Manual
MS-00809-0100-0700, Rev AC
November 2023

Rosemount™ 700XA

Gas Chromatograph

ROSEMOUNT™

EMERSON™

Notice

EMERSON ("SELLER") SHALL NOT BE LIABLE FOR TECHNICAL OR EDITORIAL ERRORS IN THIS MANUAL OR OMISSIONS FROM THIS MANUAL. SELLER MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THIS MANUAL AND, IN NO EVENT, SHALL SELLER BE LIABLE FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PRODUCTION, LOSS OF PROFITS, ETC.

PRODUCT NAMES USED HEREIN ARE FOR MANUFACTURER OR SUPPLIER IDENTIFICATION ONLY AND MAY BE TRADEMARKS/REGISTERED TRADEMARKS OF THESE COMPANIES.

THE CONTENTS OF THIS PUBLICATION ARE PRESENTED FOR INFORMATIONAL PURPOSES ONLY AND, WHILE EVERY EFFORT HAS BEEN MADE TO ENSURE THEIR ACCURACY, THEY ARE NOT TO BE CONSTRUED AS WARRANTIES OR GUARANTEES, EXPRESSED OR IMPLIED, REGARDING THE PRODUCTS OR SERVICES DESCRIBED HEREIN OR THEIR USE OR APPLICABILITY. WE RESERVE THE RIGHT TO MODIFY OR IMPROVE THE DESIGNS OR SPECIFICATIONS OF SUCH PRODUCTS AT ANY TIME.

SELLER DOES NOT ASSUME RESPONSIBILITY FOR THE SELECTION, USE, OR MAINTENANCE OF ANY PRODUCT. RESPONSIBILITY FOR PROPER SELECTION, USE, AND MAINTENANCE OF ANY SELLER PRODUCT REMAINS SOLELY WITH THE PURCHASER AND END-USER.

Warranty

1. LIMITED WARRANTY: Subject to the limitations contained in Section 2 herein and except as otherwise expressly provided herein, Emerson ("Seller") warrants that the firmware will execute the programming instructions provided by Seller and that the Goods manufactured or Services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first. Consumables and Services are warranted for a period of 90 days from the date of shipment or completion of the Services. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. If Buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, promptly correct any errors that are found by Seller in the firmware or Services, or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the Goods/Services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Seller representative. All costs of dismantling, reinstallation and freight, and the time and expenses of Seller's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Seller. Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller. Except as otherwise expressly provided in the Agreement, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES. It is understood that corrosion or erosion of materials is not covered by our guarantee.

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.

NOTICE

The analyzer electronics and oven assembly, when housed inside a purged enclosure, meet the certifications and classifications identified in the Specifications section of the Product Data Sheet, which is located on the Emerson website: Emerson.com/global.

⚠ WARNING

Precautionary signs

Failure to observe precautionary signs may result in injury or death to personnel or cause damage to equipment.

Observe and comply with all precautionary signs posted on the device.

⚠ WARNING

Toxic vapors

Exit ports may discharge dangerous levels of toxic vapors.

Use proper protection and a suitable exhaust device.

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
Keep cover tight while circuits are live.
Use cables or wires suitable for the marked **T** ratings.
Cover joints must be cleaned before replacing the cover.
Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

⚠ WARNING

Safety compliance

Failure to follow the safety instructions may cause injury to personnel. The seller does not accept any responsibility for installations of the device or any attached equipment in which the installation or operation thereof has been performed in a manner that is negligent and/or non-compliant with applicable safety requirements.

Install and operate all equipment as designed and comply with all safety requirements.
If the device is not operated in a manner recommended by the manufacturer, the overall safety could be impaired.
Observe all safety precautions defined in the gas Safety Data Sheet (SDS), especially for hazardous locations.

⚠ WARNING

Supply mains connection

The device is intended to be connected to supply mains by qualified personnel in accordance with local and national codes.

⚠ WARNING

Power

A suitable APPROVED switch and fuse or a circuit breaker shall be provided to facilitate the disconnection of mains power.

⚠ WARNING

Ventilation

Use the device in a well-ventilated area.

If you plan to place the device in a sealed shelter, always vent it to atmosphere with ¼-in. (6.4 mm) tubing or larger. This will prevent the build up of H_2 and sample gas.

⚠ WARNING

Leak testing

All gas connections must be properly leak tested at installation.

Do not turn on gas until you have completely checked the carrier lines for leaks.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.

When handling the analyzer, always use suitable protective gloves.

These precautions are particularly important when working at heights.

If burned, seek medical treatment immediately.

⚠ WARNING

Physical access

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

NOTICE

Replaceable parts
Only a few parts inside the device are replaceable. Only trained service personnel should replace parts.

All replacement parts must be authorized by Emerson to ensure product certification compliance.

NOTICE

Equipment damage
If the device is heated without carrier flow, damage to the columns may occur.

NOTICE

Waste disposal
Waste electrical and electronic products must not be disposed of with household waste.

Please recycle where facilities exist.

Check with your local authority or retailer for recycling advice.

NOTICE

The device is certified by CSA and ATEX. See the certification tag on the device for specific details about its agency approvals.
When the vapor regulators and flow switches are fitted, they must be suitably certified with the ratings Ex d IIC Gb T6/T4/T3 and for a minimum ambient temperature range: Ta = -20 °C to +60 °C.

Where right angle bend cable adapters are used, they shall be appropriately certified and shall interface with enclosures via appropriate certified barrier glands.

Glossary

Auto zero The thermal conductivity detector (TCD) is auto zeroed at the start of a new analysis. You can also configure automatic zeroing of the TCD amplifier to take place at any time during the analysis if the component is not eluting or the baseline is steady. The flame ionization detector (FID) will auto zero at each new analysis run and can be configured to auto zero anytime during the analysis if the component is not eluting or the baseline is steady.

Baseline Signal output when there is only carrier gas going across the detectors. In a chromatogram, you should only see `Baseline` when running an analysis without injecting a sample.

Carrier gas The gas used to push the sample through the system during an analysis.

CDT Component data table.

Chromatogram A permanent record of the detector output. A chromatogram is obtained from a personal computer (PC) interfaced with the detector output through the controller assembly. A typical chromatogram displays all component peaks and gain changes. You can view it in color, as it is processed on a PC display. Check marks recorded on the chromatogram by the controller assembly indicate where timed events take place.

Component Any one of several different gases that may appear in a sample mixture. For example, natural gas usually contains the following components: nitrogen, carbon dioxide, methane, ethane, propane, isobutane, normal butane, isopentane, normal pentane, and hexanes plus.

CTS Clear to send.

DCD Data carrier detect.

DSR Data set ready.

DTR Data terminal ready.

FID Flame ionization detector. The optional FID may be used in place of a TCD for the detection of trace compounds. The FID requires a polarization voltage, and its output is connected to the input to a high impedance amplifier, an electrometer. The sample of gas to be measured is injected into the burner with a mixture of hydrogen and air to maintain the flame.

FPD Flame photometric detector. The FPD is used to analyze gas compound impurities, such as sulfur, phosphorous, and metals. When sample gas passes through the hydrogen/air flame the component's wavelengths emitted are electrically measured. The FPD is located in the analyzer's upper enclosure.

GC Gas chromatograph. The GC is a user-configurable analyzer for various process gas applications.

LSIV Liquid sample injection valve. The optional LSIV is used to convert a liquid sample to a gas sample by vaporizing the liquid in a heated chamber, so the resulting gas sample can be analyzed.

Methanator The optional methanator, also known as a catalytic converter, transforms the components that are undetectable by the FID (carbon dioxide and/or carbon monoxide) into methane by adding hydrogen and heat to the sample.

PC Personal computer.

Response factor Correction factor for each component as determined by the following calibration:

$$\mathrm{RF} = \frac{Raw area}{Calibration\ concentration}$$

Retention time	Time, in seconds, that elapses between the start of analysis and the sensing of the maximum concentration of each component by the detector.
RI	Ring indicator.
RLSD	Received line signal detect. A digital simulation of a carrier detect.
RTS	Request to send.
RxD, RD, or S_{in}	Receive data or signal in.
SCS	Sample conditioning system.
TCD	Thermal conductivity detector. A detector that uses the thermal conductivity of the different gas components to produce an unbalanced signal across the bridge of the preamplifier. The higher the temperature, the lower the resistance on the detectors.
TxD, TD, or S_{out}	Transmit data or signal out.

Contents

1 Cybersecurity recommendations for Rosemount XA gas chromatograph (GC) and MON2020 users

Install XA GC in a secure environment with physical protection

- Install the XA GC in a secure environment with physical protection.
- Scan the USB shipped with the XA GC with anti-virus software before use.
- Store all the GC related files including application files, drawings, and documents, in a secure network/drive with restricted access.

Install MON2020 on a secure personal computer (PC)

- Access to PC should be protected by adequate username/password.
- With restricted admin privileges on PC - operating system (OS) configuration, install software, etc.
- Restrict network ports and connection of mass storage devices/removable media.
- Resides on a private local area network (LAN) with firewall and network access control list configured for blocking illegitimate access.
- With anti-virus software kept current on PC.
- With Microsoft® Windows automatic updates enabled on PC.
- PC updated with Windows security patches.
- With physical access controls - locked room, key-card entry, etc.

Use XA GCs in secure network

This product is designed to be used in an industrial environment with appropriate defense-in-depth security measures and compensating controls effective against cyber-attacks. This product is not designed to be connected directly to the Internet or Internet facing networks. Security measures should include, but are not limited to:

- Ethernet should be set up in a private LAN with firewall and network access control list configured for blocking illegitimate access.
- Network devices stored with physical access controls - physical locks, ID verification, etc.
- Network devices updated with all available security patches.
- Anti-virus software kept current on all computers in the network.
- Other industry best practices for secure network.

Control access to XA GC using password of sufficient complexity

- The password length should be at least eight alphanumeric characters.
- All default users should be removed after XA GC commissioning or password upgrade to comply with the password complexity guidelines.
- Password policy level should be set after GC commissioning by accessing **Tools** → **Users** → **User Administration**.
- Use a unique password for each user.

- Avoid sharing passwords with other users.

Control access to user profile for XA GC using admin password of sufficient complexity

- The admin password length should be at least 10 alphanumeric characters.
- The admin password should include at least one number, mix of upper/lower case characters, and at least one special character (!@#$%^&*_-+=:?)
- The default admin password should be changed after GC commissioning by using the password complexity guidelines.
- Avoid sharing the password with non-admin users.

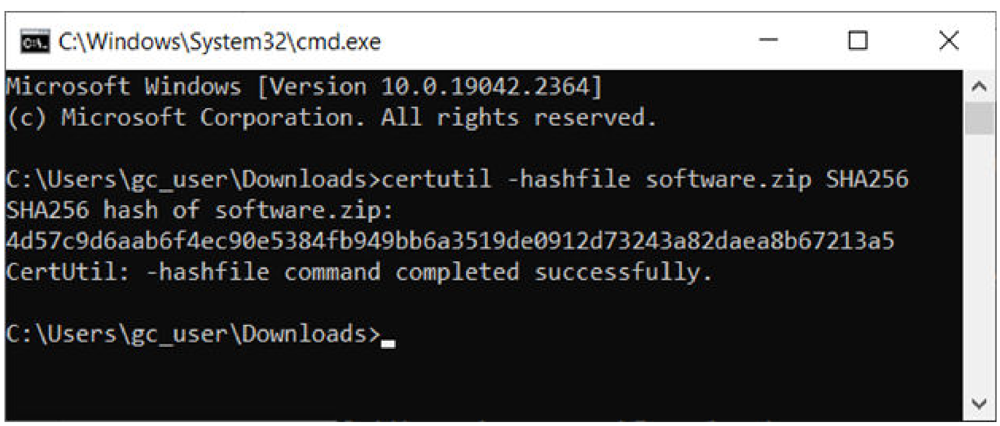
Upload/download files of the approved types to/from XA GC

- Upload/download files of the approved types to/from XA GC.
- The approved files of type include .xls, .xlsx, .pdf, .tif/.tiff, .xrted (XA trend file), .xcgm (XA chromatogram file), and .xcmp (XA comparison file).
- Scan the mass storage device with the latest anti-virus software before uploading any files to GC.

Check integrity for distributed binaries

- A hash value will be provided for some software/firmware files distributed by Emerson GC, so that the user can verify the integrity of the file.
- The hashing algorithm SHA-256 is used for calculating the hash value of the binary file.
- There are many programs for calculating the SHA-256 hash including Windows Command Prompt, Windows PowerShell, and third-party software (such as Hash Tool). The user can use a program of choice to calculate the SHA-256 hash value of the downloaded file and compare it to the value specified on the download page.
- The following is an example of using Windows Command Prompt to calculate the SHA-256 hash value:
  — In a command line, run the command:
    - `certutil -hashfile [filename] SHA256`

  — For example:



2 Overview

2.1 System description

The Rosemount 700XA is a high-speed gas chromatograph (GC) system that is engineered to meet specific field application requirements based on typical hydrocarbon stream composition and anticipated concentration of selected components. In its standard configuration, the analyzer can handle up to eight streams: seven sample streams and one calibration stream.

The 700XA system consists of two major parts: the analyzer assembly and the electronics assembly. Depending upon the particular GC, there may also be a third, optional assembly called the sample conditioning system (SCS).

The electronics and hardware are housed in an explosion-proof enclosure that meets the approval guidelines of various certification agencies for use in hazardous environments. See the certification tag on the GC for specific details about agency approvals.

2.1.1 Analyzer assembly

The analyzer assembly includes:

- Columns
- Thermal conductivity detectors (TCDs)
- Flame ionization detectors (FIDs)
- Flame photometric detector (FPD)
- Preamplifier
- Preamplifier power supply
- Stream switching valves
- Analytical valves
- Solenoids

Additionally, the gas chromatograph (GC) can be equipped with a liquid sample injection valve (LSIV) or methanator.

Related information

Upper compartment

2.1.2 Electronics assembly

The electronics assembly includes the electronics and ports necessary for signal processing, instrument control, data storage, personal computer (PC) interface, and telecommunications.

Use the electronics assembly and Rosemount MON2020 to control the gas chromatograph (GC).

The GC-to-PC interface provides you with the greatest capability, ease-of-use, and flexibility. You can use MON2020 to edit applications, monitor operations, calibrate streams, and display analysis chromatograms and reports, which you can then store as files on the PC's hard drive or print from a printer connected to the PC.

⚠ WARNING

Hazardous area explosion hazard

Failure to follow this warning may result in injury or death to personnel.

Do not use a personal computer (PC) or printer in a hazardous area.

Emerson provides serial and Ethernet communication links to connect the analyzer to the PC and to connect to other computers and printers in a safe area.

2.1.3 Sample conditioning system (SCS)

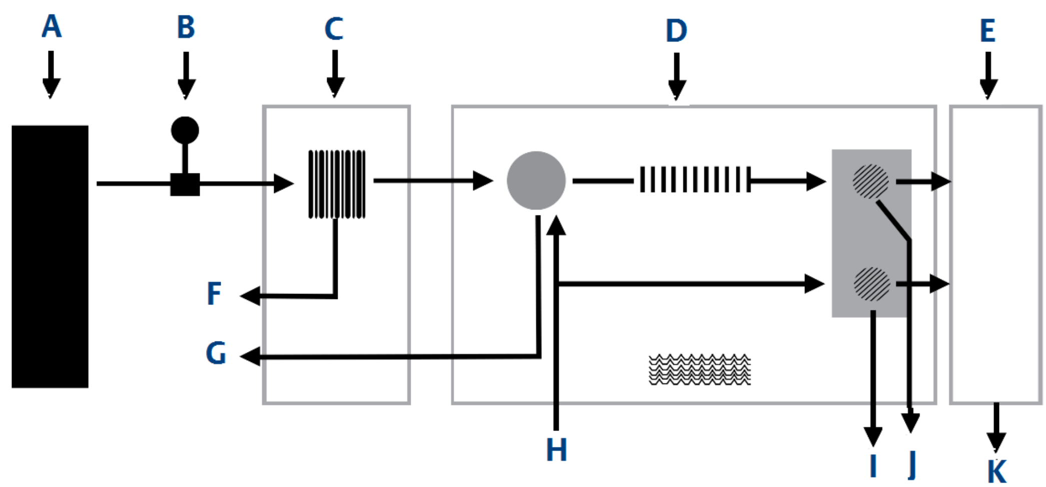
The optional sample conditioning system is located between the process stream and the sample inlet, which is often mounted below the gas chromatograph (GC).

The standard SCS configuration includes a stream switching system and filters.

2.2 Functional description

A sample probe installed in the process line takes a sample of the gas to be analyzed from the process stream. The sample passes through a sample line to the sample conditioning system (SCS) where it is filtered or otherwise conditioned. After conditioning, the sample flows to the analyzer assembly for separation and detection of the gas components.

Figure 2-1: Gas chromatography process model



A. Process line
B. Probe
C. Sample system
D. Chromatograph oven
E. Gas chromatograph (GC) controller
F. Sample return
G. Slip stream
H. Carrier gas
I. Reference vent
J. Detector vent
K. Analysis results

Separation and analysis

The GC separates the sample gas into its components as follows:

1. A precise volume of sample gas is injected into one of the analytical columns. The column contains a stationary phase (packing) that is either an active solid or an inert solid support that is coated with a liquid phase (absorption partitioning).
2. A mobile phase (carrier gas) moves the sample gas through the column.
3. The selective retardation of the components takes place in the column, causing each component to move through the column at a different rate. This separates the sample into its constituent gases and vapors.
4. A detector located at the outlet of the analytical column senses the elution of components from the column and produces electrical outputs proportional to the concentration of each component.

Output from the electronic assembly is normally displayed on a remotely located personal computer (PC) or in a distributed control system (flow computer).

To connect the GC to a PC, use a direct serial line, an optional Ethernet cable, or a Modbus®-compatible communication interface.

You can use Rosemount MON2020 to display several chromatograms with separate color schemes, allowing you to compare present and past data.

In most cases, it is essential to use MON2020 to configure and troubleshoot the GC. The PC may be remotely connected via Ethernet, telephone, radio, or satellite communications. Once installed and configured, the GC can operate independently for long periods of time.

2.3 Software description

The gas chromatograph (GC) uses two distinct types of software. This enables total flexibility in defining the calculation sequence, report content, format, type, and amount of data for viewing, control, and/or transmission to another computer or controller assembly.

The two types are:

- Embedded GC firmware
- Rosemount MON2020 software

Emerson installs the RTOS firmware and the application software before shipping the GC.

Emerson tailors the application configuration to the customer's process and ships the configuration on a USB stick with the GC. Emerson also tests the hardware and software together as a unit before the equipment leaves the factory.

MON2020 communicates with the GC; you can use it to initiate site system setup, such as operational parameters, application modifications, and maintenance.

2.3.1 Embedded gas chromatograph (GC) firmware

The GC’s embedded firmware supervises operation of the GC through its internal microprocessor-based controller.

All direct hardware interface is via this control software. It consists of a multitasking program that controls separate tasks in system operation, as well as hardware self-testing, user application downloading, start-up, and communication. After configuration, the GC can operate as a stand-alone unit.

2.3.2 Rosemount MON2020

The MON2020 software provides you with control of the gas chromatograph (GC), monitors analysis results, and inspects and edits various parameters that affect the analyzer operation. It also controls display and printout of the chromatograms and reports, and it stops and starts automatic analysis cycling or calibration runs.

After the equipment/software has been installed and the operation stabilized, automatic operation takes place over an Ethernet network.

MON2020 is a Windows™-based program that allows you to maintain, operate, and troubleshoot a GC. Individual GC functions that can be initiated or controlled by MON2020 include, but are not limited to, the following:

- Valve activations
- Timing adjustments
- Stream sequences
- Calibrations
- Baseline runs
- Analyses
- Halt operation
- Stream/detector/heater assignments
- Stream/component table assignments
- Stream/calculation assignments
- Diagnostics
- Alarm and event processing
- Event sequence changes
- Component table adjustments
- Calculation adjustments
- Alarm parameters adjustments
- Analog scale adjustments
- Local operator interface (LOI) variable assignments (optional)

Reports and logs that can be produced, depending upon the GC application in use, include, but are not limited to, the following:

- Configuration report
- Parameter list
- Analysis chromatogram
- Chromatogram comparison
- Alarm log (unacknowledged and active alarms)
- Event log
- Various analysis reports

2.4 Theory of operation

Related information

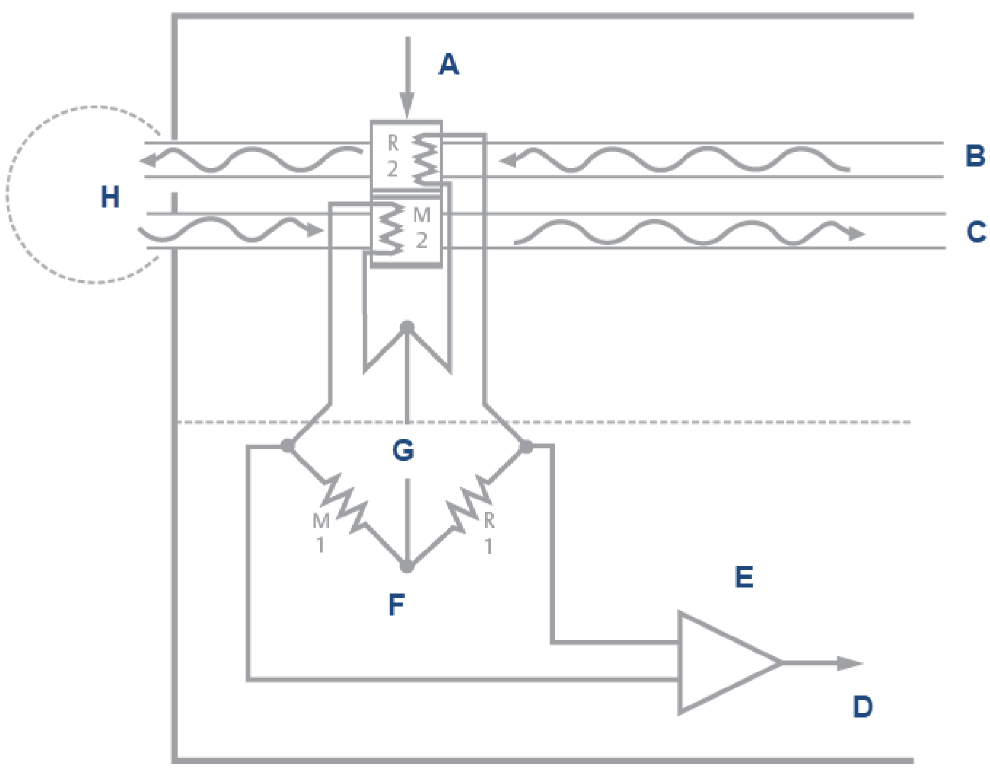
Glossary

2.4.1 Thermal conductivity detector (TCD)

One of the detectors available on the gas chromatograph (GC) is a TCD, which consists of a balanced bridge network with heat sensitive thermistors in each leg of the bridge. Each thermistor is enclosed in a separate chamber of the detector block.

One thermistor is designated the reference element, and the other thermistor is designated the measurement element. See Figure 2-2 for a schematic diagram of the TCD.

Figure 2-2: Analyzer assembly with TCD bridge



A. *Detector block (in heated oven section of analyzer)*
B. *Reference flow (carrier gas)*
C. *Measurement flow ("MV")*
D. *Signal out*
E. *Preamplifier (in analyzer electronics housing)*
F. *Detector bridge*
G. *DC power*
H. *Valves, columns, etc.*

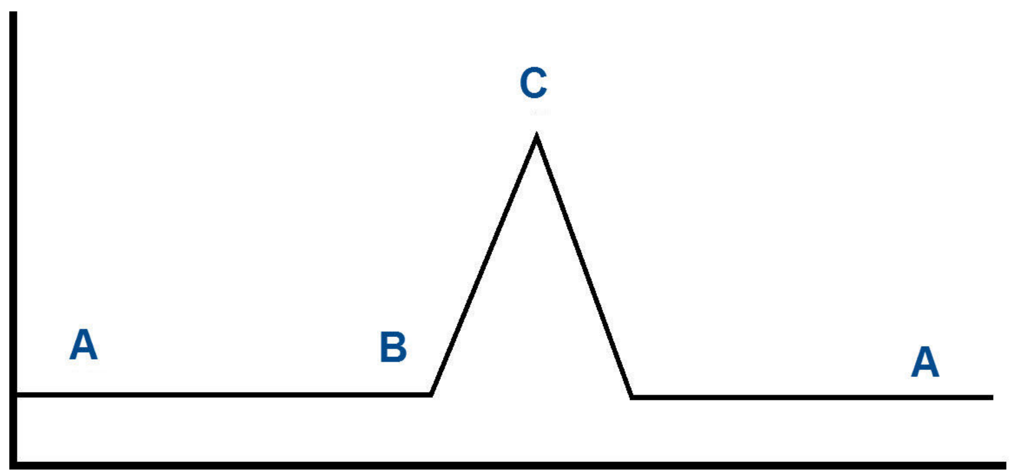
In the quiescent condition, prior to injecting a sample, both legs of the bridge are exposed to pure carrier gas. In this condition, the bridge is balanced, and the bridge output is electrically nulled.

The analysis begins when the sample valve injects a fixed volume of sample into the column. The continuous flow of carrier gas moves the sample through the column. As successive components elute from the column, the temperature of the measurement element changes.

The temperature change unbalances the bridge and produces an electrical output proportional to the component concentration.

The differential signal developed between the two thermistors is amplified by the preamplifier. Figure 2-3 illustrates the change in detector electrical output during elution of a component.

Figure 2-3: Detector output during component elution



A. Detector bridge balanced
B. Component begins to elute from column and is measured by thermistor.
C. Peak concentration of component

In addition to amplifying the differential signal developed between the two thermistors, the preamplifier supplies drive current to the detector bridge.

The signal is proportional to the concentration of a component detected in the gas sample. The preamplifier provides four different gain channels as well as compensation for baseline drift.

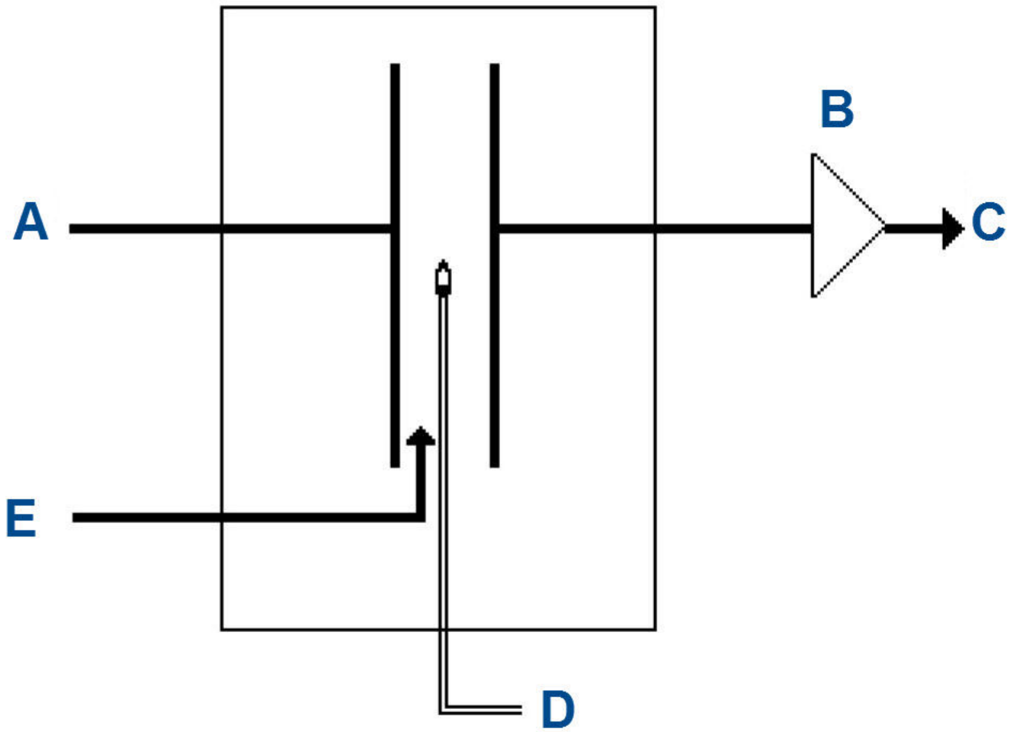
The signals from the preamplifier are sent to the electronic assembly for component concentration computation, recording, or viewing on a personal computer (PC) with Rosemount MON2020.

2.4.2 Flame ionization detector (FID)

Another detector available for the Rosemount 700XA is the flame ionization detector (FID).

The FID requires a polarization voltage, and its output is connected to the input with a high impedance amplifier that is called an electrometer. The burner uses a mixture of hydrogen and air to maintain the flame. The sample of gas to be measured is also injected into the burner. See Figure 2-4 for a schematic diagram of the FID.

Figure 2-4: Analyzer assembly with FID detector bridge



A. *Polarizing voltage*
B. *Electrometer*
C. *Signal out*
D. *Sample/hydrogen (H_2)*
E. *Air*

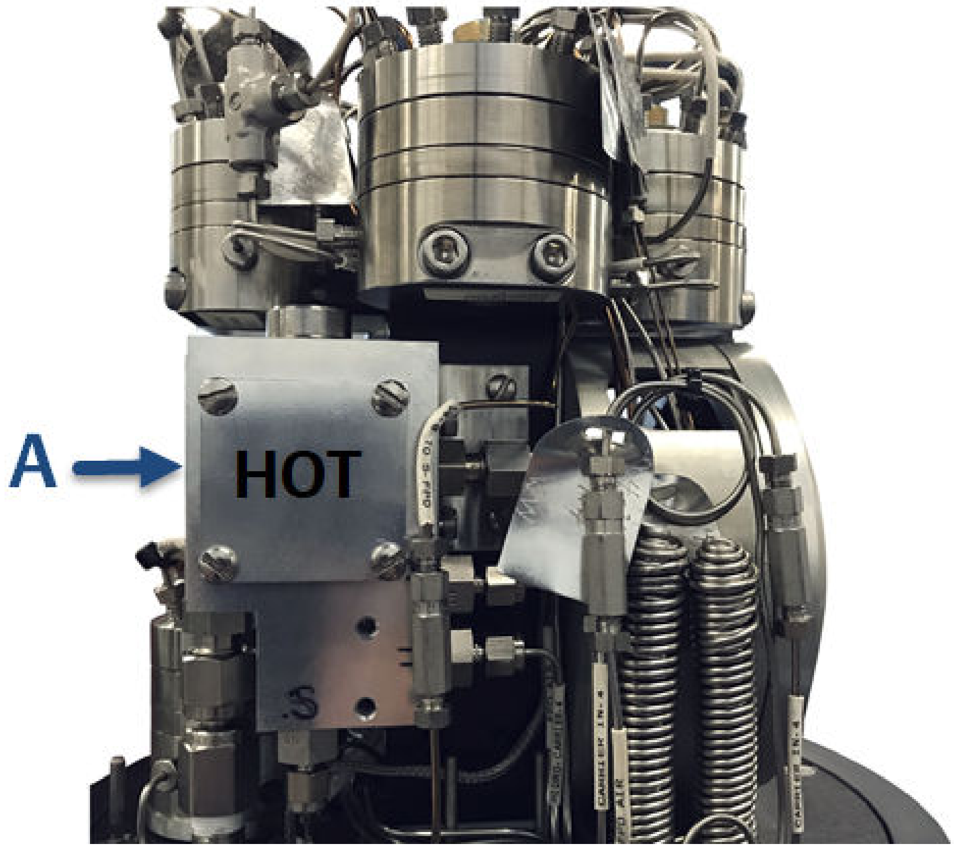
2.4.3 Micro flame photometric detector (µFPD) burner

The flame photometric detector (FPD) is a very sensitive and selective detector for the analysis of sulfur or organophosphorus containing compounds. The detector is very stable and easy to use.

As the analyte is burned in a hydrogen and air flame, a characteristic wavelength of light is emitted at 394 nm for sulfur. The emitted light is amplified by the photomultiplier tube (PMT) and processed by the signal processor. The response to phosphorus is linear, and the response to sulfur is quadratic.

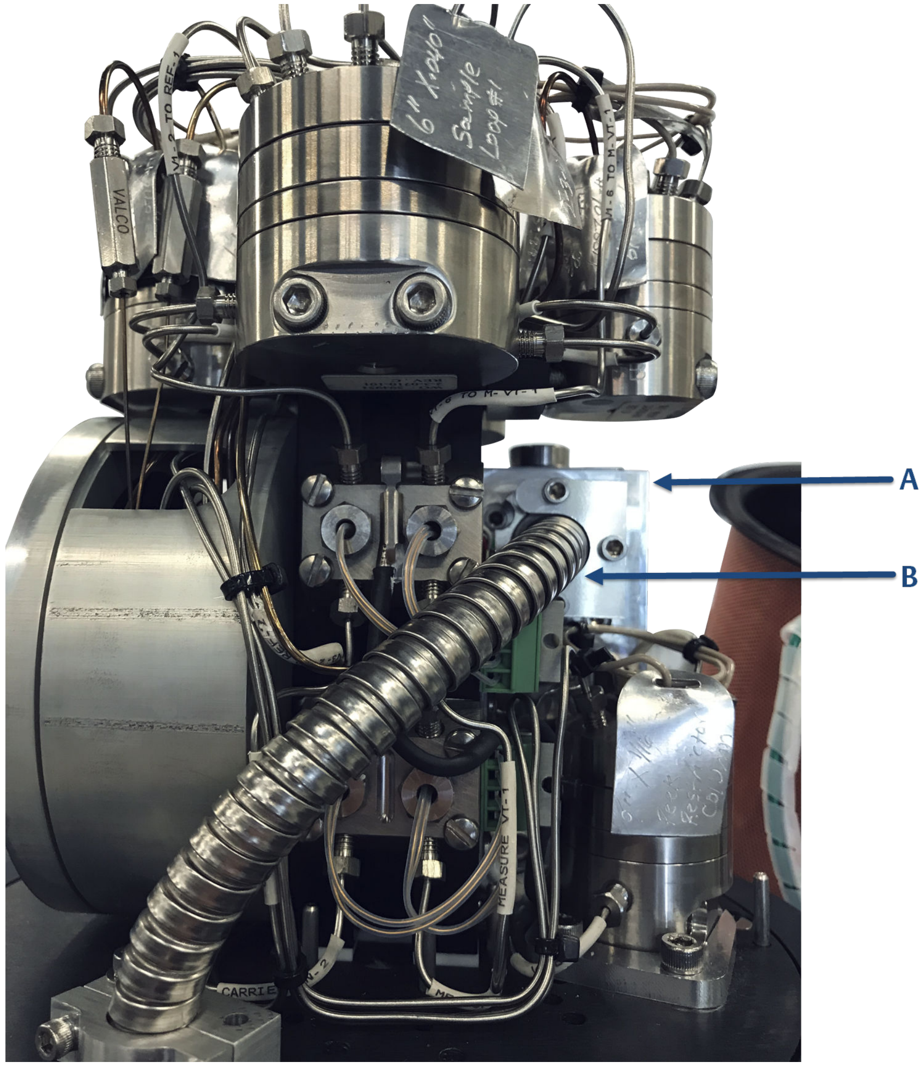
The Emerson µFPD solution consists of three key parts: burner, fiber cable, and PMT electronics. The hydrogen and air in the burner help to burn the sample containing sulfur components. The light emitted from the chemical reaction is then transmitted using the fiber cable from the oven assembly to the electronics module. The PMT electronics module consists of a 394 nm filter, a photomultiplier tube , and all the necessary electronics to digitize the signal. The digital signal is then transmitted to the main central processing unit (CPU) using CAN bus.

Figure 2-5: µFPD burner - front view



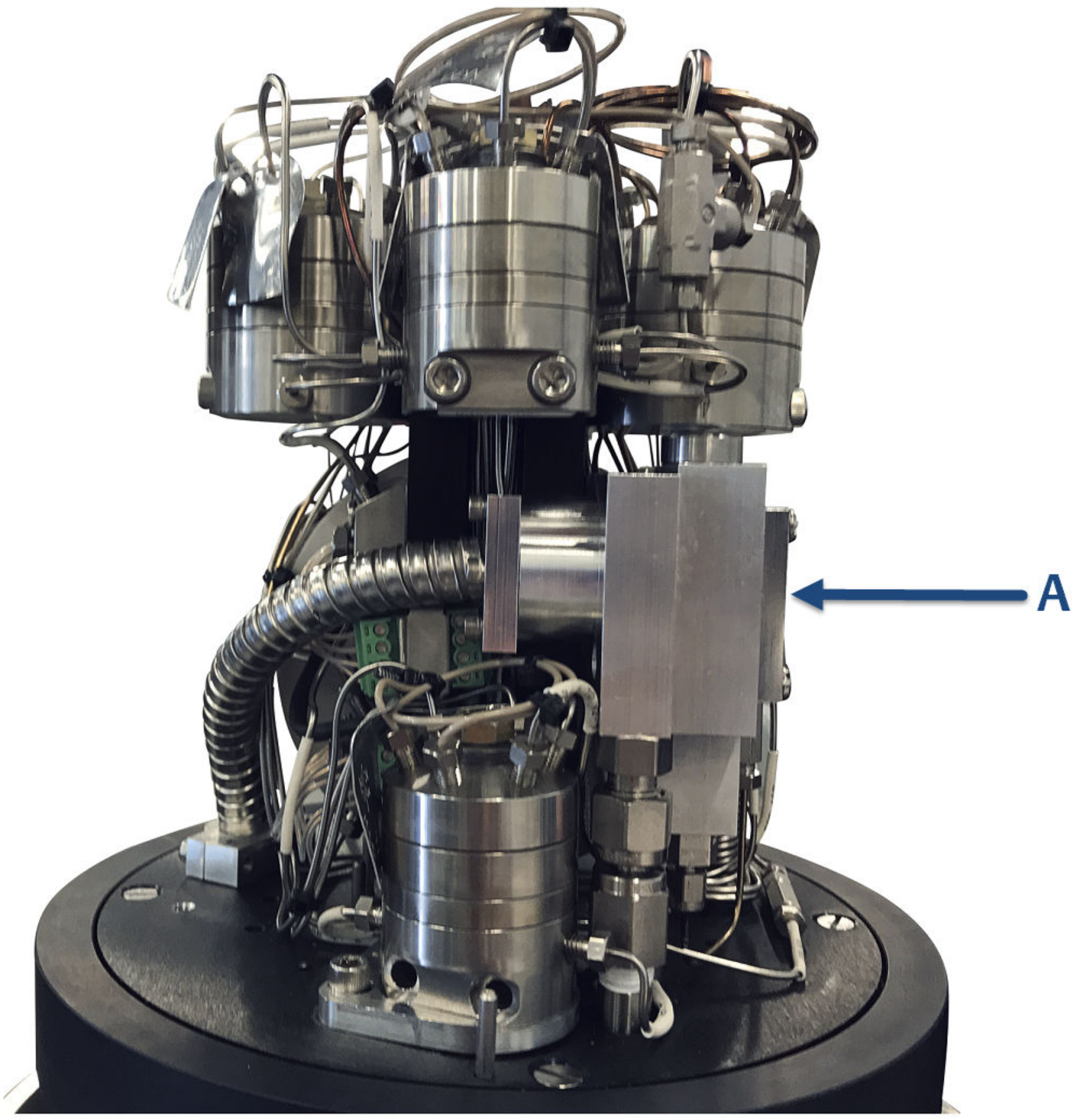
A. µFPD burner

Figure 2-6: µFPD burner - back view



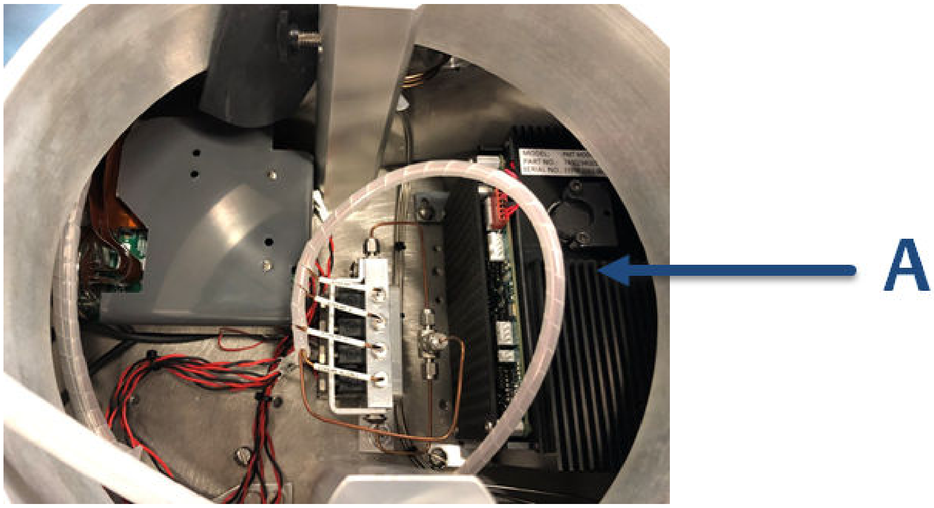
A. µFPD burner
B. Fiber cable

Figure 2-7: μFPD burner - side view



A. *μFPD burner and cable*

Figure 2-8: µFPD PMT



A. µFPD PMT in the upper enclosure

The detection system in the µFPD uses the reactions of sulfur components in a hydrogen/air flame as a source for analytical detection. The source of the µFPD's signal is derived from the light produced by an excited molecule created in the flame's combustion, that is, a photochemical process called chemiluminescence. A thermocouple is fitted to the flame cell to ensure that the flame is present. If the flame is not detected, the electrometer shuts off the hydrogen to the flame cell. It then supplies a voltage to the igniter, waits five seconds, and opens the hydrogen shut off valve. The electrometer will make between one and five ignition attempts if necessary. You can select the number of ignition attempts on the **Hardware** → **Detector** screen. If the electrometer does not succeed in igniting, then the gas chromatograph (GC) shuts off the hydrogen, triggers an alarm, and waits for attention from the operator.

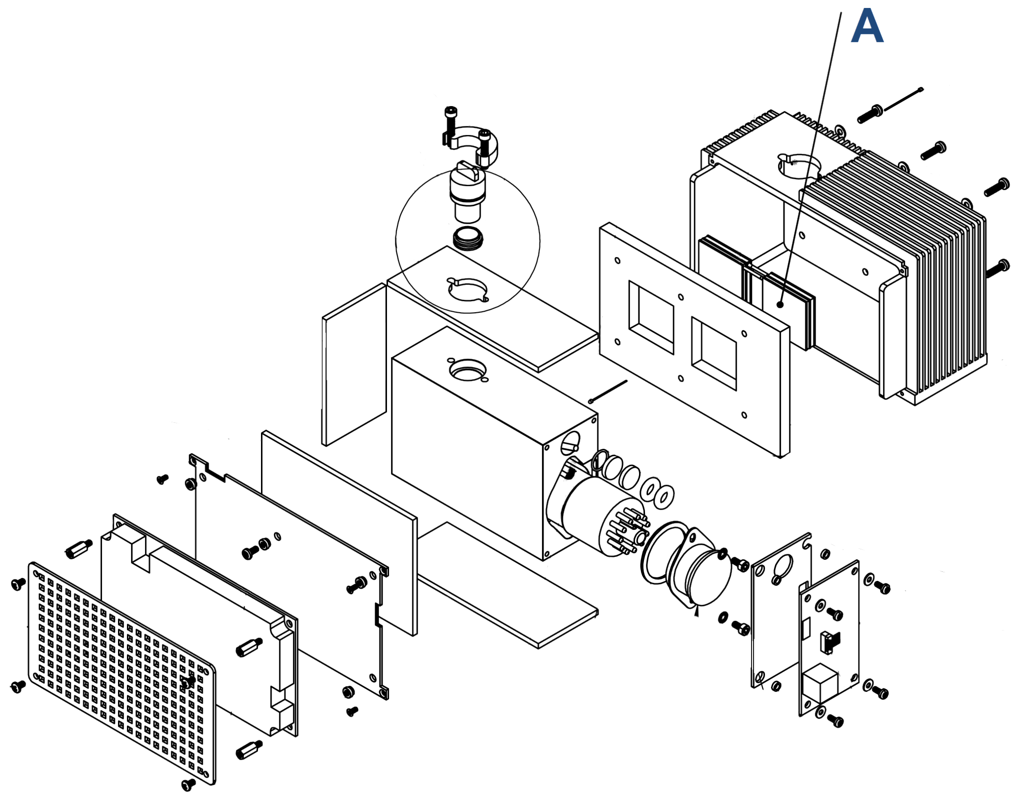
Related information

Micro flame photometric detector (µFPD)

2.4.4 Micro flame photometric detector (µFPD) electronics module

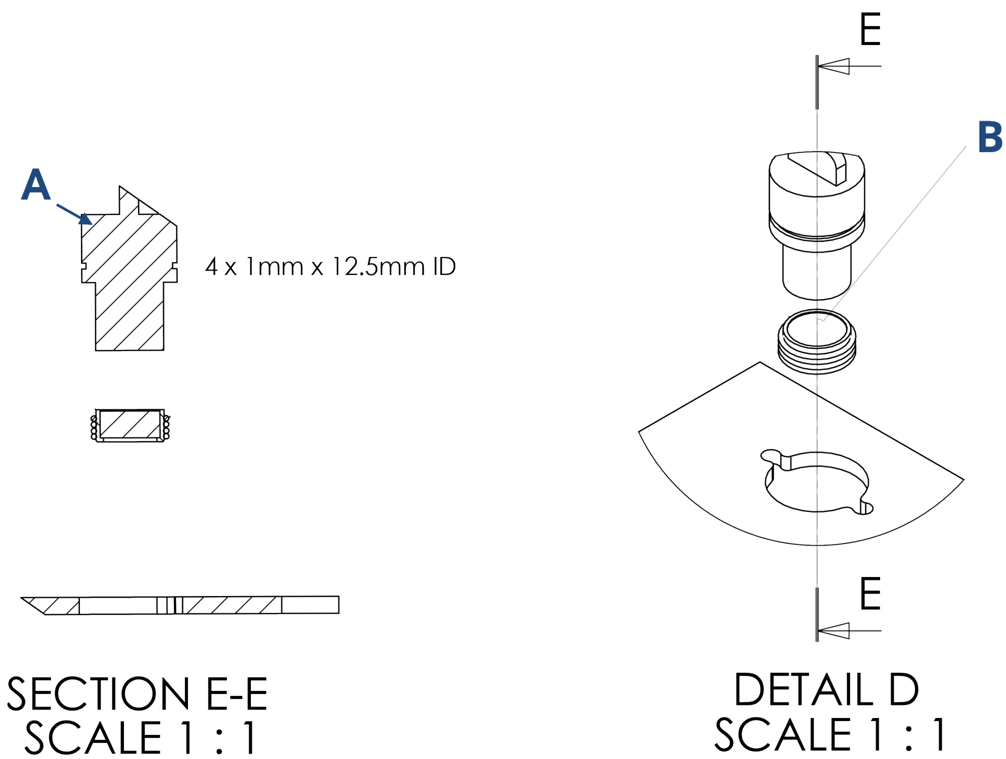
The electronics module contains two chambers. The internal chamber contains the photo multiplier tube (PMT) to insulate it from outside temperature changes. The external chamber is a thermo-electric cooler (TEC) controlled chamber, which houses the internal chamber along with the electronic board that generates high voltage power through the PMT.

Figure 2-9: Electronics module, exploded view



A. Apply thermal compound to both sides.

Figure 2-10: Electronics module, detailed



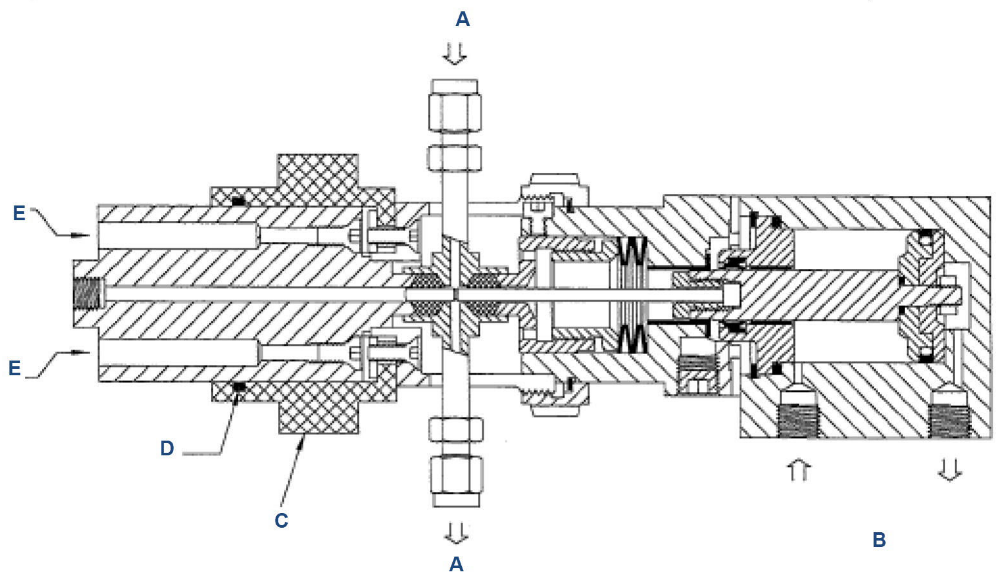
A. *Maier photonics filter*
B. *O-ring*

On the outside of the external chamber is the electronics main board. This board is the vital part of the µFPD electronics module. It controls the temperature of the TEC, provides power to the igniter, monitors the flame temperature, and digitizes the PMT signal and transmits to the main central processing unit (CPU) using CAN bus.

2.4.5 Liquid sample injection valve (LSIV)

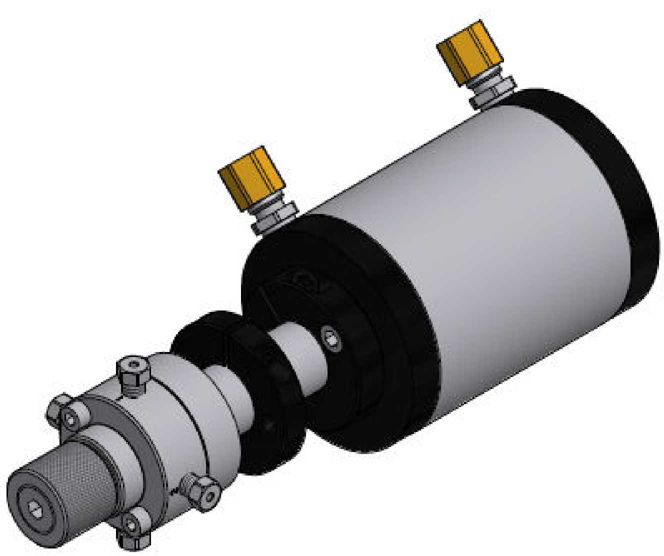
The optional LSIV converts a liquid sample into a gas sample for analysis.

Figure 2-11: LSIV cross section



A. *Liquid sample*
B. *Air supply: four-way action*
C. *Thermal barrier adapter flange: polyether ether ketone (PEEK)*
D. *O-ring*
E. *Heater element*

Figure 2-12: LSIV



The LSIV penetrates the wall of the lower compartment and is held in place by a retaining ring.

The mounting arrangement is designed to ensure integrity of the flameproof enclosure.

The flash chamber block is stainless steel and is surrounded by an insulating mounting adapter. It houses the heater and an RTD.

The next section houses sample input connections and stem sealing components. There are two ⅛-in. outer dimension (OD) tubing ports in this section; one port is for sample input, the other is the exhaust for sample flow.

The flash chamber components are within the enclosure cavity and surrounded with insulating covers. At working temperatures, the surfaces of these covers become very hot to the touch.

The tip of the cylindrical flash chamber is the port where the flashed sample is taken to the oven system. The port near the outer diameter of the end of the heated flash chamber block is the input for carrier gas.

2.4.6 Methanator

After all other components have been separated from the sample, carbon monoxide and carbon dioxide, which are normally present in quantities too small to be detected by the gas chromatograph (GC), can be sent through the optional methanator, where the two gases are combined with hydrogen to make methane in a heat-generated catalytic reaction.

The methanator is also known as a methanizer or catalytic converter.

2.4.7 Data acquisition

Every second, the controller assembly takes exactly 50 equally spaced data samples (one data sample every 20 milliseconds).

As a part of the data acquisition process, groups of incoming data samples are averaged together before the result is stored for processing. Non-overlapping groups of 50 samples are averaged and stored, and thus reduce the effective incoming data rate to 50/10 samples per second. For example, if N = 5, then a total of 40/5 or 8 (averaged) data samples are stored every second.

The value for the variable N is determined by the selection of a peak width parameter (PW). The relationship is

$N = PW$

where PW is given in seconds. Allowable values of N are 1 to 63; this range corresponds to PW values of 2 to 63 seconds.

The variable N is known as the integration factor. This term is used because N determines how many points are averaged, or integrated, to form a single value. The integration of data upon input, before storing, serves two purposes:

- The statistical noise on the input signal is reduced by the square root of N. In the case of N = 4, a noise reduction of 2 would be realized.
- The integration factor controls the bandwidth of the chromatograph signal. It is necessary to match the bandwidth of the input signal to that of the analysis algorithms in the controller assembly. This prevents small, short-duration perturbations from being recognized as true peaks by the program. It is therefore important to choose a peak width that corresponds to the narrowest peak in the group under consideration.

2.4.8 Peak detection

For normal area or peak height concentration evaluation, the determination of a peak's start point and end point is automatic.

The manual determination of start and end points is used only for area calculations in `Forced Integration` mode. Automatic determination of peak onset or start is initiated whenever **Integrate Inhibit** is turned off. Analysis is started in a region of signal quiescence and stability, such that the signal level and activity can be considered as baseline values.

Note
The controller assembly software assumes that a region of signal quiescence and stability will exist.

Having initiated a peak search by turning **Integrate Inhibit** off, the controller assembly performs a point by point examination of the signal slope. It does this by using a digital slope detection filter, a combination low pass filter and differentiator. The output is continually compared to a user-defined system constant called `Slope Sensitivity`. A default value of `8` is assumed if no entry is made. Lower values make peak onset detection more sensitive, and higher values make detection less sensitive. Higher values (20 to 100) would be appropriate for noisy signals, (such as high amplifier gain).

Onset is defined where the detector output exceeds the baseline constant, but peak termination is defined where the detector output is less than the same constant.

Sequences of fused peaks are also automatically handled. This is done by testing each termination point to see if the region immediately following it satisfies the criteria of a baseline. A baseline region must have a slope detector value less than the magnitude of the baseline constant for a number of sequential points. When a baseline region is found, this terminates a sequence of peaks.

A zero reference line for peak height and area determination is established by extending a line from the point of the onset of the peak sequence to the point of the termination. The values of these two points are found by averaging the four integrated points just prior to the onset point and just after the termination points, respectively.

The zero reference line will, in general, be non-horizontal, and thus compensates for any linear drift in the system from the time the peak sequence starts until it ends.

In a single peak situation, peak area is the area of the component peak between the curve and the zero reference line. The peak height is the distance from the zero reference line to the maximum point on the component curve. The value and location of the maximum point is determined from quadratic interpolation through the three highest points at the peak of the discrete value curve stored in the controller assembly.

For fused peak sequences, this interpolation technique is used both for peaks, as well as valleys (minimum points). In the latter case, lines are dropped from the interpolated valley points to the zero reference line to partition the fused peak areas into individual peaks.

The use of quadratic interpolation improves both area and height calculation accuracy and eliminates the effects of variations in the integration factor on these calculations.

For calibration, the controller assembly may average several analyses of the calibration stream.

2.4.9 Basic analysis computations

Two basic analysis algorithms are included in the controller assembly:

Area analysis	Calculates area under component peak.

Peak height analysis	Measures height of component peak.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Concentration analysis - response factor

Concentration calculations require a unique response factor for each component in an analysis. You can enter these response factors manually, or the system can automatically determine them through calibration procedures (with a calibration gas mixture that has known concentrations).

The response factor calculation, using the external standard, is:

$$ARF_n = \frac{Area_n}{Cal_n} \text{ or } HRF_n \frac{Ht_n}{Cal_n}$$

where

ARF_n Area response factor for component *n* in area per mole percent

$Area_n$ Area associated with component *n* in calibration gas

Cal_n Amount of component *n* in mole percent in calibration gas

Ht_n Peak height associated with component *n* mole percent in calibration gas

HRF_n Peak height response factor for component *n*

The controller assembly stores calculated response factors to use in the concentration calculations; these response factors are printed out in the configuration and calibration reports.

Average response factor is calculated as follows:

$$RFAVG_n = \frac{\sum_{i=1}^{k} RF_i}{k}$$

where

$RFAVG_n$ Area or height average response factor for component *n*

RF_i Area or height average response factor for component *n* from the calibration run

k Number of calibration runs used to calculate the response factors

The percent deviation of new *RF* averages from old *RF* average is calculated in the following manner:

$$deviation = \left[\frac{RF_{new} - RF_{old}}{RF_{old}} \times 100\right]$$

where the absolute value of percent deviation has been previously entered by the operator.

Concentration calculation - mole percentage (without normalization)

After response factors have been determined by the controller assembly or entered by the operator, component concentrations are determined for each analysis by using the following equations:

$$CONC_n = \frac{Area_n}{ARF_n} \text{ or } CONC_n = \frac{Ht_n}{HRF_n}$$

where:

ARF_n	Area response factor for component *n* in area per mole percent
$Area_n$	Area associated with component *n* in unknown sample
$CONC_n$	Concentration of component *n* in mole percent
Ht_n	Peak height associated with component *n* mole percent in unknown sample
HRF_n	Peak height response factor for component *n*

Component concentrations may also be input through analog inputs 1 to 4 or may be fixed. If a fixed value is used, the calibration for that component is the mole percent that will be used for all analyses.

Concentration calculation in mole percentage (with normalization)

The normalized concentration calculation is:

$$CONCN_n = \frac{CONC_n}{\sum_{i=1}^{k} CONC_i} \times 100$$

where:

$CONCN_n$	Normalized concentration of component *n* in percent of total gas concentration
$CONC_i$	Non-normalized concentration of component n in mole percent for each *k* component
$CONC_n$	Non-normalized concentration of component *n* in mole percent
k	Number of components to be included in the normalization

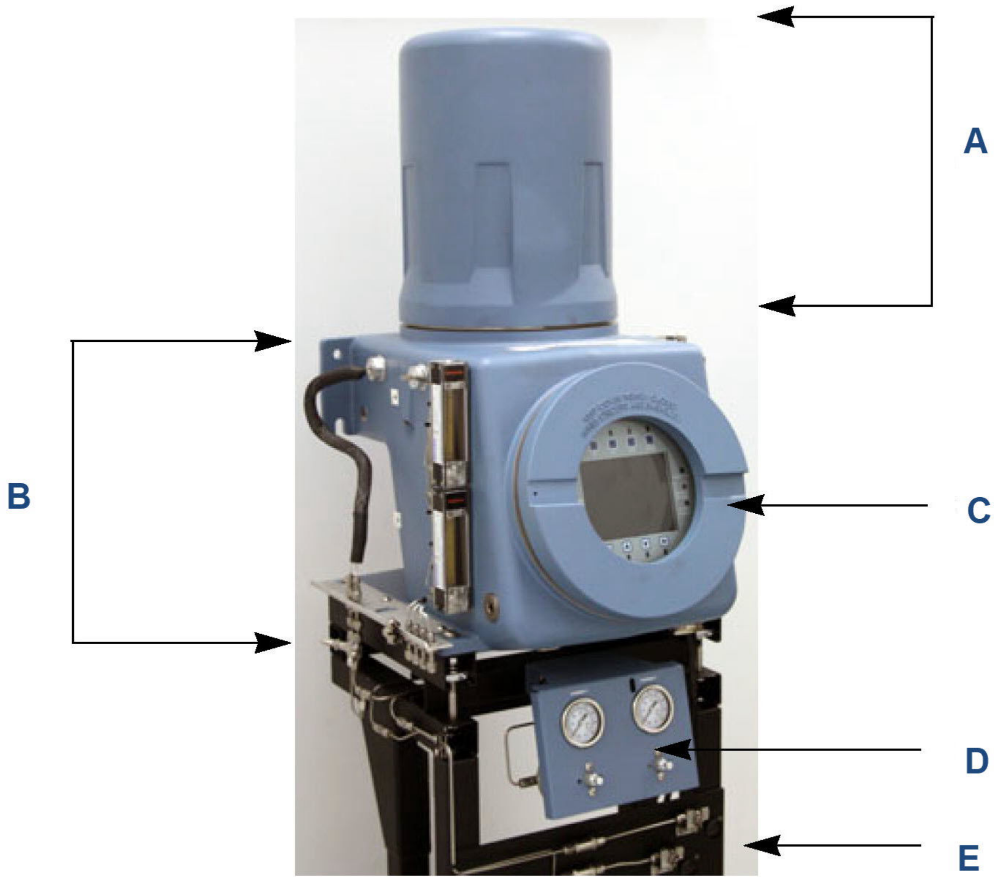
Note
The average concentration of each component will also be calculated when data averaging is requested.

3 Equipment description and specifications

3.1 Equipment description

The Rosemount 700XA consists of a copper-free aluminum explosionproof chamber and a front panel assembly. The chamber is divided into two compartments that together house the gas chromatograph's (GC's) major components. Emerson has designed this GC for hazardous locations.

Figure 3-1: Rosemount 700XA Gas Chromatograph



A. *Upper compartment*
B. *Lower compartment*
C. *Front panel assembly*
D. *Mechanical regulators*
E. *Sampling system (optional)*

3.1.1 Front panel assembly

The front panel assembly is located on the front section of the lower enclosure and consists of a removable, explosion-proof panel that shields either a switch panel or a local operator interface (LOI).

Figure 3-2: 8-stream switch panel (left) and 18-stream switch panel (right)

Switch panel

The switch panel contains a network of **On/Off** switches that allow you to manually control the gas chromatograph's (GC's) stream and analytical valves.

There are two types of switch panels: 8-stream and 18-stream. The 8-stream switch panel is the standard panel and is used when the GC has only one heater/solenoid board installed; if two heater/solenoid boards are installed, then the 18-stream switch panel is used.

Figure 3-3: Stream valve switches

A valve has the following three operational modes:

AUTO The valve turns on and off according to the ***Timed Events*** table (accessible through Rosemount MON2020). To set a valve to **AUTO** mode, set its switch on the switch panel to the **Up** position.

OFF The valve turns off and remains off until the operational mode is changed. To set a valve to **OFF** mode, set its switch on the switch panel to the **Center** position (the switch is neither flipped up nor down).

ON The valve turns on and remains on until the operational mode is changed. To set a valve to **ON** mode, set its switch on the switch panel to the **Down** position.

Figure 3-4: Status LEDs

Top of switch panel

The switch panels also contain the following status lights that allow you to monitor the GC's condition:

Working Turns green when the GC is in **Analysis** mode.

Unack. Alarm Turns yellow if there is an unacknowledged alarm.

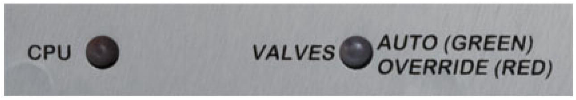
Active Alarm Turns red if there is an active alarm.

Flame ionization detector (FID)/flame photometric detector (FPD) The 18-stream switch panel contains an FID or FPD status LED that can indicate the following:

- A green light means the flame has ignited.
- A flashing yellow light means an attempt is being made to ignite the flame.
- A red light means the flame as gone out or that the FID or FPD is over-temperature.

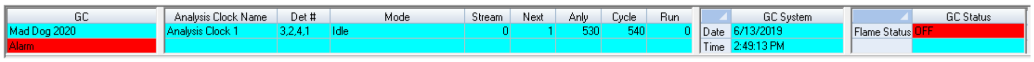
Figure 3-5: FID/FPD status LED

Figure 3-6: Status LEDs (bottom of switch panel)



MON2020 detects the FID and FPD statuses. You can ignite the flame manually or remotely using MON2020.

Figure 3-7: MON2020 status indicators



Note

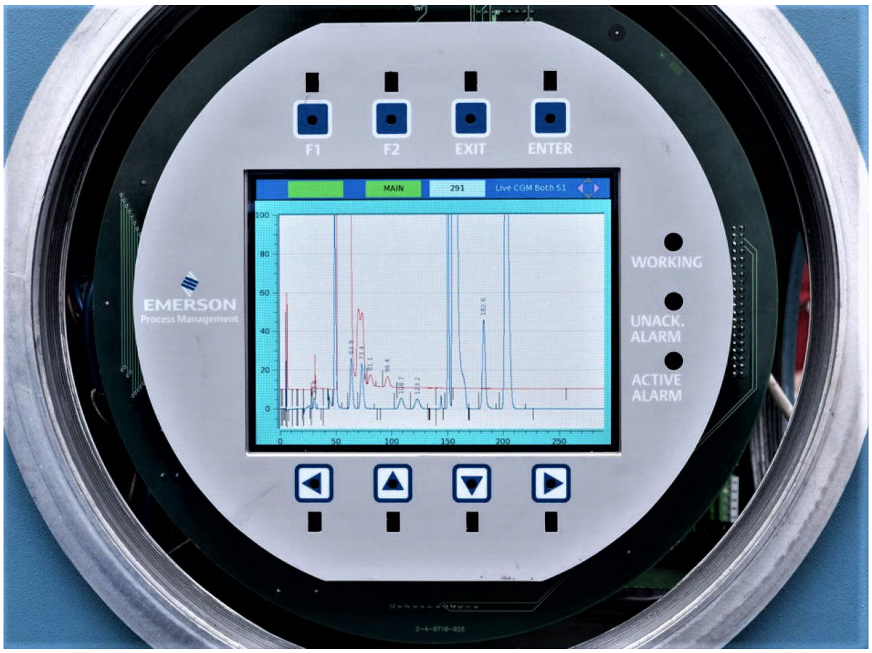
During GC start up, all LEDs turn on for approximately ten seconds.

Local operator interface (LOI)

The optional LOI gives you in-depth control over the functions of the gas chromatograph (GC).

The LOI has a high resolution color display that is touch key activated and allows you to operate the GC without a computer.

Figure 3-8: LOI



The LOI includes the following features:

- Color LCD display with VGA (640 x 480 pixels) resolution
- ASCII text and graphics modes
- Adjustable auto-backlighting
- Eight infrared-activated touch screen keys that eliminate the requirement for a magnetic pen
- Complete GC status, control, and diagnostics, including full chromatogram display

3.1.2 Upper compartment

The upper compartment contains the following components:

Valves	There are two types of XA valves: 6-port and 10-port. A gas chromatograph (GC) can have a maximum of six XA valves consisting of a maximum of four 10-port valves.
Column module	Either capillary or micro-packed.
Thermal conductivity detector (TCD)	The GC has a maximum of two TCDs as well as a micro flame photometric detector (μFPD) or a flame ionization detector (FID).
Two heating elements	A top hat heater and a column heater.
One temperature switch for each heating element	The switch turns off its heating element if the heating element reaches 320 °F (160 °C).
Pressure switch	The pressure switch activates when the carrier pressure falls below a predetermined set point. When activated, the switch triggers a general alarm that displays on the front panel or local operator interface (LOI) and in Rosemount MON2020.
Flame ionization detector (FID)	The optional FID detects trace levels of hydrocarbons.
Flame photometric detector (FPD)	The optional FPD, which detects trace levels of sulfur compounds, can be used in place of a TCD, installed as a side car component. For more information, refer to the FPD for Gas Chromatographs Hardware Reference Manual.
Micro flame photometric detector (μFPD)	The optional integral μFPD detects trace levels of sulfur compounds.
Methanator	The methanator, or catalytic converter, is an optional component that converts otherwise undetectable carbon dioxide and/or carbon monoxide into methane by adding hydrogen and heat to the sample.
Liquid sample injection valve (LSIV)	The optional LSIV can vaporize a liquid sample, thereby expanding the GC's capability to measure liquids.

Related information

Micro flame photometric detector (μFPD)

3.1.3 Lower compartment

The lower compartment consists of the following components:

Backplane

The backplane is the gas chromatograph's (GC's) central printed circuit board (PCB). Its main function is as a connection point for the GC's specialized plug-in PCBs. The backplane also hosts connections for analog outputs and analog inputs, serial ports, and an Ethernet port.

Card cage

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.

Keep cover tight while circuits are live.

Use cables or wires suitable for the marked **T** ratings.

Cover joints must be cleaned before replacing the cover.

Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

The card cage holds the specialized PCBs that plug into the backplane. The following PCBs are housed in the card cage:

- Preamplifier board
- Central processing unit (CPU) board
- Base input/output (I/O) board
- Heater/solenoid board

The card cage also has four additional slots for the following optional PCBs:

- A second preamplifier board
- A second heater/solenoid board
- Two optional communications boards

Optional AC/DC power supply

⚠ WARNING

Electric shock

Failure to check the power supply label may result in injury or death to personnel or cause damage to the equipment. Applying 110 to 220 Vac to a DC power input GC severely damages the GC.

See power supply label prior to connection.

Check the GC's power design to determine if it is equipped for AC or DC power.

Note

The Rosemount 700XA CSA-certified unit is equipped with ¾-in. NPT adapters.

3.1.4 Mechanical pressure regulators

The mechanical pressure regulators and gauges are used to set and monitor the pressure of the carrier gas flow through the gas chromatograph's columns, as well as the pressure of the flame ionization detector (FID) or flame photometric detector (FPD) air and fuel (H_2), if installed.

The regulators and gauges are typically located on front of the analyzer below the electronics enclosure.

Figure 3-9: Regulators and gauges

3.2 Specifications

Type	Specification
Dimensions (without sampling system)	Height x width x depth: 50 in. (12700 mm) x 40 in. (1016 mm) x 24 in. (610 mm)
Weight (without sampling system)	Approximately 150 lb. (68 kg)
Mounting	Wall mount (standard) Free-standing (optional)
Power usage	125 to 250 W
Valve actuation	Sample gas: 90 psig (6 barg) maximum Carrier gas: 90 psig (6 barg) maximum Actuation gas: 110 psig (8 barg) maximum
Environment Indoor/outdoor	Thermal conductivity detector (TCD): -4 to +140 °F (-20 to +60 °C) Flame ionization detector (FID): +32 to +140 °F (0 to +60 °C) Flame photometric detector (FPD): +32 to +122 °F (0 to +50 °C)
Hazardous area certifications (hardware dependent)	**USA and Canada** Class I, Zone 1, Ex/AEx db IIC, Gb T6/T4/T3 Class I, Division 1, Groups B, C, and D, IP66 **EU ATEX and IECEx** Ex db IIC Gb T6/T4/T3 Ta = -4 to +140 °F (-20 to +60 °C) SIRA 08ATEX 1328X IECEx SIR 08.0093X **UKCA** CSAE 23UKEX1077X

Consult factory for additional product certifications available.

Table 3-1: Approval temperature ratings

T6	Basic system; no alternative options included
T4	Liquid sample injection valve (LSIV) option included
T4	Heat trace option with a maximum +176 °F (+80 °C) temperature switch set point
T3	Heat trace option with a maximum +230 °F (+110 °C) temperature switch set point

3.2.1 Electronics hardware

Type	Specifications
Communication (standard)	• Analog inputs: — Two standard 4-20 mA inputs filtered with transient protection • Analog outputs: — Six isolated outputs, 4–20 mA • Serial communication ports: — Three termination blocks — Configurable as RS-232, RS-422, or RS-485 — One D-sub (9-pin) port for personal computer (PC) connection • Digital inputs: — Five inputs, user assignable — Optically isolated, rated to 30 Vdc at 0.5 A • Digital outputs: — Five outputs, user assignable — Form C and electro-mechanically isolated, 24 Vdc
Communication (optional)	Four expansion slots available for additional communications. Each slot has the capacity to add one of the following: • Four analog inputs (isolated) card • Four analog outputs (isolated) card • Eight digital inputs (isolated) card • Five digital outputs (isolated) card • One RS-232, RS-422, or RS-485 serial connection card (up to two maximum)
Ethernet	Two available connections • One RJ45 port • One 4-wire termination – with 10/100 Mbps

3.2.2 Airless analytical oven

Type	Specification
Valves	6-port and 10-port XA valves; piston-operated diaphragms with pneumatic actuation
Columns	Maximum of 90 ft. (27 m) of micro-packed columns; 1/16-in. outside diameter or 300 ft. (91 m) of capillary columns
Solenoid actuation	24 Vdc Maximum 100 psig (7 barg)
Temperature control	24 Vdc 2 heaters 2 optional heaters Maximum oven operating temperature of +302 °F (+150 °C)

3.2.3 Software

Type	Specification
Software	Windows™-based Rosemount MON2020
Firmware	Embedded firmware
Methods	8 ***Timed Event*** tables and 8 ***Component Data*** tables
Analysis clocks	Multiple analysis clock configurations
Peak integration	Fixed time or auto slope and peak identification Update retention time upon calibration or during analysis
Cyber security	Encrypted SSL communication between gas chromatograph (GC) and MON2020

3.2.4 Corrosion protection

Type	Specification
Enclosure material	Copper-free and aluminum-coated with industrial grade powder coat suitable for high humidity and salt-laden environments.
Process wetted materials	Stainless steel; if the function of an item excludes the use of stainless steel, such as the glass rotameter tubes, materials that are resistant to corrosion are used.
Electronics	All electronic circuit boards are covered with a clear conformal coating.

3.2.5 Archived data storage capabilities

Type of record	Number of records	Remarks
Analysis results	31,744	88 days with 4-minute cycle time
Final calibration results	370	1 year
Calibration results	100	N/A
Final validation results	370	1 year
Validation results	100	N/A
Analysis chromatograms	8,515(1)	Approximately 22.5 days assuming running 4-minute analysis and 1 analysis clock

Type of record	Number of records	Remarks
Final calibration chromatograms	370	1 year(2)
Final validation chromatograms	370	1 year(2)
Protected chromatograms	100	User-selectable
Hourly averages(3)	250(1)	Approximately 9 days, assuming 4-minute cycle time
Daily averages	365	1 year
Weekly averages	58	1 year
Monthly averages	12	1 year
Variable averages	250(1)	N/A
Every run (up to 250 variables)	250(1)	N/A
Alarm logs	1000	N/A
Event logs	1000	N/A

(1) *Changed from 2.0.x release.*
(2) *The gas chromatograph (GC) can store final calibration and validation chromatograms for a year, provided that no more than one calibration/validation is run per day and the cycle time is less than 15 minutes. If the cycle time exceeds 15 minutes, the oldest final calibration/validation chromatograms are deleted to make room for newer ones.*
(3) *You can have a total of 256 averages, including hourly, 24-hour, weekly, monthly, variable, and every run averages.*

4 Getting started

Emerson started and inspected your gas chromatograph (GC) before it left the factory. Emerson also installed program parameters and documented them in the ***GC Config Report*** furnished with your GC.

4.1 Select site

The site you select for the gas chromatograph (GC) is important for measurement accuracy.

Procedure

Install the GC as close as possible to the sample system, but allow for adequate access space for maintenance tasks and adjustments.

⚠ WARNING

Hazardous area explosion hazard

Failure to follow this warning may result in injury or death to personnel.

Do not use a personal computer (PC) or printer in a hazardous area.

Emerson provides serial and Ethernet communication links to connect the analyzer to the PC and to connect to other computers and printers in a safe area.

Allow a minimum of 3 ft. (0.9 m) in front of the GC for operator access. Ensure that exposure to radio frequency interference (RFI) is minimal.

4.2 Unpack the gas chromatograph (GC)

Unpack and inspect the Rosemount 700XA upon receipt.

⚠ WARNING

This device is heavy equipment. Two people are required to move the device.

Failure to observe this warning may cause serious injury to personnel.

Observe all proper lifting methods as defined by your site operating procedures.

Procedure

1. Unpack the equipment.
    a) Remove the GC from the shipping crate.
    b) Remove the USB memory stick containing the software, applications, quick start guides, and manuals.

    Note
    The Rosemount MON2020 version number is located on the back of the USB card.

2. Retain the shipping information.
3. Inspect all parts and assemblies for possible shipping damage.

4. If any parts or assemblies appear to have been damaged in shipment, first file a claim with the carrier.
5. Next, complete a full report describing the nature and extent of the damage and forward this report immediately to your Emerson Customer Care representative.

   Include the GC's model number in the report.

   Emerson will provide disposition instructions as soon as possible. If you have any questions regarding the claim process, contact your Emerson Customer Care representative for assistance.
6. Only proceed to install and start up the GC if all required materials are on hand and free from obvious defects.
7. If your GC is configured with an flame ionization detector (FID) or flame photometric detector (FPD), remove the vent plug from the FID/FPD outlet.

NOTICE

The vent plug has a tag attached to it that reads: *REMOVE VENT PLUGS PRIOR TO OPERATION.* Failure to remove the cap could result in a performance failure or damage to the detector.

4.3 Required tools and components

You will need the following tools and components to install the gas chromatograph (GC).

- Zero grade carrier gas:
  - 99.995% pure
  - Less than 5 ppm water
  - Less than 0.5 ppm hydrocarbons
- High pressure dual-stage regulator for the carrier gas cylinder
  - High side up to 3000 psig (207 barg)
  - Gauge (psig)
  - Low side capable of controlling pressure up to 150 psig (10 barg)
- Calibration standard gas with correct number of components and concentrations
- Dual-stage regulator for the calibration gas cylinder with a low pressure side capable of controlling pressure up to 30 psig (2 barg)
- Sample probe regulator (fixture for procuring the stream or sample gas for chromatographic analysis)
- Coalescing filter
- Membrane filter
- ⅛-in. stainless steel tubing
  - For connecting calibration gas to the GC
  - For connecting carrier gas to the GC
  - For connecting stream gas to the GC
  - Sulfinert tubing required if sulfur components are present in calibration gas
- Heat tracing, as required for sample transport and calibration lines

- Miscellaneous tube fittings, tubing benders, and tubing cutter
- 14 American wire gauge (AWG) (18 metric wire gauge [MWG]) or larger electrical wiring and conduit to provide 120 or 240 Vac, single phase, 50 to 60 Hz, from an appropriate circuit breaker and power disconnect switch.
- Digital volt-ohm meter with probe-type leads
- Flow measuring device
- Open-end wrenches sized:
  - ¼-in.
  - 5/16-in.
  - 7/16-in.
  - ½-in.
  - 9/16-in.
  - ⅝-in.
- Torque wrench

Related information

Gas chromatograph wiring

4.4 Supporting tools and components

⚠ WARNING

Hazardous area explosion hazard

Failure to follow this warning may result in injury or death to personnel.

Do not use a personal computer (PC) or printer in a hazardous area.

Emerson provides serial and Ethernet communication links to connect the analyzer to the PC and to connect to other computers and printers in a safe area.

- Use a Windows™-based PC and either a direct or remote communications connection to interface with the gas chromatograph (GC).

  Note
  Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

- The GC comes with an Ethernet port on the backplane factory-wired with an RJ-45 connector.

Related information

Connect directly to a personal computer (PC) using the gas chromatograph's (GC’s) Ethernet1 port

5 Installation and start-up

Note
Because the Rosemount 700XA is available in different configurations, it is possible that not all of the instructions in this section apply to your particular gas chromatograph (GC). In most cases, however, to install and set up a 700XA, Emerson recommends that you follow the instructions in the same order as they are presented in this manual.

5.1 Installation considerations

Before installing the gas chromatograph (GC):

1. **⚠ WARNING**

   The GC is heavy and has a high potential of injuring personnel or damaging equipment.

   Anchor the GC solidly before making electrical connections.
   Until all bolts are tight, ensure that the GC is supported to prevent unforeseen accidents.

2. Ensure that the connections to the enclosure meet local standards.
3. Use approved seals: either cable glands or conduit seals.
   a. Install conduit seals within 3 in. (76 mm) of the enclosure.
   b. Seal unused openings with approved blanks (plugs). Threads for these openings are M32 x 1.5.
4. Remove any packing materials before powering up the GC.
5. **⚠ WARNING**

   Hazardous area explosion hazard

   Failure to follow this warning may result in injury or death to personnel.

   Do not use a personal computer (PC) or printer in a hazardous area.
   Emerson provides serial and Ethernet communication links to connect the analyzer to the PC and to connect to other computers and printers in a safe area.

Related information

Mounting arrangements

5.2 Mounting arrangements

The Rosemount 700XA can be installed in one of the following mounting arrangements:

- Wall mount
- Pole mount
- Floor mount

⚠ WARNING

This device is heavy equipment. Two people are required to move the device.

Failure to observe this warning may cause serious injury to personnel.

Observe all proper lifting methods as defined by your site operating procedures.

5.2.1 Mount the gas chromatograph (GC) to the wall

The simplest mounting arrangement is the wall mount.

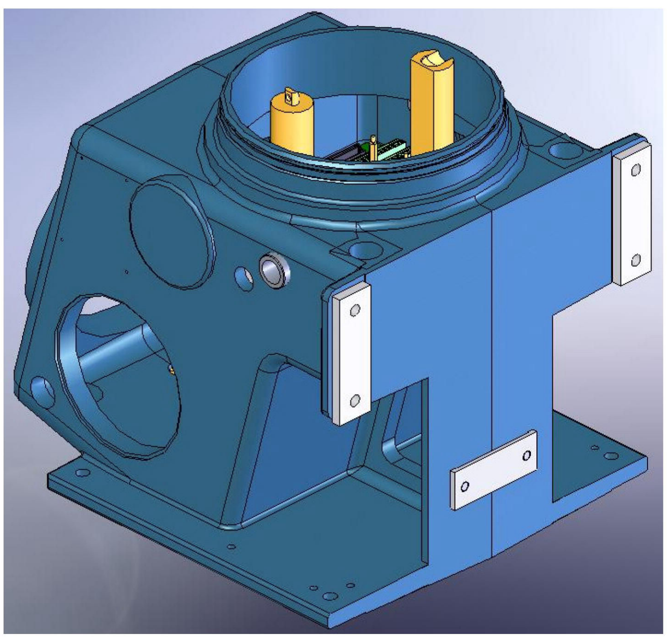
If you specify *Wall Mount* on the sales order, Emerson will ship the GC with a wall mount installation kit. Four locations on the mounting ears are available for support.

⚠ WARNING

The GC is heavy and has a high potential of injuring personnel or damaging equipment.

- Anchor the GC solidly before making electrical connections.
- Until all bolts are tight, ensure that the GC is supported to prevent unforeseen accidents.

Figure 5-1: Wall mount



Prerequisites

Pre-install a pair of 7/16-in diameter bolts with washers on the wall before installing the final pair of bolts.

The first pair of bolts should be approximately 41.63 in. (1057 mm) off the ground, and 13.63 in. (346 mm) apart. Each bolt should have 0.63 in. (16 mm) of bare length projecting. Drill a second pair of holes 3.56 in. (90.4 mm) above the first.

Procedure

1. Maneuver the GC so that the notches in the mounting ears can be placed over the bolts on the wall and then place the washers over the bolts.
2. Install the second pair of bolts with washers and then tighten all the bolts.

5.2.2 Mount the gas chromatograph (GC) to a pole

The pole mount arrangement uses an additional plate and spacers to allow the necessary clearance for nuts.

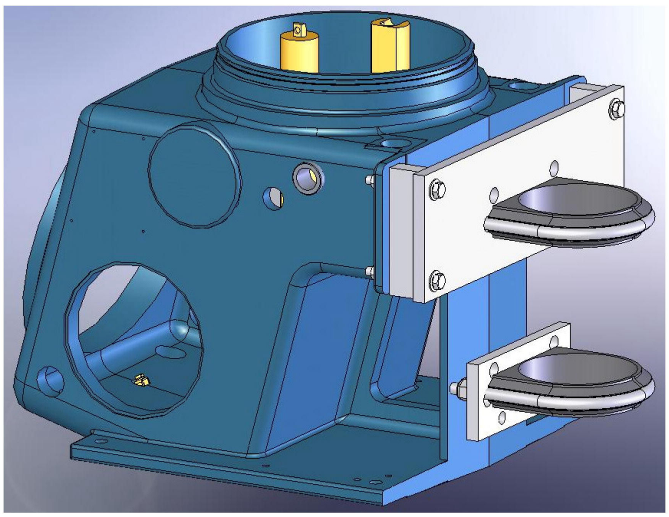
If you specify *Pole Mount* on the sales order, Emerson will provide the necessary hardware.

⚠ WARNING

The GC is heavy and has a high potential of injuring personnel or damaging equipment.

Anchor the GC solidly before making electrical connections.
Until all bolts are tight, ensure that the GC is supported to prevent unforeseen accidents.

Figure 5-2: Pole mount



Procedure

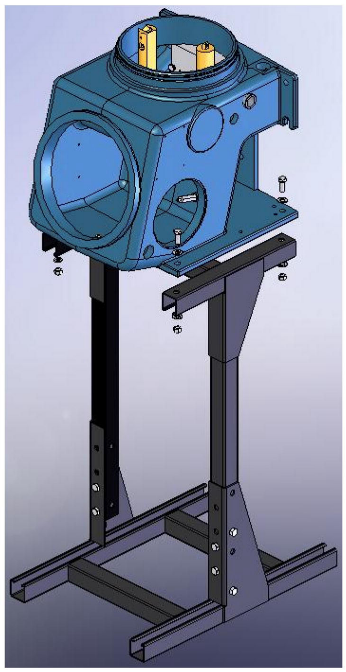
1. Use the U-bolt to firmly install the large plate on the pole about 44 in. (1118 mm) above the ground.
2. Install the long bolts and spacers.
3. Place nuts and washers on the lower bolts.
4. Install the small plate just tightly enough to hold its position, with the small plate's U-bolt about 6.88 in. (174. 8 mm) below the large plate's U-bolt.
5. Hold the matching spacer in place with the bolts installed loosely.
6. Orient the GC so that the notches in the mounting ears can be placed over the lower bolts on the plate and then add the washers and nuts.
7. Place the nuts with washers on the upper bolts and then tighten all bolts.
8. Adjust the lower bracket to align the bolts with the plate. Tighten the bolts.

5.2.3 Mount the gas chromatograph (GC) on the floor

If you specify *Floor Mount* in the sales order, Emerson sends the floor mounting arrangement pre-assembled with the GC.

The arrangement includes an additional support stand that is intended to be anchored to a floor or an instrument pad. The base rails have holes that are 13⅝ in. (346 mm) apart, side to side, and 16¾ in. (425.4 mm) apart front to back. The holes are ½ in. (13 mm) in diameter and will accept up to 7/16 in. (11 mm) bolts.

Figure 5-3: GC mounted on floor



5.3 Gas chromatograph wiring

5.3.1 Wiring precautions

- All wiring, as well as circuit breaker or power disconnect switch locations, must conform to the Canadian Electrical Code (CEC) or National Electrical Code (NEC); all local, state, or other jurisdictions; and company standards and practices.
- Provide single-phase, three-wire power at 115 or 220 Vac, 50-60 Hz.

Note
If you do not have a single phase, three-wire AC power source, you must purchase an isolation transformer.

- Locate a power shut-off or disconnect switch in a safe area.
- Provide the gas chromatograph (GC) and any optionally installed devices with one 20-amp circuit breaker for protection.

Note
15 amps is the maximum current for 14 American Wire Gauge (AWG).

- Ensure that the 24 Vdc input power is compliant with the separated extra-low voltage (SELV) standard by suitable electrical separation from other circuits.
- Use multi-stranded copper conductor wire according to the following recommendations:
  — For power feed distances up to 250 ft. (76 m), use 14 AWG (18 metric wire gauge [MWG]), stranded.
  — For power feed distances 250 ft. (76 m) to 500 ft. (152 m), use 12 AWG (25 MWG), stranded.
  — For power feed distances 500 ft. (152 m) to 1000 ft. (305 m), use 10 AWG (30 MWG), stranded.

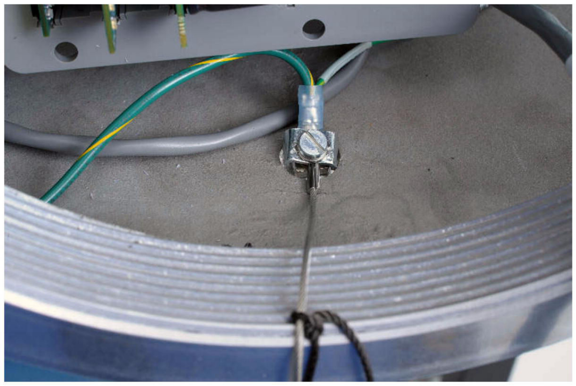
5.3.2 Signal wiring

Follow these general precautions for field wiring digital and analog input/output (I/O) lines:

- For shielded signal conducting cables, shield-drain wires must not be more than two American Wire Gauge (AWG) sizes smaller than the conductors for the cable. Shielding is grounded at only one end.
- Metal conduit or cable (according to local code) used for process signal wiring must be grounded at conduit support points, because intermittent grounding helps prevent the induction of magnetic loops between the conduit and cable shielding.
- A single-point ground must be connected to a copper-clad, 10-ft. (3 m) long, ¾-in. (19 mm) diameter steel rod, which is buried, full-length, vertically into the soil as close to the equipment as is practical.

Note
Emerson does not provide the grounding rod.

Figure 5-4: Interior ground lug, lower enclosure



- Resistance between the copper-clad steel ground rod and the earth ground must not exceed 25 Ohms.
- On ATEX-certified units, the external ground lug 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.
- The equipment-grounding conductors used between the gas chromatograph (GC) and the copper-clad steel ground rod must be sized according to your local regulations; the following specifications apply in the US.

Length	Wire
15 ft. (4.6 m) or less	8 AWG, stranded, insulated copper
15 ft. (4.6 m) to 30 ft. (9.1 m)	6 AWG, stranded, insulated copper
30 ft. (9.1 m) to 100 ft. (30.5 m)	4 AWG, stranded, insulated copper

- All interior enclosure equipment-grounding conductors must be protected by metal conduit.
- External equipment that is connected to the GC should be powered via isolation transformers to minimize the ground loops caused by the internally shared safety and chassis grounds.
- All process signal wiring should be of a single, continuous length between field devices and the GC. If, however, the length of the conduit runs require that multiple wiring pulls be made, the individual conductors must be interconnected with suitable terminal blocks.
- Use suitable lubrication for wire pulls in conduit to prevent wire stress.
- Use separate conduits for AC voltage and DC voltage circuits.
- Do not place digital or analog I/O lines in the same conduit as AC power circuits.
- Use only shielded cable for digital I/O line connections.
  — Ground the shield at only one end.
  — Shield-drain wires must not be more than two AWG sizes smaller than the conductors for the cable.
- When inductive loads (relay coils) are driven by digital output lines, the inductive transients must be diode-clamped directly at the coil.

- Any auxiliary equipment wired to the GC must have its signal common isolated from earth/chassis ground.

NOTICE

Signal interference
If you don't follow this precaution, the data and control signals to and from the GC could be adversely affected.

Do not place any loop of extra cable left for service purposes inside the GC purged housing near the conduit entry for AC power.

5.3.3 Electrical conduit installation precautions

- Conduit cutoffs must be cut at a 90-degree angle. Cut conduits with a cold cutting tool, hacksaw, or by some other approved means that does not deform the conduit ends or leave sharp edges.
- Coat all conduit fitting-threads, including factory-cut threads, with a metal-bearing conducting grease prior to assembly.
- Temporarily cap the ends of all conduit runs immediately after installation to prevent accumulation of water, dirt, or other contaminants. If necessary, swab out conduits prior to installing the conductors.
- Install drain fittings at the lowest point in the conduit run; install seals at the point of entry to the gas chromatograph (GC) to prevent vapor passage and accumulation of moisture.
- Use liquid-tight conduit fittings for conduits exposed to moisture.

When a conduit is installed in hazardous areas, follow these general precautions for conduit installation:

- All conduit runs must have a fitting, which contains explosionproof sealing (potting) located within 3 in. (76 mm) from the conduit entrance to the explosionproof housing. The seal should have a minimum ingress protection (IP) rating of IP54 or equivalent NEMA®/Type rating on the conduit sealing devices.
- The conduit installation must be vapor tight, with threaded hub fittings, sealed conduit joints and gaskets on covers, or other approved vapor-tight conduit fittings.

⚠ WARNING

Failure to observe precautionary signs may result in serious injury or death to personnel.

Observe all precautionary signs posted on the certified explosionproof equipment. Consult your company's polices and procedures and other applicable documents to determine wiring and installation practices that are appropriate for hazardous areas.

5.3.4 Sample system requirements

Line length	If possible, avoid long sample lines. In long flow sample lines, velocity can be increased by decreasing downstream pressure and using bypass flow via a fast loop. **Note** Stream switching requires a sample pressure of 20 psig (1.4 barg).

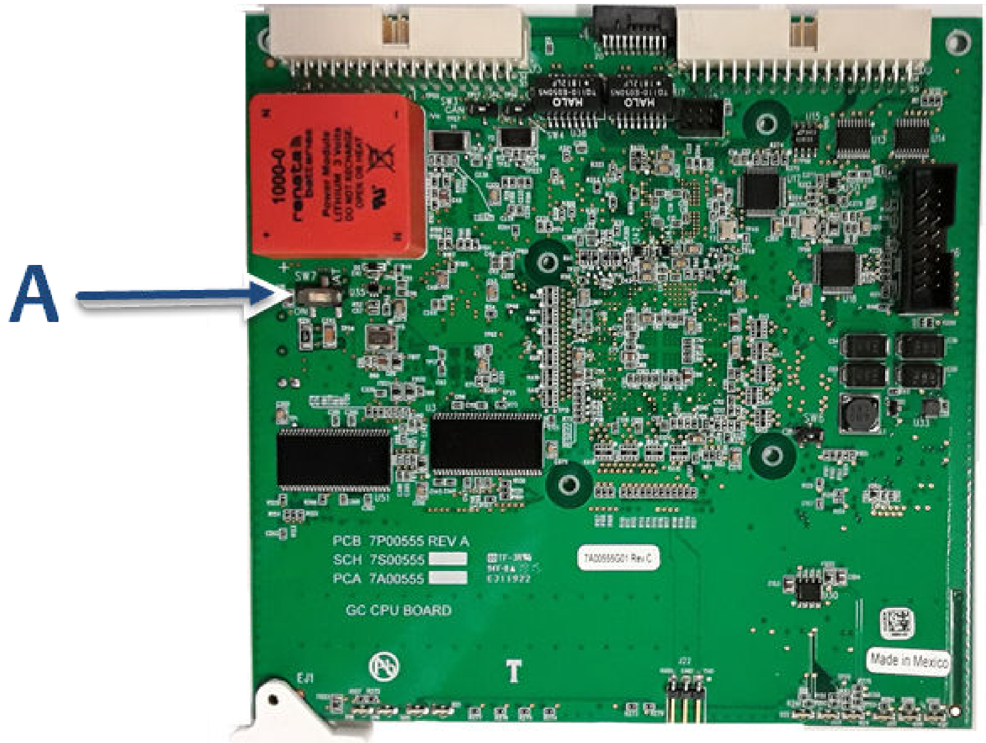
Sample line tubing material	Use sulfur-inert tubing for H_2S streams; for all other applications, use stainless steel tubing. Ensure tubing is clean and free of grease.
Dryers and filters	Use small sizes to minimize time lag and prevent back diffusion. Install a minimum of one filter to remove solid particles. Most applications require fine-element filters upstream of the gas chromatograph (GC). The GC 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. Parts should be rated for sample pressure and temperature.
Pipe threads and dressings	Use PTFE tape. Do not use pipe thread compounds or pipe dope.
Valving	Install a block valve downstream of sample takeoff point for maintenance and shutdown. The block valve should be a needle valve or cock valve type, of proper material and packing, and rated for process line pressure.

5.4 Electrical installation

NOTICE

Emerson switches off central processing unit (CPU) boards before shipping to preserve their batteries. Before installing the CPU board, be sure to switch it on.

Figure 5-5: CPU board



A. *SW7 battery power* ***ON***

5.4.1 Connect power supply

⚠ WARNING

Electrical hazard

Failure to follow this warning may result in injury or death to personnel or cause damage to equipment.

Ensure that the 24 Vdc input power source is switched Off before connecting the wires.
Ensure that the 24 Vdc power supply is safety extra low voltage (SELV) compliant by suitable electrical separation from other circuits.

NOTICE

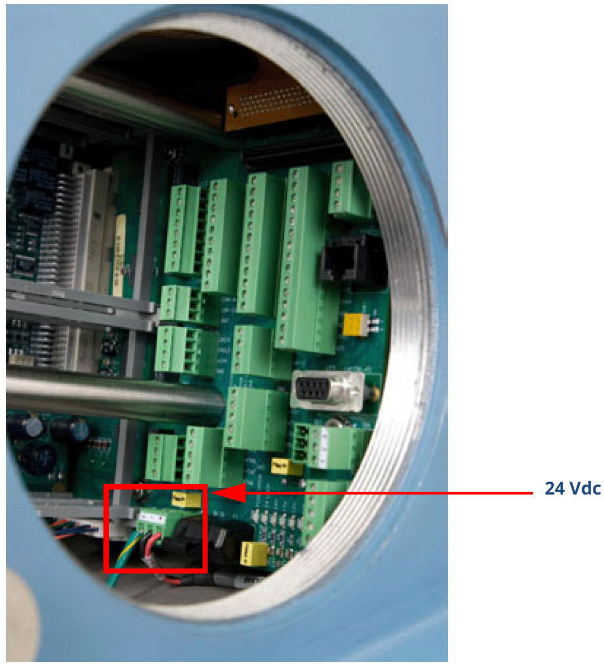
Equipment damage
Failure to observe this precaution may damage equipment.

Check the gas chromatograph (GC) prior to wiring to determine if it is equipped for DC power.

Procedure

1. Locate the plug-together termination block inside the electronics enclosure.

Figure 5-6: 24 Vdc power connection on the backplane



2. Bring the two leads in through one of the two possible entries on the lower compartment. Connect to the termination plug provided with the GC.

Figure 5-7: Wiring entries on the under side of the lower enclosure

Attribute	Wire color
+ (positive)	red
– (negative)	black

NOTICE

Do not disconnect the factory-installed ground wire.

The backplane board that connects to the 24 Vdc is protected from lead reversal by the use of blocking diodes.

If the red (+) and black (-) leads are inadvertently reversed, no damage will occur; however, the system will not have power.

3. Connect the DC power leads to the power disconnect switch that should be properly fused.

   The recommended fuse size is 8 amps.

5.4.2 Connect optional AC/DC power converter

⚠ WARNING

Failure to follow this warning may result in injury or death to personnel or cause damage to equipment.

Check the gas chromatograph (GC) prior to wiring to determine if it is equipped for optional AC power.

Procedure

1. Locate the plug-together termination block inside the electronics enclosure, atop the power supply and adjacent to the card cage.

   Figure 5-8: AC/DC termination block

   ⚠ WARNING

   Failure to follow this warning may result in injury or death to personnel or cause damage to equipment.

   Do not connect the AC power leads without first ensuring that the AC power source is switched **Off**.

   NOTICE

   Failure to observe this precaution may cause damage to equipment.
   Do not apply electrical power to the GC until all interconnections and external signal connections have been verified and proper grounds have been made.

   AC wiring is usually color coded as:

Label	Wire color
Hot (H)	Brown or black
Neutral (N)	Blue or white
Ground (G)	Green with yellow tracer or green

2. Bring the power leads in through the left entry on the bottom of the enclosure.

3. If necessary at remote locations, connect the GC chassis ground wire to an external copper ground rod.

Related information

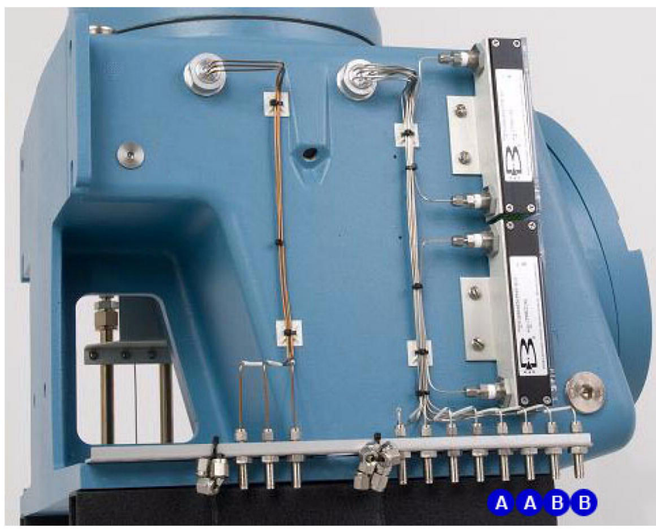
Signal wiring

5.4.3 Connect gas lines

Procedure

1. Remove the plug from the 1/16-in. sample vent tubing marked **SV1** that is located on the flow panel assembly. Depending on your configuration, there may also be a second sample vent marked **SV2**. If so, remove its plug as well.

Figure 5-9: Sample vent and measure vent lines



A. Sample vent
B. Measure vent

- If desired, connect the sample vent lines to an external, ambient pressure vent. If the vent line is terminated in an area exposed to wind, protect the exposed vent with a metal shield.
- Use ¼-in. or ⅜-in. tubing for vent lines longer than 10 ft. (3 m)

Note
Do not discard the vent line plugs. They are useful when leak-checking the gas chromatograph (GC) and its sample or gas line connections.

At this stage in the installation, the measure vent (**MV**) lines (labeled on the side of the GC) should remain plugged until the GC has been checked for leaks. For regular operation, however, the **MV** lines must be unplugged.

2. Connect the carrier gas to the GC.

   The carrier gas inlet is labeled **Carrier In** and is a ¼-in. T-fitting.

   ⚠ WARNING

   Leak testing

   All gas connections must be properly leak tested at installation.
   Do not turn on gas until you have completely checked the carrier lines for leaks.

   ⚠ WARNING

   Explosion hazard

   Failure to follow this warning may result in injury or death to personnel.

   Do not turn on sample gas until you have completely checked the carrier lines for leaks.

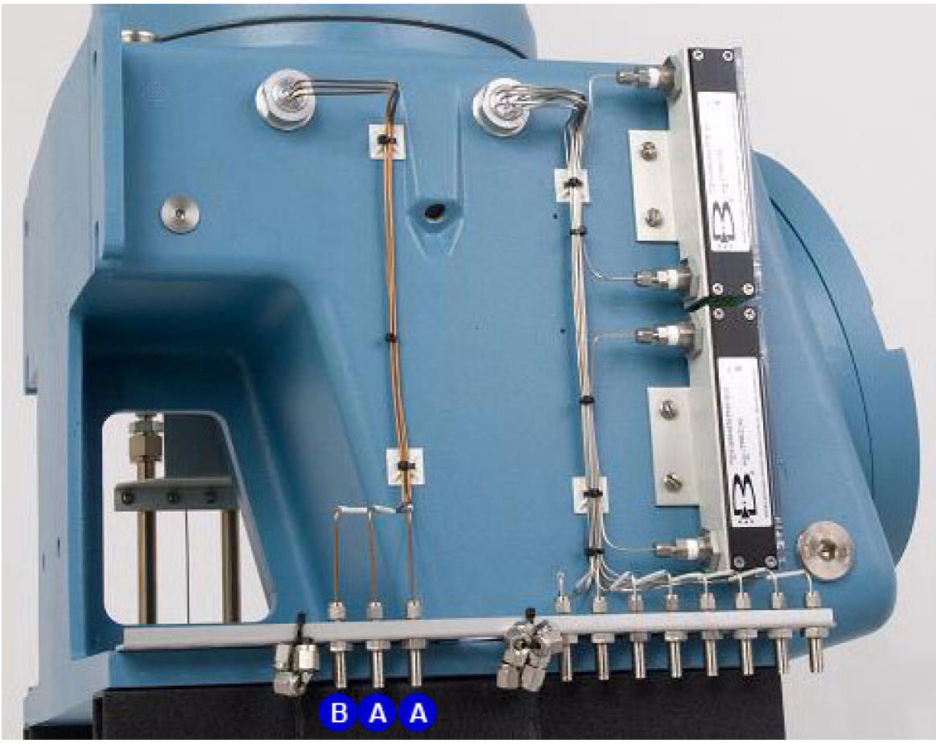
   - Use stainless steel tubing to convey carrier gas.
   - Use a dual-stage regulator with high-side capacity of 3,000 psig (206.8 barg) and low-side capacity of 150 psig (10.3 barg).
   - Carrier gas is fed from two bottles for carrier gas plumbing.

3. Connect calibration standard gas to the GC.

   When installing the calibration standard gas line, ensure that the correct tubing connection is made.

   - Use ⅛-in. stainless steel tubing to connect calibration standard gas unless the application requires treated tubing.
   - Use a dual-stage regulator with low-side capacity of up to 30 psig (2.1 barg)

Figure 5-10: Sample stream inlets and calibration gas inlet



A. Sample stream inlets
B. Calibration gas inlet

4. Connect sample gas stream(s) to the GC.

   - Use ⅛-in. stainless steel tubing, as appropriate, to connect sample gas.
   - Unless stated otherwise in the product documentation, ensure that the pressure of the calibration and sample line is regulated at 15 psig (1 barg) to 20 psig (1.4 barg).

Postrequisites

After all lines have been installed, proceed with leak-checking the carrier and sample lines.

5.4.4 Maximum effective distance by communication protocol type

Table 5-1 lists the maximum distance at which the indicated protocol can transmit data without losing effectiveness. If you need longer runs, use a repeater or other type of extender to maintain the protocol's efficiency.

Table 5-1: Maximum distance for each communication protocol

Communication protocol	Maximum distance
RS-232	50 ft. (15 m)
RS-422/RS-485	4,000 ft. (1,219 m)
Ethernet (CAT5)	300 ft. (91 m)

5.4.5 RS-485 serial port terminating resistors

To ensure correct communication with all hosts, place a 120-ohm terminating resistor across the gas chromatograph (GC) serial port terminals on the RS-485 link. On a multi-dropped link, install the terminating resistor on the last controller link only.

5.4.6 Installing and connecting to an analog modem card

The Rosemount 700XA has two slots (input/output [I/O] Slot A and I/O Slot B) in the card cage for installing an analog modem.

Note
Rosemount MON2020 only recognizes Microsoft® Windows™-compatible modems that have all relevant drivers installed correctly.

Note
Analog modems will only work with PSTN phone lines. Analog modems will not work with voice over Internet protocol VOIP networks.

The following four LEDs are provided on the modem for troubleshooting:

RI (Ring indicator) This LED flashes when it senses a ring. This LED should only flash once per connection, because the modem automatically answers on the first ring.

CD (Carrier detect) This LED glows green while connected to MON2020.

RX (Receive) This LED flashes while the gas chromatograph (GC) receives data from MON2020.

TX (Transmit) This LED flashes while the GC sends data to MON2020.

Install the analog modem

Procedure

1. Start Rosemount MON2020 and connect to the gas chromatograph (GC).
2. Go to **Tools → I/O Cards...**.
   The ***I/O Cards*** window displays.
3. Change the **Card Type** for the appropriate input/output (I/O) slot to `Communication Module - Modem`.
4. Click **Save**.

MON2020 displays the following message: `The GC must be rebooted for the ROC Card changes to take effect.`

5. Click **OK** to dismiss the message.
6. Click **OK** to close the ***I/O Cards*** window.
7. Disconnect from the GC.
8. Turn off the GC.
9. Insert the analog modem card into the appropriate I/O slot in the GC's card cage.
   Ensure that the I/O slot matches the one you selected in Step 3.
10. Tighten the card's screws to secure the modem in the slot.
11. Insert a telephone cable into the modem card's **RJ-11** socket.
12. Start the GC.
13. Return to MON2020 and connect to the GC via its Ethernet connection.
14. Go to **Application** → **Communication...**.
    The ***Communication*** window displays. The appropriate I/O slot should be listed in the first column (***Label***).
15. Set the **Baud Rate** for the analog modem card to `57600`.
16. Make note of the I/O slot's Modbus® Id.
17. Click **Save**.
18. Click **OK** to close the ***Communication*** window.
19. Disconnect from the GC.

5.4.7 Connect directly to a personal computer (PC) using the gas chromatograph's (GC's) Ethernet1 port

The GC's dynamic host configuration protocol (DHCP) server feature and its **Ethernet1** port on the backplane at **J22** allows you to connect directly to the GC. This is a useful feature for GCs that are not connected to a local area network; all that is needed is a PC, typically a notebook computer, and a CAT5 Ethernet cable.

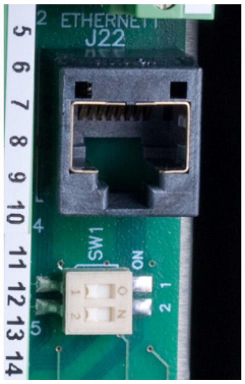
Procedure

1. Plug one end of the Ethernet cable into the PC's Ethernet port and the other end into the GC's **RJ45** socket on **J22** on the backplane.

2. Locate switch at **SW1** directly beneath the Ethernet port on the backplane. Place **SW1** in the **On** position.

   The switch labeled **2** is for future use.

Figure 5-11: SW1 switches on the backplane



Note

The GC can be connected (or remain connected) to the local network on Ethernet2 (**TB11**) on the backplane while the DHCP feature on Ethernet1 is being used.

   This starts the GC's DHCP server feature. The server typically takes approximately 20 seconds to initialize and start up.

3. Wait for 20 seconds and then do the following to ensure that the server has provided an Internet protocol (IP) address to the PC:
   a) From the PC, go to **Start** → **Control Panel** → **Network Connections**.
      The ***Network Connections*** window lists all dial-up and local area network (LAN)/high-speed Internet connections installed on the PC.
   b) In the list of LAN/high speed Internet connections, find the icon that corresponds to the PC-to-GC connection and check the status that displays beneath the Local Area Connection.
      It should show the status as **Connected**. The PC is now capable of connecting to the GC.

      If the status is **Disconnected**, it may be that the PC is not configured to accept IP addresses. Proceed to Step 4

4. Right-click the **Properties** icon.
   The ***Local Area Connection Properties*** window displays.
5. Scroll to the bottom of the ***Connection*** list box and select `Internet Protocol (TCP/IP)`.
6. To configure the PC to accept IP addresses issued from the GC, select the `Obtain an IP address automatically` and `Obtain DNS server address automatically` check boxes.
7. Click **OK** to save the changes and to close the ***Internet Protocol (TCP/IP) Properties*** window.
8. Click **OK** to close the ***Local Area Connection Properties*** window.
9. Return to the ***Network Connections*** window and confirm that the appropriate icon's status reads **Connected**.

Postrequisites

If the icon still reads **Disconnected** refer to Troubleshoot dynamic host configuration protocol (DHCP) connectivity issues.

Note
If you power cycle the GC, you will lose connectivity.

5.4.8 Connect to the gas chromatograph (GC) using Rosemount MON2020

To connect to the GC using the **RJ45** Ethernet1 connection:

Procedure

1. Start MON2020.
   The ***Connect to GC*** window displays.
2. Locate the default **Direct-DHCP** under the ***GC Name*** column.

   This GC directory is created automatically when MON2020 is installed. You can rename the GC, but do not change the Internet protocol (IP) address that it references, `192.168.135.100`.
3. Click the associated **Ethernet** button.
   MON2020 prompts you to enter a user name and password.
4. Enter your user name and password.

MON2020 connects you to the GC.

5.4.9 Troubleshoot dynamic host configuration protocol (DHCP) connectivity issues

Recommended actions

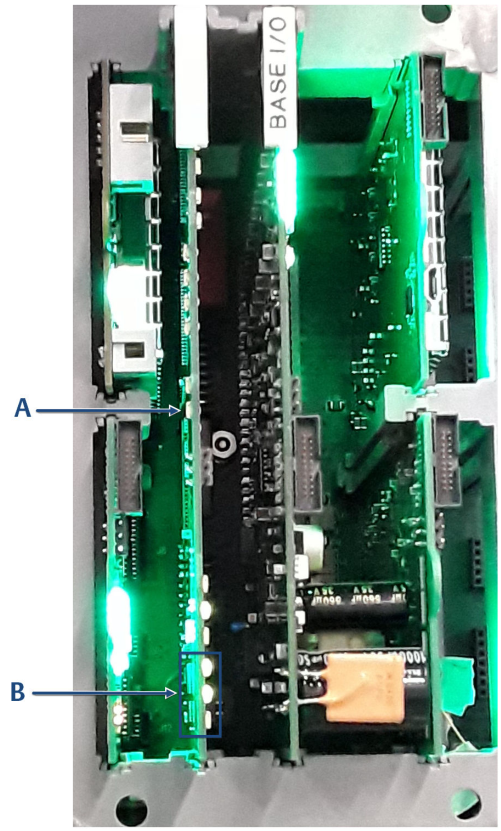
1. Ensure that the gas chromatograph (GC) is up and running. If equipped with a front panel, check the **CPU LED** on the front panel; a green light means that the GC is operational. If equipped with a local operator interface (LOI), ensure that the LOI is communicating with the GC.
2. Check that the **SW1** switch is in the **On** position.
3. Check the following connections:
    a) If you are using a Ethernet straight-through cable, ensure that the personal computer (PC) has an Ethernet network interface card with auto-MDIX.

    b) If your Ethernet network interface card does not support auto-MDIX, ensure that you are using an Ethernet crossover patch cable.

c) Check to see if the GC's central processing unit (CPU) board link lights are on.

   See Figure 5-12. The three Ethernet1 LEDs are located on the front bottom edge of the card. If link lights are off, check your connections.

Figure 5-12: CPU board link lights



A. CPU board
B. Ethernet link lights

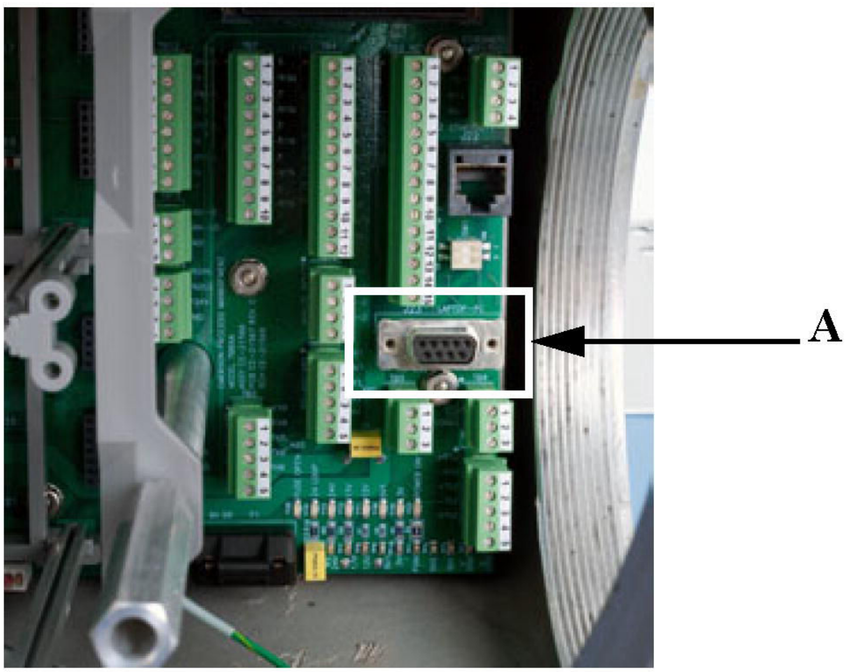
4. Do the following to ensure that your network adapter is enabled:
   a) Go to **Start** → **Control Panel** → **Network Connections...**.
   b) Check the status of the **Local Area Connection** icon. If the status appears as **Disabled**, right-click the icon and select **Enable** from the context menu.
5. Do the following to try to repair the network connection:
   a) **Go to Start** → **Control Panel** → **Network Connections...**.
   b) Right-click the **Local Area Connection** icon and select **Repair** from the context menu.

5.4.10 Connect directly to a personal computer (PC) using the gas chromatograph's (GC's) serial port

The GC's serial port at **J23** on the backplane allows a PC with the same type of port to connect directly to the GC.

This is a useful feature for a GC that is located in an area without Internet access; all that is needed is a PC running Microsoft® Windows™, a notebook computer, and a straight-through serial cable.

Figure 5-13: J23 serial port



A. *J23 port*

To set up the PC for the direct connection:

Procedure

1. Install the communications cable between two computers:
    a) Navigate to **Start** → **Control Panel** and select the **Phone and Modem** icon.
    The ***Phone and Modem*** screen displays.
    b) Select the ***Modems*** tab and click **Add...**.
    The ***Add Hardware Wizard*** displays.
    c) Select the **Don't detect my modem; I will select it from a list** check box and then click **Next**.
    d) Click **Have Disk**.
    The ***Install from Disk*** screen appears.
    e) Click **Browse**
    The ***Browse*** screen displays.

f) Navigate to the Rosemount MON2020 install directory (typically `C:\Program Files (x86)\Emerson Process Management\MON2020`) and select **Emerson Direct Connection.inf**.

g) Click **Open**.
You return to the ***Install from Disk*** screen.

h) Click **OK**.
You return to the ***Add Hardware Wizard***.

i) Click **Next**.

j) Select an available serial port and click **Next**.
The ***Hardware Installation*** screen displays.

k) Click **Continue Anyway**.
After the driver is installed, you return to the ***Add Hardware Wizard***.

l) Click **Finish**.
You return to the ***Phones and Modems*** screen. The **Emerson Direct Connect** modem should be listed in the ***Modem*** column.

2. Start MON2020 and do the following to create a GC connection for the Emerson Direct Connection modem:

a) Go to **File** → **GC Directory...**.
The ***GC Directory*** screen displays.

b) Select **Add** from the ***GC Directory*** screen's ***File*** menu.
A New GC row is added to the bottom of the table.

c) Select the `New GC` text and type a new name for the GC connection.

d) Select the new GC's **Direct** check box.

e) Click the **Direct** button located at the bottom of the ***GC Directory*** screen.
The ***Direct Connection Properties*** window displays.

f) Select **Daniel Direct Connection** (COM *n*) from the ***Port*** drop-down list.

NOTICE

The letter *n* stands for the COM port number.

g) Select **57600** from the ***Baud Rate*** drop-down list.

h) Click **OK** to save the settings.
You return to the ***GC Directory*** screen.

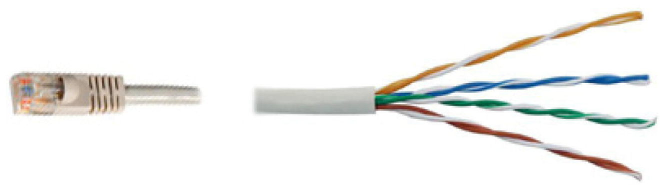
i) Click **OK** to save the new GC connection and to close the ***GC Directory*** screen.

3. Connect one end of the direct connect cable to the GC's serial port at **J23** on the backplane.
4. Connect the other end of the direct connect cable to the PC's corresponding serial port.
5. Go to **Chromatograph** → **Connect...**.
The ***Connect to GC*** screen displays.
6. Click **Direct** next to the GC entry to connect to the GC using the serial cable connection.

5.4.11 Connect directly to a personal computer (PC) using the gas chromatograph's (GC's) wired Ethernet terminal

The Rosemount 700XA has a wired Ethernet terminal at **TB11** on the backplane that you can connect to with a static Internet protocol (IP) address. All that is needed is a PC, typically a notebook computer, and a two-wire, twisted pair CAT5 Ethernet cable with one of its plugs removed to expose the wires.

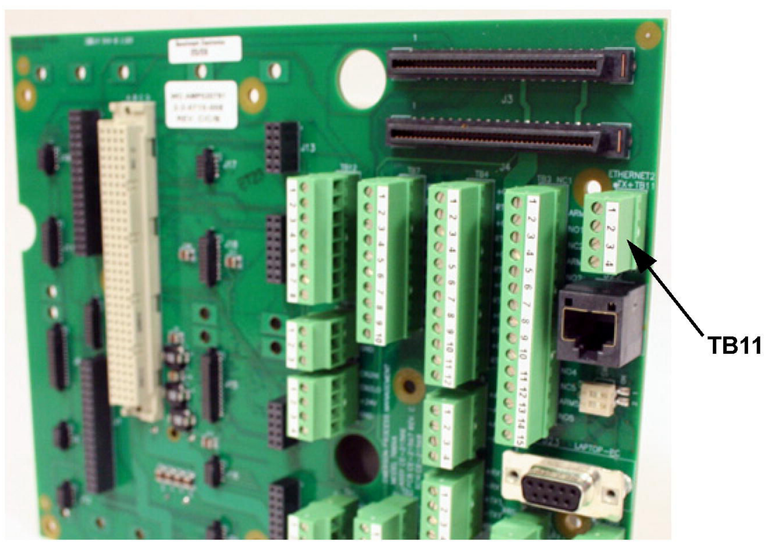
Figure 5-14: Crimped CAT5 cable



Note

The GC can be connected (or remain connected) to the local network on Ethernet2 (**TB11**) on the backplane while the dynamic host configuration protocol (DHCP) feature is being used.

Figure 5-15: Wired Ethernet terminal block on the backplane



Procedure

1. Use the following schematics as a guide to wiring the GC via its four-wire connector at **TB11**.

   Figure 5-16 shows the traditional wiring scheme. Figure 5-17 shows how to wire a CAT5 cable without the **RJ45** plug.

   Figure 5-16: Field wiring to TB11

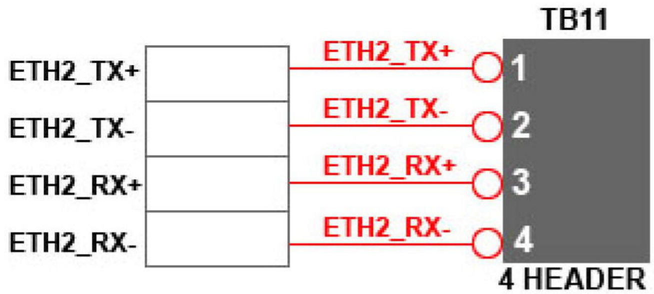
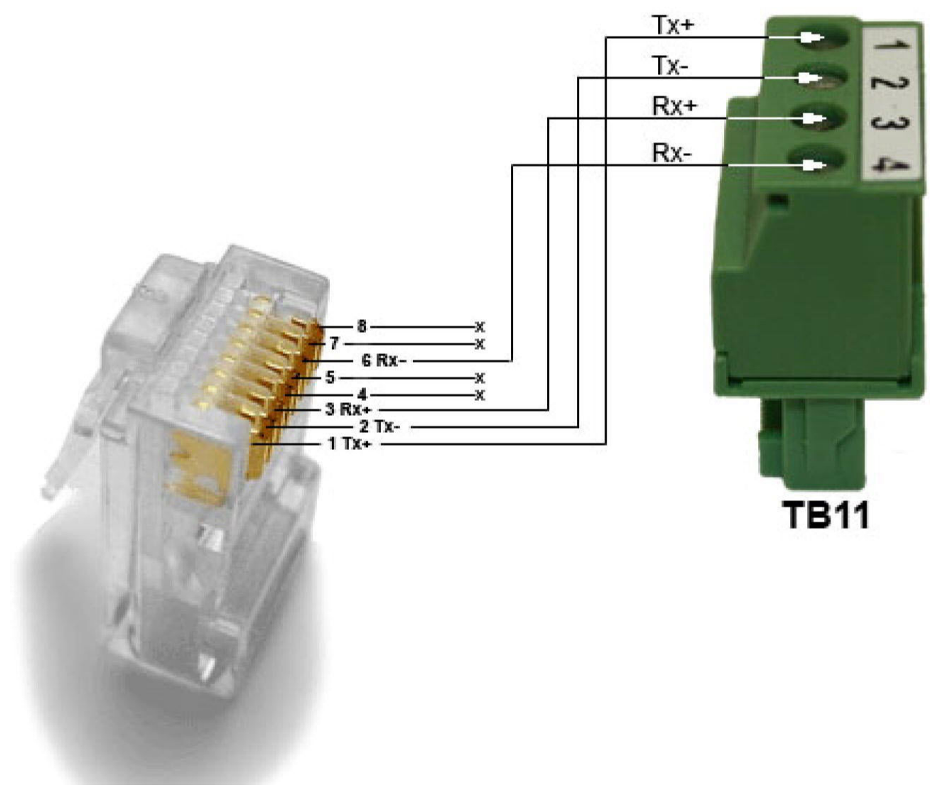
   

   Figure 5-17: CAT5 wiring to TB11

2. Once you have wired the cable to the Ethernet terminal, plug the other end into a PC or a wall jack.

5.4.12 Assign a static Internet protocol (IP) address to the gas chromatograph (GC)

Procedure

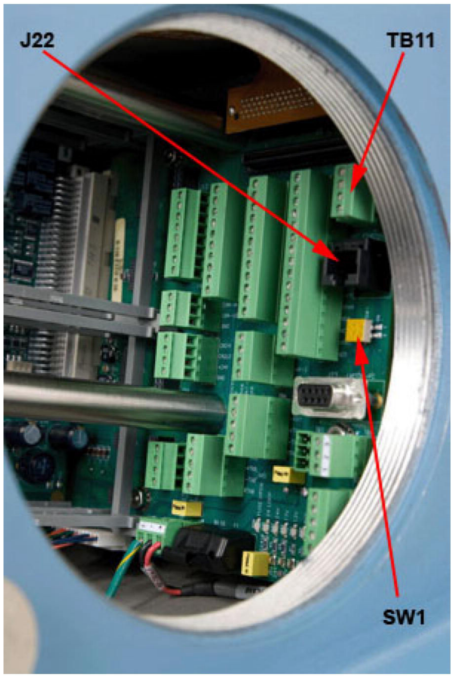
1. Start Rosemount MON2020 and log in to the GC using a direct Ethernet connection.
2. Go to **Application** → **Ethernet ports...**.
   The ***Ethernet Ports*** window displays.
3. Depending upon the Ethernet port to which you want to assign a static IP address, do the following:
   a) The Ethernet port at **TB11**: Enter the appropriate values in the **Ethernet2 IP Address**, the **Ethernet 2 Subnet**, and the **Default Gateway** fields.
   b) The **RJ45** Ethernet port at **J22**: Enter the appropriate values in the **Ethernet1 IP Address**, the **Ethernet1 Subnet**, and the **Default Gateway** fields.

   Note
   See your information technology (IT) staff to obtain IP, subnet, and gateway addresses.

   Important
   To configure a Ethernet IP address using the local operator interface (LOI), refer to Figure A-54.

4. Click **OK**.
5. Log off the GC.
6. Access the backplane, which is located in the GC's lower enclosure.

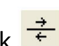
Figure 5-18: Port locations on the backplane



7. If you are setting up a static IP address for the Ethernet1 port at **J22**, and you also intend to connect to your company's local area network, do the following:
   a) Locate the set of dip switches, labeled **1** and **2** , at **SW1** on the backplane.
      SW1 is located directly beneath the Ethernet port at **J22** .
   b) Move dip switch **1** to its left position (**Off**).

   This disables the dynamic host configuration (DHCP) server.
8. To connect to the GC:
   a) Start MON2020 and select **File** → **GC Directory....**
      The ***GC Directory*** window displays.
   b) Select **Add**.
      MON2020 adds a new GC profile to the end of the table.

      Note
      You can name the GC's profile as well as add a short description.

   c) Select the new profile and click **Ethernet...** Enter the GC's static IP address in the **IP address** field.
   d) Click **OK**.
      The ***Ethernet Connection Properties for New GC*** window closes.
9. Click **Save** to save the new profile.
10. Click **OK** to close the ***GC Directory*** window.
11. Select **Chromatograph** → **Connect...** to connect to the GC or click  .
    The ***Connect to GC*** window displays. The newly created GC profile should be listed in the table.
12. Locate the new GC profile and click the **Ethernet** button that is associated with it.
    The ***Login*** window displays.
13. Enter a **User Name** and **User Pin** and click **OK**.

5.4.13 Wiring the discrete digital inputs and outputs

The backplane has five discrete outputs and five discrete inputs. Refer to the Rosemount MON2020 Software for Gas Chromatographs Manual to learn how to configure the digital outputs.

Related information

Wire an ROC800 digital output (DO) module

Wire the discrete digital inputs

⚠ WARNING

Electric shock

Failure to observe this precaution may cause serious personal injury or death.

The equipment operates using mains voltage that is dangerous to life. Make sure that the circuit breakers are set to **OFF** and tagged off before removing the top cover or opening the front cover.

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

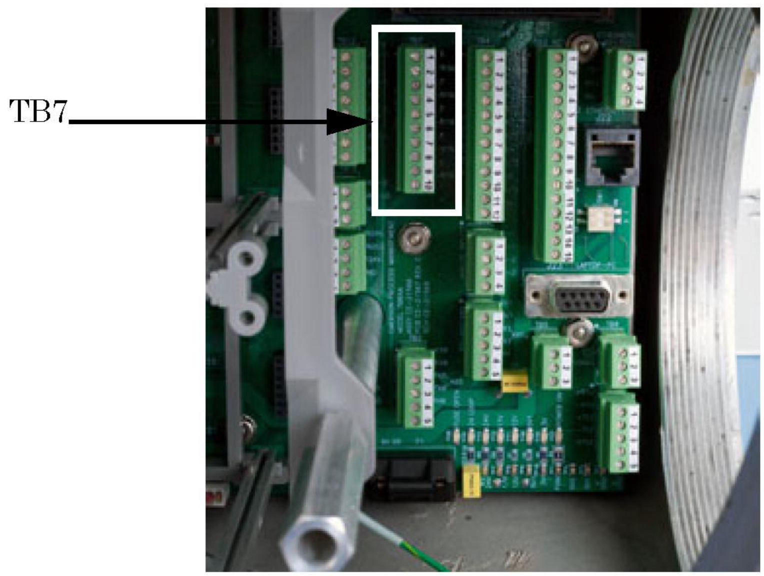
- Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
- Keep cover tight while circuits are live.
- Use cables or wires suitable for the marked **T** ratings.
- Cover joints must be cleaned before replacing the cover.
- Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

To connect digital signal input lines to the gas chromatograph (GC):

Procedure

1. Disconnect power to the analyzer and allow the components to cool for at least five minutes.
2. Open the electronics enclosure door and access the backplane.
3. Make the digital input wiring connections on the backplane at **TB7**.

Figure 5-19: TB7 on the backplane



Note
The discrete digital input terminals on the backplane are self-powered. Devices connected to the digital input will be powered by the GC's dedicated isolated 24 V power supply.

Note
The discrete digital input terminals are optically isolated from the GC's other circuitry.

4. Route digital input/output (I/O) lines away from the sensitive detector lines (on the left side of the backplane) and away from the analog inputs and outputs.

   There are connections for five digital inputs on the backplane at **TB7**, as indicated in Table 5-2.

   Table 5-2: Discrete digital inputs at TB7

TB7	Function
Pin 1	Digital input 1
Pin 2	Digital input return
Pin 3	Digital input 2
Pin 4	Digital input return
Pin 5	Digital input 3
Pin 6	Digital input return
Pin 7	Digital input 4
Pin 8	Digital input return
Pin 9	Digital input 5
Pin 10	Digital input return

Wire an ROC800 digital input (DI) module

To connect the ROC800 DI module to a field device:

Procedure

1. Expose the end of the wire to a maximum length of ¼ in. (6.4 mm).

   NOTICE

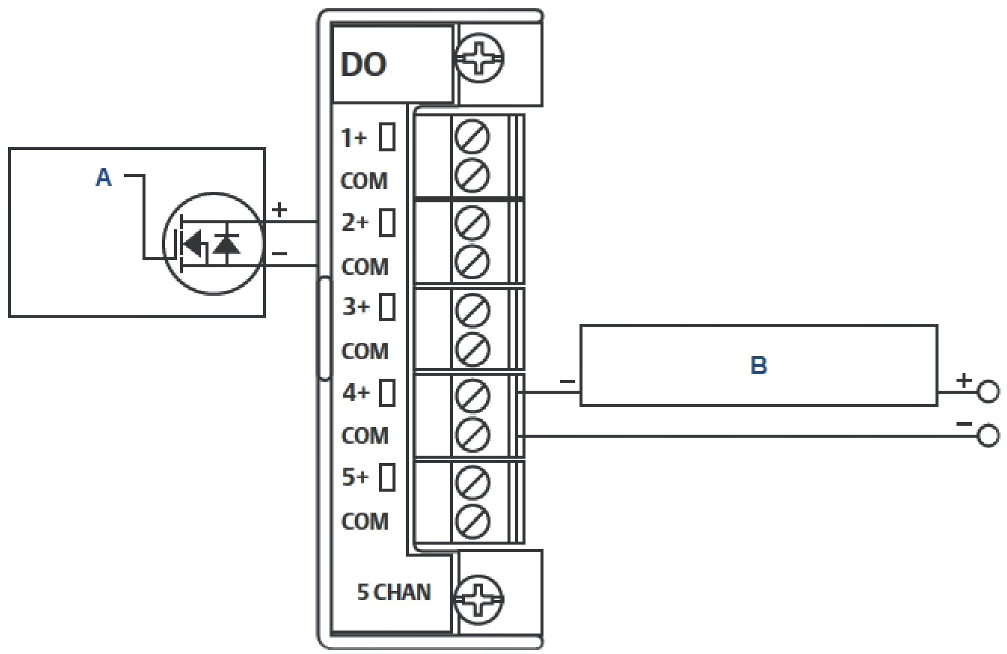
   Emerson recommends twisted-pair cables for input/output (IO) signal wiring. The module's terminal blocks accept wire sizes between 12 and 22 American wire gauge (AWG). Allow some slack when making connections to prevent strain.

   NOTICE

   Failure to follow this notice may cause a short circuit and damage equipment. Allow only a minimal amount of bare wire to prevent short circuits.

2. Insert the exposed end into the clamp beneath the termination screw.
3. Tighten the screw.

Figure 5-20: Typical wiring



A. Control
B. Discrete device (externally powered)

Table 5-3: ROC800 discrete digital wiring

Terminal	Label	Definition
1	1	Channel 1 Positive
2	2	Channel 2 Positive
3	3	Channel 3 Positive
4	4	Channel 4 Positive
5	5	Channel 5 Positive
6	6	Channel 6 Positive
7	7	Channel 7 Positive
8	8	Channel 8 Positive
9	COM	Common
10	COM	Common

Wiring the discrete digital outputs

The discrete outputs are located on **TB3**, which is a 15-pin connector, and have five Form-C relays on the backplane. All contact outputs have a rating of 1A at 30 Vdc.

Figure 5-21: TB3 on the backplane

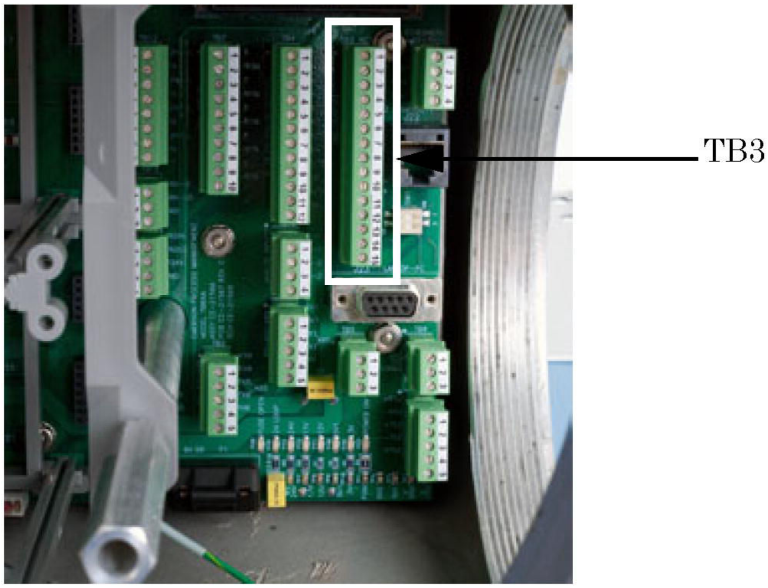


Table 5-4 lists the discrete digital output function for each pin on the **TB3** connector.

Table 5-4: Discrete digital outputs on TB3

Pin	Function
Pin 1	Normally closed (NC1) DIG_OUT NC1
Pin 2	ARM1 DIG_OUT ARM1
Pin 3	Normally open (NO1) DIG_OUT NO1
Pin 4	NC2 DIG_OUT NC2
Pin 5	ARM 2 DIG_OUT ARM2
Pin 6	NO2 DIG_OUT NO2
Pin 7	NC3 DIG_OUT NC3
Pin 8	ARM3 DIG_OUT ARM3
Pin 9	NO3 DIG_OUT NO3

Table 5-4: Discrete digital outputs on TB3 *(continued)*

Pin	Function
Pin 10	NC4 DIG_OUT NC4
Pin 11	ARM4 DIG_OUT ARM4
Pin 12	NO4 DIG_OUT NO4
Pin 13	NC5 DIG_OUT NC5
Pin 14	ARM5 DIG_OUT ARM5
Pin 15	NO5 DIG_OUT NO5

Note
Form-C relays are single-pole double-throw (SPDT) relays that have three positions: normally closed (NC); an intermediate position, also called the make-before-break position (ARM); and normally open (NO).

Related information

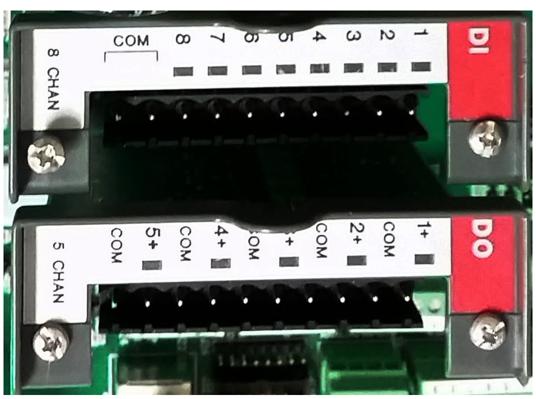
List of engineering drawings - Rosemount 700XA

Optional discrete digital inputs (DI)

When plugged into one of the optional card slots in the card cage, the Emerson ROC800 DI card provides eight additional discrete digital inputs. The discrete digital inputs can monitor the status of relays, open-collector or open-drain type solid-state switches, and other two-state devices.

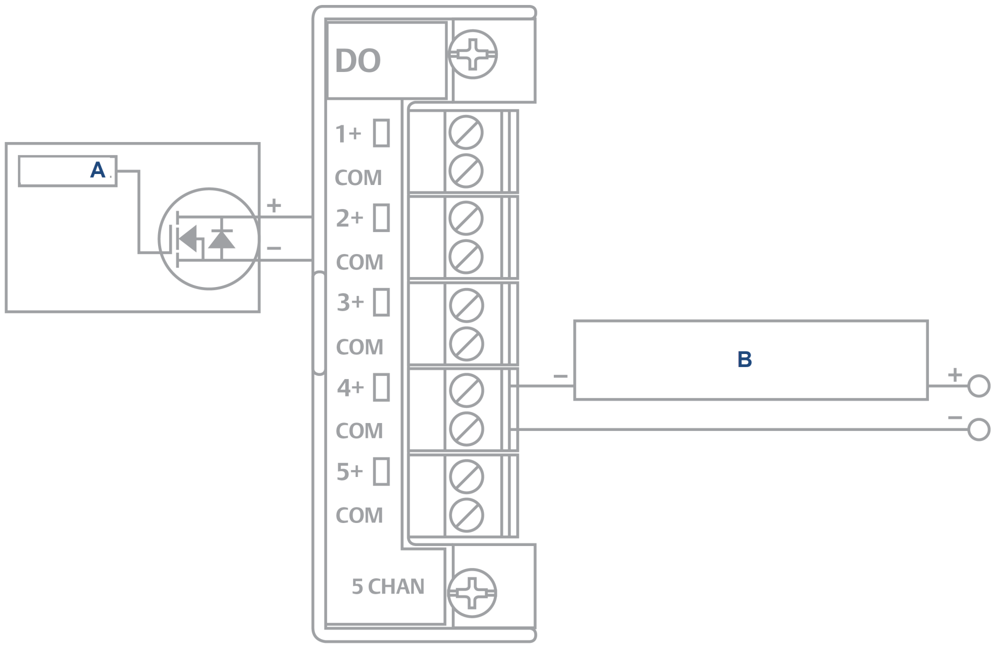
For more information, see *ROC800-Series Discrete Input Module* at Emerson's ROC 800-Series website.

Figure 5-22: Optional digital input/output (I/O) modules



Wire an ROC800 digital output (DO) module

Figure 5-23: Discrete digital output wiring



A. Control
B. Discrete device (externally powered)

Terminal	Label	Definition
1	1+	Positive discrete output
2	COM	Discrete output return
3	2+	Positive discrete output
4	COM	Discrete output return
5	3+	Positive discrete output
6	COM	Discrete output return
7	4+	Positive discrete output
8	COM	Discrete output return
9	5+	Positive discrete output
10	COM	Discrete output return

To connect the ROC800 DO module to a field device:

Procedure

1. Expose the end of the wire to a maximum length of ¼ in. (6.4 mm).

NOTICE

Emerson recommends twisted-pair cables for input/output (IO) signal wiring. The module's terminal blocks accept wire sizes between 12 and 22 American wire gauge (AWG). Allow some slack when making connections to prevent strain.

NOTICE

Failure to follow this notice may cause a short circuit and damage equipment. Allow only a minimal amount of bare wire to prevent short circuits.

2. Insert the exposed end into the clamp beneath the termination screw.
3. Tighten the screw.

5.4.14 Wiring the analog inputs

All Rosemount 700XA gas chromatographs (GCs) have at least two analog inputs. An additional four analog inputs are available with an ROC800 AI-16 card that can be installed into one of the optional slots in the card cage.

Analog inputs on the backplane

There are two analog input connections on the backplane at terminal block 10 (**TB10**).

Figure 5-24: TB10 on the backplane

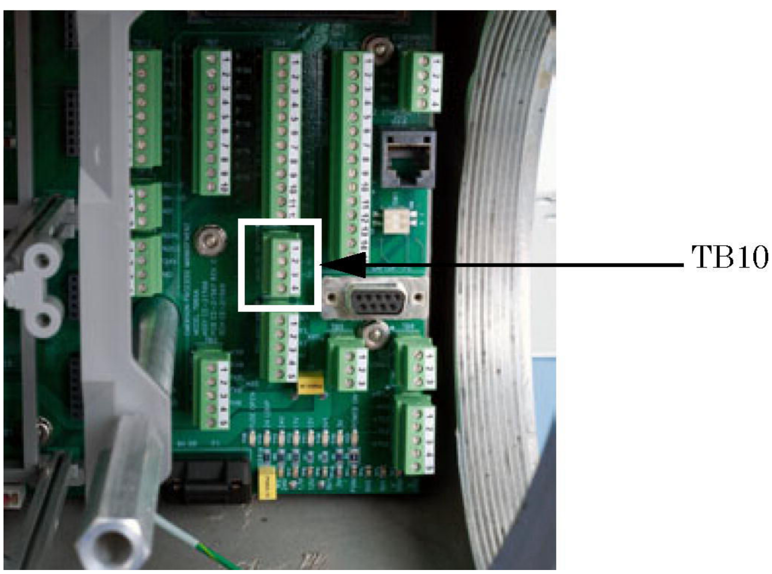


Table 5-5: Analog inputs TB10

Pin	Function
Pin 1	+AI_1
Pin 2	-AI_1
Pin 3	+AI_2

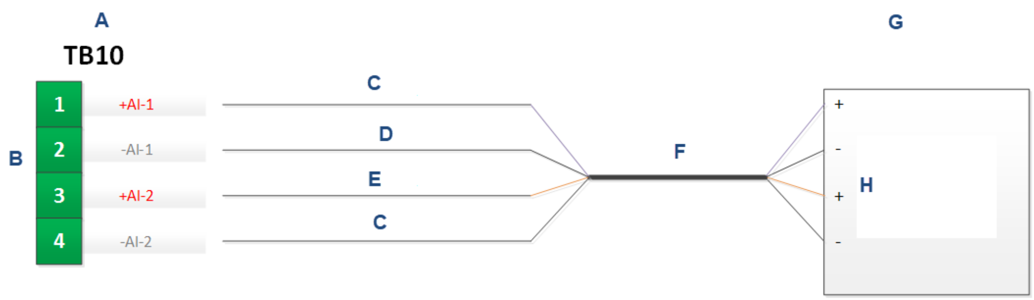
Table 5-5: Analog inputs TB10 *(continued)*

Pin	Function
Pin 4	-AI_2

Analog inputs settings switches

Figure 5-25 shows how to wire two analog inputs (**TB10**).

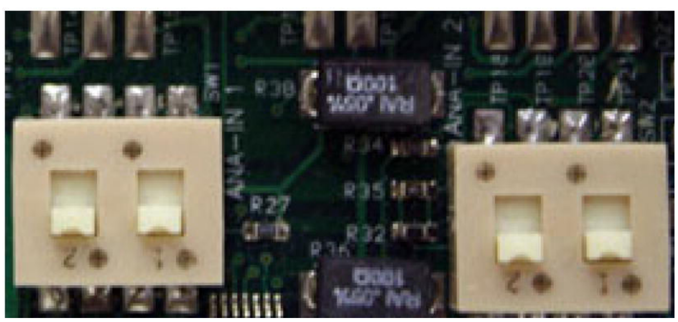
Figure 5-25: Customer wiring for analog inputs



A. Backplane
B. Analog inputs
C. Analog input 1
D. Analog input ground
E. Analog input 2
F. Cable
G. Customer devices
H. Customer 4-20 mA outputs

Figure 5-26 shows the factory settings for the analog input switches that are located on the base input/output (I/O) board. These analog inputs are set to accept a current (4-20 mA) source.

Figure 5-26: Factory settings for analog input switches



Use the **Hardware → Analog Inputs** menu in Rosemount MON2020 to configure the analog inputs.

Note
To set an analog input to accept a voltage (0-10 Vdc) source, flip the appropriate switch in the opposite direction from that shown in Figure 5-26.

Select the input type for an analog input

You can set an analog input to either voltage (0-10 V) or current (4-20 mA) by flipping the appropriate switches on the base input/output (I/O) board.

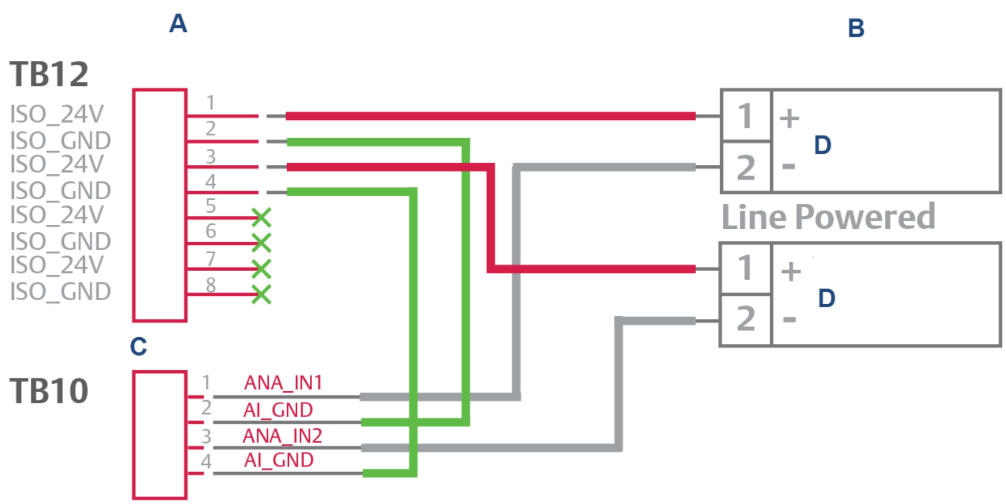
Procedure

1. Turn off the gas chromatograph (GC).
2. Locate and remove the base I/O board, which is in the card cage in the GC's lower enclosure.
3. Set analog input #1.;
   - To set analog input #1 to current, locate **SW1** on the backplane base I/O board and push the switches up, toward the card ejector.
   - To set the analog input to voltage, push the switches down, away from the card ejector.
4. Set analog input #2.
   - To set analog input #2 to current, locate **SW2** on the base I/O board and push the switches up, toward the card ejector.
   - To set the analog input to voltage, push the switches down, away from the card ejector.
5. Replace the base I/O board in the card cage.
6. Close and fasten the electronic enclosure door.
7. Apply power to the GC.
8. Select **Hardware** → **Analog Inputs...**.
   The ***Analog Inputs*** window displays.
9. Set analog input.
   - To set the analog input to current, select mA from the ***mA/Volts*** drop-down list for the appropriate analog input.
   - To set the analog input to voltage, select **Volts** from the ***mA/Volts*** drop-down list for the appropriate analog input.
10. Click **Save** to save the changes and keep the window open or click **OK** to save the changes and close the window.

Typical wiring for line-powered transmitters

Figure 5-27 shows the most common wiring plan for supplying power to two 4-20 mA transmitters, such as pressure sensor transmitters.

Figure 5-27: Typical wiring for line-powered transmitters



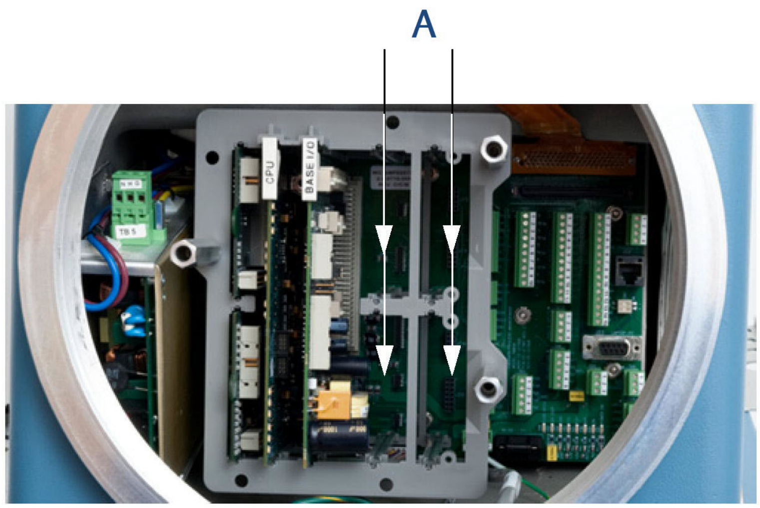
A. *Backplane*
B. *Customer transmitter*
C. *Analog inputs*
D. *Transmitter 4-20 mA output*

Optional analog inputs (AI)

When plugged into one of the optional card slots on the card cage, the ROC800 AI-16 card provides four additional analog inputs.

The AI channels are scalable, but are typically used to measure either a 4-20 mA analog signal or a 1-5 Vdc signal. If required, the low end of the AI module's analog signal can be calibrated to zero. For more information, see Analog Input Modules (ROC800 Series).

Figure 5-28: Optional input/output (I/O) expansion card slots



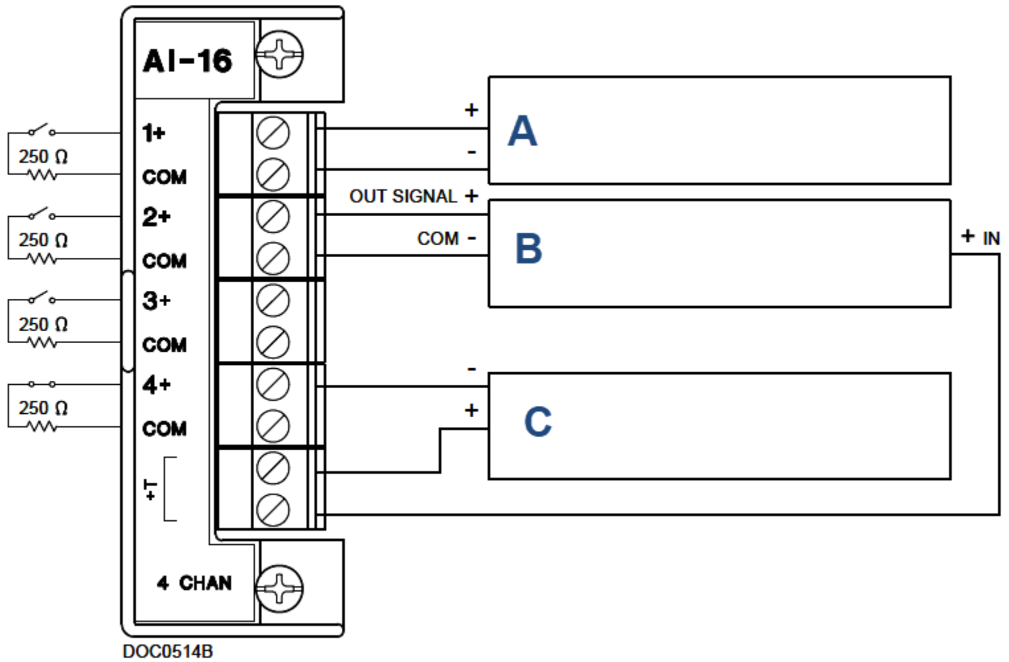
A. Optional card slots

Wire a ROC800 AI-16 module

NOTICE

Electrostatic discharge (ESD)
Operators and technicians must wear an electrostatic wrist strap when handling printed circuit cards to prevent shorting the boards through static electricity. Do not install or remove the printed circuit assemblies while power is applied to the device. Keep electrical components and assemblies in their protective (conductive) carriers or wrapping until ready for use. Use the protective carrier as a glove when installing or removing printed circuit assemblies.

Figure 5-29: Typical ROC800 wiring



A. 1-5 volt device, externally powered
B. 1-5 volt device, ROC800 powered
C. Current loop device 4-20 mA, ROC800 powered

To connect the ROC800 AI-16 module to a device:

Procedure

1. Expose the end of the wire to a maximum length of ¼ in. (6.4 mm).

   Note
   Emerson recommends twisted-pair cables for input/output (I/O) signal wiring. The module's terminal blocks accept wire sizes between 12 and 22 American wire gauge (AWG). Allow some slack when making connections to prevent strain.

   NOTICE

   Electrical hazard
   Exposing bare wires may cause a short circuit and damage equipment.

   Keep exposed bare wires to a minimum.

2. Insert the exposed end into the clamp beneath the termination screw.
3. Tighten the screw.

   There are two dip switches on the terminal block side of the module that can be used to set a 250 Ω resistor in or out of circuit for each analog input.

   To put an analog input's resistor in circuit, flip the appropriate dip switch to **I**; to put an analog input's resistor out of circuit, flip the appropriate dip switch to **V**.

Calibrate a ROC800 AI-16 module

Prerequisites

To calibrate the ROC800 AI-16 module you must have a personal computer (PC) with the *ROCLINK™ 800 Configuration* software installed and open.

See Emerson's ROC800 Series page for details, downloads, and manuals.

Procedure

1. Go to **Configure** → **I/O** → **RTD Points** → **Calibration**.
2. Select an analog input.
3. Click **Update** to request one value update from the input.
4. Click **Freeze** to stop the values of the input from being updated during calibration.

   Note
   If you are calibrating a temperature input, disconnect the RTD sensor and connect a decade box or comparable equipment to the RTD terminals of the ROC card.

5. Click **Calibrate**.
6. Enter a value for **Set Zero** after stabilization.
7. Enter a value for **Set Span** after stabilization.
8. Enter values for up to three **Midpoints** one at a time or click **Done** if you are not configuring midpoints.
9. Click **OK** to close the main calibration window and unfreeze the associated inputs.

Postrequisites

To calibrate the inputs for another analog input, return to Step 1.

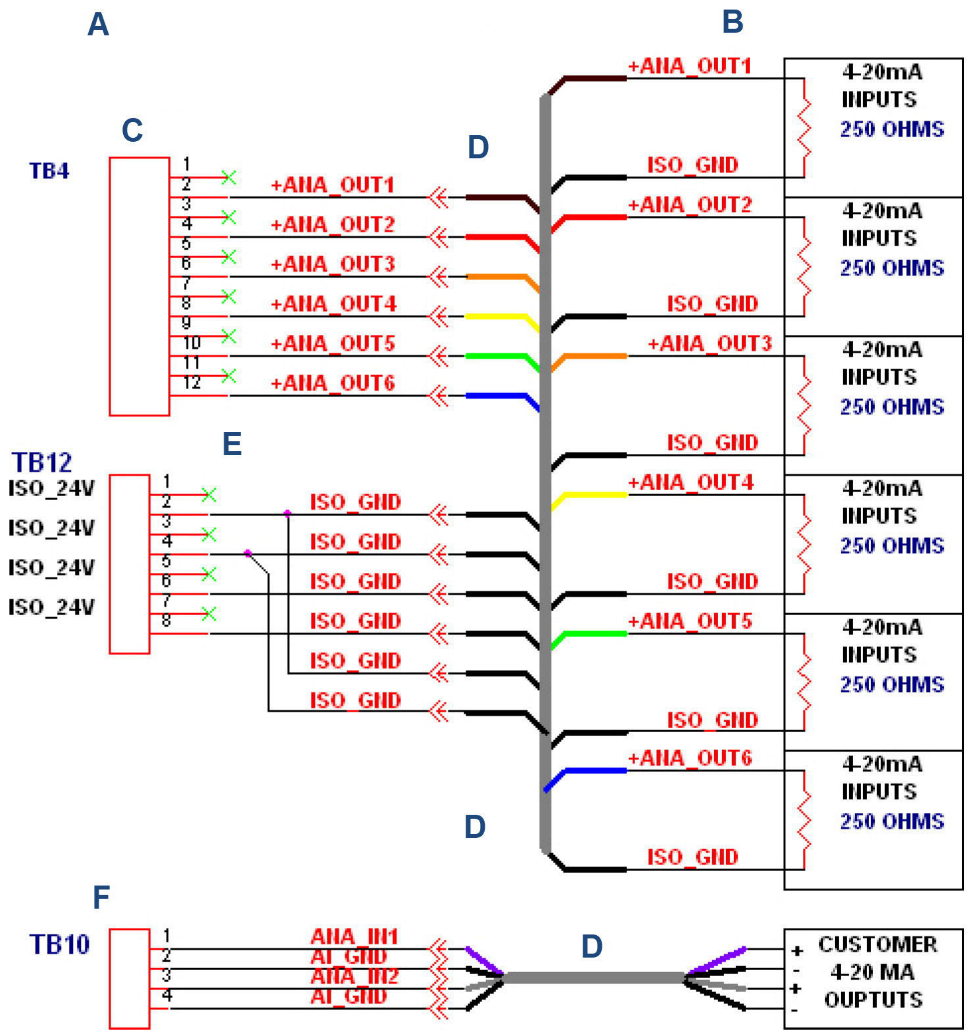
5.4.15 Analog output wiring

The Rosemount 700XA has at least six analog outputs. An additional four analog inputs are available with an ROC800 AO card that can be installed into one of the optional slots in the card cage.

Factory settings for analog output switches

Figure 5-30 shows how to wire up to six devices to the analog outputs that are located on the backplane. It also shows how to wire up to two analog inputs.

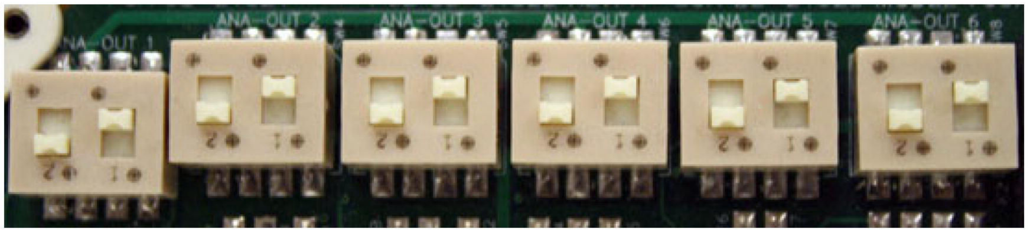
Figure 5-30: Wiring for six analog outputs



A. Backplane
B. Customer devices
C. Analog outputs
D. Cable
E. Analog power and ground
F. Analog inputs

Figure 5-31 shows the factory settings for the analog output switches that are located on the base input/output (I/O) board.

Figure 5-31: Factory settings for analog output switches



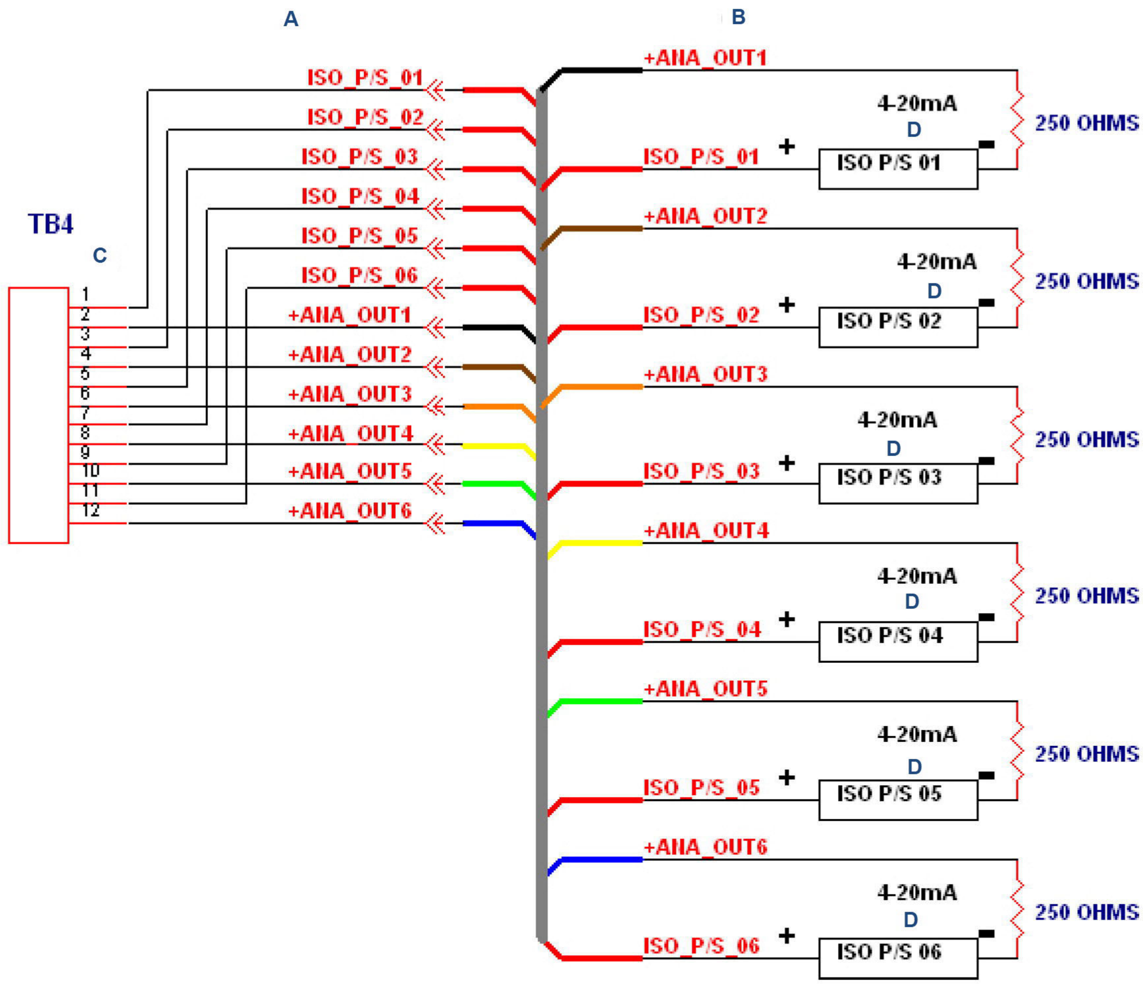
Wire customer externally-powered analog outputs

It is possible to furnish power to each analog output while maintaining isolation between channels.

Procedure

Use Figure 5-32 to provide power wiring to each analog output while maintaining isolation between channels.

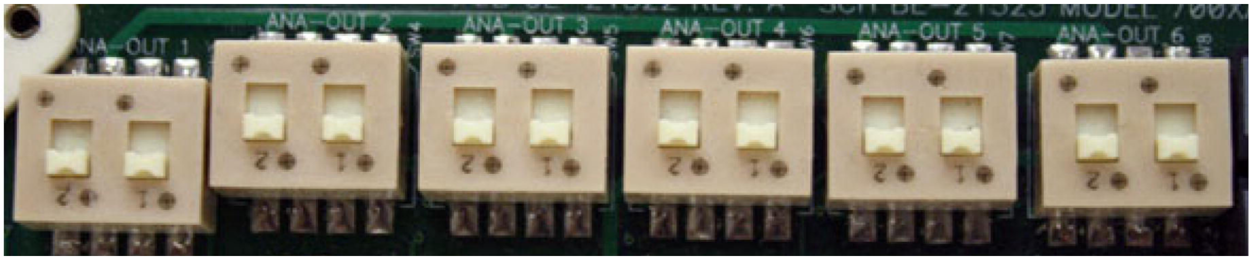
Figure 5-32: Wiring for customer-powered analog outputs



A. *Backplane*
B. *Customer devices*
C. *Analog outputs*
D. *Inputs*

Figure 5-32 shows the settings for the analog outputs switches, located on the base input/output (I/O) board, that are necessary to provide power to each analog output while maintaining isolation between channels.

Figure 5-33: Settings for analog output switches



The settings for the analog outputs connections located on the backplane are necessary to provide power to each analog output while maintaining isolation between channels.

Optional analog outputs

When plugged into one of the optional card slots on the card cage, the ROC800 AO card provides four additional analog outputs. Each channel provides a 4 to 20 mA current signal for controlling analog current loop devices.

For more information, see Emerson's ROC 800-Series website.

Connect ROC800 analog output (AO) module to a field device

Procedure

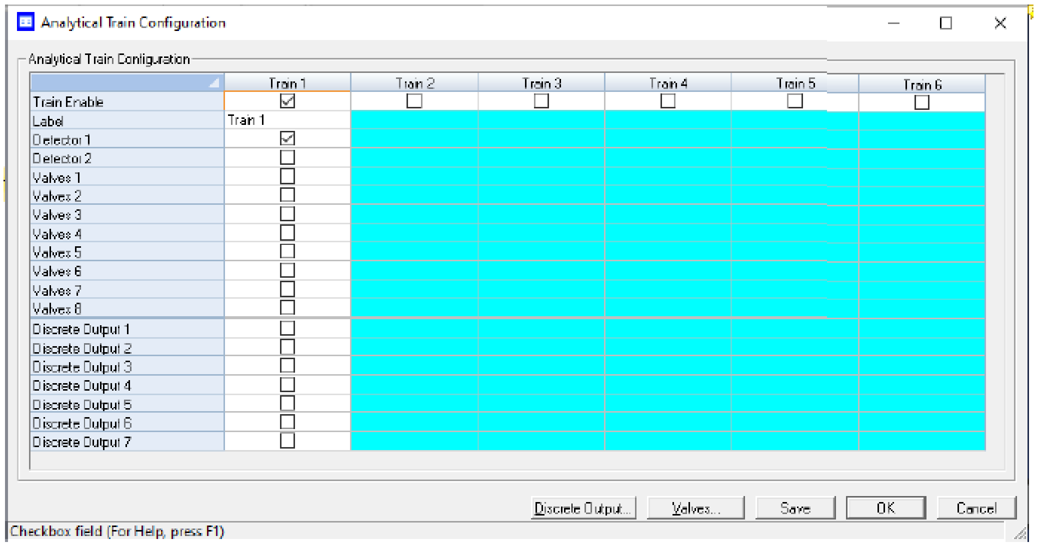
1. Expose the end of the wire to a maximum length of ¼ in. (6.4 mm)

   Note
   Emerson recommends using twisted-pair cables for input/output (I/O) signal wiring. The module's terminal blocks accept wire sizes between 12 and 22 American wire gauge (AWG). Expose minimal bare wire to prevent short circuits. Allow some slack when making connections to prevent strain.

2. Insert the exposed end into the clamp beneath the termination screw.
3. Tighten the screw.
4. Close the electronics enclosure door and apply power to the gas chromatograph (GC).
5. Run Rosemount MON2020 and connect to the GC.

5.4.16 Configure analytical train

Figure 5-34: Analytical Train Configuration window



Procedure

1. Assign the usage of valves and DOs to each analyzer on the **Hardware** → **Valves**, **Hardware** → **Detectors**, and **Hardware** → **Discrete Outputs** screens.
2. Open the **Application** → **Analytical Train Configuration** screen.

   You can use the ***Filter Selections*** drop-down list to filter by the type of hardware you are interested in. The options are:

   - All
   - Detectors
   - Valves
   - Discrete Output
   - Heaters

   By default, `All` is selected, and all types of hardware are displayed. To filter by a certain type of hardware, select it from the list. Then only rows with the selected hardware will be displayed.
3. Click **Discrete Output** and **Valves**. Assign the respective DOs, valves, and detectors to each analytical train.

   The valves are assigned with **Usage** as `Analyzer#` displayed on this screen. All available detectors are also displayed on this screen. You cannot configure the same valve or DO to multiple trains, but you can configure the same detector to multiple trains.
4. On the **Application** → **Timed Events** screen, filter the configured events as per train selection by selecting the **Train#** check box.

5.4.17 Configure an analysis clock

Use this feature to configure a single analysis clock or multiple clocks.

One analysis clock can be considered as one virtual gas chromatograph (GC) that has independent ***Sample Loop***, ***Analytical Path***, and ***Timed Event*** tables.

Multiple analysis clocks can run independently to analyze multiple streams at the same time. Emerson sets the number of analysis clocks at the factory per the mechanical configurations of the GC.

Mechanical configurations	Description
Trains (1 - 6)	The configured trains that are used by the analysis
Default Stream Sequence (Def Strm Seq)	Sets the default sequence to be used by the indicated analysis during auto-sequencing.
Purge Duration	The amount of time, in seconds, to purge the stream before starting an analysis, calibration, or validation run. The default value is `60 SEC`. Purging allows sample gas to flow through the sample loop prior to beginning the run.
Energy Value Check	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's energy value is within the CV Check Allowed Deviation. If it isn't, the GC triggers the `Energy Value Invalid` alarm. The following conditions must be met before the GC can perform a EV Check: • At least one stream must be set up in the ***Streams*** screen as a calibration stream, and the **Auto** flag for this stream must be enabled. The EV Check is performed under any of the following circumstances: • During a warm start that follows a power failure during normal operation. The GC waits for the heater to reach its set point and stabilize. It then analyzes the calibration gas as an unknown stream and identified the peaks. If all the component peaks are identified, the GC computes the calibration gas's energy value and performs the EV check. • After a successful calibration, the GC computes the gas's energy value with the new response factors and performs the EV Check

1. Press **Insert** to add a new analysis.
2. Press **Delete** to delete an analysis.

5.5 Leak checking and purging for first calibration

NOTICE

Equipment damage

Failure to clean and dry the tubing may compromise the integrity of the analyzer or its warranty.

Make sure all tubing is clean and dry internally.
Prior to installation, blow the tubing free of internal moisture, dust, or other contaminants.

Verify that all electrical connections are correct and safe and then turn the gas chromatograph (GC) on.

5.5.1 Check the gas chromatograph (GC) for leaks

Prerequisites

Leak checking carrier and calibration gas lines requires power and a personal computer (PC) connected to the GC.

Note
Refer to the analyzer's drawing documentation package that shipped with the GC for leak checking and identifying vents.

Emerson tested the GC and fittings for leaks at the factory prior to shipment.

Procedure

1. Plug the measure vent (labeled **MV**) vent line if it is open.

   Leave the **SV** or sample vent line open or unplugged.

2. Slowly pressurize each line in turn; then block in the line, making sure the pressure holds.

   For example, the carrier gas line should be slowly brought up to 100 psig (6.89 barg) ± 2% with the dual-stage regulator at the carrier gas cylinder, and the actuation pressure should be 100 psig (6.89 barg) maximum.

3. After two minutes, shut the carrier gas bottle valve and observe the high side regulator gauge on the carrier gas bottle.

   a. The gauge should not bleed down more than 100 psig (6.89 barg) in ten minutes.

   b. If helium is lost at a faster rate, leaks are usually found between the carrier gas bottle and the analyzer. Check and tighten all connections, as well as the dual-stage regulator.

4. When the leak check is complete, reopen the helium bottle valve. Remove the plug from the **MV** line.

5. Shut the metering valve below the rotameter on the front of the flow panel.

   Leave the metering valve shut for now; you will reopen it later during initial purging and the analyzer's first calibration.

6. Repeat the procedure with sample gas and stream gas.

   Note
   Do not use a liquid leak detector, such as Snoop®, on the valves or components in the oven.

   Note
   Refer to the *Flow Configuration* schematic in the documentation packet that shipped with the GC for detailed instructions on plugging the flame ionization detector (FID) and flame photometric detector (FPD) vents.

5.5.2 Plugged lines, columns, and valves

If the lines, columns, or valves are plugged, check the gas flow at valve ports.

For a reference, use the flow diagram in the drawing package that shipped with your gas chromatograph (GC) and remember these points about flow diagrams:

- Port-to-port flow paths are indicated by solid or dashed lines on the valve symbol in the drawing.
- A dashed line indicates flow direction when the valve is `On` or energized.
- A solid line indicates flow direction when the valve is `Off` or not energized.

5.5.3 Purge carrier gas lines

Prerequisites

Purging carrier and calibration gas lines requires power and a personal computer (PC) connected to the gas chromatograph (GC).

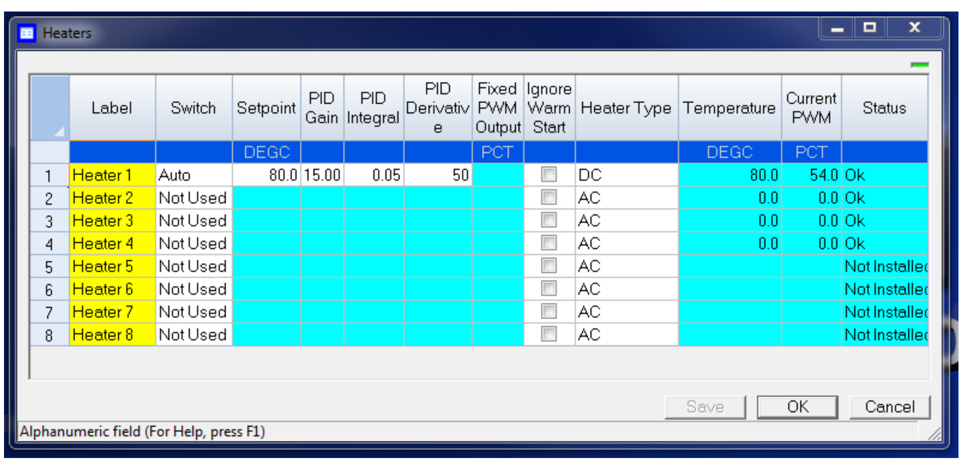
Procedure

1. Ensure that the vent line plugs have been removed and the vent lines are open.
2. Ensure that the carrier gas bottle valve is open.
3. Set the GC side of the carrier gas to 115 psig (7.93 barg).
4. Turn on the GC and the PC.
5. Start Rosemount MON2020 and connect to the GC.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

6. Select **Hardware → Heaters...**.
The ***Heaters*** window displays.

Figure 5-35: Heaters window



	Label	Switch	Setpoint	PID Gain	PID Integral	PID Derivative	Fixed PWM Output	Ignore Warm Start	Heater Type	Temperature	Current PWM	Status
			DEGC				PCT			DEGC	PCT	
1	Heater 1	Auto	80.0	15.00	0.05	50		☐	DC	80.0	54.0	Ok
2	Heater 2	Not Used						☐	AC	0.0	0.0	Ok
3	Heater 3	Not Used						☐	AC	0.0	0.0	Ok
4	Heater 4	Not Used						☐	AC	0.0	0.0	Ok
5	Heater 5	Not Used						☐	AC			Not Installe
6	Heater 6	Not Used						☐	AC			Not Installe
7	Heater 7	Not Used						☐	AC			Not Installe
8	Heater 8	Not Used						☐	AC			Not Installe

7. Allow the GC system temperature to stabilize and the carrier gas lines to become fully purged with carrier gas, which usually takes at least an hour.
The temperature values for the heaters should indicate that the GC is warming up.

The ***Status*** column displays `OK`.

8. Select **Control** → **Auto Sequence...**.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Note
You can also perform Step 6 through Step 8 with the local operator interface (LOI).

NOTICE

Emerson recommends a continuous operation without sample gas for a period of four to eight hours (or overnight), during which no changes should be made to the settings described in Step 1 through Step 7.

5.5.4 Purge calibration gas lines

Prerequisites

Purging calibration gas lines requires power and a personal computer (PC) connected to the gas chromatograph (GC).

⚠ WARNING

Safety compliance

Failure to follow the safety instructions may cause injury to personnel. The seller does not accept any responsibility for installations of the device or any attached equipment in which the installation or operation thereof has been performed in a manner that is negligent and/or non-compliant with applicable safety requirements.

Install and operate all equipment as designed and comply with all safety requirements.

If the device is not operated in a manner recommended by the manufacturer, the overall safety could be impaired.

Observe all safety precautions defined in the gas Safety Data Sheet (SDS), especially for hazardous locations.

Procedure

1. Ensure that the carrier gas lines have been fully purged and that the sample vent plugs have been removed.
2. Close the calibration gas bottle valve.
3. Fully open the block valve associated with the calibration gas feed.

   The block valve is usually located on the lower right-hand corner of the front panel. Refer to the Rosemount MON2020 Software for Gas Chromatographs Manual for instructions on selecting streams.
4. Open the calibration gas bottle valve.
5. Increase the outlet pressure to 15 psig (1 barg), plus or minus five percent, at the calibration gas bottle regulator.
6. Close the calibration gas bottle valve.
7. Let both gauges on the calibration gas bottle valve bleed down to 0 psig (0 barg).
8. Repeat Step 4 through Step 7 five times.

9. Open the calibration gas bottle valve.

5.6 Start up the system

Procedure

1. For system start-up, run a single-stream analysis of the calibration gas.
    a) Verify the calibration stream is set to `Auto`.
    b) Use Rosemount MON2020 to run a single stream analysis on the calibration stream. Once proper operation of the gas chromatograph (GC) is verified, halt the analysis by selecting **Control** → **Halt...**.

        Example

        Go to **MON2020** → **Control** → **Single Stream** → **Calibrate** and select the associated analysis stream.

        Unless stated otherwise in the product documentation, ensure that the pressure of the calibration and sample line is regulated at 10 to 30 psig (0.7 to 2.1 barg). Emerson recommends 15 psig (1 barg).

    c) Validate calibration gas and retention times and run a manual calibration.
    d) Go to **MON2020** → **Application** → **Component Data** and select the associated stream. Check the ***Component Data*** table for calibration gas validation information and retention times.
    e) Go to **MON2020** → **Control** → **Calibration** and select the analysis stream to run a manual calibration. Select the **Purge stream for 60 seconds** checkbox and **Normal** calibration type radio button; then click **OK**.

        Note
        Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

2. Select **Control** → **Auto Sequence...** to start auto sequencing of the line gas stream(s).

    Note
    Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

    The GC begins the auto sequence analysis.

6 Operation and maintenance

6.1 Warning and notice

⚠ WARNING

Precautionary signs

Failure to observe precautionary signs may result in injury or death to personnel or cause damage to equipment.

Observe and comply with all precautionary signs posted on the device.

NOTICE

Failure to follow this notice can result in damage to the card.
Turn off the device before removing a card from the card cage assembly.

6.2 Start a 2-point calibration

The 2-point calibration process calculates an exponential power fit that the gas chromatograph (GC) uses to accurately analyze a sample stream with a flame photometric detector (FPD).

Prerequisites

The 2-Point calibration process requires two calibration gases that will be used to generate the data for the exponential power fit calculation. While both calibration gases should have the same components, one of the calibrations gases, called the low calibration gas (LCG), should have a lower concentration of the components than the other calibration gas, which is called the high calibration gas (HCG). The GC can then compute the coefficients for the 2-point (2-Pt) exponential power fit by doing a single-level calibration on these individual LCG and HCG streams.

Procedure

1. Start Rosemount MON2020 and press **F6** to open the ***Component Data*** window.
2. Change the Calib Type for the target component to **2 pt Calib**.
3. For the target component, select the component data table (CDT) that is associated with the LCG from the ***2 Pt Calib High CDT*** drop-down list.
4. For the target component, select the CDT that is associated with the HCG from the ***2 Pt Calib High CDT*** drop-down list.
5. Run a single stream analysis on the stream associated with the LCG until the readings stabilize.
6. Run a forced calibration on the stream associated with the LCG.
7. Run a normal calibration on the stream associated with the LCG.
8. Run a single stream analysis on the stream associated with the HCG until the readings stabilize.
9. Run a forced calibration on the stream associated with the HCG.
10. Run a normal calibration on the stream associated with the HCG.

The GC is ready to analyze the sample or validation stream using the 2 Pt Exp with the response factor that was calculated during the LCG and HCG runs.

6.3 Troubleshooting and repair

The most efficient method for maintaining and repairing the Rosemount 700XA is a component-replacement concept that allows you to return the system to operation as quickly as possible.

Use troubleshooting test procedures to identify sources of trouble, such as printed-circuit assemblies, valves, etc., and replace them with parts in known good working order.

6.4 Routine maintenance

The Rosemount 700XA will perform accurately for long periods with very little attention (except for maintaining the carrier gas cylinders).

It helps to keep a bi-monthly record of certain parameters to assure that the gas chromatograph (GC) is operating to specifications. Fill out the maintenance checklist bi-monthly, date it, and keep it on file for access by maintenance technicians as necessary. This gives a historical record of the operation of the Rosemount 700XA, enables a maintenance technician to schedule replacement of gas cylinders at a convenient time, and allows quick troubleshooting and repair when necessary.

Also, create a diagnostic file, which contains calibration and analysis chromatograms, alarm and event logs, analysis reports, and the complete configuration file, and file it with the checklist, furnishing a positive dated record of the Rosemount 700XA. You can compare these chromatograms and reports to the chromatograms and reports run during the troubleshooting process.

Before contacting Customer Care, connect to your GC and save the diagnostics data file. From Rosemount MON2020, go to **Tools** → **Save Diagnostic Data** to save the diagnostic data file.

Rosemount MON2020 prompts you to send an email to Customer Care (at gc.csc@emerson.com) with the diagnostic data file.

6.4.1 Maintenance checklist

Print the sample maintenance checklist in Figure 6-1 for your records.

If you have a problem, please complete the checklist first and have the results available, as well as the sales order number, when calling your Emerson Customer Care representative for technical assistance. The sales order number is on the nameplate located on the front of the Rosemount 700XA. Emerson files the chromatograms and reports archived when your gas chromatograph (GC) left the factory by this number.

Note
To find the default measurements for the parameters on the checklist, use Rosemount MON2020 to view the GC's parameter list.

Figure 6-1: Sample Maintenance Checklist

MAINTENANCE CHECKLIST

Date Performed: ________________ Sales Order Number: ________________

System Parameters	As Found	As Left
Carrier Gas Cylinder		
Cylinder Pressure Reading (High)	_____ psig	_____ psig
Cylinder Pressure Outlet Reading	_____ psig	_____ psig
Cylinder Pressure Panel Regulator	_____ psig	_____ psig
Sample System		
Sample Line Pressure(s)	(1)_____ psig	_____ psig
	(2)_____ psig	_____ psig
	(3)_____ psig	_____ psig
	(4)_____ psig	_____ psig
	(5)_____ psig	_____ psig
Sample Flows	(1)___ cc/min	___ cc/min
Sample Vent 1 (SV1)	(2)___ cc/min	___ cc/min
Sample Vent 2 (SV2)	(3)___ cc/min	___ cc/min
	(4)___ cc/min	___ cc/min
	(5)___ cc/min	___ cc/min
Calibration Gas		
High Pressure Reading	_____ psig	_____ psig
Outlet Pressure Reading	_____ psig	_____ psig
Flow	___ cc/min	___ cc/min

6.4.2 Save diagnostic data

At least every other month, create and save a diagnostic data file and check carrier and calibration gas supplies.

Fill out a ***Maintenance*** checklist.

6.4.3 Service programs

Rosemount Lifecycle Services offers maintenance service programs that are tailored to fit specific requirements.

Contracts for service and repair can be arranged by contacting Lifecycle Services at the address or telephone number on the back of this manual or visiting the website at: Lifecycle Services.

6.4.4 Precautions for handling printed circuit (PC) assemblies

Printed circuit assemblies contain complementary metal-oxide-semiconductor (CMOS) integrated circuits, which can be damaged if the assemblies are not properly handled.

NOTICE

Electrostatic discharge (ESD)
Operators and technicians must wear an electrostatic wrist strap when handling printed circuit cards to prevent shorting the boards through static electricity. Do not install or remove the printed circuit assemblies while power is applied to the device. Keep electrical components and assemblies in their protective (conductive) carriers or wrapping until ready for use. Use the protective carrier as a glove when installing or removing printed circuit assemblies.

Figure 6-2: SW7 on the central processing unit (CPU) board

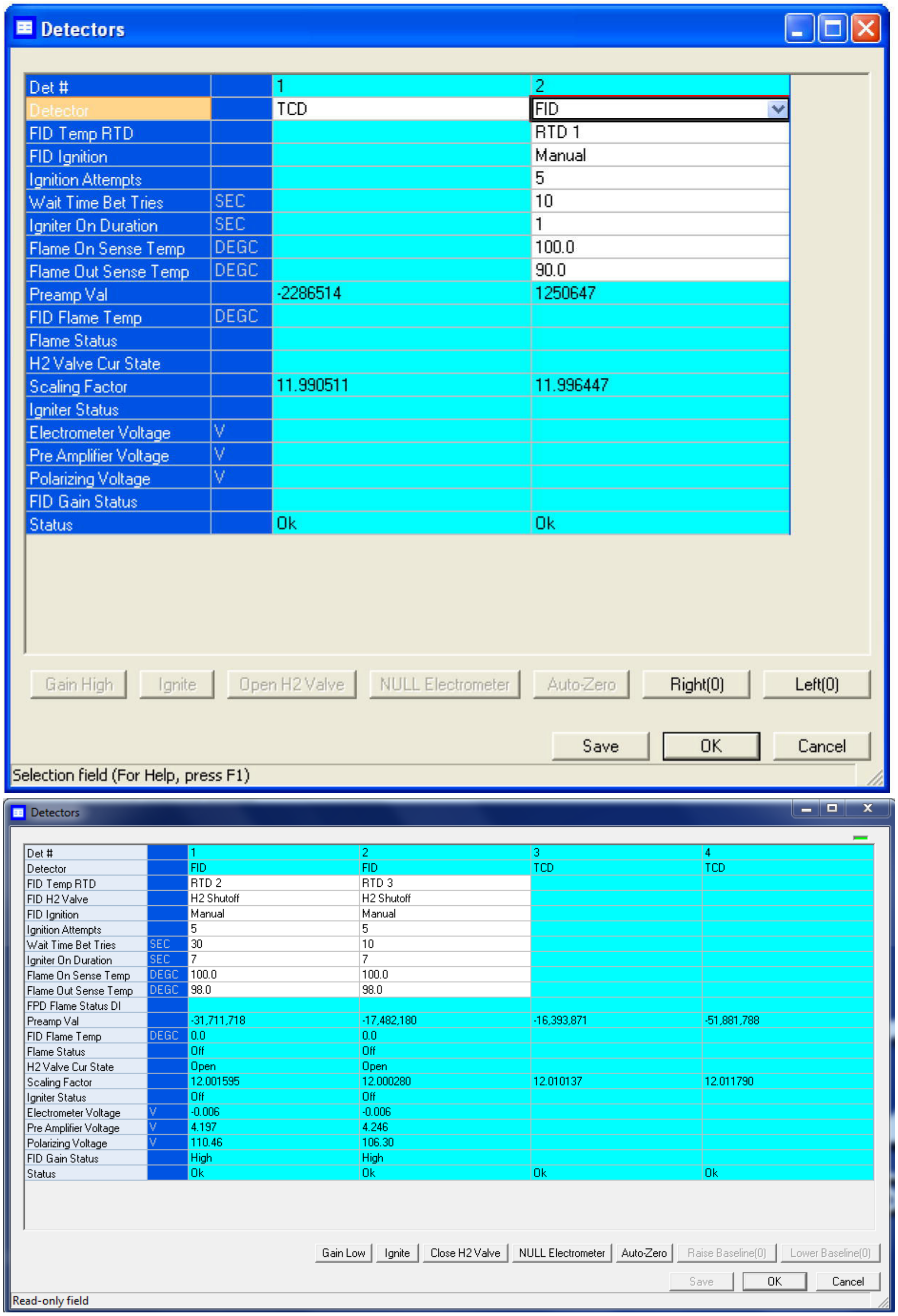
A. *SW7 switch (**ON** is towards the dot.)*

6.4.5 Flame ionization detector (FID) configuration

When connected to the gas chromatograph (GC) via Rosemount MON2020, select **Hardware** → **Detectors** to access the ***Detectors*** dialog.

Refer to the Rosemount MON2020 Software for Gas Chromatographs Reference Manual for additional configuration details.

Figure 6-3: Rosemount MON2020 - Detectors window



Halt the analysis: **Control** → **Halt (F3)**.

Configure the following fields from the ***Detectors*** dialog:

- FID Ignition - Manual or Automatic
- Ignition Attempts
- Wait Time Bet (between) Tries
- Igniter On duration
- Flame On Sense Temp
- Flame Out Sense Temp
- Electrometer Voltage

Note
If the FID does not appear in the ***Detectors*** window your gas chromatograph (GC) may not be fitted with an FID. Disconnect from MON2020 and turn off the GC. Inspect the S1 switch, which is located on the half-moon-shaped wire terminal board. The switch should be set to **ON**.

6.4.6 Replace the central processing unit (CPU)

Procedure

1. Save the gas chromatograph (GC) configuration file. In Rosemount MON2020, go to **File** → **Save Configuration (to PC)**.
2. Power down the GC.
3. Open the GC cover.
4. Remove the clear plastic cover that holds the boards in place.
5. Remove the CPU board.

NOTICE

Electrostatic discharge (ESD) handling precautions required

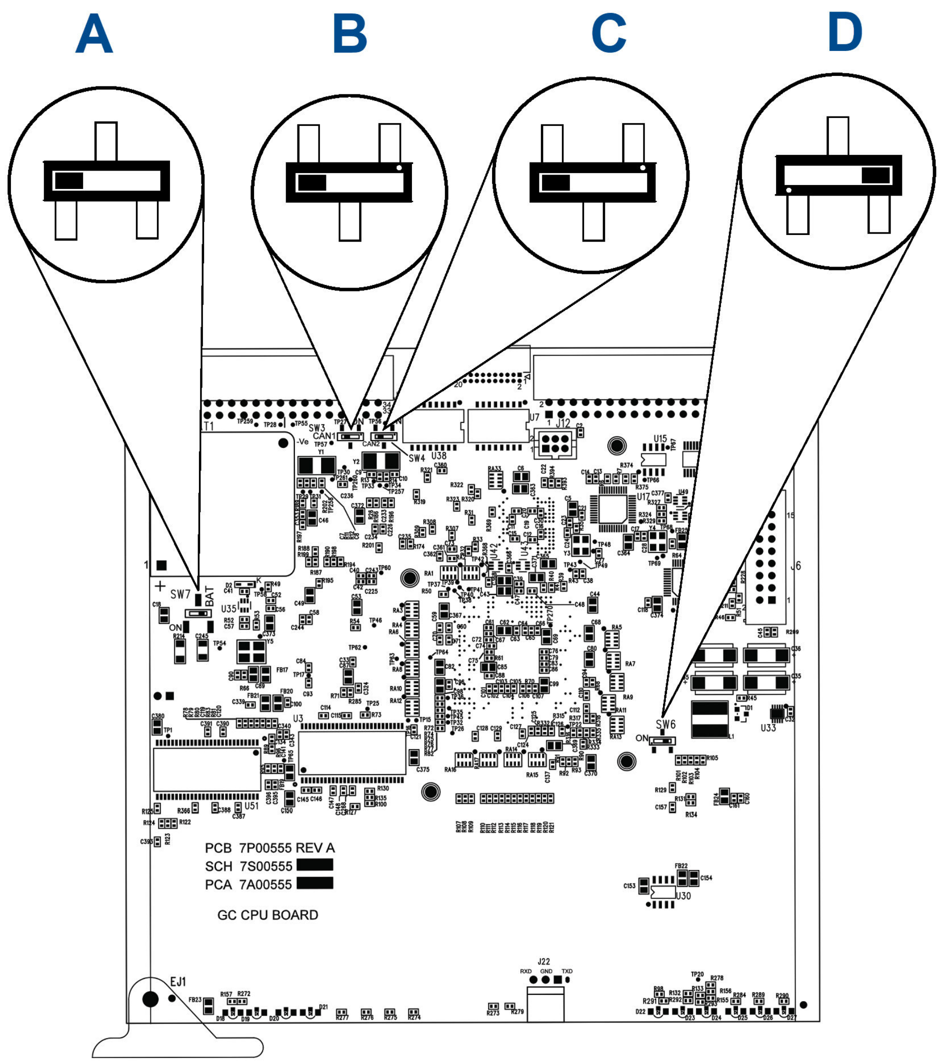
CPU boards are sensitive electronic devices.

Do not ship or store near strong electrostatic, electromagnetic, or radioactive fields.

Use an anti-static wrist strap (or ESD wrist strap) when handling the boards.

6. On the new CPU board, set up switches as shown in the following image:

Figure 6-4: CPU switch settings



*A. Turn **SW7** ON (toward the dot).*
*B. Turn **SW3** OFF (away from the dot).*
*C. Turn **SW4** OFF (away from the dot).*
*D. Turn **SW6** OFF (away from the dot).*

NOTICE

Rosemount 700XA GCs are tagged with CPU board part number *7A00555G02*.

7. Install the new CPU board in the card cage.
   Ensure the board is seated firmly in place.
8. Place the clear plastic cover back over the boards.
9. Close the GC cover.

10. Power up the GC and connect to it through Rosemount MON2020.
11. In Rosemount MON2020, go to **Chromatograph** → **View/Set Date_Time**. Set the date and time for the GC.

    Consult the Rosemount MON2020 Software for Gas Chromatographs Reference Manual for more information.

12. In Rosemount MON2020, go to **Tools** → **Cold Boot**. Cold boot the GC.
    The GC reboots automatically and disconnects from Rosemount MON2020.
13. Wait for the GC to reboot.
14. Reconnect to the GC using Rosemount MON2020.
15. In Rosemount MON2020, go to **File** → **Restore Configuration (to GC)**. Use the configuration file you saved in Step 1 or use the last known good configuration.
16. Wait for the heaters to stabilize.
17. Go to **Control** → **Auto Sequence** to auto sequence the GC.

6.4.7 Repairing and maintaining the valves

The valves require minimal repair and maintenance, such as replacing the diaphragms.

Required tools for valve maintenance

The tools required for performing repair and general maintenance on the Rosemount XA Series valve assemblies are:

- Torque wrench, scaled in foot-pounds
- ½-in. socket for 10-port valves
- 7/16-in. socket for 6-port valves
- ¼-in. open-ended wrench
- 5/16-in. open-ended wrench
- 5/32-in. Allen wrench

Valve replacement parts

Replacement parts required for each Rosemount XA Series valves consist of the following parts:

- Diaphragm kit 6-port XA valve (PN 2-4-0710-248)
- Diaphragm kit 10-port XA valve (PN 2-4-0710-171)

Figure 6-5: XA series valves

Overhaul a valve

Note
Rosemount valves have a lifetime warranty. Replacement factory-built XA Series valves are available. Call your local Emerson Customer Care representative for more information.

If you are overhauling a six-port valve, refer to drawing #CE-22260.

If you are overhauling a ten-port valve, refer to drawing #CE-22300.

Procedure

1. Shut off the carrier and sample gas streams entering the unit.

   ⚠ WARNING

   Burns

   Some parts of the analyzer may be heated to 248 °F (120 °C).

   To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

   Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.
   When handling the analyzer, always use suitable protective gloves.
   These precautions are particularly important when working at heights.
   If burned, seek medical treatment immediately.

2. Remove the top hat heater from the oven system.
3. If the faulty valve is not easily accessible, loosen the thumb screw and tilt the oven on its side.
4. Disconnect tubing and fittings that attach to the valve from other locations.
5. Use an Allen wrench to remove the two base plate bolts on the valve to be replaced or serviced.
6. Remove the valve from the gas chromatograph (GC).

7. Loosen the valve's torque bolt.

Figure 6-6: Valve

A. Torque bolt

See Drawing CE-22260.

8. Holding the lower piston plate, pull the valve straight off the block.

   The alignment pins may stick slightly.

9. Remove and discard the old valve diaphragms and gaskets.
10. Clean the sealing surface as required using a non-lint-forming cloth and isopropyl alcohol. Blow the sealing surface with clean, dry instrument air or carrier gas.

NOTICE

Dirt, including dust and lint, can cause troublesome leakage.
Do not use an oil-based cleaner on the valve.

11. Replace the old diaphragms and gaskets, in the same order, with the new ones supplied.
12. Reassemble the valve using the following steps:
    a) Align the pins with holes in the block and push the valve assembly into place.
    b) Tighten the valve's torque bolt.

       The six-port valve requires 20 ft.-lb. of torque.

       The ten-port valve requires 30 ft.-lb. of torque.

    c) Return the valve to the assembly.
    d) Reinstall the valve using the two mounting screws and reconnect all fittings and tubing.

Related information

List of engineering drawings - Rosemount 700XA

Replace solenoids

You can replace the oven system solenoids and/or the stream switching solenoids.

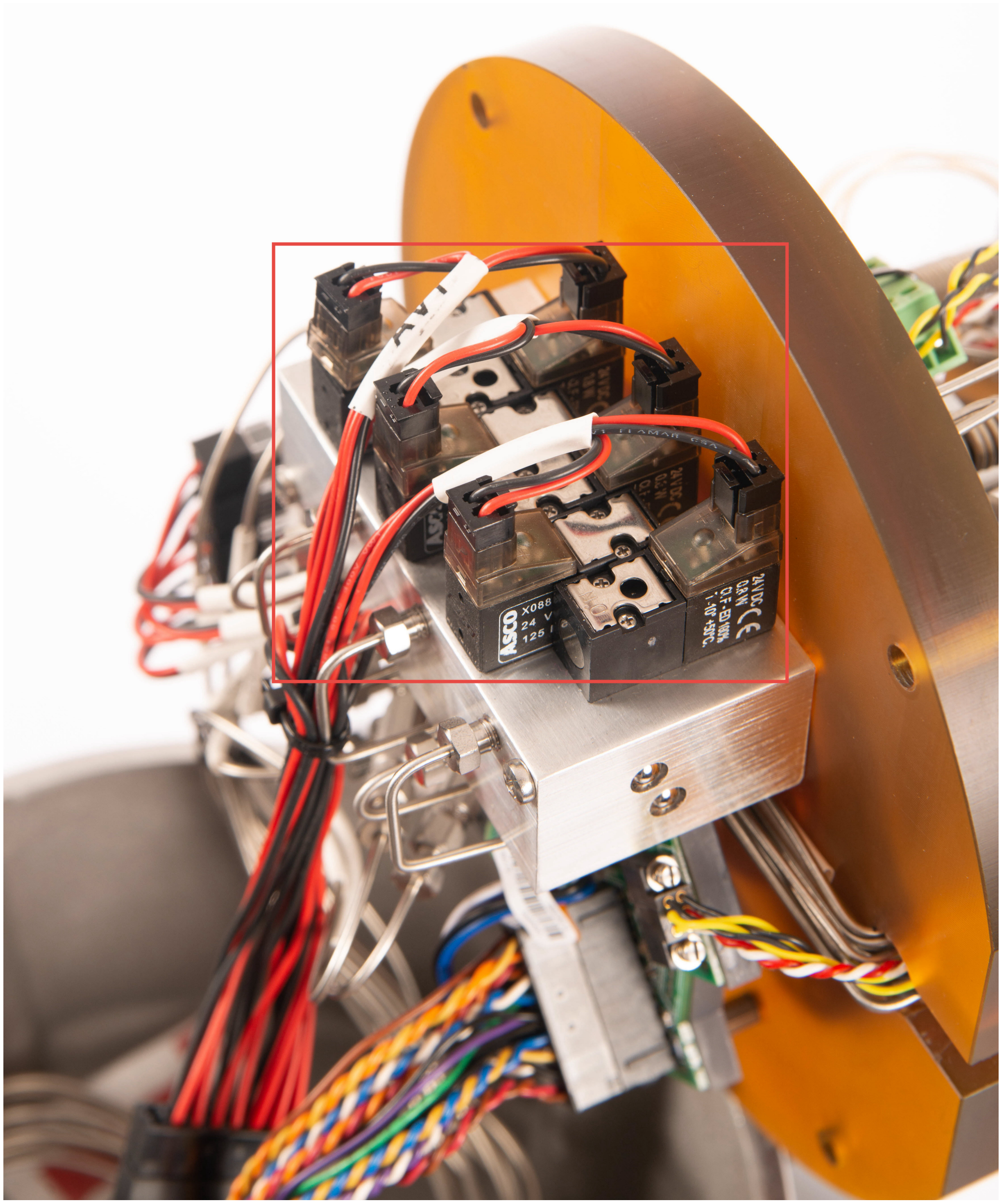
⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

- Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
- Keep cover tight while circuits are live.
- Use cables or wires suitable for the marked **T** ratings.
- Cover joints must be cleaned before replacing the cover.
- Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

Figure 6-7: Solenoids



Prerequisites

Required tools:

- 5/32-in. allen wrench
- Phillips head screwdriver #1

Procedure

1. Remove the thermal cover from the upper enclosure.
2. Loosen the ultem thumb screw and tilt the oven on its side to gain access to the solenoids that are located on the underside of the ultem.

3. Loosen the screws holding the solenoid in place and remove the solenoid.
4. Place a small amount of silicone grease on the target device (pneumatic block, four-way stream block, etc.) where the solenoid is to be placed.

   The grease ensures a tight seal.
5. Place the new solenoid.
6. Tighten the screws to hold the solenoid in place.
7. Place the oven upright.
8. Tighten the ultem thumb screw.

Liquid sample injection valve (LSIV) maintenance

The following procedures detail how to remove and install an LSIV, as well as how to replace an LSIV's seals.

Install a MAT liquid sample injection valve (LSIV)

You can maintain the LSIV while it is attached to the enclosure. However, it may be easier to perform maintenance with the LSIV removed from the upper enclosure.

⚠ WARNING

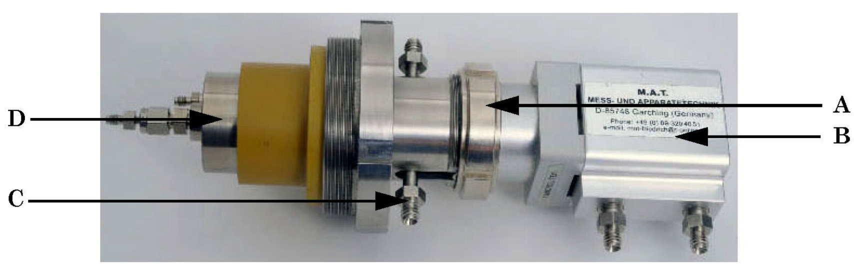
Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.
When handling the analyzer, always use suitable protective gloves.
These precautions are particularly important when working at heights.
If burned, seek medical treatment immediately.

Figure 6-8: MAT LSIV components



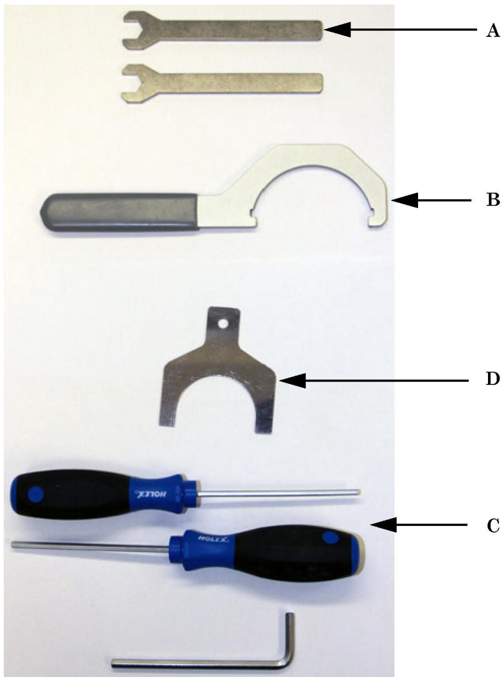
A. Union coupling
B. Actuation section
C. Liquid sample connector
D. Thermal barrier adapter

For a detailed view of the MAT LSIV's components, see Figure 6-11.

Prerequisites

Although, for the most part, you can remove and disassemble the LSIV with traditional tools, such as a wrench or pliers, the following tools ar eshipped with your LSIV-mounted gas chromatograph (GC).

Figure 6-9: LSIV tools



A. *Two 10 mm wrenches*
B. *Union coupling wrench*
C. *Two 3 mm Allen wrenches*
D. *Union coupling spacer*

Procedure

1. Install new MAT valve by doing the following:
    a) Attach the retaining ring to the MAT LSIV.
    b) Slide the MAT LSIV into the mounting hole in the gas chromatograph (GC). Refer to Drawing #DE-20990 in Engineering drawings.
    c) Tighten the retaining ring by twisting it clockwise to secure the MAT LSIV to the GC.
2. Connect the following internal GC gas lines to the MAT LSIV:
    a) Connect the carrier gas line to the MAT LSIV.
    b) Connect the sample gas line to the MAT LSIV.
3. Place the insulation sleeve around the flash chamber as shown in Drawing #DE-20990.
4. Connect the following external GC gas lines to the MAT LSIV:
    a) Liquid Sample IN

b) Liquid Sample Out

c) Air Actuator Inject

d) Air Actuator Retract

5. Install air solenoid items.

   Refer to Drawing #DE-20990.

6. Perform a standard system leak test.
7. Restart the sample flow.

You can now return the GC to service.

Remove the MAT liquid sample injection valve

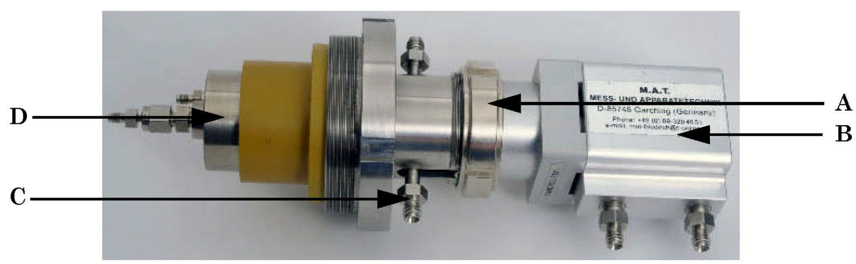
Inside the upper compartment of the gas chromatograph (GC), there are two insulation covers, which open like clam shells that slide off of the end of the LSIV, to be removed.

Procedure

1. Disconnect the carrier and sample tubing from the LSIV.
2. Remove the heater and resistance temperature device (RTD) from the heater block.
3. Disconnect sample and air tubing from the outer portions of the LSIV.
4. Unscrew the retaining ring, using a pin spanner wrench or other tool.

   With the retaining ring loose, the LSIV assembly is free to be pulled out of the upper enclosure.

Figure 6-10: Rosemount 700XA after LSIV has been removed



A. Union coupling
B. Actuation section
C. Liquid sample connector
D. Thermal barrier adapter

Replace liquid sample injection valve (LSIV) seals

Due to the possible damage caused by the presence of solids in the sample stream, combined with the regular, repeated motion of the injection valve stem, LSIV seals may require annual replacement.

Note

Specific application conditions should dictate the frequency of the seals replacement; monitor analytical performance to determine appropriate replacement intervals.

Note

ID numbers listed in parentheses refer to Figure 6-11.

Figure 6-11: LSIV exploded view

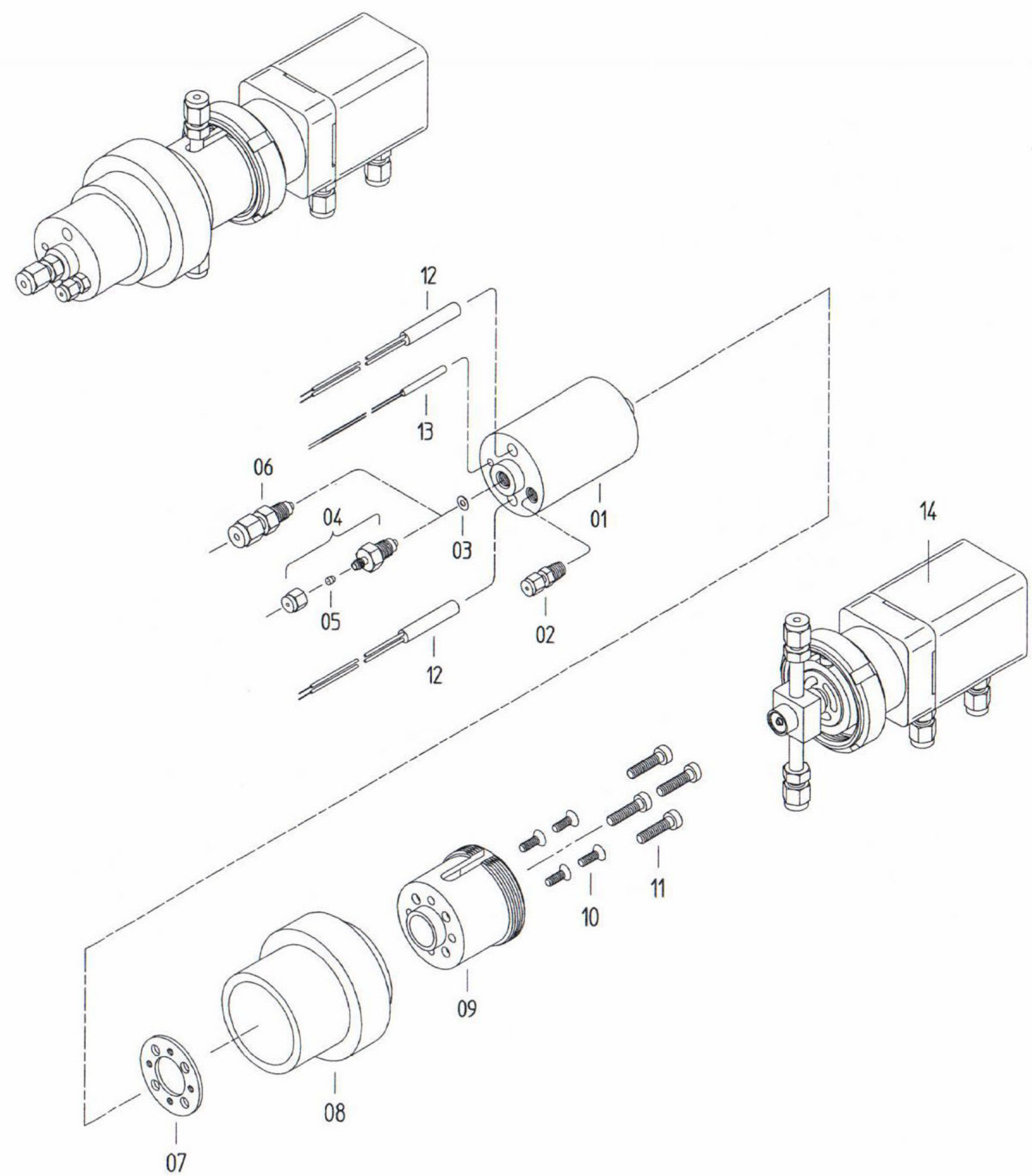


Table 6-1: LSIV parts

ID number	Part number	Part name
01	125-004-XA-EM-SS	Vaporizer-cylinder, stainless steel (SS) 316
02	001-104-1/16-SS	Connector/carrier, 1/16-in, SS 316(1)
03	120-112-1/8-PEEK	Gasket, ⅛-in, polyetheretherketone (PEEK)
04	125-00801/16-SS	Connector/capillary-column, 1/16-in, SS 316(1) Equipped with VESPEL-ferrule, 1/16-in(2)
05	001-131-1/16-V	VESPEL-ferrule, 1/16-in bore 0.5 mm/0.19-in Usable for capillary column fused silica 0.32(3)
06	101-228-1/8-SS	Connector, ⅛-in, SS 316(4) (required only if using packed column ⅛-in or stream splitter)
07	120-038	Anchor plate
08	125-118-XA-EM-PEEK	Thermal barrier adapter flange (PEEK)
09	130-020-SS	Head piece, SS 316
10	001-164-SS	Screw, M4 x 12 hex socket countersunk head, SS 304
11	001-166-SS	Screw, M5x16 hex socket head cap, SS 304
12	No part number	Heater element(5)
13	No part number	Thermocouple(5)
14	No part number	Valve top unit

(1) *Denotes standard equipment.*
(2) *See part ID 05.*
(3) *See part ID 04.*
(4) *Only if required.*
(5) *Emerson equipment.*

Procedure

1. Halt sample flow and allow time for the LSIV to cool.
2. Remove the actuation portion of the valve by unscrewing the union coupling from the heater section, which should remain attached to the gas chromatograph (GC).

   Emerson has provided a union coupling wrench for this purpose.

   This will expose the sample flow chamber and the old seals that ride the metering rod , which should be treated with great care to prevent bending or scratching.
3. Pull the sample flow chamber assembly off the metering rod. Remove the two seals.

   To do this, you may need to push from the opposite side with a rod smaller than 0.175 in (4.4 mm).
4. Place new seals on the sample flow chamber assembly. Press the chamber and seals back over the metering rod.
5. Place the actuation section in position on the heater section’s headpiece.
6. Use the union coupling spacer to ensure that the union coupling is properly aligned with the heater section’s headpiece.
7. Use the union coupling wrench to re-tighten the union coupling over the heater section.
8. Restart the sample flow.

Postrequisites

Return the GC to service.

6.4.8 Repairing and maintaining the detectors

When a thermal conductivity detector (TCD) fails to perform normally, you may need to replace it.

Signs that a TCD may be faulty include, but are not limited to, the following:

- A chromatogram with a wandering or drifting baseline
- A chromatogram with a noisy baseline
- A chromatogram with a no peaks
- No chromatogram

A test for a faulty TCD involves measuring the resistance of each filament using a multimeter. A pair of thermistors should give the same resistance reading; therefore, if a thermistor reading is significantly different from the reading of its mate, replace the pair. Otherwise, the TCD bridge will be unbalanced, noisy, and drifty.

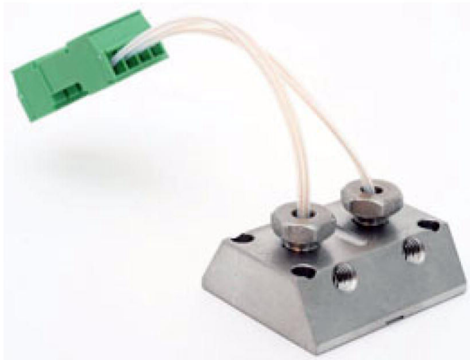
Required tools for thermal conductivity detector (TCD) maintenance

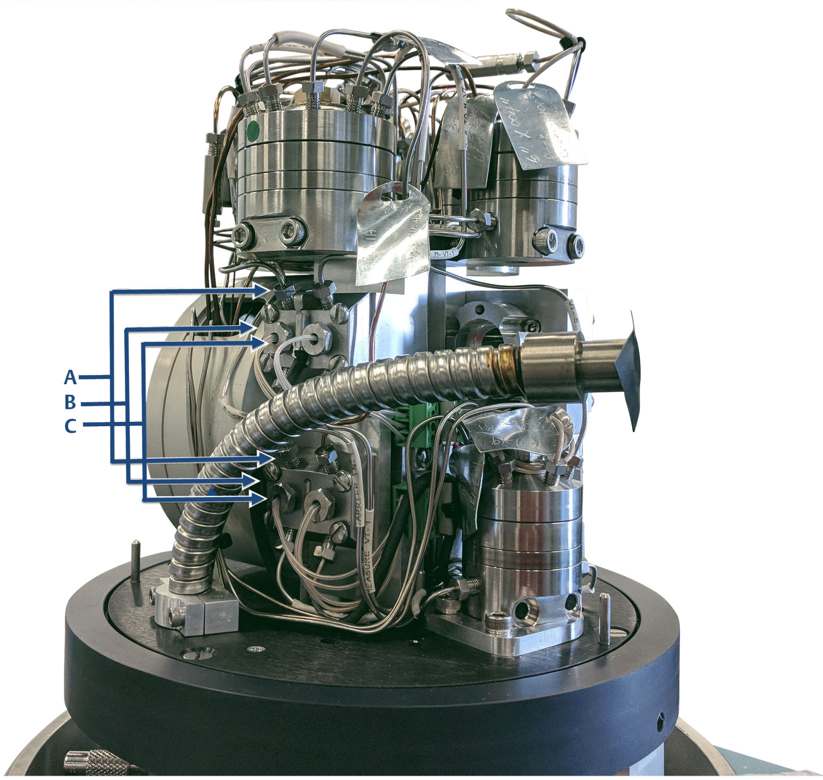
A flat-head screwdriver is required for removing and replacing TCDs. Use a multimeter to test the thermistor pair.

Thermal conductivity detector (TCD) replacement parts

Consult the parameter list that was provided with the gas chromatograph (GC) for the thermistor kit required to replace one TCD. A new thermistor seal (2-6-5000-084) is also required.

Figure 6-12: TCD





A. Gas connector
B. TCD block
C. TCD 1 and TCD 2 retainer nuts and thermistor leads

Replace a thermal conductivity detector (TCD)

See drawing DE-22143 in List of engineering drawings - Rosemount 700XA.

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

- Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
- Keep cover tight while circuits are live.
- Use cables or wires suitable for the marked **T** ratings.
- Cover joints must be cleaned before replacing the cover.
- Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

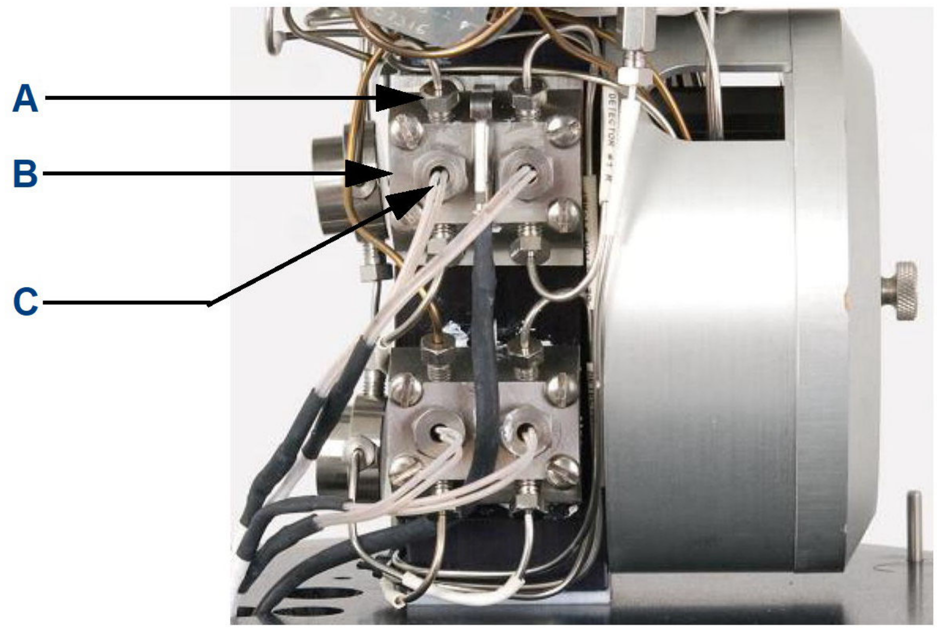
Procedure

1. Disconnect all power to the GC.
2. If you have not already done so, remove the explosion-proof dome and the thermal cover.

3. Unscrew and remove the TCDs from the TCD block and the gas connectors.

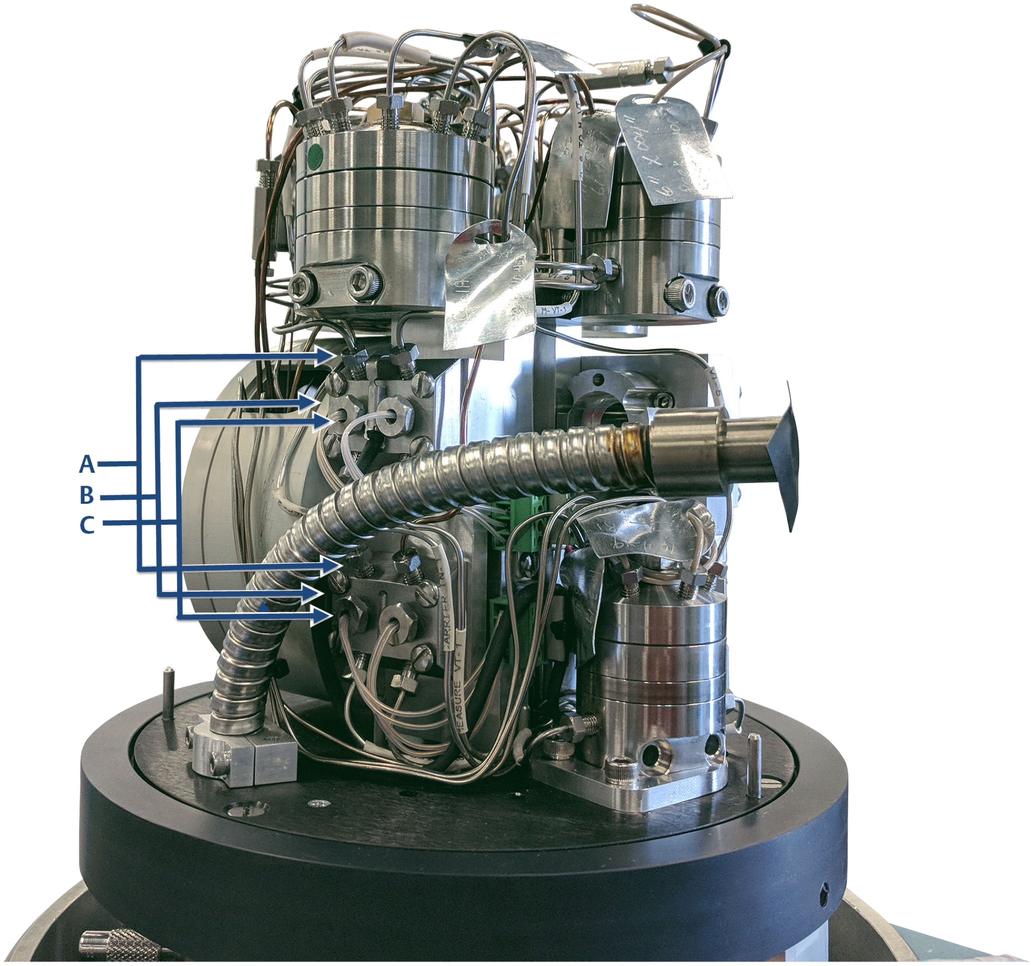
   Be careful not to damage the PTFE washer that is placed between the TCD and the TCD block.

Figure 6-13: Components of a TCD block



a. Gas connector
b. TCD block
c. TCD

Figure 6-14: Components of a TCD



A. Gas tubing connector
B. TCD block
C. TCD 1 and TCD 2 retaainer nuts and thermistor leads

4. Loosen the two retainer nuts.
5. Use a flat head screw driver and remove the four TCD termination block screws.
6. The TCD thermistors are held within the TCD block by the retainer nut. To replace the thermistor, do the following:
    a) Unscrew and release the thermistor leads from the termination block.
    b) Unscrew the retainer nut from the TCD block.
    c) Remove the PTFE seals as well as the thermistor and its wires from the retainer nut.
    d) Remove the PTFE shields from the old thermistor wires and install on the new thermistor wires.
    e) Insert a new PTFE seal into the TCD block.
    f) Thread the thermistor through the retainer nut.

g) Screw the retainer nut back into the TCD block.

   Ensure a tight fit (quarter turn after finger tight); otherwise a potential leak path might open.

h) Reconnect the thermistor leads to the termination block, taking care to reconnect the thermistor leads to the corresponding terminal block screws.

Note
The thermistors are a matched pair (2-5-1611-003) and must be replaced as such. Repeat Step 6 for each thermistor in a pair.

Note
Tighten the block screws with a torque wrench to 20 in.-oz.

7. Reconnect the gas tubings.

   Make sure tubing is properly seated and reattach the TCD housing with the four screws.

8. Replace the thermal cover and explosion-proof dome.
9. Apply power to the GC.

Remove the flame ionization detector (FID)

The FID has no replaceable parts. If it has damage (such as a broken RTD or igniter coil) you will need to remove and replace the FID.

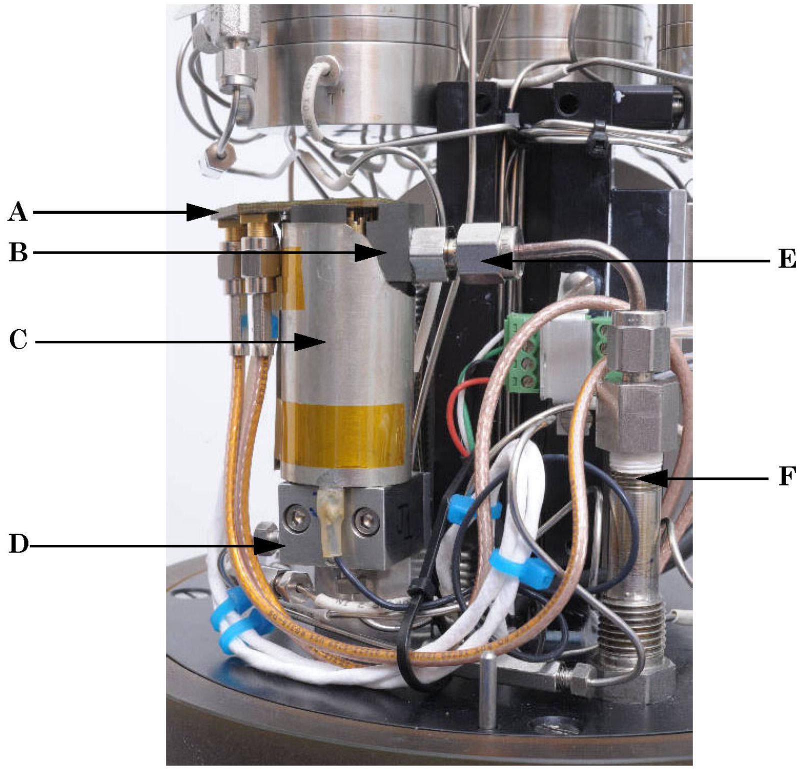
⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
Keep cover tight while circuits are live.
Use cables or wires suitable for the marked **T** ratings.
Cover joints must be cleaned before replacing the cover.
Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

Figure 6-15: FID



A. Termination board
B. Cap
C. Ground shield cover
D. Mounting bracket
E. Vent connector
F. Exhaust tube

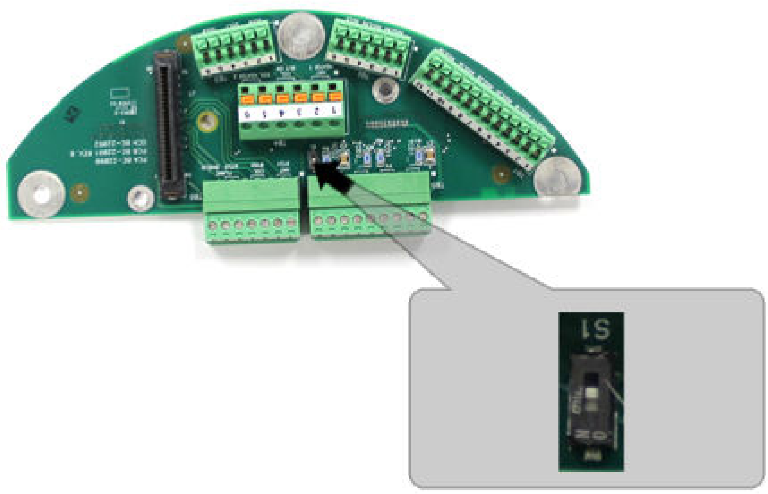
Procedure

1. Disconnect all power to the gas chromatograph (GC).

   Allow at least 10 minutes for the components to cool down.

2. Locate the FID switch, which is on the half-moon-shaped wire terminal board, and flip it to the **OFF** position.

Figure 6-16: Location of the FID switch



3. Remove the explosion-proof dome and the thermal hood.
4. Remove the screw connecting the termination board to the FID cap.
5. Remove the two screws from the mounting bracket.
6. Unscrew and remove the vent connector.

Note
Use a backing wrench on the bolt fronting the FID cap when removing the vent connector.

7. Remove the screw from the top of the FID assembly.

NOTICE

Electrostatic discharge (ESD)
Operators and technicians must wear an electrostatic wrist strap when handling printed circuit cards to prevent shorting the boards through static electricity. Do not install or remove the printed circuit assemblies while power is applied to the device. Keep electrical components and assemblies in their protective (conductive) carriers or wrapping until ready for use. Use the protective carrier as a glove when installing or removing printed circuit assemblies.

Postrequisites

To reassemble the FID, refer to Reassemble the flame ionization detector (FID). The final step is to flip the FID switch to the **ON** position.

Reassemble the flame ionization detector (FID)

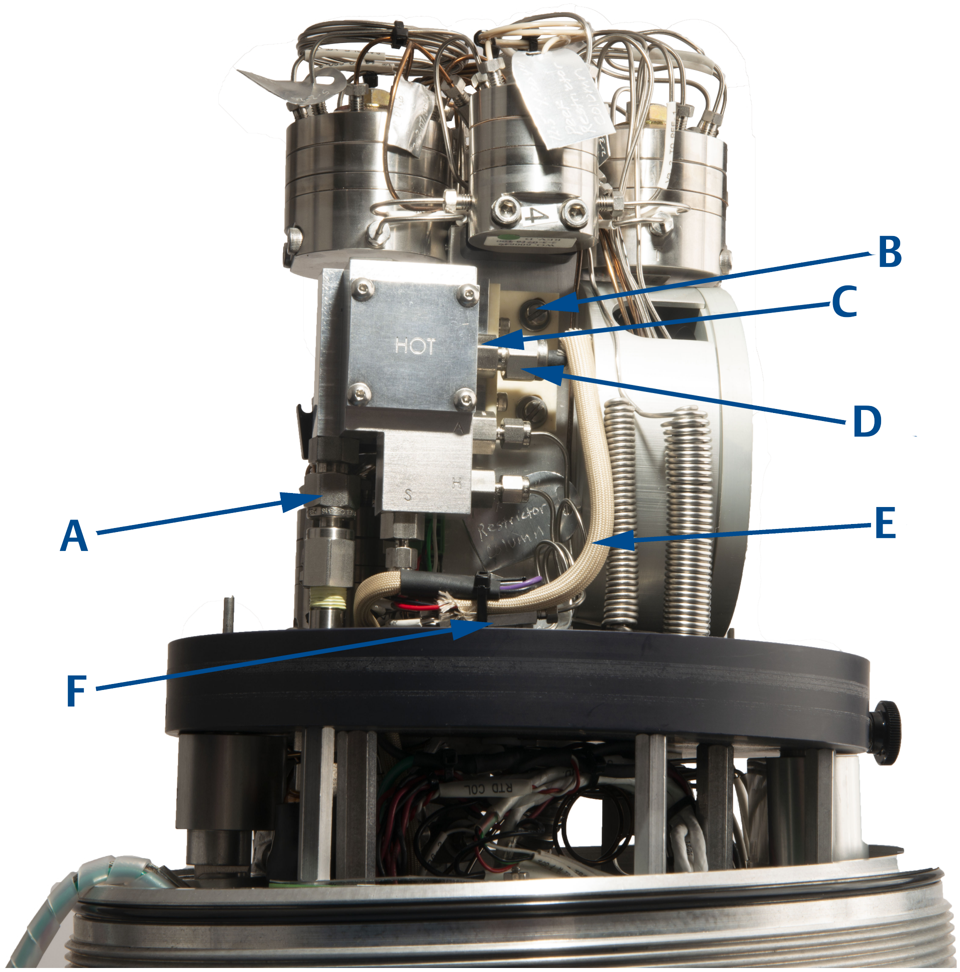
Procedure

1. Insert the FID into the mounting bracket and secure with the two block screws.
2. Grasp the edges of the FID board and align with the six socket tubes that extend into the pins in the cap.

3. Replace the screw at the top of the FID assembly.
4. Tighten the tubing nut connector, securing the FID exhaust tube.
5. Screw in the tubing nut connectors located at the base of the FID.
6. Install the explosion-proof cover over the FID assembly and secure to the base with eight bolts.

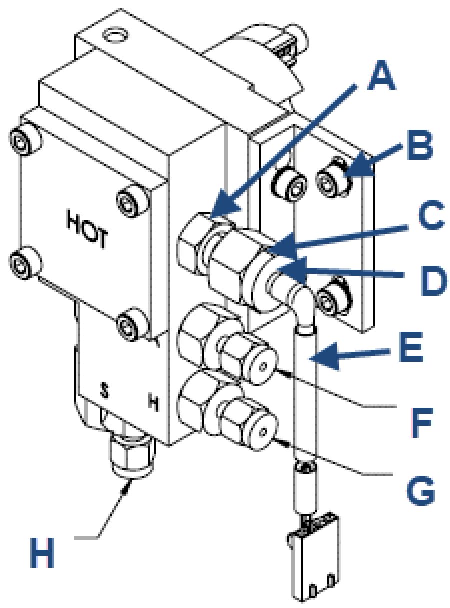
Replace igniter/thermocouple assembly

Figure 6-17: Igniter/thermocouple assembly front view



A. Bulkhead nut
B. Screws and washers
C. Fitting
D. Bulkhead nut
E. Igniter/thermocouple assembly
F. Igniter connector

Figure 6-18: Igniter side view



A. *Fitting*
B. *Screws and washers*
C. *Bulkhead nut*
D. *Black plastic edge*
E. *Igniter/thermocouple assembly*
F. *Port A*
G. *Port H*
H. *Port S*

Procedure

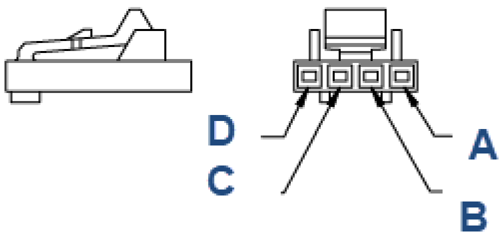
1. Loosen the bulkhead nut.
2. Detach the igniter connector.
3. Remove the screws and washers from the plastic bracket.
4. Rotate the micro flame photometric detector (μFPD) burner around the bulkhead nut until there is enough room to remove the igniter/thermocouple assembly.
5. Loosen the nut; then slide the igniter/thermocouple assembly and ferrule (not shown here) out of the μFPD burner through the fitting.
6. Slide the bulkhead nut and a new ferrule on the new igniter/thermocouple assembly. Then slide the μFPD burner through the fitting.
7. Align the black plastic edge of the igniter with the end of the nut and gradually tighten the nut to the fitting. Keep pushing the igniter toward the burner while tightening the nut. The back edge has to be flush with the end of nut when secured. Tighten the nut to 4 in.-lb.

   Do not overtighten the nut.
8. Rotate the μFPD burner back to its original position. Finger tighten the screws and washers.

9. Tighten the bulkhead nut to 20-in. lb.
10. Secure the screws and washers.
11. Reconnect the igniter connector.

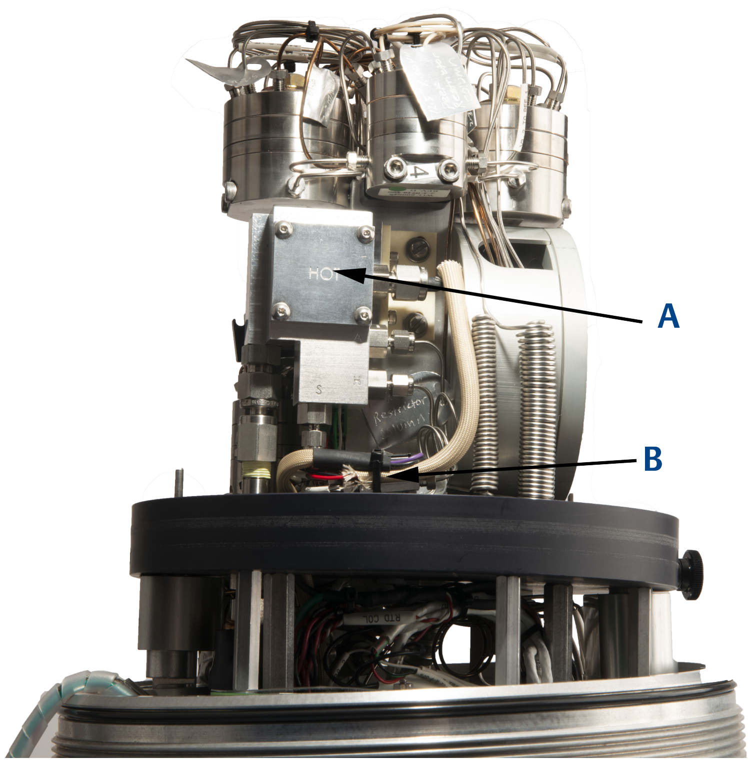
Troubleshoot igniter/thermocouple assembly

Figure 6-19: Igniter/thermocouple assembly drawing



A. Purple, igniter
B. Black, igniter
C. White, thermocouple
D. Red, thermocouple

Figure 6-20: Igniter/thermocouple assembly photo



A. Back plate
B. Connectors

- Resistances measured between pins 1 and 2 shall be 0.5 - 1.2 ohms.
- Resistances measured between pins 3 and 4 shall be less than 4 ohms.

Recommended actions

1. Detach connectors.

   Voltage between pins 1 and 2 on extension cable end shall measure 3.0 to 3.3 Vdc while igniting. You can manually ignite with the ***Detectors*** pop-up window.

   If no voltage is measured, you may need to replace the photomultiplier tube (PMT) module or extension cable.

2. Remove black plate.

   Igniter shall glow red while igniting or if you apply 3 Vdc to pins 1 and 2 on burner end. Do not apply more than 3.3. Vdc to igniter. Do not apply voltage to igniter for more than 20 seconds.

Remove the micro flame photometric detector (μFPD) burner

Use this procedure and refer to assembly drawing DE-22143 to replace the μFPD burner.

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
Keep cover tight while circuits are live.
Use cables or wires suitable for the marked **T** ratings.
Cover joints must be cleaned before replacing the cover.
Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.
When handling the analyzer, always use suitable protective gloves.
These precautions are particularly important when working at heights.
If burned, seek medical treatment immediately.

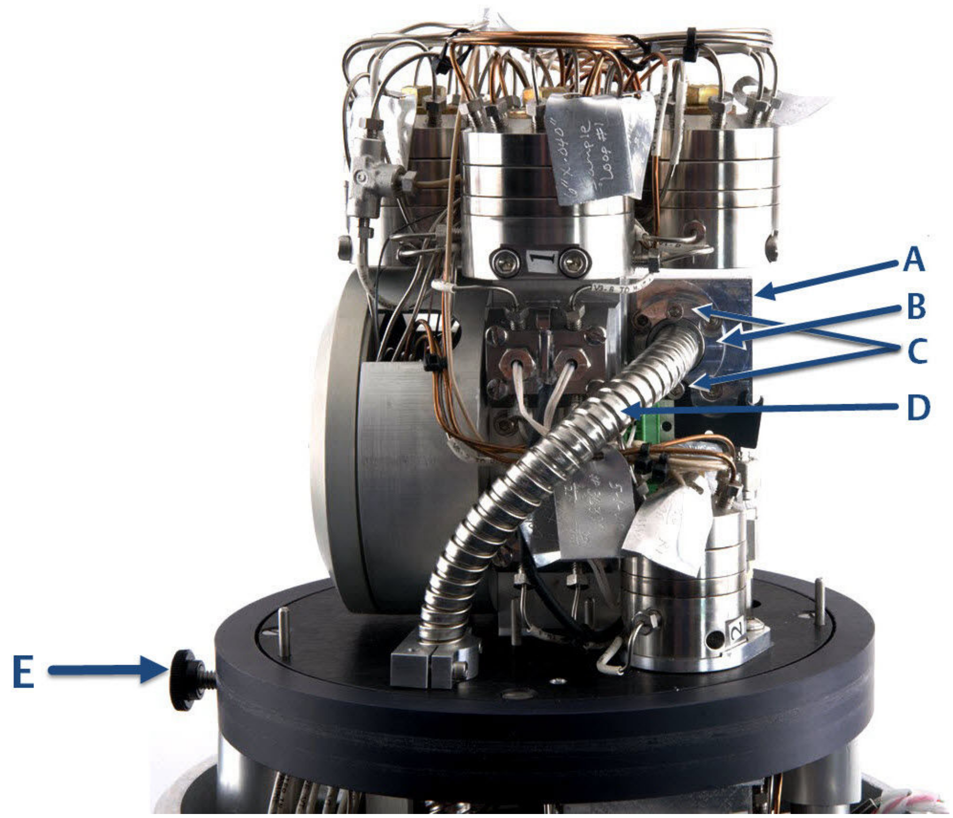
Tools required

- 7⁄64-in. Allen wrench
- Phillips screwdriver
- Flathead screwdriver

Procedure

1. Disconnect all power to the unit. Allow at least 10 minutes for the components to cool-down.
2. Remove the explosion-proof dome and the thermal hood.
3. Use a 7⁄64-in. Allen wrench and remove the fiber cable screws from the µFPD burner mounting plate to disconnect the cable.

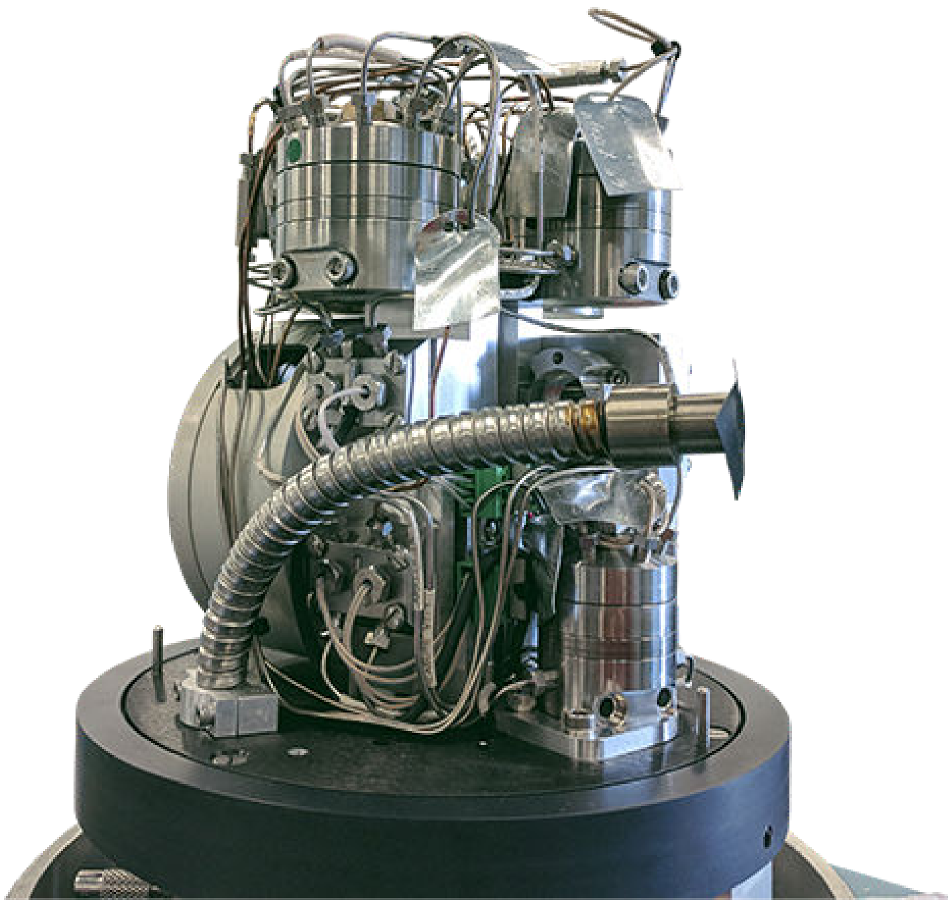
Figure 6-21: µFPD burner disassembly back view



A. µFPD burner
B. µFPD fiber cable clamp
C. Screws µFPD burner
D. µFPD fiber cable
E. Thumb screw

4. Affix electrical tape to the end of the disconnected fiber cable to prevent debris or moisture contamination.

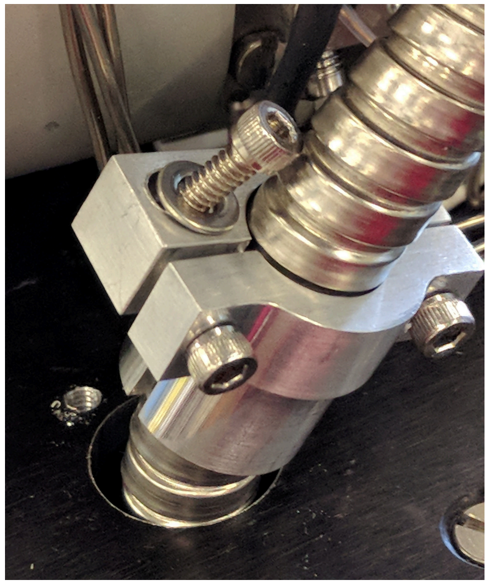
Figure 6-22: μFPD fiber cable disassembled



5. Remove the two screws from the μFPD burner housing.

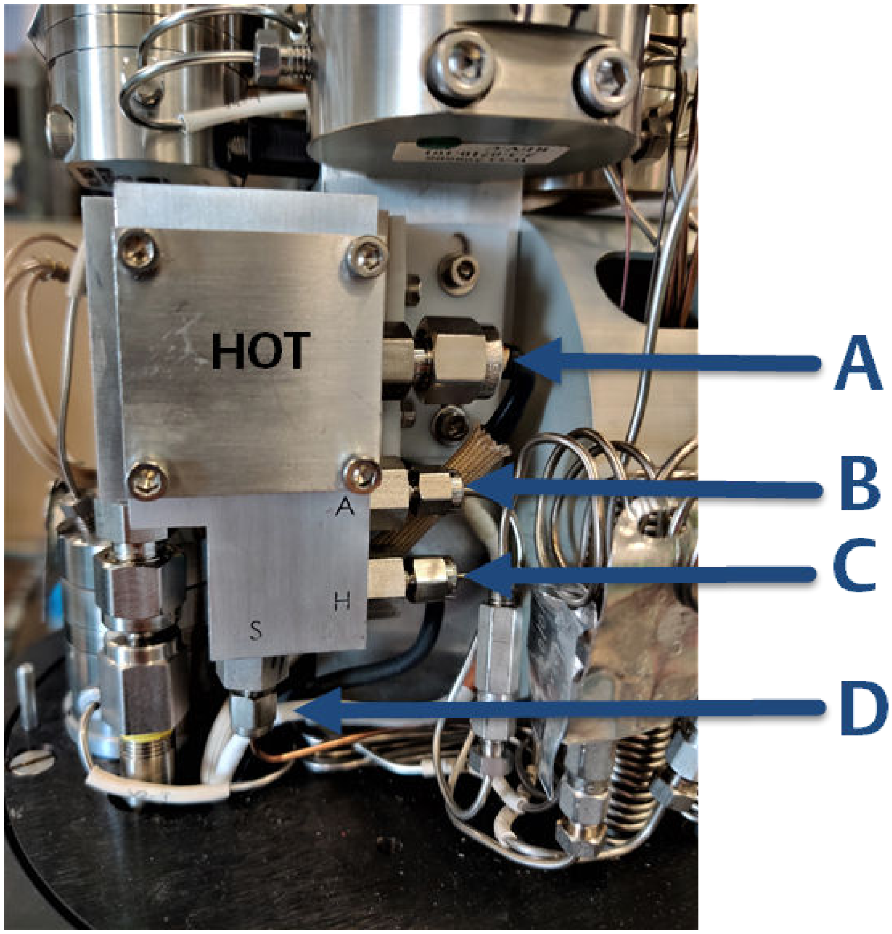
6. Remove the fiber cable clamp screws and O-ring. Set aside for reassembly.

Figure 6-23: μFPD fiber cable clamp disassembly



7. Disconnect the air intake, hydrogen intake, and sample lines.

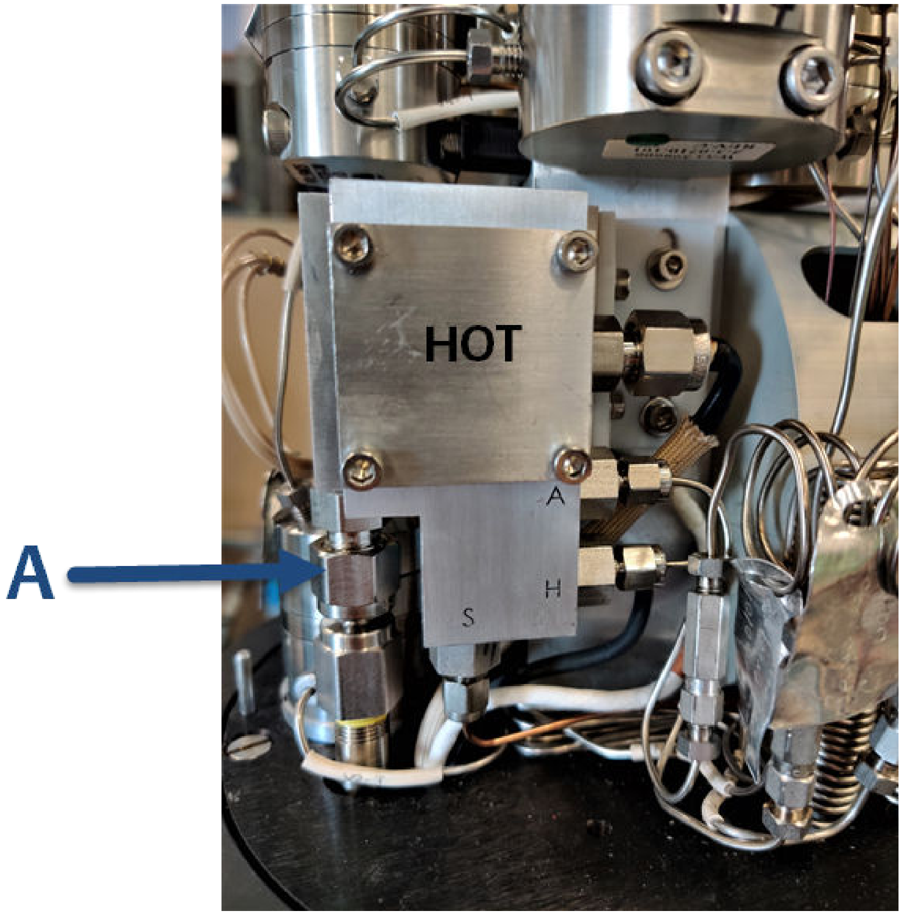
Figure 6-24: μFPD igniter and intake lines



A. Igniter/thermocouple (TC)
B. Air intake port
C. Hydrogen intake port
D. Sample intake port

8. Loosen the top bulkhead nut and remove the μFPD burner assembly.

Figure 6-25: μFPD burner bulkhead



A. *Bulkhead nut*

Install the micro flame photometric detector (μFPD) burner

Use this procedure and refer to assembly drawing DE-22143 to install the μFPD burner.

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
Keep cover tight while circuits are live.
Use cables or wires suitable for the marked **T** ratings.
Cover joints must be cleaned before replacing the cover.
Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.
When handling the analyzer, always use suitable protective gloves.
These precautions are particularly important when working at heights.
If burned, seek medical treatment immediately.

Tools required

- 7⁄64-in. Allen wrench
- Phillips screwdriver
- Flathead screwdriver

Procedure

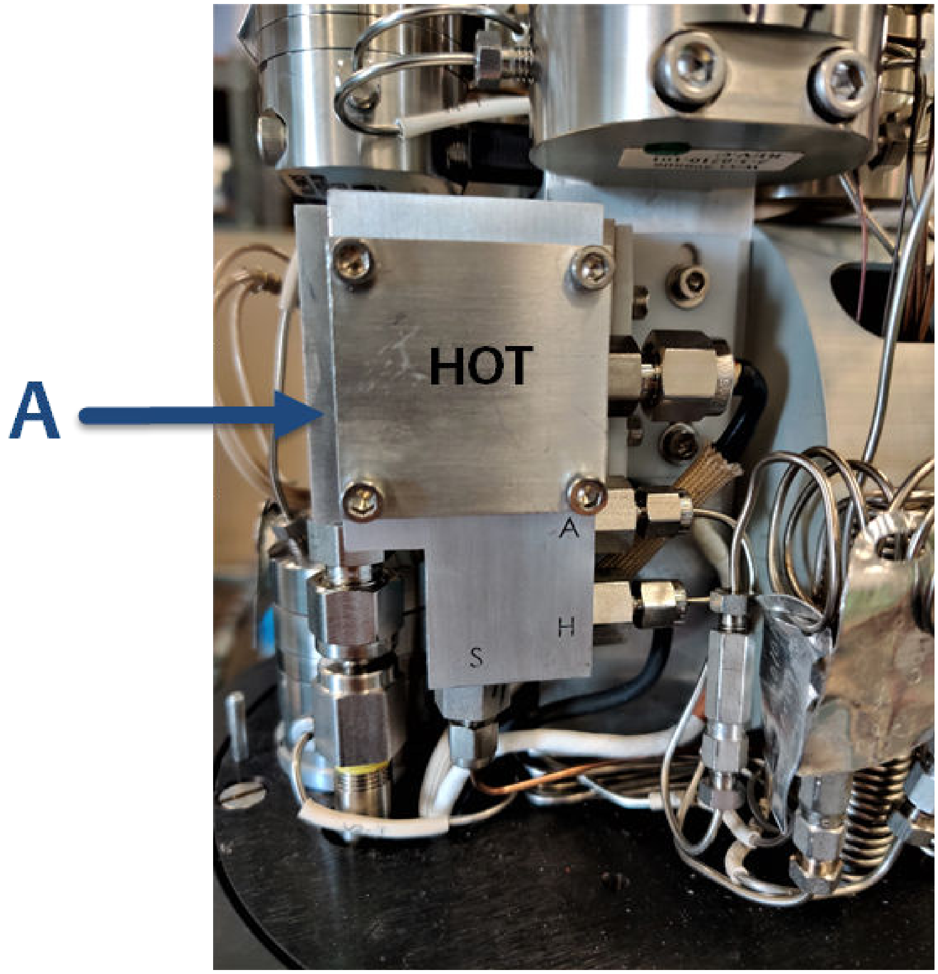
1. Disconnect all power to the unit.

   Allow at least 10 minutes for the components to cool-down.

2. Remove the explosion-proof dome and the thermal hood.

3. Attach the male fitting of the μFPD burner to the bulkhead nut on the GC. Finger tighten the bulkhead nut.

Figure 6-26: μFPD burner installation

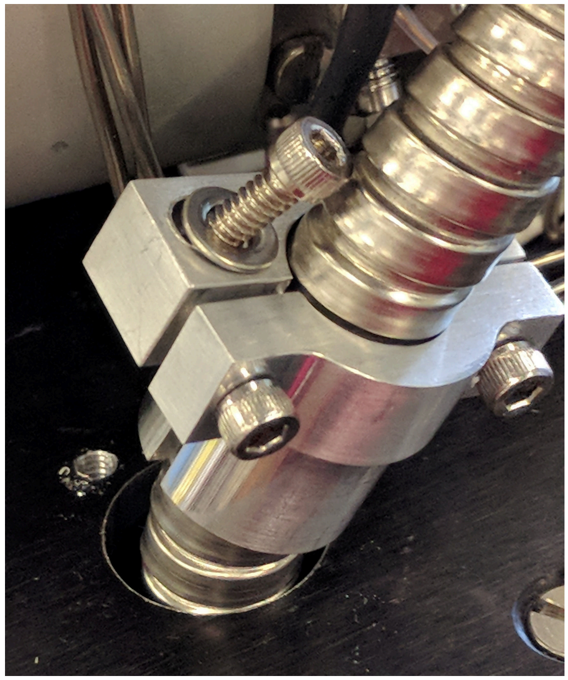


A. μFPD burner

4. Attach and finger tighten two screws/washers on the plastic bracket to center post.

5. Tighten the bulkhead connector with torque of 20 in. lb.

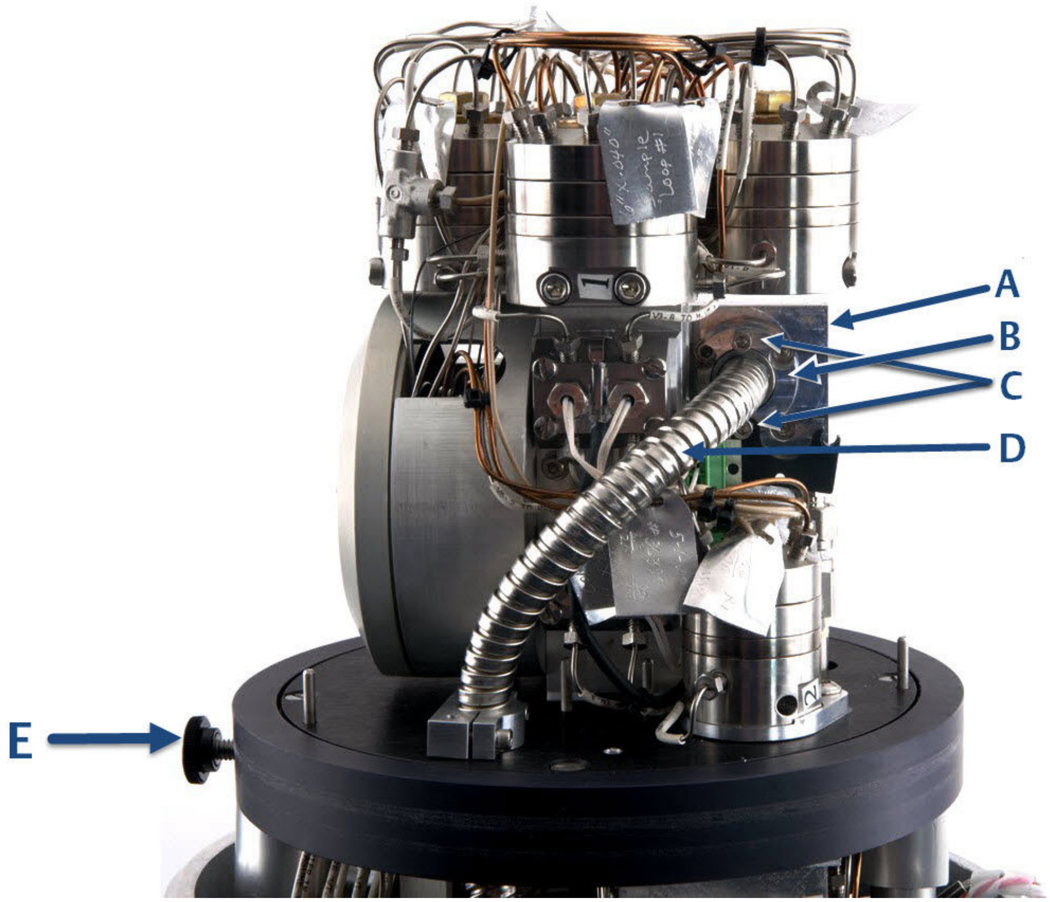
Figure 6-27: μFPD fiber cable clamp assembly



6. Install the fiber cable to the μFPD burner connector and secure with cable clamp.

7. Install the two screws in the rear of the μFPD burner housing.

Figure 6-28: μFPD burner assembly



- *A. μFPD burner*
- *B. μFPD cable clamp*
- *C. Screws μFPD burner*
- *D. μFPD fiber cable*
- *E. Thumb screw*

8. Connect the igniter, air intake, hydrogen intake, and sample lines.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

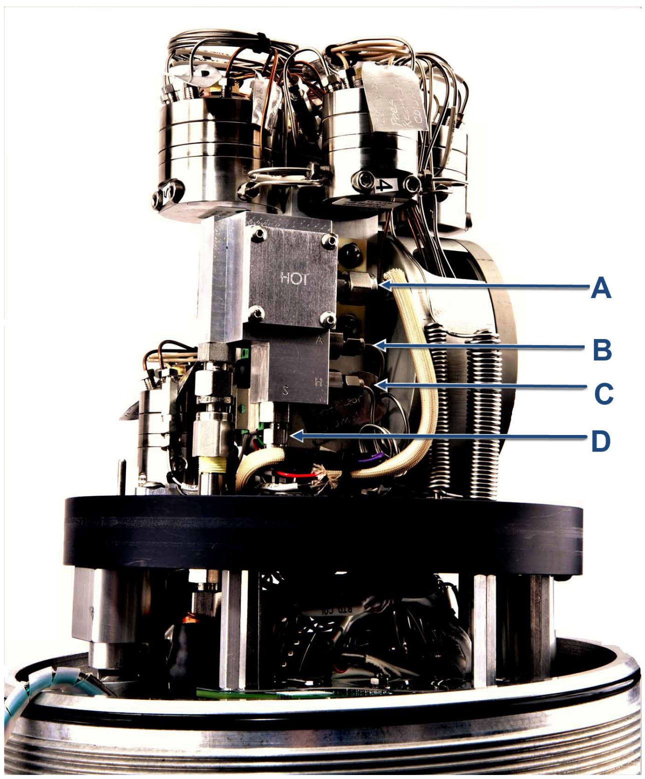
Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.

When handling the analyzer, always use suitable protective gloves.

These precautions are particularly important when working at heights.

If burned, seek medical treatment immediately.

Figure 6-29: µFPD igniter and intake lines



A. Igniter/thermocouple
B. Air intake port
C. Hydrogen intake port
D. Sample intake port

9. Replace the thermal hood and the explosion-proof dome.
10. Apply power to the GC.

Remove the micro flame photometric detector photomultiplier tube (μFPD PMT) module

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
Keep cover tight while circuits are live.
Use cables or wires suitable for the marked **T** ratings.
Cover joints must be cleaned before replacing the cover.
Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.
When handling the analyzer, always use suitable protective gloves.
These precautions are particularly important when working at heights.
If burned, seek medical treatment immediately.

Tools required

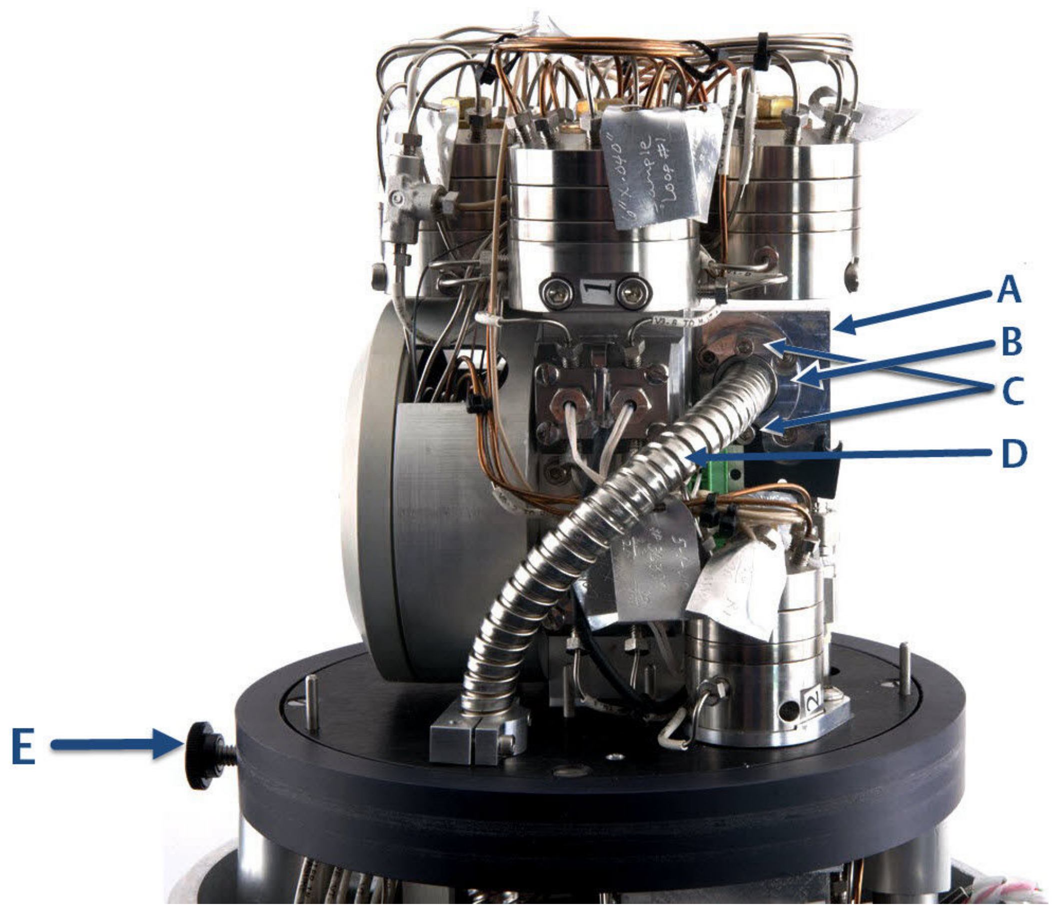
- 7⁄64-in. Allen wrench
- Phillips screwdriver
- Flathead screwdriver

Procedure

1. Disconnect all power to the unit. Allow at least 10 minutes for the components to cool-down.
2. Remove the explosion-proof dome and the thermal hood.

3. Use a 7⁄64-in. Allen wrench and loosen the fiber cable screws from the µFPD burner mounting plate to disconnect the cable.

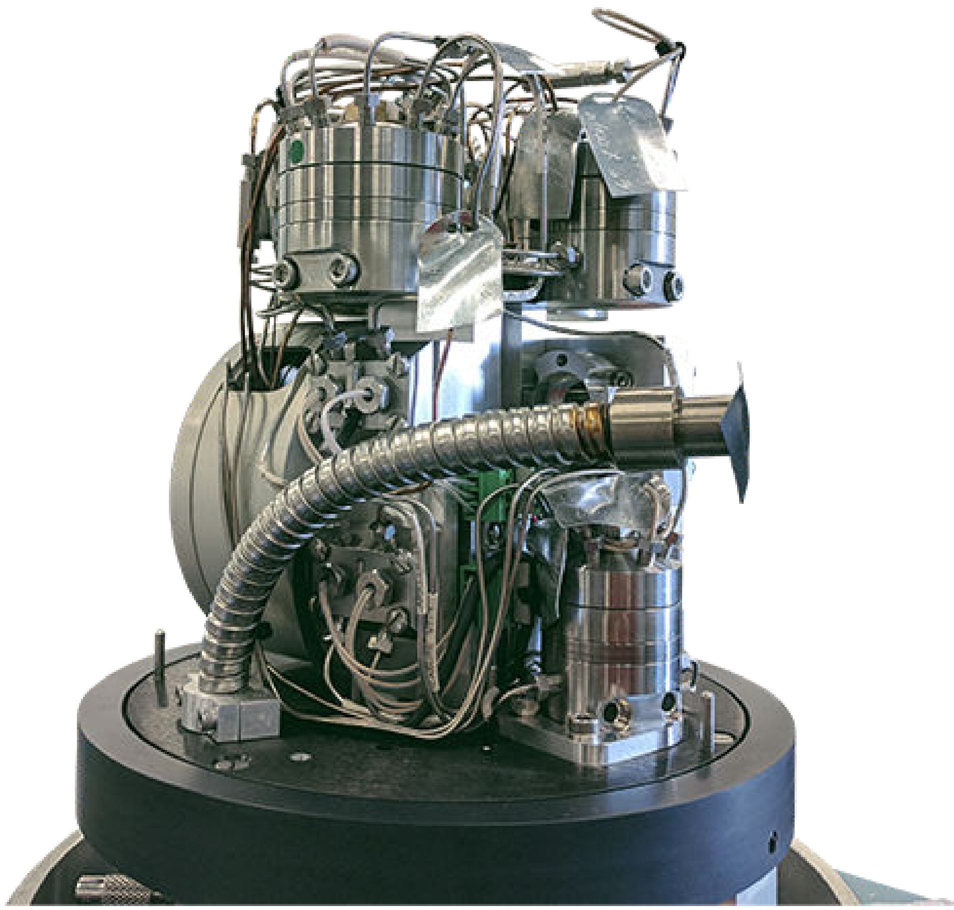
Figure 6-30: µFPD burner disassembly



- *A. µFPD burner*
- *B. Fiber cable clamp*
- *C. Screws µFPD burner*
- *D. µFPD fiber cable*
- *E. Thumb screw*

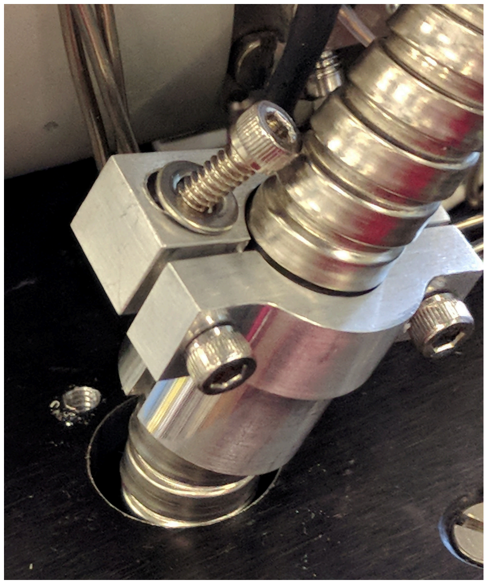
4. Affix electrical tape to the end of the disconnected fiber cable to prevent debris or moisture contamination.

Figure 6-31: µFPD fiber cable disassembled



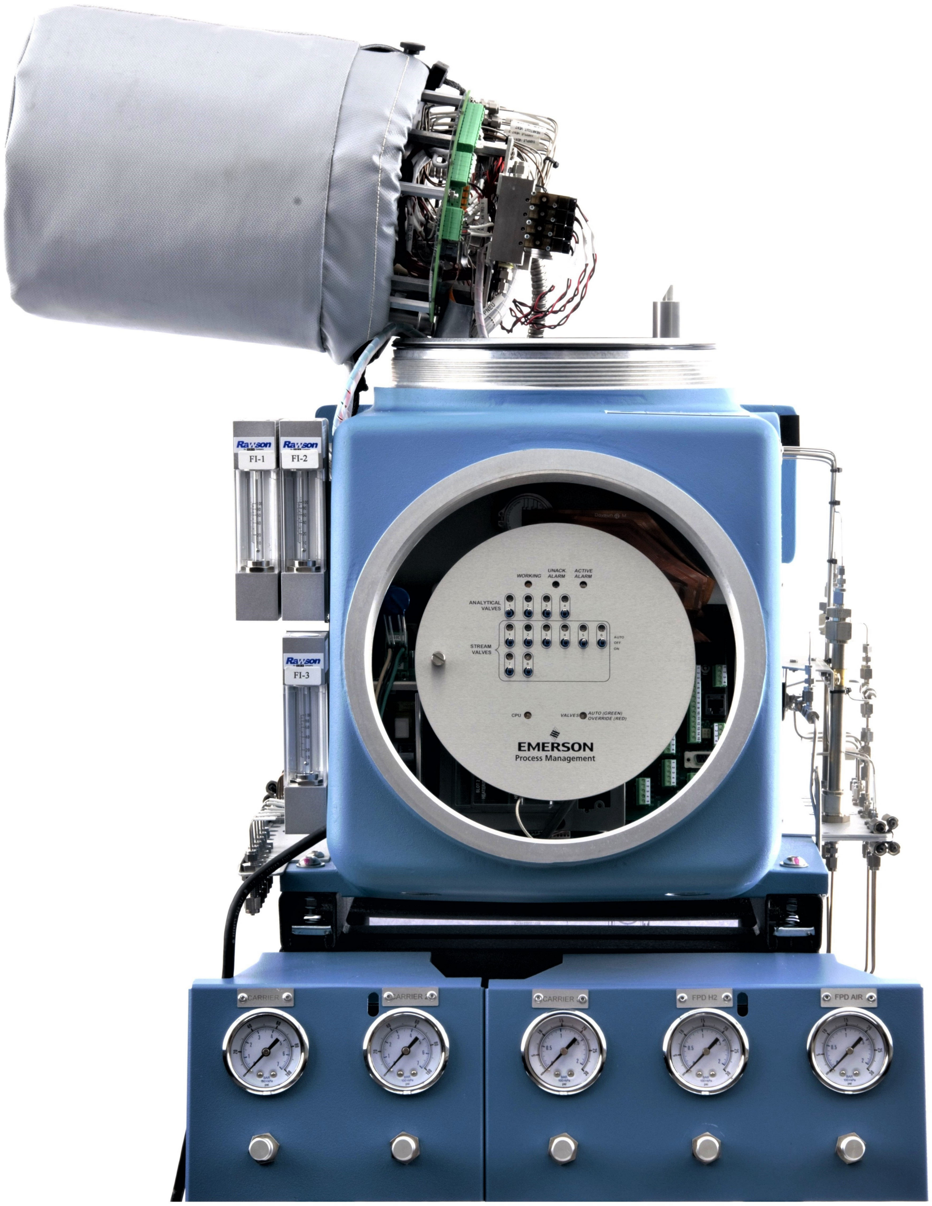
5. Loosen the screws holding the fiber cable bottom clamp. Slide the bottom clamp up.

Figure 6-32: µFPD fiber cable clamp disassembly



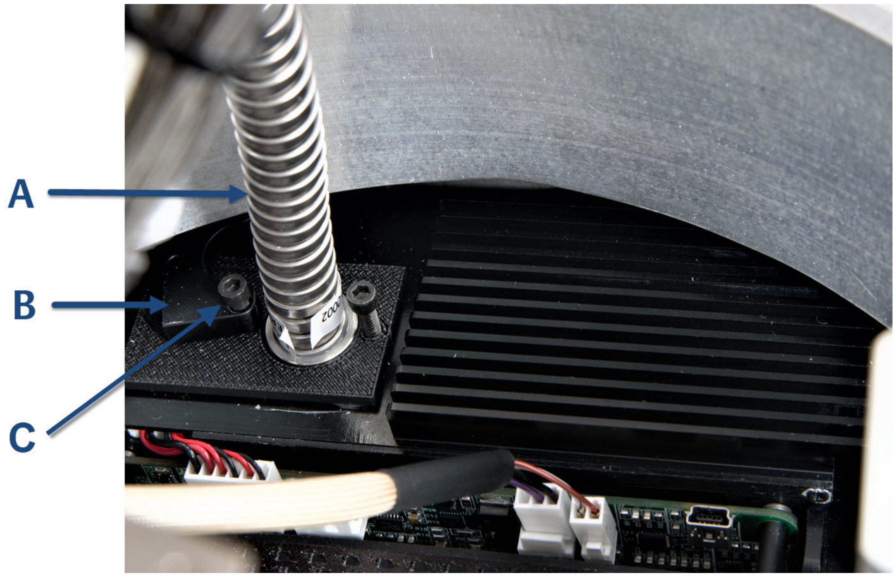
6. Loosen the thumb screw and carefully lift and tilt the Ultem plate and upper assembly.

Figure 6-33: Upper assembly tilted



7. Loosen the fiber cable clamp screws and disconnect the fiber cable from the PMT.

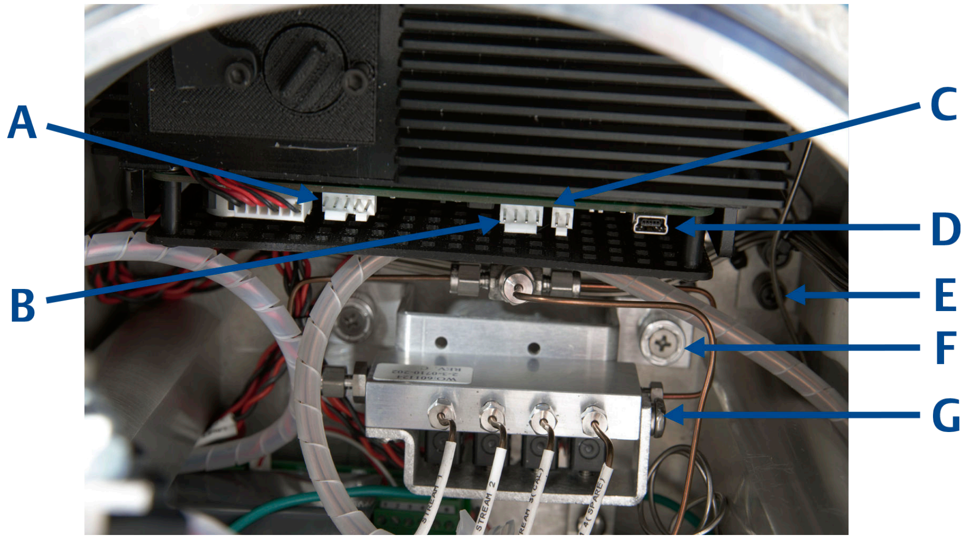
Figure 6-34: Fiber cable disconnected from the µFPD PMT module



A. Fiber cable
B. Cable clamp
C. Cable clamp screws

8. Disconnect the wire terminals for J6, J10, and J2.

Figure 6-35: µFPD PMT module connections



A. J6 - CAN and power signals
B. J10 - igniter
C. J2 - thermocouple
D. USB connector
E. PMT module bracket screws
F. Stream manifold screws
G. Stream manifold

9. Loosen the two Phillips screws from the stream solenoid manifold.
10. Move the entire manifold away from the µFPD PMT module.
11. Use a large flat head screwdriver to loosen the two µFPD PMT module bracket screws.
12. Move the 1/16-in. stainless steel tubing away and pull the µFPD PMT module out of the enclosure.

Install the micro flame photometric detector (µFPD) photo multiplier tube (PMT) module

Tools required

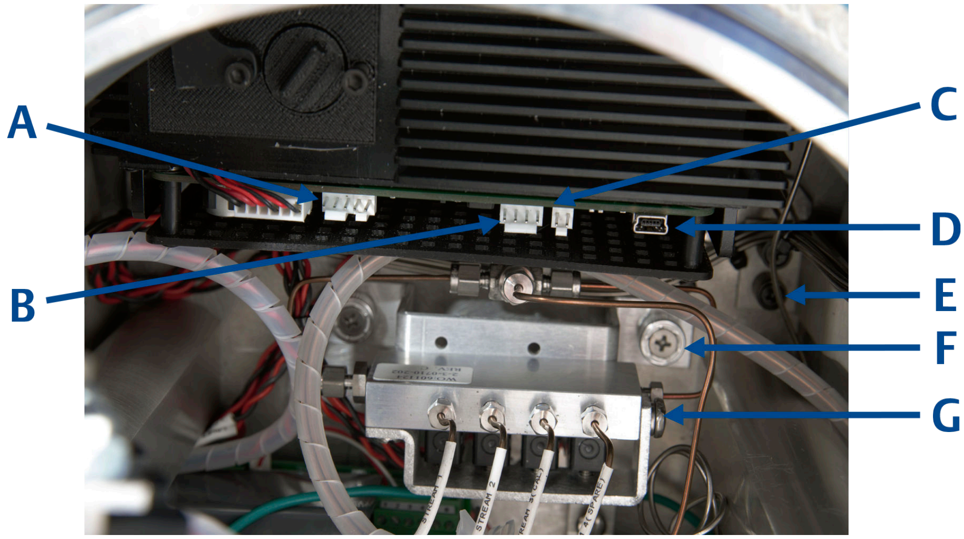
- 7⁄64-in. Allen wrench
- Phillips screwdriver
- Flathead screwdriver

Procedure

1. Lower the µFPD PMT module into the enclosure.
2. Use a large flathead screwdriver to tighten the two µFPD PMT module bracket screws.
3. Use a Phillips head screwdriver and tighten the two screws to attach the stream solenoid manifold.

4. Attach the J6, J10, and J2 wire terminals to the µFPD PMT module.

Figure 6-36: µFPD PMT module connections

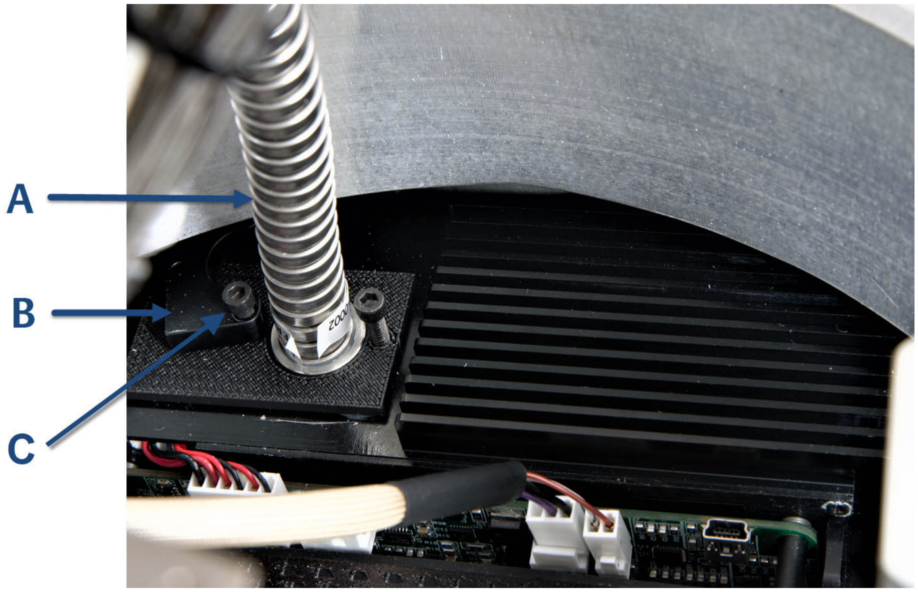


A. J6 - CAN and power signals
B. J10 - igniter
C. J2 - thermocouple
D. USB connector
E. PMT module bracket screws
F. Stream manifold screws
G. Stream manifold

5. Connect the fiber cable to the µFPD PMT module and tighten the two cable clamp Allen screws.

   The shoulder of fiber cable shall be flush with clamp surface to ensure fiber cable is fully inserted into PMT module.

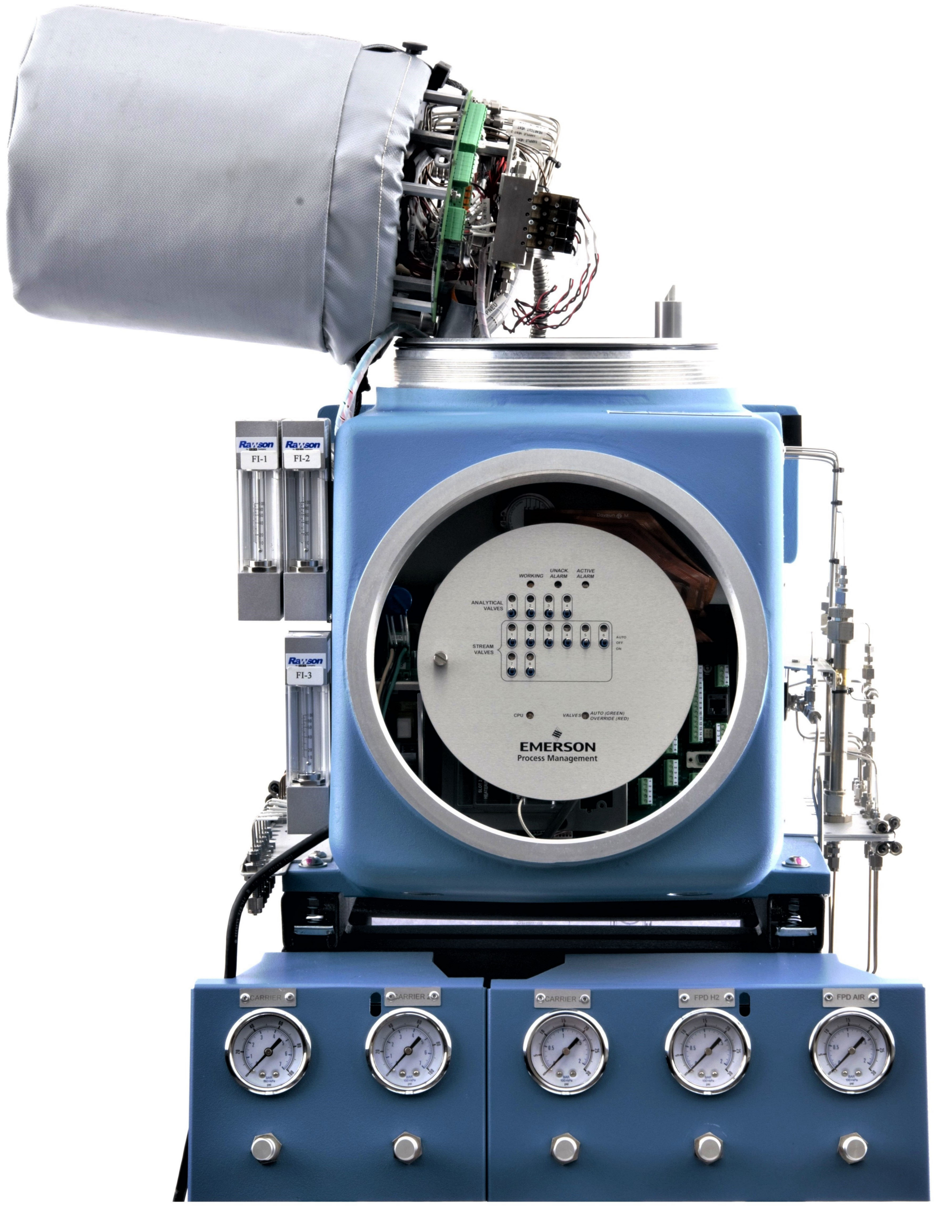
Figure 6-37: Fiber cable connected to the µFPD PMT module



A. Fiber cable
B. Cable clamp
C. Cable clamp screws

6. Carefully tilt and lower the Ultem plate and upper assembly. Tighten the thumb screw.

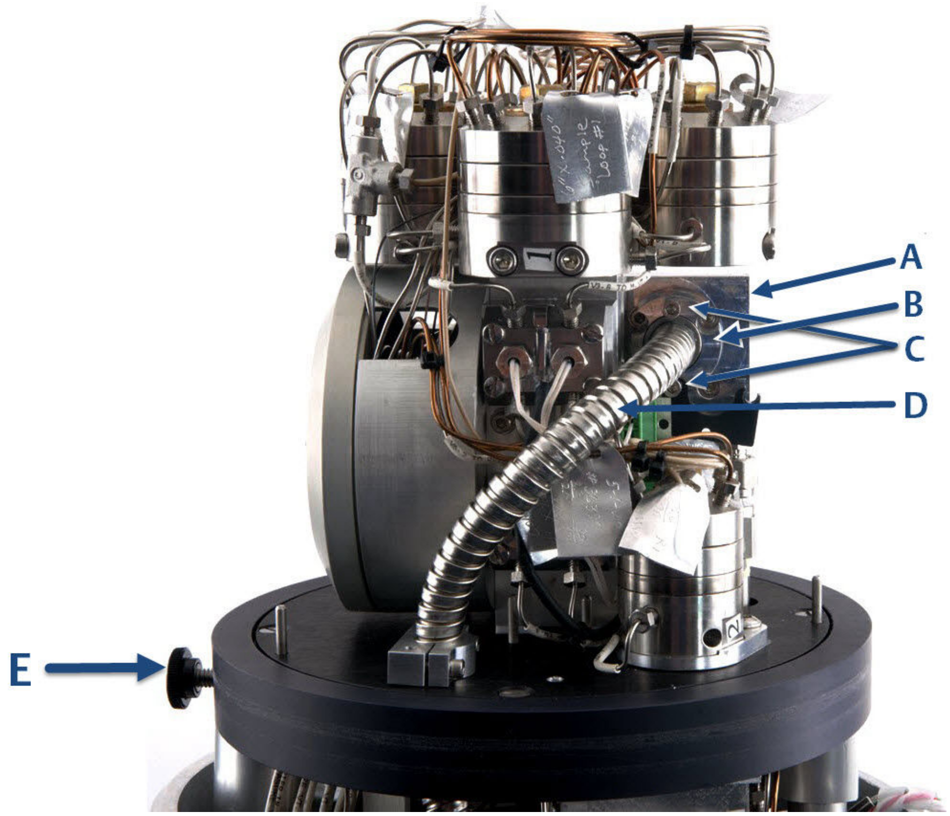
Figure 6-38: Upper assembly tilted



7. Remove electrical tape on the end of the fiber cable.

8. Insert the fiber cable into the µFPD burner.

Figure 6-39: µFPD fiber cable assembly

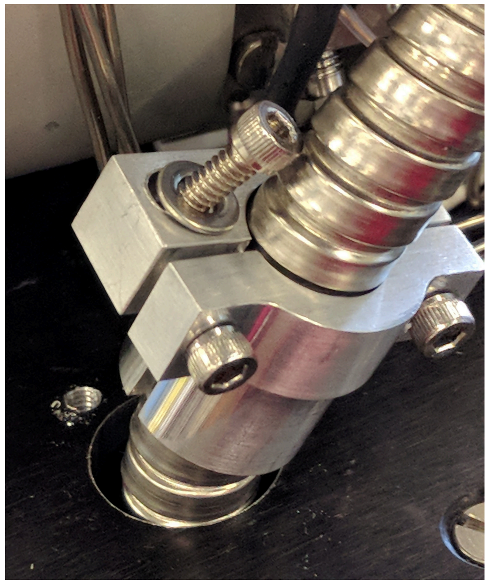


A. µFPD burner
B. Fiber cable clamp
C. Screws µFPD burner
D. µFPD fiber cable
E. Thumb screw

9. Tighten the burner fiber cable clamp screws.

10. Tighten the fiber cable upper clamp screws.

Figure 6-40: μFPD fiber cable clamp assembly



11. Replace the insulated cover and the explosion-proof dome.
12. Apply power to the gas chromatograph (GC).

6.4.9 Maintain the methanator

The optional methanator, which is a catalytic converter, converts otherwise undetectable CO_2 and/or CO into methane by adding hydrogen and heat to the sample. The methanator requires little maintenance.

Order Rosemount Kit PN 2-3-0710-265 for the methanator replacement parts.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.

When handling the analyzer, always use suitable protective gloves.

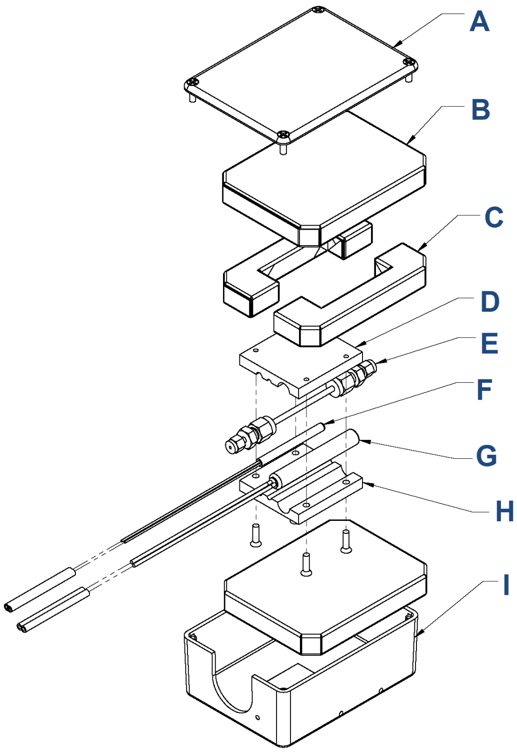
These precautions are particularly important when working at heights.

If burned, seek medical treatment immediately.

Note

Insulate the methanator assembly to prevent heat loss.

Figure 6-41: Methanator assembly



A. *Methanator housing cover*
B. *Heater insulator (2)*
C. *Heater insulator, split*
D. *Heater block, methanator bottom*
E. *Methanator column*
F. *RTD*
G. *Cartridge heater*
H. *Heater block, methanator top*
I. *Methanator housing*

The RTD is replaceable. When replacing it, take care to anchor the RTD cable to the tubing to prevent loosening over time.

To replace the RTD, consult drawing #CE-22715.

Related information

List of engineering drawings - Rosemount 700XA

6.4.10 Measure vent flow

Prerequisites

You will need an accurate flow meter for this measurement.

Procedure

1. Consult the parameter list that was provided with the gas chromatograph (GC) to learn the appropriate flow rate.
2. Attach a flow meter to each measurement vent output on the side of the GC that is labeled *MVn*, where *n* is for each vent.

   The flow should match the value displayed in the parameter list.

6.4.11 Access electrical components

Emerson designed the gas chromatograph (GC) to operate for long periods of time without needing preventative or regularly scheduled maintenance.

The enclosure is explosion-proof, dust-proof, water-proof, and flame-proof.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.
When handling the analyzer, always use suitable protective gloves.
These precautions are particularly important when working at heights.
If burned, seek medical treatment immediately.

Prior to opening the GC, use MON2020 to ensure that there are no configuration or parameter errors.

Procedure

1. Ensure electrical power is disconnected from the GC and the environment is safe.
2. Allow the GC to cool.
3. Unscrew and remove the front panel.

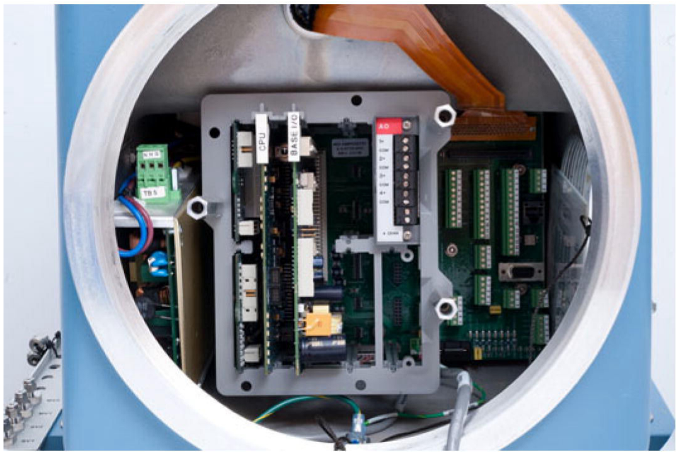
Figure 6-42: Remove the front panel

4. Unscrew and remove the switch panel or LOI.

Figure 6-43: Remove the switch panel or LOI

The PCBs are located in the card cage.

Figure 6-44: PCBs in the card cage



5. Note the location and direction of any board removed. Release the catch(es) and remove/replace the circuit board(s) as necessary.
6. Close and latch the electronics enclosure door.
7. Apply power to the GC.

Replace AC/DC power supply

The AC/DC power supply is mounted on the left wall of the lower enclosure adjacent to the card cage. To access it, remove the front panel and the switch panel or local operator interface (LOI) from the lower enclosure.

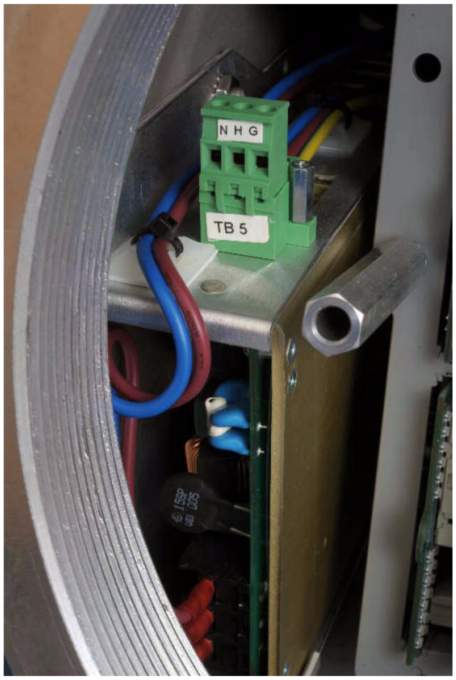
⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
Keep cover tight while circuits are live.
Use cables or wires suitable for the marked **T** ratings.
Cover joints must be cleaned before replacing the cover.
Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

Figure 6-45: AC/DC power supply in lower compartment



Prerequisites

A Cross point #2 Phillips screwdriver is required to remove and replace the AC/DC power supply.

Procedure

1. Remove power from the gas chromatograph (GC).

2. Unscrew and remove the front panel.

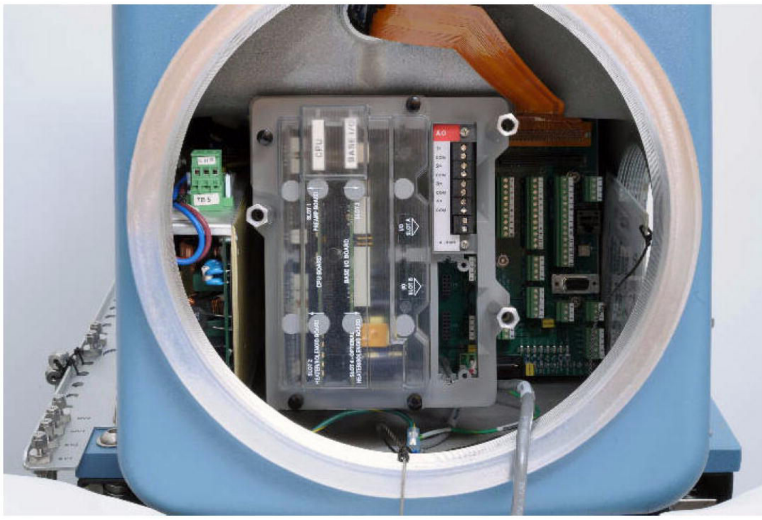
Figure 6-46: Removing the front panel

3. Unscrew and remove the switch panel or LOI to allow access to the card cage.

Figure 6-47: Removing the switch panel or LOI

4. If present, remove the clear cover from the card cage.

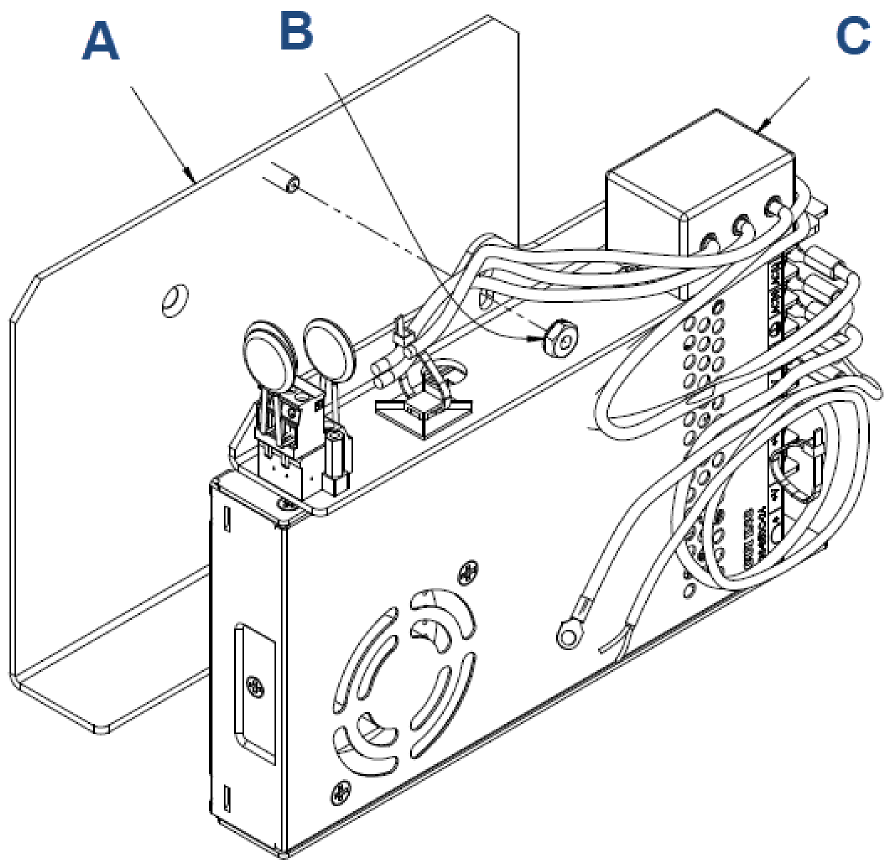
Figure 6-48: Card cage



5. Unplug all the cards in the card cage but do not remove them.
6. Unscrew the three switch panel connector posts. Remove the washers as well.
7. Lift the card cage with the boards and remove it from the lower enclosure.
8. Unscrew and remove the post closest to the power supply.
9. Unplug the connector at the top of the power supply on the left.
10. Unplug the low voltage cable connected along the lower edge of the backplane.
11. Disconnect the ground lead from the power supply at the chassis ground immediately inside the lower enclosure opening.
12. Remove the nut just above the power supply. Twist the power supply free of the attaching stud and lift it from its anchor plate. Remove the power supply carefully to avoid damage due to wire interferences.
13. Using a Phillips screwdriver, remove the two screws attaching the anchor plate to the inside of the enclosure.
14. Remove the anchor plate through the front opening of the enclosure.

15. The replacement power supply is shipped with the new anchor plate attached to it with a nut. Remove this nut to separate the new power supply and anchor plate.

Figure 6-49: Replacement power supply



A. Anchor plate
B. Nut
C. Replacement power supply

16. Place and mount the new anchor plate to the inside of the enclosure with the Phillips screws and a Phillips screwdriver.

    The orientation of the new anchor plate will clear the threaded hole as shown in Figure 6-50.

Figure 6-50: Power supply anchor plate in GC enclosure

17. Maneuver the new power supply into the anchor plate, ensuring that the wires are free to be connected.

6.4.12 Communications

The Rosemount 700XA has four serial communication ports: Port 0, Port 1, Port 2, and Port 3, which is a dedicated personal computer (PC) to gas chromatograph (GC) port.

You can set the mode for each of the first three ports to RS232, RS422, or RS485. Normally, the customer specifies these port configurations at the time of order, and Emerson sets them at the factory. However, the customer can use Rosemount MON2020 to change them at any time.

Note
The backplane has two switches located at **SW1**. The first switch is used for starting the DHCP server. The second switch is reserved for future use.

The backplane has two Ethernet ports:

Name	Location	Connector type
ETHERNET1	J22	RJ45 (DHCP-enabled)
ETHERNET2	TB11	4-wire terminal block

Related information

Connect directly to a personal computer (PC) using the gas chromatograph's (GC's) Ethernet1 port

Maximum distance by communication type

Communication Type	Maximum distance
RS-232	50 ft (15.24 m)
RS-422/RS-485	4,000 ft (1,219.20 m)
Ethernet (CAT5)	300 ft (91.44 m)

Change the line drivers

The following table lists the relevant traits of the gas chromatograph's (GC's) serial ports.

Port name	Port mode	Terminal block location on the backplane	Communication modes supported
Port 0	RS232	TB1	Modbus® ASCII/RTU
	RS422, RS485	TB2	
Port 1	RS232	TB5	
	RS422, RS485	TB6	
Port 2	RS232	TB8	
	RS422, RS485	TB9	
Port 3 (DB9 connector)	RS232	J23 (Laptop-PC)	Modbus® ASCII/RTU Direct connection through Rosemount MON2020

Note
You can use Port 3 to connect directly to the personal computer (PC).

⚠ WARNING

Explosion

Failure to de-energize the analyzer may cause an explosion and severely injure personnel.

Before opening the analyzer, disconnect all electrical power and ensure that the area is free of explosive gases.
Keep cover tight while circuits are live.
Use cables or wires suitable for the marked **T** ratings.
Cover joints must be cleaned before replacing the cover.
Conduit runs to the enclosure must have sealing fitting adjacent to enclosure.

⚠ WARNING

Burns

Some parts of the analyzer may be heated to 248 °F (120 °C).

To prevent burns, do not touch any of the hot parts. All parts of an analyzer are always hot unless it has been switched off and allowed to cool down.

Before fitting, removing, or performing any maintenance on the analyzer, make sure that it has been switched off and allowed to cool for at least two hours.
When handling the analyzer, always use suitable protective gloves.
These precautions are particularly important when working at heights.
If burned, seek medical treatment immediately.

The factory setting for each port is RS232. To change the setting of a serial portL

Procedure

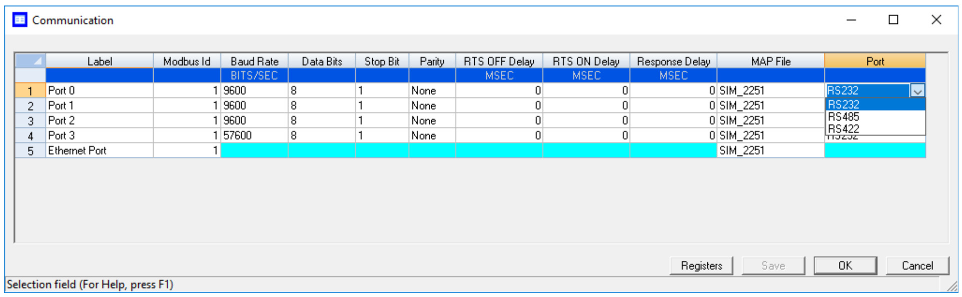
1. Start MON2020 and connect to the GC.
2. Select **Applications** → **Communication**.
   The ***Communication*** window displays.

3. Select the appropriate mode from the ***Port*** drop-down list for the appropriate serial port.

   The options are:

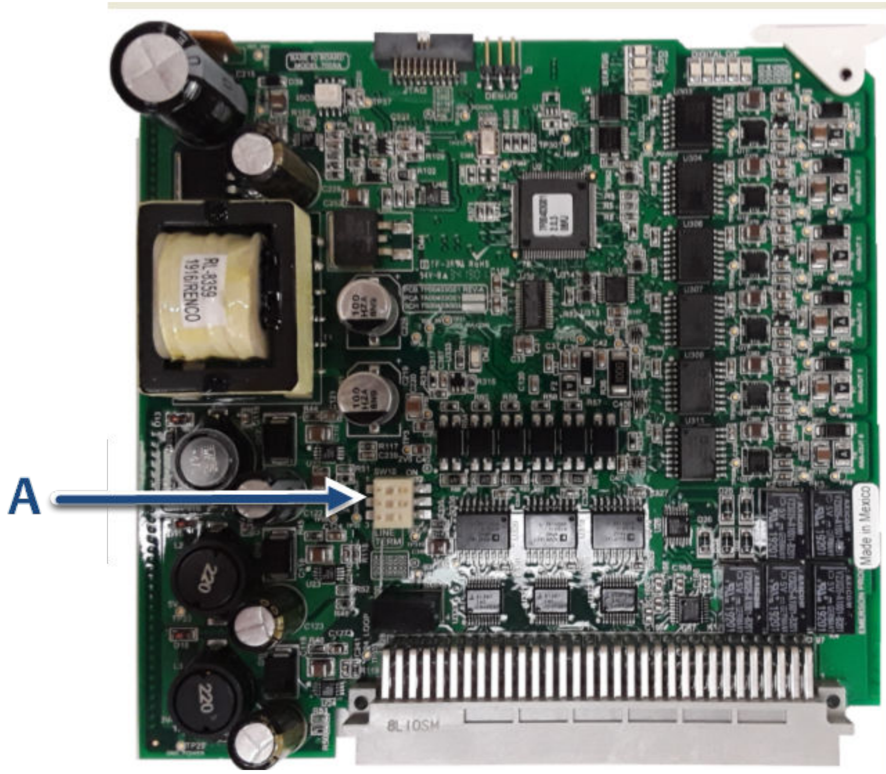
   - RS232
   - RS485
   - RS422

Figure 6-51: Rosemount MON2020 Communication window



4. Click **OK**.
5. Close MON2020.
6. Turn off the GC.
7. Locate and remove the base in/out (I/O) board, which is located in the card cage in the GC's lower enclosure.
8. Consult Figure 6-52, which shows the correct switch settings.

Figure 6-52: Base I/O board (PN 7A00403G01/G02)



A. SW10 - ON position - factory setting

9. Consult the following figures, which show the correct switch settings for each mode.

   Port 0 corresponds with channel “1” on each switch; Port 1 corresponds with channel “2” on each switch; Port 2 corresponds with channel “3” on each switch.

Figure 6-53: RS-232 switch

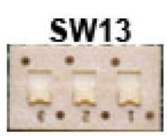


Figure 6-54: RS-422 (full duplex/four-wire) switches

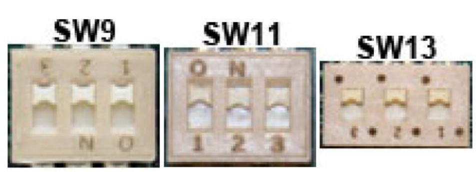
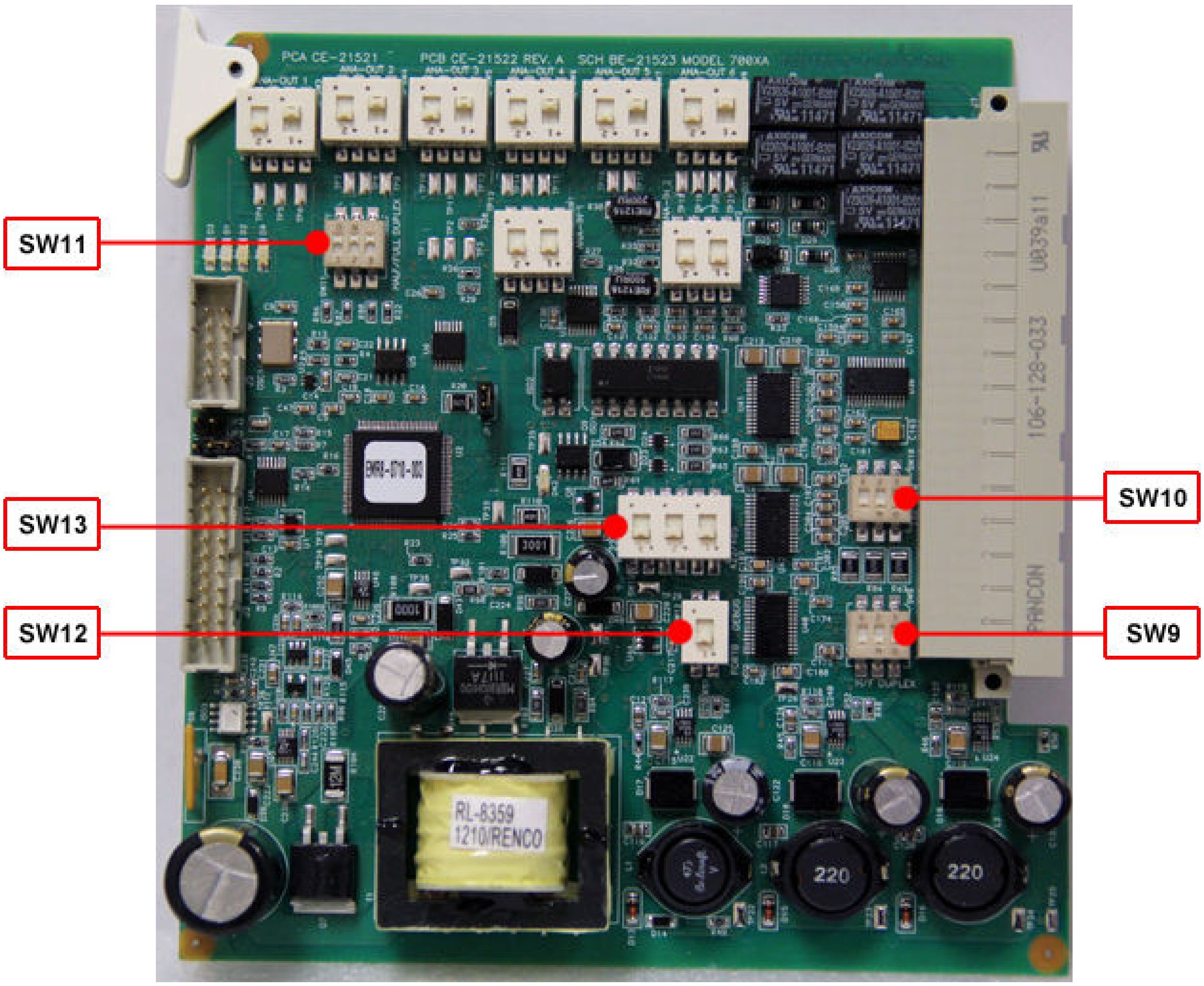


Figure 6-55: RS-485 (half duplex/two-wire) switches

Therefore, if you want to set Port 1 to RS-232 mode, you would set *channel 2* on SW13 to the down position.

10. To learn the location of a switch on the Base I/O board, consult Figure 6-56:

Figure 6-56: Serial port switches on the base I/O board



11. Make sure that SW12 is set to the down position or Port 0 will not function.

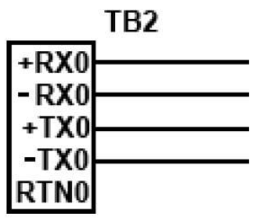
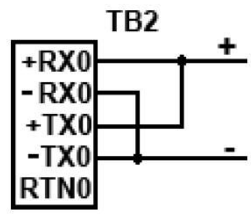
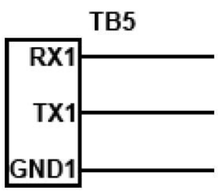
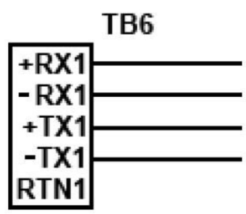
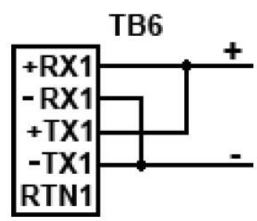
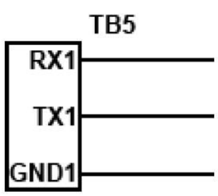
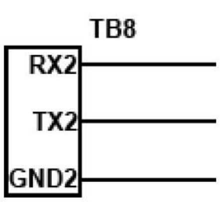
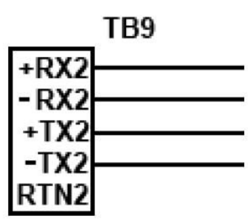
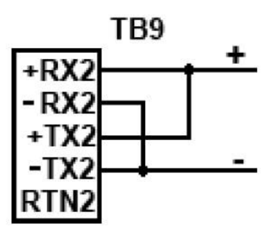
Note
Ordinarily SW12 should never be adjusted. It is used by the factory for testing purposes. If it was somehow set to the top, be sure to return it to its factory-set position, which is the down position.

---

12. To enable line termination for a serial port, set the appropriate port switch on **SW10** to the bottom position.
13. Replace the Base I/O board in the card cage.
14. Consult Table 6-2, which shows the correct termination block wiring for each mode and port.

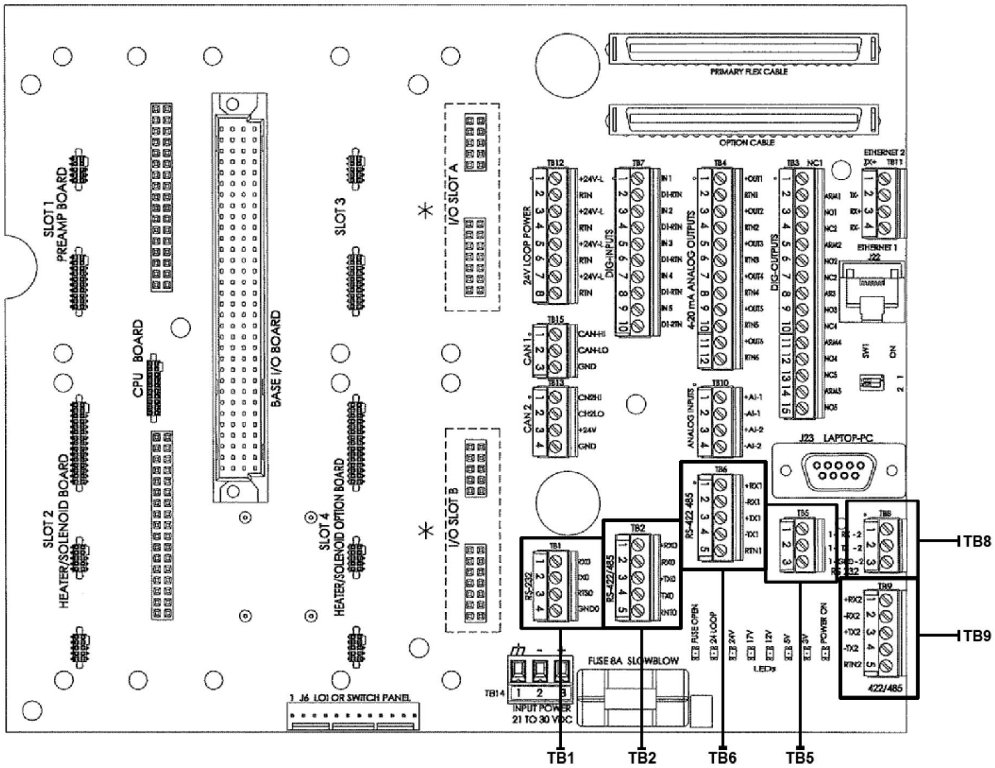
Table 6-2: Port configurations

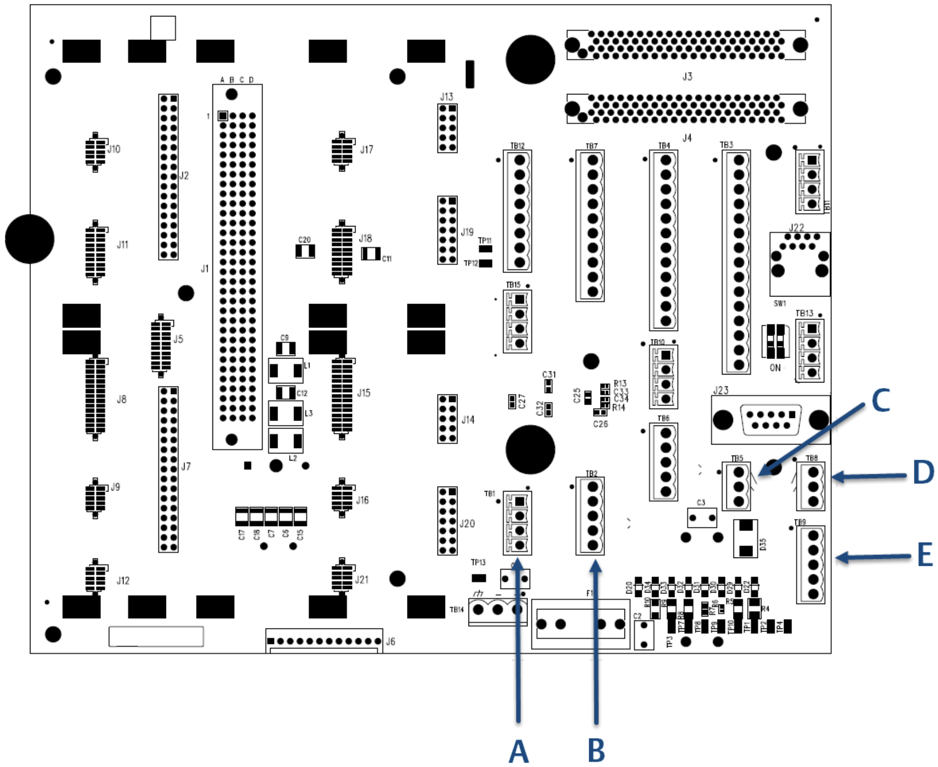
The first column lists the port number; the first row lists the communications mode. The table cell at which the desired port and the desired mode intersect contains the appropriate wiring for that configuration.

	RS232	RS422 (full duplex/4-wire)	RS485 (half duplex/2-wire)
Port 0			
Port 1			
Port 1		N/A	N/A
Port 2			

15. Access the backplane and see Figure 6-57 to locate the appropriate terminal blocks:

Figure 6-57: RS232 and RS485, TB1 and TB2 on the backplane





A. *TB1, Serial Port 0, RS232*
B. *TB2, Serial Port 0, RS422/485*
C. *TB5, Serial Port 1, RS232*
D. *TB8, Serial Port 2, RS232*
E. *TB9, Serial Port 2, RS422/485*

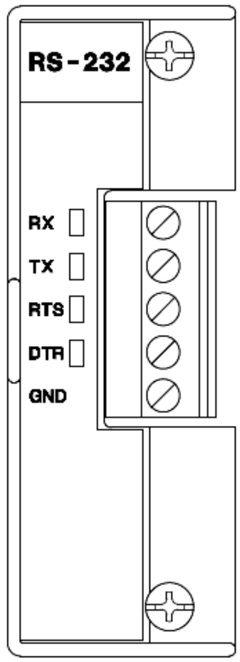
16. Once the appropriate termination blocks are wired correctly, close and secure the electronics enclosure door, and apply power to the GC.

Install optional RS-232 serial ports

You can install an optional RS-232 board in one or both of the expansion in/out (I/O) slots provided on the gas chromatograph's (GC's) card cage in the electronics enclosure.

You can use this extra port for Modbus® ASCII/RTU communications or to connect directly to a computer installed with Rosemount MON2020.

Figure 6-58: RS-232 connections



Terminal	Label	Definition
1	RX	Receive
2	TX	Transmit
3	RTS	Request to send
4	DTR	Data termininal ready
5	GND	Ground

Procedure

1. Start Rosemount MON2020 and connect to the GC.
2. Select **Tools** → **I/O Cards**.
3. Identify the appropriate card slot under the ***Label*** column and then select **Communications module - RS232** from the appropriate ***Card Type*** drop-down list.
4. Click **OK**.
5. Turn off the GC.
6. Install the RS-232 board into the appropriate I/O card slot in the GC's card cage.
7. Close and secure the electronics enclosure door.
8. Apply power to start the GC.

Install an optional RS-485/RS-422 serial port card

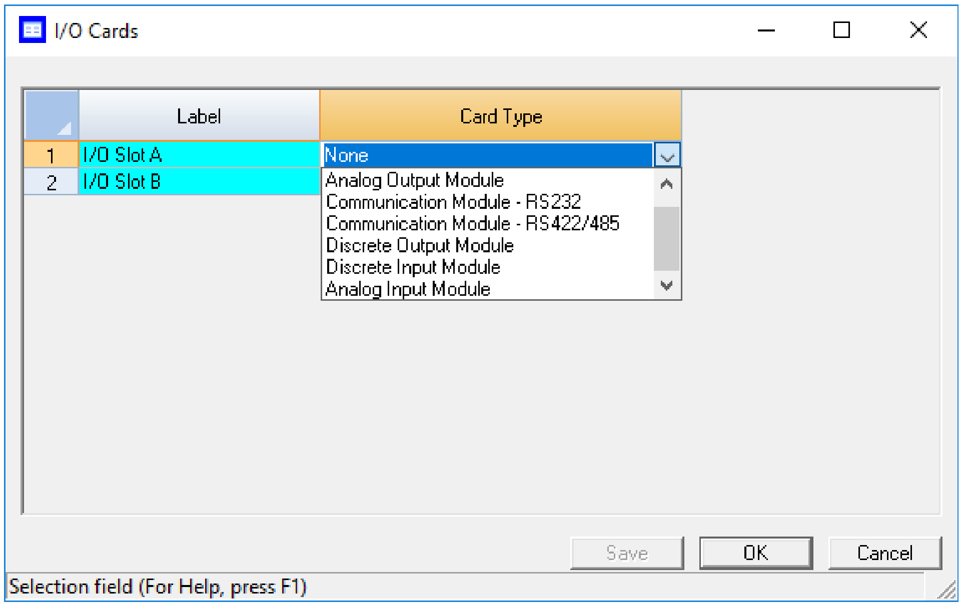
You can install an optional RS-485 board in one or both of the expansion in/out (I/O) slots provided with the gas chromatograph's (GC's) card cage in the electronics enclosure. You can configure this card to RS-422 (four wire) or RS-485 (two wire) mode.

RS-485 mode is the default setting. See Emerson.com/ROC800-Series.

Procedure

1. Start Rosemount MON2020 and connect to the GC.
2. Go to **Tools → I/O Cards**.
   The ***I/O Cards*** window displays.
3. Identify the appropriate card slot under the Label column and then select **Communications module - RS422/485** from the appropriate ***Card Type*** drop-down list.

Figure 6-59: Rosemount MON2020 I/O Cards window



4. Click **OK**.
5. Turn off the GC.
6. Install the RS-485/RS-422 serial port card into the appropriate expansion slot in the GC's card cage.
7. Replace the card cage cover, local operator interface (LOI) board, and enclosure cover. Start the GC.

Configuring the optional RS-485 serial port to function as an RS-422 serial port

See Table 6-3 for the correct jumper settings to configure the optional RS-485 serial port to function as an RS-422 serial port:

Table 6-3: Configuring the serial connections for RS-485/RS-422 serial communications

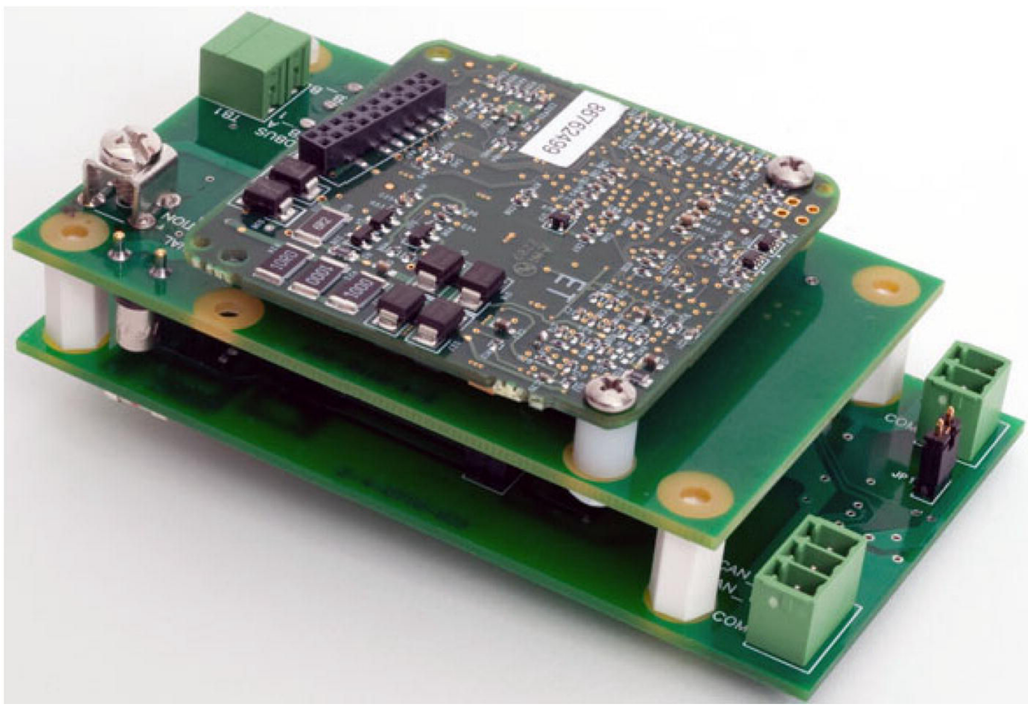
Jumpers	RS-485 (half duplex/2-wire)	RS-422 (full duplex/4-wire)
J3	Half	Full
J5	Half	Full
	Termination IN	**Termination OUT**
J4	In	Out
J6	In	Out

Table 6-3: Configuring the serial connections for RS-485/RS-422 serial communications *(continued)*

Jumpers	RS-485 (half duplex/2-wire)	RS-422 (full duplex/4-wire)
TB1 wire terminals	**RS485 (half duplex/2-wire)**	**RS422 (full duplex/4-wire)**
A	RxTx+	Rx+
B	RxTx-	Rx-
Y	Normally closed	Tx+
Z	Normally closed	Tx-

6.4.13 Installing or replacing a FOUNDATION™ Fieldbus module

Figure 6-60: FOUNDATION Fieldbus module



The FOUNDATION Fieldbus module should be mounted adjoining the card cage. It is held in place by the LOI post tips that attach to the LOI posts.

Mounting the FOUNDATION Fieldbus module requires the following items:

- A FOUNDATION Fieldbus module
- A FOUNDATION Fieldbus assembly bracket
- A FOUNDATION Fieldbus cable assembly
- Two screws
- Two flat washers

Remove a FOUNDATION™ Fieldbus module

Note
Be sure to properly ground yourself before performing this procedure.

Procedure

1. Unscrew the two local operator interface (LOI) post tips.
   You can now detach the FOUNDATION Fieldbus module from the card cage.
2. Remove the two screws that attach the FOUNDATION Fieldbus assembly bracket to the FOUNDATION Fieldbus module.

Install a FOUNDATION™ Fieldbus module

NOTICE

Properly ground yourself before performing this procedure.

Note
The gas chromatograph (GC) draws 21 mA from the FOUNDATION Fieldbus module.

Procedure

1. Attach the Fieldbus assembly bracket to the FOUNDATION Fieldbus module by aligning the two holes in the Fieldbus assembly bracket with the two holes at the bottom of the FOUNDATION Fieldbus module and screwing in the two thumb screws.
2. Attach the Fieldbus assembly bracket to the card cage by aligning the Fieldbus assembly bracket's second set of holes with the local operator interface (LOI) post tip holes in the card cage.
3. Screw in the LOI post tips.
4. Use the Table 6-4 to connect the FOUNDATION Fieldbus cable assembly to the backplane:

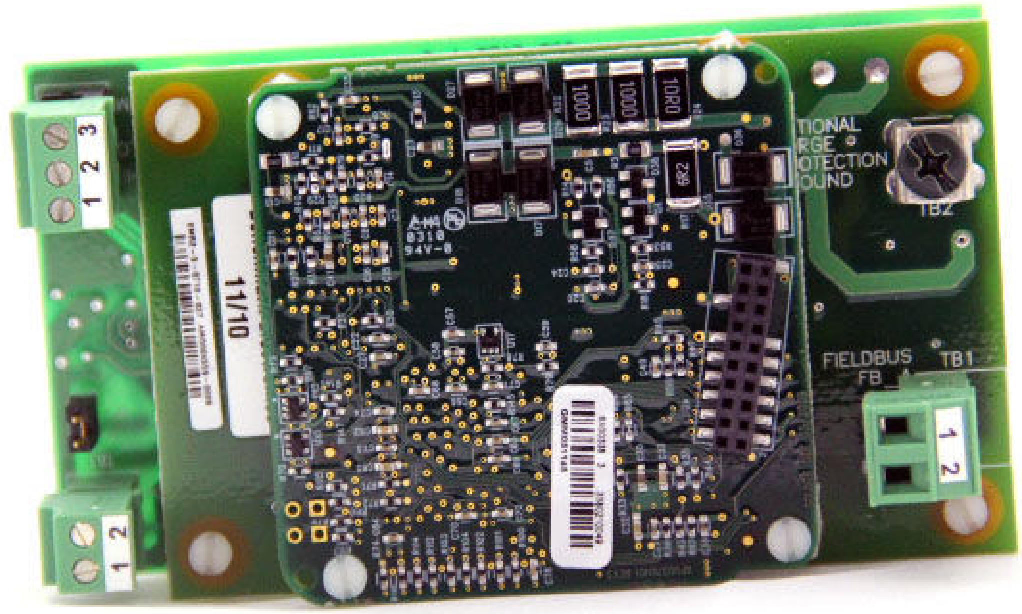
Table 6-4: FOUNDATION Fieldbus wiring

Backplane terminal block	Post number	Wire color
TB15	1	Brown
	2	White
	3	Green
TB13	3	Red
	4	Black

Connect the GC's FOUNDATION™ Fieldbus module to a Fieldbus segment

The FOUNDATION Fieldbus module has a terminal at TB1 on the carrier board, which is the middle card in the stack. This terminal can be used to connect to a fieldbus segment.

Figure 6-61: Carrier board showing connector at TB1



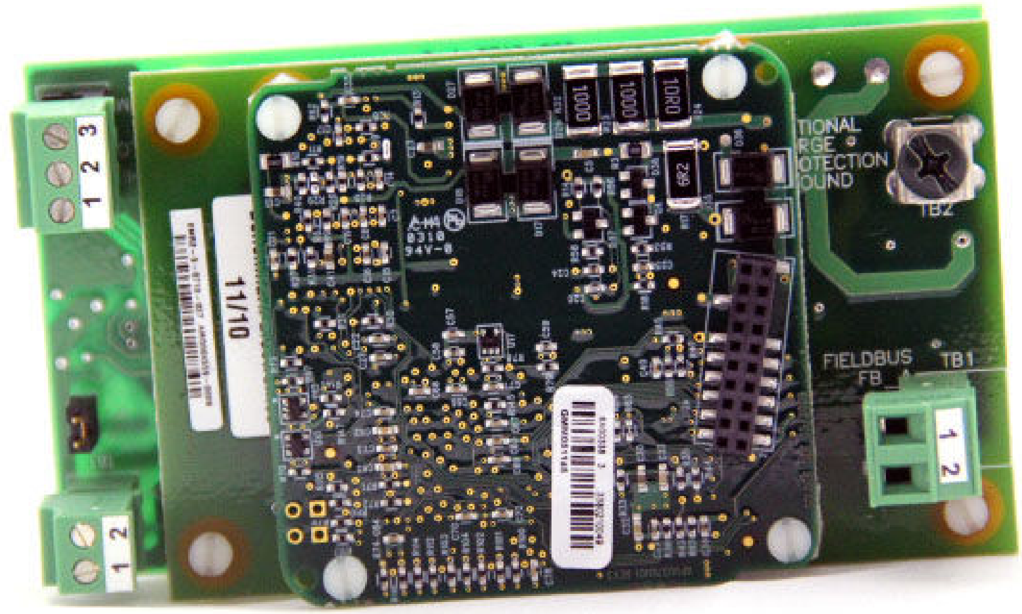
To connect to a fieldbus segment, do the following:

Procedure

1. Attach one end of a wire to **1** on the TB1 terminal and to the positive (+) terminal on the fieldbus segment.
2. Attach one end of a wire to **2** on the TB1 terminal and to the negative (-) terminal on the fieldbus segment.

Connect the optional ground wire

Figure 6-62: Carrier board showing ground lug at TB2



NOTICE

The FOUNDATION Fieldbus module is designed to be intrinsically safe; however attaching a ground wire will nullify this feature.

Procedure

If you wish to provide the FOUNDATION Fieldbus module with surge protection, connect the ground lug at **TB2** on the module's carrier board to the frame of the gas chromatograph (GC).

FOUNDATION™ Fieldbus jumper settings

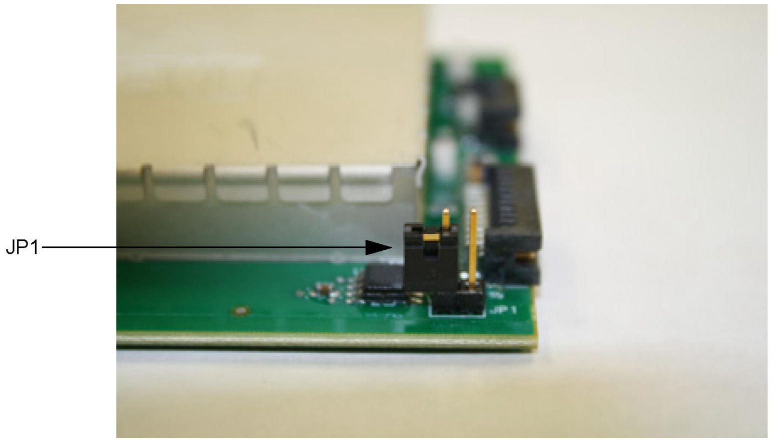
In order for the FOUNDATION Fieldbus module to work correctly, you must set several jumpers that are spread across a number of circuit boards.

Table 6-5: FOUNDATION Fieldbus jumper settings

Board	Jumper	Set?
Preamplifier	JP1	No
Heater Solenoid Driver(s)	JP1	No
Base I/O	JP1	Yes
	JP2	No
	JP3	Yes (Pins 2 and 3)
CPU	S3	No
	S4	No
LOI	J1	Yes

For more details, consult the following drawings:

Figure 6-63: Preamplifier board



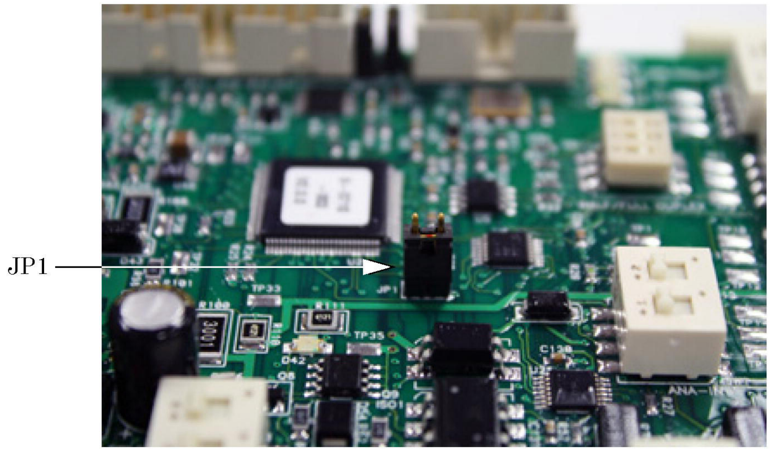
JP1 on the preamplifier board should **not** be set. The preamplifier board is located in slot 1 of the card cage.

Figure 6-64: Heater/solenoid driver board

JP1 on the heater/solenoid driver board should **not** be set. The heater/solenoid driver board is located in slot 2 of the card cage. If there is an additional heater/solenoid driver board, it will be located in slot 4, and its JP1 jumper also should **not** be set.

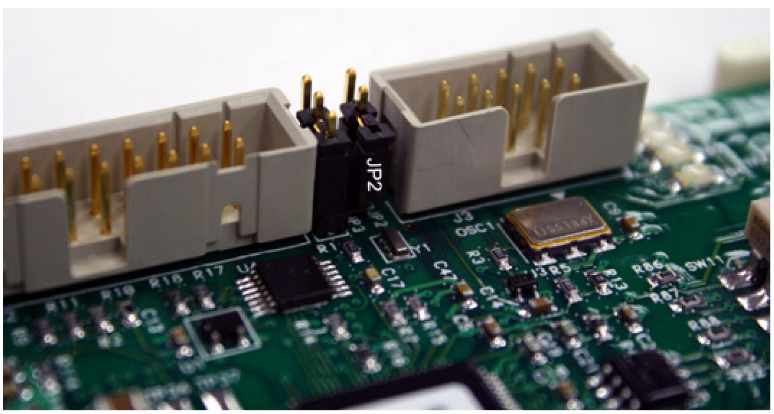
The Base I/O board, which is located in slot 3 of the card cage, has three jumpers that affect the performance of the Foundation Fieldbus.

Figure 6-65: JP1 on the Base I/O board



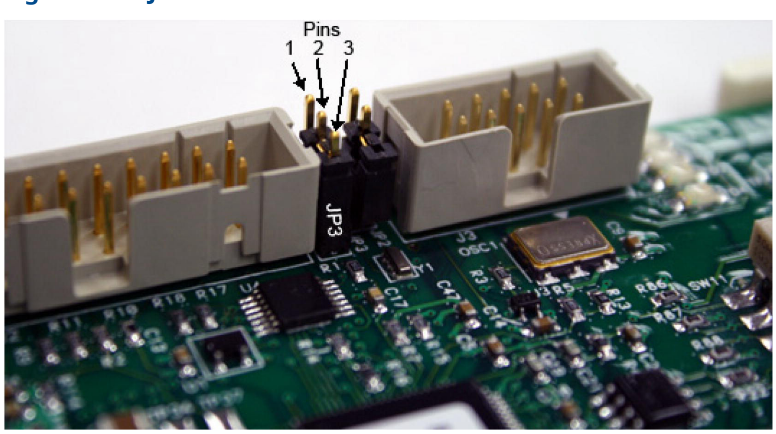
JP1 on the Base I/O board **should** be set.

Figure 6-66: JP2 on the base in/out (I/O) board



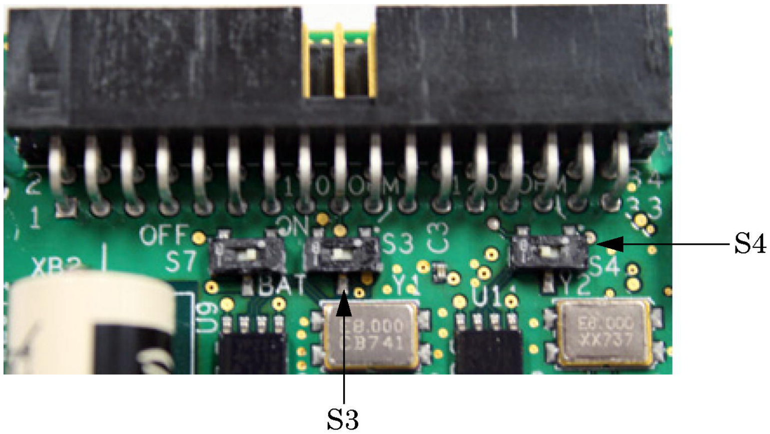
JP2 on the Base I/O board should **not** be set.

Figure 6-67: JP3 on the base I/O board



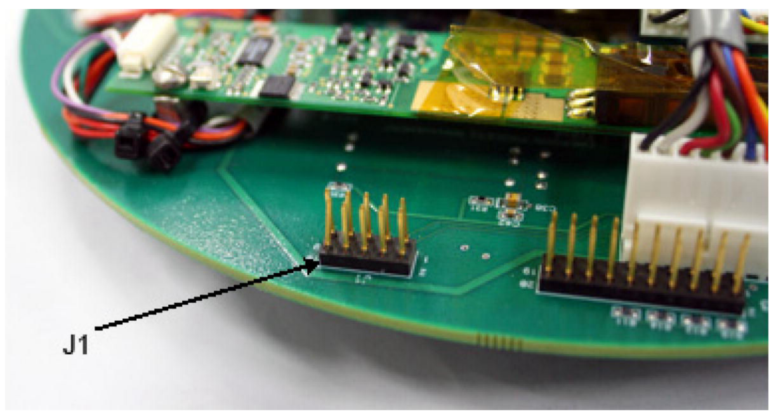
JP3 on the Base I/O board has three pins, and the jumper **should** be set on pins 2 and 3.

Figure 6-68: CPU board



S3 and S4 on the CPU board should be switched to **OFF**, which is the left-most position while holding the board right-side up.

Figure 6-69: LOI board



The J1 jumper is located on the back of the LOI, at the top while holding the LOI right-side up. It **should** be set.

6.4.14 Analog inputs and outputs

Use MON2020 to calibrate or adjust the analog outputs.

However, make sure to measure these outputs with a calibrated digital meter upon initial installation at zero scale and full scale. Then use MON2020 to set the sapn so that it represents values from 0 to 100 percent of the user-defined units in use.

Nominally, calibration is made within a range of 4-20 milliamperes (mA) output from each analog channel. To set a reference point to trigger an alarm condition, configure zero scale calibration with a 0 mA output and full scale calibration set up to 22.5 mA output.

If there is reason to suspect that the span on any particular channel might be off after a period of time and heavy use, then recalibrate the analog output for that channel.

Analog output adjustment

Emerson sets the initial analog output adjustments at the factory before shipment at standard values (4-20 mA). You many need to check and/or adjust these values depending on output cabling/impedance.

The adjustment may require two people if the units are some distance apart. It requires a calibrated digital meter to check the zero and full scale values at the receiving end. You can use MON2020 to adjust the scale or span value.

You can use different engineering units, volts, and percentages to calibrate the analog outputs.

6.4.15 Upgrading the embedded software

The base GC firmware performs functions similar to operating systems such as DOS, Windows™, or Linux®. The base GC firmware provides the basic resources and interfaces to run the customer's applications. There is no direct user-level interface to the firmware.

If you need to upgrade the firmware to your system, refer to the MON2020 Software for Gas Chromatographs Reference Manual for additional information.

The GC's applications use the tools provided by firmware to perform the desired gas chromatograph applications for the user. There are different applications to facilitate different gas chromatographic needs. To load a new application or to upgrade an existing application, refer to the MON2020 Software for Gas Chromatographs Reference Manual for details.

7 Troubleshooting

The information is arranged either by major subsystems or by major functions of the gas chromatograph (GC).

Note
Correct **all** alarms before recalibrating.

7.1 Hardware alarms

Use LTLOI Failure through Flame Photometric Detector Board 1 Comm Failure to identify the alarm, potential cause, and solution for the problem.

7.1.1 LTLOI Failure

Recommended actions

1. Power the gas chromatograph (GC) down completely.
2. Check that the local operator interface (LOI) is connected to the backplane board at one end and the LOI board at the other end.
3. Power up the GC.
4. If the message appears again, replace the LOI board.

7.1.2 Maintenance Mode

A technician has put the gas chromatograph (GC) into Maintenance mode for servicing.

Recommended action

To disable Maintenance mode, deselect the **Maintenance Mode** check box in the ***System*** dialog.

7.1.3 Power Failure

Potential cause

The gas chromatograph (GC) has experienced a restart, caused by a power failure, since alarms were last cleared.

Recommended action

Allow the GC to automatically restart in Warm Start mode.

During Warm Start mode, the GC does the following:

a. Waits for the heaters to stabilize.
b. Purges the sample loop.
c. Actuates the valves for two cycles.

After completing these actions, the GC switches to auto-sequence mode.

7.1.4 User Calculation Failure

The gas chromatograph (GC) has detected one or more errors while parsing a user-defined calculation.

Potential cause

This usually happens when a user-defined calculation attempts to use a system variable that does not exist.

Recommended action

Fix the calculation that is referring to the undefined system variable.

7.1.5 Low Battery Voltage

The gas chromatograph (GC) has detected a low battery voltage on the central processing unit (CPU) board.

Recommended actions

Replace the CPU board immediately to avoid losing GC configuration data.

a) Save the diagnostic data file. In Rosemount MON2020, go to **Tools** → **Save Diagnostic Data...**.

b) Power down the GC.

c) Ensure that **SW7** on the CPU board is in the On position.

d) Replace the CPU board.

e) Restore configuration back to the GC. In Rosemount MON2020, go to **File** → **Restore Configuration to GC...**.

7.1.6 Preamp Board Comm Failure

The gas chromatograph (GC) cannot detect the preamp board.

Preamp board 1 or 2.

Recommended actions

1. Power the GC down completely.
2. Check that the board is properly seated in the correct slot on the backplane.

   In Rosemount MON2020, select **Hardware** → **Installed Hardware** for hardware slot locations.
3. Power up the GC.
4. If the message appears again, replace the preamp board.

7.1.7 Flame ionization detector (FID), flame photometric detector (FPD), or µFPDG2 (FPDG2) Failure

Alert message identifies FID/FPD or FPD G2 hardware. The FID/FPD or µFPD is not detected.

Recommended actions

1. Power the gas chromatograph (GC) down completely.

2. Check that the board is properly seated in the correct slot (Preamp 2) on the backplane.
3. Power up the GC.
4. If the message appears again, for the FID, replace the electrometer. For the μFPD, replace the photomultiplier tube (PMT) module.

7.1.8 Heater Solenoid Board (1 or 2) Comm Failure

Heater/solenoid board not detected.

Recommended actions

1. Power the gas chromatograph (GC) down completely.
2. Check that the board is properly seated in the correct slot (Heater Solenoid 1 or Heater Solenoid 2) on the backplane.
3. Power up the GC.
4. If message appears again, replace the heater/solenoid board.

7.1.9 Base in/out (IO) Board Comm Failure

The gas chromatograph (GC) is not detecting the base IO (multifunction IO) board.

Recommended actions

1. Power the GC down completely.
2. Check that the board is properly seated in the correct slot on the backplane.
3. Power up the GC.
4. If message appears again, replace the base IO board.

7.1.10 Stream Skipped

The gas chromatograph (GC) cannot analyzer one or more streams in the stream sequence, because the streams' Usage option is set to Unused.

Recommended actions

In Rosemount MON2020, do one of the following:

- Remove the unused stream(s) from the stream sequence.
- Change the Usage option of the stream(s) in the ***Streams*** dialog to something other than Unused.

7.1.11 GC Idle

Potential cause

Someone has placed the gas chromatograph (GC) in Idle mode. The GC is not running an analysis.

7.1.12 Heater (1-8) Out of Range

The gas chromatograph (GC) has failed to regulate heater zone temperatures for the indicated heater to within preset limits.

Recommended actions

1. Check temperatures within the GC, using Rosemount MON2020 or the local operator interface (LOI).

   Be aware that the GC may generate this alarm following start-up or if the set point has been changed.
2. Check wiring, looking for splits or loose connections at the termination board (for both the heaters and the RTDs.
3. If necessary, replace the defective heater and/or RTD.

7.1.13 Flame Out

Detector 1 Flame Out

The flame ionization detector (FID) or flame photometric detector (FPD) will not light or has extinguished.

Potential cause

The FID is out.

Recommended actions

1. Use the front switch panel or Rosemount MON2020 to ignite the flame.
2. If unable to sustain the flame, confirm that both fuel and air cylinders are connected and contain sufficient pressure.
3. Confirm that the fuel and set points are set to achieve the factory-desired mixture.
4. Confirm that there is no blockage at the FID exhaust outlet, such as a cap or ice.
5. Check that the wiring connections are secure for the FID, both on the FID cap and at the termination board.
6. If necessary, replace the FID module.

To ignite the flame manually:

1. Connect the air to the inlet and slowly bring the pressure to 60 psig (4.1 barg).
2. Connect hydrogen to the inlet and slowly bring the inlet pressure to 60 psig (4.1 barg).
3. Remove tubing from the flame cell exhaust and use a digital flow meter to adjust the air control valve until you obtain a reading of 160 cc/min.
4. Turn off the air supply.
5. Set the auto relight switch (**S1**) on the electrometer printed circuit board (PCB) to the **OVERRIDE** position.
6. Use the digital flow meter to adjust the hydrogen control valve until you obtain a reading of 100 cc/min.
7. Turn on the air supply.
8. Set the auto relight switch (**S1**) on the electrometer PCB to the **RUN** position. The auto relight sequence begins as follows:
   a. The LED on the electrometer comes on after 10 seconds, and the glow plug fitted to the side of the flame cell is supplied a voltage.
   b. After another five seconds, the hydrogen shut-off valve operates.
   c. The gas mixture ignites.

d. If the flame does not light in five seconds, the electrometer de-energizes the hydrogen shut-off valve to stop the flow into the flame cell.

e. The flame cell is purged with air and nitrogen carrier gas.

f. The process starts again (up to ten times) until the flame stays lit.

g. If the flame does not stay lit, the LED flashes. If the alarm output is linked to the 2350A controller discrete input, an alarm is present on the controller.

h. Set the auto relight switch (**S1**) on the electrometer PCB to the **RESET** position and then back to the **RUN** position.

i. The relight sequence restarts.

Potential cause

The FPD is out.

Recommended actions

1. In Rosemount MON2020, click **Open H2 Valve**.
   The H2 Valve Cur State field changes to **Open**.
2. Click **Ignite**.
   The Flame Status field changes when the internal temperature exceeds the value set in the Flame On Sense Temp field.

   Note
   If the Flame Ignition field is set to **Auto**, the GC will automatically restart the flow if it goes out.

3. If the GC fails to light after resetting the electrometer, recheck the air and hydrogen flow.

7.1.14 Flame Over Temperature

Detector 1 flame over temperature.

The flame ionization detector (FID) flame temperature is above safe limits set at the factory. The FID flame has been extinguished, the fuel supply valve closed, and automatic analyses halted.

Recommended actions

1. Confirm that both fuel and air cylinders are connected and contain sufficient pressure.
2. Confirm that fuel and air set points are set to achieve desired mixture.
3. Use the local operator interface (LOI) or Rosemount MON2020 to ignite the FID.

7.1.15 Detector Scaling Factor Failure

The gas chromatograph (GC) detected an excess scaling factor deviation for the detector.

Detectors 1-3.

Recommended action

Replace the preamp board.

The preamp boards for detectors 1 and 2 are located in Preamp 1.

The preamp board for detector 3 is located in Preamp 2.

7.1.16 No sample flow (1 or 2)

This alarm applies to the optional sample flow switch. The corresponding flow switch indicates that there is no sample flow in the gas chromatograph (GC).

Recommended actions

Check the sample gas rotameter in the sample conditioning system for flow.

- If no gas flow or no rotameter is present:
    a. Confirm that there is gas flow at the sample point location.
    b. Ensure that the sample valves in the sample conditioning system are open.
    c. Ensure that the bypass return vent path is free of obstruction.
    d. Confirm that the sample line is connected from the sample point to the GC's sample conditioning system and is free of obstruction.
    e. Close the valve at the sample tap, remove pressure from the line, and check the filters at the probe, the sample conditioning system, or both. If they are filled with liquids or particulates, replace the filtering elements.
- If automatic stream selection valves are present, confirm that they are operating properly.
- If a slight sample gas flow is present at the rotameter in the sample conditioning system, drain or replace all filters.
- If you observe flow in the rotameter, replace the sample flow switch.

7.1.17 Low Carrier Pressure (1-4)

Input carrier pressure for the detector is below the preset limit.

Recommended actions

1. Check that the carrier cylinder pressure is at least 10 psig (0.69 barg) above the mechanical regulator set point.
2. If input carrier pressure is low, check the carrier cylinder pressure.
3. Replace the carrier gas cylinder if required.

7.1.18 Analog Input (1-10) High Signal

Measured value for the indicated analog input is greater than the customer-defined full scale range.

7.1.19 Analog Input (1-10) Low Signal

Measured value for the indicated analog input is lower than the customer-defined full scale range.

7.1.20 Analog Output (1-10) High Signal

Measured value for the indicated analog output is greater than the customer-defined full scale range.

7.1.21 Analog Output (1-10) Low Signal

Measured value for the analog output is lower than the customer-defined zero range.

7.1.22 Stream (1-20) Validation Failure

The most recent validation sequence for the indicated stream failed.

Recommended actions

1. Ensure that the validation gas cylinder isolation valves are open.
2. Ensure that the validation gas regulators are set properly.
3. If the validation gas regulator pressure is below the set point, replace the gas bottle with a full one.
4. If the gas used for validation is the same as the gas that is used for calibration, ensure that the cylinder gas composition value listed on the cylinder's tag or on the certificate of analysis received from the supplier matches the value displayed in Rosemount MON2020's ***Component Data*** table.

7.1.23 Stream (1-20) RF Deviation

The most recent calibration sequence failed.

Recommended actions

1. Ensure that the calibration gas cylinder isolation valves are open.
2. Ensure that the calibration gas regulators' pressures are set properly and that the cylinder is not below the set point. If the cylinder is below the set point, replace it with a full cylinder
3. Verify that the calibration cylinder gas composition value listed on the cylinder tag or on the certificate of analysis received from supplier matches the calibration cylinder gas composition value displayed in Rosemount MON2020's ***Component Data*** table. If there is a mismatch, edit the ***Component Data*** table to reflect the correct value. Re-run the calibration sequence.
4. If the calibration is still unsuccessful, contact your Emerson representative.

7.1.24 Energy Value Invalid

For each configured analysis, perform a check of the analyzed energy value of the calibration gas against the known value as part of the warm start sequence.

The *Energy Value Invalid* alarm is raised to instruct the associated DCS that the analyzer has failed and all data should be ignored until a successful calibration run has been performed to verify the analysis of the gas chromatograph (GC).

On completing warm-up, the GC performs a single analysis of the calibration stream. Using results of the analysis, the GC calculates the energy value and compares it against the previously entered value stored in the tables.

If the calculated energy value is within the allowable limits set up by the operator, the *Energy Value Invalid* alarm is cleared, and the GC returns to normal operation; otherwise, the *Energy Value Invalid* alarm remains active.

Recommended actions

1. Ensure that correct calibration gas energy value and limits have been entered in the **Component Data Table** → **Edit Energy Value** dialog.

2. Ensure the calibration gas bottle is open and not low or empty.
3. Check analyzed concentration results for each individual component versus calibration gas concentrations in the ***Component Data*** table.
4. Adjust timed events if necessary.

7.1.25 Calibration Energy Check Fail

After completing a calibration sequence, the gas chromatograph (GC) performs a calibration gas energy value check.

If the calculated energy value fails the check, the software automatically runs the calibration again.

If the second calibration also fails this check, the GC raises a system alarm, *Calibration Energy Value Check Fail*.

Recommended actions

1. Ensure the calibration gas bottle is open and not low or empty.
2. Check analyzed concentration results for each individual component versus calibration gas concentrations in the ***Component Data*** table.
3. Adjust timed events if necessary.

7.1.26 Stored Data Integrity Failure

Archived results, event logs, and alarm logs are stored as records in the instrument database along with a CRC16 checksum. When the data is retrieved, the gas chromatograph (GC) recomputes the checksum and checks the stored checksum against the calculated checksum. If they don't match, the GC raises a *Stored Data Integrity Failure* alarm.

Recommended actions

1. Reset archives using the dialog under **MON2020** → **Logs/Reports Menu**.

   NOTICE

   All archived data in the GC will be lost.

2. If this problem recurs, replace the central processing unit (CPU) board.

7.1.27 ROM Checksum Failure

The gas chromatograph (GC) recomputes the firmware checksum at periodic intervals. If the calculated checksum varies from the original value, the GC raises a *ROM Checksum Failure* alarm.

Recommended actions

1. Re-flash the GC controller firmware in Rosemount MON2020: **Tools** → **Upgrade Firmware**.

   NOTICE

   All archived data in the GC will be lost.

2. If this problem recurs, replace the central processing unit (CPU) board.

7.1.28 Sample Fluid Unavailable

The stream switching sequence defined in the Custom Logic configuration failed to successfully execute.

Recommended action

Confirm proper operation of all sample system components and ability to provide adequate sample flow.

7.1.29 Flame Photometric Detector Board 1 Comm Failure

The gas chromatograph (GC) cannot detect the flame photometric detector (FPD).

Recommended actions

1. Power the GC down completely.
2. Check that all cables are securely connected to the FPD interface module.
3. Power up the GC.
4. If the message appears again, replace the FPD photomultiplier tube (PMT) module.

7.2 No power to flame photometric detector (FPD)

Recommended actions

1. Check cable (7A00454G01), connectors, and terminals.
2. Check flex cable.
3. Check that the voltage from the lower terminal is 25 Vdc.

7.3 Can't ignite flame photometric detector (FPD)

Recommended actions

1. Check the flow.

   Gas flow rates are measured at exhaust while oven reaches to set temperature. The air flow should be 150 cc/min, and the H_2 flow should be 100 cc/min.
2. Check igniter resistance in ohms.

   The resistance should be 0.6 to 1 ohms.
3. Ensure that the flame temperature is >> 493.1 °F (220 °C) when the ignitor is first turned on and then goes down to 413.1 °F (140 °C).
4. Ensure that there are no restrictions at the exhaust line.

7.4 No peaks showing

Recommended actions

1. Ensure that the flame is on.
2. Ensure that the sample gas has been injected.

3. Check carrier gas flow.
4. Check sample flow.
5. Check columns.

7.5 Small peaks

Recommended actions

1. Clean the burner windows with isopropyl alcohol (IPA).
2. Adjust the air to H_2 flow rate to between 1.3 and 1.7.
3. Ensure that the flame photometric detector (FPD) high voltage is 800 Vdc for side cart option of FPD.

7.6 No temperature readings

Recommended action

Check the thermocouple.

The thermocouple's resistance should be less than 3.5 ohms.

7.7 Noisy baseline

Recommended action

Click **Autozero** to adjust the baseline.

7.8 Peak clipping

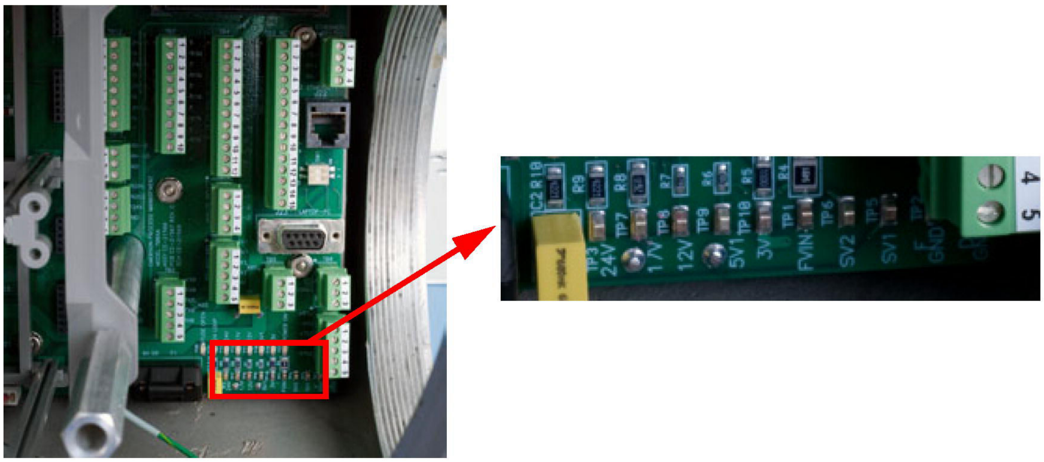
Recommended action

Click **Autozero** to adjust the baseline.

7.9 Test points

The backplane has a set of test points that allow you to measure the voltage output of the base input/output (I/O) card.

Figure 7-1: Lower enclosure showing test points on the backplane



Each test point is labeled with a voltage value that, when measured with a voltmeter, should give a measurement equal to what is displayed on the label. A reading that does not match this label may indicate a faulty base I/O card. Try swapping out the suspect card with a different one, and take another measurement. To get a measurement for a test point, touch the voltmeter's negative probe to the **DGND** test point and touch the voltmeter's positive probe to the desired test point.

The test points are associated with the following gas chromatograph (GC) components:

Table 7-1: Backplane test points and associated GC components

Test point	GC component	Tolerances for DC voltages
VIN	Voltage in	N/A
I RTN	Isolated return	N/A
I 24V (regulated)	Isolated voltage (loop power)	24 V (±2.4 V)
24V (regulated)	GC power	24 V (±2.4 V)
17V5	Preamplifier (input for the bridge circuit)	17.5 V ±0.5 V
12V	Optional I/O cards	12 V ±0.6 V
5V1	System chips	5.1 V ±0.25 V
3V4	System chips	3.4 V ±0.15 V
FVIN	Field voltage input	24 V ± 1.5 V
FVGND	Field voltage ground	0 V ± 3 V

The input voltage range for a DC power supply is between 23.5 and 24.5 volts.

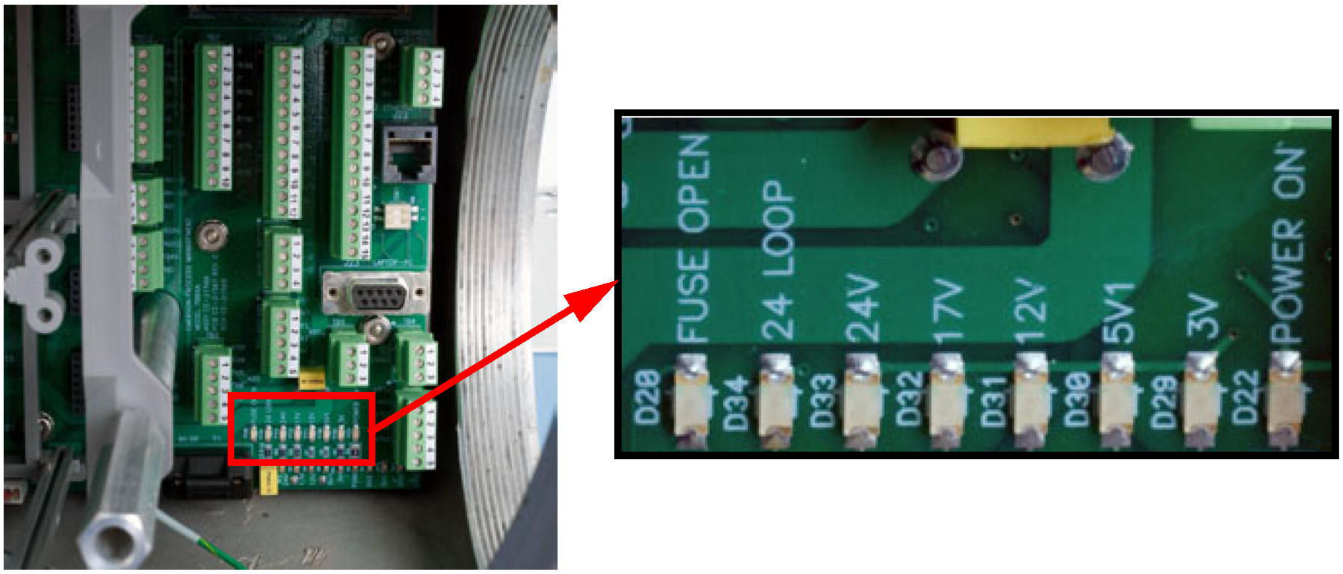
The input range for an AC power supply is 90 to 264 volts (auto-ranging).

7.10 Voltage LEDs

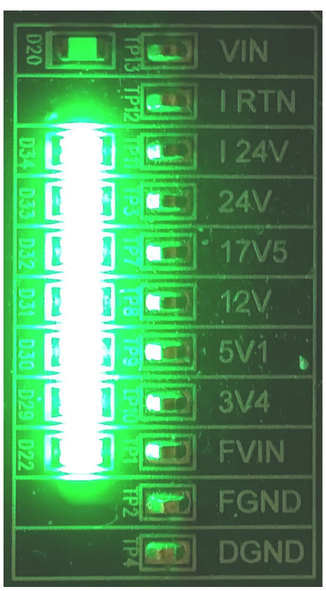
A set of LEDs can be found above the test points .

These LEDs are a quick way to visually inspect the voltage status of some of the gas chromatograph's (GC's) electrical components.

Figure 7-2: Voltage LEDs



The following LEDs are associated with the following GC components:



VIN (fuse open)	Glows red when the fuse has blown or been removed; otherwise, it is not lit.
1 RTN - 24 loop (Power)	Glows when the power supply for the analog outputs is functioning properly; otherwise it is not lit.
24V regulated (GC power)	Glows when the GC power is functioning properly; otherwise, it is not lit.
17V (Input for the preamp)	Glows when the power supply for the preamp is functioning properly; otherwise, it is not lit.
12V (Input for the I/O cards0	Glows when thee optional ROC expansion card's power supply is functioning properly; otherwise, it is not lit.
5V1	Glows when the system chip's 5.1 V power supply is functioning properly; otherwise, it is not lit.
3V4	Glows when the 3.4 V power supply for the system chips is functioning properly; otherwise, it is not lit.
Power ON	Glows when the GC is on; otherwise, it is not lit.

7.11 Monitoring the detector(s) and columns temperature

Use MON2020 to monitor the temperature of the detector(s) and columns to determine if the GC is thermally stable.

When connected to the GC via MON2020, select **Hardware** → **Heaters** to access this function.

When viewing the ***Heater*** window, the typical heater configuration is as follows:

- **Heater 1** is the analytical block heater.
- **Heater 2** is the "high hat" heater.

The Temperature column on the ***Heaters*** window displays the current temperature; the Current PWM column displays the percentage of power being used to run the heater.

The settings and values shown in the ***Heaters*** window and described below, are preset at the factory and are based on the specific customer application. Do not change these values unless application engineering or or customer service personnel recommend it or as part of a factory application requirement.

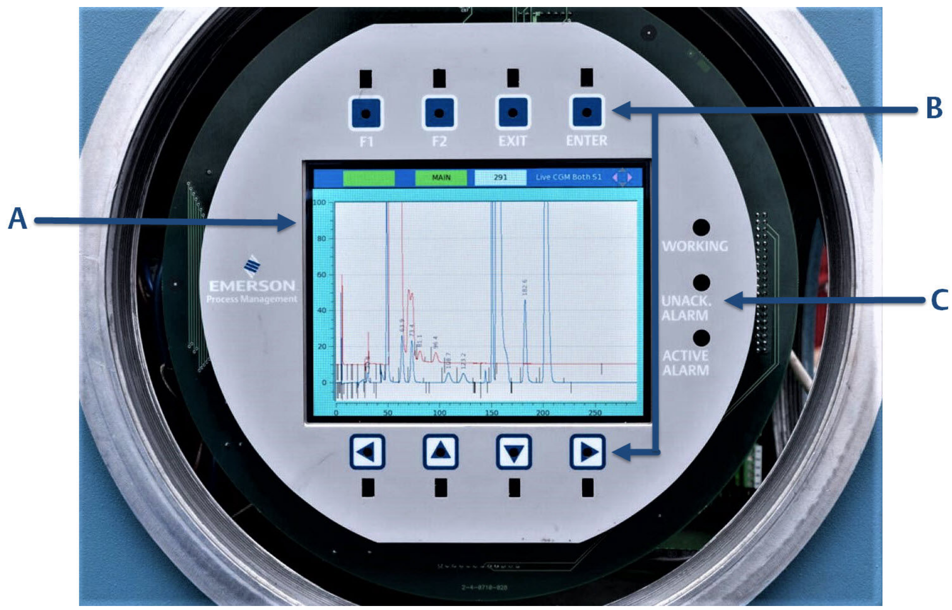
Function	Typical setting
Detector(s) or analytical block temperature	176 °F (80 °C)
Oven temperature	176 °F (80 °C)
Spare Or, Methanator Or, LSIV	N/A 572 °F (300 °C) 302 °F (150 °C)

A Local operator interface (LOI)

A.1 Local operator interface (LOI) for displaying and entering data

The LOI has multiple components that you can use to interact with the unit.

Figure A-1: LOI components



A. LCD display screen
B. Keypads
C. LED indicators

A.1.1 LED indicators

There are three LED status indicators on the local operator interface (LOI) that show the overall status of the gas chromatograph (GC). These LEDs are positioned to the right of the display screen. Each LED, when lit, indicates a specific condition.

	The GC is currently running an analysis.
	The GC has at least one unacknowledged alarm.
	The GC has an out-of-tolerance or alarm condition that requires an operator action.

A.1.2 LCD display screen

The LCD display screen measures 4.4 by 3.3 in. (111.4 x 83.5 mm) and is capable of 640 by 480 VGA pixel resolution, supporting both text and full graphics.

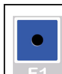
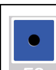
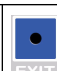
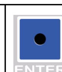
The backlighting, boost, and brightness are all under software control. The boost and brightness levels are user-adjustable.

A.1.3 Keypad

The keypad consists of eight infrared keys.

Command keys

The four keys located above the LCD display screen are command keys.

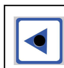
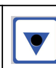
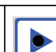
			

Related information

Navigating the screens

Arrow keys

The four keys below the LCD display screen are arrow keys that allow you to navigate within the screen by scrolling or moving the cursor from field to field. These keys function in the same way as a computer keyboard's arrow keys.

			
Left	Up	Down	Right

Pressing a key

To press a key, place a finger on the glass over the associated key hole and then remove the finger.

Holding a finger over the key hole will cause that key to repeat until the finger is removed.

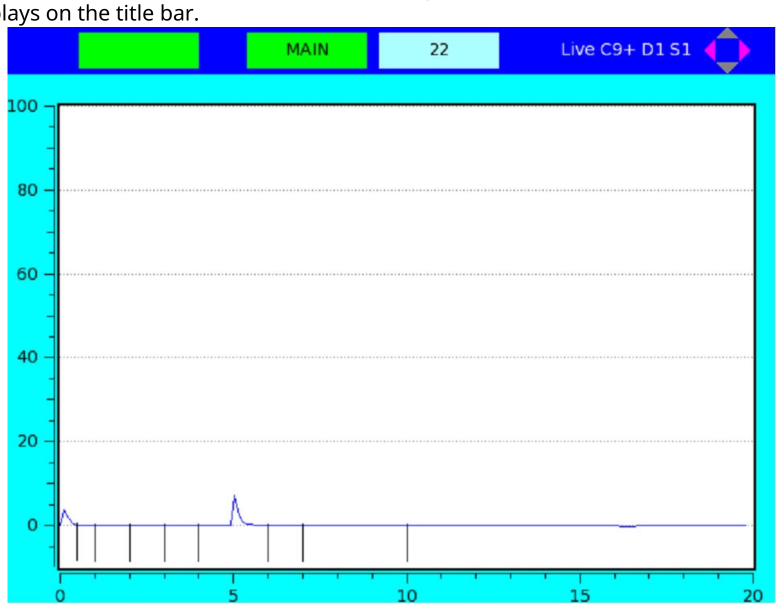
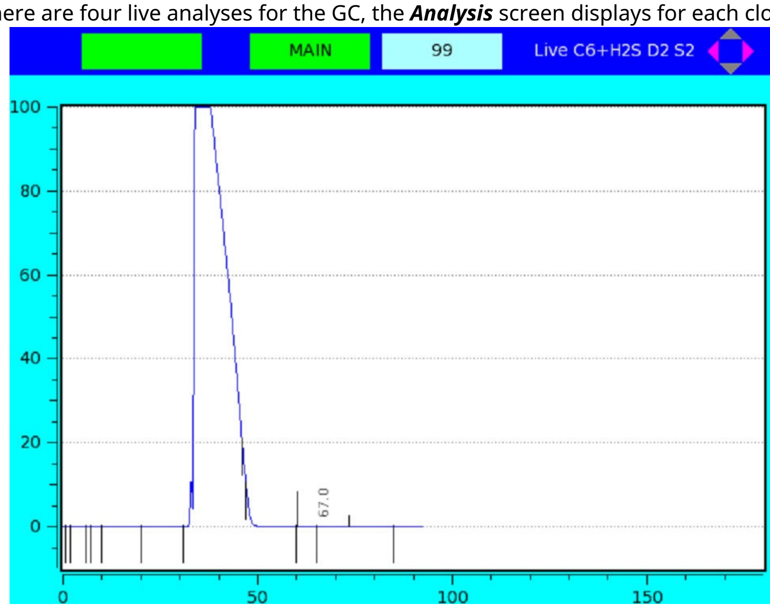
A.2 Using the local operator interface (LOI)

A.2.1 Start-up

When the gas chromatograph (GC) starts, the local operator interface (LOI) automatically runs in Status Display mode. Each analyzer's information is displayed in rows. The GC may have from one to four analyzers.

Only the description and values section of the LOI status variables are scrolled manually between the configured analyzers for the GC.

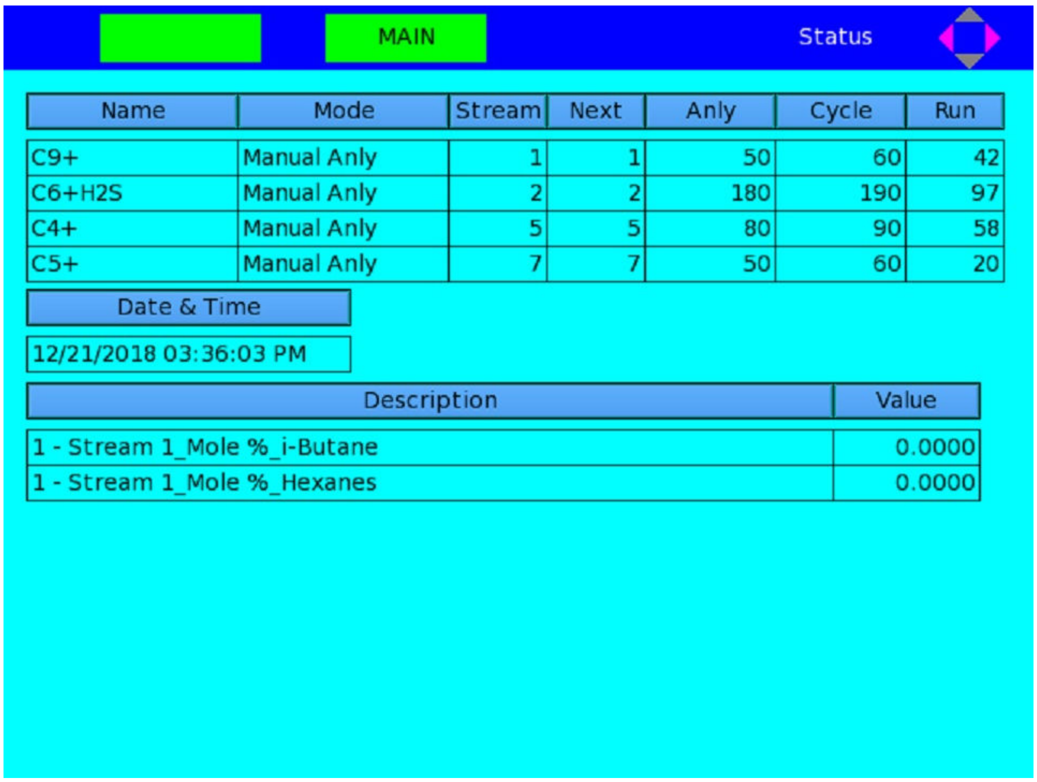
Screen	Description
Status	Displays information about the operational state of the analyzer, including a manually-scrolling list of up to 25 user-selectable parameters that can be defined or modified using the MON2020 software. **Note** There is more than one ***Live Chromatogram*** screen if the GC is configured with more than one analysis/cycle clock.

Screen	Description
Live Chromatogram	Displays the chromatogram for the current analysis in real time. **Note** There is more than one ***Live Chromatogram*** screen if the GC is configured with more than one analysis/cycle clock. Four detectors are supported for a single analysis. If there is more than one detector for one analysis (ex. Det 1, Det 3, Det 5), *D1/3/5* displays on the title bar.  If there are four live analyses for the GC, the ***Analysis*** screen displays for each clock.  **Note** This screen does not display if the GC is not currently analyzing a sample.
Active Alarms	Lists active alarms, if any.
Heater	Displays information about the PID temperature control loops.

Screen	Description
Valves	Displays the settings and states of the stream and analyzer valves.

In Status Display mode, pressing the **RIGHT** key takes you to the next available non-idle analysis live CGM screen. If all the cycle clocks are idle, then press **RIGHT** on the ***Status*** screen to go to the ***Alarm*** screen. Press **LEFT** on the ***Alarm*** screen to go to the ***Status*** screen. When you press **RIGHT**, the LOI displays each screen in succession and then loops back to the ***Status*** screen.

Figure A-2: LOI Status screen



This screen displays the Analysis names and all the four cycle clocks in the ***Status*** table. The LOI status variables are shown for one cycle clock every 15 seconds as depicted in Figure A-2. For the next 15 seconds, the LOI automatically scrolls and displays the next cycle clock's variables.

In *Status Display* mode, you can manually scroll to the next screen using the **RIGHT** key, or to the previous screen using the **LEFT** key. You can pause automatic scrolling at any time by pressing the **EXIT** key, and you can resume automatic scrolling by pressing either the **LEFT** or the **RIGHT** key. Automatic scrolling resumes after ten minutes of keypad inactivity.

Press **F1** when *MOVE* is displayed in the green box below to foucs inside the screen, so that you can navigate through the controls of the screen using the **LEFT**, **RIGHT**, **UP**, and **DOWN** keys. Press **EXIT** to return focus to the top level (outside of the screen). Press **LEFT** or **RIGHT** at the top level to resume automatic scrolling in addition to moving to the previous or next screen.

At any time, while in Status Display mode, you can press **ENTER** or **F2** to enter the ***Main Menu***. Use the **EXIT** key to leave the ***Main Menu*** and return the LOI to Status Display mode.

If you log onto the GC from the ***Main Menu*** to perform operations or edit data, when you exit the menu you will automatically be logged off the LOI.

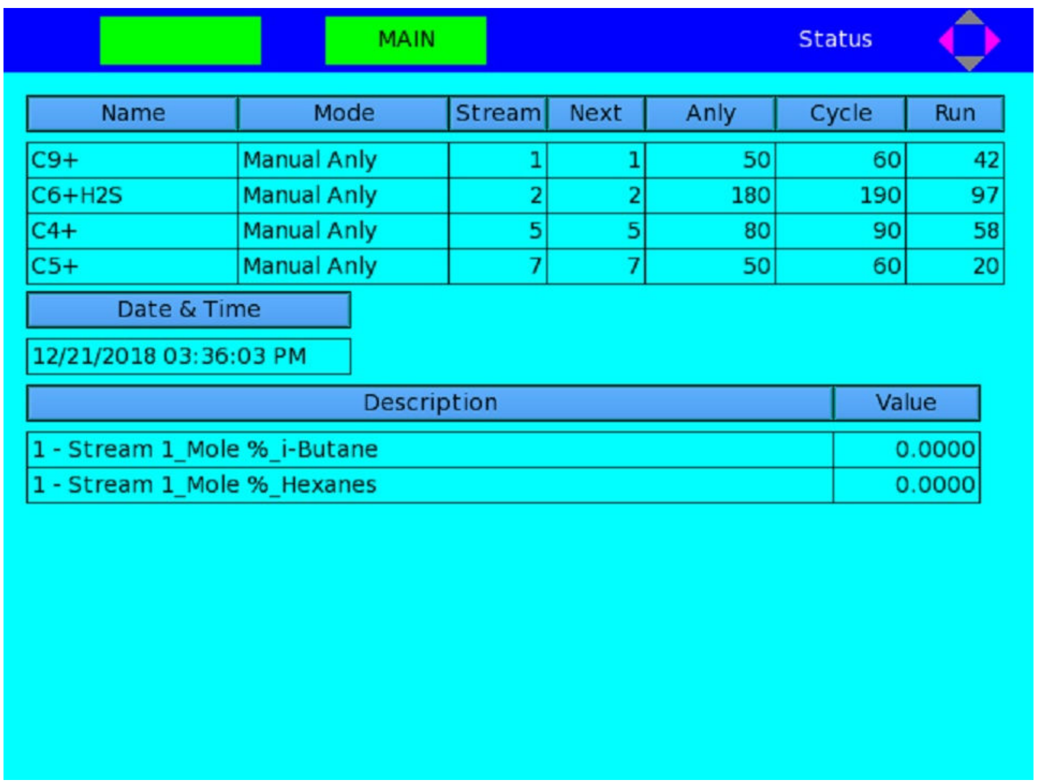
A.2.2 Navigating menus

The ***Status*** screen is now the default home screen. This screen lists information from the four analyzers as well as the local operator interface (LOI) variables.

You can also access the ***Status*** screen from the ***Application*** menu. This ***Status*** screen displays the same list of items as the ***Home Status*** screen but, the **F1** key has works differently here. The **Move** label displays as soon as you select the ***Status*** screen from the ***Application*** menu.

When the user presses **F1** then, the **Move** label changes to **Next**, indicating that the LOI status variables for the next analyzer are displayed at the bottom of the page. If you press **F1** again, the status variables for next analyzer displays. These LOI status variables keep revolving between the analyzers in order every time you press **F1**.

Figure A-3: LOI Home (Status) screen



At any time while in Status Display mode, you can press **ENTER** or **F2** to enter the ***Main Menu***.

Use the **UP** or **DOWN** keys to navigate between fields or controls within each drop-down menu. Pressing **DOWN** while focus is on the last field of a drop-down menu moves the focus to the first field on a screen. Alternatively, pressing **UP** while focus is on the first field of the drop down menu causes the focus to move to the last field.

Use the **ENTER** key from the ***Main Menu*** to activate submenus and individual menu items.

Press **EXIT** to leave the ***Main Menu*** and return the LOI to Status Display mode if no menu is dropped down. If a menu is dropped down, then pressing **EXIT** closes that menu.

If you log in to the gas chromatograph (GC) from the ***Main Menu*** to perform operations or edit data, when you exit the menu you will automatically be logged off the LOI.

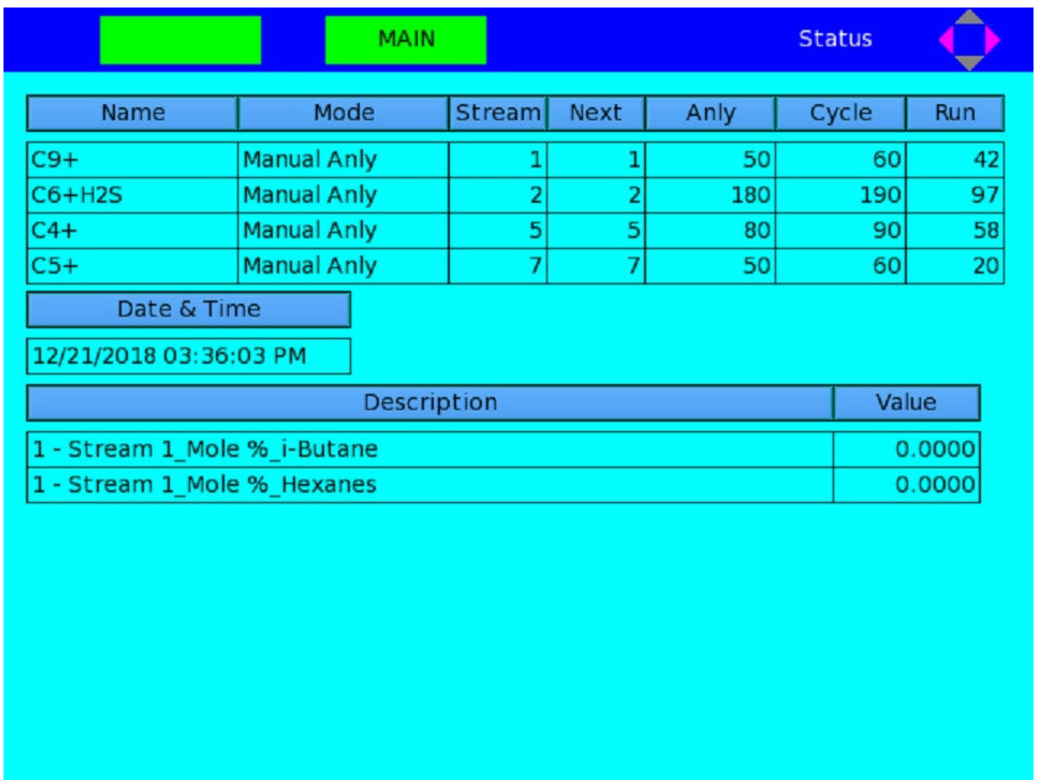
The ***Main Menu*** allows you access to all of the available LOI screens; however, you must be logged on to make changes. If you are not logged on and you attempt to edit a field, the ***Login*** screen will appear first.

After a period of fifteen minutes of inactivity, the LOI automatically logs you off.

A.2.3 Navigating the screens

Local operator interface (LOI) screen have several functions. They can display data for review or edit and initiate activities.

Figure A-4: LOI Home (Status) screen



Within any given screen, the function of the **ENTER** key depends upon the context. You can use it to validate and save changes or to initiate an action.

If the gas chromatograph (GC) finds a validation error after you press **ENTER**, an *Invalid Entry* message displays. Press **ENTER** again to close the message and then re-enter your data.

Press **EXIT** to close the currently open screen. If you have made changes to the screen, the LOI will display a confirmation message asking if you want to save your changes. Use the arrow keys to select the appropriate button and press **ENTER**. If you select **No**, your changes will be discarded and the ***Main Menu*** will display; if you select **Cancel**, the message window will close and you will be returned to the current screen; if you select **Yes**, your changes will be validated and saved and then you will be returned to the ***Main Menu***.

The **F1** and **F2** keys are context dependent. A one-word description of the function of each of these keys displays in a green prompt box directly under the key in the title bar of the top-level full-sized screen.

In some cases, **F1** acts as a toggle between scrolling either a line or a page at a time. When this is true, the currently selected option (**LN** or **PG**) displays with a green background and black text, while the non-selected option displays with a black background and green text. The table below lists the possible functions of the **F1** key:

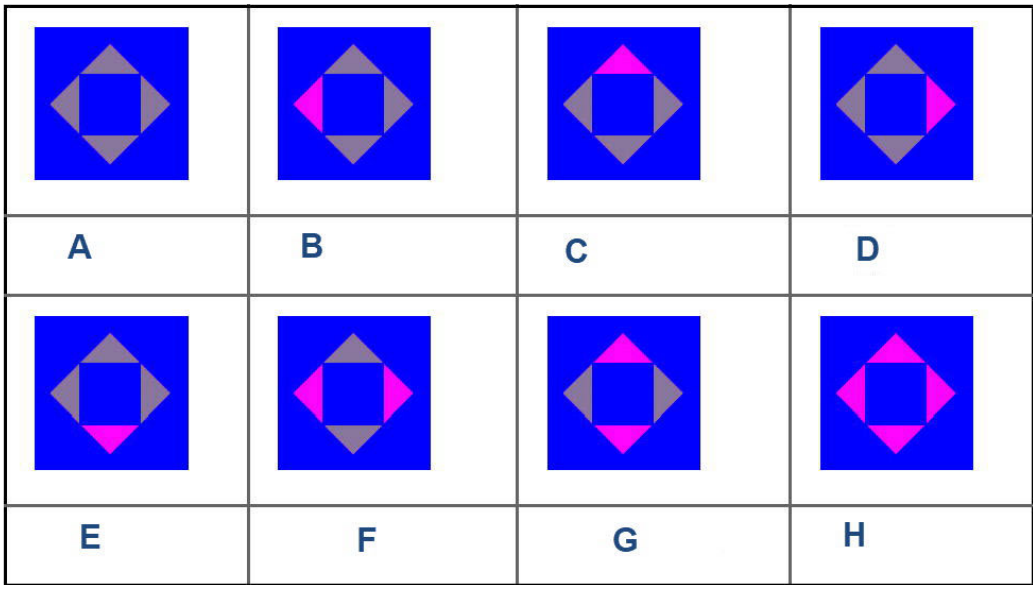
MOVE	Press **F1** to move the cursor around within the boundary of the screen.
EDIT	Press **F1** to open the edit dialog for the field that contains the cursor. The type of dialog that displays depends upon the type of field to be edited.
SELECT	Press **F1** to select the field to be edited.
BACKSP	Press **F1** to delete the character to the left of the cursor.
LN PG	Press **F1** to scroll line by line within a screen.
LN PG	Press **F1** to scroll page by page within a screen.
EXECUTE	Press **F1** to click the button and execute the command

Note
Throughout this appendix, when referring to the **F1** key, the key's current valid function will be indicated in parenthesis—for instance, **F1 (MOVE)** or **F1 (SELECT)**.

The **F2** key, when *MAIN* is displayed in the prompt box, closes all screens and goes back to the ***Main Menu***.

There is a navigation icon in the upper right corner of the screen that indicates which navigation keys are active for the currently displayed screen.

Figure A-5: Navigation keys



A. None
B. Left
C. Up
D. Right
E. Down
F. Left/right
G. Up/down
H. All

When you press a key, a green check will flash in the upper left corner if the key is valid; if the key is not valid, a red cross (*X*) will flash in the upper left corner.

Related information

Editing numeric fields
Editing non-numeric fields

A.2.4 Editing numeric fields

When the focus is on an editable field, pressing **F1 (EDIT)** will display the ***Edit*** dialog containing the field's original text.

Use the **LEFT** or **RIGHT** keys to move through the individual characters within the field and to select the character to be changed. Use the **UP** or **DOWN** keys to select the value of each digit. The possible values are **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **0**, "**-**" (minus), "**.**" (period), and **E**.

Special characters supported are: **@**, **!**, **#**, **$**, **%**, ▯, **&&**, *****, "_", **=** , and **?**

The "-" value is available for signed numbers.

The "." and the **E** values are available for floating-point numbers, except for retention times and timed event values.

The following rules apply when entering a floating-point value:

- More than one **E** is not allowed.

- More than one "." is not allowed.
- If the previous position is an **E**, then a "." and a **0** are not allowed.
- A "-" is allowed only after an **E** or at the first position.
- If the previous position is ".", then an **E** is not allowed.
- If the first character is a "-" and the current index is **1**, then a "." is not allowed.
- If the previous position is a "-", then a **0** is not allowed.
- If the next character is an **E**, then a "." is not allowed at the previous location.

The **DOWN** key moves backward in the list from the current value of the selected digit.

The **UP** key moves forward in the list from the current value of the selected digit.

The **F1 (BACKSP)** key acts as a backspace and deletes the digit immediately to the left of the current position.

The **ENTER** key validates and saves the entry and then closes the ***Edit*** dialog. The new entry will display in the field.

The **EXIT** key cancels any changes that were entered and closes the ***Edit*** dialog, restoring the previous value to the field.

A.2.5 Editing non-numeric fields

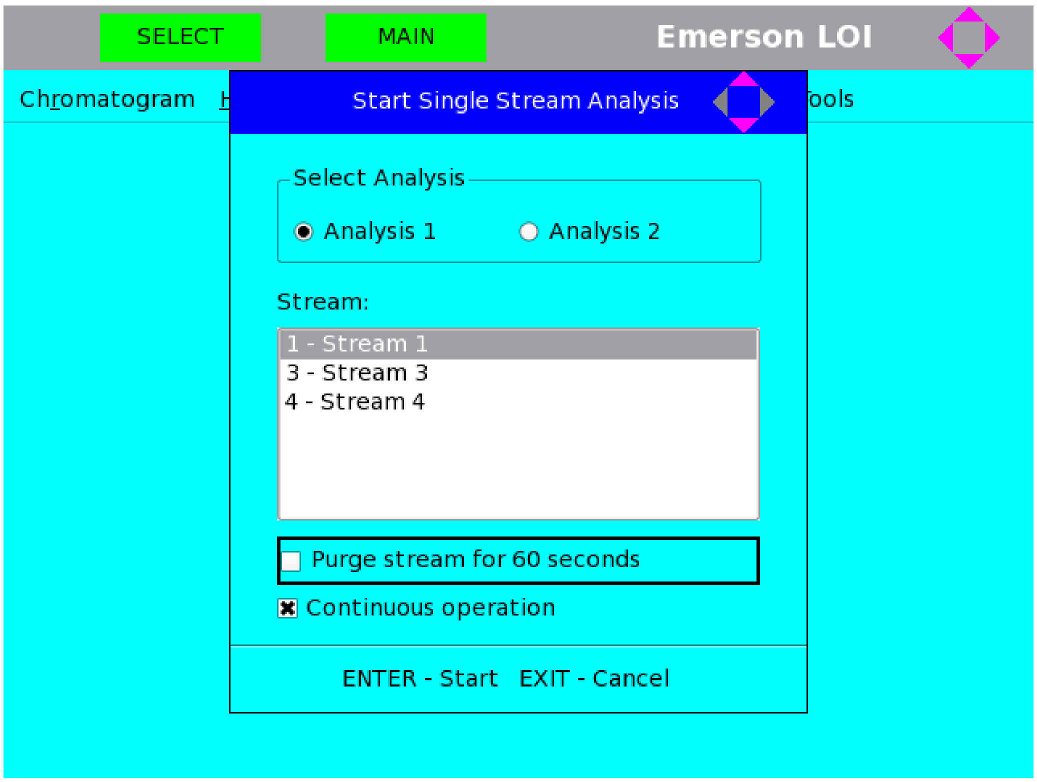
The function of the keys when editing non-numeric data is context-dependent.

Editing alphanumeric fields

Alphanumeric fields take numbers (**0** - **9**) and letters (**a** - **z**, **A** - **Z**).

Select check boxes

Figure A-6: Selecting a check box



Procedure

Press **F1 (SELECT)** to select or deselect a check box.

Click buttons

Procedure

Press **F1 (EXECUTE)** to click a button and execute a command.

Select radio buttons

Procedure

1. Press **F1 (SELECT)** to select a group of radio buttons.
2. Use the **UP/DOWN** or **LEFT/RIGHT** keys to move through the various radio buttons within the group.

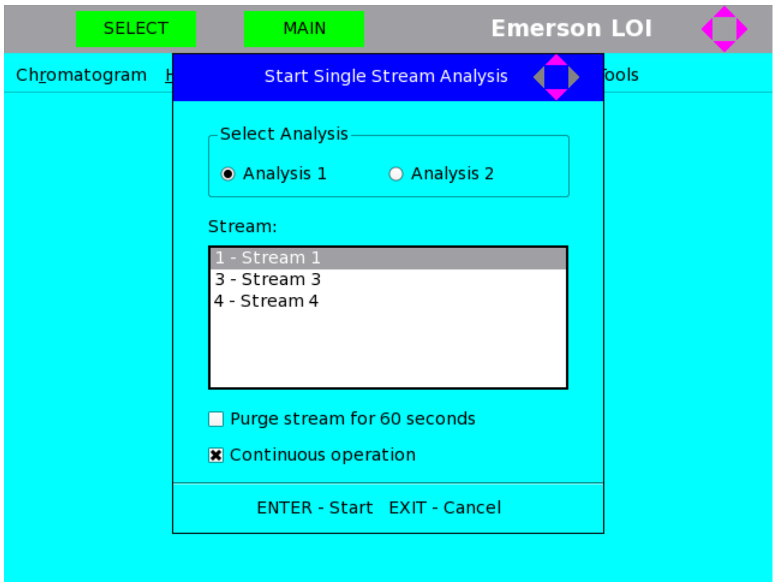
3. Press **ENTER** to accept the current selection or press **EXIT** to abort any changes and to restore the previous selection.

Select an item from a list box

Procedure

1. Press **F1 (SELECT)** while focused on the list box to switch it to Edit mode.

Figure A-7: Selecting a list box



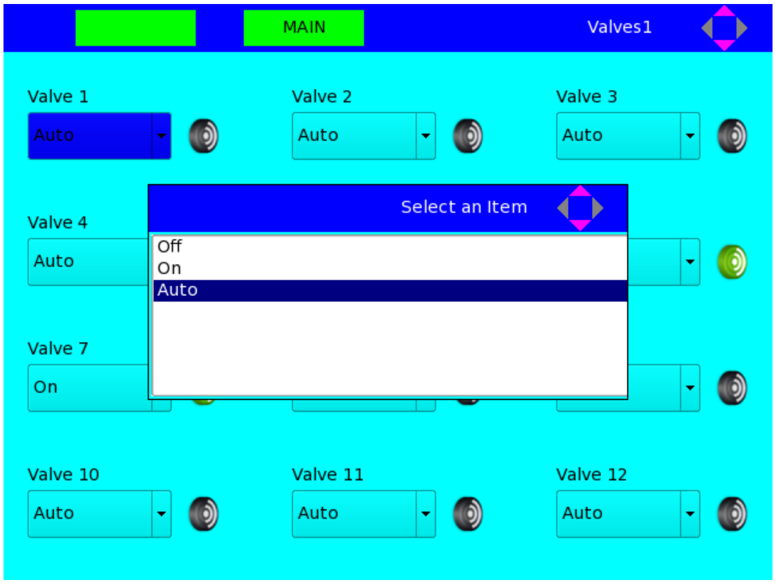
2. Use the **UP** and **DOWN** keys to move between the values within the list box.
3. Press **ENTER** to accept the current selection or press **EXIT** to abort the new selection, and the list box will revert to the previous selection.

Select an item from a combo box

Procedure

1. Press **F1 (SELECT)** while focused on the combo field.
   A ***Combo*** dialog opens and displays a list of available selections.

Figure A-8: Selecting from a combo box



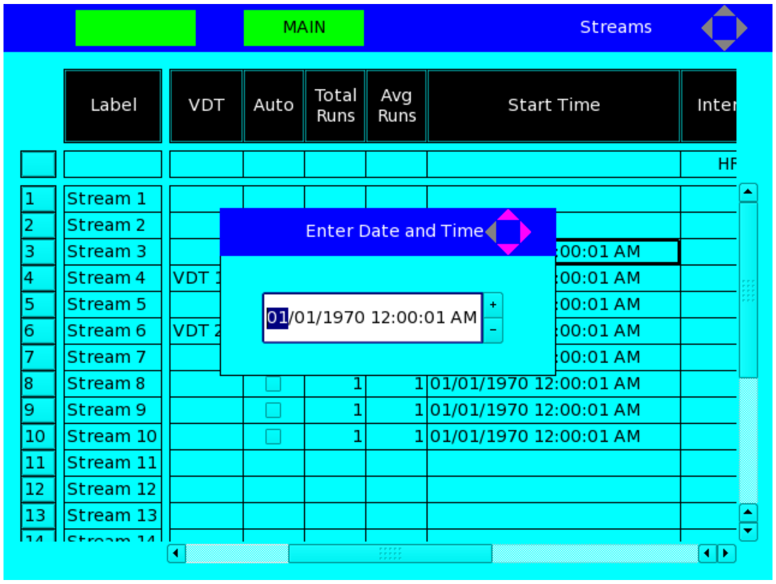
2. Use the **UP** and **DOWN** keys to move between the selections.
3. Press **ENTER** to select the desired value or press **EXIT** to restore the combo box's initial value.

Enter a date and time

Procedure

1. Press **F1 (SELECT)** while focused on the **Date and Time** field
   The ***Enter the Date and Time*** dialog displays. By default, the focus is set on the **Month** unit.

   Figure A-9: Entering a date and time

2. Use the **UP** and **DOWN** keys to change the value of the unit—that is, to go from **January** to **February**, or from **1** to **2**.
3. Use the **LEFT** and **RIGHT** arrow keys to change units—that is, to go from months to years or hours to minutes.

   Note
   If the focus is on the leftmost section, the **LEFT** key will be inactive, and similarly if the focus is on the rightmost section, the **RIGHT** key will be inactive.

4. Press **ENTER** to save the change or press **EXIT** to discard the change and restore the original value.

Set the time

Procedure

1. Press **F1 (SELECT)** while focused on the **Time** field
   The ***Enter the Time*** dialog displays. By default, the focus is set on the **Hour** unit.
2. Use the **UP** and **DOWN** keys to change the value of the unit.
3. Use the **LEFT** and **RIGHT** arrow keys to change units—to go from hours to minutes, for example.

   Note
   If the focus is on the leftmost section, the **LEFT** key will be inactive, and similarly if the focus is on the rightmost section, the **RIGHT** key will be inactive.

4. Press **ENTER** to save the change or press **EXIT** to discard the change and restore the original value.

A.3 Navigate and interact with the screen

This tutorial, which guides you through the procedure for editing data on a screen, will incorporate all of the preceding information to demonstrate the typical method of navigating and interacting with the local operator interface (LOI).

You will learn how to perform the following actions:

- Open and close screens.
- Navigate through tables.
- Select fields for editing.
- Save data.

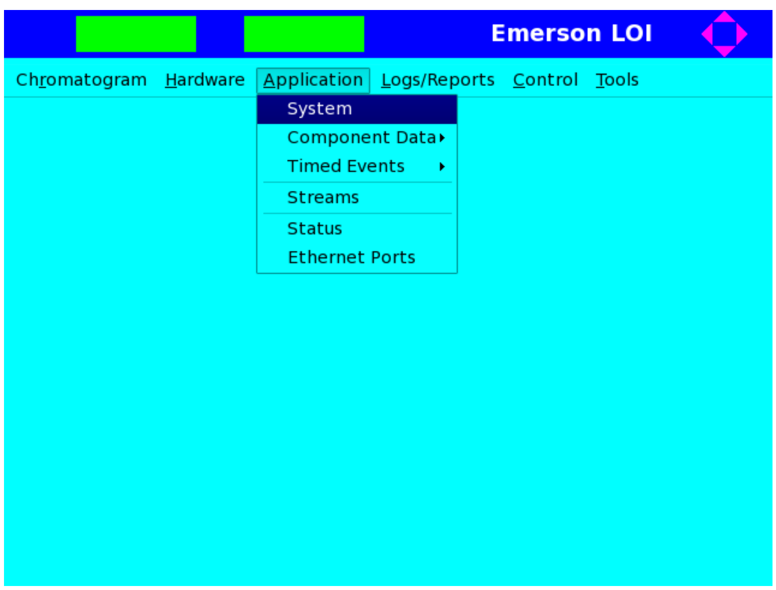
Procedure

1. From the ***Main Menu***, click the **RIGHT** key enough times to navigate to the ***Application*** menu.

   The ***System*** submenu, as it is the first item in the list, is already selected.

   Note
   In this instance, the term click means to tap the glass on the spot directly above the arrow's keyhole.

   Figure A-10: Navigate to the Application menu



   Note
   Notice the navigation icon in the upper right corner, which indicates that all four arrow keys are active. This allows you to navigate to all of the menu items and sub menu items.

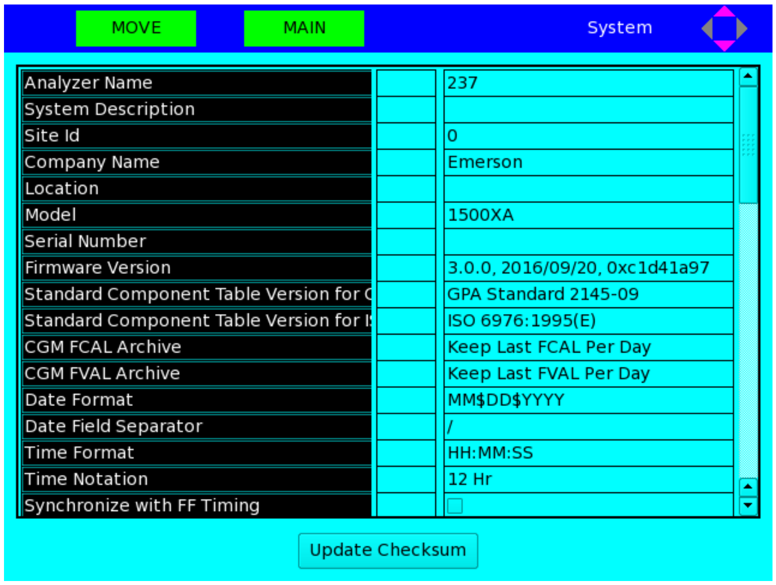
Note

Notice that the green prompt boxes are empty. This means that the **F1** and **F2** keys are inactive from the ***Main Menu***.

---

2. Click **ENTER**.
   The ***System*** screen displays.

Figure A-11: System screen



Note

Notice the navigation icon in the upper right corner, which indicates that no arrow keys are active.

Notice that the green prompt boxes now display function keywords. *MAIN* means that if you click **F2**, the LOI will close the current screen and return you to the ***Main Menu***. *MOVE* means that if you click **F1**, the arrow keys are enabled for navigation within the ***System*** screen.

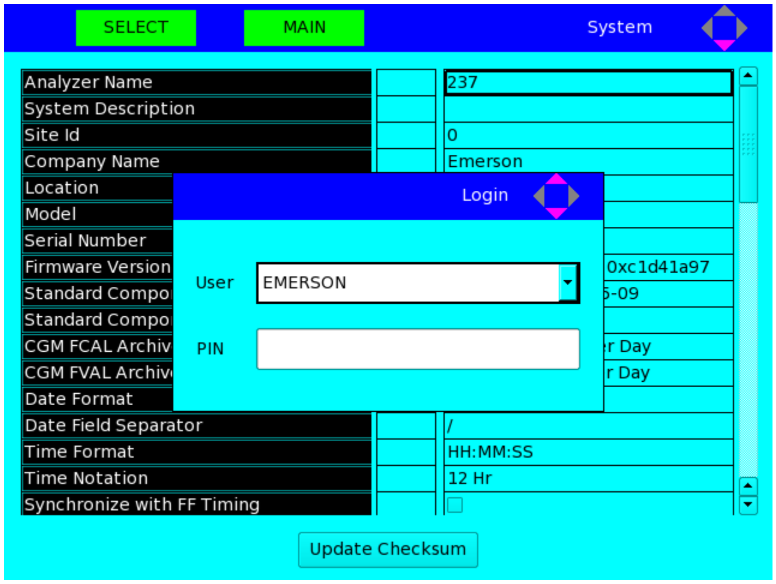
---

3. Click **F1**.
   The LOI switches to Edit mode. Notice that the navigation icon in the upper right corner of the screen indicates that the **DOWN** key is active.
4. Click the **DOWN** key once.
   Now the navigation icon indicates that both the **UP** and **DOWN** keys are active.
5. Click the **UP** arrow once to return to the previous cell.
   The navigation icon again indicates that only the **DOWN** key is active.

   Notice that the green ***F1*** prompt box reads *EDIT*.

6. Click **F1**.
   You must be logged in to the gas chromatograph (GC) to make a change to any screen. If you try to edit a field before logging in—as you just did, the LOI displays the ***Login*** dialog to prompt you to log in.

Figure A-12: Login screen (Edit mode prompt)



Note
Notice that there is also a navigation icon on the ***Login*** dialog.

7. Click **F1 (SELECT)** and navigate up or down the list to highlight your user name.

Note
For the remainder of this tutorial, when referring to the **F1** key, the key's current valid function will be indicated in parenthesis—for instance, **F1 (MOVE)** or **F1 (SELECT)**.

8. Click **ENTER**.
9. Navigate to the **Password** field, press **F1 (EDIT)**, and enter your password.

Important
The password security policy requires a login name and password. Security levels include:

- High - password policy level includes following parameters:
  - Ensure minimum eight characters length and maximum of 12 characters.
  - Ensure at least one upper case character.
  - Ensure at least one lower case character.
  - Ensure at least one digit.
  - Ensure at least one special character:
    - At symbol, exclamation mark, percent symbol, Caret symbol, Ampersand symbol, Asterisk symbol, underscore, equals, plus, question mark, colon, or dash
    - @, !, #, $, %, ^, &&, *, _, =, +, ?, :, -^
    - Immediate reuse of a password will not be allowed. This will avoid setting same password as new password repetitively
    - Ensure password doesn't contain user name

- There will not be any kind of password expiration after certain time

- Medium password policy level includes the following parameters:
  — Ensure minimum eight characters length and maximum of 12 characters.
  — Ensure at least one upper case character.
  — Ensure at least one digit.
  — Ensure password doesn't contain user name.
  — There will not be any kind of password expiration after certain time.

  :

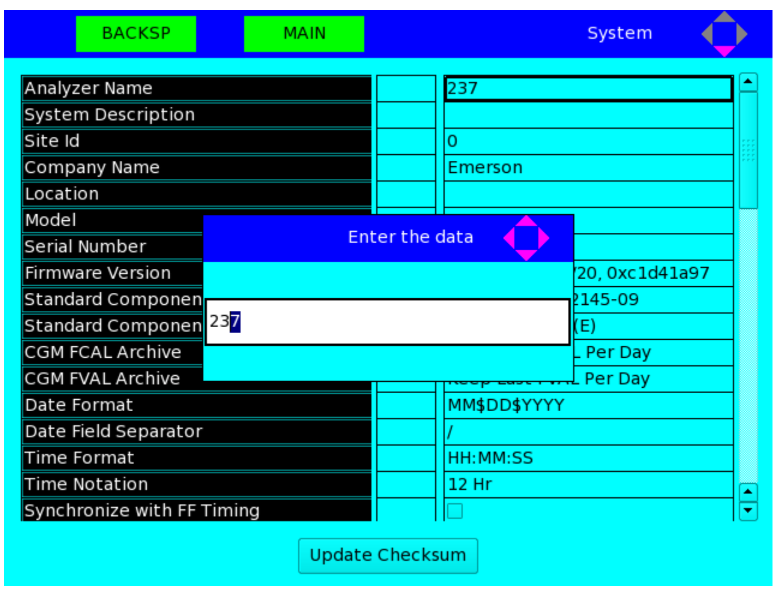
- Low password policy level include the following rules:
  — Ensure minimum eight characters length and maximum of 12 characters
  — Password should contain any alphanumeric character combination (i.e., numbers, small letters, capital letters, special characters).
  — There will not be any kind of password expiration after certain time

---

10. Click **ENTER** twice.
    Now that you are logged in, you can edit the fields on the screen.
11. Click **F1 (EDIT)**.
    The ***Enter the data*** dialog displays.

    The ***Enter the data*** dialog allows you to edit the selected field.

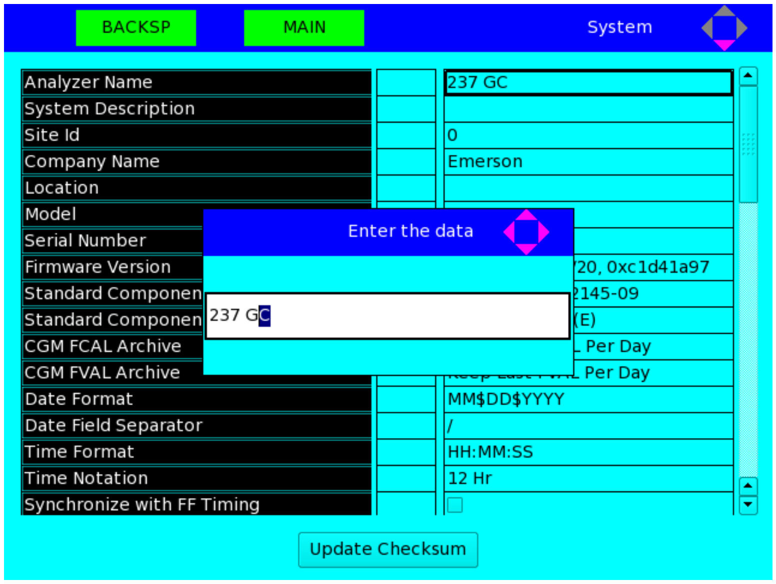
Figure A-13: Enter the data screen



12. To delete a character, press **F1 (BACKSP)**. To enter new data, use the **UP** and **DOWN** keys to cycle through the available characters, and use the **RIGHT** key to add a new character to the field.

13. When you are finished entering data, press **ENTER** to validate and save the new information. To discard the information, press **EXIT**.

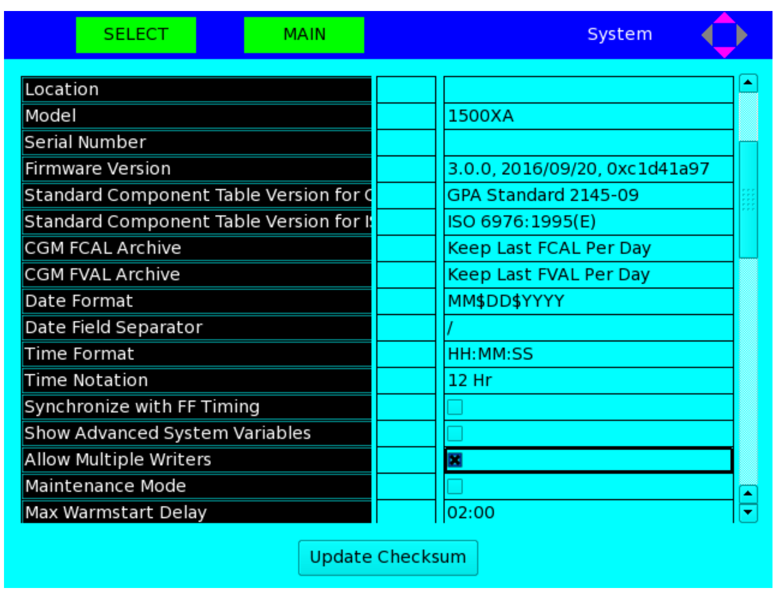
Figure A-14: New data displayed



Note
If a validation error is found after pressing **ENTER**, an *Invalid Entry* message displays. Press **ENTER** to close the message and then re-enter your data.

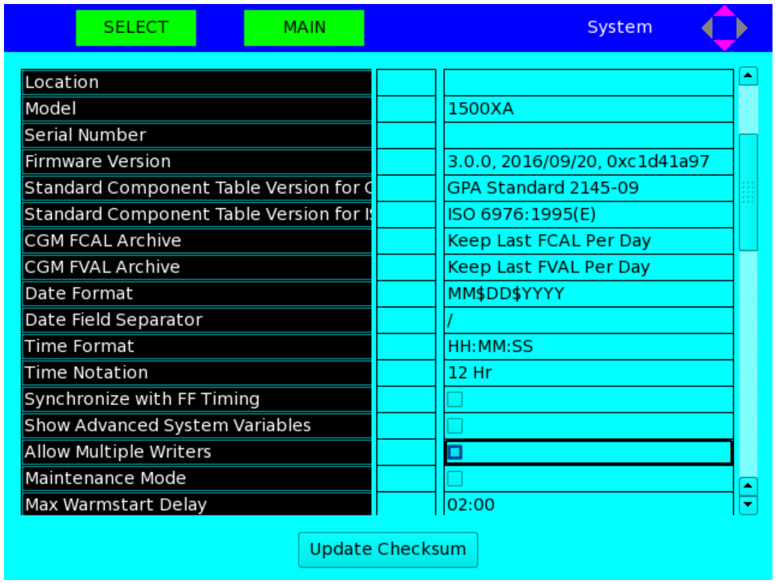
14. Use the **DOWN** arrow to move to the **Allow Multiple Writers** check box.

Figure A-15: Allow Multiple Writers check box selected



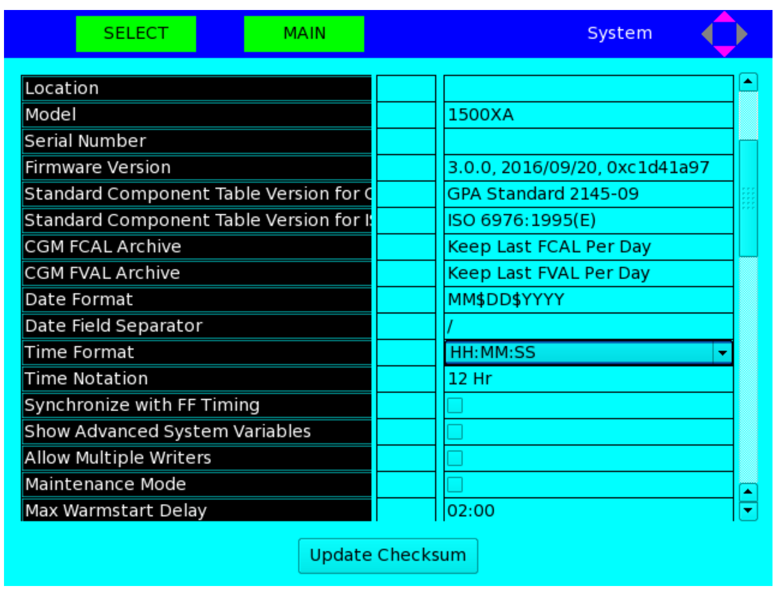
15. Press **F1 (SELECT)**.
    This clears the check box.

Figure A-16: Allow Multiple Writers check box not selected



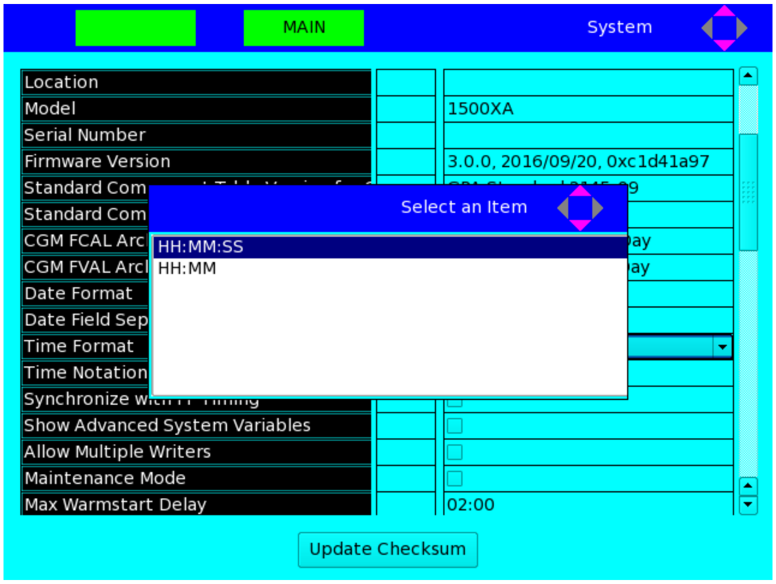
16. Click **F1 (SELECT)** again to reselect the check box.
17. Navigate to the Time Format field.

Figure A-17: Time Format field



18. Press **F1 (SELECT)**.
    The ***Select an Item*** combo box displays.

Figure A-18: Select an Item combo box



19. Use the **DOWN** key to scroll down to the last item in the combo box. Press **ENTER**.
20. Press **ENTER** a second time to save all the changes that were made to the table.

Note
If you neglect to press **ENTER** at this point, all of your changes will be lost.

21. Press **F2 (MAIN)** to return to the ***Main Menu***.

A.4 Local operator interface (LOI) screens

The ***Main Menu*** has six top-level submenus: ***Chromatogram***, ***Hardware***, ***Application***, ***Control***, ***Logs/Reports***, and ***Tools***.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Table A-1 through Table A-4 list the submenus and commands that are available from the ***Main Menu***.

Table A-1: Chromatogram menu

Submenu	Command	Subcommands	Reference
Chromatogram			Chromatogram menu
	View	N/A	Chromatogram menu
		Live Chromatogram View screen (Status Mode)	Figure A-21
		Live Chromatogram screen (Advanced Mode)	Figure A-22
		Archived Chromatogram screen (Advanced Mode)	Figure A-27
		Live && Archived Chromatogram Viewer Options menu	Figure A-28
		CGM Scaling screen	Figure A-29
		Select Detector screen	Figure A-30
		Chromatogram TEV table	Figure A-31
		Chromatogram CDT table	Figure A-32
		Chromatogram Raw Data table	Figure A-33

Table A-2: Hardware and Application menus

Submenu	Command	Subcommands	Reference
Hardware			Hardware menu
	Heaters	N/A	Figure A-35
	Valves	N/A	Figure A-36
	Detectors	N/A	Figure A-34
	Discrete Inputs	N/A	Figure A-38
	Discrete Outputs	N/A	Figure A-39
	Analog Inputs	N/A	Figure A-40
	Analog Outputs	N/A	Figure A-41
	Installed Hardware	N/A	Figure A-42
Application			Figure A-43
	System	N/A	Figure A-44
	Component Data		Figure A-45
		CDT 1	
		CDT 2	
		CDT 3	

Table A-2: Hardware and Application menus *(continued)*

Submenu	Command	Subcommands	Reference
		CDT 4	
	Timed Events		Figure A-46
		TEV 1	
		TEV 2	
		TEV 3	
		TEV 4	
	Streams	N/A	Figure A-50
	Status	N/A	Figure A-53
	Ethernet Ports	N/A	Figure A-54

Table A-3: Logs/Reports and Control Menus

Submenu	Command	Reference
Logs/Reports		Logs/Reports menu
	Maintenance Log	Figure A-57
	Event Log	Figure A-58
	Alarm Log	Figure A-59
	Unack Alarms	Figure A-60
	Active Alarms	Figure A-61
	Report Display	Figure A-63
Control		Control menu
	Auto Sequence	Figure A-65
	Single Stream	Figure A-66
	Halt	Figure A-67
	Calibration	Figure A-68
	Validation	Figure A-69
	Stop Now	Figure A-70

Table A-4: Tools menu

Submenu	Command	Reference
Manage Tools		Tools menu
	Screen Control	Figure A-72
	Diagnostics	Figure A-74
	Logout	No screen

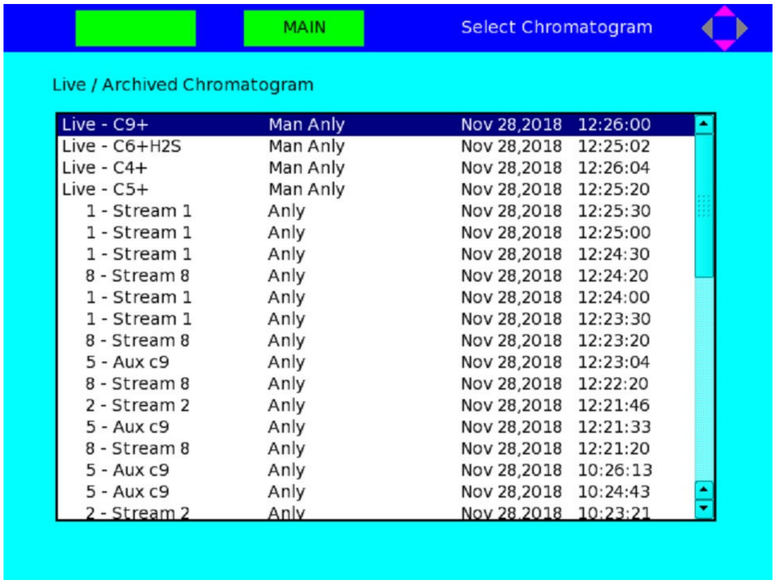
A.4.1 Chromatogram menu

The ***Chromatogram*** menu enables you to view live and archived chromatograms and their associated component data tables (CDTs) and timed event (TEV) tables, as well as to edit the display properties if the chromatogram screens.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

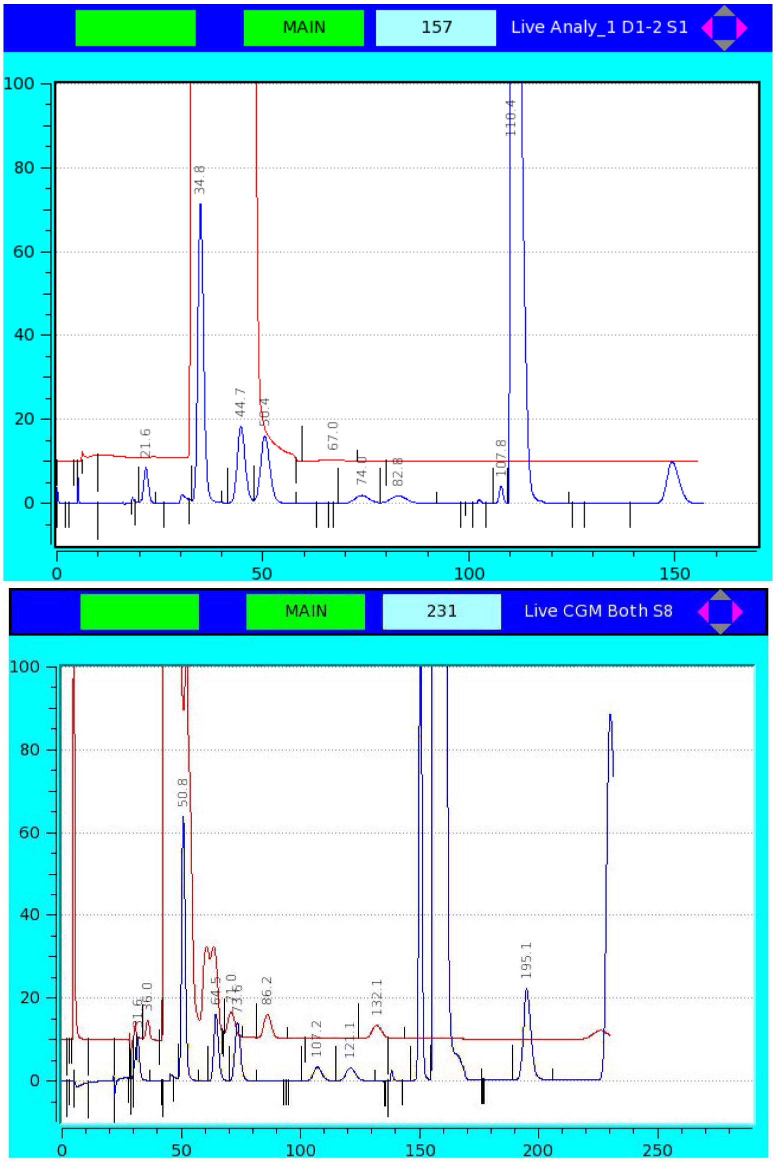
Figure A-19: Chromatogram menu

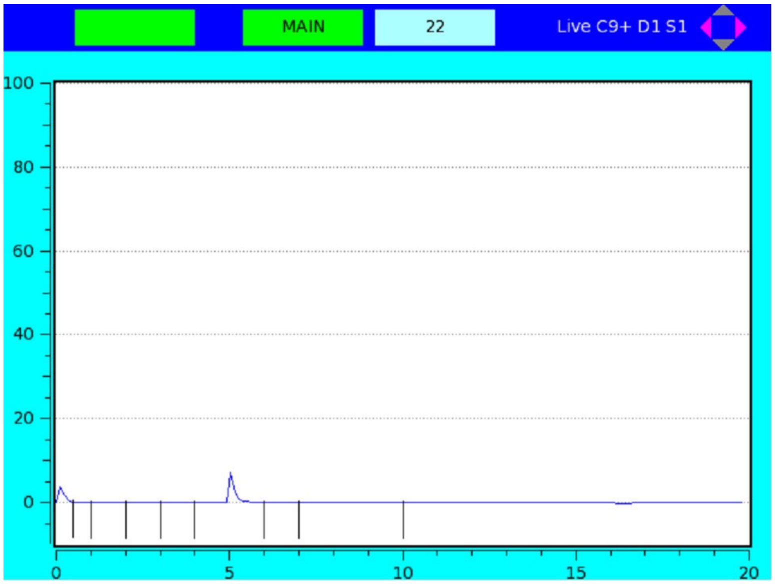
Figure A-20: Select Chromatogram screen



- After selecting the live chromatogram, select **Options** and view and select the detectors associated with that cycle clock.
- All the detectors that are associated with a cycle clock are shown with a radio button. The other detectors that are not associated with that cycle clock are grayed out as shown in Figure A-21

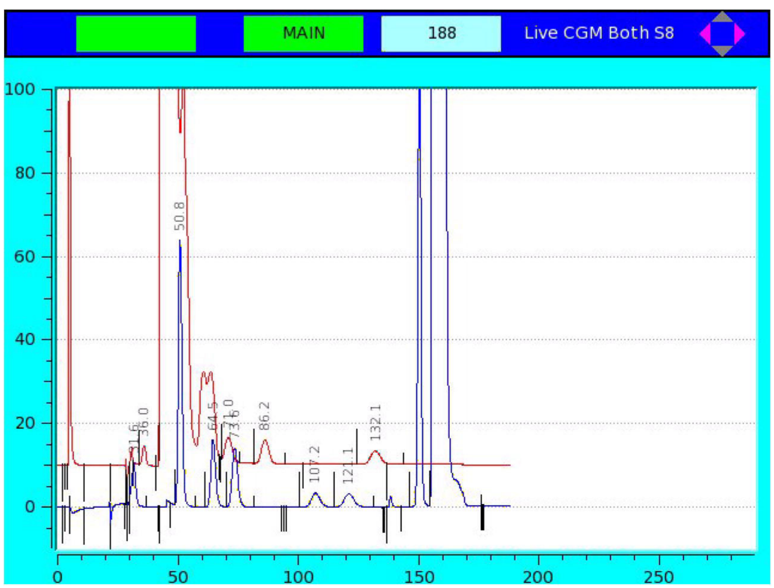
Figure A-21: Live Chromatogram View (Status mode) screen





Note
The blue box displays the current analysis time.

Figure A-22: Live Chromatogram View (Advanced mode) screen



Note
The blue box displays the current analysis time.

Figure A-23: Live Chromatogram - Analysis 1

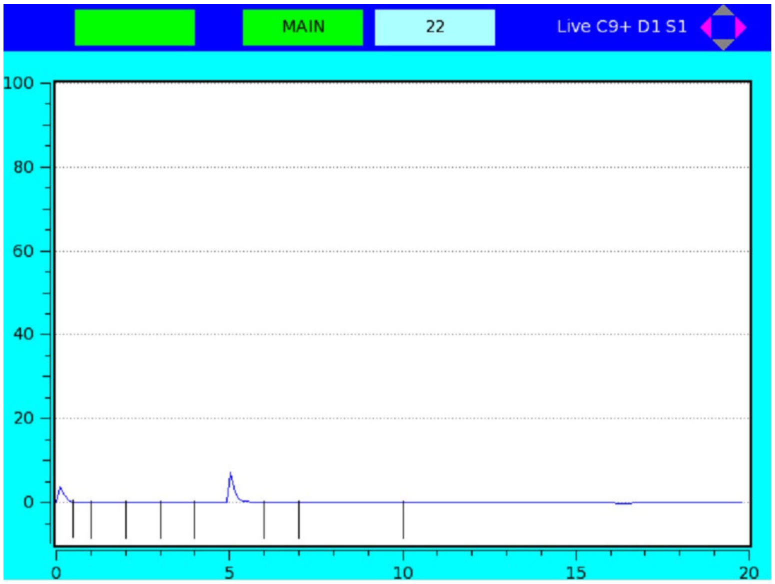


Figure A-24: Live Chromatogram - Analysis 2

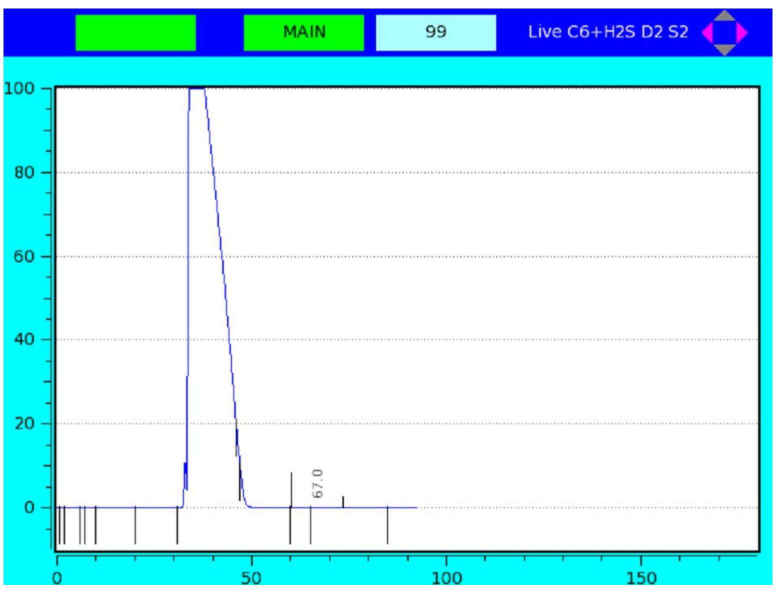


Figure A-25: Live Chromatogram - Analysis 3

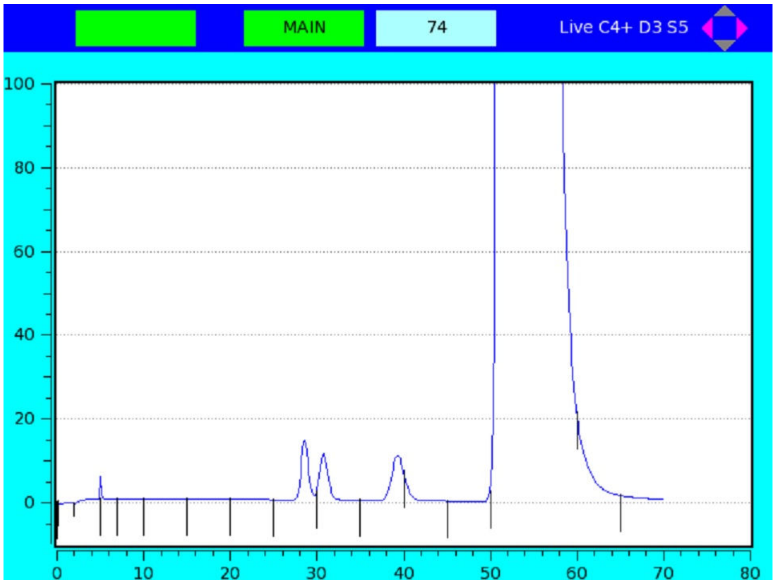


Figure A-26: Live Chromatogram - Analysis 4

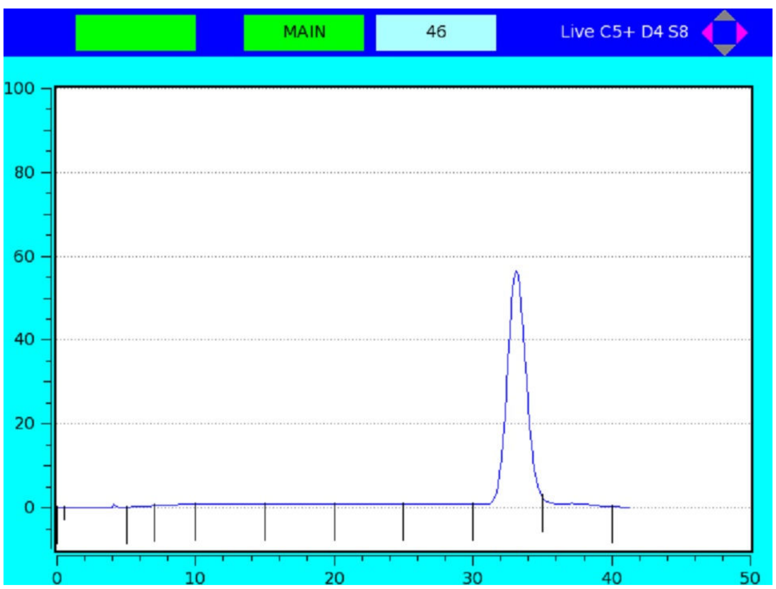


Figure A-27: Archived Chromatogram (Advanced mode) screen

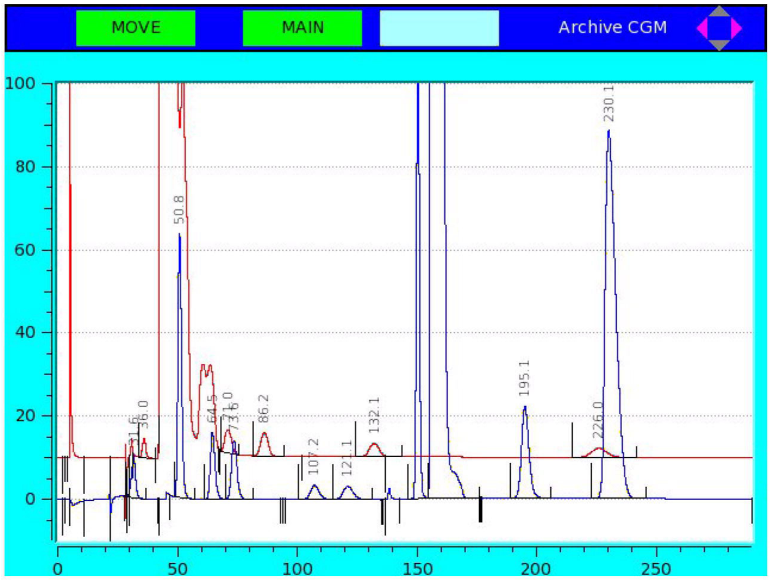
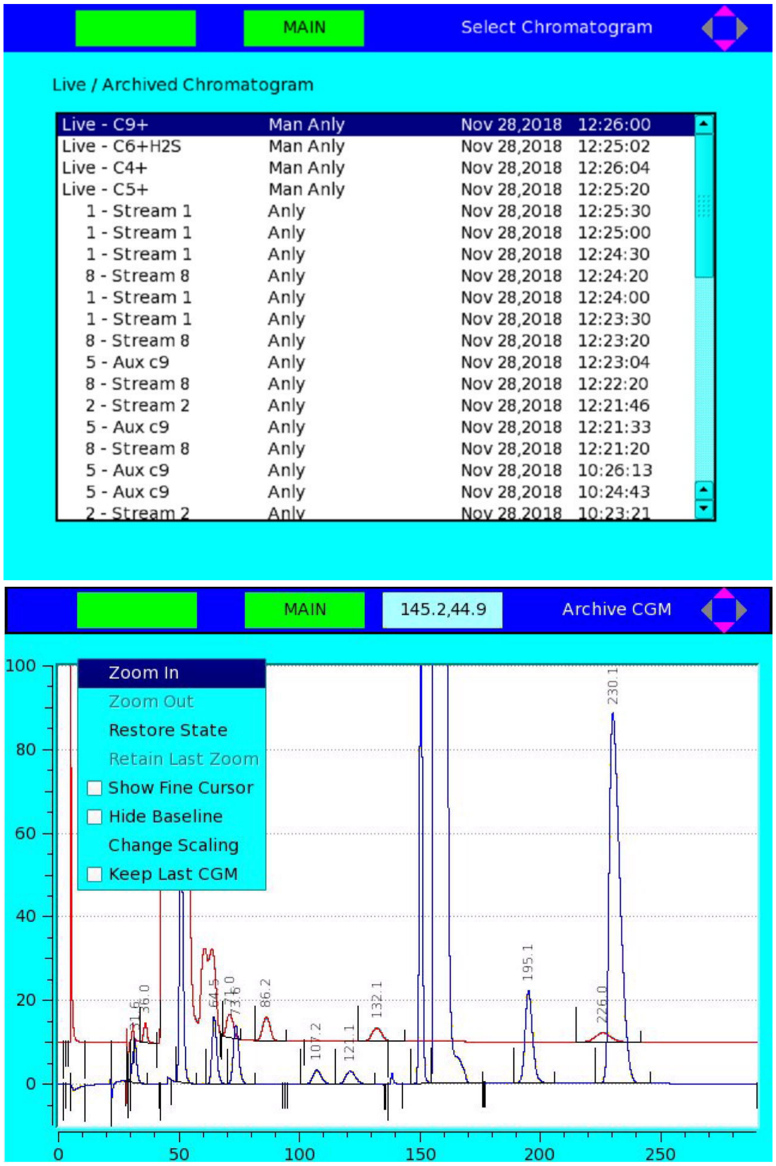
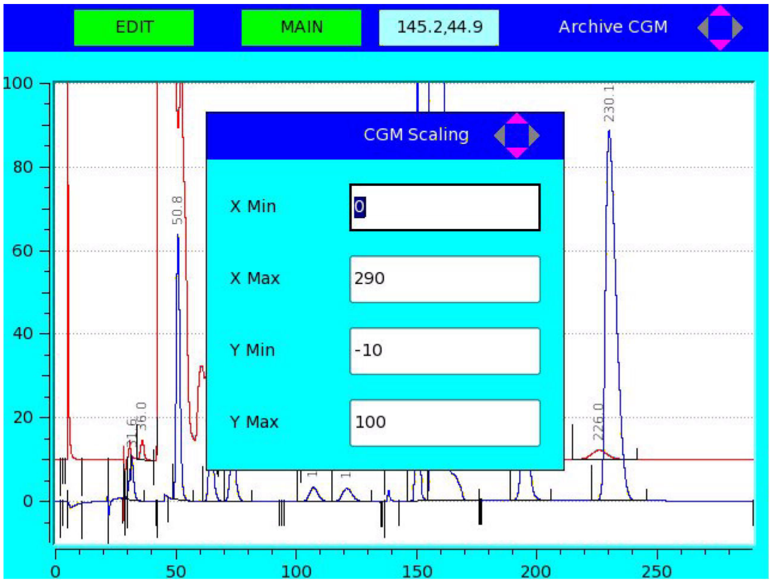


Figure A-28: Live and Archived Chromatogram Viewer Options screen



Note
The blue box displays the cursor's X- (analysis time) and Y- (amplitude) coordinates.

Figure A-29: CGM Scaling screen



After selecting the live CGM, select the ***Options*** menu to view and select the detectors associated with that cycle clock.

Figure A-30: Detector selection via Options menu

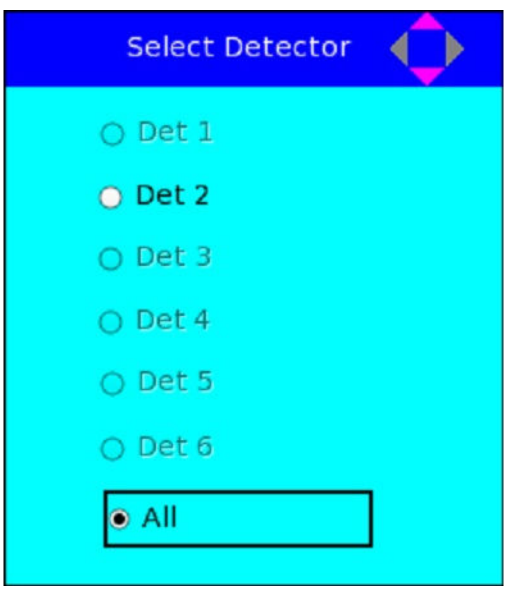
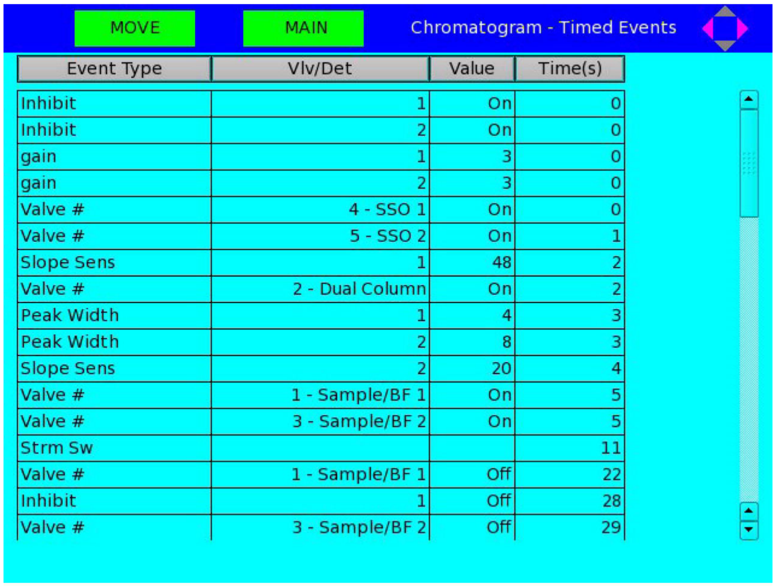
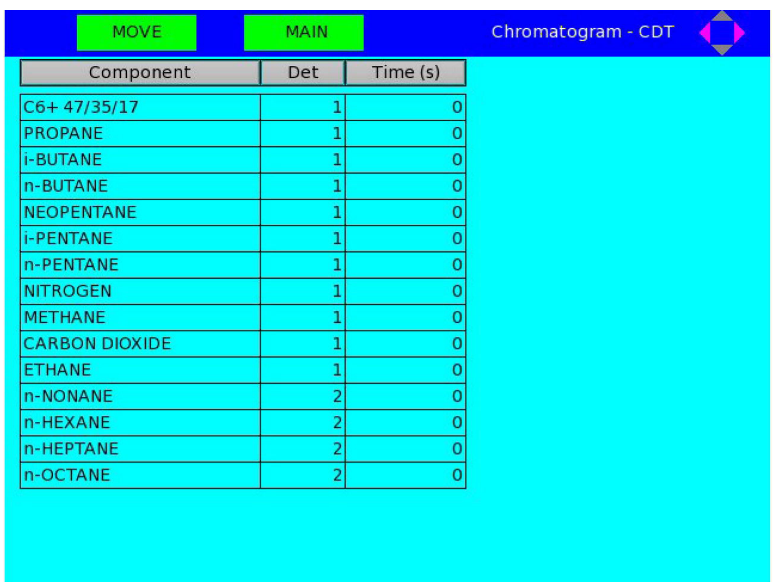


Figure A-31: Chromatogram Timed Events (TEV) Table screen



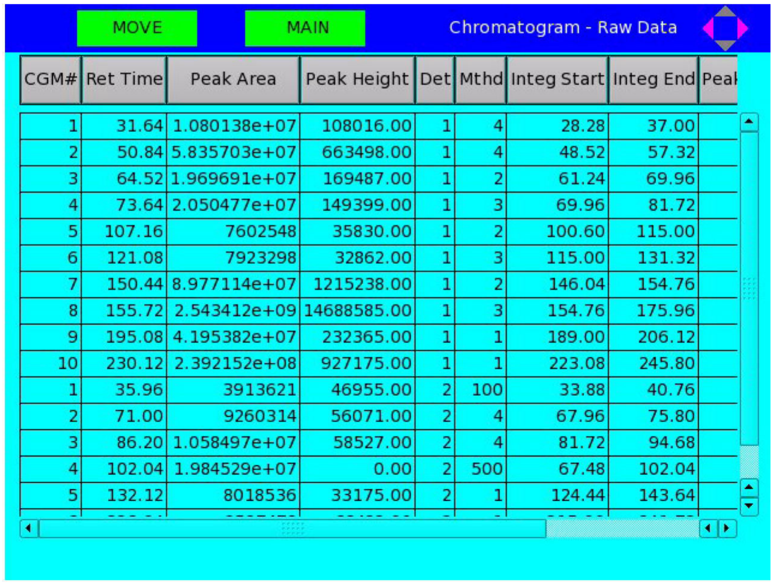
Event Type	Vlv/Det	Value	Time(s)
Inhibit	1	On	0
Inhibit	2	On	0
gain	1	3	0
gain	2	3	0
Valve #	4 - SSO 1	On	0
Valve #	5 - SSO 2	On	1
Slope Sens	1	48	2
Valve #	2 - Dual Column	On	2
Peak Width	1	4	3
Peak Width	2	8	3
Slope Sens	2	20	4
Valve #	1 - Sample/BF 1	On	5
Valve #	3 - Sample/BF 2	On	5
Strm Sw			11
Valve #	1 - Sample/BF 1	Off	22
Inhibit	1	Off	28
Valve #	3 - Sample/BF 2	Off	29

Figure A-32: Chromatogram Component Data Table (CDT) screen



Component	Det	Time (s)
C6+ 47/35/17	1	0
PROPANE	1	0
i-BUTANE	1	0
n-BUTANE	1	0
NEOPENTANE	1	0
i-PENTANE	1	0
n-PENTANE	1	0
NITROGEN	1	0
METHANE	1	0
CARBON DIOXIDE	1	0
ETHANE	1	0
n-NONANE	2	0
n-HEXANE	2	0
n-HEPTANE	2	0
n-OCTANE	2	0

Figure A-33: Chromatogram Raw Data Table screen



CGM#	Ret Time	Peak Area	Peak Height	Det	Mthd	Integ Start	Integ End	Peak
1	31.64	1.080138e+07	108016.00	1	4	28.28	37.00	
2	50.84	5.835703e+07	663498.00	1	4	48.52	57.32	
3	64.52	1.969691e+07	169487.00	1	2	61.24	69.96	
4	73.64	2.050477e+07	149399.00	1	3	69.96	81.72	
5	107.16	7602548	35830.00	1	2	100.60	115.00	
6	121.08	7923298	32862.00	1	3	115.00	131.32	
7	150.44	8.977114e+07	1215238.00	1	2	146.04	154.76	
8	155.72	2.543412e+09	14688585.00	1	3	154.76	175.96	
9	195.08	4.195382e+07	232365.00	1	1	189.00	206.12	
10	230.12	2.392152e+08	927175.00	1	1	223.08	245.80	
1	35.96	3913621	46955.00	2	100	33.88	40.76	
2	71.00	9260314	56071.00	2	4	67.96	75.80	
3	86.20	1.058497e+07	58527.00	2	4	81.72	94.68	
4	102.04	1.984529e+07	0.00	2	500	67.48	102.04	
5	132.12	8018536	33175.00	2	1	124.44	143.64	

A.4.2 Hardware menu

The ***Hardware*** menu enables you to view and manage the GC's hardware components.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Figure A-34: Hardware menu

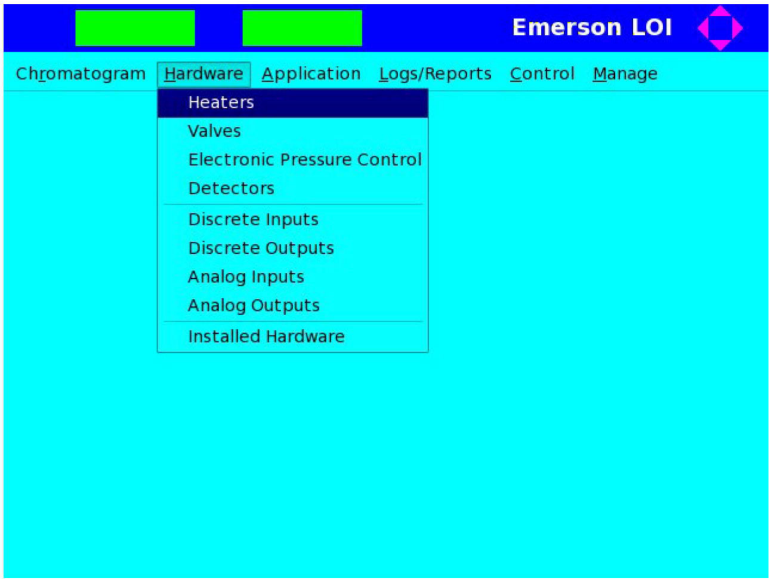


Figure A-35: Heaters screen

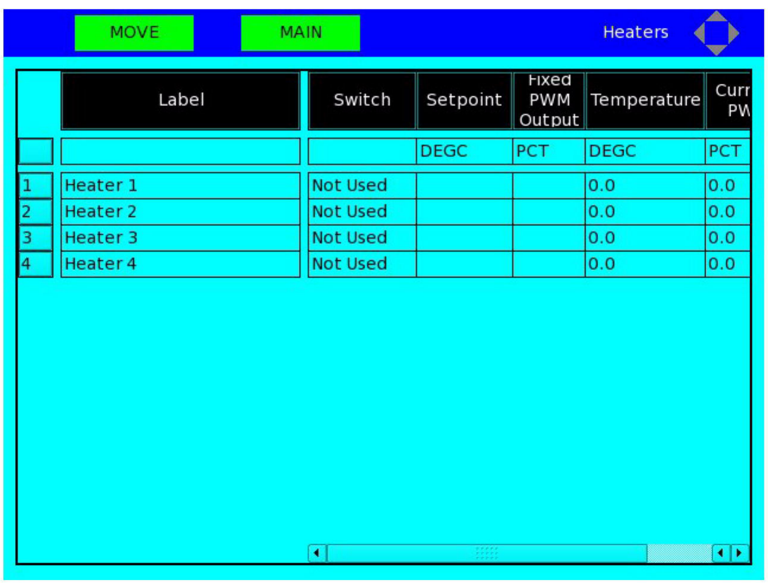


Figure A-36: Valves screen

Note
The usage (Sample/BF1, Dual Column), mode (Auto, Off), and state (green = on, black = off, red = error) of each valve is displayed.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Figure A-37: Detectors screen

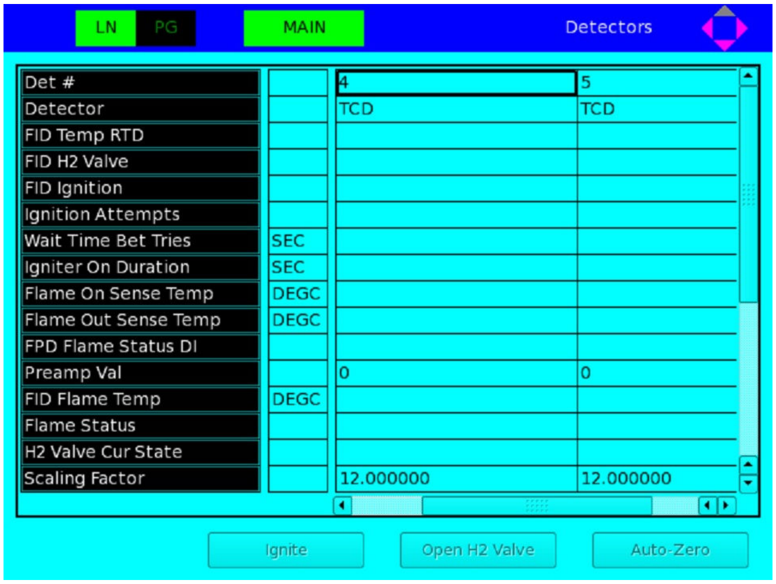


Table A-5: Detector screen fields

Detector Screen	G1 Board		G2 Board	
Field Names	**Flame ionization detector (FID)**	**Flame photometric detector (FPD)**	**FID**	**FPD**
FID Temp RTD	Selectable	Blank	Blank	Blank
H2 Valve	Selectable	Blank	Selectable	Selectable
Flame Ignition	Selectable	Blank	Selectable	Selectable
Ignition Attempts	Editable	Blank	Editable	Editable
Wait Time Bet Tries	Editable	Blank	Editable	Editable
Igniter On Duration	Editable	Blank	Editable	Editable
Flame On Sense Temp	Editable	Blank	Editable	Editable
Flame Out Sense Temp	Editable	Blank	Editable	Editable
FPD Flame Status DI	Blank	Selectable	Blank	Blank
Scaling Factor	Read only	Read only	Read only	Blank
Flame Temp	Read only	Blank	Read only	Read only

The ***Detector*** screen field label names and their respective field statuses are described as editable or non-editable depending on G1/G2 board types.

When you select one of the buttons on G1 boards (for example, **Auto-zero**), then since FID and μFPD are both enabled for Auto-zero, when that button is selected a combo box displays for you to select either FID or μFPD detector (if both detector types are configured with the gas chromatograph [GC]). After selecting one of the detectors, the Auto-zero event is triggered for that detector.

For G2 boards, since the μFPD is disabled for Auto-zero no combo box displays for you to select the detector. Only one detector is a valid selection for Auto-zero in the available detectors on that GC, so the **Auto-zero** selection triggers the event for the FID detector. If the button option is valid for more than one detector type, only then does the combo box display. If only one detector type is valid for that specific button, then the combo box does not display and the selection triggers that specific event on the only workable detector.

Table A-6: Detector screen Auto-zero buttons

Button Name	G1 Board		G2 Board	
	FID	FPD	FID	FPD
Auto-Zero	Enabled	Enabled	Enabled	Disabled

Figure A-38: Discrete Inputs screen

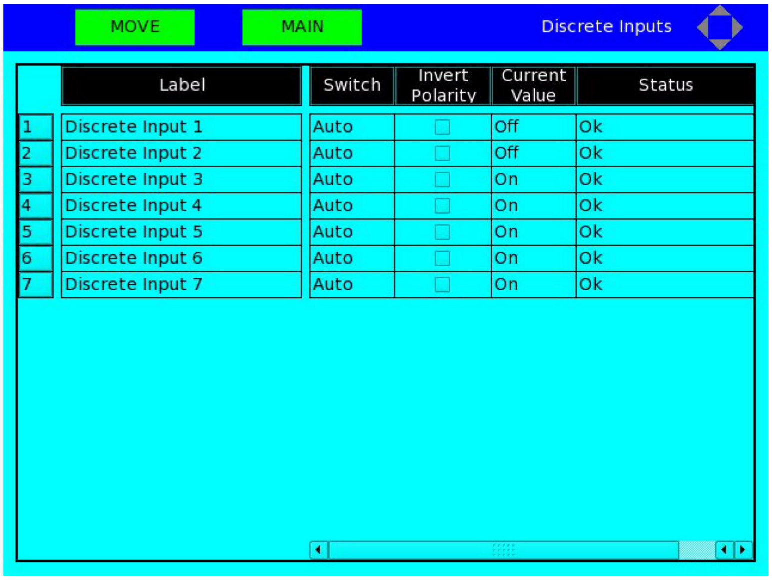


Figure A-39: Discrete Outputs screen

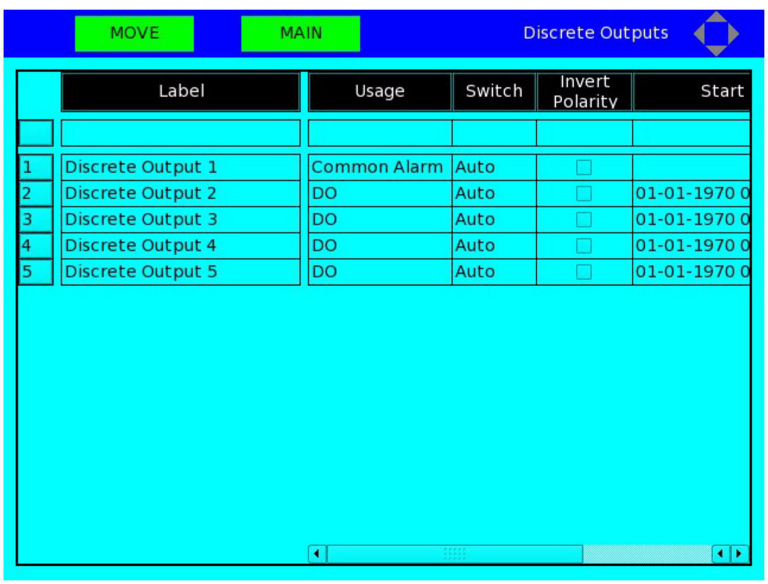


Figure A-40: Analog Inputs screen

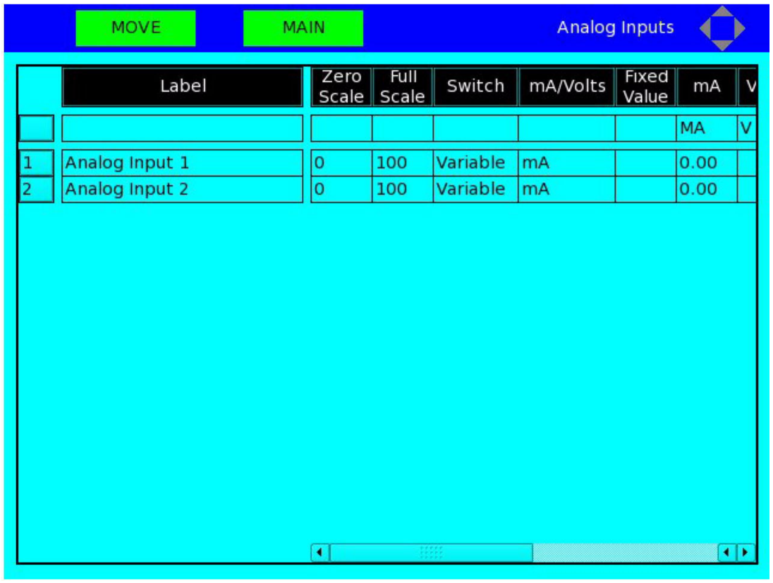


Figure A-41: Analog Outputs screen

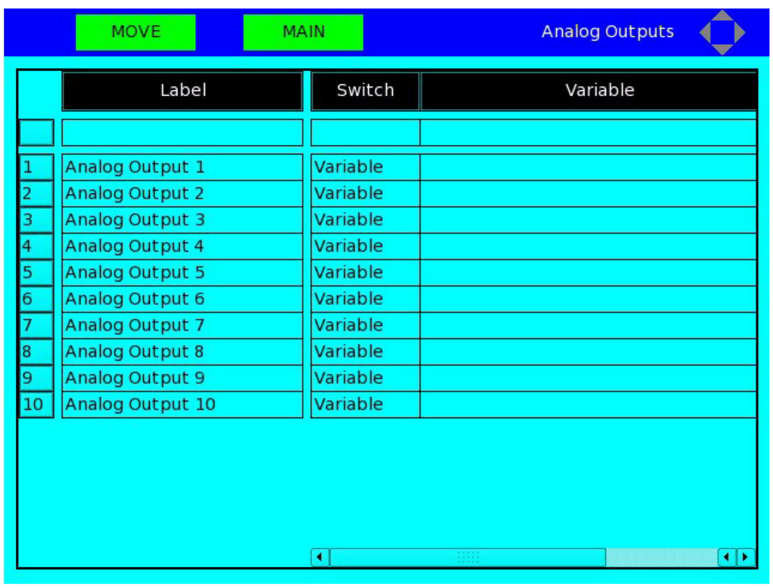
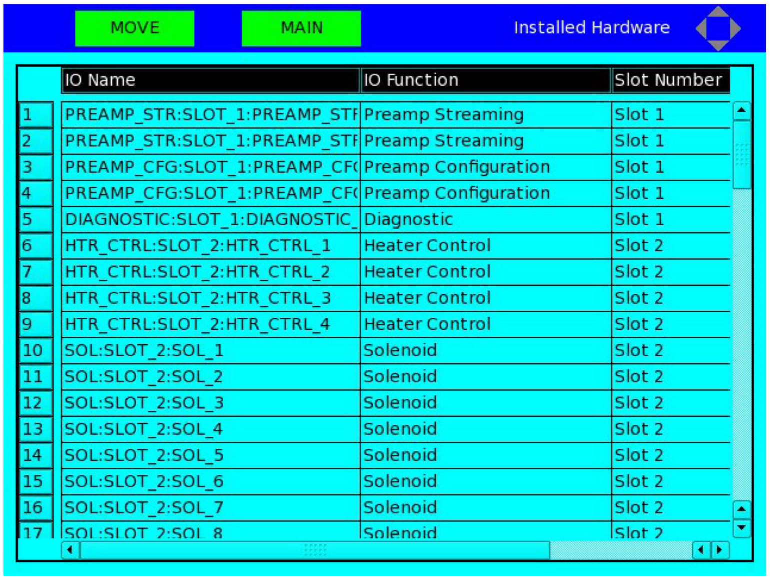


Figure A-42: Installed Hardware screen



A.4.3 Application menu

The ***Application*** menu allows you to view the ***Component Data***, ***Timed Events***, and ***Streams*** tables for the gas chromatograph (GC). The ***System***, ***Status***, and ***Ethernet Ports*** screens are also accessible from this menu.

Note

Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Figure A-43: Application menu

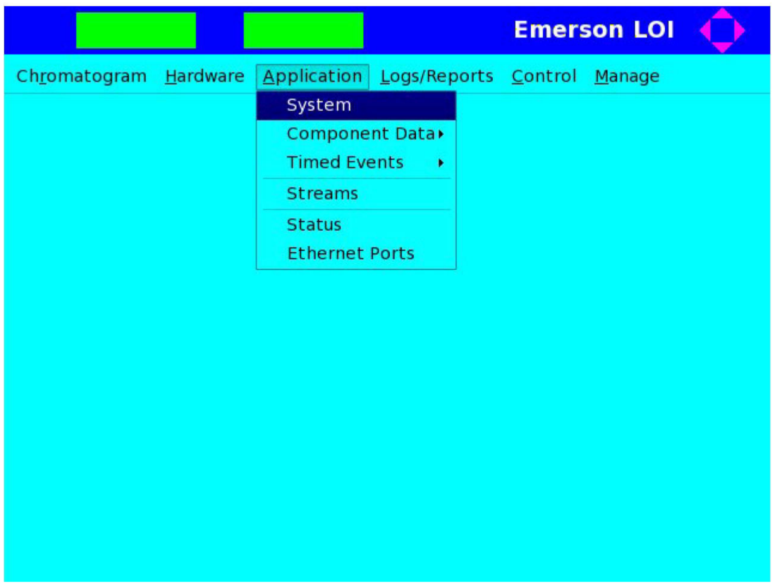


Figure A-44: System screen

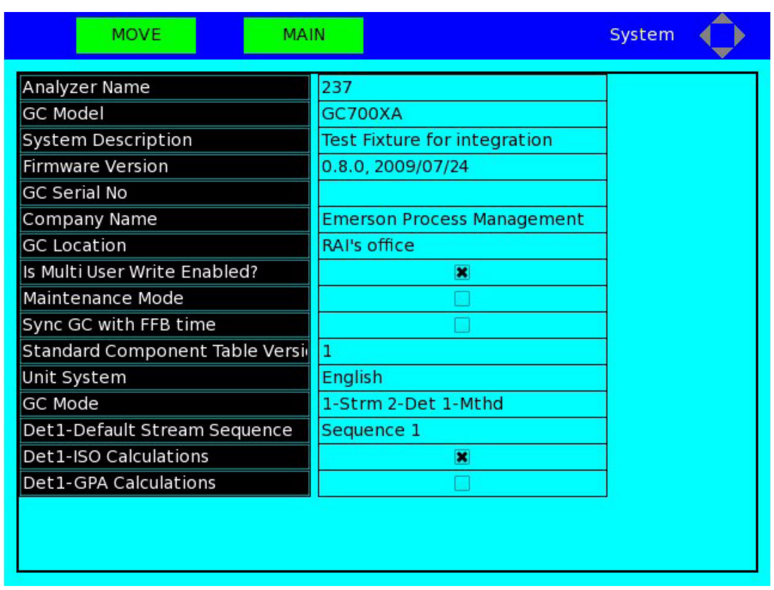
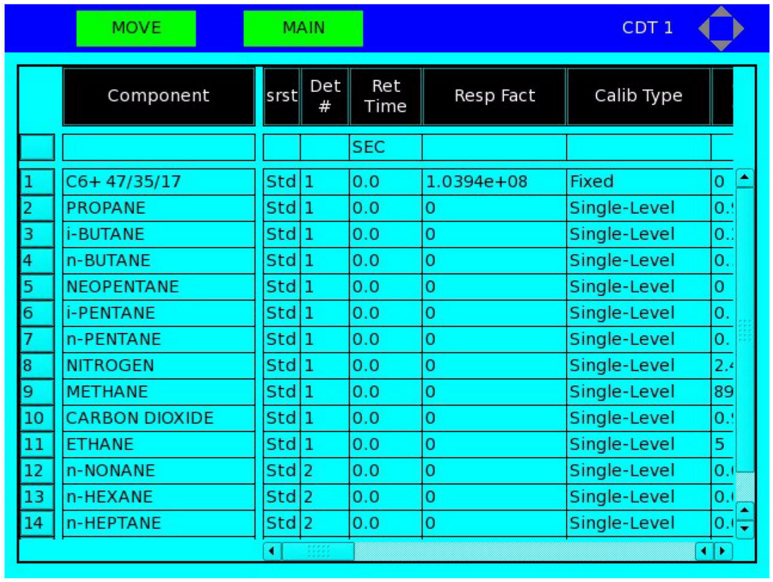
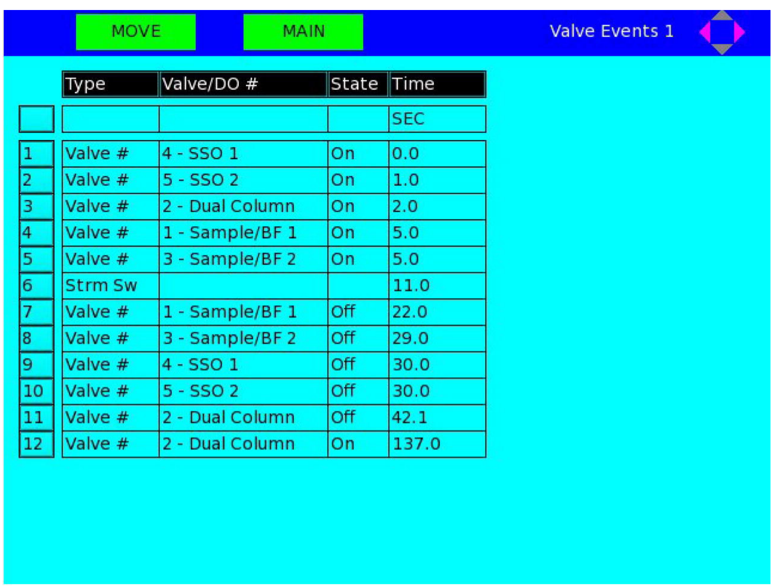


Figure A-45: Component Data Table (CDT) screen



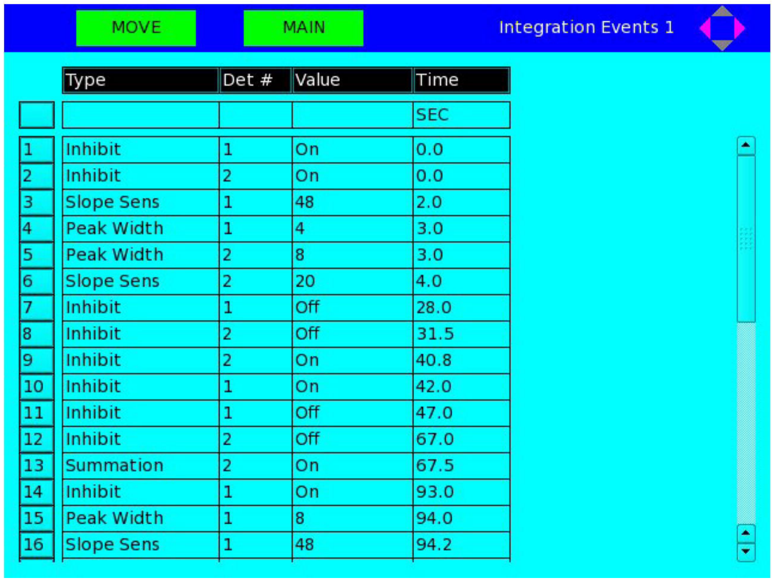
	Component	srst	Det #	Ret Time	Resp Fact	Calib Type	
				SEC			
1	C6+ 47/35/17	Std	1	0.0	1.0394e+08	Fixed	0
2	PROPANE	Std	1	0.0	0	Single-Level	0.
3	i-BUTANE	Std	1	0.0	0	Single-Level	0.
4	n-BUTANE	Std	1	0.0	0	Single-Level	0.
5	NEOPENTANE	Std	1	0.0	0	Single-Level	0
6	i-PENTANE	Std	1	0.0	0	Single-Level	0.
7	n-PENTANE	Std	1	0.0	0	Single-Level	0.
8	NITROGEN	Std	1	0.0	0	Single-Level	2.
9	METHANE	Std	1	0.0	0	Single-Level	89
10	CARBON DIOXIDE	Std	1	0.0	0	Single-Level	0.
11	ETHANE	Std	1	0.0	0	Single-Level	5
12	n-NONANE	Std	2	0.0	0	Single-Level	0.
13	n-HEXANE	Std	2	0.0	0	Single-Level	0.
14	n-HEPTANE	Std	2	0.0	0	Single-Level	0.

Figure A-46: Timed Events (TEV) - Valve Events screen



	Type	Valve/DO #	State	Time
				SEC
1	Valve #	4 - SSO 1	On	0.0
2	Valve #	5 - SSO 2	On	1.0
3	Valve #	2 - Dual Column	On	2.0
4	Valve #	1 - Sample/BF 1	On	5.0
5	Valve #	3 - Sample/BF 2	On	5.0
6	Strm Sw			11.0
7	Valve #	1 - Sample/BF 1	Off	22.0
8	Valve #	3 - Sample/BF 2	Off	29.0
9	Valve #	4 - SSO 1	Off	30.0
10	Valve #	5 - SSO 2	Off	30.0
11	Valve #	2 - Dual Column	Off	42.1
12	Valve #	2 - Dual Column	On	137.0

Figure A-47: TEV - Integration Events screen



	Type	Det #	Value	Time
				SEC
1	Inhibit	1	On	0.0
2	Inhibit	2	On	0.0
3	Slope Sens	1	48	2.0
4	Peak Width	1	4	3.0
5	Peak Width	2	8	3.0
6	Slope Sens	2	20	4.0
7	Inhibit	1	Off	28.0
8	Inhibit	2	Off	31.5
9	Inhibit	2	On	40.8
10	Inhibit	1	On	42.0
11	Inhibit	1	Off	47.0
12	Inhibit	2	Off	67.0
13	Summation	2	On	67.5
14	Inhibit	1	On	93.0
15	Peak Width	1	8	94.0
16	Slope Sens	1	48	94.2

Figure A-48: TEV - Spectrum Gain Events screen

	Det #	Gain	Time
			SEC
1	1	3	0.0
2	2	3	0.0

Figure A-49: TEV - Analysis Time screen

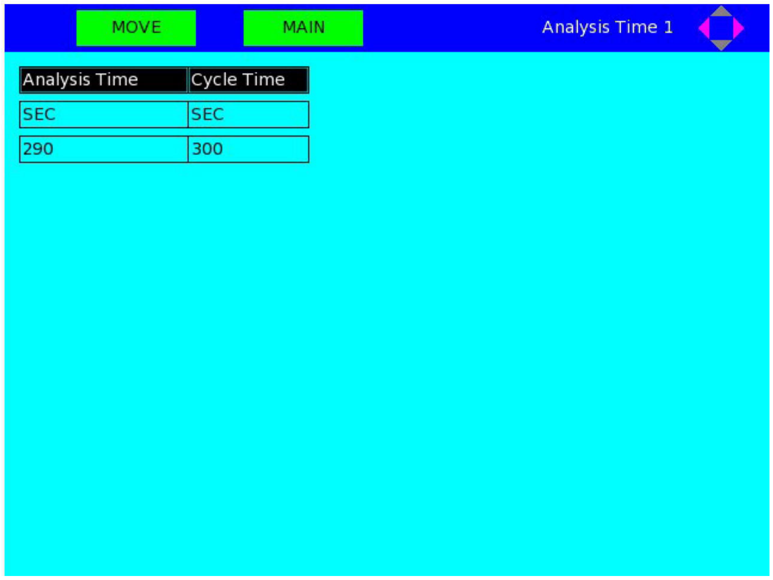
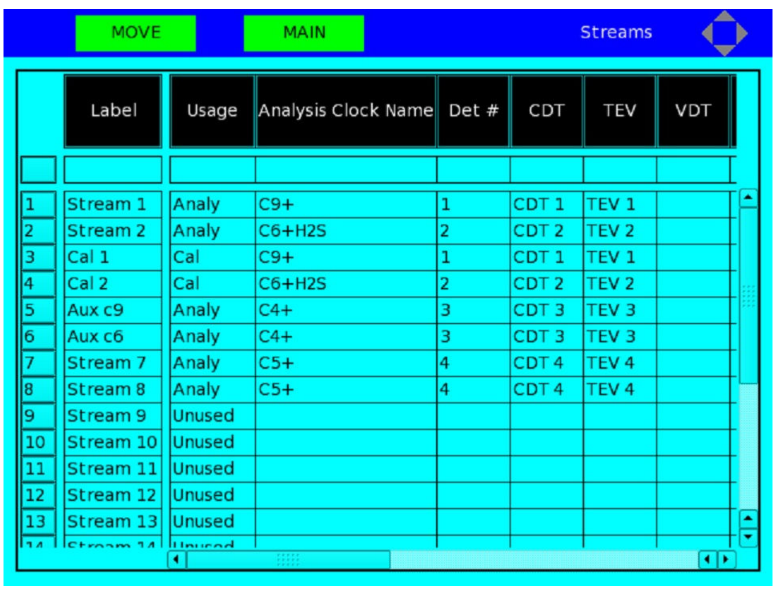
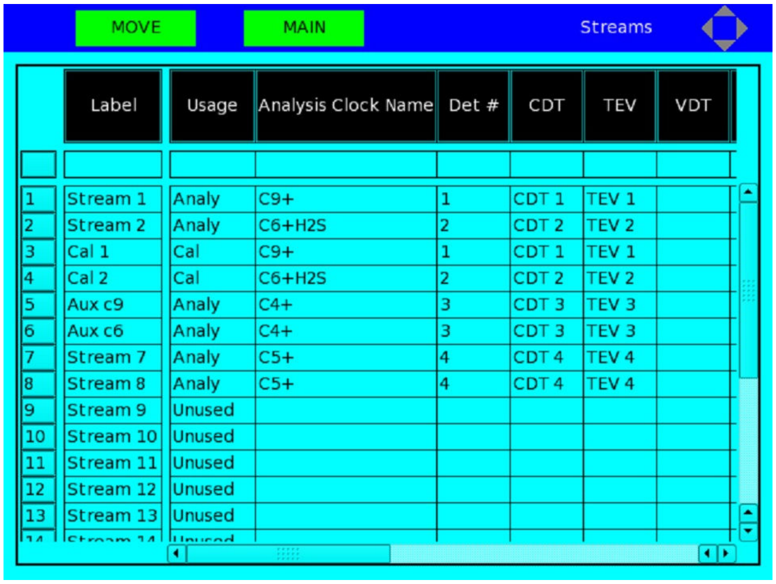


Figure A-50: Streams Screen



The ***Streams*** screen shows the different streams configured for the specific cycle clock.

Figure A-51: Single Stream Analysis screen



- All four Analyses are listed in this screen.
- For the selected Analysis, the streams are displayed.

Figure A-52: Single Stream Analysis (continued)

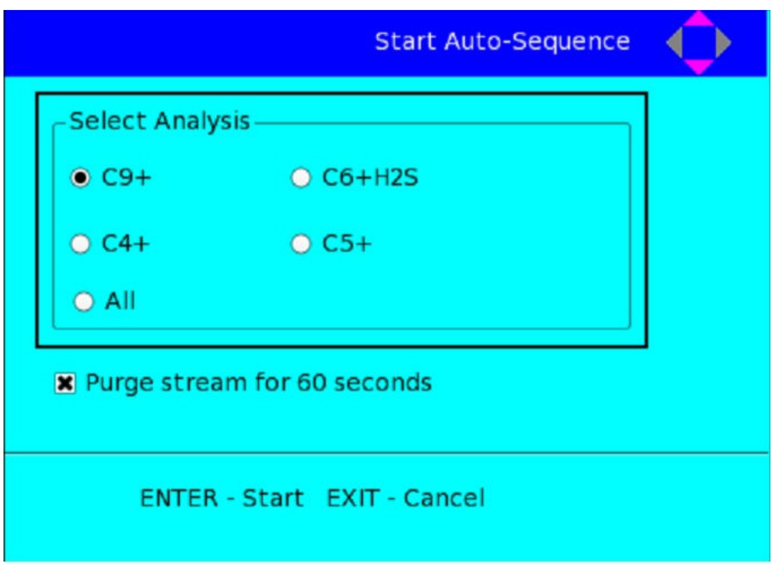


Figure A-53: Status screen

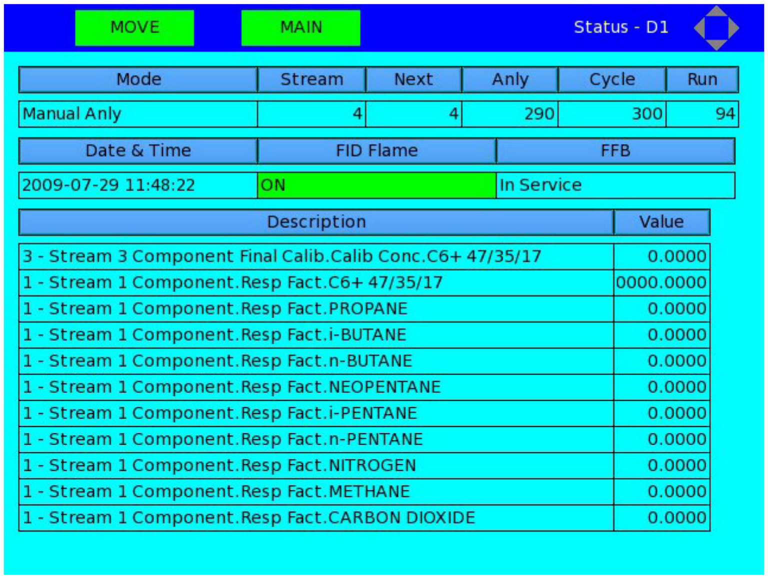
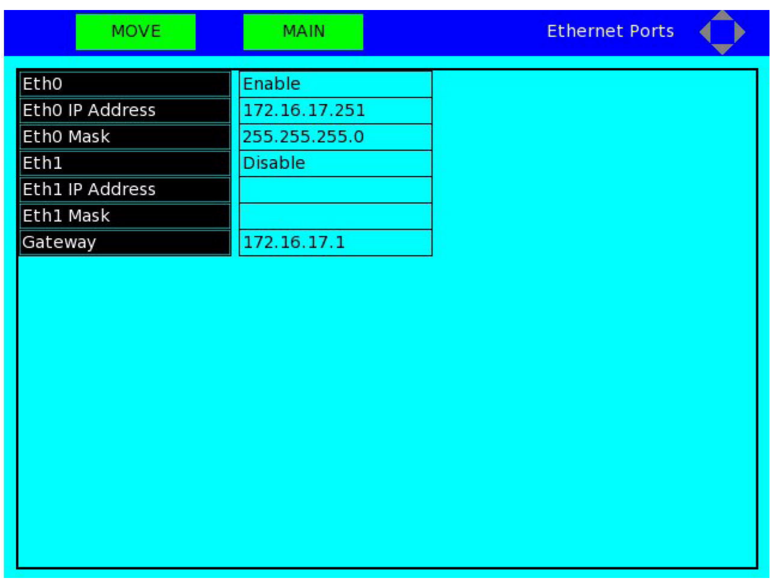


Figure A-54: Ethernet Ports screen



A.4.4 Logs/Reports menu

The ***Logs/Reports*** menu enables you to view the various reports that are available from the gas chromatograph (GC).

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Figure A-55: Logs/Reports menu

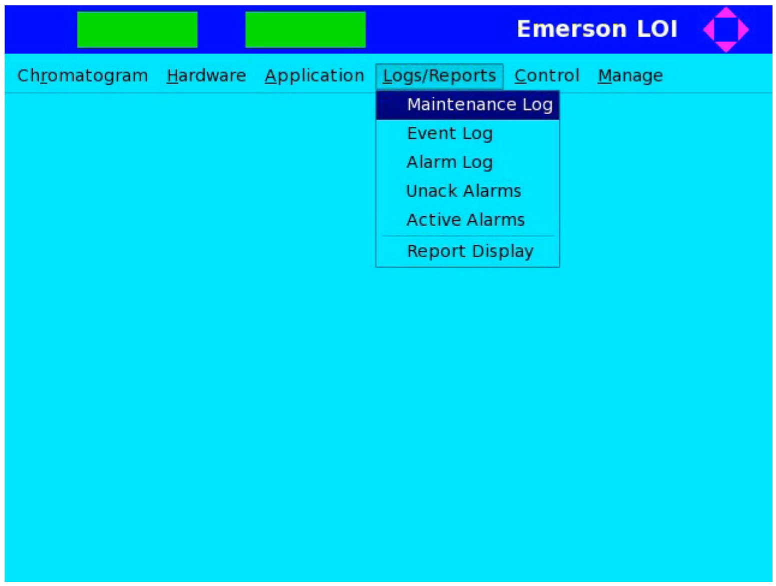
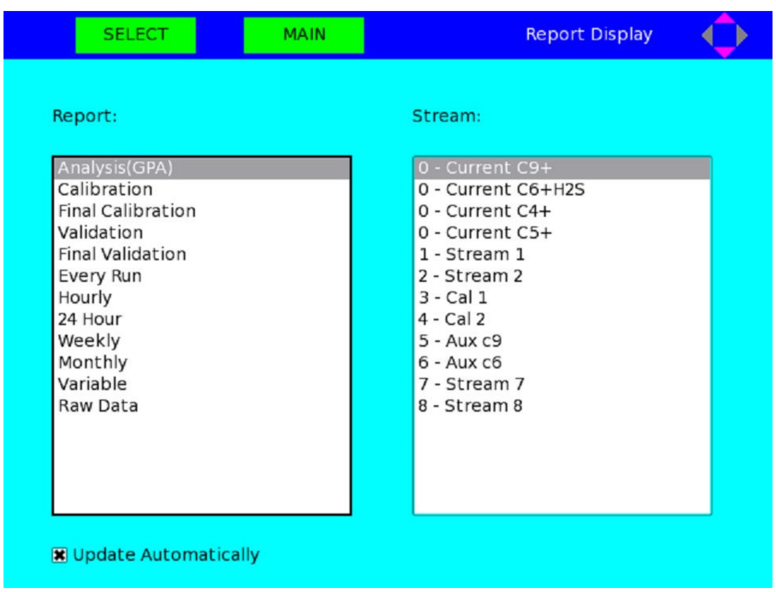


Figure A-56: Report Display screen



The ***Report Display*** screen shows the analysis names for Cycle Clock 3 and 4. It also shows all the streams associated with cycle clocks.

Figure A-57: Maintenance Log screen

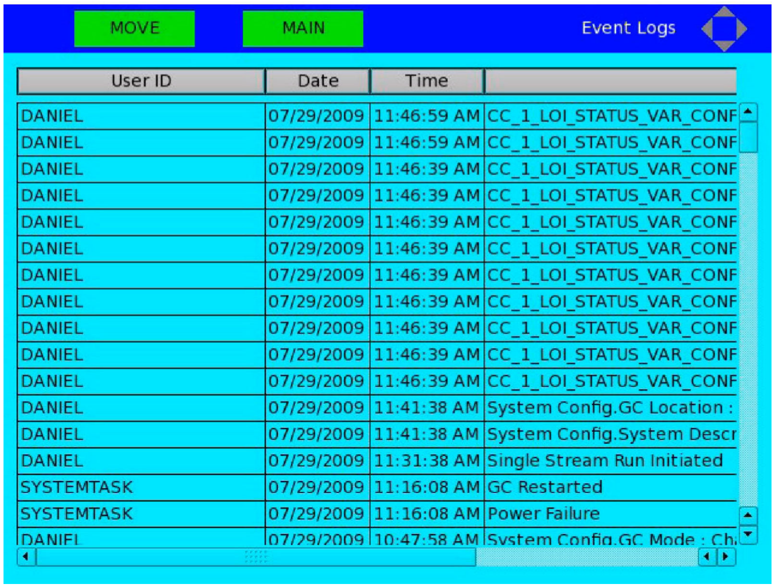


Figure A-58: Event Logs screen

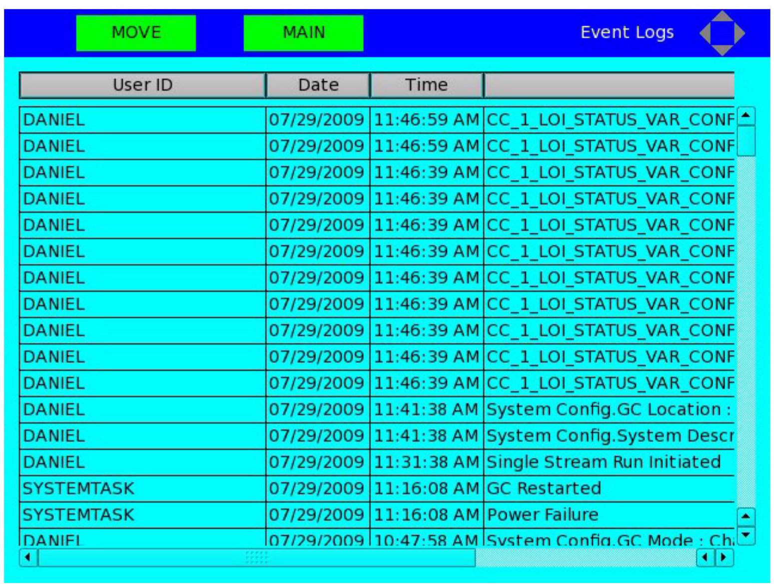


Figure A-59: Alarm Logs screen

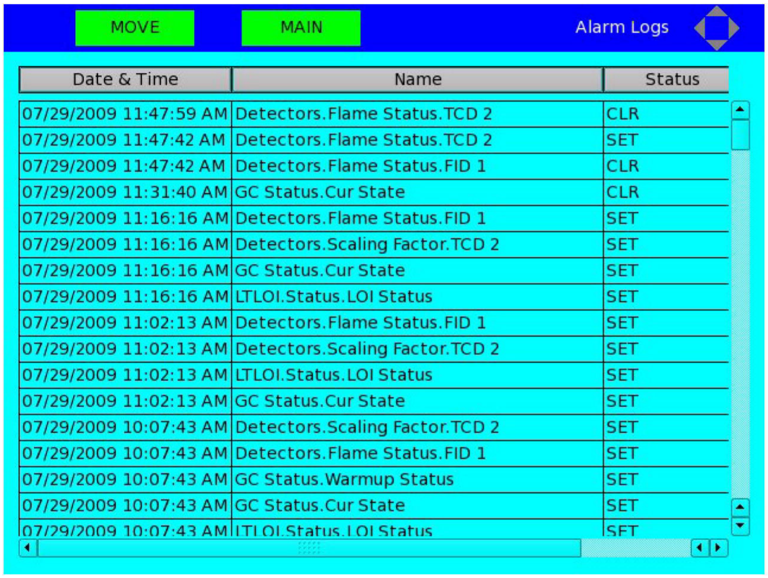
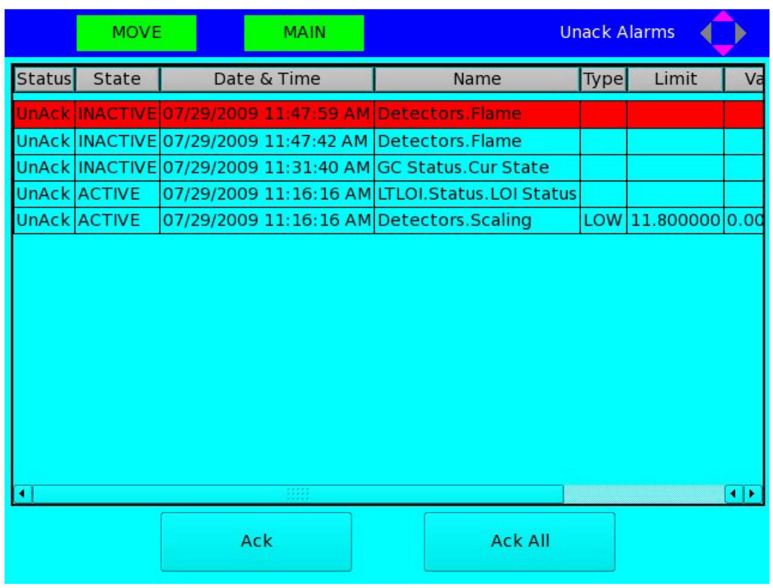


Figure A-60: Unack Alarms screen



Analysis Cycle Clocks 3 and 4 Unacked alarms when Idle.

Figure A-61: Active Alarms screen

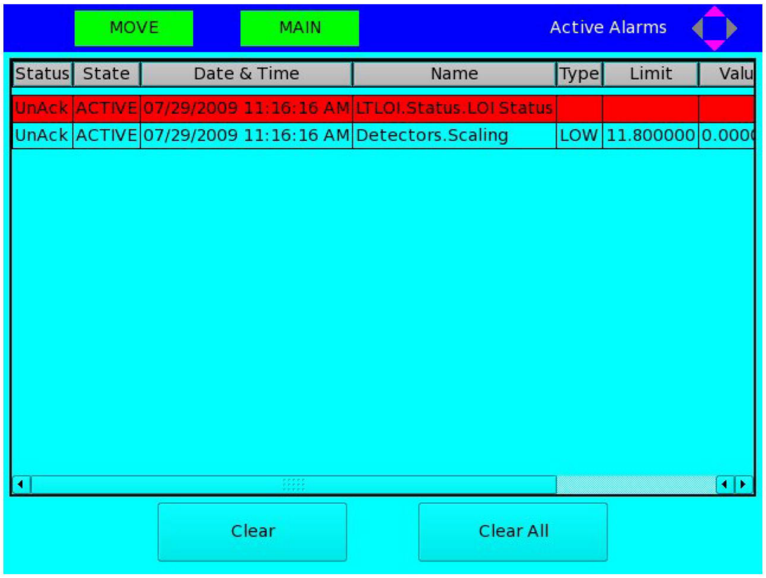
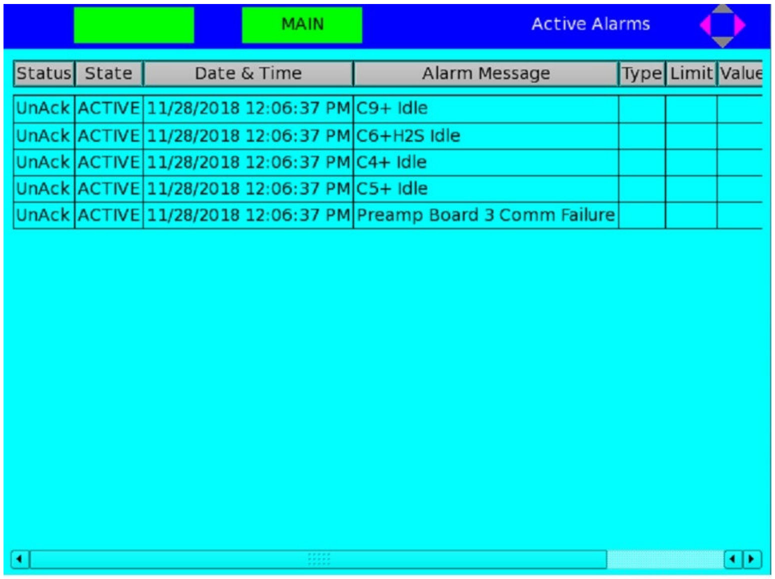


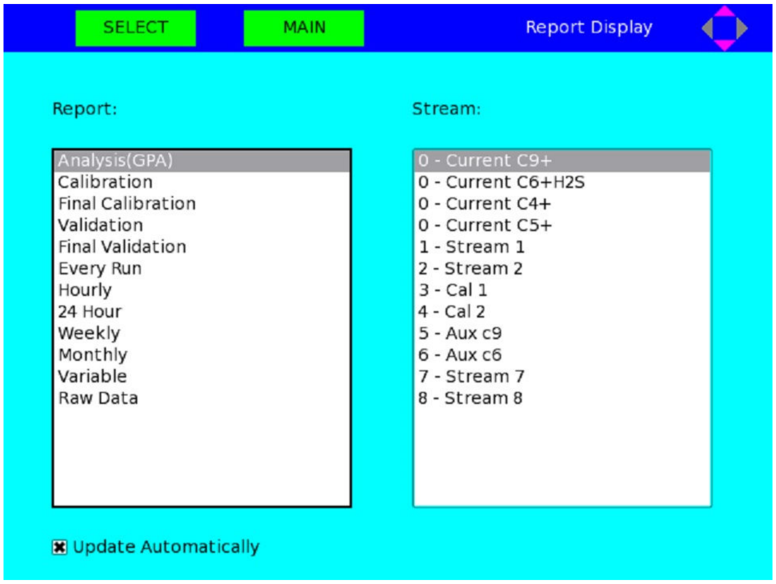
Figure A-62: Active Alarm screen with multiple analysis clocks



Note

Analysis Cycle Clocks 3 and 4 - alarms when Idle.

Figure A-63: Report Display screen



The right side of the ***Report Display*** screen shows the analysis names for the four analysis clocks and all the streams associated with cycle clocks

A.4.5 Control menu

The ***Control*** menu enables you to stop, calibrate, or place on automatic control a sample stream from the analyzer.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Figure A-64: Control Menu screen

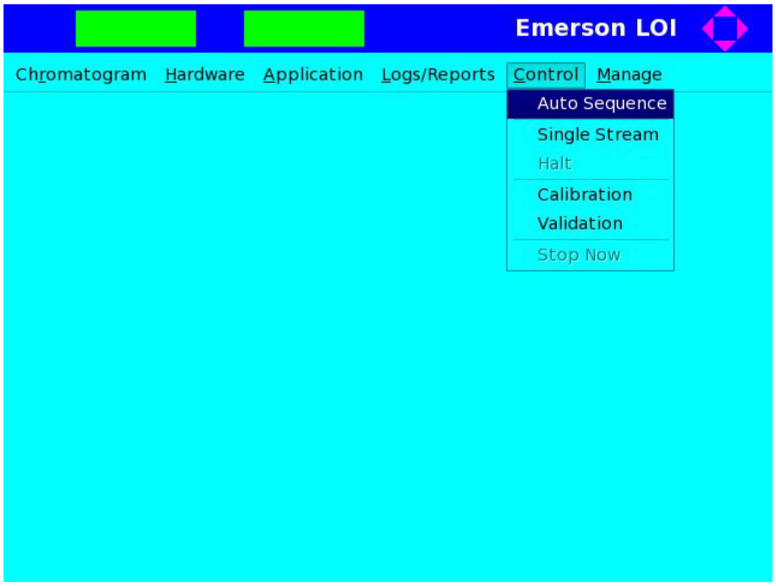
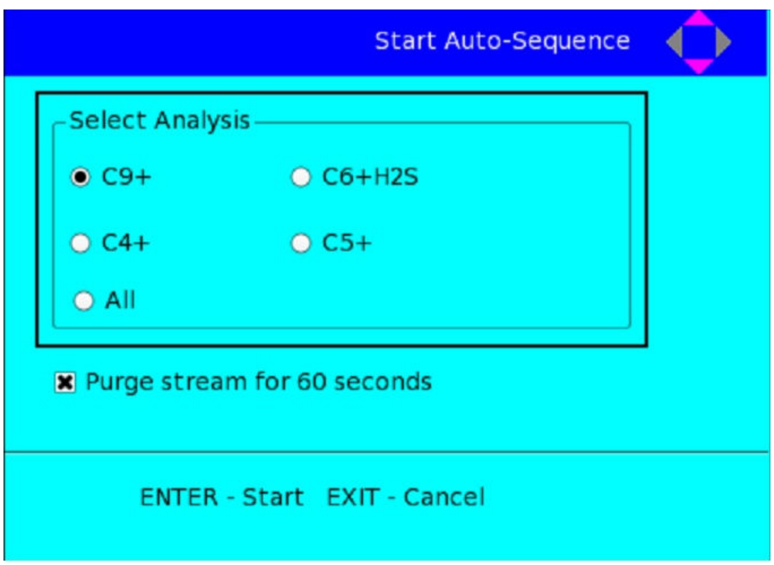
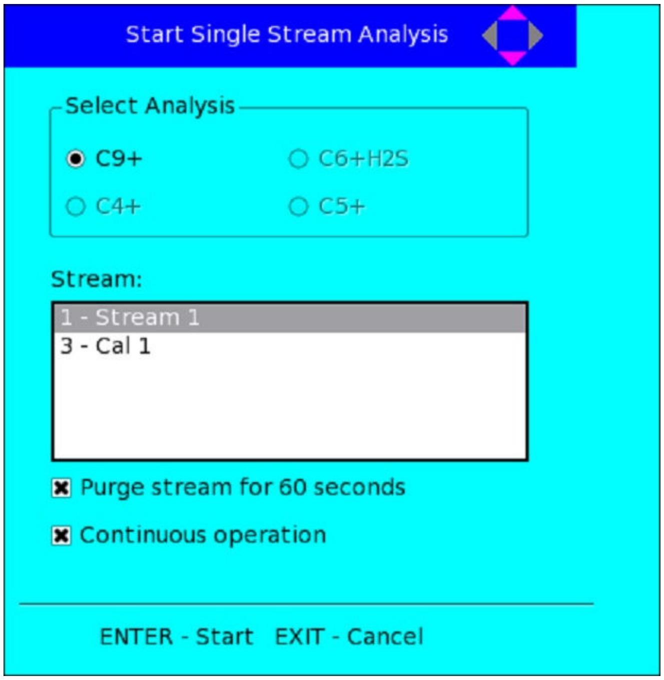


Figure A-65: Auto Sequence screen



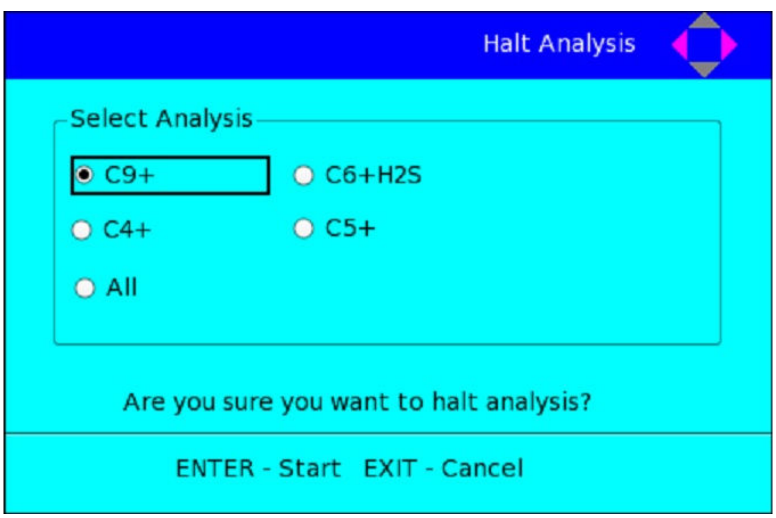
The ***Auto Sequence*** screen provides selections for the four Analysis options or ALL. Select the radio button and press **ENTER** to begin auto sequencing. Press **EXIT** to abort the process.

Figure A-66: Single Stream screen



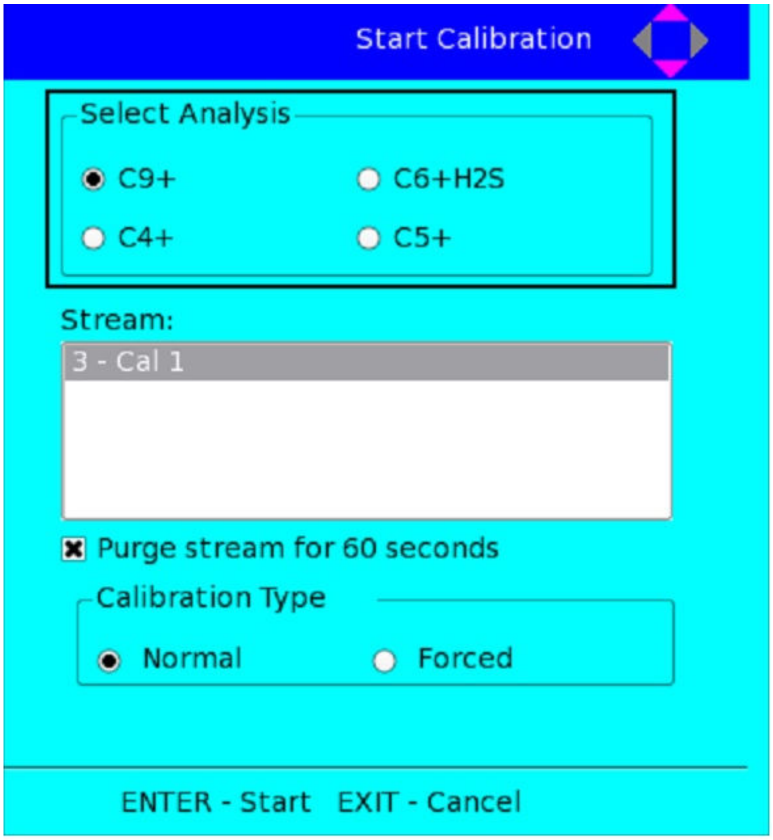
The ***Single Stream*** screen provides selections for the four Analysis options. Select the radio button and press **ENTER** to begin the analysis. Press **EXIT** to abort the process. The stream for the selected analysis is indicated in the field below the analysis.

Figure A-67: Halt screen



The ***Halt*** screen provides selections to halt the analysis for the four Analysis options or All. Select the radio button and press **ENTER** to halt the current analysis. Press **EXIT** to abort the process.

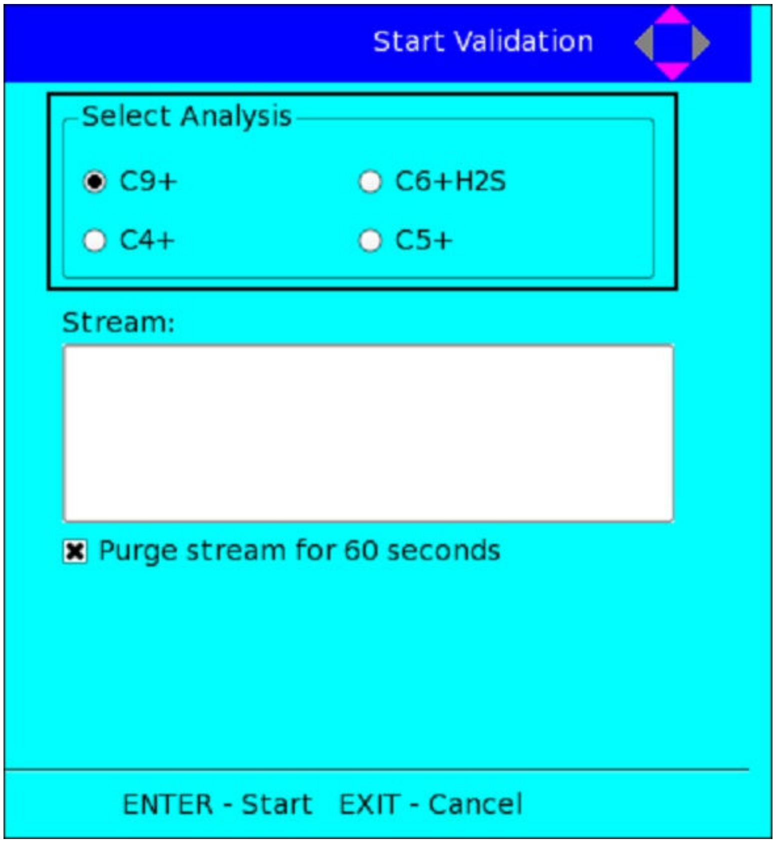
Figure A-68: Calibration screen



The ***Calibration*** screen provides selections for provides selections for the four Analysis options or ALL.

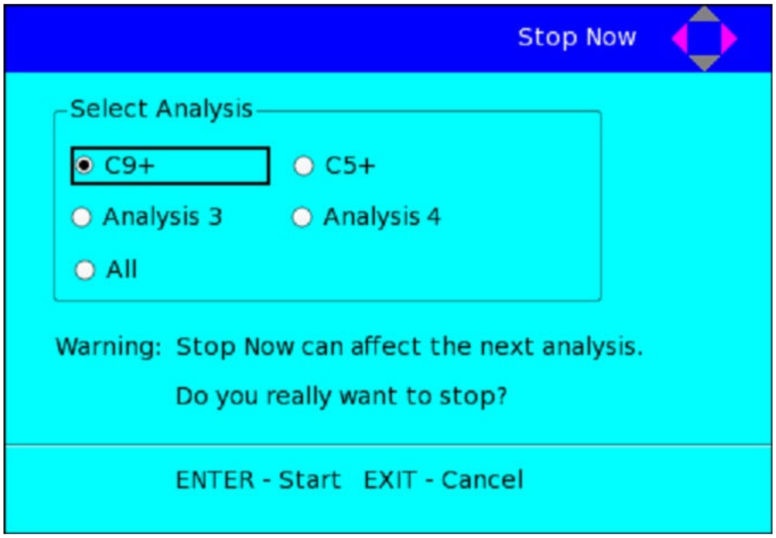
1. Select the radio button and press **ENTER**.
2. Select the Calibration Type, Normal or Forced.
3. Press **ENTER** to begin the calibration.
4. Press **EXIT** to abort the process.

Figure A-69: Validation screen



The ***Validation*** screen provides selections for the four Analysis options or All. Select the radio button and press **ENTER** to begin the validation. Press **EXIT** to abort the process.

Figure A-70: Stop Now screen



Important
Do not perform a **Stop Now** unless absolutely necessary. Whenever possible, use the **Halt** function.

This function forces the system into Idle mode. If **Stop Now** is performed while an analysis clock run is in progress, the components may continue to elute from the columns. No analysis data will be generated. To immediately stop an analysis run, do the following:

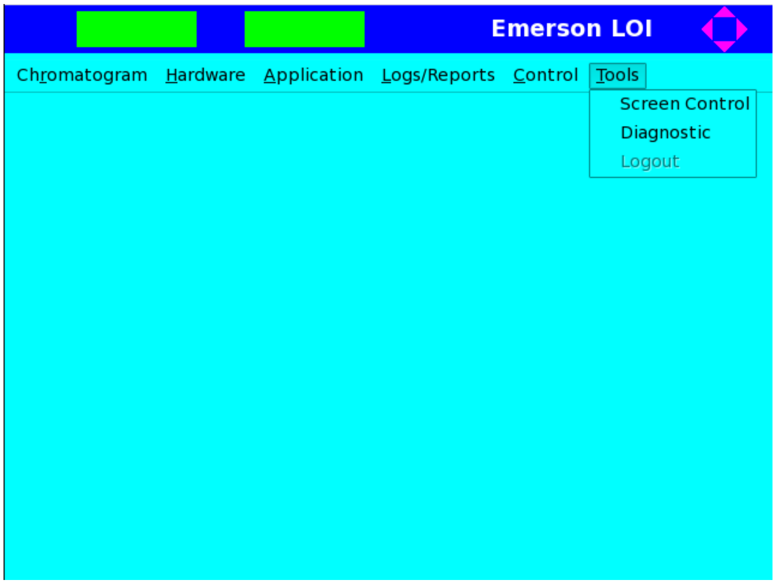
A. *Select **Control** → **Stop Now**. A confirmation message displays.*
B. *Select the **Analysis Clock** radio button and press **ENTER** to stop the analysis.*
C. *Click **Yes** and the current analysis clock run stops.*
D. *Press **EXIT** to abort the process to stop.*

A.4.6 Tools menu

The ***Tools*** menu enables you to change the screen control, change a user's password, and log off of the gas chromatograph (GC) to which you are connected.

Note
Consult the Rosemount MON2020 Software for Gas Chromatographs Manual for more information.

Figure A-71: Tools Menu screen



Use the **Tools** → **Screen Control** menu to adjust screen brightness **Up** or **Down.**

Use the **Boost Up** or **Down** command to increase or decrease the contrast intensity.

Figure A-72: Screen Control screen

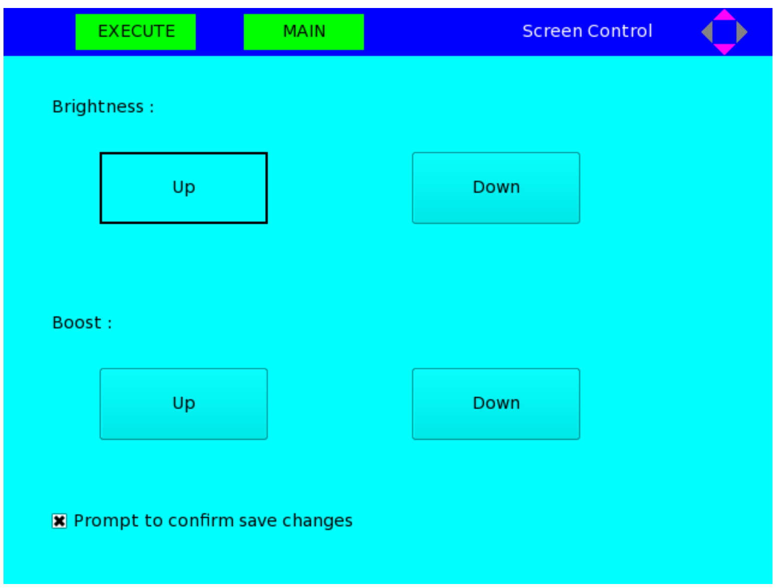


Figure A-73: Change PIN screen

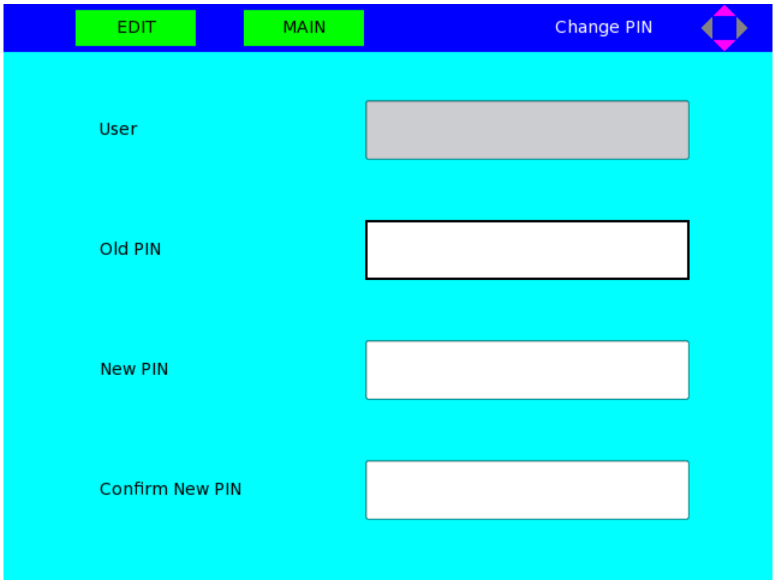


Figure A-74: Diagnostic screen

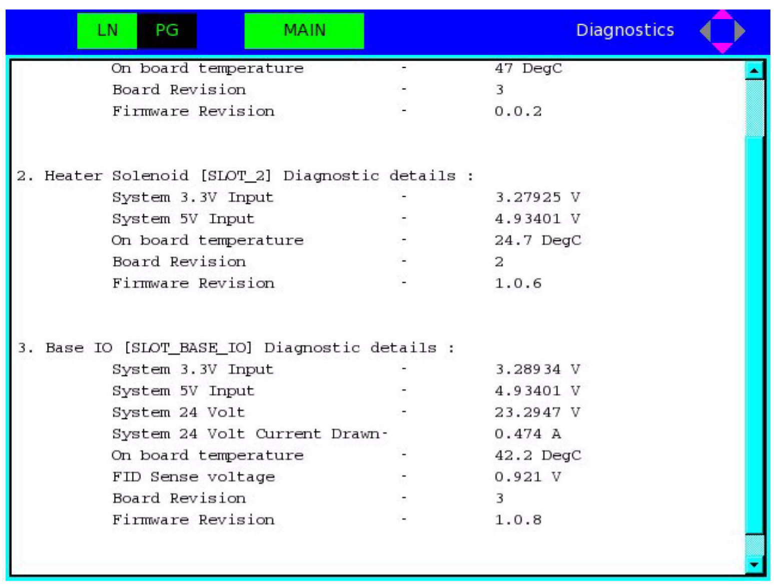
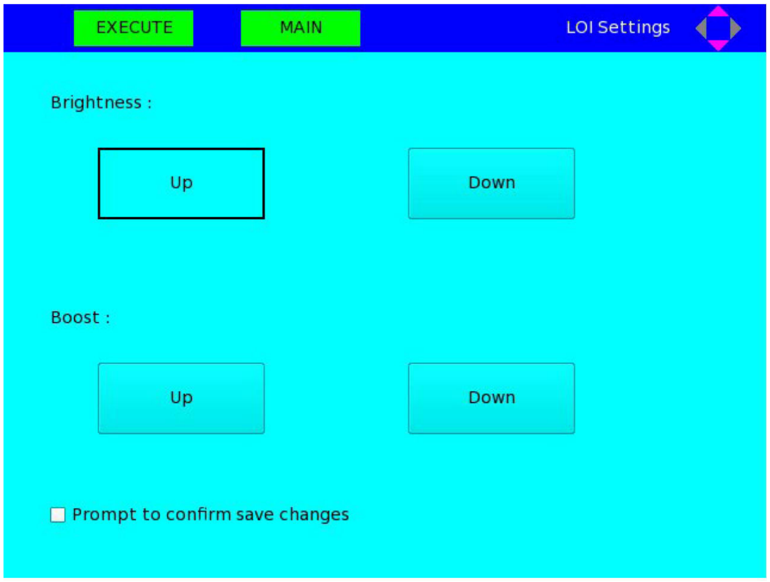


Figure A-75: LOI Settings screen



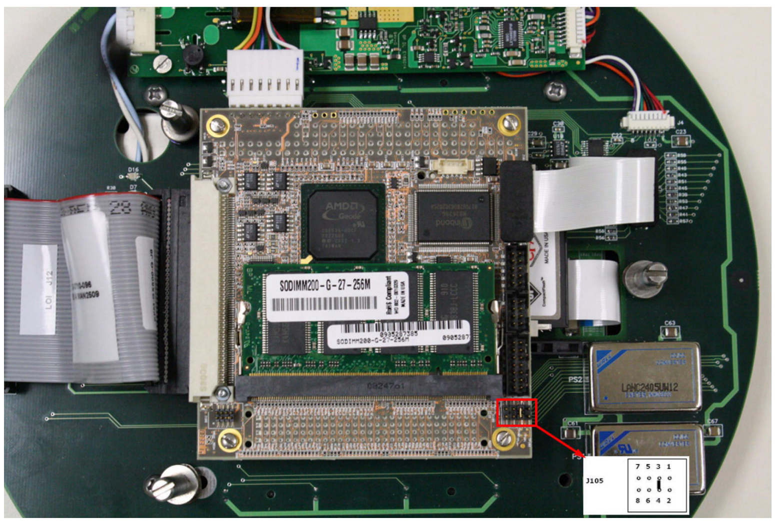
A.5 Troubleshoot a blank local operator interface (LOI) display screen

If the LOI is powered up but the LCD display screen is blank, do the following:

Procedure

1. Power down the gas chromatograph and allow to cool before opening the upper enclosure door.
2. Unscrew and remove the LOI board.
3. Flip the LOI over to expose its motherboard and associated electronics. Make sure the J12 connector is tightly connected to the motherboard via ribbon cable.

Figure A-76: Jumpers at J105 on LOI motherboard



4. Check the jumpers located at J105 on the motherboard. These jumpers control the screen's power. To function properly, jumper pins 3 and 4 must be set; if they are not, set them.

If the screen is still blank, replace the board.

B Carrier gas installation and maintenance

This appendix provides a description of the optional carrier manifold (P/N 2-3-5000-050) that permits the connection of two carrier gas bottles, or cylinders, to a gas chromatograph (GC) system.

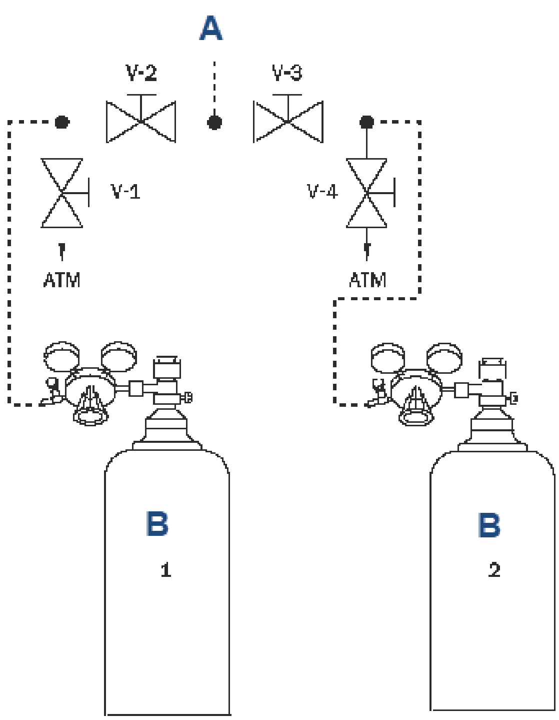
B.1 Carrier gas

The benefits of this manifold are as follows:

Note
The illustration and information in this appendix are adapted from drawing AE-10098.

- When one bottle is nearly empty (i.e., 110 psig [758.4 kPa] remaining), the other bottle becomes the primary supply.
- You can disconnect each bottle for refilling without interrupting gas chromatograph (GC) operation.

Figure B-1: Manifold for two carrier gas bottles to GC system



A. Analyzer
B. Carrier cylinder

Valve	Carrier gas cylinder	Valve description
V-1	Carrier Cylinder 1	Bleed valve
V-2	Carrier Cylinder 1	Block valve
V-3	Carrier Cylinder 2	Block valve
V-4	Carrier Cylinder 2	Bleed valve

B.2 Install manifold and purge line

To install and purge the dual-bottle carrier gas manifold, proceed as follows:

Procedure

1. Install manifold as shown in Figure B-1. Close all valves and tighten all fittings. Run tubing to the gas chromatograph (GC), but do not connect.
2. Back off pressure regulator (counter clockwise) fully.
3. Open cylinder valve for Carrier Cylinder 1.
   The pressure indicator will read the cylinder pressure.
4. Open the shut-off valve attached to the carrier regulator.
5. Regulate pressure out of the cylinder to 20 psig (137.9 kPa); then close the cylinder valve.
6. Open V-1 (bleed valve) and let the carrier gas bleed to atmosphere until both gauges read 0 psig; then close V-1.
7. Repeat Step 4 and Step 5 twice to purge the line to V-2.
8. Purge the line to V-3 by repeating Step 2 through Step 6; but this time, use bleed valve V-4 and Carrier Cylinder 2.
9. With valves 1-4 closed, open both cylinder valves and regulate both carriers to approximately 10 psig (68.9 kPa).
10. Open V-2 and V-3 simultaneously; then turn both cylinder valves off and let the carrier gasses bleed through the line to the GC until all gauges read 0 psig.
11. Repeat Step 8 and Step 9 twice to purge the line to the GC.
12. Close V-3; leave V-2 open.
13. Open the cylinder valve of Carrier Cylinder 1 and, with carrier gas flowing at 10 psig (68.9 kPa) or below, connect the carrier line to the GC.
14. Slowly regulate Carrier Cylinder 1 to 110 psig (6.9 to 758.4 kPa).
15. Open V-3 and slowly regulate Carrier Cylinder 2 to 100 psig (689.4 kPa).
    By doing this, all but 100 pounds of Carrier Cylinder 1 will be used before any of Carrier Cylinder 2 is used. When Carrier Cylinder 1 gets to 100 pounds, replace the cylinder.
16. Leak-check all of the fittings carefully.
17. Let the GC run overnight before calibrating.

B.3 Replace carrier cylinder

To replace one carrier cylinder without interrupting gas chromatograph (GC) operation:

Procedure

1. Turn cylinder valve off.
2. Back off on cylinder pressure regulator until handle turns freely.
3. Remove cylinder.
4. Attach new cylinder to regulator.
5. Open cylinder valve for Carrier Cylinder 1.

   The pressure indicator will read the cylinder pressure.
6. Open the shut-off valve attached to the carrier regulator.
7. Regulate pressure out of the cylinder to 20 psig (1.4 BarG); then close the cylinder valve.
8. Repeat Step 6 and Step 7 twice to purge the line to **V-2**.
9. Open **V-1** (bleed valve) and let the carrier gas bleed to atmosphere until both gauges read 0 psig (0 BarG); then close **V-1**.
10. Repeat
11. Leak-check the fitting.
12. Open the appropriate block valve to the analyzer (V-2 or V-3) and regulate outlet pressure to appropriate level.

    See Step 14 and Step 15 of Install manifold and purge line.

B.4 Calibration gas for BTU analysis

The calibration gas used for BTU analysis should be blended of gases specified as primary standards. Primary standard gases are blended using weights that are traceable to the National Institute of Standards and Technology (NIST). For other applications, blend the calibration gas to the specifications detailed in the analyzer's Application Data Sheets.

The calibration gas should not have any component that could drop out at the coldest temperature to which the gas will be subjected. A typical blend for a temperature of 0 °F (-17.7 °C) is listed in the following table. No dropout will occur in this calibration gas if it is blended at a pressure below 250 psig (1723.7 kPa).

Gas	Mole Percent
Nitrogen	2.5
Carbon Dioxide	0.5
Methane	Balance
Propane	1.0
Isobutane	0.3
N-butane	0.3
Neopentane	0.1
Isopentane	0.1
N-pentane	0.1
N-hexane	0.03

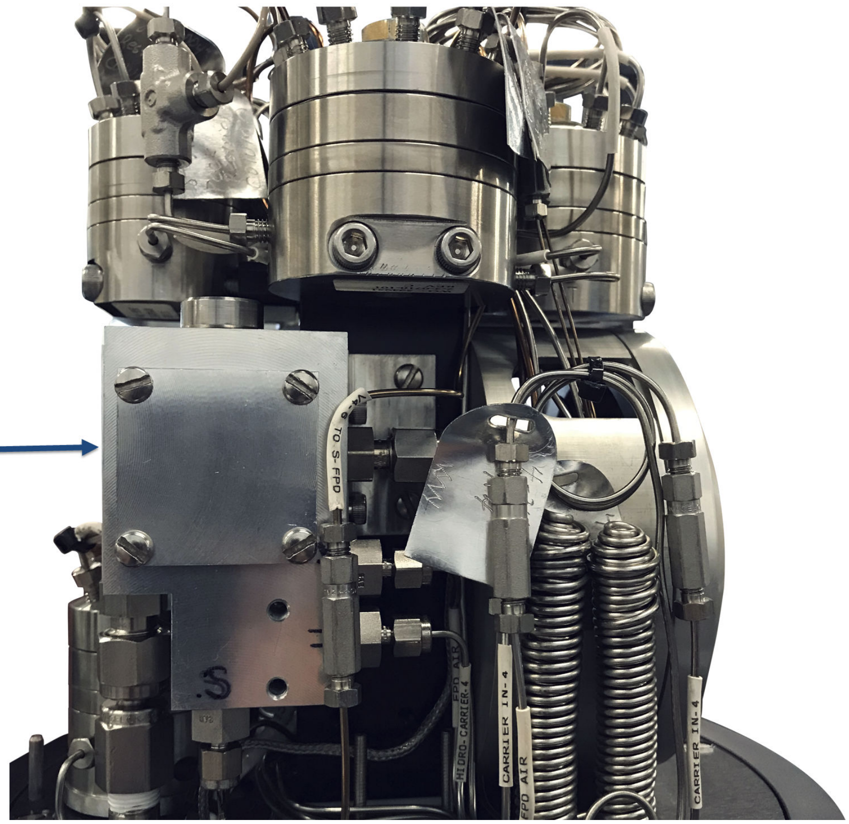
Carefully plan the sampling system for the best chromatographic analyses.

C Micro flame photometric detector (µFPD)

The latest version of the Rosemount 700XA is now designed with an integral µFPD. In previous versions of the gas chromatograph (GC), side-car design was the only option for the FPD. The new design reduces the gas chromatograph's footprint and eliminates the side-car.

Figure C-1: Rosemount 700XA µFPD

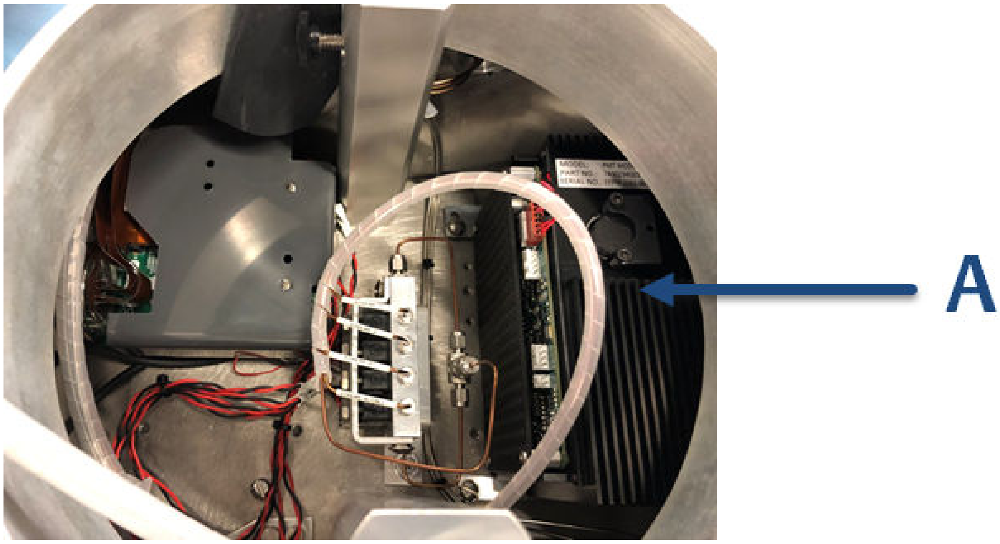
A



A. µFPD burner assembly

The µFPD photo multiplier tube (PMT) is located in the upper enclosure beneath the oven assembly ULTEM base plate.

Figure C-2: μFPD PMT



C.1 Configure the micro flame photometric detector (μFPD)

Procedure

1. Open MON2020 and select **Hardware** → **Detectors**.
   If your gas chromatograph (GC) has an integral FPD, **FPD G2** displays in Slot 1 or Slot 2.

   Note
   Before making any modifications to this window, halt the analysis.

2. Select **Hardware** → **Detectors**.

3. Select **Manual** if you want to control the burner ignition; select **Auto** if you want the GC to control the burner ignition.

   The following data displays for each detector:

Name	Description
Det #	Numerical identifier for the detector to which the following data applies.
Detector	Options, which depend on your GC's configuration, are: • TCD (thermal conductivity detector) • FPD G2 (μFPD) • FID (flame ionization detector) • FID G2
H2 Valve	Optional hydrogen carrier shut-off valve
Flame Temp RTD	Select the appropriate resistance temperature device (RTD) from the drop-down list. The RTD measures the temperature of the flame.
Flame Ignition	Select **Manual** if you want to control the burner ignition; select **Auto** if you want the GC to control the burner ignition.
Ignition Attempts	Indicates the number of times the GC will try to light the flame. If an **Auto** ignition sequence fails to light the flame after the specified number of attempts, the GC will close the hydrogen valve, switch the ignition parameter to **Manual**, and set an active alarm.
Wait Time Bet Tries	Indicates the amount of time, in seconds, the GC will wait between ignition attempts.
Igniter On Duration	Indicates the length of time that the igniter will remain on.
Flame On Sense Temp	The flame ignites when the internal temperature exceeds the value set in this field.
Flame Out Sense Temp	The flame is extinguished when the internal burner temperature falls below the value set below the **Flame On Sense Temp**.
FPD Flame Status DI	Applies to FPDs only. Allows you to select from a list of available digital inputs (DIs). The DI that is selected will receive the FPD's flame status value.
Preamp Val	Detector count. Read-only.
Flame Temperature	Temperature of the flame as read by the RTD. Read-only.
Flame Status	Options are: **Off**, **On**, and **Over Temperature**. Read-only.
H2 Valve Cur State	Options are: **Open** and **Closed**. Read-only.
Scaling Factor	Preamp calibration factor.
Igniter Status	Options are: **Off** and **On**. Read-only.
Electrometer Voltage(1)	Output at first stage of FID preamp. Read-only.
Pre Amplifier Voltage(1)	Output at second stage of FID preamp. Read-only.
Polarizing Voltage(1)	Igniter voltage. Read-only.
Gain Status	Options are: **Low** and **High**.
Status	Options are: **Ok**, **Not Installed**, and **Internal Error**. Read-only.

(1) *Not used with μFPD.*

4. If the **Flame Ignition** field is set to **Manual**, and if the **Flame Status** field is set to **Off**, do the following to restart the flame:
   a) Click **Ignite**.

The **Flame Status** field changes to **On** when the internal temperature exceeds the value set in the **Flame On Sense Temp** field.

D Recommended spare parts

D.1 Recommended spare parts for Rosemount 700XA thermal conductivity detector (TCD) analyzers

Quantity		Description	Part number
1-5 gas chromatographs (GCs)	6 or more GCs or critical installations		
1	1	Kit, fuse, XA	2-3-0710-074
1	2	Solenoid, 4-way, MAC, 24 Vdc	2-4-0710-224
1	1	Thermistor seals, package of 10	2-3-0500-391
1 per valve	1 per valve	Kit diaphragm, 10-port XA	2-4-0710-171
1 per valve	1 per valve	Kit, diaphragm, 6-port XA	2-4-0710-248
1	1	Column set	Note 2
1 per stream	1 per stream	Filter element 2 micron	2-4-5000-113
1 per stream	1 per stream	Membrane kit, 120 filter	2-4-5000-938
0	1	PCA detector preamp	2-3-0710-001 7A00401G01
0	1	PCA solenoid/heater driver	2-3-0710-002 9A00402G01
0	1	PCA base in/out (I/O)	2-3-0710-003 7A00403G01
0	1	PCA backplane	2-3-0710-005 7A00420G01
0	1	PCA main central processing unit (CPU)	2-3-0710-0077A00555G01
0	(1)	Assembly, power supply (AC)	7A00077G01
0	(2)	Pressure switch carrier	2-4-0710-266
0	1 per detector	Kit, thermistors, thermal conductivity detector (TCD)	(2)
0	1 per carrier	Carrier dryer assembly	2-3-0500-180

(1) *If the GCs are powered with an AC line in, we recommend one spare.*
(2) *If the GCs have a pressure switch installed, we recommend one spare.*

D.2 Recommended spare parts for Rosemount 700XA flame ionization detector (FID)/thermal conductivity detector (TCD) analyzers

Quantity		Description	Part number
1-5 gas chromatographs (GCs)	**6 or more GCs or critical installations**		
1	1	Kit, fuse, XA	2-3-0710-074
1	2	Solenoid, 4-way, MAC, 24 Vdc	2-4-0710-224
1	1	Thermistor seals, package of 10	2-3-0500-391
1 per valve	1 per valve	Kit diaphragm, 10-port XA	2-4-0710-171
1 per valve	1 per valve	Kit diaphragm, 6-port XA	2-4-0710-248
1	1	Column set	(1)
1 per stream	1 per stream	Filter element, 2 micron	2-4-5000-113
1 per stream	1 per stream	Membrane kit, 120 filter	2-4-5000-938
0	1	PCA detector preamp	7A00401G01
0	1	PCA solenoid/heater driver	9A00402G01
0	1	PCA base in/out (I/O)	7A00403G01
0	1	PCA backplane	7A00420G01
0	1	PCA main central processing unit (CPU)	7A00555G01
0	1	PCA flame ionization detector (FID) electrometer	2-3-0710-014
0	(2)	Assembly, power supply (AC)	7A00077G01
0	1	Assembly, micro FID, XA	2-3-0710-077
0	(3)	Kit, field methanator replacement	2-3-0710-700
0	(3)	Pressure switch, carrier	2-4-0710-266
0	1 per detector	Kit, thermistors, thermal conductivity detector (TCD)	N(1)
0	1 per carrier	Carrier dryer assembly	2-3-0500-180

(1) Application dependent. Please contact your Emerson Customer Care representative and provide the GC's sales order number for the recommended part number and description.
(2) If the GCs are powered with an AC line, we recommend one spare.
(3) If the GCs have this option installed, we recommend one spare.

D.3 Recommended spare parts for Rosemount 700XA flame ionization detector (FID) analyzers

Quantity		Description	Part number
1-5 gas chromato-graphs (GCs)	6 or more GCs or critical installations		
1	1	Kit, fuse, XA	2-3-0710-074
1	2	Solenoid, 4-way, MAC, 24 Vdc	2-4-0710-224
1 per valve	1 per valve	Kit, diaphragm, 10-port XZ	2-4-0710-171
1 per valve	1 per valve	Kit, diaphragm, 6-port XA	2-4-0710-248
1	1	Column set	(1)
1 per stream	1 per stream	Filter element, 2 micron	2-4-5000-113
1 per stream	1 per stream	Membrane kit, 120 filter	2-4-5000-938
0	1	PCA detector preamp	7A00401G01
0	1	PCA solenoid/heater driver	9A00402G01
0	1	PCA base in/out (I/O)	7A00403G01
0	1	PCA backplane	
0	1	PCA main central processing unit (CPU)	7A00555G01
0	1	PCA flame ionization detector (FID) electrometer	2-3-0710-014
0	(2)	Assembly, power supply (AC)	7A00077G01
0	1	Assembly, micro FID, XA	2-3-0710-077
0	(3)	Kit, field, methanator replacement	2-3-0710-700
0	(3)	Pressure switch, carrier	2-4-0710-266
0	1 per carrier	Carrier dryer assembly	2-3-0500-180

(1) *Application dependent. Please contact your Emerson Customer Care representative and provide the GC's sales order number for recommended part number and description.*
(2) *If the GCs are powered with an AC line, we recommend one spare.*
(3) *If the GCs have this option installed, we recommend one spare.*

D.4 Recommended spare parts for Rosemount 700XA micro flame photometric detector (μFPD) analyzers

Description	Part number	Quantity
μFPD burner	7A00233G01	0 (as needed)
μFPD fiber cable	7P00444H01	0 (as needed)
μFPD assembly, igniter, and thermocouple	7A00232G01	1
μFPD Edmond optics lens, 25 mm outer diameter (OD)	7C00319-001	2
μFPD flame chamber	7P00435H01	0 (as needed)
μFPD gas mixer	7P00437H01	0 (as needed)
μFPD side entry photomultiplier tube (PMT) module	7A00234G01	0 (as needed)
μFPD O-ring kit	7A00243G01	1
μFPD screws, connectors, and washers kit	7A00244G01	1

E Shipping and long-term storage recommendations

For applications equipped with special columns, such as mole sieve, read and follow the additional instructions shipped with the analyzer and/or column set first. If you need another copy, please contact customer service.

The following recommendations should be followed:

- For shipping purposes the gas chromatograph should be secured to a wooden pallet, maintained in a vertical position and enclosed in a wood framework.
- Auxiliary equipment such as sample probes may be stored in the packaging in which it was shipped. If this packaging material is no longer available, secure the equipment to prevent excessive shaking and protect the accessories in a water proof enclosure.
- The gas chromatograph should be stored in a sheltered environment that is temperature controlled between -30 °C (-22 °F) and 60 °C (140 °F) to keep the gas chromatograph's protective coatings from deteriorating from exposure to rain or caustic or corrosive environments. Humidity in the sheltered environment should be non-condensing. Be especially cautious of humidity if the conduit has been potted. Temporary caps and desiccant may be necessary.
- The configuration of the analyzer may be retained through battery back-up on the CPU for at least two years. If lost for some reason, a custom program for downloading the appropriate GC application is included on the USB shipped with the system documentation.
- If the gas chromatograph has been in operation, the system should be purged with carrier gas before powering the gas chromatograph down, especially when heavy hydrocarbons or components that tend to polymerize are present. Allowing the gas chromatograph to perform a few analysis cycles without sample gas is an acceptable method of purging the system.

  Note
  To expedite the purge process, you may use 30 psig of a dry inert gas, such as nitrogen or helium.

  Monitor the results and halt the analyzer after component values fall to **0** or after peaks are significantly reduced in size. Save a copy of the diagnostic data under **Tools** → **Save Diagnostic Data**; once the file has been saved to a local PC, USB, or hard drive, you may remove power.
- After removing power from the GC, remove the purge gas and immediately cap all inlets and vents, including the carrier drier. These vents and inlets should be capped with the fittings that were in place when the GC shipped from the factory or with Swagelok® caps (not provided). This will protect the columns and filters and should result in a trouble-free start up when the unit is returned to service.
- The sample conditioning system vents and inlets should also be capped with the fittings that were in place when the system shipped from the factory. Additionally, all vents should be closed.
- Any remaining openings—such as conduit entries—should also have appropriate plugs installed to prevent foreign material such as dust or water from entering the system.

F Pre-defined Modbus® map files

For the Modbus map files used with the gas chromatograph, see the Pre-Defined Modbus Map Files Reference Manual.

G Engineering drawings

G.1 List of engineering drawings - Rosemount 700XA

- BE-22175 Label Set Field Wiring Card 1 (Sheets 1, 2, and 3)
- DE-22050 Outline and Dimensional Pole, Wall and Floor Mounting Units, Rosemount 700XA
- CE-22260 Assembly, 6 Port XA Valve, Rosemount 700XA
- CE-22300 Assembly, 10 Port XA Valve, Rosemount 700XA
- DE-22143 (Sheets 1-7) Unit Assembly Rosemount 700XA Gas Chromatograph (GC)

MS-00809-0100-0700
Rev. AC
2023

For more information: **Emerson.com/global**