

2104461—rev. AB

# NGC8106 Single Stream Sampler

User's Manual



**TOTALFLOW**  
MEASUREMENT & CONTROL SYSTEMS

**ABB**

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# Introduction

This manual is written to provide an experienced chromatography technician with the requirements necessary to install, set up and operate the Totalflow® Model NGC8106 Natural Gas Chromatograph.

Each of the chapters in this manual presents information in an organized and concise manner. Readers are able to look at the headings and get a broad picture of the content without reading every word. Also, there are overviews at the beginning of each chapter that provides the user with an idea of what is in the chapter and how it fits into the overall manual.

## Chapter Descriptions

The manual provides the following information:

Chapter	Name	Description
1	System Description	Provides a description of the Totalflow NGC8106 system components and specifications.
2	Installation	Includes unpacking and detailed procedures for set up and installation.
3	NGC8106 Startup	Provides the user with a tutorial on how to get a newly installed NGC8106 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 various problems.
Appendix A	Modbus Register	Provides a listing of all valid Modbus registers.

## Getting Help

Totalflow takes pride in the ongoing support provided to 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.

If requiring assistance, call:

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

## 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.

## 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.

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

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

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

**CAUTION**  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 for additional information.

**WARNING**  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 for additional information.

**Environmental Enclosure**  Indicates procedures that are only valid if the system design includes an environmental enclosure.

## Safety Practices and Precautions

This manual contains information and warnings which have to be followed by the user 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. Please refer to the certification drawings that were shipped with this unit for specific guidelines. Extra copies of the certification drawings, referenced on the unit's name tag, can be obtained, free of charge, by contacting Totalflow Technical Support at the number listed in the Getting Help section.

## 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.

## 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:



**CAUTION**

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



**WARNING**

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 obtained 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.

WARNING 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.

## Equipment Markings



Protective ground (earth) terminal.

### **Grounding the Product**

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

### **Operating Voltage**

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

### **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.

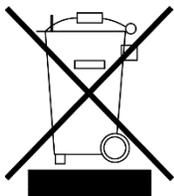
### **Safe Equipment**

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

## **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.

# 1.0 SYSTEM DESCRIPTION

## 1.1 System Overview

This chapter introduces the user to the Totalflow® Model NGC8106 Single Stream Sampler (NGC8106). The NGC8106 is designed to continuously sample and analyze a single natural gas stream. The NGC8106 determines composition, calorific value and then stores the analysis information. It is designed for natural gas streams, 800 to 1500 Btu/scf (29.8 to 55.9 megajoules/meter<sup>3</sup>).

The unit is a fully functional gas chromatograph for pipeline-quality natural gas. It is designed to analyze natural gas streams that are dry of both hydrocarbon liquids and water. The unit can collect and retain analysis information for a single stream. Applicable installations include: Sampling, Distribution, Custody Transfer with Metrology quality results, Production, Gas Gathering and End User Gas Markets.

### 1.1.1 Framework

Based on ABB Totalflow's XSeries technology, the NGC8106 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 NGC8106 to run other applications such as AGA-3 and AGA-7 while simultaneously performing stream sampling and analysis. This new platform is designed for operation on the Windows® CE Real Time Operating System.

### 1.1.2 Calibration

Once installed on the meter run, the unit can immediately calculate the calorific value of natural gas. The user can either use their own calibration blend to adjust the unit to their company's standards or use Totalflow's recommended C6+ calibration gas.

### 1.1.3 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 and carrier and calibration gas (see Figure 1-1).



## 1.2 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 NGC8106 and injected into the chromatographic columns where component separation occurs.

The NGC8106 analyzes each sample and uses 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 the 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.

### 1.2.1 Hydrocarbons

To further define the natural gas components, Table 1–1 gives additional details for each hydrocarbon. Among 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 1–1 Hydrocarbons**

Molecular Formula	Common Abbreviation	Component	Boiling Point
C1H4	C1	Methane	-161.6
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

### 1.3 Hardware System Specifications

**Table 1–2 System Specifications**

	12 Vdc		24 Vdc		
	No. Aux. Heater	W/Aux. Heater	No Aux. Heater	W/Aux. Heater	
<b>Supply Voltage</b>	10.5–16 Vdc	10.5–16 Vdc	21–28 Vdc	21–28 Vdc	
<b>Recommended AC Power Supply</b>	14.5V	14.5V	25V	25V	
<b>Maximum Instantaneous Current<sup>1</sup></b>	4 Amp	8.2 Amp	2.2Amp	5.2Amp	
<b>Avg. Power Consumption After Startup<sup>2</sup></b>	Up to 7 Watts	Up to 53 Watts	Up to 7 Watts	Up to 64 Watts	
<b>Environment Temperature</b>	Storage		-22°F to +140°F (-30°C to 60°C)		
	Normal Operation		0°F to +131°F (-18°C to 55°C)		
	W/environmental enclosure		-40°F to +131°F (-40° C to 55°C)		
<b>Repeatability</b>	±0.25 Btu @ 1,000 Btu (± 0.0125%) ambient ±0.50 Btu @ 1,000 Btu (± 0.025%) over temp. range of 0–131°F (-18° C to 55°C)				
<b>Helium Carrier</b>	Consumption rate: 12 ml/minute typical to 20 ml/minute maximum.				
<b>Medium</b>	800 to 1500 Btu per standard cubic foot (29.8 to 44.6 megajoules/meter <sup>3</sup> )				
<b>Analysis Time</b>	Approx. 12 minutes; interval between cycles is adjustable.				
<b>Calibration/Sample Stream</b>	Being a single stream sample/analyzer, the calibration and sampling stream are shared. The sampling stream tubing must be removed, and the calibration stream connected, when performing a unit calibration. In normal operation, the calibration stream is removed and the sample stream reconnected. A T-Valve could be installed to select between the sample and calibration streams. Purge time must be sufficient to purge the previous gas sample. Longer lengths of shared tubing will require longer purge times.				
<b>Construction</b>	NEMA/Type 4X (IP56) Aluminum alloy with white polyester powder coating. Explosion-Proof; See specification sheet for certifications.				
<b>Installation Time</b>	Requires 2-3 hours for installation. Minimum eight hour run time for repeatability.				
<b>Mounting</b>	Pipe run, free-standing pipe, shelf or environmental enclosure.				
<b>8106 Dimension</b>		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

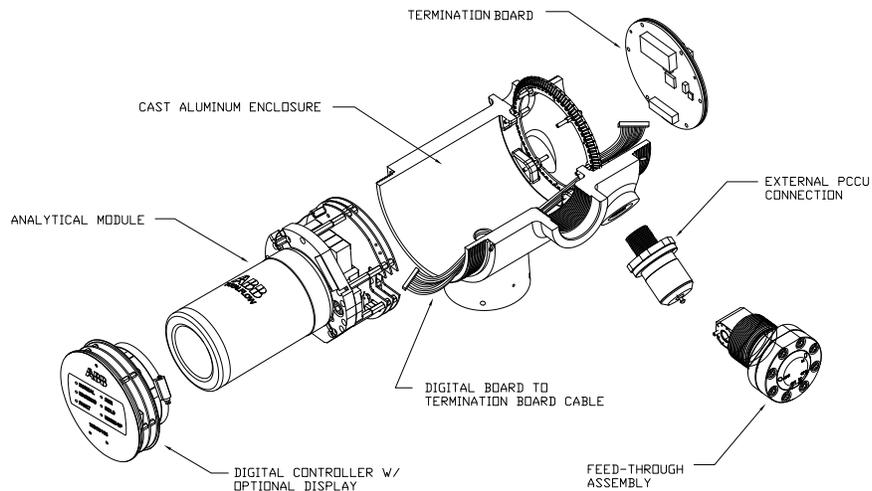
<sup>1</sup> Usually experienced at startup. Use this for power supply sizing requirements (includes approx. 20% buffer and is calculated for maximum allowable power supply voltages).

<sup>2</sup> At Recommended AC Power Supply Voltage. Highly temperature dependant with Feed-Through Heater operating continuously. Usually occurs at only the coldest ambient operating temperature, i.e., 0°F (-18°C).

### 1.3.1 NGC8106 Standard Hardware Features

The Totalflow NGC8106 Single Stream Sampler features a rugged, field-ready design. Installation, start up 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 1-2)
  - 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 (i.e., 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 1-2 Modular Design NGC8106**

### 1.3.2 Recommended Spare Parts

Totalflow has provided a recommended spare parts list for the NGC8106 product line. Consideration was given to the cost of the repair time and the cost of stocking repair parts. The NGC8106's modular design is uniquely suited for quick repair

times. A more comprehensive discussion of recommended spare parts can be found in Chapter 4-Maintenance.

### 1.3.3 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 1-3 through Figure 1-6 displays the outline dimensions of the NGC8106.

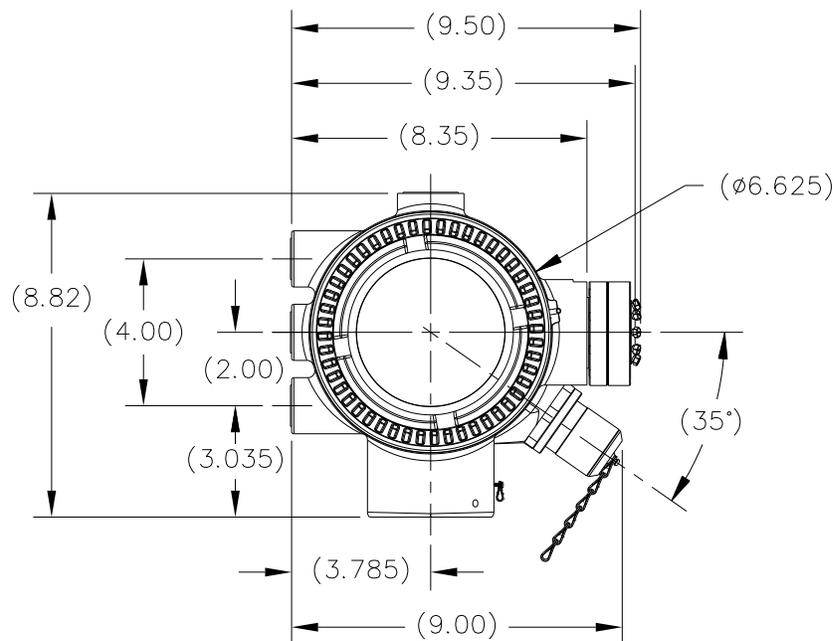
The end caps have precision-engineered threading and are susceptible to damage if treated roughly. Enclosure and all fittings, including feed-through, MMI connection and breather, are tested to NEMA/Type 4X. Unauthorized removal of the end caps are protected with a 1/16" hex socket set screw on each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

This enclosure can be mounted a variety of ways to include mounting on a meter run via a pipe saddle, stand-alone pipe, shelf mount or an optional environmental enclosure. The unit can be directionally positioned using the 1/8" hex socket screws that are located in the neck of the enclosure.

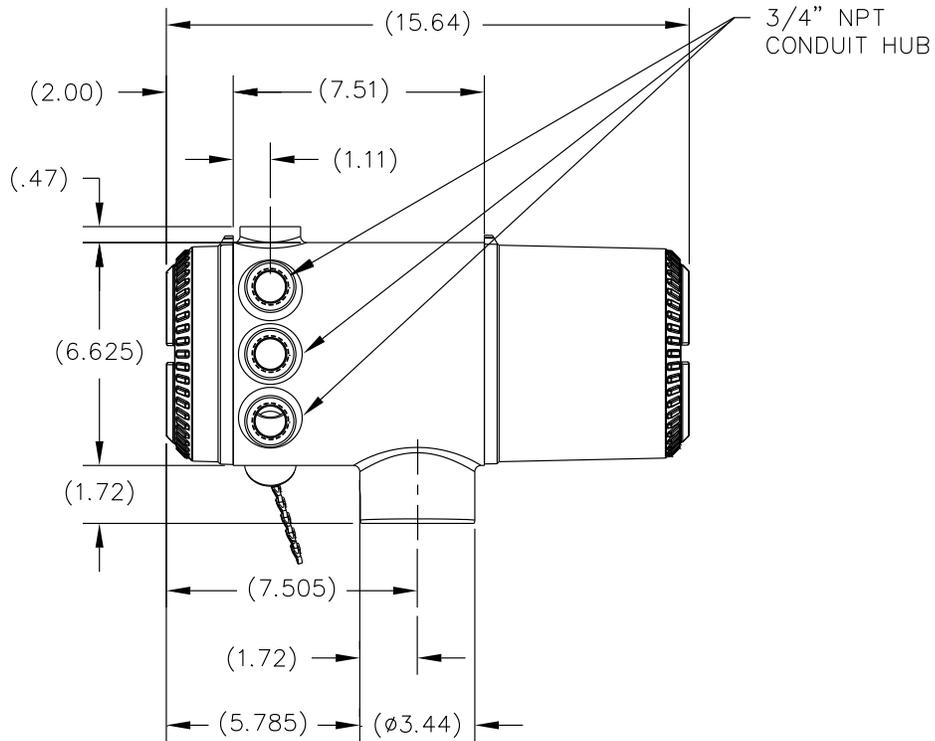
#### 1.3.3.1 Exterior Hubs

The unit enclosure features six exterior hubs:

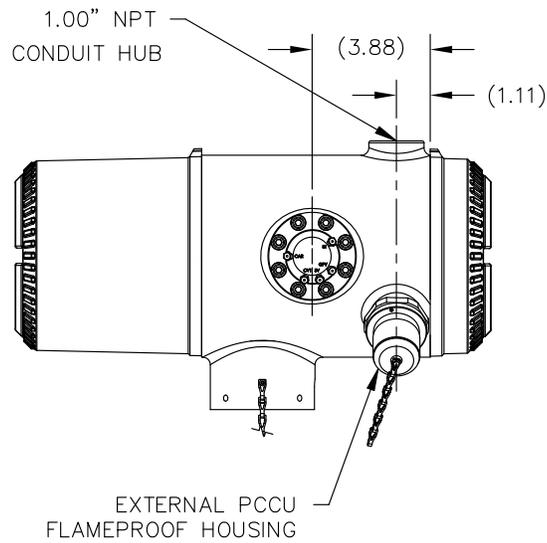
- Gas feed-through assembly
- Explosion-proof local MMI port
- Four miscellaneous hubs, including:
  - Communication hub
  - Power hub
  - Digital input/output wire hub
  - Undefined hub



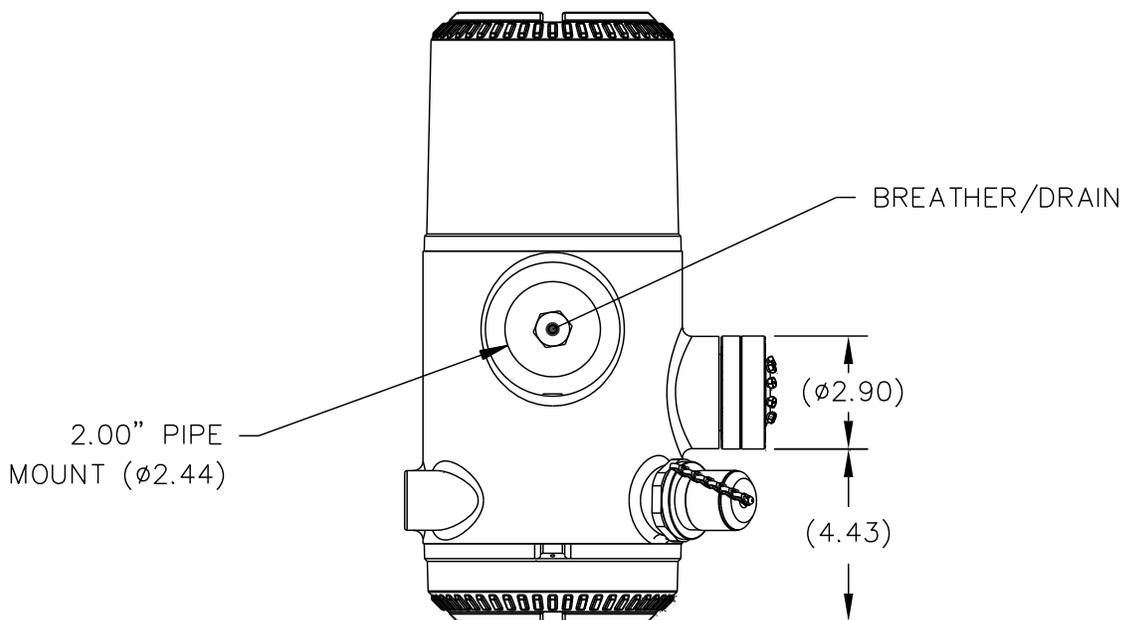
**Figure 1-3 NGC8106 Enclosure**



**Figure 1-4 NGC8106 Enclosure Left Side**



**Figure 1-5 NGC8106 Enclosure Right Side**



**Figure 1-6 NGC Enclosure Bottom View**

### 1.3.4 Feed-Through Assembly

A single sample stream is connected to the NGC8106 via the feed-through assembly (see Figure 1-7) or through an optionally installed sample conditioning module. The feed-through assembly also serves as the connection for carrier gas and the calibration/sample stream. Additionally, it contains the vents for the sample and column gases. The feed-through assembly comes in three configurations:

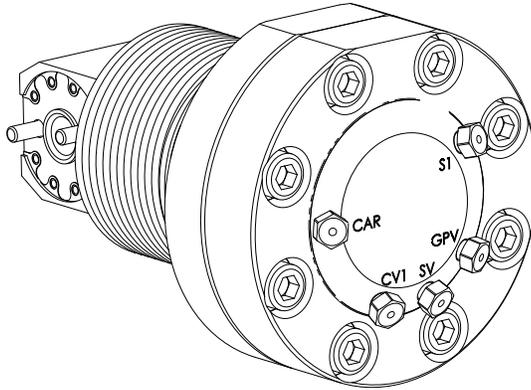
- Without auxiliary heater
- With 12 Vdc auxiliary heater
- With 24 Vdc auxiliary heater

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

#### 1.3.4.1 Inlets

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

- 1 sample stream (S1) shared with calibration stream
- 1 carrier input stream.



**Figure 1-7 NGC8106 Feed-Through Assembly**



**CAUTION** The 0.5 micron filters should NOT be considered a replacement for the primary filtering system. Optional sample conditioning modules are designed for this purpose.

#### 1.3.4.2 Vents

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

- 1 column vent (CV1)
- 1 sample/calibration vent (SV)
- 1 gauge port vent (GPV)

#### 1.3.5 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.

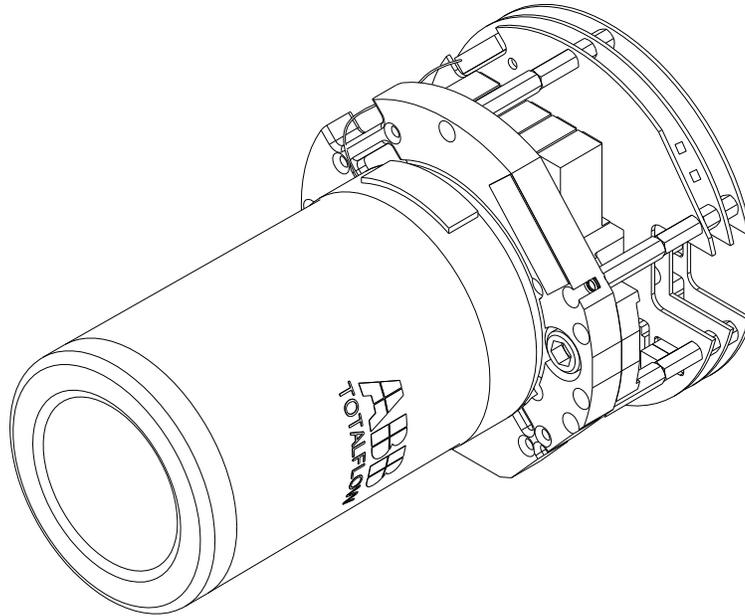
The sub-assemblies that comprise the analytical module, GC module and manifold assembly come in two configurations: 12 Vdc and 24 Vdc.

In Figure 1-8, the user can see the analytical module assembly removed from the enclosure.

##### 1.3.5.1 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

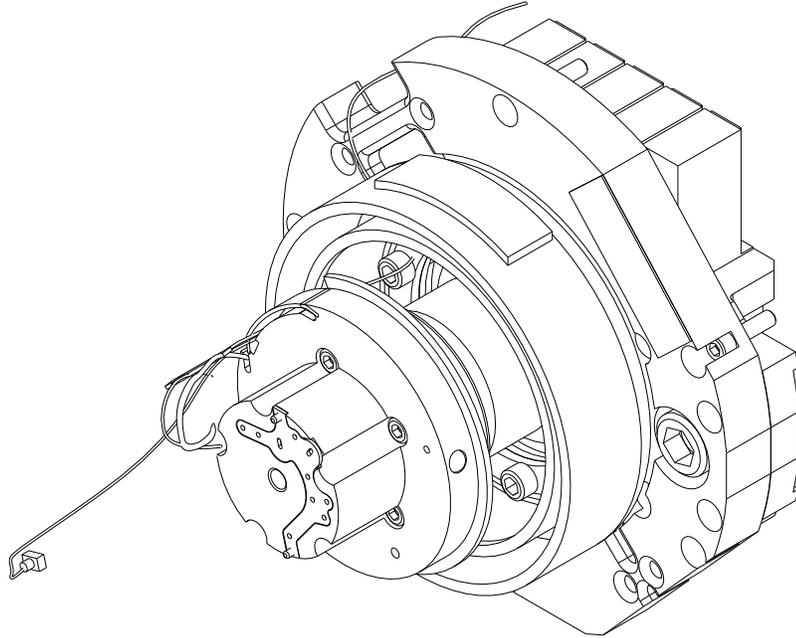


**Figure 1-8 Analytical Module**

#### **1.3.5.2 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 a constant temperature for the GC module and columns. The valve controls the stream processing and carrier and calibrations gases. The cables complete the information chain from the GC module to the analytical processor and the digital controller assembly.

Figure 1-9 shows the manifold assembly. This is not a field replaceable part.



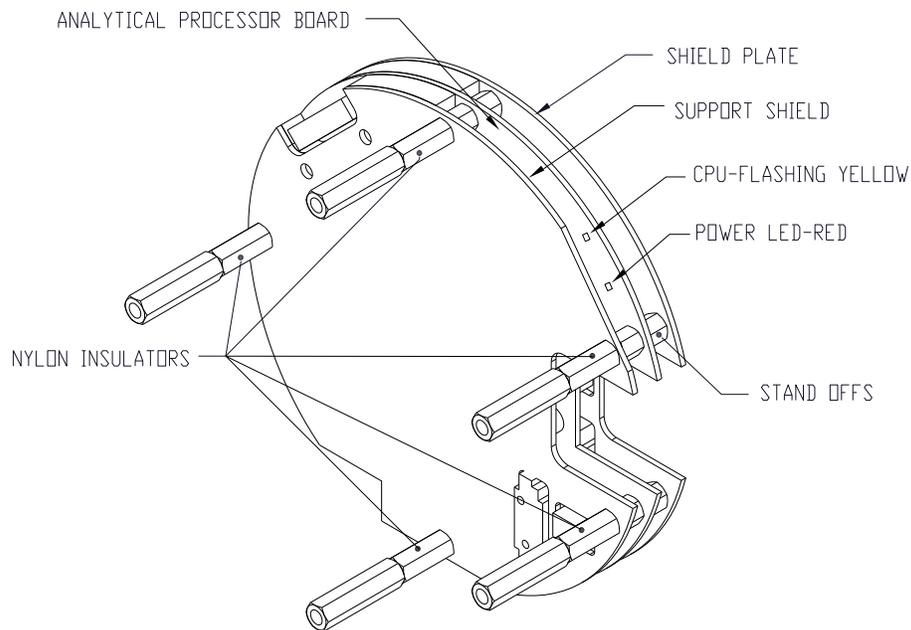
**Figure 1-9 Manifold Assembly**

### **1.3.5.3 Analytical Processor Assembly**

The analytical processor board provides real-time system control and measurement of the analytical processes within the NGC8106. It accomplishes 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 valve, 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 solid (not flashing), the software in the analytical processor is not running properly.

Figure 1-10 displays the analytical processor assembly. This is not a field replaceable part.

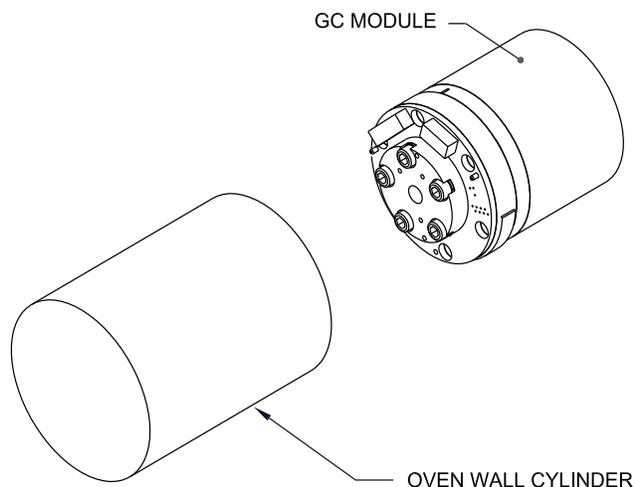


**Figure 1-10 Analytical Processor Assembly**

#### 1.3.5.4 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.

Figure 1-11 displays the GC module with the oven wall removed.



**Figure 1-11 GC Module Assembly**

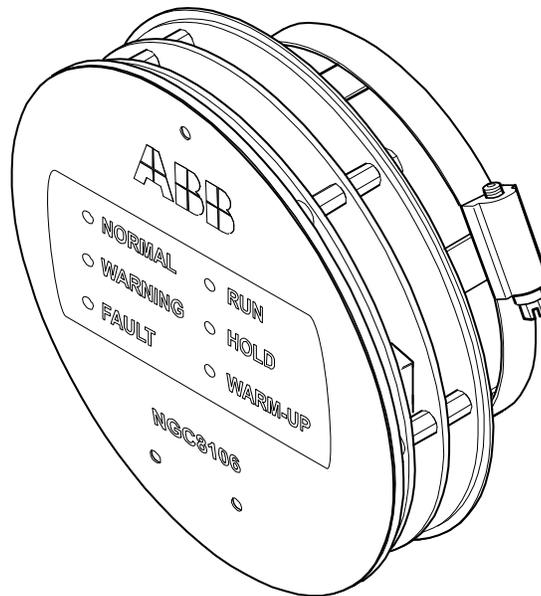
### 1.3.6 Digital Controller Assembly and Display

This assembly (see Figure 1-12) contains the digital electronic board, mounting assembly and user 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)
- One (1) secure digital card socket with up to 4 GB removable storage (optional)



**Figure 1-12 Digital Controller Assembly with Display**

The display board provides six LEDs that display the current status of the NGC8106:

- Normal
- Warning
- Fault
- Run
- Hold
- Warm-Up

### 1.3.7 Termination Board

The NGC8106 termination board acts as a connection to the outside world (see Figure 1-13). 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.

### 1.3.7.1 Features

- Transient protection
- EMI/RFI protection
- PTC fuses
- Voltage regulator for digital controller
- Dedicated local serial data interface (up to 115200 bps)
- Two (2) LED status indicators (software programmable)
- One (1) power monitor status indicator
- 1.5 Vdc LED status indicator
- Two (2) DI's and two (2) DO's connected to digital controller
- Two (2) remote serial ports (RS232/RS422/RS485 software selectable)
- Optional Ethernet interface with three (3) LED status indicators
- Optional USB host and client interface

### 1.3.7.2 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, XP and Windows 7 utilities. Maintenance functions can be performed by personnel with little or no knowledge of gas chromatography; see the online help files for more information.

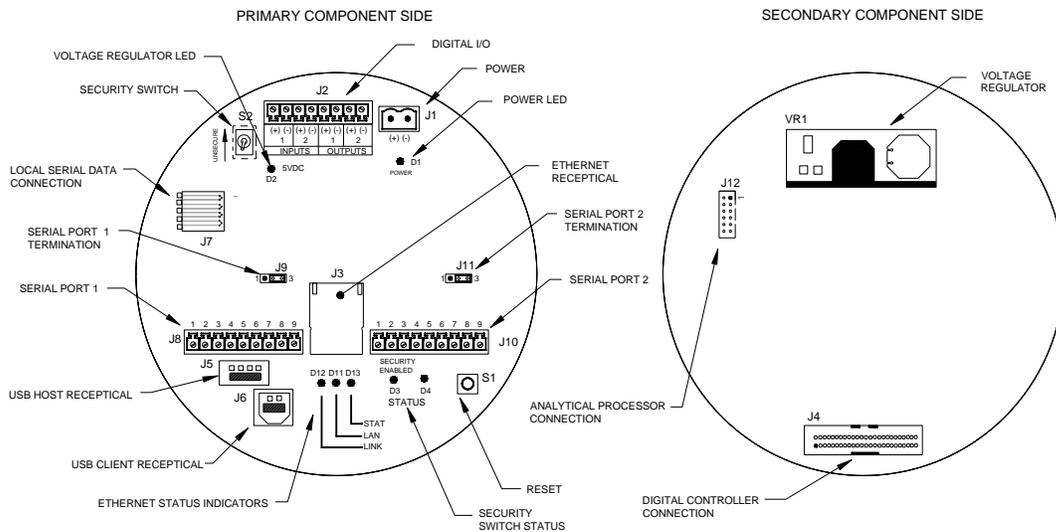
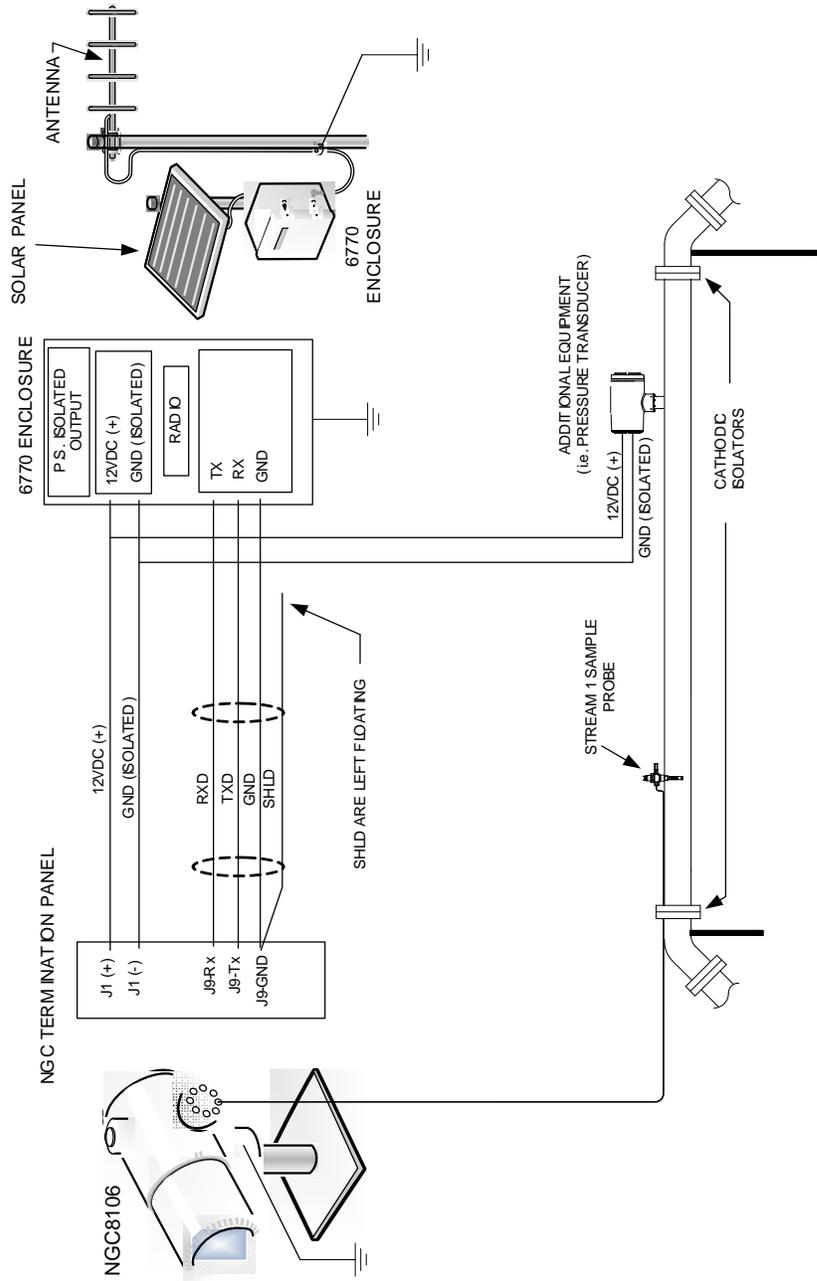


Figure 1-13 Termination Board

## 1.4 Grounding the NGC8106

The NGC8106 must be properly grounded. The NGC8106 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 #12AWG wire. The NGC8106 cannot be connected to any pipeline where cathodic protection exists. If the system uses cathodic

protection, the NGC8106 must be mounted on a section of pipe that has been electrically isolated from the cathodic currents (see Figure 1-14).



**Figure 1-14 NGC8106 Grounding Considerations**

### 1.4.1 Power Supply

The power supply for the NGC8106 should have an isolated output (i.e., 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 used in conjunction with

a radio. If the radio is connected to the NGC8106 via RS232/485/422, the communications should share the power ground. The communication shield should only be connected at the NGC8106's end. The other end should be left to float (left unconnected).

#### 1.4.2 Sample Probe

If the sample probe is mounted to a section of pipe where cathodic currents may exist, the user needs to place isolators in the sample tubing between the sample probe and the NGC8106. Any time that the sample probe is on a section of pipe other than the one where the NGC8106 is directly mounted, tubing isolators should be employed. It is very important that the probe ground and the NGC8106 ground be at the same potential. If this cannot be ensured, tubing isolators must be used.

#### 1.4.3 Other Considerations

If other devices are to be powered from the same isolated power supply that is powering the NGC8106, 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 NGC8106's heater will draw about four (4) Amps (if the auxiliary heater is installed, it might be as much as eight (8) Amps). This load (4-8 Amps) being drawn across any considerable length of cable can result in a substantial voltage drop. Refer to the Cable Length Power Specifications table. The resulting lower input voltage to the additional device could affect its operation. Input voltage excursions fluctuate with the toggling of the NGC8106's heater(s). The heater(s) are turning on and off in an effort to maintain a constant internal temperature for the NGC8106's GC module.

In an office environment, ensure there is a good earth ground to the NGC8106. Often the third pin (ground) on the power cable is missing or has been removed. Improper grounding can lead to erratic behavior. 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.

### 1.5 Calibration/Validation Stream

On the NGC8106 feed-through assembly, the sample stream must be removed and the calibration gas connected when performing a manual calibration. It is recommended that a metal diaphragm regulator be set to  $15 \pm 2$  PSIG input. The recommended calibration gas component concentrations for use with Peak Find are found in Table 1–3.

**FYI**



It should be noted the components found in Table 1–3 represent a typical blend and is not suitable for all applications.

**Table 1–3 Calibration Gas Blend Recommended Components**

Component Name	Abbreviation	Mol %	Component Name	Abbreviation	Mol %
Nitrogen	N2	2.500	Normal Butane	NC4	0.300
Methane	C1	89.570	Neo Pentane	Neo C5	0.100
Carbon Dioxide	CO2	1.000	Iso Pentane	IC5	0.100

Ethane	C2	5.000	Normal Pentane	NC5	0.100
Propane	C3	1.000	Hexanes and Heavier	C6+	0.030
Iso Butane	IC4	0.300			

## 1.6 Operating Voltages and Cable Lengths

The NGC8106 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 four (4) Amps minimum. 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 NGC8106 and the DC power supply. When running wiring from the power source to the NGC8106, consideration must be given to the voltage dropped between the power source and the NGC8106. Smaller wire gauges have greater resistance and, therefore, a greater voltage drop across the wiring. The following tables (see Table 1–4 and Table 1–5) 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 NGC8106 and requiring power (XMs, 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 if other questions exist, call Totalflow Customer Service at:

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

**Table 1–4 12 Vdc Battery Power Supply System Maximum Cable Lengths**

Model /Option	Min. Batt Voltage (V)	Units	10 AWG <sup>3</sup>	12 AWG	14 AWG	16 AWG	6 mm <sup>2</sup> <sup>3</sup>	4 mm <sup>2</sup> <sup>3</sup>	2.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>
12 Vdc NGC8106 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 NGC8106 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 1–5 AC Power Supply System Maximum Cable Lengths**

*(No External Devices Connected to NGC8106, AC Power Supply Only)*

Model /Option	Recommended PS Voltage (V)	Units	10 AWG <sup>3</sup>	12 AWG	14 AWG	16 AWG	6 mm <sup>2</sup> <sup>3</sup>	4 mm <sup>2</sup> <sup>3</sup>	2.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>
12 Vdc NGC8106 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 NGC8106 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 NGC8106 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 NGC8106 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

<sup>3</sup> This wire size may require splicing in 12 AWG or 2.5mm<sup>2</sup> or smaller wires at each end of the cable to be able to fit screw terminals.

## 1.7 Sample Transport Tubing Design

Information in this section enables the user to design the sample transport tubing connected between the temperature compensated regulator (TCR) sample probe and the installed NGC8106. 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.

### 1.7.1 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 delivers 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 particle free. During cutting, fitting and deburring, the technician should ensure that no particles are allowed to remain in the tubing.

### 1.7.2 Calculation

Sample transport lag time estimated calculations do not consider the volume of the sample conditioning system. As such, 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.

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

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

### 1.7.3 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 NGC8106. To arrive at the total cycle time between representative samples, sample transit time must be added to the NGC8106 cycle time.

### 1.7.4 Transit Volume

The total volume of sample gas in transit is calculated by multiplying the volume per foot of sample transport tubing by the total length of tubing. To assist in making these calculations, refer to Table 1-6 for the internal volume of commonly used sample transport tubing.

**Table 1–6 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

### 1.7.5 Gas Volume in Transit Tubing

Gases are compressible. As such, 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 the 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 the number of moles of the gas sample contained in a certain volume of sample transport tubing.

### 1.7.6 Mole

Mole is a fundamental unit that describes the number of chemical molecules. One mole always represents one Avogadro’s number:  $6.02 \times 10^{23}$  of molecules. The number of moles can be determined by the following 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 the pressure in the sample transport tubing. Reducing the gas sample pressure reduces the mass of gas in the sample transport tubing. This is referred to as line peak. Once the transport volume is known for standard conditions, transport lag time can be determined.

### 1.7.7 Maintaining Phase

When designing sample transport tubing, phase of sample must be maintained. Gases that contain 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, steam or hot glycol. This prevents components from condensing on the transport tubing walls and prevents any water within the tubing from freezing and blocking the sample flow.

### 1.7.8 Heat Tracing Sample Lines

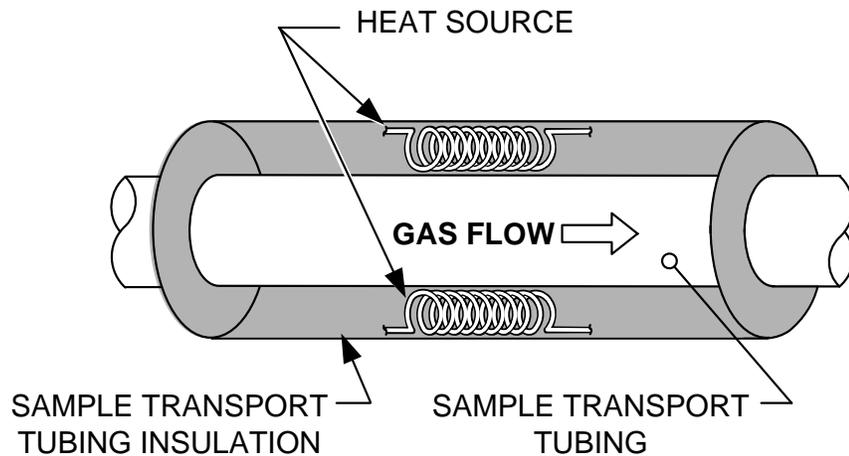
If there is a possibility that vapor samples could condense in the sample transport line, heat tracing the sample line should be considered (see Figure 1-15).

To determine the 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 the requirements of national and local codes.



*Figure 1-15 Heat Tracing Sample Line*

### 1.7.9 Tube Corrosion

When designing transport tubing, the effect that corrosion has on tubing must be considered. For hydrocarbon service, stainless steel transport tubing, type 316SS, is recommended.

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

### 1.7.10 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 ensure that, in the cutting and deburring process, no particles are allowed to remain in the tubing.

## 1.8 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 1-16).

**FYI**



Figure 1-16 is for reference purposes only, but it is typical of a sample conditioning module with liquid separator and liquid shutoff.

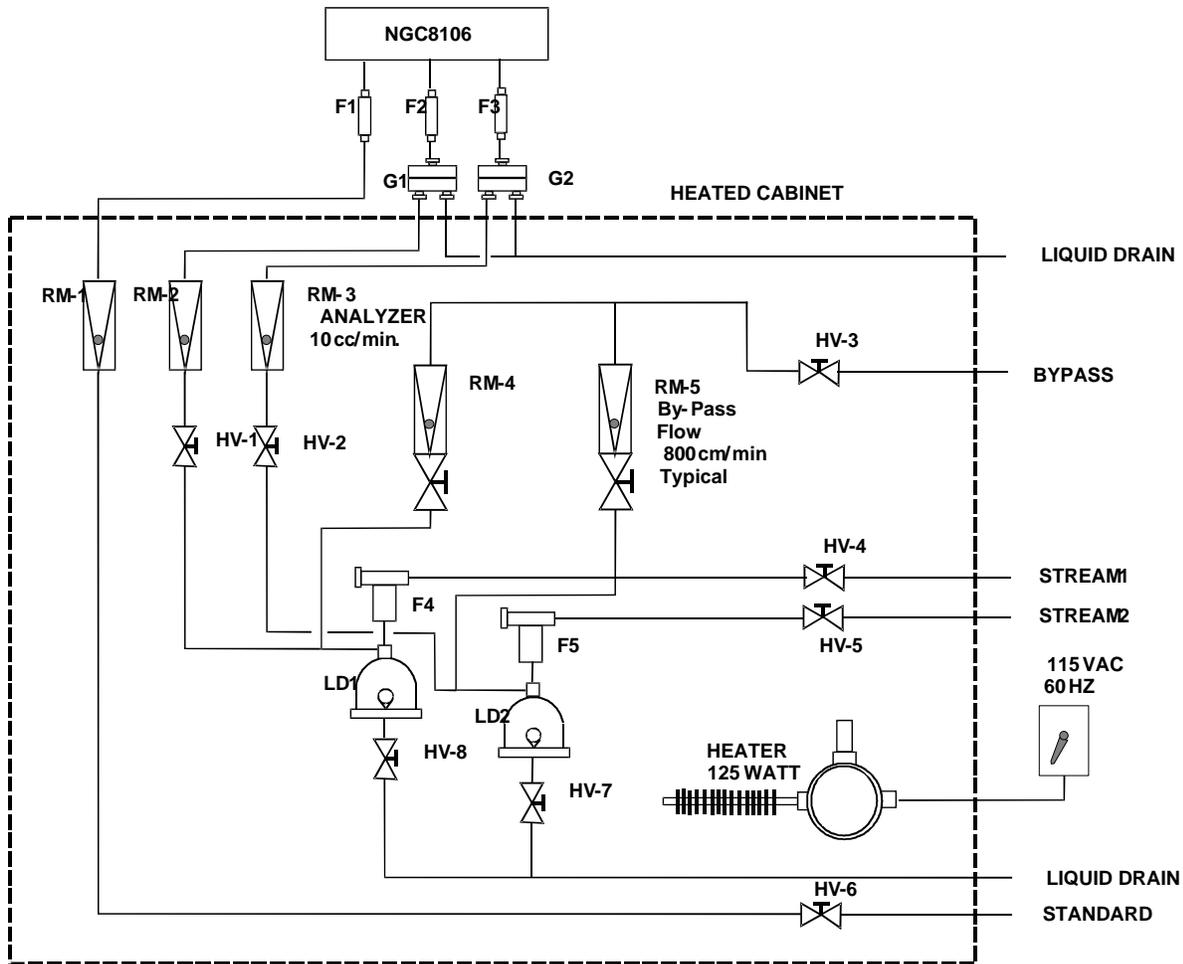


Figure 1-16 Typical Sample Installation Diagram

### 1.8.1 Calculations

Lag time calculation qualifying factors are as follows:

- 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. The sample temperature is 80°F (26.7°C). 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.

### 1.8.2 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 equation, the lowest possible pressure should be used. This minimizes transport tubing lag time to reduce line or molecule peak. Care should be taken to ensure that enough pressure is available. This keeps the sample flowing throughout the analysis system.

## 1.9 NGC8106 Standard Software Features

Totalflow's onboard 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 with application-based plug-in software modules
- Audit quality historical data
- Operational alarms
- Tri-level software security system
- Multiple calculation options
- Selectable engineering units
- Analysis reporting
- Communication protocol selection
- Web-enabled data collection

### 1.9.1 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, retain the last 480 diagnostics reports, retain the last 480 alarms and retain the last 480 events. These functions can be reconfigured by the user.

### 1.9.2 Security System

Users implementing PCCU version 7.6.0 or higher have access to three types of security:

- Hardware security (bi-level)
- PCCU enforced security (bi-level)
- Role Based Access Control (multi-level)

Both the hardware and PCCU security functions are legacy systems. The hardware security consists of the security switch located on the termination board and is set to either On or Off. The PCCU security system forces the user to log on as either an administrator or a user.

Role Based Access Control (RBAC) is a new feature within PCCU that is designed to allow an administrator to designate roles and control access levels to various applications and processes in Totalflow G4 devices.

Beginning with a set of default roles, it is possible to duplicate, rename and delete these items to create a working list of access roles which are relevant to the user's company hierarchy. From this role list, it is then possible to create and customize user accounts with various roles. The user is also given the ability to take the newly created configuration and save it in the form of a security file to their PC. This security file can then be sent to a G4 device, where it is then implemented. It is important to note that RBAC can override the hardware security switch.

See the help files in the host software package for more information.

### 1.9.3 Compressibility Options

User selectable measurement calculations may be defined and include:

- AGA-8 detail
- ISO summation factor
- Single virial summation factor
- None (a factor of one is used)
- NX-19

### 1.9.4 Calculation Options

During stream set up process, the user may select from several calculation files. Selection of a suitable file automatically sets other factors such as concentration/Btu basis and saturated gas treatment (see Table 1–7). For additional information, please refer to the PCCU help files.

**Table 1–7 Calculation File Settings**

Calculation File	Agency	Document	Temp1	Temp2	Comp.	Constants
gost-30319-aga8	GOST	30319	20		AGA-8	
gpa-2172-96-aga8-2145-03A-fts	GPA	2172-1996			AGA-8	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	

### 1.9.5 Engineering Units

User selectable engineering units can be defined for the measurement stream. These include most metric system units as well as standard US units. Access to this capability requires turning on the unit Conversion application and may be applied to data reporting. For additional information, please see the host software help files.

### 1.9.6 Supported Protocols

The NGC8106 hardware and software support several communication protocols:

- ABB Totalflow Local
- ABB Totalflow Remote
- Modbus Slave (ASCII)
- Modbus Slave (RTU)
- Modbus Host (ASCII)

- Modbus Host (RTU)
- ABB Totalflow TCP (Ethernet Connector)
- Modbus TCP Server
- Modbus TCP Client
- LevelMaster

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

## 1.10 PCCU Local Communication Options

Local communication with the NGC8106 requires the use of PCCU32 software running on a PC and a man machine interface (MMI) cable. ABB Totalflow recommends using a USB cable for high speed local communication in a remote location. RS-232 serial communication with the NGC8106 can also be a high-speed application for users operating a PC with the Windows XP operating system or newer.

When operating the NGC8106 in a network environment, using Ethernet is an excellent and practical solution.

For example, Table 1–8 compares communication times between the different available options for several common operational tasks:

**Table 1–8 Communication Option Comparison**

Communication	Operational Task <sup>4</sup>		
	Data Collection Single Stream	Save Files	Restore Files
Serial: 38,400 Baud	10 Seconds	2.5 Minutes	2.5 Minutes
Serial: 115,200 Baud <sup>5</sup>	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

## 1.11 NGC8106 Startup Diagnostics

The ABB Totalflow NGC8106 has an extensive, built-in list of tests which are performed each time the unit is started. This startup testing may be disabled, but ABB 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 startup tests may also be performed on a regular schedule. Please see the PCCU help files for more information on scheduling diagnostics.

---

<sup>4</sup> Operational task speed directly correlates to PC processor speed.

<sup>5</sup> Personal computer operating on Windows XP operating system or newer.

### **1.11.1 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.

### **1.11.2 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.

### **1.11.3 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 series of comparisons. The failure of any of these comparisons indicates an erratic deviation exists. This means the processor is not able to control the function.

### **1.11.4 Stream Test**

This test measures various pressures for the input stream. Stream failure indicates an inability to meet certain criteria.

During the initial startup, the input stream is disabled. If input pressure is detected, the input stream is re-enabled, tested and either passed or failed.

## **1.12 Startup Wizard**

The NGC8106 Startup Wizard is designed to walk the technician through procedures required for setting up the unit. Following the installation and connection to the NGC8106, the Startup Wizard begins automatically. This only occurs the first time the user connects to the unit. This will also occur at 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 NGC8106 Diagnostics.

### **1.12.1 Wizard**

The wizard initiates the process of entering information to enable the NGC8106 to perform at its peak functionality. This includes device set up, stream set up, etc. Each screen has an associated help topic that automatically displays when the user moves throughout the screens. These topics define the required information.

## **1.13 Historical Data**

The NGC8106 compiles historical data that can be used for custody transfer needs, verifies NGC8106 operation over time and provides a limited data backup for communication link reliability. Data retained by the NGC8106 can be collected via a remote communication link or by a laptop PC operator interface.

### **1.13.1 Retaining Data**

The user can configure how much data is retained by the NGC8106 via the operator interface. The default configuration is as follows:

### 1.13.2 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
- Wobbe index [dry Btu (superior CV)]
- Alarms

### 1.13.3 Stream Averages

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

### 1.13.4 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

### 1.13.5 Audit Logs

- Last 100 alarms
- Last 100 events

## 1.14 TCR Sample Probe (Optional Equipment)

The temperature compensated regulator (TCR) sample probe is used to capture natural gas from the pipeline for NGC8106 sampling and analysis. To capture the gas sample, it is recommended that the TCR sample probe be mounted on horizontal pipe runs; however, it can be mounted on vertical runs if this is more suitable to the customer's installation.

The TCR sample probe is specifically selected for operation with the NGC8106. The design of the probe prevents icing without the need for electrical power.



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.

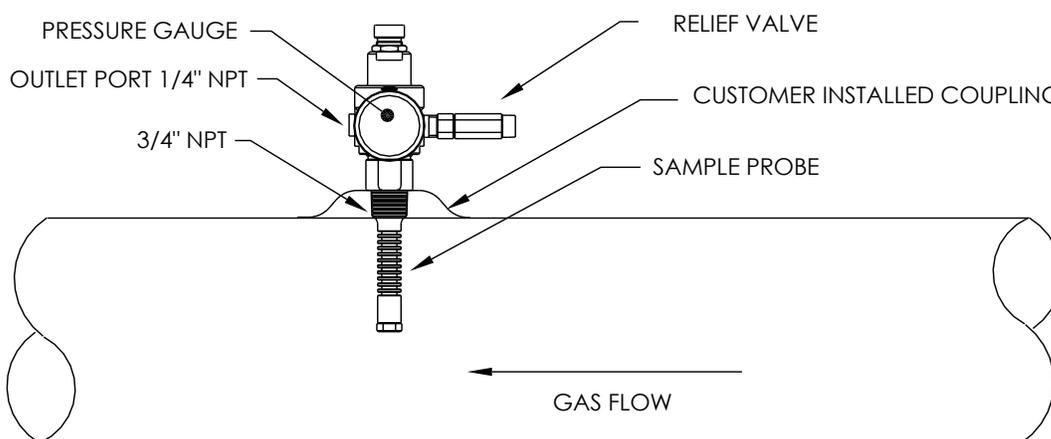
Refer to Table 1–9 to ensure that the user has the correct sample probe for their installation. The length of the sample probe is dependent on the diameter of the user’s meter run.

ABB Totalflow recommends that a TCR be installed with the NGC8106. Refer to Figure 1-17.

**FYI**  Please read the installation instructions in Chapter 2 to develop a pipeline installation plan prior to actual installation.

**Table 1–9 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 1-17 Temperature Compensated Regulator with Sample Probe**

#### 1.14.1 Location

- Locate the pipeline coupling on the gas meter run. Ensure that it is in close proximity to the NGC8106. This allows the stainless steel sample line, from sample probe to the chromatograph, to be as short as possible.
- The coupling should be mounted so that the probe can be installed horizontally or vertically on the meter run pipe. This means that the coupling should be mounted on either the top or the side of the meter run pipe.
- The sample probe should not be mounted at the end of headers, dead “Ts”, large volume accumulators or other areas where gas is likely to be stagnant.
- Installation should allow the probe to penetrate the center 1/3 of the main gas meter run. This allows sufficient heat transfer with the flowing gas sample. The sample probe inlet should be high enough to avoid the 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.

### 1.14.2 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 NGC8106 should be  $15 \pm 2$  PSIG ( $103 \pm 14$  Kpa).
- To maintain this pressure at the NGC8106 filters, it may be necessary to increase TCR sample probe pressure to a value greater than 15 PSIG. Pressure is dependent on the sample transport tubing length between the TCR sample probe and sampler/analyzer.
- Be sure to use tubing electrical isolators on the sample tubing when connected to pipelines that are not isolated from cathodic protection.

## 1.15 ENC82 Environmental Enclosure (Optional Equipment)

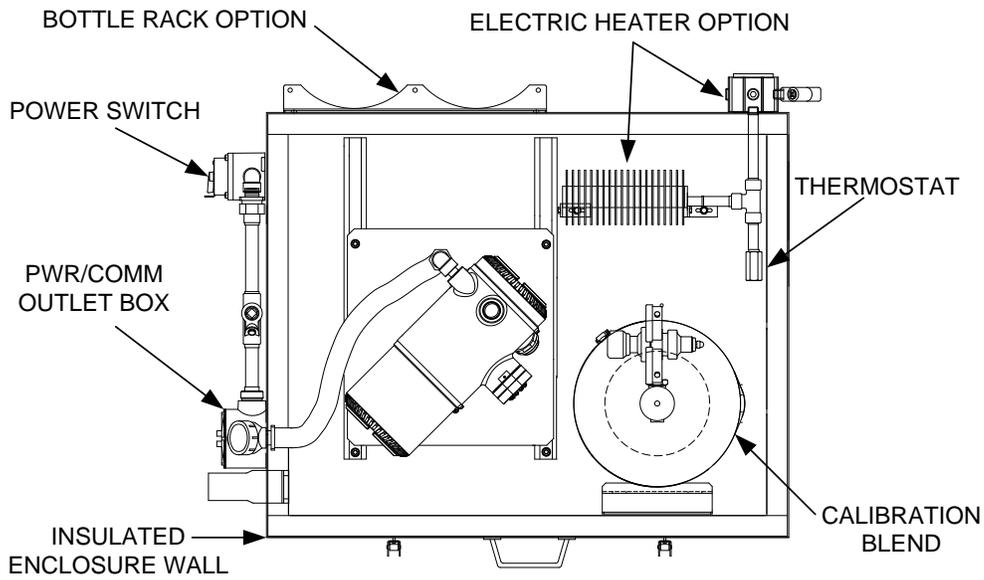
In colder climates (ambient temperatures 0°F to -40°F), the environmental enclosure (ENC82) allows the mounting of the NGC8106 directly on the pipe. This insulated, weatherproof enclosure has brackets for the NGC8106 and a small startup/calibration bottle. Having the calibration bottle in the heated enclosure ensures a much more stable and consistent calibration.

### 1.15.1 Standard Features

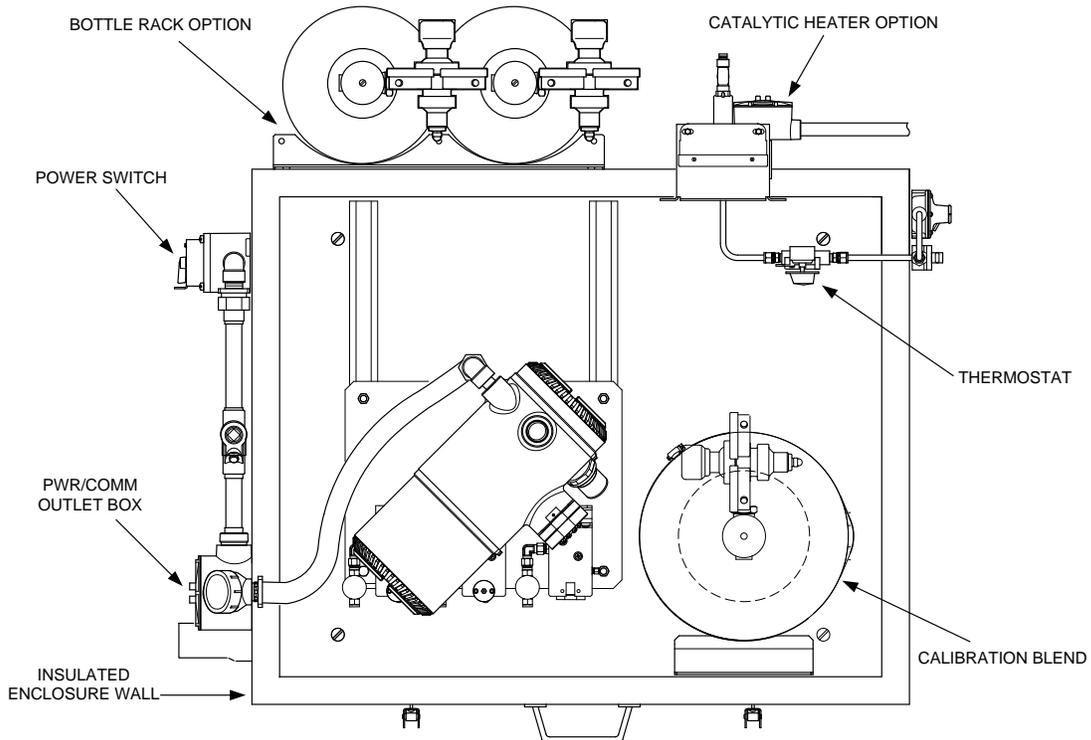
- Available with either an electric or catalytic heater option:
  - The catalytic heater is a 1500 Btu/hour input. This includes a standard filter/drain kit.
  - The electric heater option features 120VAC/400W heater and thermostat.
- Sample conditioning system
- Heated line entry
- Rigid conduit
- Mounts 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.

#### 1.15.1.1 Enclosure

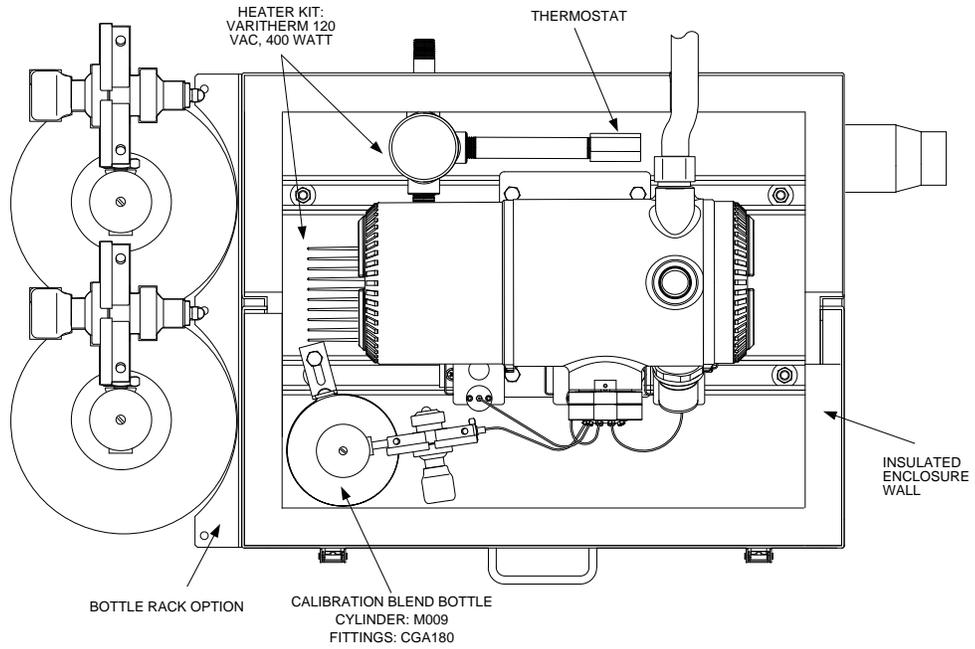
The heater and enclosure are designed to maintain a 40°F inside temperature when outside temperature is -40°F. Two enclosures are available for installation depending upon site requirements. The large enclosure (ENC82L) features a large foot print (38”w x 31”d x 30.5”h) (see Figure 1-18 and Figure 1-19). The small enclosure (ENC82S) is designed for a single NGC8106 unit and features a smaller foot print (24”w x 19”d x 21”h) (see Figure 1-20 and Figure 1-21).



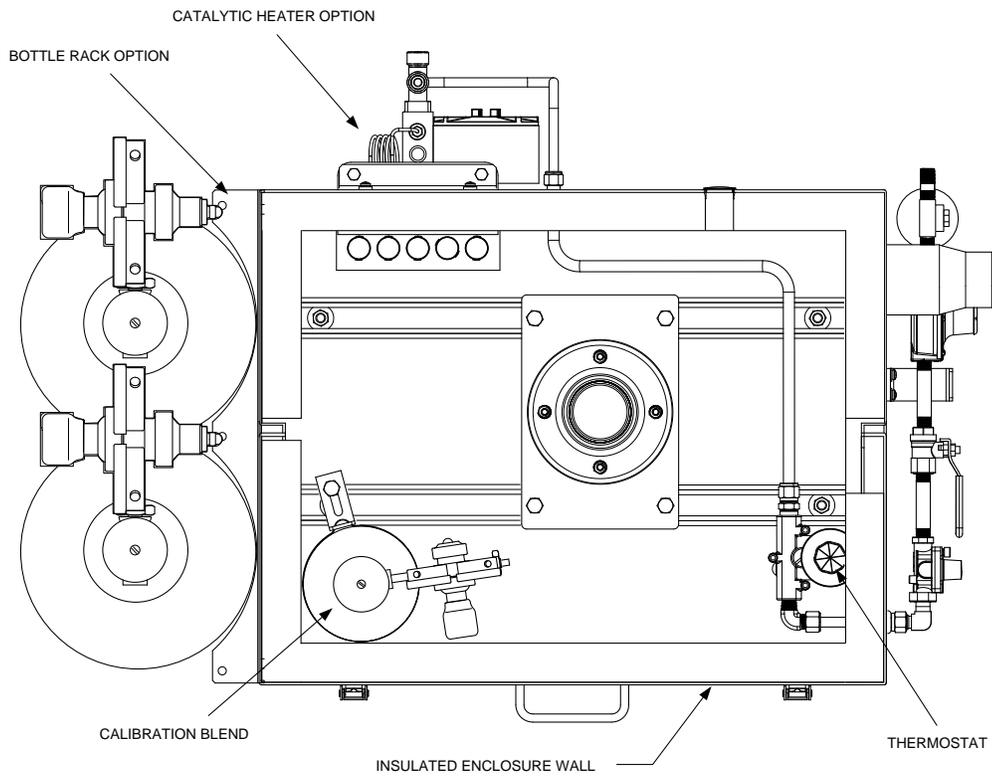
**Figure 1-18 ENC82L Environmental Enclosure with Electric Heater**



**Figure 1-19 ENC82L Environmental Enclosure with Catalytic Heater**



**Figure 1-20 ENC82S Environmental Enclosure with Electric Heater**



**Figure 1-21 ENC82S Environmental Enclosure with Catalytic Heater**

### 1.15.1.2 Mounting Options

The ENC82 may be mounted directly on the pipe run, with or without the sample probe enclosed. Optional support leg(s) 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.

### 1.15.2 Optional Features

The following is a list of optional features:

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

## 1.16 Sample Conditioning Modules (Optional Equipment)

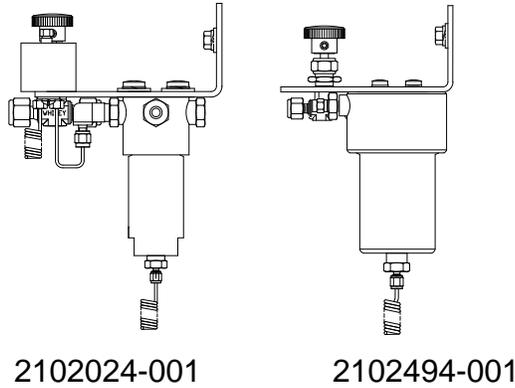
For some NGC8106 installations, it may be necessary to install an optional sample system conditioning module to compensate for non-ideal natural gas samples. These optional modules are pre-engineered to provide various levels of protection and bypass flows (see Figure 1-22). All of the sample conditioning modules include a level of particulate protection and come in two flow sizes: 50 CC and 450 CC per minute (see Table 1–10).

For installations where the gas is ideal, and the sample probe is located less than 10' from the NGC8106, no sample conditioning module is required.

### 1.16.1 Gas Types

The user can select from one of four sample conditioning modules for installations where the 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.



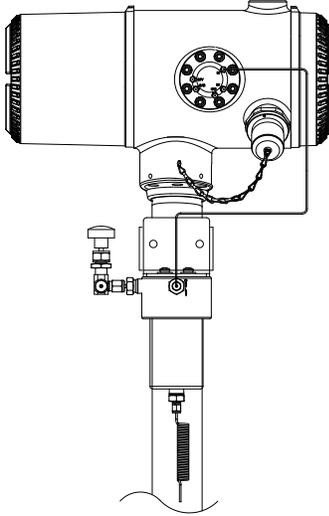
**Figure 1-22 Available Sample Conditioning Modules**

**Table 1–10 Sample Conditioning Module Descriptions**

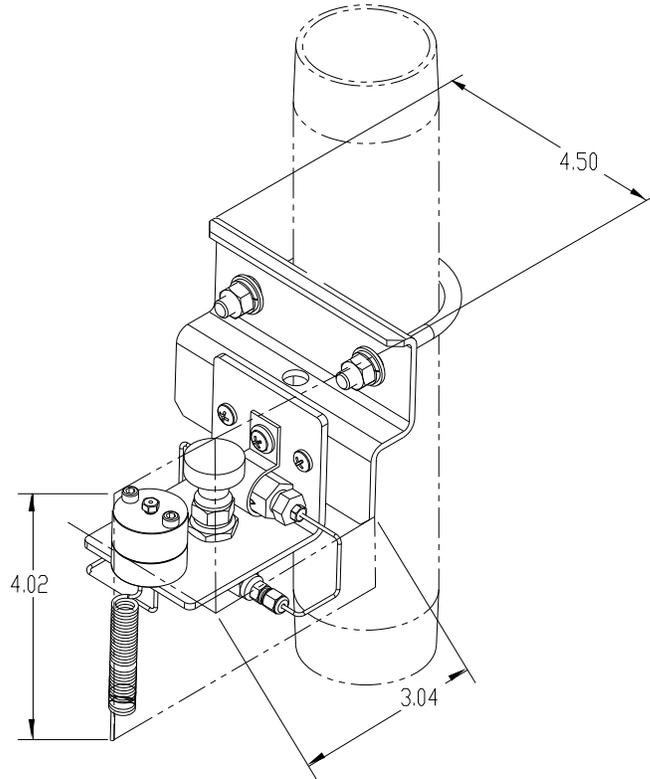
Part Number	Description
2102024-001	<p>Designed for sample point distances greater than 10' (3m) and less than 150' (50m) with known particulate and liquid contamination. Designed for stable gas samples containing pipe scale and other solid contaminants and possibly minor amounts of liquid contamination. System features:</p> <ul style="list-style-type: none"> <li>• Particulate/coalescing filter</li> <li>• Liquid/vapor separator</li> </ul>
2102494-001	<p>Designed for sample point distances 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 coalesce (a+ avenger) filter. Additionally, it 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.</p> <ul style="list-style-type: none"> <li>• Particulate/coalescing filter</li> <li>• Liquid/vapor separator</li> </ul>

### 1.16.2 Mounting Bracket

A sample conditioning system mounting bracket is available.



**Figure 1-23 Single Stream Sample Conditioning Assembly**



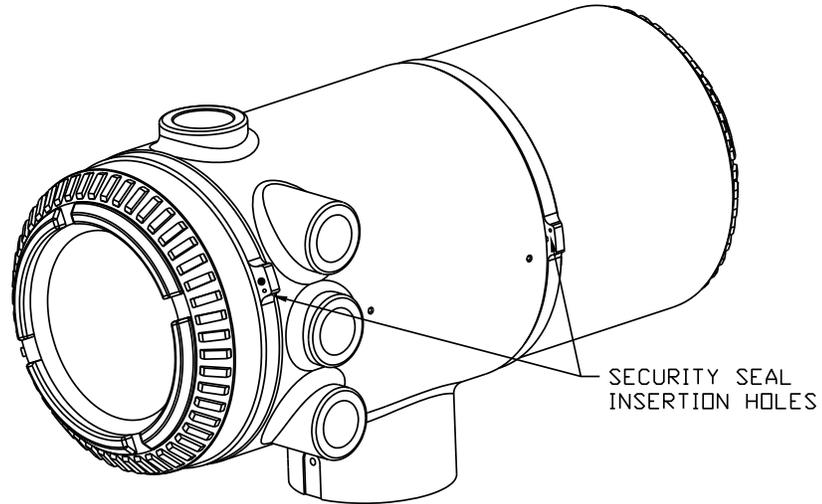
**Figure 1-24 Single Stream Conditioning Module Dimensions**

## 1.17 Security Seal (Optional Equipment)

For some NGC8106 installations, it may be preferred to attach a security seal on the enclosure's front and rear end caps. To accommodate the seal, please note the holes in the tab that are on each end cap (See Figure 1-25).

### 1.17.1 Customer Supplied Materials

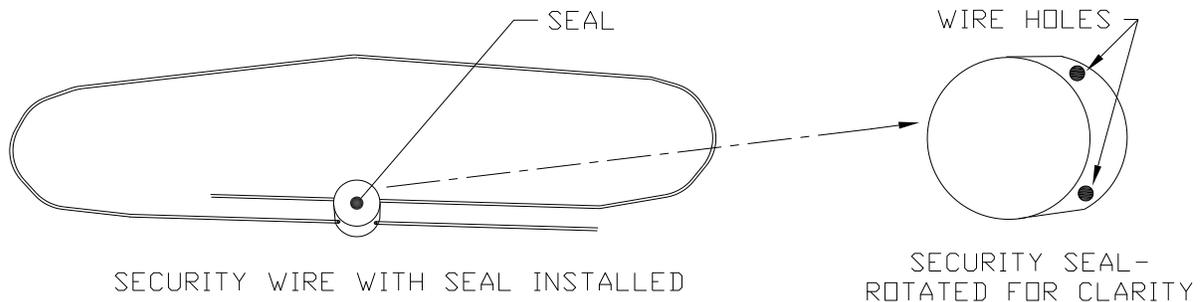
- One (1) each security wire seal
- Seal press



**Figure 1-25 NGC8106 End Cap Tabs for Security Seal**

### 1.17.2 Instructions

- 1) Insert the security wire through the holes located on the end cap tabs.
- 2) Bring the ends together. Upon completion, insert through the holes in the security seal (see Figure 1-26).
- 3) Use the seal press to compress the seal into the wire. Ensure that the wire is firmly captured inside the seal.



**Figure 1-26 Security Wire with Seal**

## 1.18 Optional Equipment Enclosure (Optional Equipment)

If the optional enclosure is used, it may be configured to include other options. These options include, but are not limited to, a battery pack to provide power to the NGC8106, communication equipment, solar power charger and additional I/O.

Three enclosures are commonly used for NGC8106 installations: the 6200, 6700 and 6800 optional equipment enclosures.

The 6200 installation supports AC to DC. There is no battery pack option in this installation.

The 6700 enclosure supports AC to DC. There is no battery pack option in this installation.

The 6800 enclosure supports battery pack<sup>6</sup> operation for the NGC8106 via solar power, UPS system, AC to DC power or communication equipment.

Following the 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.

### 1.18.1 6200 Optional Equipment Enclosure

The 6200 can accommodate the following equipment:

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

### 1.18.2 6700 Optional Equipment Enclosure

The 6700 enclosure can accommodate the following:

- Communication kit
- 120/240 Vac to 12 Vdc power supply
- 110/240 Volt to 12 Vdc
- 110/240 Volt to 24 Vdc

### 1.18.3 6800 Optional Equipment Enclosure

The 6800 enclosure can accommodate the following:

- Communication kit
- Solar panel power option
  - Two (2) ea. 110 Ah Batteries
- 115/230 Vac UPS power option (24 Vdc systems only)
  - Two (2) ea. 40–110 Ah Batteries

## 1.19 Power Supply Options (Optional Equipment)

Power supply options available for the NGC8106 are as follows:

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

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<sup>6</sup> Autonomy measured in hours.

- 115/230 Vac with UPS to 24 Vdc

### 1.19.1 12/24 Vdc Solar Panel Power Pack

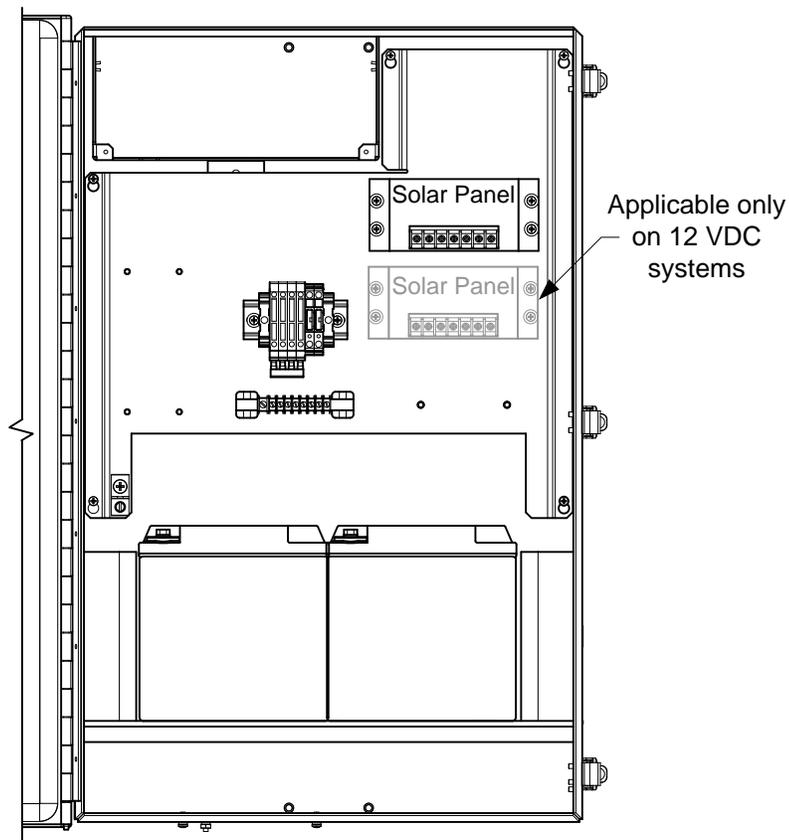
The solar panel power option employs a solar controller to maintain voltage on two 110 Ah batteries:

- 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 (2) 1 Amp loads. The system disconnects batteries when the voltage drops below the minimum recharge level. Minimum configuration consists of dual 50W solar panels. The system is designed to accommodate dual 110W solar panels as a maximum.



Auxiliary fusing is not available when using the optional heater.



**Figure 1-27 6800 Enclosure with 12/24 Vdc Solar Panel Power Pack Option**

### 1.19.2 115/230 Vac UPS Power Option (24 Vdc Systems Only)

This option assumes the site availability of 115/230 Vac power. An Uninterruptible Power Supply (UPS) and two 50 Ah batteries provide back-up power for short power interruptions. The 100 Ah batteries are available for longer autonomy:

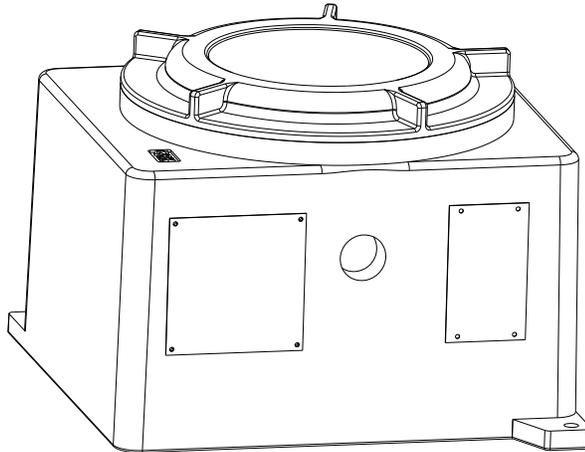
- 3-day autonomy with standard 50 Ah batteries and no optional heater



### 1.19.3.1 Enclosure

The custom designed, explosion-proof enclosure consists of a square-shaped cast aluminum housing, powder coated, with a top explosion-proof threaded cap for access to internal components (see Figure 1-29).

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 the cap.



**Figure 1-29 Explosion-Proof AC Power Supply**



## 2.0 INSTALLATION

### 2.1 Overview

This chapter provides information for field installation of the NGC8106 and optional equipment. After completing the procedures within this chapter, the NGC8106 is ready for startup.

The following procedures, unless otherwise stated, are applicable to all NGC8106 units. The NGC8106 is designed to be pipe-mounted (see Figure 2-1). Optionally, a shelf-mounting kit (see Figure 2-2) may be purchased for use in 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.



It is highly recommended that the user thoroughly read this chapter to establish an installation plan. Also, before beginning, refer to the wiring diagrams delivered with the new NGC8106. Store these under the Drawings tab in the back of this manual.

#### 2.1.1 What this Means



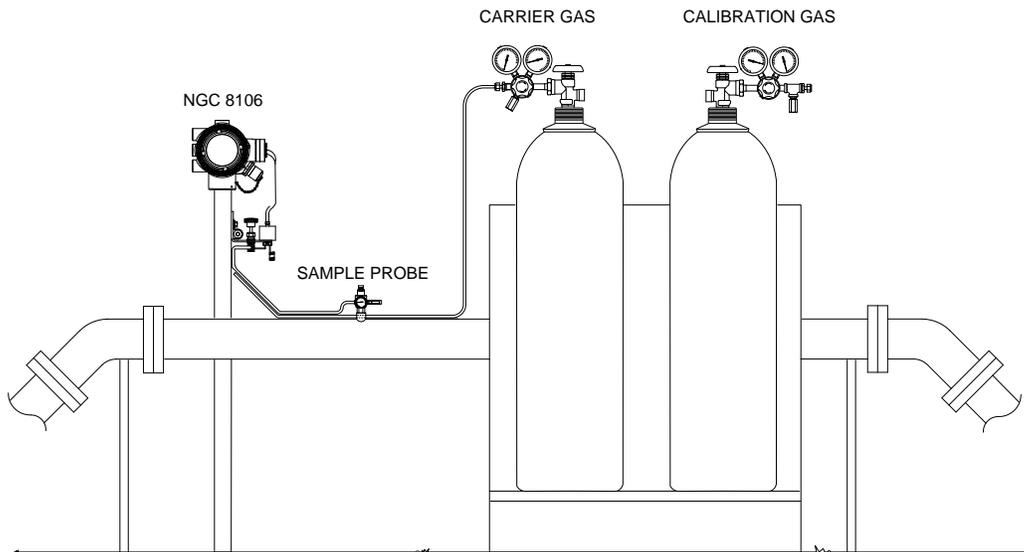
Installation instructions that feature this icon are applicable **ONLY** when the installation involves an environmental enclosure (ENC82). All other instructions may or may not be applicable.

#### 2.1.2 Organization

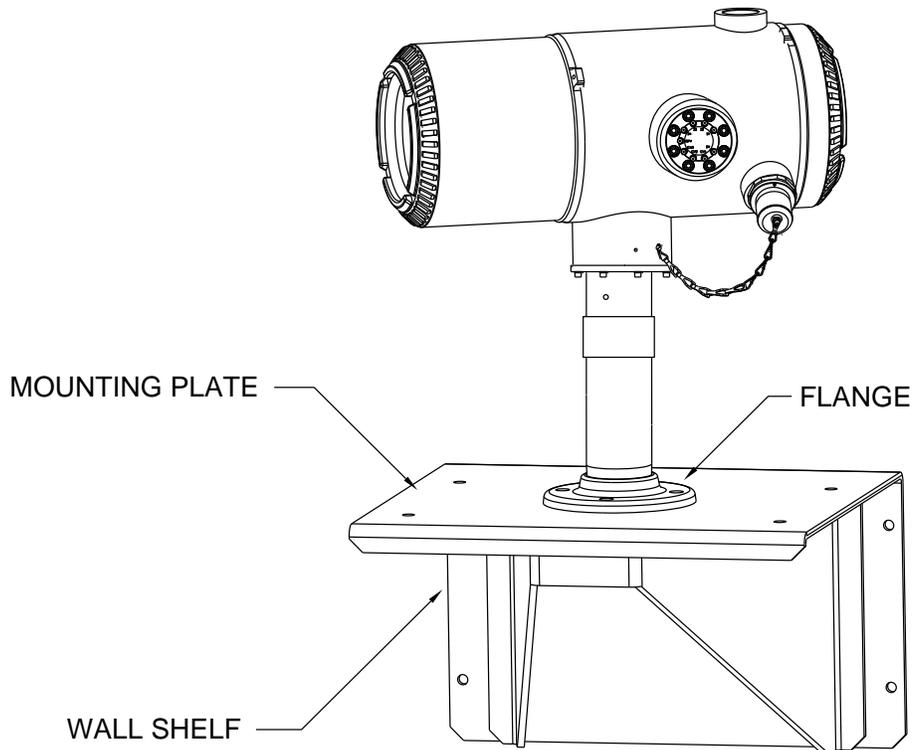
The following instruction sections are organized in the suggested installation order. Not all installation instructions will apply to the user's situation. As this is the case, certain procedures may vary when the installation does not require certain equipment.



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



**Figure 2-1 Basic Meter Run Installation**



**Figure 2-2 Typical Wall Shelf Mount Installation**

### 2.1.3 Locating Area for Installation

The NGC8106 is designed for mounting on the 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 NGC8106 operation.

The NGC8106 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 ensure the analysis accuracy of the current sample.

### 2.1.4 Installation

The following information (see Table 2–1) is designed to enable the user 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 (ENC82L/ENC82S) for inclement climates. While a set of instructions may be indicated for the user's installation, it may not be required specifically.



The NGC8106 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 2–1 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
•	•	•	•	•	NGC8106 Installation	2.12
•	•	•	•	•	Sample Conditioning Module Installation	2.13
•	•	•	•	•	Sample Line Connections	2.14

Pipe-Mount	Free-Standing	Wall Shelf	ENC82L	ENC82S	Installation Instructions	Section
			•	•	Sample Line to NGC8106 Inside of ENC82	2.15
			•		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

## 2.2 Unpacking and Inspection

### 2.2.1 Shipping Carton

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

### 2.2.2 Unpacking

The NGC8106 is shipped in a specially designed shipping carton 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. Upon completion, remove all items from the box.

### 2.2.3 Bill of Lading

After removing the protective shipping cover from the NGC8106, compare the shipped contents with those listed on the bill of lading. All items should match those on the bill of lading.

### 2.2.4 Inspection

Examine the internal NGC8106 components for evidence of damage.

Points of inspection are:

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

### 2.2.5 Damaged Components

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

Telephone:

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

## 2.3 Sample Probe Installation

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



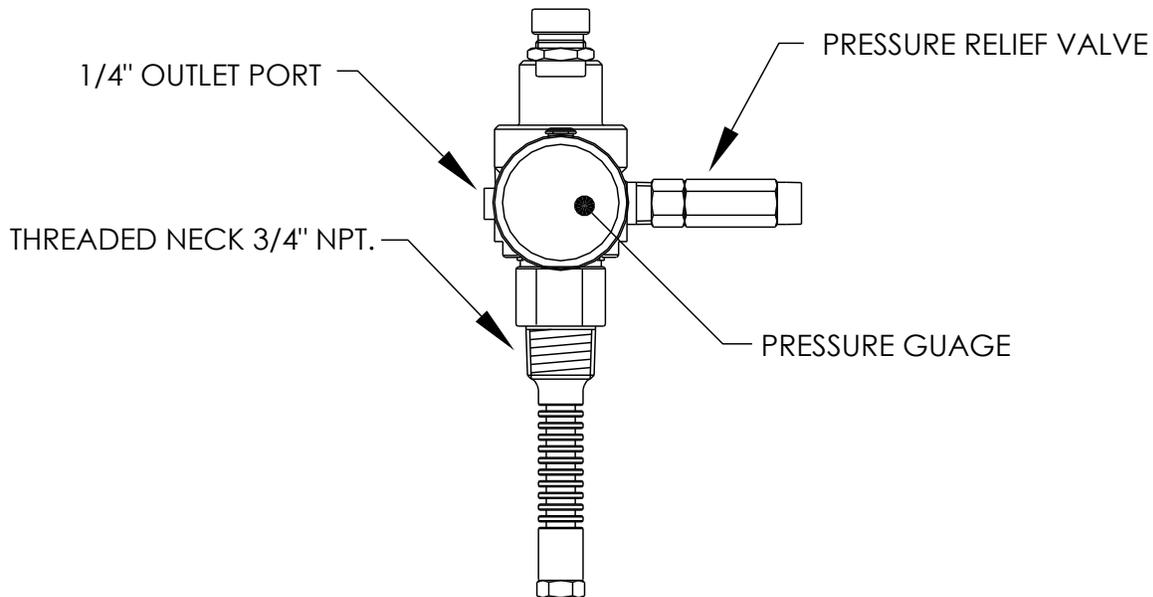
Sample probe pipe coupling should be located on the top of the meter run but may be mounted vertical or horizontal.

### 2.3.1 Materials

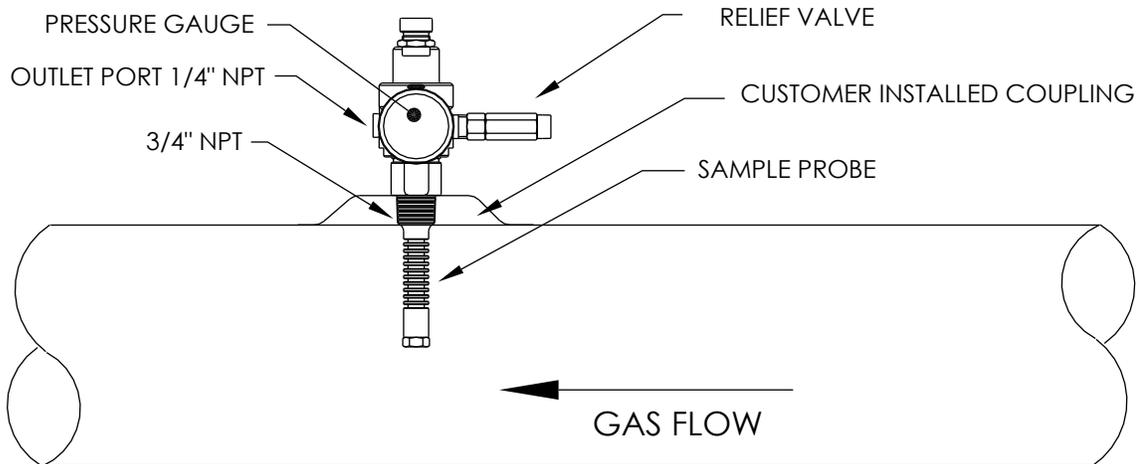
- 3/4" NPT pipe coupling (previously installed)
- Sample probe (configuration to be determined by the technician and is based on installation and local codes.)
- Teflon tape
- Or customer-supplied pipe dope (suitable for chromatography)

### 2.3.2 Instructions

- 1) Shut down the meter run, and isolate it from the gas source. Be sure to use proper lockout and tagging procedures.
- 2) Bleed off the gas from the meter run.
- 3) Ensure the installed mounting coupling is free of dirt and debris.
- 4) Ensure the sample probe threads are free of dirt and debris.
- 5) Using Teflon tape or pipe dope, wrap or cover the NPT threads of the sample probe (see Figure 2-3).
- 6) Insert the gas probe into the pipeline coupling (see Figure 2-4).
- 7) Using the correct tool, tighten probe. Securely tighten so there is no gas leakage. DO NOT OVER TIGHTEN.
- 8) Install the shut-off valve on the secondary side of the sample probe, if preferred.



**Figure 2-3 Sample Probe**



**Figure 2-4 Sample Probe Insertion**

## 2.4 Stand-Alone Installation

If the user is installing a NGC8106 using a free-standing pipe, use this procedure to install the pipe. Before beginning, review the procedure and the materials required for installation.

### 2.4.1 Material Not Supplied

- One (1) 2" pipe with flange
- One (1) 2" pipe coupling

or

- One 2" mounting pipe (installed). Length dependent upon final overall preferred height of the NGC8106.

**FYI**



Optional equipment may be ordered from ABB Totalflow.

### 2.4.2 Instructions

- 1) Select a location to install the mounting pipe that allows for easy user access and is close to the sample probe. Lines should be as short as possible.
- 2) Install a mounting pipe. Be careful to ensure the pipe is vertically aligned.
- 3) Screw the 2" pipe coupling onto the top of the mounting pipe.
- 4) Screw the optional mounting flange pipe into the top of the pipe coupling.

**FYI**



Continue to the NGC8106 Installation instructions.  
The method of installation must be consistent with the user's company policy.

## 2.5 Large Free-Standing Environmental Enclosure Installation



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

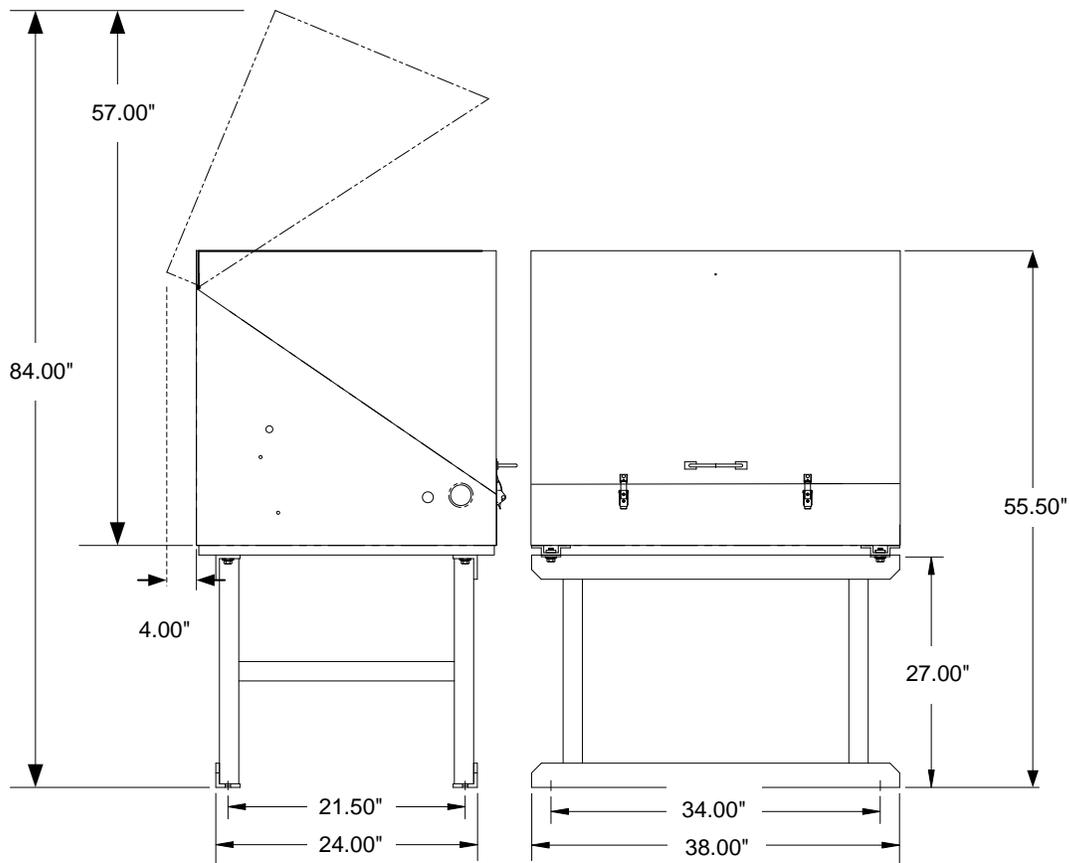
The following steps will typically require two people.

### 2.5.1 Materials

- Four (4) each -  $\frac{1}{2}$ -13 x  $1 \frac{1}{4}$  SST bolt
- Four (4) each -  $\frac{1}{2}$  SST flat washer
- Four (4) each -  $\frac{1}{2}$ " SST split Washer
- One (1) each - Stand

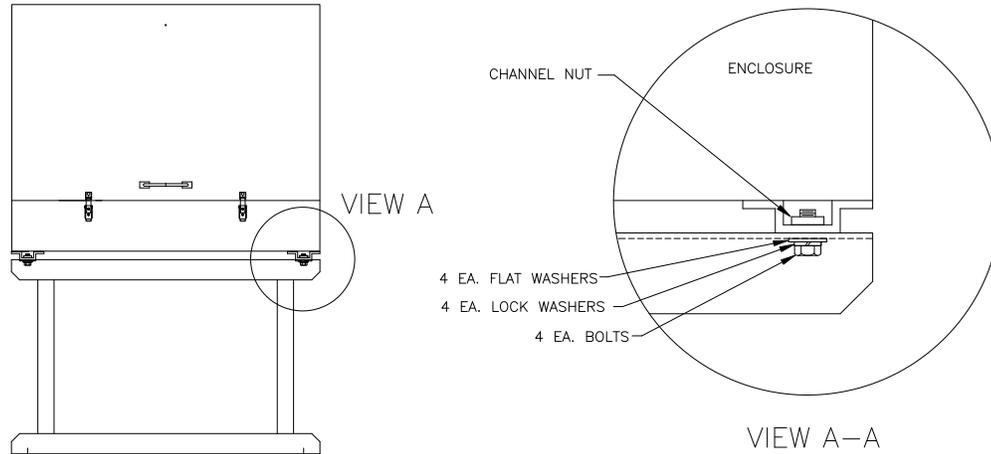
### 2.5.2 Installation

- 1) The stand is made symmetrical so that the top and bottom are identical. Situate the stand base on a flat, stable, surface.
- 2) Set the enclosure on top of the stand. Orientate so that the stand brace is horizontal with front of enclosure (see Figure 2-5).



**Figure 2-5 ENC82L–Enclosure Stand Installation**

- 3) Place a split washer and then a flat washer on one of the 1 ¼" bolts. Insert through the bolt hole located in the angle iron and then into the outermost corner of the enclosure (see Figure 2-6).
- 4) Move the channel nut into position so that bolt will screw into nut. Screw the bolt into the nut. Do not tighten.



**Figure 2-6 ENC82L-Enclosure Mounting Hardware**

- 5) Repeat for all other corners.
- 6) Position the enclosure on the stand, centering the stand underneath; otherwise, off set, as preferred. Upon completion, tighten all bolts.
- 7) Foot plate mounting holes are pre-drilled for mounting to a pad. The hardware is to be supplied by the user.

## 2.6 Small Free-Standing Environmental Enclosure Installation



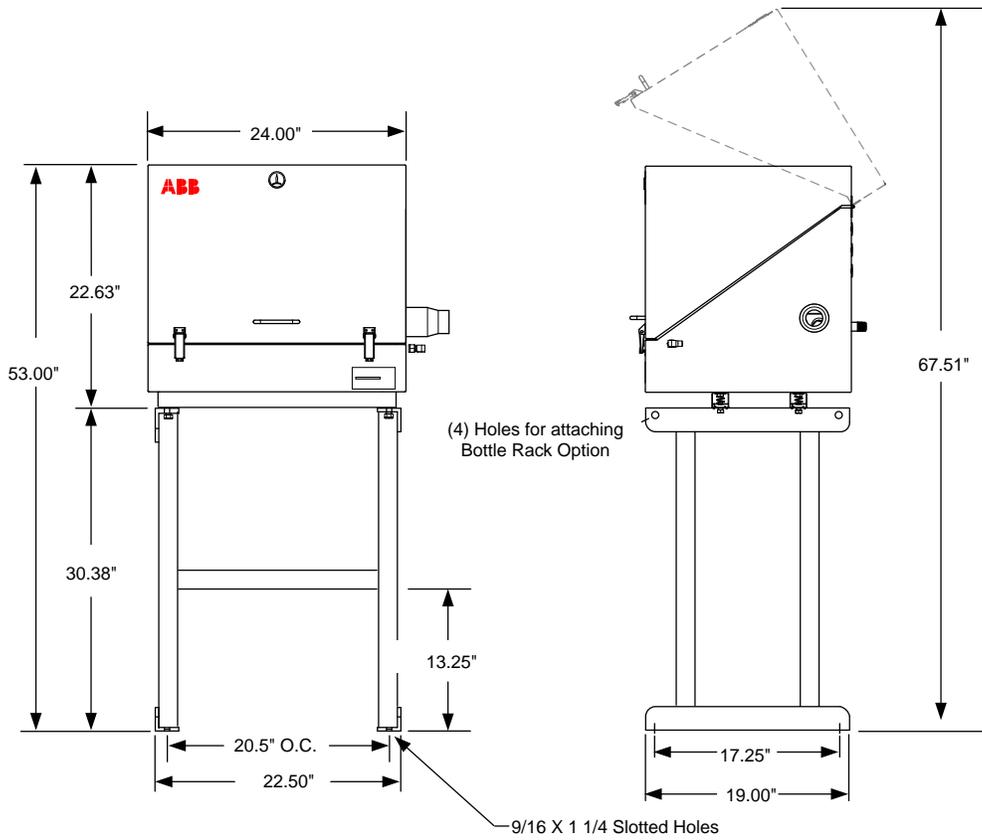
If the installation includes a small, free-standing environmental enclosure, follow these instructions; otherwise, move to the next section.

### 2.6.1 Materials

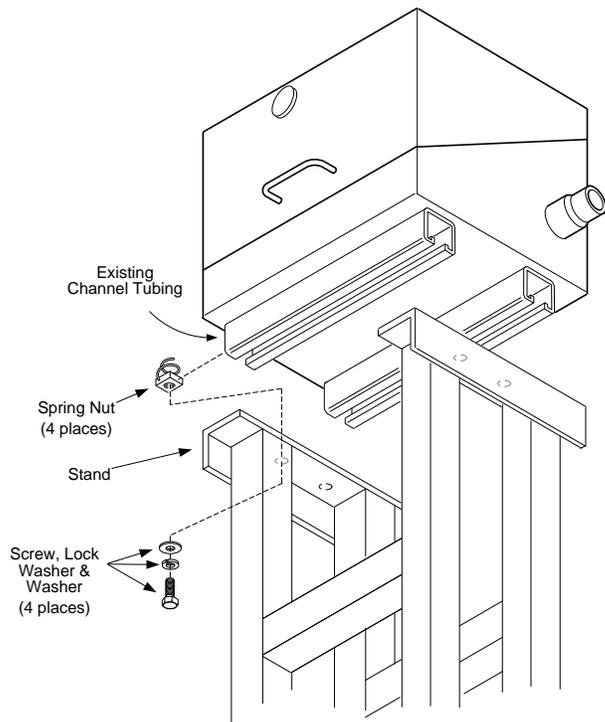
- Four (4) each - ½-13 x 1 ¼ SST bolt
- Four (4) each - ½ SST flat washer
- Four (4) each - ½" SST split Washer
- One (1) each - Stand

### 2.6.2 Installation

- 1) The stand is NOT made symmetrical. Locate the angle iron with the slotted holes for floor anchors, and place the stand base on a flat, stable surface.
- 2) Set the enclosure on top of the stand. Orientate so that the stand brace is horizontal with the front of the enclosure (see Figure 2-7).
- 3) Place a split washer and then a flat washer on one of the 1 ¼" bolts. Insert through the bolt hole located in the angle iron and into the outermost corner of the enclosure (see Figure 2-8).



**Figure 2-7 ENC82S-Enclosure Installation**



**Figure 2-8 ENC82S-Enclosure Mounting Hardware**

- 4) Move the channel spring nut into position so that bolt will screw into nut. Screw the bolt into the nut. Do not tighten.
- 5) Repeat for all other corners.
- 6) Position the enclosure on the stand, centering stand underneath; otherwise, offset, as preferred. Tighten all bolts.
- 7) Foot plate mounting holes are pre-drilled for mounting to a pad. The hardware is to be supplied by the user.

## 2.7 Large Pipe-Mounted Environmental Enclosure Mounting Kit



Environmental Enclosure

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

### 2.7.1 Materials

- Four (4) each - ½" -13 x 1 ¼ SST bolt
- Four (4) each - ½" SST flat washer
- Four (4) each - ½" SST split washer
- Two (2) each - 2 ½" x ¼" 43" steel angle iron

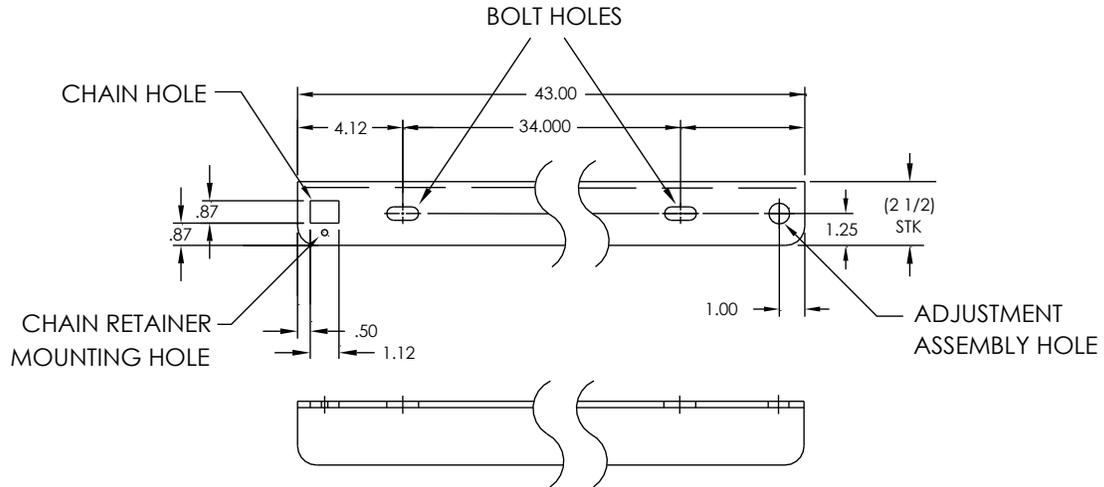
FYI



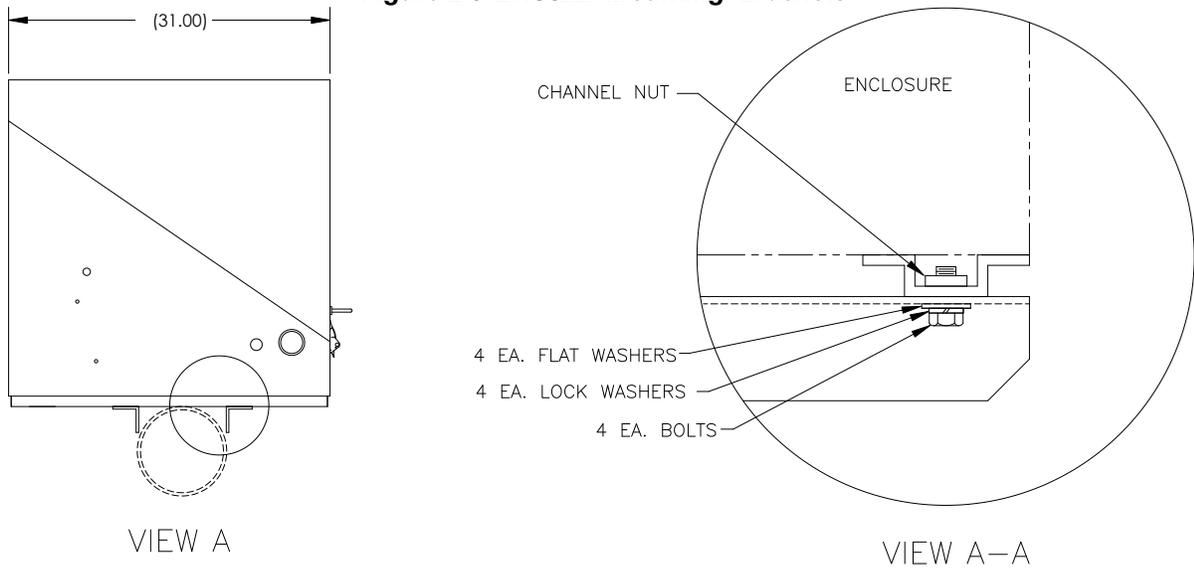
May be used in conjunction with the optional support leg kit. See Support Leg Installation procedures within this chapter.

### 2.7.2 Installation

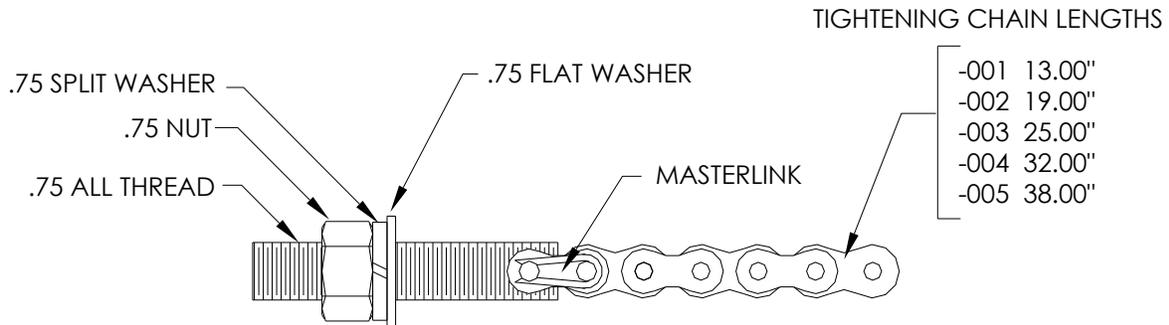
- 1) Set two pieces of angle iron (see Figure 2-9) on the bottom of the upside-down enclosure. Ensure that the side with the holes is facing the bottom of the enclosure and the solid sides of the angle iron are facing each other. Angle iron should be spaced so that the diameter of the pipe will fit in between.
- 2) Place a split washer and then a flat washer on one of the 1 ¼" bolts (see Figure 2-10).
- 3) Insert the bolt through one of the slotted holes located in the angle iron and into the outermost corner of the enclosure. Move the channel nut into position so that bolt will screw into the nut.
- 4) Screw the bolt into the nut. Leave loose for later adjustment.
- 5) Install the other bolt, split washer and flat washer into the other slotted hole.
- 6) Repeat for the other angle iron. Final tightening of the bolts is performed after the unit is mounted on the pipe to allow for left-to-right and front-to-back positioning.
- 7) Remove the nut and washers from the adjustment assembly, if necessary (see Figure 2-11).
- 8) Insert all-thread through the round hole on the adjustment side of the angle iron.
- 9) Place the flat washer, split washer and nut on the all-thread.



**Figure 2-9 ENC82L-Mounting Brackets**



**Figure 2-10 ENC82L-Mounting Hardware Installation**

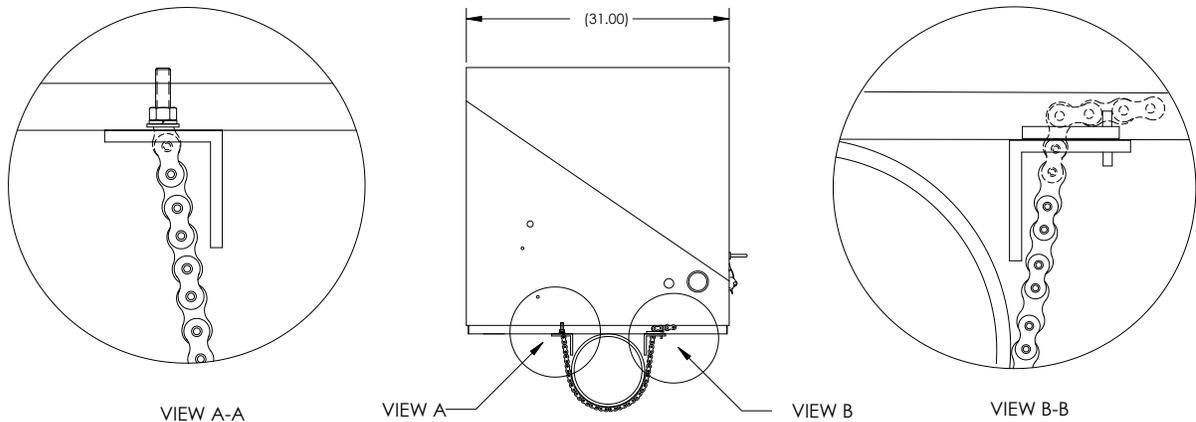


**Figure 2-11 ENC82L-Adjustment Assembly**

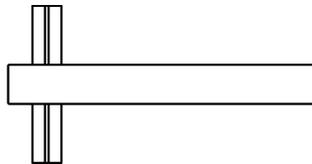
- 10) Screw the nut onto the all-thread until the top of the nut is level with the top of the all-thread. Final tightening may be performed after the mounting chain is in place.

**FYI**  Lift the enclosure above the meter run. Allow enough clearance to clear pipe.

- 11) Set the enclosure on top of the pipe between the angle iron mounting brackets. Keep the unit steady on top of the pipe.
- 12) Wrap the mounting chain underneath the pipe (see Figure 2-12). Feed the chain up through the square retainer hole of the angle iron. Pull up until most of the slack has been taken out of the mounting chain.
- 13) Feed the long flat end of the chain retainer (see Figure 2-13) through the middle of a chain link. Upon completion, move the retainer lock into position where the round peg fits into the small, round mounting hole.



**Figure 2-12 ENC82L–Pipe Mount installation**



**Figure 2-13 ENC82L–Chain Retainer Lock**

- 14) Adjust the enclosure into final position on the pipe. Tighten nut on the all-thread (adjustment assembly) until the unit is securely in place.
- 15) Adjust the enclosure position on the angle iron, if necessary, and then tighten the bolts until secure.

## 2.8 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.

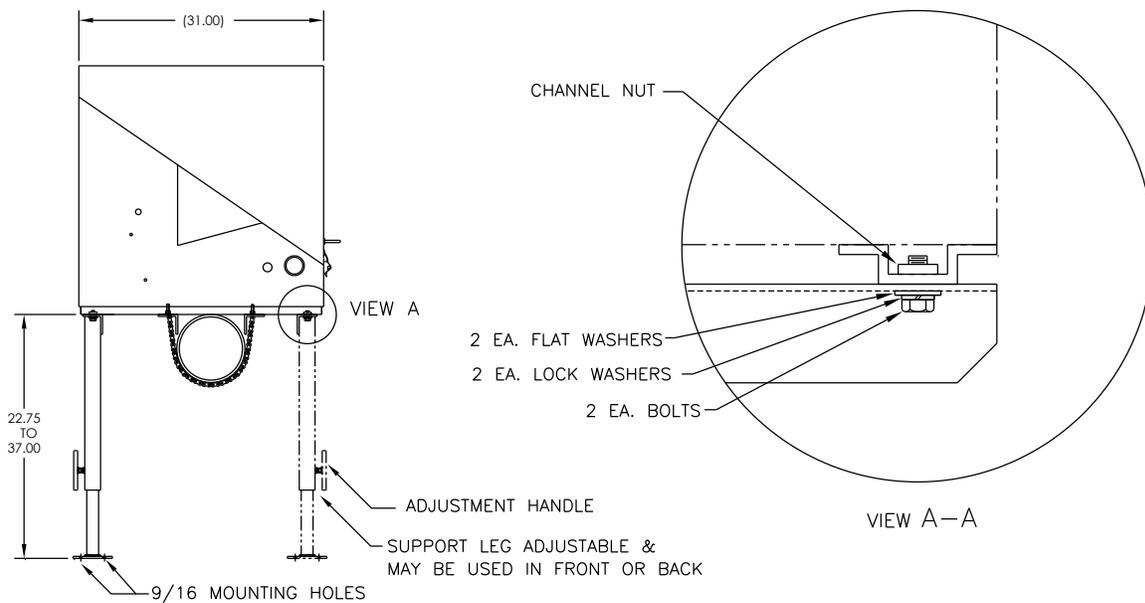
### 2.8.1 Materials

- Two (2) each -  $\frac{1}{2}$ -13 x 1  $\frac{1}{4}$  SST bolt
- Two (2) each -  $\frac{1}{2}$  SST flat washer
- Two (2) each -  $\frac{1}{2}$ " SST split washer
- One (1) each - Pre-assembled adjustable height support leg

**TIP**  Must use with the pipe-mounting kit.

### 2.8.2 Instructions

- 1) Set the support leg underneath the front or rear (or both if using two kits) of the pipe-mounted enclosure. Orientate so that the leg brace is horizontal with the front of the enclosure (see Figure 2-14).
- 2) Place the split washer and then flat washer on one of the 1  $\frac{1}{4}$ " bolts.
- 3) Insert the bolt through the hole located in the angle iron and into the outermost corner of the enclosure. Move the channel nut into position so that the bolt will screw into the nut.



**Figure 2-14 ENC82L-Optional Support Leg Overview**

- 4) Screw the bolt into the nut. Leave loose for later adjustment. Repeat for the other corner.
- 5) If installing two support legs, repeat for the other angle iron. Final tightening of the bolts may be performed after the support leg(s) are in the preferred positioned on a flat, stable surface.
- 6) Loosen the adjustment handle. Drop the leg foot down and retighten the adjustment handle.
- 7) Foot plate mounting holes are pre-drilled for mounting to a pad. The hardware is to be supplied by the user.

## 2.9 Small Pipe-Mounted Environmental Enclosure Mounting Kit



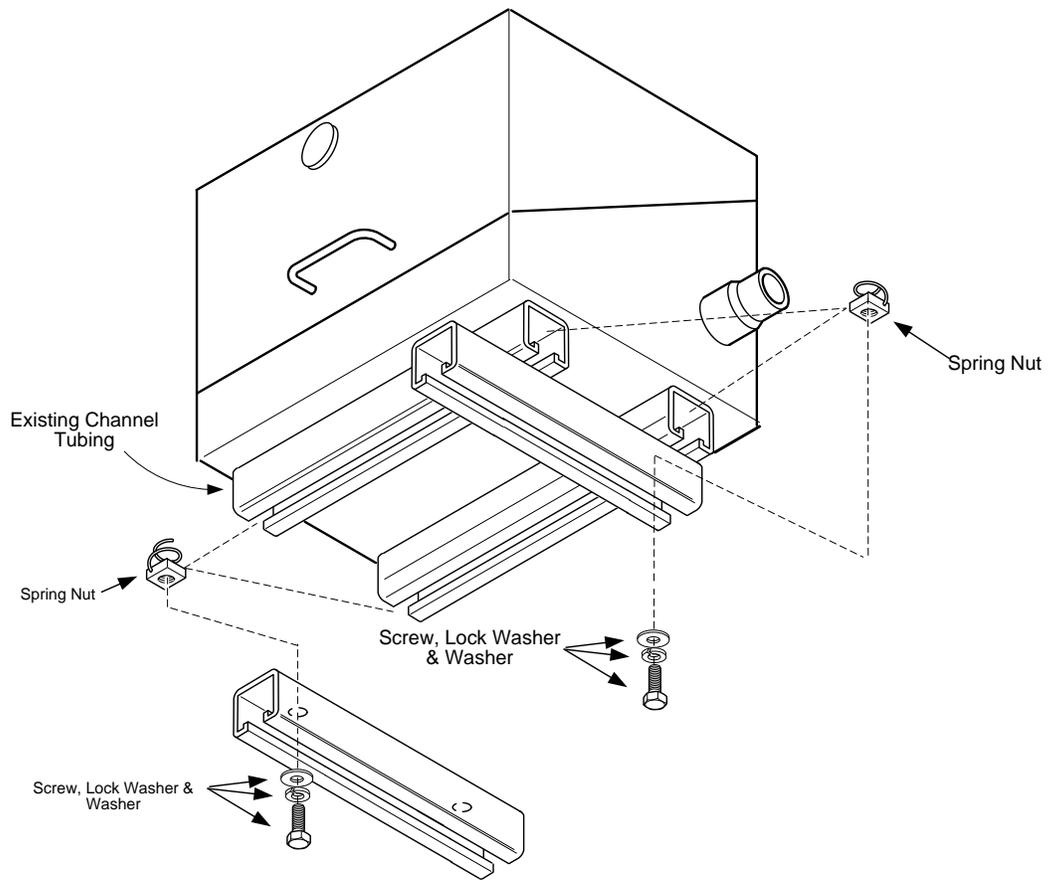
If the installation includes a pipe-mounted environmental enclosure, follow these instructions; otherwise, continue to the next applicable set of instructions. The mounting kit is available for 2", 3", 4", and 6" pipe only.

### 2.9.1 Materials

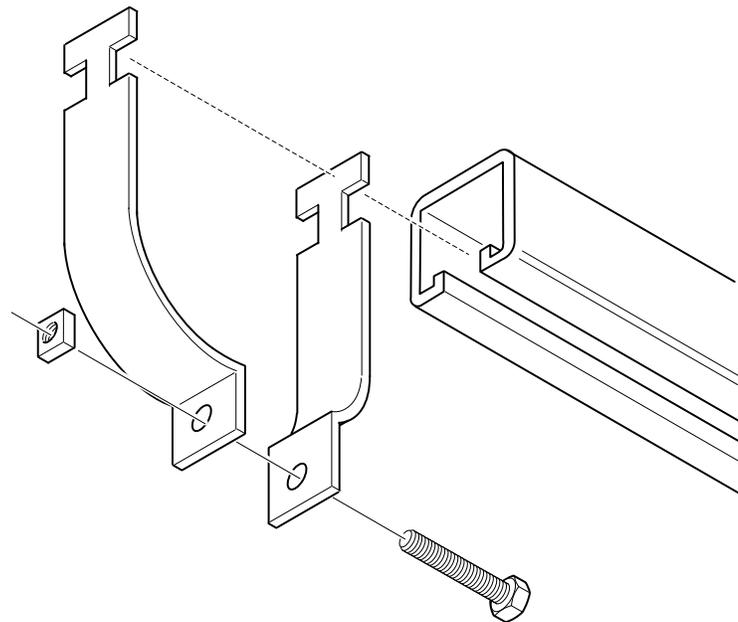
- Two (2) each - Split U-brackets w/hardware
- Two (2) each - 10 1/2" channel tubes
- Four (4) each - 1/2" spring nut
- Four (4) each - 1/2" SST split washer
- Four (4) each - 1/2-13 x 1 1/4 SST bolt
- Four (4) each - 1/2" SST split washer

### 2.9.2 Installation

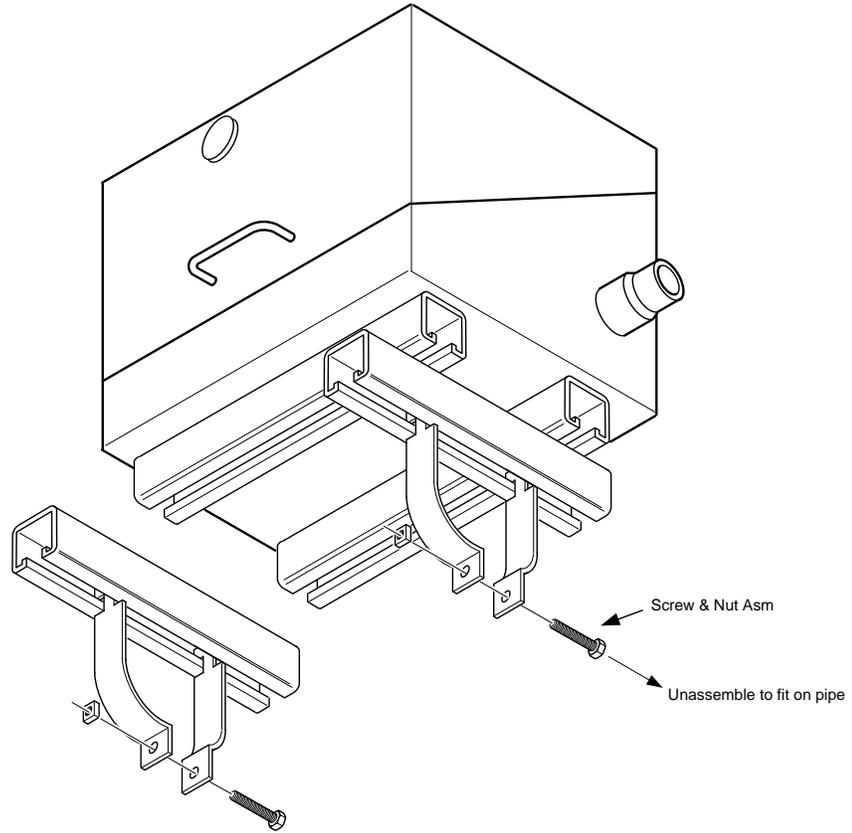
- 1) Place the enclosure upside down to gain access to the channel tubing on the bottom of the enclosure.
- 2) Insert and move each spring nut into the approximate position inside of the existing channel tubing (see Figure 2-15).
- 3) Set two pieces of channel tubing on the bottom of the upside-down enclosure. Ensure that 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 the approximate position inside of the existing channel tubing.
- 5) Place the split washer and then the flat washer on one of the 1 1/4" bolts.
- 6) Insert the bolt through the hole located in the channel tubing and into the spring nut inside of the existing channel tubing. Move the 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 the screw and nut from both U-brackets (see Figure 2-16).
- 9) Slide both sides of the U-bracket into the newly mounted channel tubing (see Figure 2-17). Ensure that the pieces are correctly oriented to fit around the pipe. Repeat for second bracket and tubing.
- 10) Separate the U-brackets to allow mounting on the pipe. Set the unit on the pipe and move the brackets together so that they surround the pipe.
- 11) Reassemble U-bracket with the screw and nut. Leave loose until the enclosure has been centered over pipe and adjusted for position (see Figure 2-18). Tighten.



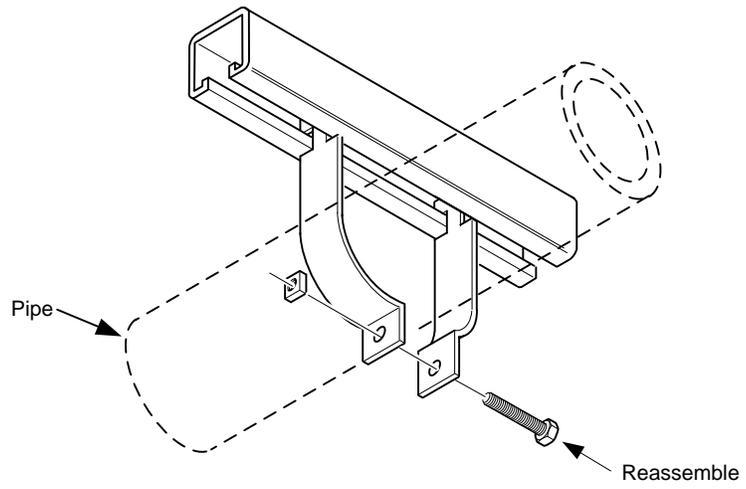
**Figure 2-15 ENC82S-Channel Tubing Installation**



**Figure 2-16 ENC82S-Pipe-Mount Split Brackets**



**Figure 2-17 ENC82S– Pipe-Mount Assembly**



**Figure 2-18 ENC82S–Pipe-Mounted**

## 2.10 Pipe Saddle Installation

If the user is installing a NGC8106 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.

### 2.10.1 Material Not Supplied

- One (1) each - Pipe saddle
- One (1) each - 2" mounting pipe. Length dependent upon the preferred height of the NGC8106.
- One (1) each - 2" pipe with flange (Optional)
- One (1) each - 2" pipe coupling (Optional)

**FYI**



Optional equipment may be ordered from ABB Totalflow.

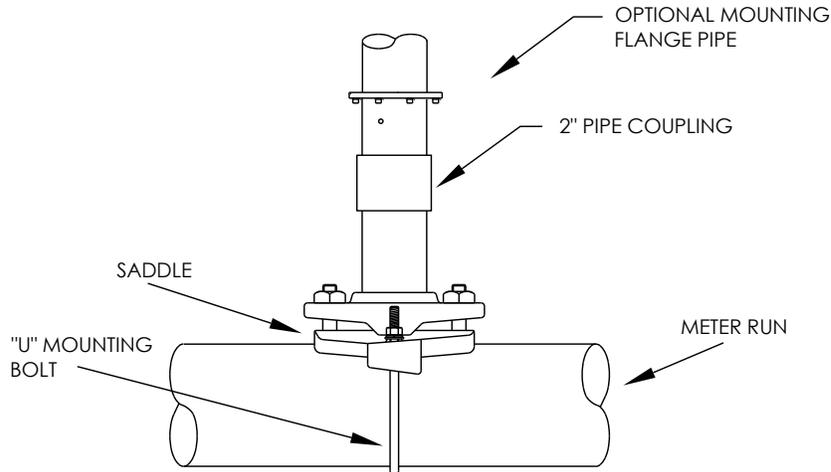
### 2.10.2 Instructions

- 1) Position the pipe saddle on the meter run. Select a location that allows easy user access and is close to the sample probe. Lines should be as short as possible.
- 2) Temporarily attach the saddle on the meter run pipe. Use a U-bolt and associated hardware (see Figure 2-19).
- 3) Screw one end of the 2" pipe into the saddle flange on the pipe saddle until it is "wrench tight". Place a level against the pipe, and vertically align. Adjust the saddle until vertical alignment is achieved.
- 4) After vertical alignment, securely tighten the 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.
- 6) Screw the optional mounting pipe with flange into the top of the pipe coupling.

**FYI**



Continue to the NGC8106 Installation instructions. The method of installation must be consistent with user's company policy.



**Figure 2-19 Typical Pipe Saddle Installation**

## 2.11 Shelf Installation

If the installation calls for the NGC8106 shelf mounting kit, use this procedure to mount the shelf; otherwise, continue to the next applicable set of instructions. Before beginning, review the procedure and the materials required for installation.

### 2.11.1 Materials

- Four (4) each - ¼" x 20 1" SST hex head machine screws
- NGC8106 mounting shelf with flange
- One (1) each - 2" mounting pipe. The length is dependent upon the preferred height of the NGC8106.
- One (1) each - 2" pipe with flange (optional)
- One (1) each - 2" pipe coupling (optional)

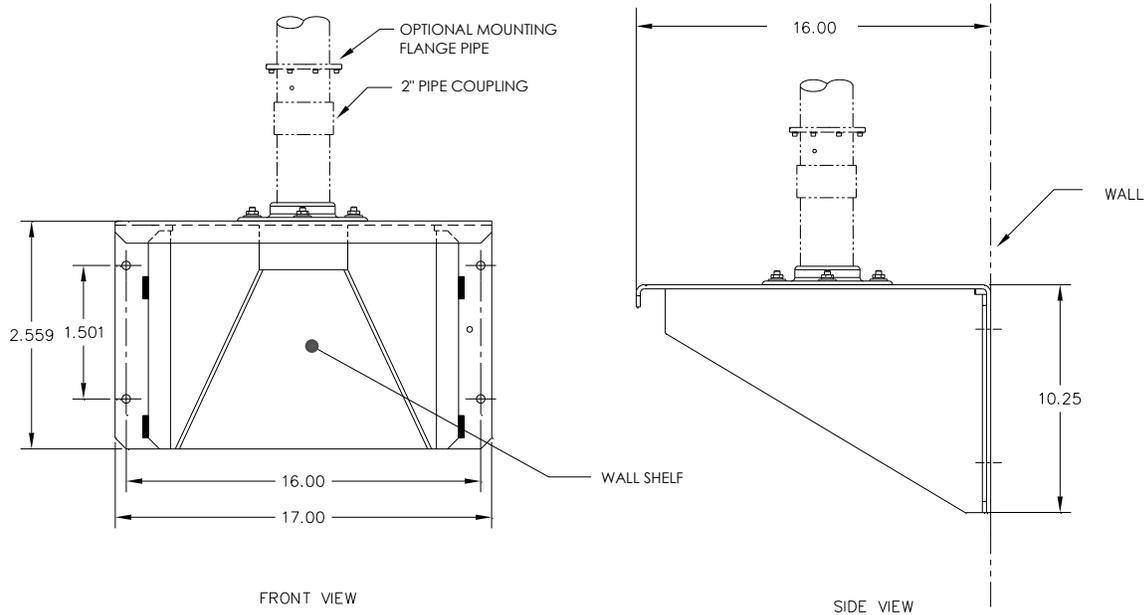
### 2.11.2 Instructions

- 1) Locate the wall position where the NGC8106 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. Be careful to keep level. Use the four ¼ x 20, 1-inch SST hex head machine screws in each of the four shelf mounting holes. Refer to Figure 2-20.
- 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 NGC8106 Installation instructions. The method of installation must be consistent with the user's company policy.



**Figure 2-20 Shelf Installation**

## 2.12 NGC8106 Installation

Once the mounting system has been installed, these instructions should be followed to install the NGC8106 onto the mounting pipe. These instructions are relevant to all of the mounting system types that have been presented within this manual.



Both the large and small environmental enclosures are shipped with the NGC8106 mounting system installed inside the environmental enclosure. The following instructions should be followed to install the NGC8106 onto the mounting pipe.

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

### 2.12.1 Materials

- Installed mounting pipe
- Four (4) each - 5/16" hex socket screws (optional - for use with mounting pipe with flange kit)
- NGC81006

### 2.12.2 Instructions

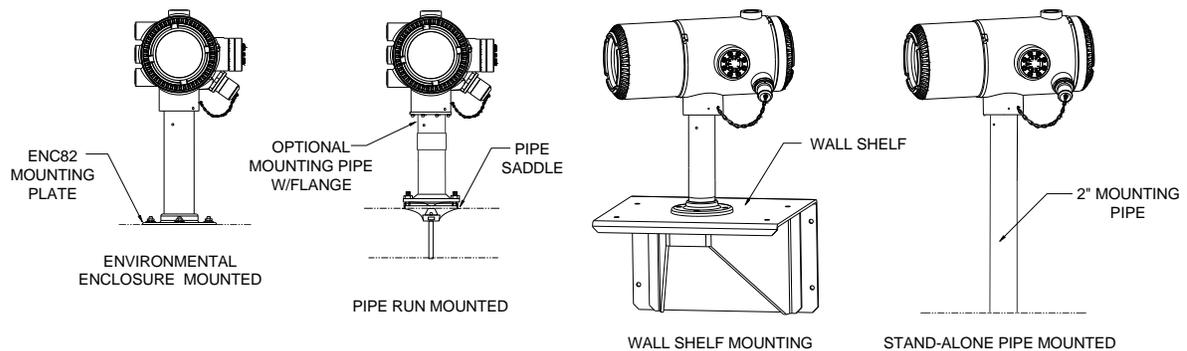
**FYI**



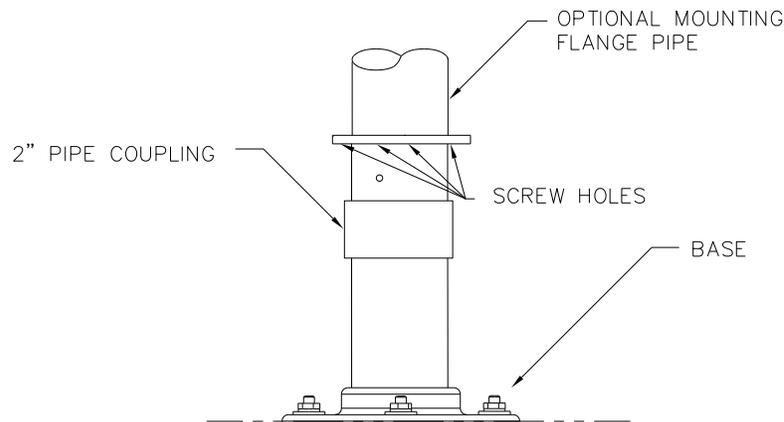
When positioning the unit, the user should take into consideration the mounting of the sample conditioning system, conduit locations and access to the rear end cap of the unit.

- 1) Position the NGC8106 on top of the 2" pipe stand (see Figure 2-21). The positioning needs to be in close approximation to the correct orientation.

- 2) If the installation has the optional mounting pipe with flange, ensure the screw holes in the upper flange align with the holes located in the NGC8106 neck bottom (see Figure 2-22).
  - 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 and access to the feed-through assembly and the termination board that is 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.
- 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 2-21 NGC8106 Mounting**



**Figure 2-22 NGC8106 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 and into the neck bottom of the unit. Tighten using the 1/4" hex wrench. Repeat for all screws.
- 5) If the installation has the optional mounting flange pipe, small adjustments may be made to the orientation by applying additional pressure to the mounting pipe with a pipe wrench. Tighten the mounting pipe into the shelf mounted flange or pipe saddle flange.

Otherwise, loosen the hex socket set screw, rotate unit and retighten.

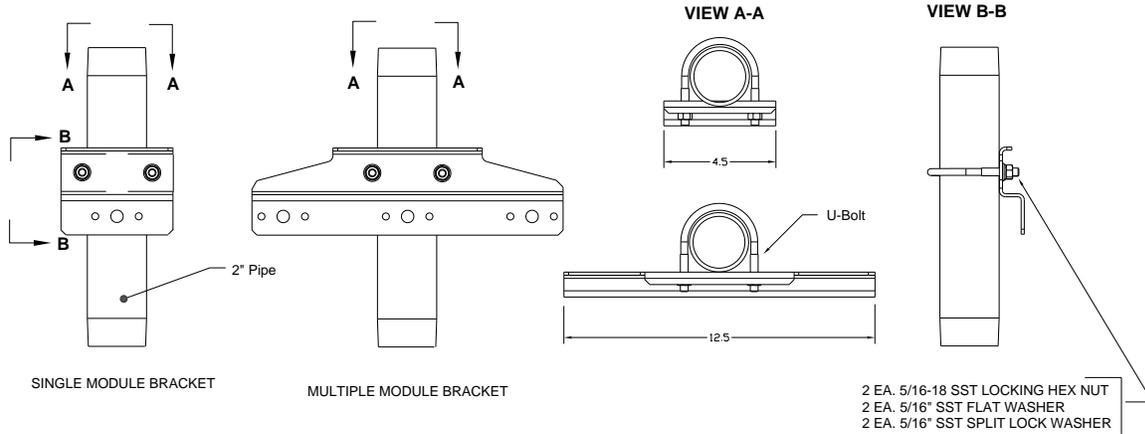
## 2.13 Sample Conditioning Module Installation

### 2.13.1 Materials

- Installed NGC8106
- Single or multiple module mounting kit (see Figure 2-23)
- One (1) each - .312 x 2.5 x 3.62 x 1.5 U-bolt
- Two (2) each - 5/16" SST split washer
- Two (2) each - 5/16" SST flat washer
- Two (2) each - 5/16-18 SST lock nut
- Sample conditioning module(s) and hardware (see Figure 2-23 and Figure 2-24)

### 2.13.2 Mounting Kits

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



**Figure 2-23 Sample System Mounting Kits**

### 2.13.3 Instructions

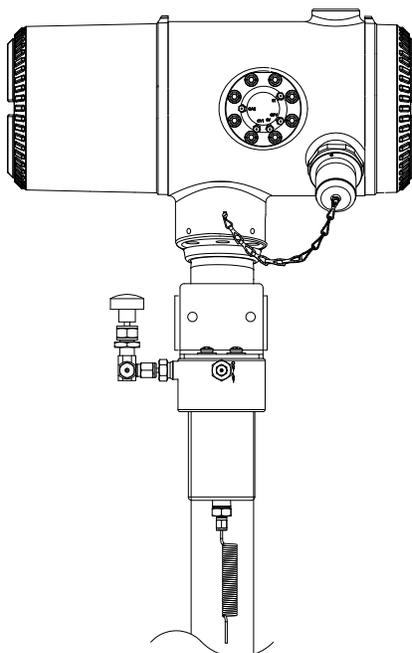
#### CAUTION



When installing the module bracket inside of the ENC82S small environmental enclosure, the mounting bracket must be installed upside down to allow for the required space; otherwise, the module bracket installed inside of the ENC82L large environmental enclosure should be oriented as shown in Figure 2-24.

- 1) On the sample conditioning module, align the mounting holes to the corresponding holes in the bracket. Please view the Caution note above regarding orientation of the mounting bracket. Insert the bolt through the hole in the bracket, from front to back, and then 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 that are located in the mounting bracket. Ensure that the bracket back fits flat against the pipe and the module mounting lip sets away from the pipe.
- 5) Place the flat washer and then a split washer on the end of the U-bolt. Screw the nut onto the end of the bolt. Upon completion, tighten.
- 6) Repeat step 5 for the other side of the U-bolt.
- 7) Move the bracket into position underneath the NGC8106. Ensure there is enough clearance for the sample conditioning module(s).
- 8) Tighten both nuts.



**Figure 2-24 Sample Conditioning Assembly**

## 2.14 Sample Line Connections

Following the installation of the sample conditioning module, the sample tubing from the sample probe to the sample conditioning system and then on to the NGC8106 feed-through assembly should be installed.



If the sample conditioning module and the NGC8106 are located inside an ENC82, review the Sample Line Connections to NGC8106 Inside of the ENC82 section for information pertaining to this installation.

### 2.14.1 Materials

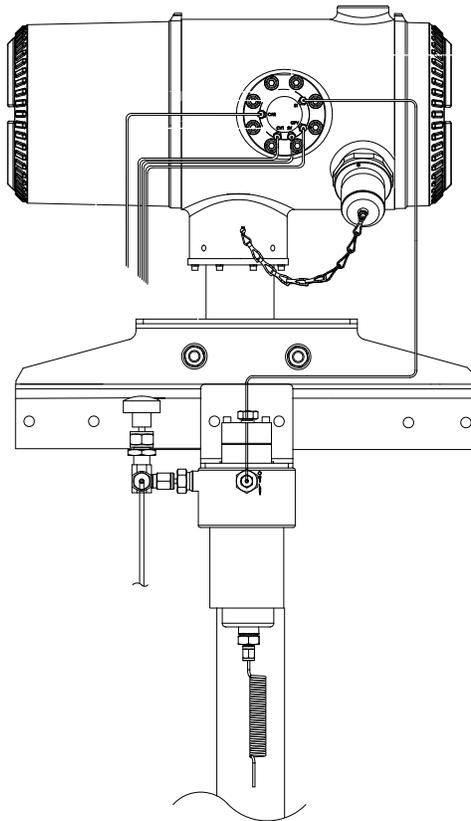
- 1/8" SST chromatography-grade transport tubing. The length of the tubing should be determined by the technician and is based on the distance from the sample probe to the sample conditioning module.

- Two (2) each - Ferrule and nut
- One (1) each - 1/4" NPT to 1/8" reducer or other size as determined from the sample probe output port
- One (1) each - Sample conditioning module transport tubing (supplied with the sample conditioning module)

### 2.14.2 Instructions

**TIP**  Ensure that the ends of the stainless steel tubing are open and not restricted.

- 1) Locate the sample input fitting on the sample conditioning module (see Figure 2-25).
- 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 2-25 Sample Conditioning Module Line Connections**

**TIP**  If the sample conditioning module and NGC8106 are located inside an ENC82, review the Sample Line to NGC8106 Inside of Environmental Enclosure section for information pertaining to this installation.

**FYI**



Tube, ferrule and nut should always enter 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 NGC8106 feed-through assembly and remove the sealing screw.
  
- 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 NGC8106 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. The valve is located on the sample probe.

**WARNING**



The user needs to ensure they are following the 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 NGC8106 feed-through assembly. Move the Valco nut down onto the ferrule, screw into port and tighten.

**CAUTION**



DO NOT over tighten. After securing the tubing, check for gas leaks.

## 2.15 Sample Line to NGC8106 Inside of ENC82

Environmental  
Enclosure



The sample line being installed to a unit, located inside the ENC82, requires making minute changes to the instructions listed for their installation. The following information and steps should be noted during the installation.

### 2.15.1 Materials

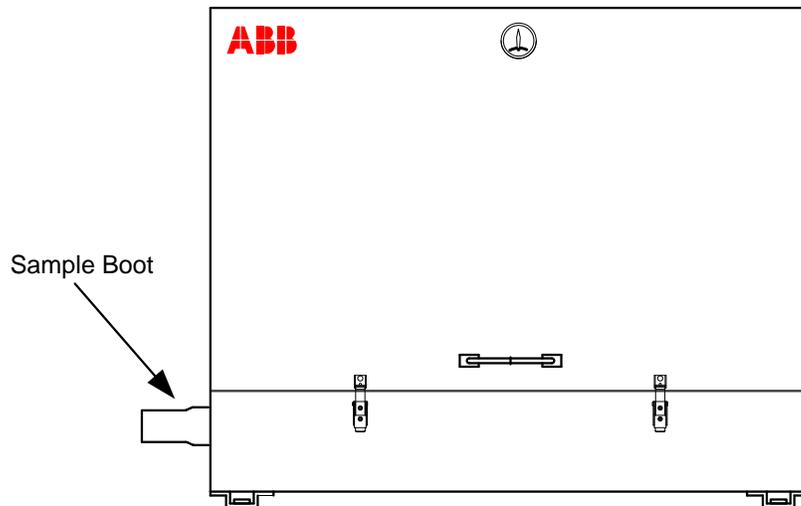
- Installed sample conditioning module
- 1/8" SST chromatography-grade transport tubing (amount to be determined by technician and is based on the distance from the sample probe to the sample conditioning module)

- Two (2) each - Ferrule and nut
- One (1) each - ¼" NPT to 1/8" reducer or other size as determined from the sample probe output port
- One (1) each - Sample conditioning module transport tubing (supplied with sample conditioning module)
- 1/16" or larger vent tubing and materials for making connection to the 1/16" purge coil to vent outside of the enclosure (provided by user)
- Heat trace materials provided by user

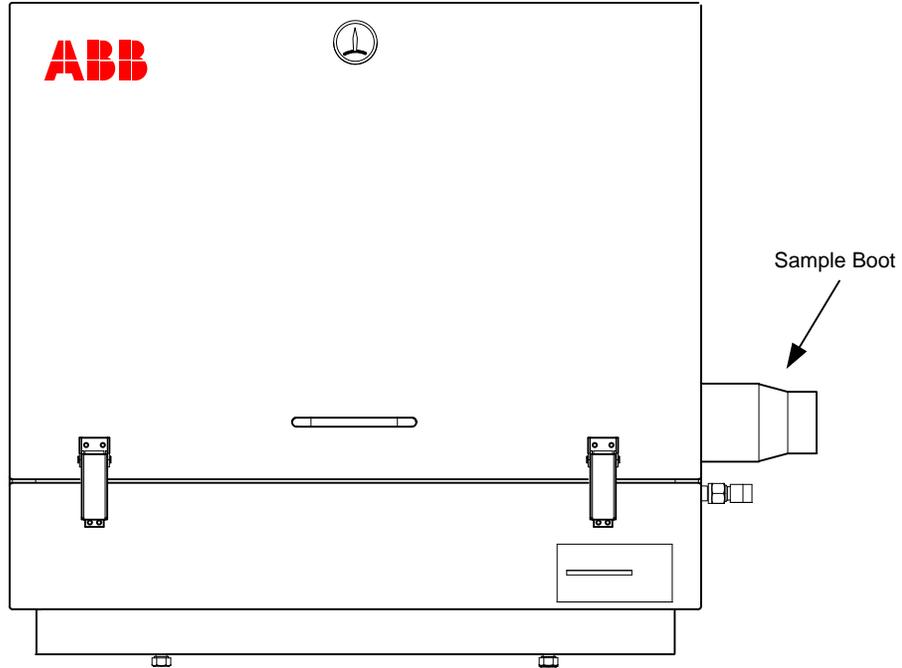
### 2.15.2 Instructions

**TIP**  Ensure that the ends of the stainless steel tubing are open and not restricted.

- 1) Locate the sample input fitting on the sample conditioning module (see Figure 2-26) and the sample output fitting on the installed sample probe.
- 2) Locate the sample boot on the side of the environmental enclosure. The sample line must feed through the sample boot that is located on the side of the enclosure.
- 3) Measure and cut the SST tubing to the required length. Feed the sample tubing through the sample boot.



**Figure 2-26 ENC82L–Environmental Enclosure Sample Boot**



**Figure 2-27 ENC82S–Environmental Enclosure Sample Boot**

- 4) If necessary, install the reducer into the sample probe output fitting.
- 5) Install the ferrule and nut onto one end of the sample tubing.
- 6) Insert the tubing with the ferrule into the reducer/sample probe output fitting. Move the nut down onto the ferrule, screw onto the fitting and tighten.
- 7) Install the ferrule and nut onto the other end of the sample tubing.
- 8) Insert the ferrule into the sample conditioning module input fitting. Move nut down onto the ferrule, screw onto the fitting and tighten.
- 9) Locate the sample output fitting on the sample conditioning module.
- 10) Locate the sample input on the NGC8106 feed-through assembly and remove sealing screw.



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

- 11) 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 NGC8106 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 the plastic caps from the restrictor coils, sealing screws from the feed-through column vents and the sealing screw from the sample vent lines.
- 14) Purge the air from the transport tubing by opening the shut-off valve located on the sample probe.

**WARNING**

Follow the requirements of national and local codes when performing this purge.

- 15) Insert tubing with the ferrule into the corresponding input port located on the NGC8106 feed-through assembly. Move the Valco nut down onto the ferrule, screw into the port and tighten.

**CAUTION**

DO NOT over-tighten. After securing the tubing, check for gas leaks.

- 16) Measure and cut the vent tubing to a sufficient length to guarantee the purge coils vent outside of the enclosure. Feed the vent tubing through the sample boot.
- 17) Make the necessary bends in the tubing to ease the installation of the tubing into the required fittings on the end of the sample conditioning module purge coil.
- 18) Please follow Heat Trace manufacturer's suggested installation instructions for applying Heat Trace equipment.

## 2.16 ENC82L Optional Power/Comm Outlet Box Assembly



Environmental Enclosure

If installing the NGC8106 inside an 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.

### 2.16.1 Materials

- One (1) each - Outlet box assembly
- One (1) each - Internal NGC8106 connection assembly
- One (1) each - Flexible cable assembly
- One (1) each - DC power switch box
- One (1) each - Support bracket
- Two (2) each - 10-32 x 3/4" SS pan head screw, Phillips
- Two (2) each - #10 SST flat washer
- Two (2) each - #20 SST split washer

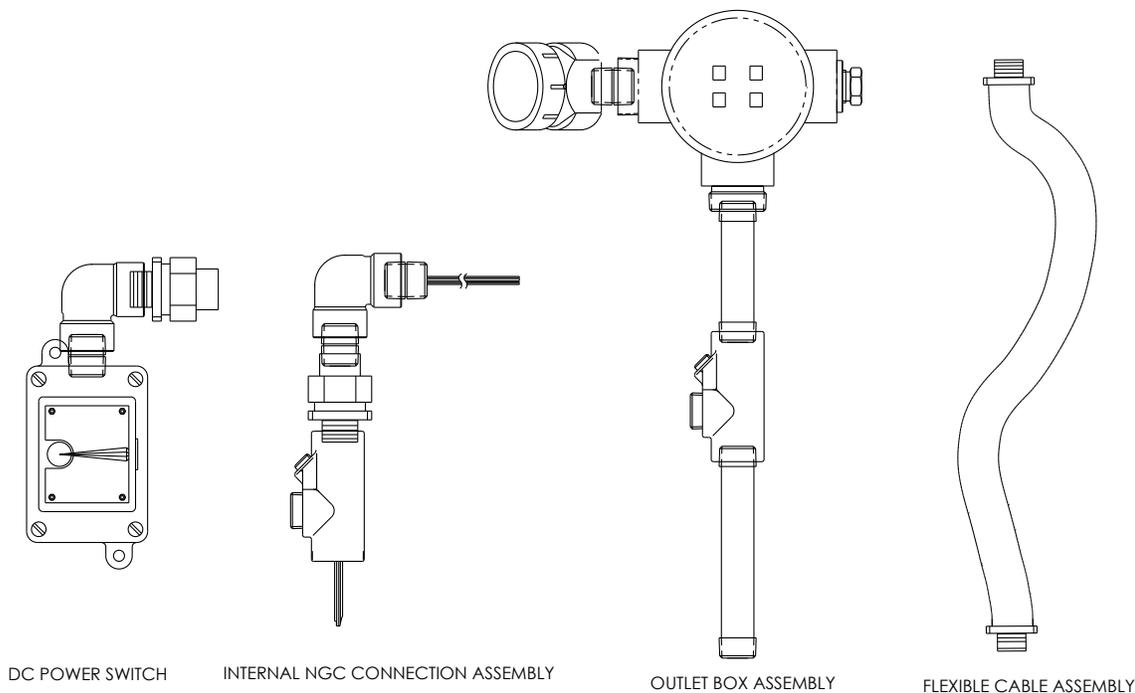
### 2.16.2 Customer Supplied Materials

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

### 2.16.3 Instructions

- 1) Gain access to the rear termination board by loosening the countersunk hex socket locking set screw in the rear end cap. Use a 1/16" hex wrench. Upon completion, unscrew the end cap.
- 2) Remove the hub plug from the bottom most access hub.

- 3) Beginning with the internal connection assembly (see Figure 2-28), feed the 13" wire bundle (elbow end of the assembly) through the open hub. Continue to pull the wire past the terminations until the nipple fitting is in position to screw into the hub.



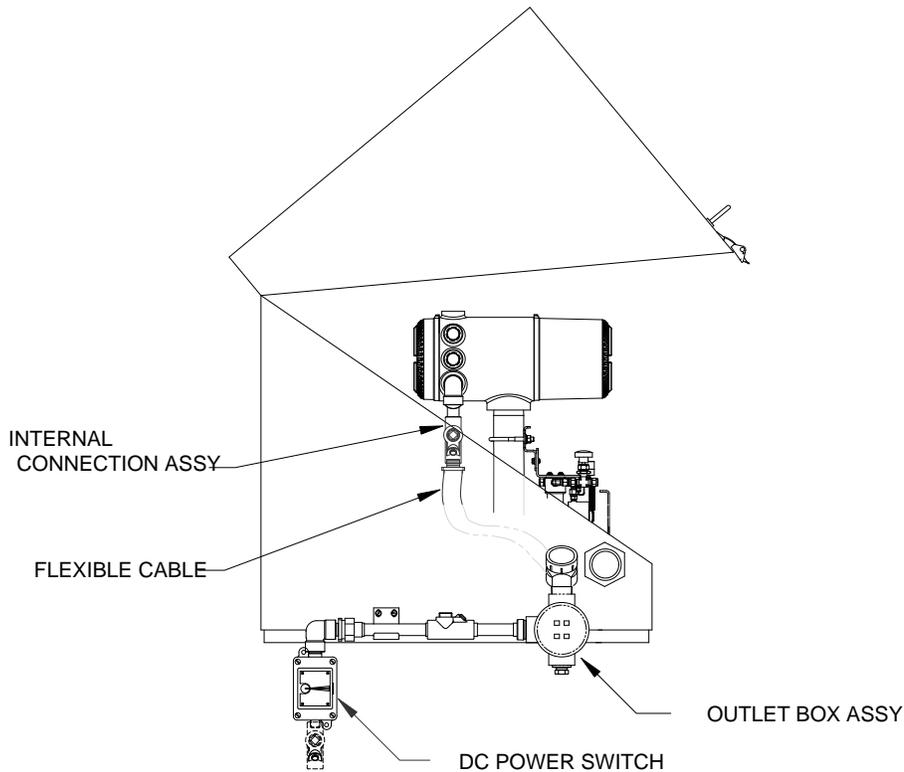
**Figure 2-28 Power Communication Outlet Box Assembly**

- 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. Begin at the end with the sealing gasket until the threads meet the conduit seal.
- 6) Rotate the flexible cable assembly clockwise. Screw the threads into the conduit seal until tight. For explosion-proof installations, a minimum of five (5) threads must be engaged.
- 7) Feed the wires through the small hole located near the sample boot in the lower front of the enclosure (see Figure 2-29).
- 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.

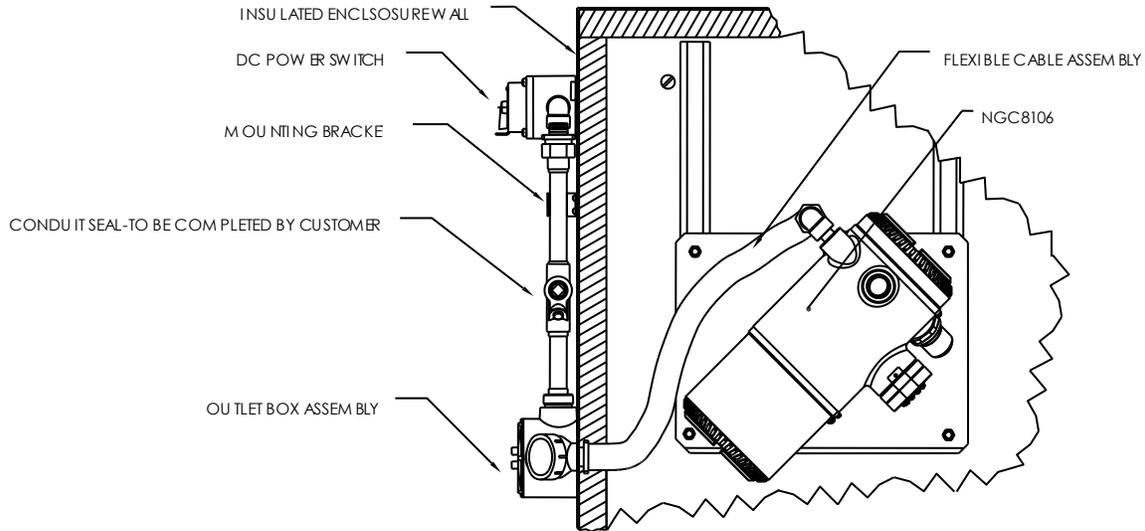
- 9) Feed the wires through the outlet box elbow and out past the wiring panel. Move the assembly up to the threaded end of the cable.
- 10) Begin threading the outlet box assembly onto the end of the flexible cable assembly. Rotate the entire outlet box assembly clockwise until snug and is in a vertical (360°) position. For explosion-proof installations, the final assembly must have a minimum of five (5) threads engaged.
- 11) Locate the support bracket mounting holes on the enclosure.

- 12) Place the split washer and 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 the hole. Do not tighten.
- 15) Repeat steps 13 through 14 for the second screw.



**Figure 2-29 ENC82L Large Enclosure**

- 16) Locate the support bracket mounting holes on the enclosure.
- 17) Place the split washer and 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. Do not tighten.
- 20) Repeat steps 18 through 19 for the second screw.
- 21) Level the bracket. Tighten the screws until snug.
- 22) Move the outlet box assembly down so that it rests on the mounting bracket (see Figure 2-30).



**Figure 2-30 Assembled Power/Communication Assembly**

- 23) At the NGC8106 termination board, trim and strip the wire ends.
- 24) Remove the power field termination J1 connector from the termination board.
- 25) Using the wiring instructions in Figure 2-31, install each wire into the correct terminal. Upon completion, replace the connector on the board.
- 26) Trim and strip the wire ends that are 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 2-31, install each wire into the correct terminal. Upon completion, replace the connector on the board.
- 29) Remove the DC power switch box cover.
- 30) Remove the switch mounting screws. When finished, remove the switch.
- 31) Cut a 3' length of power (+) wire.

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



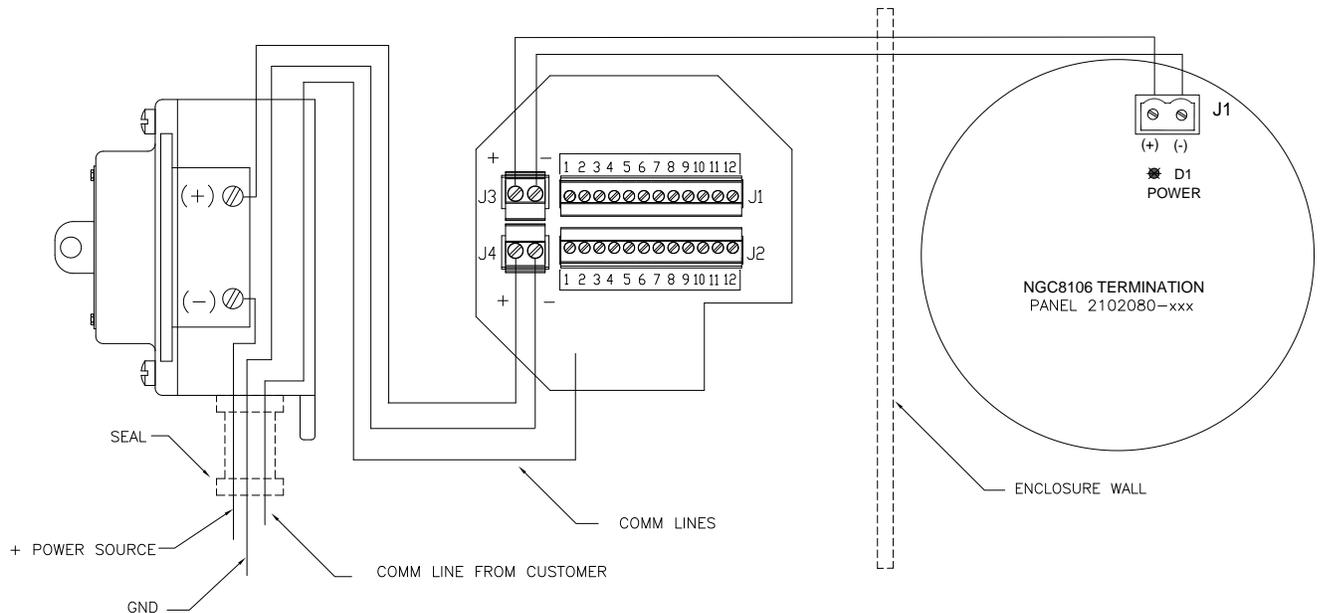
For the purpose of this manual, it is assumed that the communication wiring will be included with the power wiring in one conduit run.

- 32) Tape the 3' power (+) wire, ground and communication wire ends together.
- 33) Feed the wires through the conduit hub located on the bottom of the DC power switch box. Feed the wires past the cover opening, around the elbow and then out.
- 34) Continue pulling the 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 2-31 Power Wiring Diagram**

- 35) Feed the excess wire through the 6" nipple fitting, the conduit seal, the 5" nipple fitting and then out into outlet box opening. Pull out enough 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 2-31, install power (+) and power (-) wires into the correct terminal pins. Upon completion, replace the connector on board.
- 38) Holding the wires, slide the DC power switch box up to the 6" nipple fitting on the end of the outlet box assembly.
- 39) Slide the conduit union onto the end of nipple fitting. When finished, screw on.
- 40) Loosen the terminal screws on the DC power switch.
- 41) Using the wiring instructions in Figure 2-31, wire power (+) to the upper terminal screw. Upon completion, tighten.
- 42) Bring the new power (+) wire into the power switch enclosure and pull the short length out to allow for wiring.
- 43) Using the wiring instructions in Figure 2-31, wire the new power (+) length to the bottom terminal screw. Tighten.
- 44) Re-install the DC power switch into the box.
- 45) Using the wiring instructions in Figure 2-32 (RS-232), Figure 2-33 (RS-485) or Figure 2-34 (RS-422), make the field connections to plug the NGC8106

termination board com port(s), and re-insert into the corresponding connector in the termination board.

- 46) Make the field connections to plug J1. Upon completion, re-insert into the corresponding connector in outlet box.
- 47) Make the field connections to plug J2, and re-insert into the corresponding connector in the outlet box.

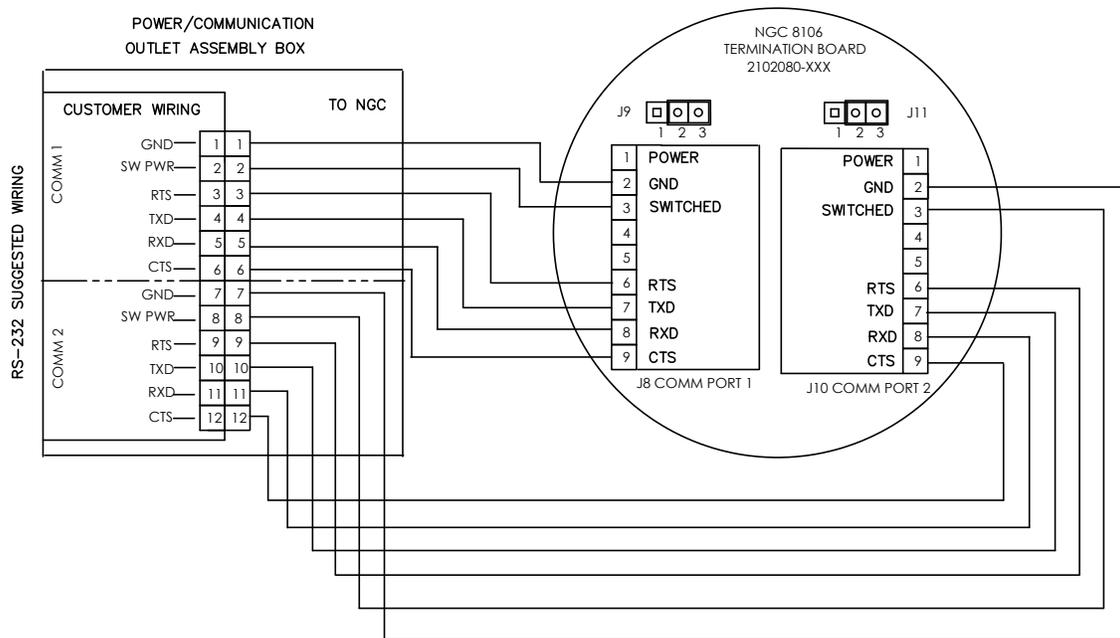


Communication wiring terminations inside the power/communication outlet box assembly are pass-through connections. This means that J1-pin 1 is associated with J2-pin 1; therefore, pin outs may be user-defined. This being the case, wiring instructions for this assembly are only suggestions.

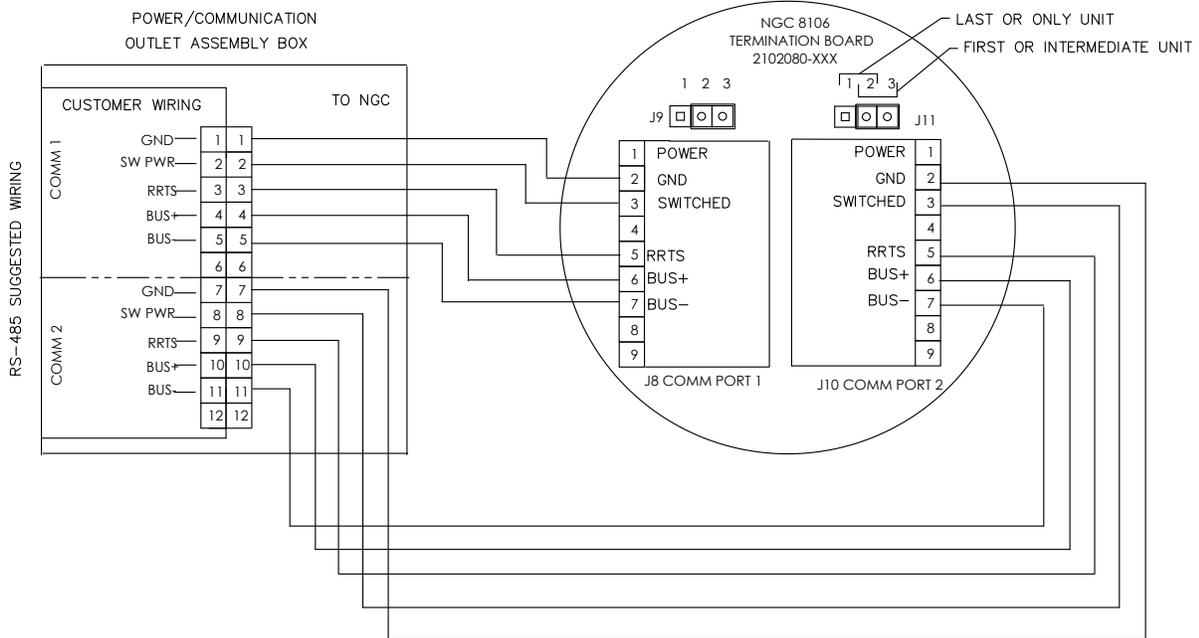


External wiring and connections should be performed by an experienced technician and follow requirements of national and local codes.

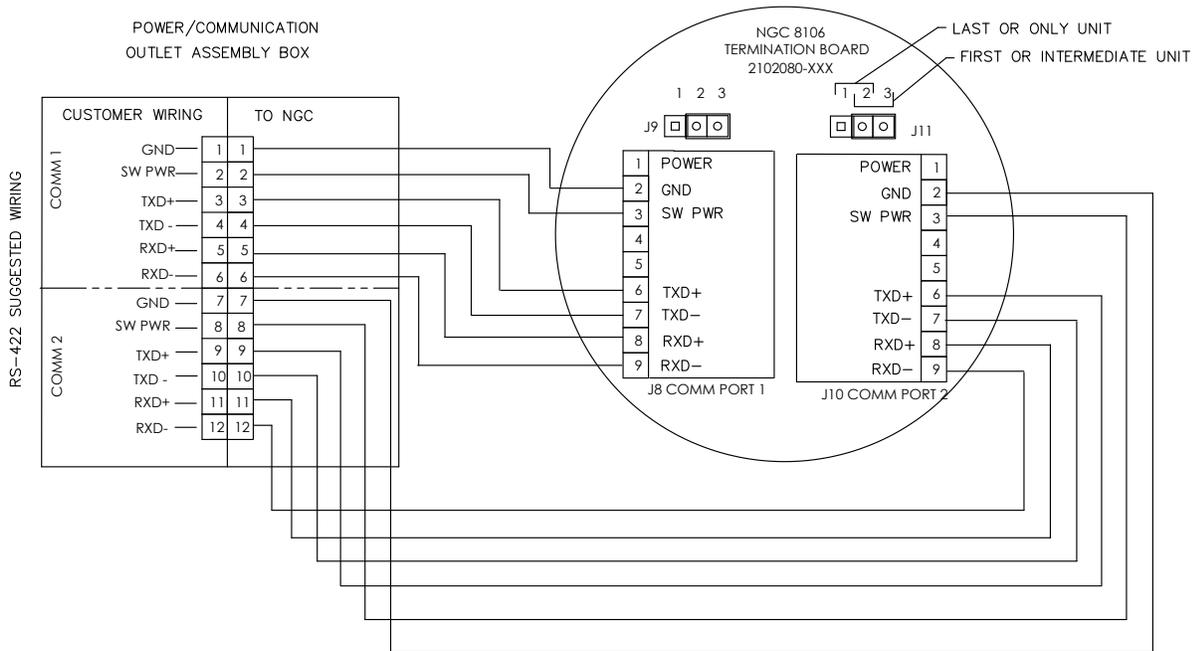
- 48) Following the instructions included with the unit, complete the seal between the DC power switch and the outlet box assembly.



**Figure 2-32 Suggested RS-232 Wiring Instructions**



**Figure 2-33 Suggested RS-485 Wiring Instructions**



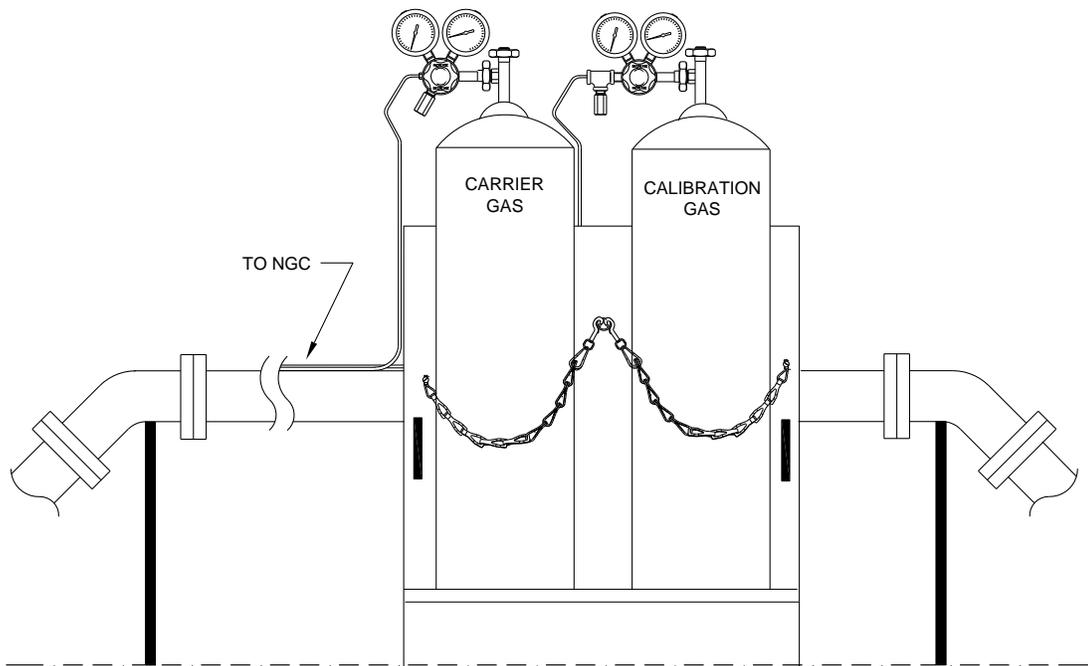
**Figure 2-34 Suggested RS-422 Wiring Instructions**

## 2.17 Carrier/Calibration Bottle Rack Installation on a 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 2-35). This bottle rack is not available through ABB Totalflow; therefore, the instructions are generalized.

### 2.17.1 Instructions

- 1) Position the bottle rack in close proximity to the NGC8106.
- 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 their falling.



**Figure 2-35 Carrier/Calibration Gas Bottle Rack Installation**

## 2.18 ENC82 Carrier Gas Bottle Rack Installation



The carrier gas bottle rack is used to hold carrier gas bottles and is installed on the back of the ENC82L or the side of the ENC82S.



A gas regulator should be installed on each gas bottle (see Figure 2-36).

### 2.18.1 Materials

- One (1) each - Bracket with chain assembly attached
- Two (2) each - 3/8"-16 x 5/8 SST hex head bolt
- Two (2) each - 3/8" SST split washers
- Two (2) each - 3/8" SST flat washers

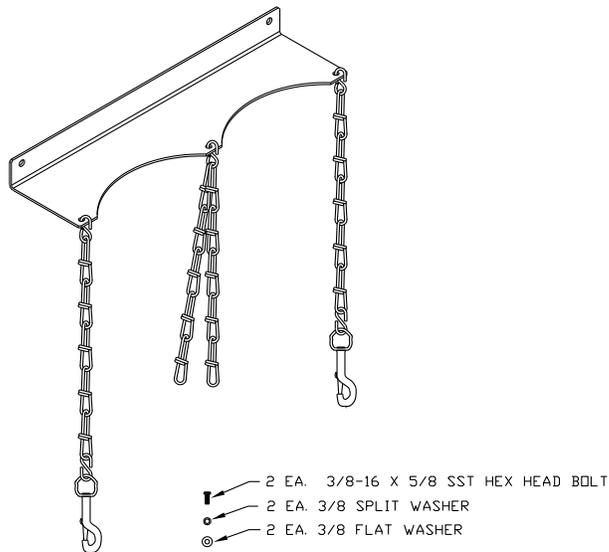
### 2.18.2 Instructions

- 1) Locate the bracket holes on the rear of the large enclosure or the side of the small enclosure stand.
- 2) Place a split washer and then a flat washer on one of the 5/8" bolts. Upon completion, insert through the bolt hole that is located in the bottle rack bracket and into the corresponding hole located along the bottom edge of the enclosure. Tighten (see Figure 2-37).

**FYI**

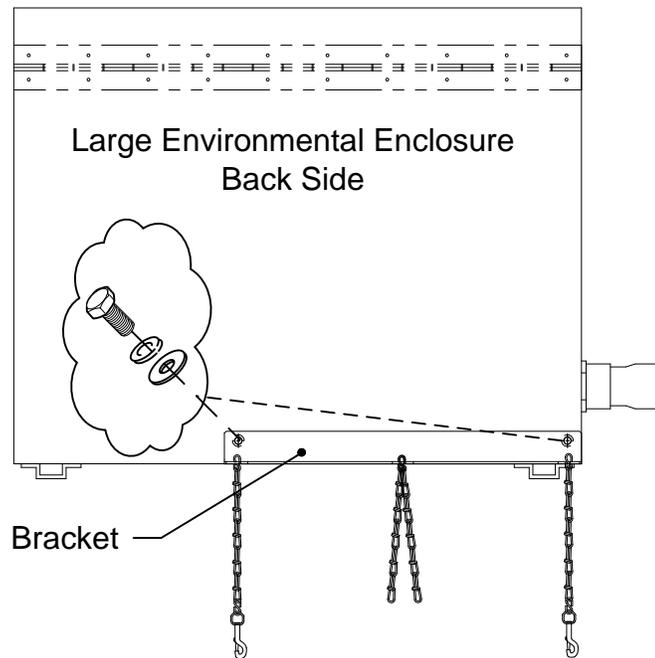


Enclosure hole contains a captive nut.

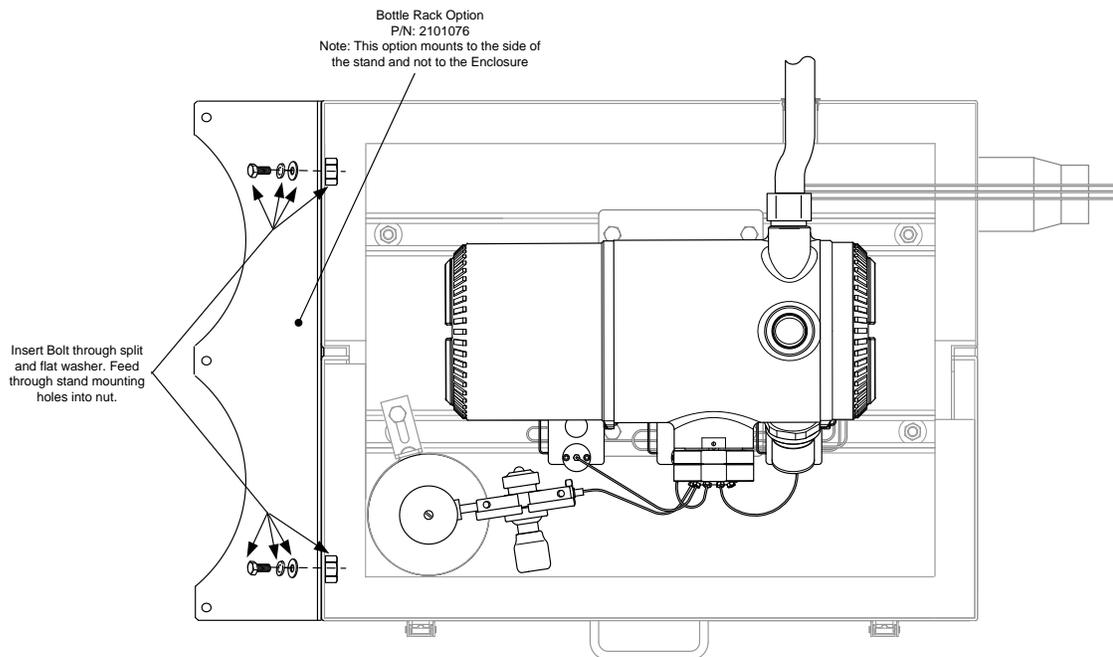


**Figure 2-36 Dual Bottle Rack Assembly**

- 3) Screw the bolt into the captive nut on the large enclosure or the nut provided with small enclosure kit. Tighten.
- 4) Repeat for the second bolt.
- 5) Install the carrier gas bottle in the bottle rack.
- 6) Using chains, strap the bottle(s) to the rack by attaching bolt snap to one of the center chains.
- 7) Repeat step 5 -6 if installing a second bottle.



**Figure 2-37 ENC82L–Dual Bottle Rack Installation**



**Figure 2-38 ENC82S–Dual Bottle Rack Installation**

## 2.19 Carrier Gas Regulator Installation

The following instructions are valid for all installations.

### 2.19.1 Materials

- Carrier regulator assembly with low pressure switch (see Figure 2-39)
- Installed carrier gas bottle

**FYI**



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

### 2.19.2 Instructions

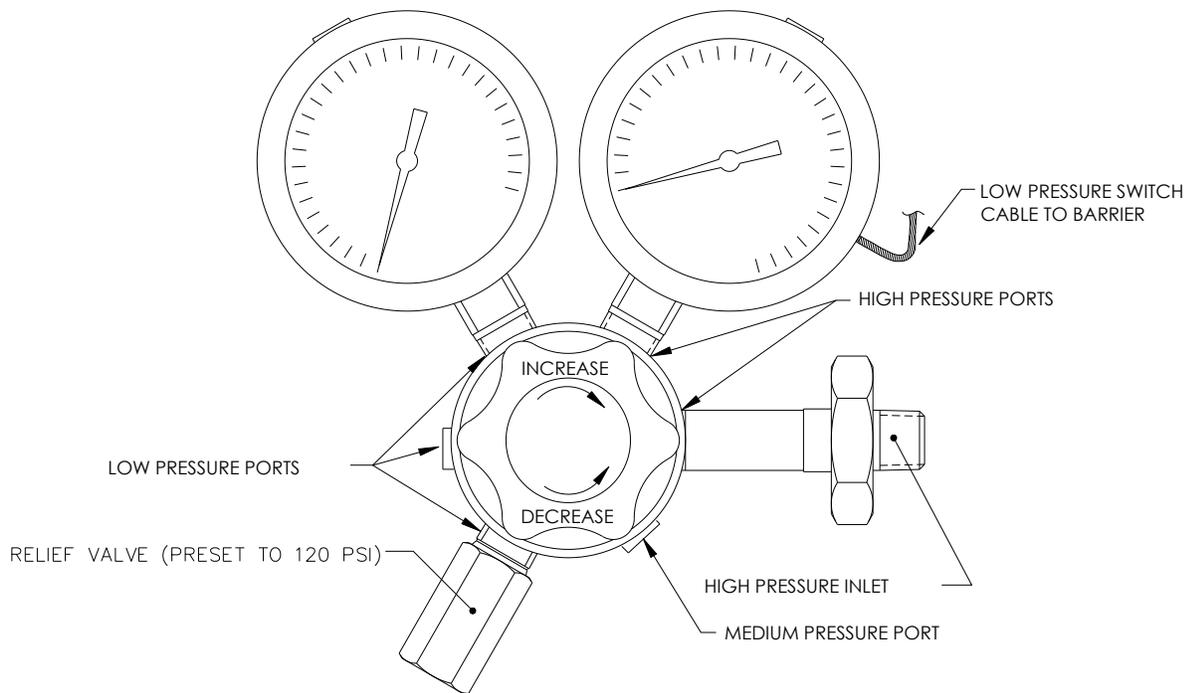
- 1) Remove the protective cap from the high pressure inlet, if required.
- 2) Insert the ferrule on the regulator high pressure inlet into the calibration gas bottle outlet.
- 3) Screw the nut onto the thread. Tighten.

**WARNING**

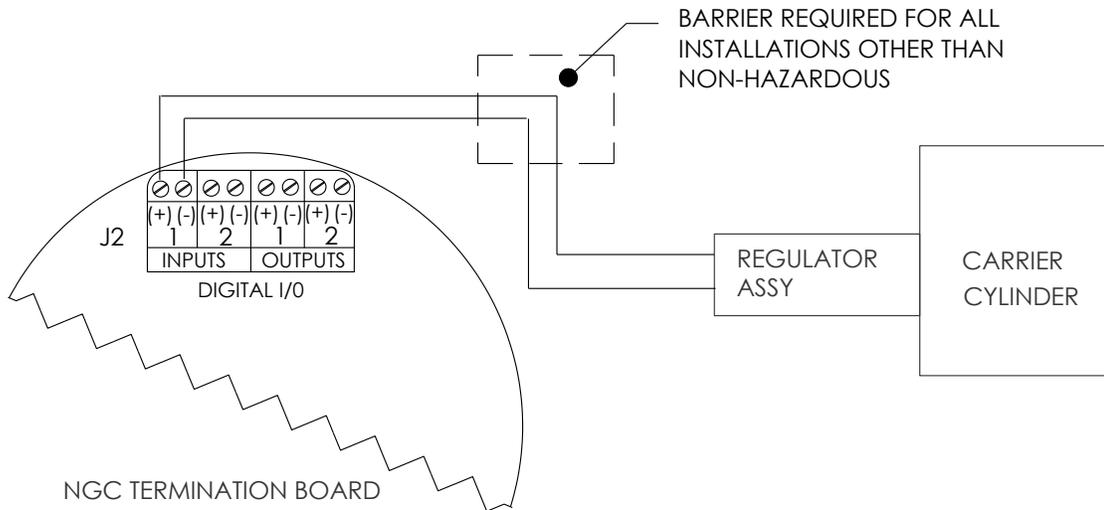


DO NOT connect the low pressure switch directly to the NGC8106 without a barrier.

- 4) Remove the J2 field wiring connector from the NGC8106 termination board that is located inside the rear of the enclosure (see Figure 2-40).



**Figure 2-39 Carrier Gas Pressure Regulator with Relief Valve**



**Figure 2-40 Carrier Gas Low Pressure Switch Wiring Instruction**

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

## 2.20 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 2-41.

**FYI**



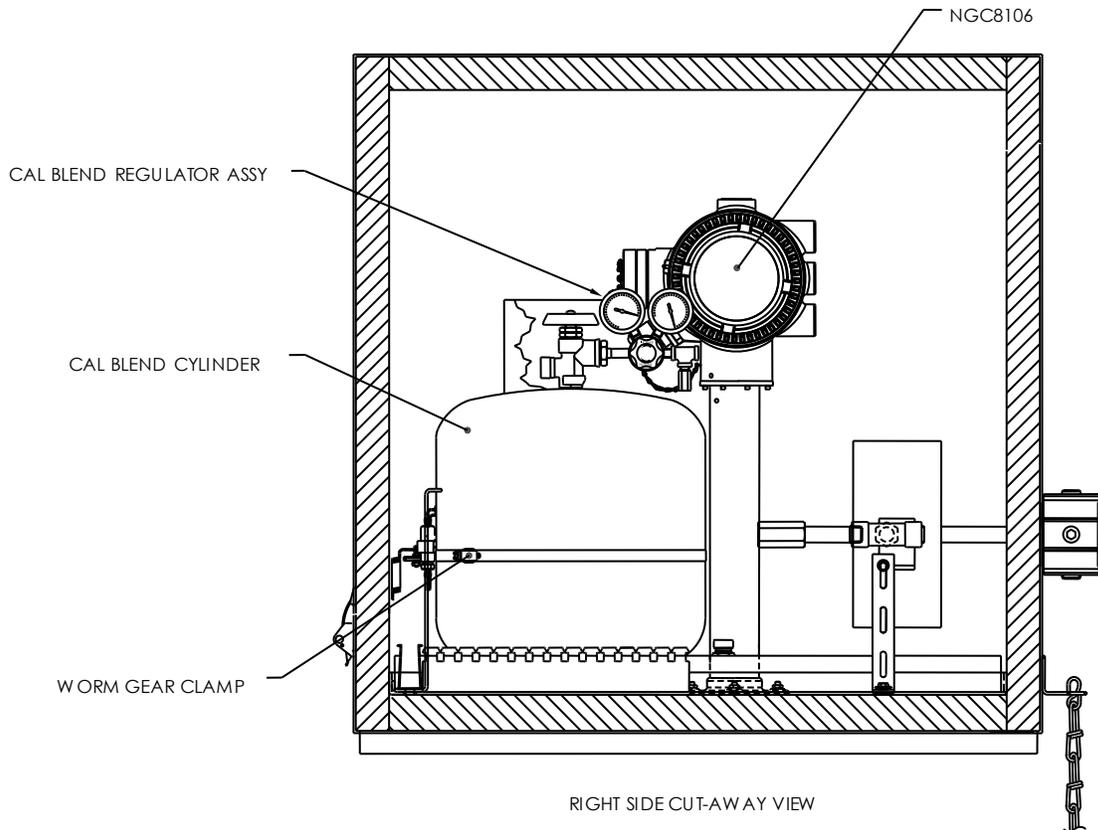
A gas regulator should be installed on each gas bottle.

### 2.20.1 Materials

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

### 2.20.2 Instructions

- 1) Locate the bottle bracket in the right front area of the environmental enclosure (see Figure 2-41).
- 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 the worm gear.
- 4) Using a flat-blade screwdriver, turn the screw on the worm gear until the strap is snug.



**Figure 2-41 Calibration Bottle Location**

## 2.21 ENC82S Calibration Gas Bottle Installation



Environmental Enclosure

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 2-42.

FYI



A gas regulator should be installed on each gas bottle.

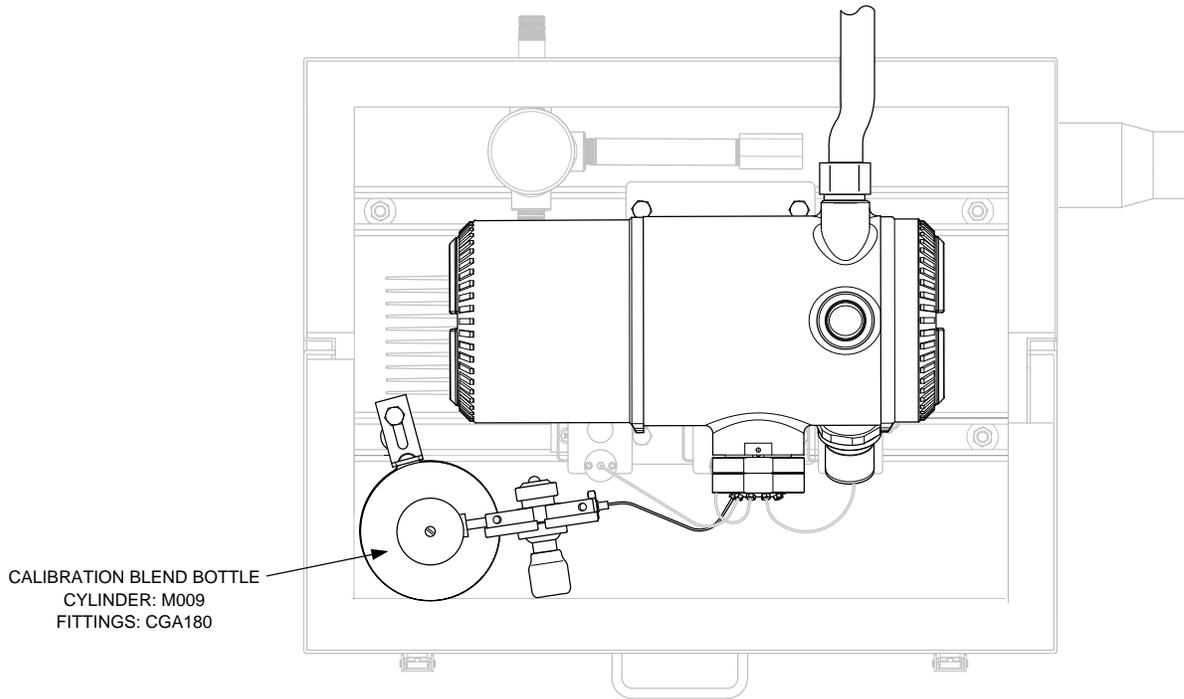
### 2.21.1 Materials

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

### 2.21.2 Instructions

- 1) Locate the bottle bracket and the bottle clamp in the left front area of the environmental enclosure (see Figure 2-42).
- 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 screwdriver, turn the screw on the worm gear until the strap around bottle is snug.



**Figure 2-42 Calibration Bottle Location**

## 2.22 Calibration Gas Regulator Installation

The following instructions are valid for all installations.

### 2.22.1 Materials

- Calibration blend regulator assembly with low pressure switch (see Figure 2-43)
- Installed calibration gas bottle

**FYI**



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

### 2.22.2 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.

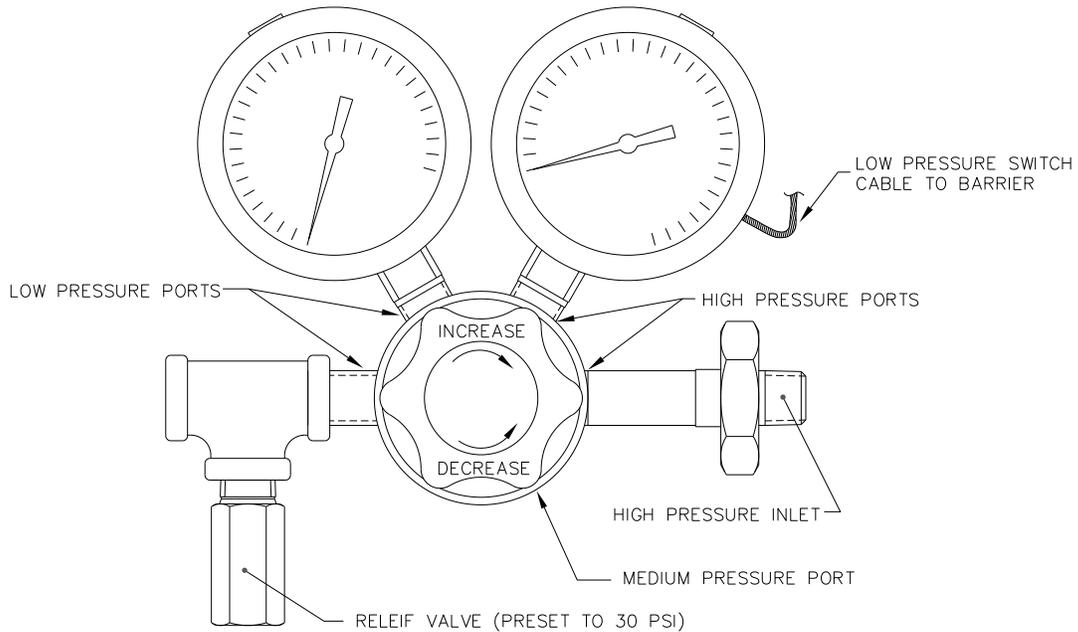
**WARNING**



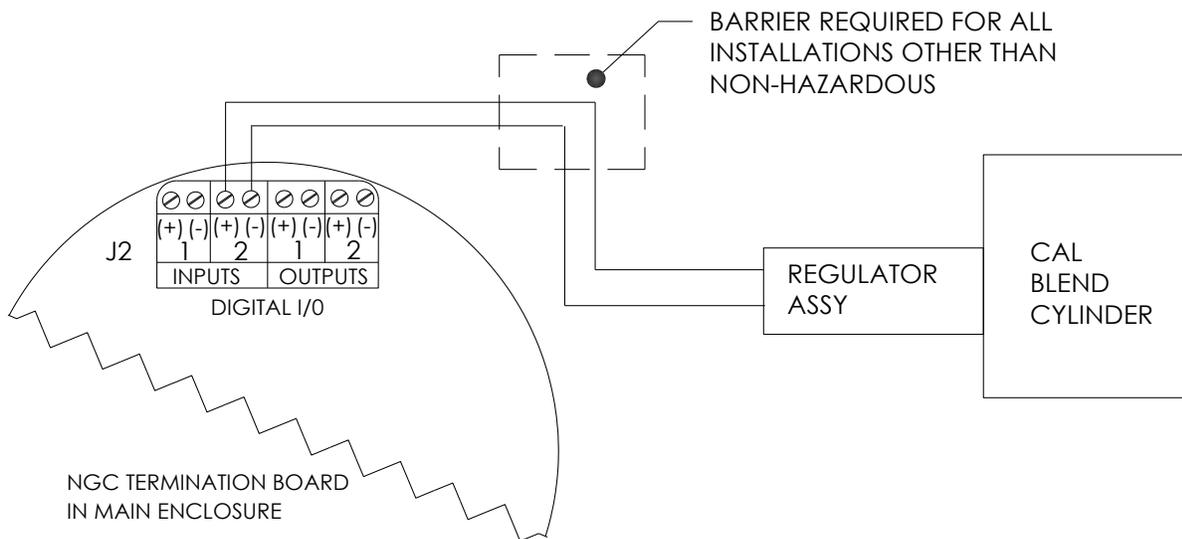
DO NOT connect the low pressure switch directly to the NGC8106 without a barrier.

- 5) Remove the J2 field wiring connector from the NGC8106 termination board that is located inside the rear of the main enclosure (see Figure 2-44).

- 6) Using a small, flat-blade screwdriver, 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 2-43 Calibration Gas Pressure Regulator with Relief Valve**



**Figure 2-44 Calibration Blend Low Pressure Switch Wiring Instruction**

## 2.23 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 NGC8106. They are applicable for both a meter run and an environmental enclosure installation.

**FYI**



The NGC8106 is a single stream sample/analyzer. The sample stream and the calibration stream share the same port on the feed-through assembly. A stainless-steel valve can be employed to switch between the sample stream and the calibration gas; however, the operator should wait for the BTU reading to level out after switching between the two sources. The shared tubing going into the feed-through must be allowed time to purge the previous gas (sample/calibration). The longer the shared portion of tubing, the longer the required purge time. If a 2-port stainless-steel valve is not employed, sample tubing and cal gas tubing will need to be swapped between normal operation and calibration procedures.

### 2.23.1 Materials

- Installed carrier gas pressure regulator
- 1/16" SST chromatography-grade transport tubing (Amount to be determined by the technician and is based on the distance from the 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 and is based on the distance from the calibration gas bottle regulator to the sample input filter)
- Four (4) each - 1/16" ferrule and nut
- Two (2) each - 1/4" NPT to 1/16" reducer or other size, as determined from the carrier/calibration gas regulator

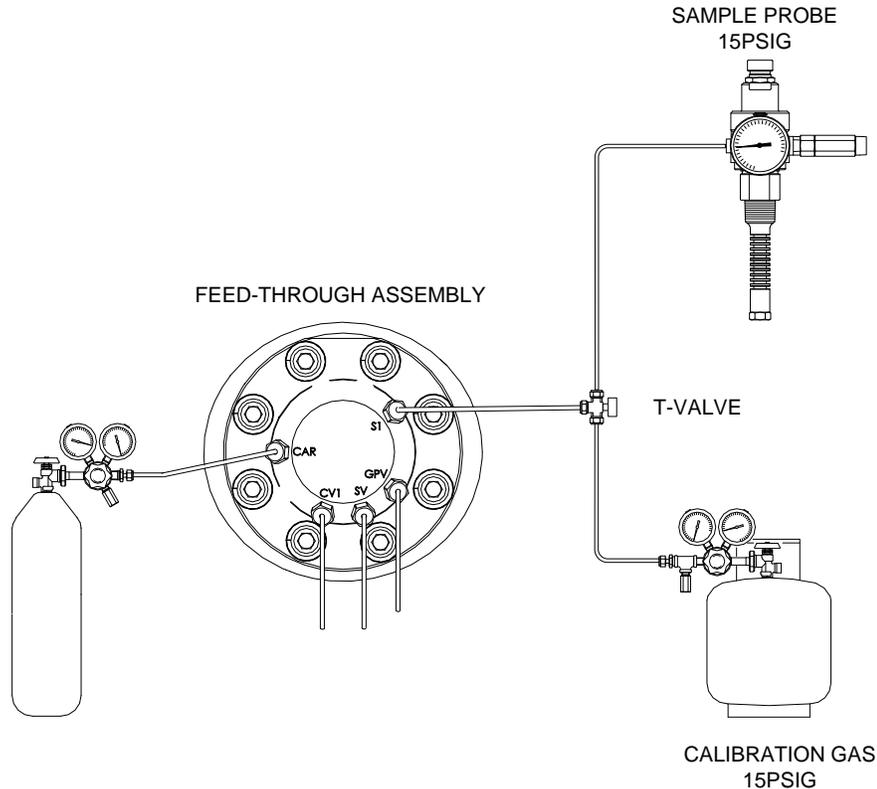
**FYI**



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

### 2.23.2 Instructions

- 1) Locate the carrier gas input port (CAR) on the NGC8106 feed-through assembly (see Figure 2-45).
- 2) Locate the 1/4" 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 NGC8106 and the pressure regulator.



**Figure 2-45 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 and tighten.
- 7) Carrier gas pressure should be set at 90 PSIG.
- 8) Locate the carrier gas input (CAR) on the NGC8106 feed-through assembly and remove the sealing screw.
- 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 port and tighten.
- 11) Calibration (and sample) gas are both connected to input port S1 on the NGC8106 feed-through assembly (see Figure 2-45) .As such, remove the sealing screw. Refer to the above FYI.
- 12) Locate the 1/4" 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 NGC8106 and the 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 that is located on the regulator.



**WARNING** 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 (S1) 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.

## 2.24 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 NGC8106 is installed in the environmental enclosure, the sample vent line **MUST** vent outside of the enclosure. Other installations may only require short lines. Please follow the requirements of national and local codes during this installation.

### 2.24.1 Materials

- Four (4) each - 1/16" ferrule and nut
- Four (4) each - 1/16" SST vent tubing (supplied with NGC8106) or
- Four (4) each - 1/16" SST tubing (Amount to be determined by the technician and is based on the distance from the NGC8106 to the external vent location)

### 2.24.2 Instructions

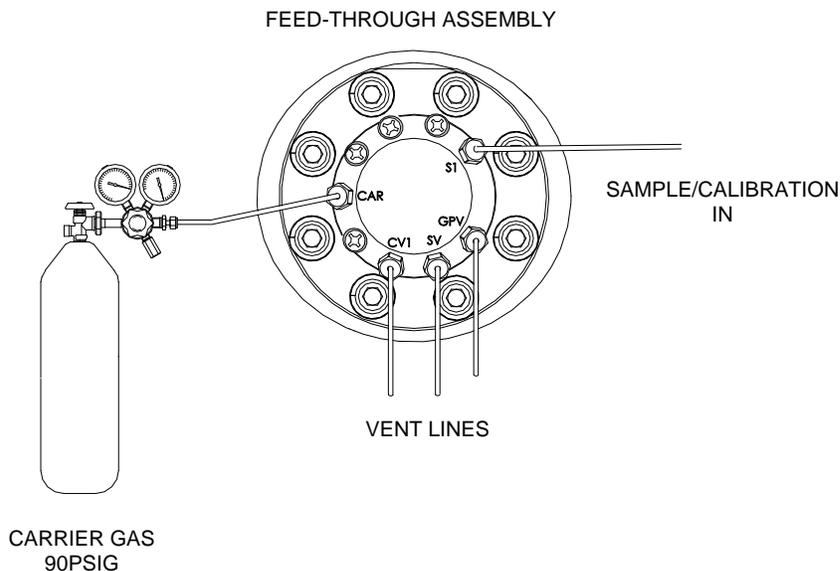
- 1) Locate the gauge port vent (GPV), sample vent (SV) and column vent 1 (CV1) ports on the NGC8106 feed-through assembly (see Figure 2-46). Remove the sealing screws for the vent ports.
- 2) Using the supplied vent tubing (if sufficient length) and ferrule, place the nut and ferrule onto the short 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 the new tubing (not supplied by ABB 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. Be careful to keep the 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.



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 2-46 Vent Line Connections on Feed-Through Assembly**

## 2.25 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.

### 2.25.1 Materials

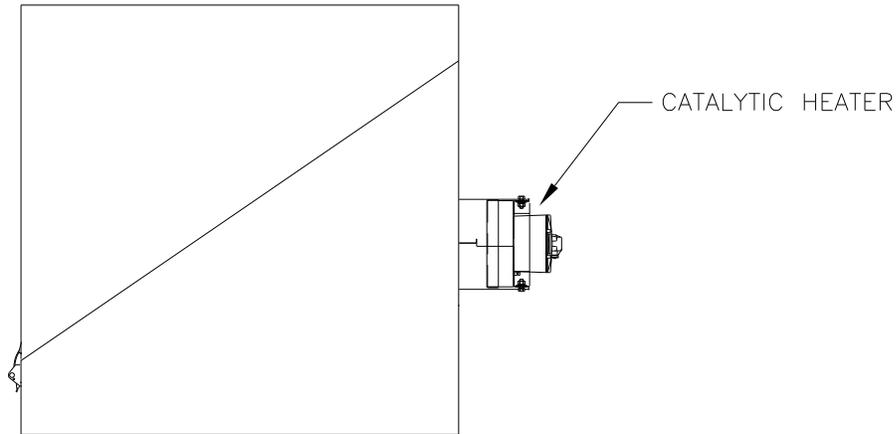
- Catalytic heater (installed at factory)
- Thermostat assembly with temperature probe
- Regulator assembly with shut-off
- T-assembly
- Tubing
- Filter/Drain Assembly
- Temperature probe mounting clip
- Teflon tape
- 1/4" male pipe connection from external gas source to catalytic heater. Materials for the gas source are not provided by ABB Totalflow.

Quantities and materials are to be determined by the technician based on installation and local codes.

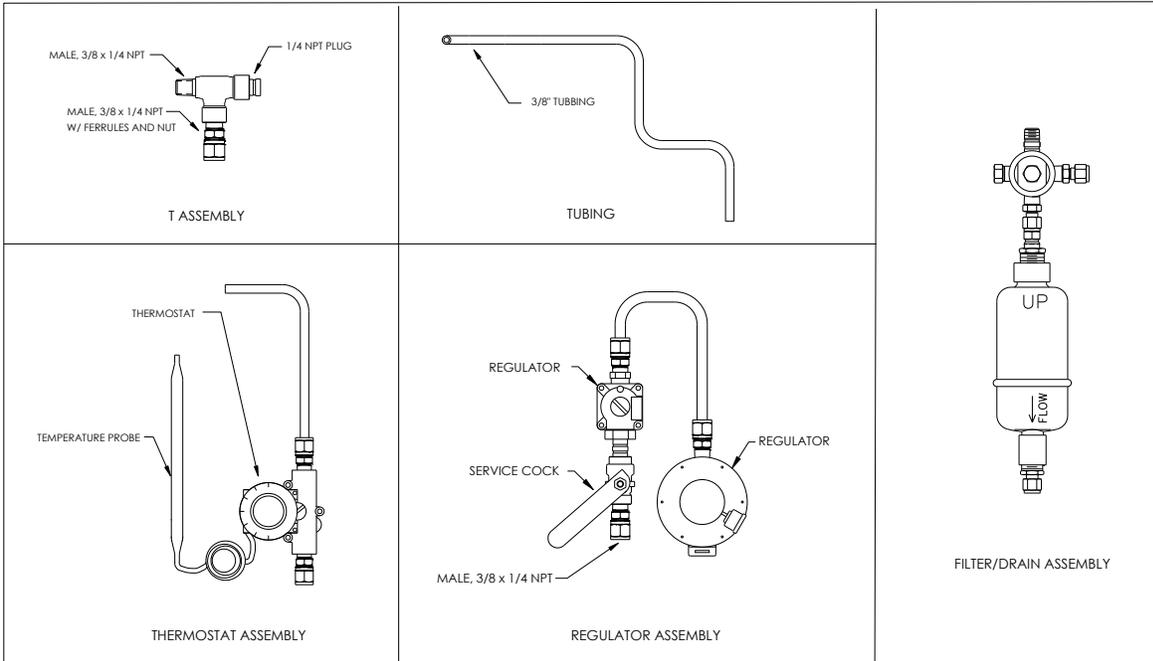
- DC power source wiring. Materials for the external power source for electrical preheat wiring are not provided by ABB Totalflow. Quantities and materials are to be determined by the technician and are based on installation and local codes.

### 2.25.2 Instructions

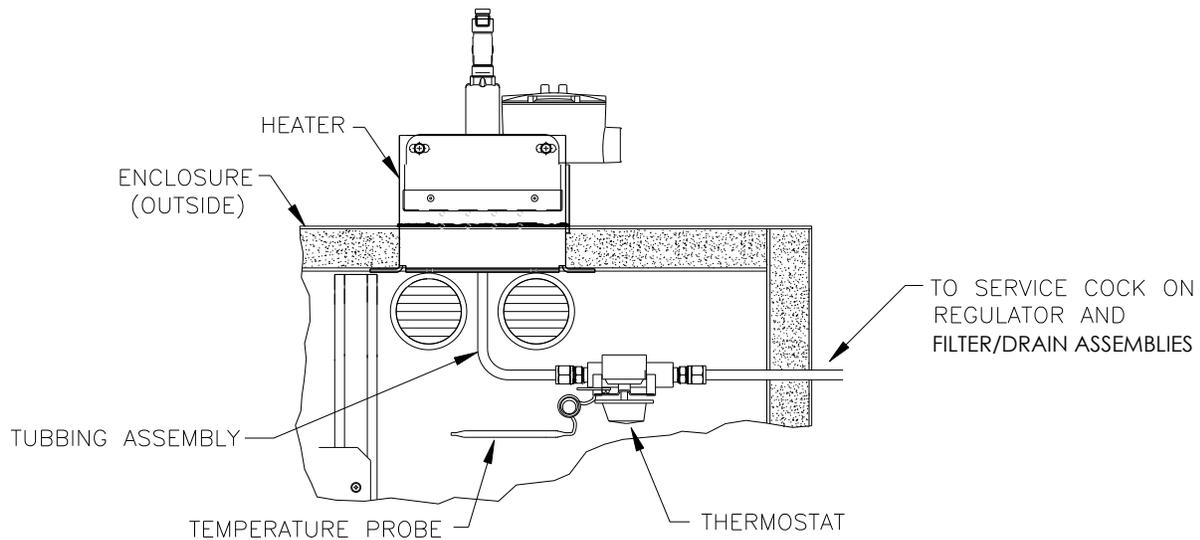
- 1) Locate the installed catalytic heater on the rear of the environmental enclosure (see Figure 2-47).
- 2) Remove the protective end cap from the catalytic heater input fitting, if required.
- 3) Apply Teflon tape to the thread's male end of the T-assembly (see Figure 2-48).
- 4) Screw the threaded end of the T-assembly into the  $\frac{1}{4}$ " female fitting located on the factory-installed catalytic heater. This is accomplished by turning the entire assembly clockwise until tight (see Figure 2-49).



**Figure 2-47 Catalytic Heater Option in Environmental Enclosure**

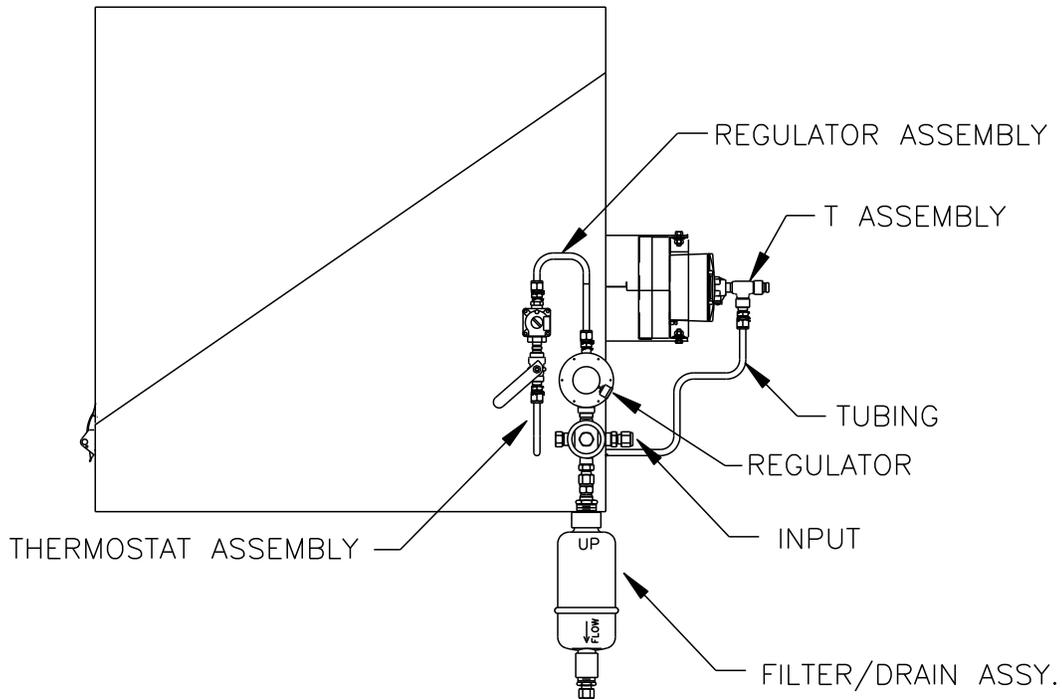


**Figure 2-48 Catalytic Heater Assemblies**



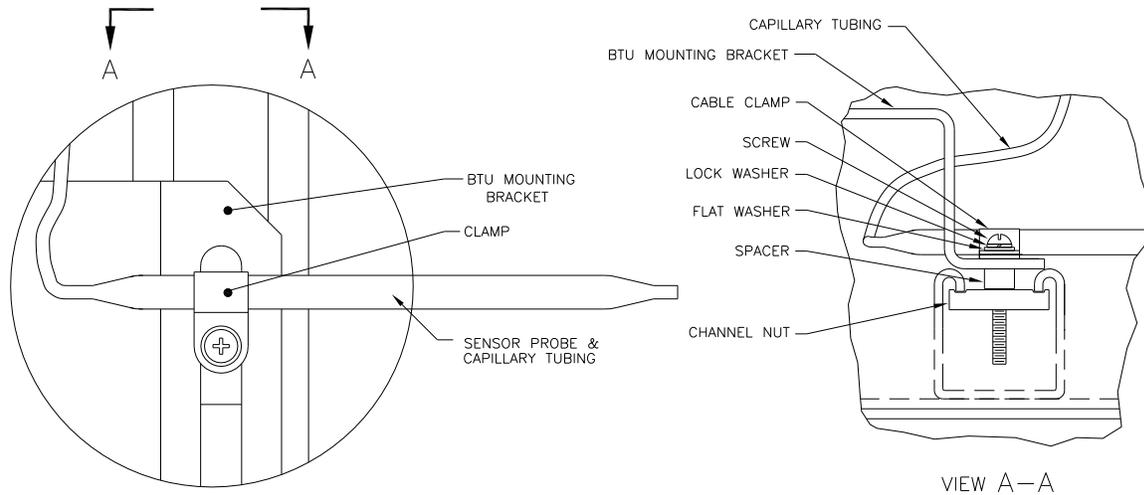
**Figure 2-49 Thermostat Assembly Installed**

- 5) Screw the threaded end of the T-assembly into the 1/4" female fitting located on the factory-installed catalytic heater. This is accomplished by turning the entire assembly clockwise until tight (see Figure 2-50).
- 6) Remove the ferrules and nut from the bottom of the T-assembly. Apply Teflon tape to the threads.
- 7) Insert the short, bent end of the 3/8" tubing closest to longest straight portion of the tubing and then through the hole located below catalytic heater.



**Figure 2-50 Regulator and Filter/Drain Assembly Installed**

- 8) Place the nut, front ferrule and back ferrule onto the opposite end of the tubing. Position so that the ferrules and nut screw onto the bottom of the T-assembly. Screw the nut until tight.
- 9) Remove the ferrules and nut from the thermostat end of the thermostat assembly. Apply Teflon tape to the threads.
- 10) Insert the tube end of the thermostat assembly through the exterior wall on the side of the enclosure (see Figure 2-50).
- 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 the end of the regulator assembly closest to the service cock. Apply Teflon tape to the threads.
- 13) Place the nut, front ferrule and back ferrule onto the end of the thermostat assembly that is 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 2-50).
- 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. Tighten the nut.
- 17) Gently uncoil the temperature probe capillary tubing from the thermostat. Insert through the hole that is located below the thermostatic gas valve. Be careful to not crimp or make sharp bends in the capillary tubing (see Figure 2-51).
- 18) Remove the mounting screw and washers from the right rear NGC8106 mounting bracket (see Figure 2-51).



**Figure 2-51 Temperature Probe Installation**

- 19) Insert the screw with the washers still in place through the hole located on the mounting clip. Re-insert through the mounting bracket and into the channel nut (see Figure 2-51).
- 20) Position the probe underneath the mounting clip. Tighten the screw into the channel nut to hold the probe in place.



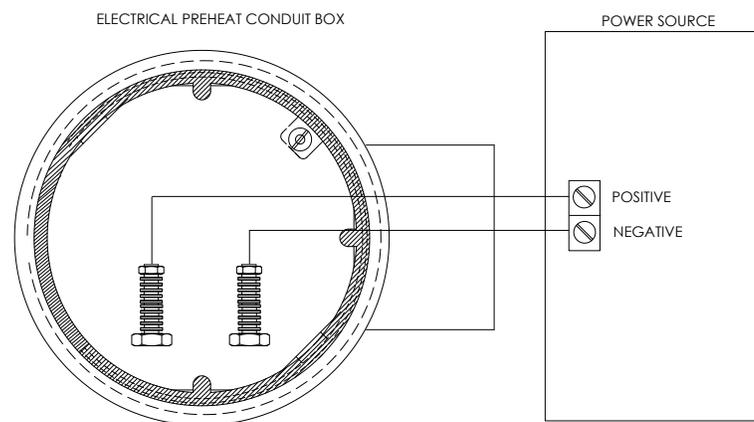
**WARNING** The technician responsible for installing the gas supply should follow local and national codes.

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



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

- 22) Using the wiring instructions shown in Figure 2-52 and the manufacturer's instructions enclosed with heater, make the external connections.



**Figure 2-52 Electrical Pre-Heater Wiring Instructions**

## 2.26 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, the external gas connections, electrical pre-heater wiring and installation of the filter drain kit are the only things required.

### 2.26.1 Materials

- Teflon tape
- 1/4" male pipe connection from the external gas source to the catalytic heater. Materials for the gas source are not provided by ABB Totalflow. Quantities and materials are to be determined by the technician and are based on installation and local codes.
- DC power source wiring. Materials for the external power source for electrical preheat wiring are not provided by ABB Totalflow. Quantities and materials are to be determined by the technician and are based on installation and local codes.

### 2.26.2 Instructions



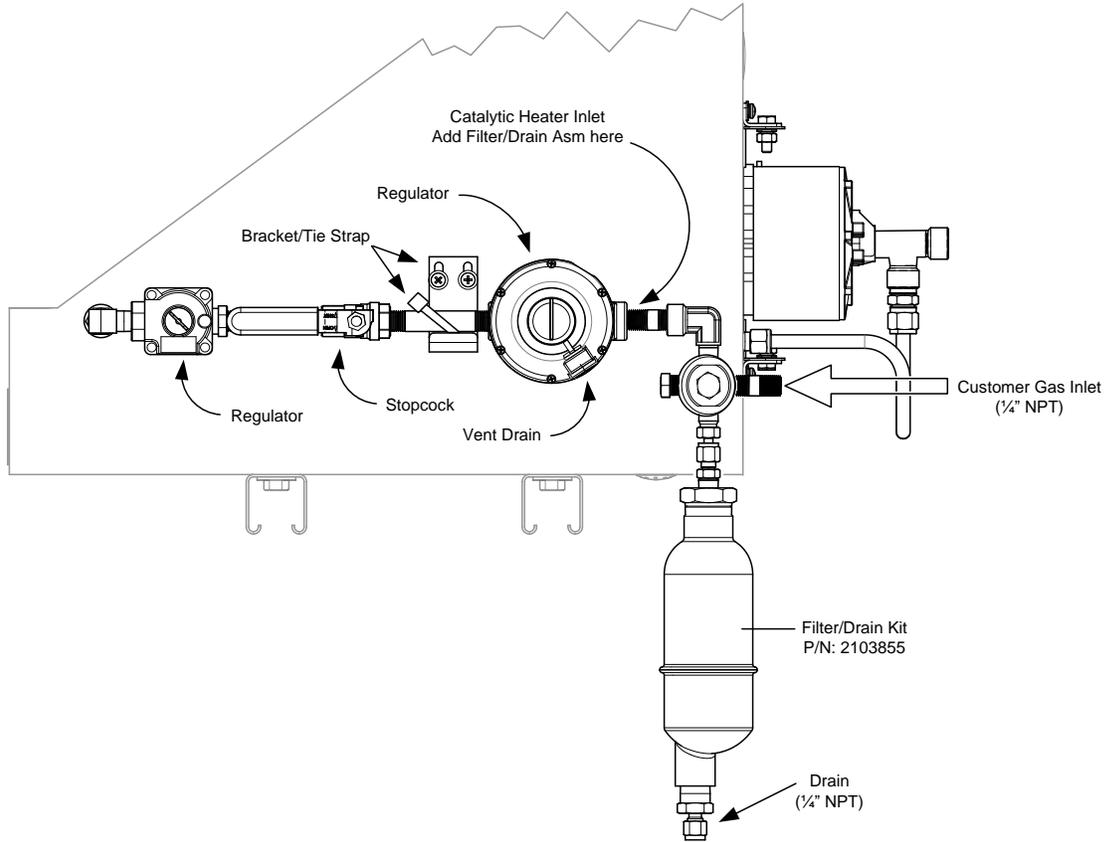
The technician responsible for installing the gas supply should follow local and national codes.

- 1) Using the manufacturer's instructions supplied with the regulator, make the 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. Tighten the nut (see Figure 2-53).

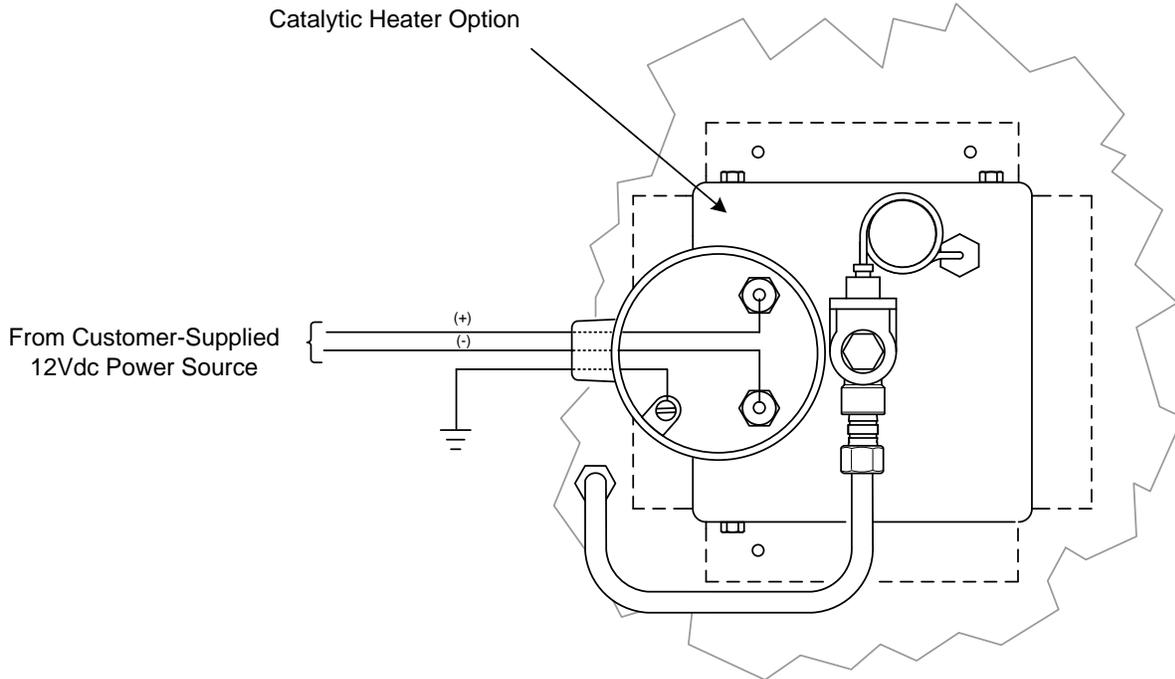


The technician responsible for installing the power supply should follow local and national codes.

- 4) Using the wiring instructions shown in Figure 2-52 and the manufacturer's instructions enclosed with the heater, make the external connections.



**Figure 2-53 ENC82S Filter/Drain Assembly Installation**



**Figure 2-54 ENC82S Catalytic Heater Pre-Heat Wiring**

## 2.27 ENC82 Optional Electric Heater Installation



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



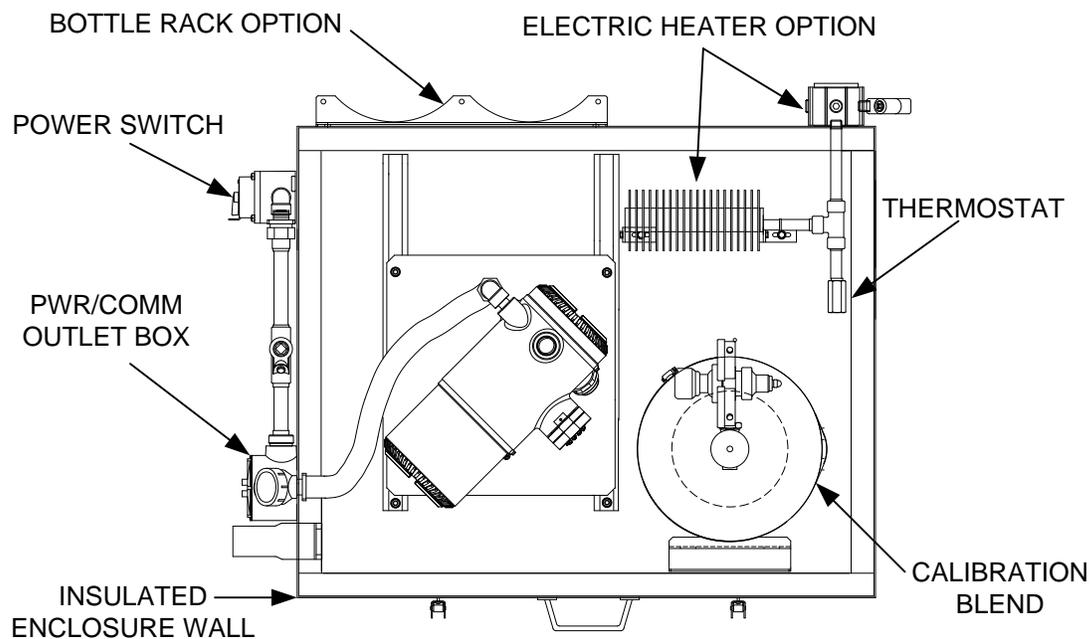
Verify the heater and fittings are approved for the classification rating of the area of installation.

### 2.27.1 Materials

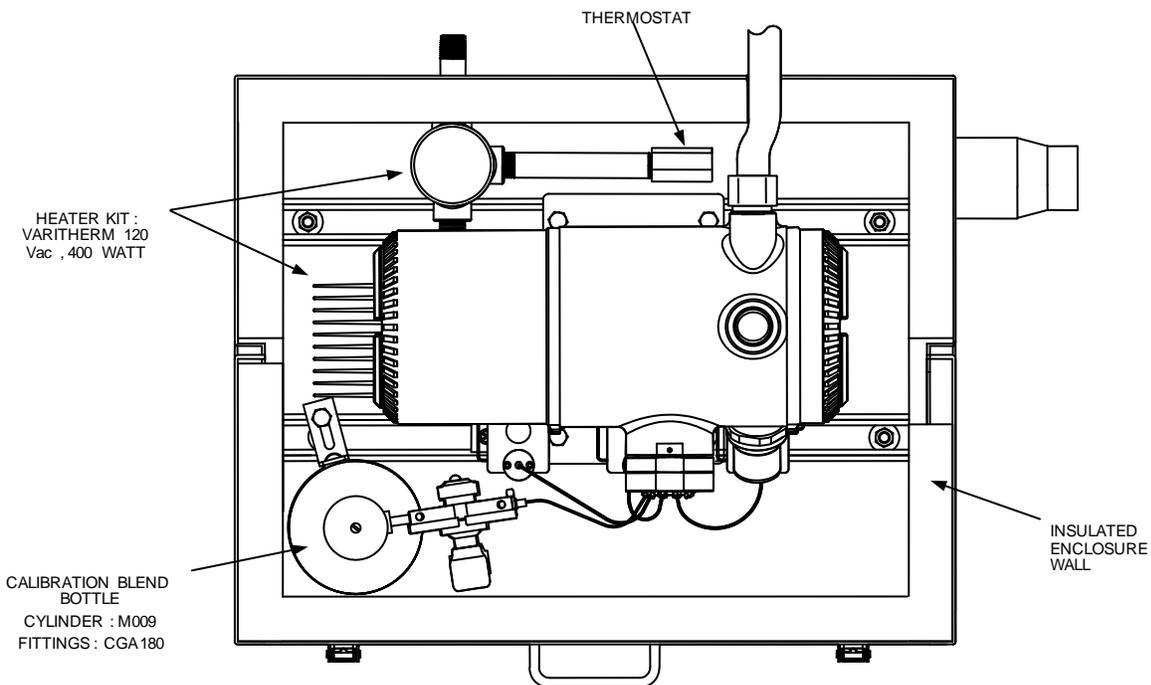
- Electric heater option (Factory Installed. See Figure 2-55 and Figure 2-56).
- AC power source wiring. Materials for the external power source for electric heater wiring are not provided by ABB Totalflow. Quantities and materials are to be determined by the technician and are based on installation and local codes.



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



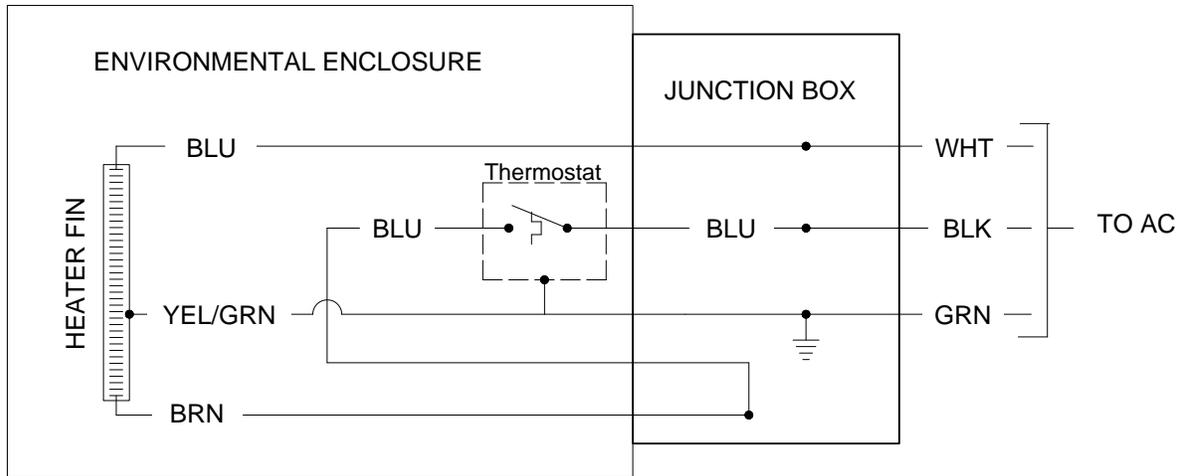
**Figure 2-55 ENC82L Electric Heater Installed in Enclosure**



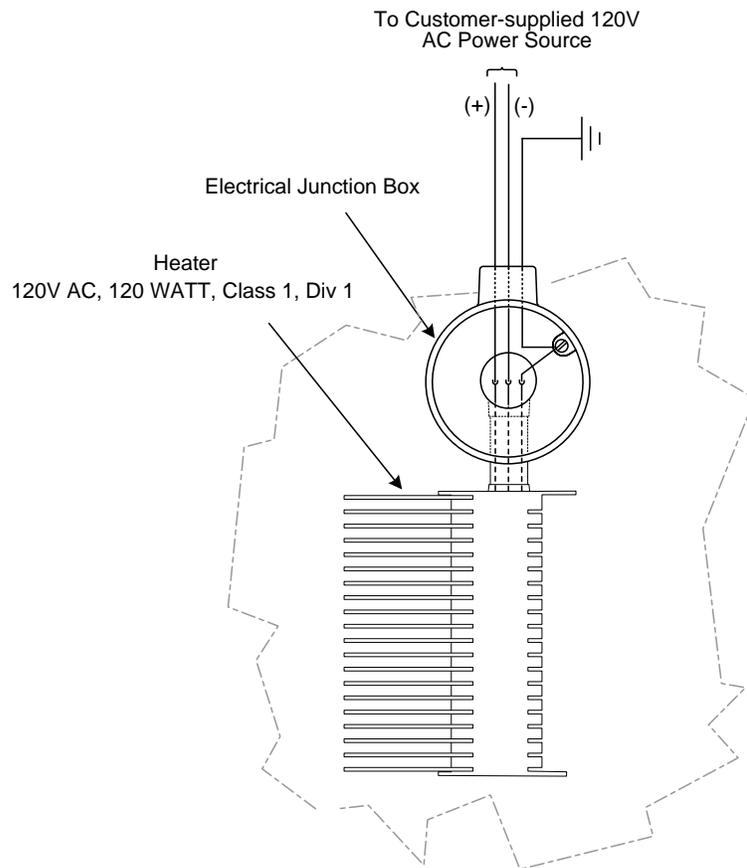
**Figure 2-56 ENC82S Electric Heater Installed in Enclosure**

### 2.27.2 Instructions

- 1) Using the wiring instructions shown in Figure 2-57 or the manufacturer's instructions enclosed with the heater, make the external connections.



**Figure 2-57 ENC82L Electric Heater Option Wiring Instructions**



**Figure 2-58 ENC82S Electric Heater Option Wiring Instructions**

## 2.28 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.

### 2.28.1 Customer Supplied Materials

- Aerosol-insulating foam

### 2.28.2 Instructions

- 1) When all sample and vent connections are complete, apply aerosol-insulating foam from inside the enclosure. The user needs to ensure that they are pointing toward the outside of boot. Make sure that the overspray falls outside the enclosure.

## 2.29 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 NGC8106, communication equipment, solar power charger and additional I/O.

Three enclosures are commonly used for the NGC8106 installation: the 6200, 6700 or 6800 enclosures. The unit may be mounted on a 2" pipe or mounted on a flat surface such as a wall.

If configured, 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.

### 2.29.1 6200 Optional Equipment Enclosure

The 6200 can accommodate the following equipment:

- Power supply kit for 6200
  - 110/240 Volt to 12 Vdc
  - 110/240 Volt to 24 Vdc

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

### 2.29.2 6700 Optional Equipment Enclosure

The 6700 enclosure can accommodate the following:

- Power supply kit
  - 120/240 Vac / 12 Vdc power supply
  - 110/240 Volt to 12 Vdc

- 110/240 Volt to 24 Vdc

### **2.29.3 6800 Enclosure**

The 6800 enclosure can accommodate the following:

- Solar panel power option (12 or 24 Vdc option)
- 115/230 Vac UPS power option (24 Vdc systems only)

### **2.29.4 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 NGC8106. Avoid obstructions.

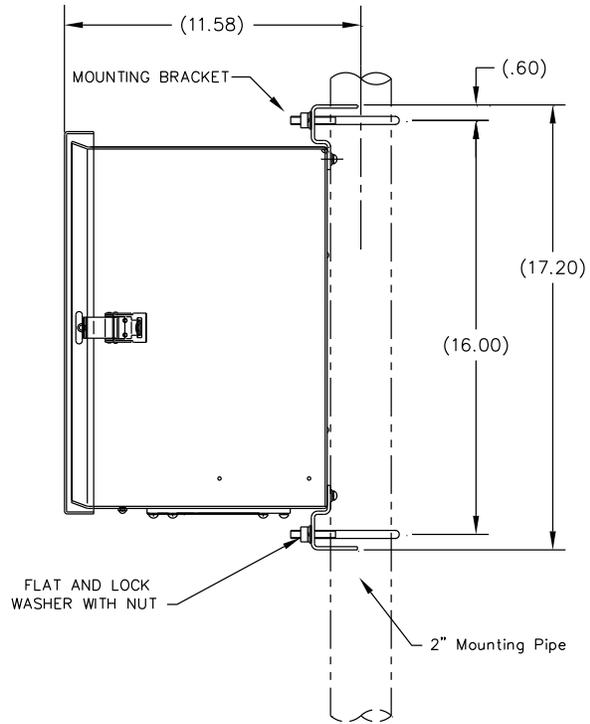
### **2.29.5 Pipe-Mount Instructions**

The enclosure mounting brackets and fastening hardware are supplied with the unit. The user must provide a 2" pipe of suitable length (see Figure 2-59).

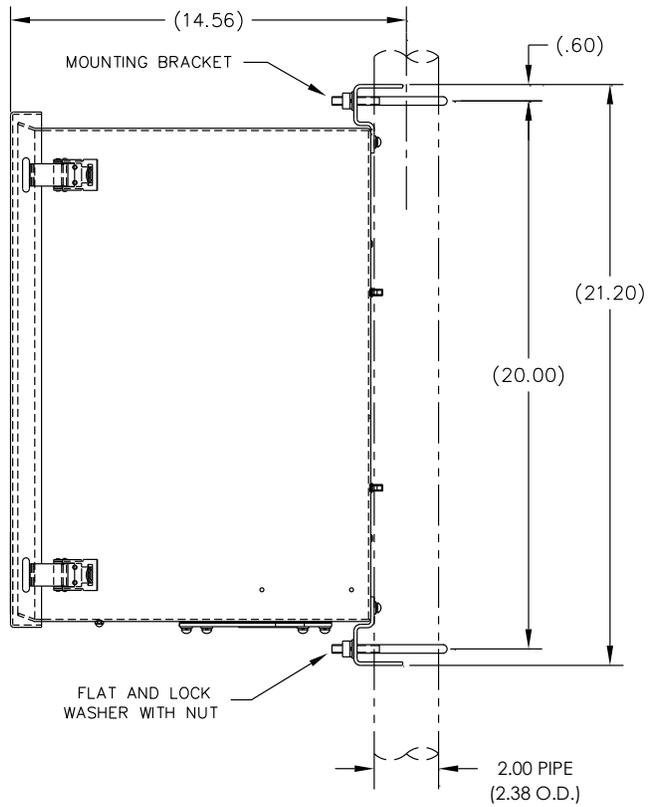
If a charging source such as a solar panel is preferred, this procedure may be adapted to mount the solar panel on the upper portion of the pipe.

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

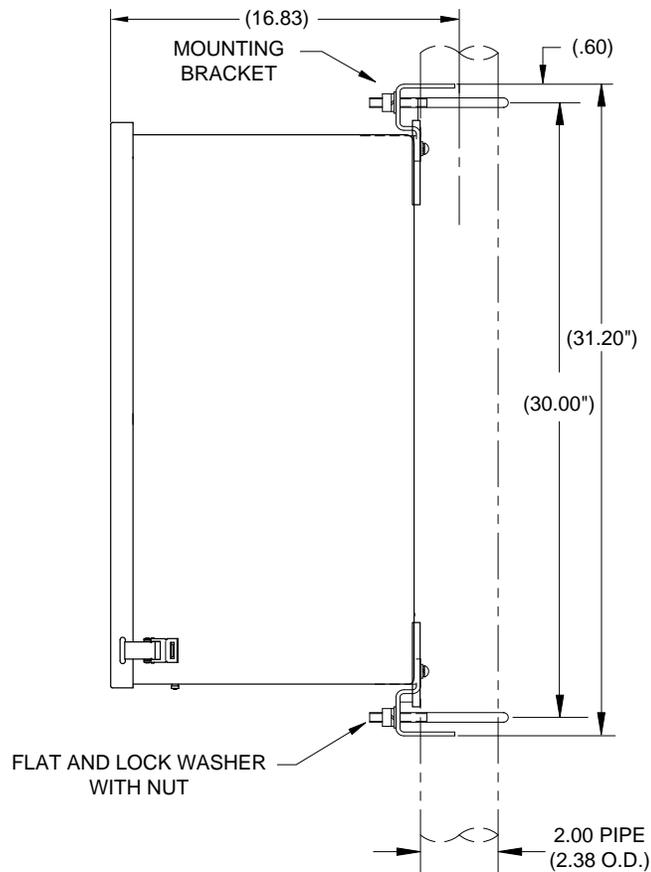
- 1) When the unit is received, unpack and inspect all components for evidence of damage. Report damage to the shipping carrier and to ABB Totalflow's service department.
- 2) Using instructions supplied with the mounting kit, attach the bracket to the back of the enclosure unit.
- 3) Position the unit on the 2" mounting pipe, and secure in place with two U-bolts, split washers, flat washers and two bolts (see Figure 2-59, Figure 2-60 and Figure 2-61).



**Figure 2-59 6200 Enclosure Pipe-Mounting Installation**



**Figure 2-60 6700 Enclosure Pipe-Mounting Installation**



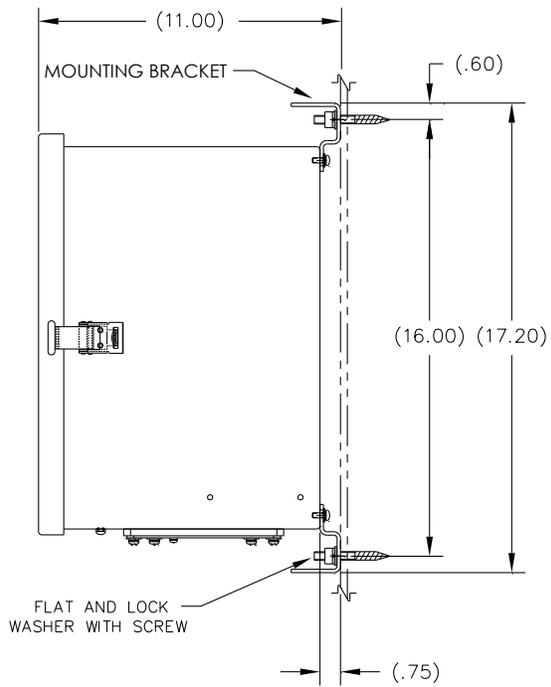
**Figure 2-61 6800 Enclosure Pipe-Mounting Installation**

### 2.29.6 Wall-Mount Instructions

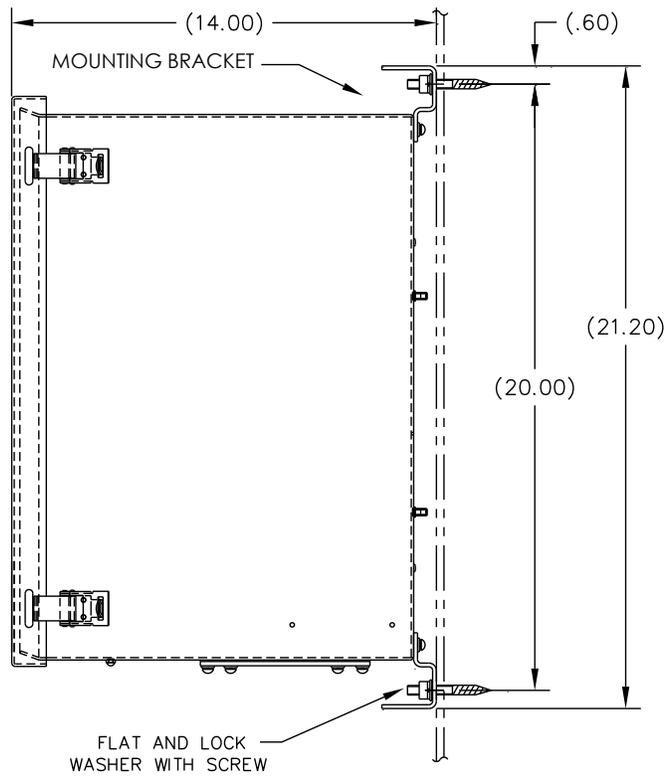
Before beginning, review the procedures and the materials required for installation. A typical installation should be similar to Figure 2-62, Figure 2-63 and Figure 2-64.

The enclosure mounting brackets and fastening hardware are supplied with the unit.

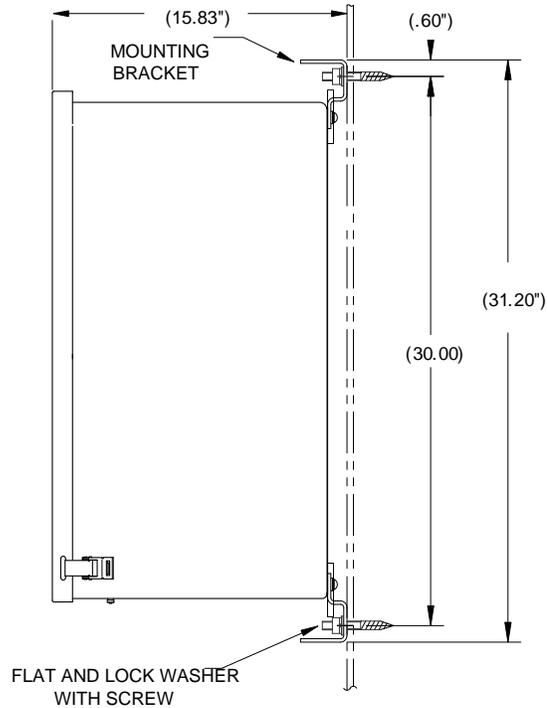
- 1) When the unit is received, unpack and inspect all components for evidence of damage. Report damage to the shipping carrier and to ABB Totalflow's service department.
- 2) Using instructions supplied with the mounting kit, attach the bracket to the back of the enclosure unit.
- 3) Prepare the wall surface for mounting and mount the enclosure to the wall.



**Figure 2-62 6200 Enclosure Wall-Mounted Installation**



**Figure 2-63 6700 Enclosure Wall-Mounted Installation**



**Figure 2-64 6800 Enclosure Wall-Mounted Installation**

## 2.30 115/230 Vac UPS Power Pack (24 Vdc Systems)

Before beginning, review the procedures 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.

### 2.30.1 Instructions

- 1) If configured, the optional equipment unit should contain an installed power pack. The optional equipment enclosure should be installed using the previous instructions within 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 NGC8106 section in Chapter 1 - System Description before making power connections.





**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.

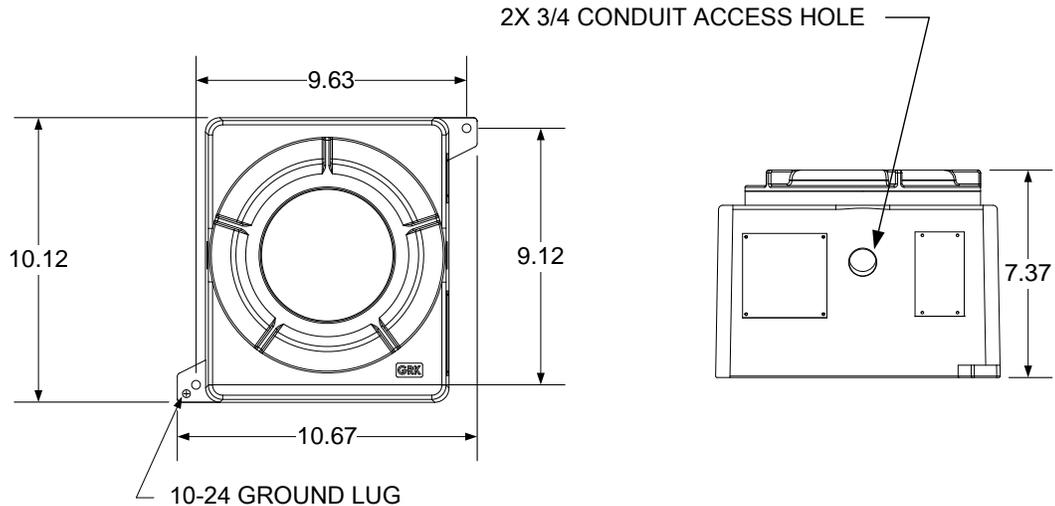


**WARNING**

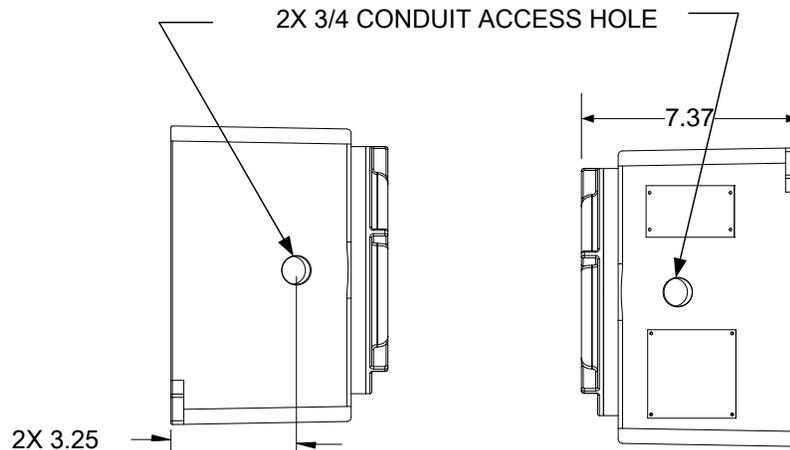
Installation must be performed by person(s) qualified for the type and area of installation according to national and local codes.

### 2.31.1 Customer Supplied Materials

- Plastic cable ties
- AC wiring. Please refer to the cable recommendation chart in Chapter 1 (see Table 1–5).
- 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 2-66 Explosion-Proof AC Power Supply Top/Front Dimensions**



**Figure 2-67 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.

**2.31.2 Instructions**

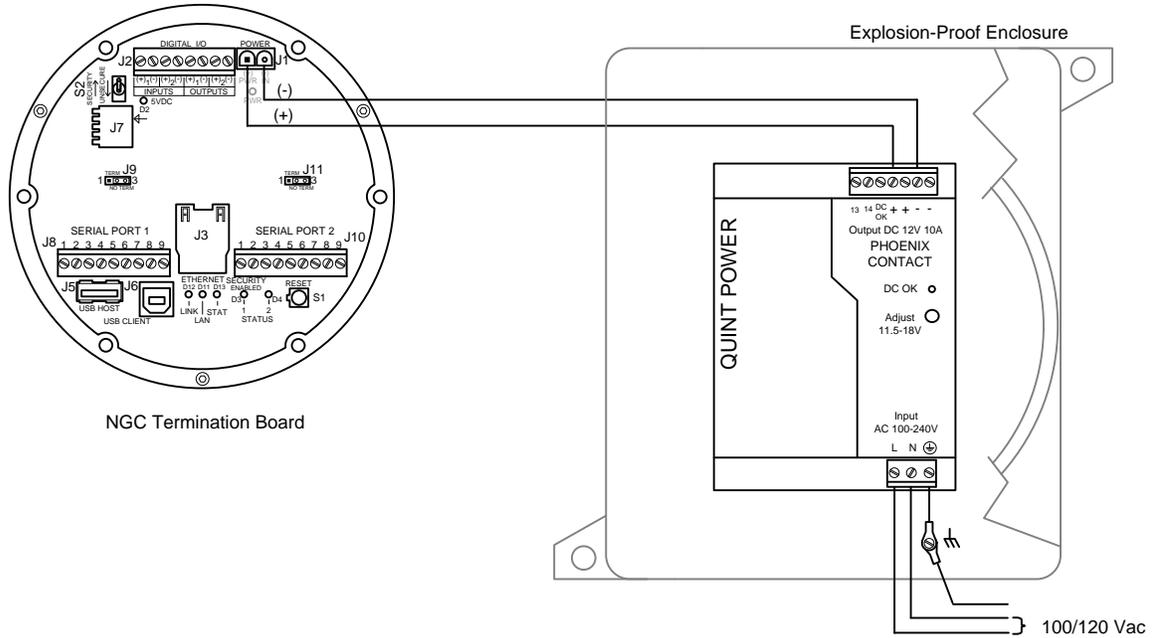
- 1) The AC power supply is shipped separately. When the unit is received, unpack and inspect all components for evidence of damage. Report damage to the shipping carrier and to ABB Totalflow's service department.
- 2) Mount the explosion-proof enclosure on a nearby wall or panel. Make sure that the rigid, explosion-proof conduit or appropriate flexible conduit can be installed between the power supply's explosion-proof enclosure and the NGC8106. Avoid obstructions.
- 3) Remove the necessary plugs from the side of the explosion-proof enclosure to install the rigid conduit.



**CAUTION**

Please review the Grounding the NGC8106 section in Chapter 1-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 2-68, 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 NGC8106 into the power supply enclosure. See Table 1-4 in Chapter 1 for wire sizes.
- 7) Remove the J1 connector from the NGC8106 termination board. Using the wiring instructions in Figure 2-68, make field connections from the power supply wire from F1 terminal B to the J1 connector (+) pin. Connect the ground wire TB1 terminal 1A to the J1 connector (-) pin. DO NOT re-insert the J1 connector to the termination board.
- 8) Go to the DC Power Installation section later in this chapter.



**Figure 2-68 Explosion-Proof AC Power Supply Wiring Instructions**

### 2.32 110/240 Vac to 12/24 Vdc Power Supply Installation



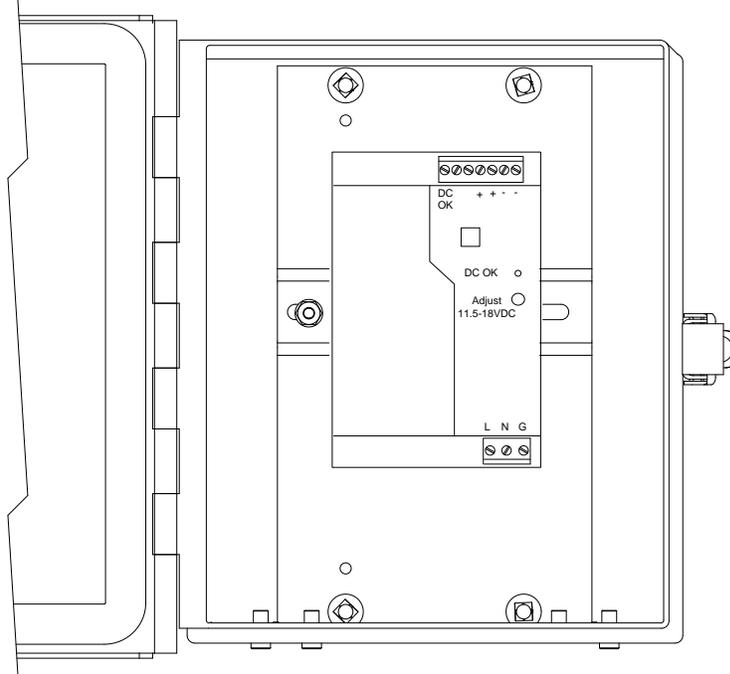
**WARNING**

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 national and local codes when installing the power supply.

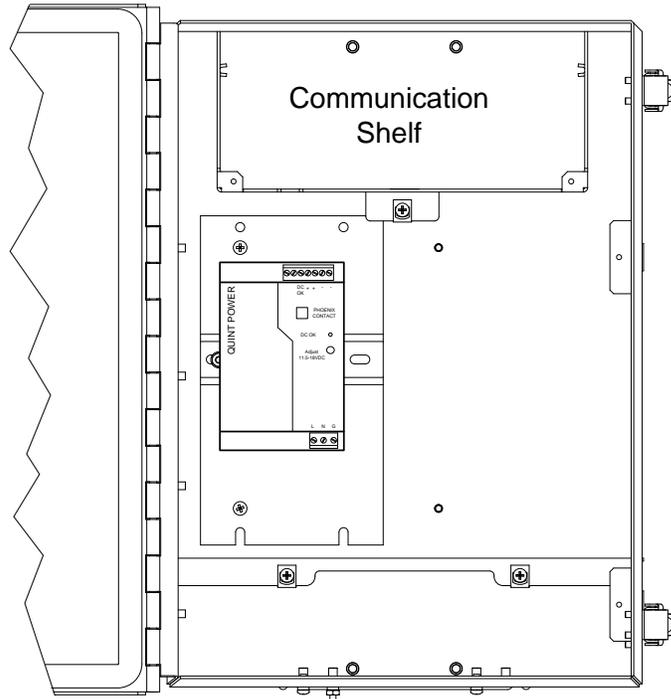


**WARNING**

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



**Figure 2-69 6200 Optional Equipment Enclosure with Power Supply**



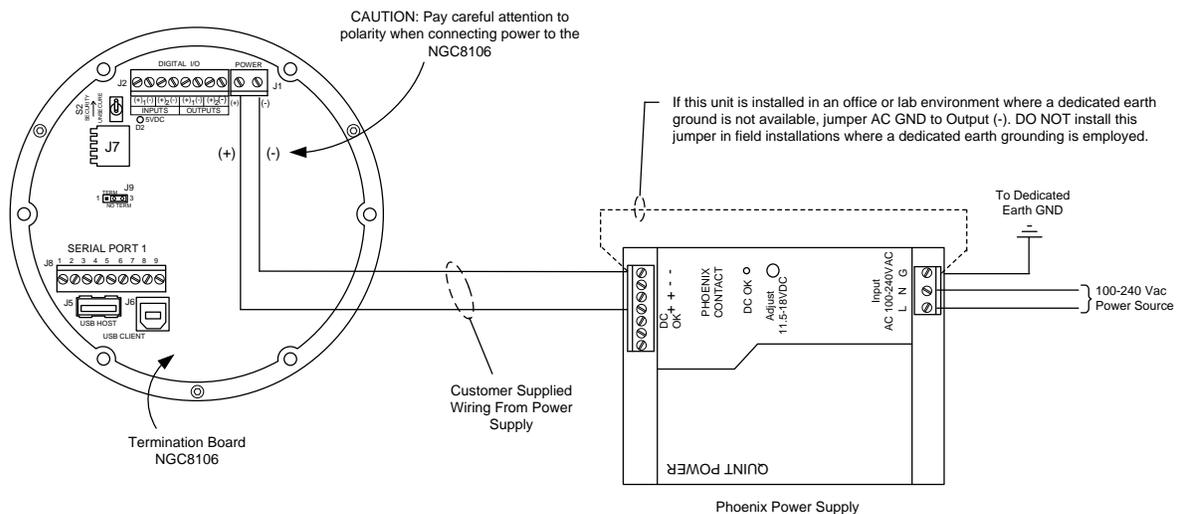
**Figure 2-70 6700 Optional Equipment Enclosure with Power Supply**

### 2.32.1 Instructions

- 1) If configured, the optional equipment unit should contain an installed AC power supply. The optional equipment enclosure should be installed using the previous instructions within 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**  Please review the Grounding the NGC8106 section in Chapter 1- System Description before making power connections.

- 4) Using the wiring instructions in Figure 2-71, 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 NGC8106 into the power supply enclosure. See Table 1–4 in Chapter 1 for wire sizes.
- 6) Remove the J1 connector from the NGC8106 termination board. Using the wiring instructions in Figure 2-71, make field connections from the power supply wire from F1 terminal B to J1 connector (+) pin. 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 section later in this chapter.



**Figure 2-71 AC/DC Converter Wiring Instructions**

## 2.33 Battery Pack Installation

FYI

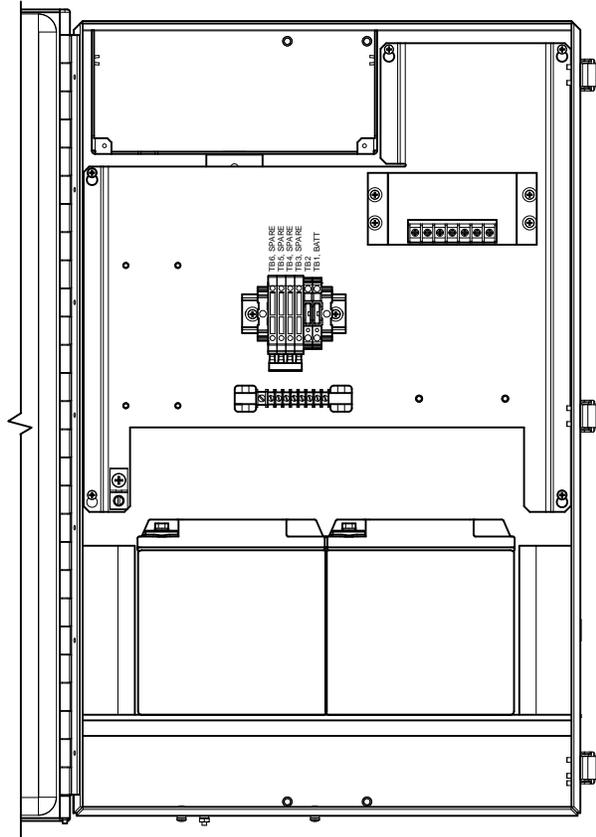


To extend the life of the battery pack, fully charge the battery prior to installation. Systems using solar panels may not fully charge the battery. Charging the battery quickly removes the oxide buildup and improves the life of the battery.

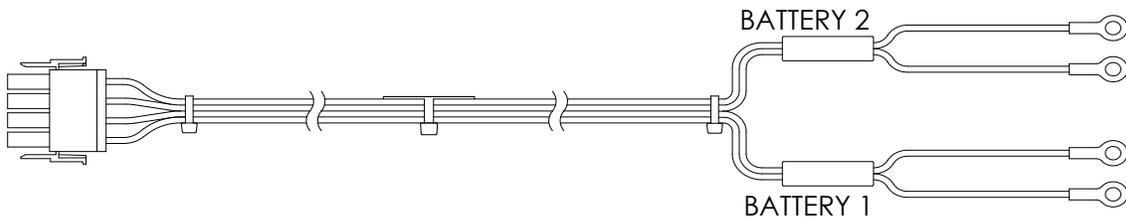
CAUTION



DO NOT overcharge the battery pack.



**Figure 2-72 Optional 6800 Enclosure with Battery Pack**

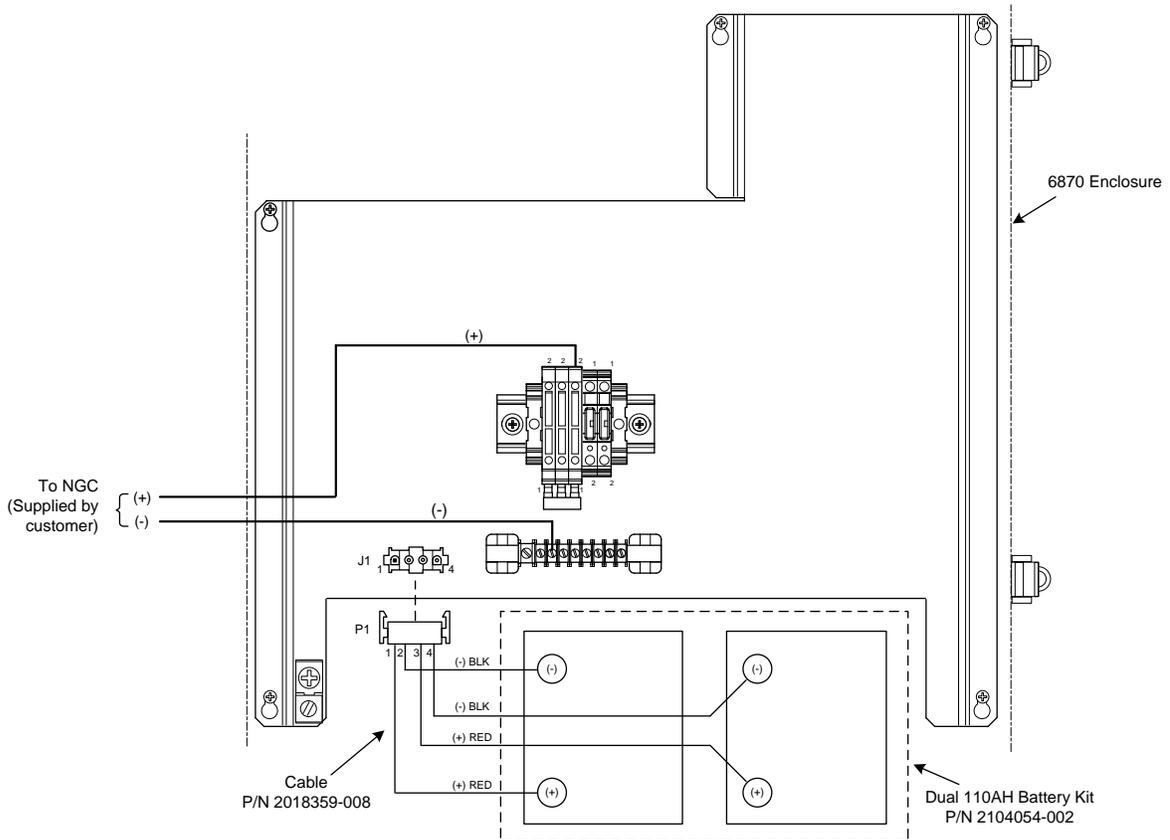


**Figure 2-73 12/24 Vdc Dual Battery Pack Cable**

### 2.33.1 Instructions

- 1) Insert the battery(s) into the battery compartment with the terminals facing up (see Figure 2-72).

- 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 2-73). Make the following battery connections using Figure 2-74 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 2-74 Battery Pack with DC Power Supply Wiring Instructions**

- 3) If the system calls for a solar panel charging system, proceed to the instructions for the solar panel installation later in this chapter; otherwise, continue the DC power installation later in this chapter.



Please review Grounding the NGC8106 section in Chapter-1 System Description before making power connections.

- 4) Go to the DC Power Installation section later in this chapter.

## 2.34 Solar Power Pack

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



**WARNING**

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 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.

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



**CAUTION**

Please review the Grounding the NGC8106 section in Chapter 1-System Description before making power connections.

- 3) Pipe the conduit and associated DC wiring from the NGC8106 into the power supply enclosure. See Table 1–4 in Chapter 1 for wire sizes.
- 4) Field wire the solar panel cables to the solar charger inside the enclosure. Using the wiring instructions in Figure 2-75 for 12 Vdc or Figure 2-76 for 24 Vdc, make the field connections.
  - Loosen the terminal block securing screws, insert wire and then retighten. Connect the solar panel (+) lead to pin 4 and the (-) wire to pin 3 terminal. Verify 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 the mounting pipe cable with the provided plastic tie-wraps.

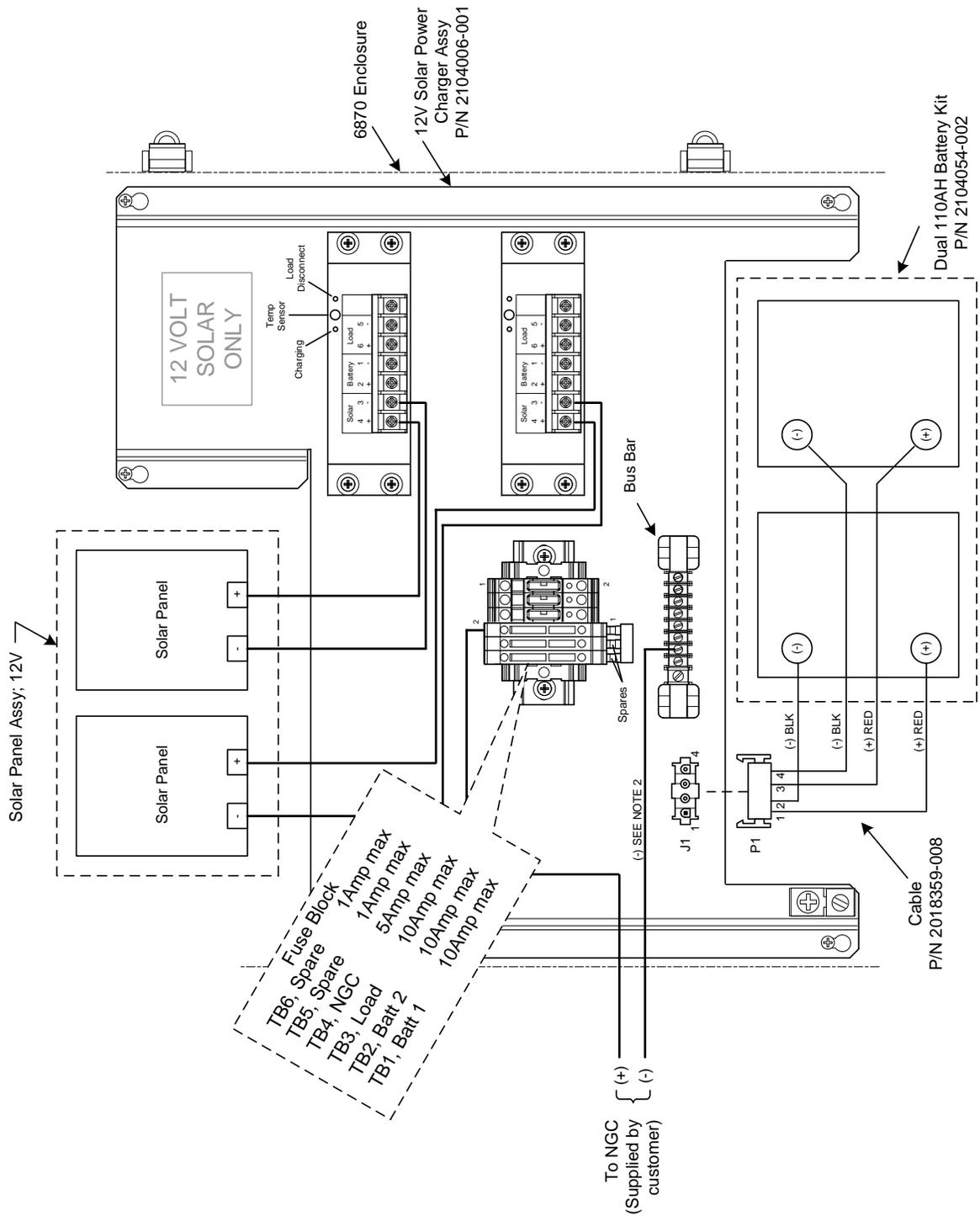
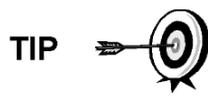


Figure 2-75 12 Vdc Battery Pack/Solar Panel Wiring Instructions



## 2.35 DC Power Installation



**TIP**

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 board.

### 2.35.1 Instructions

- 1) If the installation includes the optional power switch:
  - Apply power to switch; turn switch to the “ON” position.
- 2) If the installation includes the optional equipment enclosure with the optional power supply:
  - Apply power to the 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 on the Phoenix connector:
  - 12 Volt system: Voltage is between 11.5 and 16.0 Volts (see Table 1–4).
  - 24 Volt system: Voltage is between 21.0 and 28.0 Volts (see Table 1–5).

If the 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) The unit will begin Startup Diagnostics and oven stabilization. This completes the hardware installation. Proceed to the next chapter to begin unit set up and operation.

## 2.36 Remote Communication Installation

As the 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 2–2 shows serial port pin outs and termination settings.

**Table 2–2 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
3	Switched Power Out	Switched Power Out	Switched Power Out
4	Operate	Operate	Operate

	<b>RS-232</b>	<b>RS-485</b>	<b>RS-422</b>
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 -
<b>PIN</b>	<b>PORT 2 (J10)</b>	<b>PORT 2 (J10)</b>	<b>PORT 2 (J10)</b>
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 -
<b>TERMINATIONS</b>		<b>PORT 1 (J9)</b>	<b>PORT 2 (J11)</b>
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

## 3.0 NGC8106 START UP

This chapter describes the minimum requirements to start up a newly installed NGC8106 sampler/analyzer system. Specific details to further customize the NGC8106 are discussed in the PCCU32 help files.



### WARNING

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

### FYI



Before beginning, complete the tasks outlined in Chapter 2 - Installation.

## 3.1 PCCU32 Installation and Setup

ABB Totalflow's PCCU32 6.0 (or later) software is required to communicate with the NGC8106. Previous versions of PCCU32 are not compatible with the NGC8106.

PCCU32 software, running in a laptop Windows desktop environment, offers the most capabilities for programming the NGC8106. The Windows-environment features user-friendly help files and easy to follow menus that enable the user to step through many of the required choices.

The NGC8106 hardware is designed using Windows Mobile technology CE operating system; therefore, communication between a personal computer and the NGC8106 may be accomplished using a USB cable. When this method of communication is preferred, Windows ActiveSync is required and supplied with PCCU32. Ethernet connectivity is also available.

### 3.1.1 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 Start button, and select the Run option. In the Run dialog box, type in the following: D:\Disk1\setup.exe (D being the CD Drive designation).
- 2) Follow the screen prompts during the installation. When the user is asked if they want to install ActiveSync, the answer will depend 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 USB, the user needs to check the Install ActiveSync box. If communicating via RS-232, click the Next button. If communicating with a PDA, ActiveSync is already installed; however, if it is a later version of the software, the user will have the ability to upgrade to the latest version. To verify the version, open ActiveSync, and click Help. From the drop-down, select About Microsoft ActiveSync.
- 3) The next screen prompt will allow the user to select the correct port for communication: USB Port for connecting via USB or Serial Port for connecting via RS-232. If the user has previously installed the PCCU32 software and selected a port but they are in the process of re-installing or upgrading, select Keep Current Port.

- 4) The installation places a PCCU\_NGC folder on the Window's desktop with the other shortcuts. The shortcut is correct, assuming the install directory was not changed. If the install directory was changed, the shortcut will have to be changed to the new directory path. If using a network, the PGC1000 on the Network shortcut will require a network ID or IP address. For a stand-alone desktop shortcut, right-click on the shortcut, select Create Shortcut and drag it to the desktop.

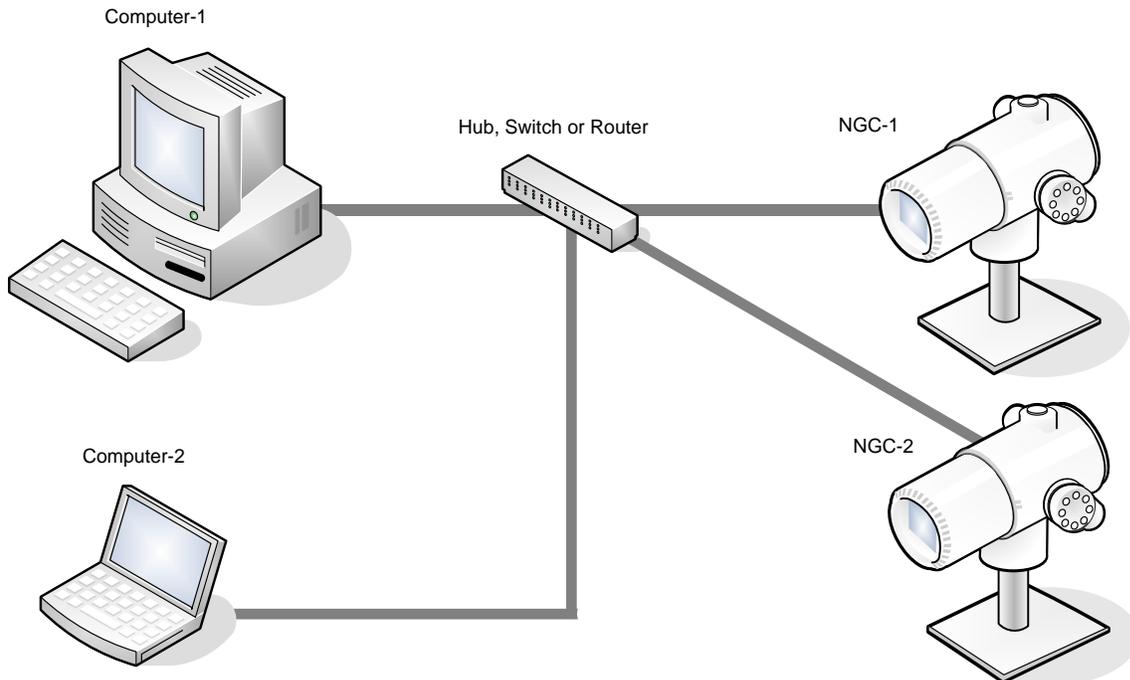
## 3.2 Ethernet Installation and Setup

Installation of an NGC8106 in a network environment may be implemented using the following instructions. Some decisions may require input from the user's network administrator.

PCCU32 communication with the NGC8106 over an Ethernet connection (TCP/IP) requires the use of a hub, switch or router (see Figure 3-1). Ethernet (local) communication in a remote area may also be used.

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 NGC8106 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. This is handled by the network administrator.



**Figure 3-1 Ethernet Connections**

### 3.2.1 TCP/IP Network Connection

#### 3.2.1.1 Materials Required

- Ethernet straight-through cable (see Figure 3-2).
- Hub, switch or router and associated wiring to NGC8106 (see Figure 3-1).

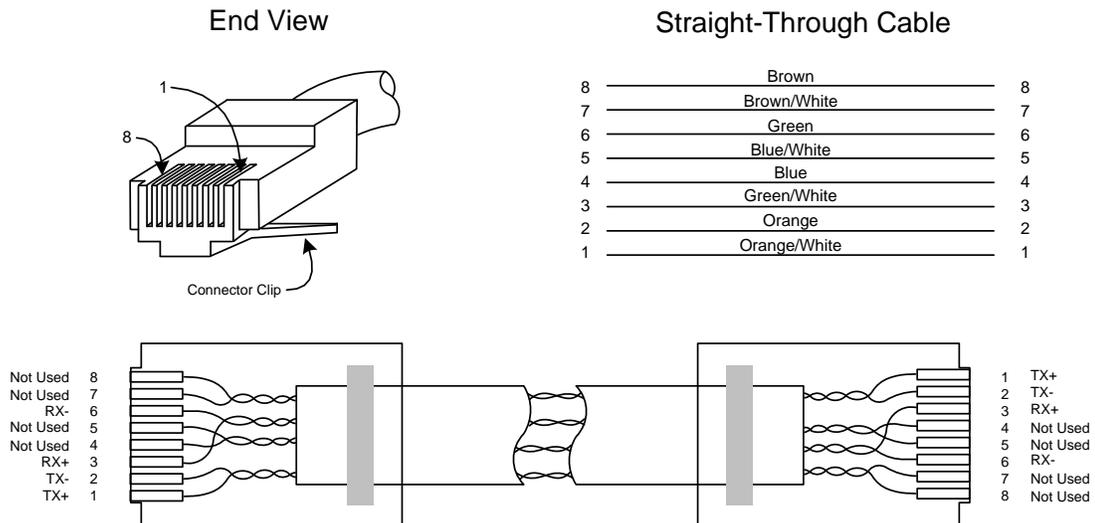
#### 3.2.1.2 Instructions

- 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".
  - Press OK.
  - At the command prompt, type ipconfig /all (space after ...ipconfig).
  - Record the PC and LAN settings displayed for later use.
- 2) Make the local connection to the NGC8106 using either the USB or RS-232 cable. This will begin the initial setup of the parameters.
- 3) From the Analyzer Operation screen in PCCU32, click on the Show Tree-View button in the upper left corner of the screen.
- 4) Click on Communications to display 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. Please see the Windows help files for more information on naming computers.



**Figure 3-2 Ethernet Cable-Typical**

- 6) Enable or disable the dynamic host configuration protocol (DHCP). To disable the DHCP and assigned IP address, set to No. Continue to the next step; otherwise, select Yes, and move to step 7.

- 7) Enter the IP address assigned by the network administrator and subnet mask, if different (default is 255.255.255.0).
- 8) When all preferred changes have been made, select Send.
- 9) Reset the NGC8106 by pressing the Reset button. This is located on the termination board housed in the rear of NGC8106 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 the prompt ">", type "ping" followed by a space. Type in either the network ID or IP address, and press Enter. A successful communication will show multiple replies for the unit.

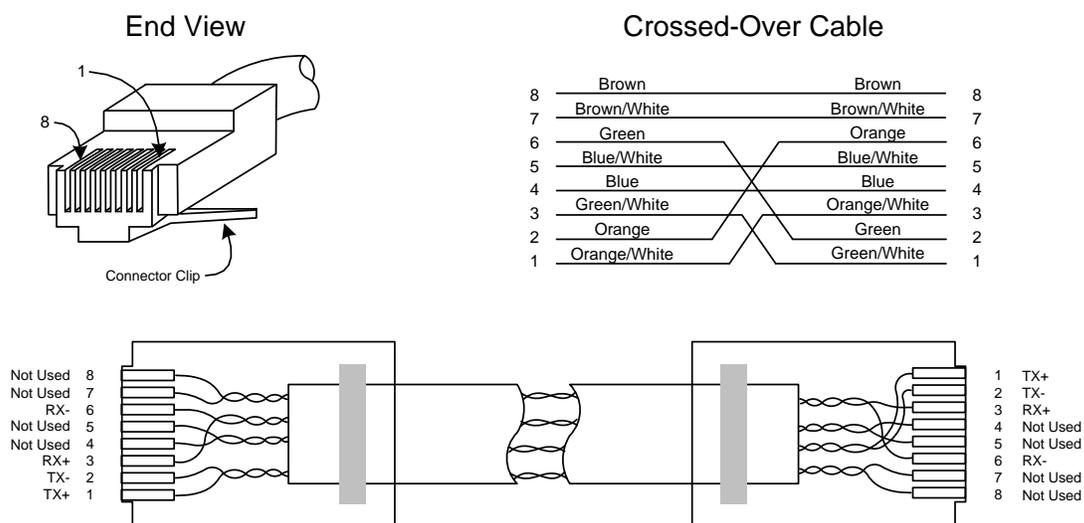
### 3.2.2 TCP/IP Local Connection

#### 3.2.2.1 Material Required:

- Ethernet cross-over cable (see Figure 3-3).

#### 3.2.2.2 Instructions

- 1) Make the local connection to the NGC8106 using either a USB or RS-232 cable. This will enable the user to perform the initial setup of the parameters.



**Figure 3-3 Ethernet Cross-Over Cable**

- 2) From the Analyzer Operation screen in PCCU32, click on the Show Tree-View button in the upper left corner of screen.
- 3) Click on Communications to display the Communication Setup screen.
- 4) Select the Network tab. Enable DHCP. Send changes and record a new IP address for later use.
- 5) Exit PCCU32 and disconnect the local communication cable.

- 6) Connect the Ethernet cross-over cable between the PC and NGC8106.
- 7) Open PCCU32 software. Click on 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 PCCU32 com port to TCP. 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:

- Verify a cross-over Ethernet cable 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.

**FYI**



### 3.3 Connecting to NGC8106’s Local Port

The laptop computer connects to the local port via USB or RS-232 and uses one of two cables (See Figure 3-4).

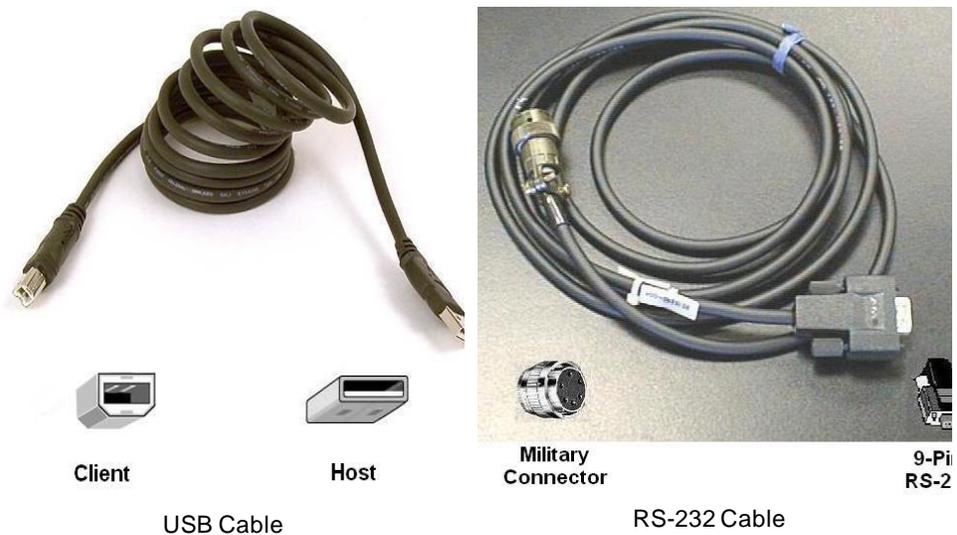
**FYI**



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.

#### 3.3.1 Instructions

- 1) Connect the MMI cable to the designated port on the PC and to the local port. This is located on the outside of the NGC8106. 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) Click on the Windows Start button. Select Programs – PCCU-NGC (or the correct program folder if changed during installation). From the fly-out menu, select PCCU32. This will display PCCU32’s initial screen.
- 3) Assuming the MMI cable is connected, click on 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, since going on the assumption that we are setting up the unit for the first time, the NGC Startup Wizard will appear. If so, see NGC Startup on the next page.



**Figure 3-4 MMI Communication Cables**

**TIP**  If the Invalid Security Code screen should appear, enter four zeros (0000) for the new code, and click OK. The NGC8106 should have defaulted to 0000 on startup.

- 4) Again, 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 take the user to the Analyzer Operation screen. This screen 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. The user will need to scroll through the available selections and select USB. If the user is using serial communications with the round connector on the NGC8106 end, select the communications port being used (COM1, etc.). When finished, close the Setup screen, and click the Connect icon again.

### 3.4 NGC8106 Diagnostics

In Chapter 2-Installation, the DC power circuit to the NGC8106 was completed. Once power was applied to the unit, the NG8106 began the startup procedure:

- Unit cold started and loaded startup information into RAM memory.
- Startup Diagnostics to run. If diagnostics are not successful, the unit will return a system fault and cease startup.

Startup 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 run. To pass this test, the oven temperature must reach 60° C and 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 the ambient temperature, this could take up to an hour. During this time, the user can enter information via the Startup Wizard.

During the initial start-up, the input stream is disabled. If input pressure is detected during the stream test, the input stream will be re-enabled, tested and either passed or failed. If the device fails the input stream test, the input stream will remain disabled.

During the diagnostics or upon completion, the user may view the status of the diagnostic tests by clicking on the Diagnostics button 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 no input stream 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 spelled out in the Startup Wizard.

### 3.5 NGC8106 Startup Wizard

After starting PCCU32 and clicking the Connect icon, the NGC8106 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 the user through the process of entering all the necessary information to enable the operation of the NGC8106. 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, and fill 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 view the results. If the diagnostics are still in progress, the Startup Wizard will not allow the user to continue until the diagnostics have finished.

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

#### 3.5.1 Station Setup Instructions

- 1) Enter the Station ID (ten alphanumeric digits) and Location (24 alphanumeric digits) (see Table 3–1). The Station ID should be a unique identifier from other devices that the user communicates with.
- 2) Verify the date and time. If they are incorrect, set the PCCU Date/Time parameter field 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 help topic displayed with each screen.

- 3) When all the preferred changes have been made, click the Send button and then the Next button to move to the next screen.

**Table 3–1 Station Setup Screen Information**

Description	Value
Station ID	Assign a unique identifier (ten alphanumeric digits).
Location	Enter information regarding the meter location (24 alphanumeric digits).
Date/Time	Display the current unit's date/time.
Set Device with PCCU Date/Time	Resets the device's date and time to match the PC.

**3.5.2 Stream Setup Instructions**

- 1) Enter the Stream ID, Location, Contract Settings and Calculation Settings (see Table 3–2).
- 2) When all the preferred changes have been made, select the Send button and then the Next button to move to the next screen.



**TIP**

During the stream setup, please 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 3–2 Stream Setup Screens**

Setup Tab		Available Values
Stream ID		Assign unique Identifier (ten alphanumeric digits).
Location		Enter information regarding the meter location (24 alphanumeric digits).
Calibration Stream		Stream 1 is used for calibration AND as the input sampling stream.
Contract Settings	Value	Available Units
Contract Pressure	14.73 PSIA (default)	KPa, InH2O, 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(AGA-8), ISO-6976-1995, etc. <sup>1</sup>
Sum IC5 & NeoC5		No (default), Yes
C6+ Index Split Mode <sup>2</sup>		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.

<sup>1</sup> File selection automatically sets the remainder of items on this screen. See PCCU Help files for more information.

<sup>2</sup> 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.

### 3.5.3 Calibration Setup Instructions

- 1) In a single stream sampler/analyzer, stream 1 (S1) is used for calibration and stream sampling. Unless a T-valve is being used, the operator will have to remove the stream tubing and connect the tubing from the calibration gas. When calibration has completed, the sample stream should be re-connected to the stream 1 (S1) port. When switching between sample gases and calibration gases, time should be allowed for the tubing to purge the previous gas. Wait for the BTU value to settle.
- 2) Change the Calibration Cycles Average and Purge Cycles, if required. Default Calibration Cycles Average is 3 and Purge Cycles is 2.
- 3) Make changes to the concentrations in the % BLEND column. Ensure that the Total Mole % equals 100%.

#### CAUTION



Caution should be used when entering the component blend percentages to 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 the methane (C1) to force the total to 100%.

- 4) When finished and Total Mole% equals 100%, select the Next button to move to the next screen.
- 5) When all preferred changes have been made, select the Send button and then the Next button to move to the next screen.

### 3.5.4 Diagnostics

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

#### FYI



During the initial startup, the input stream is disabled. The input stream is enabled when stream pressure is detected. If no stream pressure is detected, a failure is logged.

Totalflow recommends that the diagnostic stream test be performed after initial diagnostics. Select the Help button for additional information.

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

### 3.5.5 Update Configuration

- 1) Totalflow recommends that the user save the unit configuration file following setup. Change the parameter value beside Save Configuration Data to Now to save the configuration.
- 2) Select the Send button and then the Next button to move to the next screen.

### 3.5.6 Analyze Calibration Stream

- 1) Prior to running the sample stream, the NGC8106 should run a calibration. Connect the calibration gas to the input port (S1). The cycle clock will begin, and the user should see animated gas running on the input stream.
- 2) Allow the stream to process for two or three cycles (approximately 30-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 the Next button to verify the analysis results.
- 4) Compare the normalized % for each component-to-component and percentages listed on the calibration blend bottle. Component percentages should be relatively similar.

#### TIP



There will not be any comparisons for C6+ individual components. There may be values in the Normalized column for Hexane thru Decane, but this is based on the C6+ configuration entered in Stream Setup. For comparison purposes, use the components called Heavies.

- 5) Select the Next button to verify the 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 second peak from the left that looks like two peaks is a composite peak of C2- and is not used in calculations.
- 7) Select the Next button to verify the 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 first peak on the left is a composite peak of C3+ and is not used in calculations.
- 9) Disconnect the calibration blend and reconnect the sample tubing. Select the Next button to begin the process stream analysis. Select Run on the left side of the screen to begin the sample analysis. The buttons beside Run should turn blue, the cycle clock will begin, and the user should see animated gas running on the process stream.

### 3.5.7 Startup Completion

- 1) The unit should continue to cycle through the input process stream performing analysis and producing data.
- 2) ABB Totalflow recommends that the unit be allowed to run at least eight hours before calibration to allow the unit to stabilize.
- 3) Select the Close button to complete the Startup Wizard and to return to PCCU32's Local Analyzer Operation screen. If completed satisfactorily, the Startup Wizard should not reappear when connecting to the unit. However, should the user like to review or make changes, they may re-enter the Startup Wizard by selecting NGC8106 Startup Wizard from the Help drop-down menu.

## 3.6 Calibrating the NGC8106

The NGC8106 is factory-calibrated and should not require an immediate calibration. It is recommended that the unit operate for a period of eight continuous hours before a field calibration. After the eight hours have elapsed, a

field calibration should be performed. This will allow for 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 two purge cycles and three calibration cycles. When the calibration is complete, a thorough examination of the results should follow.



Allow the NGC8106 to run for a minimum of eight hours before a field calibration is performed.

### 3.6.1 Instructions

- 1) After connecting the calibration blend to the input port (S1), select Cal from the Analyzer Operation screen.
- 2) When the current cycle completes, the unit should begin a calibration cycle.
- 3) When the calibration is complete, the unit should move to the designated Next mode. The user can view the results on the Analyzer Operation screen.
- 4) The calibration stream's UnNormalized total should be 0.5% (between 99.5% and 100.5%).



If values exceed these parameters, proceed to the Troubleshooting chapter within this manual.

- 5) Carefully examine the calibration stream's Chrom-1 and Chrom-2 by clicking on the  button. Look for unlabeled peaks and base line anomalies. Figure 3-5 and Figure 3-6 should be used as a guide.



If errors exist, proceed to the Troubleshooting chapter within 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.

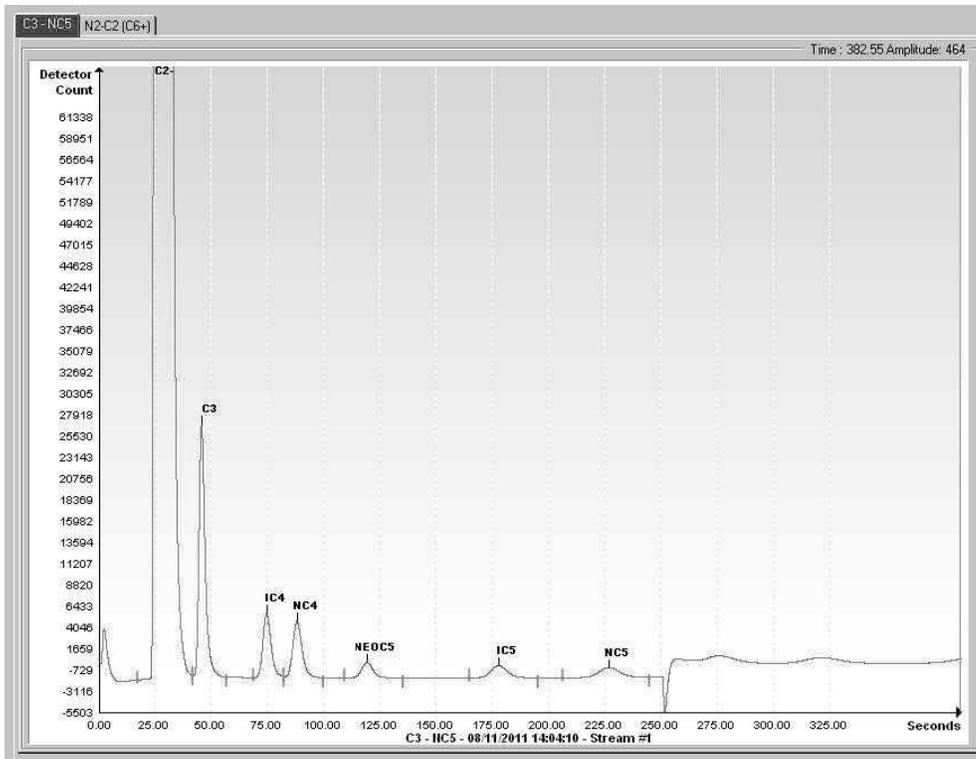


Figure 3-5 Typical Chromatograph for Chrom-1 (Heavies)

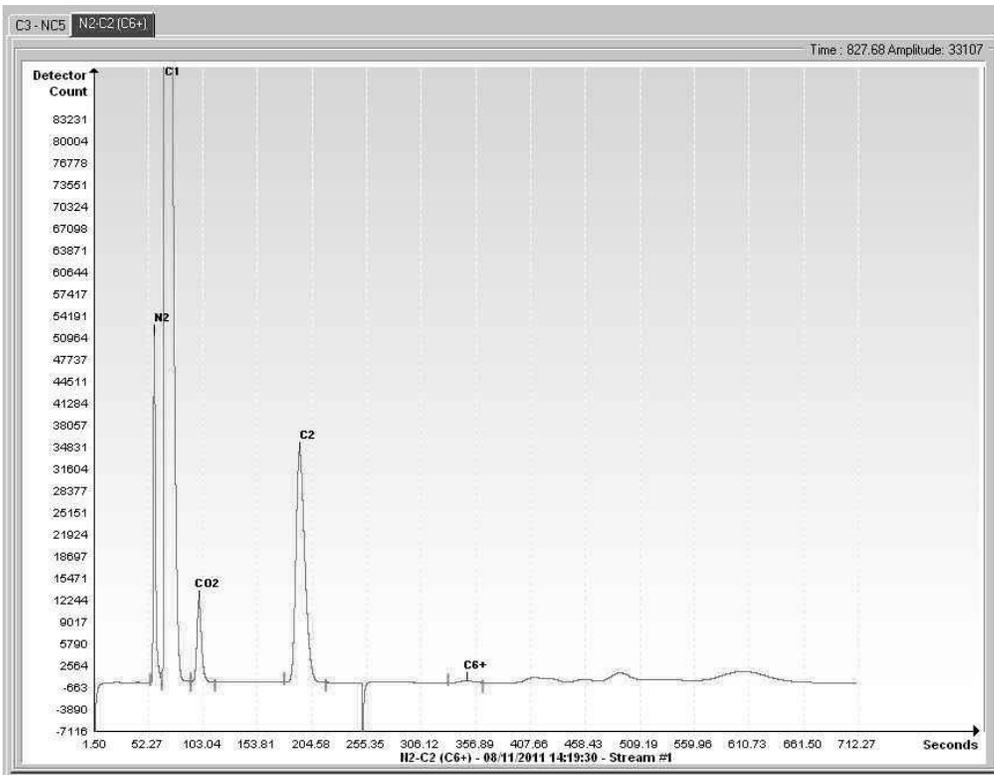


Figure 3-6 Typical Chromatograph for Chrom-2 (Lights)

## 3.7 Security System Setup

### 3.7.1 Hardware Security

The NGC8106 board has a bi-level security system built in. For the purpose of this manual, this is referred to as hardware security. The security switch, located on the termination board of the NGC8106, 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.

### 3.7.2 PCCU Security

When the NGC8106 is accessed through the PCCU32 or WINCCU host software packages, either remotely or locally, there is a second level of security included. This is referred to as the software security.

The security switch, located on the termination board of the NGC8106, must be switched on for the hardware security system to be functional. The switch must be switched off to change the device's security code. Security codes are checked via remote communication, whether the switch is on or off.

When the system is set up, each user logs onto the system with a unique user name (up to 25 alphanumeric digits) and a 4-digit alphanumeric password. This takes place before the user connects to the unit.

The software security system is designed to have two levels of user access:

- Reading data files – read-only access (User)
- Sending application and configurations - read/write access (Admin)

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 consists of 4-digit alphanumeric pass codes (level 1 and level 2).



**TIP**

The NGC8106 does not send an error message when trying to write an operation where the proper hardware security code does not exist; it simply will not accept value changes.

### 3.7.3 Role Based Access Control (RBAC)

The RBAC system is effective in PCCU versions 7.16.0 or higher. RBAC adds a third level of security to the NGC8106 and supersedes the hardware security system.

While available for setup, RBAC is not operational when the new system is delivered. This allows the customer to define any specific roles beyond the basic four (4) defined roles:

- Basic
- Advanced
- Expert
- Administrator

Administrators can develop additional roles, set up and assign specific users a role and define application access independently for each user. Levels of access for each application are:

- Yes or No

- Read, Write or Read/Write

Users accessing the device or changing the security settings will automatically generate a record to a security log.

Once roles and access have been defined, the \*.RBA file can be saved to a PC and then downloaded into additional devices.

Additional information may be found in the PCCU help files.

### 3.8 Alarm Definitions

The user has the ability to define the threshold for the NGC8106 alarm parameters. The NGC8106 provides 124 standard alarms. Of these, a number of alarms are defaulted to Enabled (see Table 3-3). 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.



**TIP**

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

**Table 3-3 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
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

## 4.0 MAINTENANCE

### 4.1 Overview

This chapter provides the user with maintenance information and instructions on how to remove and install NGC8106 components. Performance of the recommended procedures maintains the unit in optimal 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, NGC8106 downtime will be reduced, and the system will operate at optimum analytical efficiency. Perform all the recommended procedures as presented within this chapter. If additional procedures are developed, they should be included with those already in existence.

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.



For all maintenance steps: remove power from the device, or ensure the area is known to be non-hazardous, including the internal volume of the enclosure, before removing any enclosure cover or performing any of the maintenance steps in this section.

#### 4.1.1 Help

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

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

#### 4.1.2 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 NGC8106 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 NGC8106 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 NGC8106 inoperable.

#### 4.1.3 How to Use This Chapter

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.

#### 4.1.4 Returning Part(s) for Repair

If an ABB Totalflow component is to be returned for repair, securely wrap it in protective anti-static packaging. Before returning a component, call ABB Totalflow for a Return for 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 the original system warranty will be shipped to the customer, F.O.B.



When the user removes the front or rear end caps, their hands can become coated with a black-thread lubricant. If this happens, wash hands before performing maintenance functions. Use 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.

## 4.2 Spare Part Components

The information in this section presents the user with the components (see Figure 4-1) and parts that are accessible for removal and installation. Replacement components will be covered first. Subsequent sections will have instructions for replacing spare parts.

### 4.2.1 Replacement Components

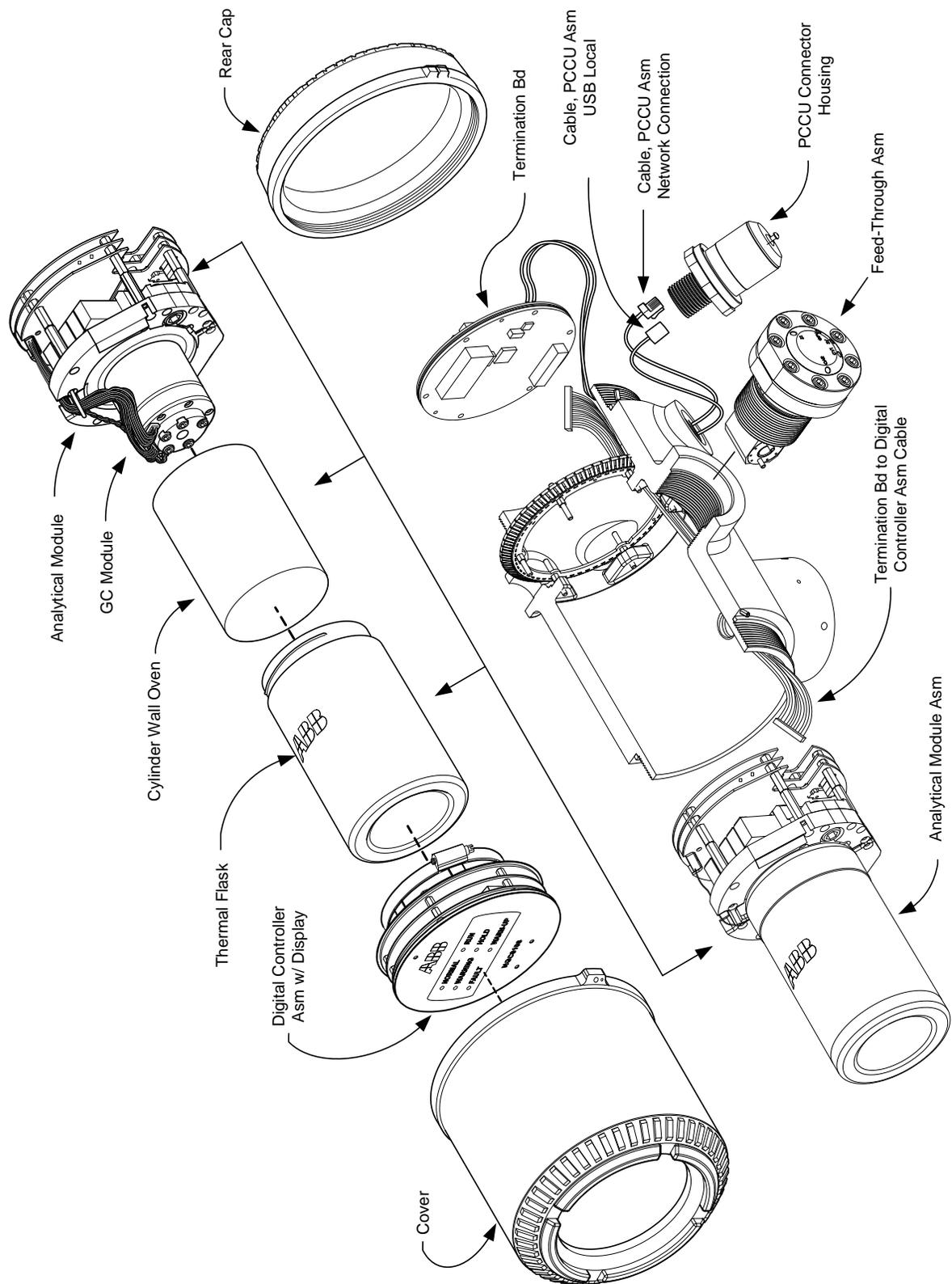
The following is a list of components that may be replaced:

- Analytical module (12 or 24 Vdc) with or without GC module (see Figure 4-2)
- GC module
- Digital controller assembly with display
- Termination panel
- Feed-through assembly without preheat (see Figure 4-3)
- Feed-through assembly with preheat (12 or 24 Vdc)

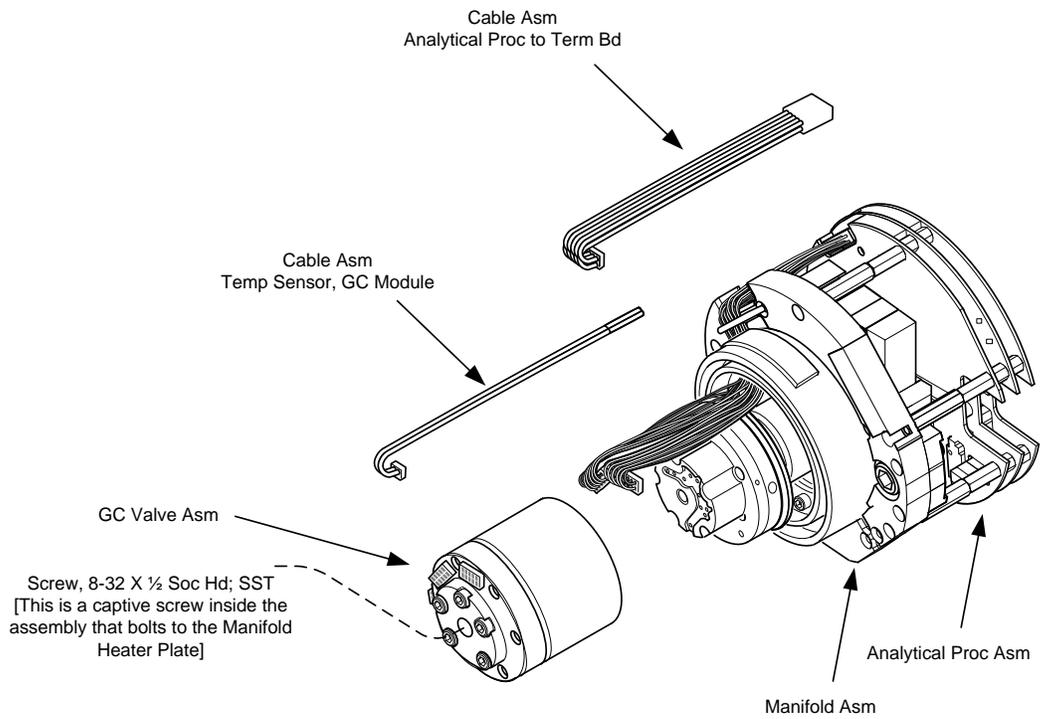
### 4.2.2 Replacement Parts

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

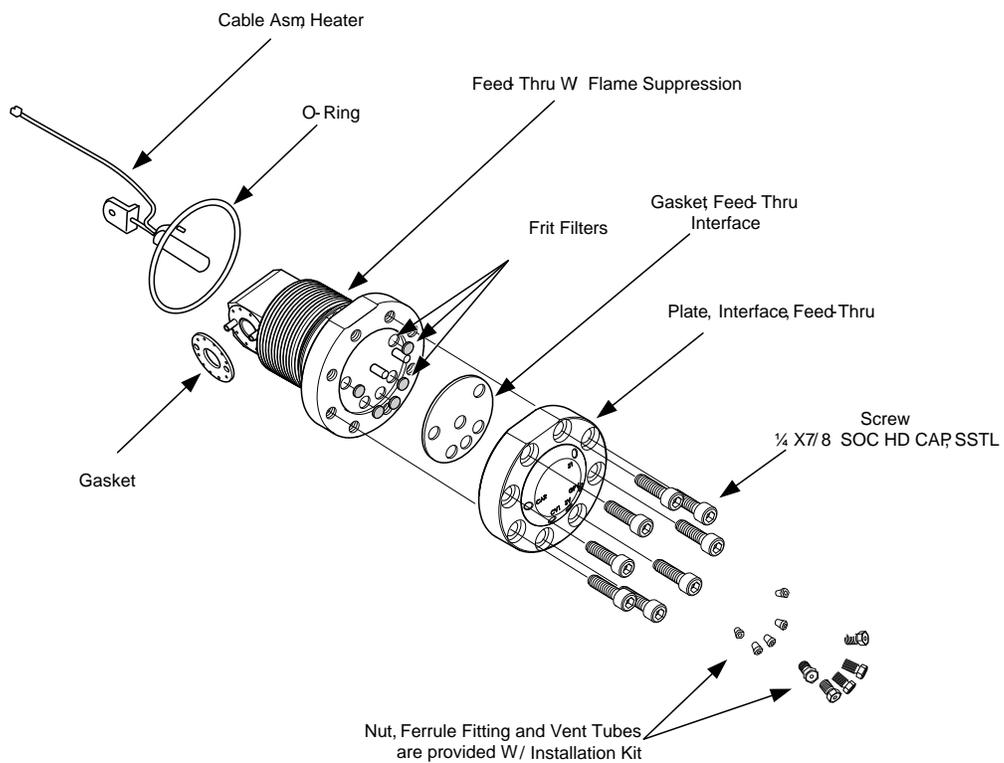
- Lithium battery
- Frit filters
- Analytical processor to termination panel cable
- Termination panel to digital controller cable
- Feed-through O-ring
- Feed-through interface gasket
- Feed-through manifold gasket
- Feed-through heater with temperature sensor (12 or 24 Vdc)
- GC module temperature sensor



**Figure 4-1 NGC8106 Overall View**



**Figure 4-2 Analytical Module, Exploded**



**Figure 4-3 Feed-Through Assembly, Exploded**

### 4.2.3 Repair Time

ABB Totalflow has provided a recommended spares list for the NGC8106. Consideration was given to the cost of the repair time and the cost of stocking the repair parts. The NGC8106's modular design is uniquely suited for quick repair times. The following table lists four categories that concern repair times and the spares required to achieve those various repair times. Repair days are represented as work days not calendar days.

**Table 4-1 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. If the user has multiple units or applications at a single site, this would be a typical scenario.
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.

### 4.2.4 Recommended Spares

Recommended spares are provided for each of these categories, depending upon whether there is a single or multiple units at the site(s) and whether the applications are fixed applications (stocked at the factory) or built-to-order (not stocked at the factory). The user will need to balance the cost of the spares with the cost of the repair time. With the variety of options available, the user can manage the repair time for the units, as needed.

### 4.2.5 Customer Service

Customer service can be called out and may have the stocked applications available for replacement (depending upon usage by the individual on service calls). The scheduling for a call-out is typically a week. If service personnel are needed in a more timely fashion, maintenance contracts may need to be considered. Phone support from the factory is available to help with the diagnosis of a problem. Alarms from the unit are also a key to quick diagnosis and repair of any failure.

**Table 4-2 Recommended Spare Parts**

Part Description	Stock Application	
	1	>1
12 Vdc Analytical Module Assy. w/o GC Module		1
12 Vdc Analytical Module Assy. With GC Module	1	
24 Vdc Analytical Module Assy. w/o GC Module		1
24 Vdc Analytical Module Assy. With GC Module	1	
Cable between the Analog Processor and the Termination Board	1	1
Digital Controller Board & Display, Completed Assy.	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

### 4.3 Field Tool Kit

The recommended NGC8106 maintenance tools (see Table 4-3) are included in the optional field tool kit.

**Table 4-3 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, 1/4"
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

## 4.4 Visual Inspection

Periodically, the NGC8106 should be given an external, visual examination. Visual checks maintain optimum system operation and accuracy of natural gas sample analysis.

### 4.4.1 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 NGC8106: These must not be bent or closed off. The connections must be tight. Such conditions impede the sample flow to the NGC8106.
- 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 and power and signal conduit runs to Div 2 or non-hazardous areas must be sealed per NEC codes.

## 4.5 Backing Up Configuration Files (Save)

Before beginning any maintenance on the NGC8106, the user should collect the data and back up all configuration files to their laptop's hard drive or a floppy disk. This safeguards the data and allows the user to re-start the unit without the trouble associated with re-configuring the NGC8106 should any problems arise.

Although there are Save buttons in the Entry mode screens that 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. This safeguards the system in the event of a "cold" start.

### 4.5.1 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 on the main PCCU32 toolbar. The user can also click the Save and Restore Utility icon on the toolbar.
- 3) In the Save and Restore window, click the Save Station Files button.
- 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 Yes is selected, the station files will be downloaded to that drive.

**FYI**



The user may not want to restore the station files to TfCold. Some problems addressed in the Troubleshooting chapter may require a selective restore. For more information, see the Troubleshooting chapter and PCCU help files.

## 4.6 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 selected, these files are downloaded to the user's laptop hard drive or on a floppy disk. The Restore function uploads these files into the NGC8106's TfCold drive. This safeguards the data and allows the user to re-start the unit without the problems of re-configuring the NGC8106 should any problems arise.

### 4.6.1 Instructions

- 1) While in PCCU, use the Save and Restore Utility found under File Utilities in the Operate drop-down menu on the main PCCU32 toolbar. The user can also click the Save and Restore Utility icon on the toolbar.
- 2) In the Save and Restore window, click the Restore Station Files button.
- 3) When the Restore Station Files window displays, 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 section. Upon completion, verify the unit is functioning properly.

**FYI**



The user may not want to restore the station files to TfCold. Some problems addressed in the Troubleshooting chapter may require a selective restore. For more information, see the Troubleshooting chapter and PCCU help files.

## 4.7 Reset Procedures

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

### 4.7.1 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 NGC8106 microprocessor and will 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 satisfactory before proceeding.

**CAUTION**



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

- 3) Gain access to the rear termination board on the NGC8106 by loosening the countersunk hex socket locking set screw in the rear end cap. Use a 1/16" hex wrench. Upon completion, unscrew the end cap.

- 4) To warm start the unit, depress the S1 reset switch on the termination board.  
Or, to remove the NGC8106 from service, disconnect the power connector J1 from the board.
- 5) To place NGC8106 back into service, return the power connection J1 to the termination board.

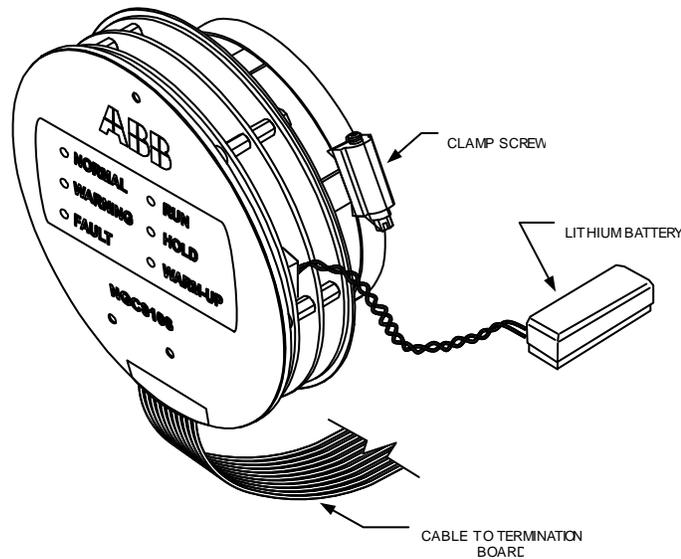
#### 4.7.2 Cold Start Instructions

A cold start clears all the data that is stored in RAM as well as resetting all entered variables to their factory default values. Discretionary use of this procedure is advised.

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may 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. This voids any warranty.

- 2) Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap. Use a 1/16" hex wrench. Upon completion, unscrew the end cap.
- 3) Gain access to rear termination panel on the NGC8106 by loosening the countersunk hex socket locking set screw in the rear end cap. Use a 1/16" hex wrench. Upon completion, unscrew the end cap.
- 4) Unplug the lithium battery connector from the J5 receptacle on the digital controller board (see Figure 4-4).
- 5) Push the Reset button located on the termination board. This is located in the rear of the enclosure.
- 6) Initially, the Boot Loader screen will appear on front display.
- 7) When the Navigation screen displays, restore the lithium battery connection on the digital controller board.



**Figure 4-4 Digital Controller Complete Assembly**

## 4.8 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 protocol 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
- NGC8106 setup information
- Startup 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 NGC8106) 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 ABB Totalflow technical specialist recommends this procedure. If questions exist, call ABB Totalflow support at (800) 442-3097 – option 2.

### 4.8.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.

- 3) Shut down PCCU32.



TIP

The system may not allow the deletion of active files when the NGC8106 is in normal operation (running from FLASH); therefore, the user should force the unit into Boot Loader mode.

- 4) Force the NGC8106's operating system into Boot Loader mode.
- 5) Press the Reset button on the NGC8106's termination board. Wait about eight seconds until the Initializing System screen displays.
- 6) Press the Reset button a second time. The unit should now be in Boot Loader mode.
- 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 on the folder, and select Delete. The folder will disappear.
- 10) Open the Flash folder by double-clicking on it.
- 11) Highlight the TfCold folder. Right-click on it, and select Delete. The folder will disappear.
- 12) Press the Reset button on the termination board. 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 PCCU32.

## 4.9 Lithium Battery Status

Prior to various maintenance procedures, especially when a cold start is not desirable or feasible, the user should verify that the lithium battery status is satisfactory.

If the user is directed to these instructions from another set of instructions, please return to them when the status has been verified.

### 4.9.1 Instructions

- 1) While in the PCCU Analyzer Operation screen, select Station Setup from the icons across the top of the screen.
- 2) Select the value beside Lithium Battery Status.
- 3) If the 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, the lithium battery should be connected or replaced prior to removing power from the unit. See the Replacing the Lithium Battery instructions later in the chapter.

## 4.10 Changing NGC8106 Clock

When measurement streams are turned on within NGC8106, changing the clock could affect the time when log period entries are made. To protect the integrity of accounting audit trails, the NGC8106 handles these types of clock changes as follows:

**FYI**



Examples are based on a 60-minute log period.

#### **4.10.1 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).

#### **4.10.2 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. NGC8106 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. A new flow record is then written. This period is also based on a 55-minute accumulation.

#### **4.10.3 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. NGC8106 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). A new flow record is then written. 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.

### **4.11 Replacing Calibration or Carrier Gas Bottle(s)**

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

#### **4.11.1 Instructions**

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may 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 NGC8106 feed-through assembly, loosen the nut and ferrule from the corresponding inlet. Allow the air to purge from the line.



**WARNING**

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 the connections at the bottle regulator and the feed-through assembly.
- 9) In PCCU32, with the unit still in hold, run two single cycles. Inspect the chromatograms to determine if the unit is processing correctly. If chroms are satisfactory, return the unit to normal operation.

## 4.12 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.



**CAUTION**

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

### 4.12.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may 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. Be careful to not unplug the flat ribbon cable connecting the digital controller assembly to the termination board or the lithium battery.



**CAUTION**

DO NOT remove the NGC8106 board-mounted lithium battery or the termination board cable at this time. Removing the lithium battery will cause a cold start, and that may not be preferred. When replacing the lithium battery, the termination board 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. Be careful to align the display horizontally before tightening the screw.

## 4.13 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. This voids any warranty.

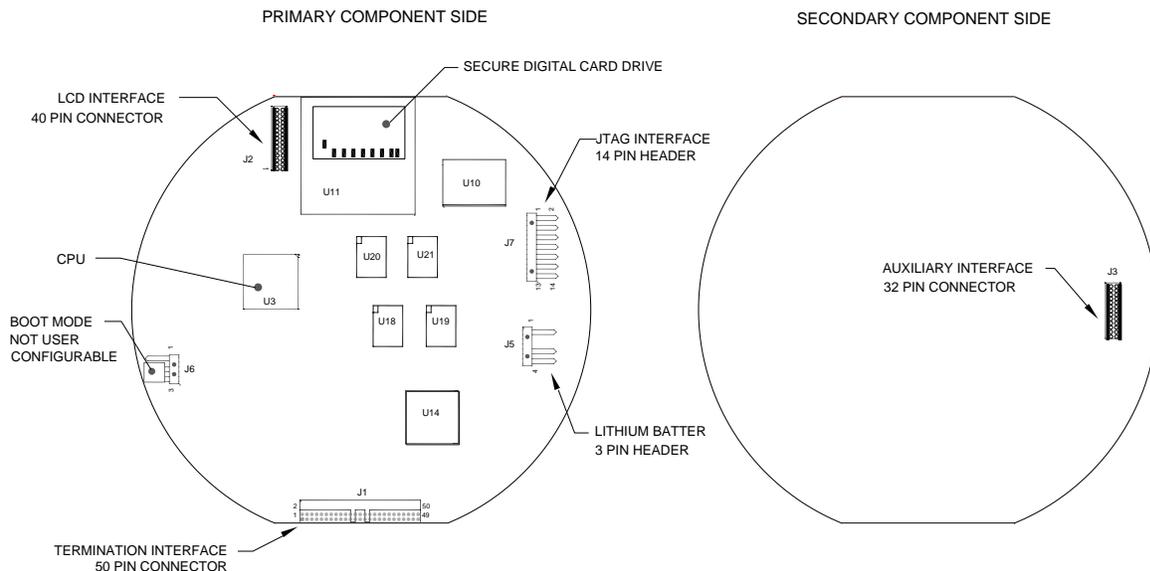
#### 4.13.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.
- 3) Back up the configuration files. Follow the instructions detailed previously in the Backing Up Configuration Files section.
- 4) Turn off all sample streams, calibration gas and carrier gas.
- 5) Disconnect or remove the power from the NGC8106 unit externally or by removing the J1 connector from the termination board.



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

- 6) Following the instructions detailed in the Removing Digital Controller Assembly section, remove the assembly.
- 7) Unplug the termination board to digital controller assembly flat ribbon cable. Leave the lithium battery connected.



**Figure 4-5 Digital Controller Board**

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

**CAUTION**

Please note that the termination board 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 into pin 50, the right side of plug. The plug is keyed. As such, 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 NGC8106 (step 5).
- 11) Restore the configuration files. Follow the instructions detailed previously in the Restore Configuration Files section.
- 12) Re-install front and rear end caps.

**CAUTION**

For the purposes of returning this assembly to Totalflow service for warranty or repair, please contact ABB Totalflow customer service for an RA number. Please keep the lithium battery connected to the digital controller board for return.

**FYI**

Please note that since power was removed from this unit, the NGC8106 will perform Startup Diagnostics and stabilize. If the user has disabled the Startup 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 startup should be performed.

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

## 4.14 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 NGC8106. Read through all procedural steps before beginning disassembly.

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

**CAUTION**

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 be free from lint or dust particles. ABB 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.

**TIP**

For the purposes of returning this assembly to ABB Totalflow service for warranty or repair, please contact ABB Totalflow customer service for an RA number.

### 4.14.1 Instructions

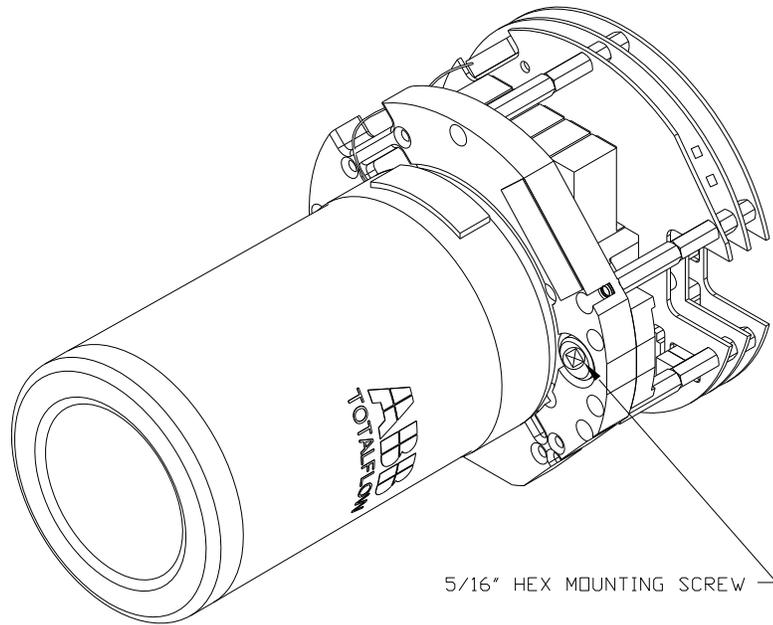
- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.

- 3) Back up the configuration files. Follow the instructions detailed previously in the Backing Up Configuration Files section.
- 4) Using the Lithium Battery Status instructions, verify the battery status is satisfactory before proceeding.
- 5) Turn off all sample streams, calibration gas and carrier gas.
- 6) Disconnect or remove the power from the NGC8106 unit externally or by removing the J1 connector from the termination board.

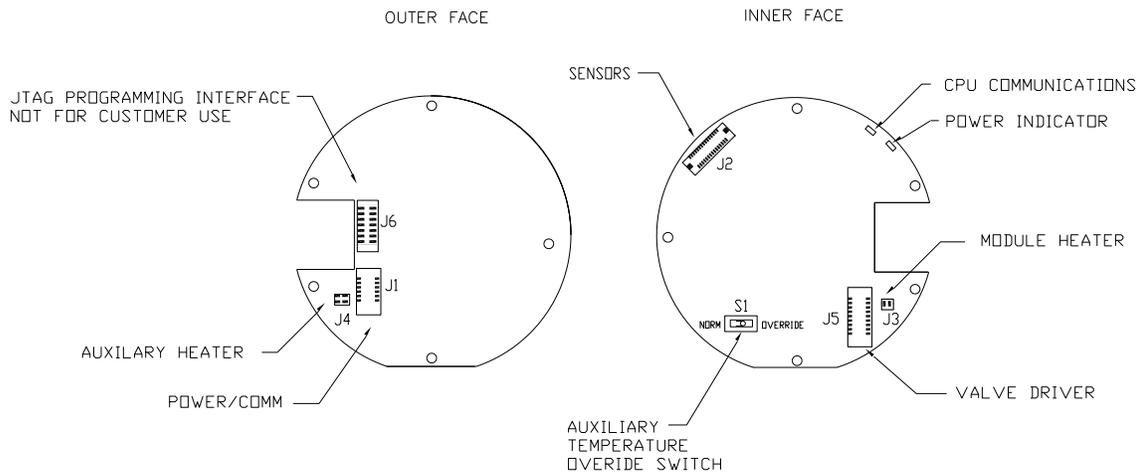


As with all electronic components, caution should be used when handling boards. Static electricity can potentially damage board components. This voids the warranty

- 7) Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap. Use a 1/16" hex wrench. Upon completion, unscrew the end cap.
- 8) Following the instructions detailed previously in the Digital Controller Assembly Mounting Bracket section, remove the assembly. If weather/circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on the cable connections. Move to step 10.
- 9) Carefully unplug the cable to the termination board. Leave 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 4-6) holding the analytical module in place until the module can be slowly lifted from the enclosure. Take 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 4-7).
- 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. Ensure 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 4-6 Analytical Module**



**Figure 4-7 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 4-7).
- 17) Carefully insert the module into the enclosure. Rotate 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) Re-assemble the digital controller assembly. Use the instructions previously covered in this chapter.

- 20) Plug the termination board to the digital controller ribbon cable into the digital controller assembly.

**CAUTION**



Please note that the termination board 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 into 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 NGC8106 (Step 6).
- 24) Follow the Cold Start procedure detailed within this chapter.
- 25) Re-install the front and rear end caps.

**FYI**



Please note that since power was removed from this unit, the NGC8106 will perform Startup Diagnostics and stabilize. If the user has disabled the Startup 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 startup should be performed.

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

## 4.15 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.

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

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. Additionally, the gas sample flow line openings should be free of foreign contaminants.

**CAUTION**



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. Additionally, the gas sample flow line openings should be free of foreign contaminants. Also, be careful with the miniature D-type connector pins.

### 4.15.1 Instructions

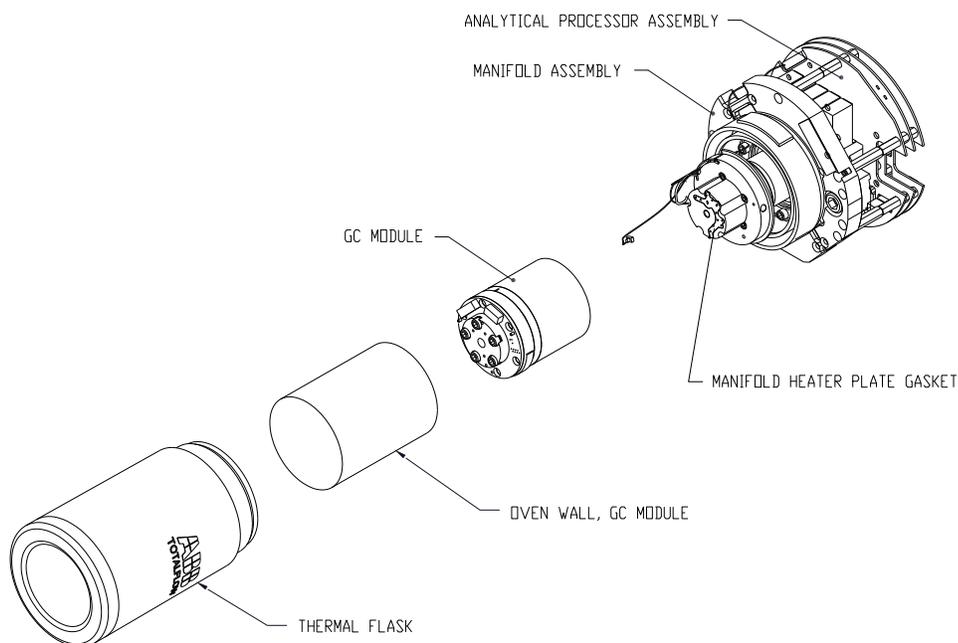
- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.

- 3) Back up the configuration files. Follow the instructions detailed previously in the Backing Up Configuration Files section.
- 4) Using the Lithium Battery Status instructions, verify the battery status is satisfactory before proceeding.
- 5) Turn off all sample streams, calibration gas and carrier gas.
- 6) Disconnect or remove the power from the NGC8106 unit externally or by removing the J1 connector from the termination board.



As with all electronic components, caution should be used when handling boards. Static electricity can potentially damage board components. This voids the warranty.

- 7) Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap. Use a 1/16" hex wrench. Upon completion, unscrew the end cap.
- 8) Following the instructions detailed previously in the Digital Controller Assembly Mounting Bracket section, remove the assembly. If weather/circumstances permit, the digital controller assembly may be suspended by the cables to eliminate stress on the cable connections. If so, move to step 10.
- 9) Carefully unplug the cable to the termination board. Leave the lithium battery plugged in. Set the digital controller assembly aside on a clean, lint-free surface.
- 10) Unscrew the thermal flask counterclockwise (see Figure 4-8). 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 4-8 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 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. Rotate 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. Be careful to not press against the wires attached to the connector head.
- 18) Replace the oven wall onto the GC module. Be 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) Using instructions previously covered in this chapter, re-assemble the digital controller assembly
- 21) Plug the termination board to the digital controller ribbon cable and then into the digital controller assembly, if disconnected.

**CAUTION**



Please note that the termination board 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 into pin 50, the right side of the plug. The plug is keyed. Do not force 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 NGC8106 (Step 6).

**TIP**



For the purposes of returning this assembly to ABB Totalflow service for warranty or repair, please contact ABB Totalflow customer service for an RA number.

- 25) Follow the Cold Start procedure within this chapter.
- 26) Re-install the front and rear end caps.

**FYI**



Please note that since power was removed from this unit, the NGC8106 will perform Startup Diagnostics and stabilize. If the user has disabled the Startup 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 startup should be performed.

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

## 4.16 Replacing Termination Board

This section presents the procedures for removal and installation of the power termination board. This board is located in the rear of the NGC8106. Read through all procedural steps before removing the assembly.

### 4.16.1 Instructions

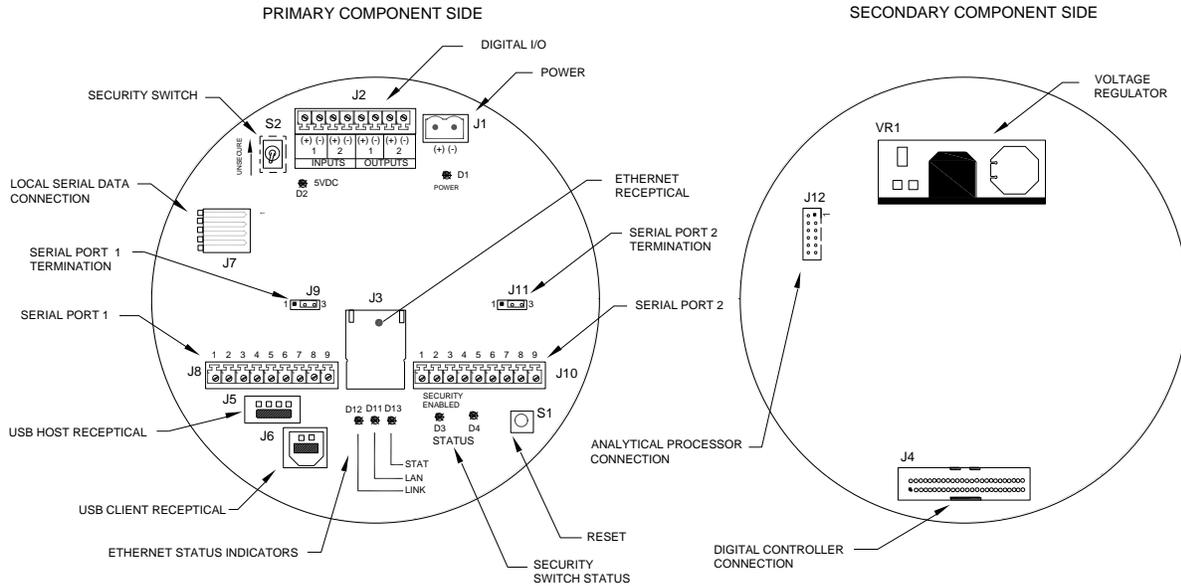
- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from unit.
- 3) Following the instructions detailed previously in the Backing Up Configuration Files section, back up the configuration files.
- 4) Using the Lithium Battery Status instructions, verify the battery status is satisfactory before proceeding.
- 5) Gain access to the rear termination panel of the NGC8106 by loosening the countersunk hex socket locking set screw in the rear end cap. Use a 1/16" hex wrench. Upon completion, unscrew the end cap.

**CAUTION**  As with all electronic components, caution should be used when handling boards. Static electricity can potentially damage board components. This voids the warranty.

- 6) Disconnect or remove power from the NGC8106 unit externally or by removing the J1 connector from the termination board (see Figure 4-9).
- 7) Disconnect all connectors from the 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 board in place.
- 9) Lift the protective overlay out.
- 10) Lift the termination board out. Be careful of the wires fed into the enclosure through the hubs and the cables connected to the back. **DO NOT REMOVE EMI GASKET.**
- 11) Carefully unplug the ribbon cable to the digital controller from the back of the termination board, J4, and the analytical processor, J12. Set the board aside.

**CAUTION**  Please note that the termination board 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 into pin 50, the right side of the plug. The plug is keyed. Do not force plug into the connector.

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



**Figure 4-9 Termination Board**

- 15) Replace the nuts to hold the termination board in place.
- 16) Restore J2, J8, J10, J3 and J6 connections, if applicable.
- 17) Once the unit is reassembled, apply power to the NGC8106 (Step 6).
- 18) Reinstall the front and rear end caps.



**TIP**

For the purposes of returning this assembly to ABB Totalflow service for warranty or repair, please contact ABB Totalflow customer service for an RA number.

**FYI**



Please note that since power was removed from this unit, the NGC8106 will perform Startup Diagnostics and stabilize. If the user has disabled the Startup 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 startup should be performed. For more information on enabling the diagnostics in PCCU, click the Diagnostics button and then the Help button.

## 4.17 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 NGC8106. Read through all the procedural steps before removing the assembly.

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

### 4.17.1 Instructions

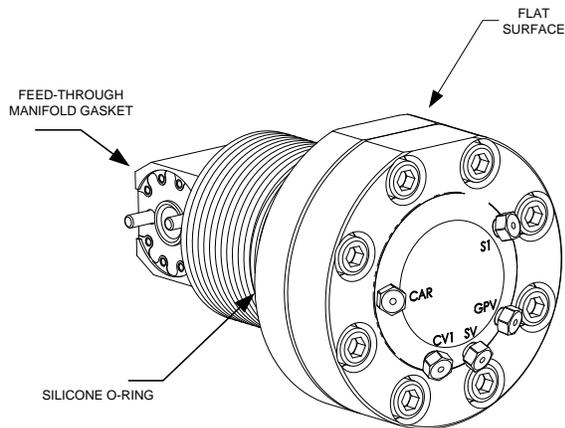
- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.

- 2) Collect data from the unit.
- 3) Following the instructions detailed in the Backing Up Configuration Files section, back up the configuration files.
- 4) Using the Lithium Battery Status instructions, verify the battery status is satisfactory before proceeding.
- 5) Turn off all sample streams, calibration gas and carrier gas.
- 6) Disconnect or remove the power from the NGC8106 unit externally or by removing the J1 connector from the termination board.



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 this chapter entitled, Digital Controller Assembly Mounting Bracket, remove the assembly. If weather/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 1/4" 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 o-ring and manifold gasket supplied with new feed-through assembly (see Figure 4-10).
- 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 4-10 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 pass 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 pass 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 4-7).
- 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) Reassemble the digital controller assembly, using instructions previously covered in this chapter.
- 27) Plug the termination panel to the digital controller ribbon cable and into the digital controller assembly.



**CAUTION**

Please note that the termination board 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 into pin 50, the right side of the plug. The plug is keyed. Do not force 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 NGC8106 (Step 6).
- 30) Reinstall the front and rear end caps.

**FYI**



Please note that since the power was removed from this unit, the NGC8106 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 the Diagnostics button and then the Help button.

## 4.18 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.

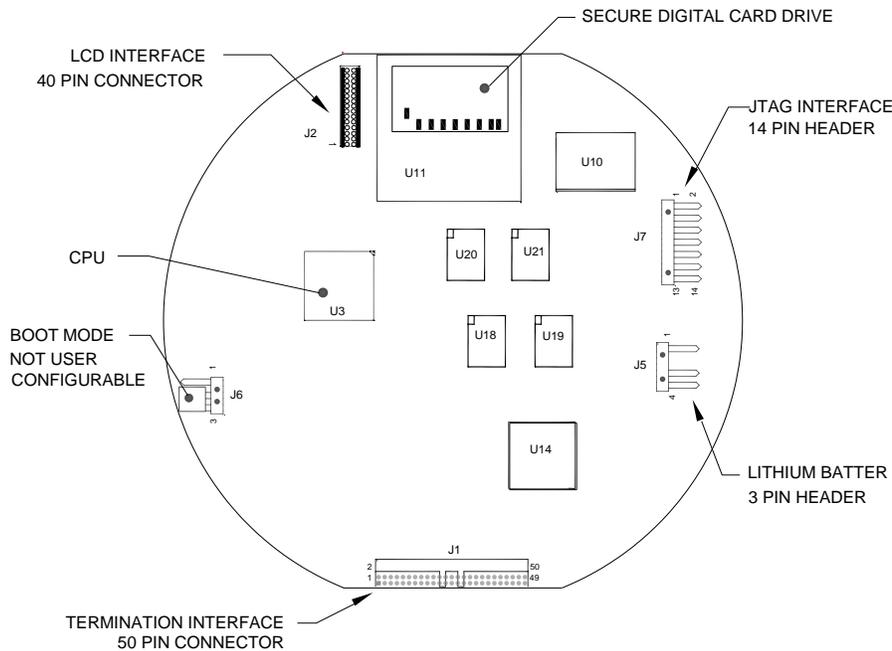
### 4.18.1 Instructions

**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, the user may continue to the next step.
- 2) Collect data from the unit.
- 3) Back up the configuration files, following the instructions detailed previously in this chapter entitled, Backing Up Configuration Files.

**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 4-11).
- 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 Lithium Battery Status instructions, verify that the battery status is ok before proceeding.
- 9) Reinstall the front end cap.



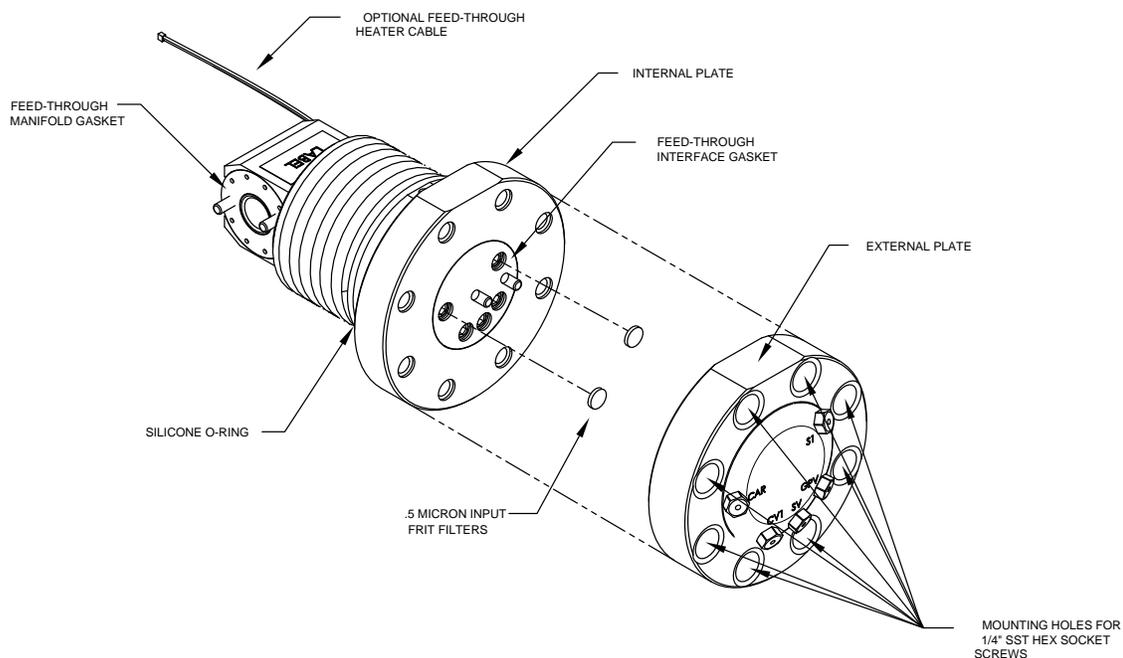
**Figure 4-11 Primary Component Side Digital Controller Board**

## 4.19 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, the user should 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.

### 4.19.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.
- 3) Back up the configuration files, following the instructions detailed previously in this chapter entitled, Backing Up Configuration Files.
- 4) Turn off the sample stream, calibration gas and carrier gas.
- 5) Using a 7/32" hex wrench, loosen and remove all 8-1/4" hex socket screws (see Figure 4-12).
- 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, the user must remove the sample input lines and the carrier and calibration gas lines.



**Figure 4-12 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 1/4" open end wrench, loosen the Valco nut, and remove the input line. Repeat for all sample, carrier and calibration gas lines.
- 9) Remove the 8-1/4" 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, the user should also 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. 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 8-1/4" 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.

## 4.20 Replacing Feed-Through Interface Gasket

Should the feed-through interface gasket require replacement (see Figure 4-12), 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.

### 4.20.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.
- 3) Back up the configuration files, following the instructions detailed previously in this chapter entitled, Backing Up Configuration Files.
- 4) Turn off sample stream, calibration gas and carrier gas.
- 5) Using a 7/32" hex wrench, loosen and remove all 8-1/4" 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, the user must 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 1/4" open end wrench, loosen the Valco nut and remove the input line. Repeat for all sample, carrier and calibration gas lines.
- 9) Remove the 8-1/4" 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 8-1/4" mounting screws, using a star pattern when tightening the screws.
- 14) If the sample, carrier and calibration gas lines were removed, purge air from the transport tubing, and reconnect to the corresponding ports.



DO NOT over-tighten. After securing the tubing, check for gas leaks.

## 4.21 Replacing Feed-Through Manifold Gasket

Should the feed-through manifold gasket require replacement (see Figure 4-12), 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.

#### 4.21.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.
- 3) Back up the configuration files, following the instructions detailed previously in this chapter entitled, Backing Up Configuration Files.
- 4) Using the Lithium Battery Status instructions, verify the battery status is ok before proceeding.
- 5) Turn off the sample stream, calibration gas and carrier gas.
- 6) Disconnect or remove power from the NGC8106 unit externally, or remove the J1 connector from 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 this chapter entitled, Digital Controller Assembly Mounting Bracket, remove assembly. If weather/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 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 4-7).
- 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) Reassemble the digital controller assembly, using instructions previously covered in this chapter.

- 19) Plug the termination panel to the digital controller ribbon cable into the digital controller assembly.



Please note that the termination board 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 into pin 50, the right side of the plug. The plug is keyed. Do not force 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



Please note that since power was removed from this unit, the NGC8106 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 the Diagnostics button and then the Help button.

## 4.22 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.

### 4.22.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.
- 3) Back up the configuration files following the instructions detailed previously in this chapter entitled, Backing Up Configuration Files.
- 4) Using the Lithium Battery Status instructions, verify the battery status is ok before proceeding.
- 5) Turn off the sample stream, 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 the boards. Static electricity can potentially damage board components, voiding any warranty.

- 7) Gain access to the digital controller assembly by loosening the countersunk hex socket locking set screw in the front end cap using a 1/16" hex wrench and then unscrewing the end cap.
- 8) Following the instructions detailed previously in this chapter entitled, Removing Digital Controller Assembly, remove the assembly (see *Figure*

4-4). If weather/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.

- 9) Carefully unplug the cable to the termination panel, leaving the lithium battery plugged in, and set the digital controller assembly aside on a clean, lint-free surface.
- 10) Using a 5/16" hex wrench, loosen the mounting screw holding the analytical module in place until the module can be slowly lifted from the enclosure, taking care to not pull the wires attached to the rear of the assembly (see Figure 4-7).
- 11) Detach the analytical module rear face jack J1 and J4, if the auxiliary heater is installed.
- 12) Set the module on a clean, lint-free surface.
- 13) Reach into the enclosure through the front opening, and unplug the ribbon cable from the rear of the termination panel J4.
- 14) On the replacement cable, verify the orientation by viewing the keyed receptacle on the termination panel and cable. Insert the plug into the J4 connector.
- 15) Verify that the gasket on the feed-through assembly manifold interface is in place and in good condition. If the gasket has fallen off inside the enclosure or is stuck to the GC module, replace onto the feed-through manifold interface, ensuring that the gasket does NOT cover the gas portholes.
- 16) Insert the mounting screw into the analytical module.
- 17) Holding the analytical module at the opening of the enclosure, reconnect jack J1 and J4, if the auxiliary heater is installed (see Figure 4-6).
- 18) Carefully insert the module into the enclosure, rotating the module to ensure that the rear components clear the manifold interface on the inside area of the feed-through assembly. The feed-through manifold interface and analytical module are keyed to ensure the proper alignment.
- 19) When the analytical module is in place, tighten the mounting screw.
- 20) Reassemble the digital controller assembly using the instructions previously covered in this chapter.
- 21) Plug the termination panel into the digital controller ribbon cable and then into the digital controller assembly.

**CAUTION**



Please note that the termination board 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 into pin 50, the right side of the plug. The plug is keyed. Do not force plug into the connector.

- 22) Insert the lithium battery pack into the enclosure between the enclosure and the thermal flask.
- 23) Once the unit is reassembled, apply power to the NGC8106 (Step 6).
- 24) Reinstall the front and rear end caps.

FYI



Please note that since the power was removed from this unit, the NGC8106 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 the Diagnostics button and then the Help button.

## 4.23 Replacing Analytical Processor to Termination Panel Cable

Should the cable connecting the analytical processor to the termination panel require replacement, use the following instructions.

### 4.23.1 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Collect data from the unit.
- 3) Back up the configuration files following the instructions detailed previously in this chapter entitled, Backing Up Configuration Files.
- 4) Using the Lithium Battery Status instructions, verify the battery status is ok before proceeding.
- 5) Disconnect or remove the power from the NGC8106 unit externally, or remove the J1 connector from the termination panel.

CAUTION



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 this chapter entitled, 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 4-7).
- 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 4-9).
- 8) Reinstall the termination panel.

CAUTION



Please note that the termination board 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 into pin 50, the right side of the plug. The plug is keyed. Do not force plug into the connector.

- 9) Once the unit is reassembled, apply power to the NGC8106 (Step 6).

TIP



For the purposes of returning this assembly to Totalflow service for warranty or repair, please contact Totalflow customer service for an RA number.

- 10) Reinstall the rear end cap.

**FYI**



Please note that since power was removed from this unit, the NGC8106 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 the Diagnostics button and then the Help button.



## 5.0 TROUBLESHOOTING

### 5.1 Overview

As an aid to troubleshooting the NGC8106, this chapter will provide troubleshooting guidelines for the various subsystems of the NGC8106. 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 NGC8106 enclosure.

Some of the procedures are based on tests performed on the NGC8106 termination panel and others are based on tests performed on components located in a separate enclosure. The user will determine which of these procedures correspond to their particular unit. If using equipment other than the Totalflow enclosure, the user will need to 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.

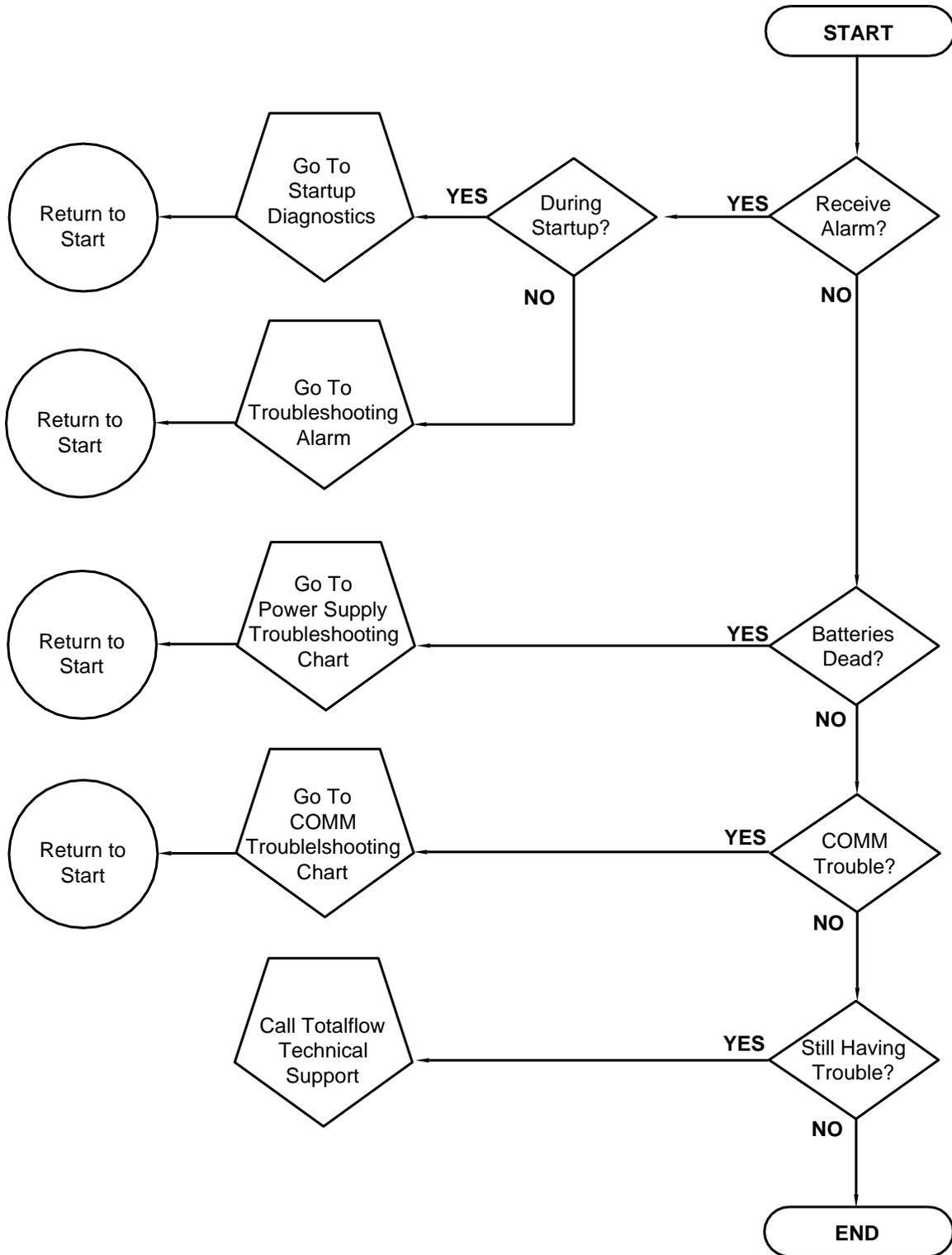
#### 5.1.1 Troubleshooting Support

If troubleshooting instructions do not lead to a resolution and assistance is required, the user can contact the Totalflow service department.

USA: (800) 442-3097 or International: 001-918-338-4880

#### 5.1.2 Getting Started

Using Figure 5-1, the user can determine which section pertains to them and skip to that section.



**Figure 5-1 Troubleshooting Flowchart**

## 5.2 Startup Diagnostic Troubleshooting

This section focuses on determining what has caused an alarm during start-up diagnostics. The Totalflow® NGC8106 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 4 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. Please see the PCCU help files for more information on scheduling diagnostics.

**FYI**



Totalflow has endeavored to perform extensive testing on each NGC8106 prior to shipment, and each unit is factory calibrated using our standard calibration blend.

**TIP**



During the stream test, the input stream will be disabled if no pressure is detected. Failure to detect pressure on the input stream will result in an input stream failure.

### 5.2.1 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.

### 5.2.2 Carrier Pressure Regulator Test

If the 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.

#### 5.2.2.1 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.

### 5.2.2.2 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 NGC8106 is plugged, etc.
Flow Blocked	A blockage was sensed during one of the tests. The flow test was run in an attempt to dislodge the blockage but was not successful. See flow test below.
Pressure Reg Test	This is an additional test that is in progress because the basic test failed. A different status will be displayed after the test has finished.
Flow Test	The flow test is in progress. The flow test is initiated when a blockage is sensed. The flow test will raise the pressure in an attempt to blow the plug out through the vent. If unsuccessful, the flow blocked status will be displayed.
Failed	The additional tests cannot prove with certainty but either the GC module or the manifold assembly is bad.

### 5.2.2.3 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 column vent 1 (CV1). If this test fails, proceed to the next step.
- 4) Using the Replacing Analytical Module Assembly instructions in Chapter 4 - 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 Chapter 4-Maintenance, replace the GC module.

### 5.2.3 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.

#### 5.2.3.1 Description

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

#### 5.2.3.2 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 Chapter 4-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

### 5.2.4 Processor Control Test

If Col 1 carrier pressure test fails, 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.

#### 5.2.4.1 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.

#### 5.2.4.2 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 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.

### 5.2.5 Stream Test

The stream flow diagnostics go through a series of tests, testing the input 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.

**TIP**  During the stream test, if no pressure is detected on the input stream it will be disabled and a failure will be logged.

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 stream waiting to be tested. The tests are run sequentially.

#### 5.2.5.1 Description

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

#### 5.2.5.2 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 Chapter 4-Maintenance, replace the analytical module assembly.
- 4) Using the Replacing GC Module instructions in Chapter 4-Maintenance, replace the GC module.

### 5.3 Troubleshooting Alarms

This section focuses on determining what has caused an alarm following normal operation. The Totalflow NGC8106 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 5-1 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.



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. Please see the PCCU32 help files for more information regarding these.

**Table 5-1 NGC8106 Alarms**

Description	Enable	Type	Severity
Pressure Regulator 1	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

Description	Enable	Type	Severity
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

### 5.3.1 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

### 5.3.2 Alarm Severity

**Table 5-2 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, but 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 the input stream from having its 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 the input 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 stream data from being updated, should not use this category of alarm.

### 5.3.3 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.

#### 5.3.3.1 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.

#### 5.3.3.2 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), 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 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 Feed-Through Assembly Blockage Test procedure, found in this chapter, on column vent 1 (CV1). 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 Chapter-4 Maintenance, replace the analytical module assembly.
- 11) Using the Replacing GC Module instructions in Chapter 4-Maintenance, replace the GC module.

### 5.3.4 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.

#### 5.3.4.1 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.

#### 5.3.4.2 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 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 Chapter 4-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 Analytical Module Assembly instructions in Chapter 4-Maintenance, replace the analytical module assembly.
- 11) Using the Replacing GC Module instructions in Chapter 4-Maintenance, replace the GC module.

### 5.3.5 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.

#### 5.3.5.1 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.

#### 5.3.5.2 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 GC Module Assembly Replacement instructions in Chapter 4-Maintenance.

Otherwise, continue to the next step.

- 4) Remaining options are not field repairable. Using the Analytical Module Assembly instructions in Chapter 4-Maintenance, replace the analytical module assembly.

**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.

### 5.3.6 No Stream Valve Selected

If 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.

#### 5.3.6.1 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 the input stream, but continue to try and run chruns. This can also be caused if the digital and analytical board moves out of synchronization.

#### 5.3.6.2 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 NGC8106 in hold, allow 25 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 the input stream.
- 4) Perform start-up diagnostics.  
If the stream test fails, continue to the next step.
- 5) Perform a warm start.

**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.

### 5.3.7 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.

#### 5.3.7.1 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.

### 5.3.7.2 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.



**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.

### 5.3.8 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.

#### 5.3.8.1 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.

#### 5.3.8.2 Instructions

- 1) Following Calibrating the NGC8106 instructions in Chapter 3-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, 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.



**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.

### 5.3.9 Calibration Un-Normalized Error Alarm

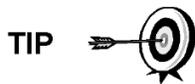
If the calibration un-normalized error alarm is in fault status, the following procedure will step the user through the troubleshooting process. On occasion, these instructions may detour the user to other procedures, and, when complete, they should return to these procedures to continue.

#### 5.3.9.1 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.

#### 5.3.9.2 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may 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.
- 4) Following the Calibrating the NGC8106 instructions in Chapter 3-Startup, perform a calibration ensuring that the Next Mode is set to Hold.
- 5) When 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 marked 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  $\pm .50\%$  (between 99.5 and 100.5).
- 10) 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.

### 5.3.10 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.

### 5.3.10.1 Description

These alarms are indicative of a synchronization problem following a manual data post process in factory mode.

### 5.3.10.2 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may continue to the next step.
- 2) Following Reset Procedure instructions in Chapter 4-Maintenance, perform a warm start.

## 5.3.11 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.

### 5.3.11.1 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.

### 5.3.11.2 Instructions

- 1) On the Analyzer Operation screen, click Hold under Next Mode. When the unit completes the current cycle and enters hold, the user may 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.
- 4) Following the Calibrating the NGC8106 instructions in Chapter 3-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.

### 5.3.12 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.

#### 5.3.12.1 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.

#### 5.3.12.2 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, the user may 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.
- 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 NGC8106 instructions in Chapter 3-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.

### 5.3.13 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.

#### 5.3.13.1 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.

### 5.3.13.2 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 0°F and 120°F.

Otherwise, continue to the next step.

- 2) If the temperature differential does not seem reasonable, the analytical processor assembly may have a bad temperature sensor. As this alarm is only a warning, it will not affect the operation of the 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

### 5.3.14 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.

#### 5.3.14.1 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.

#### 5.3.14.2 Instruction

- 1) Check the power supply to 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.

### 5.3.15 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.

#### 5.3.15.1 Description

These alarms are indicative of the carrier gas bottle pressure below the threshold.

#### 5.3.15.2 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 following the procedure in the Introduction section of this manual.

#### 5.3.16 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.

#### 5.3.16.1 Description

These alarms are indicative of the calibration gas bottle pressure below the threshold.

#### 5.3.16.2 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.

#### 5.3.17 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.

#### 5.3.17.1 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.

#### **5.3.17.2 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.

#### **5.3.18 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.

##### **5.3.18.1 Description**

These alarms are indicative of problem with the GC module.

##### **5.3.18.2 Instructions**

- 1) Following the GC Module Replacement instructions in Chapter 4-Maintenance, replace the GC module.

#### **5.3.19 No Pilot Valve Change Detected Alarm**

If 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.

##### **5.3.19.1 Description**

These alarms are indicative of the pressure regulator problem on the manifold. During backflush, a valve is changed, but no disturbance is registered.

##### **5.3.19.2 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.

### **5.3.20 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.

#### **5.3.20.1 Description**

These alarms are indicative of a pressure issue such as a blocked vent tube, too short bleed cycle or stream test is in auto, etc.

#### **5.3.20.2 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) Following the GC Module Replacement instructions in Chapter 4-Maintenance, replace the GC module.

### **5.3.21 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.

#### **5.3.21.1 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.

#### **5.3.21.2 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.

### **5.3.22 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.

#### **5.3.22.1 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.

### 5.3.22.2 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 Procedure instructions in Chapter 4-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.

### 5.3.23 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.

#### 5.3.23.1 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.

#### 5.3.23.2 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 Procedure instructions in Chapter 4-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.

### 5.3.24 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.

#### **5.3.24.1 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.

#### **5.3.24.2 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.

### **5.3.25 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.

#### **5.3.25.1 Description**

These alarms are indicative of a missing peak during a calibration cycle and calibration will not be used.

#### **5.3.25.2 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, the user may continue to the next step.
- 3) When the unit enters hold, select Peak Find from the Analyzer Operation screen. Ensure that Automatic is check marked 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 3-5 and Figure 3-6 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 NGC8106 instructions in Chapter 3-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.

### **5.3.26 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.

#### **5.3.26.1 Description**

These alarms are indicative of a change to the process stream un-normalized total of the sufficient percentage to activate the alarm.

#### **5.3.26.2 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, the user may continue to the next step.
- 4) When the unit enters hold, select Peak Find. Select Run Auto PF. Ensure that Automatic is check marked 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 NGC8106 instructions in Chapter 3-Startup, perform a calibration.

## **5.4 Alarm Troubleshooting Tests**

### **5.4.1 Sample Vent Pressure Test**

#### **5.4.1.1 Instructions**

- 1) Attach flowmeter to the sample valve.
- 2) From the Analyzer Operation screen, click on 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.

### **5.4.2 Column Vent Pressure Test**

#### **5.4.2.1 Instructions**

- 1) Attach flowmeter to CV1.
- 2) From the Analyzer Operation screen, click on 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.

### 5.4.3 Sample Pressure Test

#### 5.4.3.1 Instructions

- 1) Place unit in Hold.
- 2) From the Analyzer Operation screen, click on Diagnostics.
- 3) Select the Manual Operation tab and select Monitor.
- 4) Read the sample pressure from the current reading.
- 5) Under Manual Control, open stream 1 valve.
- 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.

### 5.4.4 Feed-Through Assembly Blockage Test

- 1) Remove the feed-through assembly from the NGC8106 following Feed-Through Assembly instructions in Chapter 4-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 SV and activate. If the flow through assembly is impeded, the test has failed. Return to the troubleshooting alarm instructions.

### 5.4.5 Temperature Sensor Test

#### 5.4.5.1 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.

## **5.4.6 Abnormal Calibration Gas Depletion**

### **5.4.6.1 Description**

If the calibration (and/or carrier) gas has depleted significantly sooner than expected, there may one or more issues.

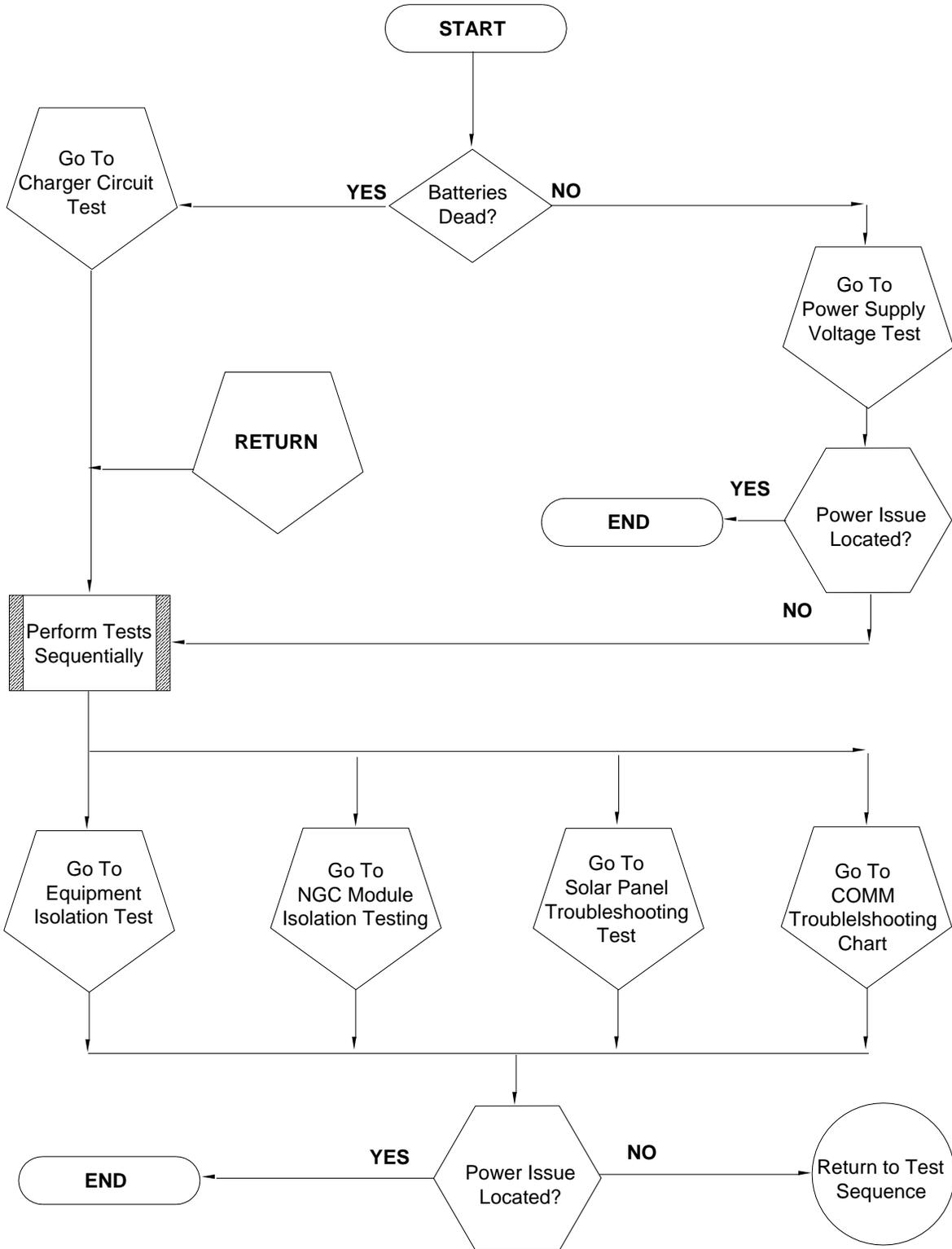
### **5.4.6.2 Instructions**

- 1) If the NGC8106 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 NGC8106.
- 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 NGC8106 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.

## **5.5 Power Troubleshooting**

### **5.5.1 Overview**

This section focuses on determining what has caused the NGC8106 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 NGC8106 to lose power. Notice that the power troubleshooting flowchart (see Figure 5-2) takes the user through several tests, but also directs them to the communication troubleshooting flowchart located further in this chapter.



**Figure 5-2 Power Troubleshooting Flowchart**

## 5.5.2 Power Supply Voltage Test

**TIP**



This test assumes a power supply is in good working order and has previously been tested and qualified to power an NGC8106. If the power supply is under suspicion, it is recommended that it be replaced with a known good power supply before conducting these tests.

### 5.5.2.1 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 System Specifications in Chapter 1).

If this is a new installation and the external equipment is being powered from the NGC8106 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 NGC8106 and the power source. Verify 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 NGC8106) like a fuse, diode or a barrier device, etc.

Correct and retest as necessary.

- 4) Disconnect the power supply cable at the NGC8106 termination panel J1.

- 5) Measure the power supply cable voltage at the connector and compare with the table recommendations (see Table 1–4 and Table 1–5).

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 NGC8106 termination panel J1.

## 5.5.3 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 NGC8106.

This procedure assumes that the previous power supply voltage test was performed and that no errors were found.

### 5.5.3.1 Instructions

- 1) While the NGC8106 is operating, verify that the voltage at the NGC8106 termination panel is between 11.5 Vdc-16 Vdc (for 12 Vdc systems) or 22 Vdc to 28 Vdc (for 24 Vdc systems).

The NGC8106 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 NGC8106 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 and then let it monitor the NGC8106 while operating for a few minutes. This should provide a good indication of the minimum voltage appearing at the NGC8106 terminals.

- 2) Is the voltage within limits? If no, 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 NGC8106 termination panel? If no, return to Figure 5-2 and continue the test sequence. If yes, continue to the next step.
- 4) Disconnect the peripheral equipment from the NGC8106.
- 5) While the NGC8106 is operating, verify that the voltage at the NGC8106 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 no, return to Figure 5-2 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.

#### 5.5.4 NGC8106 Module Isolation Test

This test isolates the NGC8106 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.

##### 5.5.4.1 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 Chapter 4-Digital Controller Assembly Mounting Bracket, remove the digital controller and disconnect the termination panel to the digital controller cable.
- 3) Using instructions in Chapter 4-Replacing Analytical Module, remove the analytical module.
- 4) With power still disconnected from the NGC8106, 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 NGC8106 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 NGC8106.

- 7) If the voltage drop is greater than 0.1V, replace the termination panel using instructions in Chapter 4-Replacing Termination Panel and return to step 6. If the voltage drop is again greater than 0.1V, call Totalflow technical support, following the instructions in the Introduction to this manual, Getting Help.

If the drop is less than 0.1V, 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 chapter 4.

If no, use instructions in Chapter 4- 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 NGC8106 to fully boot and for the NGC8106 to start drawing normal to full power. However, under normal operation, the NGC8106 should never draw current beyond its rated values.
- 12) Return to the equipment isolation test.

## 5.5.5 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, the user will need to test the battery pack, AC charger/power supply or the solar panel.

The following instructions contain the steps required to perform the circuit testing.

### 5.5.5.1 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

### 5.5.5.2 Instructions

- 1) Begin by disconnecting power from the AC charger/power supply, located in the optional enclosure.
- 2) Replace the battery with a known good battery using the Battery Pack Replacement procedure located in Chapter 4-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 5-3. 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 5-2 power troubleshooting flowchart and continue.

**Table 5–3 Specifications for Solar Panels**

Panel	Max	Volts at P <sub>Max</sub>	Open Circuit	Load Resistance	Loaded Voltage
50	54W	17.4V	21.7V	5 Ω 100W	16–18 Vdc
85	87W	17.4V	21.7V	5 Ω 100W	16–18 Vdc

### 5.5.6 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, the user may need to test the solar panel.

The following instructions contain the steps required to do so.

#### 5.5.6.1 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

#### 5.5.6.2 Required Equipment

- Digital Multimeter with 0-20 Vdc range.
- Required resistors for testing specific panels listed in Table 5–3.

**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.

#### 5.5.6.3 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 5–3. 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 2-75 and Figure 2-76).
- 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 5–3 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 5–3 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 5–3. If the solar panel is not above the minimum, replace the solar panel and return to step 3.

### 5.5.7 AC Charger/Power Supply Troubleshooting Test

If the system setup includes an AC charger/power supply connected to the optional equipment enclosure, and is not supplying the required voltage to the NGC8106 unit, the user may need to test the AC charger/power supply. The following instructions contain the steps required to do so.

#### 5.5.7.1 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 5-3).
- 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.

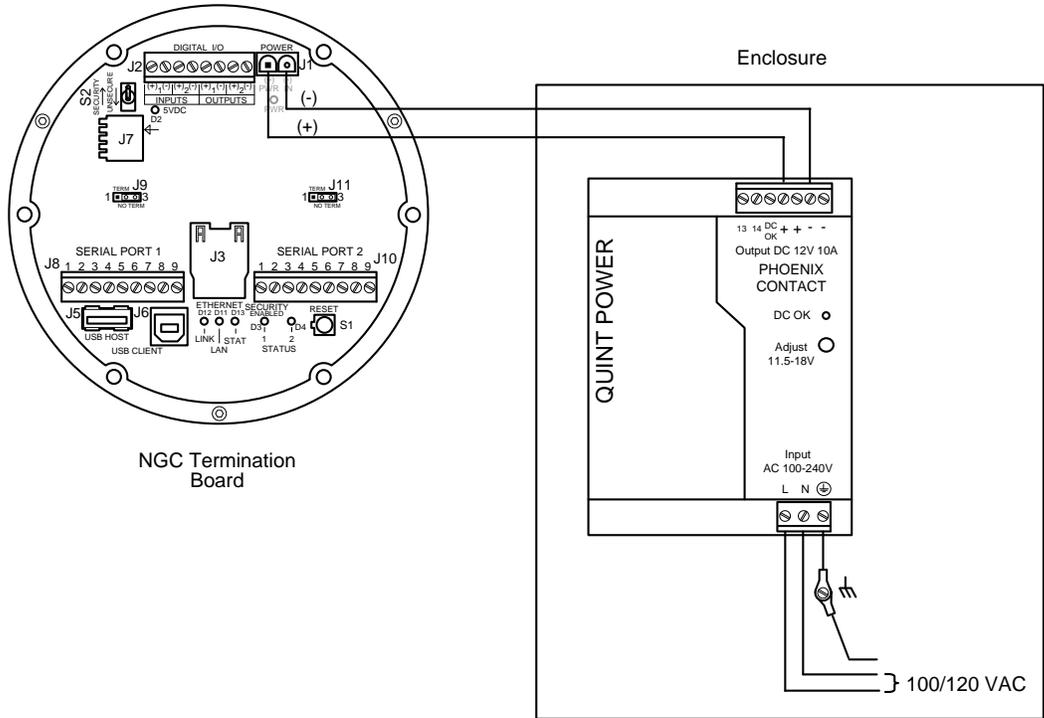


Figure 5-3 AC Charger/Power Supply Wiring

### 5.6 Troubleshooting Communications

These troubleshooting procedures are applicable to an NGC8106 with an installed radio in the optional equipment enclosure. Use Figure 5-4 as an aid for troubleshooting communication problems. The three basic types of radio communications that can be used between the NGC8106 and a radio receiver are:

- RS-232 Communications (see Table 5-4 for pin Configurations)
- RS-485 Communications (see Table 5-6 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 set up 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 radios inhibit (SLEEP) mode input. Power out will go to the radios power input.

#### 5.6.1 Communication

Troubleshooting the communications for this unit requires that equipment in two areas be tested: the NGC8106 Comm Ports and the external Communication device. This is discussed in more detail in the Communications Overview section.

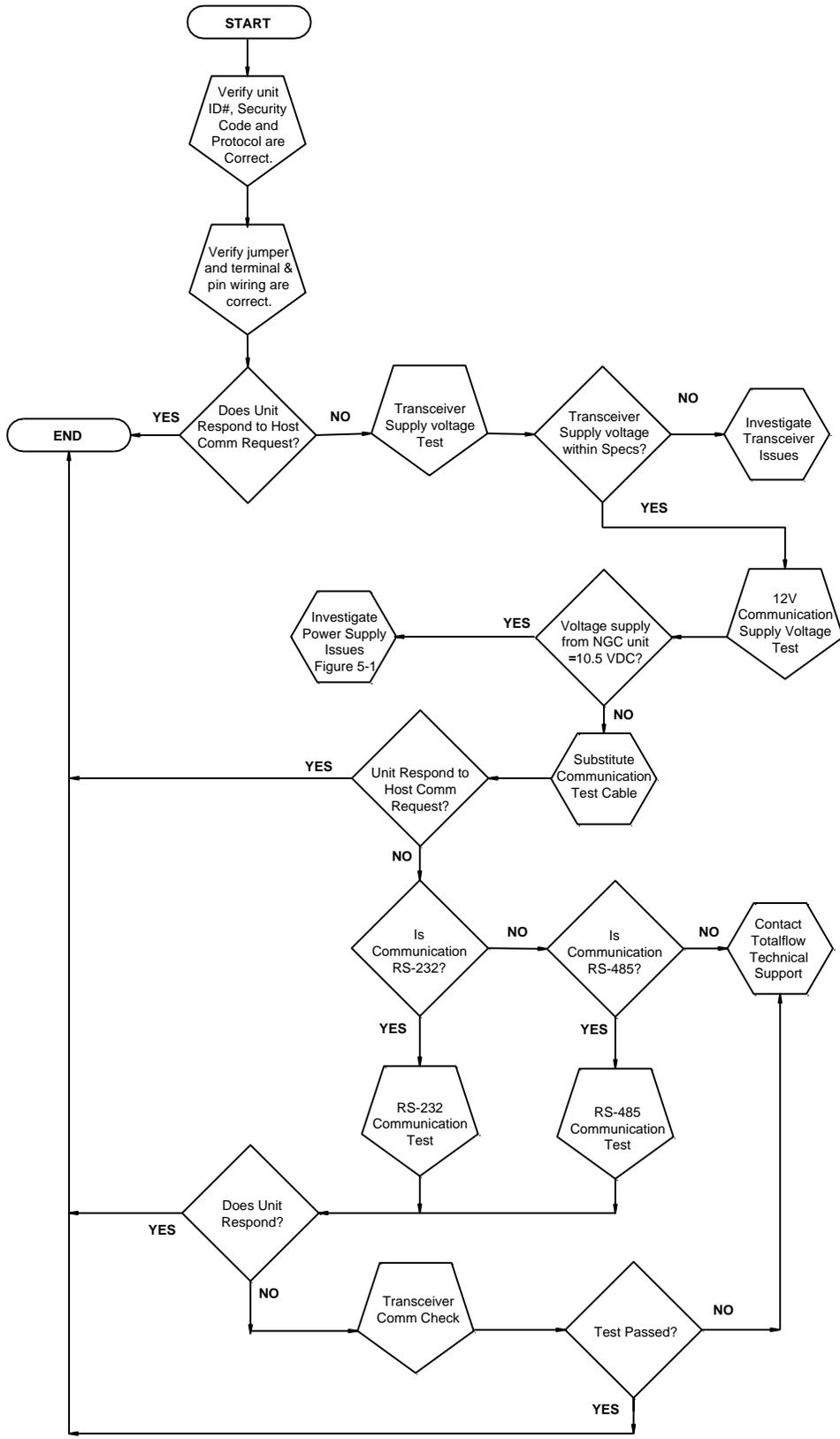
Other communication troubleshooting information is shared in the following categories:

- RS232 Communications
- RS485 Communications
- RS422 Communications

## 5.6.2 Setting Up Communication

After the installation of the communication equipment and before placing the communication system into operation, the user should note the following:

- Verify field wiring terminations on the NGC8106 termination panel.
- Verify field wiring from the NGC8106 unit to the termination strip inside the enclosure.
- Verify the field wiring from the termination strip to the radio.
- Check the NGC8106 identifier (ID). Log the ID for future reference.
- Log the NGC8106 access security code, baud rate, listen cycle, protocol and interface for future reference.



**Figure 5-4 Communication Troubleshooting Flowchart**

The following helpful hints aid the user after the communication equipment has been installed and setup: When the communication equipment is powered/switched on, the NGC8106 displays the communication icon after it recognizes the NGC8106 ID and is responding.

Check the baud rate of the NGC8106 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 user. Should the power fall below this level, remote communications will be terminated.

Test the remote communications using 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.

### 5.6.3 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.

### 5.6.4 12 Vdc Communication Supply Voltage Test

#### 5.6.4.1 Instructions

If the transceiver does not feature a sleep mode and power is supplied through an optional relay, begin with Step 1 -Relay Supply Voltage Test.

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 5-2).

### 5.6.5 Transceiver Check

#### 5.6.5.1 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 to 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.

### 5.6.6 RS-232 Communication Test

The following RS-232 serial communication test procedure is directed from Figure 5-4 and will assist the user in what may be the possible cause for the indicated error message.

Before performing this test, please verify that the field wiring is correct (see Table 5-4).

**Table 5-4 RS-232 Field Wiring on NGC8106 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 the termination settings of the serial port 1 J9 and serial port 2 J11 on the termination panel have pins 2 and 3 jumpered.

### 5.6.6.1 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 NGC8106.



**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 5–4).

- 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 5–4).

- 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 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 5-4.

### 5.6.7 RS-485 Communications

The following RS-485 serial communication test procedure is directed from Figure 5-4 and will assist the user in 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 5–5).

**Table 5-5 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

**5.6.8 RS-485 Communication Test**

Before performing this test on the termination panel located inside the rear end cap, please verify that the wiring is correct (see Table 5-6).

**Table 5-6 RS-485 Field Wiring on NGC8106 Termination Panel**

PIN	Description	Description
	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)

**5.6.8.1 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 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 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 XMODBUS REGISTERS

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
Component Index for Stream			
3001	3001	51.200.0	Component Table #1 Component Index #1 (C3)
3002	3002	51.200.1	Component Table #1 Component Index #2 (IC4)
3003	3003	51.200.2	Component Table #1 Component Index #3 (NC4)
3004	3004	51.200.3	Component Table #1 Component Index #4 (Neo C5)
3005	3005	51.200.4	Component Table #1 Component Index #5 (IC5)
3006	3006	51.200.5	Component Table #1 Component Index #6 (NC5)
3007	3007	51.200.6	Component Table #1 Component Index #7 (C6+)
3008	3008	51.200.7	Component Table #1 Component Index #8 (N2)
3009	3009	51.200.8	Component Table #1 Component Index #9 (C1)
3010	3010	51.200.9	Component Table #1 Component Index #10 (CO2)
3011	3011	51.200.10	Component Table #1 Component Index #11 (C2)
3012	3012	51.200.11	Component Table #1 Component Index #12 (C6s)
3013	3013	51.200.12	Component Table #1 Component Index #13 (C7s)
3014	3014	51.200.13	Component Table #1 Component Index #14 (C8s)
3015	3015	51.200.14	Component Table #1 Component Index #15 (C9s)
3016	3016	51.200.15	Component Table #1 Component Index #16 (Spare)
3017	3017	51.200.0	Component Table #2 Component Index #1
3018	3018	51.200.1	Component Table #2 Component Index #2
3019	3019	51.200.2	Component Table #2 Component Index #3
3020	3020	51.200.3	Component Table #2 Component Index #4
3021	3021	51.200.4	Component Table #2 Component Index #5
3022	3022	51.200.5	Component Table #2 Component Index #6
3023	3023	51.200.6	Component Table #2 Component Index #7
3024	3024	51.200.7	Component Table #2 Component Index #8
3025	3025	51.200.8	Component Table #2 Component Index #9
3026	3026	51.200.9	Component Table #2 Component Index #10
3027	3027	51.200.10	Component Table #2 Component Index #11
3028	3028	51.200.11	Component Table #2 Component Index #12
3029	3029	51.200.12	Component Table #2 Component Index #13
3030	3030	51.200.13	Component Table #2 Component Index #14
3031	3031	51.200.14	Component Table #2 Component Index #15
3032	3032	51.200.15	Component Table #2 Component Index #16
3033	3033	51.201.1	Analysis Time (in 1/30ths of 1 second) (N/A)
3034	3034	51.201.0	Current Stream Number (15.0.28)
3035	3035	51.201.1	Mask of streams associated with Component Table 41 (N/A)
3036	3036	51.201.3	Current Month (1-12) (15.1.8)
3037	3037	51.201.4	Current Day (1-31) (15.1.9)
3038	3038	51.201.5	Current Year (0-99) (15.1.10)

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
3039	3039	51.201.6	CurrentHour (0-24) (15.1.11)
3040	3040	51.201.7	CurrentMinutes (0-59) (15.1.12)
3041	3041	51.201.8	Cycle Start Month (1-12) (15.1.13)
3042	3042	51.201.9	Cycle Start Day (1-31) (15.1.14)
3043	3043	51.201.10	Cycle Start Year (0-99) (15.1.15)
3044	3044	51.201.11	Cycle Start Hour (0-24) (15.1.16)
3045	3045	51.201.12	Cycle Start Minutes (0-59) (15.1.17)
3046	3046	51.201.42	Bit Flags Transmitter
3047	3047	51.201.43	Bit Flags Transmitter
3048	3048	51.201.1	Bit Flags Stream #1 Low (N/A)
3049	3049	51.201.1	Bit Flags Stream #1 High (N/A)
Int16 for Stream			
3058	3058	51.201.2	New Data Flag(15.1.7)
3059	3059	51.201.13	Cal/Analysis Flag(15.1.18)
3060	3060	51.201.32	Read the Current State (19.1.0)
3061	3061	51.201.33	Read the Next State (19.1.0)
3062	3062	51.201.1	Auto Calibration During Start-up (N/A)
3063	3063	51.201.22	Alternate Purge Cycles (15.0.24)
3064	3064	51.201.23	Alternate Calibration Cycles (15.0.19)
3065	3065	51.201.24	Number of Purge Cycles (15.0.23)
3066	3066	51.201.25	Number of Calibration Cycles (15.0.18)
3067	3067	51.201.1	Low Carrier Mode (N/A)
3068	3068	51.201.1	Low Power Mode (N/A)
3069	3069	51.201.1	Pre-Purge Selection (Future)
3070	3070	51.201.1	Normal Status (N/A)
3071	3071	51.201.1	Fault Status (N/A)
3072	3072	51.201.26	Carrier Bottle Low (DI1) (11.0.0)
3073	3073	51.201.27	Calibration Bottle Low (DI2) (11.0)
3074	3074	51.201.1	Manual Update Response Factors (N/A)
3075	3075	51.201.1	Auto Update Response Factors (N/A)
3076	3076	51.201.1	Disable Stream Switching (N/A)
3077	3077	51.201.1	Transmitter Current Warning (N/A)
3078	3078	51.201.1	Transmitter Current Fault (N/A)
3079	3079	51.201.1	Transmitter Initial Warning (N/A)
3080	3080	51.201.1	Transmitter Initial Fault (N/A)
3081	3081	51.201.18	Stream #1 Current Warning (15.128.1)
3085	3085	51.201.14	Stream #1 Current Fault (15.128.0)
3089	3089	51.201.38	Stream #1 Initial Warning (15.128.3)
3093	3093	51.201.34	Stream #1 Initial Fault (15.128.2)

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
3097	3097	51.201.28	Stream #1 Skip Flag (19.0.7)
5001	5001	51.208.2	Cycle Clock (19.2.2)
5002	5003	51.208.1	Cycle Time (19.2.1)
5003	5005	51.208.0	Detector 0 (N/A)
5004	5007	51.208.0	Detector 1 (N/A)
5005	5009	51.208.0	Detector 2 (N/A)
5006	5011	51.208.0	Detector 3 (N/A)
Mole % for Stream			
7001	7001	51.203.0	Mole % - Component#1
7002	7003	51.203.1	Mole % - Component#2
7003	7005	51.203.2	Mole % - Component#3
7004	7007	51.203.3	Mole % - Component#4
7005	7009	51.203.4	Mole % - Component#5
7006	7011	51.203.5	Mole % - Component#6
7007	7013	51.203.6	Mole % - Component#7
7008	7015	51.203.7	Mole % - Component#8
7009	7017	51.203.8	Mole % - Component#9
7010	7019	51.203.9	Mole % - Component#10
7011	7021	51.203.10	Mole % - Component#11
7012	7023	51.203.11	Mole % - Component#12
7013	7025	51.203.12	Mole % - Component#13
7014	7027	51.203.13	Mole % - Component#14
7015	7029	51.203.14	Mole % - Component#15
7016	7031	51.203.15	Mole % - Component#16
GPM % for Stream			
7017	7033	51.204.0	GPM % - Component#1
7018	7035	51.204.1	GPM % - Component#2
7019	7037	51.204.2	GPM % - Component#3
7020	7039	51.204.3	GPM % - Component#4
7021	7041	51.204.4	GPM % - Component#5
7022	7043	51.204.5	GPM % - Component#6
7023	7045	51.204.6	GPM % - Component#7
7024	7047	51.204.7	GPM % - Component#8
7025	7049	51.204.8	GPM % - Component#9
7026	7051	51.204.9	GPM % - Component#10
7027	7053	51.204.10	GPM % - Component#11
7028	7055	51.204.11	GPM % - Component#12
7029	7057	51.204.12	GPM % - Component#13

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
7030	7059	51.204.13	GPM % - Component#14
7031	7061	51.204.14	GPM % - Component#15
7032	7063	51.204.15	GPM % - Component#16
Floats for Stream			
7033	7065	51.202.0	BTU - Dry(15.4.5)
7034	7067	51.202.1	BTU - Saturated(15.4.6)
7035	7069	51.202.2	Specific Gravity(15.4.9)
7036	7071	51.202.3	Compressibility(15.4.11)
7037	7073	51.202.4	WOBBE Index(15.4.7)
7038	7075	51.202.6	Total UN-normalized mole(15.4.12)
7039	7077	51.202.13	Total GPM (15.4.13)
7040	7079	51.202.8	Ideal BTU (15.4.4)
7041	7081	51.202.9	DensityNormal (15.4.10)
7042	7083	51.202.10	Inferior WOBBE (15.4.8)
7043	7085	51.202.11	Methane Number (15.4.27)
7044	7087	51.202.12	Speed of Sound (15.4.54)
7045	7089	51.241.0	Rolling Average #1
7046	7091	51.241.1	Rolling Average #2
7047	7093	51.241.2	Rolling Average #3
7048	7095	51.241.3	Rolling Average #4
7049	7097	51.241.4	Rolling Average #5
7050	7099	51.241.5	Rolling Average #6
7051	7101	51.241.6	Rolling Average #7
7052	7103	51.241.7	Rolling Average #8
7053	7105	51.241.8	Rolling Average #9
7054	7107	51.241.9	Rolling Average #10
7055	7109	51.241.10	Rolling Average #11
7056	7111	51.241.11	Rolling Average #12
7057	7113	51.241.12	Rolling Average #13
7058	7115	51.241.13	Rolling Average #14
7059	7117	51.241.14	Rolling Average #15
7060	7119	51.241.15	Rolling Average #16
7061	7121	51.206.0	24 Hour Average for Component#1
7062	7123	51.206.1	24 Hour Average for Component#2
7063	7125	51.206.2	24 Hour Average for Component#3
7064	7127	51.206.3	24 Hour Average for Component#4

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
7065	7129	51.206.4	24 Hour Average for Component#5
7066	7131	51.206.5	24 Hour Average for Component#6
7067	7133	51.206.6	24 Hour Average for Component#7
7068	7135	51.206.7	24 Hour Average for Component#8
7069	7137	51.206.8	24 Hour Average for Component#9
7070	7139	51.206.9	24 Hour Average for Component#10
7071	7141	51.206.10	24 Hour Average for Component#11
7072	7143	51.206.11	24 Hour Average for Component#12
7073	7145	51.206.12	24 Hour Average for Component#13
7074	7147	51.206.13	24 Hour Average for Component#14
7075	7149	51.206.14	24 Hour Average for Component#15
7076	7151	51.206.15	24 Hour Average for Component#16
7077	7153	51.207.0	Previous 24 Hour Average for Component#1
7078	7155	51.207.1	Previous 24 Hour Average for Component#2
7079	7157	51.207.2	Previous 24 Hour Average for Component#3
7080	7159	51.207.3	Previous 24 Hour Average for Component#4
7081	7161	51.207.4	Previous 24 Hour Average for Component#5
7082	7163	51.207.5	Previous 24 Hour Average for Component#6
7083	7165	51.207.6	Previous 24 Hour Average for Component#7
7084	7167	51.207.7	Previous 24 Hour Average for Component#8
7085	7169	51.207.8	Previous 24 Hour Average for Component#9
7086	7171	51.207.9	Previous 24 Hour Average for Component#10
7087	7173	51.207.10	Previous 24 Hour Average for Component#11
7088	7175	51.207.11	Previous 24 Hour Average for Component#12
7089	7177	51.207.12	Previous 24 Hour Average for Component#13
7090	7179	51.207.13	Previous 24 Hour Average for Component#14
7091	7181	51.207.14	Previous 24 Hour Average for Component#15
7092	7183	51.207.15	Previous 24 Hour Average for Component#16
7093	7185	51.244.44	Previous 24 Hour Average for Wet (Superior) BTU
7094	7187	51.244.39	Previous 24 Hour Average for Dry (Inferior) BTU
7095	7189	51.244.51	Previous 24 Hour Average for Relative Density
7096	7191	51.244.40	Previous 24 Hour Average for Compressibility
7097	7193	51.244.41	Previous 24 Hour Average for Wet (Superior) WOBBE
7098	7195	51.244.47	Previous 24 Hour Average for Total Unnormalized Mole Fractions
7099	7197	51.244.48	Previous 24 Hour Average for Total Liquids
7100	7199	51.244.50	Previous 24 Hour Average for Ideal BTU
7101	7201	51.244.46	Previous 24 Hour Average for Average for Normal Density
Floating Point Register Group - Transmitter			
7200	7200	51.202.7	Ground Reference (N/A)
7201	7202	51.202.18	Power (12.247.9)

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
7202	7204	51.202.19	Mandrel Temp (12.247.7)
7203	7206	51.202.20	Column 1 Pressure (12.247.5)
7204	7208	51.202.21	Column 2 Pressure (12.247.6)
7205	7210	51.202.7	Analog Input #6 - Spare (N/A)
7206	7212	51.202.7	Ambient Temp (N/A)
7207	7214	51.202.7	Voltage Reference (N/A)
7208	7216	51.202.7	(N/A)
7209	7218	51.233.0	Calibration Standard - Component#1 (15.31.0)
7210	7220	51.233.1	Calibration Standard - Component#2 (15.31.1)
7211	7222	51.233.2	Calibration Standard - Component#3 (15.31.2)
7212	7224	51.233.3	Calibration Standard - Component#4 (15.31.3)
7213	7226	51.233.4	Calibration Standard - Component#5 (15.31.4)
7214	7228	51.233.5	Calibration Standard - Component#6 (15.31.5)
7215	7230	51.233.6	Calibration Standard - Component#7 (15.31.6)
7216	7232	51.233.7	Calibration Standard - Component#8 (15.31.7)
7217	7234	51.233.8	Calibration Standard - Component#9 (15.31.8)
7218	7236	51.233.9	Calibration Standard - Component#10 (15.31.9)
7219	7238	51.233.10	Calibration Standard - Component#11 (15.31.10)
7220	7240	51.233.11	Calibration Standard - Component#12 (15.31.11)
7221	7242	51.233.12	Calibration Standard - Component#13 (15.31.12)
7222	7244	51.233.13	Calibration Standard - Component#14 (15.31.13)
7223	7246	51.233.14	Calibration Standard - Component#15 (15.31.14)
7224	7248	51.233.15	Calibration Standard - Component#16 (15.31.15)
7225	7250	51.205.0	Response Factor - Component#1 (15.5.0)
7226	7252	51.205.1	Response Factor - Component#2 (15.5.1)
7227	7254	51.205.2	Response Factor - Component#3 (15.5.2)
7228	7256	51.205.3	Response Factor - Component#4 (15.5.3)
7229	7258	51.205.4	Response Factor - Component#5 (15.5.4)
7230	7260	51.205.5	Response Factor - Component#6 (15.5.5)
7231	7262	51.205.6	Response Factor - Component#7 (15.5.6)
7232	7264	51.205.7	Response Factor - Component#8 (15.5.7)
7233	7266	51.205.8	Response Factor - Component#9 (15.5.8)
7234	7268	51.205.9	Response Factor - Component#10 (15.5.9)
7235	7270	51.205.10	Response Factor - Component#11 (15.5.10)
7236	7272	51.205.11	Response Factor - Component#12 (15.5.11)
7237	7274	51.205.12	Response Factor - Component#13 (15.5.12)
7238	7276	51.205.13	Response Factor - Component#14 (15.5.13)
7239	7278	51.205.14	Response Factor - Component#15 (15.5.14)
7240	7280	51.205.15	Response Factor - Component#16 (15.5.15)
7241	7282	51.239.0	Alt Calibration Standard - Component#1 (15.40.0)
7242	7284	51.239.1	Alt Calibration Standard - Component#2 (15.40.1)

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
7243	7286	51.239.2	Alt Calibration Standard - Component#3 (15.40.2)
7244	7288	51.239.3	Alt Calibration Standard - Component#4 (15.40.3)
7245	7290	51.239.4	Alt Calibration Standard - Component#5 (15.40.4)
7246	7292	51.239.5	Alt Calibration Standard - Component#6 (15.40.5)
7247	7294	51.239.6	Alt Calibration Standard - Component#7 (15.40.6)
7248	7296	51.239.7	Alt Calibration Standard - Component#8 (15.40.7)
7249	7298	51.239.8	Alt Calibration Standard - Component#9 (15.40.8)
7250	7300	51.239.9	Alt Calibration Standard - Component#10 (15.40.9)
7251	7302	51.239.10	Alt Calibration Standard - Component#11 (15.40.10)
7252	7304	51.239.11	Alt Calibration Standard - Component#12 (15.40.11)
7253	7306	51.239.12	Alt Calibration Standard - Component#13 (15.40.12)
7254	7308	51.239.13	Alt Calibration Standard - Component#14 (15.40.13)
7255	7310	51.239.14	Alt Calibration Standard - Component#15 (15.40.14)
7256	7312	51.239.15	Alt Calibration Standard - Component#16 (15.40.15)
7257	7314	51.240.0	Alt Response Factor - Component#1 (15.43.0)
7258	7316	51.240.1	Alt Response Factor - Component#2 (15.43.1)
7259	7318	51.240.2	Alt Response Factor - Component#3 (15.43.2)
7260	7320	51.240.3	Alt Response Factor - Component#4 (15.43.3)
7261	7322	51.240.4	Alt Response Factor - Component#5 (15.43.4)
7262	7324	51.240.5	Alt Response Factor - Component#6 (15.43.5)
7263	7326	51.240.6	Alt Response Factor - Component#7 (15.43.6)
7264	7328	51.240.7	Alt Response Factor - Component#8 (15.43.7)
7265	7330	51.240.8	Alt Response Factor - Component#9 (15.43.8)
7266	7332	51.240.9	Alt Response Factor - Component#10 (15.43.9)
7267	7334	51.240.10	Alt Response Factor - Component#11 (15.43.10)
7268	7336	51.240.11	Alt Response Factor - Component#12 (15.43.11)
7269	7338	51.240.12	Alt Response Factor - Component#13 (15.43.12)
7270	7340	51.240.13	Alt Response Factor - Component#14 (15.43.13)
7271	7342	51.240.14	Alt Response Factor - Component#15 (15.43.14)
7272	7344	51.240.15	Alt Response Factor - Component#16 (15.43.15)
7273	7346	51.202.14	Detector 0 value (12.247.0)
7274	7348	51.202.15	Detector 1 value (12.247.1)
7275	7350	51.202.16	Detector 2 value (12.247.2)
7276	7352	51.202.17	Detector 3 value (12.247.3)
Registers 7400-7599 are for stream #1			
7401	7401	51.210.0	Mole % - Component#1(C3)
7402	7403	51.210.1	Mole % - Component#2(IC4)
7403	7405	51.210.2	Mole % - Component#3(NC4)
7404	7407	51.210.3	Mole % - Component#4(Neo C5)

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
7405	7409	51.210.4	Mole % - Component#5(IC5)
7406	7411	51.210.5	Mole % - Component#6(NC5)
7407	7413	51.210.6	Mole % - Component#7(C6+)
7408	7415	51.210.7	Mole % - Component#8(N2)
7409	7417	51.210.8	Mole % - Component#9(C1)
7410	7419	51.210.9	Mole % - Component#10(CO2)
7411	7421	51.210.10	Mole % - Component#11(C2)
7412	7423	51.210.11	Mole % - Component#12(C6s)
7413	7425	51.210.12	Mole % - Component#13(C7s)
7414	7427	51.210.13	Mole % - Component#14(C8)
7415	7429	51.210.14	Mole % - Component#15(C9)
7416	7431	51.210.15	Mole % - Component#16(spare)
7417	7433	51.211.0	GPM % - Component#1
7418	7435	51.211.1	GPM % - Component#2
7419	7437	51.211.2	GPM % - Component#3
7420	7439	51.211.3	GPM % - Component#4
7421	7441	51.211.4	GPM % - Component#5
7422	7443	51.211.5	GPM % - Component#6
7423	7445	51.211.6	GPM % - Component#7
7424	7447	51.211.7	GPM % - Component#8
7425	7449	51.211.8	GPM % - Component#9
7426	7451	51.211.9	GPM % - Component#10
7427	7453	51.211.10	GPM % - Component#11
7428	7455	51.211.11	GPM % - Component#12
7429	7457	51.211.12	GPM % - Component#13
7430	7459	51.211.13	GPM % - Component#14
7431	7461	51.211.14	GPM % - Component#15
7432	7463	51.211.15	GPM % - Component#16
7433	7465	51.209.0	BTU - Dry
7434	7467	51.209.1	BTU - Saturated
7435	7469	51.209.2	Specific Gravity
7436	7471	51.209.3	Compressibility
7437	7473	51.209.4	WOBBE Index
7438	7475	51.209.5	Total UN-normalized mole
7439	7477	51.209.11	Total GPM
7440	7479	51.209.6	Ideal BTU
7441	7481	51.209.7	DensityNormal
7442	7483	51.209.8	Inferior WOBBE
7443	7485	51.209.9	Methane Number

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
7444	7487	51.209.10	Speed of Sound
7445	7489	51.235.0	Rolling Average #1
7446	7491	51.235.1	Rolling Average #2
7447	7493	51.235.2	Rolling Average #3
7448	7495	51.235.3	Rolling Average #4
7449	7497	51.235.4	Rolling Average #5
7450	7499	51.235.5	Rolling Average #6
7451	7501	51.235.6	Rolling Average #7
7452	7503	51.235.7	Rolling Average #8
7453	7505	51.235.8	Rolling Average #9
7454	7507	51.235.9	Rolling Average #10
7455	7509	51.235.10	Rolling Average #11
7456	7511	51.235.11	Rolling Average #12
7457	7513	51.235.12	Rolling Average #13
7458	7515	51.235.13	Rolling Average #14
7459	7517	51.235.14	Rolling Average #15
7460	7519	51.235.15	Rolling Average #16
7461	7521	51.212.0	24 Hour Average for Component#1
7462	7523	51.212.1	24 Hour Average for Component#2
7463	7525	51.212.2	24 Hour Average for Component#3
7464	7527	51.212.3	24 Hour Average for Component#4
7465	7529	51.212.4	24 Hour Average for Component#5
7466	7531	51.212.5	24 Hour Average for Component#6
7467	7533	51.212.6	24 Hour Average for Component#7
7468	7535	51.212.7	24 Hour Average for Component#8
7469	7537	51.212.8	24 Hour Average for Component#9
7470	7539	51.212.9	24 Hour Average for Component#10
7471	7541	51.212.10	24 Hour Average for Component#11
7472	7543	51.212.11	24 Hour Average for Component#12
7473	7545	51.212.12	24 Hour Average for Component#13
7474	7547	51.212.13	24 Hour Average for Component#14
7475	7549	51.212.14	24 Hour Average for Component#15
7476	7551	51.212.15	24 Hour Average for Component#16
7477	7553	51.213.0	Previous 24 Hour Average for Component#1
7478	7555	51.213.1	Previous 24 Hour Average for Component#2
7479	7557	51.213.2	Previous 24 Hour Average for Component#3
7480	7559	51.213.3	Previous 24 Hour Average for Component#4
7481	7561	51.213.4	Previous 24 Hour Average for Component#5
7482	7563	51.213.5	Previous 24 Hour Average for Component#6

Modbus Reg #		Input Reg	Description
32-bit	16-bit		
7483	7565	51.213.6	Previous 24 Hour Average for Component#7
7484	7567	51.213.7	Previous 24 Hour Average for Component#8
7485	7569	51.213.8	Previous 24 Hour Average for Component#9
7486	7571	51.213.9	Previous 24 Hour Average for Component#10
7487	7573	51.213.10	Previous 24 Hour Average for Component#11
7488	7575	51.213.11	Previous 24 Hour Average for Component#12
7489	7577	51.213.12	Previous 24 Hour Average for Component#13
7490	7579	51.213.13	Previous 24 Hour Average for Component#14
7491	7581	51.213.14	Previous 24 Hour Average for Component#15
7492	7583	51.213.15	Previous 24 Hour Average for Component#16