Operations Manual
7P00370-H01, Rev B
May 2016

Rosemount 370XA Gas Chromatograph

ROSEMOUNT

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Process Management

NOTICE

Warranty

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2. LIMITATION OF REMEDY AND LIABILITY: SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE. THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF WARRANTY HEREUNDER SHALL BE LIMITED TO REPAIR, CORRECTION, REPLACEMENT OR REFUND OF PURCHASE PRICE UNDER THE LIMITED WARRANTY CLAUSE IN SECTION 1 HEREIN. IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE TO BUYER OF THE SPECIFIC GOODS MANUFACTURED OR SERVICES PROVIDED BY SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXTEND TO INCLUDE INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES. THE TERM "CONSEQUENTIAL DAMAGES" SHALL INCLUDE, BUT NOT BE LIMITED TO, LOSS OF ANTICIPATED PROFITS, LOSS OF USE, LOSS OF REVENUE AND COST OF CAPITAL.

Contents

1 Introducing the 370XA

Topics covered in this chapter:

- *General description*
- *Specifications*
- *Certifications*

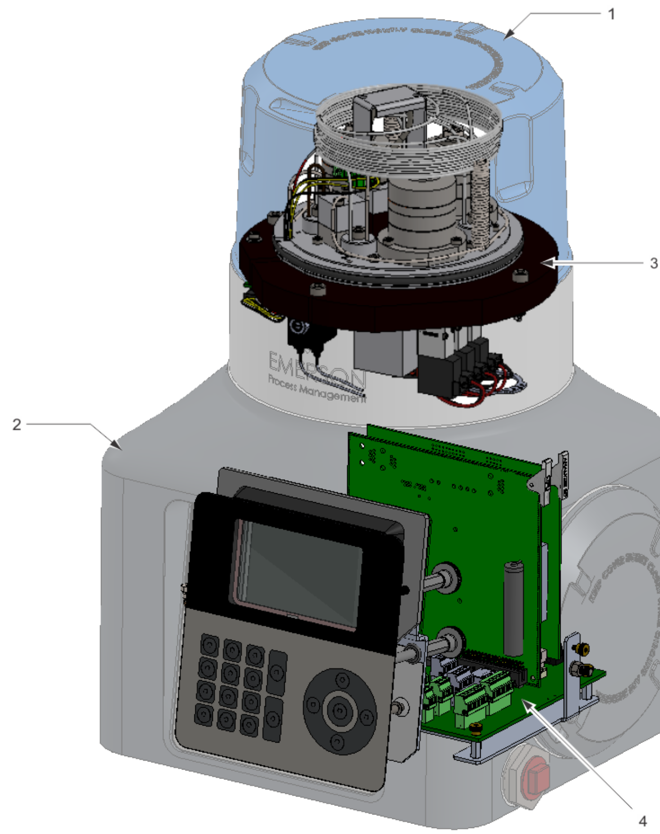
This manual contains information pertaining to the Rosemount® 370XA Gas Chromatograph. The purpose of this manual is to provide detailed installation, operation, maintenance, and troubleshooting procedures.

1.1 General description

The Rosemount 370XA Gas Chromatograph is the latest analyzer to join the XA series of Emerson gas chromatographs. Designed to simplify natural gas measurement analysis, the 370XA provides greater ease of use and increased measurement performance for your C6+ BTU/CV analysis.

Another unique benefit of the 370XA is its Maintainable Module™ technology, which allows you to easily replace the GC module in the field in approximately two hours, including warm-up and purge, greatly reducing downtime and overall operating costs.

Figure 1-1: Rosemount 370XA Gas Chromatograph



Structurally, the 370XA has two major sections. The upper section (1) consists of the analysis module (3). The lower section (2) of the gas chromatograph houses the electronics (4) and the LCD display.

1.2 Specifications

Table 1-1: 370XA electronics specifications

Electronics	
Power	24VDC (standard) at the unit. 21-30VDC (operating range) at the unit. Class 2 power supply as required for CSA approval. **Note**: Provide the GC with one 5-amp circuit breaker for protection.
Power consumption at 72 °F (22 °C)	50 Watts (startup) 20 Watts (steady state)

Table 1-2: 370XA construction specifications

Construction	
Environmental temperature	-20 °C (-4 °F) to 60 °C (140 °F)
Enclosure protection rating	IP65 and Type 4X
Dimensions (without sample system or mounts)	460 mm (H) x 305 mm (W) x 280 mm (D) 18” (H) x 12” (W) x 11” (D)
Mounting options	Pipe, wall
Weight (without sample system or mounts)	22 kg (50 lbs.)

Table 1-3: 370XA performance specifications

Performance	
Application	four-minute C6+ analysis
Repeatability	Controlled environment ± 0.0125% calorific value ± 0.125 BTU/scf per 1,000 BTU/scf -4 °F (-20 °C) to 140 °F (60 °C) ± 0.025% calorific value ± 0.25 BTU/scf per 1,000 BTU/scf
Metrology approvals	Measurement Canada, NMi (OIML)
Calculations	ISO 6976, AGA-8, GPA 2172 (using the GPA 2145 physical properties table)
Carrier gas	Zero-grade helium at 6.2 BarG (90 PSIG). Zero grade hydrogen available as an option.
Actuation gas	Helium, nitrogen, or clean dry air at 6.2 BarG (90 PSIG).
Sample input pressure range	0.7 to 1.7 BarG (10 to 25 PSIG)
Valves	Three 6-port diaphragm chromatograph valves.
Oven	Airless iso-thermal

Table 1-3: 370XA performance specifications *(continued)*

Performance	
Detector	Thermal conductivity detector (TCD)
Streams	One sample stream and one calibration stream
Number of chromatograms stored internally	Stores up to 88 days of analysis results and up to 2500 individual chromatograms.

Table 1-4: 370XA standard communications

Standard communications	
Ethernet	Two available connections: one RJ-45 plug-in port and one 4-wire termination. Both with 10/100 Mbps.
Analog input	One standard input filtered with transient protection, 4–20 mA that is user scalable and assignable.
Analog outputs	Two isolated outputs, 4–20 mA.
Digital inputs	One input that is user assignable, optically isolated, and rated to 30 VDC at 0.5 A.
Digital output	One user-assignable output, Form C and electro-mechanically isolated, 24 VDC.
Serial ports	Two termination blocks, configurable as RS-232 or RS-485.

1.3 Certifications

Table 1-5: Certifications

ATEX	
Manufacturer	Rosemount Houston, TX, USA
Product	370XA Gas Chromatograph
Certificate number	Sira 13ATEX1030
Certification code	Ex d IIB+H2 T6 Gb
Ambient range	Ta = -20 °C to +60 °C
Serial number	device dependent
Year of manufacture	device dependent
Warnings	DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT. DO NOT OPEN WHILE ENERGIZED. USE SUPPLY CABLES OR WIRES SUITABLE FOR AT LEAST 80 °C.

Table 1-5: Certifications *(continued)*

ATEX	
Other markings	CE 0359 Ex II 2G
Electrical ratings	DC: 21 - 30 V, ⎓, 55 W MAX
Number and size of the conduit entries	3 conduit entries: M32 X 1.5
EN 60079-0:2009	Explosive atmospheres - Part 0: Equipment - General requirements
EN 60079-1:2007	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"

Table 1-6: IECEx Equipment for use in explosive atmospheres

IECEx	Ex d IIB+H2 T6 Gb - 20 °C to 60 °C	IP65	IECEx CSA 13.0005

Table 1-7: CSA certifications

CSA	C SP US	Class I, Div. 1; Groups B, C, D; T6; Type 4X Class I, Zone 1; Ex/AEx d IIB + H2; T6; IP65

2 Anatomy of the 370XA

Topics covered in this chapter:

2.1 Exterior: Front View

Figure 2-1: 370XA front view

1. **Explosion-proof dome**

   Unscrew the explosion-proof dome to gain access to the analytical oven.

2. **Explosion-proof body**

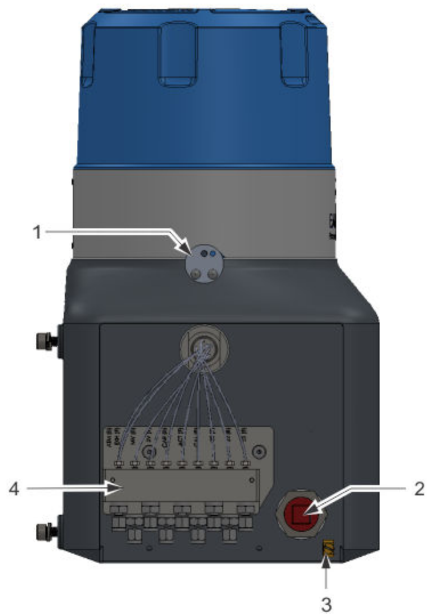
   The explosion-proof body houses the electronics.

3. **Local operator interface**

   The local operator interface (LOI) contains keys and an LCD display for interacting with the gas chromatograph.

2.2 Exterior: Left View

Figure 2-2: 370XA left-side view



1. **Locking bolt**

   Secures the dome to the enclosure. To engage the lock, screw in the hex screw with a 2 mm hex wrench; to release the lock, unscrew the hex screw with a 2mm hex wrench.

2. **Cable entry**

   M32 conduit entry. This is the most convenient entry point for the power cable. If this entry is not used for cables then a certified plug must be used.

Table 2-1: Certified conduit plugs

Certification type	Additionally supplied certified parts
CSA	M32-to-¾-inch adapter and a ¾-inch sealing plug
ATEX/IECEx	M32 plug

3. **Grounding lug**

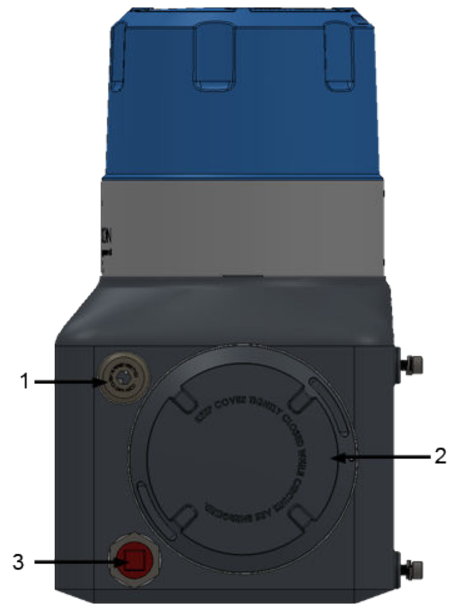
   Connects to an external grounding system, as required for ATEX-certified installations.

4. **Tubing bulkhead**

   The central hub for the sample, carrier, and other gas inlets.

2.3 Exterior: Right View

Figure 2-3: 370XA right-side view



1. **Upper cable entry**

Table 2-2: Certified sealing plugs

Certification type	Additionally supplied certified parts
CSA	M32-to-¾-inch adapter and a ¾-inch sealing plug
ATEX/IECEx	M32 plug

2. **Port hole**

   Unscrew and remove to gain access to the field wiring connections and the circuit boards.

3. **Lower cable entry**

   Supplied with an M32 certified plug and an M32-to-¾ NPT adapter. This is the most convenient entry point for connecting cables to the Ethernet port, communications ports, and external device terminals. If this entry is not used for cables then a certified plug must be used.

Table 2-3: Certified conduit plugs

Certification type	Additionally supplied certified parts
CSA	M32-to-¾-inch adapter and a ¾-inch sealing plug

Table 2-3: Certified conduit plugs *(continued)*

Certification type	Additionally supplied certified parts
ATEX/IECEx	M32 plug

2.4 Exterior: Rear View

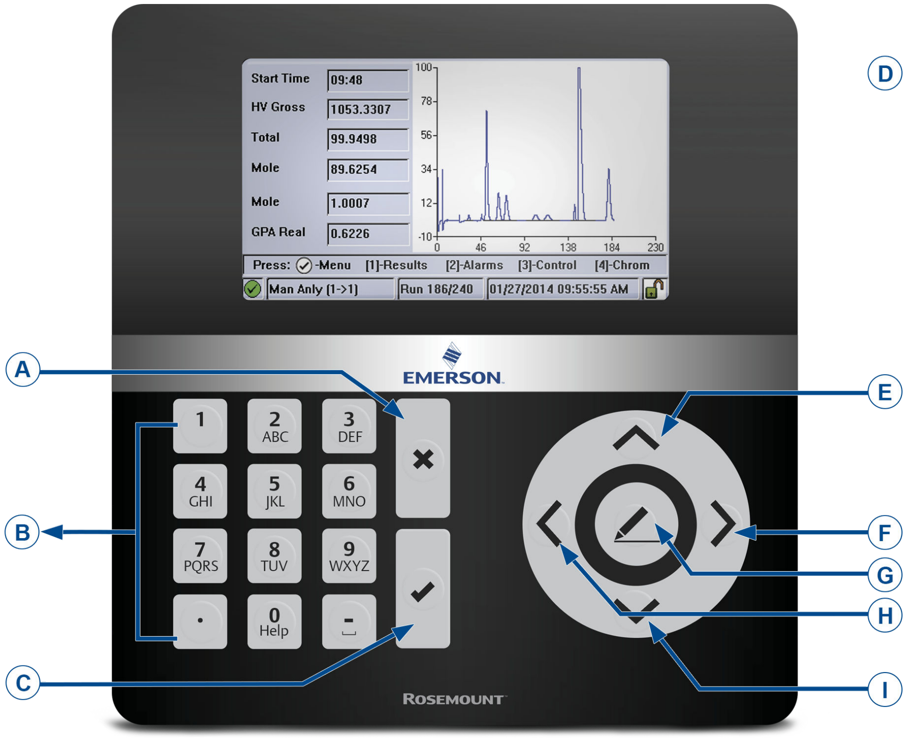
Figure 2-4: 370XA rear view

1. **Mounting bolts**

   These M8 bolts are used to mount the GC to its final destination, depending upon the mounting configuration chosen. Each bolt is 1.8 centimeters long.

2.5 Exterior: The local operator interface

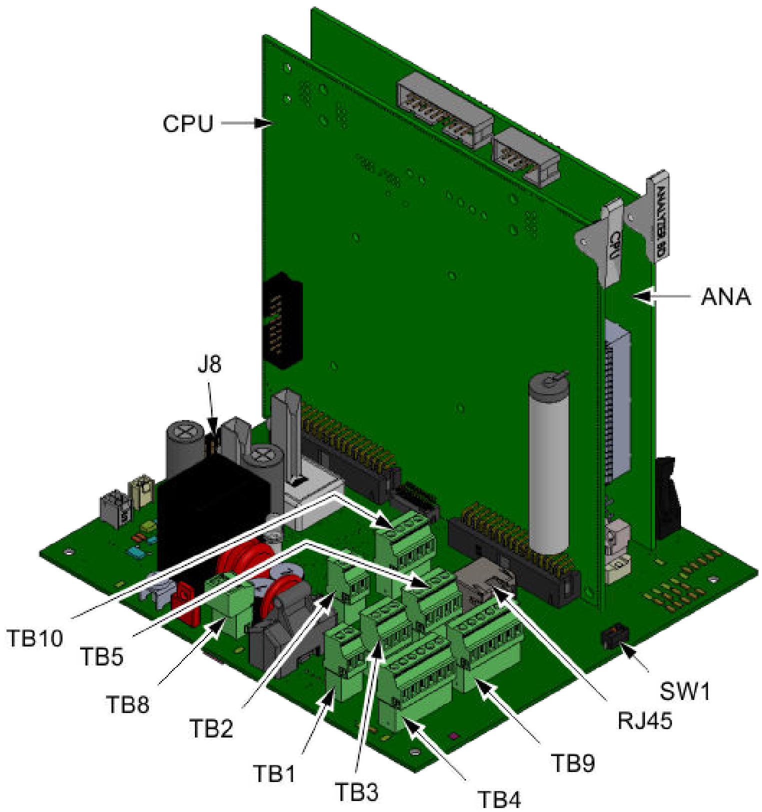
Figure 2-5: Local operator interface



A. *Exit/cancel*
B. *Alphanumerical keypad*
C. *Enter*
D. *Full color screen: 480 x 272 pixels*
E. *Up*
F. *Right*
G. *Select/edit*
H. *Left*
I. *Down*

2.6 Interior: Back plane

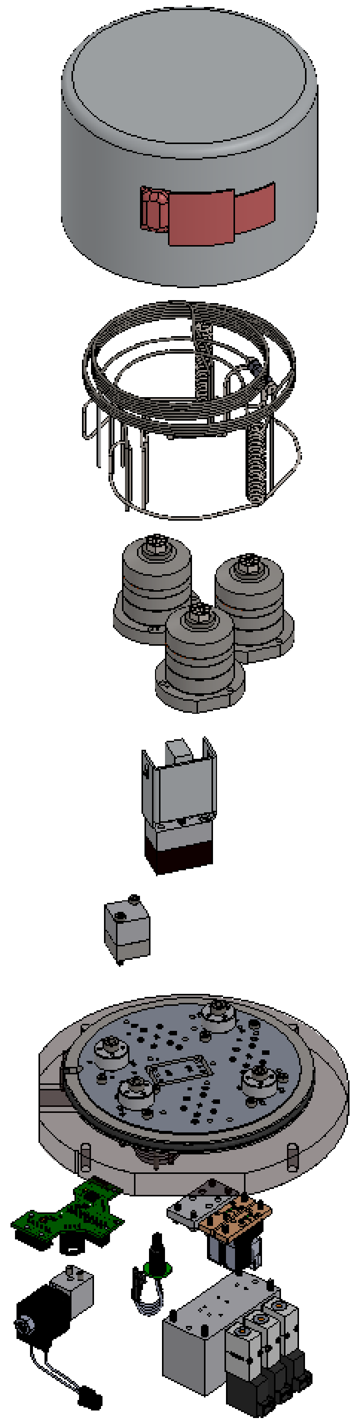
Figure 2-6: 370XA Backplane board



TB1. Digital input	**TB10**. Analog outputs (2)
TB2. Analog input	**RJ-45**. Plug-in Ethernet port
TB3. Digital output	**J8**. LOI connector
TB4. COM1 port	**CPU**. CPU board
TB5. Wired Ethernet port	**ANA**. Analyzer board
TB8. 24 VDC power	**SW1**. DHCP switch
TB9. COM2 port	

2.7 Interior: Maintainable Module™

Figure 2-7:



1. **Heater cap**

Controls the thermal environment surrounding the analytical components of the module, which is crucial to ensure the reliable and repeatable analysis.

2. **Chromatography columns**

   Separates the sample gas into its component compounds so that they can be detected and measured. The 370XA's pre-coiled, micro-packed columns contain active materials that selectively impede the flow of individual component compounds based on their boiling point, so that components with lower boiling points take longer to travel through the columns than components with higher boiling points. The 370XA uses four chromatograph columns and a single restrictor column.

3. **Analytical valves**

   Manipulates the flow of carrier and sample gases through the columns and the detector. The analytical valves use diaphragm-actuated pistons to block or release the flow of the gases between adjacent ports on the valve. The majority of maintenance on the maintainable module will involve replacing the diaphragms and cleaning the sealing surfaces of the analytical valves.

4. **Detector**

   Detects and measures the components of the sample gas after the components are separated by the columns. A single thermal conductivity detector (TCD) has two thermistors that respond to the difference in thermal conductivity between the carrier gas and the separated components.

5. **Sample shut-off valve**

   Shuts off the flow of gases to the sample loop for the first five seconds of an analysis to allow the sample loop to equalize to atmospheric pressure through the sample vent. This ensures that a consistent amount of sample gas is injected into the analytical columns each analysis cycle regardless of the sample pressure or flow.

   Note

   It is good practice to replace the diaphragm of the sample shut-off valve whenever the analytical valve diaphragms are replaced.

6. **Manifold assembly**

   Most of the components of the analytical oven are mounted on the manifold, which also contains a multi-layered *printed flow-path board* (PAFB) that replaces the interconnecting tubing that traditionally exists between the valves, columns, solenoids, and detectors.

7. **Intelligent module board**

   To facilitate easy replacement of the maintainable module, its operating and calibration settings are stored on the *intelligent module board* (IMB). When a new maintainable module is installed, it downloads these settings from the IMB. When the settings are changed, the new configurations are uploaded to the IMB.

8. **Stream selection solenoids**

The sample gas stream to be analyzed is selected by a two-way isolation solenoid. Each stream has a unique stream-selection solenoid. A maintainable module can have up to three stream-selection solenoids and one calibration solenoid.

9. **Carrier gas pressure sensor**

   Measures the carrier gas pressure as a part of the electronic pressure control.

10. **Valve actuation solenoids**

    Each analytical valve is actuated by its own four-way solenoid. The actuation solenoid directs the actuation gas to the appropriate pistons in its associated actuation valve.

11. **Carrier gas pressure control valve**

    Electronically controls the carrier gas pressure.

3 Installing the 370XA

Topics covered in this chapter:

3.1 Site requirements

Consider the following when choosing an installation site for the GC:

- This gas chromatograph is designed to operate at temperatures between -4 ºF (-20 ºC) and 140 ºF (60 ºC).
- Install the GC as close as possible to the sample point but allow for adequate access for maintenance tasks and adjustments. The analyzer should also be installed to allow easy access and viewing of the LOI.
- Allow at least 10 inches (254 mm) on the right hand side of the GC to permit access to the side portal hole where the field terminations are made.
- Allow a minimum of 10 inches (254 mm) above the top of the dome to facilitate access to the analytical module.

3.2 Mounting requirements

The 370XA can be mounted on a 4-inch pole or onto a wall using one of the mounting kit options.

The pole or wall must be able to support at least 50 pounds (20 kg) and withstand the forces applied when performing routine maintenance, such as removing the oven enclosure dome.

3.3 Actions Upon Receipt of GC

3.3.1 Unpacking

There are no special unpacking considerations.

3.3.2 Inspection and verification of received equipment

Check the equipment against the packing slip to see if the shipment is complete.

Inspect the equipment for damage incurred during shipment. If any parts or assemblies appear to have been damaged, do the following:

1. File a claim with the carrier.
2. Take photos of the damaged area(s).
3. Contact your local Rosemount sales representative.

3.4 Mount the GC

The 370XA can be installed in one of the following mounting options:

- Wall mount
- Pole mount

Check the packing slip or the GC's sales order to learn which mounting hardware was selected for it.

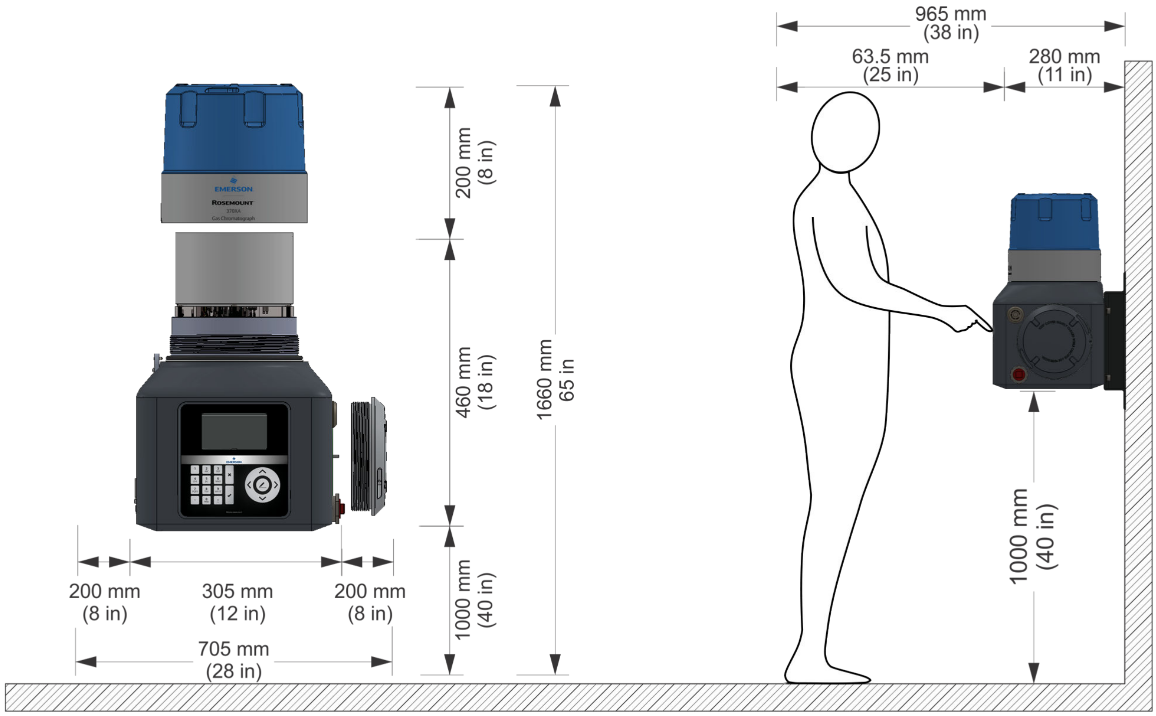
Note

All options require the same mounting bracket but use different hardware to mount it.

When putting a unit into its final position, be careful to avoid damaging any of the external components or their attachments. Also, make sure you understand the installation procedure before handling the unit, and collect the appropriate tools beforehand.

3.4.1 Minimum installation clearances

Figure 3-1: Installation clearances



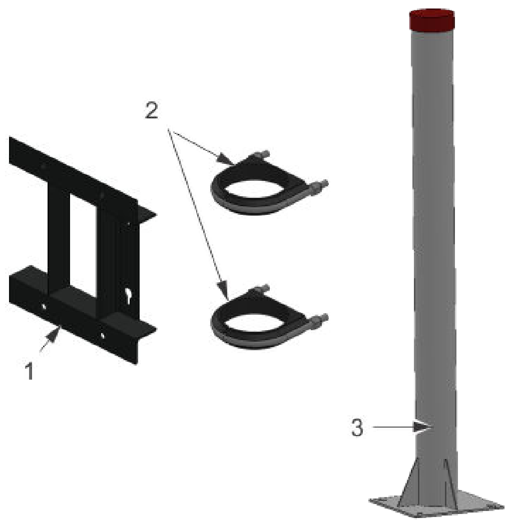
3.4.2 Mount the GC on a pole

The pole mount arrangement uses a pair of U-shaped pipe clamps and a mounting bracket to attach the gas chromatograph to a pole that is four inches in diameter.

An optional floor mount is available that is a pole welded to a square base with mounting holes.

Parts

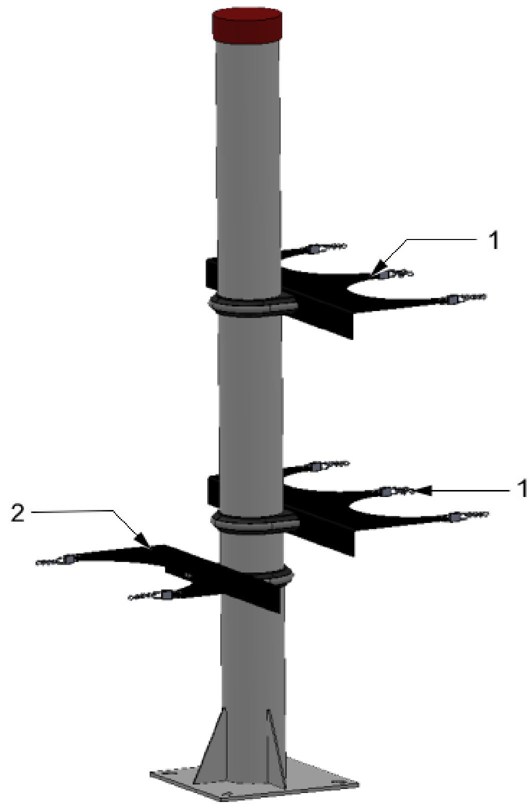
Figure 3-2: Pole mount parts



1. Mounting bracket
2. 4-inch pipe clamps, each with two nuts
3. Optional 4-inch diameter pole with metal base containing mounting holes suitable for ½-inch anchors

Optional gas bottle accessories

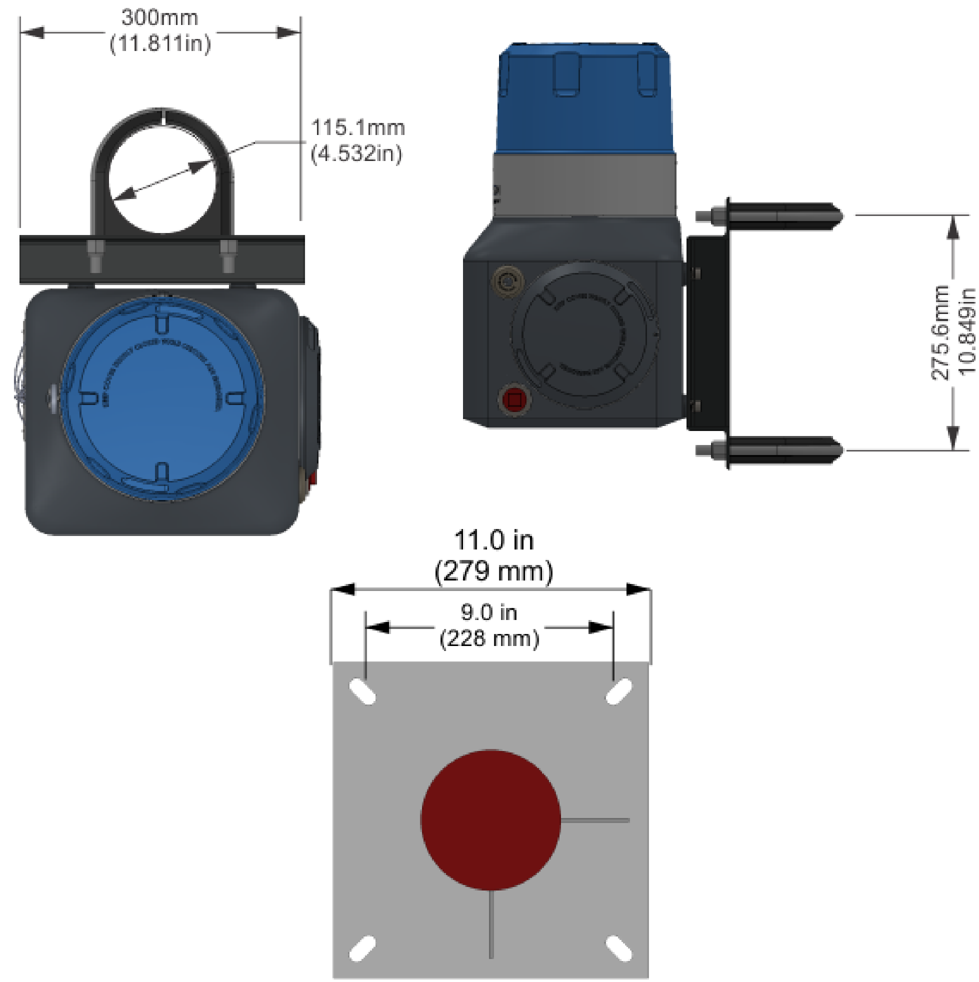
Figure 3-3: Pole mount with accessories



1. Carrier gas bottle cradle assemblies (2)
2. Calibration gas bottle cradle assembly

Dimensions

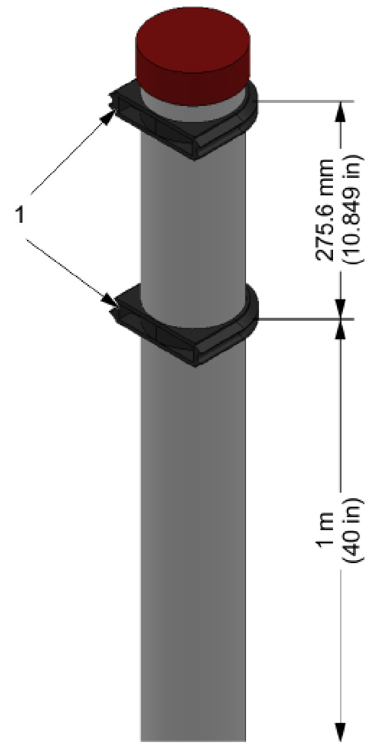
Figure 3-4: 370XA dimensions



Instructions

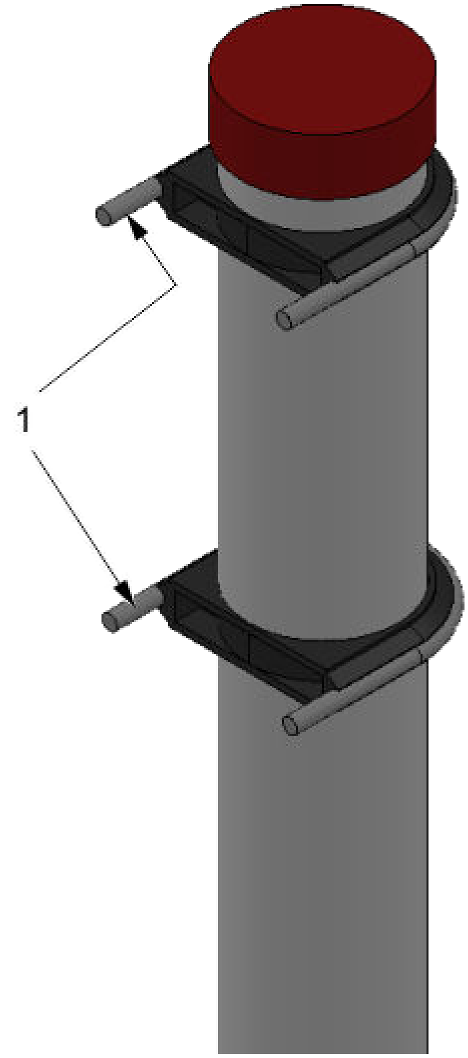
1. Slide the u-bolt plastic inserts (1) onto the pole and place the lower clamp approximately 1 m (40 inches) from the ground and the upper clamp 27 cm (10¾ inches) above the lower clamp.

Figure 3-5: Install plastic u-bolt inserts



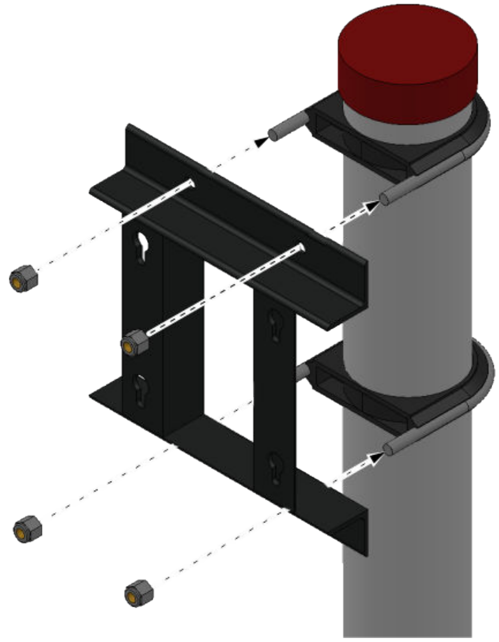
2. Slide the two u-bolts (1) into the plastic inserts.

Figure 3-6: Install the u-bolts into the plastic inserts



3. Attach the mounting frame to the pole by matching the frame's mounting holes to the prongs of the pipe clamps.

Figure 3-7: Install mounting frame



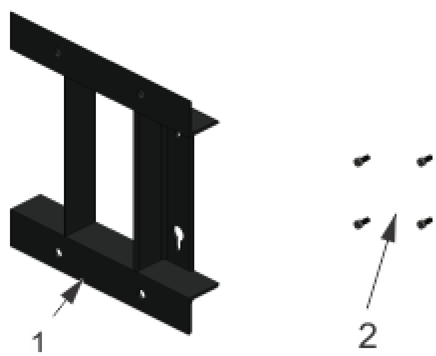
4. Tighten the nuts onto the prongs. The mounting bracket should be firmly attached to the pole.

   See *Section 3.4.4*.

3.4.3 Mount the GC on a wall

Parts

Figure 3-8: Wall mount bracket parts

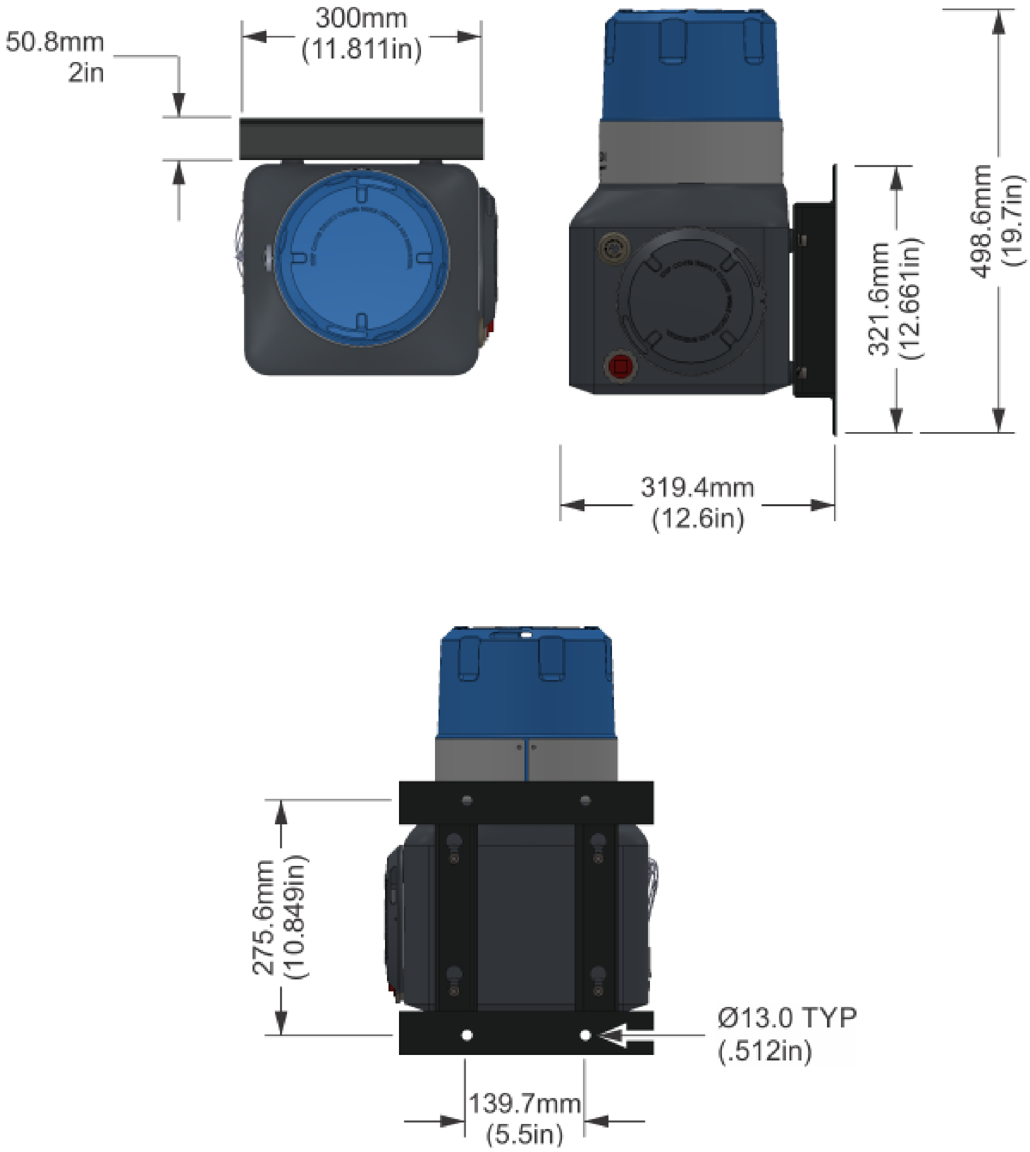


1. Mounting bracket
2. Four 7/16” (10 mm) mounting bolts with washers

Note
You will also need four 10 mm (⅜-in) threaded wall anchors that are capable of supporting at least 50 pounds (22 kg).

Dimensions

Figure 3-9: 370XA wall mount dimensions

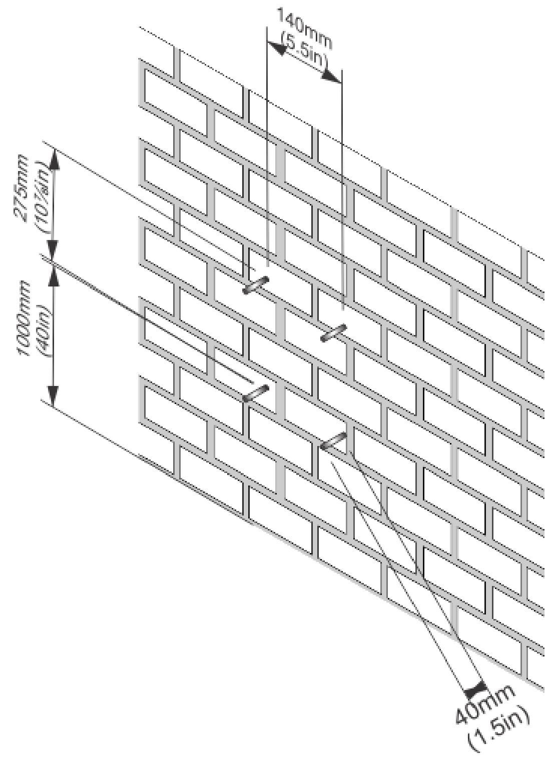


Instructions

The wall must be able to hold approximately 50 pounds (22 kg).

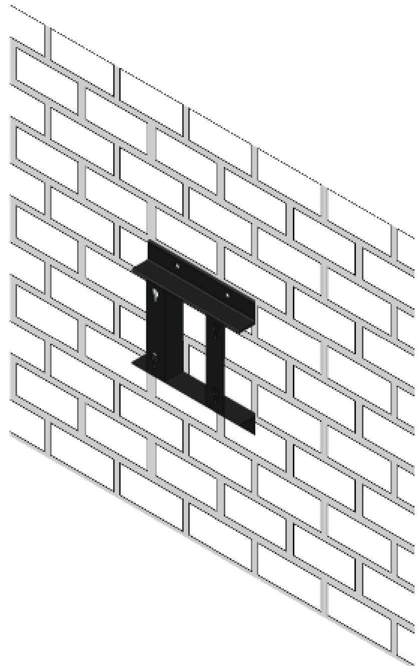
1. Install four threaded wall anchors according to the dimensions given in the graphic below.

Figure 3-10: Install wall anchors



2. Place the mounting bracket on to the wall anchors and tighten the mounting nuts.

Figure 3-11: Install wall mounting bracket

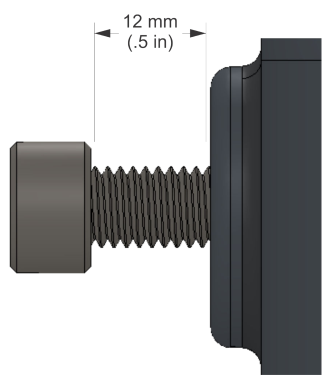


See *Section 3.4.4*.

3.4.4 Secure the 370XA to the mounting bracket

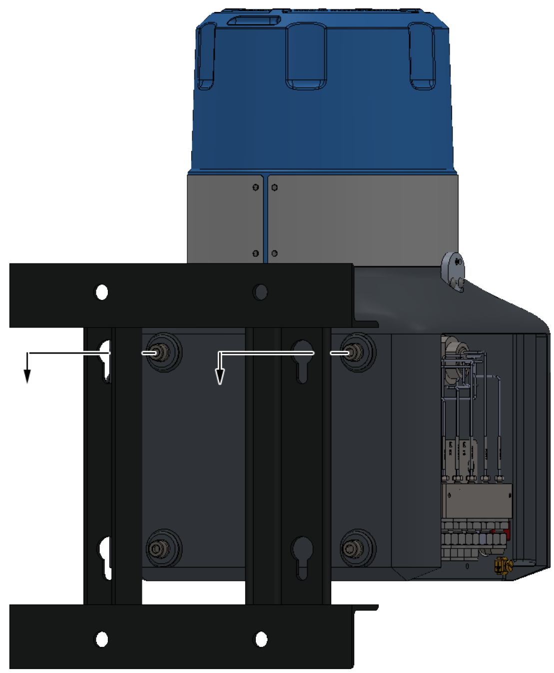
1. Screw two bolts, without the washers, into the top mounting holes on the back of the GC, leaving ½ inch (15 mm) of the thread exposed.

Figure 3-12: Mounting bolts



2. Maneuver the GC to insert the two top bolts into the eyelets of the mounting bracket and allow the bolts to drop down and hold the GC loosely on the bracket.

Figure 3-13: Aligning the GC with the bracket top bolts



3. Screw in the two bottom bolts through the mounting bracket with the washers on. The flat washer should be against the bracket, and the spring washer between the flat washer and the bolt head. Hand tighten these two bolts so that they secure the GC in place.
4. One at a time, remove the top bolts, put on the washers, and screw the bolts into the back of the GC and hand tighten.

3.5 Mount the sample conditioning system

There are several sample conditioning systems (SCS) that are available for the 370XA. The side-mounted single stream SCS includes all of the components required for single stream natural gas applications on a metal plate that conveniently attaches to the side of the 370XA. For multiple stream applications, several plate-mounted options are available that can be mounted to a pole, a wall, or a floor stand.

It is also possible to use a third-party SCS. A third-party SCS must contain the following functional components:

- Moisture drier for the carrier gas
- 2-micron or better particulate filter
- Liquid filter/shut-off
- Flow control to limit the sample flow to between 20 and 50 cc/min

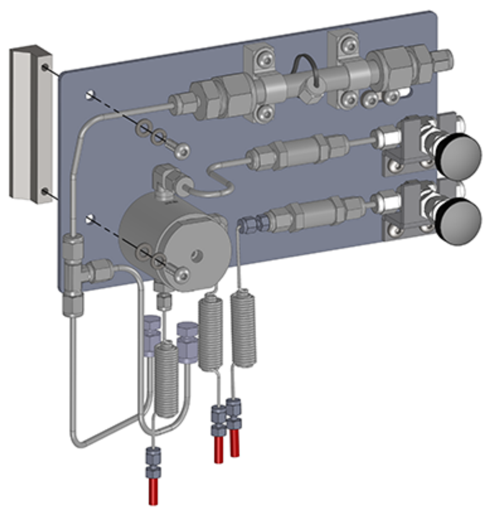
⚠ WARNING!

Using a sample conditioning system that does not include all of these components will invalidate your gas chromatograph's warranty.

3.5.1 Attach a single-stream, side-mounted sample conditioning system to the GC

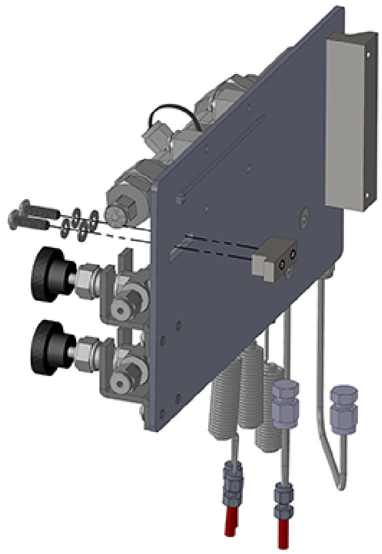
1. Use the two one-inch bolts and a 5/32 hex wrench to screw the large mounting bar tightly to the left side of the plate with the angled foot facing the edge of the plate.

Figure 3-14: Side-mounted single stream sample conditioning system



2. Use the two half-inch bolts and a 5/32 hex wrench to screw the small mounting bar loosely to the right side of the plate with the angled foot facing the edge of the plate.

Figure 3-15: Attach the mounting bar to the plate

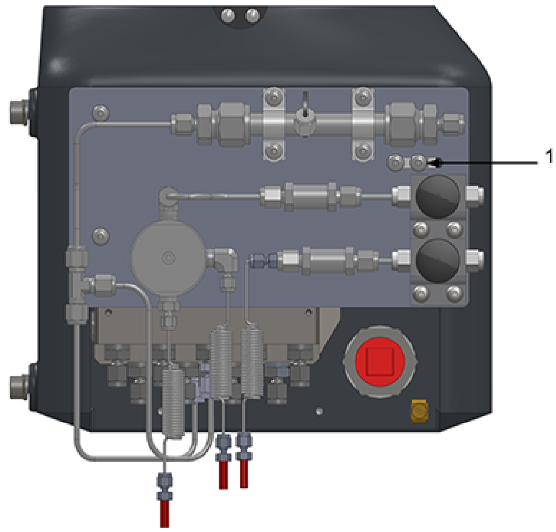


3. Angle the plate onto the left side of the GC so that the large mounting block fits behind the left edge of the cut-out. Swing the right side of the plate around until it attaches to the right side of the cut-out.

Figure 3-16: Attach the mounting plate to the 370XA GC

4. Slide the small mounting bar (1) to the right so that it fits behind the right edge of the cut-out. Tighten the small mounting block's screws.

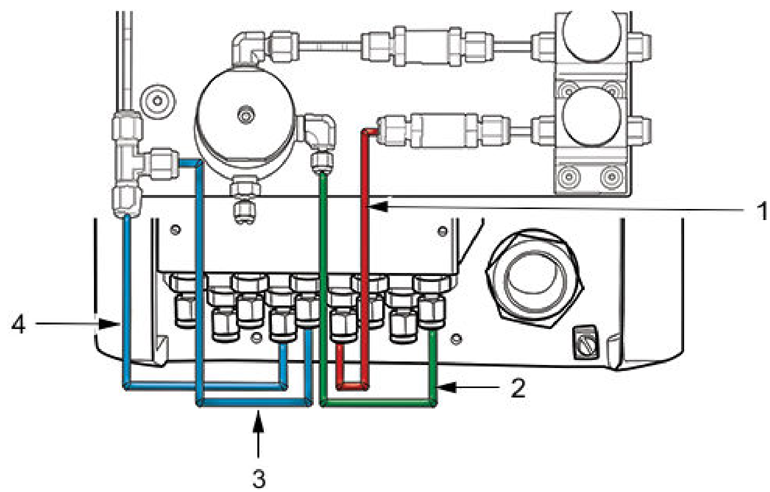
Figure 3-17: Secure the mounting bar with the mounting block



3.5.2 Connect sample conditioning system tubing to the GC

1. Use the tubing supplied with the sample system to connect the stream, calibration, actuation, and calibration gases from the sample plate to the GC's manifold block.

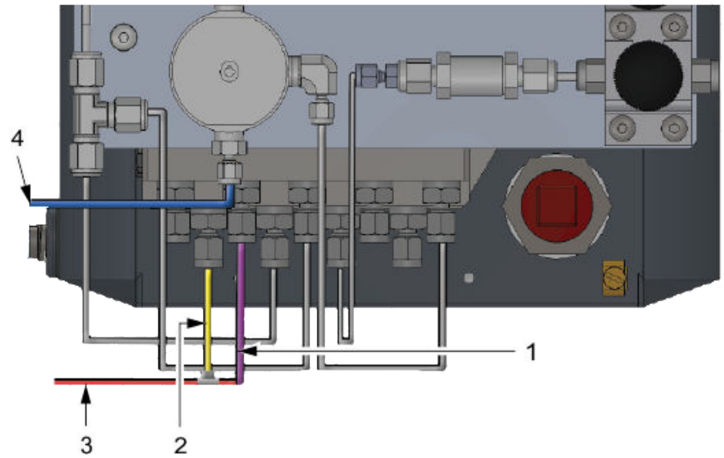
Figure 3-18: Connecting the gases to the sample plate



A. *Calibration tubing*
B. *Sample tubing*
C. *Actuation tubing*
D. *Carrier tubing*

2. The atmospheric vents should be connected to a vent line of at least ⅜-inch diameter that is routed to the atmosphere in a safe area to ensure there is no back-pressure created on the vents.

Figure 3-19: Atmospheric vents line connections



A. Sample
B. Measure
C. Atmospheric vent
D. Bypass vent

The flows of the vents are:

- Sample Vent - 10 to 50 cc/min of sample gas for approximately 3.5 minutes of the 4 minute cycle.
- Measure vent - Continuous flow of less than 10 cc/min of carrier gas and 10cc of sample gas per analysis cycle.
- Sample Bypass - Continuous flow of 150 to 200 cc/min of sample gas.

3.6 Connect to the carrier gas

Table 3-1: Carrier gas specifications

Carrier gas	Hydrogen or helium
Purity	99.9995% (ultra high)
Moisture content	Less than 10 ppm
Hydrocarbon content	Less than 0.5 ppm
Supply reserve	90 psi (620 kPaG)
Carrier gas flow	Approx. 10 cc/min

Note

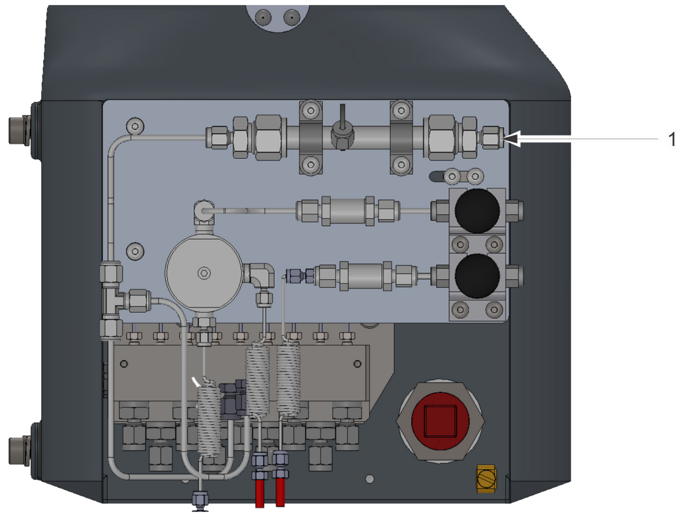
The fifth code in the model string of the 370XA engraved on the metal band of the dome indicates the carrier gas to be used. The letter code **HE** indicates helium, and **H2** indicates hydrogen.

To ensure the continuous operation of the analyzer, install two high pressure carrier gas cylinders and connect them to the GC through a manifold arrangement that permits the replacement of empty cylinders without disrupting the operation of the analyzer.

The manifold arrangement can be a manual valve arrangement or a commercially available auto switch-over dual regulator assembly.

The following image shows the carrier gas connector (1).

Figure 3-20: 370XA carrier gas connection



The carrier gas must be regulated from bottle pressure to 90 psi (620 kPa) using a two-stage bottle regulator with stainless steel diaphragms. Use a dual-stage regulator to ensure the outlet pressure will not change with changes in the bottle pressure. Stainless steel diaphragms are required to avoid contamination of the analytical oven. Use ⅛-inch stainless steel tubing that is clean and free of grease to connect from the carrier gas bottle manifold to the inlet of the carrier gas drier (1) on the 370XA sample conditioning system (as shown [show single stream and multi stream panels and indicate inlet of drier]). Before making the final connection to the sample system, blow through the lines with helium for 30 seconds to remove any contamination such as water or metal shavings from cutting the tube.

⚠ WARNING!

Regulate the carrier gas to 90 psi (620 kPa). Pressures higher than this may damage the analyzer and cause an unsafe environment.

3.7 Connect to actuation gas

The analytical valves require actuation gas to operate. When helium is used as a carrier gas, the default configuration is to also use helium as the actuation gas. When hydrogen is used as a carrier gas, or if there is a desire to minimize helium usage, another clean dry gas such as nitrogen or clean-dry air should be used as the actuation gas.

Table 3-2: Actuation gas specifications

Moisture content	Less than 10 ppm
Particulate	Less than 2 microns
Supply pressure	90 psi (620 kPaG)

Note

If you intend to use locally generated instrument air, ensure that the pressure is sufficient and use filters and dryers to ensure the actuation gas will meet the above specifications in order to avoid excessive maintenance.

3.7.1 Helium actuation gas

When the carrier gas is also used as the actuation gas, the actuation gas supply connection should be teed from the helium supply after the moisture filter.

3.7.2 Alternative actuation gas

If a gas other than the carrier gas is to be used as the actuation gas, the supply should be connected directly to the actuation gas port on the 370XA gas manifold. The actuation gas should be nitrogen, dry air, or some other non-hazardous gas.

3.8 Connect to the calibration gas

The gas chromatograph requires a high quality, certified calibration gas to ensure accurate analysis. Although the 370XA is typically set for an automatic daily calibration run in custody transfer applications, it can be configured with MON2020 for any time frequency, or set to manual calibration only.

The calibration gas must contain each component that you want to measure. To ensure that all of the components in the calibration gas remain in the gas phase and that the composition remains consistent, install a calibration bottle heater blanket and use insulated or heat-traced stainless steel tubing between the calibration gas and the gas chromatograph.

The following table recommends the ideal component concentrations for a calibration gas that can be used with most common natural gas applications. Also provided in the table is the minimum recommended concentration for each component to ensure an accurate and repeatable calibration.

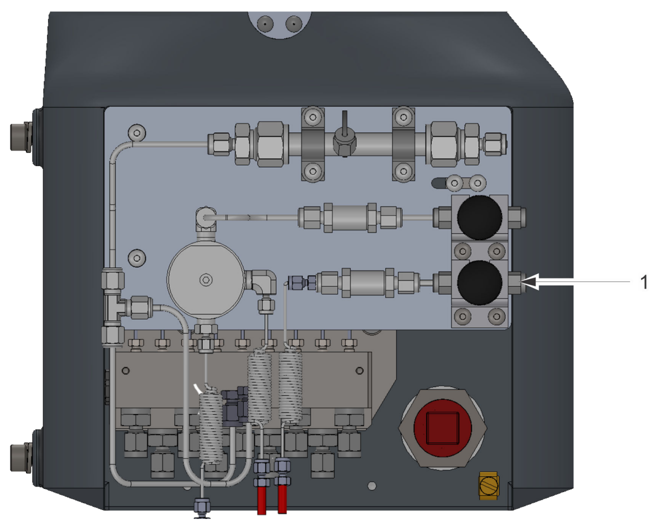
Table 3-3: Ideal calibration component concentrations

Component	Recommended Concentration
Methane	89.57%
Ethane	5.0%
Propane	1.0%
i-Butane	0.3%
n-Butane	0.3%
2,2 Dimethyl butane	0.015%
neo-Pentane	0.1%
iso-Pentane	0.1%
n-Pentane	0.1%
n-Hexane	0.015%
Nitrogen	2.5%
Carbon Dioxide	1.0%

2,2 Dimethyl butane is the lightest C6+ component and should be added to the n-Hexane concentration to be entered as the C6+ calibration concentration.

The following image shows the calibration gas connector (1).

Figure 3-21: calibration gas connector



Regulate the calibration gas from bottle pressure to 15 psi (100 kPa) using a two-stage bottle regulator with stainless steel diaphragms. Use a dual-stage regulator to ensure the outlet pressure will not change with changes in the bottle pressure. Use stainless steel diaphragms to avoid contamination. Use ⅛-inch stainless steel tubing that is clean and free of grease to connect from the calibration gas bottle regulator to the calibration gas inlet connection on the 370XA sample conditioning system (1). Before making the final connection to the Sample Conditioning System (SCS), blow through the lines for 30 seconds to remove any contamination, such as water or metal shavings from cutting the tube.

⚠ WARNING!

Do not allow the calibration gas pressure to rise above 30 psi (200 kPa), because doing so may damage the analyzer and cause an unsafe condition.

3.9 Connect to the sample gas

The sample handling system controls how the gas sample is extracted, conditioned, and transported to the analyzer and is critical to the accurate and reliable performance of any gas chromatograph. The basic principles of sample handling are as follows:

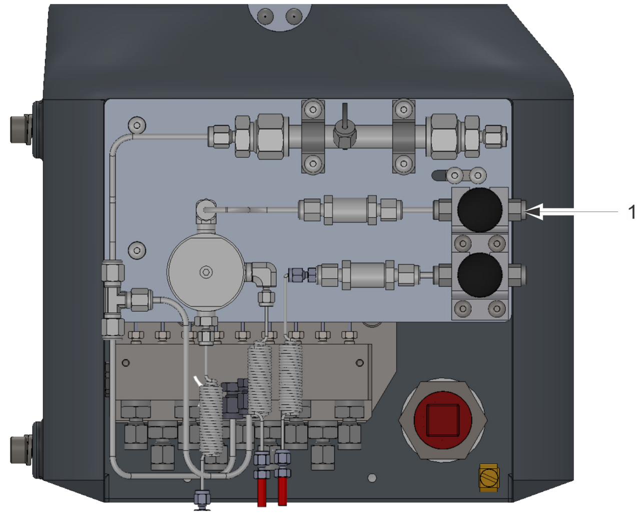
- Take a representative vapor sample.
- Control the pressure without causing components to condense.
- Remove particulate and liquid contaminates.
- Transport the sample to the GC while maintaining the composition.

In the typical natural gas application, any liquid or solid contamination in the gas will tend to accumulate on the inside pipe walls, even if it is clean and dry gas. To take a representative sample of the flowing gas, insert a sample probe into the center third of the pipeline. A major flow disturbance in the pipe, such as an elbow fitting or an orifice fitting, will cause the contaminants to be temporarily mixed with the flowing gas stream; therefore, if practical, place the probe greater than five pipe diameters from such a flow disturbance to reduce the amount of contaminants that may be extracted with the gas sample.

Once the sample is extracted, the gas should be passed through both particulate and liquid filters to remove any remaining contaminants before it enters the gas chromatograph.

The following image shows the sample gas connector (1).

Figure 3-22: Sample gas connector



The sample pressure entering the gas chromatograph sample conditioning system should be between 15 and 30 psi (100 and 200 kPa). If the pressure in the pipeline is higher than this, regulate the sample pressure to this pressure with a dual stage regulator. Pressure regulation should occur immediately after the probe, or be combined with the probe (a regulator probe) because any extended lengths of sample line before the pressure regulator adds significant lag time, which is the time taken for the sample entering the probe to reach the analyzer oven.

Note that when the pressure of a gas is reduced, the temperature of the gas will decrease. This is called the Joules-Thompson effect. If the temperature is reduced below the sample's hydrocarbon dew point, the higher hydrocarbons will begin to condense and be removed from the gas phase, which changes the composition of the gas. The analyzed sample will no longer accurately represent the flowing gas stream.

To avoid this hydrocarbon condensation, heat the regulator and sample lines to the gas chromatograph to at least 30 °F (17 °C) above the expected temperature of the flowing gas stream.

Use stainless steel tubing and fittings for all of the sample lines. Use Teflon tape when making threaded connections in the sample system. Do not use pipe thread compounds.

Once the sample is extracted, the gas should pass through both a 2-micron particulate filter and a liquid filter/shut-off to remove any remaining contaminants before it enters the gas chromatograph.

⚠ CAUTION!

If the sample system does not contain a 2-micron filter and a liquid filter/shut-off, the GC's warranty may be void if it is determined the failure is due to contamination.

Note
All sample conditioning systems sold with the 370XA include a 2-micron filter for each stream, and a liquid filter/shut-off can also be purchased separately for each stream.

Observe the following guidelines for installing sample lines:

- Line Length

  If possible, avoid long sample lines. In case of a long sample line, flow velocity can be increased by increasing the sample pressure and by using by-pass flow via a speed loop.
- Sample Line Tubing Material

  Ensure tubing is clean and free of grease.
- Dryers and Filters
  - Use small sizes to minimize time lag and prevent back diffusion.
  - Install a minimum of one filter to remove solid particles. Most applications require fine-element filters upstream of the GC. The recommended sampling system includes a 2-micron filter.
  - Use ceramic or porous metallic type filters. Do not use cork or felt filters.

  Note
  Install the probe/regulator first, immediately followed by the coalescing filter and then the membrane filter.
- Pressure Regulators and Flow Controllers
  - Use stainless steel wetted materials.
  - Should be rated for sample pressure and temperature.
- Pipe Threads and Dressings

  Use Teflon tape. Do not use pipe thread compounds (dope).
- Valving
  - Install a block valve downstream of sample takeoff point for maintenance and shutdown.
  - Block valve should be needle valve or cock valve type, of proper material and packing, and rated for process line pressure.

3.10 Electrical connections

⚠ WARNING!

It is the responsibility of the end user to ensure that all wiring conforms to the local electrical codes or regulations.

The 370XA has three cable entries for wiring. If you intend to run the power and communications cables through a single entry, the lower left entry is the most convenient. If you intend to run the power and communication cables separately, the lower left entry is most convenient for the power wiring, and the lower right entry is most convenient for the communication wiring. The upper right cable entry can be used if there is not enough space to run all of the wiring through the two lower cable entries.

The cable entries are M32-threaded connections. If your gas chromatograph is CSA-certified then a certified M32-to-¾-inch conduit adapter and ¾-inch certified plugs will be shipped with your GC. If your gas chromatograph is ATEX/IECeX-certified then M32-certified plugs will be shipped with your GC.

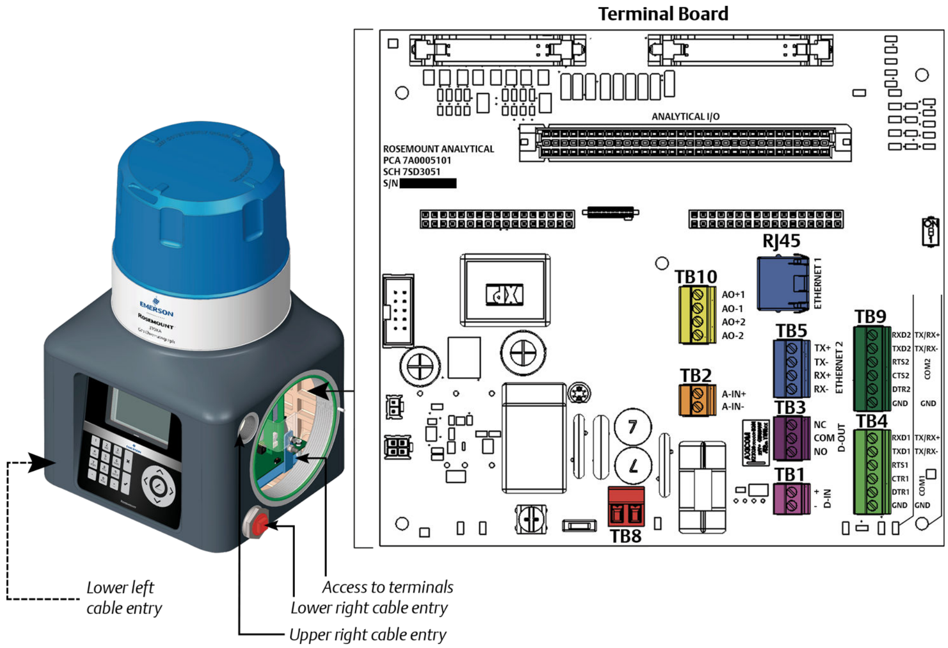
The maximum wire size for all of the 370XA's terminals is 12 AWG or 3.5 mm^2. The terminals can be unplugged from the back plane to make the connection, and then plugged back into place.

⚠ WARNING!

All electrical connections should be made with no power applied.

3.10.1 Terminal wiring diagram

Figure 3-23: Terminal board wiring diagram



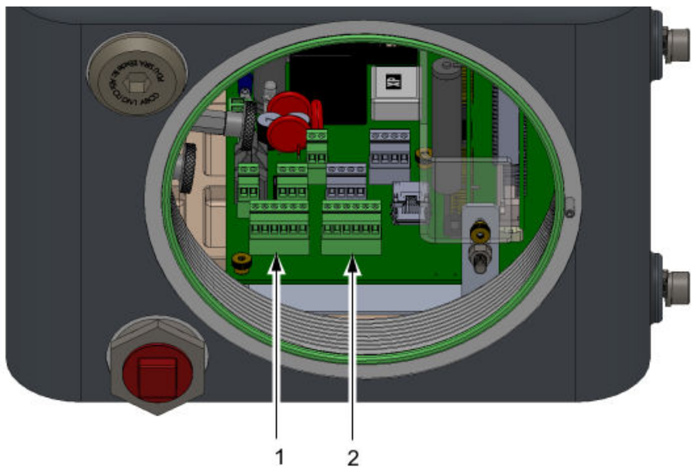
Terminal Board Map Key

Power	Ethernet 2	COM1 Port (RS-232)	COM2 Port (RS-232)	Analog Outputs (2)	Analog Input	Digital Output	Digital Input
TB8: - , + (24 VDC)	TB5: RX-, RX+, TX-, TX+	TB4: GND, TXD, RXD	TB9: GND, TXD, RXD	TB10: AO2-, AO2+, AO1-, AO1+	TB2: A-IN-, A-IN+	TB3: NO, COM, NC	TB1: D-IN-, D-IN+
		COM1 Port (RS-485)	**COM2 Port (RS-485)**				
		TB4: GND, TX/RX-, TX/RX+	TB9: GND, TX/RX-, TX/RX+				

3.11 Connect to serial ports

The 370XA has two serial ports on the backplane that can be individually configured for RS-232 or RS-485 mode using the local operator interface or MON2020. The cables for the serial communications should be individually shielded pairs with the shield connected to a clean electrical earth at one end only.

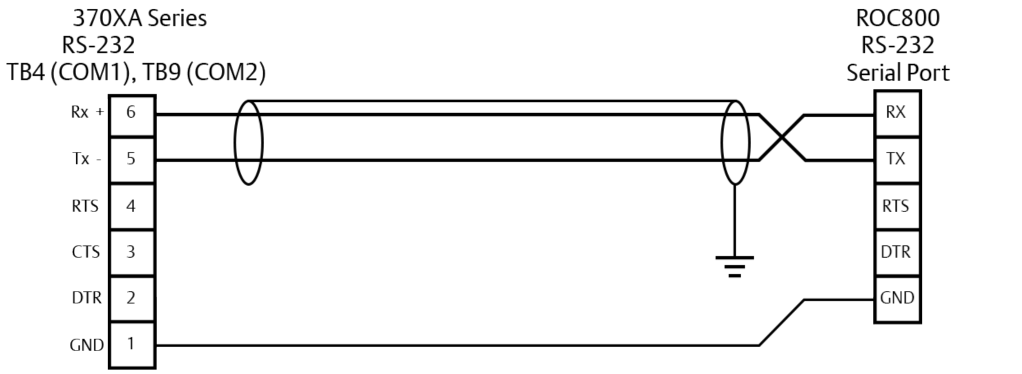
Figure 3-24: Backplane serial ports



1. COM1
   - Modes: RS-232 and RS-485
   - Backplane location: TB4
   - Supported Modbus formats: ASCII and RTU
2. COM2
   - Modes: RS-232 and RS-485
   - Back plane location: TB9
   - Supported Modbus formats: ASCII and RTU

3.11.1 RS-232 wiring

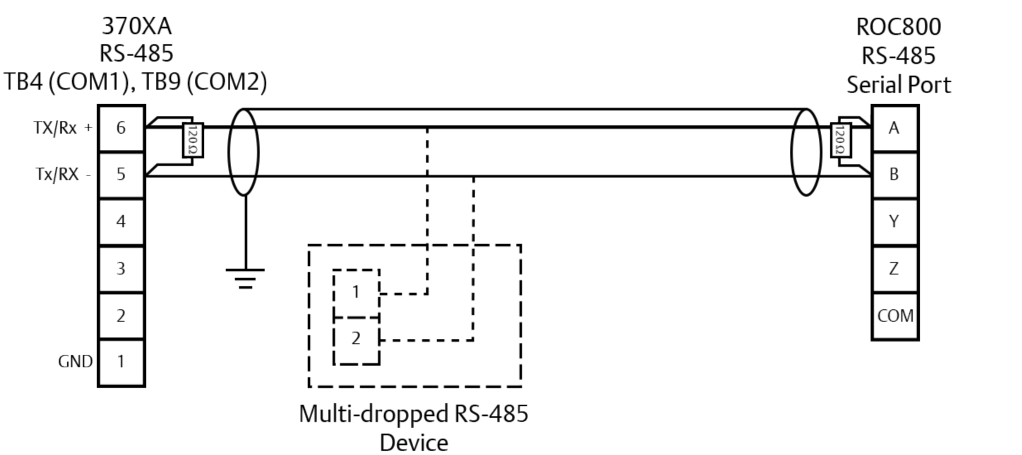
Figure 3-25: RS-232 wiring diagram



- The RS-232 protocol requires a three-wire connection, including a ground and does not support multi-drop.
- The communication pair should be individually shielded with the shield connected at one end only.
- There is no need to connect the RTS, CTS, or DTR terminals in most applications.
- The maximum recommended distance for reliable communications with RS-232 is 50 feet (15 meters).

3.11.2 RS-485 wiring

Figure 3-26: RS-485 wiring diagram

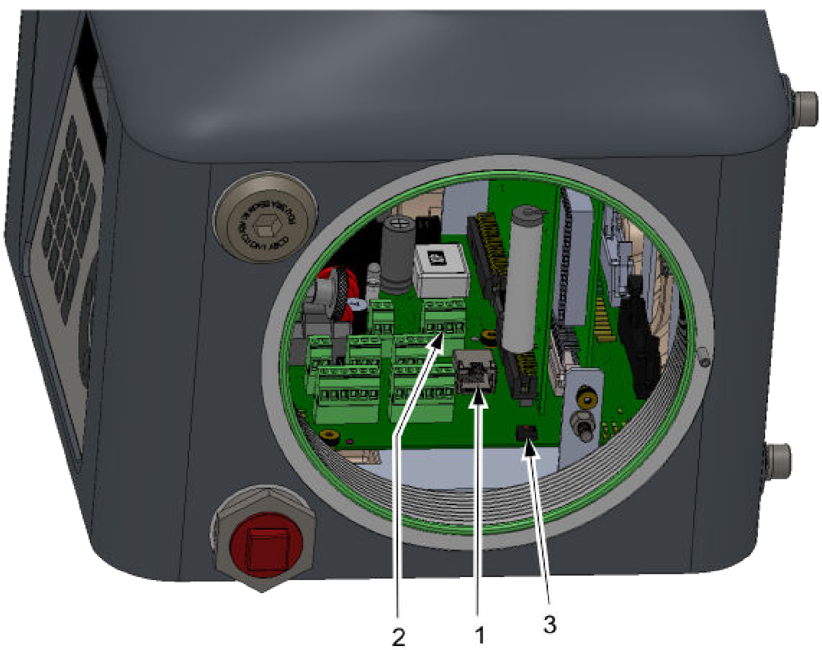


Note
The terminating resistors shown in the graphic above are not required for most installations but may help in reducing communication errors for long distance or multi-dropped applications.

- The RS-485 protocol is suitable for longer distance communications and also allows multi-dropped communication to multiple devices.
- For long distance RS-485 communications, wire 100 ohm to 120 ohm terminating resistors in parallel to the two endpoint terminals.
- If the GC is connected with multiple devices on an RS-485 link, terminating resistors should only be installed at the two end points.

3.12 Connect to Ethernet ports

Figure 3-27: Ethernet ports on the backplane



1. Ethernet 1
   - Backplane location: J9
   - Terminal type: RJ-45, DHCP-enabled
2. Ethernet 2
   - Backplane location: TB5
   - Terminal type: Wired
3. DHCP switch
   - Back plane location: SW1

The 370XA has two Ethernet ports that can be configured with unique IP addresses, subnet masks, and gateway addresses.

- Ethernet 1 is an RJ-45 connector designed to accept common Ethernet cable connections found on computers and other Ethernet enabled devices and is primarily intended for local connection to a computer, but can also be permanently connected to other Ethernet devices.
- Ethernet port 2 is a field terminated port primarily intended for connection to supervisory systems or other Ethernet enabled devices.
- Both ports can be used for MODBUS TCP communication and communication to the MON2020 configuration and diagnostics software.

Note

You can establish up to 10 simultaneous Modbus TCP connections from the Modbus master. Connections attempts made after the ten connection will be ignored.

3.12.1 Ethernet 1 port

Ethernet 1 was designed primarily for local connection to a computer, such as a technician's laptop, for occasional maintenance and diagnostic purposes. The connector is the same RJ-45 Ethernet connector commonly found on most Internet-capable devices.

The RJ-45 port has a DHCP server that will automatically assign an Internet Protocol (IP) address to a computer when it is connected to the port. There is a switch at SW1 on the back plane that turns the server on and off.

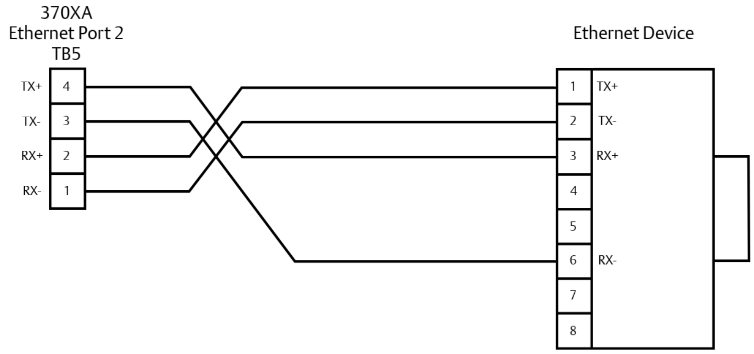
Note

If your computer is not configured to automatically configure Ethernet settings, contact your IT department for instructions on how to change your IP settings to an address in the same range as the Ethernet subnet on the GC, or to obtain an IP address and subnet for the 370XA that will work with your computer's settings.

If Ethernet 1 port is to be wired to other Ethernet-enabled devices, such as a router, hub, or local area network, then set the DHCP server switch to **OFF** to ensure that the operation of the network is not affected.

3.12.2 Ethernet 2 port

Figure 3-28: Ethernet 2 port on the backplane

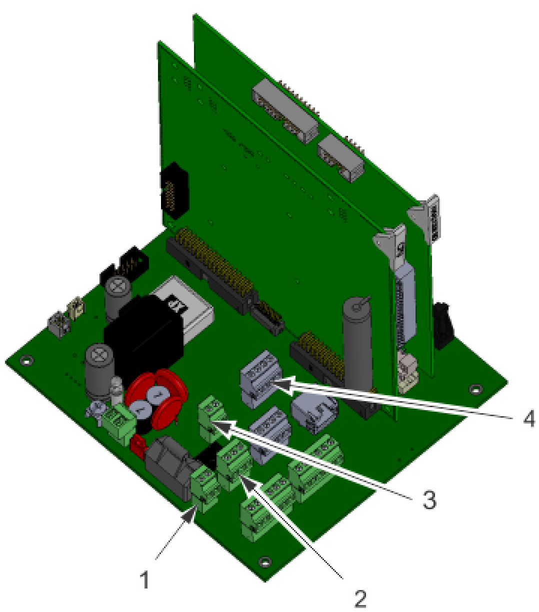


The second Ethernet port is intended to be connected to an Ethernet-enabled supervisory network such as a flow computer, Supervisory Control and Data Acquisition (SCADA) system, or Distributed Control System (DCS). This port can also be used to permanently connect to a maintenance network with MON2020.

Since this port is intended for connection to hard wired Ethernet networks, the IP address, the subnet, and the gateway address must be configured appropriately for the network connection. Consult with your network administrator for the required settings.

3.13 Connect to external devices

Figure 3-29: Digital and Analog device connections



1. Digital input (TB1)	3. Analog input (TB2)
2. Digital output (TB3)	4. Two analog outputs (TB10)

3.13.1 Digital inputs

The discrete digital input can be configured to trigger alarms, change the stream sequence, or other functions. The input is optically isolated and can accept either a contact closure such as a pressure switch or a DC voltage signal between 5 and 30 VDC at 1 Amp.

Figure 3-30: Wiring diagram for a digital input connected to a contact closure device

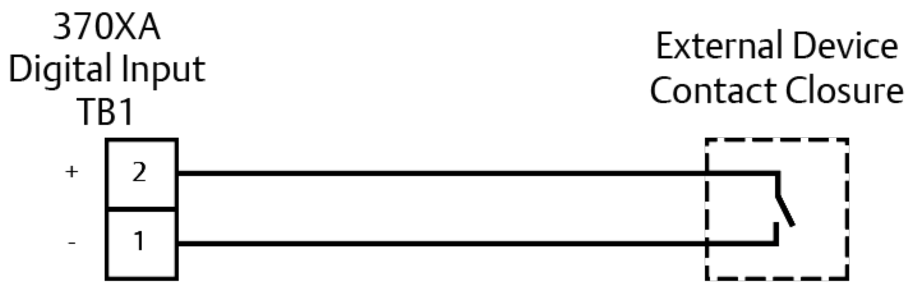
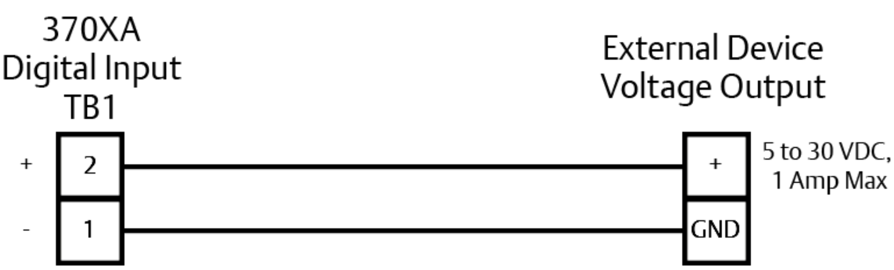


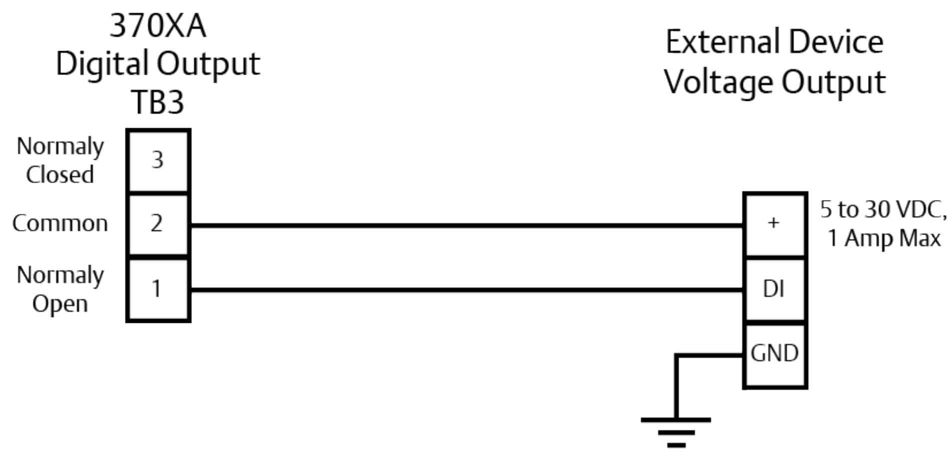
Figure 3-31: Wiring diagram for a digital input connected to a voltage output device such as a flow computer



3.13.2 Digital output

The digital output is a Form C dry contact relay output with normally open and normally closed contacts. The output is typically configured as an alarm output, but can be configured for other purposes. When using the digital output as an alarm output, it is important to configure the circuit for fail-safe operation, which means that the “normally open” contact should be used and configured so that a power failure will raise an alarm in the connected device.

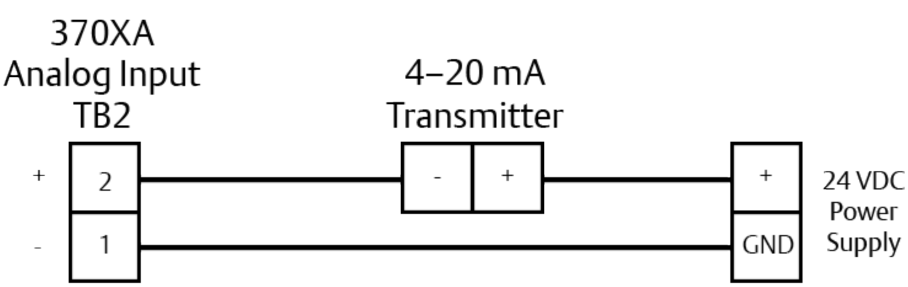
Figure 3-32: Wiring for a digital output for fail-safe mode



3.13.3 Analog input

You can use the analog input to monitor and generate an alarm from an external signal, such as a pressure transmitter on the carrier gas bottles or as a composition component input from another analyzer, such as a moisture or H2S analyzer. The analog input is optically isolated and requires external loop power.

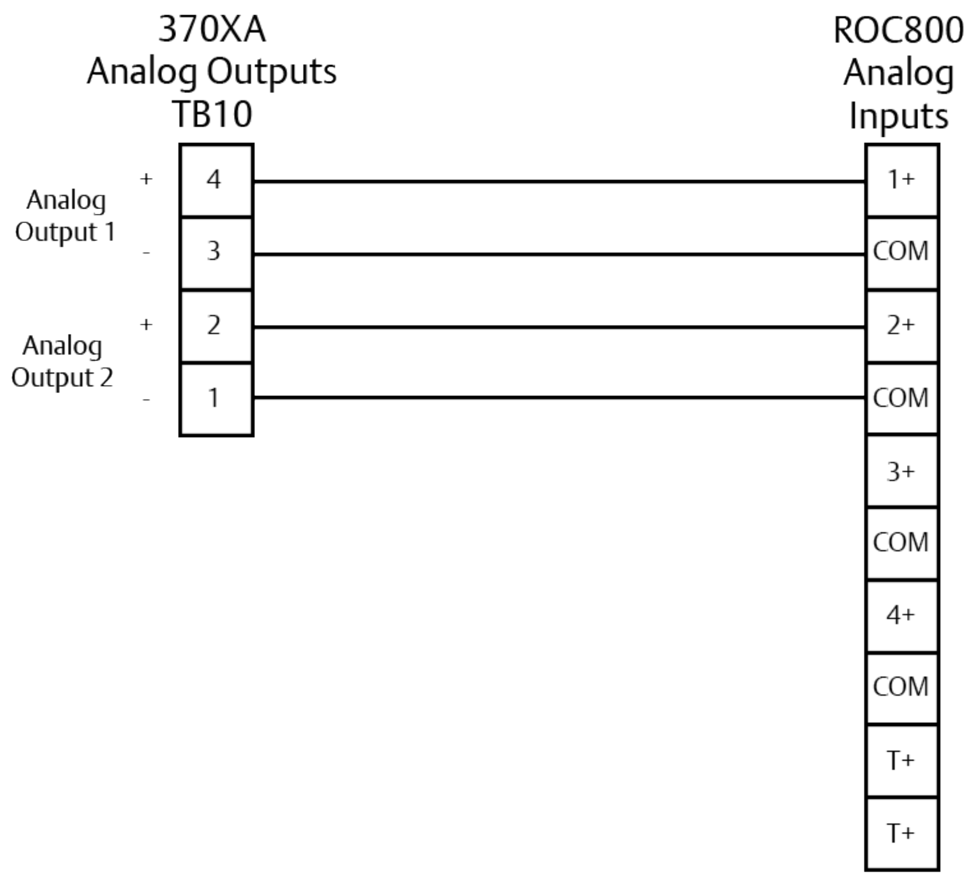
Figure 3-33: Analog Input wiring with an external power supply and a loop powered transmitter



3.13.4 Analog outputs

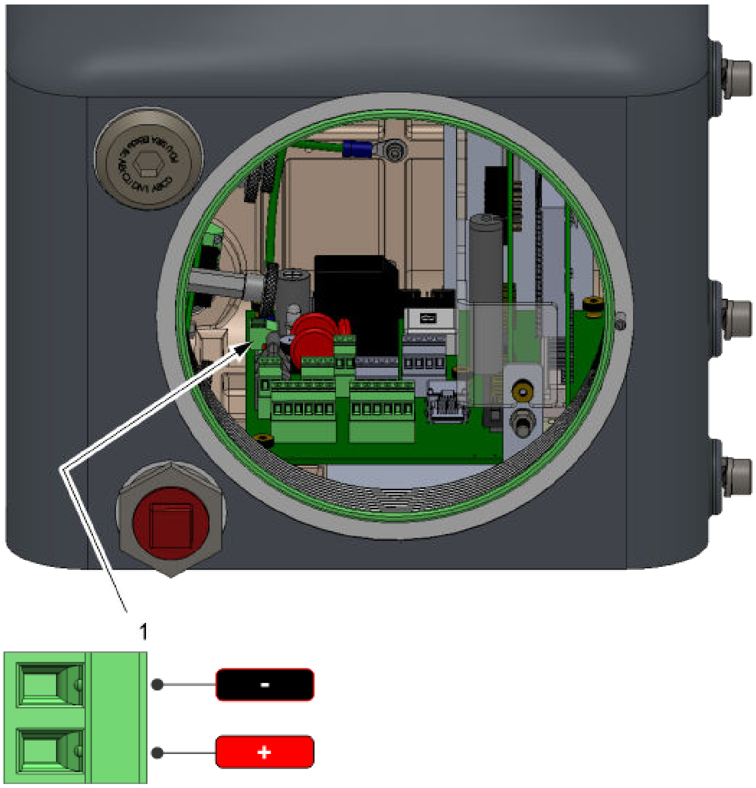
The 370XA has two analog outputs. Each analog output can be used to transmit a GC variable, such as an energy value or a component concentration, as a 4 to 20 mA signal. The outputs are self-powered and require a loop resistance of less than 500 ohms.

Figure 3-34: An analog output connected to an ROC800 analog input card



3.14 Connect to power

Figure 3-35: Power source wiring



3.14.1 Power source wiring

Follow these precautions when installing power source wiring:

- All wiring, as well as circuit breaker or power disconnect switch locations, must conform to all national standards as well as all local, state, or other jurisdictions.
- Provide the GC with a 5 Amp circuit breaker for protection.
- To operate correctly the 370XA requires at least 21 VDC at the terminals on the backplane. When wiring for DC power connections, you must account for the voltage drop due to the resistance of the cable. The following tables estimate the voltage drop and the maximum length of cable with a 24 VDC supply at the maximum power draw, while the analytical oven heats up during startup, of 55 W.

Table 3-4: Voltage drop for AWG cable length

American Wire Gauge (AWG) size	**12**	**14**	**16**	
Resistance per 1000 feet	1.62	2.58	4.08	Ohms
Voltage drop per 1000 feet at 2.5 A	4.05	6.44	10.21	VDC

Table 3-4: Voltage drop for AWG cable length *(continued)*

Maximum length (3 VDC power Drop)	740	465	293	Feet

Table 3-5: Voltage drop for Metric Wire Size cable length

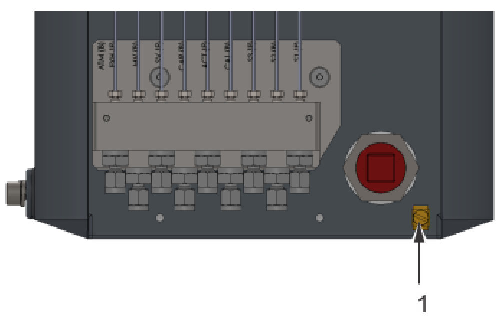
Metric Wire Size	2.5	1.5	mm^2
Resistance per 100 m	1.3	2.1	Ohms
Voltage drop at 100m at 2.5 A	3.25	5.25	VDC
Maximum length (3 VDC power Drop)	92	57	meters

3.14.2 Electrical and signal ground

Follow these general precautions for grounding electrical and signal lines:

- On ATEX-certified units, the external ground lug (1) must be connected to the customer's protective ground system via 9 AWG (6 mm^2) ground wire. After the connection is made, apply a non-acidic grease to the surface of the external ground lug to prevent corrosion.

Figure 3-36: External ground lug location



- The equipment-grounding conductors used between the GC and the copper-clad steel ground rod must be sized according to your local regulations.

3.15 Start up and configure the gas chromatograph

3.15.1 Apply carrier and actuation gas

If the carrier gas and actuation gas are the same supply, start them together.

If a separate actuation gas supply is being used, apply pressure and leak check the actuation gas first, and then repeat for the carrier gas.

⚠ CAUTION!

Applying carrier gas without actuation gas can result in a direct path of the carrier gas to the vent that will rapidly use up the carrier gas supply.

1. Back off the bottle regulator so that when the bottle valve is opened, there will be no pressure applied.
2. Open the bottle valve.
3. Slowly increase the regulated pressure to 90 psi (620 kPa).
4. Leak check the lines from the bottle to the GC.

3.15.2 Apply calibration gas

1. Close the calibration gas isolation valve on the sample handling system.
2. Back off the bottle regulator so that when the bottle valve is opened, there will be no pressure applied.
3. Open the bottle valve.
4. Slowly increase the regulated pressure to 15 psi (100 kPa).
5. Leak check the lines from the bottle to the GC.

Note

Do not open the isolation valve to the calibration gas yet. This will be done during the startup of the GC.

3.15.3 Apply sample gas

Perform the following procedure for each sample line.

1. Close the sample isolation valve on the sample handling system.
2. Back off the sample regulator so that when the sample point isolation valve is opened, there will be no pressure applied.
3. Open the sample point isolation valve.
4. Slowly increase the regulated pressure to 15 psi (100 kPa).
5. Leak check the lines from the bottle to the GC.

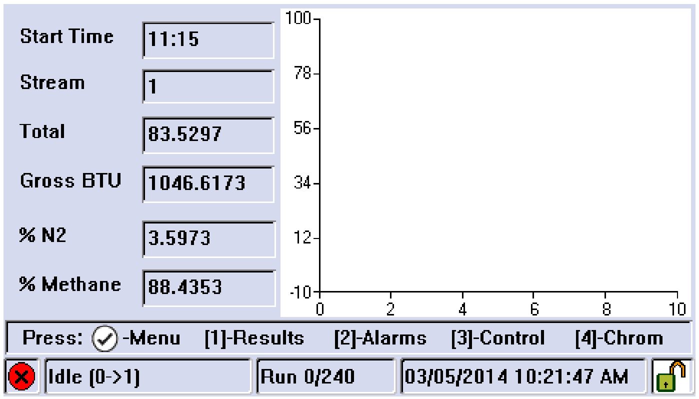
Note

Do not open the isolation valve to the calibration gas yet. This will be done during the startup of the GC.

3.15.4 Turning on power for the first time

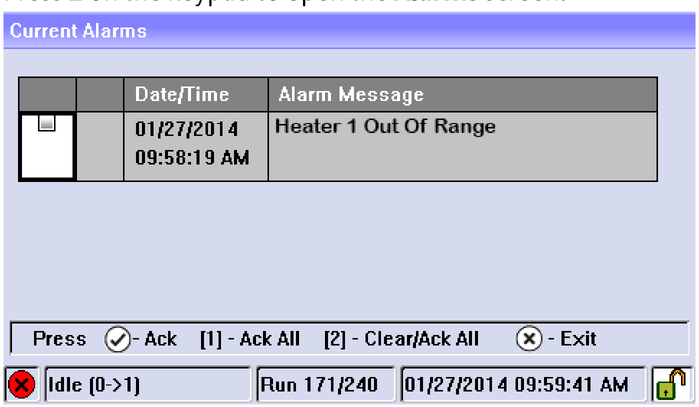
At this point, actuation gas and carrier gas should be flowing through the GC. The GC can take up to two hours to heat up to temperature, during which time the software settings can be configured and the system purged.

1. Turn on the power supply to the GC. The local operator interface's bootup screen displays. When the Home screen displays, bootup is complete. The bootup process takes less than three minutes.
2. Wait fifteen minutes.



A red alarm icon should be visible in the lower right corner of the Home screen.

3. Press **2** on the keypad to open the **Alarms** screen.



Note

You may be required to log in first. The default login values are:

User: **emerson**

Password: [blank]

4. Confirm that the alarm that was triggered was the **Heater 1 Out Of Range** alarm. Other possibe alarms are the **GC Idle** alarm, **Carrier Pressure Low** alarm, and the **Power Failure** alarm.

Note

If the **Current Alarms** screen displays the **Carrier Pressure Low** alarm, confirm that the carrier gas supply is on and that the pressure regulator is set to 90 psi (620 kPa). If the alarm persists, see the *Troubleshooting* section. Because this is the first time that the GC has been turned on, the other alarms can be ignored.

5. Press **2** to acknowledge and clear the alarm.

> **Note**
> The **Heater 1 Out Of Range** alarm will reappear every fifteen minutes until the GC reaches its temperature setpoint. Continue to press 2 as necessary.

6. Press the **Exit** key to return to the **Home** screen.

3.15.5 Set the time

1. Press the **Enter** key to go to the **Main Menu**.
2. Use the right arrow key to move to the **Tools** menu.
3. Use the down arrow key to move to the **Set GC Time** command and press the **Enter** key. The **Set GC Time** screen displays.
4. Set the current date and time.
   - Press the **Edit** key to activate a field.
   - Use the numeric keys to enter the date and time.
   - Press the **Enter** key to accept an entry and to de-activate the field.
   - Use the arrow keys to move to the next field.
5. If your country employs daylight savings time, select the **Enable Day Light Savings** check box, which is unselected by default.

> **Note**
> You must use MON2020 to configure daylight savings time.

3.15.6 Configure the gas chromatograph's Ethernet ports

1. Go to the **Main Menu** and select **TCP/IP** on the **Application** menu.

   The **TCP/IP** screen displays.

2. Make a note of the Ethernet settings for both ports.

   Ethernet 1 is the RJ-45 terminal that is commonly used for local computer access; **Ethernet 2** is the port that is commonly used for communication with a supervisory system such as a flow computer, Remote Terminal Unit (RTU), SCADA, or DCS.
3. Enter the Ethernet settings according to the network requirements of your installation.

   If you intend to use **Ethernet 1** for local access only, do not change the settings. Contact your network administrator or the person in charge of configuring your supervisory system network for the settings required to connect the GC to your network.

3.15.7 Connect a computer directly to the 370XA

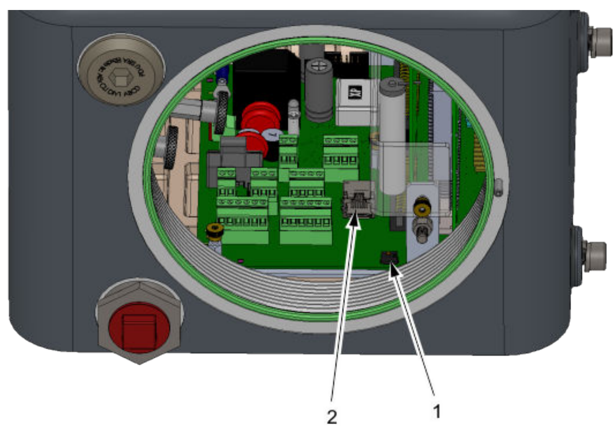
The **Ethernet 1** port uses a common RJ-45 connector for connections between local devices and includes a Dynamic Host Configuration Protocol (DHCP) server that automatically configures the settings of a computer when it connects to **Ethernet 1**.

Switch on the DHCP server for a local, single-computer connection, or switch it off if you intend to connect **Ethernet 1** to multiple devices on a local area network (LAN).

3.15.8 Connect a local computer to the 370XA

1. Locate the switch at SW1 (1) on the backplane. It is in front of the RJ-45 Ethernet plug (2). Flip the switch on. This activates the GC's DHCP server. The server typically takes 20 seconds to initialize and start up.

Figure 3-37: Backplane switches and RJ-45 connector



Note

If you intend to connect the RJ-45 port to a router or switch, ensure the GC's DHCP server is turned off by flipping the SW1 switch to OFF. Connecting to your LAN with the DHCP server on will disrupt your local network's functioning.

Note

The GC can be connected (or remain connected) to a local network via the wired Ethernet 2 port on the back plane while the DHCP feature is being used.

2. Connect between the GC's RJ-45 connector and the local computer with a standard Cat 5 Ethernet cable.
3. Wait 30 seconds for the computer to update its TCP/IP settings.

Note

If your computer is not configured for dynamic IP addressing (static IP), you will need to configure the 370XA with a static IP address that is in the same subnet as your computer. Contact your network administrator for these IP settings and enter the required settings into the TCP/IP Settings screen on the 370XA.

4. Start MON2020.

Note

You must have at least MON2020 version 3.0 to communicate to the 370XA.

5. Select **Connect** on the **Chromatograph** menu.

   The **Connect to GC** window opens.

6. Click the **Ethernet** button in the Direct-DHCP row.

   The **Login** screen opens.

7. Enter your login information and press **OK**.

   The computer will connect to the GC. The status bar at the bottom of the MON2020 screen will show the GC name, the alarm status, the mode and the time and date of the connected GC.

3.15.9 Configure the serial communications settings from the LOI

To configure the serial port communication settings to communicate with ModBus host devices such as a flow computer, RTU, SCADA, or DCS, the protocol settings for all the devices on the network must match. Obtain the required serial port settings prior to configuring the settings on the GC.

1. Go to the **Main Menu** and select **Communications** on the **Application** menu. The **Communications** screen opens.
2. Enter the serial port settings.
   - **Modbus ID -** The address that the host device will use to communicate with the GC. For applications where the GC is the only slave device on the network, the ModBus ID is typically set to 1. For multi-dropped applications where the GC is one of several on the serial network, the ModBus ID needs to be unique. Refer to your host device configuration to determine the ModBus ID to be configured on the GC.
   - **Baud Rate -** The baud rate can be set at the standard rates from 1200 baud up to 57600. For ModBus communications, the typical setting is **9600**.
   - **Data Bits -** The number of bits used for communications. The typical setting for ASCII mode communications is **7**. The typical setting for RTU mode communications is **8**.

- **Stop Bits -** The number of bits sent to indicate the end of a message. Typically set to **1**.
- **Parity -** The error checking mode for the parity bit in ASCII mode messages. This can be set to either **ODD** or **EVEN** for ASCII mode communications and must match the host device's setting. Set to **NONE** for RTU mode communications.
- **MAP File -** The ModBus address map. By default, this is set to SIM_2251, which is a pre-configured map with the same mapping as the Daniel 2251 controller, and is the most common communication mapping for flow computer-to-GC communications. Refer to the MON2020 manual to learn more about configuring custom maps.
- **Port** - The selection between RS-232 and RS-485 physical layer communication protocol.

Note

The 370XA does not have a setting for ASCII or RTU mode. The GC automatically detects the mode during its initial communications with the host device and automatically selects the correct mode.

3. Press ✓ to save the changes and return to the **Main Menu**.

3.15.10 Set the calibration gas concentration values

Note

You can use MON2020 to enter these values. Select **Component Data** from the **Application** menu.

1. Go to the **Main Menu**.
2. Move to the **Application** menu and select **Calibration Gas Info**.

   The **Calibration Concentration** screen displays.

3. Enter the concentration values that are written on the calibration gas' certificate into the appropriate fields on the **Calibration Concentration** screen.

   Note

   If the **Auto Calculate Methane** check box is selected, the Methane value will be calculated based on the values entered in the other fields. This value updates after each new entry.

4. If the calibration gas' certificate displays a Methane value, compare the value to the Calibration Concentration screen's Methane value. If the values do not match, confirm that you have entered the other values correctly.
5. Press ✓.

   The **Uncertainty %** screen displays.

6. Enter the uncertainty values from the calibration gas' certificate into the appropriate fields on the **Uncertainty %** screen.

Note

If the calibration gas certificate does not list the uncertainty percentages, enter the default value of **2**.

---

7. Press .

   The **Cal Gas Certificate CV** screen displays.

8. Enter the *Cal Gas Certificate CV* and *CV Check Deviation* values from the calibration gas' certificate.

Note

The GC calculates the energy content using the C6+ ratio configured in the GC at the factory. Because the energy content data on the calibration certificate is typically calculated using the energy value of the actual components in the mixture, there may be a difference between the GC's energy values and the calibration certificate's energy values. If the values don't match, enter the calculated values from the GC to ensure the energy value check during the calibration runs will not cause nuisance alarms.

---

9. Press .

For other configuration settings, refer to the *Advanced Configuration* section.

3.15.11 Calibrating the GC for the first time

1. Open the **Heater** screen.
2. Confirm that the *Temperature* for Heater 1 matches the *Setpoint* and the *Current PWM* is less than **40**. If not, see the *Troubleshooting* section.

Note

The *Current PWM* shows the percentage of time power is applied to the heater. Values under 40 indicate a stable temperature has been reached. If a stable temperature has not been reached three hours after the power was applied, refer to the troubleshooting guide.

---

3. Press to close the screen.
4. Go to the **GC Control** menu and select **Single Stream**.

   The **Start Single Stream Analysis** screen displays.

Note

You may be asked to log in first.

---

5. Select the calibration stream by clicking the **Edit** button and using the arrow keys to highlight **4-Cal**, and clicking the **Edit** key again.
6. Make sure the **Purge Stream for 60 seconds** and the **Continuous Operation** check boxes are selected.
7. Press to start the analysis.
8. Press to return to the Home screen.

Note

The first few analysis runs will show a chromatogram on the **Home** screen that may not look normal. This is common for the first runs after the unit has been started up after an extended amount of down time.

---

9. Let the analysis run for 30 minutes and then go to the **GC Control** menu and select **Halt**.
10. Wait for the analysis cycle to finish and the mode change to *Idle*.
11. Return to the **GC Control** menu and select **Calibration**.

    The **Start Calibration** screen displays.

12. Make sure the **Purge Stream for 60 seconds** and the **Normal** check boxes are selected.
13. Press to start the calibration.
14. Wait for the calibration cycle to complete. By default, this will run for 3 analysis cycles for a total of 13 minutes, including the 60-second purge.

Note

If the calibration generated any alarms go to the Current Alarms screen to view them. Refer to the troubleshooting section to learn how to resolve the calibration issues.

---

15. Open the isolation valves for the sample stream(s) and set the pressure to between 15 and 30 psi (100 to 200 kPa).
16. Go to the **GC Control** menu and select **Auto Sequence**.

    The **Start Auto Sequence** screen displays.

17. Make sure the **Purge Stream for 60** seconds check box is selected.
18. Press to start the analysis.
19. Go to the **View** menu and select **Reports**.

    The **Report Display** screen displays.

20. View the Analysis Report for each stream and confirm that the un-normalized total is between **98** and **102**. If it is not, refer to the *Troubleshooting* section.

The gas chromatograph is now running and analyzing the sample streams. It will automatically calibrate once a day with the default settings, so the calibration gas must remain on. Refer to the *Advanced Configuration and Operation* section for further information and configuration instructions.

4 Using the 370XA

Topics covered in this chapter:

You can perform many routine maintenance functions directly from the LOI. In most cases, the 370XA can be installed, configured, and placed on line without the use of a computer.

4.1 Interacting with the LOI

The LOI automatically starts up when the GC is turned on. The LOI displays the **Startup** screen, which updates with its start up status. After the firmware has booted up, the LOI will display the **Home** screen.

To edit data, you must be logged in at the appropriate security level; if you attempt to edit data without being logged in, the **Login** screen will appear.

You will be logged off automatically after a period of 15 minutes of inactivity. The LOI will turn off the back light and return to the Home screen.

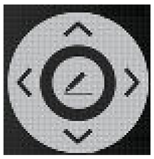
4.1.1 Menu operation

To view the **Main Menu** from the **Home** screen, press **Enter** (). Use the arrow keys to navigate through the menus.

To exit from the **Main Menu** and return to the **Home** screen, press **Exit** (). If you were logged on when exiting the menu, you will be logged off.

4.1.2 Screen operation

Use the up and down arrow keys to navigate between a screen's fields. Pressing the down arrow key while focus is on the last field on the screen will move the focus to the first field on the screen; alternatively, pressing the up arrow key while focus is on the first field on the screen will move the focus to the last field on the screen.



Select/Edit. Puts the field currently in focus into edit mode, unless the focus is on a table, in which case pressing this key allows you to navigate amongst the table's cells.

If there is no field in edit mode, you can exit that screen in one of two ways:

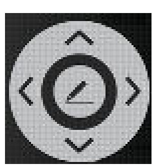
Enter. If you made any changes to the screen's data, the LOI validates and saves them, while also generating the appropriate event log entries. The LOI then exits the current screen.

Exit. If you made any changes to the screen's data, the LOI discards the changes and exits the current screen.

4.1.3 Entering numeric data

The valid key entries for numeric data are the numbers 1 - 9, the negative sign (-), and the decimal point (.).

The decimal point is only available for floating-point numbers.

Press  to put the numeric field into edit mode.

Press  to validate and save new data.

Press  to cancel the new data and keep the original data.

Press the **left arrow key** to delete the digit immediately to the left of the currently highlighted number.

Press the **right arrow key** to move the cursor to the right one space.

4.1.4 Enter alphanumeric data

To enter a letter into an alphanumeric field, press the appropriate key to cycle through its alphanumeric options until the desired letter appears. For example, to enter an "H", you must press the **4GHI** key three times.

4.2 How to perform common tasks with the LOI

4.2.1 Acknowledge an alarm

1. Go to the **Current Alarm** screen. This can be done in one of two ways:
    - From the **Home** screen, press **2** on the keypad.
    - From the **Main Menu**, navigate to the **View** menu and select **Current Alarms**.
2. From the **Current Alarms** screen, use the up and down arrow keys to move to the alarm that you want to acknowledge.
3. Press .

    The alarm will be acknowledged.

4.2.2 Acknowledge all alarms

1. Go to the **Current Alarms** screen. This can be done in one of two ways:
    - From the **Home** screen, press **2** on the keypad.
    - From the **Main Menu**, navigate to the **View** menu and select **Current Alarms**.
2. Press **1** on the keypad.

    All alarms will be acknowledged.

4.2.3 Acknowledge and clear all alarms

1. Go to the **Current Alarms** screen. This can be done in one of two ways:
    - From the **Home** screen, press **2** on the keypad.
    - From the **Main Menu**, navigate to the **View** menu and select **Current Alarms**.
2. Press **2** on the keypad.

    The alarms will be acknowledged and cleared from the GC and the screen.

4.2.4 View the maintenance log

1. Go to the **Main Menu**. This can be done in one of two ways:
   - From the **Home** screen, press .
   - From any other screen, press .
2. From the **Main Menu** screen, use the left or right arrow keys to move to the **Logs** menu.
3. Use the down arrow to highlight the **Maintenance Log** command.
4. Press .

   The **Maintenance Log** screen displays.

4.2.5 View the event log

1. Go to the **Main Menu**. This can be done in one of two ways:
   - From the **Home** screen, press .
   - From any other screen, press .
2. From the **Main Menu** screen, use the left or right arrow keys to move to the **Logs** menu.
3. Use the down arrow to highlight the **Event Log** command.
4. Press .

   The **Event Log** screen displays.

4.2.6 View a live chromatogram

Live chromatograms display on the **Home** screen by default, but there are two other ways of viewing a live chromatogram on its own screen.

Method #1

From the **Home** screen, press **4** on the keypad. The **Live CGM** screen displays.

Method #2

1. Go to the **Main Menu** screen. This can be done in one of two ways:
   - From the **Home** screen, press .
   - From any other screen, press .

The **Main Menu** displays with the **View** menu selected.

2. From the **View** menu, use the down arrow to highlight the **Chromatogram** command.
3. Press .

   The **CGM Settings** screen displays. The live chromatogram is at the top of the list and has an icon beside it.

4. Press .

   The **Live CGM** screen displays.

4.2.7 View an archived chromatogram

1. Go to the **Main Menu** screen. This can be done in one of two ways:
   - From the **Home** screen, press .
   - From any other screen, press .

   The **Main Menu** displays with the **View** menu selected.

2. From the **View** menu, use the down arrow to highlight the **Chromatogram** command.
3. Press .

   The **CGM Settings** screen displays.

4. Press the down arrow key to move from the live chromatogram and to select the archived chromatogram that you want to display.
5. Press .

   The **Archived CGM** screen displays.

4.2.8 Start a single stream analysis run

1. Go to the **Main Menu** screen. This can be done in one of two ways:
   - From the **Home** screen, press .
   - From any other screen, press .
2. From the **Main Menu** screen, use the left or right arrow keys to move to the **GC Control** menu.

3. Press the down arrow to highlight the **Single Stream** command.
4. Press .

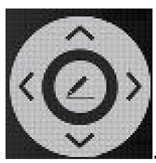
   The **Start Single Stream Analysis** screen displays.

5. Press the down arrow key to highlight the stream that you want to analyze.

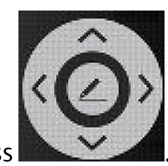
   The **Purge stream for 60 seconds** feature allows sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis. The feature is checked by default.

   The **Continuous operation** feature allows for the repeated analysis of the selected stream. The feature is checked by default.
6. To select or clear the **Purge stream for 60 seconds** check box or the **Continuous operation** check box, do the following:

   a. Press the down arrow key to move from the **Stream** list box to the **Purge stream for 60 seconds** check box.

   b. To select or clear the **Purge stream for 60 seconds** check box, press .

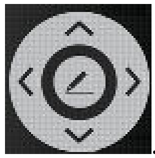
   c. Press the down arrow key to move from the **Purge stream for 60 seconds** check box to the **Continuous operation** check box.

   d. To select or clear the **Continuous operation** check box, press .
7. Press  to start the analysis run.

4.2.9 Start a calibration analysis run

1. Go to the **Main Menu** screen. This can be done in one of two ways:
   - From the **Home** screen, press .
   - From any other screen, press .
2. From the **Main Menu** screen, use the left or right arrow keys to move to the **GC Control** menu.
3. Press the down arrow to highlight the **Calibration** command.
4. Press .

The **Start Calibration** screen displays.

5. Press .

6. Press .

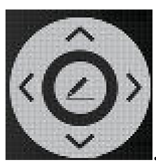
   The **Purge stream for 60 seconds** feature allows sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis. The feature is checked by default.

   There are two types of calibration:

   - A *Normal* calibration is a manual calibration in which the newly computed calibration factors are updated to the CDT *only if* the deviation with previous factors don't exceed limits set in the CDT. This is the default option.
   - A *Forced* calibration is a manual calibration in which the component data table for the selected stream is updated with calibration factors *even if* that data is outside the acceptable deviations that are listed in the component data table.

7. To select or clear the **Purge stream for 60 seconds** check box, do the following:

   a. Press the down arrow key to move from the **Stream** drop-down list to the **Purge stream for 60 seconds** check box.

   b. To select or clear the **Purge stream for 60 seconds** check box, press .

   c. If you do not want to select a calibration type, press  and the calibration starts.

8. To select a calibration type, do the following:

   a. Press the down arrow key to move from the **Purge stream for 60 seconds** check box to the set of **Calibration Type** check boxes.

      The **Normal** check box will be selected.

   b. If you want to select **Forced**, press the down arrow key and it will be selected.

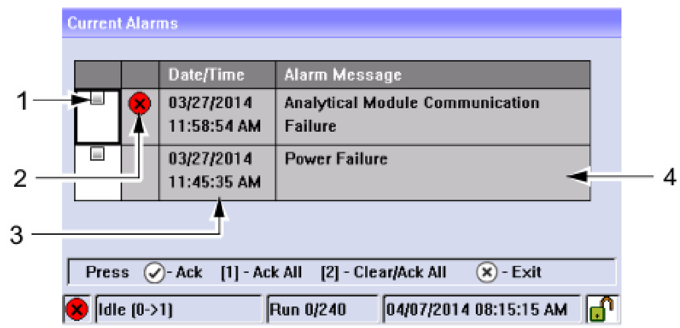
   c. Press  to start the calibration run.

4.3 LOI screen descriptions

4.3.1 The View menu

The Current Alarms screen

Figure 4-1: Current Alarms screen



1. **Check box**

   Select the alarm's check box in order to acknowledge it.

2. **State**

   Indicates whether the alarm is active ( ), unacknowledged ( ), or inactive (blank).

3. **Date/Time**

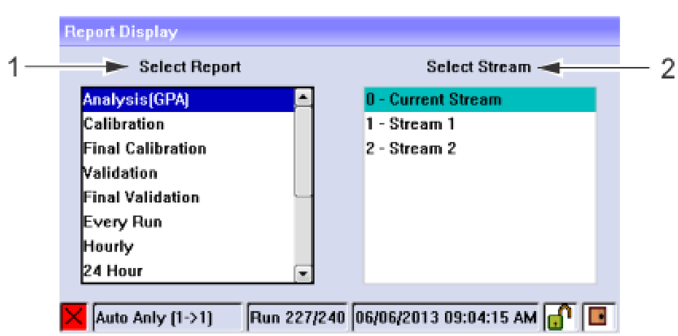
   Indicates the date and time at the GC when the alarm condition occurred.

4. **Alarm Message**

   Describes the alarm.

The Reports screen

Figure 4-2: Report Display screen



1. **Select Report**

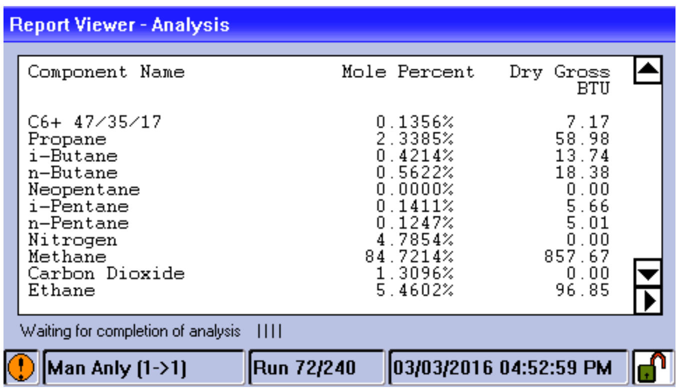
   Lists the report types that can be generated and displayed by the LOI.
2. **Select Stream**

   Select the stream that was analyzed.

The Report Viewer screen

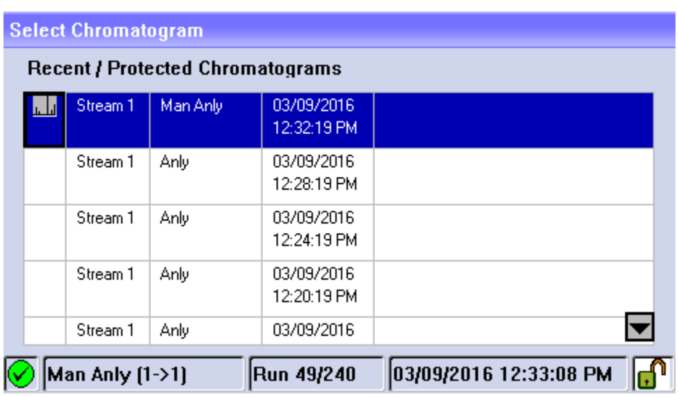
This window displays after you select a report type from the **Reports** screen. This screen's content is dependent upon the type of report selected.

Figure 4-3: Report Viewer screen



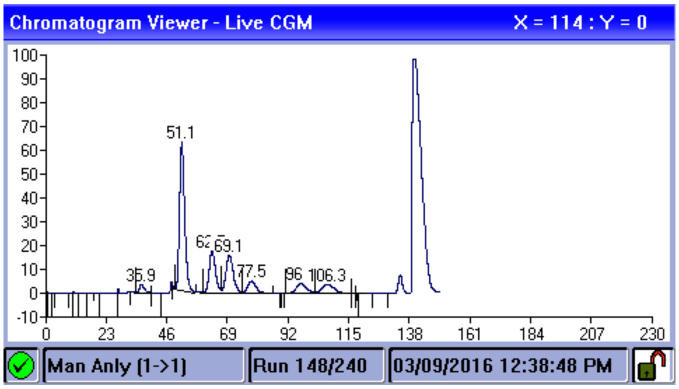
The Chromatogram screens

Figure 4-4: Select Chromatogram screen



The *CGM Viewer* screen displays when you select **Chromatogram** from the **View** menu.

Figure 4-5: Chromatogram Viewer - Live CGM

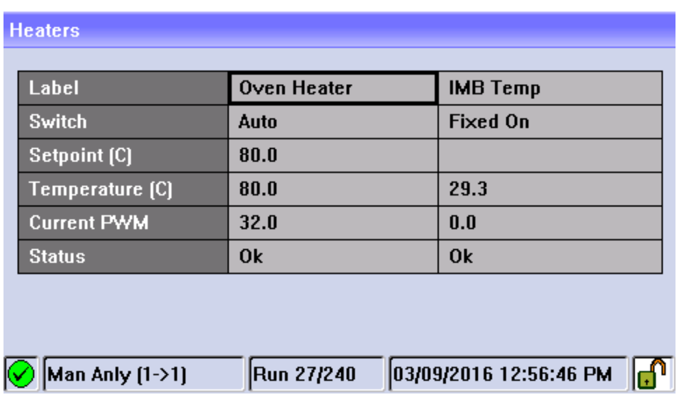


Section Label	Description
Select CGM	The LOI can display a live or an archived chromatogram, but not both. The chromatograms listed in the Archived drop-down list are sorted by date, with the newest file listed first.
Scale	Allows you to enlarge or shrink the chromatogram.

4.3.2 The Hardware menu

The Heaters screen

Figure 4-6: Heaters screen



Label

The heater's name. This can be changed with MON2020.

Switch

Indicates the state of the heater:

- **Auto**: The heater is controlled by the GC.
- **Fixed On**: The heater is controlled manually, through user input.
- **Not used**: The heater is shut off.

The switch state can be changed with MON2020.

Setpoint (C)

Indicates the target temperature. The setpoint and the unit of measurement (Celsius or Fahrenheit) can be changed with MON2020.

Temperature (C)

Indicates the current temperature.

Current PWM

Indicates the current percentage of power being provided to the heater.

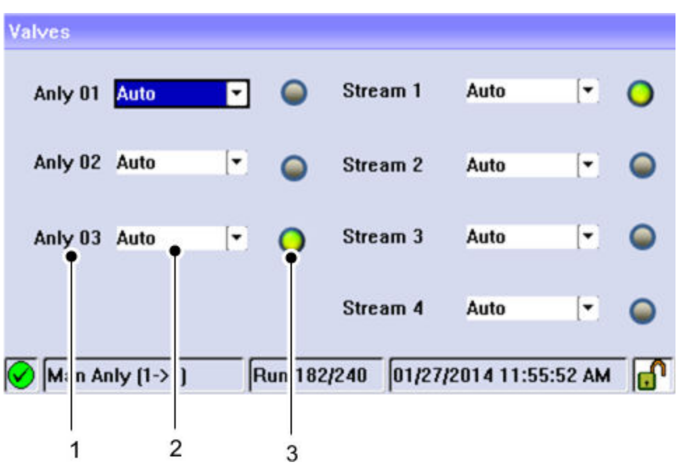
Status

Indicates the operational state of the heater.

- OK: The heater's control card is installed and is working correctly.
- Not installed: The heater is not installed.
- Out of Control: The heater is running but the temperature is not within control limits.
- Error: The GC cannot communicate with the heater.

The Valves screen

Figure 4-7: Valves screen



1. **Label**

   The name of the valve as set in MON2020.

2. **Mode**

   There are three modes:

   - Auto - The valve's on or off state is controlled by the GC.
   - Off
   - On

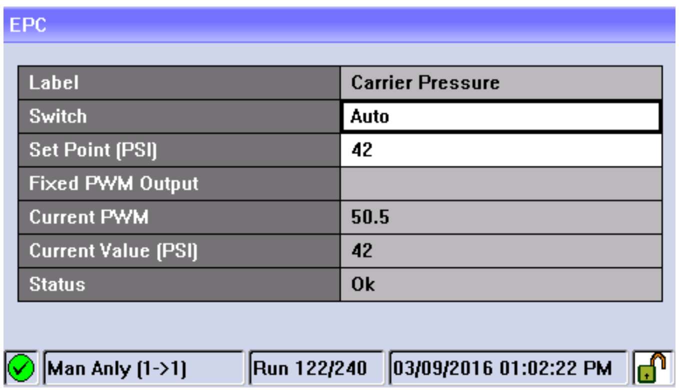
   The mode can be set by the user.

3. **Status icon**

   Green means that the valve is on, or active; gray means the valve is off, or inactive.

The EPC screen

Figure 4-8: EPC screen



Label

The name of the EPC as set in MON2020.

Switch

- Auto: The EPC is controlled by the GC.
- Fixed On: The EPC is controlled manually, through user input.
- Not used: The EPC is shut off.

Set Point

Indicates the target pressure.

Fixed PWM Output

The desired percentage of power to provide to the EPC.

Current PWM

Indicates the current percentage of power being provided to the EPC.

Current Value

The current pressure.

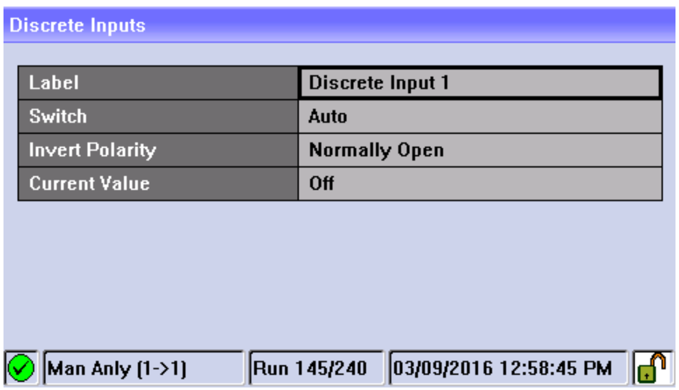
Status

Indicates the operational state of the EPC.

- OK: The EPC is installed and is working correctly.
- Out of Range: The EPC is running but the pressure is not within control limits.
- Error: The GC cannot communicate with the EPC.

The Discrete Input screen

Figure 4-9: Discrete inputs screen



Label

The name of the discrete input as set in MON2020.

Switch

Indicates the discrete input's operational mode. There are three modes:

- Auto - The discrete input’s on or off state is controlled by the GC.
- Off
- On

The mode can be set by the user.

Invert Polarity

The Invert Polarity option reverses the way a voltage signal is interpreted by the discrete input. By default, the Invert Polarity option is set to *Normally Open*, which means that a low voltage signal is interpreted by the discrete input as ON, and a high voltage signal is interpreted by the discrete input as OFF. Setting Invert Polarity to *Normally Closed* means that a low voltage signal is interpreted by the discrete input as OFF, and a high voltage signal is interpreted by the discrete input as ON.

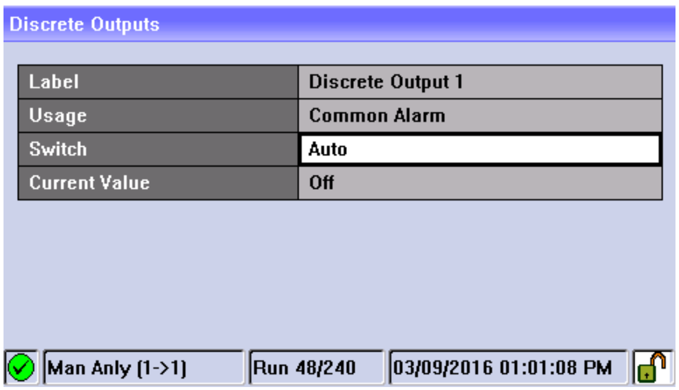
This option can be changed with MON2020.

Current Value

Indicates the current state of the discrete input. Options are **On** and **Off**.

The Discrete Outputs screen

Figure 4-10: Discrete Outputs screen



Label

The name of the discrete output as set in MON2020.

Usage

A discrete output's usage mode determines which signals are routed to it via the Limited Alarm and Discrete Alarm functions. A discrete output can be assigned one of the following usage modes:

- DO
- Common alarm
- Stream
- Analyzer01

The usage mode can be changed with MON2020.

Switch

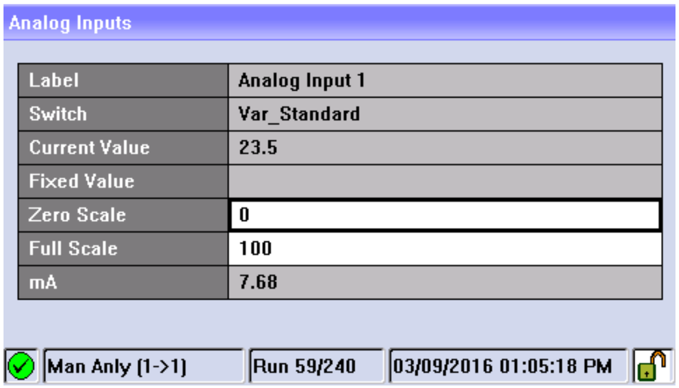
Indicates the discrete input's operational mode. Options are: **Auto**, **On**, and **Off**. This field can be changed by the user.

Current Value

Indicates the current state of the discrete output. Options are **On** and **Off**.

The Analog Inputs screen

Figure 4-11: Analog Inputs screen



Label

The name of the analog input as set in MON2020.

Switch

An analog input has two operational modes:

- Setting the switch to **Variable** means that the analog input will be set automatically, based on the signal it receives.
- Setting the switch to **Fixed** means that the analog input will be set to the value that you enter in the *Fixed Value* field.

This field can be changed with MON2020.

Current Value

Displays the current value of the analog input signal.

Fixed Value

If the analog input is set to **Fixed**, then analog input signal will be set the value that you enter into this field. This field can be changed with MON2020.

Zero Scale

The minimum analog input signal value. This field can be changed with MON2020.

Full Scale

The maximum analog input signal value. This field can be changed with MON2020.

mA

Displays the amount of current being received, in milliamperes.

The Analog Output screens

Figure 4-12: Analog Output 1 screen

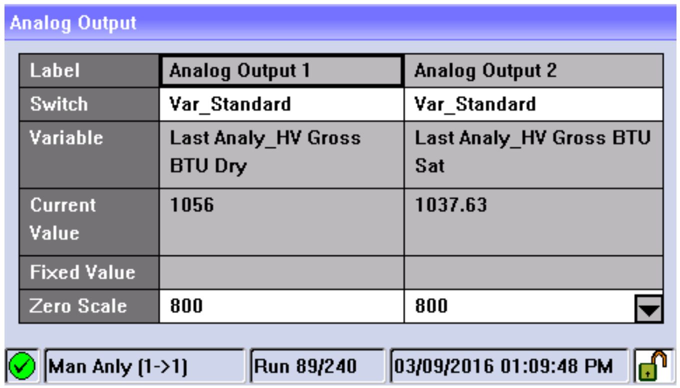
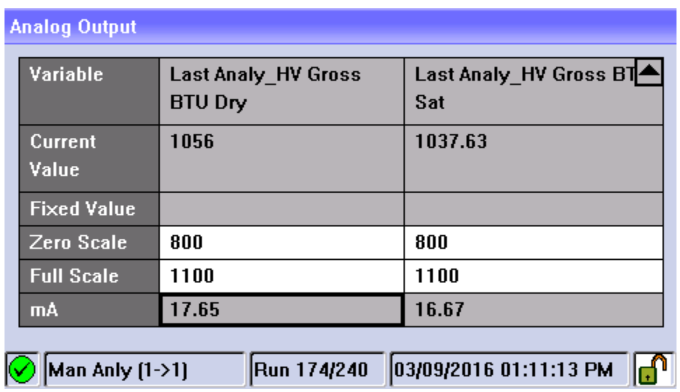


Figure 4-13: Analog Output 2 screen



Label

The name of the analog output as set in MON2020.

Switch

An analog output has two operational modes:

- Setting the switch to **Variable** means that the analog output will be proportional to the variable displayed in the *Variables* field.
- Setting the switch to **Fixed** means that the analog output will be set to the value that is entered in the appropriate *Fixed* Value field.

This field can be changed with MON2020.

Variable

Displays the system variable to which the analog output is associated. This variable can be changed with MON2020.

Current Value

Displays the current scaled value of the analog output signal.

Fixed Value

If the analog output is set to **Fixed**, then analog output signal will be set the value that you enter into this field. This field can be changed by the user.

Zero Scale

The minimum analog output signal value.

Full Scale

The maximum analog output signal value.

mA

Displays the amount of current being produced in milliamperes.

4.3.3 The Application menu

The System screen

Analyzer Name

Displays the GC name that appears in the Status Bar on the main window when MON2020 is connected to the GC.

System Description

Displays information that further identifies the currently connected system.

Firmware Version

Revision level of firmware of the GC.

GC Serial Number

Serial number of the GC.

Company Name

The name of the company that owns the GC.

GC Location

The physical location of the GC.

Maintenance Mode

Switches the GC to maintenance mode and triggers an alarm that the GC is down for maintenance. This option can be switched on or off by the user.

Enable Energy Value Check

At the end of a calibration, if this feature is enabled, the GC will calculate the Energy Value and compare it against the value entered on the Cal Gas Cert CV screen. If the values diverge significantly, the **Calibration Energy Value Check Fail** alarm will be triggered.

Std Comp Table Version

Indicates which version of the GPA's standard component table is being used.

Default Stream Sequence

Displays the default sequence to be used by the GC during auto-sequencing.

The Component Data Table screen

Component

Displays the list of available components for the selected stream.

Ret Time

A component's retention time, which is the time, in seconds, when the apex of the component's peak is expected to appear.

Resp Fact

A component's response factor is equal to the value of the component's peak divided by the component's concentration value.

Calib Conc

The concentration amount, in mole percent, of the component that is present in the calibration gas.

Uncert %

The maximum acceptable percent of deviation between the new sample concentration value for the specified component and its calibration concentration value.

The Timed Events Table screen

Event Type

Displays the type of event that occurred.

Valve/Det

The ID number or name of the valve or detector that was affected by the event.

Value

The value depends on the event that is displayed the Event Type column:

- Slope Sensitivity and Peak Width: The number of points to be used.
- Single Baseline: Off, End, Bgn.
- All other events: On or Off.

Time (s)

Indicates at what time, in seconds, the event will occur during the analysis.

The Streams screen

Label

The name of the stream.

Usage

The type of stream. There are four types: Analy (Analysis), Cal (Calibration), Validate (Validation), and Unused.

Tot

The number of runs to make for each calibration or validation.

Avg

The number of most-recent calibration or validation runs to use in the average calculation; for instance, if five calibration runs are performed and Avg is set to 3, then the last three runs of the five will be used to average the calibration results.

Date/Time

The time at which the first automatic calibration or validation should be performed.

The Status Display screen

Description

The GC parameter that is being monitored. This can be changed with MON2020's **LOI Status Variables** screen.

Value

The GC parameter's current value.

The Communications screen

Label

The name of the port. This can be changed using the MON2020 configuration software.

Modbus ID

Identification number of the Modbus device used by a host device to communicate with the GC.

Baud Rate

The baud rate setting. Can be set to one of the following:

- 1200
- 2400
- 9600
- 19200
- 38400
- 57600

Data Bits

The number of data bits. For RTU communication this is typically set to 8 bits, and for ASCII mode this is typically set to 7 bits.

Stop Bits

The number of stop bits. This can only be set to 1 in the 370XA.

Parity

The parity check method. For RTU mode, this should be set to NONE. For ASCII mode, this can be set to EVEN or ODD.

MAP File

The name of the Modbus MAP file being used by the port. The SIM_2251 modbus map is the same registers as the legacy Model 500/2350A C6+ application that is commonly pre-configured in custody transfer flow computers and RTU systems and uses the "Daniel" modbus message format.

The "default Map" is a fully configurable modbus map that uses the MODICON message format.

Both modbus maps can be modified using the MON2020 software. For details on modifying the modbus maps, refer to the MON2020 manual.

Port

The type of physical message protocol to be used for the port. Each port can be set to RS-232 or RS-485 mode independently.

Note

The port will automatically communicate in ASCII or RTU mode, depending on the message format received from the host device.

TCP/IP Settings

Ethernet 1 IP Address

IP address to use to connect to the GC's RJ45 Ethernet port.

Ethernet 1 Mask

Subnet mask for the Eth1 IP address.

Ethernet 1 Gateway

Default gateway address for the Eth1 IP address.

Ethernet 1 DHCP

Indicates whether or not the RJ45 Ethernet port's DHCP feature is enabled. The DHCP enable switch is located on the back plane at SW1.

Ethernet 2 IP Address

IP address to use to connect to the GC's wired Ethernet port.

Ethernet 2 Mask

Subnet mask for the Eth2 IP address.

Ethernet 2 Gateway

Default gateway address for the Eth2 IP address.

4.3.4 The Logs menu

The Alarm Log screen

User Name

User name of the person who is logged in to the gas chromatograph.

Date/Time

Indicates the date and time when the alarm condition began.

State

Indicates whether the alarm is active (SET) or inactive (CLR).

Alarm Msg

Describes the alarm condition.

The Event Log screen

User Name

User name of the person who made the change.

Date/Time

Indicates the date and time when the event occurred.

Event Msg

Displays a description of the event.

The Maintenance Log screen

User ID

User name of the person who made the log entry.

Date/Time

The date and time that the log entry was created.

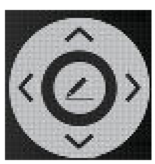
Message

Describes the nature of the maintenance activity that was performed. You can edit this field.

Note
To add an entry to the log, press **1** on the keypad.

The Add a New Maintenance Log screen

This screen can be accessed from the **Maintenance Log** screen.

1. Use the up or down arrow keys to select the appropriate maintenance task from the drop-down list.
2. Press  to add the log message to the **Maintenance Log** screen. The entry and its creation date will appear at the top of the log.

4.4 The GC Control menu

4.4.1 The Auto Sequence screen

Select the **Purge stream for 60 seconds** check box if you want to allow sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

To start the auto sequence process, press  on the keypad.

4.4.2 The Single Stream screen

Select the **Purge stream for 60 seconds** check box if you want to allow sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

Select the **Continuous operation** check box if you want to allow for the repeated analysis of the selected stream.

To start a single stream analysis, select a stream and then ✓ on the keypad.

4.4.3 The Halt screen

You must be logged in at least at the Regular user level to access this screen. If you are not already logged in, the Login screen will display.

To halt an analysis, press ✓ on the keypad.

4.4.4 The Calibration screen

You must be logged in at least at the Regular user level to access this screen. If you are not already logged in, the **Login** screen will display.

There are two types of calibration:

- Select **Normal** to perform a manual calibration in which the component data table for the selected stream will be updated with calibration data *unless* the data is outside the acceptable deviations that are listed in the component data table.
- Select **Forced** to perform a manual calibration in which the component data table for the selected stream will be updated with calibration data *even if* that data is outside the acceptable deviations that are listed in the component data table.

Select the **Purge stream for 60 seconds** check box if you want to allow sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

To start a calibration, select a stream and then press ✓ on the keypad.

4.4.5 The Validation screen

You must be logged in at least at the Regular user level to access this screen. If you are not already logged in, the **Login** screen will display.

Select the **Purge stream for 60 seconds** check box if you want to allow sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

To start a validation, select a stream and then press ✓ on the keypad.

4.4.6 The Auto Valve Timing screen

You must be logged in at least at the Regular user level to access this screen. If you are not already logged in, the **Login** screen will display.

This automatic procedure, which takes up to one hour to complete, includes the following sequence of tasks:

- Sets the timing for each valve.
- Matches all the component peaks.

- Adjusts the timed events based on peak integration times.
- Runs a calibration.
- Checks the range and order of response factors.
- Adjusts the retention time deviations to avoid peak overlapping.

Select the **Purge stream for 60 seconds** check box if you want to allow sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

To start the process, select a stream and then press ✓ on the keypad.

4.5 The Tools menu

4.5.1 The Screen Control screen

Use the up or down arrow keys to select a brightness level from the list box and then press ✓ on the keypad.

4.5.2 The Set GC Time screen

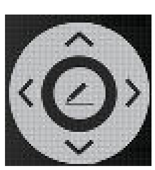
You must be logged in at least at the Regular user level to access this screen. If you are not already logged in, the Login screen will display.

To change the date or time:

1. Press ✓ to activate the **MM** text box.
2. Enter the appropriate number for the current month.
3. Press ✓.
4. Move to the next text box.
5. Repeat the first three steps.

Daylight savings time is the practice of temporarily advancing clocks so that afternoons have more daylight and mornings have less. Typically clocks are adjusted forward one hour near the start of spring and are adjusted backward in autumn. Since the use of daylight savings time is not universal, you have the option of enabling or disabling it with the LOI.

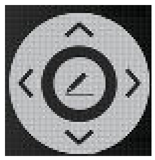
To enable or disable daylight savings:

1. Use the down arrow key to select the **Enable Day Light Savings** check box.
2. Press  to toggle the check box.

4.5.3 The Login screen

Note
The word “emerson” is the default User Administrator login for all Rosemount gas chromatographs. There is no default password.

To log in to the gas chromatograph:

1. Press  to activate the **User** drop-down box.
2. Use the arrow keys to highlight your user name.
3. Press  to deactivate the **User** drop-down box.
4. Use the down arrow key to move to the **Pin** text box.
5. Use the alphanumeric keypad to enter your password into the text box.

   Note
   To enter a letter into an alphanumeric field, press the appropriate key to cycle through its options until the desired letter appears. For example, to enter an “H”, you must press the **4GHI** key three times.

6. Press .

4.6 Advanced configuration and operation topics

4.6.1 Validation

The 370XA can be configured to validate an analysis of the calibration standard (or another stream) to ensure that the analysis is within specified limits. The validation can be configured for any of the streams, including the calibration stream (default). The validation can be configured to run automatically at a set time and frequency, or it can be initiated manually.

In previous generations of gas chromatographs, a daily calibration was run to verify the correct operation and to account for changes in measurement on a daily basis. A calibration run is typically configured to run for 3 analysis cycles of the calibration gas and will change the response factors.

The main advantage of the validation is to confirm the analysis is within specifications without changing the calibration factors.

Prepare for a validation

Before starting a validation run you must configure the stream that you intend to use as the validation stream.

The 370XA allows you to assign virtual streams to any of its stream selection solenoids. By default, the fifth stream is configured as the validation stream.

1. Start MON2020 and select **Streams** on the **Application** menu.

   The **Streams** window opens.

2. Enter the *Total Runs* and *Avg Runs* for the validation cycle.

   The *total runs* is the number of analysis cycles that will be run in total. The *average runs* is the number of runs that will be used to average and then validate the data. For example, if the total runs is 3, and the average runs is 2, the validation cycle will analyze the validation streams for three cycles, and the last two cycles will be used to average the results and validate the measured values. By default, both are configured for one run only.

3. Select the physical stream in the *Stream Valve* column that will be used for the validation gas.

   - If the validation is to be done against the calibration gas, select **Calibration** from the **Stream Valve** drop-down list.
   - If the validation is to be done with a gas other than the calibration gas on a single-stream GC, select **Calibration** from the **Stream Valve** drop-down list and install a manual three-way valve before the calibration inlet on the sample conditioning system.
   - If the validation is to be done with gas other than the calibration gas on one of the streams of a multi-stream GC, select the appropriate stream valve from the **Stream Valve** drop-down list.

4. If you are using the calibration gas or if the validation gas is permanently installed and you want to run a validation on a schedule, do the following:

   a. Select the check box in the appropriate *Auto* column.
   b. Select the *Start Time* for the first validation.
   c. Enter the *Interval*, in hours, between validation runs.

   Note

   If you are configuring an auto-validation and an auto-calibration, schedule the validation run to occur at least 30 minutes before the calibration run to provide a validation of the measurement just before the calibration cycle re-calculates the response factors.

   ---

5. Click **OK** to save the data and close the **Streams** window.

6. Select **Validation Data** on the **Application** menu. The **Validation Data** window opens.

Note

The Validation Data command will not be available on the Application menu unless at least one stream is assigned to Validate in the Usage column on the Streams window.

7. Select the *Variables* to be validated and enter the *Nominal Value* and the *Percent Deviation* for each.

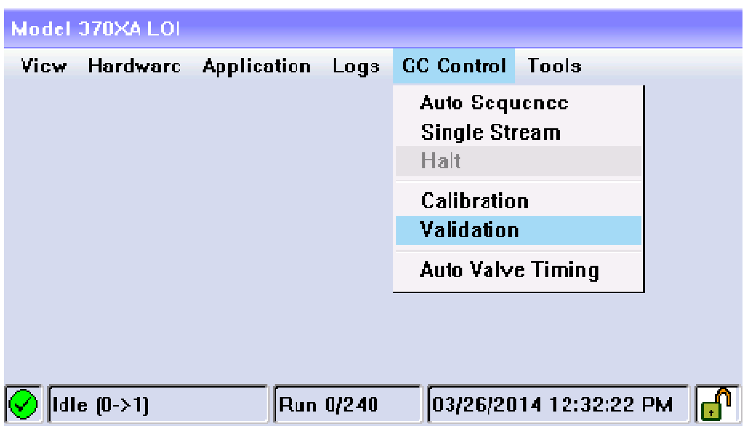
Note

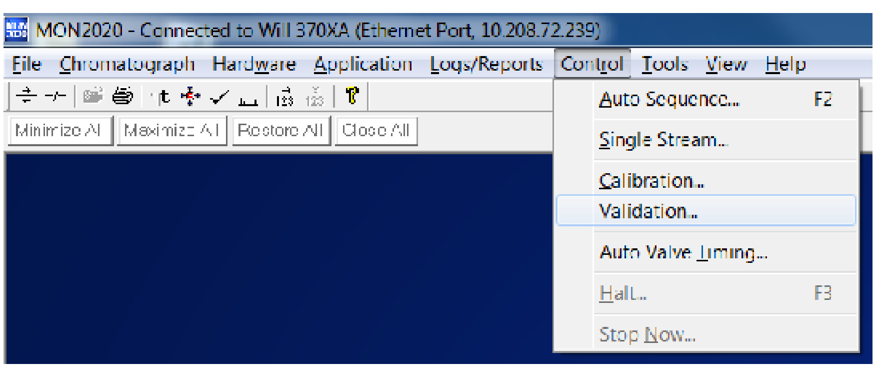
When entering variables, if you want to enter the next component from the component data table based on the previously entered component, click **C+Copy (F8)**.

Run a validation

Once the validation settings have been configured, the validation cycle will begin at the scheduled time if the GC is in Auto mode.

The validation cycle can also be started by selecting **Validation** on the **Control** menu.





Note

You can generate a Validation Report at any time by choosing Main Menu > View > Report Display from the LOI or Logs/Reports > Report Display from MON2020.

4.6.2 Change the calibration gas

Changing the calibration gas is a very critical procedure that can significantly affect the accuracy of the gas chromatograph if not performed correctly. Before using a new calibration gas blend for calibrating the gas chromatograph, the composition stated on the certificate must be verified by using the 370XA to analyze the new calibration gas.

1. Go to the **Tools** menu and select **Change Cal Cylinder**. The **Calibration Cylinder Replacement Assistant** screen displays.

    Note

    You may be required to log in first. The default login values are:
    User: emerson

    Password: [blank]

2. Follow the software assistant's prompts.

    Note

    Step 6 of 10: The calibration gas concentrations can be obtained from the bottle certificate. The screen will auto calculate the Methane value if the **Auto Calculate Methane** check box is selected. If the calibration gas' certificate displays a Methane value, compare the value to the screen's Methane value. If the values do not match, confirm that you have entered the other values correctly.

    Note

    Step 7 of 10: If the certificate states an uncertainty percentage for each component, enter them here. If the certificate does not show the uncertainty percentages, then the default value of 2% should be used. The uncertainty values can be used to confirm that the analysis of the calibration gas matches the certificate values before the standard is used to calibrate the GC.

    Note

    Step 8 of 10: If the certificate includes the energy content, enter it on this screen. If the certificate does not include an energy content, use the calculated energy content shown.

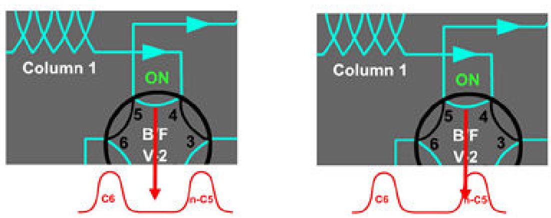
After you have followed all of the assistant's prompts, it will analyze the calibration gas and repeat the analysis until the nitrogen value repeats within the uncertainty value entered on a previous screen. Because air is 78% nitrogen and the calibration gas contains significantly less nitrogen than this, the analyzed nitrogen content should typically start high and then decrease as the system is purged with the new gas. The screen displays the nitrogen value for each run on the table to the left of the chromatogram. Once the nitrogen value has stabilized, the last analysis will be compared to the entered certificate values to ensure that the GC is analyzing accurately.

4.6.3 Auto valve timing

The analytical valves in the oven are switched on or off during the analysis cycle to change the analytical flow path to separate certain components through particular columns. For the C6+ analysis, column one separates the hexane and heavier components (C6+) from the pentane and lighter components, column two separates the propane to pentane components, and column three separates the nitrogen, methane, carbon dioxide, and the ethane. The timing of the valve switching is critical to the accurate performance of the analysis.

Over time, the resistance to flow and the performance of the columns will change (typically, the retention times get slower) resulting in the switching of the valves "cutting" into some of the component, rather than switching between the peaks as they elute from a column.

Figure 4-14: The timing of the valve switching to separate between two components eluting from a column. The example on the left shows the ideal time between the two peaks. The example on the right shows the valve timing is too early, and will result in the exclusion of some of the normal-pentane.



Traditionally, highly trained gas chromatograph experts would manually adjust the valve timing and tune the timing of the integration events occasionally to account for the small changes in retention times and measurement issues.

Auto valve timing (AVT) automates this process so that even an inexperienced user can initiate an adjustment of the valve timing, letting the GC's internal algorithm adjust and optimize the valve timing automatically.

To initiate AVT, go to the **Control** menu from the LOI or MON2020 and select **Auto Valve Timing**.

The AVT will use the calibration stream to make adjustments. The configuration selection provides options for the starting point for the adjustments:

- **Use module default** - The AVT algorithm will start using the factory default values loaded into the module when the module was originally built. Use this option when maintenance has been performed on the module, for example, the analysis valve diaphragms have been overhauled, and the retention times have significantly changed from the last calibration.
- **Use current** - The AVT algorithm will start using the valve timing and integration settings currently in the module.

4.6.4 Warm-start mode

When power is reinstated after being lost while the GC is in auto-analysis mode, the GC will enter warm-start mode and try to go back on line. In warm-start mode, the GC monitors the oven temperature until it is stabilized at the set point, runs calibration gas, and checks that all of the components are detected correctly. Once the calibration gas has been analyzed correctly, the GC will re-enter auto-analysis mode.

If the warm-start mode fails to complete within 2 hours, a **warm start failure** alarm will be triggered, and the GC will go into Idle mode.

4.6.5 Maintenance mode

Maintenance mode allows you to work on the GC while alerting the supervisory system that the current analysis may not be valid, and should not be used. Maintenance mode triggers a system alarm that can be read as a Modbus Register (bit 0 on Register 3046 in the SIM_2251 Modbus map), and on the Common Alarm digital output.

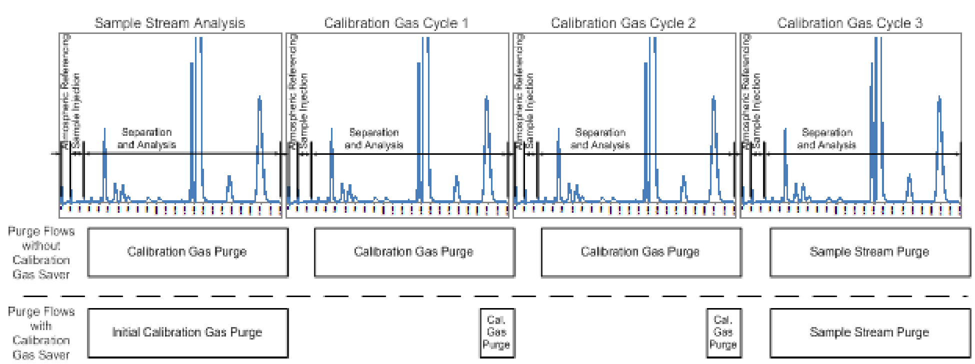
To enable maintenance mode, select its check box on the **System** window from the LOI or MON2020.

When maintenance mode is active, the analysis in the Modbus registers will still be updated so that communication to the supervisory system can be tested; however, the analysis results during maintenance mode will not be included in the averages calculated by the GC.

4.6.6 Conserve calibration gas

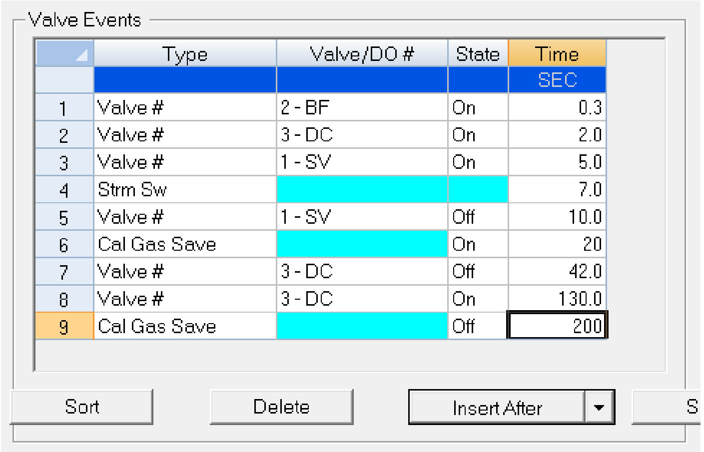
To save calibration gas, the 370XA has a unique feature called Cal-Gas Saver that reduces calibration gas usage significantly. During normal operations, the next stream will start to be purged through the sample loop from when the sample shut-off valve that is operated by the back-flush valve timing, at around 25 seconds, is opened, through to the start of the next analysis. This ensures that the sample lines and the sample loop are completely purged of the previous stream and the sample loop is full of the next sample to be analyzed.

Figure 4-15: Cal-Gas saver



A calibration cycle involves running multiple analysis cycles of the calibration gas. Because there are multiple runs of the same gas, there is no need to purge the sample lines leading up to the sample loop after the first analysis run. To conserve the amount of calibration gas used by the 370XA while still maintaining calibration accuracy, the calibration gas saver feature turns off the calibration gas stream for a longer period during the calibration gas analysis cycles to dramatically reduce the amount of calibration gas consumed.

Figure 4-16: The Valve Events table showing the Cal Gas Save events turned on at 20 seconds and turned off at 200 seconds.



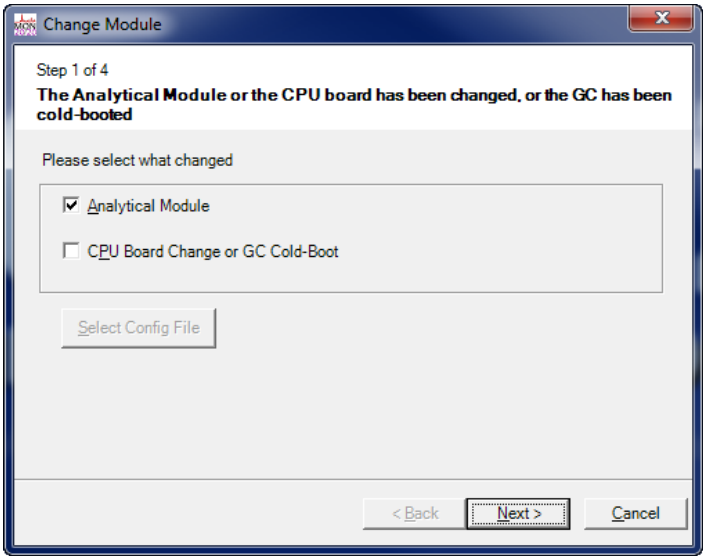
By default, the calibration gas saver is switched on at 20 seconds and turned off at 200 seconds, but these values can be changed.

1. Start MON2020 and select **Timed Events** on the **Application** menu. The **Time Events** window opens.
2. Locate the first **Cal Gas Save** event on the **Valve Events** table. This event switches on the Cal-Gas Saver feature.
3. Enter a new start time in the appropriate **Time** field.
4. Locate the second **Cal Gas Save** event on the **Valve Events** table. This event switches the Cal-Gas Saver feature off.
5. Enter a new end time in the appropriate **Time** field.
6. Click **OK** to save the changes and close the window.

4.6.7 New Module Software Assistant

When you install a new analytical module on the 370XA and turn on the power, the GC will recognize that a new module has been installed and will start the New Module software assistant, which will heat up the oven, run carrier gas through the analytical paths, and cycle the analytical valves to rapidly purge the system.

Figure 4-17: New Module software assistant

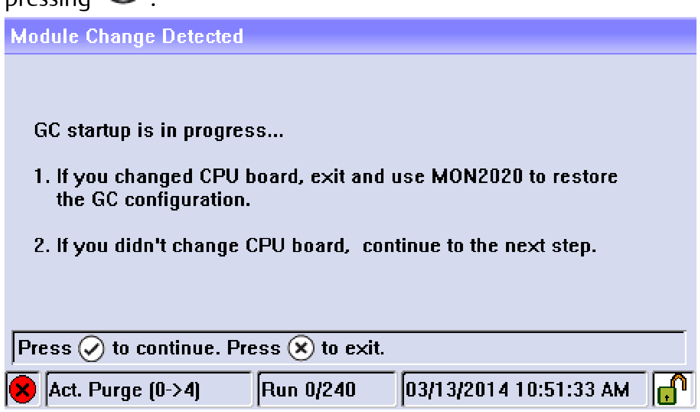


Note

The New Module software assistant can also be initiated from the LOI or MON2020 by selecting Module Validation on the Tools menu.

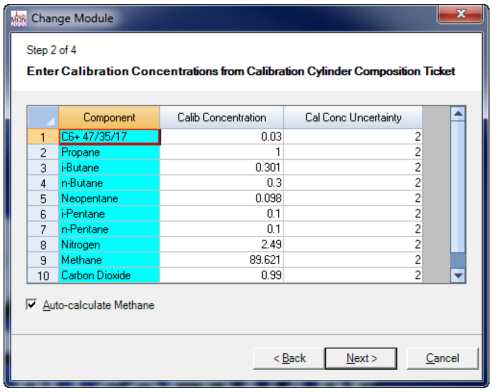
Note

Changing the CPU board will also start the New Module software assistant because of the mismatch between the CPU board and the analytical module. In this case, you should stop the assistant by pressing ⊗.



While the GC is heating up to temperature, the LOI will show the Calibration Gas Info composition screen so that you can confirm that the module's calibration gas values match the concentrations and the uncertainty on the calibration gas bottle certificate.

Figure 4-18: Calibration concentration information



When the oven temperature has stabilized, the software assistant will automatically run calibration gas and validate the module. The validation will run three analysis cycles of calibration gas and confirm that the analysis is within the pre-configured specifications. If the analysis is within the specifications, a calibration cycle will then be run. If the analysis is not within the specifications, a Module Validation Fail alarm will be raised, and the unit will go into Idle mode.

After the calibration cycle is completed, the 370XA will then go into Auto mode and begin analyzing the stream gas.

5 Recommended Spare Parts

The 370XA gas chromatograph was designed for easy maintenance in the field with a unique "maintainable module." To minimize downtime in the field, you can replace the entire analytical module with a spare one. Additionally, the module can be repaired on a component level by a trained technician either in the field, at a central maintenance location, or by the Rosemount Analytical Lifecycle services team.

This list of spares includes an entire analytical module, plus the components typically required to maintain the module in typical natural gas service and the sample handling components that may need to be replaced on a regular basis.

Table 5-1: 370XA spare parts

Part Number	Qty	Description
7A00136G02	1	Replacement Maintainable Module Kit, C6+, Multi-Stream (3 Sample + Cal)
7A00137G01	3	370XA 6-port Valve Diaphragm Repair Kit
7A00140G01	1	Sample Shut-Off Valve Repair Kit
7C00020-001	1	Valve, Solenoid, 4-Way, SMC
7C00023-001	1	Valve, Solenoid, 2-Way Isolation, Asco
7C00024-001	1	Valve, Proportional, Solenoid, Asco
2-4-5000-938	1	Membrane Kit, Genie® Model 120 Filter/Bypass/LSO
2-4-5000-113	1	Filter Element 2 micron,Swagelok SS-2F-K4-2
7A00022G01	1	ASSY, Carrier Dryer, Compact, Sample System, 370XA

6 Replacing the maintainable module

Topics covered in this chapter:

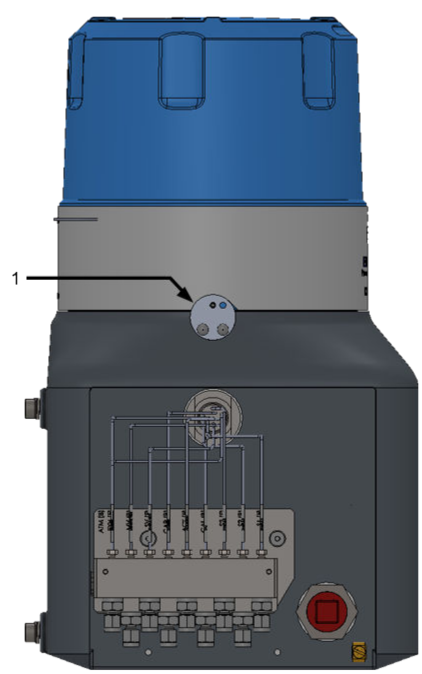
6.1 Remove the maintainable module

Tools required:

- 2 mm hex or Allen wrench
- 4 mm hex or Allen wrench

1. Remove power from the GC.
2. Turn off the sample gas(es) at the isolation valve(s) in the external sample system that is closest to the GC
3. Turn off the calibration gas at the isolation valve closest to the GC.
4. Turn off the carrier and actuation gases at the isolation valve closest to the GC.
5. Use a 2 mm hex wrench to loosen the dome locking screw (1). It is located on the left side of the GC above the gas lines.

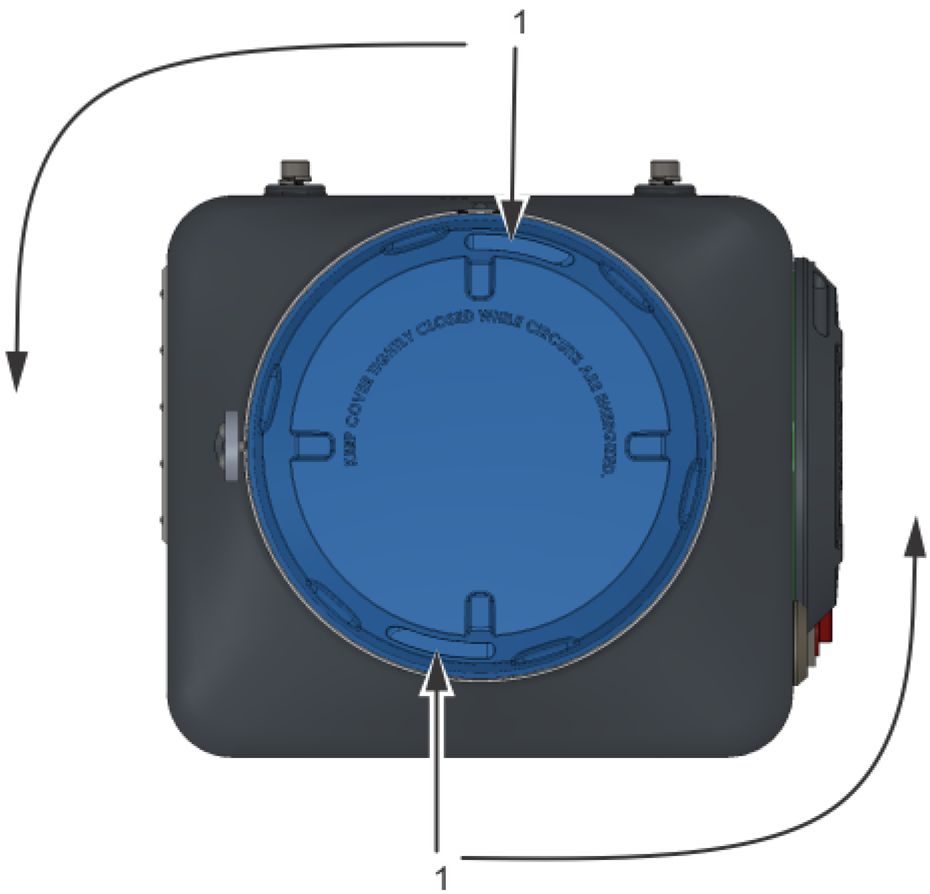
Figure 6-1: Dome locking screw



6. Unscrew the dome to remove it.

   If the dome is too tight, insert two screwdrivers or similar tools into the grooves (1) at the top rim of the dome to provide additional leverage when twisting the dome.

Figure 6-2: Dome removal



⚠ CAUTION!

The grooves are designed to aid you in loosening the dome. Do not attempt to use them to tighten the dome.

7. Remove the insulation cap.

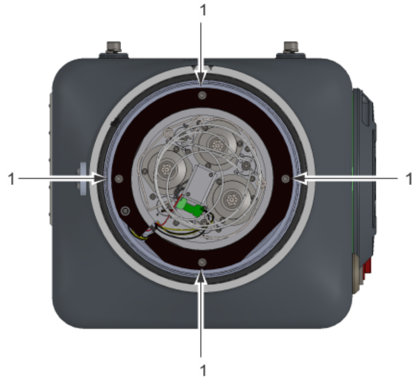
⚠ WARNING!

The oven will be approximately 176 °F (80 °C) and hot to the touch.

8. Loosen the four 4 mm (5/32-inch) hex screws holding the module to the base.

You may hear the release of some trapped carrier and sample gases. If the release is continuous, confirm that the sample, calibration, carrier, and actuation gases are isolated.

9. Remove the four hex screws (1).

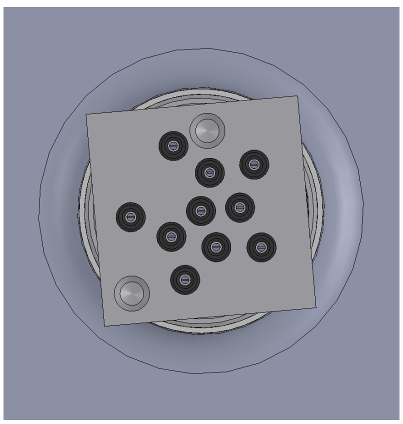


10. Remove the analytical module.

    a. Grip the module base and carefully lift it off its housing.

    b. While continuing to hold the module, disconnect the three connectors.

11. Discard the ten o-rings on the spring-action feed-through. New o-rings should be installed when a new or overhauled module is installed.

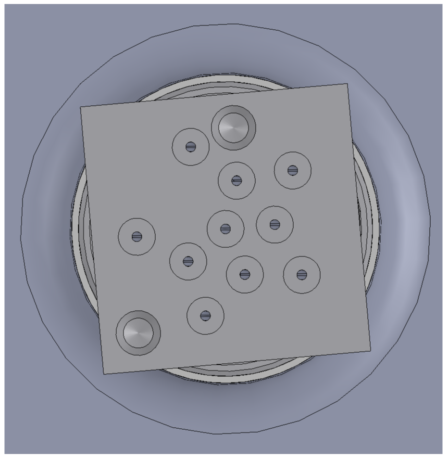


6.2 Install a maintainable module

Parts required	An analytical module and a pack of ten o-rings.
Tools required	A 5 mm hex or allen wrench.

The power should remain off, the various gases should continue to be isolated external to the GC, and the dome should remain off.

1. Inspect the spring-loaded feed-through to ensure all the o-rings have been removed.



2. Install the new o-rings into the spring-loaded feed-through.

Note

To ensure the proper and reliable operation of the GC, always use new o-rings supplied as a part. O-rings should never be re-used or sourced from third-party suppliers.

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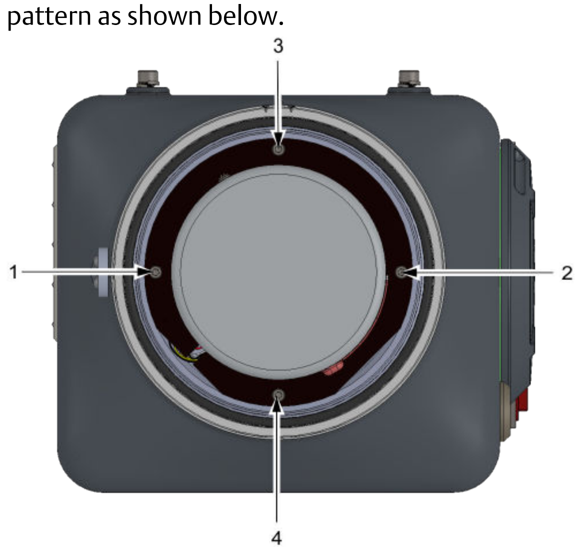
3. Inspect the under side of the new analytical module to ensure that there are no o-rings stuck to the module base.
4. Connect the solenoid electrical connector to the male connector leading to the solenoids.
5. Connect the male 18-pin signal connector to the connector on the IMB circuit board.
6. Connect the two-pin heater connectors.
7. Align the groove on the module base to the front of the GC and lower the module down onto the guide pins on the spring-loaded feed-through.
8. Insert the four module mounting screws and hand tighten.
9. To ensure the module is installed square, tighten the mounting screws in a cross-pattern as shown below.



10. Place the insulation cap over the heater cap.
11. Open the actuation gas isolation valve.

Note
When opening the valves for the various gases to the GC, listen for leaks. If a leak is heard, isolate all of the gases and check that the o-rings in the spring-loaded feed-through are installed correctly.

12. Set the carrier gas supply pressure to 90 psig (6.2 BarG) and open the isolation valve on the carrier gas supply to the GC.
13. Set the calibration gas pressure to 15 psig (1 BarG) and open the isolation valve on the calibration gas supply to the GC.
14. Set the sample gas(es) pressure to 15 psig (1 BarG) and open the isolation valve to the GC.
15. Screw the dome over the analytical module and hand tighten.

⚠ CAUTION!

The hazardous area flame-path seal is a combination of the number of threads, and the o-ring seal and does not rely on the dome being tightened excessively; therefore, do not over tighten the dome because this could result in difficulty when removing the dome at a later stage. Hand-tightening the dome to the end of the thread is all that is required.

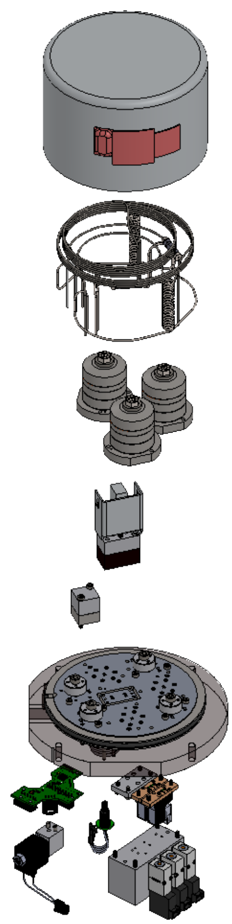
16. Tighten the dome locking screw.
17. Power up the GC.

After the firmware starts running, the GC will check the serial number of the new module to determine if it matches the serial number of the module that was in place when the GC was shut down. If it does not, the GC will start the new module software assistant. If the serial numbers do match, the GC will warm up and stay in idle mode.

7 Overhauling the analytical module

Topics covered in this chapter:

Figure 7-1: Maintainable module - exploded view



The following table lists the most common problems along with their solutions:

Table 7-1: Troubleshooting the Maintainable module

Problem	Section
A single stream cannot be selected for analysis but other streams can, or one stream appears to be contaminating other streams.	*Section 7.1*.
An analytical valve is not actuating correctly.	*Section 7.2*.
The retention times for the components have shifted later in the analysis run, or valve switching noise is excessive.	*Section 7.3*. When overhauling the analysis valves, it is good practice to overhaul the sample shut-off valve as well.
The un-normalized total is erratic and fluctuates with changes in the sample pressure.	*Section 7.4*
The module is contaminated by a large amount of liquids, or the response of the detectors has dramatically reduced.	*Section 7.7*
The analyzer has been exposed to significant contamination that resulted in a reduction in the separation of the components.	*Section 7.8*
If the carrier gas pressure is not being controlled or there is excessive drift on the baseline, the carrier gas pressure control valve should be replaced.	It may be difficult to diagnose whether the issue is with the pressure control valve or the pressure sensor, so it is recommended to replace both if there is a problem with the carrier gas pressure control.

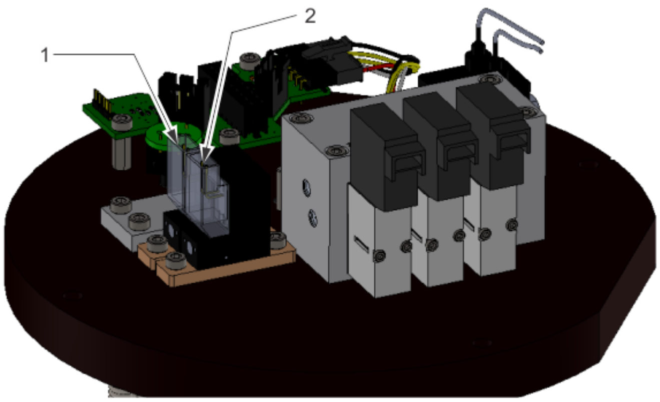
7.1 Replace a stream selection solenoid

Parts required	A replacement stream selection solenoid (#7C00023-001).
Tools required	A 2.5 mm hex or allen wrench.

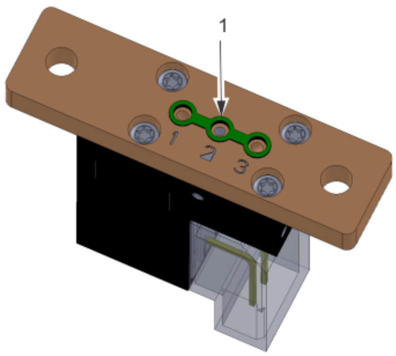
This procedure assumes that you have removed the analytical module from the GC. If this is not the case, see *Section 6.1*, *Step 10*.

1. Turn the module upside down so that it is resting on its heater cap.

   The stream selection solenoids—the sample stream (1) and the calibration stream (2)—will be exposed.



2. Identify the solenoid(s) to be replaced.
3. Remove the electrical connector from the solenoid:
   a. Squeeze the top of the connector.
   b. Press the retention lever in.
   c. Carefully pull the connector out.
4. Unscrew the two 2.5 mm hex screws.
5. Remove the solenoid and the seal.
6. Inspect the new solenoid's seal (1) and ensure that it is firmly seated in the base of the solenoid.



7. Place the solenoid onto the module base with the connector located closest to the module edge.
8. Hand-tighten the two hex screws to secure the solenoid.
9. Reconnect the connector to the solenoid, ensuring the retention clip engages. The connectors are labeled according to the following table:

Label	Solenoid
SV1	Calibration solenoid
SV2	Stream 1
SV3	Stream 2
SV4	Stream 3

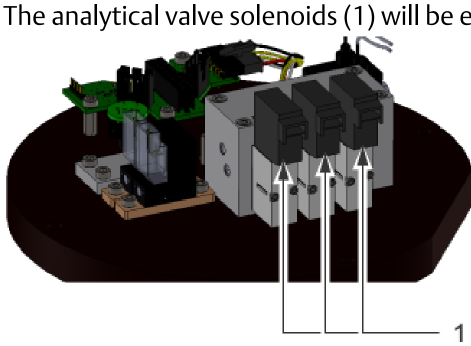
10. Reinstall the module on the 370XA base and analyze gas through each stream to confirm the repair has been successful.

7.2 Replace an analytical valve solenoid

This procedure assumes that you have removed the analytical module from the GC.

1. Turn the module upside down so that it is resting on its heater cap.

   The analytical valve solenoids (1) will be exposed.



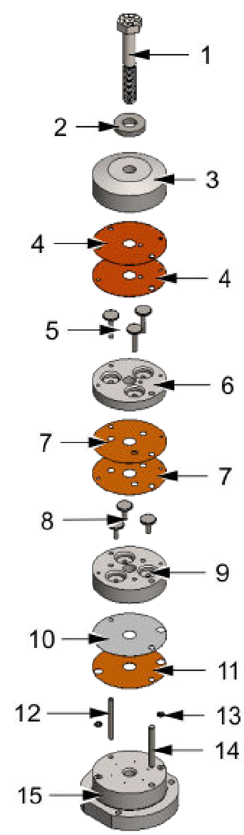
2. Identify the solenoid(s) to be replaced.
3. Remove the electrical connector from the solenoid:
   a. Squeeze the top of the connector.
   b. Press the retention lever in.
   c. Carefully pulling out.
4. Use the Phillips-head screw-driver to unscrew the two solenoid retaining screws.
5. Remove the solenoid seal.
6. Inspect the new solenoid's seal and ensure that it is firmly seated in the base of the solenoid.
7. Use the mounting screws to hold the new seal in place.

8. Place the new solenoid on the manifold block and hand-tighten the two mounting screws.
9. Reconnect the connector to the solenoid, ensuring the retention clip engages. The connectors are labeled according to the following table:

Valve label	Manifold label	Description
AV1	AV1	Sample valve
AV2	AV2	Back-flush valve
AV3	AV3	Dual column valve

10. Reinstall the module on the 370XA and run an analysis to confirm correct operation.

7.3 Overhaul the analytical valve



1. Hex bolt	6. Lower piston plate	11. Primary diaphragm
2. Flat washer	7. Upper actuator diaphragms	12. Thin guide pin
3. Actuation cap	8. Short pistons	13. O-rings (2)
4. Lower actuator diaphragms	9. Upper piston plate	14. Thick guide pin

5. Long pistons	10. Cushion diaphragm	15. Actuation base plate

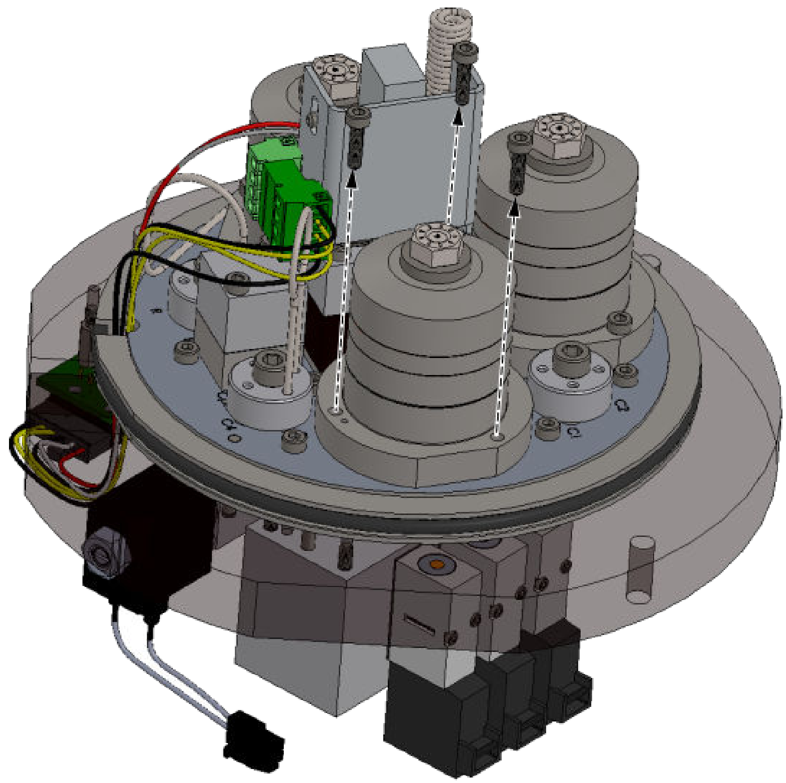
Parts required	A valve overhaul kit for each valve to be serviced.
Tools required	• A vise with aluminum soft-jaws or some other protection to avoid marking the analytical valves with the vice jaws. • A 2.5mm hex or allen wrench. • An 11mm (7/16in) socket and a socket wrench. • A torque wrench. • A no-residue, evaporating electrical contact cleaner.

To maximize the time between repairs to the module, it is recommended to overhaul all three analytical valves and the sample shut-off valve at one time, rather than repairing only a single valve when it is suspect.

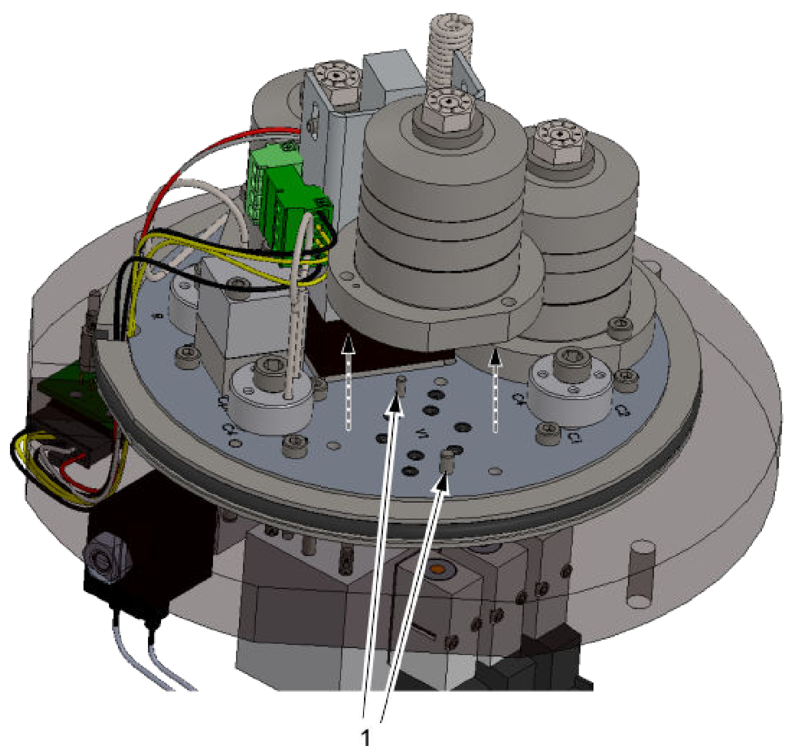
Perform this procedure in a clean environment. When removing the components from the valve, place them onto a clean work surface to avoid contaminating the valve components.

This procedure assumes that you have removed the analytical module from the GC.

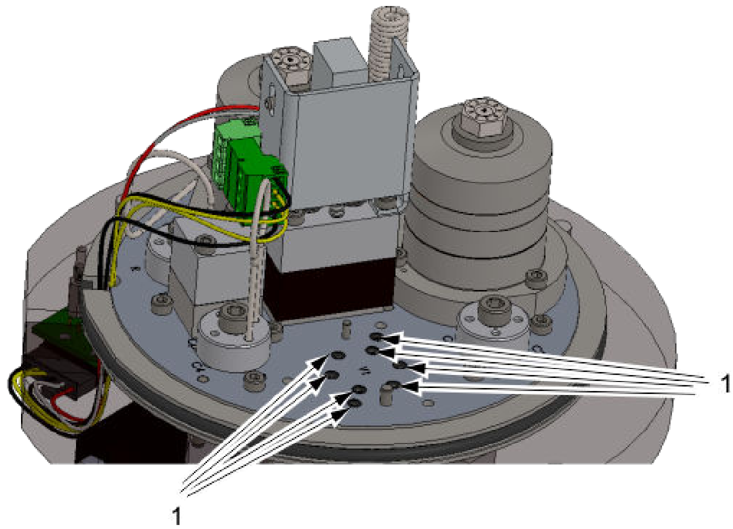
1. Remove the heater cap from the module.
2. Remove the three hex screws holding down the analytical valve.



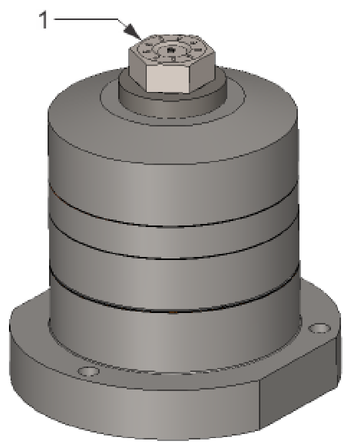
3. Remove the valve by carefully lifting it until it clears the locating pins (1) on the module base.



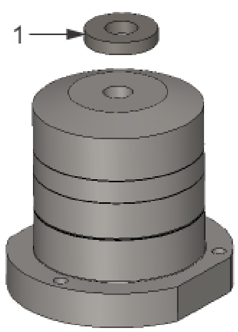
4. Remove the eight o-rings (1) from the base of the module and dispose of them.



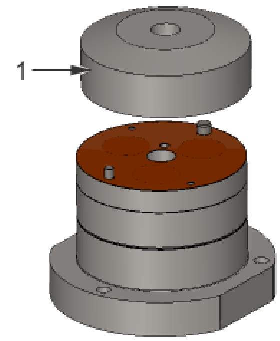
5. Place the analytical valve in the vice, clamping onto the flat edges of the valve's base.
6. Use the socket wrench and socket to remove the valve's center hex bolt (1).



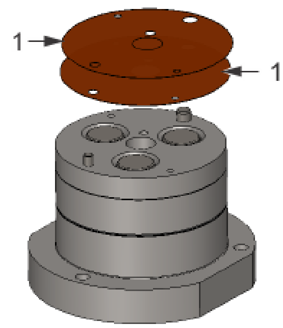
7. Remove the flat washer (1).



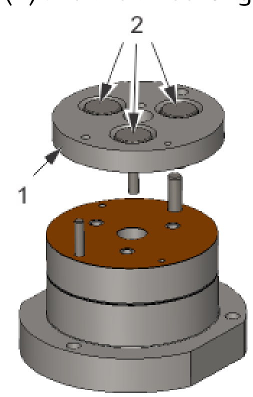
8. Remove the actuation cap plate (1).



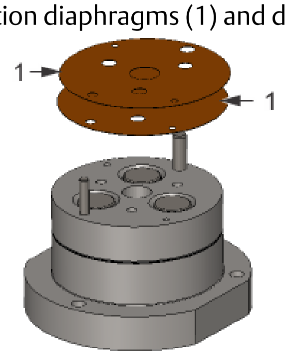
9. Remove and dispose of the two upper actuation diaphragms (1).



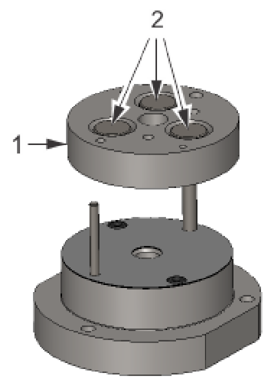
10. Remove the lower piston plate (1) and the three long pistons (2) as one assembly.



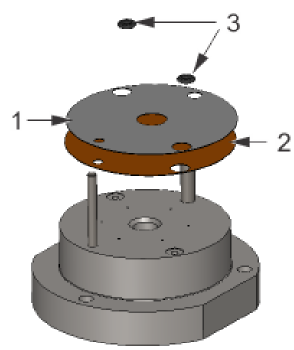
11. Remove the two upper actuation diaphragms (1) and discard them.



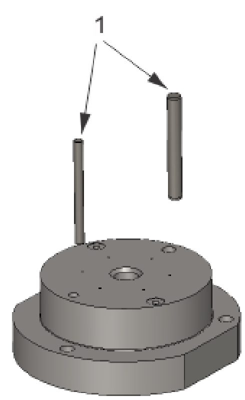
12. Remove the upper piston plate (1) and the three short pistons (2) as one assembly.



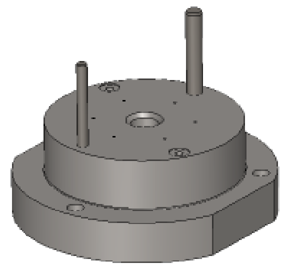
13. Remove and discard the cushioning diaphragm (1), the primary diaphragm (2), and the two o-rings (3).



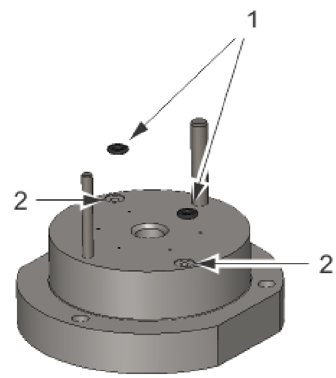
14. Remove the two guide pins (1).



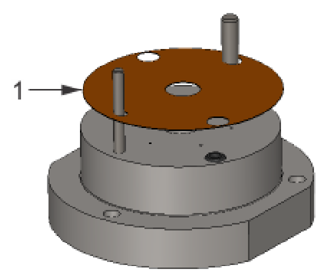
15. Use a clean and lint-free cloth to remove any residue clinging to the upper sealing surface of the base plate.
16. Spray the electrical contact cleaner through each of the ports of the base plate, ensuring a clean, unobstructed flow through each port.
17. Clean the upper sealing surface of the base plate with the electrical contact cleaner.
18. Blow down the base plate with clean and dry air.
19. Return the two guide pins to the valve's base.



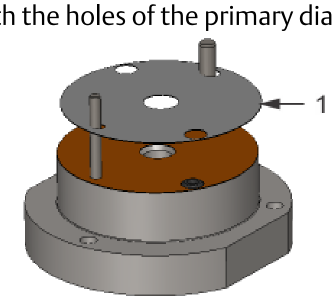
20. Place an o-ring (1) over each actuation gas port hole (2). The holes are located on the actuation base plate.



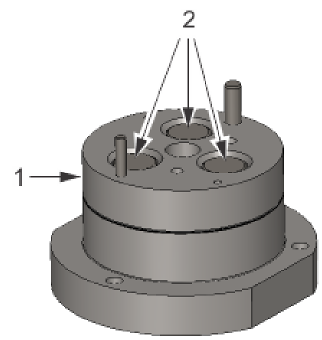
21. Place the primary diaphragm (1), which has four holes, so that the holes in the diaphragm align with the two guide pins and the two actuation gas ports with the o-rings.



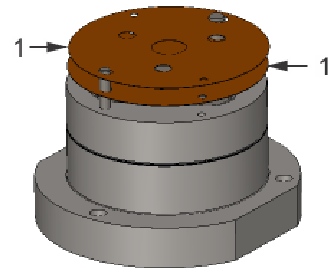
22. Place the cushioning diaphragm (1) onto the primary diaphragm so that the diaphragm's holes align with the holes of the primary diaphragm.



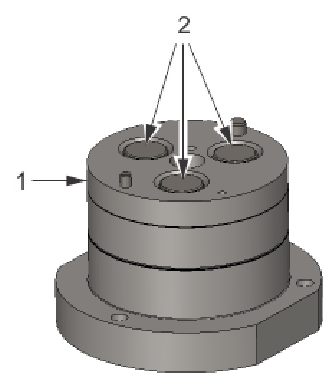
23. Place the upper actuation plate (1) over the actuation base plate with the upper actuation plate's short pistons (2) pointing down. The pistons should be flat with the top of the piston plate.



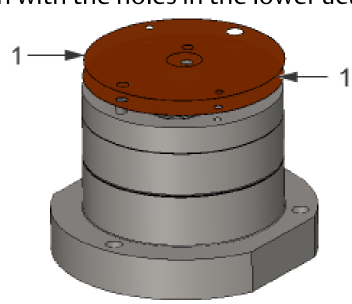
24. Place the two upper actuation diaphragms over the upper actuation plate so that the diaphragms' holes align with the holes in the upper actuation plate.



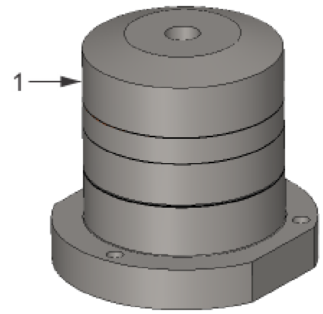
25. Place the lower actuation plate (1) onto the upper actuation plate with the lower actuation plate's long pistons (2) pointing down. The pistons should be flat with the top of the piston plate.



26. Place the two lower actuation diaphragms (1) over the lower actuation plate so that the diaphragms' holes align with the holes in the lower actuation plate.



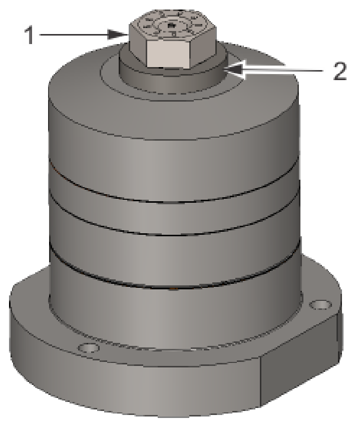
27. Place the actuation cap (1) over the lower actuation plate.



28. Insert the hex bolt (1) with its flat washer (2) into the assembled valve's center hole and hand-tighten.

Note

The washer is slightly curved and should be placed so that it curves up to the center.



29. Use a torque wrench and 11 mm socket to tighten the hex bolt to **20 ft/lb (2.76 kg/m)**.
30. Set the new o-rings into the actuation valve ports on the module base plate.
31. Insert the three socket screws into the holes of the analytical valve base plate.
32. Align the thick and thin locating pins in the base plate with the locating holes in the analysis valve and install the analysis valve onto the base plate.
33. Tighten the socket screws with the 2.5 mm hex or allen wrench.

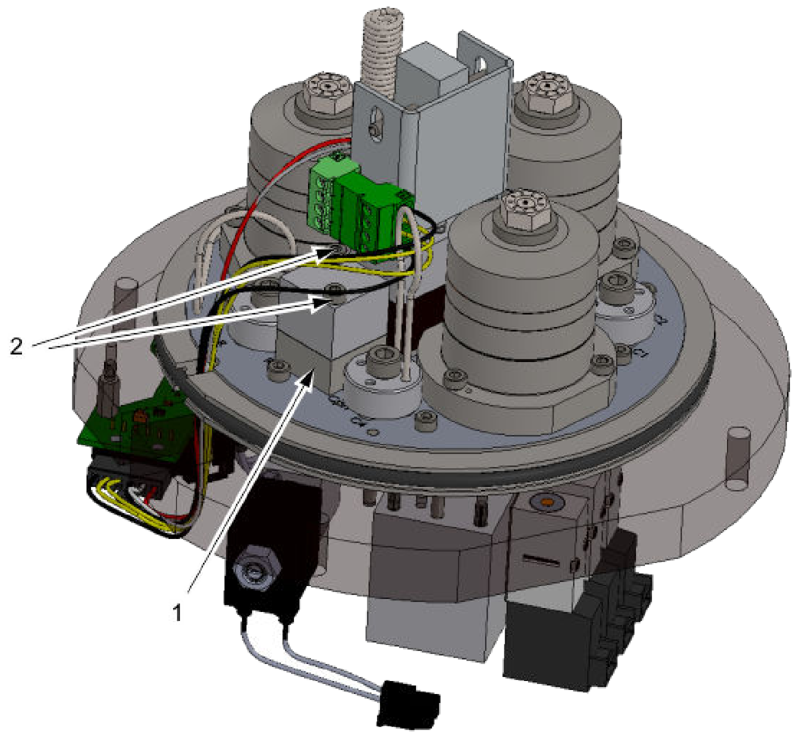
7.4 Overhaul the sample shut-off valve

Parts required	A sample shut-off valve overhaul kit (#7A00TBA).
Tools required	• A 2.5 mm hex or allen wrench. • A no-residue, evaporating electrical contact cleaner.

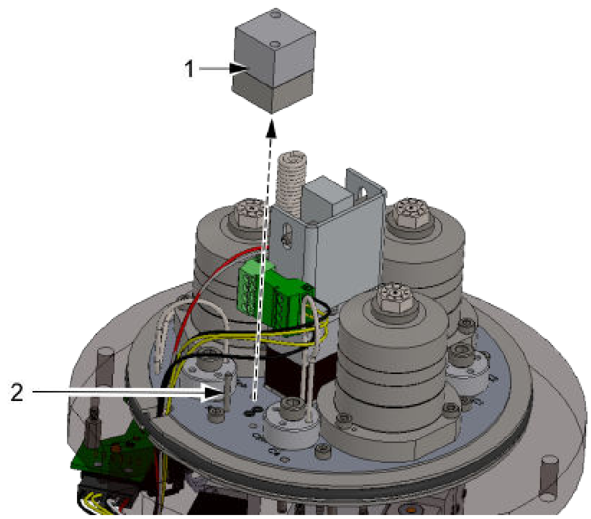
Perform this procedure in a clean environment. When removing the components from the valve, place them onto a clean work surface to avoid contaminating the valve internals.

This procedure assumes that you have removed the analytical module from the GC.

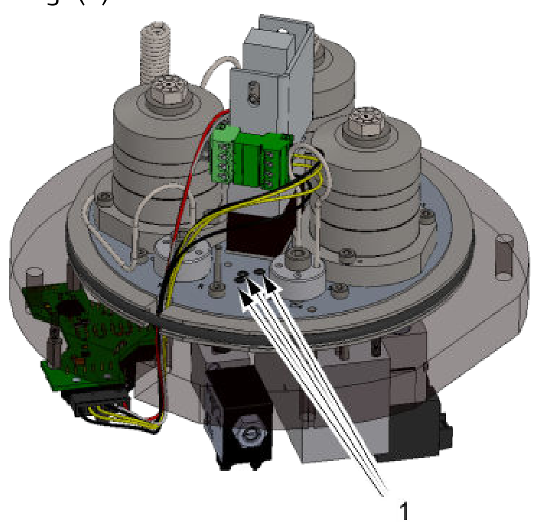
1. Remove the heater cap from the module.
2. Use the 2.5 mm hex or allen wrench to remove the two mounting screws (2) on the sample shut-off (SSO) valve (1).



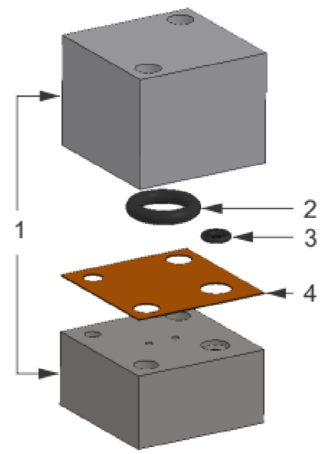
3. Remove the two parts of the SSO valve (1) from the module and the locating pin (2).



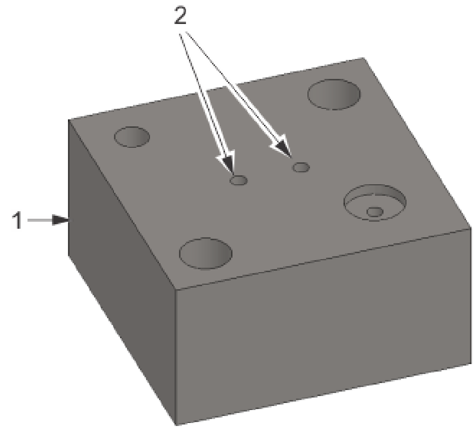
4. Discard the three o-rings (1) from the module base.



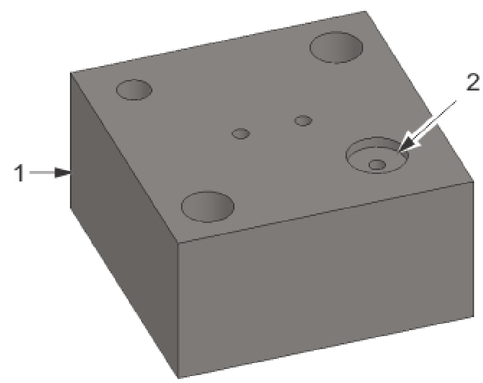
5. Remove the locating pin and separate the upper and lower plates of the SSO valve.
6. Remove and discard the small o-ring (3), the large o-ring (2), and the diaphragm (4) from the interior of the SSO valve (1).



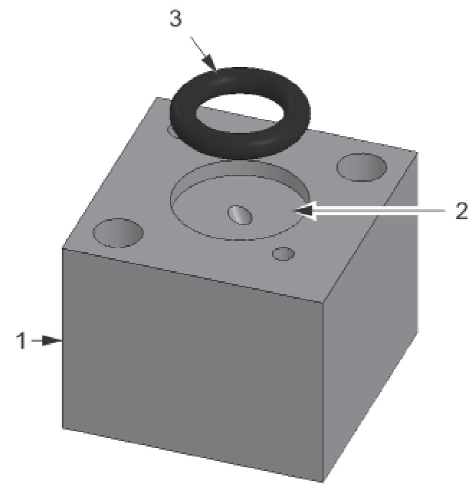
7. Use the electrical contact cleaner to cleanse the sealing surface of the lower plate (1) and the two sample flow holes (2) through the lower plate.



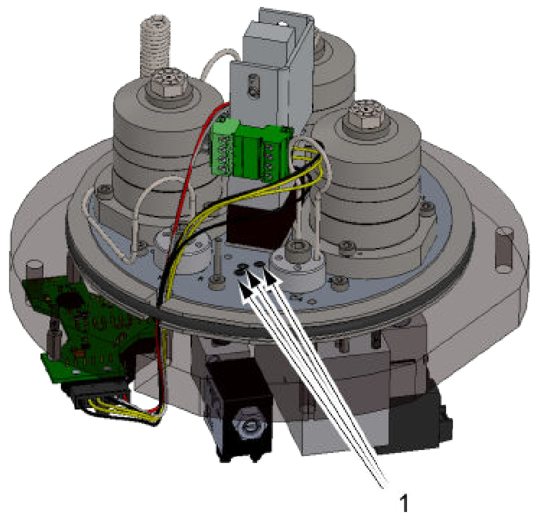
8. Blow down the lower plate with clean and dry air.
9. Set one of the small o-rings from the kit into the actuation gas path recess (2) on the lower plate (1).



10. Turn the upper plate (1) upside down and set the large o-ring (3) from the kit into the recess (2) of the upper plate.



11. Place the remaining three small o-rings from the kit on the SSO valve's sample and actuation gas paths (1) on the module base.

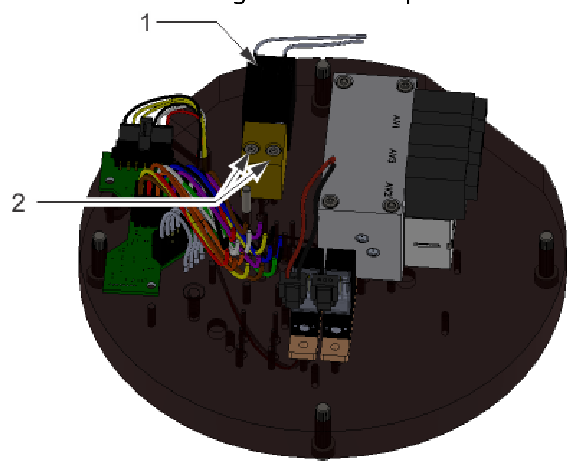


12. Insert the locating pin into the module base.
13. Turn the lower actuating plate so that its o-ring is face up and then slide the lower actuating plate over the locating pin and into place on the module base.
14. Place the SSO diaphragm from the kit onto the lower plate and align the diaphragm's holes with the holes in the lower plate.
15. Slide the upper plate over the locating pin and align the upper plate's mounting holes with the holes in the lower plate.
16. Insert the two mounting bolts and tighten with the 2.5 mm hex or allen wrench.

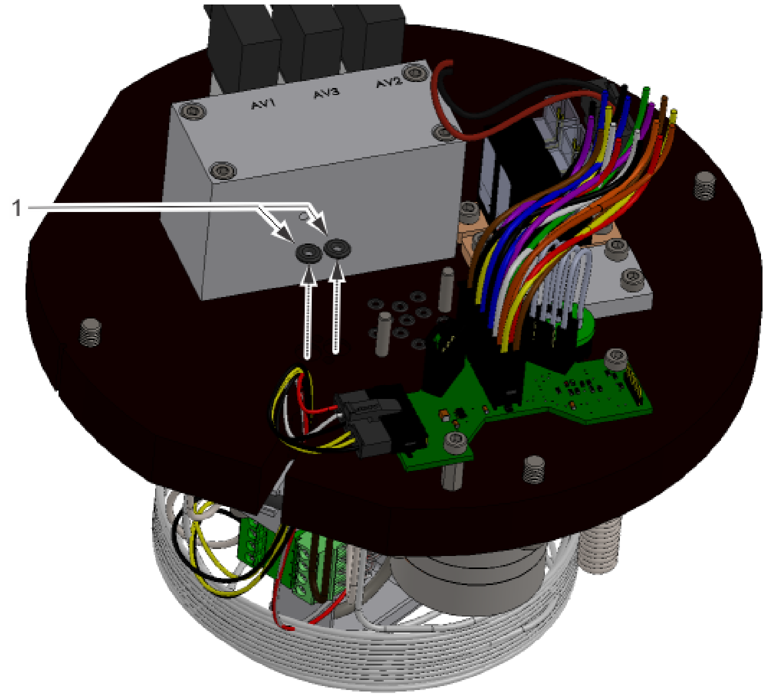
7.5 Replace the carrier pressure control valve

Parts required	• A carrier pressure control valve kit (#7C00024-001) • Two sets of o-ring kits (#7C00030-006)
Tools required	A 2.5mm hex or allen wrench.

1. Rest the module upside down on the heater cap.
2. Unclip the electrical connector leading to the carrier pressure control valve (1).



3. Use a 2.5 mm hex wrench to remove the two carrier pressure control valve mounting bolts (2).
4. Carefully lift off the carrier pressure control valve.
5. Remove and dispose of the two o-rings in the module base.

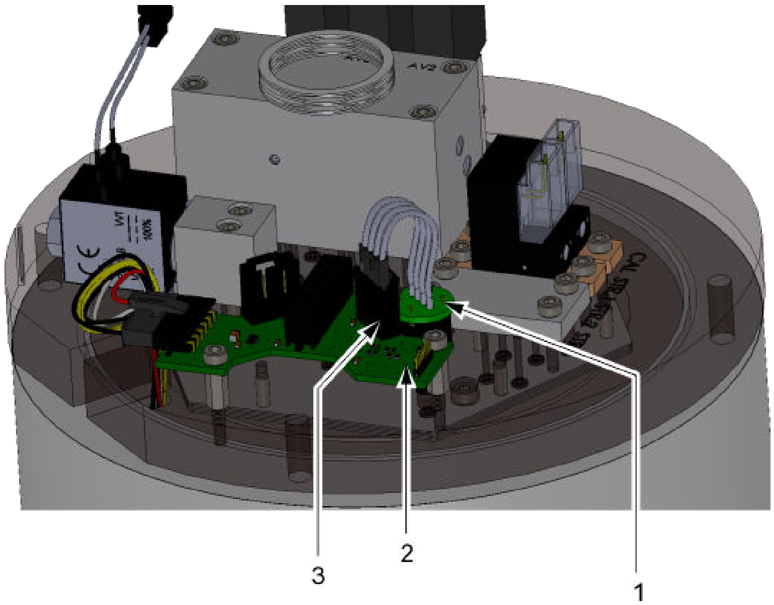


6. Install the new o-rings into the module base.
7. Use the 2.5 mm hex wrench to screw the new carrier pressure control valve onto the module. Do not over-tighten.
8. Re-connect the electrical connector and ensure the retention clip is engaged.

7.6 Replace the carrier gas pressure sensor

Parts required	A carrier gas pressure sensor kit (#7A00053G01).
Tools required	• A 2.5 mm hex or allen wrench • An 8 mm wrench

1. Rest the module upside down on the heater cap.
2. Disconnect the carrier gas pressure sensor's (1) electrical connectors (3) from the Intelligent Module Board (2).



3. Use the 2.5 mm hex wrench to remove the Intelligent Module Board (IMB).
4. Use the 8 mm wrench (or small adjustable wrench) to gently unscrew the pressure sensor from the module base.
5. Check that the o-ring was removed with the sensor. If not, remove and dispose of the o-Ring.
6. Carefully hand-tighten the new sensor into the module base.
7. Use the 8 mm wrench (or small adjustable wrench) to carefully tighten the sensor by a half-turn. Do not over-tighten.
8. Use the 2.5 mm hex wrench to reinstall the IMB.
9. Reconnect the electrical connectors into the IMB.

7.7 Replace the detectors

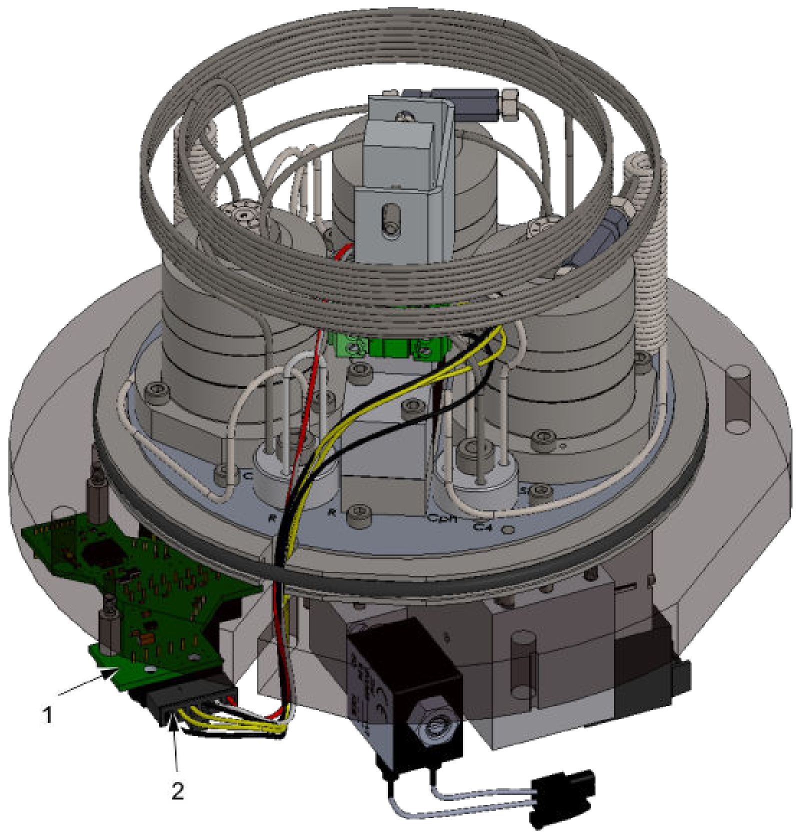
Parts required	A detector overhaul kit.
Tools required	• A 2.5 mm hex or allen wrench • A 1 mm hex or allen wrench • An 8 mm open-ended wrench

Note
The detectors should always be replaced as a pair.

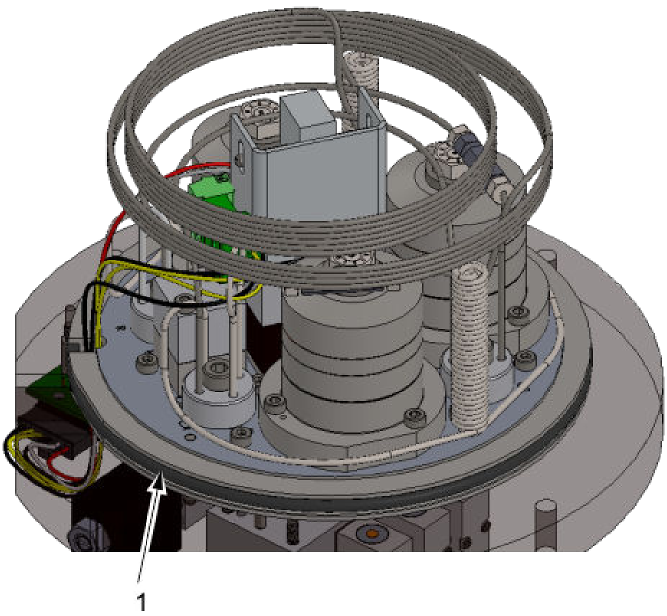
Perform this procedure in a clean environment. When removing the components from the valve, place them onto a clean work surface to avoid contaminating the valve components.

This procedure assumes that you have removed the analytical module from the GC.

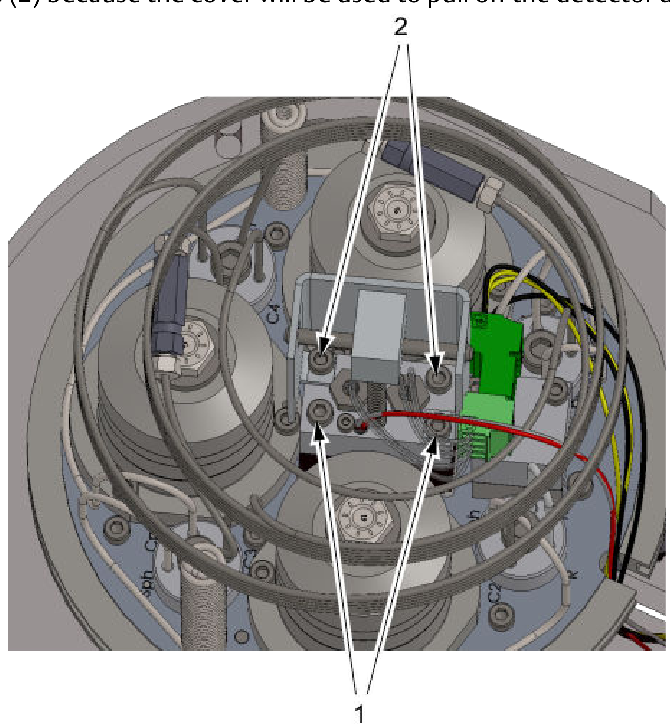
1. Remove the heater cap from the module.
2. Disconnect the detector's electrical connector (2) from the Intelligent Module Board (1), which is located on the under side of the maintainable module.



3. Remove the large o-ring (1) from around the module base to enable the cables from the detector assembly to move freely.



4. Pull the cables up through the middle of the columns so that they will not interfere with removing the detector assembly.
5. Remove the two TCD block mounting screws (1). Do not remove the two heat-pipe cover screws (2) because the cover will be used to pull off the detector assembly.



6. Remove the detector assembly by gently pulling up with a small rocking motion on the heat-pipe bracket.

Note

One or both of the heat-pipes may stay in the base plate. Do not try to remove them because you may bend the soft heat-pipes which will reduce their performance.

7. Discard the two o-rings on the detector block.
8. Use the 2.5 mm hex or allen wrench to remove the two heat-pipe cover retaining screws and then lift off the heat-pipe cover.
9. If the detector assembly still contains any heat-pipes, carefully twist and pull them out.

⚠ CAUTION!

The thermal performance of the heat pipe and the analytical performance of the GC will be greatly reduced if the heat pipe is damaged or bent excessively.

10. Use the 8 mm open-ended wrench to unscrew the two detectors and then remove them.
11. Unscrew and remove the detector wires from the detector connector, noting which detector wire goes into which terminal.
12. Use the 1 mm hex or allen wrench to remove the Teflon seals that are in each of the detector recesses. Discard the Teflon seals.
13. Use electrical contact cleaner to cleanse the sealing surfaces and the two sample flow holes that run through the detector assembly.
14. Blow down the detector assembly with clean and dry air, nitrogen, or helium.
15. Insert a new Teflon seal into the bottom of each of the detector recesses. Ensure that each seal is flat on the sealing edge at the base of the recess.
16. Screw the detectors into the detector assembly. Tighten the screws with the 8 mm open-ended wrench.
17. Insert the detector wires into their corresponding terminals. You should have noted this in Step 11.
18. If any heat-pipes were removed from the detector assembly, reinsert them into the detector block.
19. Place the heat-pipe springs over the heat pipes.
20. Re-install the heat pipe cover and hand-tighten the screws until the base of the bracket is tight against the detector assembly.
21. Lightly coat the exposed ends of the heat pipes with thermal compound.
22. Press two new o-rings into the detector base, ensuring that they are packed tightly in the recesses to form tight ovals.
23. Orient the module so that the groove on the base is facing you. Place the detector assembly onto the detector block with the RTD and cables on the left.
24. If a heat-pipe remained in the base when the detector was removed, reinstall the spring over the heat pipe as the detector assembly is put into place.
25. Hand tighten the detector's two mounting screws with a 2.5 mm hex or allen wrench.

26. Ensure that the heat-pipe cap is moving freely and is at the full extension.
27. Route the cables under the columns and through the cable entry groove on the left of the module.
28. Re-install the large o-ring around the module's top-plate so that the cables are held into the cable entry groove.
29. Plug the connector into the IMB board. There should be an audible click when the clip is engaged.

7.8 Replace the chromatograph columns

Parts required	A 370XA C6+ 4-minute column set (# 7A00101G01).
Tools required	A 4 mm hex or allen wrench

The chromatograph columns should be replaced as a set. The tubing connectors use a unique double o-ring sealing arrangement. The bolt on the tubing connectors should only need to be loosened to facilitate removing the columns, and should not be removed unless the o-rings are to be replaced.

7.8.1 Installation

1. Use the 4 mm hex or allen wrench to loosen each of the tubing connector bolts by a ½ turn only.

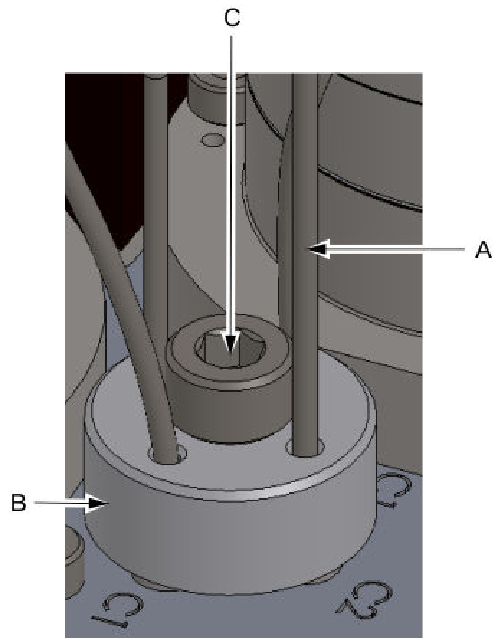
Note

Do not remove the bolt from the tube connector fitting, because the o-rings and spacers will come out of the fitting.

2. Carefully pull each column end from the tubing connectors.
3. Discard the old columns.
4. Install the new columns:

    a. Insert each column into the appropriate connectors according to the markings on the manifold plate and the tag on the column. See “Column assignments” on page 6-39 and “Column drawings” on page 6-39 for help matching the column with the column connectors.

    b. Push the tube (A) into the connector (B) until it meets resistance and is fully inserted into the connector.



c. When all of the tubing for a single connector is inserted, tighten the connector bolt (C) with the 4 mm hex or allen wrench.

Note

If the connectors are not tightened correctly, there is the potential for a leak. The tubing must go through both of the two o-rings. It is important to follow the procedure and check the fitting before applying gas to the unit.

d. Carefully pull each tube entering the fitting to ensure that it is held by both o-rings. If a tube is not held by both o-rings, it will pull out easily, and the bolt will need to be loosened and the procedure repeated until all four tubes are sealed by the dual o-rings.

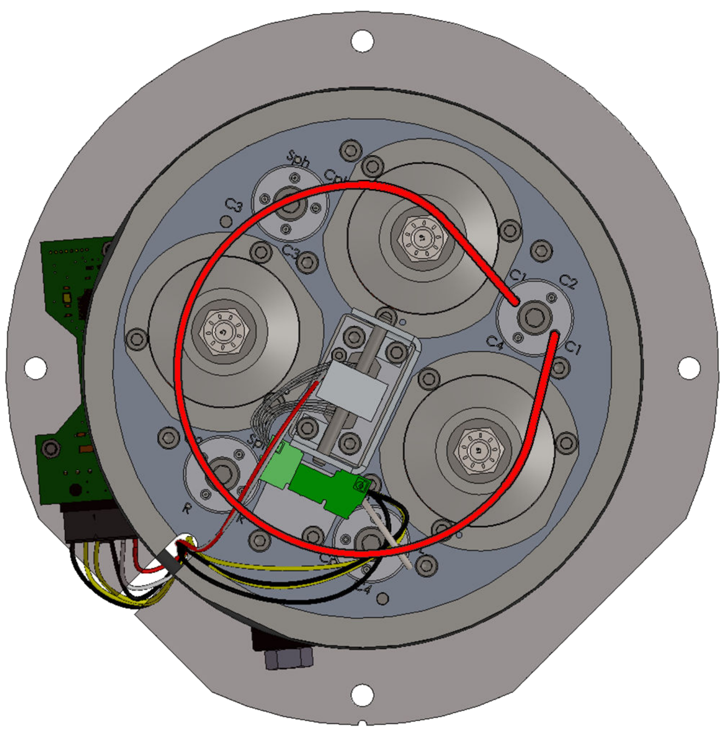
7.8.2 Column assignments

Tubing Connector 1		Tubing Connector 2		Tubing Connector 3		Tubing Connector 4	
C2	Column 2	Sph	Sample Pre-Heat Coil	Sph	Sample Pre-Heat Coil	SL	Sample Loop
C1	Column 1	Cph	Carrier Pre-Heat Coil	R	Restrictor Column	SL	Sample Loop
C4	Column 4	C2	Column 2	R	Restrictor Column	C4	Column 4
C1	Column 1	C3	Column 3	C2	Column 2	Cph	Carrier Pre-Heat Coil

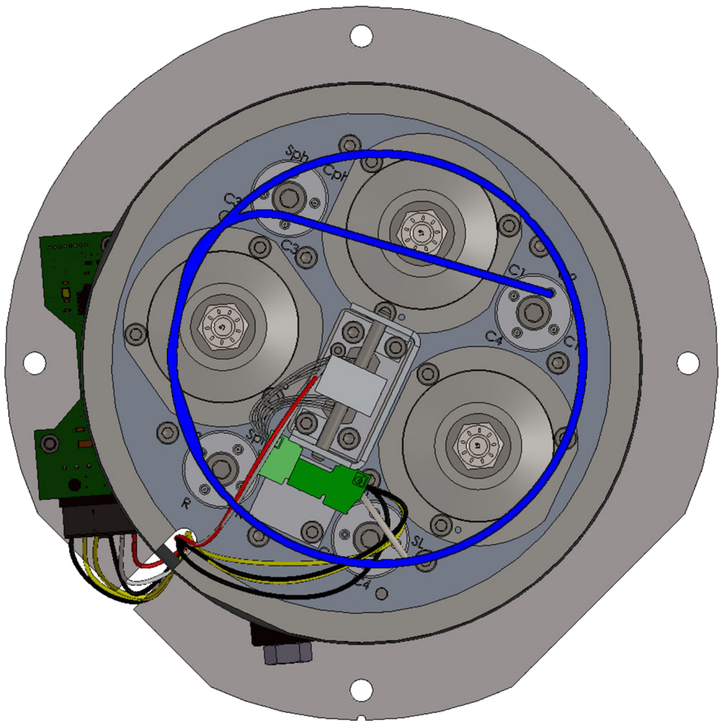
7.8.3 Column drawings

Use the drawings that follow to match the column with the column connectors.

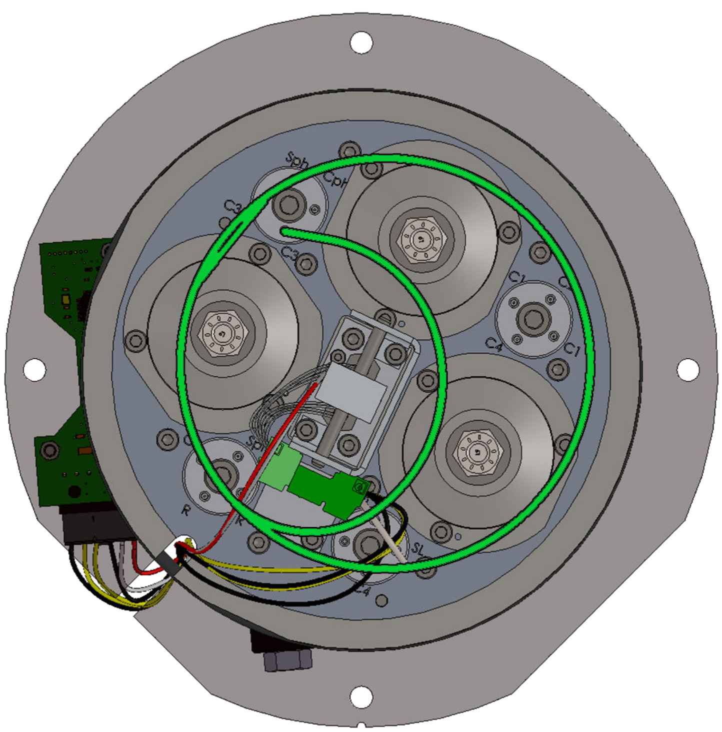
Column 1



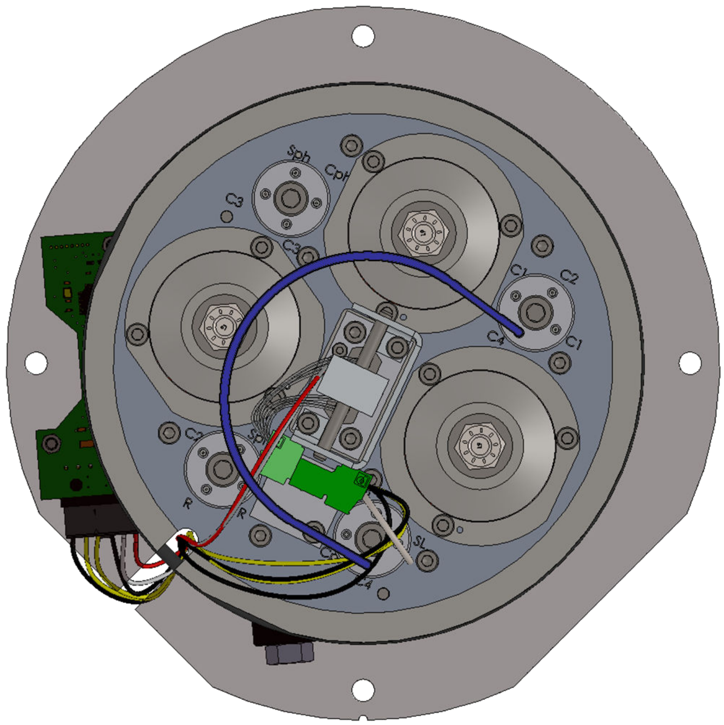
Column 2



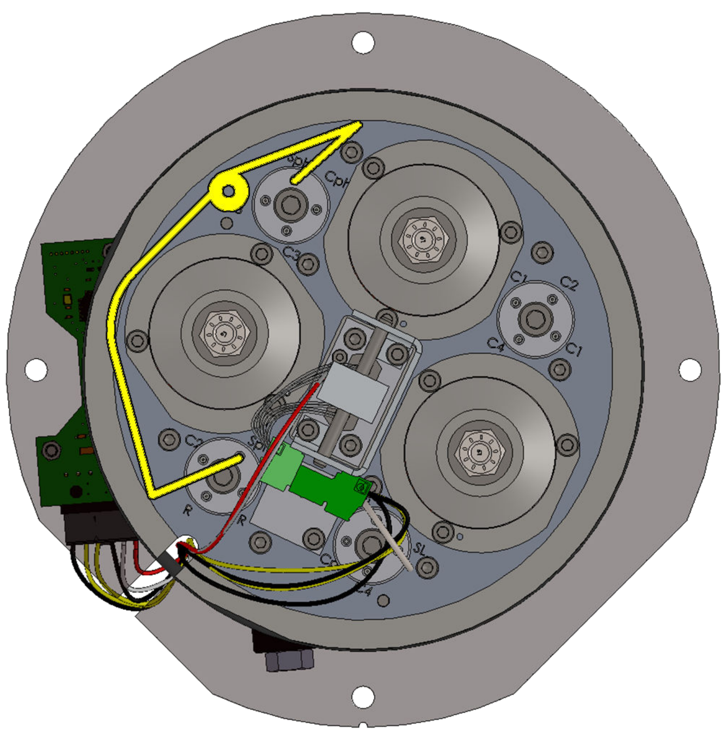
Column 3



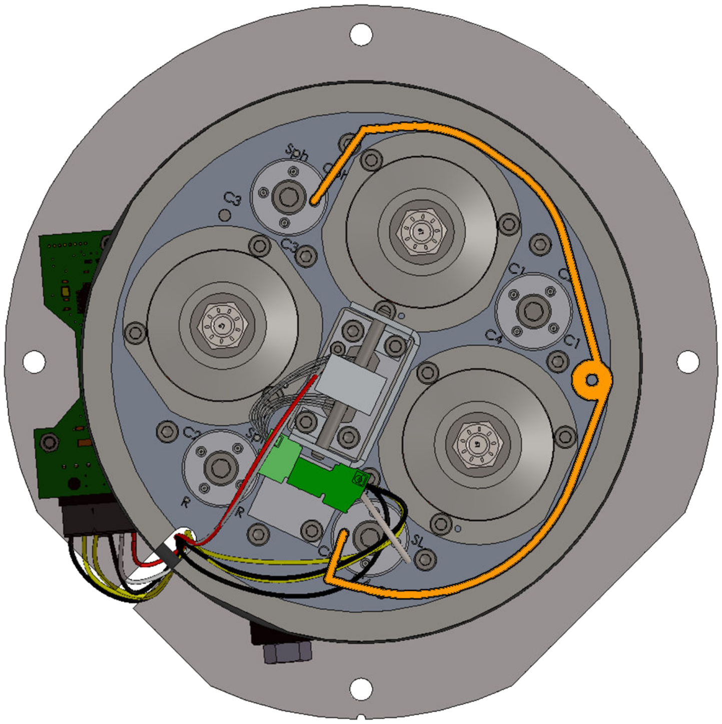
Column 4



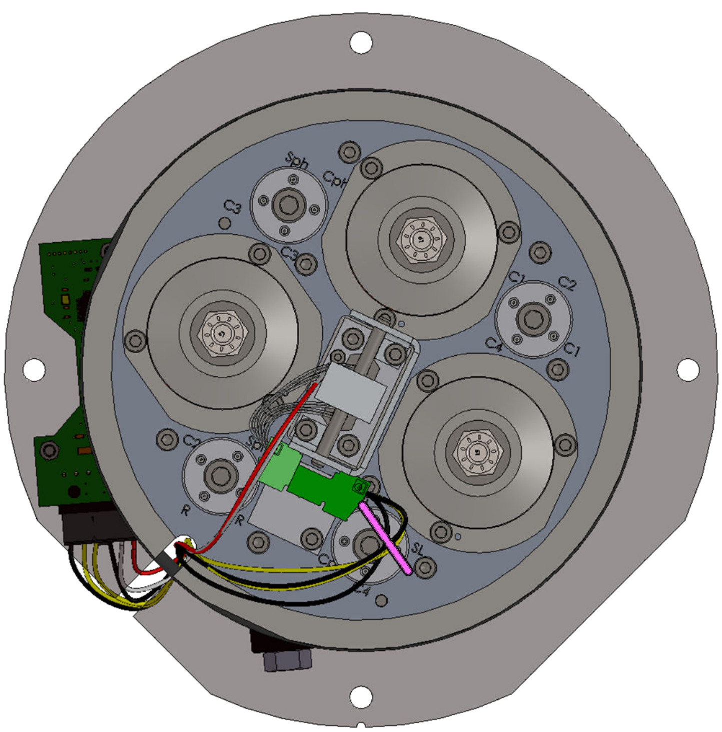
Sample Pre-Heat Coil (Sph)



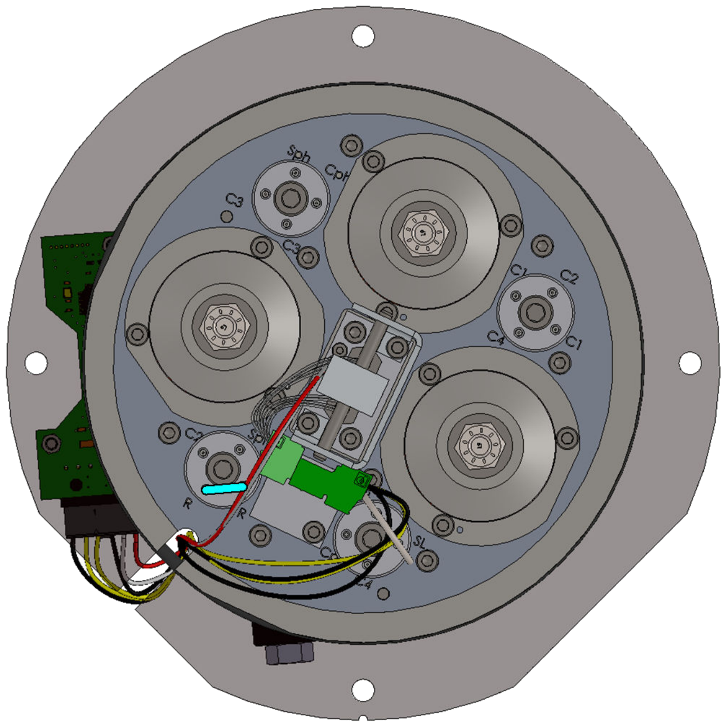
Carrier Pre-Heat Coil (Cph)



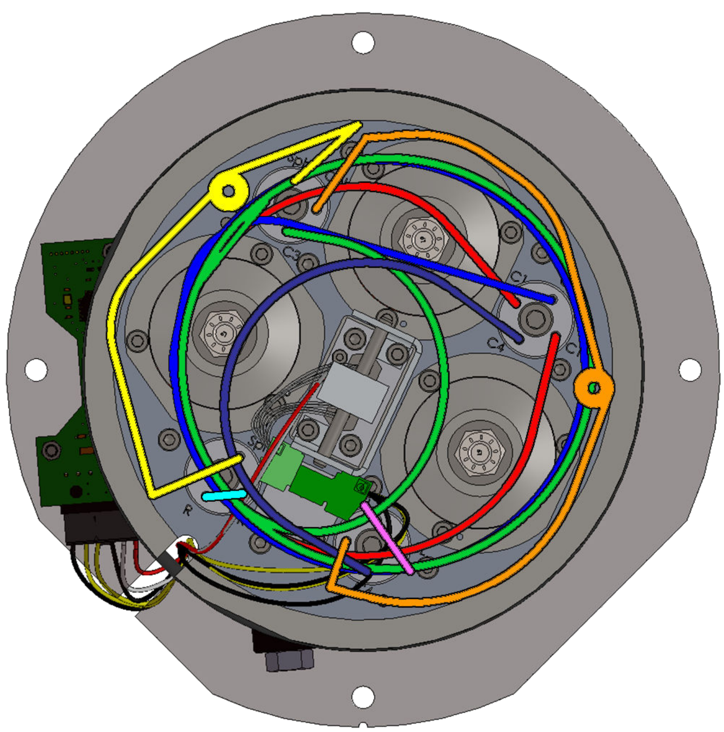
Sample Loop (SL)



Restrictor Column (R)



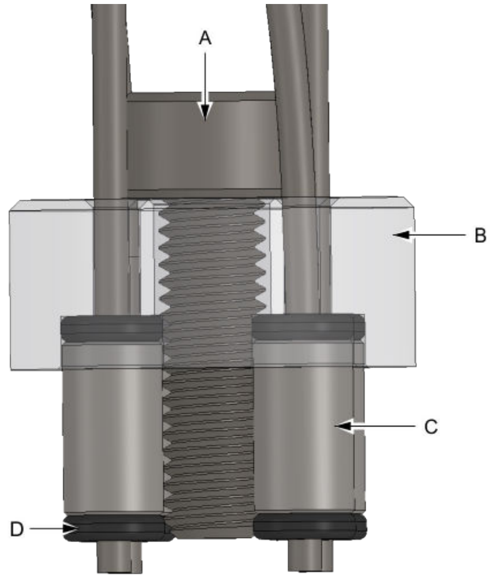
Completed installation



7.9 Replace the o-rings in a tubing connector

Parts required	1 packet of replacement o-rings (# 7C00030-006).
Tools required	A 4 mm hex or allen wrench

1. Use a 4 mm hex wrench to loosen the tubing connector bolt (A) by a ½-turn.



2. Pull each of the four tubes out of the connector.
3. Remove the tubing connector bolt.
4. Remove the tubing connector (B).
5. Remove and dispose of the four upper o-rings.
6. Remove the four o-ring spacers (C).
7. Remove and dispose of the four lower o-rings. If the o-rings stick inside the base plate, use a short length of 1/16th stainless tube to work the o-ring out.
8. Place a new o-ring into each of the four tubing holes in the base plate.
9. Insert a new spacer into each of the four holes in the baseplate, firmly pushing them down until the o-ring from the previous step is seated into the bottom. Check that the top of each of the spacers is protruding the same distance as the other spacers to ensure each o-ring is seated flat.
10. Place a new o-ring on top of each of the four spacers, loosely aligning the center hole of the o-ring with the center hole of the spacer.
11. Place the tube connector over the o-rings and spacers, ensuring the holes in the cap align with the o-rings and spacers.
12. Screw in the mounting bolt and hand-tighten.
13. Insert the columns into the connector according to *Section 7.8.2* and *Section 7.8.3*. Each of the columns has tags that identify their application.

Note

If the connectors are not tightened correctly, there is the potential for a leak. The tubing must go through both of the two o-rings as shown in Step 1. It is important to follow the procedure and check the fitting before applying gas to the unit.

14. Push each tube into the fitting so until it stops hard against the base plate.
15. Apply downward pressure onto the four tubes entering the fitting and tighten the bolt using the 4 mm hex or allen wrench.
16. Carefully pull each tube entering the fitting to ensure that it is held by both o-rings. If a tube is not held by both o-rings, it will pull out easily, and the bolt will need to be loosened and the procedure repeated from step 14 until all four tubes are sealed by the dual o-rings.

8 Troubleshooting the 370XA

Topics covered in this chapter:

8.1 Alarms

Alarm	Description and Suggested Actions
Maintenance Mode	The maintenance mode is on. The flag in the Modbus map for maintenance mode is switched on, and the discrete out for active the Common Alarm (if configured) will be on. Refer to "Maintenance mode" on page 4-38 for more information.
Power Failure	The 24VDC power supply to the GC failed. Note that the SET time indicates the time power was restored to the GC. To determine when the power was lost, look at the time of the last analysis before the power fail occurred.
User Calculation Failure	An error occurred in one of the User Defined calculations. Check the user calculations for divide by zero errors or for incorrect references.
Low Battery Voltage	The CPU battery voltage is low. As the battery is soldered onto the board, the CPU board needs to be returned to the factory to replace the battery correctly.
Stream Skipped	There was an error in stream sequencing that resulted in failure to analyze one of the streams in the stream sequence. This alarm will occur if a stream's usage is switched to "Unused" without removing the stream from the Stream Sequence. To correct this start MON2020 and select **Stream Sequence** on the **Application** menu. Delete the unused stream from the sequence.

Alarm	Description and Suggested Actions
GC Idle	The analysis mode was switched to GC Idle and there was no connection to a MON2020 software session. If the mode is changed to Idle while MON2020 is connected, this alarm will not be generated. If the mode is switched to Idle via the local operator interface, or the GC is in Idle mode when a MON2020 software session is disconnected, this alarm will be active.
Warm Start Failed	The GC has failed to return to analysis mode after a power failure. If the GC is in Auto Analysis mode and the power is lost, when power is reapplied the unit will heat up and analyze calibration gas until all of the component peaks are identified. When all of the peaks are identified and the analysis is good, the GC will go back into Auto Analysis mode. However, if the peaks are not identified within the time period indicated in the Max Warm Start Delay field on the System window, the GC will raise the Warm Start Fail alarm and go into Idle Mode and will not analyze stream gas.
Heater 1 Out Of Range	The Analytical Oven Heater failed to reach the set-point within 15 minutes or reads higher than the setpoint. Refer to the Heater Failure troubleshooting guide.
Heater 2 Out Of Range	For the default configuration of the 370XA, this is not used. The **Switch** setting on the **Heaters** screen for Heater 2 must be set to **Fixed ON** and the **Fixed PWM Output** set to **0**.
Detector 1 Scaling Factor Failure	The scaling factor generated for the high and low gain preamp channel was outside the acceptable range of values. This is typically caused by a fault on the analyzer board, which should be replaced.
Carrier Pressure Low	The carrier gas pressure, as measured on the carrier gas pressure sensor on the analytical module, is too low. Check the regulated pressure at the bottle is at 90 PSI (6.2 BarG), and confirm the isolation valves between the bottle and the 370XA are all open. Refer to for help with troubleshooting this issue.

Alarm	Description and Suggested Actions
Carrier Pressure Out Of Range	The carrier gas pressure, as measured on the carrier gas pressure sensor on the analytical module, is outside of the control limits. Check the regulated pressure at the bottle is at 90 PSI (6.2 BarG). If the regulated pressure is OK, check the connections on the Carrier Pressure Control Valve and the pressure sensor. Refer to for help with troubleshooting this issue.
Analog Input 1 High Signal Analog Input 1 Low Signal Analog Output 1 High Signal Analog Output 1 Low Signal Analog Output 2 High Signal Analog Output 2 Low Signal	The value of the variable assigned to the analog output is outside the range of the analog output. If the value is valid, re-range the Analog Output and the associated device that is receiving the signal so that the value of the variable is within the range.
Stream 1 Validation Failure Stream 2 Validation Failure Stream 3 Validation Failure Stream 4 Validation Failure Stream 5 Validation Failure	The analysis of the validation gas for the associated stream is outside the allowable percent deviation, as defined in the Validation Data table. Confirm that the Validation Gas concentration is entered correctly in the validation data table. If the concentrations are entered correctly, check the validation run analysis results and chromatogram for analysis errors.
Stream 1 RF Deviation Stream 2 RF Deviation Stream 3 RF Deviation	Streams 1 to 3 should only be set to Analysis or Unused. This alarm may occur If the streams are incorrectly configured for calibration. To resolve this error, start MON2020 and select **Streams** on the **Application** menu. Set the stream's **Usage** to **Analysis** or **Unused**.
Stream 4 RF Deviation	The response factor for one or more components have changed during a calibration run by a percentage greater than set in the Component Data Table. Check that the calibration gas concentration has been entered into the component data table correctly, and confirm that the calibration gas bottle is not empty or isolated. If the concentrations are correct, the isolation valves are open, and there is sufficient calibration gas pressure (higher than 20 PSI or 1.4 Bar), check the calibration analysis and chromatograms for analytical errors.

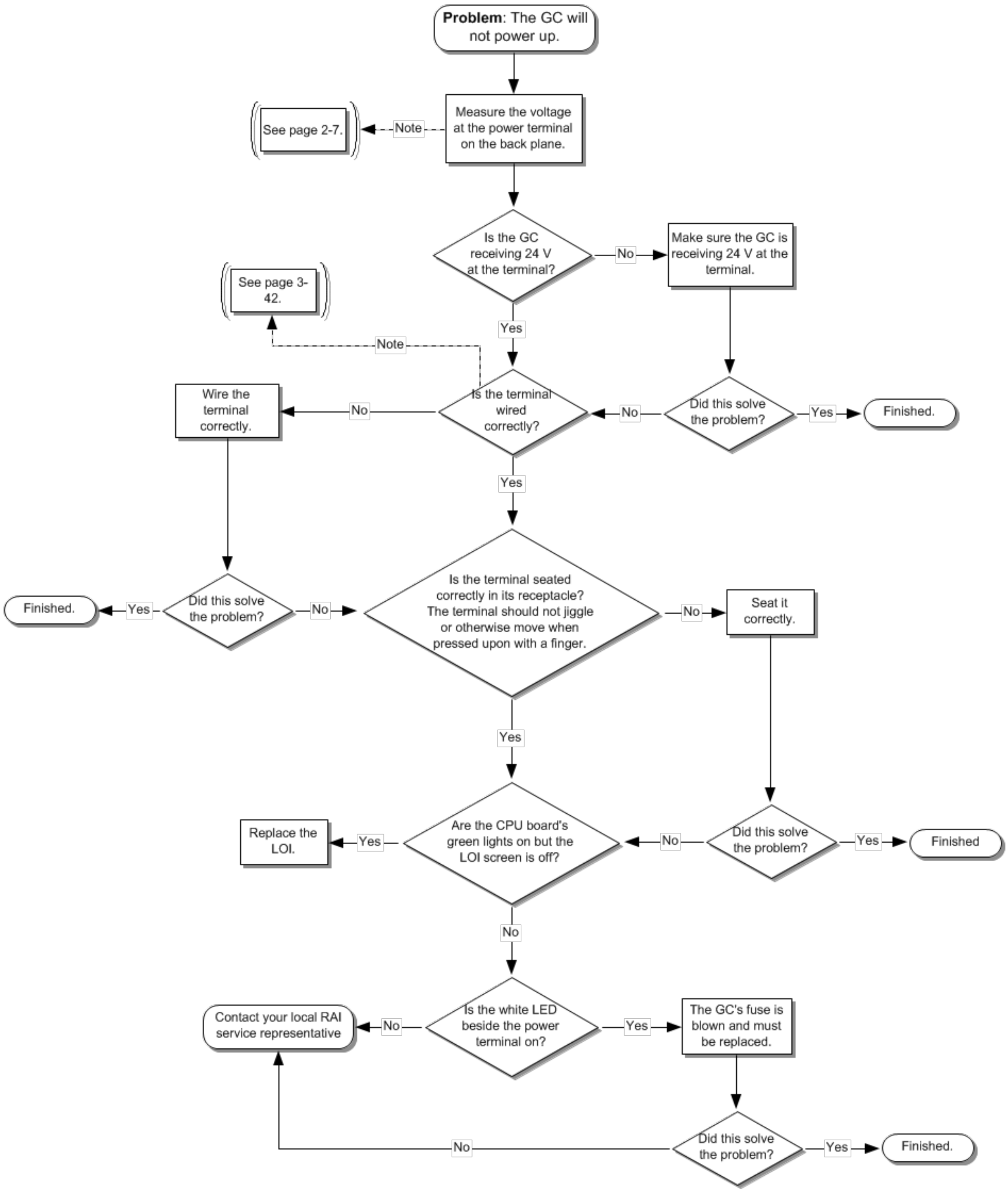
Alarm	Description and Suggested Actions
Analyzer Board Comm Failure	The communication link between the CPU board and the analyzer board has failed. Remove power and confirm the analyzer board is seated correctly on the back plane. If the analyzer board is seated correctly, replace the analyzer board. If replacing the analyzer board does not rectify the issue, replace the back plane board.
LOI Comm Failure	The communication link between the CPU Board and the Local Operator Interface (LOI) has failed. Remove power and confirm the connectors from the LOI are seated correctly in the back plane. If the connectors are seated correctly, replace the LOI. If replacing the LOI does not rectify the issue, replace the back plane board.
Auto Valve Timing Failure	The GC has taken too many analysis runs during an Auto Valve Timing (AVT) routine without finding the ideal valve timing. Confirm that the Calibration Gas isolation valves are on and there is greater than 10 PSI (0.7 Bar) of calibration gas. Refer to for help with troubleshooting this issue.
Analytical Module Communication Failure	The Intelligent Module board on the analytical module is not communicating with the CPU board.
Analytical Module Not Initialized	The analytical module failed to initialize when power was applied.
Module Validation Failure	The analysis of the calibration gas failed during the Module Validation process. Refer to for help with troubleshooting this issue.
IMB Incompatible	The firmware revision of the IMB is newer than the firmware revision of the CPU board. Upgrade the CPU firmware.
IMB CDT Component is missing in GC	A component that is in the component data table stored in a recently installed module is not configured in the GC's existing component data table. The component data table of the GC must match (with the exception of neo-Pentane) the component data table of a replacement module.
Energy Value Invalid	If enabled, the GC analyzes the calibration gas as an unknown stream and computes its energy value. The GC then compares this value to the Cal Gas Cert CV and determines if the calibration gas' energy value is within the CV Check Allowed Deviation. If it isn't, the GC triggers the Energy Value Invalid alarm.

Alarm	Description and Suggested Actions
Stream 1 Ideal RF Deviation Stream 2 Ideal RF Deviation Stream 3 Ideal RF Deviation	Streams 1 to 3 should only be set to Analysis or Not Used. This alarm may occur If the streams are incorrectly configured for calibration. To resolve this error, start MON2020 and select Streams on the Application menu. Set the stream's Usage to Analysis or Unused.
Stream 4 Ideal RF Deviation	The response factor for one or more components is outside of the limits of the Ideal Response Factor check setting.
Stream 1 RF Out Of Order Stream 2 RF Out Of Order Stream 3 RF Out Of Order	Streams 1 to 3 should only be set to Analysis or Not Used. This alarm may occur If the streams are incorrectly configured for calibration. To resolve this error, start MON2020 and select Streams on the Application menu. Set the stream's Usage to Analysis or Unused.
Stream 4 RF Out Of Order	The response factors for one or more components is not in the order of thermal conductivity configured for natural gas applications.
Calibration Energy Value Check Fail	The energy value calculated from the analysis value of the calibration during a calibration cycle is not within the limits of the energy value entered from the calibration certificate.
Stored Data Integrity Failure	Data associated with the GC's measurement results and logs are stored in the GC along with a 16-bit cyclic redundancy check (CRC) code. When the data is retrieved, its integrity is verified by recomputing the CRC code and comparing it with the CRC code stored along with the data. If there is a mismatch, then this alarm is generated, and you should save the current configuration and replace the CPU board.
n-Pentane RT Drift	The retention time for the n-Pentane peak has drifted too close to valve 3's timing. This is typically due to contamination in the valves and indicates the module should be exchanged and overhauled soon.
Ethane RT Drift	The retention time for the ethane peak has drifted too close to the end of the analysis cycle. This is typically due to contamination in the valves and indicates the module should be exchanged and overhauled soon.

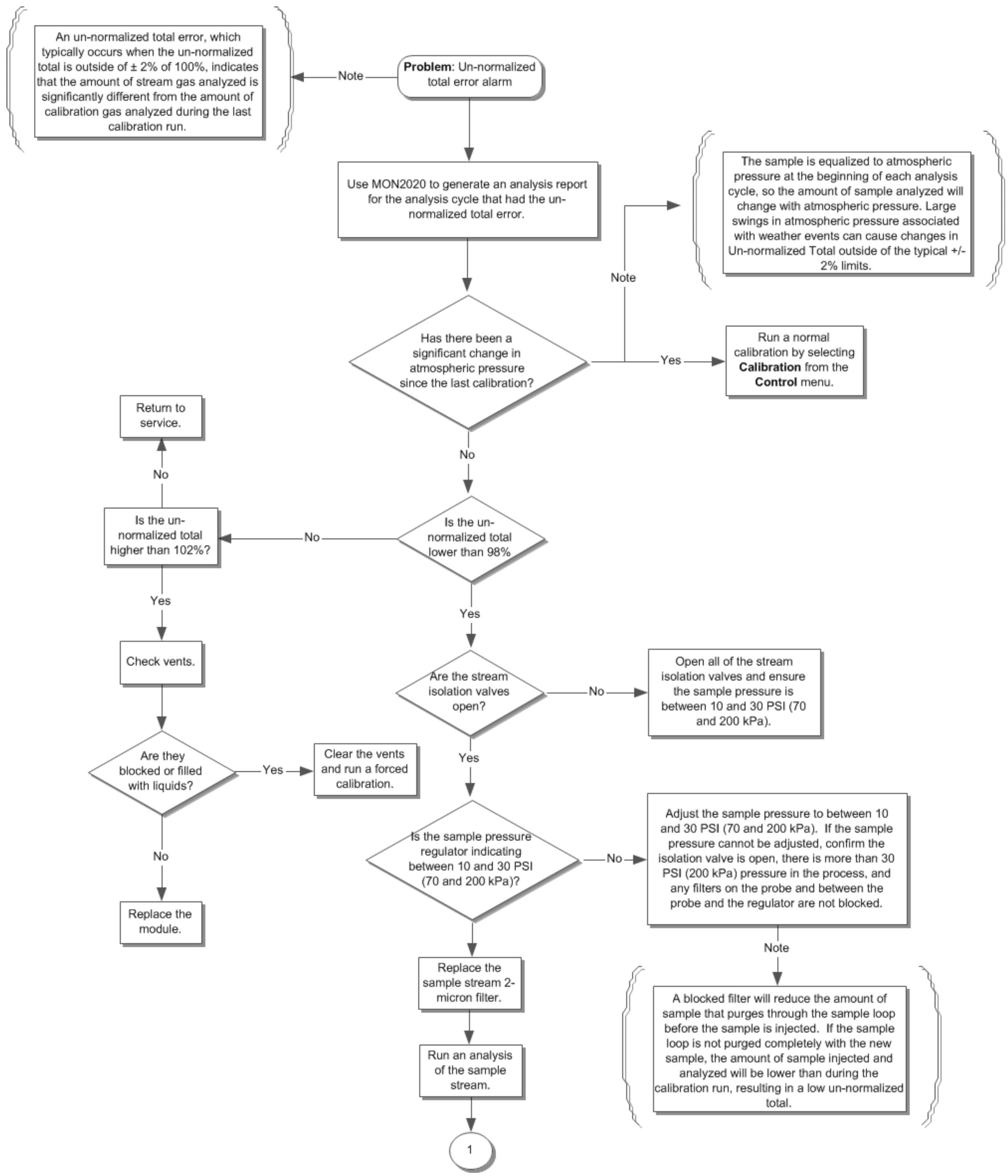
8.2 Flowcharts

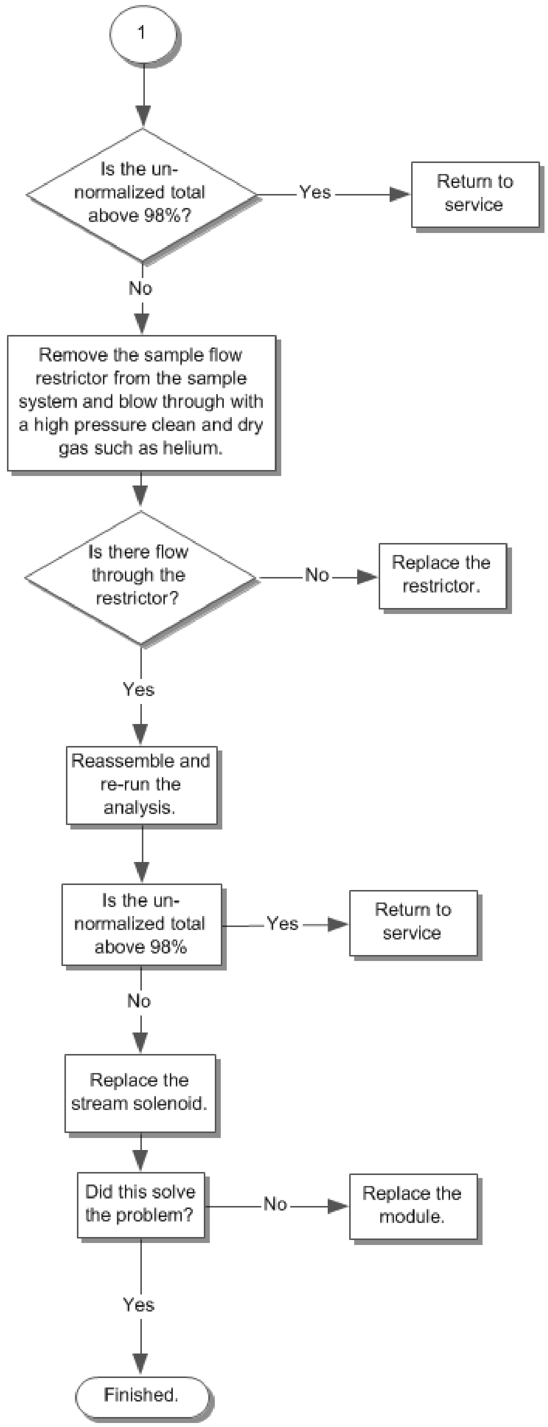
If you do not find help in the troubleshooting flowcharts, contact your local Rosemount service representative.

8.2.1 The GC won't power up

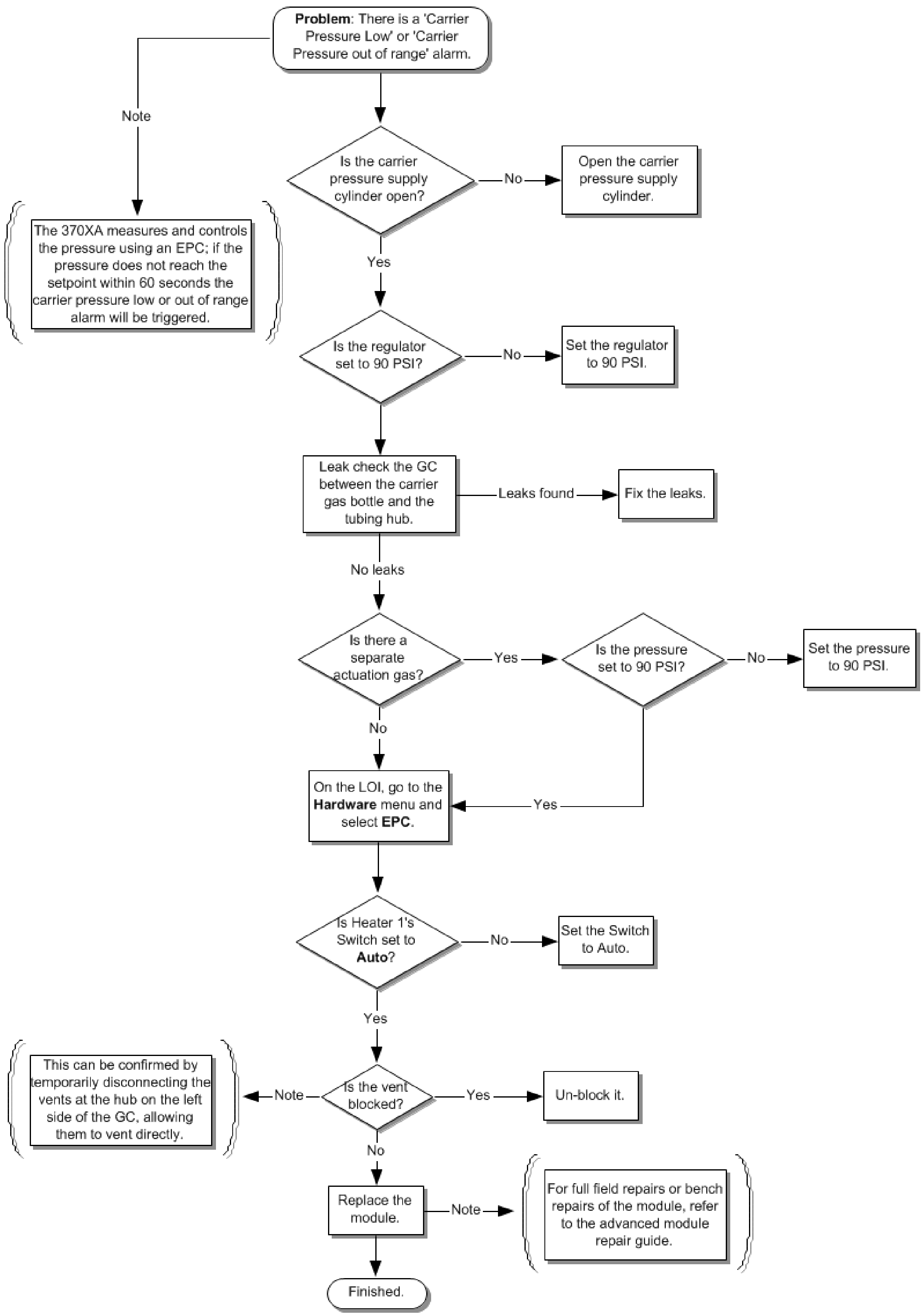


8.2.2 Un-normalized total error

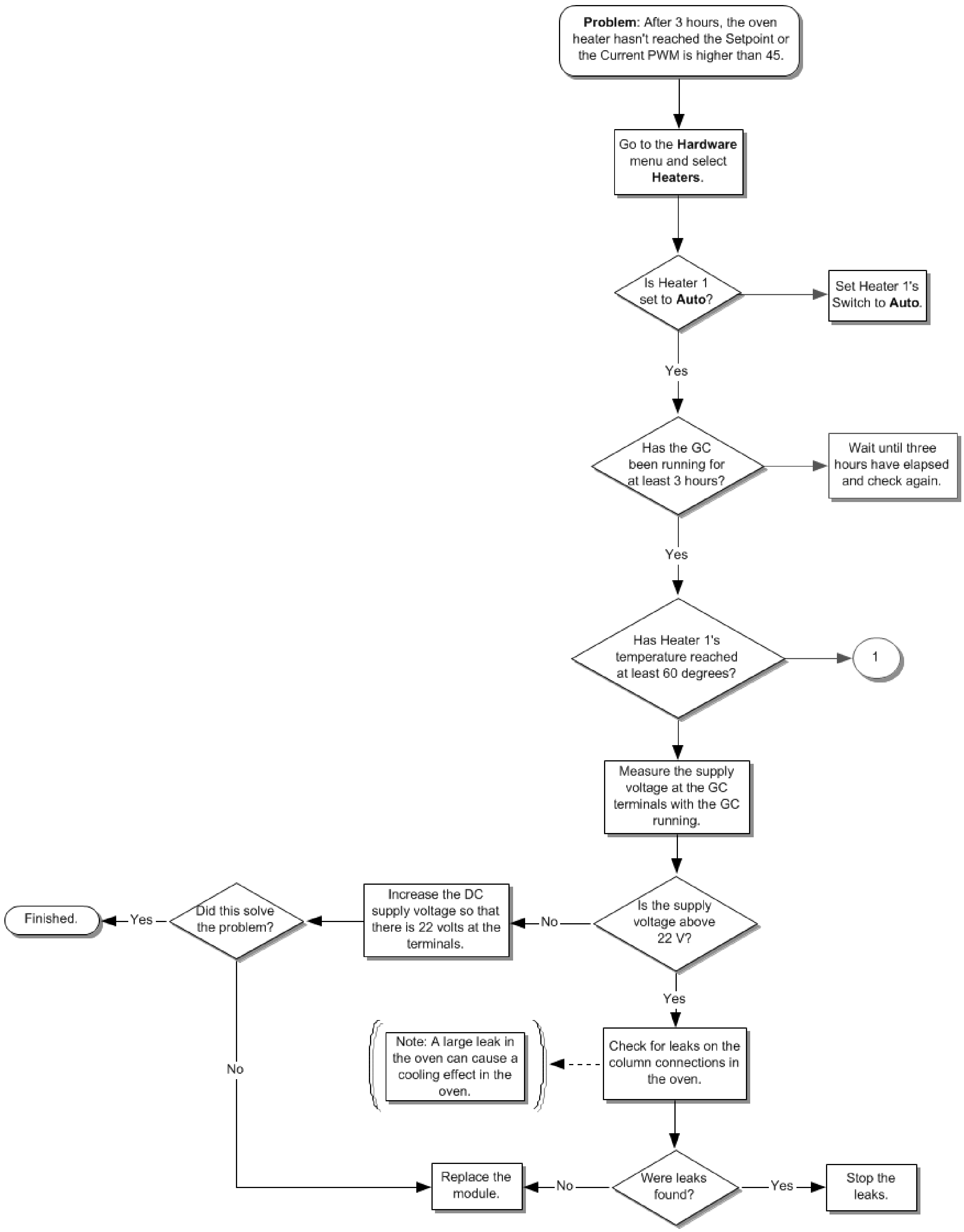


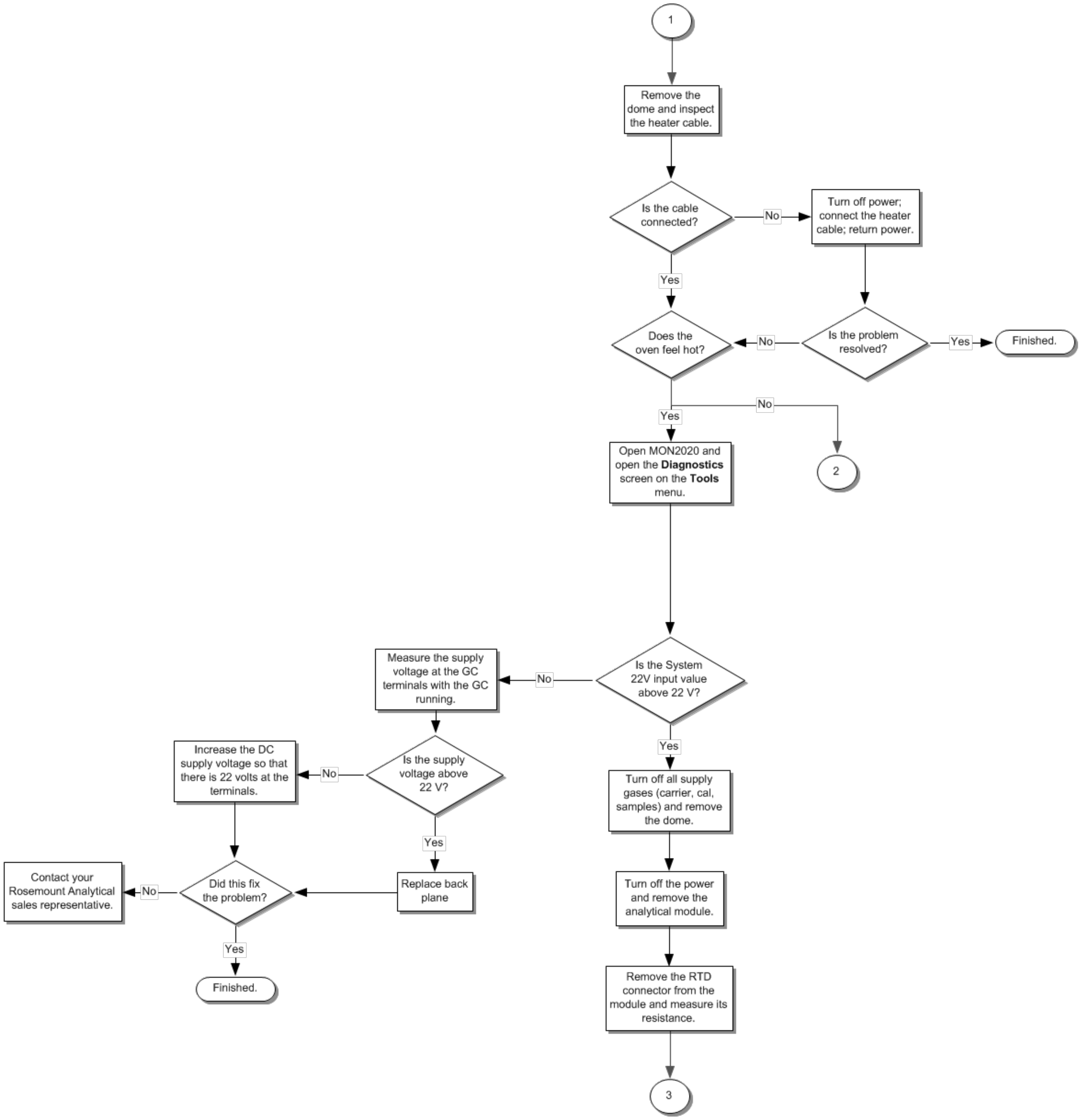

1
Is the un-normalized total above 98%?
Yes
Return to service
No
Remove the sample flow restrictor from the sample system and blow through with a high pressure clean and dry gas such as helium.
Is there flow through the restrictor?
No
Replace the restrictor.
Yes
Reassemble and re-run the analysis.
Is the un-normalized total above 98%
Yes
Return to service
No
Replace the stream solenoid.
Did this solve the problem?
No
Replace the module.
Yes
Finished.

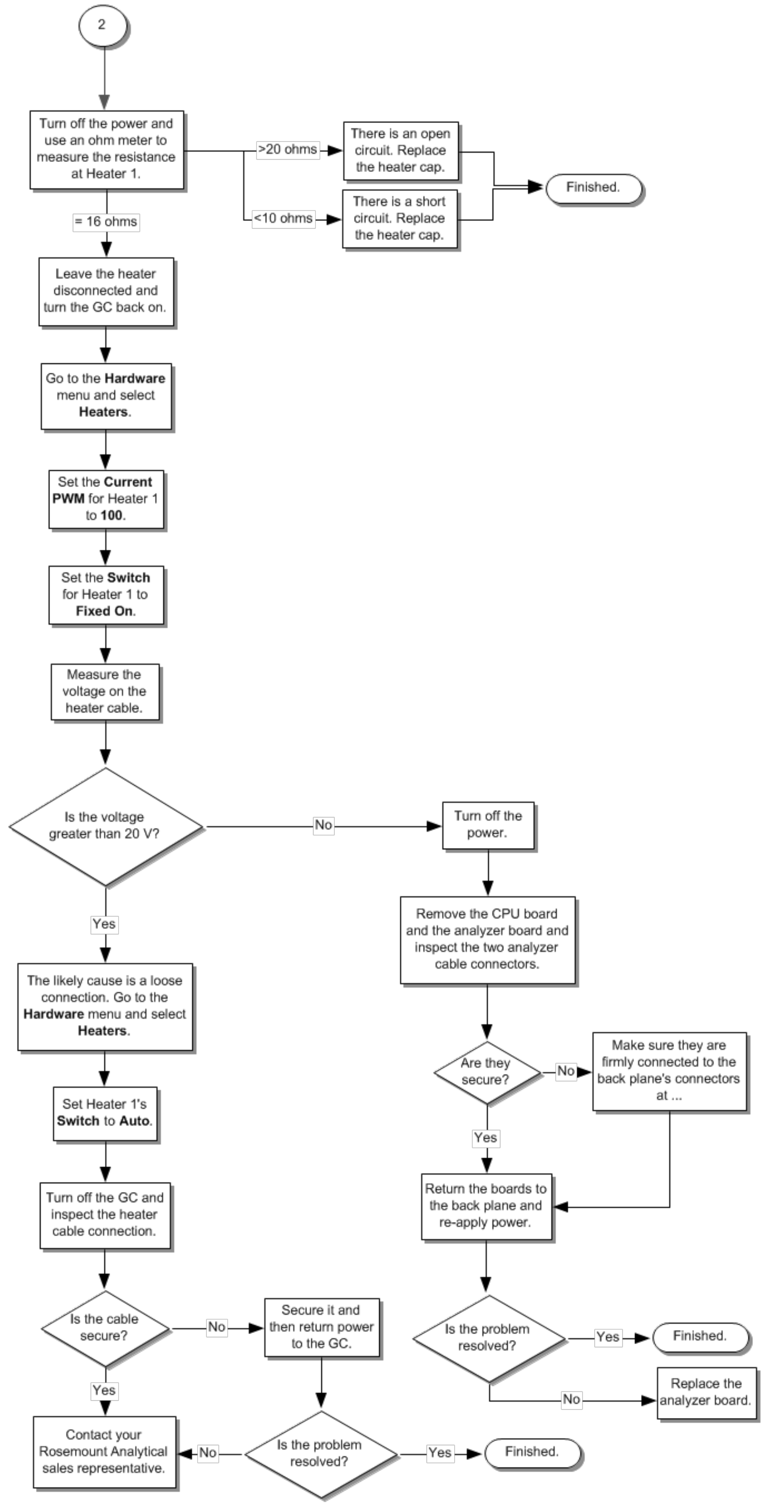
8.2.3 Carrier pressure alarms

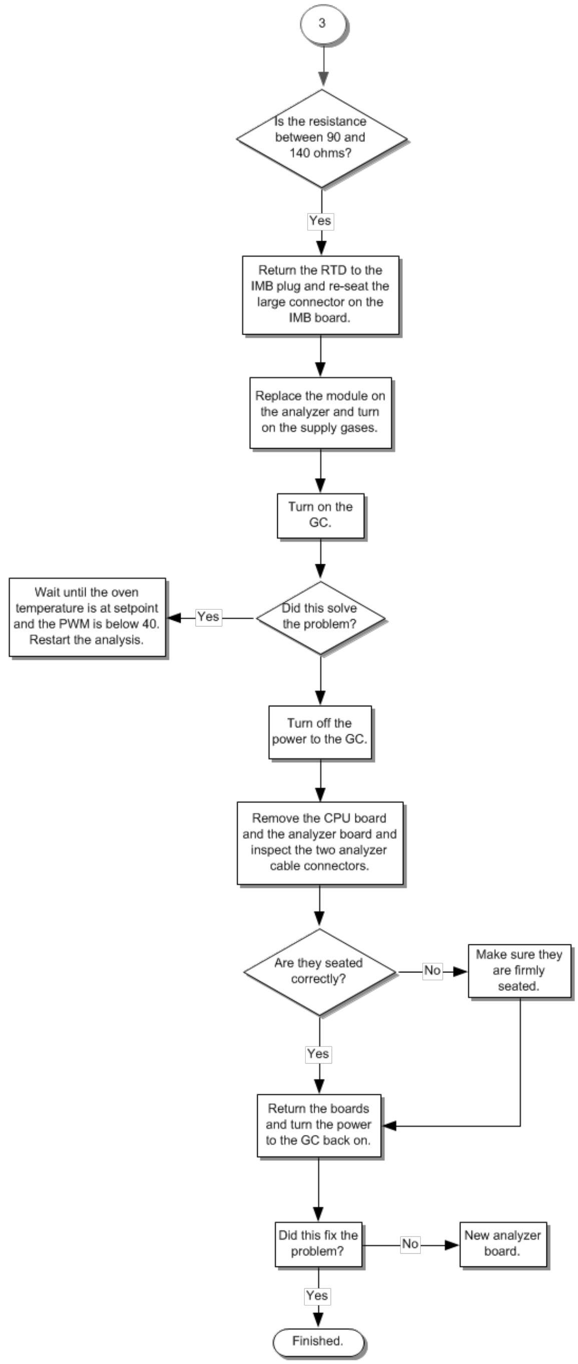


8.2.4 Heater won't reach set point

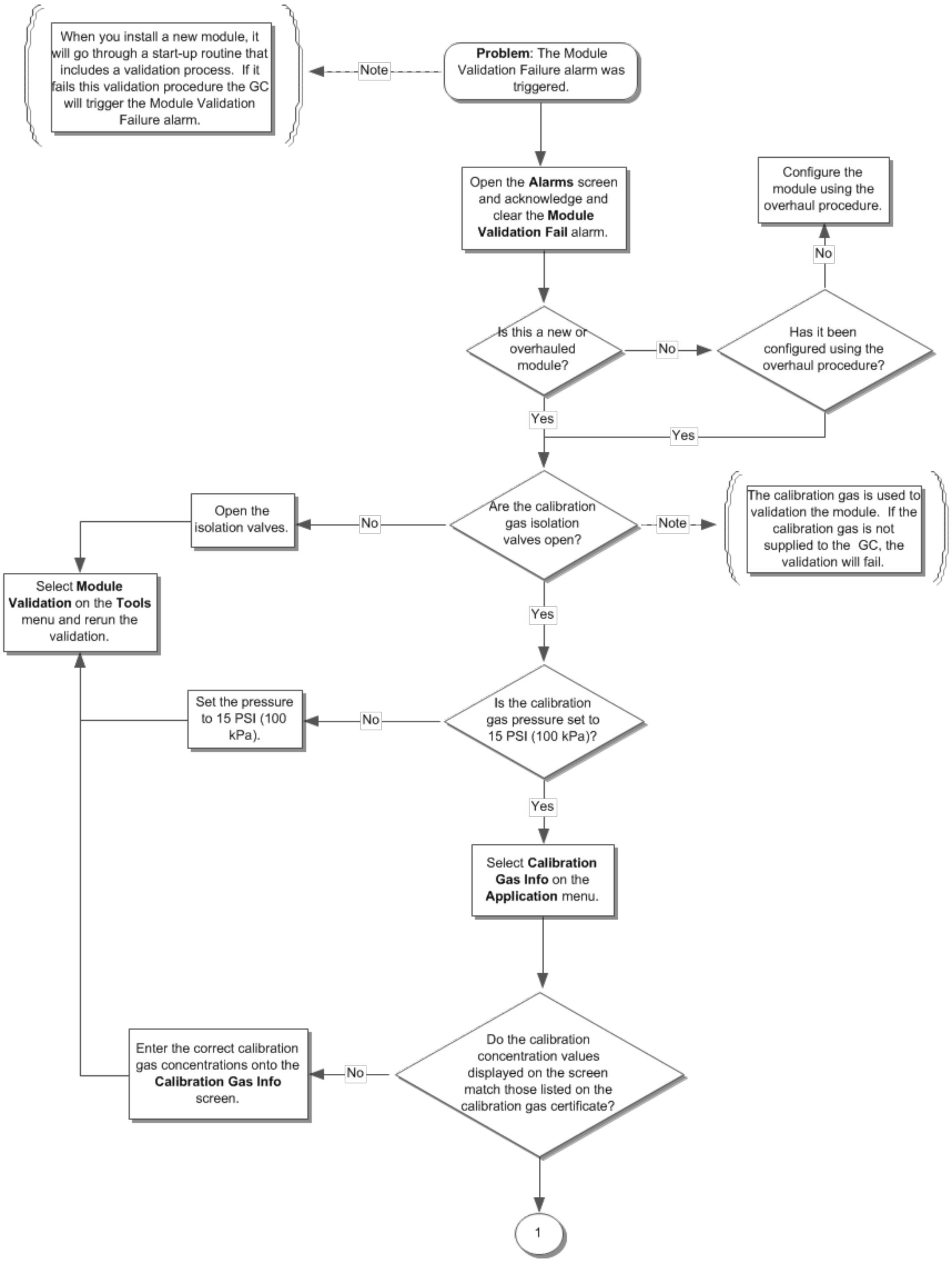


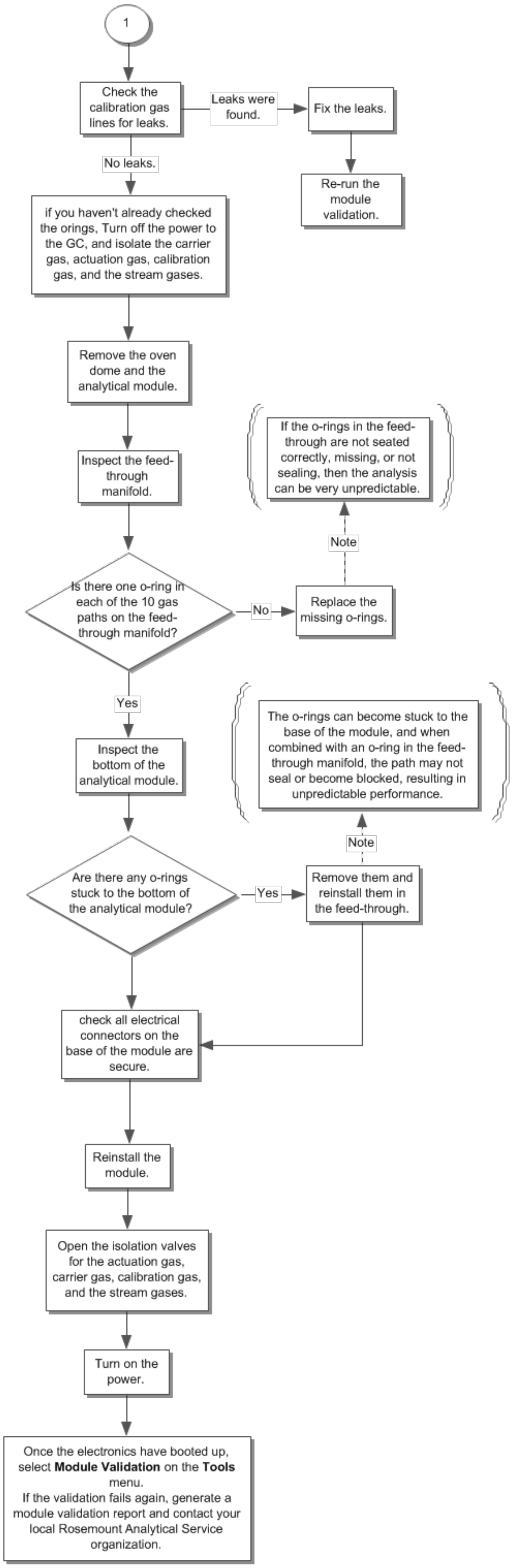

1
Remove the dome and inspect the heater cable.
Is the cable connected?
No
Turn off power; connect the heater cable; return power.
Yes
Does the oven feel hot?
No
Is the problem resolved?
Yes
Finished.
No
Yes
2
Open MON2020 and open the Diagnostics screen on the Tools menu.
Is the System 22V input value above 22 V?
No
Measure the supply voltage at the GC terminals with the GC running.
Is the supply voltage above 22 V?
No
Increase the DC supply voltage so that there is 22 volts at the terminals.
Yes
Replace back plane
Did this fix the problem?
No
Contact your Rosemount Analytical sales representative.
Yes
Finished.
Yes
Turn off all supply gases (carrier, cal, samples) and remove the dome.
Turn off the power and remove the analytical module.
Remove the RTD connector from the module and measure its resistance.
3


2
Turn off the power and use an ohm meter to measure the resistance at Heater 1.
>20 ohms
There is an open circuit. Replace the heater cap.
<10 ohms
There is a short circuit. Replace the heater cap.
Finished.
= 16 ohms
Leave the heater disconnected and turn the GC back on.
Go to the Hardware menu and select Heaters.
Set the Current PWM for Heater 1 to 100.
Set the Switch for Heater 1 to Fixed On.
Measure the voltage on the heater cable.
Is the voltage greater than 20 V?
No
Turn off the power.
Remove the CPU board and the analyzer board and inspect the two analyzer cable connectors.
Are they secure?
No
Make sure they are firmly connected to the back plane's connectors at ...
Yes
Return the boards to the back plane and re-apply power.
Is the problem resolved?
Yes
Finished.
No
Replace the analyzer board.
Yes
The likely cause is a loose connection. Go to the Hardware menu and select Heaters.
Set Heater 1's Switch to Auto.
Turn off the GC and inspect the heater cable connection.
Is the cable secure?
No
Secure it and then return power to the GC.
Is the problem resolved?
Yes
Finished.
No
Yes
Contact your Rosemount Analytical sales representative.

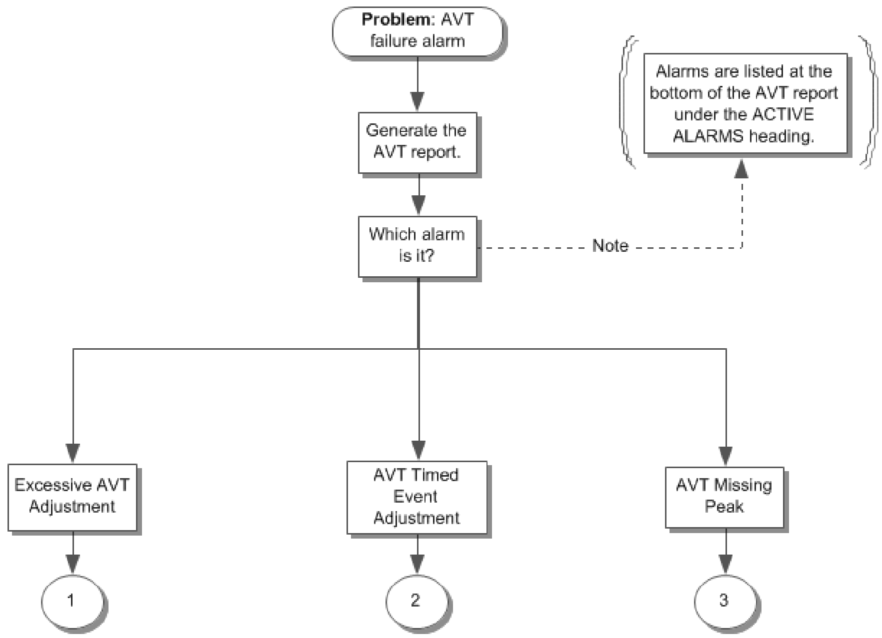

3
Is the resistance between 90 and 140 ohms?
Yes
Return the RTD to the IMB plug and re-seat the large connector on the IMB board.
Replace the module on the analyzer and turn on the supply gases.
Turn on the GC.
Did this solve the problem?
Yes
Wait until the oven temperature is at setpoint and the PWM is below 40. Restart the analysis.
Turn off the power to the GC.
Remove the CPU board and the analyzer board and inspect the two analyzer cable connectors.
Are they seated correctly?
No
Make sure they are firmly seated.
Yes
Return the boards and turn the power to the GC back on.
Did this fix the problem?
No
New analyzer board.
Yes
Finished.

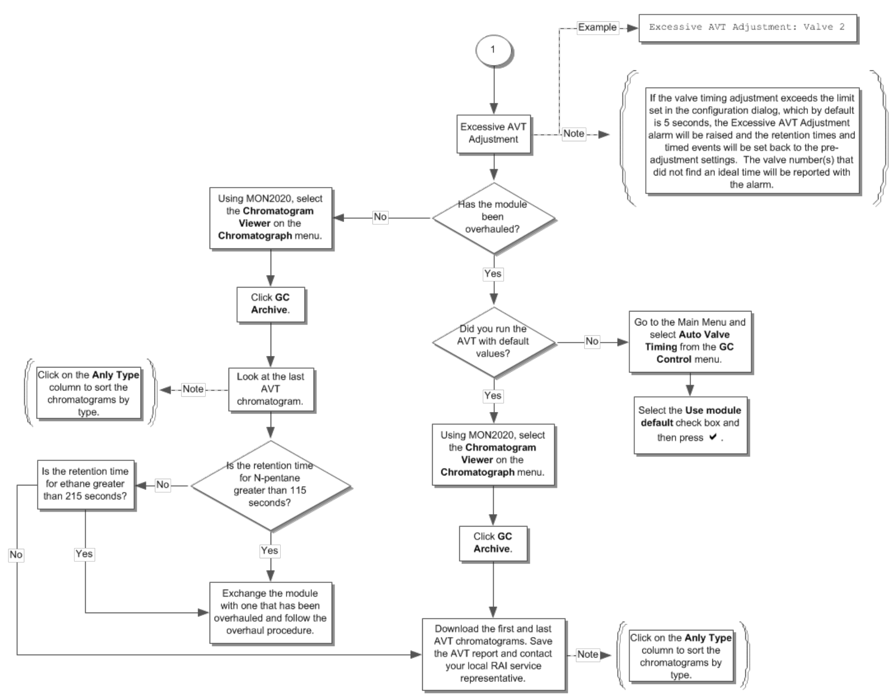
8.2.5 Module validation fails

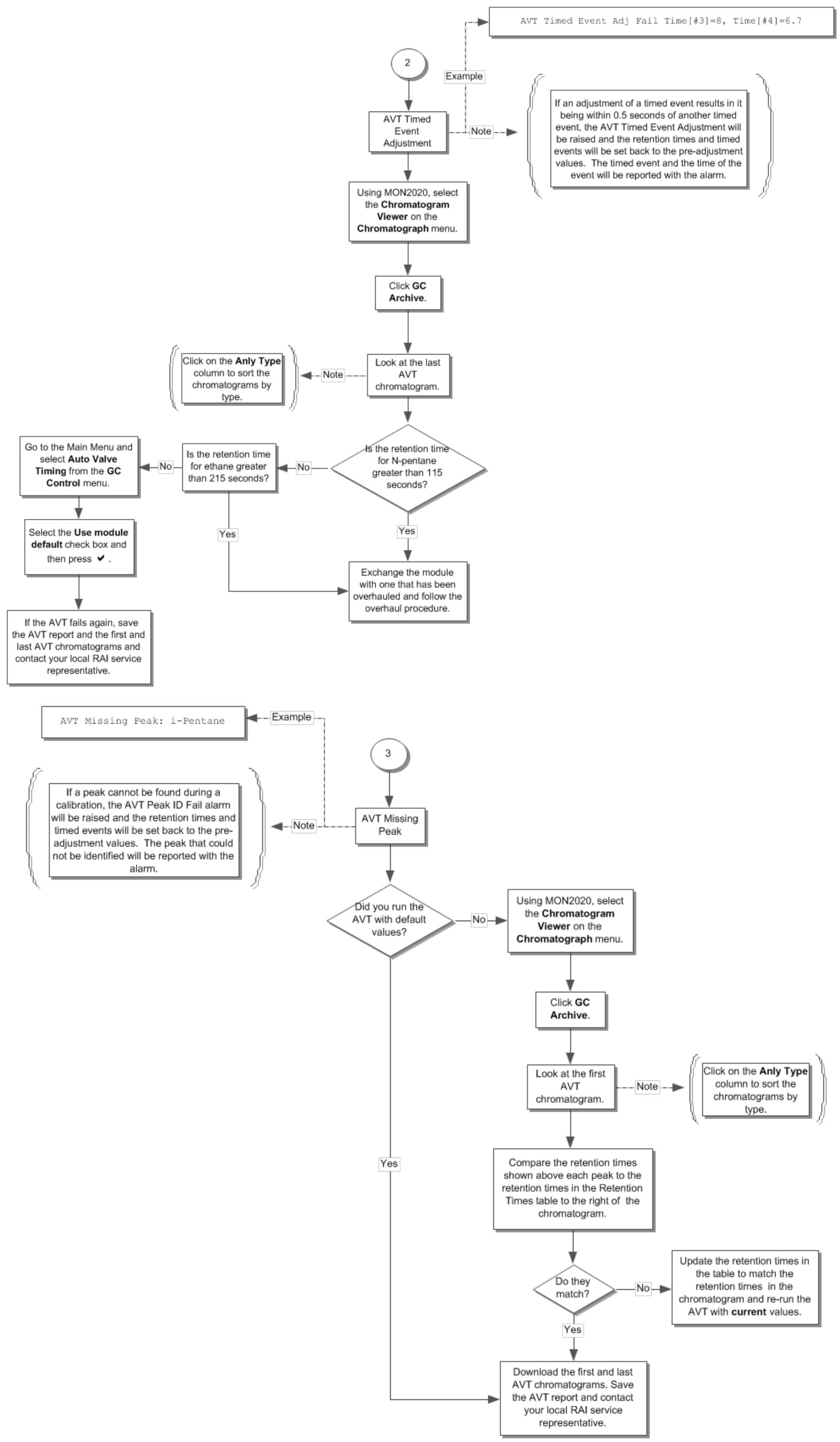



1
Check the calibration gas lines for leaks.
Leaks were found.
Fix the leaks.
Re-run the module validation.
No leaks.
if you haven't already checked the orings, Turn off the power to the GC, and isolate the carrier gas, actuation gas, calibration gas, and the stream gases.
Remove the oven dome and the analytical module.
Inspect the feed-through manifold.
If the o-rings in the feed-through are not seated correctly, missing, or not sealing, then the analysis can be very unpredictable.
Note
Is there one o-ring in each of the 10 gas paths on the feed-through manifold?
No
Replace the missing o-rings.
Yes
Inspect the bottom of the analytical module.
The o-rings can become stuck to the base of the module, and when combined with an o-ring in the feed-through manifold, the path may not seal or become blocked, resulting in unpredictable performance.
Note
Are there any o-rings stuck to the bottom of the analytical module?
Yes
Remove them and reinstall them in the feed-through.
check all electrical connectors on the base of the module are secure.
Reinstall the module.
Open the isolation valves for the actuation gas, carrier gas, calibration gas, and the stream gases.
Turn on the power.
Once the electronics have booted up, select **Module Validation** on the **Tools** menu.
If the validation fails again, generate a module validation report and contact your local Rosemount Analytical Service organization.

8.2.6 Auto valve timing fails






AVT Timed Event Adj Fail Time[#3]=8, Time[#4]=6.7
2
Example
AVT Timed Event Adjustment
Note
If an adjustment of a timed event results in it being within 0.5 seconds of another timed event, the AVT Timed Event Adjustment will be raised and the retention times and timed events will be set back to the pre-adjustment values. The timed event and the time of the event will be reported with the alarm.
Using MON2020, select the Chromatogram Viewer on the Chromatograph menu.
Click GC Archive.
Look at the last AVT chromatogram.
Note
Click on the Anly Type column to sort the chromatograms by type.
Is the retention time for N-pentane greater than 115 seconds?
No
Is the retention time for ethane greater than 215 seconds?
No
Go to the Main Menu and select Auto Valve Timing from the GC Control menu.
Select the Use module default check box and then press ✔.
If the AVT fails again, save the AVT report and the first and last AVT chromatograms and contact your local RAI service representative.
Yes
Yes
Exchange the module with one that has been overhauled and follow the overhaul procedure.
AVT Missing Peak: i-Pentane
Example
3
AVT Missing Peak
Note
If a peak cannot be found during a calibration, the AVT Peak ID Fail alarm will be raised and the retention times and timed events will be set back to the pre-adjustment values. The peak that could not be identified will be reported with the alarm.
Did you run the AVT with default values?
No
Using MON2020, select the Chromatogram Viewer on the Chromatograph menu.
Click GC Archive.
Look at the first AVT chromatogram.
Note
Click on the Anly Type column to sort the chromatograms by type.
Compare the retention times shown above each peak to the retention times in the Retention Times table to the right of the chromatogram.
Do they match?
No
Update the retention times in the table to match the retention times in the chromatogram and re-run the AVT with current values.
Yes
Yes
Download the first and last AVT chromatograms. Save the AVT report and contact your local RAI service representative.

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