Model 500
Gas Chromatograph

Hardware Reference Manual

Part Number 2-3-9000-537
Revision L

June 2023

EMERSON™

Safety Messages

WARNING
EXPLOSION HAZARD
Failure to de-energize the analyzer may cause serious injury or death to personnel.

Do not open when energized or when an explosive atmosphere may be present.

Keep cover tight while circuits are live.

WARNING
EXPLOSION/FIRE HAZARD
Failure to observe this warning may cause serious injury or death to personnel.

Do not open when an explosive atmosphere may be present.

Do not open when energized.

Use supply cables or wires suitable for at least 176 °F (80 °C).

WARNING
BURN HAZARD
Internal components may be hot. Failure to allow the GC to cool down may result in injury to personnel.

Allow the GC to cool down before disassembling any components.

Always wear proper personal protective equipment (PPE) when disassembling the analyzer.

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

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

NOTICE
Prior to converting carrier gas to hydrogen, it is recommended to review local hazardous area requirements to ensure compliance.

Cybersecurity recommendations for Model 500 and MON2000/MON2000 PLUS users

Install Model 500 GC in Secure Environment with Physical Protection

- Install Model 500 GC in Secure Environment with Physical Protection.
- **WARNING**
  Physical access: Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and must be protected against. Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This extends to all systems used within the facility.
- Before use, scan the USB shipped with the GC with anti-virus software.
- Store all the GC related files, including application files, drawings, and documents in the secure network/drive with restricted access.

Model 500 Gas Chromatograph
System Reference Manual

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IMPORTANT INSTRUCTIONS

- Read all instructions prior to installing, operating, and servicing this product.
- Follow all warnings, cautions, and instructions marked on and supplied with this product.
- Inspect the equipment packing case and if damage exists, notify your local carrier for liability.
- Open the packing list and carefully remove equipment and spare or replacement parts from the case. Inspect all equipment for damage and missing parts.
- If items are damaged or missing, contact the manufacturer at 1 713 396 8880 for instructions about receiving replacement parts.
- Install equipment as specified per the installation instructions and per applicable local and national codes. All connections shall be made to proper electrical and pressure sources.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent personal injury.
- Use of this product for any purpose other than its intended purpose may result in property damage and/or serious injury or death.
- Before opening the flameproof enclosure in a flammable atmosphere, the electrical circuits must be interrupted.
- Repairs must be performed using only authorized replacement parts as specified by the manufacturer. Use of unauthorized parts can affect the product's performance and place the safe operation of the product at risk.
- When installing or servicing ATEX-certified units, the ATEX approval applies only to equipment without cable glands. When mounting the flameproof enclosures in a hazardous area, only flameproof cable glands certified to IEC 60079-1 must be used.
- Technical assistance is available <u>24 hours a day, 7 days a week</u> by calling 1 713 396 8880.

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DESCRIPTION

1.1 PURPOSE OF THIS MANUAL

This manual (P/N 3-9000-537) is intended as a user's guide to accompany the Model 500 gas chromatograph.

NOTICE

For software operation instructions, see the MON2000 Software for Gas Chromatographs User Manual (P/N 3-9000-522)

This manual provides the following information:

1.1.1 Section 1 Description

- A general description of the Model 500 gas chromatograph (GC) and its components, their configurations and functions.
- A brief description of the GC's software, user interface, and capabilities.
- Introduction to GC theory of operation and terminology.

1.1.2 Section 2 Equipment Description

- Guidelines for sampling system and gas connections.
- Descriptions of Analyzer subsystems and components.
- Descriptions of GC Controller subsystems and components.

1.1.3 Section 3 Installation and Startup

Instructions for installing the GC hardware.

1.1.4 Section 4 Operation

Instructions for operating the GC by means of its built-in keypad and liquid crystal display (LCD), if provided.

1.1.5 Section 5 Maintenance

- Instructions for regular maintenance and care of the GC hardware.
- Instructions for troubleshooting, repair, and service of the GC hardware.

1.1.6 Section 6 Recommended Spare Parts

List of boards, valves, and other components suggested as spare parts.

1.1.7 Appendices

Appendices with additional, helpful reference materials and drawings.

1.2 INTRODUCTION

The Model 500 GC is a high-speed gas chromatograph that is factory engineered to meet specific field application requirements based on typical stream composition and the anticipated concentration of the components of interest. The Model 500 typically consists of three major components, the Analyzer Assembly, the Controller, and the Sample Conditioning System:

Analyzer Assembly (Model 500 Series) - Located near the sample tap. The Analyzer includes GC columns, detectors, preamplifier, stream switching valves, and solenoids. The Model 500 Analyzer is housed in a National Electrical Manufacturers Association (NEMA) 7, National Electrical Code (NEC) Class I, Division 1, Groups B, C, and D approved enclosure, for use in a hazardous environment.

GC Controller - Located no further than 2000 feet (610 meters) away from the Analyzer. The GC Controller includes electronics and ports for signal processing, instrument control, data storage, personal computer (PC) interface, and telecommunications. The GC Controller is available in various enclosures and configurations, as follows:

Explosion Proof - NEMA 4X (weatherproof and corrosion resistant) and NEMA 7, NEC Class I, Division 1, Groups B, C, and D approved enclosure, for use in a hazardous environment. Available with or without a built-in keypad and liquid crystal display (LCD).

Rack Mount - Suitable for use in a nonhazardous environment. Made for mounting on a standard 19 inch rack. Available with or without a built-in keypad and LCD.

Retrofit - Suitable for use in a nonhazardous environment. Made for mounting on a 12-inch rack previously sold for 2251 GC Controller. The Retrofit enclosure is not available with a built-in keypad and LCD (therefore, a PC is required for operating).

Sample Conditioning System (SCS) - Located between the process stream and the Analyzer sample inlet, usually mounted on the lower portion of the Analyzer stand. The standard configuration SCS includes a mounting plate, block (or shutoff) valves, and filters. Optionally, the SCS can be configured with Genie® bypass filters, liquid shut-off valves, and optional solenoids for stream switching: all of which can be enclosed in an electric (heat tape design) oven.

In its standard configuration, the Model 500 Analyzer can handle up to five streams: typically, four for sample and one for calibration. With an optional stream switch assembly added, the Model 500 Analyzer can switch up to twelve streams, maximum.

The GC Controller, is designed to be operated primarily from a personal computer (PC) running the MON2000 Software package. This provides the user with the greatest capability, ease-of-use, and flexibility. One PC running MON2000 can connect with up to 32 gas chromatographs. The PC is used to display chromatograms and reports, which can then be stored as files on the PC, or printed from either the PC's or the GC's printer.

Also, each individual GC can be operated from its built-in keypad and LCD (if installed in that configuration); however, this method offers more limited functions. Display of the chromatograms on the LCD is accomplished in scrolling strip chart fashion.

Since neither the PC nor a normal printer can be placed in a hazardous area, serial port and Modbus communications links are provided for connecting the Model 500 Analyzer to the PC, other computers, printers, chromatographs, and Controllers.

1.3 FUNCTIONAL DESCRIPTION

A functional block diagram of a typical Model 500 Analyzer installation is shown in Figure 1-1. 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 sample conditioning system where it is filtered or otherwise conditioned. After conditioning, the sample flows to the Analyzer for separation and detection of the components of the gas.

The chromatographic separation of the sample gas into its components is accomplished in the Analyzer in the following manner. A precise volume of sample gas is injected into one of the unit's analytical columns. The column contains a stationary phase (packing) that is either an active solid (adsorption partitioning) or an inert solid support that is coated with a liquid phase (absorption partitioning). The gas sample is moved through the column by means of a mobile phase (carrier gas). Selective retardation of the components of the sample takes place in the column that causes each component to move through the column at a different rate. This action separates the sample into its constituent gases and vapors.

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 Analyzer detectors are amplified in the Analyzer electronics, then transmitted to the GC Controller for further processing. See also, Section 1.5, “Theory of operation” on page 7.

Output from the GC Controller is normally displayed on a remotely located personal computer (PC) or a printer. Connection between the GC Controller and the PC can be accomplished via a direct serial line, the Modbus-compatible communication interface, modem or ethernet card.

Multiple chromatograms may be displayed on the PC monitor, and compared or contrasted with separate color schemes. This allows a stored chromatogram to be compared/contrasted with a current or another stored chromatogram. This could be of great assistance when changing parameters or isolating a problem.

Use of a PC for configuration and troubleshooting procedures is essential in most instances. Basic operations can also be performed from a keypad and liquid crystal display that are built into certain versions of the GC Controller. The PC may be remotely connected via telephone, radio, ethernet or satellite communications. Once installed and configured, the Model 500 Analyzer can operate independently for long periods of time.

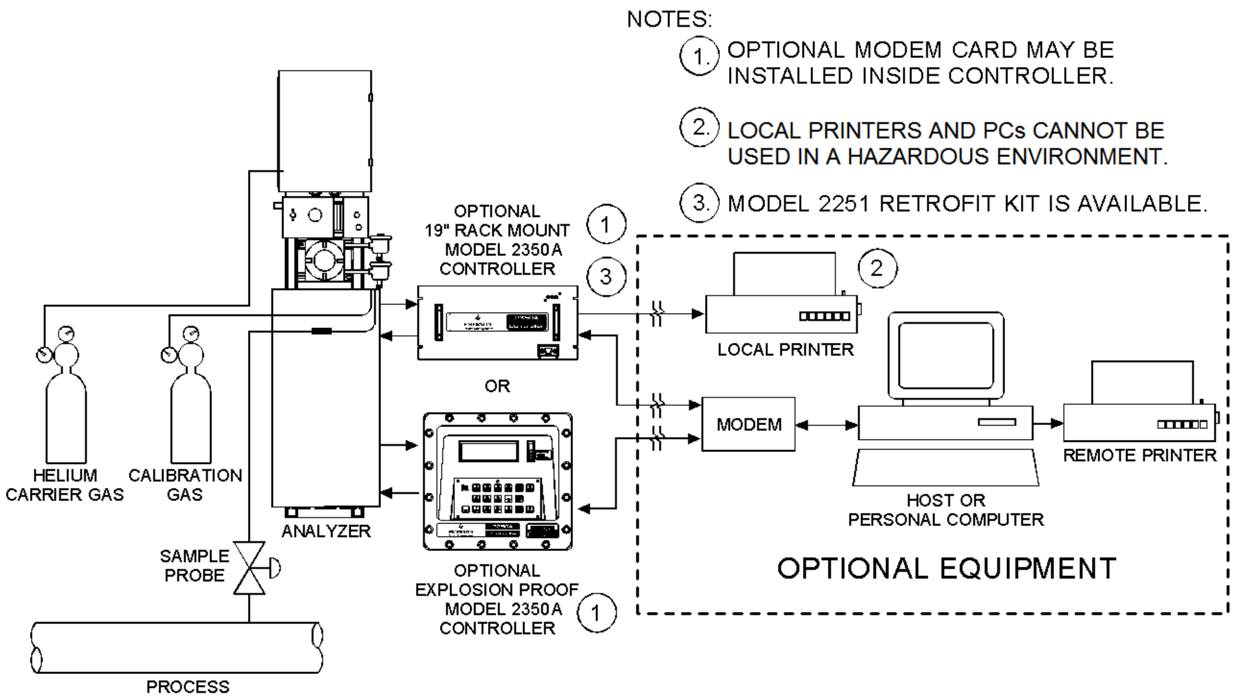

Figure 1-1 Model 500 Analyzer Functional Block Diagram

1.4 MODES OF OPERATION

1.4.1 User Interfaces

You have at least one, and optionally two, user interfaces from which to operate the gas chromatograph (GC) system:

PC connected to the GC and running MON2000 - The PC connected to the GC and running MON2000 offers the greatest amount of capability and flexibility.

Find complete user instructions for MON2000 in the program's online HELP screens and in the program user's manual, *MON2000 Software for Gas Chromatographs User Manual* (P/N 3-9000-522).

or

The GC Controller's built-in keypad and LCD - The GC Controller's built-in keypad and LCD offer essential startup and operation functions. They are useful in a hazardous environment or if no PC is available.

This feature is optional on all standalone models of the GC, except the portable Compact BTU GC.

1.4.2 Capabilities

Individual gas chromatograph Controller functions that can be initiated or controlled by the GC and its software, MON2000, are listed in the *MON2000 Software for Gas Chromatographs User Manual* (P/N 3-9000-522).

1.5 THEORY OF OPERATION

NOTICE

See also Section 1.6, "GLOSSARY" on page 16, for definitions of some of the terminology used in the following explanations.

1.5.1 The Analyzer Detector

The Analyzer detector subsystem 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. A schematic diagram of the thermal conductivity detector is shown in Figure 1-2.

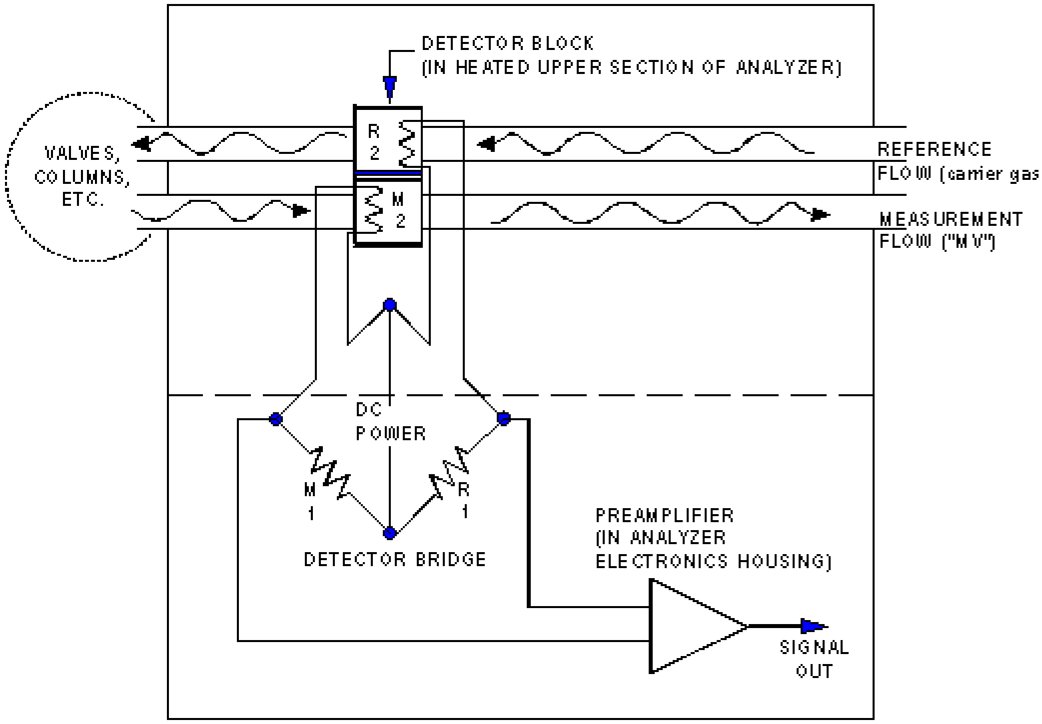

Figure 1-2 Schematic Diagram of Analyzer Detector Bridge

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 1-3 illustrates the change in detector electrical output during elution of a component.

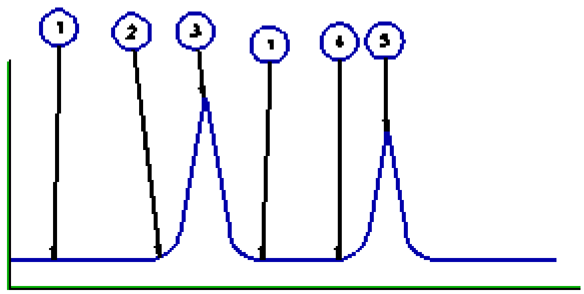

Figure 1-3 Detector output during component elution

1. Detector bridge balanced.
2. First component begins to elute from column and to be sensed by the measurement thermistor.
3. Peak concentration of first component.
4. Second component begins to elute from column and to be sensed by the measurement thermistor.
5. Peak concentration of second component.

In addition to amplifying the differential signal developed between the detector's two thermistors, the preamplifier also supplies drive current to the detector bridge. The preamplifier also supplies drive current to the detector bridge. The voltage signal is converted to a 4 to 20-milliamp (mA) current loop for transmission to the GC Controller. 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 GC Controller for computation, recording on a printer, or viewing on a PC monitor or LCD.

1.5.2 Data Acquisition

Every second, exactly 40 equi-spaced data samples are taken for analysis by the GC Controller (i.e., once every 25 milliseconds). Each data sample, after having been precision-amplified, is subjected to a sixteen bit analog to digital (A/D) conversion. The sampling frequency of 40 Hertz (Hz) was chosen to reduce 60 Hz normal mode noise.

After each point on the chromatograph signal is sampled, the resulting number is stored in a buffer area in the GC Controller's memory for processing. 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 to the Controller's memory for processing. Non-overlapping groups of N samples are averaged and stored, and thus reduce the effective incoming data rate to 40/N samples/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:

$$N = PW \text{seconds}$$

where PW is given in seconds. All the various details in the analysis process are independent of the value of N. Allowable values of N are 1 to 63, which corresponds to values of PW from 1 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. First, 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. Secondly, 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 GC

Controller. This prevents small, short duration perturbations from being recognized as true peaks by the program. It is therefore important to choose a Peak Width corresponding to the narrowest peak in a group under consideration.

1.5.3 Peak Detection

For normal area or peak height concentration evaluation, the determination of a peak's start, peak point, and end 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. It is important that this be the case because this assumption is made by the GC Controller.

Having initiated a peak search by turning Inhibit off, the GC Controller performs a point by point examination of the signal slope. This is achieved by using a digital slope detection filter which is a combination low pass filter and differentiator. The output of this detector is constantly compared to a system constant entered by the operator 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.

Peak termination is determined by the same application of this detector to the signal, but in the reverse sense. Onset is defined where the detector output exceeds the baseline constant, but termination is defined subsequently where the detector output is less than the same baseline 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 GC Controller.

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 GC Controller may average several analyses of the calibration stream.

1.5.4 Basic Analysis Computations

Two basic analysis algorithms are included in the GC Controller. These are:

- Area Analysis - Calculates area under component peak
- Peak Height Analysis - Measures height of component peak

Concentration Analysis by Using Response Factor

Concentration calculations require a unique response factor foreach 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).

Response factor calculation: (using the external standard)

$$ARF_n = \frac{Area_n}{Cal_n}$$

or

$$HRF_n = \frac{Ht_n}{Cal_n}$$

where:

ARF_n	Area response factor for component n in area per mole percent (%).
HRF_n	Height response factor for component n.
$Area_n$	Area associated with component n in calibration gas.
Ht_n	Height associated with component n in mole percent in calibration gas.
Cal_n	Amount of component n in mole percent in calibration gas.

Calculated response factors are stored by the GC Controller 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 response factor for component n from the calibration run.

k Number of calibration runs actually used to calculate the response factors.

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

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

where the absolute value of *% deviation* for alarm has been previously entered by the operator.

Concentration Calculations in Mole % without Normalization

Once response factors have been determined by the GC Controller or entered by the operator, component concentrations are determined for each analysis by using the following equations:

$$CONC_n = \frac{Area_n}{ARF_n}$$

or

$$CONC_n = \frac{Ht_n}{HRF_n}$$

where:

$CONC_n$ Concentration of component n in mole percent.

$Area_n$ Area of component n in unknown sample

ARF_n Response factor of component n calculated from area of calibration sample. Units are area per mole percent.

Ht_n Peak height of component n in unknown sample

HRF_n Response factor of component n calculated from peak height of calibration sample. Units are height per mole percent.

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

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

Concentration Calculations with Normalization

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

where:

$CONCN_n$ Normalized concentration of component n in percent of total gas concentration.

$CONC_n$ Non-normalized concentration of component n in mole percent.

$CONC_i$ Non-normalized concentration (in mole percent) from each of the k components to be grouped into this normalization.

k Number of components to be included in the normalization.

NOTICE

For additional information about other calculations that are performed by the GC Controller and software, see the MON2000 Software for Gas Chromatographs user manual (P/N 3-9000-522).

1.6 GLOSSARY

Auto Zero: Automatic zeroing of the preamplifier. May be entered into the Controller to take place at any time during the analysis when either the component is not eluting or the baseline is steady.

Chromatogram: A permanent record of the detector output. A chromatograph is obtained from a PC interfaced with the detector output through the GC Controller. 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 GC Controller 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: Fitting resembling a pipe or a box with a removable cover for access to electric conduits.

CTS: Clear to send (a serial port pin assignment).

DCD: Data carrier detect; see also, RLSD (a serial port pin assignment).

DSR: Data set ready (a serial port pin assignment).

DTR: Data terminal ready (a serial port pin assignment).

Response Factor: Correction factor for each component as determined by the calibration. See "Concentration Analysis by Using Response Factor" on page 12 for more information.

Retention Time: The time (in seconds) that elapses between start of analysis (0 seconds) and the sensing of the maximum concentration of each component by the Analyzer detector.

RI: Ring indicator (a serial port pin assignment).

RLSD: Received line signal detect (a digital simulation of carrier detect); see also, DCD (a serial port pin assignment).

RTS: Request to send (a serial port pin assignment).

RxD, RD, or S_{IN}: Receive data, or signal in (a serial port pin assignment).

TxD, TD, or S_{OUT}: Transmit data, or signal out (a serial port pin assignment).

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EQUIPMENT DESCRIPTION

This section provides descriptions of the various subsystems and components that make up the Model 500 gas chromatograph. This section is organized as follows:

- Sampling System
  - Sampling Point Location
  - Sample Volume and Flow Rate
  - Sample Conditioning
  - Contamination Precautions
  - Valving
  - Calibration Gas
- Analyzer
  - Physical Description
  - Chromatograph Valves
  - Detector Subsystem
  - Analyzer Preamplifier Unit
  - Analyzer Specifications
  - Utility Gas Requirements
- Controller
  - Controller Hardware Configurations
  - Optional Keypad and Display
  - Alarm Specifications

2.1 SAMPLING SYSTEM

A well designed, properly adjusted sampling system is essential to optimum performance of any gas chromatograph. If a good sample is not obtained for analysis, the whole purpose of the system is compromised.

The purpose of the sample handling system is not to transfer an exact sample of process fluid to the chromatograph. Rather, the purpose is to transfer a representative sample of the fluid--after it has been conditioned--that is compatible with chromatograph sample requirements. This statement encompasses a big difference and is very important to remember.

The Sample Conditioning System (SCS) is located between the process stream and the Analyzer, and is usually mounted on the lower portion of the Analyzer stand. It serves these purposes:

- Extracts final sample from the fast loop,
- Performs final filtration,
- Performs stream switching for a multi-stream Analyzer, and
- Adjusts the final pressure, temperature, and flow control on the selected sample flowing to the sample valve.

The following points should be considered in selecting and installing a sampling system.

2.1.1 Sampling Point Location

Gas samples must be representative of the process stream and must be taken from a location where stratification or separation of components does not occur. The sampling point should be as close as feasible to the Analyzer.

2.1.2 Sample Volume and Flow Rate

An adequate response time for sample analysis requires that sample volumes should generally be as small as possible, and the flow rate between the sampling point and the Analyzer should be as high as possible, consistent with accuracy. To minimize time lag and to prevent back diffusion, dryers and filters in the sampling line should be as small as possible. When long sampling lines cannot be avoided, flow velocity in the line can be increased by decreasing the downstream pressure.

Typically, pressure is reduced at the sample point with a pressure regulating sample probe. The input pressure to the Analyzer can be adjusted between 10 and 20 pounds per square inch, gauge (psig). Reducing the pressure at the sample point avoids the problem of heavy liquid dropout in the sample line during cold weather. The flow rate in the sample line is set at 50 cubic centimeters (cc) per minute with the restrictor valve at the Analyzer.

Use this general rule to approximate sample lag time caused by the length of sample line. Sample line constructed of 1/8-inch tubing contains approximately 1 cc of volume per foot. Therefore, with a flow rate of 50 cc per minute, the lag time of the sample between the sample point and the Analyzer is calculated by dividing the length of the line (in feet) by 50. For example, the sample in a 100 foot sample line will take 2 minutes to travel the length of the line.

2.1.3 Sample Conditioning

Sample systems should contain at least one filter to remove solid particles from the sample stream. Most applications require fine-element filters upstream of the Analyzer.

2.1.4 Contamination Precautions

Several precautions are recommended to minimize the possibility of contaminating samples. Except in special applications, filters should be of either the ceramic or the porous metallic type to avoid the absorption losses characteristic of fiber or paper filters. Pressure regulators and flow controllers containing cork or felt filters or absorbent diaphragms should not be used. Sampling lines for noncorrosive streams should be stainless steel tubing and must be clean and free of grease. Lines must be pressure tight to prevent diffusion of moisture or atmospheric gases into the sample. Pipe threads should be dressed only with Teflon tape on pipe threads and never with pipe thread compounds (dope).

2.1.5 Valving

A block valve should be installed immediately downstream of the sample takeoff point to permit shutdown of the system for maintenance. Block valves should be either needle valves or cocks of the proper material and packing, and should be rated for the process line pressure. Tight seating of all connections is essential.

2.1.6 Calibration Gas

A calibration gas used for Process 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). 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 C6+ blend for a temperature of zero degrees Fahrenheit (0 °F) is listed in the following table. No dropout will occur in this calibration gas if it is blended at a pressure below 250 psig.

Table 2-1 Contents of Example Calibration Gas

Gas	Mole Percent
Nitrogen	2.5
Carbon dioxide	0.5
Methane	Balance
Ethane	5.0
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.

2.2 ANALYZER

2.2.1 Physical Description

The Analyzer is physically divided into two major sections (see Figure 2-1). The upper heated section is temperature controlled and contains the following components:

- Pneumatically actuated valves that control the flow of the sample and carrier gases
- Detector elements
- Analytical columns
- A temperature-controlled heater block

The lower section consists of two explosion-proof housings that contain printed-circuit assemblies for the following functions:

- Valve control
- Heater-block temperature control
- Detector drive
- Detector output signal preamplifier.

The Analyzer assembly, sample valves, and associated piping are mounted in a self-supporting rack that may be placed at or near the sample tap. Under most environmental conditions, the Analyzer assembly requires no additional shelter.

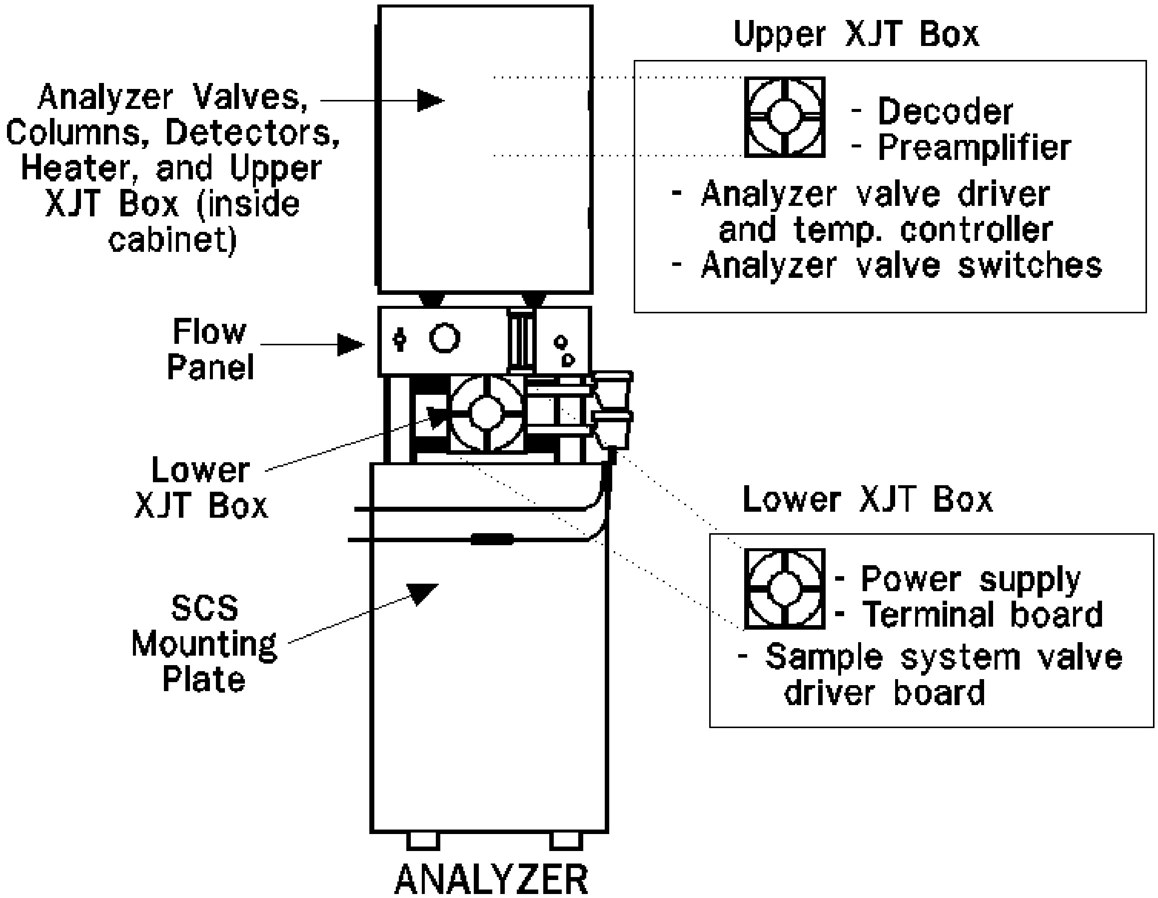


Figure 2-1 Analyzer Subsystems

2.2.2 Chromatograph Valves

A chromatograph valve is shown in Figure 2-2 in exploded view. Its pistons are pneumatically actuated in both switching directions by the actuating assemblies located below the primary plate.

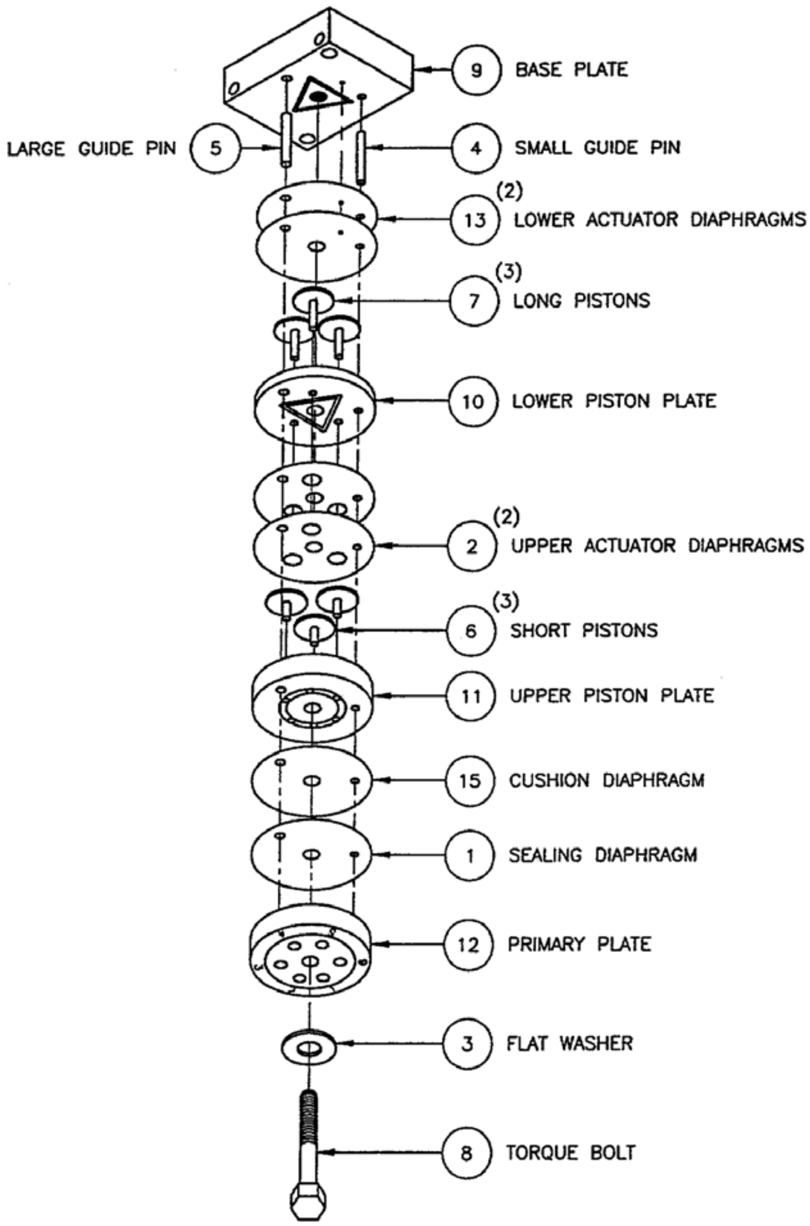


Figure 2-2 Chromatograph Valve

Primary Plate

The primary plate contains precisely machined internal passages that enter and exit the valve at top ports, each of which is connected to the top and/or bottom of the plate within the valve. The primary plate, which is the only metallic element that comes in contact with the sample, is isolated from the remainder of the valve by specially formulated diaphragms.

NOTICE

GC valve should be torqued to 30 ft. lbs.

Actuating Subassemblies

Below the primary plate, pistons are operated by pneumatic pressure applied to actuating diaphragms through ports in the base plate.

Operation

When pneumatic pressure is applied to the actuating diaphragms, the pistons are actuated, thus forcing the sealing diaphragm against the primary plate. This closes the passages that are connected at the bottom of the plate. When pressure is removed, the pistons are free to move, and flow is resumed through the passages.

2.2.3 Detector Subsystem

The operation of the Analyzer detector subsystem was previously discussed in the "Theory of Operation" section of this manual.

2.2.4 Analyzer Preamplifier Unit

The electrical output from the detector is amplified by the Analyzer preamplifier unit. The preamplifier also supplies drive current to the detector bridge. The voltage signal is converted to a 4 to 20-milliamp (mA) current loop for transmission to the GC Controller. The signal is proportional to the concentration of a component detected in the gas sample. The preamplifier provides four different gain channels and compensates for baseline drift. The signals from the preamplifier are then sent to the GC Controller, where they provide the basis for analysis computations and a chromatographic trace, or chromatogram.

2.2.5 Analyzer Specifications

Power Requirements: 120 volts, alternating current (VAC), +10/-15VAC; 50 to 60 Hertz (Hz); single phase; 10 amperes (A) (maximum during warmup) (additional 10 amps if unit has a Sample System Oven).

Ambient Temperature Range: -18 degrees Celsius (C) to +55 C (0 F to +130 F)

Humidity: 0 to 95 percent relative humidity, noncondensing

Vibration: Designed for mounting on process piping or other field structures subject to normal process vibrations

National Electrical Code (NEC) Area Classification: Suitable for NEC Class 1, Division 1, Groups B, C, and D

Rack Size:

- Height: 58 inches (147.3 centimeters [cm])
- Width: 18 inches (45.7 cm) maximum
- Depth: 18 inches (45.7 cm)

Weight: Approximately 125 pounds (56.8 kilograms [kg]), including mounting hardware.

Sample Requirements:

- Fluid Phase - Vapor
- Pressure - 15 to 30 psig, regulated to ±10 percent
- Flow Rate - 50 cc/min, typical

Analyzer Output Signal: Four different gain channels to provide a 4 to 20 mA signal to the Controller.

Transient Over Voltages Category: Installation Category (Over Voltage Category II)

Cleaning requirements: Restricted to the 6-port valve (refer to "Valve Cleaning" on page 5-22).

2.2.6 Utility Gas Requirements

Carrier Gas: Typically zero grade helium (99.995% pure, with less than 5 ppm water, and less than 0.5 ppm hydrocarbons).

Valve Actuation Gas: Typically zero grade, 99.995% pure helium at 115 psig. Consumption is 100cc per analysis cycle. Clean, dry air also may be used for valve actuation. Carrier Gas and Valve Actuation Gas are normally supplied from a common cylinder, since overall gas consumption is minimal.

2.3 CONTROLLER

The Model 500 Controller is a microprocessor-based device that provides the Model 500 Analyzer with highly accurate timing, precision calculations, pertinent report generation, and an interface with other devices. The Controller provides both analog outputs and a direct digital link with output devices through RS-232C, RS-422, or RS-485 ports. Volatile portions of the program are protected by a lithium battery backup if power is lost or turned off at the unit.

The Controller can be packaged for side-by-side use with the Model 500 Analyzer in a hazardous area, or for remote use in a safe area in a 19-inch rack mounting. Also, a retrofit kit is available to replace the older model GC Controller (Model 2251) used with the Model 500 Analyzer. The retrofit kit is suitable for 12-inch rack mounting.

The Model 500 Controller can be linked directly to a PC by serial connection or by a telecommunication link that uses Modbus protocol. This provides the preferred method for operating the GC System. Limited control of the GC System is also possible through a built-in keypad and display, which are optional components of the explosion-proof, hazardous environment GC Controller package. The local alphanumeric keypad and display allow for maintenance and minor adjustments in a hazardous environment.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Do not operate a PC or printer in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

The 19-inch rack mounted, 12-inch rack retrofit kit, and the explosion-proof NEMA 4X, Groups B, C, and D, Controllers all operate identically.

2.3.1 Controller Hardware Configurations

The Controller may be provided for hazardous area mounting, 19-inch rack mounting, or used in a 12-inch rack retrofit kit. See Figure 2-3 through Figure 2-5. The unit consists of an STD-bus based computer and related boards, including boards for terminating field wiring. The enclosure for hazardous areas qualifies as flameproof (explosion-proof NEMA 4X, Groups B, C, and D). Connections to the enclosure are through one 2-inch (50mm) hole (reduced to 3/4 inch with bushing) and two 1-inch (25 mm) conduit fittings located in the bottom. These accept matching conduit or cable entries. Field connections are made through explosion-proof conduit or flameproof glands.

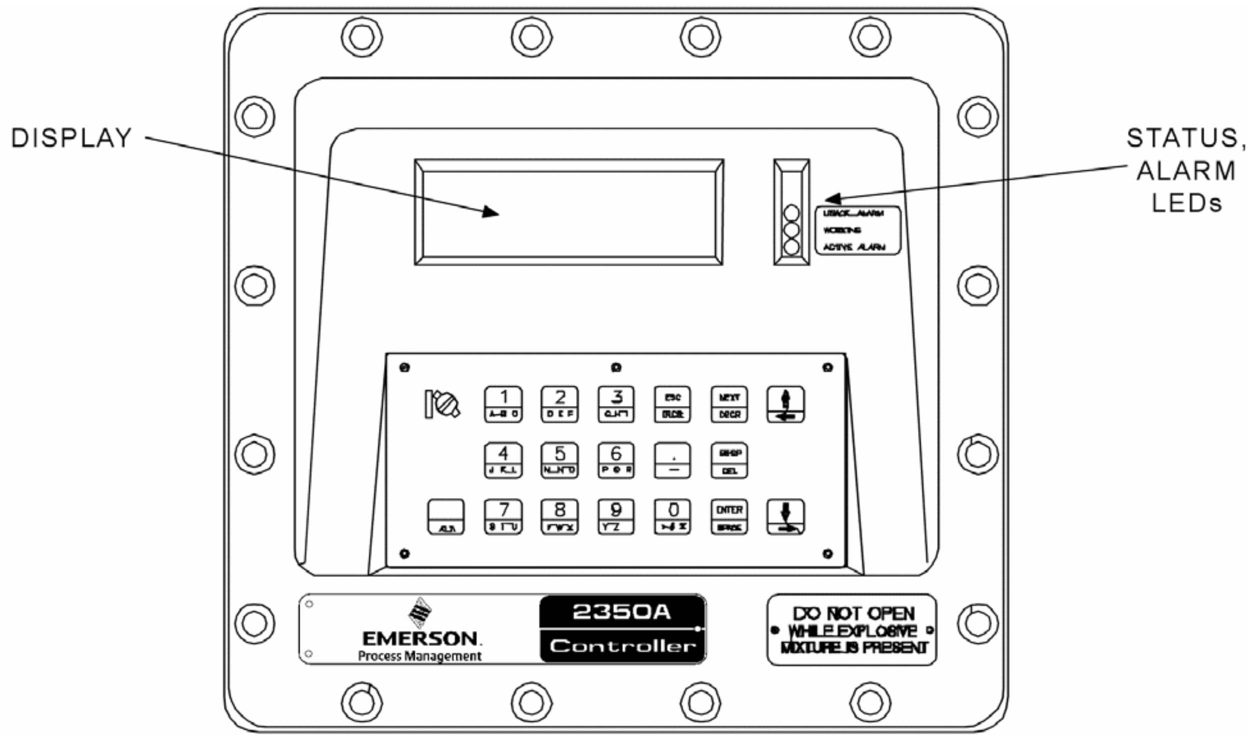


Figure 2-3 GC Controller, Explosion-Proof Version

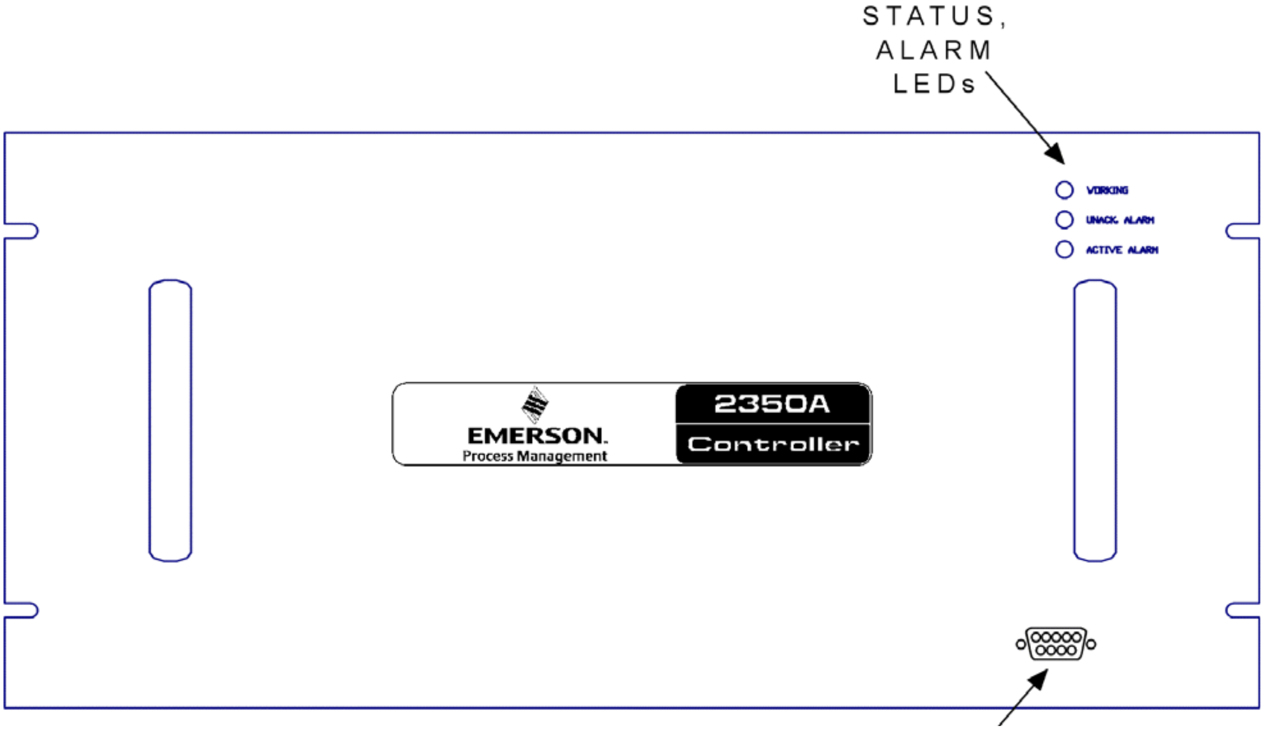


Figure 2-4 GC Controller, 19-inch Rack Mounted Version

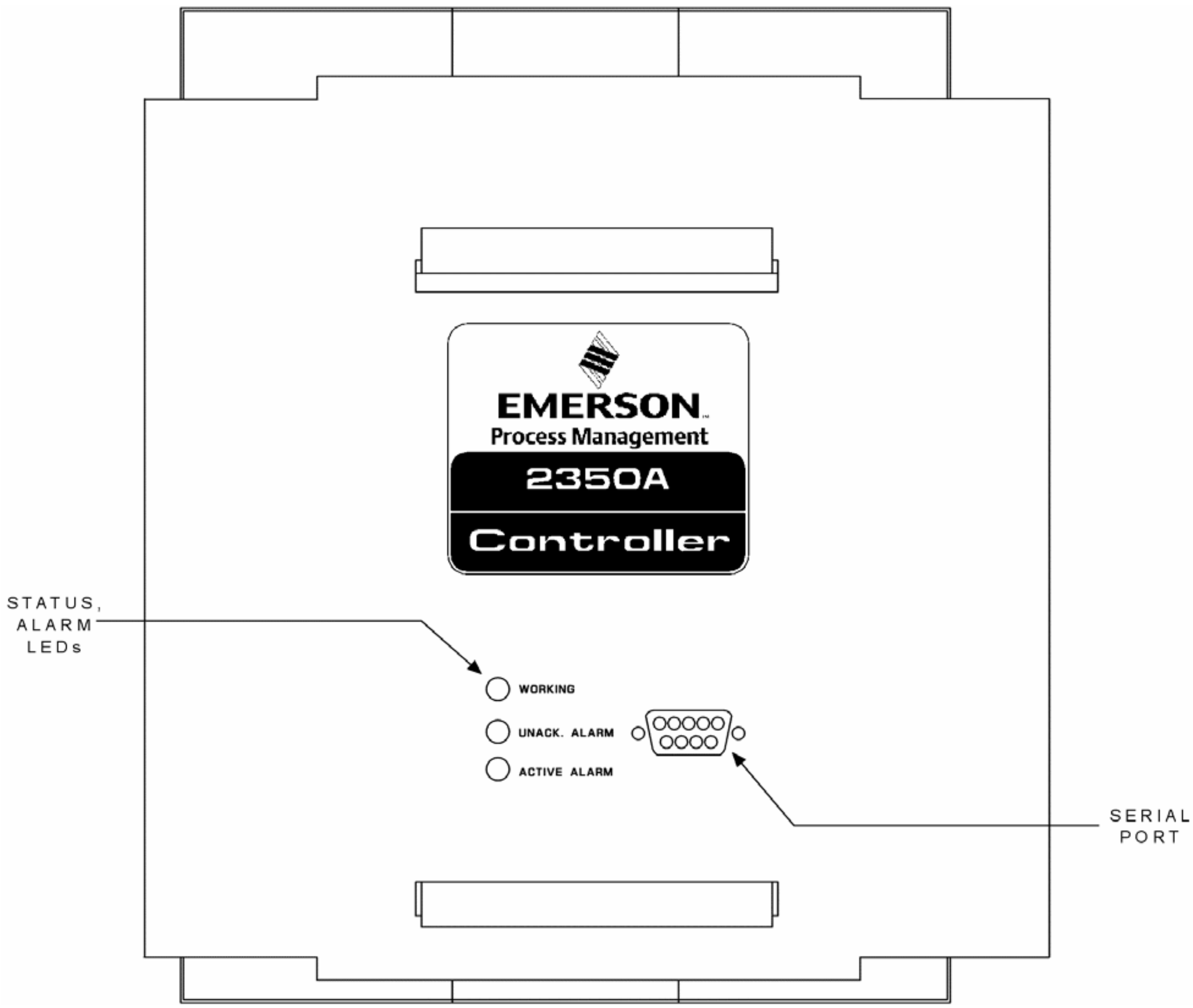


Figure 2-5 Model 2251 Retrofit Kit (12-inch rack) for the GC Controller

For operating a printer in a nonhazardous area at the GC site, a DB-25 parallel port is available on the GC's Terminal Board for field wiring.

For connecting a PC to the GC at the GC site (for setup, operation, or maintenance in a nonhazardous area), a DB-9 serial port connector is available on the Controller's front panel.

The STD-Bus Card Cage inside the GC Controller is equipped with two cards. Card slots are preassigned so that cables can be consistently routed. However, the COM4A board and the modem board (and Ethernet card when using a 16-bit CPU board) can be piggy-backed in any order on the CPU board. If a Radicom modem is used, it must be the top board in the card cage assembly.

An optional stream switching assembly (with either AC or DC solenoids) can be controlled by the GC Controller, allowing for switching up to 12 streams.

Analog Inputs and Outputs

The GC Controller can accommodate eight fully differential analog 4 to 20 mA input signals. Four of the analog inputs are used by the associated Analyzer, and they are filtered with transient protection. The additional four input ports provide the ability to accept signals from other Analyzers, so that the analytical report of the chromatograph can include other information on the gas stream, such as water or sulphur content. Transient protection and shield terminations are available for these inputs.

There is capability for a maximum of ten analog outputs. Two analog outputs are available as standard components of the Controller; the other eight analog outputs are optional. All ten analog outputs are current type: 4-20 mA, not isolated. Also, all ten analog outputs can be calibrated by the MON2000 software.

Digital Inputs and Outputs

The Controller has the capability of sixteen digital inputs used as follows:

5 - to read a Modbus address, as defined by DIP switch positions.

2 - to indicate presence and type of front panel as defined by switch positions

1 - Spare

1 - temperature sensor input to shut off LCD backlight

1 - GC alarm, optically isolated, with transient protection

5 - stream flow alarms, optically isolated, with transient protection

1 - photocell detector, front panel backlight (night on, day off)

The Controller has the capability of 22 digital outputs used as follows:

6 - Analyzer control

8 - driver outputs for DC air solenoids (stream switching, 12 total streams)

5 - alarms, optically isolated, with transient protection

3 - front panel indicators (green, yellow, red)

The digital transient-protected discrete outputs can furnish up to 50 mA. If more current is required (up to 0.5A), a special transient protection plug-in module should be installed (see Appendix C, this manual, for transient protection module details).

Communications

There are 3 to 8 communication ports externally available, depending on options package selected. The communications ports can use either RS-232, RS-422, or RS-485 protocol, which, for the LX-800 CPU board, can be set via MON20/20, and for the 6117 CPU board, must be set by Data Interface Chips resident on the board.

The communications ports are configured at the factory, as specified by the customer's communications requirements. The Modbus switch positions are also normally set at the factory as specified by the customer. If any changes need to be made in the field, refer to the drawings in the rear of this manual.

Driver Outputs

The Controller has eight stream switch outputs, 120 mA continuous current, which can be used to control optional AC or DC solenoid switch boards. This increases stream switch capability from the standard capability of four streams and 1 CAL to a maximum capability of twelve streams.

NOTICE

The optional stream switching assembly (AC or DC solenoid systems) has provisions for eight stream routes, but adding this option has the net effect of adding only seven more stream routes to the standard stream capacity of five (thus giving a total stream capacity of twelve). The reason is, one of the Analyzer's standard five stream routes becomes dedicated to the optional stream switch assembly when the optional stream switch assembly is installed.

General Controller Specifications

Power requirements (without current outputs): 63.25VA typical for basic instrument

Voltage options:

- 115 VAC ±15 percent, 50 to 60 Hz @ 0.33 A
- 230 VAC ± 15 percent, 50 to 60 Hz @ 0.275 A

Temperature:

- Operating range: -18 C to 55 C (0 F to 131 F)
- Storage range: -40 C to 85 C (-40 F to 185 F)

Humidity: 0 to 95 percent relative humidity, noncondensing

Explosion-proof NEMA 4X, Groups B, C, and D, enclosure dimensions:

- Height:13 inches
- Width:14 inches
- Depth: 14 inches

Rack mounted dimensions (standard 19-inch):

- Height:8.75 inches
- Width: 19 inches
- Depth: 8.5 inches

Retrofit kit enclosure dimensions (12-inch rack, "panel mount"):

- Height:8.5 inches
- Width:11 inches
- Depth:11 inches

Weight: Approximately 74 pounds for Explosion-Proof NEMA 4X, Groups B, C, and D, version (not including stand)

Electrical/Mechanical Safety and Integrity - Certifications and Classifications

Both the Analyzer and the GC Controller, when housed inside explosion-proof enclosures, meet these certifications and classifications for electrical and/or mechanical safety and integrity:

National Electrical Manufacturers Association (NEMA) 7 for National Electrical Code (NEC) Class I, Division 1, Groups B, C, and D areas. Meets Underwriters Laboratories Inc. (UL) 1203, "Explosion-Proof and Dust-Proof Electrical Equipment of use in hazardous (Classified) locations" for NEC Class I, Division 1, Groups B, C, and D, and Canadian Standards Association (C.S.A.) 22.2 No. O-M1962, Part II and C.S.A. 22.2 No. 30-M1986 for NEC Class I, Division 1, Groups B, C, and D.

EEx d IIB T6 - Meets CENELEC EN 50 014, and EN 50 018, "Electrical Apparatus for Potentially Explosive Atmospheres...", Parts 1 and 5, as flameproof for Group II, Subdivision B, Temperature Class T6.

The GC Controller, when housed inside explosion-proof enclosure, meets these certifications and classifications for electrical and/or mechanical safety and integrity:

NEMA 4X - Meets NEMA 250, "Enclosures for Electrical Equipment (1000 volts maximum)", for type 4X, Canadian Electrical Code, Part II, Rule 2-400 1 d, and C.S.A. C22.2 No. 94-1967 as C.S.A. enclosure 4, and International Electrotechnical Commission (IEC) 144, "Degrees of protection of enclosures of Switchgear...", for IP 65.

Both the Analyzer, when housed inside explosion-proof enclosure, and the GC Controller, when housed inside (a) the explosion-proof enclosure, (b) the rack mount enclosure, or the retrofit enclosure, meet the **Federal Communications Commission (FCC) Part 15, Subparts A and B** classification for control against excessive radio frequency emissions.

GC Controller Circuit Board List

The GC Controller circuit boards are inserted or attached to an STD-bus card cage assembly. The Controller has two boards inserted into the card cage, and two of the boards are attached to the card cage outside.

The 6117 CPU board has three optional piggy-back boards that can be attached to it via the PC 104 bus:

- Modem
- COM4A serial ports 5, 6, 7, and 8
- Ethernet

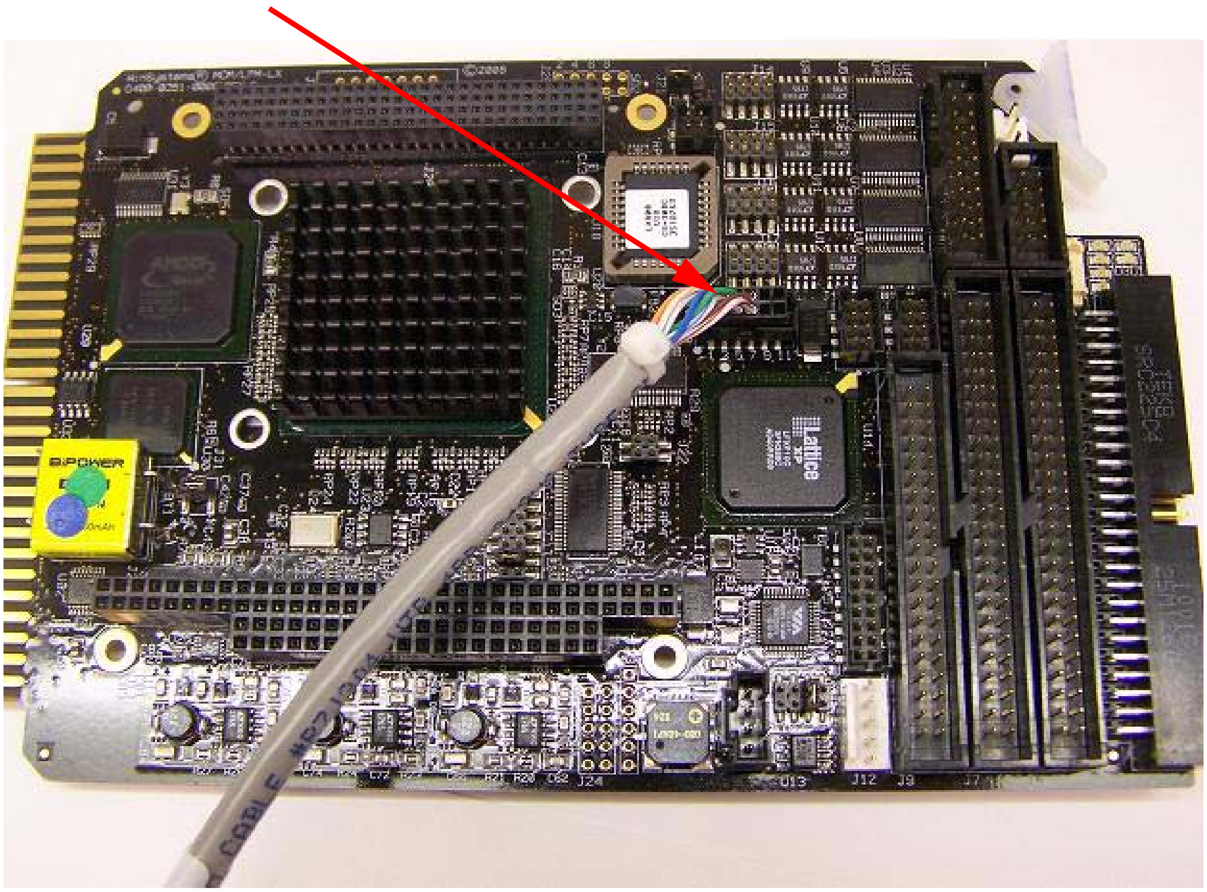
There are two optional piggy-back boards that can be attached to the LX-800 CPU board via the PC 104 bus:

- Modem
- COM4A serial ports 5, 6, 7, and 8

NOTICE

The LX-800's onboard Ethernet port can be used instead of the optional Ethernet board, unless the LX-800 is installed with application revision 3.99 or earlier (16 bit BOS), in which case, the Ethernet board must be used.

onboard ethernet port



The inserted circuit boards of the GC Controller perform these functions:

Table 2-2 Functions of Inserted Circuit Boards, GC Controller Card Cage Assembly

Subsystems	**Handle Label or Part Number**	**Function(s)**	**See drawing number...**
32-bit CPU microprocessor board or 16-bit CPU microprocessor board	LX800 MCM/LPM-6117	Microprocessor; control of parallel printer port; control of COM1, COM2, COM3, and COM4 communication ports; system memory; RS-422 serial protocol; three timers, digital I/O, and CompactFlash. Additional memory for higher capacity data archives.	DE-20782
COM4A Board (CPU Daughter board)		Control of COM5 - COM8	BE-20767
Modem (CPU Daughter board)		telephone modem	N/A
Analog I/O board [requires MON2000 software, version 2.3 or later]	Analog*	Control of eight analog inputs (4 for user applications and 4 for Analyzer-Controller inter-connect) and two, six, or ten analog outputs	BE-18044
Ethernat Card (16-bit CPU daughter board)	PCM-NE 2000	Flexible, high-performance networking capability; broad spectrum of software support.	N/A

There are two circuit boards attached to the outside of the card cage:

- The System Interface and Driver board, and
- The GC Controller's Terminal Board for Field Wiring.

The GC Controller's Terminal Board for Field Wiring provides termination connections for these items:

- Communication ports (COM1, COM2, COM3, COM4, COM5, COM6, COM7, and COM8),

- Analog inputs and outputs,
- Digital inputs and outputs,
- Controller-Analyzer interconnections,
- Parallel printer port, and
- Optional stream switching assemblies.

NOTICE

See drawing DE-20782 for an illustration of the GC Controller's Terminal Board for Field Wiring.

The GC Controller's Terminal Board for Field Wiring also has sockets for transient protection modules, and a 250 VAC, 2A fuse (5 x 20 mm) that protects all of the boards from transient surges.

NOTICE

See Appendix C and drawing CE-18115 for a list of transient suppression modules that are installed for various configurations of the GC Controller and its communication, analog output, and stream-switching options.

The System Interface and Driver board provides these functions:

- Drivers for switching the eight optional valve solenoids,
- Location for 8-position DIP switch to set the Modbus address,
- Opto-isolation circuits for the discrete inputs and outputs,
- Switching power supply and temperature shutdown circuit for the LCD display,
- RS-232 to RS-422 conversion for the LCD display, and
- Voltage-to-current conversion for the analog outputs.

- Jumper for selecting driving voltage source for the 4-20 mA circuit.

NOTICE

See drawing CE-18118 for an illustration of the System Interface and Driver board.

Also see Figure 2-6, which illustrates, through a block diagram, the function and placement of the GC Controller circuit boards.

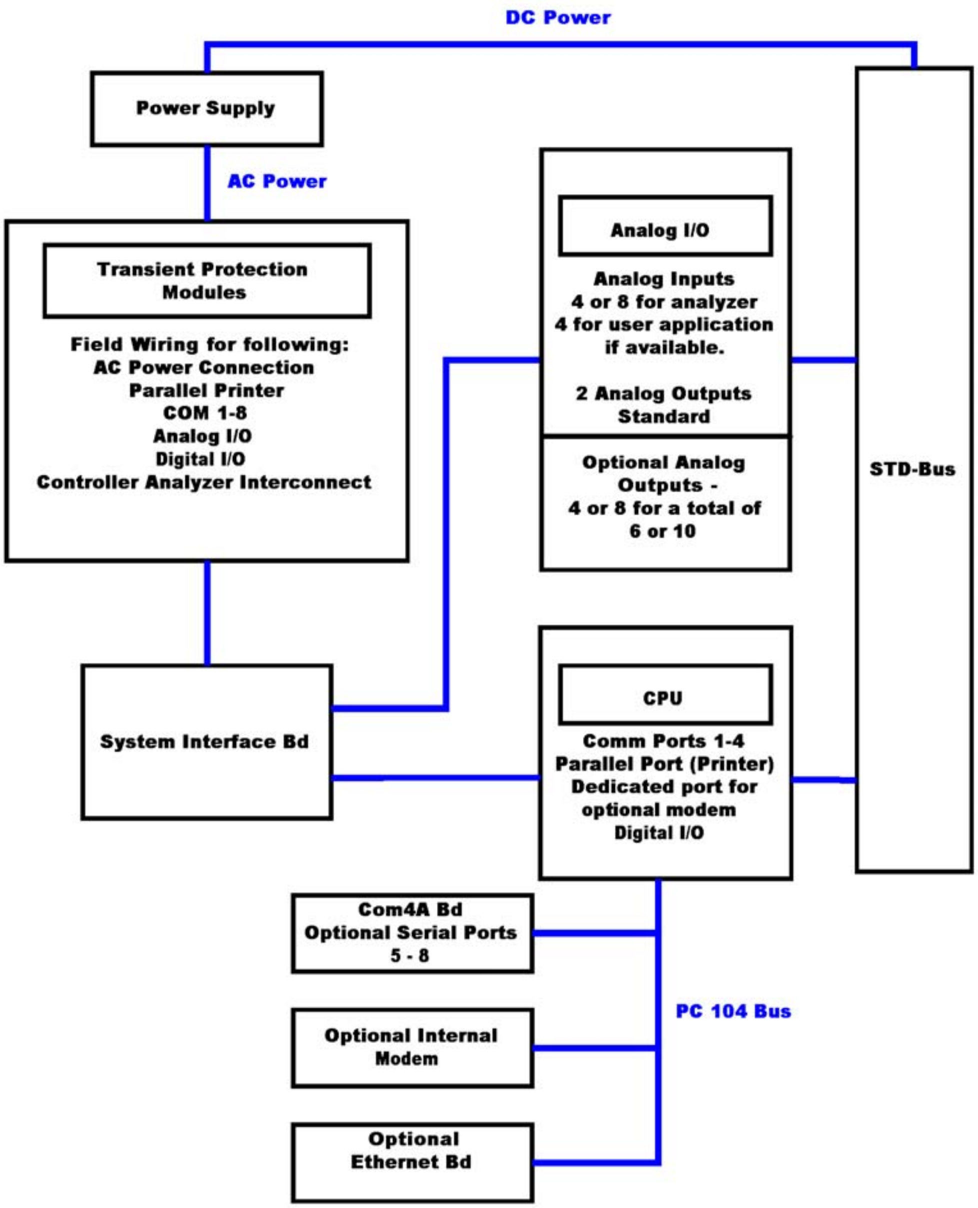


Figure 2-6 Block Diagram of the GC Controller Circuit Boards

2.3.2 Optional Keypad and Display

A keypad and liquid crystal display (LCD), optionally built into the enclosure's front panel, are available for the explosion-proof and rack mount versions of the GC Controller. (See Figure 2-5 for an illustration of the explosion-proof Controller with optional keypad and LCD.) The built-in keypad and LCD are especially useful for the explosion-proof version. They permit onsite display, control, and data entry at a GC Controller that is situated in a hazardous environment. Note, however, that the control capabilities offered through the built-in keypad and LCD are more limited than those available through a PC connected to the GC Controller.

NOTICE

For details on using the Controller's built-in keypad and LCD, see "Operation from Local Keypad and Display" on page 4-1.

Keypad

The front panel keypad is an 18-Key data/function entry device arranged so that the ALT key causes the lower key markings to be displayed/ entered. The designations marked on the top of the keys will be displayed/entered when the ALT key is not pressed.

Display

The Controller display, measuring 5.5 x 2 inches, is capable of 8 lines by 41 characters. It is certified for use with a explosion-proof NEMA 4X, Groups B, C, and D, enclosure. The display is capable of producing the complete alphabet and numbers from the keypad. The video display on the Controller may show a truncated (or curtailed) version of the displays available at the PC. Although the keypad/display located at the Controller site can do many of the functions that the PC software can do remotely, any extensive operations are more conveniently performed through MON2000 on the larger screen and keypad of a PC. A few adjustments will be more conveniently accomplished at the Controller site.

2.3.3 Alarm Specifications

The GC Controller has the capacity for 36 alarms. There are also operator defined alarms. Some of the alarms are active only if the configuration of the Controller requires the function that is associated with those alarms. Active alarms are shown in the ALARMS menu.

Status Indicators

Three colored LED status indicators are located at the side of the display on the front panel. The indicators are arranged from yellow, green, and red. When illuminated, the LED status indicators signify the following:

- Yellow LED: When illuminated, the Yellow LED indicates that an out-of-tolerance value or an alarm condition was entered into the Controller memory for printout with the analysis. The Controller memory retains the alarm for printout until the operator clears the alarm(s). This indicator is partially application controlled and may be set at different out-of-tolerance levels with different applications.
- Green LED: When illuminated, the Green LED indicates that the Controller is operating. If the green LED is illuminated and the Model 500 does not accept changes, a password lockout may have been entered. If a password has been entered, the password must be re-entered before the Model 500 program can be changed.
- Red LED: When illuminated, the Red LED indicates an out-of-tolerance value or an alarm condition in the RUN mode that requires operator action. Alarm contacts are closed under these conditions. The Red LED is automatically turned off and contacts opened by the Controller at the start of the next analysis.

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INSTALLATION AND SETUP

NOTICE

Because the Model 500 Gas Chromatograph system is available in different configurations, not all of the instructions in this section may apply. In most cases, however, to install and set up a Model 500 Gas Chromatograph system, it is recommended that you follow the instructions in nearly the same order as presented in this manual. (Also see Table 3-1 for a summary of installation and setup steps.)

This section provides instructions for installing and setting up the Model 500 Gas Chromatograph system. This section is organized as follows:

- Precautions and Warnings
  - Hazardous Environments
  - Power Source Wiring
  - Signal Wiring
  - Electrical and Signal Ground
  - Electrical Conduit
  - Sample Systems Requirements
- Preparation
  - Introduction
  - Site Selection
  - Unpacking the Unit
  - Necessary Tools and Components
  - Optional Tools and Components
- Installing the Analyzer
  - Point-to-Point Wiring Guide, Analyzer-Controller
  - Analyzer AC-Power Wiring
  - Sample and Gas Lines

- Installing the GC Controller
  - Modbus Slave Address (COM ID) Setup
  - Controller-Analyzer Wiring
  - Controller-PC Wiring (Serial Connections)
  - CPU and COM4A Serial Communications Setups
  - Controller-Printer Wiring
  - Discrete (Digital) I/O Wiring
  - Analog I/O Wiring
  - Controller AC-Power Wiring
- Analyzer Leak Checks and Purging for First Calibration
  - Analyzer Leak Checks
  - Purging Carrier Gas Lines
  - Purging Calibration Gas Lines
- System Start-up

Summary of Installation and Setup Steps

1. Observe Precautions and Warnings (See "Precautions and Warnings" on page 3-3)
2. Plan Site Location (See "Preparation" on page 3-12)
3. Obtain Supplies and Tools (See "Necessary Tools and Components" on page 3-15)
4. Install Analyzer Wiring (See "Point-to-point Wiring Guide, Analyzer-Controller" on page 3-18)
5. Install Analyzer Sample & Gas Lines (See "Sample and Gas Lines" on page 3-27)
6. Install GC Controller Wiring (See "Installing the GC Controller" on page 3-30)
7. Perform Leak Checks (See "Analyzer Leak Checks" on page 3-78)
8. Purge Carrier Gas Lines (See "Purging Carrier Gas Lines" on page 3-80)
9. Purge Calibration Lines (See "Purging Calibration Gas Lines" on page 3-83)

10. Start Up GC System (See "System Start-Up" on page 3-85)

3.1 PRECAUTIONS AND WARNINGS

NOTICE

The Analyzer and GC Controller, when housed inside explosion-proof enclosures, meet the certifications and classifications identified in "Electrical/Mechanical Safety and Integrity - Certifications and Classifications" on page 2-18. Emerson does not, however, accept any responsibility for installations of these, 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.

WARNING

EQUIPMENT DAMAGE OR PERSONAL INJURY

The responsible body shall operate the equipment as designed and specified by the manufacturer.

Failure to do so may cause personal injury or damage to the equipment.

3.1.1 Hazardous Environments

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Follow these precautions if installing or operating the Model 500 Analyzer and the GC Controller instrumentation in a *hazardous area*:

1. Install and operate only the explosion-proof version of the GC Controller in a hazardous area.
2. Do not operate in a hazardous area any printer or personal computer (PC) that is connected to the GC Controller. To interface with a GC Controller in a hazardous area, use the Controller's keypad and liquid crystal display (LCD) that are built into the explosion-proof housing as options. Or, alternatively, use a PC that is located in a nonhazardous area and remotely connected to the GC Controller.
3. Ensure that field connections to the Analyzer and the GC Controller are made through explosion-proof conduit or flameproof glands.

CAUTION

EQUIPMENT DAMAGE OR PERSONAL INJURY

Observe ALL applicable regulations when installing explosion-proof GC units.

Failure to observe all regulations when installing explosion-proof GC units may result in noncompliance, equipment damage or personal injury.

The explosion-proof GC Controller and Analyzer housings are certified for use in locations where fire and explosion hazards may exist, specifically, areas that are classified by the National Electronics Code (NEC) as Class I, Division 1, Groups B, C, and D. However, other regulations apply. For example, all interconnecting runs of cable through conduit must be sealed at least 18 inches beyond the conduit's point of entry into certified explosion-proof housing. Consult your company's policies and procedures and other applicable requirements documents to determine appropriate wiring and installation practices.

3.1.2 Power Source Wiring

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Follow these precautions when installing AC power source wiring to the Model 500 Analyzer and the GC Controller instrumentation:

1. All wiring must conform to the National Electric Code, local state or other jurisdiction, and company standards and practices.
2. Provide single-phase, three-wire, AC power at 115 or 230 volts AC, 50-60 Hz.
3. A switch or circuit breaker shall be included in the building installation in a safe area.
   (a) The switch or circuit breaker is marked as the power disconnect device.
   (b) For Rack mount units, the power disconnect switch shall be in close proximity to the equipment and easily accessible to the operator.
4. Provide 20 ampere circuit breaker protection so that the major components of the Model 500 Analyzer system–the Analyzer, the GC

Controller, and any optionally installed sample oven or stream switching devices--are all protected by one circuit breaker.

5. Use multi-stranded copper conductor wire according to the following recommendations:

   (a) For power feed distances up to 250 feet (76 meters), use wire size American Wire Gauge (AWG) 14 (18 Metric Wire Gauge, stranded).

   (b) For power feed distances 250 feet to 500 feet (76 meters to 152 meters), use wire size AWG 12 (25 Metric Wire Gauge, stranded).

   (c) For power feed distances 500 feet to 1000 feet (152 meters to 305 meters), use wire size AWG 10 (30 Metric Wire Gauge, stranded).

3.1.3 Signal Wiring

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

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

1. Metal conduit must be used for all process signal wiring.
2. Metal conduit used for process signal wiring must be grounded at conduit support points (grounding the conduit at multiple points helps prevent induction of magnetic loops between the conduit and cable shielding).
3. Use suitable lubrication for wire pulls in conduit to prevent wire stress.
4. All process signal wiring should be a single, continuous length between field devices and the GC Controller. If, however, length or conduit runs require that multiple wiring pulls be made, the individual conductors must be interconnected with suitable terminal blocks.

5. Use separate conduits for AC voltage and DC voltage circuits (see Figure 3-1).
6. Do not place digital or analog I/O lines in same conduit as A-C power circuits (see Figure 3-1).
7. Use only shielded cable for digital I/O line connections.
   (a) Ground the shield at only one end.
   (b) Shield-drain wires must not be more than two AWG sizes smaller than the conductors for the cable.

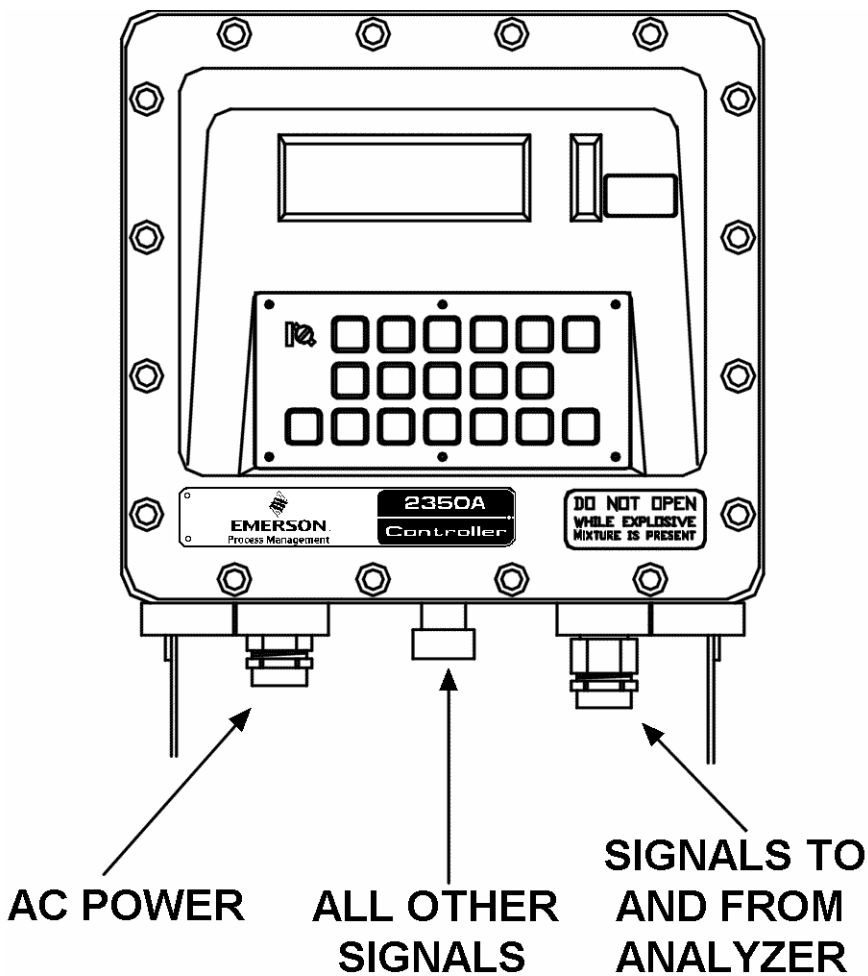


Figure 3-1. Seperate Conduit Entries

8. When inductive loads (relay coils) are driven by digital output lines, the inductive transients must be diode clamped directly at the coil.
9. Any auxiliary equipment wired to the GC Controller must have its signal common isolated from earth/chassis ground.

NOTICE

Applicable to the digital and analog I/O lines connecting to the GC Controller, including the Analyzer-Controller Interconnect lines: Any loop of extra cable left for service purposes inside the GC Controller explosion-proof housing must *not be placed near the conduit entry for AC power*.

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

3.1.4 Electrical and Signal Ground

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Follow these general precautions for grounding electrical and signal lines:

1. 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.
2. Metal conduit used for process signal wiring must be grounded at conduit support points (Grounding the conduit at multiple points helps prevent induction of magnetic loops between the conduit and cable shielding).
3. A clamp type ground lug (color green) is located on the inside bottom front of the GC Controller's case. Chassis ground conductors (color

code green) inside the Controller's enclosure should be stranded, insulated copper wire. These device chassis ground conductors should all be connected to the clamp type ground lug.

4. A clamp type ground lug is located on the outside of the GC Controller's case at the rear of the lower right (facing the operator panel) casting rib. This ground point should be connected to a copper ground rod as described next.
5. A single-point ground (the outside case ground lug) must be connected to a copper-clad, 10-foot long, 0.75" diameter steel rod, which is buried, full-length, vertically into the soil as close to the equipment as is practical. (Grounding rod not provided by Rosemount Customer Care.)
6. Resistance between the copper-clad steel ground rod and the earth ground must not exceed 25 Ohms.
7. The equipment-grounding conductors used between the GC Controller and the copper-clad steel ground rod must be sized according to the following specifications:

   -length, 15 feet or less-

   (4.6 meters) AWG 8, stranded, insulated copper wire

   -length, 15 to 30 feet-

   (4.6 to 9.1 meters) AWG 6, stranded, insulated copper wire

   -length, 30 to 100 feet-

   (9.1 to 30.5 meters) AWG 4, stranded, insulated copper wire
8. All inter-enclosure equipment-grounding conductors must be protected by metal conduit.
9. External equipment, such as data printers, that are connected to the GC Controller should be powered via isolation transformers to minimize the ground loops caused by the internally shared safety and chassis grounds.

3.1.5 Electrical Conduit

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Follow these general precautions for conduit installation:

1. 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.
2. 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.
3. Temporarily cap the ends of all conduit run runs immediately after installation to prevent accumulation of water, dirt, or other contaminants. If necessary, swab out conduits prior to installing the conductors.
4. Install drain fittings at the lowest point in the conduit run; install seals at the point of entry to the GC Controller's explosion-proof housing to prevent vapor passage and accumulation of moisture.
5. Use liquid-tight conduit fittings, such as Myers® Scru-tite® or similar, for conduit which is 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:

1. All conduit runs must have an explosion-proof sealing (potting) fitting located within 18 inches (45.5 centimeters) distance from the conduit entrance to explosion-proof housings.
2. 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.

CAUTION

EQUIPMENT DAMAGE OR PERSONAL INJURY

Consult your company's 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 cause personal injury or damage to equipment.

3.1.6 Sample Systems Requirements

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Observe the following guidelines for installing GC sample systems:

Sample 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.

Dryers and Filters in Sample Line:

- 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 Analyzer.
- Do use ceramic or porous metallic type filters. *Do not* use cork or felt filters.

Pressure Regulators and Flow Controllers in Sample Line: *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.

3.2 PREPARATION

3.2.1 Introduction

Your Model 500 Analyzer was started and checked out before it left the factory. Program parameters were installed in the system and documented in the "PC Config Report" furnished with your Model 500 Analyzer.

3.2.2 Site Selection

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Follow these guidelines for site selection:

1. Provide adequate access space for performing maintenance and adjustments.
   (a) Allow a minimum of 16 inches (41 cm) in front for enclosure opening and access.
   (b) Allow a minimum of 15 inches (38 cm) at the rear and left side for case removal.
   (c) If possible, mount the Analyzer components in a vertical stack configuration; it provides the greatest operator convenience.
2. Install the Analyzer as close as possible to the sample stream.
3. Install the GC Controller no further than 2000 feet (610 meters) away from the Analyzer.
   (a) In a hazardous environment, you can install the explosion-proof version of the GC Controller near the Analyzer, on either a 19-inch or 12-inch rack.
   (b) Observe the same recommendations for minimum clearance: 16 inches (41 cm) in front enclosure opening and access, and 15 inches (38 cm) at the rear and left side for case removal.
   (c) Refer to drawing CE-23878 in the Analyzer drawings addendum of this manual.
4. Ensure that exposure to radio frequency (RF) interference is minimal.

3.2.3 Unpacking the Unit

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

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

1. Unpack the equipment:
   (a) Model 500 series Analyzer
   (b) GC Controller
2. Ensure that all documentation and software are included:
   (a) This manual, the *Model 500 Gas Chromatographs Hardware Reference Manual*, P/N 3-9000-537.
   (b) The software manual, *MON2000 Software for Gas Chromatographs User Manual*, P/N 3-9000-522.
   (c) CD(s) with the MON2000 software program and GC Applications.

Installation and startup of the Model 500 Analyzer 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 of the nature and extent of the damage and forward the report immediately to Rosemount Customer Care for further instructions. Include complete model number information. Disposition instructions will be returned immediately by Rosemount Customer Care. Refer to the Customer Repair Report in the back of this manual.

3.2.4 Necessary Tools and Components

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Observe the following checklist of tools and components that you will need for installing the Analyzer and GC Controller:

1. Chromatographic grade carrier gas: zero grade helium or nitrogen (99.995% pure, with less than 5 ppm water, and less than 0.5 ppm hydrocarbons).
2. 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.
3. Calibration standard gas with correct number of components and concentrations (see Section 2.1.6, “Calibration Gas” on page 4).
4. Dual-stage regulator for the calibration gas cylinder, low pressure side capable of controlling pressure up to 30 psig.
5. Sample probe (fixture for procuring the stream, or sample gas for chromatographic analysis).
6. 1/8-inch stainless steel (SS) tubing for connecting calibration standard to analyzer, 1/4-inch SS tubing for connecting helium carrier to the analyzer, 1/8-inch SS tubing for connecting stream gas to the analyzer.
7. Miscellaneous Swagelok tube fittings, tubing benders and tubing cutter.
8. 14 American Wire Gauge (AWG) (18 Metric Wire Gauge) or larger electrical wiring and conduit to provide 115 or 230 volts AC, single phase, 50 to 60 Hertz (Hz), from an appropriate circuit breaker and power disconnect switch. (See previous guidelines in Section 3.1.2, “Power Source Wiring” on page 5.)

9. Liquid leak detector (SNOOP® or equivalent).
10. Digital volt-ohm meter with probe-type leads.
11. A flow measuring device such as Alltech Digital Flow Check™ Flowmeter.

3.2.5 Optional Tools and Components

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

Observe the following checklist of tools and components you may need for installing and using the GC System:

1. *For operation in a nonhazardous area only*: Printer and printer paper.
2. *For operation in a nonhazardous area only*: An IBM-compatible PC and a "straight-through" serial cable connection between the external DB-9 (female) serial ports of the GC Controller and a serial port of the PC. (For details, see Section 3.4.3, "Controller PC Wiring (Serial Connections)" on page 37.).

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Do not operate a PC or printer in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

If you are working in a hazardous area and need to perform routine operations, use the optional keypad and LCD that are built into the explosion-proof GC Controller. To make more significant changes, however, use a remotely connected PC installed with MON2000. See the *MON2000 Software for Gas Chromatographs User Manual*, P/N 3-9000-522, for more information.

Serial cable specifications:

- Straight-through serial cable with the following terminations:
- DB-9, maleconnects to GC Controller external serial port
- DB-9 or DB-25, femaleconnects to PC serial port

3. Interconnect Cable, P/N 6-4618-122, if not already installed between the Analyzer and GC Controller. This is a shielded, computer and communications grade, 15-conductor cable for making the thirteen interconnections between the Analyzer and the GC Controller. This cable, if not enclosed in conduit between the Analyzer and the GC Controller, is suitable only for use in non-hazardous environments. The cable must be run inside conduit for hazardous environments. (For cable termination details, see Section 3.3.1, this manual.)
4. Direct Serial Connect Cable, P/N 3-2350-068, to connect the PC or an external modem directly to the one of the GC Controller's serial ports on the GC Controller's Terminal Board for Field Wiring (TB). This cable comes in a customer-specified length. It is terminated with a DB-9 female plug at one end, for connection to a PC or external modem's serial port, and six exposed leads at the other end for connection to the one of the GC Controller's serial ports on the TB. (See Section 3.4.3.3 for directions on how to install this cable.)
5. Items necessary for connecting the GC Controller to an external modem, a multi-drop serial 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).

3.3 INSTALLING THE ANALYZER

3.3.1 Point-to-point Wiring Guide, Analyzer-Controller

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

NOTICE

This section applies only to GC systems which have not been shipped "prewired." In most cases, the explosion-proof system will already have had the Analyzer-Controller connections made. If your system has already been wired, skip this section, and proceed to the next section.

To make wiring connections between the Analyzer and the GC Controller, follow these steps:

1. Disconnect all electrical power to both the Analyzer and the GC Controller.

2. At the Analyzer site, locate the lower explosion-proof box (its cover is marked with original equipment manufacturer's catalog number "XJT"). Remove its threaded Condulet cover.

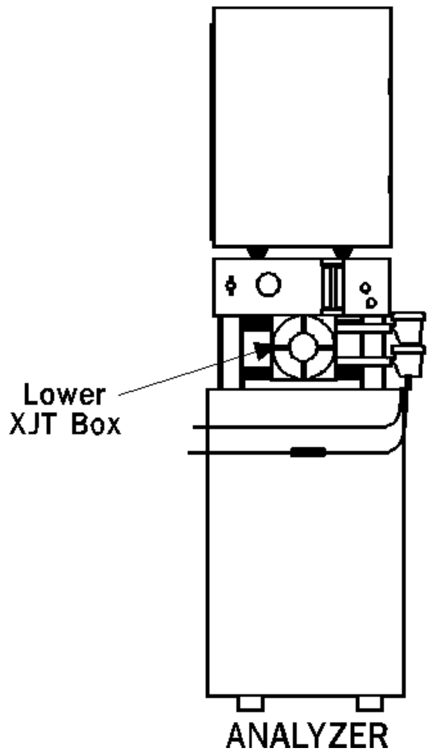


Figure 3-2. Lower Explosion-Proof (XJT) Box at Analyzer

3. You will need to feed the Interconnect Cable through the inlet on the upper left side of the XJT box, and make connections to the interconnect Terminal Board (TB-4) which lies behind Valve Driver board (see Figure 3-3).

   (a) The Interconnect Cable is computer and control applications grade, 15-conductor, shielded cable. Individual conductors are stranded tinned copper, #22 AWG-(7x30). (Also see description in Section 3.2.5, “Optional Tools and Components” on page 16.)

(b) Maximum length of Interconnect Cable (or, the maximum distance between the Analyzer and the GC Controller) should not exceed 2000 feet (610 meters).

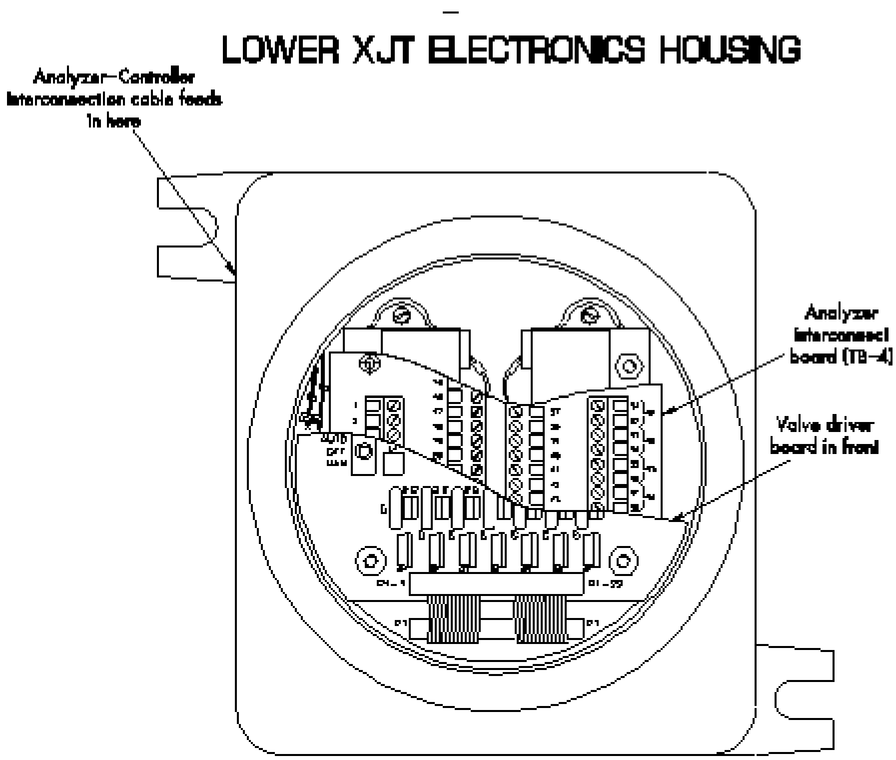


Figure 3-3. Behind the Condulet Cover is the Valve Driver Board, then TB-4

4. With the Condulet cover removed, loosen and remove the four (4) thumbscrews that hold the Valve Driver board.
5. Carefully edge the Valve Driver board off the holding screws. Do not disconnect the Valve Driver board from the cable; merely let the board rest face down, secured by the cable (see Figure 3-4).
6. With the Analyzer TB-4 now exposed, connect thirteen of the Interconnect Cable's fifteen leads to terminals 11 through 23. See Table 3-1 and Figure 3-5 for purposes and destinations of leads. Also see "CAUTION", step (6).

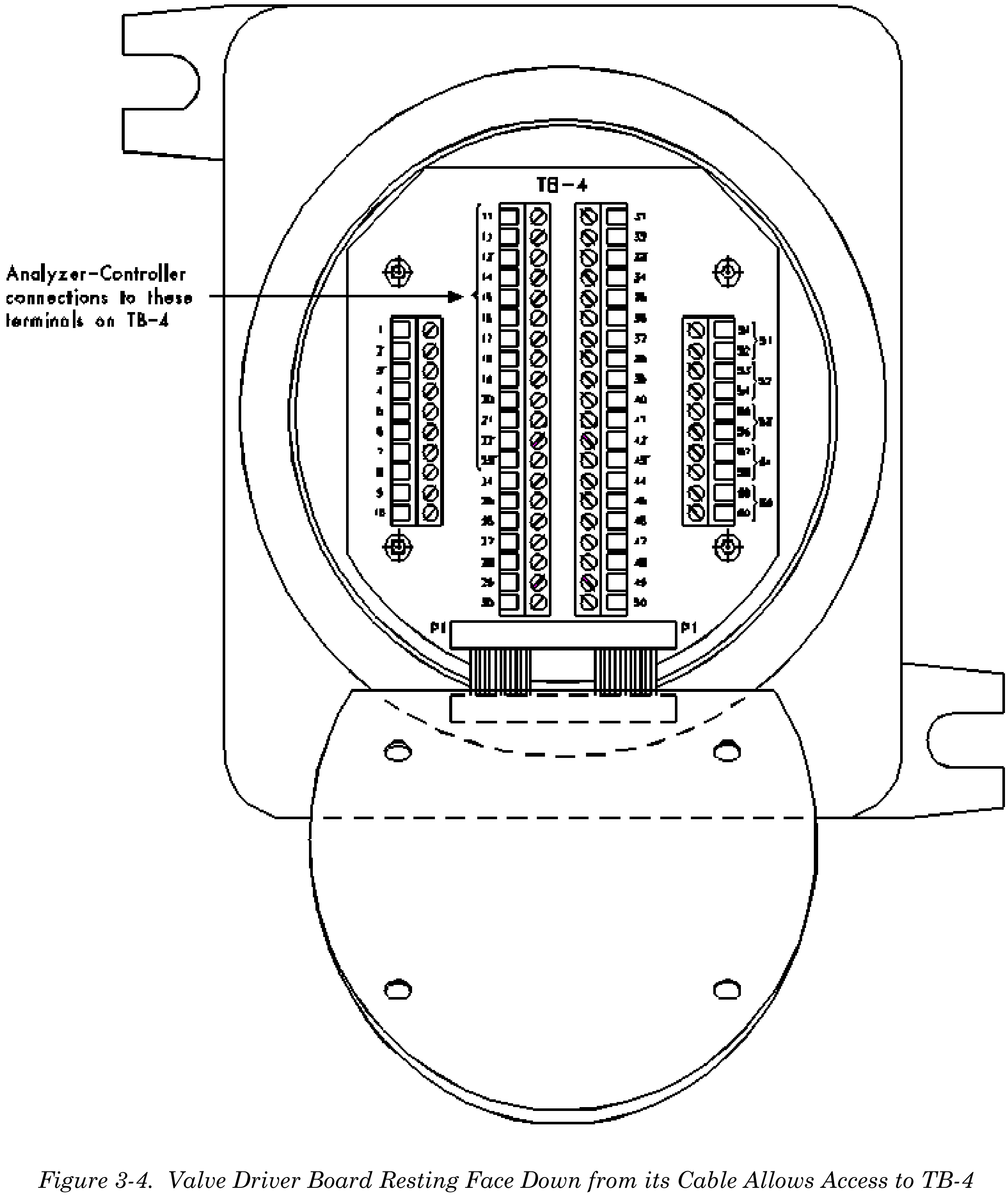


Figure 3-4. Valve Driver Board Resting Face Down from its Cable Allows Access to TB-4

Table 3-1. Analyzer and GC Controller Interconnect Leads

Board Acronyms:
- Interconnect Terminal Board of Analyzer (TB-4)
- Terminal Board for Field Wiring at Controller (TB)

Analyzer (TB-4)	color		color	Controller (TB)
Terminal 11		Function code 1		J19, Terminal 1
Terminal 12		Function code 2		J19, Terminal 2
Terminal 13		Function code 4		J19, Terminal 3
Terminal 14		Function code 8		J19, Terminal 4
Terminal 15		Function code strobe		J20, Terminal 1
Terminal 16		Common - function codes		J19, Terminal 5
Terminal 17		Auto Zero (AZ)		J20, Terminal 2
Terminal 18		Preamp gain channel 1		J18, Terminal 1
Terminal 19		Preamp gain channel 2		J18, Terminal 4
Terminal 20		Preamp gain channel 3		J18, Terminal 7
Terminal 21		Preamp gain channel 4		J18, Terminal 10
Terminal 22		Common - preamp gain		J18, Terminal 11
Terminal 23		Alarm function (AF)		J20, Terminal 3

NOTICE

Connect the interconnect cable SHIELD to one terminal; specifically, terminal 12 of J18, on the GC Controller TB.

CAUTION

EQUIPMENT DAMAGE OR PERSONAL INJURY

Do not apply AC electrical power to the Analyzer or the GC Controller until all electrical power, interconnection, and external signal connections have been verified, and proper grounds have been made. Refer to Section 3.1.3 for general precautions concerning signal wiring.

Failure to properly connect the GC unit may result in serious equipment damage or personal injury.

7. Access the GC Controller's Terminal Board for Field Wiring (TB), and connect the other leads of the Interconnect Cable to the GC Controller's TB (see instructions in Section 3.4.2, "Controller-Analyzer Wiring" on page 35). Ensure that the connections correspond to those listed in Table 3-1 and Figure 3-5.

   At this time, you may also want to complete the remainder of all electrical connections at the GC Controller. If so, see Section 3.4, "Installing the GC Controller" on page 30.

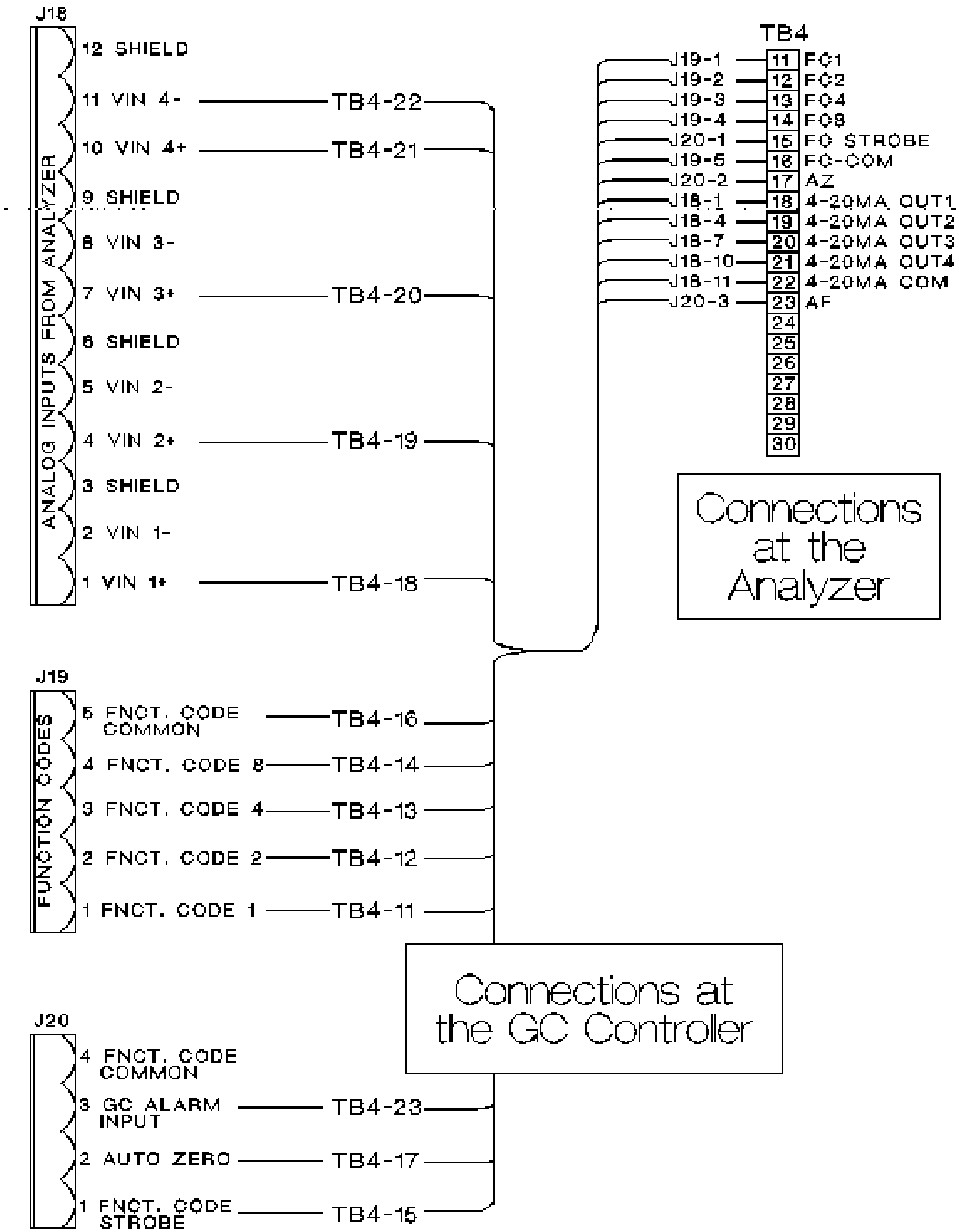


Figure 3-5. Analyzer and GC Controller Interconnect Leads

8. After confirming that all Interconnect Cable terminations are correct between the Analyzer and the GC Controller, lift the Valve Driver board from its resting position and place it over the four holding screws.

   Reinstall the four thumb screws to secure the Valve Driver board in place.

9. If necessary, complete wiring connections between the Analyzer's Valve Driver board and any optional stream switch boards.

10. If necessary, complete wiring for connecting AC power to the Analyzer, with proper connections to hot, neutral, and ground; but **do not turn on AC power to the Analyzer yet** (see CAUTION below; see details for AC power connection to Analyzer in Section 3.3.2, “Analyzer AC Power Wiring” on page 26).

CAUTION

EQUIPMENT DAMAGE OR PERSONAL INJURY

Do not apply AC electrical power to the Analyzer or the GC Controller until all electrical power, interconnection, and external signal connections have been verified, and proper grounds have been made.

Failure to properly connect the GC unit may result in serious equipment damage or personal injury.

11. Leave the Analyzer's lower XJT box open if you need to connect sample and gas lines. (You will need to manually operate the sample valve switches on the Valve Driver board.) Otherwise, reinstall the Condulet cover of the Analyzer's lower XJT box.

12. If necessary, proceed to Section 3.3.3, “Sample and Gas Lines” on page 27 for instructions on connecting sample and gas lines to the Analyzer.

3.3.2 Analyzer AC Power Wiring

1	Observe Precautions and Warnings
2	Plan Site Location
3	Obtain Supplies and Tools
4	Install Analyzer Wiring

To connect 115 volts AC Power to the Analyzer, follow these steps:

1. Locate the three leads for connecting 115 volts AC-power to the Analyzer.

   (a) Leads are "pig-tailed" from the Analyzer power supply through conduit to a customer power NPT connection directly behind the lower XJT box of the Analyzer (see drawing CE-10492, Analyzer drawings addendum of this manual).

   (b) Leads are colored as follows:

   - BLACK: hot
   - WHITE: neutral
   - GREEN: ground

2. Connect Analyzer AC-power leads to a properly controlled 115 volts AC-power source (i.e., with circuit breaker and power disconnect switch).

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

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

Failure to observe all safety precautions could result in serious injury or death.

Make power line splices and conduit seals that comply with applicable wiring requirements (for hazardous environments).

CAUTION

EQUIPMENT DAMAGE OR PERSONAL INJURY

Do not apply AC electrical power to the Analyzer or the GC Controller until all electrical power, interconnection, and external signal connections have been verified, and proper grounds have been made.

Failure to properly connect the GC unit may result in serious equipment damage or personal injury.

3. If necessary, connect the Analyzer's chassis ground to an external copper ground rod (at remote locations). See Section 3.1.4, "Electrical and Signal Ground" on page 8, regarding electrical and signal ground.

3.3.3 Sample and Gas Lines

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

To install GC sample and gas lines, follow these steps:

NOTICE

Use stainless steel 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.

1. Remove the plug from the Analyzer Sample Vent (SV) line (1/16-inch tubing marked "SV", located at left side of Analyzer.

NOTICE

At this stage in the installation, the Analyzer Measure Vent (MV) line (marked "MV") is left plugged until Analyzer leak checks are completed. For regular Analyzer operation, however, the MV line must be unplugged, or open.

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

   (a) If desired, connect "SV" vent 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.

   (b) Use 1/4-inch or 3/8-inch tubing for vent lines longer than 10 feet.

2. Connect carrier gas to Analyzer. (DO NOT TURN ON GAS AT THIS TIME.)

NOTICE

See Appendix B, this manual, 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.**

   (a) Use 1/4-inch stainless steel tubing to conduct carrier gas.

   (b) Use dual-stage regulator: high side capacity 3000 psig; low side capacity 150 psig.

   (c) Analyzer carrier gas inlet is a 1/4-inch fitting located behind the lower XJT Condulet box.

3. Connect calibration standard gas to Analyzer. (DO NOT TURN ON GAS AT THIS TIME.)

   (a) Use 1/8-inch stainless steel tubing to conduct calibration standard gas.

   (b) Use dual-stage regulator: low side capacity up to 30 psig.

   (c) Calibration gas inlet is identified in the applicable Sample Conditioning System ("S.C.S.") drawing in the Analyzer drawings addendum to this manual. (See drawings CE-16120, CE-16220, CE-16320, CE-16420, CE-16180, CE-16278, CE-24324, CE-24416, or CE-24513.)

NOTICE

When installing the calibration standard gas line, take care to follow the proper "S.C.S." drawing in order to make the correct tubing connection to the auto-cal solenoid. Drawings are included in this manual which address stream and column gas connections. Choose the drawing that applies to your installation.

4. Connect sample gas stream(s) to Analyzer. (DO NOT TURN ON GAS AT THIS TIME.)

   (a) Use 1/8-inch or 1/4-inch stainless steel tubing to conduct calibration standard gas.

   (b) Ensure that pressure of sample line is regulated to maintain 15-30 psig ±10%.

   (c) Sample gas stream inlet(s) are identified in the applicable Sample Conditioning System ("S.C.S.") drawing in the Analyzer drawings addendum to this manual. (See drawings CE-16120, CE-16220, CE-16320, CE-16420, or CE-16520.)

5. After all lines have been installed, proceed with Controller wiring connections (see next section).

   Leak check procedures for the GC sample and gas lines are given in Section 3.5.1, “Analyzer Leak Checks” on page 78. They require AC power to be turned on at the Analyzer.

3.4 INSTALLING THE GC CONTROLLER

3.4.1 Modbus Slave Address (COM ID) Setup

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

NOTICE

The GC Controller's COM ID is determined by dual inline package (DIP) switch settings. In most cases, the COM ID setup made at the factory will not require changes. (Unless otherwise specified by the customer, the DIP switch settings made at the factory give the Controller a COM ID of 1 (one)).

This section applies only to GC systems that have not been shipped "prewired" or may not have had the COM ID set according to customer specifications.

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

1. **Change the GC Controller's COM ID, or**
2. **Visually inspect and verify the COM ID as determined by the DIP switch settings.**

<u>To inspect or change the GC Controller's COM ID setup, follow these steps</u>:

1. At the GC Controller site, locate the DIP switch as described in the following steps.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

2. For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

   Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage. The DIP switch is located on the lower left side of the front panel (see Figure 3-6).

Figure 3-6. Explosion-Proof Controller DIP Switch

3. For rack mount and panel mount Controllers, use a flat head screw driver to remove the access panel on the right side of the card cage assembly (see Figure 3-7).

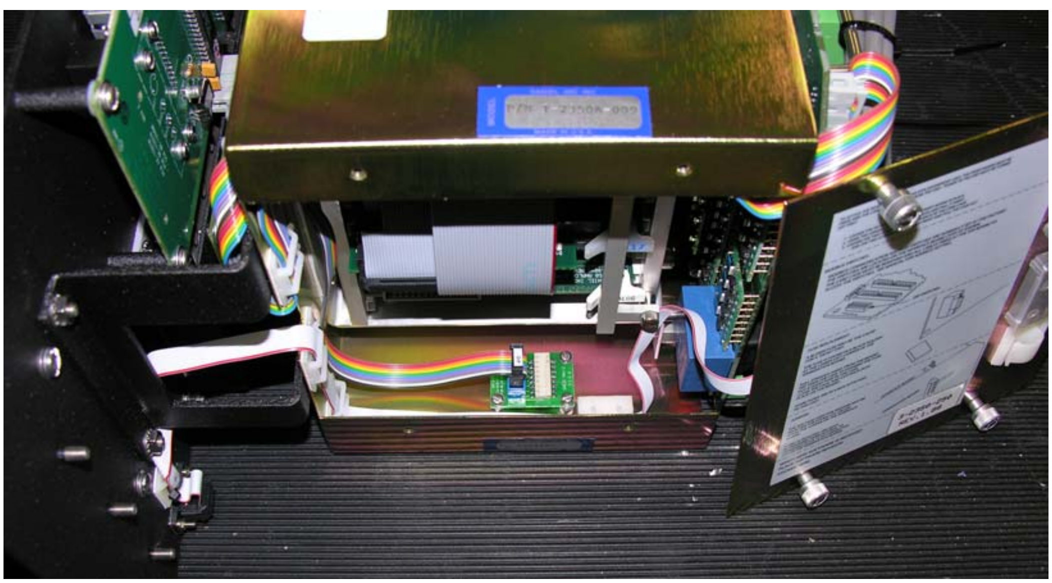


Figure 3-7. Right Side View of Rack Mount and Panel Mount Controllers

4. Inspect or change the DIP switch settings as necessary.

   (a) See Table 3-2 as a guide.

   (b) *Make sure you record in the GC Controller's maintenance records any changes you make to the switch settings.*

5. When finished with the inspection or changes, reassemble the Controllers using the following steps.

   (a) For explosion-proof Controllers, close the front panel and replace the screws.

   (b) For Rack mount and Panel mount Controllers, reattach the right side Access Panel and secure with the four flat head screws.

Figure 3-8. COM ID DIP Switch

Explanation of DIP Switch Setting

- 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.
- Switch to ON = 1
- Switch to OFF = 0
- 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.

Table 3-2. Modbus Slave Address (COMID) DIP Switch Settings

Dip Switch Settings Switch Positions					
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	OFF	ON	ON	OFF	OFF
7	ON	ON	ON	OFF	OFF
8	OFF	OFF	OFF	ON	OFF

RAM CLEAR	
Dip Switch Setting Switch Positions	
	8
Clears RAM when unit powered down	ON
Keeps RAM when unit powered down	OFF

3.4.2 Controller-Analyzer Wiring

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

NOTICE

This section applies only to GC systems that have not been shipped "prewired." In most cases, the explosion-proof system will already have had the Controller-Analyzer connections made. If your system has already been wired, skip this section, and proceed to the next section.

NOTICE

Applicable to the digital and analog I/O lines connecting to the GC Controller, including the Analyzer-Controller Interconnect lines: Any loop of extra cable left for service purposes inside the GC Controller explosion-proof housing must *not be placed near the conduit entry for AC power*.

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

To make wiring connections between the GC Controller and Analyzer, follow these steps:

1. Disconnect all electrical power to both the Analyzer and the GC Controller.
2. Ensure that Interconnect Cable wiring connections to the Analyzer have been made as explained earlier in Section 3.3.1, this manual.

3. At the GC Controller site, remove the Controller enclosure's front panel.
   (a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.
   (b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.
   (c) For the Rack mount and the Panel mount Controllers, the rear of the enclosure is open; and an Access Panel on the right side of the unit allows access for most field wiring procedures without removing the enclosure.
4. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's card cage assembly, facing the enclosure's front panel. (In the Rack mount Controller, the TB faces outward toward the rear of the enclosure.)
5. Route the Analyzer-Controller Interconnect Cable appropriately, especially in the case of the explosion-proof Controller enclosure.

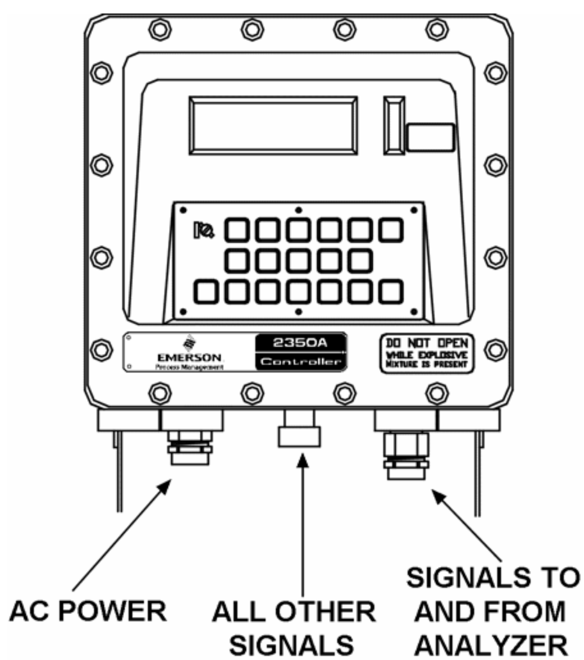


Figure 3-9. Seperate Conduit Entries for Cable In/Out of GC Controller

6. Make Interconnect Cable wiring connections to the GC Controller TB as listed earlier (see Section 3.3.1, "Point-to-point Wiring Guide, Analyzer-Controller" on page 18 and Table 3-1).

3.4.3 Controller PC Wiring (Serial Connections)

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

A preferred method for operating a Model 500 Analyzer System is from a connected personal computer (PC). The PC must be:

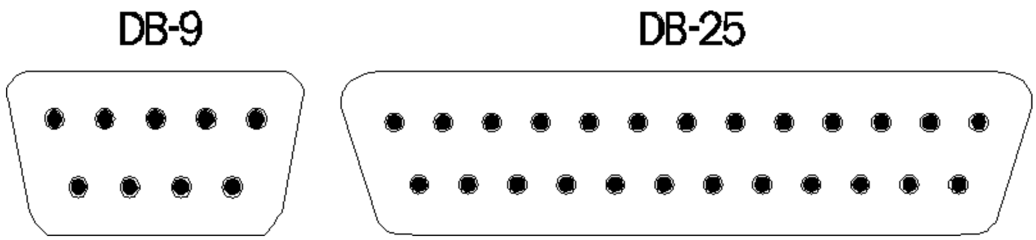
- Running MON2000 software
- Connected to the GC System by a serial link

This section of the manual addresses the various possibilities for wiring a serial connection between a PC and the GC System.

Before Connecting

Before connecting a PC to the GC Controller, determine the following:

- 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 designated as "COM1" through "COM8," and they can be used by other peripheral equipment attached to the PC, such as printers, mice, or modems, etc.

NOTICE

You will need to connect the GC Controller to one of the PC's available, or unused serial ports.

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

- What serial ports are available at the GC Controller? When you select one, consider these points:
  - The GC Controller's COM1 serial channel is usually reserved for connecting a PC, especially for service or troubleshooting purposes, since the GC Controller's easy-access front panel serial port is connected to serial channel COM1.

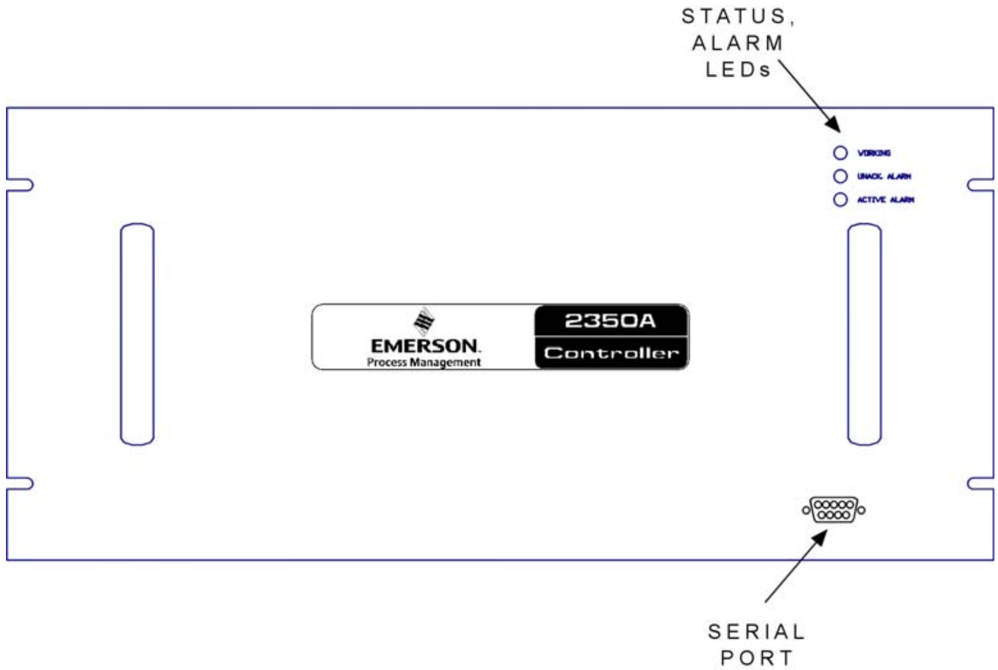


Figure 3-10. The Front Panel Serial Port is Connected to GC Controller's Serial Channel COM1

  - COM8 is used for the display/keypad when unit has COM5-8 option (COM4A Board). However, when the unit has a display/ keypad but does not have the COM8 option, COM4 must be RS-232, and is used for the display/keypad. Therefore, there is no COM4 output on the field Terminal Board.
  - The optional Modem piggy-backs on to the CPU 104 BUS (See Internal Modem for the Model 2350A Gas Chromatograph, drawing BE-20767).

  - Any one of the Controller's eight serial channels could also be reserved for connecting to a Data Collection Systems (DCS) or multi-drop serial data highway system (and thus, would be unavailable for a serial PC connection).

- Is the connection to be made in a...
  - Nonhazardous environment?
  - Short distance between the PC and Controller?
  - With temporary or permanent cable connection?

  See "PC-to-GC, Front Panel Quick and Easy RS-232" on page 40.

- Is the connection to be made in a...
  - Hazardous or nonhazardous environment?
  - Short distance between the PC and Controller?
  - Permanent cable connection?

  See "PC-to-GC, Permanent Cable Connection for Short Distance RS-232" on page 41.

- Is the connection to be made with a...
  - Long distance between the PC and Controller?
  - Permanent cable connection?

  See "PC-to-GC, Long Distance with RS-422 or RS-485" on page 43.

PC-to-GC, Front Panel Quick and Easy RS-232

The easiest way to connect a PC to the GC Controller is with an 'off-the-shelf', straight-through serial cable connected to the GC Controller's front panel DB-9 serial port jack.

To connect a PC to the GC Controller's front panel DB-9 serial port jack, proceed as follows:

⚠ WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Do not operate a PC in a hazardous environment. Do not make or break front panel wiring connections in a hazardous environment. In a hazardous environment, ensure that field connections to the Analyzer or GC Controller (including serial port) are made through explosion-proof conduit or flameproof glands.

Failure to observe all safety precautions could result in serious injury or death.

1. Obtain a "straight-through" serial cable:
   - 50 feet long or less,
   - DB-9 or DB-25 female plug at one end (for PC connection), and
   - DB-9 male plug at the other end (for GC connection).
   - You can buy this type of cable, with plug-ends already installed, from most computer supply retailers, so there should be no need to custom-wire a serial cable for this type of connection. (If, however, it is necessary to custom-wire a cable because of circumstances, see guidelines provided in Appendix A, this manual.)
2. Connect the serial cable's plugs to the appropriate serial port jacks at the PC and GC (front panel). Then use the MON2000 Software to "Connect" and operate the GC as needed.

PC-to-GC, Permanent Cable Connection for Short Distance RS-232

Another way to connect a PC to the GC Controller is with straight-through serial cable connected to one of the GC Controller's internal serial ports located on the Controller's Terminal Board for Field Wiring (TB).

If the length of cable can be 50 feet or less, connect the serial cable to one of the GC Controller's 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 a PC to one of the GC Controller's internal serial port jacks, proceed as follows:

1. Access the GC Controller's Terminal Board for Field Wiring (TB).

   If necessary, see instructions provided in Step 1 of Section 3.4.1, “Modbus Slave Address (COM ID) Setup” on page 30.

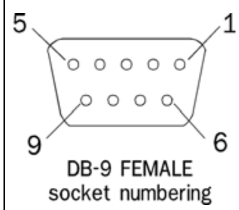
2. Choose an available serial port on the TB that is configured for RS-232 serial protocol.

NOTICE

Unless specified otherwise by customer order, all serial channels on all versions of the Controller are configured by default from the factory for RS-232. For the Rack mount, *retrofit, and explosion-proof versions* of the GC Controller, and serial channel, COM4 is used for the keypad and display without the COM4A Board. With the COM4A Board installed, COM8 is used for the keypad and display. For further details, see Section 3.4.4, and drawing DE-20782, GC Controller drawings addendum.

- The easiest option is to use a "straight-through" serial cable, like the one described for the GC Controller front-panel connection (see “PC-to-GC, Front Panel Quick and Easy RS-232” on page 40), and connect it to either one of the DB-9 female jacks on the TB.
- Another option is to use a Direct Serial Connect Cable (P/N 3-2350-068), or fabricate one like it.
  - Connect the DB-9 female plug end to the DB-9 male serial port on the PC.
  - Connect the cable's exposed leads to the GC serial port on the TB.
  - When the DB-9 female plug of the cable is connected to a standard PC, its six leads will be configured for RS-232 as shown in Table 3-3.

Table 3-3. Direct Serial Connect Cable, P/N 3-2350-068

Function at PC's serial port	**Pin number of the female DB-9 plug** 	**Exposed lead color**	**Connect exposed leads to one of GC Controller RS-232 serial comm ports on Terminal Board (TB) for field wiring: (J5, J6, J10, or J11) pin number...**
DCD (RLSD)	1	red	1 - DCD (RLSD)
S_{IN} (RxD)	2	white	2 - SOUT (TxD)
S_{OUT} (TxD)	3	black	3 - SIN (RxD)
GND	5	green	5 - GND
RTS	7	blue	8 - CTS
CTS	8	brown	7 - RTS

- Still another option is to fabricate a serial cable and its plug-ends by following guidelines provided in Appendix A, this manual.

PC-to-GC, Long Distance with RS-422 or 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).

<u>To connect a PC to one of the GC Controller's internal serial port jacks that accept RS-422 or RS-485 serial protocol, proceed as follows</u>:

1. Obtain the following equipment:

- An asynchronous line driver / interface device with RS-232 input, and RS-422 or RS-485 output. (See Appendix A, this manual, 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).

2. Connect the straight-through serial cable from the PC's 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.
3. Configure the line driver for data communications equipment (DCE) operation. (See Appendix A, for an example configuration of a "Black Box" brand, model LD485A-MP "RS-232/RS-485 Multipoint Line Driver.")
4. Access the GC Controller's Terminal Board for Field Wiring (TB).

   If necessary, see instructions provided in Step 1 of Section 3.4.1, “Modbus Slave Address (COM ID) Setup” on page 30.
5. Choose an available serial port on the TB 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 Section 3.4.4, “CPU and COM4A Serial Communications Setups” on page 45 for a list of ports and terminals assigned to serial communications.)

NOTICE

When the unit has the COM4A Board installed, COM8 is used for the display/keyboard. However, if the unit does not have the COM4A Board installed, the display/keyboard uses COM4 and it must be RS-232. Therefore, there is no COM4 output on the Field Termination Board.

3.4.4 CPU and COM4A Serial Communications Setups

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

The GC Controller has 3 to 8 serial communications ports (depending on options).

The serial signal definitions and the ports that support them are as follows:

PC104 CPU		
RS-232	**RS-422**	**RS-485**
J5, J6, J10, and J11; and DB-9 ports P2 and P3	J5, J6, J10 and J11; and DB-9 ports P2 and P3	J5, J6, J10 and J11; and DB-9 ports P2 and P3
COM4A		
RS-232	**RS-422**	**RS-485**
Com 5 = P22 Com 6 = P23 Com 7 = P24	Com 5 = P22 Com 6 = P23 Com 7 = P24	Com 5 = P22 Com 6 = P23 Com 7 = P24

The serial ports and terminals listed above are located on the GC Controller's Terminal Board for Field Wiring (TB).

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

NOTICE

The front panel serial port on the GC Controller is configured for RS-232, by default, and is connected to the Controller's serial port COM1. Consequently, the Controller's COM1 is usually reserved for direct serial communication between the Controller and a PC.

NOTICE

A telephone Modem Board plugs into the COM4A Board and can be configured for RS-232. For directions on how to connect a modem to the GC Controller, see Appendix G.4 and the MON2000 Software for Gas Chromatographs User Manual (P/N 3-9000-522).

Serial ports configured for RS-422 or RS-485 are most commonly used for long distance serial communications systems, such as a Data Collection System or a multi-drop serial data highway network. For these systems, the GC Controller can communicate as a Modbus slave device.

NOTICE

In any Modbus host-slave DCS or multi-drop serial data highway network, there must only be one host--to which any one of the GC Controller's serial ports can respond as a Modbus slave. (With four serial ports, the GC Controller could be connected to a maximum of four different serial data networks).

For more details about using the MON2000 Software to configure the GC Controller for Modbus communication (and determining contents of the Controller's Modbus registers), see the *MON2000 Software for Gas Chromatographs User Manual* (P/N 3-9000-522).

To connect serial communications lines to the GC Controller, follow these steps:

1. Access the GC Controller's Terminal Board for Field Wiring (TB).

   If necessary, see instructions in Section 3.4.1, "Modbus Slave Address (COM ID) Setup" on page 30.

2. Route serial communications lines appropriately, especially in the case of the explosion-proof Controller enclosure.

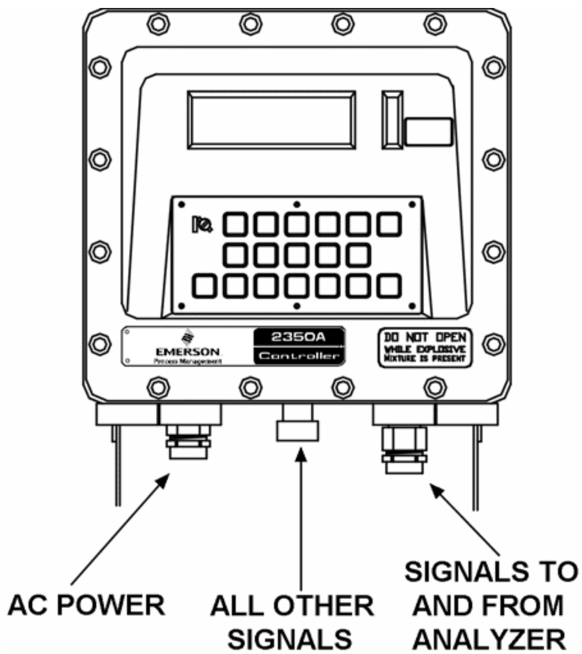
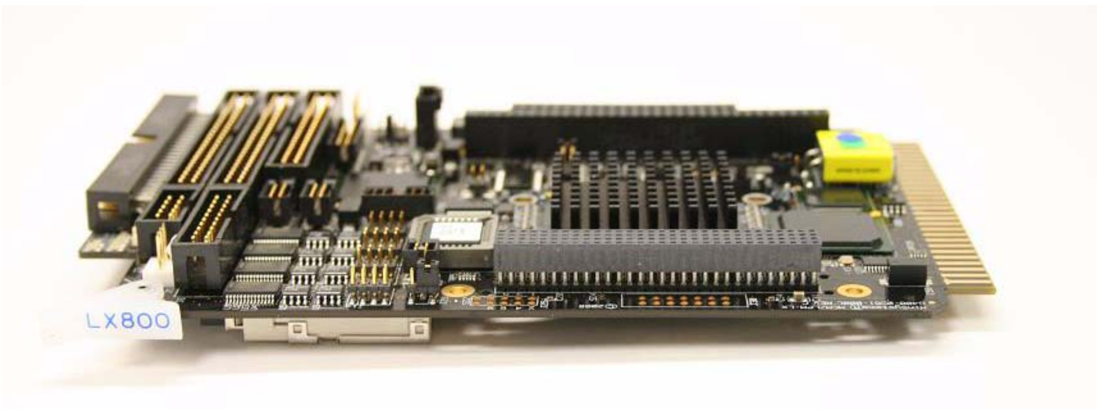


Figure 3-11. Seperate Conduit Entries

3. Make serial communications line connections to the GC Controller TB. The port numbers and pinouts are listed in the following serial specifications sections.

CPU RS-232/RS-422/RS-485 Configurations

The WinSystems® LX-800 CPU board (P/N #2-3-2350-232) provides four serial channels, each of which can be set by MON2000 to use the RS-232, RS-422, or RS-485 protocols. See the Serial Ports section of the *MON2000 Software for Gas Chromatographs* manual for more information.



The WinSystems® 6117 CPU board (P/N LPM/MCM-6117) provides four serial channels, each of which can be configured to use the RS-232, RS-422, or RS-485 protocols with the addition of optional driver IC's.

The 6117 CPU board must set jumpers to configure the serial channels. See "Jumper-based Serial Channel Configurations" on page A-15 for more information.

CPU COM1/COM2, Keyboard and Printer Output Header

COM1, COM2, the keyboard, and the printer are terminated at J1. Refer to "Multi-I/O Connector" on page 66 and Figure 3-21 for additional information.

LX-800 CPU COM3/COM4 Output Header

COM3 and COM4 can be configured two different ways. To configure a system ***without*** a keyboard and display, plug the end of the ribbon cable (P/N #3-2350-084, Rev. C) labeled **CPU J6** into the CPU header labeled **J6**; plug the end of the ribbon cable labeled **INTF J10** into the header on the System Interface Board labeled **J10**, for access to serial port 4 on the field termination board; plug the end labeled **INTF J8** into the header on the System Interface Board labeled **J8**, for access to serial port 3 on the field termination board.

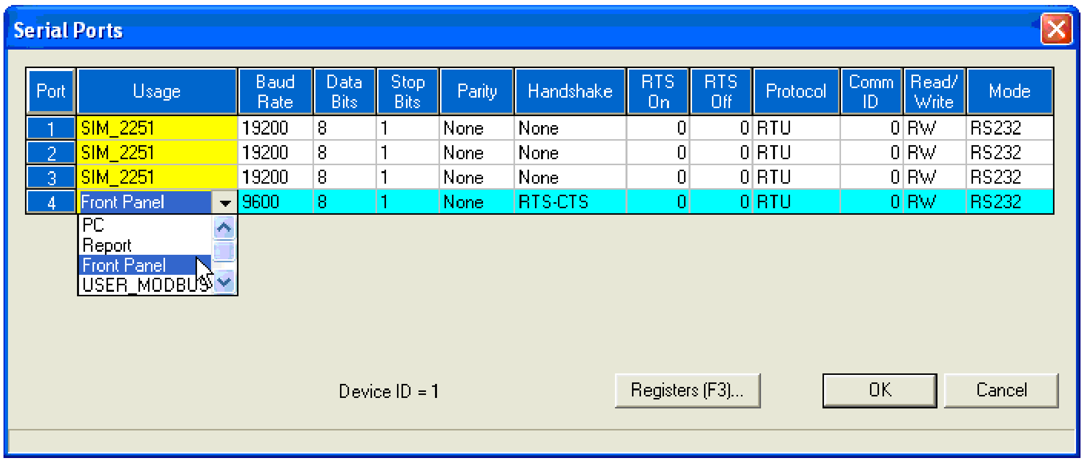
For a system ***with*** a keyboard and display, do the following:

1. Connect the 20-pin ribbon cable (P/N #3-2350-087 Rev. C) to the J6 connector on the CPU board.
2. Plug the 10-pin connector labeled **INTF J12** into the header labeled **J12** on the system interface board for the serial port interface to the keyboard and display.
3. Plug the 10-pin connector labeled **INTF J8** into header labeled **J8** on the system interface board for the interface to serial port 3. This will provide access to the COM3 port on the field termination board. COM4 is now dedicated for use as the serial port interface to the keyboard and display.

4. Start MON2000 and do the following:

   (a) Select **Serial Ports...** from the **Application** menu.

   (b) Set the *Usage* for serial port 4 to **Front Panel**.



   (c) Click **OK**.

NOTICE

The mode (RS-232, RS-422 or RS-485) for all four ports can be set through MON2000.

16-bit CPU COM3/COM4 Output Header

COM3 and COM4 can be configured two different ways. To configure a system ***without*** a keyboard and display, connect cable (P/N 3-2350-084) from **CPU J6** to the System Interface Board **J8** and **J10**. This provides access to COM3 on **J10** and COM4 on **J11** of the Field Termination Board. The serial port setup for COM4 in MON2000 must be set as a **PC port**.

For a system ***with*** a keyboard and display, connect cable (P/N 3-2350-087) from **CPU J6** to the System Interface Board at **J8** and **J12**. This provides access to COM3 on **J10** and COM4 is dedicated for use as a serial interface to the keyboard and display. COM4 will not be available at J11 of the Field Termination Board. The serial port setup for COM4 in MON2000 must be set as a **Front Panel**.

J6

COM3 DCD	1	2	COM3 DSR
COM3 RX	3	4	COM3 RTS
COM3 TX	5	6	COM3 CTR
COM3 DTR	7	8	COM3 RI
GND	9	10	N/C
COM4 DCD	11	12	COM4 DSR
COM4 RX	13	14	COM4 RTS
COM4 TX	15	16	COM4 CTS
COM4 DTR	17	18	COM4 RI
GND	19	20	N/C

COM4A RS-232/RS-422/RS-485 Configuration

To configure the PCM-COM4A Board for the desired mode of operation, use the following information.

Each of the four serial channels may be configured independently for either RS-232, RS-422, or RS-485 signal levels. An optional chip kit (P/N 3-2350-115) is necessary to allow configuration of a single channel for RS-422 use or up two channels of RS-485 usage. If four channels of RS-422 use is desired, four (P/N 3-2350-115) kits will be required. Configuration of each channel consists of installing and/or removing the appropriate line driver ICs and installing the required jumpers. Appropriate jumpering, chip installation and the output connector pin out is shown for each of the channels in each mode.

Channel 1 - I/O Connector J6

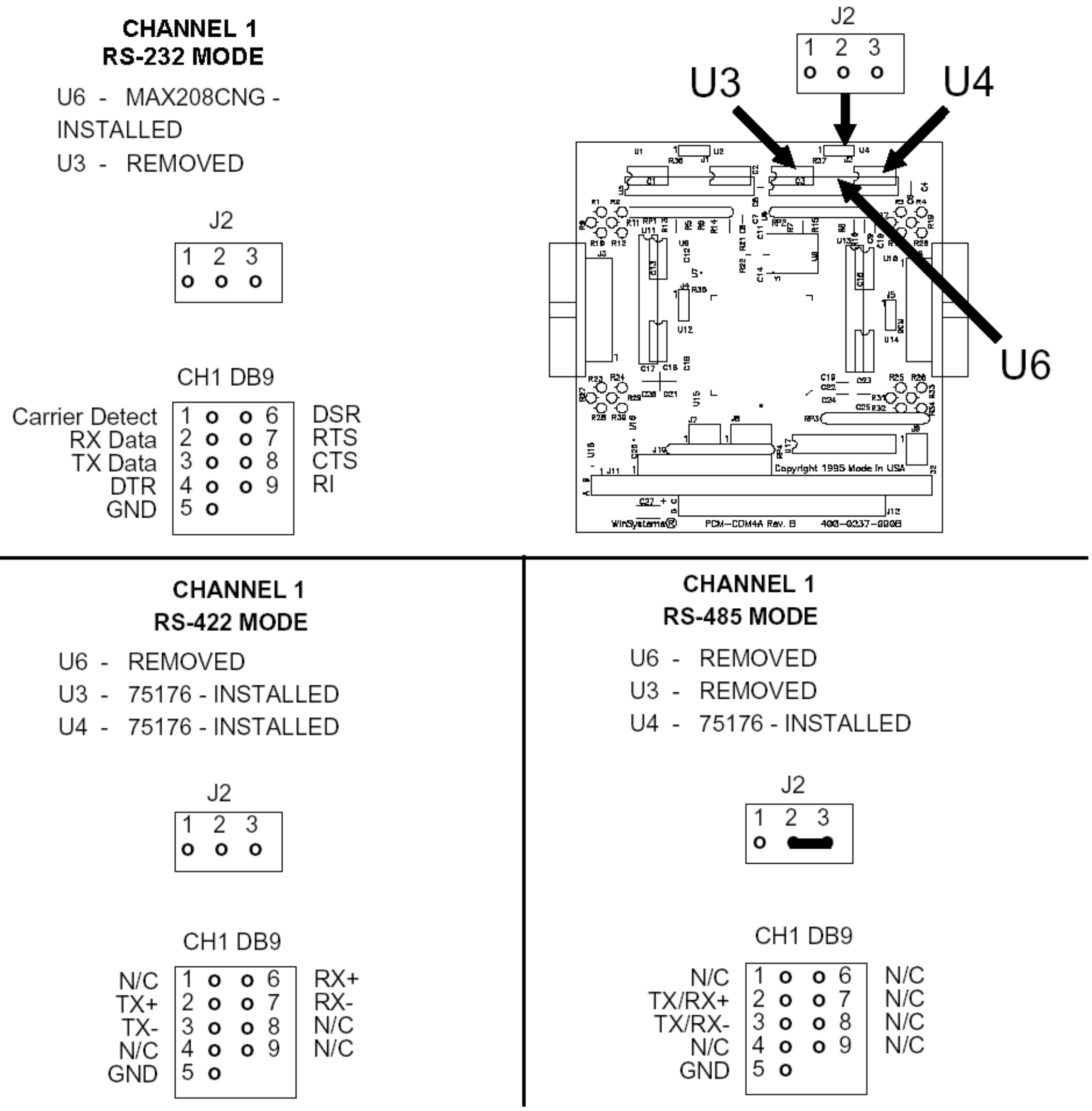


Figure 3-12. Channel 1 - I/O Connector J6

Channel 2 - I/O Connector J6

CHANNEL 2
RS-232 MODE

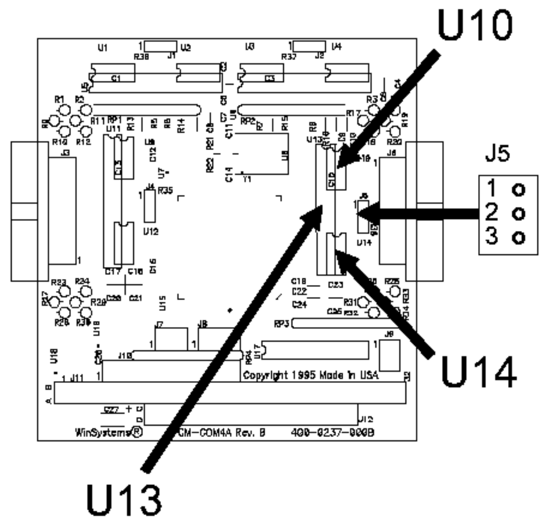
U13 - MAX208CNG - INSTALLED
U10 - REMOVED
U14 - REMOVED

J5

1	o
2	o
3	o

CH2 DB9

Carrier Detect	1 o	o 6	DSR
RX Data	2 o	o 7	RTS
TX Data	3 o	o 8	CTS
DTR	4 o	o 9	RI
GND	5 o		



CHANNEL 2
RS-422 MODE

U13 - REMOVED
U10 - 75176 - INSTALLED
U14 - 75176 - INSTALLED

J5

1	o
2	o
3	o

CH2 DB9

N/C	1 o	o 6	RX+
TX+	2 o	o 7	RX-
TX-	3 o	o 8	N/C
N/C	4 o	o 9	N/C
GND	5 o		

CHANNEL 2
RS-485 MODE

U13 - REMOVED
U10 - REMOVED
U14 - 75176 - INSTALLED

J5

1	o
2	
3	

CH2 DB9

N/C	1 o	o 6	N/C
TX/RX+	2 o	o 7	N/C
TX/RX-	3 o	o 8	N/C
N/C	4 o	o 9	N/C
GND	5 o		

Figure 3-13. Channel 2 - I/O Connector J6

Channel 3 - I/O Connector J3

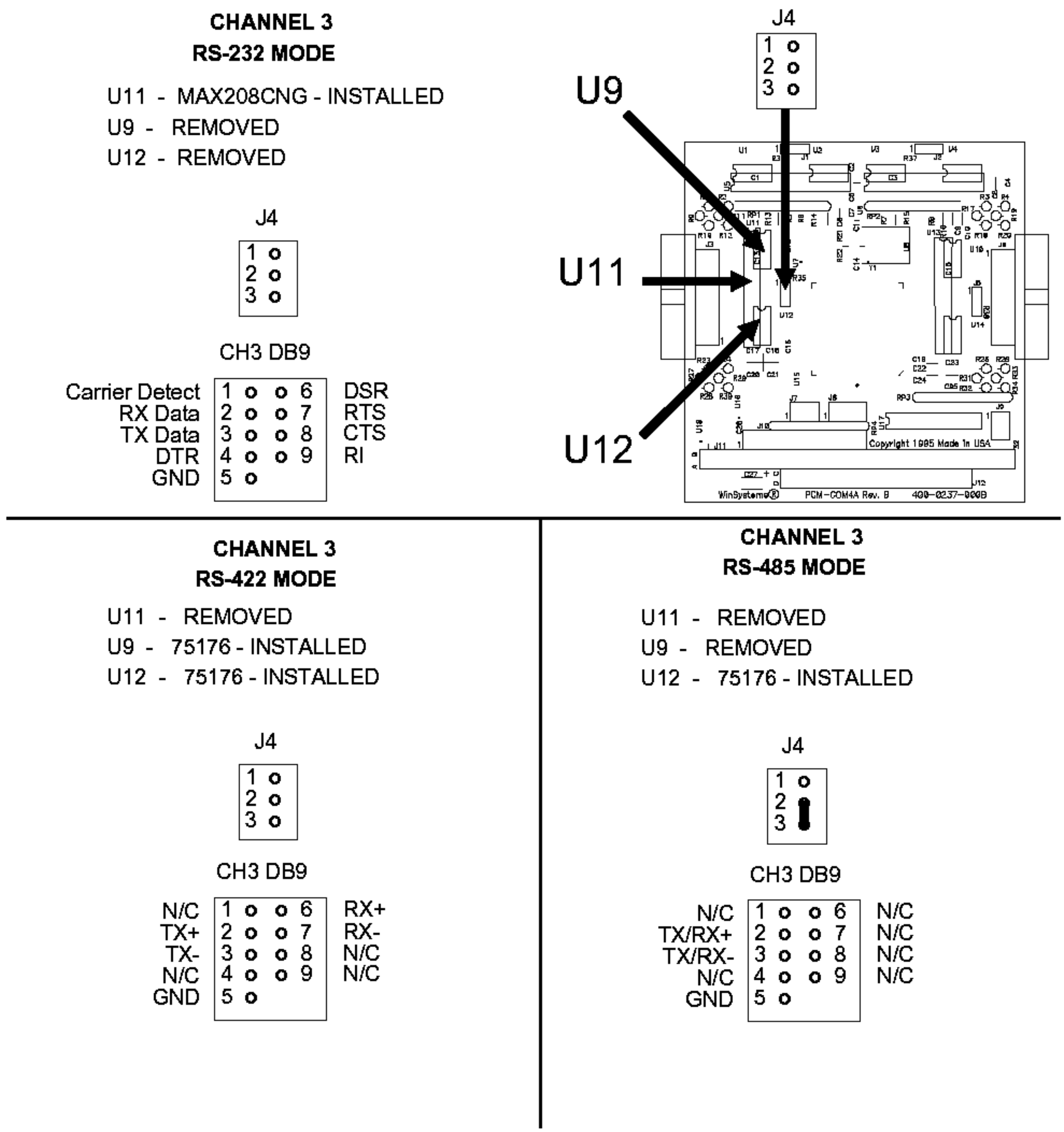


Figure 3-14. Channel 3 - I/O Connector J3

Channel 4 - I/O Connector J3

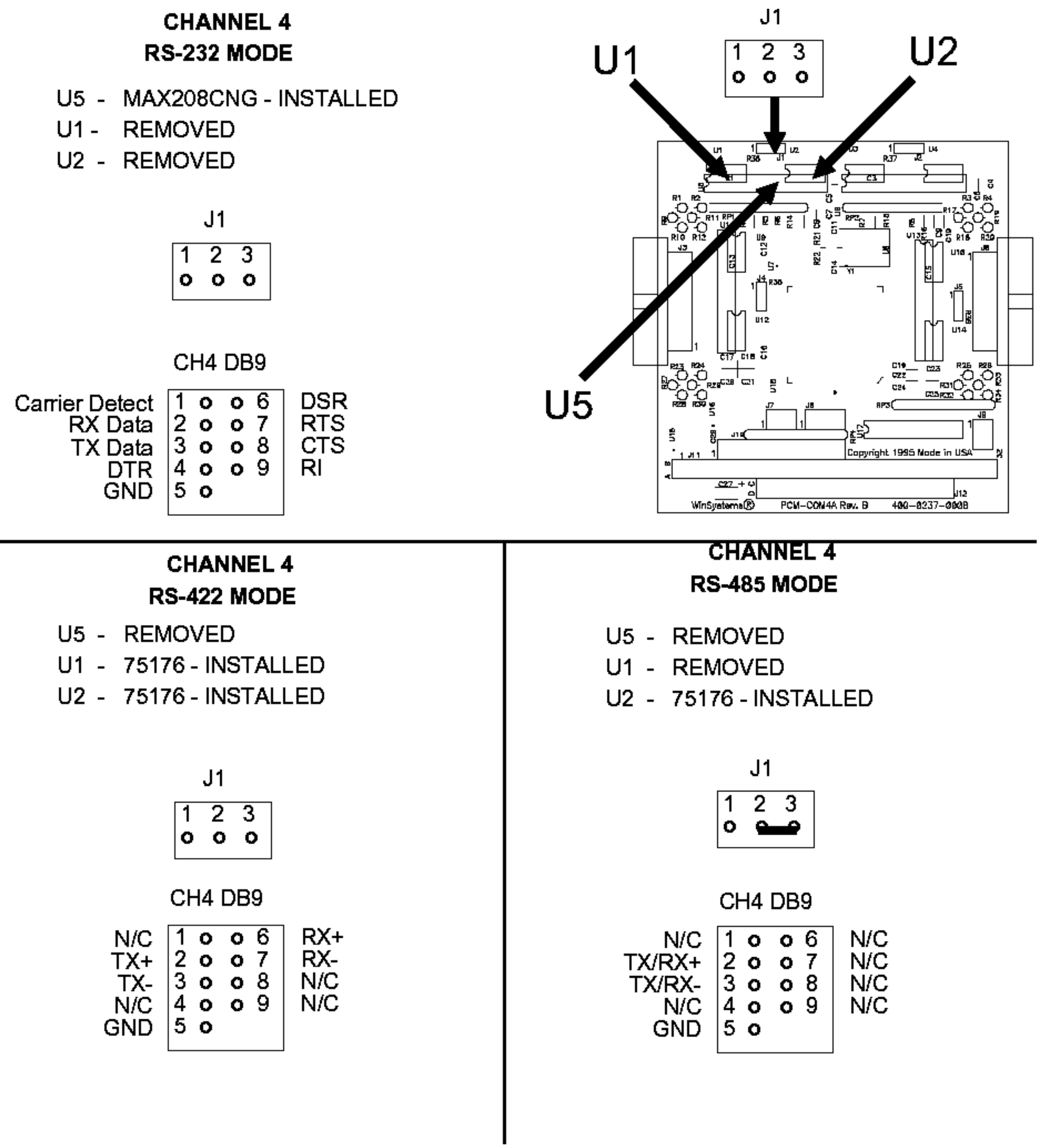


Figure 3-15. Channel 4 - I/O Connector J3

COM4A RS-232 Configuration

Ports:

- Maximum number of RS-232 ports available: seven (see Section 3.4.5, "Controller Printer Wiring" on page 69), which are routed to
  - DB-9 plug connections (female): P2 (COM1) and P3 (COM2); or P22 (COM5), P23 (COM6), P24 (COM7).
  - Phoenix plug connections (or bare-wire) connections: GC Controller TB, J5 (COM1), J6 (COM2), J10 (COM3), and J11 (COM4).

Voltage:

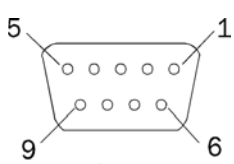
±5 volts or ±12 volts, depending on jumper settings

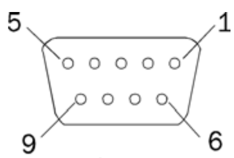
Recommended Maximum Cable Length:

50 feet (15 meters)

Pinouts:

RS-232		
Terminal Board for Field Wiring at Controller (TB)		
J5 (COM1), J6 (COM2), J10 (COM3), or J11 (COM4)	Terminal 1	RLSD (DCD)
	Terminal 2	S_{OUT} (TxD)
	Terminal 3	S_{IN} (RxD)
	Terminal 4	DTR
	Terminal 5	GND
	Terminal 6	DSR
	Terminal 7	RTS
	Terminal 8	CTS
	Terminal 9	RI

RS-232		
Terminal Board for Field Wiring at Controller (TB)		
P22 (COM5) P23 (COM6) P24 (COM7)	Terminal 1	N/C
	Terminal 2	S_{OUT} (TxD)
	Terminal 3	S_{IN} (RxD)
	Terminal 4	DSR
	Terminal 5	GND
	Terminal 6	DTR
	Terminal 7	CST
	Terminal 8	RTS
	Terminal 9	RI
Terminal Board for Field Wiring at Controller (TB)		
P2 (COM1) or P3 (COM2)	Terminal 1	RLSD (DCD)
	Terminal 2	S_{OUT} (TxD)
	Terminal 3	S_{IN} (RxD)
DB-9 FEMALE socket numbering	Terminal 4	DTR
	Terminal 5	GND
	Terminal 6	DSR
NOTE: DB-9 plug on GC Controller is wired to eliminate the need for a null-modem cable between the GC and a PC.	Terminal 7	RTS
	Terminal 8	CTS
	Terminal 9	RI

RS-232		
Terminal Board for Field Wiring at Controller (TB)		
P22 (COM5) P23 (COM6) P24 (COM7)	Terminal 1	N/C
	Terminal 2	S_{OUT} (TxD)
	Terminal 3	S_{IN} (RxD)
	Terminal 4	DSR
	Terminal 5	GND
DB-9 FEMALE socket numbering	Terminal 6	DTR
NOTE: DB-9 plug on GC Controller is wired to eliminate the need for a null-modem cable between the GC and a PC.	Terminal 7	CTS
	Terminal 8	RTS
	Terminal 9	RI

COM4A RS-422 Configuration

Ports:

- Maximum number of RS-422 ports available: five (see Section 3.4.5, "Controller Printer Wiring" on page 69), which are routed to
  - DB-9 plug connections (female): P3 (COM2), P22 (COM5), P23 (COM6), P24 (COM7); or
  - Phoenix plug (or bare-wire) connections: GC Controller TB, J6 (COM2) and J10 (COM3).

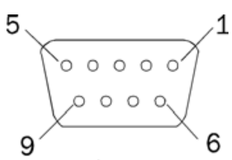
Voltage:

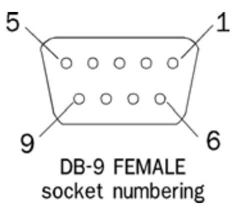
Line drivers meet Electronics Industries Association (EIA) specifications for RS-422

Recommended Maximum Cable Length:

4000 feet (1219 meters)

Pinouts:

RS-422		
Terminal Board for Field Wiring at Controller (TB)		
J6 (COM2)	Terminal 2	Tx
	Terminal 3	Tx+
	Terminal 5	GND
	Terminal 6	Rx+
	Terminal 7	Rx
Terminal Board for Field Wiring at Controller (TB)		
J10 (COM3)	Terminal 2	Tx
	Terminal 3	Tx+
	Terminal 4	Rx+
	Terminal 5	GND
	Terminal 7	Rx
Terminal Board for Field Wiring at Controller (TB)		
P3 (COM2)  DB-9 FEMALE socket numbering	Terminal 2	Tx
	Terminal 3	Tx+
	Terminal 4	Rx+
	Terminal 5	GND
	Terminal 8	Rx

RS-422		
Terminal Board for Field Wiring at Controller (TB)		
P22 (COM5) P23 (COM6) P24 (COM7)  	Terminal 2	Tx
	Terminal 3	Tx+
	Terminal 4	Rx+
	Terminal 5	GND
	Terminal 8	Rx

COM4A RS-485 Configuration

Ports:

- Maximum number of RS-485 ports available: seven (see Section 3.4.5, “Controller Printer Wiring” on page 69), which are routed to:
  - DB-9 plug connections (female): P2 (COM1), P3 (COM2), P22 (COM5), P23 (COM6), P24 (COM7); or
  - Phoenix plug connections (or bare-wire) connections: GC Controller TB, J5 (COM1), J6 (COM2), J10 (COM3), and J11 (COM4 for RS-485).

Voltage:

Line drivers meet Electronics Industries Association (EIA) specifications for RS-485

Recommended Maximum Cable Length:

4000 feet (1219 meters)

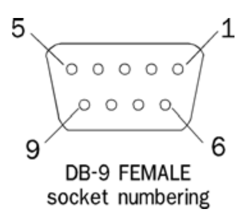
Pinouts:

<table>
<tr><td colspan="3">RS-485</td></tr>
<tr><td colspan="3">Terminal Board for Field Wiring at Controller (TB)</td></tr>
<tr><td rowspan="3">J5 (COM1)
J6 (COM2)

or

J10 (COM3
)J11 (COM4)</td><td>Terminal 2</td><td>RxTx</td></tr>
<tr><td>Terminal 3</td><td>RxTx+</td></tr>
<tr><td>Terminal 5</td><td>GND</td></tr>
<tr><td colspan="3">Terminal Board for Field Wiring at Controller (TB)</td></tr>
<tr><td rowspan="3">P2 (COM1)

or

P3 (COM2)
P22 (COM5)
P23 (COM6)
P24 (COM7)
</td><td>Terminal 2</td><td>RxTx</td></tr>
<tr><td>Terminal 3</td><td>RxTx+</td></tr>
<tr><td>Terminal 5</td><td>GND</td></tr>
</table>

Parallel Printer Interface

Both the LX-800 and the 6117 CPU boards support a standard parallel printer port. The parallel port connected via cable (P/N 3-2350-083) routes the signals from the CPU board to the System Interface Board.

The parallel printer cable (customer supplied) is connected to J1 on the Field Termination Board.

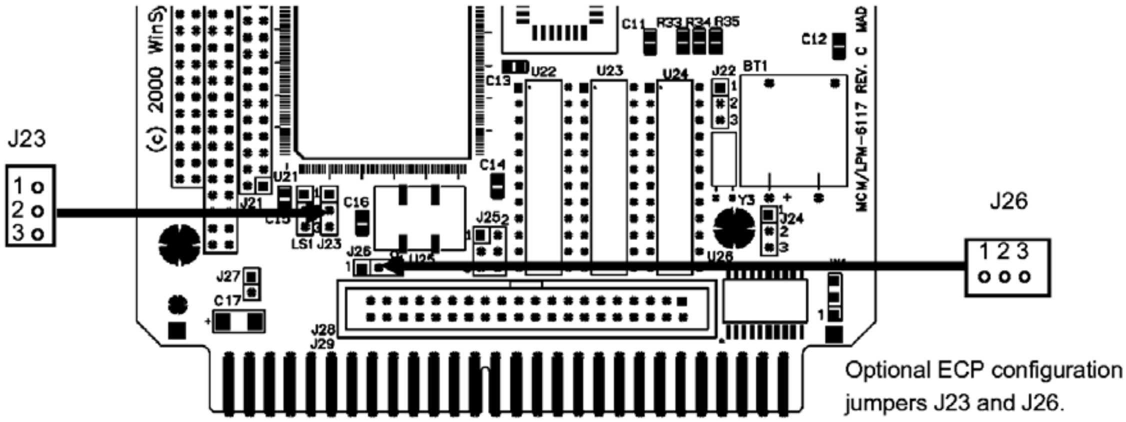


Figure 3-16. 16-bit CPU board's Parallel Printer Port

PC/104 Bus Interface

Both the LX-800 and the 6117 CPU boards support I/O expansion through the standard PC/104 Bus connectors at J19 and J20. The 6117 CPU board supports 8-bit and 16-bit PC/104 Bus modules; the LX-800 CPU board supports 8-bit, 16-bit, and 32-bit PC/104 Bus modules. The PC/104 Bus connector pin definitions are provided here for reference.

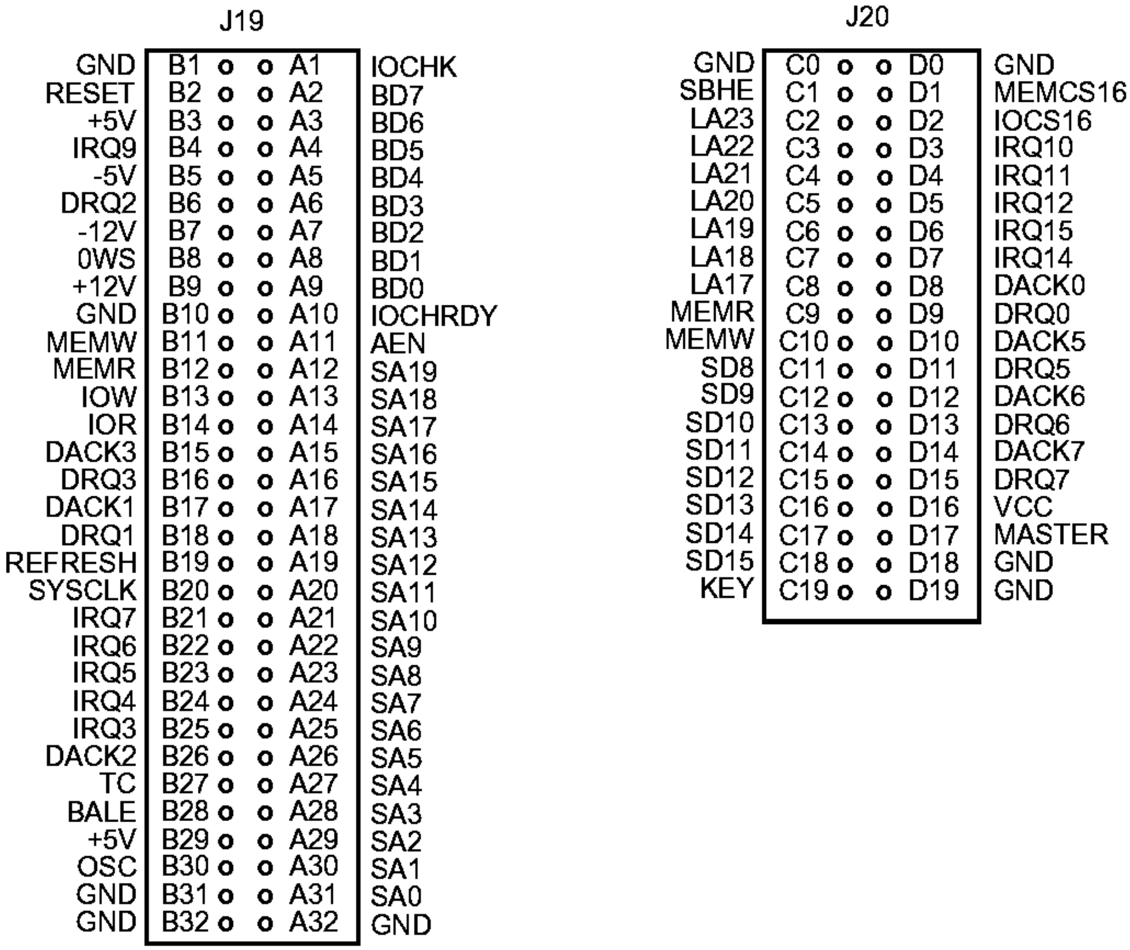


Figure 3-17. PC Bus Interface

16-bit CPU Board Silicon Disk Configuration

The Model 500 GC, when installed with a 16-bit CPU board, uses the M-Systems' Disk OnChip (DOC) device as a Solid State Disk drive. This section documents the required hardware configuration for the DiskOnChip device used for the Model 500 Analyzer. The Silicon disk array is memory mapped into a 32K byte hole at segment E800H and has an I/O control register at TECH.

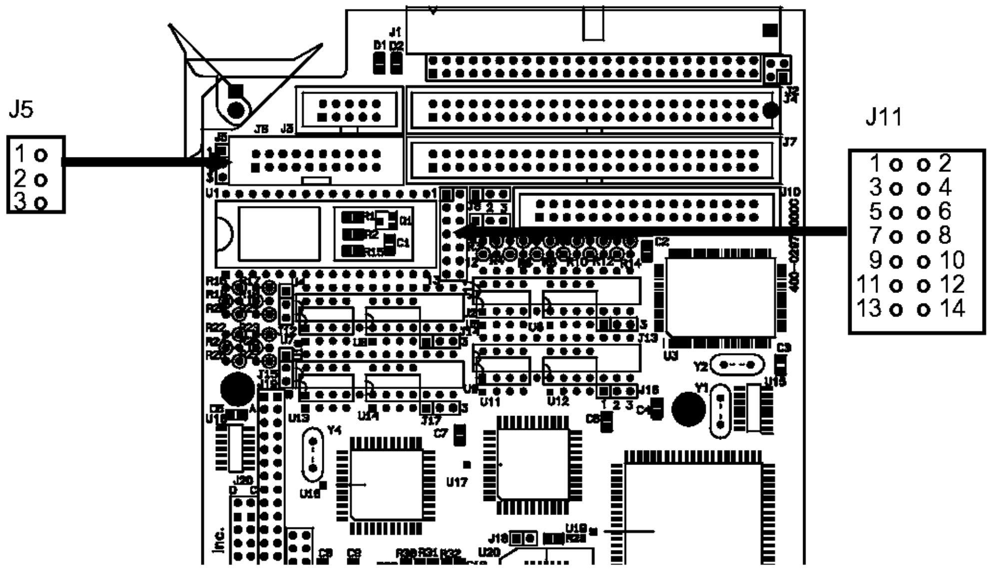
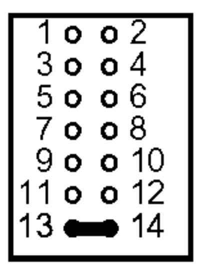


Figure 3-18. Disk Configuration

<u>Silicon Disk Mode</u>

The Model 500 Analyzer, when installed with a 16-bit CPU board, uses the M-Systems DiskOnChip (DOC) device. The mode is controlled via pins 13-14 on jumper block at J11 as shown here:

J11



DOC USAGE

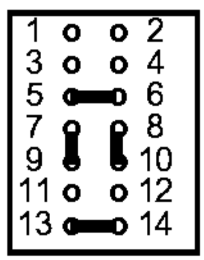
Figure 3-19. DiskOnChip Jumper Block

NOTICE

Jumpering for DOC mode with EPROM, RAM, or FLASH installed effectively acts to disable the Solid State Disk and similarly, when a DOC device is installed and the jumper is selected for standard devices the DOC is disabled.

Device Type Selection

Before using the M-Systems the proper device type must be selected by correctly jumpering J11. The supported device type jumperings are shown here:



DOC DEVICE

Figure 3-20. DiskOnChip Jumper Block J11

Multi-I/O Connector

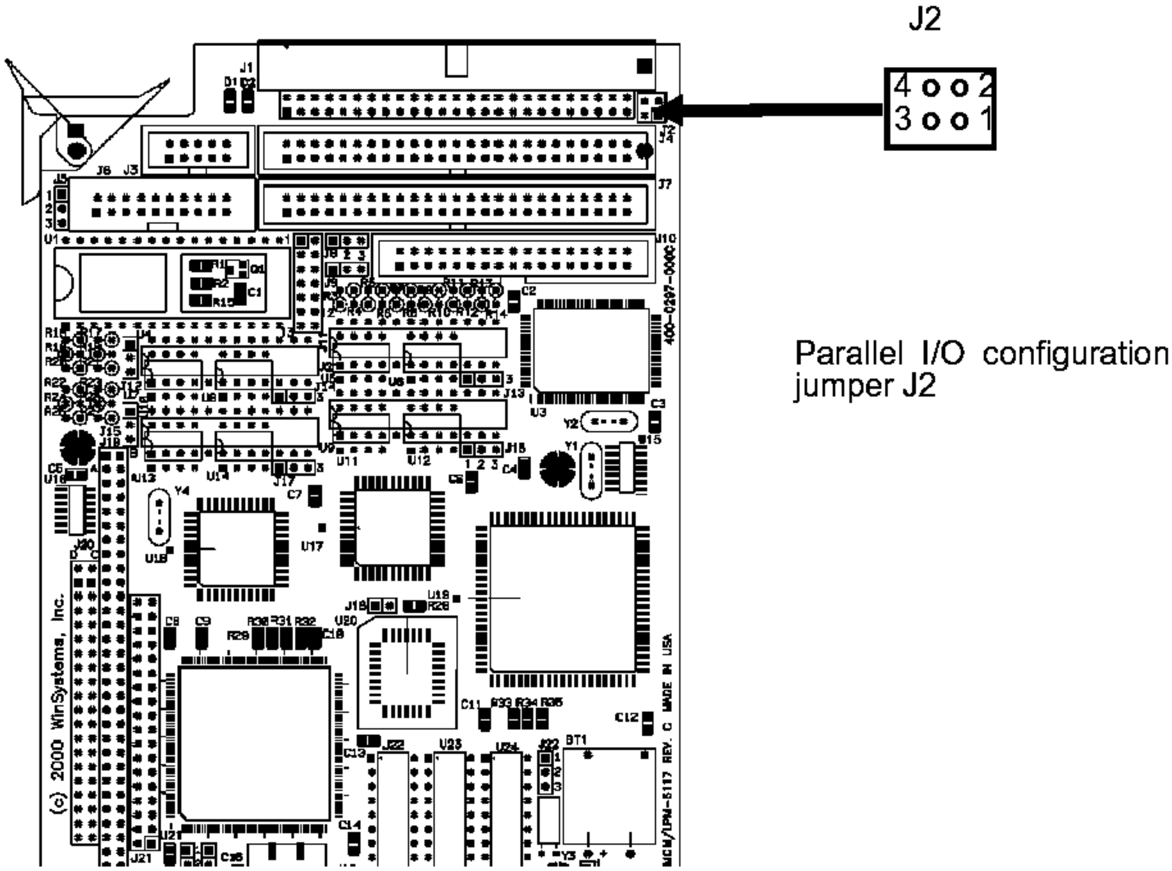


Figure 3-21. Multi-I/O Connector

The I/O to the serial channels, the printer port, and keyboard are all terminated via the connector at J1. A cable (P/N 3-2350-083) plugs into the 50-pin connector.

Parallel I/O Configuration

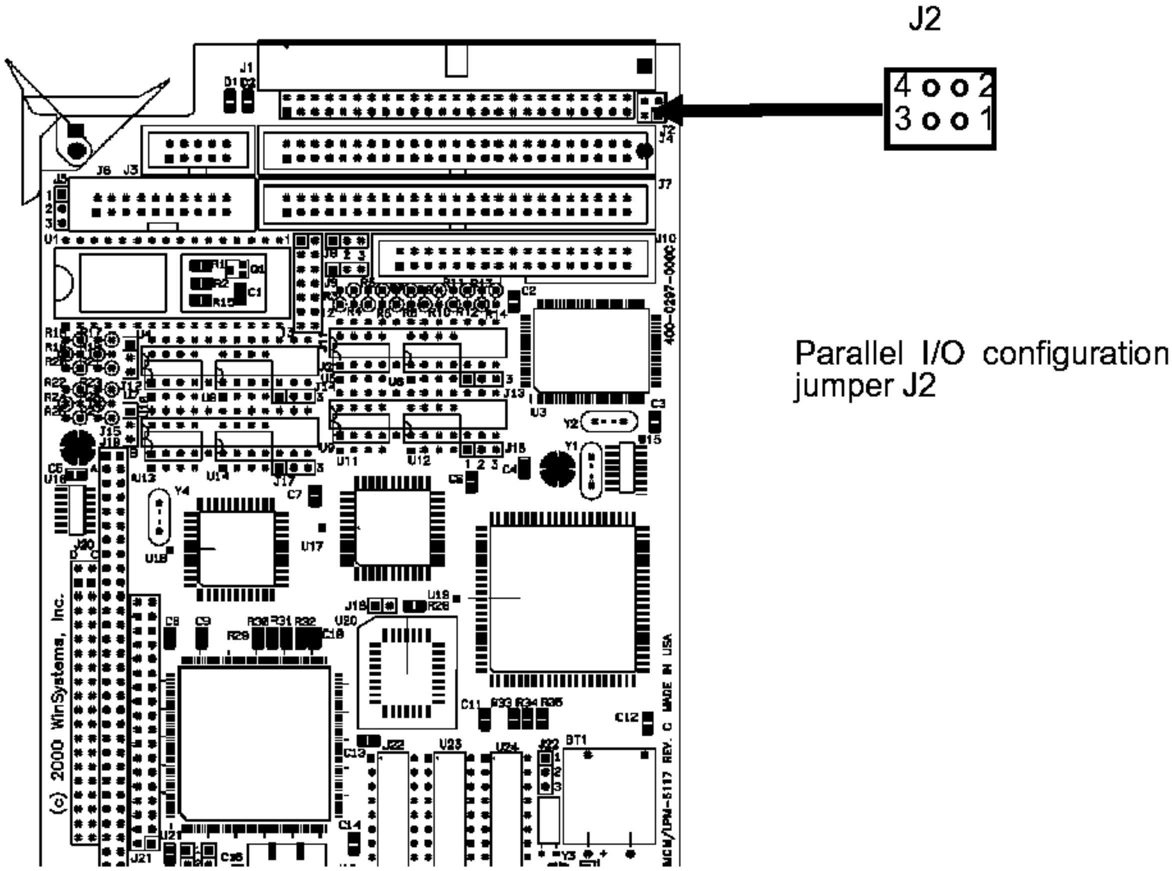


Figure 3-22. Parallel I/O Configuration

The 16-bit CPU board (LPM/MCM-6117) uses the WinSystems® WS16C48 ASIC high-density I/O chip mapped at a base address of 120H. The first 24 lines are capable of fully latched event sensing with sense polarity being software programmable. Two 50-pin connectors allow for easy mating with industry standard I/O racks. The pin out for the two connectors are shown in Figure 3-23.

Parallel I/O Connectors

The 48 lines of parallel I/O are terminated through two 50-pin connectors at J7 and J4. The J7 connector handles I/O ports 0-2 while J4 handles ports 3-5. The pin definitions for J7 and J4 are shown here:

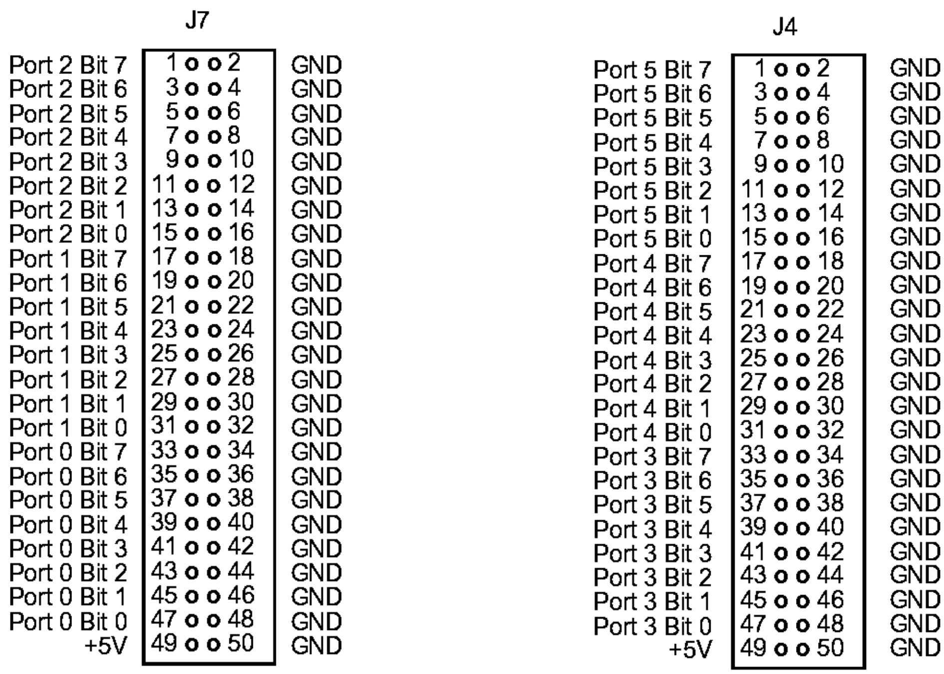


Figure 3-23. Parallel I/O Connectors J7 and J4

Parallel I/O VCC Enable

The I/O connectors can provide +5 volts to an I/O rack or for miscellaneous purposes by jumpering J2. When J2 is jumpered +5 volts are provided at pin 49 of both J4 and J7. It the user's responsibility to limit current to a safe value (less than 1A) to avoid damaging the CPU board. The jumper definitions for J2 are shown here:

Figure 3-24. I/O VCC Enable

3.4.5 Controller Printer Wiring

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

A printer can be connected directly to the GC Controller at either the Controller's parallel printer port or one of the Controller's serial ports. The type and scheduling of reports produced at the GC Controller printer are then determined by settings made in MON2000, the GC control software run from a PC (from "Reports" Submenu, select "GC Report Request" and/or "GC Printer Control").

Only a generic printer driver is used at the GC Controller. Better control of printer output is available to the printer at the GC-connected PC rather than at the GC Controller. See "Config Rpt - Maint. Log Menu" on page 4-17.

Note, too, that a printer connected to the GC Controller should not be operated in a hazardous environment.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Do not operate a standard, off-the-shelf printer in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

Two sets of instructions are provided in this section, one for connecting a printer to the Controller's parallel printer port and one for connecting a printer to one of the Controller's serial ports.

To connect a printer to the Controller's parallel printer port, follow these steps:

1. Access the GC Controller's Terminal Board for Field Wiring (TB) (See drawing P/N DE-20782).

   If necessary, see instructions in step 3 of Section 3.4.1, "Modbus Slave Address (COM ID) Setup" on page 30.
2. Locate the DB-25 female parallel printer port on the TB. It is labeled "P1".
3. Use a standard parallel printer cable (customer supplied) for making the connection between the GC Controller and the printer's parallel port.

To connect a printer to one of the Controller's serial (COM) ports, follow these steps:

1. Access the GC Controller's Terminal Board for Field Wiring (TB) (See drawing P/N DE-20782).

   If necessary, see instructions provided in Section 3.4.1, "Modbus Slave Address (COM ID) Setup" on page 30.
2. Choose an available serial port on the TB that is configured for RS-232 serial protocol.

   (a) Leave at least one serial port available for connecting the GC Controller to a PC (usually COM1).

   (b) Also leave available the other serial ports planned for use by RS-232 serial devices.

   (c) See Section 3.4.4, "CPU and COM4A Serial Communications Setups" on page 45 for a complete listing of the TB's serial ports and their pinouts in order to prepare a serial printer cable.
3. After the wiring connections have been completed, use the MON2000 Software to configure the GC Controller's serial port for use by a printer.

   (a) Select the "Application > Serial Ports menu path".

   (b) Choose the serial port that correlates to the COM port chosen in Step 2.

   (c) Set "Usage" to Report, "Prtcl" to ASCII and "RW" to W.

(d) Set all other settings to default values (i.e., "Baud Rate" 9600, "Data Bits" 7, "Stop Bits" 1, "Parity" None, "RTS On" 0, "RTS Off" 0).

3.4.6 Discrete (Digital) I/O Wiring

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

<u>To connect digital signal input/output lines to the GC Controller, follow these steps</u>:

1. Access the GC Controller's Terminal Board for Field Wiring (TB).
2. Route digital I/O lines appropriately, especially in the case of the explosion-proof Controller enclosure. Refer to Drawing P/N DE-20782.

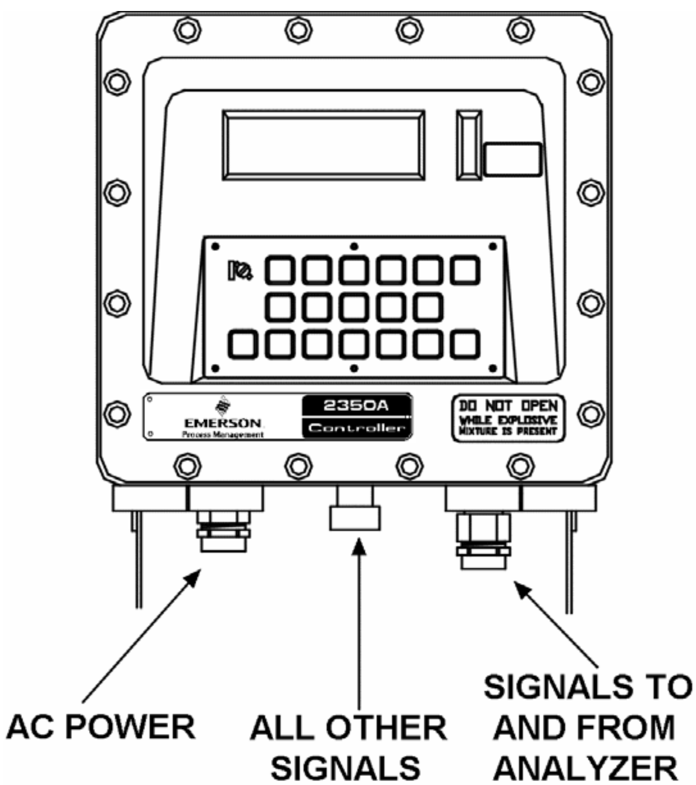


Figure 3-25. GC Controller Conduit Entries

3. Make digital I/O connections to the GC Controller TB. There are connections for five digital input and five digital output lines, as follows:

   (a) Digital Inputs-GC Controller TB, connection ports "J7" and "J9"

   Digital Outputs-GC Controller TB, connection port "J8"

   (b) For specific terminal, or pin number assignments, see drawing DE-20782, GC Controller drawings addendum, this manual.

4. To enable digital input signals, also make these "jumper-wire" connections (see Figure 3-26):

   (a) Jumper terminals #4 and #6 (common) on "J7".

(b) To enable digital input, apply either 12 or 24 volts DC to terminal #5, on "J7":

- 12 volts DC is available from the GC Controller's power supply by jumpering terminal #2 to terminal #5 (see NOTICE, below, and Figure 3-26).
- 24 volts DC is NOT available from the GC Controller's power supply; it must be obtained from an external power supply.

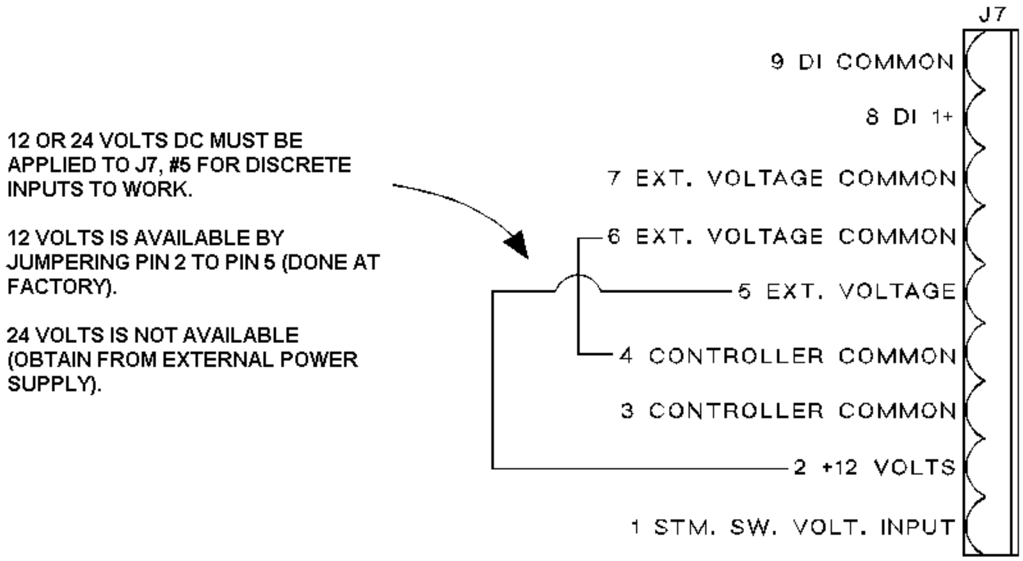


Figure 3-26. Digital Input Jumper Wire Connections

NOTICE

Jumpering terminal #2 to terminal #5, for 12 volts DC power to enable digital input, is now done at the factory. You should not have to make this "jumper-wire" connection for a GC Controller that was built after March 1996.

NOTICE

For high-current digital output, also install a special transient protection module (TPM), P/N 3-2350-019, in TPM socket M8, Terminal Board for Field Wiring, rear side of board. (See Appendix C, for TPM details.) Also, move jumper JP1 on the System Interface Board (CE-18118) from centered 12 V to centered 24 V and apply +24 VDC to "J13" and "J-14" on the rear side of the Terminal Board for Field Wiring.

3.4.7 Analog I/O Wiring

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

<u>To connect analog signal input/output lines to the GC Controller, follow these steps</u>:

1. Access the GC Controller's Terminal Board for Field Wiring (TB).

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

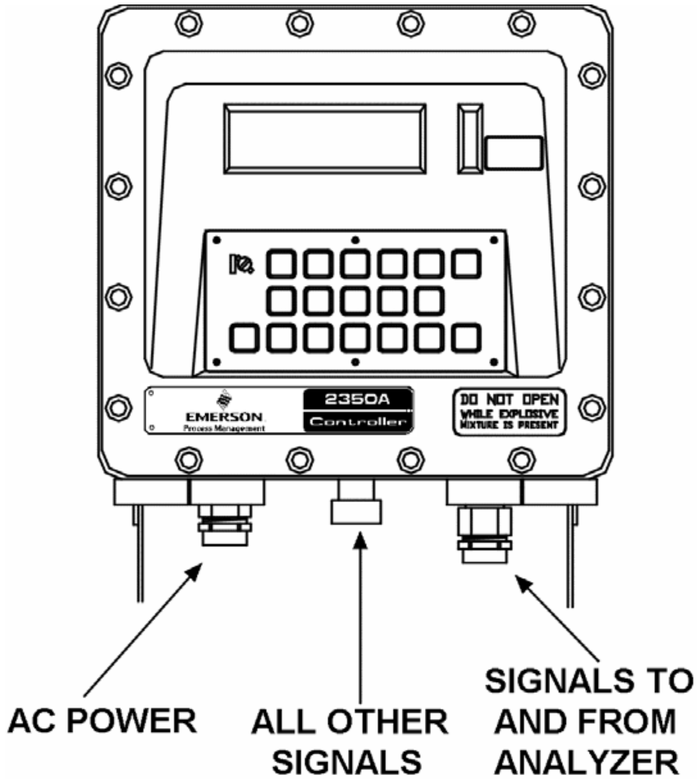


Figure 3-27. Seperate Conduit Entries

3. Make analog I/O connections to the GC Controller TB. In standard configuration, there are connections for four analog input and two analog output lines, as follows:

   (a) Analog Inputs-GC Controller TB, connection port "J12"

   Analog Outputs-GC Controller TB, connection port "J14"

   (b) For specific pin number assignments, see drawing DE-20782, GC Controller drawings addendum, this manual.

NOTICE

As an option, the Series 2350A GC Controller can be configured with additional analog outputs (there are two analog outputs on the standard Analog Board, P/N 3-2350-041). For more analog outputs, the existing "Analog" board must be exchanged for one of these optional Analog Boards, allowing a quantity of either six or ten analog outputs (see drawing BE-18044 in the GC Controller drawings addendum, this manual):

- **Analog I/O - (6) analog outputs (P/N 3-2350-039)**
- **Analog I/O - (10) analog outputs (P/N 3-2350-034)**

If additional analog outputs are installed, the existing System Interface/Driver board must be exchanged for one of these optional System Interface Boards, allowing a quantity of either six or ten analog outputs (see drawing CE-18118):

- **Analog I/O - (6) analog outputs (P/N 3-2350-022)**
- **Analog I/O - (10) analog outputs (P/N 3-2350-023)**

***If additional analog outputs are installed*, specific transient protection modules must also be installed on the GC Controller's Terminal Board for Field Wiring (TB). For details about transient protection modules, see Appendix C. Also see drawing CE-18115, sheet 2, in the GC Controller drawings addendum, this manual.**

Once the Analog Board, System Interface Board, and the proper transient protection modules are installed, field wiring for the added analog outputs from the GC Controller are made to GC Controller TB, ports "J13" and "J15".

3.4.8 Controller AC Power Wiring

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

To connect 115 or 130 volts AC-Power to the GC Controller, follow these steps:

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

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

Failure to observe all safety precautions could result in serious injury or death.

1. Access the GC Controller's Terminal Board for Field Wiring (TB).

   If necessary, see instructions provided in Section 3.4.1, step (1).

2. Locate the AC-power connection terminal group on the TB. It is labeled "J21" and has three connection points labeled "1 HOT," "2 NEU," and "3 GND."

   Also see drawing DE-20782 in the GC Controller drawings addendum, this manual.

3. Connect AC-power leads from a properly controlled 115 or 230 volts AC-power source (i.e., with circuit breaker and power disconnect switch) to terminal J21 on the Controller TB.

   (a) The Controller has a transformer that will accept either 115 volts or 230 volts.

   (b) Ensure that the power source leads are properly connected to the HOT, NEUTRAL, and GROUND terminals. (Generally, the color convention for these wires is HOT - black, NEUTRAL - white, and GROUND - green.)

(c) Make power line splices and conduit seals that comply with applicable wiring requirements (for hazardous environments).

CAUTION

EQUIPMENT DAMAGE OR PERSONAL INJURY

Do not apply AC electrical power to the Analyzer or the GC Controller until all electrical power, interconnection, and external signal connections have been verified, and proper grounds have been made.

Failure to properly connect the GC unit may result in serious equipment damage or personal injury.

4. If necessary, connect the Controller's chassis ground to an external copper ground rod (at remote locations). See Section 3.1.4, “Electrical and Signal Ground” on page 8 regarding electrical and signal ground.

3.5 ANALYZER LEAK CHECKS AND PURGING FOR FIRST CALIBRATION

3.5.1 Analyzer Leak Checks

4	Install Analyzer Wiring
5	Install Analyzer Sample & Gas Lines
6	Install GC Controller Wiring
7	Perform Leak Checks

To perform Analyzer leak checks, follow these steps:

1. Plug the Measure Vent (labeled "MV") vent line if it is open. (The "SV", or Sample Vent line should be left open, or unplugged.)
2. Slowly pressurize each line in turn, then block-in the line, making sure the pressure holds.

For example, the carrier gas line should be slowly brought up to 110 psig (±2 percent) with the dual-stage regulator at the carrier gas cylinder.

3. After 2 minutes, shut the carrier gas bottle valve and observe the high-side regulator gauge on the carrier gas bottle.
   (a) The gauge should not bleed down more than 115 psig in 10 minutes.
   (b) If helium is lost at a faster rate, leaks are usually found between the carrier gas bottle and the analyzer. Check and tighten all connections, as well as the dual-stage regulator.
4. When the leak check is complete, reopen the helium bottle valve. Remove the plug from the MV line.
5. Repeat the procedure with sample gas and stream gas after first shutting the metering valve below the rotameter on the front of the Flow Panel. The metering valve is left shut for now, but will be reopened later during initial purging and the Analyzer's first calibration.

3.5.2 Purging Carrier Gas Lines

7	Perform Leak Checks
8	Purge Carrier Gas Lines
9	Purge Calibration Lines
10	Start Up GC System

CAUTION

EQUIPMENT DAMAGE OR PERSONAL INJURY

Purging carrier and calibration gas lines will require that AC power be turned on to the Analyzer. Ensure that unit interconnections and all external signal connections have been verified, and proper grounds have been made.

Failure to verify all connections may result in equipment damage or personal injury.

NOTICE

Tubing should be clean and dry internally. During installation use compressed air to remove moisture, dust, or other contaminants from all tubing.

To purge the carrier gas lines, as preparation for first calibration, follow these steps:

1. Ensure that the "MV" vent line plug has been removed, and the vent line is open.
2. Turn ON the AC power to the Analyzer.

   With AC power turned ON and the upper XJT box open, the green LED (by the "Column Heater" label) should now be illuminated. (See Figure 3-28 and Figure 3-29.)

3. Ensure that all of the Analyzer Valve Switches, upper XJT box, are set to the AUTO position.

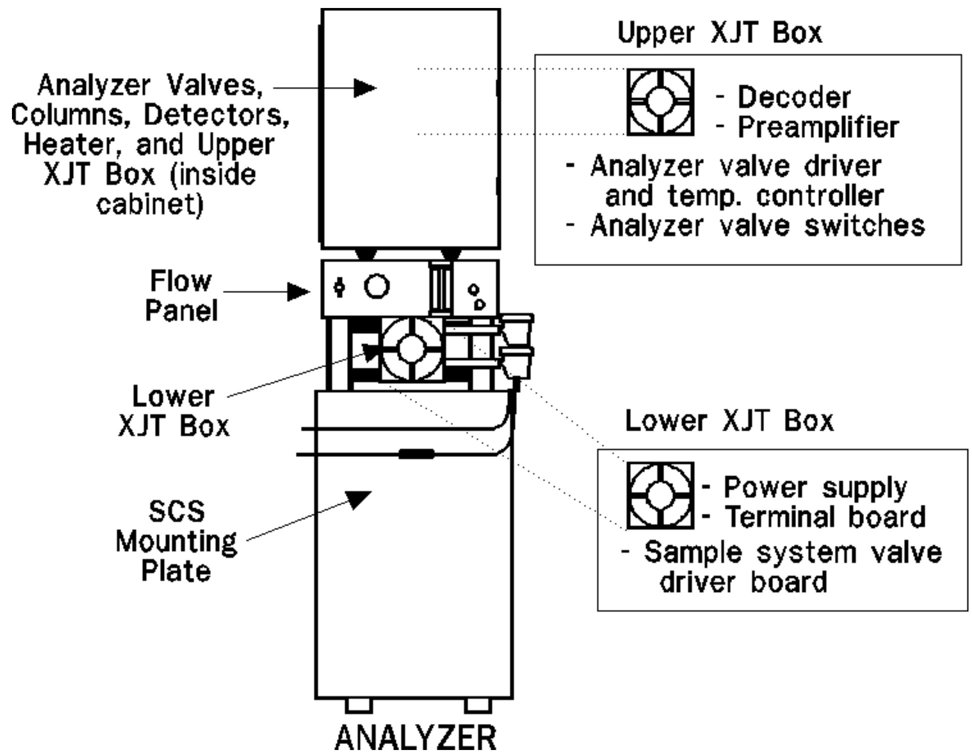


Figure 3-28. Location of Analyzer XJT Boxes

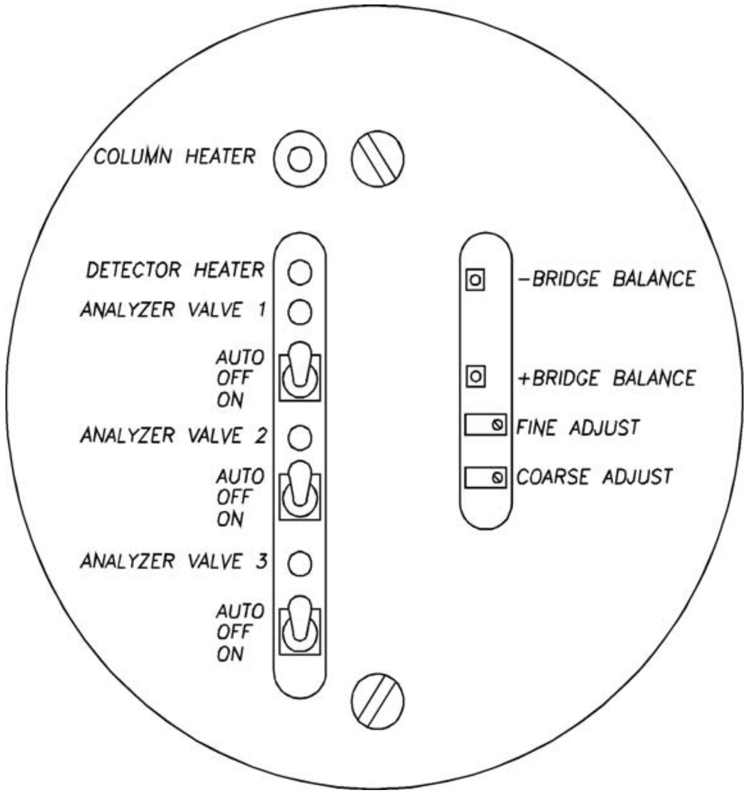


Figure 3-29. Analyzer Valve Switches, Upper XJT

4. Ensure that all of the Analyzer Valve Switches, upper XJT box, are set to the AUTO position.
5. Ensure that the carrier gas bottle valve is open.
6. Set the carrier gas line pressure at 115 psig. Use the dual stage regulator at the carrier gas bottle to adjust pressure.

NOTICE

Do not use the "Carrier Pressure Adjust" valve (on the Flow Panel of the Analyzer) to adjust carrier gas line pressure. That valve is factory-set and should not be adjusted.

7. Allow the Analyzer system temperature to stabilize and the carrier gas lines to become fully purged with carrier gas.

   A period of 4 to 8 hours (or overnight) is recommended, during which all of the settings described in steps (1) through (5) are maintained. No other settings should be made.

3.5.3 Purging Calibration Gas Lines

7	Perform Leak Checks
8	Purge Carrier Gas Lines
9	Purge Calibration Lines
10	Start Up GC System

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

1. Ensure that the carrier gas lines have been fully purged, as described in the previous section.
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 the SCS plate of the Analyzer).
4. Fully open the metering valve (on Flow Panel, below the rotameter).
5. Open the lower XJT box of the Analyzer (Figure 3-28) to access the Valve Driver board (Figure 3-30).
6. On the Valve Driver board, lower XJT box, set the Stream switch "S2" to MAN (if Stream 2 will be used for calibration gas).
7. Open the calibration gas bottle valve.
8. At the calibration gas bottle regulator, increase outlet pressure to 20 psig, ±5%.
9. Close the calibration gas bottle valve.
10. Let both gauges on the calibration gas bottle valve bleed down to 0 (zero) psig.
11. Repeat steps (7) through (10) five times.

12. Open the calibration gas bottle valve.
13. Regulate the flow through the rotameter to approximately 50 cubic centimeters per minute (cc/min) by adjusting the metering valve on the Flow Panel.
14. Prepare for normal operation, as follows:
    (a) On the Valve Driver board, lower XJT box, reset the Stream switch "S2" to AUTO (if Stream 2 will be used for calibration gas).
    (b) Close both XJT boxes.

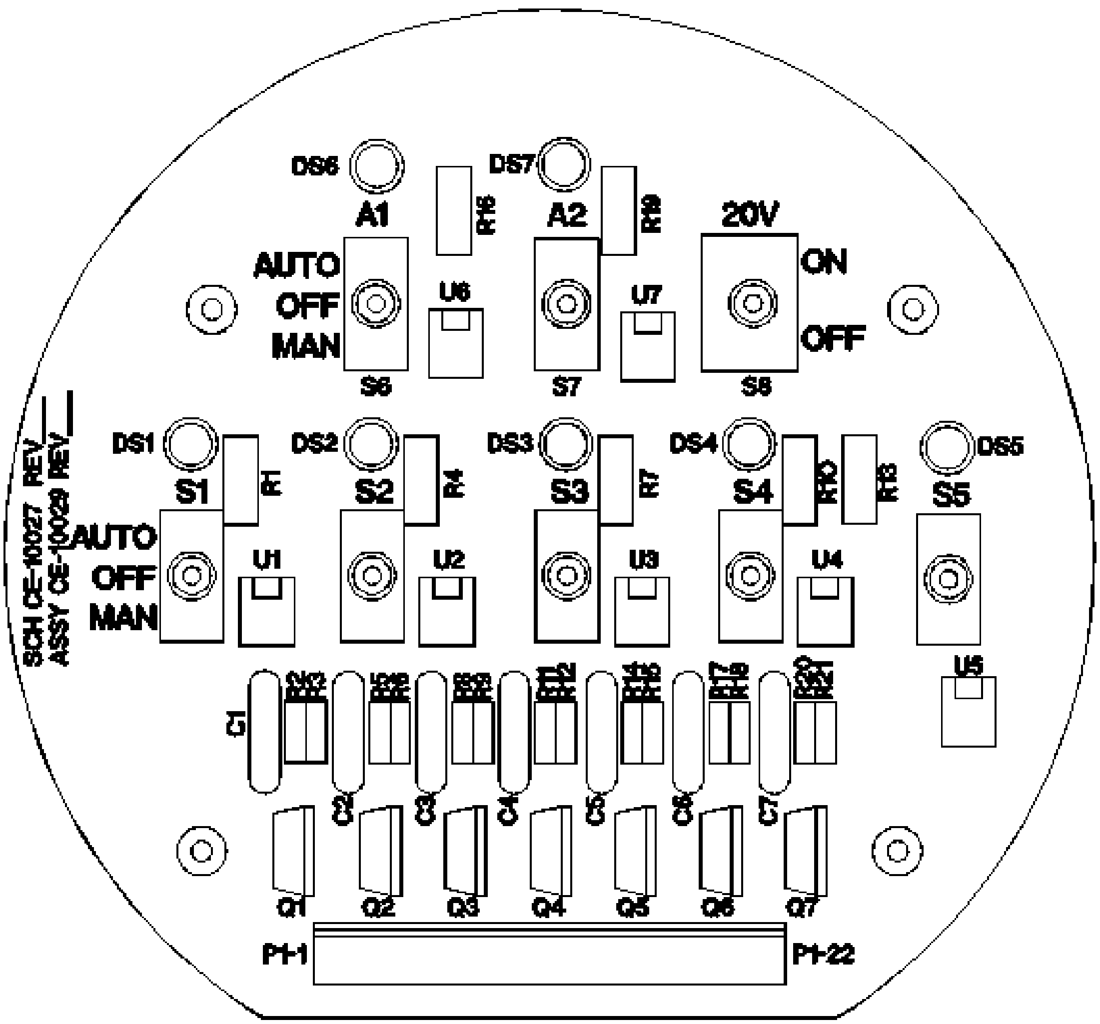


Figure 3-30. Analyzer Valve Driver Board (in lower explosion-proof housing)

3.6 SYSTEM START-UP

7	Perform Leak Checks
8	Purge Carrier Gas Lines
9	Purge Calibration Lines
10	Start Up GC System

To perform system start-up, follow these steps:

1. For system start-up, run an analysis of the calibration gas.

   Ensure that the Stream switch for the calibration gas has been set to AUTO (see last step, previous section).

2. Run the GC System in "Single Stream" mode.

   - To operate the GC System with a PC and the MON2000 Software, refer to the MON2000 Software for Gas Chromatographs User Manual (P/N 3-9000-522).

   or

   - To operate the GC System from the front panel keypad and LCD, refer to "Operation from Local Keypad and Display" on page 4-1.

NOTICE

For process GC systems that handle multiple streams and are equipped with optional purge system components, you must also set up solenoid purge flow prior to normal operation of the GC system. For more information about this, along with a procedure for setting solenoid purge flows, see Appendix E.

OPERATION FROM LOCAL KEYPAD AND DISPLAY

You have at least one, and optionally two, user interfaces from which to operate the gas chromatograph (GC) system:

PC connected to the GC and running the MON2000 Software program - This user interface offers the greatest amount of capability and flexibility. For instructions, see the *MON2000 Software for Gas Chromatographs User Manual* (P/N 3-9000-522).

or

The GC Controller's built-in keypad and Liquid Crystal Display (LCD) - This offers only essential startup and operation functions, but is useful in a hazardous environment or if no PC is available. (See Figure 4-1.)

NOTICE

When the unit has the COM4A Board installed, COM8 is used for the display/keyboard. However, if the unit does not have the COM4A Board installed, the display/keyboard uses COM4 and it must be RS-232. Therefore, there is no COM4 output on the Field Termination Board.

NOTICE

The built-in keypad and LCD are offered as options for all standalone units of the Model 500 GC with a 2350A Controller, except for the portable Compact BTU / 2350A GC System.

This section only addresses using the GC Controller's built-in keypad and LCD. This section is organized as follows:

- Interface Components for Local Data Display and Entry
  - Light Emitting Diode (LED) Indicators
  - Liquid Crystal Display (LCD)
  - Keypad
- Logging On to View or Edit Data
  - First Time Log-On
  - Subsequent Log-On
  - Start / Halt an Auto Sequence Analysis
  - Editing Procedures
  - Validity Checks of Data Entries
- Local Display Menus
  - Main Menu
  - Hardware Menu
  - Operator Entries Menu
  - Alarms Menu
  - Chromatogram Menu
  - GC Control Menu
  - Data Records Menu
  - Config Rpt - Maint. Log Menu

4.1 INTERFACE COMPONENTS FOR LOCAL DATA DISPLAY AND ENTRY

The components for local data display and entry are the light emitting diode (LED) indicator lights, the liquid crystal display (LCD), and the built-in keypad.

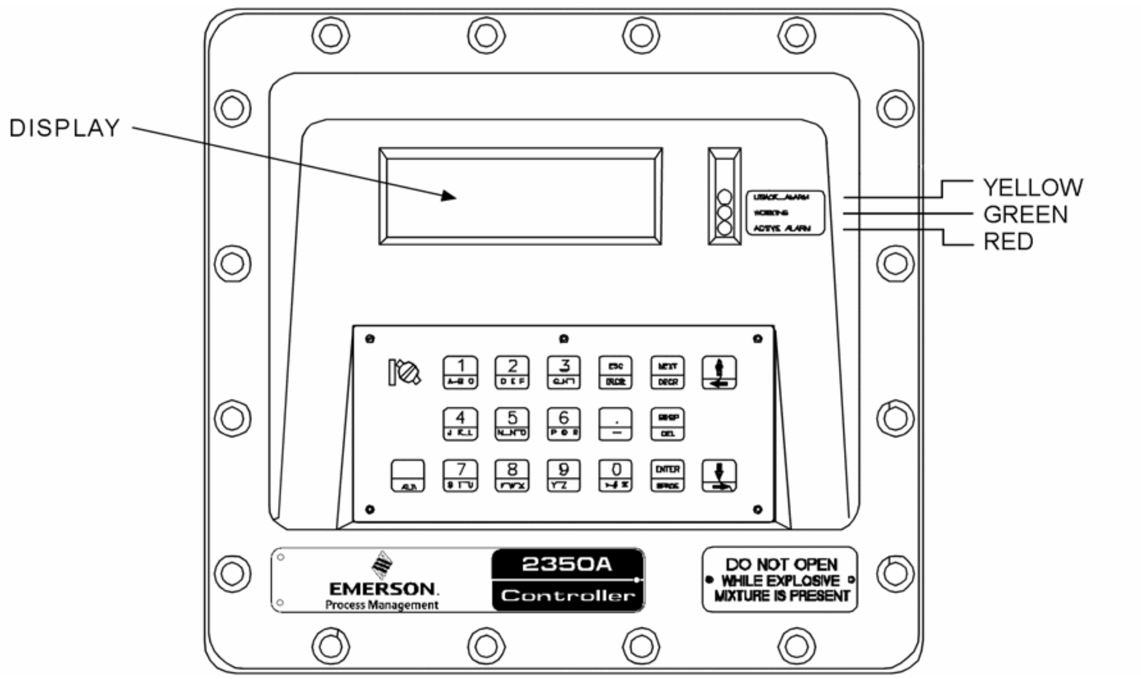


Figure 4-1. LED Lights, LCD, and Keypad for Local Data Display and Entry

4.1.1 Light Emitting Diode (Led) Indicators

There are three colored status indicators on the GC Controller that show the gross status of the total system. Table 4-1 summarizes the conditions indicated when these indicators are illuminated:

Table 4-1. Conditions Indicated by the GC Controller's LED Status Indicator Lights

YELLOW	The GC has an unacknowledged alarm(s).
GREEN	The Controller is currently running an analysis.
RED	The GC is in RUN mode, and has an out-of-tolerance or alarm condition that requires an operator action.

4.1.2 Liquid Crystal Display (LCD)

The LCD measures 5.5 x 2 inches and is capable of 64 by 256 resolution, with full graphics. It is certified for use with an explosion-proof NEMA 4X, Groups B, C, and D, enclosure. The display is capable of producing the complete alphabet and numbers from the keypad. The video display on the Controller may show a truncated (or curtailed) version of the displays available at the PC.

To adjust the contrast and backlighting of the screen *while logged out*:

Press these keys:

NEXT Key	Reset contrast and backlighting to default values
UP ARROW key	Increase contrast
DOWN ARROW key	Decrease contrast
LEFT ARROW key	Increase backlighting
RIGHT ARROW key	Decrease backlighting

To log out if the Main Menu screen is displayed: Press ESC.

4.1.3 Keypad

The front panel keypad on the Controller is arranged so that the most-used keys may be pressed directly. These are the numeric keys, the ESC, NEXT, BKSP, ENTER, period (.) and ( ) ( ) keys. The other keys are obtained by pressing ALT and the desired letter or symbol on the lower half of the key. For instance, to obtain capital A, press ALT while simultaneously pressing the A key. To obtain capital B, hold down ALT and press B twice. Although not shown on the keypad, the small letter b may be obtained by holding down ALT and pressing B five times. All letters of the alphabet may be obtained by similar actions. The other functions or symbols shown on the lower half of the keys are obtained similarly. The numerical keys, the period (.) the dash or minus (-) and the function keys are used to enter data values or to issue instructions to the Controller/Analyzer. (See Figure 4-2 and Table 4-2.)

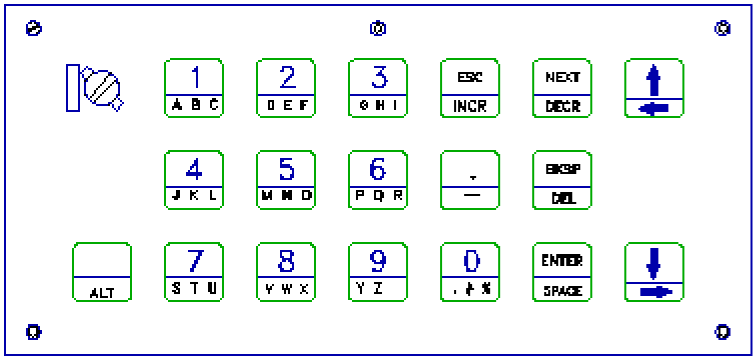


Figure 4-2. Local Site GC Controller Keypad

Table 4-2. Local Keypad Key Strokes and Their Functions

Numerals, Period (.) and Minus Sign (-)	For entering numeric data or function codes.
Enter (ENTER)	Log on to the menu and/or move to the next field, saving the current value. Inputs into memory any valid data shown on the alphanumeric display. If no data has been entered, ENTER causes a skip to the next field.
Escape (ESC)	Exits the current menu and saves the current values. A pop-up screen will ask if changes should be saved (YES or NO).
Up Arrow	Causes a move up one field and saves the current value.
Down Arrow	Causes a move down one field and saves the current value.
Left Arrow	Causes a move left one space and saves the current value.
Right Arrow	Causes a move right one space and saves the current value.
Next (NEXT)	Goes forward to next set of data; e.g., if stream 1 value set is displayed, go to data in stream 2. Also exits the current data set and saves the values.
Increment (INCR)	Adds an item to timed event (TEV) or component data (CDT) tables or used to page up in a list that covers more than one display (ALT and INCR keys).
Decrement (DECR)	Deletes an item from the (TEV) or (CDT) tables or used to page down in a list that covers more than one display (ALT and DECR keys).

Backspace (BKSP)	Deletes the character before the cursor position.
Delete (DEL)	Deletes the character at the cursor position (ALT and DEL keys).
Space (SPACE)	Adds a space or is used to toggle lists (ALT and SPACE keys).
Lower Function (ALT)	Shifts the keys marked with a lower function legend into normal mode for data entering/monitoring/operation requirements. Use by pressing ALT and the desired function key.
Alphabet	Press and hold ALT key with any desired letter of the alphabet. Upper case letters are entered by pressing 1, 2, or 3 times in order and lower case letters by pressing 4, 5, or 6 times in same order.

4.2 LOGGING ON TO VIEW OR EDIT DATA

4.2.1 First Time Log-On

To log on the first time, proceed as follows:

1. Press the ENTER key to display the login prompt.
2. Type in the letters for your username, then press the ENTER key.

NOTICE

VERY IMPORTANT. Each new Model 500 GC unit is shipped with one "Super-user" named EMERSON downloaded into its memory. Therefore, for the first log-on to a new GC unit, enter the USERNAME: EMERSON.

<u>To enter the username "EMERSON", do the following</u>:

1. Type in "E" by pressing and holding the  key, pressing the  key twice, then releasing the  key.

2. Type in "M" by pressing and holding down the ALT. key, pressing the 5 MNO key once, then releasing the ALT. key.

3. Type in "E" by pressing and holding down the ALT. key, pressing the 2 DEF key twice, then releasing the ALT. key.

4. Type in "R" by pressing and holding down the ALT. key, pressing the 6 PQR key three times, then releasing the ALT. key.

5. Type in "S" by pressing and holding down the ALT. key, pressing the 7 STU key once, then releasing the ALT. key.

6. Type in "O" by pressing and holding down the ALT. key, pressing the 5 MNO key three times, then releasing the ALT. key.

7. Type in "N" by pressing and holding down the ALT. key, pressing the 5 MNO key twice, then releasing the ALT. key.

4.2.2 Subsequent Log-On

For subsequent log-on, follow these steps:

1. If screen-saver mode is active (i.e., the screen's backlight is turned off and "Emerson" is written on the screen in various locations), then press any key on the keypad and wait 10 seconds for contrast and backlighting to take effect.

2. Press the ENTER key. A screen similar to the following should be displayed (see Figure 4-3).

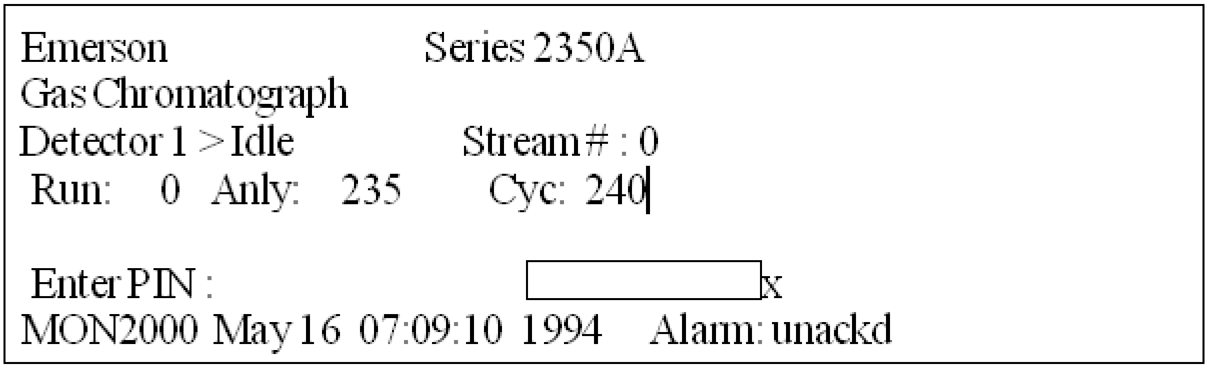


Figure 4-3. Press the ENTER key, then enter Username / PIN

NOTICE

If the "Enter PIN: x" prompt does not remain displayed after you pressed the ENTER key; press the ESC key, and then press the ENTER key again.

3. Enter your Username (and Personal Identification Number (PIN) if necessary), and then press the ENTER key. If you have a PIN number assigned, you only have to enter the PIN. This allows the Main Menu to be shown on the screen (see Section 4.3.1, “Main Menu” on page 14 for an illustration). The super-user assigns pin numbers and user read/write access permission from the MON2000 Software program.
4. From the Main Menu, press the number of the menu desired, or use the DOWN or UP ARROW keys to highlight the menu desired, then press the ENTER key.

4.2.3 Start / Halt an Auto Sequence Analysis

To start an auto sequence analysis, proceed as follows:

1. In the Main Menu screen, press the 5 key to select "GC Control."

2. In the GC Control submenu screen, press the 1 key to select "Auto."
3. At the "Auto Purge" prompt, either...
   (a) Press the ESC key to accept the default "Yes" option, or
   (b) Toggle the default "Yes" option to "No" by pressing the ALT+SPACE keys; then press the ESC key.

NOTICE

"Auto Purge" allows sample gas to flow through the sample loop for 60 seconds prior to the beginning of the first analysis cycle.

4. At the "Write Changes" prompt, press the ENTER key to accept the default "Yes" option. (Or, to return to the GC Control submenu without beginning an auto sequence analysis, press the ESC key.)
5. The green LED indicator will illuminate to show the GC is running an analysis.

To see the progress of analysis runs, press the ESC key to return to the Main Menu screen; then press the ESC key again to exit from operator control of the GC System. The status screen will appear, and next to the "RUN: " field, a number is displayed. The number increases periodically to indicate the seconds elapsed since the beginning of the current analysis run.

To halt ongoing analysis runs, proceed as follows:

1. In the GC Control submenu, press the 4 key to select "Halt."
2. At the "Halt - Write Changes" prompt, press the ENTER key. (Or, to return to the GC Control submenu without halting analysis runs, press the ESC key.)

When analysis runs are halted at the end of the current analysis cycle, the green LED indicator will no longer be illuminated.

NOTICE

If you choose "Stop Now", instead of "Halt", it forces the system to an immediate idle. This may allow components to continue to elute from the columns. Therefore, it is recommended you choose "Halt" instead of "Stop Now." A "Halt" command stops analysis runs after the current run is finished.

4.2.4 Editing Procedures

For editing, follow these guidelines:

Move through menu items or data fields	Scroll through the menu sequence to the desired data by pressing ENTER after each correct or unchanged term or value. Also use direction arrows. Pressing ENTER without first entering data causes the Controller to skip to the next item.
View off screen menu items	The menu displays eight lines. Use the DOWN ARROW key to move to a submenu below the last item shown on a menu when necessary.
Go to a particular menu item	To get into a particular menu, scroll down to the menu and press ENTER or press the number of the menu. The menus work like a tree with the submenus branching for their particular functions.
Return to initial screen	Exit the editing procedure and save your changes by pressing the ESC key as many times as necessary to return to the initial screen.
Save changes	After editing changes are completed, press the ENTER or ESC key. The query "Write Changes ?" will appear. • Toggle the SPACE key to answer yes or no. • Press the ESC key to save any parameter changes and return to the preceding menu. • Press ENTER to save a changed or new item and move to the next item on a menu.

Correct a mistake	If the wrong numeric key has been pressed during insertions, press the BKSP key to back up and delete the item, then enter the new value. Move the cursor to an item and press the DEL key to delete an item.
Enter data for multiple streams	After entering an item, for example on stream one, press NEXT to save the item and skip to the next sequence (stream two).
Make time entries	All time entries are in seconds to the nearest 1/10 second.
Stop analysis runs	Press 5 (GC Control) and then 4 (HALT) to stop after the present run.
NOTICE **Never edit the program during an analysis run from which data is to be used. Editing may cause analysis errors for that particular run. Also, do not attempt to edit or stop the Controller during a calibration sequence. Calibration errors may result.**	
Get out of screen saver mode	To get out of the screen saver mode, press any key on the keypad. (No keys pressed during one hour will activate screen saver mode.)
Match entered data with Data ID Tag	When entering data, a data identification tag will appear to the right of the data box on the display to indicate the type of entry expected. (For details, see Section 4.2.4, “Editing Procedures” on page 10.)
Change "Yes" prompt to "No"	Press the ALT+SPACE keys. The ALT+SPACE key combination is used to toggle lists.

4.2.5 Validity Checks of Data Entries

The GC Controller compares each operator entry with preprogrammed range and format requirements. The Controller does not allow an unacceptable parameter to be entered, such as an entry that is out of range or has wrong units (e.g., a letter instead of a number).

If an unacceptable parameter has been entered, enter a new or valid parameter. Valid parameters are normally established as part of the application software. The range requirements are described as part of the individual parameter description.

Data identification tags will appear to the right of any data box on the display to indicate the type of entry expected. These identification tags will help you make valid entries.

Data identification tags, and the corresponding valid entries, are as follows:

s = string (size limited to 12-digit insertions)

b = byte

I = integer (limited to numbers)

l = long (4-byte integer)

f = float (4-byte floating point number)

d = double (8-byte floating point number)

t = toggle (switch from one entry to another with SPACE)

m = time

q = sequence (stream series)

x = text (multiple letters/digits)

= none (none=edit field)

4.3 LOCAL DISPLAY MENUS

The local display Main Menu has seven items listed, each of which branches into another menu. This is illustrated below in the menu tree diagram, Figure 4-4, and explained further in the sections that follow. Refer to MON2000 Software for Gas Chromatographs User Manual, P/N 3-9000-522 for detailed information regarding the commands and functions that follow.

Main Menu	
1 Hardware	1 Streams
	2 Analog Inputs
	3 Analog Outputs
	4 Discrete Inputs
	5 Discrete Outputs
	6 Valves
	7 Current GRI Values
2 Operator Entries	1 Components
	2 Timed Events
	3 Analysis/Cycle Time
	4 System
	5 Calculation Control
	6 User Defined
3 Alarms	1 Limit Alarms
	2 Discrete Alarms
	3 Active Alarms
	4 Unackd Alarms
4 Chromatogram	1 Live
5 GC Control	1 Auto
	2 Single Stream
	3 Calibration
	4 Halt
	5 Stop Now

6 Data Records	1 Raw Data
	2 Raw Data 2
	3 Raw Data 3
	4 Analysis
	5 Cal Results
	6 Stream Data
7 Config Rpt - Maint. Log	1 Reports
	2 PC Config. Report
	3 Maintenance Log

Figure 4-4. Menu Tree for Local GC Controller Keypad and Display.

4.3.1 Main Menu

The Main Menu serves as the entry point into all submenus below it.

Main Menu

1	Hardware
2	Operator Entries
3	Alarms
4	Chromatogram
5	GC Control
6	Data Records
7	Config Rpt-Maint. Log

4.3.2 Hardware Menu

The various submenus of the HARDWARE menu allow an operator to define the stream functions, analog inputs/outputs, discrete inputs/outputs, adjust the scales and range of the inputs/outputs (within limits), set the valves, and view the Gain Ratio Indicators (GRI) from the Analyzer.

Hardware

1	Streams
2	Analog Inputs
3	Analog Outputs
4	Discrete Inputs
5	Discrete Outputs
6	Valves
7	Current GRI Values

4.3.3 Operator Entries Menu

The submenus of the OPERATOR ENTRIES menu enable an operator to adjust and refine the entries normally specified in the application as it leaves the factory. Modifications may be made in entries from the Component Data Table (CDT), Retention Times (RT), Response Factors (RF), etc. for various components and streams. These submenus may be used to adjust or define timed events, analysis and cycle times for sample streams, designate system names and define the calculations desired. Names or labels can be specified for data that may be desired for the various reports. These submenus allow the operator to refine and customize the applications for the desired usage.

Operator Entries

1	Component Data
2	Timed Events
3	Analysis/Cycle Times
4	System
5	Calculation Control
6	User Defined

4.3.4 Alarms Menu

The ALARMS menu allows the operator to view, set limits and respond to various alarms.

Alarms

1	Limit Alarms
2	Discrete Alarms
3	Active Alarms
4	Unackd Alarms

4.3.5 Chromatogram Menu

The CHROMATOGRAM menu allows the operator to view a live chromatogram while the GC System is conducting analysis runs.

Chromatogram

1	Live

4.3.6 GC Control Menu

The GC CONTROL menu enables the operator to stop, calibrate, or place on automatic control a sample stream from the Analyzer. This may occur a number of times while modifying inputs in the OPERATOR INPUTS menu. Entering "HALT" will allow the Analyzer to finish the presently running operating sequence. Entering "STOP NOW" orders the Analyzer to stop immediately and may require that some parameters be reentered. In most cases the GC Control menu will operate in the "AUTO" mode.

GC Control

1	Auto
2	Single Stream
3	Calibration
4	Halt

GC Control

5	Stop Now

4.3.7 Data Records Menu

The DATA RECORDS submenu will be particularly helpful to maintenance personnel when a problem occurs in one or more of the streams. A view of the Raw Data or Analysis Reports can help in isolating or indicating areas that may need maintenance attention. Saved periodic historical reports will allow maintenance personnel to review the operation of the GC System and often head off incipient problems.

Data Records

1	Raw Data
2	Raw Data 2
3	Raw Data 3
4	Analysis
5	Cal Results
6	Stream Data

4.3.8 Config Rpt - Maint. Log Menu

The MAINTENANCE LOG menu allows the operator or maintenance personnel to view historical maintenance actions, add any pertinent maintenance entries into the log, and or change entries as necessary. The PC Config Report requests the control to output a config report. The report will be printed on the Controller's printer.

Maintenance Log

1	Reports
2	PC Config. Report
3	Maintenance Log

This page is intentionally left blank.

MAINTENANCE

This section provides instructions and checklists for maintaining or repairing the Model 500 Analyzer System. This section is organized as follows:

- Troubleshooting and Repair Concept
- Routine Maintenance
  - Model 500 Analyzer Maintenance Checklist
  - Routine Maintenance Procedures
  - Contract Service
- Locating and Gaining Access to Equipment Elements
  - Analyzer Electrical / Electronic Units
  - Detector Elements, Heater Elements, Valves and Columns
- Precautions for Handling Printed Circuit Assemblies
- Service, Troubleshooting, and Repair Instructions
  - Preamplifier
  - Temperature Control
  - Decoder
  - Analyzer Troubleshooting Guide
  - Chromatograph Valves
  - Detector Bridge Balance
  - Temperature Measurements
  - Measure Vent Flow (MV)
  - Analog Inputs
- GC Controller Maintenance

  GC Controller Access
- Communications

  GC Controller Address Change

- Analog Inputs and Outputs
  - Analog Output Dialog Description
  - Changing a Variable
  - Changing the Bargraph
  - Performing a 2350A Manual Calibration
  - Performing a 2350A Automated Calibration
  - Analog Loopback Test Circuits
  - Upgrading Analog Outputs
- Discrete Digital Inputs and Outputs

  Digital Loopback Test Circuit
- Fuse Protection
- Analyzer-Controller Interconnect

  Function Codes

5.1 TROUBLESHOOTING AND REPAIR CONCEPT

The most efficient method for maintaining (repairing) the Model 500 Analyzer System is based on a unit-replacement concept that permits returning 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 elements are then either repaired in the field by reference to the applicable instructions or returned to Emerson, for repair or replacement.

5.2 ROUTINE MAINTENANCE

The Model 500 Analyzer System will perform accurately for long periods with very little attention. However a bi-monthly record of certain parameters will assist greatly in assuring that your Analyzer is operating to specifications. The Model 500 Maintenance Checklist should be filled in bi-monthly, dated, and kept on file for access by maintenance technicians as necessary. See next page. This gives you a historical record of the operation of your Analyzer, 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 Analyzer. The chromatogram and reports will also prove valuable in comparison with the chromatograms and reports run during troubleshooting.

Copy the Model 500 Maintenance Checklist (next page) as necessary for your files. If you have a problem, please complete the checklist and reports, and have the results available when calling Rosemount Customer Care with a problem. Also have the Sales Order number when calling. The Sales Order number can be found on the corner of the upper electronics housing of the Analyzer. The chromatograms and reports archived when your Analyzer left the factory are filed by this number (i.e. "HE-xxxxx") or
(XXXXX). Two numbers may be found. Record both. One is the sales order number. The other is the serial number.

5.2.1 Model 500 Maintenance Checklist

Date Performed: ____________________ **Sales Order Number: HE-**____________

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
	(2)___ cc/min	____cc/min	40-60 cc
	(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

5.2.2 Routine Maintenance Procedures

1. Complete the Model 500 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.
2. Save a Chromatogram of the operating Analyzer on the PC with MON2000. Print configuration, calibration, and raw data reports and file them with the Maintenance Checklist. Also, upload the current application to the PC with MON2000.
3. Check the printer paper roll (if used) to ensure that a sufficient supply of paper remains. Check carrier and calibration gas supplies.
4. There is no routine maintenance to be performed on the GC Controller.

5.2.3 Contract Service

Emerson offers maintenance (service) programs that are tailored to fit specific requirements. Contracts for service and repair can be arranged by contacting the Rosemount Customer Care at the address or telephone number on the Customer Repair Report at the back of this manual. There are also contact numbers and information available via: www.emerson.com/en-us/catalog/automation-solutions/measurement-instrumentation.

5.3 LOCATING AND GAINING ACCESS TO EQUIPMENT ELEMENTS

5.3.1 Analyzer Electrical/Electronic Units

The electrical/electronic units of the Analyzer, except for the detector and heater elements, are located in the upper and lower explosion-proof housings of the Analyzer and are fully accessible from the front of the unit. Printed circuit assemblies are contained inside an explosion-proof housing, accessible by removing a threaded cover plate from the housing front. See Figure 5-1.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

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 observe all safety precautions could result in serious injury or death.

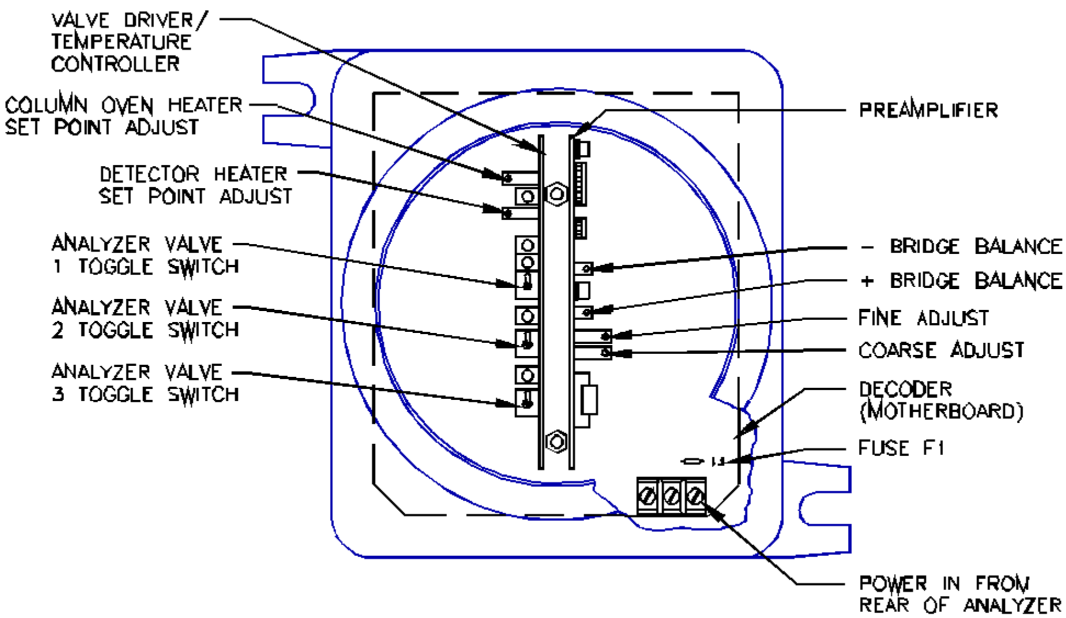


Figure 5-1. Upper Explosion-Proof Housing Electrical Components

The following circuit assemblies are located inside the upper explosion-proof housing:

- Temperature controller/valve-driver printed circuit assembly (on the left side of the housing)
- The preamplifier printed circuit assembly (on the right side of the housing)
- Decoder control printed circuit assembly, which is reached by unplugging the temperature controller/valve-driver and the preamplifier printed circuit assembly.

5.3.2 Detector Elements, Heater Elements, Valves and Columns

The detector elements, heater elements, valves and columns are located in the upper section of the Analyzer. To gain access to these components remove the gray insulation.

- The detector elements are located in the upper explosion-proof housing in front of the heater block. To gain access to the detector elements, remove the threaded cover plate.
- The heater elements are inserted in the bottom of the heater block.
- The columns are located inside the top of the block. To gain access to the columns remove the top cover plate.

5.4 PRECAUTIONS FOR HANDLING PRINTED CIRCUIT 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 500 Analyzer printed circuit assemblies or the GC Controller 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.

5.5 SERVICE, TROUBLESHOOTING, AND REPAIR INSTRUCTIONS

This section contains service, troubleshooting, and repair information for the Analyzer. The information is arranged as appropriate either by major subsystems or by major functions of the instrument. Table 5-1 refers you to more frequent possible causes for the hardware alarms.

NOTICE

Correct ALL alarms before recalibrating.

Table 5-1. Alarms and Possible Causes

	ALARMS	POSSIBLE CAUSE(S)
1.	Application Checksum Failure	Disk on Chip.
2.	ROM Checksum Failure	Disk on Chip.
3.	RAM Diagnostics Failure	Bad RAM.
4.	Preamp Input 1 Out of Range	Carrier gas gone; air not purged from carrier lines; power failure; bad thermistors; preamp out of balance or failed; Analyzer temperature; interconnection wiring; control; power supplies.
5.	Preamp Input 2 Out of Range	Same as number 4.
6.	Preamp Input 3 Out of Range	Same as number 4.
7.	Preamp Input 4 Out of Range	Same as number 4.
8.	Preamp Failure	Same as number 4.
9.	Analog Output 1 High	Measured value program for output #1 greater than operator defined full scale range.
10.	Analog Output 2 High	Same as number 9.
11.	Analog Output 3 High	Same as number 9.
12.	Analog Output 4 High	Same as number 9.
13.	Analog Output 5 High	Same as number 9.

	ALARMS	POSSIBLE CAUSE(S)
14.	Analog Output 6 High	Same as number 9.
15.	Analog Output 7 High	Same as number 9.
16.	Analog Output 8 High	Same as number 9.
17.	Analog Output 9 High	Same as number 9.
18.	Analog Output 10 High	Same as number 9.
19.	Analog Output 1 Low	Measured value program for output lower than operator specified zero range.
20.	Analog Output 2 Low	Same as number 19.
21.	Analog Output 3 Low	Same as number 19.
22.	Analog Output 4 Low	Same as number 19.
23.	Analog Output 5 Low	Same as number 19.
24.	Analog Output 6 Low	Same as number 19.
25.	Analog Output 7 Low	Same as number 19.
26.	Analog Output 8 Low	Same as number 19.
27.	Analog Output 9 Low	Same as number 19.
28.	Analog Output 10 Low	Same as number 19.
29.	Analyzer Failure	Carrier gas low (below 105 PSIG at Carrier Gas bottle) or gone/ bad solenoid/ carrier gas leak in system.
30.	Power Failure	The GC Controller has experienced a re-start since alarms were last cleared, caused by power failure. Automatically starts in RUN mode and runs Cal gas until it identifies all retention times or a maximum of two hours before switching to line gas.
31.	Fused Peak Overflow - Noisy Baseline	Air not purged from carrier lines; bad thermistors; preamp out of balance or failed.
32.	RF % Deviation	Calibration gas low or out; valve timing error; faulty auto-calibration solenoid.
33.	Warm Start Calibration fails	Same as number 32.

5.5.1 Preamplifier

The preamplifier has no parts that may be serviced in the field. If the unit fails, return it to Rosemount Customer Care for repair or replacement.

5.5.2 Temperature Control

The temperature control circuitry is not field serviceable. If the board fails, return the board to Rosemount Customer Care for repair or replacement. If a replacement temperature board is installed, temperature set points must be re-calibrated. See Section 5.5.7, "Temperature Measurements" on page 25.

5.5.3 Decoder

Fuse Replacement

The Decoder board is protected by a 3A, 120VAC Picofuse, which is installed in-line on the neutral, A-C connection to the board. The fuse is located above the power strip in the lower right corner of the Decoder board and is replaced by unsoldering the bad fuse from the printed circuit board (PCB) and installing a new fuse. Use a low power soldering iron.

Instructions for Removing the Decoder Board

⚠ WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

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 observe all safety precautions could result in serious injury or death.

<u>To remove the Decoder Board from the upper explosion-proof housing, proceed as follows</u>:

1. Disconnect the Analyzer 120VAC power source.
2. Loosen two screws securing the round Analyzer electronics faceplate, and remove the faceplate.
3. Pull the two printed circuit board assemblies out of the electronics housing. Pull firmly, making sure that the wiring harness does not catch on the top of either card. Place each card in an anti-static protection bag.
4. Unscrew the two nylon spacers to which the faceplate was mounted.
5. Disconnect the three power leads from the terminal strip (TB1) in the lower right corner of the Decoder board.
6. Disconnect the brown connectors at the top. Grasp each connector by its top and bottom side, and depress to release the hold-down catch. Only a small pressure is required, but the connector must be fully engaged for the latch to release. Pull the connector with a left/right, up/down motion until it disengages. A screwdriver will help in depressing the top catch.
7. Release the four captive screws holding the board in the rear of the electronics housing.
8. Pull the card forward to release it from the two studs near the center top and bottom of the board.
9. Remove the board, maintaining the wire bundles in the center top and bottom of the electronics housing opening. Pull the lower end of the board out through the opening while pushing the top end of the board into the top rear of the housing. The card guides are mounted so that they can flex sideways during board removal.

Instructions for Reinstalling the Decoder Board

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

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 observe all safety precautions could result in serious injury or death.

To replace the Decoder Board, proceed as follows:

1. Pull the power and interconnect cables out of the front center of the housing.
2. Insert the board into the housing. Push the end with short guides into the top rear, and hold the interconnect cable down while the board is maneuvered into the housing.
3. Push the top cable into the top of the housing. Then position the board so it can be held in place by its four captive screws at the board's four corners.
4. Tighten the four captive screws to secure the board in place.
5. Attach the wires and plugs that were disconnected while removing the Decoder board.
6. Mount the two nylon spacers on the mounting studs near the center top and bottom of the Decoder board.
7. Reinstall the two printed circuit boards, such that the component sides of the boards face outward, left and right (see Figure 5-1). The temperature controller/valve drive board is in the left slot and the preamp is in the right slot.
8. Replace the housing faceplate, making sure that the switch shoulders are inside the locating holes.

5.5.4 Analyzer Troubleshooting Guide

A process 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 Analyzer Maintenance Checklist. 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. Table 5-2 is a Troubleshooting Checklist to obtain data for a problem diagnosis. This data will be useful if it becomes necessary to call the Rosemount Customer Care for assistance.

Flow Balance Check

1. Ensure that the flow panel gauge is reading properly. Refer to the Analyzer Maintenance Checklist for values. Do not adjust; check with Rosemount Customer Care if your reading is abnormal.
2. Check flow at the measure vent and sample vent (see Troubleshooting Checklist).

Temperature

Ensure that the temperature is constant in both the Analyzer and Sample Conditioning System (SCS) oven, if an oven is used (refer to Section 5.5.7, "Temperature Measurements" on page 25).

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 no sample is 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 valve sealing diaphragms by foreign matter
- Improperly adjusted flows
- Leaks in the carrier system
- Column deterioration due to liquid contamination from a sample
- Misidentifying 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 checking for leaks, perform the Detector Bridge Balance procedure before replacing the detector thermistors or the preamplifier board.

Table 5-2. Analyzer Troubleshooting Checklist

	AS FOUND	AS LEFT	NOMINAL
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 (see par. 5.5.6)	_____ mV	_____ mV	0 ±0.5 mV
SAMPLE SYSTEM Leak check with SNOOP® from sample probe to sample solenoid.			
MODEL 500 INPUTS			

GC	GRI	PAZ (12-bit AD)	Value (12-bit AD)	PAZ (16-bit AD)	Value (16-bit AD)
1	0.0 to 0.0	600 to 800	0 to 4095	4800 to 6400	-32767 to 32767
2	0.8 to 1.1	600 to 800	0 to 4095	4800 to 6400	-32767 to 32767
3	0.8 to 1.1	600 to 800	0 to 4095	4800 to 6400	-32767 to 32767
4	0.8 to 1.1	1150 to 1500	0 to 4095	9200 to 12000	-32767 to 32767

	AS FOUND	AS LEFT	NOMINAL
ANALYZER POWER SUPPLY TB4: Terminals (+20V) 24 (common) 25 (20 Volts), and (- 20V) 26 (+20 Volts) (+20V) (- 20V)	___ Volts ___ Volts ___ mV AC ___ mV AC		+20.0 ±.5V -20.0 ±.5 V 0.0 ±40 mV 0.0 ±40 mV
CHROMATOGRAM Check baseline Check component values on report Number of peaks Retention times Date and file			

	AS FOUND	AS LEFT	NOMINAL
TEMPERATURE (see par. 5.5.7)			
Detector Temperature Thermocouple Wire #1 (Type J)	°C or ____ mV	°C or ____ mV	75 °C
Heater Block Temperature Thermocouple Wire #2 (Type J)	°C or ____ mV	°C or ____ mV	75 °C
Sample System Temperature (if applicable)	°C	°C	*
MEASURE VENT FLOW (see par. 5.5.8)			
Analyzer Valve 3 ON	___ cc/min	___ cc/min	12-18 cc/min
Analyzer Valve 3 OFF	___ cc/min	___ cc/min	

*Refer to System Operational Parameters

Leak-Checking the Analyzer

To perform a field-service leak check of the Analyzer, follow these steps:

1. Plug all Analyzer vents.
2. Make sure the setting of the carrier gas cylinder regulator is 115 pounds per square inch, gauge (psig).
3. Check all fittings at the pressure regulator flow panel and at the carrier gas cylinder regulator with a leak detector. Correct any leaks detected by a bubble indication.
4. Turn the carrier gas cylinder shut-off valve clockwise to close. Observe the carrier gas 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 gas pressure remains constant, no leaks are present.
5. Actuate the VALVE ON/OFF switches and observe the pressure with the valves in different positions than in step (4). (When the valves are

switched, some pressure change is normal because of carrier loss. Momentarily open cylinder valve to restore pressure if necessary.)

6. If the pressure does not hold constant, check all valve fittings for tightness.
7. Repeat step (5) again. If leaks persist, check the valve ports with a commercial Helium leak detector. Do not use a liquid leak detector on the valves or components in the upper Analyzer oven (within the black insulated cover).

To perform a factory-level leak check of the Analyzer, follow these steps:

NOTICE

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

1. Plug the Measure Vent (labeled "MV") vent line. (The "SV", or Sample Vent line should be left open, or unplugged.)
2. Access the upper explosion-proof box (XJT) of the Analyzer so that you will be able to manually operate the analyzer valve switches located on the switch panel inside the box.

   (a) See Figure 5-2 for an illustration of the Analyzer XJT box locations.

(b) See Figure 5-3 for an illustration of the Analyzer Valve Switches, upper XJT.

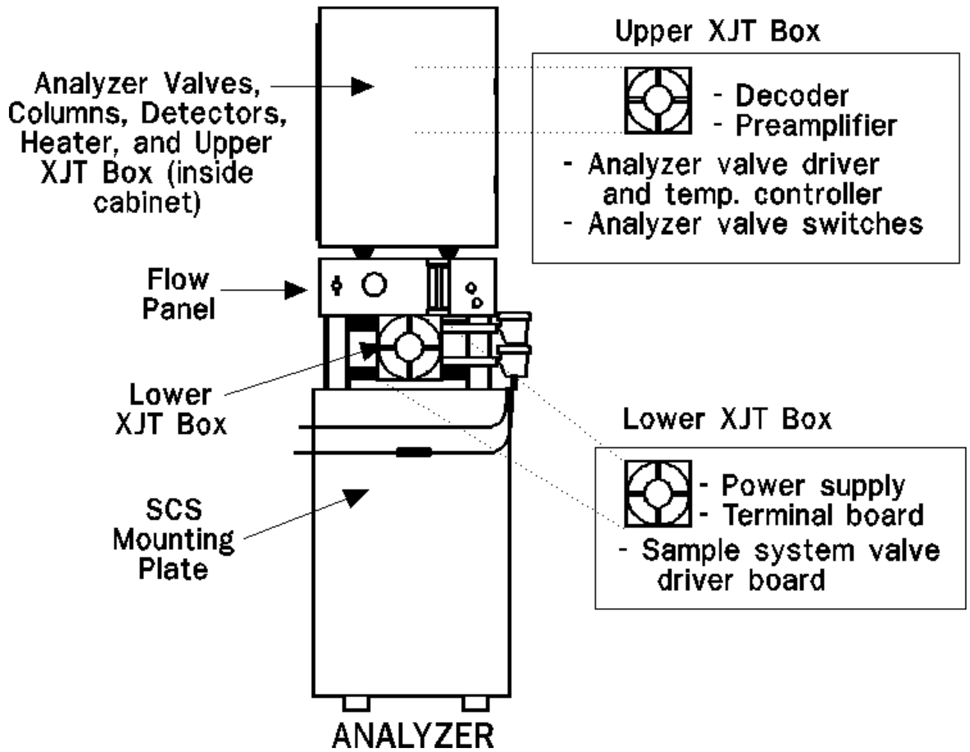


Figure 5-2. Location of Analyzer XJT Boxes

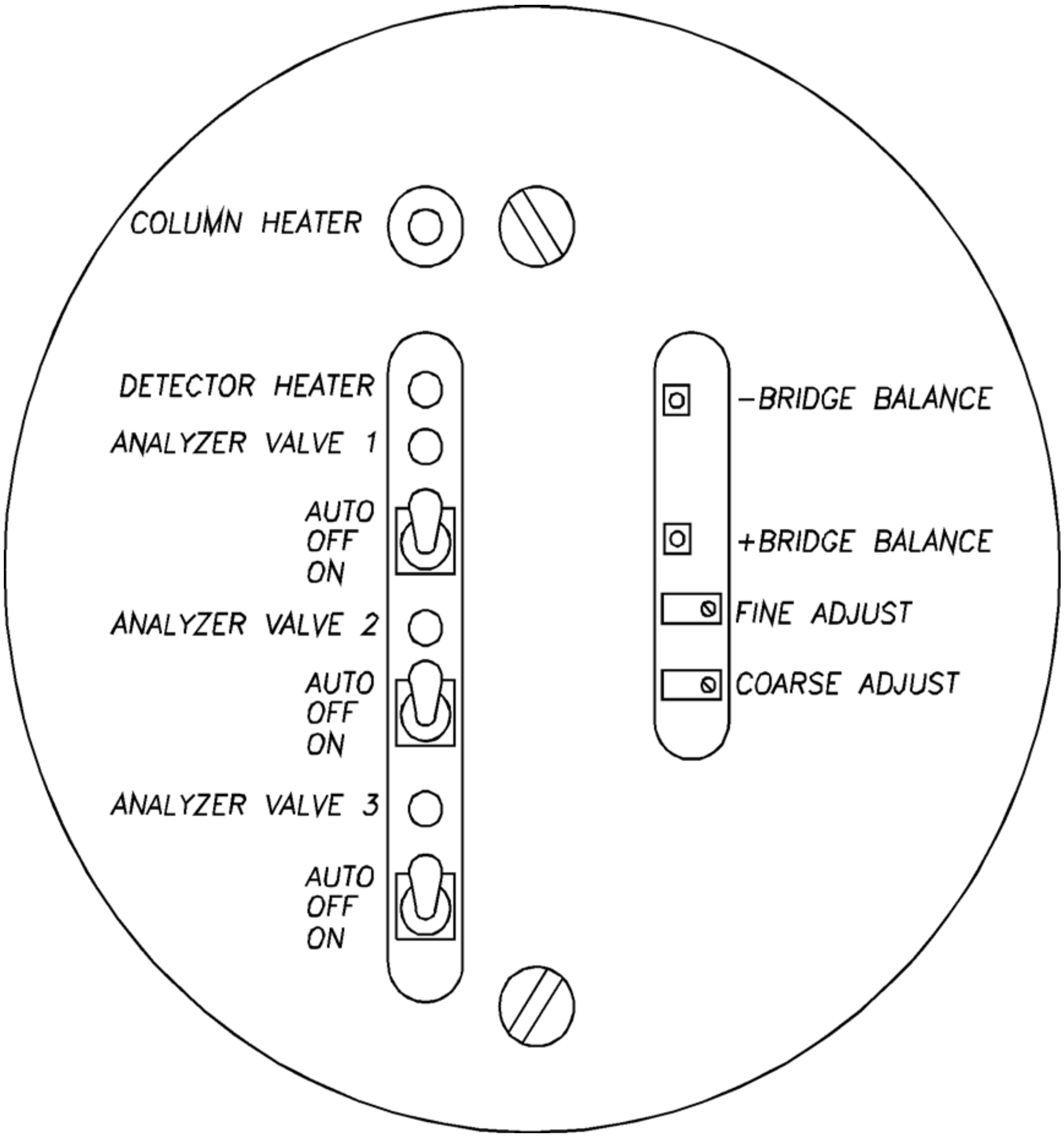


Figure 5-3. Analyzer Valve Switches, Upper XJT

Leak check the carrier gas line first, according to the steps that follow:

1. Purge the Analyzer Valves with carrier gas, as follows:

   (a) Open the carrier gas bottle valve and slowly increase the carrier gas feed line pressure to 115 pounds per square inch gauge (psig), ±2%, with the dual-stage regulator at the carrier gas bottle.

   NOTICE

   Do not use the "Carrier Pressure Adjust" valve (on the Flow Panel of the Analyzer) to adjust carrier gas line pressure. That valve is factory-set and should not be adjusted.

   (b) Toggle each Analyzer Valve switch to OFF and ON positions about four to five times (Analyzer Valve switches are in upper XJT box).

2. Pressurize and check the carrier gas (helium) feed line, as follows:

   (a) Set all Analyzer Valve switches to the ON position.

   (b) Open the carrier gas bottle valve, and ensure that the carrier gas feed line pressure is 110 pounds per square inch gauge (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 during a period of 2-3 minutes.

   (e) Set all Analyzer Valve switches to the OFF position.

   (f) Repeat steps (4)(b) through (4)(d)

   (g) Set all Analyzer Valve switches to the AUTO position for regular operation.

3. This completes the carrier gas line leak check. Next, leak check the calibration gas feed line, according to the steps that follow.

4. Plug the Sample Vent (labeled "SV") vent line.

5. Pressurize the calibration gas line to 50 psig.

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.

(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 during a period of 2-3 minutes.

6. This completes the calibration gas line leak check. **Next, leak check the sample gas lines, according to the steps that follow**.
7. Plug the "SV" vent line (it may already be plugged if you performed steps (5) through (7), above, to leak-check the calibration gas line).
8. Pressurize the sample gas line to 50 psig or a known pressure.

NOTICE

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

(a) Shut off the sample gas.

(b) 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 2-3 minutes.

9. Leak test all other sample stream lines by connecting gas to each of the sample streams and repeating steps (9) through (10)(b).

10. **Finish the test and set up the Analyzer for normal operation, as follows**:
    (a) Ensure that all Analyzer Valve switches, upper XJT box, are set to the AUTO position.
    (b) Unplug, or open the "MV" and "SV" vent lines.
    (c) 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 SCS mounting plate, and reconnect the sample stream lines.

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, that is, de-energize.
- A combination of solid and dashed lines indicates a constant flow path regardless of the ON/OFF state of the valve.

5.5.5 Chromatograph Valves

Valve Cleaning

A sonic cleaner is ideal for valve cleaning. However, for field service purposes, electrical contact cleaner also works well. DO NOT USE AN OIL BASE CLEANER.

Valve Overhaul

The chromatograph valve is designed to withstand millions of actuation cycles without leakage or failure. If service is required, the valve can be overhauled using a standard kit of replacement parts available from Rosemount Customer Care.

The following are procedures for overhauling the valve using a Rebuild Kit from Rosemount Customer Care. A torque wrench scaled in foot-pounds is required.

Valve Overhaul Instructions

To overhaul the Chromatograph valve, follow these steps and refer to drawing CE-20234 in the Analyzer drawings addendum of this manual:

1. Remove the malfunctioning valve from the Analyzer. Secure the valve in a vise, clamping only at the baseplate.
2. Loosen the torque bolt by turning counterclockwise.
3. Remove the entire valve from the vise and prepare for disassembly in a clean area.
4. Remove the torque bolt and disassemble the valve starting with the primary plate.
5. Carefully slide the remaining portion of the valve from the mounting fixture.
6. Inspect each valve piece for obvious debris, scratches or contamination and clean as required with sonic cleaner or electrical contact cleaner. DO NOT USE AN OIL BASE CLEANER. After cleaning, blow clean dry instrument air or Helium through the valve ports.
7. Discard the old valve diaphragms. Replace the old valve diaphragms with the new diaphragms in the valve repair kit.
8. Re-assemble the valve by following the instructions in drawing CE-20234.

5.5.6 Detector Bridge Balance

The following procedure should be carried out if the Analyzer does not produce a chromatogram.

To perform a detector bridge balance, follow these steps:

1. Halt any ongoing analyses. Using the MON2000 Software program, select the "Control" submenu from the Main Menu screen. Then, from the "Control" submenu, press "H" to Halt. MON2000 will ask you if

you want to Halt the Analysis. Select "Yes," and press the ENTER key.

2. Remove the cover of the upper explosion-proof enclosure on the Analyzer.
3. Refer to Figure 5-4, and 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).
4. Check the detector bridge voltage. The voltage should read 0 millivolts (mV) ±0.5mV. Adjust the coarse and fine potentiometers immediately beneath the test points to obtain the specified reading.

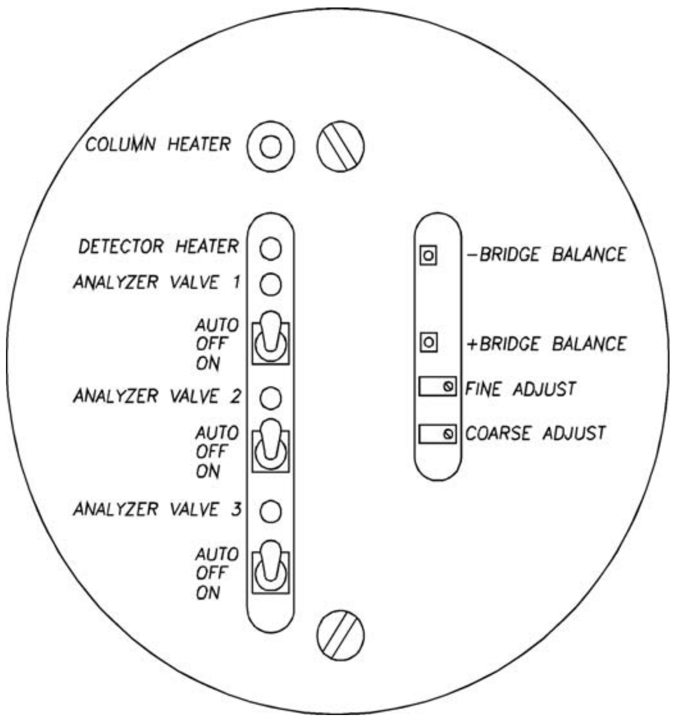


Figure 5-4. Analyzer Detector Bridge Balance Locations

5.5.7 Temperature Measurements

To measure the Detector and Heater Block temperatures, you will need a Fluke Model 51 K/J thermometer or equivalent.

To measure Detector and Heater Block temperatures, proceed as follows:

1. Unscrew the Condulet cover of the lower explosion-proof (XJT) housing.
2. Next, loosen and remove the four two thumb screws that hold the Valve Driver board.
3. Carefully edge the Valve Driver board off the holding screws. Do not disconnect the Valve Driver board from the cable; merely let the board rest face down, secured by the cable.
4. Locate the two Type J thermocouples. They are in the left side of the housing and are marked #1 (Detector) and #2 (Heater Block). (See Figure 5-5.)

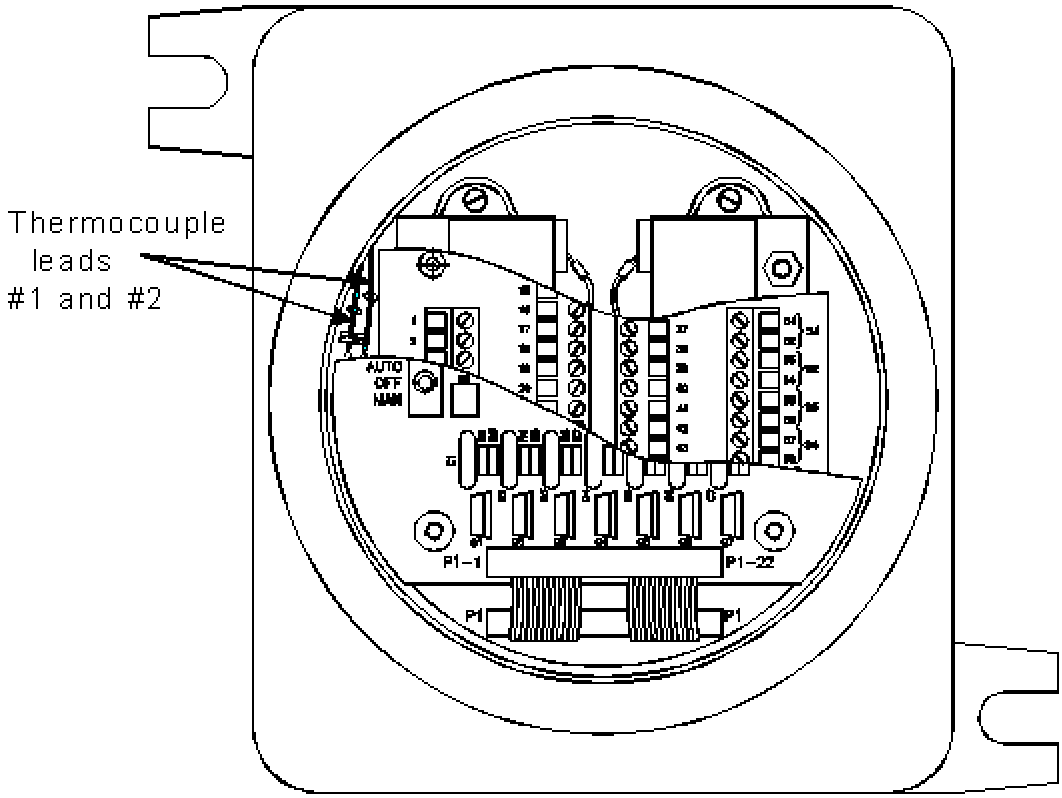


Figure 5-5. Thermocouple Leads in Lower Explosion-Proof Housing

5. Set the thermometer for a "J" reading, then insert the ends of the two wires marked #1, and measure their temperature. Repeat with wire #2.

   (a) The column heater temperatures should be 80±3 °C. The detector heater reading will be 5 degrees cooler than the column heater with a wider temperature range fluctuation.

   (b) Do NOT try to adjust these temperatures without consulting Rosemount Customer Care. The temperature control board is not field serviceable.

   (c) If you determine that the temperature control board is bad, return it to Rosemount Customer Care for replacement.

6. Replace the Valve Driver board and the Condulet cover removed in steps (1) through (3).

5.5.8 Measure Vent Flow (MV)

You will need an accurate flow meter (Alltech Digital Flow Check™ Flowmeter or equivalent) for this measurement.

To measure the MV vent flow, proceed as follows:

1. Attach a flow meter to the vent output on the left side of the Analyzer marked "MV".
2. The flow should measure 12-18 cc/min.

5.5.9 Analog Inputs

The analog inputs available to the GC Controller from the Model 500 Analyzer and external analyzers are shown in the following tables. (See also, drawing DE-20782 in Addendum 2, GC Controller Drawings, this manual.)

Table 5-3. Analog Inputs to GC Controller (from Analyzer)

Board Acronyms: Terminal Board for Field Wiring at Controller (TB)		
DETECTOR/PREAMPLIFIER SIGNAL OUTPUTS from ANALYZER		
TB, J18, Terminal 11		common
TB, J18, Terminal 1	4-20 mA	Gain channel 1 (8x1)
	Measure between terminals 1(+) and 2( ), at TB, J18	
TB, J18, Terminal 4	4-20 mA	Gain channel 2 (8x4)
	Measure between terminals 4(+) and 5( ), at TB, J18	
TB, J18, Terminal 7	4-20 mA	Gain channel 3 (8x32)
	Measure between terminals 7(+) and 8( ), at TB, J18	
TB, J18, Terminal 10	4-20 mA	Gain channel 4 (8x256)
	Measure between terminals 10(+) and 11( ), at TB, J18	

Table 5-4. Analog Inputs to GC Controller (from User Devices)

Board Acronyms: Terminal Board for Field Wiring at Controller (TB)		
TB, J12, Terminals 1,2,3	4-20 mA, common, shield	Analog-in 1
TB, J12, Terminals 4,5,6	4-20 mA, common, shield	Analog-in 2
TB, J12, Terminals 7,8,9	4-20 mA, common, shield	Analog-in 3
TB, J12, Terminals 10,11,12	4-20 mA, common, shield	Analog-in 4

5.6 GC CONTROLLER MAINTENANCE

The GC Controller is designed to operate for long periods of time without need for preventive or regularly scheduled maintenance. If the Model 500 GC Controller is installed in an explosion-proof enclosure, it is dust, water, and flame proof.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

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 observe all safety precautions could result in serious injury or death.

Should there be a need to open the explosion-proof enclosure, first disconnect all AC electrical power to the unit, and ensure the area is free of explosive gases. Also, prior to opening the GC Controller, check the operating parameters of the application, with either a PC or the GC Controller's built-in display, and attempt to isolate or fix any incorrect parameters.

5.6.1 GC Controller Access

To access any of the GC Controller's electrical components, perform all of the following steps if the Controller is in an explosion-proof enclosure. (Step (2) is not applicable if the GC Controller is in a nonhazardous-environment, or Rack or Panel mount units.)

1. Ensure AC electrical power is disconnected from the unit and the environment is safe.
2. Remove the 16 screws holding the front panel (with the display) to the enclosure. The front panel has hinges at the bottom secured by a cotter pin, and the panel will fold down. This front panel is heavy, so make sure it doesn't drop and cause damage.
3. Inside is the card cage holding the circuit boards. The termination board is held to the card cage by six screws and is plugged into the System Interface Board near the top edge. Loosen the screws and pull the termination board out as far as the wires will allow. Let it lie flat inside the enclosure. Remove the AC power connector from the front of the termination board on the lower left hand side.
4. With a flat-bladed screwdriver at least 8"long, remove two screws at the lower front corners and two screws at the upper rear corners of the card cage. Carefully lift the card cage up and out until access is gained to the circuit boards.
5. Note the location 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 the cables can be replaced in the same order. Release the catch(es) and remove/replace the circuit board(s) as necessary.
6. Replace the card cage and tighten screws in the reverse order as the disassembly.

5.7 COMMUNICATIONS

NOTICE

See Section 3.4.4, this manual, for a list of the GC Controller ports and terminals (pins) assigned to serial communications.

There are 3 to 8 communications ports available from the GC Controller. In addition, a communications port (8) is used by the GC Controller display and keypad. The GC Controller/display link uses either RS-232C or RS-422 protocols. Communications using RS-232C or RS-485 protocols are available in the additional external ports. The communication protocols can be set with MON2000 if the GC is installed with an LX-800 CPU board; the protocols can be set by changing jumpers if the GC is installed with a 6117 CPU board. These jumpers are normally specified by the customer at the factory. If it becomes necessary to change the communications at the site, access to the boards inside the enclosure is required to change the data interface chips. The enclosure should not be opened when hazardous gases are present. Refer to Section 5.6.1, “GC Controller Access” on page 29 if a communications change becomes necessary.

The Data Interface Chips to be changed are located on the 6117 CPU Board. The standard configuration would be both channel 1 and 2 RS-232C.

Optional chip configurations for the communications ports are:

If:	RS-232	(1) large dip chip
	RS-485	(1) small dip chip
	RS-422	(2) small chips

5.7.1 GC Controller Address Change

NOTICE

See "Modbus Slave Address (COM ID) Setup" on page 3-30 for an explanation of DIP switch settings and their determination of the GC Controller's Modbus slave address (COM ID).

When the desired GC Controller device address is known, it will be set before the Model 500 leaves the factory. If the GC Controller device address needs to be changed in the field, it will be necessary to change the arrangement of an 8-position DIP switch. Refer to "Modbus Slave Address (COM ID) Setup" on page 3-30 for the location and arrangement of the DIP switch settings and Figure 3-6, Figure 3-7, and Figure 3-8.

The GC Controller address on the DIP switch can be set as a 5-bit binary number with the position marked "1" as the least significant bit. For the switch positions, OFF = 0 and ON = 1. Refer to "Modbus Slave Address (COM ID) Setup" on page 3-30 for more dip switch settings.

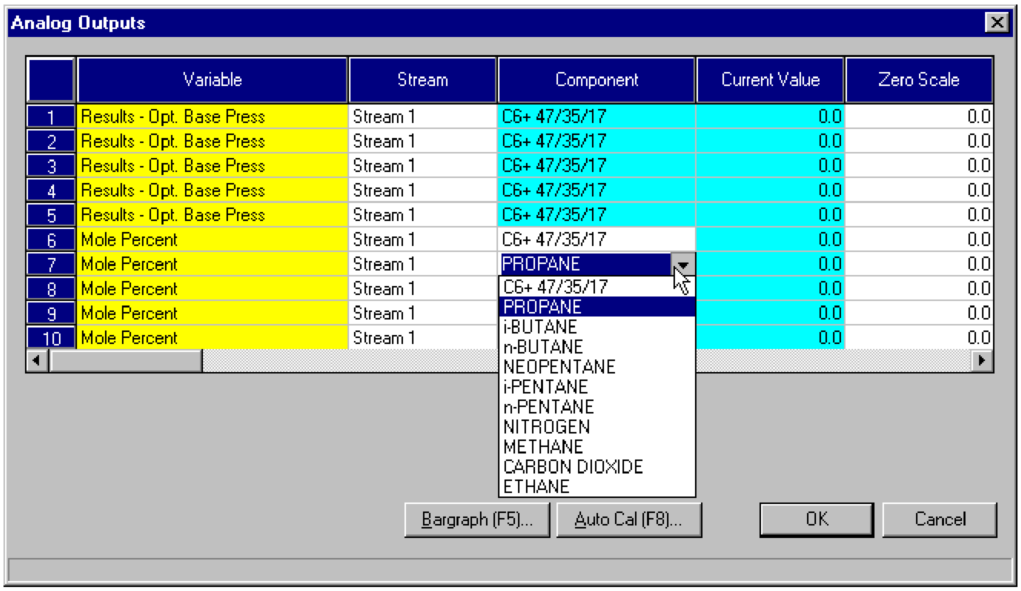
5.8 ANALOG INPUTS AND OUTPUTS

The analog outputs can be calibrated/adjusted using a PC with the MON2000 program software. However the user output (GC Controller analog 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 from the PC 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. (Refer also to Drawing DE-20782.) 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.

5.8.1 Analog Output Dialog Description

1. Use the *Application* > *Analog Outputs* menu path to access this function.
2. The Analog Outputs dialog box appears.



To edit the settings displayed, double-click on the appropriate cell or left-click the mouse button and use the provided pull-down menus.

NOTICE

When assigning analog outputs, first check the CGM Analog Output Config field in the System dialog box (see Section 5.1). An analog output assignment that uses the same analog output number as the CGM setting will produce erratic CGM trace output, possibly with incorrect scaling.

See the following table for details.

Table 5-5. Description of Analog Output Settings

Setting	Description
< Number>	Number label assigned Number of available analog outputs is dependent upon the GC controller model. **Note**: If the GC unit includes an Analog Expansion Module (AEM), PN 1-0500-001, reserve analog output number 1 (first row) for the variable Bargraph.
< Variable>	Type of GC analysis data on which to base signal level of analog output
< Stream>	Name of stream monitored by this output
<Component>	Name of component monitored by this output
<Current Value>	Current readout values of the analog output (values reflect scale assignments)
<Zero Scale>	Value used to represent the minimum value (4mA) when scaling the analog output value
<Full Scale>	Value used to represent the maximum value (20mA) when scaling the analog output value
<Fixed/Var>	Analog output operation mode Fixed = fixed Var = variable If the operation mode is fixed, the analog output is set to the number entered for the Fixed Value.
<Fixed Value>	Analog output value used during fixed operation
<Zero Adjustment>	Value used to correct Zero Scale
<Full Adjustment>	Value used to correct Full Scale

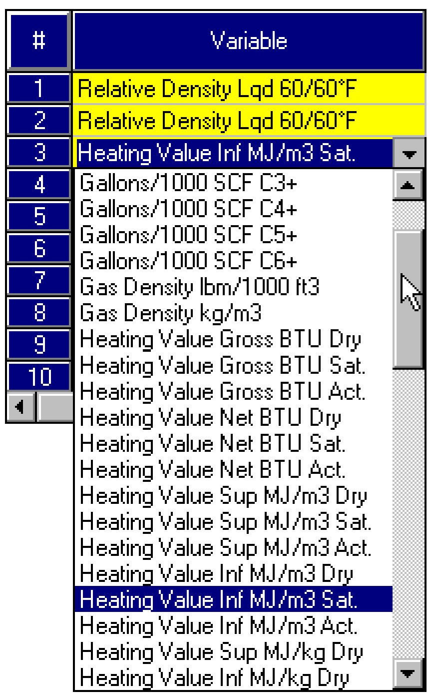
3. Click on the **OK** button to accept your changes and return to the main window.
4. Click on the **CANCEL** button to abort and return to the main window.

NOTICE

When defining a new analog output, perform a calibration first to obtain accurate Zero and Full Adjustment values (see Section 5.8.4 or Section 5.8.5).

5.8.2 Changing a Variable

To change a variable assignment, click on the appropriate Variable cell. Use the provided pull-down menu and click on the desired variable to select it.

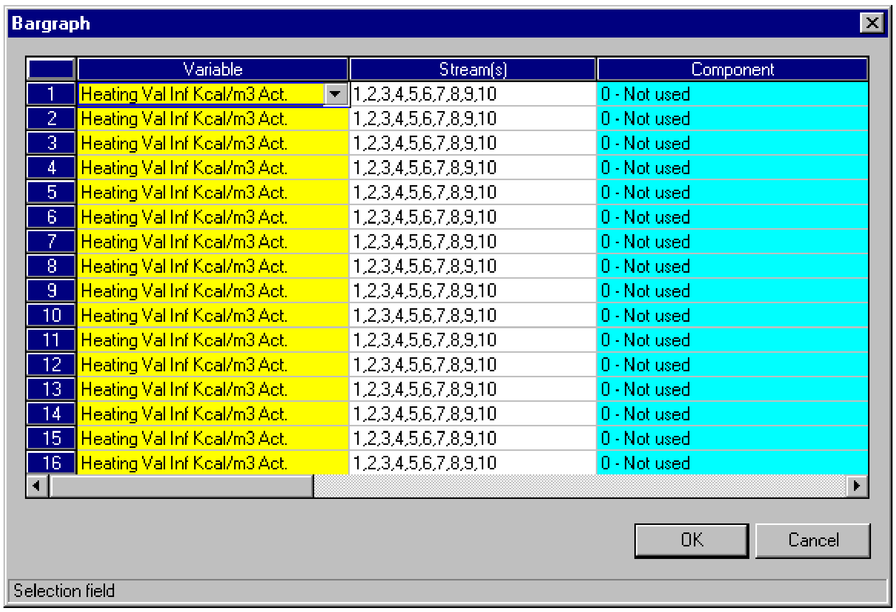


5.8.3 Changing the Bargraph

Use this function to designate which AEM output analog signals can be used to drive the bargraph device inputs. Each of the 16 available AEM output signals can be assigned to represent various GC analysis data variables.

1. To edit the variables and corresponding settings displayed by the bargraph, click on the **BARGRAPGH** button or press the **F5** key.

   (a) The Bargraph dialog box appears.

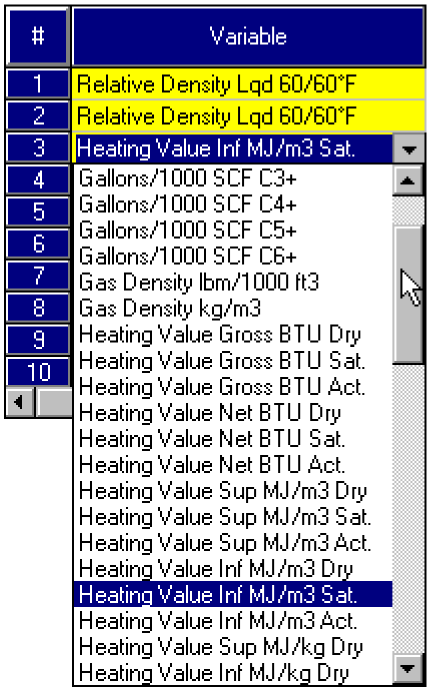


   (b) To edit the settings displayed, double-click on the appropriate cell or click and use the provided pull-down menus. See Section 5.8.1, "Analog Output Dialog Description" on page 32 for more details.

NOTICE

Multiple streams can be entered by separating the stream numbers with commas (e.g., 2,3). Bargraph results will be produced for each stream.

2. To change a variable assignment, click on the appropriate Variable cell. Use the provided pull-down menu and click on the desired variable to select it.



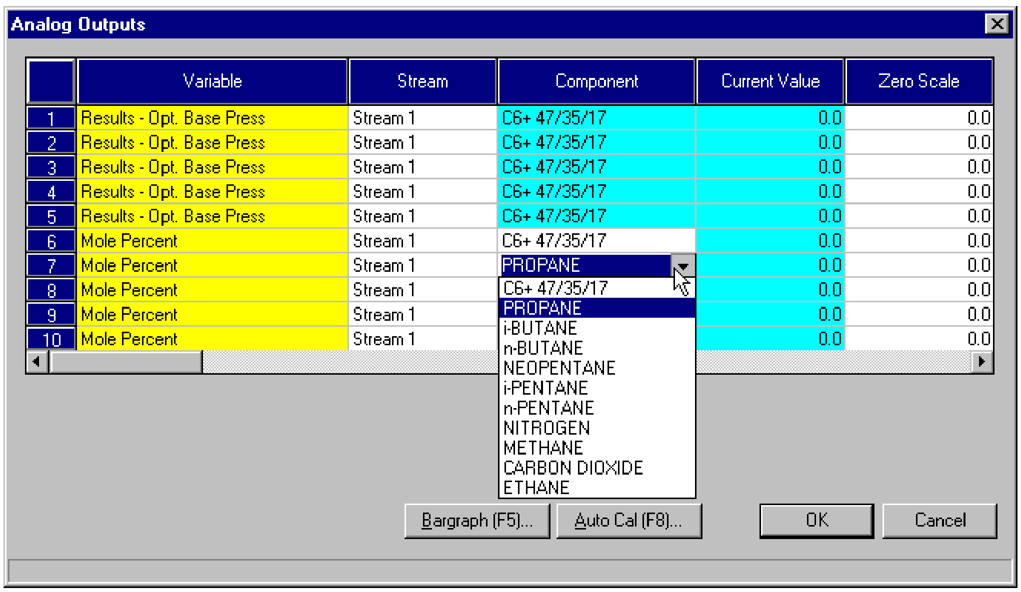
3. Click on the OK button to accept your changes and return to the Analog Outputs dialog box.

   Click on the Cancel button to abort and return to the Analog Outputs dialog box.

5.8.4 Performing a Manual Calibration

<u>To manually calibrate an analog output</u>:

1. Use the *Application* > *Analog Outputs* menu path to access this function.
2. The Analog Outputs dialog box appears.



3. Select the desired analog output by clicking anywhere in the corresponding row.
4. Set the Zero Scale and Full Scale values as desired.
5. Set the Fixed/Var parameter to "Fixed".
6. Set Fixed Value equal to the Zero Scale value.
7. Set Zero Adjustment and Full Adjustment to "0.0".

NOTICE

Setting both adjustment values to "0.0" disables the scale adjustment.

8. Click **OK** to accept your changes and exit from the Analog Outputs dialog box.
9. Return to the Analog Outputs dialog box. Wait until the Current Value of the analog output is equal to the Zero Scale value (see Step 2).
10. Record the value, in engineering units, read by the receiving device (e.g., a voltmeter).
11. Set Fixed Value equal to the Full Scale value (see Step 2).
12. Click **OK** to accept your changes and exit from the Analog Outputs dialog box.
13. Return to the Analog Outputs dialog box. Wait until the Current Value of the analog output is equal to the Full Scale value (see Step 2).
14. Record the value, in engineering units, read by the receiving device (e.g., a voltmeter).
15. Set Zero Adjustment to the value calculated from the following formula:

$$\text{Zero Adjustment} = \text{Zero Scale} - (\text{ZeroScaleError} \times \text{ScaleRange} / \text{OutputRange})$$

    where

    OutputRange = The *Ideal Full Scale Analog Output Value* minus the *Ideal Zero Scale Analog Output Value*.

    ZeroScaleError = The *Ideal Zero Scale Analog Output Value* minus the actual measuered Zero Scale value from the analog output.

    ScaleRange = The Full Scale value minus the Zero Scale value.

16. Set Full Adjustment to the value calculated from the following formula:

$$\text{Full Adjustment} = \text{Full Scale} - (\text{FullScaleError} \times \text{ScaleRange} / \text{OutputRange})$$

    where

    OutputRange = The *Ideal Full Scale Analog Output Value* minus the *Ideal Zero Scale Analog Output Value*.

FullScaleError = The *Ideal Full Scale Analog Output Value* minus the actual Full Scale value measured at the analog output.

ScaleRange = The Full Scale value minus the Zero Scale value.

17. Set the Fixed/Var parameter to "Var".

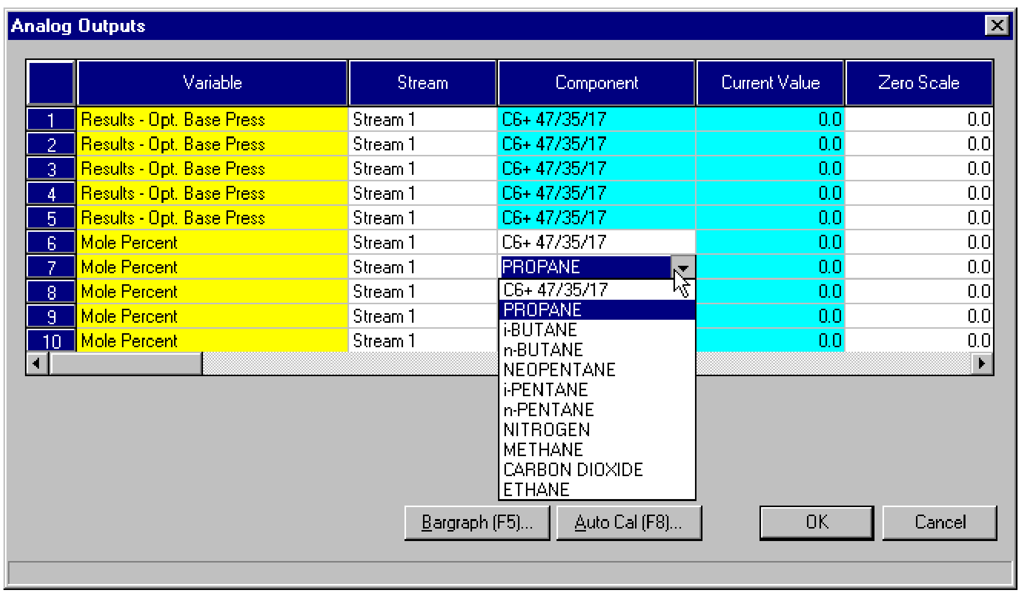
18. Click **OK** to complete the calibration and return to the main window.

5.8.5 Performing an Automated Calibration

<u>To perform an automated analog output calibration, from the Analog Outputs dialog box</u>:

1. Use the *Application* > *Analog Outputs* menu path to access this function.

2. The Analog Outputs dialog box appears.

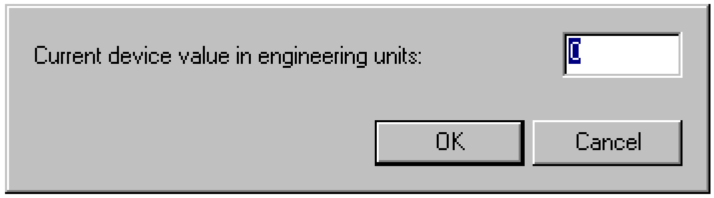


3. Select the desired analog output by clicking anywhere in the corresponding row.

4. Click on the **AutoCal (F8)** button or press the **F8** key.

   You can abort this process at any time by clicking on the **Cancel** button.

5. The Zero Scale Adjustment dialog box appears ("Current device value on engineering units").

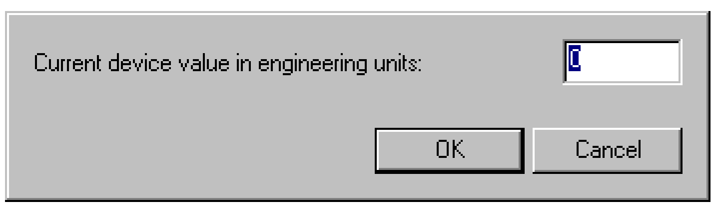


Input the appropriate value and click on the **OK** button.

NOTICE

To determine the uncalibrated Zero Scale and Full Scale analog output levels, see Section 5.8.1.

6. The Full Scale Adjustment dialog box appears ("Current device value on engineering units").



Input the appropriate value and click on the **OK** button.

NOTICE

To prevent scale adjustment, set both adjustment values to zero (0.0).

7. If the values entered are within tolerance, data in the zero and full adjustment columns is updated. Otherwise, MON2000 displays an error message.

5.8.6 Analog Loopback Test Circuits

External loopback test circuits can be built for troubleshooting the GC System's analog input/output operation. See Figure 5-6 and Figure 5-7.

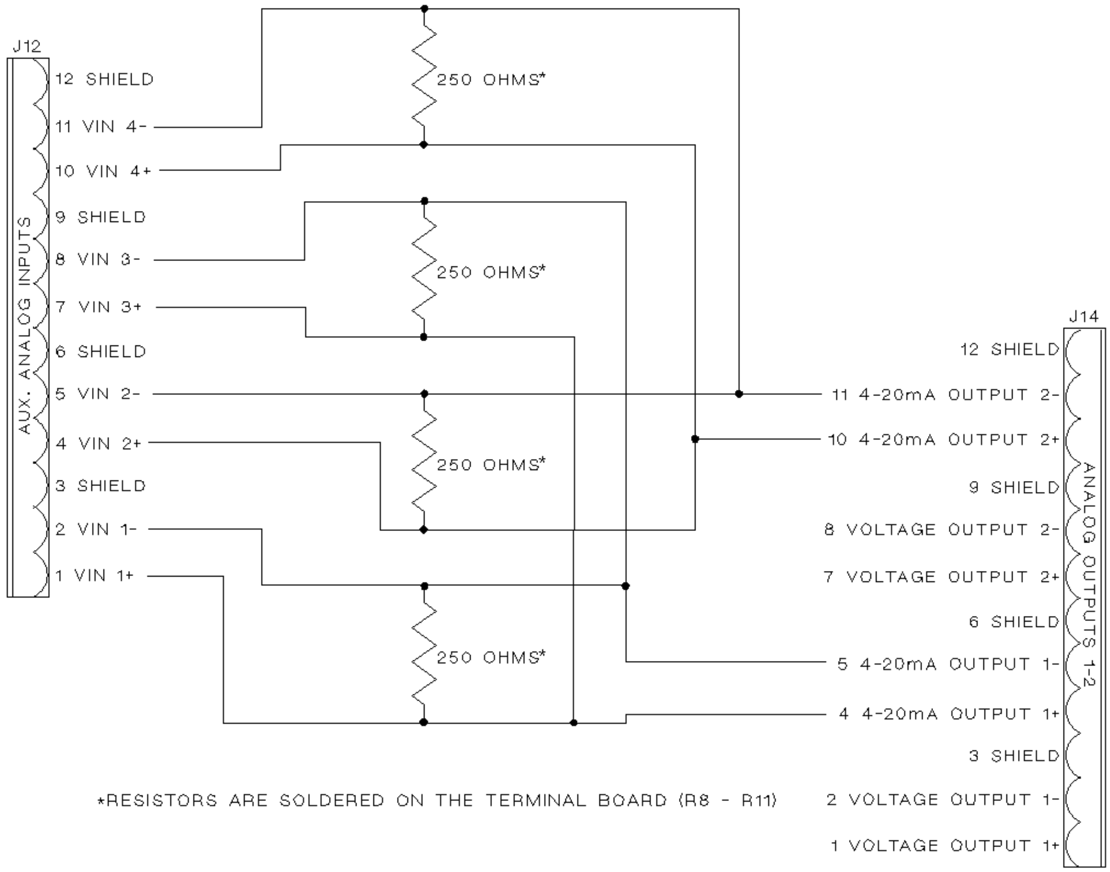


Figure 5-6. Analog Loopback with Two Analog Outputs

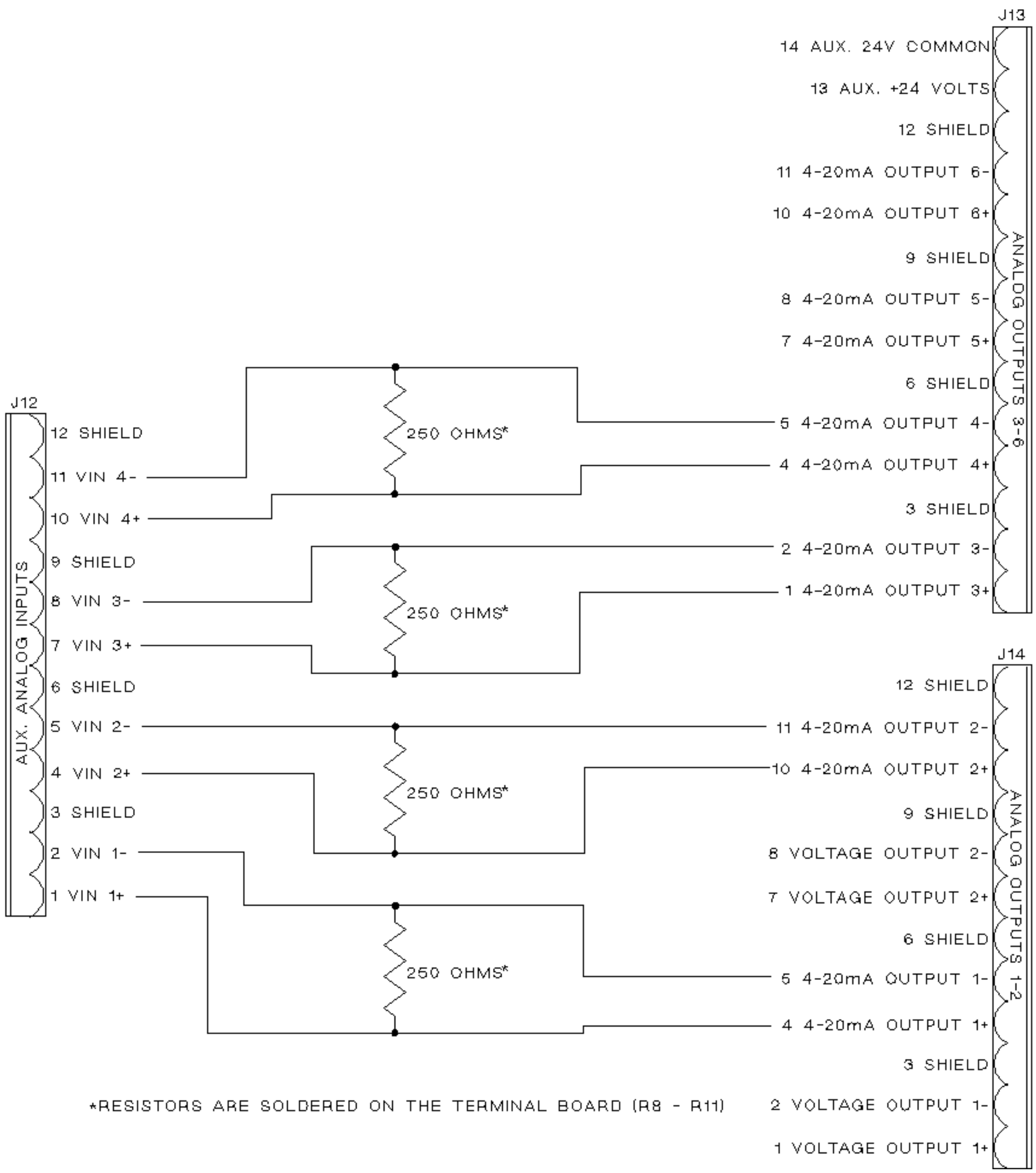


Figure 5-7. Analog Loopback with More Than Two Analog Outputs

5.8.7 Upgrading Analog Outputs

As an option, the GC Controller can be configured with additional analog outputs (there are two analog outputs on the standard Analog Board, P/N 3-2350-041). For more analog outputs, the existing "Analog" board must be exchanged for one of these optional Analog Boards, allowing a quantity of either six or ten analog outputs (see drawing BE-18044 in the GC Controller drawings addendum, this manual):

- Analog I/O - (6) analog outputs (P/N 3-2350-039)
- Analog I/O - (10) analog outputs (P/N 3-2350-034)

If additional analog outputs are installed, the existing System Interface/ Driver board must be exchanged for one of these optional System Interface Boards, allowing a quantity of either six or ten analog outputs (see drawing CE-18118):

- Analog I/O - (6) analog outputs (P/N 3-2350-022)
- Analog I/O - (10) analog outputs (P/N 3-2350-023)

If additional analog outputs are installed, specific transient protection modules must also be installed on the GC Controller's Terminal Board for Field Wiring (TB). For details about transient protection modules, see Appendix C. Also see drawing CE-18115, sheet 2, in the GC Controller drawings addendum, this manual.

Once the Analog Board, System Interface Board, and the proper transient protection modules are installed, field wiring for the added analog outputs from the GC Controller are made to GC Controller TB, ports "J13" and "J15".

NOTICE

Previous versions of the Controller, manufactured before March 1998, used two boards for analog outputs: RTI-1281, for standard two outputs, and RTI-1282, for optional additional analog outputs.

If you are replacing RTI-1281 and -1282 Analog Boards with a newer, single Analog I/O board, be sure to use MON2000 Software, version 1.5 or later to operate the Gas Chromatograph.

5.9 DISCRETE (DIGITAL) INPUTS AND OUTPUTS

For instructions on connecting digital inputs and outputs to the GC Controller, see Section 3.4.6 and drawing DE-20782, GC Controller drawings addendum, this manual.

5.9.1 Digital Loopback Test Circuit

An external loopback test circuit can be built for troubleshooting the GC System's digital input/output operation. See Figure 5-8.

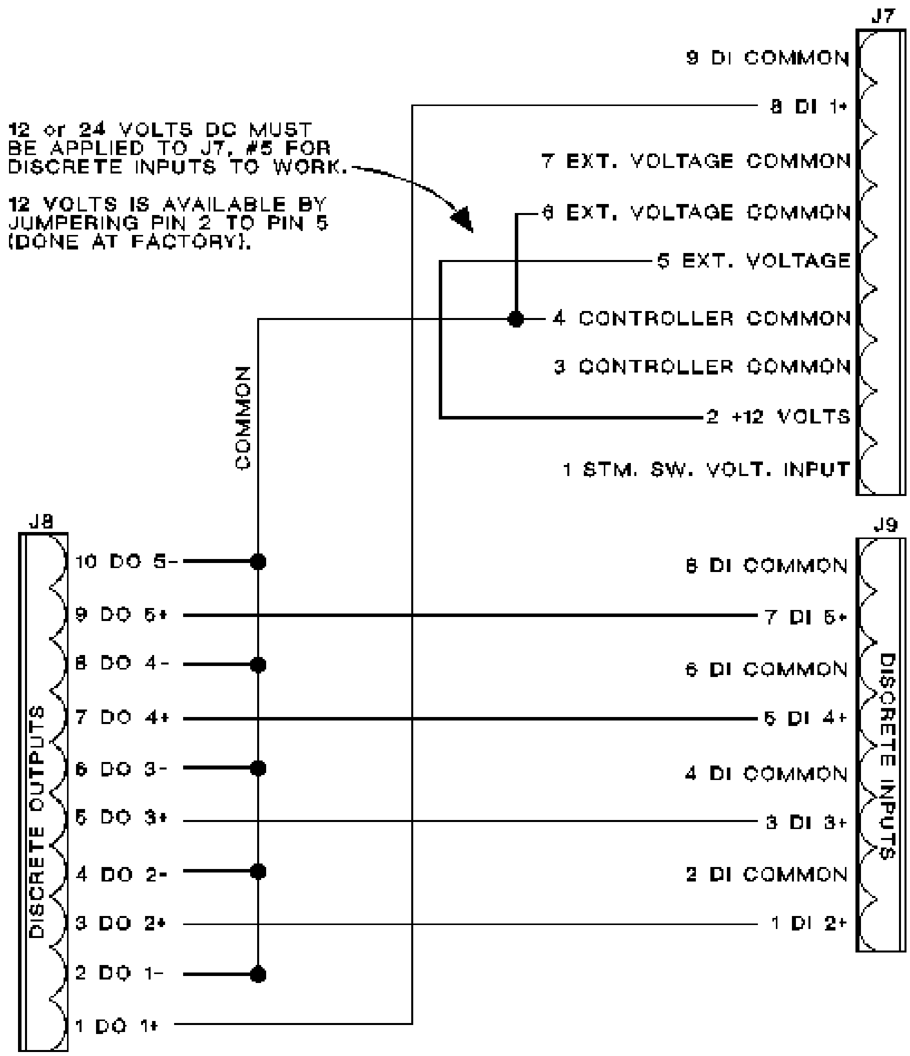


Figure 5-8. External Loopback Circuit for Testing Digital Input/Output Operation

5.10 FUSE PROTECTION

AC power fuse protection for the GC Controller is located on the Terminal Board for Field Wiring (TB). AC power surge protection is also provided by two Metal Oxide Varistors (MOVs).

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before attempting to examine or replace the Controller's fuse, disconnect AC power from the Controller.

Failure to observe all safety precautions could result in serious injury or death.

To locate and replace the Controller's fuse, note the following:

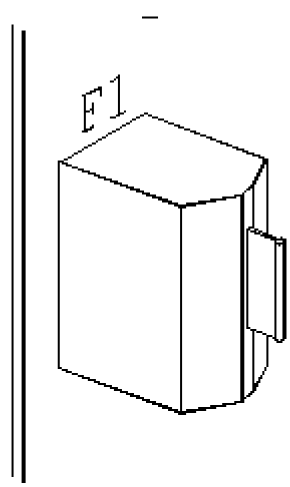


Figure 5-9. AC Fuse Holder on the GC Controller Terminal Board, Lower Left Corner

Fuse Location - Inside small black holder by lower left corner of the GC Controller TB, by label "F1" (see Figure 5-9). Spare fuses are in a small box attached to the GC Controller.

Fuse Size and Capacity - 5 x 20 millimeters (mm), 2 amperes @ 250 volts AC, "slo-blo".

Fuse Replacement - Pull fuse holder by its handle away from board, then open.

To locate and replace the DC power supply cable fuse, note the following:

Fuse Location -mounted in line with the 5 VDC power supply cable (P/N 2-3-2350-005) to System Interface Board.

Fuse Size and Capacity - 3AG, Slo-Blo, 2.5 amperes @ 250 VDC

5.11 ANALYZER-CONTROLLER INTERCONNECT

Signals between the Analyzer and GC Controller are conducted on the Analyzer-Controller Interconnect Cable. Excluding signal common, these signals are as follows (see also Section 3.3 and Table 3-2):

- Four outputs from the Analyzer preamplifier (4-20 mA current loop). These are the amplified electrical output from the Analyzer detector and bridge.
- Function Code signals, the Function Code Strobe, and Auto Zero. These signals are initialized at the GC Controller and interpreted at the Analyzer's decoder board in order to properly time (a) the Analyzer and stream valve activations and (b) zeroing of the Analyzer pre-amp signals output.
- Alarm function.

See Figure 5-10, next page for a schematic that identifies the Analyzer-Controller Interconnect Cable terminations.

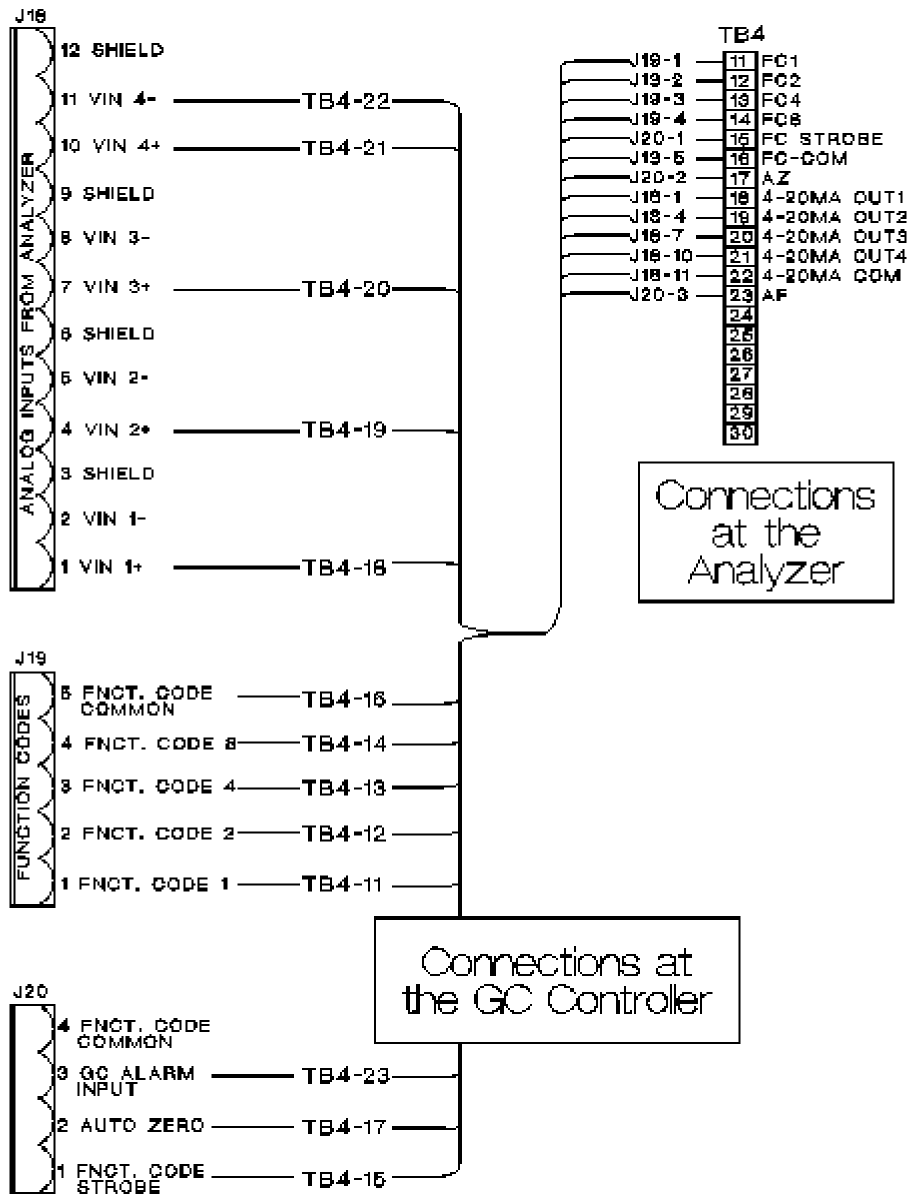


Figure 5-10. Analyzer and GC Controller Interconnect Leads

5.11.1 Function Codes

If the Analyzer valves are not being activated during "Continuous Operation" or "Auto Sequence" mode, it may be necessary to determine whether Function Code signals are being transmitted correctly. This section provides a guide to the Function Codes.

The four Function Code signals form a binary number which, after interpretation by the Analyzer's decoder board, determines the position of specific chromatograph valves. Chromatograph valve positions are either SET (ON) or RESET (OFF).

Table 5-6 lists the voltage measurements that should occur at the Function Code terminals for corresponding states of the chromatograph valves. A measurement of 5 (five) volts at any of the function code terminals indicates a binary zero (0). A measurement of 0 (zero) volts indicates a binary one (1).

For additional reference, Table 5-7 provides the Function Code dictionary in hexadecimal for corresponding states of the chromatograph valves.

Table 5-6. Voltage Measurements at Function Code Terminals

	Function Code	Function Code	Function Code	Function Code
Cntllr TB - Terminal No.	J19, #1	J19, #2	J19, #3	J19, #4
Analyzer - Terminal No.	TB4, #11	TB4, #12	TB4, #13	TB4, #14
VOLTAGE MEASUREMENTS				
Valve 1 ON	5 volts DC	5 volts DC	0 volts DC	5 volts DC
Valve 1 OFF	0	5	0	5
Valve 2 ON	5	0	0	5
Valve 2 OFF	0	0	0	5
Valve 3 ON	0	5	0	0
Valve 3 OFF	5	0	0	0
Valve 4 ON	5	5	5	5
Valve 4 OFF	0	5	5	5
Valve 5 ON	5	0	5	5
Valve 5 OFF	0	0	5	5
Stream 1	5	5	5	0
Stream 2	0	5	5	0
Stream 3	5	0	5	0
Stream 4	0	0	5	0
Stream 5	5	5	0	0

NOTICE

- **The Function Code Strobe (measured at either the GC Controller TB, J20, #1 or the Analyzer TB4, #15) occurs 1 (one) second or more following any given event.**
- **Function Code Common is at these terminals: GC Controller TB, J19, #5 and the Analyzer TB4, #16 (see Figure 5-9).**

Table 5-7. Function Code Dictionary in Hexadecimal

INPUT (hexadecimal)	VALVE = SET (ON)	VALVE = RESET (OFF)
0	Analyzer Valve (AV)-4	
1		AV-4
2	AV-5	
3		AV-5
4	AV-1	
5		AV-1
6	AV-2	
7		AV-2
8	Stream Valve (SV)-1	SV-2, -3, -4, -5
9	SV-2	SV-1, -3, -4, -5
A	SV-3	SV-1, -2, -4, -5
B	SV-4	SV-1, -2, -3, -5
C	SV-5	SV-1, -2, -3, -4
D	AV-3	
E		AV-3
F		

NOTICE

A measurement of 5 (five) volts at any of the function code terminals indicates a binary zero (0). A measurement of 0 (zero) volts indicates a binary one (1).

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RECOMMENDED SPARE PARTS

Following are lists of recommended spares for approximately a year's maintenance of the Model 500 Analyzer System. Maximum quantities are the number of spares that is normally adequate to cover most contingencies at facilities where a larger number of GC Systems are in operation. The minimum quantities are the number of spares at facilities with only a few GC Systems.

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

6.1 ANALYZER SPARES

6.1.1 Printed Circuit Card Assemblies (Analyzer)

Description	Part Number	Maximum	Minimum
Preamplifier assembly	3-0500-201	1	1
Temperature control assembly	3-0500-202	1	1
Decoder assembly	3-0500-200	1	1
Valve driver assembly	3-0500-178	1	1

6.1.2 Electrical and Mechanical Assemblies (Analyzer)

Description	Part Number	Maximum	Minimum
Allenair 4-Way solenoid valve	4-5000-369	1	1
ASCO 3-Way solenoid valve (Auto Cal)	4-5000-075	1	-
G.C. valve repair kit (6-port valve)	3-9300-108	3	1
Carrier gas regulator	4-9500-084	1	-

Description	Part Number	Maximum	Minimum
Temperature control thermistor	3-0500-103	1	-
Thermistor seal	6-5000-084	6	6
Thermistor set (9K)	6-1611-083	1	1
Microfuse (3A, 120VAC)	5-4203-230	2	2
Inline filter element (Nupro)	4-5000-113	2	1

6.2 GC CONTROLLER SPARES

6.2.1 Printed Circuit Card Assemblies (GC Controller)

Description	Part Number
CPU Board No.2	3-2350-190
or	
Analog I/O board No. 5	3-2350-041
or	
6-channel Analog I/O board No.5 (optional)	3-2350-039
or	
10-channel Analog I/O board No.5 (optional)	3-2350-034
or	
System interface and driver board	3-2350-005
Passive termination board	3-2350-001
Transient suppressor modules (optional)	
PCA Quad Sngl	3-2350-002
PCA Quad DIFF	3-2350-003
PCA RS-232 Sngl	3-2350-027
PCA Hi Pwr Discrete Output	3-2350-019
LED display board (explosion-proof NEMA 4X, Class C and D, unit)	3-2350-026

6.2.2 Electrical and Mechanical Components (GC Controller)

Description	Part Number	Maximum	Minimum
115/230 VAC power supply	3-2350-020	1	1
Fuse, 250 VAC, 2A (5 x 20 mm)	5-4203-420	5	1

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APPENDIX A, SUPPLEMENTAL WIRING GUIDE - SERIAL COMMUNICATIONS

This Appendix provides additional information about wiring and interfaces for serial transmissions between the Analyzer System and attached equipment (i.e., a PC, a modem, a Data Collection System (DCS), or a multi-drop serial data highway network).

This Appendix is organized as follows:

- GC Serial Port and Cable Configurations for RS-232
- RS-232 Connection from GC Controller to PC
  - DB-9 Serial Port of GC to DB-9 Port of PC
  - DB-9 Serial Port of GC to DB-25 Port of PC
  - Phoenix Plug Port of GC to DB-9 Port of PC
  - Phoenix Plug Port of GC to DB-25 Port of PC
- RS-232 Connection from GC Controller to External Modem
  - DB-9 Serial Port of GC to DB-25 Port of Modem
  - Phoenix Plug Port of GC to DB-25 Port of Modem
- Example RS-422 Connection from PC to GC
- Example RS-485 Connection from PC to GC
- Jumper-based Serial Channel Configurations

A.1 GC SERIAL PORT AND CABLE CONFIGURATIONS FOR RS-232

This section provides more detailed information about the serial port connections of the GC Controller. It identifies serial port pin assignments and diagrams for designing RS-232 serial cables, if that is necessary for your application.

GC Serial Ports are found on the GC Controller's Terminal Board for Field Wiring, and the connection points for external devices are as follows:

Table A-1. Serial Ports on the Terminal Board for Field Wiring, GC Controller

	DB-9 plug connection	**Phoenix plug (bare-wire) connection**
Serial Port 1 (COM1)	P2	J5
Serial Port 2 (COM2)	P3	J6
Serial Port 3 (COM3)	-	J10
Serial Port 4 (COM4)	-	J11
Serial Port 5 (COM5)	P22	-
Serial Port 6 (COM6)	P23	-
Serial Port 7 (COM7)	P24	-

Phoenix plug (bare-wire) connections are available to the first four serial ports.

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

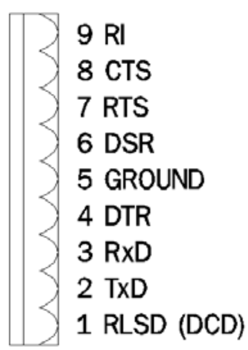


Figure A-1. Phoenix Connector (J5, J6, J10, and J11) Pinout

DB-9 plug connections available for Serial Ports 1, 2, 5, 6, and 7.

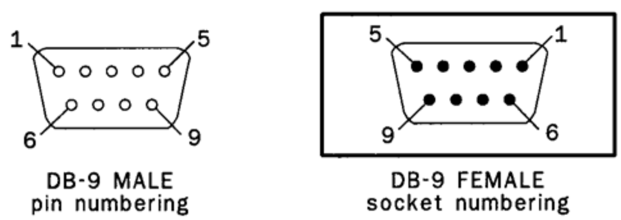
Four of the serial ports, as noted in Table A-1, permit connection via a DB-9 plug.

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, instead of a null-modem cable, for a direct serial connection between the GC Controller and the PC. (The PC is Data Terminal Equipment, or DTE.) See Section A.2.

External modem-to-GC connections, serial: A custom serial cable must 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.

Both of the GC Controller's DB-9 jacks are female and have identical pin assignments. (NOTE: A DB-9 male pin numbering scheme is also illustrated, but for reference purposes only.)



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-2. DB-9 Connector (P2, P3, P22, P23, and P24), and Pinout for Female Jacks

A.2 RS-232 CONNECTION FROM GC CONTROLLER TO PC

A.2.1 DB-9 Serial Port of GC to DB-9 Port of PC

To make an RS-232 serial connection between one of the DB-9 serial ports of the GC, and a PC with DB-9 serial port, you may be able to use a "straight-through" serial cable, terminated as DB-9 male / DB-9 female. This will work if the PC has a male DB-9 serial port, and its pin assignments are identical to those found on a typical DB-9 serial port of 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-3).

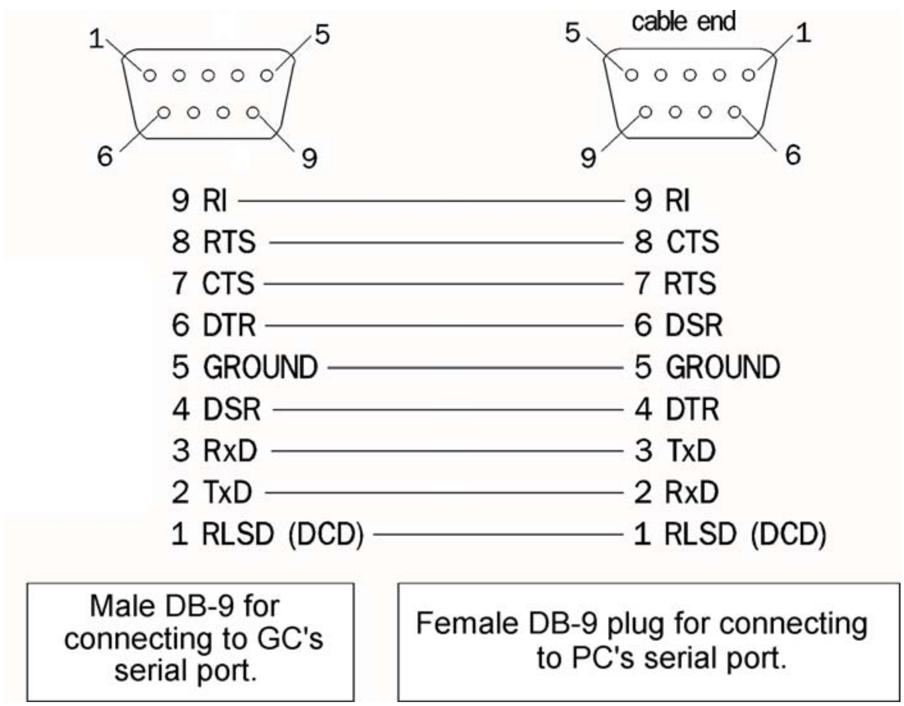


Figure A-3. GC DB-9 Port to PC DB-9 Port

A.2.2 DB-9 Serial Port of GC to DB-25 Port of PC

To make an RS-232 serial connection between one of the DB-9 serial ports of the GC, and a PC with DB-25 serial port, you may be able to use a "straight-through" serial cable, terminated as DB-9 male / DB-25 female. This will work if the PC has a male DB-25 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-4).

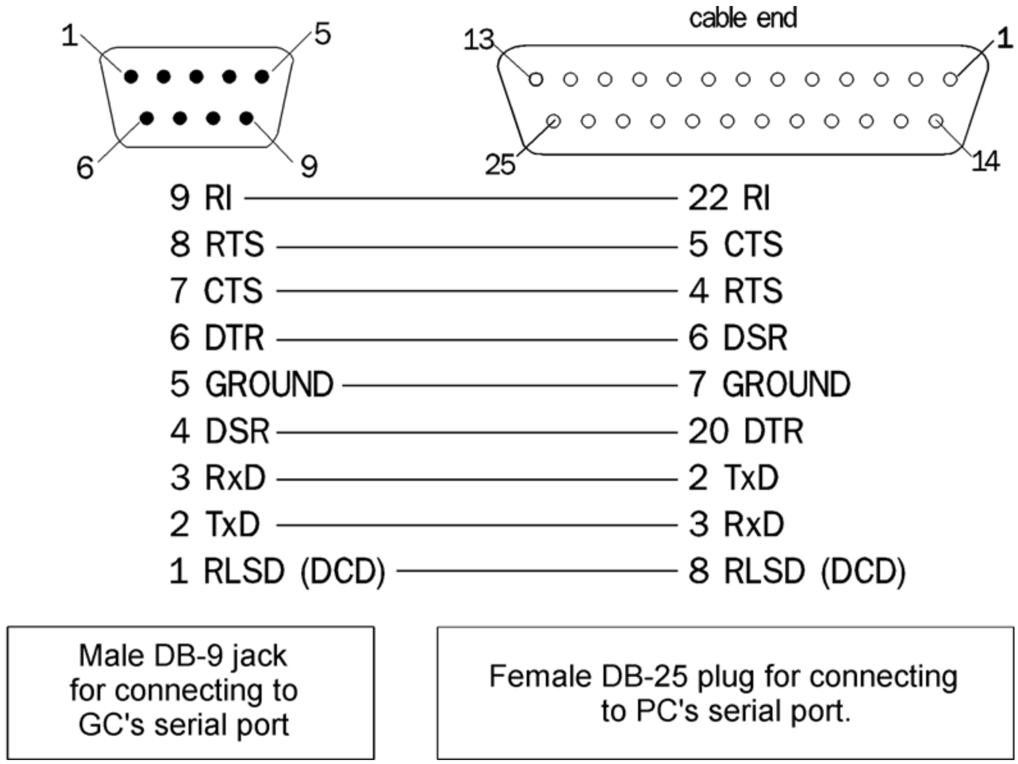


Figure A-4. GC DB-9 Port to PC DB-25 Port

A.2.3 Phoenix Plug Port of GC to DB-9 Port of PC

To make an RS-232 serial connection between one of the Phoenix Plug serial ports of the GC, and a PC with DB-9 serial port, you will need to manufacture the cable and its DB-9, female plug cable end as illustrated below (see Figure A-5).

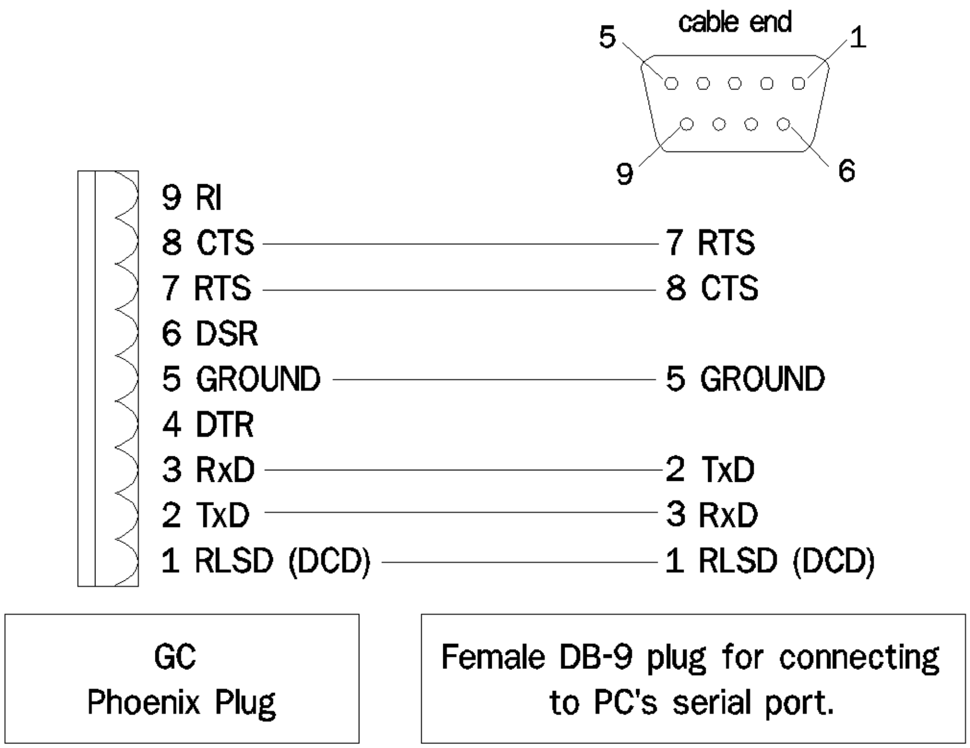


Figure A-5. GC Phoenix Plug Port to PC DB-9 Port

NOTICE

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

A.2.4 Phoenix Plug Port of GC to DB-25 Port of PC

To make an RS-232 serial connection between one of the Phoenix Plug serial ports of the GC, and a PC with DB-25 serial port, you will need to manufacture the cable and its DB-25, female plug cable end as illustrated below (see Figure A-6).

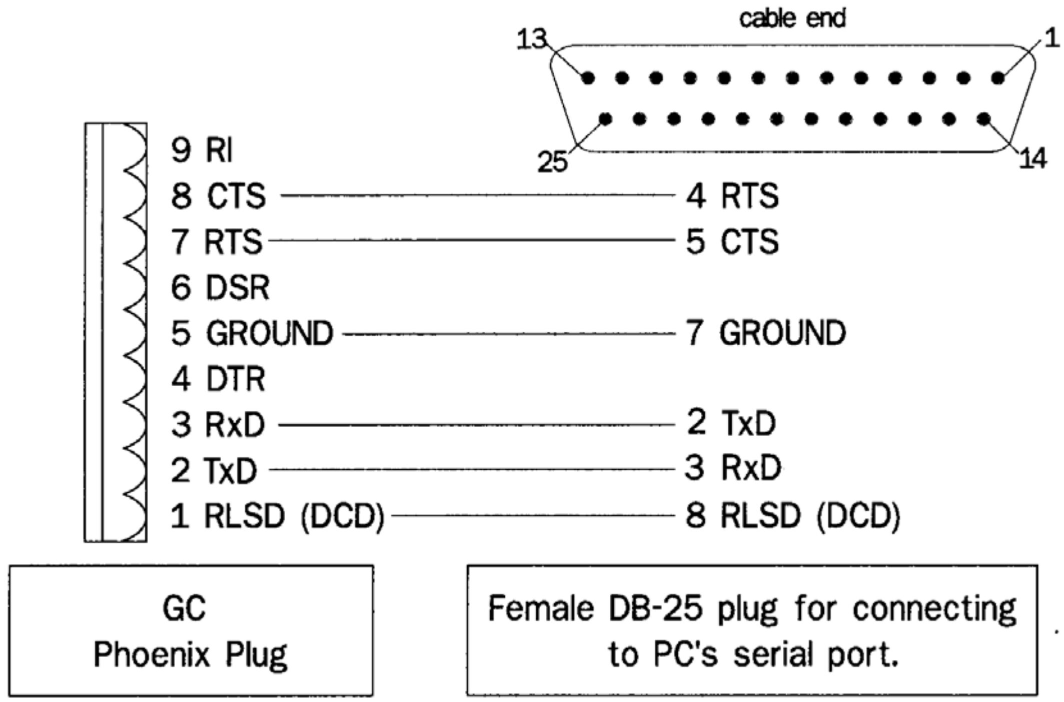


Figure A-6. GC Phoenix Plug Port to PC DB-25 Port

A.3 RS-232 CONNECTION FROM GC CONTROLLER TO EXTERNAL MODEM

A.3.1 DB-9 Serial Port of GC to DB-25 Port of Modem

To make an RS-232 serial connection between one of the DB-9 serial ports of the GC, and an external modem with a DB-25 serial port, you will need to manufacture a cable. The cable will need DB-9, male, and DB-25, male, plug cable ends as illustrated below (see Figure A-7).

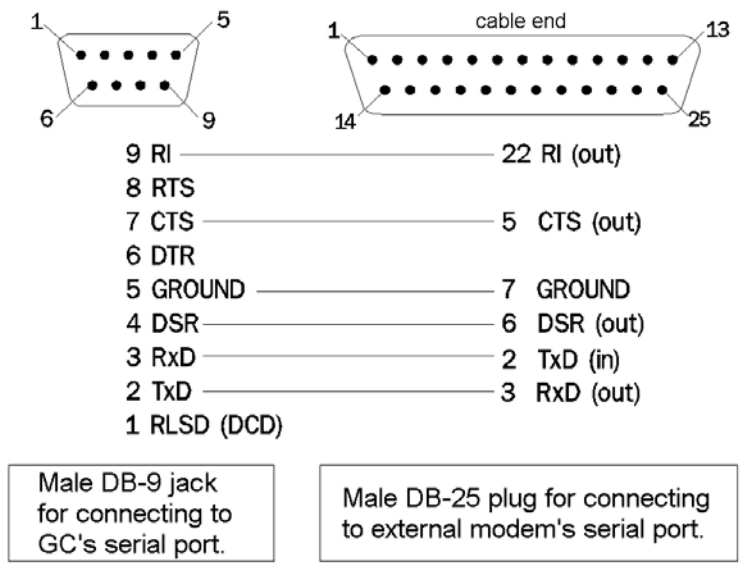


Figure A-7. GC DB-9 Port to External Modem DB-25 Port

NOTICE

The DB-9 jack on the GC serial port is wired to appear like a Data Communications Equipment (DCE). Therefore, you use a custom "null-modem" type cable, as shown above, 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, instead of a null-modem cable, for direct serial connection between the GC Controller and the PC, which is Data Terminal Equipment [DTE].)

A.3.2 Phoenix Plug Port of GC to DB-25 Port of Modem

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 serial port, you will need to manufacture the cable and its DB-25, male plug cable end as illustrated below (see Figure A-8).

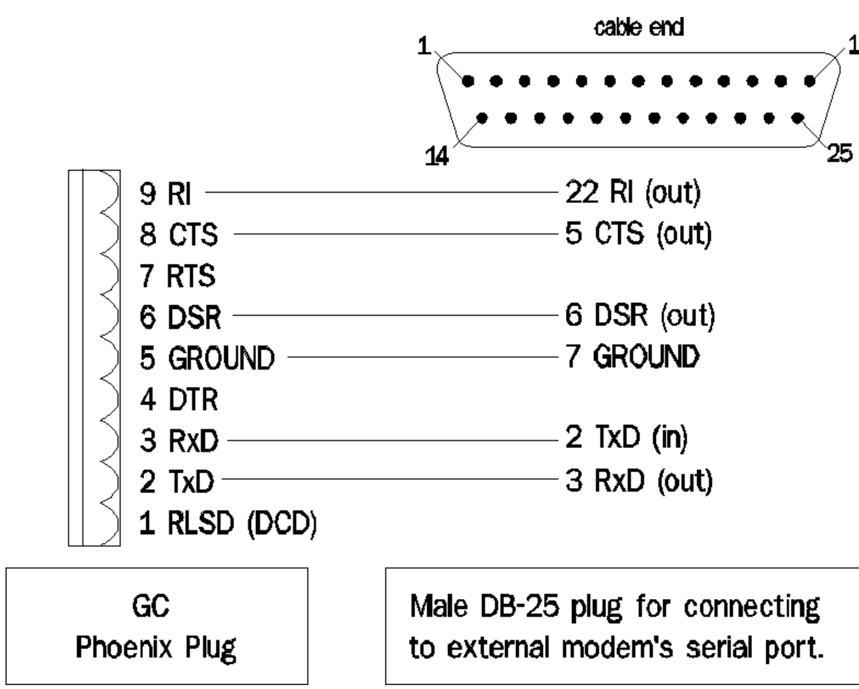


Figure A-8. GC Phoenix Plug Port to External Modem DB-25 Port

A.4 EXAMPLE RS-422 CONNECTION FROM PC TO GC

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), and
- RS-422 or RS-485 output (to connect to the GC).

RS-422 line terminations are illustrated in Figure A-9, below, and jumper and switch settings to configure the line driver device are listed in Table A-2, next page. (NOTE: For this example, a straight-through RS-232 serial cable is used to connect between the PC and the line driver.)

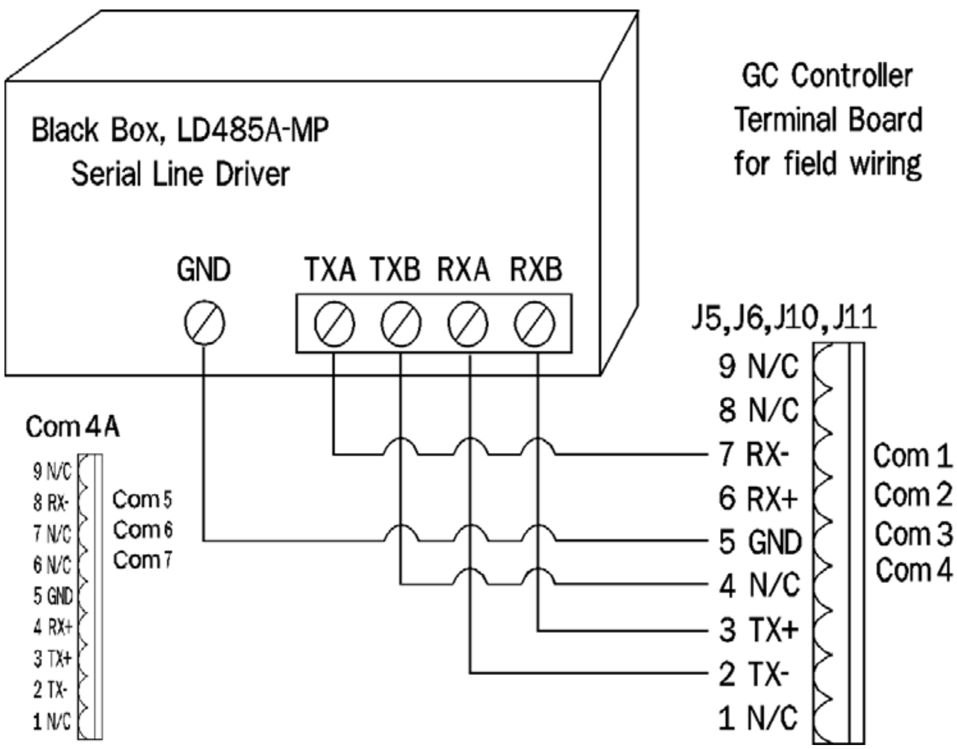


Figure A-9. Example RS-422 Serial Cable Terminations, Line Driver to GC Controller

NOTICE

See Section 3.4.4 for additional details about serial communications setups at the GC Controller.

Table A-2. Jumper and Switch Settings for LD485A-MP Line Driver, RS-422 to GC

LABEL	POSITION	PURPOSE
Front Panel Switch		
NORMAL / DLB	NORMAL	Normal operation used, instead of loopback testing.
DIP Switch Banks or Shunts		
XW1A DCE / XW1B DTE	XW1A DCE	Sets line driver to operate as data communications equipment (DCE).
S2	UNTERM	No resistor network termination needed for one PC direct to one GC.
Jumper Positions		
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 5ms.
W17	B 100ms	Disable timeout delay by 100ms.
W18	B-C	RS-485 driver enabled by RTS.

A.5 EXAMPLE RS-485 CONNECTION FROM PC TO GC

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), and
- RS-422 or RS-485 output (to connect to the GC).

RS-485 line terminations are illustrated in Figures A-10, next page, and jumper and switch settings to configure the line driver device are listed in Table A-3. (NOTE: For this example, a straight-through RS-232 serial cable is used to connect between the PC and the line driver.)

NOTICE

See Section 3.4.4 for additional details about serial communications setups at the GC Controller.

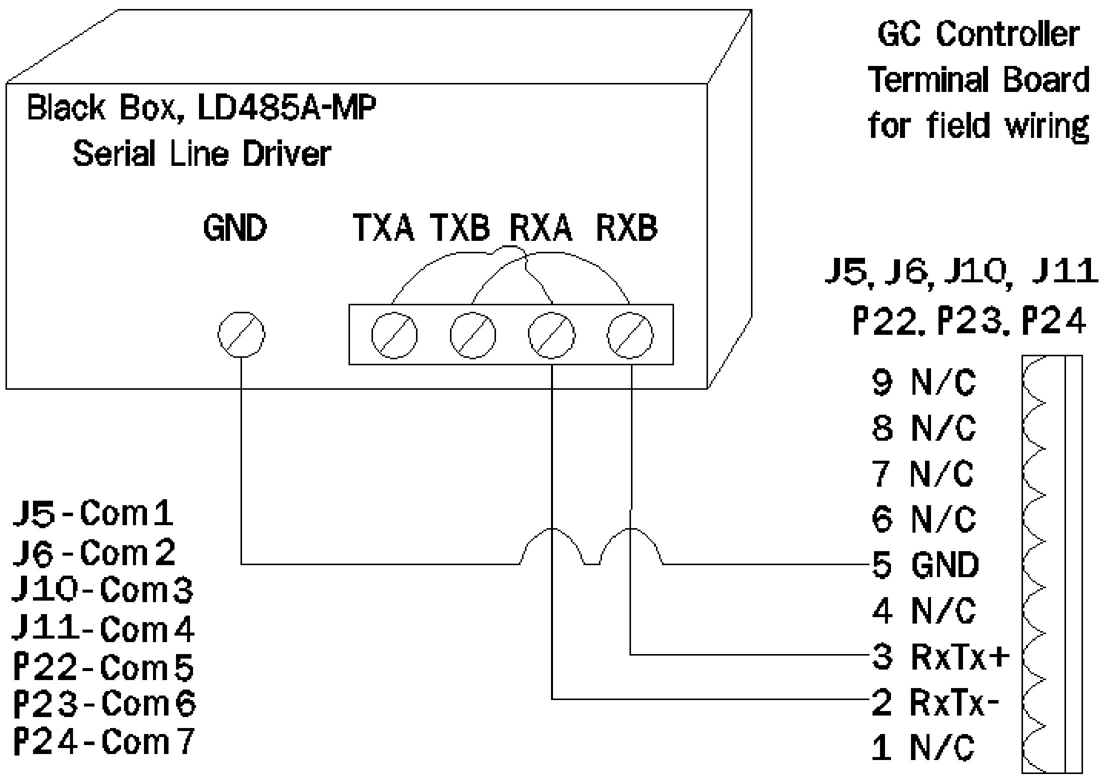


Figure A-10. Example RS-485 Serial Cable Terminations, Line Driver to GC Controller COM 1 - COM 7

Table A-3. Jumper and Switch Settings for LD485A-MP Line Driver, RS-485 to GC

LABEL	POSITION	PURPOSE
Front Panel Switch		
NORMAL / DLB	NORMAL	Normal operation used, instead of loopback testing.
DIP Switch Banks or Shunts		
XW1A DCE / XW1B DTE	XW1A DCE	Sets line driver to operate as data communications equipment (DCE).
S2	UNTERM	No resistor network termination needed for one PC direct to one GC.
Jumper Positions		

LABEL	POSITION	PURPOSE
W8	HALF	Half duplex operation.
W9	0ms	0 (zero) 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 5ms.
W17	B 100ms	Disable timeout delay by 100ms.
W18	B-C	RS-485 driver enabled by RTS.

A.6 JUMPER-BASED SERIAL CHANNEL CONFIGURATIONS

The WinSystems® CPU (P/N LPM/MCM-6117) provides four serial channels, each of which can be configured to use the RS-232, RS-422, or RS-485 protocols with the addition of optional driver IC's. The configuration options for each of the supported modes are shown on the following pages.

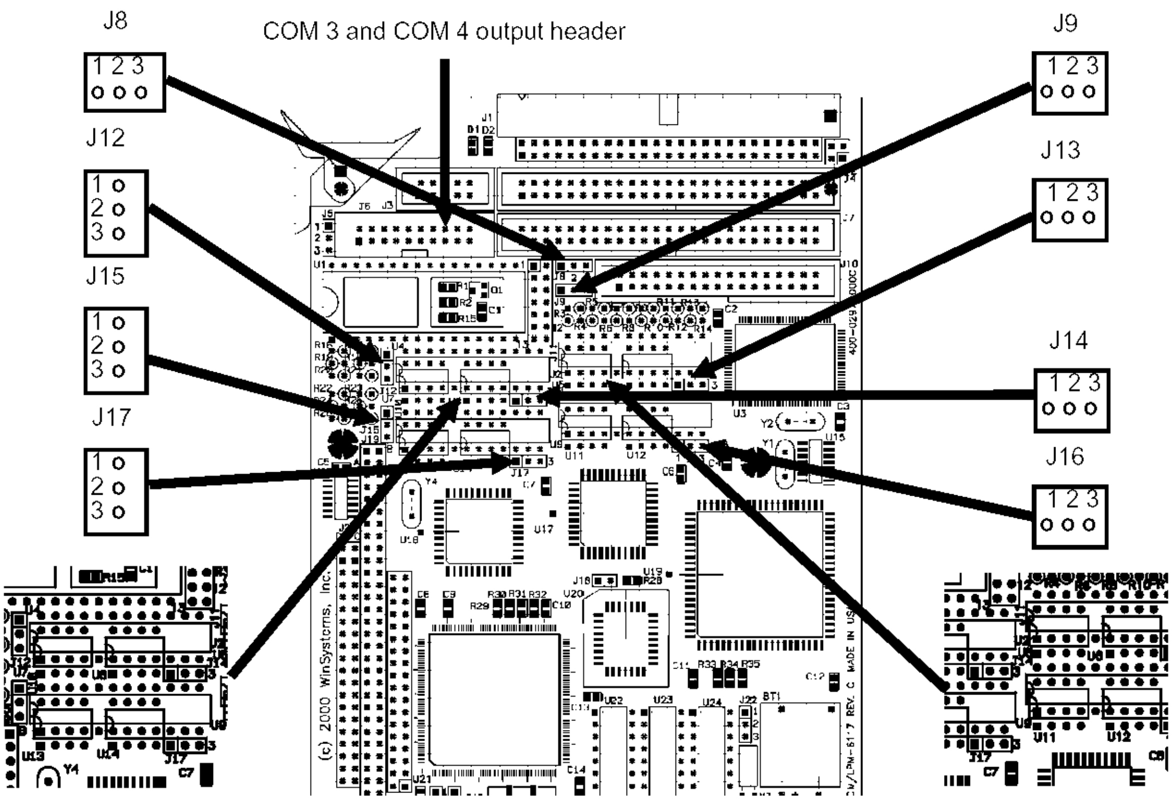


Figure A-11. CPU Configuration

CPU RS-232 Configuration

CPU COM1 RS-232 Configuration

COM1 is I/O mapped at 3F8H and utilizes a 16550 type DART contained in the Super I/O chip. When used in RS-232 mode, COM1 is terminated via the Multi-I/O connector at J1. The configuration details and the pin definitions when used with the cable (P/N 3-2350-083) are shown here:

Figure A-12. COM1 RS-232

CPU COM2 RS-232 Configuration

COM2 is I/O mapped at 2F8H and utilizes a 16550 type UART contained in the Super I/O chip. When used in RS-232 mode, COM2 is terminated via the multi-I/O connector at J1. The configuration details and the pin definitions, when used with the cable (P/N 3-2350-083), are shown here:

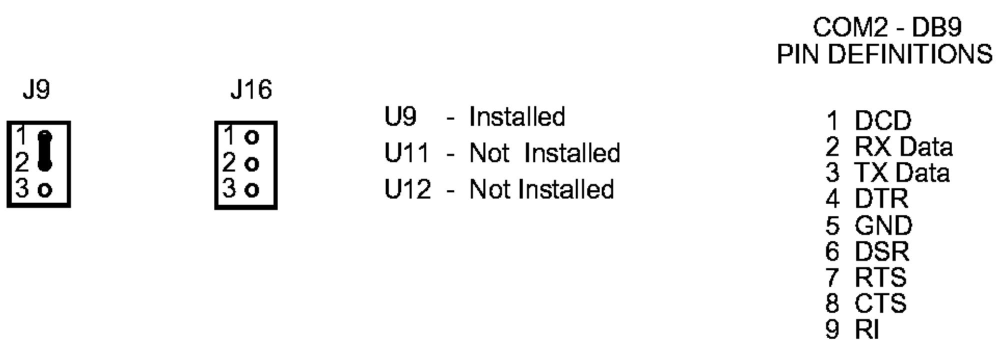
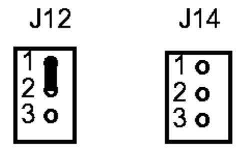


Figure A-13. COM2 RS-232

CPU COM3 RS-232 Configuration

COM3 is I/O mapped at 3E8H and utilizes a 16550 type UART contained in the 16C532 companion chip. When used in RS-232 mode, COM3 is terminated via the connector at J6. The configuration details and the pin definitions, when used with the cable (P/N 3-2350-087), are shown here:



U4 - Installed
U7 - Not Installed
U8 - Not Installed

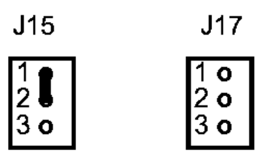
COM3 - DB9
PIN DEFINITIONS

1 DCD
2 RX DATA
3 TX DATA
4 DTR
5 GND
6 DSR
7 RTS
8 CTS
9 RI

Figure A-14. COM3 RS-232

CPU COM4 RS-232 Configuration

COM4 is I/O mapped at 2E8H and utilizes a 16550 type UART contained in the 16C532 companion chip. When used in RS-232 mode, COM4 is terminated via the connector at J6. The configuration details and the pin definitions, when used with the cable (P/N 3-2350-087), are shown here:



U10 - Installed
U13 - Not Installed
U14 - Not Installed

COM4 - DB9
PIN DEFINITIONS

1 DCD
2 RX DATA
3 TX DATA
4 DTR
5 GND
6 DSR
7 RTS
8 CTS
9 RI

Figure A-15. COM4 RS-232

CPU RS-422 Configuration

CPU COM1 RS-422 Configuration

RS-422 signal levels are supported on any, or all serial channels, with the installation of the optional "Chip Kit" (P/N 3-2350-115). This kit provides the driver IC's necessary for a single channel of RS-422. If two channels of RS-422 are required then two kits will be needed. RS-422 is a 4-wire point-to-point full-duplex interface allowing much longer cable runs than are possible than with RS-232. The differential transmitter and receiver twisted-pairs offer a higher degree of noise immunity. The following illustrations show the correct jumpering, driver IC installation and I/O connector pin definitions for each of the COM1 channels when used in RS-422 mode.

Figure A-16. COM1 DB9 RS-422

CPU COM2 RS-422 Configuration

RS-422 signal levels are supported on any, or all serial channels, with the installation of the optional "Chip Kit" (P/N 3-2350-115). This kit provides the driver ICs necessary for a single channel of RS-422. If two channels of RS-422 are required then two kits will be needed. RS-422 is a 4-wire point-to-point full-duplex interface allowing much longer cable runs than are possible than with RS-232. The differential transmitter and receiver twisted-pairs offer a higher degree of noise immunity. The following illustrations show the correct jumpering, driver IC installation and I/O connector pin definitions for each of the COM2 channels when used in RS-422 mode.

U9 - Not Installed
U11 - Installed
U12 - Installed

COM2 - DB9
PIN DEFINITIONS

1 N/A
2 TX+
3 TX-
4 N/A
5 GND
6 RX+
7 RX-
8 N/A
9 N/A

Figure A-17. COM2 RS-422

CPU COM3 RS-422 Configuration

RS-422 signal levels are supported on any, or all serial channels, with the installation of the optional "Chip Kit" (P/N 3-2350-115). This kit provides the driver ICs necessary for a single channel of RS-422. If two channels of RS-422 are required then two kits will be needed. RS-422 is a 4-wire, point-to-point full-duplex interface allowing much longer cable runs than are possible than with RS-232. The differential transmitter and receiver twisted-pairs offer a higher degree of noise immunity. The following illustrations show the correct jumpering, driver IC installation, and I/O connector pin definitions for each of the COM3 channels when used in RS-422 mode.

U4 - Not Installed
U7 - Installed
U8 - Installed

COM3 - DB9
PIN DEFINITIONS

1 N/A
2 TX+
3 TX-
4 N/A
5 GND
6 RX+
7 RX-
8 N/A
9 N/A

Figure A-18. COM3 RS-422

CPU COM4 RS-422 Configuration

RS-422 signal levels are supported on any, or all serial channels, with the installation of the optional "Chip Kit" (P/N 3-2350-115). This kit provides the driver ICs necessary for a single channel of RS-422. If two channels of RS-422 are required then two kits will be needed. RS-422 is a 4-wire, point-to-point full-duplex interface allowing much longer cable runs than are possible than with RS-232. The differential transmitter and receiver twisted-pairs offer a higher degree of noise immunity. The following illustrations show the correct jumpering, driver IC installation and I/O connector pin definitions for each of the COM4 channels when used in RS-422 mode.

U10 - Not Installed
U13 - Installed
U14 - Installed

COM4 - DB9
PIN DEFINITIONS

1 N/A
2 TX+
3 TX-
4 N/A
5 GND
6 RX+
7 RX-
8 N/A
9 N/A

Figure A-19. COM4 RS-422

CPU RS-485 Configuration

The RS-485 multi-drop interface is supported on all serial channels with the installation of the optional "Chip Kit" (P/N 3-2350-115). A single kit is sufficient to configure two of the channels for RS-485. RS-485 is a 2-wire, multi-drop interface where only one station at a time talks (transmits) while all others listen (receive). The following illustrations show the correct jumpering, driver IC installation, and I/O connector pin-out for each of the COM1 channels when used in RS-485 mode.

CPU COM1 RS-485 Configuration

U2 - Not Installed
U5 - Not Installed
U6 - Installed

COM1 - DB9
PIN DEFINITIONS

1 N/A
2 TX+/RX+
3 TX-/RX-
4 N/A
5 GND
6 N/A
7 N/A
8 N/A
9 N/A

Figure A-20. COM1 RS-485

CPU COM2 RS-485 Configuration

U9 - Not Installed
U11 - Not Installed
U12 - Installed

COM2 - DB9
PIN DEFINITIONS

1 N/A
2 TX+/RX+
3 TX-/RX-
4 N/A
5 GND
6 N/A
7 N/A
8 N/A
9 N/A

Figure A-21. COM2 RS-485

CPU COM3 RS-485 Configuration

U4 - Not Installed
U7 - Not Installed
U8 - Installed

COM3 - DB9
PIN DEFINITIONS

1 N/A
2 TX+/RX+
3 TX-/RX-
4 N/A
5 GND
6 N/A
7 N/A
8 N/A
9 N/A

Figure A-22. COM3 RS-485

CPU COM4 RS-485 Configuration

U10 - Not Installed
U13 - Not Installed
U14 - Installed

COM4 - DB9
PIN DEFINITIONS

1 N/A
2 TX+/RX+
3 TX-/RX-
4 N/A
5 GND
6 N/A
7 N/A
8 N/A
9 N/A

Figure A-23. COM4 RS-485

APPENDIX B, MANIFOLD FOR TWO CARRIER GAS BOTTLES TO GC SYSTEM

This Appendix provides a description of a Carrier Gas Manifold that permits connection of two carrier gas bottles, or cylinders, to a Gas Chromatograph (GC) System (part number for the manifold is 3-5000-050). 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.

NOTICE

The illustration and information in this Appendix are from Drawing P/N AE-10098.

This Appendix is organized as follows:

- Illustration
- Installation and Line Purging
- Replacing Carrier Cylinder

B.1 ILLUSTRATION

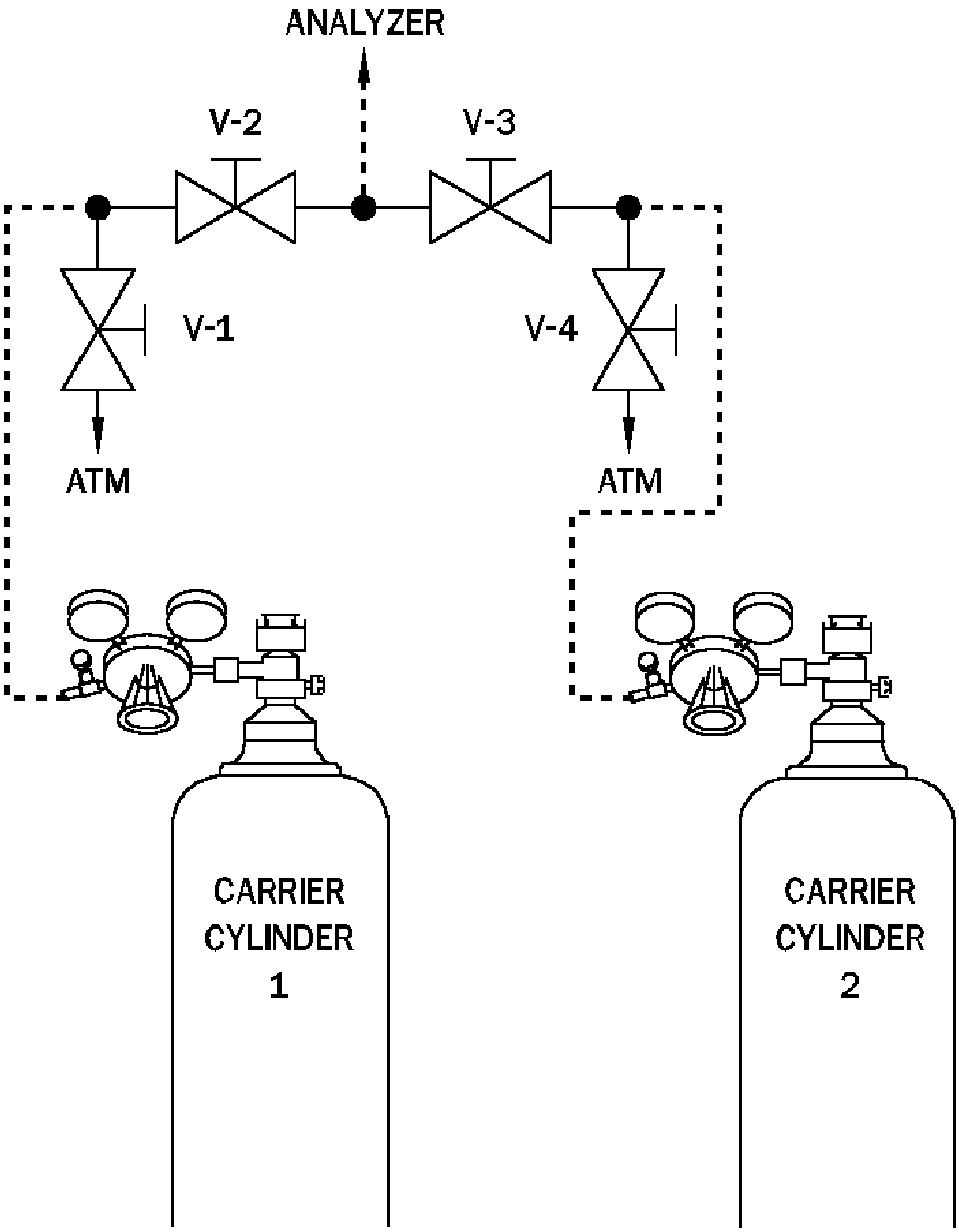


Figure B-1. Manifold for Two Carrier Gas Bottles to GC System

B.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 B-1. Close all valves and tighten all fittings. Run tubing to Analyzer, but do not connect.
2. Back off pressure regulator (counterclockwise) 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, refill the cylinder). Leak-check all of the fittings carefully.
16. Let Analyzer run overnight before calibrating.

B.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 (6) of Installation Instructions, using appropriate bleed valve to purge line. Leak-check the fitting.
4. Open block valve to Analyzer (V-2 or V-3) and regulate outlet pressure to appropriate level. (See steps (14) and (15) of Installation Instructions.)

APPENDIX C, GUIDE TO TRANSIENT PROTECTION MODULES

This Appendix provides a field service guide to the transient protection modules (TPMs) installed on the Terminal Board for Field Wiring (TB) of the Gas Chromatograph Controller.

This Appendix is organized as follows:

- Purpose of the Transient Protection Modules
- Part Applications, Numbers, and Descriptions
- Troubleshooting Transient Protection Modules

C.1 PURPOSE OF THE TRANSIENT PROTECTION MODULES

The field wiring transient protection modules (TPMs) used on the GC Controller prevent the conduction of potentially damaging, high-voltage, short-duration transient signals into the GC Controller's internal electronics. The transient signals filtered out by the TPMs originate from sources that affect the input/output connections of the GC Controller. This includes connections to stream switching systems, analog and digital input/output devices, and serial communications devices. The transient signals may be caused by the devices themselves, or by environmental conditions that induce signals through the input/output cabling.

Additionally, the GC Controller was designed to comply with European requirements. Inspections required for compliance include tests for electrostatic discharge, radiated immunity, electrical fast surge immunity, conducted RF, and magnetic field immunity. The tests conform to the electromagnetic compatibility generic requirements of EN50082-2, "Electromagnetic Compatibility Immunity Standard; Part 2: Industrial Environment" and EN50081-2, "Electromagnetic Compatibility - Generic Emission Standard; Part 2: Industrial Environment."

The three versions of the GC Controller—the explosion-proof, the 19-inch rack mount, and the retrofit—are all qualified for the European Compliance Engineered (CE) mark. In fact, the GC Controller far exceeds many of the minimum requirements for that mark.

C.2 PART APPLICATIONS, NUMBERS, AND DESCRIPTIONS

TPMs are installed on the rear side of the GC Controller's Terminal Board for Field Wiring (TB). The TB is available from Emerson, in various premanufactured versions with preassigned TPM installations, designed to handle specific combinations of applications. A table that lists the premanufactured TB versions, or con-figurations, is provided in drawing CE-18118, Sheet 3 (see Addendum 2, GC Controller Drawings, this manual).

There may be times when it is more appropriate to change, inspect, diagnose, or service the individual TPMs, rather than the entire Terminal Board (TB). Consequently, this section of the Appendix provides a guide to the individual TPMs installed on the TB, their uses, and their part numbers (see Table C-1, following page):

Further Explanation - Individually, the TPMs can be divided into two main categories: differential and single-ended modules. The differential modules are used with two-wire analog signals so that both wires are protected. Single-ended modules are usually used to clamp digital signals.

Finally, in those cases where high current or high voltage are needed for discrete outputs, a TPM is substituted that has no protection devices.

Table C-1. Transient Protection Modules Installed on the Terminal Board for Field Wiring

APPLICATION	PART NO.	PART DESCRIPTION	M# SOCKETS (channel)
COM, RS-232	3-2350-027	Quad Bi-dir Sngl Tnst	M6 (COM1) M11 (COM2) M4 (COM3) M7 (COM4)
COM, RS-422	3-2350-027	Quad Bi-dir Sngl Tnst	M11 (COM2) M4 (COM3)
COM, RS-485	3-2350-027	Quad Bi-dir Sngl Tnst	M6 (COM1) M11 (COM2) M4 (COM3) M7 (COM4)

APPLICATION	PART NO.	PART DESCRIPTION	M# SOCKETS (channel)
CONTROLLER / ANALYZER INTERCON-NECT	3-2350-002	Quad Sngl Tnst	M9 (Fnct. codes) M15 (FC Strobe, A-Zero, Alarm)
STREAM SWITCH	3-2350-002	Quad Sngl Tnst	M16 (Sol. 1-4) M10 (Sol. 5-8)
DIGITAL I/O (LOW CURRENT)	3-2350-002	Quad Sngl Tnst	M5 (Din 1) M14 (Din 2-5) M5 (Dout 5)
	NOTES: 16-pin.		
DIGITAL I/O (LOW CURRENT)	3-2350-003	Quad Diff Tnst	M8 (Dout 1-4)
ANALOG I/O	3-2350-003	Quad Diff Tnst	M1 (Ain 1-4) M13 (Ain 5-8) M12 (Aout 1-2) M3 (Aout 3-6) M2 (Aout 7-10)
	NOTES: 20 pin.		
DIGITAL I/O (HIGH CURRENT)	3-2350-TBD	Hi Pwr Discrete Output	M5 (Din 1) M14 (Din 2-5) M5 (Dout 5)
	NOTES: 16-pin.		
DIGITAL I/O (HIGH CURRENT)	3-2350-019	Hi Pwr Discrete Output	M8 (Dout 1-4)
	NOTES: 20 pin.		

C.3 TROUBLESHOOTING TRANSIENT PROTECTION MODULES

To determine the integrity of a transient protection module (TPM), follow the guidelines in these tables (see Tables C-2, C-3, and C-4):

Table C-2. Troubleshooting TPM, P/N 3-2350-002

P/N 3-2350-002 16-pin; Quad Sngl Tnst; Controller/Analyzer Interconnect, Stream Switch, and Digital I/O (low current)

VISUAL INSPECTION	
MOVs (M1-M4)	Good: Blue in color Failed: Discolored to brown or black
Resistors (R1-R4)	Good: Intact Failed: Broken, or open

CAUTION

EQUIPMENT DAMAGE

Remove transient protection module from board before all ohmmeter checks.

Failure to do so may cause equipment damage.

OHMMETER CHECK	
MOVs (M1-M4)	Good:Open, or infinite ohms Failed: Shorted, or 0 (zero) ohms
Resistors (R1-R4)	Good: ~330 ohms Failed: Open (infinite ohms) or short (0 ohms)
Diodes (Z1-Z4)	Good: Open (infinite ohms) in one direction and ~4.12 megohms in the opposite direction Failed: Short (0 ohms) in one or both directions

Table C-3. Troubleshooting TPM, P/N 3-2350-003

P/N 3-2350-003 20-pin; Quad Diff Tnst; Analog I/O and Digital I/O (low current)

VISUAL INSPECTION	
MOVs (M1-M8)	Good: Blue in color Failed: Discolored to brown or black
Resistors (R1-R8)	Good: Intact Failed: Broken, or open

CAUTION

EQUIPMENT DAMAGE

Remove transient protection module from board before all ohmmeter checks.

Failure to do so may cause equipment damage.

OHMMETER CHECK	
MOVs (M1-M8)	Good: Open, or infinite ohms Failed: Shorted, or 0 (zero) ohms
Resistors (R1-R8)	Good: ~150 ohms Failed: Open (infinite ohms) or short (0 ohms)
Diodes (Z1-Z4)	Good: Open (infinite ohms) in one direction and ~4.12 megohms in the opposite direction Failed: Short (0 ohms) in any one or both directions

Table C-4. Troubleshooting TPM, P/N 3-2350-004

P/N 3-2350-019 20-pin; Hi Pwr Discrete Output; Digital I/O (high current)

VISUAL INSPECTION	
MOVs (M1-M8)	Good: Blue in color Failed: Discolored to brown or black
Resistors (R1-R8)	Good: Intact Failed: Broken, or open

CAUTION

EQUIPMENT DAMAGE

Remove transient protection module from board before all ohmmeter checks.

Failure to do so may cause equipment damage.

OHMMETER CHECK	
MOVs (M1-M8)	Good: Open, or infinite ohms Failed: Shorted, or 0 (zero) ohms
Resistors (R1-R8)	Good: ~150 ohms (NOT CONFIRMED IN LAB) Failed: Open (infinite ohms) or short (0 ohms)
Diodes (Z1-Z4)	Good: Open (infinite ohms) in both directions Failed: Short (0 ohms) in any one or both directions

Table C-5. Troubleshooting TPM, P/N 3-2350-027

P/N 3-2350-027 16-pin; Quad Bi-dir Sngl Tnst; COMM (RS-232, RS-422, RS-485)

VISUAL INSPECTION	
MOVs (M1-M4)	Good: Blue in color Failed: Discolored to brown or black
Resistors (R1-R4)	Good: Intact Failed: Broken, or open

CAUTION

EQUIPMENT DAMAGE

Remove transient protection module from board before all ohmmeter checks.

Failure to do so may cause equipment damage.

OHMMETER CHECK	
MOVs (M1-M4)	Good: Open, or infinite ohms Failed: Shorted, or 0 (zero) ohms
Resistors (R1-R4)	Good: ~330 ohms Failed: Open (infinite ohms) or short (0 ohms)
Diodes (Z1-Z4)	Good: Open (infinite ohms) in both directions Failed: Short (0 ohms) in any one or both directions

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APPENDIX D, INTERNAL MODEM FOR GC CONTROLLER

This Appendix provides additional information for installing the internal modem for the GC Controller. (See drawing BE-20767 in Addendum 2 of this manual).

To install the Internal Modem for the GC Controller, follow these steps:

1. Halt any ongoing analysis runs.
2. Disconnect AC power from the GC Controller.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the cover from the Model 500, make certain the power supply switch is OFF and the AC power cord is disconnected.

Failure to observe all safety precautions could result in serious injury or death.

NOTICE

The following steps for accessing the various Controller electronics, steps (3) through (6), assume you are working with the explosion-proof Controller. The rack mount Controller permits easier access to the internal electronics with a side panel cover that can be opened by loosening four retaining screws.

3. Remove the cover from the GC Controller housing to expose the GC Controller's Terminal Board for Field Wiring.
4. Loosen the six screws that secure the GC Controller's Terminal Board for Field Wiring. Then unplug the Terminal Board from its connections at the back, top of the board.

5. Lower the Terminal Board down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.
6. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage away from its chassis mount so that it is easy to work on.
7. Disconnect ribbon cable plugs from the cards in the Card Cage Assembly so that you can insert and securely plug the "33.6" GC Internal Modem card into the COM4A Board.
8. Plug the telephone line into the RJ-11 phone jack at the back edge of the GC Internal Modem card.
9. Reconnect all ribbon cable plugs that were disconnected in step (8), above.
10. Return and secure the Card Cage Assembly in its chassis mounting. Tighten the four screws.
11. Return and secure the GC Controller's Terminal Board for Field Wiring in its original position. Hand-tighten the six screws.
12. Restore AC power to the 2350A GC Controller.
13. Connect the telephone line from the GC Controller's Internal Modem to a wall phone jack, if available, or to the outside telephone system.

NOTICE

The above instructions can also be found in the MON2000 Software for Gas Chromatographs User Manual (P/N 3-9000-522), along with instructions for setting parameters for the GC Controller serial port 4 or serial port 8 if a keypad and display are present.

APPENDIX E, SETTING SOLENOID PURGE FLOWS

This appendix provides the steps needed to set up solenoid purge flow. Solenoid purge flow is a necessary part of the normal operation of process GC systems that handle multiple streams and are equipped with optional solenoid purge system components.

NOTICE

A solenoid purge system for the GC is available as an optional part of the GC sample conditioning system (SCS). The utility of a solenoid purge system is greatest for GC systems with multiple streams in which the makeup of the different analysis streams may differ significantly from stream to stream.

For process GC systems with multiple streams, a solenoid purge setup is necessary before starting normal GC operation. A solenoid purge check, as outlined below, is also recommended as part of a regular GC system maintenance schedule to be performed, for example, once every month.

The steps in this solenoid purge procedure ensure there is no cross stream contamination in multi-stream sample systems. As a particular stream is being purged through the sample valve in the Analyzer, that same stream is being purged through all the sample system solenoids. This ensures that streams not being purged do not mix with the purging stream.

NOTICE

Have on hand the *sample system drawing* that was included with the GC system as part of the shipping package. This drawing identifies, in schematic form, the location of solenoid purge valves that you will need to operate during this procedure.

To set up solenoid purge flow, follow these steps:

1. At the GC Controller, halt continuous analysis.
2. At the Analyzer, ensure that all streams to be analyzed are plumbed into the system and stream pressures are set to 15-20 psig.
3. At the Analyzer, locate and close the solenoid purge valve for each solenoid. This is the valve plumbed to the normally open (NO) port of each stream solenoid.

   Refer to the sample system drawing for the location of these valves.
4. Access the Analyzer Valve Driver board(s) with stream switches. Manually turn the switch for stream 1 ON, and turn all other streams OFF.
5. Open the purge valve associated with stream 2, and regulate the flow through the solenoid purge flow indicator to approximately 200 cubic centimeters per minute (ccm).

   Refer to the sample system drawing for the location of purge valves.
6. Open the purge valve associated with stream 3, and regulate the flow through the solenoid purge flow indicator to add approximately 200 ccm to current flow.

   Flow indicator should now read 400 ccm.
7. Continue to open solenoid purge valves, adding 200 ccm flow for each additional stream (as measured at the solenoid purge flow indicator).
8. When flows for all streams, except stream 1, are set, manually turn stream 1 OFF at the Analyzer Valve Driver board.

   (a) Now, manually turn stream 2 ON at the Analyzer Valve Driver board.

   (b) Next, open the solenoid purge valve associated with stream 1 to add 200 ccm to the current flow (as measured at the solenoid purge flow indicator).
9. When all flows have been set, return all stream switches to AUTO positions (at the Analyzer Valve Driver board).
10. After you have set all stream switches to AUTO positions, close the XJT electronics box (that houses the Analyzer Valve Driver board), and commence normal analysis.

APPENDIX F, UPGRADING FROM 2251 TO 2350A GC CONTROLLER

This appendix provides the steps needed to replace a 2251 Gas Chromatograph (GC) Controller with a 2350A GC Controller.

To help you with the GC Controller replacement operation, this appendix includes wiring diagrams and step-by-step instructions. Check off each step as you complete it, and fill out the wire color charts in the wiring diagrams. This appendix is organized as follows:

- Halt Current Analysis and Power Down
- Note Existing Wiring Connections to 2251 GC Controller
- Remove Cables, Replace Controller, and Reconnect

CAUTION

POSSIBLE EQUIPMENT DAMAGE

Carefully read the following installation procedures BEFORE attempting to upgrade the 2251 GC Controller with a new 2350A GC Controller.

Failure to follow these instructions exactly may result in damage to the GC Controller, Analyzer, or peripheral devices.

F.1 HALT CURRENT ANALYSIS AND POWER DOWN

To prepare the 2251 GC Controller for disassembly, follow these steps:

1. Halt the current analysis. Press the RUN key on the 2251, and then press the YES key when prompted to stop the analysis.

   When the display on the 2251 reads "FUNCTION", proceed to step (2).

2. Turn the power OFF to the 2251. The power switch is located on the top of the power supply on the back of the 2251. The 2251 display should be blank when the power is off.

3. Disconnect the AC power cord to the 2251 power supply from the AC outlet.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the unit cover from the 2251, make certain the power supply switch is OFF and the AC power cord is disconnected.

Failure to observe all safety precautions could result in serious injury or death.

4. Remove the 2251 power supply from the back of the Controller by loosening the thumb screw, lowering the power supply, and disconnecting the square power supply connector from the Controller.

F.2 NOTE EXISTING WIRING CONNECTIONS TO 2251

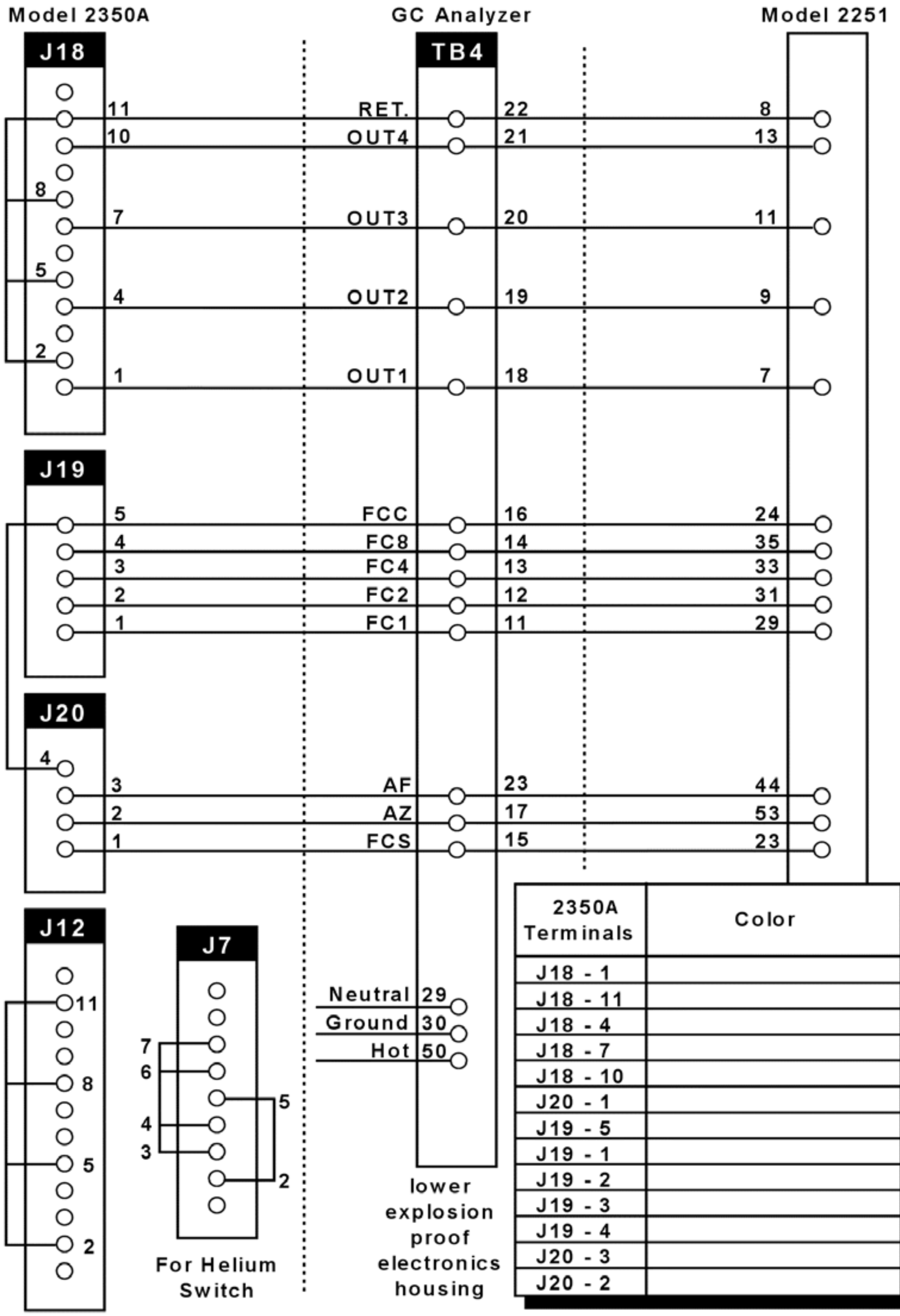
Before disconnecting any wires, first record existing wiring connections to the 2251:

1. Locate the multi-pair interconnect cable that runs from the 2251 Controller to the Analyzer. At the cable's termination at the 2251, make note of each individual wire's connection and wire color:

   Record the colors of each of the individual interconnect wires by filling out the color box in the wiring guide, next page (see Figure 1).

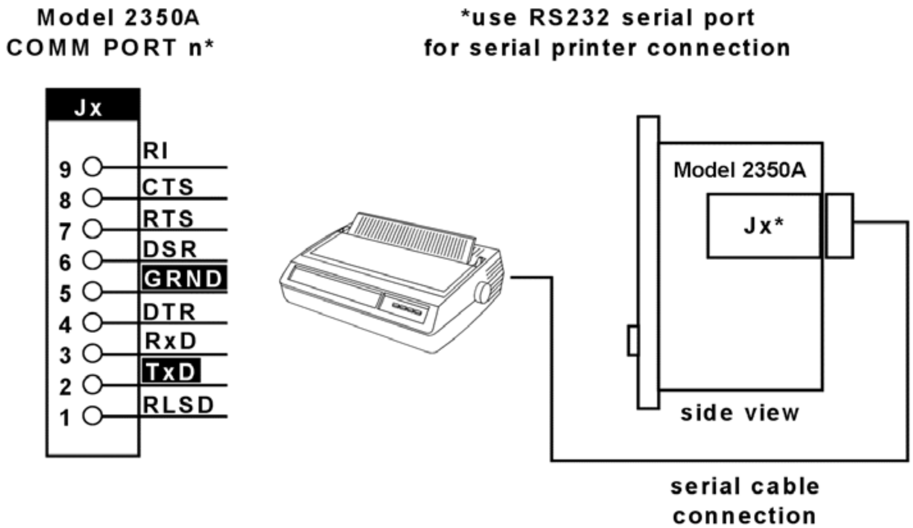
NOTICE

This step is extremely important. Be careful to complete the Controller replacement wiring color box accurately (shown in Figure 1). Do not remove any wires at this time.



2350A Terminals	Color	2251 Terminals
J18 - 1		07
J18 - 11		08
J18 - 4		09
J18 - 7		11
J18 - 10		13
J20 - 1		23
J19 - 5		24
J19 - 1		29
J19 - 2		31
J19 - 3		33
J19 - 4		35
J20 - 3		44
J20 - 2		53

Figure F-1. GC Controller 2251-to-2350A Replacement Wiring Guide



2350A Terminals	Color	2251 Terminals
	serial printer	
J10 - 2		TB4-19 (TxD)
J10 - 5		TB4-61 (GRND)

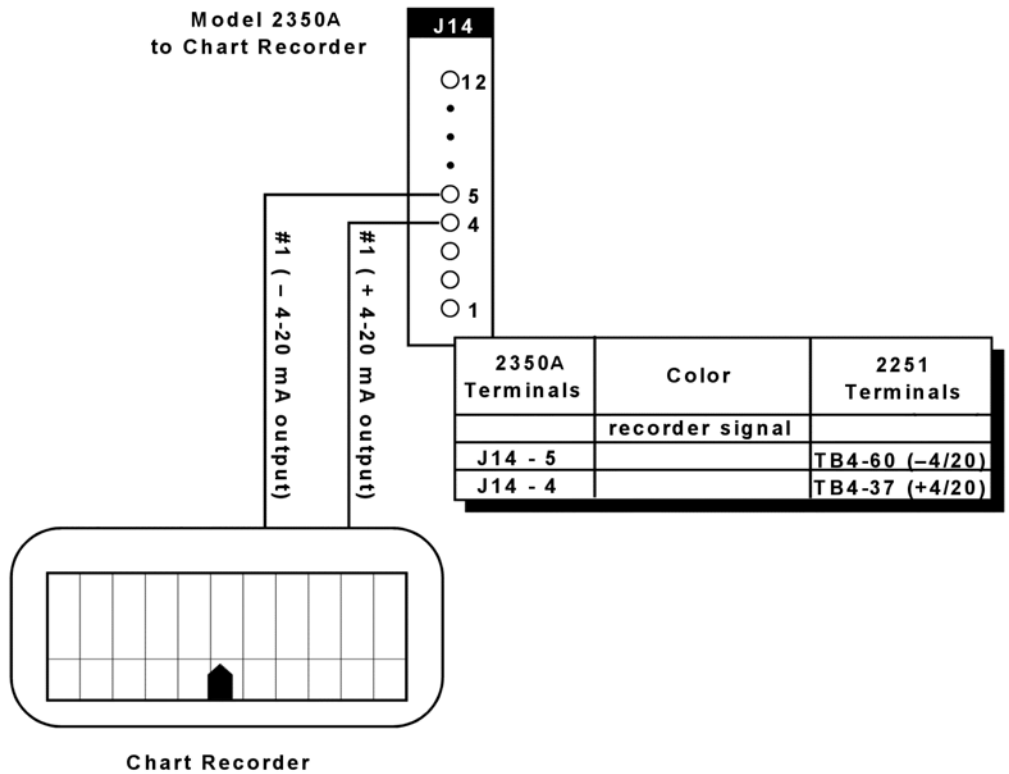
Figure F-2. Replacement Serial Printer Wiring Help

2. Locate the cable that runs from the 2251 Controller to the serial printer (if a serial printer is connected to the Controller). At the cable's termination at the 2251, make note of each individual wire's connection and color.

   Record the colors of each of the serial printer wires by filling out the color box in the wiring guide for the serial printer connection (see Figure 2). Again, this step is very important. Complete the color box accurately, but do not remove any wires at this time.

3. Locate the cable that runs from the 2251 Controller to the strip chart recorder (if a chart recorder is connected to the Controller). At the cable's termination at the 2251, make note of each individual wire's connection and color.

   Record the colors of each of the serial printer wires by filling out the color box in the wiring guide (see Figure 3). Again, this step is very important. Complete the color box accurately, but do not remove any wires at this time.



2350A Terminals	Color	2251 Terminals
	recorder signal	
J14 - 5		TB4-60 (–4/20)
J14 - 4		TB4-37 (+4/20)

Figure F-3. Replacement Chart Recorder Wiring Help

F.3 REMOVE CABLES, REPLACE CONTROLLER, AND RECONNECT

To finish the GC Controller replacement, follow these steps:

1. Turn OFF the 20 volt power supply at the Model 500 Analyzer.

   (a) Remove the cover of the lower explosion-proof electronics housing of the Model 500 Analyzer (this housing contains the 20 volt power supply switch and the five stream switches for the Analyzer).

(b) Turn OFF the 20 volt power switch, located at the top left. At this point, all lights in the lower explosion-proof housing of the Model 500 Analyzer should be OFF.

⚠ WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

The above step is a safety precaution that must be followed to avoid personal injury.

Failure to observe all safety precautions could result in serious injury or death.

2. Remove all cables from the 2251 GC Controller terminal.
3. Remove the 2251 GC Controller, and install the replacement 2350A GC Controller.

⚠ WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

DO NOT connect the 2350A GC Controller to AC power at this time!

Failure to observe all safety precautions could result in serious injury or death.

4. Use the previously completed wiring diagrams and color boxes completed previously (in Section F.2) to reconnect the Model 500 Analyzer, printer, and strip chart recorder to the 2350A GC Controller.
5. Review the wiring diagrams and color code boxes you completed to verify each wire has been terminated correctly.
6. Turn ON the 20 volt power switch to the Analyzer by turning ON the top three switches in the lower explosion-proof electronics housing (as described earlier in step (1), above, Section F.3).

7. Connect the 2350A GC Controller power cord, and turn ON the AC power to the Controller.
8. Follow the software installation procedures provided with the new MON2000 CDs.
   (a) You will need to connect a personal computer (PC) to the 2350A GC Controller in order to first operate it and download GC Applications to it.
   (b) For startup of the 2350A GC Controller in the field, a laptop computer and RS-232 serial cable connection is recommended. (Hazardous environments require a remote connection.)
   (c) A straight-through commercial serial cable connected between the PC and the 2350A GC Controller's front panel serial port will suffice in most instances. (See Figure 4 for terminals and pinouts for possible RS-232 serial connections to the 2350A GC Controller.)

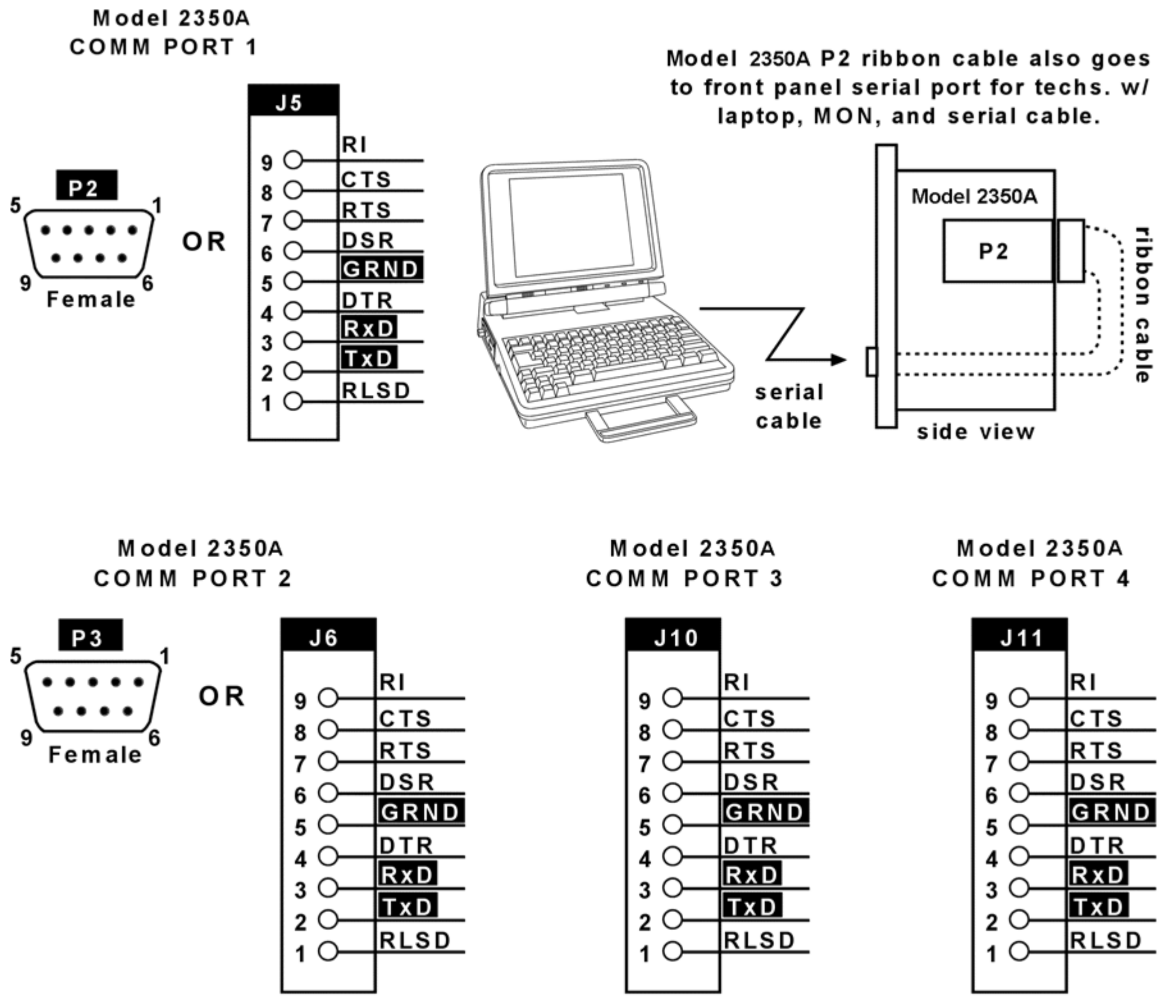


Figure F-4. Terminals and Pinouts for Possible RS-232 Serial Connections to the Model 2350A GC Controller

APPENDIX G, 2350 TO 2350A CPU RETROFIT INSTRUCTIONS

G.1 2350A CPU ASSEMBLY INTRODUCTION

The 2350A GC Controller CPU assembly has been designed to include all digital I/O and COM3 and COM4 serial ports. This eliminates the requirement (and additional cost) for an I/O assembly or DSPI/O assembly.

In addition, BOS is now resident in the DiskOnChip, instead of an EPROM set. The DiskOnChip provides additional expanded memory for archiving data, instead of having to purchase a memory expansion board assembly. The BOS file in the DiskOnChip may be upgraded in the field through the MON2000 Software (refer to the MON2000 Software for Gas Chromatographs User Manual P/N 3-9000-522 for BOS upgrade details).

Optional boards may be plugged directly into the PC/104 Bus (connectors J19 and J20) on the CPU board assembly. The COM4A Board provides four additional serial ports (COM5 through COM8). A Modem board and/or Ethernet board can also be plugged directly into the PC/104 Bus for additional communications requirements. The PC/104 Bus is designed to allow any combination of option boards to be installed in any order (refer to Figure 1).

NOTICE

If you are using the CSA approved Radicom modem; ensure that it is the top card in the card cage assembly. The connection configuration of the Radicom modem requires installation at the top of the assembly.

Figure G-1. CPU PC/104 Bus with COM4A Board

G.2 CONVERSION PROCESS

1. At the GC Controller site, remove the Controller enclosure's front panel.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

(a) *For the explosion-proof Controller*, the front panel is secured by 16 screws. Remove those screws first.

(b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.

(c) *For the rack mount Controller*, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.

2. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's card cage assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)
3. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.
4. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.
5. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.
6. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.
7. Remove all cables connected to the System Interface Board (P/N 3-2350-005, P/N 3-2350-022, or P/N 3-2350-023).
8. Remove the I/O48 board assembly (drawing P/N BE-12973) and cables from the top slot of the cage card assembly. This board is not used on the 2350A GC Controller.
9. Remove the CPU Board assembly (P/N CE-19281) and cables from the second slot of the card cage assembly. This board is not used on the 2350A GC Controller.
10. Remove the DSPI/O board assembly (drawing P/N CE-12976) and cables from the third slot of the card cage assembly. This board is not used on the 2350A GC Controller.

11. Remove any other optional boards such as memory expansion boards and associated cables. These parts are not used on the 2350A GC Controller.
12. Leave the Analog Board assembly (drawing P/N BE-18044) with attached cable in the card cage. This board is used on the 2350A basic configuration.
13. Change the fuse in the inline fuse holder from 1 amp to the 2.5 amp, Slo-Blo fuse provided. The fuse is located in the cable (P/N 2-3-2350-069) between the power supply and the System Interface Board.
14. Ensure that DIP Switches 6, 7, and 8 of S1 are all in the "OFF" position. If the 2350A is powered up with S8 in the "ON" position, it will delete the current application (commonly called a "Cold Start").
15. To inspect or change the GC Controller's COM ID setup at the GC Controller site, locate the DIP switch as described in the following steps.

⚠WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

16. For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

    Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage. The DIP switch is located on the lower left side of the front panel.

Figure G-2. Explosion-Proof Controller DIP Switch

17. For rack mount and panel mount Controllers, use a flat head screw driver to remove the access panel on the right side of the card cage assembly.

Figure G-3. Right Side View of Rack Mount and Panel Mount Controllers

18. Inspect or change the DIP switch settings as necessary.

    (a) See Table G-1 as a guide.

    (b) *Make sure you record in the GC Controller's maintenance records any changes you make to the switch settings.*

    - 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.
    - Switch to ON = 1
    - Switch to OFF = 0
    - 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.

Table G-1. Modbus Slave Address (COMID)

Dip Switch Settings Switch Positions					
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	OFF	ON	ON	OFF	OFF
7	ON	ON	ON	OFF	OFF
8	OFF	OFF	OFF	ON	OFF

RAM CLEAR	
Dip Switch Setting Switch Positions	
	8
Clears RAM when unit powered down	ON
Keeps RAM when unit powered down	OFF

G.3 BASIC 2350A CONFIGURATION

At this point, install, if any, all mounting hardware and optional PC/104 boards onto the 2350A CPU Board.

1. Install the 2350A CPU (P/N 3-2350-090) into slot 3 of the card cage assembly.
2. Install cables on the CPU Board in the following sequence:
   (a) Digital I/O cable (P/N 3-2350-081) from CPU J7 to the System Interface Board J2.
   (b) Digital I/O cable (P/N 3-2350-080) from CPU J4 to the System Interface Board J3.

(c) COM1, COM2, and the printer cable (P/N 3-2350-083) from CPU J1 to the System Interface Board J4, J9, and J11.

(d) COM3 and COM4 can be configured two different ways. To configure a system **WITHOUT** a keyboard and display, connect cable (P/N 3-2350-084) from CPU J6 to the System Interface Board J8 and J10. This provides access to COM3 on J10 and COM4 on J11 of the Field Termination Board. The serial port setup in the MON2000 Software for COM4 must be selected as a PC port.

(e) For a system **WITH** a keyboard and display, connect cable (P/N 3-2350-087) from CPU J6 to the System Interface J8 and J12. This provides access to COM3 on J10 and COM4 is dedicated for use as a serial interface to the keyboard and display. COM4 will not be available at J11 of the Field Termination Board. The serial port setup in the MON2000 Software for COM4 must be selected as Front Panel. See Figure 4.

If all four serial ports are required for communications on a system with keyboard and display, an optional COM4A Board must be installed and a COM7 and COM8 cable (P/N 3-2350-086) connected (see Section 4.0 below). The serial port setup in the MON2000 Software for COM8 must be configured as Front Panel. See Figure 5.

(f) Reinstall the Analog cable to J6 on the System Interface Board.

(g) Place the "Unit Updated to 2350A" label, included with the upgrade kit, on the instruction decal located on the inside, right wall of the explosion-proof units or on the card cage of the rack or panel mount units.

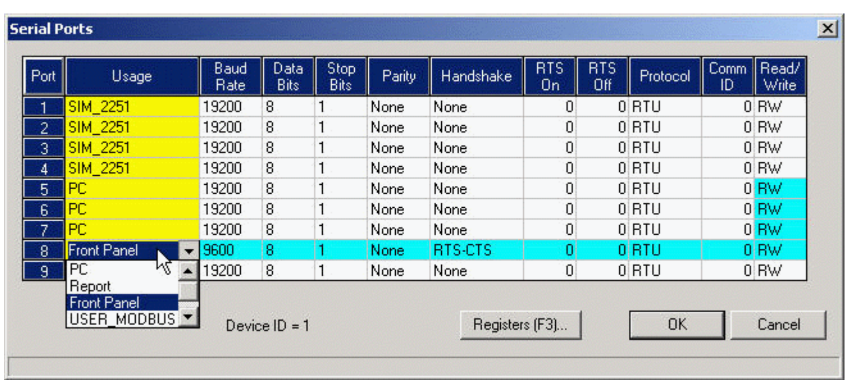


Figure G-4. MON2000 Serial Port 8 Front Panel Configuration with COM4A Board Installed

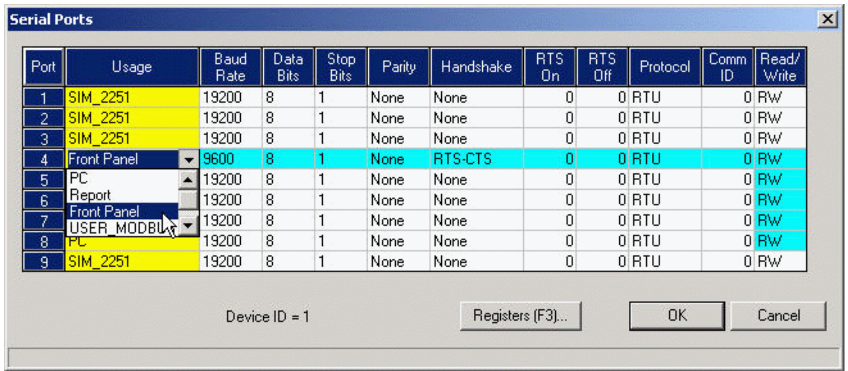


Figure G-5. MON2000 Serial Port 4 Front Panel Configuration

G.4 2350A OPTIONS

The following board configurations are optional for the Model 500 with 2350A Controller.

G.4.1 The COM4A Board

1. To add four additional communications ports at the GC Controller site, remove the Controller enclosure's front panel.

WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

(a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

(b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.

(c) For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.

2. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's Card Cage Assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)

3. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.

4. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.

5. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.

6. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.

   (a) Disconnect the Analog cable from J6 on the System Interface Board, then disconnect all CPU cables from the System Interface Board.

   (b) Remove the CPU assembly and install the COM4A Board, with associated mounting hardware to J19 and J20 PC/104 Bus connector on the CPU assembly.

   (c) Connect COM5 (P22) and COM6 (P23) on the Field Termination Board via cable (P/N 3-2350-085) to J6 on COM4A.

   (d) Connect COM7 (P24) on the Field Termination Board and COM8 via cable (P/N 3-2350-086) to J3 on COM4A.

   (e) Install the CPU assembly into the third slot of card cage. Connect the CPU cables as detailed in Section G.3, “BASIC 2350A CONFIGURATION” on page 7.

   (f) Install the DB9 connector from COM5 to P22 on the Field Termination Board with jackpost assemblies.

(g) Install the DB9 connector from COM6 to P23 on the Field Termination Board with jackpost assemblies.

(h) Install the DB9 connector from COM7 to P24 on the Field Termination Board with jackpost assemblies.

(i) Install the ten position connector from COM8 to J12 on the System Interface Board.

(j) Connect the Analog cable to J6 on the System Interface Board.

NOTICE

Refer to Section 3.4.4.1 for port configuration, RS-232, RS-422 and RS-485 and pin outs.

(k) With COM4A Boards installed, Serial Port 8 is usually assigned via MON2000 Application>Serial Ports menu path. Select Front Panel from the Usage pull-down menu (see Figure G-6 and G-7 below).

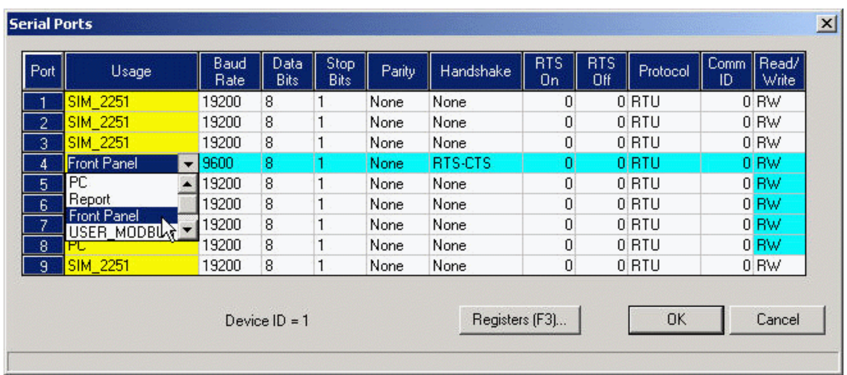
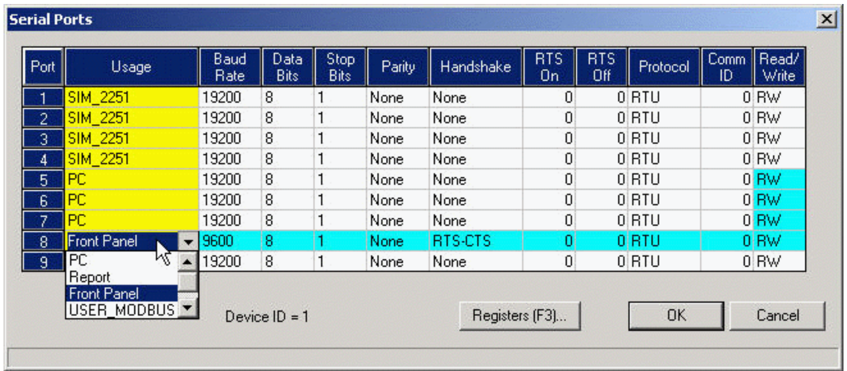


Figure G-6. MON2000 Serial Port 8 Front Panel Configuration with COM4A Board Installed



Port	Usage	Baud Rate	Data Bits	Stop Bits	Parity	Handshake	RTS On	RTS Off	Protocol	Comm ID	Read/ Write
1	SIM_2251	19200	8	1	None	None	0	0	RTU	0	RW
2	SIM_2251	19200	8	1	None	None	0	0	RTU	0	RW
3	SIM_2251	19200	8	1	None	None	0	0	RTU	0	RW
4	SIM_2251	19200	8	1	None	None	0	0	RTU	0	RW
5	PC	19200	8	1	None	None	0	0	RTU	0	RW
6	PC	19200	8	1	None	None	0	0	RTU	0	RW
7	PC	19200	8	1	None	None	0	0	RTU	0	RW
8	Front Panel	9600	8	1	None	RTS-CTS	0	0	RTU	0	RW
9	PC	19200	8	1	None	None	0	0	RTU	0	RW

Figure G-7. MON2000 Serial Port 4 Front Panel Configuration

G.5 TO ADD A MODEM

1. At the GC Controller site, remove the Controller enclosure's front panel.

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

(a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

(b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.

(c) For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.

2. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's card cage assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)
3. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.
4. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.
5. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.
6. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.
   (a) Disconnect the Analog cable from J6 of the System Interface Board, then disconnect all CPU cables from the System Interface Board.
   (b) Remove the CPU assembly and install the modem with associated hardware into J19 and J20 PC/104 Bus connector on the CPU assembly.

NOTICE

If an option board is already plugged into the PC/104 bus on the CPU, the modem and mounting hardware will be installed into the PC/104 connector on the option board.

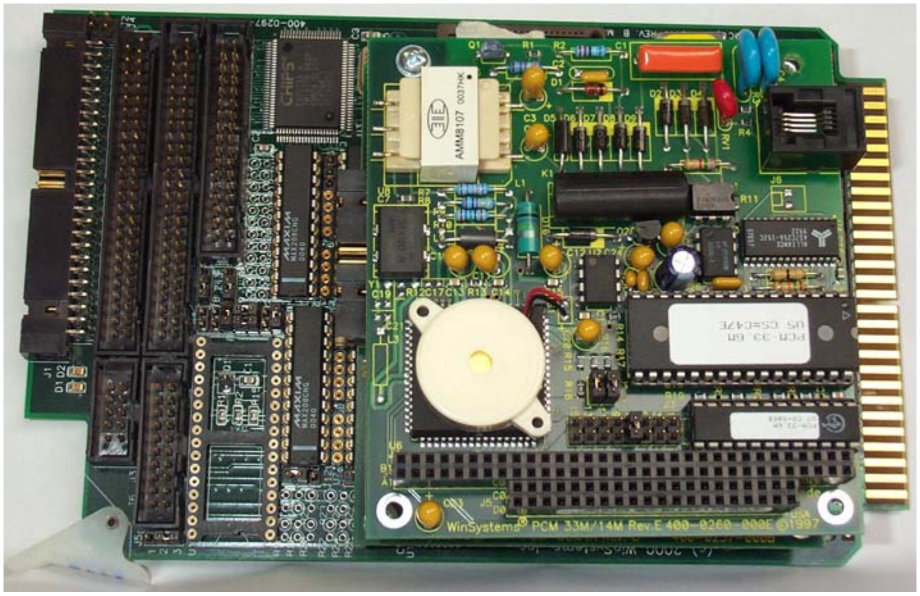


Figure G-8. Modem

(c) Plug one end of the modem extension cable (P/N 3-2350-075) into J1 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.

7. To use an existing Modem (1414):

(a) For operation with the 2350A CPU, set the Standard 1414 Modem jumpers per the following table:

Table G-2. Modem Jumpers

Jumper	Pin
J4/J5	Open
J6	3-5, 4-6
J7	7-8
J9	Open
J10	2-3

(b) On the 2350A WinSystems® CPU, set J21, pin 13-14.

G.6 TO ADD AN ETHERNET CARD

1. At the GC Controller site, remove the Controller enclosure's front panel.

⚠WARNING

SERIOUS PERSONAL INJURY OR DEATH POSSIBLE

Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.

Failure to observe all safety precautions could result in serious injury or death.

(a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

(b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.

(c) For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.

2. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's card cage assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)
3. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.
4. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.

5. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.

6. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.

   (a) Disconnect the Analog cable from J6 of the System Interface Board, then disconnect all CPU cables from the System Interface Board.

   (b) Remove the CPU assembly and install the Ethernet assembly with associated hardware into J19 and J20 PC/104 Bus connector on the CPU assembly.

NOTICE

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.

   (c) 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 reconnected to the System Interface Board). No software setup is required for this board.

   (d) If the 2350A BOS version is v1.84 or later, ensure that J6 Jumper on pins 13-14 of J1 has been removed. See Figure G-9 and Figure G-10.

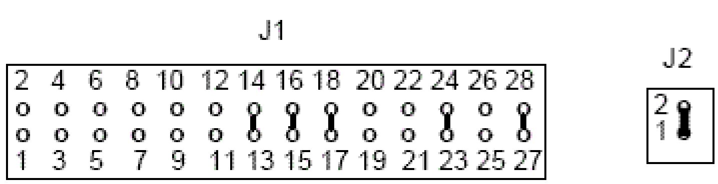


Figure G-9. Ethernet Jumper Configuration BOS v1.82 and Earlier

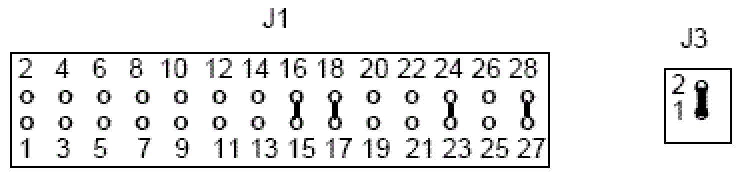


Figure G-10. Ethernet Jumper Configuration BOS v1.84 and Later

NOTICE

If an option board is installed on the PC/104 Bus on the CPU, install the Ethernet Board and mounting hardware on the PC/104 Bus connector on the option board.

NOTICE

If you are using the CSA approved Radicom modem; ensure that it is the top card in the card cage assembly. The connection configuration of the Radicom modem requires installation at the top of the assembly.

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APPENDIX H, 6117 CPU TO LX-800 CPU UPGRADE INSTRUCTIONS

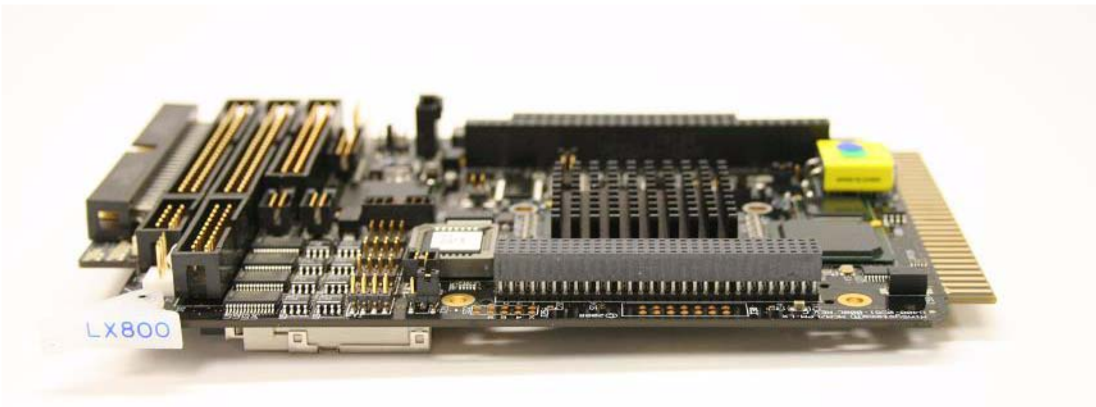
This section describes a procedure for upgrading a Model 500 gas chromatograph with a WinSystems® LX-800 CPU board (P/N #2-3-2350-232). The new CPU board is supplied with a retrofitting kit.

In addition to the new CPU board, the kit contains the following items:

- *MON2000 Gas Chromatograph Software for Windows* (P/N #2-3-2350-400). This CD-ROM also contains the software's user manual (P/N #3-9000-522).
- Six replacement cables
  - P/N #2-3-2350-083
  - P/N #2-3-2350-077
  - P/N #2-3-2350-087
  - P/N #2-3-2350-084
  - P/N #2-3-2350-080
  - P/N #2-3-2350-081
- A 5-Amp replacement fuse (P/N #2-5-4203-130)
- Two replacement card guides (P/N #2-4-5001-078)

In some cases when retrofitting the new CPU card it may be necessary to also retrofit the analog board. For more information, see "Retrofitting the Analog Board" on page H-11.

H.1 INTRODUCTION



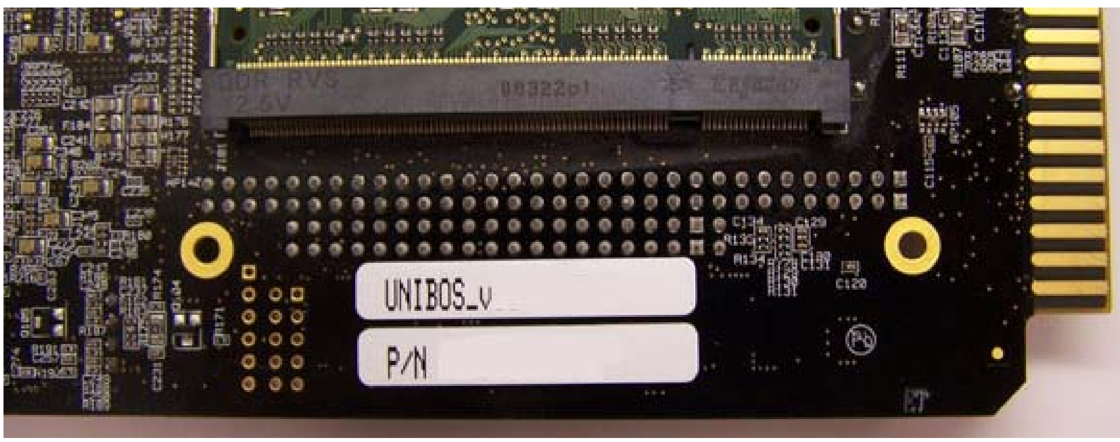
The LX-800 CPU assembly has been designed to include all digital I/O and COM1 through COM4 serial ports.

In addition, the Unified Baseline Operating System (UniBOS) is now resident on a 128 MB CompactFlash card instead of the slower 16 MB DiskOnChip module. The CompactFlash card provides additional memory for archiving data.

The UniBOS file on the CompactFlash card can be upgraded in the field with MON2000. Refer to the *MON2000 Software for Gas Chromatographs* user manual, which is located on the MON2000 CD-ROM, for information about downloading 2350A applications and UniBOS upgrades.

CAUTION

UniBOS is preloaded on the LX-800 CPU board. Do not attempt to install BOS or an earlier version of UniBOS. Doing so will irreversibly corrupt the firmware and will require the purchase of a new CPU board. To learn the version level of the UniBOS loaded onto your CPU board, refer to the label on the board's back.



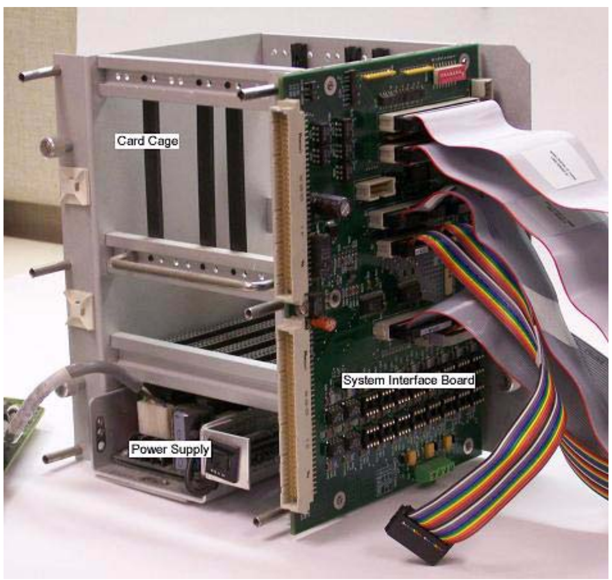
Other relevant facts about the LX-800 CPU board include:

- Optional boards can be plugged directly into the PC104 bus (64-pin connector J29 and 40-pin connector J27) on the CPU board assembly.
- An optional COM4A board provides four additional serial ports: COM5 through COM8.
- A modem card can be plugged directly into the PC104 bus for additional communications capabilities.
- If you plan to install a CSA-approved Radicom modem and two or more PC104 boards, the modem must be installed on top of the PC104 stack because the modem has only one PC104 connector.

H.2 REMOVING THE OLD CPU CARD

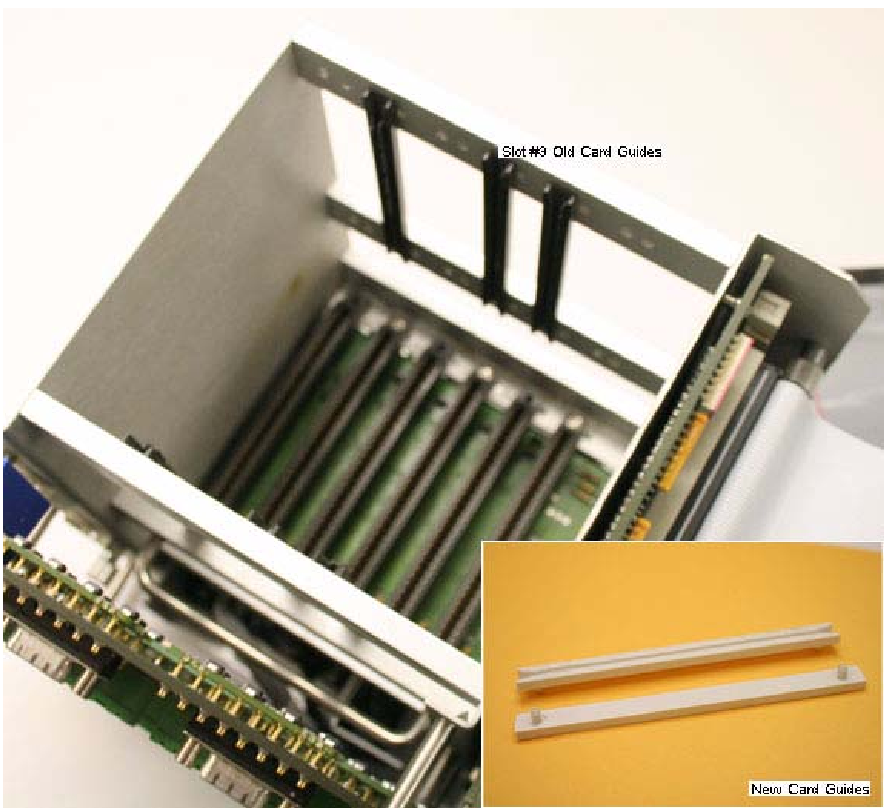
To remove the old CPU card, do the following:

1. For explosion-proof controllers, do the following:
   (a) Detach the front panel by removing the sixteen screws that hold it in place.
   (b) Loosen the six thumb screws that secure the field termination board to the card cage and remove the field termination board.
   (c) Loosen the four thumb screws that secure the card cage to the housing and remove the card cage.
2. For rack mounted controllers, loosen the four thumb screws that secure the card cage to the housing and remove the card cage.
3. The system interface board, which has all the ribbon cables and connectors, is mounted on top of the card cage. For easy access to all the cables and boards in the card cage, set the card cage assembly down on a flat surface in the upright position with the power supply end down and the system interface board to the right.



4. If present, remove the analog cables from the **J5** and **J6** connectors on the system interface board.

5. Remove all other cables that connect the system interface board to the CPU board.
6. Remove the old CPU and analog board from the card cage.
7. Discard the old ribbon cable connected to J6 on the analog board and replace it with the longer ribbon cable that is supplied with the new CPU board.
8. The new CPU board requires that low-shoulder, smooth-faced card guides be used to prevent the possibility of damaging components installed near the edge of the CPU board. Remove the existing card cage guides in slot 3 by snapping them out from the back side and replace them with the two card guides provided with the new CPU card. Slot 3 is the third slot back from the system interface board.



H.3 INSTALLING THE NEW CPU BOARD

To install the new CPU board, do the following:

1. Remove the new CPU board (P/N #2-3-2350-232) from its anti-static bag.

CAUTION

Discharge any static build up by touching the grounded case of the controller before removing the new CPU card from its protective envelope.

2. If applicable, transfer all existing PC104 boards and all mounting hardware to the new CPU board.
3. The following jumper settings must be changed on the COM4A and modem boards:
   (a) COM4A board: Move the jumper from pins 9 and 10 of J10, to pins 23 and 24.
   (b) Modem: No jumper changes required.
4. If new PC104 board(s) came with the new CPU board, install them first. See the installation procedure that is supplied with the PC104 board upgrade kit.
5. Place the new CPU board into the card cage's slot 3 where the smooth-faced card guides were installed. To allow the CPU board to move freely up and down in the card cage as the cables are plugged into the headers on the CPU, do not plug the CPU board fully into the connector on the back plane board at this time.
6. Install the cables on the CPU board in the following sequence:
   (a) Plug the end of the digital I/O cable (P/N #3-2350-081 Rev C) labeled **INTF J2** into the system interface board's J2 connector; plug the other end of the digital I/O cable into the CPU board's J7 connector.

(b) Plug the end of the digital I/O cable (P/N #3-2350-080 Rev C) labeled **INTF J3** into the system interface board's J3 connector; plug the other end of the digital I/O cable into the CPU board's J4 connector.

(c) Plug the printer/COM1/COM2 cable (P/N #3-2350-083 Rev. E) into the CPU board's J2 connector, which is located at the top of the CPU board.

(d) Plug the 26-pin printer connector labeled **INTF J4** into the System Interface Board's J4 connector.

(e) Plug the 10-pin COM2 connector labeled **INTFJ11** into the System Interface Board's J11 connector.

(f) Plug the 10-pin COM1 connector labeled **INTFJ9** into the System Interface Board's J9 connector.

7. If a COM4A board was installed and you want to install a keyboard and display, go to "Installing a Keyboard and Display with COM4A Board" on page H-8.

8. If a COM4A board was not installed and you want to install a keyboard and display, go to "Installing a Keyboard and Display without COM4A Board" on page H-9.

9. If a Com4A board was not installed and you do not want to install a keyboard and display, then proceed to the next step.

10. Plug the end of the ribbon cable (P/N #3-2350-084, Rev. C) labeled **CPU J6** into the CPU header labeled **J6**; plug the end of the ribbon cable labeled **INTF J10** into the header on the System Interface Board labeled **J10**, for access to serial port 4 on the field termination board; plug the end labeled **INTF J8** into the header on the System Interface Board labeled **J8**, for access to serial port 3 on the field termination board.

The CPU board installation is complete. If you plan to install a new analog board, go to "Retrofitting the Analog Board" on page H-11; otherwise, go to "Reassembling the 2350A" on page H-13.

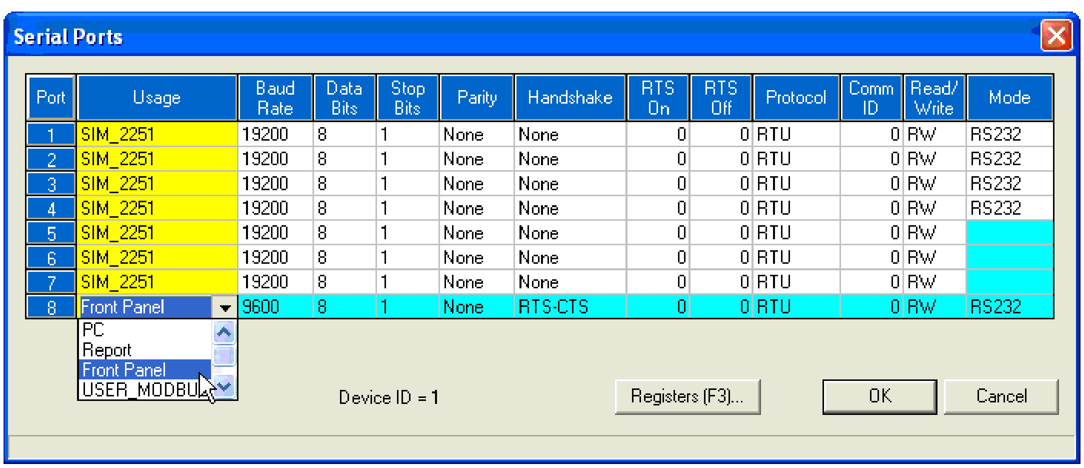
H.4 INSTALLING A KEYBOARD AND DISPLAY WITH COM4A BOARD

To connect a keyboard and display to a CPU assembly with a COM4 board, do the following:

1. Plug the 20-pin connector labeled **CPU J6** from the ribbon cable (P/N #2-2350-084 rev. C) into the J6 connector on the CPU board.
2. Plug the 10-pin connector labeled **INTF J10** into the header labeled **J10** on the system interface board for access to serial port 4 on the field termination board.
3. Plug the 10-pin connector labeled **INTF J8** into the header labeled **J8** on the system interface board for access to serial port 3 on the field termination board.
4. Plug the 10-pin connector labeled **INTF J12** from the COM4A board's ribbon cable (P/N #3-2350-151 Rev. A) to the header labeled **J12** on the system interface board. This dedicates serial port 8 to the keyboard and display interface.
5. Start MON2000 and do the following:

   (a) Select **Serial Ports...** from the **Application** menu.

   (b) Set the *Usage* for serial port 8 to **Front Panel**.



(c) Click **OK**.

NOTICE

The mode (RS-232, RS-422 or RS-485) for the first four serial ports (COM1 - COM4) can also be set through MON2000; the remaining ports (COM5 - COM8) must be set manually. See “COM4A RS-232/ RS-422/RS-485 Configuration” on page 3-51 for more information about configuring the COM5 - COM8 ports.

The CPU board installation is complete. If you plan to install a new analog board, go to “Retrofitting the Analog Board” on page H-11; otherwise, go to “Reassembling the 2350A” on page H-13.

H.5 INSTALLING A KEYBOARD AND DISPLAY WITHOUT COM4A BOARD

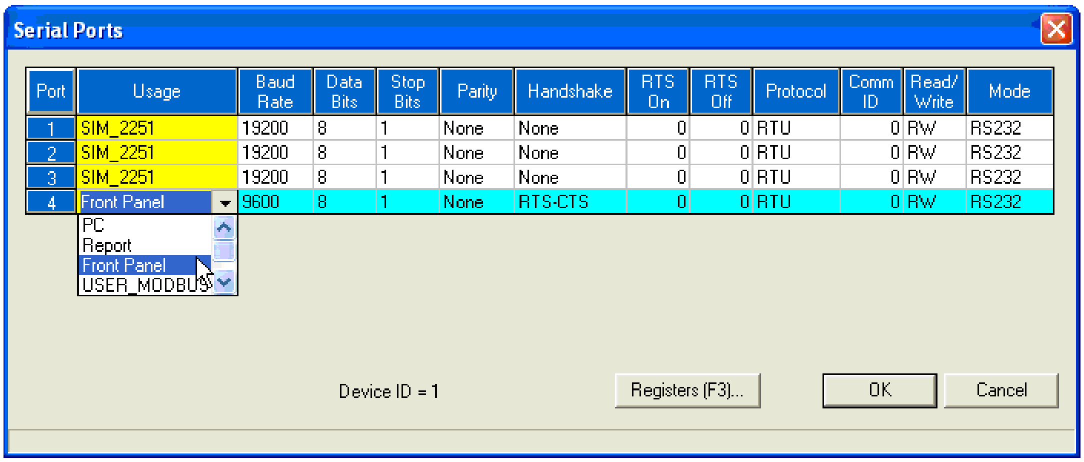
To connect a keyboard and display to a CPU assembly without a COM4 board, do the following:

1. Connect the 20-pin ribbon cable (P/N #3-2350-087 Rev. C) to the J6 connector on the CPU board.
2. Plug the 10-pin connector labeled **INTF J12** into the header labeled **J12** on the system interface board for the serial port interface to the keyboard and display.
3. Plug the 10-pin connector labeled **INTF J8** into header labeled **J8** on the system interface board for the interface to serial port 3. This will provide access to the COM3 port on the field termination board. COM4 is now dedicated for use as the serial port interface to the keyboard and display.

4. Start MON2000 and do the following:

   (a) Select **Serial Ports...** from the **Application** menu.

   (b) Set the *Usage* for serial port 4 to **Front Panel**.



   (c) Click **OK**.

NOTICE

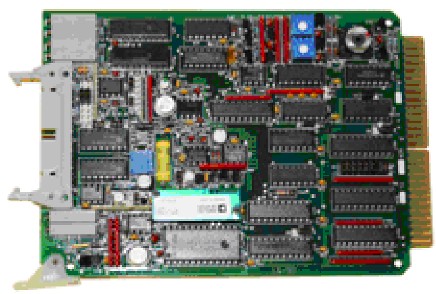
The mode (RS-232, RS-422 or RS-485) for all four ports can be set through MON2000.

H.6 RETROFITTING THE ANALOG BOARD

Model 2350 controllers shipped before late 1997 may have included 12-bit analog boards that are not compatible with the CPU boards sold as spares and in the 2350A upgrade kits. These CPU boards require a 16-bit analog board for proper operation.

H.6.1 Identifying your Analog Board

To determine whether your Model 2350 controller currently has a 12-bit or 16-bit analog board, compare its appearance to the following pictures.



12- bit analog board

16-bit analog board

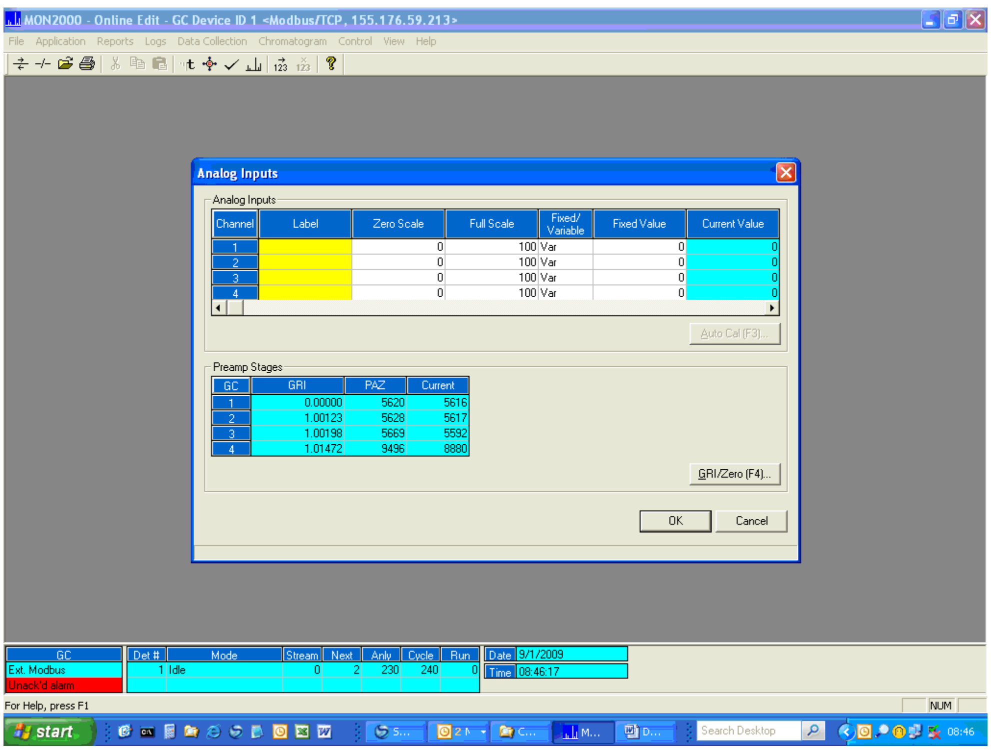
If a visual inspection is difficult to perform, you can use MON2000 to determine which analog board is currently installed. To do so, do the following:

1. Start MON2000 and connect to the appropriate GC.

2. Select **Analog Inputs...** from the **Application** menu.
3. Compare the values listed on the *Analog Inputs* window to the typical values listed in Table H-1.

Table H-1. The typical ranges for Model 2350 and Model 2350A Controllers

GC	GRI	PAZ (12-bit AD)	PAZ (16-bit AD)
1	0.0 to 0.0	0 to 4095	-32767 to 32767
2	0.8 to 1.1	0 to 4095	-32767 to 32767
3	0.8 to 1.1	0 to 4095	-32767 to 32767
4	0.8 to 1.1	0 to 4095	-32767 to 32767



In this example, the *PAZ* values are all found within the ranges expected with a 16-bit analog board. As such, this controller can be upgraded without upgrading the analog board.

For more information or questions about purchasing the appropriate 16-bit analog board, contact the Customer Service at GC.CSC@emerson.com or (713) 827-6380.

H.6.2 Installing a New Analog Board

To install the analog board, do the following:

1. Place the analog board (P/N #3-2350-034 or #3-2350-041) into slot 5 of the card cage.
2. Locate the analog cable (P/N #3-2350-077 Rev D) that is supplied with the analog board. Plug the end of the cable that is labeled **ANLG J6** into the header labeled **J6** on the analog board.
3. Plug the end of the cable that is labeled **INTF J6** into the system interface board header labeled **J6**.
4. If applicable, install the second analog cable (P/N #3-2350-076). Plug the end of the cable labeled **ANLG J5** into the header **J5** on the analog board. Plug the other end of the analog cable labeled **INTF J5** into the header labeled **J5** on the system interface board.
5. Press down firmly on both the analog board and the CPU board to insure they are completely seated into the connectors on the backplane.

H.7 REASSEMBLING THE 2350A

To reassemble the 2350A, do the following:

1. Reinstall the card cage in the rack mount or explosion proof housing by screwing in the card cage's thumb screws.
2. If a COM4A board is installed, mount the DB9 connectors for serial ports COM5 (P22), COM6 (P23), and COM7 (P24) into their designated slots at the top right side of the field termination board.

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APPENDIX I, SHIPPING AND LONG-TERM STORAGE RECOMMENDATIONS

The following recommendations should be followed:

- For shipping purposes the gas chromatograph should be secured to a wooden pallet, maintained in a vertical position and enclosed in a wood framework with a cardboard skin.
- Auxiliary equipment such as sample probes may be stored in the packaging in which it was shipped. If this packaging material is no longer available, secure the equipment to prevent excessive shaking and protect the accessories in a water proof enclosure.
- The gas chromatograph should be stored in a sheltered environment that is temperature controlled between -30°C (-22°F) and 70°C (158°F) to keep the gas chromatograph's protective coatings from deteriorating from exposure to rain or caustic or corrosive environments. Humidity in the sheltered environment should be non-condensing.
- The program stored in the remote or integral controller memory may be retained through battery back-up for at least two years. If lost for some reason, a custom program for downloading the appropriate GC application is included on the CD shipped with the system documentation.
- If the gas chromatograph has been in operation, the system should be purged with carrier gas before powering the gas chromatograph down. Allowing the gas chromatograph to perform a couple of analysis cycles without sample gas is an acceptable method of purging the system. Monitor the results and remove power after component values fall to "0" or after peaks are significantly reduced in size.
- After removing power from the GC, remove the purge gas and immediately cap all inlets and vents, including the carrier drier. These vents and inlets should be capped with the fittings that were in place when the GC shipped from the factory or with Swagelok caps (not provided). This will protect the columns and filters and should result in a trouble-free start up when the unit is returned to service.

- The sample conditioning system vents and inlets should also be capped with the fittings that were in place when the system shipped from the factory. Additionally, all vents should be closed.
- Any remaining openings—such as conduit entries—should also have appropriate plugs installed to prevent foreign material such as dust or water from entering the system.

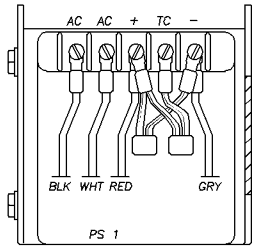
ADDENDUM 1

ANALYZER DRAWINGS

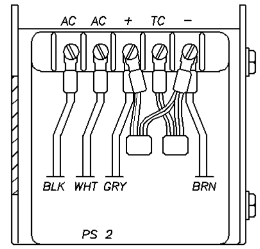
This addendum contains schematics and drawings of the Analyzer portion of the Model 500 Gas Chromatograph System. Drawings are listed below in the same page order as found in this addendum:

CE-13004	Lower Assembly, Model 512 Dual XJT w/Power Supply Wiring
DE-13081	Lower XJT, Customer Interface, Model 512
CE-16120	S.C.S. Plate, 1 Stream
CE-16180	S.C.S. Plate, Single Stream with Model 101 Bypass
CE-16220	S.C.S. Plate, 2 Streams
CE-16278	S.C.S. Plate, 2 Streams with 101 Bypass
CE-16320	S.C.S. Plate, 3 Streams
CE-16420	S.C.S. Plate, 4 Streams
BE-17204	Flow Configuration, Backflush to Measure Dual Column w/SSO
DE-18300	Wiring, 500 Series GC with S.C.S. Plate, GC Controller
DE-18301	Analyzer Wiring Diagram, 500 Series GC with S.C.S. Oven
CE-20234	Assembly, Valve, 6-Port, Chromatograph (TGP)
CE-23858	Outline and Dimensional Model 500 G.C., S.C.S. Plate
CE-23878	Outline and Dimensional Model 500 G.C. w/ Explosion-Proof and S.C.S. Plate
CE-24324	S.C.S. Plate, 3 Streams with 120 Bypass
CE-24416	S.C.S. Plate, 4 Streams with 120 Bypass Filters

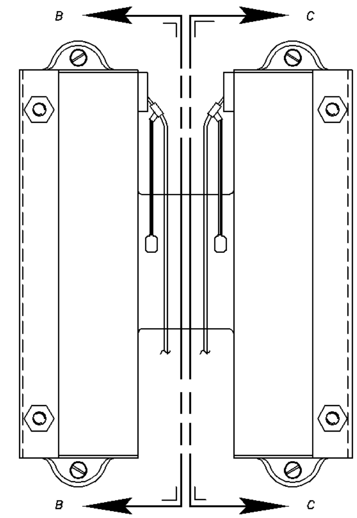
CE-24513 S.C.S. Plate, 5 Streams w/Auto Cal & Model 120 Bypass Filters

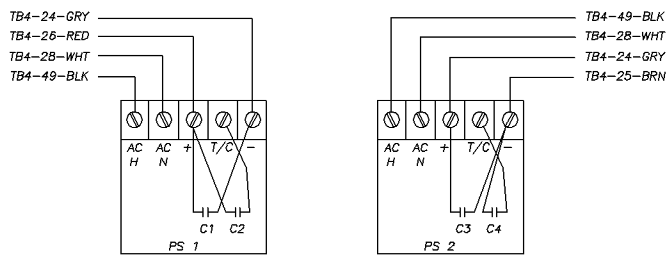


SECTION B–B

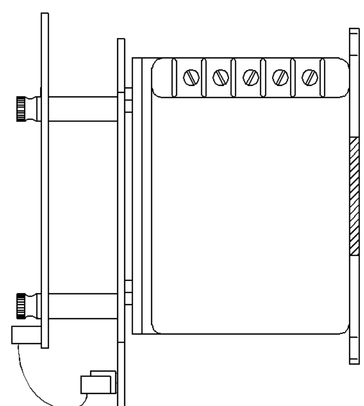


SECTION C–C

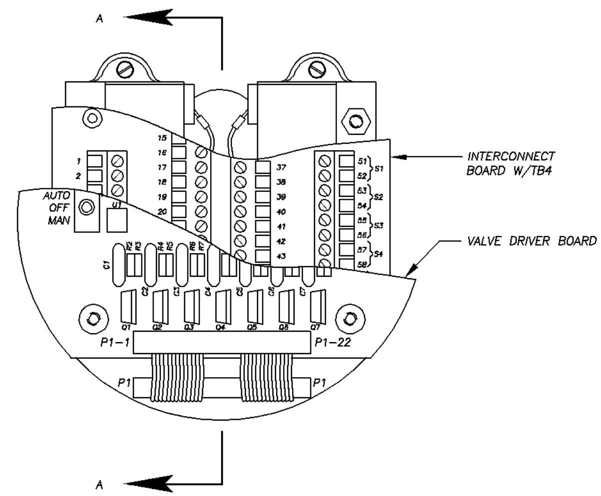




WIRING OF PSI & PS2 TO TB4 ON INTERCONNECT
PCA (3–0500–204)



SECTION A–A



SI METRIC					
THIRD ANGLE PROJECTION					
MATERIAL N/A	B	5–3–05	HM	ECO–XX–5000713	EM	DLT
FINISH N/A	A	4/89	KG	RELEASED	RN	EM
	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. – NONE	FILENAME: CE13004B1.DWG, DATE: 04-29-05, TIME: 8:54 A.M.					

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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

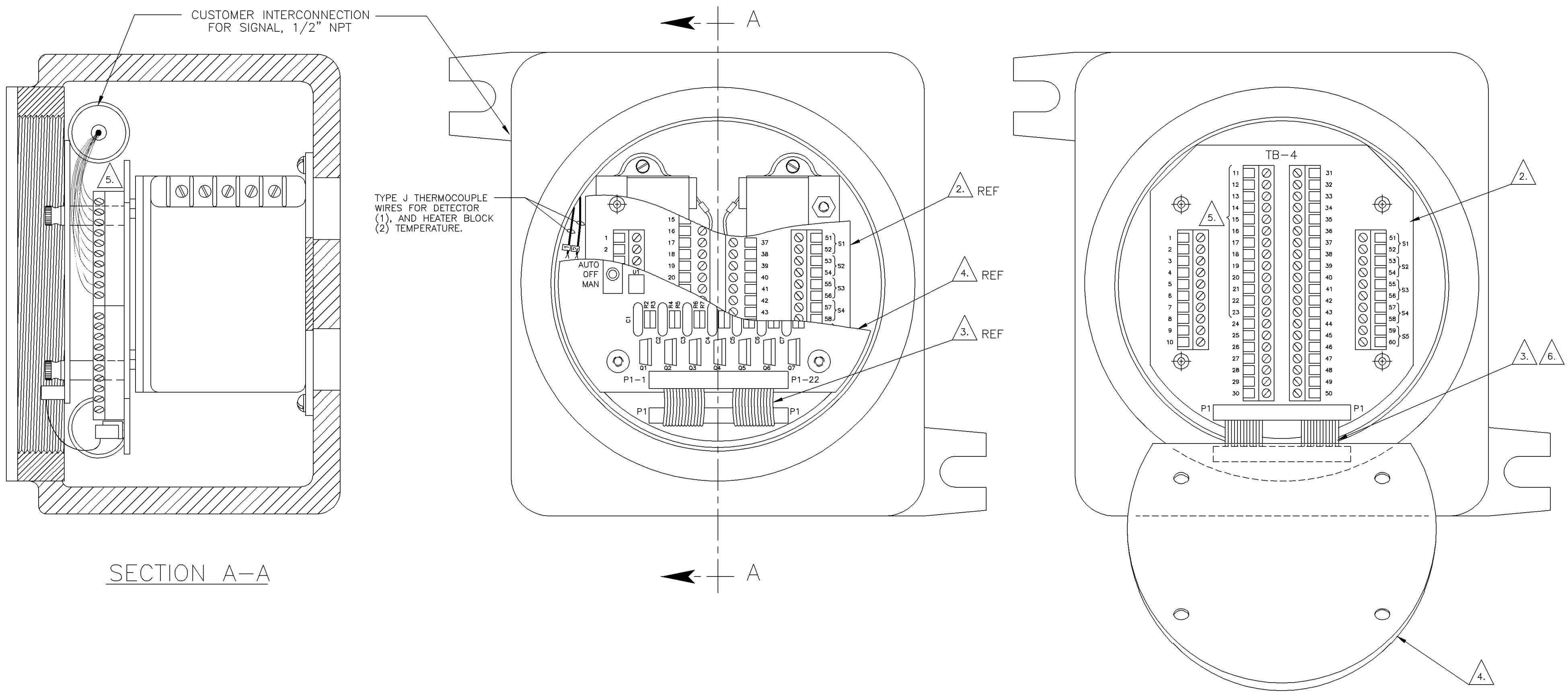
EMERSON. Process Management

TITLE

LOWER ASSEMBLY
MODEL 500 G.C.
W/POWER SUPPLY WIRING

DRN K.G.	DATE 4/7/89	DWG NO. CE–13004	REV B
CHKD RN	DATE 4/12/89		
APPD EM	DATE 8/90	SCALE NTS	P/N SEE ORDER	SHT 1 OF 1

LOWER XJT ELECTRONICS HOUSING



NOTES:

1. REFERENCE: OUTLINE & DIMENSIONAL DRAWING
2. INTERCONNECT BOARD PN: 3-0500-204.
3. RIBBON CABLE PN: 3-0508-005.
4. VALVE DRIVER BOARD PN: 3-0500-178.
5. CUSTOMER HOOK-UP FOR SIGNAL ON TB4 PINS 11 THRU 23.
6. DO NOT DISCONNECT RIBBON CABLE WHEN MAKING HOOK-UP. SIMPLY ALLOW THE VALVE DRIVER BOARD TO HANG DOWN FROM THE INTERCONNECT BOARD BY THE RIBBON CABLE.

SI METRIC						
THIRD ANGLE PROJECTION						
MATERIAL N/A	B	5-3-05	HM	ECO-XX-5000713	EM	DLT
	A	2/92	AH	RELEASED	EM	RH
FINISH N/A	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. - NONE	FILENAME: DE13081B1.DWG, DATE: 04-29-05, TIME: 6:37 A.M.					

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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

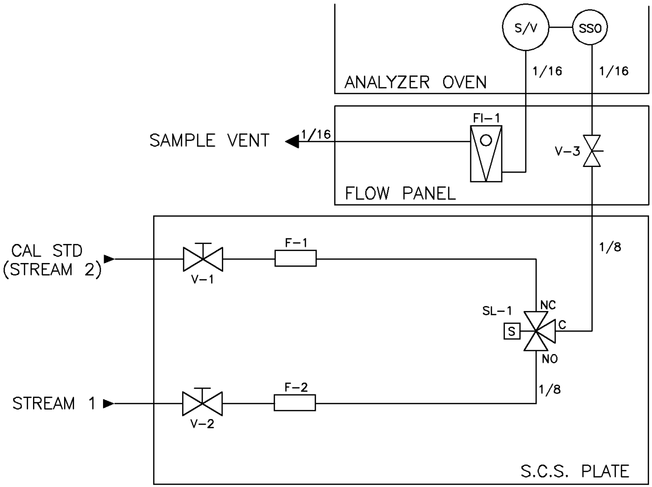
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

DRN HAYSLIP	DATE 2/19/92	TITLE LOWER XJT CUSTOMER INTERFACE MODEL 500 G.C.	
CHKD EM	DATE 2/92	DWG NO. DE-13081	REV B
APPD RH	DATE 2/92	SCALE NTS	P/N SEE ORDER	SHT 1 OF 1

NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.



SOLENOID WIRING

TB4 IS LOCATED IN THE LOWER ELECTRONICS ENCLOSURE BEHIND THE VALVE DRIVER BOARD. (REF. DE-10493)

SL-1 —— TB4 53,54

LEGEND:

QTY.	REF.	PART NO.	DESCRIPTION
2	F1-2	4-5000-112	FILTER, INLINE 1/8"
2	V1-2	4-5000-109	BLOCK VALVE 1/8"
1	V-3	4-5000-202	VALVE, REG. 1/8"
1	FI-1	4-5000-122	FLOW IND. 0-100 ccm
1	SL-1	4-5000-075	SOLENOID VALVE 3-WAY

SI METRIC
THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
D	11-29-05	HM	ECO-XX-5001321	EM	GP
C	5-3-05	HM	ECO-XX-5000713	EM	DLT
B	12/92	AH	ECO-7882	EM	RH
A	7/92	AH	RELEASED	EM	RH

FILENAME: CE16120D1.DWG, DATE: 11-29-05, TIME: 8:16 A.M.

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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

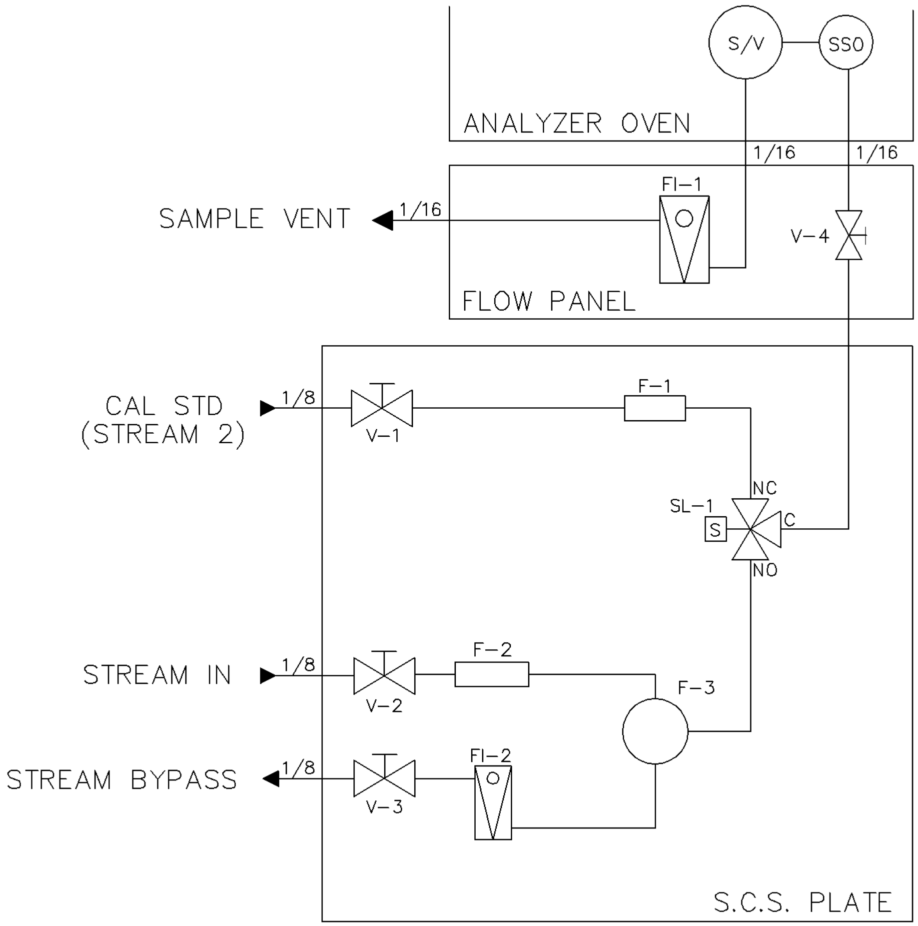
EMERSON. Process Management

TITLE: S.C.S. PLATE 1 STREAM WITH AUTOCAL

DRN HAYSLIP DATE 7/28/92
CHKD EM DATE 7/92
APPD RH DATE 7/92

DWG NO. CE-16120 REV D

SCALE NTS P/N SEE ORDER SHT 1 OF 1

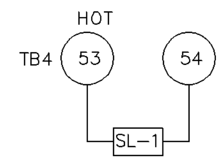


NOTES

1. ALL CUSTOMER CONNECTIONS ARE SWAGELOK TUBE FITTINGS.

SOLENOID WIRING

TB4 IS LOCATED IN THE LOWER ELECTRONICS HOUSING. BEHIND THE VALVE DRIVER BOARD REFERENCE DRAWING DE–10493.



LEGEND

QTY.	REF.	PART NUMBER	DESCRIPTION
3	V1–3	4–5000–109	VALVE, BLOCK 1/8
2	F–1,2	4–5000–112	FILTER, INLINE 1/8
1	FI–2	4–5000–120	FLOW INDICATOR 100–900 ccm
1	F–3	4–5000–939	FILTER, GENIE 120
1	SL–1	4–5000–075	VALVE, SOLENOID 3–WAY
1	V–4	4–5000–202	VALVE, METERING 1/8
1	FI–1	4–5000–122	FLOW INDICATOR 10–100 ccm

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. – NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
E	4–27–05	HM	ECO–XX–5000723	EM	SA
D	3/97	KB	ECO–9170	EM	DLT
C	1/97	RD	ECO–9113	EM	DLT
B	11/96	RD	ECO–8548	EM	DLT
A	12/95	KB	RELEASED	EM	LF

FILENAME: CE16180E1.DWG, DATE: 04–27–05, TIME: 9:29 A.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

UNLESS OTHERWISE NOTED ALL DIMENSIONS IN MILLIMETERS
X.X ±0.4
X.XX ±.12
ANGULAR ±0 30'
FINISH 5.0 RA MAX

BREAK ALL SHARP CORNERS TO 0.1–0.4 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: S.C.S. PLATE SINGLE STREAM WITH MODEL 120 BYPASS

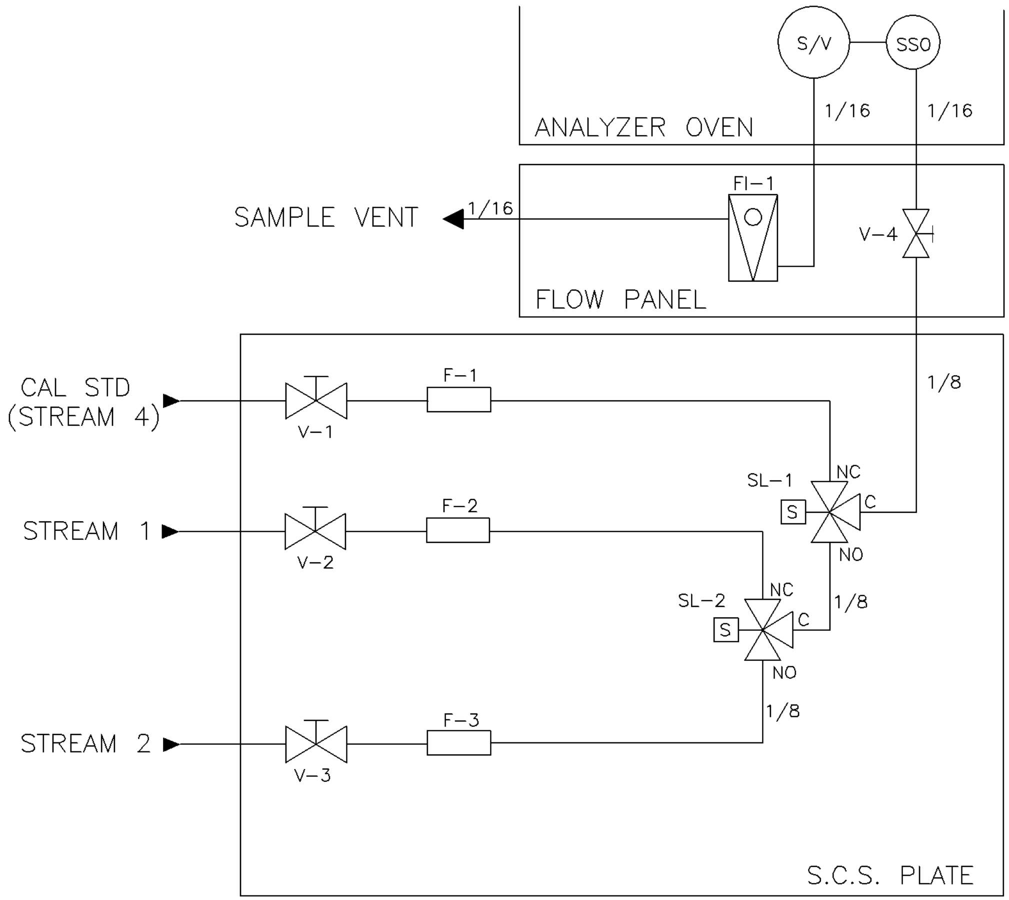
DRN BLACK DATE 12/4/95
CHKD DLT DATE 12/4/95
APPD LF DATE 12/4/95

DWG NO. CE–16180 REV E

SCALE NTS P/N SEE ORDER SHT 1 OF 1

NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.



SOLENOID WIRING

TB4 IS LOCATED IN THE LOWER ELECTRONICS ENCLOSURE BEHIND THE VALVE DRIVER BOARD. (REF. DE-10493)

SL-1 ———— TB4 55,56
SL-2 ———— TB4 51,52

LEGEND:

QTY.	REF.	PART NO.	DESCRIPTION
3	F1-3	4-5000-112	FILTER, INLINE 1/8"
3	V1-3	4-5000-109	BLOCK VALVE 1/8"
1	V-4	4-5000-202	VALVE, REG. 1/8"
1	FI-1	4-5000-122	FLOW IND. 0-100 ccm
2	SL1-2	4-5000-075	SOLENOID VALVE 3-WAY

SI METRIC
THIRD ANGLE PROJECTION

MATERIAL N/A
FINISH N/A
PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
C	5-3-05	HM	ECO-XX-5000713	EM	DLT
B	12/92	AH	ECO-7882	EM	RH
A	7/92	AH	RELEASED	EM	RH

FILENAME: CE16320C1.DWG, DATE: 04-29-05, TIME: 7:34 A.M.

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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

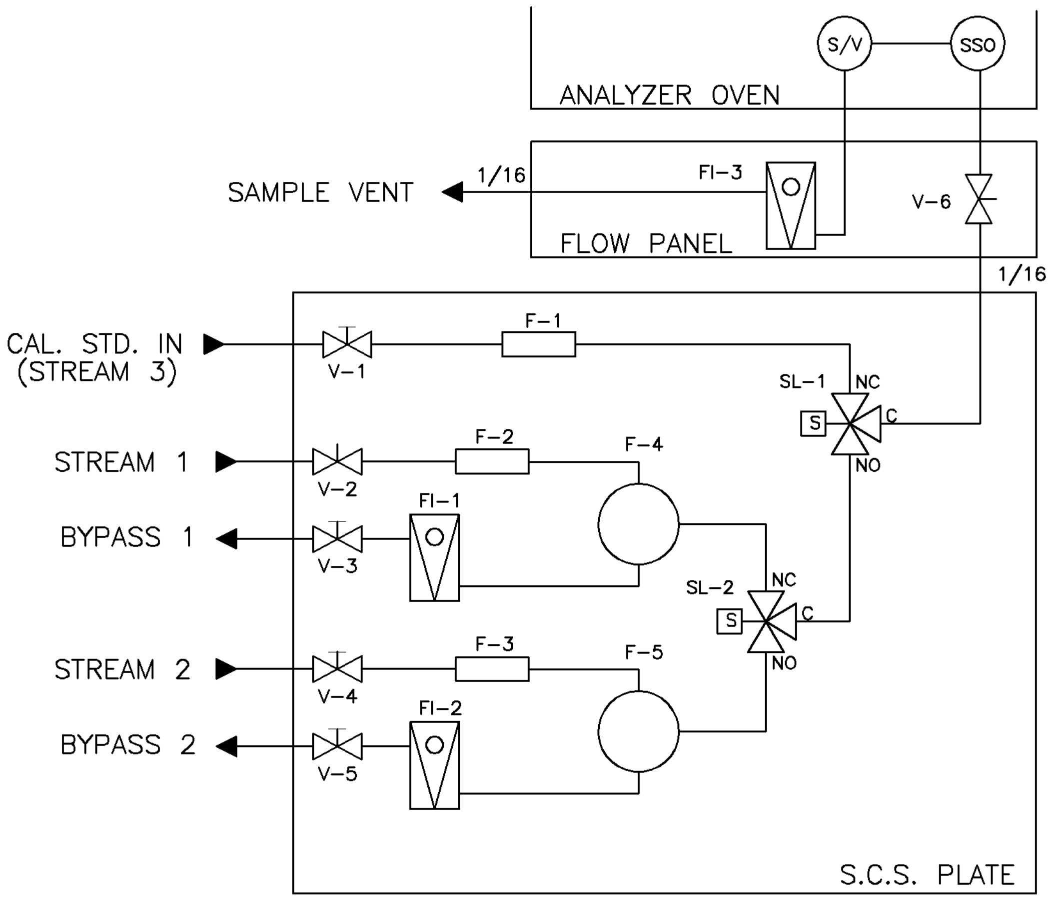
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: S.C.S. PLATE 2 STREAMS

DRN HAYSLIP DATE 7/28/92
CHKD EM DATE 7/92
APPD RH DATE 7/92

DWG NO. CE-16220 REV C
SCALE NTS P/N SEE ORDER SHT 1 OF 1



NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.

SOLENOID WIRING

(TB4 IS LOCATED IN THE LOWER ELECTRONICS ENCLOSURE BEHIND THE VALVE DRIVER BOARD, REF. DE10493)

SL 1 —— TB4 55,56
SL 2 —— TB4 51,52

LEGEND

QTY.	REF.	PART NO.	DESCRIPTION
5	V1-5	4-5000-109	VALVE, BLOCK 1/8
3	F1-3	4-5000-112	FILTER, INLINE 1/8
2	F-4,5	4-5000-939	FILTER, MODEL 120
2	FI-1,2	4-5000-120	FLOW INDICATOR 100-900 ccm
2	SL-1,2	4-5000-075	SOLENOID, 3-WAY
1	V-6	4-5000-202	VALVE, METERING 1/8
1	FI-3	4-5000-122	FLOW INDICATOR 0-100 ccm

SI METRIC
THIRD ANGLE PROJECTION

MATERIAL N/A
FINISH N/A
PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
C	4-14-05	HM	ECO-XX-5000687	EM	LF
B	11-96	RD	ECO-8548	EM	JZ
A	11-95	AH	RELEASED	EM	JZ

FILENAME: CE16278C1.DWG, DATE: 04-14-05, TIME: 8:20 A.M.

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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

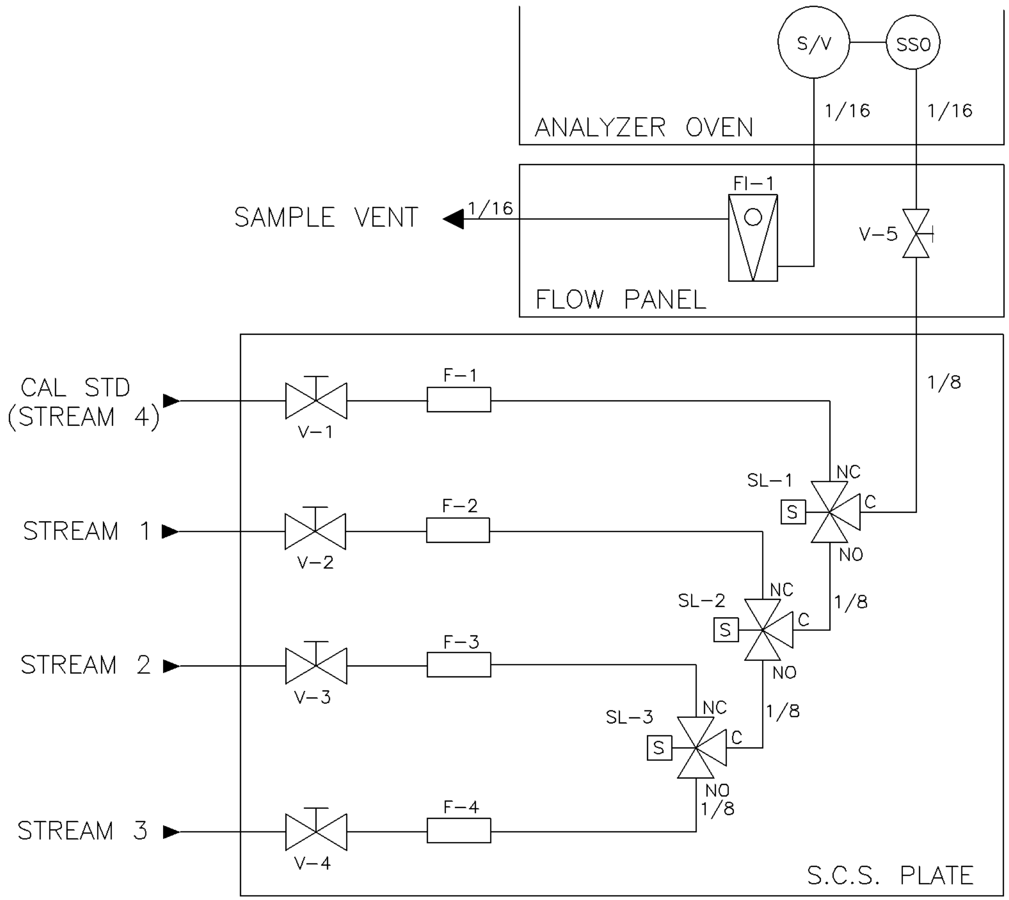
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: S.C.S. PLATE 2 STREAMS WITH 120 BYPASS

DRN HAYSLIP DATE 11-17-95
CHKD EM DATE 11-17-95
APPD JZ DATE 11-17-95

DWG NO. CE-16278 REV C
SCALE NTS P/N SEE ORDER SHT 1 OF 1



NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.

SOLENOID WIRING

TB4 IS LOCATED IN THE LOWER ELECTRONICS ENCLOSURE BEHIND THE VALVE DRIVER BOARD. (REF. DE-10493)

SL-1 —— TB4 57,58
SL-2 —— TB4 51,52
SL-3 —— TB4 53,54

LEGEND:

QTY.	REF.	PART NO.	DESCRIPTION
4	F1-4	4-5000-112	FILTER, INLINE 1/8"
4	V1-4	4-5000-109	BLOCK VALVE 1/8"
1	V-5	4-5000-202	VALVE, REG. 1/8"
1	FI-1	4-5000-122	FLOW IND. 0-100 ccm
3	SL1-3	4-5000-075	SOLENOID VALVE 3-WAY

SI METRIC
THIRD ANGLE PROJECTION

MATERIAL N/A
FINISH N/A
PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
C	5-3-05	HM	ECO-XX-5000713	EM	DLT
B	12/92	AH	ECO-7882	EM	RH
A	7/92	AH	RELEASED	EM	RH

FILENAME: CE16320B1.DWG, DATE: 04-29-05, TIME: 7:24 A.M.

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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

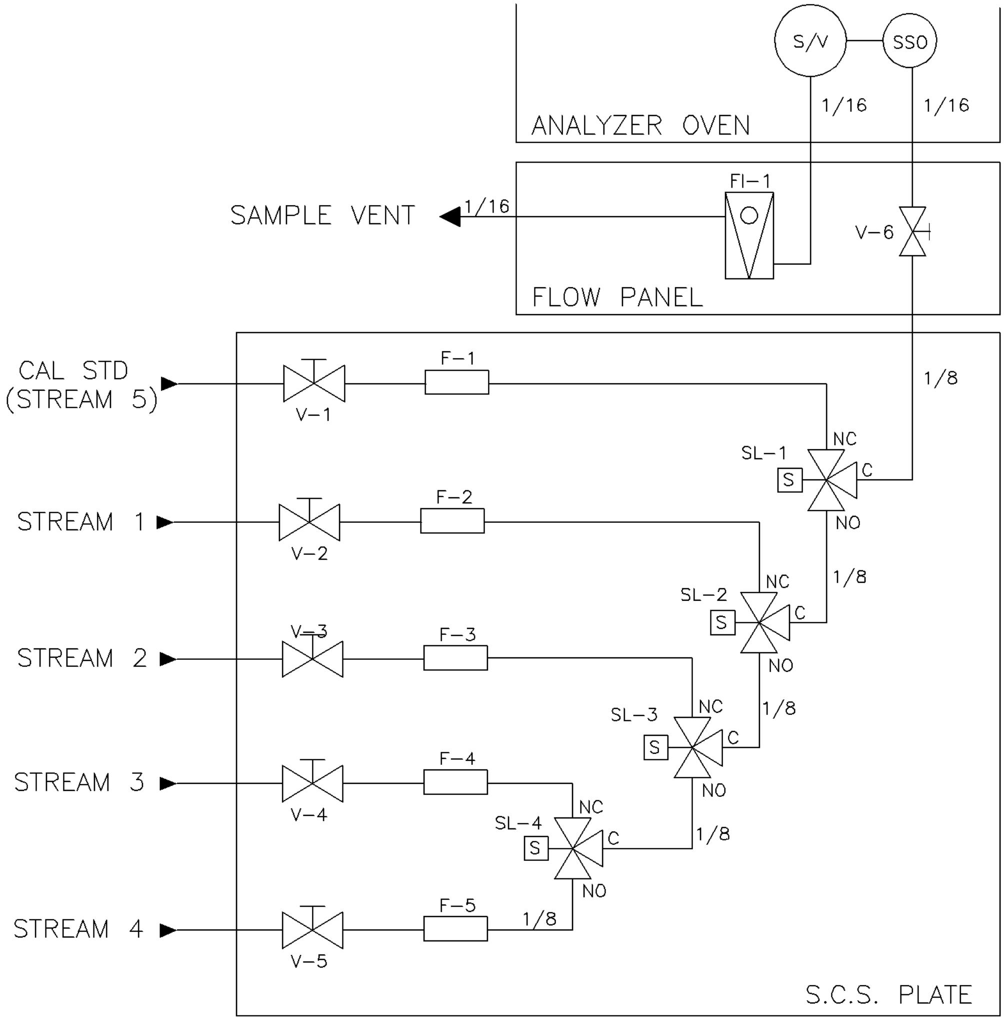
EMERSON. Process Management

TITLE: S.C.S. PLATE 3 STREAMS

DRN HAYSLIP DATE 7/28/92
CHKD EM DATE 7/92
APPD RH DATE 7/92

DWG NO. CE-16320 REV C

SCALE NTS P/N SEE ORDER SHT 1 OF 1



NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.

SOLENOID WIRING

TB4 IS LOCATED IN THE LOWER ELECTRONICS ENCLOSURE BEHIND THE VALVE DRIVER BOARD. (REF. DE-10493)

SL-1 ———— TB4 59,60
SL-2 ———— TB4 51,52
SL-3 ———— TB4 53,54
SL-4 ———— TB4 55,56

LEGEND:

QTY.	REF.	PART NO.	DESCRIPTION
5	F1-5	4-5000-112	FILTER, INLINE 1/8"
5	V1-5	4-5000-109	BLOCK VALVE 1/8"
1	V-6	4-5000-202	VALVE, REG. 1/8"
1	FI-1	4-5000-122	FLOW IND. 0-100 ccm
4	SL1-4	4-5000-075	SOLENOID VALVE 3-WAY

SI METRIC
THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
D	5-3-05	HM	ECO-XX-5000713	EM	DLT
C	3/93	LB	ECO-7949	EM	RH
B	12/92	AH	ECO-7882	DT	RH
A	7/92	AH	RELEASED	EM	RH

FILENAME: CE16420D1.DWG, DATE: 04-29-05, TIME: 7:05 A.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

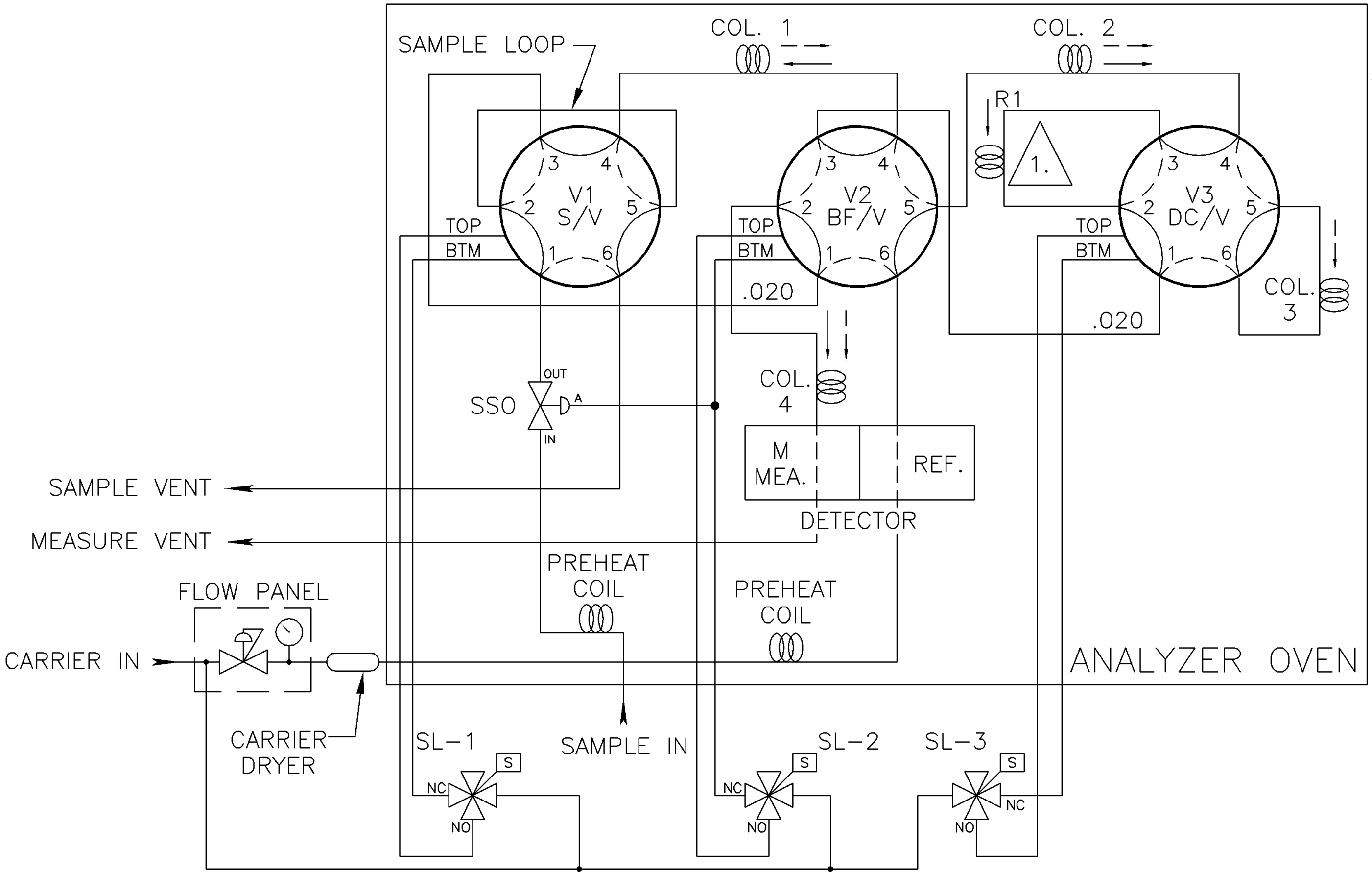
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0 30'
FINISH 200 RA MAX

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

EMERSON. Process Management

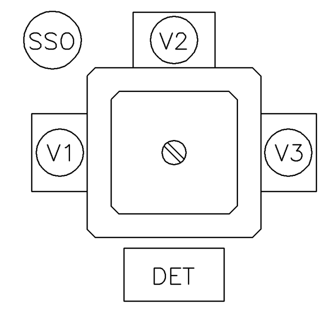
TITLE: S.C.S. PLATE 4 STREAMS

DRN HAYSLIP	DATE 7/28/92	DWG NO. CE-16420	REV D
CHKD EM	DATE 7/92		
APPD RH	DATE 7/92	SCALE NTS	P/N SEE ORDER	SHT 1 OF 1



NOTES:

1. R1 (1/16" O.D. X .004" I.D.) MATCHES THE RESTRICTION OF COLUMN 3.
2. FLOW PATH VALVE ENERGIZED: — — —
   FLOW PATH VALVE DE-ENERGIZED: ———



TOP VIEW OF ANALYZER OVEN FROM FRONT

SI METRIC	G	03/20/09	CC	ECO-XX-5004591	EM	LF
THIRD ANGLE PROJECTION	F	5-3-05	HM	ECO-XX-5000713	EM	DLT
	E	6-26-01	RD	ECO-XX-118907	EM	SB
	D	09/22/00	RD	ECO-XX-92438	EM	DLT
MATERIAL N/A	C	09/94	AH	ECO-8306	EM	RH
	B	09/92	AH	ECO-7786	EM	RH
FINISH N/A	A	08/92	AH	RELEASED	EM	RH
	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. - NONE	FILENAME: BE17204G1.DWG, DATE: 03-20-09, TIME: 11:00 A.M.					

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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

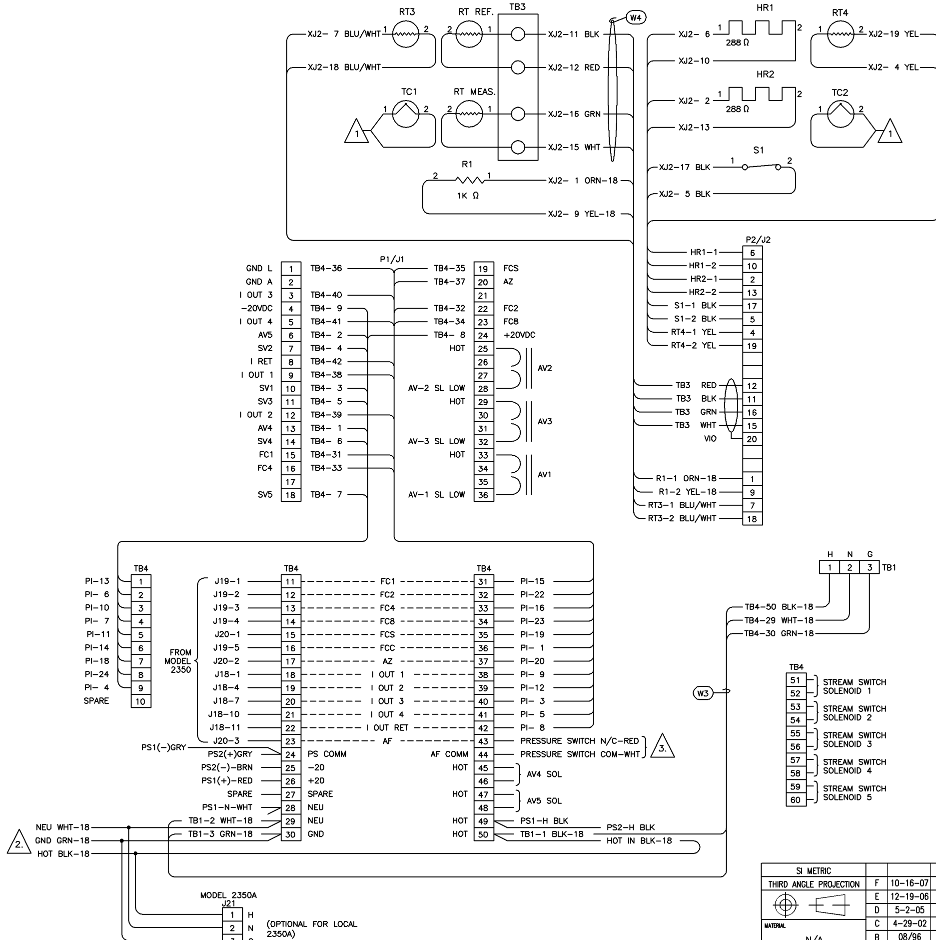
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON Process Management

TITLE

FLOW CONFIGURATION
BACKFLUSH TO MEASURE
DUAL COLUMN WITH SSO

DRN AH	DATE 07/20/92	DWG NO. BE-17204	REV G
CHKD EM	DATE 08/92		
APPD RH	DATE 08/92	SCALE NTS	P/N SEE ORDER	SHT 1 OF 1



NOTES:

1. CONNECTIONS FOR TEMPERATURE MEASUREMENTS. LABEL THERMOCOUPLE ENDS ("1" FOR TC1, "2" FOR TC2) USING WIRE MARKERS. RUN BOTH THERMOCOUPLE PAIRS THROUGH UPPER ELECTRONICS HOUSING AND POSITION IN LEFT SIDE OF LOWER ELECTRONICS HOUSING. COVER EXPOSED THERMOCOUPLE LEADS WITH PROTECTIVE TAPE PRIOR TO SHIPMENT.

   CUSTOMER NOTE: TYPE J THERMOCOUPLE WIRE ONLY MUST BE USED FOR INTERCONNECTION FOR REMOTE TEMPERATURE INDICATION. TWIST END WIRES TOGETHER AND SECURE WITH HEAT SHRINK TUBING. DO NOT SPLICE WITH WELD, BUTT SPLICE OR OTHER METAL DEVICE.

2. WIRES (3-BLK, WHT, AND GRN) TO BE PIGTAILED IN REAR CONDUIT BOX FOR CUSTOMER POWER.

3. WIRES (2-WHT AND RED) FROM PRESSURE SWITCH TERMINATING AT TB4.

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
F	10-16-07	CC	ECO-XX-5003201	EM	DLT
E	12-19-06	CC	ECO-XX-5002474	EM	DLT
D	5-2-05	HM	ECO-XX-5000673	EM	DLT
C	4-29-02	RD	ECO-XX-141182	EM	SB
B	08/96	KB	ECO-8993	EM	RH
A	02/95	AH	RELEASED	EM	RH

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL N/A
FINISH N/A
PROJ. FILE NO. - NONE
FILENAME: DE18300F1.DWG, DATE: 10-16-07, TIME: 9:58 A.M.

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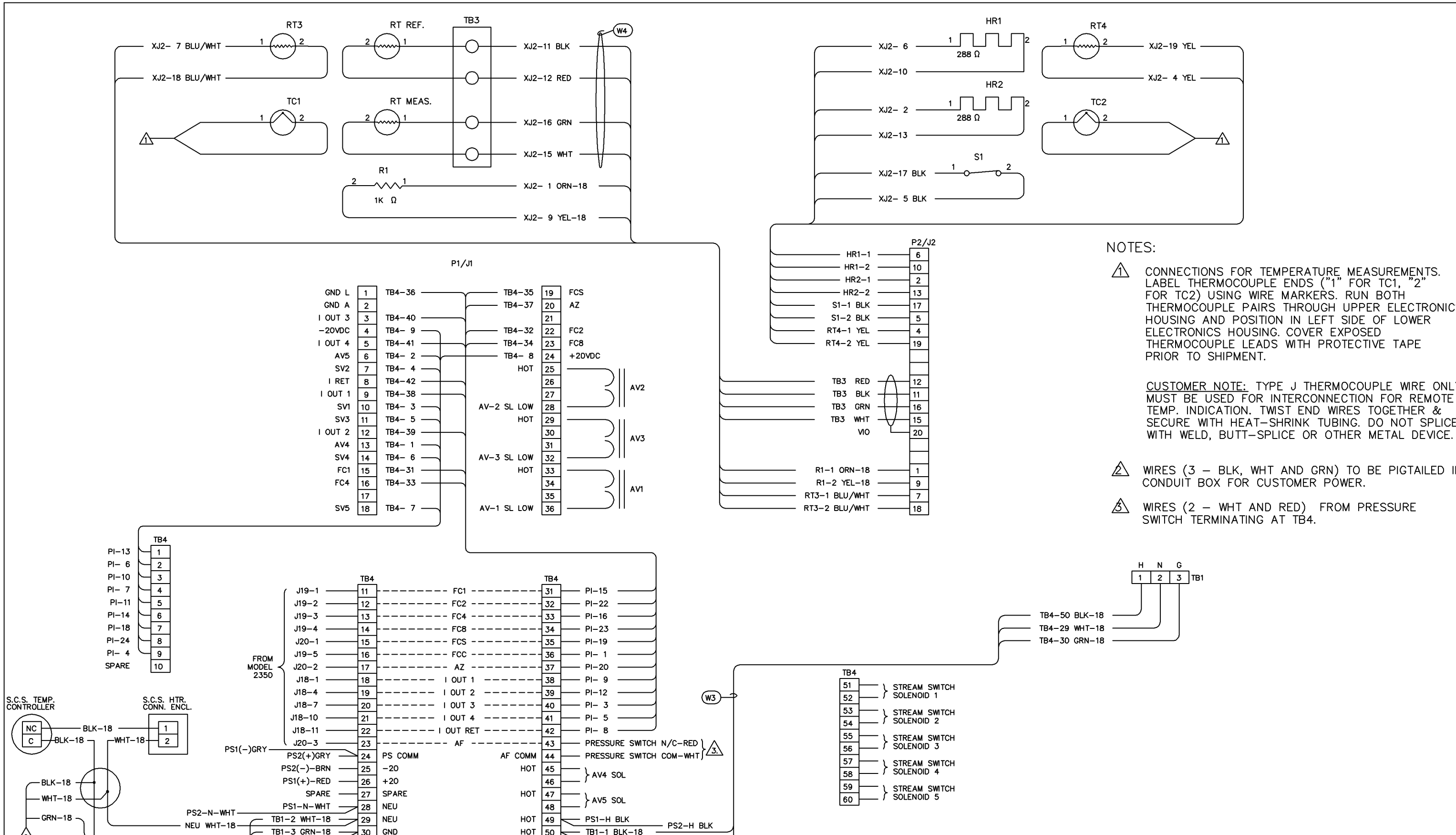
GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: WIRING, 500 SERIES G.C. WITH S.C.S. PLATE, 2350A CONTROLLER

DRN VONNIE	DATE 09/08/94	DWG NO. DE-18300	REV F
CHKD EM	DATE 02/16/95		
APPD RH	DATE 02/16/95	SCALE NTS / P/N SEE ORDER	SHT 1 OF 1



NOTES:

1. CONNECTIONS FOR TEMPERATURE MEASUREMENTS. LABEL THERMOCOUPLE ENDS ("1" FOR TC1, "2" FOR TC2) USING WIRE MARKERS. RUN BOTH THERMOCOUPLE PAIRS THROUGH UPPER ELECTRONICS HOUSING AND POSITION IN LEFT SIDE OF LOWER ELECTRONICS HOUSING. COVER EXPOSED THERMOCOUPLE LEADS WITH PROTECTIVE TAPE PRIOR TO SHIPMENT.

   CUSTOMER NOTE: TYPE J THERMOCOUPLE WIRE ONLY MUST BE USED FOR INTERCONNECTION FOR REMOTE TEMP. INDICATION. TWIST END WIRES TOGETHER & SECURE WITH HEAT-SHRINK TUBING. DO NOT SPLICE WITH WELD, BUTT-SPLICE OR OTHER METAL DEVICE.

2. WIRES (3 – BLK, WHT AND GRN) TO BE PIGTAILED IN REAR CONDUIT BOX FOR CUSTOMER POWER.

3. WIRES (2 – WHT AND RED) FROM PRESSURE SWITCH TERMINATING AT TB4.

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
D	12-19-06	CC	ECO-XX-5002474	EM	DLT
C	5-2-05	HM	ECO-XX-5000673	EM	DLT
B	8/96	KB	ECO-8993	EM	RH
A	12-94	VA	RELEASED	EM	RH

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL: SEE ORDER
FINISH: SEE ORDER
PROJ. FILE NO. – NONE
FILENAME: DE18301D1.DWG, DATE: 12-14-06, TIME: 2:34 P.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

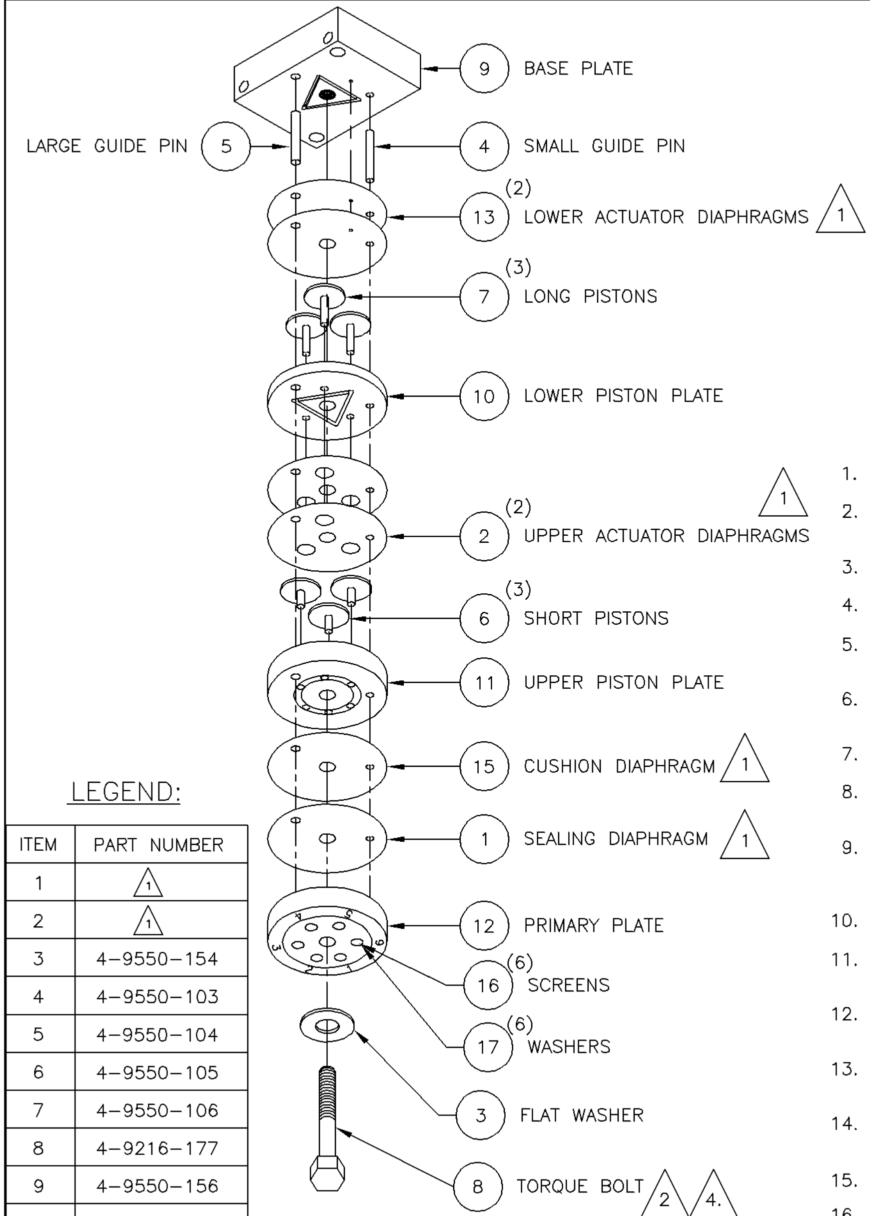
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

EMERSON. Process Management

TITLE: ANALYZER WIRING DIAGRAM 500 SERIES GC WITH S.C.S. OVEN, 2350 CONTROLLER

DRN VONNIE DATE 9/8/94
CHKD EM DATE 12/13/94
APPD RH DATE 12/13/94
DWG NO. DE-18301
REV D
SCALE NTS
P/N SEE ORDER
SHT 1 OF 1



NOTES:

△1 DIAPHRAGM KIT P/N 3-9300-107 IS USED FOR ALL APPLICATIONS.

△2 CLEAN THREADS OF TORQUE BOLT ITEM #8 WITH WIRE BRUSH WHEEL BEFORE PARTS STAGING.

△3 ALL PARTS OF VALVE MUST BE FREE OF OIL, DUST AND FINGER PRINTS. BEFORE PARTS ARE INSTALLED THEY MUST BE CLEAN AND BLOWN WITH LOW PRESSURE HELIUM.

△4. PRIOR TO INSTALLING THE BOLT, PLACE A SINGLE DROP OF WD-40 ON THE FIRST FEW THREADS, THEN BLOW OFF EXCESS WITH AIR.

6 PORT VALVE ASSEMBLY INSTRUCTIONS

1. ASSEMBLY IS TO BE ACCOMPLISHED BY BUILDING VALVE IN THE UPSIDE DOWN POSITION USING PRODUCTION FIXTURE.
2. INSPECT AND CLEAN THREADS OF ITEM #12 PRIMARY PLATE. INSTALL 2-MICRON SCREENS (ITEM 16) & WASHERS (ITEM 17) IN THE PORTS OF PRIMARY PLATE PER MEP-47623. THEN PLACE INTO HOLES IN PRODUCTION FIXTURE WITH THE GUIDE PIN HOLES FACING UP.
3. INSERT ITEM #5 LARGE GUIDE PIN INTO LARGE GUIDE PIN HOLE IN PRIMARY PLATE.
4. INSERT ITEM #4 SMALL GUIDE PIN INTO SMALL GUIDE PIN HOLE IN PRIMARY PLATE.
5. PLACE ITEM #1 AMBER SEALING DIAPHRAGM (HAVING NO HOLES IN ACTUATING PLANE) OVER PRIMARY PLATE, ALIGN LARGE AND SMALL GUIDE PIN HOLES INTO CORRECT POSITION.
6. PLACE ITEM #15 WHITE CUSHION DIAPHRAGM OVER SEALING DIAPHRAGM, ALIGN LARGE AND SMALL GUIDE PIN HOLES INTO CORRECT POSITION.
7. LOAD ITEM #6 SHORT PISTONS INTO UPPER PISTON PLATE. PISTONS SHOULD FALL FREELY INTO SEATED POSITION.
8. PLACE ITEM #11 UPPER PISTON PLATE OVER GUIDE PINS. PISTON SIDE FACING UP, ALIGN LARGE AND SMALL GUIDE PIN HOLES INTO CORRECT POSITION.
9. PLACE TWO ITEM #2 ACTUATOR UPPER DIAPHRAGMS (THICK-LARGE HOLES IN PISTON SHAFT ACTUATING PLANE) OVER GUIDE PINS, ALIGNING LARGE AND SMALL HOLES INTO CORRECT POSITION. MAKE SURE OPENINGS FOR LONG PISTONS ARE OVER HOLES SO THEY MAY FALL THROUGH THEM.
10. LOAD ITEM #7 LONG PISTONS INTO LOWER PISTON PLATE. PISTONS SHOULD FALL FREELY INTO SEATED POSITION.
11. PLACE ITEM #10 LOWER PISTON PLATE OVER GUIDE PINS, PISTON SIDE FACING UP. ALIGN LARGE AND SMALL GUIDE PIN HOLES INTO CORRECT POSITION.
12. PLACE TWO ITEM #13 ACTUATOR LOWER DIAPHRAGMS (THICK-SMALL HOLES IN PISTON SHAFT ACTUATING PLANE) OVER GUIDE PINS, ALIGNING LARGE AND SMALL GUIDE PIN HOLES INTO CORRECT POSITION.
13. LINE BASE PLATE UP WITH LARGE AND SMALL GUIDE PINS. BRING ITEM #9 BASE PLATE TOGETHER WITH VALVE ASSEMBLY, PUSHING GUIDE PINS INTO BASE PLATE.
14. GUIDE HEX HEAD TORQUE BOLT WITH FLAT WASHER INTO BASE PLATE WITH VALVE IN PRODUCTION FIXTURE. HOLD DOWN ON BASE UNTIL BOLT IS FULLY THREADED AND FINGER TIGHT INTO BASE.
15. CLAMP VALVE BASE PLATE IN VISE AND TIGHTEN TORQUE BOLT TO A FULL 30 FOOT/POUNDS USING TORQUE WRENCH.
16. TAG VALVE WITH P/N, BAG AND SEAL FOR STOCK.

LEGEND:

ITEM	PART NUMBER
1	△1
2	△1
3	4-9550-154
4	4-9550-103
5	4-9550-104
6	4-9550-105
7	4-9550-106
8	4-9216-177
9	4-9550-156
10	4-9550-157
11	4-9550-152
12	4-9550-153
13	△1
14	NOT USED
15	△1
16	9-9960-148
17	4-9550-114

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
F	5-3-05	HM	ECO-XX-5000713	EM	SLT
E	8-3-04	HM	ECO-XX-212474	EM	HS
D	10-7-03	HM	ECO-XX-187989	EM	LF
C	4-03-03	HM	ECO-XX-172542	EM	HS
B	12-20-00	RD	ECO-XX-102475	EM	SB
A	02/16/00	RD	ECO-XX-60272	EM	RH

FILENAME: CE20234F1.DWG, DATE: 04-28-05, TIME: 12:47 A.M.

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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

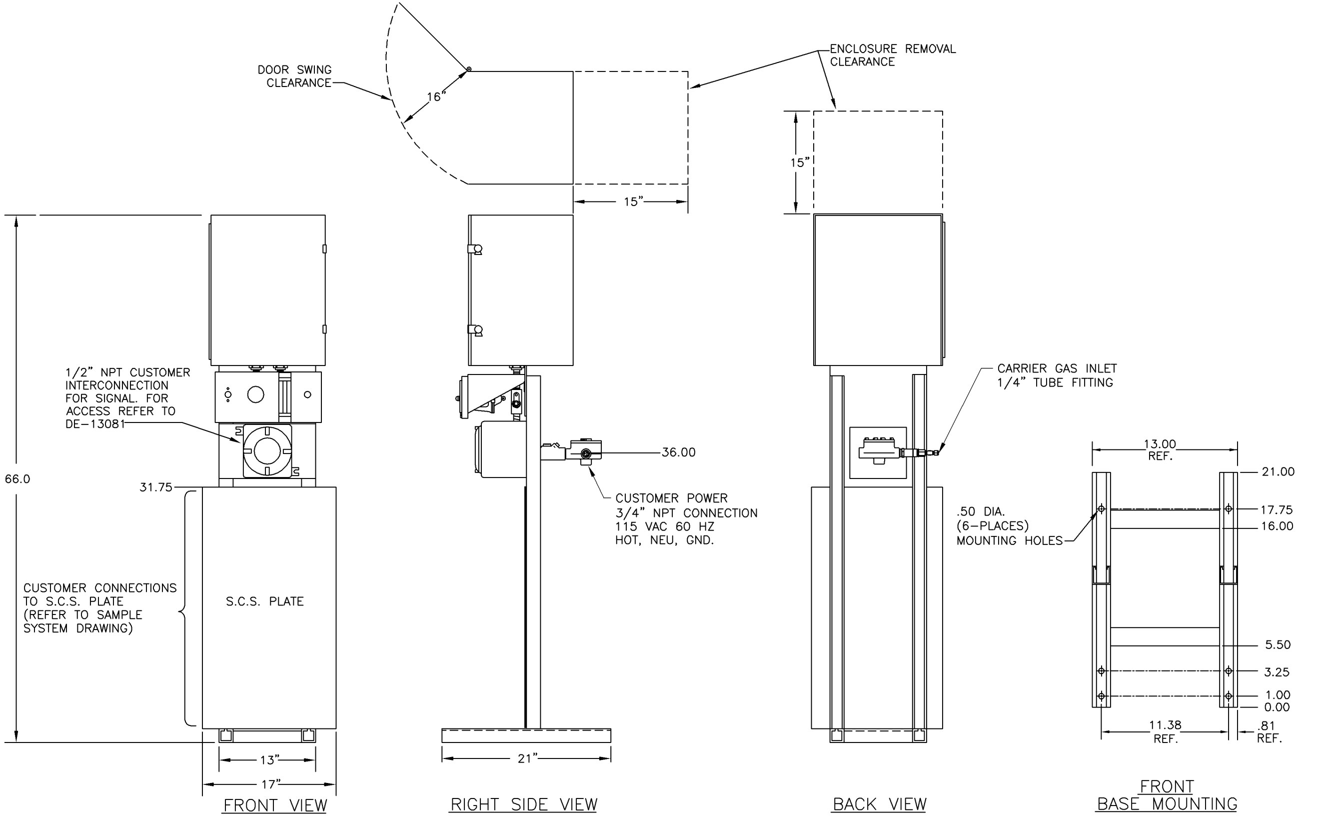
EMERSON. Process Management

DRN RD	DATE 12/06/99		
CHKD EM	DATE 01/21/00		
APPD RH	DATE 02/16/00		

TITLE
ASSEMBLY
VALVE, 6-PORT, CHROMATOGRAPH
TRIANGULAR GAS PATH (TGP)
ALL APPLICATIONS

DWG NO. CE-20234 REV F

SCALE 1/2 P/N 3-9207-102 SHT 1 OF 1



SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
E	5-24-07	CC	ECO-XX-5002818	EM	DLT
D	5-3-05	HM	ECO-XX-5000713	EM	DLT
C	5-18-04	HM	ECO-XX-205532	EM	LF
B	10-27-03	HM	ECO-XX-189860	EM	SB
A	12-31-02	RD	RELEASED	EM	SA

FILENAME: CE23858E1.dwg, DATE: 05-21-07, TIME: 9:52 A.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

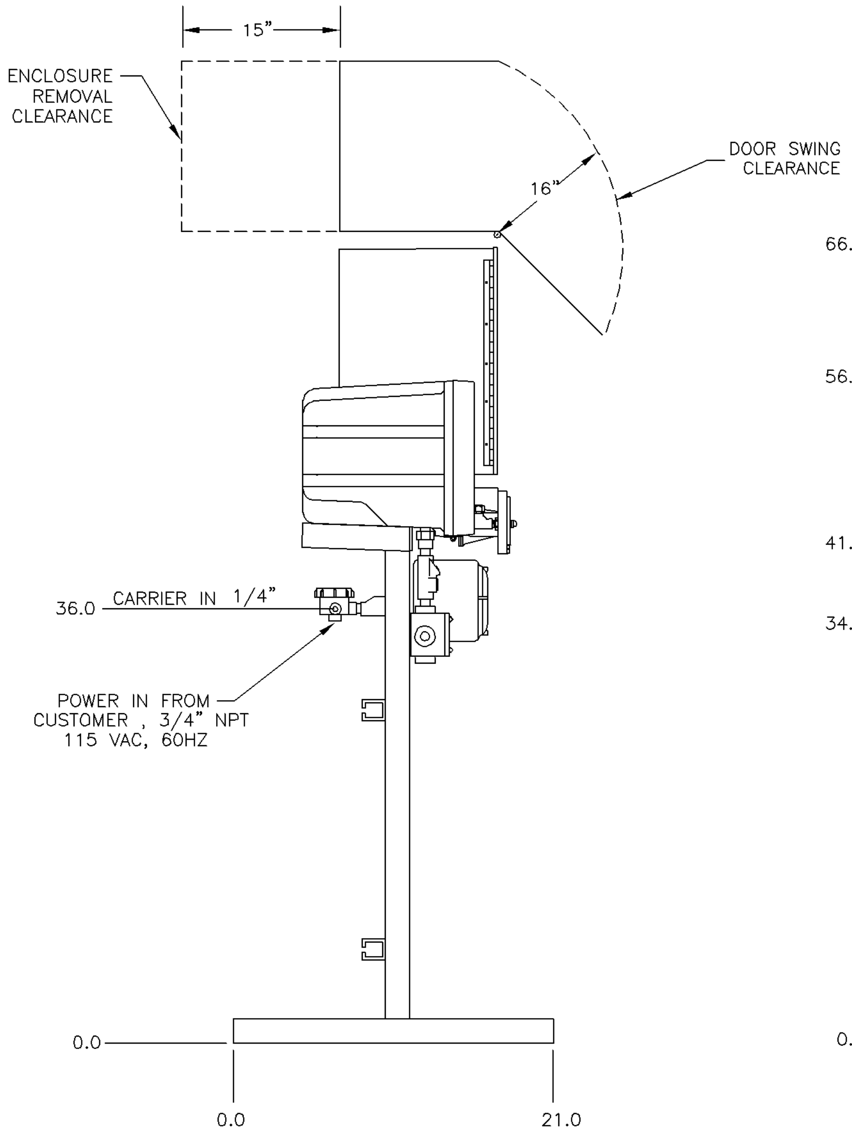
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

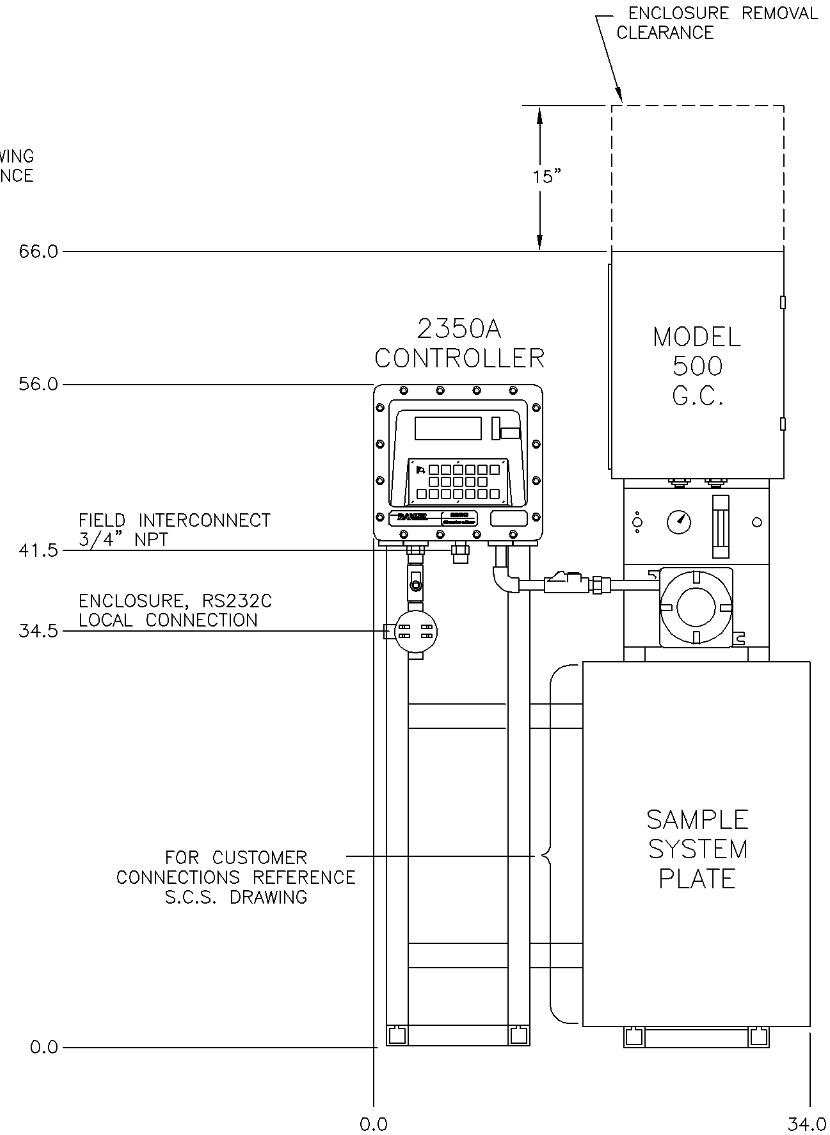
EMERSON. Process Management

TITLE: OUTLINE AND DIMENSIONAL MODEL 500 G.C. S.C.S. PLATE

DRN RD	DATE 12/30/02	DWG NO. CE-23858 REV E
CHKD EM	DATE 12/31/02	
APPD SA	DATE 12/31/02	SCALE NTS P/N SEE ORDER SHT 1 OF 1



LEFT SIDE VIEW



FRONT VIEW

SI METRIC						
THIRD ANGLE PROJECTION						
MATERIAL N/A	C	5-3-05	HM	ECO-XX-5000713	EM	DLT
	B	9-9-03	HM	ECO-XX-185506	EM	SB
FINISH N/A	A	5-12-03	HM	RELEASED	EM	SB
	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. – NONE	FILENAME: CE23878C1.DWG, DATE: 04-28-05, TIME: 11:04 A.M.					

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

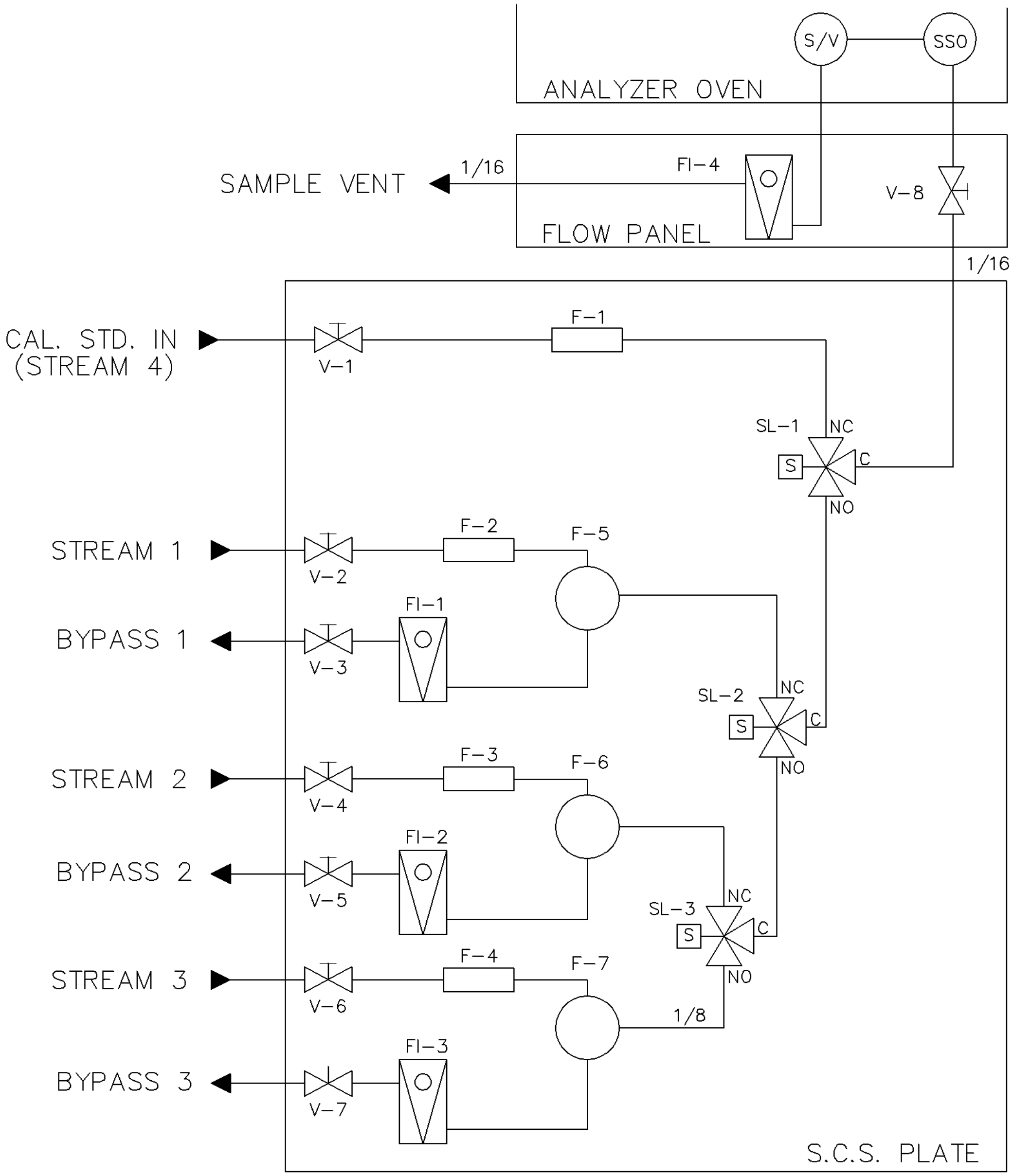
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0 30'
FINISH 200 RA MAX

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

EMERSON. Process Management

TITLE
OUTLINE AND DIMENSIONAL 500 GC W/EXPLOSION-PROOF 2350A AND S.C.S. PLATE

DRN MANCHA	DATE 5/9/03	DWG NO. CE-23878	REV C
CHKD EM	DATE 5/9/03		
APPD SB	DATE 5/12/03	SCALE NTS	P/N SEE ORDER
		SHT 1 OF 1	



NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.

SOLENOID WIRING

TB4 IS LOCATED IN THE LOWER ELECTRONICS ENCLOSURE BEHIND THE VALVE DRIVER BOARD. (REF. DE-10493)

SL 1 —— TB4 57,58
SL 2 —— TB4 51,52
SL 3 —— TB4 53,54

LEGEND

QTY.	REF.	PART NO.	DESCRIPTION
7	V1-7	4-5000-109	VALVE, BLOCK 1/8
4	F1-4	4-5000-112	FILTER, INLINE 1/8
3	F5-7	4-5000-939	FILTER, MODEL 120, LIQUID
3	FI1-3	4-5000-120	FLOW INDICATOR 100-900 ccm
3	SL1-3	4-5000-075	SOLENOID, 3-WAY
1	V-8	4-5000-202	VALVE, METERING 1/8
1	FI-4	4-5000-122	FLOW INDICATOR 0-100 ccm

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL N/A
FINISH N/A
PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
A	4-30-05	HM	RELEASED	EM	DLT

FILENAME: CE24324A1.DWG, DATE: 04-29-05, TIME: 8:43 A.M.

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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

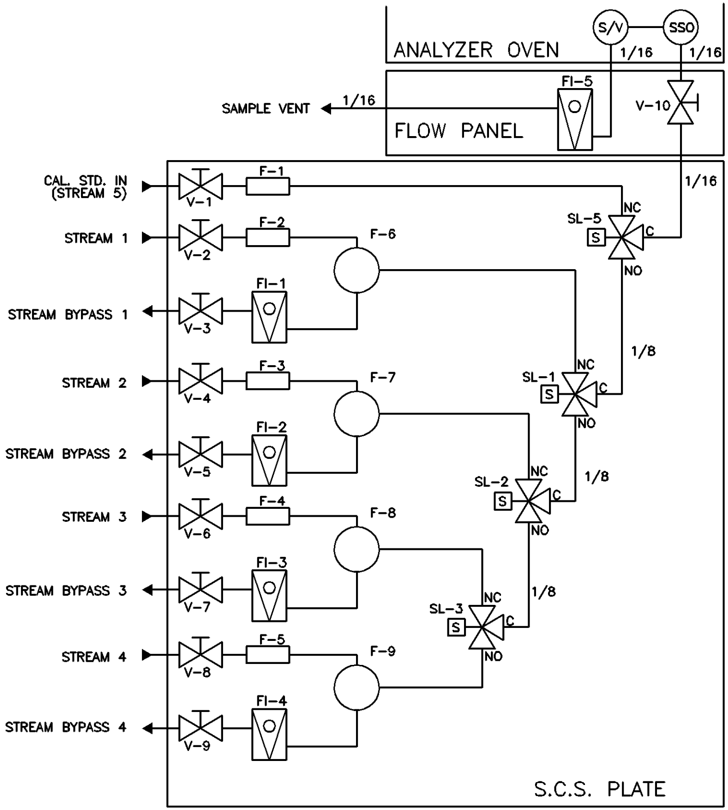
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: S.C.S. PLATE 3 STREAMS WITH 120 BYPASS

DRN MANCHA DATE 4/29/05
CHKD EM DATE 4-30-05
APPD DLT DATE 4-30-05

DWG NO. CE-24324 REV A
SCALE NTS P/N SEE ORDER SHT 1 OF 1

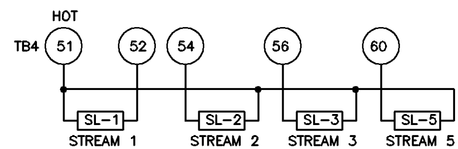


NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.

SOLENOID WIRING

TB4 IS LOCATED IN LOWER ELECTRONICS ENCLOSURE BEHIND THE VALVE DRIVER BOARD. (REF. DE-10493).



LEGEND:

5	F1-5	4-5000-112	FILTER, INLINE 1/8"
9	V1-9	4-5000-109	BLOCK VALVE 1/8"
1	V-10	4-5000-202	VALVE, REG. 1/8"
1	FI-5	4-5000-122	FLOW IND. 0-100 ccm
4	SL1,2,3,5	4-5000-075	SOLENOID VALVE 3-WAY
4	FI1-4	4-5000-120	FLOW IND. 100-900 ccm
4	F6-9	4-5000-939	FILTER, GENIE MDL. 120

SI METRIC
THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
B	10-19-05	HM	ECO-XX-5001209	EM	DLT
A	4-30-05	HM	RELEASED	EM	DLT

FILENAME: CE24416B1.DWG, DATE: 10-18-05, TIME: 2:51 P.M.

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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

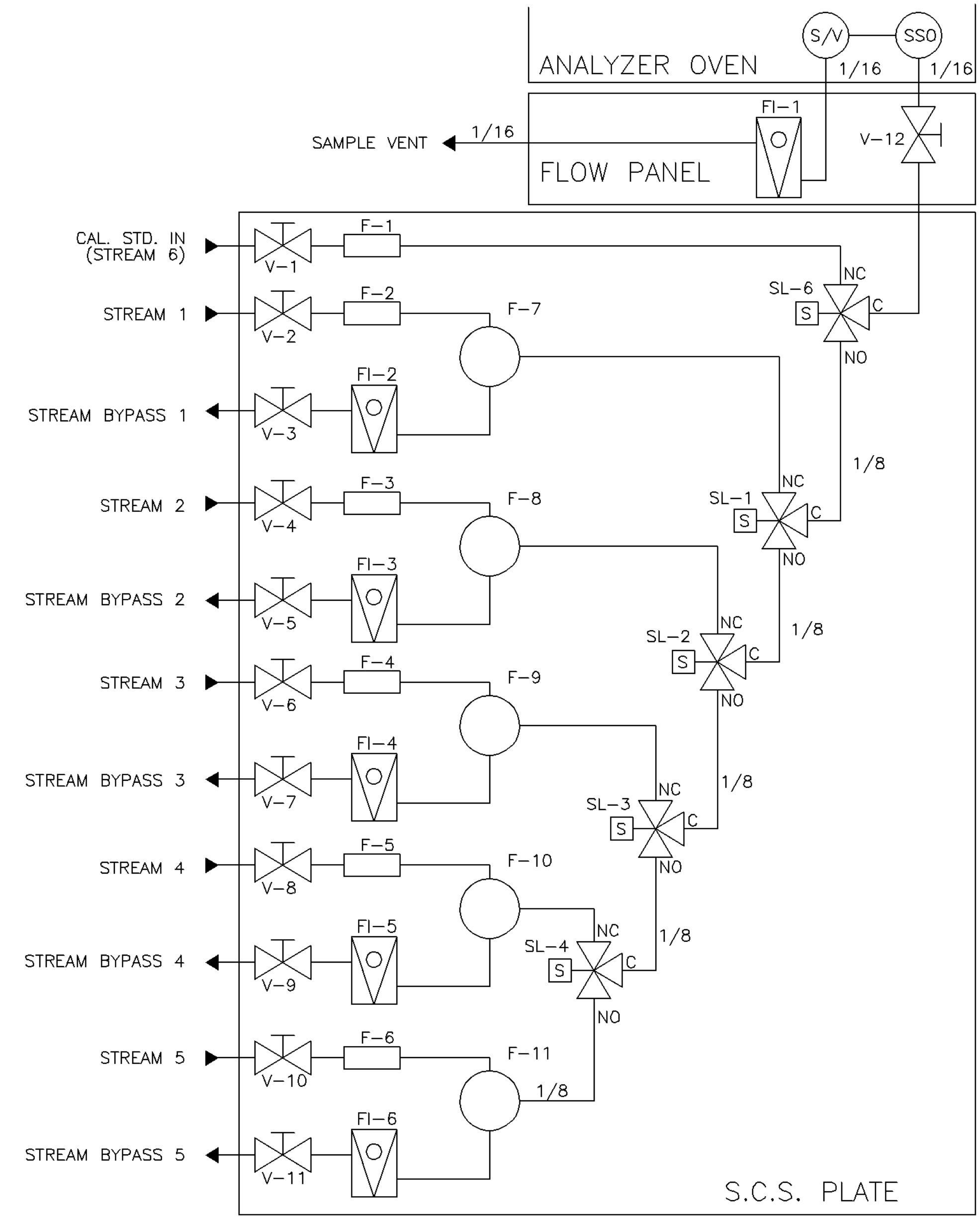
EMERSON. Process Management

TITLE
S.C.S. PLATE
4 STREAMS WITH
120 BYPASS FILTERS

DRN MANCHA DATE 4/28/05
CHKD EM DATE 4-30-05
APPD DLT DATE 4-30-05

DWG NO. CE-24416 REV B

SCALE NTS P/N SEE ORDER SHT 1 OF 1

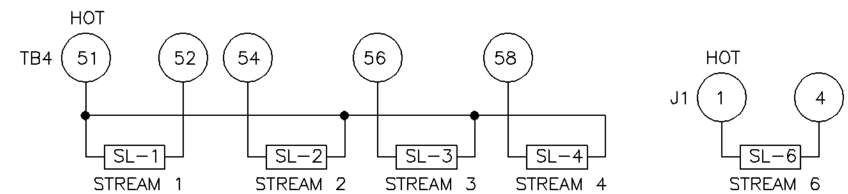


NOTES:

1. ALL CUSTOMER CONNECTIONS ARE 1/8" SWAGELOK TUBE FITTINGS UNLESS NOTED.

SOLENOID WIRING

(TB4 IS LOCATED IN LOWER ELECTRONICS HOUSING BEHIND THE VALVE DRIVER BOARD. SOLENOID DRIVER BOARD WITH J1 IS LOCATED IN AUXILIARY ELECTRONICS HOUSING AT LEFT SIDE OF ANALYZER. REFERENCE SYSTEM OUTLINE AND DIMENSIONAL DRAWING.)



LEGEND:

6	F1-6	4-5000-112	FILTER, INLINE 1/8"
11	V1-11	4-5000-109	BLOCK VALVE 1/8"
1	V-12	4-5000-202	VALVE, REG. 1/8"
1	FI-1	4-5000-122	FLOW IND. 0-100 ccm
5	SL1-4,6	4-5000-075	SOLENOID VALVE 3-WAY
5	FI2-6	4-5000-120	FLOW IND. 100-900 ccm
5	F7-11	4-5000-939	FILTER, GENIE MDL. 120

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
A	4-30-05	HM	RELEASED	EM	DLT

FILENAME: CE16538D1.DWG, DATE: 04-28-05, TIME: 2:02 P.M.

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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: S.C.S. PLATE 5 STREAMS WITH AUTO CAL. AND MODEL 120 BYPASS FILTERS

DRN MANCHA DATE 4/28/05
CHKD EM DATE 4-30-05
APPD DLT DATE 4-30-05

DWG NO. CE-24513 REV A

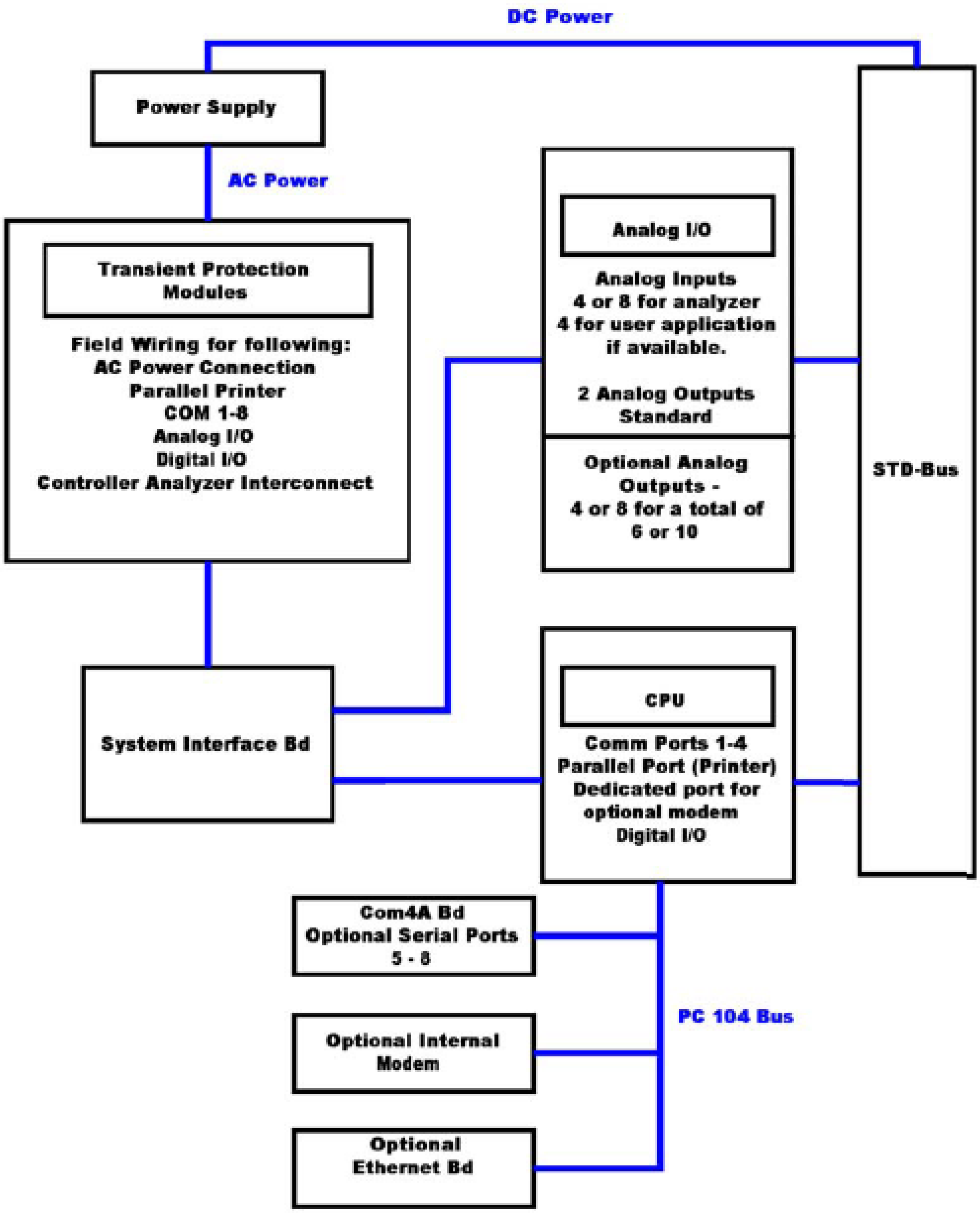
SCALE NTS P/N SEE ORDER SHT 1 OF 1

ADDENDUM 2

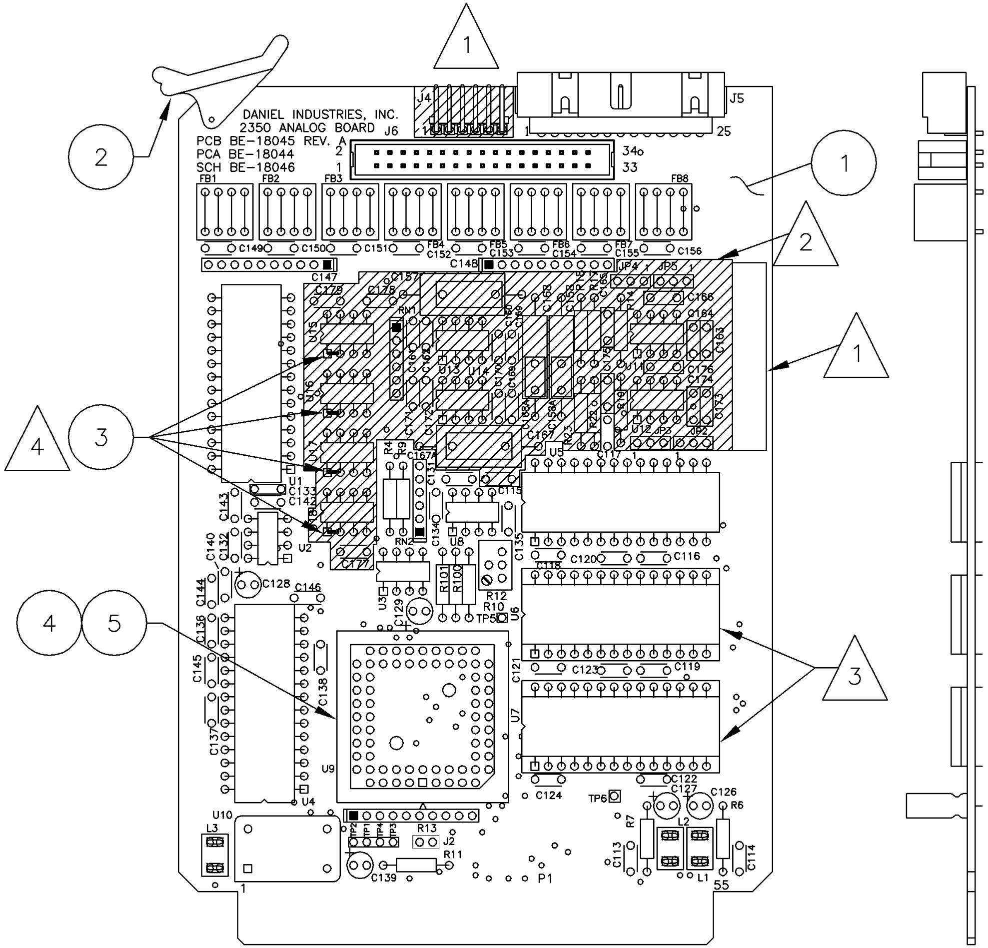
GC CONTROLLER DRAWINGS

This addendum contains schematics and drawings of the GC Controller portion of the Model 500 Gas Chromatograph System. Drawings are listed below in the same page order as found in this addendum:

BE-18044	Assembly, Analog Board
BE-20767	Assembly, Modem Board
CE-18115	Assembly, Termination Board Sheet 1 of 2: Component Side Sheet 2 of 2: Solder Side (Descript., Transient Protect. Mod., & Plugs)
CE-18118	System Interface and Driver Board
CE-20766	Assembly, COM4A Serial Board (Sheets 1-2)
CE-21743	Assembly, CPU Board 2350A
CE-21743-001	Assembly, CPU Board 2350A (32-BIT)
DE-20775	Assembly Sheet 5 of 6: Card Cage Detail
DE-20778	Dimensional, 19" Rack w/Display & Keypad
DE-20779	Dimensional, Explosion-Proof Unit
DE-20780	Dimensional, 19" Rack w/o Display & Keybd.
DE-20781	Dimensional, Panel Mount Unit (2250 Retrofit)
DE-20782	Field Wiring Terminal Board



Block Diagram of GC Controller Circuit Boards



ASSEMBLY NOTES:

1. DANIEL TO INSTALL SERIAL NUMBER LABEL AS INDICATED. BRADY LABELS SHOULD BE PLACED ON CIRCUIT SIDE OF BOARD, CENTERED BETWEEN SOCKETS OF U6 AND U7.
2. SHADED COMPONENTS ARE NOT INSTALLED.
3. U6 AND U7 ARE OPTIONAL COMPONENTS, DEPENDING ON THE NUMBER OF ANALOG CHANNELS REQUIRED (SEE TABLE).
4. INSTALL 22 GA. BUS WIRE (ITEM 3) ACROSS PINS 1 AND 2 OF U15–U18.
5. INSTALL U9 IN SOCKET.
6. AFTER ASSEMBLY, MASK OFF GOLD FINGERS AT LOCATION P1, TWO DRAIN HOLES INSIDE SOCKET FOR U9 ON CIRCUIT SIDE, U9 SOCKET ON COMPONENT SIDE (DOWN TO THE SURFACE OF THE BOARD), J2, TP1–TP4, TP5, TP6, SOCKETS FOR U6 AND U7, J5, J6, AND EJECTOR TAB (ITEM 2). CONFORMAL COAT PER MEP 47429.
7. AFTER COATING, SEAL BASE OF U9 SOCKET WITH RTV-3145 (ITEM 4). SEAL TOP OF SOCKET WITH TWO 1" X 1" PIECES OF KAPTON ADHESIVE BACKED TAPE (ITEM 5).

PART #	DESCRIPTION	COMP.
3-2350-034	PCA, ANALOG, 8 IN , 12 OUT	U5-U7
3-2350-039	PCA, ANALOG, 8 IN , 8 OUT	U5-U6
3-2350-041	PCA, ANALOG, 8 IN , 4 OUT	U5

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL: N/A

FINISH: N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
F	09/02/08	CC	ECO-XX-5004086	EM	HS
E	1-15-08	CC	ECO-XX-5003426	EM	HS
D	5-3-05	HM	ECO-XX-5000713 TITLE BLOCK	EM	DLT
D	9-5-01	RD	ECO-XX-124663	EM	DLT
C	8-24-00	RD	ECO-XX-88668	EM	DLT
B	3-8-99	RD	ECO-XX-27488	EM	DLT
A	01/98	RD	ERO-9756	EM	GCS

FILENAME: BE18044F1.DWG, DATE: 09-02-08, TIME: 12:48 A.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

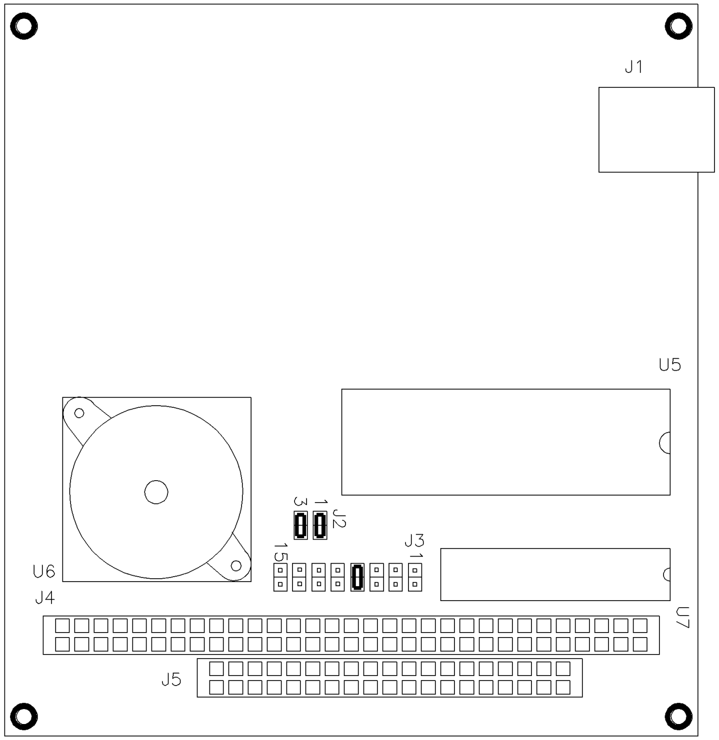
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

EMERSON Process Management

TITLE: ASSEMBLY ANALOG BOARD MODEL 2350

DRN RD	DATE 11/19/97	DWG NO. BE-18044	REV F
CHKD EM	DATE 12/23/97		
APPD GCS	DATE 1/98	SCALE NTS	P/N SEE TABLE	SHT 1 OF 1



NOTES

1. INSTALL 2 POSITION JUMPERS J2(1–2, 3–4) AND J3 (7–8)
2. MASK SOCKETS CONTACTS (COMPONENT SIDE) AND PINS (SOLDER SIDE) ON PC104 CONNECTORS J4 AND J5, TOP COVER OPENING OF SPEAKER MOUNTED ON U6, JUMPER STRIPS J2 AND J3, SOCKET WITH U5 INSTALLED, SOCKET WITH U6 INSTALLED, AND CONNECTOR J1. COAT PER MEP 47429.
3. PLACE BRADY LABELS ON BACK OF BOARD FOR TRACEABILITY.

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. – NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
A	5–3–05	HM	ECO–XX–5000713 TITLE BLOCK	EM	DLT
A	04/02/02	RD	ERO–YY–10078	EM	DLT

FILENAME: BE20767A1.DWG, DATE: 04–28–05, TIME: 1:44 P.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

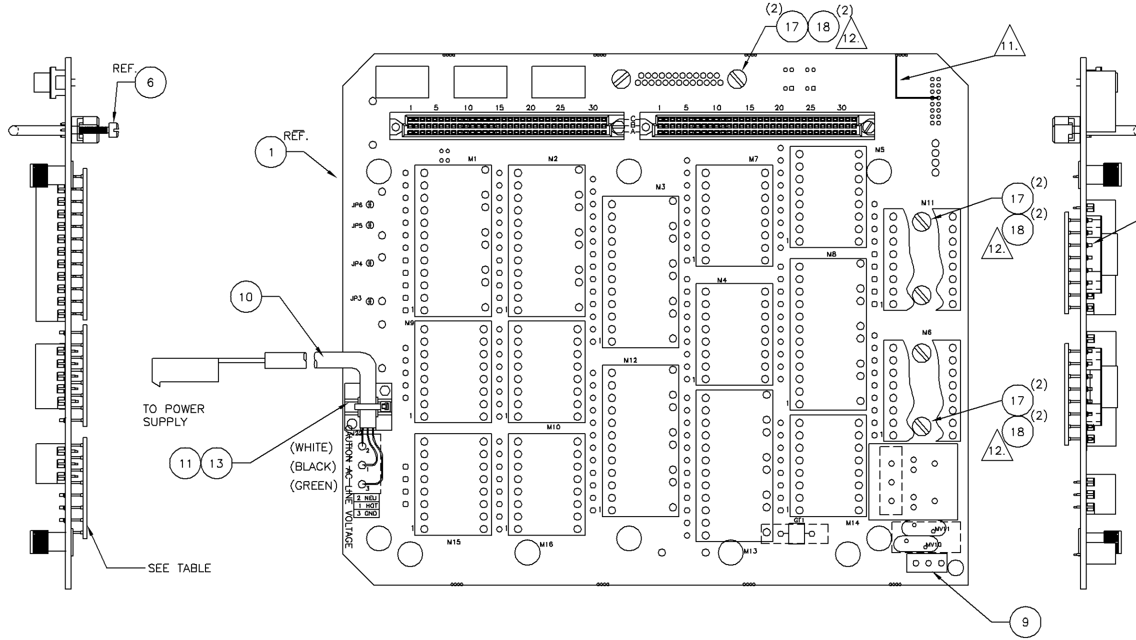
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

EMERSON. Process Management

TITLE
ASSEMBLY
MODEM BOARD
2350 CONTROLLER

DRN RD	DATE 12/18/01	DWG NO. BE–20767	REV A
CHKD EM	DATE 1/04/02		
APPD DLT	DATE 4/2/02	SCALE NTS	P/N 3–2350–099
		SHT 1 OF 1	



DASH NUMBER	PART NUMBER	DESCRIPTION	TNST. MODULES	PLUGS
-1	3-2350-001	(2) ANALOG OUTPUTS NO STREAM TNST.	M2,3,10,16 NOT INSTALLED	P15,16,17 NOT INSTALLED
-2	3-2350-028	(6) ANALOG OUTPUTS NO STREAM TNST.	M2,10,16 NOT INSTALLED	P15,16,17 NOT INSTALLED
-3	3-2350-029	(6) ANALOG OUTPUTS STREAM TNST.	M2 NOT INSTALLED	P15 NOT INSTALLED
-4	3-2350-030	(10) ANALOG OUTPUTS STREAM TNST.	M10,16 NOT INSTALLED	P16,17 NOT INSTALLED
-5	3-2350-031	(10) ANALOG OUTPUTS STREAM TNST.	ALL INSTALLED	ALL PLUGS INSTALLED
-6	3-2350-032	(2) ANALOG OUTPUTS STREAM TNST.	M2,3 NOT INSTALLED	P15 NOT INSTALLED

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
Q	03/15/10	CC	ECO-XX-5005510	EM	HS
P	11/24/08	CC	ECO-XX-5004294	EM	HS
N	5-1-07	DLT	ECO-XX-5002655	EM	DLT
M	5-3-05	HM	ECO-XX-5000713 TITLE BLOCK	EM	DLT
M	8-29-03	HM	ECO-XX-184343	EM	HS
L	7-10-03	HM	ECO-XX-179214	EM	HS
K	11-13-02	RD	ECO-XX-158967	EM	HS

FILENAME: CE18115Q2.DWG, DATE: 03-15-10, TIME: 12:49 A.M.

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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

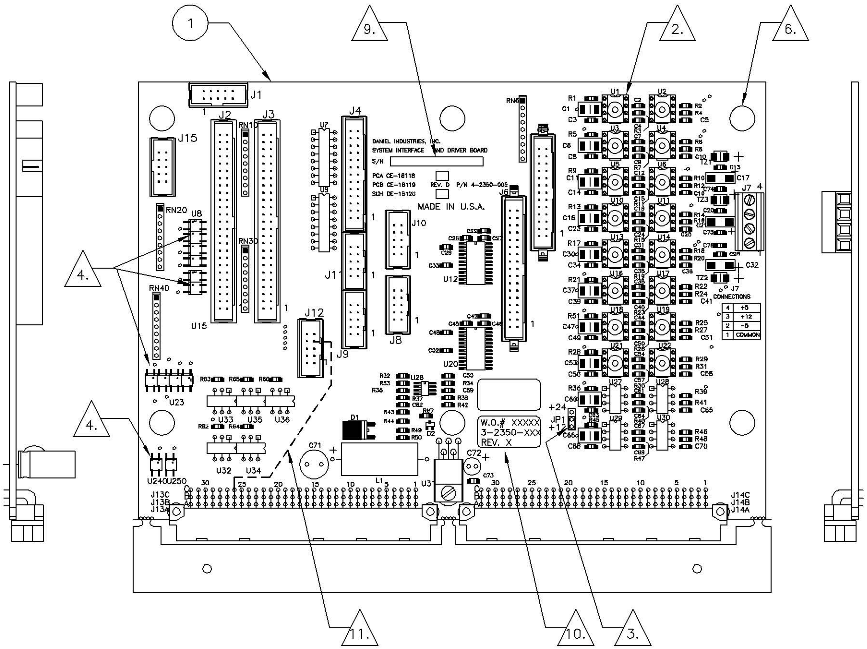
EMERSON. Process Management

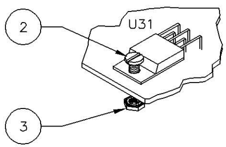
TITLE: ASSEMBLY SOLDER SIDE TERMINATION BOARD MODEL 2350

DRN MANCHA DATE 09/13/94
CHKD EM DATE 06/29/95
APPD EMB DATE 06/29/95

DWG NO. CE-18115-( ) REV Q

SCALE 1:1 P/N SEE ORDER SHT 2 OF 2





NOTES:

1. DELETED PER ECO-XX-166242.
2. SOCKETS ARE TO BE INSTALLED IN U1-6, U10-11, U13-14, U16-19 AND U21-22 LOCATIONS.
3. JP1 2-PIN JUMPER TO BE INSTALLED AS SHOWN.
4. NOTE POLARITY DOTS ON U8, U15, U23, U240 AND U250 FOR CORRECT PIN ORIENTATION.
5. DELETED
6. MASK (6) PCB MOUNTING HOLES BEFORE FLOW SOLDERING.
7. DELETED PER ECO-XX-166242.
8. AFTER TEST, CONFORMAL COAT BOTH SIDES OF BOARD PER MEP-47429. MASK THE FOLLOWING AREAS BEFORE COATING: JP1, S1, J1-J15, XU1-6, XU10-11, XU13-14 AND XU16-19.
9. INSTALL SERIAL NUMBER LABEL.
10. INSTALL BRADY LABELS AS INDICATED.
11. ON ASSEMBLIES WITH REVISION B OR EARLIER PCB(S), CONNECT A WIRE (30 AWG. GREEN KYNAR, P/N 5-4671-430) FROM J13C-PIN 26 TO J12-PIN 7 ON THE CIRCUIT SIDE.

TABLE

DASH #	P/N	DESCRIPTION	OPTIONAL PARTS
-1	3-2350-005	BASIC BOARD (2) ANALOG OUTPUTS	U1-6, U10-11, U13-14, U16-19 & U21-22 NOT INSTALLED
-2	3-2350-022	(6) ANALOG OUTPUTS	U5-6, U16-19 & U21-22 INSTALLED U1-4, U10-11 & U13-14 NOT INSTALLED
-3	3-2350-023	(10) ANALOG OUTPUTS	U1-6, U10-11, U13-14, U16-19 & U21-22 INSTALLED

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
G	5-3-05	HM	ECO-XX-5000713 TITLE BLOCK	EM	DLT
G	1-4-04	HM	ECO-XX-166242	EM	HS
F	6-14-02	RD	ECO-XX-144172	EM	DLT
E	5-29-02	RD	ECO-XX-139987	EM	HS
D	06/27/00	RD	ECO-XX-19711	EM	DLT
C	06/11/98	RD	ECO-9487	EM	DLT
B	07/96	DT	ECO-8939	EM	EMB

FILENAME: CE18118G1.DWG, DATE: 04-28-05, TIME: 12:54 A.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

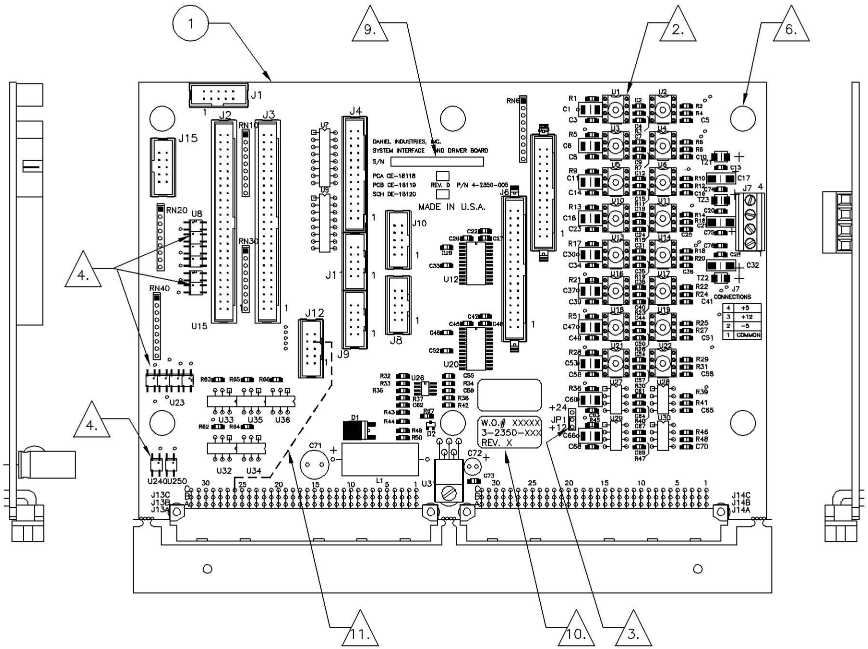
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0 30'
FINISH 200 RA MAX

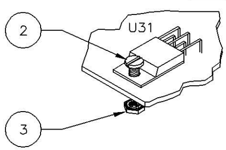
BREAK ALL SHARP CORNERS TO .003-.015 RADIUS AND REMOVE ALL BURRS

EMERSON. Process Management

TITLE: SYSTEM INTERFACE AND DRIVER BOARD 2350

DRN MANCHA	DATE 09/09/94	DWG NO. CE-18118-( )
CHKD EM'	DATE 06/29/95	REV G
APPD EMB	DATE 06/29/95	SCALE 1:1 · P/N SEE ORDER · SHT 1 OF 1





NOTES:

1. DELETED PER ECO-XX-166242.
2. SOCKETS ARE TO BE INSTALLED IN U1-6, U10-11, U13-14, U16-19 AND U21-22 LOCATIONS.
3. JP1 2-PIN JUMPER TO BE INSTALLED AS SHOWN.
4. NOTE POLARITY DOTS ON U8, U15, U23, U240 AND U250 FOR CORRECT PIN ORIENTATION.
5. DELETED
6. MASK (6) PCB MOUNTING HOLES BEFORE FLOW SOLDERING.
7. DELETED PER ECO-XX-166242.
8. AFTER TEST, CONFORMAL COAT BOTH SIDES OF BOARD PER MEP-47429. MASK THE FOLLOWING AREAS BEFORE COATING: JP1, S1, J1-J15, XU1-6, XU10-11, XU13-14 AND XU16-19.
9. INSTALL SERIAL NUMBER LABEL.
10. INSTALL BRADY LABELS AS INDICATED.
11. ON ASSEMBLIES WITH REVISION B OR EARLIER PCB(S), CONNECT A WIRE (30 AWG. GREEN KYNAR, P/N 5-4671-430) FROM J13C-PIN 26 TO J12-PIN 7 ON THE CIRCUIT SIDE.

TABLE

DASH #	P/N	DESCRIPTION	OPTIONAL PARTS
-1	3-2350-005	BASIC BOARD (2) ANALOG OUTPUTS	U1-6, U10-11, U13-14, U16-19 & U21-22 NOT INSTALLED
-2	3-2350-022	(6) ANALOG OUTPUTS	U5-6, U16-19 & U21-22 INSTALLED U1-4, U10-11 & U13-14 NOT INSTALLED
-3	3-2350-023	(10) ANALOG OUTPUTS	U1-6, U10-11, U13-14, U16-19 & U21-22 INSTALLED

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
G	5-3-05	HM	ECO-XX-5000713 TITLE BLOCK	EM	DLT
G	1-4-04	HM	ECO-XX-166242	EM	HS
F	6-14-02	RD	ECO-XX-144172	EM	DLT
E	5-29-02	RD	ECO-XX-139987	EM	HS
D	06/27/00	RD	ECO-XX-19711	EM	DLT
C	06/11/98	RD	ECO-9487	EM	DLT
B	07/96	DT	ECO-8939	EM	EMB

FILENAME: CE18118G1.DWG, DATE: 04-28-05, TIME: 12:54 A.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

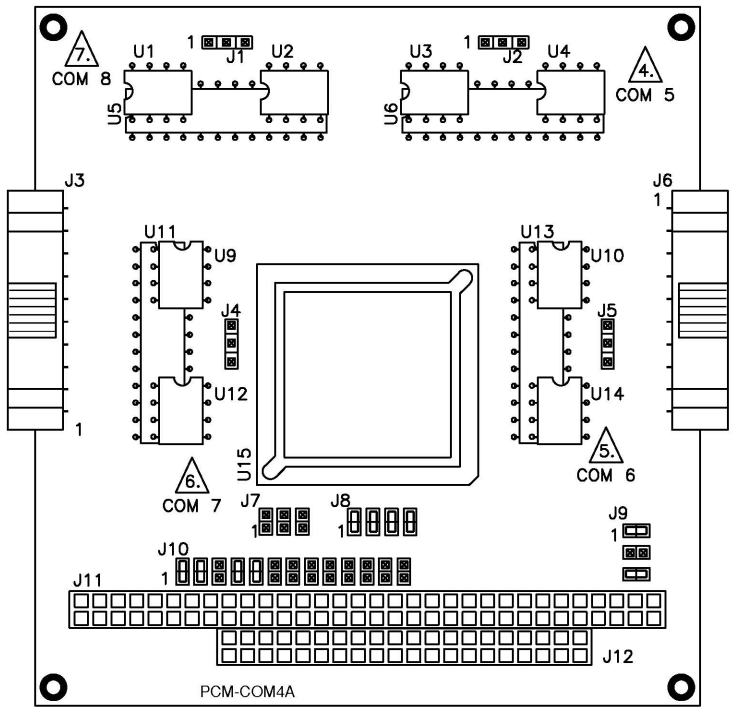
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0 30'
FINISH 200 RA MAX

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

EMERSON. Process Management

TITLE: SYSTEM INTERFACE AND DRIVER BOARD 2350

DRN MANCHA	DATE 09/09/94	DWG NO. CE-18118-( )	REV G
CHKD EM'	DATE 06/29/95		
APPD EMB	DATE 06/29/95	SCALE 1:1 P/N SEE ORDER	SHT 1 OF 1



NOTES

1. INSTALL 2 POSITION JUMPERS AND IC'S AS INDICATED FOR USE WITH LX800 CPU:

   J7–NONE, J8(1–2, 3–4, 5–6, 7–8)
   J9(1–2, 5–6), J10(1–2, 3–4, 7–8, 23–24).

   JUMPERS J1, J2, J4 AND J5 PER TABLE.

   REMOVE OR INSTALL IC'S PER TABLE.

2. MASK OFF CONNECTORS J3 AND J6, SOCKETS CONTACTS OF J11 AND J12 ON COMPONENT SIDE AND PINS ON SOLDER SIDE, JUMPER STRIPS J1, J2, J4, J5, J7, J8, J9, AND J10, SOCKETS WITH IC'S AND ADJACENT ALTERNATE SOCKETS FOR LOCATIONS U1–U6, U9, U11, U12, U10, U13, U14, U15, AND U17. CONFORMAL COAT PER MEP 47429.

3. ADD BRADY LABELS TO BACK OF BOARD.

4. U3, U4, U6, AND J2 ARE ASSOCIATED WITH COM 5.

5. U10, U13, U14, AND J5 ARE ASSOCIATED WITH COM 6.

6. U9, U11, U12, AND J4 ARE ASSOCIATED WITH COM 7.

7. U1, U2, U5, AND J1 ARE ASSOCIATED WITH COM 8.

PART NUMBER	OUTPUT					JUMPER TABLE	IC'S INSTALLED	IC'S REMOVED/NOT INSTALLED
	Mode	COM5	COM6	COM7	COM8			
2–3–2350–095	A	RS232C	RS232C	RS232C	RS232C	J1, J2, J4, J5 (PIN 1 ONLY)	U5, U6, U11, U13	U1, U2, U3, U4, U9, U10, U12, U14
2–3–2350–096	B	RS485	RS485	RS232C	RS232C	J2 AND J5 (PINS 2–3) NO JUMPERS J1 AND J4 (PIN 1 ONLY)	U4, U5, U11, U14	U1, U2, U3, U6, U9, U10, U12, U13
2–3–2350–097	C	RS485	RS485	RS422	RS232C	J2 AND J5 (PINS 2–3) NO JUMPERS J1 AND J4 (PIN 1 ONLY)	U4, U5, U9, U12, U14	U1, U2, U3, U6, U10, U11, U13

SI METRIC						
THIRD ANGLE PROJECTION	E	9–13–10	BB	ECO–XX–5005910	EM	HS
	D	1–20–07	CC	ECO–XX–5002525	EM	DLT
	C	5–3–05	HM	ECO–XX–5000713–TITLE BLOCK	EM	DLT
MATERIAL N/A	C	12–5–03	HM	ECO–XX–181318	EM	HS
	B	12–10–02	RD	ECO–XX–162135	EM	HS
FINISH	A	02/19/02	RD	ERO–YY–10078	EM	DLT
N/A	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. – NONE	FILENAME: CE20766E1.DWG, DATE: 09/16/10, TIME: 12:57 P.M.					

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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
COM4A SERIAL BOARD
2350A CONTROLLER
(LX800 CPU)

DRN RD	DATE 12/18/01	DWG NO. CE–20766	REV E
CHKD EM	DATE 01/03/02		
APPD DLT	DATE 02/19/02	SCALE NTS	P/N SEE ORDER
		SHT 1 OF 2	

2350A COM4A 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 5	U6	U3, U4	U3, U4	U6	U4	U3, U6
COM 6	U13	U10, U14	U10, U14	U13	U14	U10, U13
COM 7	U11	U9, U12	U9, U12	U11	U12	U9, U11
COM 8	U5	U1, U2	U1, U2	U5	U2	U1, U5

JUMPER PLACEMENT

	SET FOR RS-232		SET FOR RS-422		SET FOR RS-485	
COM 5	J2 NONE		J2 NONE		J2 2 - 3	
COM 6	J5 NONE		J5 NONE		J5 2 - 3	
COM 7	J4 NONE		J4 NONE		J4 2 - 3	
COM 8	J1 NONE		J1 NONE		J1 2 - 3	

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
E	9-13-10	BB	ECO-XX-5005910	EM	HS
D	1-20-07	CC	ECO-XX-5002525	EM	DLT
C	5-3-05	HM	ECO-XX-5000713 TITLE BLOCK	EM	DLT
C	12-5-03	HM	ECO-XX-181318	EM	HS

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL N/A
FINISH N/A
PROJ. FILE NO. – NONE

FILENAME: CE20766E2.dwg, DATE: 09/16/10, TIME: 12:57 P.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

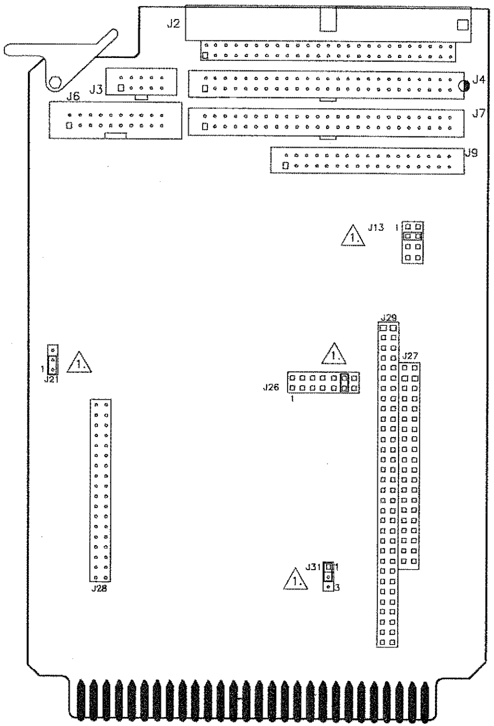
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

EMERSON. Process Management

TITLE: ASSEMBLY COM4A SERIAL BOARD 2350A CONTROLLER (LX800 CPU)

DRN MANCHA	DATE 12/5/03	DWG NO. CE-20766	REV E
CHKD EM	DATE 12/5/03		
APPD NTH	DATE 12/5/03	SCALE NTS	P/N SEE ORDER



ASSEMBLY NOTES:

1. SET JUMPERS AS FOLLOWS:
   J13 = 3-4
   J21 = 1-2
   J26 = 11-12
   J31 = 1-2
2. DELETED PER ECO-XX-5005185.
3. LOAD THE LATEST VERSION OF UNIBOS (REPRESENTED BY XXX HERE) TO THE COMPACT FLASH MEMORY, REFERENCE 2-8-2350-351.
4. ATTACH A BRADY LABEL TO THE BACK OF THE BOARD WITH FOLLOWING:
   P/N 2-3-2350-190
   UNIBOS_vXXX_2350A.
5. CMOS BIOS SETUP

VERSION 35108224-00 BUILT 08/11/2008 13:35:37

A PERIPHERAL DEVICE, PCI, USB, STD, AND PC-104 BUSSES
B PERIPHERALS
  SERIAL PORTS
    PORT A - ADDR: 0x0338 IRQ: 6
    PORT B - ADDR: 0x02F8 IRQ: 3
    PORT C - ADDR: 0x03E8 IRQ: 5
    PORT D - ADDR: 0x02E8 IRQ: 9
  PARALLEL PORTS
    ENABLED, ADDR: 0x278, IRQ: NONE, MODE: COMPATIABLE
  CAN
    DISABLED
    ASSIGN IRQ 12 TO MOUSE
    DISABLED
C GRAPHICS
    INTERNAL CONTROLLER MODE: SECONDARY CONTROLLER
    OUTPUT DISPLAY: PANEL AND CRT
    FLAT PANEL CONFIGURATION -- RESOLUTION: 640x480
D PCI, USB, AND STD BUSSES
  PCI INTERRUPT STEERING
    PCI INTA#: NONE
    PCI INTB#: NONE
    PCI INTC#: NONE
    PCI INTD#: NONE
E PC-104 BUS
  PC-104 INTERRUPT STEERING
    IRQ3: DISABLED
    IRQ4: ENABLED
    IRQ5: DISABLED
    IRQ6: DISABLED
    IRQ7: ENABLED
    IRQ9: DISABLED
    IRQ10: ENABLED
    IRQ11: ENABLED
    IRQ12: ENABLED
    IRQ14: DISABLED
    IRQ15: ENABLED

SI METRIC
THIRD ANGLE PROJECTION

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
C	10/30/09	CC	ECO-XX-5005185	EM	EM
B	07/01/09	CC	ECO-XX-5004871	EM	HS
A		CC	RELEASED		

MATERIAL: SEE ORDER
FINISH: SEE ORDER
PROJ. FILE NO. - NONE
FILENAME: CE21743C1.dwg, DATE: 10-30-09, TIME: 8:50 A.M.

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

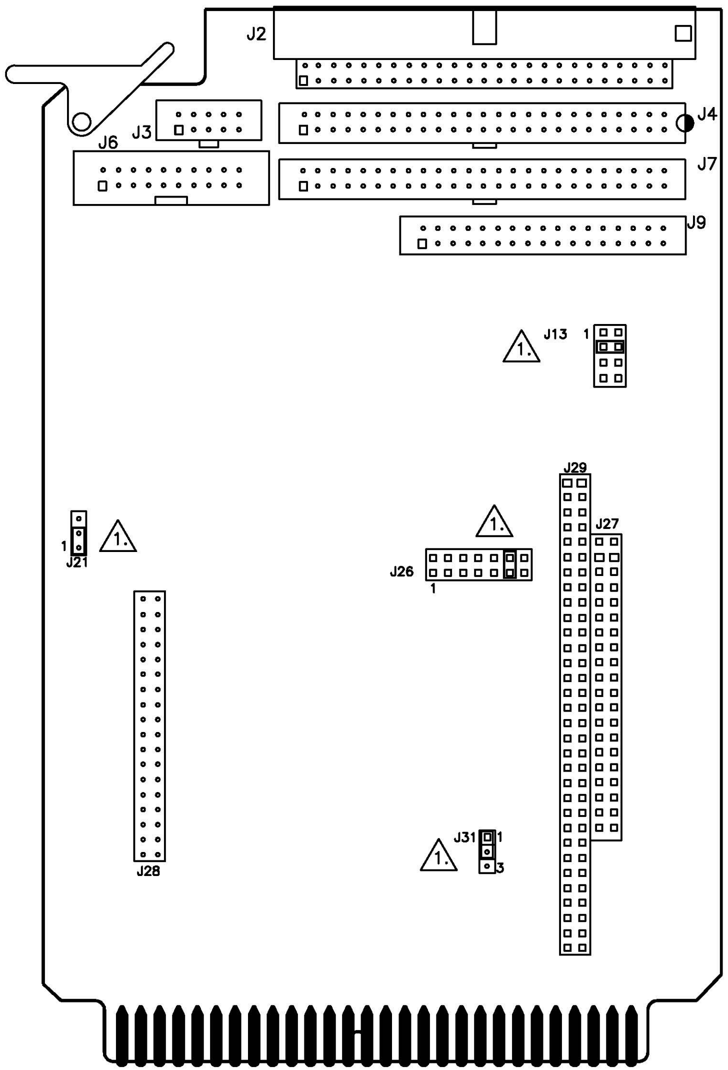
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

EMERSON. Process Management

TITLE: ASSEMBLY CPU BOARD 2350A

DRN CC	DATE 05/11/09	DWG NO. CE-21743	REV C
CHKD EM	DATE 07/01/09		
APPD HS	DATE 07/01/09	SCALE NTS, P/N 3-2350-190	SHT 1 OF 1



ASSEMBLY NOTES:

1. SET JUMPERS AS FOLLOWS:
   J13 = 3–4
   J21 = 1–2
   J26 = 11–12
   J31 = 1–2
2. NOT USED.
3. LOAD THE LATEST VERSION OF UNIBOS (REPRESENTED BY XXX HERE) TO THE COMPACT FLASH MEMORY, REFERENCE 2–8–2350–232.
4. ATTACH A BRADY LABEL TO THE BACK OF THE BOARD WITH FOLLOWING:
   P/N 2–3–2350–232
   UNIBOS_vXXX_2350A.
5. CMOS BIOS SETUP
   VERSION 35108244 BUILT 08/11/2008 13:35:37

A PERIPHERAL DEVICE, PCI, USB, STD, AND PC–104 BUSSES
B PERIPHERALS
  SERIAL PORTS
    PORT A – ADDR: 0x0338 IRQ: 6
    PORT B – ADDR: 0x02F8 IRQ: 3
    PORT C – ADDR: 0x03E8 IRQ: 5
    PORT D – ADDR: 0x02E8 IRQ: 9
  PARALLEL PORTS
    ENABLED, ADDR: 0x278, IRQ: NONE, MODE: COMPATIABLE
  CAN
    DISABLED
  ASSIGN IRQ 12 TO MOUSE
    DISABLED
C GRAPHICS
    INTERNAL CONTROLLER MODE: SECONDARY CONTROLLER
    OUTPUT DISPLAY: PANEL AND CRT
    FLAT PANEL CONFIGURATION – RESOLUTION: 640x480
D PCI, USB, AND STD BUSSES
  PCI INTERRUPT STEERING
    PCI INTA#: IRQ: 12
    PCI INTB#: NONE
    PCI INTC#: NONE
    PCI INTD#: NONE
E PC–104 BUS
  PC–104 INTERRUPT STEERING
    IRQ3: DISABLED
    IRQ4: ENABLED
    IRQ5: DISABLED
    IRQ6: DISABLED
    IRQ7: ENABLED
    IRQ9: DISABLED
    IRQ10: ENABLED
    IRQ11: ENABLED
    IRQ12: DISABLED
    IRQ14: DISABLED
    IRQ15: ENABLED

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

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
C	09/20/10	BB	ECO–XX–5005926	EM	HS
B	08/26/10	BB	ECO–XX–5005871	EM	HS
A	08/03/10	CC	RELEASED	EM	HS

FILENAME: CE21743–001C.dwg, DATE: 9/20/10, TIME: 1:48 P.M.

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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

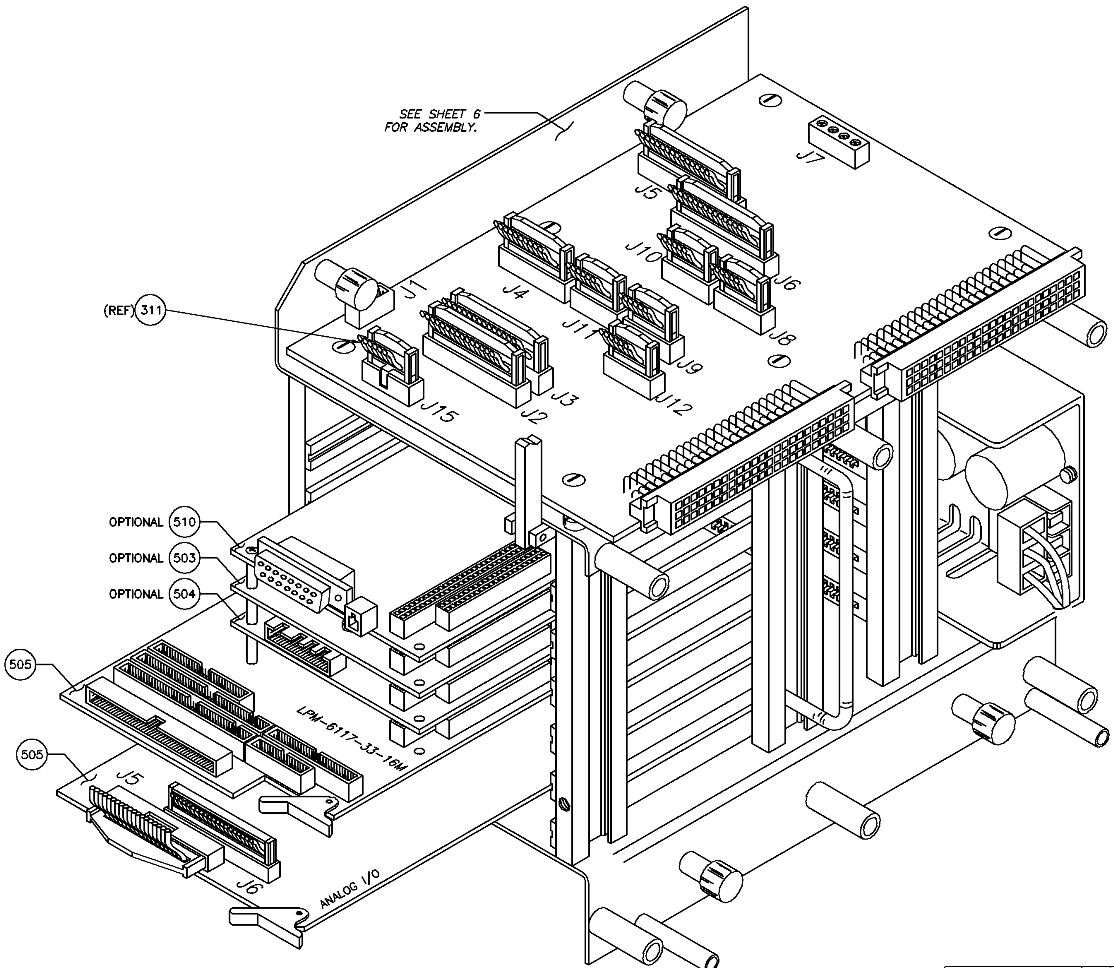
EMERSON. Process Management

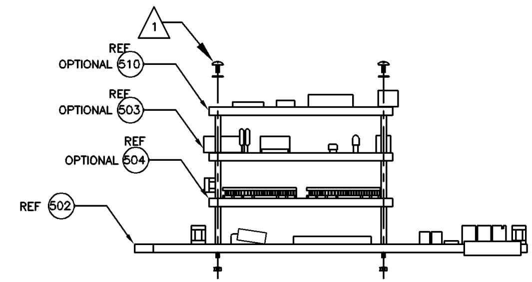
TITLE
ASSEMBLY
CPU BOARD
2350A
(32–BIT)

DRN CC	DATE 08/03/10	DWG NO. CE–21743–001	REV C
CHKD EM	DATE 08/03/10		
APPD HS	DATE 08/03/10	SCALE NTS	P/N 3–2350–232 SHT 1 OF 1

NOTES:

1. TWO (2) EACH 6-32 SCREWS, 6-32 LOCKWASHER, NYLON STANDOFF, NYLON 6-32 NUTS ARE SUPPLIED WITH COMM. BOARD (ITEM 504), MODEM BOARD (ITEM 503), AND ETHERNET BOARD (ITEM 510) TO MOUNT BOARDS ON CPU. IF ALL BOARDS ARE IN UNIT, THE COM4A BOARD IS THE BOTTOM BOARD, NEXT THE MODEM, AND THEN THE ETHERNET BOARD.
2. ANY ALTERNATIVE BOARDS MUST NOT MATERIALLY ALTER THE ENCLOSURE FREE VOLUME OR POWER CONSUMPTION.





CPU SIDEVIEW

CARD AND CABLE INSTALLATION

SLOT NUMBER	ITEM NUMBER	CARD DESCRIPTION/FUNCTION	CABLE ROUTING	CABLE ITEM NUMBER
PLUG IN TO J19/J20 ON CPU	510	ETHERNET (OPTIONAL)	ETHERNET J5 JACK EXT. CABLE	511
PLUG IN TO J19/J20 ON CPU	503	MODEM (OPTIONAL)	MODEM J11 JACK EXT. CABLE	519
PLUG IN TO J19/J20 ON CPU	504	4 CHANNEL SERIAL I/O (OPTIONAL) COMM 5 AND 6 COMM 7 AND 8	COM4A J6 TO FTB P22 AND P23 COM4A J3 TO FTB P24/INT. BD. J12	501 506
#3	502	CPU BOARD DIG I/O DIG I/O COMM 1,2 DTR COMM 3 AND 4	CPU J7 TO INTF. BD. J2 CPU J4 TO INTF. BD. J3 CPU J1 TO INTF. BD. J4/J11/J9 CPU J6 TO INTF. BD. J10/J8 OR CPU J6 TO INTF. BD. J8/J12	508 507 509 513
#5	505	ANALOG BOARD ANALOG I/O 2 OUTPUTS	ANALOG BD. J6 INTERFACE BD. J6	516
		ANALOG I/O 6 OUTPUTS OR ANALOG I/O 10 OUTPUTS	ANALOG BD. J6 TO INTERFACE BD. J6 ANALOG BD. J5 TO INTERFACE BD. J5	516 515

SI METRIC
THIRD ANGLE PROJECTION
MATERIAL N/A
FINISH N/A
PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
F	12-2-04	DLT	ECO-XX-5000336	EM	DLT
E	6-8-04	DLT	ECO-XX-203411	EM	DLT
D	1-6-04	HM	ECO-XX-166242	EM	HS
C	10-31-02	RD	ECO-XX-158738	EM	DLT
B	10-11-02	RD	ECO-XX-157611	EM	DLT
A	03/26/02	RD	ERO-YY-10078	EM	DLT

FILENAME: DE20775F5.DWG, DATE: 12-01-04, TIME: 3:36 P.M.

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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

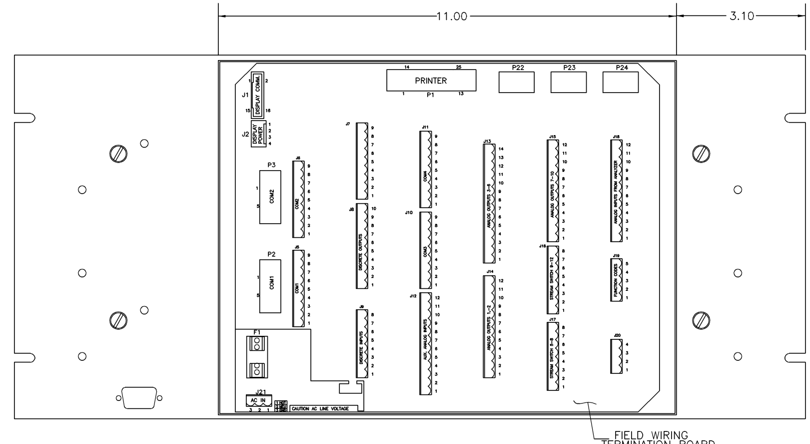
TITLE: ASSEMBLY 2350A CONTROLLER

DRN RD — DATE 1-3-02
CHKD EM — DATE 3-19-02
APPD DLT — DATE 3-26-02

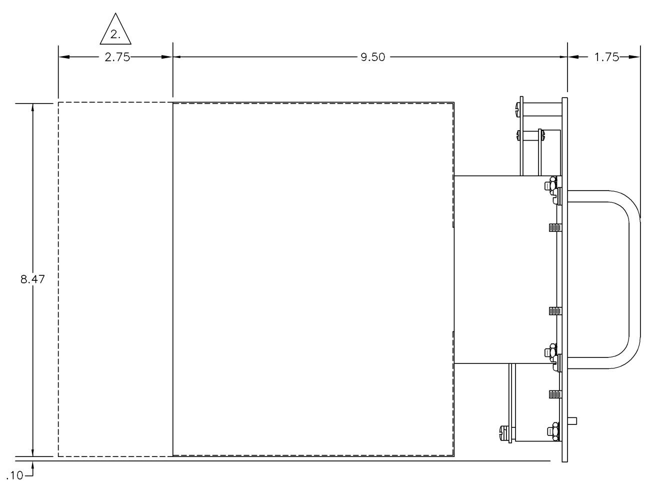
DWG NO. DE-20775 — REV F
SCALE NTS — P/N SEE ORDER — SHT 5 OF 6

NOTES:

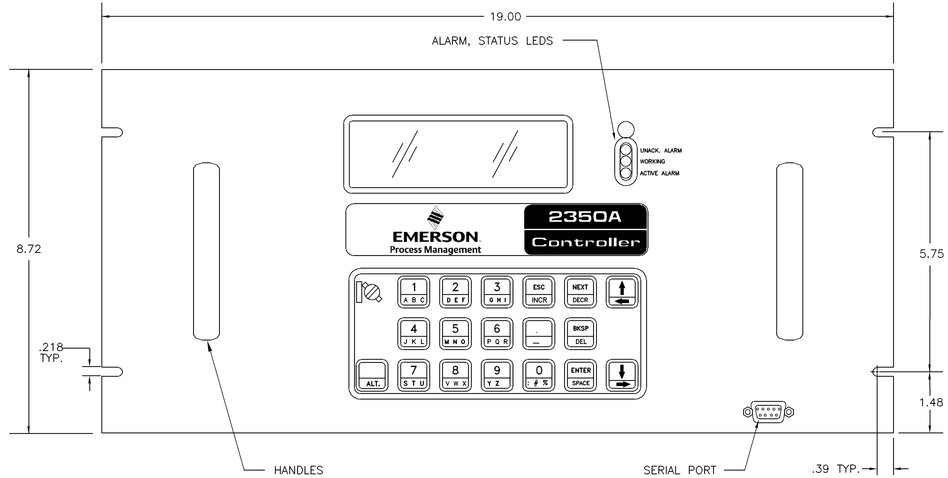
1. UNIT IS DESIGNED TO FIT IN A STANDARD 19" WIDE RACK.
2. ALLOW 2.75" DEPTH FOR TERMINATION BOARD AND CONNECTOR.



BACK VIEW



SIDE VIEW



FRONT VIEW

SI METRIC						
THIRD ANGLE PROJECTION						
MATERIAL N/A	B	6-8-04	DLT	ECO XX-203411	EM	DLT
	A	02/19/02	RD	ERO-YY-10078	EM	DLT
FINISH N/A	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. - NONE	FILENAME: DE20778B1.DWG, DATE: 05-07-04, TIME: 1:07 P.M.					

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

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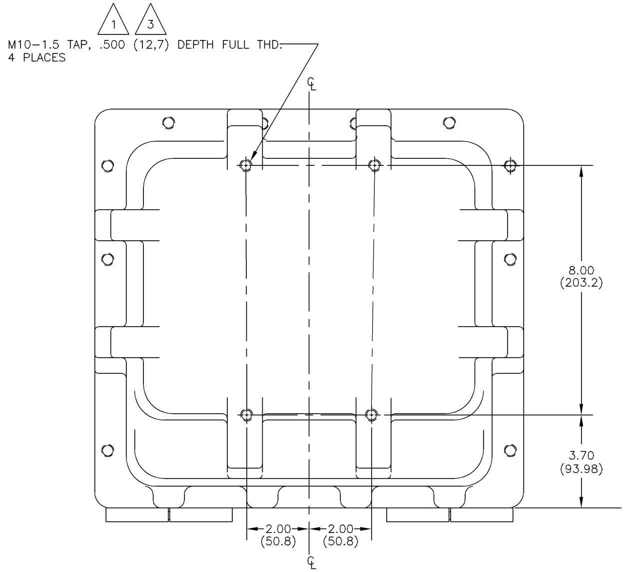
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

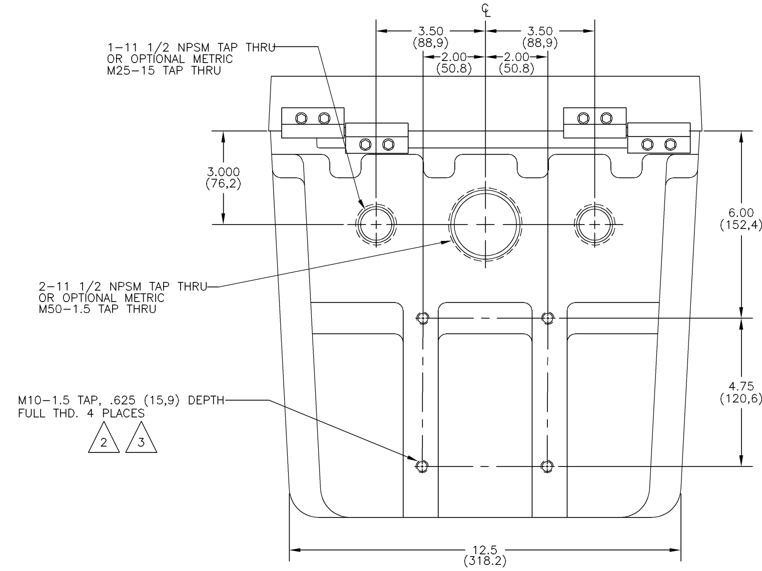
EMERSON Process Management

TITLE: DIMENSIONAL 2350A 19" RACK WITH DISPLAY AND KEYBOARD

DRN RD	DATE 1-8-02	DWG NO. DE-20778		REV B
CHKD EM	DATE 1-10-02			
APPD DLT	DATE 2-19-02	SCALE 1/1.5	P/N SEE ORDER	SHT 1 OF 1



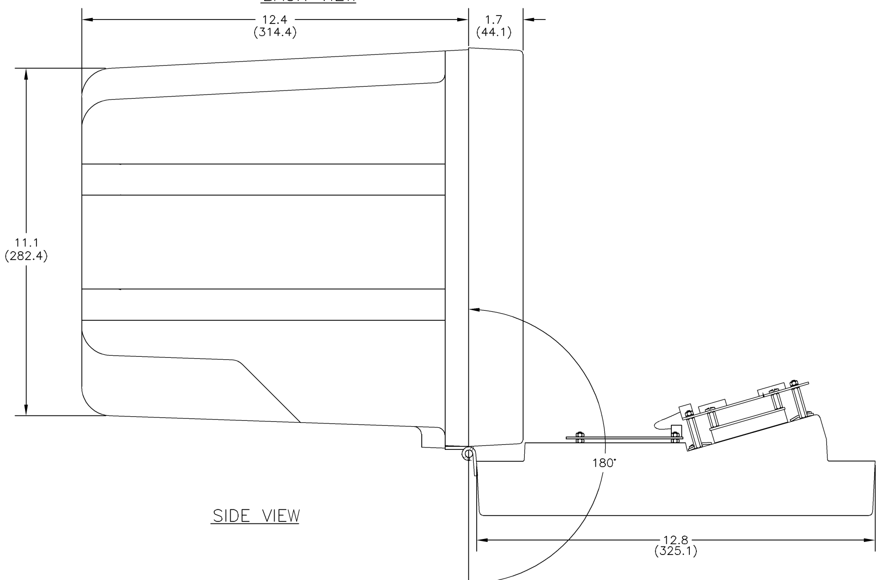
BACK VIEW



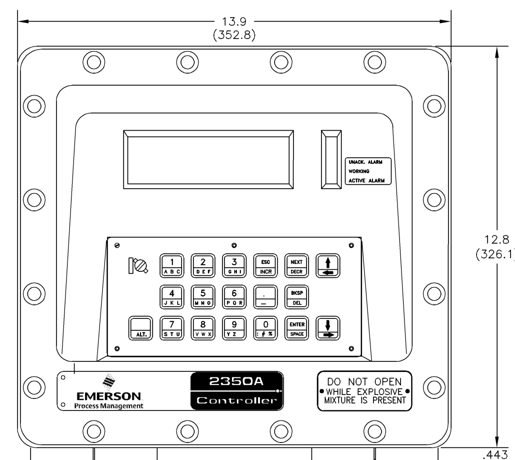
BOTTOM VIEW

NOTES:

1. HOLES FOR MOUNTING BACK OF ENCLOSURE TO MOUNTING PLATE.
2. FOR OPTIONAL MOUNTING, HOLES ARE PROVIDED FOR MOUNTING BOTTOM OF ENCLOSURE TO MOUNTING PLATE.
3. FOUR (4) SOCKET HEAD M10–1.5 x 15MM BOLTS PROVIDED WITH UNIT FOR MOUNTING THE UNIT.



SIDE VIEW



FRONT VIEW

SI METRIC						
THIRD ANGLE PROJECTION						
MATERIAL N/A	B	6-8-04	DLT	ECO XX-203411	EM	DLT
	A	02/19/02	RD	ERO-YY-10078	EM	DLT
FINISH N/A	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. - NONE	FILENAME: DE20779B1.DWG, DATE: 05-07-04, TIME: 1:46 P.M.					

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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

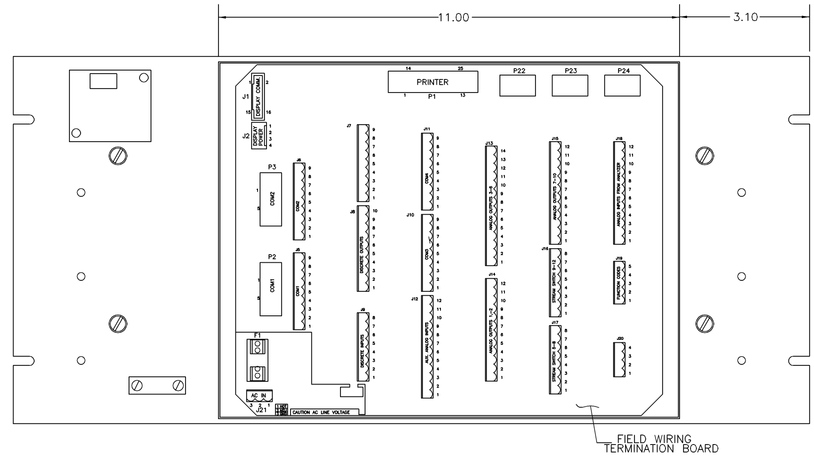
EMERSON. Process Management

TITLE: OUTLINE AND DIMENSIONAL EXPLOSION-PROOF ENCLOSURE 2350A CONTROLLER

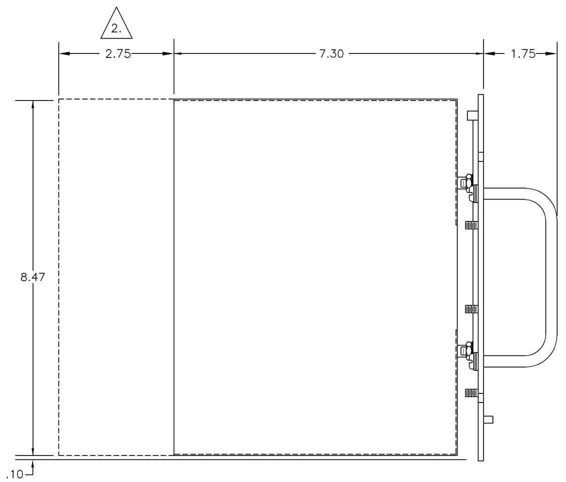
DRN RD	DATE 1-10-02	DWG NO. DE-20779	REV B
CHKD EM	DATE 1-10-02		
APPD DLT	DATE 2-19-02	SCALE NTS	P/N SEE ORDER	SHT 1 OF 1

NOTES:

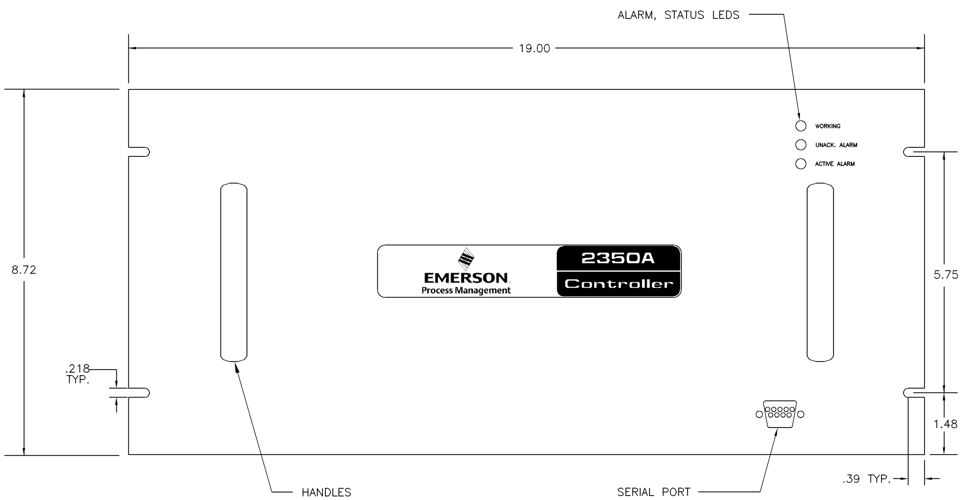
1. UNIT IS DESIGNED TO FIT IN A STANDARD 19" WIDE RACK.
2. ALLOW 2.75" DEPTH FOR TERMINATION BOARD, CONNECTORS AND POWER CORD.



BACK VIEW



SIDE VIEW



FRONT VIEW

SI METRIC						
THIRD ANGLE PROJECTION						
MATERIAL BLOCK N/A	B	6-8-04	DLT	ECO XX-203411	EM	DLT
	A	02/19/02	RD	ERO-YY-10078	EM	DLT
FINISH BLOCK N/A	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. - NONE	FILENAME: DE20780B1.DWG, DATE: 05-05-04, TIME: 4:18 P.M.					

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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

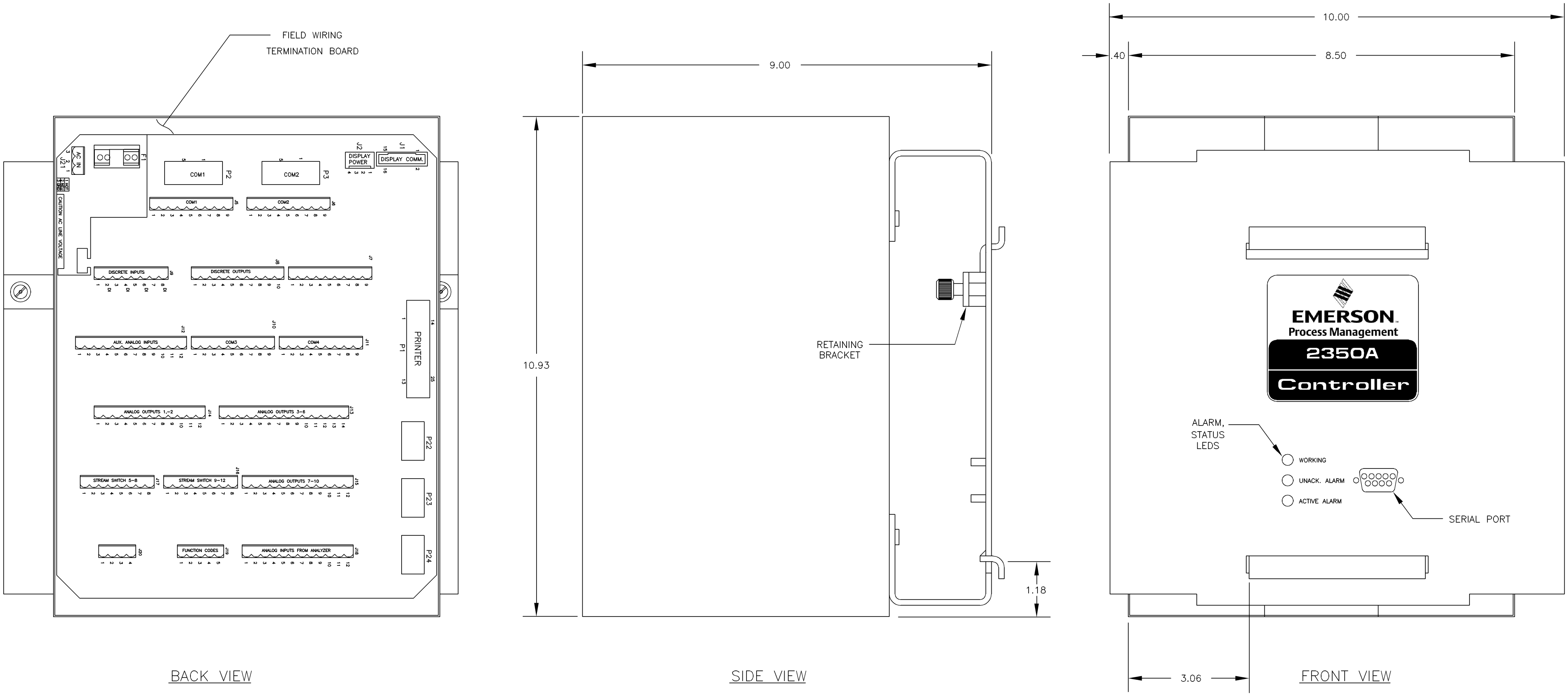
TITLE: DIMENSIONAL 2350A CONTROLLER 19" RACK WITHOUT DISPLAY AND KEYBOARD

DRN RD	DATE 1-10-02	DWG NO. DE-20780	REV B
CHKD EM	DATE 1-10-02		
APPD DLT	DATE 2-19-02	SCALE 1/1.5 P/N SEE ORDER	SHT 1 OF 1

NOTES:

1. THIS UNIT IS DESIGNED TO REPLACE 2250 SERIES G.C. CONTROLLERS THAT WERE MOUNTED IN .125 THICK RACKS OR PANELS HAVING APPROXIMATE PANEL CUTOUT OF 4"WIDE X 7" HIGH.

2. TO INSTALL UNIT, REMOVE RETAINING BRACKET THAT HAS TWO (2) THUMBSCREWS. INSTALL UNIT IN RACK OR PANEL CUTOUT FROM THE BACKSIDE AND REPLACE RETAINING BRACKET.



SI METRIC						
THIRD ANGLE PROJECTION						
MATERIAL N/A	B	6-8-04	DLT	ECO XX-203411	EM	DLT
FINISH N/A	A	02/19/02	RD	ERO-YY-10078	EM	DLT
	REV	DATE	DRN	DESCRIPTION	CHKD	APPD
PROJ. FILE NO. - NONE	FILENAME: DE20781B1.DWG, DATE: 05-07-04, TIME: 1:28 P.M.					

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GEOMETRIC TOLERANCES & DIMENSIONS PER ANSI Y14.5 LATEST REVISION

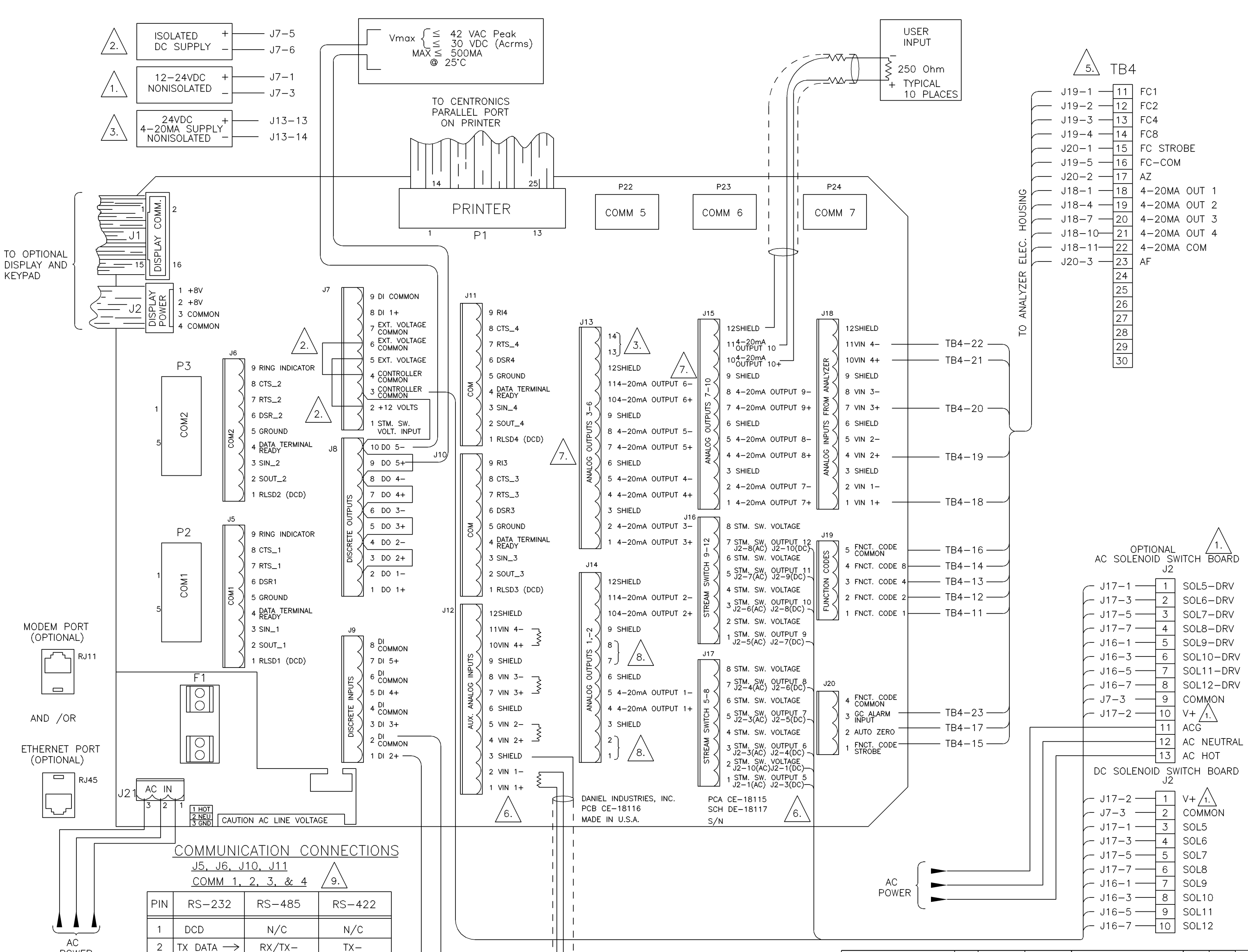
UNLESS OTHERWISE NOTED ALL DIMENSIONS IN INCHES
X.XX ±.015
X.XXX ±.005
ANGULAR ±0° 30'
FINISH 200 RA MAX

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

EMERSON
Process Management

TITLE
DIMENSIONAL
2350A PANEL MOUNT UNIT
RETROFIT

DRN RD	DATE 1-10-02	DWG NO. DE-20781	REV B
CHKD EM	DATE 1-10-02		
APPD DLT	DATE 2-19-02	SCALE NTS / P/N SEE ORDER	SHT 1 OF 1



NOTES:

1. IF DANIEL STREAM SWITCH BOX IS NOT USED, AN EXTERNAL CUSTOMER SUPPLIED VOLTAGE MAY BE APPLIED BETWEEN J7-1(+) AND J7-3(-) FOR VOLTAGES >12V BUT LESS THAN OR EQUAL TO 24V. THIS VOLTAGE IS THEN AVAILABLE ON EVEN PINS OF J16 & J17. OTHERWISE, +12VDC IN ON THE EVEN PINS OF J16 & J17
2. THE DISCRETE INPUTS ON J9 ARE FACTORY WIRED AS NON-ISOLATED INPUTS BY JUMPERING (J7-2 TO J7-5 AND J7-4 TO J7-6). IF ISOLATED INPUTS ARE REQUIRED, REMOVE THE JUMPERS FROM J7 AND CONNECT AN ISOLATED POWER SUPPLY TO J7-5 AND J7-6.
3. THE NON ISOLATED 4-20 MA OUTPUTS HAVE A COMPLIANCE VOLTAGE OF ≥10 VOLTS. THIS IS SUFFICIENT FOR ONE 250 Ω LOAD ALLOWING 5 VOLTS DROP ACROSS THE WIRING. FOR ADDITIONAL COMPLIANCE VOLTAGE RANGE OR FOR MULTIPLE 250 Ω LOADS (3), AN EXTERNAL 24VDC SUPPLY SHOULD BE CONNECTED BETWEEN J13-13(+) AND J13-14(-).
4. THERE ARE 4 ANALOG VOLTAGE INPUTS (1-5VDC). FOR 4-20 MA, A 250 OHM RESISTOR (SUPPLIED) IS INSERTED IN SOCKETS BETWEEN POSITIVE (+) AND MINUS (-) TERMINALS ON J12. SHIELDS ON CABLES INSIDE CONDUIT SHOULD BE CONNECTED AT THE SOURCE END; FAILING THAT, CONNECT THE SHIELDS ON THE 2350 END ON THE SUPPLIED TERMINALS. CABLES NOT IN CONDUIT MAY REQUIRE SHIELDS TO BE CONNECTED AT BOTH ENDS TO REDUCE MAGNETIC FIELD INTERFERENCE.
5. TB4 IS LOCATED BEHIND THE VALVE DRIVER BOARD IN THE LOWER ELEC. HOUSING OF THE 500 SERIES ANALYZER OR OR UPPER ELEC. HOUSING OF THE 1000 SERIES.
6. TO ISOLATE DIGITAL WIRING FROM ANALOG WIRING, WIRING TO CONNECTORS J10, J11, AND J18-J20 IS FROM THE LEFT AND WIRING TO CONNECTORS J5-J9, J12-J14, J16 & J17 IS FROM THE RIGHT.
7. OPTIONAL
8. INTERNAL CONNECTIONS, DO NOT USE AS EXTERNAL TIE-POINTS.
9. COMM 8 IS USED FOR THE DISPLAY/KEYBOARD WHEN UNIT HAS COMM 5-8 OPTION (COMM4A BOARD). HOWEVER WHEN THE UNIT HAS A DISPLAY/KEYBOARD, BUT DOES NOT HAVE THE COMM 8 OPTION, COMM 4 MUST BE RS-232, AND IS USED FOR THE DISPLAY/KEYBOARD. THEREFORE THERE IS NO COMM 4 OUTPUT ON THE FIELD TERMINAL BOARD.

COMMUNICATION CONNECTIONS

J5, J6, J10, J11

COMM 1, 2, 3, & 4 (9.)

PIN	RS-232	RS-485	RS-422
1	DCD	N/C	N/C
2	TX DATA →	RX/TX-	TX-
3	RX 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

P22, P23, & P24

COMM 5, 6, & 7

PIN	RS-232	RS-485	RS-422
1	N/C	N/C	N/C
2	TX DATA →	RX/TX-	TX-
3	RX DATA ←	RX/TX+	TX+
4	DSR ←	N/C	RX+
5	GND	GND	GND
6	DTR →	N/C	N/C
7	CTS ←	N/C	N/C
8	RTS →	N/C	RX-
9	RI ←	N/C	N/C

SI METRIC

THIRD ANGLE PROJECTION

MATERIAL N/A

FINISH N/A

PROJ. FILE NO. - NONE

REV	DATE	DRN	DESCRIPTION	CHKD	APPD
B	5-6-04	HM	ECO XX-204364	EM	GP
A	4-2-02	RD	ERO-YY-10078	EM	DLT

FILENAME: DE20782B1.DWG, DATE: 05-06-04, TIME: 1:21 P.M.

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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: FIELD WIRING 2350A TERMINAL BOARD

DRN DLT DATE 1-7-02

CHKD EM DATE 3-29-02

APPD DLT DATE 4-2-02

DWG NO. DE-20782 REV B

SCALE NTS P/N SEE ORDER SHT 1 OF 1

WARRANTY CLAIM PROCEDURES

To make a warranty claim, you, the Purchaser, must:

1. Provide Rosemount Customer Care with proof of the Date of Purchase and proof of the Date of Shipment of the product in question.
2. Return the product to Rosemount Customer Care within 12 months of the date of original shipment of the product, or within 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 Rosemount Customer Care office, sales office, or service center, do one of the following:

   - Call {866) 422 3683
   - Fax a request to (713) 466 8175
   - Write to:
   - Rosemount
     10241 West Little York, Suite 200
     Houston, TX 77040 USA
   - Contact **gc.csc@emerson.com**
4. When contacting Rosemount Customer Care 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 Rosemount Customer Care customs broker can handle the importation with the U.S. Customs Service.
6. Rosemount Customer Care offers both on call and contract maintenance service designed to afford single source responsibility for all its products.
7. Rosemount Customer Care 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 CARE:

Rosemount
10241 West Little York, Suite 200
Houston, TX 77040 USA
Toll Free 866 422 3683
T +1 713 396 8880 (North America)
T +1 713 396 8759 (Latin America)
F +1 713 466 8175
gc.csc@emerson.com

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