2101510– rev. AG

NGC8206 Chromatograph

User's Manual

TOTALFLOW
MEASUREMENT & CONTROL SYSTEMS

ABB

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1.0 INTRODUCTION

This manual is written to provide an experienced chromatography technician with the requirements necessary to install, set up and operate the Totalflow® Model NGC8206 Natural Gas Chromatograph.

1.1 Chapter Descriptions

The manual provides the following information:

Chapter	Name	Description
1	System Description	Provides a description of the Totalflow NGC system components and specifications.
2	Installation	Includes unpacking and detailed procedures for setup and installation.
3	Startup	Provides the user with a tutorial on how to get a newly installed NGC system up and running.
4	Maintenance	Provides procedures on how to remove and replace major modules.
5	Troubleshooting	Provides a troubleshooting chart and procedures on how to correct most problems.

1.2 Getting Help

At Totalflow, we take pride in the on-going support we provide our customers. When purchasing a product, the user receives documentation which should answer their questions; however, Totalflow Technical Support provides an 800 number as an added source of information.

For assistance, call:

USA: (800) 442-3097 or International: 1-918-338-4880

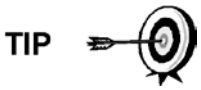
1.2.1 Before calling

- Know the Totalflow model and serial number. Serial numbers can be found on a plate located on each unit.
- Be prepared to give the customer service representative a detailed description of the problem.
- Note any alarms or messages as they appear.
- Prepare a written description of problem.
- Know the software version, board and optional part numbers.

1.3 Key Symbols

The following symbols are used frequently in the manual. These are intended to catch the user's eye and draw attention to important information.

Intended to draw attention to useful information or to clarify a statement made earlier.



Intended to draw attention to a fact that may be useful or helpful in understanding a concept.

Intended to draw your attention to information regarding security access to equipment and Software Security features.

Intended to draw attention to a statement that might keep the user from making a mistake, keep them from destroying equipment or parts, or keep them from creating a situation that could cause personal injury if caution is not used. Please refer to the "Safety Practices and Precaution" section **Getting Help**.

Intended to draw attention to a statement regarding the likelihood of personal injury or fatality that could result from improper access or techniques used while working in hazardous locations. Please refer to the "Safety Practices and Precaution" section **Getting Help**.

Indicates procedures that are only valid if system design includes an environmental enclosure.

1.4 Safety Practices and Precautions

This manual contains information and warnings which have to be followed to ensure safe operation and to retain the product in a safe condition. Installation, maintenance and repairs should only be performed by a trained and qualified technician. Refer to Certification Drawings shipped with this unit for specific guidelines. Extra copies of the certification drawings, referenced on the unit name tag, can be obtained, free of charge, by contacting Totalflow Technical Support at the number listed in the Getting Help section.

1.4.1 Safety Guidelines

- Do not open the equipment to perform any adjustments, measurements, maintenance, parts replacement or repairs until all external power supplies have been disconnected.

- Only a properly trained technician should work on any equipment with power still applied.
- When opening covers or removing parts, exercise extreme care as live parts or connections can be exposed.
- Installation and maintenance must be performed by person(s) qualified for the type and area of installation according to national and local codes.
- Capacitors in the equipment can still be charged even after the unit has been disconnected from all power supplies.

1.4.2 Safety First

Various statements in this manual, identified as conditions or practices that could result in equipment damage, personal injury or loss of life, are highlighted using the following icons:

Exercise caution while performing this task. Carelessness could result in damage to the equipment, other property and personal injury.

STOP. Do not proceed without first verifying that a hazardous condition does not exist. This task may not be undertaken until proper protection has been accomplished, or the hazardous condition has been removed. Personal injury or fatality could result. Examples of these warnings include:

- Removal of enclosure cover(s) in a hazardous location must follow guidelines stipulated in the certification drawings shipped with this unit.
- If the unit is installed or to be installed in a hazardous location, the technician must follow the guidelines stipulated in the certification drawings shipped with this unit.
- Access to a unit via a PCCU cable in a hazardous location must follow guidelines stipulated in the certification drawings shipped with this unit.
- Connecting or disconnecting equipment in a hazardous location for installation or maintenance of electric components must follow guidelines stipulated in the certification drawings shipped with this unit.

DANGER indicates a personal injury hazard immediately accessible as one reads the markings.

CAUTION indicates a personal injury hazard not immediately accessible as one reads the markings or a hazard to property, including the equipment itself.

1.4.3 Equipment Markings

Protective ground (earth) terminal.

1.4.4 Grounding the Product

If a grounding conductor is required, it should be connected to the grounding terminal before any other connections are made.

1.4.5 Operating Voltage

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

1.4.6 Danger From Loss of Ground

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 loose connection of the grounding conductor can result in a dangerous unit. Intentional interruption of the grounding conductor is not permitted.

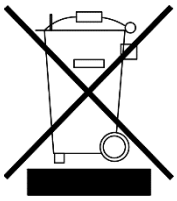
1.4.7 Safe Equipment

If it is determined that the equipment cannot be operated safety, it should be taken out of operation and secured against unintentional usage.

1.5 Compliance

EU Directive 2012/19/EU - Waste Electrical and Electronic Equipment (WEEE)

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.

2.0 SYSTEM DESCRIPTION

2.1 System Overview

This section introduces the Totalflow® Model NGC8206 Series Natural Gas Chromatograph (NGC). The NGC is designed to continually analyze natural gas streams, on-site, determine composition, calorific value and store the analysis information. It is designed for natural gas streams, 800 to 1500 Btu/scf (29.8 to 55.9 Mega joules/meter^3) with less than 100 PPM H2S.

The unit is a fully functional gas chromatograph for pipeline quality natural gas and is designed to analyze natural gas streams dry of both hydrocarbon liquids and water. The unit can collect and retain analysis information for one to four independent sample streams. Applicable installations include: Transmission, Distribution, Custody Transfer with Metrology quality results, Production, Gas Gathering and End User Gas Markets.

2.1.1 Framework

Based on ABB Totalflow XSeries technology, the NGC features a common platform that combines the expandable framework of the XSeries equipment with the capabilities of a remote gas chromatograph. This expandability allows the NGC to run other applications such as AGA-3 and AGA-7, while simultaneously doing stream analysis. This new platform is designed for operation on Windows CE Real Time Operating System.

2.1.2 Calibration

Once installed on the meter run, the unit can immediately calculate the calorific value of natural gas. The user can utilize their own calibration blend to adjust the unit to their company's standards or take advantage of various automatic operational features by using the recommended calibration gas.

2.1.3 Typical Installation

This compact unit requires minimal installation time and is fully configured and calibrated at the factory. A typical single stream pipeline installation includes a sample probe, optional sample conditioning module, carrier and calibration gas (see **Figure 2-1**). A multiple stream pipeline installation includes an installation where sample probes may be connected to the NGC (see **Figure 2-2**).

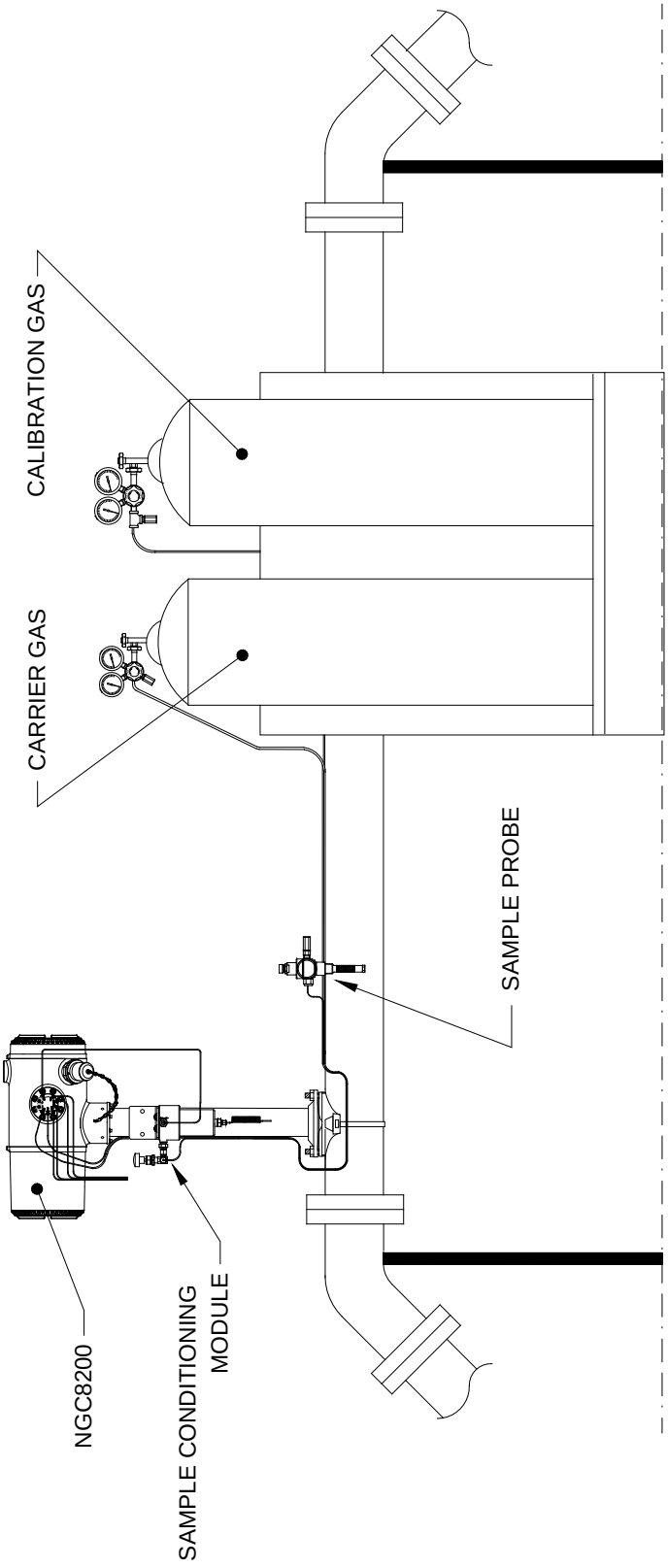
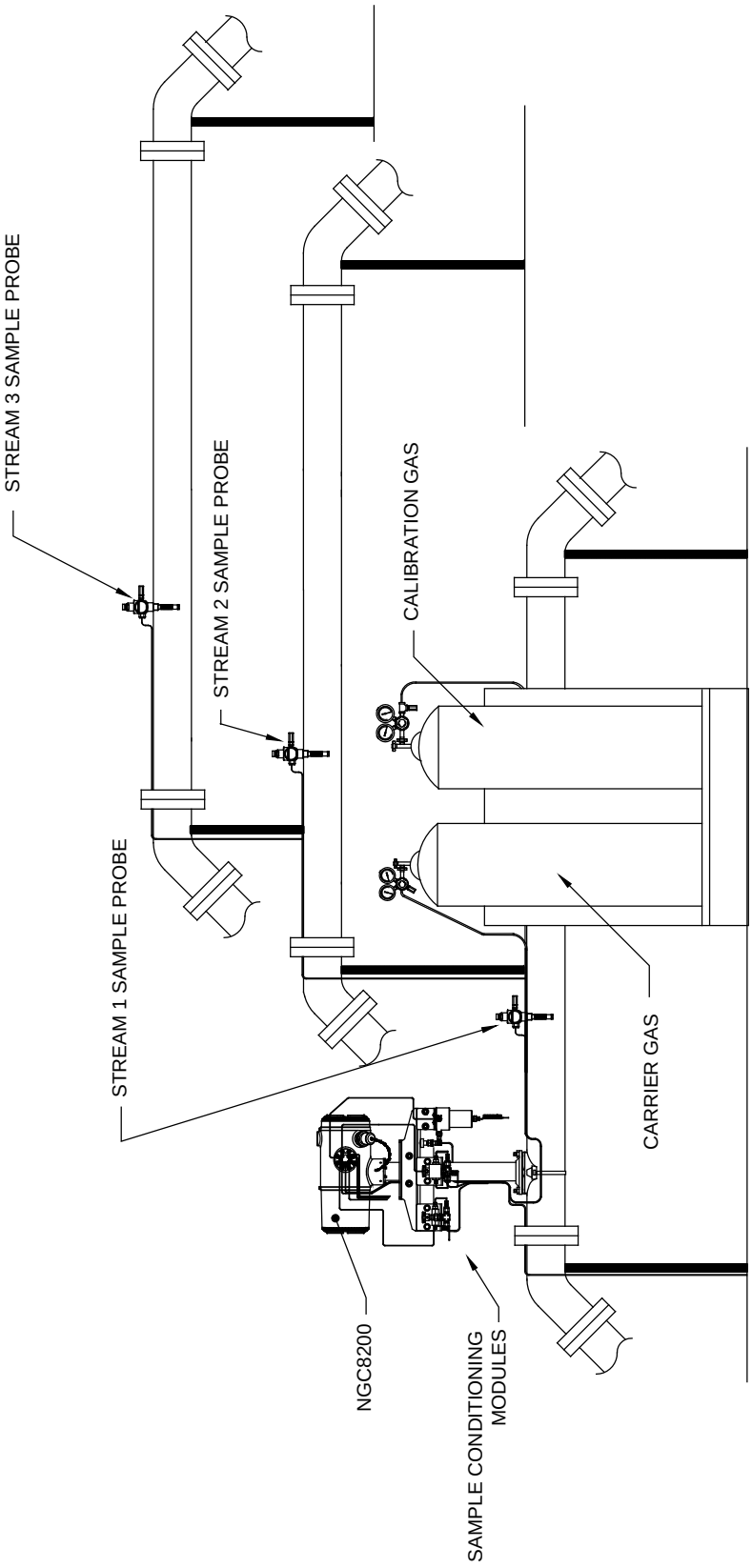


Figure 2-1 Typical Single Stream Installation



TIP For clarity, unit is shown mounted on outside meter run. For sample line length consideration, the unit should be mounted on middle pipe run.

Figure 2-2 Typical Multi-Stream Installation

2.2 Processing a Sample

A natural gas sample is extracted from the pipeline, processed for particulate removal and phase integrity by the sample conditioning module (optional as required), transported to the NGC and injected onto the chromatographic columns where component separation occurs.

The NGC analyzes each sample, utilizing established chromatographic techniques. The resulting information consists of mole percent values for each 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).

The processed sample is then vented with the carrier gas and results are stored in memory and communicated to other devices, as needed. All of these values, as well as composition, are available on various Modbus communication protocols.

2.2.1 Hydrocarbons

To further define the natural gas components, **Table 2–1** gives additional details for each hydrocarbon. Among the key information is the boiling point of the component. The boiling point of each component correlates to the order each component will exit the column.

Table 2–1 Hydrocarbons

Molecular Formula	Common Abbreviation	Component	Boiling Point
C1H4	C1	Methane	-161.60
C2H4	C2=	Ethylene	-103.75
C2H6	C2	Ethane	-88.65
C3H6	C3=	Propylene	-47.65
C3H8	C3	Propane	-42.05
C4H10	IC4	Isobutane	-11.65
C4H8	C4=	Butylene	-6.95
C4H10	C4	Butane	-.45
C5H12	NeoC5	Neopentane	9.85
C5H12	IC5	Isopentane	27.85
C5H12	C5	Pentane	34.85
C6H14	C6	Hexane	68.85
C7H16	C7	Heptane	97.85
C8H18	C8	Octane	125.55
C9H20	C9	Nonane	150.95
C10H22	C10	Decane	173.95

2.3 Hardware System Specifications

Table 2–2 System 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	14.5V	14.5V	25V	25V
Maximum Instantaneous Current[1]	4 Amp	8.2 Amp	2.2 Amp	5.2 Amp
Avg. Power Consumption After Startup[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° to 60°C)	
	Normal Operation		0°F to +131°F (-18°C to 55°C)	
	With environmental enclosure		-40°F to +131°F (-40° to 55°C)	
Repeatability	6 0.125 Btu at 1,000 Btu (60.0125%) ambient; 60.25 Btu at 1,000 Btu (60.025%) over temp. range of 0–131°F (-18° 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) Aluminum Alloy with white polyester powder coating. 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.			
8206 Dimension		**Width**	**Height**	**Depth**	**Weight**
	US	9.5“	8.82“	15.64“	29 lbs.
	Metric	241.3 mm	224.0 mm	397.3 mm	10.8 kg

[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).

2.3.1 NGC8206 Standard Hardware Features

The Totalflow® NGC (Natural Gas Chromatograph) features a rugged, field ready design. Installation, startup and troubleshooting times have been greatly reduced due to these user-friendly hardware features:

- Enclosure – compact design
  - Cast aluminum housing with six exterior hubs
  - Powder coating
  - Weatherproof construction
- Modular design (See **Figure 2-3**)
  - Digital controller assembly
  - Analytical module with compact design and single bolt replacement
  - Feed-through assembly with flame path arrestors
  - Termination panel
- State-of-the-art 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

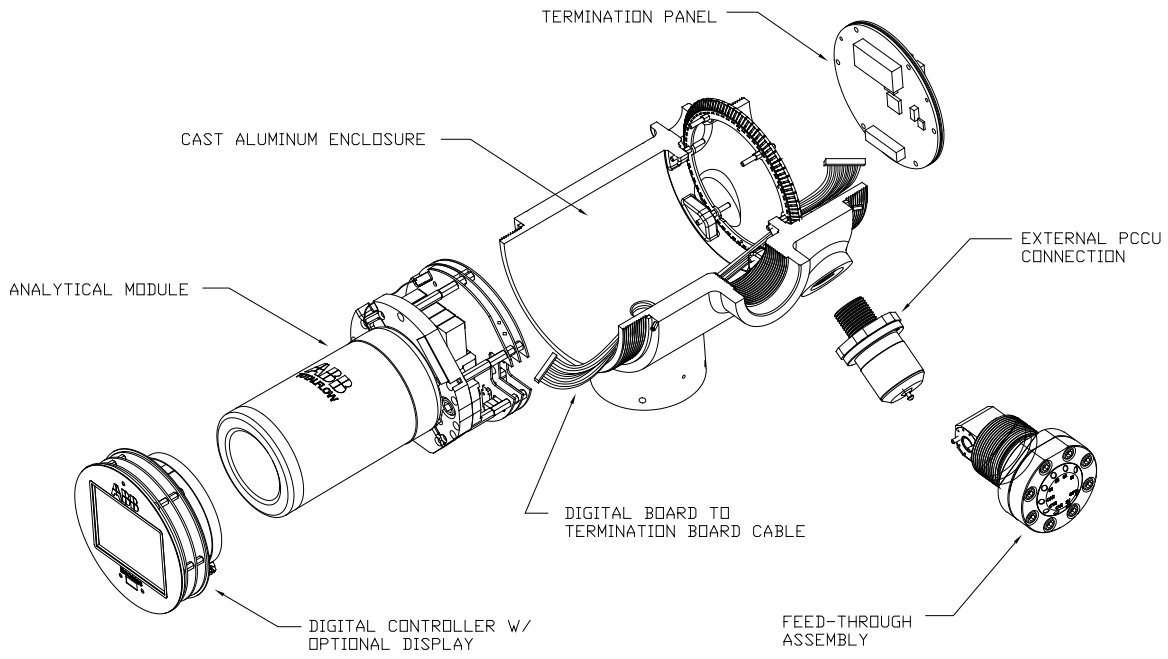


Figure 2-3 Modular Design NGC8206

2.3.2 Recommended Spare Parts

Totalflow has provided a recommended spare parts list for the NGC8206 product line. Consideration was given to the cost of the repair time and the cost of stocking repair parts. The NGC8206 modular design is uniquely suited to quick repair times. All the modules are easily replaced in a short time. A more comprehensive discussion of recommended spare parts can be found in **Maintenance**.

2.3.3 Cast Aluminum Enclosure

The custom-designed, 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 2-4** through **Figure 2-7** shows the outline dimensions of the NGC.

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

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 unit may be directionally positioned using 1/8” hex socket set screws located in the neck of the enclosure.

2.3.3.1 Exterior Hubs

The unit enclosure features six exterior hubs:

- Gas feed-through assembly
- Explosion-proof local MMI port
- Four miscellaneous hubs, including:
  - Communication hub
  - Power hub
  - Digital input/output wire hub
  - Undefined hub

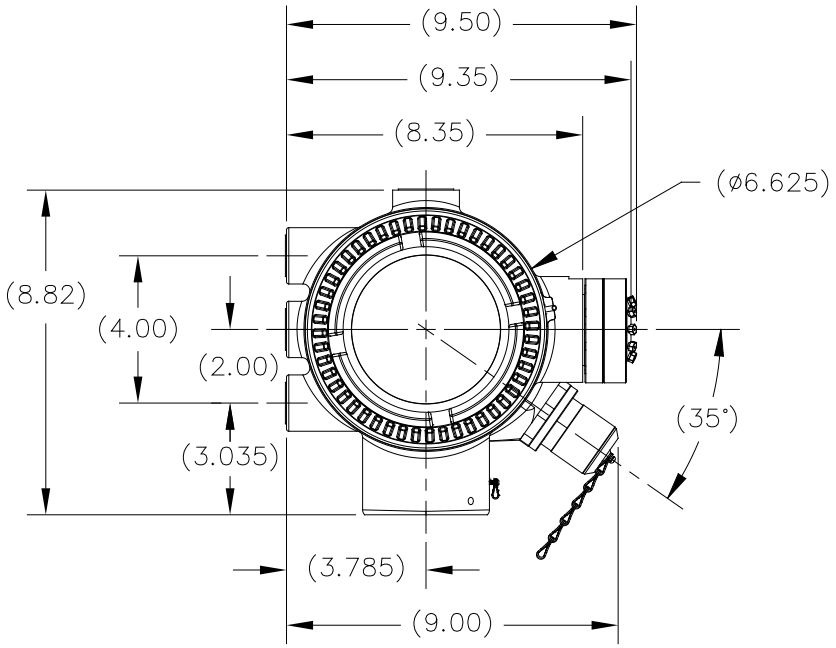


Figure 2-4 NGC8206 Enclosure

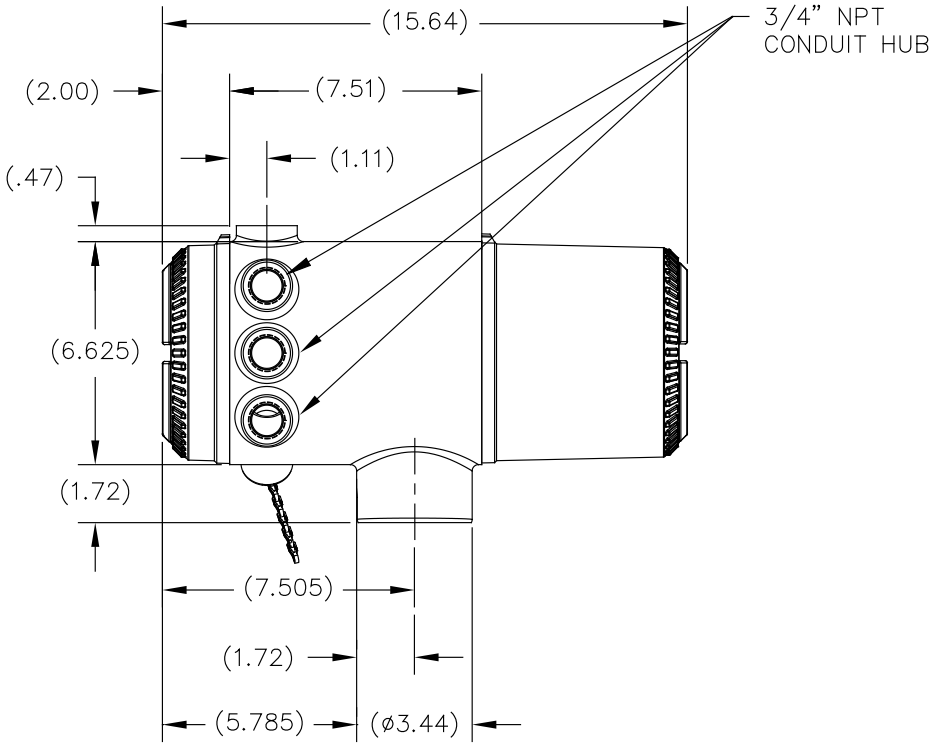


Figure 2-5 NGC8206 Enclosure Left Side

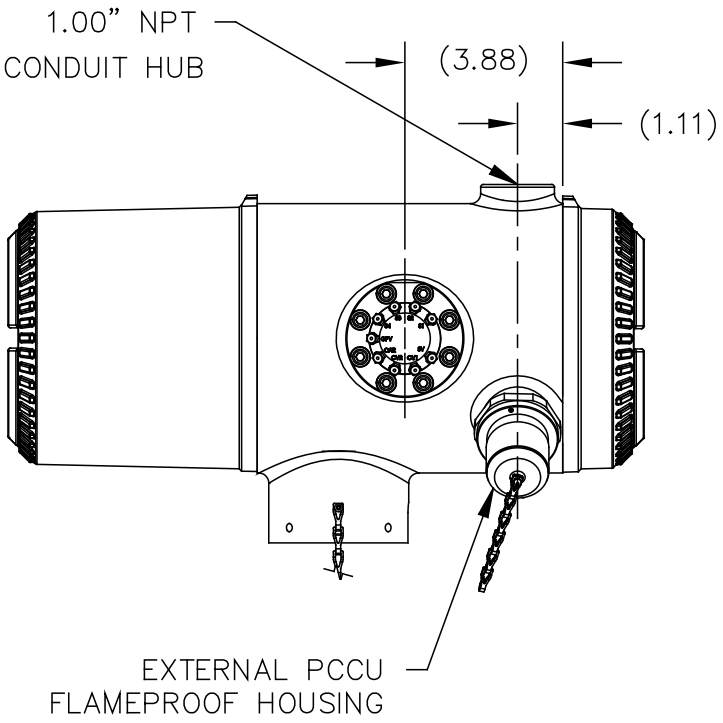


Figure 2-6 NGC8206 Enclosure Right Side

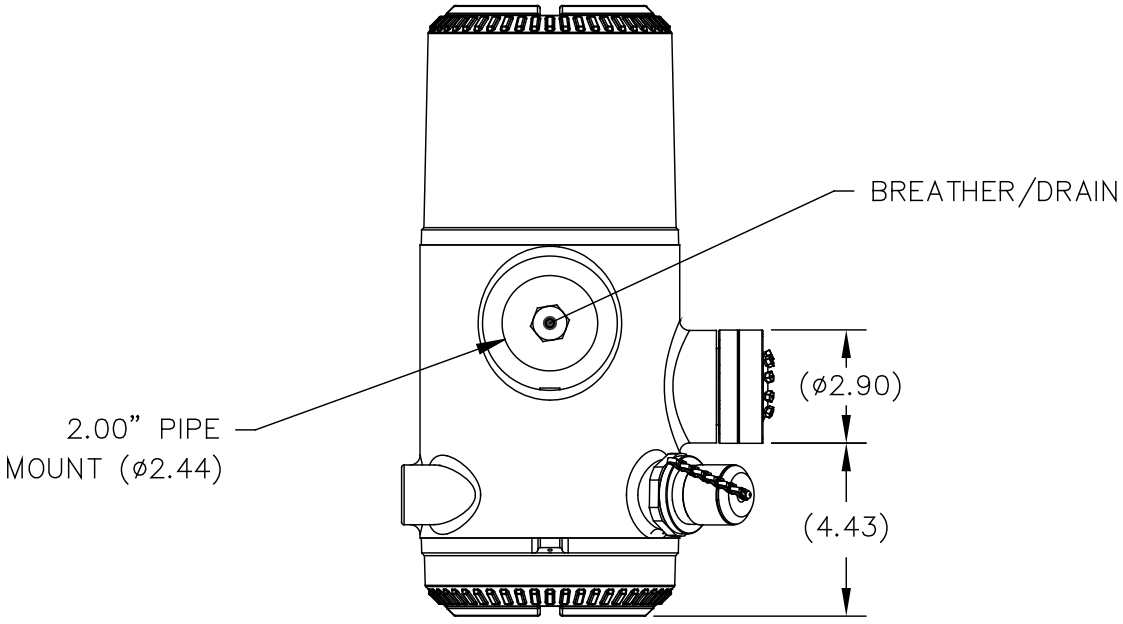


Figure 2-7 NGC8206 Enclosure Underside

2.3.4 Feed-through Assembly

Independent sample streams are connected to the NGC directly to the feed-through assembly (see **Figure 2-8)**, or through an optionally installed sample conditioning module. The feed-through assembly also serves as the connection

for carrier gas and calibration streams, and contains the vents for sample and column gases. The feed-through assembly comes in three configurations:

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

Assemblies with the auxiliary heater feature a heater with a temperature sensor cable which makes connection to the analytical module and is replaceable. Note that this cable comes in two configurations: 12 VDC and 24 VDC.

2.3.4.1 Inlets

All inlets have an internal, replaceable, 0.5 micron filters. Available inlets are:

- 1–4 sample stream inputs, calibration blend streams
- 1–3 sample streams with 1 dedicated auto cal stream, or
- 1–2 sample streams with 1–2 dedicated auto cal streams, or
- 1–4 sample streams with 1–2 manual calibration streams
- 1 carrier input stream

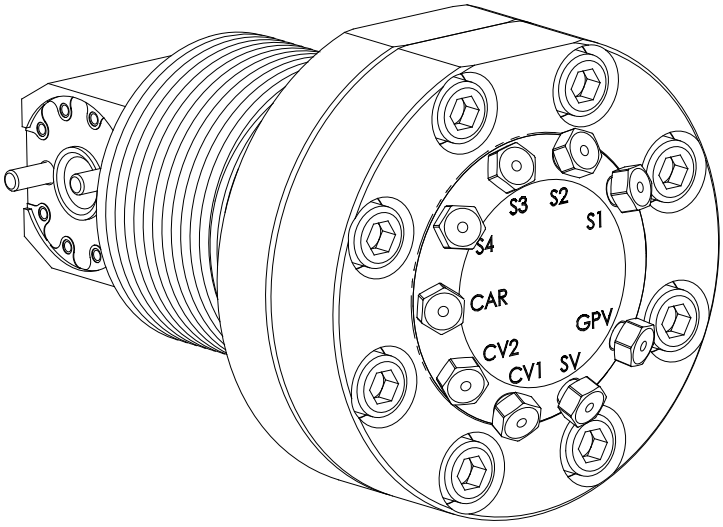


Figure 2-8 NGC Feed-through Assembly (2102026-xxx)

CAUTION The 0.5 micron Filters should not be considered as a replacement for the primary filtering system. Optional sample conditioning modules are designed for this purpose.

2.3.4.2 Vents

Feed-through assembly vents do not have filters, but require vent tubing to be attached and routed accordingly. These are:

- 2 column vents (CV1 and CV2)
- 1 sample vent (S1, S2, S3 and S4)
- 1 gauge port vent (GPV)

2.3.5 Analytical Module

The modular design of the analytical module is enhanced by the single bolt removal feature. This assembly is comprised of the manifold and analytical processor. These parts are not field-replaceable. The GC module is an important part of the analytical module, but is field-replaceable.

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

Of the subassemblies that comprise the analytical module, GC module and manifold assembly come in two configurations: 12 VDC and 24 VDC.

Figure 2-9 shows the analytical module assembly removed from the enclosure.

2.3.5.1 Features

- High-speed serial interface to digital controller board
- 32-bit digital signal processor
- Flash memory
- Analog to digital conversion circuits
- Digital oven temperature controller
- Digital auxiliary heater controller (optional feed-through heater)
- Dual digital pressure regulators
- Sample pressure sensor
- Pressure sensors (100 PSI max.)
- Thermal conductivity detectors
- System level voltage monitoring
- Analytical processor board level temperature sensor
- LED board status indicators

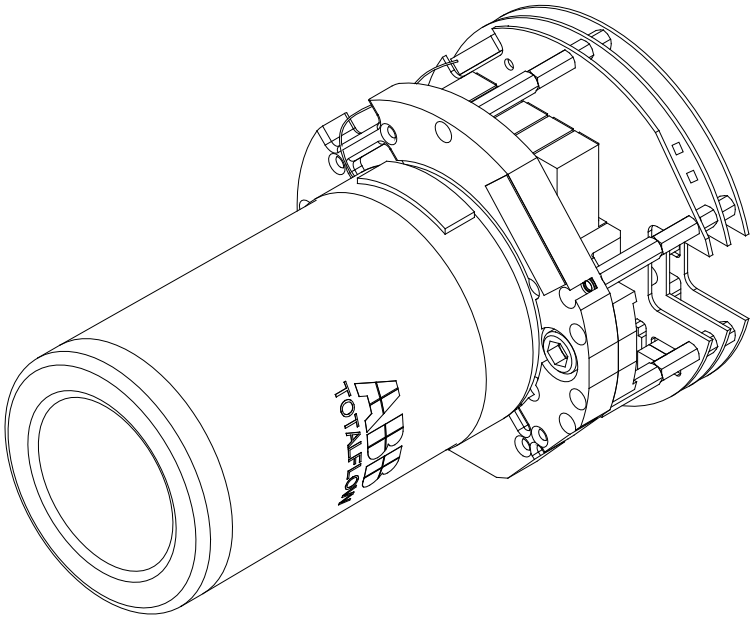


Figure 2-9 Analytical Module

2.3.5.2 Manifold Assembly

The manifold 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 valve controls the stream processing, carrier and calibrations gases. The cables complete the information chain from the GC module to the analytical processor and the digital controller assembly.

Figure 2-10 shows the manifold assembly. This is not a field-replaceable part.

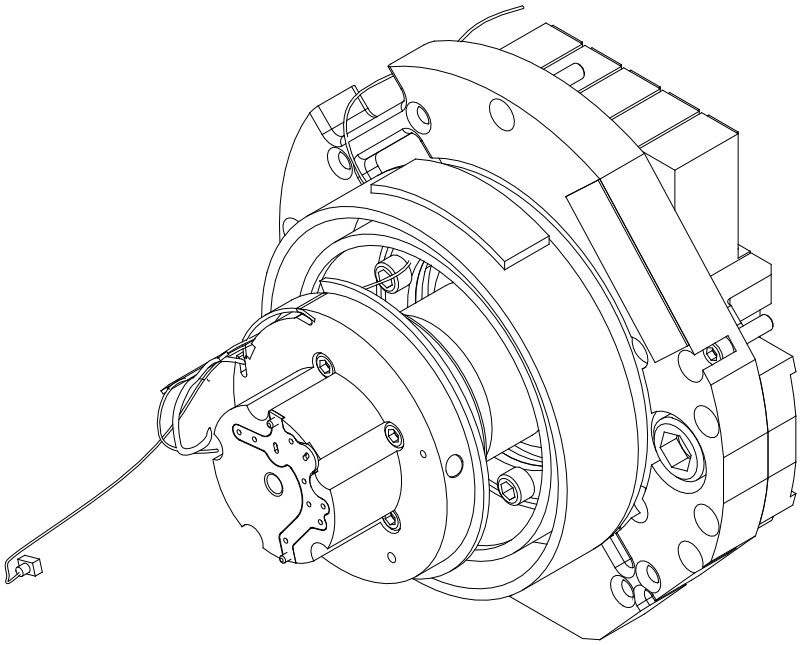


Figure 2-10 Manifold Assembly

2.3.5.3 Analytical Processor Assembly

The analytical processor board provides real-time system control and measurement of the analytical processes within the NGC. It does this by interfacing with all of 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 also has two status LEDs used for troubleshooting. The red LED indicates that the board is powered on. If the board is remotely 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 booted its program successfully and is controlling its processes as directed by the digital controller. This LED should be flashing at a high speed (between 20-40Hz). If this LED is off or is on solid with no flashing, then the software in the analytical processor is not running properly.

Figure 2-11 shows the analytical processor assembly. This is not a field-replaceable part.

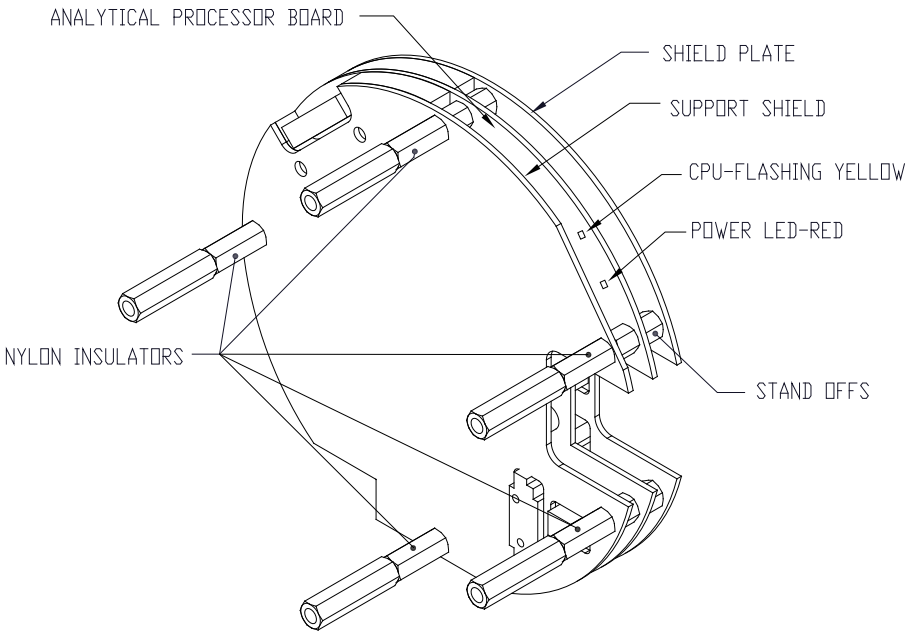


Figure 2-11 Analytical Processor Assembly

2.3.5.4 GC Module

The GC module is comprised of three parts: 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 is by single bolt removal.

Figure 2-12 shows the GC module with the oven wall removed.

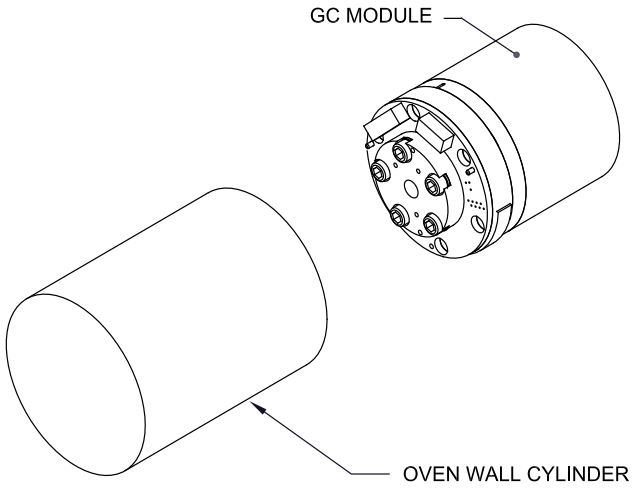


Figure 2-12 GC Module Assembly

2.3.6 Digital Controller Assembly with VGA Display

This assembly (see **Figure 2-13**) contains the digital electronic board, mounting assembly and a VGA display.

The digital controller board 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), Lithium Battery backed
- 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)

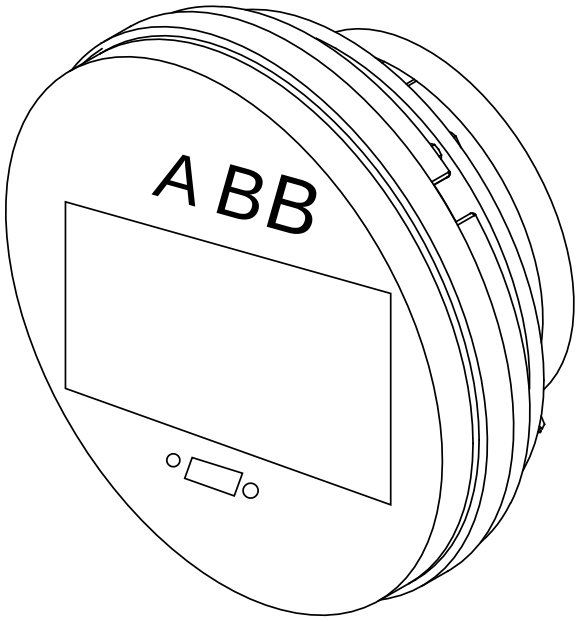


Figure 2-13 Digital Controller Assembly with Display

The display board provides a ¼ panel, 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). Available screens and user-defined screens may be navigated using the display magnet.

The VGA display features:

- ¼ panel VGA display circuit board.
- 2 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 unit is not in auto run mode.
- User interface, with hall-effect magnet navigation, for monitoring NGC8200 operation.

Figure 2-14 shows the flow of information accessible through the display.

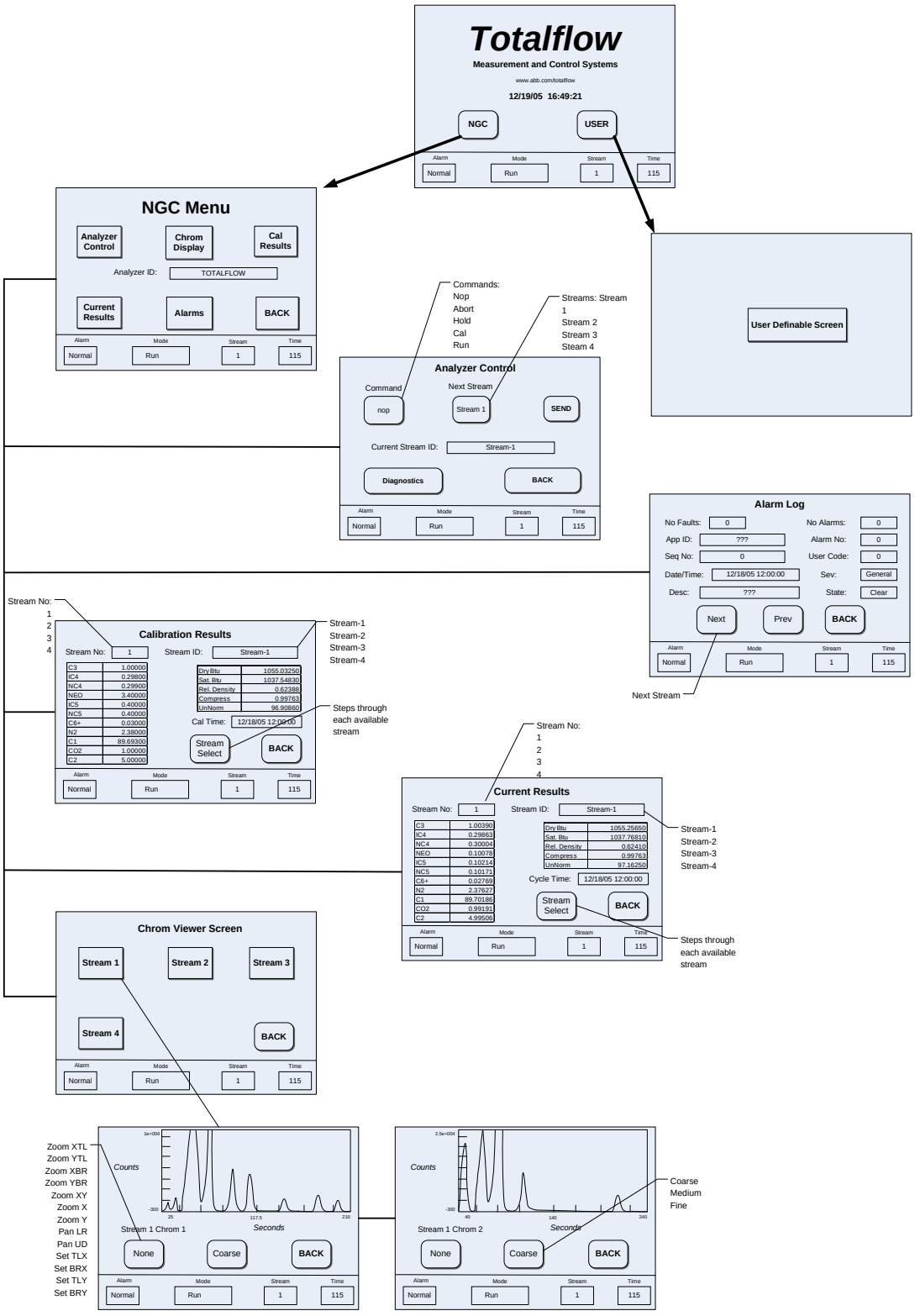


Figure 2-14 NGC VGA Display Screen

2.3.7 Termination Panel

The NGC8206 termination panel acts as a connection to the outside world (see **Figure 2-15**). It features transient protection, a voltage regulator for digital controller, positive temperature co-efficient fuses (PTC) and many other safeguards to protect the remainder of the system from electrical damage. All outside communications and I/O are channeled through this board. It is designed to be a low cost, field-replaceable maintenance solution and is designed to operate on either 12 VDC or 24 VDC.

2.3.7.1 Features

- Transient protection
- EMI/RFI protection
- PTC fuses
- Voltage regulator for digital controller
- Dedicated local serial data interface (up to 115200 bps)
- 2 LED status indicators (software programmable)
- 1 Power monitor status indicator
- 1 5 VDC LED status indicator
- 2 DIs and 2 DOs connected to digital controller
- 2 remote serial ports (RS232/RS422/RS485 software selectable)
- Optional Ethernet interface with 3 LED status indicators
- Optional USB host and client interface

2.3.7.2 Local Interface

This local PC interface requires PCCU32 version 6.0 or higher, a laptop PC and a MMI cable, either USB or serial RS-232. The software operates within the full range of Windows® 95, 98, 2000, NT and XP utilities. Maintenance functions can be performed by personnel with little or no knowledge of gas chromatography; see the online Help files for more information.

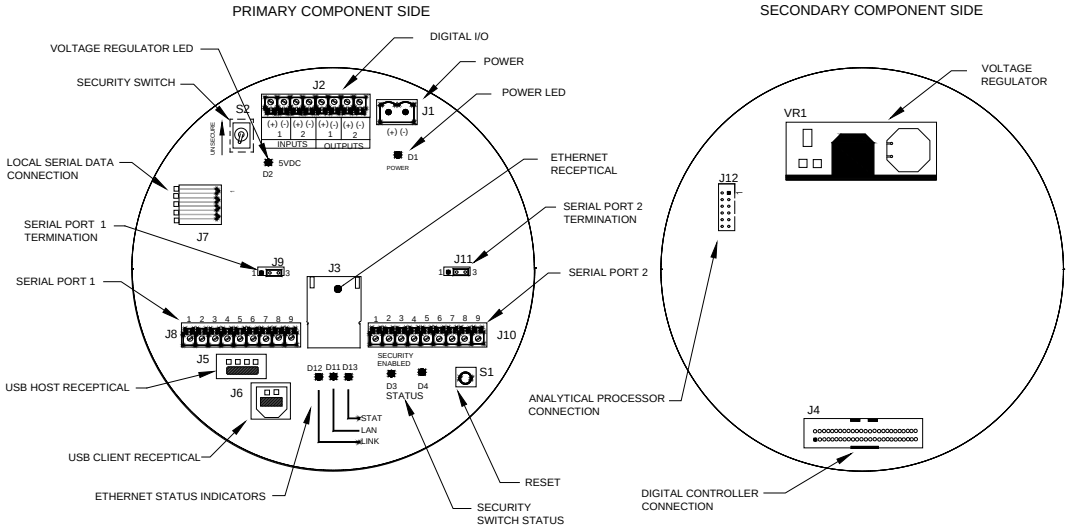


Figure 2-15 Termination Panel

2.4 Grounding the NGC

The NGC8206 must be properly grounded. The NGC 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 NGC8206 cannot be connected to any pipeline where cathodic protection exists. If the system uses cathodic protection, the NGC must be mounted on a section of pipe that has been electrically isolated from the cathodic currents (see **Figure 2-16**).

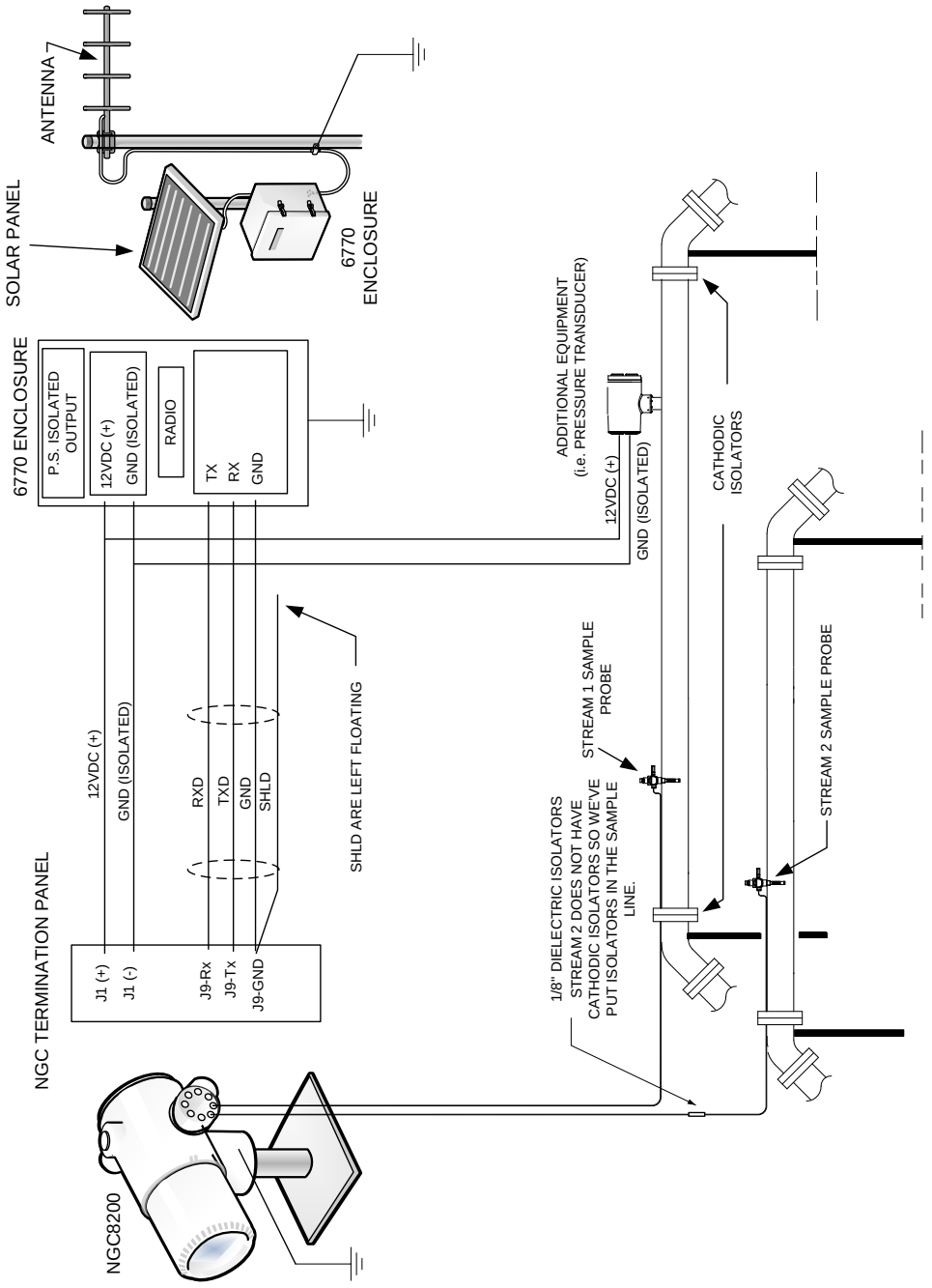


Figure 2-16 NGC Grounding Considerations

2.4.1 Power Supply

The power supply for the NGC should have an isolated output (the negative side of the 12 VDC output should not be electrically connected to chassis or earth ground). In many instances, the power supply is in conjunction with a radio. If the radio is connected to the NGC8206 via RS232/485/422, the communications should share the power ground. The communication shield should only be connected at the NGC end. The other end should be left to float (left unconnected).

2.4.2 Sample Probe

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 NGC. Any time that the sample probe is on a section of pipe other than the one where the NGC is directly mounted, tubing isolators should be employed. It is very important that probe ground and the NGC ground be at the same potential. If this cannot be insured, tubing isolators must be used.

2.4.3 Other Considerations

If other devices are to be powered from the same isolated power supply that is powering the NGC, be careful to avoid any ground loops. The various devices should be connected in a star configuration. It is also important that any additional powered devices be able to handle a fairly wide range of input voltages, as the NGC's heater will draw about 4 amps (if the auxiliary heater is installed, it might be as much as 8 amps). This load (4-8 amps) being drawn across any considerable length of cable can result in a substantial voltage drop (refer to **Table 2–4 12 VDC Battery Power Supply System Maximum Cable Lengths**). The resulting lower input voltage to the additional device could affect its operation. Input voltage excursions fluctuate with the toggling of the NGC's heater(s). The heater(s) are turning on and off in an effort to maintain a very constant internal temperature for the NGC's GC module.

In an office environment, insure that a good earth ground is established to the NGC8206. In an office situation, it is easy to not have the NGC well grounded. Often the third pin (ground) on the power cable is missing or has been removed. Improper grounding can lead to erratic behavior. Be sure that the unit is properly grounded. If the unit 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.

2.5 Calibration/Validation Stream

On the NGC feed-through assembly, one or two of the sample streams may be used for a calibration gas input. It is recommend that a metal diaphragm regulator is set to 15 ± 2 psig input. The recommended calibration gas component concentrations for use with Auto Peak Find may be found in **Table 2–3**.

Table 2–3 Calibration Gas Blend Recommended Components

Component Name	Abbreviation	Mol %	Component Name	Abbreviation	Mol %
Nitrogen	N_2	2.500	Normal Butane	NC_4	0.300
Methane	C_1	89.570	Neo Pentane	Neo C_5	0.100
Carbon Dioxide	CO_2	1.000	Iso Pentane	IC_5	0.100
Ethane	C_2	5.000	Normal Pentane	NC_5	0.100

Component Name	Abbreviation	Mol %	Component Name	Abbreviation	Mol %
Propane	C_3	1.000	Hexanes and Heavier	C_6+	0.030
Iso Butane	IC_4	0.300			

2.6 Operating Voltages and Cable Lengths

The NGC 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 size is a function of the distance between the NGC and the DC power supply. When running wiring from the power source to the NGC, consideration must be given to the voltage dropped between the power source and the NGC. Smaller wire gauges have greater resistance and, therefore, a greater voltage drop across the wiring. The following tables (see **Table 2–4** and **Table 2–5**) document multiple cable sizes and corresponding maximum cable lengths for DC and AC installations with and without the auxiliary feed-through assembly heater.

Additional devices connected to the NGC and requiring power (XMVs, radios, etc.) must be factored into this calculation. Refer to their technical specifications for the requirements of each, or call Totalflow for help computing cable requirements for additional loads.

FYI 

For non-standard applications or other questions, call Totalflow Customer Service at:

USA: (800) 442-3097 or International: 1-918-338-4880

Table 2–4 12 VDC Battery Power Supply System Maximum Cable Lengths

Model /Option	Min. Batt Voltage (V)	Units	10 AWG[1]	12 AWG	14 AWG	16 AWG	6 mm^2 [1]	4 mm^2 [1]	2.5 mm^2	1.5 mm^2
12 VDC NGC 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 NGC 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

Table 2–5 AC Power Supply System Maximum Cable Lengths

(No External Devices connected to NGC, AC Power Supply Only)

Model /Option	Recommended PS Voltage (V)	Units	10 AWG [1]	12 AWG	14 AWG	16 AWG	6 mm^2 [1]	4 mm^2 [1]	2.5 mm^2	1.5 mm^2
12 VDC NGC w/o Feed-through heater	14.50	(ft)	469.67	296.64	185.81	116.61	540.20	361.03	224.55	137.54
		(m)	143.16	90.41	56.63	35.54	164.65	110.04	68.44	41.92
12 VDC NGC with Feed-through heater	14.50	(ft)	232.43	146.80	91.95	57.71	267.33	178.66	111.12	68.06
		(m)	70.84	44.74	28.03	17.59	81.48	54.46	33.87	20.75
24 VDC NGC w/o Feed-through heater	25.00	(ft)	809.52	511.27	320.25	200.98	931.07	622.26	387.02	237.06
		(m)	246.74	155.84	97.61	61.26	283.79	189.67	117.96	72.26
24 VDC NGC with Feed-through heater	25.00	(ft)	336.97	212.83	133.31	83.66	387.57	259.03	161.10	98.68
		(m)	102.71	64.87	40.63	25.50	118.13	78.95	49.10	30.08

[1] This wire size may require splicing in 12AWG or 2.5mm^2 or smaller wires at each end of the cable to be able to fit screw terminals.

2.7 Sample Transport Tubing Design

Information in this section enables the user to design the sample transport tubing connected between the TCR sample probe and the installed NGC. 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.

2.7.1 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.

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 insure that no particles are allowed to remain in the tubing.

2.7.2 Calculation

Sample transport lag time estimated calculations do not consider the volume of the sample conditioning system. However, the following equation can be used as a quick method to estimate lag time because normal transport tubing volume is much greater than sample conditioning system tubing volume.

$$\text{Lag Time} = \frac{(\text{Volume}[\text{cc}] \text{ per Foot of Tubing}) \times (\text{Feet of Tubing})}{\text{Actual Sample Flow Rate (cc/min.)}}$$

For a detailed method of calculating lag time, see the next sub section, **Calculating Lag Time**.

2.7.3 Analysis Time

If analysis results are used for process control or custody transfer, it is important to minimize the amount of time that the sample spends in transit from the TCR sample probe to the NGC. To arrive at the total cycle time between representative samples, sample transit time must be added to NGC cycle time.

2.7.4 Transit Volume

The total volume of sample gas in transit is calculated by multiplying volume per foot of sample transport tubing by total length of tubing. To assist in making these calculations, refer to **Table 2–6** for internal volume of commonly used sample transport tubing.

Table 2–6 Internal Volume of Commonly Used Sample Transport Tubing

Tube Outside Diameter (in.)	Tube Wall Thickness (in.)	Volume per Foot (cc)
1/8	0.02	1
1/4	0.035	5
3/8	0.035	15
1/2	0.035	25

2.7.5 Gas Volume in Transit Tubing

Gases are compressible, and the volume of gas in transport tubing for standard conditions (atmospheric pressure and 70°F [21.1°C]), is a function of gas pressure and temperature within tubing.

Ideal gas equation: $PV = nRT$

Where:

P = Pressure V = Volume
T = Temperature R = Universal Gas Constant
n = Number of moles in sample transport tubing.

"n" is used to calculate number of moles of gas sample contained in a certain volume of sample transport tubing.

2.7.6 Mole

Mole is a fundamental unit that describes the number of chemical molecules. One mole always represents one Avogadro's number 6.02 x 1023 of molecules. Number of moles can be determined by the calculation formula: n = PV/RT.

Because sample and transport tubing volume and temperature are usually constant, the number of sample moles in transit is a function of pressure in sample transport tubing. Reducing gas sample pressure reduces the mass of gas in sample transport tubing. This is referred to as line peak. Once transport volume is known for standard conditions, transport lag time can be determined.

2.7.7 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 from occurring, heat trace transport tubing uses electrical power, stream or hot glycol. This prevents components from condensing on transport tubing walls and prevents any water within the tubing from freezing and blocking sample flow.

2.7.8 Heat Tracing Sample Lines

If there is a possibility that vapor samples could condense in the sample transport line, heat tracing the sample line should be considered. This could occur at ambient temperatures or when a liquid has to be kept warm for transporting or to keep it from freezing (see Figure 2-17).

To determine heat tracing temperature, a dew point calculation can be performed based on the worst-case sample composition and transport pressure.

WARNING

Heat tracing should conform to requirements of national and local codes.

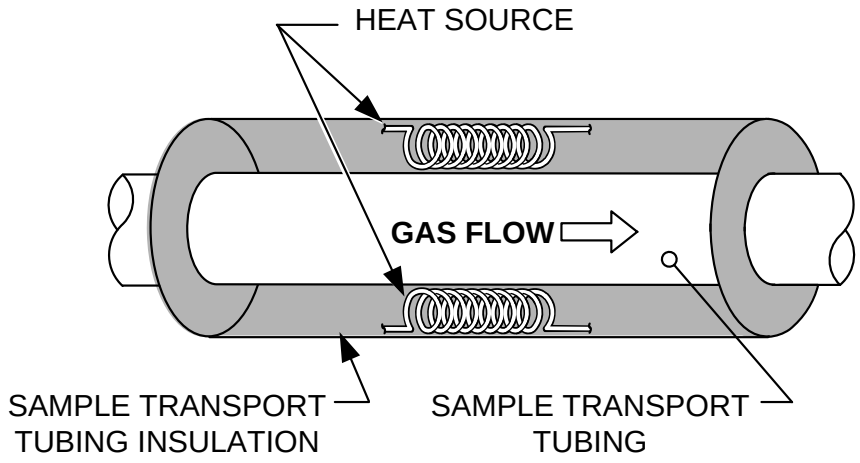


Figure 2-17 Heat Tracing Sample Line

2.7.9 Tube Corrosion

When designing transport tubing, consider the affect that corrosion has on tubing. For hydrocarbon service, stainless steel transport tubing type 316SS is recommended.

For selection of transport tubing for different types of service, refer to reference information applicable to material applications for corrosive environments.

2.7.10 Tube Preparation

In the course of installing (cutting and fitting) the tubing at an installation, it is important to dress the ends of any cut tubing and to insure that in the cutting and deburring process no particles are allowed to remain in the tubing.

2.8 Calculating Lag Time

The following calculations assume that all pressure drops occur across the valves HV-1, HV-2 and HV-6 and that the Rotameters RM-1, RM-2 and RM-3 are measuring flow at atmospheric pressure (see Figure 2-18).

FYI

Figure 2-18 is for reference purposes only but, it is typical of a sample conditioning module with liquid separator and liquid shutoff. It is included for reference only. Refer to the documentation provided with the unit.

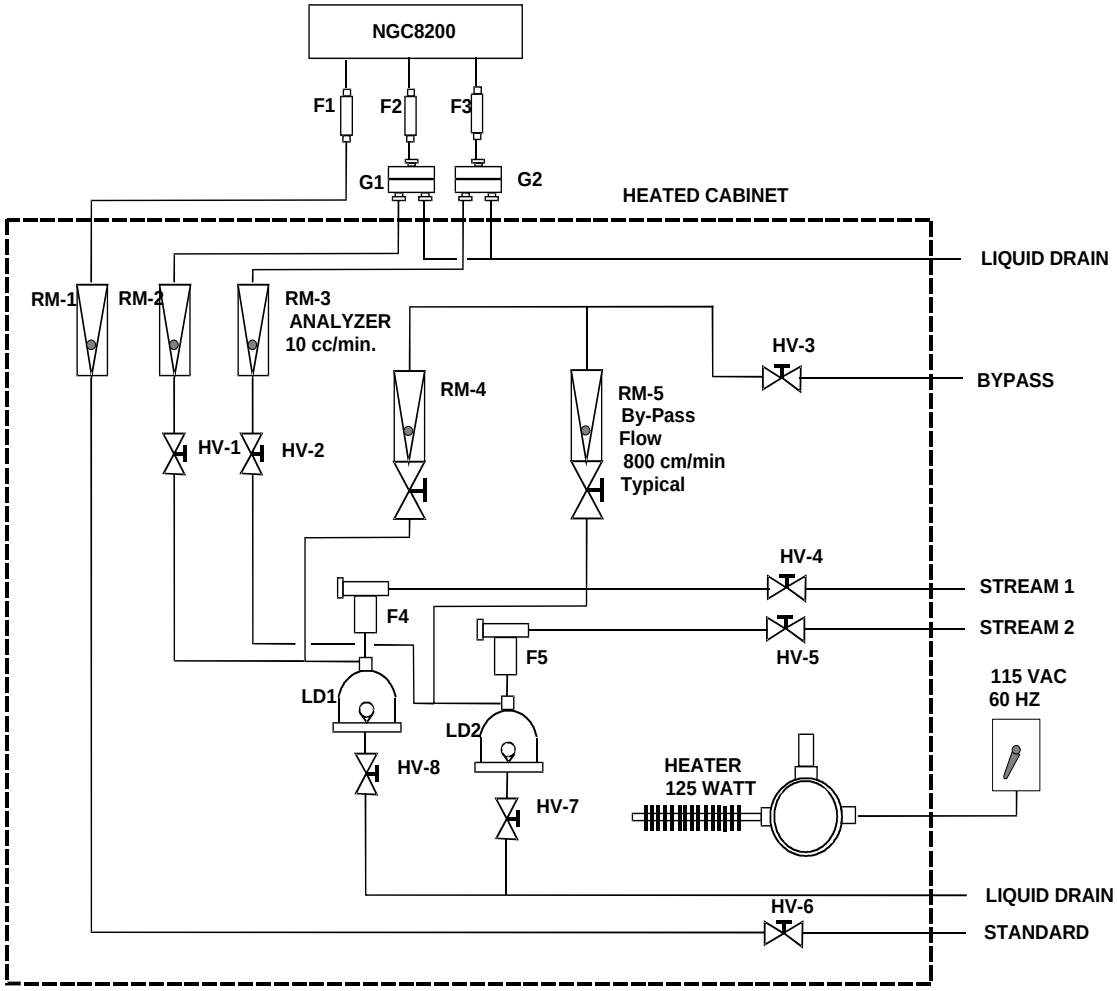


Figure 2-18 Typical Sample Installation Diagram

2.8.1 Calculations

Lag time calculation qualifying factors:

- The sample for calculation contains mostly methane gas that flows through 100 feet of ¼-inch stainless steel tubing with a wall thickness of 0.020-inch. Sample temperature is 80 °F (26.7 °C) and pressure is 15 psig (29.7 psia). Bypass rotameter in the sample conditioning system reads 50% of full scale and is calibrated with air to 1180 cc/min at full scale. Air density is 0.075 lbs/cu.ft.
- To compute transport tubing lag time, perform the calculation below.

2.8.2 Calculating Using Actual Pressure

Calculating lag time using actual pressure:

$$t = \frac{VL}{F_s}\left[\frac{P+15}{15}\right]\times\left[\frac{530}{T+460}\right]\times\left[\frac{1}{Z_p}\right]$$

Where:

T	= Purge Time	L	= Line Length, ft.
V	= Tubing Volume, cc/ft.	Fs	= Standard Flow, cc/min.
P	= Actual Pressure, PSIG	T	= Actual Temperature, °F
Zp	= Compressibility at P Pressure		

TIP 

In this step, the lowest possible pressure should be used. This minimizes transport tubing lag time to reduce line or molecule peak. Care should be taken to assure that enough pressure is available to keep sample flowing throughout the analysis system.

2.9 NGC8206 Standard Software Features

Totalflow's on-board and host software work together to provide many key features that enable the user to access, control and share data. The user-friendly interface allows multi-faceted report and communication capabilities without compromising the integrity of the system or the data.

- Modular Software Design-Application Based Plug-In Software Modules
- Audit Quality Historical Data
- Operational Alarms
- Tri-Level Software Security System
- Multiple Calculation Options
- Selectable Engineering Units (future)
- Analysis Reporting
- Communication Protocol Selection
- Web Enabled Data Collection

2.9.1 Audit Quality Data

Totalflow's software design creates a historically accurate file system that uses date and time stamped events to create an audit quality data structure.

The unit 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. Additionally, this can be reconfigured by the user.

2.9.2 Tri-Level Security

The software security system is designed to have a password administrator who sets up the accounts and privileges PCCU users. This privilege includes being able to instantiate applications and make changes to the functionality of the NGC. See the Help files in the host software package for more information.

2.9.3 Compressibility Options

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

- AGA-5
- AGA-8 Detail
- ISO Summation Factor
- Single Virial Summation Factor
- None (a factor of one is used)
- NX-19

2.9.4 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 (see **Table 2–7**). For additional information, refer to the PCCU Help files.

Table 2–7 Calculation File Settings

Calculation File	Agency	Document	Temp1	Temp2	Comp.	Constants
gost-30319-aga8	GOST	30319	20		AGA8	
gpa-2172-96-aga8-2145-03A-fts	GPA	2172-1996			AGA8	2145-03A
iso-6976-1995-15-15	ISO	6976-1995	15	15	ISO Sum Factor	
iso-6976-1995-15	ISO	6976-1995	15		None	
iso-6976-1995-20-20	ISO	6976-1995	20	20	ISO Sum Factor	
iso-6976-1995-20	ISO	6976-1995	20		None	

2.9.5 Engineering Units

User-selectable engineering units may be defined individually per measurement stream. These include most metric system units as well as standard 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, see the host software Help files.

2.9.6 Supported Protocols

The NGC hardware and software support several communication protocols:

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

2.10 PCCU Local Communication Options

Local communication with the NGC requires the use of PCCU32 software running on a PC and an MMI (man machine interface) cable. Totalflow recommends using a USB cable for high speed local communication in a remote location. RS-232 serial communication with the NGC can also be a high speed application for users operating a PC with Windows XP Operating System or newer.

When operating the NGC in a network environment, using Ethernet is an excellent and practical solution.

For example, the following chart (See **Table 2–8**) compares communication times between the different available options for common operational tasks:

Table 2–8 Communication Option Comparison

	Operational Task[1]		
Communication	**Data Coll. Single Stream**	**Save Files**	**Restore Files**
Serial: 38,400 Baud	10 Seconds	2.5 Minutes	2.5 Minutes
Serial: 115,200 Baud[2]	4 Seconds	1.1 Minutes	1.1 Minutes
USB	3 Seconds	1.5 Minutes	1.5 Minutes
Ethernet	3 Seconds	1.5 Minutes	1.5 Minutes

2.11 NGC Start-Up Diagnostics

The Totalflow NGC8206 has an extensive built-in list of tests which are performed each time the unit is started. This start-up testing may be disabled, but Totalflow recommends that it be left enabled. These diagnostics consist of four areas of testing:

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

These start-up tests may also be performed on a regular schedule. See the PCCU Help files for more information on scheduling diagnostics.

2.11.1 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 over-exceeding the expected level of pressure.

2.11.2 Oven Temperature Test

This test compares the actual oven temperature to the oven temperature set point. A failure of this test indicates that the oven is not maintaining the required temperature.

2.11.3 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.

2.11.4 Stream Test

This test measures various pressures for each available stream. Failure of a stream indicates an inability to meet certain criteria.

During the initial start-up, all streams are disabled. During the stream test, streams with input pressure are re-enabled, tested and either passed or failed. Streams with no initial input pressure fail.

---

[1] Operational task speed directly correlates to PC Processor speed.

[2] Personal Computer operating on Windows XP Operating System or newer.

2.12 Start-Up Wizard

The NGC8206 Start-up Wizard is designed to walk the technician through procedures required for setting up the unit. Following installation and connection to the NGC, the Startup Wizard begins automatically. This only happens the first time the user connects to the unit or upon start-up each time the user reconnects to the system until the unit setup is completed.

The wizard is designed to run concurrently with the NGC Diagnostics.

2.12.1 Wizard

The wizard steps through the process of entering information to get the NGC up and running: device set-up, stream set-up, calibration set-up, etc. Each screen has an associated Help screen that automatically displays when the user moves from screen to screen defining what information is required.

2.13 Historical Data

The NGC compiles historical data that can be used for custody transfer needs, verify NGC operation over time and provide a limited data backup for communication link reliability. Data retained by the NGC can be collected via a remote communication link or by a laptop PC operator interface.

2.13.1 Retaining Data

The user can configure how much data is retained by the NGC via the operator interface. The default configuration is as follows:

2.13.2 Analysis Cycles

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

2.13.3 Stream Averages

- Last 840 hour averages
- Last 35 daily averages
- Last monthly average

2.13.4 Diagnostic Reports

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

2.13.5 Audit Logs

- Last 100 alarms
- Last 100 events

2.14 TCR Sample Probe (Optional Equipment)

The temperature compensated regulator (TCR) sample probe is used to capture natural gas from the pipe line for NGC analysis. To capture the gas sample, it is recommended the TCR sample probe be mounted horizontally. It can be mounted vertically if this is more suitable to the installation.

TCR sample probe is specifically selected for operation with the NGC. The design of the probe prevents icing without the need for electrical power.

TIP

It is the customer's responsibility to install and weld a 3/4 –inch female NPT standard pipeline coupling on the main meter run gas flow pipe. This coupling allows installation of the TCR sample probe.

Check **Table 2–9** to ensure the correct sample probe for installation. The length of the sample probe is dependent on the diameter of the meter run.

ABB Totalflow recommends that a TCR be installed with the NGC. Refer to **Figure 2-19.**

FYI

Read the installation instructions in Chapter 2 to develop a pipeline installation plan prior to actual installation.

Table 2–9 Optional Temperature Compensated Regulator (TCR)

Length (inches)	Description
4	Temperature Compensated Sample Probe /Regulator/Relief Valve
8	Temperature Compensated Sample Probe /Regulator/Relief Valve

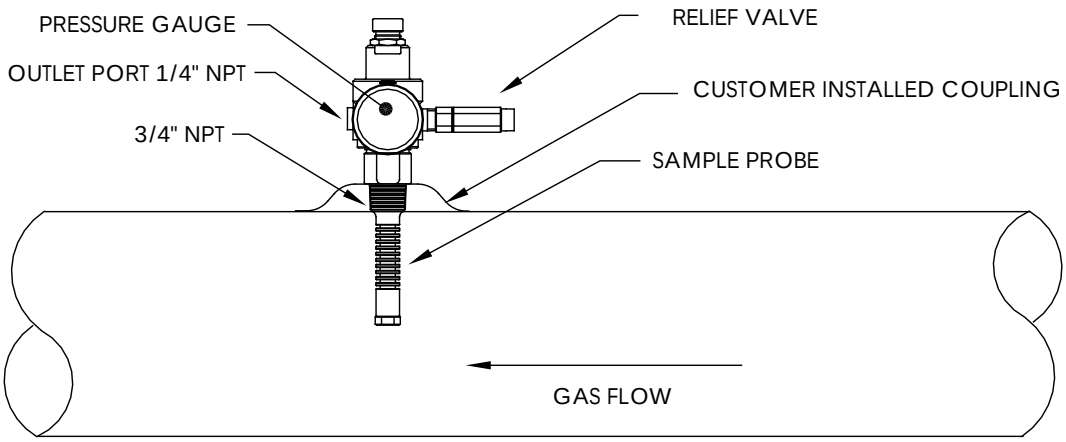


Figure 2-19 Temperature Compensated Regulator With Sample Probe

2.14.1 Location

- Locate the pipeline coupling on the gas meter run in close proximity to the NGC. This allows the stainless steel sample line from sample probe to Chromatograph to be as short as possible.
- The coupling should be mounted so 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.
- 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. 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.

2.14.2 Other Considerations

- TCR 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 NGC should be 15 $\pm$ 2 psig (103 $\pm$ 14 Kpa).
- To maintain this pressure at the NGC filters, it may be necessary to increase TCR sample probe pressure to a value greater than 15 psig. Pressure is dependent on sample transport tubing length between the TCR sample probe and analyzer.
- Be sure to use tubing electrical isolators on sample tubing when connected to pipelines that are not isolated from cathodic protection.

2.15 Environmental Enclosure (Optional Equipment)

In colder climates (ambient temperatures 0 °F to -40 °F) this environmental enclosure (ENC82) allows mounting of the NGC directly on the pipe. This insulated weatherproof enclosure has brackets for the NGC and a small start up/calibration bottle. Having the calibration bottle in the heated enclosure ensures a much more stable and consistent calibration.

2.15.1 Standard Features

- Available with either an electric or catalytic heater option:
  - The catalytic heater is a 1500 Btu/hour input, and includes a standard filter/drain kit.
  - The electric heater option features 120 VAC/400 W heater and thermostat.
- Sample conditioning system
- Heated line entry
- Rigid conduit
- Mounts either as a free-standing unit or pipe mounted unit:
  - Large enclosure may be pipe-mounted on 4" through 12" pipe.
  - Small enclosure may be pipe-mounted on 2" through 5" pipe.

2.15.1.1 Enclosure

The heater and enclosure is designed to maintain a 40 °F inside temperature when outside temperature is -40 °F. Two enclosures are available for installation

depending upon site requirements. The large enclosure (ENC82L) will hold a single or dual unit NGC and features a large foot print (38” w x 31”d x 30.5” h) See **Figure 2-20** and **Figure 2-21**. The small enclosure (ENC82S) is designed for a single NGC unit and features a smaller foot print (24” w x 19” d x 21” h). See Error! Reference source not found. and **Figure 2-23**.

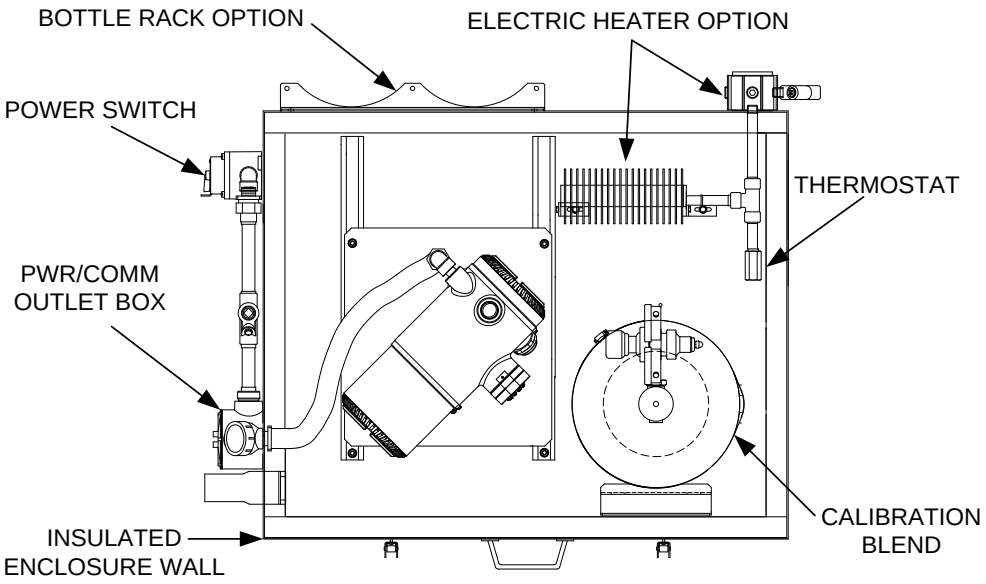


Figure 2-20 ENC82L Environmental Enclosure with Electric Heater

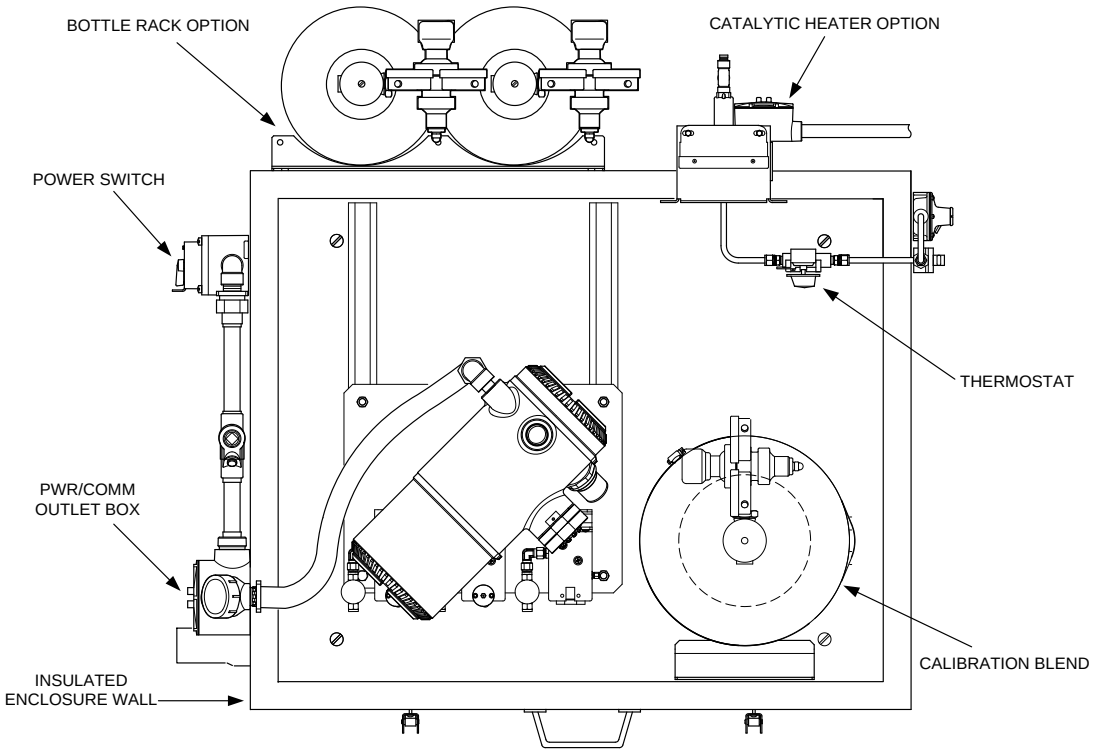


Figure 2-21 **ENC82L** ***Environmental Enclosure*** **with Catalytic Heater**

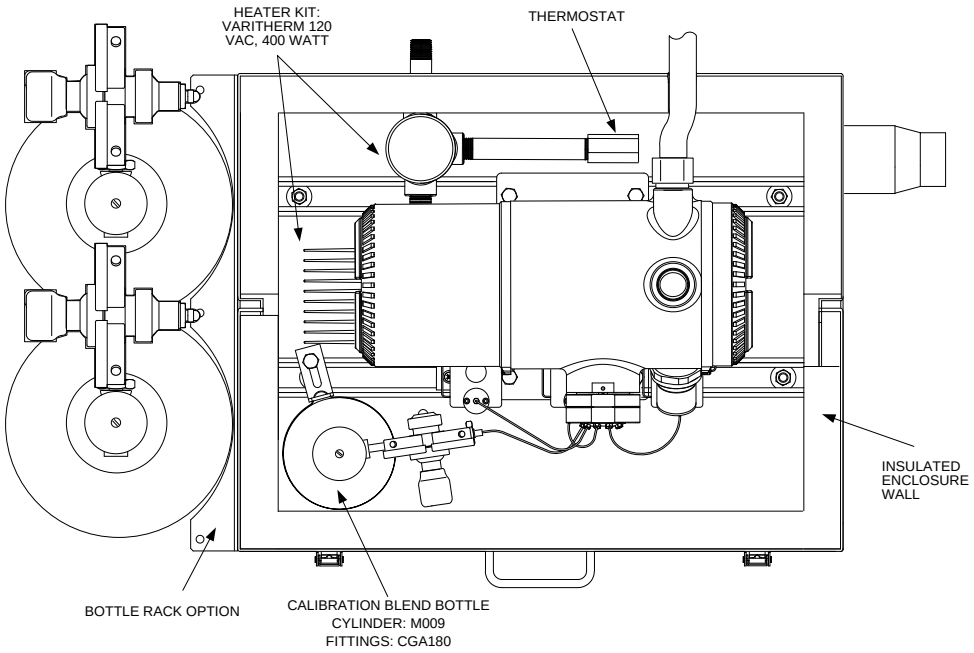


Figure 2-22: ENC82S Environmental Enclosure with Electric Heater

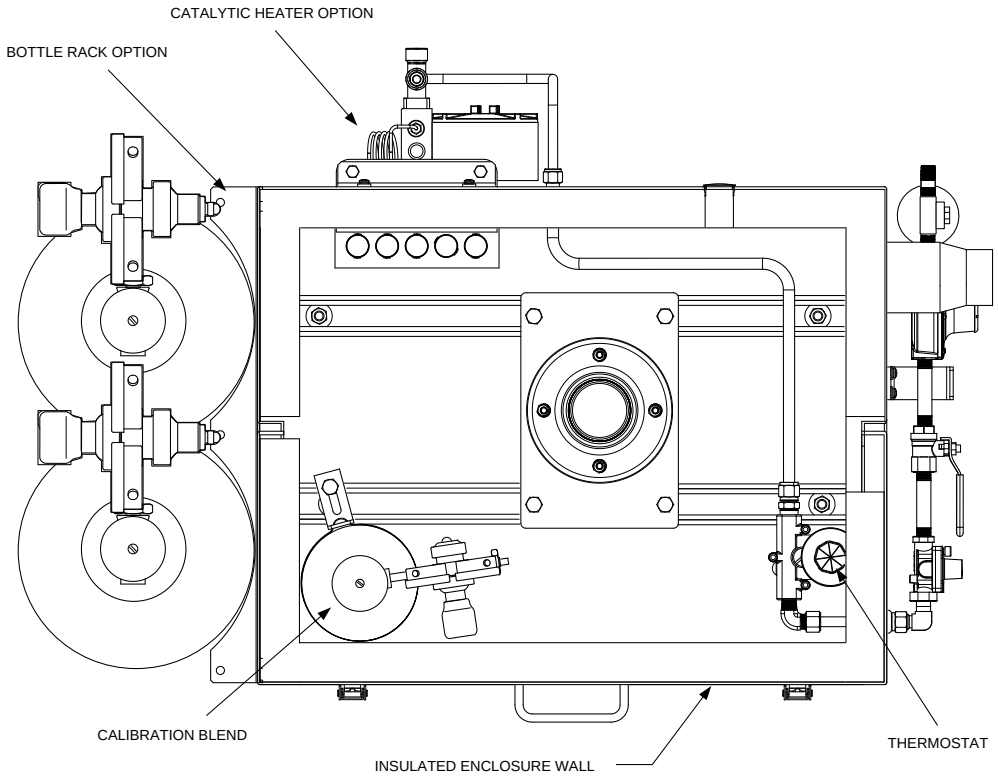


Figure 2-23 ENC82S Environmental Enclosure with Catalytic Heater

2.15.1.2 Mounting Options

The ENC82 may be mounted directly on the pipe run, with or without the sample probe enclosed. Optional support legs are available for added support when mounted on the pipe run.

Optionally, a free-standing kit may be used to mount the enclosure next to the meter run.

2.15.2 Optional Features

The following is a list of optional features:

- Calibration blend
- DC power switch (large enclosure only)
- Dual bottle rack

2.16 Sample Conditioning Modules (Optional Equipment)

For some NGC installations, it may be necessary to install an optional sample system conditioning module to compensate for non-ideal natural gas samples. These optional modules are pre-engineered to provide various levels of protection and bypass flows (see **Figure 2-24**). All of the sample conditioning modules include a level of particulate protection and come in two flow sizes: 50 CC and 450 CC per minute (see **Table 2–10**).

For installations where the gas is ideal and the sample probe is located less than 10’ from the NGC, no sample conditioning module is required.

2.16.1 Gas Types

The user can select from one of four sample conditioning modules for installations whose gas samples do not meet the ideal clean and dry conditions. The following definitions define what is meant by the condition of natural gas to be sampled.

- Clean gas is defined as having no particles larger than one micron and no more than one milligram of solids per cubic meter of gas.
- Dry gas is defined as having no more than seven pounds of water per million cubic feet of gas. Gas has less than 0.1 PPM of liquid at the coldest ambient condition expected at the coldest point in the system. The liquid can be water, oil, synthetic lubrication, glycol, condensed sample or any other non vapor contaminate.
- Stable gas is a vapor containing less than 0.1 PPM of liquid when vapor is cooled to 18.3 °F (10 °C) below the coldest ambient temperature possible at any point in the system.

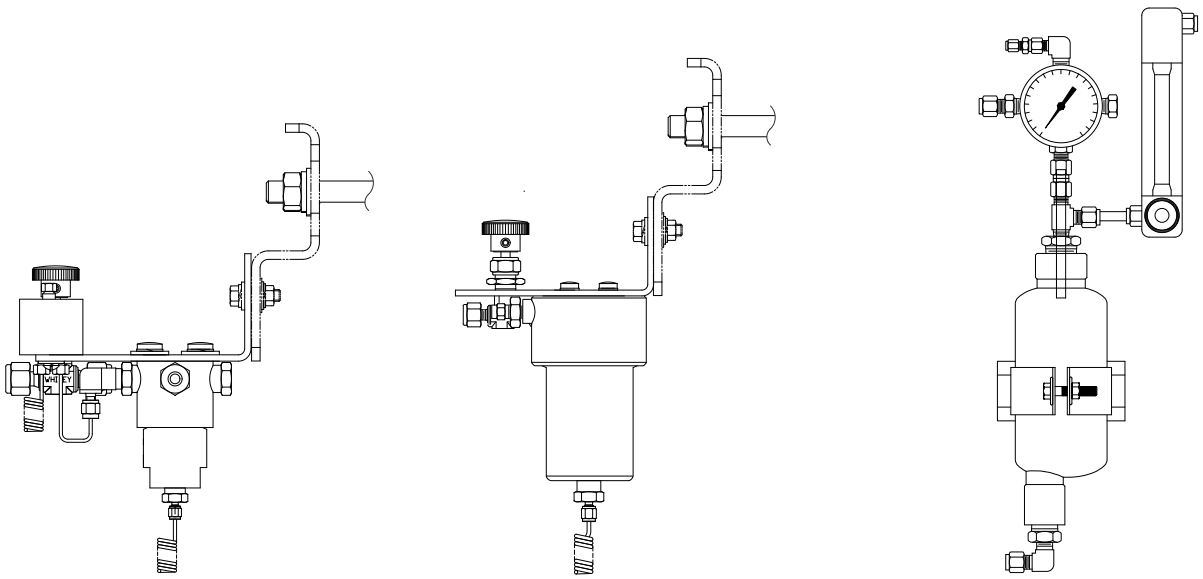


Figure 2-24 Available Sample Conditioning Modules

Table 2–10 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: • Particulate/coalescing filter • Liquid/vapor separator
2102494-001	Designed for sample point distance greater than 50’ (15m) and less than 150’ (50m). 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.

Part Number	Description
	• Particulate/coalescing filter • 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. • Balston housing/ filter • Liquid separator Armstrong drainer/trap • 0-30 psi gauge • 0-1600 cc/min adjustable metered bypass

2.16.2 Mounting Brackets

Two sample conditioning system mounting brackets are available: a single stream bracket or a multiple stream bracket (**Figure 2-25**) for up to three modules.

See **Figure 2-26** and **Figure 2-27** for installed dimensions.

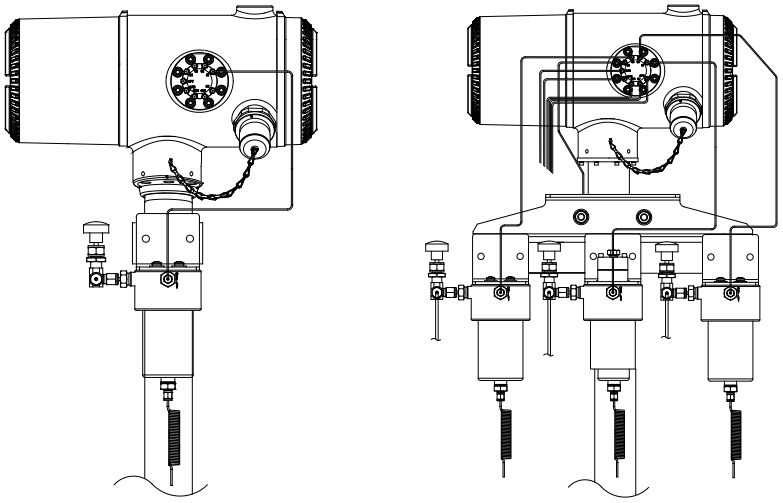


Figure 2-25 Single and Multiple Stream Sample Conditioning Assemblies

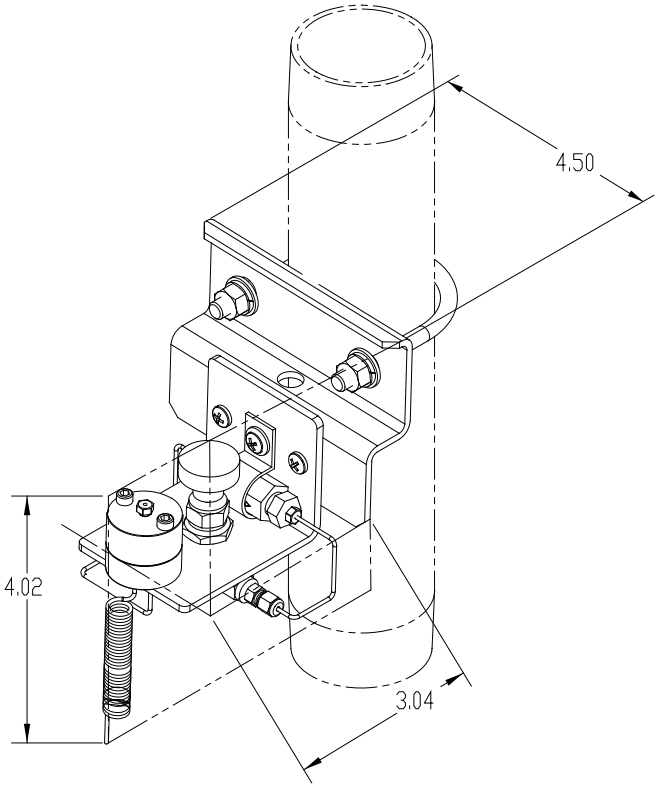


Figure 2-26 Single Stream Conditioning Module Dimensions

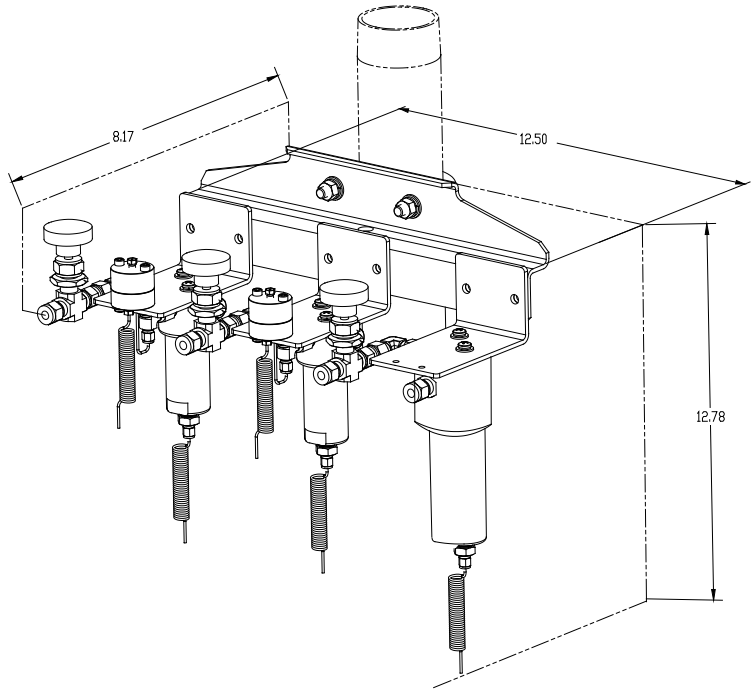


Figure 2-27 Multiple Stream Conditioning Module Dimensions

2.17 Security Seal (Optional Equipment)

For some NGC installations, it may be desirable to attach a Security Seal on the enclosure front and rear End Caps. To accommodate seal, please note the holes located in the tab located on each End Cap (See **Figure 2-28**).

2.17.1 Customer Supplied Materials

- 1 ea. Security Wire Seal
- Seal Press

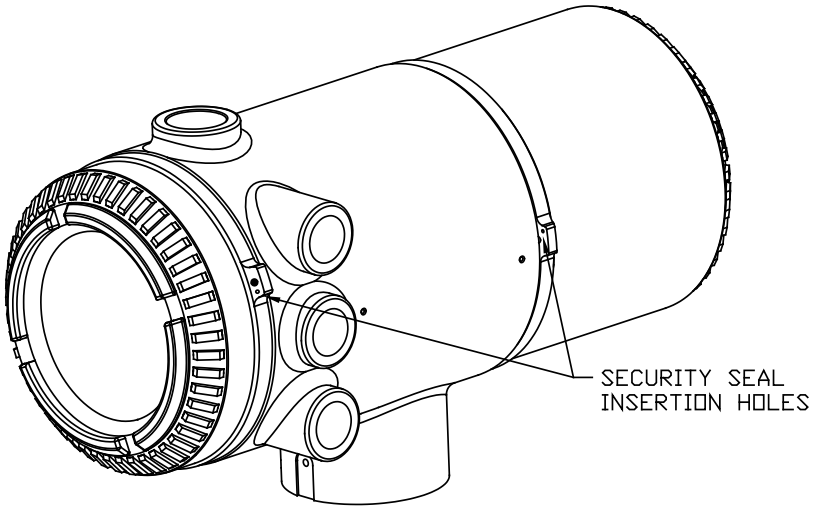


Figure 2-28 NGC End Cap Tabs for Security Seal

2.17.2 Instructions

1) Insert security wire through holes located on end cap tabs.

2) Bring ends together and insert through holes in security seal (see **Figure 2-29**).

3) Use seal press to compress seal into wire. Ensure that the wire is firmly captured inside seal.

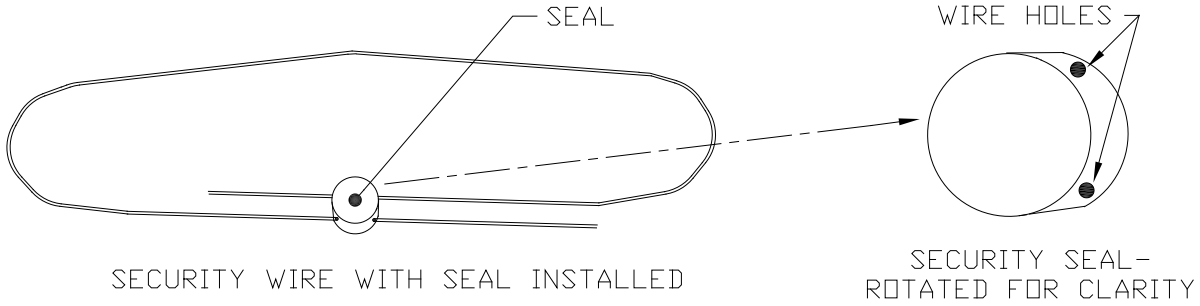


Figure 2-29 Security Wire w/ Seal

2.18 Optional Equipment Enclosure (Optional Equipment)

If optional enclosure is used, it may be configured to include other options, including but not limited, to a battery pack to provide power to the NGC, communication equipment, solar power charger and additional I/O.

Three enclosures are commonly used for the NGC installations: the 6200, 6700 and the 6800 optional equipment enclosure.

The 6200 installation will be for AC to DC or DC sites requiring communication equipment. There is no battery-backed option in this installation.

The 6700 enclosure supports AC to DC or DC sites requiring communication equipment. There is no battery-backed option in this installation.

The 6800 enclosure supports battery-backed operation for the NGC via solar power or a UPS system, AC to DC power or DC to DC power and communication equipment.

Following local codes for installation, these units would normally be located in a division 2 or general purpose area. The units may be mounted on a 2” pipe or mounted on a flat surface, such as a wall.

2.18.1 6200 Optional Equipment Enclosure

The 6200 can accommodate the following equipment:

- 110/240 Volt to 12 VDC
- 110/240 Volt to 24 VDC

2.18.2 6700 Optional Equipment Enclosure

The 6700 enclosure can accommodate the following:

- Communication kit
- 120/240 VAC to 12 VDC power supply
- 24/12 VDC to DC converter

2.18.3 6800 Optional Equipment Enclosure

The 6800 enclosure can accommodate the following:

- Communication kit
- Solar Panel Power Option
  - 2 ea. 110 Ah Batteries
- 115/230 VAC UPS Power Option (24 VDC Systems Only)
  - 2 ea. 40–110 Ah Batteries

2.19 Power Supply Options (Optional Equipment)

Power supply options available for the NGC8206 are as follows:

- 110/240 VAC to 12/24 VDC
- 115/230 VAC to 12 VDC (explosion-proof)
- 24 VDC to 12 VDC converter (not applicable for systems with auxiliary heater)
- 12/24 VDC solar panel power pack
- 115/230 VAC with UPS to 24 VDC

2.19.1 12/24 VDC Solar Panel Power Pack

The solar panel power option employs a solar controller to maintain voltage on two 110 Ah batteries:

- 14-day autonomy with standard 110 Ah batteries without optional heater
- 5-day autonomy with standard 110 Ah batteries with optional heater

Space is provided for communication equipment and fusing for auxiliary equipment. Auxiliary fusing supports a maximum of two 1 amp loads. The system

disconnects batteries when the voltage drops below the minimum recharge level. Minimum configuration consists of dual 50 W solar panels. System is designed to accommodate dual 110 W solar panels as a maximum.

CAUTION Auxiliary fusing is not available when using the optional heater.

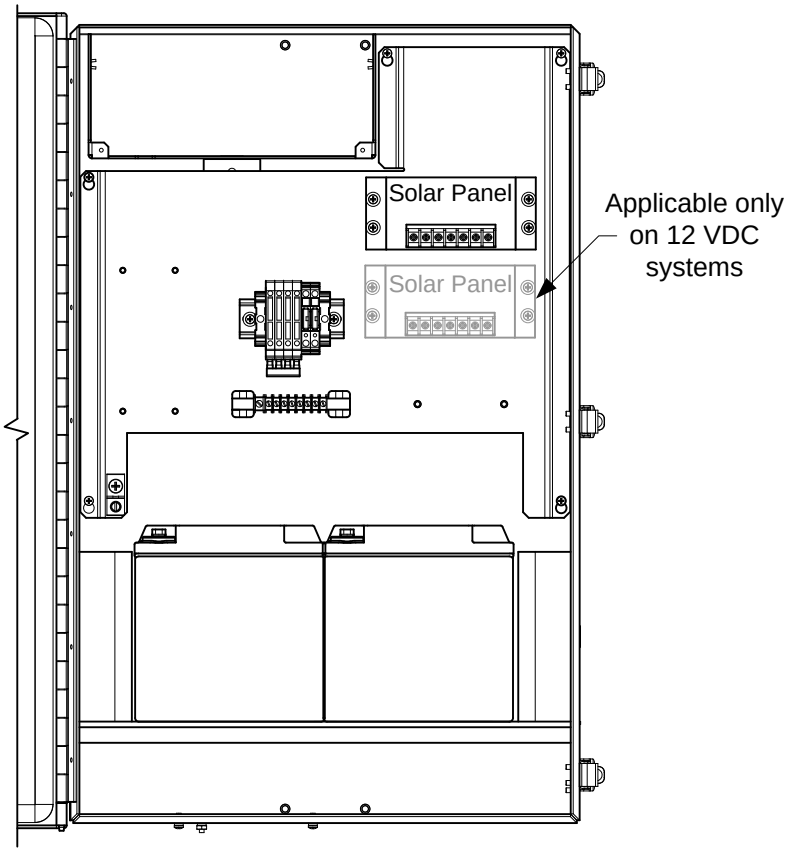


Figure 2-30 6800 Enclosure with 12/24 VDC Solar Panel Power Pack **Option**

2.19.2 115/230 VAC UPS Power Option (24 VDC Systems Only)

This option assumes site availability of 115/230 VAC power. A UPS (Uninterruptible Power Supply) and two 50 Ah batteries provide backup power for short power interruptions. 100 Ah batteries are available for longer autonomy:

- 3-day autonomy with standard 50 Ah batteries and no optional heater
- 36 hour autonomy with standard 50 Ah batteries and optional heater

Space is provided for communication equipment and fusing for auxiliary equipment. Auxiliary fusing supports a maximum of three 1 amp loads. The system disconnects batteries when the voltage drops below the minimum recharge level.

CAUTION Auxiliary fusing is disabled when on UPS power.

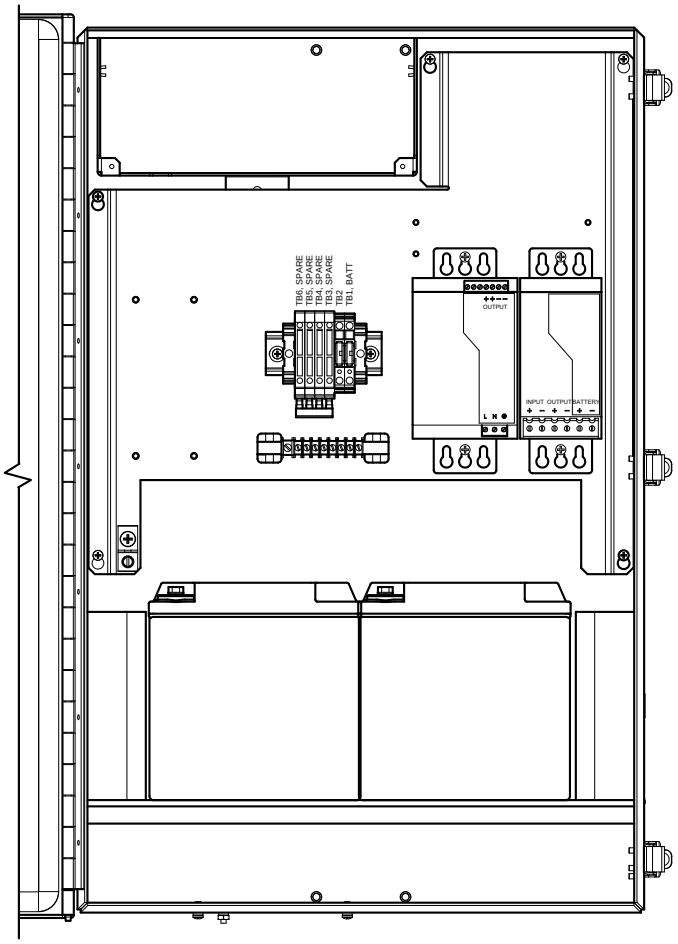


Figure 2-31 6800 Enclosure with 115/230 VAC UPS Power Option

2.19.3 Explosion-Proof Power Supply (Optional Equipment)

For installations requiring an explosion-proof power supply, Totalflow provides two power supplies (115 VAC and 230 VAC to 12 VDC) that meet these requirements and are housed in explosion-proof enclosures.

2.19.3.1 Enclosure

The custom designed, explosion-proof enclosure consists of a square shaped cast aluminum housing, powder coated, with top explosion-proof threaded cap for access to internal components (see **Figure 2-32**).

The top cap has precision-engineered threading and is susceptible to damage if treated roughly. The top cap is water tight, corrosion resistant and NEMA 4X rated. Unauthorized removal of the cap is protected with a

hex socket set screw on cap.

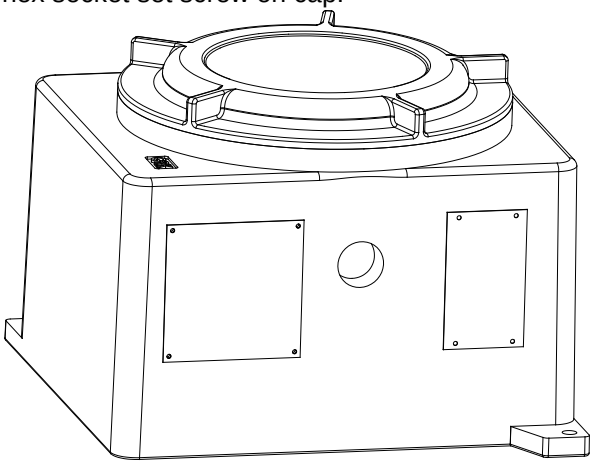


Figure 2-32 Explosion-Proof AC Power Supply

3.0 INSTALLATION

3.1 Overview

This chapter provides information for field installation of the NGC and optional equipment. After completing the procedures within this chapter, the NGC is ready for start-up.

The following procedures, unless otherwise stated, are applicable to all NGC units. The NGC is designed to be pipe-mounted (see **Figure 3-1)**. Optionally, a shelf mounting kit (see **Figure 3-2**) may be purchased for mounting the unit on a wall inside or outside of a building, or a mounting plate for use in the optional environmental enclosure.

The installation instructions in this chapter are to be performed only when the area is known to be non-hazardous.

FYI 

Read this chapter to establish an installation plan. Also, before beginning, refer to the wiring diagrams delivered with the new NGC.

3.1.1 What this Means

Installation instructions that feature this icon are applicable only when the installation involves an environmental enclosure (ENC82). All other instructions may or may not be applicable.

3.1.2 Organization

The following instruction sections are organized in the suggested installation order. Not all installation instructions will apply to the situation. For example, some procedures may vary when the installation does not require certain equipment.

FYI 

Please note that where applicable, typical instructions are first and variations or specialized instructions follow.

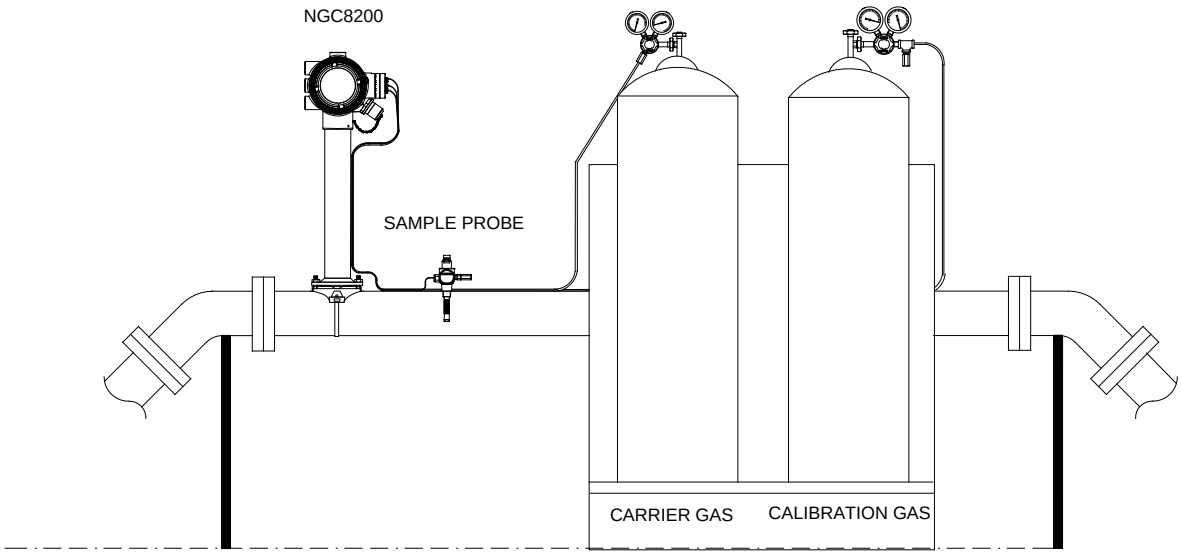


Figure 3-1 Basic Meter Run Installation

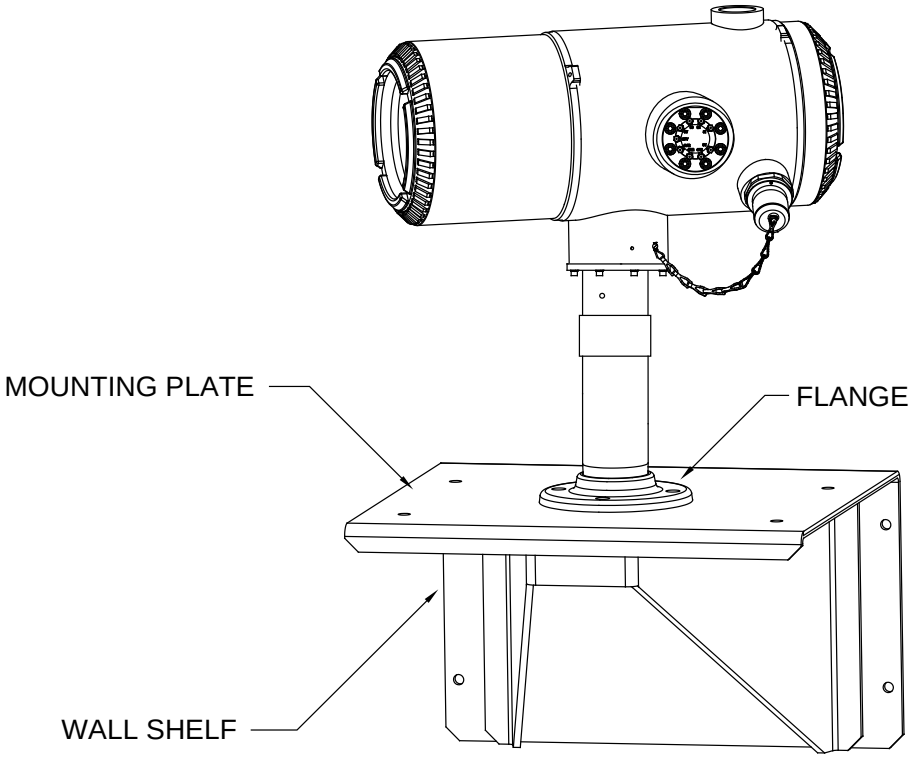


Figure 3-2 Typical Wall Shelf Mount Installation

3.1.3 Locating Area for Installation

The NGC is designed for mounting on main gas lines, 2-inch to 12-inch pipe sizes. Each type of installation is described within this chapter.

Be certain the installation site is clean and free of foreign debris that could affect NGC operation.

The NGC 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 NGC in a central location to all sample probe points.

3.1.4 Installation

The following information (see **Table 3–1**) should help to determine the procedures to follow depending upon the type of installation: pipe mount, free-standing, wall shelf or one of the two environmental enclosures (ENC82) for inclement climates. While a set of instructions maybe indicated for your installation, it may not be required specifically.

The NGC8200 is certified for installation in Classified Hazardous locations. The heater and fittings in the environmental enclosure may not have the same ratings. All components of the installation, including accessories and fittings must be approved for the classification rating of the area of installation.

Table 3–1 Installation Matrix

Pipe Mount	Free-Standing	Wall Shelf	ENC82L	ENC82S	Installation Instructions	Section
●	●	●	●	●	Sample Probe Installation	2.3
	●				Stand Alone Installation	2.4
			●		Large Free-standing Environmental Enclosure	2.5
				●	Small Free-standing Environmental Enclosure	2.6
			●		Large Pipe Mounted Environmental Enclosure Mounting Kit	2.7
			●		Optional Support Leg Kit	2.8
				●	Small Pipe Mounted Environmental Enclosure Mounting Kit	2.9
●					Pipe Saddle Installation	2.10
		●			Shelf Installation	2.11
●	●	●	●	●	NGC Installation	2.12
●	●	●	●	●	Sample Conditioning Module Installation	2.13
●	●	●	●	●	Sample Line Connections	2.14
			●	●	Sample Line(s) to NGC inside of ENC82	2.15

Pipe Mount	Free-Standing	Wall Shelf	ENC82L	ENC82S	Installation Instructions	Section
			•		ENC82L Optional Pwr/Comm Outlet Box Assembly	2.16
•	•	•			Carrier/Calibration Bottle Rack Installation on Meter Run	2.17
			•	•	ENC82 Carrier Gas Bottle Rack Installation	2.18
•	•	•	•	•	Carrier Gas Regulator Installation	2.19
			•		ENC82L Calibration Gas Bottle Installation	2.20
				•	ENC82S Calibration Gas Bottle Installation	2.21
•	•	•	•	•	Calibration Gas Regulator Installation	2.22
•	•	•	•	•	Carrier Gas and Calibration Gas Connections	2.23
•	•	•	•	•	Vent Lines Connections	2.24
			•		ENC82L Optional Catalytic Heater Installation	2.25
				•	ENC82S Optional Catalytic Heater Installation	2.26
			•	•	ENC82 Optional Electric Heater Installation	2.27
			•	•	Sealing Environmental Enclosure	2.28
•	•	•	•	•	Optional Equipment Enclosure Installation	2.29
•	•	•	•	•	115/230 VAC UPS Power Supply (24 VDC Systems)	2.30
•	•	•	•	•	115/230 VAC to 12 VDC Explosion-Proof Power Supply	2.31
•	•	•	•	•	110/240 VAC to 12/24 VDC Power Supply	2.32
•	•	•	•	•	24 VDC to 12 VDC Power Converter	2.33
•	•	•	•	•	Battery Pack Installation	2.34
•	•	•	•	•	Solar Panel Installation	2.35
•	•	•	•	•	Solar Power Pack	2.36
•	•	•	•	•	DC Power Installation	2.37
•	•	•	•	•	Remote Communication Installation	2.38

3.2 Unpacking and Inspection

3.2.1 Shipping Carton

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.

3.2.2 Unpacking

The NGC is shipped in specially designed shipping cartons which contains the unit, 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.

3.2.3 Bill of Lading

After removing the protective shipping cover from the NGC, compare shipped contents with those listed on the Bill of Lading. All items should match those on Bill of Lading.

3.2.4 Inspection

Examine internal NGC components for evidence of damage.

Points of inspection are:

- Visually inspect exterior of unit for dents, chipped paint, scratches, damaged threads or broken glass plate, etc.
- Physically inspect rear interior mounted circuit boards, cables and front interior mounted circuit boards for loose cables, boards, display and mounting screws, etc.
- If applicable, inspect calibration/carrier gas bottles to be certain they are correct for the installation.

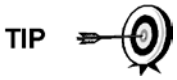
3.2.5 Damaged Components

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

Telephone: USA: (800) 442-3097 toll free or International: 1-918-338-4880.

3.3 Sample Probe Installation

If a sample probe has previously been installed, skip these instructions.



The sample probe pipe coupling should be located on the top of the meter run, but may be mounted vertical or horizontal.

3.3.1 Materials

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

3.3.2 Instructions

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 Teflon® tape or pipe dope, wrap or cover NPT threads of sample probe (see **Figure 3-3**).

6) Insert gas probe into pipeline coupling (see **Figure 3-4**).

7) Using the correct tool, tighten probe. Securely tighten so there is no gas leakage. Do not over-tighten.

8) Install shut-off valve on secondary side of sample probe, if desired.

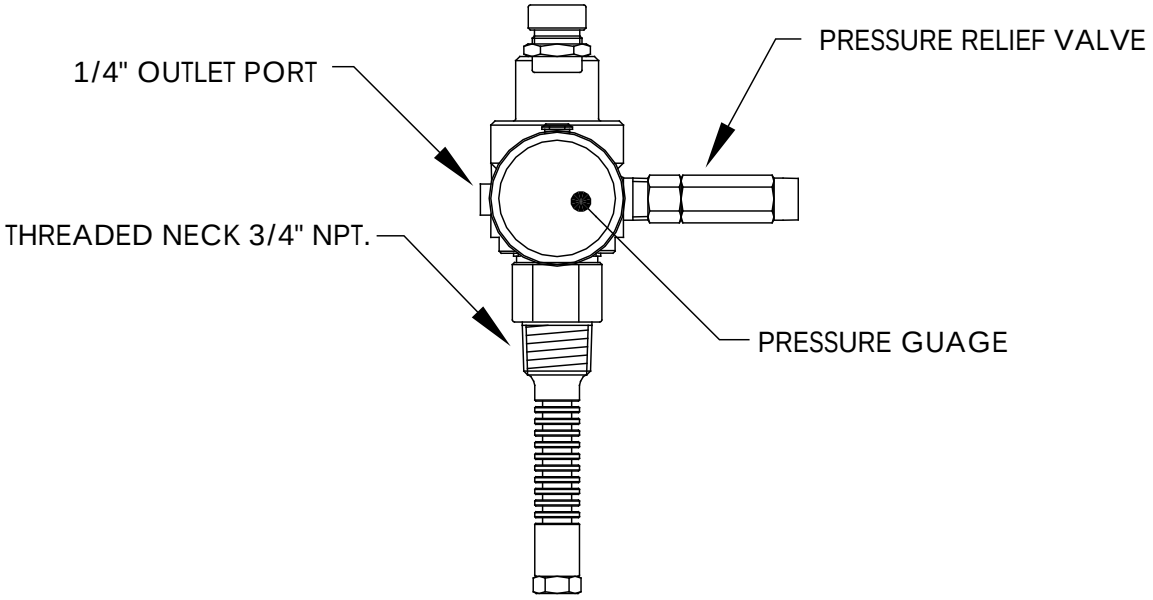


Figure 3-3 Sample Probe

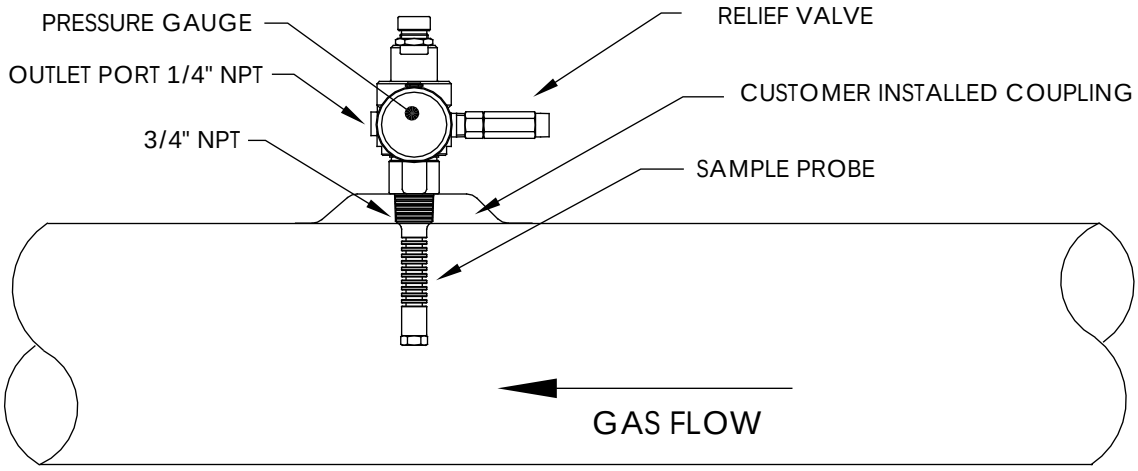


Figure 3-4 Sample Probe Insertion

3.4 Stand Alone Installation

If installing a NGC8201 using a free-standing pipe, use this procedure to install the pipe. Before beginning, review the procedure and the materials required for installation.

3.4.1 Material required

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

or

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

FYI  Optional equipment may be ordered from Totalflow.

3.4.2 Instructions

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.

FYI 

Continue to the NGC Installation instructions.

Method of installation must be consistent with customer's company policy.

3.5 Large Free-standing Environmental Enclosure Installation

If the installation includes a free-standing environmental enclosure, follow these instructions; otherwise, skip to the next section.

The following steps will typically require two people.

3.5.1 Materials

- 4 ea. ½-13 x 1 ¼ SST bolt
- 4 ea. ½ SST flat washer
- 4 ea. ½" SST split washer
- 1 ea. stand

3.5.2 Installation

1) The stand is symmetrical, so the top and bottom are identical. Locate the stand base on a flat, stable, surface.

2) Set the enclosure on top of the stand, oriented so that the stand brace is horizontal with the front of the enclosure (see **Figure 3-5**).

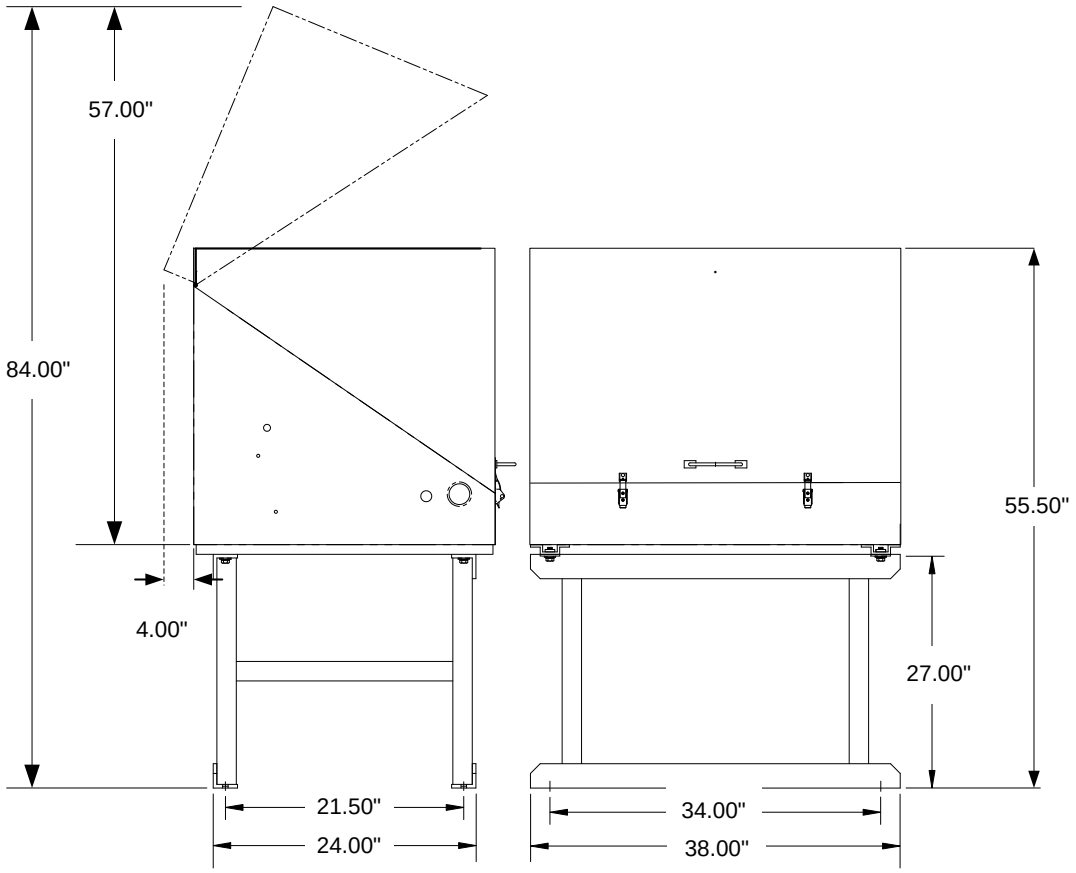


Figure 3-5 ENC82L–Enclosure Stand Installation

3) Place a split washer, then a flat washer on one of the 1 ¼" bolts and insert through bolt hole located in the angle iron into the outermost corner of the enclosure (see **Figure 3-6**).

4) Move the channel nut into position so that bolt will screw into the nut. Screw bolt into nut. Do not tighten.

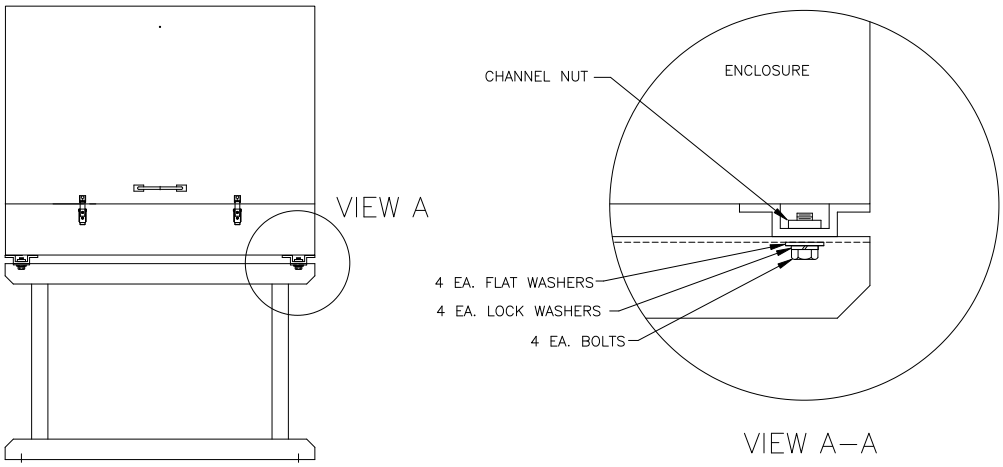


Figure 3-6 ENC82L–Enclosure Mounting Hardware

5) Repeat for all other corners.

6) Position enclosure on stand, centering stand underneath, or offset as desired, and tighten all bolts.

7) Foot plate mounting holes are pre-drilled for mounting to a pad. Hardware is to be supplied by the customer.

3.6 Small Free-standing Environmental Enclosure Installation

If the installation includes a small free-standing environmental enclosure, follow these instructions; otherwise, skip to the next section.

3.6.1 Materials

- 4 ea. ½-13 x 1 ¼ SST bolt
- 4 ea. ½ SST flat washer
- 4 ea. ½" SST split washer
- 1 ea. stand

3.6.2 Installation

1) This stand is not symmetrical. Locate angle iron with slotted holes for floor anchors and place stand base on a flat, stable, surface.

2) Set enclosure on top of stand, oriented so that the stand brace is horizontal with the front of the enclosure (see **Figure 3-7**).

3) Place a split washer, then a flat washer on one of the 1 ¼" bolts and insert through bolt hole located in the angle iron into the outermost corner of the enclosure (see **Figure 3-8**).

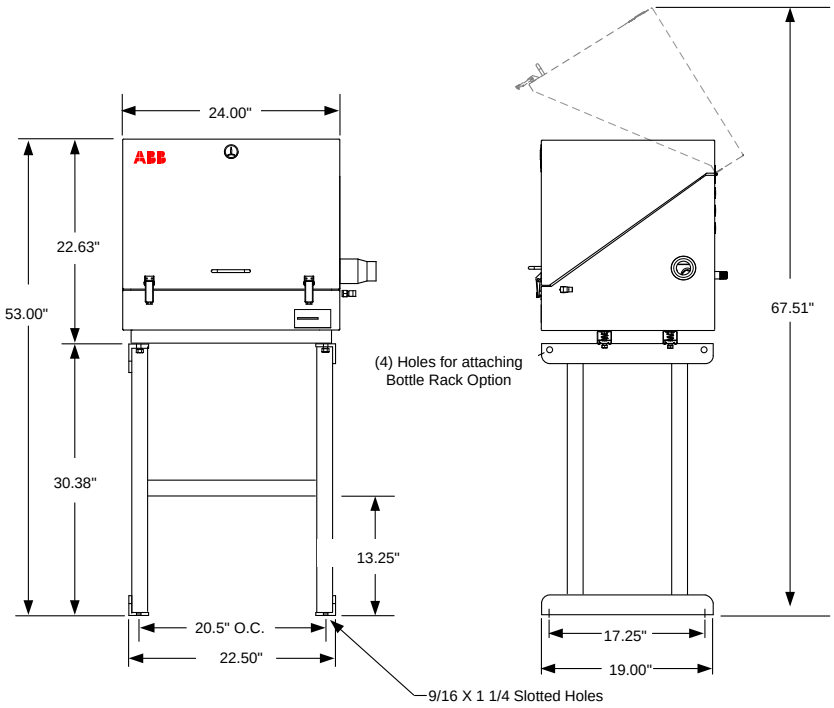


Figure 3-7 ENC82S–Enclosure Installation

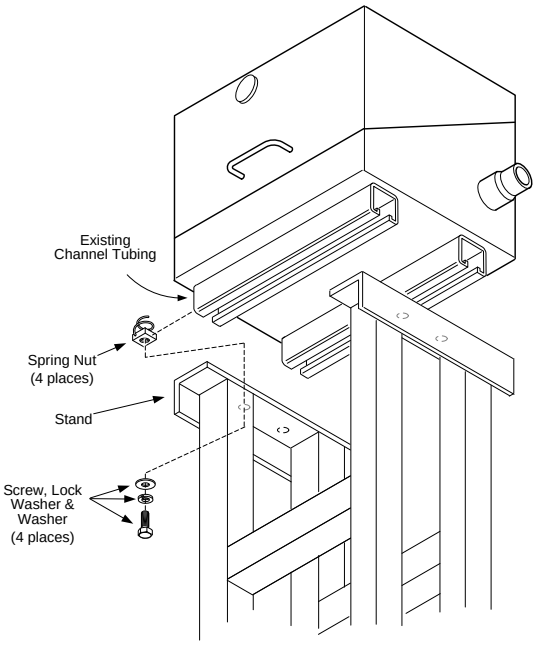


Figure 3-8 ENC82S–Enclosure Mounting Hardware

4) Move channel spring nut into position so that the bolt will screw into the nut. Screw the bolt into the nut. Do not tighten.

5) Repeat for all other corners.

6) Position the enclosure on the stand, centering the stand underneath or offset as desired and tighten all bolts.

7) Foot plate mounting holes are pre-drilled for mounting to a pad. Hardware is to be supplied by the customer.

3.7 Large Pipe-Mounted Environmental Enclosure Mounting Kit

If the installation includes a pipe-mounted environmental enclosure, follow these instructions as well as the optional support leg instructions, if applicable. Otherwise, continue to the next applicable set of instructions.

3.7.1 Materials

- 4 ea. ½" -13 x 1 ¼ SST bolt
- 4 ea. ½" SST flat washer
- 4 ea. ½" SST split washer
- 2 ea. 2 ½" x ¼" 43" steel angle iron

FYI  May be used in conjunction with optional support leg kit. See **Optional Support Leg Kit Installation** next in this chapter.

3.7.2 Installation

1) Set two pieces of angle iron (see **Figure 3-9**) on the bottom of the upside down enclosure, being sure the side with the holes is facing the bottom of the enclosure and the solid sides of the angle iron are facing each other. Angle iron should be spaced so that the diameter of the pipe will fit in-between.

2) Place a split washer, then a flat washer on one of the 1 ¼" bolts (see **Figure 3-10**).

3) Insert the bolt through one of the slotted holes located in the angle iron into the outermost corner of the enclosure. Move the channel nut into position so that the bolt will screw into the nut.

4) Screw the bolt into the nut, but leave loose for later adjustment.

5) Install the other bolt, split washer and flat washer into the other slotted hole.

6) Repeat for other angle iron. Final tightening of bolts is done after unit is mounted on pipe to allow for left-to-right and front-to-back positioning.

7) Remove nut and washers from adjustment assembly if necessary (see **Figure 3-11**).

8) Insert all-thread through round hole on adjustment side of angle iron.

9) Place the flat washer, split washer and nut on all-thread.

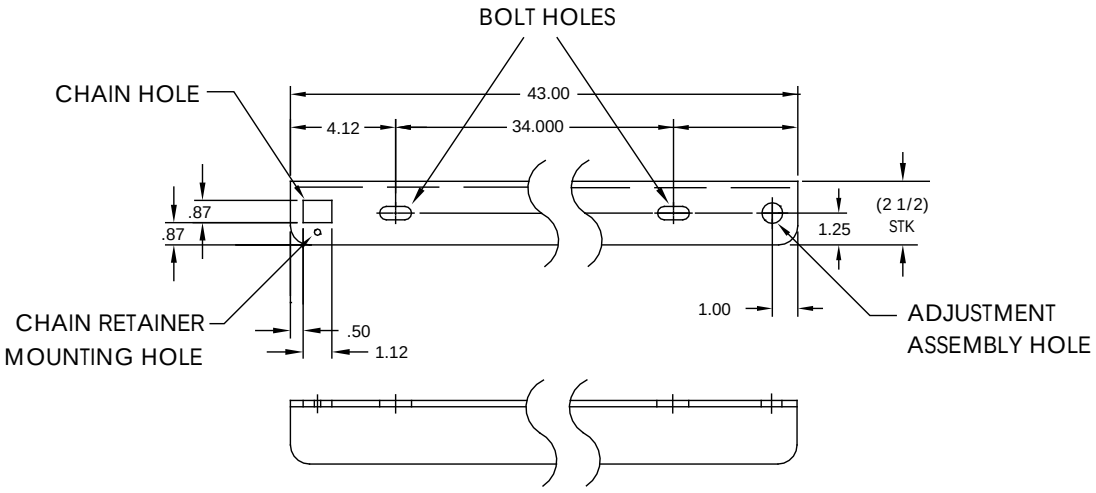


Figure 3-9 ENC82L–Mounting Brackets

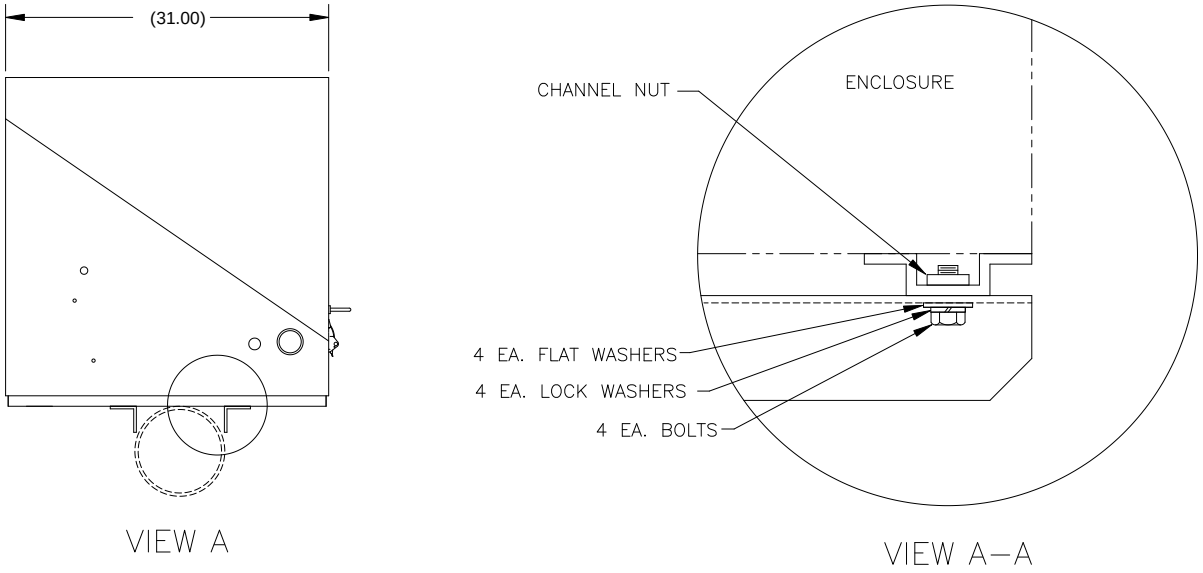


Figure 3-10 ENC82L–Mounting Hardware Installation

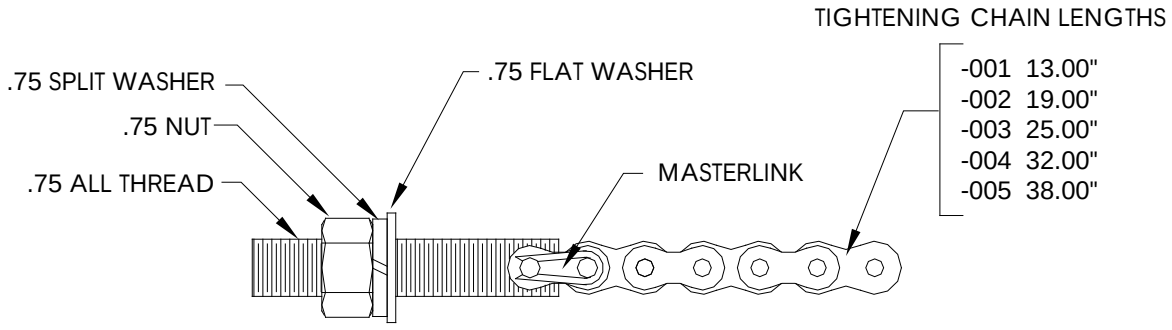


Figure 3-11 ENC82L–Adjustment Assembly

10) Screw nut onto all-thread until top of nut is level with top of all-thread. Final tightening may be done after mounting chain is in place.

FYI Lift enclosure above meter run, allowing enough clearance to clear the pipe.

11) Set the enclosure on top of the pipe in-between the angle iron mounting brackets. Keep the unit steady on top of the pipe.

12) Wrap mounting chain underneath pipe (see Figure 3-12). Feed chain up through square retainer hole of angle iron and pull up until most of the slack has been taken out of the mounting chain.

13) Feed long flat end of the chain retainer (see Figure 3-13) through the middle of a chain link then move the retainer lock into position where round peg fits into small round mounting hole.

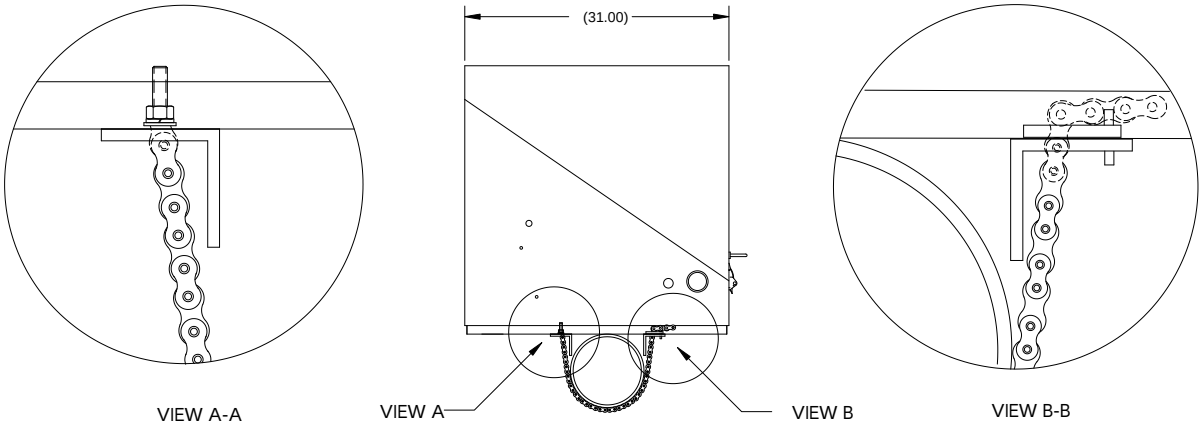


Figure 3-12 ENC82L–Pipe Mount installation

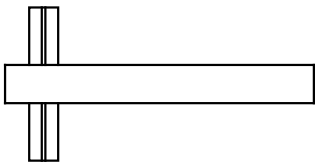


Figure 3-13 ENC82L–Chain Retainer Lock

14) Adjust enclosure into final position on the pipe and tighten nut on all-thread (adjustment assembly) until unit is securely in place.

15) Adjust enclosure position on angle iron if necessary then tighten bolts until secure.

3.8 Optional Support Leg Kit Installation

If the installation includes a pipe-mounted environmental enclosure and requires an optional support leg, follow these instructions. Otherwise, continue to the next applicable set of instructions.

3.8.1 Materials

- 2 ea. ½-13 x 1 ¼ SST bolt
- 2 ea. ½ SST flat washer
- 2 ea. ½" SST split washer
- 1 ea. pre-assembled adjustable height support leg

TIP Must use with pipe-mounting kit.

3.8.2 Instructions

1) Set the support leg underneath the front or rear (or both if using 2 kits) of pipe mounted enclosure, oriented so that the leg brace is horizontal with the front of the enclosure (see Figure 3-14).

2) Place split washer, then flat washer on one of the 1 ¼" bolts.

3) Insert the bolt through the hole located in the angle iron into the outermost corner of the enclosure. Move channel nut into position so that the bolt will screw into the nut.

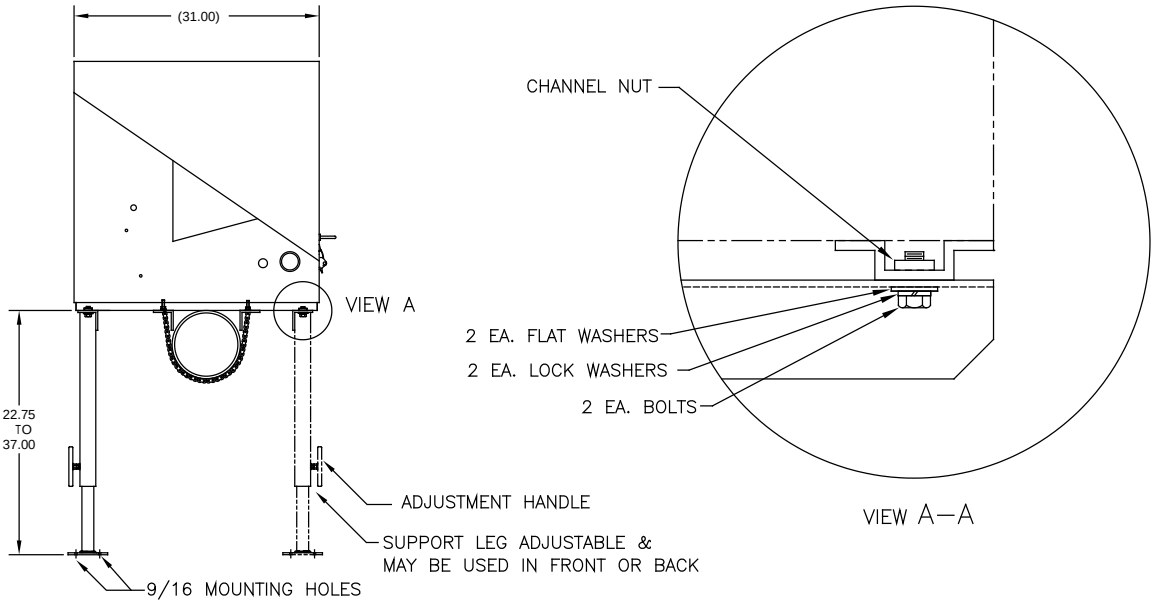


Figure 3-14 ENC82L–Optional support leg Overview

4) Screw bolt into nut, but leave loose for later adjustment. Repeat for other corner.

5) If installing two support legs, repeat for other angle iron. Final tightening of bolts may be done after support leg(s) are in desired positioned on a flat stable surface.

6) Loosen adjustment handle and drop leg foot down and retighten adjustment handle.

7) Foot plate mounting holes are pre-drilled for mounting to a pad. Hardware is to be supplied by the customer.

3.9 Small Pipe-Mounted Environmental Enclosure Mounting Kit

If the installation includes a pipe-mounted environmental enclosure, follow these instructions if applicable. Otherwise, continue to the next applicable set of instructions. Mounting kit are available for 2”, 3”, 4”, and 6” pipe only.

3.9.1 Materials

- 2 ea. split U-brackets with hardware
- 2 ea. 10 ½” channel tubes
- 4 ea. ½” spring nut
- 4 ea. ½” SST split washer
- 4 ea. ½-13 x 1 ¼ SST bolt
- 4 ea. ½” SST split washer

3.9.2 Installation

1) Place enclosure upside-down to gain access to channel tubing on the bottom of the enclosure.

2) Insert and move each spring nut into approximate position inside of existing channel tubing (see **Figure 3-15)**.

3) Set two pieces of channel tubing on the bottom of the upside-down enclosure, being sure the side with the holes is facing the bottom of the enclosure and that they are at a 90 degree angle to the existing tubing.

4) Insert and move the spring nut into approximate position inside of existing channel tubing.

5) Place the split washer, then flat washer on one of the 1 ¼” bolts.

6) Insert bolt through the hole located in the channel tubing into the spring nut inside of the existing channel tubing. Move channel nut into position so that the bolt will screw into the nut. Do not tighten.

7) Repeat for the remaining screws and nuts.

8) Remove screw and nut from both U-brackets (see **Figure 3-16)**.

9) Slide both sides of the U-bracket into the newly mounted channel tubing (see **Figure 3-17**), being sure that the pieces are correctly oriented to fit around the pipe. Repeat for second bracket and tubing.

10) Separate U-brackets to allow mounting on pipe. Set unit on pipe and move brackets together surrounding the pipe.

11) Reassemble U-bracket with screw and nut. Leave loose until enclosure has been centered over the pipe and adjusted for position (see **Figure 3-18)**. Tighten.

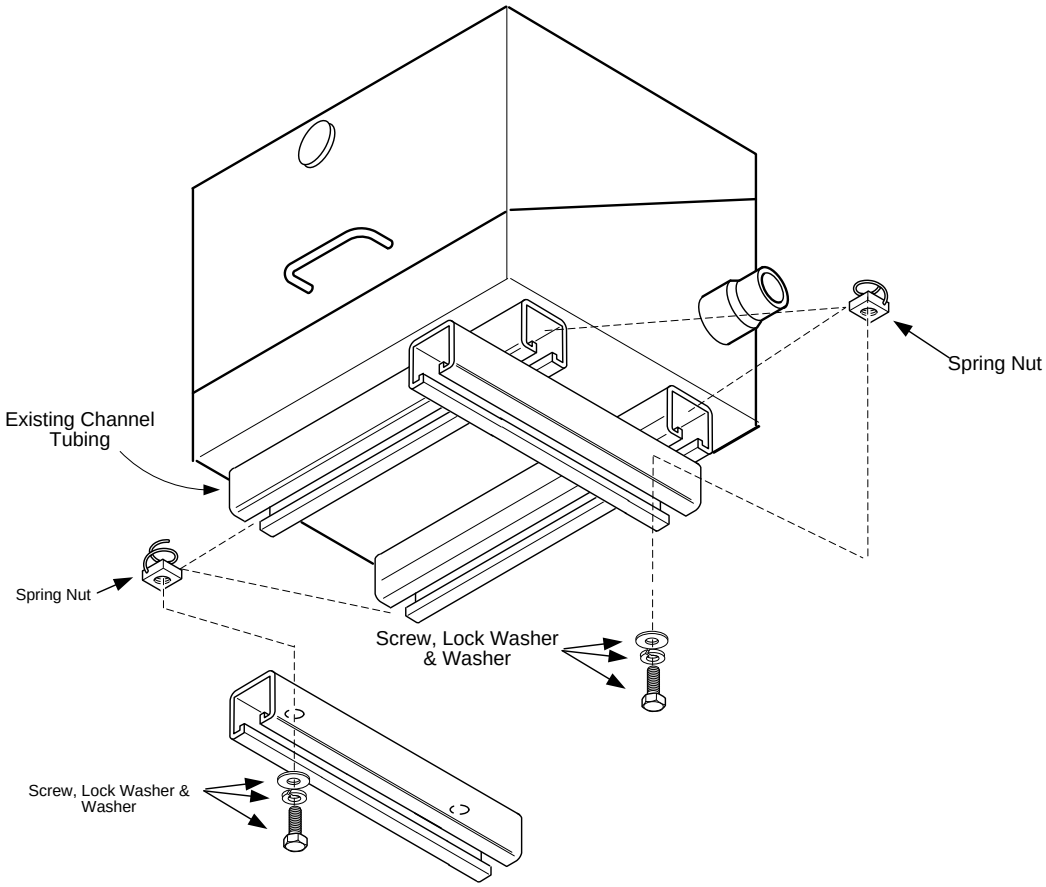


Figure 3-15 ENC82S–Channel Tubing Installation

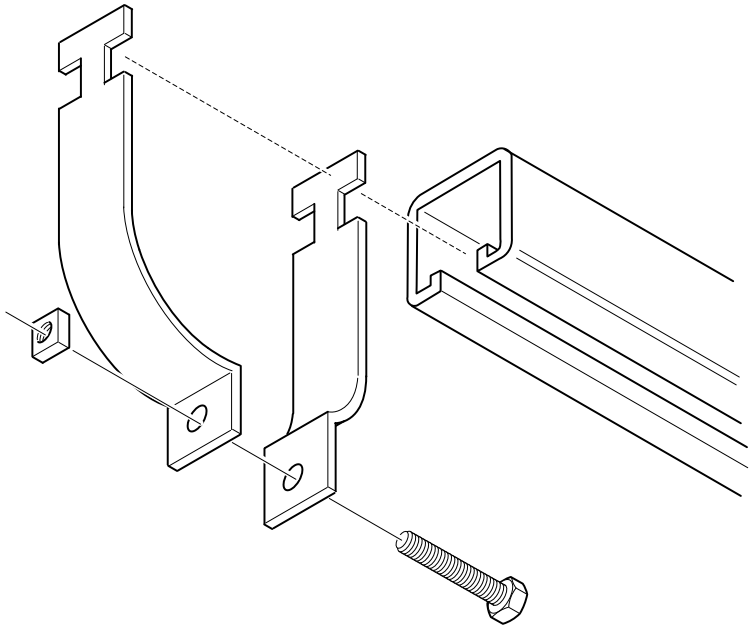


Figure 3-16 ENC82S–Pipe Mount Split Brackets

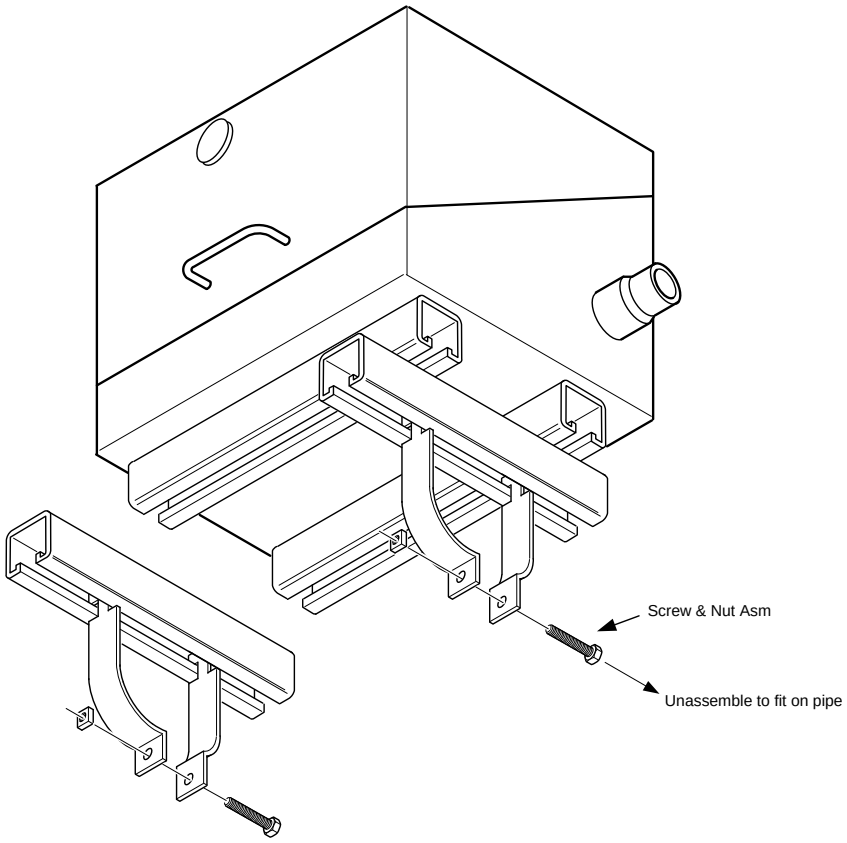


Figure 3-17 ENC82S– Pipe Mount Assembly

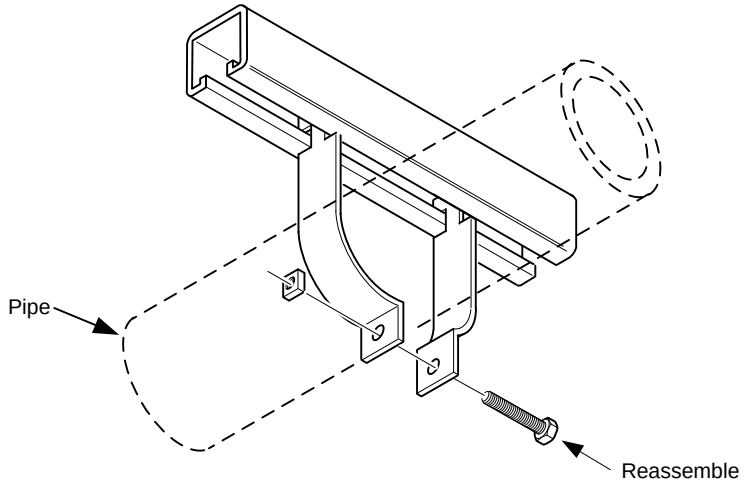


Figure 3-18 ENC82S–Pipe Mounted

3.10 Pipe Saddle Installation

If installing an NGC 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.

3.10.1 Material Not Supplied

- 1 ea. pipe saddle
- 1 ea. 2” mounting pipe. Length dependent upon final overall NGC desired height.
- 1 ea. 2” pipe with flange kit. (Optional kit comes with flange, screws, washers, and coupling.)

FYI Optional equipment may be ordered from Totalflow.

3.10.2 Instructions

1) Position pipe saddle on meter run. Select a location that allows easy access and is close to the sample probe. Lines should be a short as possible.

2) Temporarily attach saddle on the meter run pipe using U-bolt and associated hardware (see **Figure 3-19**).

3) Screw one end of the 2” pipe into the saddle flange on the pipe saddle until wrench tight. Place level against pipe and vertically align, adjusting 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” 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.

FYI Continue to the NGC Installation instructions. Method of installation must be consistent with customer’s company policy.

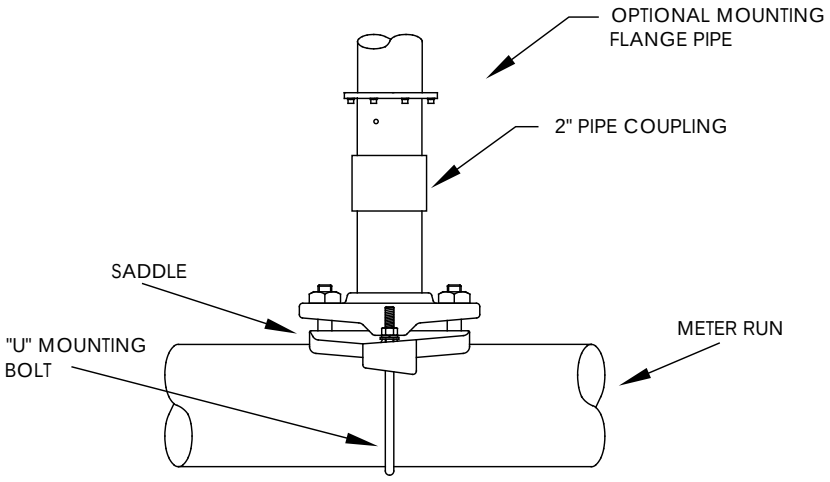


Figure 3-19 Typical Pipe Saddle Installation

3.11 Shelf Installation

If the installation calls for the NGC shelf mounting kit, use this procedure to mount the shelf. Otherwise, continue to the next applicable instructions. Before beginning, review the procedure and the materials required for installation.

3.11.1 Materials

- 4 ea. ¼" x 20 1" SST hex head machine screws
- NGC mounting shelf with flange
- 1 ea. 2" mounting pipe. Length dependent upon final overall NGC desired height.
- 1 ea. 2" pipe with flange (optional)
- 1 ea. 2" pipe coupling (optional)

3.11.2 Instructions

1) Locate the wall position where the NGC is to be mounted. The shelf should be positioned high enough on the wall so all components are accessible to service personnel. The shelf should be installed in close proximity to 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. Refer to **Figure 3-20**.

3) Screw one end of the 2" 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" pipe coupling onto the top of the mounting pipe.

5) Screw the optional mounting pipe with flange into the top of the pipe coupling.

FYI  Continue to the NGC Installation instructions. The method of installation must be consistent with the customer's company policy.

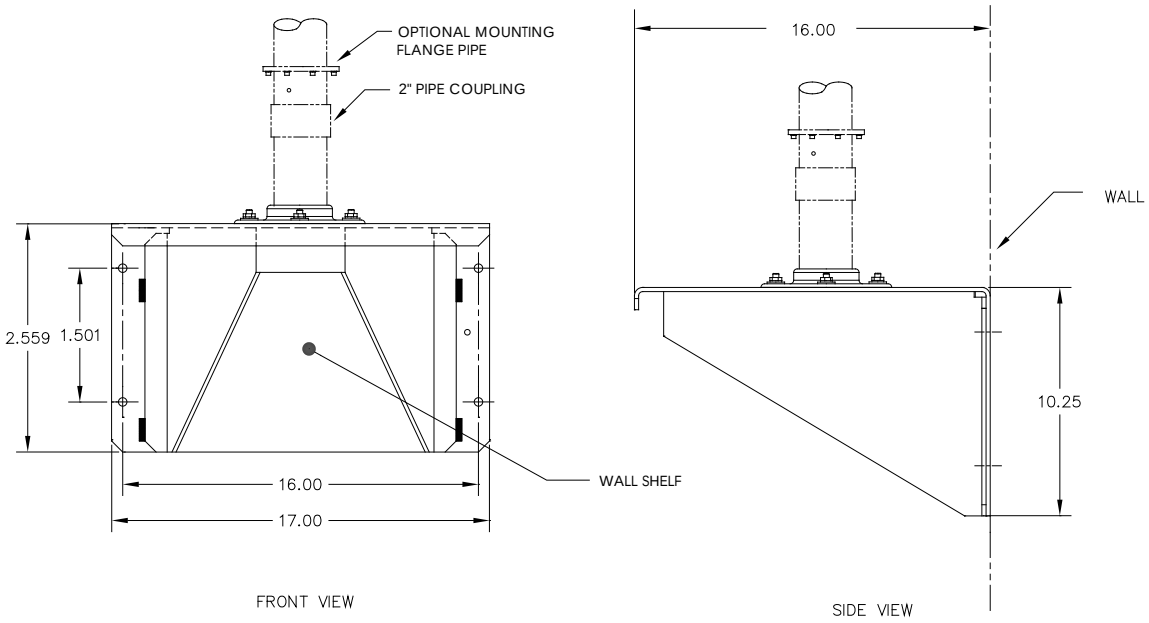


Figure 3-20 Shelf Installation

3.12 NGC Installation

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

Both the large and small environmental enclosures are shipped with the NGC mounting system installed inside the environmental enclosure. The following instructions should be followed to install the NGC onto the mounting pipe.

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

3.12.1 Materials

- Installed mounting pipe
- 4 ea. 5/16” hex socket screws (optional for use with mounting pipe with flange kit)
- NGC

3.12.2 Instructions

FYI 

When positioning the unit, take into consideration the mounting of the sample conditioning system, conduit locations and access to the rear end cap of the unit.

1) Position the NGC on top of the 2” pipe stand (see **Figure 3-21**), in close approximation to 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 NGC neck bottom (see **Figure 3-22**).

- For installation inside of an environmental enclosure, the front display of the unit 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 units, the unit would be oriented with the feed-through assembly also facing forward. Sufficient clearance is required when mounted near an inside corner.
- Otherwise, continue to the next step.

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

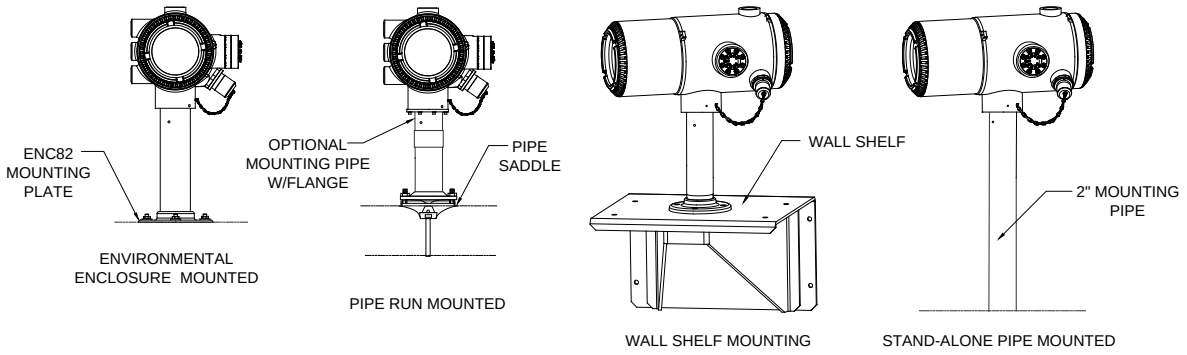


Figure 3-21 NGC Mounting

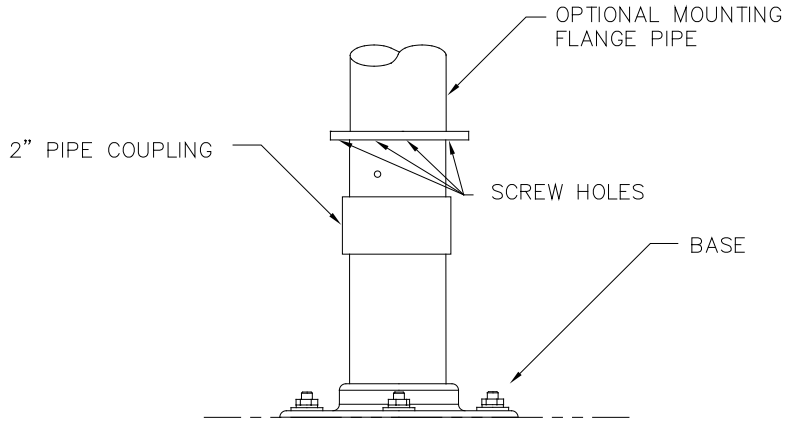


Figure 3-22 NGC Optional Mounting Flange Pipe

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 unit and tighten using ¼” 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 unit and retighten.

3.13 Sample Conditioning Module Installation

3.13.1 Materials

- Installed NGC

- Single or multiple module mounting kit (see Figure 3-23)
- 1 ea. .312 x 2.5 x 3.62 x 1.5 U-bolt
- 2 ea. 5/16” SST split washer
- 2 ea. 5/16” SST flat washer
- 2 ea. 5/16-18 SST lock nut
- Sample conditioning module(s) and hardware (see Figure 3-23 and Figure 3-24)

3.13.2 Mounting Kits

Both the 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.

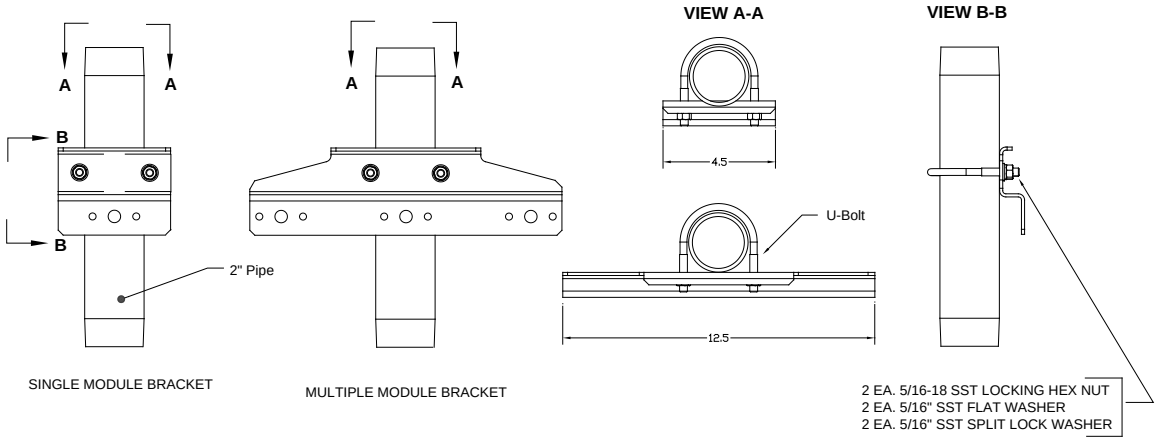


Figure 3-23 Sample System Mounting Kits

3.13.3 Instructions

CAUTION

When installing module bracket inside of the ENC82S small environmental enclosure, mounting bracket must be installed upside down to allow for required space. Otherwise, module bracket installed inside of the ENC82L large environmental enclosure should be oriented as shown in Figure 3-24.

1) On the sample conditioning module, align the mounting holes to the corresponding holes in the bracket. See the caution 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 step 4 for the other side of the U-bolt.

7) Move the bracket into position underneath the NGC, being careful to allow clearance for the sample conditioning module(s).

8) Tighten both nuts.

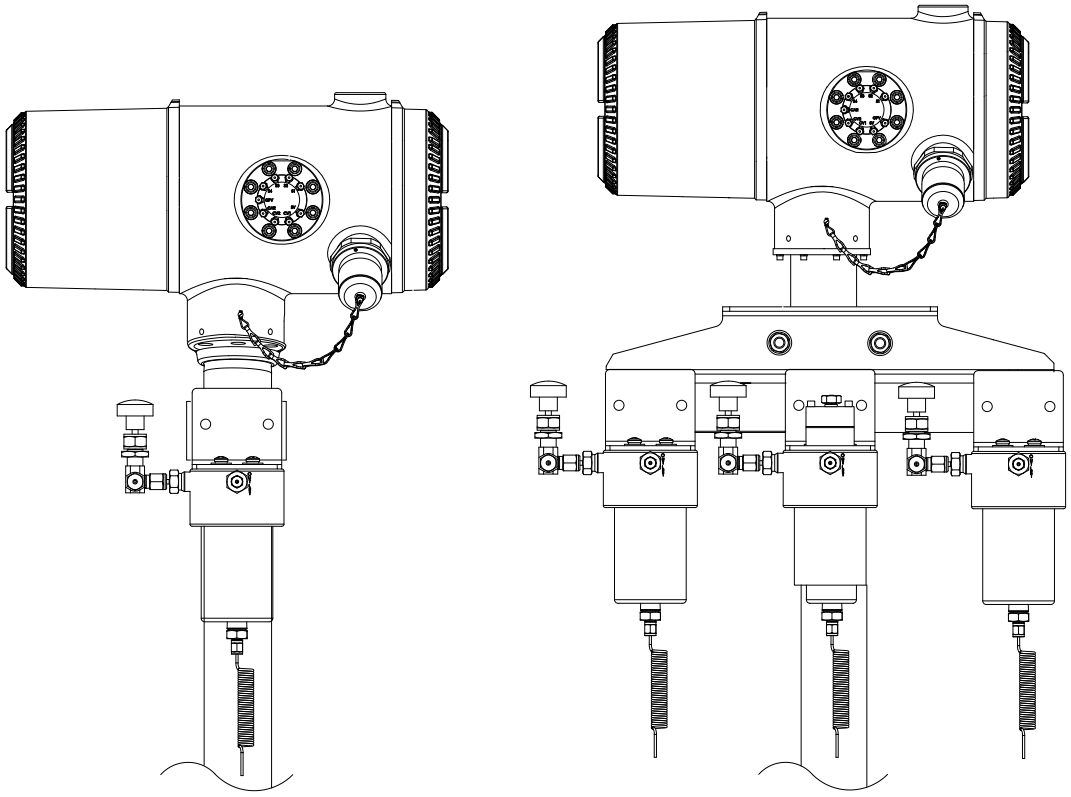


Figure 3-24 ***Single and Multiple Stream Sample Conditioning Assemblies***

3.14 Sample Line Connections

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

TIP If the sample conditioning module and NGC are located inside an ENC82, review the following sub section, **Sample Line Connections** to NGC Inside of the ENC82, for information pertaining to this installation.

3.14.1 Materials

- 1/8” 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.
- 2 ea. ferrule and nut (for each sample stream)
- 1 ea. ¼” NPT to 1/8” reducer or other size as determined from the sample probe output port (for each sample stream)
- 1 ea. sample conditioning module transport tubing (supplied with sample conditioning module).

3.14.2 Instructions

TIP Be certain that the ends of stainless steel tubing are open and not restricted.

1) Locate the sample input fitting on the sample conditioning module (see Figure 3-25).

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.

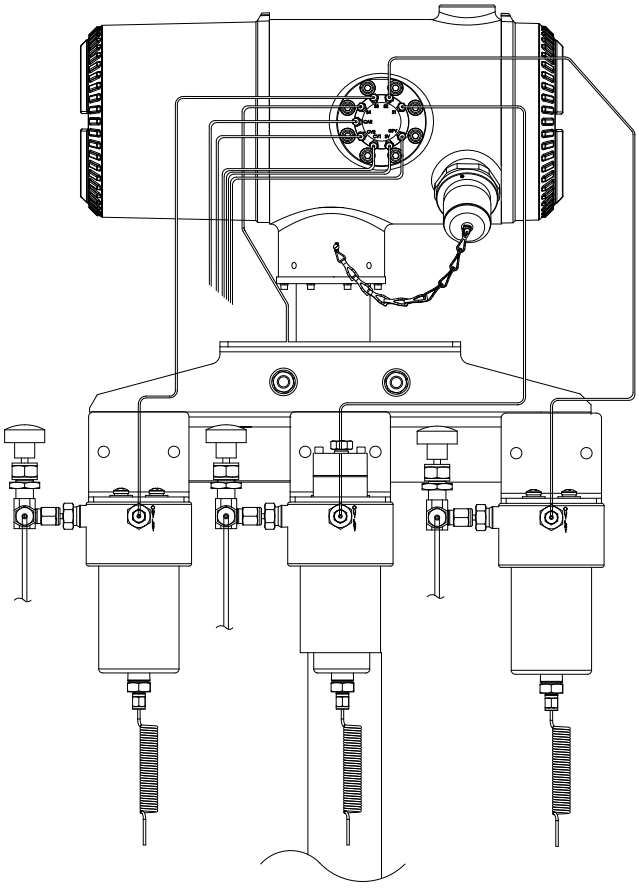


Figure 3-25 Sample Conditioning Module Line Connections

TIP If sample conditioning module and NGC are located inside a ENC82, review the following sub section, **Sample Line Connections** to NGC inside of environmental enclosure, for information pertaining to this installation.

FYI 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 NGC feed-through assembly and remove the sealing screw.

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.

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 ferrule and Valco nut into the input on the NGC 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 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.

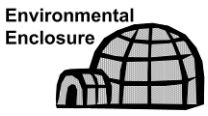
Be sure to follow requirements of national and local codes when performing this purge.

16) Insert the tubing with the ferrule into the corresponding input port located on the NGC feed-through assembly. Move the Valco nut down onto the ferrule, screw into port and tighten.

17) Repeat for each sample stream.

Do not over-tighten. After securing tubing, check for gas leaks.

3.15 Sample Line(s) to NGC Inside of ENC82



Sample line(s) being installed to a unit located inside the ENC82 require making minute changes to the instructions listed for their installation. The following information and steps should be noted during the installation.

3.15.1 Materials

- Installed sample conditioning module for each stream.
- 1/8” SST chromatography grade transport tubing (amount to be determined by technician based on distance from sample probe to sample conditioning module and number of sample streams.
- 2 ea. ferrule and nut (for each sample stream)
- 1 ea. ¼” NPT to 1/8” reducer or other size as determined from sample probe output port (for each sample stream)
- 1 ea. sample conditioning module transport tubing (supplied with sample conditioning module).
- 1/16” or larger vent tubing and materials for making connection to 1/16” purge coil to vent outside of enclosure (provided by customer for each stream)
- Heat trace materials provided by customer for each stream

3.15.2 Instructions

TIP Be certain that the ends of stainless steel tubing are open and not restricted.

1) Locate the sample input fitting on sample conditioning module (see Figure 3-26) and sample output fitting on installed sample probe..

2) Locate the sample boot on side of environmental enclosure. Sample lines must feed through the sample boot located on the side of the enclosure.

3) Measure and cut SST tubing to required length. Feed sample tubing through sample boot.

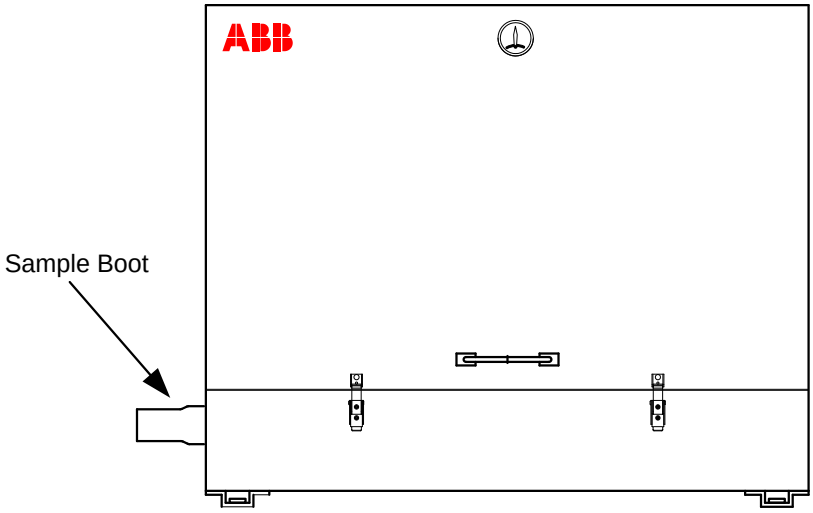


Figure 3-26 ENC82L–Environmental Enclosure Sample Boot

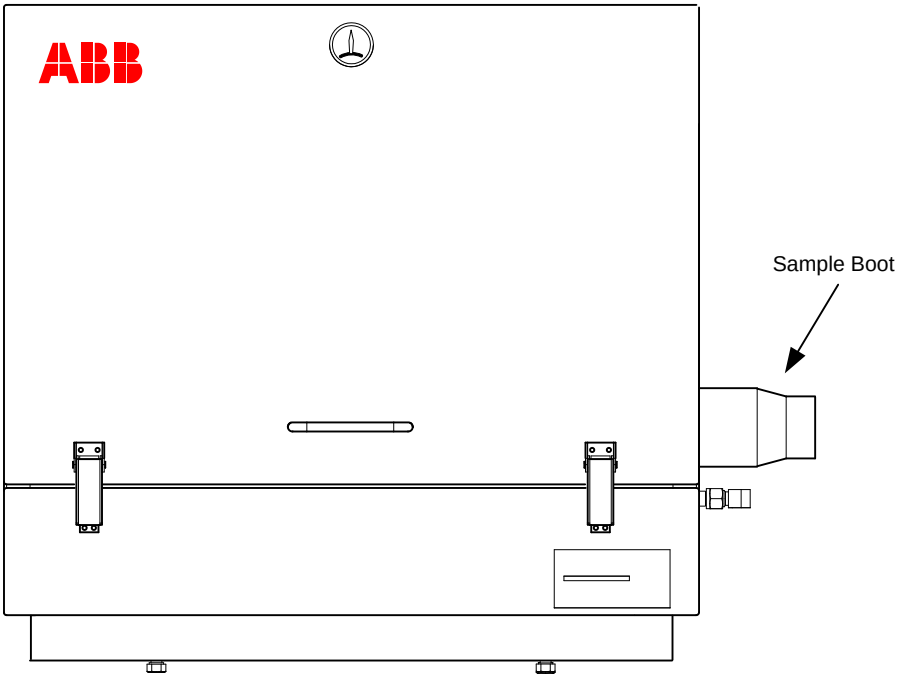


Figure 3-27 ENC82S–Environmental enclosure Sample Boot

4) If necessary, install reducer into sample probe output fitting.

5) Install ferrule and nut onto one end of the sample tubing.

6) Insert tubing with ferrule into reducer/sample probe output fitting. Move nut down onto ferrule, screw onto fitting and tighten.

7) Install ferrule and nut onto other end of the sample tubing.

8) Insert ferrule into sample conditioning module input fitting. Move nut down onto ferrule, screw onto fitting and tighten.

9) Locate sample output fitting on sample conditioning module.

10) Locate sample input on NGC feed-through assembly and remove sealing screw.

CAUTION Leave 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.

11) Make necessary bends in the tubing to ease installation of the tubing into the output fitting on the sample conditioning module, and the ferrule and Valco nut into the input on the NGC feed-through assembly.

12) 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.

13) Remove plastic caps from restrictor coils, sealing screws from feed-through column vents and sealing screw from sample vent lines.

14) Purge air from the transport tubing by opening the shut-off valve located on the sample probe.

WARNING Be sure to follow requirements of national and local codes when performing this purge.

15) Insert the tubing with the ferrule into the corresponding input port located on the NGC feed-through assembly. Move the Valco nut down onto the ferrule, screw into the port and tighten.

16) Repeat for each additional sample stream.

CAUTION Do not over-tighten. After securing the tubing, check for gas leaks.

17) Measure and cut vent tubing to sufficient length to guarantee that purge coils vent outside of enclosure. Feed vent tubing through the sample boot.

18) Make necessary bends in the tubing to ease installation of the tubing into the required fittings on the end of the sample conditioning module purge coil.

19) Follow Heat Trace manufacturer's suggested installation instructions for applying Heat Trace equipment to additional sample streams.

3.16 ENC82L Optional Pwr/Comm Outlet Box Assembly

If installing the NGC inside a ENC82, use this procedure to install the optional RS-232/RS-485/RS-422 outlet box if required; otherwise, continue to the next applicable instructions. Before beginning, review the procedure and the materials required for installation.

FYI  These instructions are only applicable to the large environmental enclosure. This option is not available for the small enclosure.

3.16.1 Materials

- 1 ea. outlet box assembly
- 1 ea. internal NGC connection assembly
- 1 ea. flexible cable assembly
- 1 ea. DC power switch box
- 1 ea. support bracket
- 2 ea. 10-32 x ¾" SS pan head screw, phillips
- 2 ea. #10 SST flat washer
- 2 ea. #20 SST split washer

3.16.2 Customer-Supplied Materials

- 14 AWG wire
- Materials for external wiring (to outlet box) not provided by Totalflow. Quantity to be determined by the technician based on installation and local codes.

3.16.3 Instructions

1) Gain access to rear termination panel by loosening the countersunk hex socket locking set screw in the rear end cap using a 1/16" hex wrench, then unscrewing the end cap.

2) Remove hub plug from the bottom most access hub.

3) Beginning with the internal connection assembly (see **Figure 3-28**), feed the 13" wire bundle (elbow end of assembly) through the open hub. Continue to pull wire past the terminations until the nipple fitting is in position to screw into the hub.

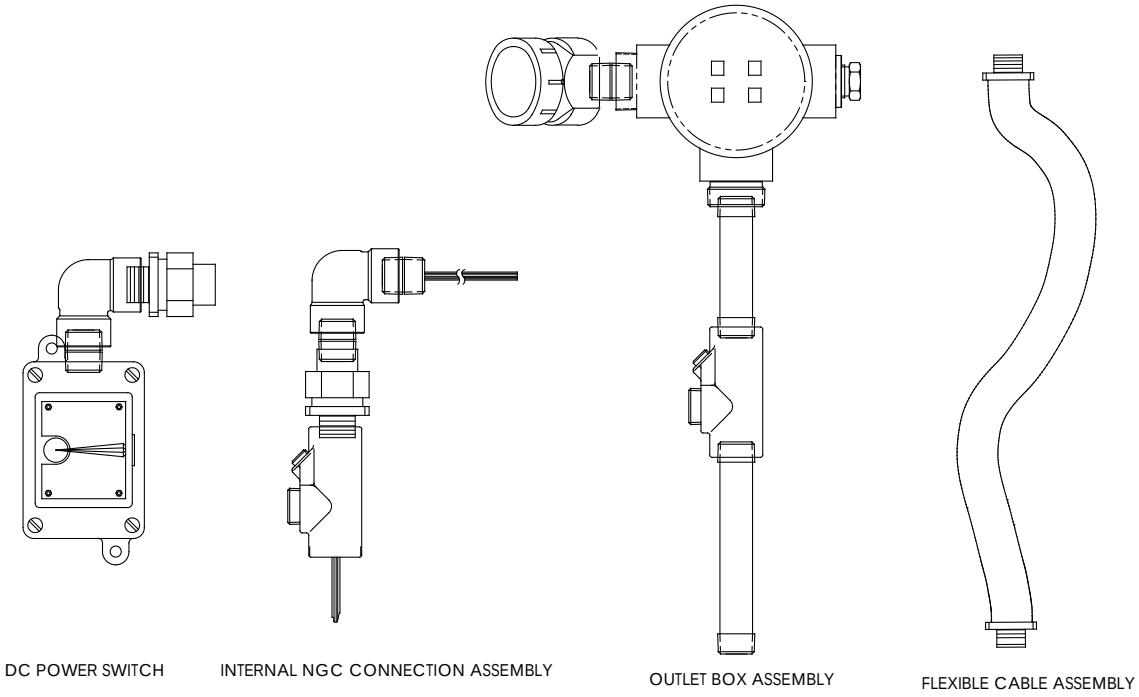


Figure 3-28 Power Communication Outlet Box Assembly

4) Moving the assembly clockwise, screw the nipple fitting into the hub until the assembly is tight and hanging straight down at a 180˚.

5) Feed the other end of the wire bundle through the flexible cable assembly, beginning at end with the sealing gasket, until threads meet the conduit seal.

6) Rotate the flexible cable assembly clockwise, screwing threads into the conduit seal until tight. For explosion-proof installations, a minimum of 5 threads must be engaged.

7) Feed wires through the small hole located near the sample boot in the lower front of the enclosure (see **Figure 3-29)**.

8) Remove the cover from the outlet box assembly.

TIP Remove the elbow cap on the outlet box assembly to facilitate feeding the wrapped wire around the elbow.

9) Feed wires through the outlet box elbow and out past the wiring panel, moving the assembly up to the threaded end of the cable.

10) Begin threading the outlet box assembly onto the end of flexible cable assembly, rotating the entire outlet box assembly clockwise until snug and in a vertical (360˚) position. For explosion-proof installations, the final assembly must have a minimum of 5 threads engaged.

11) Locate the support bracket mounting holes on the enclosure.

12) Place the split washer, then a flat washer on the end of each screw.

13) Insert the screw through the mounting bracket and into the hole on the side of the enclosure.

14) Using a phillips point screwdriver, start the screw into hole, but do not tighten.

15) Repeat steps 13 through 15 for the second screw.

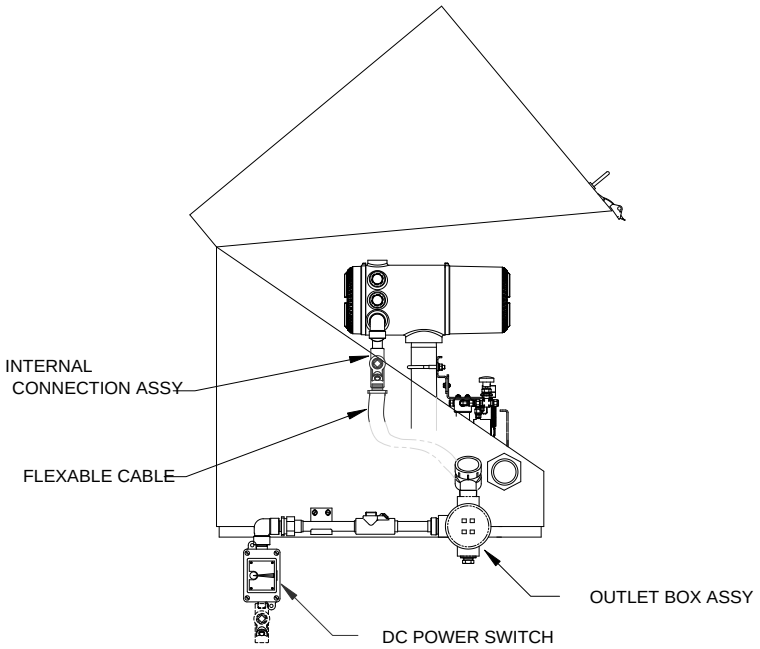


Figure 3-29 ENC82L Large Enclosure

16) Locate the support bracket mounting holes on the enclosure.

17) Place the split washer, then a flat washer on the end of each screw.

18) Insert the screw through the mounting bracket and into the hole on the side of the enclosure.

19) Using a phillips point screwdriver, start the screw into the hole, but do not tighten.

20) Repeat steps 13 through 15 for the second screw.

21) Level the bracket and tighten the screws until snug.

22) Move the outlet box assembly down so that it rests on the mounting bracket (see **Figure 3-30**).

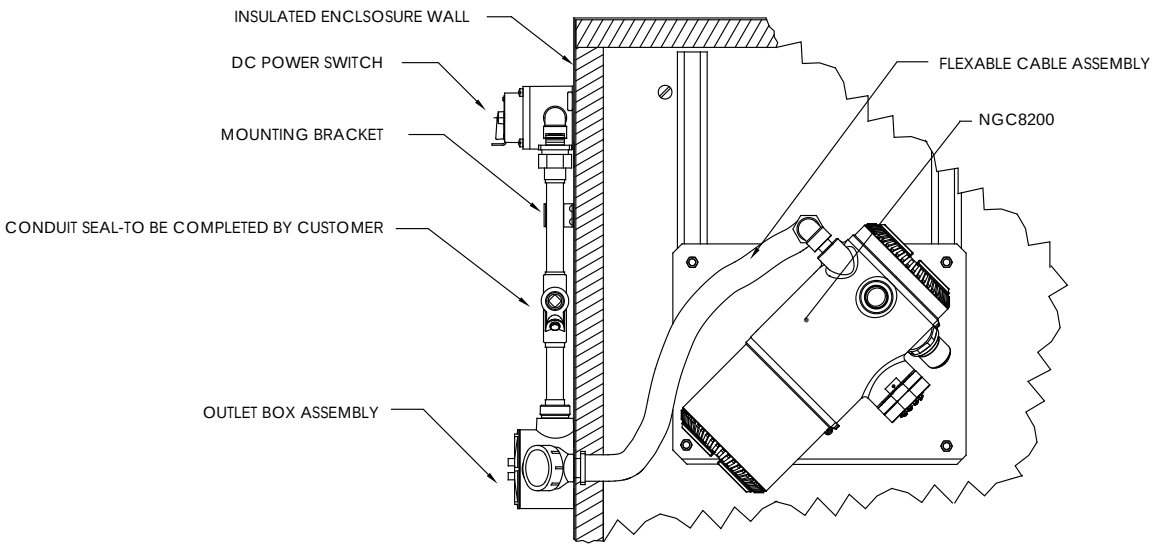


Figure 3-30 Assembled Power/Communication Assembly

23) At the NGC termination panel, trim and strip the wire ends.

24) Remove the power field termination J1 connector from the termination panel.

25) Using the wiring instructions in **Figure 3-31**, install each wire into the correct terminal and replace the connector on the board.

26) Trim and strip wire ends located in the external outlet box.

27) Remove the power field termination J3 connector from the outlet box panel.

28) Using the wiring instructions in **Figure 3-31**, install each wire into the correct terminal and replace the connector on the board.

29) Remove the DC power switch box cover.

30) Remove the switch mounting screws and remove the switch.

31) Cut a 3' length of power (+) wire.

TIP Optionally, communication wires may be run directly to the spare conduit hub located on the bottom of the outlet box assembly. Follow requirements of national and local codes.

For the purpose of this manual, assume that communication wiring will be included with the power wiring in one conduit run.

32) Tape the 3' power (+) wire, ground and communication wire ends together.

33) Feed through the conduit hub located on the bottom of the DC power switch box, past the cover opening, around the elbow and out.

34) Continue pulling wire until approximately 2' of wire is extending out of the DC power switch box.

TIP Be careful to not pull the 3' power (+) wire past the DC power switch box opening.

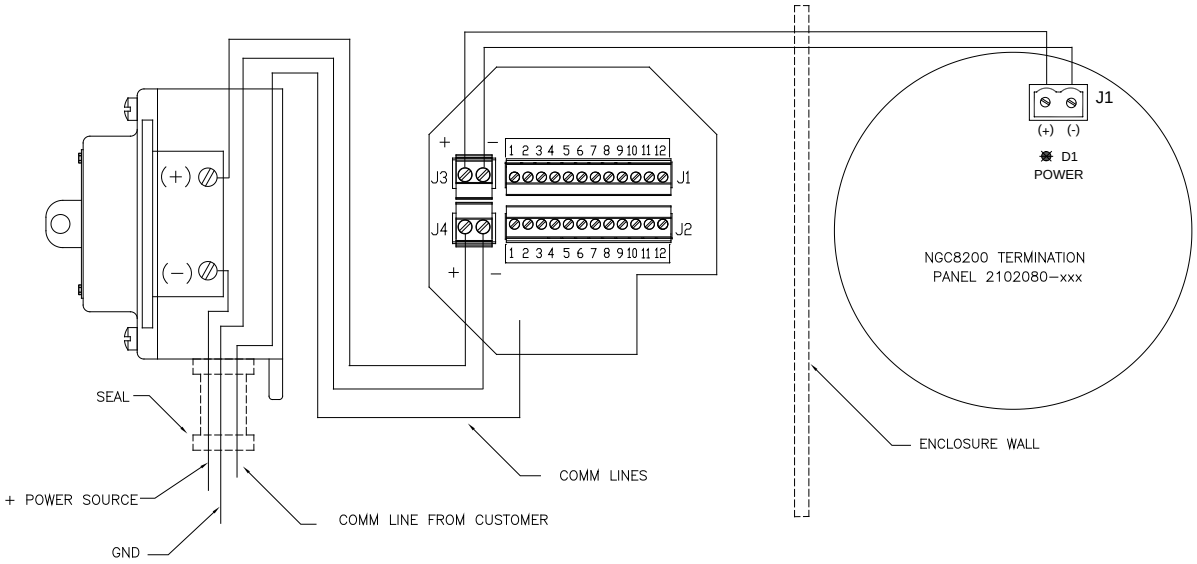


Figure 3-31 Power Wiring Diagram

35) Feed the excess wire through the 6” nipple fitting, conduit seal, 5” nipple fitting and out into outlet box opening. Pull sufficient wire to complete field wiring.

36) Remove the power field termination J4 connector from the outlet box panel.

37) Using the wiring instructions in **Figure 3-31**, install power (+) and power (-) wires into the correct terminal pins and replace the connector on the board.

38) Holding the wires, slide the DC power switch box up to the 6” nipple fitting on the end out the outlet box assembly.

39) Slide the conduit union onto the end of the nipple fitting and screw on.

40) Loosen the terminal screws on the DC power switch.

41) Using the wiring instructions in **Figure 3-31**, wire power (+) to upper terminal screw and tighten.

42) Bring the new power (+) wire into the power switch enclosure and pull the short length out to allow wiring.

43) Using the wiring instructions in **Figure 3-31**, wire the new power (+) length to the bottom terminal screw and tighten.

44) Re-install the DC power switch into the box.

45) Using the wiring instructions in **Figure 3-32** (RS-232), **Figure 3-33** (RS-485) or **Figure 3-34** (RS-422), make field connections to plug NGC termination panel com port(s), and re-insert into the corresponding connector in the termination panel.

46) Make field connections to plug J1, re-insert into corresponding connector in outlet box.

47) Make field connections to plug J2, re-insert into corresponding connector in outlet box.

FYI

Communication wiring terminations inside the power/communication outlet box assembly are pass-through connections, meaning that J1-pin 1 is associated with J2-pin 1. Therefore, pinouts may be user-defined and wiring instructions for this assembly are only suggestions.

CAUTION

External wiring and connections should be performed by an experienced technician and follow requirements of national and local codes.

48) Following the instructions included with the unit, complete the seal between the DC power switch and the outlet box assembly.

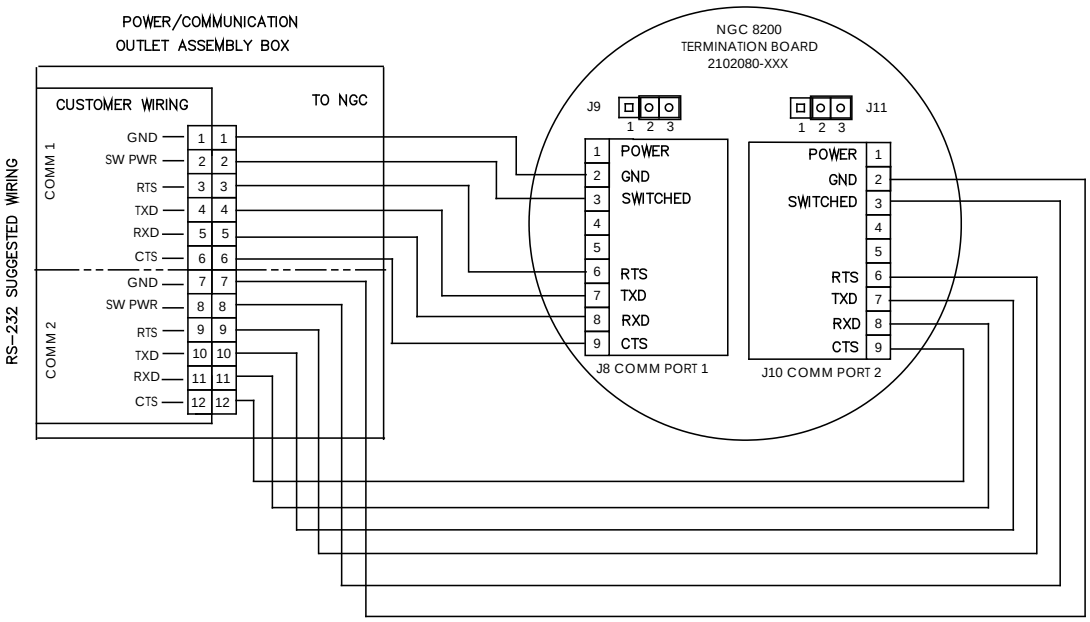


Figure 3-32 Suggested RS-232 Wiring Instructions

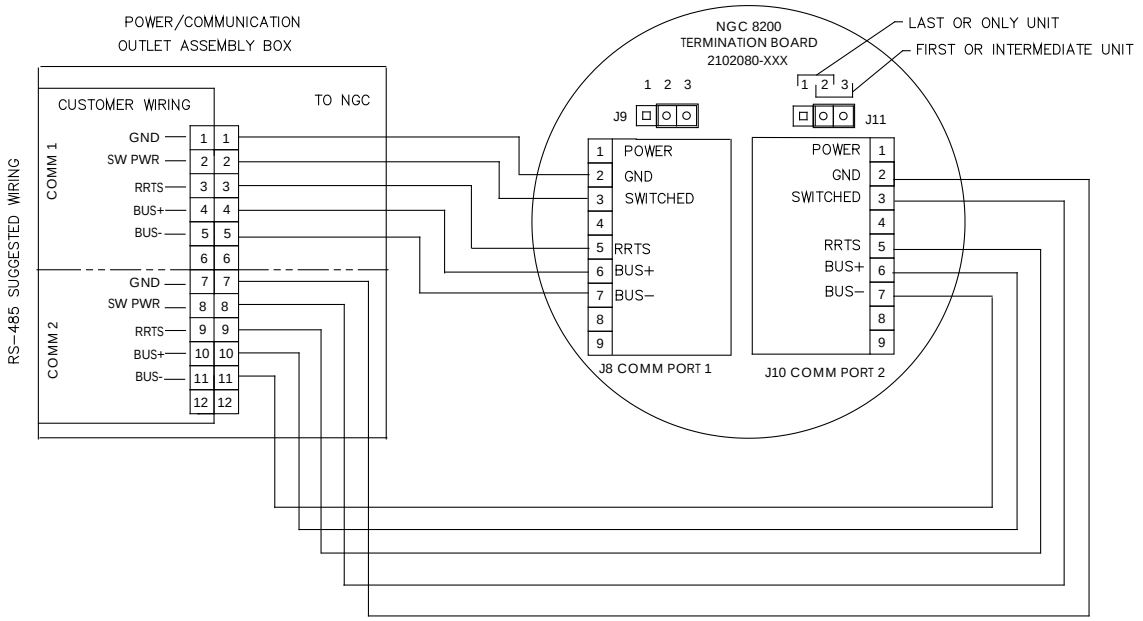


Figure 3-33 Suggested RS-485 Wiring Instructions

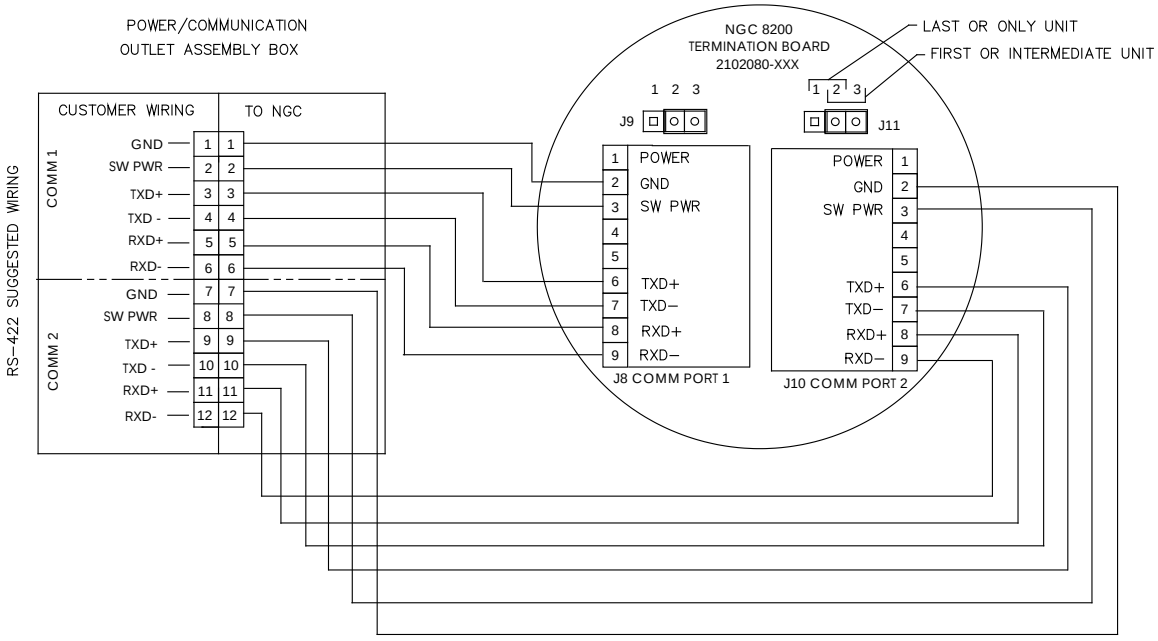


Figure 3-34 Suggested RS-422 Wiring Instructions

3.17 Carrier/Calibration Bottle Rack Installation on Meter Run

The carrier/calibration gas bottle rack is used to hold the carrier and calibration gas bottles on installations not using an environmental enclosure. A gas regulator should be installed on each gas bottle (see **Figure 3-35**). This bottle rack is not available through Totalflow; therefore, the instructions are generalized.

3.17.1 Instructions

1) Position the bottle rack in close proximity to the NGC.

2) Secure the rack to the pipe meter run with the provided mounting hardware.

3) Install both the carrier and calibration gas bottles in the rack.

4) Strap both bottles in the rack to prevent falling.

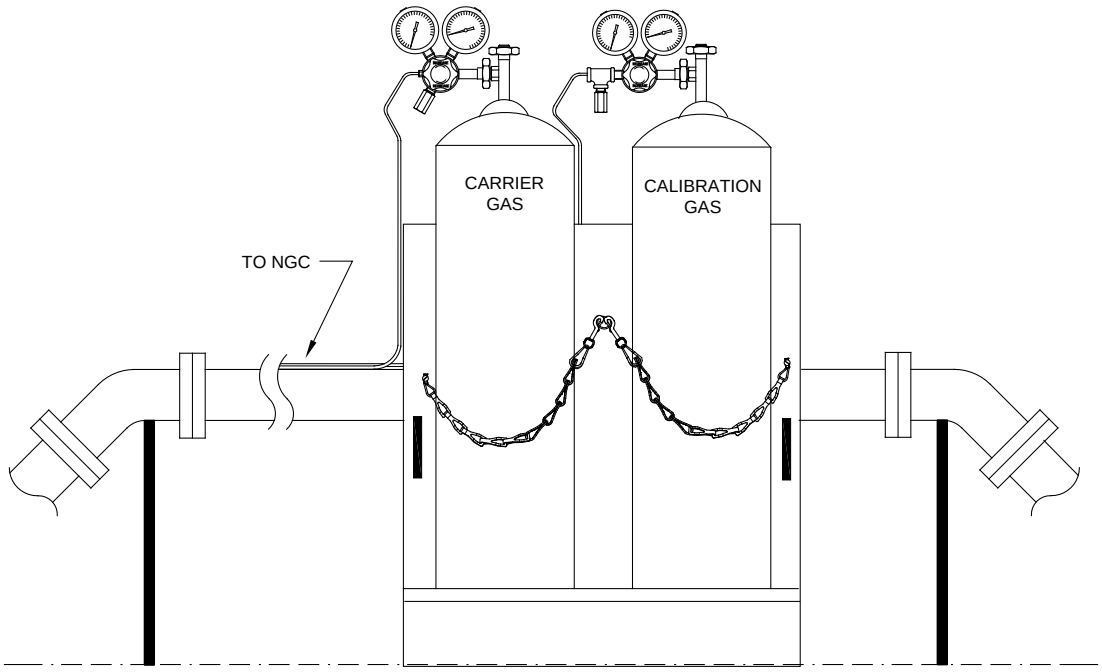


Figure 3-35 Carrier/Calibration Gas Bottle Rack Installation

3.18 ENC82 Carrier Gas Bottle Rack Installation

The carrier gas bottle rack is installed on the back of the ENC82L or the side of the ENC82S.

FYI

A gas regulator should be installed on each gas bottle (see Figure 3-36).

3.18.1 Materials

- 1 ea. bracket with chain assembly attached
- 2 ea. 3/8”-16 x 5/8 SST hex head bolt
- 2 ea. 3/8” SST split washers
- 2 ea. 3/8” SST flat washers

3.18.2 Instructions

1) Locate bracket holes on the rear of the large enclosure or the side of the small enclosure stand.

2) Place a split washer then a flat washer on one of the 5/8” bolts and insert through bolt hole located in the bottle rack bracket into the corresponding hole located along the bottom edge of the enclosure, then tighten (see Figure 3-37).

FYI Enclosure hole contains a captive nut.

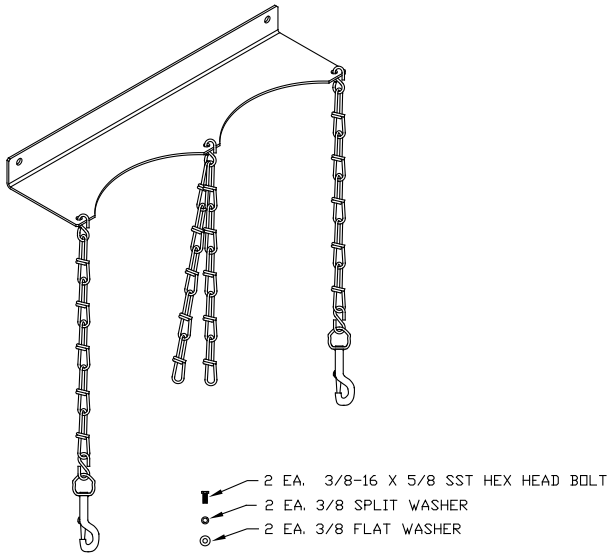


Figure 3-36 Dual Bottle Rack Assembly

3) Screw the bolt into the captive nut on the large enclosure or nut provided with small enclosure kit, tighten.

4) Repeat for second bolt.

5) Install carrier gas bottle in bottle rack.

6) Using chains, strap the bottle(s) to the rack by attaching a bolt snap to one of the center chains.

7) Repeat step 5 if installing a second bottle.

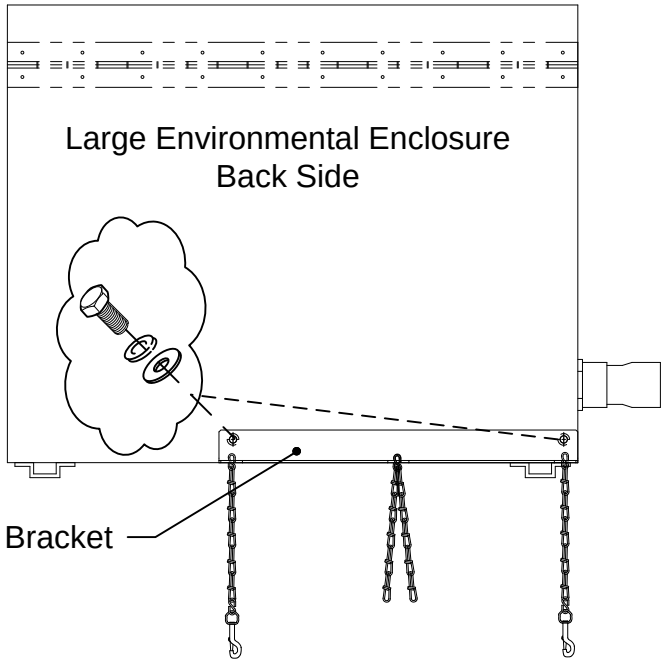


Figure 3-37 **ENC82L–Dual Bottle Rack Installation**

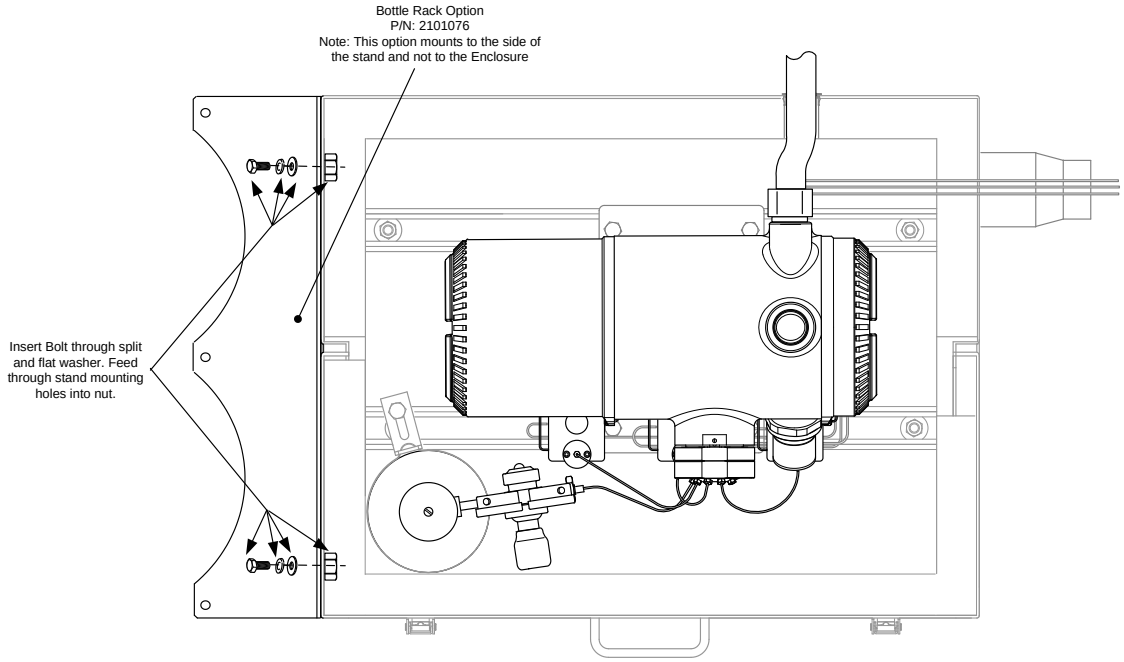


Figure 3-38 ENC82S–Dual Bottle Rack Installation

8) Install carrier gas bottle in bottle rack.

9) Using chains, strap the bottle(s) to the rack by attaching a bolt snap to one of the center chains.

3.19 Carrier Gas Regulator Installation

The following instructions are valid for all installations.

3.19.1 Materials

- Carrier regulator assembly with low pressure switch (see **Figure 3-39**)
- Installed carrier gas bottle

FYI These instructions assume that the carrier gas bottle has been installed.

3.19.2 Instructions

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 bottle outlet.

3) Screw the nut onto the thread and tighten.

WARNING Do not connect the low pressure switch directly to the NGC without a barrier.

4) Remove the J2 field wiring connector from the NGC termination panel located inside the rear of the enclosure (see **Figure 3-40**).

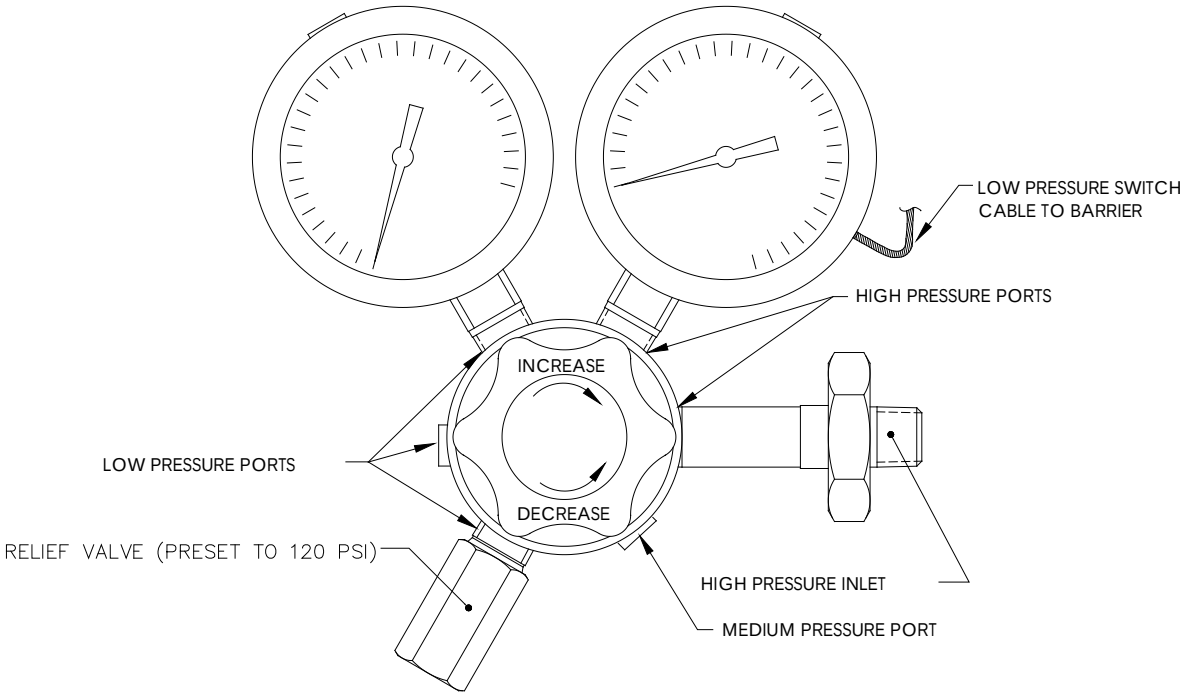


Figure 3-39 Carrier Gas Pressure Regulator with Relief Valve

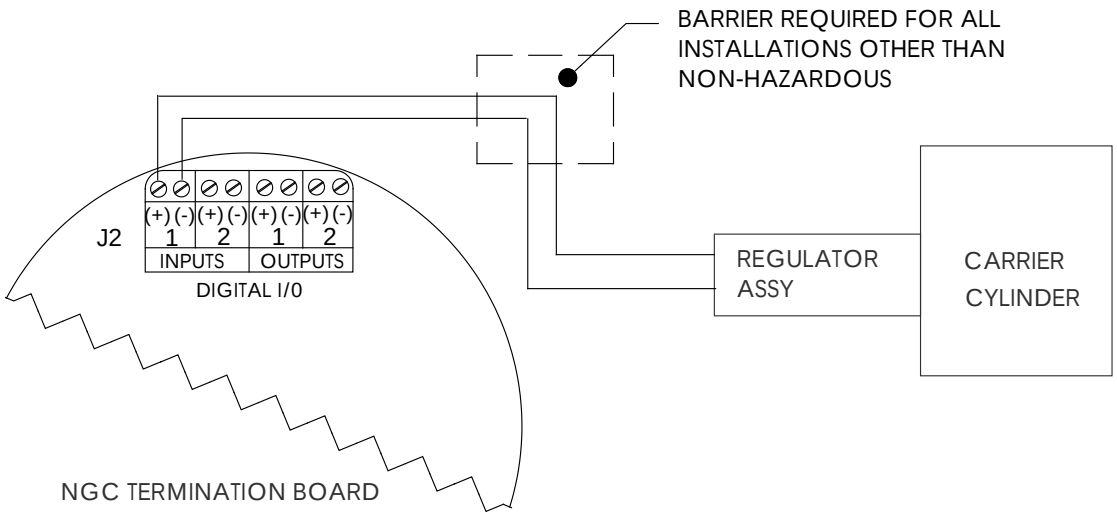


Figure 3-40 Carrier Gas Low Pressure Switch Wiring Instruction

5) Using a small flat blade screw driver, 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.

3.20 ENC82L Calibration Gas Bottle Installation

The calibration gas bottle mounting rack is used to hold the calibration gas bottle when located inside of the large environmental enclosure. Refer to **Figure 3-41**.

FYI A gas regulator should be installed on each gas bottle.

3.20.1 Materials

- Strapping material (shipped with environmental enclosure)
- Calibration gas blend bottle

3.20.2 Instructions

1) Locate the bottle bracket in the right front area of the environmental enclosure (see **Figure 3-41**).

2) Set the calibration bottle inside of the enclosure, situated against the bottle bracket.

3) Thread the strap through the holes in the bracket and around the bottle. Insert the end of the strap into worm gear.

4) Using a flat blade screw driver, turn the screw on worm gear until strap is snug.

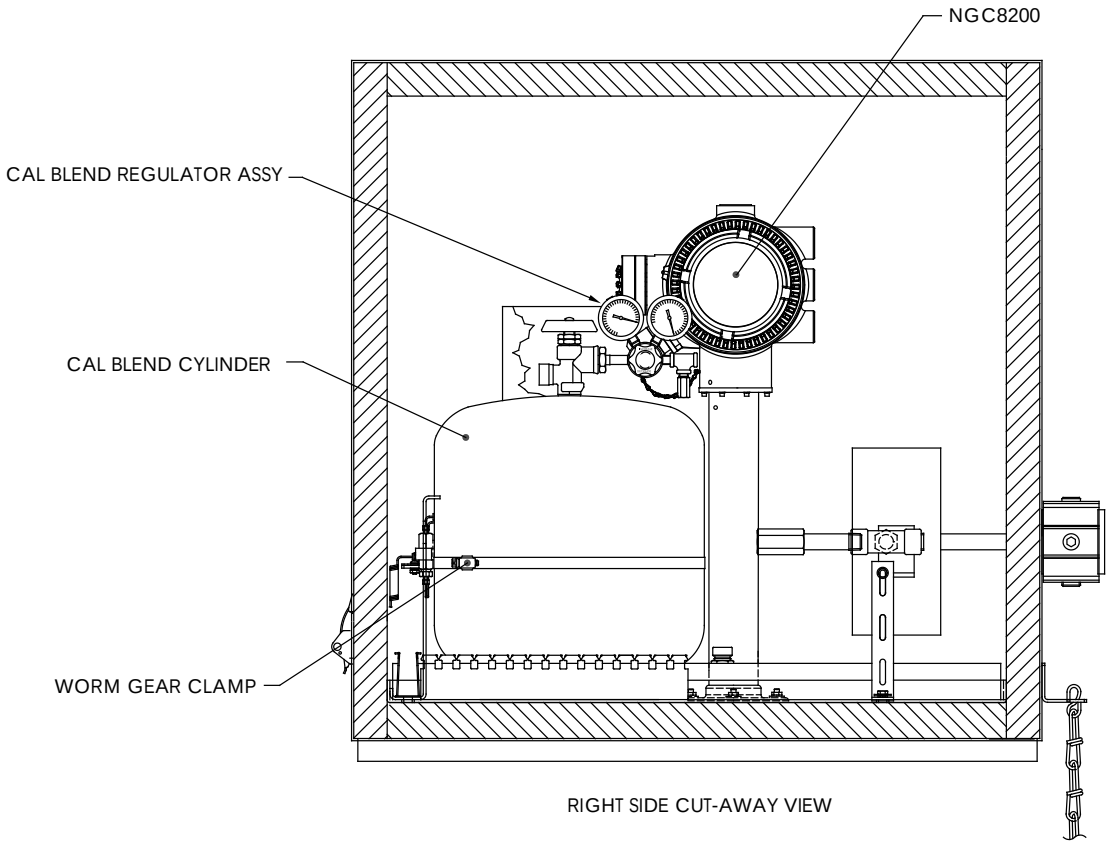


Figure 3-41 Calibration Bottle Location

3.21 ENC82S Calibration Gas Bottle Installation

The calibration gas bottle mounting rack is used to hold the calibration gas bottle when located inside of the small environmental enclosure. Refer to **Figure 3-42**.

FYI A gas regulator should be installed on each gas bottle.

3.21.1 Materials

- Strapping material (shipped with environmental enclosure)
- Calibration gas blend bottle

3.21.2 Instructions

1) Locate the bottle bracket and bottle clamp in the left front area of the environmental enclosure (see **Figure 3-42**).

2) Loosen the worm drive clamp if needed so that calibration bottle may be inserted through the clamp.

3) Set the calibration bottle inside of the clamp, situated against the bottle bracket.

4) Using a flat blade screw driver, turn the screw on the worm gear until the strap around the bottle is snug.

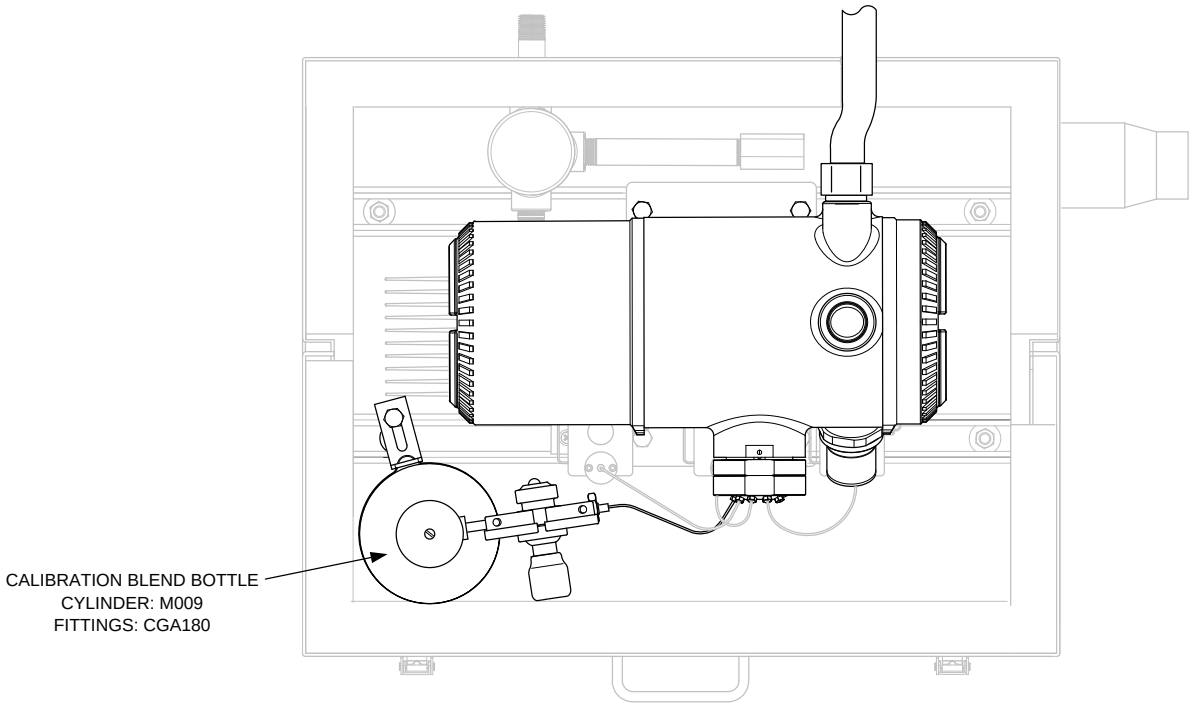


Figure 3-42 Calibration Bottle Location

3.22 Calibration Gas Regulator Installation

The following instructions are valid for all installations.

3.22.1 Materials

- Calibration blend regulator assembly with low pressure switch (see **Figure 3-43**)
- Installed calibration gas bottle

FYI These instructions assume that the carrier gas bottle has been installed.

3.22.2 Instructions

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 bottle outlet.

3) Screw the nut onto the thread and tighten.

4) Check for leaks.

WARNING Do not connect the low pressure switch directly to the NGC without a barrier.

5) Remove the J2 field wiring connector from the NGC termination panel located inside the rear of the main enclosure (see **Figure 3-44**).

6) Using a small flat blade screw driver, loosen DI2 pins 3 and 4.

7) Insert the red wire into the (+) terminal (pin 3).

8) Retighten pin 3.

9) Insert the black wire into the (-) terminal (pin 4).

10) Retighten pin 4.

11) Replace the termination connector in the J2 board connector.

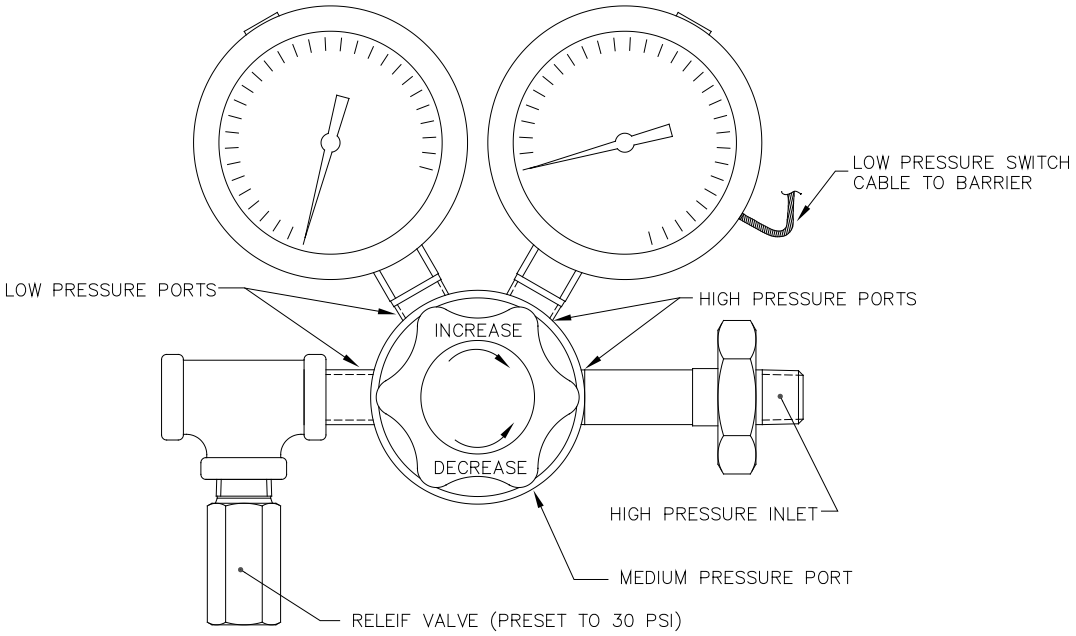


Figure 3-43 Calibration Gas Pressure Regulator with Relief Valve

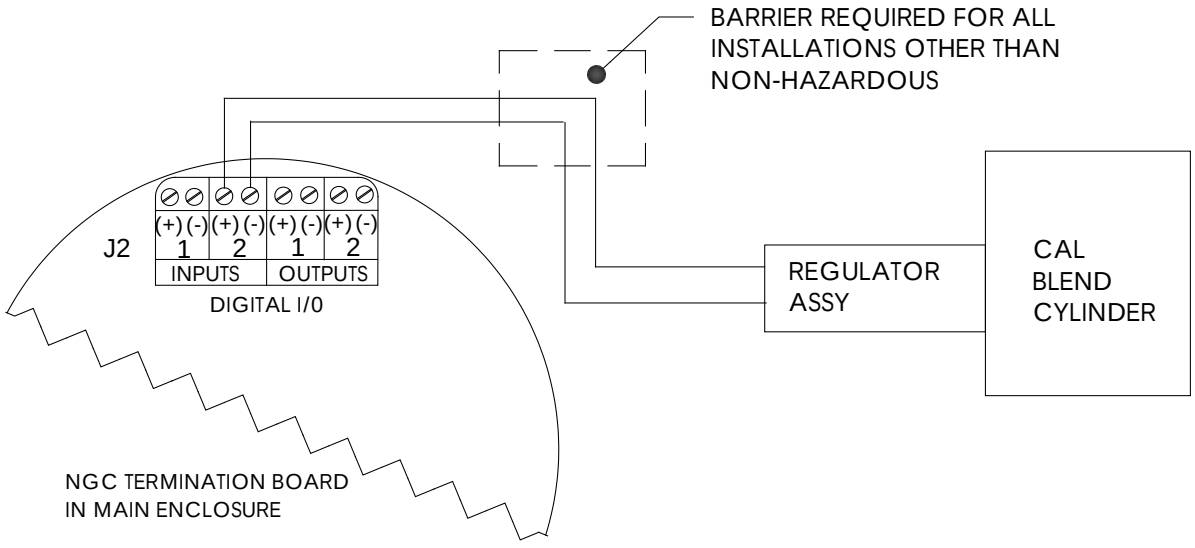


Figure *3-44 Calibration Blend Low Pressure Switch Wiring Instruction*

3.23 Carrier Gas and Calibration Gas 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 NGC. They are applicable for both a meter run and an environmental enclosure installation.

3.23.1 Materials

- Installed carrier gas pressure regulator
- 1/16” SST chromatography grade transport tubing (amount to be determined by the technician based on the distance from carrier gas bottle regulator to the sample input filter)
- Installed calibration gas pressure regulator
- 1/16” SST chromatography grade transport tubing (amount to be determined by the technician based on the distance from the calibration gas bottle regulator to the sample input filter)
- 4 ea. 1/16” ferrule and nut
- 2 ea. ¼” NPT to 1/16” reducer or other size as determined from the carrier/calibration gas regulator.

FYI These instructions assume that the regulators and gas bottles have previously been installed.

3.23.2 Instructions

1) Locate the carrier gas input port (CAR) on the NGC feed-through assembly (see **Figure 3-45**).

2) Locate the ¼” low pressure output fitting on the installed pressure regulator.

3) Measure and cut the 1/16” SST tubing to the required length.

4) Make the necessary bends in the tubing to ease the installation of the tubing into the NGC and pressure regulator.

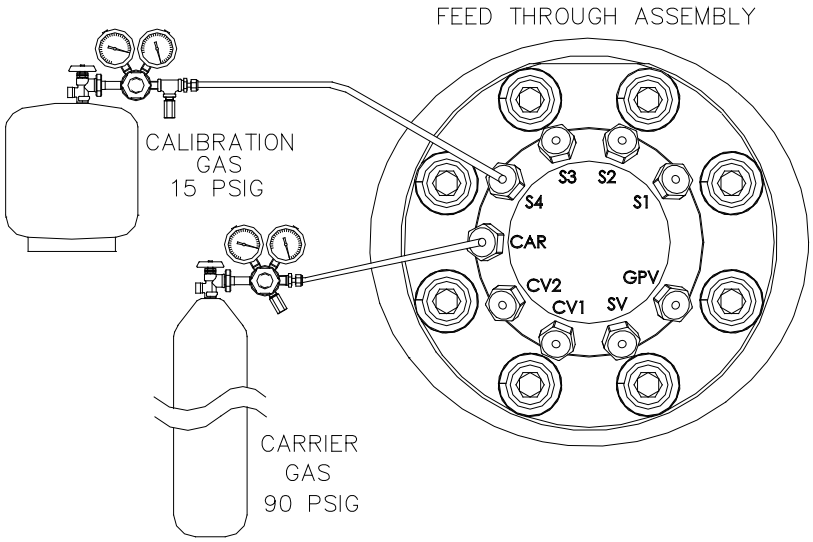


Figure 3-45 Carrier and Calibration Gas Connections

TIP 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 fitting, tighten.

7) Carrier gas pressure should be set at 90 PSIG.

8) Locate the carrier gas input (CAR) on the NGC feed-through assembly and remove the sealing screw.

CAUTION 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.

WARNING Be sure to follow the requirements of the national and local codes when performing this purge.

10) Insert the tube with the ferrule into the carrier gas input port (CAR) on the feed-through assembly. Move the Valco nut down onto the ferrule, screw into the port and tighten.

11) Determine the input port for the calibration gas (typically S4) on the NGC feed-through assembly (see **Figure 2-43**) and remove the sealing screw.

12) Locate the ¼" low pressure output fitting on the installed pressure regulator on the calibration gas bottle.

13) Measure and cut the 1/16" 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 NGC 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.

WARNING Be sure to follow the requirements of national and local codes when performing this purge.

19) Insert the tube with the ferrule into the calibration gas input port (S4) on the feed-through assembly. Move the Valco nut down onto the ferrule, screw into the port and tighten.

WARNING Leak test all gas connections when completed.

3.24 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 NGC 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 this installation.

3.24.1 Materials

- 4 ea. 1/16” ferrule and nut
- 4 ea. 1/16” SST vent tubing (supplied with NGC) or
- 4 ea. 1/16” SST tubing (amount to be determined by the technician based on the distance from the NGC to the external vent location)

3.24.2 Instructions

1) Locate the gauge port vent (GPV), sample vent (SV)), column vent 1 (CV1) and column vent 2 (CV2) ports on the NGC feed-through assembly (see **Figure 3-46**). 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 Valco nut down onto the ferrule, screw into the port and tighten.

If the vent tubing is not of sufficient length, measure and cut new tubing (not supplied by Totalflow). 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 Valco nut down onto the ferrule, screw into the port and tighten.

3) Repeat step 2 for all other vents as listed in step 1.

CAUTION 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.

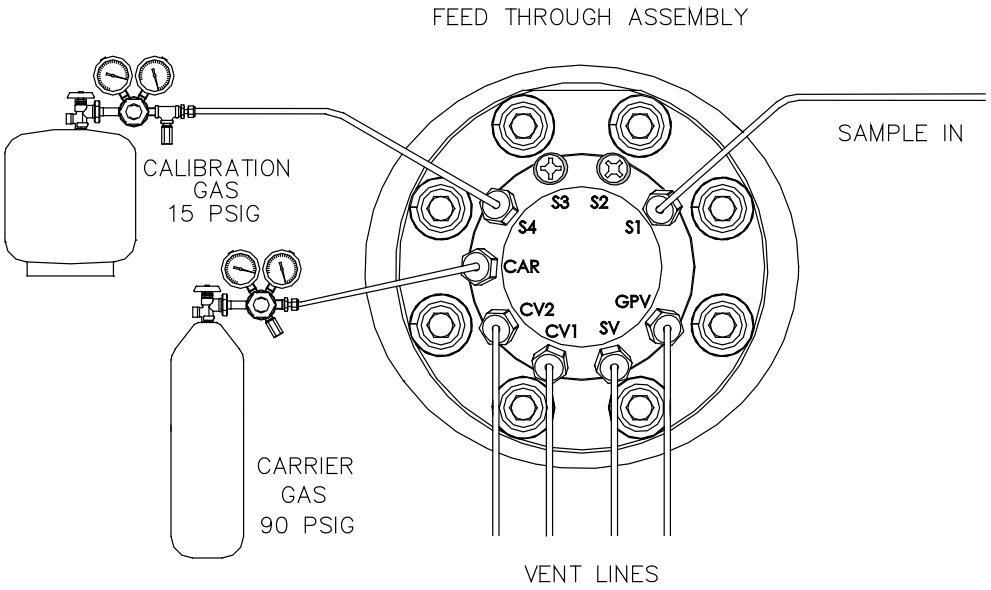


Figure 3-46 Vent Line Connections on Feed-through Assembly

3.25 ENC82L Optional Catalytic Heater Installation

The following procedures describe the steps for installing a catalytic heater for the environmental enclosure.

Verify the heater and fittings are approved for the classification rating of the area of installation.

These instructions are only applicable to the large environmental enclosure. In the small environmental enclosure the catalytic heater is already installed.

3.25.1 Materials

- Catalytic heater (installed at the factory)
- Thermostat assembly with temperature probe
- Regulator assembly with shut-off
- T assembly
- Tubing
- Filter/drain assembly
- Temperature probe mounting clip
- Teflon® tape
- ¼" male pipe connection from external gas source to catalytic heater. Materials for gas source are not be provided by Totalflow. Quantities and materials to be determined by the technician based on installation and local codes.
- DC power source wiring. Materials for external power source for electrical preheat wiring are not provided by Totalflow. Quantities and materials to be determined by the technician based on installation and local codes.

3.25.2 Instructions

1) Locate the installed catalytic heater on the rear of the environmental enclosure (see **Figure 3-47**).

2) Remove the protective end cap from the catalytic heater input fitting, if required.

3) Apply Teflon® tape to threads of the male end of the T assembly (see **Figure 3-48**).

4) Screw the threaded end of the T assembly into the ¼" female fitting located on the factory-installed catalytic heater, by turning the entire assembly clockwise until tight (see **Figure 3-49**).

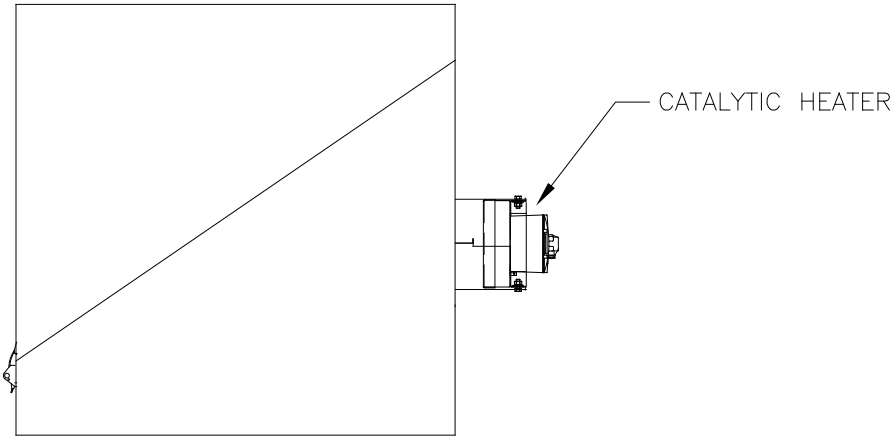


Figure 3-47 Catalytic Heater Option in Environmental Enclosure

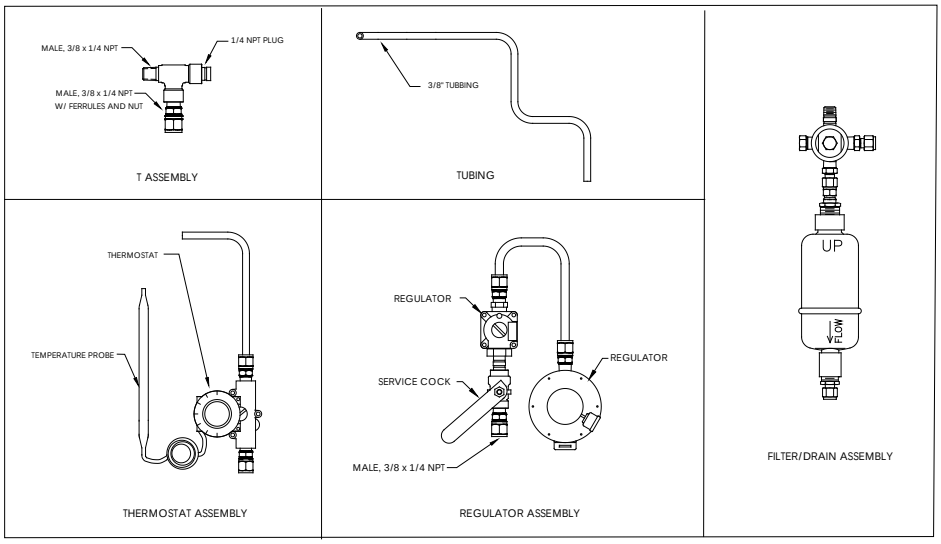


Figure 3-48 Catalytic Heater Assemblies

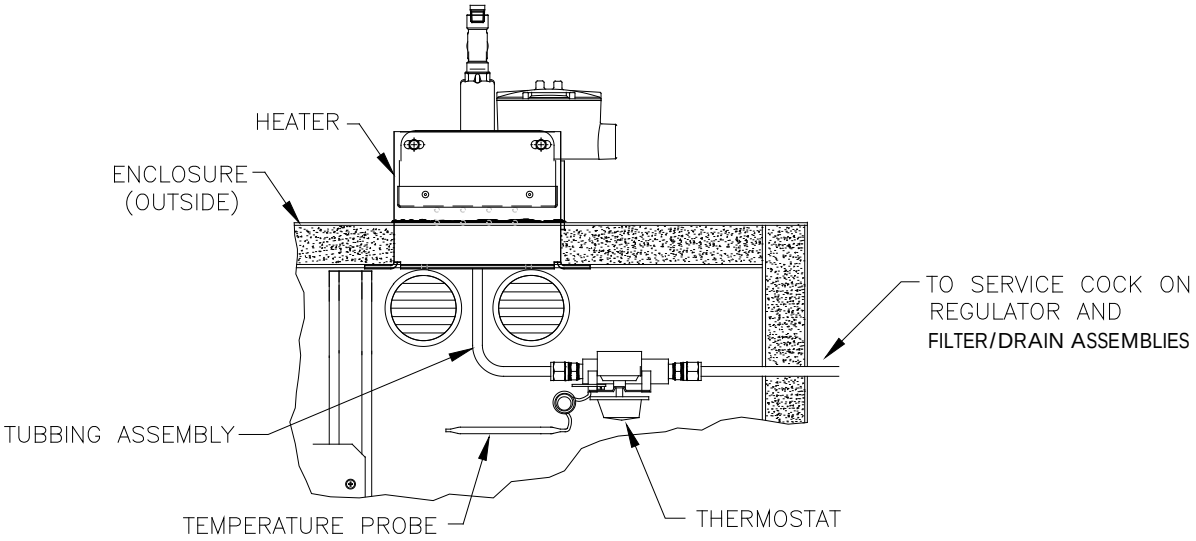


Figure 3-49 Thermostat Assembly Installed

5) Screw the threaded end of the T assembly into the ¼" female fitting located on the factory-installed Catalytic heater, by turning the entire assembly clockwise until tight (see **Figure 3-50**).

6) Remove ferrules and nut from the bottom of the T assembly. Apply Teflon® tape to threads.

7) Insert the short bent end of the 3/8" tubing closest to the longest straight portion of the tubing through the hole located below the catalytic heater.

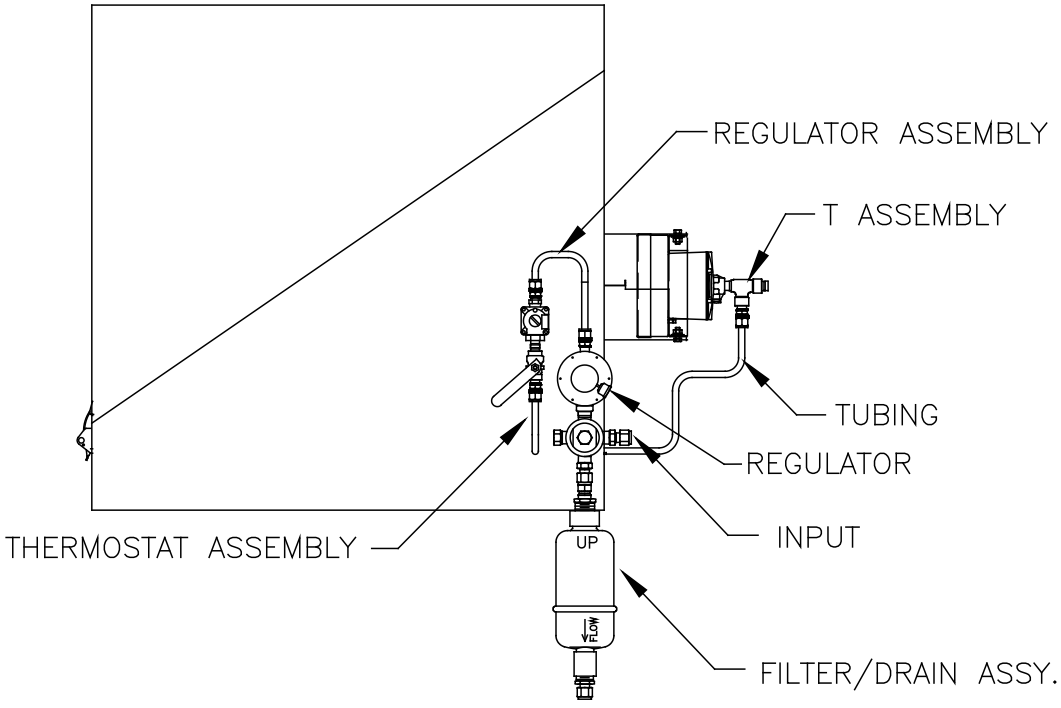


Figure 3-50 Regulator and Filter/Drain Assembly Installed

8) Place the nut, front ferrule and back ferrule onto the opposite end of the tubing and position so that the ferrules and nut screw onto the bottom of T assembly. Screw nut until tight.

9) Remove ferrules and nut from the thermostat end of the thermostat assembly. Apply Teflon® tape to threads.

10) Insert tube end of thermostat assembly through the exterior wall on the side of the enclosure (see Figure 3-50).

11) Place the nut, front ferrule and back ferrule onto the end of the 3/8" bent tubing inside of the enclosure. Position the thermostat assembly so that the nut and ferrules screw onto the thermostat assembly.

12) Remove the ferrules and nut from end of the regulator assembly closest to the service cock. Apply Teflon® tape to threads.

13) Place the nut, front ferrule and back ferrule onto the end of the thermostat assembly protruding from the enclosure.

14) Hold the regulator assembly with the curved tubing up, above the protruding tubing. Screw the ferrules and nut onto the nipple (see Figure 3-50).

15) Apply Teflon® tape to the port one nipple on the filter/drain assembly.

16) Insert the port one nipple on the filter/drain assembly into the output port on the regulator and tighten the nut.

17) Gently uncoil the temperature probe capillary tubing from the thermostat and insert through the hole located below the thermostatic gas valve, being careful to not crimp or make sharp bends in the capillary tubing (see Figure 3-51).

18) Remove mounting screw and washers from the right rear NGC mounting bracket (see Figure 3-51).

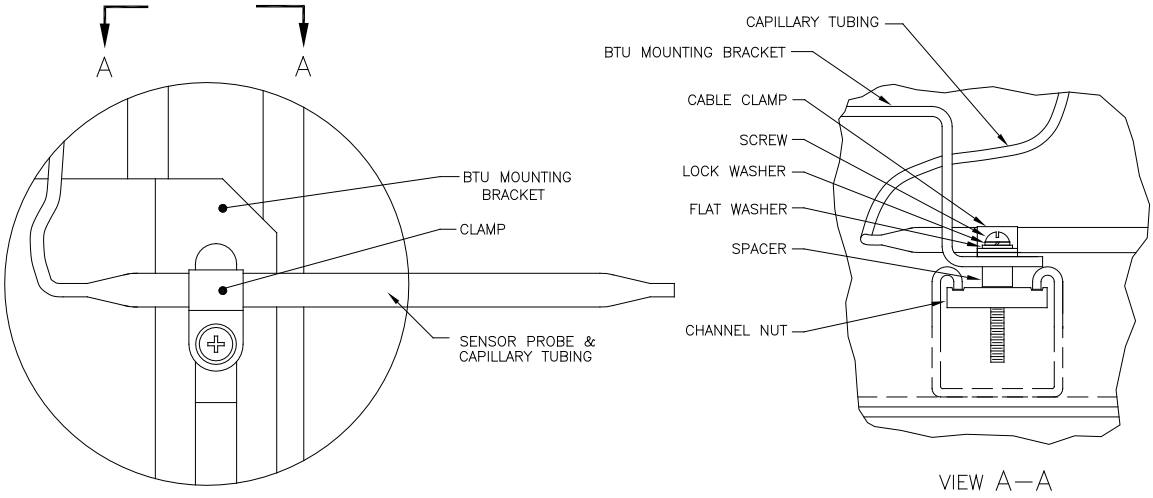


Figure 3-51 Temperature Probe Installation

19) Insert the screw with washers still in place through the hole located on the mounting clip and re-insert through the mounting bracket into the channel nut (see Figure 3-51).

20) Position the probe underneath the mounting clip. Tighten the screw into the channel nut to hold the probe in place.

The technician responsible for installing the gas supply must follow local and national codes.

21) Using the regulator manufacturer's instructions supplied with the regulator, make external gas connections.

The technician responsible for installing the power supply must follow local and national codes.

22) Using the wiring instructions shown in **Figure 3-52** and the manufacturer's instructions enclosed with heater, make external connections.

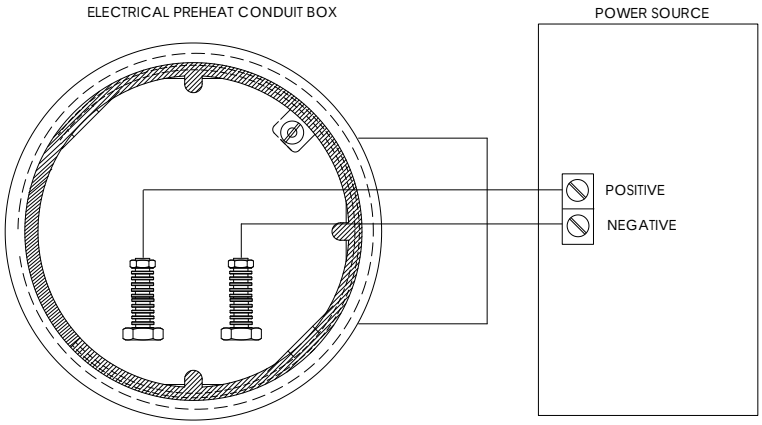


Figure 3-52 Electrical Pre-heater Wiring Instructions

3.26 ENC82S Optional Catalytic Heater Installation

These instructions are only applicable to the small environmental enclosure (ENC82S).

Verify the heater and fittings are approved for the classification rating of the area of installation.

If the optional catalytic heater is configured for the small environmental enclosure, external gas connections, electrical pre-heater wiring, and installation of the filter drain kit are all that are required.

3.26.1 Materials

- Teflon® tape
- ¼" Male pipe connection from external gas source to catalytic heater. Materials for gas source are not provided by Totalflow. Quantities and materials to be determined by the technician based on installation and local codes.
- DC power source wiring. Materials for external power source for electrical preheat wiring are not provided by Totalflow. Quantities and materials to be determined by the technician based on installation and local codes.

3.26.2 Instructions

WARNING The technician responsible for installing the gas supply must follow local and national codes.

1) Using the manufacturer's instructions supplied with the regulator, make external gas connections.

2) Apply Teflon® tape to the port one nipple on the filter/drain assembly.

3) Insert the port one nipple on the filter/drain assembly into the output port on the regulator and tighten the nut (see **Figure 3-53**).

WARNING The technician responsible for installing the power supply must follow local and national codes.

4) Using the wiring instructions shown in **Figure 3-52** and the manufacturer's instructions enclosed with heater, make external connections.

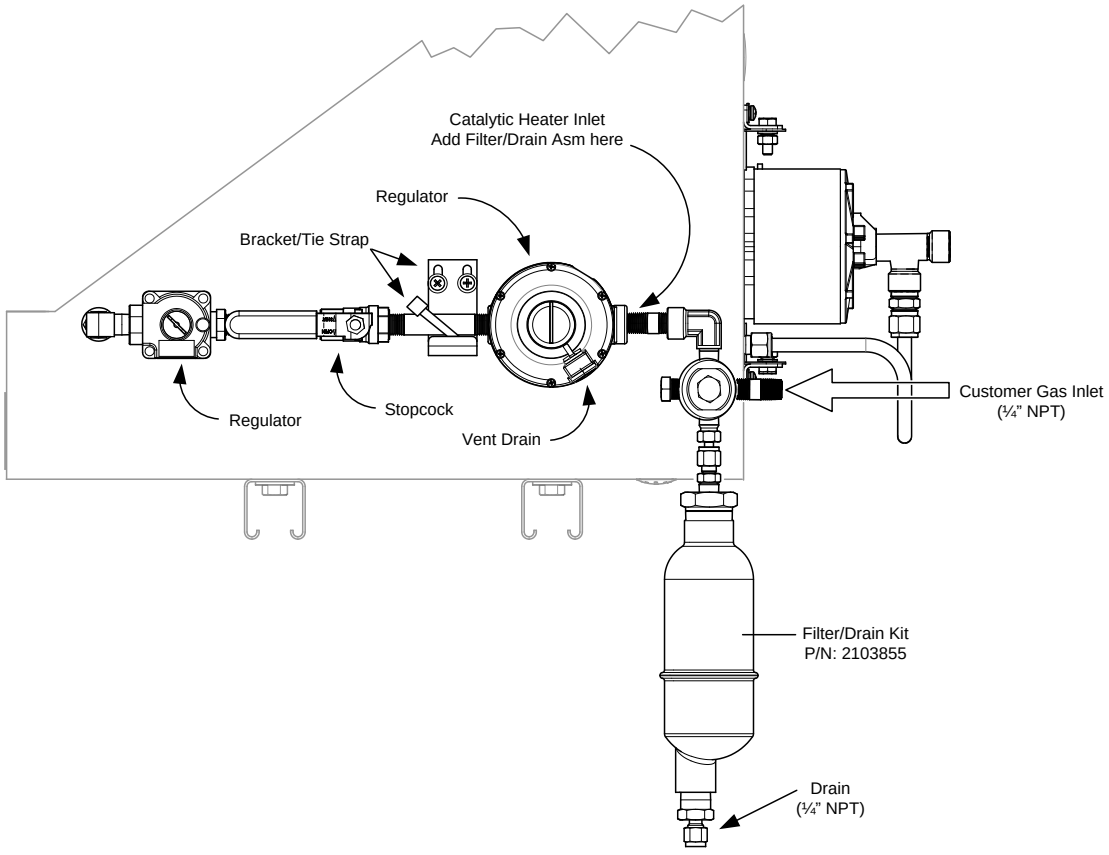


Figure 3-53 ENC82S Filter/Drain Assembly Installation

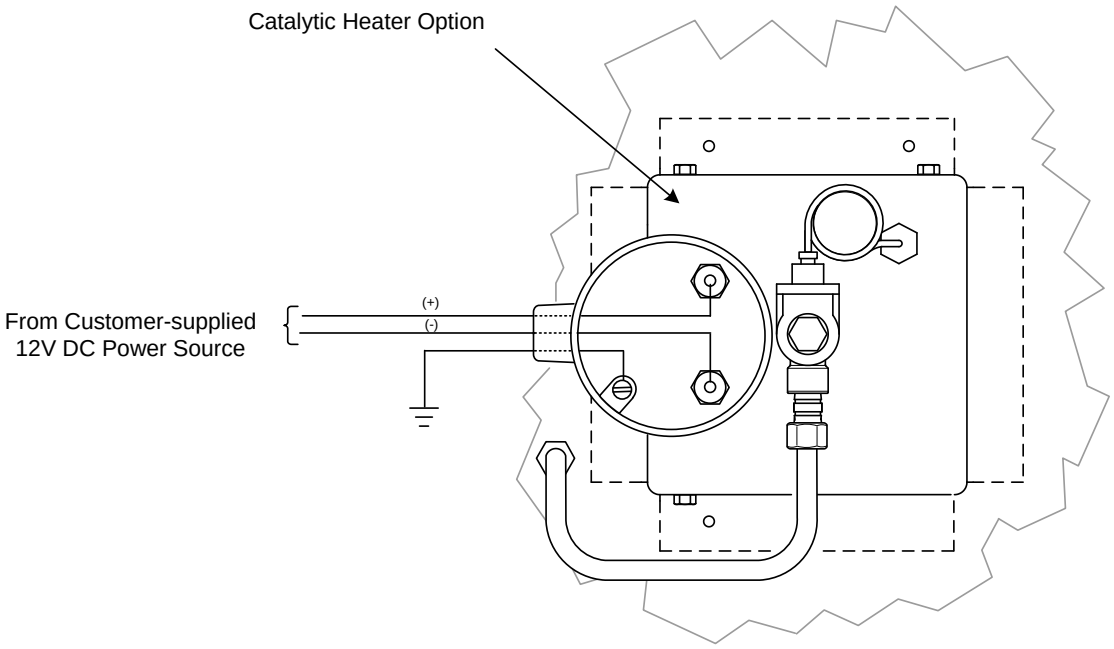


Figure 3-54 ENC82S Catalytic Heater Pre-Heat Wiring

3.27 ENC82 Optional Electric Heater Installation

The following procedures describe the steps for wiring an electric heater for the environmental enclosure.

Verify the heater and fittings are approved for the classification rating of the area of installation.

3.27.1 Materials

- Electric heater option (factory-installed, see **Figure 3-55** and **Figure 3-56**).
- AC power source wiring. Materials for external power source for electric heater wiring not provided by Totalflow. Quantities and materials to be determined by the technician based on installation and local codes.

The technician responsible for installing the power supply must follow local codes.

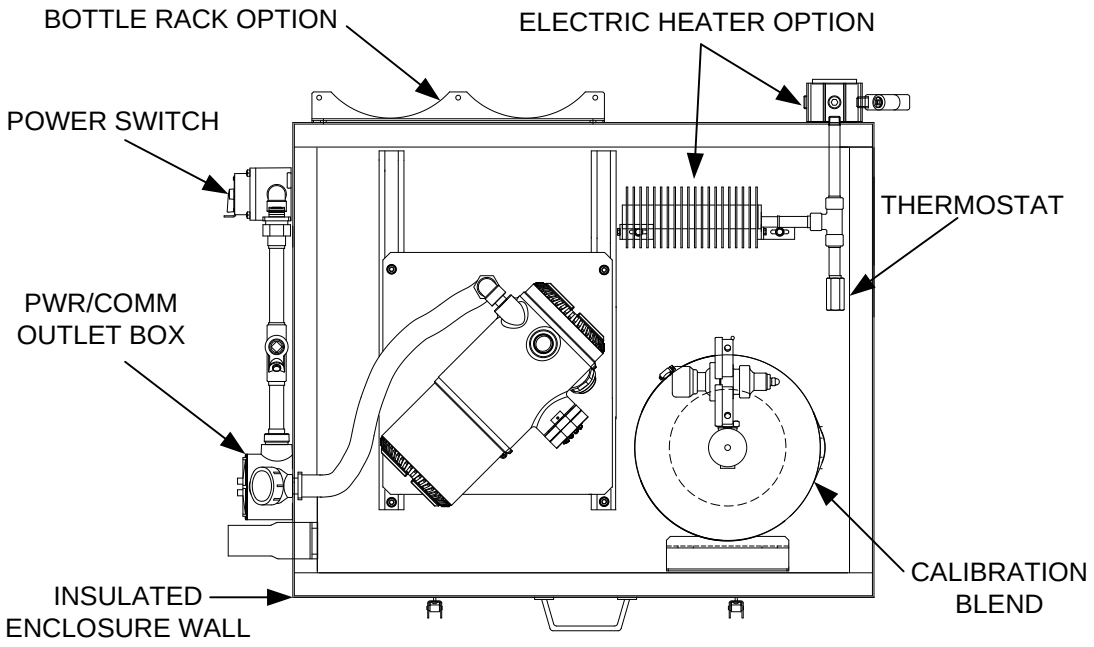


Figure 3-55 ENC82L Electric Heater Installed in Enclosure

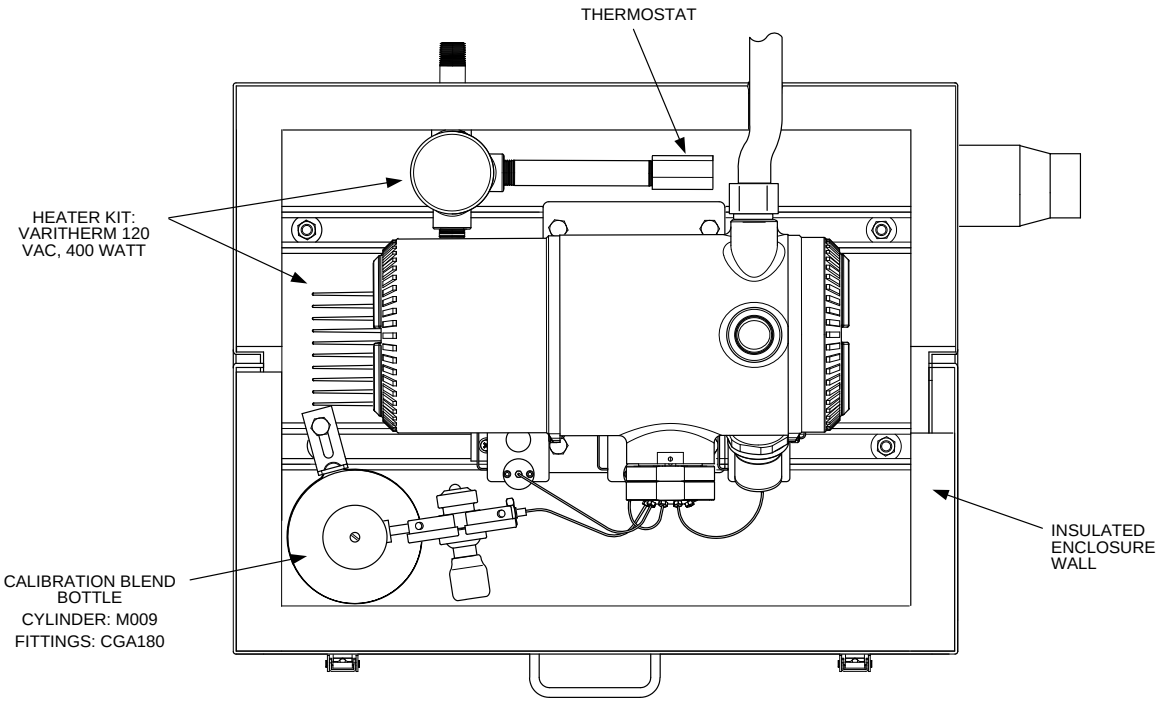


Figure 3-56 ENC82S Electric Heater Installed in Enclosure

3.27.2 Instructions

1) Using the wiring instructions shown in **Figure 3-57** and manufacturer's instructions enclosed with heater, make external connections.

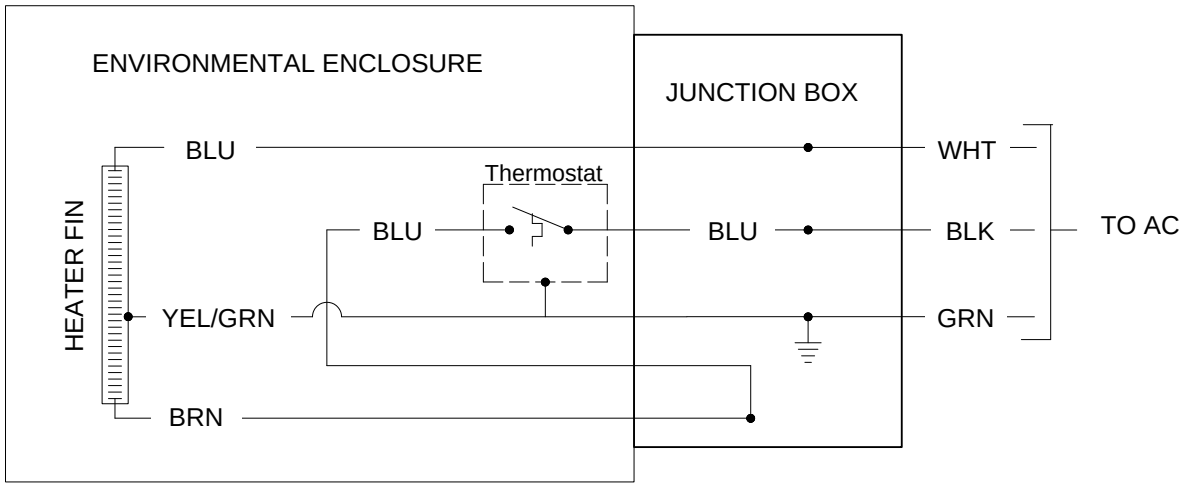


Figure 3-57 Electric Heater Option Wiring Instructions

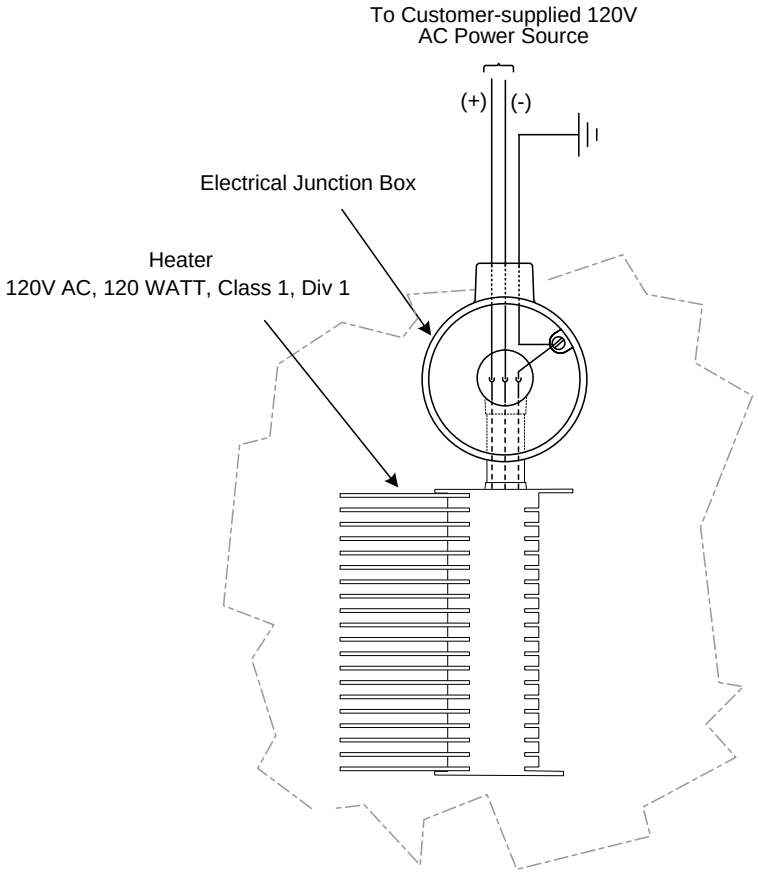


Figure 3-58 ENC82S Electric Heater Option Wiring Instructions

3.28 Sealing Environmental Enclosure

When all sample and vent tubing has been installed and leak-tested, the sample boot must be sealed. The following procedures describe the steps for sealing the environmental enclosure.

3.28.1 Customer Supplied Materials

- Aerosol insulating foam

3.28.2 Instructions

1) When all sample and vent connections are complete, apply aerosol insulating foam from inside the enclosure pointing toward the outside of boot, ensuring that the overspray falls outside the enclosure.

3.29 Optional Equipment Enclosure Installation

If the optional enclosure is used, it may be configured to include other options, including, but not limited to, a battery pack to provide reserve power to the NGC, communication equipment, solar power charger and additional I/O.

Three enclosures are commonly used for the NGC8206 installations: the 6200, 6700 and 6800 enclosure. The unit may be mounted on a 2” pipe or mounted on a flat surface such as a wall.

The battery and solar panel are packed and shipped separately from the enclosure.

Before beginning, review the procedures and the materials required for the installation; inspect all power cables where they terminate and the connector for breakage.

The optional equipment enclosure may be approved for classified hazardous locations or potentially explosive atmospheres. Verify the rating listed on the unit tag and install per the referenced control drawing. Be sure to follow the requirements of national and local codes when installing the optional equipment enclosure.

3.29.1 6200 Optional Equipment Enclosure

The 6200 can accommodate the following equipment:

- Power Supply Kit for 6200
- 120 VAC/12 VDC power supply
- 240 VAC/12 VDC power supply

The 6200 installation will be for AC and 24 VDC sites. There is no battery-backed option in this installation.

3.29.2 6700 Optional Equipment Enclosure

The 6700 optional equipment enclosure can accommodate the following:

- Power Supply Kit
  - 120/240 VAC / 12 VDC power supply
  - 24 VDC/12 VDC DC to DC converter
- ABB Totalflow XFC/XRC electronic board
  - XFC/XRC onboard battery charger
- Battery Options

    - 1 each 26/30 AH battery
- Communications kit

The 6700 enclosure supports battery-backed operation for the NGC. The XFC/XRC electronic board provides a battery charger/regulator for the system.

3.29.3 6800 Enclosure

The 6800 enclosure can accommodate the following :

- Solar Panel Power Option
- 115/230 VAC UPS Power Option (24 VDC systems only)

3.29.4 Location

Mount the enclosure on a nearby wall, panel or pole. Make sure that the approved conduit can be installed between the power supply's enclosure and the NGC. Avoid obstructions.

3.29.5 Pipe Mount Instructions

Enclosure mounting brackets and fastening hardware are supplied with the unit. The customer must provide 2" pipe of suitable length (see **Figure 3-59**).

If a charging source such as a solar panel is desired, this procedure may be adapted to mount the solar panel on the upper portion of the pipe.

The instructions assume the mounting pipe has been previously installed. If not, refer to installation sections previously in this chapter for either free-standing pipe installation or pipe saddle installation.

1) When the unit is received, unpack and inspect all components for evidence of damage. Report damage to the shipping carrier and to the Totalflow service department.

2) Using instructions supplied with the mounting kit, attach the bracket to the back of enclosure unit.

3) Position the unit on the 2" mounting pipe and secure in place with two U-bolts, split washers, flat washers and two bolts (see **Figure 3-59**, **Figure 3-60** and **Figure 3-61**).

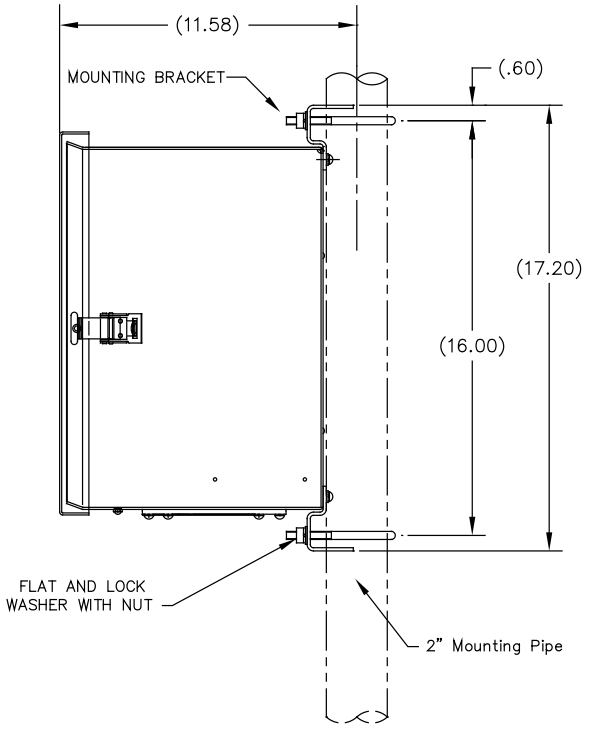


Figure 3-59 6200 Enclosure Pipe-Mounting Installation

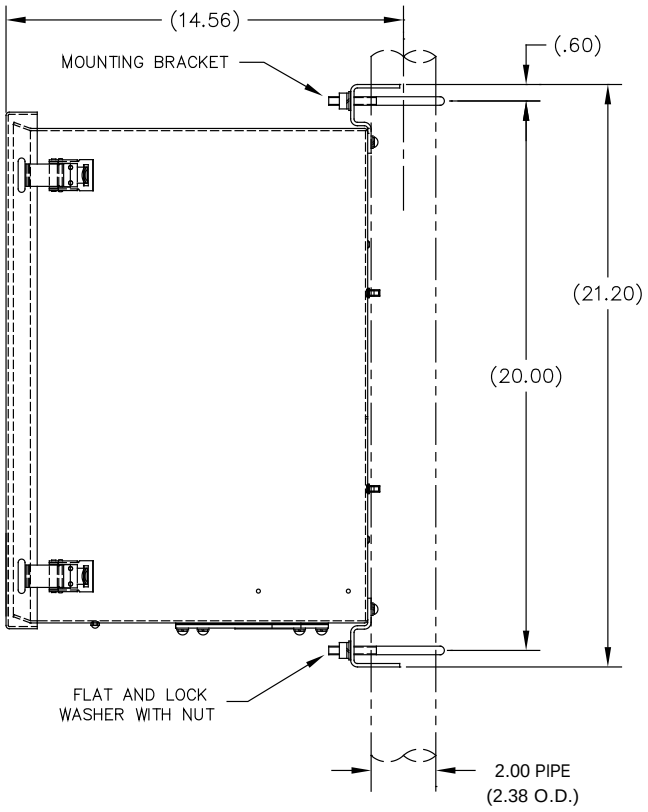


Figure 3-60 6700 Enclosure Pipe Mounting Installation

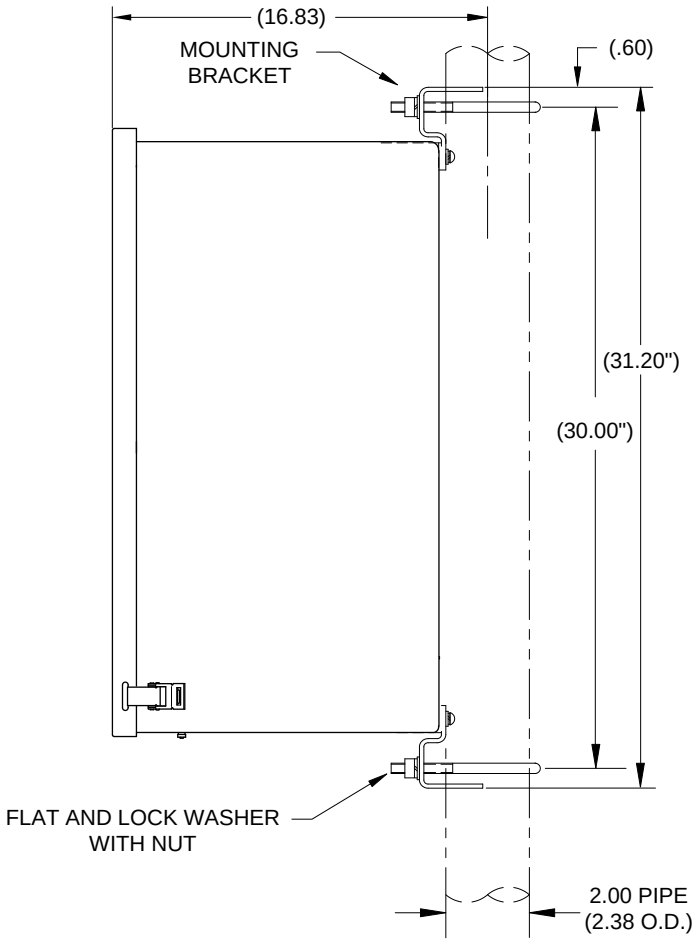


Figure 3-61 6800 Enclosure Pipe Mounting Installation

3.29.6 Wall Mount Instructions

Before beginning, review the procedure and the materials required for installation. A typical installation should be similar to **Figure 3-62**, **Figure 3-63** and **Figure 3-64.**

Enclosure mounting brackets and fastening hardware are supplied with the unit.

1) When the unit is received, unpack and inspect all components for evidence of damage. Report damage to the shipping carrier and to the ABB Totalflow service department.

2) Using instructions supplied with the mounting kit, attach the bracket to the back of the enclosure unit.

3) Prepare the wall surface for mounting, and mount the enclosure to the wall.

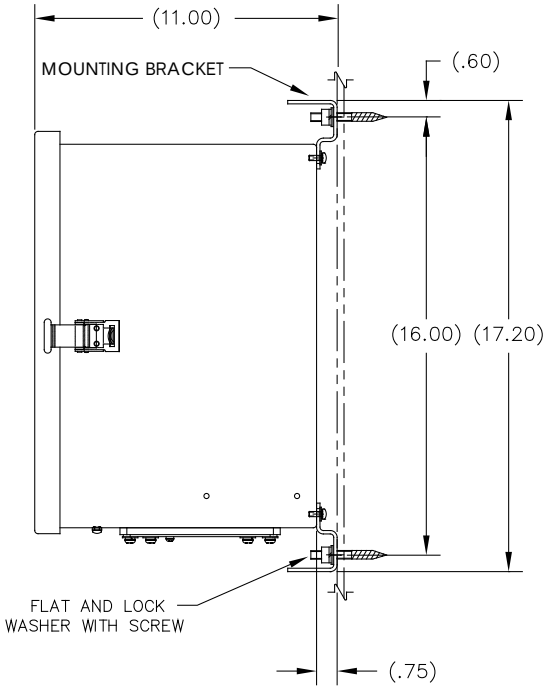


Figure 3-62 6200 Enclosure Wall Mounted Installation

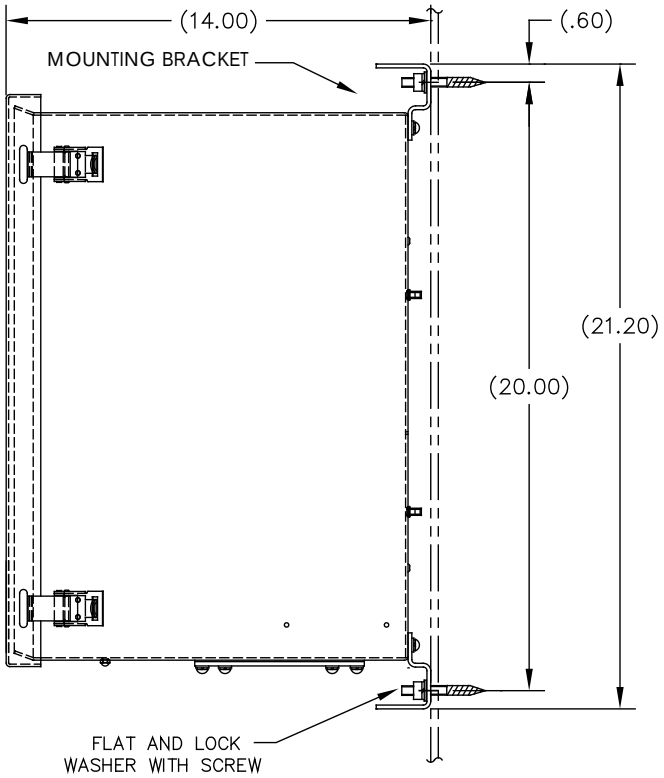


Figure 3-63 6700 Enclosure Wall Mounted Installation

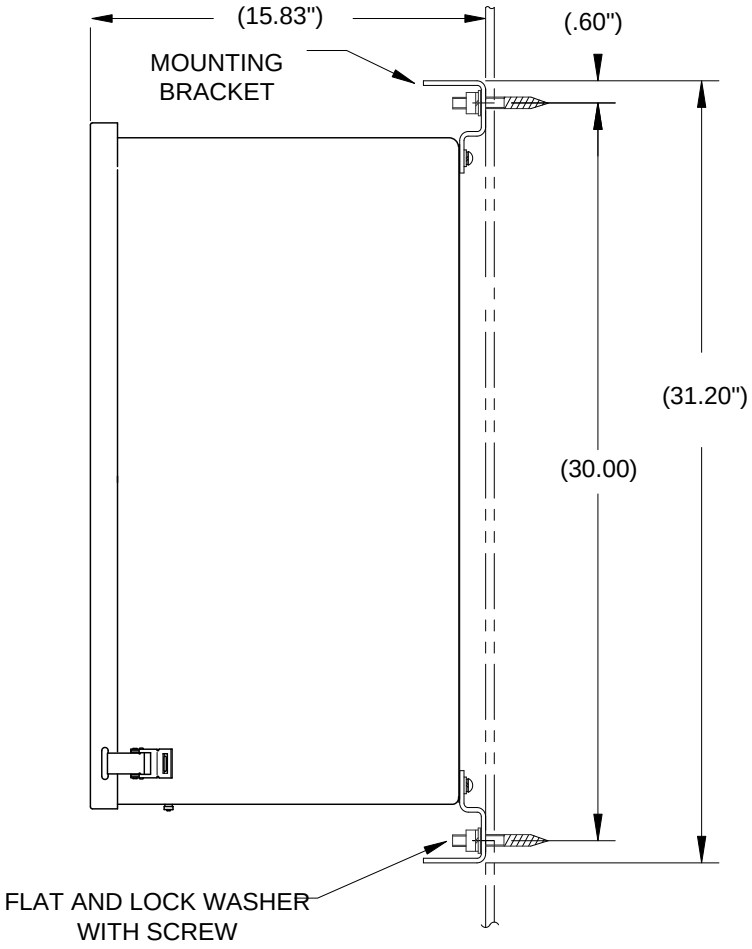


Figure 3-64 6800 Enclosure Wall Mounted Installation

3.29.6.1 Wall Mount Instructions

1) When the unit is received, unpack and inspect all components for evidence of damage. Report damage to the shipping carrier and to the ABB Totalflow service department.

2) Using instructions supplied with the mounting kit, attach the bracket to the back of the enclosure unit.

3) Prepare the wall surface for mounting, and mount the enclosure to the wall.

3.30 115/230 VAC UPS Power Supply (24 VDC Systems)

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

This power supply may be approved for classified hazardous locations or potentially explosive atmospheres. Verify the rating listed on the unit tag, and install per the referenced control drawing. Be sure to follow the requirements of national and local codes when installing the power supply.

Installation must be performed by person(s) qualified for the type and area of installation, according to national and local codes.

3.30.1 Instructions

1) If configured, the optional equipment unit should contain an installed power supply. The **Optional Equipment Enclosure Installation** should be installed using instructions shown previously in this chapter.

2) Remove the necessary plugs from the side of the enclosure to install the rigid conduit.

3) Pipe the conduit and associated AC wiring into the enclosure.

Please review the Grounding the NGC section in, **System Description**, before making power connections.

4) Using wiring instructions in **Figure 3-65**, make the field connections from the 115 VAC hot and neutral or the two hot wires for 230 VAC.

5) Pipe the conduit and associated DC wiring from the NGC into the power supply enclosure. See **Table 2–4** for wire sizes.

6) Remove the J1 connector from the NGC termination panel. Using the wiring instructions in **Figure 3-65,** make field connections from the power supply wire as shown to J1 connector (+) pin and connect the ground wire to J1 connector (-) pin. Do not re-insert the J1 connector to the termination board.

7) Proceed to the **Battery Pack Installation** instructions later in this chapter.

8) Go to **DC Power Installation** later in this chapter.

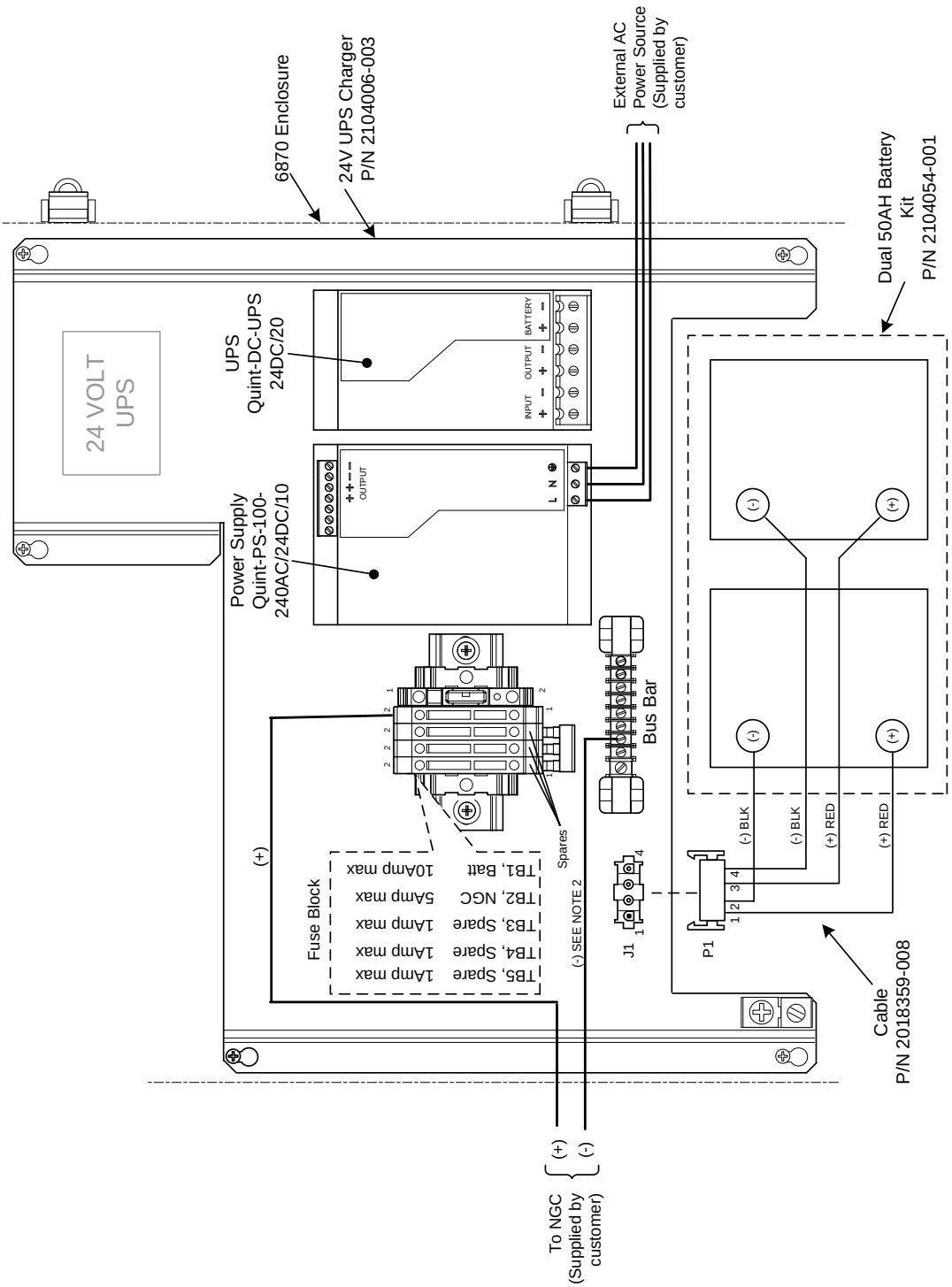


Figure 3-65 115/230 VAC UPS Power Supply Option

3.31 115/230 VAC to 12 VDC Explosion-Proof Power Supply Installation

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

The AC/DC power supply may be approved for classified hazardous locations or potentially explosive atmospheres. Verify the rating listed on the unit tag and install per the referenced control drawing. Be sure to follow the requirements of national and local codes when installing the power supply.

Installation must be performed by person(s) qualified for the type and area of installation, according to national and local codes.

3.31.1 Customer Supplied Materials

- Plastic cable ties
- AC wiring. Please refer to the cable recommendation chart in Chapter 1 (see **Table 2–5 AC Power Supply System Maximum Cable Lengths**).
- Explosion-proof conduit with fittings and poured seals or approved explosion-proof/flame-proof flexible cable with fittings according to the requirements of the national and local codes.

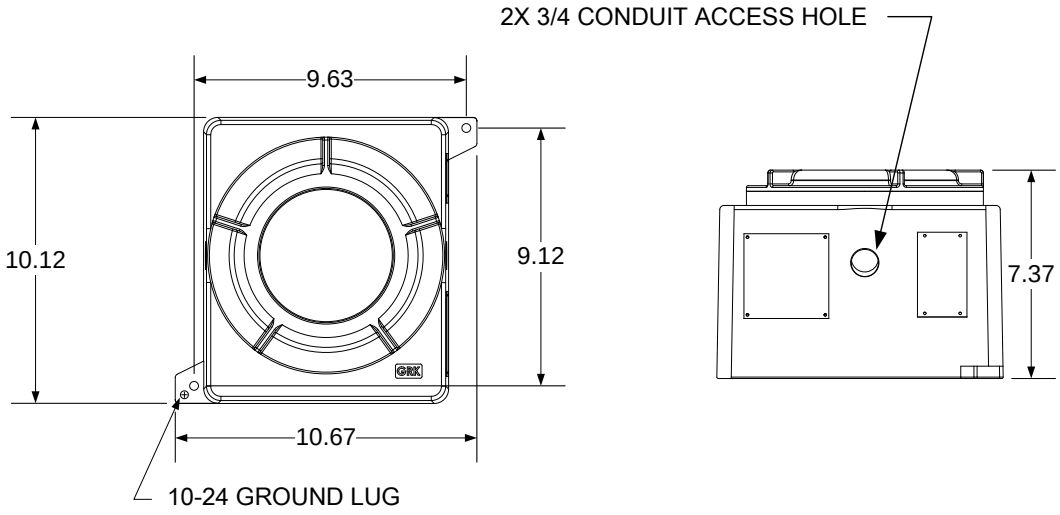


Figure 3-66 Explosion-Proof AC Power Supply Top/Front Dimensions

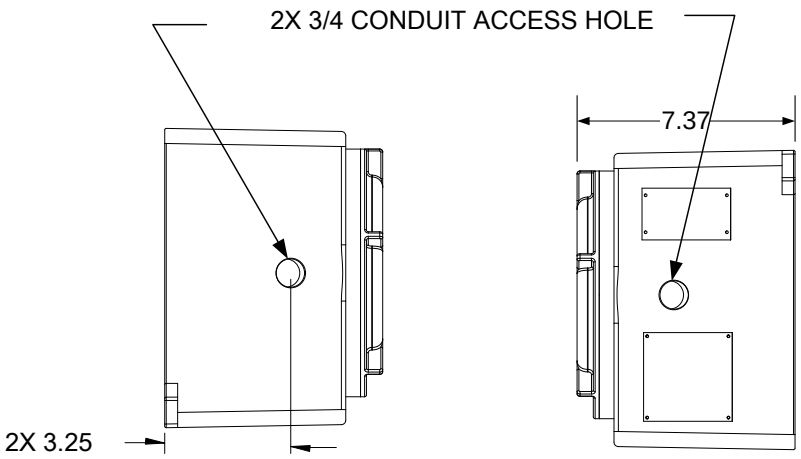


Figure 3-67 Explosion-Proof AC Power Supply Side Dimensions

WARNING The installation must be performed by person(s) qualified for the type and area of installation according to national and local codes.

3.31.2 Instructions

1) The AC power supply is shipped separately. When the unit is received, unpack and inspect all components for evidence of damage. Report damage to the shipping carrier and to the ABB Totalflow service department.

2) Mount the explosion-proof enclosure on a nearby wall or panel. Make sure that the rigid explosion-proof conduit or appropriate flexible conduit can be installed between the power supply's explosion-proof enclosure and the NGC. Avoid obstructions.

3) Remove the necessary plugs from the side of the explosion-proof enclosure to install the rigid conduit.

CAUTION Review the Grounding the NGC section in **2.0 System Description**, before making power connections.

4) Pipe the conduit and associated AC wiring from the external power source into the AC power supply enclosure.

5) Using the wiring instructions in **Figure 3-68**, make field connections from the 115 VAC hot and neutral or the two hot wires for 230 VAC to TB1 terminal 5A and terminal 6A on the power supply.

6) Pipe the conduit and associated DC wiring from the NGC into the power supply enclosure. See **Table 2–4** in Chapter 1 for wire sizes.

7) Remove the J1 connector from the NGC termination panel. Using the wiring instructions in **Figure 3-68**, make field connections from the power supply wire from F1 terminal B to J1 connector (+) pin and connect the ground wire TB1 terminal 1A to J1 connector (-) pin. Do not re-insert J1 connector to the termination board.

8) Go to the **DC Power Installation** later in this chapter.

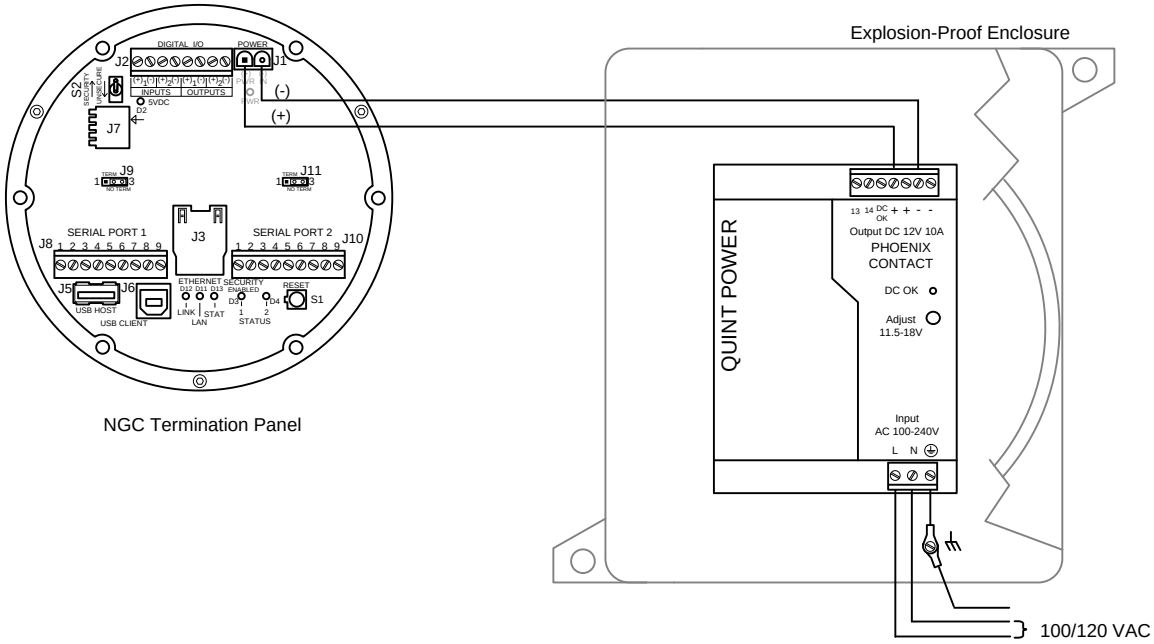


Figure 3-68 Explosion-Proof AC Power Supply Wiring Instructions

3.32 110/240 VAC to 12/24 VDC Power Supply Installation

The power supply may be approved for classified hazardous locations or potentially explosive atmospheres. Verify the rating listed on the unit tag and install per the referenced control drawing. Be sure to follow the requirements of the national and local codes when installing the power supply.

Installation must be performed by person(s) qualified for the type and area of installation, according to national and local codes.

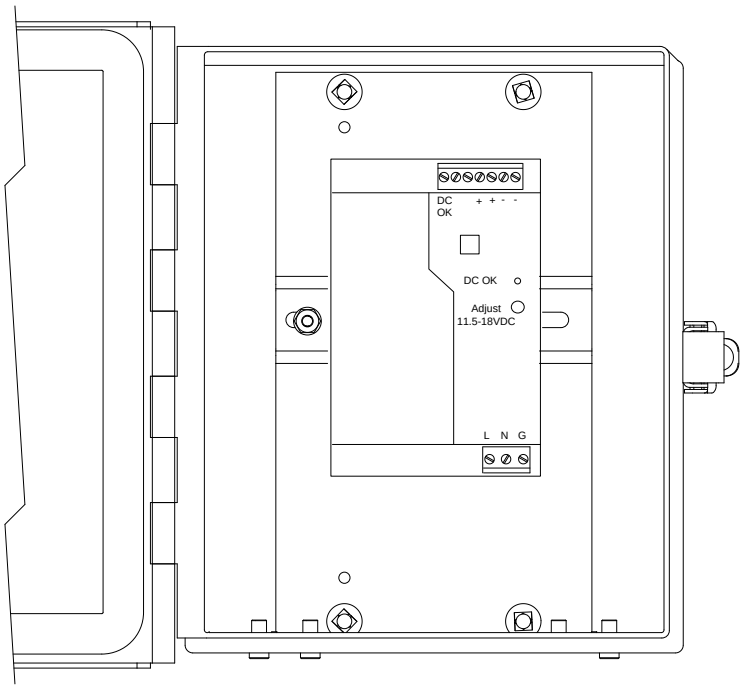


Figure 3-69 6200 Optional Equipment Enclosure with Power Supply

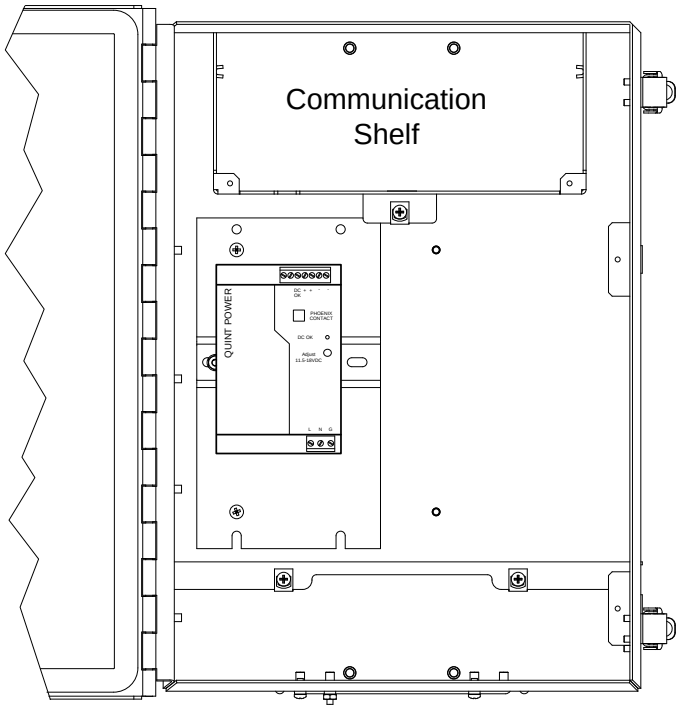


Figure 3-70 6700 Optional Equipment Enclosure with Power Supply

WARNING

The AC/DC power supply may be approved for classified hazardous locations or potentially explosive atmospheres. Verify the rating listed on the unit tag, and install per the referenced control drawing. Be sure to follow the requirements of national and local codes when installing the power supply.

WARNING

Installation must be performed by person(s) qualified for the type and area of installation, according to national and local codes.

3.32.1 Instructions

1) If configured, the optional equipment unit should contain an installed AC power supply. The Optional equipment enclosure should be installed using instructions shown previously in this chapter.

2) Remove the necessary plugs from the side of the enclosure to install the rigid conduit.

3) Pipe the conduit and associated AC wiring into the enclosure.

CAUTION

Review the Grounding the NGC section in **System Description**, before making power connections.

4) Using wiring instructions in **Figure 3-71**, make the field connections from the 115 VAC hot and neutral or the two hot wires for 230 VAC to TB1 terminal 5A and terminal 6A on the power supply.

5) Pipe the conduit and associated DC wiring from the NGC into the power supply enclosure. See **Table 2–4** in Chapter 1 for wire sizes.

6) Remove the J1 connector from the NGC termination panel. Using the wiring instructions in **Figure 3-71**, make field connections from the power supply wire from F1 terminal B to J1 connector (+) pin and connect the ground wire TB1 terminal 1A to J1 connector (-) pin. Do not re-insert the J1 connector to the termination board.

7) Go to **DC Power Installation** later in this chapter.

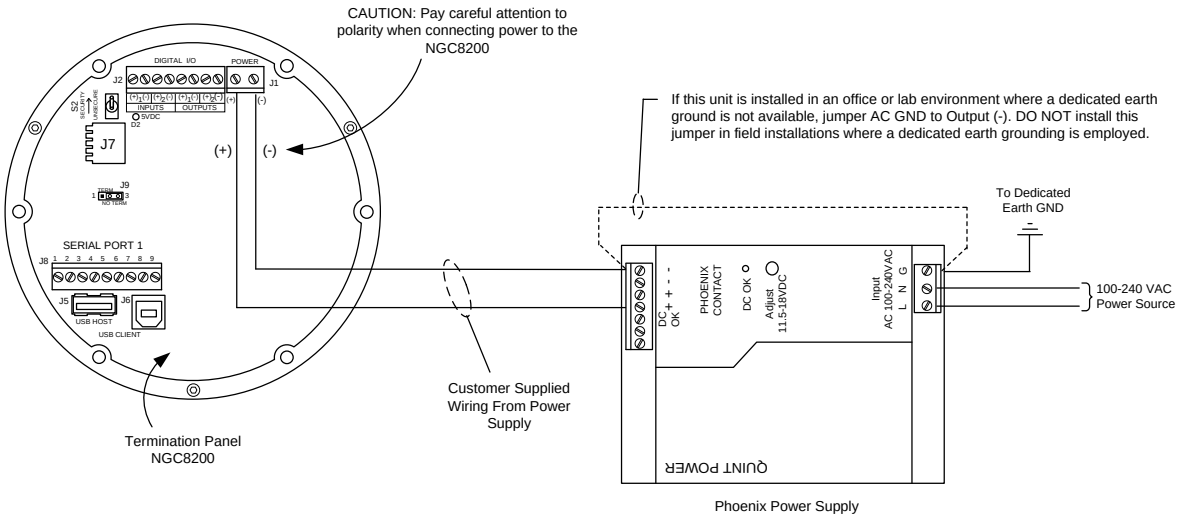


Figure 3-71 AC/DC Converter Wiring Instructions

3.33 24 VDC to 12 VDC Power Converter

Before beginning, review the procedure and the materials required for installation. This power converter is not applicable for NGC systems with optional auxiliary feed-through heater.

The DC/DC power converter may be approved for classified hazardous locations or potentially explosive atmospheres. Verify the rating listed on the unit tag and install per the referenced control drawing. Be sure to follow the requirements of national and local codes when installing the power converter.

Installation must be performed by person(s) qualified for the type and area of installation, according to national and local codes.

3.33.1 Instructions

1) If configured, the optional equipment enclosure should contain an installed converter. Enclosure should be installed using instructions shown previously in this chapter.

2) Remove the necessary plugs from the side of the enclosure to install the rigid conduit.

3) Pipe the conduit and associated DC wiring into the enclosure.

Review the Grounding the NGC section in **System Description**, before making power connections.

4) Using the wiring instructions in **Figure 3-72**, make field connections from the 24 VDC(+) and (-) source to TB1 terminal 11A (+) and terminal 12A (-) on the power supply.

5) Pipe the conduit and associated DC wiring from the NGC into the power supply enclosure. See **Table 2–4** for wire sizes.

6) Remove the J1 connector from the NGC termination panel. Using the wiring instructions in **Figure 3-72** make the field connections from the power supply wire from the TB1 terminal 7A to the J1 connector (+) pin and connect the ground wire from TB1 Terminal 8A to the J1 connector (-) pin. Do not re-insert the J1 connector to the termination board.

7) Go to the **DC Power Installation** later in this chapter.

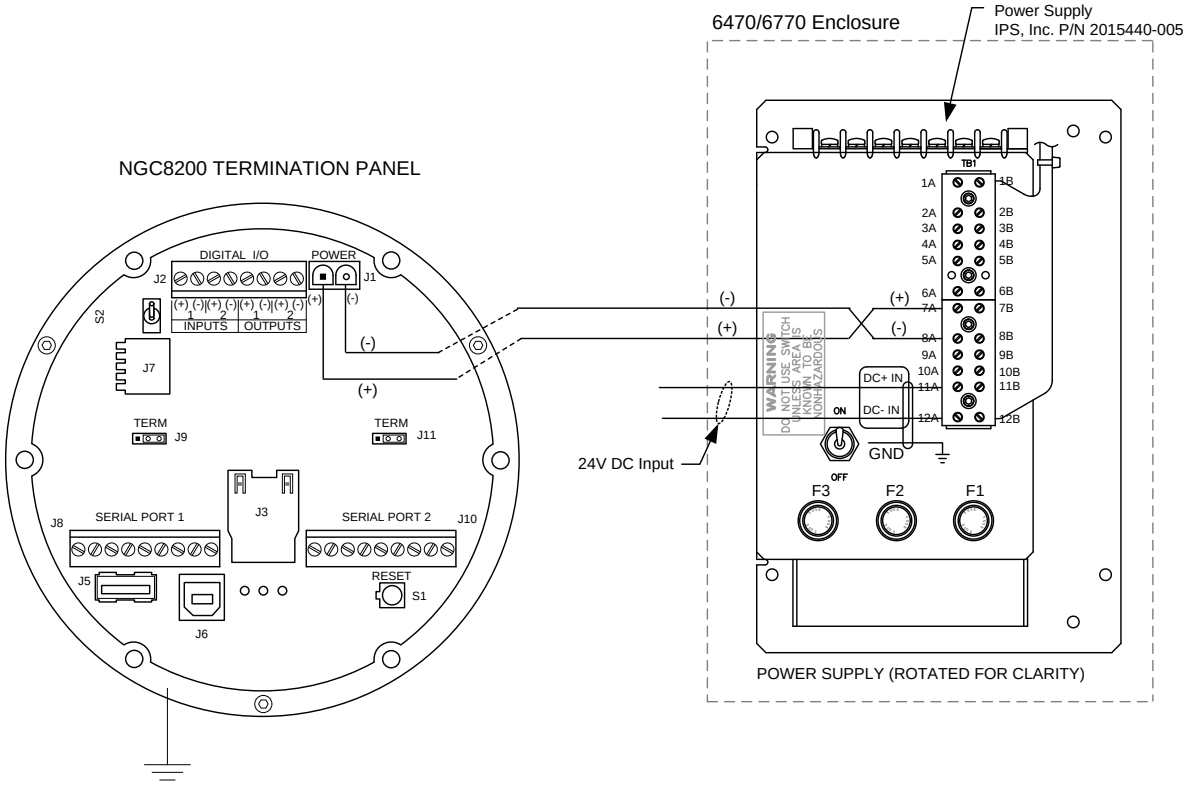


Figure 3-72 24 VDC/12 VDC Power Supply Converter

3.34 Battery Pack Installation

FYI

To extend the life of the battery pack, fully charge the battery prior to installation. Systems using solar panels may not fully charge the battery. Charging the battery quickly removes the oxide buildup and improves the life of the battery.

CAUTION

Do not over-charge the battery pack.

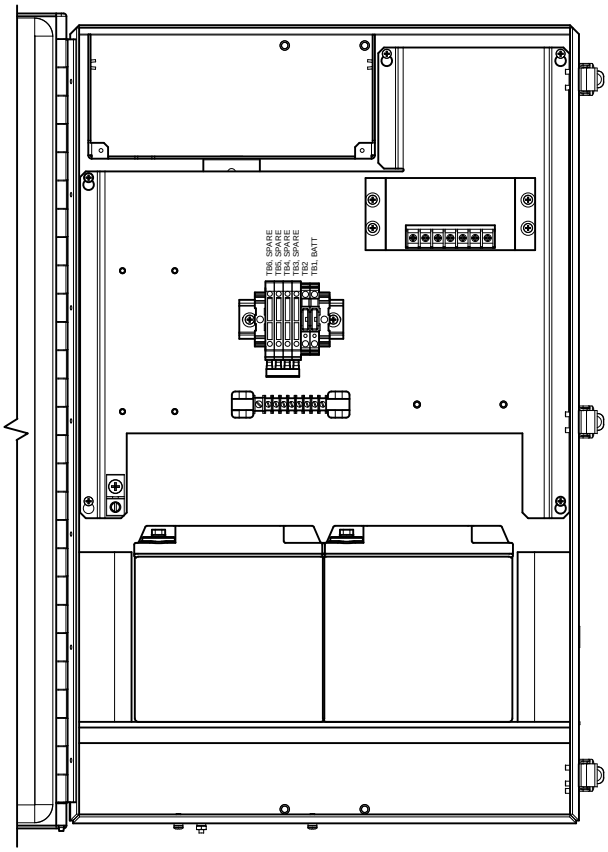


Figure 3-73 Optional 6800 Enclosure with Battery Pack

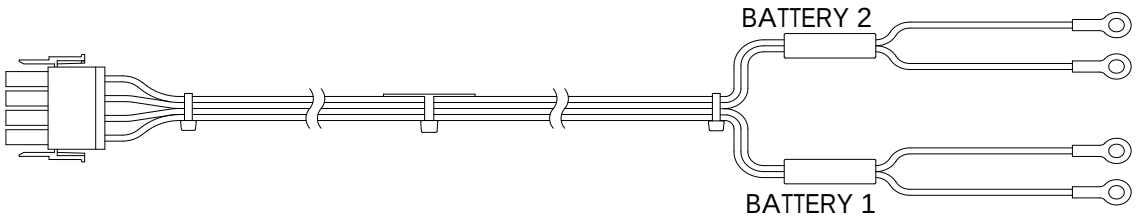


Figure 3-74 12/24 VDC Dual Battery Pack Cable

3.34.1 Instructions

1) Insert the battery(s) into the battery compartment with the terminals facing up (see **Figure 3-73**).

2) For the 12/24 VDC solar power system or the 24 VDC UPS power system, a dual battery cable is provided with the unit (see **Figure 3-74**). Make the following battery connections using **Figure 3-75** for 12 or 24 VDC.

- Connect the battery 1 red wire lug to battery 1 positive terminal.
- Connect the battery 1 black wire lug to battery 1 negative terminal.
- Connect the battery 2 red wire lug to battery 2 positive terminal.
- Connect the battery 2 black wire lug to battery 2 negative terminal.

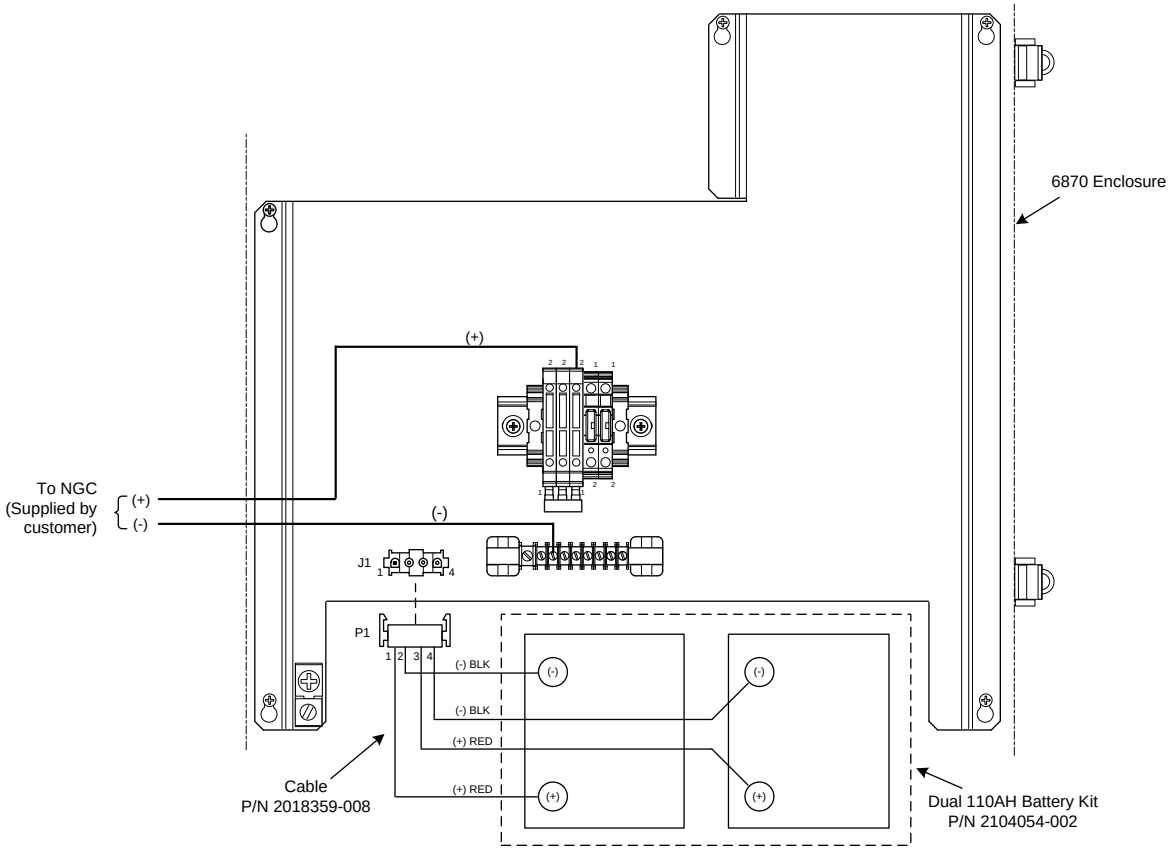


Figure 3-75 Battery Pack with DC Power Supply Wiring Instructions

3) For AC charging systems containing one or two batteries (see **Figure 3-76**), connect the battery cable to the prewired power supply cable(s).

4) If the system calls for a solar panel charging system, proceed to instructions for solar panel installation later in this chapter. Otherwise, continue the **DC Power Installation** later in this chapter.

CAUTION Review the Grounding the NGC section in **System Description**, before making power connections.

5) Go to the **DC Power Installation** section later in this chapter.

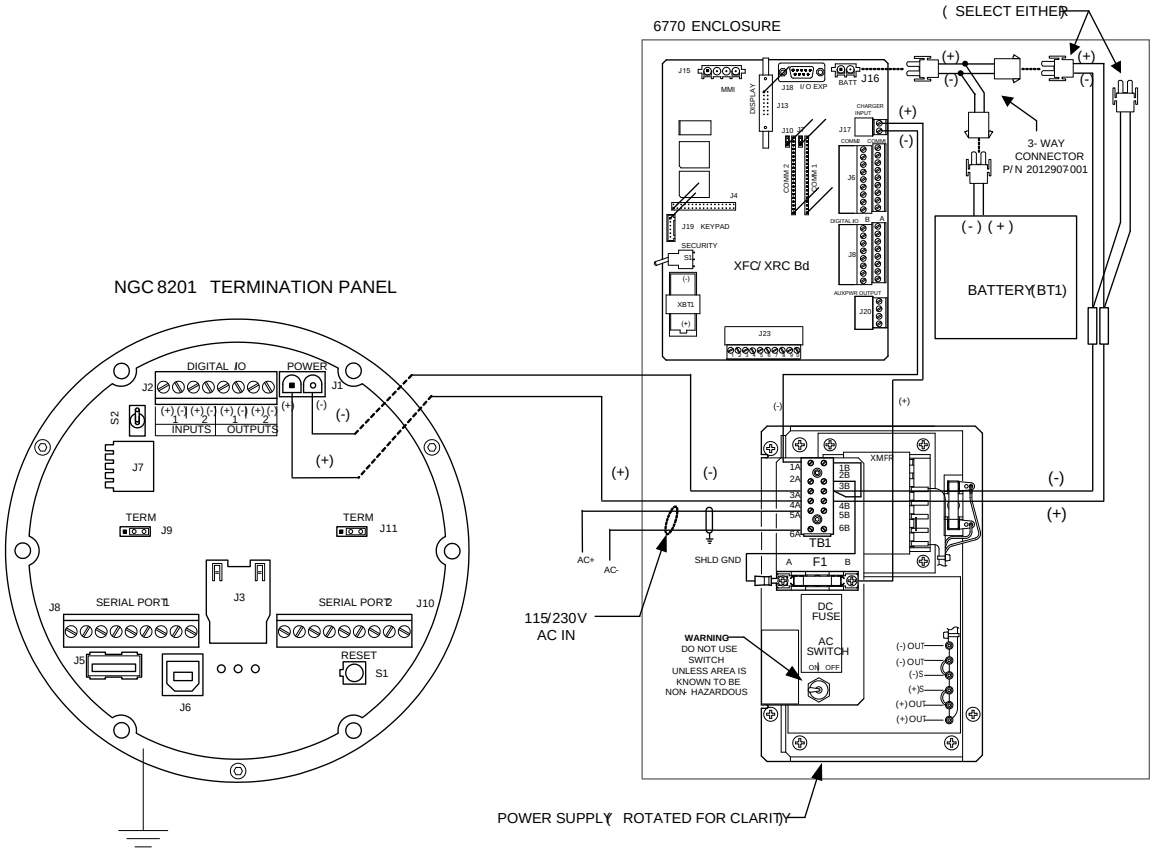


Figure 3-76 Battery Pack with AC Power Supply Wiring Instructions

3.35 Solar Panel Installation

The solar panel is designed for outdoor mounting on a 2" extension pipe located near the optional equipment enclosure (see **Figure 3-77**). The solar panel must be mounted within 12 feet of the unit (other cable lengths available). For wall mounted units, it can be mounted on top or side of a meter house.

Do not connect the solar panel power cable to the unit unless the main battery pack has been connected.

If installation procedures are required for mounting the solar panel on the top or side of meter house, contact Totalflow's Service Department; see **Getting Help** in the Introduction section of this manual.

3.35.1 Materials Supplied

- Two solar panels
- U-Bolts and fastening hardware
- Solar panel cables (Standard is 12', other lengths are available.)
- Solar panel mounting brackets (if not already attached to solar panel)

3.35.2 Material not Supplied

- Cable ties

- One 9-inch extension of 2-inch pipe or other suitable length of pipe, threaded on one end.
- One 2-inch coupling.

FYI

Exercise caution when installing the solar panel so as not to damage it. When mounted, solar panel will face up from horizon at 50° angle.

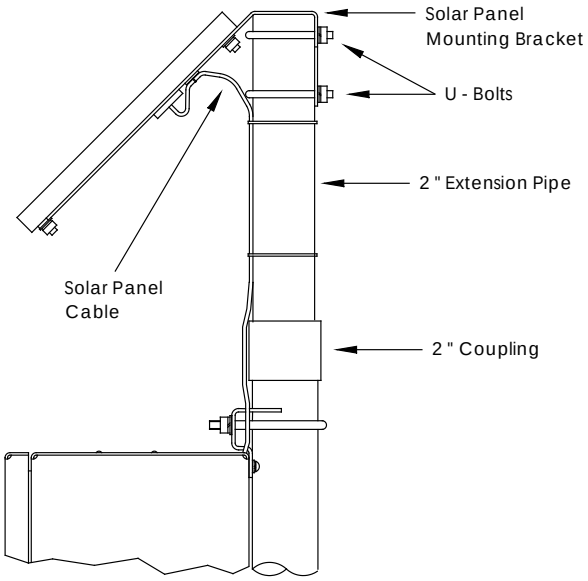


Figure 3-77 Typical Solar Panel Installation

3.35.3 Instructions

1) Attach 2” pipe coupling to top end of enclosure mounting pipe. Securely tighten.

2) Install 2” pipe extension into coupling and securely tighten.

3) Check solar panels using digital voltmeter to verify polarity and output voltage. Voltage will vary depending on amount of sun and angle to the sun.

4) Install solar panels on mounting bracket with provided hardware, if required.

CAUTION

Do not connect the other end of the solar panel cable to the board until instructed to do so.

5) Attach solar panel mounting plates to the top end of the 2” extension pipe with U-bolts and associated mounting hardware. Do not tighten U-bolts until solar panels are correctly positioned.

6) For northern hemispheres, position solar panels facing south. For southern hemispheres, position solar panels facing north. For optimum charging, solar panels should not be in shadows for the majority of the day. Panels should be kept clean for maximum charging.

3.36 Solar Power Pack

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

The power supply may be approved for classified hazardous locations or potentially explosive atmospheres. Verify the rating listed on the unit tag and install per the referenced control drawing. Be sure to follow the requirements of the national and local codes when installing the power supply.

Installation must be performed by person(s) qualified for the type and area of installation, according to national and local codes.

3.36.1 Instructions

1) If configured, the optional equipment enclosure should contain an installed power supply. The enclosure and solar panel(s) should be installed using instructions detailed previously in this chapter.

2) Remove plug from the access hole in equipment enclosure. Insert the solar panel power cable through an access hole on side of case. Allow enough power cable for field wiring to solar charger connector pins 3 and 4.

Review the Grounding the NGC8206 section in, **System Description**, before making power connections.

3) Pipe the conduit and associated DC wiring from the NGC8206 into the power supply enclosure. See **Table 2–4** for wire sizes.

4) Field wire the solar panel cables to the solar charger inside the enclosure. Use the wiring instructions in **Figure 3-78** for 12 VDC, or use **Figure 3-79** for 24 VDC, to make the field connections.

- Loosen the terminal block securing screws, insert the wire then retighten. Connect solar panel (+) lead to pin 4 and (-) wire to pin 3 terminal. Verify hat the main battery pack is connected.

5) Following the connection of the solar panel power cable, secure the cable to the 2’ extension pipe and mounting pipe cable with the plastic tie-wraps provided.

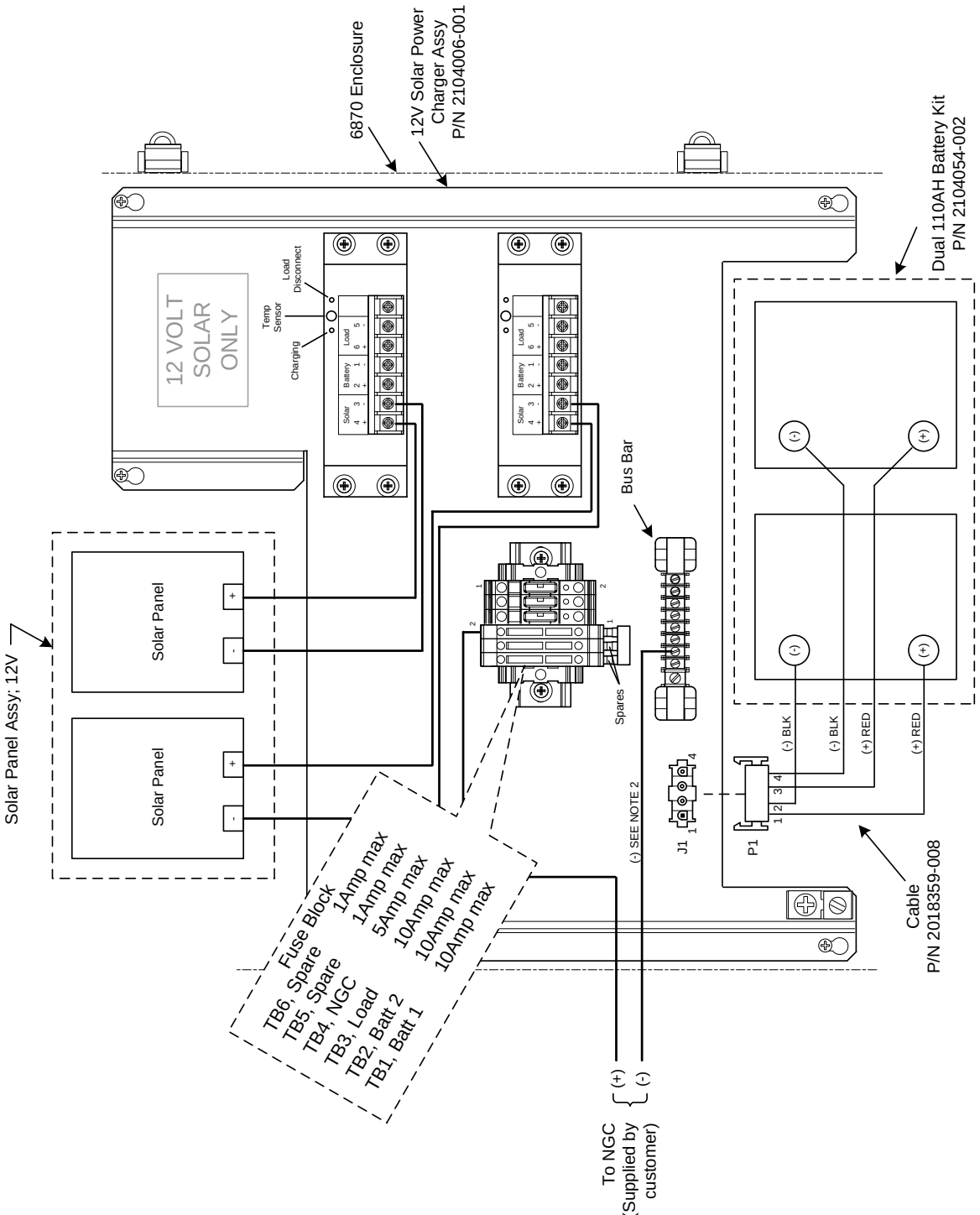


Figure 3-78 12 VDC Battery Pack/Solar Panel Wiring Instructions

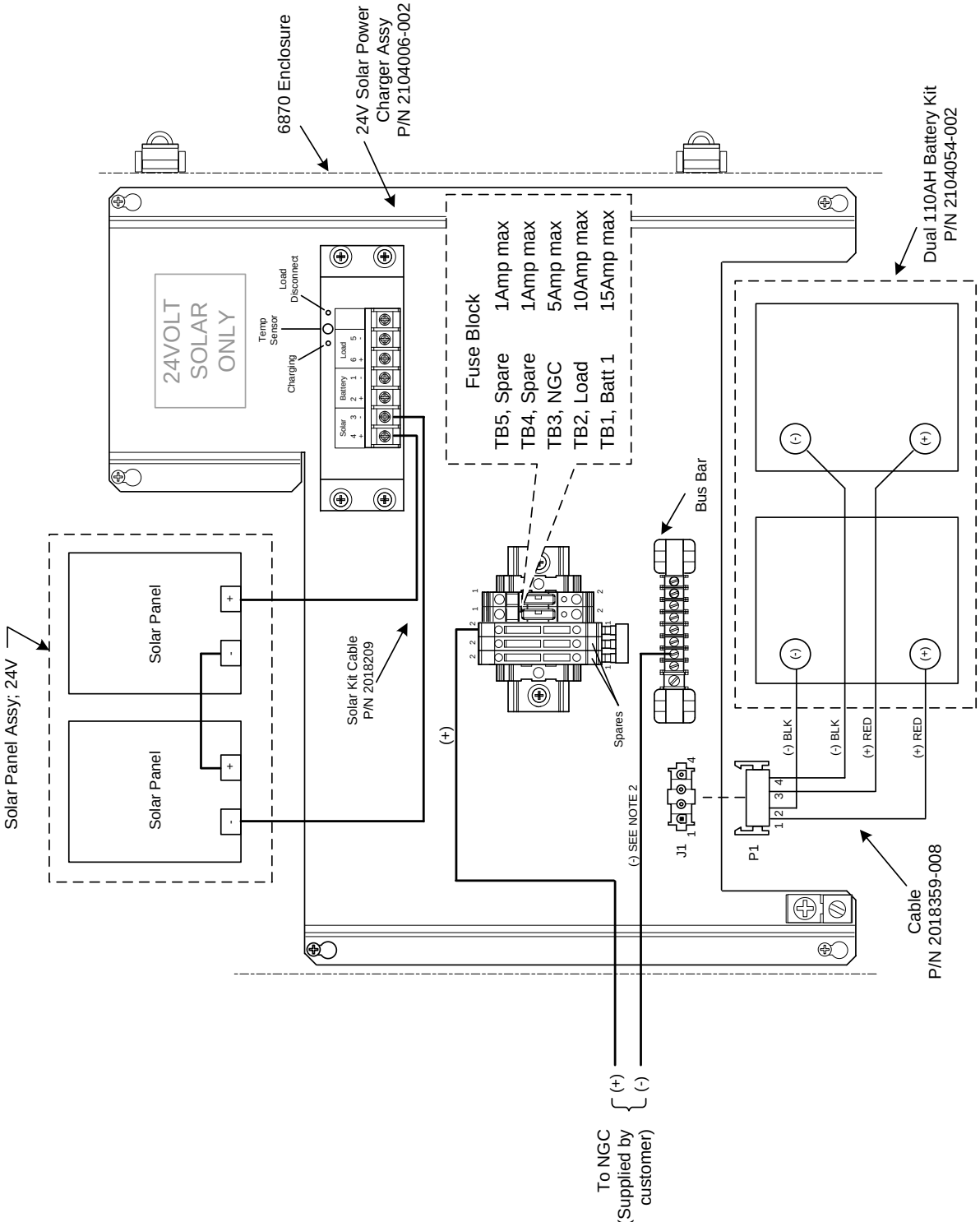


Figure 3-79 24 VDC Battery Pack/Solar Panel Wiring Instructions

3.37 DC Power Installation

These instructions assume that all external wiring has been completed to the point where connections have been made to the field termination connector, but the connector has not been plugged into the termination panel.

3.37.1 Instructions

1) If the installation includes the optional power switch:

- Apply power to switch; turn switch to “ON” position.

2) If the installation includes the optional equipment enclosure with the optional power supply:

- Apply power to power supply.

3) If the installation includes a solar panel connected to a battery:

- Plug in the charger regulator battery connector.

4) Test power using a multi-meter connected to the J1 terminals of the phoenix connector:

- 12 Volt System: voltage is between 11.5 and 16.0 volts (see **Table 2–4**).
- 24 Volt System: voltage is between 21.0 and 28.0 volts (see **Table 2–5**).

If volts are within range, the power should be disconnected, the phoenix connector inserted into the termination panel J1 connector and power re-applied.

During Startup operations, the unit will require:

- 12 Volt System: 11.5 volts minimum.
- 24 Volt System: 21.0 volts minimum.

5) If the NGC8200 has the optional VGA screen, the unit will show “Totalflow Boot Loader” followed by the navigational screen, when functional.

6) Unit will begin *Start-up Diagnostics* and oven stabilization. This completes the hardware installation. Proceed to the next chapter, **NGC8206 STartup**, to begin unit setup and operation.

3.38 Remote Communication Installation

As remote communication installation is specific to the communication transceiver, only basic information is supplied here. Additionally, wiring instructions should be shipped with the unit. Both communication ports (serial port 1 and 2) can function as RS-232, RS-422 or RS-485.

Table 3–2 shows serial port pinouts and termination settings.

Table 3–2 Port 1 and Port 2 Pin-Outs/Terminations

	RS-232	RS-485	RS-422
PIN	**PORT 1 (J8)**	**PORT 1 (J8)**	**PORT 1 (J8)**
1	Power Out	Power Out	Power Out
2	Ground	Ground	Ground

	RS-232	RS-485	RS-422
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	**PORT 2 (J10)**	**PORT 2 (J10)**	**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 (J9)**	**PORT 2 (J11)**
First or Intermediate Unit (RS-485)		Pins 2–3	Pins 2–3
Last or Only Unit (RS-485)		Pins 1–2	Pins 1–2
RS-232		Pins 2–3	Pins 2–3

4.0 NGC8206 STARTUP

This chapter describes the minimum requirements to start up a newly installed NGC system. Specific details to further customize the NGC are discussed in the PCCU32 help files.

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

Before beginning, complete the tasks outlined in the, Installation section.

4.1 PCCU32 Installation and Setup

Totalflow® PCCU32 6.0 (or later) software is required to communicate with the NGC8200. Previous versions of PCCU32 are not compatible with the NGC8200.

PCCU32 software running in a Windows environment offers the most capabilities for programming the NGC. The Windows environment features user-friendly help files and easy-to-follow menus that enable the user to step through many required choices.

The Totalflow NGC8200 hardware is designed using Windows Mobile technology CE operating system; therefore, communication between a personal computer and the NGC8200 may be accomplished using a USB cable. When this method of communication is desired, Windows ActiveSync is required and supplied with PCCU32.

4.1.1 Software Installation Instructions

1) Insert the PCCU32 disk into the PC drive. If the CD drive is set to auto play, the installation program should begin; otherwise, click the Windows' Start button, and select **Run**. Within the Run dialog box, type the following: **D:\Disk1\setup.exe**. D stands as the CD drive designation.

2) Follow screen prompts during installation. When asked to install ActiveSync, the answer depends on whether the unit was shipped with a USB (default) or a round RS-232 military type connector as the local port connector. This is the connector on the outside of the unit with the round, explosion-proof cap. If using USB, check the install ActiveSync box. If communicating via RS-232, simply click **Next**. If communicating with a PDA, ActiveSync is already installed, but this installation may contain a later version allowing for a upgrade. To verify the version, open ActiveSync, and click the **Help** icon. Within the help file, select **About Microsoft ActiveSync**.

3) Another screen prompt allows for the selection of the correct port for communication: USB port for connecting via USB and serial port for connecting via RS-232. If the PCCU software was previously installed and the port was already selected, select **Keep Current Port**.

4) The installation puts a PCCU folder on the Window's desktop with shortcuts. The shortcuts are correct, assuming the installation directory was not changed. If the installation directory was changed, the shortcuts will have to be changed to the new directory path. If using a network, the NGC on the Network shortcut will require a network ID or IP address. For a standalone desktop shortcut, right-click on the shortcut, select **Create Shortcut** from the pop-up menu, and drag it to the desktop.

4.2 Ethernet Installation and Setup

Installation of an NGC in a network environment may be implemented using the following instructions. Some decisions may require input from the network administrator.

PCCU32 communication with the NGC over an Ethernet connection (TCP/IP) requires the use of a hub, switch or router (see **Figure 4-1**). Ethernet (local) communication in a remote area may also be utilized.

PCCU32 makes use of the Windows DHCP Utility. Dynamic host configuration protocol (DHCP) can randomly assign a unique IP address within the defined subnet mask. This utility also allows the user to define a more user-friendly network ID. This ID must be unique within the subnet mask; however, a new IP address may be automatically assigned to the NGC if the NGC's power is cycled. For this reason, it may be preferable to disable the DHCP.

Disabling the DHCP requires that a unique IP address be assigned, generally by the network administrator.

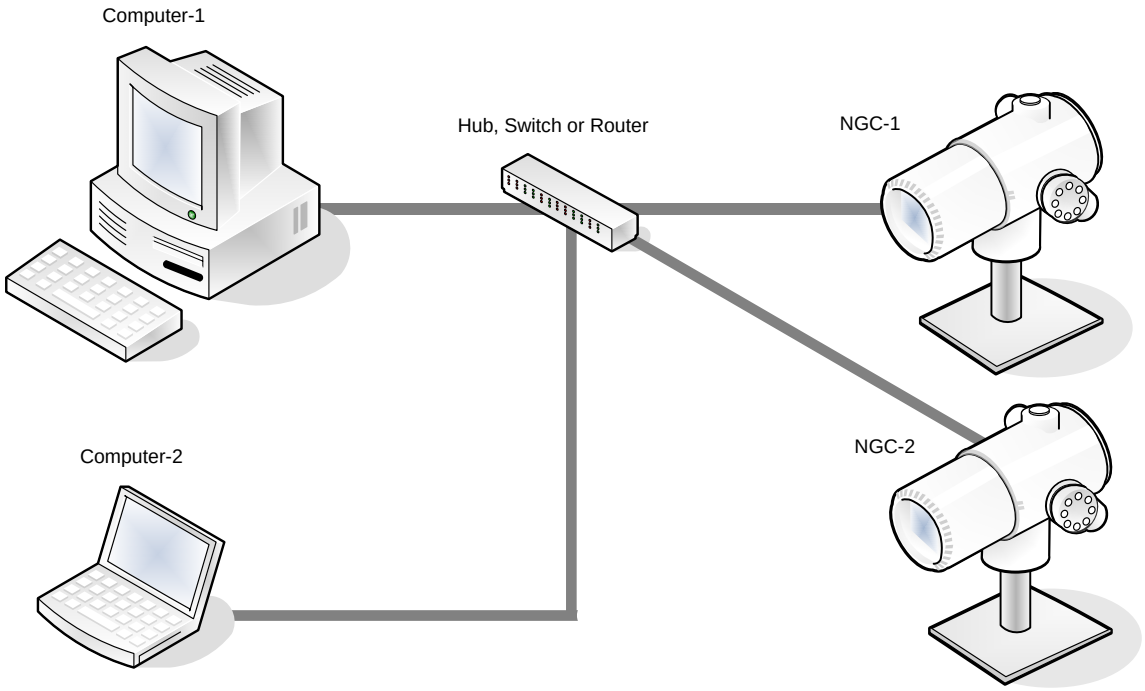


Figure 4-1 Ethernet Connections

4.2.1 TCP/IP Network Connection

Materials Required:

- Ethernet Straight through Cable (see **Figure 4-2**).
- Hub, Switch or Router and Associated Wiring to NGC (see **Figure 4-1**).

4.2.1.1 Instructions

1) Acquire TCP/IP Network Settings:

- Click the Windows Start button. From the pop-up menu, select **Run**.
- In the Run dialog box, type the program name: **CMD**.
- Click **OK**.

- At the command prompt, type **ipconfig /all** (space after **ipconfig**).
- Record the PC and LAN settings displayed for later use.

2) Make local connection to the NGC using either the USB or RS-232 cable to do initial setup of the parameters.

3) From the Analyzer Operation screen in PCCU, click **Show Tree View** in the upper left corner of the screen.

4) Click **Communications** to show the communication setup screen.

5) Select the **Network** tab.

FYI

If using a Windows network, the user can use the network ID feature. Network IDs are limited to 15 alphanumeric digits, with limited special characters. See the Windows help files for more information about naming computers.

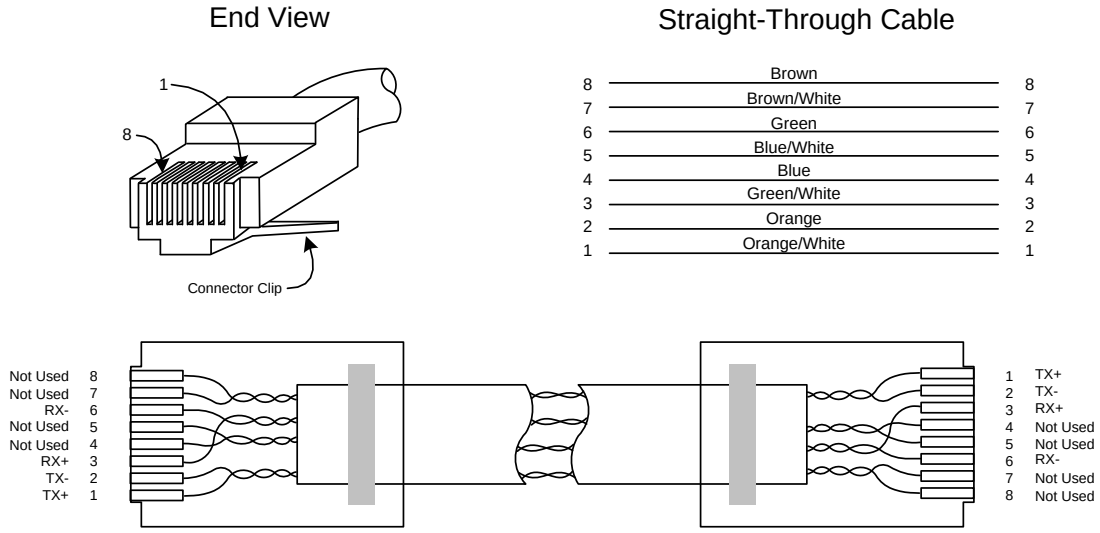


Figure 4-2 Ethernet Cable-Typical

6) Enable or disable the dynamic host configuration protocol (DHCP). To disable the DHCP and assigned IP address, set to **No** and continue to the next step; otherwise, select **Yes** and skip to step 6.

7) Enter the IP address assigned by the network administrator and subnet mask, if different (default is 255.255.255.0).

8) When all desired changes have been made, select **Send**.

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

10) Verify the Ethernet communication:

- Change to TCP/IP network cable.
- From the Windows Start Menu, select **Run**. From the Run dialog box, type **CMD** to open the Command window.

11) At prompt ">" type: **ping** followed by a space, then either the network ID or IP address, and click **Enter**. A successful communication will show multiple replies for the unit.

4.2.2 TCP/IP Local Connection

Material Required:

- Ethernet Cross-Over Cable (see **Figure 4-3**).

4.2.2.1 Instructions

1) Make local connection to the NGC using either a USB or RS-232 cable to set up the initial parameters.

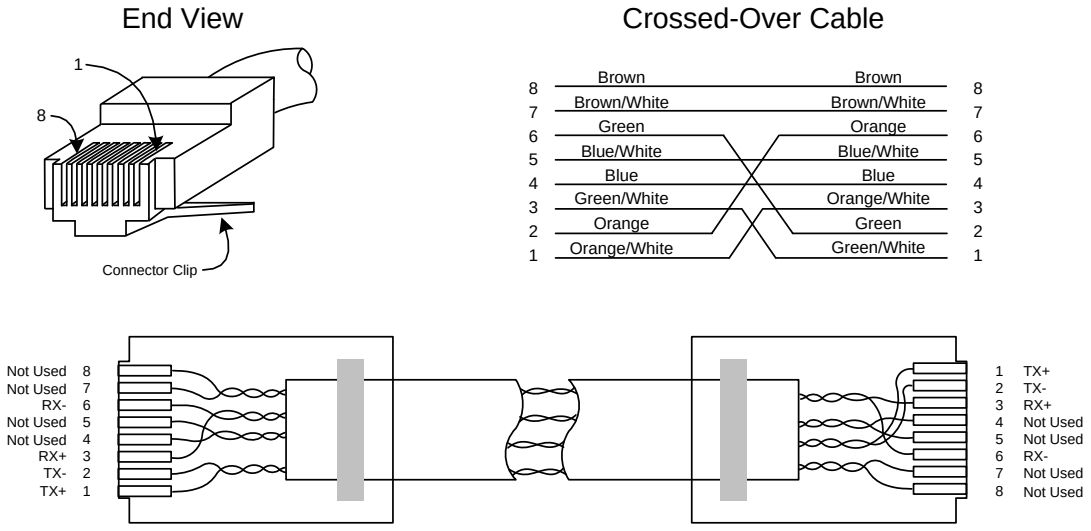


Figure 4-3 Ethernet Cable-Cross-Over

2) From the Analyzer Operation screen in PCCU, click **Show Tree View** in the upper left corner of screen.

3) Click **Communications** to show the communication setup screen.

4) Select the **Network** tab. Enable DHCP. Send changes, and record a new IP address for later use.

5) Exit PCCU, and disconnect the local communication cable.

6) Connect the Ethernet cross-over cable between the PC and NGC.

7) Open PCCU software. Click **Operate** on the menu bar. Navigate through the drop-down list to **Setup**. From the fly-out menu, select **System Setup**.

8) Under Communications, set the PCCU com port to TCP, and enter the IP address previously noted in the network ID or IP box. Close the System Setup screen.

9) Verify the TCP/IP communications by clicking the *Entry* button on the main screen (upper most left button).

If receiving a “Communication Link Failed” error message, investigate the following possible causes:

FYI 

Verify a crossover Ethernet is being used and not a straight through Ethernet cable.

If using a network hub or network, verify the firewall is not blocking the IP address.

If the laptop is connected to a network, verify a virtual private network (VPN) is not being used to access a corporate network. The VPN may need to be disconnected before a local Ethernet connection is possible.

4.3 Connecting to the NGC8206 Local Port

The laptop computer connects to the local port via USB or RS-232 using one of two cables (See **Figure 4-4**).

FYI 

ActiveSync software is required to communicate when using a USB. If ActiveSync was not installed during the PCCU32 installation, connecting the USB cable should trigger the ActiveSync installation to begin.

4.3.1 Communicate Instructions

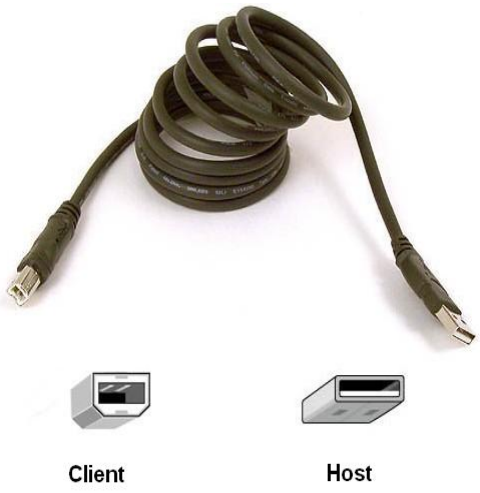
1) Connect the MMI cable to the designated port on the PC and to the local port located on the outside of the NGC. If the unit is configured for the RS-232 MMI cable, connect to the appropriate communication port on the PC (default is COM1). If the unit is configured for a USB cable, connect the host end of the USB cable to any USB port on the PC.

2) Although shortcuts were previously discussed, the following is the traditional method of connection. Click on the Windows Start button. From the menu, select **Programs** and then **PCCU** (or correct program folder if changed during installation). From the fly-out menu, select **PCCU32**. This will display the PCCU32 initial screen.

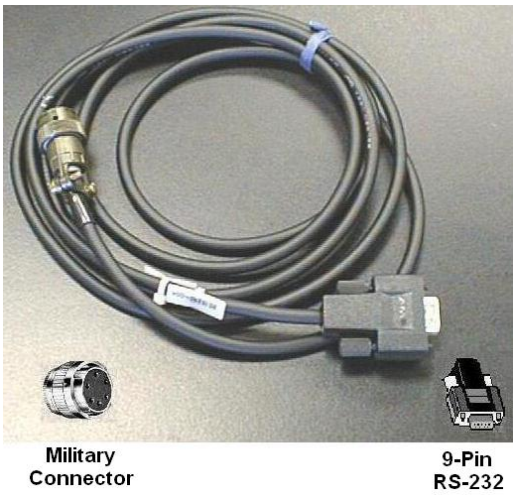
3) Assuming the MMI cable is connected, click the **Connect** icon (left-most icon at the top of the screen). If this unit had been previously set up, the Local Connect screen would appear with some labeled buttons. However, if setting up the unit for the first time, the NGC Startup Wizard will appear. If so, see NGC Startup on the next page.

TIP 

If the Invalid Security Code screen appears, enter four zeros (0000) for the new code, and click **OK**. The NGC should have defaulted to 0000 on startup.



USB Cable
P/N 180 1800-xxx



RS-232 Cable
P/N 2015240-xxx

Figure 4-4 MMI Communication Cables

4) If the unit has already been set up, the Local Connect screen displays two buttons: Entry Setup and Collect Historical Data. Clicking on **Entry Setup** will takes the user to the Analyzer Operation screen which has links to other operations. Daily operations should be performed from this screen. Historical data collection can also be performed from here by clicking on the **Collect** icon at the top of the screen.

FYI

If a communication error is received, click on the Setup icon along the top of the screen, and verify the PCCU com port. If using USB, this should indicate USB; if not, click on the down arrow and scroll through the available selections, and select USB. If the serial communications with the round connector on the NGC end is used, select the communications port being used (COM1, etc.). When finished, close the Setup screen, and click the Connect icon again.

4.4 NGC Diagnostics

Previously in Installation, the DC power circuit to the NGC was completed. Once power was applied to the unit, the NGC began the start-up procedure:

- Unit cold started, loading start-up information into RAM memory
- Start-up diagnostics run. If diagnostics are not successful, unit will return a system fault and cease start-up.
- Start-up diagnostics consists of four areas of testing:
- Carrier Pressure Regulator Test
- Oven Temperature Test
- Processor Control Test
- Stream Test

As noted above, the oven temperature test is one of the diagnostic tests. To pass this test, the oven temperature must reach 60° C and somewhat stabilize.

Additionally, part of the processor control test is testing the amount of effort the oven controller takes to keep the oven at its set point of 60° C. Based on ambient temperatures, this could take up to an hour. During this time, the user can be entering information via the Startup Wizard.

During the initial start-up, all streams are disabled. During the stream test, streams with input pressure will be re-enabled, tested and either passed or failed. Streams with no initial input pressure will fail and are left disabled. Streams can always be re-enabled later if they will be used.

During the diagnostics or upon completion, the user may view the status of the diagnostic tests by clicking **Diagnostics** on the Analyzer Operation screen. Part of the startup diagnostic takes the user to the Diagnostic screen. When the unit completes the startup diagnostics and has passed the appropriate tests, with the exception of streams with no pressure, the unit will go into hold mode. Totalflow recommends that the unit be allowed to run at least eight hours to completely stabilize and then a calibration is performed. This is also described in the Startup Wizard.

4.5 NGC Start-Up Wizard

After starting PCCU32 and clicking the **Connect** icon, the NGC Startup Wizard begins automatically. This will only happen the first time the user connects to the unit or each time they reconnect to the unit and have not completed the Startup Wizard.

The wizard walks through the process of entering all the necessary information to get the NGC up and running. Each screen has an associated help screen that automatically displays when moving from screen to screen.

Step through all the screens in the Startup Wizard, filling in the required information. The unit may be concurrently running the startup diagnostics as the user is entering data into the Startup Wizard. One of the steps in the Startup Wizard is displaying the Diagnostics screen to see the results. If the diagnostics are still in progress, the Startup Wizard will not allow the user to continue until they finish.

The following procedure is only an outline, and specific steps are discussed in the Wizard help file.

4.5.1 Station Setup Instructions

1) Enter the **Station ID** (10 alphanumeric digits) and **Location** (24 alphanumeric digits) (see **Table 4–1**). The Station ID should be a unique identifier from other NGCs the user may communicate with.

2) Verify the date and time; if incorrect, Set Device with the PCCU Date/Time to **Yes**.

Additional items in the Station Setup screen are not required for startup. For more information regarding the setup of these items, see the topic on the startup help displayed with each screen.

3) When all desired changes have been made, select **Send** and then **Next** to move to the next screen.

Table 4–1 Station Setup Screen Information

Description	Value
Station ID	Assign unique Identifier (10 alphanumeric digits)

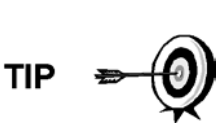
Location	Enter information regarding meter location (24 alphanumeric digits).
Date/Time	Shows current unit Date/Time
Set Device with PCCU Date/Time	Resets device date and time to match PC

4.5.2 Stream Setup Instructions

1) Enter the Stream ID, Location, Contract Settings and Calculation Settings (see Table 4–2).

2) When all the desired changes have been made, select **Send** and then **Next** to move to the next screen.

3) Complete steps 1 and 2 for each sample stream.



During the stream setup, note that each time Next is selected, the user should see the Stream ID, located on the first line of each screen, change value. The user must move through all four streams even if the unit is a single stream unit.

Table 4–2 Stream Setup Screens

Setup Tab		Available Values
Stream ID		Assign unique Identifier (10 alphanumeric digits)
Location		Enter information regarding 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, PSFa, 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.[1]
Sum IC5 & NeoC5		No (default), Yes
C6+ Index Split Mode[2]		Default-User Defined with C6+ Reported, 47.466% C6 35.340% C7 17.194% C8, 50% C6 50% C7 0% C8, 50% C6 25% C7 25% C8, 57.143% C6 28.572% C7 14.285% C8, User-Defined C6+ Not Reported.
C6, C7, C8, C9, C10`		Used to enter split percentages if desired.

4.5.3 Calibration Setup Instructions

1) Verify that each process stream is set up to use the correct calibration stream (Stream 4 Default).

[1] File selection automatically sets the remainder of items on this screen. See PCCU Help files for more information.

[2] Note that making a selection in this field (other than User Defined) will override any values in the C6+ Split Percent area of the Stream Setup screen.

2) To make changes to the calibration stream for each process stream, use the Back button to return to the setup for the stream and make changes.

3) Change Calibration Cycles Average and Purge Cycles, if required. Default Calibration Cycles Average is 3 and Purge Cycles is 2.

4) Make changes to the concentrations in the % BLEND column insuring that the Total Mole % equals 100%.

Caution should be used when entering component blend percentages to carefully match the components labeled on the calibration bottle. Mistakes will cause incorrect values.

If the Total Mole % does not equal 100% exactly, add or subtract the remainder to or from methane (C1) to force the total to 100%.

5) When finished and Total Mole % equals 100.00%, select **Next** to move to the next screen.

6) When all desired changes have been made, select **Send** and then **Next** to move to the next screen.

4.5.4 Diagnostics

1) Diagnostics began when power was applied to the unit. The user cannot proceed beyond the Diagnostics screen until diagnostics have passed. When completed, select **Next** to move to the next screen.

2) To change the run order of process streams, change values beside Sequence Numbers. In this same screen, streams may be disabled or enabled.

FYI 

During the initial start-up, all streams will be disabled. During the stream test, streams with an input pressure will be re-enabled, tested and either passed or failed. Streams with no initial input pressure will fail.

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

3) When all desired changes have been made, select **Send** and then **Next** to move to the next screen.

4.5.5 Update Configuration

1) Totalflow recommends that the user save the unit configuration file following setup. Change the value beside Save Configuration Data to **Now** to save configuration.

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

4.5.6 Analyze Calibration Stream

1) Prior to running the sample streams, the NGC should run the calibration stream (default Stream 4). Select **Stream 4** on the left side of the screen. The button beside Stream 4 should illuminate, the cycle clock will begin, and the user should see animated gas running on the calibration stream.

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 unit completes the current cycle, it will enter hold mode.

3) Select **Next** to verify analysis results.

4) Compare normalized % for each component to the component and percent listed on the calibration blend bottle. Component percentages should be relatively similar.

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 Chrom-1.

6) Verify that the appropriate components are visible and labeled. For the standard C6+ application, the user 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 Chrom-2.

8) Verify that the appropriate components are visible and labeled. The user 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) Select **Next** to begin the process stream analysis. Select **Run** on the left side of the screen to begin the first process stream in the sequence. The buttons beside Run should turn blue, the cycle clock will begin, and the user should see animated gas running on the process stream.

4.5.7 Start-up Completion

1) The unit should continue to cycle through all enabled streams performing analysis and producing data.

2) Totalflow recommends that the unit be allowed to run at least eight hours before calibration to allow unit to stabilize.

3) Select **Close** to complete the Start-up Wizard and return to the PCCU Local Analyzer Operation screen. If completed satisfactorily, the Start-up Wizard should not re-appear when connecting to unit. However, should the user like to review or make changes, they may re-enter the Wizard by selecting **NGC Start-up Wizard** from the Help drop-down menu.

4.6 Calibrating the NGC

The NGC is factory-calibrated and should not require that a calibration be performed immediately. It is recommended the unit operate for a period of eight continuous hours before a field calibration.

At that time, a field calibration should be performed. This will allow adjustments due to the location's barometric pressure and other factors.

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. When calibration is complete a thorough examination of the results should follow.

Allow the NGC to run for a minimum of eight hours before a field calibration is performed.

4.6.1 Instructions

1) From the Analyzer Operation screen, select **Cal**.

2) When the current cycle completes, the unit should begin a calibration on the designated cal stream (stream 4 default).

3) When the calibration is complete, the unit should move to the designated next mode. View results on the Analyzer Operation screen.

4) The calibration stream's Un-Normalized total should be 6.5% (between 99.5% and 100.5%).

CAUTION If values exceed these parameters, proceed to the **Troubleshooting** section of this manual.

5) Carefully examine the calibration stream's Chrom-1 and Chrom-2 by clicking the button. Look for unlabeled peaks and base line anomalies. **Figure 4-5** and Figure 4-6 should be used as a guide.

CAUTION If errors exist, proceed to the **Troubleshooting** section of this manual.

6) Once the unit is running smoothly and is producing good Chroms and all the peaks are labeled and eluting correctly, perform a save and restore procedure to update TFCold.

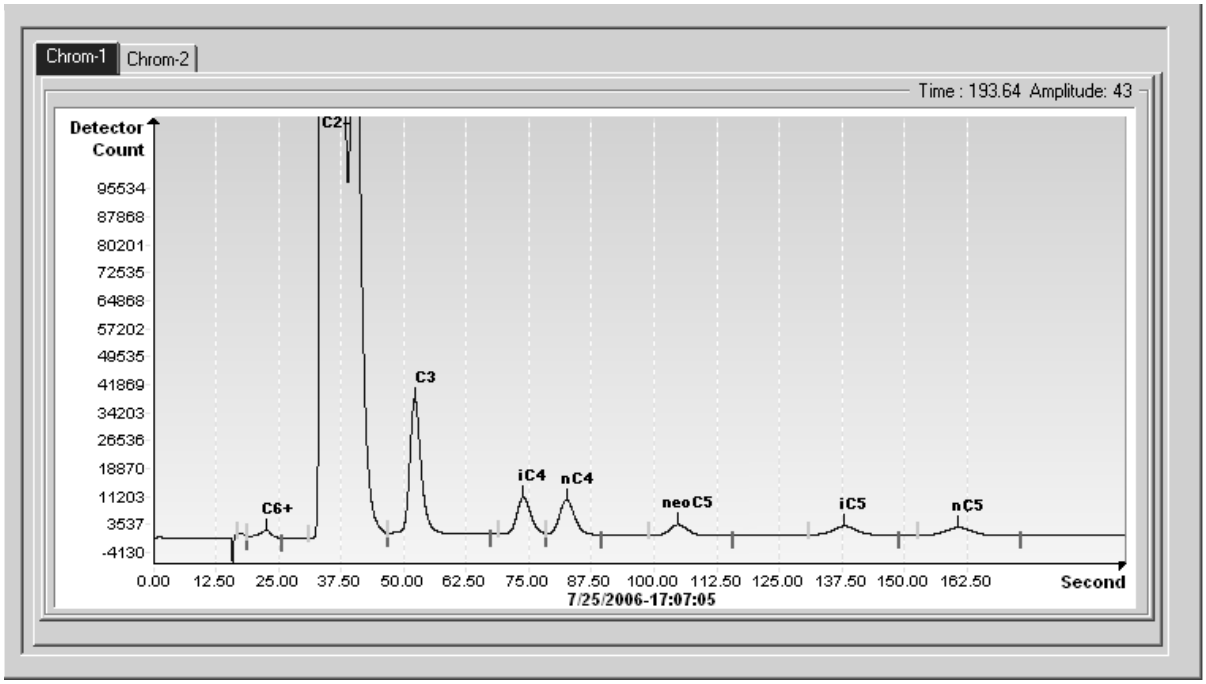


Figure 4-5 Typical Chromatograph for Chrom-1 (Heavies)

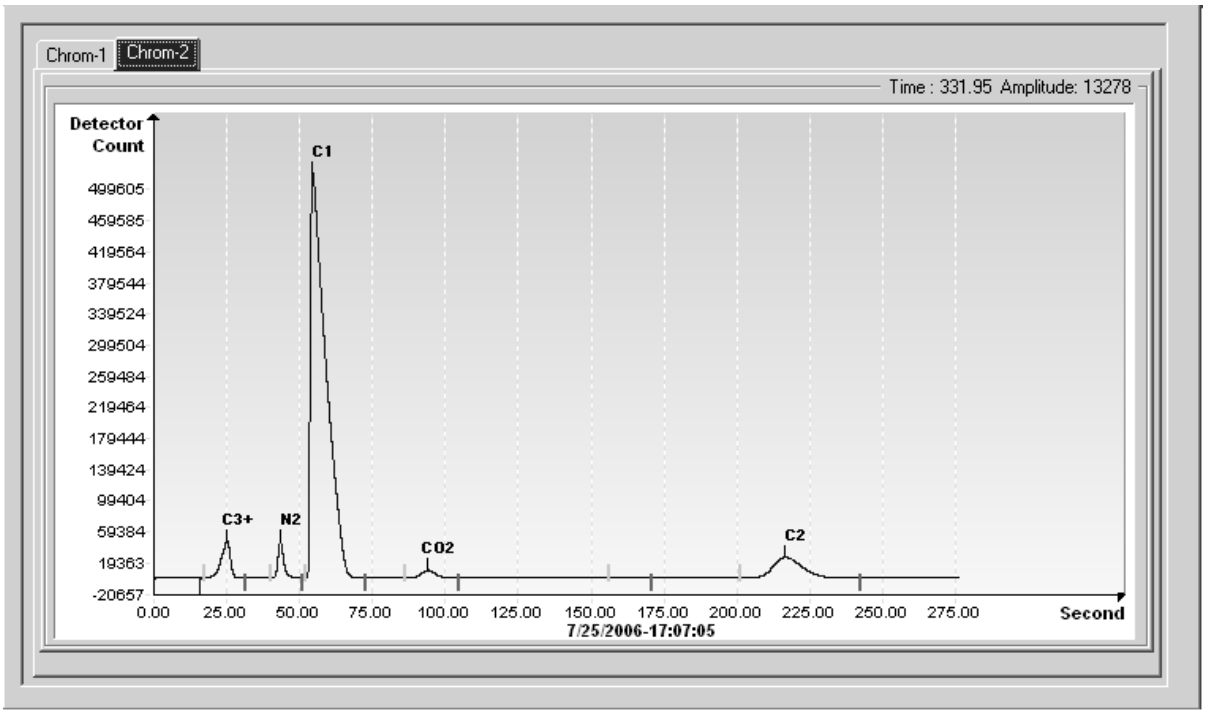


Figure 4-6 Typical Chromatograph for Chrom-2 (Lights)

4.7 Security System

The NGC Board has a bi-level security system built in. For the purpose of this manual, this is referred to as hardware security. When the NGC is accessed through PCCU32 or WINCCU Host software packages, either remotely or locally, there is a third level of security included. This is referred to as the software security.

The security switch located on the termination panel of the NGC must be switched down for the hardware security system to be functional. The switch must be switched up to change the device's security code. Security codes are checked via remote communication whether the switch is on or off.

4.7.1 Security Code

The setup, as designed, has each user log on to the system with a unique user name (up to 25 alphanumeric digits) and 4-digit alpha-numeric password before connecting to the unit.

4.7.2 Hardware Security

The hardware security system is designed to have two levels of user access: 1) reading data files, read only access, and 2) sending application and configurations, read/write access.

By default, user access is restricted from modifying the application table or from downloading files to the device's TFData and TFCold drives, but has all other user-type privileges. These default privileges can be edited by the administrator and consist of 4-digit alphanumeric pass codes, level 1 and level 2.

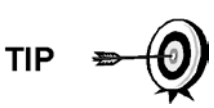
4.7.3 Software Security

The tri-level software security system is designed for the password administrator to set up the accounts and privileges for themselves as well as all other host

software users. These privileges include being able to instantiate applications and make changes to the functionality of the NGC.

A second level of user access includes application editing and downloading files to a device. User access by default is restricted from modifying and downloading the application table or from downloading files to the device's TFData and TFCold drives but has all other user-type privileges.

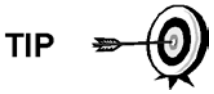
These default privileges can be edited by the administrator and consist of a user name (up to 25 alphanumeric digits) and a password (up to 25 alphanumeric digits). These are separate privileges that may be given individually or totally. See the help files in the host software package for more information.



The NGC does not send an error message when the user tries to write an operation but does not have the proper hardware security code; it simply does not accept value changes.

4.8 Alarm Definitions

The user has the ability to define the threshold for the NGC alarm parameters. The NGC provides 124 standard alarms. Of these, a number of alarms are defaulted to enabled (see **Table 4–3**). Many of these are considered system alarms, and the user is cautioned not to make changes to the logic. A multitude of additional alarms are available and user-configurable.



The user may define alarms, beyond defaults, for each process stream.

Table 4–3 Defaulted 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 Chrom Process	GT	0	System Fault
Bad Bead	GT	0	Fault
Sample Flow Detect	GT	0	Fault
Cpu Loading	GT	85	Warning

Alarm Descriptions	Logic Type	Threshold Default	Severity
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

5.0 MAINTENANCE

5.1 Overview

This chapter provides the user with maintenance information and instructions on how to remove and install NGC components. Performance of the recommended procedures maintains the unit in optimum operating condition, reduces system downtime and ensures accuracy of natural gas sample analysis.

It is recommended that the user develop regularly scheduled daily, weekly or monthly maintenance programs. By establishing such programs, NGC downtime will be reduced and the system will operate at optimum analytical efficiency. Perform all the recommended procedures as presented within this chapter.

Practical experience permits updating the maintenance procedures and associated schedules over time. This results in many procedures being performed on a routine basis before potential problem(s) result in a failure.

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

5.1.1 Help

If technical assistance is required during performance of maintenance functions or if returning parts, contact ABB Totalflow customer service department at the following phone number:

USA: (800) 442-3097 or International: 1-918-338-4880

5.1.2 Maintaining Cleanliness

It is important that an inspection time period be established to examine the unit for internal and external cleanliness and damage.

Because an NGC installation is primarily exposed to external environmental conditions, it is important that it be regularly inspected for cleanliness, both externally and internally. Even though the NGC 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 NGC inoperable.

5.1.3 How to Use This Chapter

It is recommended that the user develop a regularly scheduled maintenance program. By establishing a maintenance program, NGC downtime can be minimized.

Record all items within this chapter in the maintenance practice procedures. Practical experience permits updating this schedule over a period of time. This results in many maintenance items being handled on a routine basis before potential problem(s) result in a failure.

5.1.4 Returning Part(s) for Repair

If a Totalflow 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.

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.

When removing the front or rear end caps, hands can become coated with a black thread lubricant. If this happens, wash hands before performing maintenance functions, using Go-Jo or an equivalent type hand cleanser. The lubricant must not come in contact with components. Do not wipe lubricant on clothing as it cannot be removed easily.

If enclosure needs more thread lubricant, use Vaseline.

5.2 Spare Part Components

The information in this section presents the components (see **Figure 5-1**) and parts that are accessible for removal and installation. Replacement components will be covered first in this chapter, followed by instructions for replacing spare parts.

5.2.1 Replacement Components

The following is a list of components that may be replaced:

- Analytical module (12 or 24 VDC) with or without GC module (see **Figure 5-2**)
- GC module
- Digital controller assembly with display
- Termination panel
- Feed-through assembly without preheat (see **Figure 5-3**)
- Feed-through assembly with preheat (12 or 24 VDC)

5.2.2 Replacement Parts

The following is a list of parts that 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

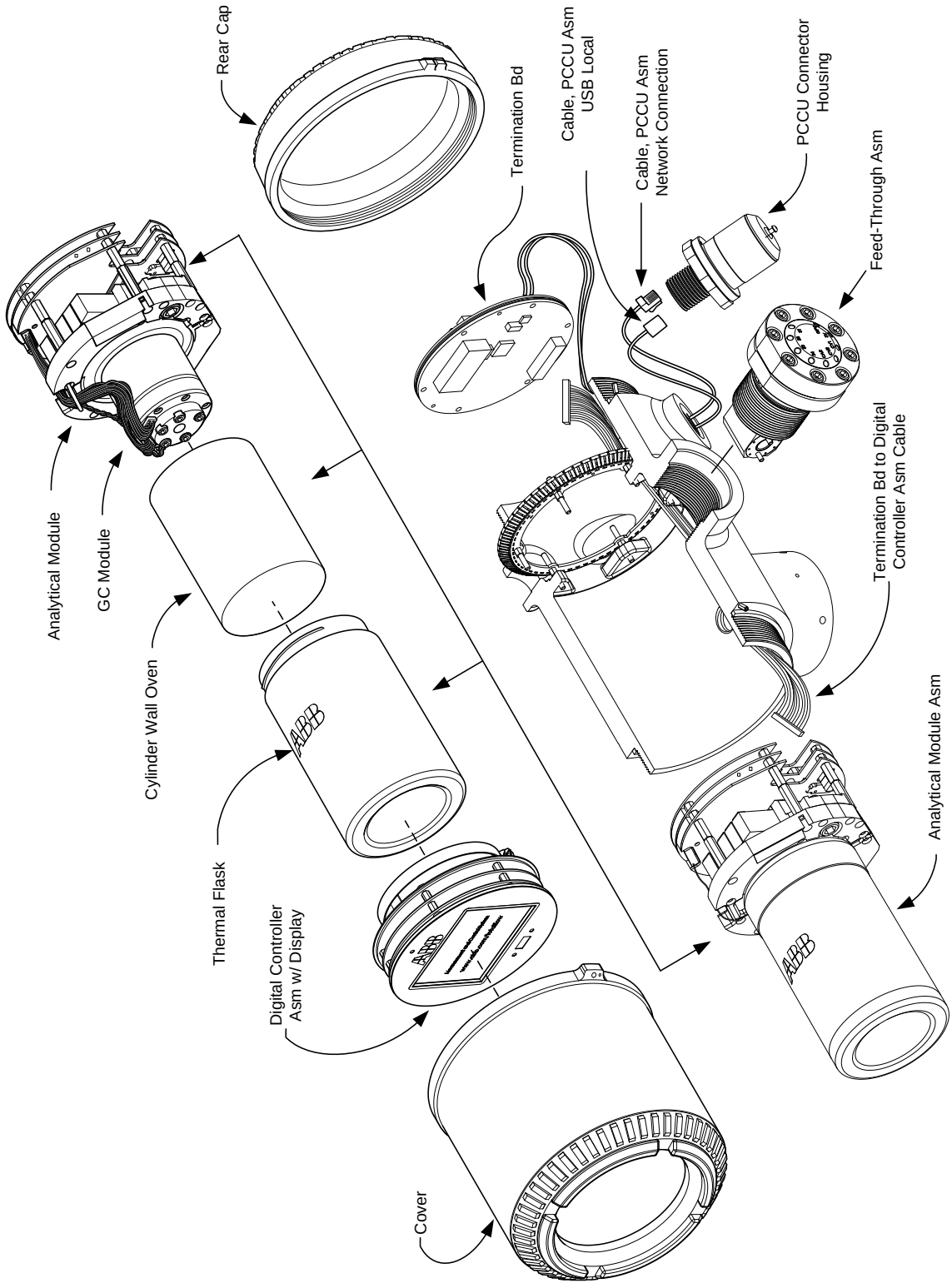


Figure 5-1 NGC8206 Overall View

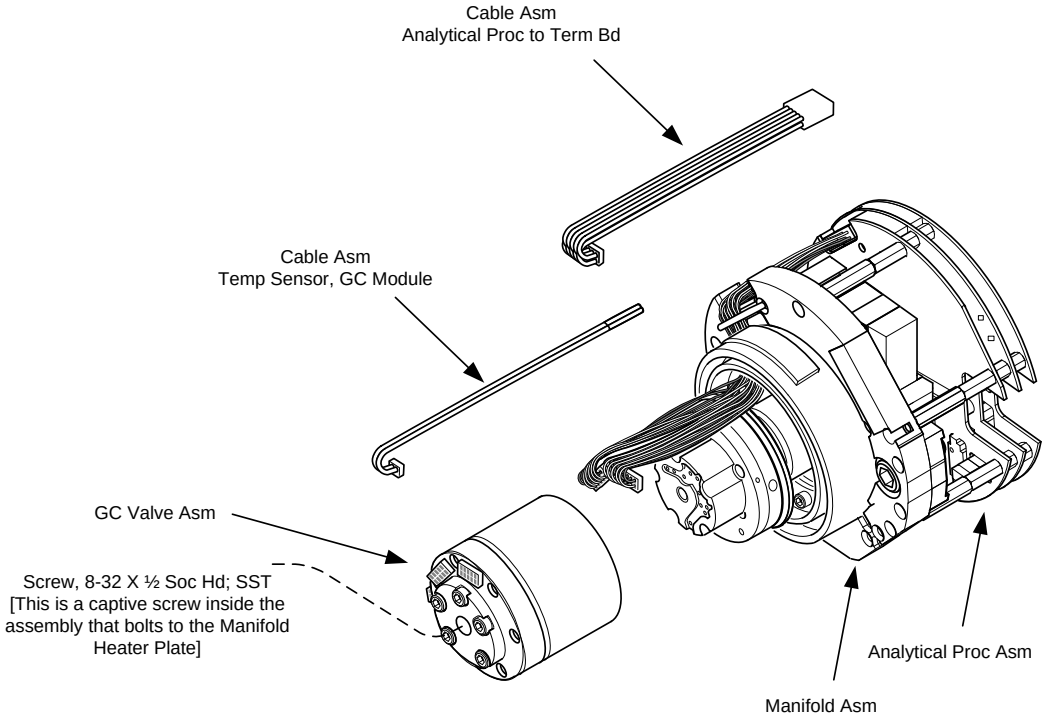


Figure 5-2 Analytical Module, Exploded

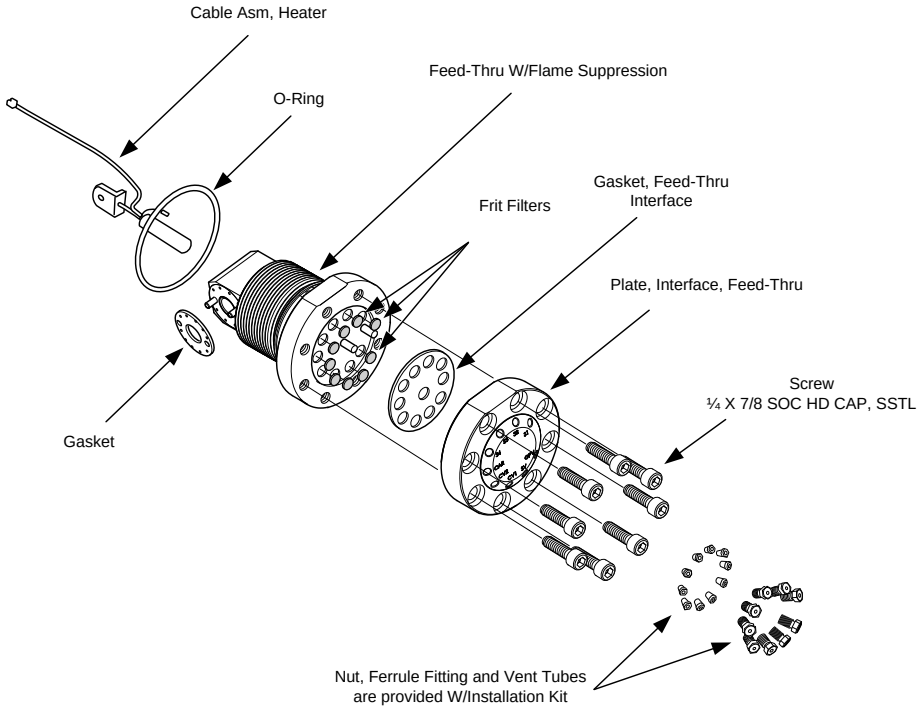


Figure 5-3 Feed Through Assembly, Exploded

5.2.3 Repair Time

ABB Totalflow has provided a recommended spares list for the NGC8206 product line. Consideration was given to the cost of the repair time and the cost of stocking the repair parts. The NGC8206 modular design is uniquely suited for quick repair times. Below are four categories of repair times and the spares required to achieve those various repair times.

Table 5–1 Repair Time vs. Down Time

Repair Time	Requirements
No down time	If the application cannot allow for any down time, the user will need to consider having two units up and running. When one fails the user can simply switch to the backup unit and send the failed unit in for repair.
In less than 8 hours	If the user is required to have a down time of less than eight hours, the user will have to stock replacement parts on site. The repair parts required would depend on the variety of applications at the site. This would be a typical scenario if the user has multiple units or applications at a single site.
In less than 48 hours	This category is for applications where the parts would be stocked at the factory. Overnight delivery of the part would allow for repair the next day. This might be typical for a fixed application that could tolerate a 48 hour repair time.
In less than 120 hours	This category is suited for any application or mix of applications. Within five working days, the site can receive shipment of stocked or built-to-order parts.

5.2.4 Recommended Spares

Recommended spares are provided for each of these categories, depending upon whether there is a single or multiple unit 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.

5.2.5 Customer Service

Customer service can be called out and may have the stocked applications available for replacement. The scheduling for a call out is typically a week. As a result, maintenance contracts may need to be considered if service personnel are needed in a more timely fashion. Phone support from the factory is available to help with diagnosis of the problem. Alarms from the unit are also a key to quick diagnosis and repair of any failure.

Table 5–2 Recommended Spare Parts

Part Description	Stock Application	
	1	>1
12 VDC Analytical Module assembly w/o GC Module		1
12 VDC Analytical Module assembly with GC Module	1	

Part Description	Stock Application	
	1	>1
24 VDC Analytical Module assembly w/o GC Module		1
24 VDC Analytical Module assembly with GC Module	1	
Cable between the Analog Processor and the Termination Board	1	1
Digital Controller Board and Display, Completed assembly.	1	1 per application
Digital Controller Board Assembly (Auxiliary unit with no display)	1	1 per application
Filter Frit for Feed-through Assembly	2	2
GC Module tested and characterized		1 per application
MMI Port RS-232	1	1
Ribbon Cable for connection between the Digital Controller and Termination Panel	1	1
Termination Panel	1	
USB Local MMI Port	1	1

5.3 Field Tool Kit

The recommended NGC maintenance tools are presented in **Table 5–3** and are included in the optional field tool kit.

Table 5–3 Tool Requirements

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

5.4 Visual Inspection

The NGC should be given an external visual examination on an established time period. Visual checks maintain optimum system operation and accuracy of natural gas sample analysis.

5.4.1 Inspection

During the visual inspection, components should be examined for the following conditions:

- Pipe or wall mounting: The unit 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 bottle mounting rack: The mounting rack should be tilted backward slightly to keep the bottles from falling forward.
- Bottles within mounting rack: The bottles must be securely strapped in the mounting rack.
- Bottle 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 NGC: These must not be bent or closed off. The connections must be tight. Such conditions impede the sample flow to NGC.
- 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 conduit runs to Div 2 or non-hazardous areas must be sealed per NEC codes.

5.5 Backing Up Configuration Files (Save)

Before beginning any maintenance on the NGC, collect the data and back up all configuration files to the laptop's hard drive or a floppy disk. This safeguards the data and allows for a re-start of the unit without the problems of re-configuring the NGC should anything arise.

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.

5.5.1 Instructions

1) Collect data from the unit.

2) While in PCCU, use the Save and Restore Utility found under File Utilities in the Operate drop-down menu or by clicking **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) When finished saving the station files, a new window will offer the option to restore the station files to the TFCold drive. If the user selects **Yes**, the station files will be downloaded to that drive.

FYI 

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 Troubleshooting and PCCU help files.

5.6 Restore Configuration Files

The Restore function enables the user to follow various maintenance procedures or download configuration files to the flow computer.

If prior to performing maintenance, the Save Configuration Files was used, these files were downloaded to the laptop hard drive or on a floppy disk. The Restore

function uploads these files into the NGC TFCold drive. This safeguards the data and allows for a re-start of the unit without the problems of re-configuring the NGC should anything arise.

5.6.1 Instructions

1) While in PCCU, use the Save and Restore Utility found under File Utilities in the Operate drop down menu or by clicking **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.

4) Perform a cold start following the instructions in the **Reset Procedures** sub section and verify the unit is functioning properly.

FYI  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.

5.7 Reset Procedures

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

5.7.1 Warm Start Instructions

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 NGC 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 NGC microprocessor to lock-up.

1) Collect data from the unit.

2) Using the Lithium Battery Status instructions, verify the battery status is OK before proceeding.

3) Gain access to the rear termination panel on the NGC 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.

CAUTION  As with all electronic components, caution should be used when handling boards. Static electricity can potentially damage board components, voiding any warranty.

4) To warm start the unit, depress the S1 reset switch on the termination panel.

Or, to remove the NGC from service, disconnect the power connector J1 from the board.

5) To place NGC in service, return the power connection J1 to the termination panel.

5.7.2 Cold Start Instructions

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.

CAUTION  As with all electronic components, caution should be used when handling boards. Static electricity can potentially damage board components, voiding any warranty.

2) Gain access to 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 NGC 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 5-4**).

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 front display.

7) When the Navigation screen appears, restore the lithium battery connection on the digital controller board.

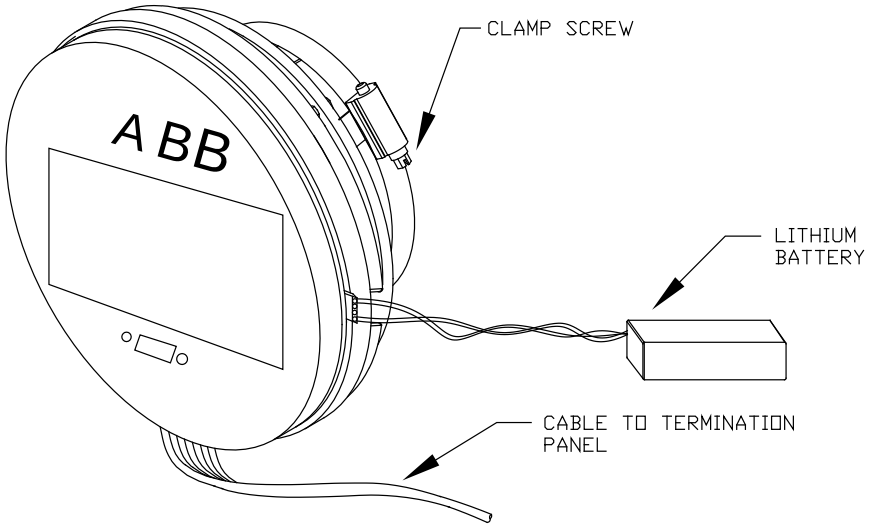


Figure 5-4 Digital Controller Complete Assembly

5.8 Restore Factory Defaults

Occasionally, it may be necessary to restore factory defaults. If critical configuration data is accidentally changed or erroneous results have been produced, the unit 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. This includes the following items:

- Communication port settings
- Calibration gas concentrations
- Instantiated applications
- NGC setup information
- Start-up wizard re-initialized
- Electronic pressure settings
- All application parameters including display changes

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

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 Totalflow technical specialist recommends this procedure. If questions exist, call Totalflow support at (800) 442-3097 option 2.

5.8.1 Instructions

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) Collect data from the unit.

3) Shut-down PCCU32.

The system may not allow the deletion of active files when the NGC is in normal operation (running from FLASH); therefore, the user should force unit into Boot Loader mode.

4) Force the NGC operating system into Boot Loader.

5) Press the **Reset** button on the NGC termination panel. Wait about eight seconds until the Initializing System screen appears.

6) Press the **Reset** button a second time. The unit should now be in Boot Loader mode. The screen will revert to the TOTALFLOW display screen.

7) Right-click on the Activesync icon located in the System Tray on the PC. From the pop-up screen, select **Explore**.

8) In the new window, highlight the TFData folder under Mobile Devices.

9) Right click and select **Delete**. The folder should disappear.

10) Open the Flash folder by double-clicking.

11) Highlight the tfCold folder. Right-click and select **Delete**. The folder should disappear.

12) Press the **Reset** button on the termination panel. This action should cause the \Flash\Factory\tfCold information, saved at the factory, to be copied into a new TFData folder. This will restore all factory settings. The unit has successfully been reset if the user sees the Startup Wizard when they reconnect with PCCU.

5.9 Lithium Battery Status

Prior to some maintenance procedures, especially when a Cold Start is not desirable or feasible, the user should verify that the Lithium Battery Status is OK.

If the user is directed to these instructions from another set of instructions, please return to them when the status has been verified.

5.9.1 Instructions

1) While in the PCCU Analyzer Operation screen, select **Station Setup** from the buttons across the top of the screen.

2) Select the value beside lithium battery status.

3) If Lithium Battery Status value reads OK, then power may be removed from the unit 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 unit. See instructions later in the chapter, **Replacing Lithium Battery**.

5.10 Changing NGC Clock

When measurement streams are instantiated on the PGC, changing the clock could affect the time when log period entries are made. To protect the integrity of accounting audit trails, the NGC handles these types of clock changes as follows:

FYI  Examples are based on a 60 minute Log Period.

5.10.1 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).

5.10.2 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. NGC 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.

5.10.3 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. NGC 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).

FYI 

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.

5.11 Replacing Calibration or Carrier Gas Bottle(s)

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

5.11.1 Instructions

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) Turn off the calibration and/or carrier gas at the bottle.

3) Remove the regulator from the bottle.

4) Exchange the bottle with the full bottle.

5) Re-install the regulator into the bottle. 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 NGC feed-through assembly, loosen the nut and ferrule from the corresponding inlet, allowing air to purge from the line.

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 bottle regulator and feed-through assembly.

9) In PCCU, with unit still in hold, run two single cycles. Inspect the chromatograms to determine if the unit is processing correctly. If Chroms are OK, return the unit to normal operation.

5.12 Removing Digital Controller Assembly

This section presents the procedures for removal and installation of the digital controller assembly and mounting bracket. If the user has been directed here from another procedure, return back to the corresponding procedure when disassembly is complete.

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

5.12.1 Instructions

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) 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.

Do not remove the NGC board-mounted lithium battery or the termination panel cable at this time. Removing the lithium battery will cause a cold start and that may not be desirable. When replacing the lithium battery, the termination panel cable must remain connected to power the digital controller assembly; otherwise, the unit will cold start. The user will receive specific instructions during each procedure if either cable should be unplugged.

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

5.13 Replacing Digital Controller Complete Assembly

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

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

5.13.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

4) Turn off all sample streams, calibration gas and carrier gas.

5) Disconnect or remove the power from the NGC unit externally, or remove the J1 connector from the termination panel.

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

6) Following the instructions detailed in sub section, **Removing Digital Controller Assembly**, remove the assembly.

7) Unplug the termination panel to digital controller assembly flat ribbon cable, leaving the lithium battery connected.

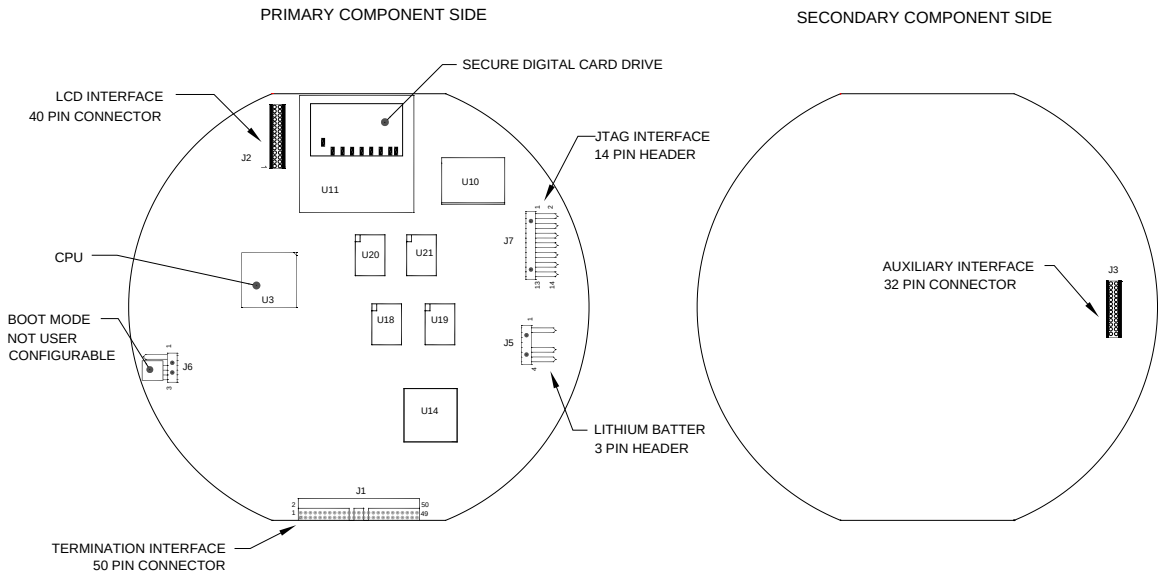


Figure 5-5 Digital Controller Board

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.

CAUTION

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 NGC (Step 5).

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 counter clockwise for less.

12) Restore the configuration files following the instructions detailed previously in sub section, **Restore Configuration Files**.

13) Reinstall front and rear end caps.

CAUTION

To return this assembly to Totalflow service for warranty or repair, contact Totalflow customer service for an RA number. Keep the lithium battery connected to the digital controller board for return.

FYI

Note that since power was removed from this unit, the NGC will perform start-up diagnostics and stabilize. If the user has disabled the start-up diagnostics, they should be enabled and power cycled to the unit. If the power has been withheld from the unit for an unknown or lengthy period of time, a complete start-up should be performed.

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

5.14 Replacing Analytical Module

This section presents the procedures for removal and installation of the analytical module. The module is a completely self-contained unit and is part of the NGC8200. Read through all procedural steps before beginning disassembly.

Verify before beginning the procedure 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.

When the analytical module is removed, the module should be placed on a clean, dirt-free work surface. Care should be taken that gas ports are free from lint or dust particles. Totalflow strongly suggests that the GC replacement module 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 return this assembly to Totalflow service for warranty or repair, please contact Totalflow customer service for an RA number.

5.14.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

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 NGC unit externally, or remove the J1 connector from the termination panel.

As with all electronic components, caution should be used when handling 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 then unscrewing the end cap.

8) Following the instructions detailed previously in the section, **Removing Digital Controller Assembly**, remove the assembly. If weather/circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on the cable connections. Skip 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 (see **Figure 5-6**) 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 5-7**).

12) Set 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.

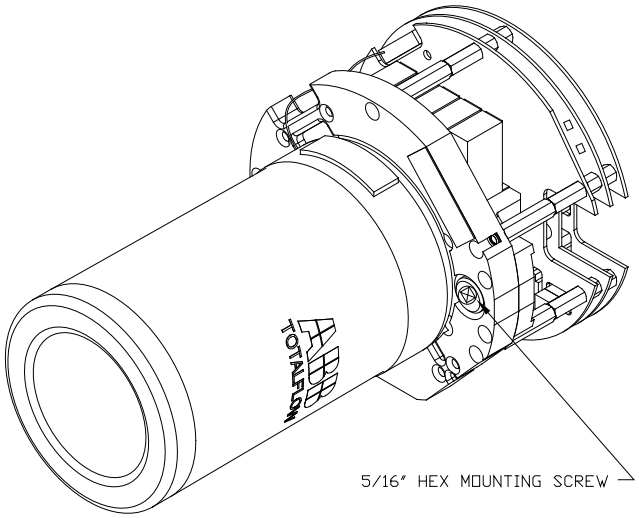


Figure 5-6 Analytical Module

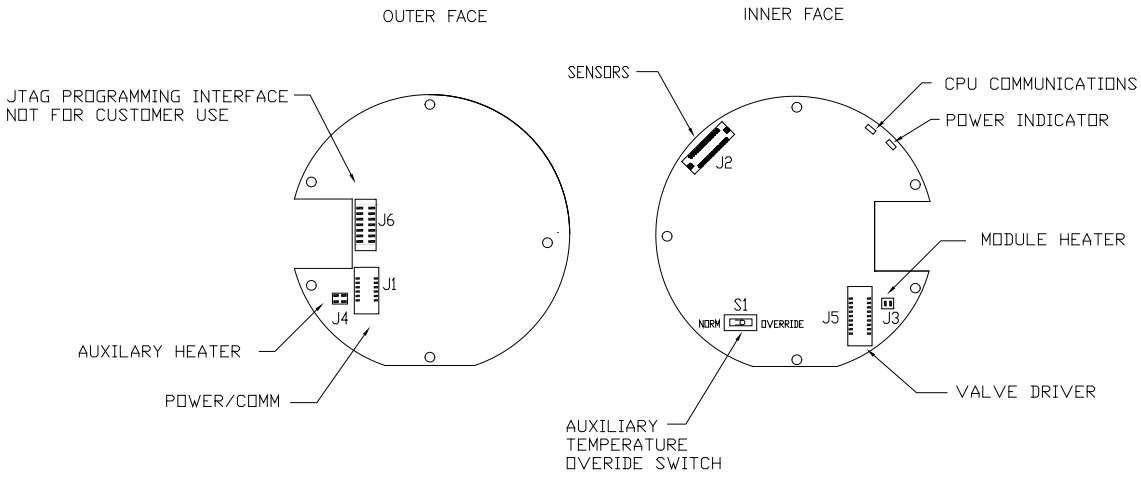


Figure 5-7 Analytical Processor Board

16) Holding the new analytical module at the opening of the enclosure, reconnect jack J1 and J4, if the auxiliary heater is installed (see **Figure 5-7**).

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) Use **Replacing Digital Controller Complete Assembly** previously covered.

20) Plug the termination panel to the digital controller ribbon cable into the digital controller assembly.

CAUTION

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.

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 unit is reassembled, apply power to the NGC (Step 6).

24) Follow the Cold Start procedure in **Maintenance**.

25) Reinstall the front and rear end caps.

FYI

Note that since power was removed from this unit, the NGC will perform start-up diagnostics and stabilize. If the user has disabled the start-up diagnostics, they should be enabled and power cycled to the unit. If power has been withheld from the unit for an unknown or lengthy period of time, a complete start-up should be performed.

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

5.15 Replacing GC Module

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

Verify before beginning the procedure 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.

CAUTION

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.

5.15.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, Backing Up Configuration Files.

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 NGC unit externally, or remove the J1 connector from the termination panel.

CAUTION

As with all electronic components, caution should be used when handling 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 then unscrewing the end cap.

8) Following the instructions detailed previously in the section, **Removing Digital Controller Assembly**, remove the assembly. If weather and circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on cable connections. If so, 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) Unscrew the thermal flask counterclockwise (see **Figure 5-8**). When loose, lift the flask from the unit. Set aside.

11) Unscrew the oven wall counterclockwise (oven wall may be hot). When loose, lift the cylinder from the GC module. Set aside.

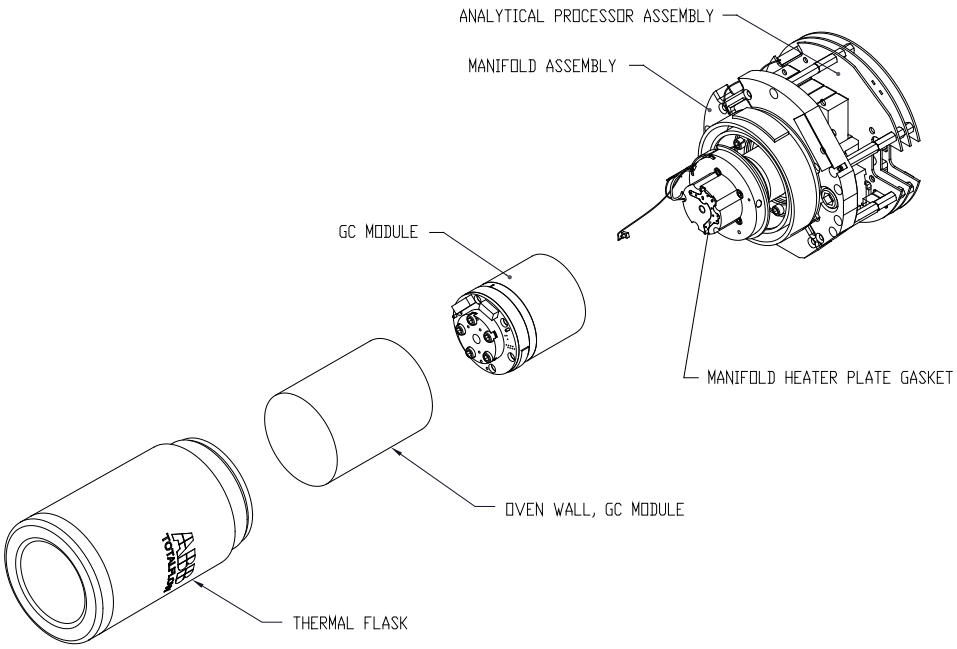


Figure 5-8 GC Module, Exploded View

12) 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.

13) 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.

14) Verify that the manifold heater plate gasket is in place and in good condition.

15) 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 unit should not turn once it is seated correctly.

16) When the GC module is in place, tighten the mounting screw.

17) Carefully restore the cable connectors to J1, J2 and J3 jacks, being careful to not press against the wires attached to the connector head.

18) 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.

19) Replace the thermal flask over the GC module. When the flask reaches the mounting bracket, turn clockwise to tighten.

20) Use **Replacing Digital Controller Complete Assembly** previously covered.

21) Plug the termination panel to the digital controller ribbon cable and then into the digital controller assembly, if disconnected.

CAUTION 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.

22) Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.

23) Turn on all sample streams, calibration gas and carrier gas.

24) Once the unit is reassembled, apply power to the NGC (Step 6).

TIP To return the assembly to Totalflow service for warranty or repair, please contact Totalflow customer service for an RA number.

25) Follow the Cold Start procedure in **Maintenance**.

26) Reinstall the front and rear end caps.

FYI Note that since power was removed from this unit, the NGC will perform start-up diagnostics and stabilize. If the user has disabled the start-up diagnostics, they should be enabled and power cycled to the unit. If power has been withheld from the unit for an unknown or lengthy period of time, a complete start-up should be performed.

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

5.16 Replacing 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 NGC. Read through all procedural steps before removing the assembly.

5.16.1 Instructions

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) Collect data from unit.

3) Back up configuration files, following the instructions detailed previously in the section, Backing Up Configuration Files.

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 NGC 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.

CAUTION As with all electronic components, caution should be used when handling boards. Static electricity can potentially damage board components, voiding any warranty.

6) Disconnect or remove power from the NGC unit externally, or remove the J1 connector from the termination panel (see **Figure 5-9)**.

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.

CAUTION

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.

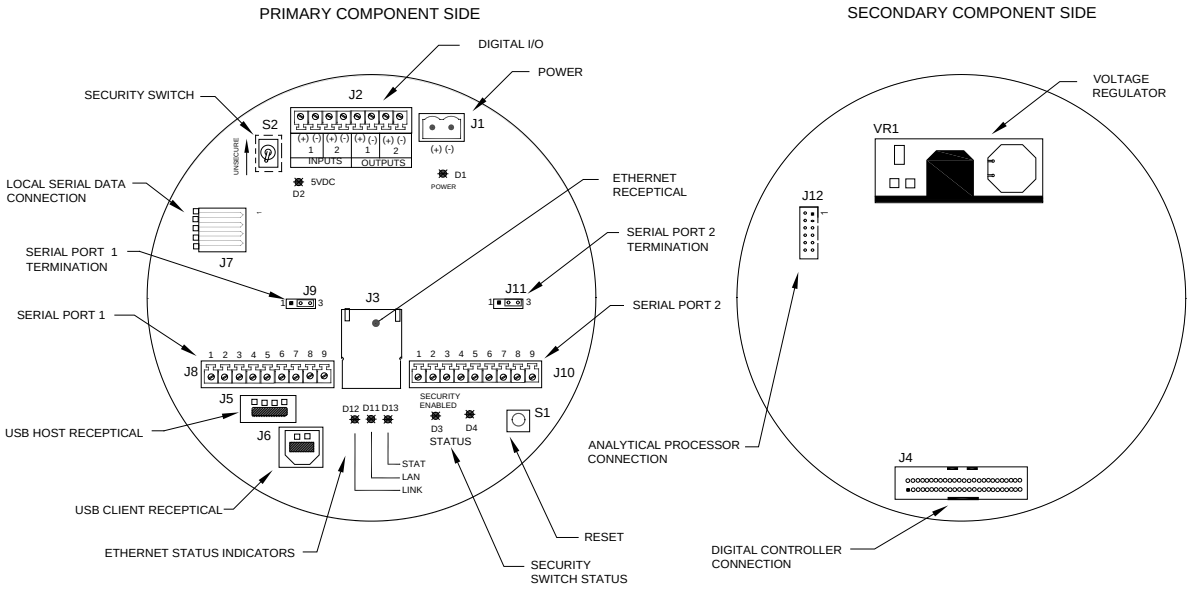


Figure 5-9 Termination Panel

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 unit is reassembled, apply power to the NGC (Step 6).

18) Reinstall the front and rear end caps.

TIP

To return the assembly to Totalflow service for warranty or repair, please contact Totalflow customer service for an RA number.

FYI

Note that since power was removed from this unit, the NGC will perform start-up diagnostics and stabilize. If the user has disabled the start-up diagnostics, they should be enabled and power cycled to the unit. If the power has been withheld from the unit for an unknown or lengthy period of time, a complete start-up should be performed.

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

5.17 Replacing 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 NGC. Read through all the procedural steps before removing the assembly.

Verify before beginning the procedure 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.

5.17.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, Backing Up Configuration Files.

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 NGC unit externally, or remove the J1 connector from the termination panel.

CAUTION As with all electronic components, caution should be used when handling 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, then unscrewing the end cap.

8) Following the instructions detailed previously in the section, **Removing Digital Controller Assembly**, remove the 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 Valco 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 5-10**).

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.

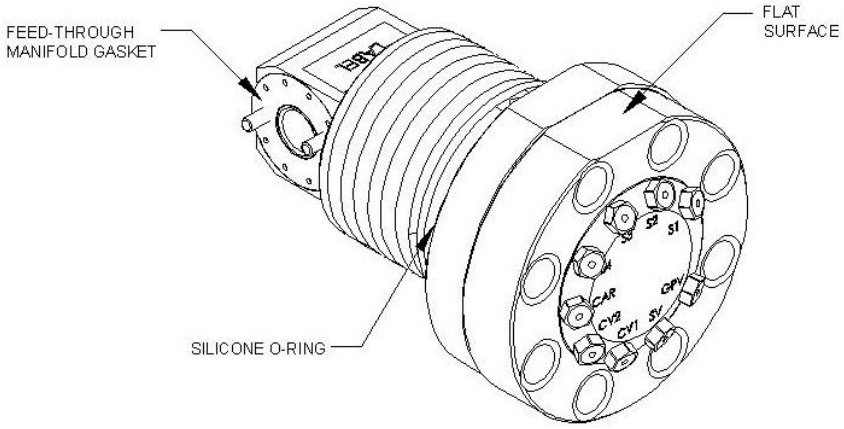


Figure 5-10 Feed-Through Assembly

18) Insert the replacement feed-through assembly through the opening and screw in clockwise until completely screwed in but not tight.

19) 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.

20) If the flat surface, when screwed all the way in, is less than 180 degrees past the top, turn the assembly counter clockwise 1 full turn plus enough to bring the flat surface to where it is on top and horizontal.

21) Using a 5/64” hex wrench, tighten the feed-through set screw.

22) Insert the mounting screw into the analytical module.

23) Holding the analytical module at the opening of the enclosure, reconnect jack J1 and J4, if the auxiliary heater is installed (see **Figure 5-7**).

24) 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.

25) When the analytical module is in place, tighten the mounting screw.

26) Use **Replacing Digital Controller Complete Assembly** previously covered.

27) Plug the termination panel to the digital controller ribbon cable and into the digital controller assembly.

CAUTION

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.

28) Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.

29) Once the unit is reassembled, apply power to the NGC (Step 6).

30) Reinstall the front and rear end caps.

FYI

Note that since the power was removed from this unit, the NGC will perform start-up diagnostics and stabilize. If the user has disabled the start-up diagnostics, they should be enabled and power cycled to the unit. If the power has been withheld from the unit for an unknown or lengthy period of time, a complete start-up should be performed.

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

5.18 Replacing Lithium Battery

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

5.18.1 Instructions

CAUTION

Do not remove power to the unit. Loss of power to the unit will perform a cold start. All data and configuration files will be destroyed.

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

CAUTION

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 5-11**).

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.

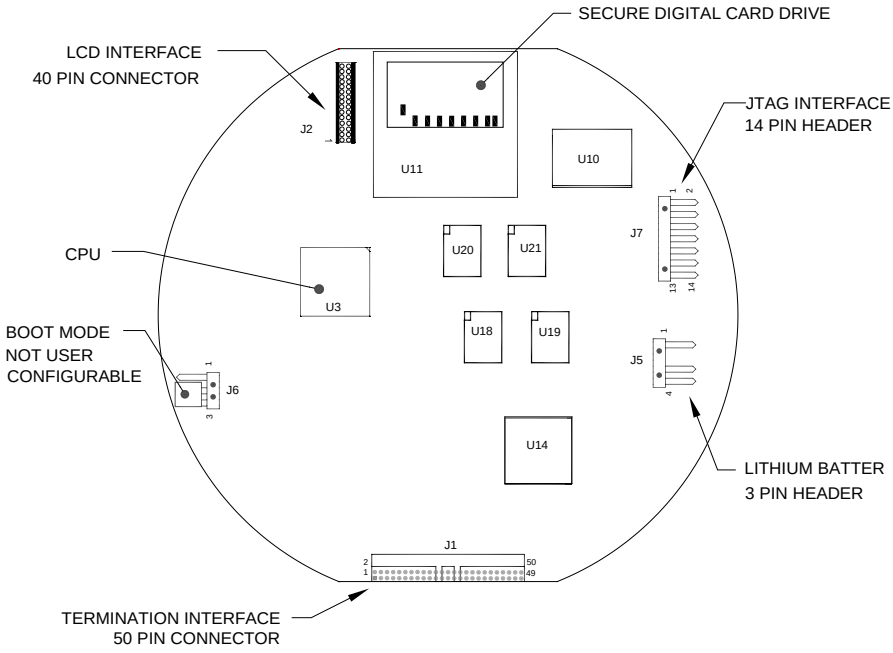


Figure 5-11 Primary Component Side Digital Controller Board

5.19 Replacing Frit Filters

Several reasons exist for replacing the frit filters from a scheduled maintenance procedure to decrease sample pressure due to clogged filters. When replacing the filters on 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. For the purposes of this manual, these instructions contain steps for the worst case scenario.

5.19.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

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 5-12**).

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.

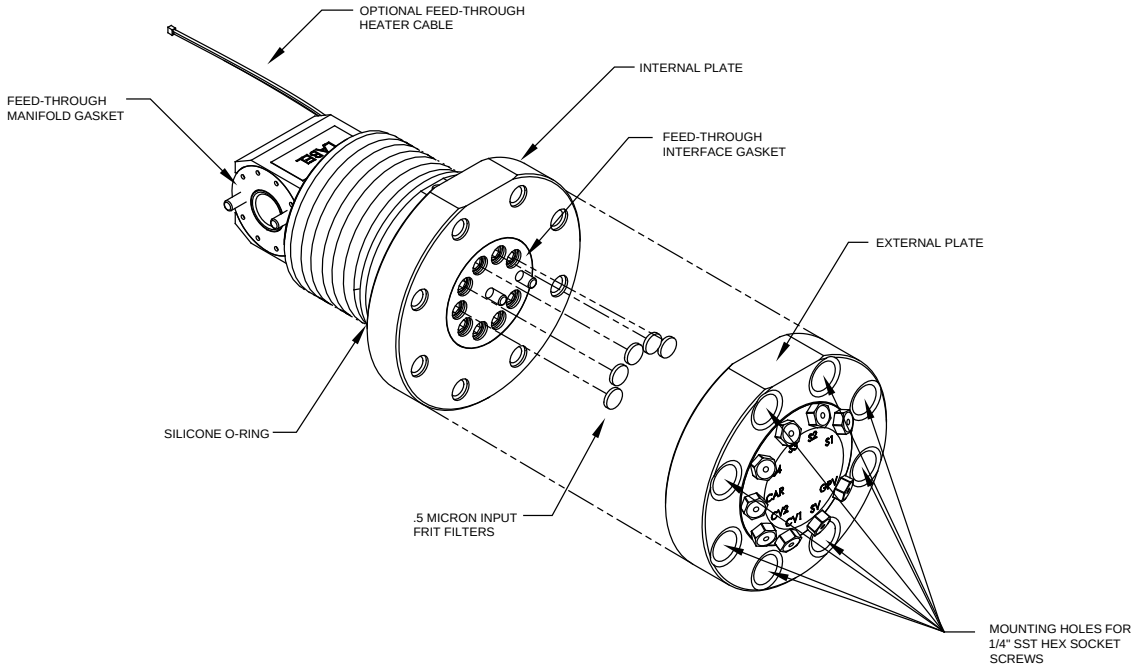


Figure 5-12 Feed-through Assembly, Exploded View

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 8.

8) Using a ¼" open end wrench, loosen the Valco 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.

CAUTION Do not over-tighten. After securing the tubing, check for gas leaks.

5.20 Replacing Feed-through Interface Gasket

Should the feed-through interface gasket require replacement (see **Figure 5-12**), 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.

5.20.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

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 8.

8) Using a ¼" open end wrench, loosen the Valco 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.

CAUTION Do not over-tighten. After securing the tubing, check for gas leaks.

5.21 Replacing Feed-through Manifold Gasket

Should the feed-through manifold gasket require replacement (see **Figure 5-12**), 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.

5.21.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files, following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

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 NGC unit externally, or remove the J1 connector from termination panel.

CAUTION As with all electronic components, caution should be used when handling 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 then unscrewing the end cap.

8) Following the instructions detailed previously in the section, **Removing Digital Controller Assembly**, remove the assembly. If weather and circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on 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, 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 5-7**).

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) Use **Replacing Digital Controller Complete Assembly** previously covered.

19) Plug the termination panel to the digital controller ribbon cable into the digital controller assembly.

CAUTION 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 unit is reassembled, apply power to the NGC8201 (Step 6).

22) Reinstall the front and rear end caps.

FYI 

Note that since power was removed from this unit, the NGC8201 will perform startup diagnostics and stabilize. If the user has disabled the startup diagnostics, it should be enabled and power cycled to the unit. If the power has been withheld from the unit 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**.

5.22 Replacing Termination Panel to Digital Controller Cable

Should the termination panel to digital controller cable become damaged and require replacement, follow these instructions. Typically, the user would change the cable while performing another procedure, but for the purposes of this manual, the instructions will start and finish as a complete procedure.

5.22.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

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 NGC unit externally, or remove the J1 connector from the termination panel.

CAUTION 

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.

   Following the instructions detailed previously in the section, **Removing Digital Controller Assembly**, remove the assembly (see **Figure 5-4**). If weather and circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on the cable connections; the user may skip to step 10.

8) 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.

9) 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 5-7**).

10) Detach the analytical module rear face jack J1 and J4, if the auxiliary heater is installed.

11) Set the module on a clean, lint-free surface.

12) Reach into the enclosure through the front opening, and unplug the ribbon cable from the rear of the termination panel J4.

13) 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.

14) 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 onto the feed-through manifold interface, ensuring that the gasket does not cover the gas portholes.

15) Insert the mounting screw into the analytical module.

16) Holding the analytical module at the opening of the enclosure, reconnect jack J1 and J4, if the auxiliary heater is installed (see **Figure 5-6)**.

17) 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.

18) When the analytical module is in place, tighten the mounting screw.

19) Use **Replacing Digital Controller Complete Assembly** previously covered.

20) Plug the termination panel into the digital controller ribbon cable and then into the digital controller assembly.

CAUTION

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.

21) Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.

22) Once the unit is reassembled, apply power to the NGC (Step 6).

23) Reinstall the front and rear end caps.

FYI

Note that since the power was removed from this unit, the NGC will perform start-up diagnostics and stabilize. If the user has disabled the start-up diagnostics, they should be enabled and power cycled to the unit. If the power has been withheld from the unit for an unknown or lengthy period of time, a complete start-up should be performed.

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

5.23 Replacing Analytical Processor to Termination Panel Cable

Should the cable connecting the analytical processor to the termination panel require replacement, use the following instructions.

5.23.1 Instructions

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) Collect data from the unit.

3) Back up the configuration files following the instructions detailed previously in the section, **Backing Up Configuration Files (Save)**.

4) Using the Lithium Battery Status instructions, verify the battery status is ok before proceeding.

5) Disconnect or remove the power from the NGC unit externally, or remove the J1 connector from the termination panel.

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

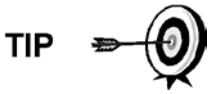
6) Following the instructions detailed previously in the section, **Replacing Termination Panel**, remove the panel and unplug the cable. Reaching into the enclosure, unplug the analytical processor to the termination panel cable from the analytical processor assembly (see **Figure 5-7**).

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 5-9**).

8) Reinstall the termination panel.

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 unit is reassembled, apply power to the NGC (Step 6).



To return the assembly to Totalflow service for warranty or repair, please contact Totalflow customer service for an RA number.

10) Reinstall the rear end cap.

Note that since power was removed from this unit, the NGC will perform start-up diagnostics and stabilize. If the user has disabled the start-up diagnostics, they should be enabled and power cycled to the unit. If the power has been withheld from the unit for an unknown or lengthy period of time, a complete start-up should be performed.

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

6.0 TROUBLESHOOTING

6.1 Overview

As an aid to troubleshooting the NGC, this chapter will provide troubleshooting guidelines for the various subsystems of the NGC. Some of these procedures will differ slightly from other Totalflow products because the communications, power charger/source and other I/O are contained in a separate enclosure rather than within the NGC enclosure.

Some of the procedures are based on tests performed on the NGC termination panel and others are based on tests performed on components located in a separate enclosure. Determine which of these procedures correspond to the particular unit. If using equipment other than the Totalflow enclosure, refer to the manufacturer's procedures for troubleshooting their equipment.

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

6.1.1 Troubleshooting Support

If troubleshooting instructions do not lead to a resolution and assistance is required, contact the Totalflow service department.

USA: (800) 442–3097 or International: 001–918-338-4880

6.1.2 Getting Started

Using **Figure 6-1**, determine which section to use.

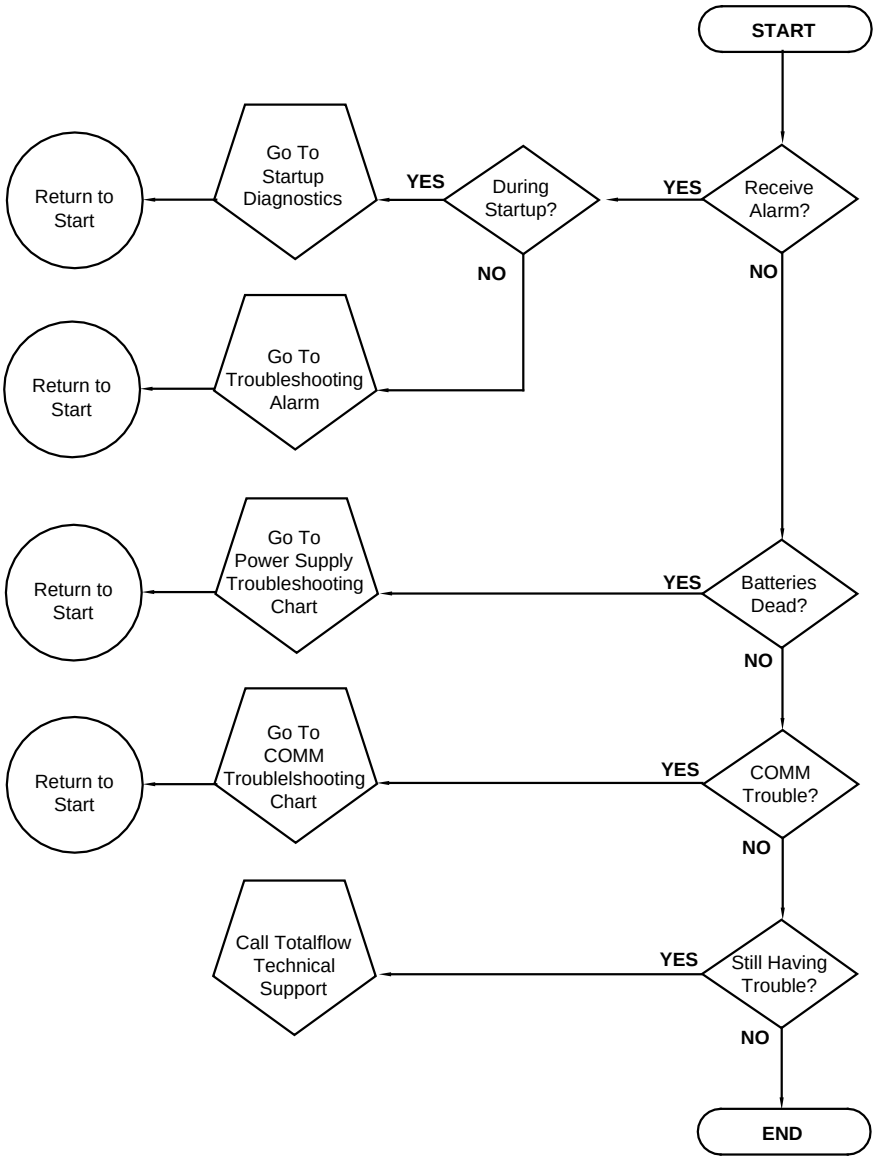


Figure 6-1 Troubleshooting Flowchart

6.2 Start-Up Diagnostic Troubleshooting

This section focuses on determining what has caused an alarm during start-up diagnostics. The Totalflow® NGC8200 has an extensive built-in list of tests which are performed each time the unit is started. This start-up testing may be disabled, but Totalflow recommends 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 start-up tests may also be performed on a regular schedule. See the PCCU help files for more information on scheduling diagnostics.

FYI  Totalflow has performed extensive testing on each NGC8200 prior to shipment, and each unit is factory-calibrated using our standard calibration blend.

TIP  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.

6.2.1 Status

The following description status and definitions are standard for all start-up diagnostics. Additionally, each test group will have status results that will narrow down the possibilities for troubleshooting.

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 plus additional more in-depth tests were run and also failed.
Aborted	Tests were aborted by the user using the Abort command.

6.2.2 Carrier Pressure Regulator Test

If Col 1 or Col 2 carrier pressure test failed, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour to other procedures, and, when complete, the user should return to these procedures to continue.

6.2.2.1 Description

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

6.2.2.2 Status

The following descriptive status and definitions are applicable for only the carrier pressure regulator test and are in addition to those defined for all start-up diagnostics.

Status	Description
Low Reg Pressure	Pressure is too low to continue the test. Possible causes are the carrier bottle is low, the regulator on the carrier bottle needs to be turned up to 90 PSIG, carrier line from the bottle to the NGC 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.

Status	Description
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 be display
Failed	The additional tests can not prove with certainty but either the GC module or the manifold assembly is bad.

6.2.2.3 Instructions

1) Verify the carrier gas bottle pressure regulator is open. If not, open the regulator on the carrier gas bottle. Otherwise, continue to the next step.

2) Verify the carrier gas bottle pressure regulator set point is 90 PSIG. If not, correct the set point to 90 PSIG (620.5 kPa or 6.2 bars). Otherwise, continue to the next step.

3) Perform the column vent pressure test procedure in this chapter for both column vent 1 and column vent 2. If either test failed, proceed to the next step.

4) Using the **Replacing Analytical Module** instructions in **Maintenance**, replace the analytical module assembly.

Totalflow recommends that a replacement analytical module be installed at this point and additional steps be performed in a clean, lint free atmosphere. Because the customer does not have the required equipment to determine which specific module needs replaced, the final instructions are by process of elimination, beginning with the most likely module.

The Totalflow repair department offers a range of services for troubleshooting and repairing/replacing the non-functioning parts. For more information regarding the repair service, contact customer service:

USA: (800) 442-3097 or International: 001-918-338-4888

5) Using the Replacing GC Module instructions in **Maintenance**, replace the GC module.

6.2.3 Oven Temperature Test

If the oven temperature test failed, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.2.3.1 Description

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

6.2.3.2 Instructions

1) Verify that the cable is plugged in and in good repair. If the cable is unplugged, plug in the cable. Otherwise, continue to the next step.

2) Verify that the analytical processor to GC module cable is plugged in and in good repair. If the cable is unplugged, reinstall plug. If cable appears to be damaged, continue to the next step.

3) Using the **Replacing Analytical Module** Assembly instructions in **Maintenance**, replace the analytical module assembly.

Totalflow recommends that a replacement analytical module be installed at this point, and additional steps be performed in a clean, lint free atmosphere.

The Totalflow repair department offers a range of services for troubleshooting and repairing/replacing the non-functioning parts. For more information regarding the repair service, contact customer service:

USA: (800) 442-3097 or International: 1-918-338-4880

6.2.4 Processor Control Test

If Col 1 or Col 2 carrier pressure test failed, or the oven temperature test failed, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour to other procedures, and when complete, the user should return to these procedures to continue.

6.2.4.1 Description

These alarms are indicative of a lack of ability to control a function. If the failure is either 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 something as easy as a missing GC module cover or analytical module thermal flask.

6.2.4.2 Instructions

1) If the start-up diagnostics are being performed following the disassembly/replacement of a module or spare part, insure that the unit is completely reassembled, including the thermal flask and both the front and rear end caps, and then re-start the diagnostics. If diagnostics again fail, repeat disassembly steps and verify that all gaskets and connections are tight and correctly installed. Otherwise, continue to the next step.

2) If the start-up diagnostics are being performed from an initial startup, verify that the analytical module is not loose inside the enclosure.

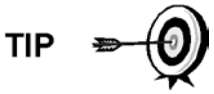
3) Verify that the GC module is tight and that the cables are correctly installed and not damaged.

4) Reassemble the unit and restart diagnostics. If the unit continues to fail, replace the entire analytical module and return to Totalflow for warranty repair/replacement.

6.2.5 Stream Test

The stream flow diagnostics go through a series of tests, testing 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.

The following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.



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

6.2.5.1 Status

The following descriptive status and definitions are applicable for only the stream test and are in addition to those defined for all start-up 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 will be displayed by streams waiting to be tested. The tests are run sequentially.

6.2.5.2 Description

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

6.2.5.3 Instructions

1) Perform the sample vent pressure test procedure, found in this chapter, for the sample vent. If the test failed, proceed to the next step.

2) Perform the feed-through assembly blockage test on the sample vent (SV). If the test fails, replace the feed-through assembly with new or refurbished assembly. Otherwise, continue to the next step.

Totalflow recommends that a replacement analytical module be installed at this point and additional steps be performed in a clean, lint free atmosphere. Because the customer does not have the required equipment to determine which specific module needs replaced, the final instructions are by process of elimination, beginning with the most likely module.

The Totalflow repair department offers a range of services for troubleshooting and repairing/replacing the non-functioning parts. For more information regarding the repair service, contact customer service:

USA: (800) 442-3097 or International: 1-918-338-4880

3) Using the Analytical Module Assembly instructions in Maintenance, **Replacing Analytical Module** assembly.

4) Using the Replacing GC Module instructions in Maintenance, **Replacing GC Module**.

6.3 Troubleshooting Alarms

This section focuses on determining what has caused an alarm following normal operation. The Totalflow® NGC8200 has an extensive built-in list of alarms, some of which are user-configurable. These alarms may be grouped into three areas: warning, fault and system fault. See **Table 6–1** for a list of all enabled alarms. To view all the available alarms, select **Setup** under Stream 1 on the Analyzer Operation screen and select **Alarm Definitions.**

FYI 

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

Table 6–1 NGC8200 Alarms

Description	Enable	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 Bottle (DI1)	Yes	LT	Warning
Low Cal Gas Bottle (DI2)	Yes	LT	Warning
GCM Chrom 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

6.3.1 Operators

- GT = Greater Than
- LT = Less Than
- And = Including
- Or = Instead of
- GE = Greater Than or Equal To
- LE = Less Than or Equal To
- NAND = And Not
- Nor = Not Or

- Plus = In addition to
- Minus = Not Included or subtract from

6.3.2 Alarm Severity

Table 6–2 Alarm Severity

Type	Definition
General	Indicates that an alarm exists, but that it is not critical to the operation of the unit. Use general when testing for some condition that may occur from time to time and want to know when it happens.
Warning	Indicates that an alarm exists, typically is not critical but may indicate or provide unexpected results.
Fault	Indicates that a malfunction exists that may affect the operation of the unit and most likely will provide unexpected results. The fault will keep any affected streams from having their data updated. However, a fault would 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	This typically 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, and, unless the user has a situation in which he/she wants to stop all stream data from being updated, should not use this category of alarm.

6.3.3 Pressure Regulator 1 or 2 Alarm

If the pressure regulator 1 or pressure regulator 2 alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour to other procedures, and, when complete, the user should return to these procedures to continue.

6.3.3.1 Description

These alarms are indicative of low or restricted carrier pressure. The causes range from an empty or low carrier bottle, restricted pressure or to a blockage inside the GC module.

6.3.3.2 Instructions

1) If the carrier bottle regulator includes an installed low pressure switch, investigate if the low carrier gas bottle warning is also present; otherwise, continue to next step.

If the low carrier gas bottle warning is present, replace the carrier gas bottle; otherwise, continue to the next step.

2) Verify the carrier gas bottle pressure is above 90 PSIG. If the pressure is below 90 PSIG, replace the carrier gas bottle. Otherwise, continue to the next step.

3) Verify the carrier gas bottle pressure regulator set point is 90 PSIG. If not, correct the set point to 90 PSIG. Otherwise, continue to the next step.

4) Verify the column vent 1 (CV1) and 2 (CV2), sample vent (SV) and gauge port vent (GPV) are open and unobstructed.

5) Check the sampling system for leaks and tubing restrictions. Repair the leak or restriction, if found. Otherwise, continue to the next step.

6) Perform start-up diagnostics.

7) If the carrier pressure regulator 1 and 2 tests both pass, continue to the next step.

8) Perform the Column Vent Pressure Test procedure, found in this chapter, for both column vent 1 and column vent 2. If either test failed, proceed to the next step.

9) Perform the **Feed-through Assembly Blockage Test** procedure, found in this chapter, 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. Otherwise, continue to the next step.

Totalflow recommends that a replacement analytical module be installed at this point and additional steps be performed in a clean, lint free atmosphere.

Because the customer does not have the required equipment to determine which specific module needs replaced, the final instructions are by process of elimination, beginning with the most likely module.

The Totalflow repair department offers a range of services for troubleshooting and repairing/replacing the non-functioning parts. For more information regarding the repair service, contact customer service:

USA: (800) 442-3097 or International: 1-918-338-4880

10) Using the **Replacing Analytical Module** instructions in Maintenance, replace the analytical module assembly.

11) Using the **Replacing GC Module** instructions in Maintenance, replace the GC module.

6.3.4 Sample Pressure Alarm

If the sample pressure alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour to other procedures, and, when complete, should return the user to these procedures to continue.

6.3.4.1 Description

These alarms are indicative of low sample or calibration gas pressure. The causes range from an empty or low calibration gas bottle to a blockage inside the GC module.

6.3.4.2 Instructions

1) If the calibration gas bottle regulator includes an installed low pressure switch, investigate if the lo bottle calibration gas warning is also present; otherwise, continue to next step.

   If the lo bottle calibration gas warning is present, replace the calibration gas bottle; otherwise, continue to the next step.

2) Verify the calibration gas bottle pressure is above 15 PSIG. If the pressure is below 15 PSIG, replace the calibration gas bottle. Otherwise, continue to next step.

3) Verify the calibration gas bottle pressure regulator set point is 15 PSIG. If not, correct the set point to 15 PSIG. Otherwise, continue to next step.

4) Verify the sample vent is open and unobstructed.

5) Perform the **Sample Vent Pressure Test**, found in this chapter. If the test failed, continue to the next step; otherwise, skip to step 7.

6) Perform the **Feed-through Assembly Blockage Test** found in this chapter, on the sample vent (SV). If the test fails, replace the feed-through assembly. Otherwise, continue to next step.

7) Check the sampling system for leaks and tubing restrictions. Repair the leak or restriction, if found. Otherwise, continue to next step.

8) Perform start-up diagnostics. If the stream test fails, continue to the next step.

9) Follow **Replacing Frit Filters** instructions in Maintenance, verify filters are clean and free of obstructions. If needed, replace filters.

Totalflow recommends that a replacement analytical module be installed at this point and additional steps be performed in a clean, lint free atmosphere.

Because the customer does not have the required equipment to determine which specific module needs replaced, the final instructions are by process of elimination, beginning with the most likely module.

The Totalflow repair department offers a range of services for troubleshooting and repairing/replacing the non-functioning parts. For more information regarding the repair service, contact customer service:

USA: (800) 442-3097 or International: 1-918-338-4880

10) Using the **Replacing Analytical Module** instructions in Maintenance, replace the analytical module assembly.

11) Using the **Replacing GC Module** instructions in Maintenance, replace the GC module.

6.3.5 Oven Temperature Error Alarm

If the oven temperature error alarm is in system fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.5.1 Description

This alarm is indicative of 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.

6.3.5.2 Instructions

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) Follow the **Temperature Sensor Test** procedure found in this chapter. If the test fails, follow the Temperature Sensor to **Replacing GC Module** instructions in Maintenance. Otherwise, continue to the next step.

4) The remaining options are not field-repairable. Using **Replacing Analytical Module** instructions in, Maintenance, replace the analytical module assembly.

The information provided for troubleshooting this alarm is only intended to cover basic steps that can be performed in the field. On occasion, additional troubleshooting steps may be provided by Totalflow technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to Totalflow for comprehensive testing and/or repair.

6.3.6 No Stream Valve Selected

If the No Stream Valve Selected alarm is in system fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.6.1 Description

These alarms are indicative of 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 chroms. This can also be caused if the digital and analytical board moves out of synchronization.

6.3.6.2 Instructions

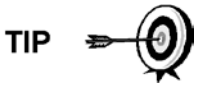
1) Check the sampling system for leaks, tubing restrictions and incorrect pressure settings. Repair the leak or restriction, or adjust the pressure setting, if found; otherwise, continue to next step.

2) Place the NGC 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 unit should still be in hold. Manually enable all streams.

4) Perform start-up diagnostics. If the stream test fails, continue to the next step.

5) Perform a warm start.



The information provided for troubleshooting this alarm is only intended to cover basic steps that can be performed in the field. On occasion, additional troubleshooting steps may be provided by Totalflow technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to Totalflow for comprehensive testing and/or repair.

6.3.7 Digital-Analog Board Communication Error Alarm

If the Digital-Analog Board Communication Error alarm is in system fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.7.1 Description

These alarms are indicative of 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.

6.3.7.2 Instructions

1) In the alarm log, check the frequency of the error. If multiple errors exist, place the unit in hold and then launch a cycle.

2) If the alarms continue to register, perform a warm start.

3) When the unit completes the start-up diagnostics without error, place the unit in run.

4) Following 2-3 cycles, verify that no new alarms are registering.

If the alarms continue to register, call Totalflow technical support.

The information provided for troubleshooting this alarm is only intended to cover basic steps that can be performed in the field. On occasion, additional troubleshooting steps may be provided by Totalflow technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to Totalflow for comprehensive testing and/or repair.

6.3.8 Calculation Error Alarm

If the Calculation Error alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.8.1 Description

These alarms are indicative of the AGA-8 compressibility calculation not functioning properly. Typically, this error would be caused by a gas sample being out of specification for AGA-8 but could indicate that the component's peak has shifted.

6.3.8.2 Instructions

1) Following the **Calibrating the NGC** instructions in Startup, perform a calibration 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 Auto PF**. This process will typically require 45 minutes to complete. 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.

The information provided for troubleshooting this alarm is only intended to cover basic steps that can be performed in the field. On occasion, additional troubleshooting steps may be provided by Totalflow technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to Totalflow for comprehensive testing and/or repair.

6.3.9 Calibration Un-Normalized Error Alarm

If the Calibration Un-normalized Error alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.9.1 Description

These alarms are indicative of 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.

6.3.9.2 Instructions

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) Verify the calibration blend concentrations to 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) Following the **Calibrating the NGC** instructions in Startup, perform a calibration ensuring that the Next Mode is set to **Hold**.

5) When the unit enters hold, select **Peak Find**.

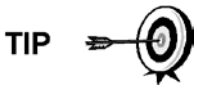
6) Verify that the peaks are correctly labeled and integrated. If the peaks are correctly labeled and integrated, return the unit to operation; otherwise, continue to the next step.

7) Select **Peak Find** from the Analyzer Operation screen. Ensure that **Automatic** is check and then select **Run Auto PF**. This procedure will require approximately 45 minutes.

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 Totalflow 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 6.50% (between 99.5 and 100.5).

10) Return the unit to regular operation.



The information provided for troubleshooting this alarm is only intended to cover basic steps that can be performed in the field. On occasion, additional troubleshooting steps may be provided by Totalflow technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to Totalflow for comprehensive testing and/or repair.

6.3.10 Stream Sequence Error Alarm

If the Stream Sequence Error alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.10.1 Description

These alarms are indicative of a synchronization problem following a manual data post process in factory mode.

6.3.10.2 Instructions

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) Following the **Reset Procedures** instructions in Maintenance, perform a warm start.

6.3.11 Calibration CV Percent Error Alarm

If the Calibration CV Percent Error alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.11.1 Description

These alarms are indicative of a change to the CV Percent 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.

6.3.11.2 Instructions

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) Verify the calibration blend concentrations to calibration blend concentrations listed on the Calibration Setup screen. If the 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) Following the **Calibrating the NGC** instructions in Startup, perform a calibration 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.

TIP 

The information provided for troubleshooting this alarm is only intended to cover basic steps that can be performed in the field. On occasion, additional troubleshooting steps may be provided by Totalflow technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to Totalflow for comprehensive testing and/or repair.

6.3.12 Calibration RF Percent Error Alarm

If the Response Factor (RF) Percent Error alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, the user should return to these procedures to continue.

6.3.12.1 Description

These alarms are indicative of 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.

6.3.12.2 Instructions

1) Verify the calibration blend concentrations to 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 Auto 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) Following the **Calibrating the NGC** instructions in Startup, perform a calibration 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.

TIP 

The information provided for troubleshooting this alarm is only intended to cover basic steps that can be performed in the field. On occasion, additional troubleshooting steps may be provided by Totalflow technical support in an effort to reduce down time. Additionally, it may be desirable to return a module to Totalflow for comprehensive testing and/or repair.

6.3.13 Enclosure Temperature Alarm

If the Enclosure Temperature alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.13.1 Description

These alarms are indicative of 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.

6.3.13.2 Instructions

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 unit may be operating out of range. This unit is designed to operate between 08F and 1208F.

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 effect the operation of the unit. The user may replace the analytical module, as needed.

FYI 

The Totalflow repair department offers a range of services for troubleshooting and repairing/replacing the non-functioning parts. For more information regarding the repair service, contact customer service:

USA: (800) 442-3097 or International: 1-918-338-4880

6.3.14 Power Supply Alarm

If the Power Supply alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.14.1 Description

These alarms are indicative of input voltage either below 11 volts or above 16 volts. Causes may range from a power supply issue to a bad cable.

6.3.14.2 Instruction

1) Check the power supply to the termination panel, following instructions later in this chapter, Termination Panel Supply Voltage Test. If the test fails, restore the power supply to proper working specifications; otherwise, continue to the next step.

2) Following the Cable Replacement instructions in Chapter 4, Maintenance, check the analytical processor to termination panel cable for damage. If the cable is damaged, replace; otherwise, continue to the next step.

3) Following the Cable Replacement instructions in Chapter 4, Maintenance, check the termination panel to digital controller cable for damage. If the cable is damaged, replace; otherwise, contact Totalflow technical support for additional instructions.

6.3.15 Low Carrier Gas Bottle (DI1) Alarm

If the Low Carrier Gas Bottle (DI1) alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.15.1 Description

These alarms are indicative of the carrier gas bottle pressure below the threshold.

6.3.15.2 Instructions

1) Verify that the carrier gas bottle 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 bottle PSIG, replace the carrier gas bottle.

3) If the threshold is below the current bottle PSIG, verify the regulator is functioning properly.

4) Perform the **Abnormal Calibration Gas Depletion** procedure, found in this chapter. If the procedure fails to locate the problem, contact Totalflow technical support.

6.3.16 Low Cal Gas Bottle (DI2) Alarm

If the lo bottle calibration gas (DI2) alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.16.1 Description

These alarms are indicative of the calibration gas bottle pressure below the threshold.

6.3.16.2 Instructions

1) Verify that the calibration gas bottle 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 bottle PSIG, replace the calibration gas bottle.

3) If the threshold is below the current bottle PSIG, verify the regulator is functioning properly.

4) Perform the **Abnormal Calibration Gas Depletion** procedure, found in this chapter. If the procedure fails to locate the problem, contact Totalflow technical support following the procedure in the Introduction section of this manual.

6.3.17 GCM Processing Error Alarm

If the GCM Chrom Process alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.17.1 Description

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

6.3.17.2 Instructions

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

   If alarms continue to register, call Totalflow technical support.

6.3.18 Bad Bead Alarm

If the Bad Bead alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and when complete, they should return to these procedures to continue.

6.3.18.1 Description

These alarms are indicative of problem with the GC module.

6.3.18.2 Instructions

1) Following the **Replacing GC Module** instructions in Maintenance, replace the GC module.

6.3.19 No Pilot Valve Change Detected Alarm

If the No Pilot Valve Change Detected alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.19.1 Description

These alarms are indicative of a pressure regulator problem on the manifold. During backflush, a valve is changed, but no disturbance is registered.

6.3.19.2 Instructions

1) Verify the carrier gas bottle pressure is above 90 PSIG. If the pressure is below 90 PSIG, replace the carrier gas bottle. Otherwise, continue to the next step.
2) Verify the carrier gas bottle pressure regulator set point is 90 PSIG. If not, correct the set point to 90 PSIG. Otherwise, continue to the next step.
3) Following the Manifold Replacement instructions in Chapter 4, Maintenance, replace the manifold.

6.3.20 Sample Flow Detection Alarm

If the Sample Flow Detection alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.20.1 Description

These alarms are indicative of a pressure issue such as a blocked vent tube, too short bleed cycle, stream test is in auto, etc.

6.3.20.2 Instructions

1) Inspect the vent tubes for blockage, including crimps in tubing, dirt or debris.

2) Following the instructions later in this chapter, perform the sample pressure test.

3) Verify the sample bleed time is set greater than one second.

4) Use **Replacing GC Module** instructions Maintenance.

6.3.21 CPU Loading Alarm

If the CPU Loading alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.21.1 Description

These alarms are indicative of the processor being overloaded. An occasional spike in processor loading is to be expected. Multiple occurrences are not field-repairable.

6.3.21.2 Instructions

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 Totalflow technical support for additional help.

6.3.22 System Memory Available Alarm

If the System Memory Available alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.22.1 Description

These alarms are indicative of the task memory resource getting full. The recommended files size for the task memory is 1 to 2 MB. This alarm may be received after adding additional applications.

6.3.22.2 Instructions

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.

FYI  Please note that when increasing the available memory, the available RAM file space is reduced. Caution should be used.

3) Following the **Reset Procedures** instructions in Maintenance, warm start the unit to defrag the system memory.

4) Reducing the number of instantiated applications may be required. Contact Totalflow technical support for assistance.

6.3.23 RAM File Available Alarm

If the RAM File Available alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.23.1 Description

These alarms are indicative of the TFData file resource 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.

6.3.23.2 Instructions

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.

FYI  Please note that when increasing the RAM file space, the available memory file space is reduced. Caution should be used.

3) Following the **Reset Procedures** instructions in Maintenance, warm start the unit to defrag the system memory.
4) Reducing the number of instantiated applications, trend files or lengthening the log periods may be required. Contact Totalflow technical support for assistance.

6.3.24 FLASH File Available Alarm

If the FLASH File Available alarm is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.24.1 Description

These alarms are indicative of 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.

6.3.24.2 Instructions

1) View the alarm history for multiple occurrences. If an occasional warning is registered, this is not a problem.
2) Please contact Totalflow technical support for assistance.

6.3.25 Missing Peak - Calibration Not Used

If the Missing Peak-Calibration Not Used is in warning status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.25.1 Description

These alarms are indicative of a missing peak during a calibration cycle and calibration will not be used.

6.3.25.2 Instructions

1) Verify 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 unit completes the current cycle and enters hold, continue to the next step.
3) When the unit enters hold, select **Peak Find** from the Analyzer Operation screen. Ensure that **Automatic** is check and then select **Run Auto PF**. This procedure will require approximately 45 minutes.
4) Verify that peaks are correctly labeled and integrated. Refer to **Figure 4-5** and Figure 4-6 for comparison. On Chrom 1, NC5 peak should elute around 160 seconds. On Chrom 2, C2 peak should elute at approximately 220 seconds. If peaks are correctly labeled and integrated, return the unit to operation, and continue to the next step; otherwise, contact Totalflow technical support.
5) Allow the unit to cycle 3-4 times.
6) Following the Calibrating the NGC instructions in Startup, perform a calibration ensuring that the Next Mode is set to **Hold**.
7) When the unit enters hold, verify that peaks are correctly labeled and integrated. If peaks are correctly labeled and integrated, return the unit to operation.
8) If peaks are not correctly labeled and integrated, contact Totalflow technical support for assistance.

6.3.26 Stream Un-Normalized Total

If the Stream Un-normalized Total is in warning status (default), the following procedure will step the user through the troubleshooting process. If the severity of the alarm is set to fault, the new stream data is not allowed to update. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

6.3.26.1 Description

These alarms are indicative of a change to the process stream un-normalized total of the sufficient percentage to activate the alarm.

6.3.26.2 Instructions

1) Verify that the alarm threshold is a valid configuration. Typically, the unnormalized total should be within 6.50% (between 99.5 and 100.5).
2) Verify 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 unit completes the current cycle and enters hold, continue to the next step.
4) When the unit enters hold, select **Peak Find**. Select **Run Auto PF**. Ensure that **Automatic** is check and then select **Run Auto PF**. This procedure will require approximately 45 minutes.
5) Verify that peaks are correctly labeled and integrated. If peaks are correctly labeled and integrated, return the unit to operation; otherwise, continue to the next step.
6) Allow unit to cycle 3-4 times.
7) Follow the **Calibrating the NGC** instructions in Startup, perform a calibration.

6.4 Alarm Troubleshooting Tests

6.4.1 Sample Vent Pressure Test

6.4.1.1 Instructions

1) Attach a flowmeter to the sample valve.

2) From the Analyzer Operation screen, click **Diagnostics**.

3) Select the **Manual Operation** tab.

4) Under Manual Control, open the sample shutoff valve.

5) When opened, the SV should measure a spike to 15 sccm. Close the valve when done reading.

6) If the SV does not spike to 15 sccm, the test has failed.

7) Return to troubleshooting instructions.

6.4.2 Column Vent Pressure Test

6.4.2.1 Instructions

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 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.

6.4.3 Sample Pressure Test

6.4.3.1 Instructions

1) Place unit 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.

6.4.4 Feed-through Assembly Blockage Test

1) Remove the feed-through assembly from the NGC following **Replacing Feed-through Assembly** instructions in Maintenance.
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 start-up 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.

6.4.5 Temperature Sensor Test

6.4.5.1 Instructions

1) Unplug the sensor from the GC module.
2) Connect the digital multimeter (DMM) set to read resistance, positive lead to pin 1 and 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.

6.4.6 Abnormal Calibration Gas Depletion

6.4.6.1 Description

If the calibration (and/or carrier) gas has depleted significantly sooner than expected, there may one or more issues.

6.4.6.2 Instructions

1) If the NGC has been running normally but consuming too much calibration (and/or carrier) gas, carefully leak-test the gas bottle regulator, tubing and connections to the NGC.
2) If the unit is new start-up installation, check and tighten the analytical module mounting bolt. The module may have been loosened due to vibration during shipping.
3) If the unit has been disassembled recently, re-check and tighten all assemblies including the analytical module mounting bolt.
4) If the NGC has been powered down for any significant length of time, the calibration (also carrier and sample) gas should be shut off. Some valves may be left in an open or partially open state allowing gas to continue flowing.

6.5 Power Troubleshooting

6.5.1 Overview

This section focuses on determining what has caused the NGC 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 NGC to lose power. Notice that the power troubleshooting flowchart

(see Figure 6-2) takes the user through several tests, but also directs them to the communication troubleshooting flowchart located later in this chapter.

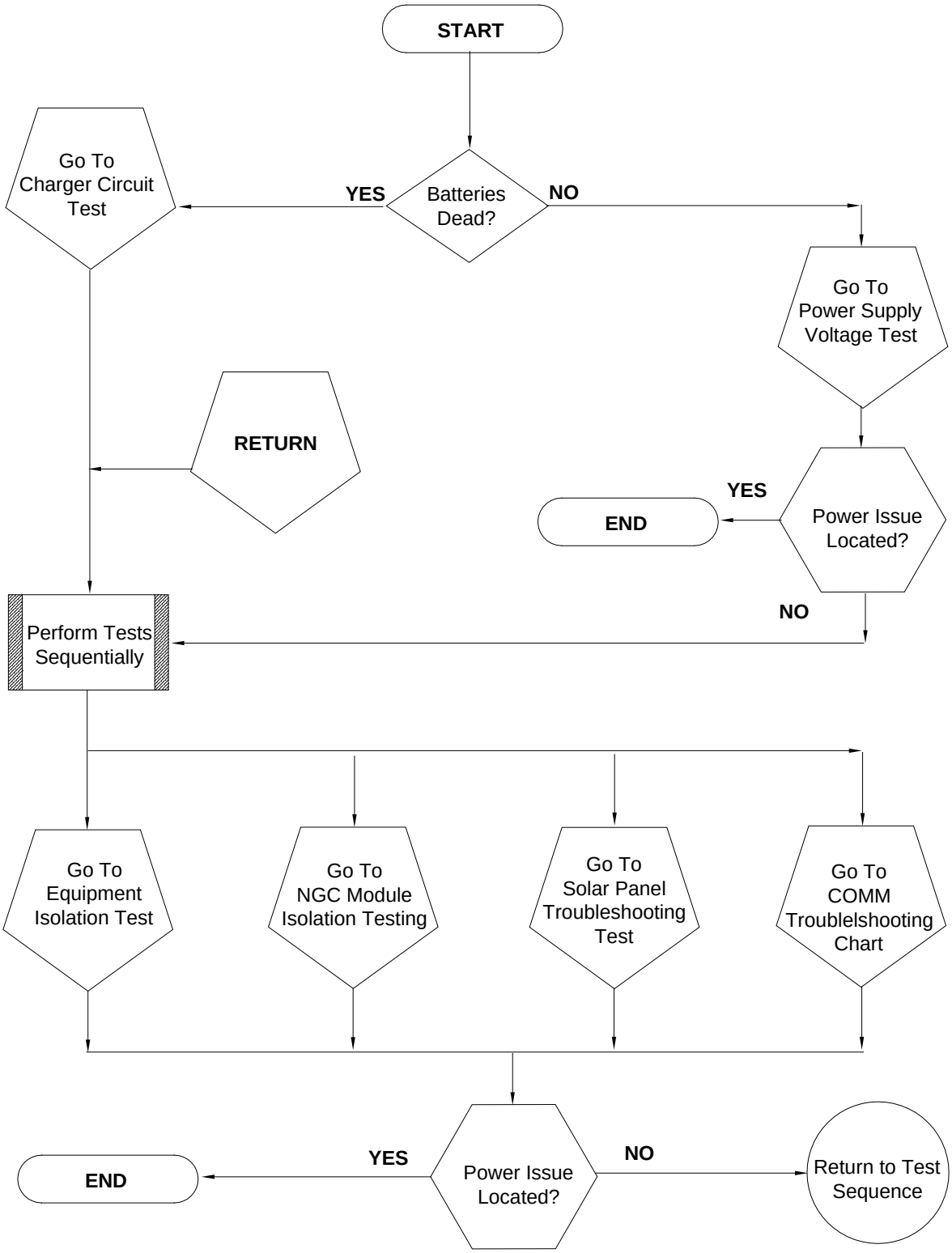
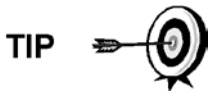


Figure 6-2 Power Troubleshooting Flowchart

6.5.2 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 NGC. If the power supply is under suspicion, it is recommended that it be replaced with a known good power supply before conducting these tests.

6.5.2.1 Instructions

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 **Hardware System Specifications**).

If this is a new installation and the external equipment is being powered from the NGC termination panel, call Totalflow technical support for help in evaluating the cable and power supply installation requirements.

Correct and retest as necessary.

2) Check for a poor cable connection in the cable between the NGC and the power source. Verify that all field wiring screw terminals are tight.

Correct and retest as necessary.

3) Verify that there are no other devices that may drop an excessive voltage across them in the power supply circuit (to the NGC) like a fuse, diode or a barrier device, etc.

Correct and retest as necessary.

4) Disconnect the power supply cable at the NGC termination panel J1.

5) Measure the power supply cable voltage at the connector and compare with the table recommendations (see **Table 2–4** and **Table 2–5**).

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.

6) Reconnect the power supply cable to the NGC termination panel J1.

6.5.3 Equipment Isolation Test

This test isolates the peripheral equipment from the equation to verify that excessive current is not being drawn from the power source, thus reducing the amount of power supplied to the NGC.

This procedure assumes that the previous power supply voltage test was performed and that no errors were found.

6.5.3.1 Instructions

1) While the NGC is operating, verify that the voltage at the NGC termination panel is between 11.5 VDC-16 VDC (for 12 VDC systems) or 22 VDC to 28 VDC (for 24 VDC systems).

TIP 

The NGC 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 NGC 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 volt meter 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) using its fast transient capability. Then let it monitor the NGC while operating for a few minutes. This should provide a good indication of the minimum voltage appearing at the NGC terminals.

2) Is the voltage within limits? If not, continue to the next step. If yes, no physical problem is found.

3) Is the external equipment, such as a radio or other device, being powered from the NGC termination panel? If not, return to **Figure 6-2** and continue the test sequence. If yes, continue to the next step.

4) Disconnect the peripheral equipment from the NGC.

5) While the NGC is operating, verify that the voltage at the NGC termination panel is between 11.5 VDC-16 VDC (for 12 VDC systems) or 22 VDC to 28 VDC (for 24 VDC systems).

6) Is the voltage within limits? If not, return to **Figure 6-2** and continue the test sequence. If yes, the external equipment is drawing excessive current. Check the equipment and related wiring. Correct and retest, if necessary.

6.5.4 NGC Module Isolation Test

This test isolates the NGC modules to pinpoint equipment failure.

This procedure assumes that the previous power supply voltage test and equipment isolation test was performed and that no errors were found.

6.5.4.1 Instructions

1) With power still supplied to the termination panel J1 connector, disconnect the power supply cable at the termination panel.

2) Using instructions in, Removing Digital Controller Assembly, remove the digital controller and disconnect the termination panel to the digital controller cable.

3) Using instructions in, **Replacing Analytical Module**, remove the analytical module.

4) With power still disconnected from the NGC, 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 NGC 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).

i.e., only 0.1 VDC drop max. between the PS and the NGC.

7) If the voltage drop is greater than 0.1 V, replace the termination panel using instructions in, **Replacing Termination Panel**, and return to step 6. If the voltage drop is again greater than 0.1 V, call Totalflow technical support, following the instructions in the Introduction to this manual, Getting Help.

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.

8) Was the damaged cable found? If yes, replace the appropriate cable using instructions in **Maintenance**.

If not, use instructions in **Replacing Analytical Module**, and replace the module. Skip to step 10.

9) Reinstall the analytical module.

10) Reinstall the digital controller assembly.

11) 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 NGC to fully boot and for the NGC to start drawing normal to full power. However, under normal operation, the NGC should never, at any time, draw current beyond its rated values.

12) Return to the equipment isolation test.

6.5.5 Charger Circuit Test

If the system setup includes a battery pack, solar panel or AC charger/power supply connected to the optional equipment enclosure, and the unit's battery is not staying charged, test the battery pack, AC charger/power supply or the solar panel.

The following instructions contain the steps required to perform the circuit testing.

6.5.5.1 Things to consider

The following list points to other troubleshooting procedures that the user may want to consider as well:

- Solar Panel Troubleshooting Test
- AC Charger/Power Supply Troubleshooting Test

6.5.5.2 Instructions

1) Disconnect power from the AC charger/power supply located in the optional enclosure.

2) Replace the battery with a known good battery using the **Replacing Lithium Battery** Maintenance.

3) Reconnect the power to the charger/supply. If the battery pack is charged through an AC charger, skip to step 5; otherwise, continue to step 4.

4) Measure the solar panel charging voltage at the charger regulator using a DMM connecting the (+) and (-) leads to the (+) and (-) solar panel wires. Loaded voltage should be greater than or equal to the specification listed in **Table 6–3**. If the voltage is within range, the battery was bad.

If the loaded voltage is not above the minimum, perform the **Solar Panel Troubleshooting Test** found later in this chapter.

5) If the unit uses an AC charger, perform the **AC Charger/Power Supply Troubleshooting Test** found later in this chapter.

6) If all other testing to this point has not located the error, return to **Figure 6-2**, Power Troubleshooting flowchart and continue.

Table 6–3 Specifications for Solar Panels

Panel	Max	Volts at P_{Max}	Open Circuit	Load Resistance	Loaded Voltage
50	54 W	17.4 V	21.7 V	5 Ω 100 W	16–18 VDC
85	87 W	17.4 V	21.7 V	5 Ω 100 W	16–18 VDC

6.5.6 Solar Panel Troubleshooting Test

If the system setup includes a solar panel connected to the optional equipment enclosure, and it is not supplying the required voltage and current to the NGC unit, test the solar panel.

6.5.6.1 Things to Consider

The following list points to other troubleshooting procedures that the user may want to consider as well:

- Power Consumption Test (Remote Equipment)
- AC Charger/Power Supply Troubleshooting Test

6.5.6.2 Required Equipment

- Digital Multi-meter with 0-20 VDC range.
- Required resistors for testing specific panels listed in **Table 6–3**.

FYI  In continuous low sun light conditions, the unit may not supply the required voltage. The solar panel should be positioned so it receives the most sunlight. Do not place it in a shaded area.

6.5.6.3 Instructions

1) Measure the solar panel voltage at the controller assembly using a DMM connecting the (+) and (-) leads to the (+) and (-) solar panel wires. The loaded voltage should be greater than or equal to the specifications listed in **Table 6–3**. If the solar panel is not above the minimum, replace the solar panel, and continue to step 2.

2) Check the solar panel angle and direction. In the northern hemisphere, the panel should face due south and in the southern hemisphere, due north.

3) Check the solar panel for any physical damage or obstructions to sunlight. Sunlight obstruction prevents the solar panel from receiving enough sunlight to charge the installed battery pack. Clear any debris from the cell face of the panel.

4) Check the solar panel wiring to be certain it is correctly connected to the associated termination pins located in the enclosure (see **Figure 3-78** and **Figure 3-79**).

5) Disconnect the solar panel from the field device.

6) Set the DMM range to read over 20 VDC.

7) Determine if the open circuit voltage is greater than or equal to the specifications listed in **Table 6–3** by clipping the positive lead of the DMM to the positive wire and clipping the negative lead of the DMM to the negative wire. If the solar panel is not above the minimum, continue to the next step.

8) Using the selected resistor from **Table 6–3** for the solar panel wattage, attach the selected resistor between the two solar panel wires.

9) Clip the positive lead of the DMM to the one side of the test resistor.

10) Clip the negative lead of the DMM to the other side of the test resistor.

11) Determine if the loaded voltage is greater than or equal to the specifications listed in **Table 6–3**. If the solar panel is not above the minimum, replace the solar panel and return to step 3.

6.5.7 AC Charger/Power Supply Troubleshooting Test

If the system setup includes an AC charger/power supply connected to the optional equipment enclosure, and it is not supplying the required voltage to the NGC unit, test the AC charger/power supply.

6.5.7.1 Instructions

1) Check the input AC voltage to the enclosure power supply. Be certain the primary AC voltage is correct.

2) If the primary input AC voltage level is correct, and there is no DC output from the power supply, replace the F1 charger fuse (see **Figure 6-3**).

3) If the fuse is not faulty or there is no charger DC output voltage after replacing the fuse, replace the AC charger/power supply.

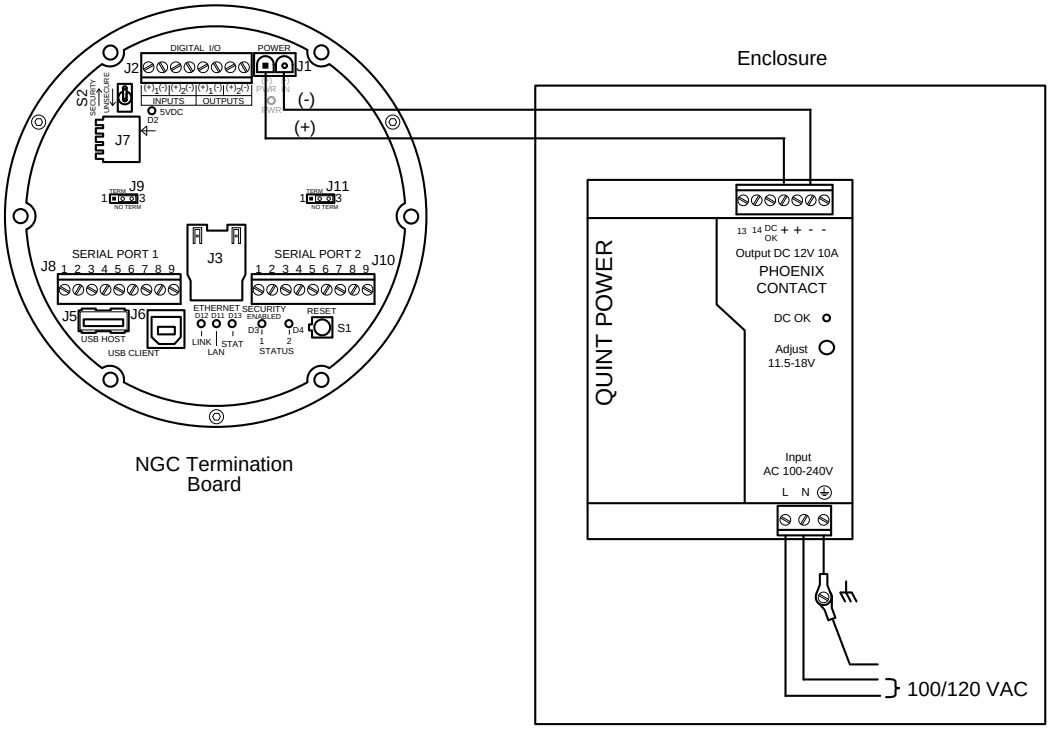


Figure 6-3 AC Charger/Power Supply Wiring

6.6 Troubleshooting Communications

These troubleshooting procedures are applicable to an NGC8200 with an installed radio in the optional equipment enclosure. Use **Figure 6-4** as an aid for troubleshooting communication problems. The three basic types of radio communications that can be used between the NGC and a radio receiver are:

- RS-232 Communications (see **Table 6–4** for pin Configurations)
- RS-485 Communications (see **Table 6–6** for pin Configurations)
- RS-422 Communications (available, but not detailed)

The radio/modem may be powered one of two ways: always on or switched. The specific system setup will determine what steps are needed to power the radio/modem.

When switching the power to a radio with inhibit (SLEEP) mode, the serial port 1 or 2 switched power line will go to the radio's inhibit (SLEEP) mode input. Power out will go to the radio's power input.

6.6.1 Communication

Troubleshooting the communications for this unit requires that equipment in two areas be tested: the NGC Comm Ports and the external Communication device. This is discussed in more detail in the Communications Overview section.

Other communication troubleshooting information is shared in the following categories:

- RS232 Communications
- RS485 Communications
- RS422 Communications

6.6.2 Setting Up Communication

After the installation of the communication equipment, and before placing the communication system into operation, note the following:

- Verify field wiring terminations on the NGC termination panel.
- Verify field wiring from the NGC unit to the termination strip inside the enclosure.
- Verify the field wiring from the termination strip to the radio.
- Check the NGC identifier (ID). Log the ID for future reference.
- Log the NGC access security code, baud rate, listen cycle, protocol and interface for future reference.

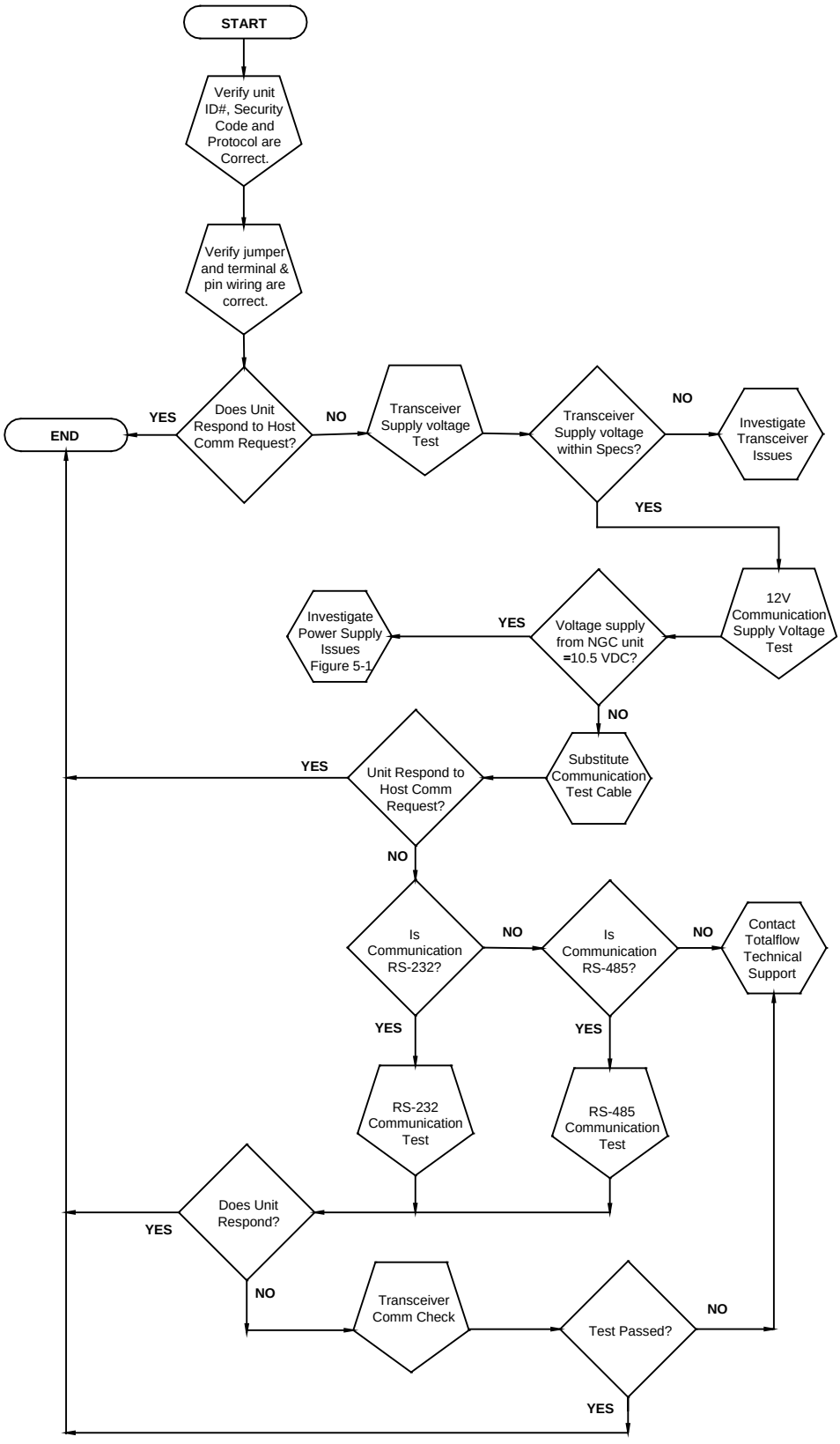


Figure 6-4 Communication Troubleshooting Flowchart

When the communication equipment is powered/switched on, the NGC displays the communication icon after it recognizes the NGC ID and is responding.

Check the baud rate of the NGC transmission and the listen time settings. The baud rate and time settings can be changed by entering the Station Setup screen from the Analyzer Operation screen. Default settings are 1200 baud and the listening time is four seconds with the communications interface turned off.

FYI 

The minimum power required for operating the remote communications is 11.9 VDC (default) or as set by the user. Should the power fall below this level, remote communications will be terminated.

Test the remote communications using the RS-232 troubleshooting cable. Use the RS-232 to RS-485 communication converter in conjunction with the RS-232 troubleshooting cable to test the RS-485 remote communications.

6.6.3 Transceiver Supply Voltage Test

Using the wiring information and guidelines supplied by the transceiver manufacturer, verify that the transceiver is receiving the manufacturer's suggested voltage. If the unit is receiving sufficient voltage, continue to the optional equipment enclosure wiring voltage test.

FYI 

If the transceiver is not receiving sufficient voltage, investigate the power supply issues. These may involve wiring irregularities at the AC charger/power supply, XFC/XRC board or at the power relay if using the relay for switching power to the radio.

6.6.4 12 VDC Communication Supply Voltage Test

6.6.4.1 Instructions

If the transceiver does not feature a sleep mode and power is supplied through an optional relay, begin with step 1.

If the transceiver features a sleep mode, or is continuously powered, begin with step 2.

1) If the transceiver does not feature a sleep mode and receives power through an optional relay, activate serial port 1 or 2 switched power out (pin 3) and, using a digital multimeter (DMM) set to volts DC, measure the voltage at the relay between relay coil terminals.

If the voltage reads the same as the supplied voltage (12 VDC) and the transceiver is still not receiving power, the relay may be incorrectly wired (use normally open contacts), or the relay may be bad.

If the relay is not receiving power, continue to step 2.

2) If the transceiver features a sleep mode or is continuously powered, using a digital multimeter (DMM) set to volts DC, measure the voltage at each power supply wiring junction. Verify the wiring is firmly connected and measure the voltage between Power (+) and Ground (-).

The voltage should be greater than or equal to 11.9 VDC for this unit. If the voltage is less than 11.9, return to the test sequence outlined in the power troubleshooting flowchart (see **Figure 6-2**).

6.6.5 Transceiver Check

6.6.5.1 Instructions

1) If available, use a wattmeter to check the transceiver output power. Refer to the manufacturer's documentation for measuring instructions.

2) If available, use two (2) hand-held transceivers and verify the communication path between the master and remote sites. Voice-activated interface can be used, if available.

3) Verify that the transceiver is set to the correct frequency. Refer to the manufacturer's documentation for checking frequency instructions.

4) If a directional antenna is used, verify the orientation of the antenna to the master site.

FYI 

If a communication problem still exists, and the unit has passed the transceiver check test, contact Totalflow customer service for additional help.

6.6.6 RS-232 Communication Test

The following RS-232 serial communication test procedure is directed from **Figure 6-4** and will assist with what may be the possible cause for the indicated error message.

Before performing this test, verify that the field wiring is correct (see **Table 6–4**).

Table 6–4 RS-232 Field Wiring on NGC Termination Panel

	Description	Description
PIN	**Jack 8–Port 1**	**Jack 10–Port 2**
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

TIP 

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.

6.6.6.1 Instructions

Voltage on the following steps may be hard to see using a digital multimeter. If available, an oscilloscope will provide a more accurate reading. To verify, the host software must be continuously polling the NGC.

TIP 

Generally speaking, these tests performed on the terminal board will only verify incorrect or damaged wiring. If all previous testing passed and all wiring, jack and terminations have been verified as correct, the board will need to be replaced. Contact Totalflow customer service. See Getting Help in the introduction of this manual for instructions.

1) Using an oscilloscope, measure the receiving data voltage on the termination panel J8 or J10 between:

Port 1, J8–pin 2 (Ground) and pin 8 (Receive Data) or

Port 2, J10–pin 2 (Ground) and pin 8 (Receive Data).

When the unit is receiving data from the host, the voltage should vary between -5 VDC and +5 VDC. This would indicate that the unit is receiving data; continue to step 2. If the unit is not receiving data, investigate the wiring issues (see **Table 6–4**).

2) Using an oscilloscope, measure the request to send voltage on the termination panel J8 or J10 between:

Port 1, J8–pin 2 (Ground) and pin 6 (Request to Send) or

Port 2, J10–pin 2 (Ground) and pin 6 (Request to Send).

When the unit is communicating with the host, the voltage should be +5 VDC and remain +5 VDC until the XFC transmit stops. This would indicate that the unit is transmitting data; continue to step 3. If the unit is not receiving data, investigate the wiring issues (see **Table 6–4**).

3) Using an oscilloscope, measure the transmit data voltage on the termination panel J8 or J10 between:

Port 1, J8–pin 2 (Ground) and pin 7 (Transmit Data) or

Port 2, J10–pin 2 (Ground) and pin 7 (Transmit Data).

When the unit is transmitting to the host, the voltage should vary between -5 VDC and +5 VDC. This would indicate that the unit is transmitting data. If the unit is still not responding, continue to the next test as directed in **Figure 6-4**.

6.6.7 RS-485 Communications

The following RS-485 serial communication test procedure is directed from **Figure 6-4** and will assist with what may be the possible cause for the indicated error message.

TIP 

When troubleshooting RS-485 mode, verify the termination settings of port 1 J9 and port 2 J11 on the termination panel are correctly jumpered (see **Table 6–5**).

Table 6–5 RS-485 Terminations

Serial Comm Port	1	2
Jumper	**J9**	**J11**
First or Intermediate Unit	pins 2–3	pins 2–3
Last or Only Unit	pins 1–2	pins 1–2

6.6.8 RS-485 Communication Test

Before performing this test on the termination panel located inside the rear end cap, verify that the wiring is correct (see **Table 6–6**).

Table 6–6 RS-485 Field Wiring on NGC Termination Panel

	Description	Description
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 (-)
8	Receive Bus (+) (RS-422)	Receive Bus (+) (RS-422)
9	Receive Bus (-) (RS-422)	Receive Bus (-) (RS-422)

6.6.8.1 Instructions

Voltage on the following steps may be hard to see using a digital multi-meter. If available, an oscilloscope will provide a more accurate reading. To verify, the host software must be continuously polling the meter.

FYI

Generally speaking, these tests performed on the termination panel will only verify incorrect or damaged wiring. If all previous testing passed and all wiring, jack and terminations have been verified correct, the termination panel may need to be replaced. But the termination panel does not typically fail. Contact Totalflow customer service. See Getting Help in the introduction of this manual for instructions.

1) Using an oscilloscope, measure the line driver voltage on the termination panel J8 or J10 between:

Port 1, J8–pin 7 (BUS-) and pin 6 (BUS+) or

Port 2, J10–pin 7 (BUS-) and pin 6 (BUS+).

When the unit is receiving data from the host, the voltage should vary between +5 VDC and 0 VDC. This would indicate that the unit is receiving data.

2) Using an oscilloscope, measure the remote request to send voltage on the termination panel J8 or J10:

Port 1, J8–pin 2 (Ground) and pin 5 (RRTS)

Port 2, J10–pin 2 (Ground) and pin 5 (RRTS)

When the unit is transmitting data, the voltage should vary between +5 VDC and 0 VDC. This would indicate that the RRTS is working correctly.

3) If any inaccuracy exists, investigate the wiring errors or damaged wires.

FYI  If a communication problem still exists and the unit has passed the tests in steps 1 and 2, additional testing will be required.

APPENDIX A MODBUS REGISTERS

The table below lists the Modbus register assignments for the NGC. The 32-Bit and 16-Bit Register Format columns relate to the Register Format setup in a communication port setup. 32-Bit registers are transferred as a single 32-bit register. 16-Bit registers are transferred as 32-bits via two consecutive 16-bit registers. The NGC Address column displays the fixed NGC application, array, registers. The Description column is a short explanation of the data contained in the registers. The Status column indicates whether viable data is available for the corresponding register. Since Modbus registers are typically requested by providing the starting register and the number of sequential registers, the registers indicated as unavailable can be part of a the sequential register group without creating an error. The data in those registers will be zero.

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
			16 Bit Integer Group - Current Stream	
3001	3001	51.200.0	Component Table #1, Component Register #1	available
3002	3002	51.200.1	Component Table #1, Component Register #2	available
3003	3003	51.200.2	Component Table #1, Component Register #3	available
3004	3004	51.200.3	Component Table #1, Component Register #4	available
3005	3005	51.200.4	Component Table #1, Component Register #5	available
3006	3006	51.200.5	Component Table #1, Component Register #6	available
3007	3007	51.200.6	Component Table #1, Component Register #7	available
3008	3008	51.200.7	Component Table #1, Component Register #8	available
3009	3009	51.200.8	Component Table #1, Component Register #9	available
3010	3010	51.200.9	Component Table #1, Component Register #10	available
3011	3011	51.200.10	Component Table #1, Component Register #11	available
3012	3012	51.200.11	Component Table #1, Component Register #12	available
3013	3013	51.200.12	Component Table #1, Component Register #13	available
3014	3014	51.200.13	Component Table #1, Component Register #14	available
3015	3015	51.200.14	Component Table #1, Component Register #15	available
3016	3016	51.200.15	Component Table #1, Component Register #16	available
3017	3017	51.200.0	Component Table #2, Component Register #1	available
3018	3018	51.200.1	Component Table #2, Component Register #2	available
3019	3019	51.200.2	Component Table #2, Component Register #3	available
3020	3020	51.200.3	Component Table #2, Component Register #4	available
3021	3021	51.200.4	Component Table #2, Component Register #5	available
3022	3022	51.200.5	Component Table #2, Component Register #6	available
3023	3023	51.200.6	Component Table #2, Component Register #7	available
3024	3024	51.200.7	Component Table #2, Component Register #8	available
3025	3025	51.200.8	Component Table #2, Component Register #9	available
3026	3026	51.200.9	Component Table #2, Component Register #10	available
3027	3027	51.200.10	Component Table #2, Component Register #11	available
3028	3028	51.200.11	Component Table #2, Component Register #12	available
3029	3029	51.200.12	Component Table #2, Component Register #13	available
3030	3030	51.200.13	Component Table #2, Component Register #14	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
3031	3031	51.200.14	Component Table #2, Component Register #15	available
3032	3032	51.200.15	Component Table #2, Component Register #16	available
3033	3033	51.201.1	Analysis Time (in1/30ths of 1 second)	un-available
3034	3034	51.201.0	Current Stream Number (15.0.28)	available
3035	3035	51.201.1	Mask of streams assoc. with Component Table 41	un-available
3036	3036	51.201.3	Current Month (1-12)	available
3037	3037	51.201.4	Current Day (1-31)	available
3038	3038	51.201.5	Current Year (0-99)	available
3039	3039	51.201.6	Current Hour (0-24)	available
3040	3040	51.201.7	Current Minutes (0-59)	available
3041	3041	51.201.8	Cycle Start Month (1-12)	available
3042	3042	51.201.9	Cycle Start Day (1-31)	available
3043	3043	51.201.10	Cycle Start Year (0-99)	available
3044	3044	51.201.11	Cycle Start Hour (0-24)	available
3045	3045	51.201.12	Cycle Start Minutes (0-59)	available
3046	3046	51.201.42	Bit Flags Transmitter (Bit 14 = Xmtr Fail)	available
3047	3047	51.201.43	Bit Flags Transmitter (Bit 0 = Power Fail)	available
3048	3048	51.201.1	Bit Flags Stream #1 Low	un-available
3049	3049	51.201.1	Bit Flags Stream #1 High	un-available
3050	3050	51.201.1	Bit Flags Stream #2 Low	un-available
3051	3051	51.201.1	Bit Flags Stream #2 High	un-available
3052	3052	51.201.1	Bit Flags Stream #3 Low	un-available
3053	3053	51.201.1	Bit Flags Stream #3 High	un-available
3054	3054	51.201.1	Bit Flags Stream #4 Low	un-available
3055	3055	51.201.1	Bit Flags Stream #4 High	un-available
3056	3056	51.201.1	Bit Flags Stream #5 Low	un-available
3057	3057	51.201.1	Bit Flags Stream #5 High	un-available
3058	3058	51.201.2	New Data Flag	available
3059	3059	51.201.13	Cal/Analysis Flag (0 = Cal, 1 = Analysis)	available
3060	3060	51.201.32	Read the Current State	available
3061	3061	51.201.33	Read the Next State	available
3062	3062	51.201.1	Auto Calibration During Startup	un-available
3063	3063	51.201.22	Alternate Purge Cycles	available
3064	3064	51.201.23	Alternate Calibration Cycles	available
3065	3065	51.201.24	Number of Purge Cycles	available
3066	3066	51.201.25	Number of Calibration Cycles	available
3067	3067	51.201.1	Low Carrier Mode	un-available
3068	3068	51.201.1	Low Power Mode	un-available
3069	3069	51.201.1	Pre-Purge Selection	un-available
3070	3070	51.201.1	Normal Status	un-available
3071	3071	51.201.1	Fault Status	un-available
3072	3072	51.201.26	Carrier Bottle Low (DI1) (1 = closed, 0 = open)	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
3073	3073	51.201.27	Cal. Bottle Low (DI2) (1 = closed, 0 = open)	available
3074	3074	51.201.1	Manual Update Response Factors	un-available
3075	3075	51.201.1	Auto Update Response Factors	un-available
3076	3076	51.201.1	Disable Stream Switching	un-available
3077	3077	51.201.1	Transmitter Current Warning	un-available
3078	3078	51.201.1	Transmitter Current Fault	un-available
3079	3079	51.201.1	Transmitter Initial Warning	un-available
3080	3080	51.201.1	Transmitter Initial Fault	un-available
3081	3081	51.201.18	Stream #1 Last Current Warning	available
3082	3082	51.201.19	Stream #2 Last Current Warning	available
3083	3083	51.201.20	Stream #3 Last Current Warning	available
3084	3084	51.201.21	Stream #4 Last Current Warning	available
3085	3085	51.201.14	Stream #1 Last Current Fault	available
3086	3086	51.201.15	Stream #2 Last Current Fault	available
3087	3087	51.201.16	Stream #3 Last Current Fault	available
3088	3088	51.201.17	Stream #4 Last Current Fault	available
3089	3089	51.201.38	Stream #1 Initial Warning	available
3090	3090	51.201.39	Stream #2 Initial Warning	available
3091	3091	51.201.40	Stream #3 Initial Warning	available
3092	3092	51.201.41	Stream #4 Initial Warning	available
3093	3093	51.201.34	Stream #1 Initial Fault	available
3094	3094	51.201.35	Stream #2 Initial Fault	available
3095	3095	51.201.36	Stream #3 Initial Fault	available
3096	3096	51.201.37	Stream #4 Initial Fault	available
3097	3097	51.201.28	Stream #1 Skip Flag	available
3098	3098	51.201.29	Stream #2 Skip Flag	available
3099	3099	51.201.30	Stream #3 Skip Flag	available
3100	3100	51.201.31	Stream #4 Skip Flag	available
32 Bit Integer Group - Current Stream				
5001	5001	51.208.2	Cycle Clock	available
5002	5003	51.208.1	Cycle Time	available
5003	5005	51.208.0	Detector 0	un-available
5004	5007	51.208.0	Detector 1	un-available
5005	5009	51.208.0	Detector 2	un-available
5006	5011	51.208.0	Detector 3	un-available
Floating Point Register Group - Current Stream				
7001	7001	51.203.0	Mole % - Component #1	available
7002	7003	51.203.1	Mole % - Component #2	available
7003	7005	51.203.2	Mole % - Component #3	available
7004	7007	51.203.3	Mole % - Component #4	available
7005	7009	51.203.4	Mole % - Component #5	available
7006	7011	51.203.5	Mole % - Component #6	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7007	7013	51.203.6	Mole % - Component #7	available
7008	7015	51.203.7	Mole % - Component #8	available
7009	7017	51.203.8	Mole % - Component #9	available
7010	7019	51.203.9	Mole % - Component #10	available
7011	7021	51.203.10	Mole % - Component #11	available
7012	7023	51.203.11	Mole % - Component #12	available
7013	7025	51.203.12	Mole % - Component #13	available
7014	7027	51.203.13	Mole % - Component #14	available
7015	7029	51.203.14	Mole % - Component #15	available
7016	7031	51.203.15	Mole % - Component #16	available
7017	7033	51.204.0	GPM % - Component #1	available
7018	7035	51.204.1	GPM % - Component #2	available
7019	7037	51.204.2	GPM % - Component #3	available
7020	7039	51.204.3	GPM % - Component #4	available
7021	7041	51.204.4	GPM % - Component #5	available
7022	7043	51.204.5	GPM % - Component #6	available
7023	7045	51.204.6	GPM % - Component #7	available
7024	7047	51.204.7	GPM % - Component #8	available
7025	7049	51.204.8	GPM % - Component #9	available
7026	7051	51.204.9	GPM % - Component #10	available
7027	7053	51.204.10	GPM % - Component #11	available
7028	7055	51.204.11	GPM % - Component #12	available
7029	7057	51.204.12	GPM % - Component #13	available
7030	7059	51.204.13	GPM % - Component #14	available
7031	7061	51.204.14	GPM % - Component #15	available
7032	7063	51.204.15	GPM % - Component #16	available
7033	7065	51.202.0	BTU - Dry	available
7034	7067	51.202.1	BTU - Saturated	available
7035	7069	51.202.2	Specific Gravity	available
7036	7071	51.202.3	Compressibility	available
7037	7073	51.202.4	WOBBE Index	available
7038	7075	51.202.6	Total UN-normalized mole %	available
7039	7077	51.202.13	Total GPM	available
7040	7079	51.202.8	Ideal BTU	available
7041	7081	51.202.9	Density Normal	available
7042	7083	51.202.10	Inferior WOBBE	available
7043	7085	51.202.11	Methane Number	available
7044	7087	51.202.12	Speed of Sound	available
7045	7089	51.241.0	Rolling Average for Component #1	available
7046	7091	51.241.1	Rolling Average for Component #2	available
7047	7093	51.241.2	Rolling Average for Component #3	available
7048	7095	51.241.3	Rolling Average for Component #4	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7049	7097	51.241.4	Rolling Average for Component #5	available
7050	7099	51.241.5	Rolling Average for Component #6	available
7051	7101	51.241.6	Rolling Average for Component #7	available
7052	7103	51.241.7	Rolling Average for Component #8	available
7053	7105	51.241.8	Rolling Average for Component #9	available
7054	7107	51.241.9	Rolling Average for Component #10	available
7055	7109	51.241.10	Rolling Average for Component #11	available
7056	7111	51.241.11	Rolling Average for Component #12	available
7057	7113	51.241.12	Rolling Average for Component #13	available
7058	7115	51.241.13	Rolling Average for Component #14	available
7059	7117	51.241.14	Rolling Average for Component #15	available
7060	7119	51.241.15	Rolling Average for Component #16	available
7061	7121	51.206.0	24 Hr Average for Component #1	available
7062	7123	51.206.1	24 Hr Average for Component #2	available
7063	7125	51.206.2	24 Hr Average for Component #3	available
7064	7127	51.206.3	24 Hr Average for Component #4	available
7065	7129	51.206.4	24 Hr Average for Component #5	available
7066	7131	51.206.5	24 Hr Average for Component #6	available
7067	7133	51.206.6	24 Hr Average for Component #7	available
7068	7135	51.206.7	24 Hr Average for Component #8	available
7069	7137	51.206.8	24 Hr Average for Component #9	available
7070	7139	51.206.9	24 Hr Average for Component #10	available
7071	7141	51.206.10	24 Hr Average for Component #11	available
7072	7143	51.206.11	24 Hr Average for Component #12	available
7073	7145	51.206.12	24 Hr Average for Component #13	available
7074	7147	51.206.13	24 Hr Average for Component #14	available
7075	7149	51.206.14	24 Hr Average for Component #15	available
7076	7151	51.206.15	24 Hr Average for Component #16	available
7077	7153	51.207.0	Previous 24 Hr Average for Component #1	available
7078	7155	51.207.1	Previous 24 Hr Average for Component #2	available
7079	7157	51.207.2	Previous 24 Hr Average for Component #3	available
7080	7159	51.207.3	Previous 24 Hr Average for Component #4	available
7081	7161	51.207.4	Previous 24 Hr Average for Component #5	available
7082	7163	51.207.5	Previous 24 Hr Average for Component #6	available
7083	7165	51.207.6	Previous 24 Hr Average for Component #7	available
7084	7167	51.207.7	Previous 24 Hr Average for Component #8	available
7085	7169	51.207.8	Previous 24 Hr Average for Component #9	available
7086	7171	51.207.9	Previous 24 Hr Average for Component #10	available
7087	7173	51.207.10	Previous 24 Hr Average for Component #11	available
7088	7175	51.207.11	Previous 24 Hr Average for Component #12	available
7089	7177	51.207.12	Previous 24 Hr Average for Component #13	available
7090	7179	51.207.13	Previous 24 Hr Average for Component #14	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7091	7181	51.207.14	Previous 24 Hr Average for Component #15	available
7092	7183	51.207.15	Previous 24 Hr Average for Component #16	available
7093	7185	51.244.44	Rolling Average BTU - Dry	available
7094	7187	51.244.39	Rolling Average BTU - Sat	available
7095	7189	51.244.51	Rolling Average Specific Gravity	available
7096	7191	51.244.40	Rolling Average Compressibility	available
7097	7193	51.244.41	Rolling Average Superior Wobbe	available
7098	7195	51.244.47	Rolling Average Total Un-Normalized Mole %	available
7099	7197	51.244.48	Rolling Average Total GPM	available
7100	7199	51.244.50	Rolling Average Ideal BTU	available
7101	7201	51.244.46	Rolling Average Density Normal	available
7102	7203	51.245.44	24 Hr Average for BTU - Dry	available
7103	7205	51.245.39	24 Hr Average for BTU - Sat	available
7104	7207	51.245.51	24 Hr Average for Specific Gravity	available
7105	7209	51.245.40	24 Hr Average for Compressibility	available
7106	7211	51.245.41	24 Hr Average for Superior Wobbe	available
7107	7213	51.245.47	24 Hr Average for Total Un-Normalized Mole %	available
7108	7215	51.245.48	24 Hr Average for Total GPM	available
7109	7217	51.245.50	24 Hr Average for Ideal BTU	available
7110	7219	51.245.46	24 Hr Average for Density Normal	available
7111	7221	51.246.44	Previous 24 Hr Average for BTU - Dry	available
7112	7223	51.246.39	Previous 24 Hr Average for BTU - Sat	available
7113	7225	51.246.51	Previous 24 Hr Average for Specific Gravity	available
7114	7227	51.246.40	Previous 24 Hr Average for Compressibility	available
7115	7229	51.246.41	Previous 24 Hr Average for Superior Wobbe	available
7116	7231	51.246.47	Previous 24 Hr Avg. for Total Un-Norm Mole %	available
7117	7233	51.246.48	Previous 24 Hr Average for Total GPM	available
7118	7235	51.246.50	Previous 24 Hr Average for Ideal BTU	available
7119	7237	51.246.46	Previous 24 Hr Average for Density Normal	available
7120-7199	N/A	51.202.7		un-available
Floating Point Register Group - Transmitter				
7200	7399	51.202.7	Ground Reference	un-available
7201	7401	51.202.18	Power	available
7202	7403	51.202.19	Mandrel Temp	available
7203	7405	51.202.20	Column 1 Pressure	available
7204	7407	51.202.21	Column 2 Pressure	available
7205	7409	51.202.7	Analog Input #6 - Spare	un-available
7206	7411	51.202.7	Ambient Temp	un-available
7207	7413	51.202.7	Voltage Reference	un-available
7208	7415	51.202.7	Unassigned	un-available
7209	7417	51.233.0	Calibration Standard - Component #1	available
7210	7419	51.233.1	Calibration Standard - Component #2	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7211	7421	51.233.2	Calibration Standard - Component #3	available
7212	7423	51.233.3	Calibration Standard - Component #4	available
7213	7425	51.233.4	Calibration Standard - Component #5	available
7214	7427	51.233.5	Calibration Standard - Component #6	available
7215	7429	51.233.6	Calibration Standard - Component #7	available
7216	7431	51.233.7	Calibration Standard - Component #8	available
7217	7433	51.233.8	Calibration Standard - Component #9	available
7218	7435	51.233.9	Calibration Standard - Component #10	available
7219	7437	51.233.10	Calibration Standard - Component #11	available
7220	7439	51.233.11	Calibration Standard - Component #12	available
7221	7441	51.233.12	Calibration Standard - Component #13	available
7222	7443	51.233.13	Calibration Standard - Component #14	available
7223	7445	51.233.14	Calibration Standard - Component #15	available
7224	7447	51.233.15	Calibration Standard - Component #16	available
7225	7449	51.205.0	Response Factor - Component #1	available
7226	7451	51.205.1	Response Factor - Component #2	available
7227	7453	51.205.2	Response Factor - Component #3	available
7228	7455	51.205.3	Response Factor - Component #4	available
7229	7457	51.205.4	Response Factor - Component #5	available
7230	7459	51.205.5	Response Factor - Component #6	available
7231	7461	51.205.6	Response Factor - Component #7	available
7232	7463	51.205.7	Response Factor - Component #8	available
7233	7465	51.205.8	Response Factor - Component #9	available
7234	7467	51.205.9	Response Factor - Component #10	available
7235	7469	51.205.10	Response Factor - Component #11	available
7236	7471	51.205.11	Response Factor - Component #12	available
7237	7473	51.205.12	Response Factor - Component #13	available
7238	7475	51.205.13	Response Factor - Component #14	available
7239	7477	51.205.14	Response Factor - Component #15	available
7240	7479	51.205.15	Response Factor - Component #16	available
7241	7481	51.239.0	Alt Calibration Standard - Component #1	available
7242	7483	51.239.1	Alt Calibration Standard - Component #2	available
7243	7485	51.239.2	Alt Calibration Standard - Component #3	available
7244	7487	51.239.3	Alt Calibration Standard - Component #4	available
7245	7489	51.239.4	Alt Calibration Standard - Component #5	available
7246	7491	51.239.5	Alt Calibration Standard - Component #6	available
7247	7493	51.239.6	Alt Calibration Standard - Component #7	available
7248	7495	51.239.7	Alt Calibration Standard - Component #8	available
7249	7497	51.239.8	Alt Calibration Standard - Component #9	available
7250	7499	51.239.9	Alt Calibration Standard - Component #10	available
7251	7501	51.239.10	Alt Calibration Standard - Component #11	available
7252	7503	51.239.11	Alt Calibration Standard - Component #12	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7253	7505	51.239.12	Alt Calibration Standard - Component #13	available
7254	7507	51.239.13	Alt Calibration Standard - Component #14	available
7255	7509	51.239.14	Alt Calibration Standard - Component #15	available
7256	7511	51.239.15	Alt Calibration Standard - Component #16	available
7257	7513	51.240.0	Alt Response Factor - Component #1	available
7258	7515	51.240.1	Alt Response Factor - Component #2	available
7259	7517	51.240.2	Alt Response Factor - Component #3	available
7260	7519	51.240.3	Alt Response Factor - Component #4	available
7261	7521	51.240.4	Alt Response Factor - Component #5	available
7262	7523	51.240.5	Alt Response Factor - Component #6	available
7263	7525	51.240.6	Alt Response Factor - Component #7	available
7264	7527	51.240.7	Alt Response Factor - Component #8	available
7265	7529	51.240.8	Alt Response Factor - Component #9	available
7266	7531	51.240.9	Alt Response Factor - Component #10	available
7267	7533	51.240.10	Alt Response Factor - Component #11	available
7268	7535	51.240.11	Alt Response Factor - Component #12	available
7269	7537	51.240.12	Alt Response Factor - Component #13	available
7270	7539	51.240.13	Alt Response Factor - Component #14	available
7271	7541	51.240.14	Alt Response Factor - Component #15	available
7272	7543	51.240.15	Alt Response Factor - Component #16	available
7273	7545	51.202.14	Detector 0 value	available
7274	7547	51.202.15	Detector 1 value	available
7275	7549	51.202.16	Detector 2 value	available
7276	7551	51.202.17	Detector 3 value	available
7277-7400	N/A	51.202.7		un-available
			Registers 7400-7599 are for stream #1	
7401	7801	51.210.0	Mole % - Component #1	available
7402	7803	51.210.1	Mole % - Component #2	available
7403	7805	51.210.2	Mole % - Component #3	available
7404	7807	51.210.3	Mole % - Component #4	available
7405	7809	51.210.4	Mole % - Component #5	available
7406	7811	51.210.5	Mole % - Component #6	available
7407	7813	51.210.6	Mole % - Component #7	available
7408	7815	51.210.7	Mole % - Component #8	available
7409	7817	51.210.8	Mole % - Component #9	available
7410	7819	51.210.9	Mole % - Component #10	available
7411	7821	51.210.10	Mole % - Component #11	available
7412	7823	51.210.11	Mole % - Component #12	available
7413	7825	51.210.12	Mole % - Component #13	available
7414	7827	51.210.13	Mole % - Component #14	available
7415	7829	51.210.14	Mole % - Component #15	available
7416	7831	51.210.15	Mole % - Component #16	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7417	7833	51.211.0	GPM % - Component #1	available
7418	7835	51.211.1	GPM % - Component #2	available
7419	7837	51.211.2	GPM % - Component #3	available
7420	7839	51.211.3	GPM % - Component #4	available
7421	7841	51.211.4	GPM % - Component #5	available
7422	7843	51.211.5	GPM % - Component #6	available
7423	7845	51.211.6	GPM % - Component #7	available
7424	7847	51.211.7	GPM % - Component #8	available
7425	7849	51.211.8	GPM % - Component #9	available
7426	7851	51.211.9	GPM % - Component #10	available
7427	7853	51.211.10	GPM % - Component #11	available
7428	7855	51.211.11	GPM % - Component #12	available
7429	7857	51.211.12	GPM % - Component #13	available
7430	7859	51.211.13	GPM % - Component #14	available
7431	7861	51.211.14	GPM % - Component #15	available
7432	7863	51.211.15	GPM % - Component #16	available
7433	7865	51.209.0	BTU - Dry	available
7434	7867	51.209.1	BTU - Saturated	available
7435	7869	51.209.2	Specific Gravity	available
7436	7871	51.209.3	Compressibility	available
7437	7873	51.209.4	WOBBE Index	available
7438	7875	51.209.5	Total Un-Normalized mole %	available
7439	7877	51.209.11	Total GPM	available
7440	7879	51.209.6	Ideal BTU	available
7441	7881	51.209.7	Density Normal	available
7442	7883	51.209.8	Inferior WOBBE	available
7443	7885	51.209.9	Methane Number	available
7444	7887	51.209.10	Speed of Sound	available
7445	7889	51.235.0	Rolling Average for Component #1	available
7446	7891	51.235.1	Rolling Average for Component #2	available
7447	7893	51.235.2	Rolling Average for Component #3	available
7448	7895	51.235.3	Rolling Average for Component #4	available
7449	7897	51.235.4	Rolling Average for Component #5	available
7450	7899	51.235.5	Rolling Average for Component #6	available
7451	7901	51.235.6	Rolling Average for Component #7	available
7452	7903	51.235.7	Rolling Average for Component #8	available
7453	7905	51.235.8	Rolling Average for Component #9	available
7454	7907	51.235.9	Rolling Average for Component #10	available
7455	7909	51.235.10	Rolling Average for Component #11	available
7456	7911	51.235.11	Rolling Average for Component #12	available
7457	7913	51.235.12	Rolling Average for Component #13	available
7458	7915	51.235.13	Rolling Average for Component #14	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7459	7917	51.235.14	Rolling Average for Component #15	available
7460	7919	51.235.15	Rolling Average for Component #16	available
7461	7921	51.212.0	24 Hr Average for Component #1	available
7462	7923	51.212.1	24 Hr Average for Component #2	available
7463	7925	51.212.2	24 Hr Average for Component #3	available
7464	7927	51.212.3	24 Hr Average for Component #4	available
7465	7929	51.212.4	24 Hr Average for Component #5	available
7466	7931	51.212.5	24 Hr Average for Component #6	available
7467	7933	51.212.6	24 Hr Average for Component #7	available
7468	7935	51.212.7	24 Hr Average for Component #8	available
7469	7937	51.212.8	24 Hr Average for Component #9	available
7470	7939	51.212.9	24 Hr Average for Component #10	available
7471	7941	51.212.10	24 Hr Average for Component #11	available
7472	7943	51.212.11	24 Hr Average for Component #12	available
7473	7945	51.212.12	24 Hr Average for Component #13	available
7474	7947	51.212.13	24 Hr Average for Component #14	available
7475	7949	51.212.14	24 Hr Average for Component #15	available
7476	7951	51.212.15	24 Hr Average for Component #16	available
7477	7953	51.213.0	Previous 24 Hr Average for Component #1	available
7478	7955	51.213.1	Previous 24 Hr Average for Component #2	available
7479	7957	51.213.2	Previous 24 Hr Average for Component #3	available
7480	7959	51.213.3	Previous 24 Hr Average for Component #4	available
7481	7961	51.213.4	Previous 24 Hr Average for Component #5	available
7482	7963	51.213.5	Previous 24 Hr Average for Component #6	available
7483	7965	51.213.6	Previous 24 Hr Average for Component #7	available
7484	7967	51.213.7	Previous 24 Hr Average for Component #8	available
7485	7969	51.213.8	Previous 24 Hr Average for Component #9	available
7486	7971	51.213.9	Previous 24 Hr Average for Component #10	available
7487	7973	51.213.10	Previous 24 Hr Average for Component #11	available
7488	7975	51.213.11	Previous 24 Hr Average for Component #12	available
7489	7977	51.213.12	Previous 24 Hr Average for Component #13	available
7490	7979	51.213.13	Previous 24 Hr Average for Component #14	available
7491	7981	51.213.14	Previous 24 Hr Average for Component #15	available
7492	7983	51.213.15	Previous 24 Hr Average for Component #16	available
7493	7985	51.247.44	Rolling Average BTU - Dry	available
7494	7987	51.247.39	Rolling Average BTU - Sat	available
7495	7989	51.247.51	Rolling Average Specific Gravity	available
7496	7991	51.247.40	Rolling Average Compressibility	available
7497	7993	51.247.41	Rolling Average Superior Wobbe	available
7498	7995	51.247.47	Rolling Average Total Un-Normalized Mole	available
7499	7997	51.247.48	Rolling Average Total GPM	available
7500	7999	51.247.50	Rolling Average Ideal BTU	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7501	8001	51.247.46	Rolling Average Density Normal	available
7502	8003	51.248.44	24 Hr Average for BTU - Dry	available
7503	8005	51.248.39	24 Hr Average for BTU - Sat	available
7504	8007	51.248.51	24 Hr Average for Specific Gravity	available
7505	8009	51.248.40	24 Hr Average for Compressibility	available
7506	8011	51.248.41	24 Hr Average for Superior Wobbe	available
7507	8013	51.248.47	24 Hr Average for Total Un-Normalized Mole %	available
7508	8015	51.248.48	24 Hr Average for Total GPM	available
7509	8017	51.248.50	24 Hr Average for Ideal BTU	available
7510	8019	51.248.46	24 Hr Average for Density Normal	available
7511	8021	51.249.44	Previous 24 Hr Average for BTU - Dry	available
7512	8023	51.249.39	Previous 24 Hr Average for BTU - Sat	available
7513	8025	51.249.51	Previous 24 Hr Average for Specific Gravity	available
7514	8027	51.249.40	Previous 24 Hr Average for Compressibility	available
7515	8029	51.249.41	Previous 24 Hr Average for Superior Wobbe	available
7516	8031	51.249.47	Previous 24 Hr Avg for Total Un-Normalized Mole %	available
7517	8033	51.249.48	Previous 24 Hr Average for Total GPM	available
7518	8035	51.249.50	Previous 24 Hr Average for Ideal BTU	available
7519	8037	51.249.46	Previous 24 Hr Average for Density Normal	available
7520-7600	N/A	51.202.7		un-available
		Registers 7600-7799 are for stream #2		
7601	8201	51.215.0	Mole % - Component #1	available
7602	8203	51.215.1	Mole % - Component #2	available
7603	8205	51.215.2	Mole % - Component #3	available
7604	8207	51.215.3	Mole % - Component #4	available
7605	8209	51.215.4	Mole % - Component #5	available
7606	8211	51.215.5	Mole % - Component #6	available
7607	8213	51.215.6	Mole % - Component #7	available
7608	8215	51.215.7	Mole % - Component #8	available
7609	8217	51.215.8	Mole % - Component #9	available
7610	8219	51.215.9	Mole % - Component #10	available
7611	8221	51.215.10	Mole % - Component #11	available
7612	8223	51.215.11	Mole % - Component #12	available
7613	8225	51.215.12	Mole % - Component #13	available
7614	8227	51.215.13	Mole % - Component #14	available
7615	8229	51.215.14	Mole % - Component #15	available
7616	8231	51.215.15	Mole % - Component #16	available
7617	8233	51.216.0	GPM % - Component #1	available
7618	8235	51.216.1	GPM % - Component #2	available
7619	8237	51.216.2	GPM % - Component #3	available
7620	8239	51.216.3	GPM % - Component #4	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7621	8241	51.216.4	GPM % - Component #5	available
7622	8243	51.216.5	GPM % - Component #6	available
7623	8245	51.216.6	GPM % - Component #7	available
7624	8247	51.216.7	GPM % - Component #8	available
7625	8249	51.216.8	GPM % - Component #9	available
7626	8251	51.216.9	GPM % - Component #10	available
7627	8253	51.216.10	GPM % - Component #11	available
7628	8255	51.216.11	GPM % - Component #12	available
7629	8257	51.216.12	GPM % - Component #13	available
7630	8259	51.216.13	GPM % - Component #14	available
7631	8261	51.216.14	GPM % - Component #15	available
7632	8263	51.216.15	GPM % - Component #16	available
7633	8265	51.214.0	BTU - Dry	available
7634	8267	51.214.1	BTU - Saturated	available
7635	8269	51.214.2	Specific Gravity	available
7636	8271	51.214.3	Compressibility	available
7637	8273	51.214.4	WOBBE Index	available
7638	8275	51.214.5	Total Un-Normalized mole %	available
7639	8277	51.214.11	Total GPM	available
7640	8279	51.214.6	Ideal BTU	available
7641	8281	51.214.7	Density Normal	available
7642	8283	51.214.8	Inferior WOBBE	available
7643	8285	51.214.9	Methane Number	available
7644	8287	51.214.10	Speed of Sound	available
7645	8289	51.236.0	Rolling Average for Component #1	available
7646	8291	51.236.1	Rolling Average for Component #2	available
7647	8293	51.236.2	Rolling Average for Component #3	available
7648	8295	51.236.3	Rolling Average for Component #4	available
7649	8297	51.236.4	Rolling Average for Component #5	available
7650	8299	51.236.5	Rolling Average for Component #6	available
7651	8301	51.236.6	Rolling Average for Component #7	available
7652	8303	51.236.7	Rolling Average for Component #8	available
7653	8305	51.236.8	Rolling Average for Component #9	available
7654	8307	51.236.9	Rolling Average for Component #10	available
7655	8309	51.236.10	Rolling Average for Component #11	available
7656	8311	51.236.11	Rolling Average for Component #12	available
7657	8313	51.236.12	Rolling Average for Component #13	available
7658	8315	51.236.13	Rolling Average for Component #14	available
7659	8317	51.236.14	Rolling Average for Component #15	available
7660	8319	51.236.15	Rolling Average for Component #16	available
7661	8321	51.217.0	24 Hour Average for Component #1	available
7662	8323	51.217.1	24 Hour Average for Component #2	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7663	8325	51.217.2	24 Hour Average for Component #3	available
7664	8327	51.217.3	24 Hour Average for Component #4	available
7665	8329	51.217.4	24 Hour Average for Component #5	available
7666	8331	51.217.5	24 Hour Average for Component #6	available
7667	8333	51.217.6	24 Hour Average for Component #7	available
7668	8335	51.217.7	24 Hour Average for Component #8	available
7669	8337	51.217.8	24 Hour Average for Component #9	available
7670	8339	51.217.9	24 Hour Average for Component #10	available
7671	8341	51.217.10	24 Hour Average for Component #11	available
7672	8343	51.217.11	24 Hour Average for Component #12	available
7673	8345	51.217.12	24 Hour Average for Component #13	available
7674	8347	51.217.13	24 Hour Average for Component #14	available
7675	8349	51.217.14	24 Hour Average for Component #15	available
7676	8351	51.217.15	24 Hour Average for Component #16	available
7677	8353	51.218.0	Previous 24 Hr Average for Component #1	available
7678	8355	51.218.1	Previous 24 Hr Average for Component #2	available
7679	8357	51.218.2	Previous 24 Hr Average for Component #3	available
7680	8359	51.218.3	Previous 24 Hr Average for Component #4	available
7681	8361	51.218.4	Previous 24 Hr Average for Component #5	available
7682	8363	51.218.5	Previous 24 Hr Average for Component #6	available
7683	8365	51.218.6	Previous 24 Hr Average for Component #7	available
7684	8367	51.218.7	Previous 24 Hr Average for Component #8	available
7685	8369	51.218.8	Previous 24 Hr Average for Component #9	available
7686	8371	51.218.9	Previous 24 Hr Average for Component #10	available
7687	8373	51.218.10	Previous 24 Hr Average for Component #11	available
7688	8375	51.218.11	Previous 24 Hr Average for Component #12	available
7689	8377	51.218.12	Previous 24 Hr Average for Component #13	available
7690	8379	51.218.13	Previous 24 Hr Average for Component #14	available
7691	8381	51.218.14	Previous 24 Hr Average for Component #15	available
7692	8383	51.218.15	Previous 24 Hr Average for Component #16	available
7693	8385	51.247.144	Rolling Average BTU - Dry	available
7694	8387	51.247.139	Rolling Average BTU - Sat	available
7695	8389	51.247.151	Rolling Average Specific Gravity	available
7696	8391	51.247.140	Rolling Average Compressibility	available
7697	8393	51.247.141	Rolling Average Superior Wobbe	available
7698	8395	51.247.147	Rolling Average Total Un-Normalized Mole %	available
7699	8397	51.247.148	Rolling Average Total GPM	available
7700	8399	51.247.150	Rolling Average Ideal BTU	available
7701	8401	51.247.146	Rolling Average Density Normal	available
7702	8403	51.248.144	24 Hr Average for BTU - Dry	available
7703	8405	51.248.139	24 Hr Average for BTU - Sat	available
7704	8407	51.248.151	24 Hr Average for Specific Gravity	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7705	8409	51.248.140	24 Hr Average for Compressibility	available
7706	8411	51.248.141	24 Hr Average for Superior Wobbe	available
7707	8413	51.248.147	24 Hr Average for Total Un-Normalized Mole %	available
7708	8415	51.248.148	24 Hr Average for Total GPM	available
7709	8417	51.248.150	24 Hr Average for Ideal BTU	available
7710	8419	51.248.146	24 Hr Average for Density Normal	available
7711	8421	51.249.144	Previous 24 Hr Average for BTU - Dry	available
7712	8423	51.249.139	Previous 24 Hr Average for BTU - Sat	available
7713	8425	51.249.151	Previous 24 Hr Average for Specific Gravity	available
7714	8427	51.249.140	Previous 24 Hr Average for Compressibility	available
7715	8429	51.249.141	Previous 24 Hr Average for Superior Wobbe	available
7716	8431	51.249.147	Previous 24 Hr Avg for Total Un-Normal Mole %	available
7717	8433	51.249.148	Previous 24 Hr Average for Total GPM	available
7718	8435	51.249.150	Previous 24 Hr Average for Ideal BTU	available
7719	8437	51.249.146	Previous 24 Hr Average for Density Normal	available
7720-7800	N/A	51.202.7		un-available
			Registers 7800-7999 are for stream #3	
7801	8601	51.220.0	Mole % - Component #1	available
7802	8603	51.220.1	Mole % - Component #2	available
7803	8605	51.220.2	Mole % - Component #3	available
7804	8607	51.220.3	Mole % - Component #4	available
7805	8609	51.220.4	Mole % - Component #5	available
7806	8611	51.220.5	Mole % - Component #6	available
7807	8613	51.220.6	Mole % - Component #7	available
7808	8615	51.220.7	Mole % - Component #8	available
7809	8617	51.220.8	Mole % - Component #9	available
7810	8619	51.220.9	Mole % - Component #10	available
7811	8621	51.220.10	Mole % - Component #11	available
7812	8623	51.220.11	Mole % - Component #12	available
7813	8625	51.220.12	Mole % - Component #13	available
7814	8627	51.220.13	Mole % - Component #14	available
7815	8629	51.220.14	Mole % - Component #15	available
7816	8631	51.220.15	Mole % - Component #16	available
7817	8633	51.221.0	GPM % - Component #1	available
7818	8635	51.221.1	GPM % - Component #2	available
7819	8637	51.221.2	GPM % - Component #3	available
7820	8639	51.221.3	GPM % - Component #4	available
7821	8641	51.221.4	GPM % - Component #5	available
7822	8643	51.221.5	GPM % - Component #6	available
7823	8645	51.221.6	GPM % - Component #7	available
7824	8647	51.221.7	GPM % - Component #8	available
7825	8649	51.221.8	GPM % - Component #9	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7826	8651	51.221.9	GPM % - Component #10	available
7827	8653	51.221.10	GPM % - Component #11	available
7828	8655	51.221.11	GPM % - Component #12	available
7829	8657	51.221.12	GPM % - Component #13	available
7830	8659	51.221.13	GPM % - Component #14	available
7831	8661	51.221.14	GPM % - Component #15	available
7832	8663	51.221.15	GPM % - Component #16	available
7833	8665	51.219.0	BTU - Dry	available
7834	8667	51.219.1	BTU - Saturated	available
7835	8669	51.219.2	Specific Gravity	available
7836	8671	51.219.3	Compressibility	available
7837	8673	51.219.4	WOBBE Index	available
7838	8675	51.219.5	Total Un-Normalized mole %	available
7839	8677	51.219.11	Total GPM	available
7840	8679	51.219.6	Ideal BTU	available
7841	8681	51.219.7	Density Normal	available
7842	8683	51.219.8	Inferior WOBBE	available
7843	8685	51.219.9	Methane Number	available
7844	8687	51.219.10	Speed of Sound	available
7845	8689	51.237.0	Rolling Average for Component #1	available
7846	8691	51.237.1	Rolling Average for Component #2	available
7847	8693	51.237.2	Rolling Average for Component #3	available
7848	8695	51.237.3	Rolling Average for Component #4	available
7849	8697	51.237.4	Rolling Average for Component #5	available
7850	8699	51.237.5	Rolling Average for Component #6	available
7851	8701	51.237.6	Rolling Average for Component #7	available
7852	8703	51.237.7	Rolling Average for Component #8	available
7853	8705	51.237.8	Rolling Average for Component #9	available
7854	8707	51.237.9	Rolling Average for Component #10	available
7855	8709	51.237.10	Rolling Average for Component #11	available
7856	8711	51.237.11	Rolling Average for Component #12	available
7857	8713	51.237.12	Rolling Average for Component #13	available
7858	8715	51.237.13	Rolling Average for Component #14	available
7859	8717	51.237.14	Rolling Average for Component #15	available
7860	8719	51.237.15	Rolling Average for Component #16	available
7861	8721	51.222.0	24 Hr Average for Component #1	available
7862	8723	51.222.1	24 Hr Average for Component #2	available
7863	8725	51.222.2	24 Hr Average for Component #3	available
7864	8727	51.222.3	24 Hr Average for Component #4	available
7865	8729	51.222.4	24 Hr Average for Component #5	available
7866	8731	51.222.5	24 Hr Average for Component #6	available
7867	8733	51.222.6	24 Hr Average for Component #7	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7868	8735	51.222.7	24 Hr Average for Component #8	available
7869	8737	51.222.8	24 Hr Average for Component #9	available
7870	8739	51.222.9	24 Hr Average for Component #10	available
7871	8741	51.222.10	24 Hr Average for Component #11	available
7872	8743	51.222.11	24 Hr Average for Component #12	available
7873	8745	51.222.12	24 Hr Average for Component #13	available
7874	8747	51.222.13	24 Hr Average for Component #14	available
7875	8749	51.222.14	24 Hr Average for Component #15	available
7876	8751	51.222.15	24 Hr Average for Component #16	available
7877	8753	51.223.0	Previous 24 Hr Average for Component #1	available
7878	8755	51.223.1	Previous 24 Hr Average for Component #2	available
7879	8757	51.223.2	Previous 24 Hr Average for Component #3	available
7880	8759	51.223.3	Previous 24 Hr Average for Component #4	available
7881	8761	51.223.4	Previous 24 Hr Average for Component #5	available
7882	8763	51.223.5	Previous 24 Hr Average for Component #6	available
7883	8765	51.223.6	Previous 24 Hr Average for Component #7	available
7884	8767	51.223.7	Previous 24 Hr Average for Component #8	available
7885	8769	51.223.8	Previous 24 Hr Average for Component #9	available
7886	8771	51.223.9	Previous 24 Hr Average for Component #10	available
7887	8773	51.223.10	Previous 24 Hr Average for Component #11	available
7888	8775	51.223.11	Previous 24 Hr Average for Component #12	available
7889	8777	51.223.12	Previous 24 Hr Average for Component #13	available
7890	8779	51.223.13	Previous 24 Hr Average for Component #14	available
7891	8781	51.223.14	Previous 24 Hr Average for Component #15	available
7892	8783	51.223.15	Previous 24 Hr Average for Component #16	available
7893	8785	51.247.244	Rolling Average BTU - Dry	available
7894	8787	51.247.239	Rolling Average BTU - Sat	available
7895	8789	51.247.251	Rolling Average Specific Gravity	available
7896	8791	51.247.240	Rolling Average Compressibility	available
7897	8793	51.247.241	Rolling Average Superior Wobbe	available
7898	8795	51.247.247	Rolling Average Total Un-Normalized Mole %	available
7899	8797	51.247.248	Rolling Average Total GPM	available
7900	8799	51.247.250	Rolling Average Ideal BTU	available
7901	8801	51.247.246	Rolling Average Density Normal	available
7902	8803	51.248.244	24 Hr Average for BTU - Dry	available
7903	8805	51.248.239	24 Hr Average for BTU - Sat	available
7904	8807	51.248.251	24 Hr Average for Specific Gravity	available
7905	8809	51.248.240	24 Hr Average for Compressibility	available
7906	8811	51.248.241	24 Hr Average for Superior Wobbe	available
7907	8813	51.248.247	24 Hr Average for Total Un-Normalized Mole %	available
7908	8815	51.248.248	24 Hr Average for Total GPM	available
7909	8817	51.248.250	24 Hr Average for Ideal BTU	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
7910	8819	51.248.246	24 Hr Average for Density Normal	available
7911	8821	51.249.244	Previous 24 Hr Average for BTU - Dry	available
7912	8823	51.249.239	Previous 24 Hr Average for BTU - Sat	available
7913	8825	51.249.251	Previous 24 Hr Average for Specific Gravity	available
7914	8827	51.249.240	Previous 24 Hr Average for Compressibility	available
7915	8829	51.249.241	Previous 24 Hr Average for Superior Wobbe	available
7916	8831	51.249.247	Previous 24 Hr Avg for Total Un-Normalized Mole %	available
7917	8833	51.249.248	Previous 24 Hr Average for Total GPM	available
7918	8835	51.249.250	Previous 24 Hr Average for Ideal BTU	available
7919	8837	51.249.246	Previous 24 Hr Average for Density Normal	available
7920-8000	N/A	51.202.7		un-available
			Registers 8000-8199 are for stream #4	
8001	9001	51.225.0	Mole % - Component #1	available
8002	9003	51.225.1	Mole % - Component #2	available
8003	9005	51.225.2	Mole % - Component #3	available
8004	9007	51.225.3	Mole % - Component #4	available
8005	9009	51.225.4	Mole % - Component #5	available
8006	9011	51.225.5	Mole % - Component #6	available
8007	9013	51.225.6	Mole % - Component #7	available
8008	9015	51.225.7	Mole % - Component #8	available
8009	9017	51.225.8	Mole % - Component #9	available
8010	9019	51.225.9	Mole % - Component #10	available
8011	9021	51.225.10	Mole % - Component #11	available
8012	9023	51.225.11	Mole % - Component #12	available
8013	9025	51.225.12	Mole % - Component #13	available
8014	9027	51.225.13	Mole % - Component #14	available
8015	9029	51.225.14	Mole % - Component #15	available
8016	9031	51.225.15	Mole % - Component #16	available
8017	9033	51.226.0	GPM % - Component #1	available
8018	9035	51.226.1	GPM % - Component #2	available
8019	9037	51.226.2	GPM % - Component #3	available
8020	9039	51.226.3	GPM % - Component #4	available
8021	9041	51.226.4	GPM % - Component #5	available
8022	9043	51.226.5	GPM % - Component #6	available
8023	9045	51.226.6	GPM % - Component #7	available
8024	9047	51.226.7	GPM % - Component #8	available
8025	9049	51.226.8	GPM % - Component #9	available
8026	9051	51.226.9	GPM % - Component #10	available
8027	9053	51.226.10	GPM % - Component #11	available
8028	9055	51.226.11	GPM % - Component #12	available
8029	9057	51.226.12	GPM % - Component #13	available
8030	9059	51.226.13	GPM % - Component #14	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
8031	9061	51.226.14	GPM % - Component #15	available
8032	9063	51.226.15	GPM % - Component #16	available
8033	9065	51.224.0	BTU - Dry	available
8034	9067	51.224.1	BTU - Saturated	available
8035	9069	51.224.2	Specific Gravity	available
8036	9071	51.224.3	Compressibility	available
8037	9073	51.224.4	WOBBE Index	available
8038	9075	51.224.5	Total UN-normalized mole	available
8039	9077	51.224.11	Total GPM	available
8040	9079	51.224.6	Ideal BTU	available
8041	9081	51.224.7	Density Normal	available
8042	9083	51.224.8	Inferior WOBBE	available
8043	9085	51.224.9	Methane Number	available
8044	9087	51.224.10	Speed of Sound	available
8045	9089	51.238.0	Rolling Average for Component #1	available
8046	9091	51.238.1	Rolling Average for Component #2	available
8047	9093	51.238.2	Rolling Average for Component #3	available
8048	9095	51.238.3	Rolling Average for Component #4	available
8049	9097	51.238.4	Rolling Average for Component #5	available
8050	9099	51.238.5	Rolling Average for Component #6	available
8051	9101	51.238.6	Rolling Average for Component #7	available
8052	9103	51.238.7	Rolling Average for Component #8	available
8053	9105	51.238.8	Rolling Average for Component #9	available
8054	9107	51.238.9	Rolling Average for Component #10	available
8055	9109	51.238.10	Rolling Average for Component #11	available
8056	9111	51.238.11	Rolling Average for Component #12	available
8057	9113	51.238.12	Rolling Average for Component #13	available
8058	9115	51.238.13	Rolling Average for Component #14	available
8059	9117	51.238.14	Rolling Average for Component #15	available
8060	9119	51.238.15	Rolling Average for Component #16	available
8061	9121	51.227.0	24 Hr Average for Component #1	available
8062	9123	51.227.1	24 Hr Average for Component #2	available
8063	9125	51.227.2	24 Hr Average for Component #3	available
8064	9127	51.227.3	24 Hr Average for Component #4	available
8065	9129	51.227.4	24 Hr Average for Component #5	available
8066	9131	51.227.5	24 Hr Average for Component #6	available
8067	9133	51.227.6	24 Hr Average for Component #7	available
8068	9135	51.227.7	24 Hr Average for Component #8	available
8069	9137	51.227.8	24 Hr Average for Component #9	available
8070	9139	51.227.9	24 Hr Average for Component #10	available
8071	9141	51.227.10	24 Hr Average for Component #11	available
8072	9143	51.227.11	24 Hr Average for Component #12	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
8073	9145	51.227.12	24 Hr Average for Component #13	available
8074	9147	51.227.13	24 Hr Average for Component #14	available
8075	9149	51.227.14	24 Hr Average for Component #15	available
8076	9151	51.227.15	24 Hr Average for Component #16	available
8077	9153	51.228.0	Previous 24 Hr Average for Component #1	available
8078	9155	51.228.1	Previous 24 Hr Average for Component #2	available
8079	9157	51.228.2	Previous 24 Hr Average for Component #3	available
8080	9159	51.228.3	Previous 24 Hr Average for Component #4	available
8081	9161	51.228.4	Previous 24 Hr Average for Component #5	available
8082	9163	51.228.5	Previous 24 Hr Average for Component #6	available
8083	9165	51.228.6	Previous 24 Hr Average for Component #7	available
8084	9167	51.228.7	Previous 24 Hr Average for Component #8	available
8085	9169	51.228.8	Previous 24 Hr Average for Component #9	available
8086	9171	51.228.9	Previous 24 Hr Average for Component #10	available
8087	9173	51.228.10	Previous 24 Hr Average for Component #11	available
8088	9175	51.228.11	Previous 24 Hr Average for Component #12	available
8089	9177	51.228.12	Previous 24 Hr Average for Component #13	available
8090	9179	51.228.13	Previous 24 Hr Average for Component #14	available
8091	9181	51.228.14	Previous 24 Hr Average for Component #15	available
8092	9183	51.228.15	Previous 24 Hr Average for Component #16	available
8093	9185	51.247.344	Rolling Average BTU - Dry	available
8094	9187	51.247.339	Rolling Average BTU - Saturated	available
8095	9189	51.247.351	Rolling Average Specific Gravity	available
8096	9191	51.247.340	Rolling Average Compressibility	available
8097	9193	51.247.341	Rolling Average Superior Wobbe	available
8098	9195	51.247.347	Rolling Average Total Un-Normalized Mole %	available
8099	9197	51.247.348	Rolling Average Total GPM	available
8100	9199	51.247.350	Rolling Average Ideal BTU	available
8101	9201	51.247.346	Rolling Average Density Normal	available
8102	9203	51.248.344	24 Hour Average for BTU - Dry	available
8103	9205	51.248.339	24 Hour Average for BTU - Sat	available
8104	9207	51.248.351	24 Hour Average for Specific Gravity	available
8105	9209	51.248.340	24 Hour Average for Compressibility	available
8106	9211	51.248.341	24 Hour Average for Superior Wobbe	available
8107	9213	51.248.347	24 Hour Average for Total Un-Normalized Mole %	available
8108	9215	51.248.348	24 Hour Average for Total GPM	available
8109	9217	51.248.350	24 Hour Average for Ideal BTU	available
8110	9219	51.248.346	24 Hour Average for Density Normal	available
8111	9221	51.249.344	Previous 24 Hr Average for BTU - Dry	available
8112	9223	51.249.339	Previous 24 Hr Average for BTU - Sat	available
8113	9225	51.249.351	Previous 24 Hr Average for Specific Gravity	available
8114	9227	51.249.340	Previous 24 Hr Average for Compressibility	available

32 Bit Register Format	16 Bit Register Format	NGC Address	Description	Status
8115	9229	51.249.341	Previous 24 Hr Average for Superior Wobbe	available
8116	9231	51.249.347	Previous 24 Hr Avg for Total Un-Normalized Mole %	available
8117	9233	51.249.348	Previous 24 Hr Average for Total GPM	available
8118	9235	51.249.350	Previous 24 Hr Average for Ideal BTU	available
8119	9237	51.249.346	Previous 24 Hr Average for Density Normal	available
8120-8199	N/A	51.202.7		un-available

Contact us:

ABB Inc., Measurement & Analytics
Quotes: totalflow.inquiry@us.abb.com
Orders: totalflow.order@us.abb.com
Training: totalflow.training@us.abb.com
Support: upstream.support@us.abb.com
+1 800 442 3097 (opt. 2)
www.abb.com/upstream

Main Office - Bartlesville
7051 Industrial Blvd
Bartlesville, OK 74006
Ph: +1 918 338 4888

Kansas Office - Liberal
2705 Centennial Blvd
Liberal, KS 67901
Ph: +1 620 626 4350

Texas Office – Odessa
8007 East Business 20
Odessa, TX 79765
Ph: +1 432 272 1173

Texas Office - Houston
3700 W. Sam Houston
Parkway S., Suite 600
Houston, TX 77042
Ph: +1 713 587 8000

California Office -
Bakersfield
4300 Stine Road
Suite 405-407
Bakersfield, CA 93313
Ph: +1 661 833 2030

Texas Office –
Pleasanton
150 Eagle Ford Road
Pleasanton, TX 78064
Ph: +1 830 569 8062