# Model 700
# Gas Chromatograph

## System Reference Manual

Applies to Both
Daniel Danalyzer Model 700
Rosemount Analytical Model 700

Part Number 3-9000-521
Revision J

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EMERSON
Process Management

# Model 700 Gas Chromatograph
# System Reference Manual

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# INTRODUCTION

This section describes the contents and purpose of the Model 700 *Gas Chromatograph System Reference Manual*, a description of the Model 700 system, an explanation of the theory of operation, and a glossary of chromatograph terminology.

Use this section to get acquainted with the basic engineering of the Model 700 product.

## 1.1 DESCRIPTION OF MANUAL

The Model 700 *Gas Chromatograph System Reference Manual* (P/N 3-9000-521) consists of Installation, Operations, and Maintenance and Troubleshooting Procedures. Also, included is information about the MON2000 software interface.

## 1.2 SYSTEM DESCRIPTION

The Model 700 is a high-speed gas chromatograph (GC) system that is engineered to meet specific field application requirements based on typical natural gas stream composition and anticipated concentration of the selected components. In its standard configuration, the Model 700 can handle up to four streams: typically, three for sample and one for calibration.

The Model 700 system consists of three major parts: the Analyzer Assembly, Controller Assembly, and Sample Conditioning System (SCS).

Model 700 subsystems are: a Flame Ionization Detector (Micro-FID), a Liquid Sample Injector (LSIV) and a Methanator.

### Analyzer Assembly

The Analyzer Assembly (upper enclosure) includes columns TCD/Micro-FID detectors, Methanator, preamplifier, preamplifier power supply, stream switching valves, and solenoids. See Figure 1-2 Block Diagram Upper Enclosure for TCD details and Figure 1-5 Block Diagram Upper Enclosure for Micro-FID details. Additionally, the Model 700 may be equipped with the Liquid Sample Inject Valve (LSIV) or a Methantor.

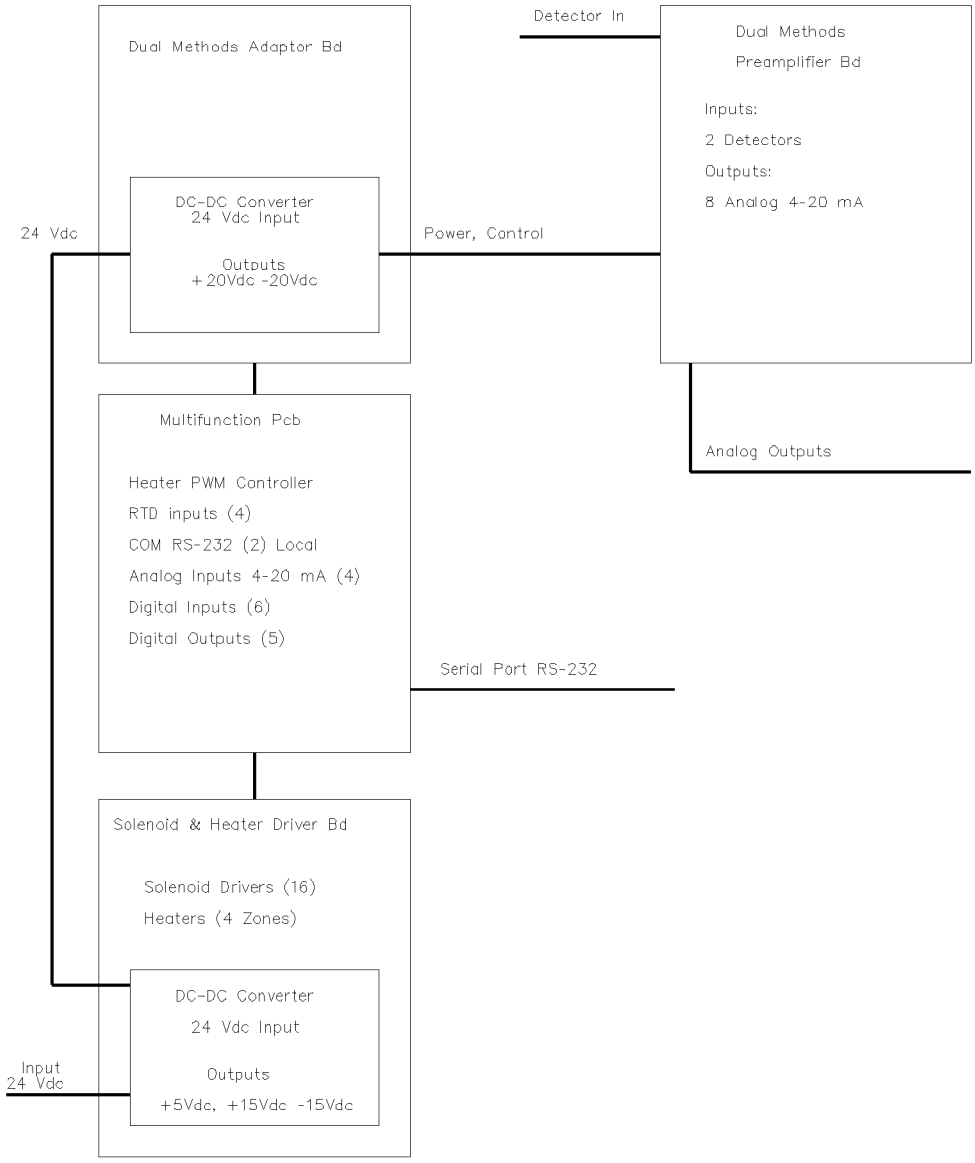



*Figure 1-1 Block Diagram Upper Enclosure with TCD*

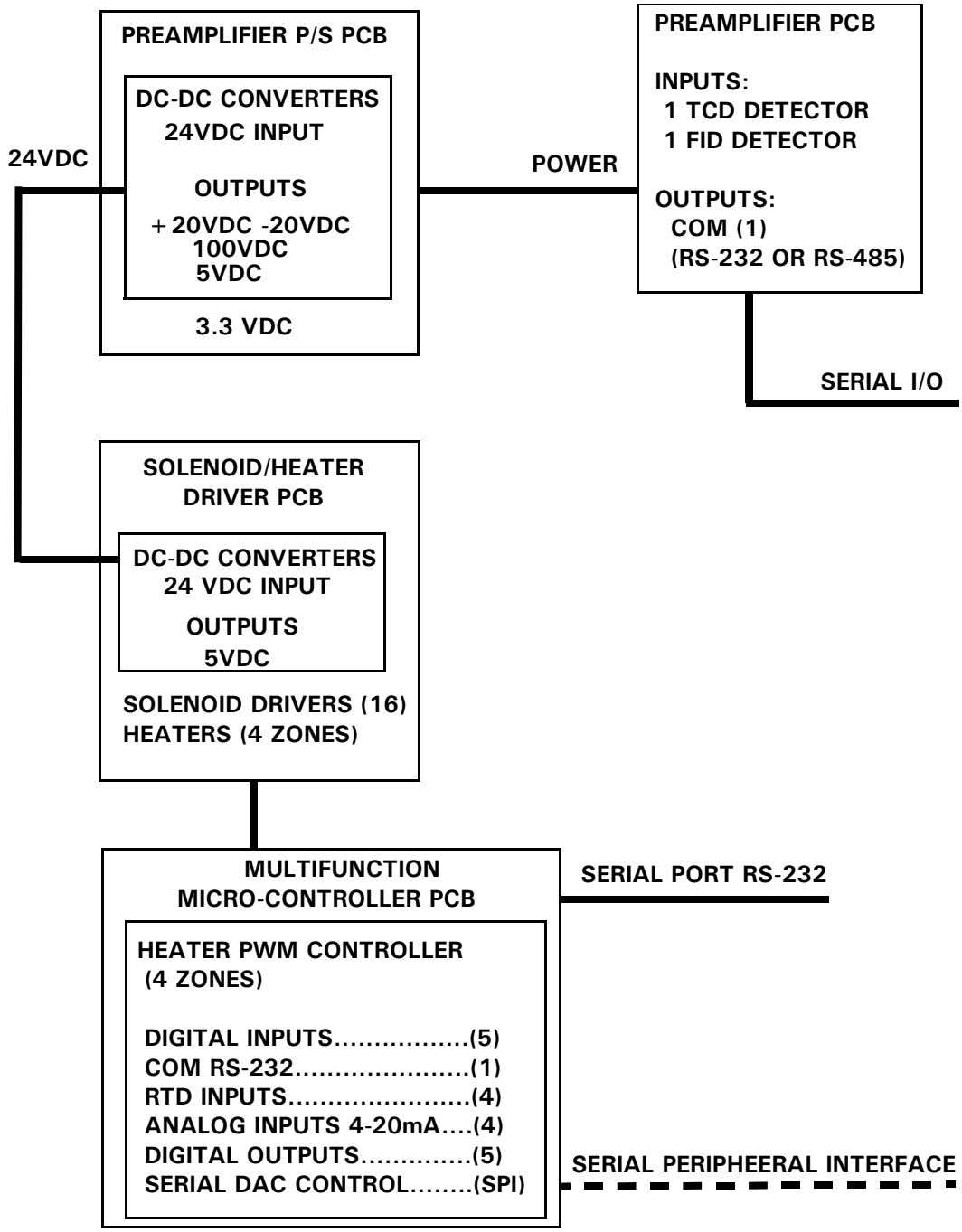



*Figure 1-2 Block Diagram Upper Enclosure with Micro-FID*

### Controller Assembly

The Controller Assembly (lower enclosure) includes electronics and ports for signal processing, instrument control, data storage, personal computer (PC) interface, and telecommunications. This assembly allows the user to control the GC functions via a PC with the MON2000 software package (see Section 1.3).

See Figure 1-3 and Figure 1-4 for lower enclosure block diagrams.

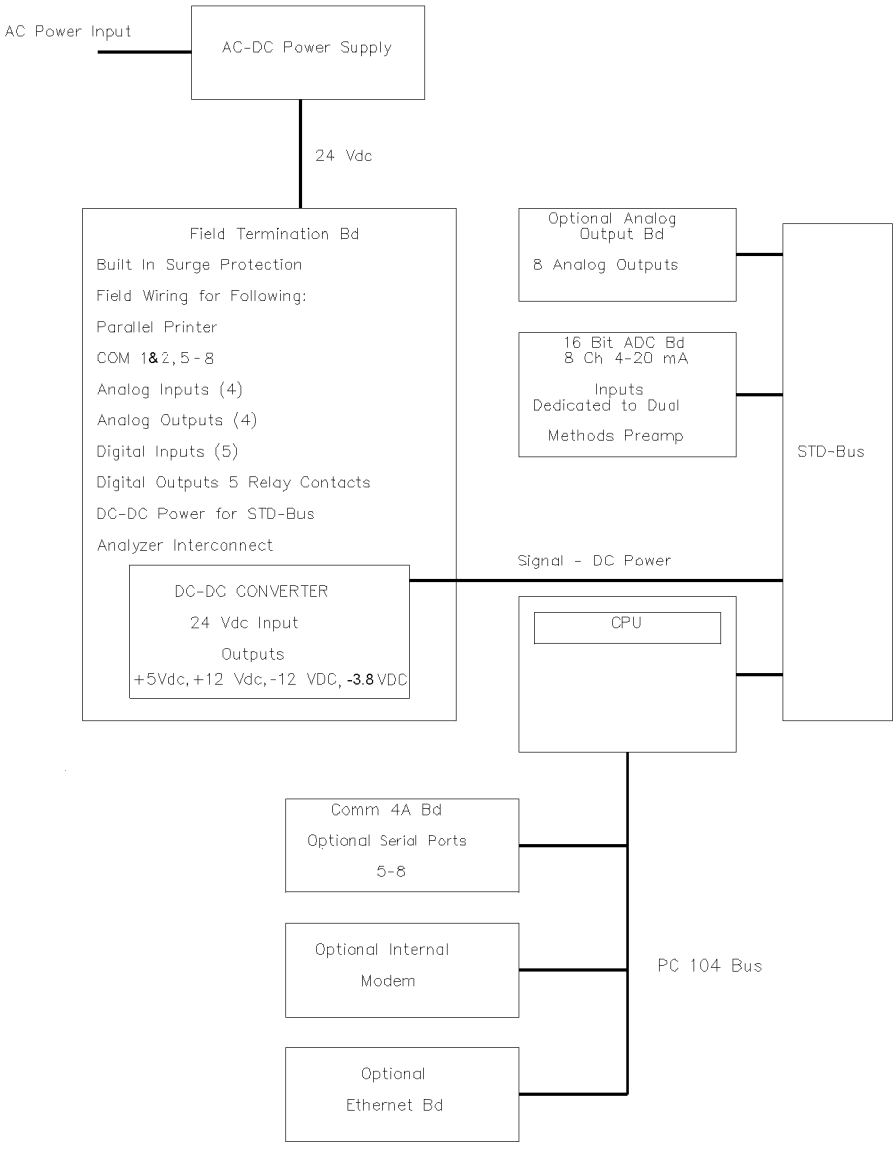



*Figure 1-3 Block Diagram TCD Lower Enclosure*

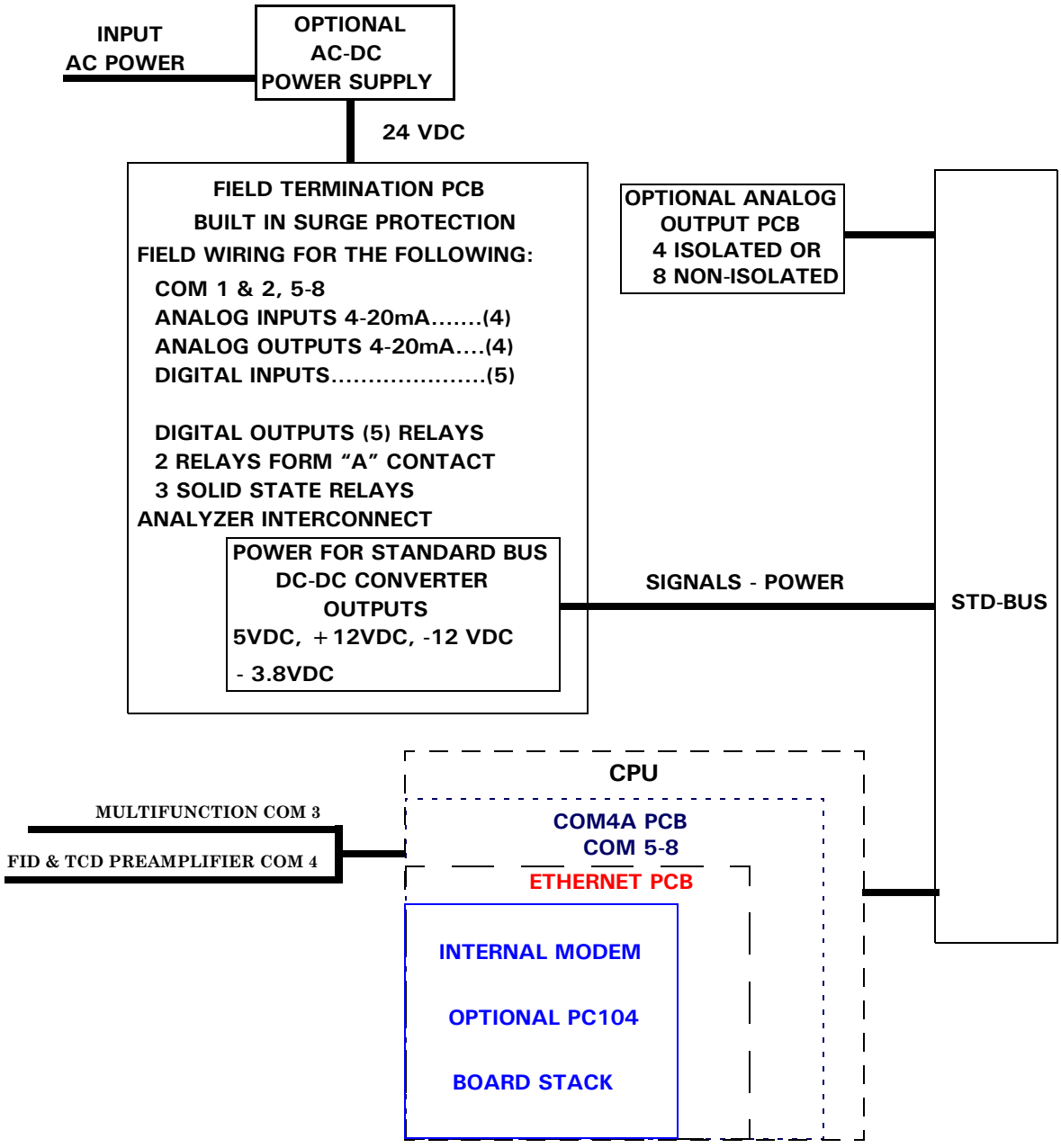



*Figure 1-4 Block Diagram Micro-FID Lower Enclosure*

The GC-PC interface provides the user with the greatest capability, ease-of-use, and flexibility. One PC running MON 2000 can connect with up to 32 chromatographs (via RS-485 serial communications links). MON 2000 is used to edit applications, monitor operations, calibrate streams, and display analysis chromatograms and reports, which can then be stored to files on the PC hard drive or printed from either the PC printer port or the GC printer port.

### Sample Conditioning System (SCS)

The sample conditioning system is located between the process stream and the Analyzer Assembly sample inlet (mounted on the lower portion of the Analyzer Assembly stand). The standard configuration includes a Stream Switching System and filters.

The Model 700 electronics and hardware are housed in two explosion-proof enclosures and meet IEC Class I, Zone 1, Ex d IIB+$H_2$, T4 (NEC Class 1, Division 1, Groups B, C, and D) approval for use in a hazardous environment.

### 1.2.1 Functional Description

A sample of the gas to be analyzed is taken from the process stream by a sample probe installed in the process line. The sample passes through a sample line to the 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.

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Do not use a PC or a printer in a hazardous area. Serial port and Modbus communications links are provided to connect the unit to the PC and to connect to other computers and printers in a safe area.**

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

The chromatographic separation of the sample gas into its components is accomplished in the following manner. 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). The sample gas is moved through the column by means of a mobile phase (carrier gas). 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.

**NOTICE**

**For additional information,**
**see Section 1.4**

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. Outputs from the detector(s) are amplified in the Analyzer Assembly electronics, then transmitted to the Controller Assembly for further processing.

Output from the Controller Assembly is normally displayed on a remotely located PC or a printer. Connection between the Controller Assembly and the PC can be accomplished via a direct serial line or via a Modbus-compatible communication interface.

Several chromatograms may be displayed via MON2000, with separate color schemes, allowing the user to compare present and past data.

Use of the MON2000 software for configuration and troubleshooting procedures is essential in most cases. The PC may be remotely connected via telephone, radio or satellite communications. Once installed and configured, the Model 700 can operate independently for long periods of time.

### 1.2.2 Available Functions

Individual GC functions that can be initiated or controlled by the GC system and its software, MON2000, include (but are not limited to) the following:

- valve activations
- timing adjustments
- stream sequences
- calibrations
- baseline runs
- analyses
- halt operation
- stream/detector 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

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

## 1.3 SOFTWARE DESCRIPTION

The MON2000 uses three distinct types of software. This enables total flexibility in defining the calculation sequence, printed report content, format, type and amount of data for viewing, control and/or transmission to another computer or Controller Assembly. The three types are:

- Baseline Operating System (BOS)
- Application configuration software
- Maintenance and Operations software (MON2000 version 2.2 or later)

The BOS and the Application configuration software are installed when the Model 700 system is shipped. The application configuration is tailored to the customer's process and shipped on a floppy disk. Note that the hardware and software are tested together as a unit before the equipment leaves the factory. The MON2000 software program communicates with the Model 700 system and allows an initial site system setup (i.e., operational parameters, application modifications, and maintenance).

### BOS

The Baseline Operating System (BOS) supervises operation of the Model 700 through its internal microprocessor-based controller; all direct hardware interface is via this control software. It consists of a multi-tasking program that controls separate tasks in system operation, as well as hardware self-testing, user application downloading, start-up, and communications. Once configured, a Model 700 can operate as a stand alone unit.

## MON2000

MON2000, available as a Windows-based program, provides the human-machine interface for maintenance, operation, and troubleshooting. It allows the user to download applications developed for a specific GC unit. MON2000 provides operator control of the connected Model 700, monitors analysis results, and inspects and edits various parameters that affect Model 700 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 can be initiated. The link between the MON2000 computer and the Model 700 can either be direct, via a local serial connection or remote, via an ethernet network, modems, telephone lines and/or radio.

Operation of multiple Model 700 chromatographs (up to 32) with a single MON2000 computer, via a multi-drop serial link, is also supported.

**NOTICE**

**See Section 1.7 for definitions of the terminology used in the following explanations.**

## 1.4 THEORY OF OPERATION

The following sections discuss the theory of operation for the Model 700, the engineering principles and concepts used.

### 1.4.1 Thermal Conductivity Detector (TCD)

One of the detectors (located on the oven in the Analyzer upper assembly) is a thermal conductivity detector that 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 the measurement element. See Figure 1-5 for a schematic diagram of the thermal conductivity detector (TCD).

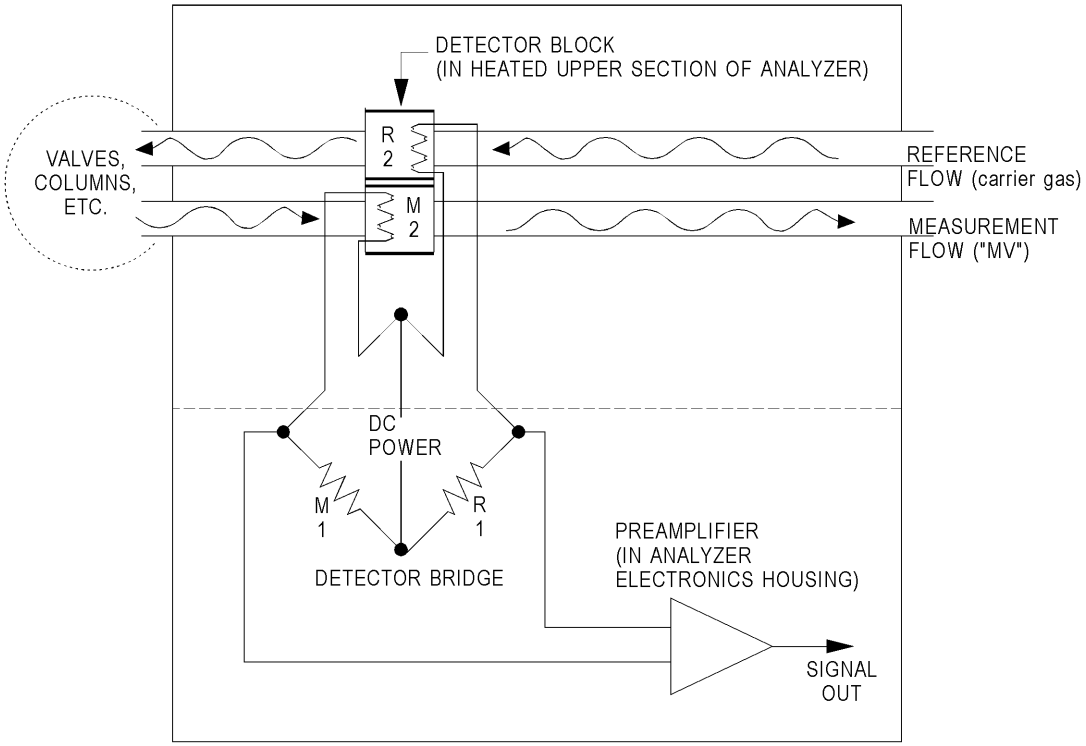


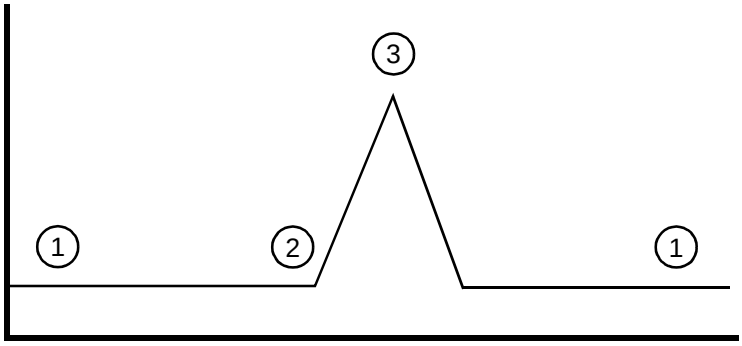

*Figure 1-5 Analyzer Assembly with TCD Detector Bridge*

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 bridge can be balanced by the fine and coarse adjustment potentiometers located on the preamplifier circuit board.)

The analysis begins when a fixed volume of sample is injected into the column by operation of the sample valve. The sample is moved through the column by the continuous flow of carrier gas. 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 1-6 illustrates the change in detector electrical output during elution of a component.




1 detector bridge balanced

2 component begins to elute from column and is measured by thermistor

3 peak concentration of component

*Figure 1-6 Detector Output During Component Elution*

In addition to amplifying the differential signal developed between the two thermistors, the preamplifier supplies drive current to the detector bridge. The voltage signal is converted to a 4-20 milliampere (mA) current loop for transmission to the Controller Assembly.

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 Controller Assembly for computation, recording on a printer, or viewing on a PC monitor (via MON2000).

### 1.4.2 Flame Ionization Detector (Micro-FID)

The other detector (located on the oven in the Analyzer Assembly) is a Flame Ionization Detector. The Micro-FID requires a polarization voltage and its output is connected to the input to a high impedance amplifier which 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 1-7 for a schematic diagram of the Flame Ionization Detector (Micro-FID).

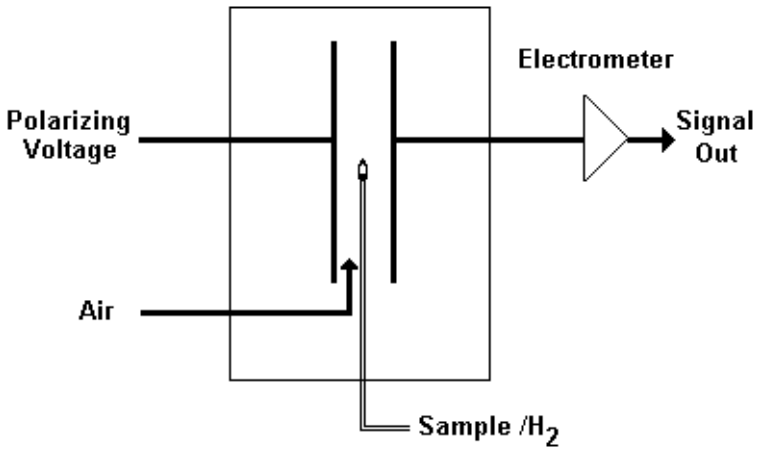



*Figure 1-7 Analyzer Assembly with Micro-FID Detector Bridge*

### 1.4.3 LSIV

The Liquid Sample Inject Valve (LSIV) penetrates the wall of the upper enclosure and is held in place by a retaining ring. The mounting arrangement is designed to ensure integrity of the flameproof enclosure.

**Model 700 LSIV Upper Enclosure**

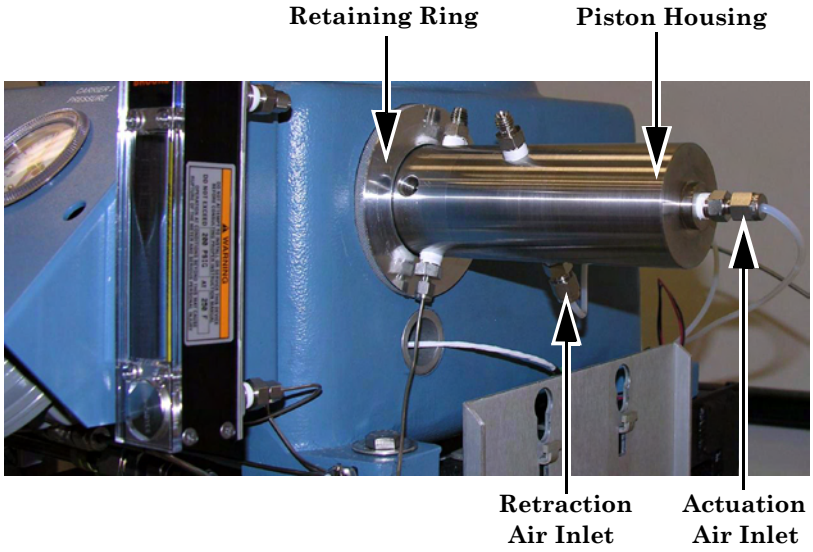



*Figure 1-8 Model 700 LSIV Assembly*

The outermost end houses an air operated piston. Air at 15 to 45 psi is directed by a solenoid valve to either advance the stem to inject the sample or to retract the stem.

The next section houses an auxiliary stem seal assist. A piston driven by air at 80 to 100 psi keeps adequate load on the stem seal to counteract wear at the high temperatures and pressures that might be encountered. There are two ¼"npt ports in this section; one port retracts the sample piston and the other port activates the seal assist.

The innermost section houses the stem seals and the sample chamber. There are five ¼" npt ports in this section.

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

The tip of the LSIV is the port where flashed sample is taken to the oven system.

The port at right angles to the length of the LSIV is the input for carrier gas.

The heater block, a cylinder of aluminum, is installed off-center surrounding the flash chamber, close to the wall of the upper enclosure. It houses the heater and an RTD and is retained by a jamb nut that should only be finger tight.

### 1.4.4 Methanator

After all other components have been separated from the sample, normally undetectable CO and $CO_2$ are sent through the methanator. They are combined with hydrogen to make methane in a heat generated catalytic reaction. The methanator is also known as a methanizer or a catalytic converter.

**Model 700 Methanator Upper Enclosure**

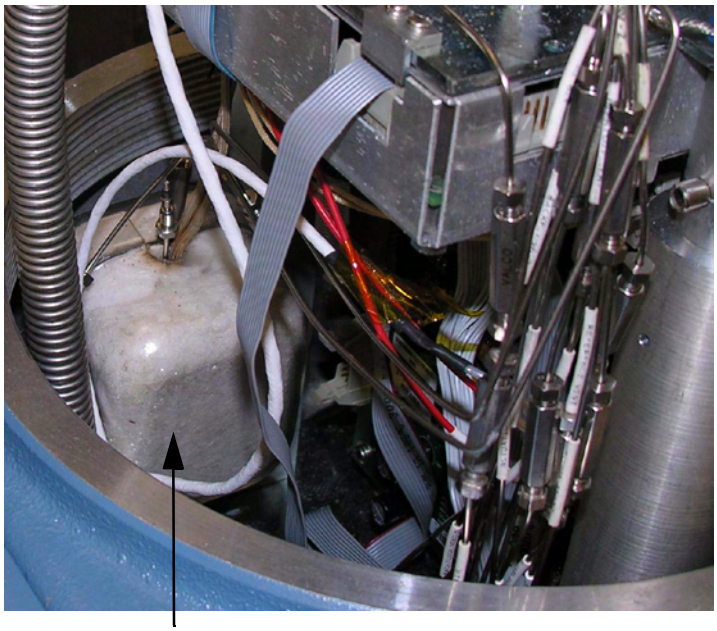



*Figure 1-9 Model 700 Methanator Assembly*

### 1.4.5 Data Acquisition

Every second, exactly 40 equi-spaced data samples are taken (i.e., one data sample every 25 milliseconds) for analysis by the Controller Assembly. The sampling frequency of 40 Hertz (Hz) was chosen to reduce normal mode noise (at 60 Hz).

After each point on the chromatograph signal is sampled, the resulting number is stored for processing in a buffer area of the Controller Assembly memory. During the analysis, only the last 256 data points are available for processing.

Because the data analysis is done as the signal is sampled (in real-time), only a limited number of past data samples is required to analyze any signal.

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 N samples are averaged and stored, and thus reduce the effective incoming data rate to 40/N samples per second. For example, if N = 5, then a total of 40/5 or 6 (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 two 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.

### 1.4.6 Peak Detection

**NOTICE**

**The Controller Assembly software assumes that a region of signal quiescence and stability will exist.**

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 the 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.

Having initiated a peak search by turning Integrate Inhibit off, the Controller Assembly performs a point by point examination of the signal slope. This is achieved 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, e.g. 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 valued 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.

**NOTICE**

**For additional information about other calculations performed, see the MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522).**

## 1.5 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

### 1.5.1 Conc Analysis - Response Factor

Concentration calculations require a unique response factor for each component in an analysis. These response factors may be manually entered by an operator or determined automatically by the system through calibration procedures (with a calibration gas mixture that has known concentrations).

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

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

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”

Calculated response factors are stored by the Controller Assembly for use in the concentration calculations, and 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.

### 1.5.2 Conc Calc - Mole Percentage (without Normalization)

Once 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:

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

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 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.

NOTICE

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

### 1.5.3 Conc Calc 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 |

## 1.6 ADDITIONAL RESOURCES

In addition to this manual, Model 700 *Gas Chromatograph System Reference Manual*, refer to the following:

- MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522). Use this manual for installing the MON2000 and Modbus Test (WinMB) software programs, getting started, checking various gas chromatograph (GC) application settings, and configuring and monitoring your GC system.

## 1.7 GLOSSARY

### Auto Zero

Automatic zeroing of the TCD preamplifier may be configured to take place at any time during the analysis when either the component is not eluting or the baseline is steady.

The Micro-FID is automatically zeroed at each new analysis run and can be configured to take place anytime during the analysis when either the component is not eluting or the baseline is steady. The TCD is only automatically zeroed at the start of a new analysis.

### 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. In C6+ analysis we use Ultra Pure (zero grade) Carrier Gas for the carrier. This gas is 99.995 percent pure.

### Chromatogram

A permanent record of the detector output. A chromatograph is obtained from a PC interfaced with the detector output through the Controller Assembly. A typical chromatogram displays all component peaks, and gain changes. It may be viewed in color as it is processed on a PC VGA display. Tick 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.

**Condulet**

A box with a removable cover providing access to wiring in conduit (conduit outlet) that is part of an optional cable entry package.

**CTS**

Clear to send

**DCD**

Data carrier detect

**DSR**

Data set ready

**DTR**

Data terminal ready

### FID

Flame Ionization Detector - The optional Micro-FID may be used in place of one TCD for the detection of trace compounds. The Micro-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.

### LSIV

Liquid Sample Inject Valve - The optional LSIV is used to convert a liquid sample to a gas sample by vaporizing the liquid in a heated chamber, then analyzing the flashed sample.

### Methanator

The optional Methanator, a catalytic converter, converts otherwise undetectable $CO_2$ and/or CO into methane by adding hydrogen and heat to the sample.

### Response Factor

Correction factor for each component as determined by the calibration:

$$RF = \frac{RawArea}{CalibrationConcentration}$$

### Retention Time

Time (in seconds) that elapses between the start of analysis (0 seconds) 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

**TCD**

Thermal Conductivity Detectors – Detectors that use 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

# EQUIPMENT DESCRIPTION AND SPECIFICATIONS

Use the following sections to reference the Model 700 equipment description or specifications.

## 2.1 EQUIPMENT DESCRIPTION

The Model 700 consists of two copper-free aluminium explosion-proof housings, upper and lower, and a front flow panel assembly. The enclosures are separated by a pipe conduit which routes electrical wiring from the lower enclosure to the upper enclosure. Designed to be explosion-proof, this unit is built for installation in hazardous locations.
See Section 3.1 for more information.

*Figure 2-1 Model 700 Gas Chromatograph*

**NOTICE**

**All circuit boards are connected through a common ground via the enclosure.**

### 2.1.1 Upper Enclosure

The Model 700 upper explosion-proof housing contains the electronic controller (multifunction board), the Oven System, the Stream Switching System (SSS) and preamplifier assembly.

**Model 700 Upper Enclosure**

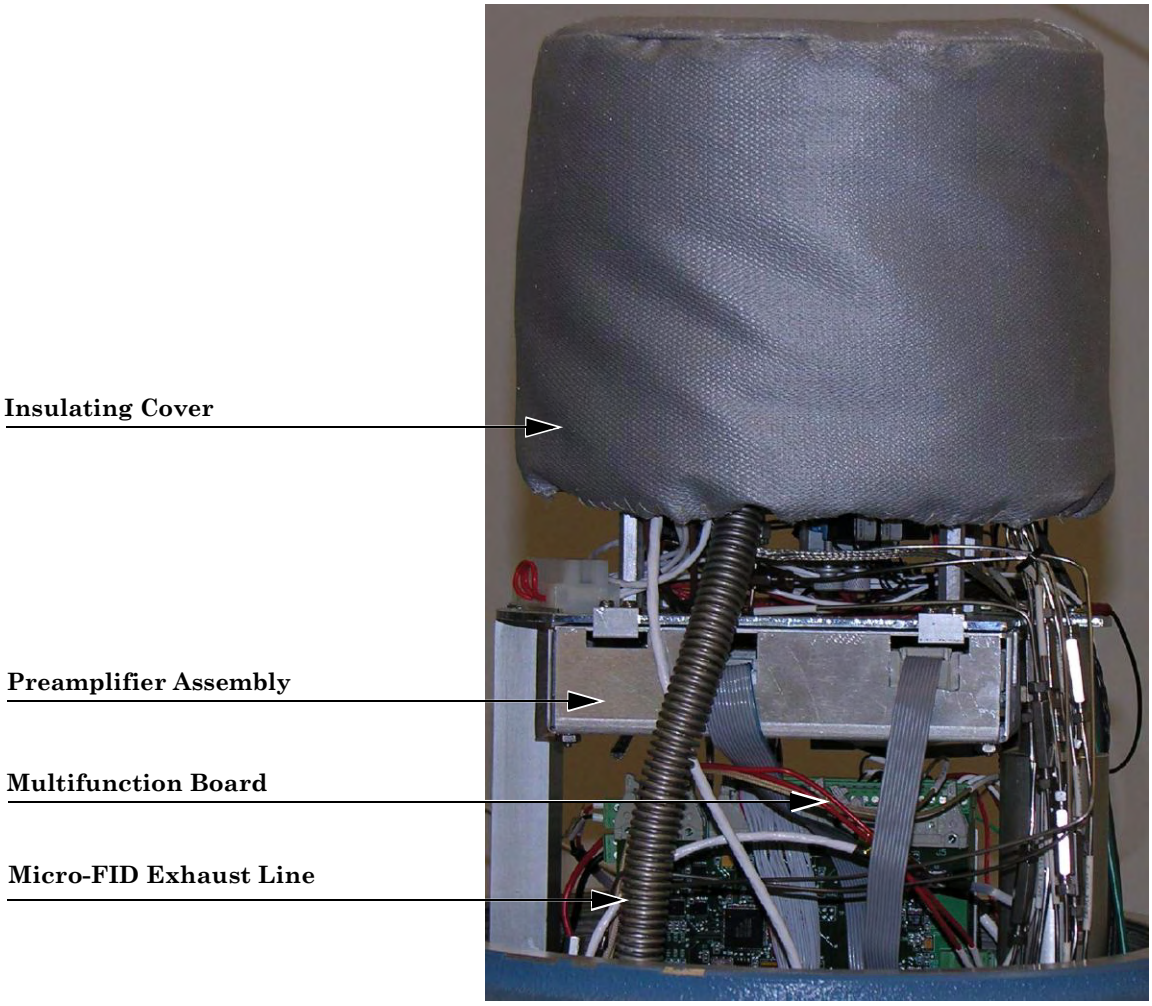



*Figure 2-2 Upper Enclosure Assembly*

A more detailed equipment list includes:

- TCD Oven System (consists of the electronics, up to three chromatograph valves and the stream switching system):
  - column module (i.e., “oven”)
  - one or two pairs thermal conductivity detectors (TCDs)
  - valve system consisting of:
    - › three sample-directing valves
    - › plastic manifold that thermally insulates the Oven System and connects the actuating part to the solenoid valves attached to the plastic manifold
  - two heater zones: column with one cartridge heater and one block with three heaters
  - two thermal cut-off switches: (oven temperature switch) opens at 257°F (±5 °) (125 °C)

**Model 700 Upper Enclosure**

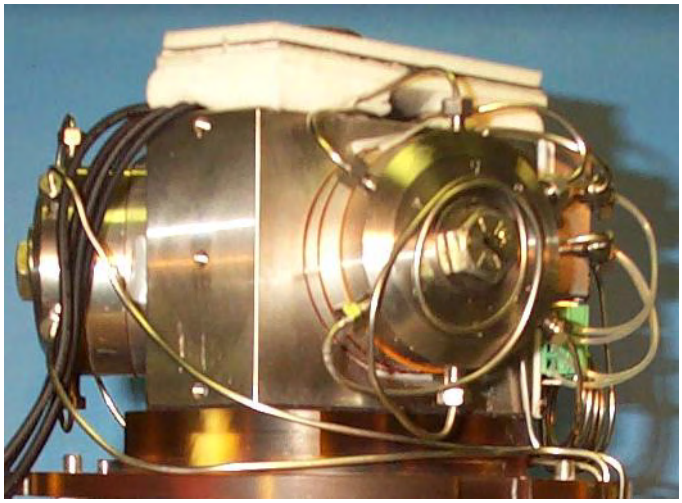


*Figure 2-3 TCD Oven System Assembly*

- Micro-FID

**Model 700 FID Upper Enclosure**

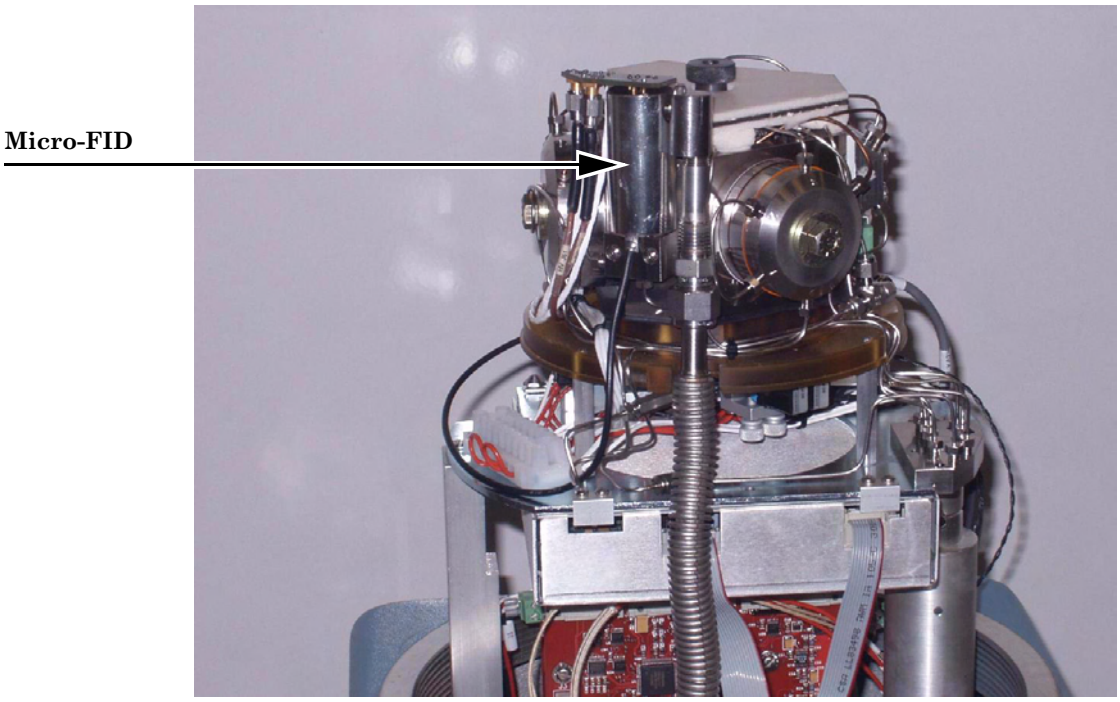



*Figure 2-4 Model 700 Micro-FID Upper Assembly*

The optional Flame Ionization Detector may be used in place of one TCD for the detection of trace levels of compounds.

- Methanator

**Model 700 Methantor Upper Enclosure**

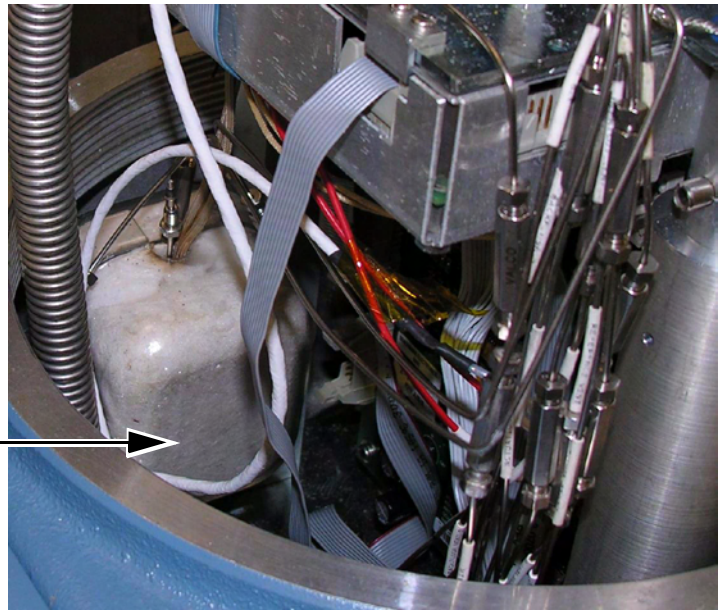
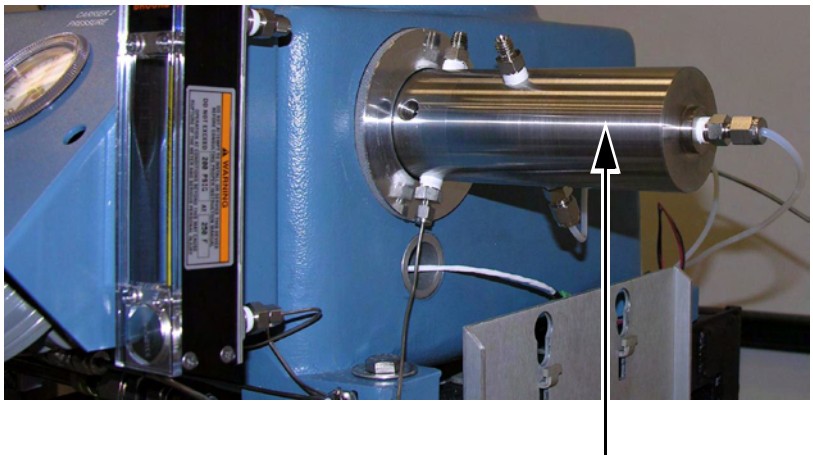



*Figure 2-5 Model 700 Methanator Upper Assembly*

The optional Methanator, a catalytic converter, converts otherwise undetectable $CO_2$ and/or CO into methane by adding hydrogen and heat to the sample.

**Model 700 LSIV Right Side View**



**LSIV Assembly**

*Figure 2-6 LSIV Assembly*

The optional Liquid Sample Inject Valve (LSIV) is used to convert a liquid sample to a gas sample for analysis on the Model 700 Gas Chromatograph.

A measured sample is placed in a heated chamber above the vaporization point of the liquid and then it is flashed to a gas. Once vaporized, the sample is pushed by the carrier gas through the heated tubing into the column train.

- Stream Switching System (SSS) which consists of:
  - manifold block
  - solenoid valves
  - valve clamps
  - temperature sensor
  - oven temperature switch
  - tubing
  - insulation cover

**Model 700 Upper Enclosure**

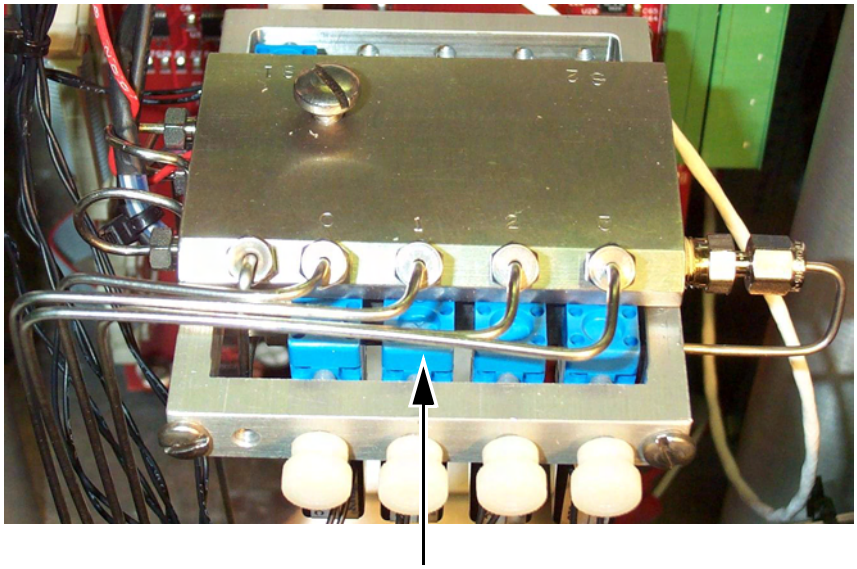



*Figure 2-7 SSS Installed*

- TCD Electronics
  - Dual Methods Adapter Board
  - Driver I/O Board
  - Multifunction Board
  - Preamplifier Board
  - External Locking Device

- Micro-FID Electronics
  - Solenoid/Heater Driver Board
  - Multifunction Board
  - Preamplifier Power supply
  - Driver I/O Board
  - Multifunction Board

### 2.1.2 Lower Enclosure

The Model 700 lower enclosure consists of:

**Model 700 Lower Enclosure**

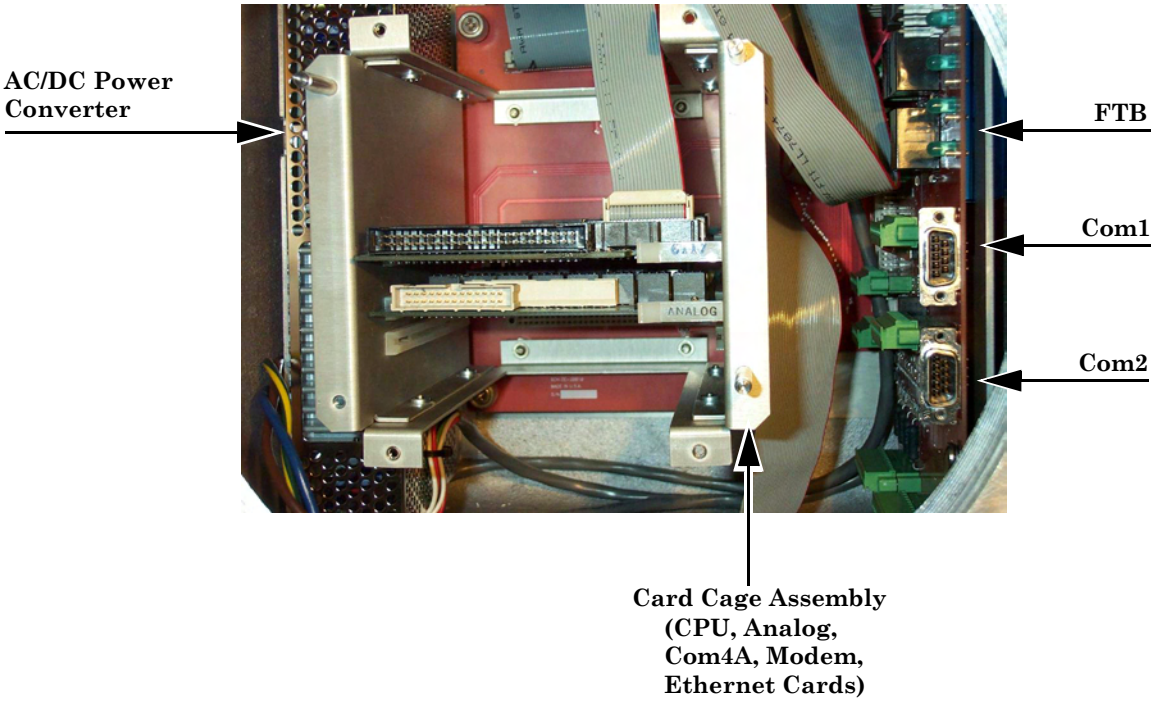



*Figure 2-8 Lower Enclosure Assembly*

- Card cage assembly, containing:

**WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**See power supply label prior to connection. Check the unit power design to determine if it is equipped for AC or DC power. Applying 110/220 VAC to a DC power input unit will severely damage the unit.**

Failure to do so may result in injury to personnel or cause damage to the equipment.

- WinSystems CPU board
- Com4A board (optional)
- analog board
- analog board (optional)
- digital I/O
- internal modem (optional)
- ethernet card (optional)
- field termination board (FTB)
- connection for AC/DC power supply (converter)
- internal and external ground
- external locking device
- DB pin connection for serial communications

**NOTICE**

**The Model 700 CSA-certified unit is equipped with 3/4 inch cross-over adapters.**

**CAUTION**

**If the carrier gas pressure drops below a set point, this switch causes the analysis to stop and activates the analyzer failure alarm.**

### 2.1.3 Flow Panel Assembly

The Flow Panel Assembly is attached to the front of the upper enclosure and consists of the following: (see Figure 2-2):

- carrier pressure regulator(s) and gauge(s)
- sample flow meter
- Sample Vent (SV)
- Measure Vent (MV)
- actuation pressure limiting regulator
- pressure switch, mounted internally

## 2.2 EQUIPMENT SPECIFICATIONS

### 2.2.1 Utilities

Use the following table to determine the utility specifications.

*Table 2-1 Model 700 Unit Specifications*

| Type | Specification |
|---|---|
| unit dimensions (P/N 20351) | • basic unit envelope<br>w - 15.2" (387 mm)<br>h - 41.5" (1054 mm)<br>d - 19.2" (488 mm)<br>• wall mount<br>w - 18.2" (463 mm)<br>h - 41.5" (1054 mm)<br>d - 19.2" (488 mm)<br>• pole mount<br>w - 18.2" (463 mm)<br>h - 41.5" (1054 mm)<br>d - 25.0" (635 mm)<br>• floor mount<br>w - 18.2" (463 mm)<br>h - 58.0" (1470 mm)<br>d - 19.2" (488 mm) |
| unit weight | • wall mount 130 lbs (59 kg)<br>• pole mount 135 lbs (61 kg)<br>• floor mount 150 lbs (68) |
| materials | • 303 and 316 stainless steel<br>• 316 stainless steel and Kapton in contact with sample<br>• Swagelock and Valco fittings |
| mounting | • floor mount<br>• pole mount:<br>- 2" (60.3 mm)<br>- 3" (89.0 mm)<br>- 4" (114.3 mm)<br>• direct wall mount |

**NOTICE**

**Allow 14" (360 mm additional) clearance for removal of dome.**

*Table 2-1 Model 700 Unit Specifications*

| Type | Specification |
|---|---|
| power | • 24 VDC standard<br>• 75W (Model 700 w/TCD)<br>• 150W (Model 700 w/Methanator or LSIV)<br>• 36VDC, Sol/Drv PCB Transorb<br>• 90-130/180-264 VAC<br>• 47-63HZ (single phase)<br>• AC optional |
| | **CAUTION**<br>**Voltage range includes line voltage variations.** |
| instrument air | not required; optional for valve actuation, min pressure of 90 psig |
| environment | • -18 to 55 °C (0 to 130 °F)<br>• 0 to 95% RH (non-condensing)<br>• indoor/outdoor<br>• pollution - degree 2 (the unit can withstand some non conductive environmental pollutants e.g., humidity)<br>• max altitude 2000m |
| classification | • For Canada: Class 1,Zone 1,Ex d IIB (+$H_2$),T4 (pending)<br>• For USA: Class 1,Zone 1,AEx d IIB (+$H_2$),T4 (pending) |
| international | CENELEC/IEC Class 1,Zone 1, EEx d IIB(+H2) T4 (pending)<br>ATEX CE EEx d IIC T4<br>Certification number SIRA - 04ATEX1055X<br>**Special conditions for safe use must be met.** The maximum constructional gap ($i_c$) is less than that required by Table 1 of IEC 60079-1:2004 as detailed below: |

| FLAMEPATH | MAXIMUM GAP (MM) | COMMENT |
|---|---|---|
| Fitting tube adaptor/fitting tube taper | 0.000 | Taper fit |
| Fitting tube/taper/tubes | 0.132 | |

### 2.2.2 Electronic Hardware

Review the system block diagrams, Upper and Lower Electronics, to become familiar with the Model 700.

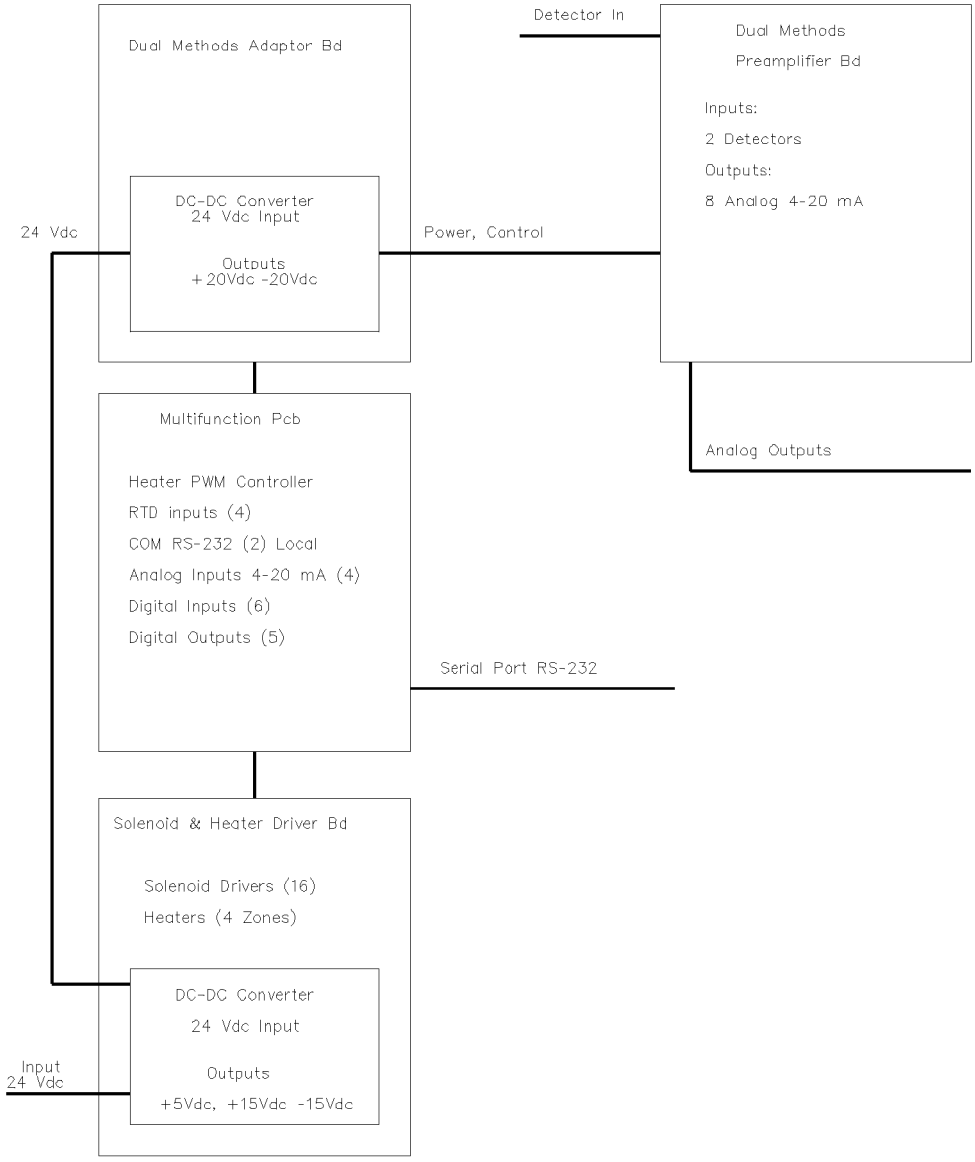



*Figure 2-9 Upper Electronics with TCD Block Diagram*

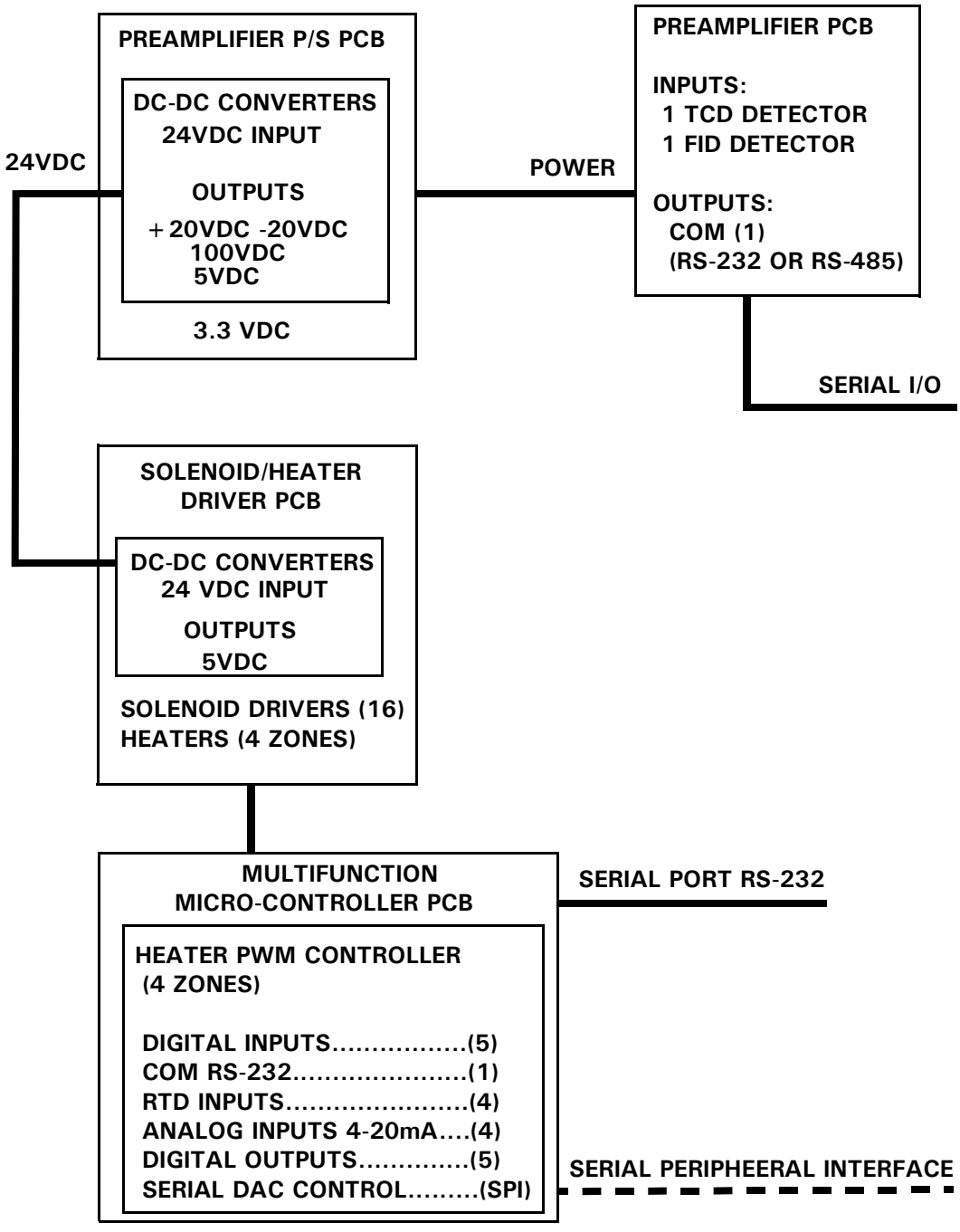



*Figure 2-10 Upper Electronics with Micro-FID Block Diagram*

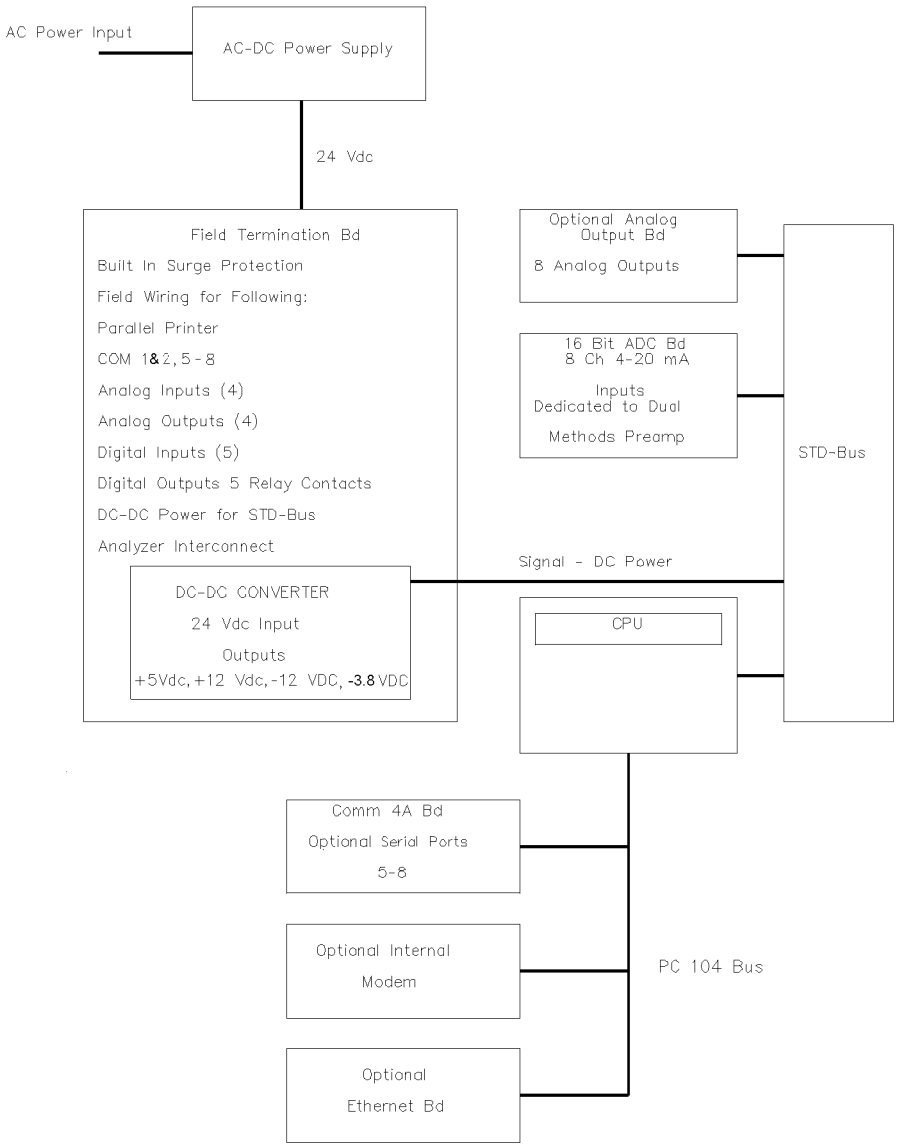



*Figure 2-11 Lower Electronics TCD Block Diagram*

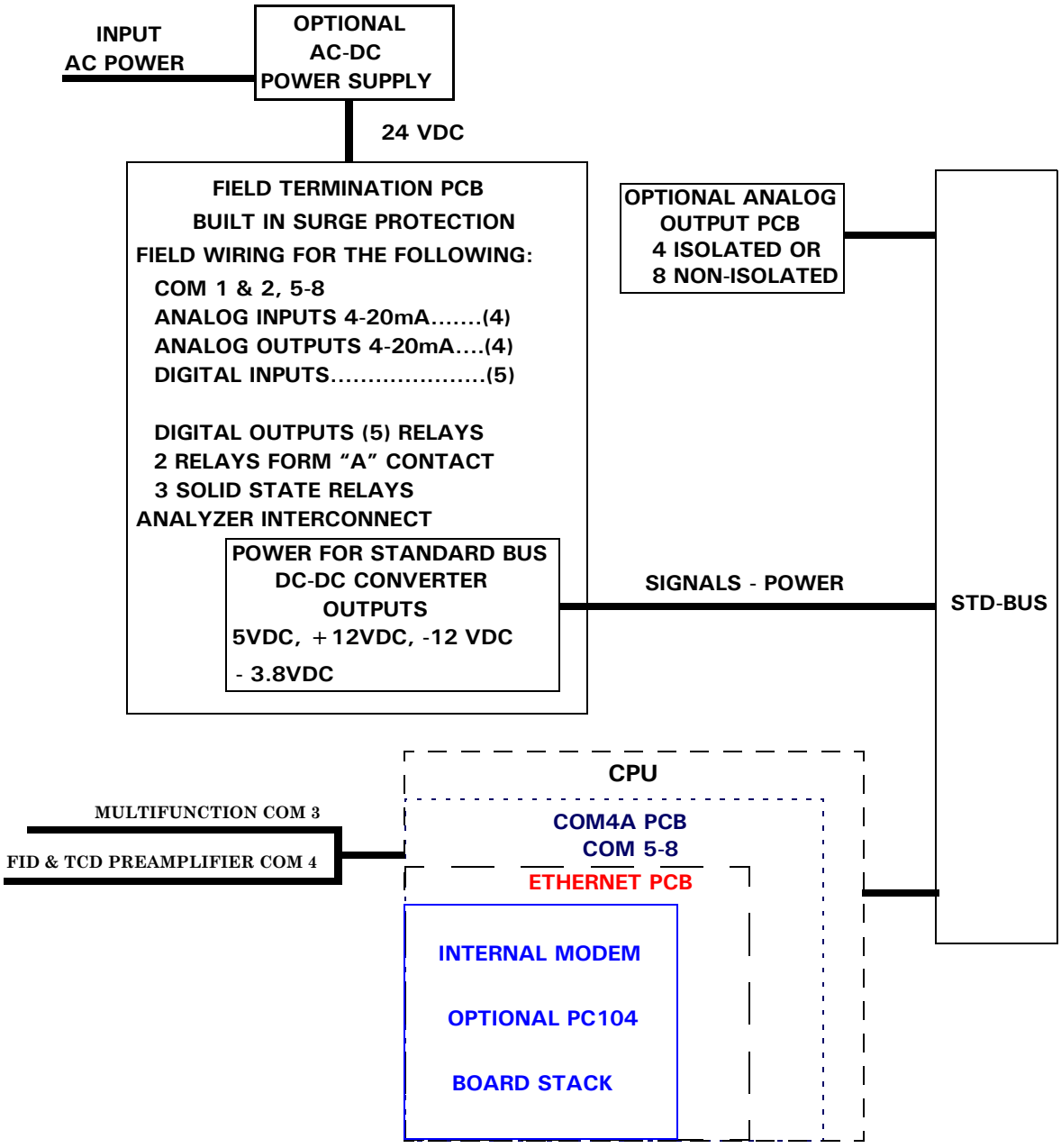



*Figure 2-12 Lower Electronics Micro-FID Block Diagram*

Use the following table to determine the electronic hardware specifications.

*Table 2-2 Electronic Hardware Specification*

| **Type** | **Specification** |
|---|---|
| Rating | Division 1; no purge required |
| CPU | WinSystems 386sx 33 MHz |
| Memory | 4 MB System RAM |
| DiskOnChip | 8 MB – 288 MB |
| Communication Ports | 6 configurable Modbus ports; support RS-232/422/485 protocols |
| Optional Modem | 56K Baud Telephone |
| Analog Inputs | 4, 12-pin Phoenix on FTB |
| Standard Analog Outputs | 4, 12-pin Phoenix on FTB |
| Optional Analog Outputs | 8, non-isolated outputs 24-pin Phoenix<br>Located on Optional Analog Board<br>Or,<br>4, isolated outputs 12-pin Phoenix connector<br>Located on Optional Analog Board |
| Discrete Digital Inputs | GC_IN (dedicated to pressure switch); 4 user-defined inputs |
| Digital Outputs (5) | 2 Relays “Form A” contacts<br>Relay contact rating 24 VDC nominal @ 1 Amp<br>3 Solid State Relays - Rating of 0.375A @30 VDC on FTB - 10 pin Phoenix connector |
| Detector Inputs | Optionally 2 micro-volume TCD inputs<br>1 Flame Ionization Detector (Micro-FID) input |
| Transient Protection | over-voltage category II |

### 2.2.3 Micro Heat Sink Oven

Use the following table to determine the oven specifications.

*Table 2-3 Oven Assembly Specifications*

| Type | Specification |
|---|---|
| Valves | 6-port and 10-port valves; piston-operated diaphragms with pneumatic actuation |
| Columns | max of 40 feet (12 m) of micro-packed columns; 1/16-inch (1.6-mm) outside diameter |
| Solenoid Actuation | • 24 VDC<br>• max 90 psi |
| Wetted Parts | 316 stainless steel and kapton diaphragm |
| Temperature Control | • 24 VDC heat sink<br>• 2 zones (1 column, 1 block)<br>• max operating temperature of 115 °C (239 °F) |
| Sample System | 1 zone, includes Stream Switching System |
| Sample Streams | • standard: max of 3 analytical and 1 auto calibration<br>• optional: max of 8 |

**NOTICE**

**The Model 700 has its own applications and is not compatible with 2350/ 2350A applications.**

### 2.2.4 Software

Use the following table to determine the software specifications.

*Table 2-4 Software Specifications*

| Type | Specification |
|---|---|
| Software | PC-based MON2000; runs 2350 and 2350A applications (v2.4 or later) |
| Firmware | embedded firmware compatible with 2350/2350A applications (v1.8 or later) |
| Methods | 4 Timed Event Tables and 4 Component Data Tables assignable to each stream |
| Peak Integration | • fixed time or auto slope and peak identification<br>• update Retention Time upon calibration or during analysis |

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# INSTALLATION AND SETUP

This section provides instructions for installing and setting up the Model 700 Gas Chromatograph (GC) System for Zone 1/ Division I environments.

This procedure involves the following steps:

- observe precautions and warnings
- plan site location
- obtain supplies and tools
- install GC wiring
- install GC sample and gas lines
- perform leak checks
- purge carrier gas lines
- purge calibration lines
- start up GC system

## 3.1 PRECAUTIONS AND WARNINGS

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Install and operate all equipment as designed and is compliant with all safety requirements.**

The "Seller" does not accept any responsibility for installations of the Model 700, 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.

### 3.1.1 Hazardous Environments

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Observe all precautionary signs posted on the Model 700 enclosure.**

Failure to do so may result in injury to personnel or cause damage to the equipment.

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Observe all precautionary signs posted on the Model 700 enclosure.**

The Model 700 enclosures are certified for Class 1, Zone 1, EEx d IIB (+H2) T4 locations and also complies with the ATEX directive 94/9/EC EEx d IIC T4.

ATEX certified units must be installed strictly in compliance with the requirements of ISO 60079-14.

Before opening the Model 700 assembly, reduce the risk of igniting hazardous atmospheres by disconnecting the equipment from all power supplies. Keep the assembly closed tightly when in operation to reduce the risk of igniting hazardous atmospheres.

Inlet (incoming) wiring must meet local standards (i.e. in conduit with seal fitting within 18" or via cable glands certified to ISO 60079-1). Seal all unused entries with blanks certified to ISO 60079-1.

Observe all precautionary signs posted on the Model 700 enclosure. Failure to do so may result in injury to personnel or cause damage to the equipment.

Please direct all health, safety and certification related questions to: Daniel Measurement and Control, Inc. Applications Engineering Group or Rosemount Analytical, Inc.

Follow these precautions if installing or operating the Model 700 instrumentation in a hazardous area:

1. Install and operate only the Zone 1/ Division I version of the Model 700 in a hazardous area.
2. Do not operate any printer or personal computer (PC) that is connected to a GC which is installed in a hazardous area. To interface with a GC in a hazardous area, use a PC that is located in a nonhazardous area and remotely connected to the GC.
3. Ensure that field connections to the analyzer are made through explosion-proof conduit or flameproof glands.

### 3.1.2 Power Source Wiring

Follow these precautions when installing AC power source wiring:

1. All wiring must conform to the CEC or NEC, local state or other jurisdiction, and company standards and practices.
2. Provide 24 VDC power or optional single-phase, 3-wire, power at 115 or 230 VAC, 50-60 Hertz.
3. Locate circuit breaker and optional power disconnect switch in a safe area.

**CAUTION**

**15 amps is the maximum current for 14 AWG (wire).**

4. Provide the Model 700 system and any optionally installed devices with one 15-Amp circuit breaker for protection.
5. Ensure that the 24 VDC input power is S.E.L.V. compliant by suitable electrical separation from other circuits.

6. Use multi-stranded copper conductor wire according to the following recommendations:
   - For power feed distances up to 250 feet (76 meters), use 14 AWG (American Wire Gauge) (18 Metric Wire Gauge), stranded.
   - For power feed distances 250 to 500 feet (76 to 152 meters), use 12 AWG (25 Metric Wire Gauge), stranded.
   - For power feed distances 500 to 1000 feet (152 to 305 meters), use 10 AWG (30 Metric Wire Gauge), stranded.
   - Cable entries are M32 in accordance with ISO 965.

### 3.1.3 Card Cage Removal

The Model 700 card cage assembly is designed to be disconnected and removed from the lower enclosure to allow space for user power and signal connections. This may be particularly important for applications where large numbers of I/O connections are required.

To disassemble the Card Cage,

1. Remove the lower enclosure cover and the front flow panel assembly.

Note: Leave the wires attached to the flow panel assembly and allow it to hang outside of the enclosure.

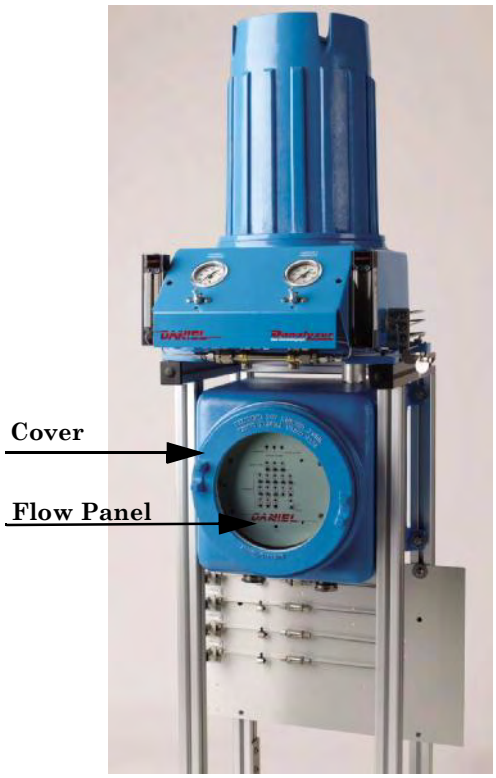



*Figure 3-1 Lower Enclosure Disassembly*

2. Carefully disconnect all of the ribbon cables from the boards in the card cage assembly (CPU, Analog, Modem, Ethernet, etc.).

**NOTICE**

**Note the location of the ribbon cables for ease of reassembly.**

**Flow Panel**

*Figure 3-2 Card Cage Cable Disassembly*

3. Use a Phillips head screw driver and remove the two screws located at the top of the card cage and one screw on the bottom left side of the card cage (not visible in the figure).

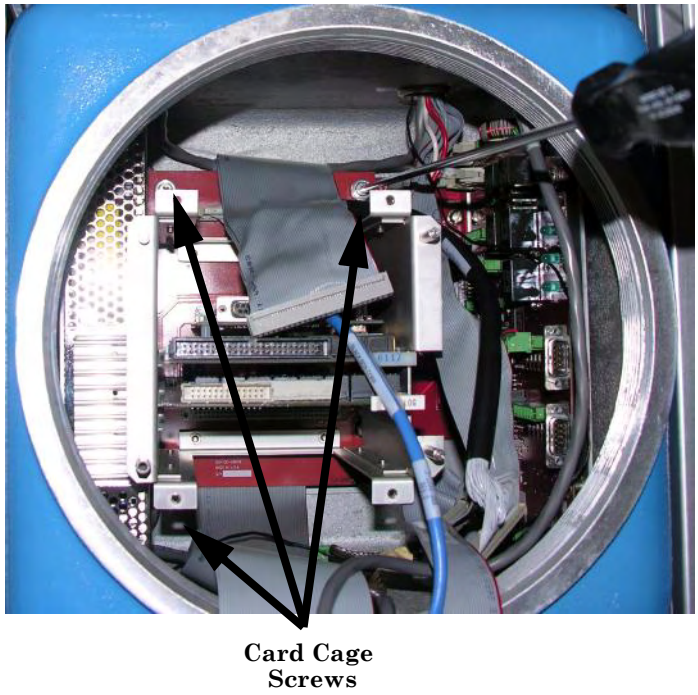



*Figure 3-3 Card Cage Assembly Screw Locations*

4. Slide the card cage assembly out of the lower enclosure.

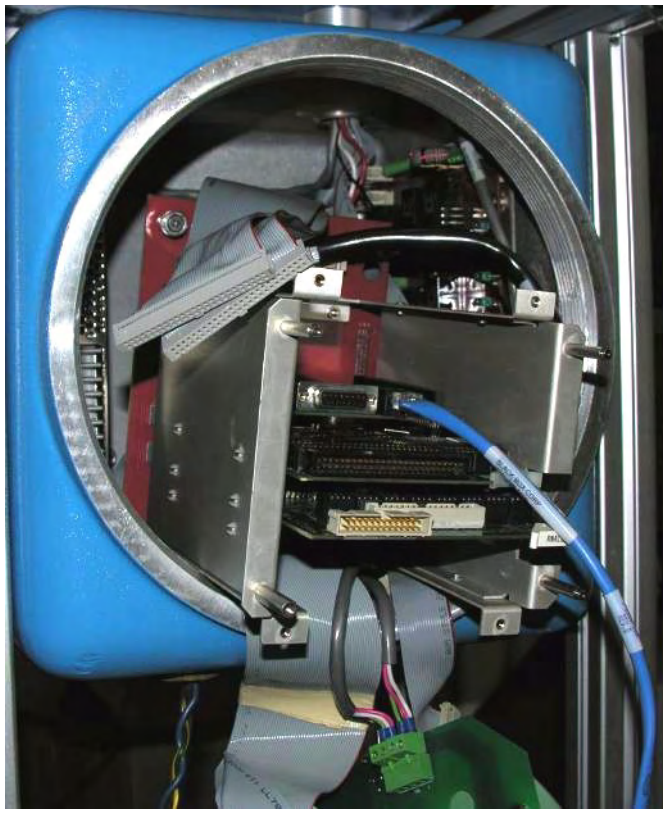


*Figure 3-4 Card Cage Disassembly*

5. User power and signal connections may be made with the card cage removed from the lower enclosure.

*Figure 3-5 Card Cage Disassembly for Power and Signal Wiring*

### 3.1.4 Signal Wiring

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

**CAUTION**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Observe all precautionary signs posted on the *Model 700* enclosure. Applicable to all digital and analog I/O lines connecting to the GC: Any loop of extra cable left for service purposes inside the GC housing must not be placed near any AC power lines.**

If this precaution is not followed, the data and control signals to and from the GC can be adversely affected.

- Metal conduit must be used for all process signal wiring.
- Metal conduit or cable (in compliance with EN 60079-14) used for process signal wiring must be grounded at conduit support points (intermittent grounding of conduit helps prevent induction of magnetic loops between the conduit and cable shielding).
- All process signal wiring should be a single, continuous length between field devices and the GC. If, however, length or 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 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.

### 3.1.5 Electrical and Signal Ground

Follow these general precautions for grounding electrical and signal lines:

- For shielded signal conducting cables, shield-drain wires must not be more than two AWG sizes smaller than the conductors for the cable. Shielding is grounded at only one end.
- Metal conduit used for process signal wiring must be grounded at conduit support points (intermittent grounding of conduit helps prevent induction of magnetic loops between the conduit and cable shielding).
- A single-point ground (the outside case ground lug) must be connected to a copper-clad, 10-foot long, 3/4-inch diameter steel rod, which is buried, full-length, vertically into the soil as close to the equipment as is practical (note: the grounding rod is not furnished.)

- 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 AWG 9 (6mm$^2$) 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 GC and the copper-clad steel ground rod must be sized according to the following specifications:

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

- All inter-enclosure equipment-grounding conductors must be protected by metal conduit.
- External equipment, such as data printers, that are connected to the GC should be powered via isolation transformers to minimize the ground loops caused by the internally shared safety and chassis grounds.

### 3.1.6 Electrical Conduit

Follow these general precautions for conduit installation:

- Conduit cutoffs must be square. Cutoffs must be made by a cold cutting tool, hacksaw, or by some other approved means that does not deform the conduit ends or leave sharp edges.
- All conduit fitting-threads, including factory-cut threads, must be coated with a metal-bearing conducting grease, such as Crouse-Hinds STL or equivalent, 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 GC explosion-proof housing to prevent vapor passage and accumulation of moisture.
- Use liquid-tight conduit fittings, such as Myers Scru-tite or similar, for conduits exposed to moisture.

When conduit is installed in hazardous areas (e.g., areas classified as NEC Class I, Division 1, Groups B, C, and D), follow these general precautions for conduit installation:

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Observe all precautionary signs posted on the equipment. Consult your company policies and procedures and other applicable requirements documents to determine wiring and installation practices that are appropriate for hazardous areas.**

Failure to do so may result in injury to personnel or cause damage to the equipment.

- All conduit runs must have a fitting, which contains explosion-proof sealing (potting) located within 18 inches from the conduit entrance to the explosion-proof housing.
- 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.

### 3.1.7 Sample System Requirements

Observe the following guidelines for installing GC sample systems:

**CAUTION**

**Stream switching requires a sample pressure of 20 psig.**

**CAUTION**

**The calibration gas stream inlet is the last stream inlet following the sample gas.**

**Line Length:**

If possible, avoid long sample lines. In case of a long sample line, flow velocity can be increased by decreasing downstream pressure and using by-pass flow via a speed loop.

**Sample Line Tubing Material:**

- Use stainless steel tubing for noncorrosive streams.
- Ensure tubing is clean and free of grease (see Figure 3-6 for details).

**Model 700 Upper Enclosure**

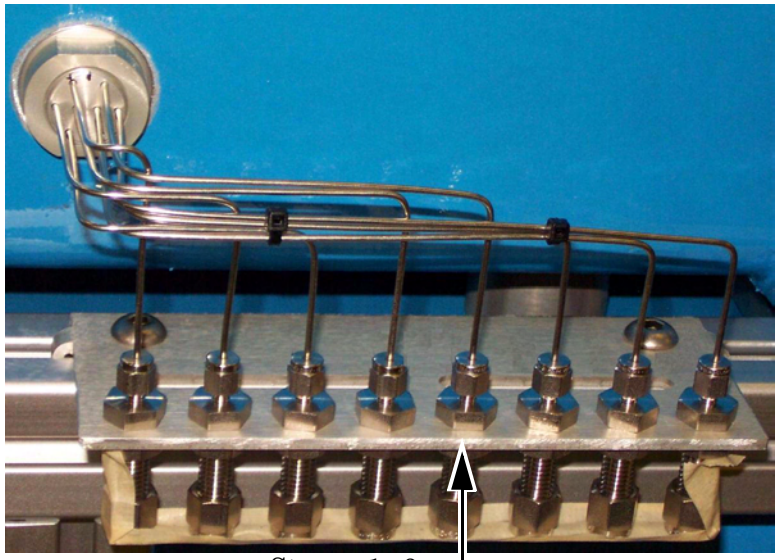



*Figure 3-6 Stream Inlets (Right side of unit)*

**Dryers and Filters:**

Use small sizes to minimize time lag and prevent back diffusion.

- Install a minimum of one filter to remove solid particles. Most applications require fine-element filters upstream of the GC. The Model 700 hardware includes a 2 micron filter.
- *Do* use ceramic or porous metallic type filters. *Do not* use cork or felt filters.

**Pressure Regulators and Flow Controllers:**

- *Do not* use types containing cork or felt filters, or absorbent diaphragms.

**Pipe Threads, Dressing:**

- *Do* use Teflon tape. *Do not* use pipe thread compounds (dope).

**Valving:**

- Install a block valve downstream of sample takeoff point for maintenance and shutdown.
- Block valve should be needle valve or cock valve type, of proper material and packing, and rated for process line pressure.

**NOTICE**

**Install the probe/regulator first, *immediately* followed by the coalescing filter and then the membrane filter.**

**See Appendix C for a recommended natural gas installation.**

## 3.2 PREPARATION

Your Model 700 GC was started and checked out before it left the factory. Program parameters were installed and documented in the PC Config Report furnished with your Model 700.

### 3.2.1 Site Selection

Install the GC as close as possible to the sample system but allow for adequate access space for maintenance tasks and adjustments. Allow a minimum of 14 inches (36 cm) in front for enclosure opening and access.

- Allow a minimum of 14 inches (36 cm) above the top of the dome enclosure for dome removal and access.
- Ensure that exposure to radio frequency (RF) interference is minimal.

### 3.2.2 Unpacking the Unit

See the following checklist for unpacking the unit and inspecting for damage:

1. Unpack the equipment:
   - Model 700 system
   - software and manuals
   - documentation package
2. Ensure that all documentation and software are included:
   - this manual Model 700 *Gas Chromatograph System Reference Manual* (P/N 3-9000-521)
   - the software manual, MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522)
   - diskette(s) or CD-ROMs with the MON2000 *Software for Gas Chromatographs Windows* software program, Modbus Test software program, and GC applications (P/N 2-3-2350-400)

3. Remove any packing materials from internal areas of the unit (particularly in the dome enclosure).

Installation and startup should proceed only if all required materials are on hand and free from obvious defects.

**If any parts or assemblies appear to have been damaged in shipment**, first file a claim with the carrier. Next, complete a full report describing the nature and extent of the damage and forward this report immediately to Daniel Measurement Services for further instructions (see the Customer Repair Report at the back of this manual). Include complete model number information. Disposition instructions will be returned immediately.

### 3.2.3 Model 700 Installation Arrangements

**NOTICE**

**The wall should be strong enough to support the 200 lb. load.**

The Model 700 GC can be ordered for installation in the following mounting arrangements (see drawing P/N DE-20993):

- wall mount
- pole mount
- floor mount

**Wall Mount**

The simplest arrangement is wall mount (see drawing P/N DE-20993). The unit has two mounting ears on each side. The ear-holes are used to attach the unit to a wall.

The uppermost of the holes should be about 30 inches from the floor for the most efficient use of the unit.

The space between the enclosures and the wall (1.3 inches) allows adequate access above and around the unit.

**Pole Mount**

The pole mount arrangement uses mounting ears as attachment points for the plates clamped to a pole (see drawing P/N DE-20993). The plates accept the recommended u-bolt systems for the 2 inch, 3 inch or 4 inch nominal pipe sizes. The base attachment of the pole being used must be able to accommodate the weight of the unit.

**Floor Mount**

The floor mount arrangement includes additional external framing that creates a free-standing unit (see drawing P/N DE-20993). The mounting ears, located on the base of the frame, are used to anchor the unit to a floor or instrument pad. The frame, also provides a means for attaching sample-conditioning plates or for anchoring tubing-runs.

### 3.2.4 Required Tools and Components

You will need these tools and components to install the Model 700:

- zero grade carrier gas (99.995% pure, with less than 5 ppm water, and less than 0.5 ppm hydrocarbons)
- high pressure dual-stage regulator for the carrier gas cylinder, high side up to 3000 pounds per square inch, gauge (psig), low side capable of controlling pressure up to 150 psig
- calibration standard gas with correct number of components and concentrations (see Appendix Table C-1)

- dual-stage regulator for the calibration gas cylinder, low pressure side capable of controlling pressure up to 30 psig
- sample probe regulator (fixture for procuring the stream, or sample gas for chromatographic analysis)
- coalescing filter
- membrane filter
- 1/8-inch stainless steel (SS) tubing for connecting calibration standard to GC, 1/8 inch SS tubing for connecting carrier gas to the GC, 1/8-inch SS tubing for connecting stream gas to the GC
- heat tracing (as required) for sample transport and calibration lines
- miscellaneous Swagelok tube fittings, tubing benders and tubing cutter
- 14 AWG (American Wire Gauge) (18 Metric Wire Gauge) or larger electrical wiring and conduit to provide 115 or 230 volts AC, single phase, 50 to 60 Hertz, from an appropriate circuit breaker and power disconnect switch (see guidelines in Section 3.1.2)
- liquid leak detector (Snoop or equivalent)
- digital volt-ohm meter with probe-type leads
- flow measuring device such as Set-A-Flow (P/N 4-4000-229)
- open-end wrenches sized 1/4, 5/16, 7/16, 1/2, 1/16 and 5/8-inch

### 3.2.5 Supporting Tools and Components

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Do not use a PC or a printer in a hazardous area. Serial port and Modbus communications links are provided to connect the unit to the PC and to connect to other computers and printers in a safe area.**

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

Supporting tools and components include:

- Use an IBM-compatible PC and either a direct or remote communications connection to interface with the Model 700 system. See Section 2.1 of the MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522) for more information on specific PC requirements.
- The Model 700 comes with serial Port 2 on the Field Termination Board (FTB) factory-wired with a DB 9-pin connection. Use the provided serial cable (P/N 3-2350-068) to hookup to a PC. See Table A-4 for more information regarding these connections.

**NOTICE**

**You can use the serial cable installed for the Model 700.**

**For straight-through serial cable installation and fabrication instructions, see Appendix A.**

If a different serial cable is used to connect from the PC to the pre-wired DB 9-pin, follow these specifications:

| Terminal | Connection |
|---|---|
| DB 9-pin male | Serial Port 2 |
| DB 9-pin male<br>DB 25-pin female | PC serial port |

- Use items necessary for connecting the GC to a network or other type of remote data transfer system (an example item might be an RS-232/RS-485 conversion box for long distance serial transmission), as applicable.
- Use a printer, connected either at the PC or the GC unit, to record analysis and other data. See Section 3.4.6 for wiring information.

## 3.3 MODEL 700 INSTALLATION

### 3.3.1 DC Power Supply

**WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Ensure that the 24 VDC input power source is switched OFF before connecting the wires. Also, ensure that the 24 VDC input power is S.E.L.V. compliant by suitable electrical separation from other circuits.**

Failure to follow these warnings may result in injury or death to personnel or cause damage to the equipment.

**CAUTION**

**D**

**AMAGE TO EQUIPMENT**

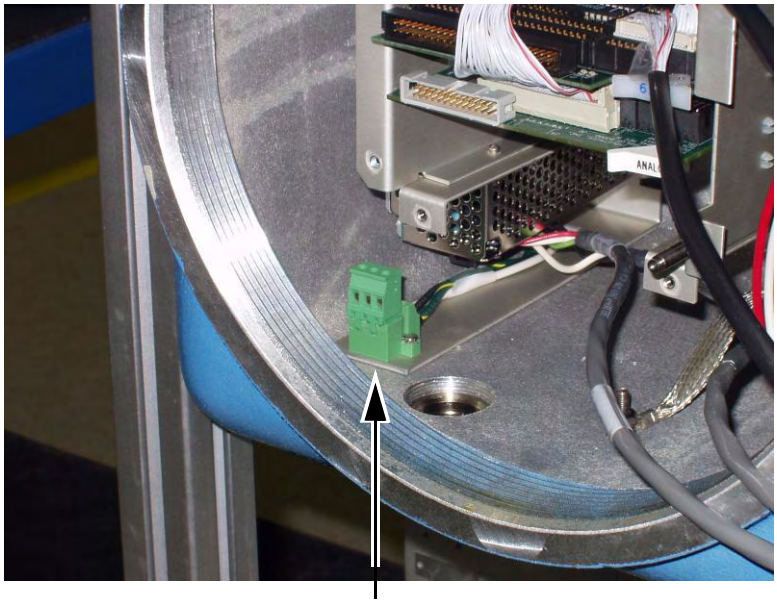
**Check the unit prior to wiring to determine if it is equipped for DC power.**

Failure to observe this precaution may damage equipment.

To connect 24 VDC power to the GC:

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

**Model 700 Lower Enclosure**



**DC Power Wiring**

*Figure 3-7 DC Power Wiring*

2. Bring the two leads in through the left entry on the bottom of the lower enclosure. Connect to the termination plug provided with the unit.

   Use the following table for the DC power wiring details:

*Table 3-1 DC Power Wiring*

| Attribute | Wire Color |
|---|---|
| + (positive) | red |
| – (negative) | black |

**NOTICE**

**A new version of the Solenoid/Heater Driver Board that includes the Diode protection will soon be released.**

3. Each board that connects to the 24 VDC is protected from lead reversal by the use of blocking diodes. The following boards are connected to the 24 VDC:
   - Field Termination Board
   - Isolated Analog Output Option Board
   - Solenoid/Heater Driver board
   - Micro-FID/TCD Preamplifier Board

   If the Red (+) and Black (-) leads are inadvertently reversed, no damage will occur, however, the system will not power on.
4. Connect the DC power leads to the power disconnect switch that is properly fused. The recommended fuse size is 10 Amps.

### 3.3.2 Optional AC – DC Power Converter

To connect 115 or 230 VAC power to the GC:

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Check the unit prior to wiring to determine if it is equipped for optional AC power.**

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

1. Locate the plug-together termination block inside the lower enclosure (located on the lower left side behind the power supply).

**Model 700 Lower Enclosure**

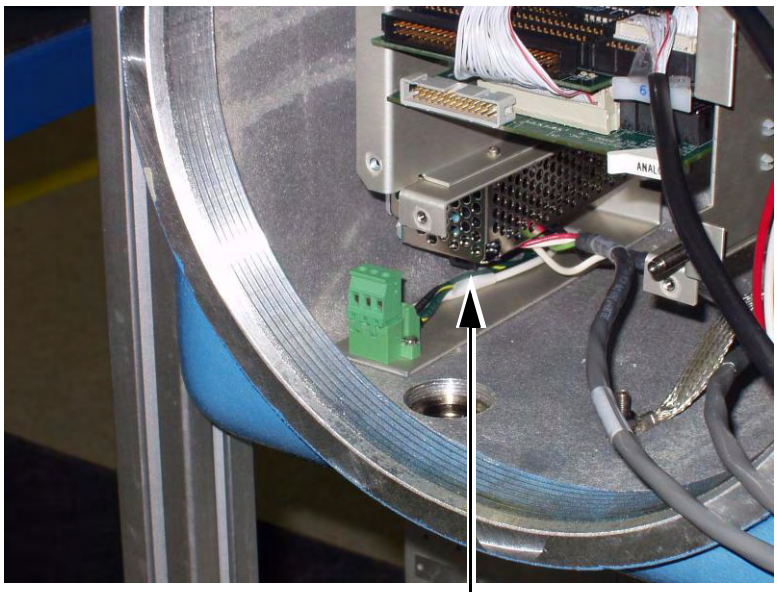



*Figure 3-8 AC/DC Power Converter*

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

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

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

**CAUTION**

**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.**

Failure to observe this precaution may cause damage to equipment.

AC wiring is usually colored as:

*Table 3-2 AC Wiring*

| Attribute | Wire Color |
|---|---|
| hot | brown or black |
| neutral | blue or white |
| ground | green or green |

2. Bring the power leads in through the left entry on the bottom of the enclosure.
3. If necessary, connect the GC chassis ground to an external copper ground rod (at remote locations). See Section 3.1.5 regarding electrical and signal grounding.

### 3.3.3 Sample and Gas Lines

**NOTICE**

**Use SS tubing. Keep tubing clean and dry internally to avoid contamination. Before connecting the sample and gas lines, flow clean air or gas through them. Blow out internal moisture, dust, or other contaminants.**

To install GC sample and gas lines:

1. Remove the plug from the Sample Vent (SV) line (1/16-inch tubing marked "SV" located on the Flow Panel Assembly).
   - If desired, connect the SV line 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 1/4-inch or 3/8-inch tubing for vent lines longer than 10 feet.

   Note that, at this stage in the installation, the GC Measure Vent (MV) line (marked "MV") remains plugged until leak checks are completed. For regular operation, however, the MV line must be unplugged, or open.

   Do not discard the vent line plugs. They are useful at any time when leak-checking the GC and its sample or gas line connections.

2. Connect carrier gas to the GC. (The carrier gas inlet is a 1/8-inch tee fitting located on the left side of the upper enclosure.)

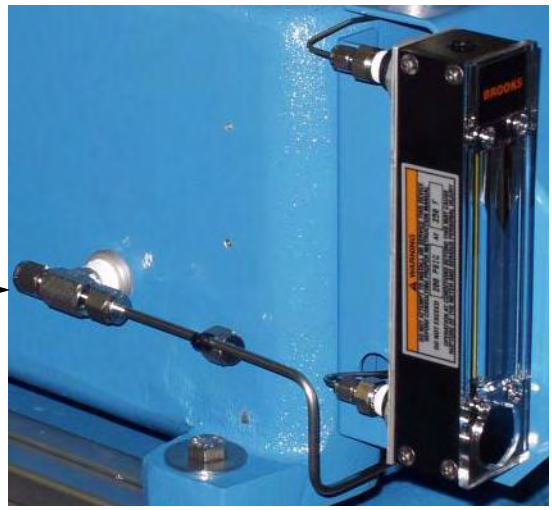
**CAUTION**

**MAY CAUSE INJURY TO PERSONNEL OR EQUIPMENT DAMAGE**

**Do not turn on gas until you have completed leak checking the carrier and sample lines (see Step 5).**

Failure to follow this precaution may cause injury to personnel or damage equipment.

**Model 700 Lower Enclosure**




- Use 1/8-inch or 1/4-inch stainless steel tubing to conduct carrier gas.
- Use a dual-stage regulator with high-side capacity of 3000 psig and low-side capacity of 150 psig.

- See Appendix C for a description of a dual-cylinder carrier gas manifold (P/N 3-5000-050) with these features:.
  - Carrier gas is fed from two bottles.
  - When one bottle is nearly empty (100 psig), the other bottle becomes the primary supply.
  - Each bottle can be disconnected for refilling without interrupting GC operation.

**NOTICE**

**The first stream is the calibration gas stream.**

3. Connect calibration standard gas to the GC
   - Use 1/8-inch stainless steel tubing to conduct calibration standard gas.
   - Use a dual-stage regulator with low-side capacity of up to 30 psig.

**NOTICE**

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

- The Calibration gas inlet is the last inlet following the sample gas (see Figure 3-9).

**Model 700 Upper Enclosure**

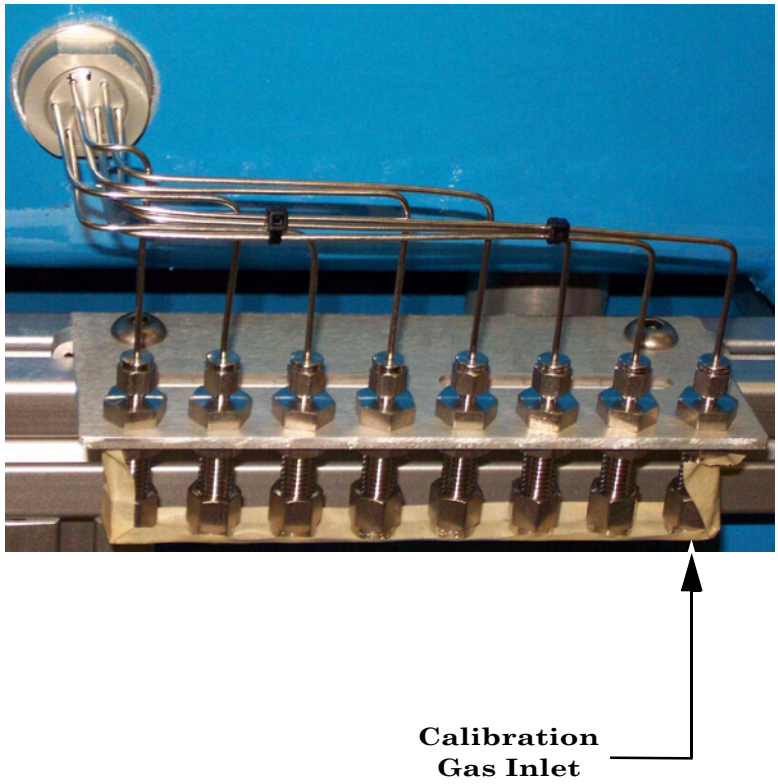



*Figure 3-9 Calibration Gas Stream Inlet (Right side of unit)*

4. Connect sample gas stream(s) to the GC.
   - Use 1/8-inch or 1/4-inch stainless steel tubing to conduct calibration standard gas.
   - Ensure that pressure of sample line is regulated to maintain 15 to 30 psig (±10%).

- Gas stream inlet(s) are identified (see Figure 3-10) for details.

**Model 700 Upper Enclosure**

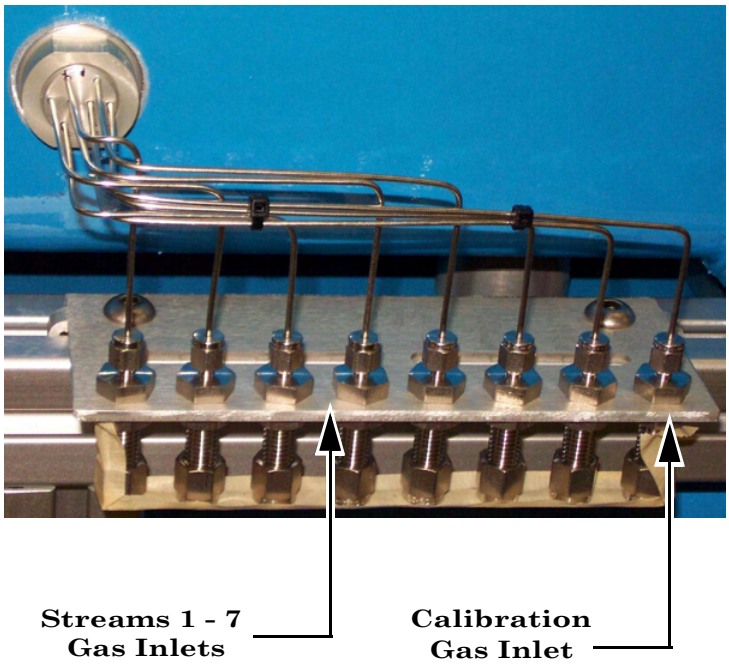



*Figure 3-10 Sample Stream Inlets (Right side of unit)*

5. After all lines have been installed, proceed with leak checking the carrier and sample lines. See Section 3.5.1; note that it requires the AC power to be turned on at the GC.

## 3.4 SETTING THE COM ID

**NOTICE**

**Follow the steps in this section only if you wish to do the following:**

- **Change the Com ID setting.**
- **Visually inspect and verify the DIP switch settings.**

The Model 700 Com ID is determined by dual inline package (DIP) switch settings.

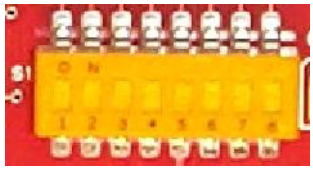


*Figure 3-11 Dip Switch*

In most cases, the Com ID configuration made at the factory will not need to be changed. The factory DIP switch settings produce a Com ID of 1.

### 3.4.1 Inspect or Change the Com ID

**NOTICE**

**Note that the MON2000 software Com I.D.s will override the hardware settings. To use the hardware Com I.D. configuration, enter a zero '0' in the MON2000 Com I.D, settings. For details, refer to MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522).**

To visually inspect and verify the DIP switch settings or to change the Com ID settings on the multifunction board,

1. Remove the dome from the upper enclosure.

**CAUTION**

**MAY CAUSE INJURY TO PERSONNEL OR EQUIPMENTDAMAGE**

**Use caution when accessing an enclosure. A voltage of 115 to 230 VAC, along with various DC voltages, are present.**

Failure to follow this precaution may cause injury to personnel or damage equipment.

2. Loosen the thumb screws on the Oven System mounting plate.

3. Carefully lift up the assembly and rotate so that the enclosure opening is accessible.

**Model 700 Upper Enclosure**

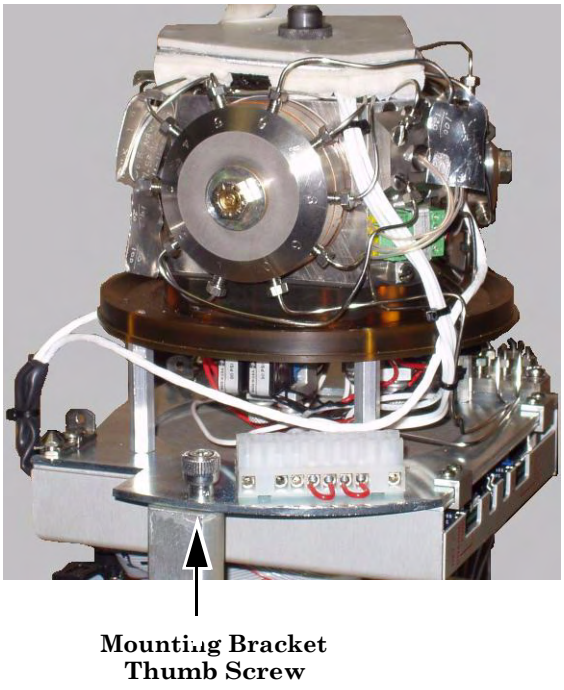



*Figure 3-12 Oven Mounting Bracket*

4. Locate the multifunction board. It is mounted on a bracket towards the center of the upper enclosure.

**Model 700 Upper Enclosure**

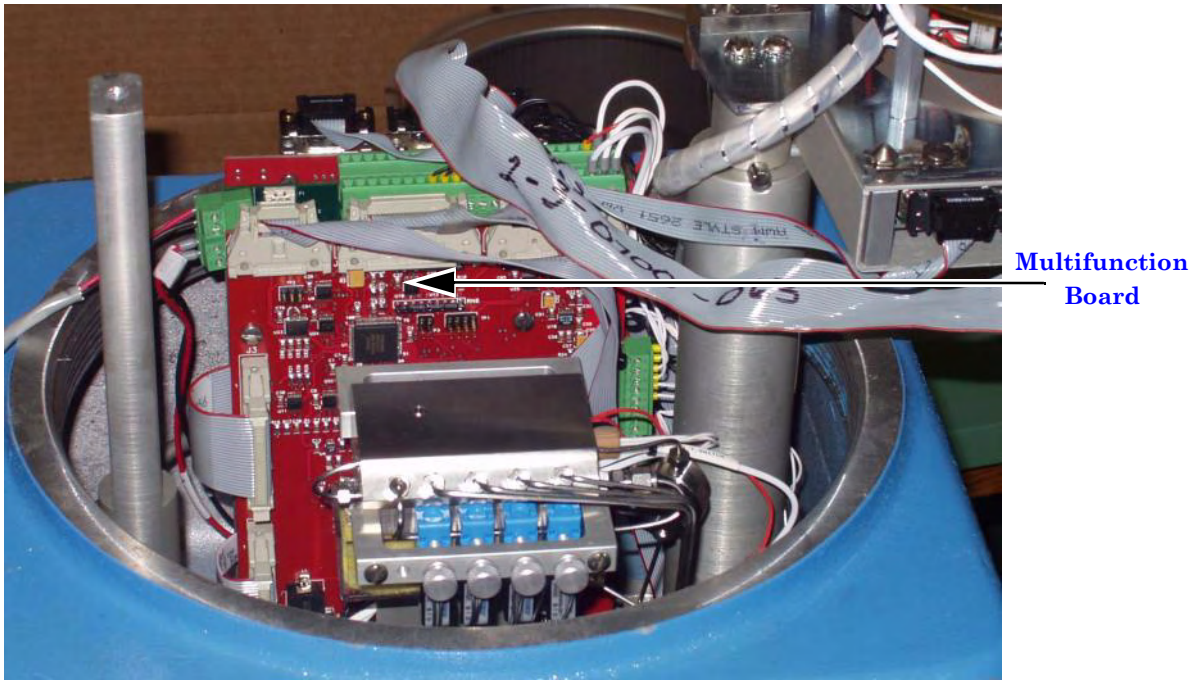



*Figure 3-13 Multifunction Board Location*

5. On the multifunction board, locate the Modbus slave address (Com ID) DIP switch. It is labeled "S1" and mounted on the lower right corner of the board.

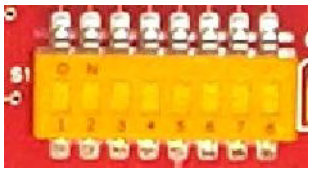


*Figure 3-14 Dip Switch*

6. Inspect or change the DIP switch as necessary, using the wiring diagram as a guide (see Table 3-3).
   - Make settings on switch S1 located on the multifunction board.
   - Switches "1" through "5" form a 5-bit binary number for setting the Modbus slave address (also known as *Com ID* or *Device ID).*
   - Switch number "1" is the least significant bit, and switch number "5" is the most significant bit. Set these switches either ON or OFF.
   - Switch "6" and "7" are spares and switch "8" is used to cold start the processor (see Table 3-4).

   Use the GC maintenance records to document any changes made to the switch settings.

*Table 3-3 Modbus Slave Address (Com ID) DIP Switch Settings*

| Com ID | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | ON | OFF | OFF | OFF | OFF |
| 2 | OFF | ON | OFF | OFF | OFF |
| 3 | ON | ON | OFF | OFF | OFF |
| 4 | OFF | OFF | ON | OFF | OFF |
| 5 | ON | OFF | ON | OFF | OFF |
| 6 | SPARE | | | | |
| 7 | SPARE | | | | |
| 8 | COLD START | | | | |

*Table 3-4 Switch Positions for Cold Start*

| | 8 |
|---|---|
| Normal (Run) | OFF |
| Cold Start | ON |

### 3.4.2 Preparing for Serial Connections

The method for operating a Model 700 system is from a connected personal computer (PC). The PC must be:

- Running MON2000 software (version 2.2 or later). See the MON2000 *User Manual* (P/N 3-9000-522) for more information.
- Connected to the Model 700 via a serial link.

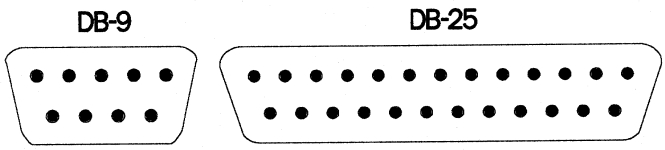
This section addresses the basic ways to wire a serial connection between a PC and the GC system.

Before connecting a PC to the Model 700, determine the following:

1. What serial ports are available at the PC?

   When you select one, consider these points:

   - Standard PC serial ports are type RS-232.
   - Usually there are two external serial port jacks on a PC, located on the rear panel. Most often, they are either DB-9 or DB-25 male (see below).




   - PC serial ports can be used by other peripheral equipment attached to the PC, such as a printer, mouse, or modem, etc.

     To determine which PC serial ports are already being used by other equipment and which port can be used for connecting to the GC, note existing serial connections, refer to your PC user manual, and use diagnostic software (such as Norton Utilities).

2. What serial ports are available at the GC? The Model 700 **without the** Micro-FID comes equipped with three serial ports (standard), unless the customer needs a LOI Interface connection, then only two com ports are standard. The installation of the optional Com4A board (with or without a LOI) brings the total number of available serial ports to six.

**NOTICE**

**Model 700 software upgrades may be installed via any available Com Port.**

When you select a serial port, consider these points:

- Com1 and Com2 from the WinSystems CPU board (J1) to Field Termination board (J5 and J7) (standard configuration)
- Com3 from WinSystems CPU board (J6) to the multifunction board
- Com4 is reserved for the LOI (Local Operator Interface), if installed.

The Model 700 **with the** Micro-FID comes equipped with two serial ports (standard). The installation of the optional Com4A board bring the total number of available serial ports to six.

When you select a serial port, consider these points:

- Com1 and Com2 from the WinSystems CPU board (J1) to Field Termination board (J5 and J7) standard configuration
- Com3 from WinSystems CPU board (J6) to the multifunction board (J4)
- Com4 from the WinSystems board (J6) is connected to the Micro-FID/TCD Preamplifier board (J4)

For additional serial ports, the:

- Optional Com4A board may be installed at the factory. Com5 through Com8 are fully available to the user and are factory-configured to RS-232 protocol. See Appendix A for additional options (RS-422/485).
- With the optional Com4A board installed, six Com ports are available to the user.

3. Is the connection to be made in a …
   - Short distance between the PC and GC?
   - With temporary or permanent cable connection?

   See Section 3.4.3, FTB Connection (RS-232).
4. Is the connection to be made with a …
   - Short distance between the PC and GC?
   - Permanent cable connection (see Section 3.4.4).
5. Is the connection to be made with a …
   - Long distance between the PC and GC?
   - Permanent cable connection (see Section 3.4.5).

### 3.4.3 FTB Connection (RS-232)

The easiest way to connect a PC to the GC is with an off-the-shelf, straight-through serial cable connected to the GC serial port DB 9-pin connector pre-wired on the FTB.

1. Obtain a straight-through serial cable with these specifications:
   - 50 feet long (or less)
   - DB 9-pin or DB 25-pin female plug at one end (for PC connection)
   - DB 9-pin male plug at the other end (for GC connection)
2. Connect the serial cable plugs to the appropriate serial port jacks at the PC and GC. Use the MON2000 software to monitor and operate the GC as needed.

**NOTICE**

**You can buy this cable from most computer supply retailers.**

**If, however, it is necessary to custom-wire a cable because of circumstances, see guidelines provided in Appendix B.**

**NOTICE**

**For detailed information concerning serial communications, refer to Appendix A.**

### 3.4.4 PC to GC Cable Short Distance Connection (RS-232)

The PC-GC connection is made with straight-through serial cable connected to one of the GC internal serial ports on the FTB.

If the length of cable can be 50 feet or less, connect the serial cable to one of the GC serial ports configured for RS-232. (Recall that output from a standard PC serial port follows RS-232 serial definition.) Cable that is longer than 50 feet, when used for RS-232 serial transmission, can result in spurious loss or corruption of data.

To connect your PC to one of the Model 700 serial port jacks:

1. Access the GC FTB (see Figure 3-15). located on the right wall of the lower enclosure.

**Model 700 Lower Enclosure**

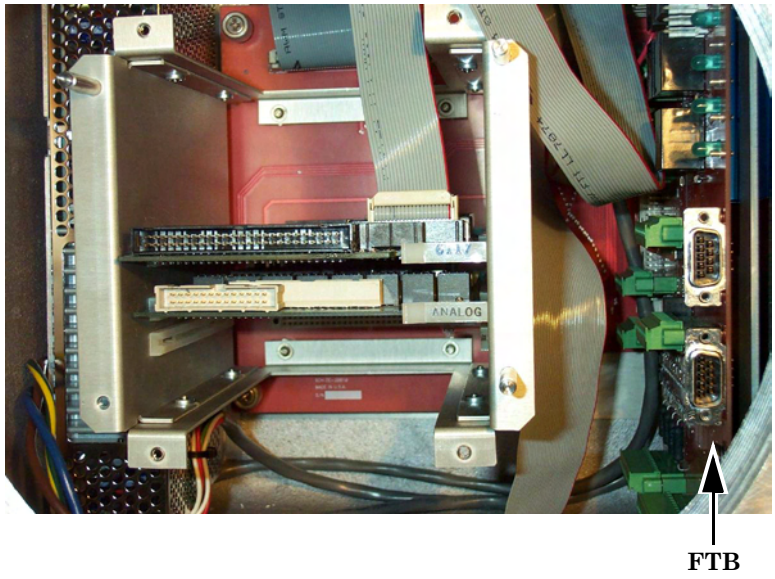



*Figure 3-15 Field Termination Board*

2. Choose an available serial port on the FTB (see P/N CE-21157 in Appendix D) that is configured for RS-232 protocol.

   Unless specified by the customer, serial ports are configured for RS-232.

   For further details, see Figure 3-16 and Figure 3-17.

**NOTICE**

**Model 700, standard configuration, has two communications ports available on the FTB; Com1 and Com2.**

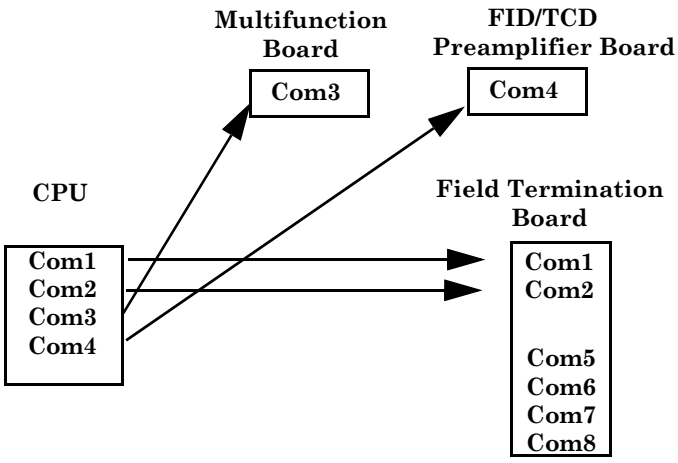



*Figure 3-16 Configuration without Com4A Board*

**NOTICE**

**Com 4 is dedicated to the Micro-FID/TCD Preamplifier. When the LOI becomes available, it will use a video board instead of a serial port connection.**

**NOTICE**

**Model 700, with the Com 4A board installed, has six communications ports available on the FTB; Com1 and Com2, and Com5, Com6, Com7, and Com8.**

**NOTICE**

**Com 4 is dedicated to the Micro-FID/TCD Preamplifier. When the LOI becomes available, it will use a video board instead of a serial port connection.**

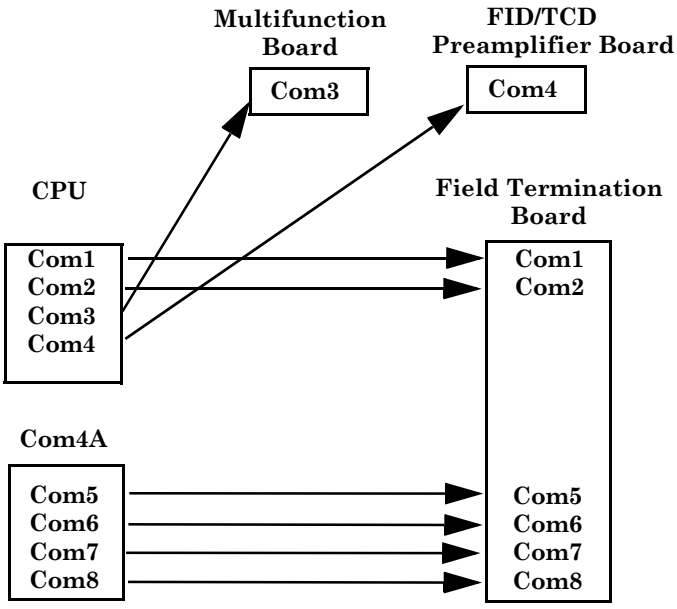



*Figure 3-17 Configuration with Com4A Board*

3. Connect the appropriate serial cable.

   If using a direct 6 conductor serial cable, connect the exposed cable leads to the FTB serial port. A pinout of a female DB 9-pin socket is shown in Figure 3-18.

**NOTICE**

**See Appendix A for instructions on fabricating a direct serial cable.**

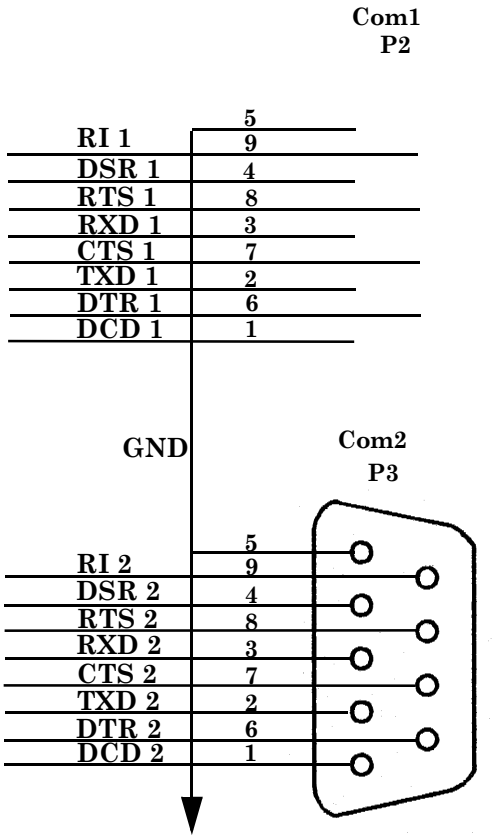



*Figure 3-18 FTB Com1 and Com2 DB 9-pin Connector*

4. Field Termination Board serial communications settings are shown in Figure 3-19 through Figure 3-23.

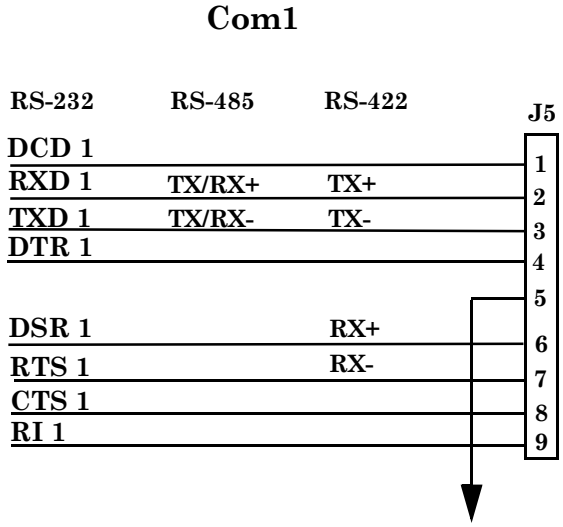



*Figure 3-19 FTB Com 1 DB 9-pin Phoenix Connector*

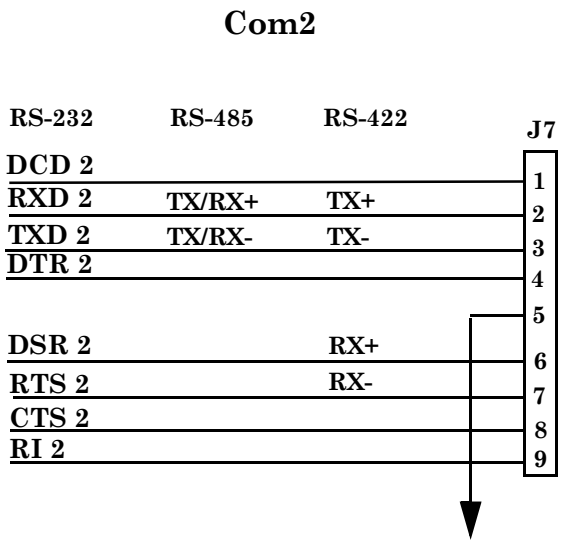



*Figure 3-20 FTB Com2 DB 9-pin Phoenix Connector*

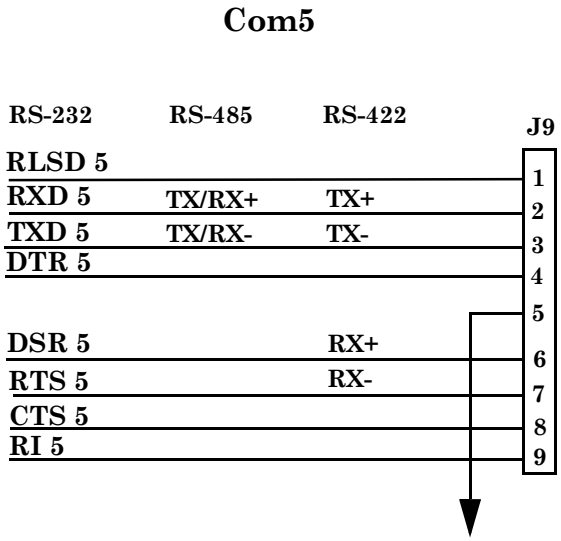



*Figure 3-21 FTB Com5 DB 9-pin Phoenix Connector*

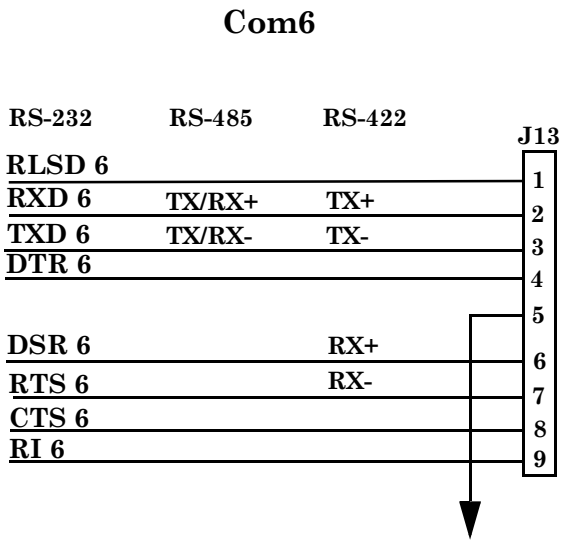



*Figure 3-22 FTB Com6 DB 9-pin Phoenix Connector*

## Com7

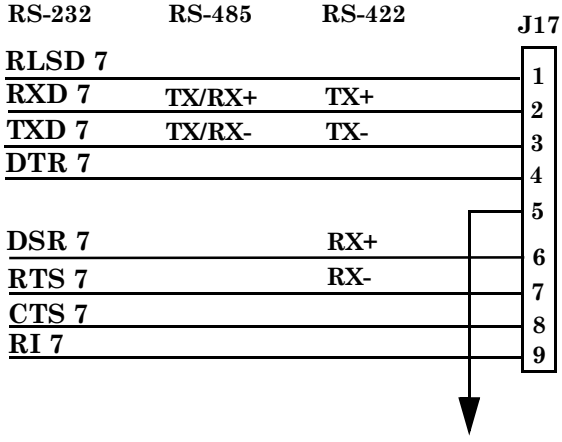



*Figure 3-23 FTB Com7 DB 9-pin Phoenix Connector*

## Com8

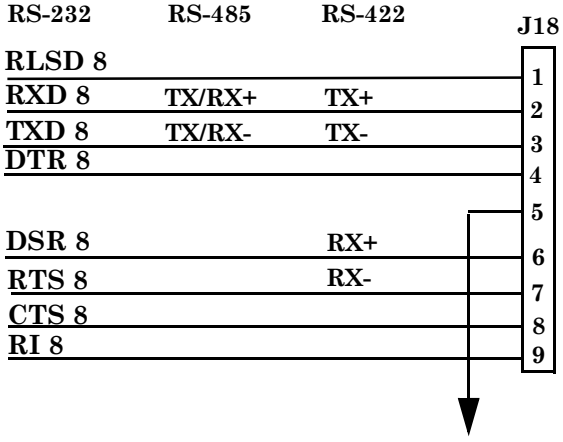



*Figure 3-24 Com8 DB 9-pin Phoenix Connector*
*GC Phoenix Plug Port*

To make an RS-232 serial connection between one of the Phoenix Plug serial ports of the GC, and an external modem with DB 25-pin serial port, you will need to manufacture the cable and its DB 25-pin, male plug cable end as illustrated below (see Figure 3-25).

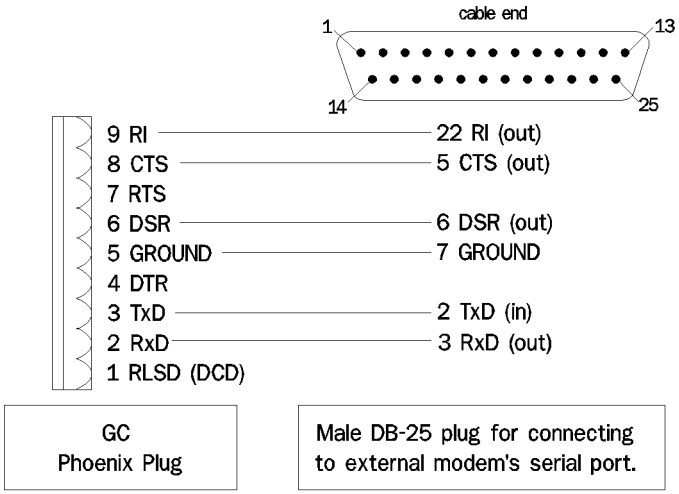



*Figure 3-25 GC Phoenix Plug Port to External Modem DB 25-pin Port*

### 3.4.5 Long Distance Connection (RS-422, RS-485)

RS-422 and RS-485 serial protocols are recommended for longer distance serial connections between the PC and GC System (i.e., distances greater than the 50 feet).

To connect your PC to one of the internal Model 700 RS-422/RS-485 serial port jacks:

5. Obtain the following equipment:
   - An asynchronous line driver (or interface device) with RS-232 input and RS-422/RS-485 output. See Appendix A for example brand and model.
   - Shielded, computer-grade, twisted pair cable (to connect the asynchronous line driver device to the GC).
   - A straight-through serial cable (to connect the PC to the line driver).
6. Connect the straight-through serial cable from the PC serial port to the RS-232 serial port of the line driver device. Then connect the twisted pair cable to the RS-422/RS-485 serial port of the line driver.
7. Configure the line driver for data communications equipment (DCE) operation. See Appendix A for an example configuration.
8. Access the GC FTB (see Figure 3-15 in Section 3.4.2).
9. Choose an available serial port on FTB that is configured for RS-422 or RS-485 serial protocol, and connect the twisted pair cable from the line driver. See Appendix A for example connection. Also see Figure 3-19 through see Figure 3-23 for a list of ports and terminals assigned for serial communications.

**NOTICE**

**Serial ports Com1 through Com3 are configured by default for RS-232.**

**For further details or instructions on how to configure these ports to RS-422/485, see Appendix A.**

### 3.4.6 GC-Printer Wiring

**NOTICE**

**The GC uses only a generic printer driver. The PC printer allows more control and better quality output.**

A printer can be connected directly to the GC the Field Termination Board (FTB) at one of the serial ports. The type and scheduling of reports produced at the GC printer are determined by settings made in MON2000 (from the Reports menu, select GC Report Request and/or GC Printer Control; see the *MON2000 Software for Gas Chromatographs User Manual* (P/N 3-9000-522) for more information).

To connect a printer to the GC serial port:

1. Access the GC FTB (see Figure 3-15 in Section 3.4.2).
2. Choose an available serial port on the FTB that is configured for RS-232 serial protocol.
3. After the wiring connections have been completed, use MON2000 to configure the GC serial port.
   (a) From the Application menu, select *Serial Ports*. The Serial Ports window appears.
   (b) Select the appropriate Port row and set *Usage* to "Report", *Protocol* to "ASCII" and *RW* to "W".
   (c) Ensure that the *Com ID* setting is correct.
   (d) Leave all other settings at the default values (see the MON2000 *User Manual* for more information).

**NOTICE**

**See Appendix A for a complete listing of the serial ports and corresponding pinouts to fabricate a serial printer cable.**

### 3.4.7 Discrete Digital I/O Wiring

The Field Termination Board (P/N 3-0700-010) has five discrete outputs and four discrete inputs.

**Discrete Digital Inputs**

To connect digital signal input/output lines to the GC (P/N 3-0700-010):

1. Access the FTB (see Figure 3-26) (P/N 3-0700-010).

**Model 700 Lower Enclosure**

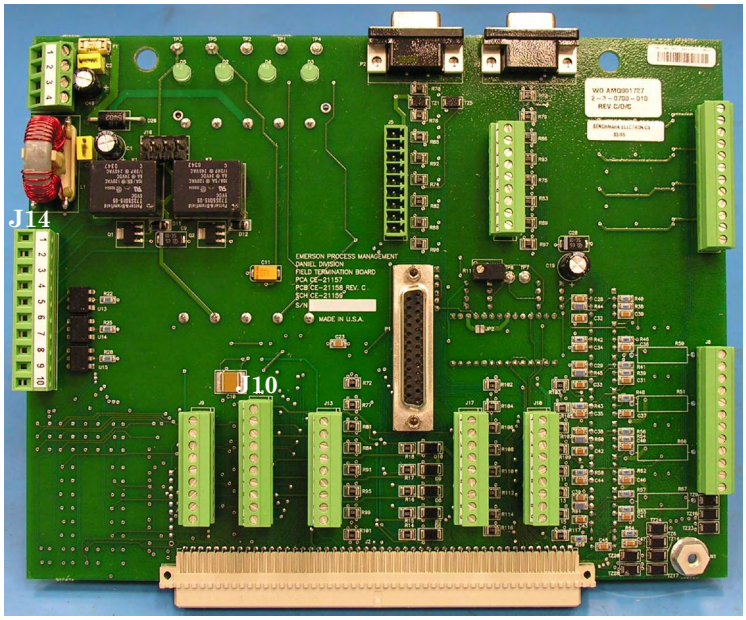



*Figure 3-26 Field Termination Board*

The FTB has five discrete outputs and four discrete inputs. The discrete input, DIG_IN4, is dedicated to a pressure switch. The discrete inputs are located on J10 (10 pin Phoenix connector).

2. Route digital I/O lines appropriately, especially in the case of the explosion-proof enclosure.

   There are connections for four digital inputs and five digital output lines (Phoenix 10-pin connector), as follows:

*Table 3-5 FTB Discrete Digital Inputs*

| J10 | Function | Description |
|---|---|---|
| Pin 1 | DIG_IN1 | |
| Pin 2 | GND | |
| Pin 3 | DIG_IN2 | |
| Pin 4 | GND | |
| Pin 5 | DIG_IN3 | to customer |
| Pin 6 | GND | |
| Pin 7 | DIG_IN4 | dedicated to a pressure switch |
| Pin 8 | GND | dedicated to a pressure switch |
| Pin 9 | DIG_IN5 | |
| Pin 10 | GND | |

**Discrete Digital Outputs**

The discrete outputs are located on J14 (P/N 3-0700-010) (Phoenix 10-pin connector) have two “Form A” relays on the FTB. Outputs 3-5 are Solid State switches with a rating of .375A @30 VDC. The relays, with sealed enclosures, have a contact current rating of 1.0 Amperes each (see Figure 3-26).

For discrete digital outputs, see Table 3-6.

*Table 3-6 FTB Discrete Digital Outputs*

| J14 | Function |
|---|---|
| Pin 1 | DIG_OUT |
| Pin 2 | DIG_OUT |
| Pin 3 | DIG_OUT |
| Pin 4 | DIG_OUT |
| Pin 5 | DIG_OUT_ 3+ |
| Pin 6 | DIG_OUT_ 3- |
| Pin 7 | DIG_OUT_ 4+ |
| Pin 8 | DIG_OUT_ 4- |
| Pin 9 | DIG_OUT_ 5+ |
| Pin 10 | DIG_OUT_ 5- |

### 3.4.8 Analog Input Wiring

There are four analog inputs on the Field Termination Board (P/N 3-0700-010 and drawing CE-21157) located at J4 (12-pin Phoenix connector).

*Table 3-7 FTB Analog Inputs*

| J4 | Function |
|---|---|
| Pin 1 | VIN+_1 |
| Pin 2 | VIN-_1 |
| Pin 3 | Shield |
| Pin 4 | VIN+_2 |
| Pin 5 | VIN-_1 |
| Pin 6 | Shield |
| Pin 7 | VIN+_3 |
| Pin 8 | VIN-_1 |
| Pin 9 | Shield |
| Pin 10 | VIN+_4 |
| Pin 11 | VIN-_1 |
| Pin 12 | Shield |

### 3.4.9 Analog Output Wiring

There are four standard analog outputs on the standard FTB (P/N 3-0700-010 and drawing CE-21157); located at J8 (12-pin Phoenix connector). Additionally, if installed, the optional analog board has eight analog outputs

*Table 3-8 FTB Analog Outputs*

| J8 | Function |
|---|---|
| Pin 1 | IOUT+_1 |
| Pin 2 | IOUT-_1 |
| Pin 3 | Shield |
| Pin 4 | IOUT+_2 |
| Pin 5 | IOUT-_2 |
| Pin 6 | Shield |
| Pin 7 | IOUT+_3 |
| Pin 8 | IOUT-_3 |
| Pin 9 | Shield |
| Pin 10 | IOUT+_4 |
| Pin 11 | IOUT-_4 |
| Pin 12 | Shield |

There are eight analog outputs on the optional analog output board (P/N 2-3-0580-037 and drawing CE-21157); located at J3 (24-pin Phoenix connector):

*Table 3-9 Optional Analog Outputs*

| J3 | Function |
|---|---|
| Pin 1 | IOUT+_5 |
| Pin 13 | IOUT-_5 |
| Pin 2 | Shield |
| Pin 14 | IOUT+_6 |
| Pin 3 | IOUT-_6 |
| Pin 15 | Shield |
| Pin 4 | IOUT+_7 |
| Pin 16 | IOUT-_7 |
| Pin 5 | Shield |
| Pin 17 | IOUT+_8 |
| Pin 6 | IOUT-_8 |
| Pin 18 | Shield |
| Pin 7 | IOUT+_9 |
| Pin 19 | IOUT-_9 |
| Pin 8 | Shield |
| Pin 20 | IOUT+_10 |
| Pin 9 | IOUT-_10 |
| Pin 21 | Shield |
| Pin 10 | IOUT+_11 |
| Pin 22 | IOUT-_11 |
| Pin 11 | Shield |
| Pin 23 | IOUT+_12 |
| Pin 12 | IOUT+_12 |
| Pin 24 | Shield |

### 3.4.10 Optional Boards

Optional modem boards are available for the Model 700 GC.

The jumper settings and pinouts for each board is shown below.

**Optional WinSystems Modem**

*Table 3-10 J8 Modem Board Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |
| 3 and 4 | In |
| 5 and 6 | In |
| 7 and 8 | In |

*Table 3-11 J9 Modem Board Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |
| 5 and 6 | In |

*Table 3-12 J10 Modem Board Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |
| 3 and 4 | In |
| 5 and 6 | In |
| 9 and 10 | In |
| 15 and 16 | In |

### Optional Radicom Modem Settings

*Table 3-13 J26 Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |

*Table 3-14 J27Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |

*Table 3-15 J30 Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |

*Table 3-16 J31 Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 2 and 3 | In |

### Ethernet Settings

*Table 3-17 J1 PCM-NE2000 Ethernet Board Jumper Settings*

| Pin(s) | Position |
|---|---|
| 15 and 16 | In |
| 17 and 18 | In |
| 21 and 22 | In |

*Table 3-18 J2 PCM-NE2000 Ethernet Board Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |

*Table 3-19 J3 PCM-NE2000 Ethernet Board Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |
| 7 and 8 | In |

## 3.5 LEAK CHECKS AND PURGING FOR FIRST CALIBRATION

Apply AC power to the unit after verifying all electrical connections are correct and safe. Ensure that all interconnections and external signal connections have been verified and proper grounds have been made before turning on the power.

### 3.5.1 Initial Leak Check

The focus of this section is for field connections to the analyzer, during the installation process. See Section 4.6 for an in depth discussion of analyzer leak checks.

**Carrier Gas Line Leak Checks**

1. Plug the Measure Vent (labeled "MV") to block the free flow of Carrier Gas through the GC.
2. *Slowly* pressurize the "GC side" of the Carrier Gas to 110 psig (±2 percent) with the dual-stage regulator at the Carrier Gas cylinder.
3. After two minutes, shut off the Carrier Gas bottle valve by turning it clockwise. Then, observe the high-side regulator gauge on the Carrier Gas bottle.
   - The gauge should not bleed down more than 200 psig in 10 minutes.
   - If Carrier Gas is lost at a faster rate, then all tube fittings between the Carrier Gas bottle and the GC (including the dual-stage regulator) must be checked for leaks and tightened if necessary.

**NOTICE**

**The GC does not have an inline Block Valve to shut off the Carrier Gas flow.**

Most leaks at this stage (Installation and Setup) are usually found between the Carrier Gas bottle and the GC.

The dual-stage regulator fitting connecting to the Carrier bottle, may not seat properly with some Carrier Gas bottles and allow a leak. If this occurs, carefully wrap a small length of Teflon tape around the tip of the inlet tube on the dual-stage regulator (which sits against the Carrier Gas bottle valve seat).

4. Once the GC passes the "Initial leak check", reopen the Carrier Gas bottle valve and remove the Measurement Vent (MV) plug.

**Calibration Line Leak Check**

1. Slowly pressurize the Calibration line (up to 20 psig).
2. Block-in the line by turning the "Cal Stream" blocking valve clockwise until seated.
3. Shut off the Calibration gas at the gas bottle by turning the valve clockwise.
4. Observe the high-side of the Calibration gas dual-stage regulator making sure the pressure holds. The pressure should not decrease for a period of two to three minutes.
5. When the GC passes the "Initial Calibration Gas leak check", re-open the Calibration gas bottle valve and the in-line "Cal Stream" block valve.

**Sample Lines (Streams) Leak Check**

1. Slowly pressurize the Sample line (up to 20 psig).
2. Block-in the line.
3. Observe the regulator, making sure the pressure holds. The pressure should not decrease for a period of two to three minutes.
4. When the GC passes the "Initial Sample Gas leak check", re-open the Sample Gas lines.

### 3.5.2 Purging Carrier Gas Lines

Purging carrier and calibration gas lines requires AC power.

**NOTICE**

**Tubing should be clean and dry internally. During installation, the tubing should have been blown free of internal moisture, dust, or other contaminants.**

To purge the Carrier Gas lines,

1. Ensure that the MV vent line plug has been removed, and the vent line is open.
2. Ensure that the Carrier Gas bottle valve is open.
3. Set the Carrier Gas line pressure at 110 psig. Use the dual stage regulator at the Carrier Gas bottle to adjust pressure.
4. Turn ON the AC power to the GC.
5. Establish communications with the GC via the MON2000 software. (Use the *File* > *Quick Connect* menu path; see Section 2.7.2 in the MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522) for more information.)

**NOTICE**

**Do not use the "Carrier Pressure Adjust" regulator adjustment (on the Flow Panel Assembly) to adjust Carrier Gas line pressure. This pressure is factory-set and should not be adjusted.**

**NOTICE**

**A period of 4 to 8 hours (or overnight) is recommended, during which all of the settings described in Steps 1 through 7 are maintained. No other settings should be made.**

6. Use the *Applications>Temperature Control menu path to access this function*. The readouts of the block, column and SSS heater controllers should indicate that the unit is warming up. Also, the yellow and red status indicators on the FTB4 should be on.
7. Allow the GC system temperature to stabilize and the Carrier Gas lines to become fully purged with Carrier Gas.
8. Select the Auto Sequence Function. Use the *Control > Auto Sequence* menu path described in Section 4 of the MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522).

### 3.5.3 Purging Calibration Gas Lines

To purge the calibration gas lines, as preparation for first calibration:

1. Ensure that the Carrier Gas lines have been fully purged, as described in the previous section, and that the SV plug has been removed.
2. Close the calibration gas bottle valve.
3. Fully open the block valve associated with calibration gas feed (the block valve should be located on lower right-hand corner of the front panel).

   See Section 5.8 in the MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522) for instructions on selecting streams.
4. Open the calibration gas bottle valve.
5. At the calibration gas bottle regulator, increase outlet pressure to 20 psig, ±5%.
6. Close the calibration gas bottle valve.
7. Let both gauges on the calibration gas bottle valve bleed down to 0 (zero) psig.
8. Repeat Steps 4 through 7, five times.
9. Open the calibration gas bottle valve.

## 3.6 SYSTEM STARTUP

To perform system start-up,

1. For system startup, run an analysis of the calibration gas.

   (a) If equipped with an optional stream switching board, ensure that the stream switch for the calibration stream is set to AUTO.

   Otherwise, ensure that the calibration gas supply is turned on and set to the correct pressure (25 to 30 PSIG).

   (b) Using the MON2000 software, run a single stream analysis on the calibration stream. Once proper operation of the GC is verified, halt the analysis.

   Use the *Control* > *Calibration and Control* > *Halt* menu paths; see Sections 4.3 and 4.4 in the MON2000 *Software for Gas Chromatographs User Manual (*P/N 3-9000-522*)* for more information.

2. Start Auto Sequence of the line gas stream(s).

   Use the *Control* > *Auto Sequence* menu path; see Section 4.1 in the MON2000 *Software for Gas Chromatographs User Manual (*P/N 3-9000-522*)* for more information. The GC will begin the Auto Sequence analysis mode.

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# MAINTENANCE AND TROUBLESHOOTING

## 4.1 TROUBLESHOOTING AND REPAIR CONCEPT

The most efficient method for maintaining and repairing the Model 700 GC system is a component-replacement concept that allows you to return the system to operation as quickly as possible. Sources of trouble, such as printed-circuit assemblies, valves, etc., are identified during troubleshooting test procedures and are replaced at the lowest level practical with units in known working order. The defective components are then either repaired in the field or returned to Daniel Measurement Services (DMS) for repair or replacement.

## 4.2 ROUTINE MAINTENANCE

The Model 700 GC system will perform accurately for long periods with very little attention (except for maintaining the Carrier Gas cylinders). A bimonthly record of certain parameters will assist greatly in assuring that your Model 700 is operating to specifications. The maintenance checklist should be filled out bimonthly, dated, and kept on file for access by maintenance technicians as necessary (see Table 4-1).This gives you a historical record of the operation of your Model 700, enables a maintenance technician to schedule replacement of gas cylinders at a convenient time, and allows quick troubleshooting and repair when it becomes necessary.

A chromatogram, a Configuration Report, and a Raw Data Report should also be made and filed with the checklist, furnishing a positive dated record of the Model 700. The chromatogram and reports can also be compared to the chromatograms and reports run during the troubleshooting process.

### 4.2.1 Bimonthly Maintenance Checklist

Copy the sample maintenance checklist as necessary for your files (see Table 4-1). If you have a problem, please complete the checklist and reports, and have the results available when calling DMS with a problem. Also have the Sales Order number. The Sales Order number can be found on the nameplate located on the left side wall of the upper housing of the Model 700. The chromatograms and reports archived when your Model 700 left the factory are filed by this number.

*Table 4-1 Maintenance Checklist*

| **Date Performed:** | **Sales Order Number:** | | |
|---|---|---|---|
| **System Parameters** | **As Found** | **As Left** | **Nominal** |
| **Carrier Gas Cylinder** | | | |
| Cylinder Pressure Reading (High) | ____ psig | ____ psig | ____ psig |
| Cylinder Pressure Outlet Reading | ____ psig | ____ psig | 110 psig |
| Carrier Pressure Panel Regulator | ____ psig | N/A | 85 psig |
| **Sample System** | | | |
| Sample Line Pressure(s) | (1)____ psig | ____ psig | 20 psig |
| | (2)____ psig | ____ psig | 20 psig |
| | (3)____ psig | ____ psig | 20 psig |
| | (4)____ psig | ____ psig | 20 psig |
| | (5)____ psig | ____ psig | 20 psig |
| Sample Flows | (1)___ cc/min | ____cc/min | 40-60 cc |
| Sample Vent 1 (SV1) | (2)___ cc/min | ____cc/min | 40-60 cc |
| Sample Vent 2 (SV2) | (3)___ cc/min | ____cc/min | 40-60 cc |
| | (4)___ cc/min | ____cc/min | 40-60 cc |
| | (5)___ cc/min | ____cc/min | 40-60 cc |
| **Calibration Gas** | | | |
| High Pressure Reading | ____ psig | ____ psig | |
| Outlet Pressure Reading | ____ psig | ____ psig | 20 psig |
| Flow | ____ cc/min | ___ cc/min | 40-60 cc |

### 4.2.2 Routine Maintenance Procedures

- Complete the maintenance checklist bi-monthly. Place the sales order number, date, and time on the form and file it. This gives you a basis for comparison in the future if you need it.
- Save a Chromatogram of the operating Model 700 on the PC with the MON2000 software. Print Configuration, Calibration, and Raw Data reports and file them with the MON2000.
- Check the printer paper (if used) to ensure that a sufficient supply of paper remains. Check carrier and calibration gas supplies.

### 4.2.3 Contact Service

Daniel Measurement Services (DMS) offers maintenance service programs that are tailored to fit specific requirements. Contracts for service and repair can be arranged by contacting the DMS at the address or telephone number on the Customer Repair Report at the back of this manual.

## 4.3 ACCESS TO GC EQUIPMENT ELEMENTS

### 4.3.1 Electrical/Electronic Components

**WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**The explosion-proof housing should not be opened when the unit is exposed to an explosive environment. If access to the explosion-proof housing is required, precautions must be taken to ensure that an explosive environment is not present.**

Failure to do so may result in injury to personnel or cause damage to the equipment.

The Model 700 electrical/electronic components are located in the upper and lower explosion-proof housings. All of the electrical/electronic components are fully accessible from the front and top of the Model 700.

**Model 700 Micro-FID Assembly**

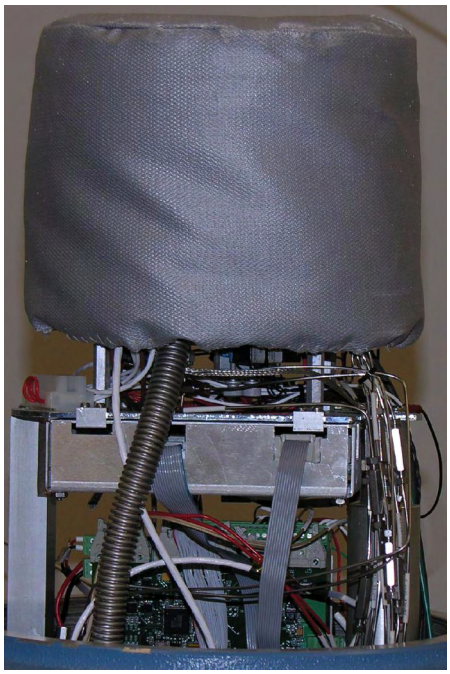


*Figure 4-1 Model 700 with TCD/Micro-FID Front View*

**Model 700 with TCD Upper Enclosure**

- Multifunction Board
- Dual Methods Adapter Board
- Dual Methods Preamplifier Board
- Solenoid Heater/Driver Board

**Model 700 with TCD Lower Enclosure**

- WinSystems CPU Board
- Analog Board
- Analog Board (optional)
- Com4A Board (optional)
- Ethernet Board (optional)
- Radicom Modem board (optional)
- DC/DC Field Termination Board

**Model 700 with Micro-FID/TCD Upper Enclosure**

- Multifunction Board
- Solenoid/Heater Driver Board
- Micro-FID/TCD Preamplifier Board
- Micro-FID/TCD Preamplifier Power Supply Board
- Micro-FID Connector Board

**Model 700 with Micro-FID/TCD Lower Enclosure**

- Field Termination Board
  - Backplane Board
  - Interconnect Board
- WinSystems CPU (with PC104 interface)
- Com4A PC/104 Board (optional)

**NOTICE**

**The optional Radicom Modem is always mounted on top of the PC//104 card stack.**

- Ethernet Board (optional)
- Radicom Modem Board (optional)
- Eight Channel Analog (non-isolated 4-20mA) Output Board (optional)
- Four Channel Analog (isolated 4-20mA) Output Board (optional)
- Front Panel Analytical and Stream Switch Panel
- Dual Methods Adapter Board

**Model 700 Lower Enclosure Electronics**

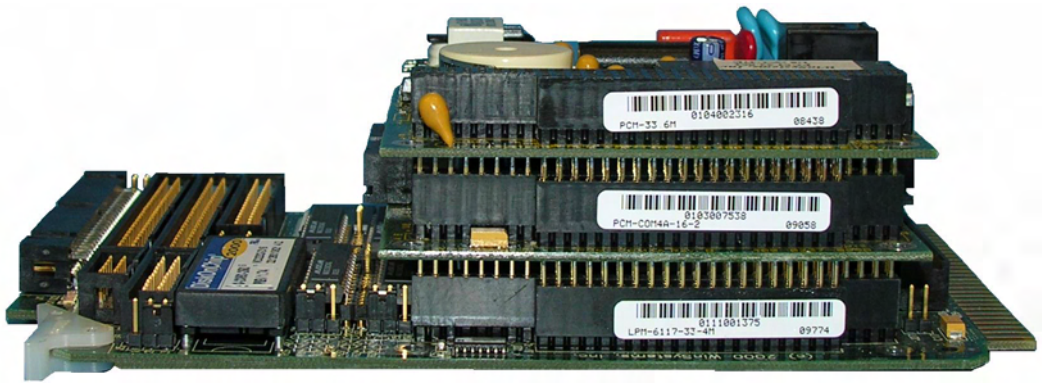


*Figure 4-2 CPU, Com4A, and Modem Boards*

### 4.3.2 Detector Elements, Heater Elements, Valves and Columns

The detector elements, heater elements, valves and columns are located in the upper explosion-proof housing of the Model 700 GC.

Remove the thermal cover and insulating shield to gain access to these components.

**Model 700 Upper Enclosure**


*Figure 4-3 Upper Explosion-proof Housing*

**NOTICE**

**The optional Ethernet board is not shown, but plugs into the CPU board or the Com4A board.**

The detector elements, including the Micro-FID, are located in the block (TCD) and on the Micro-FID Base attached to the valve block.

**Model 700 TCD Upper Enclosure**

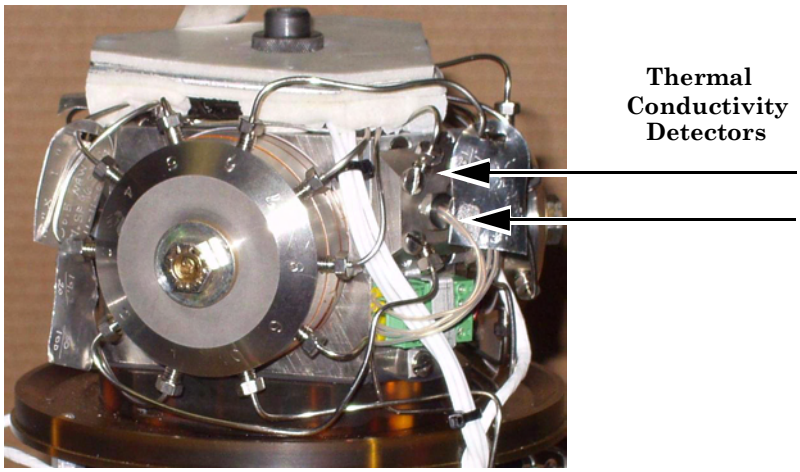



*Figure 4-4 Thermal Conductivity Detector*

**Model 700 Micro-FID Upper Enclosure**

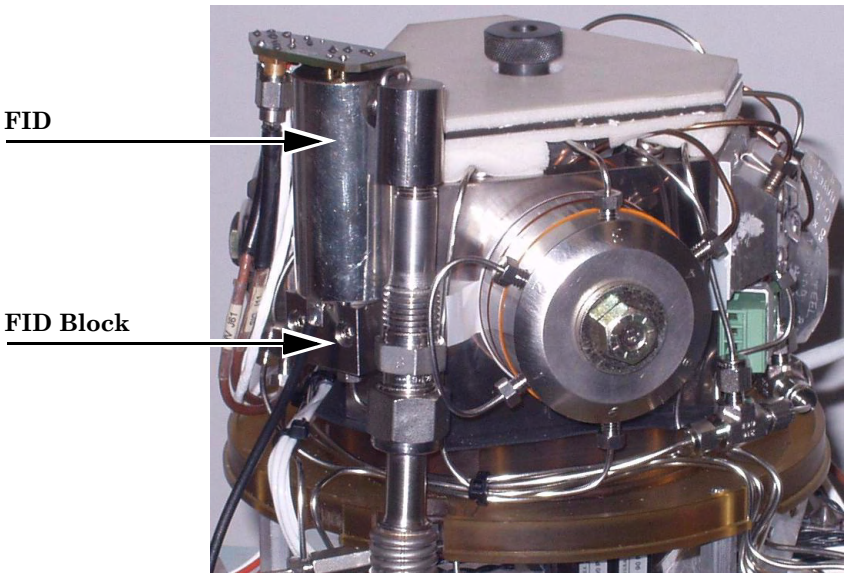



*Figure 4-5 Flame Ionization Detector*

There are five heater elements: three valve block heaters, the column heater, and the stream switching system heater (see Figure 4-4).

The stream switching heater is a cartridge heater inserted into the stream switch block (manifold).

The column heater is a cartridge heater located in the middle of the column mandrel.

The block heaters are cartridge heaters located in the corners of the block. Column and block heaters are identical and are installed from the underside of the manifold (plastic base) of the oven.

## 4.4 PRECAUTIONS FOR HANDLING PC ASSEMBLIES

Printed circuit assemblies contain CMOS integrated circuits, which can be damaged if the assemblies are not properly handled. The following precautions must be observed when working with the assemblies:

- Do not install or remove the Model 700 printed circuit assemblies while power is applied to the units.
- 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.
- Maintain contact with a grounded surface to prevent static discharge when installing or removing printed circuit assemblies.

## 4.5 GENERAL TROUBLESHOOTING

NOTICE

**Correct ALL alarms before re-calibration.**

This section contains general troubleshooting information for the Model 700. The information is arranged as appropriate either by major subsystems or by major functions of the instrument. See Table 4-2 for frequent possible causes of the hardware alarms.

### 4.5.1 Hardware Alarms

Use the following table to identify the alarm and possible cause to remedy the problem.

*Table 4-2 Basic Hardware Troubleshooting via Alarms*

| Alarm | Possible Cause |
|---|---|
| Application Checksum Failure | DiskOnChip |
| ROM Checksum Failure | DiskOnChip |
| RAM Diagnostics Failure | bad RAM |
| Micro-FID/TCD Preamplifier Alarms<br>Micro-FID Temperature High<br>Micro-FID Comm. Failure | extinguished flame |
| Analog Output 1 High | Measured value program for Analog Output 1 is greater than user-defined full scale range. |
| Analog Output 2 High | same as Analog Output 1 High |
| Analog Output 3 High | same as Analog Output 1 High |
| Analog Output 4 High | same as Analog Output 1 High |
| Analog Output 5 High | same as Analog Output 1 High |
| Analog Output 6 High | same as Analog Output 1 High |
| Analog Output 7 High | same as Analog Output 1 High |
| Analog Output 8 High | same as Analog Output 1 High |
| Analog Output 9 High | same as Analog Output 1 High |
| Analog Output 10 High | same as Analog Output 1 High |
| Analog Output 11 High | same as Analog Output 1 High |
| Analog Output 12 High | same as Analog Output 1 High |

*Table 4-2 Basic Hardware Troubleshooting via Alarms (Continued)*

| Alarm | Possible Cause |
|---|---|
| Analog Output 1 Low | Measured value program for Analog Output 1 is lower than user-defined zero range. |
| Analog Output 2 Low | same as Analog Output 1 Low |
| Analog Output 3 Low | same as Analog Output 1 Low |
| Analog Output 4 Low | same as Analog Output 1 Low |
| Analog Output 5 Low | same as Analog Output 1 Low |
| Analog Output 6 Low | same as Analog Output 1 Low |
| Analog Output 7 Low | same as Analog Output 1 Low |
| Analog Output 8 Low | same as Analog Output 1 Low |
| Analog Output 9 Low | same as Analog Output 1 Low |
| Analog Output 10 Low | same as Analog Output 1 Low |
| Analog Output 11 Low | same as Analog Output 1 Low |
| Analog Output 12 Low | same as Analog Output 1 Low |
| Analog Input High 1 | Measured value program for Analog Input 1 is greater than the user-defined full scale range. |
| Analog Input High 2 | Same as Analog Input 1 High |
| Analog Input High 3 | Same as Analog Input 1 High |
| Analog Input High 4 | Same as Analog Input 1 High |
| Analog Input Low 1 | Measured value program for Analog Input 1 is lower than the user-defined full scale range. |
| Analog Input Low 2 | Same as Analog Input 1 Low |
| Analog Input Low 3 | Same as Analog Input 2 Low |
| Analog Input Low 4 | Same as Analog Input 3 Low |
| Preamp Input 1 Out of Range | Indicates either Carrier Gas gone; air not purged from carrier lines; power failure; bad thermistors; preamp out of balance or failed; analyzer temperature low; interconnection wiring. |
| Preamp Input 2 Out of Range | same as Preamp Input 1 Out of Range |
| Preamp Input 3 Out of Range | same as Preamp Input 1 Out of Range |
| Preamp Input 4 Out of Range | same as Preamp Input 1 Out of Range |
| Preamp Failure | same as Preamp Input 1 Out of Range |
| Analyzer Failure | Indicates either the Carrier Gas is low (below 90 psig at Carrier Gas bottle) or gone; a bad solenoid; a Carrier Gas leak in system. |

*Table 4-2 Basic Hardware Troubleshooting via Alarms (Continued)*

| Alarm | Possible Cause |
|---|---|
| Power Failure | GC Controller has experienced a re-start since alarms were last cleared, caused by power failure. Automatically starts in RUN mode and runs calibration gas until it identifies all retention times or for a maximum of two hours before switching to line gas. |
| TCD<br>Fused Peak Overflow - Noisy Baseline | Air not purged from carrier lines; bad thermistors; shields. |
| RF% Deviation | Calibration gas low or out; valve timing error; faulty auto-calibration solenoid. |
| Warm Start Calibration Failure | same as RF% deviation |
| Valve Timing Failure | same as RF% deviation |

### 4.5.2 Troubleshooting Checklist

An online gas chromatograph can operate properly only if flows are balanced and constant, the temperature is constant, no leaks are present, and the GC Controller is correctly timed. Before going through the troubleshooting procedures, perform the routines of the Basic Hardware Troubleshooting via Alarms (see Table 4-2). Checklist records performed regularly may indicate problems and prevent any sudden breakdown.

Do not adjust any values if they are within the nominal tolerance values on the Checklist. Compare the values with those obtained in preceding weeks. This may pinpoint your problem immediately.

The following is a guide for troubleshooting if a problem with sample analysis occurs. See Table 4-2 for diagnostic data. This data will be useful if it becomes necessary to call DMS for assistance.

*Table 4-3 Troubleshooting Checklist*

| Description | As Found | As Left | Notes |
|---|---|---|---|
| **Analyzer** | | | |
| Leak check with "Snoop" from Carrier Gas bottle to Analyzer regulator. | | | |
| Leak check with "Snoop" from calibration standard to auto-calibration solenoid. | | | |
| Pre-amp balance voltage | _____mV | _____mV | 0 (±0.5 mV) |
| **Sample System** | | | |
| Leak check with "Snoop" from sample probe to sample solenoid | | | |
| **Controller Inputs** | | | |
| GRI (CH.1) 0.0 - 0.0 | | | |
| GRI (CH.2) 0.8 - 1.2 | | | |
| GRI (CH.3) 0.8 - 1.2 | | | |
| GRI (CH.4) 0.8 - 1.2 | | | |
| | _____ | _____ | 4800 to 6400 |
| **Value (12-bit AD)** | _____ | _____ | 4800 to 6400 |
| PAZ1 | _____ | _____ | 4800 to 6400 |
| PAZ2 | _____ | _____ | 9200 to 12000 |
| PAZ3 | | | |
| PAZ4 | | | |
| | _____ | _____ | -32767 to 32767 |
| **Value (16-bit AD)** | _____ | _____ | -32767 to 32767 |
| GC 1 | _____ | _____ | -32767 to 32767 |
| GC2 | _____ | _____ | -32767 to 32767 |
| GC3 | | | |
| GC4 | | | |

*Table 4-3 Troubleshooting Checklist (Continued)*

| Description | As Found | As Left | Notes |
|---|---|---|---|
| **Power Supply (DC – DC) Input Voltage Ranges:** (23V - 28VDC) | | | **NOTE: See Figure 4-6 through Figure 4-9 for test point locations.**<br><br>**FTB:**<br>+ 12V @ 0.25A (± 0.6)<br>+ 5V @ 3A (± 0.25V)<br>- 3.8V @ 0.1A (± 0.2V)<br>- 12 V @ 0.25A (C 0.6V)<br><br>**Dual Methods Adapter**<br>+ 20V @ 0.35A (± 1V)<br>- 20V @ 0.35A (± 1V)<br>+ 5VDC (± 0.25V)<br><br>**NOTICE**<br><br>**The Dual Methods Board is used on Model 700 GCs with 2350A Controllers.** |
| **Power Supply (AC – DC) Input Voltage Range:** (90–130/180-264 VAC) (Auto-ranging) | | | **SOL/HTR Driver**<br>N/A<br><br>**Output Voltage/Current:**<br>24.0VDC<br>**Output Power:**<br>Continuous load demand power, measured at the Output Terminals of the Power Supply, **shall not** exceed 140 Watts. |

*Table 4-3 Troubleshooting Checklist (Continued)*

| Description | As Found | As Left | Notes |
|---|---|---|---|
| **Chromatogram** | | | |
| Check baseline | | | |
| Check component values on report | | | |
| Number of peaks | | | |
| Retention times | | | |
| Date and file | | | |
| **Temperature** | | | |
| Column Module Temperature | ____ °C<br>____ °F | ____°C<br>____°F | 79.80 - 80.20 °C<br>175.64 - 176.36 °F |
| Valve Block Temperature | ____°C<br>____°F | ____ °C<br>____ °F | 79.80 - 80.20 °C<br>175.64 - 176.36 °F |
| Stream Switching System | ____ °C<br>____ °F | ____ °C<br>____ °F | 64.0 - 66.0 °C<br>147.2 - 150.8 °F |
| Sample System Temperature | ____ °C | ____ °C | ** |
| **Measure Vent Flow** | | | |
| Valve 3 ON<br>Valve 3 OFF | ___ cc/min<br>___ cc/min | ____ cc/min<br>____ cc/min | 12-18 cc/min<br>± 2 cc between Valve 3 states of ON / OFF |

**Refer to System Operational Parameters

### 4.5.3 Test Points Dual Methods Board and FTB

This section applies to Model 700 GCs with the TCD and 2350A Controllers. If your Model 700 GC is equipped with an Micro-FID or LSIV this section does not apply.

Use the test points in Figure 4-6 through Figure 4-9 to ensure that the voltage meets specifications on the Dual Methods Adapter Board and the Field Termination Board (see Table 4-3 for voltage specifications).

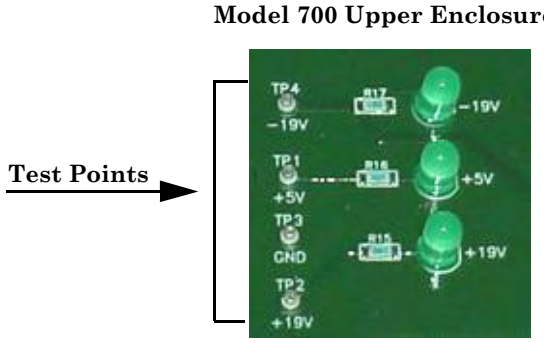
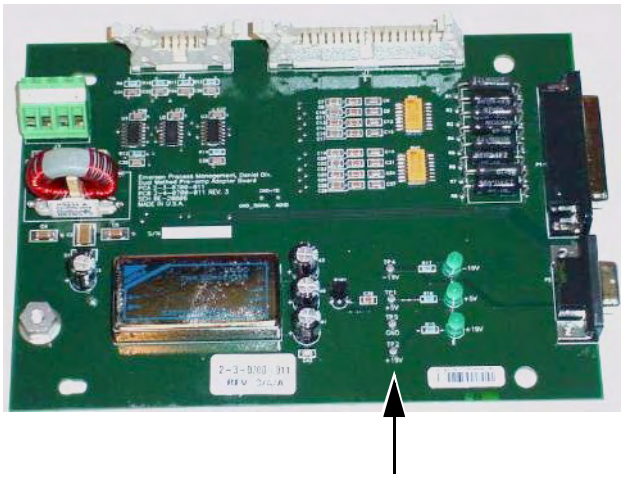



*Figure 4-6 Test Points Dual Methods Board (Cut View)*

**Model 700 Upper Enclosure**



**Dual Methods Bd. Test Points**

*Figure 4-7 Test Points Dual Methods Board*

**Model 700 Lower Enclosure**

**FTB Test Points**


*Figure 4-8 Test Points Field Termination Board (Cut View)*

**Model 700 Lower Enclosure**

**Test Points**

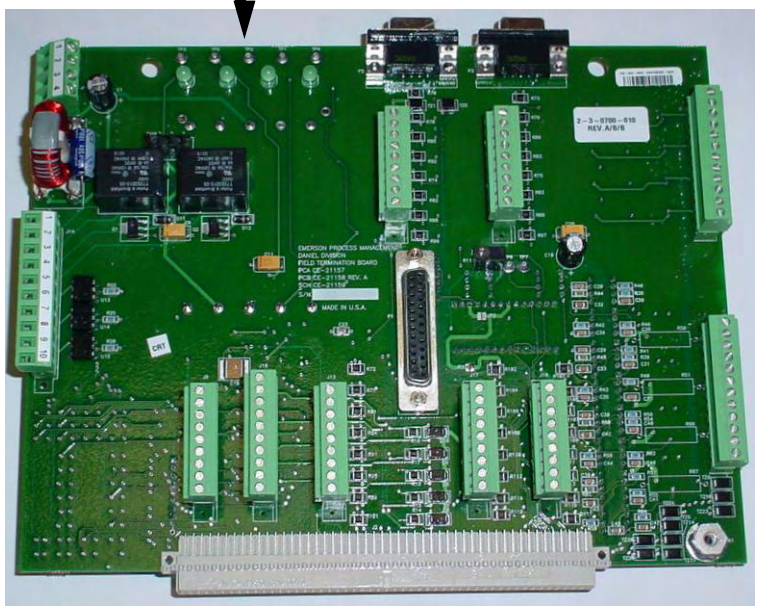


*Figure 4-9 Test Points Field Termination Board*

### 4.5.4 Preamplifier

The preamplifier (P/N 3-0580-002) has no parts that may be serviced in the field. If the unit fails, return it to DMS for repair or replacement.

### 4.5.5 Flow Balance Check

Ensure that the flow panel gauge is properly set. Refer to the Model 700 Troubleshooting Checklist (see Table 4-3) for values. Do not adjust; check with DMS if your reading is abnormal.

Check the flow at the measure vent and sample vent (see Table 4-3).

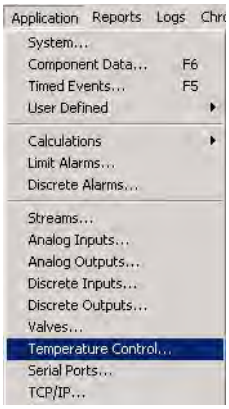
### 4.5.6 Temperature

Use the Temperature Control function for monitoring the Temperature of the Oven (Detector/s and Columns) and the Stream Switching block to determine when the Model 700 is thermally stable. The bottom row labeled Temperature (C) displays the current temperatures.

The settings and values shown in Figure 4-10 and described in Table 4-4 are preset at the factory and are based on the specific customer application. These values should not be changed unless recommended by Daniel Customer Service Personnel, or it is a factory application requirement.

When connected via MON2000, use the *Application>Temperature Control* menu path to access this function.

The Temperature Control dialog displays.



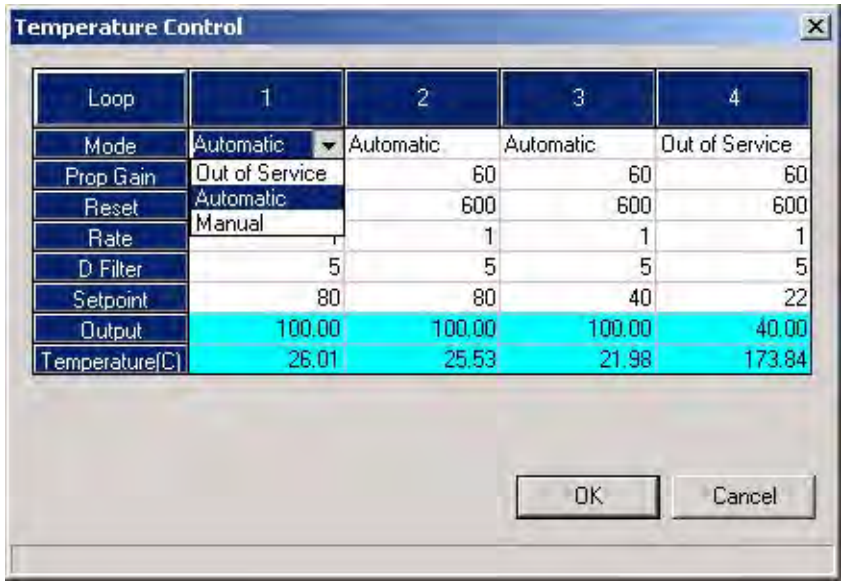




*Figure 4-10 Temperature Control Dialog*

Use the pull down menu to select the appropriate mode setting (e.g. AUTOMATIC, MANUAL, or OUT OF SERVICE). Ensure that the temperature is constant for the Oven (i.e. Multivalve System block and column module kit) and the SSS.

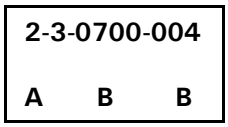
Columns 1 through 3 (Zones 1-3) have a temperature range of 20 °C to 100 °C (68 °F to 212 °F). Column 4 (Zone 4) has a temperature range of 20 °C to 450 °C (68 °F to 842 °F).

*Table 4-4 Temperature Control Dialog*

| Column | Function | Typical Setting |
|---|---|---|
| Column 1 | Detector/s or Block Temperature | 80 °C (176.0 °F) |
| Column 2 | Column Temperature | 80 °C (176.0 °F) |
| Column 3 | Sample Stream Block or Valco™ Valve | 40 °C (104 °F)<br>60 °C (140 °F) |
| Column 4 | Spare<br>Or, Methanator<br>Or, LSIV | N/A<br>300 °C (572 °F)<br>150 °C (302 °F) |

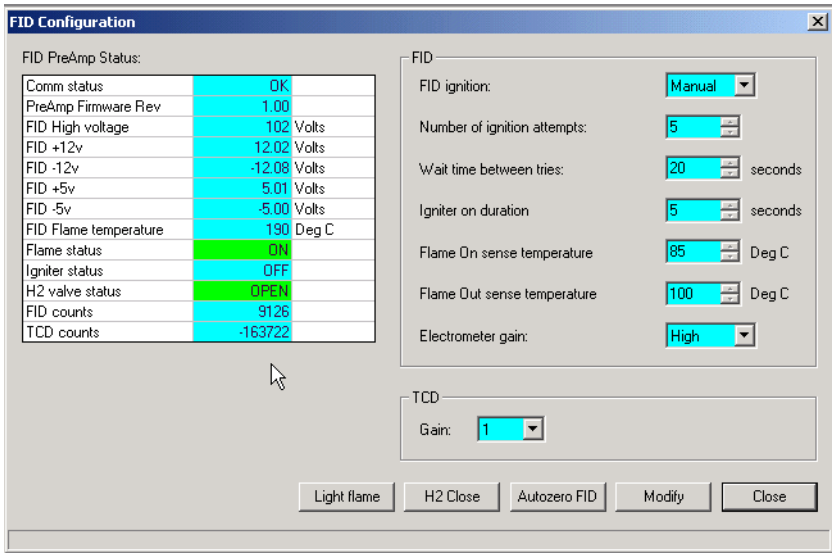
**NOTICE**

**The Model 700 with a Micro-FID or LSIV has the Multifunction board (P/N 2-3-0700-004 Revision B with an extended temperature range for Column 4 (Zone 4) from 20 °C to 450 °C (68 °F to 842 °F). The board is labeled:**



### 4.5.7 FID Configuration

When connected to the GC via MON2000, use the *Application>FID Configuration* menu to access the FID Configuration dialog. Refer to the *MON2000 Software for Gas Chromatographs User Manual* (P/N 3-9000-522) for additional configuration details.




Configure the following fields from the FID Configuration dialog:

- FID Ignition - Manual or Automatic
- Number of Ignition attempts
- Wait time between attempts
- Igniter **ON** duration
- Flame **ON** sense temperature Degrees C
- Flame **OUT** sense temperature Degrees C
- Electrometer (TCD) gain

### Baseline Drift

To ensure that the baseline is not drifting, compare the baseline upsets caused by valve actuations with those of the spectrum chromatogram provided with the Operational Parameters Sheet.

Ensure that no evidence of component elutions is present when sample is not being injected.

If differences exist between the two spectrum chromatograms, the problem may be due to one or more of the following:

- programming of events
- contamination of the multivalve sealing diaphragms by foreign matter
- improperly adjusted flows
- leaks in the carrier system
- column deterioration due to liquid contamination from a sample
- mis-identifying peaks

A noisy baseline can be caused by carrier leaks, an electronic failure in the preamplifier, a faulty power supply, or defective thermistors in the detector. If the baseline is still noisy after correcting for leaks, perform the Detector Bridge Balance procedure (see Section 4.8) before replacing the detector thermistors or the preamplifier board.

## 4.6 Leak Checks

### 4.6.1 Field Service

To perform a field-service leak check of the Model 700,

1. Plug all Model 700 vents.
2. Make sure the setting of the carrier cylinder regulator is 115 psig (pounds per square inch, gauge).
3. Check all fittings at the pressure regulator flow panel and at the carrier cylinder regulator with a leak detector. Correct any leaks detected by a bubble indication.
4. Turn the Carrier Gas shut-off valve clockwise to close. Observe the carrier pressure for ten minutes to check for a drop in carrier pressure.

   The drop should be less than 200 psig on the high side of the regulator/gauge. If the carrier pressure remains constant, no leaks are present.
5. Using MON2000, manually actuate the valves ON and OFF and observe the pressure with the valves in different positions (see Step 4).
6. If the pressure does not hold constant, check all valve fittings for tightness.
7. Repeat Step 5. If leaks persist, check the valve ports with a commercial gas leak detector.

**NOTICE**

**When the valves are switched, some pressure change is normal because of carrier loss.**

**Momentarily open the cylinder valve to restore pressure if necessary (see Step 5).**

**NOTICE**

**Do not use a liquid leak detector on the valve or components within the MVS insulated cover.**

### 4.6.2 Factory Level Leak Check

This section describes how to perform a factory-level leak check. Before performing the leak check, plug the Measure Vent (labeled “MV”) vent line if it is open. The Sample Vent (labeled “SV”) line should be left open, or unplugged.

The following steps are performed to leak-check the Model 700 at the factory when the unit is quality-checked prior to release. This procedure is more thorough and is designed to isolate specific zones where a leak may occur.

**NOTICE**

**Do not use the "Carrier Pressure Adjust" valve (on the Flow Panel of the Model 700 GC) to adjust Carrier Gas line pressure. The valve is factory-set and should not be adjusted.**

Leak check the Carrier Gas line first, according to the steps that follow.

1. Purge the valves with Carrier Gas:
   (a) Open the Carrier Gas bottle valve and slowly increase the Carrier Gas feed line pressure to 110 psig, ±2%, with a dual-stage regulator at the Carrier Gas bottle.
   (b) Using MON2000, manually actuate the valves ON and OFF about four to five times.
2. Pressurize and check the Carrier Gas feed line:
   (a) Set all Model 700 valves to ON.
   (b) Open the Carrier Gas bottle valve, and ensure that the Carrier Gas feed line pressure is 110 psig, ±2%.
   (c) Shut the Carrier Gas bottle valve.
   (d) Observe the pressure on the high-side regulator gauge of the Carrier Gas bottle. Because the MV vent line is plugged, the pressure should not decrease in 2 to 3 minutes.
   (e) Set all valves to OFF position.
   (f) Repeat Steps (b) through (d).
   (g) Via MON2000, set all valves to AUTO for regular operation.

**NOTICE**

**Calibration gas line pressure of 50 psig is for leak check and test purposes only. For normal operation, the calibration gas line pressure is maintained at 20-30 psig.**

Next, leak check the calibration gas feed line, per the following steps:

1. Plug the SV vent line.
2. Pressurize the calibration gas line to 50 psig.

(a) Shut the calibration gas bottle valve.

(b) Observe the pressure on the high-side regulator gauge of the calibration gas bottle. Because the SV vent line is plugged, the pressure should not decrease in a period of 2 to 3 minutes.

Next, leak check the sample gas lines, per the following steps:

1. Ensure that the Sample valve (SV) vent line is plugged.

   (a) Pressurize the sample gas line to 50 psig or a known pressure.

   (b) Shut off the sample gas.

   (c) Observe the pressure on any gauge that indicates pressure between the closed sample gas block valve and the plugged SV vent line. Because the line is plugged, the pressure should not decrease during a period of 2 to 3 minutes.

2. Leak test all other sample stream lines by connecting gas to each of the sample streams and repeating Step 1(a) through 1(b).

**NOTICE**

**Calibration gas line pressure of 50 psig is for leak check and test purposes only. For normal operation, the calibration gas line pressure is maintained at 20-30 psig.**

Finish the test and set up the Model 700 for normal operation, as follows:

1. Using MON2000, ensure that all valves are set to AUTO.
2. Unplug, or open, the MV and SV vent lines.
3. If the calibration gas bottle was used to leak check the sample stream lines, reconnect the calibration gas bottle to the calibration gas line on the flow panel assembly. Reconnect the sample stream lines.

### 4.6.3 Plugged Lines, Columns, or Valves

To ensure that lines, columns, and valves are not plugged, check the gas flow at valve ports. For a reference, use the flow diagram in the drawing package, and remember these points about flow diagrams:

- Port-to-port flow paths are indicated by solid or dashed lines.
- A dashed line indicates flow direction when the valve is ON, that is, energized.
- A solid line indicates flow direction when the valve is OFF, i.e., not energized.
- A combination of solid and dashed lines indicates a constant flow path regardless of the ON/OFF state of the valve.

## 4.7 CHROMATOGRAPH VALVES

Only minimal repair and maintenance is required by the customer (e.g., replacing the diaphragms). DMS recommends returning the Oven Assembly for major repairs to maintain the validity of the warranty.

### 4.7.1 Required Tools

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

- torque wrench, scaled in foot-pounds
- 1/2" socket
- 1/4" open-end wrench
- #1 flat screwdriver

### 4.7.2 Chromatograph Valve Replacement Parts

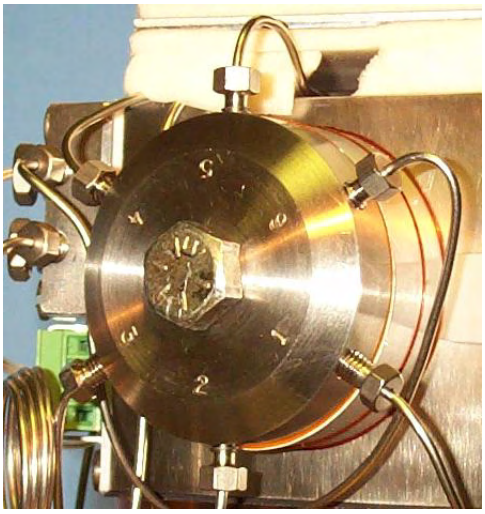
Replacement parts required for each of the chromatograph valves on the Oven Assembly consists of the following parts:

- Diaphragm Kit 6-port Valve (P/N 2-4-0700-187)
- Diaphragm Kit 10-port Valve (P/N 2-4-0700-171)

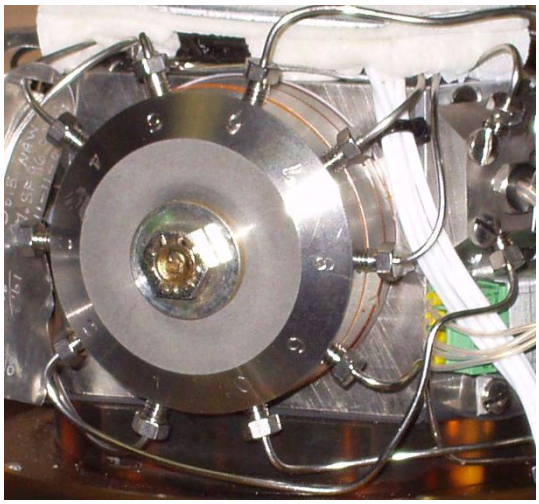
**NOTICE**

**If an existing unit has a teflon gasket between the lower actuation diaphragms and the kiosk block, install gasket P/N 2-4-0700-064 (for 6-port valves) and P/N 2-4-0700-160 (for 10-port valves). Otherwise, the teflon gasket is not required.**

**Model 700 TCD Upper Enclosure**



**6-port Valve**



**10-port Valve**

*Figure 4-11 Chromatograph Valve Assemblies*

### 4.7.3 Valve Cleaning

For cleaning the valve, isopropyl alcohol (P/N 9-9960-111) should be used.

**NOTICE**

**Do not use an oil base cleaner on the valve.**

NOTICE

**The Oven System may be removed and repaired at a bench. However, it is not necessary to remove the oven.**

### 4.7.4 TCD Oven System Removal

Use the following procedure for removing the Oven System from the Model 700 unit:

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Disconnect all electrical power to the unit and ensure the area is free of explosive gases.**

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

1. Disconnect all power to the unit.
2. Remove the explosion proof dome and the thermal cover.

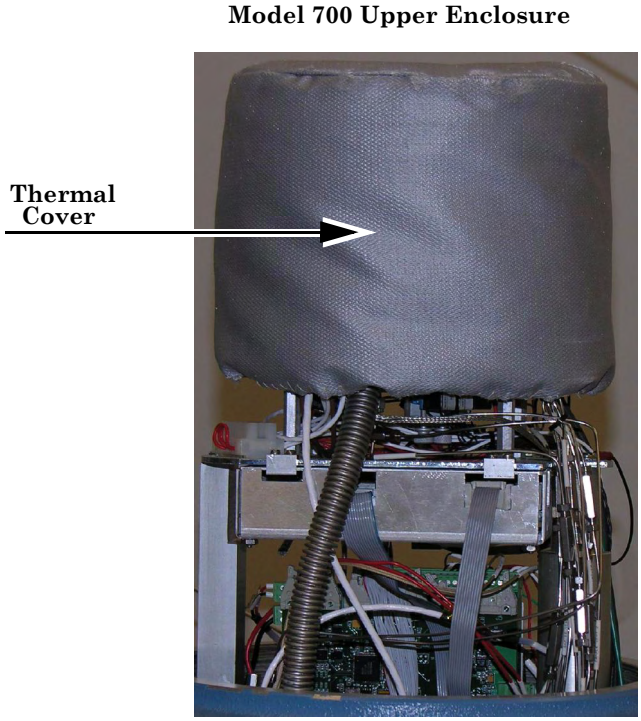



*Figure 4-12 Micro-FID Oven System Thermal Cover*

3. Loosen the screw on the mounting bracket that secures the Oven Plate to the support post (see Figure 4-13).
4. Lift up slightly and rotate the oven forward one quarter turn so that the components are accessible.

**Model 700 TCD Upper Enclosure**

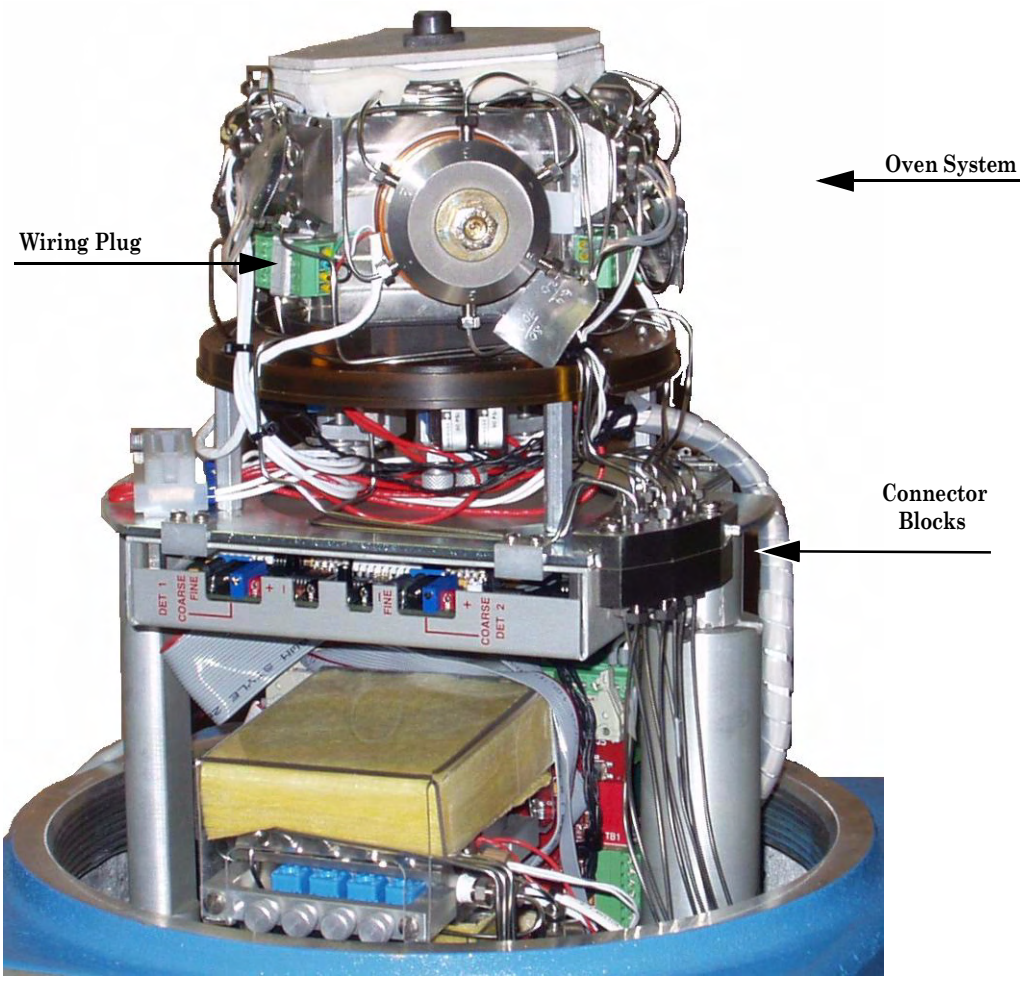



*Figure 4-13 TCD Upper Assembly Components*

5. Unplug the solenoid wiring from the driver board end.

6. Unplug the heat control wiring from the driver board side.
7. Unplug the heater wiring from the driver board end.
8. Loosen the screws on the connector blocks.

**Model 700 TCD Upper Enclosure**

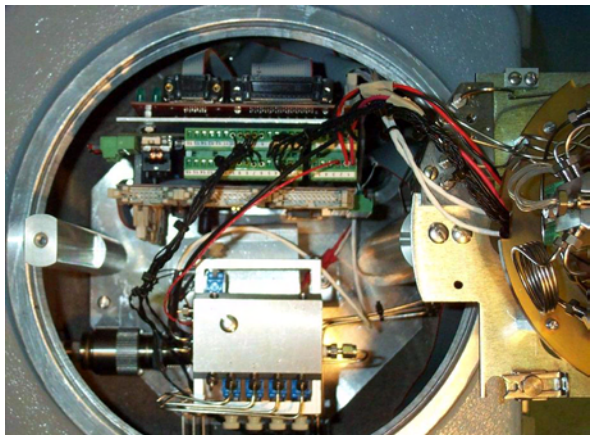


*Figure 4-14 TCD Oven System Disassembly*

9. Disconnect the three Preamplifier wires and the solenoid wire plug (see Figure 4-14).
10. Lift the oven assembly from the unit for bench maintenance and repairs.
11. Reinstall in reverse order of Steps 1-9.

### 4.7.5 Micro-FID Removal

Use the following procedure for removing the Micro-FID from the Model 700 unit.

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Disconnect all electrical power to the unit and ensure the area is free of explosive gases.**

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

1. Disconnect all power to the unit.
2. After powering down the Model 700, allow at least 10 minutes for the components to cool-down.
3. Remove the explosion proof dome and the thermal cover.

**CAUTION**

**MAY CAUSE INJURY TO PERSONNEL**

**This unit operates at high temperature. Allow a cool-down period of at least 10 minutes after shut-down and handle the unit carefully.**

Failure to follow this precaution may result in injury to personnel

**Model 700 Micro-FID Upper Enclosure**

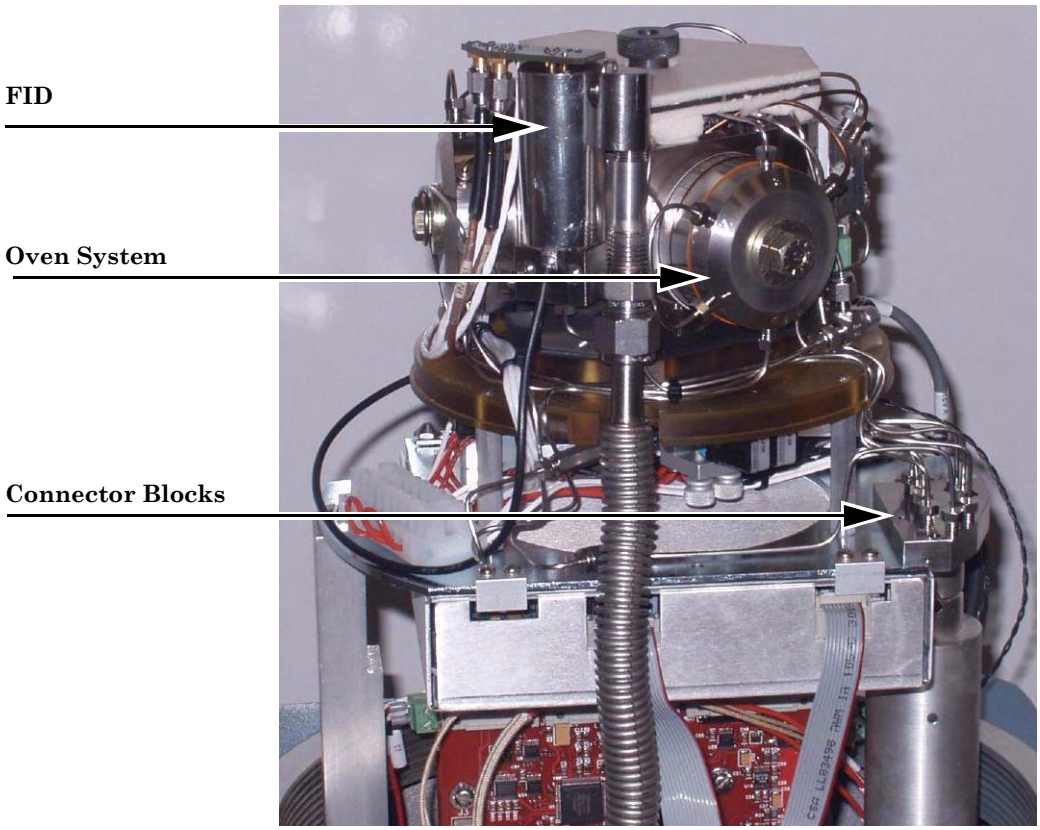



*Figure 4-15 Micro-FID Upper Assembly Components*

4. Grasp the edges of the Connector Board on top of the unit and pull and wiggle to remove the six socket tubes that extend onto the pins in the cap (see Figure 4-16).

5. Remove the exhaust tube from the side by pulling the 'U' shaped retainer from the top of the exhaust body and moving the exhaust tube away from the Micro-FID. Take care not to lose the clip.

**Model 700 Micro-FID Upper Enclosure**

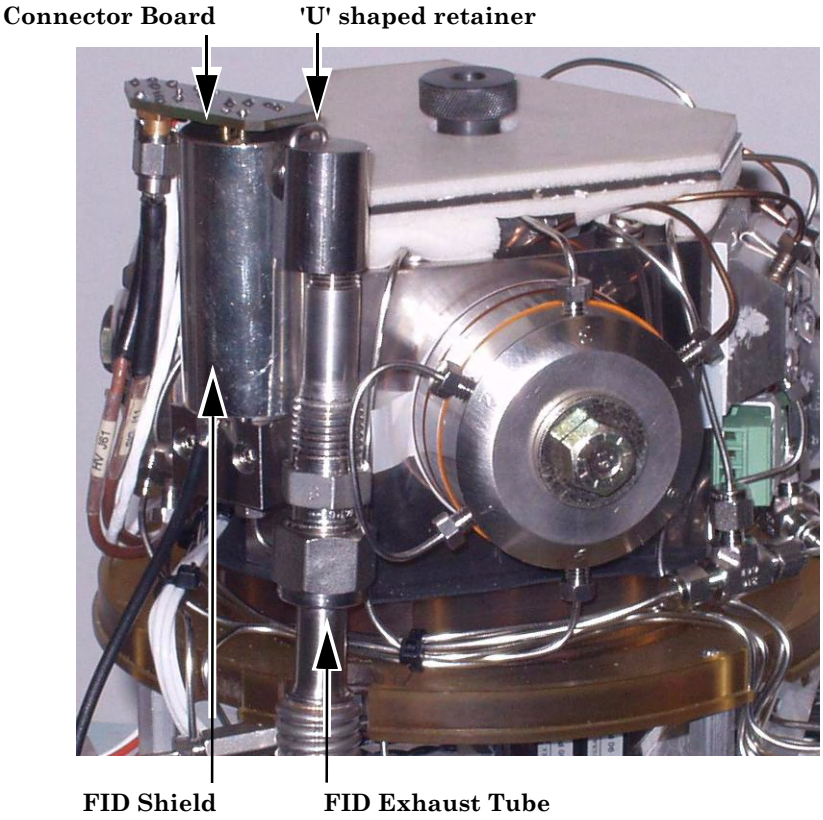



*Figure 4-16 Model 700 with Micro-FID Upper Assembly*

6. Loosen the two screws in the top of the Micro-FID.
7. Grasp the shielded section and lift it over the burner. Pull the cap out of the shield. Remove the body from the shield, if necessary.

### 4.7.6 Micro-FID Maintenance

The Micro-FID cap has no replaceable parts. Damage like a broken RTD or broken igniter coil requires a replacement cap.

The burner tip can be removed for cleaning.

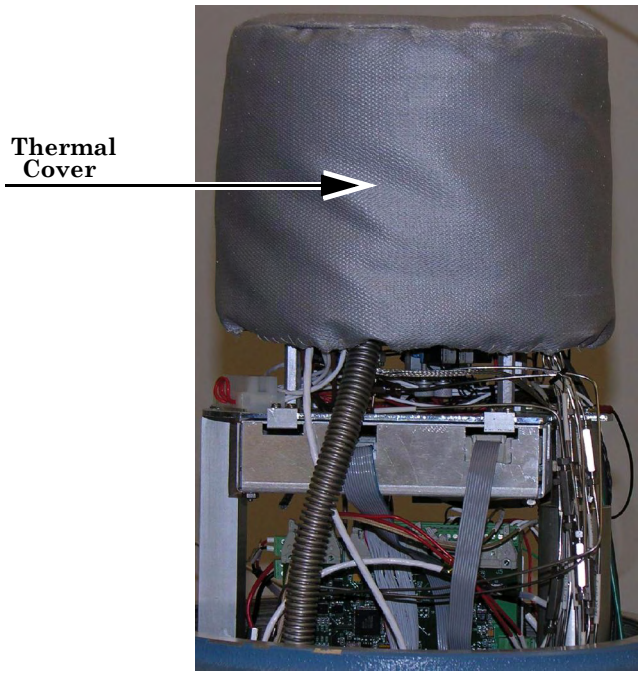
1. Loosen the isolating nut one turn.
2. Gently lift out the burner tip tube. Use short needle nose pliers if it is stubborn, taking care not to bend the tube. The alternative is to unscrew the assembly and clean as an assembly.

### 4.7.7 Micro-FID Re-assembly

1. Insert burner tip tube into the isolating nut. Be certain it is fully seated. There should be about .350" of tube visible.
2. Tighten the isolating nut in small increments until the tube ceases to pull free. Slight additional tightening will ensure proper sealing.
3. Place the cap onto the end of the body with the deep cavity. Once the alignment pin is in its mating hole, gently press the two parts together and ensure the o-ring is seated properly.
4. Slide the Micro-FID shield onto the body from the bottom. Align the notch with the exhaust fitting and insert the two screws.
5. Lower the Micro-FID body assembly onto the base, placing the alignment pin in its hole. Press the body into place, seating the o-ring. Tighten the screws slightly more than 'finger tight.'
6. Re-connect the ground lead.

7. Press the Micro-FID exhaust tube onto the fitting and anchor with the 'U' shaped clip. (1/16" tubing makes an adequate clip.)
8. Plug the connector board onto the cap.
9. Replace the thermal cover on the upper enclosure.

**Model 700 FID/TCD Upper Enclosure**




10. Replace the explosion-proof cover on the assembly, then apply power to the unit.

### 4.7.8 LSIV Maintenance

The LSIV can be maintained while attached to the enclosure. However, the user may find it easier to perform maintenance with the LSIV removed from the Model 700 upper enclosure.

**CAUTION**

**MAY CAUSE INJURY TO PERSONNEL**

**This unit operates at high temperature. Allow a cool-down period of at least 10 minutes after shut-down and handle the unit carefully.**

Failure to follow this precaution may result in injury or death to personnel

### 4.7.9 LSIV Removal

Inside the Model 700 upper enclosure there are two insulation covers (which open like clam shells that slide off of the end of the LSIV) to be removed.

1. Disconnect the carrier and sample tubing from the LSIV.
2. Remove the heater and 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.

## Replacing LSIV Seals

**CAUTION**

**DAMAGE TO EQUIPMENT**

**Use of wrenches other than a strap wrench to disassemble the LSIV can damage the valve beyond repair.**

Failure to follow this precaution may damage equipment.

## Tools Required for Disassembly:

- 2 each - 1 inch strap wrenches
- 1 each - assembly tool for seal nuts

1. Using two strap wrenches, if needed, unscrew the seal assist housing from the LSIV body. Once the threads are free, pull the pieces apart taking care to avoid bending the stem.
2. There are two seals with a central packing gland between them to be removed, either from the stem or the bore in the body. Use care to avoid scratching the stem or bore surfaces.
3. Replace the two seals with the central packing gland between them onto the stem. Carefully align the two assemblies and insert the seals into the bore.
4. Screw the assemblies together hand-tight.

## LSIV Disassembly

Use the following procedure to disassemble the LSIV and refer to Figure 4-17.

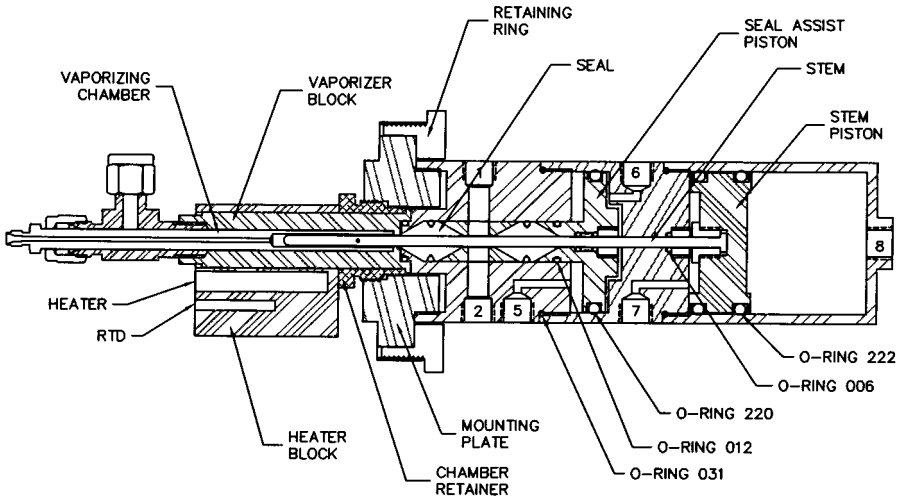



*Figure 4-17 Model 700 with LSIV*

1. Use the one (1) inch strap wrenches and unscrew the piston housing (counter-clockwise) from the seal assist housing (use one strap wrench on the piston housing and one strap wrench on the seal assist housing).

**CAUTION**

**DAMAGE TO EQUIPMENT**

**Use care when disassembling the LSIV to prevent bending the valve stem.**

Failure to follow this precaution may cause damage to the equipment.

2. When the threads disengage, slowly continue to pull apart the LSIV assembly. Be careful not to bend the valve stem and pull until the valve stem is free of the seal assist housing or the piston is free of the piston housing.
3. Separate the piston and valve stem assembly from the piston housing or seal assist housing by carefully pulling it straight out.
4. Unscrew (counter-clockwise) the seal assist housing from the lower body.
5. Unscrew (counter-clockwise) the retaining ring from the body.
6. Pull the piston/packing gland out of the lower body.
7. Push out the football seals and the central packing gland from the body.
8. Unscrew (counter-clockwise) the stem lock nut from the piston.
9. Remove the valve stem from the piston.
10. Unscrew the seal nut from the upper piston packing gland.
11. Remove the o-rings and the collar.

### 4.7.10 Methanator Maintenance

The optional Methanator, 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.

**Model 700 Methanator Upper Enclosure**

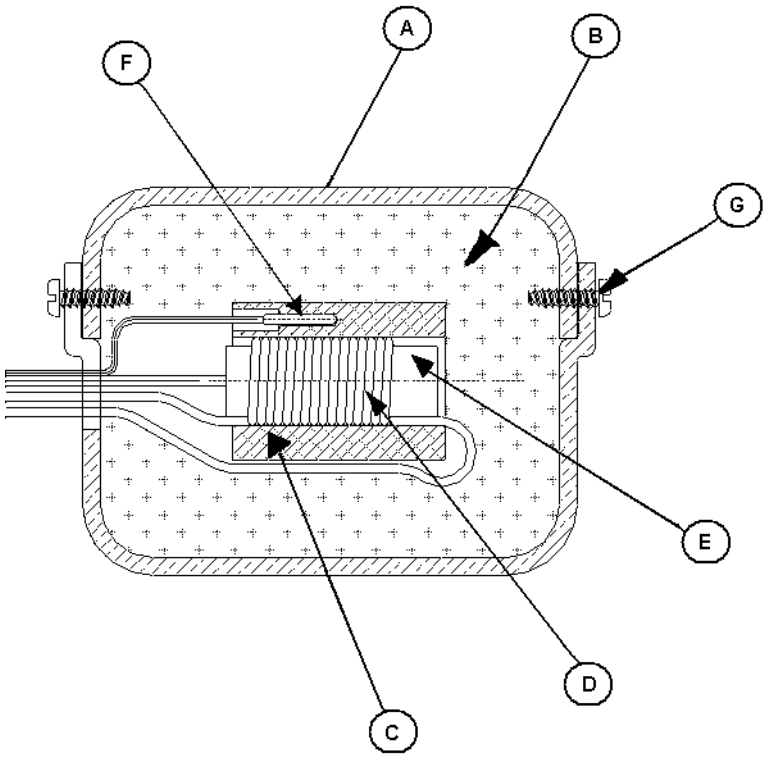



*Figure 4-18 Model 700 Optional Methanator Assembly*

The assembly consists of:

- A: Case
- B: Insulation
- C: Tube
- D: Catalytic Column
- E: Heater
- F: RTD (temperature detector)
- G: Two #6-20 x 1/2 stainless steel screws

The RTD can be replaced , if necessary. If it is replaced, care must be taken to anchor the RTD cable to the tubing to prevent loosening over time.

A catalytic column needing replacement should be replaced with a full heater/column assembly that includes the tube, column, heater and RTD.

To replace the catalytic column (see Figure 4-18),

1. Disconnect the tubing and wiring, then lift the Methanator from the enclosure.
2. Remove the two screws and open the box (enclosure). The catalytic column assembly is housed inside this insulation-filled box.
3. Exchange the catalytic assembly and re-fill the enclosure with insulation.
4. Reverse this procedure to reassemble the Methanator.

### 4.7.11 Valve Overhaul

The chromatograph valves are designed to withstand millions of actuation cycles without leakage or failure. If service is required, the valve can be overhauled using replacement parts available from Daniel Measurement Services (DMS).

**NOTICE**

**Replacement factory-built valves are available.**

**DMS recommends returning and replacing the 6-port Valve for extensive repairs or complete replacement.**

Use the following procedure for overhauling a 6-Port Valve:

**NOTICE**

**The Oven System may be removed and repaired at a bench. However, it is not necessary to remove the oven.**

1. Shut off carrier and sample gas streams entering the unit.
2. Remove the insulating cover from the Oven System.
3. If the faulty valve is not easily accessible, loosen the thumb screw and rotate the oven forward (see Figure 4-13 and Figure 4-14).
4. Disconnect tubing and fittings that attach to the valve from other locations.

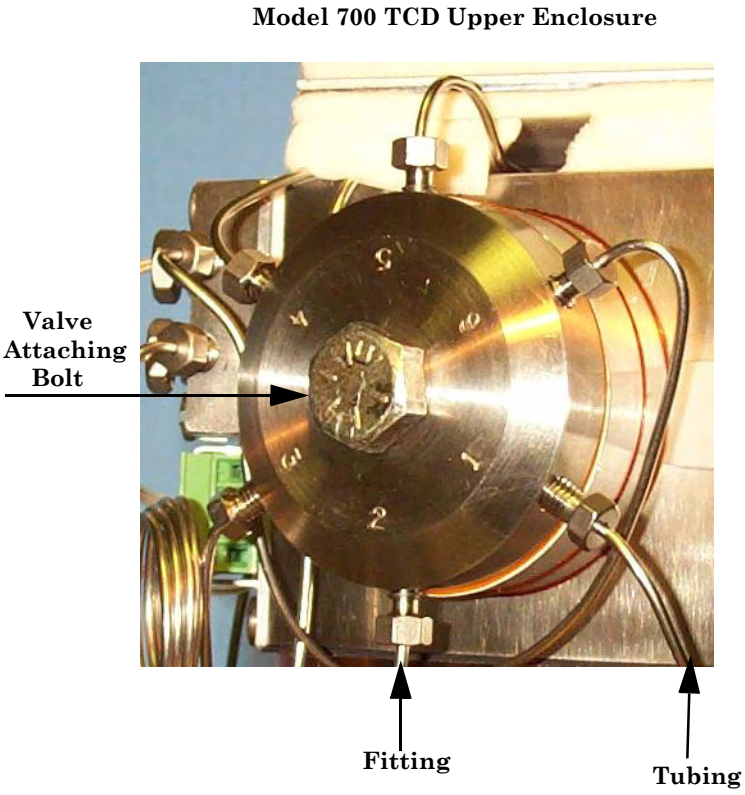



*Figure 4-19 TCD Valve Tubing and Fittings*

5. Loosen the attaching bolt on the valve to be replaced or serviced (see Figure 4-19).

6. Holding the lower piston plate, pull the valve straight off the block. The alignment pins may stick slightly.
7. Remove and discard the old valve diaphragms and gaskets. Replace, in the same order, with the new ones supplied.
8. Reinstall the valve using the following steps:
   (a) Clean the sealing surface as required using Chemwipes with alcohol. Blow the sealing surface with clean, dry instrument air or Carrier Gas. Dirt including dust and lint can cause troublesome leakage.
   (b) Align the pins with holes in the block and push the valve assembly into place.
   (c) Tighten the valve "attaching bolt" to 30 lbs./ft. (40 N-m)
   (d) Reconnect all fittings and tubing (see Figure 4-19).

**NOTICE**

**Ensure that the primary seal diaphragm is correctly installed on the primary plate.**

**NOTICE**

**Do not scratch the primary plate surface.**

**NOTICE**

**Do not use an oil base cleaner on the valve.**

### 4.7.12 Oven System and Stream Switching System Solenoid Valve Replacement

Both the Oven System and the Stream Switching System use the same solenoid valves. The solenoids are replaced in both systems using the same procedure (see Section 4.7.13).

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Disconnect all electrical power to the unit and ensure the area is free of explosive gases.**

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

### 4.7.13 Solenoid Valve Replacement

Replace the Oven System and Stream Switching System (SSS) solenoids using the following steps.

**NOTICE**

**Carrier Gas leaks may be caused by the SSS solenoids See Section 4.6 for leak check procedures.**

1. Remove the dome from the upper enclosure.
2. Loosen the mounting bracket thumb screw that secures the oven to the chassis, see Figure 4-20.

**Model 700 TCD Upper Enclosure**

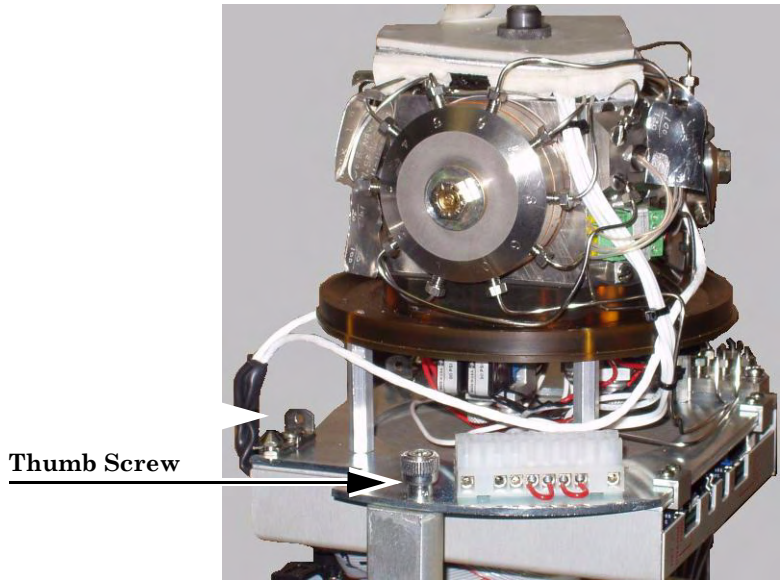



*Figure 4-20 Side View TCD Oven System Mounting Bracket*

3. Holding the left side of the oven mounting plate, gently lift up the assembly and rotate it so that the enclosure opening is accessible.

**Model 700 TCD Upper Enclosure**

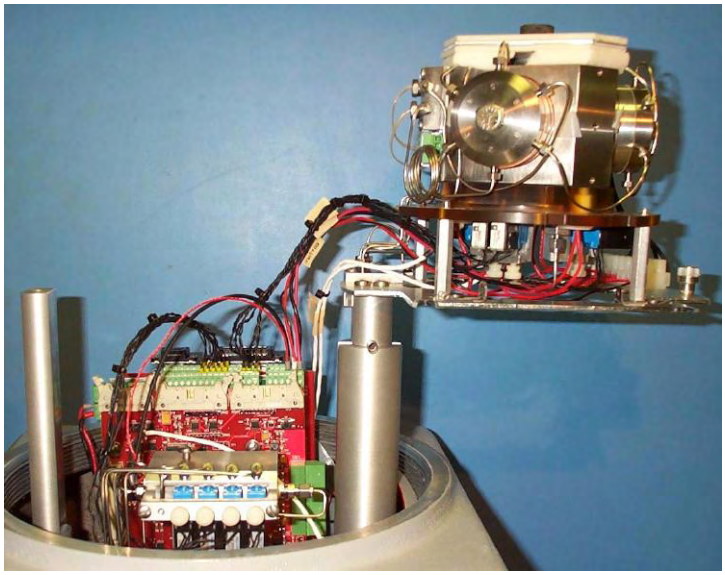


*Figure 4-21 Rotated TCD Upper Assembly*

4. Loosen the thumb screws holding the valve in place.

**Model 700 TCD Upper Enclosure**

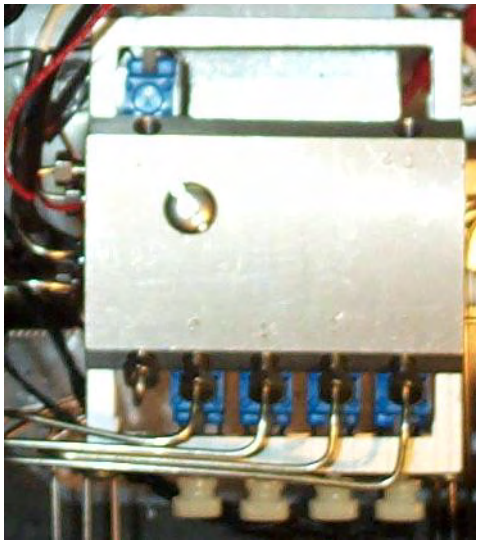


*Figure 4-22 Stream Switching Assembly*

5. Lift the solenoid off of the alignment pins (approximately 1/8”).
6. Slide out the solenoid block.
7. Disconnect the wire leads and remove the gasket from the bottom of the solenoid block.
8. Replace the old leads at the connector plug or splice the wires from the new solenoid to the old leads.

**NOTICE**

**The solenoids are not polarity sensitive.**

9. Reassemble the SSS and Oven System in reverse order of Steps 1 through 7.

**Model 700 TCD Upper Enclosure**

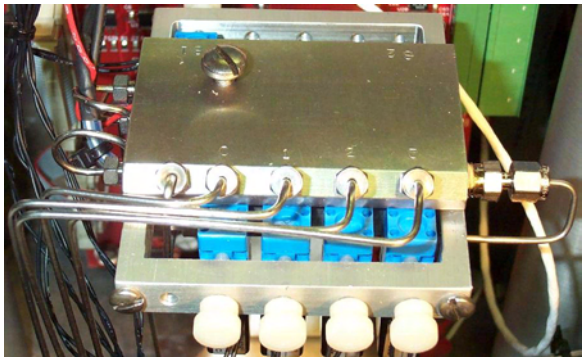


*Figure 4-23 Stream Switching System Final Assembly*

## 4.8 TCD DETECTOR BRIDGE BALANCE

The following procedure should be performed if the Model 700 does not produce a chromatogram.

If necessary to balance the detector bridge,

1. Remove the cover of the upper explosion-proof housing and the thermal cover on the Model 700 for access the preamplifier.

**Model 700 FID/TCD Upper Enclosure**

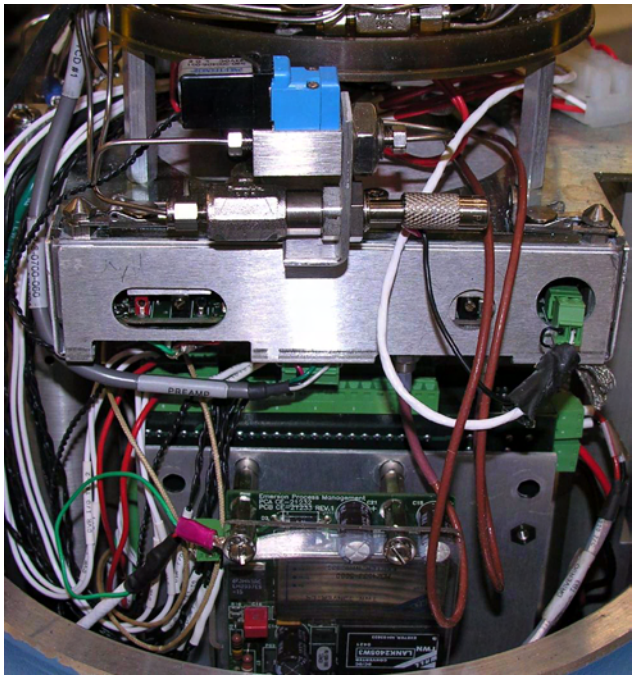


*Figure 4-24 Model 700 Micro-FID/TCD Preamplifier*

2. Attach the negative lead of a digital voltmeter to the black test point (-BRIDGE BALANCE). Attach the positive lead of the digital voltmeter to the red test point (+BRIDGE BALANCE).

**Model 700 TCD Upper Enclosure**

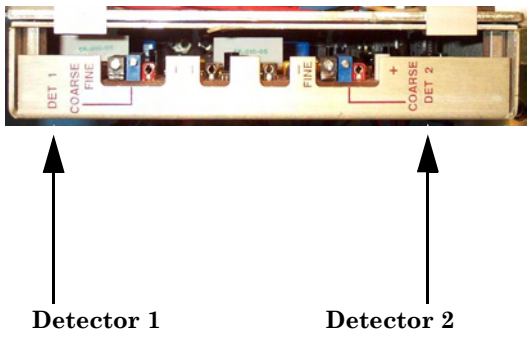



*Figure 4-25 Model 700 TCD Bridge Balance*

**Model 700 Micro-FID Upper Enclosure**

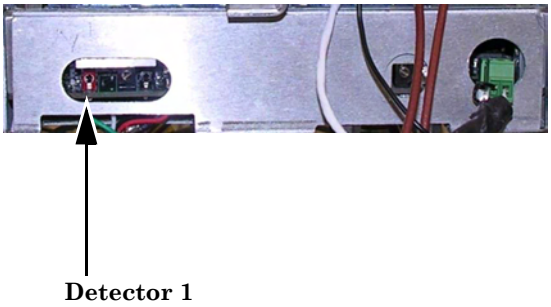



*Figure 4-26 Model 700 Micro-FID Bridge Balance*

3. Check the detector bridge voltage. The voltage should read 0 millivolts (mV), ±0.5 mV. Adjust the coarse and fine potentiometers which are located immediately to the left of each of the (red) test points to obtain the specified reading.

## 4.9 MEASURE VENT FLOW

You will need an accurate flow meter for this measurement.

To measure the MV vent flow, proceed as follows:

1. Attach a flow meter to the vent output on the right side of the Model 700 "MV1"(marked on the tag).

   The flow should measure 12-18 cc/min.

2. Attach a flow meter to the vent "MV2" marked on the tag.

   The flow should measure 12-18 cc/min.

**Model 700 Upper Enclosure**

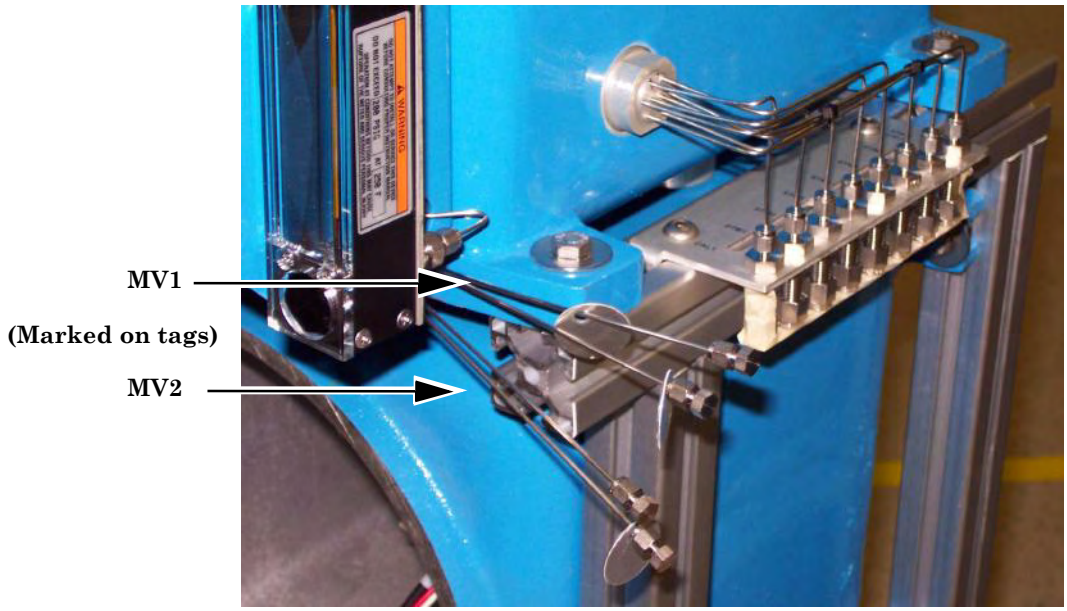



*Figure 4-27 Measure Flow Vents*

## 4.10 MODEL 700 ELECTRICAL COMPONENTS

The Model 700 GC is designed to operate for long periods of time without need for preventive or regularly scheduled maintenance. The Model 700 is designed using explosion-proof enclosures. The enclosure is dust-proof, water-proof, and flame-proof.


**DANGER TO PERSONNEL AND EQUIPMENT**

**Disconnect all electrical power to the unit and ensure the area is free of explosive gases.**

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

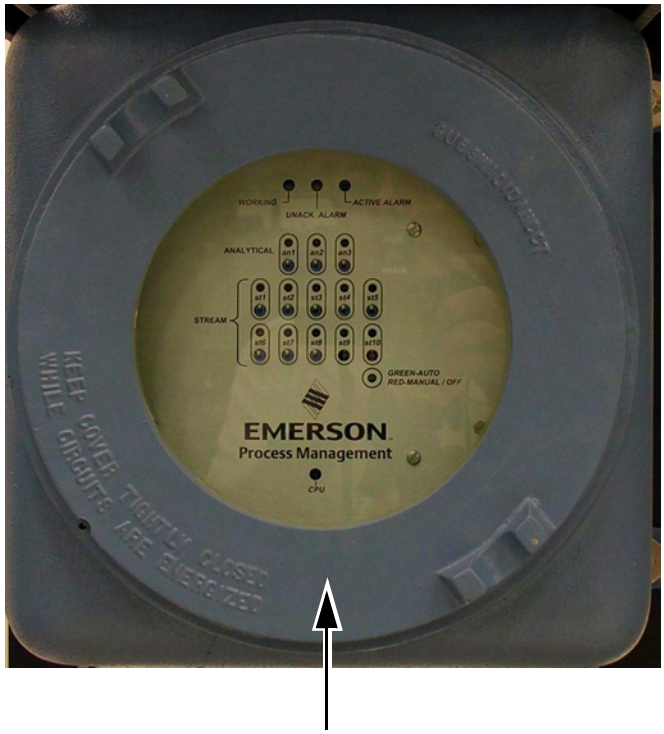
Should there be a need to open the explosion-proof enclosure, first disconnect all electrical power to the unit, and ensure the area is free of explosive gases. Prior to opening the Model 700, check the operating parameters of the application with a PC using MON2000 software and attempt to isolate or fix any incorrect parameters.

To access the GC electrical components,

1. Ensure electrical power is disconnected from the unit and the environment is safe.

2. Remove the lower enclosure cover and access the card cage assembly holding the circuit boards.

**Model 700 Lower Enclosure**




**Explosion-proof Cover**

*Figure 4-28 Model 700 Lower Enclosure*

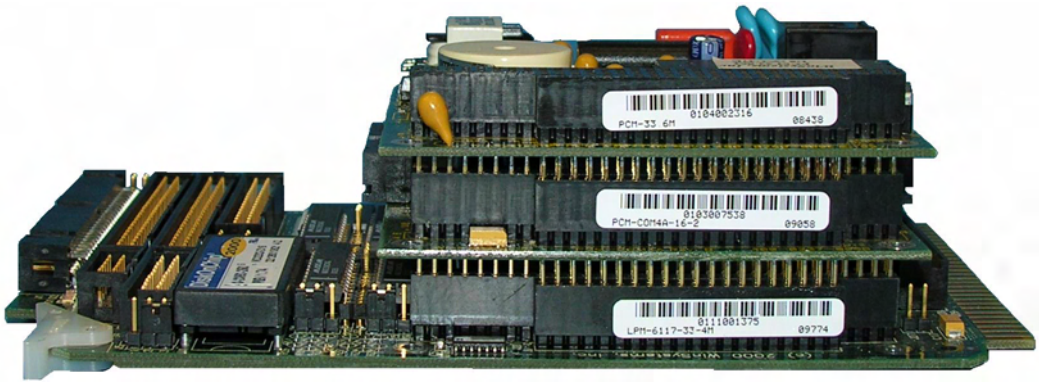


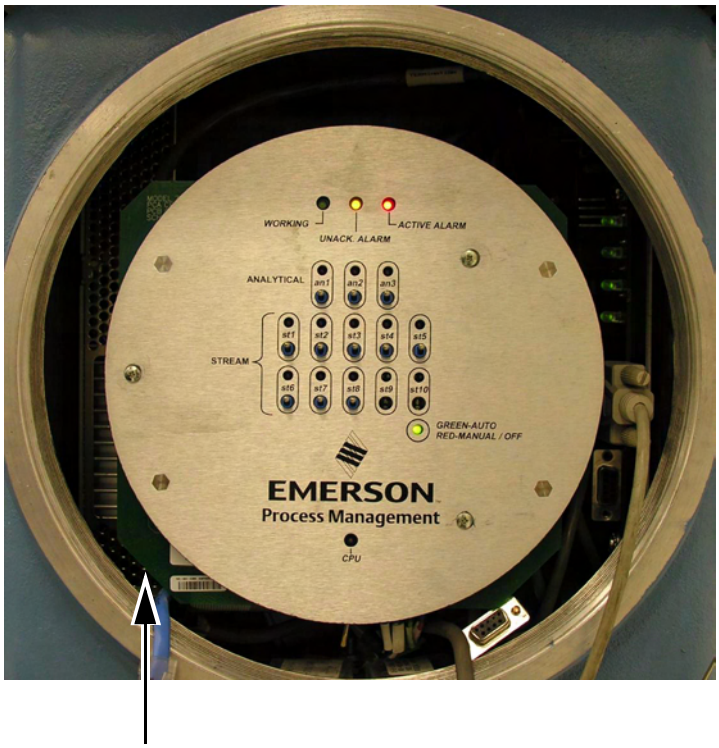

*Figure 4-29 Model 700 Card Stack Assembly*

3. Note the location and direction of any board removed. Remove only one end of any cable necessary to obtain access to the desired board. Remember or make note of the cable installation so that the cables can be replaced in the same order. Release the catch(es) and remove/replace the circuit board(s) as necessary.

**NOTICE**

**After removing the cable(s), any board may be replaced without removing the card cage assembly.**

**Model 700 Lower Enclosure**




**Card Cage Assembly**

*Figure 4-30 Model 700 Lower Assembly*

### 4.10.1 DC Power Supply Replacement Procedures

The DC/DC Power Supply is mounted on the left wall of the lower enclosure (see Figure 4-31) and is accessible by removing the threaded cover plate from the housing.

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Disconnect all electrical power to the unit and ensure the area is free of explosive gases.**

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

**Model 700 Lower Enclosure**

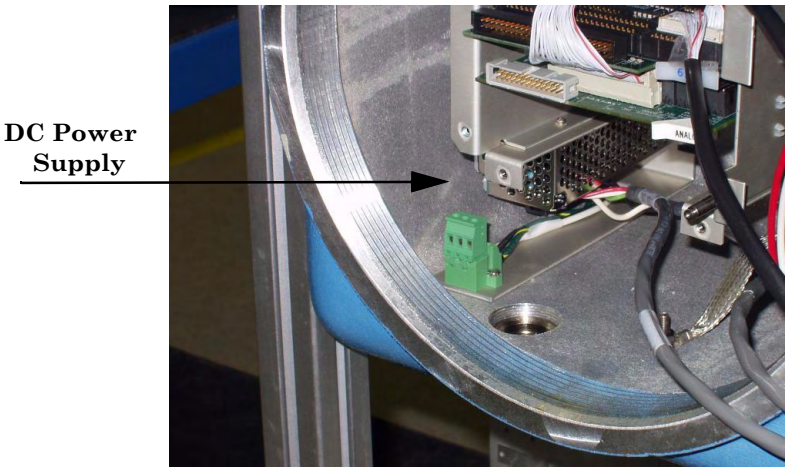



*Figure 4-31 DC Power Supply Lower Enclosure*

Tools required to remove and replace the DC Power Supply:

- Cross point #2 Phillips screw driver (long shank is helpful).
- Head lamp (flashlight)

NOTICE

**Needle nose pliers may be used to turn rear thumbscrews.**

To remove and replace a faulty DC Power supply:

1. Disconnect the cables from the CPU, the Com4A board (if installed), the modem board and the Ethernet board (if installed).
2. Unscrew the card cage thumb screws and remove the card cage assembly.
3. Unscrew the two thumb screws on the power supply bracket.
4. Remove the assembly from the unit.
5. Disconnect, label and bundle all leads.
6. Attach all leads to the new DC Power Supply.
7. Align the power supply bracket and tighten the two thumb screws.
8. Reinstall the card cage assembly, tighten the thumb screws and reconnect all cables.
9. Replace the threaded cover plate on the lower enclosure housing.

NOTICE

See Appendix A for a list of the ports and terminals (pins) assigned to serial communications.

## 4.11 COMMUNICATIONS

### Model 700 GC with the TCD

The Model 700 GC with the TCD has seven communications channels available; without the LOI installed, three communications ports from the WinSystems CPU board (P/N CE-20765) and four communications ports from the Com4A board. Six communication channels are available; with the LOI installed, two from the WinSystems CPU board and four ports from the Com4A board.

### Model 700 GC with the Micro-FID/TCD

The Model 700 GC with the TCD has two communications channels available; without the Com4A board installed. Model 700, with the Com 4A board installed, has six communications ports available on the FTB; Com1 and Com2, and Com5, Com6, Com7, and Com8.

Com 4 is dedicated to the Micro-FID/TCD Preamplifier. When the LOI becomes available, it will use a video board instead of a serial port connection (see Figure 3-16 and Figure 3-17).

The communication protocols are selected inside the Model 700 GC with jumpers. The protocols are normally specified by the customer and then set at the factory.

If it becomes necessary to change the communications settings at the site, access to the boards inside the enclosure is required to make changes. See Section 3.4.2 if a communications change becomes necessary.

**WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**The enclosure should not be opened when hazardous gases are present.**

Failure to do so may result in death or injury to personnel or cause damage to the equipment.

The jumpers to be changed are located on the WinSystems CPU board and the WinSystems Com4A board.

When the desired Model 700 GC address (Com ID) is known, it will be set before the unit leaves the factory. If the address (Com ID) needs to be changed in the field, it will be necessary to change the arrangement of an 8-position DIP switch on the multifunction board.

**Model 700 Upper Enclosure**

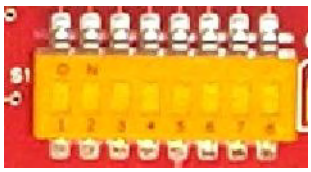


*Figure 4-32 Dip Switch*

This board is mounted on a bracket towards the center of the upper enclosure.

**Model 700 TCD Upper Enclosure**

**Multifunction Board**

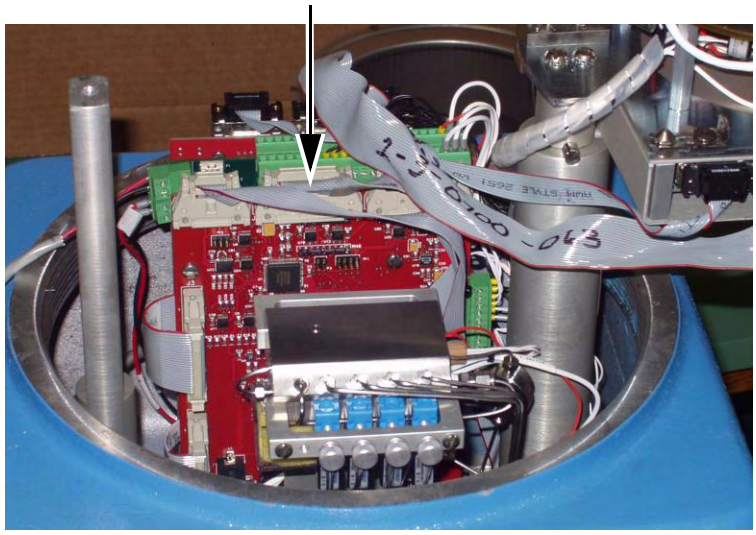


*Figure 4-33 Multifunction Board*

Ensure the cables are replaced in the exact order and positions.

**NOTICE**

**See Section 3.4.1 this manual, for an explanation of DIP switch settings and their determination of the GC Controller Modbus slave address (Com ID).**

(a) For example Model 700 GCs with a TCD,

- Switches "1" through "5" form a 5-bit binary number for setting the Modbus slave address (also known as Com ID or Device ID.)
- Switch number “1” is the least significant bit, and switch number “5” is the most significant bit. Set these switches either ON or OFF.

- Switch "6" is a spare for future use. Switches "7" and "8" are set as needed for the presence of an optional LOI (Local Operator Interface) connected via COM8 (when the COM4A board is installed).
  If the COM4A board is not installed, the LOI is connected via COM4. This address should display via the MON2000 software.

(b) For example Model 700 GCs with a Micro-FID ,

- Switch number “1” is the least significant bit, and switch number “5” is the most significant bit. Set these switches either ON or OFF.
- Switch “6” and “7” are spares and switch “8” is used to cold start the processor (see Table 3-4).

## 4.12 ANALOG INPUTS/OUTPUTS

The analog outputs can be calibrated and or adjusted via the MON2000 software. However, these outputs should be measured with a good digital meter upon initial installation at zero scale and full scale. Then the span can be set with MON2000 software so that it represents values from zero 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. However, zero scale calibrations can be set with 0 mA output, and full scale calibration can be set with 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 the analog output for that channel should be recalibrated.

## 4.12.1 Model 700 Analog Inputs

There are four analog inputs available on the Field Termination Board (J4 - 12-pin Phoenix connector).

**Model 700 Upper Enclosure**

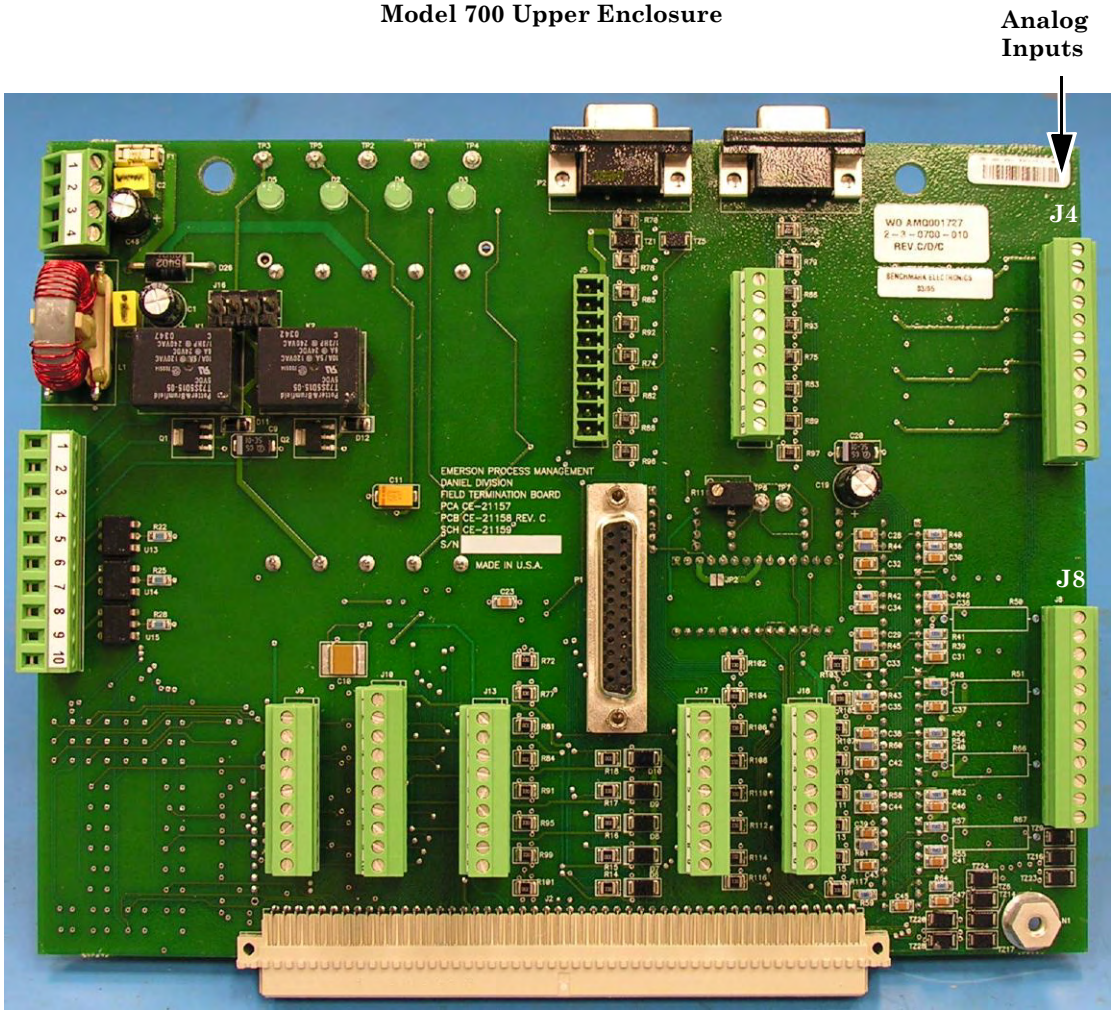



*Figure 4-34 Analog Board - Inputs*

The Model 700 analog inputs are configured as follows:

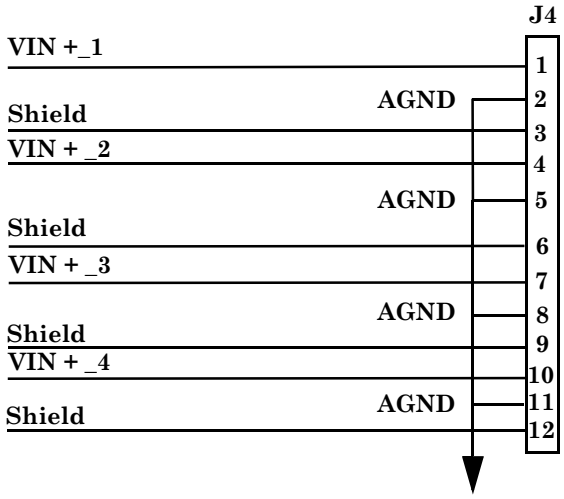



*Figure 4-35 Analog Inputs*

### 4.12.2 Analog Output Adjustment

The initial analog output adjustment will be set at the factory, before shipment, at standard values (4-20 mA). It may be necessary to check and/or adjust these values depending on output cabling/impedance. The adjustment may require two persons if the units are some distance apart. It will require a good digital meter to check the zero and full scale values at the receiving end. The scale or span value can be adjusted by a PC with the Model 700 when the values are known at the receiving end.

It is possible to calibrate the analog outputs using different engineering units, volts and percentages. For examples and detailed instructions, refer to the MON2000 *Software for Gas Chromatographs Users Manual* (P/N 3-9000-522).

## 4.12.3 Model 700 Analog Outputs

### Standard Analog Outputs

The Model 700 has four standard analog outputs (J8 - 12-pin Phoenix connector) on the Field Termination board (P/N 3-0700-010).

**Model 700 Upper Enclosure**

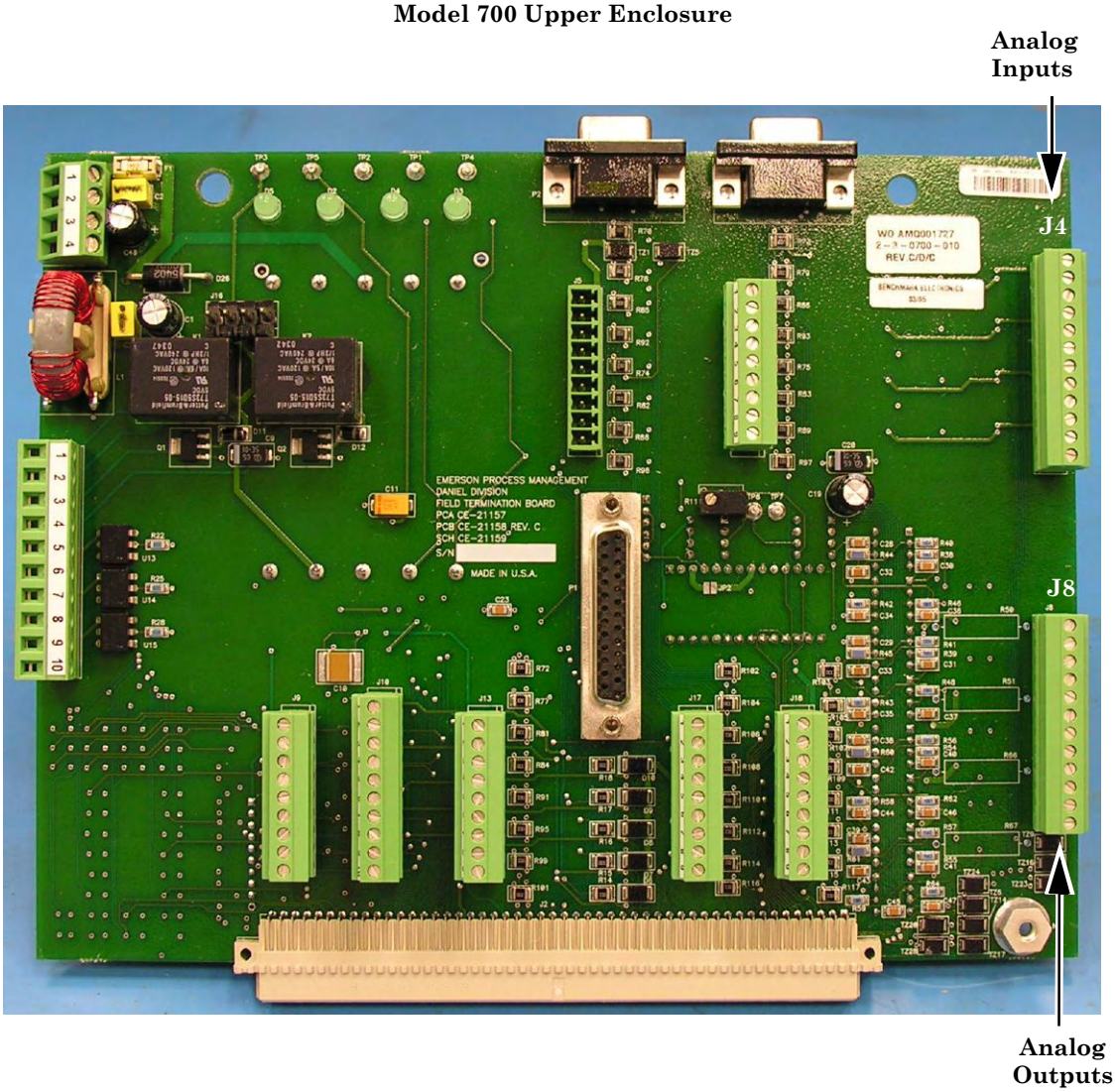



*Figure 4-36 FTB Board Analog Outputs*

The Model 700 analog outputs are configured as follows:

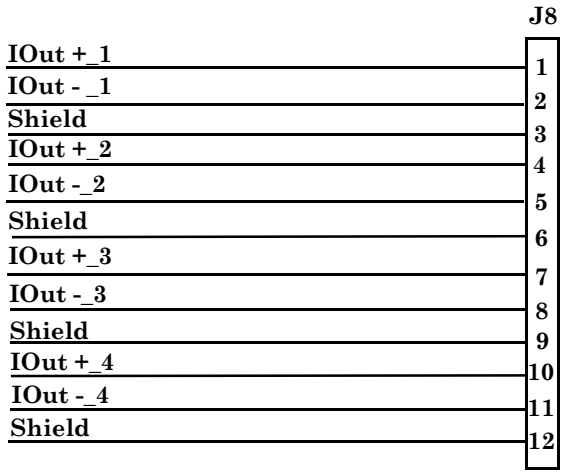



*Figure 4-37 Analog Outputs*

The analog outputs for the optional analog board (P/N 2-3-0580-037) are configured as follows

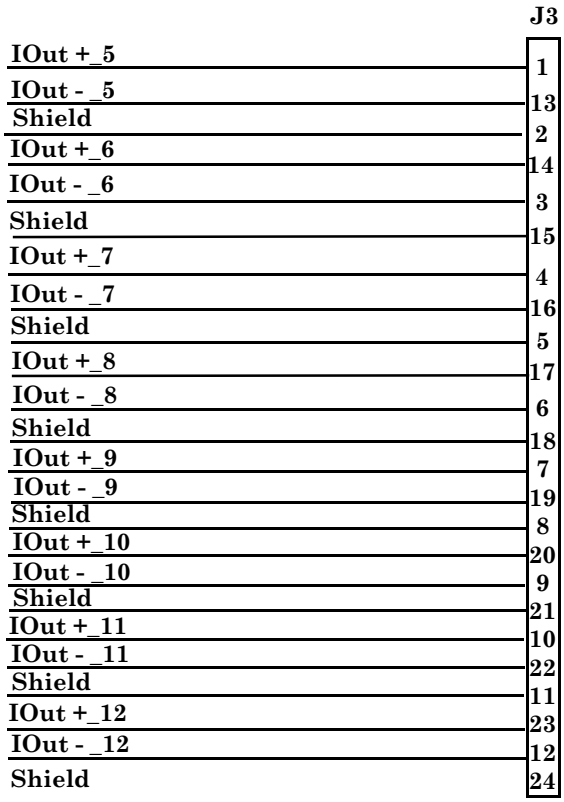



*Figure 4-38 Optional Analog Board Outputs*

## 4.13 DISCRETE DIGITAL INPUTS/OUTPUTS

For instructions on connecting digital inputs and outputs to the GC Field Termination Boards, see Section 3.4.7 for more details.

An external loopback test circuit can be built for troubleshooting the Model 700 digital input/output operation.

## 4.14 RECOMMENDED SPARE PARTS

See Appendix D for the lists of recommended spare parts for approximately one year of maintenance. The quantities represent the number of spares to cover most contingencies at facilities where GC systems are in operation.

Daniel Measurement Services offers service and repair service contracts that make maintaining most spares for the GC system unnecessary. Details regarding service contracts may be obtained by contacting DMS at the address or telephone number on the Customer Repair Report in the back of this manual.

NOTICE

**Refer to the MON2000 *Software for Gas Chromatographs User Manual,* Appendix F (P/N 3-9000-522) for BOS upgrade procedures.**

## 4.15 UPGRADE PROCEDURES

### 4.15.1 Base Operating System

The Base Operating System performs functions similar to operating systems such as DOS or Windows® or Linux®.

BOS provides the basic resources and interfaces to run the user's tasks. Unlike *DOS* or Windows or *Linux*, since BOS is an embedded real-time multi-tasking preemptive operating system, there is no direct user level interface to it. If a BOS upgrade is required to your system, refer to the MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522) for additional BOS information.

### 4.15.2 Applications

The GC application, which runs under BOS, utilizes the tools provided by BOS to perform the desired gas chromatograph functions for the user. There are different applications to provide for different gas chromatographic needs. To load a new application or to upgrade an existing application refer to the MON2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522) for details.

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NOTICE

**Com4 is reserved for an optional LOI. With the Com4A board installed, Com8 is used for the LOI.**

**Com3 is reserved for the multifunction board.**

# APPENDIX A, COMMUNICATIONS SPECIFICATIONS

## A.1 TCD SERIAL COMMUNICATIONS

The Model 700 with a TCD has three standard CPU serial communications ports: Com1, Com2, Com4, and four optional Com4A board serial ports: Com5 Com6, Com7, Com8 and Com9 for the optional internal modem. Per the matrix below, jumper settings can be configured for either RS-232, RS-422, or RS-485 serial signal definitions.

*Table A-1 Matrix of Possible TCD Configurations Field Termination Board*

| Logical Address | Operation | Comments |
|---|---|---|
| Com1 and Com2 (WinSys CPU Board) J1 to FTB | RS-232, RS-422 or RS-485 | PC, Flow Computer, Modem (external) |
| Com3 (WinSys CPU Board) J6 to Multifunction Board | RS-232 | Reserved for Multifunction Board |
| Com4 (WinSys CPU Board) J6 to FTB | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | Unless LOI is installed, then Com 4 is reserved for the LOI |
| Com5 (WinSys Com4A Board) J9 (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | Modem (External) |
| Com6 (WinSys Com4A Board) J13 (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | |
| Com7 (WinSys Com4A Board) J17 (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | |
| Com8 (WinSys Com4A Board) J18 (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | Reserved for LOI, when installed |
| Com9 | | Reserved for internal modem |

### A.1.1 Model 700 with a TCD Comm Ports

**NOTICE**

**A telephone modem can be connected to any of the GC serial ports configured for RS-232.**

**If an internal modem (WinSystems P/N 3-0580-042) or (P/N 3-0700-029 Radicom) is installed, it is assigned to serial port Com9.**

**If the Com4A board is installed, the modem is assigned to Com9.**

**With or without the Com4A board, the internal modem is assigned to Com9.**

The WinSystems CPU Board has three communications ports that can be used for the PC or the Flow Computer, as the customer desires.
When a keyboard and a display is required, Com4 is used for the optional Local Operator Interface (LOI).
The four channel WinSystems Com4A board (optional) is installed for applications requiring more than three communications ports. Each channel is individually configured for RS-232, RS-422, or RS-485 (for ports Com5, Com6, Com7, and Com8).
Configuration of each channel requires installing and/or removing the appropriate line driver ICs and installing jumpers. A Chip Kit (P/N CK-75176-2) is used when configuring a single channel for RS-422 mode or when configuring a two channel (maximum) mode for RS-485.
If a modem and a serial controller are both required, an external modem will be assigned to either Com1 or to Com5.
Serial ports configured for RS-232 are most commonly used for direct serial communication between the GC and a PC or modem.
Serial ports configured for RS-422 or RS-485 are most commonly used for long distance serial communications systems, such as a DCS or a network. For these systems, the GC can communicate as a Modbus slave device.

**NOTICE**

**In any Modbus *host-slave* DCS or network, there must only be one host to which any one of the GC serial ports can respond as a Modbus slave.**

**To use the MON 2000 software to configure the GC for Modbus communication, see the MON 2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522).**

**NOTICE**

**Model 700, Standard configuration, has three ports available on the FTB; Com 1, Com 2, and Com 5.**

For further details, see Figure A-1 through Figure A-4.

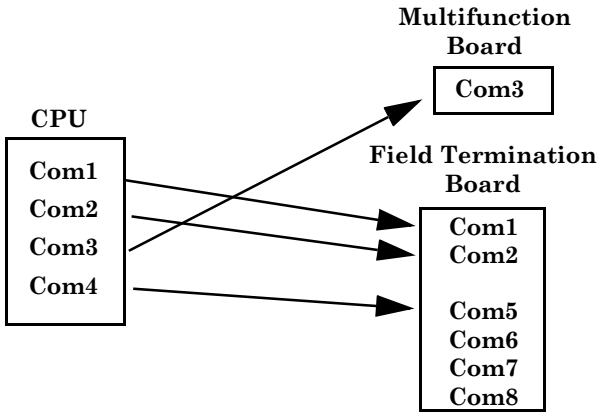



*Figure A-1 Standard Configuration without LOI and Com4A Board*

**NOTICE**

**Model 700, with the LOI installed, has two communications ports available on the FTB; Com1 and Com2.**

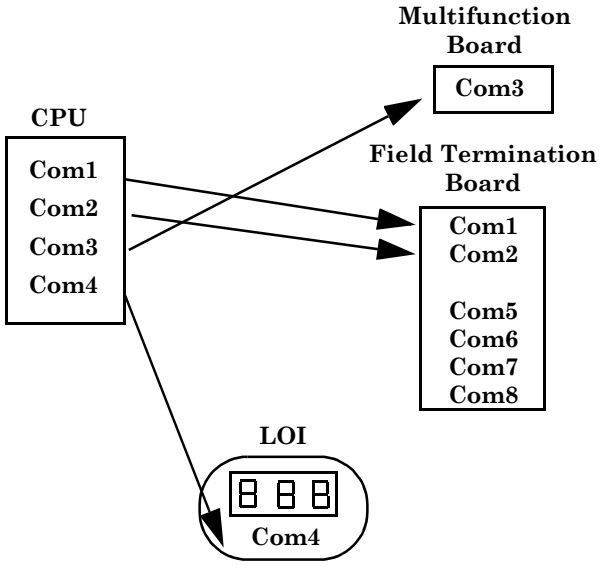



*Figure A-2 Configuration with LOI*

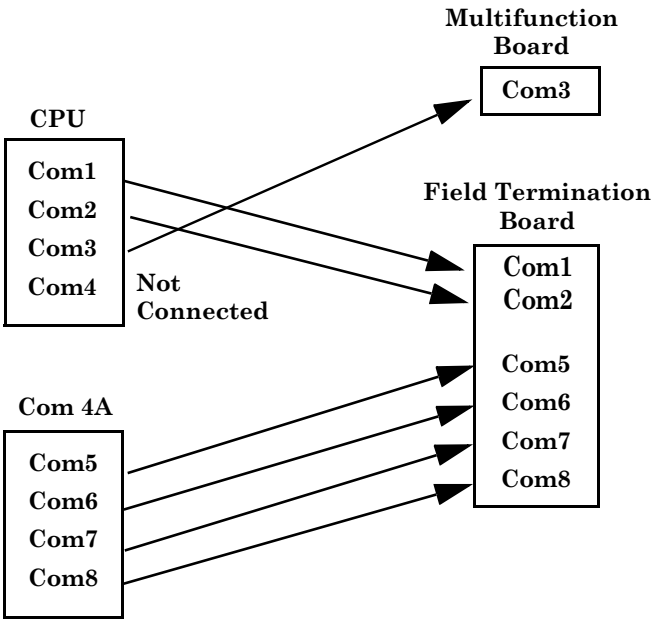



*Figure A-3 Configuration with Com4A Board*

**NOTICE**

**Model 700, with the Com4A board installed, has six communications ports available on the FTB; Com1 and Com2, and Com5, Com6, Com7, and Com8.**

**NOTICE**

**Model 700, with the LOI and Com4A board installed, have six communications ports available on the FTB; Com1 and Com2, and Com5, Com6, Com7, and Com8.**

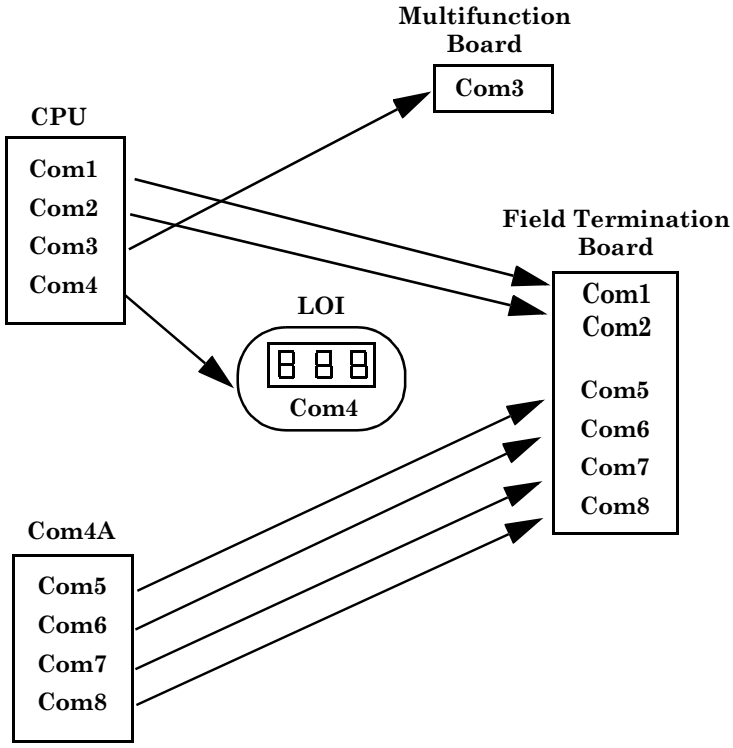



*Figure A-4 Configuration with Com4A Board and LOI*

If using a direct 6-conductor serial cable, connect the exposed cable leads to the FTB serial port. A pinout of a female DB 9-pin socket is shown in Figure A-5.

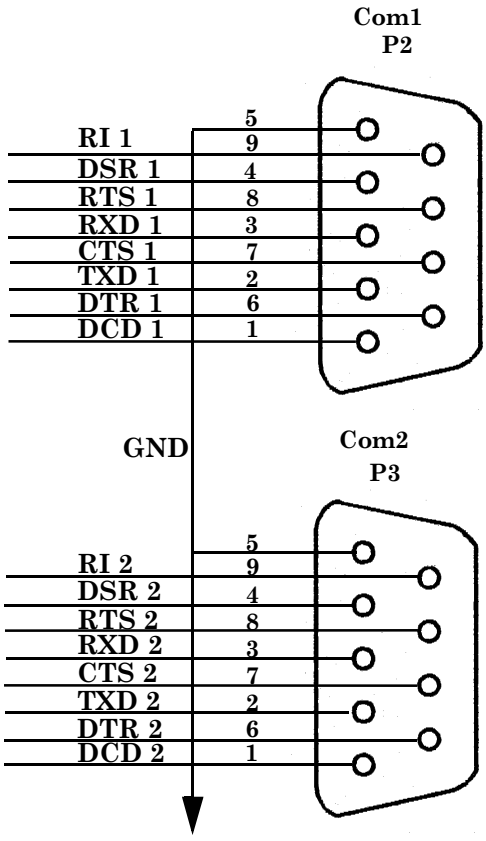



*Figure A-5 FTB Com1 and Com2 DB9 Connector*

**NOTICE**

**Com3 is reserved for Multifunction board.**

**Com4 is reserved for the FID/TCD board.**

## A.2 FID SERIAL COMMUNICATIONS

The Model 700 with a FID/TCD has two standard WinSystems CPU Board serial communications ports: Com1 and Com2 that can be used for the PC or the Flow Computer, as the customer desires.

The four channel WinSystems Com4A board (optional) is installed for applications requiring more than two communications ports. Each channel is individually configured for RS_232, RS-422 or RS-485 (for ports Com5 Com6, Com7, Com8).

*Table A-2 Matrix of Possible FID Configurations Field Termination Board*

| Logical Address | Operation | Comments |
|---|---|---|
| Com1 and Com2 (WinSys CPU Board) J1 to FTB | RS-232, RS-422 or RS-485 | PC, Flow Computer, Modem (external) |
| Com3 (WinSys CPU Board) J6 to Multifunction Board | RS-232 | Reserved for Multifunction PCB |
| Com4 (WinSys CPU Board) J6 to FID/TCD Preamplifier | RS-232 | Reserved for FID/TCD Preamplifier PCB |
| Com5 (WinSys Com4A Board) J9 on FTB (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | Modem (External) |
| Com5 (WinSys Com4A Board) J9 on FTB (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | |
| Com6 (WinSys CPU Board) J13 on FTB (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | |
| Com7 (WinSys Com4A Board) J17 on FTB (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | |
| Com8 (WinSys Com4A Board) J18 on FTB (9-pin Phoenix) | RS-232, RS-422 or RS-485 (RS-422 and RS-484 needs Chip Kit #CK 75176-2) | Reserved for LOI, when installed |
| Com9 | | Reserved for internal modem |

**NOTICE**

**In any Modbus *host-slave* DCS or network, there must only be one host to which any one of the GC serial ports can respond as a Modbus slave.**

**To use the MON 2000 software to configure the GC for Modbus communication, see the MON 2000 *Software for Gas Chromatographs User Manual* (P/N 3-9000-522).**

Configuration of each channel requires installing and/or removing the appropriate line driver ICs and installing jumpers. A Chip Kit (P/N CK-75176-2) is used when configuring a single channel for RS-422 mode or when configuring a two channel (maximum) mode for RS-485.

If a modem and a serial controller are both required, an external modem will be assigned to either Com1 or to Com5.

Serial ports configured for RS-232 are most commonly used for direct serial communication between the GC and a PC or modem.

Serial ports configured for RS-422 or RS-485 are most commonly used for long distance serial communications systems, such as a DCS or a network. For these systems, the GC can communicate as a Modbus slave device.

For further details, see Figure A-6 and Figure A-7.

**NOTICE**

**Model 700, standard configuration, has two communications ports available on the FTB; Com1 and Com2.**

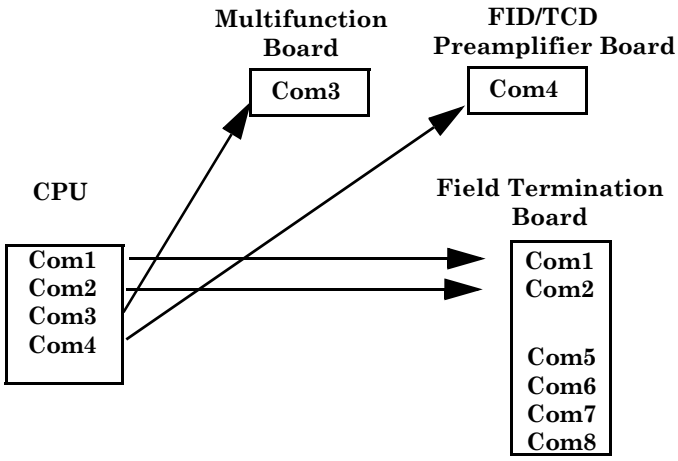



*Figure A-6 Configuration without Com4A Board*

**NOTICE**

**Com 4 is dedicated to the Micro-FID/TCD Preamplifier. When the LOI becomes available, it will use a video board instead of a serial port connection.**

**NOTICE**

**Model 700, with the Com 4A board installed, has six communications ports available on the FTB; Com1 and Com2, and Com5, Com6, Com7, and Com8.**

**NOTICE**

**Com 4 is dedicated to the Micro-FID/TCD Preamplifier. When the LOI becomes available, it will use a video board instead of a serial port connection.**

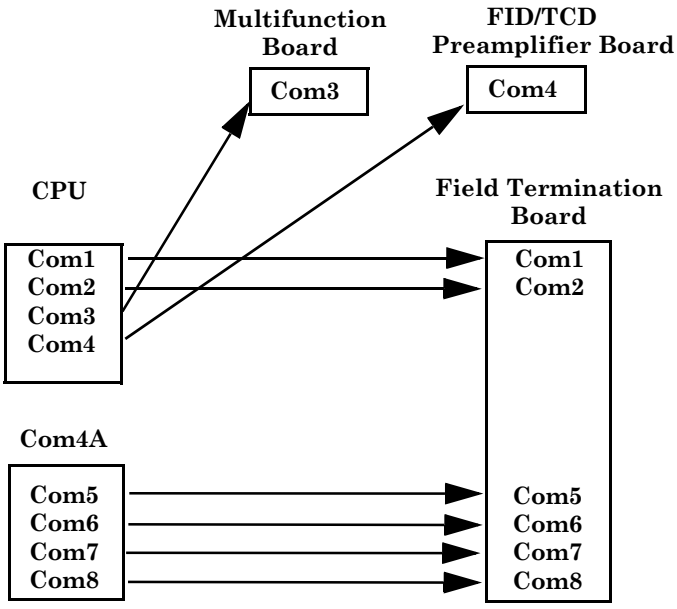



*Figure A-7 Configuration with Com4A Board*

NOTICE

**Serial communications for FTB (Com1- Com4) is standard. Com3 reserved for the Multifunction board.**

**Serial communications with optional Com4A board are available on ports Com5 - Com8.**

### A.2.1 Connecting Serial Communications to the GC

To connect serial communications lines to the GC,

1. Access the FTB in the lower enclosure.
2. Route serial communications lines appropriately.
3. Make serial communications line connections to the FTB. See Section A.1.1 for port numbers and pinouts.

   Each of the various combinations available for GC serial communications ports (i.e., RS-232, RS-422, or RS-485) require:

   - specific jumper settings on the WinSystems CPU board or the optional Com4A board

   In most instances, installation of these jumper settings *requires no modification*. Configurations have been performed at the factory prior to shipment of the Model 700, according to customer specifications for serial communications.

NOTICE

**If you are changing or adding serial communications to the GC, ensure that the correct jumpers are set.**

### RS-232 Ports

See Appendix A.2.2 for RS-232 port connections

**Voltage:** ±5 volts or ±12 volts, depending on jumper settings

**Recommended Maximum Cable Length:** 50 feet (15 meters)

**Pinouts:** See Appendix A.2.2

### RS-422 Ports

See Appendix A.2.2 for RS-422 port connections.

Voltage: line drivers meet Electronics Industries Association (EIA) specifications for RS-422.

**Recommended Maximum Cable Length:** 4000 feet (1219 meters)

Pinouts: See Appendix A.2.2

### RS-485 Serial Specifications

See Appendix A.2.2 for RS-485 port connections.

**Voltage:** line drivers meet Electronics Industries Association (EIA) specifications for RS-485

**Recommended Maximum Cable Length:** 4000 feet (1219 meters)

**Pinouts:** See Appendix A.2.2

## A.2.2 FTB Serial Communications

The settings are shown in Figure A-8 through Figure A-13.

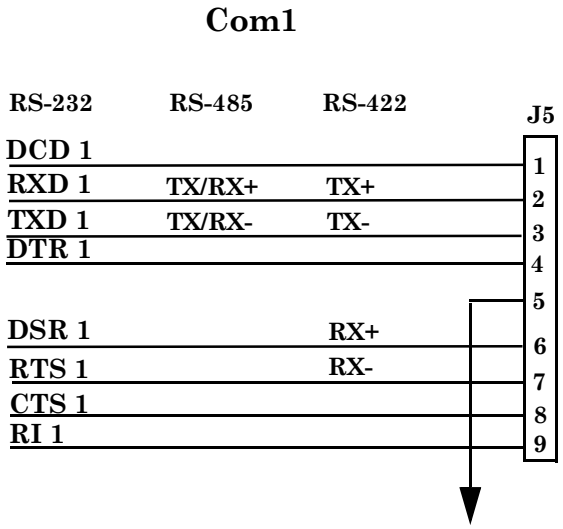



*Figure A-8 FTB Com1 DB 9-pin Phoenix Connector*

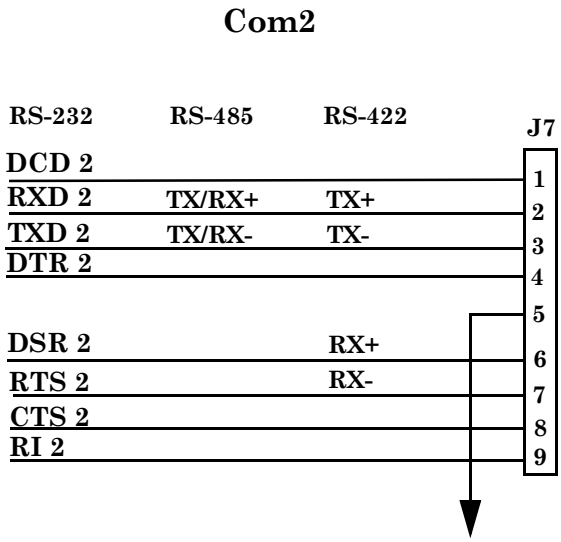



*Figure A-9 FTB Com2 DB 9-pin Phoenix Connector*

## Com5

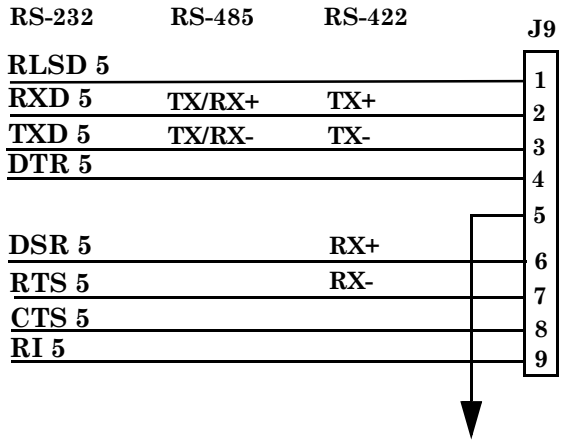



*Figure A-10 FTB Com5 DB 9-pin Phoenix Connector*

## Com6

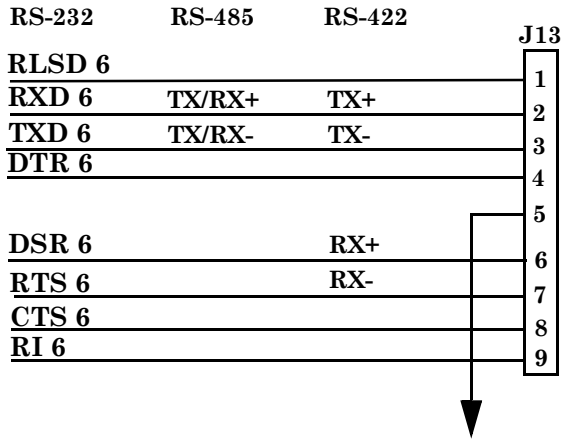



*Figure A-11 FTB Com6 DB 9-pin Phoenix Connector*

## Com7

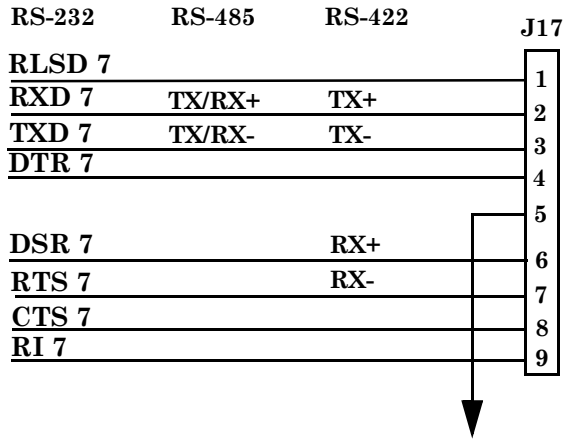



*Figure A-12 FTB Com7 DB 9-pin Phoenix Connector*

## Com8

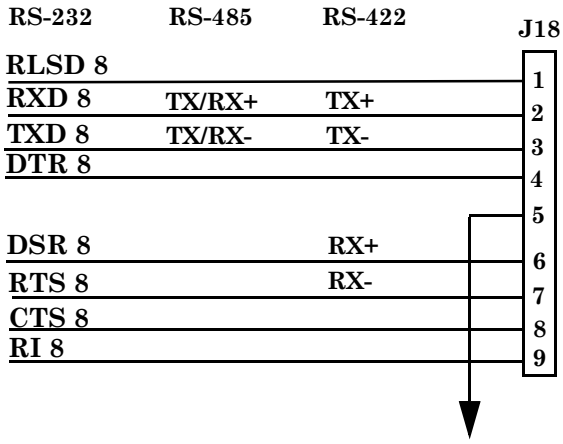



*Figure A-13 FTB Com8 DB 9-pin Phoenix Connector*

## WinSystems CPU

Jumper settings and pinouts for the four WinSystems CPU board serial communications ports; Com1, Com2, Com3, and Com4 are defined in the following tables.

*Table A-3 Communication with WinSystems CPU*

**Com1**

| **RS-232 Mode** |
|---|
| J8 – Jumpers Pins 1 and 2 |
| J13 – No jumpers |
| U2 – Installed (Standard) |
| U5 – Removed |
| U6 – Removed |
| **RS-422 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J8 – Jumper Pins 1 and 2 |
| J13 – No jumpers |
| U2 – Removed |
| U5 – Installed |
| U6 – Installed |
| **RS-485 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J8 – Jumper Pins 1 and 2 |
| J13 – Jumper Pins 2 and 3 |
| U2 – Removed |
| U5 – Removed |
| U6 – Installed |

*Table A-4 Communication with WinSystems CPU*

| **Com2** |
|---|
| **RS-232 Mode** |
| J9 – Jumpers Pins 1 and 2 |
| J16 – No jumpers |
| U9 – Installed (Standard) |
| U11 – Removed |
| U12 – Removed |
| **RS-422 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J9 – Jumper Pins 1 and 2 |
| J16 – No jumpers |
| U9 – Removed |
| U11 – Installed |
| U12 – Installed |
| **RS-485 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J9 – Jumper Pins 1 and 2 |
| J16 – Jumper pin 2 and 3 |
| U9 – Removed |
| U11 – Removed |
| U12 – Installed |

*Table A-5 Communication with WinSystems CPU*

| **Com3 Reserved for Multifunction Board** |
|---|
| **RS-232 Mode** |
| J12 – Jumpers Pins 1 and 2 |
| J14 – No jumpers |
| U4 – Installed (Standard) |
| U7 – Removed |
| U8 – Removed |

*Table A-6 Communication with WinSystems CPU*

**Com4 (Reserved for FID/TCD Preamplifier Board)**

| **RS-232 Mode** |
|---|
| J15 – Jumpers Pins 1 and 2 |
| J17 – No jumpers |
| U10 – Installed (Standard) |
| U13 – Removed |
| U14 – Removed |
| **RS-422 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J15 – Jumpers Pins 1 and 2 |
| J17 – No jumpers |
| U10 – Removed |
| U13 – Installed |
| U14 – Installed |
| **RS-485 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J15 – Jumpers Pins 1 and 2 |
| J17 – Jumpers Pins 2 and 3 |
| U10 – Removed |
| U13 – Removed |
| U14 – Installed |

## WinSystems MCM/LPM – Com4A Board

Jumper settings and pinouts for the four WinSystems Com4A board (optional) serial communications ports; Com5, Com6, Com7, and Com8 are defined in the following tables.

*Table A-7 Communication with WinSystems MCM/LPM – Com4A Board (Optional)*

| **Com5** |
|---|
| **RS-232 Mode** |
| J2 – No jumpers |
| U6 – Installed (Standard) |
| U3 – Removed |
| U4 – Removed |
| **RS-422 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J2 – No jumpers |
| U6 – Removed |
| U3 – Installed |
| U4 – Installed |
| **RS-485 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J2 – Jumper Pins 2 and 3 |
| U6 – Removed |
| U3 – Removed |
| U4 – Installed |

| **Com6** |
| --- |
| **RS-232 Mode** |
| J5 – No jumpers |
| U13 – Installed (Standard) |
| U10 – Removed |
| U14 – Removed |
| **RS-422 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J5 – No jumpers |
| U13 – Removed |
| U10 – Installed |
| U14 – Installed |
| **RS-485 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J5 – Jumper pins 2 and 3 |
| U13 – Removed |
| U10 – Removed |
| U14 – Installed |

**Com7**

| **RS-232 Mode** |
| --- |
| J4 – No jumper |
| U11 – Installed (Standard) |
| U9 – Removed |
| U12 – Removed |

| **RS-422 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| --- |
| J4 – No jumpers |
| U11 – Removed |
| U9 – Installed |
| U12 – Installed |

| **RS-485 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| --- |
| J4 – Jumper pins 2 and 3 |
| U11 – Removed |
| U9– Removed |
| U12 – Installed |

| Com8 |
| --- |
| **RS-232 Mode** |
| J1 – No jumpers |
| U5 – Installed (Standard) |
| U1 – Removed |
| U2 – Removed |
| **RS-422 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J1 – No jumpers |
| U5 – Removed |
| U1 – Installed |
| U2 – Installed |
| **RS-485 Mode (Need WinSys Chip Kit CK # 75176-2)** |
| J1 – Jumper pins 2 and 3 |
| U5 – Removed |
| U1 – Removed |
| U2 – Installed |

## Com4A Board Compatibility Settings

*Table A-8 J10 Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |
| 3 and 4 | In |
| 7 and 8 | In |
| 9 and 10 | In |

*Table A-9 J7 Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | Open |
| 3 and 4 | Open |
| 5 and 6 | Open |

*Table A-10 J8 Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |
| 3 and 4 | In |
| 5 and 6 | In |
| 7 and 8 | In |

*Table A-11 J9 Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |
| 5 and 6 | In |

## WinSystems Ethernet Board

The PCM-NE2000-16 PC-104 can be configured by using the on-board jumper block Jumper settings and pinouts used on the Model 700 for the PCM-NE-2000-16 PC-104 Ethernet board (optional) are defined in the following table:

*Table A-12 Ethernet Board Pin Settings*

| Jumper | Pin Position "In" |
|---|---|
| J1 | 13 and 14<br>15 and 16<br>17 and 18<br>23 and 24<br>27 and 28 |
| J2 | 1 and 2 |
| J3 | 1 and 2 |

### Radicom 56K Baud Modem Board

The jumper settings and pinouts for the Radicom Modem (P/N 3-0700-029) are shown below: (see Section 3.4.10).

*Table A-13 J26 Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |

*Table A-14 J27 Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |

*Table A-15 J30 Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 1 and 2 | In |

*Table A-16 J31 Radicom Modem Jumper Settings*

| Pin(s) | Position |
|---|---|
| 2 and 3 | In |

## A.3 WIRING LOCAL RS-232 COMMUNICATIONS

### A.3.1 GC Serial Port and Cable Configurations

This section provides more detailed information about local serial port connections for the Model 700. It identifies serial port pin assignments and diagrams for designing RS-232 serial cables.

GC serial ports are found on the Field Termination Board and the connection points for external devices are as follows:

**Model 700 Lower Enclosure**

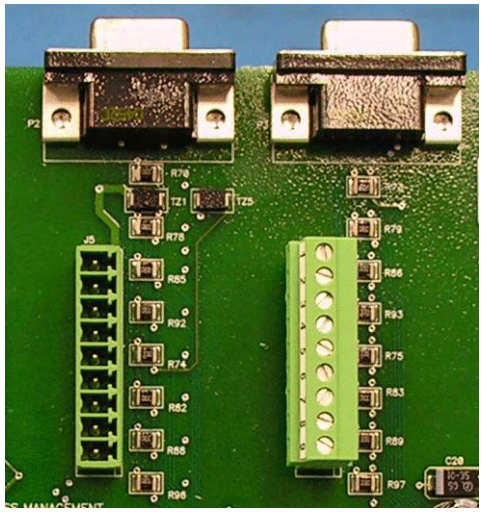



*Figure A-14 FTB Serial Connections*

**Model 700 Lower Enclosure**

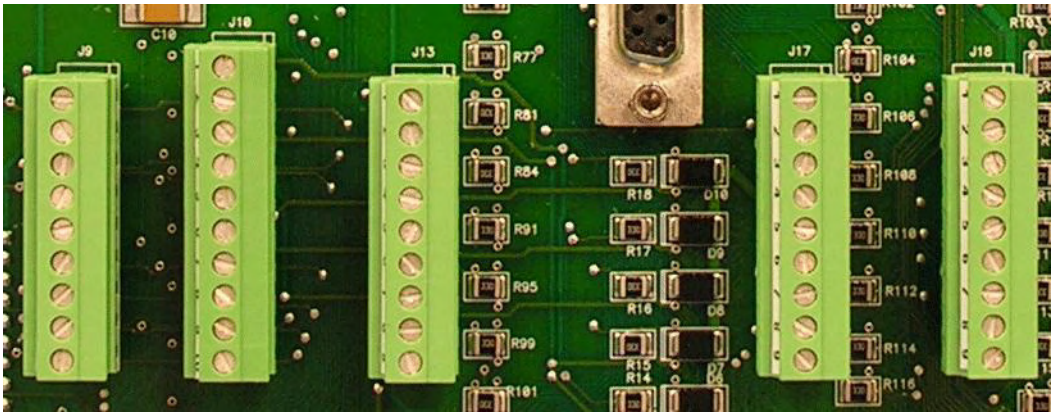



*Figure A-15 FTB Serial Connections*

*Table A-17 Serial Ports on Field Termination Board*

| Port | Comments | Phoenix Plug (bare-wire) connection |
|---|---|---|
| Serial Port 1 (Com1) | P2 DB 9-pin Connection | J5 |
| Serial Port 2 (Com2) | P3 DB 9-pin Connection | J7 |
| Serial Port 3 (Com3) | Reserved for Multifunction Board | N/A |
| Serial Port 4 (Com4) | Reserved for LOI with Com4A board (TCD units)<br><br>Reserved for FID/TCD Preamplifier Board (FID/TCD units) | N/A |
| Serial Port 5 (Com5) | | J9 |
| Serial Port 6 (Com6) | | J13 |
| Serial Port 7 (Com7) | | J17 |
| Serial Port 8 (Com8) | | J18 |

Phoenix plug (bare-wire) connections are available to all four serial ports. Pin-outs are identical for all four serial port Phoenix plugs and jacks. Each Phoenix plug/jack (male) combination allows a bare-wire connection and uses 9-Pins as illustrated:

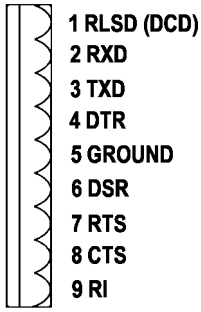



*Figure A-16 Phoenix Connector (J5, J6, J10, and J11) Pinout*

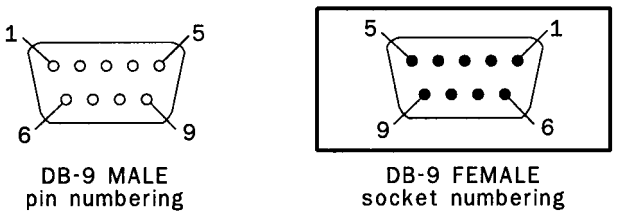
Null modem connections (DB 9-pin) are available for Serial Ports 1 and 2 only, as noted in Table A-17.

**NOTICE**

**PC-to-GC connections, direct serial:**
**The GC serial ports were wired to appear as DCE, so a straight-through serial cable is used for a direct serial connection between the GC and the PC. (The PC is Data Terminal Equipment, or DTE.) See Section A.3.2.**

**External modem-to-GC connections, serial: a null modem cable and gender changes may be purchased from any computer products store, for the GC to external modem connection. However, a custom serial cable may be built to emulate a null-modem cable for a connection between the GC Controller and an external modem. (The modem is Data Communications Equipment, or DCE.) See Section A.4.**

Both of the GC DB 9-pin jacks are female and have identical pin assignments. Note that a DB 9-pin male numbering scheme is also illustrated, but for reference purposes only as follows (see Figure A-17).




pinout for both DB-9 female jacks at GC Controller

| 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| GND | DSR | RxD | TxD | RLSD |

| 9 | 8 | 7 | 6 |
|---|---|---|---|
| RI | RTS | CTS | DTR |

*Figure A-17 DB 9-pin Connector (P2 and P3) and Pinout for Jacks*

### A.3.2 GC DB 9-pin Serial Port to PC DB 9-pin Port

To make an RS-232 serial connection between one of the DB 9-pin serial ports of the GC, and a PC with DB 9-pin serial port, use a straight-through serial cable, terminated as DB 9-pin male / DB 9-pin female. This will work if the PC has a male DB 9-pin serial port, and its pin assignments are identical to those found on a typical DB 9-pin serial port of an IBM PC.

The straight-through serial cable can be obtained from most computer products suppliers, so custom-building a cable normally is not necessary. Wiring and signal paths are illustrated as follows (see Figure A-18).

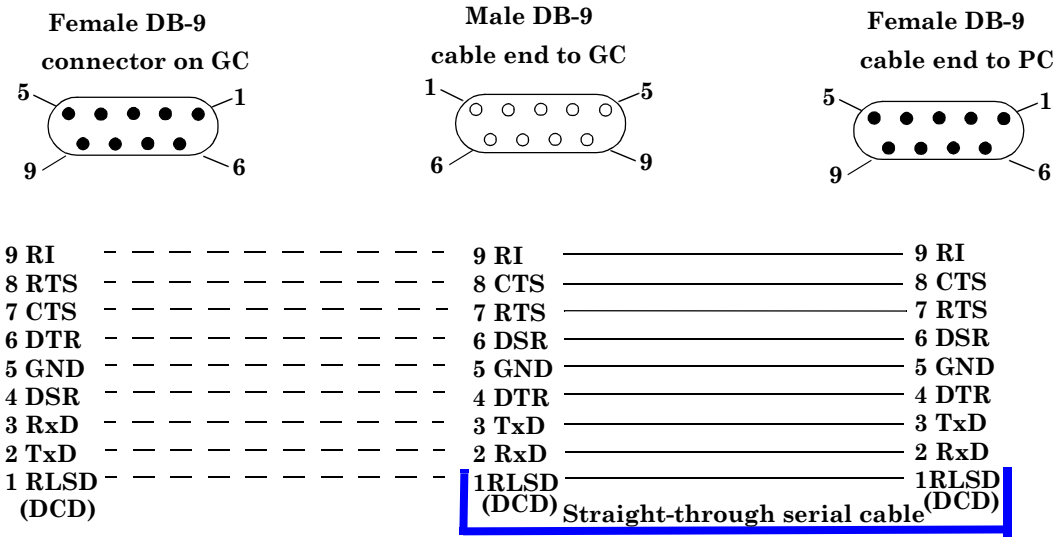



*Figure A-18 GC DB 9-pin Port to PC DB 9-pin Port*

### A.3.3 GC DB 9-pin Serial Port to PC DB 25-pin Port

To make an RS-232 serial connection between one of the DB 9-pin serial ports of the GC, and a PC with DB 25-pin serial port, you may be able to use a straight-through serial cable, terminated as DB 9-pin male / DB 25-pin female. This will work if the PC has a male DB 25-pin serial port, and its pin assignments are identical to those found on an IBM PC. The necessary straight-through serial cable can be obtained from most computer products suppliers, so custom-building a cable normally is not necessary. Wiring and signal path are illustrated as follows (see Figure A-19).

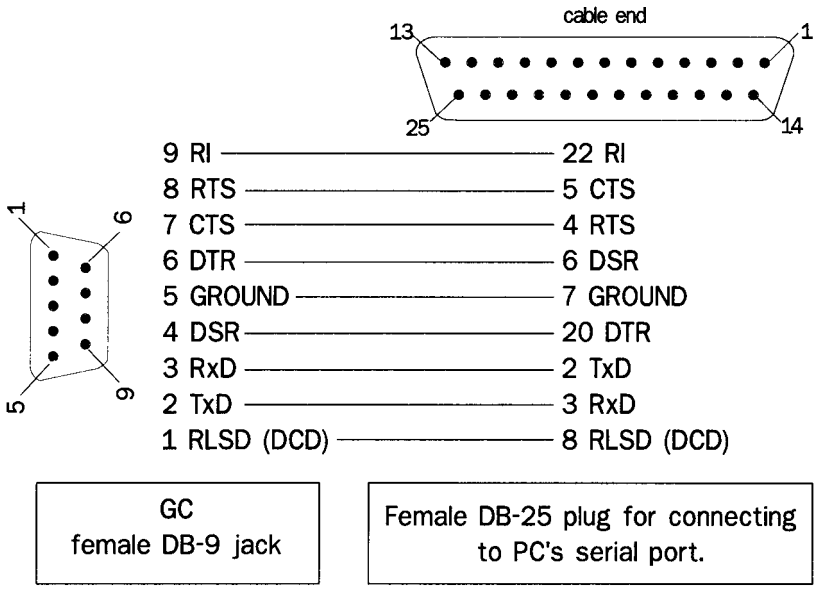



*Figure A-19 GC DB 9-pin Port to PC DB 25-pin Port*

**NOTICE**

**The cable for this application is also available (P/N 3-2350-068) in a customer-specified length with six exposed leads and a female DB 9-pin connector.**

### A.3.4 GC PHOENIX Plug Port to PC DB 9-pin Port

To make an RS-232 serial connection between one of the Phoenix Plug serial ports of the GC, and a PC with DB 9-pin serial port, you will need to manufacture the cable and its DB 9-pin, female plug cable end as illustrated below (see Figure A-20).

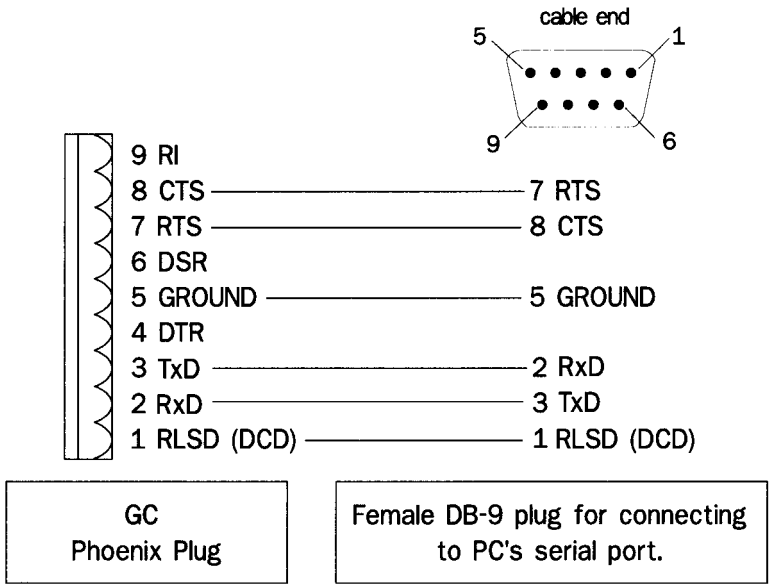



*Figure A-20 GC DB 9-pin Port to PC DB 25-pin Port*

### A.3.5 GC PHOENIX Plug Port to PC DB 25-pin Port

To make an RS-232 serial connection between one of the Phoenix Plug serial ports of the GC, and a PC with DB 25-pin serial port, you will need to manufacture the cable and its DB 25-pin, female plug cable end as illustrated below (see Figure A-21).

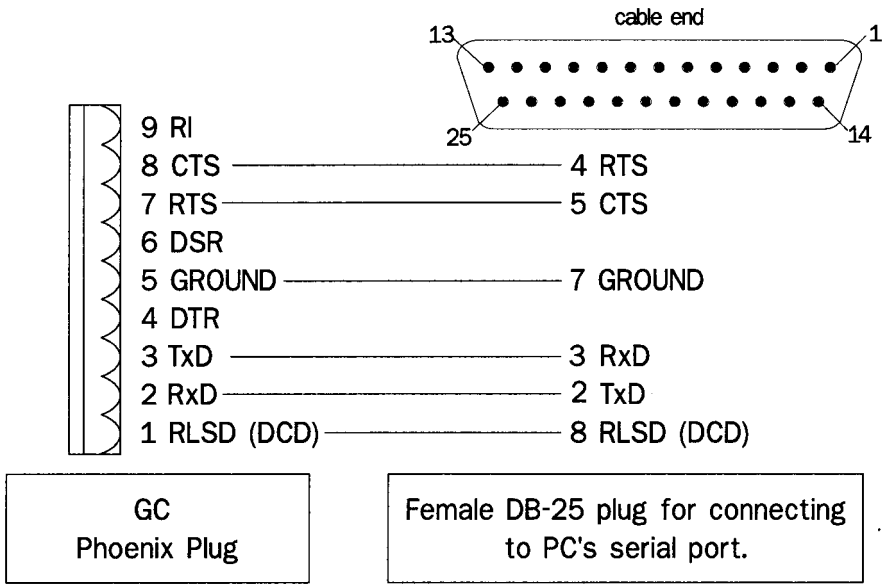



*Figure A-21 GC Phoenix Plug Port to PC DB 25-pin Port*

## A.4 WIRING REMOTE RS-232 COMMUNICATIONS

### A.4.1 GC DB 9-pin Serial Port to Modem DB 25-pin Port

To make an RS-232 serial connection between one of the DB 9-pin serial ports of the GC, and an external modem with a DB 25-pin serial port, you may use gender changes and a null modem cable purchased from any computer products supplier, or you may manufacture a cable. The manufactured null modem cable will need a male DB 9-pin connector and a male DB 25-pin connector. Wire the cable ends as illustrated below (see Figure A-22).

**NOTICE**

**The DB-9 connector on the GC serial port is wired to appear as Data Communications Equipment (DCE). Use a custom null-modem type cable to make the connection between the GC and an external modem. (GC serial ports were wired to appear as DCE so that a straight-through serial cable could be used for a direct serial connection between the GC Controller and the PC, which is Data Terminal Equipment [DTE].)**

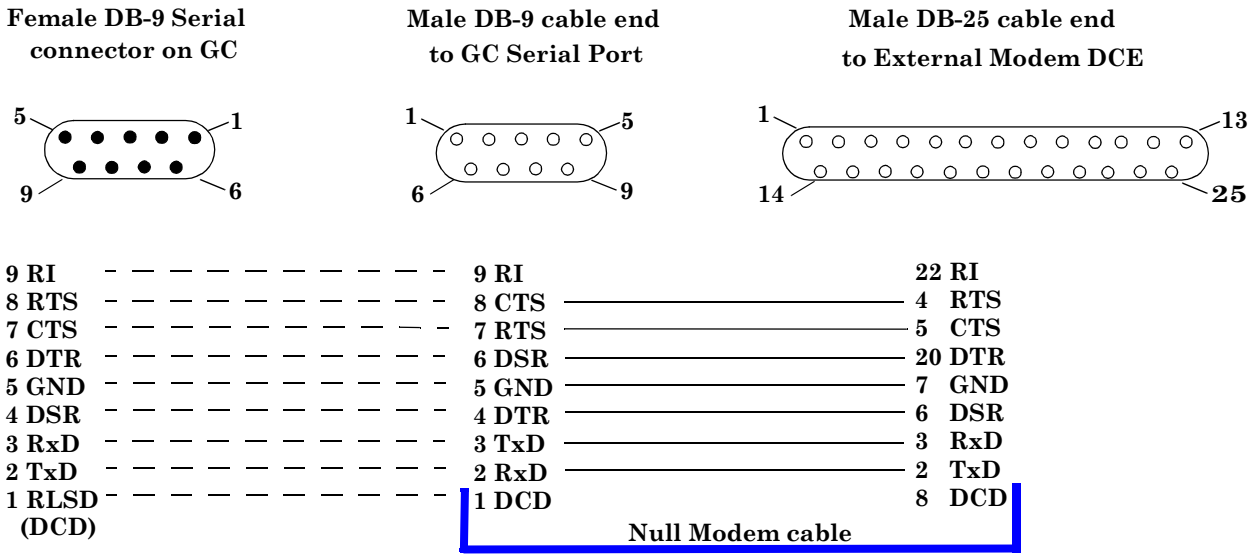



*Figure A-22 GC DB 9-pin Port to External Modem DB 25-pin Port*

### A.4.2 GC PHOENIX Plug to Modem DB 25-pin Port

To make an RS-232 serial connection between one of the Phoenix Plug serial ports of the GC, and an external modem with DB 25-pin serial port, you will need to manufacture the cable and its DB 25-pin, male plug cable end as illustrated below (see Figure A-23).

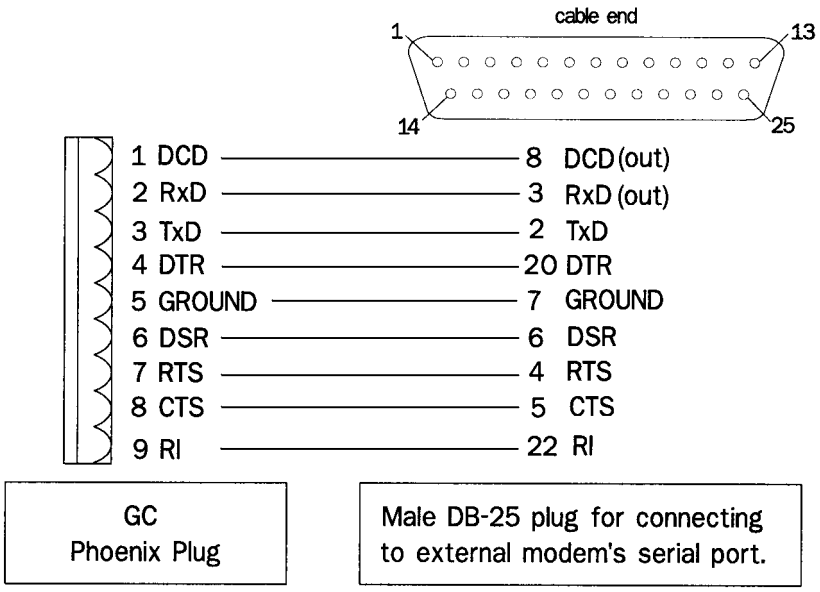



*Figure A-23 GC Phoenix Plug Port to External Modem DB 25-pin Port*

## A.5 EXAMPLE RS-422 PC-GC CONNECTION

**NOTICE**

**See Section 3.4 for additional details about serial communication setups.**

This section demonstrates an example RS-422 connection from a PC to GC that is accomplished through use of an asynchronous line driver/interface device. The line driver device serves as an interface between the RS-232 output of the PC and the RS-422 protocol needed for long distance serial input to the GC. Specifics of the line driver are as follows:

- Black Box brand
- Model LD485A-MP RS-232/RS-485 Multipoint Line Driver
- RS-232 input (to connect to the PC)
- RS-422 or RS-485 output (to connect to the GC)

**NOTICE**

**For this example, a straight-through RS-232 serial cable is used to connect between the PC and the line driver.**

RS-422 line terminations are illustrated in Figure A-24, below, and jumper and switch settings to configure the line driver device are listed in Table A-18 and Table A-19.

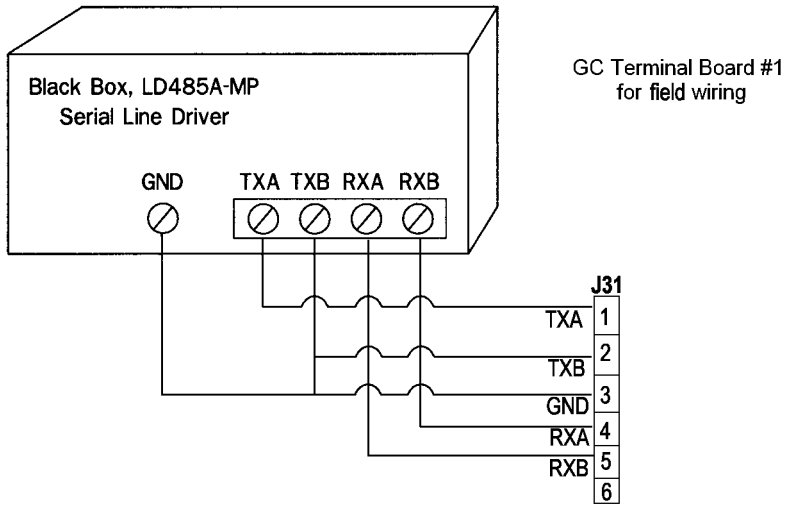



*Figure A-24 Example RS-422 Serial Cable Terminations*

*Table A-18 Switch Settings for LD485A-MP, RS-422 to GC*

| Switch Type | Label | Position | Purpose |
|---|---|---|---|
| Front Panel Switch | NORMAL / DLB | NORMAL | Uses normal operation, instead of loopback testing. |
| DIP Switch Bank | XW1A DCE / XW1B DTE | XW1A DCE | Sets line driver to operate as data communications equipment (DCE). |
| DIP Switch Bank | S2 | UNTERM | Eliminates need for resistor network termination to connect one PC directly to one GC. |

*Table A-19 Jumper Settings for LD485A-MP, RS-422 to GC*

| Jumper | Position | Purpose |
|---|---|---|
| W8 | HALF | half duplex operation |
| W9 | ON | no delay, clear to send (CTS) always true |
| W15 | A-B | RS-485 driver enabled by request to send (RTS) |
| W16 | A-B | half duplex turnaround delay at 5 ms |
| W17 | B 100 ms | disable timeout delay by 100 ms |
| W18 | B-C | RS-485 driver enabled by RTS |

NOTICE

**See Section 3.4 for additional details about serial communication setups.**

## A.6 EXAMPLE RS-485 PC-GC CONNECTION

This section demonstrates an example RS-485 connection from a PC to GC that is accomplished through use of an asynchronous line driver/interface device. The line driver device serves as an interface between the RS-232 output of the PC and the RS-485 protocol needed for long distance serial input to the GC. Specifics of the line driver are as follows:

- Black Box brand
- Model LD485A-MP RS-232/RS-485 Multipoint Line Driver
- RS-232 input (to connect to the PC)
- RS-422 or RS-485 output (to connect to the GC)

NOTICE

**For this example, a straight-through RS-232 serial cable is used to connect between the PC and the line driver.**

Refer to Figure A-25 and Figure A-26 for RS-485 line terminations, jumpers and switch settings to configure the line driver device (also listed in Table A-19).

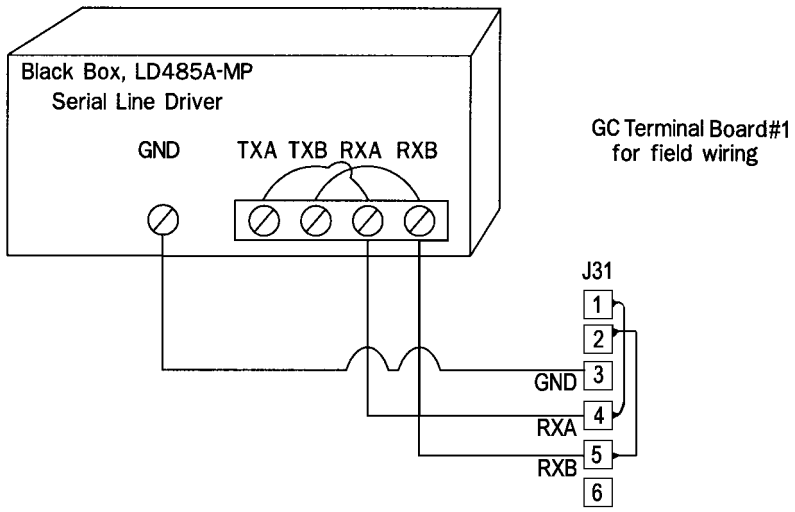



*Figure A-25 Example RS-485 Serial Cable Terminations, Line Driver to GC Controller Com3*

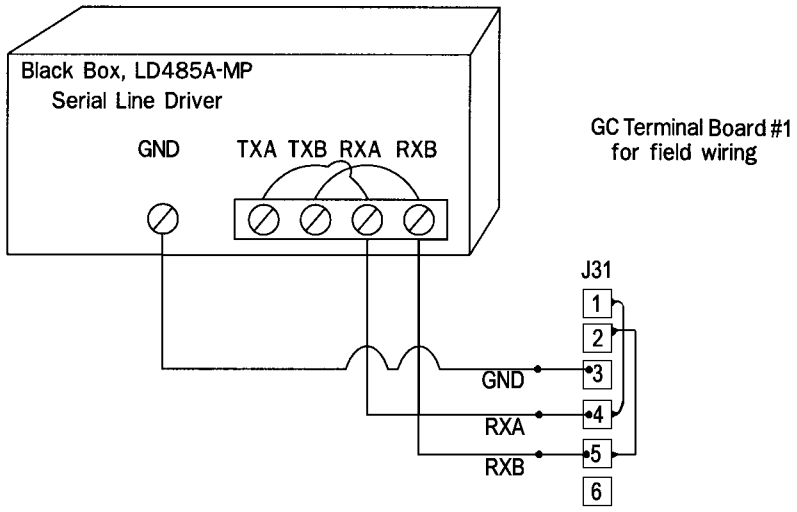



*Figure A-26 Example RS-485 Serial Cable Terminations, Line Driver to GC Controller Com4*

*Table A-20 Switch Settings for LD485A-MP, RS-485 to GC*

| Switch Type | Label | Position | Purpose |
|---|---|---|---|
| Front Panel Switch | NORMAL / DLB | NORMAL | Normal operation used, instead of loopback testing. |
| DIP Switch Banks | XW1A DCE / XW1B DTE | XW1A DCE | Sets line driver to operate as data communications equipment (DCE). |
| DIP Switch Banks | S2 | UNTERM | Eliminates need for resistor network termination to connect one PC directly to one GC. |

*Table A-21 Jumper Settings for LD485A-MP, RS-485 to GC*

| Jumper | Position | Purpose |
|---|---|---|
| W8 | HALF | half duplex operation |
| W9 | 0 ms | 0 milliseconds delay from time request to send (RTS) received as true until clear to send (CTS) asserted as true |
| W15 | A-B | RS-485 driver enabled by RTS |
| W16 | A-B | half duplex turnaround delay at 5 ms |
| W17 | B 100 ms | disable timeout delay by 100 ms |
| W18 | B-C | RS-485 driver enabled by RTS |

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NOTICE

**Revision C of the Internal Modem requires MON2000 software, version 2.2 or later.**

# APPENDIX B, MODEM INSTALLATION

This appendix provides information for installing the optional Internal Modem for the Model 700 (P/N 3-0700-029). The modem communications is established via COM4 and the MON2000 version 2.2 software, which then redirects modem communications through to Com9.

## B.1 OPTIONAL INTERNAL MODEM

**⚠WARNING**

**DANGER TO PERSONNEL AND EQUIPMENT**

**Before removing the cover from the GC, ensure that the power supply switch is OFF and the AC power cord is disconnected.**

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

To install the internal modem,

1. Halt any ongoing analysis runs.
2. Disconnect the power from the unit.
3. Remove the explosion-proof dome and the Oven System protective cover.

4. Disconnect the Analog cable from J6 of the System Interface board, then disconnect all CPU cables from the System Interface board.
5. Remove the CPU assembly and install the modem, with associated hardware into J19 and J20 PC/104 Bus connector on the CPU assembly. The modem must be the top board in the assembly. See Figure below.

**Model 700 Lower Enclosure**

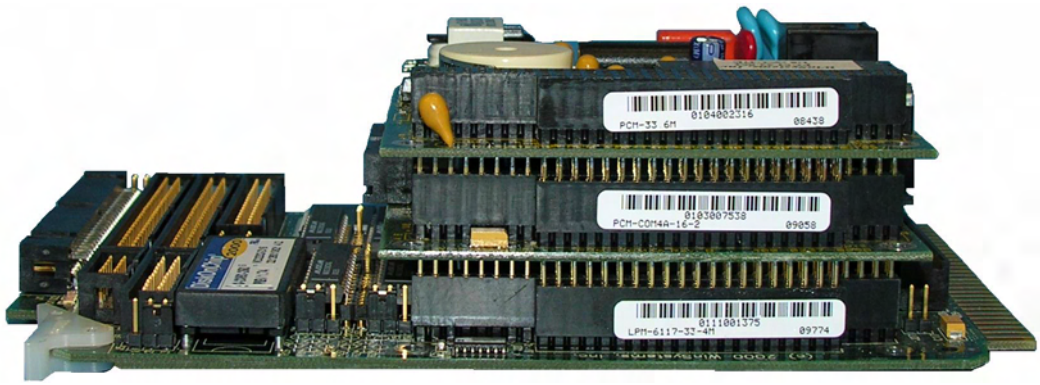

*Figure B-1 Radicom 56K Baud Modem Installation*

6. Set communication port jumper settings on the modem board (P/N 3-0700-029) as follows:

| Jumper | Pin |
|---|---|
| J26 | 1-2 |
| J27 | 1-2 |
| J30 | 1-2 |
| J31 | 2-3 |

7. Plug one end of the modem extension cable (P/N 3-2350-075) into RJ11 of the modem assembly. The in-line jack on the remaining end of the modem extension cable attaches to the lower left inside wall of the card cage shield (after the CPU assembly is reinstalled and all cables reconnected to the System Interface board). No software setup is required for this board.
8. Insert the phone line into the modem extension assembly.

### B.1.1 Optional Ethernet Board

To add an Ethernet Assembly:

1. Disconnect the Analog cable from J6 of the FTB, then disconnect all CPU and optional board cables and lines.
2. Remove the CPU assembly and install the Ethernet assembly with associated hardware into J19 and J20 PC/104 Bus connector on the CPU assembly. If an option board is already plugged into the PC/104 Bus on the CPU, install the Ethernet assembly and mounting hardware into the PC/104 Bus connector on the option board.
3. Plug one end of the Ethernet extension cable (P/N 3-2350-088) into J5 of the Ethernet assembly. The in-line jack on the remaining end of the Ethernet extension cable attaches to the lower left inside wall of the card cage shield, after the CPU assembly is reinstalled and all cables and lines reconnected. No software setup is required for this board.
4. Run the Ethernet line through the conduit into the lower enclosure and connect it to the Ethernet extension cable.

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# APPENDIX C, MANIFOLD CARRIER FOR GAS BOTTLES

## C.1 CARRIER GAS

**NOTICE**

**The illustration and information in this appendix are adapted from drawing AE-10098.**

This appendix provides a description of the carrier manifold (P/N 3-5000-050) that permits connection of two carrier gas bottles, or cylinders, to a gas chromatograph (GC) system. The benefits of this manifold are as follows:

- When one bottle is nearly empty (i.e., 100 psig remaining), the other bottle becomes the primary supply.
- Each bottle can be disconnected for refilling without interrupting GC operation.

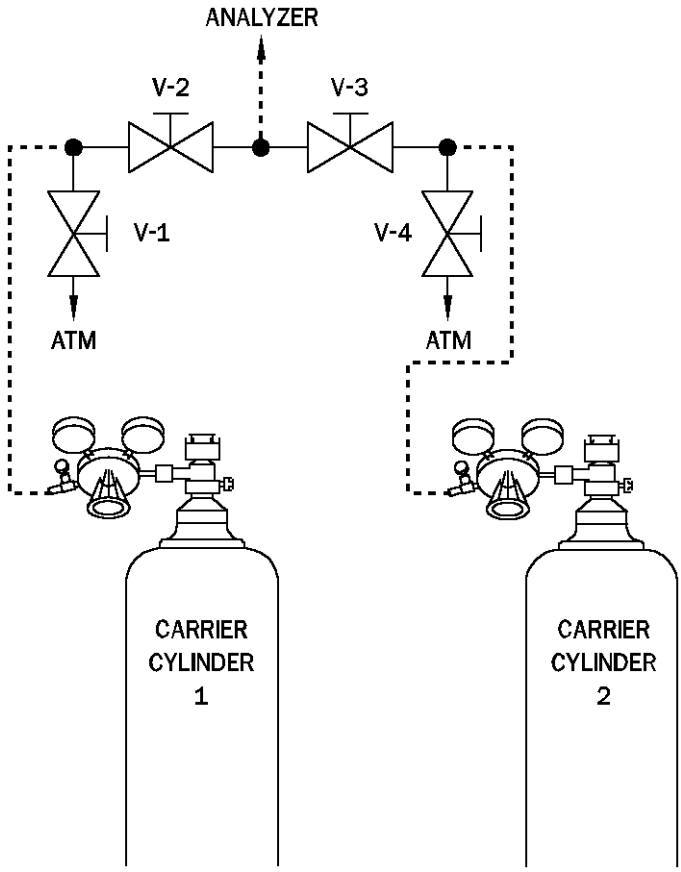



*Figure C-1 Manifold for Two Carrier Gas Bottles to GC System*

## C.2 INSTALLATION AND LINE PURGING

To install and purge the dual-bottle carrier gas manifold, proceed as follows:

1. Install manifold as shown in Figure C-1. Close all valves and tighten all fittings. Run tubing to the Analyzer, 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, 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 Steps 4 and 5 two more times to purge the line to V-2.
8. Purge the line to V-3 by repeating Steps 2 through 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.
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 Analyzer until all gauges read 0 psig.
11. Repeat steps (8) and (9) two more times to purge line to Analyzer.
12. Close V-3, leave V-2 open.

13. Open cylinder valve of Carrier Cylinder 1 and, with carrier gas flowing at 10 psig or below, connect carrier line to Analyzer.
14. Slowly regulate Carrier Cylinder 1 to 110 psig.
15. Open V-3 and slowly regulate Carrier Cylinder 2 to 100 psig. (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). Leak-check all of the fittings carefully.
16. Let the Analyzer run overnight before calibrating.

## C.3 REPLACING CARRIER CYLINDER

To replace one carrier cylinder without interrupting GC operation, proceed as follows:

1. Turn cylinder valve off.
2. Back off on cylinder pressure regulator until handle turns freely. Remove cylinder.
3. Attach new cylinder to regulator and repeat Steps 3 through 7 of Installation Instructions, Section C.2, using appropriate bleed valve to purge line. Leak-check the fitting.
4. Open the appropriate block valve to the Analyzer (V-2 or V-3) and regulate outlet pressure to appropriate level. (See Steps 14 and 15 of Installation Instructions, Section C.2.)

## C.4 CALIBRATION GAS

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 (N.I.S.T). For other applications, the calibration gas should be blended 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 zero degrees Fahrenheit is listed in the following table (Table C-1). No dropout will occur in this calibration gas if it is blended at a pressure below 250 psig.

*Table C-1 Contents of Example Calibration Gas*

| 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 |

The sampling system should be carefully planned for the best chromatographic analyses.

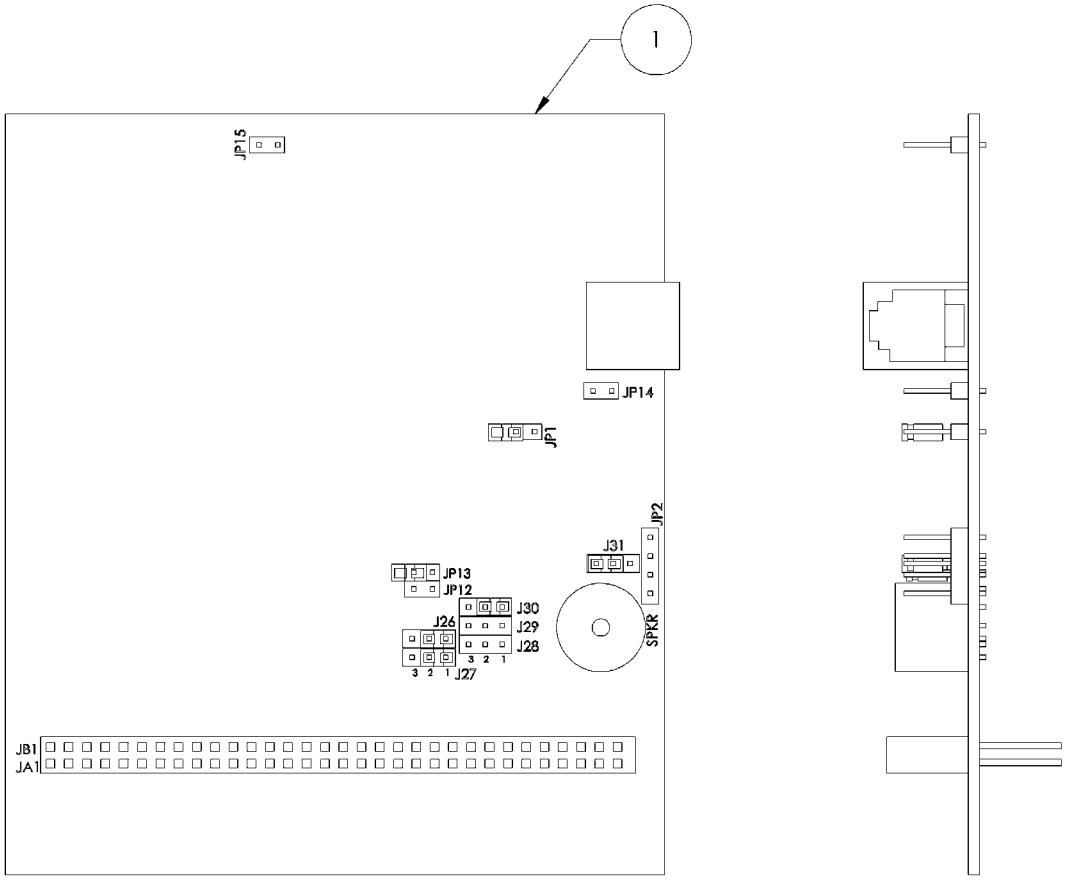
# APPENDIX D, ENGINEERING DRAWINGS

## D.1 LIST OF ENGINEERING DRAWINGS

This addendum contains the following engineering drawings for the Model 700 Gas Chromatograph.

| | |
|---|---|
| BE-21154 | Assembly Modem Board Model 700 GC |
| CE-20765 | Assembly CPU 2350A/700 (Sheets 1 and 2) |
| CE-20931 | Assembly Radial 6-port Valve, Kiosk Oven Model 700 GC |
| CE-20958 | Assembly 10-port Valve Model 700 GC |
| CE-21276 | Assembly Micro-FID Model 700 GC |
| CE-21345 | Methanator Assembly |
| CE-25002 | C9+ Flow Config. Det. 1 B/F to Meas.D/C Det. 2 to Meas. Model 700 |
| CE-25003 | C6+ Flow Config. Det. 1 B/F to Meas.D/C Det. 2 to Meas. Model 700 |
| CE-25004 | C6+ Flow Config. Det. 1 B/F to Meas.to Meas. Model 700 |
| CE-25006 | C6+ and $O_2$ Flow Config. Det. 1 B/F to Meas.D/C, DC Model 700 |

| | |
|---|---|
| CE-25007 | Flow Configuration<br>Det. 1 B/F to Meas. (Helium)<br>Det. 2 B/F to Meas. (Argon)<br>Model 700 |
| DE-20991 | Internal Cable Wiring Model 700<br>Analyzer (Sheets 1 & 2) |
| DE-20992 | Field Wiring Field Termination<br>Board Model 700 GC |
| DE-20993 | Outline and Dimensional Pole,<br>Wall & Floor Mounting Units<br>Model 700 GC |
| DE-21405 | Internal Wiring Micro-FID |
| SP-00700 | Spare Parts List Model 700 GC |
| SP-00701 | Spare Parts List Model 700 GC |




## NOTES:

1. INSTALL 2 POSITION JUMPERS
   J26(1-2), J27(1-2), J30(1-2), J31(2-3)
2. MASK SOCKETS CONTACTS (COMPONENT SIDE) AND PINS (SOLDER SIDE) ON PC104 CONNECTORS JA1 AND JB1 TOP COVER OPENING OF SPEAKER. (ALL JUMPER STRIPS)
   JP14, JP15, JP1, JP2, J31, JP12, JP13, J26,-J30.
   COAT PER MEP 47429.
3. PLACE BRADY LABELS ON BACK OF BOARD FOR TRACEABILITY.
4. PLACE 2 EACH OF STANDOFF SCREWS, AND NUT (ITEM 2, 3, & 4) IN BAG (ITEM 5) AND PUT WITH EACH BOARD.

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL
SEE ORDER

FINISH
SEE ORDER

PROJ. FILE NO. G-00001

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| B | 6-29-04 | DLT | REL'D XX-209763 | EM | DLT |
| A | 1-29-04 | HM | REL'D XX-196577 | DLT | AC |
| 2 | 10-21-03 | HM | ADDED NOTE #4 | DLT | AC |
| 1 | 9-24-03 | HM | RELEASED | | |

FILENAME:BE21154B1.SLDDRW, DATE: 6-29-04, TIME: 9:39 A.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER
ANSI Y14.5
LATEST REVISION

UNLESS OTHERWISE NOTED
ALL DIMENSIONS IN INCHES

| | |
|---|---|
| X.XX | ±.015 |
| X.XXX | ±.005 |
| ANGULAR | ±0° 30' |
| FINISH | 200 RA MAX |

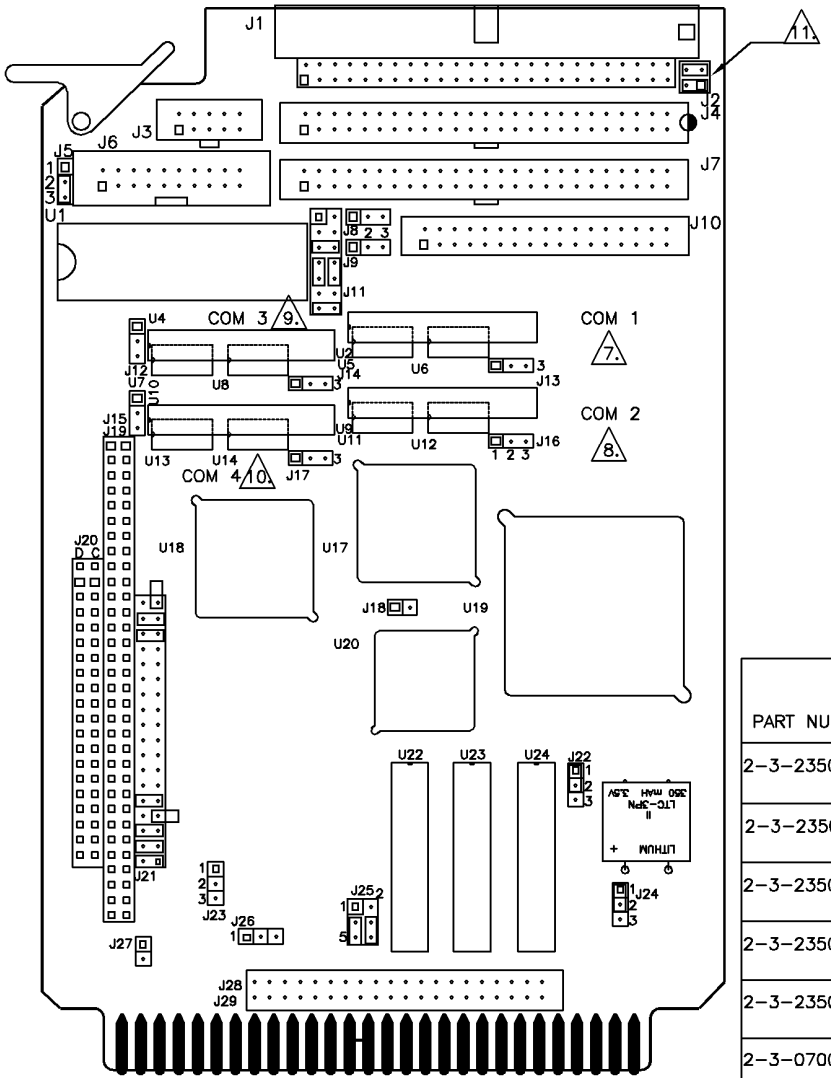
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON.
Process Management

TITLE

ASSEMBLY
MODEM BOARD
MODEL 700 GC

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DRN | HM | DATE | 8/11/03 | DWG NO. | BE-21154 | | REV B |
| CHKD | DLT | DATE | 1-29-04 | | | | |
| APPD | AC | DATE | 1-29-04 | SCALE | NTS | P/N 3-0700-029 | SHT 1OF1 |




ASSEMBLY NOTES:

1. MASK OFF GOLD FINGERS AT LOCATION J29, CONNECTORS J1, J3, J4, J6, J7, J10, J19, J20, AND J28, JUMPERS STRIPS J2, J5, J8, J9, J11–J18, AND J21–J27, AND IC'S AND SOCKETS AT LOCATIONS U1, U2, AND U4–U14. CONFORMAL COAT PER MEP 47429.
2. AT LOCATION J11, INSTALL THE FOLLOWING JUMPERS PINS 5–6, 7–9, 8–10 AND 13–14.
3. AT LOCATION J21, INSTALL THE FOLLOWING JUMPERS 1–2, 3–4, 5–6, 9–10, 31–32, AND 33–34. HANG JUMPERS FROM ONE PIN ON PINS 7 AND 35 FOR OPTIONS IN TABLE.
4. CONFIRM JUMPERS J5 PIN 2–3, J22 PIN 1–2, J24 PIN 1–2, AND J25 PINS 3–5 AND 4–6. INSTALL JUMPERS J8, J9 AND J12 THROUGH J17 PER TABLE. REMOVE INSTALL IC'S PER TABLE.
5. INSTALL DISK ON CHIP INTO SOCKET AT LOCATION U1, NOTING ORIENTATION OF PIN 1.
6. ADD BRADY LABELS TO BACK OF BOARD.

7. U2, U5, U6, J8, AND J13 ARE ASSOCIATED WITH COM 1.

8. U9, U11, U12, J9, AND J16 ARE ASSOCIATED WITH COM 2.

9. U4, U7, U8, J12, AND J14 ARE ASSOCIATED WITH COM 3.

10. U10, U13, U14, J15, AND J17 ARE ASSOCIATED WITH COM 4.

11. FOR ALL DASH NUMBERS EXCEPT –028, CONNECT J2 PINS 1–3 AND 2–4. FOR –028, CONNECT PINS 1–2 AND 3–4.

| PART NUMBER | OUTPUT MODE | COM1 | COM2 | COM3 | COM4 | JUMPER TABLE | IC'S INSTALLED | IC'S REMOVED/ NOT INSTALLED |
|---|---|---|---|---|---|---|---|---|
| 2-3-2350-090 | A | RS232C | RS232C | RS232C | RS232C | J8, J9, J12, J15(PINS 1 & 2) J13, J14, J16, J17(NONE) | U2, U4, U9, U10 | U5, U6, U7, U8, U11, U12, U13, U14 |
| 2-3-2350-091 | B | RS232C | RS232C | RS485 | RS485 | J8, J9, J12, J15(PINS 1 & 2) J14, J17(PINS 2 & 3); J13, J16(NONE) | U2, U8, U9, U14 | U4, U5, U6, U7, U10, U11, U12, U13 |
| 2-3-2350-092 | C | RS232C | RS232C | RS485 | RS232C | J8, J9, J12, J15(PINS 1 & 2) J14(PINS 2 & 3); J13, J16, J17(NONE) | U2, U8, U9, U10 | U4, U5, U6, U7, U11, U12, U13, U14 |
| 2-3-2350-093 | D | RS232C | RS232C | RS422 | RS232C | J8, J9, J12, J15(PINS 1 & 2) J13, J14, J16, J17(NONE) | U2, U7, U8, U9, U10 | U4, U5, U6, U11, U12, U13, U14 |
| 2-3-2350-094 | E | RS232C | RS485 | RS422 | RS232C | J8, J9, J12, J15(PINS 1& 2) J16(PINS 2 & 3); J13, J14, J17(NONE) | U2, U7, U8, U10, U12 | U4, U5, U6, U9 U11, U13, U14 |
| 2-3-0700-028 | A | RS232C | RS232C | RS232C | RS232C | J8, J9, J12, J15(PINS 1 & 2) J13, J14, J16, J17(NONE) | U2, U4, U9, U10 | U5, U6, U7, U8, U11, U12, U13, U14 |

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| G | 9-12-05 | HM | ECO-XX-5001095 | EM | HS |
| F | 10-28-04 | DLT | ECO-XX-5000256 | EM | DLT |
| E | 6-16-04 | DLT | ECO-XX-207756 | EM | DLT |
| D | 4-13-04 | HM | ECO-XX-202454 | EM | HS |
| C | 12-5-03 | HM | ECO-XX-181318 | EM | HS |
| B | 02/26/02 | RD | ERO YY-10078 | EM | DLT |
| A | 02/19/02 | RD | NOT RELEASED | EM | DLT |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: SEE ORDER
FINISH: SEE ORDER
PROJ. FILE NO. – NONE

FILENAME: CE20765G1.DWG, DATE: 09-08-05, TIME: 1:31 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

BREAK ALL SHARP CORNERS TO .003–.015 RADIUS AND REMOVE ALL BURRS

EMERSON Process Management

TITLE: ASSEMBLY CPU BOARD 2350A/700

| | | | |
|---|---|---|---|
| DRN RD | DATE 12-27-01 | DWG NO. CE-20765 | REV G |
| CHKD EM | DATE 1-25-02 | | |
| APPD DLT | DATE 1-25-02 | SCALE NTS P/N SEE ORDER | SHT 1 OF 2 |

## 2350A CPU COMMUNICATION PORT CONFIGURATIONS

### IC PLACEMENT

| | SET FOR RS-232 | | SET FOR RS-422 | | SET FOR RS-485 | |
|---|---|---|---|---|---|---|
| | IC INSTALLED | IC NOT INSTALLED | IC INSTALLED | IC NOT INSTALLED | IC INSTALLED | IC NOT INSTALLED |
| COM 1 | U2 | U5, U6 | U5, U6 | U2 | U6 | U2, U5 |
| COM 2 | U9 | U11, U12 | U11, U12 | U9 | U12 | U9, U11 |
| COM 3 | U4 | U7, U8 | U7, U8 | U4 | U8 | U4, U7 |
| COM 4 | U10 | U13, U14 | U13, U14 | U10 | U14 | U10, U13 |

### JUMPER PLACEMENT

| | | | | | | |
|---|---|---|---|---|---|---|
| COM 1 | **J8** | **J13** | **J8** | **J13** | **J8** | **J13** |
| | 1 - 2 | NONE | 1 - 2 | NONE | 1 - 2 | 2 - 3 |
| COM 2 | **J9** | **J16** | **J9** | **J16** | **J9** | **J16** |
| | 1 - 2 | NONE | 1 - 2 | NONE | 1 - 2 | 2 - 3 |
| COM 3 | **J12** | **J14** | **J12** | **J14** | **J12** | **J14** |
| | 1 - 2 | NONE | 1 - 2 | NONE | 1 - 2 | 2 - 3 |
| COM 4 | **J15** | **J17** | **J15** | **J17** | **J15** | **J17** |
| | 1 - 2 | NONE | 1 - 2 | NONE | 1 - 2 | 2 - 3 |

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL: SEE ORDER

FINISH: SEE ORDER

PROJ. FILE NO. – NONE

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| G | 9-12-05 | HM | ECO-XX-5001095 | EM | HS |
| F | 10-28-04 | DLT | ECO-XX-5000256 | EM | DLT |
| E | 6-16-04 | DLT | ECO-XX-207756 | EM | DLT |
| D | 4-13-04 | HM | ECO-XX-202454 | EM | HS |
| C | 12-5-03 | HM | ECO-XX-181318 | EM | HS |

FILENAME: CE20765G2.DWG, DATE: 09-08-05, TIME: 1:38 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.009
ANGULAR ±0° 30'
FINISH 200 RA MAX

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

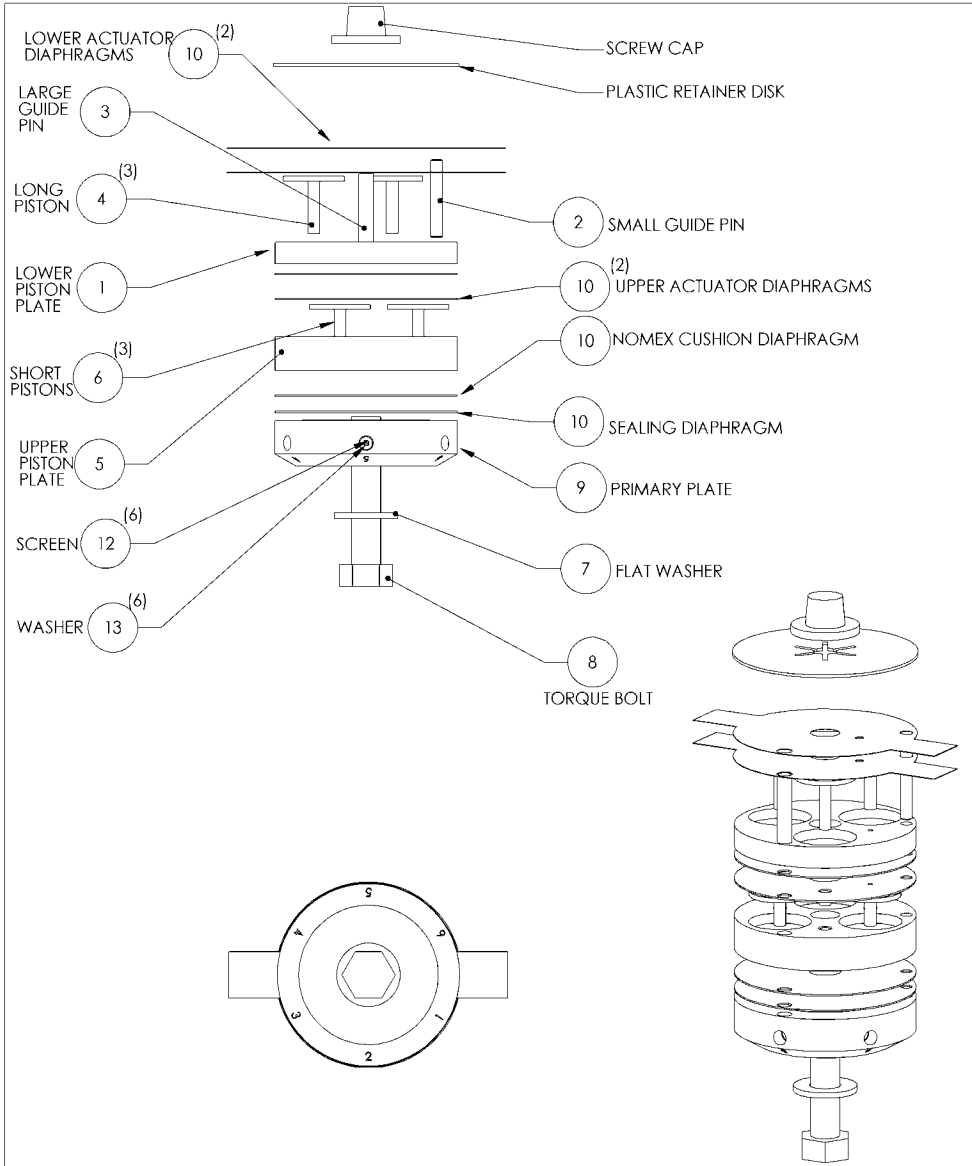
EMERSON. Process Management

TITLE: ASSEMBLY CPU BOARD 2350A\700

| | | | |
|---|---|---|---|
| DRN | MANCHA | DATE | 12-5-03 |
| CHKD | EM | DATE | 12-5-03 |
| APPD | HS | DATE | 12-5-03 |

DWG NO. CE-20765 REV G

SCALE NTS P/N SEE ORDER SHT 2 OF 2









## NOTES:

6 PORT VALVE ASSEMBLY INSTRUCTIONS

THIS PROCEDURE TO BE PERFORMED IN A CLEAN AND DRY AREA. ALL PARTS TO BE BLOWN CLEAN AND DRY WITH NITROGEN BEFORE ASSEMBLY.

1. ASSEMBLY IS ACCOMPLISHED IN THE UPSIDE DOWN POSITION.
2. INSTALL 2-MICRON SCREENS (ITEM 12) & WASHERS (ITEM 13) IN THE PORTS OF PRIMARY PLATES (ITEM 9) PER MEP-47623. PLACE ITEM 9, PRIMARY PLATES(S) INTO SHOP ASSEMBLY FIXTURE AND INSTALL ITEM 3, LARGE DOWEL PIN AND ITEM 2, SMALL DOWEL PIN.
3. PLACE ITEM 10, AMBER SEALING DIAPHRAGM ( HAVING NO ACTUATOR HOLES) ALIGN LARGE AND SMALL DOWEL PIN HOLES.
4. PLACE ITEM 10, WHITE NOMEX CUSHION DIAPHAGM (HAVING NO ACUATOR HOLES) ALIGN LARGE AND SMALL DOWEL PIN HOLES.
5. PLACE ITEM 5, UPPER PISTON PLATE OVER DOWEL PINS.
6. PLACE ITEM 6, SHORT PISTONS IN PISTON PLATE 3 PLACES. PISTON SHAFT MUST FALL THROUGH HOLES. DO NOT FORCE
7. PLACE ITEM 10, AMBER UPPER ACTUATOR DIAPHRAGMS WITH LARGE ACTUATOR HOLES OVER DOWEL PINS 2 PLACES. ALIGN WITH LARGE AND SMALL DOWEL PINS.
8. PLACE ITEM 1, LOWER PISTON PLATE OVER DOWEL PINS.
9. PLACE ITEM 4, LONG PISTONS IN PISTON PLATE 3 PLACES. PISTON SHAFT MUST FALL FREELY THROUGH HOLES. DO NOT FORCE.
10. PLACE ITEM 10, AMBER LOWER ACTUATOR DIAPHRAGMS WITH SMALL ACTUATOR HOLES OVER DOWEL PINS 2 PLACES. ALIGN WITH LARGE AND SMALL DOWEL PINS.
11. INSTALL ITEM 8, BOLT AND ITEM 7, FLAT WASHER UP THRU PRIMARY PLATE. HOLDING BOLTHEAD AND RETAINER WITH ONE HAND, INSTALL PLASTIC RETAINER DISK P/N 2-4-0700-191 & CAP P/N 2-4-9326-007 TO HOLD ASSEMBLY TOGETHER UNTIL INSTALLED INTO UNIT. REMOVE FROM FIXTURE, PUT IN PLASTIC BAG AND STAPLE SHUT. TAG WITH PART NUMBER.

| SI METRIC | | | | | | |
|---|---|---|---|---|---|---|
| THIRD ANGLE PROJECTION | | | | | | |
| | | | | | | |
| | D | 2-25-05 | HM | ECO-XX-5000518 | EM | BLB |
| | C | 8-3-04 | HM | ECO-XX-212474 | EM | HS |
| MATERIAL: SEE ORDER | B | 6-29-04 | DLT | ECO-XX-209763 | EM | DLT |
| | A | 10-17-03 | HM | REL'D ECO 189137 | DLT | BLB |
| FINISH: BLOCK N/A | REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
| PROJ. FILE NO. G-00001 | FILE NAME: CE20931D1.SLDDRW, DATE: 2-14-05, TIME: 2:22 P.M. | | | | | |



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES

| | |
|---|---|
| X.XX | ±.015 |
| X.XXX | ±.005 |
| ANGULAR | ±0° 30' |
| FINISH | 200 RA MAX |

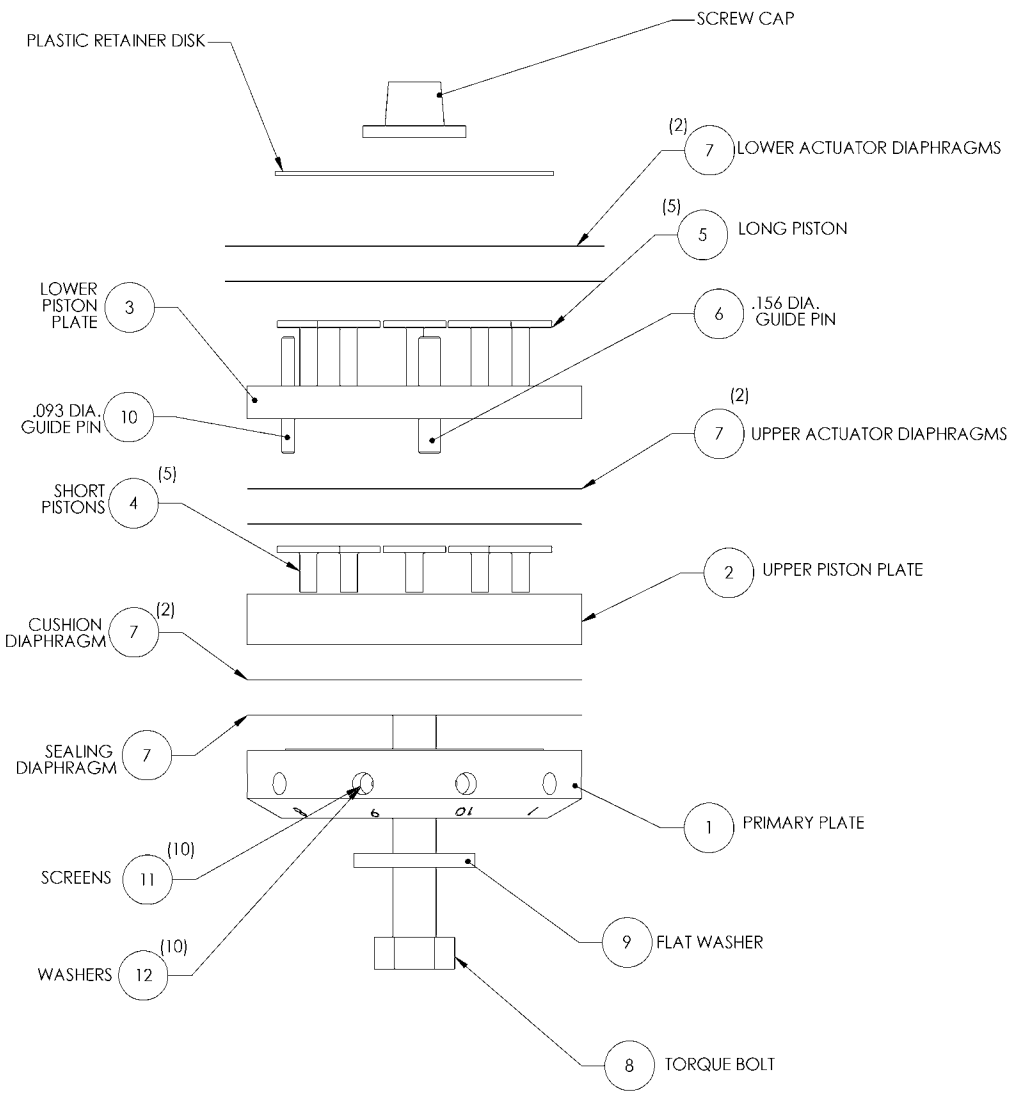
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

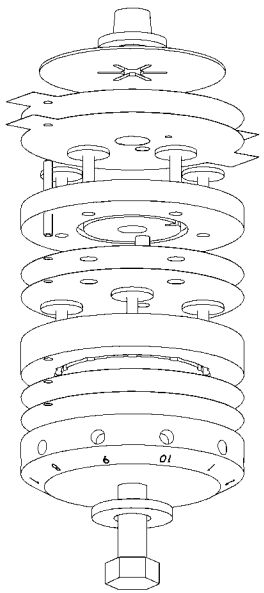
EMERSON. Process Management

TITLE

**ASSEMBLY**
**RADIAL 6 PORT VALVE, KIOSK OVEN**
**MODEL 700 GC**

| | | | | | |
|---|---|---|---|---|---|
| DRN | HM | DATE | 8-19-02 | DWG NO. CE-20931 | REV D |
| CHKD | DLT | DATE | 10-17-03 | | |
| APPD | BLB | DATE | 10-17-03 | SCALE 1:1 / P/N 2-3-0700-107 | SHT 1 OF 1 |



## NOTES:

THIS PROCEDURE TO BE PERFORMED IN A CLEAN AND DRY AREA. ALL PARTS TO BE BLOWN CLEAN AND DRY WITH NITROGEN BEFORE ASSEMBLY.

10 PORT VALVE ASSEMBLY INSTRUCTIONS

1. Assembly is to be accomplished by building the valve in the upside down position using production fixture.
2. Inspect the primary plate, Item #1, to insure that the tubing ports are clean and that the sealing surface has no scratches or pits. Install 2-micron screens (Item 11) & Washers (Item 12) in the ports of primary plates (Item 1) per Mep-47623. Then place it in the fixture with the sealing surface facing up.
3. Insert .156 Dia. guide pin, Item #6, and .093 Dia. guide pin, Item #10, in the locating holes in the plate.
4. Place the amber sealing diaphragm ( has no holes in the actuating plane) over the guide pins and align.
5. Place the white cushion diaphragm (has same hole pattern as sealing diaphragm in step 4) over the sealing diaphragm and align.
6. Place the upper piston plate, Item #2, over the guide pins with the piston recess holes facing up.
7. Load 5 each of the short pistons, Item #4, into the recess holes of the plate.
8. Place 2 each of the amber sealing diaphragms ( has 5 large holes for long pistons to feed through) over the guide pins and align.
9. Place the lower piston plate, Item #3, over the guide pins with the piston recess holes facing up.
10. Load 5 each of the long pistons, Item #5, into the recess holes of the plate.
11. Place two amber sealing diaphragms (with extended ears) over the guide pins and align.
12. Place washer, Item #9, over bolt, Item #8, and insert the bolt from the bottom up through the valve assembly.
13. Place a plastic retainer disk and retaining cap, P/N 2-4-9326-907, over the end of the bolt to hold the assembly together until installed on the analyzer.

| SI METRIC | | | | | | |
|---|---|---|---|---|---|---|
| THIRD ANGLE PROJECTION | | | | | | |
| | E | 2-25-05 | HM | ECO-XX-5000518 | EM | BLB |
| | D | 8-3-04 | HM | ECO-XX-212474 | EM | HS |
| | C | 6-29-04 | HM | ECO-XX-209763 | EM | DLT |
| | B | 11-11-03 | HM | ECO-XX-190965 | EM | BLB |
| | A | 10-17-03 | HM | REL'D ECO 189137 | HM | BLB |
| | REV | DATE | DRN | DESCRIPTION | CHKD | APPD |

MATERIAL: SEE ORDER

FINISH: BLOCK N/A

PROJ. FILE NO. G-00001

FILE NAME: CE20958E1.SLDDRW, DATE: 2-14-05, TIME: 2:37 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES

| | |
|---|---|
| X.XX | ±.015 |
| X.XXX | ±.005 |
| ANGULAR | ±0° 30' |
| FINISH | 200 RA MAX |

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

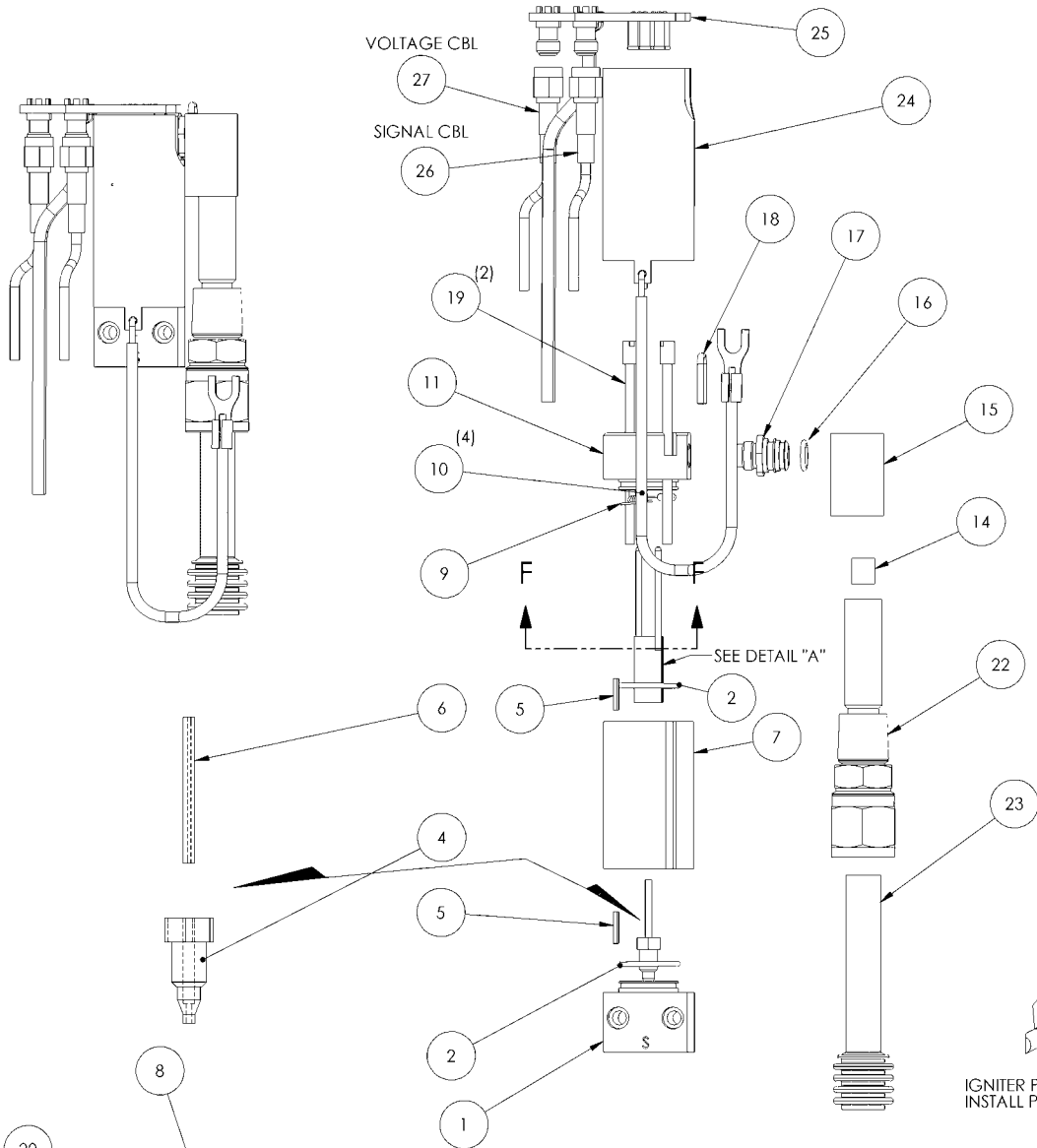
EMERSON. Process Management

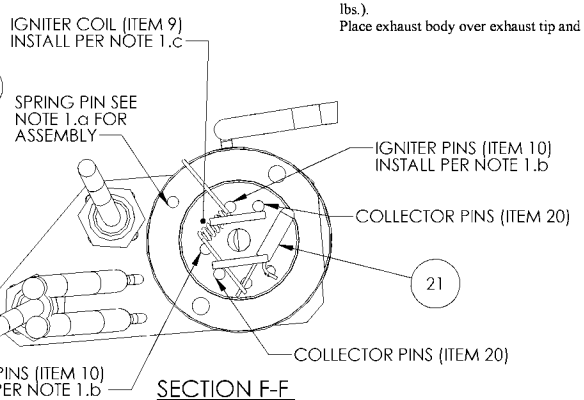
TITLE: ASSEMBLY 10 PORT VALVE MODEL 700 GC

| | | | |
|---|---|---|---|
| DRN | HM | DATE | 10/1/03 |
| CHKD | DLT | DATE | 10-17-03 |
| APPD | BLB | DATE | 10-17-03 |

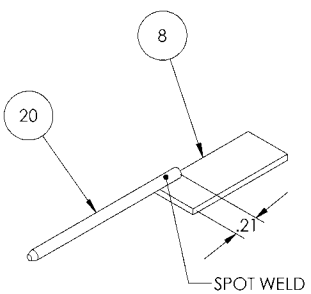
DWG NO. CE-20958 REV E

SCALE 1:1 P/N 2-3-0700-118 SHT 1OF1




SECTION F-F
SCALE 2 : 1




DETAIL "A"
TWO REQ'D.

## NOTES:

1. Build cap assembly:
   a. Press spring pin (Item 5) into hole in shoulder face of cap (Item 11).
   b. From the smaller diameter end of the cap, press 4 igniter pins (Item 10) into their holes. The tapered ends go first. The ends stop flush with the opposite surface of the cap.
   c. Weld the igniter coil (Item 9) to the ends of the igniter pins farthest from the flat face. Coils rise above the pins. Trim off excess coil wire. Ensure coils are separated. Weld RTD (item 21) to the ends of the remaining pins. Trim off excess wire. Check both devices for continuity.
   d. Weld collector plate (Item 8) to collector pin (Item 20) per "Detail A" press the collector plate assemblies into their holes in the cap using an installation fixture. Apply pressure only to the ends of the pins and not to the plates. The free ends of the collector plate pins stop flush with the opposite surface of the cap. The inner surfaces should be parallel and .220" apart.
   e. Thoroughly degrease assembly with methanol and bake dry at 75 deg C.
   f. Very lightly lubricate o-ring (Item 2) with Petroleum based grease, wipe off excess and install on smaller diameter end.

2. Build base assembly:
   a. Press spring pin (Item 5) into its hole next to cylindrical end of base (Item 1).
   b. Screw flame tip isolator (Item 4) into cylindrical end of base, lightly. Insert flame tip (Item 6) into isolator. Press into hole until it bottoms. Torque assembly only enough to seat and retain flame tip (2-5 In-lbs.).
   c. Degrease and bake as with cap.
   d. Lubricate, wipe and install o-ring (Item 2) in groove in cylindrical end.

3. Place body (Item 7) on base. Its internal baffle will surround the flame Tip. Align the hole in the body with the spring pin. Wiggling the body while pressing to the base will help the body seat fully over the o-ring.

4. Put cap in place on body. Align the spring pin with the hole in the body. Wiggle parts while assembling to seat over the o-ring. Install long screws (Item 19) and tighten (2-3 in-lbs).

5. Place shield (Item 24) over FID.

6. Lubricate o-ring (Item 16) and install on exhaust tip (Item 17). Screw Exhaust tip into cap. Tighten enough to seat (3-6 in lbs.). With all openings plugged, assembly should hold 5 psig without leaking.

7. Apply Teflon tape (9-9960-039) to fitting end (Item 22). Press flame arrester pellet (Item 14) fully into fitting end. Screw fitting into exhaust body (Item 15) (15-20 in-lbs.).
   Place exhaust body over exhaust tip and retain with clip (Item 18).

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| B | 8-19-05 | DLT | ECO-XX-5001017 | EM | BLB |
| A | 8-12-05 | HM | REL'D ECO-XX-5000240 | DLT | BLB |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: SEE ORDER
FINISH: N/A
PROJ. FILE NO. G-00001

FILE NAME: CE21276B1.SLDDRW, DATE: 8-19-05, TIME: 11:00 A.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

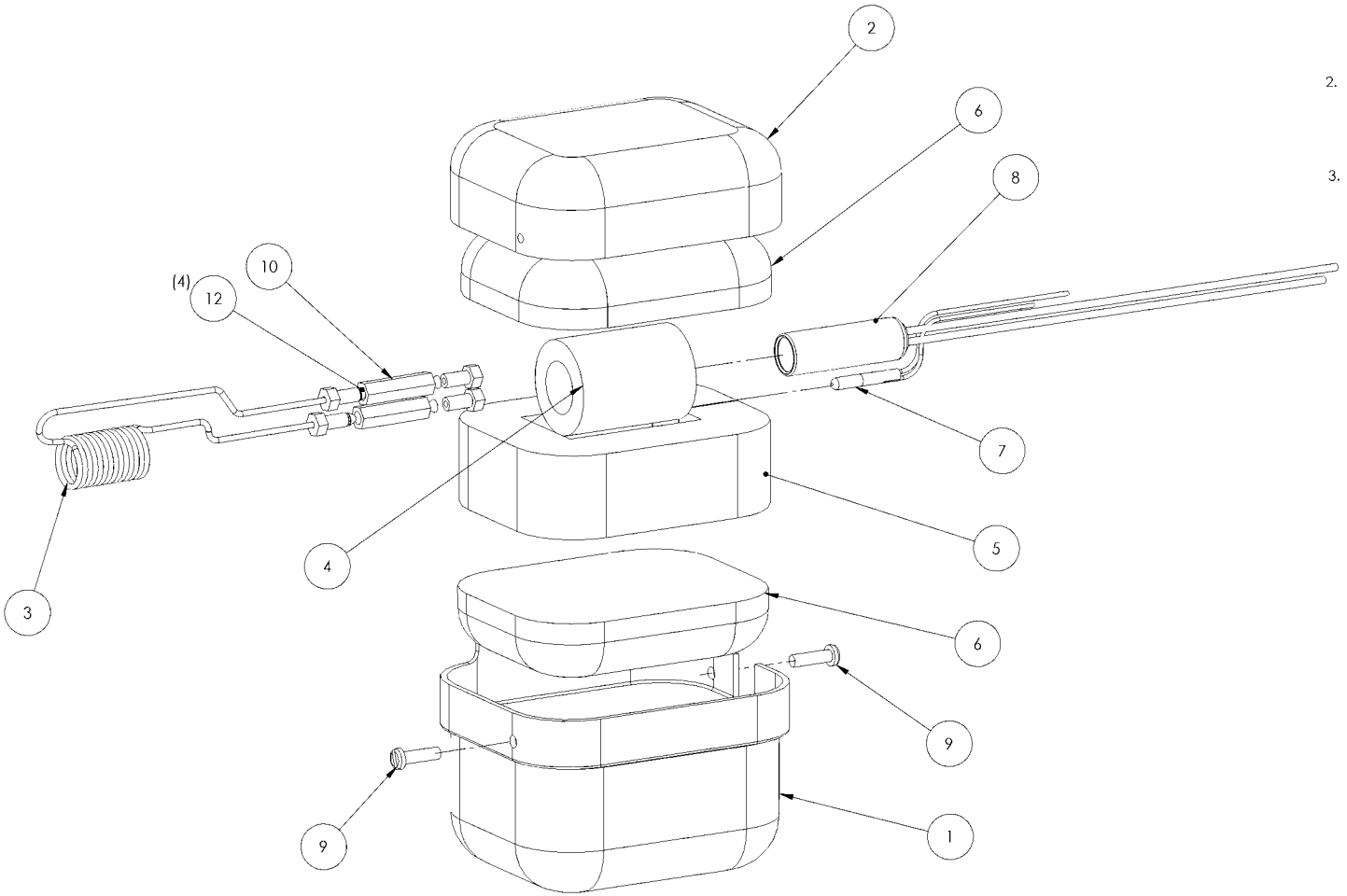
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE
# ASSEMBLY MICRO-FID MODEL 700 G.C.

| | | | |
|---|---|---|---|
| DRN MANCHA | DATE 10/25/04 | DWG NO. CE-21276 | REV B |
| CHKD DLT | DATE 8/12/05 | | |
| APPD BLB | DATE 8/12/05 | SCALE 1:2 | P/N 2-3-0700-131 SHT 1 OF 1 |




## NOTES:

1. INSULATE ENCLOSURE:
   - A. PLACE A SOLID SHAPED PIECE OF INSULATION (ITEM 6) IN THE CASE BODY (ITEM 1) AND THE CASE TOP (ITEM 2).
   - B. PLACE A HOLLOW PIECE OF INSULATION (ITEM 5) IN THE CASE BODY ON TOP OF THE FIRST INSULATION.
2. ASSEMBLE CONVERTER ASSEMBLY:
   - A. INSTALL COLUMN COIL (ITEM 3) IN CERAMIC TUBE (ITEM 4).
   - B. INSTALL HEATER (ITEM 8) (15W. 24V CARTRIDGE TYPE) INTO CENTER OF COIL.
   - C. INSTALL METHANATOR RTD (ITEM 7) INTO HOLE IN CERAMIC TUBE.
3. COMPLETE ASSEMBLY:
   - A. BEND TUBING SO THAT TUBING ENDS ARE PARALLEL AND CLOSE TO EACH OTHER.
   - B. ADD UNIONS (ITEMS 10 & 12) TO THE ENDS OF THE TUBINGS.
   - C. FASTEN THE HEATER LEADS AND RTD LEADS TO THE TUBES WITH A SMALL AMOUNT OF KAPTON TAPE P/N 9-9960-093 (ITEM 4) 1-1/2" FROM THE HEATER.
   - D. PLACE THIS ASSEMBLY INTO THE POCKET IN THE INSULATION IN THE CASE BODY. FILL GAPS IN THE INSULATION WITH ADDITIONAL INSULATION.
   - E. PLACE COVER ON ASSEMBLY AND PRESS INTO PLACE WITHIN BODY. INSTALL RETAINING SCREWS (ITEM 9).

| | | | | | | |
|---|---|---|---|---|---|---|
| SI METRIC | | | | | | |
| THIRD ANGLE PROJECTION | | | | | | |
| | | | | | | |
| MATERIAL: SEE ORDER | A | 8-12-05 | HM | REL'D ECO XX-5001011 | DLT | BLB |
| FINISH: BLOCK N/A | P1 | 3-7-05 | HM | PRELIMINARY | DLT | BLB |
| PROJ. FILE NO. G-00001 | REV | DATE | DRN | DESCRIPTION | CHKD | APPD |

FILE NAME: CE21345A1.SLDDRW, DATE: 08-12-05, TIME: 3:25 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES

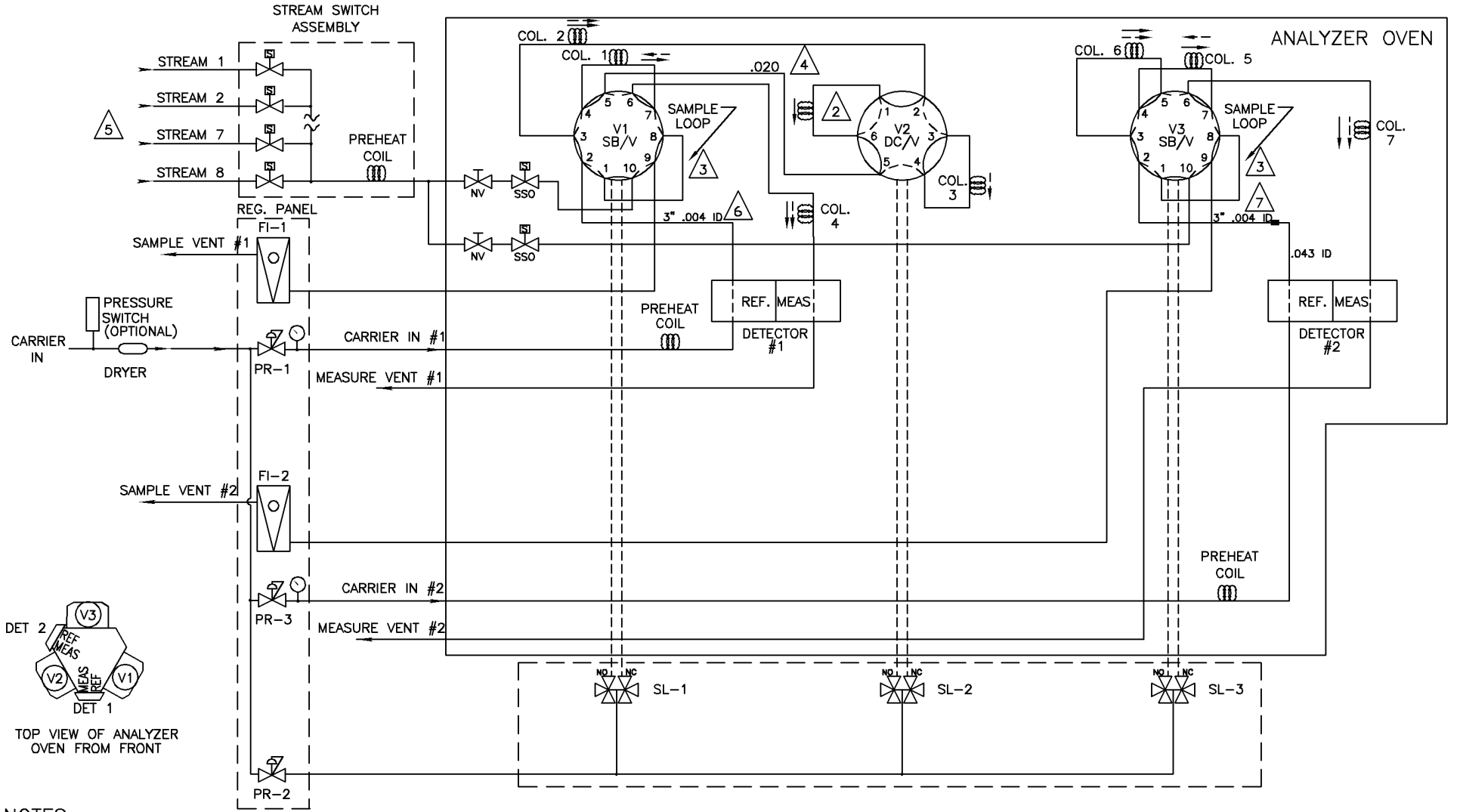
| | |
|---|---|
| X.XX | ±.015 |
| X.XXX | ±.005 |
| ANGULAR | ±0° 30' |
| FINISH | 200 RA MAX |

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: ASSEMBLY METHANATOR MODEL 700 G.C.

| | | | |
|---|---|---|---|
| DRN. BLD/HM | DATE 03/07/05 | DWG NO. CE-21345 | REV A |
| CHKD DLT | DATE 8-12-05 | | |
| APPD BLB | DATE 8-12-05 | SCALE 1:1 | P/N 3-0700-180 SHT 1 OF 1 |




## NOTES:

1. FLOW PATH VALVE ENERGIZED: — — —
   FLOW PATH VALVE DE-ENERGIZED: ———
2. R1 (.004" I.D.) MATCHES RESTRICTION OF COL. 3.
3. SAMPLE LOOP 8" X 0.043 ID TUBING.
4. V1/5 TO V2/1: USE 0.020 ID TUBING.
5. UP TO 8 STREAMS; THE LAST STREAM USED IS THE CALIBRATION INPUT.
6. INSTALL 3" OF .004 ID 1/16 TUBING FOR FLOW RESTRICTION.
7. INSTALL 3" OF .004 ID 1/16 TUBING FOR FLOW RESTRICTION AT VALVE. USE CAPILLARY COUPLER AND .043 ID TUBING TO EXTEND TO DETECTOR.

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| H | 1-19-05 | DLT | ECO-XX-5000436 | EM | DLT |
| G | 9-20-04 | HM | ECO-XX-5000133 | EM | LF |
| F | 6-4-04 | DLT | ECO-XX-206304 | EM | DLT |
| E | 5-25-04 | DLT | ECO-XX-205951 | EM | DLT |
| D | 3-25-04 | DLT | REL'D ECO 200113 | EM | DLT |
| C | 11-6-03 | DLT | REL'D ECO 189137 | EM | DLT |
| B | | DLT | REDREW REQ PNL | | |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: N/A
FINISH: N/A
PROJ. FILE NO. G-00001

FILENAME: CE25002H1.DWG, DATE: 01-14-05, TIME: 2:39 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

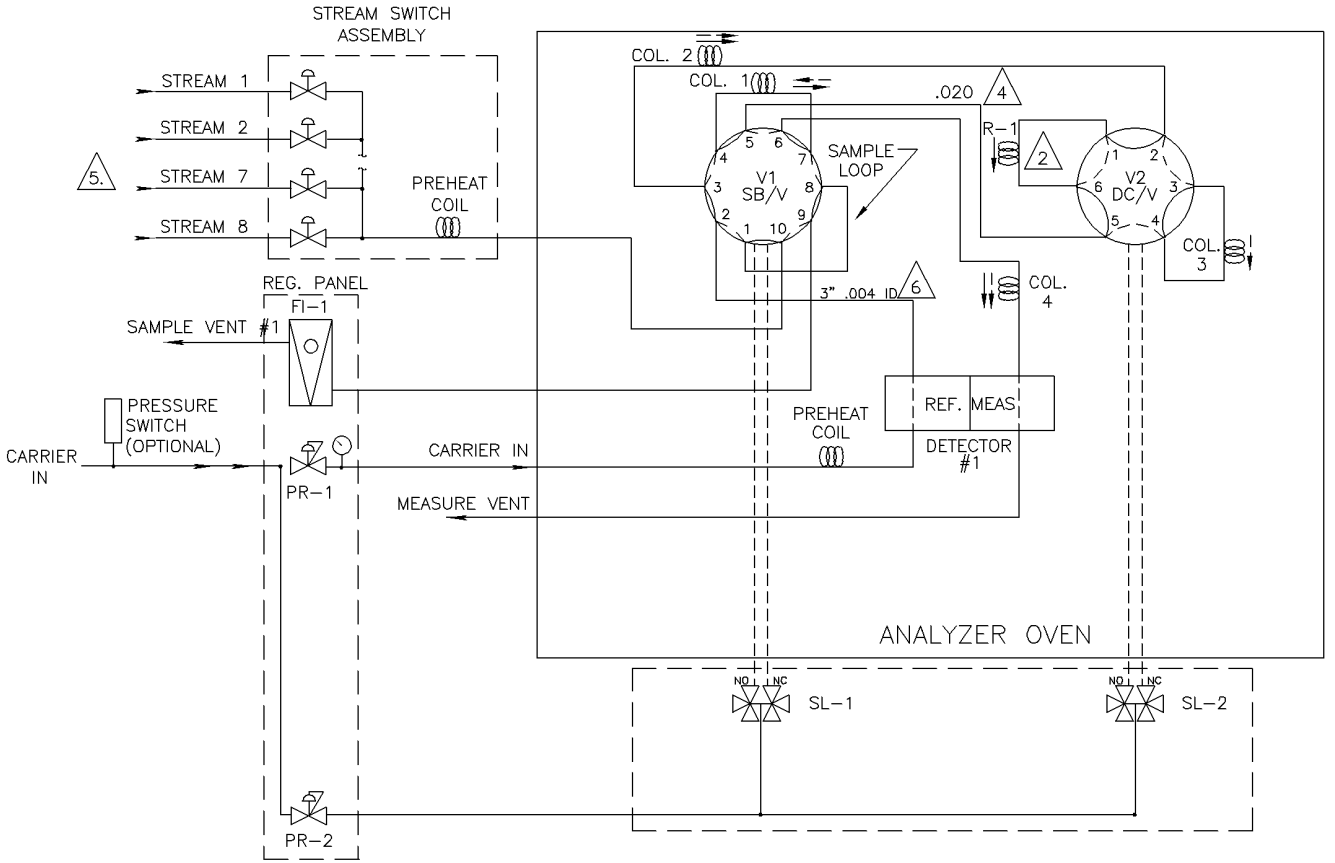
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
XX ±.015
X.XXX ±.003
ANGULAR ±0° 30'
FINISH 200 RA MAX

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

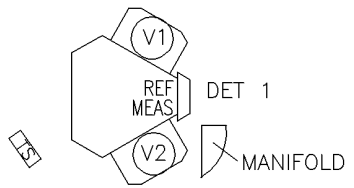
TITLE: C9+ FLOW CONFIG. DET. 1 B/F TO MEAS. D/C DET. 2 B/F TO MEAS. MODEL 700

| | | | |
|---|---|---|---|
| DRN HM | DATE 12-9-02 | DWG NO. CE-25002 | REV H |
| CHKD EM | DATE 11-6-03 | | |
| APPD DLT | DATE 11-6-03 | SCALE NTS | P/N SEE ORDER | SHT 1 OF 1 |




NOTES:

1. FLOW PATH VALVE ENERGIZED: — — —
   FLOW PATH VALVE DE-ENERGIZED: ———
2. R1 (.004" I.D.) MATCHES RESTRICTION OF COL. 3.
3. DELETED PER ECO-5000085.
4. V1/5 TO V2/5: USE 0.020 ID TUBING.
5. UP TO 8 STREAMS; THE LAST STREAM USED IS THE CALIBRATION INPUT.
6. INSTALL 3" OF .004 ID 1/16 TUBING FOR FLOW RESTRICTION.




TOP VIEW OF ANALYZER OVEN FROM FRONT

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| G | 5-25-05 | HM | ECO-XX-5000798 | EM | SA |
| F | 11-4-04 | HM | ECO-XX-5000085 | EM | SB |
| E | 9-20-04 | HM | ECO-XX-5000133 | EM | LF |
| D | 6-4-04 | DLT | ECO-XX-206304 | EM | DLT |
| C | 5-25-04 | DLT | ECO-XX-205951 | EM | DLT |
| B | 3-25-04 | HM | ECO-XX-200113 | DLT | BLB |
| A | 11-6-03 | HM/DLT | REL'D ECO 189137 | DLT | BLB |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: N/A
FINISH: N/A
PROJ. FILE NO. G-00001

FILENAME: CE25003G1.DWG, DATE: 05-25-05, TIME: 11:05 A.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0 30'
FINISH 200 RA MAX

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

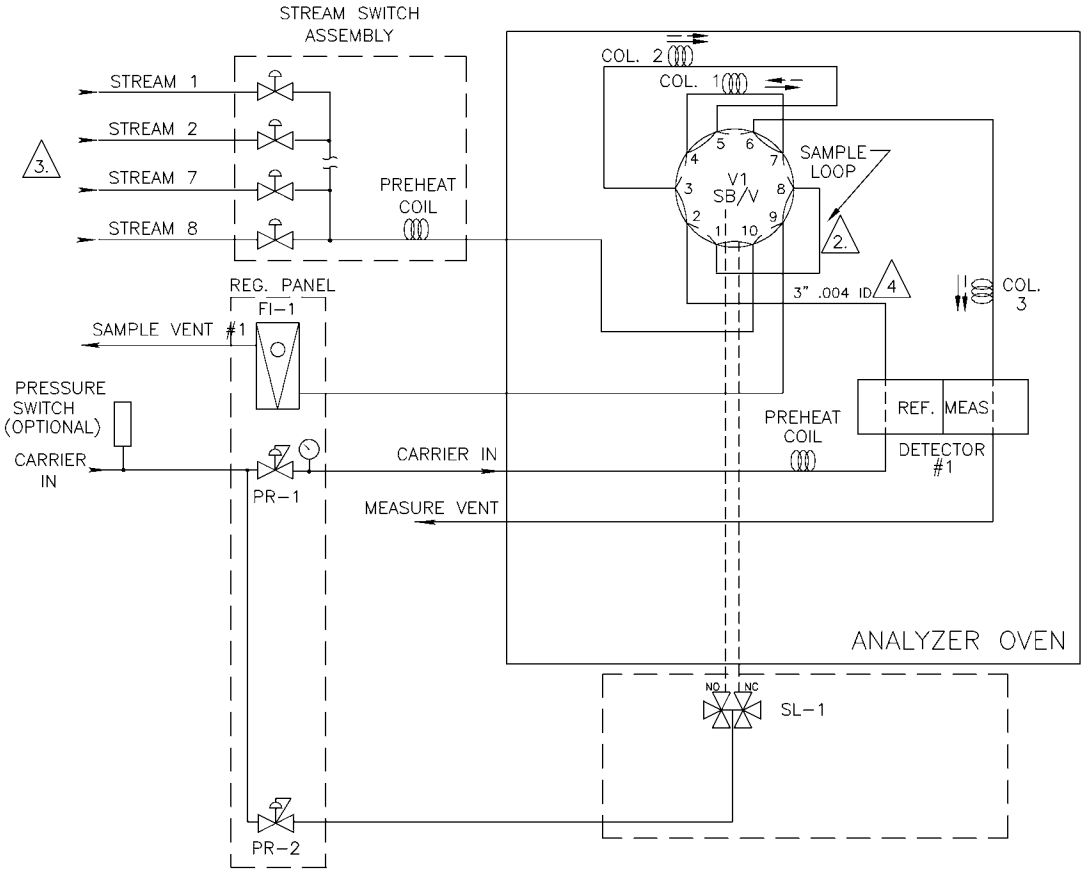
EMERSON. Process Management

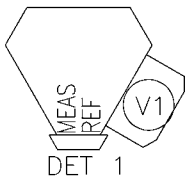
TITLE: FLOW CONFIGURATION DET. 1, B/F TO MEASURE, DUAL COLUMN MODEL 700

| | | | |
|---|---|---|---|
| DRN HM/DLT | DATE 9/25/03 | DWG NO. CE-25003 | REV G |
| CHKD BLB | DATE 11-6-03 | | |
| APPD DLT | DATE 11-6-03 | SCALE NTS | P/N SEE ORDER | SHT 1 OF 1 |

NOTES:

1. FLOW PATH VALVE ENERGIZED: — — —
   FLOW PATH VALVE DE-ENERGIZED: ———
2. SAMPLE LOOP 8" X 0.043 ID TUBING.
3. UP TO 8 STREAMS; THE LAST STREAM USED IS THE CALIBRATION INPUT.
4. INSTALL 3" OF .004 ID 1/16 TUBING FOR FLOW RESTRICTION.




TOP VIEW OF ANALYZER OVEN FROM FRONT

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| D | 6-4-04 | DLT | ECO-XX-206304 | EM | DLT |
| C | 5-25-04 | DLT | ECO-XX-205951 | EM | DLT |
| B | 3-26-04 | HM | ECO-XX-200113 | DLT | BLB |
| A | 11-7-03 | HM | RELEASED | EM | SB |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: N/A
FINISH: N/A
PROJ. FILE NO. – NONE

FILENAME: CE25004D1.DWG, DATE: 06-01-04, TIME: 2:57 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

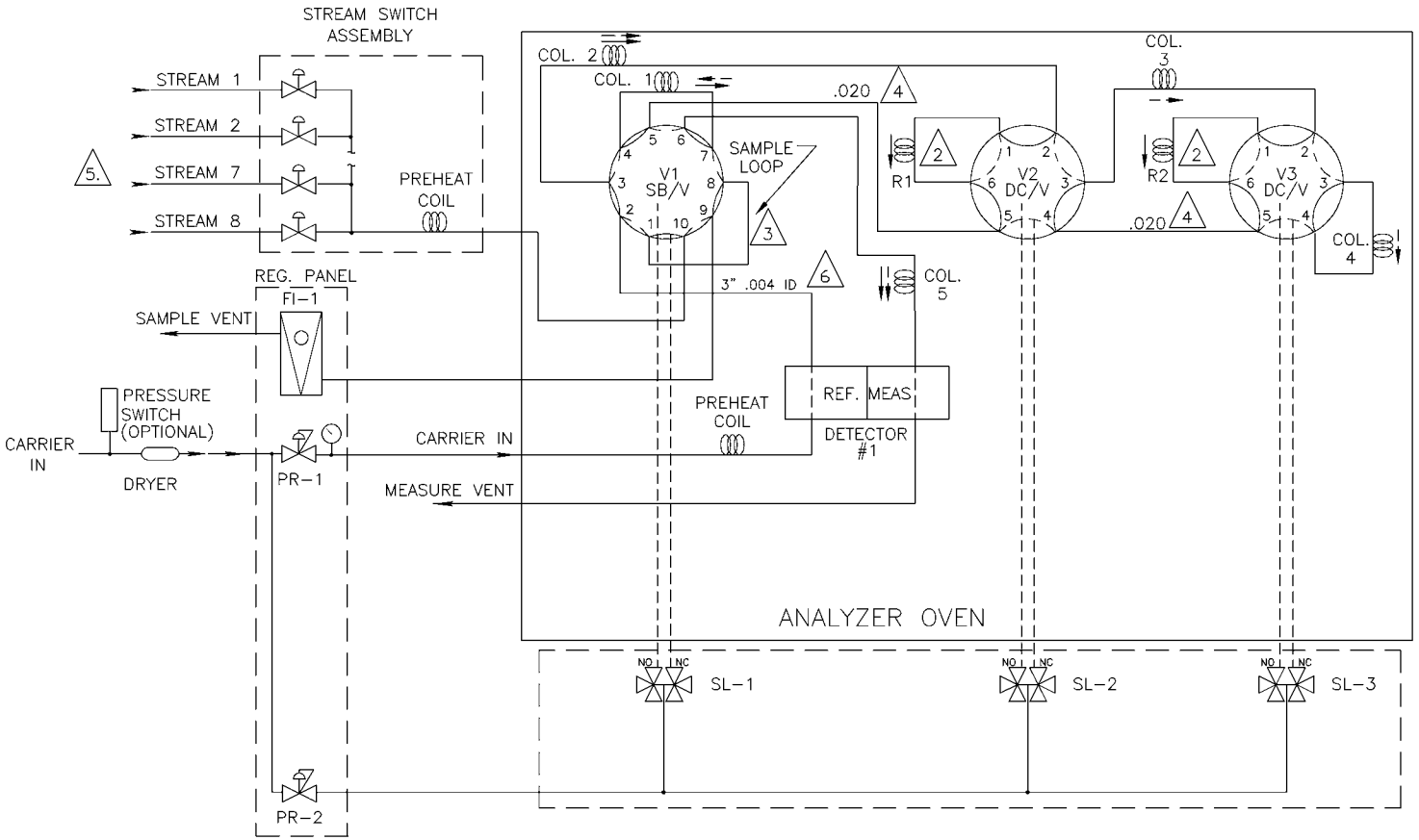
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

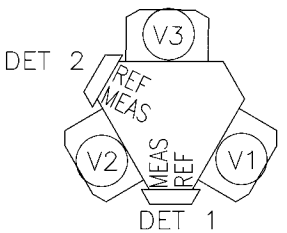
TITLE: C6+ FLOW CONFIG. DET. 1 B/F TO MEAS. MODEL 700

| | | | |
|---|---|---|---|
| DRN HM | DATE 11-4-03 | DWG NO. CE-25004 | REV D |
| CHKD EM | DATE 11-7-03 | | |
| APPD SB | DATE 11-7-03 | SCALE NTS | P/N SEE ORDER |
| | | SHT 1 OF 1 | |




NOTES:

1. FLOW PATH VALVE ENERGIZED: — — —
   FLOW PATH VALVE DE-ENERGIZED: ———
2. R1 (.004" I.D.) MATCHES RESTRICTION OF COL. 3 & COL. 4.
   R2 (.004" I.D.) MATCHES RESTRICTION OF COL. 4.
3. SAMPLE LOOP 8" X 0.043 ID TUBING.
4. V1/5 TO V2/5: USE 0.020 ID TUBING.
   V2/4 TO V3/5: USE 0.020 I.D. TUBING.
5. UP TO 8 STREAMS; THE LAST STREAM USED IS THE CALIBRATION INPUT.
6. INSTALL 3" OF .004 ID 1/16 TUBING FOR FLOW RESTRICTION.




TOP VIEW OF ANALYZER OVEN FROM FRONT

| | | | | | | |
|---|---|---|---|---|---|---|
| B | 6-4-04 | DLT | ECO XX-206304 | EM | DLT |
| A | 5-10-04 | HM | RELEASED | EM | SB |
| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL N/A
FINISH N/A
PROJ. FILE NO. - NONE

FILENAME: CE25006B1.DWG, DATE: 06-01-04, TIME: 3:10 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

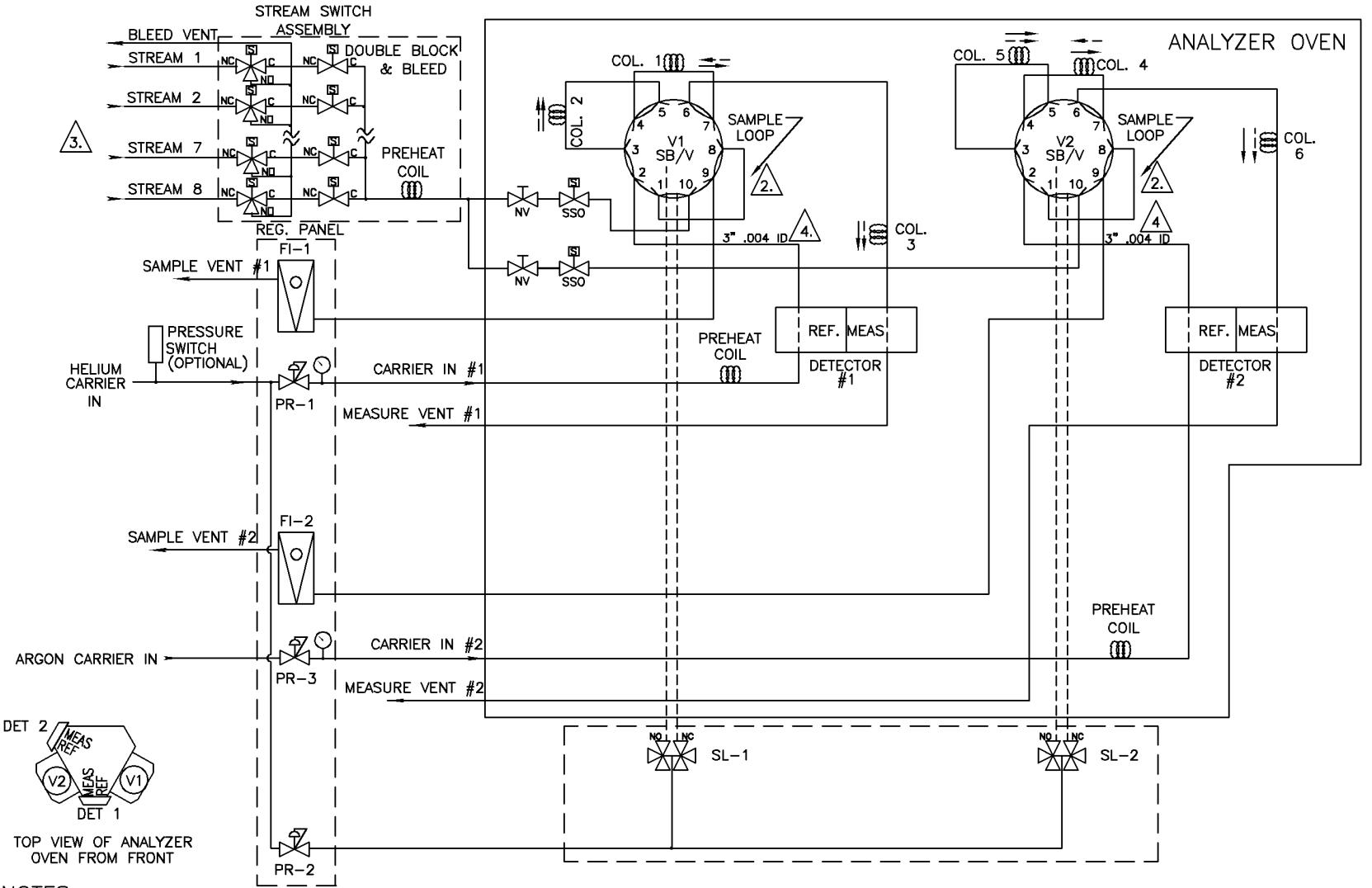
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON Process Management

TITLE: C6+ AND $O_2$ FLOW CONFIG. DET. 1 B/F TO MEAS. D/C, D/C MODEL 700

| | | | |
|---|---|---|---|
| DRN | MANCHA | DATE | 5-6-04 |
| CHKD | EM | DATE | 5-10-04 |
| APPD | SB | DATE | 5-10-04 |

DWG NO. CE-25006 REV B
SCALE NTS P/N SEE ORDER SHT 1 OF 1




## NOTES:

1. FLOW PATH VALVE ENERGIZED: — — —
   FLOW PATH VALVE DE-ENERGIZED: ———
2. SAMPLE LOOP 8" X 0.043 ID TUBING.
3. UP TO 8 STREAMS; THE LAST STREAM USED IS THE CALIBRATION INPUT.
4. INSTALL 3" OF .004 ID 1/16 TUBING FOR FLOW RESTRICTION.

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| C | 1-19-05 | DLT | ECO XX-5000436 | EM | DLT |
| B | 6-30-04 | DLT | ECO XX-209521 | EM | BLB |
| A | 6-7-04 | HM | RELEASED | EM | SB |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: N/A
FINISH: N/A
PROJ. FILE NO. G-00001
FILENAME: CE25007C1.dwg, DATE: 01-14-05, TIME: 3:41 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.010
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

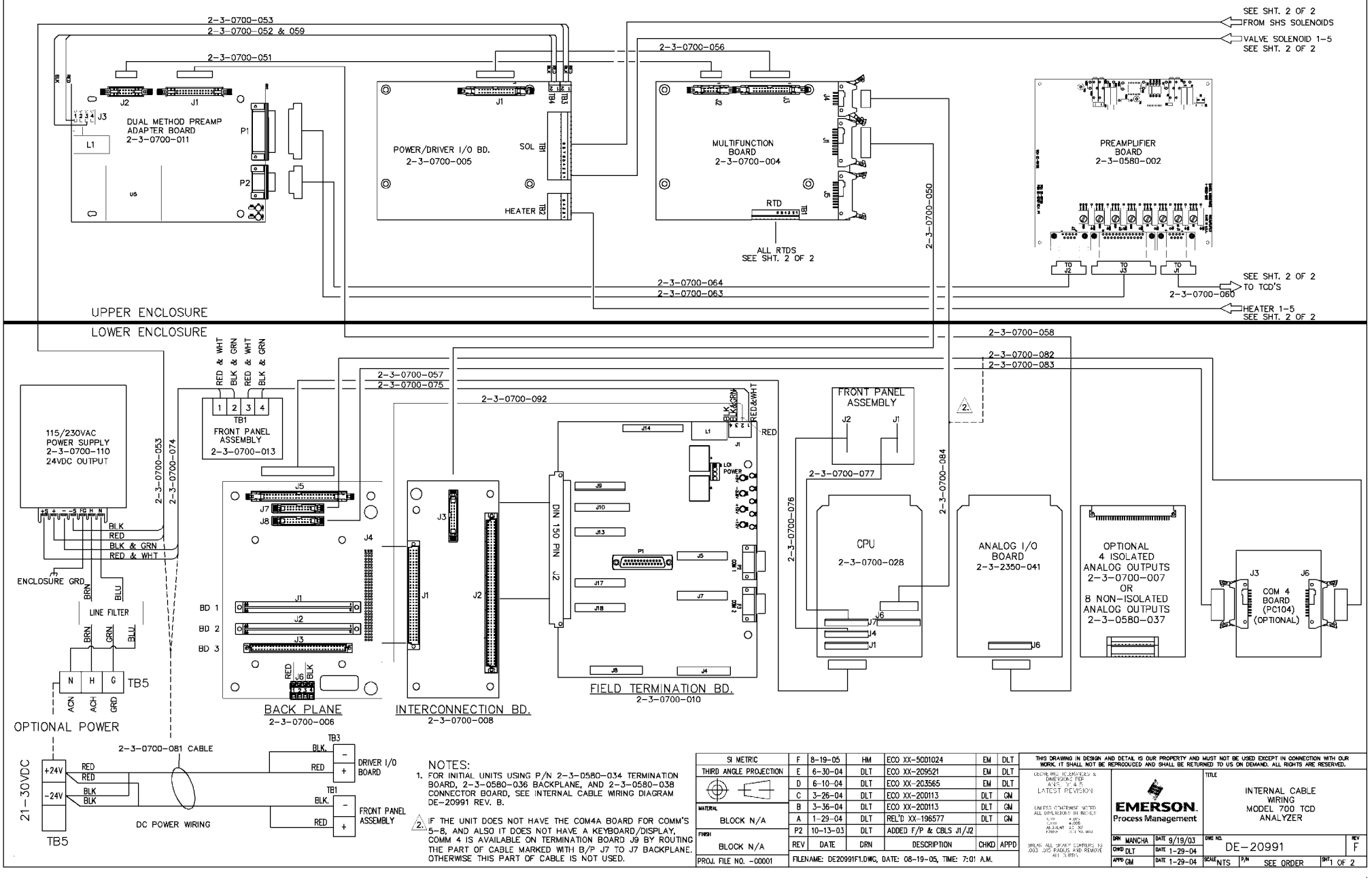
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

| | | |
|---|---|---|
| DRN MANCHA | DATE 6/7/04 | |
| CHKD EM | DATE 6-7-04 | |
| APPD SB | DATE 6-7-04 | |

TITLE
FLOW CONFIGURATION.
DET. 1: B/F TO MEAS. (HELIUM)
DET. 2: B/F TO MEAS. (ARGON)
MODEL 700

DWG NO. CE-25007 REV C
SCALE NTS P/N SEE ORDER SHT 1 OF 1




NOTES:

1. FOR INITIAL UNITS USING P/N 2-3-0580-034 TERMINATION BOARD, 2-3-0580-036 BACKPLANE, AND 2-3-0580-038 CONNECTOR BOARD, SEE INTERNAL CABLE WIRING DIAGRAM DE-20991 REV. B.
2. IF THE UNIT DOES NOT HAVE THE COM4A BOARD FOR COMM'S 5-8, AND ALSO IT DOES NOT HAVE A KEYBOARD/DISPLAY, COMM 4 IS AVAILABLE ON TERMINATION BOARD J9 BY ROUTING THE PART OF CABLE MARKED WITH B/P J7 TO J7 BACKPLANE. OTHERWISE THIS PART OF CABLE IS NOT USED.

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| F | 8-19-05 | HM | ECO XX-5001024 | EM | DLT |
| E | 6-30-04 | DLT | ECO XX-209521 | EM | DLT |
| D | 6-10-04 | DLT | ECO XX-203565 | EM | DLT |
| C | 3-26-04 | DLT | ECO XX-200113 | DLT | GM |
| B | 3-16-04 | DLT | ECO XX-200113 | DLT | GM |
| A | 1-29-04 | DLT | REL'D XX-196577 | DLT | GM |
| P2 | 10-13-03 | DLT | ADDED F/P & CBLS J1/J2 | | |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: BLOCK N/A
FINISH: BLOCK N/A
PROJ. FILE NO. -00001
FILENAME: DE20991F1.DWG, DATE: 08-19-05, TIME: 7:01 A.M.

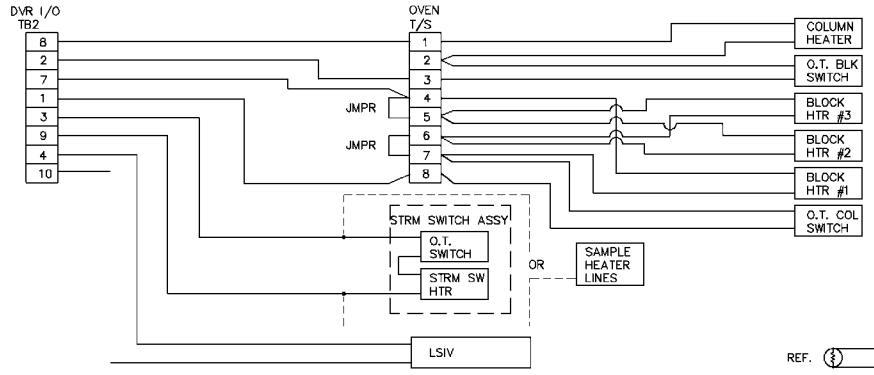


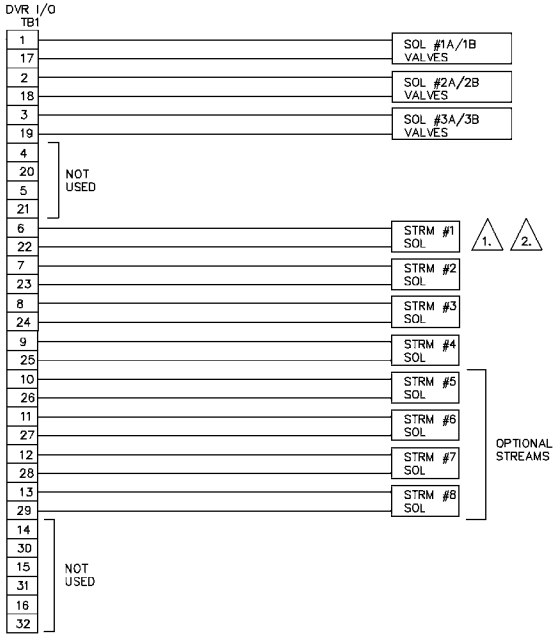
GEOMETRIC TOLERANCES & DIMENSIONING PER ANSI Y14.5 LATEST REVISION
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
BREAK ALL SHARP CORNERS TO .003 - .015 RADIUS AND REMOVE ALL BURRS

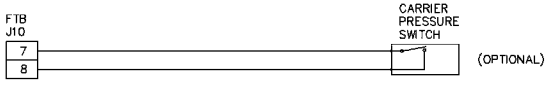
EMERSON. Process Management

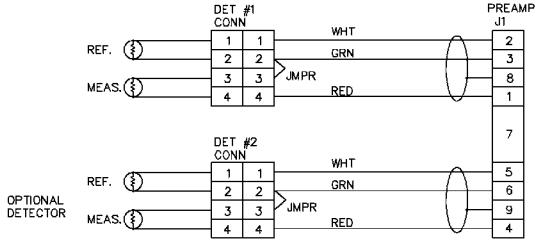
TITLE: INTERNAL CABLE WIRING MODEL 700 TCD ANALYZER

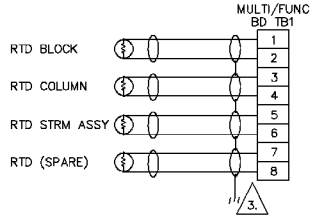
| | | | |
|---|---|---|---|
| DRN MANCHA | DATE 9/19/03 | DWG NO. DE-20991 | REV F |
| CHKD DLT | DATE 1-29-04 | | |
| APPD GM | DATE 1-29-04 | SCALE NTS | P/N SEE ORDER |
| | | | SHT 1 OF 2 |



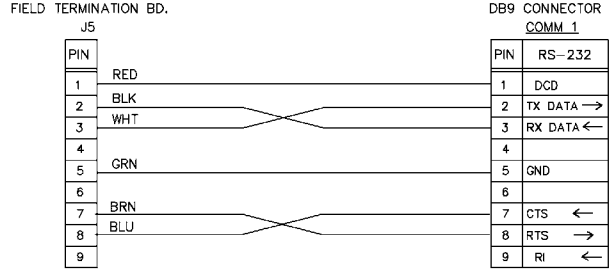



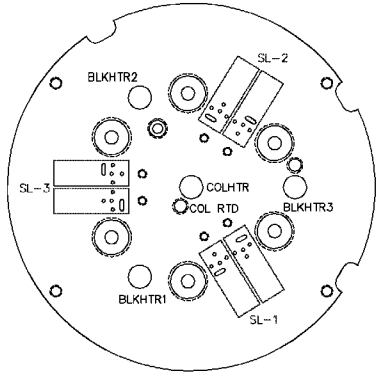




WIRING 6FT. 3-2350-068 COMM CABLE

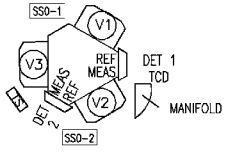



NOTES:

1. CALIBRATE IS THE LAST STREAM USED.
2. IF THE STREAM SWITCHING IS DOUBLE BLOCK AND BLEED, THERE ARE TWO SOLENOIDS FOR EACH STREAM WIRED IN PARALLEL.
3. CONNECT SHIELDS TO MOUNTING SCREW OF OVEN MOUNTING PLATE.




KIOSK MANIFOLD BOTTOM VIEW




TOP VIEW OF ANALYZER OVEN FROM FRONT

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| F | 6-30-04 | DLT | ECO XX-209521 | EM | DLT |
| D | 6-10-04 | DLT | ECO XX-203565 | EM | DLT |
| C | 3-26-04 | DLT | ECO XX-200113 | DLT | GM |
| B | 3-26-04 | DLT | ECO XX-200113 | DLT | GM |
| A | 1-29-04 | DLT | REL'D XX-196577 | DLT | GM |
| P2 | | DLT | PRELIMINARY | | |
| F | F | HM | ECO XX-5001024 | EM | DLT |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: BLOCK N/A
FINISH: BLOCK N/A
PROJ. FILE NO. G-00001

FILENAME: DE20991F2.DWG, DATE: 08-19-05, TIME: 7:18 A.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.010
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 250 Ra MAX

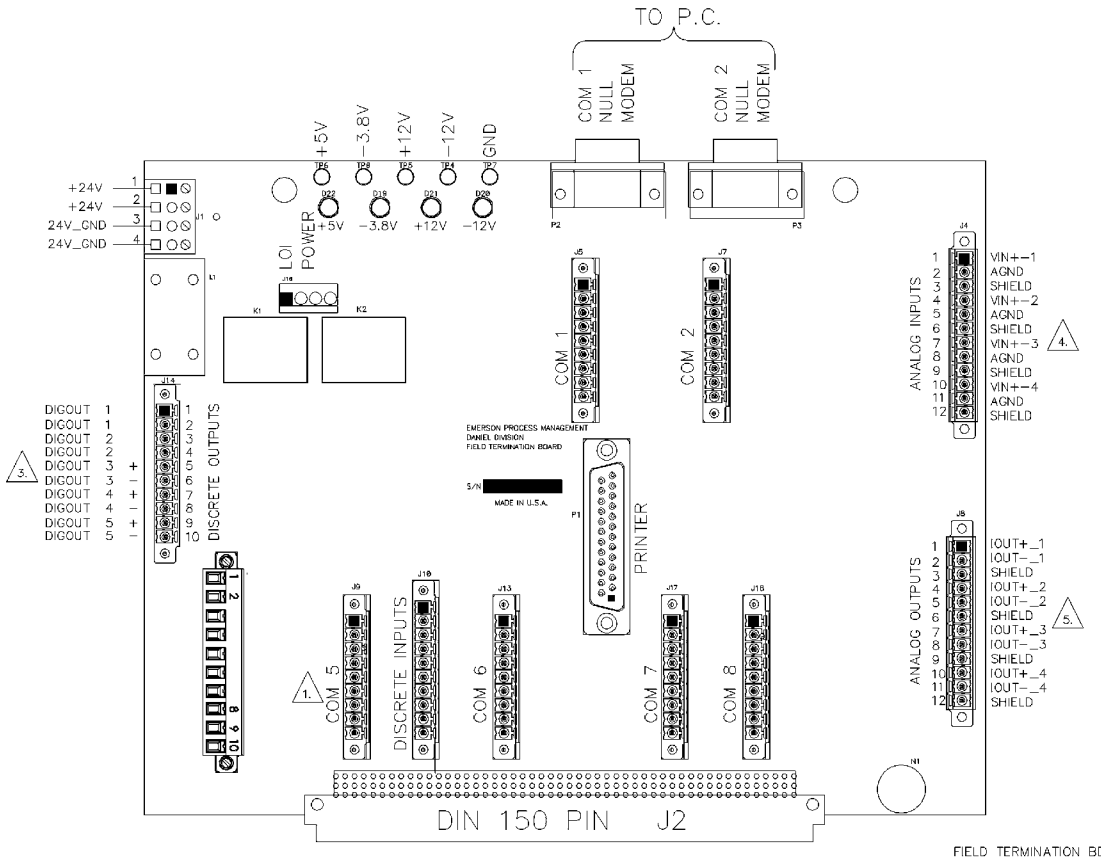
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: INTERNAL CABLE WIRING MODEL 700 TCD ANALYZER

| | | | |
|---|---|---|---|
| DRN | MANCHA | DATE | 8/19/03 |
| CHKD | DLT | DATE | 1-29-04 |
| APPD | GM | DATE | 1-29-04 |

DWG NO. DE-20991 REV F
SCALE NTS P/N SEE ORDER SHT 2 OF 2




FIELD TERMINATION BOARD

## NOTES:

FOR INITIAL UNITS USING P/N 2-3-0580-034 TERMINATION BOARD, SEE FIELD WIRING DIAGRAM DE-20992 REV. B OR EARLIER.

1. IF THE UNIT DOES NOT HAVE THE COM4A BOARD FOR COMMS 5 -8, COMM 4 IS AVAILABLE ON J9. WITH THE COM 4A BOARD INSTALLED, COM 5 IS AVAILABLE ON J9.
2. DISCRETE INPUTS REQUIRE A ISOLATED CONTACT OR OPEN COLLECTOR INPUT. OPEN CIRCUIT VOLTAGE IS 12VDC WITH A 5K OHM RESISTANCE.
3. DISCRETE OUTPUTS 1 AND 2 ARE NORMALLY OPEN RELAY CONTACTS WITH A RATING OF 1A @ 30VDC. ANY INDUCTANCE LOAD SHOULD HAVE TRANSIENT SUPPRESSION. DISCRETE OUTPUTS 3 THROUGHT 5 ARE SOLID STATE SWITCHES WITH A RATING OF 0.375A @ 30VDC AND HAVE A 36V ZENER TRANSIENT SUPPRESSOR ACROSS OUTPUTS.
4. ANALOG INPUTS ARE 4-20MA. THE LOW SIDE IS CONNECTED ANALOG GND. TOTAL INTERNAL RESISTANCE IS 249 OHMS.
5. ANALOG OUTPUTS ARE NON-ISOLATED 4-20MA. THE LOW SIDE IS CONNECTED TO ANALOG GND THROUGH A 15 OHM RESISTOR. RECEIVING DEVICE REQUIRES A DIFFERENTIAL INPUT. OPEN CIRCUIT VOLTAGE IS 11VDC. MAX. EXTERNAL LOAD AT 20MA IS 550 OHMS MINUS 52.1 INTERNAL RESISTANCE MINUS EXTERNAL WIRING RESISTANCE.
6. ALL INPUTS AND OUTPUTS ARE TRANSIENT PROTECTED EXCEPT FOR THE TWO RELAY CONTACT OUTPUTS DIGOUT 1 AND DIGOUT 2.
7. SIX FOOT SERIAL COMMUNICATION CABLE, WIRED TO FIELD TERMINATION BOARD J5, SUPPLIED WITH EACH UNIT.
8. POWER TERMINAL STRIP IS LOCATED ON POWER SUPPLY MOUNTING BRACKET IN LOWER ENCLOSURE.
9. OPTIONAL 8 ANALOG BOARD OR OPTIONAL 4 ISOLATED ANALOG BOARD LOCATED IN LOWER SLOT OF CARDCAGE IN LOWER ENCLOSURE. TERMINAL STRIP IS LOCATED ON FRONT EDGE OF BOARD.
10. OPTIONAL ISOLATED 4 ANALOG OUTPUT BOARD PROVIDES 24 VOLTS LOOPBACK POWER FOR EACH OUPUT. ALL OUTPUTS ARE COMPLETELY ISOLATED FROM EACH OTHER. THE OPEN CIRCUIT VOLTAGE IS 24V. THE MAXIMUM LOAD AT 20mA IS 1.2K OHMS MINUS 40.5 OHMS INTERNAL RESISTANCE MINUS EXTERNAL WIRING RESISTANCE.

TB5 (8.)

| | | |
|---|---|---|
| 21−30VDC | +24V | RED |
| | −24V | BLK |

TB5 (8.)

| | | |
|---|---|---|
| 115/230 VAC | ACN | N — WHT |
| | AC | H — BLK |
| | GND | G — GRN |

J2 (9.) — ISOLATED ANALOG OUTPUT BOARD (10.)

| | |
|---|---|
| 1 | IOUT+_5 |
| 2 | IOUT−_5 |
| 3 | SHIELD |
| 4 | IOUT+_6 |
| 5 | IOUT−_6 |
| 6 | SHIELD |
| 7 | IOUT+_7 |
| 8 | IOUT−_7 |
| 9 | SHIELD |
| 10 | IOUT+_8 |
| 11 | IOUT−_8 |
| 12 | SHIELD |

J3 (9.) — NON-ISOLATED ANALOG OUTPUT BOARD (5.)

| | |
|---|---|
| 1 | IOUT+_5 |
| 13 | IOUT−_5 |
| 2 | SHIELD |
| 14 | IOUT+_6 |
| 3 | IOUT−_6 |
| 15 | SHIELD |
| 4 | IOUT+_7 |
| 16 | IOUT−_7 |
| 5 | SHIELD |
| 17 | IOUT+_8 |
| 6 | IOUT−_8 |
| 18 | SHIELD |
| 7 | IOUT+_9 |
| 19 | IOUT−_9 |
| 8 | SHIELD |
| 20 | IOUT+_10 |
| 9 | IOUT−_10 |
| 21 | SHIELD |
| 10 | IOUT+_11 |
| 22 | IOUT−_11 |
| 11 | SHIELD |
| 23 | IOUT+_12 |
| 12 | IOUT−_12 |
| 24 | SHIELD |

### COMMUNICATION CONNECTIONS

FIELD TERMINATION BD. J5 (7.) — DB9 CONNECTOR COMM 1

| PIN | | PIN | RS-232 |
|---|---|---|---|
| 1 | RED | 1 | DCD |
| 2 | BLK | 2 | TX DATA → |
| 3 | WHT | 3 | RX DATA ← |
| 4 | | 4 | |
| 5 | GRN | 5 | GND |
| 6 | | 6 | |
| 7 | BRN | 7 | CTS ← |
| 8 | BLU | 8 | RTS → |
| 9 | | 9 | RI ← |

### COMMUNICATION CONNECTIONS

J5, J7, J9, J13, J17, & J18 (1.)

| PIN | RS-232 | RS-485 | RS-422 |
|---|---|---|---|
| 1 | DCD | N/C | N/C |
| 2 | RX DATA ← | RX/TX+ | TX+ |
| 3 | TX DATA → | RX/TX− | TX− |
| 4 | DTR → | N/C | N/C |
| 5 | GND | GND | GND |
| 6 | DSR ← | N/C | RX+ |
| 7 | RTS → | N/C | RX− |
| 8 | CTS ← | N/C | N/C |
| 9 | RI ← | N/C | N/C |

### COMMUNICATION CONNECTIONS

P2 AND P3 (NULL MODEM)

COMM 1, & 2

| PIN | RS-232 |
|---|---|
| 1 | DCD |
| 2 | TX DATA → |
| 3 | RX DATA ← |
| 4 | DSR ← |
| 5 | GND |
| 6 | DTR → |
| 7 | CTS ← |
| 8 | RTS → |
| 9 | RI ← |

### DISCRETE INPUTS (2.)

J10 CONNECTOR

| PIN | RS-232 |
|---|---|
| 1 | DIG_IN1 |
| 2 | GND |
| 3 | DIG_IN2 |
| 4 | GND |
| 5 | DIG_IN3 |
| 6 | GND |
| 7 | DIG_IN4 |
| 8 | GND |
| 9 | DIG_IN5 |
| 10 | GND |

CARRIER PRESSURE SWITCH (OPTIONAL)

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| F | 10-13-04 | HM | ECO XX-5000196 | EM | DLT |
| E | 8-10-04 | DLT | ECO XX-5000003 | DLT | GM |
| D | 6-10-04 | HM | ECO XX-203565 | EM | DLT |
| C | 3-23-04 | DLT | ECO XX-200113 | DLT | GM |
| B | 3-8-04 | DLT | ECO XX-199533 | EM | DLT |
| A | 1-29-04 | HM | REL'D XX-196577 | DLT | GM |
| 2 | 12-17-03 | HM | REV. DISCRETE INPUTS | DLT | GM |

SI METRIC | THIRD ANGLE PROJECTION | MATERIAL: BLOCK N/A | FINISH: BLOCK N/A

GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES X.XX ±.015, X.XXX ±.005, ANGULAR ±0.30', FINISH 200 RA MAX

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

PROJ. FILE NO. G-00001

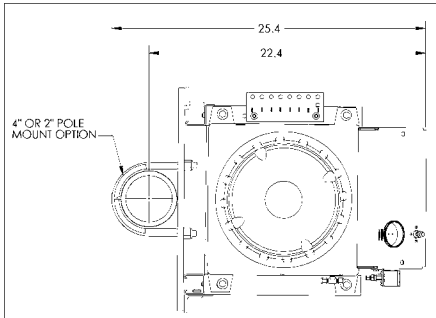
FILENAME: DE20992F1.DWG, DATE: 10-12-04, TIME: 1:16 P.M.

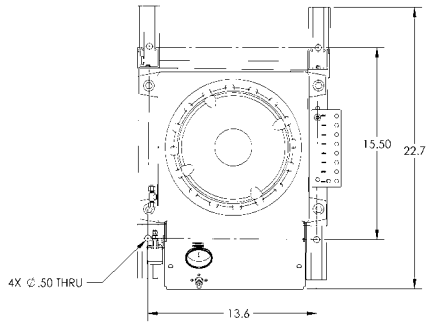


EMERSON Process Management

TITLE: FIELD WIRING MODEL 700 G.C.

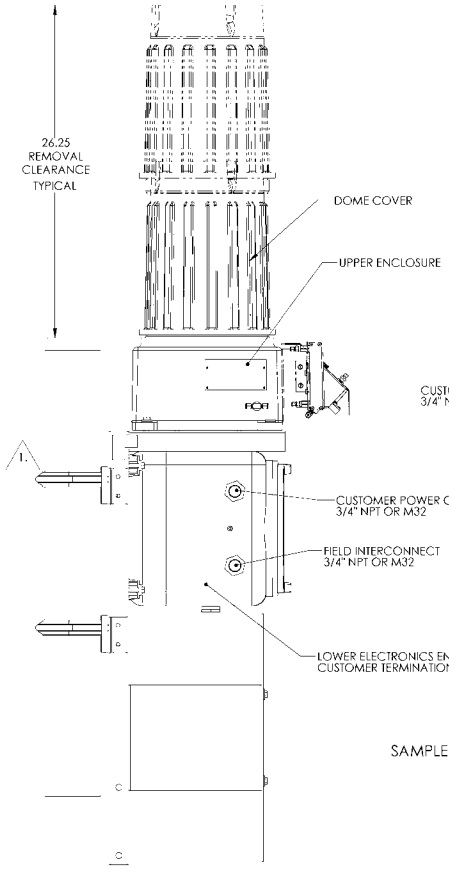
| | | |
|---|---|---|
| DRN DLT | DATE 9/2/03 | DWG NO. DE-20992 REV F |
| CHKD DLT | DATE 1-29-04 | |
| APP'D GM | DATE 1-29-04 | SCALE NTS P/N N/A SHT 1 OF 1 |



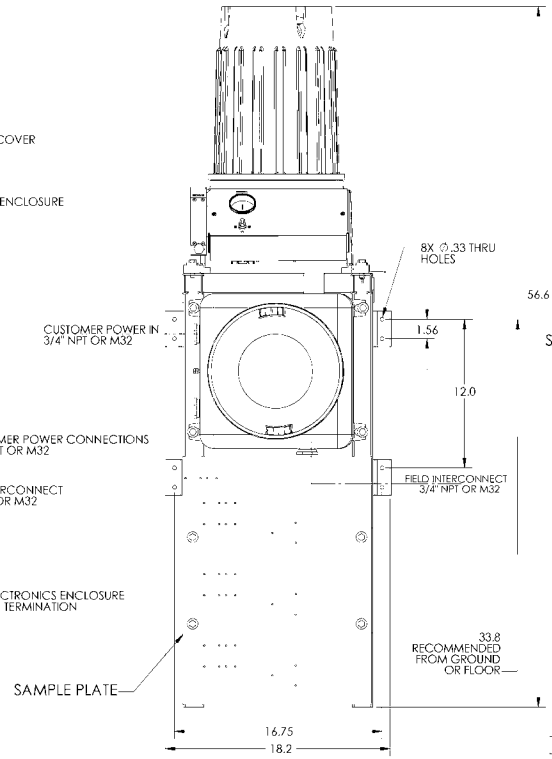




NOTES:

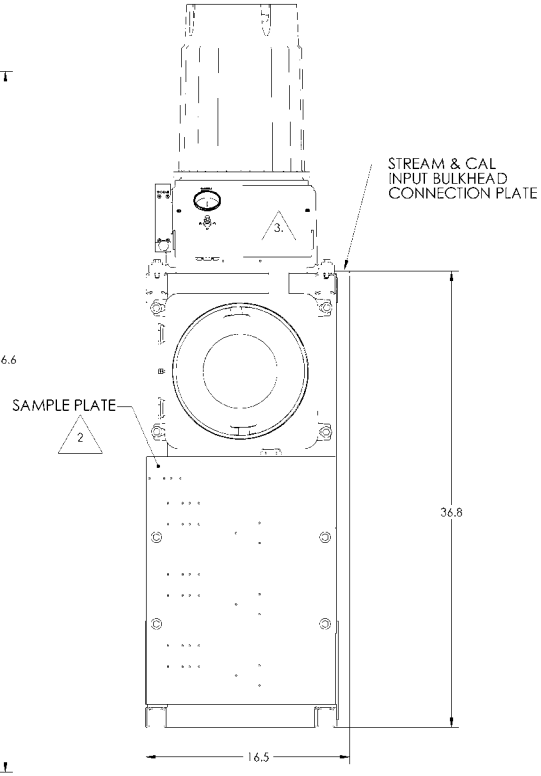
1. PIPE MOUNTING KIT TO BE SHIPPED LOOSE WITH UNIT. ONLY ANGLE BRACKETS AND BRACKET MOUNTING HARDWARE ARE INSTALLED.
2. SEE SAMPLE PLATE DRAWING FOR ASSEMBLY.
3. SHOWN WITH ONE GAGE & REGULATOR BUT MAY HAVE TWO EACH.



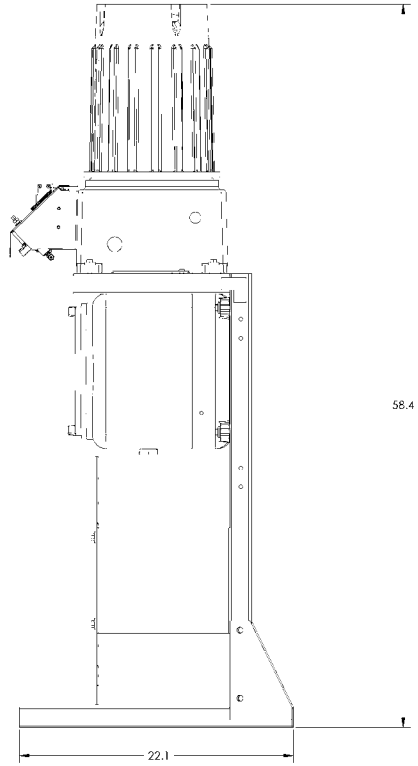

POLE MOUNT UNIT




FRONT VIEW WALL MOUNT UNIT




FRONT VIEW FLOOR MOUNT UNIT




SIDE VIEW FLOOR MOUNT UNIT

| REV | DATE | DRN | DESCRIPTION | CHKD | APPD |
|---|---|---|---|---|---|
| C | 8/22/05 | HM | ECO-XX-5001024 | DLT | BLB |
| B | 6-10-04 | HM | ECO-XX-203565 | EM | DLT |
| A | 1-29-04 | HM | REL'D XX-196577 | DLT | BLB |
| I | 9-03 | HM | RELEASED | DLT | BLB |

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: SEE ORDER
FINISH: N/A
PROJ. FILE NO. G-00001
FILE NAME: DE20993C1.SLDDRW, DATE: 08-22-05, TIME: 3:50 P.M.



GEOMETRIC TOLERANCES & DIMENSIONING PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN INCHES
X ±.03
.XX ±.010
ANGULAR ±2°30'
FROM .250 IN MAX

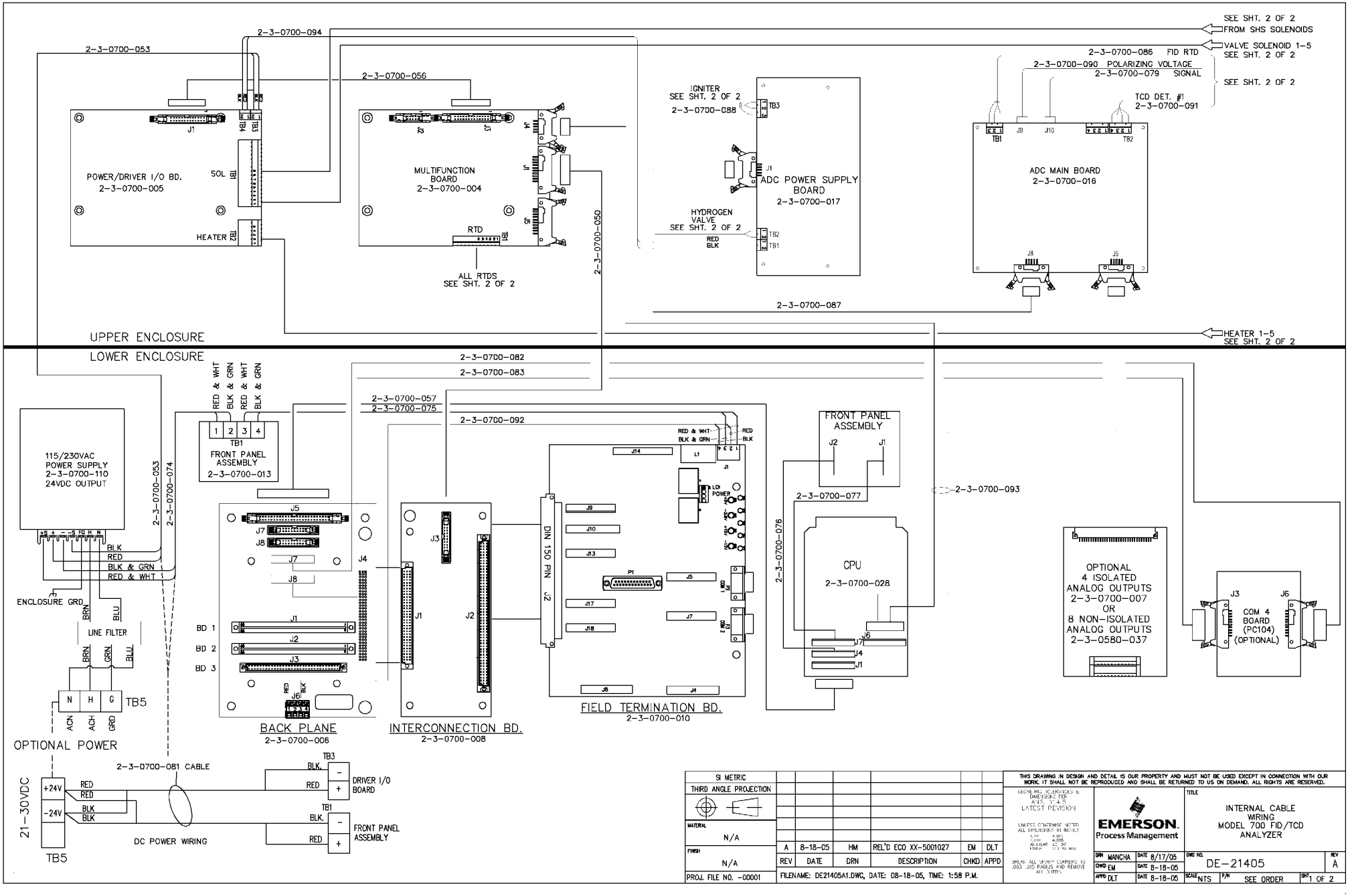
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: OUTLINE & DIMENSIONAL
POLE, WALL, & FLOOR MOUNTING UNITS
MODEL 700 GC

| | | | |
|---|---|---|---|
| DRN | HM | DATE | 8/13/03 |
| CHKD | DLT | DATE | 1-29-04 |
| APPD | BLB | DATE | 1-29-04 |

DWG NO: DE-20993
REV: C
SCALE: 1:1 WT: SEE ORDER SHT: 1 OF 1




| | | | | | | |
|---|---|---|---|---|---|---|
| SI METRIC | | | | | | |
| THIRD ANGLE PROJECTION | | | | | | |
| MATERIAL N/A | | | | | | |
| FINISH N/A | A | 8-18-05 | HM | REL'D ECO XX-5001027 | EM | DLT |
| PROJ. FILE NO. -00001 | REV | DATE | DRN | DESCRIPTION | CHKD | APPD |

FILENAME: DE21405A1.DWG, DATE: 08-18-05, TIME: 1:58 P.M.



GEOMETRIC TOLERANCES & DIMENSIONING PER ANSI Y14.5 LATEST REVISION

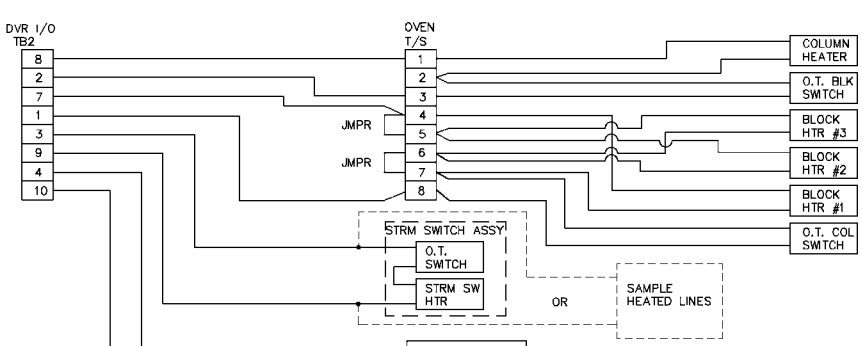
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES

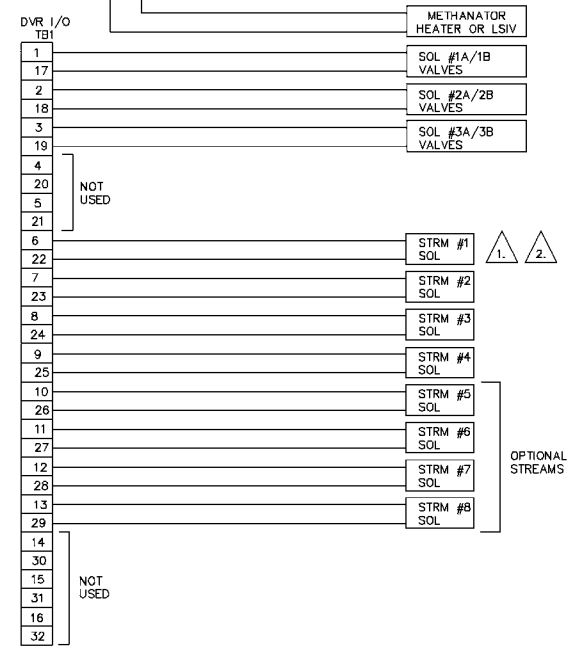
BREAK ALL SHARP CORNERS TO .003 .015 RADIUS AND REMOVE ALL BURRS

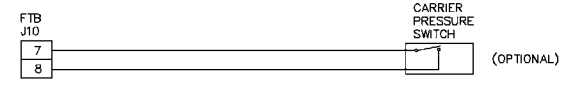
EMERSON. Process Management

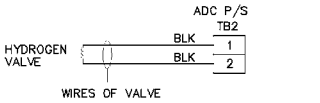
TITLE: INTERNAL CABLE WIRING MODEL 700 FID/TCD ANALYZER

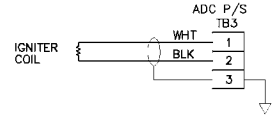
| | | | |
|---|---|---|---|
| DRN MANCHA | DATE 8/17/05 | DWG NO. DE-21405 | REV A |
| CHKD EM | DATE 8-18-05 | | |
| APPD DLT | DATE 8-18-05 | SCALE NTS P/N SEE ORDER | SHT 1 OF 2 |

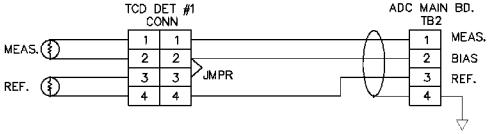


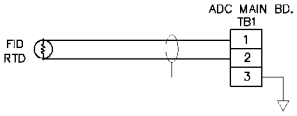



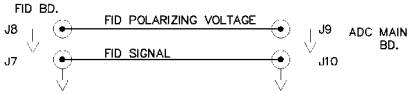



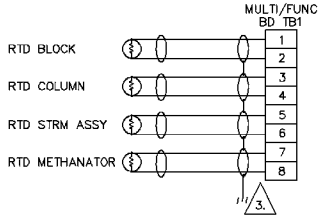



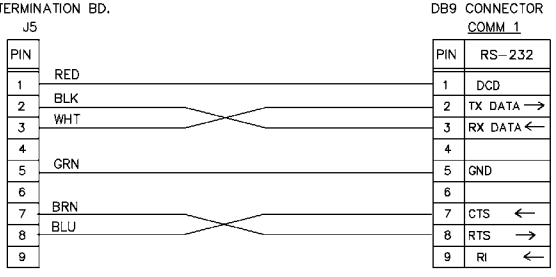




WIRING 6FT. 3-2350-068 COMM CABLE



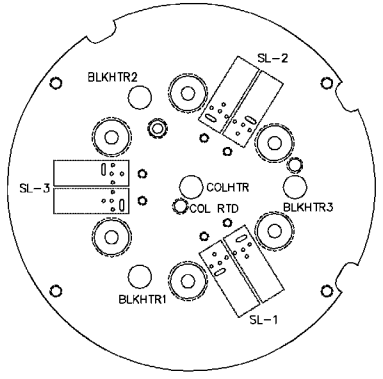

NOTES:

1. CALIBRATE IS THE LAST STREAM USED.
2. IF THE STREAM SWITCHING IS DOUBLE BLOCK AND BLEED, THERE ARE TWO SOLENOIDS FOR EACH STREAM WIRED IN PARALLEL.
3. CONNECT SHIELDS TO MOUNTING SCREW OF OVEN MOUNTING PLATE.

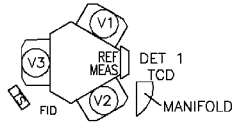
FID LOCAL CONNECTIONS

METHANATOR
- HEATER – ZONE 4
- RTD – ZONE 4
- $H_2$ – ZONE 4

LSIV
- HEATER BLOCK – ZONE 4
- RTD – ZONE 4
- EXT. PISTON DRIVE
- SAMPLE HEAT – ZONE 3




KIOSK MANIFOLD BOTTOM VIEW




TOP VIEW OF ANALYZER OVEN FROM FRONT

| | | | | | | |
|---|---|---|---|---|---|---|
| SI METRIC | | | | | | |
| THIRD ANGLE PROJECTION | | | | | | |
| MATERIAL N/A | | | | | | |
| FINISH N/A | A | 8-18-05 | HM | REL'D ECO XX-5001027 | EM | DLT |
| PROJ. FILE NO. G-00001 | REV | DATE | DRN | DESCRIPTION | CHKD | APPD |

FILENAME: DE21405A2.DWG, DATE: 08-18-05, TIME: 2:04 P.M.



GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.010
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 800 Ra MAX

BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: INTERNAL CABLE WIRING MODEL 700 FID/TCD ANALYZER

| | | | |
|---|---|---|---|
| DRN MANCHA | DATE 8/17/05 | DWG NO. DE-21405 | REV A |
| CHKD EM | DATE 8-18-05 | | |
| APPD DLT | DATE 8-18-05 | SCALE NTS P/N SEE ORDER | SHT 2 OF 2 |

DANIEL®

5650 Brittmoore Road, Houston, Tx. 77041
(713) 467-6000

# SPARE PARTS LIST

Proposal _____
Date _____
P.O. _____
S.O. _____

EMERSON
Process Management

| ITEM | QTY. | PART NO. | DESCRIPTION | UNIT PRICE | TOTAL NET |
|---|---|---|---|---|---|
| 1 | 1 | 2-3-2350-090 | CPU BOARD | | |
| 2 | 1 | 2-3-2350-041 | ADC BOARD 16 BIT | | |
| 3 | 1 | 2-3-0580-037 | PREAMPLIFIER BOARD | | |
| 4 | 1 | 2-3-0700-010 | FIELD TERMINATION BOARD | | |
| 5 | 1 | 2-3-0700-136 | FUSE KIT (5X 1A, 5X 2.5A, 5X 6A) | | |
| 6 | 1 | 2-3-0700-011 | DUAL METHODS ADAPTER BOARD | | |
| 7 | 1 | 2-3-0700-005 | DRIVER I/O BOARD | | |
| 8 | 1 | 2-3-0700-004 | MULTIFUNCTION BOARD | | |
| 9 | 0 | 2-3-0700-029 | MODEM BOARD PC-104 (OPTIONAL) | | |
| 10 | 0 | 2-3-2350-098 | ETHERNET (TCP/IP) BOARD (OPTIONAL) | | |
| 11 | 0 | 2-3-0580-037 | ANALOG BOARD, 8 NON-ISOLATED4-20MA (OPTIONAL) | | |
| 12 | 1 | 2-3-0700-007 | ANALOG BOARD, 4 ISOLATED 4-20MA (OPTIONAL) | | |
| 13 | 1 | 904260 | POWER SUPPLY, VOLGEN | | |
| 14 | 2 | 2-4-0700-152 | SOLENOID VALVE, PNEUTRONICS SRS | | |
| 15 | 1 | 2-4-0700-187 | REPAIR KIT, 6-PORT VALVE | | |
| 16 | 2 | 2-4-0700-171 | REPAIR KIT, 10-PORT VALVE | | |
| 17 | 1 | 2-4-9500-084 | CARRIER GAS REGULATOR (MASONEILAN) | | |

| REV | ECO NO | DATE | CHKD | APPD |
|---|---|---|---|---|
| | | | | |
| | | | | |
| D | XX-5001024 | 8-22-05 | EM | DLT |
| C | XX-5000003 | 8-10-04 | EM | DLT |
| B | XX-200113 | 3-30-04 | EM | DLT |
| A | XX-196577 | 2-10-05 | EM | DLT |

TITLE

SPARE PARTS LIST

MODEL 700 TCD ANALYZERS

| DRN | DATE |
|---|---|
| CGC | 2-4-04 |
| CHKD | DATE |
| EM | 2-10-04 |
| APPD | DATE |
| DLT | 2-10-04 |

TOTAL

SP-00700 SHEET 1 OF 2

| ITEM | QTY. | PART NO. | DESCRIPTION | UNIT PRICE | TOTAL NET |
|---|---|---|---|---|---|
| | | | | | |
| 18 | 1 | 2-3-0520-101 | COLUMN SET, 4 MINUTE BTU | | |
| 19 | 1 | 2-6-1611-083 | THERMISTOR SET, 9K WITH SEALS (OPTIONAL TCD UNIT) | | |
| 20 | 1 | 2-3-0500-391 | TEFLON THERMISTOR SEALS (SET OF 10) (OPT TCD UNIT) | | |
| 21 | 1 | 2-4-5000-113 | ELEMENT FOR INLINE NUPRO FILTER | | |
| 22 | 1 | 2-4-5000-938 | ELEMENTS FOR GENIE 120 FILTER (KIT OF 5) | | |
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DANIEL®

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(713) 467-6000

# SPARE PARTS LIST

Proposal _____
Date _____
P.O. _____
S.O. _____

EMERSON.
Process Management

| ITEM | QTY. | PART NO. | DESCRIPTION | UNIT PRICE | TOTAL NET |
|---|---|---|---|---|---|
| 1 | 1 | 2-3-2350-090 | CPU BOARD | | |
| 2 | 1 | 2-3-0700-016 | ADC MAIN BOARD (NOTE INCLUDES BELOW ADC MODULE 2-3-0700-015) | | |
| 3 | 1 | 2-3-0700-015 | ADC MODULE | | |
| 4 | 1 | 2-3-0700-010 | FIELD TERMINATION BOARD | | |
| 5 | 1 | 2-3-0700-136 | FUSE KIT (5X 1A, 5X 2.5A, 5X 6A) | | |
| 6 | 1 | 2-3-0700-017 | ADC POWER SUPPLY BOARD | | |
| 7 | 1 | 2-3-0700-005 | DRIVER I/O BOARD | | |
| 8 | 1 | 2-3-0700-004 | MULTIFUNCTION BOARD | | |
| 9 | 0 | 2-3-0700-029 | MODEM BOARD PC-104 (OPTIONAL) | | |
| 10 | 0 | 2-3-2350-098 | ETHERNET (TCP/IP) BOARD (OPTIONAL) | | |
| 11 | 0 | 2-3-0580-037 | ANALOG BOARD, 8 NON-ISOLATED4-20MA (OPTIONAL) | | |
| 12 | 1 | 2-3-0700-007 | ANALOG BOARD, 4 ISOLATED 4-20MA (OPTIONAL) | | |
| 13 | 1 | 904260 | POWER SUPPLY, VOLGEN | | |
| 14 | 2 | 2-4-0700-152 | SOLENOID VALVE, PNEUTRONICS SRS | | |
| 15 | 1 | 2-4-0700-187 | REPAIR KIT, 6-PORT VALVE | | |
| 16 | 2 | 2-4-0700-171 | REPAIR KIT, 10-PORT VALVE | | |
| 17 | 1 | 2-4-9500-084 | CARRIER GAS REGULATOR (MASONEILAN) | | |

| REV | ECO NO | DATE | CHKD | APPD |
|---|---|---|---|---|
| | | | | |
| | | | | |
| A | XX-5001027 | 8-18-05 | EM | DLT |

TITLE

SPARE PARTS LIST

MODEL 700 ANALYZER
FID OR FID/TCD UNITS

| DRN | DATE |
|---|---|
| DLT | 8-18-05 |
| CHKD | DATE |
| EM | 8-18-05 |
| APPD | DATE |
| DLT | 8-18-05 |

TOTAL

SP-00701 SHEET 1 OF 2

| ITEM | QTY. | PART NO. | DESCRIPTION | UNIT PRICE | TOTAL NET |
|---|---|---|---|---|---|
| | | | | | |
| 18 | 1 | 2-6-1611-083 | THERMISTOR SET, 9K WITH SEALS (OPTIONAL TCD UNIT) | | |
| 19 | 1 | 2-3-0500-391 | TEFLON THERMISTOR SEALS (SET OF 10) (OPT TCD UNIT) | | |
| 20 | 1 | 2-4-5000-113 | ELEMENT FOR INLINE NUPRO FILTER | | |
| 21 | 1 | 2-4-5000-938 | ELEMENTS FOR GENIE 120 FILTER (KIT OF 5) | | |
| 22 | 1 | 2-3-0700-190 | ASSEMBLY CAP FID BURNER | | |
| 23 | 1 | 2-3-0700-191 | METHANATOR COLUMN/HEATER/SENSOR REPLACEMENT (OPTIONAL FOR UNIT WITH METHANATOR) | | |
| 24 | | | | | |
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## WARRANTY CLAIM PROCEDURES

To make a warranty claim, you, the Purchaser, must:

1. Provide Daniel with proof of the Date of Purchase and proof of the Date of Shipment of the product in question.
2. Return the product to Daniel within twelve (12) months of the date of original shipment of the product, or within eighteen (18) months of the date of original shipment of the product to destinations outside of the United States. The Purchaser must prepay any shipping charges. In addition, the Purchaser is responsible for insuring any product shipped for return, and assumes the risk of loss of the product during shipment.
3. To obtain Warranty service or to locate the nearest DMS office, sales, or service center call (713) 827-6314, Fax (713) 827-6312, or write to:

   Daniel Measurement Services
   11100 Brittmore Park Drive
   Houston, Texas 77041

   Or contact DMS via the following site
   **www.emersonprocess.com/daniel**

4. When contacting DMS for product service, the Purchaser is asked to provide information as indicated on the following page entitled "Customer Repair Report".
5. For product returns from locations outside the United States, it will be necessary for you to obtain the import consignment address so that DMS's customs broker can handle the importation with the U.S. Customs Service.
6. DMS offers both on call and contract maintenance service designed to afford single source responsibility for all its products.
7. DMS reserves the right to make changes at any time to any product to improve its design and to insure the best available product.

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# CUSTOMER REPAIR REPORT

FOR SERVICE, COMPLETE THIS FORM, AND RETURN IT ALONG WITH THE AFFECTED EQUIPMENT TO CUSTOMER SERVICE AT THE ADDRESS INDICATED BELOW.

COMPANY NAME: _____

TECHNICAL CONTACT:_____ PHONE: _____

REPAIR P. O. #:_____ IF WARRANTY, UNIT S/N:_____

INVOICE ADDRESS: _____

_____

_____

SHIPPING ADDRESS: _____

_____

RETURN SHIPPING METHOD: _____

EQUIPMENT MODEL #:_____ S/N:_____FAILURE DATE: _____

DESCRIPTION OF PROBLEM: _____

_____

_____

WHAT WAS HAPPENING AT TIME OF FAILURE? _____

_____

ADDITIONAL COMMENTS:_____

_____

_____

REPORT PREPARED BY:_____ TITLE: _____

IF YOU REQUIRE TECHNICAL ASSISTANCE, PLEASE FAX OR WRITE THE CUSTOMER SERVICE DEPARTMENT AT:

DANIEL MEASUREMENT SERVICES
DIVISION OF EMERSON PROCESS MANAGEMENT
ATTN: CUSTOMER SERVICE
11100 BRITTMOORE PARK DRIVE
HOUSTON, TEXAS 77041

PHONE: (713) 827-6314
FAX: (713) 827-6312

**FOR FASTEST SERVICE CONTACT DANIEL VIA OUR WEBSITE:**
**www.emersonprocess.com/daniel**

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*www.emersonprocess.com*