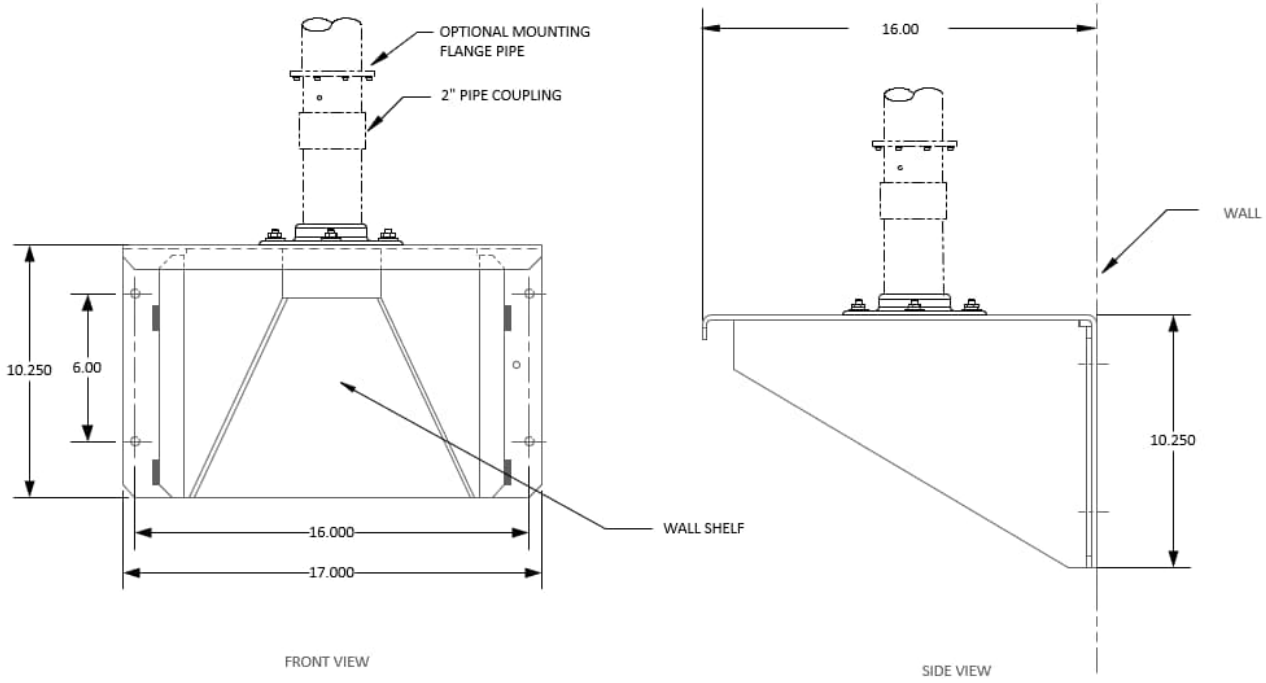
- Four ¼ inch x 20, 1-inch SST hex head machine screws
- Mounting shelf with flange

- One 2 inch mounting pipe. Length is dependent upon final desired analyzer height.
- One 2 inch pipe with flange (optional)
- One 2 inch pipe coupling (optional)

To mount the shelf:

1. Locate the wall position where the analyzer is to be mounted. The shelf should be positioned high enough on the wall so that all components are accessible to service personnel. The shelf should be installed near the installed sample probe.
2. Mount the shelf to the wall, being careful to keep level, using four ¼ x 20, 1-inch SST hex head machine screws in each of the four shelf mounting holes. See Figure 4-4.
3. Screw one end of the 2 inch mounting pipe into the flange on the mounting plate until wrench-tight.
4. If the configuration includes the optional pipe with flange, screw the 2 inch pipe coupling onto the top of the mounting pipe.
5. Screw the optional mounting pipe with flange into the top of the pipe coupling.
6. Proceed to mount the analyzer (see section 4.3.4).

**Figure 4-4: Shelf installation**




## 4.3.4 Analyzer installation

Once the mounting system has been installed, regardless of the type used, follow these instructions to install the analyzer onto the mounting pipe.

Before beginning, review the procedure and the materials required for installation.

Materials:

- Installed mounting pipe
- Four 5/16 inch hex socket screws (optional for use with mounting pipe with flange kit)

To install the analyzer:

**IMPORTANT NOTE:** When positioning the device, take into consideration the mounting of the sample conditioning system, conduit locations, and access to the rear end cap of the device.

1. Position the analyzer on top of the 2 inch pipe stand (see Figure 4-5), in approximately the correct orientation.
2. If the installation has the optional mounting pipe with flange, ensure the screw holes in the upper flange align with the holes located in the analyzer neck bottom (see Figure 4-6).
   - For installation inside of an environmental enclosure, the front display of the device would normally face left, with the feed-through assembly facing the front opening of the enclosure.

This allows screen visibility, access to the feed-through assembly and the termination panel located in the rear of the housing.

— For the shelf-mounted devices, the device would be oriented with the feed-through assembly also facing forward. Sufficient clearance is required when mounted near an inside corner.

3. Secure in place by tightening the hex socket set screw, located in the neck of the device, using a 1/8 inch hex wrench.

**Figure 4-5: Analyzer mounting**

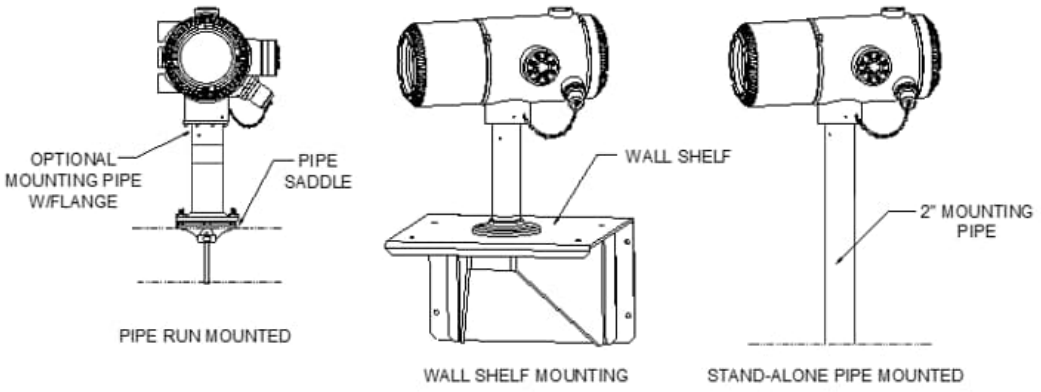
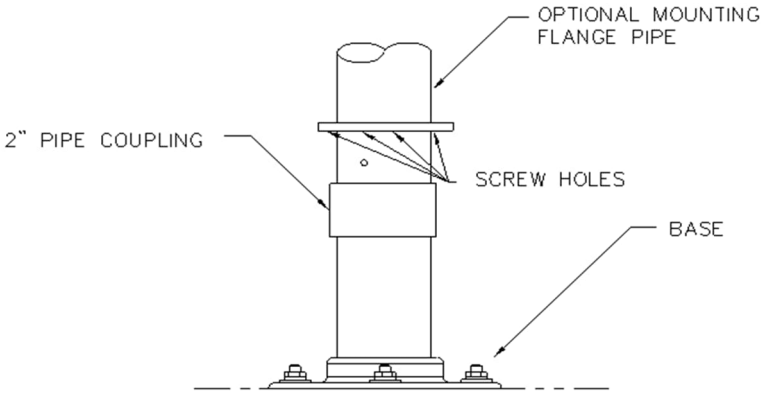



**Figure 4-6: Optional mounting flange pipe**




4. If the installation has the optional mounting flange pipe, insert the hex socket screw through the hole in the welded flange into the neck bottom of the device and tighten using a ¼ inch hex wrench. Repeat for all screws.
5. If the installation has the optional mounting flange pipe, small adjustments may be made to orientation. Apply additional pressure to the mounting pipe with a pipe wrench and then tighten the mounting pipe into the shelf-mounted flange or pipe saddle flange. Otherwise, loosen the hex socket set screw, rotate the device, and retighten.

# 4.4 Sample system installation

## 4.4.1 Sample system design considerations

Information in this section enables the user to design the sample transport tubing connected between the sample probe and the installed analyzer. Minimizing transport lag time and maintaining a single vapor phase sample are important factors to consider when selecting transport tubing.

Lag time is the time required to purge out one volume of transport tubing and the volume of the sample conditioning system.

## 4.4.2 Tube quality

Use only good quality, clean, stainless steel chromatographic grade transport tubing for carrier, calibration gas and sample lines. Use of poor-quality stainless-steel tubing gives unsatisfactory results.

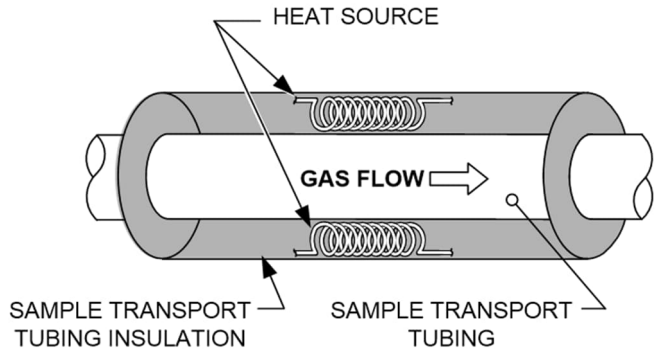
**IMPORTANT NOTE:** Do not use any type of plastic, Teflon®, or Teflon®-lined braided steel tubing.

Transport tubing must be chromatographically clean. Tubing should be free of hydrocarbon contamination and particles. During cutting, fitting, and deburring, the technician should ensure that no particles are allowed to remain in the tubing.

## 4.4.3 Maintaining phase

When designing sample transport tubing, phase of sample must be maintained. Gases containing high concentrations of high boiling components can cause problems when they condense on the inside of the transport tubing surface. To prevent condensation, the sample transport tubing should be heat-traced to prevent any hydrocarbons or water from condensing in the sample lines (see Figure 4-7).

**Figure 4-7: Heat tracing sample line**




## 4.4.4 Sample probe installation

ABB recommends the use of a sample probe to extract the sample from the process stream. A probe is essential in supplying a representative sample to the analyzer. Without a probe, analytical accuracy will be negatively impacted and more maintenance will be required on the analytical system.

### 4.4.4.1 Location

- Locate the pipeline coupling on the gas meter run in close proximity to the analyzer. This allows the stainless-steel sample line from sample probe to the chromatograph to be as short as possible.
- The coupling should be mounted so that the probe can be installed horizontally or vertically on the meter run pipe. This means the coupling should be mounted on either the top or the side of the meter run pipe.
- The sample probe should not be mounted at the ends of headers, dead T's, large volume accumulators or other spots where gas is likely to be stagnant.
- Installation should allow the probe to penetrate the center 1/3 of the main gas meter run. This allows sufficient heat transfer with the flowing gas sample. The sample probe inlet should be high enough to avoid sampling of liquids at the bottom of the pipe.
- The sample probe must be installed where the probe has access to the fastest flow of gas within the pipe.
- The sample probe should be mounted a minimum of five pipe diameters from any device which could cause aerosols or significant pressure drops.

### 4.4.4.2 Other considerations

- The sample probe line pressure should be as close to 1 atmosphere as possible to reduce sample transport lag times due to line pack. Sample pressure at the analyzer should be 15 ± 2 psig (103 ± 14 Kpa).
- To maintain this pressure at the analyzer filters, it may be necessary to increase sample probe pressure to a value greater than 15 psig. Pressure is dependent on sample transport tubing length between the TCR sample probe and the analyzer.
- Be sure to use tubing electrical isolators on sample tubing when connected to pipelines that are not isolated from cathodic protection.

**IMPORTANT NOTE:** The sample probe pipe coupling should be located on the top of the meter run but may be mounted vertically or horizontally.

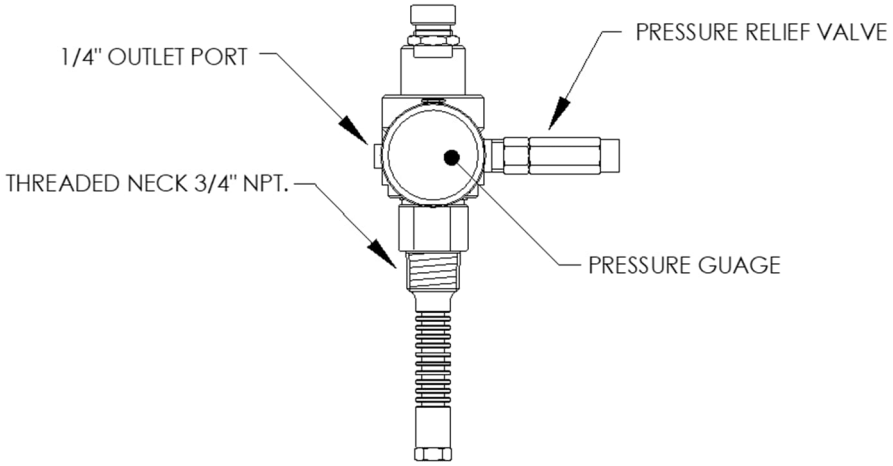
Materials:

- ¾ inch NPT pipe coupling (previously installed)
- Sample probe (configuration to be determined by the technician based on installation and local codes.)
- PTFE tape, like Teflon®, or customer-supplied pipe dope (suitable for chromatography)

To install a sample probe:

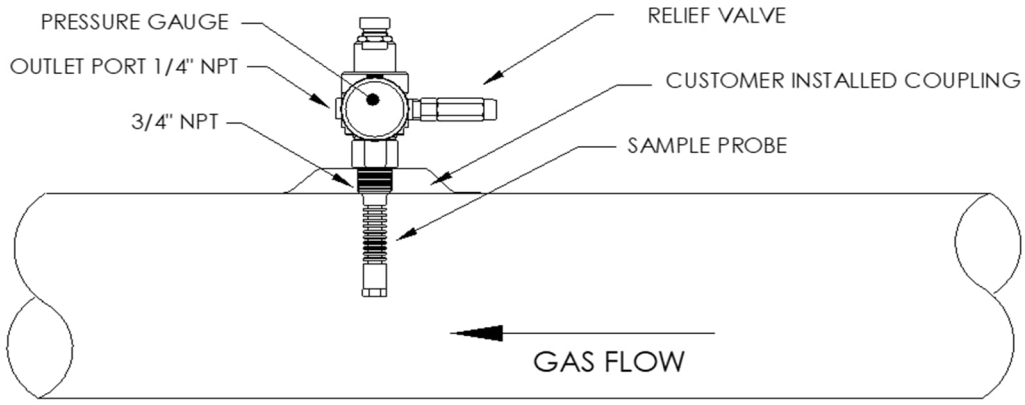
1. Shut down the meter run and isolate from gas source. Be sure to use proper lockout and tagging procedures.
2. Bleed off gas from the meter run.
3. Ensure installed mounting coupling is free from dirt and debris.
4. Ensure sample probe threads are free from dirt and debris.
5. Using PTFE tape or pipe dope, wrap or cover NPT threads of sample probe (see Figure 4-8).

**Figure 4-8: Sample probe**




6. Insert gas probe into pipeline coupling (see Figure 4-9).
7. Using the correct tool, tighten the probe so there is no gas leakage. Do not over-tighten.
8. Install the shut-off valve on the outlet port of the sample probe, if desired.

**Figure 4-9: Sample probe insertion**




## 4.4.5 Sample conditioning modules

For some installations, it may be necessary to install an optional sample system conditioning module to compensate for non-ideal gas samples (see Figure 4-10). These optional modules are engineered to provide various levels of protection and bypass flows. All sample conditioning modules include a level of particulate protection and come in two flow sizes: 50 CC and 450 CC per minute (see Table 4-1 for descriptions).

**Figure 4-10: Available sample conditioning modules**

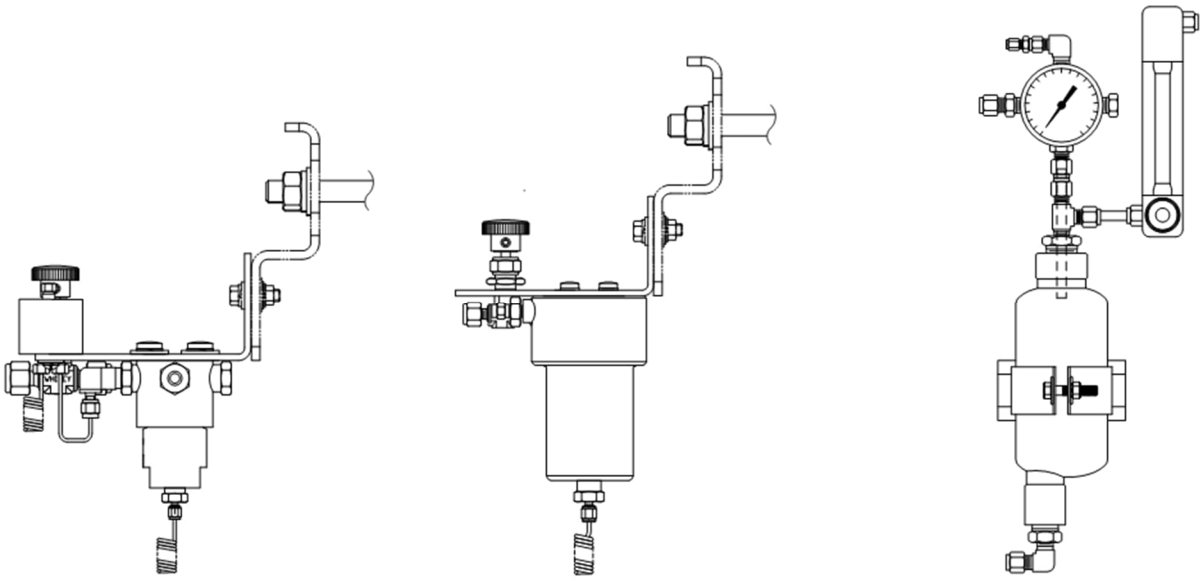



**Table 4-1: Sample Conditioning module descriptions**

| Part Number | Description |
|---|---|
| 2102024-001 | Designed for sample point distances greater than 10’ (3 m) and less than 150’ (50 m) with known particulate and liquid contamination. For stable gas samples containing pipe scale and other solid contaminates and possibly minor amounts of liquid contamination. System features:<br>— Particulate/coalescing filter<br>— Liquid/vapor separator |
| 2102494-001 | Designed for a sample point distance greater than 50’ (15 m) and less than 150’ (50 m). The sample gas is known to contain particulate and liquid contamination with a good probability of line flooding in upset conditions, enough at times to overflow the coalescer (a+ avenger) filter. It also has a Genie® membrane for liquid rejection and a Genie® liquid shut off to be used when liquid carry-over would harm the chromatograph if it was introduced as a sample. This model contains a liquid shut-off to protect the GC. The liquid shut-off resets itself when liquids are no longer present.<br>— Particulate/coalescing filter<br>— Liquid/vapor separator |
| 2104677-001 | Designed to remove condensing sample line liquid or water that has penetrated the sample probe. The system expels the liquid or water downward into the bottom of the Armstrong® trap drainer via inertial separation. Sample gas is extracted from the fitting at the top of the Armstrong® accumulator. The pressurize accumulator expels collecting liquid from the bottom by a modulation float valve design that triggers liquid build-up in the trap accumulator.<br>— Balston housing/ filter<br>— Liquid separator Armstrong® drainer/trap<br>— 0-30 psi gauge<br>— 0-1600 cc/min adjustable metered bypass |

#### 4.4.5.1 Mounting Brackets

Two sample conditioning system mounting brackets are available: a single stream bracket or a multiple stream bracket for up to three modules (see Figure 4-11).

See (Figure 4-12) and (Figure 4-13) for installed module dimensions.

**Figure 4-11: Single and multiple stream sample conditioning assemblies**

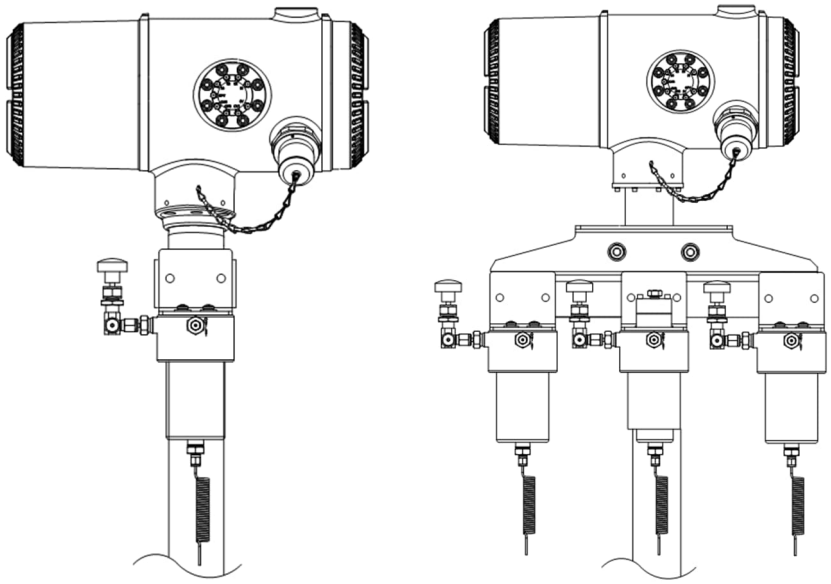


**Figure 4-12: Single stream conditioning module dimensions**

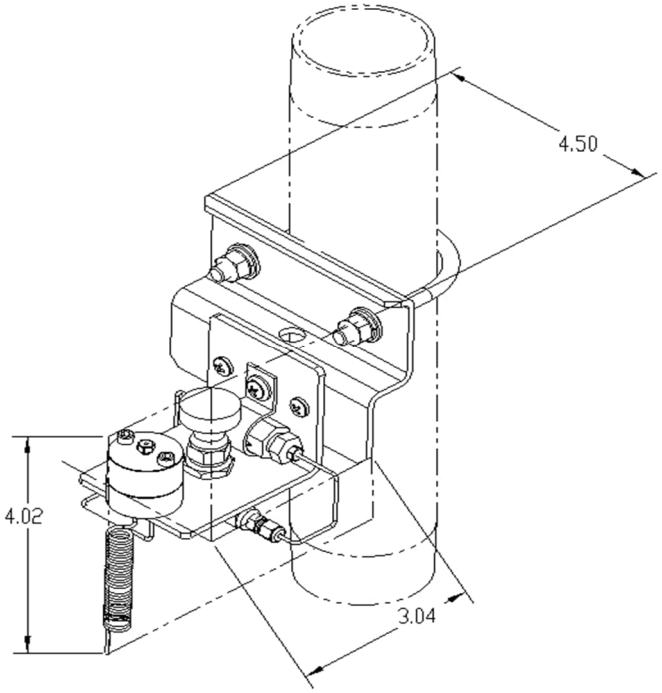
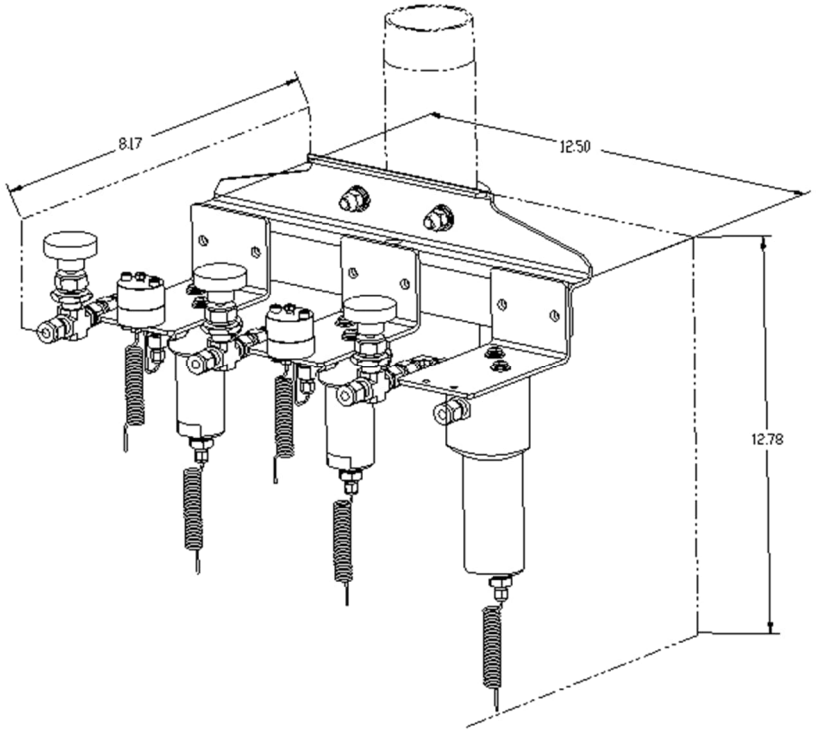


**Figure 4-13: Multiple stream conditioning module dimensions**



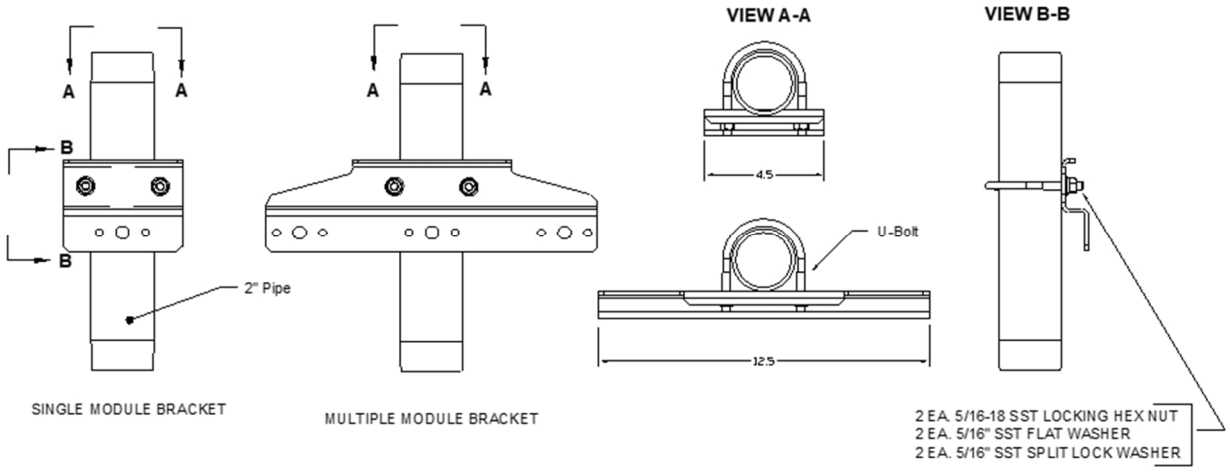

### 4.4.5.2 Install the sample conditioning module

Materials:

- Single or multiple module mounting kit
- One .312 x 2.5 x 3.62 x 1.5 U-bolt
- Two 5/16 inch SST split washers
- Two 5/16 inch SST flat washers
- Two 5/16-18 SST lock nuts
- Sample conditioning module(s) and hardware

The two sample conditioning module mounting brackets are installed identically. The single module bracket holds a single stream sample conditioning module, while the multiple module bracket holds up to three sample conditioning modules.

**Figure 4-14: Sample system mounting kits**



**IMPORTANT NOTE:** When installing the module bracket inside of the ENC82S small environmental enclosure, the mounting bracket must be installed upside down to allow for required space. Otherwise, the module bracket installed inside of the ENC82L large environmental enclosure should be oriented as shown in Figure 4-11.

To install the sample conditioning module bracket:

1. On the sample conditioning module, align the mounting holes to the corresponding holes in the bracket. See the note above regarding orientation of the mounting bracket. Insert the bolt through the hole in the bracket, from front to back through the mounting hole in the module.
2. Place the split washer and then the flat washer on the bolt. Screw the nut onto the end of the bolt until finger-tight. Repeat for the second mounting bolt. Tighten both nuts.
3. Repeat for all additional modules.
4. Straddle the mounting pipe with the U-bolt and insert the threaded ends through the holes located in the mounting bracket so that the bracket back fits flat against the pipe and the module mounting lip sets away from the pipe.
5. Place the flat washer, then a split washer on the end of the U-bolt. Screw the nut onto the end of the bolt and finger-tighten.
6. Repeat steps 4 and 5 for the other side of the U-bolt.
7. Move the bracket into position underneath the analyzer, being careful to allow clearance for the sample conditioning module(s).
8. Tighten both nuts.

### 4.4.6 Sample line connections

After the installation of the sample conditioning module(s), install the sample tubing from the sample probe to the sample conditioning system and feed-through assembly.

Materials:

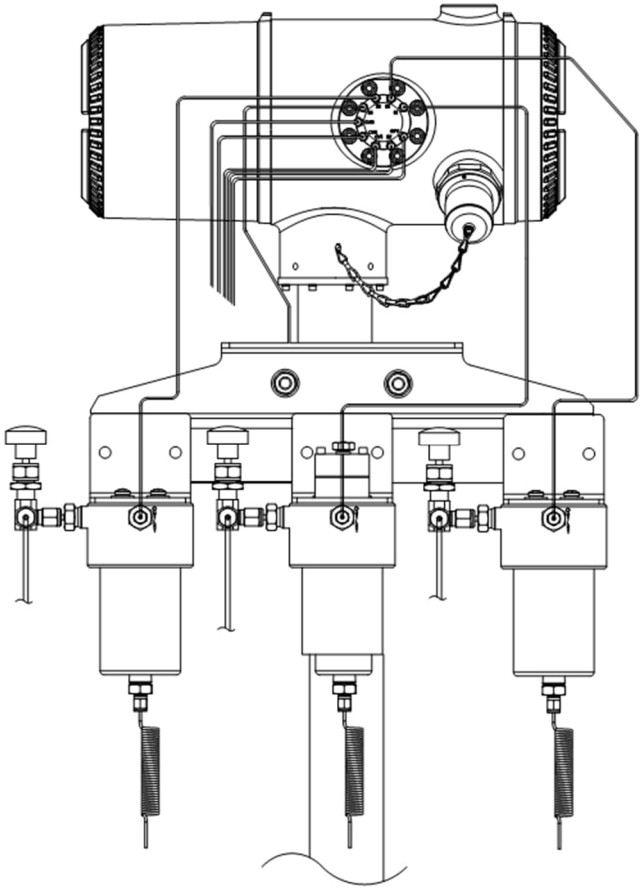
- 1/8 inch SST chromatography-grade transport tubing. Length of tubing to be determined by the technician based on the distance from the sample probe to the sample conditioning module and the number of sample streams.
- Two ferrules and nuts (for each sample stream)
- One ¼ inch NPT to 1/8 inch reducer or other size as determined from the sample probe output port (for each sample stream)
- One sample conditioning module transport tubing (supplied with sample conditioning module).

To install the sample lines:

**IMPORTANT NOTE:** Be certain that the ends of the stainless-steel tubing are open and not restricted.

1. Locate the sample input fitting on the sample conditioning module (see Figure 4-15).
2. Locate the sample output fitting on the installed sample probe.
3. Measure and cut the SST tubing to the required length.
4. Make the necessary bends in the tubing to ease installation of the ferrule and nut into the sample conditioning module input port.

**Figure 4-15: Sample conditioning module line connections**



**IMPORTANT NOTE:** Tube, ferrule and nut should always enter the connection at a right angle.

5. If necessary, install the reducer into the sample probe output fitting.
6. Install the ferrule and nut onto one end of the sample tubing.
7. Insert the tubing with the ferrule into the reducer/sample probe output fitting. Move the nut down onto the ferrule, screw onto fitting and tighten.
8. Install the ferrule and nut onto the other end of the sample tubing.
9. Insert the ferrule into the sample conditioning module input fitting. Move the nut down onto the ferrule, screw onto fitting and tighten.
10. Locate the sample output fitting on the sample conditioning module.
11. Locate the sample input on the feed-through assembly and remove the sealing screw.

**NOTICE – Equipment damage.** Leave the sealing screw in any unused ports. If unused stream ports are not sealed, moisture can enter the manifold which can damage the instrument and void the warranty.

12. Make the necessary bends in the tubing to ease installation of the tubing into the output fitting on the sample conditioning module and the stream input into the input on the feed-through assembly.
13. Insert the tubing with the ferrule into the output fitting on the sample conditioning module. Move the nut down onto the ferrule, screw onto the fitting and tighten.
14. Remove the plastic caps from the restrictor coils, the sealing screws from the feed-through column vents and the sealing screw from the sample vent lines.
15. Purge the air from the transport tubing by opening the shut-off valve located on the sample probe.
16. Insert the tubing with the ferrule into the corresponding input port located on the feed-through assembly. Move the nut down onto the ferrule, screw into the port and tighten. Do not over-tighten.

17. Repeat for each sample stream.
18. After securing tubing, check for gas leaks.

## 4.5 Carrier and calibration system installation

The procedures in this section wire the Digital Inputs (DI) to the calibration and carrier gas regulator assemblies. The examples show the DI1 used for the calibration gas and the DI2 for the carrier gas. For ease in wiring, you may remove the modular terminal connector J2 from the terminal board.

### 4.5.1 Calibration/validation stream

On the analyzer feed-through assembly, one or two of the sample streams may be used for a calibration gas input. It is recommended that a metal diaphragm regulator is set to 15 ±2 psig input. Table 4-2 shows the recommended calibration gas component concentrations for a standard BBK-BBF 8206 analyzer.

**Table 4-2: Calibration gas blend recommended components**

| Component Name | Abbreviation | Mol % | Component Name | Abbreviation | Mol % |
|---|---|---|---|---|---|
| **Nitrogen** | N2 | 2.500 | **Normal Butane** | NC4 | 0.300 |
| **Methane** | C1 | 89.570 | **Neo Pentane** | Neo C5 | 0.100 |
| **Carbon Dioxide** | CO2 | 1.000 | **Iso Pentane** | IC5 | 0.100 |
| **Ethane** | C2 | 5.000 | **Normal Pentane** | NC5 | 0.100 |
| **Propane** | C3 | 1.000 | **Hexanes and Heavier** | C6+ | 0.030 |
| **Iso Butane** | IC4 | 0.300 | | | |

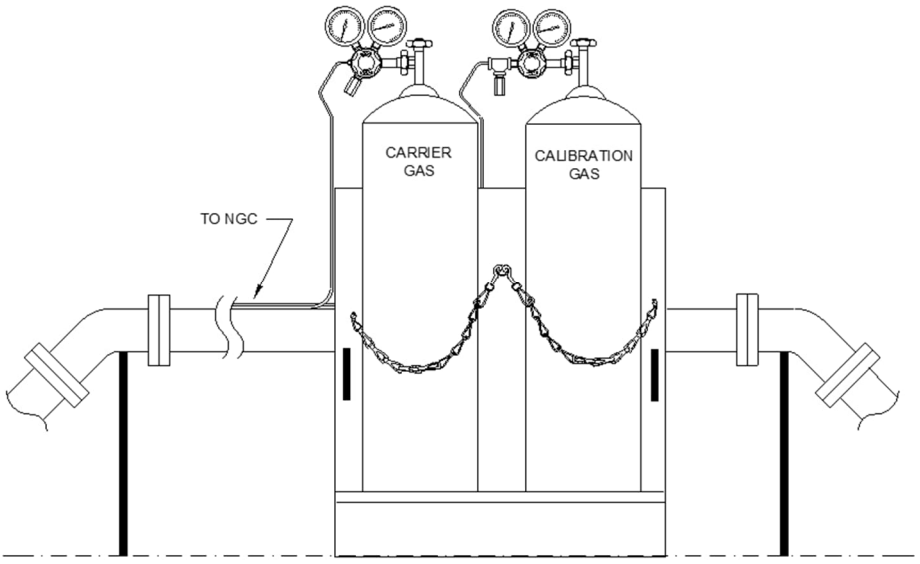
### 4.5.2 Cylinder rack installation on meter run

The carrier/calibration gas cylinder rack is used to hold the carrier and calibration gas cylinders on installations not using an environmental enclosure. A gas regulator should be installed on each gas cylinder (see Figure 4-16). These instructions are generalized. Contact the cylinder rack manufacturer for more specifics.

To install the cylinder rack:

1. Position the cylinder rack near the analyzer.
2. Secure the rack to the pipe meter run with the provided mounting hardware.
3. Install both the carrier and calibration gas cylinders in the rack.
4. Secure both cylinders in the rack to prevent falling.

**Figure 4-16: Carrier and calibration gas cylinders rack installation**




### 4.5.3 Carrier gas regulator installation

The following instructions are valid for all installations. These instructions assume that the carrier gas cylinder has been installed. This example uses the DI1 for wiring the carrier gas system.

Materials:

— Carrier regulator assembly with low pressure switch (see Figure 4-17)
— Installed carrier gas cylinder

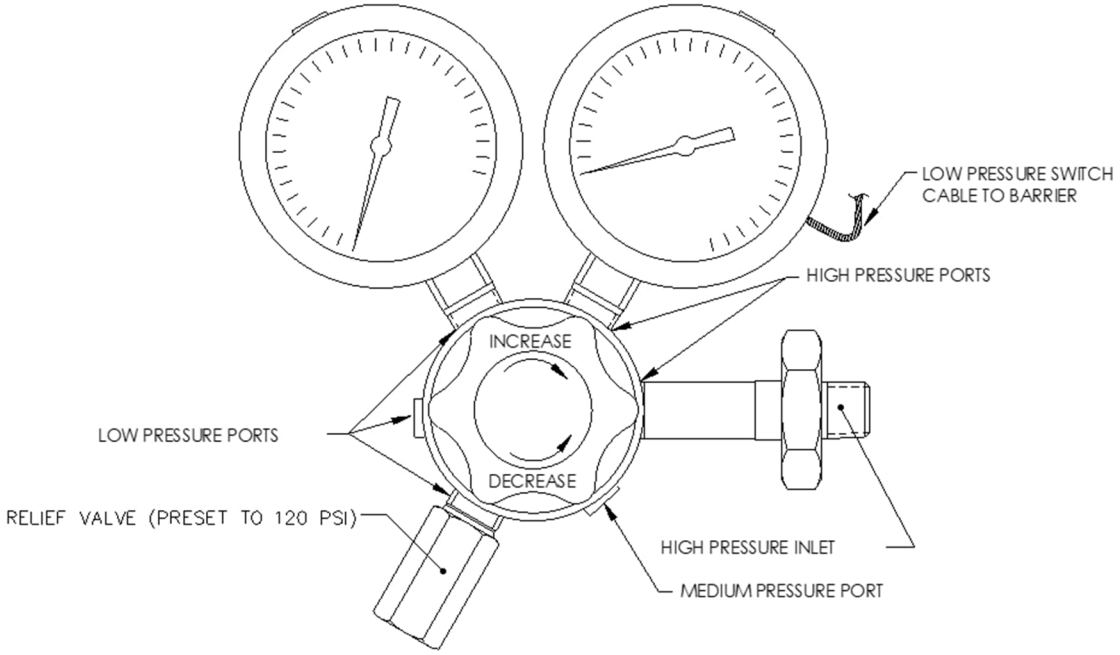
To install the carrier gas regulator:

1. Remove the protective cap from the high-pressure inlet, if required.
2. Insert the ferrule on the regulator high-pressure inlet into the carrier gas cylinder outlet.
3. Screw the nut onto the thread and tighten.

**DANGER – Serious damage to health / risk to life**. Do not connect the low pressure switch directly to the analyzer without a customer-supplied intrinsically safe barrier. It must meet all national regulations for classified hazardous atmospheres.

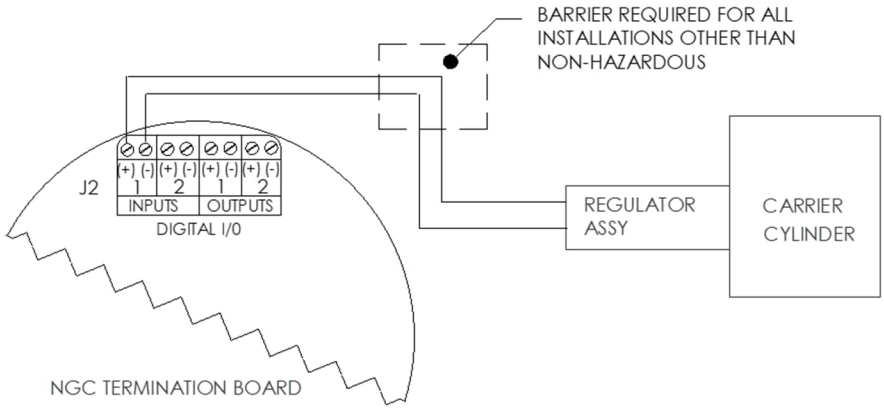
4. Remove the J2 field wiring connector from the termination panel located inside the rear of the enclosure.

**Figure 4-17: Carrier gas pressure regulator with relief valve**




5. Using a small flat head screwdriver, loosen DI1 pins 1 and 2.
6. Insert the red wire into the (+) terminal (pin 1).
7. Retighten pin 1.
8. Insert the black wire into the (-) terminal (pin 2).
9. Retighten pin 2.

**Figure 4-18: Carrier gas low pressure switch wiring (using DI1)**




10. Proceed to wire for the calibration gas system in the next procedure.

## 4.5.4 Calibration gas regulator installation

The following instructions are valid for all installations. These instructions assume that the carrier gas cylinder has been installed. This example uses the DI2 for wiring the calibration gas system.

Materials:

- Calibration blend regulator assembly with low pressure switch (see Figure 4-19)
- Installed calibration gas cylinder

To install the calibration gas regulator:

1. Remove the protective cap from the high-pressure inlet, if required.
2. Insert the ferrule on the regulator high-pressure inlet into the calibration gas cylinder outlet.
3. Screw the nut onto the thread and tighten.
4. Check for leaks.

**DANGER – Serious damage to health / risk to life**. Do not connect the low-pressure switch directly to the analyzer without a customer-supplied intrinsically safe barrier. It must meet all national regulations for classified hazardous atmospheres.

5. Using a small flat head screwdriver, loosen DI2 pins 3 and 4.
6. Insert the red wire into the (+) terminal (pin 3).
7. Retighten pin 3.
8. Insert the black wire into the (-) terminal (pin 4).
9. Retighten pin 4.
10. Replace the termination connector in the J2 board connector.

**Figure 4-19: Calibration gas pressure regulator with relief valve**

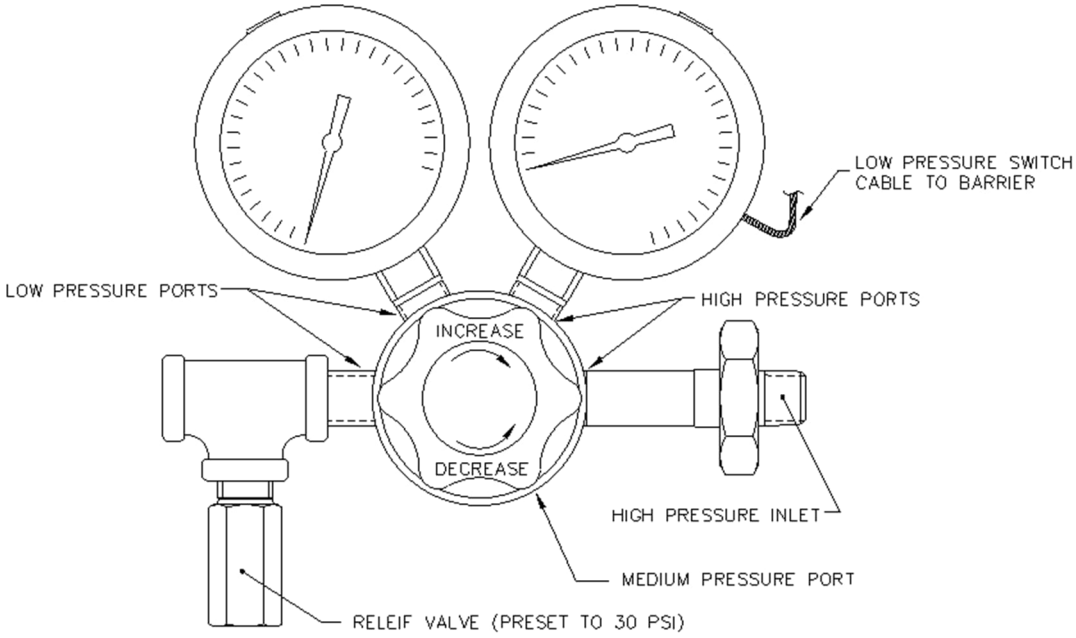
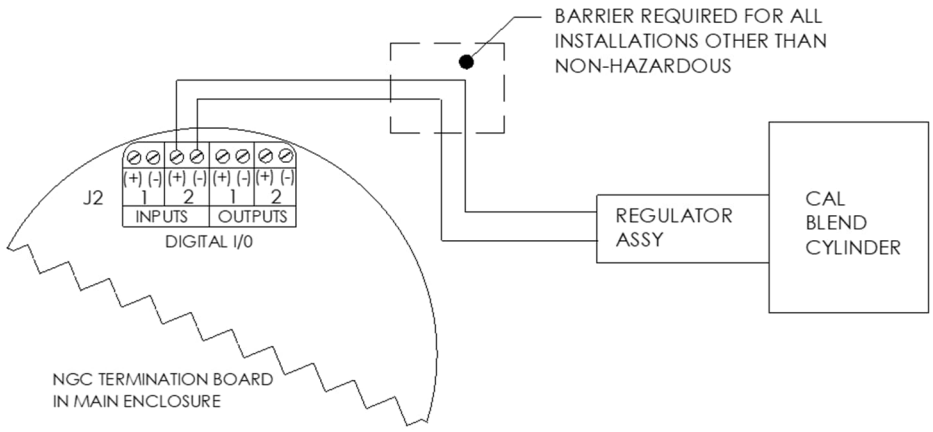



**Figure 4-20: Calibration blend low pressure switch wiring instruction (using DI2)**



### 4.5.5 Carrier gas and calibration gas line connections

The following procedures describe the steps for connecting the external carrier gas and calibration gas lines from the respective regulators to the feed-through assembly on the analyzer. They are applicable for both a meter run and an environmental enclosure installation. These instructions assume that the regulators and gas cylinders have previously been installed.

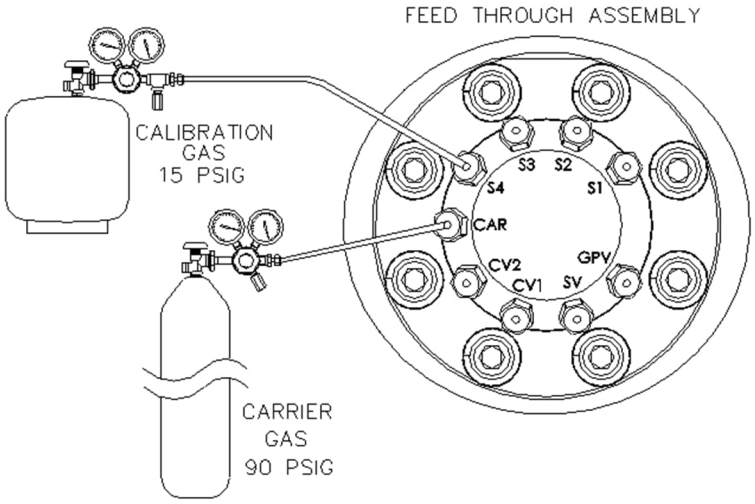
Materials:

- Installed carrier gas pressure regulator
- 1/16 inch SST chromatography grade transport tubing (amount to be determined by the technician based on the distance from carrier gas cylinder regulator to the sample input filter)
- Installed calibration gas pressure regulator
- 1/16 inch SST chromatography grade transport tubing (amount to be determined by the technician based on the distance from the calibration gas cylinder regulator to the sample input filter)
- Four 1/16" ferrules and nuts
- Two ¼ inch NPT to 1/16 inch reducers or other size as determined from the carrier/calibration gas regulator

To connect gas lines:

1. Locate the carrier gas input port (CAR) on the feed-through assembly (see Figure 4-21).
2. Locate the ¼ inch low pressure output fitting on the installed pressure regulator.
3. Measure and cut the 1/16 inch SST tubing to the required length.
4. Make the necessary bends in the tubing to ease the installation of the tubing into the analyzer and pressure regulator.

**Figure 4-21: Carrier and calibration gas connections**




**IMPORTANT NOTE:** Tube, ferrule and nut should always enter the connection at a right angle.

5. Install the reducer into the carrier gas regulator.
6. Insert the tube with the ferrule into the reducer/pressure regulator output fitting. Move the nut down onto the ferrule, screw onto the fitting and tighten.
7. Carrier gas pressure should be set at **90 PSIG**.
8. Remove the sealing screw from the carrier gas input.

**NOTICE – Equipment damage.** Leave the sealing screw in any unused ports. If unused stream ports are not sealed, moisture can enter the manifold which can damage the instrument and void warranty.

9. Purge the air from the transport tubing by opening the shut-off valve located on the regulator.
10. Insert the tube with the ferrule into the carrier gas input port (CAR) on the feed-through assembly. Move the nut down onto the ferrule, screw into the port and tighten.
11. Determine the input port for the calibration gas on the feed-through assembly and remove the sealing screw. Any stream can be used for calibration gas, but typically S4 is used.

12. Locate the ¼ inch low pressure output fitting on the installed pressure regulator on the calibration gas cylinder.
13. Measure and cut the 1/16 inch SST tubing to the required length.
14. Make the necessary bends in the tubing to ease the installation of the ferrule and tubing into the analyzer and pressure regulator.
15. Install the reducer into the calibration gas regulator, if required.
16. Insert the tube with the ferrule into the reducer/pressure regulator output fitting. Move the nut down onto the ferrule, screw onto the fitting and tighten.
17. Calibration gas pressure should be set at **15 PSIG**.
18. Purge the air from the transport tubing by opening the shut-off valve located on the regulator.
19. Insert the tube with the ferrule into the calibration gas input port (S4) on the feed-through assembly. Move the nut down onto the ferrule, screw into the port and tighten.
20. Leak test all gas connections when completed.

## 4.6 Vent lines connections

The following procedure provides general steps for connecting the external vent lines from the respective output ports on the feed-through assembly. When the analyzer is installed in the environmental enclosure, the sample vent line must vent outside of the enclosure. Other installations may only require short lines. Follow the requirements of national and local codes during installation.

Materials:

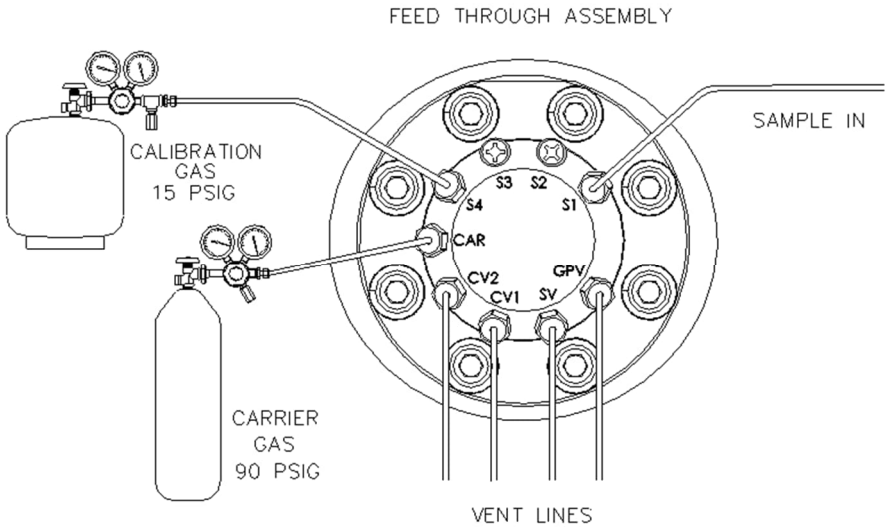
- Four 1/16 inch ferrules and nuts
- Four 1/16 inch SST vent tubing (supplied with analyzer) or
- Four 1/16 inch SST tubing (amount to be determined by the technician based on the distance from the analyzer to the external vent location)

To connect vent lines:

1. Locate the gauge port vent (GPV), sample vent (SV)), column vent 1 (CV1) and column vent 2 (CV2) ports on the feed-through assembly (see Figure 4-22). Remove the sealing screws for the vent ports.
2. Using the supplied vent tubing (if sufficient length) and ferrule, place the nut and ferrule onto the short end of the bent tubing. Insert the tubing and ferrule into one of the vent ports, with the open end of the tubing pointing down. Move the nut down onto the ferrule, screw into the port and tighten.
3. If the vent tubing is not of sufficient length, measure and cut new tubing (not supplied). Make the necessary bends to install the tubing. Place the nut and ferrule onto the corresponding end of the tubing. Insert the tubing and ferrule into one of the vent ports, being careful to keep tubing horizontal, with the open end of the tubing pointing down. Move the nut down onto the ferrule, screw into the port and tighten.
4. Repeat step 2 or 3 for all other vents listed in step 1.

**NOTICE – Equipment damage.** All four vents must be open to atmospheric pressure without back pressure. Position the vent tubing in a downward direction so that moisture does not accumulate in the tubing.

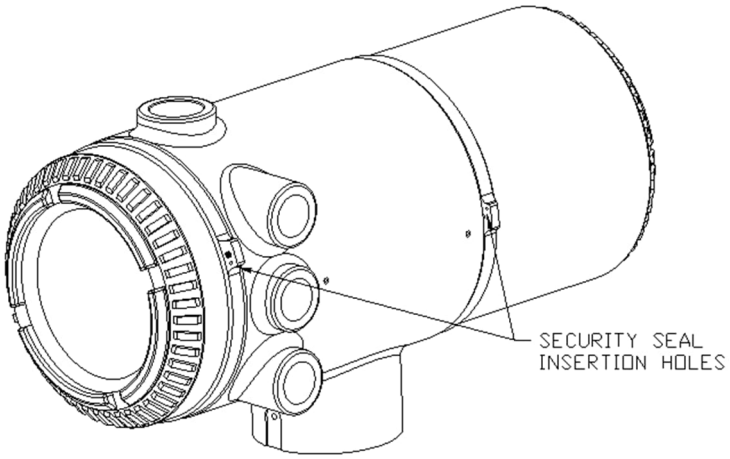
**Figure 4-22: Vent line connections on feed-through assembly**




## 4.7 Security seal

For some installations, it may be desirable to attach a security seal on the enclosure front and rear end caps. To accommodate seal, note the holes located in the tab located on each end cap (see Figure 4-23).

**Figure 4-23: End cap tabs for security seal**



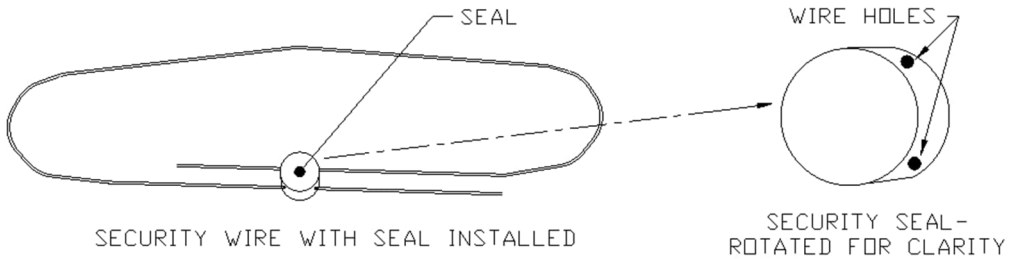

Customer-supplied materials:

- 1 each security wire seal
- Seal press

To attach a security seal:

5. Insert security wire through holes located on end cap tabs.
6. Bring ends together and insert through holes in security seal (see Figure 4-24).
7. Use seal press to compress seal into wire. Ensure that the wire is firmly captured inside seal.

**Figure 4-24: Security wire with seal**



# 5 Wiring

This section describes the wiring required to connect external devices with serial interfaces and the power supply.

**DANGER – Serious damage to health / risk to life**. Do not begin wiring unless the area is known to be non-hazardous.

## 5.1 Wire for serial communication

The analyzer's Serial Ports 1 and 2 (J8 and J10) support RS-232, RS-422 or RS-485 communication. They support connection to devices with serial interfaces including:

- Remote communication equipment such as a radio
- Flow computers or remote controllers (for flow measurement scenarios requiring live analysis)

Serial port configuration depends on the external device being connected. Note that the serial ports can also provide power to the attached device (pins 1 or 3) depending on the power requirement of the device. Determine the device's serial interface type and requirements and configure the serial ports accordingly. Wiring for communication devices is specific to the communication transceiver, therefore only general information is given here. Table 5-1 shows serial port pinouts and termination settings.

**Table 5-1: Serial Port 1 and Port 2 pinouts and terminations**

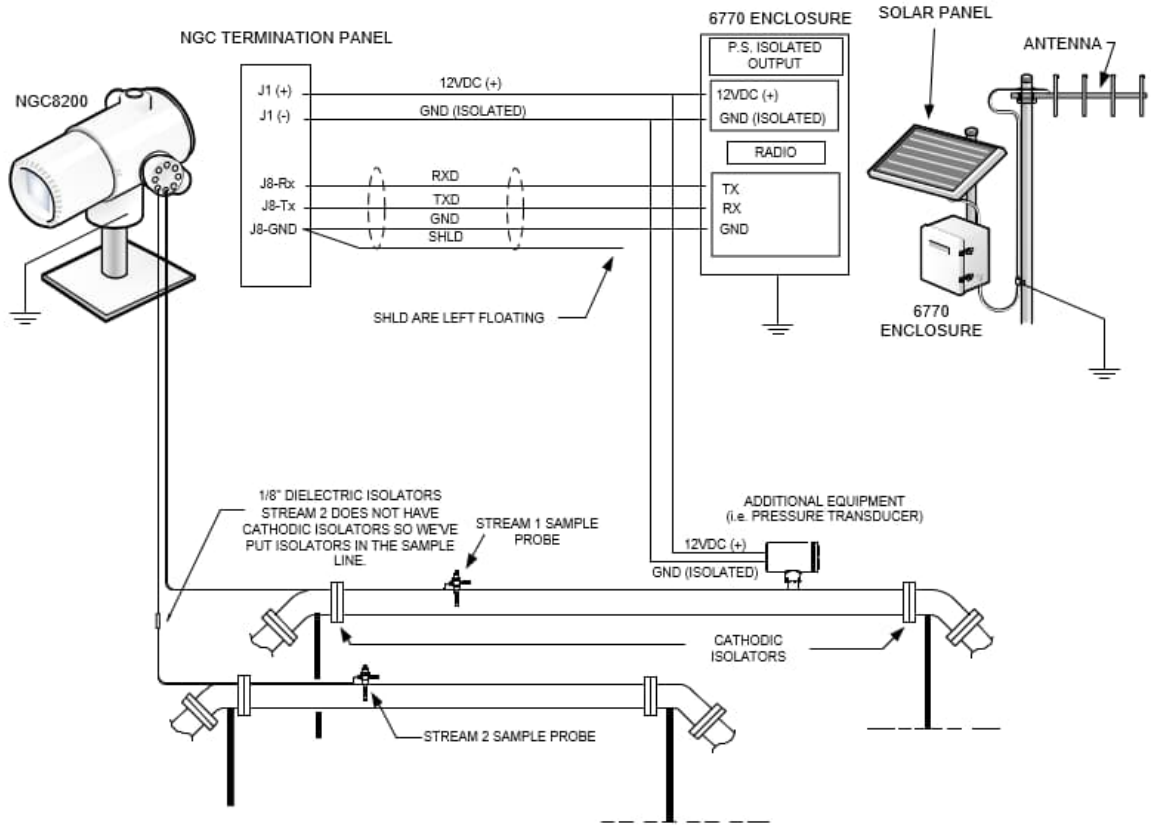
| | **RS-232** | **RS-485** | **RS-422** |
|---|---|---|---|
| **PIN** | **SERIAL PORT 1 (J8)** | **SERIAL PORT 1 (J8)** | **SERIAL PORT 1 (J8)** |
| 1 | Power Out | Power Out | Power Out |
| 2 | Ground | Ground | Ground |
| 3 | Switched Power Out | Switched Power Out | Switched Power Out |
| 4 | Operate | Operate | Operate |
| 5 | Not Used | RRTS | RTS |
| 6 | Request To Send | Bus + | Transmit Bus + |
| 7 | Transmit Data | Bus - | Transmit Bus - |
| 8 | Receive Data | No Connection | Receive Bus + |
| 9 | Clear To Send (CTS) | No Connection | Receive Bus - |
| **PIN** | **SERIAL PORT 2 (J10)** | **SERIAL PORT 2 (J10)** | **SERIAL PORT 2 (J10)** |
| 1 | Power Out | Power Out | Power Out |
| 2 | Ground | Ground | Ground |
| 3 | Switched Power Out | Switched Power Out | Switched Power Out |
| 4 | Operate | Operate | Operate |
| 5 | Not Used | RRTS | RTS |
| 6 | Request To Send | Bus + | Transmit Bus + |
| 7 | Transmit Data | Bus - | Transmit Bus - |
| 8 | Receive Data | No Connection | Receive Bus + |
| 9 | Clear To Send (CTS) | No Connection | Receive Bus - |
| **TERMINATIONS** | **PORT 1 (SP1 TERM, J9)** | **PORT 2 (SP2 TERM, J11)** | |
| First or intermediate device (RS-485) | Pins 2–3 | Pins 2–3 | |
| Last or only device (RS-485) | Pins 1–2 | Pins 1–2 | |
| RS-232 | Pins 2–3 | Pins 2–3 | |

## 5.2 Wire for power and grounding

This section describes the power supply requirements, power considerations, the wiring of the power terminal on the analyzer's termination board, and grounding. Carefully review requirements and considerations before wiring the analyzer and additional devices (if any).
Figure 5-1 shows an example of an analyzer's installation and wiring. This scenario includes an independent enclosure containing a power supply and a radio system for remote communication.

The example shows the analyzer's power terminal (J1) wired to the isolated 12 Vdc power supply. Refer to this figure when reviewing the following sections.

**Figure 5-1: Example of analyzer wiring**




## 5.2.1 Power supply requirements

Review the following requirements before powering the analyzer. Also see Table 2-1: Analyzer specifications.

- The power supply for the analyzer should have an isolated output (the negative side of the 12 or 24 VDC output should not be electrically connected to any chassis or external earth ground).
- Power supplies should meet or exceed the operating voltage requirements per analytical head (see Table 2-1).
- In some instances, the power supply is installed in conjunction with a radio. If the radio is connected to the analyzer via RS-232/485/422, the communications should share the power ground. The communication shield should only be connected at the analyzer end. The other end should be left to float (left unconnected, see Figure 5-1).

## 5.2.2 Operating voltages and cable lengths

The analyzer is designed for connection to a 12 VDC or 24 VDC power source. The 12 volt power source must provide a minimum of 10.5 VDC to a maximum of 16 VDC at 4 amps minimum; and the 24 volt must provide a minimum of 21 VDC to a maximum of 28 VDC at 2.2 amps. The configurations with the auxiliary feed-through heater increase the requirements.

Adequate wire gauge to connect the analyzer to the DC power supply depends on the distance between the two. Wire gauge and length affects the voltage delivered to the analyzer. Voltage drop across the wiring should be minimized. Table 5-2 shows the recommended wire lengths for different gauge values.

**IMPORTANT NOTE:** Additional devices connected to the analyzer and requiring power (XMVs, radios, etc.) must be factored into this calculation. Refer to the technical specifications to compute cable requirements for additional loads. For non-standard applications or other questions, contact Technical Support (see contact information on the last page of this manual).

**Table 5-2: 12 VDC battery power supply system maximum cable lengths**

| Model option | Min. batt voltage (V) | Unit | 10 AWG see note | 12 AWG | 14 AWG | 16 AWG | 6 mm² see note | 4 mm² see note | 2.5 mm² | 1.5 mm² |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 VDC analyzer w/o feed-through heater | 12.00 | ft | 78.28 | 49.44 | 30.97 | 19.43 | 90.03 | 60.17 | 37.42 | 22.92 |
| | | m | 23.86 | 15.07 | 9.44 | 5.92 | 27.44 | 18.34 | 11.41 | 6.99 |
| 12 VDC analyzer with feed-through heater | 12.00 | ft | 38.74 | 24.47 | 15.32 | 9.62 | 44.55 | 29.78 | 18.52 | 11.34 |
| | | m | 11.81 | 7.46 | 4.67 | 2.93 | 13.58 | 9.08 | 5.64 | 3.46 |

Note: This wire size may require splicing in 12 AWG or 2.5 mm² or smaller wires at each end of the cable to be able to fit screw terminals.

### 5.2.3 Other considerations

When the same power supply is used to power other devices in addition to the analyzer:

- Avoid any ground loops.
- Connect all devices in a star configuration.
- Determine the operating voltage range for the devices. Devices must be tolerant to input voltage fluctuations within their acceptable range. Input voltage to these devices can be affected by the length of the cable connecting to the power supply.

### 5.2.4 Ground the analyzer

The analyzer must always be properly grounded.

- In the field:
  - The analyzer has a grounding lug on the mounting neck of the enclosure. This lug should be tied to a good earth ground with no smaller than 12 AWG wire.
  - The analyzer cannot be connected to any pipeline where cathodic protection exists. If the system uses cathodic protection, the analyzer must be mounted on a section of pipe that has been electrically isolated from the cathodic currents (see Figure 5-1).
- In an indoor environment (office/lab/processing plant, etc.):
  - For installations in an office environment, ensure that a good earth ground to the analyzer is established. Improper grounding can lead to erratic behavior. If the device is not properly grounded, the user could have as much as 60 VAC (half line voltage) on the case of the equipment due to capacitive coupling within the power supply. Refer to the power supply manufacturer for specific grounding requirements.

### 5.2.5 Cathodic protection

If the sample probe is mounted to a section of pipe where cathodic currents may exist, put isolators in the sample tubing between the sample probe and the analyzer. Any time that the sample probe is on a section of pipe other than the one where the analyzer is directly mounted, tubing isolators should be employed. See Figure 5-1. It is very important that the probe ground and the analyzer ground be at the same potential. If this cannot be ensured, tubing isolators must be used.

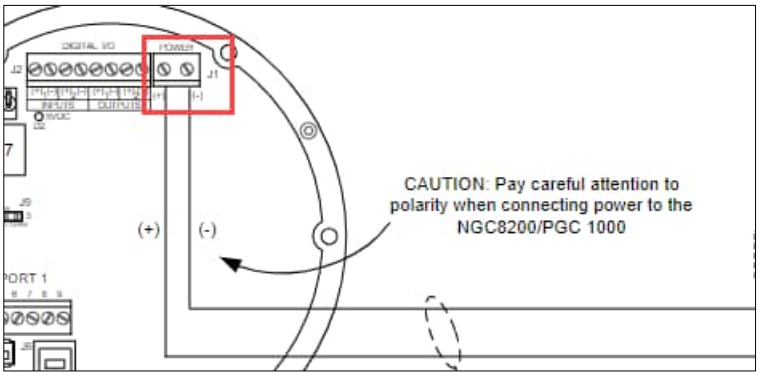
### 5.2.6 Wire the analyzer power connector

The power connector is located on the analyzer termination board. It can be removed for wiring. This procedure assumes that the optimal length of the wires between the analyzer and the power supply is used as per section 5.2.2 Operating voltages and cable lengths.

To wire the power connector:

1. Remove the modular connector from the POWER terminal (J1) on the analyzer's terminal board.
2. Observing polarity carefully:
   a. Insert the wire from the power supply's positive pin to the analyzer's positive pin (+).
   b. Insert the wire from the power supply's negative pin to the analyzer's negative pin (-).
3. Re-insert the modular connector on the POWER terminal (J1) if the power wires at the other end are not yet connected to the power source. If the power wires are already connected to the power source, you can wait to apply power to the analyzer for analyzer startup in section 6 Startup.

**Figure 5-2: Power connector on the analyzer**




# 6 Startup

This chapter describes the startup and basic configuration of a newly installed analyzer. PCCU32 connection with the analyzer is required. A startup wizard displays as soon as successful connection with the analyzer is established. The wizard facilitates the required configuration to place the analyzer in service.

**IMPORTANT NOTE:** PCCU32 6.0 (or later) is required to communicate with the analyzer for configuration. Previous versions of PCCU32 are not compatible with the NGC or PGC. To obtain and install the latest PCCU32 version, see sections 6.1 Download PCCU32 from the ABB website and 6.2 Install PCCU32.

It is assumed that the installation, wiring, and connection of system components as described in section 4 Installation and section 5 Wiring are completed.

**DANGER – Explosion Hazard.** Do not open or remove any enclosure covers unless the area is known to be non-hazardous.

For additional or advanced configuration options, click **Help** on the PCCU32 screens for the analyzer.

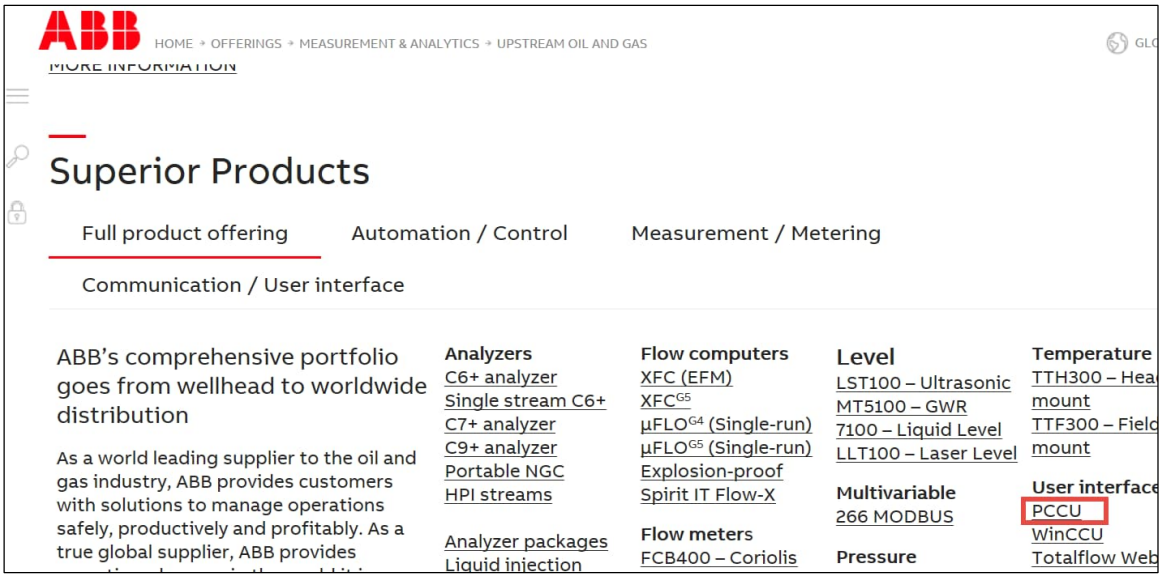
## 6.1 Download PCCU32 from the ABB website

The latest PCCU version is available on the ABB website. This procedure describes how to locate and download the latest PCCU installation package. Always review release notes for new features or bug fixes before installing and using new PCCU versions. Note that the webite shows the major version of PCCU, but the installation package file name contains the part and revision numbers: 2103445-XXX, where 2103445 is the unique part number for PCCU, and XXX is the revision number. For example, the installation package for PCCU 7.74 has the number 2103445-098 in the file name.

To review release notes and download the PCCU installation package:

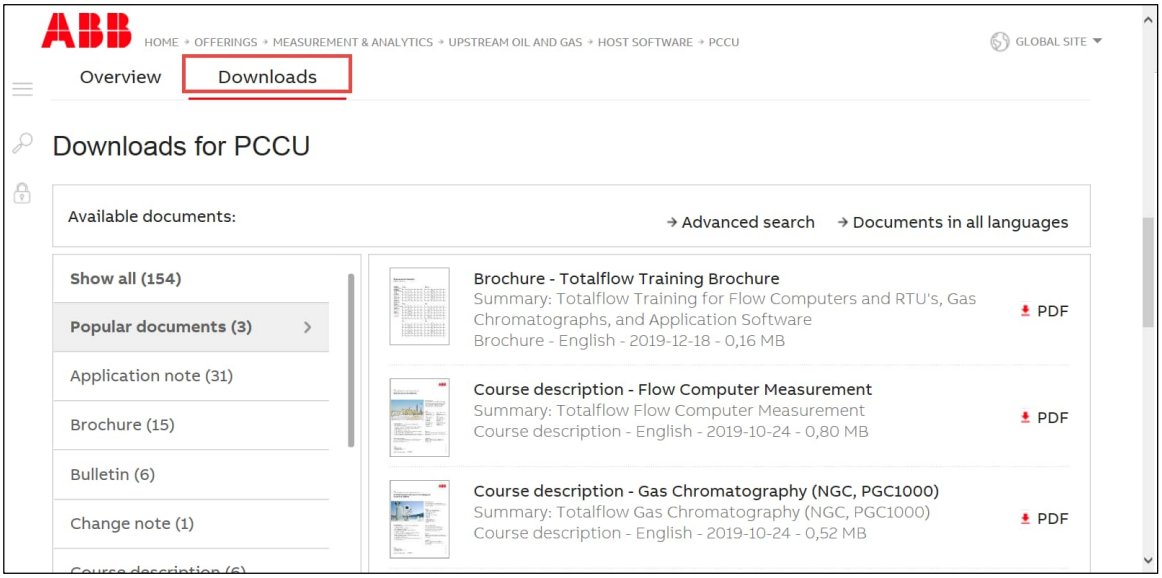
1. Go to www.abb.com/upstream.
2. Under Products, select **PCCU** from the User Interface category (Figure 6-1).

**Figure 6-1: ABB Upstream home page**



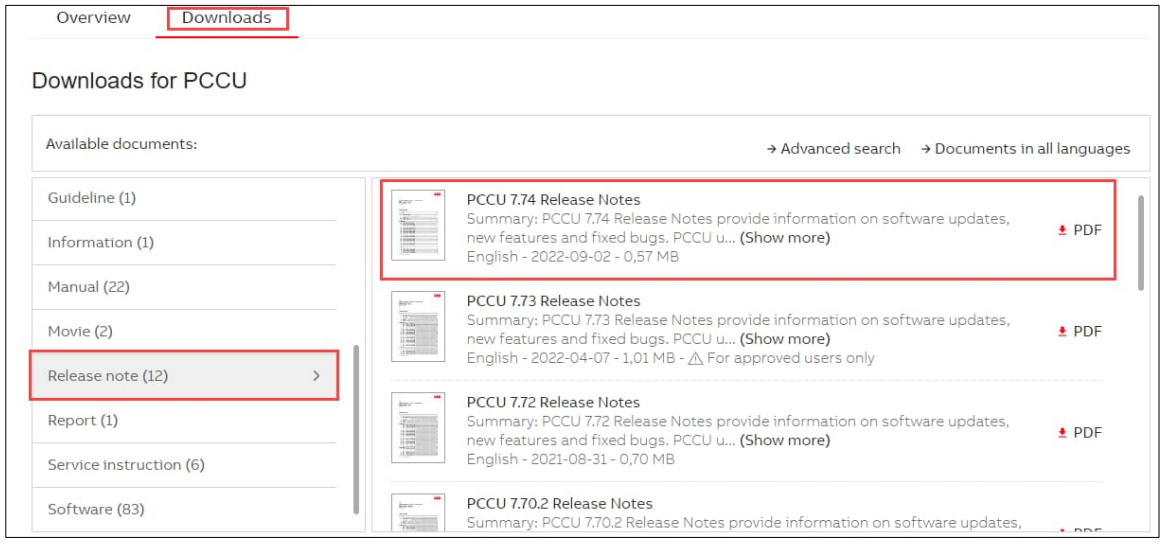

3. On the PCCU page, scroll down and select the **Downloads** tab (Figure 6-2).

**Figure 6-2: PCCU page - document downloads**



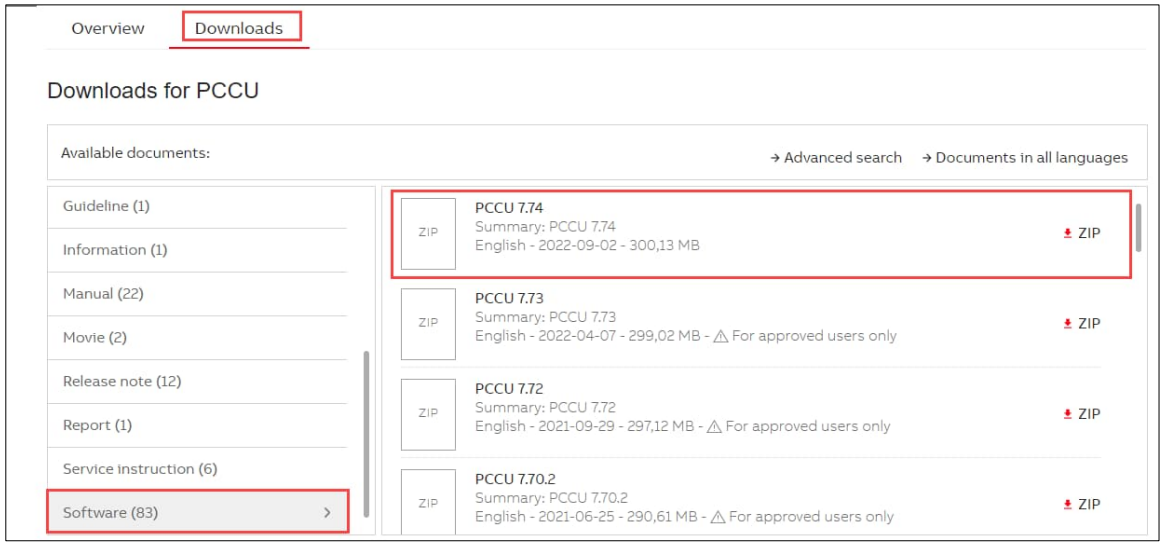

4. On the PCCU Downloads page, scroll down on the left menu of available documents, locate, and select **Release note** (Figure 6-3).

**Figure 6-3: Release notes list**




5. Locate the release notes for the latest revision on the displayed list. There may be release notes for other versions. Make sure to select the required one.
6. Select the release notes to view from the browser or click the **PDF** icon to download the document.
7. Scroll down on the left menu again to locate and select **Software** (Figure 6-4).

**Figure 6-4: PCCU installation software revisions list**




8. Locate and select the latest software version in the displayed list (identified by major revision number, such as PCCU 7.74).
9. Select the **ZIP** icon to download. The installation package file name has the part and rev number, for example: 2103445-098EX.ZIP.
10. Select **Save** at the download prompt. (Save the file on the laptop used to configure the device.)

## 6.2 Install PCCU32

PCCU32 software operates in a Windows® environment. PCCU32 must be installed in the PC or laptop that connects to the analyzer for configuration and operation. This procedure assumes that the desired PCCU32 installation package has been downloaded from the ABB website and stored in a local folder as described in section 6.1 Download PCCU32 from the ABB website.

**IMPORTANT NOTE:** The installation creates a PCCU folder and its shortcut on the desktop or laptop. The default name of the folder and shortcut can be changed at the time of installation. If you prefer non-default folder names, make sure to change the names when prompted during installation.

To install:

1. Locate the downloaded compressed file on the PC or laptop.
2. Unzip the downloaded installation file and save extracted files in desired folder.
3. Open created folder.
4. Double-click **Setup.exe** to run the installation program. Follow the screen prompts during installation.
5. Click **Finish** when installation completes.
6. Proceed to establish connection with the analyzer using any of the options described in section 6.3 Establish initial local communication.

# 6.3 Establish initial local communication

The analyzer supports external connections on its external MMI port for local communication. The available port for local connection depends on the purchased option. USB is the standard option. RS-232 is the other option.
Ethernet can also be used for initial local communication, but access to the terminal board in the back of the analyzer is required. Removal of the the rear cap is required.
All ports are configured at the factory for local operator access.

- The USB port is faster than the RS-232 port and therefore recommended for first-time local communication.
- The Ethernet port is the fastest interface, but it may be disabled from the factory, and must be enabled before initial communication. The analyzer has a default IP addressed (169.254.0.11).
- PCCU supports the use of any of these ports but must be configured for each type.

The following sections describe how to set up PCCU to connect with the analyzer for each port type. Select the procedure for the preferred connection choice. Connections to the external port may be required in certain locations for safety.

**IMPORTANT NOTE:** If the Invalid Security Code warning appears when attempting to connect to the analyzer, enter four zeros (**0000**) and click **OK**. Security codes are required for connection when the security switch on the analyzer's terminal board is set to enable security. During initial installation and commissioning, flip the security switch up (disable security) to avoid having to provide the code every time you need to connect with the analyzer. If security is required to place the device in-service, see section 9 Configure security.

## 6.3.1 Connect using USB port (standard)

This section describes initial local connection using the analyzer's USB port. Figure 6-5 shows the cable required and Table 6-1: Cable for USB connection provides cabling details.

**IMPORTANT NOTE:** Flash 102411-042 and OS 2102141-015 or earlier versions used to require ActiveSync software to communicate when using USB. Flash 2102411-044 and OS 2102141-016 and later versions no longer support ActiveSync and ActiveSync is no longer required for communication using USB. Flash 2102411-043 has been withdrawn.

**PCCU 7.74 or later** is required to connect with analyzers running **Flash 2102411-044** and **OS 2102141-016 and later** versions.

**Figure 6-5: Cable for USB connection**

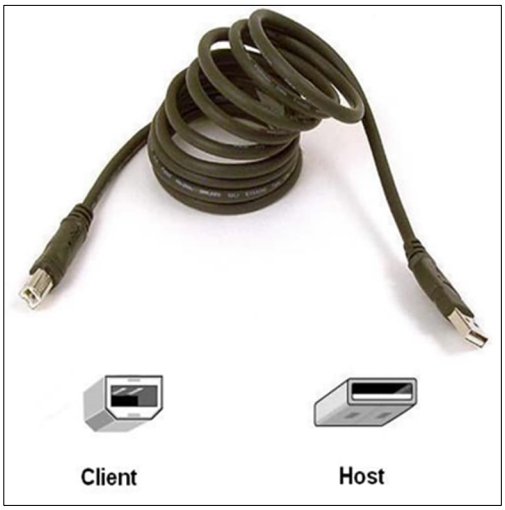


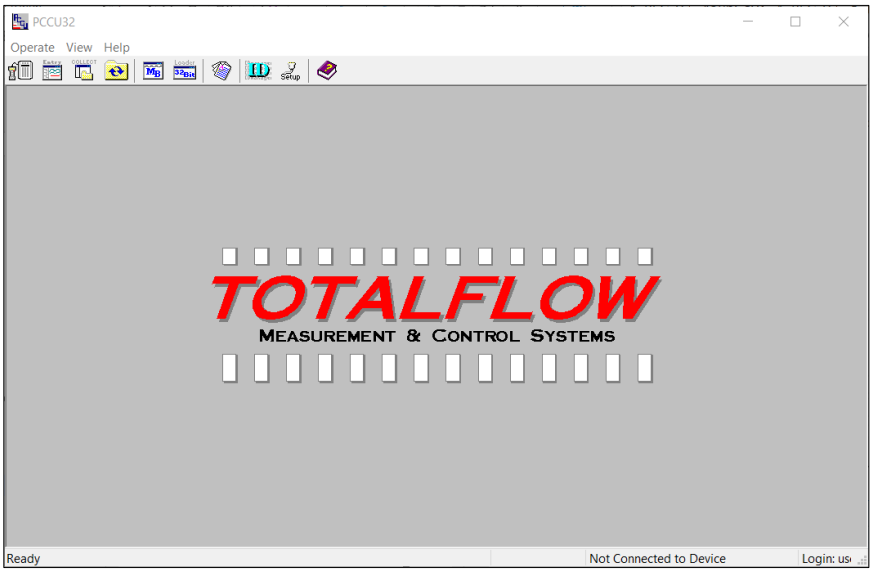

**Table 6-1: Cable for USB connection**

| Host system interface type | Required cabling termination (connectors) or adaptors | ABB part number |
|---|---|---|
| USB 2.0 Type A receptacle | USB 2.0 Type B plug to USB 2.0 Type A plug cable (referred as USB PCCU32 cable) | 1801800-xxx |

To set up communication using the USB port:

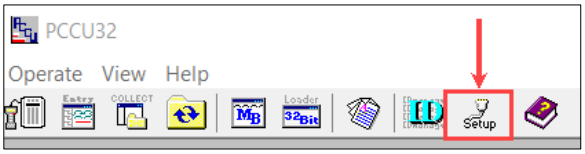
1. Connect the USB cable from the laptop to the analyzer: The cable's **client** end (type B) connects to the analyzer. The **Host** end (type A) connects to the laptop's USB port.
2. Power on the analyzer. Observe the analyzer's LCD initializing sequence. Diagnostic tests begin immediately. See section 6.4 Power on sequence for details.
3. Launch PCCU: Locate and select the PCCU shortcut. The main PCCU screen displays.

**Figure 6-6: Main PCCU32 screen (prior to connection with device)**



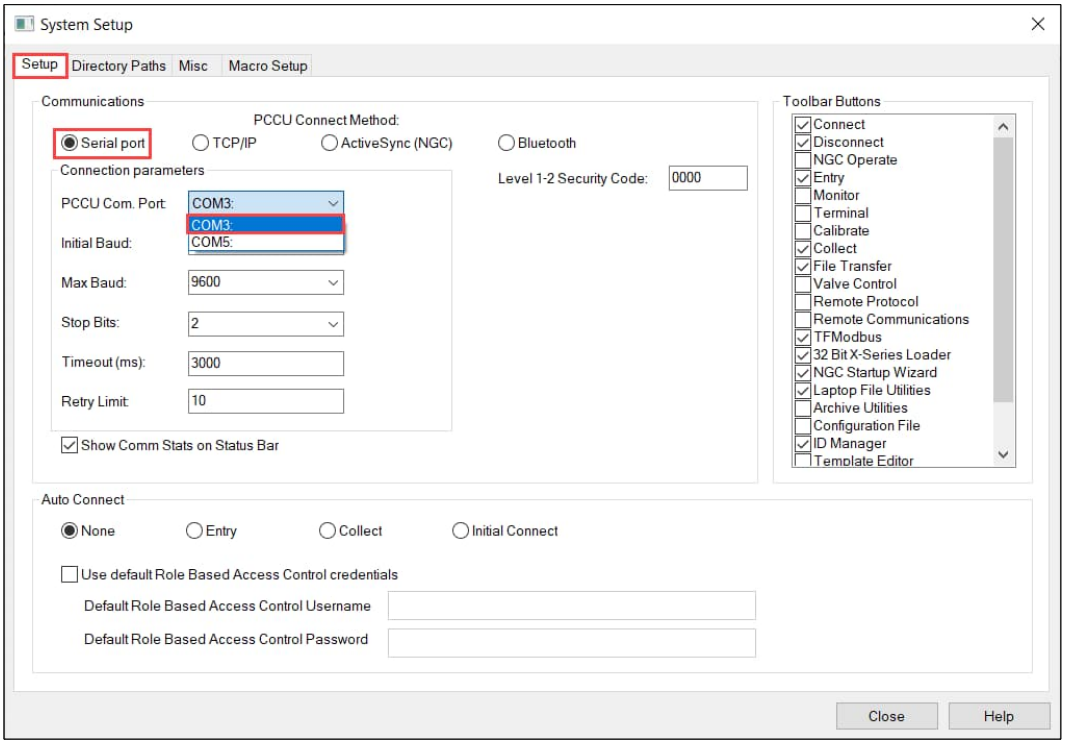

4. Click **Setup** on the PCCU32 toolbar menu.

**Figure 6-7: PCCU32 Connection Setup**



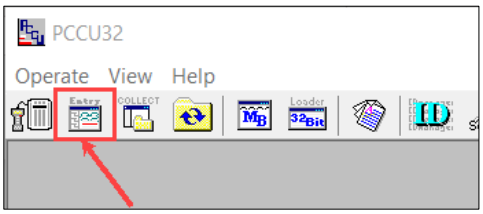
5. On the System **Setup** tab, under PCCU Connect Method, click **Serial port** (Figure 6-8).
6. Select the port from the **PCCU Com. Port** drop-down list. USB ports are typically identified as COM3 or greater. Select the port used for the connection. Note that COM1 or COM2 are typically used to identify legacy RS-232 serial ports. Select these only when using MMI to connect to the analyzer as described in section 6.3.2 Connect using RS-232).

**Figure 6-8: PCCU system setup (USB communication)**




7. Click **Close** to exit connection setup and return to main PCCU screen.
8. Click the **Entry** icon on the PCCU32 toolbar to connect to the device.

**Figure 6-9: PCCU32 top menu bar**




9. Click **Yes** if the message to synchronize the date and time displays. This message displays if the analyzer's calendar clock does not match the laptop's date and time which is usually the case with a new system.

When connection is successful, the analyzer's startup wizard screen displays. The wizard provides the sequence to complete basic analyzer configuration. Go to section 6.5 Startup wizard.

## 6.3.2 Connect using RS-232 port

This section describes initial local connection using the analyzer's RS-232 port. Use this port for local communication (see section 6.3.1 Connect using USB).

**IMPORTANT NOTE:** Connection to the RS-232 port requires cable adapters to support RS-232 interfaces on older PCs or laptops. Legacy systems with traditional DB-9 serial interfaces require DB-9 to military-connector cables (Figure 6-10). Newer PCs or laptops do not have legacy RS-232 interfaces. Therefore, additional cable adaptors or converters are still necessary (DB-9 to USB converters, for example). The Digi® Edgeport®/1 converter (Figure 6-11) is recommended and can be purchased from ABB (part number 1801382-001). Contact technical support to order or for more details. See Table 6-2.

**Figure 6-10: MMI-to-DB-9 (female) cable**

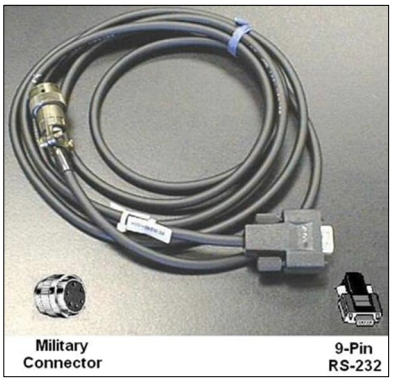



**Figure 6-11: USB-to-DB9 (male) Digi® Edgeport®/1 converter**

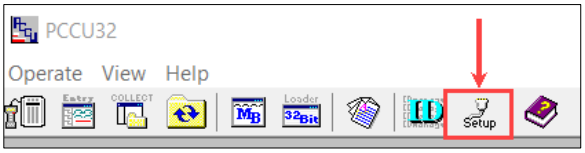
**Table 6-2: Required cables for connection with MMI port**

| Host system (PC/Laptop) port type | Required cabling termination (connectors) or adaptors | ABB part number |
|---|---|---|
| **Legacy serial** (**RS-232**) **interface**, DB-9 (9-PIN, male connector) | **1 cable/adapter required**: Serial DB-9 (9 POS, female connector) to circular military cable (referred to as MMI cable) | 2015240* |
| **USB** | **2 converter/adapter cables required**:<br>— Serial DB-9 (9 POS, female connector) to circular military cable<br>— Digi® Edgeport®/1 converter: Serial DB-9 (9 POS, male connector)-to-USB cable) | 2015240* and 1801382-001 |

*May be available in several lengths. The 8' cable is part number 2015240-004.

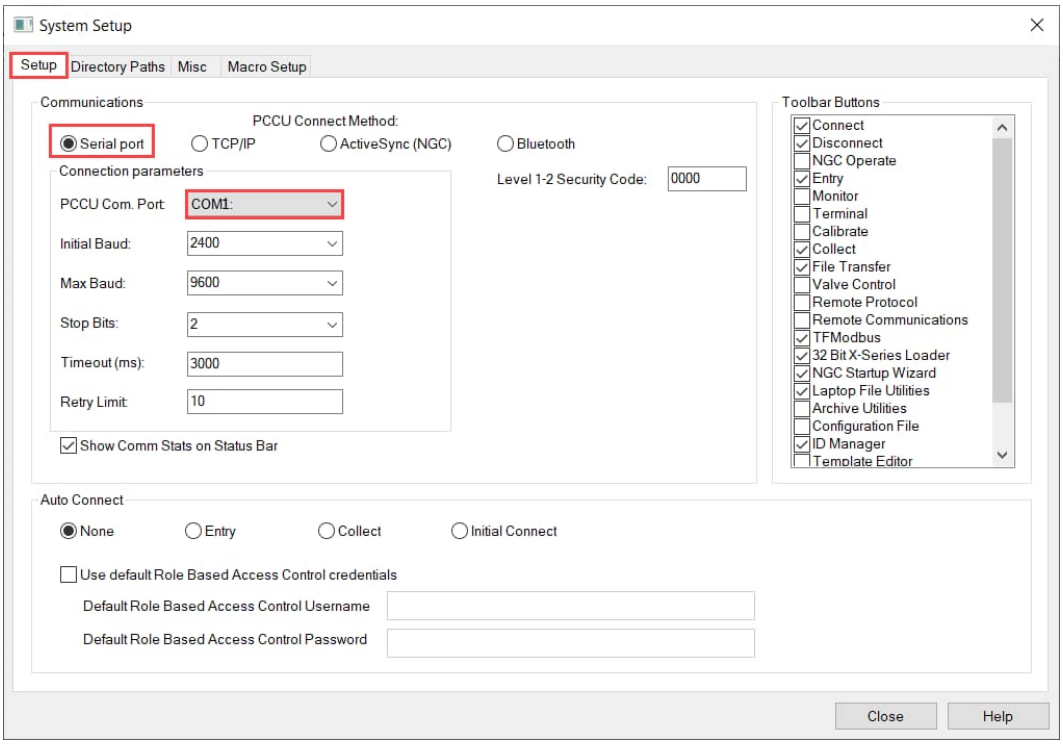
To set up communication using the MMI port:

1. For laptops with legacy COM1/COM2 interfaces, connect the MMI cable as follows:
   a. Connect the circular miliary end to the MMI port on the analyzer.
   b. Connect the DB-9 end to the laptop's COM1 or COM2 port.
2. For laptops with USB ports only, use also the Digi® Edgeport®/1 converter. Connect the MMI cable and converter as follows:
   a. Connect the circular miliary end to the MMI port on the analyzer.
   b. Connect the DB-9 end to the Digi® Edgeport®/1 converter's DB-9 end.
   c. Connect the Digi® Edgeport®/1 converter's USB end to the laptop USB ports.
3. Power on the analyzer. Observe the analyzer's LCD initializing sequence. Diagnostic tests begin immediately. See section 6.4 Power on sequence for details.
4. Launch PCCU.
5. Click **Setup** on the PCCU32 toolbar.



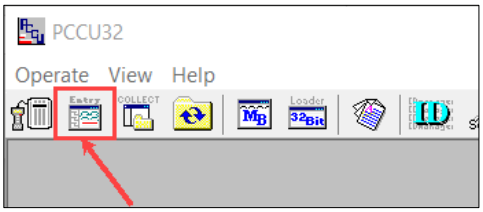
6. On the System **Setup** tab, under PCCU Connect Method, click **Serial port**. (Figure 6-12).
7. Select the port from the **PCCU Com. Port** drop-down list. Legacy serial interfaces are typically identified as COM1 or COM2. Select the port used for the connection.

**Figure 6-12: PCCU system setup (MMI communication)**




8. Click **Close** to exit connection setup.
9. Click the **Entry** icon on the PCCU32 toolbar to connect to the device.

**Figure 6-13: PCCU32**




10. Click **Yes** if the message to synchronize the date and time displays. This message displays if the analyzer's calendar clock does not match the laptop's date and time which is usually the case with a new system.

When connection is successful, the analyzer's startup wizard screen displays. The wizard provides the sequence to complete basic analyzer configuration. Go to section 6.5 Startup wizard.

### 6.3.3 Connect using Ethernet port

If the analyzer's Ethernet port is disabled in a new analyzer, you can connect your laptop/PC to the port and then power on the analyzer and have the Ethernet port temporarily enabled. This happens also if you connect to the port and the analyzer is rebooted.

**IMPORTANT NOTE:** For the Ethernet port to be temporarily enabled, you must be connected to the port prior to power being applied to the analyzer. Once you disconnect, the port will no longer be enabled. If the Ethernet port will only be used for initial local connection and will not be connected to a network, it is recommended that it remains disabled. After initial connection and configuration are completed, simply disconnect the laptop from the port and the port is disabled.

If the analyzer will be connected permanently to a network, the port must be enabled and configured as described in section 8 Configure for network connection.

### 6.3.3.1 Cabling for connection to operator laptop

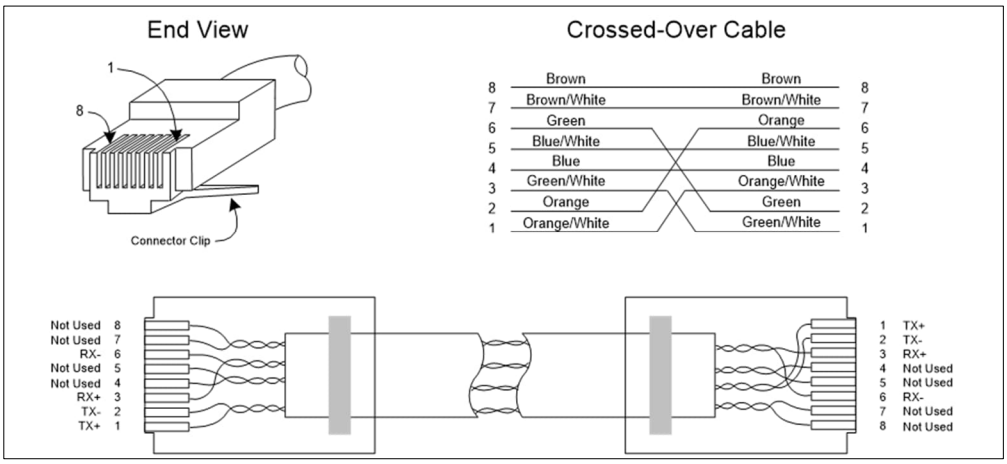
The analyzer's Ethernet port does not have the ability to autoconfigure for cable type. Local operator connection to the analyzer's Ethernet port requires a crossover Ethernet cable. Table 6-3 shows details.

**Table 6-3: Ethernet cabling for local connection**

| Host system (PC/Laptop) port type | Required cabling termination (connectors) or adaptors | Maximum distance |
|---|---|---|
| Ethernet | Cross-over Ethernet CAT 5 cable with RJ-45 connectors at both ends. | 100 meters (328 feet) |

You can purchase crossover cables or build your own. Figure 6-14 shows the crossover cable pinouts. If you build your own cable, ensure the connectors are properly crimped and that no internal wires are exposed outside of the connector. Test the cable for proper connectivity. If you are experiencing connection issues, always check that you have the correct cable pinout and that the cable and connectors are free from damage and are properly inserted in the ports.

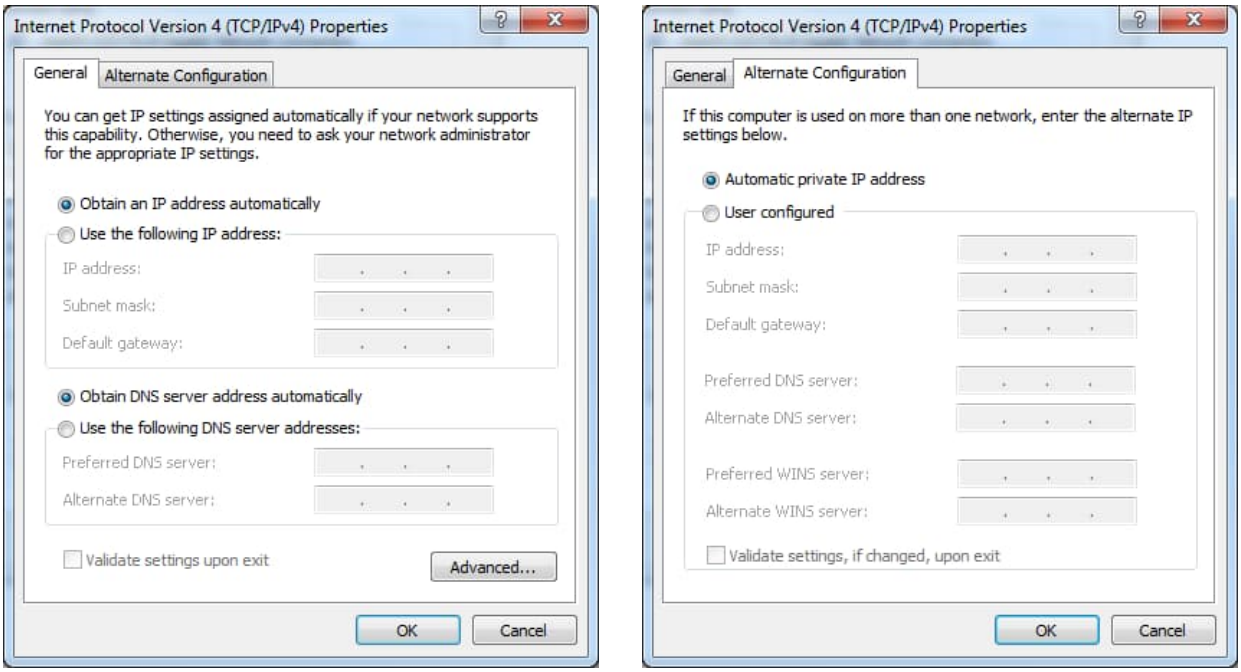
**Figure 6-14: Crossover Ethernet cable**




### 6.3.3.2 Configure the host system

If the laptop is configured to automatically obtain the IP address, do not change the TCP/IP configuration. If the laptop has a static TCP/IP configuration, configure it for dynamic IP addressing and (automatic) private addressing (See Figure 6-15 for Windows® 7 system examples, screens may differ depending on the Windows OS).

**Figure 6-15: IP configuration for host system (automatic addressing)**



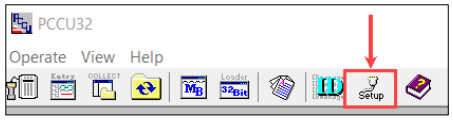

### 6.3.3.3 Set up PCCU32 and connect

This procedure assumes that the default Ethernet configuration is intact. The analyzer has a default IP address assigned at the factory (169.254.0.11).

To configure PCCU32 for TCP/IP communication:

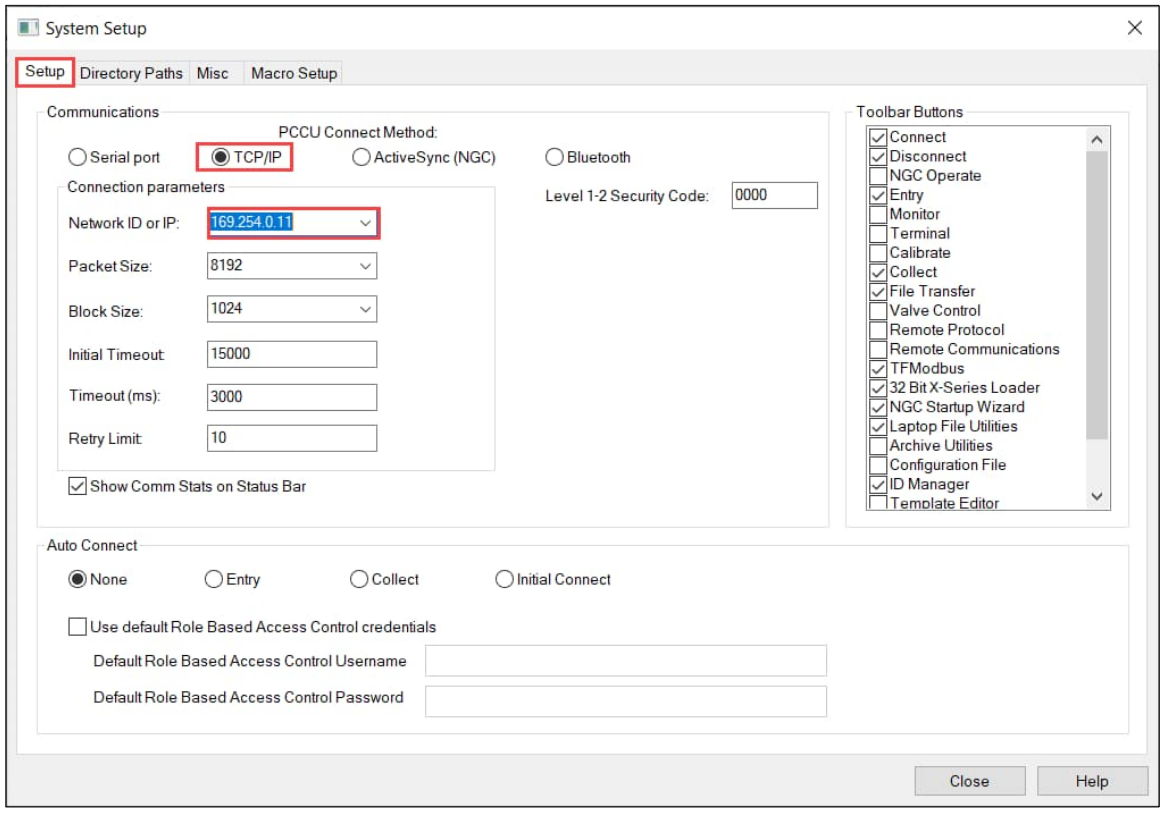
1. Connect an Ethernet cross-over cable between the PC and analyzer. Make sure the PC or laptop is powered on.
2. Power on the analyzer. Diagnostic tests begin immediately. See section 6.4 Power on sequence for details.
3. Launch PCCU32.
4. Click **Setup** on the PCCU32 toolbar menu.

**Figure 6-16: PCCU32 Setup**



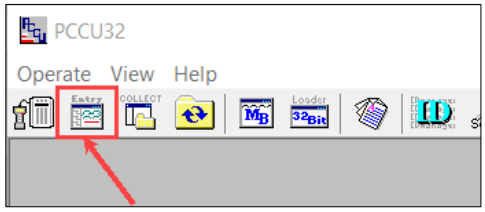

5. On the System **Setup** tab, under PCCU Connect Method, click **TCP/IP** (Figure 6-17).
6. Type the default IP address (**169.254.0.11**) into **Network ID or IP** field.

**Figure 6-17: PCCU setup for local Ethernet communication**




7. Click **Close** to close connection setup.
8. Click **Entry** on the PCCU32 menu bar to connect to the device.
9. Click the **Entry** icon on the PCCU32 toolbar to connect to the device. If unable to connect, see section 8.6 Basic Ethernet connection troubleshooting.

**Figure 6-18: PCCU32**




10. Click **Yes** if the message to synchronize the date and time displays. This message displays if the analyzer's calendar clock does not match the laptop's date and time which is usually the case with a new system.

When connection is successful, the analyzer's startup wizard screen displays. The wizard provides the sequence to complete basic analyzer configuration. Go to section 6.5 Startup wizard.

# 6.4 Power on sequence

## 6.4.1 Initialization

At power on, the analyzer starts its initialization sequence:

- Performs a cold-start
- Loads startup information into RAM memory. The message "Boot Loader" displays.
- Start Diagnostics. Diagnostic results are available on the Diagnostic tab in PCCU. Once the initializing sequence is complete, connect with the analyzer using PCCU.

## 6.4.2 Startup diagnostics

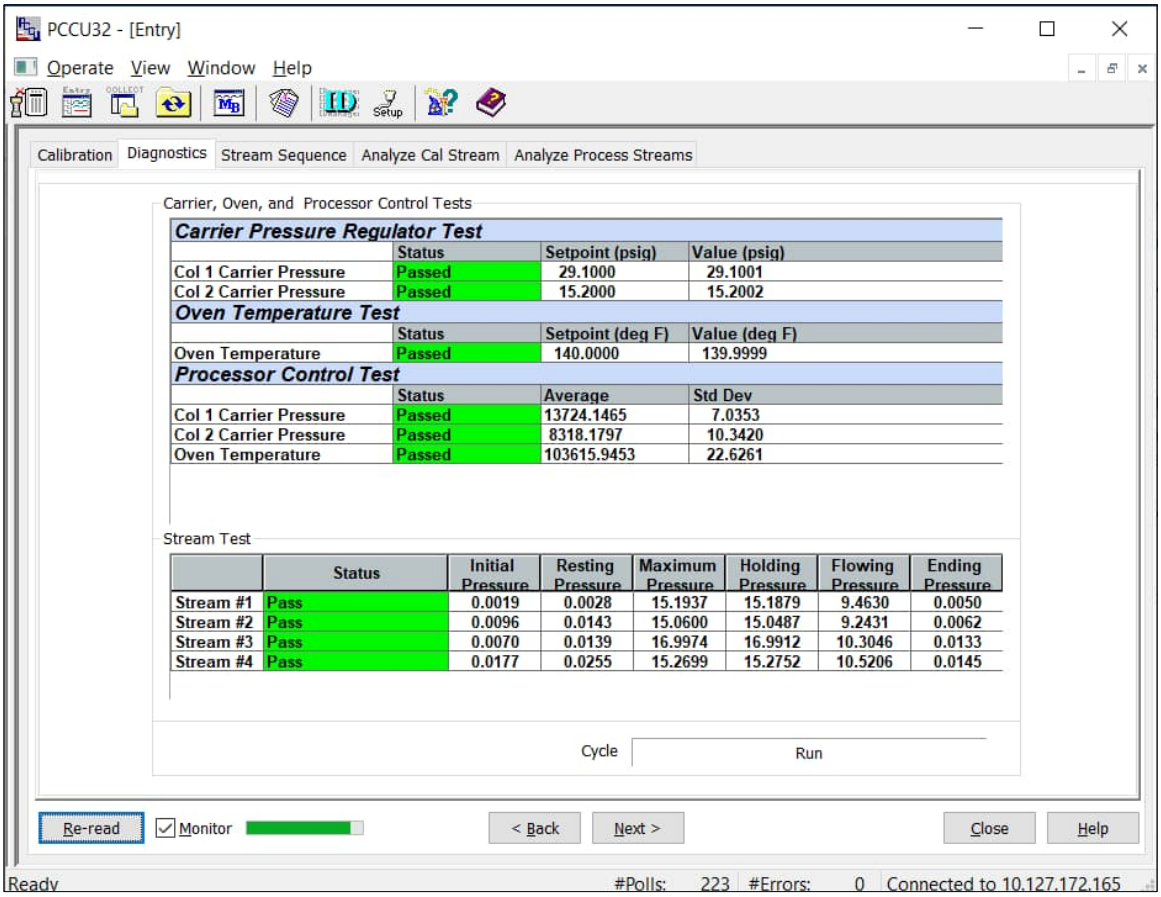
The analyzer has an extensive built-in list of tests which are automatically performed each time the device is started.

**IMPORTANT NOTE:** Additional diagnostics configuration and scheduling options are available. Click **Help** on the Diagnostics screen for additional details.

Figure 6-19 shows the **Diagnostics** tab as shown from the Startup Wizard. In this example the analyzer has passed all tests. The following tests are performed:

- Carrier Pressure Regulator Test
- Oven Temperature Test
- Processor Control Test
- Stream Test

**Figure 6-19: Completed Diagnostics (displayed from the Startup Wizard)**




During the diagnostics or upon completion, view the status of the diagnostic tests by clicking **Diagnostics** on the Analyzer Operation screen. When the device completes the startup diagnostics and has passed the appropriate tests (with the exception of streams with no pressure), the device will go into hold mode. We recommend that the device be allowed to run for at least eight hours to completely stabilize. Then perform calibration as described in section 7.

#### 6.4.2.1 Carrier pressure regulator tests

This test compares the actual column pressure to the column pressure set point using carrier gas. A failure of this test indicates that the carrier pressure is not meeting or is exceeding the expected level of pressure. A failure of this test indicates that the carrier pressure cannot be regulated to the setpoint.

#### 6.4.2.2 Oven temperature test

This test compares the actual oven temperature to the oven temperature set point. The factory set point value for oven temperature is 60 °C (140 °F). A failure of this test indicates that the oven is not maintaining the required temperature.

**IMPORTANT NOTE:** Depending on ambient temperatures, reaching the desired oven temperature could take up to an hour. During this time, you can follow the Startup Wizard as described in section 6.5 Startup wizard and enter information as prompted.

#### 6.4.2.3 Processor control test

This test contains three test areas: column 1 carrier pressure, column 2 carrier pressure, and oven temperature. In each area, the test measures the effort required to maintain the required value. From those measurements, the test develops a standard deviation and makes a comparison. The failure of any of these comparisons indicates that an erratic deviation exists, meaning the processor is not able to control the function.

#### 6.4.2.4 Stream test

This test measures various pressures for each available stream: Initial, Resting, Maximum, Holding, Flowing and Ending.

**Figure 6-20: Pressure test for streams**

| Stream | Pressure |
|---|---|
| **Initial** | < .5 psi |
| **Resting** | < .5 psi |
| **Maximum** | < 20 psi |
| **Holding** | ± .2 psi for 6 seconds |
| **Flowing** | Between 5 and 20 psi |
| **Ending** | < .5 psi |

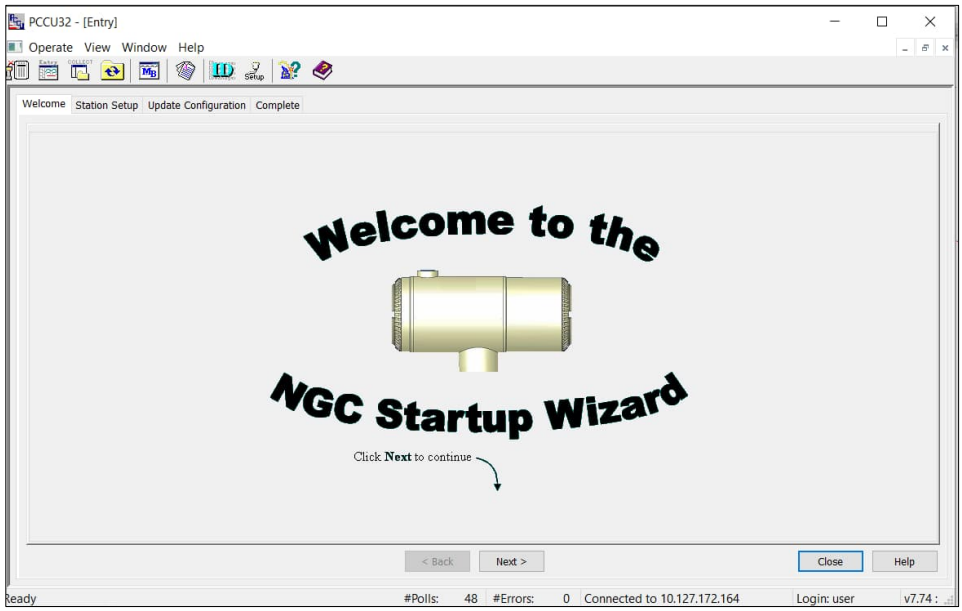
Results from testing the various stream pressures at first-time installation helps to verify that the Stream Sample Valves (SSVs) or the Sample Shut Off (SSO) valve are not leaking when closed. It also verifies that the SSVs allow sample gas to pass through when opened.

**IMPORTANT NOTE:** During startup, all streams are disabled. During the stream test, streams with input pressure will be enabled, tested, and either passed or failed. Streams with no initial input pressure will fail and are left disabled. Streams can always be enabled later if they will be used (see section 6.5.7 Enable/Disable stream).

## 6.5 Startup wizard

After starting PCCU32 and clicking the **Entry** icon, the analyzer's Startup Wizard begins automatically (Figure 6-21). The wizard initializes at first-time connection with a new analyzer or each time you reconnect to the analyzer and have not completed the Startup Wizard. The wizard presents analyzer configuration screens in the sequence required to place the analyzer in service.

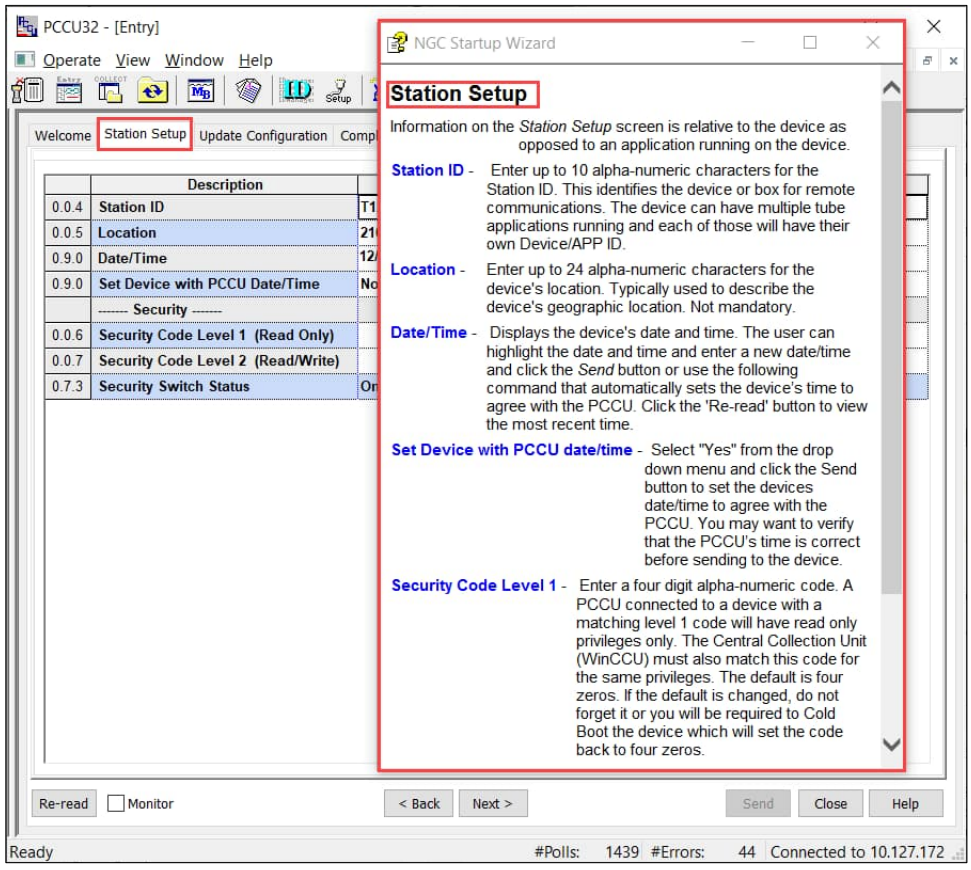
**Figure 6-21: Startup Wizard**




Follow the prompts in the Wizard. The wizard may run concurrently with the Diagnostics. Follow the wizard to complete configuration even if the diagnostics are still running.

**IMPORTANT NOTE:** As each wizard screen is displayed, its associated help topic also displays (Figure 6-22). If the topic is closed, you can display it again by clicking **Help** on the desired screen.

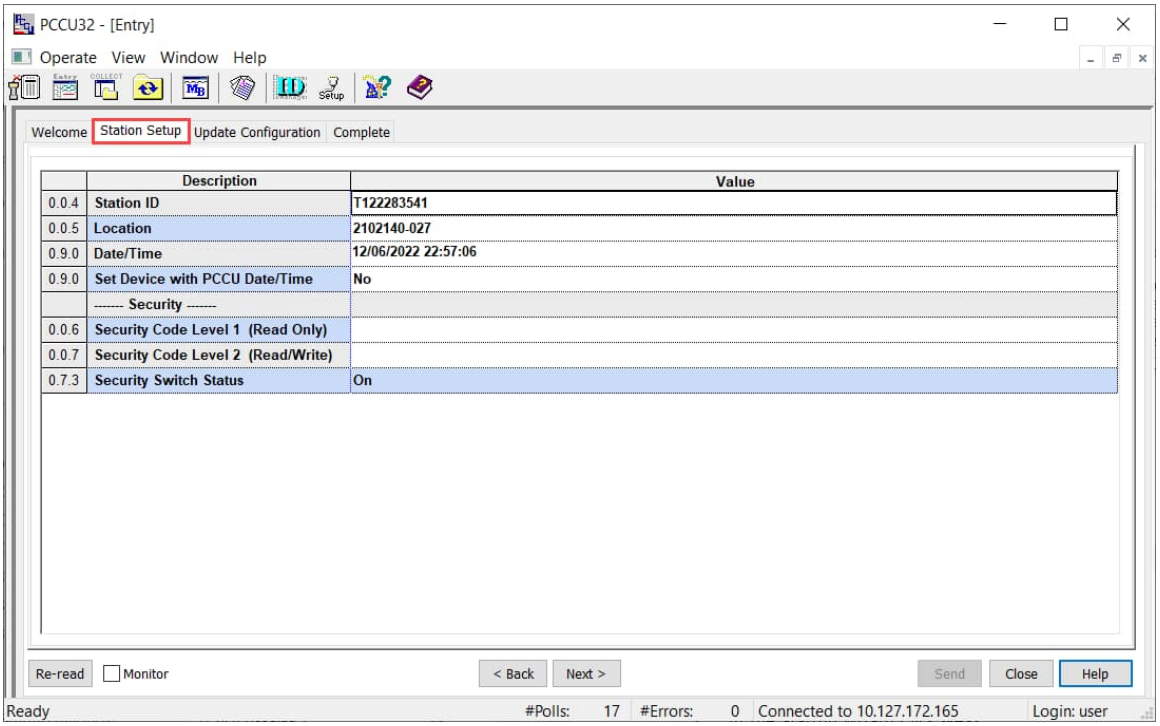
**Figure 6-22: Context sensitive Help topic**



## 6.5.1 Set up the station

1. At the Startup Wizard, click **Next**. The **Station Setup** tab displays (Figure 6-23).

**Figure 6-23: Station setup**




2. Enter the Station ID (10 alphanumeric digits) and Location (24 alphanumeric digits). See
3. Table 6-4. The Station ID should be a unique identifier from other analyzers.
4. Verify the date and time; if incorrect, select **Yes** for Set Device with the PCCU Date/Time.

**IMPORTANT NOTE:** Additional items in the Station Setup screen are not required for startup. For more information regarding the setup of these items, click **Help** to see more information about each screen.

5. When all desired changes have been made, click **Send** and then **Next** to move to the next screen.

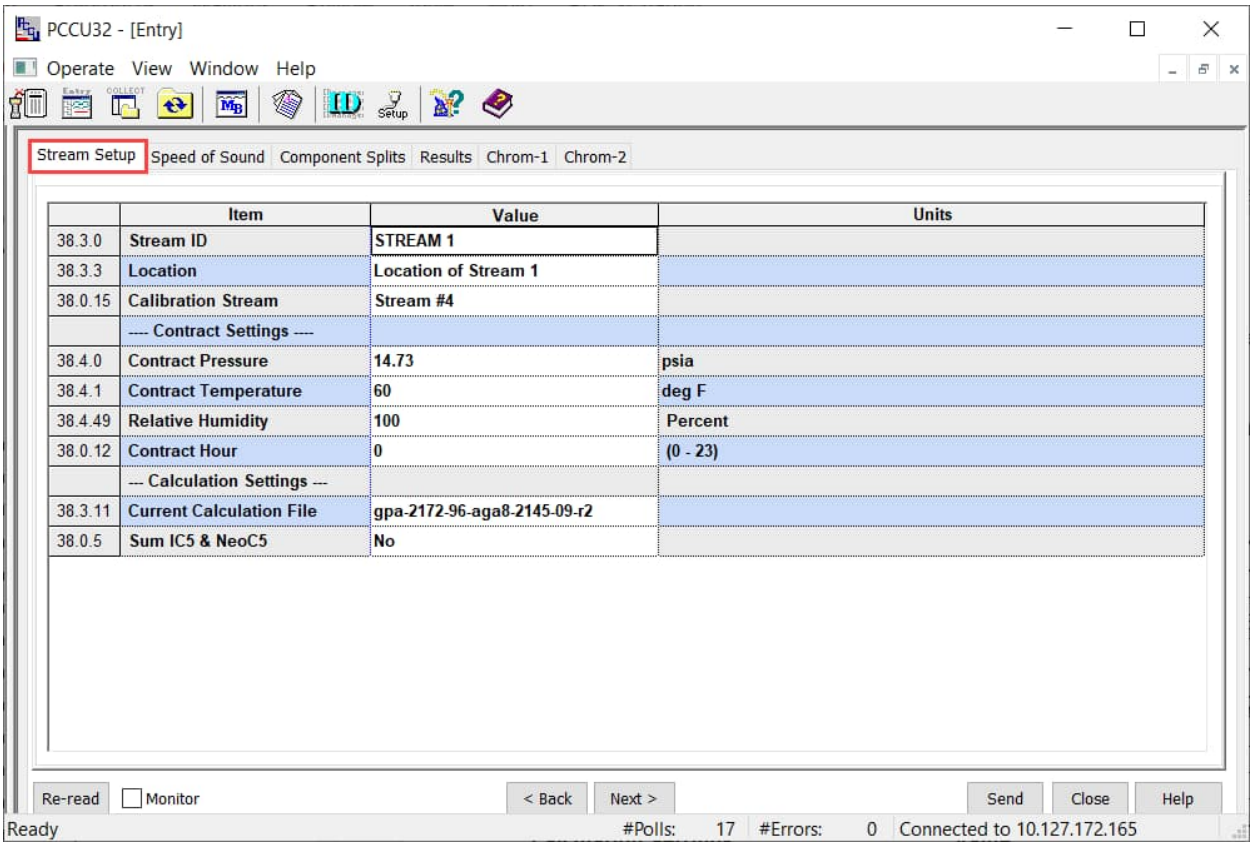
**Table 6-4: Station setup basic parameters**

| Description | Value |
|---|---|
| Station ID | Assign unique identifier (10 alphanumeric digits) |
| Location | Enter meter location (24 alphanumeric digits). |
| Date/Time | Shows current device Date/Time |
| Set device with PCCU Date/Time | Resets device date and time to match PC/laptop |

## 6.5.2 Set up the stream

1. At the **Stream Setup** tab (Figure 6-24), enter the Stream ID, Location, Contract Settings, and Calculation Settings (see
2. 
3. Table 6-5).

**Figure 6-24: Stream Setup (Stream 1)**




4. When all the desired changes have been made, click **Send** and then **Next** to move to the next screen.
5. Complete the configuration at each screen presented and click **Next**. When the last screen for the stream is completed and you click **Next,** the **Stream Setup** tab appears again for the next stream.
6. Start configuration of the second stream on the **Stream Setup** tab and go through all the screens.
7. Complete steps 1 and 4 for each additional sample stream.
8. Click **Next** on the last screen for the final stream. The Calibration tab displays (see section 6.5.3, next).

**IMPORTANT NOTE:** During the stream setup, each time Next is selected you should see the Stream ID located on the first line of each screen. Update values as required. Move through all four streams even if the device is a single stream device.

**Table 6-5: Stream setup screens**

| **Setup Tab** | **Values** | |
|---|---|---|
| Stream ID | Assign unique identifier (10 alphanumeric digits) | |
| Location | Enter meter location (24 alphanumeric digits) | |
| Calibration Stream | Stream 4 (default), Stream 1, Stream 2, Stream 3, or Stream (Any) | |
| **Contract Settings** | **Value** | **Available Units** |
| Contract Pressure | 14.73 PSIA (default) | KPa, InH20, Mbar, InHg, PSIA, Bar, mmHg, MPa, Pa or kgcm2 |
| Contract Temperature | 60.00 °F (default) | C, F, R or K |
| Relative Humidity | 100.00 % (default) | Percent |
| Contract Hour | 0 (default) | Hour (0-23) |

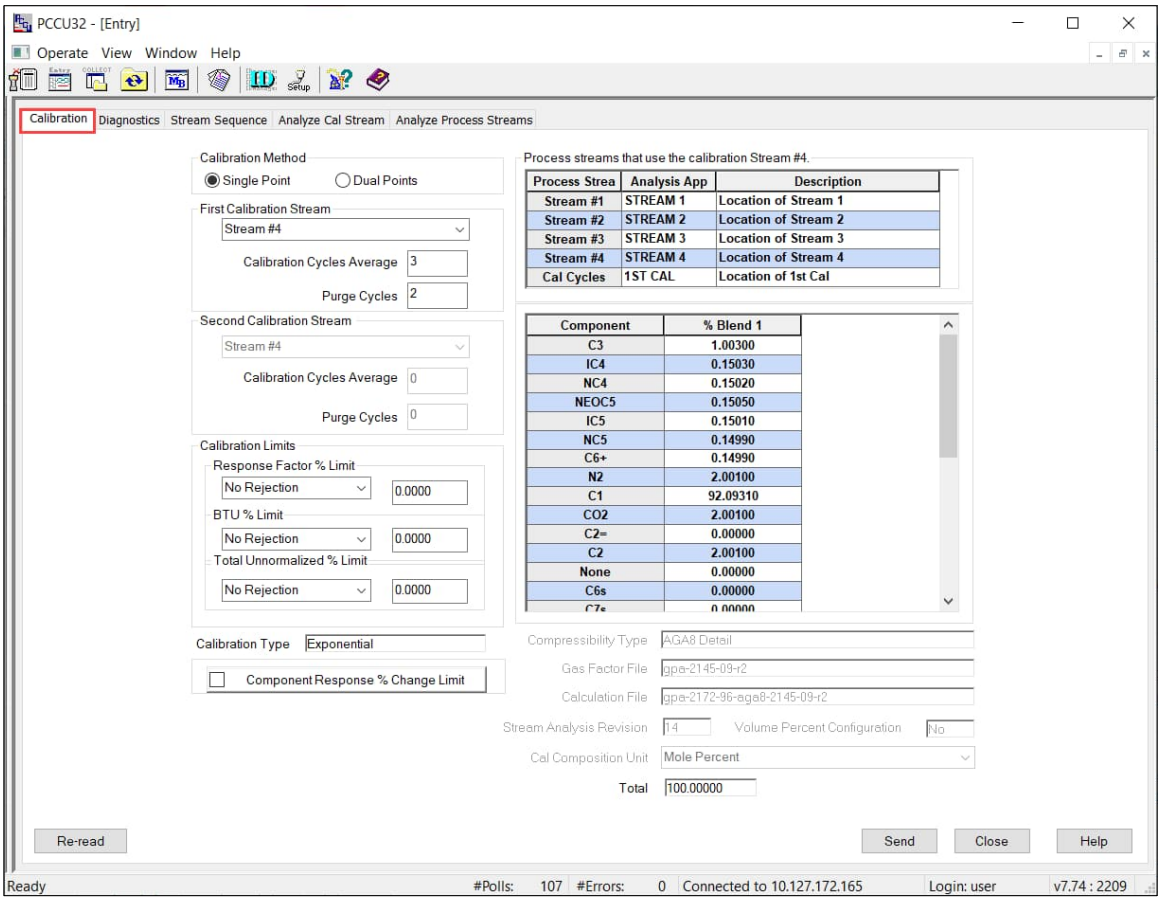
| Calculation Settings | Value |
|---|---|
| Current Calculation File | GPA-2172-1996(AGA8), ISO-6976-1995, etc. See note 1. |
| Sum IC5 and NeoC5 | No (default), Yes |
| C6+ Index Split Mode. See note 2. | Select one of the 3 following options:<br>– **User-defined with C6+ Reported** (Default). The selection will use what the user enters on the C6+ split ratios. All values, the C6+ value and the individual split values, are transmitted if required.<br>– **Pre-defined C6+ Splits**. Select one of the following:<br>• 47.466% C6 35.340% C7 17.194% C8<br>• 50% C6 50% C7 0% C8<br>• 50% C6 25% C7 25% C8<br>• 57.143% C6 28.572% C7 14.285% C8<br>– **User-Defined C6+ Not Reported**. The selection will use what the user enters on the C6+ split ratios. Only the split values (not the C6+ value) are transmitted, if required. |
| C6, C7, C8, C9, C10 | Used to enter split percentages, if desired. |

Note 1: File selection automatically sets the remainder of the items on this screen. See PCCU Help files for more information.
Note 2: A selection in this field (other than User-defined) will override any values in the C6+ Split Percent area of the Stream Setup screen. See the **Stream Setup: Component Splits** help topic on PCCU32 for more information.

## 6.5.3 Set up calibration

1. At the **Calibration** tab (Figure 6-25) verify that each process stream is set up to use the correct calibration stream (Stream 4 is the default).

**Figure 6-25: Calibration setup**



2. Change the Calibration Cycles Average and Purge Cycles, if required. The default Calibration Cycles Average is 3 and the default Purge Cycles is 2.
3. Enter calibration cylinder blend information in the component concentration table: Update the value for each component in the **% Blend** column. Ensure that the Total Mole equals 100%.

**NOTICE – Incorrect results.** When entering component blend percentages, carefully match the components labeled on the calibration cylinder. Mistakes will cause incorrect values.

If the Total Mole does not equal 100% exactly, re-check each entry and make sure it matches the calibration cylinder information. If you have entered each value correctly, then add or subtract the remainder to or from methane (C1) to force the total to 100%.

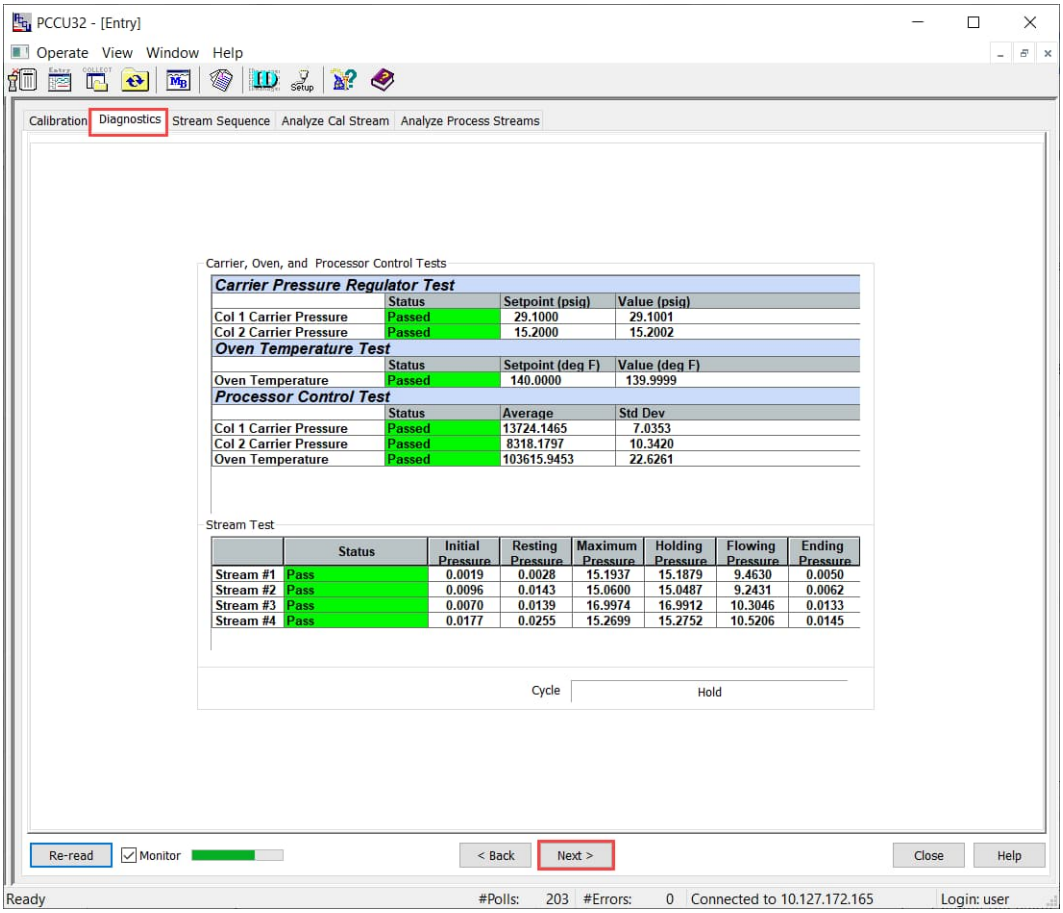
4. When finished, the Total Mole equals 100%, and all desired changes have been made, click **Send** and **Close**.

## 6.5.4 View diagnostics

Diagnostics began when power was applied to the device. You should not proceed beyond the Diagnostics screen until diagnostics have passed.

1. Click the **Diagnostics** tab to verify that the analyzer has completed and passed the tests (Figure 6-26). If any of the test fails, correct the problem.

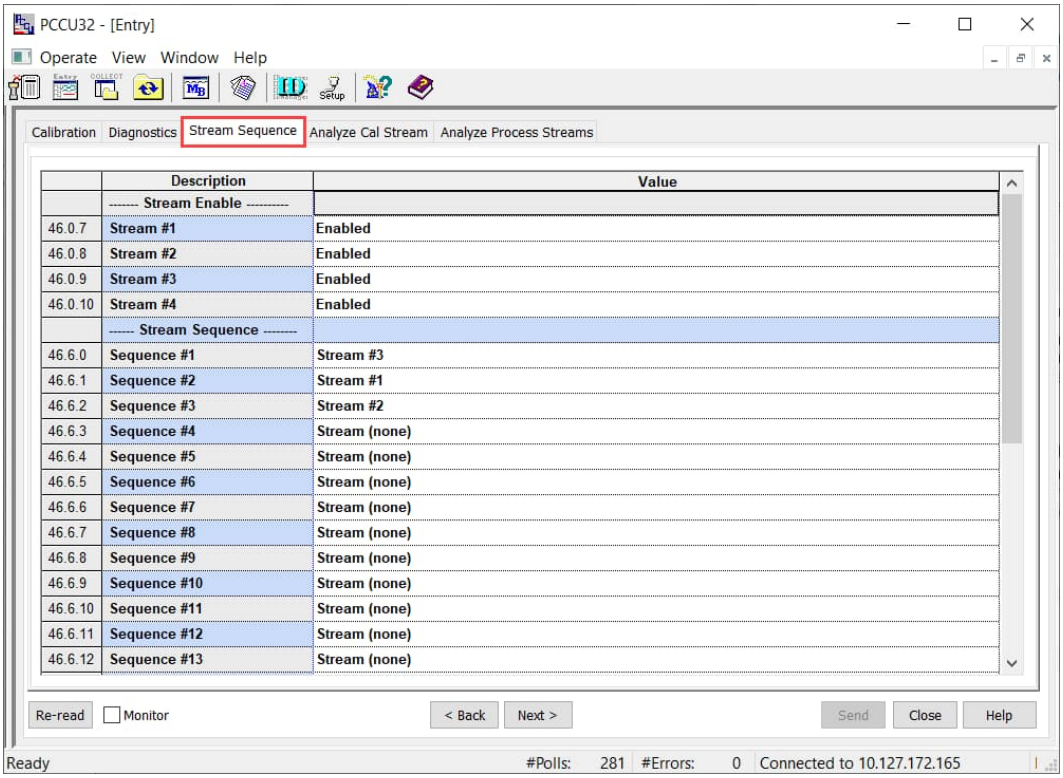
**Figure 6-26: Diagnostics tab: tests completed**




2. Select **Next** to move to the next screen.
3. On the **Stream Sequence** tab (Figure 6-27), you can change the run order of the process streams by selecting a stream number from the drop-down list next to the Sequence Numbers. Streams may also be disabled or enabled.

**IMPORTANT NOTE:** During the initial startup, all streams will be disabled. During the stream test, sample streams will be enabled, tested and either passed or failed. Streams that were not enabled, prior to the diagnostics test, will be automatically disabled again when the test is completed. Streams with no input pressure will fail.

**Figure 6-27: Stream Sequence**




4. When all desired changes have been made, click **Send** and then **Next** to move to the next screen.

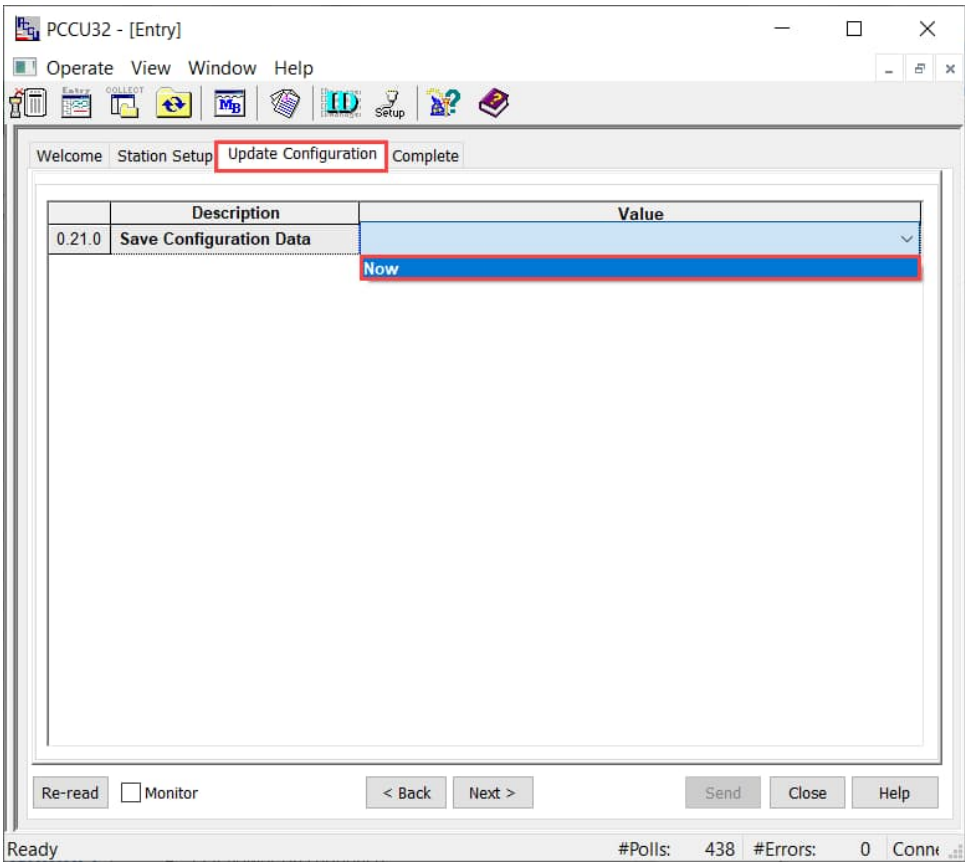
**IMPORTANT NOTE** To enable or disable streams after completion of diagnostics, select **Stream Sequence** from the Analyzer Operation screen. It is recommended that the diagnostic stream test be performed on streams enabled after initial diagnostics. Select **Help** for additional information.

## 6.5.5 Update configuration

Save the device configuration file following setup:

1. At the **Update Configuration** tab, click on the value field next to **Save Configuration Data** and click **Now** (Figure 6-28).

**Figure 6-28: Save initial configuration**




2. Click **Send** and then **Next** to move to the next screen.

## 6.5.6 Analyze the calibration stream

This procedure determines if the analyzer provides accurate composition analysis of the calibration gas blend. If composition analysis does not reflect the expected composition in the blend, the analyzer requires calibration. Perform this procedure prior to running the process streams.
To run the analyzer's calibration stream:

1. At the **Analyzer Cal Stream** tab, select **Stream 4** on the left side of the screen (Figure 6-29). The on-screen indicator next to **Stream 4** should light up, the cycle clock begins, and you should see on-screen animation of gas flowing on the calibration stream (Figure 6-30).

**Figure 6-29: Run the calibration stream (Stream 4)**

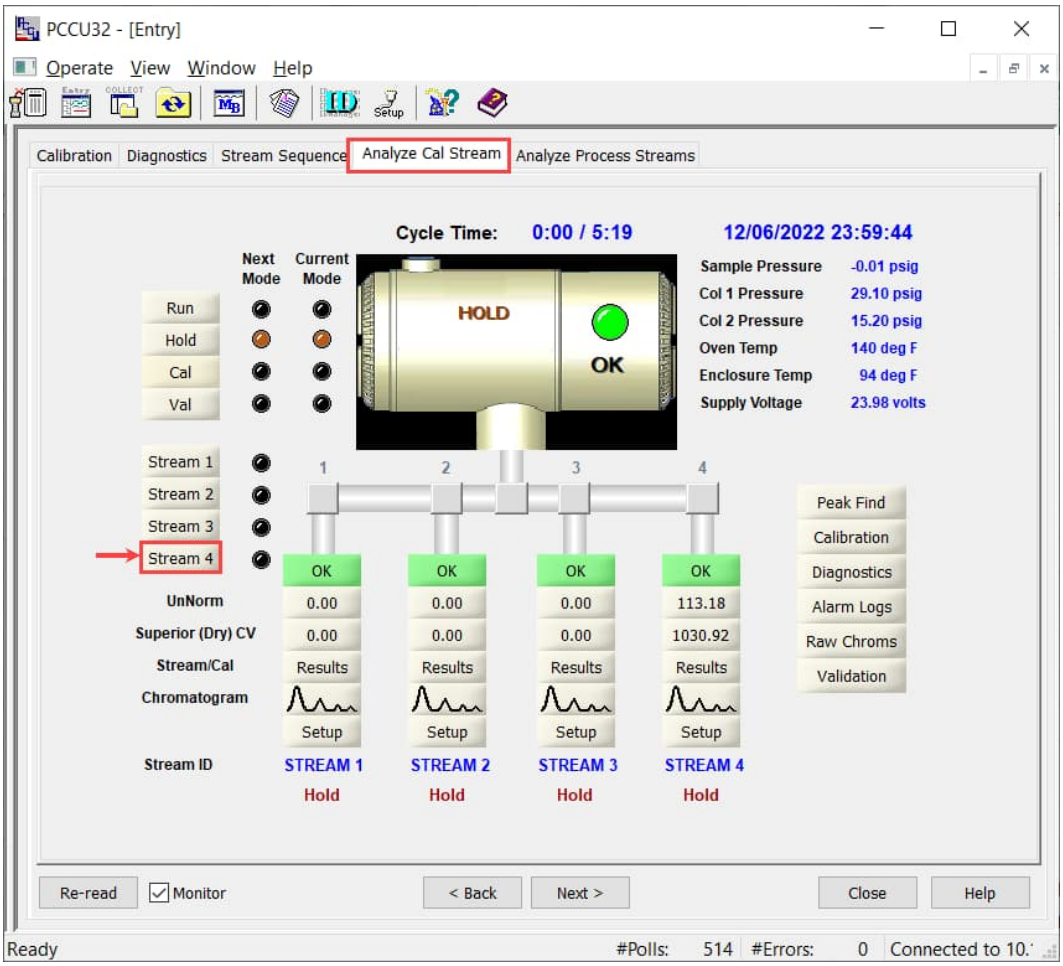
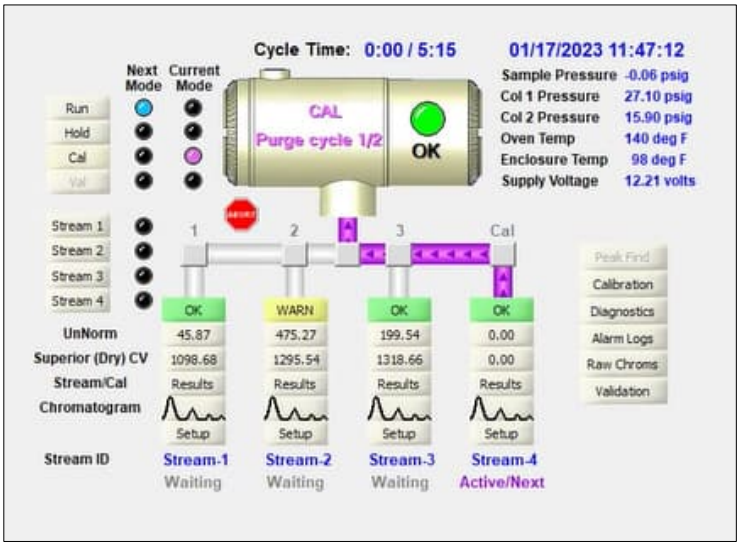



**Figure 6-30: Calibration stream analysis running**




2. Allow the stream to process for two or three cycles (approximately 10 to 15 minutes). During the final cycle, change the next mode to **Hold**. When the device completes the current cycle, it will enter hold mode.
3. Select **Next** to verify analysis results.
4. At the **Results** tab, compare normalized percent for each component to the component and percent listed on the calibration blend cylinder. Component percentages should be the same.

**IMPORTANT NOTE:** There will not be any comparisons for C6+ individual components. There may be values in the Normalized column for hexane through decane, but this is based on the C6+ configuration entered in Stream Setup. For comparison purposes, use the components called heavies.

5. Select **Next** to verify heavy components on Chromatogram-1.
6. At the **Chrom-1** tab, verify that the appropriate components are visible and labeled. For the standard C6+ application, you should see C6+, C3, IC4, nC4, neoC5, iC5 and nC5. The 2nd peak from left that looks like two peaks is a composite peak of C2- and is not used in calculations.
7. Select **Next** to verify light components on Chromatogram-2.
8. At the **Chrom-2** tab, verify that the appropriate components are visible and labeled. You should see N2, C1, CO2, and C2. The 1st peak on the left is a composite peak of C3+ and is not used in calculations.
9. When chromatograms have been verified, ensure that unused streams are disabled. Streams that are used and have passed diagnostics are automatically enabled. If you have already configured the streams as required, go to step 10 next, if not, follow the procedure in section 6.5.7 Enable/Disable streams.
10. **Next** to begin the sample stream analysis and to place the analyzer in service.

## 6.5.7 Enable/Disable streams

**IMPORTANT NOTE:** If the analyzer runs a stream that did not pass diagnostics it could cause a **Bad Bead** alarm (Section 11.2.17) and **No Pilot Valve Change Detected** alarm (section 11.2.18). It is recommended that unused streams are disabled.

To enable or disable streams:

1. If you are in the Startup Wizard, click the **Stream Sequence** tab (
2. Figure 6-31). Note that when you are out of the wizard, the **Stream Sequence** tab is available by going to **Analyzer Operation** on the navigation tree (
3. Figure 6-32).

**Figure 6-31: Enable or disable streams in the wizard**

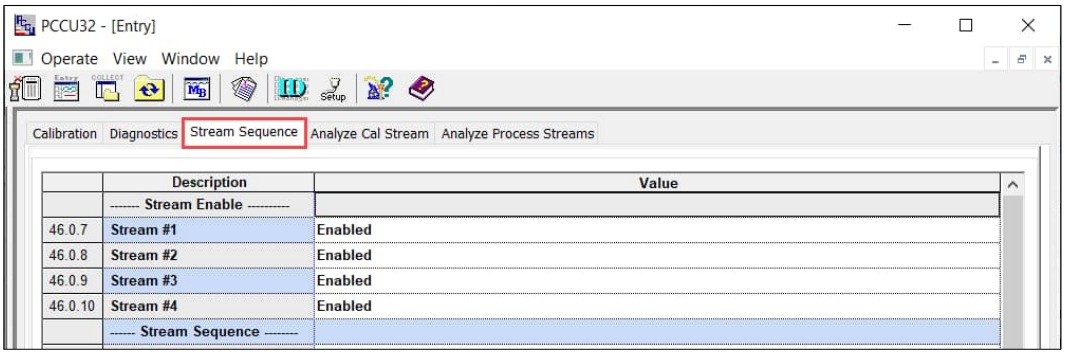
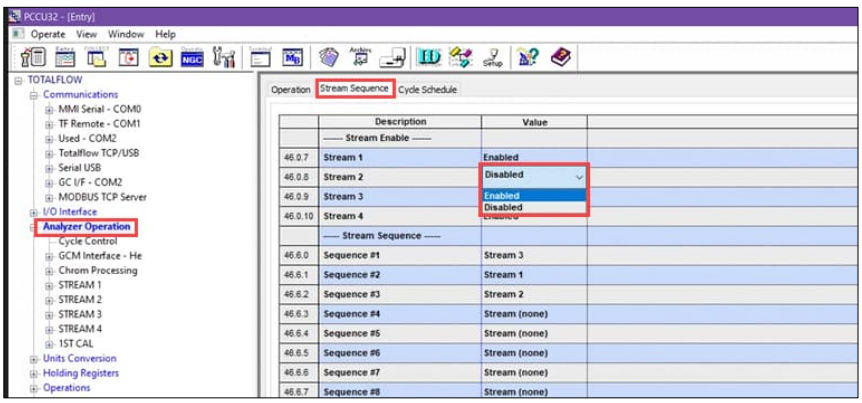



**Figure 6-32: Enable or disable streams if out of the wizard**




1. Select the value field for the stream to enable or disable.
2. Select **Enabled** or **Disabled** from the drop-down menu.

3. Click **Send**.
4. If you were trying to complete the wizard return to the **Analyze Cal Stream** tab.
5. Click **Next** to Run Analysis streams. Follow steps in section 6.5.8 Run Analysis Process streams.

## 6.5.8 Run Analysis Process streams

1. At the **Analysis Process Streams** tab, select **Run** on the left side of the screen (Figure 6-33) to begin the first sample stream in the sequence. The indicator next to **Run** should turn blue, the cycle clock begins, and you should see on-screen animation of gas flowing on the sample stream (Figure 6-34).

**Figure 6-33: Run Analysis Sample Streams**

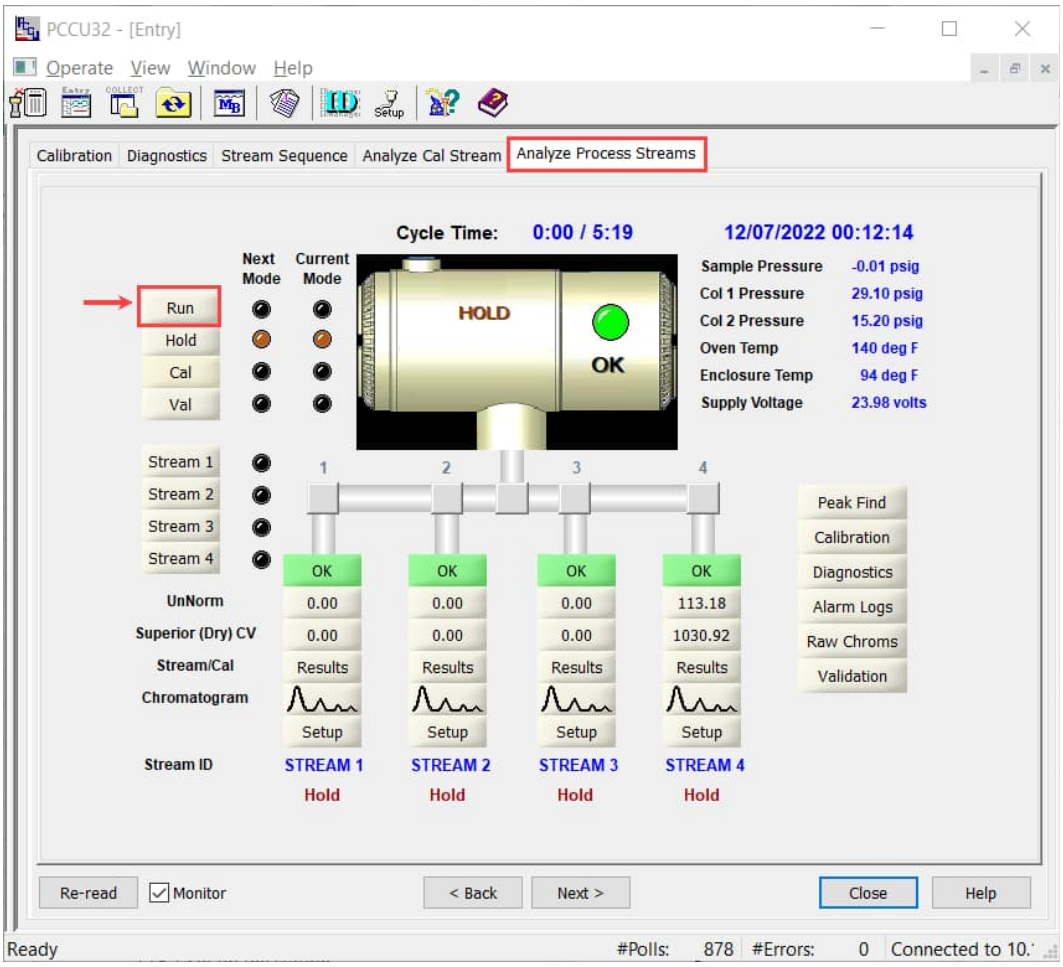
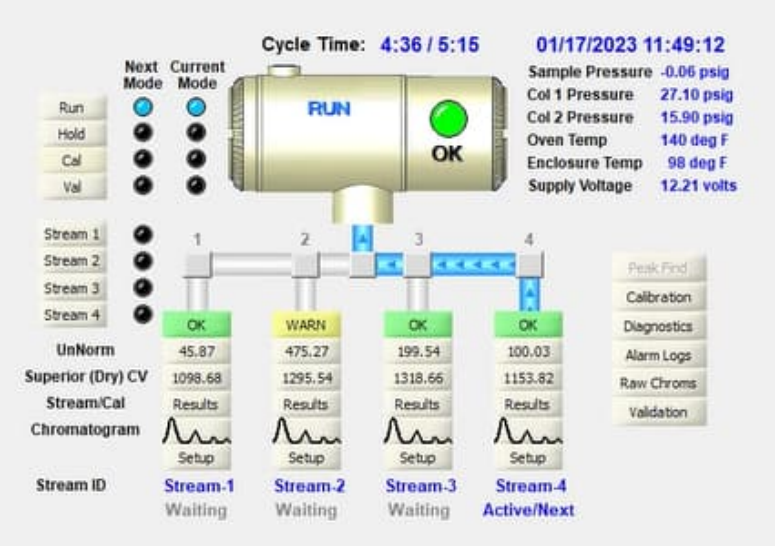


**Figure 6-34: Process stream analysis running**




2. Click **Next**.

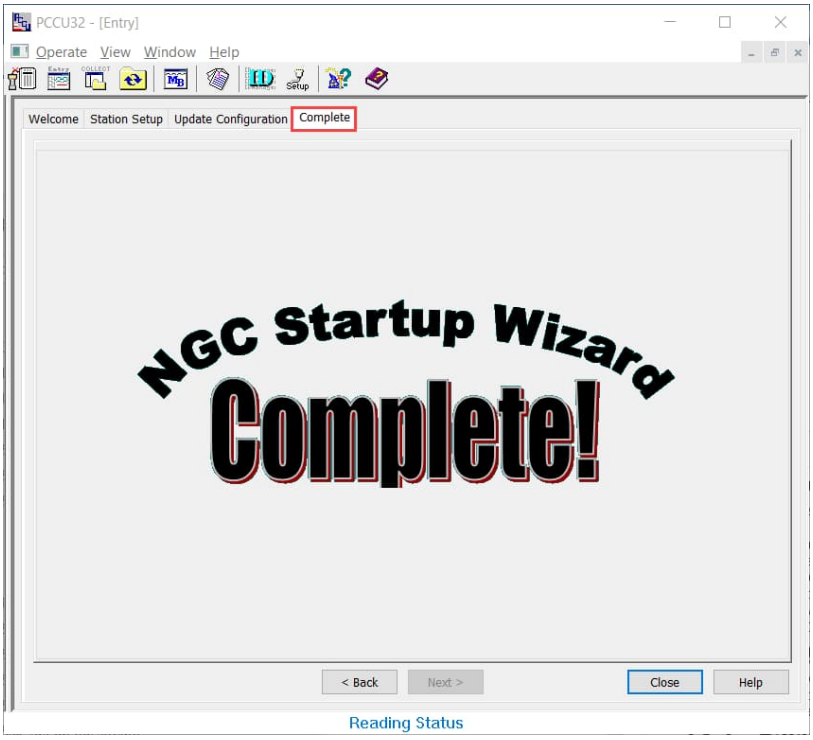
## 6.5.9 Complete startup

The device should continue to cycle through all enabled streams, performing analysis and producing data. If it was determined that calibration is required, it is recommended that the device be allowed to run for at least eight hours before calibration to allow the device to stabilize.

To complete the Startup Wizard:

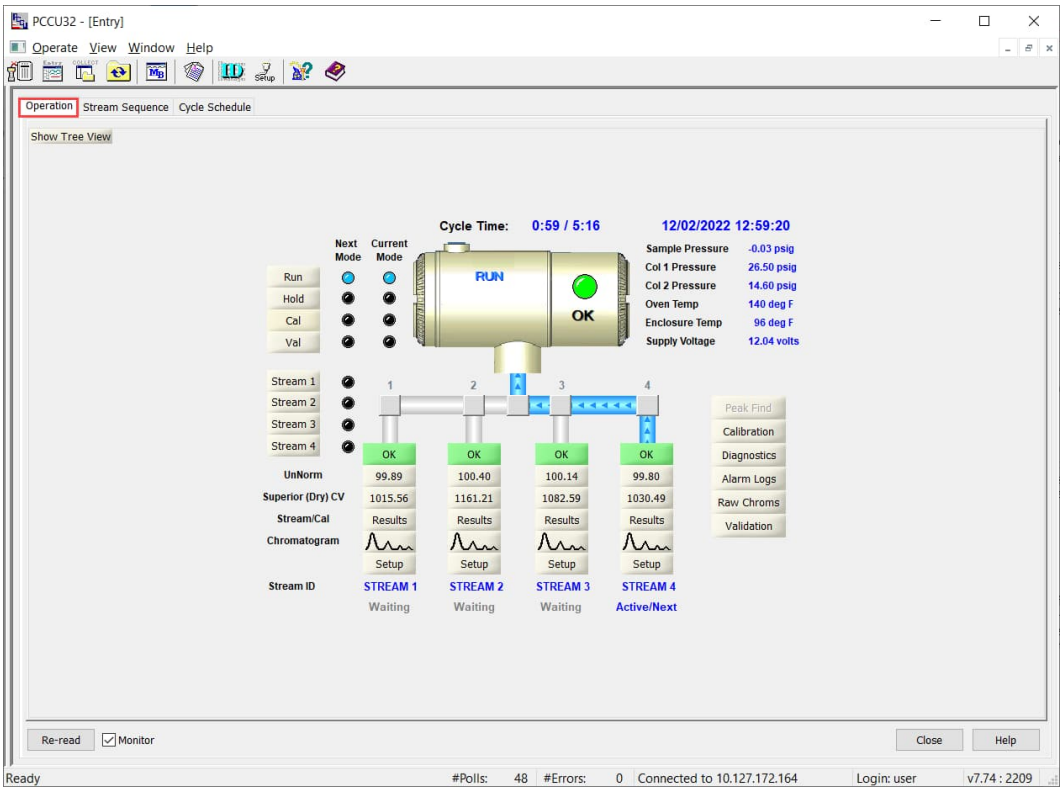
1. On the **Complete** tab, click **Close** to exit the wizard (Figure 6-35).

**Figure 6-35: Final Wizard screen**



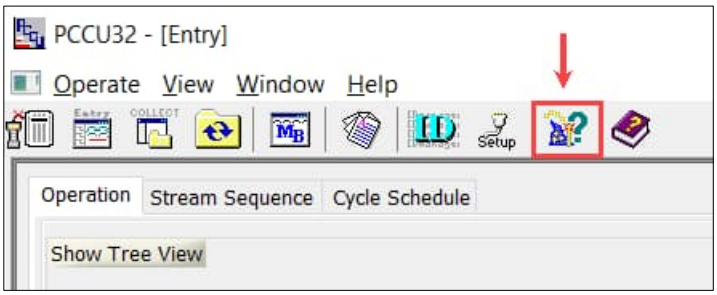

After the wizard is closed, the **Operation** screen displays (Figure 6-36). For additional configuration or operation of the analyzer click **Show Tree View**.

**Figure 6-36: Analyzer Operation screen**




If completed satisfactorily, the startup Wizard should not re-appear when connecting to the analyzer again. However, should you want to review or make changes, you may re-start the Wizard by selecting the Wizard icon from the PCCU32 top menu bar (Figure 6-37).

**Figure 6-37: Restart the Startup Wizard from the Operation screen**




# 6.6 Manual peak find

Many troubleshooting procedures require the Peak Find tools. With Peak Find you can examine chromatograms to determine if component peaks appear as expected, or modify certain parameters when chromatograms do not display expected results.

**IMPORTANT NOTE:** This section describes procedures using peak find in **Manual** mode. This mode allows user configuration of relevant parameters if fine tuning/correction is needed. Manual mode is the only available mode and is automatically used in systems with versions of Flash **2102411-043** and OS **2102141-016** and later. Earlier software versions show options for either **Manual** or **Automatic** modes. For systems with those software versions, manual mode is still recommended and must be selected to complete the procedures in this section.

Peak Find consists of the following (Figure 6-38):

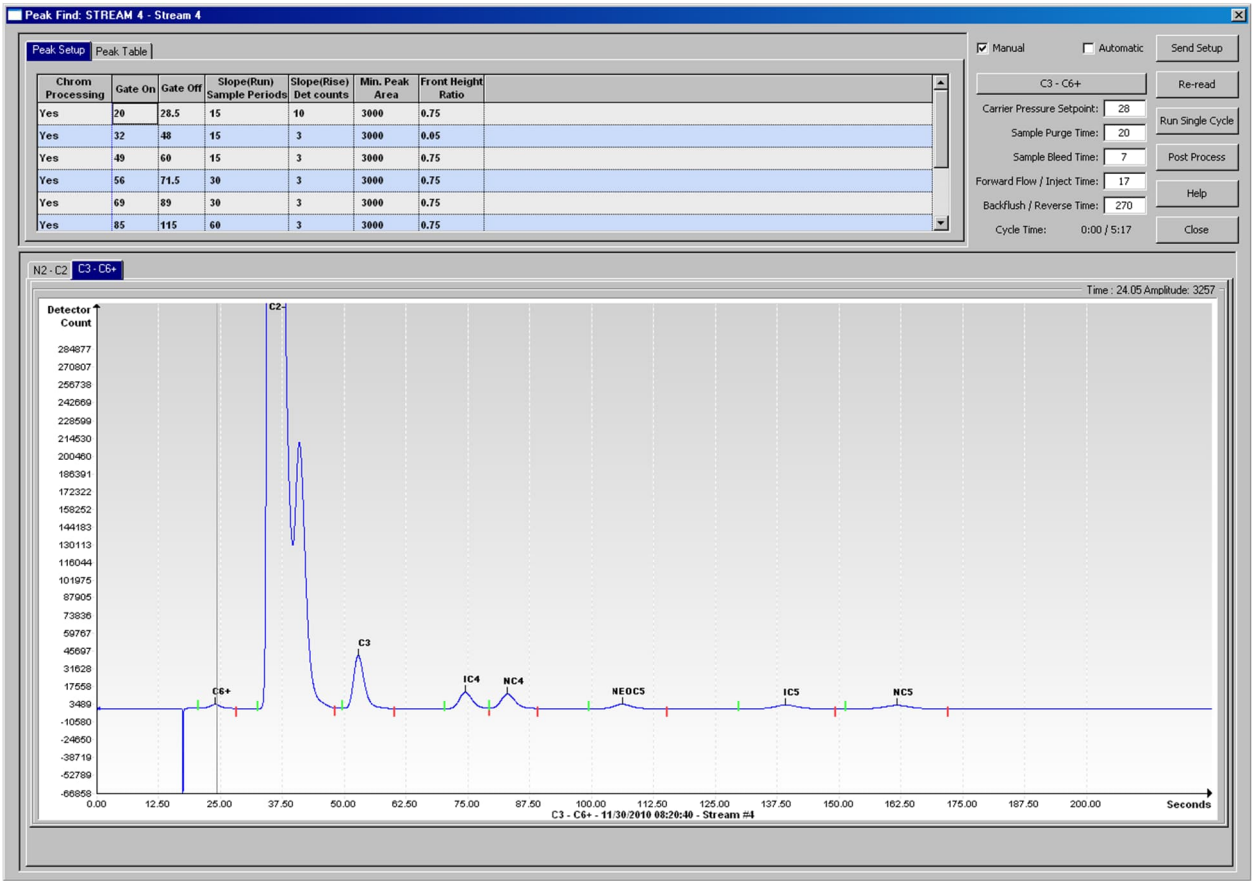
- The **Peak Setup** and **Peak Table** tabs to determine or modify the peak characteristics and label peaks when needed.
- Pressure and time/duration parameters for sample processing
- Function buttons to save, process peak setup changes, or run an analysis cycle when required.

— Chromatogram view: To view chromatograms of the last stream processed. Two chromatograms are available (switch views by selecting the tab for the desired chromatogram):
  - The **C3-C6+** chromatogram tab which shows the heavier boiling point peaks
  - The **N2-C2** chromatogram tab which show the lighter boiling point peaks

The **Peak Setup** tab displays a table with key characteristics or parameters for each displayed component peak. Some of these parameters can be modified such as the Gate On, Gate Off, and Minimum Peak Area [Slope (Run), Slope (Rise), and Front Height Ratio cannot be modified].

**IMPORTANT NOTE:** Modifications to parameters in the Peak Setup table are processed by the **Post Process** function without the need to run a cycle (Click **Post Process** after changes to view the effect of the changes). Modifications to the Pressure and time/duration parameters require the run of a cycle (Click **Run a Single Cycle** to view the effect of the changes).

**Figure 6-38: Peak Setup screen**




It is assumed that a PCCU32 connection with the analyzer is successfully established, and the analyzer **Operation** screen is in view. It is also assumed that a number of analysis cycles have already been completed. If analysis has not taken place, there is no data to produce the chromatogram (the view area is empty). The Peak Find chromatogram view window displays a message to instruct you to run an analysis cycle.

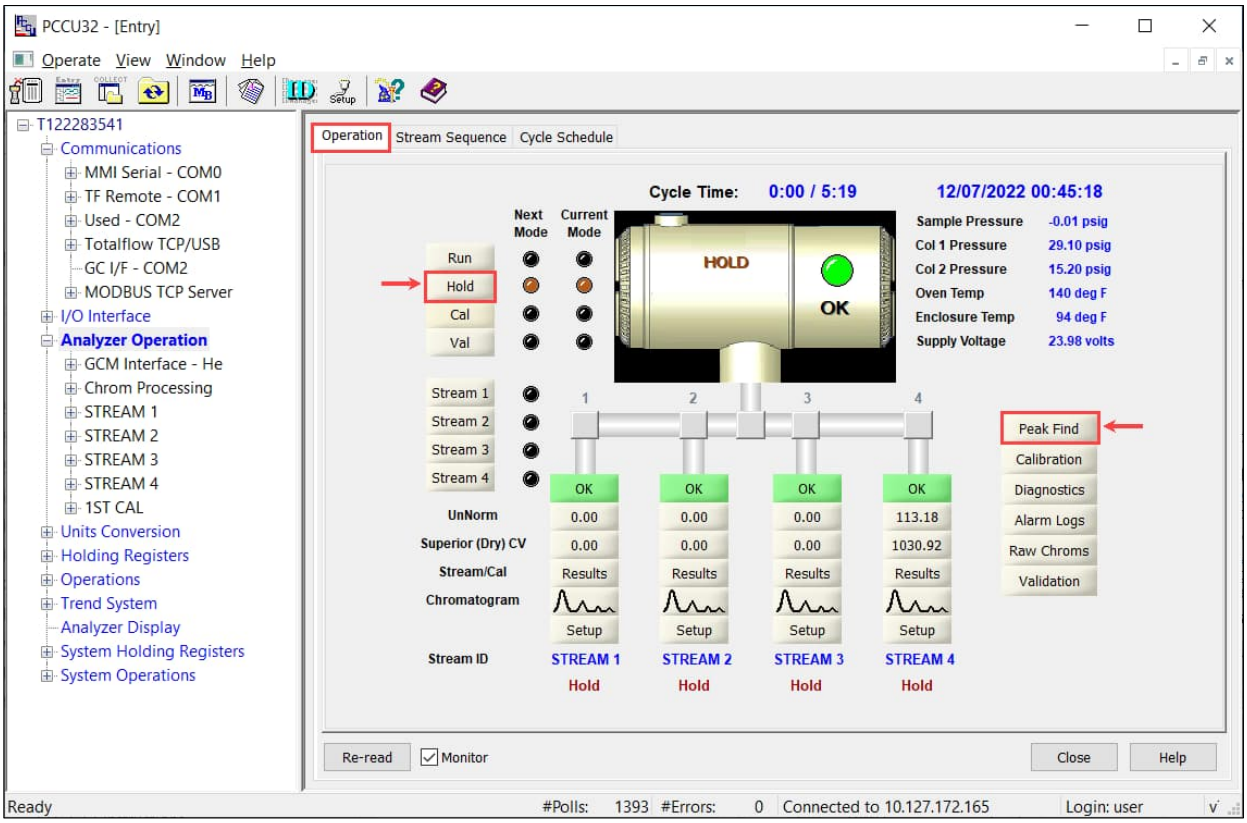
**IMPORTANT NOTE:** All Peak Find procedures require **Expert** view.

To use the Peak Find function:

1. Click **View** on the top PCCU32 menu, select **Expert**. Wait for the change to take effect and return to the analyzer **Operation** screen.
2. Click **Hold** on the **Operation** screen. The Operation screen should indicate the analyzer is in Hold mode.

3. Click **Peak Find** (see Figure 6-39). If the **Peak Find** button is grayed out, the unit has not completed the current cycle. Wait for the cycle to complete, and when the button activates, try again. After selecting Peak Find, the **Peak Setup** screen should display.

**Figure 6-39: PCCU Operation screen**




4. In systems with newer software, observe what is displayed on the **Peak Setup** screen. If chromatograms are available (analysis cycles have been completed), they display automatically. The C3-C6+ (heavy components, Figure 6-40) chromatogram is shown by default. The C2-N2 (light components, Figure 6-40) chromatogram is available in the other tab. If no chromatogram displays:
   a. If the message to run a cycle displays, click the **Run Single Cycle** button.
   b. Click **Re-read** and wait for the chromatogram to display.
5. In systems with older software, select the **Manual** checkbox.
   a. Observe the displayed chromatograms.
   b. If no chromatograms display, click Run Single Cycle button.
   c. Click Re-read and wait for the chromatogram to display.
6. Observe peaks on the chromatograms and verify that they display as expected.
   a. If they do not, proceed to section 6.6.1 Troubleshoot peak find.
   b. If the peaks displays as expected, proceed to section

**Figure 6-40: Peak Find screen for C3-C6+ chromatogram (heavies)**

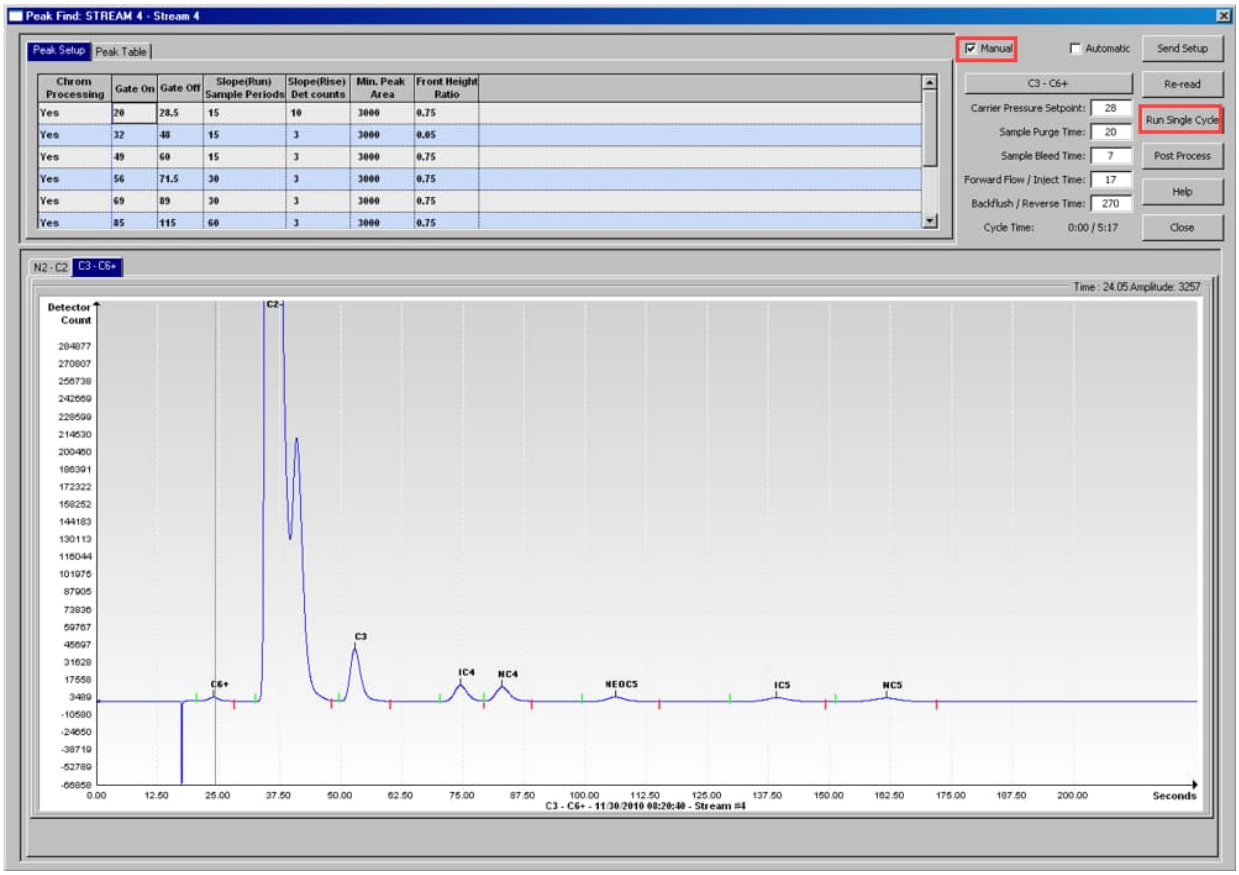
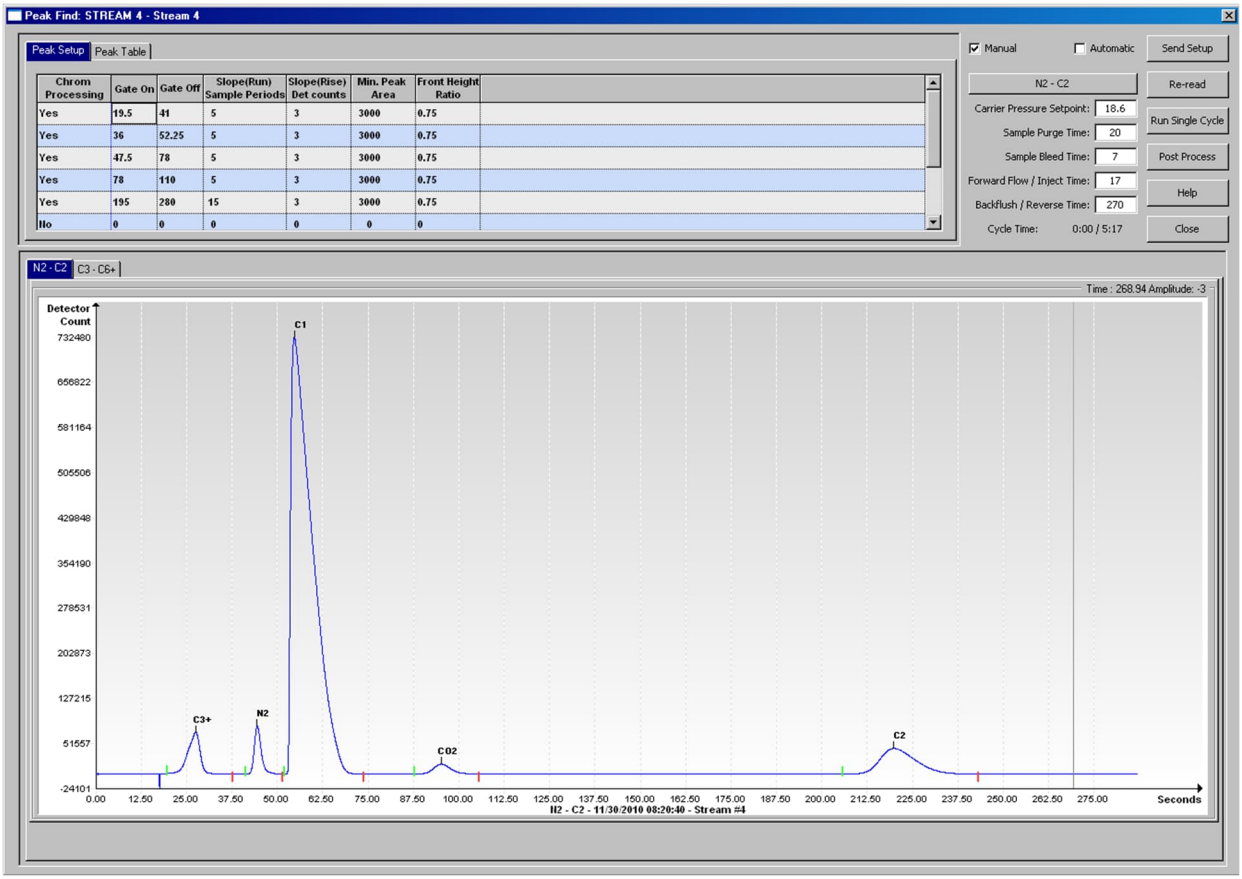



**Figure 6-41: Peak Find screen for N2-C2 chromatogram (lights)**



## 6.6.1 Troubleshoot peak find

Table 6-6 lists some potential problems that may occur during peak find, their causes and recommended solutions.

**IMPORTANT NOTE:** When making parameter changes, make sure you select the correct component on the table (correct component row), or the correct component set for the pressure/time duration parameters (click the **C3-C6+** or **N2-C2** button above these parameters). Note that in systems with newer software revs, these buttons are labeled as **BBK:C3-C6+** or **BBF:N2-C2**.

**Table 6-6: Peak find troubleshooting**

| Description | Cause | Solution |
|---|---|---|
| Unnormalized total is not ±0.5% of 100% | Carrier pressure set points are out of range | See section 6.6.1.1 Adjust Carrier Pressure Set Point |
| | Peaks are integrated correctly but not labeled | See section 6.6.1.3 Label Peaks |
| | Peaks are incorrectly labeled | See section 6.6.1.3 Label Peaks |
| Gate Markers are located on the side of a peak | Front Height Ratio may need to be refined | Call Technical Support for assistance |
| | Gates may need to be added | See section 6.6.1.2 Adjust Peak Gate times |
| N2-C2 Chromatogram, C2 peak time is not eluting around 220 seconds | Column 2 Carrier Pressure may not be correct | See section 6.6.1.1 Adjust Carrier Pressure Set Point |
| NC5 peak time is not eluting at approximately 160 seconds | Column 1 Carrier Pressure may not be correct | See section 6.6.1.1 Adjust Carrier Pressure Set Point |
| A small peak elutes after NC5 Peak | Inject time may be too long | See section 6.6.1.4 Adjust the Forward Flow Duration |
| Some components are not gated correctly | Carrier Pressure Set Point may be too high or too low | See section 6.6.1.1 Adjust Carrier Pressure Set Point |
| | Gate times may be incorrect | See section 6.6.1.2 Adjust Peak Gate times |

**IMPORTANT NOTE:** Modifications to parameters in the Peak Setup table are processed by the **Post Process** function without the need to run a cycle (Click **Post Process** after changes to immediately view the effect of the changes). Modifications to the Pressure and time/duration parameters require the run of a cycle (click **Run a Single Cycle** to view the effect of the changes).

### 6.6.1.1 Adjust Carrier Pressure Set Point

**IMPORTANT NOTE:** Changing the **Carrier Pressure Set Point** could cause the unnormalized total to be outside range (±0.5% of 100%). You should always perform calibration and verify results after changing the value of the Carrier Pressure Set point. Performing calibration restores the unnormalized total to the correct range (±0.5% of 100%).

The analyzer has two column trains with their own carrier pressure regulator. Generally, if nC5 on Column 1 elutes at approximately 160 seconds and C2 on Column 2 elutes at approximately 220 seconds, the unit performs optimally. There may be special applications which can cause these times to be different.

If nC5 and C2 are not within 2 seconds of the above ranges, you may want to change the carrier pressures. Note that changing the carrier pressures will move the other peaks.

To modify carrier pressures:

1. If not in expert view, click **View** on the top PCCU32 menu and select **Expert**. Wait for the change to take effect and return to the analyzer **Operation** screen.
2. Click **Hold** on the Analyzer Operation screen and wait until the end of the cycle. The Operation screen should indicate the analyzer is in Hold mode.
3. When the unit enters Hold mode, click **Peak Find**.

4. Type a new value in the **Carrier Pressure Setpoint** field. While analyzers vary from one to the other, one PSI change will move the nC5 by 5 to 7 seconds, and C2 peak by 10 to 12 seconds. Increase pressure to decrease the time that the components elute and decrease pressure to increase the time they elute.

**Table 6-7: Suggested carrier pressure setpoint adjustment values**

| Chromatogram | Incorrect peak time | Carrier pressure adjustment |
|---|---|---|
| **BBF: N2-C2** | If the last peak is greater than 222 seconds | Increase the pressure by 0.1 pounds for every second away form 220. |
| | If the last peak is faster than 218 seconds | Decrease the pressure by 0.1 pounds for each second away from 220. |
| **BBK: C3-C6+** | If the last peak is greater than 162 seconds | Increase the pressure by 0.2 pounds for every second away from 160. |
| | If the last peak is faster than 158 seconds | Decrease the pressure by 0.2 pounds for every seconds away from 160. |

5. Click **Send Setup**.
6. Click **Run Single Cycle**. The chromatograms will update at the end of the cycle (typically in 5 minutes).
7. Verify that the changes are reflected in the chromatogram.
8. Repeat this process until you obtain preferred results.

#### 6.6.1.2 Adjust Peak Gate times

Gate On and Gate Off times on the Peak Setup tab table determines when to start and stop looking for peaks. Each Gate On/Gate Off time applies the parameters in its row to the peaks in its time frame. The Gate On time should begin in an area prior to the first component peak and in a relatively flat area on the baseline. Likewise, the Gate Off time should be on a flat area and not fall during a component peak.

To modify peak gate time values:

1. Type a new value for Gate On and Gate Off times in the **Peak Setup** tab table.
2. Repeat step 1 for each component as required.
3. Click **Send Setup**.
4. Click **Post Process**. Chromatograms should update.
5. Verify that the changes are reflected in the chromatogram.

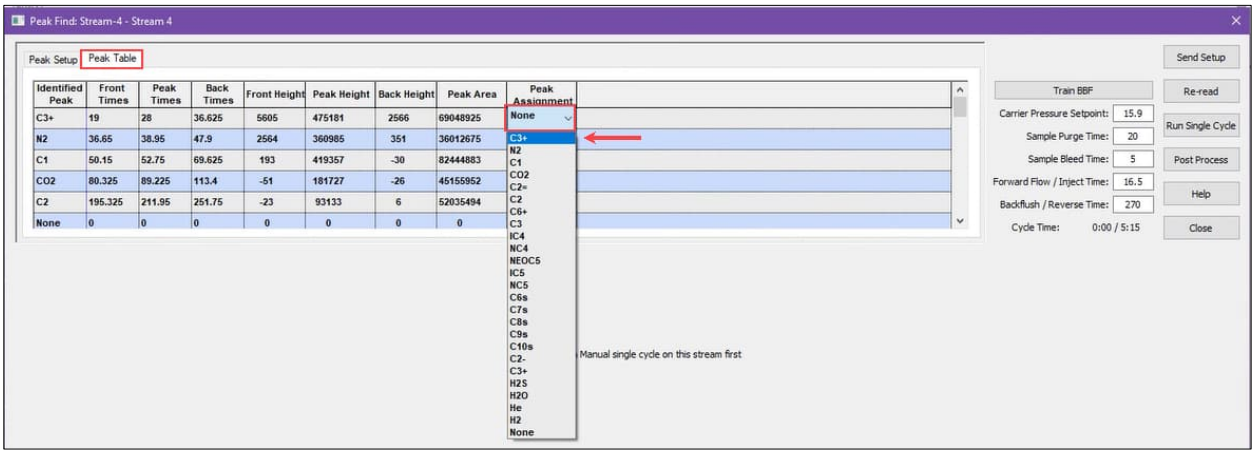
#### 6.6.1.3 Label Peaks

If peaks are integrated correctly and column pressures are within range but no labels display, you may need to label the peaks. You can label peaks from the **Peak Table** tab or the Chromatogram view area.

To label peaks from the **Peak Table** tab (recommended):

1. Select the **Peak Table** tab.
2. For each row, select the **Peak Assignment** column field. A drop-down list of component names displays.
3. Select the desired component name.
4. Repeat step 2-3 for each component (each row in the table).

**Figure 6-42: Peak Table**




5. Click **Send Setup**.
6. Click **Post Process**.
7. Verify that the new chromatograms display correct labels.

To manually label the peaks from the chromatogram view window:

1. Select the desired chromatogram tab.
2. Zoom in on the chromatogram.
   a. Place the cursor above the integrated peak area. Right click and hold the mouse button.
   b. Drag the cursor across the area to be enlarged.
   c. Release the right mouse button. The chromatogram and peak area will be increased.
   d. Adjust the size as needed.
3. Place the cursor inside of the peak, right click, and select **Label Peak**.
4. On the **Manual Peak Label** window, click **Select One**. A list of component names displays.
5. On the component name list, locate and click the correct name of the peak.
6. Click **Label Peak**.
7. Click **Send Setup**.
8. Repeat steps 3-7 for all peaks requiring a label.
9. Click **Post Process**. After reprocessing, the chromatogram should display the correct labels.
10. Repeat steps 1-9 for the other chromatogram.

#### 6.6.1.4 Adjust the Forward Flow Duration

A small peak (part of C6+) displaying after the nC5 peak indicates that the Forward Flow is too long. It may be necessary to shorten the Forward Flow Flow/Inject Time. Make small time increment changes to this parameter to avoid over-compensation.

Adjust the Forward Flow/Inject Time in the carrier pressure/time parameter area:

1. Select the desired chromatogram.
2. Type a new value for the **Forward Flow Flow/Inject Time** field.
3. Click **Send Setup**.
4. Click **Run a Single Cycle**.
5. Repeat steps 1-3 as necessary. If the Cal Blend component concentrations IC5 and nC5 are similar, the peak areas should be within 3% of each other. If using ABB's standard blend, IC5 and NC5 are approximately 0.1%.

If water causes a problem, you may need to increase the Backflush/Reverse Time.

# 7 Calibrate the analyzer

The analyzer is factory-calibrated and should not require a calibration immediately. It is recommended the device operate for a period of eight continuous hours before field-calibrating.

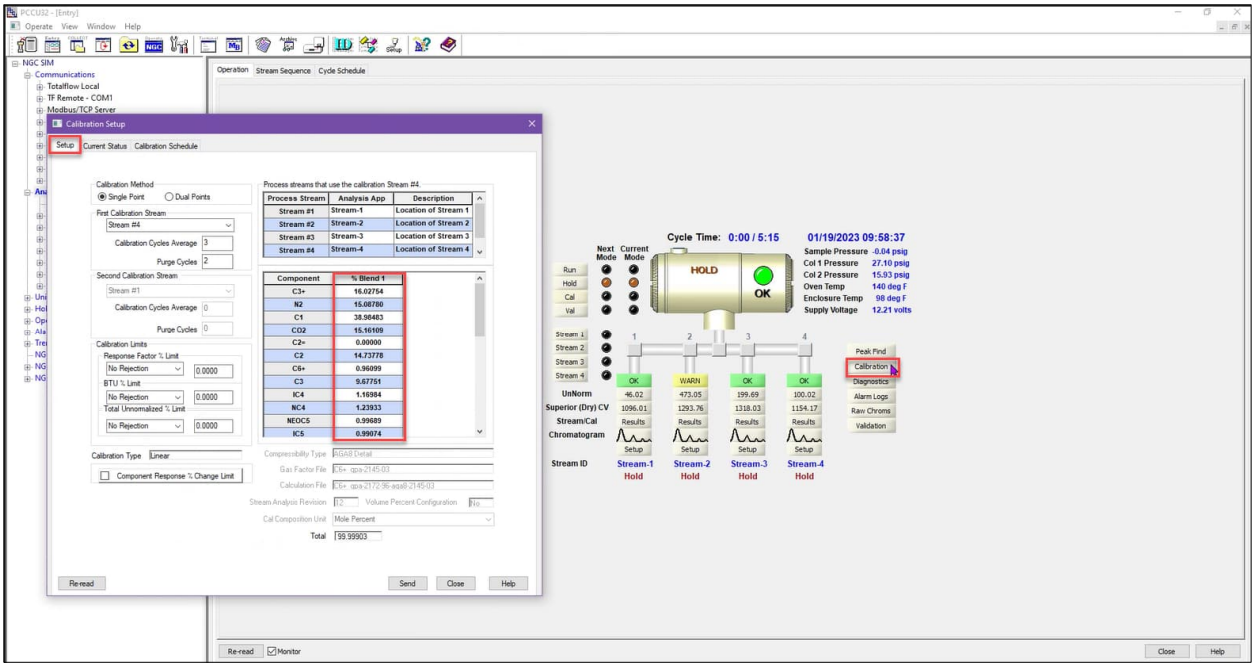
Before calibrating, run a manual peak find to verify proper timing and peak assignments (see section 6.6). After calibration, run manual peak find again to verify calibration results.

A calibration cycle includes purge cycles and multiple calibration cycles for averaging. The system defaults to stream 4 (cal stream), two purge cycles and three calibration cycles.

To calibrate:

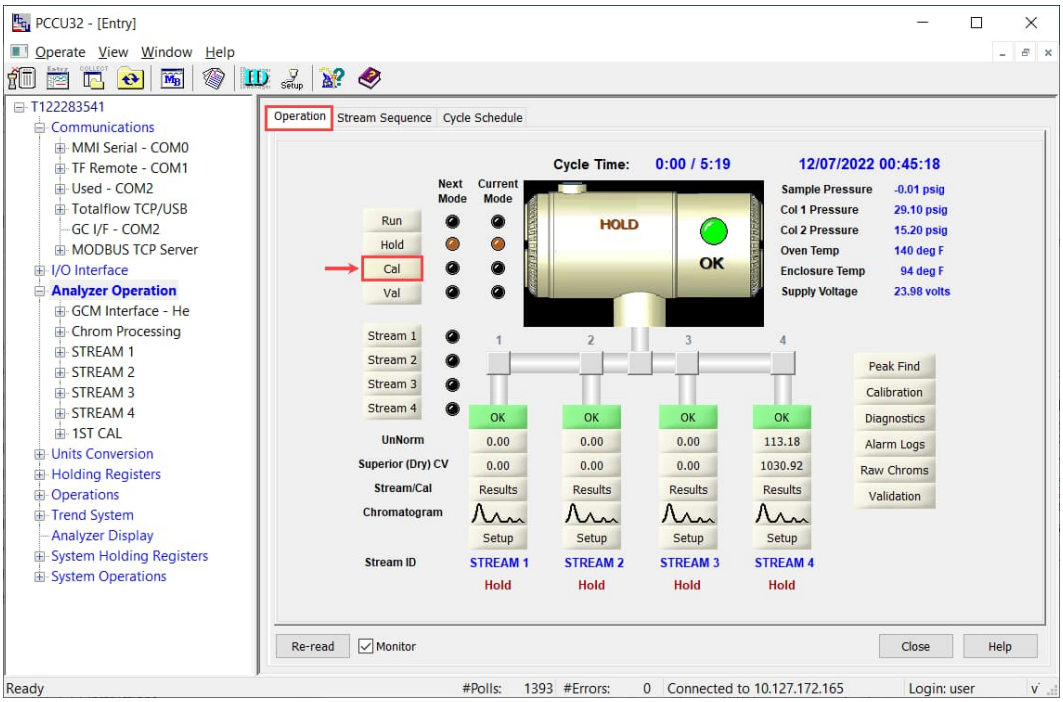
1. Select **Calibration** on the right side of the **Operation** screen. The Calibration Setup window appears.
2. On the **Setup** tab, set up the blend concentrations.

**Figure 7-1: Set up gas concentrations**



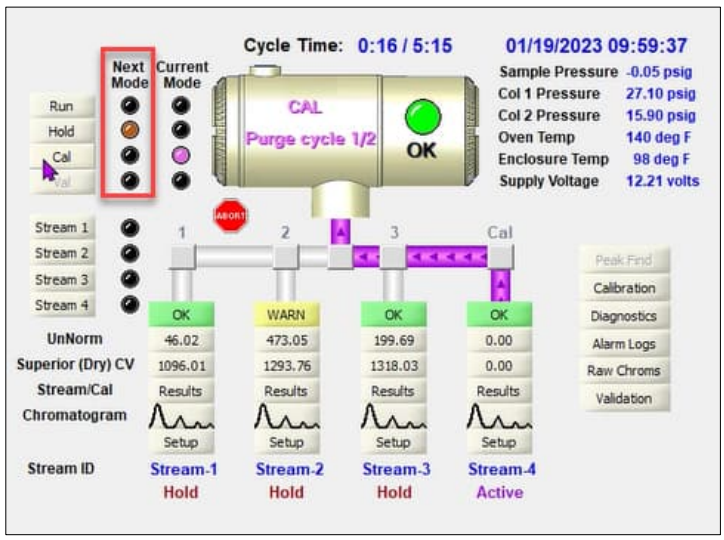

3. Click **Send**.
4. From the Operation screen, select **Cal**.

**Figure 7-2: Run calibration**




5. When the current cycle completes, the device should begin a calibration on the designated calibration stream (default is stream 4).

**Figure 7-3: Calibration running**




6. When the calibration is complete, the device should move to the designated Next Mode. View results on the Analyzer Operation screen.
7. The un-normalized total of the calibration stream should be between 99.5% and 100.5%. If values exceed these parameters, proceed to the Troubleshooting section.
8. Carefully examine the calibration stream's Chromatogram-1 and Chromatogram-2 by clicking the button. Look for unlabeled peaks and base line anomalies. Use Figure 7-4 and Figure 7-5 as a guide. If errors exist, proceed to the Troubleshooting section.
9. Once the device is running smoothly, is producing good chromatograms, and all the peaks are labeled and eluting correctly, perform a save and restore procedure to update tfCold.

**Figure 7-4: Typical chromatograph for chromatogram-1 (heavies)**

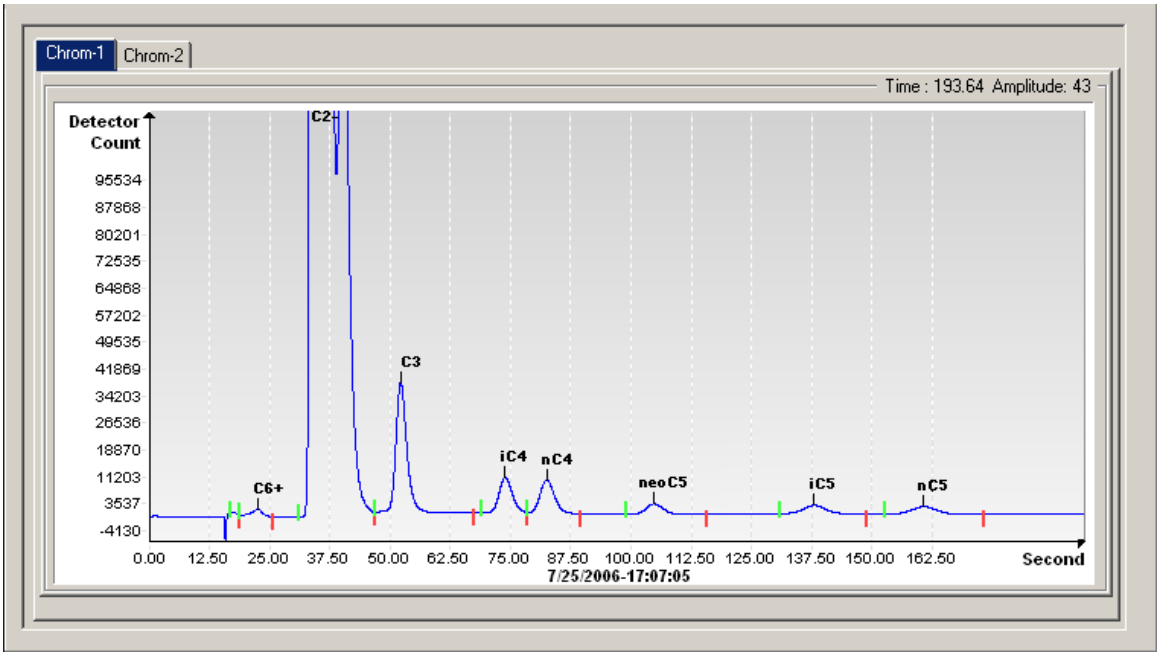
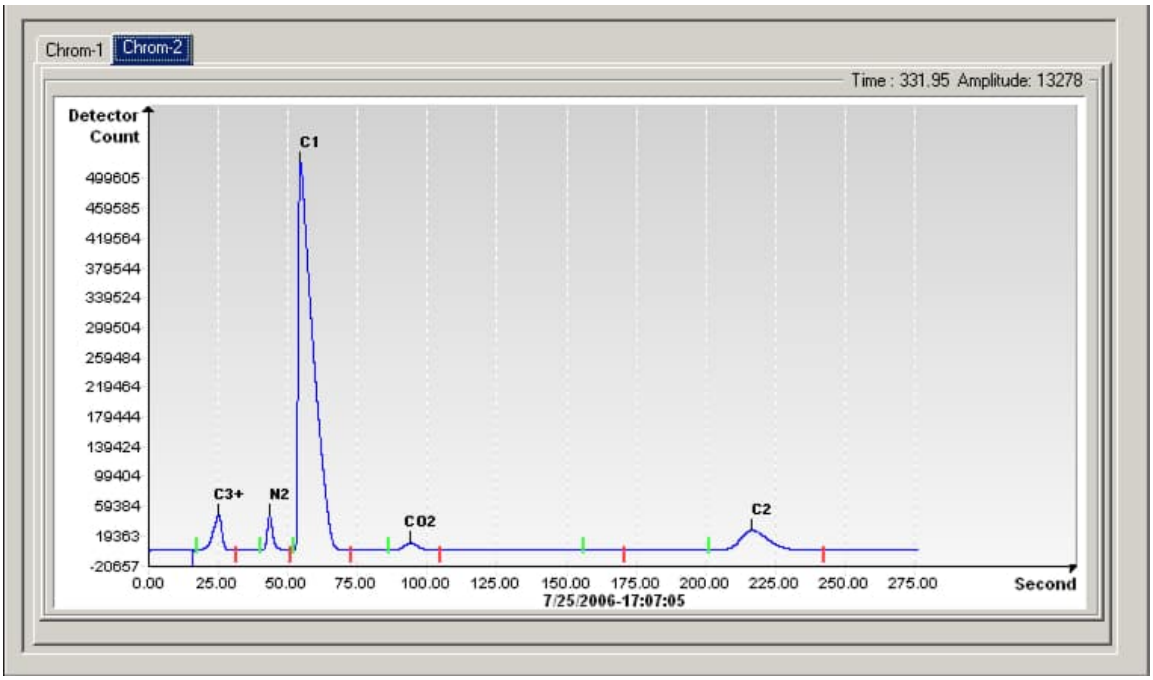


**Figure 7-5: Typical chromatograph for chromatogram-2 (lights)**

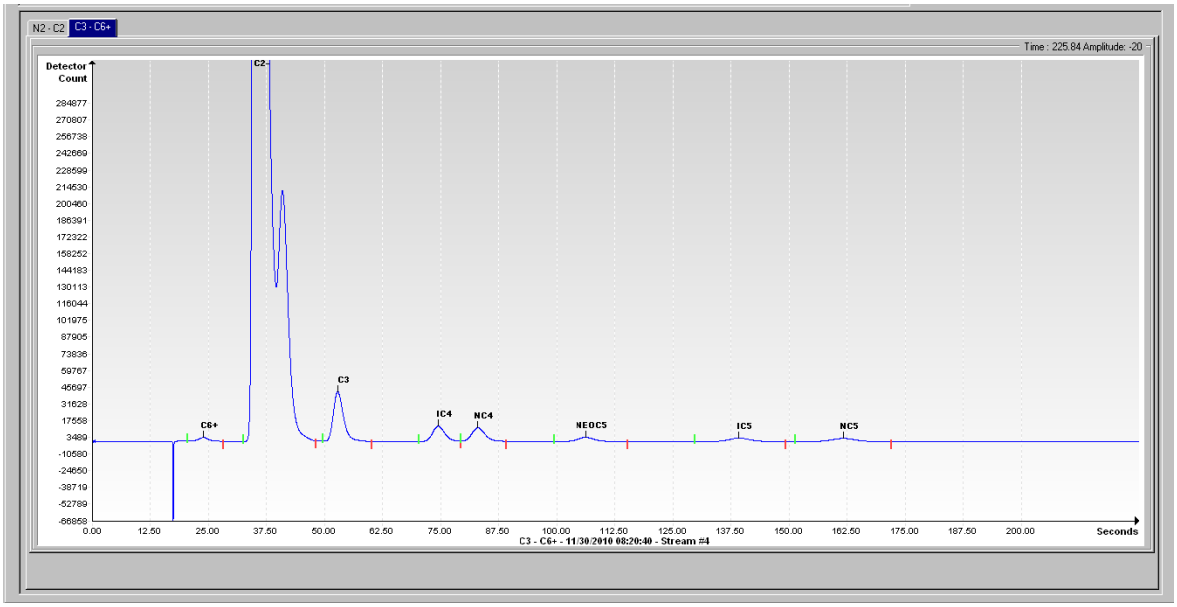



# 7.1 Verify calibration data using peak find

This procedure assumes that the unit has completed calibration and moved back into Hold mode. Perform the following verification steps before moving into Run mode:

1. Click on the **Peak Find** icon on the right side of the Operation screen. A chromatogram will load at the bottom of the screen. This is the last cycle of the calibration stream. There will be a delay as the data downloads. There is a tab for C3-C6+ (heavy components) and N2-C2 (light components). C3-C6+ is displayed first. If no chromatograms display, click **Re-read**.

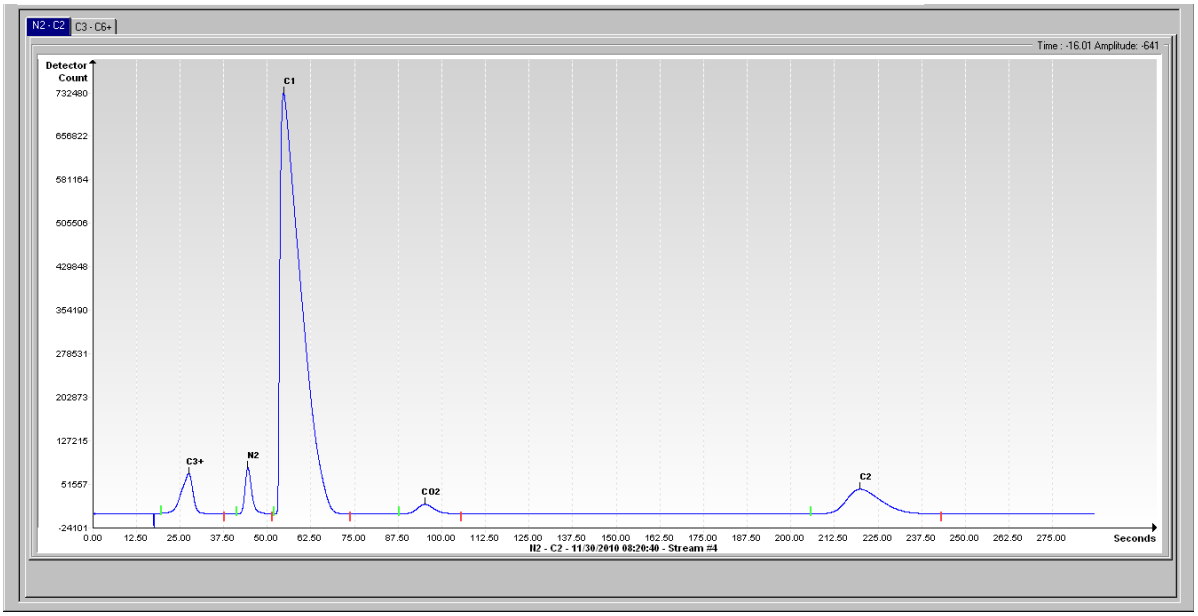
**Figure 7-6: C3-C6+ (heavies)**




2. Look at the date/time below the chromatogram. This time should coincide with the start of the last cycle of the calibration process that was just run. This signifies that the calibration data was accepted (no alarms, etc.). If this displays an older date and time (generally indicating factory calibration), then the new calibration data has not updated. If this occurs, an alarm should show on the Operation screen.
3. Verify that there are seven (7) peaks: C6+, C3, iC4, nC4, neoC5, iC5 and nC5. The second double-looking peak from the left is a composite peak of C2. This may or may not be labeled but is not used in calculations.

4. Place the vertical line of the cursor over the small tick mark on nC5 and verify that the time in the upper right-hand corner of the chromatogram is approximately 160 seconds, within 3 or 4 seconds.
5. Click the **N2-C2** tab and verify that there are four (4) peaks: N2, C1, CO2 and C2. The first peak on the left is a composite peak of C3+. This may or may not be labeled but is not used in calculations. There could be trace amounts of other components in the calibration blend as indicated by gates with no component label.

**Figure 7-7: N2-C2 (lights)**




6. Place the vertical line of the cursor over the small tick mark on C2 and verify the time in the upper right corner of the chromatogram is approximately 220 seconds, within 3 or 4 seconds.

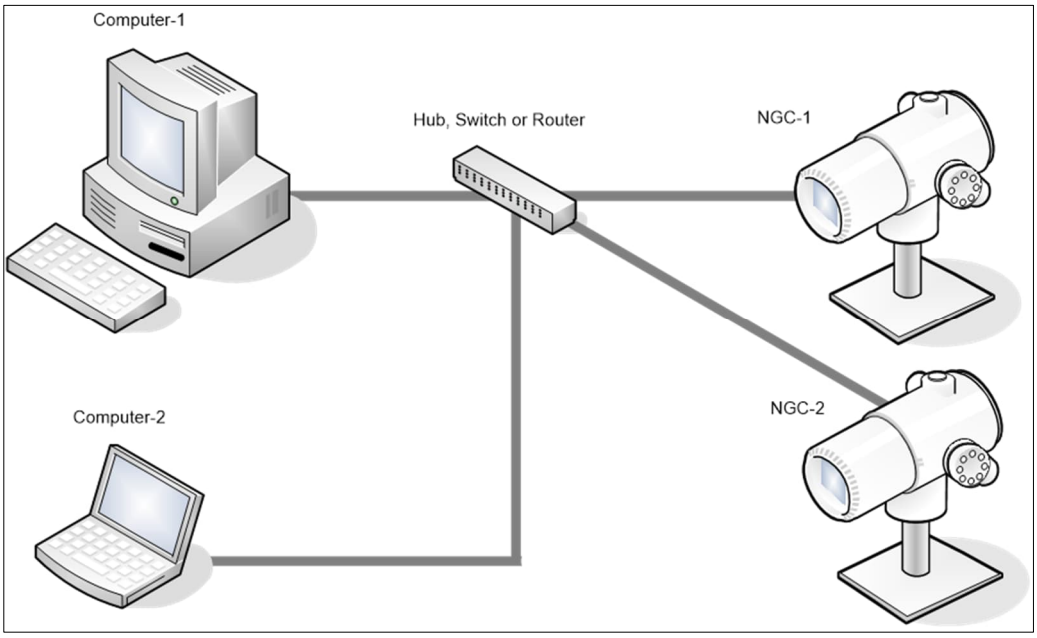
# 8 Configure for network connection

The analyzer supports network communication though its Ethernet port. If the analyzer will be connected to an Ethernet network, enable and configure the Ethernet interface. This section enables Ethernet, configures IP parameters, and verifies connectivity.

## 8.1 Basic topology

Ethernet network configuration requires additional network equipment such as switches or routers (Figure 8-1). In the field, network routers connect a local field network (LAN) to the customer WAN, routing traffic to and from the LAN.

**Figure 8-1: Network connections**




## 8.2 IP addressing

Network communication requires a valid and unique IP address for the analyzer. The default IP address needs to be replaced.
For IP addressing, the analyzer supports manual configuration or the Dynamic Host Configuration Protocol (DHCP):

- With enabled DHCP, the analyzer obtains the IP parameters automatically. For DHCP support, a DHCP server must be available. If saving IP addresses is required on the field, a network router with a DHCP server should be available and enabled onsite. Private IP addresses can be available from this server and automatically assigned to the analyzer and other devices in the field.
- For valid public IP addresses, consult with your network administrator and obtain the correct parameters for all devices onsite.

**IMPORTANT NOTE:** This section describes manual configuration of the IP parameters. Manual configuration ensures that the IP address is static. This may be a requirement for certain field scenarios. When using DHCP, the IP address may change if the analyzer is power cycled. If a static address is required, keep DHCP disabled.

## 8.3 Cabling for connection to network

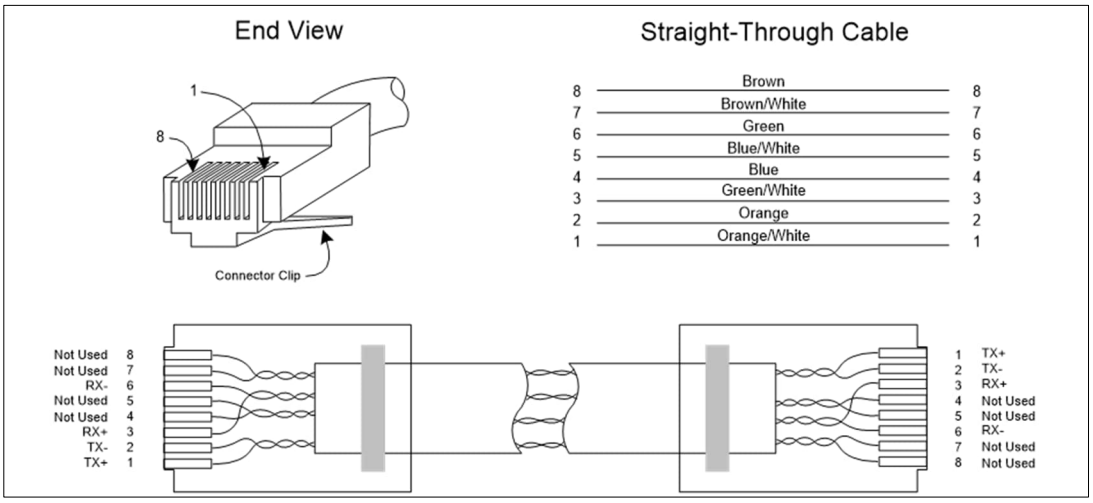
Use straight Ethernet through cables to connect the analyzer to network equipment. Table 8-1 shows cable details. Note that most network equipment can detect cable type and autoconfigure for that type (straight through or crossover).

**Table 8-1: Ethernet cabling for network connection**

| System | Required cabling termination (connectors) or adaptors | ABB part number |
|---|---|---|
| Network device (Ethernet hub, switch or router) | Straight-through Ethernet CAT 5 cable with RJ-45 connectors at both ends. Maximum distance: 100 meters (328 feet) | 1681011 |

Straight through Ethernet cables are easily available for purchase. Figure 8-2 shows the Ethernet cable pinouts in case you need to identify or build one. If you build your own cable, ensure the connectors are properly crimped and that no internal wires are exposed outside of the connector. Test the cable for proper connectivity. If you are experiencing connection issues, always check that you have the correct cable and that the cable and connectors are free from damage and properly inserted in the ports.

**Figure 8-2: Straight through Ethernet cable pinouts**




# 8.4 Enable Ethernet and configure IP parameters

This procedure changes the default configuration of the Ethernet interface. If you are performing this procedure through a local connection on the Ethernet port, this connection will be lost after configuration change. To test network connection after configuration change, make sure to connect the device and laptop to the Ethernet switch or network router. The laptop must be reconfigured with an IP address compatible with the new IP address assigned to the analyzer to reestablish connection.

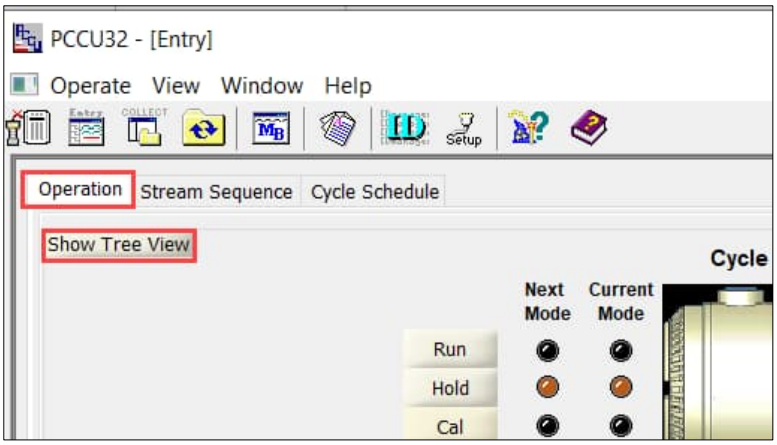
**IMPORTANT NOTE:** Analyzer reboot is required to enable the Ethernet interface. If the analyzer is already in RUN mode, it will resume RUN mode after the reboot if the **Process Mode After Start-Up** parameter on the Diagnostics tab is set to: **Previous Mode**.

You can also perform Ethernet configuration changes through a connection using either the USB or MMI ports. If using the USB, establish a connection per section 6.3.1 Connect using USB, before you start this procedure. It is assumed that the startup wizard was completed at first-time connection.

To enable Ethernet:

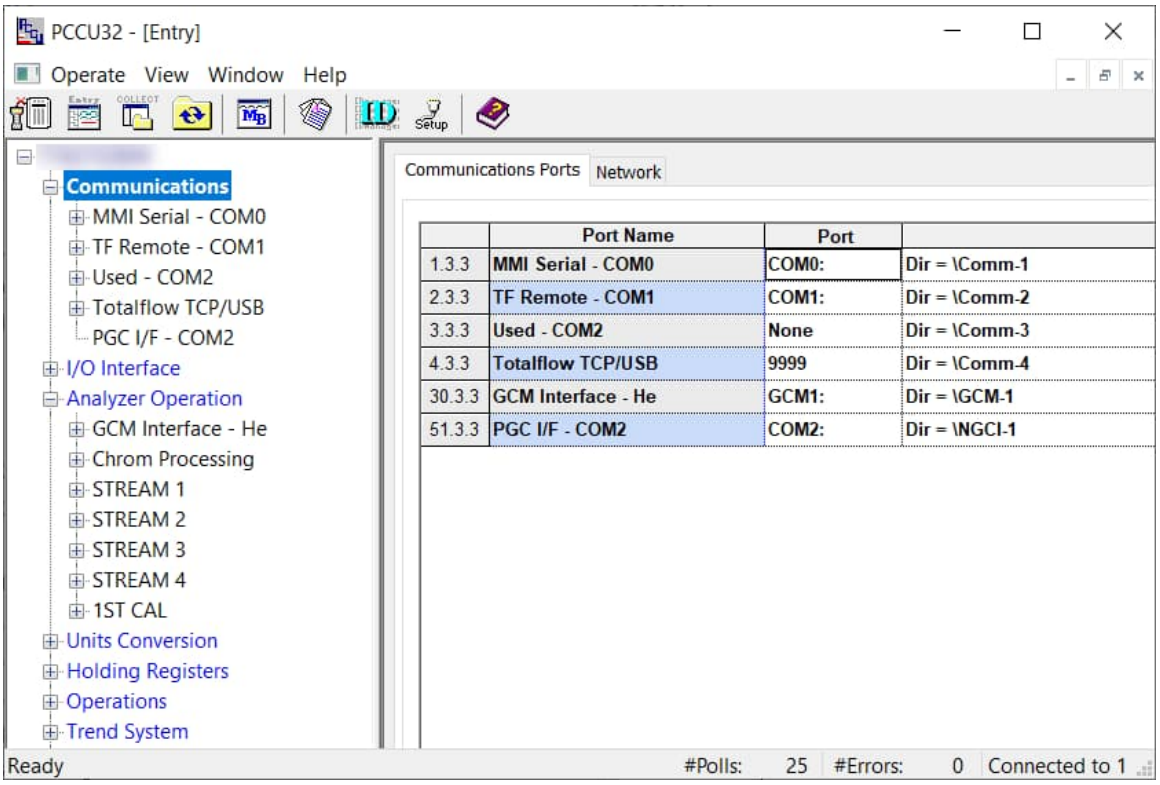
1. Launch PCCU and click **Entry**. The analyzer's Operation screen displays.
2. Click **Show Tree View** in the upper left corner of screen (Figure 8-3).

**Figure 8-3: Analyzer Operation screen**



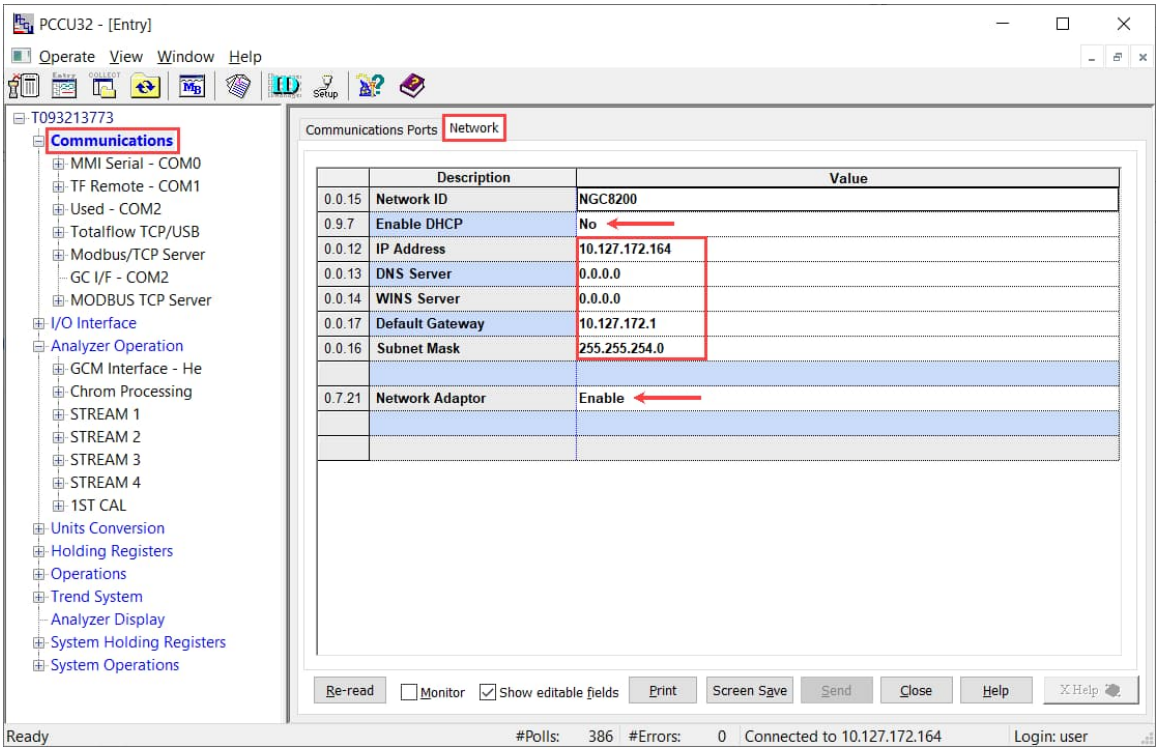

3. On the navigation tree, click **Communications**. The Communication Ports screen displays (Figure 8-4).

**Figure 8-4: Analyzer Communication Ports tab**




4. Select the **Network** tab (Figure 8-5).
5. Ensure DHCP is set to **No**.
6. Configure IP parameters: Type IP address, default gateway, subnet mask. Take note of the IP address. It will be needed later to verify network communication.
7. Set the Network Adapter to **Enable**.

**Figure 8-5: Configuration for Network connection**




8. Click **Send**. The new IP parameters display.

9. Reset the analyzer by pressing the Reset button located on the termination panel housed in the rear of the enclosure.

**WARNING – Bodily injury**. Do not open or remove covers unless the area, including the internal volume of the enclosure, is known to be non-hazardous.

**IMPORTANT NOTE:** If using DHCP, the analyzer obtains the IP parameters from a DHCP server. After reset, these parameters should display in the **Network** tab automatically. Take note of the IP address assigned. The IP address is used to verify network connection.

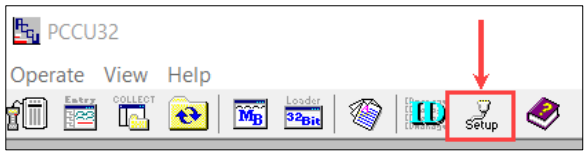
## 8.5 Verify network connection

After enabling and updating the Ethernet configuration, verify network connectivity. If the configuration is correct, you should be able to ping the analyzer's IP address and receive a response or be able to establish a connection using PCCU.

To verify connection over the network using PCCU:

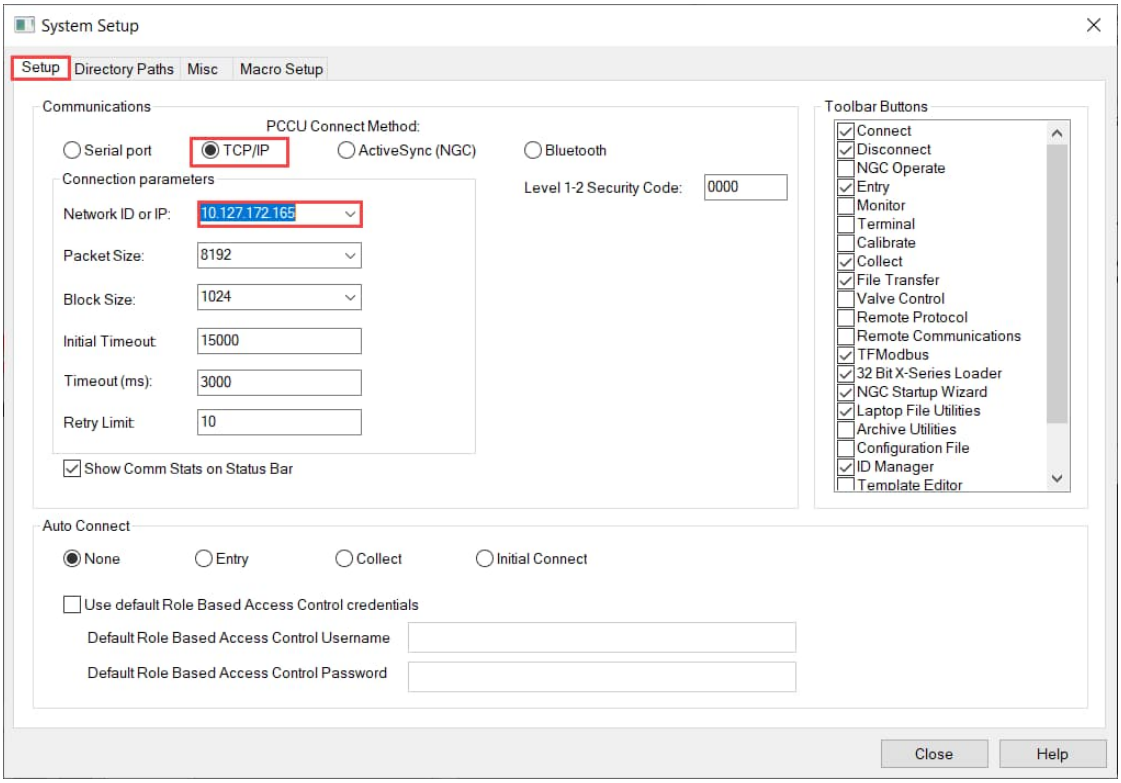
1. Connect the analyzer Ethernet port to the local network switch or router.
2. Configure the laptop with valid IP address compatible with the IP address assigned to the analyzer.
3. Connect the laptop to the local network switch or router.
4. Launch or restart PCCU32.
5. Click **Setup** on the PCCU32 toolbar.

**Figure 8-6: PCCU32 Setup**




6. On the **Setup** tab, select **TCP/IP** as the PCCU Connect Method (Figure 8-7).
7. In the **Network ID or IP** field, type the analyzer's IP address.

**Figure 8-7: PCCU32 TCP/IP connection setup**



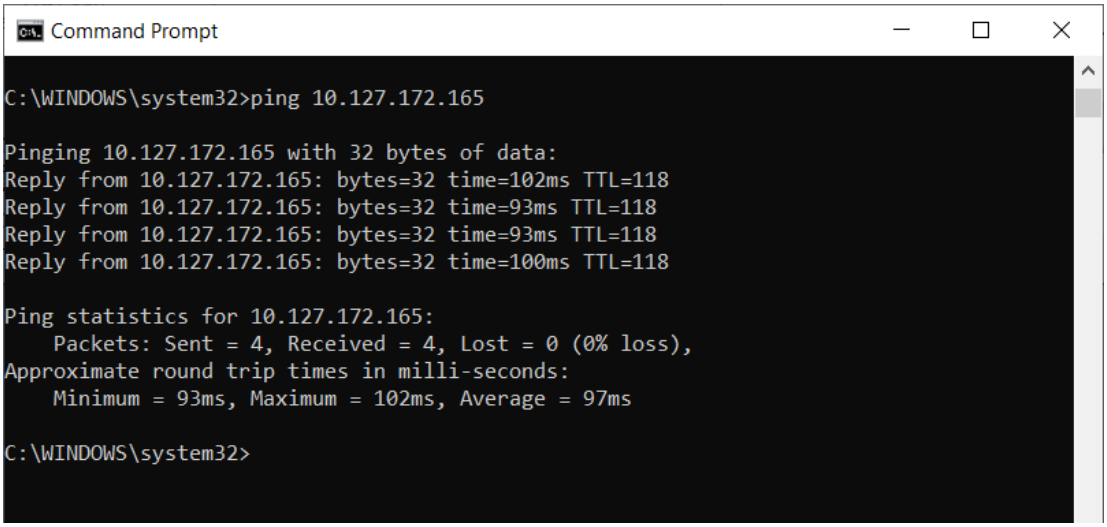

8. Click **Close** to exit connection setup and return to main the PCCU screen.

9. Click the **Entry** icon on the PCCU32 toolbar to connect to the device.
10. Ensure that the analyzer's operation screen displays. If unable to establish connection, see section 8.6 Basic Ethernet connection troubleshooting.

To verify connection over network using PING:

1. Using command line in your laptop (start **cmd** on the laptop).
2. Ping the analyzer's IP address (Figure 8-8).
3. Verify that the analyzer responds to the ping. If the ping receives no response, verify IP configuration on both analyzer and laptop, cabling and connections, network switch/router configuration, etc.

**Figure 8-8: Ping analyzer to verify network communication**




## 8.6 Basic Ethernet connection troubleshooting

If unable to establish a connection with the analyzer, investigate the possible cause:

1. Ensure PCCU is configured for TCP/IP connection and that the IP address of the analyzer is configured correctly.
2. Verify the laptop's configured IP parameters. The laptop's IP address must be compatible with the analyzer's (same subnet, etc.)
3. Verify that the analyzer's configuration in the **Network** tab is correct.
   a. If manually configured, ensure IP address, subnet mask and gateway are correct.
   b. If using DHCP, ensure that the IP parameters display. If they don't, check that the DHCP server is enabled and connected to the network. In field networks, the DHCP server is typically embedded in the network router. The network router should have the correct IP configuration, be connected to the network, and have its DHCP services enabled.
4. Check Ethernet cables and connectors:
   a. Ensure all devices are connected to the network equipment.
   b. Ensure cables are the correct type: Crossover cable for direct connection to the analyzer, straight-through cable for network connection.
   c. Ensure that connectors are completely inserted into the ports.
5. Ensure the network switch/hub or router is powered on and its ports are enabled.
6. If a firewall is enabled on the network router, ensure it is not blocking the analyzer's IP address.

# 9 Configure security

The analyzer supports security configuration to prevent unauthorized or malicious access. There are two security configuration options:

- Enable bi-level security. Enable onboard security with the hardware security switch and configure bi-level security codes to control access from PCCU32.
- Configure Role-Based Access Control (RBAC). Create user accounts and associated privileges. User credentials will be required to connect the analyzer with PCCU32.

Table 9-1 provides basic security guidelines for the analyzer. The security options apply to local, remote, and network access.

**Table 9-1: Security guidelines**

| Recommendation | Description |
|---|---|
| **Secure physical access to the device** | Control access to the device, its internal components, and connected peripherals. |
| **Secure access with security switch** | Turn the onboard security switch on to enforce authentication through bi-level security codes or RBAC. See section 9.1. |
| **Configure bi-level security codes** | Change default security codes to private codes (the default security code for both level 1 and level 2 is 0000). See section 9.1. |
| **Enable Role-Based Access Control (RBAC)** | Configure RBAC if tighter control is required: define user accounts, and specific privileges. See section 9.2 Configure Role Base Access Control (RBAC). When you enable role-based access, you can also enable authentication for each of the communication ports.<br>Change the default RBAC passwords and security codes. |
| **Secure network connection** | The device only connects to a firewall-protected private network. Do not connect directly to the Internet. |
| **Manage credentials** | Store all private credentials, keys, and security codes in safe locations. Share private credentials, keys, and security codes only with properly trained and authorized personnel.<br>Change or update private credentials, keys, and security codes as needed. |

## 9.1 Configure bi-level security

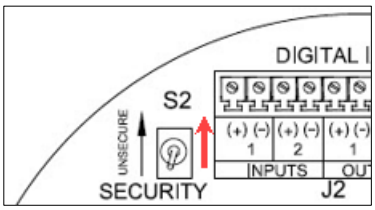
This procedure enables security with the hardware security switch and the configuration of bi-level security access for PCCU32. When analyzer security is configured in this way, security codes are required for connection to the device with PCCU32. Table 9-2 describes the two levels of security for this method. Each level requires the configuration of a security code.

**Table 9-2: Bi-level security**

| Security level | Access | Description |
|---|---|---|
| **Level 1** | Read only | View access: Ability to view data or monitor device operation |
| **Level 2** | Read and write | Full access: Ability to configure, upgrade, add applications, etc. |

Local communication using USB is required for this procedure. The security switch must be set to the UNSECURE position (flip switch **up**, Figure 9-1) before configuration. Do not forget to flip the switch **down** after configuring the security code.

**Figure 9-1: Disable security on terminal board (switch UP)**




**IMPORTANT NOTE:** After this procedure is completed, connection to the analyzer will be restricted to users with the correct security codes. Take note of the configured codes.

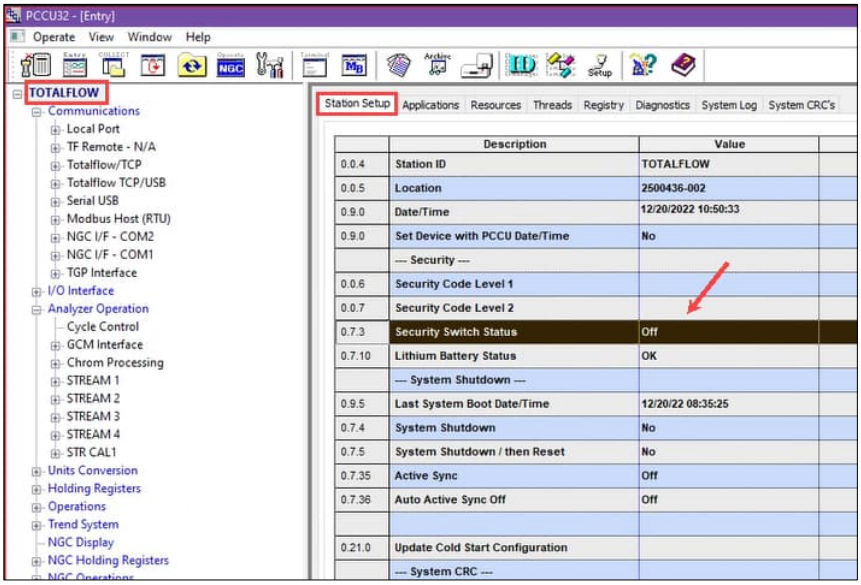
This procedure requires access to the internal analyzer's termination board to be able to change the position of the security switch. Be sure to take the safety precautions required for your site to remove the cover and access the board.

**WARNING – Bodily injury**. Do not open or remove covers unless the area, including the internal volume of the enclosure, is known to be non-hazardous.

To enable security:

1. Access the analyzer's termination board.
2. Locate the security switch (S2).
3. Verify that the security switch (S2) is up (UNSECURE).
4. From PCCU entry mode, click the top node on the navigation tree. The **Station Setup** tab displays.
5. Under the Security section, verify that **Security Switch Status** is **OFF**.

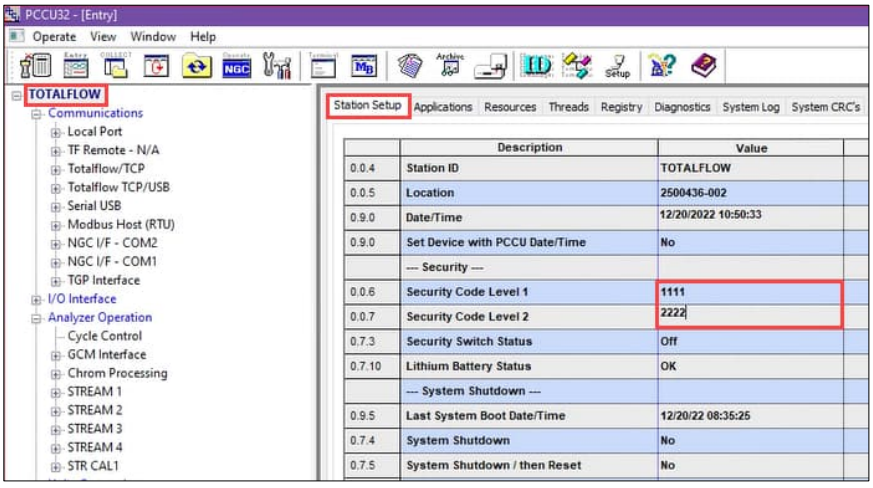
**Figure 9-2: Security switch status: Off**




6. Type a four-digit security code into Security Code Level 1. Level 1 access grants read only access to the device.
7. Type a four-digit security code for Security Code Level 2. Level 2 access grants read and write access to the device.

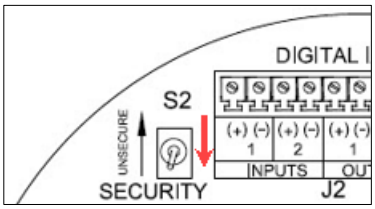
**IMPORTANT NOTE:** Record the security codes. They are not visible on the Station Setup tab after you save them.

**Figure 9-3: Configure security codes (example)**



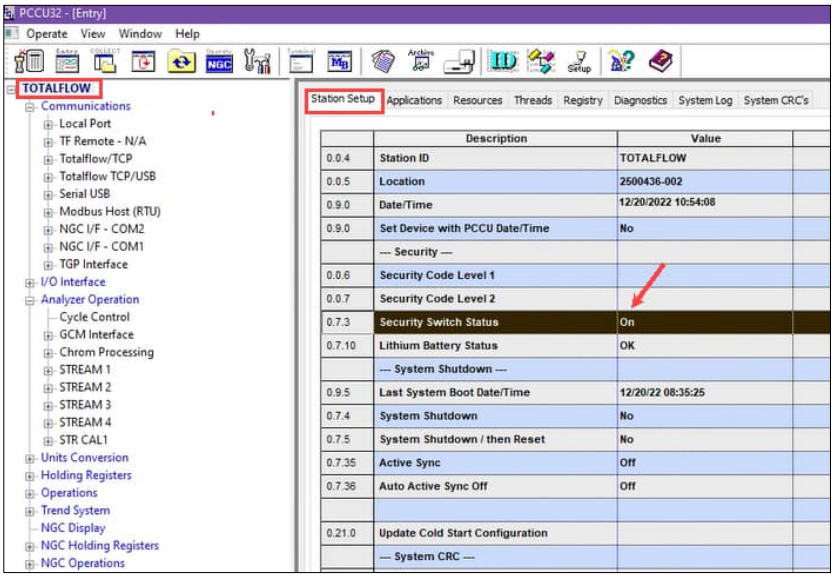

8. Click **Send**.
9. On the terminal board, flip the security switch (S2) down (Figure 9-4).

**Figure 9-4: Enable security on terminal board (switch DOWN)**




10. On the **Station Setup** tab, click **Re-read**. Verify that the security switch status is **On** (Figure 9-14). Enforcement of the security codes is in effect.
11. Click **Close** to close PCCU32 connection with device.

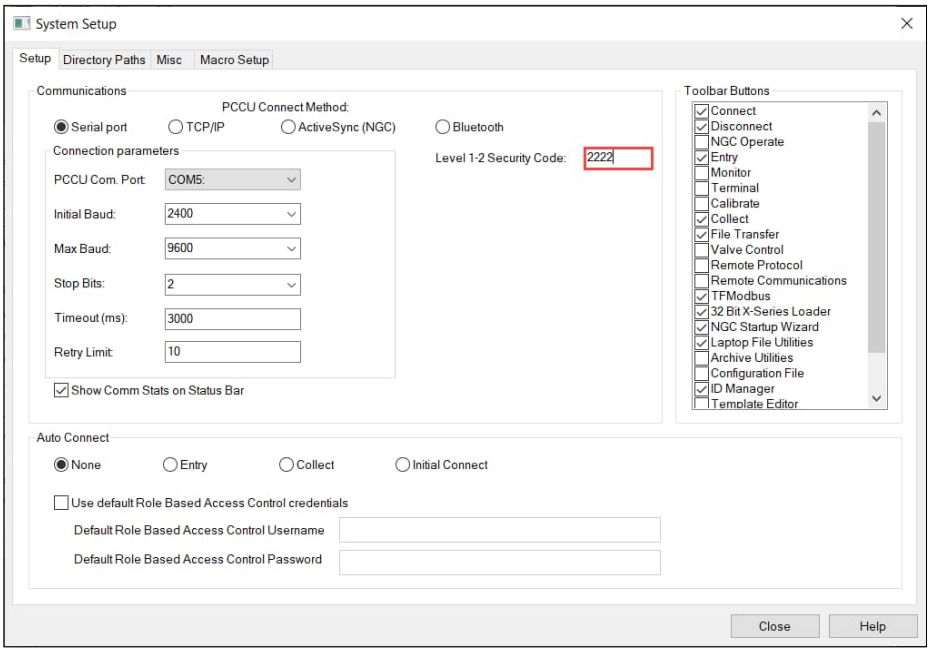
**Figure 9-5: Security Switch Status: On**




**IMPORTANT NOTE:** PCCU32 requires the security codes the next time it attempts connection with the analyzer.

12. Test security code enforcement: Click the **Setup** icon on the PCCU top menu bar.
13. Type the security code in the Level 1-2 Security Code field (Figure 9-6).
14. Click **Close** to exit setup.
15. Click **Entry**.
16. Verify connection is established.

**Figure 9-6: Enter security code**




**IMPORTANT NOTE:** The analyzer may not display an error message when a user tries to write an operation without the proper security code (for example if you entered a code for read-only access); it simply does not accept value changes.

If connected with remote communication or Ethernet, you cannot change the security code.

Security codes are checked via remote communication whether the switch is on or off. A TCP/IP connection, whether direct or over a network, is considered remote. Connection attempts for TCP/IP will always require the security codes.

# 9.2 Configure Role Base Access Control (RBAC)

Role Based Access Control (RBAC) is a feature within PCCU32 that allows an administrator to designate roles and control access levels to various applications and processes in the analyzer. The system provides pre-defined privileges for each role.

When defining RBAC for the analyzer, consider all required user-access to the system. First, create an administrator account and then add users. Assign a default role to each user. For additional non-admin users, you can modify the default privileges to limit access as required.

Figure 9-7 shows the **Security Editor** window used to define users and roles for RBAC. This example shows the default **Administrator** role, the list of functions (processes or applications) and the type of access granted for these functions. The default definition provides full access for the Administrator role.

**Figure 9-7: Default Administrator role access in RBAC PCCU32 Security Editor**

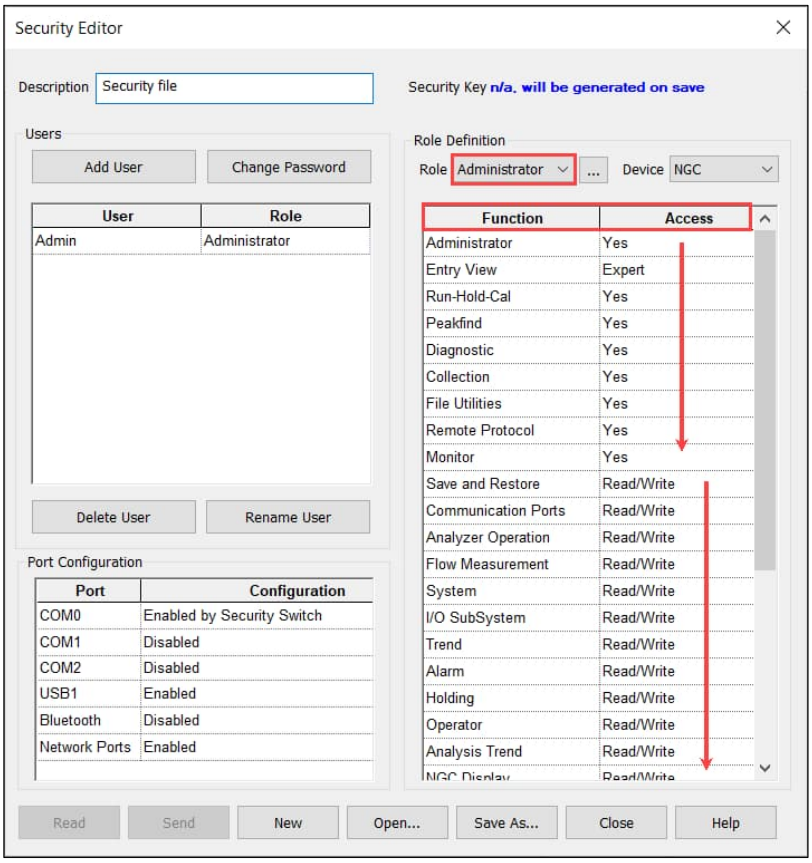
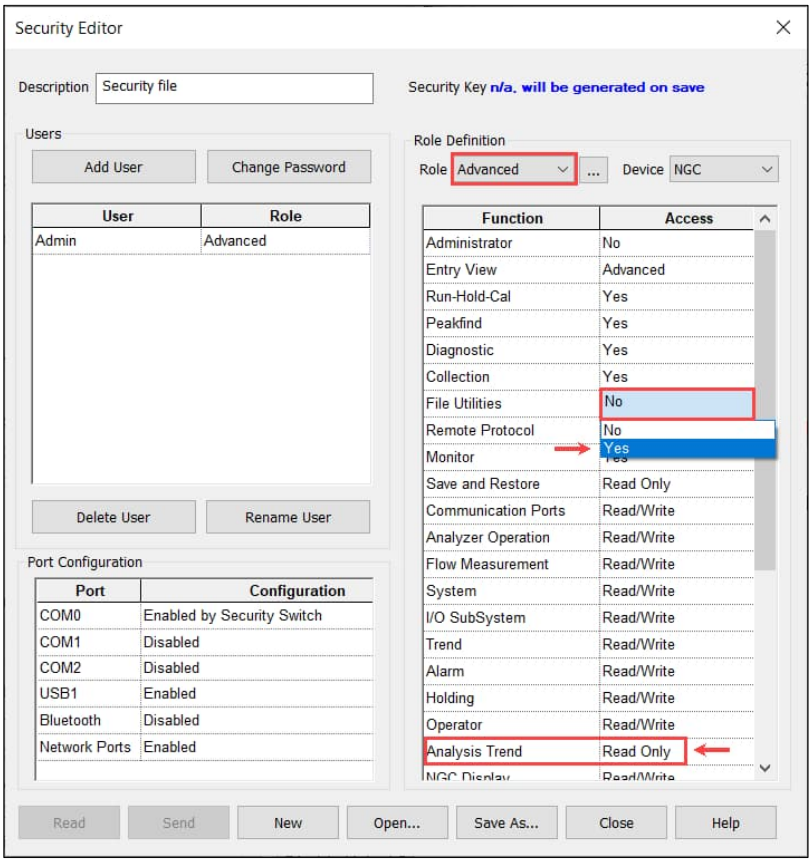



Figure 9-8 shows the default **Advanced** role definitions. Note that the Advanced role does not have full access for some functions. Default access configuration for each function can be customized by changing the default setting as necessary.

**Figure 9-8: Default Advanced role access in RBAC PCCU32 Security Editor**




All users and their roles are saved in an RBAC configuration file. This file is stored in the analyzer and can also be saved on a local PC or laptop for use in other analyzers requiring the same security configuration. This saves time when configuring multiple analyzers with the same security requirements.

When the RBAC security configuration is in effect, it restricts or disables any unapproved applications and functions for the current user. Restricted applications and restricted functions are not visible on the PCCU32 navigation tree. The **Send** button is also grayed out on applications with read-only functionality.

**NOTICE – Security override:** After RBAC is implemented, it overrides the switch-enforced bi-level security.

## 9.2.1 Default access roles

Default roles are automatically available in PCCU32:

- Administrator
- Expert
- Advanced
- Basic
- File Admin

The Administrator role has the highest level access rights to all functions. Administrators add users, define roles, and save security configuration files to a PC or laptop. Expert, Advanced, and Basic roles have decreasing levels of access rights. The File Admin role has the access rights of the Basic role plus minimum rights required for sending and reading RBAC security files to and from an analyzer. The security files can upload to multiple analyzers for implementation.

## 9.2.2 Set up and create a new RBAC security control file

To set up a new RBAC security system:

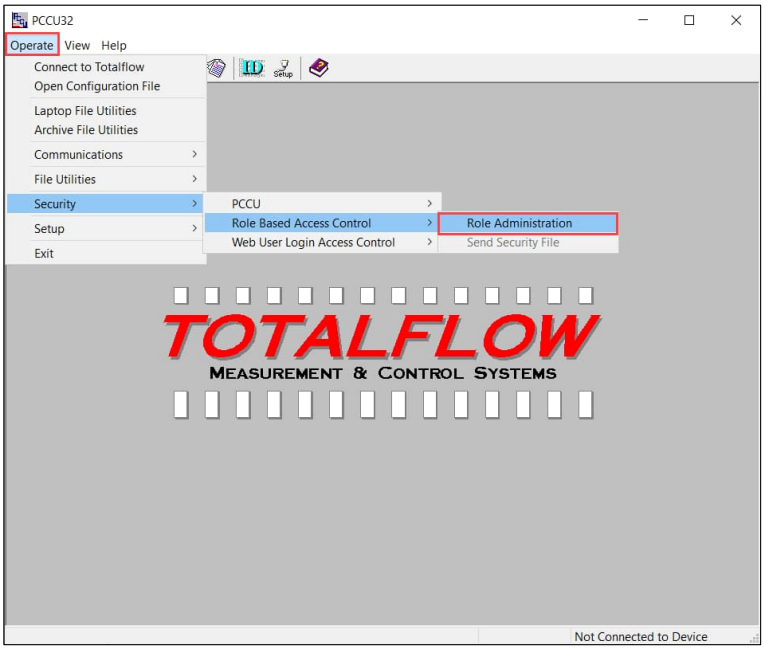
1. Create a security control file.
2. Create an administrator account.
3. Create individual user accounts and assign default roles.
4. Create customized roles if necessary.
5. Configure communication ports.
6. Save the security file.

## 9.2.3 Create the administrator account

To create the administrator account:

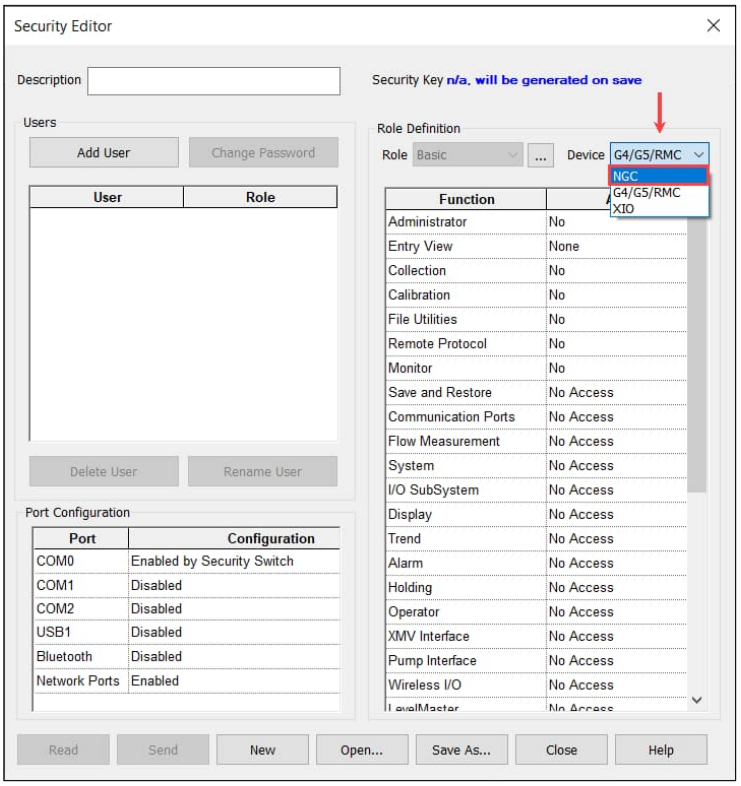
1. Launch PCCU32 and click **Operate** > **Security** > **Role Based Access Control** > **Role Administration** on the top menu bar.

**Figure 9-9: Configure RBAC from PCCU32**



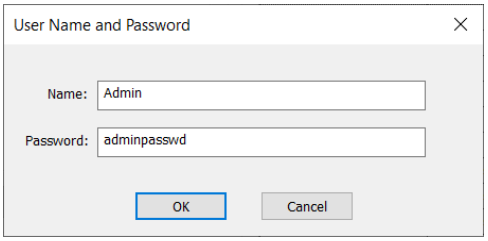

2. On the Security Editor window, select the **Device** drop-down list and select **NGC**.

**Figure 9-10: Security Editor**



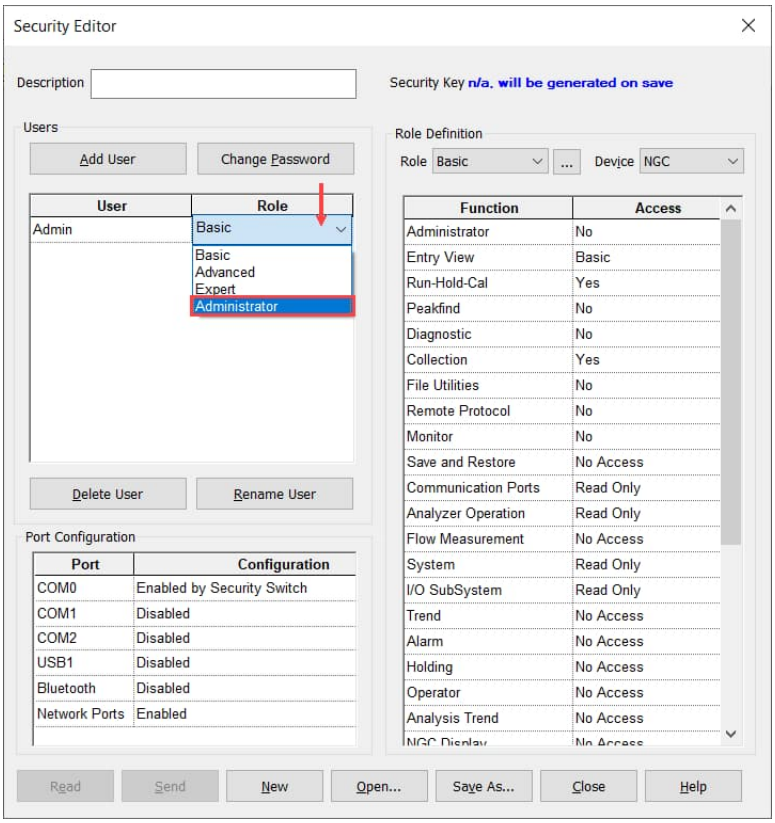

3. Click **Yes** to confirm device change to **NGC**.
4. Add the Administrator user:
   a. Click **Add User**.
   b. Type the user name into the Name field.
   c. Type the password into the Password field.
   d. Click **OK**. The Users list shows the administrator name with Basic as the default role. Assign the correct role in the next step.

**Figure 9-11: Type user credentials**




5. Click the **Role** drop-down list next to the user and select **Administrator**.

**Figure 9-12: Assign Administrator role to Administrator account**




## 9.2.4 Create additional user accounts with standard roles

This procedure creates new users and assigns non-administrator roles to those users.

To add new users:

1. Click **Add User**.
   a. Type the user name into the Name field.
   b. Type the password into the Password field.
   c. Click **OK**. The Users list shows the new user with a default role. Assign the correct role in the next step.

**Figure 9-13: New user credentials**

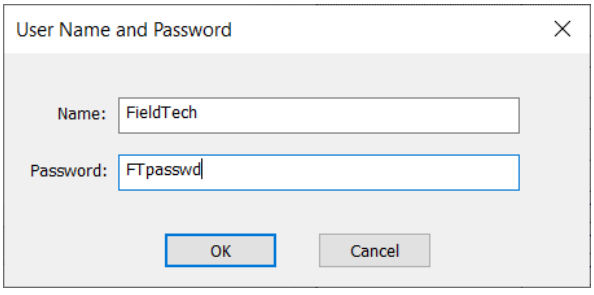
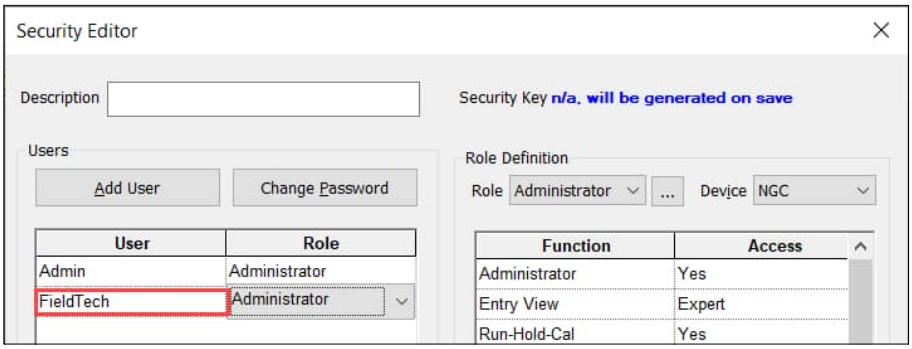
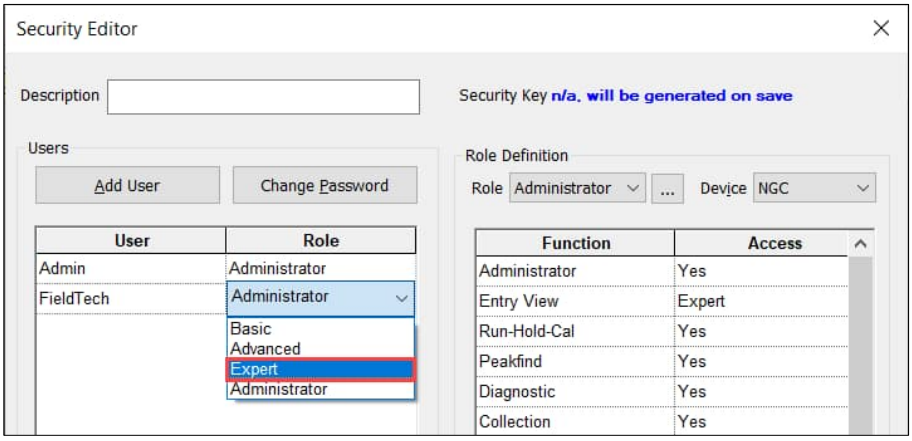


**Figure 9-14: Newly created user**




2. Click the **Role** drop-down list next to the user and select the preferred role from the list.

**Figure 9-15: Assign standard role to new user**




3. Repeat steps 1-2 for each new user.
4. When all users and roles are defined, save the security configuration file as described next, in section 9.2.5 Save RBAC configuration file.

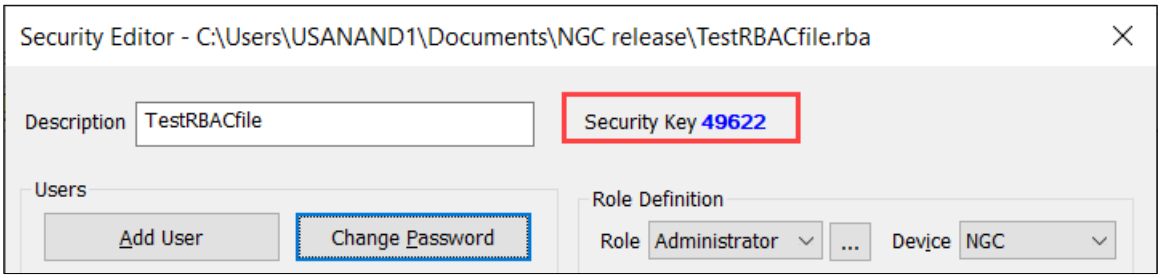
## 9.2.5 Save RBAC configuration file

Once RBAC configuration is complete, the configuration file can be saved in the operator PC or laptop. The saved file can be uploaded in any desired analyzer if the configuration is applicable. Using the same configuration file for multiple analyzers saves configuration time.

To save on a local drive:

1. Type a description of the security file into the **Description** field.
2. Click **Save As** to save the new security control file.
3. Type a password for the security file and click **OK**. The Save Security File dialog displays.
4. Navigate to the appropriate folder, then rename the file as necessary.
5. Click **Save**. When the file is saved a security key is encrypted with the file.
6. Take note of the Security Key assigned to the file.

**Figure 9-16: Security Key assigned to RBAC file**




7. Click **Close** to exit the Security Editor. To save the security configuration on the analyzer, see section 9.3 Save security configuration on the device, next.

## 9.3 Save security configuration on the device

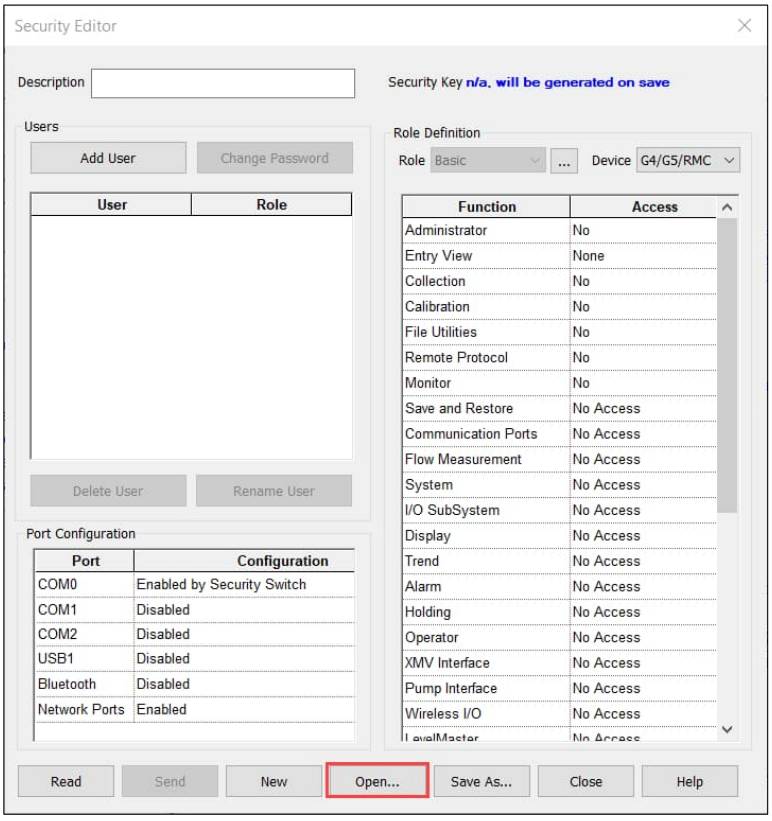
The security configuration must be saved on the analyzer to take effect.

**IMPORTANT NOTE:** When a security file is sent to a device, the security definitions will be enforced every time you connect with the analyzer using PCCU32. The file can be modified and saved again from the Security Editor if it requires updates. Once on the analyzer, however, the security file cannot be disabled or removed. To revoke RBAC security (remove the file), you will need to reload a new analyzer configuration file.

To save the security configuration on the analyzer:

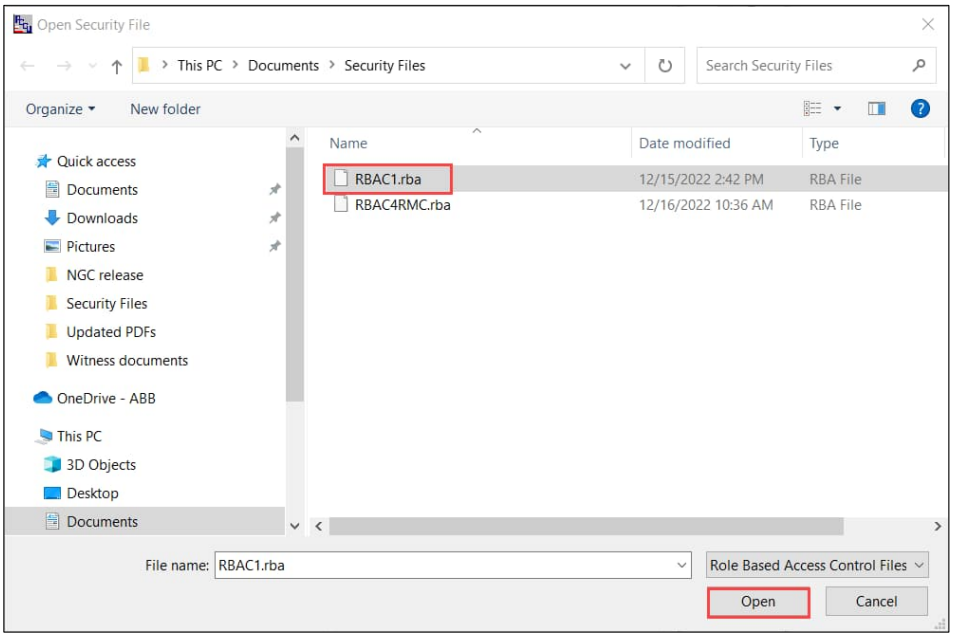
1. Click the **Entry** icon to connect to the analyzer. The Analyzer operator screen displays.
2. Click **Operate** > **Security** > **Role Base Access Control** > **Role Administration**. The Security Editor window displays.
3. Click **Open**.

**Figure 9-17: Security Editor: open security file**



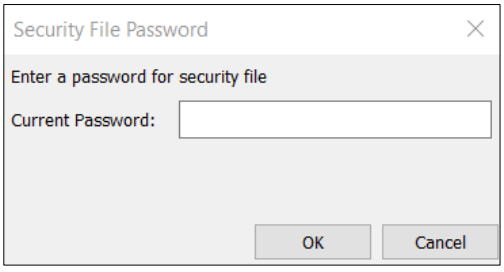

4. Locate and select the new security file from the file browser, then click **Open**. Note that the **Send** button in the Security Editor window activates.

**Figure 9-18: Locate saved RBAC file**



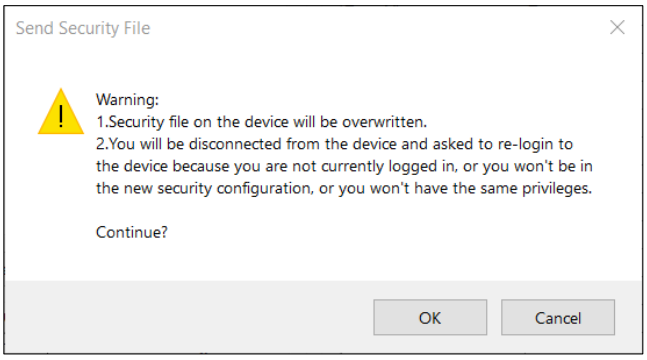

5. Type the password for the security file:

**Figure 9-19: Enter security file password**




6. Click **OK**.
7. Click **Send** to save the security file on the analyzer.
8. Click **OK** at the warning.

**Figure 9-20: Send Security File warning**




9. Click **Close** to exit the Security Editor. Connection with analyzer will be lost.
10. Restart PCCU32.
11. Click **Entry** to connect with the analyzer again.
12. Type credentials at the login prompt (Figure 9-21) and then, click **OK**.
13. Verify that connection is established.

**Figure 9-21: Login prompt when RBAC is enabled**


# 10 Maintenance

**NOTICE – Equipment damage or loss of data.** As with all electronic components, use caution when handling boards. Static electricity can potentially damage board components, voiding any warranty.

This chapter provides maintenance information and instructions on how to remove and install analyzer components. Develop regularly scheduled daily, weekly or monthly maintenance programs. By establishing such programs, analyzer downtime will be reduced, and the system will operate at optimum analytical efficiency.

**WARNING – Bodily injury**. Do not open or remove covers, including the PCCU local communications cover, unless the area, including the internal volume of the enclosure, is known to be non-hazardous.

## 10.1 Maintaining cleanliness

It is important that an inspection schedule be established to examine the device for internal and external cleanliness and damage.

Because an analyzer installation is exposed to external environmental conditions, it is important that it be regularly inspected for cleanliness, both externally and internally. Even though the analyzer is tightly sealed against moisture and foreign contamination, it is recommended that the internal components be examined for moisture and/or contamination. If contamination is found, the system should be shut down and cleaned. If such contamination is not removed, it could render the analyzer inoperable.

## 10.2 Visual inspection

The analyzer should be visually examined on an established schedule to maintain optimum system operation.

During the visual inspection, examine components for the following conditions:

- Pipe or wall mounting: The device must be in a vertical position and the mounting brackets tightened on the pipe. The wall mounting bracket must be securely affixed to the mounting wall.
- Carrier gas cylinder mounting rack: The mounting rack should be tilted backward slightly to keep the cylinders from falling forward.
- Cylinders within mounting rack: The cylinders must be securely strapped in the mounting rack.
- Cylinder regulators: These must be tightened securely and checked for leaks.
- Pipe-mounted sample probe: These must be securely mounted in the pipe meter run using an approved probe adapter.
- Stainless steel tubing connected between sample probe and analyzer: These must not be bent or closed off. The connections must be tight.
- Tightness of front and rear end caps: Hand-tightening gently is adequate.
- Input/output terminations, external power or signal cable runs: All input/output cable, power and signal connections to the NGC or PGC must be installed in accordance with the applicable national and local electrical codes for the intended use. Classified Hazardous Locations will require a suitable enclosure seal to ensure the explosion proof protection.

— The visual examination should also verify there is no damage to the cast aluminum explosion-proof enclosure.

## 10.3 Technical support and returns

If technical assistance is required during maintenance or for returning parts, contact ABB customer service. See the contact information at the end of this document.

If an ABB component is to be returned for repair, securely wrap it in protective anti-static packaging. Before returning a component, call for a return authorization number (RA). Affix this number to the outside of the return package. Use the RMA form (see the link provided in the Additional information section).

Parts shipments must be prepaid by the customer. Any part not covered by original system warranty will be shipped to the customer F.O.B.

**NOTICE – Equipment damage.** The end caps have precision-engineered threading and are susceptible to damage if treated roughly. Take care when removing housing covers. Explosion-proof threads are coated with thread lubricant. Reapply appropriate thread lubricant as needed.

## 10.4 Spare part components

The information in this section presents the components and parts that are accessible for removal and installation.

### 10.4.1 Replacement components

The following components may be replaced (see Figure 10-1):

— Analytical module (12 or 24 VDC) with or without GC module (see Figure 10-2)
— GC module
— Digital controller assembly with display
— Termination panel
— Feed-through assembly without preheat (see Figure 10-3)
— Feed-through assembly with preheat (12 or 24 VDC)

### 10.4.2 Replacement parts

The following parts may be replaced:

— Lithium Battery
— Frit Filters
— Analytical processor to termination panel cable
— Termination panel to digital controller cable
— Feed-through O-ring
— Feed-through interface gasket
— Feed-through manifold gasket
— Feed-through heater (12 or 24 VDC)
— GC module temperature sensor

**Figure 10-1: Component overview**

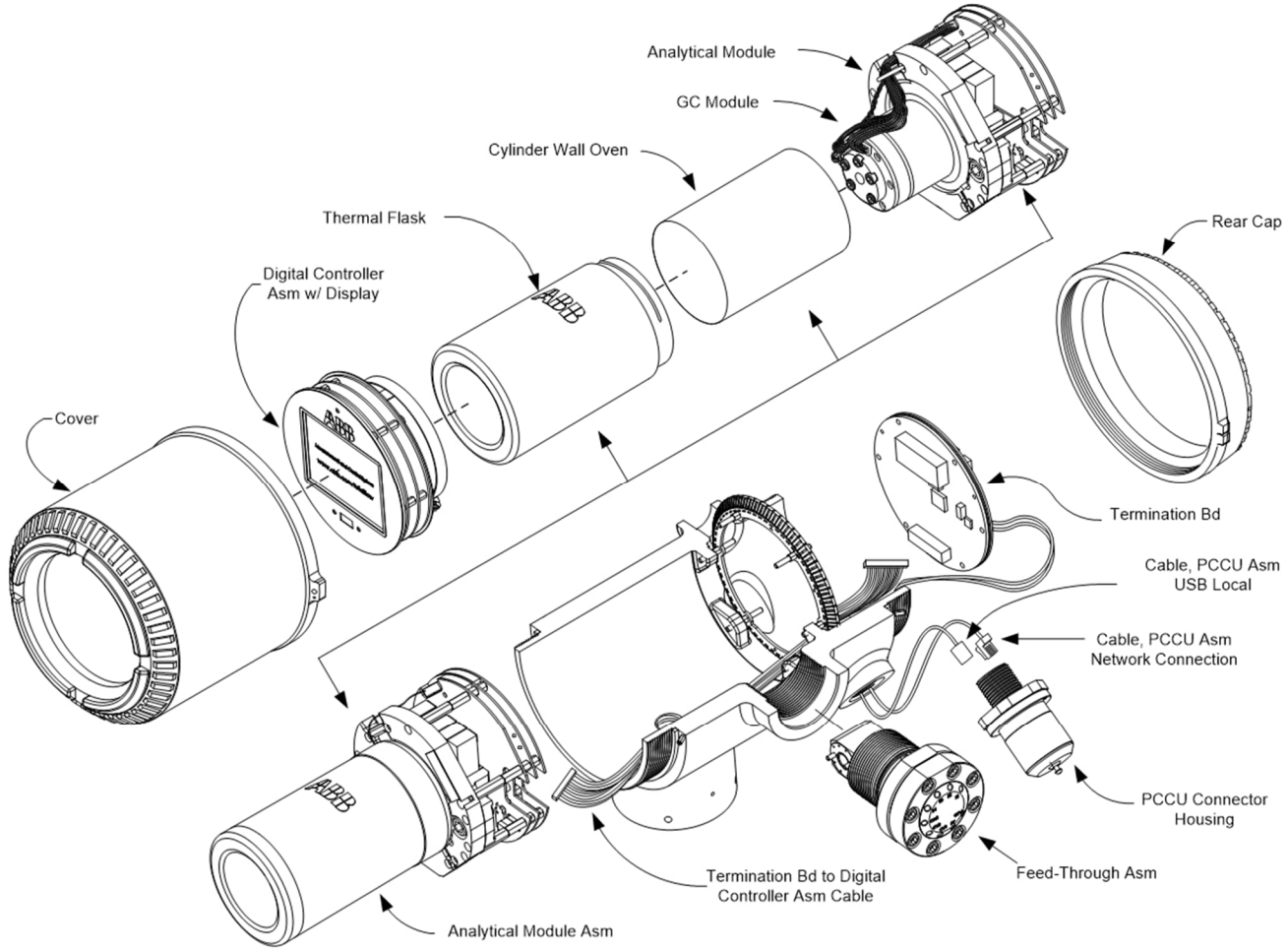



**Figure 10-2: Analytical Module, Exploded**

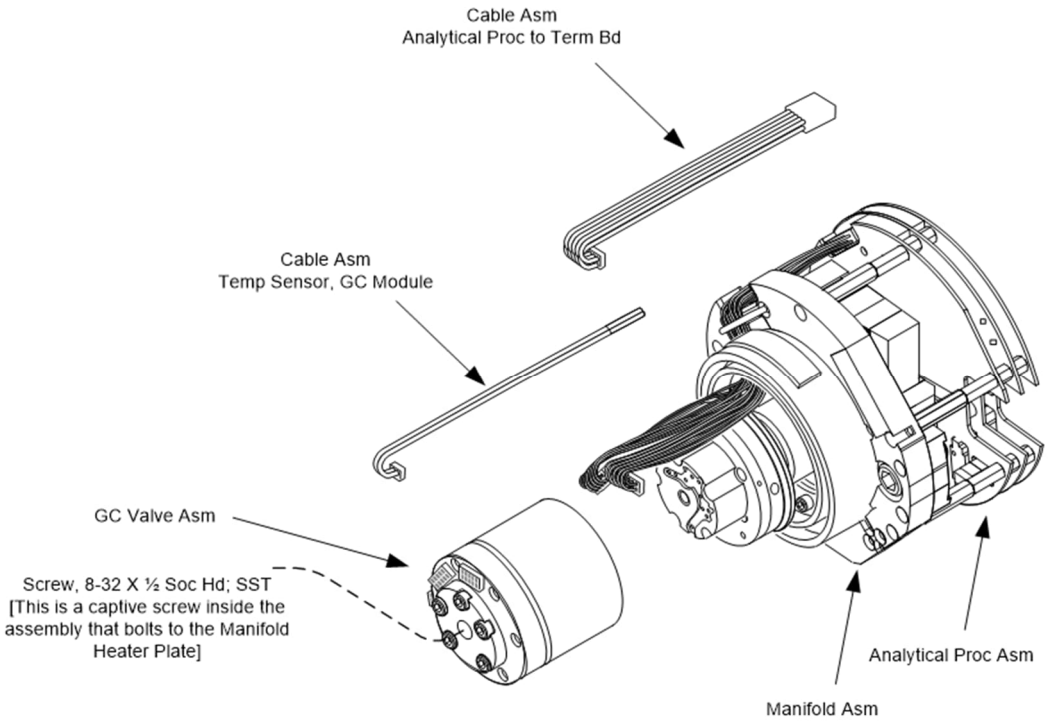
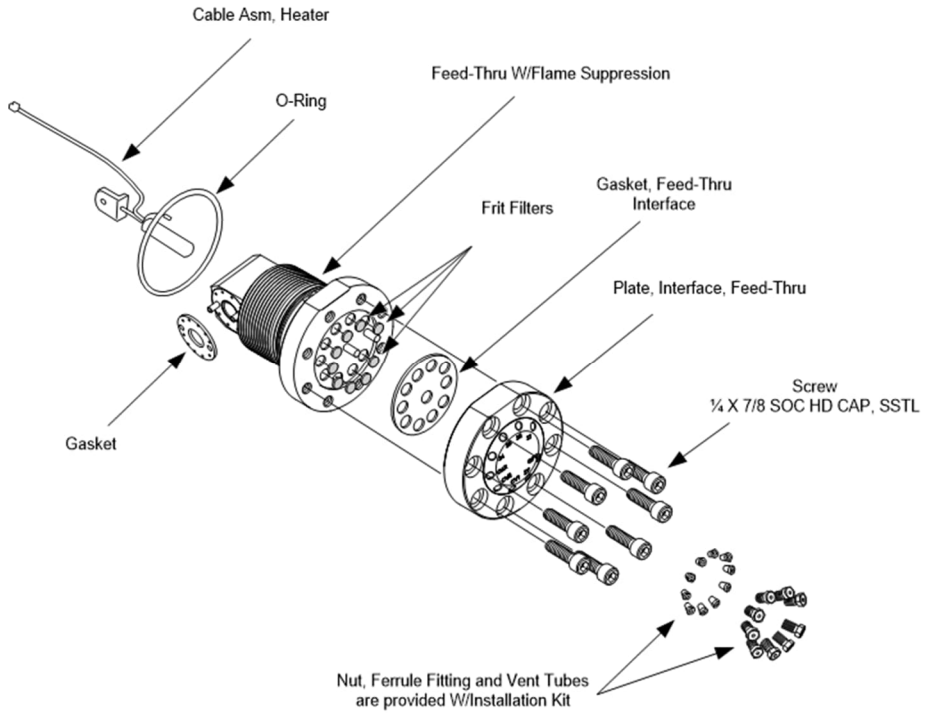


**Figure 10-3: Feed Through Assembly, Exploded**




### 10.4.3 Spare parts

Recommended spare parts depends upon whether there is a single or multiple devices at the site(s) and whether the applications are fixed applications (stocked at the factory). Balance the cost of the spares with the cost of the repair time.

**Table 10-1: Spare parts**

| Spare part | Part number |
|---|---|
| 12 VDC analytical module assembly w/o GC module | 2102807-509 |
| 12 VDC analytical module assembly with GC module | 2102172-506 |
| 24 VDC analytical module assembly w/o GC module | 2102807-510 |
| 24 VDC analytical module assembly with GC module | 2102172-507 |
| Cable between the analog processor and the termination board | 2101817-001 |
| Digital controller board and display, completed assembly | 2101800-512 |
| Digital controller board assembly (Auxiliary device with no display) | 2101800-521 NGC8206<br>2101800-516 PGC1000 |
| Filter frit for feed-through assembly | 1801512-001 |
| GC module tested and characterized | 2103180-501 BBK-BBF |
| MMI Port RS-232 | 2101739-004 |
| Ribbon Cable for connection between Digital Controller and Termination Panel | 1801513-001 |
| Magnet for operating the display | 1801755-001 |
| Termination Panel | 2102080-003 |
| USB connector for MMI interface | 2101739-003 |

## 10.5 Field tool kit

The recommended maintenance tools are presented in Table 10-2 and are included in the optional field tool kit.

**Table 10-2: Field tools**

| Description | Part Number | -001 kit | -002 kit |
|---|---|---|---|
| Bag, ABB Nylon 11” x 6” Tool | 2102304-001 | • | • |
| Cutter, 1/16” Tubing | 1800683-001 | • | |
| Extractor Tool, IC 8-24 Pin | 1801690-001 | • | • |
| Hex Key, Set 1/16-5/16 (12 Pcs) | T10790 | • | • |
| Screwdriver, 3/32 x 2” Standard | T10440 | • | • |
| Stripper, Wire | T10601 | • | • |
| Tool, Ball Driver, 10.3” Long, 5/16” | 1801821-001 | • | • |
| Tools, Nut Driver, 6” Shank, ¼” | 1801822-001 | • | • |
| Wrench, 10” Adjustable | 1801820-001 | • | |
| Wrench, 3/8 x 7/16 Open End | T10805 | • | • |
| Wrench, 1/4 x 5/16 Open End | T10800 | • | • |
| Wrench, 6” Adjustable | 1801819-001 | • | • |

## 10.6 Back up configuration files

Before beginning any maintenance on the analyzer, collect the data and back up all configuration files. This safeguards the data and allows for a restart of the device without the need to reconfigure the analyzer.

Although there are save buttons in the Entry Mode screens which allows the user to back up entry mode data items, a complete system backup is only accomplished by using the Save and Restore Utility. When using this utility to back up files, the user should also download the files to the tfCold drive in case of a cold start.

To back up files:

1. Collect data from the device.
2. While in PCCU, go to the **Operate** drop-down menu. Select **File Utilities,** then click the **Save and Restore** Utility. Or click the **Save and Restore** Utility on the toolbar.
3. In the Save and Restore window, click **Save Station Files**.
4. When the Save Station Files window appears, verify the default name and path for the files. Click **OK**. This will save the tfData files to the PC.
5. After saving the station files, a new window will offer the option to restore the station files to the tfCold drive. If desired, select **Yes**. The station files will be downloaded to that drive.

**IMPORTANT NOTE:** It may not always be desirable to restore the station files to tfCold. Some problems addressed in the Troubleshooting section may require a selective restore. For more information, see the Troubleshooting section and the PCCU help files.

## 10.7 Update embedded software

The analyzer supports embedded software updates. Software update packages for both OS and Flash are available online. Depending on the new features introduced or bug fixes, the update may be of the flash only or, it may require that both the OS and the flash are updated. Always review release notes to determine what is required.

The PCCU32’s device loader utility is used for software update. This procedure assumes that the update is through a direct connection (recommended) with the analyzer’s Ethernet port which requires access to the terminal board (removal or rear cap is required). If unable to access the terminal board, use the MMI port. Update time will be slower if you use RS-232. If the MMI is an USB port, update will be faster than RS-232.

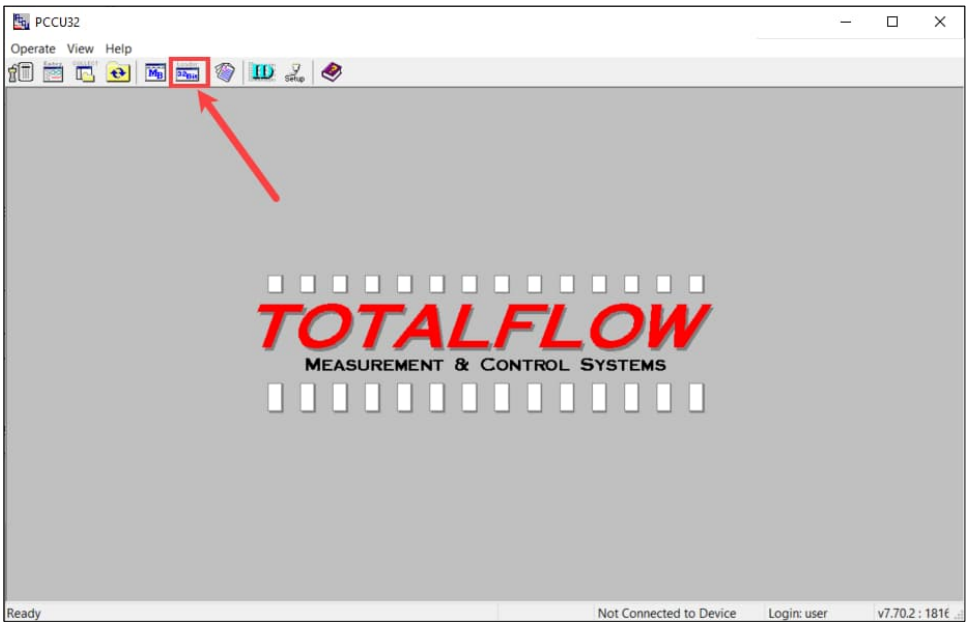
**DANGER – Explosion risk. Serious damage to health / risk to life**. Do not open or remove covers unless the area is known to be non-hazardous.

**IMPORTANT NOTE:** This procedure applies to software updates of systems with OS 2102141-016 and Flash 2102411-043 versions and later. For software updates of systems with OS 2102141-015 and Flash 2102411-042 versions or earlier, see the technical bulletin for upgrading analyzers (TekBul 220).

To update:

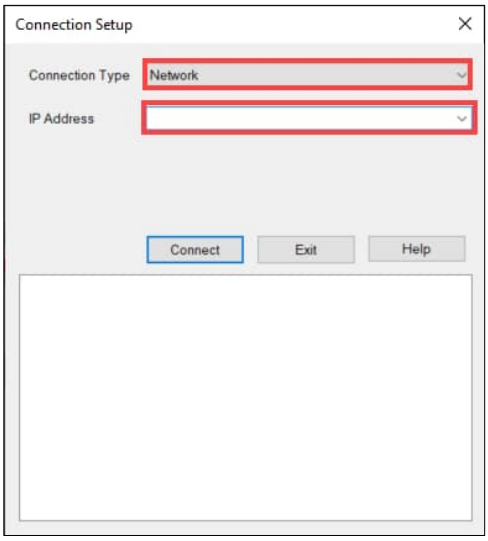
1. Click the **32 Bit loader** icon on the PCCU top menu.

**Figure 10-4: Select 32-bit loader**




2. Click **Yes** at the warning if you have backed up your device data. If you have not backed up the analyzer, see section 10.6 Back up configuration files.
3. At the Connection Setup window (Figure 10-5):
   a. Select **Network** in the Connection Type drop-down list. "Network" is the correct option, even though the physical Ethernet is point-to-point. A point-to-point connection is recommended for update.
   b. Type the IP address of the target analyzer in the IP Address field.

**Figure 10-5: Connection Setup**



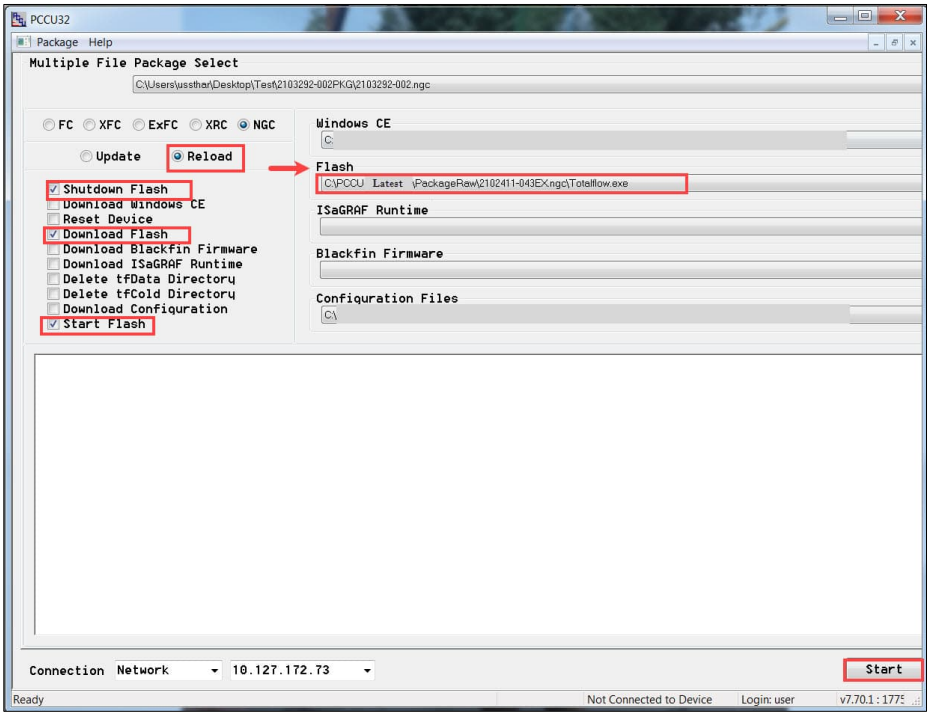

4. Click **Connect**. The loader screen displays.

**IMPORTANT NOTE:** Always verify that in the Connection field, at the bottom left corner of the loader screen, the option: **Network** displays; and that the IP address is the address of the target analyzer. Avoid upgrading the wrong device. Direct connection to the device is always recommended to avoid connecting to the wrong device over a network.

5. Load the Flash (Figure 10-6):
   a. Click the **Flash** browse button to locate the Flash file in your system.
   b. Select the Flash file: **2102411-0xxEX.ngc**. Where xx is the version of the update package.

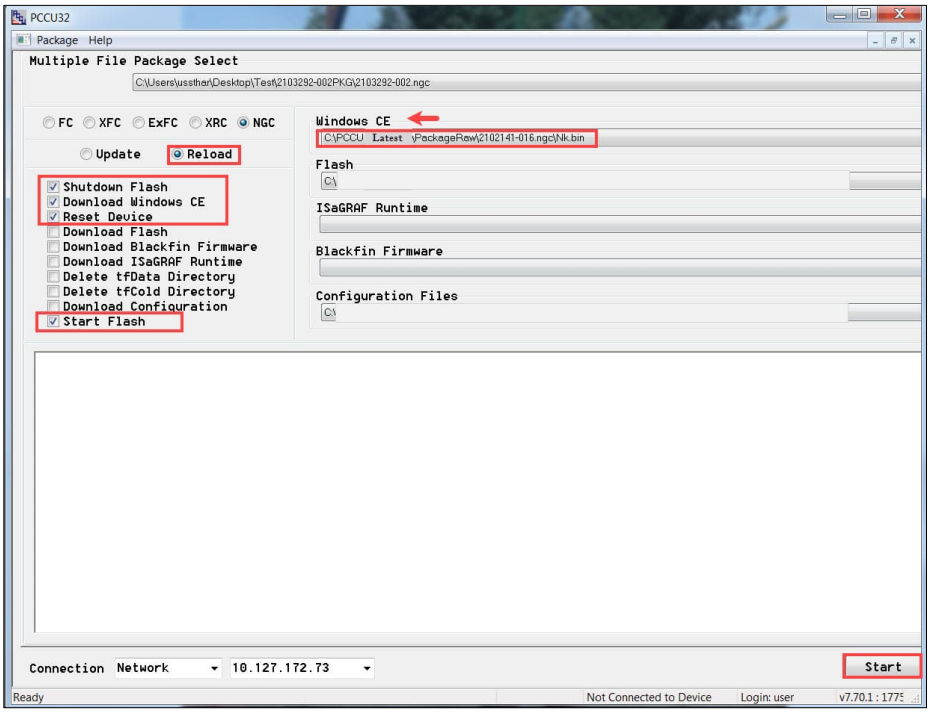
c. Select **Reload**.
d. Select the following three reload options: **Shutdown Flash**, **Download Flash**, and **Start Flash**.
e. Verify that the Network IP address in the Connection field (bottom, left of the screen) is the address of the device you intend to update.
f. Click **Start**.

**Figure 10-6: Load the Flash**



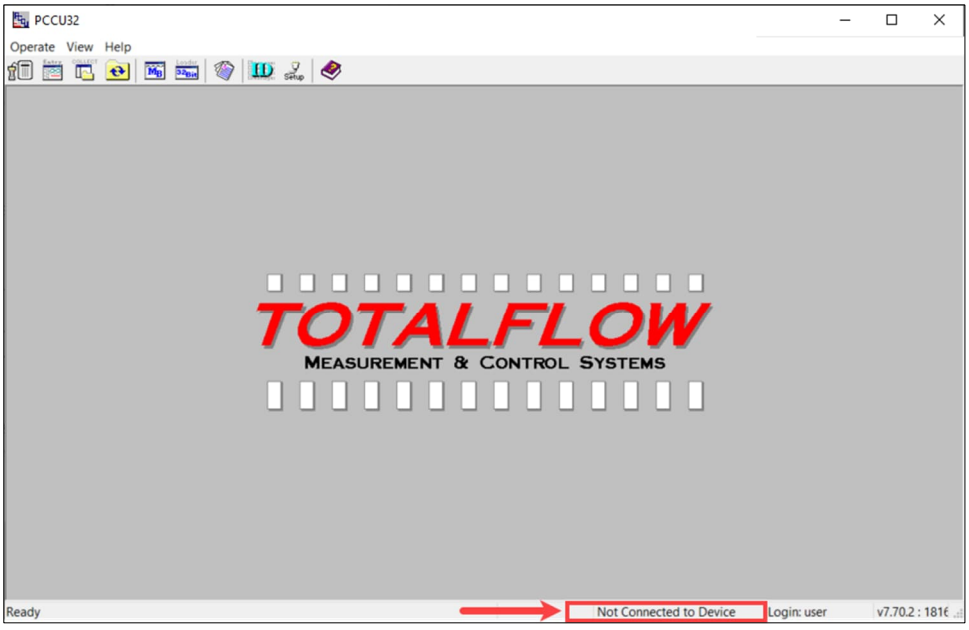

6. Load the OS if required (Figure 10-7):
   a. Click the Windows browse button to locate the Flash file in your system.
   b. Select the OS file: **2102141-0xx6.ngc**. Where xx is the version of the update package.
   c. Select **Reload**.
   d. Select the following four reload options: **Shutdown Flash**, **Download Windows CE**, **Reset Device**, and **Start Flash**.
   e. Verify that the Network IP address in the Connection field is the address of the device you intend to update.
   f. Click **Start**.

**Figure 10-7: Load the OS**




7. Verify that the screen displays the message: "Operation complete".
8. Click **Close** to exit the 32-bit loader. The connection with the device using Ethernet closes and the home PCCU screen displays. Note that there is no connection with the device.

**Figure 10-8: Home PCCU Screen (disconnected from device)**




## 10.8 Restore configuration files

The Restore function enables various maintenance procedures or the download of configuration files to the analyzer.

If prior to performing maintenance, the Save Configuration Files was used, these files were downloaded to the laptop hard drive or external storage. The Restore function uploads these files onto the analyzer tfCold drive.

To restore files:

1. In PCCU, go to the **Operate** drop-down menu.
   - Select **File Utilities** then click the **Save and Restore** Utility.
   - Or click the **Save and Restore** Utility on the toolbar.
2. In the Save and Restore window, click **Restore Station Files**.
3. When the Restore Station Files window appears, verify the default name and path for the files. Click **OK.** This will restore the files to the tfCold drive.

**IMPORTANT NOTE:** It may not always be desirable to restore the station files to tfCold. Some problems addressed in the Troubleshooting section may require a selective restore.

4. Perform a cold start following the instructions in section 10.9.2, and verify that the device is functioning properly.

# 10.9 Reset procedures

On occasion, it may be necessary to reset the device. There are two types of reset procedures: warm or cold.

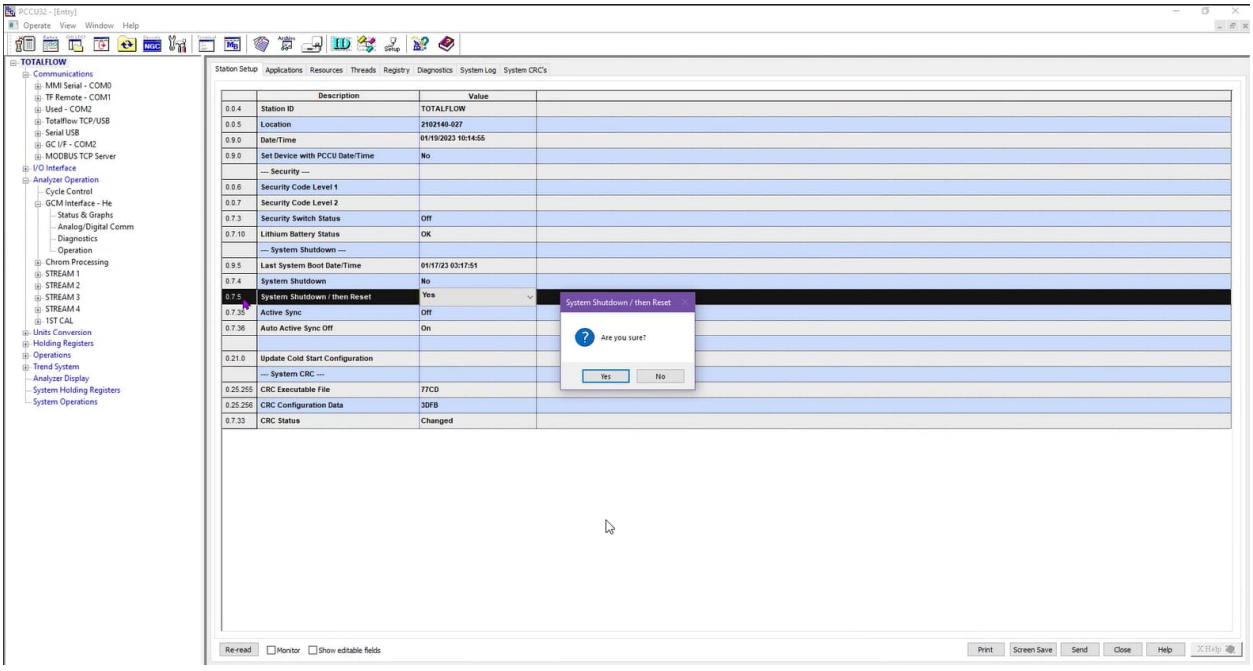
## 10.9.1 Warm start

A warm start occurs when the main power is removed and then re-applied while memory backup is enabled. This does not clear the data stored in RAM. The warm start will only reset the analyzer's microprocessor and not disturb any data that has been stored in RAM. A warm start can be used when a power or communication interruption caused the microprocessor to lock up. There are two ways to perform a warm start: using PCCU Entry view or pressing the reset button.

To perform a warm start with Entry view in PCCU:

1. In PCCU Entry view, select the **Station Setup** tab.
2. Locate the **System shutdown / then Restart** field.
3. From the drop-down menu, select **Yes**.

**Figure 10-9: Warm start using PCCU**




4. Click **Send**.
5. Click **Yes** to confirm.

To perform a warm start with the reset button:

**DANGER – Explosion risk. Serious damage to health / risk to life**. Do not open or remove covers unless the area is known to be non-hazardous.

1. Collect data from the device.
2. Using the Lithium Battery Status instructions in section 10.11, verify the battery status is OK before proceeding.

**NOTICE – Loss of data.** If the lithium battery is not sufficiently charged, a warm start will become a cold start.

3. Gain access to the rear termination panel on the analyzer by loosening the countersunk hex socket locking set screw in the rear end cap using a 1/16” hex wrench and then unscrewing the end cap.
4. To warm start the device, depress the S1 reset button on the termination panel.
5. Or, to remove the analyzer from service, disconnect the power connector J1 from the board.
6. To place analyzer in service, return the power connection J1 to the termination panel.

### 10.9.2 Cold start

**IMPORTANT NOTE:** A cold start will utilize factory calibration. Run manual peak find and recalibrate the device after a cold start. See sections 6.5.3 and 6.6.

**DANGER – Explosion risk. Serious damage to health / risk to life**. Do not open or remove covers unless the area is known to be non-hazardous.

To perform a cold start with the reset button:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16” hex wrench and then unscrewing the end cap.
3. Gain access to rear termination panel on the analyzer by loosening the countersunk hex socket locking set screw in the rear end cap using a 1/16” hex wrench and then unscrewing the end cap.
4. Unplug the lithium battery connector from the J5 receptacle on the digital controller board (see Figure 10-10).
5. Push the Reset button located on the termination panel located in the rear of the enclosure.
6. Initially, the Boot Loader screen will appear on the front display.
7. When the Navigation screen appears, restore the lithium battery connection on the digital controller board.

**Figure 10-10: Digital controller complete assembly**

# 10.10 Restore factory defaults

Occasionally, it may be necessary to restore factory defaults. This procedure should not be a normal operation. It should only be used when all other setup and troubleshooting options have been exhausted or used when a technical specialist recommends this procedure. If critical configuration data is accidentally changed or erroneous results have been produced, the device may require a reset to factory defaults. Inadvertently changing setup data, including critical local communication protocols settings, may require the user to revert all setup information (configuration data) to factory settings. Factory reset includes the following:

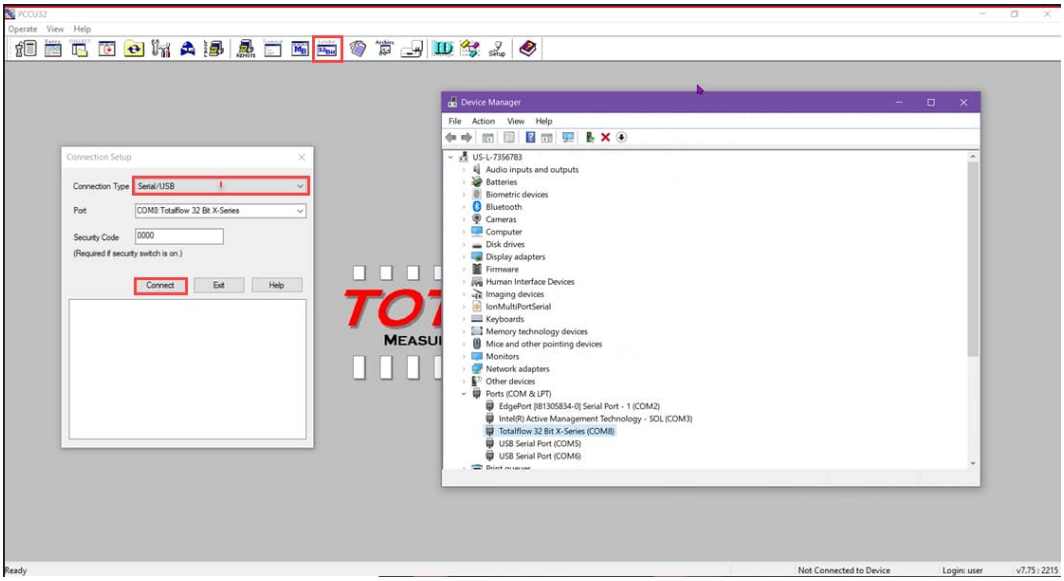
- Communication port settings
- Calibration gas concentrations
- Instantiated applications
- Analyzer setup information
- Startup wizard initialization
- Electronic pressure settings
- All application parameters including display changes

This procedure will require the user to delete both the tfData folder (the current setup data being used to operate the analyzer) and the tfCold folder (non-volatile backup of the setup data).

To restore to factory defaults:

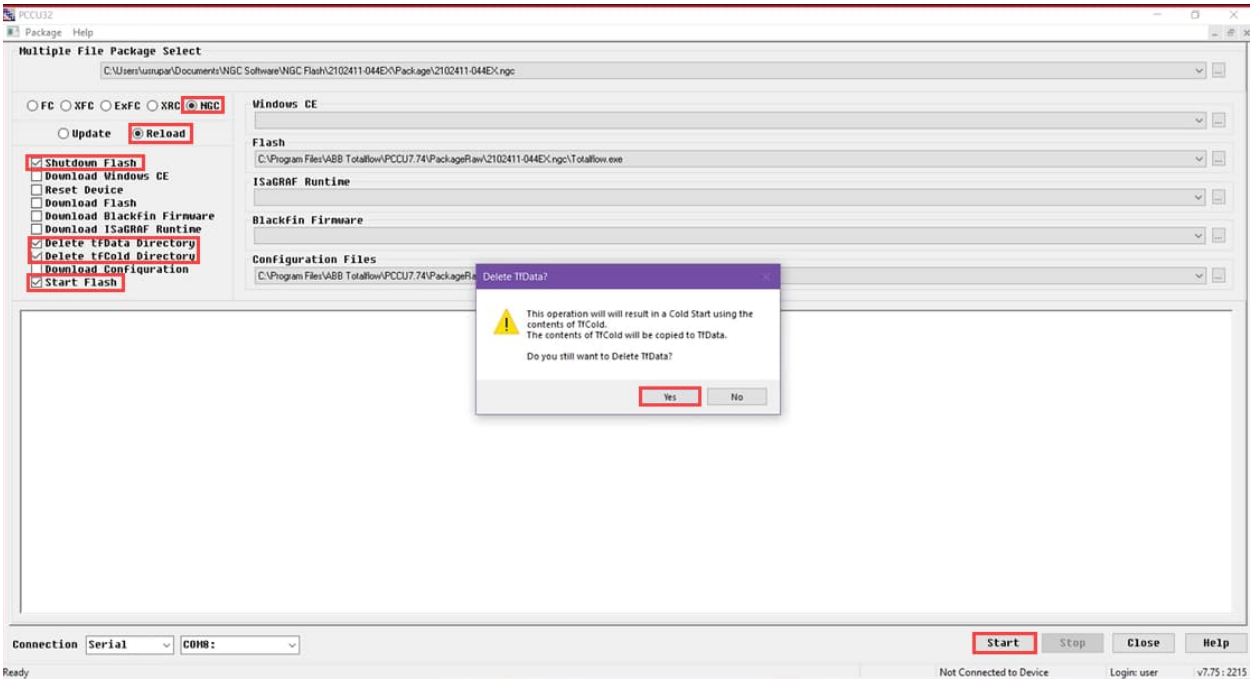
1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect all needed data from the device. See section 10.6 Back up configuration files.
3. On the PCCU top menu, click the **32 Bit Loader** icon (see Figure 10-11).

**Figure 10-11: 32 Bit loader and Connection Setup**




4. Click **Yes** to confirm that data has been collected.
5. Select the connection type: **Serial/USB** or **Network**.
6. Click **Connect**. The Loader screen displays (see Figure 10-12.)
7. Select the **NGC** and **Reload** radio buttons.
8. Check the following four options: **Shutdown Flash**, **Delete tfData Directory**, **Delete tfCold Directory** and **Start Flash**.
9. A popup window will ask if you still want to delete tfData which will result in a Cold Start. If you have backed up your data, then click **Yes**.
10. Click **Start**.

**Figure 10-12: Factory reset with loader**




11. Click **Close** to exit the 32 Bit loader.
12. Go to Entry mode in PCCU.

The device has successfully been reset if you see the Startup Wizard when you reconnect with PCCU.

# 10.11 Lithium battery status

Prior to some maintenance procedures, especially when a Cold Start is not desirable or feasible, verify that the Lithium battery status is OK.

To check battery status:

1. While in the PCCU Analyzer Operation screen, select the **Station Setup** tab.
2. Select the value beside lithium battery status.
3. If Lithium Battery Status value reads OK, then power may be removed from the device without causing a cold start.
4. If Lithium Battery Status reads Low Voltage or Not Connected, then the lithium battery should be connected or replaced prior to removing power from the device. See section 10.20, Replacing the lithium battery.

# 10.12 Change the clock

When measurement streams are instantiated on the analyzer, changing the clock could affect the time when log period entries are made. To protect the integrity of accounting audit trails, the analyzer handles these types of clock changes as follows (examples are based on a 60 minute Log Period).

## 10.12.1 Clock change not crossing a log period boundary

When the next log period entry is made, the clock is not altered.

Example: If the present time is 4:15 p.m. and the clock is changed to 4:05 p.m. of the same day, the daily flow record is the same. The entry reflects the accumulation over a 70 minute time period (15 minutes plus 55 minutes).

## 10.12.2 Forward clock change crossing a log period boundary

This forces a log period entry for part of the log period that has accumulated since the last log period entry. The analyzer then advances to a new data flow record and begins maintaining the balance of the day's data in a newly defined boundary.

Example: If the present time is 4:55 p.m. and the clock is changed to 5:05 p.m. of the same day, the entry reflects only a 55 minute average accumulation. Then a new flow record is written and this period is also based on a 55 minute accumulation.

### 10.12.3 Backward clock change crossing a log period boundary

This forces a log period entry for part of the log period that has accumulated since the last log period entry. This is the same as for a forward clock change crossing an hourly boundary. The analyzer advances to a new day's data flow record and maintains the balance of the day's data in a new record.

Example: If the present time is 5:05 p.m. and the clock is changed to 4:55 p.m. of the same day, the log period record entry reflects only a 5 minute average accumulation (5:00 to 5:05). Then a new flow record is written and this log period is based on a 5 minute accumulation (4:55 to 5:00).

**IMPORTANT NOTE:** A backward clock change uses two (2) daily records to maintain data integrity. This assures that previously recorded data is not overwritten.

If it is necessary to make small backward time changes, less than one (1) hour, the user should wait until the current hour has progressed far enough to make a change that does not cross an hour boundary.

## 10.13 Replace calibration or carrier gas cylinder(s)

When calibration or carrier gas cylinder(s) require replacement, use the following instructions.

To replace a cylinder:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Turn off the calibration and/or carrier gas at the cylinder.
3. Remove the regulator from the cylinder.
4. Exchange the used cylinder with the full cylinder.
5. Re-install the regulator into the cylinder. Verify that the pressure regulator is set correctly to either 15 PSIG for calibration gas or 90 PSIG for carrier gas. Open the shut-off valve on the regulator.
6. At the feed-through assembly, loosen the nut and ferrule from the corresponding inlet, allowing air to purge from the line.

**DANGER – Serious damage to health / risk to life**. Be sure to follow the requirements of the national and local codes when performing this purge.

7. Re-insert the ferrule and nut into the correct inlet and tighten.
8. Leak test connections at the cylinder regulator and feed-through assembly.
9. In PCCU, with the device still in hold, run two single cycles. Inspect the chromatograms to determine if the device is processing correctly. If the chromatograms are OK, return the device to normal operation.

## 10.14 Replace the digital controller assembly

This section presents the procedures for removal and installation of the digital controller assembly and mounting bracket.

To remove the digital controller assembly:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16" hex wrench then unscrewing the end cap.
3. Using a flat blade screwdriver, loosen the screw in the mounting clamp.
4. Unplug the ground cable from the digital controller assembly.
5. Slide the assembly off of the thermal flask, being careful to not unplug the flat ribbon cable connecting the digital controller assembly to the termination panel or the lithium battery.

**NOTICE – Equipment damage or loss of data.** Do not remove the board-mounted lithium battery or the termination panel cable. Removing the lithium battery will cause a cold start which may not be desirable. When replacing the lithium battery, the termination panel cable must remain connected to power the digital controller assembly; otherwise, the device will cold start.

6. To reassemble, perform steps 3–5 in reverse order, being careful to align the display screen horizontally before tightening screw.

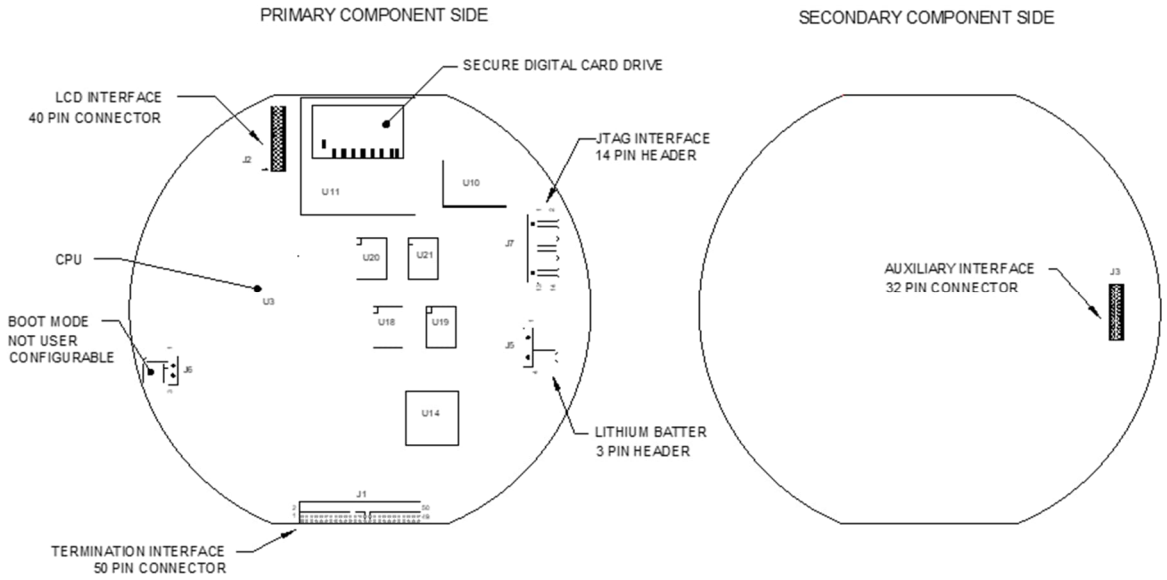
# 10.15 Replace the digital controller complete assembly

Access to the digital controller assembly is gained by removing the front-mounted digital controller assembly from the analytical module.

To replace the digital controller assembly:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files, following the instructions detailed previously in the section, 10.6.
4. Turn off all sample streams, calibration gas and carrier gas.
5. Disconnect or remove the power from the device externally, or remove the J1 connector from the termination panel.
6. Following the instructions detailed in section 10.14, remove the assembly.
7. Unplug the termination panel to digital controller assembly flat ribbon cable, leaving the lithium battery connected.

**Figure 10-13: Digital controller board**




8. To reassemble using the replacement assembly, perform steps 6–7 in reverse order, being careful to align the display screen before tightening. Check the lithium battery plug for proper installation on the connector.

**IMPORTANT NOTE:** Note that the termination panel to digital controller ribbon cable pin 1 wire is not red. On the digital controller board, the red edge (pin 1) of the cable should plug onto pin 50, the right side of plug. The plug is keyed; do not force the plug into the connector.

9. Re-plug the ground cable onto the new assembly.
10. Once assembled, apply power to the analyzer.
11. Adjust the contrast potentiometer R18 for optimum display. To adjust the display contrast, use an extra small Phillips point screwdriver to turn the potentiometer R18 clockwise for more contrast or counterclockwise for less contrast.
12. Restore the configuration files following the instructions in section 0.
13. Reinstall front and rear end caps.

Since power was removed from the device, the analyzer will perform startup diagnostics and stabilize. If the startup diagnostics were disabled, re-enabled and power cycle to the device. If the power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information on enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

## 10.16 Replace the analytical module

This section presents the procedures for the removal and installation of the analytical module. The module is a completely self-contained device and is part of the analyzer. Read through all procedural steps before beginning disassembly.

Verify before beginning the procedure that the replacement module is appropriately rated for the system voltage. Compare the module voltage to the ID tag located on the side of the enclosure.

**NOTICE – Equipment damage.** When the analytical module is removed, the module should be placed on a clean, dirt-free work surface. Take care that gas ports are free from lint or dust particles. The GC replacement module should be kept in a sealed, static free envelope until the last possible moment before installation.

It is important that the bottom surface of the module be placed on a clean, lint free cloth to prevent components from being scratched, damaged or contaminated.

To replace the analytical module:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files, following the instructions in section 10.6.
4. Using the instructions in section 10.11, verify that the lithium battery status is OK before proceeding.
5. Turn off all sample streams, calibration gas and carrier gas.
6. Disconnect or remove the power from the device externally, or remove the J1 connector from the termination panel.
7. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16” hex wrench then unscrewing the end cap.
8. Following the instructions detailed in section 10.14, remove the assembly. If weather/circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on the cable connections, then and you can move to step 10. If conditions are adverse, perform step 9.
9. Carefully unplug the cable to the termination panel, leaving the lithium battery plugged in. Set the digital controller assembly aside on a clean, lint-free surface.
10. Using a 5/16” hex wrench, loosen the mounting screw (see Figure 10-14) holding the analytical module in place until the module can be slowly lifted from the enclosure, taking care to not pull or stress wires attached to the rear of the assembly.
11. Detach the analytical module rear face jack J1 and J4 if the auxiliary heater is installed (see Figure 10-15).
12. Set the module on a clean, lint-free surface.
13. Verify that the gasket on the feed-through assembly manifold interface is in place, in good condition and free from metal filings or other contamination. If the gasket has fallen off inside the enclosure or stuck to the GC module, replace onto the feed-through manifold interface, ensuring that the gasket does not cover the gas portholes.
14. Verify the S1 auxiliary heater switch is set to the correct position. If using the auxiliary feed-through heater, set the position to Normal.
15. Insert the mounting screw into the analytical module.

**Figure 10-14: Analytical Module**

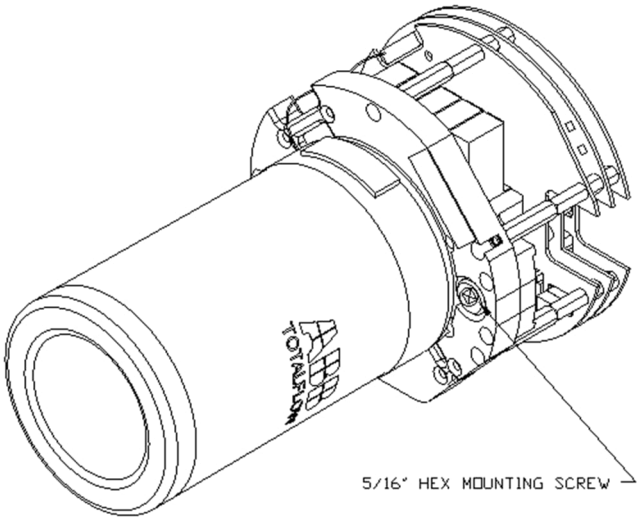
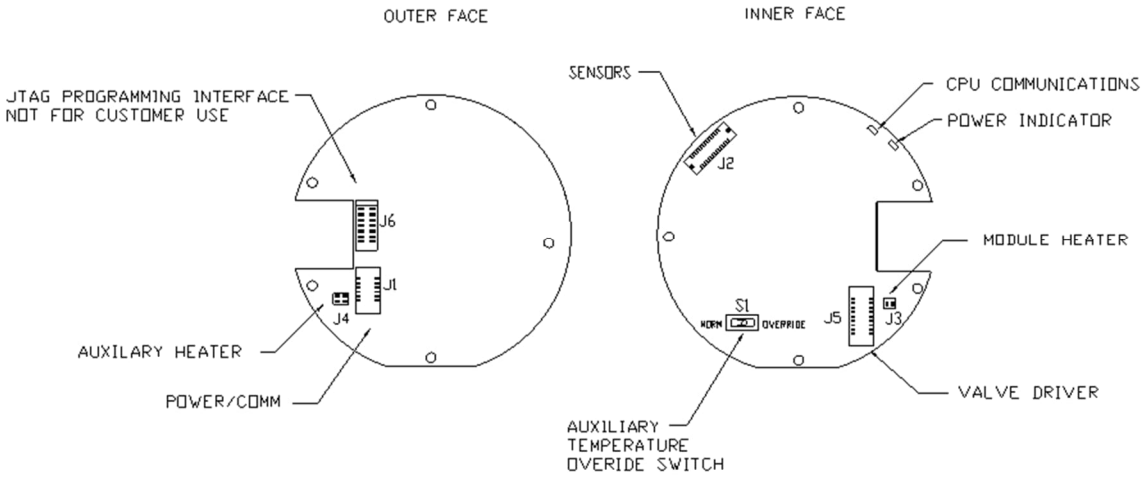



**Figure 10-15: Analytical processor board**




16. Holding the new analytical module at the opening of the enclosure, reconnect jack J1 and J4 if the auxiliary heater is installed.
17. Carefully insert the module into the enclosure, rotating the module to ensure the rear components clear the manifold interface on the inside area of the feed-through assembly. The feed-through manifold interface and the analytical module are keyed to ensure proper alignment.
18. When the analytical module is in place, tighten the mounting screw.
19. Follow the instructions to Replace the digital controller complete assembly in section 10.15.
20. Plug the termination panel to the digital controller ribbon cable into the digital controller assembly.

**IMPORTANT NOTE:** The termination panel to digital controller ribbon cable pin 1 wire is not red. On the digital controller board, the red edge (pin 1) of the cable should plug onto pin 50, the right side of plug. The plug is keyed; do not force the plug into the connector.

21. Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.
22. Turn on all sample streams, calibration gas and carrier gas.
23. Once the device is reassembled, apply power to the analyzer.
24. Follow the Cold Start procedure in section 10.9.2.
25. Reinstall the front and rear end caps.

**IMPORTANT NOTE:** Since power was removed from this device, the analyzer will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, they should be enabled and power cycled to the device. If power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information about enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

## 10.17 Replace the GC Module

This section presents the procedures for the removal and installation of the GC module. The module is a completely self-contained device and is part of the analytical module. Read through all procedural steps before removing the assembly.

Before beginning the procedure, verify that the replacement module is appropriately rated for the system voltage. Compare the module voltage to the ID tag located on the side of the enclosure.

**NOTICE – Equipment damage.** When the GC module is removed, the module should be placed on a clean, dirt-free work surface. It is important that the bottom surface of the module be placed on a clean, lint free cloth to prevent its base from being scratched or damaged. The gas sample flow line openings should be free of foreign contaminants.

If the GC module is not being immediately replaced, put the thermal flask back in place to prevent the mandrel from being scratched or damaged and to keep the gas sample flow line openings free of foreign contaminants. Also, be careful with the miniature D type connector pins.

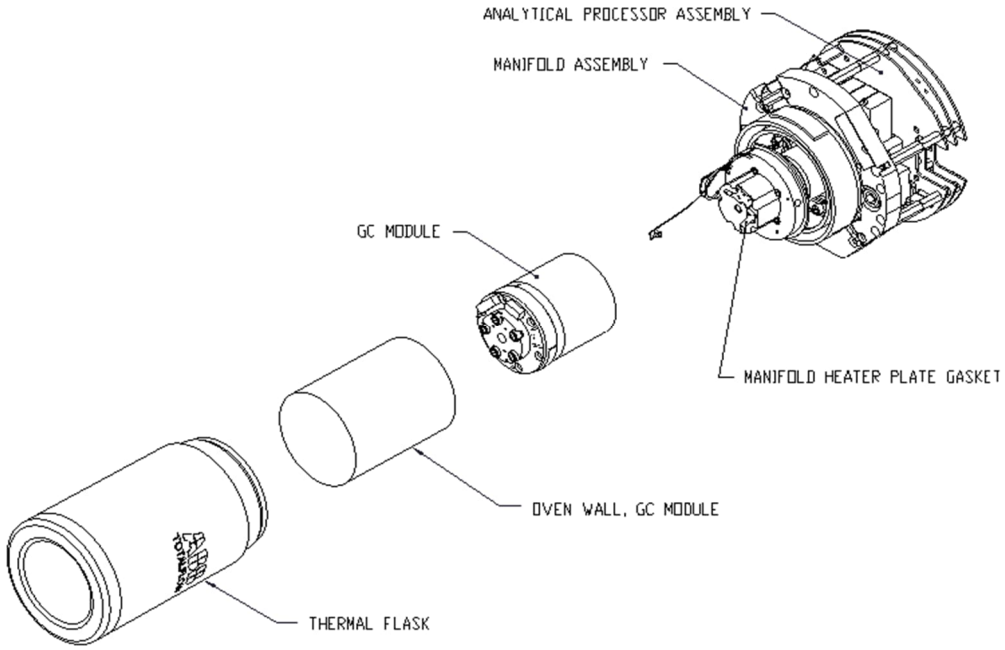
To replace the GC module:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files following the instructions detailed in section 10.6.
4. Using the Lithium battery status instructions, verify that the battery status is ok before proceeding.
5. Turn off all sample streams, calibration gas and carrier gas.
6. Disconnect or remove the power from the device externally, or remove the J1 connector from the termination panel.
7. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16” hex wrench then unscrewing the end cap.
8. Following the instructions detailed in section 10.14, remove the assembly. If weather and circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on cable connections and you can move to step 10. If conditions are adverse, continue to step 9.
9. Carefully unplug the cable to the termination panel, leaving the lithium battery plugged in, and set the digital controller assembly aside on a clean, lint-free surface.
10. Unscrew the thermal flask counterclockwise (see Figure 10-16). When loose, lift the flask from the device and set aside.
11. Unscrew the oven wall counterclockwise (oven wall may be hot).

**WARNING, HOT SURFACE – Bodily injury.** The oven wall may be hot. Wear protective gear to prevent burns.

12. Once the oven wall is loose, lift the cylinder from the GC module and set aside.

**Figure 10-16: GC module, exploded view**




13. Using the extraction tool, remove the cable connectors from J1, J2 and J3 jacks. Do not pull the connectors from the board by the wires.
14. Using a 9/64" hex wrench, loosen the mounting screw inside the center of the assembly. When loose, lift the assembly from the manifold assembly. Set aside on a clean, lint-free surface.
15. Verify that the manifold heater plate gasket is in place and in good condition.
16. Carefully insert the replacement module onto the manifold assembly, rotating the module to ensure that the key holes line up and the module rests on the base. The device should not turn once it is seated correctly.
17. When the GC module is in place, tighten the mounting screw.
18. Carefully restore the cable connectors to J1, J2 and J3 jacks, being careful to not press against the wires attached to the connector head.
19. Replace the oven wall onto the GC module, being careful to not pinch or bind any of the cables. When fully on, turn the oven wall clockwise to tighten.
20. Replace the thermal flask over the GC module. When the flask reaches the mounting bracket, turn clockwise to tighten.
21. Follow the instructions in section 10.14 to Replace the digital controller complete assembly.
22. Plug the termination panel to the digital controller ribbon cable and then into the digital controller assembly, if disconnected.

**IMPORTANT NOTE:** Note that the termination panel to the digital controller ribbon cable pin 1 wire is not red. On the digital controller board, the red edge (pin 1) of the cable should plug onto pin 50, the right side of the plug. The plug is "keyed"; do not force the plug into the connector.

23. Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.
24. Turn on all sample streams, calibration gas and carrier gas.
25. Once the device is reassembled, apply power to the analyzer.
26. Follow the Cold Start procedure in section 10.9.2.
27. Reinstall the front and rear end caps.

**IMPORTANT NOTE:** Note that since power was removed from this device, the analyzer will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, they should be enabled and power cycled to the device. If power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information on enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

# 10.18 Replace the termination panel

This section presents the procedures for removal and installation of the power termination panel. This panel is located in the rear of the analyzer. Read all procedural steps before removing the assembly.

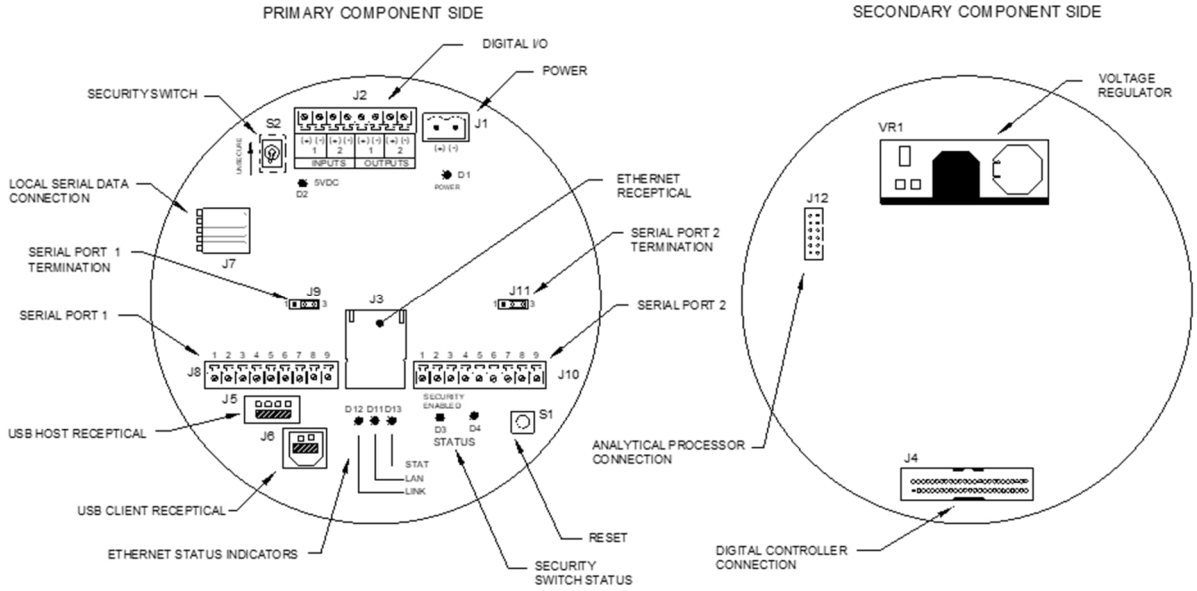
To replace the termination panel:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from device.
3. Back up configuration files, following the instructions detailed in the section 10.6.
4. Using the Lithium battery status instructions, verify the battery status is ok before proceeding.
5. Gain access to the rear termination panel of the analyzer by loosening the countersunk hex socket locking set screw in the rear end cap using a 1/16" hex wrench, and then unscrewing the end cap.
6. Disconnect or remove power from the device externally or remove the J1 connector from the termination panel (see Figure 10-17).
7. Disconnect all connectors from board J2 digital I/O, J8 and J10 serial ports, J3 Ethernet and J6 USB client connectors. Move the wires out of the way.
8. Using a 5/16" nut driver, loosen and remove the six nuts holding the termination panel in place.
9. Lift the clear protective overlay out.
10. Lift the termination panel out, being careful of the wires fed into the enclosure through the hubs and the cables connected to the back. Do not remove the EMI gasket.
11. Carefully unplug the ribbon cable to the digital controller from the back of the termination panel J4 and the analytical processor J12. Set panel aside.

**IMPORTANT NOTE:** Note that the termination panel to the digital controller ribbon cable pin 1 wire is not red. On the termination panel, the red edge (pin 1) of cable should plug onto pin 50, the right side of the plug. The plug is keyed; do not force plug into the connector.

12. Holding the replacement panel at the opening of the enclosure, reconnect the ribbon cable to the digital controller into the back of the termination panel J4 and the analytical processor cable into J12.
13. Insert the termination panel into the enclosure being careful to not pinch the wires between the mounting stud and the panel.
14. Replace the clear protective overlay into the enclosure on the mounting studs.

**Figure 10-17: Termination Panel**




15. Replace the nuts to hold the termination panel in place.
16. Restore J2, J8, J10, J3 and J6 connections, if applicable.
17. Once the device is reassembled, apply power to the analyzer.
18. Reinstall the front and rear end caps.

**IMPORTANT NOTE:** Note that since power was removed from this device, the analyzer will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, they should be enabled and power cycled to the device. If the power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information on enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

## 10.19 Replace the feed-through assembly

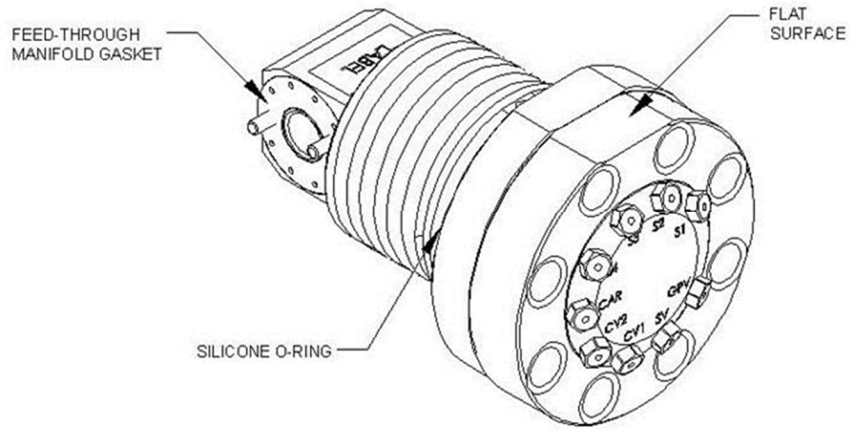
This section presents the procedures for the removal and installation of the feed-through assembly. This assembly is located on the side of the analyzer. Read through all the procedural steps before removing the assembly.

Before beginning the procedure, verify that the module is appropriately rated for the system voltage. Compare the module voltage to the ID tag located on the side of the enclosure.

To replace the feed-through assembly:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files following the instructions detailed in section 10.6.
4. Using the Lithium battery status instructions, verify the battery status is ok before proceeding.
5. Turn off all sample streams, calibration gas and carrier gas.
6. Disconnect or remove the power from the device externally, or remove the J1 connector from the termination panel.
7. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16" hex wrench, then unscrewing the end cap.
8. Following the instructions detailed in section 10.14, remove the digital controller assembly. If weather and circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on the cable connections. If this is the case, move to step 10.
9. Carefully unplug the cable to the termination panel, leaving the lithium battery plugged in. Set the digital controller assembly aside on a clean, lint-free surface.
10. Using a 5/16" hex wrench, loosen the mounting screw holding the analytical module in place until the module can be slowly lifted from the enclosure, taking care to not pull the wires attached to the rear of the assembly.
11. Detach the analytical module rear face jack J1 and J4 if the auxiliary heater is installed.
12. Set the module on a clean, lint-free surface.
13. Using a ¼" open end wrench, loosen the nut and remove the input line. Repeat for all the sample, carrier and calibration gas lines.
14. Using a 5/64" hex wrench, loosen the feed-through set screw.
15. Unscrew the feed-through assembly, turning by hand counterclockwise until free.
16. On the replacement assembly, install the O-ring and manifold gasket supplied with new feed-through assembly (see Figure 10-18).
17. Carefully apply the sealing thread lubricant to the threads on the feed-through assembly, being extremely careful to not contaminate the feed-through manifold and gasket.

**Figure 10-18: Feed-through assembly**




18. Insert the replacement feed-through assembly through the opening and screw in clockwise until completely screwed in but not tight.
    a. If the flat surface, when screwed all the way in, is over 180 degrees past the top, reverse the Feed-Through Assembly counter-clockwise until the flat surface is on top and horizontal.
    b. If the flat surface, when screwed all the way in, is less than 180 degrees past the top, turn the assembly counterclockwise 1 full turn plus enough to bring the flat surface to where it is on top and horizontal.

19. Using a 5/64” hex wrench, tighten the feed-through set screw.
20. Insert the mounting screw into the analytical module.
21. Holding the analytical module at the opening of the enclosure, reconnect jack J1 and J4, if the auxiliary heater is installed (see Figure 10-15).
22. Carefully insert the module into the enclosure, rotating the module to ensure the rear components clear the manifold interface on the inside area of the feed-through assembly. The feed-through manifold interface and analytical module are keyed to ensure proper alignment.
23. When the analytical module is in place, tighten the mounting screw.
24. Follow the instructions in section 10.15 to replace the digital controller complete assembly.
25. Plug the termination panel to the digital controller ribbon cable and into the digital controller assembly.

**IMPORTANT NOTE:** Note that the termination panel to digital controller ribbon cable pin 1 wire is not red. On the digital controller board, the red edge (pin 1) of the cable should plug onto pin 50, the right side of plug. The plug is keyed; do not force the plug into the connector.

26. Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.
27. Once the device is reassembled, apply power to the analyzer.
28. Reinstall the front and rear end caps.

**IMPORTANT NOTE:** Since the power was removed from this device, the analyzer will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, they should be enabled and power cycled to the device. If the power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information on enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

## 10.20 Replace the lithium battery

This section presents the procedures for the removal and installation of a new lithium battery. The lithium battery is inside the front end cap and is wedged between the thermal flask and the enclosure wall. Read all procedural steps before removing the assembly.

To replace the lithium battery:

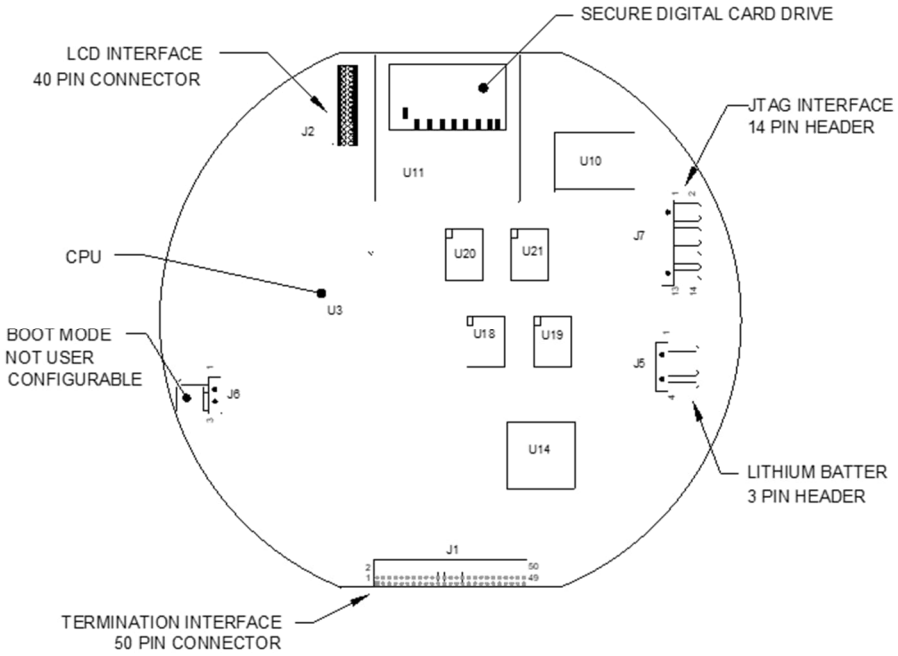
**NOTICE – Equipment damage or loss of data.** Do not remove power to the device. Loss of power to the device will perform a cold start. All data and configuration files will be lost.

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files following the instructions detailed in section 10.6.

**NOTICE – Equipment damage.** As with all electronic components, caution should be used when handling the boards. Static electricity can potentially damage board components, voiding any warranty.

4. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16” hex wrench and then unscrewing the end cap.
5. Unplug the lithium battery connector from the J5 receptacle on the digital controller board (see Figure 10-19).
6. Plug in the replacement lithium battery to J5 on the digital controller board.
7. Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.
8. Using the Lithium battery status instructions, verify that the battery status is ok before proceeding.
9. Reinstall the front end cap.

**Figure 10-19: Primary Component Side Digital Controller Board**



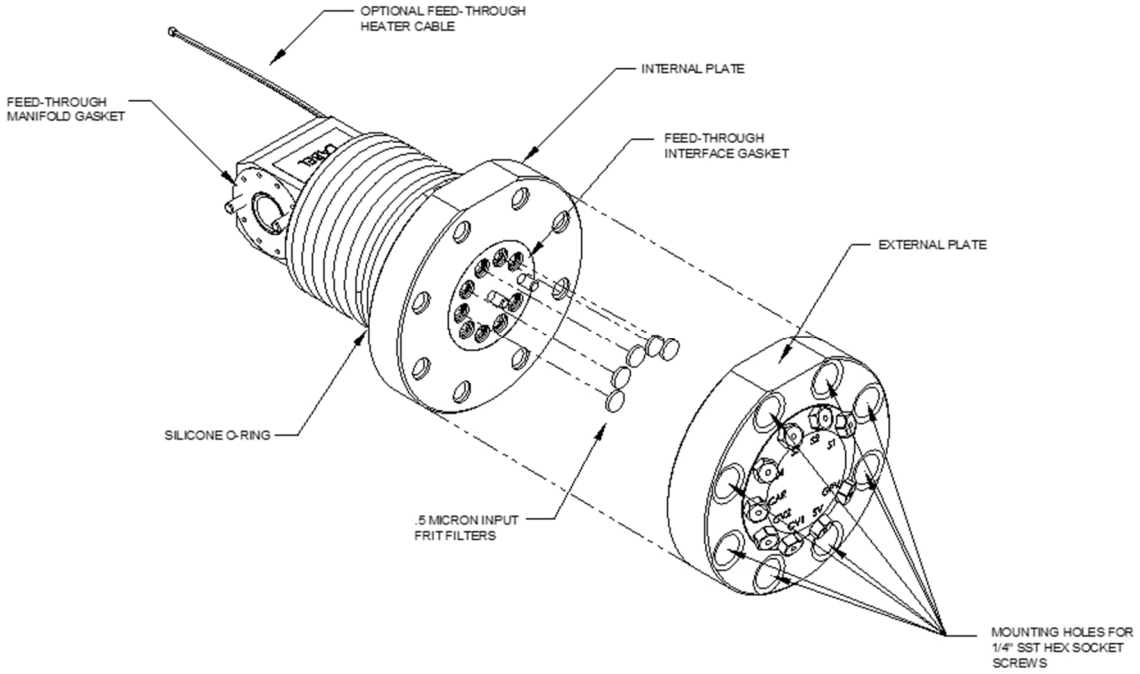

# 10.21 Replace frit filters

When replacing the filter as part of a regularly scheduled maintenance plan, it will most likely not require that the sample lines be removed from the external plate. When replacing the filters as a troubleshooting measure, remove the sample input lines and use compressed air to clear the pathway. These instructions contain steps for the worst-case scenario.

To replace the filters:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files following the instructions detailed in section 10.6.
4. Turn off all the sample streams, calibration gas and carrier gas.
5. Using a 7/32” hex wrench, loosen and remove all 8-¼” hex socket screws (see Figure 10-20).
6. If space permits, lift the external plate away from the internal plate and view the frit filters. If space does not permit lifting the plate away enough to view the filters, remove the sample input lines and the carrier and calibration gas lines.

**Figure 10-20: Feed-through assembly, exploded view**




7. If the filters appear soiled, it will be necessary to remount the external plate and remove the input lines. To remove the input lines, continue to the next step; otherwise, move to step 9.
8. Using a ¼" open end wrench, loosen the nut, and remove the input line. Repeat for all sample, carrier and calibration gas lines.
9. Remove the 8–¼" hex socket mounting screws.
10. Remove the used filters from the filter sockets. Using an edged instrument or fingernail, put pressure on the outermost edge of each filter to pop them out.
11. If replacing filters due to clogging, use compressed air to blow out the input holes in the external plate. It may also be necessary to wipe clean the gasket located on the internal plate; otherwise, move to the next step.
12. Using the replacement filter, carefully lay the filter into the filter socket, applying uniform pressure to the filter. Do not use any pointed instrument to push the filter into place. Repeat for each input stream, carrier and calibration gas input. Vents do not require filters.
13. Reseat the external plate, aligning the mounting pins on the internal plate to the corresponding holes on the external plate.
14. Replace the 8–¼" mounting screws, using a star pattern when tightening the screws.
15. If the sample, carrier and calibration gas lines were removed, purge the air from the transport tubing and reconnect to the corresponding ports. Do not over-tighten.
16. After securing the tubing, check for gas leaks.

# 10.22 Replace the feed-through interface gasket

Should the feed-through interface gasket require replacement (see Figure 10-20), follow these instructions. Typically, the user would change the gasket while performing another procedure, but for the purposes of this manual, the instructions will start and finish as a complete procedure.

To replace the feed-through interface gasket:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files, following the instructions detailed in section 10.6.
4. Turn off all the sample streams, calibration gas and carrier gas.
5. Using a 7/32" hex wrench, loosen and remove all 8 ¼" hex socket screws.
6. If space permits, lift the external plate away from the internal plate and remove the damaged gasket from the internal plate. If space does not permit lifting the plate away enough to replace the gasket, remove the sample input lines and the carrier and calibration gas lines.
7. Remount the external plate and remove the input lines. To remove the input lines, continue to the next step; otherwise, skip to step 9.
8. Using a ¼" open end wrench, loosen the nut and remove the input line. Repeat for all sample, carrier and calibration gas lines.

9. Remove the 8 ¼” hex socket mounting screws.
10. Remove the damaged gasket from the internal plate.
11. Clean the gasket area on the internal plate using a clean, dry lint-free cloth before placing the new gasket on the internal plate. The gasket is keyed to ensure that it is placed correctly. The gasket should not cover any holes in the internal plate.
12. Reseat the external plate, aligning the mounting pins on the internal plate to the corresponding holes on the external plate.
13. Replace the 8 ¼” mounting screws, using a star pattern when tightening the screws.
14. If the sample, carrier and calibration gas lines were removed, purge air from the transport tubing, and reconnect to the corresponding ports. Do not over-tighten.
15. After securing the tubing, check for gas leaks.

## 10.23 Replace the feed-through manifold gasket

If the feed-through manifold gasket requires replacement (see Figure 10-20), follow these instructions. Typically, the user would change the gasket while performing another procedure, but for the purposes of this manual, the instructions will start and finish as a complete procedure.

To replace the feed-through manifold gasket:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files, following the instructions detailed in section 10.6.
4. Using the Lithium battery status instructions, verify that the battery status is ok before proceeding.
5. Turn off all the sample streams, calibration gas and carrier gas.
6. Disconnect or remove power from the device externally or remove the J1 connector from termination panel.
7. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16” hex wrench then unscrewing the end cap.
8. Following the instructions detailed in section, 10.14 to remove the assembly. If weather and circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on cable connections and you can move to step 10.
9. Carefully unplug the cable to the termination panel, leaving the lithium battery plugged in, and set the digital controller assembly aside on a clean, lint-free surface.
10. Using a 5/16” hex wrench, loosen the mounting screw holding the analytical module in place until the module can be slowly lifted from the enclosure, taking care to not pull the wires attached to the rear of the assembly.
11. Detach analytical module rear face jack J1 and J4 if the auxiliary heater is installed.
12. Set the module on a clean, lint-free surface.
13. Replace the gasket on the feed-through assembly manifold interface, ensuring that the gasket does not cover the gas port holes.
14. Insert the mounting screw into the analytical module.
15. Holding the analytical module at the opening of the enclosure, reconnect jumper J1 and J4 if the auxiliary heater is installed (see Figure 10-15).
16. Carefully insert the module into the enclosure, rotating the module to ensure the rear components clear the manifold interface on the inside area of the feed-through assembly. The feed-through manifold interface and the analytical module are keyed to ensure proper alignment.
17. When the analytical module is in place, tighten the mounting screw.
18. Follow the instructions in section 10.15 to replace the assembly.
19. Plug the termination panel to the digital controller ribbon cable into the digital controller assembly.

**IMPORTANT NOTE:** Note that the termination panel to the digital controller ribbon cable pin 1 wire is not red. On the digital controller board, the red edge (pin 1) of the cable should plug onto pin 50, the right side of plug. The plug is keyed; do not force the plug into the connector.

20. Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.
21. Once the device is reassembled, apply power to the analyzer.
22. Reinstall the front and rear end caps.

**IMPORTANT NOTE:** Note that since power was removed from this device, the analyzer will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, it should be enabled and power cycled to the device. If the power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information on enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

## 10.24 Replace the termination panel to the digital controller cable

If the termination panel to digital controller cable becomes damaged and requires replacement, follow these instructions. Typically, the user would change the cable while performing another procedure, but the instructions will start and finish as a complete procedure.

To replace the panel:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files following the instructions detailed in section 10.6.
4. Using the Lithium battery status instructions, verify the battery status is ok before proceeding.
5. Turn off all the sample streams, calibration gas and carrier gas.
6. Disconnect or remove the power from the device externally or remove the J1 connector from the termination panel.

**NOTICE – Equipment damage.** As with all electronic components, caution should be used when handling the boards. Static electricity can potentially damage board components, voiding any warranty.

7. Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16” hex wrench and then unscrewing the end cap.
8. Following the instructions detailed in section 10.14, remove the assembly (see Figure 10-10). If weather and circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on the cable connections and you can move to step 10.
9. Carefully unplug the cable to the termination panel, leaving the lithium battery plugged in, and set the digital controller assembly aside on a clean, lint-free surface.
10. Using a 5/16” hex wrench, loosen the mounting screw holding the analytical module in place until the module can be slowly lifted from the enclosure, taking care to not pull the wires attached to the rear of the assembly (see Figure 10-15).
11. Detach the analytical module rear face jack J1 and J4, if the auxiliary heater is installed.
12. Set the module on a clean, lint-free surface.
13. Reach into the enclosure through the front opening and unplug the ribbon cable from the rear of the termination panel J4.
14. On the replacement cable, verify the orientation by viewing the keyed receptacle on the termination panel and cable. Insert the plug into the J4 connector.
15. Verify that the gasket on the feed-through assembly manifold interface is in place and in good condition. If the gasket has fallen off inside the enclosure or is stuck to the GC module, replace it onto the feed-through manifold interface, ensuring that the gasket does not cover the gas portholes.
16. Insert the mounting screw into the analytical module.
17. Holding the analytical module at the opening of the enclosure, reconnect jack J1 and J4, if the auxiliary heater is installed (see Figure 10-14).
18. Carefully insert the module into the enclosure, rotating the module to ensure that the rear components clear the manifold interface on the inside area of the feed-through assembly. The feed-through manifold interface and analytical module are keyed to ensure the proper alignment.
19. When the analytical module is in place, tighten the mounting screw.
20. Follow the instructions in section 10.15 to replace the assembly.
21. Plug the termination panel into the digital controller ribbon cable and then into the digital controller assembly.

**IMPORTANT NOTE:** Note that the termination panel to digital controller ribbon cable pin 1 wire is not red. On the digital controller board, the red edge (pin 1) of the cable should plug onto pin 50, the right side of the plug. The plug is keyed; do not force plug into connector.

22. Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.
23. Once the device is reassembled, apply power to the analyzer.
24. Reinstall the front and rear end caps.

**IMPORTANT NOTE:** Since the power was removed from this device, the analyzer will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, they should be enabled and power cycled to the device. If the power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information on enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

## 10.25 Replace the analytical processor to the termination panel cable

If the cable connecting the analytical processor to the termination panel requires replacement, use the following instructions.

To replace the cable:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
2. Collect data from the device.
3. Back up the configuration files following the instructions detailed previously in section 10.6.
4. Using the Lithium battery status instructions, verify the battery status is ok before proceeding.
5. Disconnect or remove the power from the device externally, or remove the J1 connector from the termination panel.

**NOTICE – Equipment damage.** As with all electronic components, caution should be used when handling the boards. Static electricity can potentially damage board components, voiding any warranty.

6. Following the instructions detailed in section 10.18, remove the panel and unplug the cable. Reaching into the enclosure, unplug the analytical processor to the termination panel cable from the analytical processor assembly (see Figure 10-15).
7. Using the replacement cable, insert it into the enclosure, and plug into the power/communication connector, J1. Connect the cable to the back of the termination panel J12 connector (see Figure 10-17).
8. Reinstall the termination panel.

**IMPORTANT NOTE:** Note that the termination panel to digital controller ribbon cable pin 1 wire is not red. On the digital controller board, the red edge (pin 1) of the cable should plug onto pin 50, the right side of the plug. The plug is keyed; do not force plug into connector.

9. Once the device is reassembled, apply power to the analyzer.
10. Reinstall the rear end cap.

**IMPORTANT NOTE:** Since power was removed from this device, the analyzer will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, they should be enabled and power cycled to the device. If the power has been withheld from the device for an unknown or lengthy period of time, a complete startup should be performed.

For more information on enabling the diagnostics in PCCU, click **Diagnostics** and then **Help**.

# 11 Troubleshooting

**DANGER – Serious damage to health / risk to life**. Do not open or remove covers, including the PCCU local communications cover, unless the area is known to be non-hazardous.

If these troubleshooting instructions do not lead to a resolution, and assistance is required, contact customer service. Contact information is on the last page of this manual.

## 11.1 Startup diagnostics troubleshooting

This section determines what has caused an alarm during startup diagnostics. The analyzer has extensive built-in tests which are performed each time the device is started. This startup testing may be disabled, but we recommend that it be left enabled.

The diagnostics consist of 4 areas of testing:

- Carrier Pressure Regulator Test
- Oven Temperature Test
- Processor Control Test
- Stream Test

The startup tests may also be performed on a regular schedule. See the PCCU help files for more information on scheduling diagnostics.

**IMPORTANT NOTE:** ABB performs extensive testing on each analyzer prior to shipment, and each device is factory-calibrated using our standard calibration blend.

During the stream test, streams with no gas pressure will fail and they will be disabled in the stream sequence. To enable these streams, click **Stream Setup** on the Analyzer Operation screen.

The following table applies to all startup diagnostics. Each test group will have status results to narrow-down the possibilities for troubleshooting.

**Table 11-1: Startup diagnostics**

| Status | Description |
|---|---|
| Idle | No tests are running |
| In Progress | Test(s) are in progress |
| Passed | Basic and/or additional tests, if required, passed |
| Failed | The basic test failed, and additional more in-depth tests ran and also failed |
| Aborted | Tests were aborted by the user using the Abort command |

### 11.1.1 Carrier Pressure Regulator Test

These alarms are indicative of low carrier pressure. The causes range from a closed carrier cylinder regulator to a blockage inside the GC module.

In the following table, the descriptive status and definitions are applicable for only the carrier pressure regulator test and are in addition to those defined for all startup diagnostics.

**Table 11-2: Carrier pressure regulator diagnostics**

| Status | Description |
|---|---|
| Low Reg Pressure | Pressure is too low to continue the test. Possible causes are the carrier cylinder is low, the regulator on the carrier cylinder needs to be turned up to 90 PSIG, the carrier line from the cylinder to the analyzer is plugged, etc. |
| Flow Blocked | A blockage was sensed during one of the tests. The flow test was run in an attempt to dislodge the blockage but was not successful. See flow test below. |
| Pressure Reg Test | This is an additional test that is in progress because the basic test failed. A different status will be displayed after the test has finished. |
| Flow Test | The flow test is in progress. The flow test is initiated when a blockage is sensed. The flow test will raise the pressure in an attempt to blow the plug out through the vent. If unsuccessful, the flow blocked status will display. |
| Failed | The additional tests cannot prove with certainty, but either the GC module or the manifold assembly are bad. |

To troubleshoot the carrier pressure regulator:

1. Verify the carrier gas cylinder pressure regulator is open. If not, open the regulator on the carrier gas cylinder.
2. Verify the carrier gas cylinder pressure regulator set point is 90 PSIG. If not, correct the set point to 90 PSIG (620.5 kPa or 6.2 bars).
3. Perform the column vent pressure test (see section 11.3.1) for both column vent 1 and column vent 2. If either test failed, proceed to the next step.
4. Replace the analytical module.

### 11.1.2 Oven Temperature Test

This alarm is indicative of a temperature condition. The causes range from an unplugged cable to a bad module heater.

To troubleshoot oven temperature:

1. Verify that the cable is plugged in and in good condition.
2. Verify that the analytical processor to GC module cable is plugged in and in good condition. If the cable appears to be damaged, continue to the next step.
3. Replace the analytical module.

### 11.1.3 Processor Control Test

These alarms are indicative of inability to control a function. If the failure is for one or both of the column carrier pressure tests, it could be a missing or failed gasket. If the failure is in the oven control temperature test, it could be a missing GC module cover or analytical module thermal flask.

To troubleshoot processer control:

1. If the startup diagnostics are being performed following the disassembly or replacement of a module or spare part, ensure that the device is completely reassembled, including the thermal flask and both the front and rear end caps. Then re-start the diagnostics. If diagnostics again fail, repeat disassembly steps and verify that all gaskets and connections are tight and correctly installed.
2. If the startup diagnostics are being performed from an initial startup, verify that the analytical module is not loose inside the enclosure.
3. Verify that the GC module is tight and that the cables are correctly installed and not damaged.
4. Reassemble the device and restart diagnostics. If the device continues to fail, replace the entire analytical module and return to ABB for repair or replacement.

### 11.1.4 Stream Test

The stream flow diagnostics test the stream pressure at different conditions as listed below. Each column will display the pressure results after that part of the test has completed. The status column will reflect the current and final status of the tests.

**IMPORTANT NOTE:** During the stream test, streams with no gas pressure will fail and will be disabled in the stream sequence. To enable these streams, click **Stream Setup** on the Analyzer Operation screen.

The following table gives descriptive status and definitions for only the stream test and are in addition to those defined for all startup diagnostics.

**Table 11-3: Stream test diagnostics**

| Status | Description |
|---|---|
| Failed Initial Pressure | Failed the Initial Pressure test |
| Failed Resting Pressure | Failed the Resting Pressure test |
| Failed No Pressure | Failed the Maximum Pressure test |
| Failed Holding Pressure | Failed the Holding Pressure test |
| Failed Flowing Pressure | Failed the Flowing Pressure test |
| Failed Ending Pressure | Failed the Ending Pressure test |
| Waiting | This is displayed by streams waiting to be tested.<br>The tests are run sequentially. |

These alarms are indicative of a sample pressure problem. The causes range from a plugged frit filter to a bad GC module.

To troubleshoot stream pressure:

1. Perform the Sample pressure test (see section 11.3.2) for the sample vent. If the test fails, proceed to the next step.
2. Perform the feed-through assembly blockage test (see section 11.3.3) on the sample vent (SV). If the test fails, replace the feed-through assembly with a new or refurbished assembly.
3. Replace the analytical module.
4. Replace the GC Module.

## 11.2 Troubleshooting Alarms

**IMPORTANT NOTE:** The information provided for troubleshooting alarms is only intended to cover basic steps that can be performed in the field. Additional troubleshooting steps may be provided by technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to ABB for testing and/or repair.

This section focuses on determining what has caused an alarm following normal operation. The analyzer has a built-in list of alarms, some of which are user-configurable. These alarms are grouped into four areas: general, warning, fault and system fault. Table 11-4 lists enabled alarms. To view all the available alarms, select **Setup** under Stream 1 on the Analyzer Operation screen and select **Alarm Definitions**.

Additional alarms may be enabled but are not included here for the purposes of troubleshooting. They are: component high/low concentration, component peak not found, and component RF limit exceeded. These alarms are disabled by default. See the PCCU32 help files for more information.

**Table 11-4: Default alarms**

| Description | Enabled | Type | Severity |
|---|---|---|---|
| Pressure Regulator 1 | Yes | GT | Fault |
| Pressure Regulator 2 | Yes | GT | Fault |
| Sample Pressure | Yes | GT | Fault |
| Oven Temperature Error | Yes | GT | System Fault |
| No Stream Valve Selected | Yes | GT | System Fault |
| Digital-Analog Bd Comm Error | Yes | GT | System Fault |
| Calculation Error | Yes | GT | Fault |
| Calibration Un-Normalized Total | Yes | GT | Fault |
| Stream Sequence Error | Yes | GT | Fault |
| Calibration CV Percent Error | Yes | GT | Fault |
| RF Pct Error | Yes | GT | Fault |
| Analog Bd Ambient Temp | Yes | GT | Warning |
| Analog Power Supply | Yes | GT | Warning |
| Low Carrier Gas Cylinder (DI1) | Yes | LT | Warning |
| Low Cal Gas Cylinder (DI2) | Yes | LT | Warning |
| GCM Chromatogram Process | Yes | GT | System Fault |
| Bad Bead | Yes | GT | Fault |
| No Pilot Valve Change Detected | Yes | GT | Fault |
| Sample Flow Detect | Yes | GT | Fault |
| CPU Loading | Yes | GT | Warning |
| System Memory Available | Yes | LT | Warning |
| Ram File Available | Yes | LT | Warning |
| Flash File Available | Yes | LT | Warning |
| Missing Peak-Cal Not Used | Yes | GT | Warning |
| Stream Un-Normalized Total | Yes | GT | Warning |

**Table 11-5: Alarm Severity**

| Type | Definition |
|---|---|
| General | Indicates that an alarm exists, but that it is not critical to the operation of the device. Use general when testing for a condition that may occur from time to time in order to know when it happens. |
| Warning | Indicates that an alarm exists, is not critical, but may indicate or provide unexpected results |

| | |
|---|---|
| Fault | Indicates that a malfunction exists that may affect the operation of the device and most likely will provide unexpected results. The fault will keep any affected streams from having their data updated. However, a fault does not stop a scheduled or manually initiated calibration from occurring; and if the calibration corrects the alarm condition, the alarm will be cleared. |
| System Fault | Indicates that a maintenance problem exists. Analysis processing will still occur depending on the problem; however, results will not be updated for any stream while this condition exists. Default system faults are already defined. Do not use this category of alarm unless you want to stop all stream data from being updated. |

### 11.2.1 Alarm definitions

The user can define the threshold for the alarm parameters. The analyzer provides 124 standard alarms. Of these, the alarms in Table 11-6 are set to default. Do not change the system alarms. The user may define additional alarms, beyond defaults, for each process stream.

**Table 11-6: Default alarm definitions**

| Alarm Descriptions | Logic Type | Threshold Default | Severity |
|---|---|---|---|
| Pressure Regulator 1 | GT | 0 | Fault |
| Pressure Regulator 2 | GT | 0 | Fault |
| Sample Pressure | GT | 0 | Fault |
| Oven Temperature Error | GT | 0 | System Fault |
| No Stream Valve Selected | GT | 0 | System Fault |
| Digital-Analog Bd Comm Error | GT | 0 | System Fault |
| Calculation Error | GT | 0 | Fault |
| Calibration Un-Normalized Total | GT | 0 | Fault |
| Stream Sequence Error | GT | 0 | Fault |
| Calibration CV Percent Error | GT | 0 | Fault |
| RF Pct Error | GT | 0 | Fault |
| Analog Bd Ambient Temp | GT | 0 | Warning |
| Analog Power Supply | GT | 0 | Warning |
| Out of Carrier Gas (DI1) | LT | 1 | System Fault |
| Out of Cal Gas (DI2) | LT | 1 | System Fault |
| GCM Chromatogram Process | GT | 0 | System Fault |
| Bad Bead | GT | 0 | Fault |
| Sample Flow Detect | GT | 0 | Fault |
| CPU Loading | GT | 85 | Warning |
| System Memory Available | LT | 500000 | Warning |
| Ram File Available | LT | 1000000 | Warning |
| Flash File Available | LT | 1000000 | Warning |
| Missing Peak-Cal Not Used | GT | 0.0000 | Warning |
| Stream Un-Normalized Total | GT | 0.000 | Warning |

### 11.2.2 Pressure Regulator 1 or 2 Alarm

This alarm indicates low or restricted carrier pressure. The causes could be an empty or low carrier cylinder, restricted pressure, or a blockage inside the GC module.

To troubleshoot the pressure regulator:

1. If the carrier cylinder regulator includes an installed low pressure switch, investigate if the low carrier gas cylinder warning is also present.
2. If the low carrier gas cylinder warning is present, replace the carrier gas cylinder.
3. Verify the carrier gas cylinder pressure is above 90 PSIG. If the pressure is below 90 PSIG, replace the carrier gas cylinder.
4. Verify the carrier gas cylinder pressure regulator set point is 90 PSIG. If not, correct the set point to 90 PSIG.
5. Verify the column vent 1 (CV1) and 2 (CV2), sample vent (SV) and gauge port vent (GPV) are open and unobstructed.
6. Check the sampling system for leaks and tubing restrictions. Repair the leak or restriction, if found.

7. Perform startup diagnostics.
8. If the carrier pressure regulator 1 and 2 tests both pass, continue to the next step.
9. Perform the Column Vent Pressure Test (see section 11.3.1) for both column vent 1 and column vent 2. If either test failed, proceed to the next step.
10. Perform the Feed-through Assembly Blockage Test (see section 11.3.3) on column vent 1 (CV1) and column vent 2 (CV2). If the test fails, replace the feed-through assembly with a new or refurbished assembly.
11. We recommend that a replacement analytical module be installed at this point and additional steps be performed in a clean, lint free atmosphere.
12. Replace the analytical module.
13. Replace the GC Module.

### 11.2.3 Sample Pressure Alarm

This alarm indicates low sample or calibration gas pressure. The causes range from an empty or low calibration gas cylinder to a blockage inside the GC module.

To troubleshoot sample pressure:

1. If the calibration gas cylinder regulator includes an installed low pressure switch, investigate if the low cylinder calibration gas warning is also present.
2. If the low cylinder calibration gas warning is present, replace the calibration gas cylinder.
3. Verify the calibration gas cylinder pressure is above 15 PSIG. If the pressure is below 15 PSIG, replace the calibration gas cylinder.
4. Verify the calibration gas cylinder pressure regulator set point is 15 PSIG. If not, correct the set point to 15 PSIG.
5. Verify the sample vent is open and unobstructed.
6. Perform the Sample pressure test. If the test failed, continue to the next step; otherwise, skip to step 8.
7. Perform the Feed-through assembly blockage test (see section 11.3.3), on the sample vent (SV). If the test fails, replace the feed-through assembly.
8. Check the sampling system for leaks and tubing restrictions. Repair any leak or restriction.
9. Perform startup diagnostics. If the stream test fails, continue to the next step.
10. Verify filters are clean and free of obstructions. If needed Replace frit filters.
11. Replace the analytical module.
12. Replace the GC Module.

### 11.2.4 Oven Temperature Error Alarm

This alarm indicates an issue surrounding the ability to control the oven temperature. The causes range from an unplugged cable, to an inability to communicate with a sensor.

To troubleshoot oven temperature error:

1. Verify that the auxiliary heater switch on the analytical processor board coincides with the feed-through assembly configuration. If the feed-through assembly has an installed auxiliary heater, verify that the switch on board is set to normal. If no auxiliary heater is installed, the switch should be set to override.
2. Verify that the temperature sensor is plugged into the GC module.
3. Perform the Temperature sensor test. If the test fails, Replace the GC Module.
4. The remaining options are not field-repairable. Replace the analytical module.

### 11.2.5 No Stream Valve Selected

This alarm indicates an attempt to run a cycle with insufficient sample pressure. If the sample pressure is too low when diagnostics are run, it will disable all streams but continue to try and run chromatograms.

To troubleshoot no stream valve selected:

1. Check the sampling system for leaks, tubing restrictions and incorrect pressure settings. Repair the leak or restriction or adjust the pressure setting if found.
2. Place the analyzer in hold, allow ten minutes (approximately two cycles) to lapse and then run a single cycle. If the alarm reappears, continue to the next step.
3. The device should still be in hold. Manually enable all streams.
4. Perform startup diagnostics. If the stream test fails, continue to the next step.
5. Perform a warm start (see section 10.9.1).

### 11.2.6 Digital-Analog Board Communication Error Alarm

This alarm indicates a communication error between the digital board and the analytical processor board. Verify the cable connectors are firmly and correctly connected to both the digital and analytical processor boards.

To troubleshoot digital-analog board communication error:

1. In the alarm log, check the frequency of the error. If multiple errors exist, place the device in hold and then launch a cycle.
2. If the alarms continue to register, perform a warm start.
3. When the device completes the startup diagnostics without error, place the device in run.
4. Following 2-3 cycles, verify that no new alarms are registering.

If alarms continue to register, call technical support.

### 11.2.7 Calculation Error Alarm

This alarm indicates the AGA-8 compressibility calculation is not functioning properly. Typically, this error would be caused by a gas sample being out of specification for AGA-8; but it could indicate that the component's peak has shifted.

To troubleshoot calculation error:

1. Calibrate the analyzer (see section 7), ensuring that the next mode is set to hold.
2. When the unit enters hold, select **Peak Find**.
3. Verify that the peaks are correctly labeled and integrated. If the peaks are not correctly labeled and integrated, continue to the next step. Otherwise, skip to step 5.
4. In the Peak Find screen, select **Run Manual PF**. When the cycle is complete, repeat step 3.
5. Under Next Mode, select **Run**.
6. Allow the unit to run a minimum of an hour and then perform a calibration.

### 11.2.8 Calibration Un-normalized Error Alarm

This alarm indicates a change to the un-normalized total of sufficient percentage to activate the alarm. This alarm will discontinue a scheduled calibration and will need to be disabled prior to calibrating the unit.

To troubleshoot calibration un-normalized error:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the unit completes the current cycle and enters hold, continue to the next step.
2. Compare the calibration blend concentrations to the calibration blend concentrations listed on the Calibration Setup screen. If an error exists, make corrections and send the setup when complete.
3. Under **Stream Setup** > **Alarm Definitions**, locate the calibration un-normalized error alarm and set alarm enable to **No**. Send change. Repeat for any additional streams with this alarm.
4. Calibrate the analyzer (see section 7), ensuring that the Next Mode is set to **Hold**.
5. When the unit enters hold, select **Peak Find**.
6. Verify that the peaks are correctly labeled and integrated. If the peaks are correctly labeled and integrated, return the unit to operation.
7. Select **Peak Find** from the Analyzer Operation screen. Select **Run Manual PF**.
8. When the unit enters hold, verify that the peaks are correctly labeled and integrated. If the peaks are correctly labeled and integrated, return the unit to operation; otherwise, contact technical support.
9. Reset the Alarm Enable to **Yes**. Verify that the alarm threshold is a valid configuration. Typically, the un-normalized total should be within 50% (between 99.5 and 100.5).
10. Return the unit to regular operation.

### 11.2.9 Stream Sequence Error Alarm

This alarm indicates a synchronization problem following a manual data post process in factory mode.

To troubleshoot stream sequence error:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the unit completes the current cycle and enters hold, continue to the next step.
2. Perform a warm start (see section 10.9.1).

### 11.2.10 Calibration CV Percent Error Alarm

This alarm is activated when there is a sufficient change to the CV percent. This alarm will discontinue a scheduled calibration and will need to be disabled prior to calibrating the unit.

To troubleshoot calibration CV percent error:

1. On the Analyzer Operation screen, click **Hold** under Next Mode. When the unit completes the current cycle and enters hold, continue to the next step.
2. Compare the calibration blend concentrations to the calibration blend concentrations listed on the Calibration Setup screen. If an errors exist, make corrections and send the setup when complete.
3. Under **Stream Setup** > **Alarm Definitions**, locate the Calibration CV Percent Error Alarm and set Alarm Enable to **No**. Send the change. Repeat for any additional streams with this alarm.
4. Calibrate the analyzer, ensuring that the Next Mode is set to **Hold**.
5. When the unit enters hold, select **Peak Find**.
6. Verify that the peaks are correctly labeled and integrated. If the peaks are correctly labeled and integrated, return the unit to operation.
7. Reset the Alarm Enable to **Yes**. Verify that the alarm threshold is a valid configuration.
8. Return the unit to regular operation.

### 11.2.11 Calibration RF Percent Error Alarm

This alarm indicates a change to the response factor of sufficient percentage to activate the alarm. This alarm will discontinue a scheduled calibration and will need to be disabled prior to calibrating the unit.

To troubleshoot calibration RF percent error:

1. Compare the calibration blend concentrations to the calibration blend concentrations listed on the Calibration Setup screen. If the errors exist, make corrections and send the setup when complete.
2. On the Analyzer Operation screen, click **Hold** under Next Mode. When the unit completes the current cycle and enters hold, continue to the next step.
3. Under **Stream Setup** > **Alarm Definitions**, locate the RF Percent Error Alarm and set Alarm Enable to **No**. Send the change. Repeat for any additional streams with this alarm.
4. When the unit enters hold, select **Peak Find**. Select **Run Manual PF**.
5. Verify that the peaks are correctly labeled and integrated. If the peaks are correctly labeled and integrated, return the unit to operation.
6. Allow unit to cycle 3-4 times.
7. Calibrate the analyzer, ensuring that the Next Mode is set to **Hold**.
8. Reset the Alarm Enable to **Yes**. Verify that the alarm threshold is a valid configuration.
9. Return the unit to regular operation.

### 11.2.12 Enclosure Temperature Alarm

This alarm indicates either extremely high or low temperatures inside the enclosure. Causes could range from external temperatures being extremely high or low, to a bad temperature sensor on the analytical board.

To troubleshoot enclosure temperature:

1. Compare the outside temperature with the temperature reading on the Analyzer Operation screen > Enclosure Temperature. Atmospheric temperature could be less than the enclosure temperature by as much as 20 degrees.

If the temperature differential seems reasonable, the device may be operating out of range. This device is designed to operate at temperatures between 0 °F and 120 °F.

2. If the temperature differential does not seem reasonable, the analytical processor assembly may have a bad temperature sensor. As this alarm is only a warning, it will not affect the operation of the device. The user may replace the analytical module, as needed.

### 11.2.13 Power Supply Alarm

This alarm indicates input voltage either below 11 volts or above 16 volts. Causes may range from a power supply issue to a bad cable.

To troubleshoot power supply:

1. Check the power supply to the termination panel following instructions later in this chapter for the Power supply voltage test in section 11.4.2. If the test fails, restore the power supply to proper working specifications.
2. Check the analytical processor to termination panel cable for damage. If the cable is damaged, replace it.
3. Check the termination panel to digital controller cable for damage. If the cable is damaged, replace it; otherwise, contact technical support.

### 11.2.14 Low Carrier Gas Cylinder (DI1) Alarm

This alarm indicates the carrier gas cylinder pressure is below the threshold.

To troubleshoot low carrier gas cylinder (DI1):

1. Verify that the carrier gas cylinder regulator low pressure switch threshold is set around 90 PSIG. The alarm is switched when pressure drops below the threshold.
2. If the threshold is above the current cylinder PSIG, replace the carrier gas cylinder.
3. If the threshold is below the current cylinder PSIG, verify the regulator is functioning properly.
4. If the procedure fails to locate the problem, contact technical support.

### 11.2.15 Low Cal Gas Cylinder (DI2) Alarm

This alarm indicates the calibration gas cylinder pressure is below the threshold.

To troubleshoot low cal gas cylinder (DI2):

1. Verify that the calibration gas cylinder regulator low pressure switch threshold is set around 15 PSIG. The alarm is switched when the pressure drops below the threshold.
2. If the threshold is above the current cylinder PSIG, replace the calibration gas cylinder.
3. If the threshold is below the current cylinder PSIG, verify the regulator is functioning properly.
4. Perform the Abnormal calibration gas depletion procedure, (see section 11.3.5). If the procedure fails to locate the problem, contact technical support.

### 11.2.16 GCM Processing Error Alarm

This alarm indicates an error that stops the GCM application from signaling the chromatogram application to process a chromatogram. The following internal errors could instigate this alarm: communication response error, polling error, sequence error, and data error.

To troubleshoot GCM processing error:

1. In the alarm log, check for multiple occurrences.
2. If the alarms continue to register, place the device in hold and perform a warm start.
3. When the device completes the startup diagnostics without error, place the device in run.
4. Following 2-3 cycles, verify that no new alarms are registering.

If alarms continue to register, call technical support.

### 11.2.17 Bad Bead Alarm

This alarm could indicate a problem with the GC module, the type of carrier gas used or the sample pressure. Verify that the correct carrier gas is used (see section 4.5). Check the sample pressure (see section 6.4.2.4.) Otherwise, Replace the GC Module (see section 10.17).

### 11.2.18 No Pilot Valve Change Detected Alarm

This alarm indicates a pressure regulator problem on the manifold. During backflush, a valve is changed, but no disturbance is registered.

To troubleshoot no pilot valve change detected:

1. Verify the carrier gas cylinder pressure is above 90 PSIG. If the pressure is below 90 PSIG, replace the carrier gas cylinder.
2. Verify the carrier gas cylinder pressure regulator set point is 90 PSIG. If not, correct the set point to 90 PSIG.
3. Following the Manifold Replacement instructions in section 10.23, replace the manifold. Replace the feed-through manifold gasket.

**IMPORTANT NOTE:** If both the Bad Bead Alarm and the No Pilot Valve Change Detected Alarm trigger, verify that the sample pressure is within correct operational range. See section 6.4.2.4 for sample pressure limits.

### 11.2.19 Sample Flow Detection Alarm

This alarm indicates a pressure issue such as a blocked vent tube, too short bleed cycle, stream test is in auto, etc.

To troubleshoot sample flow detection:

1. Inspect the vent tubes for blockage, including crimps in tubing, dirt or debris.
2. Perform the Sample pressure test (see section 11.3.2).
3. Verify the sample bleed time is set greater than one second.

4. Replace the GC Module.

## 11.2.20 CPU Loading Alarm

This alarm indicates the processor is being overloaded. An occasional spike in processor loading is to be expected. Multiple occurrences are not field-repairable.

To troubleshoot CPU loading:

1. View the alarm history for multiple occurrences. If an occasional warning is registered, this is not a problem.
2. If multiple alarm occurrences exist, contact technical support for additional help.

## 11.2.21 System Memory Available Alarm

This alarm indicates the task memory resource is getting full. The recommended file size for the task memory is 1 to 2 MB. This alarm may be received after adding additional applications.

To troubleshoot available system memory:

1. View the alarm history for multiple occurrences. If an occasional warning is registered, this is not a problem.
2. View the resources from the PCCU Entry screen to check the available memory. If applicable, the available memory could be increased incrementally.

**IMPORTANT NOTE:** When increasing the available memory, the available RAM file space is reduced.

3. Warm start the device to defrag the system memory (see section 10.9.1).
4. Reducing the number of instantiated applications may be required. Contact technical support for assistance.

## 11.2.22 RAM File Available Alarm

This alarm indicates the tfData file resource is becoming full. The recommended files size for tfData is 2 to 3 MB. This alarm may be received after changing the log period frequency, adding applications, or setting up additional trend files.

To troubleshoot available RAM:

1. View the alarm history for multiple occurrences. If an occasional warning is registered, this is not a problem.
2. View the resources from the PCCU Entry screen to check the available RAM file space. If applicable, the RAM file space could be increased incrementally.

**IMPORTANT NOTE:** When increasing the available memory, the available RAM file space is reduced.

1. Warm start the device to defrag the system memory (see section 10.9.1).
2. Reducing the number of instantiated applications, trend files or lengthening the log periods may be required. Contact technical support for assistance.

## 11.2.23 FLASH File Available Alarm

This alarm indicates a shortage of file space in the 32 MB FLASH. Typically, this space is not user-accessible; however, instantiating too many applications may cause an alarm.

To troubleshoot available flash file:

1. View the alarm history. If an occasional warning is registered, this is not a problem.
2. Delete excess applications if needed to clear the alarm.
3. Contact technical support if further assistance is needed.

## 11.2.24 Missing Peak - Calibration Not Used

This alarm indicates a missing peak during a calibration cycle and so calibration will not be used.

To troubleshoot a missing peak:

1. Compare the calibration blend concentrations to the calibration blend concentrations listed on the Calibration Setup screen. If errors exist, make corrections and send the setup when complete.

2. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
3. When the device enters hold, select **Peak Find** from the Analyzer Operation screen. Select **Run Manual PF**.
4. Verify that peaks are correctly labeled and integrated. On Chromatogram 1, NC5 peak should elute around 160 seconds. On Chromatogram 2, C2 peak should elute at approximately 220 seconds. If peaks are correctly labeled and integrated, return the device to operation, and continue to the next step.
5. Allow the device to cycle 3-4 times.
6. Ensure that the Next Mode is set to **Hold**.
7. When the device enters hold, verify that peaks are correctly labeled and integrated. If peaks are correctly labeled and integrated, return the device to operation.
8. If peaks are not correctly labeled and integrated, contact technical support for assistance.

### 11.2.25 Stream Un-normalized Total

This alarm indicates a change to the process stream un-normalized total of sufficient percentage to activate the alarm. If the severity of the alarm is set to fault, the new stream data is not allowed to update.

To troubleshoot stream un-normalized total:

1. Verify that the alarm threshold is a valid configuration. Typically, the unnormalized total should be within 50% (between 99.5 and 100.5).
2. Compare the calibration blend concentrations to the calibration blend concentrations listed on the Calibration Setup screen. If errors exist, make corrections and send the setup when complete.
3. On the Analyzer Operation screen, click **Hold** under Next Mode. When the device completes the current cycle and enters hold, continue to the next step.
4. When the device enters hold, select **Peak Find**. Select **Manual PF**.
5. Verify that peaks are correctly labeled and integrated. If peaks are correctly labeled and integrated, return the device to operation.
6. Allow device to cycle 3-4 times.
7. Calibrate the analyzer.

## 11.3 Alarm troubleshooting tests

### 11.3.1 Column vent pressure test

To troubleshoot column vent pressure:

1. Attach a flowmeter to CV1.
2. From the Analyzer Operation screen, click **Diagnostics**.
3. Select the **Manual Operation** tab.
4. Under Manual Control, open the stream 1 valve.
5. When opened, the CV1 should measure between 3–12 SCCM. Close the valve when done reading.
6. If the CV1 measures within this range, continue to the next step. If CV1 does not measure within the range, the test has failed. Return to troubleshooting alarm instructions.
7. Attach the flowmeter to CV2.
8. Open the stream 1 valve.
9. When opened, CV2 should measure between 3–12 SCCM. Close the valve when done reading.
10. If CV2 does not measure within this range, the test has failed. Return to troubleshooting alarm instructions.

### 11.3.2 Sample pressure test

To troubleshoot sample pressure:

1. Place the device in Hold.
2. From the Analyzer Operation screen, click **Diagnostics**.
3. Select the **Manual Operation** tab and select **Monitor**.
4. Read the sample pressure from the current reading.
5. Under Manual Control, open the stream 1 valve or the stream reflecting alarm.
6. Under Manual Control, close the sample shutoff valve.
7. The sample pressure reading under Current should increase.
8. Under Manual Control, open the sample shutoff valve.
9. The sample pressure reading under Current should decrease rapidly.

10. If the pressure decreases slowly, close the sample shutoff valve and return to the troubleshooting alarm instructions. The test has failed.

### 11.3.3 Feed-through assembly blockage test

To troubleshoot feed-through assembly blockage:

1. Remove the feed-through assembly from the analyzer (see section 10.19).
2. If testing from the pressure regulator 1 or 2 alarms, continue to steps 3 and 4.
   If testing from the stream test in the startup diagnostics or from the sample pressure alarm, skip to step 5.
3. Attach the pressure source to CV1 and activate. If the flow through assembly is impeded, the test has failed. Return to troubleshooting alarm instructions; otherwise, continue to next step.
4. Attach the pressure source to CV2 and activate. If the flow through assembly is impeded, the test has failed. Return to the column vent pressure test.
5. Attach the pressure source to SV and activate. If the flow through assembly is impeded, the test has failed. Return to the troubleshooting alarm instructions.

### 11.3.4 Temperature sensor test

To troubleshoot temperature sensor:

1. Unplug the sensor from the GC module.
2. Connect the digital multimeter (DMM) set to read resistance, with the positive lead to pin 1 and the negative lead to pin 2.
3. The meter should indicate a resistance reading between approximately 10 K ohms and 1 M ohms. The resistance value is dependent on the temperature of the gas chromatograph oven and ambient temperature; therefore, any reading in this range should indicate a functioning temperature sensor.

### 11.3.5 Abnormal calibration gas depletion

If the calibration (and/or carrier) gas has depleted significantly sooner than expected, there may one or more issues.

To troubleshoot abnormal calibration gas depletion:

1. If the analyzer has been running normally but consuming too much calibration (and/or carrier) gas, carefully leak-test the gas cylinder regulator, tubing and connections to the analyzer.
2. If it is a new startup installation, check and tighten the analytical module mounting bolt. The module may have been loosened due to vibration during shipping.
3. If the device has been disassembled recently, re-check and tighten all assemblies including the analytical module mounting bolt.
4. If the analyzer has been powered down for any significant length of time, the calibration (also carrier and sample) gas should be shut off. Some valves may have been left open or partially open, allowing gas to continue flowing.

## 11.4 Power troubleshooting

### 11.4.1 Overview

This section focuses on determining what has caused the analyzer to lose power. Generally, the loss of power can be attributed to only the power supply system. However, if the power supply system is used for powering a transceiver, or other peripheral equipment, a problem with that equipment may drain the battery and cause the analyzer to lose power.

### 11.4.2 Power supply voltage test

This test assumes a power supply is in good working order and has previously been tested and qualified to power an analyzer. If the power supply is under suspicion, it is recommended that it be replaced with a known good power supply before conducting these tests.

To test power supply voltage:

1. Check that the power supply voltage setting, the power supply current rating, and the cables used for the installation meet the recommended requirements (see section 2).
2. If this is a new installation and the external equipment is being powered from the analyzer termination panel, call technical support for help in evaluating the cable and power supply installation requirements. Correct and retest as necessary.
3. Check for a poor cable connection in the cable between the analyzer and the power source. Verify that all field wiring screw terminals are tight. Correct and retest as necessary.

4. Verify that there are no other devices that may drop an excessive voltage across them in the power supply circuit (to the analyzer) like a fuse, diode or a barrier device, etc. Correct and retest as necessary.
5. Disconnect the power supply cable at the analyzer termination panel J1.
6. Measure the power supply cable voltage at the connector and compare with the recommendations (see Table 5-2).
7. If the power supply voltage does not meet recommendations, check the cabling and other loads on the power supply. Also check the power supply output voltage setting. Correct and retest as necessary.
8. Reconnect the power supply cable to the analyzer termination panel J1.

### 11.4.3 Equipment isolation test

This test isolates the peripheral equipment to verify that excessive current is not being drawn from the power source, thus reducing the amount of power supplied to the analyzer.

This procedure assumes that the previous power supply voltage test was performed and that no errors were found.

To isolate equipment issues:

1. While the analyzer is operating, verify that the voltage at the analyzer termination panel is between 11.5 VDC-16 VDC (for 12 VDC systems) or between 22 VDC-28 VDC (for 24 VDC systems).

The analyzer uses pulse width modulation technology to drive its heaters and valves. Due to this feature, a DMM may not show the voltage present at the analyzer termination panel accurately. However, in no case (even under load), should the DMM indicate a voltage less than 11.5 VDC (or 22 VDC for 24 VDC system) if the proper cables are used. It may be necessary to have a digital voltmeter capable of capturing fast transients (less than 1 ms in duration).

For example: While using a DMM with fast transient capture capability, set the DMM to capture the minimum voltage (sometimes this is a min/max measurement). Then let it monitor the analyzer while operating for a few minutes. This should provide a good indication of the minimum voltage appearing at the analyzer terminals.

2. Is the voltage within limits? If not, continue to the next step. If yes, then no physical problem is found.
3. Is the external equipment, such as a radio or other device, being powered from the analyzer termination panel? If not, continue the test sequence. If yes, continue to the next step.
4. Disconnect the peripheral equipment from the analyzer.
5. While the analyzer is operating, verify that the voltage at the analyzer termination panel is between 11.5 VDC-16 VDC (for 12 VDC systems) or 22 VDC-28 VDC (for 24 VDC systems).
6. Is the voltage within limits? If not, continue the test sequence. If yes, the external equipment is drawing excessive current. Check the equipment and related wiring. Correct and retest, if necessary.

### 11.4.4 Analyzer module isolation test

This test isolates the analyzer modules to pinpoint equipment failure.

This procedure assumes that the previous power supply voltage test and equipment isolation test were performed and that no errors were found.

To test the analyzer module:

1. With power still supplied to the termination panel J1 connector, disconnect the power supply cable at the termination panel.
2. Using instructions in section 10.14 remove the digital controller and disconnect the termination panel to the digital controller cable.
3. Using instructions in section 10.16, remove the analytical module.
4. With power still disconnected from the analyzer, measure the voltage at the J1 connector screw terminals. Record the value as power supply voltage (open circuit).
5. Reconnect the power supply cable at the analyzer termination panel J1.
6. Measure voltage at the termination panel J1 connector screw terminals. Voltage should be within 0.1 VDC of the power supply voltage (open circuit).
7. If the voltage drop is greater than 0.1 V, replace the termination panel using instructions in section 10.18. If the voltage drop is again greater than 0.1 V, call technical support.
8. If the drop is less than 0.1 V, check the termination panel to the analytical processor cable for pinched or exposed insulation. Also, check the feed-through auxiliary heater cable for similar damage.

9. Was the damaged cable found? If yes, replace the appropriate cable.
10. If not, see section 10.16 to replace the module.
11. Reinstall the analytical module.
12. Reinstall the digital controller assembly.
13. If disconnected during a procedure, reconnect the J1 power supply connector to the termination panel. It may require 10-60 seconds for the processors in the analyzer to fully boot and for the analyzer to start drawing normal to full power. However, under normal operation, the analyzer should never draw current beyond its rated values.
14. Return to the equipment isolation test.

## 11.5 Serial communications troubleshooting

The analyzer's serial ports support RS-232, RS-485 or RS-422 communication. The type of communication the ports are configured for must match the type required by the communication equipment. Review the external equipment requirements for communication and power.

- Match serial port communication parameters. A mismatch results in communication failure.
- If powering the external device from the serial port, ensure that the power range supplied by the port will meet the device's specifications. Voltage values outside the required range may cause either damage to the device or communication failure.

### 11.5.1 RS-232 communication

Before testing RS-232 serial communication, verify that the field wiring is correct (see Table 11-7).

**Table 11-7: RS-232 Field wiring on analyzer termination panel**

| PIN | SERIAL PORT 1 (J8) | SERIAL PORT 2 (J10) |
|---|---|---|
| 1 | Power Out | Power Out |
| 2 | Ground | Ground |
| 3 | Switched Power Out | Switched Power Out |
| 4 | Operate | Operate |
| 5 | Not Used | Not Used |
| 6 | Request to Send | Request to Send |
| 7 | Transmit Data | Transmit Data |
| 8 | Receive Data | Receive Data |
| 9 | Clear to Send | Clear to Send |

When troubleshooting RS-232 mode, verify that the termination settings of the serial port 1 (J9) and serial port 2 (J11) on the termination panel have pins 2 and 3 jumpered.

### 11.5.2 RS-485 communications test

When troubleshooting RS-485 mode, verify the termination settings of serial port 1 (J9) and serial port 2 (J11) on the termination panel are correctly jumpered (see Table 11-8).

**Table 11-8: RS-485 Terminations**

| Serial Comm Port | 1 | 2 |
|---|---|---|
| Jumper | J9 | J11 |
| First or intermediate device | pins 2–3 | pins 2–3 |
| Last or only device | pins 1–2 | pins 1–2 |

Before testing, look on the termination panel located inside the rear end cap to verify that the wiring is correct (see Table 11-9).

**Table 11-9: RS-485 pinouts (on termination panel)**

| PIN | J8–Port 1 | J10–Port 2 |
|---|---|---|
| 1 | Power | Power |
| 2 | Ground | Ground |
| 3 | Switched Power Out | Switched Power Out |
| 4 | Operate | Operate |
| 5 | Remote Request to Send | Remote Request to Send |
| 6 | Transmit Bus (+) | Transmit Bus (+) |
| 7 | Transmit Bus (-) | Transmit Bus (-) |

| PIN | J8–Port 1 | J10–Port 2 |
|---|---|---|
| 8 | No Connection | No Connection |
| 9 | No Connection | No Connection |

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