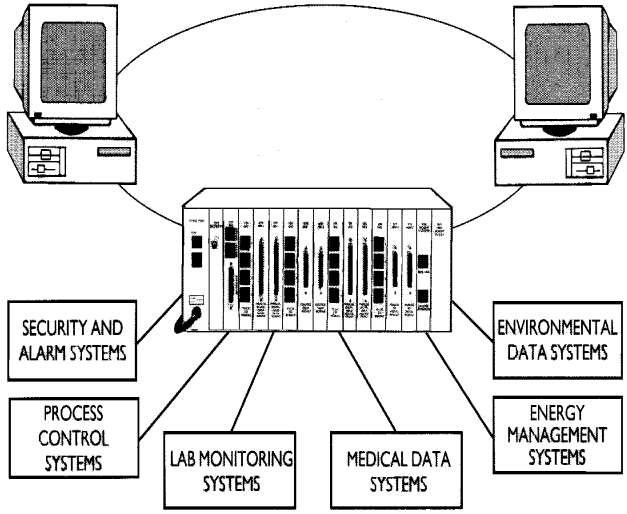
OWNER'S MANUAL

BAYTECH
M SERIES DAC

including

M3,M4,M6,M9,M16	**BASE UNITS**
V71,V72TP,V93A	**HOST MODULES**
V74/V75/V87	**4-PORT SERIAL MODULES**
V77/V78/V79/V80/V90	**PERIPHERAL DAC MODULES**
V82,M03	**ANCILLARY MODULES**



BayTech Manual Publication #U140E111-03
March 1999

Telplex, LaserShare, Print Master and TRAN-X are registered trademarks of Bay Technical Associates, Inc.

IBM, IBM PC, IBM PC/AT, IBM PC/XT are products and registered trademarks of International Business Machines CorpoHewlett-Packard LaserJet is a product and registered trademark of the Hewlett-Packard Company.

All products or company names are trademarks of their respective holders.

ABOUT THIS OWNER'S MANUAL

This document provides information required for installing and operating your Bay Tech equipment. It should allow the user to connect, power up, and access an applications menu where peripheral equipment can be controlled. We recommend reading this manual carefully, while placing special emphasis on correct cabling and configuration. If you have any problems with your installation, please contact a BayTech Applications Engineer at **228-467-8231**, call toll free from anywhere in the United States using
1-800-523-2702 or contact us at our Web Site, www.baytechdcd.com.

BayTech manufactures many remote site management products, data switches, data collection multiplexers, remote power controllers, and peripheral print sharers. If you would like information on any of these products, please contact BayTech Customer Service at the numbers previously listed.

Conventions used in this manual include:

> **CAUTION:** This term is used to denote any condition that could possibly result in physical harm to personnel or damage to equipment.
>
> **IMPORTANT:** This term is used to denote conditions that could result in the loss of communications or to highlight the proper functioning of equipment.
>
> **NOTE:** This term is used to denote items of interest to the user.
>
> **<cr>:** Carriage Return or ENTER

The information in this document is subject to change without notice. The statements, configurations, technical data, and recommendations in this document are believed to be accurate and reliable, but are presented without express or implied warranty. Users must take full responsibility for their applications of any products specified in this document. The information in this document is proprietary to Bay Technical Associates, Inc.

In the interest of improving internal design, operational function, and/or reliability, Bay Technical Associates, Inc reserves the right to make changes to the products described in this document without notice.

Bay Technical Associates, Inc does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

This manual replaces BayTech Publication U140E111-02 and includes information from the following Bay Tech publications:

U140E100-02	V71 Host Communications Module
U140A123-01	V72TP Ethernet Host Communications Module
U140E101-05	V74, V75, and V87 4 Port Serial I/O Modules
U140E103	V77 ADM-1 Module
U140E104	V78 CRM-1 Module
U140E105	V79 PDI-1 and V80 PDI-2 Modules
U140E116-02	V93A Host Communications Module
Z140A181-02	V82 PCM-1 Module

We welcome any comments you may have about our products, and we hope that you will continue to look to BayTech for your data communication needs.

INTRODUCTION TO THE M SERIES DAC

The BayTech M Series Data Acquisition and Control (DAC) models are versatile multifunction units used in data collection and process control. Typical applications include security alarm monitoring, HVAC systems, medical data systems control, manufacturing, and environmental data control. An M Series system consists of a base unit, host communication module(s), and various I/O modules.

The base unit is comprised of 3, 4, 6, 9, or 16 card slots, activity LEDs, service port, time-of-day clock (optional), power supply, and an internal high speed data bus. The service port and optional service modem allow menu-driven configuration of the main unit and installed modules from a local or remote terminal.

The host communication modules are the primary user interface to the M-Series DAC system. These modules allow the user to connect to the main unit or I/O modules and change configuration, send and receive data, and issue data commands. The host modules include:

		Introduction	Configuration	Operation
(V71)	Host Module	page 2	page 47	page 107
(V72TP)	Host Module	page 2	page 51	page 109
(V93A)	Host Module	page 2	page 98	page 177

IMPORTANT: *The first module slot of any unit equipped with LCD and front panel controls must be occupied by a host module.*

The I/O modules are used to interface directly to various peripheral devices such as security/alarm systems, process control systems, medical data systems, and environmental control systems. The I/O module types include:

		Introduction	Configuration	Operation
(V74)	A 4 EIA-232 serial I/O port module	page 3	page 57	page 132
(V75)	A 4 EIA-232/422 I/O port module	page 3	page 57	page 132
(V87)	A 4 EIA-485/422 I/O port module	page 3	page 57	page 132
(V77)	An 8 or 16 channel 12 bit A/D convertor	page 3	page 64	page 142
(V78)	An 8 channel control relay	page 4	page 80	page 150

(V79/V80)	A 16 channel switch or optically isolated inputs	page 5	page 90	page 157
(V82)	A Programmable Control module	page 5	-----	page 166
(M03)	A 16 MB memory module	page 5	-----	-----

THE V71 Host Communication Module is a user interface to the BayTech M Series Data Acquisition and Control (DAC) units. This module allows a connected host terminal to issue specific configuration or data commands to the various I/O modules or the M Series unit main board. Multiple V71 modules can be installed in an M Series chassis allowing certain I/O module types to send data to specific V71 modules. The V71 module allows for multiple line interface types including EIA-232, EIA-422, and current loop and supports serial speeds up to 115.2K bps. Other programmable features in addition to the serial interface and baud rate include word size, stop bits, parity, XON/XOFF handshaking, and the port select code. In addition, the V71 module allows for RJ-45 or DB-25 cabling.

THE V72TP host communications modules are a user interface for use with the BayTech M-Series Data Acquisition and Control (DAC) units. The V72TP allows network users, operating on a device using a TCP/IP stack with an Ethernet connection, to access various DAC peripheral modules. The V72TP host communications module has an Ethernet interface which provides access and control of M-Series DAC peripheral modules via TELNET session or through user software using a direct socket connection.

The V72TP is capable of concurrently supporting one connection per installed port. For example, an M16 with a V72TP and fifteen V74 4-port serial I/O modules can be operated with a separate connection to each port for a total of 60 simultaneous sessions. The V72TP supports Ethernet II and Ethernet SNAP frame types automatically, eliminating concern about DLC compatibility.

V93A The V93A Host Communication Modem Module is the remote user interface to the BayTech M Series DAC units. This module features a V.32bis/V.42bis internal modem and allows a remote host terminal to connect and issue specific configuration or data commands to the various I/O modules or the M Series DAC unit main board. Multiple V93A modules can be installed in a M Series chassis allowing I/O modules to send data to specific V93A modules.

> **IMPORTANT:** You should determine what types of peripheral modules you have installed in your M-Series DAC unit in addition to the host module. You should familiarize yourself with the various operation modes of the installed peripheral modules.

THE V74, V75, and V87 I/O modules are installed in a BayTech M Series DAC and are used in conjunction with a host module. The V74 has four EIA-232 serial ports, the V75 has four selectable EIA-232/EIA-422 serial ports, and the V87 has four selectable EIA-422/EIA-485 serial ports.

These modules allow a host computer system connected to the host module to individually select up to four peripheral devices (e.g., bar code readers, security systems, digital instruments, etc.) and send data to, or receive data from the selected device. The V74/V75/V87 modules will simultaneously multiplex incoming data from the peripheral devices to be transmitted to the host system. The method of data transmission from the peripheral devices to the host system is dependent upon the mode of operation. Each 4-port serial module features three user-selectable modes of operation. The three modes of operation are:

Full Duplex Communication - Allows the host module to switch between four peripheral devices and provides bidirectional data transfer between the host module and the selected peripheral device. Data received from non-selected peripheral devices is stored in a buffer until the port is selected by the host system.

Immediate Reporting Method - Provides automatic message multiplexing from all peripheral devices. Data is buffered until a terminating character is received or 256 characters are received. Messages are then sent to the host computer preceded by a port identification code.

Command Reporting Method- Reports a single message, all messages, or all buffered data from specific peripheral devices upon request from the host computer. The V74/V75/V87 may be placed into "broadcast" mode where any data received by a host module will be sent out all four ports of the selected module(s) simultaneously.

In addition to the modes of operation, you may select the serial port configuration and logical name for each port, the designated host module location, and the message terminate character. These parameters are programmed by entering configuration mode from the host module or service port. Changes are saved permanently in non-volatile memory.

THE V77 ADM-1 programmable analog-to-digital input board, is a plug-in module designed for use with the BayTech M Series DAC Data Acquisition Controllers. The primary feature of the ADM-1 is a 12 bit, successive approximation, analog-to-digital converter which provides conversion of data with high accuracy and resolution at moderate throughput rates.

The ADM-1 can be operated as either eight differential or 16 single-ended inputs. Signal input connections to the ADM-1 are made through a standard DB-25 female connector. Data resolution is 12 bits using unipolar (0 to +X volts) operation or 11 bits plus sign in the bipolar (-X to +X volts) mode. A total of eight software selectable and one hardware (jumper) selectable, unipolar/bipolar input voltage ranges

are available. Three point (25%, 50% 75%) self-calibration is provided in software to reduce or remove errors introduced by input offsets.

Sample rates up to 4000 S/sec and data averaging from 1 to 4000 samples are selectable through configuration options. Data averaging can be expanded to include larger sample sets through the use of BayTech, or commercially available, application software. Time stamping or "Time Tagging" of data is available through the use of a "time-of-day" clock located in the base unit. A time tag includes month, day, year, hour, minute and second.

Data samples are supplied to the host computer/controller from any of the following modes:

1. Upon user request (COMMAND).
2. At a specific date and/or time (SCHEDULE).
3. Real time sampling (i.e., as samples are received or IMMEDIATE).

THE V78 CRM-1 eight channel, control relay module is a microprocessor controlled plug-in unit designed for use with the BayTech M16 Data Acquisition Controllers. The main feature of the CRM-1 is eight (8) fully programmable, electromechanical, form-C, single-pole-double-throw (SPDT) relays. Each relay has a set of normally open (NO) and a set of normally closed (NC) contacts.

All relays on the V78 CRM-1 are programmable to change state by sending data commands or via time schedule by a host computer/controller. The status of a relay (energized or de-energized) may be requested by a host computer/controller. The relay status may consist of buffered data representing the history of changes in the state of a specific relay or the current state of a specific relay. The relay status may be provided with a "time stamp or "Time Tag" which is available through the use of a "time-of-day" clock located in the base unit. A time tag includes the month, day, year, hour, minute and second the relay status was taken.

Relay status data is supplied to the host computer/controller in one of the following modes:

1) Upon user request (COMMAND).
2) At a specific date and time (SCHEDULE).
3) Real time reporting of events (IMMEDIATE).

NOTE: An *event* is the change-in-state of a relay (i.e., energized to de-energized or vice versa).

Signal input connections to the CRM-1 are made through a standard DB-25F (25 pin female) connector.

THE V79/V80 PDI modules are designed for use with the M16 (DAC) Data Acquisition Controller. Both modules are used to detect *events* where an event is defined as a change-in-state of an input and return to the original state. The V79 PDI-1 module is used for the detection of switch closure in applications requiring notification of device status such as burglar alarms, fire alarms, event counters and timers, process control, etc.. The V80 PDI-2 is used for the detection of optically isolated voltage inputs in applications requiring industrial control of motors, process monitoring, limit switch status, and the monitoring of relay status.

All events detected by either module are recorded as an *event sample* and sent to a host computer/controller connected to a host module. The current status of input channels may be provided to the host computer/controller upon request. Event samples or input channel status may be provided with a "time stamp" or "Time Tag" which is available through the use of a "time-of-day" clock located in the base unit. A time tag includes the month, day, year, hour, minute and second the event occurred or the input channel status was taken.

Event status is supplied to the host computer/controller in one of the following modes:

1) Upon user request (COMMAND).
2) At a specific date/time (SCHEDULE).
3) Real time reporting of events (i.e., as events occur IMMEDIATE).

THE V82 Programmable Control Module (PCM-1) is used to monitor, control, and report information about devices connected to the M-Series peripheral modules. The M-Series peripheral modules are used to interface directly to various devices such as security/alarm systems, process control systems, medical data systems, and environmental control systems.

Bay Tech provides C library functions specific to the various peripheral modules. These functions allow you to write C programs to perform data acquisition and control applications such as process control, remote control and monitoring and data gathering.

Programming the V82 PCM-1 is accomplished by writing a C-based source program, compiling and linking this program for use on the 64180 microprocessor, and downloading the corresponding HEX file to the flash EPROM. The C library functions provided are specific for the 2500AD software, Inc. 64180 C compiler.

THE M03 memory module can hold from 1MB to 16MB total buffer size. It is used to expand the memory capabilities of the various module buffers.

QUICK START

CABLING

BASE UNIT CABLING

SERVICE PORT/SERVICE MODEM CABLING

If you have a unit equipped with a service modem, the cable required to connect the telephone interface to the modem port is a standard 4-pin modular straight-through cable.

> **CAUTION:** Use caution when installing or modifying telephone lines. Never install telephone wiring during a lightning storm. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

The service port has an RJ-45 modular connector. Most serial computers and terminals do not have modular connectors. Therefore, adapters are required to convert from DB-25 or DE-9 connectors to modular connectors. The service port uses the following communication signals:

SERVICE PORT 8-PIN MODULAR EIA-232 PIN/SIGNAL DEFINITION

PIN	SIGNAL	DIRECTION	DESCRIPTION
1	DTR	Output	Data Terminal Ready. Enable/disable receiving characters
2	GND	--------	Signal Ground
3	RTS	Output	Request To Send. +12 Volts when unit is powered on.
4	TX	Output	Transmit Data
5	RX	Input	Receive Data
6	DSR	Input	Data Set Ready. Not used as a handshake line.
7	DCD	Output	Data Carrier Detect. +12 Volts when unit is powered on.
8	CTS	Input	Clear To Send. Enable/disable transmitting characters

An adapter is required to connect an IBM PC to the service port. The 9FRJ45PC-3 and 25FRJ45PC-3 adapters are used for this connection. The pinout for these adapters is displayed in Appendix D.

V71 CABLING

The V71 has a DB-25 and two RJ-45 connectors for interface to the host terminal. The V71 supports three line interfaces: EIA-232, EIA-422, and current loop. The factory default setting provides EIA-232 line interface on the DB-25 port and the EIA-232 RJ-45 port. The line interface is programmed by entering the V71 configuration mode (see page 47).

If you change the line interface to EIA-422 in configuration mode, the default hardware settings provide EIA-422 line interface on the EIA-422/485 RJ-45 port. You can change a hardware jumper setting on the module that provides EIA-422 line interface on the DB-25 port. This procedure is discussed on page ???

Current loop line interface is provided on the DB-25 port only.

> **IMPORTANT**: Before you proceed with cabling your equipment to the V71, you should determine the required line interface for your application and verify the connector type and pin/signal definitions for your equipment.

V71 DB-25 CABLING FOR EIA-232

The DB-25 port on the V71 has a male DTE type connector and uses the following pins and signals for communication:

DB-25 PIN/SIGNAL DEFINITION FOR EIA-232 LINE INFORMATION			
Pin #	EIA-232 Signal	Direction	Description
1	PGND	----	Protective Ground
2	TX	Output	Transmit Data (data out)
3	RX	Input	Receive Data (data in)
4	RTS	Output	+ 12 volts when the M16/M8 DAC is powered up.
5	CTS	Input	Handshake In, enable/disable the transmission of characters
7	SGND	----	Signal Ground
20	DTR	Output	Handshake Out, enable/disable the receiving of characters

If you are interfacing a DCE device such as a modem to the V71 DB-25 port, you must use a straight cable as shown in Appendix D. If you are interfacing a DTE device such as a terminal to the V71 DB-25 port, you must use a crossed or null modem cable as shown in Appendix D.

V71 RJ-45 CABLING FOR EIA-232

The V71 provides EIA-232 line interface on the *EIA-232* RJ-45 modular port. Most serial computers, modems, and printers do not have RJ-45 modular connectors. Adapters are required to convert from DB-25 or DE-9 connectors to modular connectors. BayTech has a complete line of RJ-45 adapters and cables that make your installation quick and trouble free. There are drawings, in Appendix D, of an RJ-45 receptacle and plug where pin number assignments are given.

The V71 EIA-232 modular port uses the following signals:

EIA-232 RJ-45 PIN/SIGNAL DEFINITION			
Pin	EIA-232 Signal	Direction	Description
1	DTR	Output	Handshake Out, enable/disable the receiving of characters
2	GND	----	Signal Ground
3	RTS	Output	+12V when powered is applied, not used as a handshake line
4	TX	Output	Transmit Data (data out)
5	RX	Input	Receive Data (data in)
6	N/A	----	Not Used
7	GND	----	Signal Ground
8	CTS	Input	Handshake In, enable/disable the transmission of characters

COMPUTER INTERFACE, MODEM INTERFACE

An adapter is required to connect an IBM PC to the V71 serial port. The 9FRJ45PC-1 and 25FRJ45PC-1 adapters are used for this connection. The 25MRJ45MD-1 adapter is used to connect to an external modem. The pinout for these adapters is displayed in Appendix D.

> **IMPORTANT:** When modular connectors are used, crossed RJ-45 cables are required.

V71 EIA-422 LINE INTERFACE

NOTE: When using EIA-422 line interface, you must access configuration mode and reconfigure the line interface to EIA-422.

V71 RJ-45 CABLING FOR EIA-422

The V71 RJ-45 port uses the following signals for EIA-422 communication:

RJ-45 PIN/SIGNAL DEFINITION FOR EIA-422 LINE INTERFACE			
Pin	EIA-422 Signal	Direction	Description
1	HSO	Output	Handshake Out, enable/disable the receiving of characters
2	GND	----	Signal Ground
3	TX+	Output	Transmit Data (+)
4	TX-	Output	Transmit Data (-)
5	RX-	Input	Receive Data (-)
6	RX+	Input	Receive Data (+)
7	GND	----	Signal Ground
8	HSI	Input	Handshake In, enable/disable the transmission of characters

You can use either RJ-45 (8-wire) or RJ-11 (4-wire) cabling when connecting the host computer or terminal to the V71 using EIA-422 line interface. The required cable should have TX+ connected to RX+ (and vice versa), TX- connected to RX- (and vice versa), HSO connected to HSI (and vice versa), and have the signal grounds connected.

V71 (EIA-422, 8-wire) RJ-45	Equipment Connections
1 HSO	HSI
2 GND	GND
3 TX+	RX+
4 TX-	RX-
5 RX-	TX-
6 RX+	TX+
7 GND	GND
8 HIS	HSO

V71 RJ-45 (8-wire) Connection for EIA-422 Line Interface

NOTE: If you wish to use RJ-11 (4-wire) cabling, connect pins 3 through 6 on the RJ-45 connector as shown above. In addition, you should enable XON/XOFF handshaking as described on page 49.

V71 DB-25 CABLING FOR EIA-422

IMPORTANT: If you intend to use EIA-422 line interface utilizing the DB-25 connector on the V71, you must change the jumper setting on the V71 board as described below.

The V71 supports EIA-232, EIA-422, and current loop line interface. Line interface is programmed by accessing the configuration mode. From the factory, the DB-25 port and the EIA-232 RJ-45 port are the communication ports when EIA-232 line interface is selected. The DB-25 port is the communication port if current loop line interface is selected. The EIA-422/485 RJ-45 port is the communication port when EIA-422 line interface is selected. You can change the DB-25 port to support EIA-422 line interface by changing a jumper setting on the V71 board. If you wish to change the jumper setting to allow the DB-25 port to support EIA-422 line interface, use the following procedure:

If the V71 is installed in the M Series chassis, remove power from the unit by positioning the on/off switch to the off position and removing the power cord from the AC outlet. Unscrew the two straight slot screws securing the V71 to the back panel and pull the module out.

Refer to the drawing below to locate jumper JP4. The board is marked 232 for EIA-232 line interface and 422 for EIA-422 line interface. JP4 has six pins and a dual shunt jumper. The center two pins are common pins. To change the existing jumper setting to support the desired line interface, position the dual shunt jumper so that it connects the two common pins and the two 232 pins or the two 422 pins.

The V71 DB-25 port uses the following signals when configured for EIA-422 communication:

DB-25 PIN/SIGNAL DEFINITION FOR EIA-422 LINE INTERFACE			
Pin #	EIA-422 Signal	Direction	Description
1	PGND	----	Protective Ground
2	TX-	Output	Transmit Data (-)
3	RX-	Input	Receive Data (-)
5	HSI	Input	Handshake In, enable/disable the transmission of characters

7	SGND	----	Signal Ground
14	TX+	Output	Transmit Data (+)
16	RX+	Input	Receive Data (+)
20	HSO	Output	Handshake Out, enable/disable the receiving of characters

The required cable should have TX+ connected to RX+ (and vice versa), TX- connected to RX- (and vice versa), HSO connected to HSI (and vice versa), and have the signal grounds connected as shown below.

V71 (EIA-422) DB-25	Equipment Connections
1 GND	GND
2 TX-	RX-
3 RX-	TX-
5 HSI	HSO
7 GND	GND
14 TX+	RX+
16 RX+	TX+
20 HSO	HSI

NOTE: If you wish to use RJ-11 (4-wire) cabling, connect pins 3 through 6 on the RJ-45 connector as shown above. In addition, you should enable XON/XOFF handshaking as described on page 49.

V71 CURRENT LOOP LINE INTERFACE

IMPORTANT: If you intend to use current loop line interface, you must use the DB-25 connector on the V71 and reconfigure the line interface to current loop as described on page 49

Current loop line interface provides active transmit and active or passive receive signals. The V71 RJ-45 port uses the following signals for current loop line interface with active transmit and passive receive:

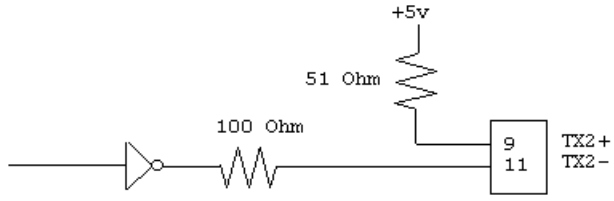
DB-25 PIN/SIGNAL DEFINITION FOR CURRENT LOOP (ACTIVE TX PASSIVE RX)			
Pin#	Current Loop Signal	Direction	Description
9	TX+	Output	Transmit Data (+)

11	TX-	Output	Transmit Data (-)
18	RX+	Input	Receive Data (+)
25	RX-	Input	Receive Data (-)

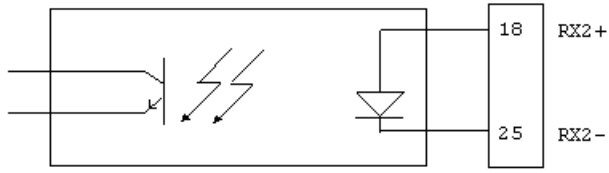
The V71 RJ-45 port uses the following signals for current loop line interface with active transmit and active receive:

DB-25 PIN/SIGNAL DEFINITION FOR CURRENT LOOP (ACTIVE TX ACTIVE RX)			
Pin#	Current Loop Signal	Direction	Description
7	GND	----	Ground
9	TX+	Output	Transmit Data (+)
11	TX-	Output	Transmit Data (-)
18	RX-	Input	Receive Data (-)
19	RX+	Input	Receive Data (+)
25	GND	----	Ground

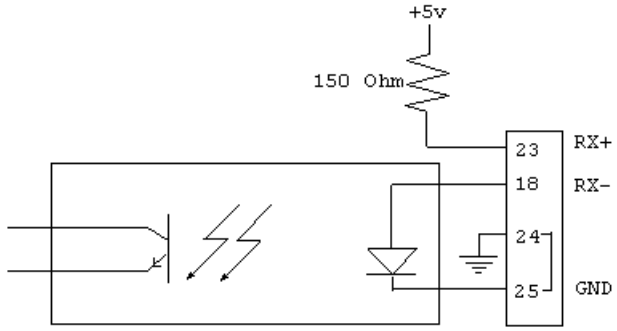
The figures below show the basic active transmit circuit, the basic passive receive circuit, and the basic active receive circuit.



Basic Active Transmit Circuit



Passive Receive Circuit



Active Receive Circuit

The figure below shows the recommended cable to connect the host computer to the V71 with active transmit and passive receive.

V71 (Current Loop) DB-25	Equipment Connections
9 TX+	RX+
11 TX-	RX-
18 RX+	TX+
25 RX-	TX-

Recommended Cabling Using Current Loop Line Interface (Active Transmit Passive Receive)

The next figure shows the recommended cable to connect the host computer to the V71 with active transmit and active receive.

V71 (Current Loop) DB-25	Equipment Connections

9 TX+	RX+
11 TX-	RX-
18 RX-	TX-
19 RX+	TX+
7	GND
25	GND

Recommended Cabling Using Current
Loop Line Interface (Active Transmit Active Receive)

NOTE: The preceding figures show the transmit and receive connections in pairs. Each pair should be connected with twisted-pair cabling.

V72TP

10BASE-T (MODULAR) CONNECTION

If your network uses 10BASE-T RJ-45 connectors, connect an RJ-45 cable between the RJ-45 port and the network hub. The modular port is defined as DTE (i.e., Pin 1 is TD+, Pin 2 is TD-, Pin 3 is RD+, and Pin 6 is RD-). Most RJ-45 network hubs will require a straight cable type. The LINK (link integrity) LED on the back panel and at the connected port on the hub will illuminate if there is a good connection between the V72/V72TP and the hub.

V74/V75/V87 CABLING

Ports on the V74 & V75 modules use the following pins and signals for communication:

V74 & V75 PINOUT INFORMATION					
PIN	SERIAL INTERFACE		DIRECTION	DESCRIPTION	
	RS-232 V74/75	RS-422 V75			
1	DTR	HSO or +12V	Output	232 - Data Terminal Ready 422 - Handshake Out or +12V	Used to enable or disable the receiving of characters

2	GND/ DCD OUT	GND	--- / Output	Signal Ground(Default) or User selectable DCD "OUT"	
3	RTS	TX+	Output	232 - +12V Out 422 - Transmit Data (+)	
4	TX	TX-	Output	232 - Transmit Data 422 - Transmit Data (-)	
5	RX	RX-	Input	232 - Receive Data 422 - Receive Data (-)	
6	DSR	RX+	--- / Input	232 - Handshake In 422 - Receive Data (+)	
7	GND/ DCD IN	GND	--- / Input	Signal Ground(Default) or User selectable DCD "IN"	
8	CTS	HSI	Input	232 - Clear To Send 422 - Handshake In	Used to enable or disable the transmitting of characters

IMPORTANT: Before you proceed with cabling your equipment to this module, you should verify the connector type and the pin/signal definitions for your equipment.

Ports on the V74, V75, and V87 modules have 8-pin modular connectors. Most serial computers, modems, and printers do not have modular connectors. Therefore, adapters are required to convert from either DB-25 or DE-9 connectors to modular connectors. BayTech has a complete line of modular adapters and cables that makes your installation quick and trouble free.

CAUTION: Do not use 4-wire modular cabling with the V74 & V 75 modules.

V74 & V75 DCD STATUS SELECTION

Each EIA-232 port can be configured so DCD can be an input or output signal by positioning jumpers on the main board of the module for each individual port. See V74 & V75 Jumper selection layout(Figures 29 & 30 or V75 Mechanical Layout Section D.2).

A. GROUND---Pins 2 & 7 of each port are signal ground in the default setting. This default setting is used in most data acquisition and control applications. Locate the

eight jumper locations for DCD status selection. Jumpers (JP5,JP7,JP9, & JP11) are used to configure DCD as an output for pin 2 for each port of the module. Jumpers (JP6,JP8,JP10, & JP12) are used to configure DCD as an input for pin 7 for each port of the module. Each port is configured from the factory with pins 2 and 7 as ground.

1. V75 (See Figure 29)--- Each port's jumper position for "ground" connects the center pin and the pin located closest to the RJ-45 connector.
2. V74 (See Figure 30)--- Each port's jumper position for"ground" connects the center pin and the pin located on the right with the RJ-45 connectors facing you. In both V74 and V75 applications use BayTech adapter, part number 25FRJ45PC-1 or 9FRJ45PC-1.

B. DCD "IN"---The DCD "IN" jumper selection is selected in applications where the individual port of the V74 or V75 will be communicating with a modem. To change the EIA-232 pin/signal definition for a V74 or V75 port to have pin 7 configured for DCD "IN" you must change the location JP6 for port 4, JP8 for port 3, JP10 for port 2, or JP12 for port 1.

1. V75 (See Figure 29)---Install the two position jumper so that it connects the center pin and the pin farthest away from the RJ-45 port. Do not move the other jumpers.
2. V74 (See Figure 30)---Install the two position jumper so that it connects the center pin and the pin located on the left of the common pin with the RJ-45 port facing you. Do not move the other jumpers. In these two applications use BayTech adapter, part number 25FRJ45MD-4.

C. DCD "OUT"---The DCD "OUT" jumper selection is used in applications where an individual port of the V75 will look like a modem connection if a computer or terminal is connected to the port. Some terminals and popular communications software packages require that DCD is "high" for a connection to be completed. To change the EIA-232 pin/signal definition for a V74 or V75 port to have pin 2 configured for DCD "OUT" you must change the location of JP5 for port 4, JP7 for port 3, JP9 for port 2, or JP11 for port 1.

1. V75 (See Figure 29)---Install the two position jumper so that it connects the center pin and the pin farthest away from the RJ-45 port. Do not move the other jumpers.
2. V74 (See Figure 30)---Install the two position jumper so that it connects the center pin and the center pin and the pin located on the left of the common pin with the RJ-45 connectors facing you. Do not move the other jumpers. In this application use BayTech adapter, part number 25FRJ45PC-3 or 9FRJ45PC-3.

> **IMPORTANT**: If the module is installed in the base unit chassis, remove power from the unit by positioning the On/Off switch to "0" (off) and unplugging the power cord from the AC outlet. Remove the module by

unscrewing the two screws securing it to the back panel and pulling the module out.

14.1.2 DCD STATUS SELECTION CHART--EIA-232 MODE ONLY (see the charts below for jumper settings)

A. DCD "GROUND" is the default setting where DCD is not used by either end of the connection(modems are not used). See figures 29 & 30 for jumper locations.

PORT #	JP POSITIONS
PORT #1	11 GROUND 12 GROUND
PORT #2	9 GROUND 10 GROUND
PORT #3	7 GROUND 8 GROUND
PORT #4	5 GROUND 6 GROUND

USE ADAPTER: 25FRJ45PC-1 OR 9FRJ45PC-1

B. DCD "OUT" or high for computers or terminals connected to the V74 or V75 that will to be communicating with a modem. See figures 29 & 30 for jumper locations.

PORT #	JP POSITIONS
PORT #1	11 OUT 12 GROUND
PORT #2	9 OUT 10 GROUND
PORT #3	7 OUT 8 GROUND
PORT #4	5 OUT 6 GROUND

USE ADAPTER: 25FRJ45PC-3 OR 9FRJ45PC-3

C. DCD "IN" or low which is necessary when a V74 or V75 port is connected to a modem. See figures 29 & 30 for jumper location.

PORT #	JP POSITIONS
PORT #1	11 GROUND 12 IN
PORT #2	9 GROUND 10 IN
PORT #3	7 GROUND 8 IN
PORT #4	5 GROUND 6 IN

USE ADAPTER: 25FRJ45MD-4

Refer to the line drawings below for DCD "IN", DCD "OUT" or "GROUND" selections and also for EIA-422 or EIA-232 selection.
V75 JUMPERS are given on the drawing below. The RJ-45 connectors face toward the bottom of the page.

Insert v75 jumper drawing

V74 JUMPERS are given on the drawing below. The RJ-45 connectors face toward the bottom of the page.

Insert v74 jumper drawing

14.1.3 V75 SERIAL INTERFACE SELECTION

The desired V75 serial interface is selected by positioning jumpers on the main board of the module for each individual port. The factory default serial interface is EIA-422.

Refer to Figure 29 on previous page and locate the eight jumper locations for serial interface selection. These jumper locations are marked on the mechanical layout as JP13 and JP14 for Port 1, JP15 and JP16 for port 2, JP17 and JP18 for Port 3 and JP19 and JP20 for Port 4.

Each port is configurable for EIA-422 or EIA-232 serial interface by installing two, 4 position jumpers to either the 422 or 232 position as marked on the board. The center row of pins for each port will be occupied by four of the jumper positions and the row of pins for either 422 or 232 will be occupied by the other four positions of these two jumpers.

> **IMPORTANT**: If the V75 module is installed in the base unit chassis, remove power from the unit by positioning the On/Off switch to "O" (off) and unplug the power cord from the AC outlet. Remove the module by unscrewing the two screws securing it to the back panel and pull the module out.

14.1.4 V74 AND V75 CABLE/ADAPTER INFORMATION

Refer to the following modular adapter drawings to interface your computers or terminals to the V74 and the V75 module using EIA-232 serial interface. Use the "...PC-1" adapters in most data acquisition and control applications where the V74 or V75 will not have modem connections. Refer to Figure 31 if your computers/terminals have DB-25 male connectors or to *Figure 32* if your computers/terminals have DE-9 connectors.

Insert drawings for the 25 pin and 9 pin pc1 adapter

Refer to the following modular adapter drawings to interface your computers or terminals to the V74 or V75 module using EIA-232 serial interface. Use the "...PC-3" adapters in applications where a port of the V75 will look like a modem connection when a computer or terminal is connected to the port. Some terminals and popular communications software packages require that DCD is "high" for a connection to be completed. Refer to *Figure 33* if your computers/terminals have DB-25 male connectors or *to Figure 34* if your computers/terminals have DE-9 connectors.

Insert drawings of the 25 and 9 pin PC3 adapters

Refer to the following modular adapter drawing *(Figure 35)* to interface modems to the V74 or V75 module.

Insert the 25 pin

Refer to the modular adapter drawing (*Figure 36*) below to connect an EIA-232 serial printer to the V74 or V75 module.

Insert the 25 pin pr2 adapter

IMPORTANT: When BayTech modular adapters are used as given in *Figures 31-36*, a crossed 8-wire modular cable is required. Do not use 4-wire modular cabling.

Insert the crossed cable drawing

14.1.5 V75 EIA-422 CABLING

The cable required to connect an EIA-422 device to the V75 module using EIA-422 serial interface must have TX+ wired to RX+ (and vice versa), TX- wired to RX- (and vice versa), HSO wired to HSI (and vice versa), and the grounds connected. Please see *Figure 37*.

V75 (EIA-422) RJ-45	Equipment Connections
1 HSO	HSI
2 GND	GND
3 TX+	RX+
4 TX-	RX-
5 RX-	TX-
6 RX+	TX+
7 GND	GND
8 HSI	HSO

Figure 37**: V75 EIA-422 Connection**

NOTE: The *HSO*, *HSI*, and *GND* signals do not need to be connected if you are not using hardware handshake lines.

14.3 V87 CABLING INFORMATION

The V87 module has four ports that are user selectable as EIA-422 or EIA-485 serial interface. Ports on the V87 module use the following pins and signals for communication:

V87 PINOUT INFORMATION				
PIN	SERIAL INTERFACE		DIRECTION	DESCRIPTION
	EIA-422	EIA-485		
1	HSO	HSO	Output	Handshake Out. Used to enable or disable the receiving of characters
2	GND	GND	----	Signal Ground
3	TX+	TX+/RX+	Output Output/Input	422 - Transmit Data (+) 485 - Transmit/Receive Data (+)
4	TX-	TX-/RX-	Output Output/Input	422 - Transmit Data (-) 485 - Transmit/Receive Data (-)
5	RX-	NU	Input/----	232 - Receive Data (-) 485 - Not Used
6	RX+	NU	Input/----	422 - Receive Data (+) 485 - Not Used

7	GND		----	Signal Ground
8	HSI	HSI	Input	Handshake In. Used to enable or disable the transmitting of characters

14.3.1 V87 SERIAL INTERFACE SELECTION

The desired serial interface is selected by positioning jumpers on the main board of the module for each individual port. Please refer to *Section 14.2.3* (V75 EIA-422 Cabling) for cabling information if using EIA-422 serial interface (default). If you wish to change one or more of the ports to operate using a different serial interface, please use the following procedure:

a. IMPORTANT: If the V87 module is installed in the base unit chassis, remove power from the unit by positioning the On/Off switch to "0" (off) and unplugging the power cord from the AC outlet. Remove the module by unscrewing the two straight slot screws securing it to the back panel and pulling the module out.

b. Refer to *Figure 39* on the following page and locate the four six-position jumper locations for serial interface selection. The jumper locations are marked on the assembly drawing for serial interface selection as *JP5* for Port 1, *JP8* for Port 2, *JP11* for Port 3, and *JP14* for Port 4.

c. Each port is configurable for EIA-422 or EIA-485 serial interface by installing a four-position jumper to either the *422* or *485* position as marked on the board. The center row of pins for each port are occupied by two of the jumper positions and the row of pins for either *422* or *485* are occupied by the other two positions of this jumper.

   NOTE: A termination resistor is installed by default. You can remove the termination resistor for each individual port by moving *JP4*, *JP7*, *JP1*, or *JP13* away from the *R/T* position for Ports 1, 2, 3, or 4 respectively.

d. Install the V87 module into the base unit chassis (see *Section 4.5*).

Insert the v87 mechanical drawing

14.3.2 V87 EIA-485 CABLING

The cable required to connect an EIA-485 device to the V87 module using EIA-485 serial interface must have TX+/RX+ wired to the TX+/RX+ line of your equipment, TX-/RX- wired to TX-/RX-, HSO wired to HSI (and vice versa), and the grounds connected. Please see *Figure 40*.

V87 (EIA-485) RJ-45	Equipment Connections
1 HSO	HSI
2 GND	GND
3 TX+/RX+	TX+/RX+
4 TX-/RX-	TX-/RX-
7 GND	GND
8 HIS	HSO

Figure 40**: V87 EIA-422 Connection**

NOTE: The *HSO*, *HSI*, and *GND* signals do not need to be connected if you are not using hardware handshake lines.

RJ-45 CABLES AND ADAPTERS

IMPORTANT: All RPC models have an RJ-45 port for connecting to a local EIA-232 device such as a computer terminal or external modem. Most serial computers do not have RJ-45 connections; therefore, an adapter is provided with this unit to convert from a DE-9 connector to an RJ-45 connector (BayTech Part No. 9FRJ45PC-1). An adapter to convert from a DB-25 connector to an RJ-45 connector is also available from BayTech, upon request (BayTech Part No. 25FRJ45PC-1).

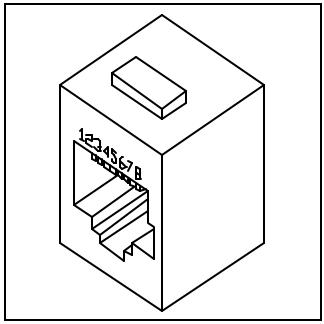


Figure 1: RJ-45 receptacle

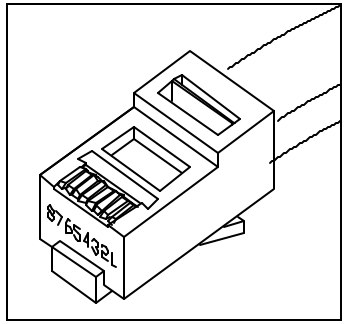


Figure 2: RJ-45 plug

The RPC RJ-45 control port uses the following signals:

EIA-232 RJ-45 PIN/SIGNAL DEFINITION			
Pin	**EIA-232 Signal**	**Direction**	**Description**
1	DTR	Output	+10V when activated by DCD. Toggles on logout for modem disconnect.
2	GND	----	Signal Ground
3	RTS	Output	+10V when powered is applied, not used as a handshake line
4	TX	Output	Transmit Data (data out)
5	RX	Input	Receive Data (data in)
6	N/C	N/C	No Connection
7	GND	-------	Signal Ground
8	DCD	Input	DCD into the RPC/Not used on RPC-2 MD01

Modem Communications: A modem can be connected to the EIA-232 serial port by using a 25MRJ45MD-8 adapter (Figure 6). Several types of modem adapters are available from BayTech. Contact an applications engineer for help in choosing the correct adapter.

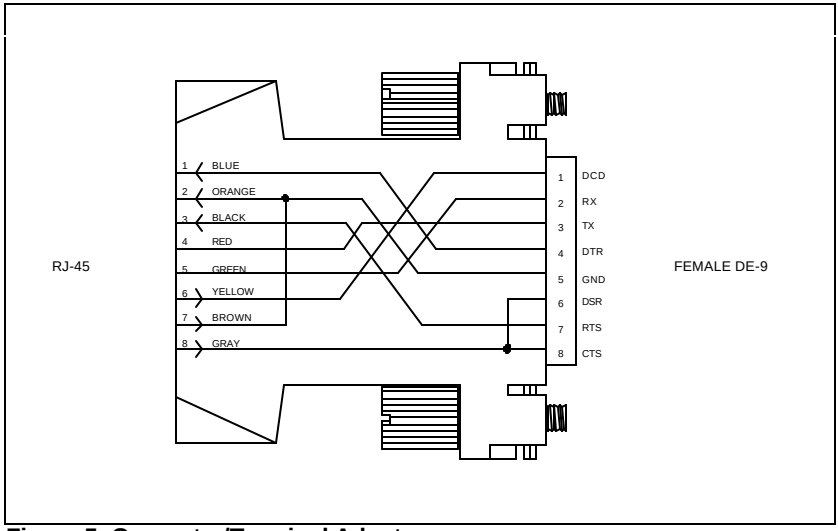


Figure 5: Computer/Terminal Adapter
BayTech Part No. 9FRJ45PC-1
Crossed RJ-45 cable is required

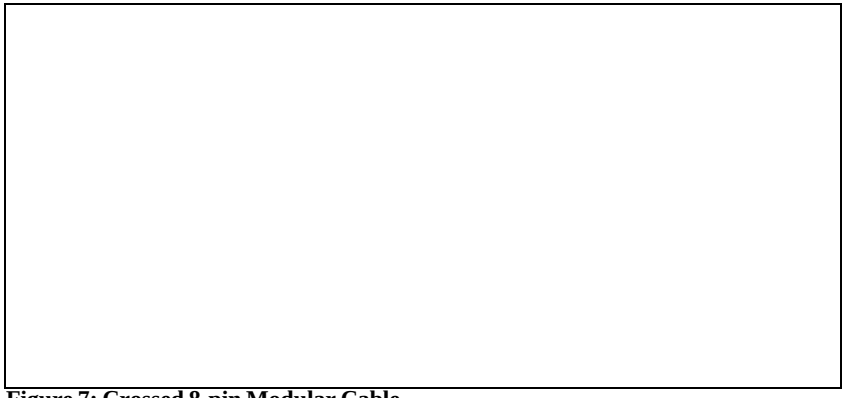


Figure 7: Crossed 8-pin Modular Cable
BayTech Part No. RJ08X007 (7 feet)

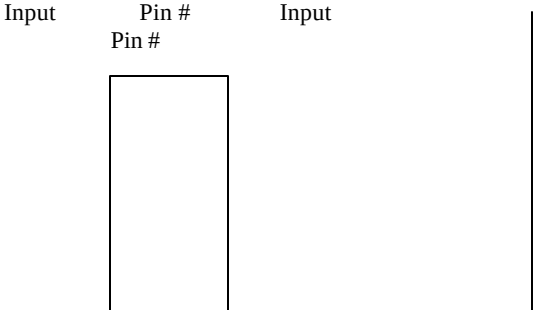
IMPORTANT: Crossed RJ-45 cables are required when modular connectors are used, as shown in Figures 4 – 6, or to interface the RPC to another BayTech product with modular connectors, such as the DS-Series data switch.

V77 Pinout

The V77 ADM-1 is installed in the M Series chassis as described in the installation section of this manual.

> **NOTE**: The V77 ADM-1 cannot be installed as Module 1. If a V77 ADM-1 is removed from a module slot and a different V77 ADM-1 is installed in that location, the newly installed module acquires the previous module's configuration. Moving a V77 ADM-1 to a different module location requires reconfiguration because the configuration parameters are stored as a function of slot location and module type. The configuration information does not stay with a relocated module.
>
> **IMPORTANT**: You must install jumper *JP1* to use ±10V range. First, remove the ADM-1 from the M Series chassis. Next, locate *JP1* in *Appendix B* and install a jumper connector on *JP1*.

Once the ADM-1 has been installed in the M Series chassis, connect a cable with a DB-25 male connector to the input connector, J2. Determine if you will be using single-ended or differential inputs. Singled-ended operation allows up to 16 inputs using grounds of the same potential. Differential operation allows up to 8 inputs using different reference polarities. Configure your input cable as shown below for single-ended operation or for differential operation.



Ground	1	14	Ground	1
	10 & 22			
Ground	2	15	Channel 16	2
	9 & 21			
Channel 8	3	16	Channel 15	3
	8 & 20			
Channel 7	4	17	Channel 14	4
	7 & 19			
Channel 6	5	18	Channel 13	5
	6 & 18			
Channel 5	6	19	Channel 12	6
	5 & 17			
Channel 4	7	20	Channel 11	7
	4 & 16			
Channel 3	8	21	Channel 10	8
	3 & 15			
Channel 2	9	22	Channel 9	
	+	-		
Channel 1	10	23	Ground	
	Polarity			
Ground	11	24	Ground	
Ground	12	25	Ground	
Ground	13			

Single-ended Input Connection Differential Input Connections

IMPORTANT: If you are connecting multiple single-ended devices, it is imperative all the grounds returns are at the same potential or erroneous operation could result. If a channel is not connected to an external circuit, it should be terminated to ground or programmed as inactive (see *Section 5.1.5.4*). This prevents the presentation or reporting of erroneous data from unused inputs.

V78 Pinout

The V78 CRM-1 is installed in the M Series chassis as described in the installation section of this manual.

NOTE: The V78 CRM-1 cannot be installed as Module 1. If a V78 CRM-1 is removed from a module slot and a different V78 CRM-1 is installed in that location, the newly installed module acquires the previous module's configuration. Moving an V78 CRM-1 to a different module location requires reconfiguration because the configuration parameters are stored as a function of slot location and module type. The configuration information does not stay with a relocated module.

Once the V78 CRM-1 has been installed in the M Series chassis, connect a cable with a DB-25 male connector to the input connector, J2. The wiper (common), normally open (NO), and normally closed (NC) contacts of each relay are provided on a specific pin. Connect your control circuitry to the desired relay contacts as shown below.

Circuit Connection	Pin #		Circuit Connection
Relay #1 Wiper	1	14	Relay #5 Wiper
Relay #1 NC	2	15	Relay #5 NC
Relay #1 NO	3	16	Relay #5 NO
Relay#2 Wiper	4	17	Relay #6 Wiper
Relay #2 NC	5	18	Relay #6 NC
Relay #2 NO	6	19	Relay #6 NO
Relay #3 Wiper	7	20	Relay #7 Wiper
Relay #3 NC	8	21	Relay #7 NC
Relay #3 NO	9	22	Relay #7 NO
Relay #4 Wiper	10	23	Relay #8 Wiper
Relay #4 NC	11	24	Relay #8 NC
Relay #5 NO	12	25	Relay #8 NO
No Connection	13		

Relay Contact Connection

V79/V80 Pinout

The V79 PDI-1 and V80 PDI-2 are installed in the M Series chassis as described in the installation section of this manual.

> **NOTE:** The V79 PDI-1 or V80 PDI-2 cannot be installed as Module 1. If a V79 PDI-1 or V80 PDI-2 is removed from a module slot and a different V79 PDI-1 or V80 PDI-2 is installed in that location, the newly installed module acquires the previous module's configuration. Moving an V79 PDI-1 or V80 PDI-2 to a different module location requires reconfiguration because the

configuration parameters are stored as a function of slot location and module type. The configuration information does not stay with a relocated module.

The V79 PDI-1 and V80 PDI-2 modules each have a DC-37F connector. Equipment connections for each module is similar. Each input of the V79 PDI-1 module has a ground connection and each input of the V80 PDI-2 module has a return connection. The figures below show the V79 PDI-1 and V80 PDI-2 connections respectively.

Circuit Connection	Pin #	Circuit Connection	Circuit Connection	Pin #
Input #1	1 20	Ground #10	Input #1	1 20
Return #10				
Ground #1	2 21	Input #11	Return #1	2 21
Input #11				
Input #2	3 22	Ground #11	Input #2	3 22
Return #11				
Ground #2	4 23	Input #12	Return #2	4 23
Input #12				
Input #3	5 24	Ground #12	Input #3	5 24
Return #12				
Ground #3	6 25	Input #13	Retum #3	6 25
Input #13				
Input #4	7 26	Ground #13	Input #4	7 26
Return #13				
Ground #4	8 27	Input #14	Return #4	8 27
Input #14				
Input #5	9 28	Ground #14	Input #5	9 28
Return #14				
Ground #5	10 29	Input #15	Return #5	10 29
Input #15				
Input #6	11 30	Ground #15	Input #6	11 30
Return #15				
Ground #6	12 31	Input #16	Return #6	12 31
Input #16				
Input #7	13 32	Ground #16	Input #7	13 32
Return #16				
Ground #7	14 33	N.C.	Return #7	14 33
N.C.				
Input #8	15 34	N.C.	Input #8	15 34
N.C.				
Ground #8	16 35	N.C.	Return #8	16 35
N.C.				
Input #9	17 36	N.C.	Input #9	17 36
N.C.				

Ground #9	18 37	N.C.		Return #9	18 37
N.C.					
Input #10	19			Input #10	19

V79 Input Connections V80 Input Connections

0.2 PDI-2 AC INPUT SETUP

The PDI-2 module has two banks of dip switches which are used to add ripple filtering for AC inputs. AC input is selected by individual channel. Location of the dip switches is shown in Figure 3.

CHANNEL	SW1	SW2
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9		1
10		2
11		3
12		4
13		5
14		6
15		7
16		8

Table 1

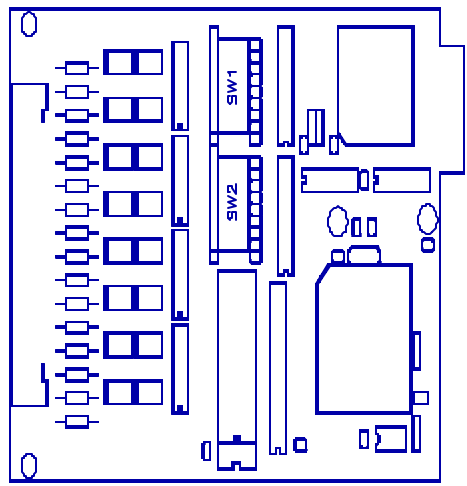


Figure 3

Dip switch SW1 1-8 provides filtering control for channels 1-8 while SW2 1-8 controls channels 9-16. Refer to Table 1 to determine which switch corresponds to a particular channel. A port is configured for AC operation by positioning the corresponding switch to ON position.

NOTE: The default setting for SW 1-8 and SW2 1-8 is "OFF" (AC filtering disabled).

V83 ECM-1 CABLING

The ECM-1 is installed in the M Series chassis as described in *Section 3.5* of the base unit operator's manual.

NOTE: The ECM-1 cannot be installed as Module 1. If an ECM-1 is removed from a module slot and a different ECM-1 is installed in that location, the newly installed module acquires the previous module's configuration. Moving an ECM-1 to a different module location requires reconfiguration because the configuration parameters are stored as a function of slot location and module type. The configuration information does not stay with a relocated module.

The ECM-1 module has a DC-37F connector. The DC-37F connector provides a means for individual connections to each input/out circuit as shown in *Figure 1*. Each input/output has a paired ground (return) connection. If all the input/output circuits are generated from a common source, a single-point ground can be used. Any of the ground connections can be used to provide the single-point ground.

Figure 1: ECM-1 Signal Connections

Circuit Connection	Pin #		Circuit Connection
Input #1	1	20	Ground # 10
Ground #1	2	21	Input # 11
Input # 2	3	22	Ground # 11
Ground # 2	4	23	Input # 12
Input # 3	5	24	Ground # 12
Ground # 3	6	25	Input # 13
Input # 4	7	26	Ground # 13
Ground # 4	8	27	Input # 14
Input # 5	9	28	Ground # 15
Ground # 5	10	29	Input # 16
Input # 6	11	30	Ground # 16
Ground # 6	12	31	NC
Input # 7	13	32	NC
Ground # 7	14	33	NC

Input # 8	15	34	NC
Ground # 8	16	35	NC
Input # 9	17	36	NC
Ground # 9	18	37	NC
Input # 10	19		

Relay Contact Connection

NOTE: Ground loops are one of the most common problems encountered when connecting electronics equipment that are physically separated. To prevent noise or erroneous data being introduced, insure your signal connections do not form ground loops.

Each counter circuit can be externally controlled through its corresponding "Gate/Out" connection. To operate a counter circuit as an externally controlled counter, set that counter's Gate/Out jumper to the GATE position, as shown in *Figure 2*. With the jumper in place, the counter input can be controlled by placing a "LO" at the GATE connection. When a counter circuit is to be used as a programmable divider, place the Gate/Out jumper to the "Out" position. Connect a reference signal to the corresponding Counter Input and set the divisor value as explained in Section 5.1.3. The divided output signal is provided at the corresponding Gate/Out connection.

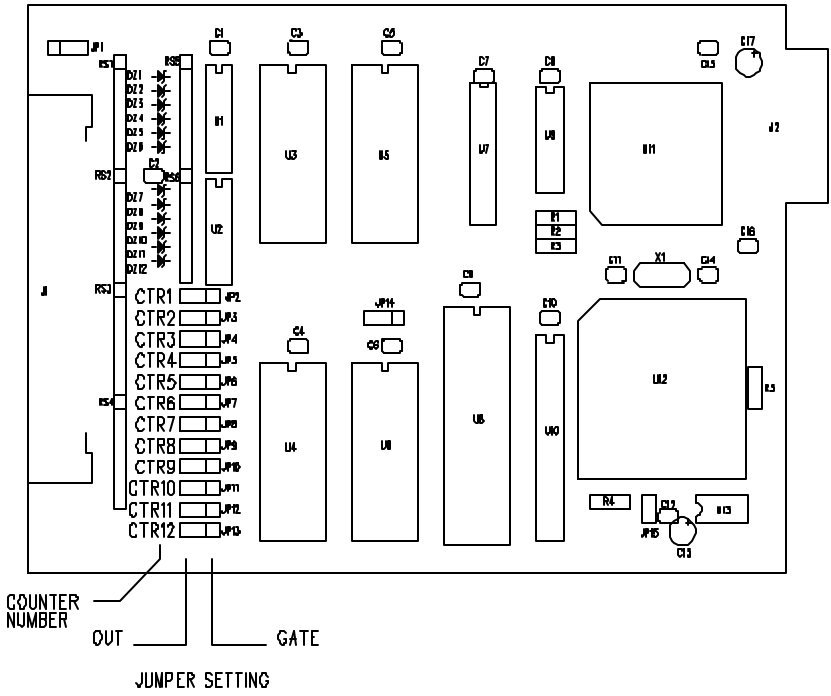


Figure 2: ECM-1 Board and GATE/OUT Jumpers

V84 ADR-1/1A CABLING

The ADR-1 and ADR-1A are installed in the M Series chassis as described in *Section 4.5* of the base unit operator's manual.

> **NOTE:** The ADR-1 and ADR-1A cannot be installed as Module 1. Also, if an ADR-1(A) is removed from a module slot and a different ADR-1(A) is installed in that location, the newly installed module acquires the previous module's configuration. Moving an ADR-1(A) to a different module location requires reconfiguration because the configuration parameters are stored as a function of slot location and module type. The configuration information does not stay with a relocated module.

Once the ADR-1 or ADR-1A has been installed in the M Series chassis, connect your analog and isolated voltage input signals to the input connector J1 with a HDL-44 male connector. Connect single-ended A-to-D ground returns to the minus (-) HDL-44 pin connector for the channel(s) to be used. For example, if Channel 1 is used in single-ended mode, connect your signal under measurement to Pin 1 and the ground to Pin 2. Make all relay connections to the input connector J2 with a DA-15F connector. Configure your input cable as shown in *Figure 1* on the following page for the ADR-1 analog and switch closure inputs, *Figure 2* on Page 6 for the ADR-1A analog and isolated voltage inputs, or as shown in *Figure 3* on Page 7 for relay connections.

Circuit Connection	J1 Pin #	Circuit Connection
No Connection	16	
A/D Channel #1+	1 31	Ground
No Connection	17	
A/D Channel #1-	2 32	Switch Input #2
Ground	18	
A/D Channel #2+	3 33	Ground
Ground	19	
A/D Channel #2-	4 34	Switch Input #3
Ground	20	
A/D Channel #3+	5 35	Ground
Ground	21	
A/D Channel #3-	6 36	Switch Input #4
Ground	22	
A/D Channel #4+	7 37	Ground
Ground	23	
A/D Channel #4-	8 38	Switch Input #5
Ground	24	
A/D Channel #5+	9 39	Ground
Ground	25	
A/D Channel #5-	10 40	Switch Input #6
Ground	26	
A/D Channel #6+	11 41	No Connection
Ground	27	
A/D Channel #6-	12 42	No Connection
Ground	28	
No Connection	13 43	No Connection
Ground	29	
No Connection	14 44	No Connection
Switch Input #1	30	
Ground	16	

Figure 1: **ADR-1 Analog and Switch Closure Input Connections (HDL-44F)**

Circuit Connection	J1 Pin #	Circuit Connection
A/D Channel 8+	16	
A/D Channel #1+	1 31	Isolated Input # 2+
A/D Channel 8-	17	
A/D Channel #1-	2 32	Isolated Input # 2-
Ground	18	
A/D Channel #2+	3 33	Isolated Input # 3+
Ground	19	
A/D Channel #2-	4 34	Isolated Input # 3-
Ground	20	
A/D Channel #3+	5 35	Isolated Input # 4+
Ground	21	
A/D Channel #3-	6 36	Isolated Input # 4-
Ground	22	
A/D Channel #4+	7 37	Isolated Input # 5+
Ground	23	
A/D Channel #4-	8 38	Isolated Input # 5-
Ground	24	
A/D Channel #5+	9 39	Isolated Input # 6+
Ground	25	
A/D Channel #5-	10 40	Isolated Input # 6-
Ground	26	
A/D Channel #6+	11 41	No Connection
Ground	27	
A/D Channel #6-	12 42	No Connection
Ground	28	
No Connection	13 43	No Connection
Isolated Input # 1+	29	
No Connection	14 44	No Connection
Isolated Input # 1-	30	
Ground	16	

Figure 2: ADR-1A Analog and Isolated Voltage Input Connections (HDL-44F)

Circuit Connection	J2 Pin #	Circuit Connection
No Connection	8	
	15	No Connection
No Connection	7	
	14	Relay #4 NC

Relay #2 NC	6		
		13	Relay #4 Wiper
Relay #2 Wiper	5		
		12	Relay #4 NO
Relay #2 NO	4		
		11	Relay #3 NC
Relay #1 NC	3		
		10	Relay #3 Wiper
Relay #1 Wiper	2		
		9	Relay #3 NO
Relay #1 NO	1		

Figure 3: Relay Connections (DA-15M)

V93A

The V93A modem has two modular connectors for device selection and configuration. One connector is for connection to a dial-up line. The other connector is used to communicate with an EIA-232 port.

EIA-232 CONNECTION

Connect the eight pin modular cable(RJ-45) to the port labeled EIA-232 on the V93A. Connect the DB9 adapter to the serial port of your PC or terminal and then connect the other end of the cable to the RJ-45 side of the adapter. Use adapter BayTech part number 9FRJ45PC-3 and cable, BayTech part number RJ08X007 that come with the RPC.

Figure 1 shows the required adapter for a PC with a DB-25 connector. Use a crossed RJ-45 cable to connect these adapters to the EIA-232 port.

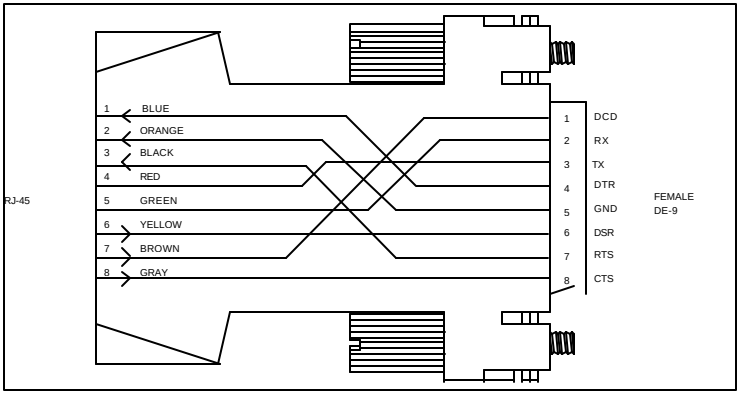


Figure 1: PC, PS/2 Computer/Terminal Adapter BayTech Part No. 9FRJ45PC-3

Figure 2 shows the required adapter for a PC or terminal with a DB-25 connector. Use a crossed RJ-45 cable to connect these adapters to the EIA-232 port.

Figure 2: PC, PS/2 Computer/Terminal Adapter BayTech Part No. 25FRJ45PC-3

IMPORTANT: When modular connectors are used as shown in *Figures 1 - 2* above with RJ-45 connectors, crossed RJ-45 cables are required. See the cable diagram that follows.

MODEM CONNECTION

Connect the phone line to the RJ-11 connector on the V93A with a RJ-11 cable.

INSTALLATION

UNPACKING

Compare the unit and serial number of the equipment you received to the packing slip located on the outside of the box. Log this information on the sheet on page 186. Inspect equipment carefully for damage that may have occurred in shipment. If there is damage to the equipment or if materials are missing, contact BayTech technical support at 228-467-8231 or call toll free inside the United States at 800-523-2702. At a minimum, you should receive the following:

a. The M Series unit.

b. This manual with any applicable addendum's.

c. Power Supply.

d. 1 ea. DE-9 (9 pin) PC com port adapter -- 9FRJ45PC-1.

e. 1 ea. RJ-45 cross over cable -- RJ08X007.

f. 1 ea. RJ-11 telco cable -- RJ04X007 (RPC-2 MD01 & RPC-2 RDR).

g. 1 ea. external modem adapter -- 25MRJ45MD-8 (RPC-2 RDR).

NOTE: Keep the shipping container and packing material in the event future shipment is required.

PREPARING THE INSTALLATION SITE

The installation area should be clean and free of extreme temperatures and humidity. Allow sufficient space behind the M Series unit for cabling and receptacle connections.

POWER

CAUTION: This unit is intended for indoor use only. Do not install near water or expose this unit to moisture. To prevent heat buildup, do not coil the power cord when in use. Do not use extension cords. Do not attempt to make any internal changes to the power source. Do not attempt to modify any portion or component of an RPC Series Unit unless specifically directed to. BayTech must perform any internal operations.

CAUTION: High-voltage surges and spikes can damage this equipment. To protect from such power surges and spikes, this unit must have a good earth ground. There is an earth ground connection next to the power input.

CAUTION: Before removing or replacing any cables or power cords, turn off main power switch located on the M Series Unit. Communication to the unit will be disrupted while power is off.

CAUTION: Do not exceed the AC current rating for the selected model.

CAUTION: Although the power switch is turned OFF, the unit is not totally isolated from the power supply. In order to be absolutely removed from the power supply, the power cord must be unplugged from the unit.

CAUTION: For PERMANENTLY CONNECTED EQUIPMENT, a readily accessible disconnect device shall be incorporated in the fixed wiring. For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and easily accessible.

CIRCUIT BREAKER (In which units is this installed?)

In the case of power overload, the circuit breaker automatically trips. Determine the cause of the tripped circuit breaker, correct the problem then reset the circuit breaker by depressing the circuit breaker switch.

MODULE INSTALLATION

Some of the modules that can be installed in the M Series include the following:

Part No.	Description	Connector Type
V71	Host module: EIA-232/EIA-422/current loop interface	DB-25 & RJ-45
V72 & V72TP	Host module: Ethernet (IEEE 802.3), 10BASE2 & 10 BASE-T	BNC & RJ-45
V74	I/O module: 4 EIA-232 serial ports	RJ-45
V75	I/O module: 4 EIA-422/232 serial ports	RJ-45
V87	I/O module: 4 EIA-485/422 serial ports	RJ-45
V77 ADM-1	I/O module: 8 or 16 analog-to-digital channels	DB-25
V78 CRM-1	I/O module: 8 control relay channels	DB-25
V79 PDI-1	I/O module: 16 switch closure channels	DC-37

V80 PDI-2	I/O module: 16 optically isolated channels	DC-37
V82 PCM-1	Programmable Control module	Internal
V83 ECM-1	I/O module: 12 event counter channels	DC-37
V84 ADR-1	I/O module: 6 analog-to-digital channels, 6 switch closure channels, and 4 relay channels	HDL-44 DA-15
V89	Cascade module	BNC
V93A	Host module: V.32bis modem	RJ-11
M03*	Memory module: Expandable up to 16MB	N/A
* - The M03 memory module occupies one module slot thereby reducing the maximum number of host or I/O modules the can be installed by one		

IMPORTANT: The first module slot (Module 1) of a M8 or M16 with a LCD display must be occupied by a host module.

You will need a straight-slot screwdriver to perform the installation.

1. **IMPORTANT:** Remove power from the unit by depressing the power switch on the front of the unit to OFF and also remove the power cord from the socket.

2. Determine which module slot the module will install into. Modules are typically installed in sequence from left to right (facing rear of unit). The module slots are labeled on the top panel as "1", "2", ..., "16". If you need to upgrade the memory on the M03 memory module, please refer to *Appendix B.4* before installing the module into the base unit.

3. Remove the flat aluminum plate covering the slot into which the new module will be installed by loosening the 2 straight slot screws and then removing the plate from the rear panel. Save the aluminum plate in the event you have to remove the module in the future.

4. Install the new module by sliding the horizontal card edges along the grooves inside the module slot. Each module has a card-edge connector that fits into a receptacle inside the base unit. Apply a moderate amount of pressure to the connector board of the module until you feel the card edge connector slip into the receptacle inside. You will not be able to mount the back plate of the module to the chassis if the module is not installed all the way.

5. Mount the back plate of the module to the M Series chassis by tightening the 2 straight slot screws on the back plate.

6. Apply power to the unit by plugging in the power cord and depressing the power switch on the front of the unit to ON.

BASE UNIT AND MODULE CONFIGURATION

BASE UNIT CONFIGURATION

The base unit can be configured from the service port, the service modem, or a host control module.

> **NOTE**: Once the date has been programmed, the base unit will automatically adjust for months having 28, 29, 30, or 31 days for all years up to 2087. The base unit also tracks the correct day of the week automatically.

HOST MODULE, SERVICE PORT, AND SERVICE MODEM CONFIGURATION (CONFIGURATION PORTS)

To access configuration mode of the base unit from one of the configuration ports, use one of the following procedures.

> **NOTE:** The configuration ports will not respond to commands for approximately 15 seconds after the unit is powered up or reset.

HOST MODULE ACCESS

1. Connect a terminal to the host module and access the base unit configuration menu using either the menu mode:

   a) Select configuration mode by typing “C” followed by <cr> at the main prompt ;

   b) and type the number of of the base unit (varies with number of module slots avaialable), followed by <cr>.

or the dynamic configuration mode.

a) Connect to the base unit by sending the port select code ($BT - default), 0, and <cr>.

NOTE: Substitute module number (1-16) for base unit number (0) to configure other modules.

b) Access configuration mode by sending $CONFIG<cr>. For example, if using the default port select code, send $BT0<cr>$CONFIG<cr> to enter into configuration mode

for the base unit. No characters should be typed between $BT0<cr> and $CONFIG<cr>.

To access the configuration mode of the base unit from the service port or service modem, use the following procedure:

SERVICE PORT OR SERVICE MODEM ACCESS

1. If configuring from the service port, connect a terminal to the *EIA-232* service port and configure the terminal's serial parameters to 9600 baud rate, 8 word size, 1 stop bit, and no parity. If configuring from the service modem, establish a connection between the remote terminal and service modem by dialing into the service modem. Once the unit is powered on, the following message will be sent out of the service port:

   Bay Technical Associates
   Service Port
   Firmware Revision 4.XX

   This same message will be sent to the remote modem once a connection is established with the service modem. The service modem has priority over the *EIA-232* service port. When a connection is established between a remote modem and the service modem, the following message will be sent out of the *EIA-232* service port:

   Incoming call
   Service port access locked out

   A terminal connected to the *EIA-232* service port is not allowed access to the M Series unit while the service modem has a connection with a remote modem. If a user connected to the *EIA-232* service port is currently communicating with the M Series unit and a remote user attempts to access configuration mode through the service modem, the remote user is not allowed access to the M Series unit.

2. Place the base unit or desired module into command mode by sending $BT0n<cr>. (Use $BAYTECHn<cr> with M4 and M8 DAC units).

NOTE: Substitute module number (1-16) for base unit number (0) to configure other modules.

3. Access configuration mode by sending $CONFIG<cr>. No characters should be typed between $BT0<cr> and $CONFIG<cr>. (Use $BAYTECH0<cr> on M4 and M8 DAC.)

Once you access configuration mode (for the base unit) from a host communications module, the service port, or the service modem, the following menu will appear on the terminal screen:

```
Control Board System Menu
Bay Technical Associates
Copyright 199X
 Unit Number 001

Set Date            1
Set Time            2
Set Unit Number     3
Exit System Menu    X

Enter Request:
```

Enter the desired selection. The "X" selection (Exit System Menu) will return you to operations mode. Once you exit configuration mode, you should disconnect by sending $BT<cr>. (Use $BAYTECH<cr> when using M4 and M8 DAC).

NOTE: Other configuration screens will appear based on the module number accessed. Refer to the appropriate module type for the proper configuration of those modules.

SET DATE

Type "1" from the menu above to receive the following prompt:

```
Enter date <MM/DD/YY>:
```

Type the desired date. For example, to enter December 31, 1999, type 12/31/99.

SET TIME

Type "2" from the menu above to receive the following prompt:

```
Enter time <HH:MM:SS>:
```

Type the desired time. For example, to enter 11:59:59, type 11:59:59.

SET UNIT NUMBER

Type "3" from the menu above to receive the following prompt:

```
Enter unit (1-30):
```

Type the desired Unit Number.

BASE UNIT DYNAMIC CONFIGURATION COMMANDS

You can configure the date and time for the base unit from a host communications module by sending the "ST" (Set Time) dynamic configuration command. The host communications module must first select base unit prior to sending the "ST" command. This is done by sending the port select code, "0", and <cr>. The format of the "ST" command is as follows:

```
ST HH:MM:SS,MM/DD/YY<cr>
```

HH is the desired hour, the first MM is the desired minute, SS is the desired second, the second MM is the desired month, DD is the desired day, YY is the desired year. For example; 11:59:59 on December 31, 1999 equates to:

$BT0<cr>ST 11:59:59,12/31/99<cr>

V71 HOST MODULE CONFIGURATION

V71 MAIN MENU CONFIGURATION

Configuration changes for the V71 host module are made through one of the configuration ports. To access the configuration mode for the V71, use one of the procedures on page 44.

With $CONFIG input the V71 host module installed as Module X will respond with an identification block and a menu of the available configuration options similar to the following:

```
Copyright (c) Bay Technical Associates, 199X
DAC V71 Rev. X.XX
This Module is 1
1) Status
2) Port Select Code
3) Serial Port Configuration
X) Exit Configuration
```

Enter Request :

NOTE: This menu shows the V71 installed as Module 1. A line showing the amount of memory is displayed as the third line in the header if an M03 memory module is installed.

NOTE: Menu selections are case sensitive. It is recommended your keyboard be in the CAPS LOCK position.

STATUS

Type “1” and <cr> to review the status of the V71 module. The V71 will respond:

Port	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff		Line Interface
					Xmit	Recv	
1	9600	8	1	None	Off	Off	EIA-232

Port Select Code is:$BT

Unit Number is : 1

Strike any key to continue

Copyright (c) Bay Technical Associates, 199X
DAC V71 Rev. X.XX
This Module is 1

1) Status
2) Port Select Code
3) Serial Port Configuration
X) Exit Configuration
Enter Request :

You can now make whatever changes are necessary by responding to the above menu. The "X" (Exit Configuration) will return you to the operations mode.

PORT SELECT CODE

Type “2” and <cr> to enter the port select code menu. The V71 will respond:

Port Select Code is:$BT

Enter Port Select Code (Max. 8 Characters)
and ENTER when done:

Type the desired port select code followed by <cr>. For example, if you type #PORT followed by <cr>, the V71 will respond with:

Port Select Code is:#PORT

Enter Port Select Code (Max. 8 Characters)
and ENTER when done:

If no additional change is desired, type <cr>. The V71 saves the new port select code permanently in the non-volatile memory and return to the main configuration menu.

> **NOTE:** You cannot program the port select code to be $BAYTECH from the service port. If you wish to use $BAYTECH as the port select code, you must program the port select code from the V71 host module.

SERIAL PORT CONFIGURATION

Type "3" and <cr> to enter the serial port menu. The V71 will respond:

Port	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff		Line Interface
					Xmit	Recv	
1	9600	8	1	None	Off	Off	EIA-232

Exit/Save 1 Set Stop Bits 4 Set Line Interface 7
Set Baud Rate 2 Set Parity 5
Set Word Size 3 Set XON/XOFF 6

Enter Request :

You can now reconfigure the V71 by selecting the appropriate option from the menu (1 to 7). For example, to change the baud rate to 115.2K baud, send "2" (Set baud rate). The V71 will respond with this menu:

1 for 50
2 for 75
3 for 110
4 for 135
5 for 150
6 for 300
7 for 600
8 for 1200
9 for 2400
A for 4800
B for 9600
C for 19200

D for 38400
E for 57600
F for 76800
G for 115.2K

Enter Request :

Send "G" for 115.2K baud rate, and the V71 will respond with the reconfigured status of the port, the option menu, and the prompt:

Port	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff		Line Interface
					Xmit	Recv	
1	115200	8	1	None	Off	Off	EIA-232

Exit/Save	1	Set Stop Bits	4	Set Line Interface	7
Set Baud Rate	2	Set Parity	5		
Set Word Size	3	Set XON/XOFF	6		

Enter Request :

You can now select other options from the menu. For example, to change the line interface to EIA-422, type "7" (Set Line Interface) and the V71 will respond with:

1 for EIA-232
2 for EIA-422
3 for 20mA Current Loop

Enter Request :

Type "2" for EIA-422 line interface and the V71 will respond with the reconfigured status of the port, the option menu, and the prompt:

Port	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff		Line Interface
					Xmit	Recv	
1	115200	8	1	None	Off	Off	EIA-422

Exit/Save	1	Set Stop Bits	4	Set Line Interface	7
Set Baud Rate	2	Set Parity	5		
Set Word Size	3	Set XON/XOFF	6		

Enter Request :

If there are no other changes, send "1" (Exit/Save) and the V71 will return to the main configuration menu.

NOTE: The new serial port configuration changes do not take effect until after you exit configuration mode.

EXIT CONFIGURATION

Type “X” and <cr> to exit the configuration menu. The V71 will respond:

```
Change your devices to match new configuration
```

This reminds you to change the host computer to match any serial port configuration changes. You should change the appropriate host computer parameters to match the new serial port configuration of the V71 at this point.

> **CAUTION:** Failure to change the host computer serial parameters to match the new serial parameters of the V71 after exiting configuration mode locks you out of all V71 functions. If this happens and you forget what changes were made, you can review the V71 configuration status and make any changes from the service port or the service modem of the M Series base unit.

> **IMPORTANT:** After exiting the V71 configuration mode and making any necessary changes to the host computer, you must send the port select code immediately followed by <cr> (e.g., $BT<cr>) to resume normal communications between the V71 and the relevant I/O modules. Failure to do so prevents the V71 from receiving any data from the I/O modules.

V72TP HOST MODULE CONFIGURATION

MAIN CONFIGURATION MENU

Configuration changes for the V72/V72TP host modules are made through the service port, or the service modem. To access the configuration mode of of the V72/V72TP module use the procedures on page 45.

With $CONFIG input the V72/V72TP host module installed as Module X will respond with an identification block and a menu of the available configuration options similar to the following:

```
M-Series V72-TP DAC Host
Unit : 1  Module: 1
F 0.28  Copyright (c) 1995-1997
```

```
Bay Technical Associates

IP Addr:          200.4.3.190       Subnet Mask:      255.255.255.0
Gateway Addr:     200.4.3.1         Select Code:      $BT
Ethernet Addr:    00.C0.48.1A.24.5D ID MSG/Login:     enabled/enabled
Unit Mem (MB):    16                IMR/CRT:          disabled/disabled
TCP Sessions:     0                 Menu/ATTN:        disabled
BrkLen            350 ms            Hst Cfg/RTel      disabled/enabled

IP Address        1
Subnet Mask       2
Gateway           3
Select Code       4
Password          5
User Interface    6
Diagnostics       7
Exit              X
```

NOTE: The Unit Mem (MB) line, showing the amount of memory is displayed only if an M03 memory module is installed.

You can now make whatever changes are necessary by responding to the above menu. The "X" selection (Exit Configuration) will return you to the operations mode.

IP ADDRESS

Type “1” (in the configuration main menu) and <cr> to change the IP address. The module will respond:

```
Enter IP address in dotted decimal form:
```

Enter the desired IP address as a series of four numbers separated by periods (e.g., 197.3.14.9) followed by <cr>.

IMPORTANT: The IP address must be programmed before the V72 module can be accessed on the network. After programming the IP address, the M-Series unit must be reset for the new information to take effect.

SUBNET MASK

Type “2” (in the configuration main menu) and <cr> to change the subnet mask. The module will respond:

```
Enter Subnet Mask in dotted decimal form:
```

Enter the desired Subnet Mask as a series of four numbers separated by periods (e.g., 255.255.255.0) followed by <cr>.

IMPORTANT: The Subnet Mask must be programmed before the V72 module can be accessed on the network. After programming the Subnet Mask, the M-Series unit must be reset for the new information to take effect.

GATEWAY

Type "3" (in the configuration main menu) and <cr> to change gateway. The module will respond:

```
Enter Gateway address in dotted decimal form:
```

Enter the desired Gateway or router address as a series of four numbers separated by periods (e.g., 197.3.14.1) followed by <cr>.

> **IMPORTANT:** After programming the Gateway address, the M-Series unit must be reset for the new information to take effect.

SELECT CODE

Type "4" (in the configuration main menu) and <cr> to change the select code. The module will respond:

```
Enter Select Code (8 chars max):
```

Type the desired port select code followed by <cr>. The V72 saves the new port select code permanently in the non-volatile memory and returns to the main configuration menu.

> **NOTE:** The select code is case sensitive. You cannot program the port select code to be $BT from the service port or service modem.

> **NOTE:** It is not necessary to reset the unit for this option to take effect.

PASSWORD

Type "5" (in the configuration main menu) and <cr> to change the password. The module will respond:

```
Current password:  BTA
Enter Password (8 chars max):
```

Type the desired password up to eight ASCII characters. Press <cr> to return to the main configuration menu.

> **IMPORTANT:** Record your password and keep it in a secure place. If a password is lost or forgotten, you must contact a BayTech applications engineer and provide authenticated authorization for the password retrieval procedure.

> **NOTE:** The password is case sensitive. Any non-alphanumeric character including <BACKSPACE> and <DELETE> or a password greater than eight characters is interpreted as an input error and you will be prompted to enter the password again.

Terminate the password entry by typing the <cr> key. The V72 will respond with:

Accept password as typed above? (Y/N) :

Press "Y" to accept the new password or "N" to reject it. If you press "N", the V72 will return to the "Enter Password" prompt. If you type "Y", the V72 will return to the main configuration menu.

NOTE: It is not necessary to reset the unit for this option to take effect.

USER INTERFACE

Type “6” (in the configuration main menu) and <cr> to move through the following options:

User interface options, press <CR> to skip option.

Enable/Disable Module ID Message? (E/D):

Press “E” to enable the Module ID Message, press “D” to disable the ID Message or press <cr> to leave the option unchanged. The default is “enabled”.

Enable/Disable Login? (E/D):

Press "E" to enable the Login Procedure, press "D" to disable the Login Password Procedure or press <cr> to leave this option unchanged. The default is “enabled

NOTE: It is not necessary to reset the unit for this option to take effect.

Enable/Disable Immediate Msg Quick Release? (E/D):

Press "E" to enable the Immediate Mode Message Quick Release Procedure, press "D" to disable this procedure, returning the module to normal message handling mode or press <cr> to leave this option unchanged. The default is “disabled”.

Enable/Disable strip LF/NUL after CR? (E/D):

Press "E" to make the V72’s Telnet processor to strip line feeds or nulls which follow carriage returns, press “D” to allow the characters to pass through or press <cr> to leave this option unchanged. The default is “disabled”.

Enable menu interface? (E/D):

Press “E” to enable the Menu interface mode of operation for the V72, press “D” to disable the Menu interface mode of operation for the V72, orpress <cr> to leave this option unchanged The default is “enabled”. If the menu is enabled the following prompt appears:

Enter menu attention Character:

Enter the attention character desired. The default is a semi-colon (;). In the menu mode of operation, the attention character is typed five times with no characters in between. This returns the user to the host module main menu.

Enable/Disable configuration from other hosts? (E/D):

Users may configure a V72/V72TP to allow it to be configured through other host modules, rather than just through the serial port. The default setting for "Hst Cfg" (Host Configuration) is disabled.

Enable/Disable reverse telnet feature (E/D):

When users want to prevent V71, V93A, or service port users from gaining access to the network through the V72/V72TP, the reverse Telnet feature may be disabled. The default setting for "Rtel" (Reverse Telnet Operation) is enabled.

Set Break Length? (Y/N):

Users may configure the V72/V72TP for a break length of 25 - 6.375 milliseconds (.025 - 6.375 seconds) in 25 millisecond increments. When a user, running a Telnet session with the V72/V72TP and connected to a serial port on a V74/V75, sends a Telnet break command (0xF4) to the V72/V72TP, the serial port will send a break signal of the programmed duration. The default setting for the Programmable Break on the V72/V72TP is 350 milliseconds. If you answer yes you will be prompted for the break length:

Enter Break Length (25 ms ticks), <CR>:

DIAGNOSTICS

Type "7" (in the configuration main menu) and <cr> to display status and diagnostics menu. The module will respond:

V72 Status & Diagnostics Menu.

System	1
Internal Communications	2
Network Interface	3
Logged Users	4
Exit	X

SYSTEM STATUS

Type "1" (in the status and diagnostics menu) and <cr> to display the system status. The module will respond:

System Status:

Available local memory (256 byte buffers): 511
System memory (M03 modules, MB): 0

Connections in use: 0
Pending messages (module #s): none
Immediate Mode User: none
Command/Configuration Mode User: Module 0
System up time (days:hh:mm:ss): 0:02:05:29

<Strike any key to continue.>

INTERNAL BUS STATUS

Type “2” (in the status and diagnostics menu) and <cr> to display the internal bus status. The module will respond:

Internal Bus Status:

Internal Bus Errors: 0
Bus transmit data channel: clear

<Strike any key to continue.>

NETWORK STATUS

Type “3” (in the status and diagnostics menu) and <cr> to display the network status. The module will respond:

Network Status:

Medium status: good
Medium faults: 0
Xmit bufr errs: 0
Available send buffers: 30
Receive queue status: open

<Strike any key to continue.>

LOGGED USERS

Type “4” (in the status and diagnostics menu) and <cr> to display the active users. The module will respond:

Active Users:

Address/Port	Internal	TX/RX	Net Data Flo TX/RX	Bus Data Flo TX/RX
Module 0	C 0,1/0,1			ok/ok

<Strike "T" to terminate a session, any other key to continue.>

EXIT

Type “X” (in the status and diagnostics menu) and <cr> exit the configuration menu. The module will respond:

```
Unit MUST BE RESET for configuration
changes to take effect.
```

V74/V75/V87 SERIAL I/O MODULE CONFIGURATION

Configuration changes for the V74/V75/V87 modules are made through any host module, the service port, or the front panel. To access the configuration mode of a 4-port serial module from any host module, use the procedures on page 44.

MAIN MENU CONFIGURATION

With $CONFIG input the serial module installed as Module X will respond with an identification block and a menu of the available configuration options similar to the following:

```
Copyright(C) Bay Technical Associates 199X-199X
Model V73/V74/V76 etc. High Speed Serial 4C
Revision F.X.XX
Unit: 1, Module: 2

Status                          1
Serial Port Configuration       2
Port Device Name                3
Port I.D                        4
Designate Host Port location    5
Message Terminate Character     6
Mode of Operation               7
Time Tag Mode                   8
Connect Port ID Echo            9
Exit                            X

Enter Request :
```

NOTE: Menu selection is case sensitive. It is recommended that your keyboard be in the CAPS LOCK position.

IMPORTANT: If you change the Message Terminate Character or Mode of Operation, when you type "X" from the above menu (Exit), the module will respond with:

```
Mode Of Operation or Terminate Character has been Changed!
Press Any Key To Reset This Unit...
```

Typing any key results in the M Series base unit and all installed modules resetting.

STATUS

Type "1" (in the configuration main menu) and <cr> to display the module status. The module will respond:

```
Current Terminate Character is    0DH
Current Host Designation is Module        1
Current Mode of Operation is              1

Strike any Key to Continue, or X to Exit

 Current Module 2 Serial Port Configuration :
```

Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon/ Xoff	
					Xmit	Recv
Device A	9600	8	1	None	Off	Off
Device B	9600	8	1	None	Off	Off
Device C	9600	8	1	None	Off	Off
Device D	9600	8	1	None	Off	Off

```
Strike any Key to Continue, or X to Exit

Current Module 2 Port I.D :
```

Port	Port I
1	01:02,1
2	01:02,2
3	01:02,3
4	01:02,4

```
Strike any Key to Continue, or X to Exit

Copyright(C) Bay Technical Associates 199X-199X
Model V73/V74/V76 etc. High Speed Serial 4C
Revision F. X.XX
Unit: 1, Module: 2

Status                          1
Serial Port Configuration       2
Port Device Name                3
Port I.D                        4
Designate Host Port location    5
Message Terminate Character     6
Mode of Operation               7
```

Time Tag Mode	8
Connect Port ID Echo	9
Port EIA Driver	A
Exit	X

Enter Request :

You can make whatever changes are necessary by responding to the above menu. The Exit function returns you to Operations Mode.

SERIAL PORT CONFIGURATION

Type “2” (in the configuration main menu) and <cr> to change the serial port configuration. The module will respond:

Enter Serial Port Number (? = Help, ENTER = Exit) :?

Type the port number of the selected module that you wish to reconfigure followed by <cr>. If you wish to review the status of the selected module, type "?". For example, if you enter "4", the module responds with the current status for Port 4 and a list of available options as follows:

Current Module 2 Serial Port Configuration :

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
4	Device D	9600	8	1	None	Off	Off

Exit/Save	1	Set Stop Bits	4
Set Baud Rate	2	Set Parity	5
Set Word Size	3	Set Xon/Xoff	6

Enter Request:

You can now reconfigure Port 4 by selecting the appropriate option from the menu (1 to 6). For example, to change the baud rate to 115.2K baud, send "2" (set baud rate). The module will respond with this menu:

1 For 300
2 For 600
3 For 1200
4 For 2400
5 For 4800
6 For 9600
7 For 19200
8 For 38400
9 For 76.8K
A For 115.2K

Enter Request :

Send "A" for 115.2K baud rate, and the module will respond with the reconfigured status of the port, the option menu, and the prompt:

Current Module 1 Serial Port Configuration :

Port	Device Name	Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
4	Device D	115.2K	8	1	None	Off	Off

Exit/Save 1 Set Stop Bits 4
Set Baud Rate 2 Set Parity 5
Set Word Size 3 Set Xon/Xoff 6
Enter Request:

You can now select other options from the menu to reconfigure Port 4. For example, to enable Xon/Xoff handshaking in the receive data direction only, send "6" (Set Xon/Xoff Xmit) in response to the prompt. The module will respond with:

Output Flow Control (Xmit) - Xon/Xoff is (OFF)
Stop/Restart Output Upon Receiving of Xoff/Xon ? (Y/N) :

Enter "Y" to enable XON/XOFF on transmit or "N" to disable XON/XOFF on transmit. Following our example, enter "N" and the module will respond with:

Input Flow Control (Recv) - Xon/Xoff is (Off)
Xoff/Xon sent based on Buffer - Full/Empty condition ? (Y/N) :

Enter "Y" to enable XON/XOFF on receive or "N" to disable XON/XOFF on receive. Following our example, enter "Y" and the module will respond with the reconfigured status for Port 4 as follows:

Current Module 1 Serial Port Configuration

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
4	Device D	9600	8	1	None	Off	On

Exit/Save 1 Set Stop Bits 4
Set Baud Rate 2 Set Parity 5
Set Word Size 3 Set Xon/Xoff 6
Enter Request:

If there are no other changes for this port, send "1" (Exit/Save) and the module will respond with:

Save Changes Permanently ? (Y/N) :

If you type "Y", the new configuration for the selected port is stored permanently in non-volatile memory and the module will subsequently power up at the new configuration. If you type "N", the new configuration is stored in RAM and lost once power is removed from the unit. After you type the desired response to the save changes prompt, the module will respond with:

Enter Serial Port Number (? = Help, ENTER = Exit) :

Enter the number of any other port you wish to reconfigure. If there are no other ports, type <cr> and the module will return to the main configuration menu.

CHANGE PORT DEVICE NAME

Type “3” (in the configuration main menu) and <cr> to change the Port Device Name. The module will respond:

Enter Port Number (? = Help, ENTER = Exit) :

Type the port number that you wish to reconfigure followed by <cr>. If you wish to review the device name status for all ports of the module, type "?". For example, if you enter "4", the module will respond with:

Current Module 1 Serial Port Configuration :

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
4	Device D	115.2K	8	1	None	Off	Off

Enter Port Device Name (Max 16 Characters)
Or ENTER for no change……..:

Enter the desired port device name up to 16 characters. For example, if you enter "Port 4", the module will respond with:

Current Module 1 Serial Port Configuration :

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
4	PORT 4	115.2K	8	1	None	Off	Off

Enter Port Device Name (Max 16 Characters)
Or ENTER for no change……..:

If the port device name is satisfactory, type <cr> and the will respond with:

```
Enter Port Number (? = Help, ENTER = Exit) :
```

Enter the number of any other port you wish to reconfigure. If there are no other ports, type <cr> and the module will return the main configuration menu.

PORT ID

Type “4” (in the configuration main menu) and <cr> to change the port ID. The module will respond:

```
Enter Port Number (? = Help, ENTER = Exit) :
```

Type the desired port number followed by <cr> or type <cr> without any number to exit to the main configuration menu. For example, if you type "1" followed by <cr> for Port 1, the I/O module responds with:

```
Current Module 3 Port I.D :

| Port | Port ID |
| 1    | 01:03,1 |

Disable Port I.D                1
Use Unit,Module,Port number     2
Use Device Name                 3

Select Port I.D (ENTER = no change):
```

Type "1" to disable the Port ID feature, "2" to send the selected port's Unit Number:Module Number,Port Number as the Port ID, or "3" to send the selected port's device name as the Port ID.

DESIGNATE HOST PORT LOCATION

Type “5” (in the configuration main menu) and <cr> to designate the host port location. The module will respond:

```
Current Host Designation is Module.....1:1,1
Enter New Host Unit Number (1-30):
```

Type the desired unit number followed by <cr>. The module will respond with:

```
Enter New Host Module Number (1 to 16):
```

Type the desired module number followed by <cr>.

> **NOTE:** If you type "0" from this menu, all completed messages are sent to the base unit (i.e., the service port or service modem).

The module will respond with:

```
Enter New Host Port Number (1 - 4):
```

Type the desired port number followed by <cr>.

> **NOTE:** If a V71 is the designated host module, the host port number is "1" (default). If the base unit is the designated host module, the host port number is "1" for the service port or "2" for the service modem.

All completed messages received while operating in immediate reporting mode are sent to the designated host port.

MESSAGE TERMINATE CHARACTER

Type “6” (in the configuration main menu) and <cr> to change the message terminate character. The module will respond:

```
Current Terminate Character is.....0DH
Enter Terminate Character in Hex
or ENTER for no change .....:
```

Enter the desired message terminating character in the form of a two-digit hexadecimal character from 00 Hex to 7F Hex. For example, if you enter "0A" (Line Feed), the module will respond with:

```
Current Terminate Character is.....0AH
Enter Terminate Character in Hex
or ENTER for no change .....:
```

If the displayed terminate character is satisfactory, type <cr> and the module will return to the main configuration menu

MODE OF OPERATION

Type “7” (in the configuration main menu) and <cr> to change the mode of operation. The module will respond:

```
MODE OF OPERATION
Full Duplex Mode          1
Immediate Message Mode    2
Command Mode              3
```

```
Immediate Data Mode          4

Current Mode of Operation is    1
Enter Mode of Operation :
```

You can now enter the mode of operation that you wish followed by <cr>. The module will return to the main configuration menu.

TIME TAG MODE

Type “8” (in the configuration main menu) and <cr> to enable or disable the time tag mode. The module will respond:

```
Current Time Tag Mode is    Disabled
Enable                      1
Disable                     2
Exit                        X

Enter Selection:
```

Type the appropriate number to enable or disable time tag or "X" (for no change) followed by <cr>. The module will return to the main configuration menu.

CONNECT PORT ID ECHO

Type “9” (in the configuration main menu) and <cr> to enable or disable the connect port ID echo. The module will respond:

```
Connect Port ID Echo is.....Disabled
Change it? (Y/N) :
```

Type “Y” to change the current setting or “N” to exit to the main configuration menu.

If Connect Port ID Echo is enabled, the programmed Port ID will be sent to the host computer whenever a Serial port is selected.

> **NOTE:** Connect Port ID Echo is not functional if the peripheral module is operating in command mode.

EXIT

Type “X” (in the configuration main menu) and <cr> to exit the configuration mode.

V77 ADM-1 MODULE CONFIGURATION

MAIN MENU CONFIGURATION

To access the menu-driven configuration mode of the V77 ADM-1 from any host module, use the procedure on page 44.

With $CONFIG input the V77 ADM-1 installed as Module X will respond with an identification block and a menu of the available configuration options similar to the following:

```
Copyright (c) Bay Technical Associates,1993
DAC V77 ADM-1 Rev. 1.##
This Module is X

CONFIGURATION MAIN MENU

Module Status              1
Sampling Setup             2
Reporting Setup            3
Channel Input Setup        4
Dynamic Configuration      5
Exit                       X

Enter Selection:
```

NOTE: The configuration menus shown in the following sections are depicted with factory default settings and may vary slightly in presentation.

Enter the number corresponding to your desired choice. Each choice will invoke a sub-menu. Each sub-menu is described in the following sections. When you exit a sub-menu, you will be returned to the configuration main menu. When "Exit" is selected from the main menu, the V77 ADM-1 will exit from configuration mode and go into an active data collection mode.

MODULE STATUS

Type “1” and <cr> to enter the Module Status menu. The V77 ADM-1 will respond:

```
MODULE STATUS
```

Sampling Method	COMMAND
Sample Start Time	HH:MM
Sample Period	HH:MM:SS
Sample Rate	1S/sec
No. of Samples to Average	10
Reporting Method	COMMAND
Reporting Start Time	24:00
Reporting Period	24:00
Host Address	1:1,1
Data Format	HEX
Time Tagging	DISABLED
Terminating Characters	0D0A

Press a key to continue or X to Exit...

Range	+/-5 or 0-10 Volts
Unipolar / Bipolar	BI
Single Ended / Differential	SE
Active Channels	1000000000000000
Dynamic Configuration	DISABLED

Press any key t o Exit

SAMPLING SETUP

Type "2" and <cr> to enter the Sampling Setup menu. The V77 ADM-1 will respond:

Sampling Method	1
Sample Start Time	2
Sample Interval	3
Sample Rate	4
No. of Samples to Average	5
Exit	X

Enter Selection:

The three Sampling Methods are Command (upon request only), Immediate (upon exiting configuration), and Schedule (where sampling begins at the Sample Start Time). Sample Interval is the interval between the start of sampling periods. Continuous sampling is selected if 00:00:00 is entered. Sample Rate can be programmed from 1 to 4000 samples per second. The sample rate for an individual channel is the programmed rate divided by the number of active channels. Number of Samples to Average is the number of samples averaged per data message.

SAMPLING METHOD

Type "1" and <cr> to enter the Sampling Method menu. The V77 ADM-1will respond:

```
SELECT SAMPLING METHOD

Sampling Method     COMMAND

Command             1
Immediate           2
Schedule            3
Exit                X

Enter Selection:
```

The V77 ADM-1 provides three Sampling Methods. These are Command (upon request via data commands only), Immediate (upon exiting configuration), and Schedule (where sampling begins at a specified time). When Command Sampling Method is selected, the V77 ADM-1 will only sample when the SAn command is issued. One data message will be read at the programmed Sampling Rate and Number of Samples to Average and reported to the host device for each channel specified. The SAn command may be issued to the V77 ADM-1 in any of the three Sampling Methods.

When Immediate Sampling Method is selected, the V77 ADM-1 will sample at the selected Sample Rate, Sample Interval, and Number of Samples to Average immediately after exiting the Configuration Main Menu. When Schedule Sampling Method is selected, the V77 ADM-1 will begin sampling at the programmed Sample Start Time. Sampling will occur at the programmed Sample Rate, Sample Interval, and Number of Samples to Average. The Sample Start Time is programmable up to 24 hours in advance of the current (time-of-day) clock time.

> **IMPORTANT:** If you program the V77 ADM-1 to commence sampling after the Report Start Time, data messages are not furnished until the Sampling Start Time is reached. Conversely, if you start sampling before the Report Start Time, the first report will contain all data sampled and buffered until reporting is initiated.

> **NOTE:** When a "Command" sample is requested by entering the SAn data command, the Reporting Method and Sampling Method currently programmed are overridden and a single data message is read and reported. Multiple SAn commands may be entered before returning to self-reporting operation. To resume the programmed Sampling Method and Reporting Method, send the port select code followed by <cr>.

SAMPLE START TIME

Type “2” and <cr> to enter the Sample Start Time menu. The V77 ADM-1 will respond:

```
SAMPLING START TIME

Sampling Start Time              HH:MM
Current Date04/28/00 and Time              MM/DD/YY HH:MM:SS

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
```

This menu shows the current Sample Start Time, the base unit's current date and time, and prompts you to enter the desired Sampling Start Time. Sampling can be delayed up to 24 hours from the current time. The Current Date04/28/00 and Time are the values reported by the base unit's time-of day clock when the reporting start time entry was selected.

> **IMPORTANT:** The Current Date04/28/00 and Time is not updated during data entry. Therefore, you must consider any delays from the time you enter the Sample Start Time until you exit the Configuration Main Menu. Be sure to set the Sample Start Time late enough to complete all configurations and exit the Configuration Main Menu before the designated Sample Start Time. If you set a Sample Start Time and exit the main configuration menu after the designated Sample Start Time elapses, sampling will be delayed until the following day.

Enter the desired Sample Start Time. For example, suppose the current time is 9:20:30 and the Sample Start Time is set to 10:45. After you exit the Configuration Main Menu, the V77 ADM-1 will start sampling data at 10:45 the programmed Sampling Setup. If the M Series loses power, sampling resumes the next time the designated Sample Start Time is observed by the time-of day clock. If, for example, power is removed at 11:30 and restored at 12:00 and the Sample Start Time is set to 10:45, sampling will resume at 10:45 the following day.

SAMPLE INTERVAL

Type “3” and <cr> to enter the Sample Interval menu. The V77 ADM-1 will respond:

```
SAMPLE INTERVAL

Sample Period          HH:MM:SS  or "CONTINUOUS"

NOTE Enter 00:00:00 for continuous sampling.

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
Enter Seconds (0-59) <cr>, or X to Exit:
```

Enter the desired Sample Interval. Enter 00:00:00 for continuous sampling. Continuous sampling is conducted at the programmed Sample Rate and Number of Samples to Average.

If a Sample Interval is entered, repetitive sampling will occur where the V77 ADM-1 will sample for a specified period of time and then stop sampling for a specified time interval. Sample Interval is the time interval between the start of sampling periods. The length of time of sampling periods is determined by the Sampling Rate and the Number of Samples to Average.

SAMPLE RATE

Type "4" and <cr> to enter the Sample Rate menu. The V77 ADM-1 will respond:

```
SAMPLE RATE

Sample Rate          1S/sec

Enter Rate (1-4000S/sec) <cr>, or X to Exit:
```

Samples rates between 1 and 4000 samples/sec can be selected. The programmed Sample Rate is the sample rate for individual channels. The maximum sample rate for an individual channel is 4000 divided the number of active channels. For example, if there are eight active channels, the maximum individual channel sample rate is 500S/sec.

The maximum sample rate, based on the number of active channels selected, is calculated automatically. If you try to exceed the maximum individual channel sample rate, your entry is ignored and the correct maximum rate displayed.

> **NOTE:** The number "4000" in the above menu is automatically reduced to the maximum individual channel sample rate based upon the number of active channels.

NUMBER OF SAMPLES TO AVERAGE

Type "5" and <cr> to enter the Samples To Average menu. The V77 ADM-1 will respond:

```
NUMBER OF SAMPLES TO AVERAGE

No. of Samples to Average.....10

Enter Samples (1-4000) <cr>, or X to Exit:
```

Enter the desired Number of Samples to Average.

REPORTING SETUP

Type "3" and <cr> to enter the Reporting Setup menu. The V77 ADM-1 will respond:

```
REPORTING SETUP
Reporting Method            1
Report Start Time           2
Report Interval             3
Host Address                4
Data Format                 5
Time Tag                    6
Terminating Character(s)    7
Exit                        X

Enter Selection:
```

REPORTING METHOD

Type "1" and <cr> to enter the Reporting Method menu. The V77 ADM-1 will respond:

```
SELECT REPORTING METHOD
Reporting Method            COMMAND

Command                             1
Immediate(when Sample Available     2
Schedule                            3
Exit                                X

Enter Selection:
```

The V77 ADM-1 provides three Reporting Methods. These are Command (via data commands only), Immediate (upon exiting configuration), and Schedule (where reporting begins at a specified time).

When Command Reporting Method is selected, the V77 ADM-1 will report data messages to the host module only when the RAn and RSn commands are issued. If the V77 ADM-1 receives an RAn (Read All Buffered Samples) command, all data messages currently stored in the buffer of the selected channel(s) are transmitted to the host-controller. Each time the V77 ADM-1 receives an RSn (Report a Single Sample if available) command, the oldest data message available is transmitted to the host-controller. The RAn and RSn commands may be issued to the V77 ADM-1 in any of the three Reporting Methods.

When Immediate Reporting Method is selected, the V77 ADM-1 will report data messages when they are available. If no data message is available, no report is made. Reporting begins immediately after exiting the Configuration Main Menu

When Schedule Reporting Method is selected, the V77 ADM-1 will begin reporting data messages at the programmed Report Start Time. The Report Start Time is programmable up to 24 hours in advance of the current (time-of-day) clock time. Data messages are stored in the buffer until the Report Start Time is reached at which time all buffered data messages are reported to the host module. Further reporting is based upon the selected Report Interval.

> **NOTE:** When a data message is requested by entering the RAn or RSn data commands, the Reporting and Sampling Methods currently programmed are overridden and the data message(s) is reported. To resume the programmed Sampling Method and Reporting Method, send the port select code followed by <cr>.

REPORT START TIME

Type "2" and <cr> to enter the Report Start Time menu. The V77 ADM-1 will respond:

```
REPORT START TIME

Reporting Start Time          HH:MM
Current Date04/28/00 and Time          MM/DD/YY HH:MM:SS

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
```

This menu shows the current Reporting Start Time, Current Date04/28/00 and Time as reported by the base unit's time-of day clock when the reporting start time entry was selected, and prompts you to enter the desired Report Start Time. Reporting can be delayed up to 24 hours from the current time.

Enter the desired Report Start Time. For example, suppose the Current Time is 9:20:30 and the Reporting Start Time is set to 10:45. After you exit the Configuration Main Menu, the V77 ADM-1 will start reporting data messages at 10:45 at the programmed Sampling Setup. If the M Series loses power, reporting resumes the next time the designated Report Start Time is observed by the time-of day clock.

> **IMPORTANT:** The Current Date04/28/00 and Time is not updated during data entry. You must consider any delays from the time you enter the Report Start Time until you exit the Configuration Main Menu. Be sure to set the Report Start Time far enough ahead of the current time to complete all configurations and exit configuration mode.

NOTE: When using Schedule Reporting Method and the ADM-1 is initially reporting, if you enter into the menu-driven mode of configuration and exit, the ADM-1 will not resume reporting data messages until the programmed Report Start Time elapses. You may program the ADM-1 without disrupting data message reporting by using dynamic configuration.

REPORT INTERVAL

Type "3" and <cr> to enter the Report Interval menu. The V77 ADM-1 will respond:

```
REPORT INTERVAL

Report Interval                 HH:MM

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
```

Enter the desired Report Interval. The Report Interval can range from 1 minute to 24 hours. Once the Report Start Time elapses, the V77 ADM-1 will report all buffered data messages to the designated host module until the buffer is empty. The V77 ADM-1 will continue to transmit all buffered data messages every time the Report Interval expires. For example, if the Report Start Time is 12:00 and the Report Interval is 1:00 (1 hour), the ADM-1 will report all messages in its buffer every hour on the hour starting at 12:00.

HOST ADDRESS

Type "4" and <cr> to enter the Host Address menu. The V77 ADM-1 will respond:

```
HOST ADDRESS

Host Address                    1:1,1

Enter Unit Number (1-32) <cr>, or X to EXIT:
Enter Module Number (1-16) <cr>, or X to EXIT:
Enter Port Number (1-4) <cr>, or X to EXIT:
```

Enter the appropriate Host Address. This consists of the Unit Number (1 to 32), Module Number (1 to 16), and Port Number (1 to 4) where the designated host module is located. Each entry should be followed by <cr>. If there is a single M Series unit in service, the Host Address would typically be Unit 1, Module 1, Port 1.

NOTE: The Host Address must be supplied to direct self-reporting data messages to the desired destination. If the Host Address is incorrect, self-reporting data messages will be misdirected or lost.

DATA FORMAT

Type “5” and <cr> to enter the Data Format menu. The V77 ADM-1 will respond:

```
SELECT DATA FORMAT

Data Format          HEX

Hexadecimal          1
Decimal              2
Engineering Units    3
Exit                 X

Enter Selection:
```

Type the number corresponding to the desired choice. The "Data Format" sub-menu provides a choice in the format of the sampled data contained in each data message. Data can be reported in Hexadecimal, Decimal, or in Engineering Units (volts).

TIME TAG

Type “6” and <cr> to enter the Time Tag menu. The V77 ADM-1 will respond:

```
ENABLE / DISABLE TIME TAGGING

Time Tagging         DISABLED

Enable               1
Disable              2
Exit                 X

Enter Selection:
```

With time tag enabled, a MM/DD/YY HH/MM/SS entry is appended to all samples, where MM is the month, DD is the day, YY is the year, HH is the hour, MM is the minute, and SS is the second according to the base unit's time-of-day clock.

TERMINATING CHARACTER(S)

Type “7” and <cr> to enter the Termnating Character(s) menu. The V77 ADM-1 will respond:

```
ENTER TERMINATING CHARACTER
Terminating Character(s)          0D0A

Enter 1 or 2 Terminating Characters in Hex Format
(i.e. 0D0A for CR+LF) <cr>, or X to Exit:
```

Type the hexadecimal representation of the desired terminating character(s). For example, <cr> would be represented by 0D Hex.

NOTE: Only ASCII characters A-F and 0-9 are acceptable.

CHANNEL INPUT SETUP

Type "4" and <cr> to enter the Channel Input menu. The V77 ADM-1 will respond:

```
CHANNEL INPUT SETUP

Range                       1
Unipolar / Bipolar          2
Single Ended / Differential 3
Active Channels             4
Exit                        X

Enter Selection:
```

RANGE

Type "1" and <cr> to enter the Range menu. The V77 ADM-1 will respond:

```
SELECT INPUT VOLTAGE RANGE

Range                +/-5 or 0-10 Volts

+/-10 Volts with JP1 installed  1
+/-5 or 0-10 Volts              2
+/-2.5 or 0-5 Volts             3
+/-1.25 or 0-2.5 Volts4
+/-0.625 or 0-1.25 Volts        5
Exit                            X

Enter Selection:
```

Enter the number (1 to 5) corresponding to the desired Range.

IMPORTANT: If you intend to operate at +/- 10 volts, insure jumper JP1 is installed before connecting inputs to the V77 ADM-1.

NOTE: A correct Unipolar/Bipolar selection must be made in conjunction with Range selection to insure proper operation.

UNIPOLAR/BIPOLAR

Type “2” and <cr> to enter the Unipolar/Bipolar menu. The V77 ADM-1 will respond:

```
SELECT INPUT POLARITY

Unipolar / Bipolar      UN

Unipolar                1
Bipolar                 2
Exit                    X

Enter Selection:
```

Select the desired Input Polarity (unipolar or bipolar). Unipolar allows the channel inputs to operate between 0 and +X volts and bipolar allows the channel inputs to operate between -X and +X volts, where X is the selected Range. The Input Polarity must be programmed in conjunction with the Range sub-menu to set up a correct signal input voltage mode of operation.

SINGLE ENDED/DIFFERENTIAL

Type “3” and <cr> to enter the Single Ended/Differential menu. The V77 ADM-1 will respond:

```
SELECT INPUT CONFIGURATION

Single Ended / Differential     SE

Single Ended            1
Differential            2
Exit                    X

Enter Selection:
```

Select the desired Input Configuration. Singled-ended operation allows up to 16 inputs using grounds of the same potential. Differential operation allows up to 8 inputs using different reference polarities. See ***Figure 1 or Figure 2 on page 5*** to determine the correct connections on connector J2.

ACTIVE CHANNELS

Type “4” and <cr> to enter the Sample Start Time menu. The V77 ADM-1 will respond:

```
SELECT ACTIVE CHANNELS

Enter 1 to ENABLE or 0 to DISABLE each channel <cr>, or X to Exit.

NOTE: Only channels 1-8 can be active if DIFFERENTIAL inputs selected!

        CHANNEL NUMBERS
             1111111
        1234567890123456

CURRENT STATUS    1000000000000000

ENTER SELECTION:
```

Type a number between 0000000000000000 and 1111111111111111 followed by <cr>. A "1" indicates that a channel is active and a "0" indicates the channel is inactive. You may enable or disable any individual input channel. It is not necessary to enter all 16 channels. You have only to enter up to the highest channel you wish to activate or deactivate. For example, if all channels are initially inactive (0000000000000000), and you only want to activate channels one and four, enter 1001<cr>.

> **NOTE:** Only channels 1 through 8 may be enabled if Differential inputs are selected (i.e., channels 9-16 cannot be active). If you enter a "1" for channels 9-16 while in differential mode, those entries will automatically revert to "0".

If you increase the number of active channels and exceed the maximum sample rate, a menu appears showing the maximum permissible sample rate based on the number of active channels. For example, if you had eight active channels allowing a maximum sample rate of 500S/sec and increased to 16 active channels, the following message appears if you select Set Sample Rate under the Sampling Setup menu:

```
SET SAMPLE RATE          250S/sec

Enter Rate (1-250S/sec) followed by ENTER or X to Exit:
```

An entry within the displayed range must be entered, or you can exit this menu and reduce the number of active channels.

DYNAMIC CONFIGURATION

Type "5" and <cr> to enter the Dynamic Configuration menu. The V77 ADM-1 will respond:

```
DYNAMIC CONFIGURATION COMMANDS

Dynamic Configuration Commands        DISABLED

Enable              1
Disable             2
Exit                X

Enter Selection:
```

Dynamic configuration mode allows the V77 ADM-1 to be programmed by downloading dynamic (on-the-fly) commands.

EXIT

Type "X" and <cr> to exit the configuration menu. The V77 ADM-1 will respond:

```
Save Changes as Defaults? (Y/N)
```

If you reply (Y), the settings are saved as the permanent power-up defaults. That is, if the M16/M8 loses power for any reason, the settings saved as defaults become the power-up settings. If you reply (N), your selections are saved as current (temporary) operating settings, but are lost upon power-down. The most recent menu selections saved as Defaults are restored as the current operating parameters when power is re-applied. If you respond with (Y), the V77 ADM-1 will respond with:

```
Saving Configuration as Defaults...
Configuration complete
```

DYNAMIC CONFIGURATION PROCEDURE AND COMMANDS

V77 ADM-1 dynamic configuration commands are issued through a host module, the service port, or the service modem (config ports). The V77 ADM-1 will recognize dynamic configuration commands only when dynamic configuration is enabled. Use the following procedure to send dynamic configuration commands to the V77 ADM-1:

1. Select the V77 ADM-1 from a config port by sending a select sequence which consists of the port select code ($BT - default), the appropriate unit number followed by a colon (01: to 30: - for cascaded units only), the desired module number (2 to 16), and a terminating character for <cr> (0D Hex). For example, to select a

V77 ADM-1 Module installed as Module 15 of a non-cascaded unit using the default port select code, send **$BT15<cr>**.

2. Once the V77 ADM-1 is selected, it enters Command Mode and allows you to send dynamic configuration commands. The V77 ADM-1 configuration commands begin with two capital letters designating the specific command and are terminated with <cr>. Most configuration commands require a number between the command letters and <cr>. This number represents the desired configuration parameter.

3. After you have sent the desired configuration command(s) to the V77 ADM-1 module, you may disconnect by sending **$BT<cr>**. You may disconnect from the V77 ADM-1 and select a different module or the base unit by sending **$BTn<cr>**.

NOTE: Multiple configuration commands may be sent while the V77 ADM-1 is in command mode. Each command should be terminated with <cr>. For example:

AV300<cr>VR1<cr>SD1<cr>

AVERAGE COMMAND

The Average (AV) command programs the Number of Samples to Average between 1 and 4000. You must ensure the combination of Sample Rate and Sample Interval is sufficient to contain the desired number of samples to be averaged. For example, if you want to average 100 samples at a Sample Rate of 15/sec, the Sample Interval must be greater than 100 secs. If you enter an interval less than the time required to average the selected number of samples, the V77 ADM-1 continues taking samples until the selected number of samples to be averaged is met. In the example above, if you select an interval of 50 seconds, the sample will not be reported until all 100 samples are taken (100 seconds). The Average command has the following format:

AV*n*<*cr*>

where *n* = 1 to 4000.

REPORTING METHOD COMMAND

The Reporting Method (RM) command programs the V77 ADM-1 Reporting Method. The Reporting Method command has the following format:

RM*n*<cr>

where *n* = 1 to 3. 1 = Command, 2 = Immediate and 3 = Schedule.

SINGLE ENDED OR DIFFERENTIAL COMMAND

The Single Ended or Differential (SD) command programs the V77 ADM-1 to use single ended or differential inputs. The Single Ended or Differential command has the following format:

SDn<cr>

where n = 1 or 2. 1 = single ended and 2 = differential.

TIME TAG COMMAND

The Time Tag (TT) command is used to enable or disable time tagging. The Time Tag command has the following format:

TTn

where n = 1 or 2. 1 = enable and 2 = disable.

UNIPOLAR/BIPOLAR COMMAND

The Unipolar/Bipolar command programs the V77 ADM-1 channel inputs for unipolar or bipolar operation. The Unipolar/Bipolar command has the following format:

UBn<cr>

where n = 1 or 2. 1 = unipolar and 2 = bipolar.

VOLTAGE RANGE COMMAND

The Voltage Range command is used to program the desired operating voltage range of the V77 ADM-1 channel inputs. The Voltage Range command has the following format:

VRn<cr>

where n = 1 to 5. 1 = -10 to +10V (with JP1 installed), 2 = -5 to +5V (or 0 to +10V), 3 = -2.5 to +2.5V (or 0 to +5V), 4 = -1.25 to +1.25V (or 0 to +2.5V), and 5 = -0.625 to +0.625V (or 0 to +1.25V).

V78 CRM-1 MODULE CONFIGURATION

To access configuration mode of the V78 CRM-1, use the procedures on page **44.**

CONFIGURATION MAIN MENU

With $CONFIG input the V78 CRM-1 module installed as Module X will respond with an identification block and a menu of the available configuration options similar to the following:

```
Copyright (c) Bay Technical Associates,1993
DAC V78 CRM-1 Rev. 1.01
This Module is X

CONFIGURATION MAIN MENU

Module Status                1
Relay Operating Setup        2
Reporting Setup              3
Dynamic Configuration        4
Exit                         X

Enter Selection:
```

NOTE: The configuration menus shown in the following sections are depicted with factory default settings and may vary slightly in presentation.

Enter the number corresponding to your desired choice. Each choice will invoke a sub-menu. Each sub-menu is described in the following sections. When you exit a sub-menu, you will be returned to the configuration main menu. When "Exit" is selected from the main menu, the V78 CRM-1 will exit from configuration mode and go into an active data collection mode.

MODULE STATUS

Type “1” (in the configuration main menu) and <cr> to display module status. The module will respond:

```
MODULE STATUS

Schedule Status              NO SCHEDULE ENTERED
Reporting Method             COMMAND
Reporting Start Time         24:00
Reporting Period             24:00
```

Host Address	1:1,1
Data Format	HEX
Time Tagging	DISABLED
Terminating Character(s	0D0A
Dynamic Configuration	DISABLED

Press a key to continue or X to Exit.

RELAY OPERATING SETUP

Type "2" (in the configuration main menu) and <cr> to display the relay operating setup menu. The module will respond:

RELAY OPERATING SETUP

List Current Schedule	1
Create/Modify Schedule	2
Enable/Disable Events	3
Delete Events/Schedule	4
Exit	X

Enter Selection:

LIST CURRENT SCHEDULE

Type "1" (in the relay operating setup menu) and <cr> to list the current schedule. The module will respond:

CURRENT SCHEDULE

EVENT NO.	START TIME	DURATION	INTERVAL	RELAY NO.
DD	HH:MM:SS	HH:MM NN:NN	D HH:MM:SS	
01	00:00:00	00:00	0 00:00:00	0
02	00:00:00	00:00	0 00:00:00	0
03	00:00:00	00:00	0 00:00:00	0
04	00:00:00	00:00	0 00:00:00	0
05	00:00:00	00:00	0 00:00:00	0
06	00:00:00	00:00	0 00:00:00	0
07	00:00:00	00:00	0 00:00:00	0
08	00:00:00	00:00	0 00:00:00	0
09	00:00:00	00:00	0 00:00:00	0
10	00:00:00	00:00	0 00:00:00	0
11	00:00:00	00:00	0 00:00:00	0
12	00:00:00	00:00	0 00:00:00	0

Press any key to EXIT

Press any key to return to the Relay Operating Setup menu.

CREATE/MODIFY SCHEDULE

Type “2” (in the relay operating setup menu) and <cr> to create or modify the current schedule. The module will respond:

EVENT NUMBER

Enter Event Number (1-12) <cr>, or X to EXIT:

Type the desired Event Number (1 to 12) followed by <cr>. The V78 CRM-1 will respond with the Event Start Time menu. The Event Start Time consists of the day of the week and time of day the initial occurrence of the selected relay event will happen.

The CRM-1 will respond with:

EVENT START TIME

Event Start Time.....SU 00:00:00
Current Date04/28/00, Day-of-Week and Time.MM/DD/YY D HH:MM:SS

Enter Day-of-Week (0=Any, 1=SUN, 2=MON....7=SAT)<cr>, or X to EXIT:

Type the desired day of the week for the initial relay event (1 to 7) or 0 for any day followed by <cr>. For example if you enter "1" for Monday, the V78 CRM-1 will respond with:

Enter Hours (0-23)<cr>, or X to EXIT:

Type the desired hour for the initial relay event followed by <cr>. For example, if you enter "14" for 2:00pm, the CRM-1 will respond with:

Enter Minutes (0-59)<cr>, or X to EXIT:

Type the desired minute of the selected hour for the initial relay event followed by <cr>. For example, type "0" to start at the top of the selected hour. After you have entered in the desired Event Start Time, the V78 CRM-1 will respond with the Event Duration menu which allows you to program how long the selected relay will stay energized once the Event Start Time elapses. The Event Start Time may be programmed in hours and minutes or in milliseconds. The V78 CRM-1 will respond with:

EVENT DURATION

Event Duration.....00:00

Select Duration in (H)ours and Minutes or (M)illiseconds
(H/M), or X to EXIT:

Type "H" to program the Event Duration in Hours and Minutes or "M" for milliseconds. For example, if you type "M" for milliseconds, the CRM-1 will respond with:

Enter Duration (10-60000 Milliseconds)<cr>, or X to EXIT:

Type the desired number of milliseconds you want the selected relay to remain energized followed <cr>.
The CRM-1 will prompt you to enter the desired relay number that you wish the selected event to energize. The CRM-1 will respond with:

Enter Relay Number (1-8)<cr>, or X to EXIT:

Type the desired relay number (1 to 8) followed by <cr>. The CRM-1 will respond with:

DATA CORRECT (Y/N)?

If the data displayed for the selected Event Number is correct type "Y". The CRM-1 will return to the Relay Operating Setup menu shown on page 16. If you type "N", the CRM-1 will return to the Event Start Time menu shown on the previous page.

ENABLE/DISABLE EVENTS

Type “3” (in the relay operating setup menu) and <cr> to enable or disable events. The module will respond:

ENABLE/DISABLE EVENTS

Event Number(s) 0 ENABLED

Enter Event Number (1-12, 0=ALL)<cr>, or X to exit:

This menu shows the current Event Numbers enabled and prompts you to type the desired Event Number to enable or disable followed by <cr>. Enter the desired Event Number to enable or disable. The V78 CRM-1 will respond with:

Enable	1
Disable	2
Exit	X

Enter Selection:

Type "1" to enable the selected relay event or "2" to disable the selected relay event.

DELETE EVENTS/SCHEDULE

Type “4” (in the relay operating setup menu) and <cr> to delete events or schedules. The module will respond:

DELETE EVENTS

Enter Event Number (1-12, 0=ALL)<cr>, or X to exit:

Type the Event Number you wish to delete or "0" for the entire schedule followed by <cr>.

REPORTING SETUP

Type “3” (in the configuration menu) and <cr> to display the reporting setup menu. The module will respond:

REPORTING SETUP

Reporting Method	1
Report Start Time	2
Report Interval	3
Host Address	4
Time Tag	5
Terminating Character(s	6
Exit	X

Enter Selection:

REPORTING METHOD

Type “1” (in the reporting setup menu) and <cr> to change the reporting method. The module will respond:

SELECT REPORTING METHOD
Reporting Method COMMAND

Command	1
Immediate (When Event Occurs)	2
Schedule	3
Exit	X

Enter Selection:

The CRM-1 provides three Reporting Methods. These are Command (via data commands only), Immediate (upon exiting configuration), and Schedule (where reporting begins at a specified time).

Regardless of the Reporting Method, when the V78 CRM-1 receives an SAn<cr> command, it will report the current status of the selected relay (energized or de-energized) to the host-controller.

When Command Reporting Method is selected, the V78 CRM-1 will report event data messages to the host module only when the RAn or RSn commands are issued. If V78 CRM-1 receives a RAn (Read All Buffered Samples) command, all data messages currently stored in the buffer of the selected relay(s) are transmitted to the host-controller. Each time the V78 CRM-1 receives a RSn (Report a Single Sample if available) command, the oldest event data message available is transmitted to the host-controller.

When Immediate Reporting Method is selected, the V78 CRM-1 will report data messages as events occur. If no event has occurred, no report is made. Reporting begins immediately after exiting the configuration main menu

When Schedule Reporting Method is selected, the V78 CRM-1 will begin reporting data messages as events occur at the programmed Report Start Time. The Report Start Time is programmable up to 24 hours in advance of the current (time-of-day) clock time. Data messages are stored in the buffer until the Report Start Time is reached at which time all buffered data messages are reported to the host module. Further reporting is based upon the selected Report Interval.

REPORT START TIME

Type “2” (in the reporting setup menu) and <cr> to change the report start time. The module will respond:

```
REPORT START TIME

Reporting Start Time          HH:MM
Current Date04/28/00 and Time          MM/DD/YY HH:MM:SS

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
```

This menu shows the current Reporting Start Time, Current Date04/28/00 and Time as reported by the base unit's time-of day clock when the reporting start time entry was selected, and prompts you to enter the desired Report Start Time. Reporting can be delayed up to 24 hours from the current time.

Enter the desired Report Start Time. For example, suppose the Current Time is 9:20:30 and the Reporting Start Time is set to 10:45. After you exit the Configuration Main Menu, the V78 CRM-1 will start reporting data messages at 10:45 at the programmed Sampling Setup. If the M Series loses power, reporting resumes the next time the designated Report Start Time is observed by the time-of day clock.

> **IMPORTANT:** The Current Date04/28/00 and Time is not updated during data entry. You must consider any delays from the time you enter the Report Start Time until you exit the Configuration Main Menu. Be sure to set the Report Start Time far enough ahead of the current time to complete all configurations and exit configuration mode.
>
> **NOTE:** When using Schedule Reporting Method and the V78 CRM-1 is initially reporting, if you enter into the menu-driven mode of configuration and exit, the V78 CRM-1 will not resume reporting data messages until the programmed Report Start Time elapses. You may program the CRM-1 without disrupting data message reporting by using dynamic configuration.

REPORT INTERVAL

Type "3" (in the reporting setup menu) and <cr> to change the reporting interval. The module will respond:

```
REPORT INTERVAL

Report Interval                 HH:MM

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
```

Enter the desired Report Interval. The Report Interval can range from 1 minute to 24 hours. Once the Report Start Time elapses, the V78 CRM-1 will report all buffered data messages to the designated host module until the buffer is empty. The V78 CRM-1 will continue to transmit all buffered data messages every time the Report Interval expires. For example, if the Report Start Time is 12:00 and the Report Interval is 1:00 (1 hour), the V78 CRM-1 will report all messages in its buffer every hour on the hour starting at 12:00.

HOST ADDRESS

Type "4" (in the reporting setup menu) and <cr> to change the host address. The module will respond:

```
HOST ADDRESS

Host Address                    1:1,1
```

Enter Unit Number (1-32) <cr>, or X to EXIT:
Enter Module Number (1-16) <cr>, or X to EXIT:
Enter Port Number (1-4) <cr>, or X to EXIT:

Enter the appropriate Host Address. This consists of the Unit Number (1 to 32), Module Number (1 to 16), and Port Number (1 to 4) where the designated host module is located. Each entry should be followed by <cr>. If there is a single M Series unit in service, the Host Address would typically be Unit 1, Module 1, Port 1.

> **NOTE:** The Host Address must be supplied to direct self-reporting data messages to the desired destination. If the Host Address is incorrect, self-reporting data messages will be misdirected or lost.

TIME TAG

Type "5" (in the reporting setup menu) and <cr> to enable or disable the time tag. The module will respond:

ENABLE / DISABLE TIME TAGGING

Time Tagging DISABLED

Enable 1
Disable 2
Exit X

Enter Selection:

With time tag enabled, a MM/DD/YY HH/MM/SS entry is appended to all samples, where MM is the month, DD is the day, YY is the year, HH is the hour, MM is the minute, and SS is the second according to the base unit's time-of-day clock.

TERMINATING CHARACTER(S)

Type "6" (in the reporting setup menu) and <cr> to change the terminating character(s). The module will respond:

ENTER TERMINATING CHARACTER
Terminating Character(s) 0D0A

Enter 1 or 2 Terminating Characters in Hex Format
(i.e. 0D0A for CR+LF) <cr>, or X to Exit:

Type the hexadecimal representation of the desired terminating character(s). For example, <cr> would be represented by 0D Hex.

NOTE: Only ASCII characters A-F and 0-9 are acceptable.

DYNAMIC CONFIGURATION

Type "5" (in the configuration main menu) and <cr> to enable or disable the dynamic configuration capability. The module will respond:

```
DYNAMIC CONFIGURATION COMMANDS

Dynamic Configuration Commands   DISABLED

Enable          1
Disable         2
Exit            X

Enter Selection:
```

Dynamic configuration mode allows the V78 CRM-1 to be programmed by downloading dynamic (on-the-fly) commands.

EXIT

Type "X" (in the relay operating setup menu) and <cr> to exit the configuration mode. The module will respond:

```
Save Changes as Defaults? (Y/N)
```

If you reply (Y), the settings are saved as the permanent power-up defaults. That is, if the M16/M8 loses power for any reason, the settings saved as defaults become the power-up settings. If you reply (N), your selections are saved as current (temporary) operating settings, but are lost upon power-down. The most recent menu selections, saved as defaults, are restored as the current operating parameters when power is re-applied. If you reply (Y), the V78 CRM-1 will respond with:

```
Saving Configuration as Defaults...
Configuration complete
```

DYNAMIC CONFIGURATION PROCEDURE AND COMMANDS

V78 CRM-1 dynamic configuration commands are issued through a host module, the service port, or the service modem (config ports). The V78 CRM-1 will recognize dynamic configuration commands only when dynamic configuration is enabled. Use

the following procedure to send dynamic configuration commands to the V78 CRM-1:

1. Select the V78 CRM-1 from a config port by sending a select sequence which consists of the port select code ($BT - default), the appropriate unit number followed by a colon (01: to 30: - for cascaded units only), the desired module number (2 to 16), and a terminating character for <cr> (0D Hex). For example, to select a V78 CRM-1 Module installed as Module 15 of a non-cascaded unit using the default port select code, send **$BT15<cr>**.

2. Once the V78 CRM-1 is selected, it enters Command Mode and allows you to send dynamic configuration commands. The V78 CRM-1 configuration commands begin with two capital letters designating the specific command and are terminated with <cr>. Most configuration commands require a number between the command letters and <cr>. This number represents the desired configuration parameter.

3. After you have sent the desired configuration command(s) to the V78 CRM-1 module, you may disconnect by sending **$BT<cr>**. You may disconnect from the V78 CRM-1 and select a different module or the base unit by sending **$BTn<cr>**.

NOTE: Multiple configuration commands may be sent while the V78 CRM-1 is in command mode. Each command should be terminated with <cr>. For example:

RM1<cr>TT2<cr>

REPORTING METHOD COMMAND

The Reporting Method (RM) command programs the V78 CRM-1 Reporting Method. The Reporting Method command has the following format:

RM*n*<cr>

where *n* = 1 to 3 (1 = Command, 2 = Immediate and 3 = Schedule).

TIME TAG COMMAND

The Time Tag (TT) command is used to enable or disable time. The Time Tag command has the following format:

TTn

where n = 1 or 2 (1 = enable and 2 = disable).

V79 PDI-1 AND V80 PDI-2 MODULE CONFIGURATION

To access configuration mode of the V79 PDI-1 or V80 PDI-2 use the procedures on page **44.**

MAIN MENU CONFIGURATION

With $CONFIG input the V79 PDI-1 module installed as Module X will respond with an identification block and a menu of the available configuration options similar to the following:

> **NOTE:** The only difference in the configuration main menu for the PDI-1 or PDI-2 modules is the second line in the header showing the module type. All subsequent menus are the same for both modules. **Thus, only the V79 PDI-1 will be discussed in the following sections**. The configuration menus shown in the following sections are depicted with factory default settings and may vary slightly in presentation.

```
Copyright (c) Bay Technical Associates,1993
DAC V79 PDI-1 Rev. 1.XX
This Module is X

CONFIGURATION MAIN MENU

Module Status              1
Sampling Setup             2
Reporting Setup            3
Dynamic Configuration      4
Exit                       X

Enter Selection:
```

MODULE STATUS

Type “1” (in the configuration main menu) and <cr> to display module status. The module will respond:

```
MODULE STATUS

Debounce Delay (Milliseconds   100
Latch Polarity                 LO to HI
Reporting Method               COMMAND
Reporting Start Time           24:00
Reporting Period               24:00
Host Address                   1:1,1
Data Format                    HEX
Time Tagging                   DISABLED
Terminating Character(s)       0D0A
Dynamic Configuration          DISABLED

Press a key to continue or X to Exit.
```

SAMPLING SETUP

Type “2” (in the configuration main menu) and <cr> to display the sampling setup menu. The module will respond:

```
SAMPLING SETUP

Debounce Delay     1
Latch Polarity     2
Exit               X

Enter Selection:
```

You may program the Debounce Delay the Latch Polarity from this menu. The Exit selection will return you to the configuration main menu. For example, if you type "1" (Debounce Delay), the PDI will respond with the following:

```
SET DEBOUNCE DELAY
(0-65535 Milliseconds)

Debounce Delay     100
Exit               X

Enter Value<CR>, or X to EXIT:
```

Type the desired debounce delay time followed by <cr>. The debounce delay is used to guard against erroneous events. An event will not be valid unless the input channel has remained at a changed state for the debounce duration.

If you type "2" from the "Sampling Setup" menu shown on the previous page (Latch Polarity), the PDI will respond with the following:

```
SET LATCH POLARITY

Latch Polarity                HI TO LO

Low to Hi Transitions only    1
Hi to Low Transitions only    2
Exit                          X

Enter Selection:
```

Enter the desired Latch Polarity. The Latch Polarity is used to latch initial events for individual inputs based on a positive going (LO to HI) or negative going (HI to LO) input.

REPORTING SETUP

Type "3" (in the configuration menu) and <cr> to display the reporting setup menu. The module will respond:

```
REPORTING SETUP

Reporting Method          1
Report Start Time         2
Report Interval           3
Host Address              4
Time Tag                  5
Terminating Character(s   6
Exit                      X

Enter Selection:
```

REPORTING METHOD

Type "1" (in the reporting setup menu) and <cr> to change the reporting method. The module will respond:

```
SELECT REPORTING METHOD
Reporting Method          COMMAND

Command                           1
Immediate (When Event Occurs)     2
Schedule                          3
Exit                              X

Enter Selection:
```

The V79 PDI-1 provides three Reporting Methods. These are Command (via data commands only), Immediate (upon exiting configuration), and Schedule (where reporting begins at a specified time).

Regardless of the Reporting Method, when the V79 PDI-1 receives an SAn<cr> command, it will report the current status of the selected relay (energized or de-energized) to the host-controller.

When Command Reporting Method is selected, the V79 PDI-1 will report event data messages to the host module only when the RAn or RSn commands are issued. If V79 PDI-1 receives a RAn (Read All Buffered Samples) command, all data messages currently stored in the buffer of the selected relay(s) are transmitted to the host-controller. Each time the V79 PDI-1 receives a RSn (Report a Single Sample if available) command, the oldest event data message available is transmitted to the host-controller.

When Immediate Reporting Method is selected, the V79 PDI-1 will report data messages as events occur. If no event has occurred, no report is made. Reporting begins immediately after exiting the configuration main menu

When Schedule Reporting Method is selected, the V79 PDI-1 will begin reporting data messages as events occur at the programmed Report Start Time. The Report Start Time is programmable up to 24 hours in advance of the current (time-of-day) clock time. Data messages are stored in the buffer until the Report Start Time is reached at which time all buffered data messages are reported to the host module. Further reporting is based upon the selected Report Interval.

REPORT START TIME

Type “2” (in the reporting setup menu) and <cr> to change the report start time. The module will respond:

```
REPORT START TIME

Reporting Start Time              HH:MM
Current Date04/28/00 and Time              MM/DD/YY HH:MM:SS

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
```

This menu shows the current Reporting Start Time, Current Date04/28/00 and Time as reported by the base unit's time-of day clock when the reporting start time entry was selected, and prompts you to enter the desired Report Start Time. Reporting can be delayed up to 24 hours from the current time.

Enter the desired Report Start Time. For example, suppose the Current Time is 9:20:30 and the Reporting Start Time is set to 10:45. After you exit the Configuration Main Menu, the V79 PDI-1 will start reporting data messages at 10:45 at the programmed Sampling Setup. If the M Series loses power, reporting resumes the next time the designated Report Start Time is observed by the time-of day clock.

> **IMPORTANT:** The Current Date04/28/00 and Time is not updated during data entry. You must consider any delays from the time you enter the Report Start Time until you exit the Configuration Main Menu. Be sure to set the Report Start Time far enough ahead of the current time to complete all configurations and exit configuration mode.

> **NOTE:** When using Schedule Reporting Method and the V79 PDI-1 is initially reporting, if you enter into the menu-driven mode of configuration and exit, the V79 PDI-1 will not resume reporting data messages until the programmed Report Start Time elapses. You may program the CRM-1 without disrupting data message reporting by using dynamic configuration.

REPORT INTERVAL

Type "3" (in the reporting setup menu) and <cr> to change the reporting interval. The module will respond:

```
REPORT INTERVAL

Report Interval                 HH:MM

Enter Hours (0-24) <cr>, or X to Exit:
Enter Minutes (0-59) <cr>, or X to Exit:
```

Enter the desired Report Interval. The Report Interval can range from 1 minute to 24 hours. Once the Report Start Time elapses, the V79 PDI-1 will report all buffered data messages to the designated host module until the buffer is empty. The V79 PDI-1 will continue to transmit all buffered data messages every time the Report Interval expires. For example, if the Report Start Time is 12:00 and the Report Interval is 1:00 (1 hour), the V79 PDI-1 will report all messages in its buffer every hour on the hour starting at 12:00.

HOST ADDRESS

Type "4" (in the reporting setup menu) and <cr> to change the host address. The module will respond:

```
HOST ADDRESS

Host Address                    1:1,1
```

```
Enter Unit Number (1-32) <cr>, or X to EXIT:
Enter Module Number (1-16) <cr>, or X to EXIT:
Enter Port Number (1-4) <cr>, or X to EXIT:
```

Enter the appropriate Host Address. This consists of the Unit Number (1 to 32), Module Number (1 to 16), and Port Number (1 to 4) where the designated host module is located. Each entry should be followed by <cr>. If there is a single M Series unit in service, the Host Address would typically be Unit 1, Module 1, Port 1.

> **NOTE:** The Host Address must be supplied to direct self-reporting data messages to the desired destination. If the Host Address is incorrect, self-reporting data messages will be misdirected or lost.

TIME TAG

Type "5" (in the reporting setup menu) and <cr> to enable or disable the time tag. The module will respond:

```
ENABLE / DISABLE TIME TAGGING

Time Tagging        DISABLED

Enable              1
Disable             2
Exit                X

Enter Selection:
```

With time tag enabled, a MM/DD/YY HH/MM/SS entry is appended to all samples, where MM is the month, DD is the day, YY is the year, HH is the hour, MM is the minute, and SS is the second according to the base unit's time-of-day clock.

TERMINATING CHARACTER(S)

Type "6" (in the reporting setup menu) and <cr> to change the terminating character(s). The module will respond:

```
ENTER TERMINATING CHARACTER
Terminating Character(s)        0D0A

Enter 1 or 2 Terminating Characters in Hex Format
(i.e. 0D0A for CR+LF) <cr>, or X to Exit:
```

Type the hexadecimal representation of the desired terminating character(s). For example, <cr> would be represented by 0D Hex.

NOTE: Only ASCII characters A-F and 0-9 are acceptable.

DYNAMIC CONFIGURATION

Type "5" (in the configuration main menu) and <cr> to enable or disable the dynamic configuration capability. The module will respond:

```
DYNAMIC CONFIGURATION COMMANDS

Dynamic Configuration Commands   DISABLED

Enable          1
Disable         2
Exit            X

Enter Selection:
```

Dynamic configuration mode allows the V79 PDI-1 to be programmed by downloading dynamic (on-the-fly) commands.

EXIT

Type "X" (in the relay operating setup menu) and <cr> to exit the configuration mode. The module will respond:

```
Save Changes as Defaults? (Y/N)
```

If you reply (Y), the settings are saved as the permanent power-up defaults. That is, if the M16/M8 loses power for any reason, the settings saved as defaults become the power-up settings. If you reply (N), your selections are saved as current (temporary) operating settings, but are lost upon power-down. The most recent menu selections, saved as defaults, are restored as the current operating parameters when power is re-applied. If you reply (Y), the V79 PDI-1 will respond with:

```
Saving Configuration as Defaults...
Configuration complete
```

DYNAMIC CONFIGURATION PROCEDURE AND COMMANDS

V79 PDI-1 dynamic configuration commands are issued through a host module, the service port, or the service modem (config ports). The V79 PDI-1 will recognize dynamic configuration commands only when dynamic configuration is enabled. Use the following procedure to send dynamic configuration commands to the V79 PDI-1:

1. Select the V79 PDI-1 from a config port by sending a select sequence which consists of the port select code ($BT - default), the appropriate unit number followed by a colon (01: to 30: - for cascaded units only), the desired module number (2 to 16), and a terminating character for <cr> (0D Hex). For example, to select a V79 PDI-1 Module installed as Module 15 of a non-cascaded unit using the default port select code, send **$BT15<cr>**.

2. Once the V79 PDI-1 is selected, it enters Command Mode and allows you to send dynamic configuration commands. The V79 PDI-1 configuration commands begin with two capital letters designating the specific command and are terminated with <cr>. Most configuration commands require a number between the command letters and <cr>. This number represents the desired configuration parameter.

3. After you have sent the desired configuration command(s) to the V79 PDI-1 module, you may disconnect by sending **$BT<cr>**. You may disconnect from the V79 PDI-1 and select a different module or the base unit by sending **$BTn<cr>**.

NOTE: Multiple configuration commands may be sent while the V79 PDI-1 is in command mode. Each command should be terminated with <cr>. For example:

RM1<cr>TT2<cr>

DEBOUNCE DELAY COMMAND

The Debounce Delay (DB) command programs the PDI Debounce Delay time. The Debounce Delay command has the following format:

DB*n*<cr>

where *n* = 0 to 65535 milliseconds.

REPORTING METHOD COMMAND

The Reporting Method (RM) command programs the PDI Reporting Method. The Reporting Method command has the following format:

RM*n*<cr>

where *n* = 1 to 3. 1 = Command, 2 = Immediate and 3 = Schedule.

TIME TAG COMMAND

The Time Tag (TT) command is used to enable or disable time tagging. The Time Tag command has the following format:

TTn

where n = 1 or 2. 1 = enable and 2 = disable.

V93A HOST MODULE CONFIGURATION

Configuration changes for the V93A Host Module are made through the service port or the service modem. To access the configuration mode of the module, use the procedures on page 44.

CONFIGURATION MAIN MENU

With $CONFIG input the V93A host module installed as Module X will respond with an identification block and a menu of the available configuration options similar to the following:

```
Status                          1
Serial Port Configuration       2
Port Device Name                3
Port Select Code                4
Attention Character             5
Disconnect Timeguard            6
Login Password                  7
Local Modem Setup               8
Exit                            X
Enter Request :
```

STATUS

Type “1” (in the configuration main menu) and <cr> to display the module status. The module will respond:

```
Installed Modules :             1,2
Port Select Code is             $BT
Attention Character is          ;
Disconnect Time Guard10:28 AM is        Disabled
```

Local Modem Setup :
Rings to Auto-Answer 2
Modem Connectivity Time-out is Disabled
Login Setup:
Login Password is BTA

Strike any Key to Continue

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
1	Host EIA-232	9600	8	1	None	Off	Off
2	Host MODEM	57.6K	8	1	None	Off	Off

Strike any Key to Continue

SERIAL PORT CONFIGURATION

Type “2” (in the configuration main menu) and <cr> to change the serial port configuration. The module will respond:

Enter Host Device Number (1-2): 1

Module 1 Serial Port Configuration :

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
1	Device A	9600	8	1	None	Off	Off

Exit/Save.....1 Set Stop Bits.....4
Set Baud Rate..2 Set Parity.....5
Set Word Size..3 Set Xon/Xoff.....6

Enter Request :

You can now reconfigure the V93A EIA-232 port by sending the appropriate option (1 to 6) from the menu. For example, to change the baud rate to 115.2K, send "2" (Set Baud Rate). The V93A will respond with:

1 For 300
2 For 600
3 For 1200
4 For 2400
5 For 4800
6 For 9600
7 For 19200
8 For 38400
9 For 57.6K
A For 76.8K
B For 115.2K
Enter Request :

Send "B" for 115.2K baud rate. The V93A will respond with the reconfigured status of the port as follows:

Module 1 Serial Port Configuration :

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
1	Device A	115.2K	8	1	None	Off	Off

Exit/Save	1	Set Stop Bits	4
Set Baud Rate	2	Set Parity	5
Set Word Size	3	Set Xon/Xoff	6

Enter Request :

You can now select other options from the menu.
If there are no other changes, send "1" (Exit/Save) and the V93A will respond with:

Save Changes Permanently ? (Y/N) :

If you type "Y", the new configuration for the selected port is stored permanently in non-volatile memory until. If you type “N” the V93A will return to the main configuration menu.

NOTE: If you are configuring the V93A from the EIA-232 port, the V93A will respond with:

Change Device to NEW Configuration
Before Answering This Request.

IMPORTANT: This message reminds you to change the serial port configuration of the host device now. If they do not match, the V93A will be unable to interpret the next command. If this happens, cycle power on the M-Series DAC and reconfigure the unit.

PORT DEVICE NAME

Type “3” (in the configuration main menu) and <cr> to change the port device name. The module will respond:

Module 1 Serial Port Configuration :

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
1	Device D	9600	8	1	None	Off	Off

Enter Port Device Name (Max. 16 characters):
or ENTER for no change .....:

Enter the desired Port Device Name up to 16 characters. For example, if you type "PORT 4" followed by <cr>, the module will respond with:

Module 1 Serial Port Configuration :

Port	Device Name	Baud Rate	Word Size	Stop Bits	Parity	Xon / Xoff	
						Xmit	Recv
1	PORT 4	9600	8	1	None	Off	Off

Enter Port Device Name (Max. 16 characters):
or ENTER for no change .....:

If the Port Device Name is satisfactory, type <cr>. The V93A will return to the main configuration menu.

> **NOTE:** If the V93A Connect Port ID Echo feature is programmed for Use Device Name, the message sent to the host device when the host selects a V74/V75 peripheral port will be the Device Name shown in the menu above.

PORT SELECT CODE

Type “4” (in the configuration main menu) and <cr> to change the port select code. The module will respond:

Port Select Code is $BT

Enter Port Select Code (Max. 8 characters):
or ENTER for no change:

Type the desired Port Select Code followed by <cr>. For example, if you type #PORT followed by <cr>, the V93A will respond with:

Port Select Code is #PORT

Enter Port Select Code (Max. 8 characters):
or ENTER for no change:

If no additional change is desired, type "ENTER". The V93A will store the new Port Select Code permanently into non-volatile memory and return to the main configuration menu

.

ATTENTION CHARACTER

Type “5” (in the configuration main menu) and <cr> to change the attention character. The module will respond:

```
Attention Character is  ;
Change It ? (Y/N) :
```

Type "Y" to change the Attention Character. The V93A will respond with:

```
Enter Attention Character :
```

Type the desired Attention Character. For example, if you type "%", the V93A will respond with

```
Attention Character is  %
Change It ? (Y/N) :
```

Type "N" if no additional change is desired. The V93A will store the new Attention Character into non-volatile memory and return to the main configuration menu.

DISCONNECT TIME GUARD

Type “6” (in the configuration main menu) and <cr> to enable or disable the disconnect time guard. The module will respond:

```
Disconnect Time Guard10:28 AM is          Enabled
Change It? (Y/N):N
```

Type "Y", to toggle the existing state of Disconnect Time Guard 10:28 AM or "N" for no change. The V93A will store the selected state of the Disconnect Time Guard into non-volatile memory and return to the main configuration menu.

LOGIN PASSWORD

Type “7” (in the configuration main menu) and <cr> to change the password. The module will respond:

```
Login Password Is      BTA
Change It:  (Y/N):
```

Type “Y” to enter the new password up to 8 ASCII characters followed by <cr>. For example, if you what to change the Login Password to LOGIN, type "LOGIN" at the prompt. The V93A will respond with:

```
Enter New Password ( 1 - 8 char., CR to end):
```

If the Login Password is correct, type "N". The V93A will store the new Login Password into non-volatile memory and return to the main configuration menu.

LOCAL MODEM SETUP

Type “8” (in the configuration main menu) and <cr> to change the local modem setup. The module will respond:

```
Local Modem Setup:
Rings to Answer              1
Connectivity Time-out        2
Exit                         X
          Enter Request :
```

Type the number corresponding to your desired choice. For example, if you type “1” (Rings to Answer), the V93A will respond with:

```
Rings to Auto-Answer         1
Change It ? (Y/N) :
```

Type “Y” to change the Number Rings to Auto-Answer setting. The V93A will respond:

```
Enter Number of Rings to Auto-Answer (1 to 4) :
```

The V93A will store the Number of Rings to Auto-Answer in non-volatile memory and return to the main configuration menu.

By responding to the message in the Local Modem Setup menu with "2" Connectivity Time-out The V93A will respond with:

```
Enter Request : 2

Modem Connectivity Time-out is 5 minutes
Change It ? (Y/N) :
```

This time-out can be programmed from 5 to 255 minutes, or 0 (=disable). The timer is started when the modem goes off-hook (DCD goes high), and the modem will return to “on hook” after the time-out has expired. The factory default is 0 (disabled).

EXIT

Type “X” (in the configuration main menu) and <cr> to exit the configuration menu.

ECHO MODE

The V93A can be placed into *echo mode* by sending seven semicolons (;) in succession. While in echo mode, the V93A will echo all characters received by the connected device back to that device. Echo mode is terminated by placing an I/O module into command mode (**$BTm<cr>** where m is the desired module number. Echo Mode would be used only when the ASCII string method of port selection is used. If the Menu Mode(Attention character method) of port selection is used the Echo Mode is not required.

RING DETECT RESET

The V93A has a Ring Detect Reset feature that will automatically cycle power on the M Series unit if an incoming call is detected and not answered within seventy seconds. The Ring Detect Reset feature is enabled by connecting a straight 2-wire or 4-wire cable between the auxiliary 4-pin modular connector on the V93A and the DIAL service modem port on the M Series chassis.

MODEM LED INDICATORS

The V93A has five LEDs on the rear panel that indicate the modem status: *TD, RD*, *CD, MR*, and *CX*. These LEDs are described below.

LED	Description
TD	Transmit Data: Indicates the modem is transmitting data.
RD	Receive Data: Indicates the modem is receiving data.
CD	Carrier Detect: Indicates a valid carrier tone has been detected.
MR	Modem Ready: Indicates the modem is ready to communicate.
CX	Connection: Indicates the V93A has a connection to the main board, to a module, or to an individual channel or port.

BASE UNIT AND MODULE OPERATION

BASE UNIT USER-PROGRAMMABLE FEATURES

You can program the year, month, day, hours, minute, and second for the main unit. All modules derive their time from the base unit's time-of-day clock. You can also program the Unit Number from 1 to 30.

BASE UNIT BASIC OPERATION

The M Series base unit acts as a switch between the host control module(s) and the I/O modules. The base unit also allows configuration for the entire M Series system from the service port or service modem.

The base unit contains the system power supply (M8 & M16 only), LEDs, a service port, an optional service modem, a main unit PC board with system control firmware and time-of-day clock (optional on M3 & M4), multiple expansion slots for host control modules and I/O modules, a power LED, and a power control switch.

When the base unit is powered up, the power LED illuminates. The base unit conducts a self test during which the LEDs cycle from the lowest to the highest, stopping on the CX LED. After a brief moment, several LEDs will light to indicate the module slots that are currently occupied. These will extinguish and all LEDs will sequence from the CX LED to the lowest LED. If all modules are operating properly, all LEDs will extinguish. Any module that is not operating properly will be indicated by the light for that number module coming on and remaining on.

NOTE: The CX LED may stay on after the self-test if the service port is connected to a terminal.

Once all module LEDs are out, the unit is in operations mode and ready to accept commands and/or data. The commands consist of data commands, dynamic configuration commands, and menu-driven configuration commands. Data and dynamic configuration commands are issued by a host control module. Menu-driven configuration commands are issued by a host control module, the service port, or the service modem.

> **NOTE:** Any modules (except host modules) that are not operating properly will most likely not affect the other modules. However, the equipment being tested, switched, or monitored by the defective module will be inaccessible until the problem is resolved.

BASE UNIT DATA COMMANDS

This section addresses the data commands supported by the base unit itself. Refer to the appropriate sections for the host control module and the various I/O modules for a description of data commands supported by those M Series components. The various configuration commands supported by the base unit are described in *Section 6* (Base Unit Configuration).

The base unit supports data commands: Read Time, Reset and Echo Mode.

BASE UNIT READ TIME (RT) COMMAND

The Read Time (RT) command is used to obtain the current time and date from the base unit's time-of-day clock. A user connected to a V71 host module or a user connected to the service port or service modem can issue the Read Time command. The user must select the base unit prior to sending the Read Time command. A user selects the base unit by sending the port select code, "0", and <cr>. For example, if using the default port select code, the user would send $BT0<cr> (use $BAYTECH0<cr> with M4 and M8 DAC).

The Read Time command has the following format:

RT<cr>.

When the RT<cr> command is issued, the base unit responds with the current time and date as follows:

HH:MM:SS,MM/DD/YY,

where HH is the hour, the first MM is the minute, SS is the second, the second MM is the month, DD is the day, and YY is the year.

BASE UNIT RESET COMMAND

The Reset command is used to instruct the entire M Series system to do a software reset. The main unit conducts a self-test and the system resumes the operation mode. The Reset command has the following format:

$BTRESET<cr> ($BAYTECHRESET<cr> on M4 and M8 DAC).

This command does not affect any saved configuration parameters that have been changed from the default values.

ECHO MODE

The service modem can be set to an "echo" mode by sending five semicolons(;) in succession from the host terminal. While in echo mode, the service modem will echo back all characters received by the connected terminal. Echo mode is terminated by selecting a specific M-Series module ($BTn<cr> n= 1-16) or a specific peripheral communications port ($BTn,p<cr> n = 1 to 16 and p = 1 to 4.

BASE UNIT LED DESCRIPTION

All units are equipped with LEDs on the front panel. The green power LED indicates power is applied to the unit. The red module LEDs are used to show connection status. These LEDs are grouped into module numbers (Module 1, Module 2, ..., to Module 16) with each module number having four LEDs (1 to 4). The functionality of the LEDs for a particular module location depends on the type of module installed in that location.

When a specific port on a V74, V75 or V87 module is selected by a host module, the LED for the selected port and port 1 of the host module will illuminate. When a host module places an I/O module into command mode, the LED for port 1 of the host will illuminate. When a V74/V75/V87 I/O module is placed into configuration mode by a host module, the service port, or the service modem, all LEDs for the I/O module will illuminate. For example, if a host module selects port 1 of a V74 module, the LED for port 1 of the host module and port 1 of the V74 module will illuminate.

There are two LEDs for the service modem (if installed) and a single LED for the EIA-232 service port. An illuminated CX LED indicates the connected terminal has selected the main board or an installed module. When a connection is established between a remote modem and the service modem, the CD LED for the service modem will illuminate.

V71 OPERATION

V71 USER-PROGRAMMABLE FEATURES

User-programmable features for the V71 include the port select code and serial port configuration. These features are programmed by accessing the menu-driven configuration mode from the V71 or service port.

V71 PORT SELECT CODE

The port select code is sent as part of a select sequence by the host terminal to a V71 in order to select specific I/O modules or the main board of the M Series model to issue configuration or data commands. The port select code is a programmable ASCII character string that can range from 1 to 8 characters.
The default port select code is $BT.

V71 SERIAL PORT CONFIGURATION

The V71 translates data for devices using different serial configurations. You can set the baud rate, word size, stop bits, parity and XON/XOFF handshaking for each individual port. In addition, you can select the line interface for the V71.

The factory default serial port configuration is 9600 baud rate, 8 bit word size, 1 stop bit, no parity, XON/XOFF handshaking disabled, and EIA-232 line interface.

V71 RESET COMMAND

The entire M-Series unit can be reset by issuing a reset command to the V71. The reset command consists of the port select code ($BT - default) followed by "RESET" <cr>. For example, if using the default port select code, send $BTRESET <cr> to the V71 to reset the unit.

V71 TEST COMMAND

A host computer can verify communication with the V71 by sending the port select code ($BT - default), followed by capital "T" and Carriage Return or Line Feed. The V71 will respond with an "ACK" character (06 Hex). For example, if using the default port select code, send $BTT<cr> and the V71 will respond with "ACK" if there is communications between the host terminal and the V71.

V71 BASIC OPERATION

Once the host computer has been cabled to the V71 and the V71 configured for the desired parameters, the host computer is ready to perform data acquisition and control functions with the various I/O modules. Among the functions you can perform are configuration and data commands. Configuration commands are used to program the features of the various I/O modules and the data commands are typically used to request stored data received from an I/O module. Data commands are also used to instruct certain I/O modules to perform a specific task (e.g., energize or de-energize a relay).

Configuration is done via verbose (menu-driven) mode or non-verbose mode where a character string is sent to configure the desired I/O module. You can also configure the system clock of the M Series unit from the V71 in the verbose mode. All I/O modules can be programmed to communicate in immediate reporting mode where data is sent to the host computer as it is received.

An I/O module must be in command mode before the V71 can access the verbose (menu-driven) configuration mode for that I/O module, issue non-verbose configuration commands, or issue data commands. The main board must be in command mode to configure the system clock. An I/O module or the main board is placed into command mode by sending a select sequence to the V71 from the host computer. The select sequence consists of the port select code, the desired module number (0 to 16), and <cr>. The module number is "0" to place the M Series main board into command mode. For example, to place the fourth I/O module into command mode, send $BT4<cr> from the host computer.

After you have configured and/or issued any necessary data commands to the desired I/O module or main board, you would typically disconnect from the I/O module/main board by sending the port select code followed by <cr>.

> **NOTE:** If you attempt to place an I/O module or the main board into command mode and the I/O module/main board is currently selected by another host module or the service port, you will receive a Busy! message. You will have to wait until the other host module or service port disconnects from the desired I/O module or main board. If you attempt to connect to a module from the service port and the module is currently in command mode, you will receive the following message: Requested Module is Busy!

V72 OPERATION

PROGRAMMABLE FEATURES

IP ADDRESS

The IP Address is the network address for the V72 host module. The IP Address consists of four bytes with each byte ranging from 0 to 255 decimal. This parameter must be programmed before the V72 can be accessed on the network. The factory default IP Address is 0.0.0.0.

SUBNET MASK

The SUBNET Mask is a bit mask that identifies the network portion of the IP address, allowing the V72 to determine whether to send a packet directly to the client or to a

gateway. The Subnet Mask consists of four bytes with each byte ranging from 0 to 255 decimal. This parameter must be programmed before the V72 can be accessed on the network. The factory default Subnet Mask is 0.0.0.0.

GATEWAY

The Gateway is the address of a router for connection to other networks. The Gateway address consists of four bytes with each byte ranging from 0 to 255 decimal. The factory default Gateway address is 0.0.0.0.

SELECT CODE

The Port Select Code is sent as part of a select sequence by the host terminal to the V72 in order to select specific modules or the main board of the M-Series unit and issue configuration or data commands. The port select code is a programmable ASCII character string that can range from 1 to 8 characters. The factory default port select code is $BT.

PASSWORD

The V72 Password, if enabled, is required of all users who attempt to access the V72. The Password consists of an ASCII character string with a maximum length of 8 characters. The factory default Password is BTA.

USER INTERFACE

The user interface is a collection of items that affect the presentation or formatting of data and messages. These items are:

1) "ID Msg"----Module ID Message. This is the message which is sent when the user first connects to the module. It identifies the V72 host and the firmware revision number. This message may be prevented from being displayed by disabling this option. Default is "enabled".

2) "Login"----Login Procedure. The V72 implements an authentication procedure, requiring the user to successfully submit a password before gaining access to the module. Disabling this option eliminates the need for users to log in, granting access upon connection. Default is "enabled".

3) "IMR"----Immediate Mode Message Quick Release. This option affects immediate mode messages only. In order to optimize data

buffer utilization and minimize network data traffic, data buffers are held for up to 100 milliseconds or until full before being sent to the receiving workstation. This allows for packing of data and prevents transmission of an excessive number of packets with small amounts of data. For most applications, this aspect of operation poses no problem. But for some applications, the transmission delay may be undesirable. In the case of 4 port serial modules configured to operate in the immediate message mode (see DAC reference for V74/75 programming), the V72 may be configured to send all messages immediately upon receipt when this option is enabled. Default is "disabled".

4) "CRT"----Carriage Return Translation. Carriage return translation reconciles discrepancies between the TELNET end of line convention and other types. TELNET applications will typically place either a null (0x0) or line feed (0xa) after a carriage return. This may cause unpredictable operation if terminal devices connected to the DAC are expecting only a carriage return. By enabling this option, the V72 will strip off any null or line feed which follows a carriage return prior to sending the data on to its destination. Default is "disabled".

5) “MENU”----Menu Mode of Operation. This option allows the user to enable or disable the “MENU”/attention character mode of operation. If the “MENU” mode of operation is disabled the V72 will be in the ASCII string mode. The default setting for the V72 is the “MENU” mode of operation.

6) “BrkLen”----Programmable Break. Users may configure the V72/V72TP for a break length of 25 - 6.375 milliseconds (.025 - 6.375 seconds) in 25 millisecond increments. When a user, running a Telnet session with the V72/V72TP and connected to a serial port on a V74/V75, sends a Telnet break command (0xF4) to the V72/V72TP, the serial port will send a break signal of the programmed duration. The default setting for the Programmable Break on the V72/V72TP is 350 milliseconds.

7) “Hst Cfg”----Host Configuration. Users may configure a V72/V72TP to allow it to be configured through other host modules, rather than just through the serial port. The default setting for “Hst Cfg” (Host Configuration) is disabled.

8) "Rtel"----Reverse Telnet Operation. When users want to prevent V71, V93A, or service port users from gaining access to the network through the V72/V72TP, the reverse Telnet feature may be disabled. The default setting for "Rtel" (Reverse Telnet Operation) Is enabled.

V72 HOST CONNECTION

The V72 host module requires a physical network connection to perform data acquisition and control functions with the M-Series modules. The V72 supports 10BASE2 or 10BASE-T Ethernet connections with Ethernet II or 802.3 SNAP framing. IP version 4 is required and TCP connections may be established to the TELNET via A TELNET client or any ephemeral port (port number above 1024). The latter form of connection requires the user to develop workstation code, but allows for automated unit access and disposition of data. Use the following procedure to access the M-Series modules through the V72 host module:

1. Open a session to the V72 module using any workstation TELNET client or ephemeral You will be presented with a welcome screen (if enabled) and a login prompt (if enabled) upon successful establishment of the session similar to the following:

    M-Series V72 DAC Host
    Unit: 1 Module: 1
    F 0.28, copyright (c) 1995-1997
    Bay Technical Associates

    To login, enter password.

    Login:

NOTE: You will not get the welcome message and/or the login prompt if either one of these options are disabled in configuration mode.

2. Enter the password at the login prompt (if enabled).

3. If the login procedure is enabled, you will receive a "Login Successful" message and a prompt to enter a selection if the password is successfully entered. At this point, you may configure modules, connect to ports, receive messages, etc.. The V72 can route data from a peripheral communications module operating in Immediate Message mode or Immediate Data mode to one and only one network workstation. A network workstation must send a command to the V72 module to receive messages or data. This command consists of the port select code ($BT - default), capital "I",

and <cr>. For example, if using the default port select code, send $BTI<cr>. If a workstation issues this command and another workstation is currently receiving immediate mode data, the requesting workstation will receive the message "Immediate Mode in use".

The V72 will send the message "Command/configuration mode in use" to a workstation that attempts to access command mode of a module while another workstation is currently in command mode for that module. The requesting workstation will not be able to place a module into command mode until the other workstation either issues a disconnect command ($BT<cr>) or makes a connection to a specific peripheral communications port.

4. A host connection to the V72 is terminated by sending the port select code ($BT - default), capital "X", and <cr>. For example, if using the default port select code, send **$**BTX<cr>.

NOTE: Some workstation TELNET client packages will not terminate their side of the TCP connection when the server initiates an end to data transmission, resulting in an unwanted half open TCP connection. To avoid this situation, it is best to terminate a TELNET session from the workstation if that capability is provided with the workstation TELNET package.

REVERSE TELNET OPERATION

The V72 provides a Telnet Client which is available if the M-Series unit has a V71 serial host module or V93 modem host module installed. This service is invoked by connecting a terminal or PC running communications software to the V71 or by dialing into a V93 and entering **$**BTn,p<cr>, where $BT is the default port select code (assuming the default port select code is used), n is the module number of the V72, p is the V72 client port number (which must be between 80-95n). The V72 will respond with the following message:

V72 Host Telnet Client Service.
Enter target IP address in dotted decimal form:

Enter the IP address of the device to which you wish to connect as a series of four decimal numbers separated by periods. There is no name resolver at this time, so the user must know the IP address of the destination. When the address is correctly entered, press "<cr>". A connection progress report will be displayed similar to the following:

Connecting.....Connected

Dots will be printed to the screen at the rate of 1 per second until the connection is established, at which time the "Connected" message is displayed. Once the connection is established, the target will take control of the session and the user may operate as from any Telnet client. If the host does not respond or refuses the connection, the following message will be displayed:

Cannot connect to host.

If a Telnet connection is terminated for any reason, the following message will be displayed:

Host session terminated.

In both the preceding connection failure and termination cases, the user will be prompted again to enter a target IP address.

To terminate a Reverse Telnet session, the user may log out of the server or issue a disconnect command to the V71 or V93 (i.e., "$BT<cr>", if using the default port select code). A logout from the server will cause the TCP connection to terminate, but the client session will remain open and the user will be prompted for an IP address. Issuing a V71/V93 disconnect ("$BT<cr>") will cause the client to issue a disconnect from the server but no notice will be provided to the user as the V71/V93 - V72 connection will have been terminated. Subsequent Telnet connections will need to be obtained by opening another client session.

RESOURCE RELEASE FUNCTION

Circumstances may arise when it may be necessary to terminate a connection remotely without having to reset the unit. For example, this situation will occur if a network user does not terminate a port connection to a V74 port. Connection termination may be accomplished using the Resource Release function. There are 3 specific methods to accomplish a connection release. In addition, a fourth command can bed used to reset the unit if necessary. These functions are described below (assuming the default select code of "$BT" is used):

$BTRI<cr> Causes the Immediate Receive mode to be released.
$BTRC<cr> Causes the Command/Configuration mode to be released (except if user is connected to the Service Port).
$BTRn,p<cr> Causes the module, port as specified by "n,p" to be released.
$BTRS<cr> Causes the unit to reset after first terminating all open sessions. This may take several minutes, during which time the unit will not be accessible .

USER INTERFACE

There are two methods to select a serial I/O port (e.g., V74, V75, etc). You can either send a port selection sequence which consists of an (1) ASCII character string or send (2) the Attention Character five times (default ;;;;;) to invoke a port selection menu.

> **IMPORTANT:** If the ASCII String Method is used to select an I/O port(V74/V75), the ASCII String Method must be used for port disconnection. If the Menu mode or attention character method is used to select the port, the Menu mode or attention character method must be used for port disconnection.

MENU MODE/ATTENTION CHARACTER METHOD

The menu mode/attention character method of operation is the default mode of operation for port selection.

```
M-Series V72-TP DAC Host
Unit: 1   Module: 1
F 0.28  Copyright (c) 1995-1997
Bay Technical Associates

IP Addr:       200.4.3.190          Subnet Mask:  255.255.255.0
Gateway Addr:  200.4.3.1            Select Code:  $BT
Ethernet Addr: 00.C0.48.1A.24.5D    ID                MSG/Login:
enabled/enabled
Unit Mem (MB): 16                   IMR/CRT:      disabled/disabled
TCP Sessions:  0                    Menu/ATTN:    enable (default)
BrkLen  350 ms                      Hst Cfg/RTel  disabled/enabled
```

After the Menu Mode/Attention Character method of operation has been selected, the V72 Ethernet module users can select a serial I/O module port(e.g., V74, V75, etc.) by invoking a port selection menu. The port selection menu is invoked by sending the Attention Character (default ;;;;;) to the V72 host module five times followed by a one second delay. The V72 will respond with a menu similar to the following, if two serial I/O modules are installed in the base unit:

```
M-Series V72-TP DAC Host
Unit: 1   Module: 1
F 0.28 Copyright (c) 1995-1997
Bay Technical Associates
```

To login, enter password. (default is BTA in capital letters)

Login:
Login successful.

Attention Character: ;

Device A	(2,1	1
Device B	(2,2	CX. 2
Device C	(2,3	3
Device D	(2,4	4
Device A	(3,1	5
Device B	(3,2	6
Device C	(3,3	7
Device D	(3,4	8
Immediate Data Collection		I
Configure		C
Manual Connection		M
Unit Reset		R
Module Status		S
Logout		T

Enter Request :

The names in the left column are the same as programmed for the Serial I/O Port Device Names and the (m,n) numbers in the middle correspond to the module and port. Type the number corresponding to the desired V72 module to select that port followed by <ENTER>. Type "C" to receive the "Configuration" selection menu , "X" to exit, or "T" to logout.

Once a port is selected, you can select another port by sending the Attention character five times followed by a one second delay to invoke the port selection menu. If you type "T" to logout, the V72 will respond with the following:

< Your 'TELNET' connection has terminated>

NOTE: The "CX" in the above menu selection indicates that Device B (Module 2, Port 2) has been selected by another session hosted by the V72.

Users will see the following message when the V72 Ethernet host module wants to connect with a previously established port connection made by another host module on the M-Series DAC unit.

<Module 2, Port 1 is use by other host.>

IMMEDIATE DATA COLLECTION

By responding to the Enter Request: message at the end of the V72 menu with "I" users can receive immediate mode data. When "Immediate Data Collection" is selected, the user receives messages or data from modules configured to operate in immediate message mode or immediate data mode. Messages are sent automatically to the designated host computer, when it is received by any port on the peripheral communications module.

NOTE: Users will see the following "CX" message when another session hosted by the V72 is in the immediate data collection mode.

<Immediate Data Collection .....CX. I>

CONFIGURATION

MODULE CONFIGURATION

Configuration changes to the M-Series DAC with a V72 Ethernet module installed can be made through the V72 host module. The configuration changes can be made for all the modules installed in the M-Series DAC, except the V72(See Section 8 for V72 Configuration) or a M03 Memory Module. The V72 will respond with a menu prompting you to enter the desired module number or main board. By responding to "C" to change the configuration of a M3 DAC with a V72 installed in Module 1 and two other modules, you will see a menu similar to the following:

Enter Request: C

Configuration
Module 2 1
Module 3 2
Main Board 3
Exit X
Enter Request: 1

By responding to the Enter Request: message at the end of the configuration menu with "1" you receive the configuration menu for Module 2 that looks similar to the following:

Enter Request: 1

Copyright(C) Bay Technical Associates 1994-1996
Model 74/75 High Speed Serial 4C-232
Revision F.2.13
Unit: 1, Module: 2

Status.....1
Serial Port Configuration.....2
Port Device Name.....3
Port I.D.....4
Designate Host Port location.....5
Message Terminate Character.....6
Mode of Operation.....7
Time Tag Mode.....8
Connect Port ID Echo 9
Exit.....X

NOTE: For detailed configuration information see the M-Series DAC Owner's Manual Number U140E111-02(Section 16) or other manuals corresponding to the specific modules installed in your M-Series DAC base unit.

IMPORTANT: There should be no active connections while configuring the unit. Reset the M-Series DAC base unit after configuration

NOTE: Users will see the following "CX" message when another session hosted by the V72 is configuring a module.

<Configure .....CX. C>

MAIN BOARD CONFIGURATION

By responding to the Enter Request: message at the end of the configuration menu with "3" you receive the "Control Board System Menu" for M-Series DAC Main Board that looks similar to the following:

Enter Request: 3
Control Board System Menu
Bay Technical Associates
Copyright 1994
Revision 0.33 C718
Unit Number 001
Set Date 1
Set Time 2

Set Unit Number	3
Program Password	4
Exit System Menu	X

Enter Request:

For detailed Control Board System Menu information see the M-Series DAC Owner's Manual Number U140E111-02.

MANUAL CONNECTION

The "Manual Connection" selection for the V72 menu is used to make a module level connection which is used for sending commands to the module. The "Manual Connection" is used to make a connection to a module such as the Control Relay Module, A-to-D Module, Event Counter Module, main board, etc. Use the "Manual Connection" for module connections other than a Serial I/O module unless you want to operate a Serial I/O module in the Command Mode of operation. The "Manual Connection" selection should not be used for configuration.

By responding to the Enter Request: message at the end of the V72 menu with "M" you receive a response similar to the following:

Device A	(2,1	1
Device B	(2,2	2
Device C	(2,3	3
Device D	(2,4	4
Device A	(3,1	5
Device B	(3,2	6
Device C	(3,3	7
Device D	(3,4	8
Immediate Data Collection		I
Configure		C
Manual Connection		M
Unit Reset		R
Module Status		S
Logout		T

Enter Request: M

Enter Module number: 2

Enter Port number (<CR> for none): 3

By entering "2" at the Enter Module number and entering "3" at the Enter Port number, the user has selected module number 2 and port number 3. Verify the connection by insuring that the red LED of Port 3, Module 2 on the front panel of the M-Series DAC base unit has been selected.

UNIT RESET

Users can instruct the M-Series DAC with the V72 Ethernet module, to "reset" by using the Menu Selection Method to reset the unit. Only a user connected to the host module can issue the reset command. Users can also instruct the M-Series DAC to reset by sending the ASCII string "$BTRESET" from the service port. The Unit Reset and $BTRESET commands do not affect any saved configuration parameters that have been changed from the default values.

> **IMPORTANT:** The Unit Reset command will terminate communications with connected equipment to the M-Series DAC.

You must re-establish communications with the M-Series DAC system after the unit has been reset. The Unit Reset menu selection is found in the V72 Module Menu. This Menu is invoked by sending the Attention Character(default ;;;;;) to the V72 host module five times. The V72 will respond with a menu similar to the following, if two Serial I/O modules are installed.

By responding to the Enter Request: message at the end of the menu with "R"(Unit Reset), you will reset the M-Series unit.

```
Device A      (2,1)                1
Device B      (2,2)                2
Device C      (2,3)                3
Device D      (2,4)                4
Device A      (3,1)                5
Device B      (3,2)                6
Device C      (3,3)                7
Device D      (3,4)                8
Immediate Data Collection          I
Configure                          C
Manual Connection                  M
Unit Reset                         R
Module Status                      S
Logout                             T

Enter Request:  R
```

The M-Series DAC unit has been reset.

MODULE STATUS

By responding to the *Enter Request*: message in the V72 menu with "S" (Module Status), you can review the current module status. The V72 host module will respond with a menu that is similar to the following:

```
Device A      (2,1)          1
Device B      (2,2)          2
Device C      (2,3)          3
Device D      (2,4)          4
Device A      (3,1)          5
Device B      (3,2)          6
Device C      (3,3)          7
Device D      (3,4)          8
Immediate Data Collection    I
Configure                    C
Manual Connection            M
Unit Reset                   R
Module Status                S
Logout                       T

Enter Request: S

V72 Status & Diagnostics Menu.

System                       1
Internal Communications      2
Network Interface            3
Logged Users                 4
Exit                         X
```

SYSTEM STATUS

By responding to the Enter Request: message in the V72 Status & Diagnostics Menu with "1" (System), you can review the current system status. The V72 host module will respond with a menu that is similar to the following:

```
>1
System Status:
Available local memory (256 byte buffers): 510
System memory (M03 modules, MB): 0
Connections in use: 1
```

Pending messages (module #s): none
Immediate Mode User: none
Command/Configuration Mode User: none
System up time (days:hh:mm:ss): 2:07:43:54
<Strike any key to continue.>

INTERNAL COMMUNICATIONS

By responding to the Enter Request: message in the V72 Status & Diagnostics Menu with "2" (Internal Communications), you can review the current internal communications status. The V72 host module will respond with a menu that is similar to the following:

V72 Status & Diagnostics Menu.

System	1
Internal Communications	2
Network Interface	3
Logged Users	4
Exit	X

> 2

Internal Bus Status:
Internal Bus Errors: 0
Bus transmit data channel: clear
<Strike any key to continue.>

NETWORK INTERFACE

By responding to the Enter Request: message in the V72 Status & Diagnostics Menu with "3" (Network Interface), you can review the current Network Interface status. The V72 host module will respond with a menu that is similar to the following:

V72 Status & Diagnostics Menu.

System	1
Internal Communications	2
Network Interface	3

```
Logged Users                    4
Exit                            X

 > 3
Network Status:
Medium status: good
Medium faults: 0
Xmit bufr errs: 0
Available send buffers: 30
Receive queue status: open
<Strike any key to continue.>
```

LOGGED USERS

By responding to the Enter Request: message in the V72 Status & Diagnostics Menu with "4" (Logged Users), you can review the Logged Users into the system. The V72 host module will respond with a menu that is similar to the following:

```
V72 Status & Diagnostics Menu.

System                          1
Internal Communications         2
Network Interface               3
Logged Users                    4
Exit                            X
> 4

Active Users:
Address/Port      Internal TX/RX   Net Data Flo TX/RX      Bus Data Flo
TX/RX
1) *200.4.3.10     none/none            ok/ok
no/ok
2)  200.4.3.10     2,3/2,3              ok/ok
ok/ok
```

The star (*) indicates that Active User #1 is currently communicating with the V72 Ethernet module. By responding to the "Strike 'T'" message in the Logged Users Menu with "T" (Terminate) you will see a screen that asks "Enter number of connection to terminate". See the screen that follows:

```
<Strike "T" to terminate a session, any other key to continue.> T
```

By responding with "2" to the "terminate a session" message, the V72 will respond with a menu that is similar to the following:

```
Enter number of connection to terminate, <CR>: 2
Connection being terminated.

Active Users:

Address/Port     Internal TX/RX    Net Data Flo TX/RX    Bus Data Flo TX/RX
1) *200.4.3.10   none/none         ok/ok                 no/ok
2) -200.4.3.10   2,3/2,3           ok/ok                 ok/ok
```

The (-) before the address located at Active User number 2 indicates that the session to Active User 2 will be terminated.

```
V72 Status & Diagnostics Menu.

System                    1
Internal Communications   2
Network Interface         3
Logged Users              4
Exit                      X
```

By responding with "X" to the "Exit" message, the user will exit from the V72 Status and Diagnostics Menu

EXIT

By responding to the Enter Request: message in the V72 Status & Diagnostics Menu with "X" (Exit), you will exit the V72 Status & Diagnostics Menu. The V72 host module will respond with the following:

```
> X
```

LOGOUT

By responding to the *Enter Request*: message in the V72 Main Menu with "T" (Logout), you will terminate your TELNET connection. The V72 host module will respond with a message similar to the following:

```
Device A    (2,1)    1
Device B    (2,2)    2
```

Device C	(2,3)	3
Device D	(2,4)	4
Device A	(3,1)	5
Device B	(3,20)	6
Device C	(3,3)	7
Device D	(3,4)	8
Immediate Data Collection		I
Configure		C
Manual Connection		M
Unit Reset		R
Module Status		S
Logout		T

<Your 'TELNET' connection has been terminated>

ASCII STRING COMMAND METHOD

Serial I/O module ports(V74/V75) can also be selected by sending an ASCII character string to the V72 host module that consists of the Port Select Code (default is $BT), the desired Serial I/O module number (2 to 3 for M3 DAC), (2 to 6 for M6 DAC), (2 to 9 for M9 DAC), and (2 to 16 for the M16 DAC), the desired Serial I/O module port number (1 to 4), and <cr>.

For example, to select Port 1 of a V74 module installed as Module 2 using the default Port Select Code, send $BT2,1<cr>.

To disconnect, either select another V72 module or send the disconnect sequence. The disconnect sequence consists of the Port Select Code followed by <cr> (e.g., $BT<cr>). Once you disconnect, you can logout by typing LOGOUT<cr>.

> **NOTE:** These commands are illustrated using the default port select code ($BT).

V72 COMMAND SUMMARY	
Command	Description
$BTn,p<cr>	Request to connect to peripheral module "n" port "p". If module m is operating in full duplex mode, full duplex communication is established when connection is made. Otherwise, the connection is for output only (from V72 to the selected module/port).
$BTn<cr>	Request to connect to module "n". Upon connection, the V72 will enter command mode for the selected module and the selected module will respond to its command set. The selected module may be configured by sending "$CONFIG<cr>" after the "$BTn<cr>".
$BTI<cr>	Receive immediate mode data. This will cause the user to receive messages or data from modules configured to operate in immediate message mode or immediate data mode.
$BT<cr>	Disconnect. Terminates the current operation mode or module/port connection. Network session remains active.
$BTX<cr>	Network disconnect. Terminates the workstation session. Releases all session resources, such as modes or ports.
$BTRI<cr>	Locates the user of the Immediate Receive Mode and terminates the session if found, releasing the mode.
$BTRC<cr>	Locates the user of the Command/Configuration mode and terminates the session if found, releasing the mode.
$BTRn,p<cr>	Locates the user of n,p (module,port) and terminates the session if found, releasing the port.
$BTRS<cr>	Reset. This command is used to reset the unit.
$BTN<cr>	Entry of this command will prevent the V72 from sending advisory or error messages to the user (see Section 4.6). This command may be useful where an automated process does not wish to contend with unit messages appearing in the data stream. By default, a connection will allow these messages to be sent unless disabled by this command.
$BTM<cr>	Entry of this command will re-enable the V72 to send module advisory and error messages to the user.
$BTS<cr>	Access the V72 status diagnostics menu.
n = desired module number (1 to 16), p = desired port number (1 to 4)	

MESSAGES

The V72 generates various messages in response to certain commands/situations as described in the table below.

V72 MESSAGES	
MESSAGE	DESCRIPTION
Module "n" not installed	Issued when a user tries to connect to a peripheral module or port that was not reported as installed to the V72. Verify that correct module number was entered. Check module operation on power-up to verify normal initialization.
Module "n" not responding	Issued when a module was reported as installed, but failed to respond within 1 second to a connection request from the V72. Repeated occurrences of this message indicate a possible problem with the module. Check module operation on power-up to verify normal initialization.
Module "n" busy	Issued when a connection request is denied by a module. A connection is typically denied when a module is already supporting a connection to another user.
Module "n", port "p" busy	Issued when a port connection request is denied by a module. A connection is typically denied when a port on the module is already supporting a connection to another user.
Login successful	Issued when a user completes the login sequence successfully. Upon the receipt of this message, the user has full access to the DAC and may issue any valid V72 command.
Login failed	Issued when user enters erroneous password. Password is case sensitive and will not tolerate any backspaces or character deletes.
Immediate Mode in use	Issued when a user tries to enter immediate receive mode (by entering "$BTI<cr>") and another user is already using the resource. Immediate receive mode may only be used by one user at a time.
Command/Configuration Mode in use	Issued when a user tries to connect to a module (not a port) for command mode or configuration purposes (by entering "$BTn<cr>") and another user is already using the resource. Command/Configuration mode may only be used by one user at a time. This particular message indicates the current user is a network client.
Command/Configuration Mode in use by Service	Issued when a user tries to connect to a module and the module is in use by a user connected to the service

V72 MESSAGES	
MESSAGE	DESCRIPTION
Port. To release mode, terminate Service Port connection.	port. To free the resource, the Service Port connection must be terminated from the device connected to it.
Resource released	Issued when the user of a module or port is successfully located and the associated process is terminated. See "Resource Release Function".
Resource not released	Issued when the user of a node or port is successfully located, but the associated process could not be terminated. For example, if the user wanted to release the Command/Configuration Mode, but the current user was connected via the Service Port, the resource would not be released.
No resource user found	Issued when no open connection could be associated with the specified mode or port.
Connecting....Connected	Issued to provide status of Telnet Client connection request. Dots are issued at 1/sec until the connection is established. If the connection cannot be established because the host fails to respond, the connection request will time out in about 30 seconds.
Cannot connect to host	Issued when a host refuses to accept or fails to respond to a connection request.
Host session terminated	Issued when a connection is terminated by either the host or the client.
n = module number (1 to 16), p = port number (1 to 4)	

MODULE DIAGNOSTICS

The V72 provides two diagnostic modes to the user. The first is an LED-based diagnostic, where the module uses its LEDs to convey information about hardware or configuration errors which will prevent network access. The second is an interactive diagnostic, which provides operational information which may help a user or Bay Tech technical support personnel to diagnose the source of a problem.

LED INDICATORS

The V72 has two LED indicators on the rear panel and four LED indicators on the front panel of the base unit corresponding to the module slot where the V72 is installed (i.e., Module 1, Module 2, etc.). The two LEDs on the module rear panel are marked as LINK and RX/TX. The green LINK LED illuminates if the V72 has a good 10BASE-T connection. Failure of this LED to illuminate indicates a physical

connection problem only if twisted pair cabling is being used. The red RX/TX LED indicates network activity.

The four LED indicators on the front panel of the base unit are used for diagnostics and operation.

DIAGNOSTIC LED INDICATIONS

When the M-Series DAC unit is reset or powered up, the LEDs on the base unit will go through a scanning sequence beginning with Module 1 Port 1 and ending with the highest module number Port 4. Then a certain number of LEDs corresponding to the number of installed modules will stay on for a brief period of time. For example, if six modules are installed, the LEDs for Module 1 Ports 1 through 4 and Module 2 Ports 1 and 2 will stay on briefly. Next, the LEDs will scan down beginning with the highest module number Port 4 and ending with Module 1 Port 1. If you notice one of the LEDs corresponding to the number of installed modules stay on after the LEDs scan down, this indicates a failure with the corresponding module. For example, if the LED for Module 1 Port 2 stays on after the LEDs scan down, then Module 2 has a problem.

The V72 will give diagnostic indications approximately five seconds after completion of the reset/power-up scan. The first diagnostic indication is a hardware check. If the V72 hardware checks out, all four V72 LEDs will flash once. If a hardware failure is detected, one of the first three LEDs for the V72 module will flash continuously. If this happens, you should contact BayTech.

If the hardware check passes, the V72 will read the configuration parameters from the main board non-volatile RAM. If the V72 configuration checks out, all V72 LEDs will flash once. Therefore, if the V72 hardware and configuration checks both pass, you should notice all four LEDs on the V72 flash twice. If you notice that one of the V72 LEDs flashes continuously after the hardware check passes (i.e., after all four V72 LEDs flash once), this indicates that a configuration error has been detected. If this happens, the V72 will not respond to any network access attempts. Configuration problems can be corrected by programming the indicated parameter as follows:

V72 CONFIGURATION DIAGNOSTIC LED DESCRIPTION	
Flashing LED	Description
1	Non-volatile Memory Fault. The data stored in the non-volatile RAM for the V72's location contained an error. This causes the device in question to be programmed with default parameter information and the IP and Gateway addresses and the subnet mask will be set to 0.0.0.0. The module will need to be reconfigured and reset before it can operate. This symptom will occur when the V72 is installed into a module slot previously occupied by a different module type.
2	Ethernet Address Fault. If an error occurs in the retrieval of the module's Ethernet address, the address will be set to all 0s, an invalid address. Before the module can operate, it will need to be programmed with a proper address. This address cannot be programmed directly by the user. Contact BayTech if this LED symptom occurs.
3	IP Address Fault. When a module is first installed, it will program its IP Address to 0.0.0.0. The IP Address will need to be programmed before the module can operate.
4	Subnet Mask Fault. When a module is first installed, it will program its Subnet Mask to 0.0.0.0. The Subnet Mask will need to be programmed before the module can operate.

NOTE: When you power up the M-Series DAC with a V72 installed for the first time, the LEDs for Ports 3 and 4 for the V72 will flash continuously until you program the IP Address and Subnet Mask (see *Section 5*) and reset the unit.

OPERATIONAL MODE

When the module passes it's hardware and configuration checks, it will then enter operational mode. In operational mode, the following LED indications may be observed.

V72 OPERATION DIAGNOSTIC LED DESCRIPTION	
LED	Description
1	Active Connection. This LED will remain illuminated for about 30 seconds after the last network connection is terminated.
3	Duplicate IP addresses--another mode on the subnet has the same IP address
4 (flashing)	Cabling Error. This LED will flash continuously when a transmission attempt fails from a cable or a connection malfunction. Once this condition is detected, the module will periodically attempt to transmit on the link and this LED will flash as long as the transmission attempt fails. When the cable problem is corrected, this indication will cease with no further intervention by the user. However, connections may have been lost and will need to be checked and reconnected if necessary.

INTERACTIVE DIAGNOSTICS

The interactive diagnostic may be accessed either through the Service Port via the V72's configuration menu, choice "7" or through a TELNET session, by entering the command "$BTS"<CR>, where "$BT" is the module select code. In either case, the user will then be presented with a menu similar to:

V72 Status & Diagnostics Menu.

System	1
Internal Communications	2
Network Interface	3
Logged Users	4
Exit	X

Pressing "1" displays system status information. This includes information about the amount of local memory available for data, system memory (resident on any installed M03 modules), the number of TCP sessions active, the module numbers of any modules (V74/V75) that have messages queued to send to the user, the Immediate mode user (the IP address of the workstation collecting immediate mode data, if there is one), the Command/Configuration mode user (the IP address of the workstation using the Command or Configuration mode, if there is one), and the system up time.

Pressing "2" displays information about internal bus communications. There is a log of bus errors (since last reset) and status of the bus transmit channel.

Pressing "3" will show the status of the network communications hardware and associated parameters. Status of the network connection, a count of network errors

since last reset, transmit errors, network transmit buffer count and status of the network packet receive queue are shown.

Pressing "4" displays a list of the connections currently hosted by the module by IP address. For each session, internal module/port connections in the transmit and receive directions are shown if they exist. Also, an indication is given for whether or not a connection can send and receive data on the network and on the internal bus. TX data flow is data in the module's outbound direction, RX data flow is data in its inbound data direction. In cases where data is not being received at a destination, this screen can help determine the source of a problem. For example, if a workstation is attempting to send data to an RS-232 device connected to a V74 which has handshook its port connection, a user can identify this situation by noting that Bus Data Flo is set to "no" in the TX direction.

V74/V75/V87 OPERATION

V74/V75/V87 USER-PROGRAMMABLE FEATURES

The V74/V75/V87 can be programmed to operate in one of three reporting modes. Other programmable features include the serial port configuration and device name for each individual port, the host module location, the message terminating character, and time tag. These features are programmed by accessing the menu-driven configuration mode from the host module or service port. All features can be programmed from the front panel of units equipped with LCD and control panel.

V74/V75/V87 SERIAL PORT CONFIGURATION

The V74/V75/V87 module translates data for devices using different serial configurations. You can set the baud rate, word size, stop bits, parity and XON/XOFF handshaking for each port. Factory default configuration on serial ports is 9600 baud rate, 8 bit word size, 1 stop bit, no parity and XON/XOFF disabled.

V74/V75/V87 PORT DEVICE NAME

You can assign individual names to each port for reference while the unit is in configuration mode or port message/data identification. Factory default is Device A for Port 1, Device B for Port 2, Device C for Port 3, and Device 4 for Port 4.

V74/V75/V87 HOST MODULE LOCATION

An M Series unit can have multiple host modules installed on a single unit or multiple units. You can program the V74/V75/V87 module to send messages to any individual host module on a single unit. The host module location consists of the M Series unit

number, module number, and port number. Messages are sent only to the designated host module in immediate reporting mode. The factory default host module location is Unit 1, Module 1, Port 1.

V74/V75/V87 PORT ID

The Port ID feature allows a user to enable or disable the Port ID for individual I/O ports. When Port ID is enabled, a port identification code proceeds data sent to the host computer when using Immediate and Command Reporting modes. The Port ID can consist of the Unit Number:Module Number,Port Number corresponding to the I/O port that received the data. The Port ID can also consist of the Device Name assigned to the I/O port in the configuration mode. The factory default Port ID is enabled and has the UU:MM,PP format.

V74/V75/V87 THE MESSAGE TERMINATING CHARACTER

The message terminating character is a single character that indicates a complete message has been received in immediate and command reporting modes. Data is held in the buffer of the M Series unit until the terminating character is received from the connected peripheral device which defines a complete message. The complete message is eventually sent to the host device depending on the mode of operation. The message terminating character can be programmed to be any two-digit hexadecimal character from 00 Hex to 7F Hex. The factory default message terminating character is 0D Hex <cr>.

V74/V75/V87 MODES OF OPERATION

This section briefly describes the three programmable modes of operation. The default mode of operation is full duplex mode.

FULL DUPLEX MODE

Full duplex mode increases input/output by interfacing the host module to four peripheral devices for each module. The host system selects a specific port by sending a *port select sequence*. The host system remains connected to the selected port until another port is selected. Data received by non-selected ports are stored in a buffer until the port is selected or a clear buffer command is sent.

IMMEDIATE MESSAGE MODE

Immediate message mode provides multiplexing of all messages from all ports to the designated host module automatically. Data is buffered until an end of message terminating character is received or 256 bytes are received. The messages are sent to the host device and can be preceded by a port identification code corresponding to the unit, module, and port number or the device name of the peripheral port that sent the message.

IMMEDIATE DATA MODE

Immediate data mode is similar to immediate message mode described above. The primary difference is that immediate data mode does not wait for a message terminating character to send data to the designated host module. Data is sent to the designated host module automatically, as soon as it is received by any port on the peripheral communications module.

COMMAND MODE

Command mode provides multiplexing of single messages, all messages, or all buffered data from specified ports on request from a host computer. When a host computer sends a data command, the V74/V75/V87 sends a single message, all messages, or all buffered data from the requested port(s) through the host module. This information can be preceded by a port identification code corresponding to the unit, module, and port or the device name of the peripheral port that sent the message. Complete messages and/or buffered data are sent to the designated host device in a round-robin fashion.

TIME TAG

The module can be programmed to provide a time tag in immediate or command operation mode. A time tag provides the month, day, year, hour, minute, and second the message or block of data was recorded according to the M Series main unit's time-of-day clock. The time tag is inserted after the port identification code if enabled.

The time tag can appear in one of four formats:

1) HH:MM:SS,
2) HH:MM:SS:mmm,
3) MM/DD/YY HH:MM:SS,
4) MM/DD/YY/ HH:MM:SS mmm

where HH: is the hour, MM: is the minute, SS is the second, mmm is the millisecond, MM/ is the month, DD/ is the day, and YY is the year of the M-Series time-of-day clock.

If you type "8" from the main configuration menu of the peripheral communications module (Time Tag Mode), the module will respond with:

Current Time Tag Mode is		Disabled
Disabled	1	
Time: HH:MM:SS	2	
Time: HH:MM:SS mmm	3	
Date/Time: MM/DD/YY HH:MM:SS	4	
Date/Time: MM/DD/YY HH:MM:SS mmm	5	
Exit	X	
Enter Selection		

Type the selection corresponding to your desired choice.

V74/V75/V87 OPERATING IN THE DIFFERENT MODES

A typical application using a V74/V75/V87 module would have a host computer such as an IBM PC connected to the host module and various devices such as cash registers, digital laboratory instruments, bar code readers, numerical machines, printers, modems, terminals, etc. connected to the serial ports.

Regardless of the mode of operation, any terminal connected to a host module can connect and send data to a specific port by sending the appropriate port select sequence followed by the data. A port select sequence consists of the port select code (default is $BT), the desired unit number followed by a colon (1: to 30: - only if using cascaded units), the desired module number (2 to 16), a comma, the desired port number (1 to 4), and a terminating character (0A Hex - *Carriage Return*). The port select sequence is not passed through to the selected port.

> **NOTE:** When the host computer/controller selects an EIA-485 port on a V87 module, all characters sent to the peripheral device are echoed back to the host device.

Full duplex reporting mode provides bidirectional communication between the host computer and the selected peripheral device. Data received by non-selected peripheral ports is buffered until selected by the host computer.

Immediate message mode provides automatic message multiplexing. A message begins when a port on the module receives a character from the device connected to it. A message is completed when the message terminating character is received or 2048 characters have been received without a terminating character.

Immediate data mode is similar to immediate message mode. The primary difference is that immediate data mode does not wait for a message terminating character to send data to the designated host module. Data is sent to the designated host module

automatically as soon as it is received by any port on the peripheral communications module.

Command reporting mode allows the host computer to send commands requesting messages or buffered data from the ports

Each message or data block sent to the host computer in immediate or command mode can be preceded by a port identification code consisting of either the unit number, a colon, the module number, a comma, and the port number or the device name of the port that received the message. In numeric form, the Port ID can range from 01:01,1 (for Unit 1, Module 1, Port 1) to 30:16,4 (for Unit 30, Module 16, Port 4). If time tag is enabled, the month, day, year, hour, minute, and second the message or block of data was recorded are sent in addition to the port identification code.

There are six commands supported by the serial port modules. Two of these commands can be issued regardless of the operation mode. These are the $CONFIG<cr> and CBn<cr> commands. The $CONFIG<cr> command instructs the module to go into configuration mode.

The CBn<cr> command clears the buffer of Port n (n = 1 to 4 or 0 for all ports). You must select the 4-port serial module from the host module in order to issue the clear buffer command. This is done by sending the port select code, the appropriate unit number followed by a colon (1: to 30: - only if using cascaded units), the module number (2 to 16), and <cr>. You can issue the clear buffer command for multiple ports by separating the port numbers with a comma. For example, to clear the receive buffer for Ports 1 through 3 of the selected module, send CB1,2,3<cr>. The other four supported commands can be issued in command reporting mode only.

OPERATING IN FULL DUPLEX MODE

In full duplex mode, the V74/V75/V87 module provides full duplex communication between the host module and the selected port. The host module and the selected port remains connected until a different port is selected or until the host module disconnects from the module by sending the port select code followed by <cr>. Data received by non-selected peripheral devices is stored in the buffer and sent to the host device when the port is selected. The serial port module does not start loading data from the new port into the host module until the new module number, port number and terminating character are received.

> **NOTE**: The port select sequence has a ten second timer. The timer starts when the first character of the port select sequence is received. Any incomplete sequence received ten seconds or more after the first character

has been received is treated as normal data and is sent to the current selected port.

OPERATING IN IMMEDIATE MESSAGE MODE

Immediate message mode provides automatic message multiplexing between the designated host module and all ports on the V74/V75/V87 module. Messages are sent automatically to the designated host computer in a round-robin fashion a message at a time. For example, if two V74 modules installed as Module 2 and Module 3 are sending messages from all ports to the same designated host module, a message from Module 2 Port 1 is sent to the designated host module followed by a message from Module 3 Port 1 followed by a message from Module 2 Port 2 followed by a message from Module 3 Port 2, and so on.

> **NOTE**: The designated host computer can select and transmit data to any serial port while simultaneously receiving messages from all ports. A terminal connected to a non-designated host module can select and send data to any port. However, messages are sent to the designated host terminal only. If a connection exists between a host module and the desired port, the requesting host module is sent a busy message.

If a designated host module is currently receiving messages and the host computer selects a port on a V74/V75/V87 operating in immediate or command mode, the messages continue to be sent to the host computer. If the host computer selects a port on a module operating in full duplex mode while receiving messages, the messages stop until the host computer disconnects. If the host computer selects a module operating in command mode while receiving messages, messages continue to be sent until the host issues a data command (not CBn<cr>). The messages do not resume until the host disconnects from the module.

The host module can make a full duplex connection to a serial port when the peripheral module is operating in full duplex, immediate message, or immediate data mode by sending the port select code, the peripheral module number, a comma, the peripheral port number, Capital "F", and <cr>.

For example, if the default port select code is used ($BT) and the peripheral module is installed as Module 2, peripheral port 1 is selected for full duplex communication by sending $BT2,F<cr>.

The host module remains in full duplex communication with Module 2, Port 1, until a disconnect is sent ($BT<cr>) or a different port is selected. When a disconnect command is sent, the peripheral module reverts back to the previous mode of operation.

OPERATING IN IMMEDIATE DATA MODE

Immediate data mode is similar to immediate mode. The primary difference is that the immediate data mode does not wait for a message terminating character to send data to the designated host module. Data is sent to the designated host module automatically as soon as it is received by any port on the peripheral communications module.

If you type "7" from the main configuration menu of a peripheral communications module (Set Mode of Operation), the module will respond with the following menu:

```
MODE OF OPERATION
Full Duplex Mode          1
Immediate Message Mode                2
Command Mode                          3
Immediate Data Mode       4

Current Mode of Operation is    Full Duplex
Enter Mode of Operation 1-4 :
```

Type "4" from this menu to select immediate data mode.

> **NOTE**: If immediate data mode is selected, the time tag will not be appended to the data if Time Tagging is enabled.

OPERATING IN COMMAND MODE

Command mode provides multiplexing to a host module of messages or buffered data from individual ports or all ports upon request from the host computer via data commands. The host computer can request single messages, all messages, or all current buffered data for individual ports. V74/V75/V87 data commands are sent through a host module using the following procedure:

1. Select the 4-port serial module from the host module by sending the port select code ($BT - default), the appropriate Unit Number followed by a colon (1: to 30: - only if using cascaded units), the desired module number (2 to 16), and <cr>. For example, to select a V74 installed on a non-cascaded unit as Module 2 using the default port select code, send $BT2<cr>.

2. Once the 4-port serial module is selected, it is placed into command mode and allows you to send data commands. Data commands consist of two capital letters designating the specific command, the desired port number(s), and <cr>. If you have a requirement to send the same command to multiple channels simultaneously, you

can use one of the following formats as shown for the CBn<cr> (clear buffer) command:

CB1,2,3,4,5,6,7,8<cr>	Clear the buffer for Ports 1-8
CB0<cr>	Clear the buffer for Ports 1-8
CB1,2,4,5<cr>	Clear the buffer for Ports 1, 2, 4, and 5

CLEAR BUFFER (CB) COMMAND

The Clear Buffer (CB) command deletes all present messages or data in the buffer for the specified port(s) in any of the reporting modes. This command has the following format: CB*n*<cr> where *n* is the desired port number (1 to 4 or 0 for all).

REPORT ALL BUFFERED MESSAGES (RA) COMMAND

The Report All Buffered Messages (RA) command instructs the module to send all messages currently stored in the buffer for the specified port(s) starting with the lowest numbered port. This command has the following format: RA*n*<cr> where *n* is the desired port number (1 to 4 or 0 for all). If there are no messages, the module responds with <cr>.

> **NOTE**: If you issue an RA command and start receiving messages, the module ignores subsequent RA commands until all messages from the current port(s) have been sent to the requesting host module or the Stop Report (SR) command is received.

REPORT ALL BUFFERED DATA (RB) COMMAND

The Report All Buffered Data (RB) command instructs the module to send all data currently stored in the buffer for the specified port(s) whether or not it is a "message". Data from the lowest numbered port specified is sent first. This command has the following format: RB*n*<cr> where *n* is the desired port number (1 to 4 or 0 for all). If there is no data in the buffer for the specified port(s), the module responds with <cr>.

REPORT SINGLE MESSAGE (RS) COMMAND

The Report Single Message (RS) command instructs the V74/V75/V87 module to send a single message currently stored in the buffer of the specified port(s). The

message sent is the oldest message in the buffer. This command has the following format: RS*n*<cr> where *n* is the desired port number (1 to 4 or 0 for all). If there are no messages in the buffer for the specified port(s), the module responds with <cr>.

STOP REPORT (SR) COMMAND

The Stop Report (SR) command instructs the V74/V75/V87 module to stop sending messages or data after an RA or RB command has been issued. You can instruct the module to resume sending messages or data by issuing the desired request for messages or data command (RA, RB, or RS). This command has the following format:

SR*n*<cr> where *n* is the desired port number (1 to 4 or 0 for all).

PORT ID STATUS (ID) COMMAND

The Port ID Status (ID) command instructs the V74/V75/V87 to report its current Port ID status for the selected module. This command has the following format: ID<cr>. When a user sends the ID command, a status message similar to the following is sent:

```
Unit 01, Module 02 Port I.D
Port 1=01:02,1
Port 2=01:02,2
Port 3=01:02,3
Port 4=01:02,4
```

This message is sent for an I/O module installed in Unit 1 as Module 2 using the default Port ID settings.

BROADCAST MODE

The 4-port peripheral communications modules (e.g., V74) supports a "broadcast" mode where any data received by the host module is sent out all four ports of the selected module(s) simultaneously. A 4-port serial module is placed into broadcast mode by sending the port select code (default - $BT), capital "B", the desired module number(s), and <cr> to the host module. To place all peripheral communications modules into broadcast mode, send $BTB<cr>.

If you wish to place multiple 4-port serial modules into broadcast mode, each module number should be separated by a comma. For example, to place three V74 modules installed as Module 2, Module 3, and Module 4 into broadcast mode using the default port select code, send the command $BTB2,3,4<cr> to the host module. The 4-port serial module remains in broadcast mode until the host module issues a disconnect command consisting of the port select code followed by <cr> (e.g., $BT<cr>).

If a peripheral communications module is configured to operate in immediate reporting mode and the destination host module places that module into broadcast mode, the destination host module can receive data or messages from the peripheral ports while simultaneously broadcasting data out to the ports.

While in broadcast mode, other host modules can connect to the I/O module(s) and issue data commands if the module(s) are in command reporting mode. The clear buffer command can be issued to any 4-port serial module in broadcast mode by another host module regardless of the programmed reporting mode.

DATA/MESSAGE PRESENTATION

Data presentation varies slightly in format depending on the reporting mode you are using. In full duplex mode, data is presented to the host computer and selected peripheral exactly as it is transmitted and/or received (i.e., the V74/V75/V87 module does not add any extra characters).

In immediate reporting mode, messages are sent to the designated host computer with an optional port identification code preceding the actual message. For example, suppose the 4-port serial module is installed in Unit 1 as Module 2, Port ID is enabled, <cr> is the programmed message terminate character, and time tag is enabled. The 4-port serial module sends complete messages to the designated host computer which appears similar to the following:

01:02,1 06/16/98 15:55:30 MESSAGE FROM PORT 1<cr>
01:02,2 06/16/98 15:55:30 MESSAGE FROM PORT 2<cr>
01:02,3 06/16/984 15:55:30 MESSAGE FROM PORT 3<cr>
01:02,4 06/16/98 15:55:30 MESSAGE FROM PORT 4<cr>

where 01:02,x represents Unit 1/Module 2/Port x, 06/16/94 15:55:30 is the time tag indicating that the message was recorded on June 16, 1998 at 3:55:30 pm, and MESSAGE FROM PORT x<cr> is the actual message (x = 1 to 4). If you are in command reporting mode and request a single message or all messages from Port x, you will receive a single message or all messages that appear in a format similar to that shown above. The Port ID can also consist of the device name of the port.

If you are operating in command reporting mode and issue the RBn<cr> command, the I/O module sends all buffered data from the requested port(s) with each data block preceded by the Unit#:Module#,Port# or device name. Only data buffered at the time the RBn<cr> command is issued is sent to the host computer. Data received after the RBn<cr> command has been issued is buffered and requires another command to be sent to the host computer.

V77 OPERATION

GENERAL

The V77 ADM-1 may be operated as 8 differential or 16 single ended input channels. The input source is an analog voltage signal which is sampled and digitized into a data message. The data message is sent to a host communication module automatically or upon request. The host communication module is the primary user interface to the V77 ADM-1 which allows a host computer or terminal to change configuration or transmit data commands and receive data messages.

Each data message may be presented in a hexadecimal, decimal, or voltage format and will be preceded by the unit/module/channel number from which the data message came. The data message may be optionally appended with a "real time" Time Tag showing the date and time the data message was recorded. Data resolution is 12 bits.

Data commands are used to instruct the V77 ADM-1 to perform various tasks that pertain to data acquisition. These include calibration, buffer clearing, report a single data message or all data messages in the receive buffer, and sample/report a single data message on demand.

You have the choice of programming the V77 ADM-1 via verbose (menu-driven) or non-verbose (dynamic) configuration mode. When using verbose configuration mode, a series of menus will prompt you to enter the desired configuration parameters. Non-verbose or dynamic configuration mode allows you to program certain parameters of the V77 ADM-1 by downloading configuration commands.

USER-PROGRAMMABLE FEATURES

You may program the Sampling Setup, Reporting Setup, Channel Input Setup, and enable/disable Dynamic Configuration on the V77 ADM-1.

SAMPLING SETUP

Sampling Setup allows you to program how the V77 ADM-1 takes samples of the analog input voltage signals. The items you may program in the Sampling Setup include Sampling Method, Sample Start Time, Sample Interval, Sample Rate, and Number of Samples to Average.

SAMPLING METHOD

Sampling Method is the manner in which sampling is initiated. The V77 ADM-1 provides three Sampling Methods. These are Command (upon request via data commands only), Immediate (upon exiting configuration), and Schedule (where sampling begins at a specified time). The default Sampling Method is Command.

SAMPLE START TIME

Sample Start Time is the time sampling begins when Schedule Sampling Method is selected. The start of sampling may be delayed up to twenty-four hours from the current time recorded by the M Series time-of-day clock. The default Sample Start Time is 00:00.

SAMPLE INTERVAL

You may program the V77 ADM-1 to sample continuously or in repetitive periods where the V77 ADM-1 will sample for a certain period of time, stop sampling, and then resume sampling after a specified time interval. Sample Interval is the time between the start of sampling periods. The duration of a sampling period is determined by the Sampling Rate and the Number of Samples to average. Continuous sampling is selected by choosing no Sample Interval. The default Sample Interval is 00:00:00 (continuous sampling).

SAMPLE RATE

Sample Rate is the actual number of samples an V77 ADM-1 channel will read in one second. Sample Rate may range from 1 to 4000 samples per second (S/sec). The sample rate for an individual channel is the programmed rate divided by the number of active channels.
The default Sample Rate is 1 S/sec.

NUMBER OF SAMPLES TO AVERAGE

The Number of Samples to Average is the number of samples averaged per data message. The V77 ADM-1 will sample at a certain Sampling Rate and average a specified number of samples. This average will then be quantized into a discrete digital value and sent to a host module as a data message upon request or automatically depending on the Reporting Method. The Number of Samples to Average may range from 1 to 4000 samples. The default Number of Samples to Average is 10 samples.

REPORTING SETUP

Reporting Setup allows you to program how the V77 ADM-1 reports data messages to the host module. The items you may program in the Reporting Setup include Reporting Method, Report Start Time, Report Interval, Set Host Address, Data Format, Time Tag, and Terminating Character(s).

REPORTING METHOD

Reporting Method is the manner in which data messages are sent to the designated host module. The V77 ADM-1 provides three Reporting Methods. These are Command (upon request via data commands), Immediate (upon exiting configuration), and Schedule (where reporting begins at a specified time). The default Reporting Method is Command.

REPORT START TIME

Report Start Time is the time reporting begins when Schedule Reporting Method is selected. The start of reporting may be delayed up to 24 hours from the current time recorded by the M Series time-of-day clock and reporting will occur in cyclic periods as determined by the Report Interval. The default Report Start Time is 00:00.

REPORT INTERVAL

You may program the V77 ADM-1 to report in repetitive periods using Schedule Reporting Method, where the V77 ADM-1 will report all data messages in the receive buffer after the specified Report Interval has elapsed. The V77 ADM-1 will report until the buffer is empty and then report again after the specified Report Interval has expired. The default Report Interval is 00:00 (every 24 hours).

HOST ADDRESS

Host Address is the designated host module where data messages are sent when using Immediate or Schedule Reporting Method. The Host Address consists of the Unit Number (1 to 32), Module Number (1 to 16), and Port Number (1 to 4) of the designated host module. The default Host Address is Unit 1, Module 1, Port 1.

DATA FORMAT

Data Format is the format of the data messages sent to the designated host module which may be in Hexadecimal, Decimal, or Engineering Units. When Hexadecimal Data Format is selected, the data message will appear as a hexadecimal value between 000 Hex (low range) and FFF Hex (high range). When Decimal Data Format is selected, the data message will appear as a decimal value between 0 (low range) and 4095 (high range). When Engineering Units Data Format is selected, the data

message will appear as the actual sampled voltage. The default Data Format is Hexadecimal.

TIME TAG

When Time Tag is enabled, a time tag is appended immediately after the data. The time tag consists of the month, day, year, hour, minute, and second at which the data was calculated. Time Tag may be enabled or disabled. The default Time Tag is disabled.

TERMINATING CHARACTER(S)

The Terminating Character(s) is added at the end of a complete data message to match the requirements of the host terminal or application software. The Terminating Character(s) consists of one or two hexadecimal characters. The default Terminating Characters are 0D Hex (cr) followed by 0A Hex (lf).

CHANNEL INPUT SETUP

Channel Input Setup allows you to program the various measurement features of the V77 ADM-1 inputs. The items you may program in the Channel Input Setup include Range, Unipolar/Bipolar, Single Ended/Differential, and Active Channels.

RANGE

Range is the desired working voltage range of the channel inputs. You may choose one of nine different voltage ranges. The voltage range depends on the Unipolar/Bipolar voltage input polarity setting. The unipolar voltage ranges are: 0 to +10 volts, 0 to +5 volts, 0 to +2.5 volts, and 0 to +1.25 volts. The bipolar voltage ranges are -10 to +10 volts with jumper JP1 installed, -5 to +5 volts, -2.5 to +2.5 volts, -1.25 to +1.25 volts, and -0.625 to +0.625 volts. The default Range is 0 to +10 volts.

UNIPOLAR/BIPOLAR

The Unipolar/Bipolar setting is used in conjunction with the Range to establish the desired input voltage range. A Unipolar setting allows an input to range from 0 to +X volts and a bipolar setting allows an input to range from -X to +X volts where X is the selected voltage range. The default Unipolar/Bipolar setting is Unipolar.

SINGLE ENDED/DIFFERENTIAL

The Single Ended/Differential selection provides selection of single-ended or differential operation. Single Ended mode allows 16 active channels and Differential mode allows 8 active channels. The default Single Ended/Differential setting is Single Ended mode.

ACTIVE CHANNELS

The Active Channels selection is used to enable individual input channels on the V77 ADM-1 for data acquisition. Single Ended mode allows up to 16 active channels and Differential mode allows up to 8 active channels. The default Active Channels setting has Channel 1 active and all other channels inactive.

DYNAMIC CONFIGURATION

You may enable or disable Dynamic Configuration for the V77 ADM-1. Dynamic configuration mode allows non-verbose or "on-the-fly" configuration commands to be issued to the V77 ADM-1. The default Dynamic Configuration setting is disabled.

DATA COMMANDS

You may issue V77 ADM-1 data commands through a host module to perform single operations while temporarily overriding the module's current operating configuration. Some data commands apply to all types of DAC modules, while others apply to specific modules. Data commands may be entered repeatedly to get specific data messages or to direct the V77 ADM-1's actions. You may issue a single data command for action on multiple channels. Data commands must be used to obtain data when using Command Reporting Method. V77 ADM-1 data commands are sent through a host module using the following procedure:

1. Select the V77 ADM-1 from the host module by sending a select sequence which consists of the port select code ($BT - default), the appropriate unit number followed by a colon (01: to 30: - for cascaded units only), the desired module number (2 to 16), and a terminating character for <cr> (0D Hex). For example, to select an V77 ADM-1 Module installed as Module 15 in a non-cascaded unit using the default port select code, send **$BT15<cr>**.

2. Once the V77 ADM-1 is selected, it enters Command Mode and allows you to send data commands. The V77 ADM-1 data commands begin with two capital letters designating the specific command and are terminated with <cr>. Most data commands also require a number

between the command letters and <cr>. This number is typically the desired input channel(s) for the data command. If you have a requirement to send the data command to multiple channels simultaneously, you may use one of the following formats as shown for the SA (sample) command:

SA1,2,3,4,5,6,7,8<cr>	Take a single sample for Ports 1-8
SA1-8<cr>	Take a single sample for Ports 1-8
SA0<cr>	Take a single sample for Ports 1-8
SA1,2,4-8<cr>	Take a single sample for Ports 1, 3, 4, 5, 6, 7, and 8

3. After you have sent the desired data command(s) to the V77 ADM-1 module, you may disconnect by sending **$BT<cr>**. You may disconnect from the V77 ADM-1 and select a different module or the base unit by sending **$BTn<cr>**.

IMPORTANT: If the V77 ADM-1 is operating in self reporting mode (i.e., Immediate or Schedule Reporting Method) and a host device issues a data command, the host system must disconnect by sending the Port Select Code and *<cr>* before the V77 ADM-1 will resume sending data messages to the designated host module.

CALIBRATE COMMAND

The Calibrate (CA) command initiates auto-calibration. When this command is sent, the V77 ADM-1 tests for offsets and automatically generates a correction value to remove any that are observed. These offset corrections are applied to all A/D values from 0 to 100 % of Full Scale (FS). Corrections are continually applied to all reported data messages until another Calibrate command is issued. At that time, a new calibration is performed and any resulting corrections applied to future readings. The Calibrate command has the following format:

CA*n*<*cr*>

where *n*=0 to 3 (0 = all, 1 = 25%, 2 = 50%, and 3 = 75% of FS).

CLEAR BUFFER COMMAND

The Clear Buffer (CB) command is useful to clear all old data from the FIFO buffer when a new data set is started. If the buffer is not cleared, previous data samples remain in the buffer until overwritten. The Clear Buffer command has the following format:

CB*n*<*cr*>

where *n* = Channel# (1 to 16 or 0 for all).

REPORT ALL BUFFERED SAMPLES COMMAND

The Report All Buffered Samples (RA) command instructs the V77 ADM-1 to report all samples currently stored in the buffer of the selected channel(s). The Report All Buffered Samples command has the following format:

RA*n*<*cr*>

where n = Channel# (1 to 16 or 0 for all).

REPORT A SINGLE BUFFERED SAMPLE COMMAND

The Report A Single Buffered Sample (RS) command instructs the V77 ADM-1 to report the first sample stored in the buffer of the selected channel(s). The Report A Single Buffer Sample command has the following format:

RS*n*<cr>

where n = Channel# (1 to 16 or 0 for all).

SAMPLE COMMAND

The Sample (SA) command instructs the V77 ADM-1 to read and report a single data message for each channel specified. When using Command Reporting Method, the data message is made from the programmed No. of Samples to Average taken at the programmed Sample Rate. When using Immediate or Schedule Reporting Method, the data message is made from the programmed No. of Samples to Average taken at a burst sampling rate. For example, if the Sample command is sent and the present No. of Samples to Average is 400, the data message reported is 400 samples taken at the burst sample rate, averaged, then reported. The Sample command has the following format:

SA*n*<cr>

where *n* = Channel# (1 to 16 or 0 for all).

DATA MESSAGE GENERATION

The V77 ADM-1 generates digital data messages by taking samples of the analog input voltage(s) at a specified sampling rate. The V77 ADM-1 computes an average value of these samples and presents this average to the host device in the form of a data message. The number of samples taken per data message is determined by the Number of Samples to Average. The V77 ADM-1 will sample analog inputs in one of three ways: Command (via command only), Immediate, and Schedule. A host module may request a data message on command using any of these Sampling Methods. Immediate Sampling Method provides continuous or repetitive interval sampling. Schedule Sampling Method is basically the same as Immediate except sampling begins at a specified Sample Start Time.

If a Sample Interval is used, the V77 ADM-1 will sample the input(s) in repetitive intervals. The Sample Interval is the time between the start of sample periods. A sample period is the time the V77 ADM-1 actually samples between each Sample Interval. The sample period is computed by dividing the Sampling Rate by the Number of Samples to Average. For example, suppose every 10 minutes you desire to sample at a 60 S/sec rate and average 720 samples. The V77 ADM-1 acquires 720 samples in 12 seconds (720/60), buffers the data, then waits 9 minutes and 48 seconds before taking another 720 samples. If the Reporting Period is set to 10 minutes, the data collected during the most recent Sample Interval is reported.

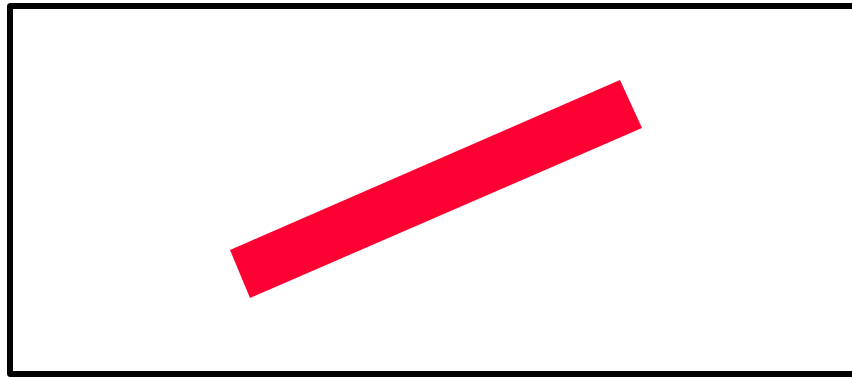


Figure 3: Sample Interval

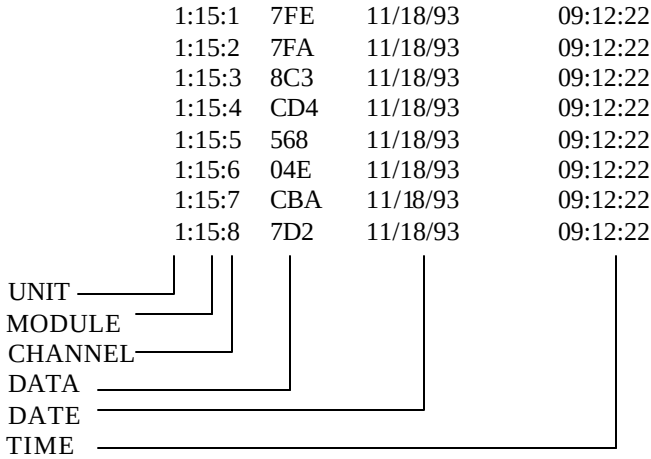
DATA MESSAGE PRESENTATION

Data message presentation varies slightly in format depending on module configuration. Entries such as, time tag, data format, number of active channels, etc. all change how data messages appear to a host-controller. However, all data messages are presented in the same basic order of fields as follows:

UU:MM,CC HHH or **DDDD** or **VV MM/DD/YY HH:MM:SS**

where, **UU** is the M Series Unit Number
MM is the V77 ADM-1 Module Number
CC is the V77 ADM-1 Channel Number
HHH is a Hex value ranging from 000 to FFF
DDDD is a Decimal value ranging from 0 to 4095
VV is an Engineering unit ranging from -10 to +10 volts
MM is the month (if Time Tag enabled)
DD is the day (if Time Tag enabled)
YY is the year (if Time Tag enabled)
HH is the hour (if Time Tag enabled)
MM is the minute (if Time Tag enabled)
SS is the second (if Time Tag enabled)

EXAMPLE: A complete data message from an V77 ADM-1 installed as Unit 1, Module 15 with Channels 1-8 active using Hex Data Format and having Time Tag enabled, would appear as follows:



Data messages requested through the use of Data Commands might include the messages from one or more channels.

V78 OPERATION

GENERAL

The main feature of the V78 CRM-1 is eight (8) fully programmable, electromechanical, form-C, single-pole-double-throw (SPDT) relays. Each relay has a

set of normally open (NO) and normally closed (NC) contacts and is capable of switching AC and DC loads up to 3 amps. The V78 CRM-1 employs electromechanical relays having zero current leakage and can be used to switch very low-current loads. All relays may change state on demand via data commands or time schedule.

Individual relay status may be presented to a host system automatically or upon request. The relay status may be the current state or change-in-state history of a specific relay. Data associated with the relay status which is generated by the V78 CRM-1 and sent to the host system will be referred to as a data message. Data messages consist of the actual relay status (energized or de-energized) preceded by the appropriate unit/module/relay number and may include a Time Tag showing the date and time the relay status was recorded. Data messages are supplied to the host system upon request, at a specific time, or as events occur. An *event* is the change-in-state of a relay.

You have the choice of programming the V78 CRM-1 via verbose (menu-driven) or non-verbose (dynamic) configuration mode. When using verbose configuration mode, a series of menus will prompt you to enter the desired configuration parameters. Non-verbose or dynamic configuration mode allows you to program certain parameters of the V78 CRM-1 by downloading configuration. You may review the current V78 CRM-1 configuration status from the control panel.

USER-PROGRAMMABLE FEATURES

You may program the Relay Operating Setup, Reporting Setup, and Dynamic Configuration on the V78 CRM-1.

RELAY OPERATING SETUP

Relay Operating Setup allows you to program the V78 CRM-1 relay time schedule. You may view the current relay schedule, create and/or modify the current schedule, enable or disable individual events, and delete individual events. The default relay schedule is null (no schedule).

REPORTING SETUP

Reporting Setup allows you to program how the V78 CRM-1 reports data messages to the host module. The items you may program in the Reporting Setup include Reporting Method, Report Start Time, Report Interval, Set Host Address, Time Tag, and Terminating Character(s).

REPORTING METHOD

Reporting Method is the manner in which data messages are sent to a designated host computer/controller. The V78 CRM-1 provides three Reporting Methods. These are Command (upon request via data commands), Immediate (upon exiting configuration), and Schedule (where reporting begins at a specified time). The default Reporting Method is Command.

REPORT START TIME

Report Start Time is the time reporting begins when Schedule Reporting Method is selected. The start of reporting may be delayed up to 24 hours from the current time recorded by the M Series time-of-day clock and reporting will occur in cyclic periods as determined by the Report Interval. The default Report Start Time is 00:00.

REPORT INTERVAL

You may program the V78 CRM-1 to report in repetitive periods using Schedule Reporting Method, where the V78 CRM-1 will report all event data messages in the receive buffer after the specified Report Interval has elapsed. The V78 CRM-1 will report until the buffer is empty and then report again after the specified Report Interval has expired. The default Report Interval is 00:00 (every 24 hours).

HOST ADDRESS

Host Address is the designated host module where event data messages are sent when using Immediate or Schedule Reporting Method. The Host Address consists of the Unit Number (1 to 32), Module Number (1 to 16), and Port Number (1 to 4) of the designated host module. The default Host Address is Unit 1, Module 1, Port 1.

TIME TAG

When Time Tag is enabled, a time tag is included in each data message which is appended immediately after the actual relay status. The time tag consists of the month, day, year, hour, minute, and second at which the data was calculated. Time Tag may be enabled or disabled. The default Time Tag is disabled.

TERMINATING CHARACTER(S)

The Terminating Character(s) is added at the end of a complete data message to match the requirements of the host terminal or application software. The Terminating Character(s) consists of one or two hexadecimal characters. The default Terminating Characters are 0D Hex <cr> followed by 0A Hex <lf>.

DYNAMIC CONFIGURATION

You may enable or disable Dynamic Configuration for the V78 CRM-1. Dynamic configuration mode allows non-verbose or "on-the-fly" configuration commands to be issued to the V78 CRM-1. The default Dynamic Configuration setting is disabled.

DATA COMMANDS

You may issue V78 CRM-1 data commands through a host module to perform single operations while temporarily overriding the module's current operating configuration. Some data commands apply to all types of DAC modules, while others apply to specific modules. Data commands may be entered repeatedly to get specific data messages or to direct the V78 CRM-1's actions. You may issue a single data command for action on multiple relays. Data commands must be used to obtain data messages when using Command Reporting Method.

V78 CRM-1 data commands are sent through a host module using the following procedure:

1. Select the V78 CRM-1 from the host module by sending a select sequence which consists of the port select code ($BT - default), the appropriate unit number followed by a colon (01: to 30: for cascaded units only), the desired module number (2 to 16), and <cr> (0D Hex). For example, to select a V78 CRM-1 installed as Module 15 in a non-cascaded unit using the default port select code, send **$BT15<cr>**.

2. Once the V78 CRM-1 is selected, it will go into Command Mode and allow you to send data commands. The V78 CRM-1 data commands begin with two capital letters designating the specific command and are terminated with a <cr>. Most data commands also require a number between the command letters and <cr>. This number is typically the desired relay(s) for the data command. If you have a requirement to send the data command to multiple relays simultaneously, you may use one of the following formats as shown for the SA (sample) command:

SA1,2,3,4,5,6,7,8<cr>	Take a single sample for Ports 1-8
SA1-8<cr>	Take a single sample for Ports 1-8
SAØ<cr>	Take a single sample for Ports 1-8

SA1,2,4-8<cr>	Take a single sample for Ports 1, 3, 4, 5, 6, 7, and 8

3. After you have sent the desired data commands to the V78 CRM-1 module, you may disconnect by sending **$BT<cr>**. You may disconnect from the V78 CRM-1 and select a different module or the base unit by sending **$BTn<cr.**

IMPORTANT: If the V78 CRM-1 is operating in self reporting mode (i.e., Immediate or Schedule Reporting Method) and a host computer/controller issues a data command, the host system must disconnect by sending the Port Select Code and <cr> before the V78 CRM-1 will resume sending data messages to the designated host module.

CLEAR BUFFER COMMAND

The Clear Buffer (CB) command is used to clear stored data messages from the buffer of the selected relay(s). The Clear Buffer command has the following format:

CB*n*<*cr*>

where *n* = Relay# (1 to 8 or 0 for all).

REPORT ALL BUFFERED DATA MESSAGES COMMAND

The Report All Buffered Data Messages (RA) command instructs the V78 CRM-1 to report all data messages currently stored in the buffer of the selected relay(s). The Report All Buffered Data Messages command has the following format:

RA*n*<*cr*>

where n = Relay# (1 to 8 or 0 for all).

REPORT A SINGLE BUFFERED DATA MESSAGE COMMAND

The Report A Single Buffered Data Message (RS) command instructs the V78 CRM-1 to report the first data message stored in the buffer of the selected relay(s). The Report A Single Buffer Sample command has the following format:

RS*n*<cr>

where n = Relay# (1 to 8 or 0 for all).

SAMPLE COMMAND

The Sample (SA) command instructs the V78 CRM-1 to read and report a the open or closed status for each relay specified. The Sample command has the following format:

SA*n*<cr>

where *n* = Relay# (1 to 8 or 0 for all).

DE-ENERGIZE RELAY COMMAND

The De-energize Relay (DR) command instructs the V78 CRM-1 to de-energize the specified relay(s). The De-energize Relay command has the following format:

DR*n*<cr>

where *n* = Relay# (1 to 8 or 0 for all).

ENERGIZE RELAY COMMAND

The Energize Relay (ER) command instructs the V78 CRM-1 to energize the specified relay(s). The Energize Relay command has the following format:

ERn<cr>

where n = Relay# (1 to 8 or 0 for all).

DATA MESSAGE GENERATION AND RELAY CONTROL

A host computer/controller connected to a V71 or V96 host module may receive data messages and control individual relays on a V78 CRM-1 module. Data message generation depends on the Reporting Method used. When using Immediate Reporting Method, the V78 CRM-1 will generate an event data message whenever a change-in-state of a relay occurs (i.e., energized to de-energized or vice versa). When using Schedule Reporting Method, the V78 CRM-1 will generate an event data message whenever a change-in-state of a relay occurs after the Report Start Time has elapsed . When using Command Reporting Method, the V78 CRM-1 will generate an event data message using the RAn<cr> or RSn<cr> commands only.

Regardless of the Reporting Method used, the host system may obtain a data message showing the present state of a relay by sending the SAn<cr> command or clear the buffer of a relay by sending the CBn<cr> command.

Individual relays may be controlled directly by a host computer/controller via command, by schedule, or both. When relays are controlled using a schedule, each

energizing and de-energizing of a relay is referred to as a relay event. Up to 12 relay events may be programmed in the schedule. Once the relay event schedule has been programmed, you may enable, disable, or delete specific relay events.

Each relay event consists of a Start Time, Duration, Interval, and Relay Number. The Event Start Time consists of the day of the week and the hour/minute/second of the day the initial event is to occur. The Event Duration Time is the amount of time a specified relay will be energized and may be programmed in hours/minutes or milliseconds. Interval is the desired time subsequent occurrences of the same event will transpire. Interval consists of the desired day of the week and hour/minute/second of the day. The Relay Number is the particular relay that will be energized for a specific event.

For example, you could program a relay to activate a sprinkler system starting on the following Monday at 5:00pm for one hour and then occurring every Monday, Wednesday, and Friday at 5:00pm for one hour after that.

DATA MESSAGE PRESENTATION

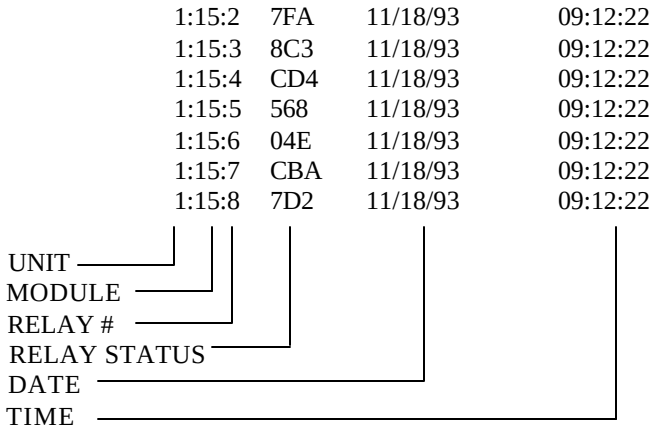
Data message presentation varies slightly in format depending on module configuration. Entries such as, time tag, data format, number of active channels, etc. all change how data messages appear to a host-controller. However, all data messages are presented in the same basic order of fields as follows:

UU:MM,CC HHH or **DDDD** or **VV MM/DD/YY HH:MM:SS**

where, **UU** is the M Series Unit Number
MM is the V77 ADM-1 Module Number
CC is the V77 ADM-1 Channel Number
HHH is a Hex value ranging from 000 to FFF
DDDD is a Decimal value ranging from 0 to 4095
VV is an Engineering unit ranging from -10 to +10 volts
MM is the month (if Time Tag enabled)
DD is the day (if Time Tag enabled)
YY is the year (if Time Tag enabled)
HH is the hour (if Time Tag enabled)
MM is the minute (if Time Tag enabled)
SS is the second (if Time Tag enabled)

EXAMPLE: A complete data message from an V78 CRM-1 installed as Unit 1, Module 15 with Channels 1-8 active using Hex Data Format and having Time Tag enabled, would appear as follows:

1:15:1 7FE 11/18/93 09:12:22



Data messages requested through the use of Data Commands might include the messages from one or more channels.

V79 AND V80 OPERATION

GENERAL

The V79 PDI-1 and V80 V80 PDI-2 modules are used in applications requiring notification of device status (e.g., burglar and fire alarms, event counters/timers, process control, etc.). The V79 PDI-1 module has 16 channel switch inputs providing a reliable method to detect and report a state change from high resistance (open) to continuity (closed) or vice versa. The V80 V80 PDI-2 is a 16 channel optically-isolated voltage input module that is non-polarity sensitive and can be individually set to detect the presence or the change of state of AC or DC inputs. We will refer to a change in state of a switch closure (V79 PDI-1) or a voltage change (V80 V80 PDI-2) as an *event*. An event sample is the actual data associated with an event which is calculated by the PDI module and sent to the host computer/controller.

Individual PDI channels can be programmed to report event samples upon request via data commands (Command Reporting Method), at a specific date/time (Schedule Reporting Method), or as the event occurs (Immediate Reporting Method). Multiple events may be stored for later retrieval and analysis. The PDI features a latch mode where the time and state of the initial event is latched and held until user reset. False reporting of events is prevented by programming variable debounce times. Event samples are preceded by the appropriate unit, module, and channel number and may be appended with a "real time" Time Tag showing the date and time the status was recorded.

You have the choice of programming the PDI via verbose (menu-driven) or non-verbose (dynamic) configuration mode. When using verbose mode, a series of menus will prompt you to enter the desired parameters. Non-verbose mode allows you to program the PDI by downloading configuration commands.

USER-PROGRAMMABLE FEATURES

You may program the Sampling Setup, Reporting Setup, and Dynamic Configuration on the PDI.

SAMPLING SETUP

Sampling Setup allows you to program the Debounce Delay and Latch Polarity for the input channels. The Debounce Delay is used to guard against erroneous events. An event will not be valid unless the input channel has remained at a changed state for the debounce duration. The debounce delay may be programmed from 0 (for no debounce) to 65535 milliseconds. The Latch Polarity is used to latch individual inputs based on a positive going (LO to HI) or negative going (HI to LO) input. The latch information is retained in memory until recalled by the user. The default Debounce Delay time is 100 milliseconds and the default Latch Polarity is a HI to LO transition.

REPORTING SETUP

Reporting Setup allows you to program how the PDI reports event samples to the host module. The items you may program in the Reporting Setup include Reporting Method, Report Start Time, Report Interval, Set Host Address, Data Format, Time Tag, and Terminating Character(s).

REPORTING METHOD

Reporting Method is the manner in which event samples are sent to the designated host module. The PDI provides three Reporting Methods: Command (upon request via data commands), Immediate (upon exiting configuration), and Schedule (where reporting begins at a specified time). The default Reporting Method is Command.

REPORT START TIME

Report Start Time is the time reporting begins when Schedule Reporting Method is selected. The start of reporting may be delayed up to 24 hours from the current time recorded by the M Series time-of-day clock and reporting will occur in cyclic periods as determined by the Report Interval. The default Report Start Time is 00:00.

REPORT INTERVAL

You may program the PDI to report in repetitive periods using Schedule Reporting Method, where the PDI will report all event samples in the receive buffer after the specified Report Interval has elapsed. The PDI will report until the buffer is empty and then report again after the specified Report Interval has expired. The default Report Interval is 00:00 (every 24 hours).

HOST ADDRESS

Host Address is the designated host module where event samples are sent when using Immediate or Schedule Reporting Method. The Host Address consists of the Unit Number (1 to 32), Module Number (1 to 16), and Port Number (1 to 4) of the designated host module. The default Host Address is Unit 1, Module 1, Port 1.

TIME TAG

When Time Tag is enabled, a time tag is appended immediately after the event sample. The time tag consists of the month, day, year, hour, minute, and second at which the data was calculated. Time Tag may be enabled or disabled. The default Time Tag is disabled.

TERMINATING CHARACTER(S)

The Terminating Character(s) is added at the end of an event sample to match the requirements of the host terminal or application software. The Terminating Character(s) consists of one or two hexadecimal characters. The default Terminating Characters are 0D Hex <cr> followed by 0A Hex <lf>.

DYNAMIC CONFIGURATION

You may enable or disable Dynamic Configuration for the PDI. Dynamic configuration mode allows non-verbose or "on-the-fly" configuration commands to be issued to the PDI. The default Dynamic Configuration setting is disabled.

DATA COMMANDS

You may issue PDI data commands through a host module to perform single operations while temporarily overriding the module's current operating configuration. Some data commands apply to all types of DAC modules, while others apply to

specific modules. Data commands may be entered repeatedly to get specific event samples. You may issue a single data command to obtain event samples from multiple channels. Data commands must be used to obtain event samples when using Command Reporting Method.

PDI data commands are sent through a host module using the following procedure:

1. Select the PDI from the host module by sending a select sequence which consists of the port select code ($BT - default), the desired module number (2 to 16), and a <cr> (0D Hex). For example, to select an PDI Module located in slot 15 using the default port select code, send **$BT15<cr>**.

2. Once the PDI is selected, it will go into Command Mode and allow you to send data commands. The PDI data commands begin with two capital letters designating the specific command and are terminated with a <cr>. Most data commands also require a number between the command letters and <cr>. This number is typically the desired channel(s) for the data command. If you have a requirement to send the data command to multiple channels simultaneously, you may use one of the following formats as shown for the SA (sample) command:

SA1,2,3,4,5,6,7,8<cr>	Take a single sample for Ports 1-8
SA1-8<cr>	Take a single sample for Ports 1-8
SA0<cr>	Take a single sample for Ports 1-8
SA1,2,4-8<cr>	Take a single sample for Ports 1, 3, 4, 5, 6, 7, and 8

3. After you have sent the desired data commands to the PDI module, you may disconnect by sending **$BT<cr>**. You may disconnect from the PDI and select a different module or the base unit by sending **$BTn<cr**.

IMPORTANT: If the PDI is operating in self reporting mode (i.e., Immediate or Schedule Reporting Method) and a host device issues a data command, the host device must disconnect by sending the Port Select Code and <cr> before the PDI will resume sending event samples to the designated host module.

CLEAR EVENT BUFFER COMMAND

The Clear Event Buffer (CB) command is used to clear all stored event samples from the buffer of the selected channel(s). The Clear Event Buffer command has the following format:

CB*n*<*cr*>

where n = Channel# (1 to 16 or 0 for all).

CLEAR EVENT COUNTER COMMAND

The Clear Event Counter (CC) command is used to reset the event counter for one or more channels to zero without reading the value of the event counter. The Clear Event Counter command has the following format:

CCn<cr>

Where n = Channel# (1 to 16 or 0 for all).

CLEAR EVENT LATCH DATA

The Clear Event Counter (CR) command is used to clear the event latch buffer. The Clear Event Counter command has the following format:

CRn<cr>

where n = Channel# (1 to 16 or 0 for all).

REPORT ALL BUFFERED EVENTS COMMAND

The Report All Buffered Events (RA) command instructs the PDI to report all event samples currently stored in the buffer of the selected channel(s). The Report All Buffered Events command has the following format:

RAn<cr>

where n = Channel# (1 to 16 or 0 for all).

REPORT EVENT COUNTER COMMAND

The Report Event Counter (RC) command instructs the PDI to report how many times an event has occurred for one or more channels since the last time a counter reset command was issued. This command does not reset the event counter. The Report Event Counter command has the following format:

RCn<cr>

where n = Channel# (1 to 16 or 0 for all).

REPORT EVENT DURATION COMMAND

The Report Event Duration (RD) command instructs the PDI to report how long the most recent recorded event for the selected channel(s) lasted. The Report Event Duration command has the following format:

RDn<cr>

where n = Channel# (1 to 16 or 0 for all).

REPORT EVENT LATCH DATA COMMAND

The Report Event Latch Data (RL) command instructs the PDI to report the active state of the initial event and the time the initial event occurred (if time tagging is enabled). This command does not reset the latch buffer. The Report Event Latch Data has the following format:

RLn<cr>

where n = Channel# (1 to 16 or 0 for all).

REPORT EVENT COUNTER AND RESET COMMAND

The Report Event Counter and Reset (RO) command instructs the PDI to report how many times an event has occurred for one or more channels and then reset the event counter to zero. The Report Event Counter and Reset command has the following format:

ROn<cr>

where n = Channel# (1 to 16 or 0 for all).

REPORT EVENT LATCH DATA AND RESET COMMAND

The Report Event Latch Data and Reset (RR) command instructs the PDI to report the active state of the initial event, the time the initial event occurred (if time tagging is enabled), and then reset the latch buffer. The Report Event Latch Data and Reset command has the following format:

RRn<cr>

where n = Channel# (1 to 16 or 0 for all).

REPORT A SINGLE BUFFERED EVENT COMMAND

The Report A Single Buffered Event (RS) command instructs the PDI to report the first event sample stored in the buffer of the selected channel(s). The Report A Single Buffer Sample command has the following format:

RSn<cr>

where n = Channel# (1 to 16 or 0 for all).

EVENT SAMPLE REPORTING

An event is defined as a change-in-state of an input channel and return to the original state. An event may be started on a rising edge (LO to HI) or a falling edge (HI to LO) as determined by the Latch Polarity. On the V79 PDI-1 switch closure module, an input is considered to be at a "HI" or "1" state when it is closed (continuity) and a "LO" or "0" state when it is open (infinite resistance). On the V80 PDI-2 optically isolated module, an input is considered to be at a "HI" or "1" state when there is voltage detected and a "LO" or "0" state whenever there is no voltage detected. An event sample is the actual data associated with an event which is calculated by the PDI module and sent to the host computer/controller

PDI event sample reporting depends on the Reporting Method used. When using Immediate Reporting Method, the PDI will report an event sample whenever an event occurs. When using Schedule Reporting Method, the PDI will report an event sample whenever a event occurs after the Report Start Time has elapsed. When using Command Reporting Method, the PDI will report an event sample or multiple samples on command only.

The PDI module can observe, record, and report when an event happened, how long the event lasted, and how many events occurred for each individual channel. The initial occurrence of an event will set the event latch bit and store the associated time in the latch buffer. You may read the state of the initial event and the time it was recorded (if time tagging is enabled) by issuing the RL or RR commands.

Each occurrence of an event starts the duration counter and increments the event counter. The duration counter measures event duration time in milliseconds with a maximum time of 65,535 stored. You may read the duration of the last recorded event by issuing the RD command.

NOTE: Duration measurements are not de-bounced. If the input circuit cycles between active and inactive before settling, only the settled value is reported. Therefore, if a PDI module is connected to a relay or switch that has "dirty" contacts, the total measurement will be less than the actual activation duration of the circuit by the amount of time spent settling.

The event counter reflects the total number of events that have occurred since the event counter was last cleared using the CC or RO command. You may read the current event counter value by sending the RC or RO command. The event counter will trigger on the rising edge of an event when LO to HI Latch Polarity is selected or on the falling edge of an event when HI to LO Latch Polarity is selected. Examples of using the event counter would include counting items moving on a conveyor belt and process control where a pre-determined number of events must take place before a defined action may take place.

NOTE: An event must have a duration greater than one millisecond plus the current debounce delay time to increment the event counter.

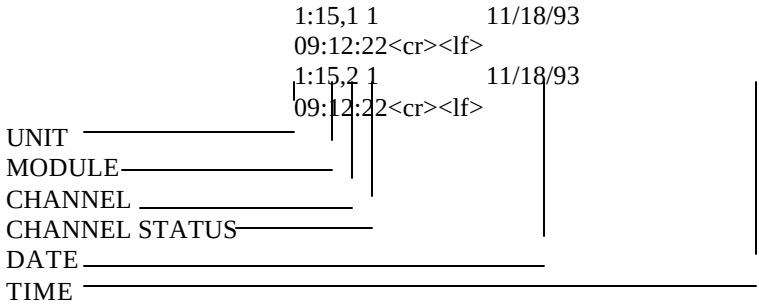
EVENT SAMPLE PRESENTATION

Event Sample presentation varies slightly in format depending on module configuration. Entries such as, time tag, data format, number of active channels, etc. all change how event samples appear to a host-controller. However, all event samples are presented in the same basic order of fields as follows:

UU:MM,CC 1 or **0 MM/DD/YY HH:MM:SS**

where, **UU** is the M Series Unit Number
MM is the PDI Module Number
CC is the PDI Channel Number
1 channel status is "closed" (V79 PDI-1) or has voltage applied (V80 PDI-2)
0 channel status is "open" (V80 PDI-2) or has no voltage applied (V80 PDI-2)
MM is the month (if Time Tag enabled)
DD is the day (if Time Tag enabled)
YY is the year (if Time Tag enabled)
HH is the hour (if Time Tag enabled)
MM is the minute (if Time Tag enabled)
SS is the second (if Time Tag enabled)

The following example shows event samples received using immediate or schedule reporting where the PDI is installed in Unit 1 Module 15 with Time Tagging enabled:



The following examples show the messages received using data commands where the PDI is installed in Unit 1 Module 15 with time tagging enabled. If you select the module and issue the **RD1<cr>** command (Report Event Duration for Channel 1), the module will respond with a single message showing the Event Duration for Channel 1 similar to the following:

1:15,1 1320 11/18/93 09:12:22

where 1:15,1 represents Unit 1/Module 15/Channel 1, 1320 indicates the event duration is 1320 milliseconds, and 11/18/93 09:12:22 is the time tag.

If you issue the **RC1<cr>** command (Report Event Counter for Channel 1), the module will respond with a message showing the Event Counter similar to the following:

1:15,1 823 11/18/93 09:12:22

where 1:15,1 represents Unit 1/Module 15/Channel 1, 823 indicates the number of recorded events is 823 times, and 11/18/93 09:12:22 is the time tag.

If you issue the **RS1<cr>** command (Report Single Buffered Event for Channel 1), the module will respond with a message showing the input status for Channel 1 similar to the following:

1:15,1 1 11/18/93 09:12:22

where 1:15,1 represents Unit 1/Module 15/Channel 1, 1 indicates the first buffered sample for Channel 1 is closed (V79 PDI-1) or has voltage applied (V80 PDI-2), and 11/18/93 09:12:22 is the time tag.

If you issue the **RL1<cr>** command (Report Event Latch Data for Channel 1), the module will respond with a message showing the state of the input that started the

initial event. This will be "1" (closed) for LO to HI Latch Polarity or "0" (open) for HI to LO Latch Polarity if using the V79 PDI-1. This will be "1" (voltage detected) for LO to HI Latch Polartiy or "0" (no voltage detected) for HI to LO Latch Polarity if using the V80 PDI-2. If time tagging is enabled, the time the initial event occurred will be appended to the event sample.

V82 OPERATION

The V82 Programmable Control Module (PCM-1) is used to monitor, control, and report information about devices connected to the M-Series peripheral modules. The M-Series peripheral modules are used to interface directly to various devices such as security/alarm systems, process control systems, medical data systems, and environmental control systems.

Bay Tech provides C library functions specific to the various peripheral modules. These functions allow you to write C programs to perform data acquisition and control applications such as process control, remote control and monitoring and data gathering.

Programming the V82 PCM-1 is accomplished by writing a C-based source program, compiling and linking this program for use on the 64180 microprocessor, and downloading the corresponding HEX file to the flash EPROM. The C library functions provided are specific for the 2500AD software, Inc. 64180 C compiler.

> **IMPORTANT:** Before you begin writing your source program, you should determine what types of peripheral modules are installed in the M-Series chassis. You should note the module location where the peripheral modules are installed (Module 1 to Module 16). You should also familiarize yourself with the basic operation of the peripheral modules. All source programs should have a ".C" extension (e.g., BAYTECH.C).

1. The name of the prototype header file is "cstartup.h". The functions included in this file are listed below:

```
int delay(unsigned int);
char *ctime();
int serout(int,int,char *);
int serin(int, int, char *);
int charsout(int, int, char *);
int charsin(int, int, char *);
int dial(int, int, char *);
int hang_up(int, int);
int atod(int, int, char *);
```

```
int disc_in(int, int);
int rlyset(int, int);
int rlyrst(int, int);
```

2. Once you have written your source code, you should compile it using the 2500AD 64180 C Compiler. When the 2500AD compiler goes into its linking procedure, it looks for a .LNK file. Bay Tech supplies a file named “T.LNK” that is used for this purpose. Below is an example batch file that will perform the necessary compile and link commands for the 2500AD compiler.

```
C64180 –d %1
ADLINK t %1
```

   For example, if the name of the batch file is “RUN.BAT” and the name of the source code is “BAYTECH.C”, then RUN BAYTECH from your DOS prompt and the 2500AD compiler will compile and link the source file. Do not include the “.C” suffix when typing RUN BAYTECH. Once the source program has been compiled and linked, the 2500AD compiler will create a file called “BAYTECH.HEX” which is used to actually program the V82 PCM-1 as described below.

3. Downloading a HEX file to the module while it is in configuration mode programs the V82 PCM-1. The HEX file is generated after the source file has been compiled and linked. Use the following procedure to place the V82 PCM-1 into configuration mode:

   3a. Programming changes are made from the service port, a V71 host module, or a V93 modem module. If you are using the service port or a V71 host module, connect a terminal to the service port or V71. Configure the terminal’s serial parameters to match those of the service port or V71. The default parameters for both ports are 9600 bps, 8 data bits, 1 stop bit, and no parity. The service port is fixed at these parameters. The V71’s parameters can be changed. If you are using the V93 host modem module, make a connection with the V93 modem over a dial-up line. Enter the appropriate password if the V93 Password is enabled.

   3b. Place the V82 PCM-1 into command mode by sending the Port Select Code (default is $BT), the appropriate Unit Number followed by a colon (1: to 30: - only if using a cascading

application), the appropriate module number (1 to 16), and <cr>.

3c. Access configuration mode by sending $CONFIG <cr>.

Once the V82-PCM-1 is in configuration mode, download the created HEX file. This can be done using a communications package or via DOS commands. For example, if using DOS, you can create a batch file to send the necessary commands similar to the following:

```
ECHO $BT>COM1:
ECHO $CONFIG>COM1:
COPY BAYTECH>HEX /B COM1:
```

In this example, the file created when the source code was compiled and linked was named BAYTECH.HEX.

Once the HEX file has been downloaded to the V82 PCM-1 flash EPROM, the M<-series DAC unit will reset and the new program becomes effective.

IMPORTANT: If your program inputs data from a V71 or V93 host module (e.g., serin(1, 1, data); where Module 1 is a V71 host module), you must make a connection to the V82 PCM-1 module Port 2 from the host module before performing any data acquisition. For example, if the V82-PCM-1 is installed as Module 4, send$BT4,2<cr> to the host module to make the necessary connection to the V82 PCM-1.

4. Function Descriptions:

4a. int delay(unsigned int a)

Input: a - delay interval
Output: 0 – successful

Description: The delay(…) function halts program execution for a specified number of milliseconds.

Example:

```
int get_connect();
int got_connect;
        *
        *
```

```
                    *
int n1;
for(n1=1;n1!=61;++n1){
        if(get_connect()==0){
                delay(1000);;
                got_connect=0;;
        } else{
                got_connect=1;
                break;
        }
}
return (got_connect);
        *
        *
        *
```

This code fragment waits up to 60 seconds for the function get_connect() to go true.

4b. char *ctime()

Input: none
Output: pointer to a string

Description: The ctime() function returns a pointer to a string of the following form:

day month date hours:minutes:seconds year\n.

No arguments are required. The buffer used by ctime() to hold the formatted output string is overwritten each time the function is called. If you wish to save the contents of the string, it is necessary to copy it elsewhere.

An example of the ctime() function is shown in the serout(...) function example below.

4c. int serout(int a,int b,char *s)

Input: a - module number (1 to 16)
b - desired port number (1 to 4)
*s - pointer string for output
Output: 0 - successful

Description: The serout(. ..) function transfers the specified null terminated character string to the selected module and port. The selected module must be a 4-port serial I/O module (e.g., V74, V75, etc.).

Example: Assume a V74 4-port serial I/O module is installed as Module 2.

```
int s;
char string[30];
                *
                *
                *
x=O;
do{
        delay(1000);
        strncpy(string,ctime());
        serout(2,1,string);
        serout(2,1,"\r");
    }
while(x<100);
        *
        *
        *
```

In this code fragment, the time and date is output to Module 2, Port 1 each second for 100 seconds. The output will be sirnilar to the following:

```
Tue Aug 13 08:11:01 1998
Tue Aug 13 08:11:02 1998
Tue Aug 13 08:11:03 1998
        *
        *
        *
Tue Aug 13 08:12:39 1998
```

4d. int serin(int a,int b,char *s)

Input: a - module number (1 to 16)
b - desired port number (1 to 4)
*s - pointer stnng for output
Output: 0 - successful

Description: The serin(...) function reads data from the selected module and stores the data as a null terminated string in the specified character array. The selected module must be a 4-port senal I/O module.

Example: Assume a V74 4-port serial I/O module is installed as Module 2 and is receiving data from a modem connected to Port 1 after a dial string has been sent.

```
int get_connect()
        *
        *
        *
{
char from_modem[30];
char *p;

serin(2,1,from_modem);
p=strchr(from_modem, 'C');
if(strncmp(p,"CONNECT",7)==0);
   return(1);
else
   return(0);
      }
        *
        *
        *
```

In this code fragment, data received from Module 2, Port 1 is stored in character array "from_modem". The "p" pointer is positioned to the first occurrence of capital "C" and the next seven characters are compared against"CONNECT". If a match is found, a connection to the remote modem is assumed and subsequent data can be sent to the modem.

4e. int charsout(int a,int b,char *s)

Input: a - module number (I to 16)
b - desired port number (1 to 4)
*s - pointer string for output
Output: 0 - successful

Description: The charsout(...) function transfers a specified number of characters from the specified character array to the selected module and port. The first character of the specified array must be a byte count (0 to 255 decimal). The charsout(...) function sends all characters in the byte count range include null characters. The selected module must be a 4-port serial I/O module (e.g., V74, V75, etc.). The charsout(...) function behaves the same way as the serout(...) function described above except that only a specified number of characters are sent and any null characters encountered in the byte count range are sent.

4.f int charsin(int a,int b,char *s)

Input: a - module number (1 to 16)
b - desired port number (1 to 4)
*s - pointer strino for output
Output: 0 - successful

Description: The charsin(...) function reads all data from the selected module including null characters and stores the data in the specified character array. The first character stored is a byte count that corresponds to the number of characters read (0 to 255 decimal). The selected module must be a 4-port serial I/O module. The charsin(...) function behaves the same way as the serin(...) function described above except that all characters are read (including null characters) and the first byte stored is the byte count.

4g. int dial(int a,int 1,char *s)

lnput: a - module number (1 to 16)
b - integer number 1
*s - nointer string for output
Output: 0 - successful

Description: The dial(. ..) function causes the selected module to go off-hook and send the character string to the modem. The selected module must be a V93 modem module.

Example: Assume a V93 modem host is installed as Module 1 and a V74 module installed as Module 2.

```
char dial_strl[7]={"ATDT18005551212\r"};

dial(1,1,dial str);
serout(2,1,"123\r\n");
```

In this example the dial string ATDT18005551212\r is first transmitted to the modem in Module 1. After a connection is made the string "123\r\n" is transmitted.

4h. int hang_up(int a,int 1)

Input: a - module number (1 to 16)
b - integer number 1
*s - pointer string for output
Output: O - successful

Description: The hang_up(...) function causes the selected module and port to go on-hook. The selected module must be a V93 modem module.

Example: Assume a V93 modem host is installed as Module 1 and a V74 module installed as Module 2.

```
char dial_str[10]={"ATDT18005551212\r"};

dial(1,1,dial str);
serout(2,1,"123\r\n");
delay(10000);
hang up(2,1);
```

In this example the dial string ATDT18005551212\r is first transmitted to the modem in Module 1. When a connection is made, the string "123\r\n" is transmitted. After a 10 second delay the modem is disconnected with the hang_up(...) function.

4i. int atod(int a,int b,float *c)

Input: a - module number (1 to 16)
b - desired channel number (1 to 16 for the V77 or 1 to 6 for the V84)
*c - pointer to storage location
Output: O - successful (always)

Description: The atod(...) function stores the value of a specified V77 ADM-1 or V84 ADR-1 analog input channel into the floating point variable.

Example: Assume a V84 ADR-1 is installed as Module 3 and a V74 I/O module is installed as Module 2.

```
double valdob;
float atodVal;
int s;
char string[30];
```

```
x=O;
do{
delay(1000):
atod(3,1,&atodVal):
valdob=atodVal:
sprintf(string,"val=;%6.3e\r\n",valdob);
++x
serout(2,1,string);
}while(x<100);
```

In this code fragment, the analog value of Module 3, Channel 1 is sent to the device connected to Module 2, Channel 1 each second for 100 seconds. The output will look like the following for a voltage input of 10.0 volts:

```
val = l.OOOOOOE+OO1
val = 1.OOOOOOE +001
val = l.OOOOOOE+OO1

val = 1.OOOOOOE + 001
```

4j. int disc_in(int a,int b)

Input: a - module number (1 to 16)
b - desired channel number (1 to 16 for the V79 & V80 or 7 to 12 for the v84)
Output: 1 - discrete input is true (V79- closed, V80- voltage detected)
O discrete input is false (V79- open, V80- no voltage detected)

Description: The disc_in(.. .) function determines the input status of a selected discrete module and channel. It returns a " 1 " if the input is true or a "0" if the input is false. The selected module must be a V79 PDI-l, V80PDI-2, or a V84 ADR-I.

Example: Assume a V84 ADR-1 is installed as Module 3 and a V74 I/O module installed as Module 2.

```
*
*
*
int s;
char string[30];

x=O
do{
delay(1000);
```

```
strncpy(string,ctime(),19);
s=disc in(3,7);
if(!s){

serout(2,1,"on ");
serout(2,1,string);
serout(2,1,"\r");
}else{
serout(2,1,"off ");
serout(2,1,string);
serout(2,1,"\r");
++x;
}while(x<100);
*
*
*
```

In this code fragment, the status of the discrete input Module 3 Channel 7 is sent to Module 2, Port I each second for 100 seconds. The output will look like the following:

```
on Tue Aug 13 08:11:01
on Tue Aug 13 08:11:02
off Tue Aug 13 08:11:03
*
*
*
on Tue Aug 13 08:12:39
```

4k. int rlyset(int a,int b)

Input: a - module number (1 to 16)
b - desired channel number (1 to 8 for the V78 or 13 to 16 for the V84)
Output: O - successful (always)

Description: The rlyset(...) function energizes the specified relay channel of a selected module. The selected module must be a V78 CRM-1 or a V84 ADR-1.

An example of the rlyset(...) function is shown in the rlyrst(...) function example below.

41. int rlyrst(int a,int b)

Input: a - module number (1 to 16)

b - desired channel number (1 to 8 for the V78 or 13 to 16 for the V84)
Output: O - successful (always)

Description: The rlyrst(...) function de-energizes the specified relay of a selected module. The selected module must be a V78 CRM-1 or a V84 ADR-1.

Example: Assume a V84 ADR-1 is installed as Module 3.

```
*
*
*
do{

delay(1000):
rlyset(3,13);
delay(1000);
rlyrst(3,13):
while l==1;
```

In this code fragment, the relay located at Module 3, Channel 13 is energized for 1 second and then deenergized for I second continuously.

5. Default channel names and logic value defulitions:

HOST AND I/O CHANNELS – DEFAULT CHANNEL NAMES AND LOGIC VALU		
Module Type	Channel Number	Logic
V71 Host Module	1 2 Note: Port 2 is used only if PCM-1 receives data from V71 Port 1.	
V93 Host Module Module	1 2 Note: Port w is used only if PCM-1 receives data from V93 Port 1.	
V74/V75/V87 I/O Module Note: These modules must be programmed to operate in command mode.	1 2 3 4	
V77 A-to-D Module Note: This module must be programmed to operatein immediate sampling mode and command reporting mode.	1 2 . . (differential) 8 . . (single-ended) 16	

V78 Relay Module Note: This module must be programmed to operate in command mode.	1 2 . . 8	1 = Energized 0 = De-Energiz
V79 Switch Closure Module Note: This module must be programmed to operate in command mode.	1 2 . . 16	1 = closed (no 0 = open (max
V80 Isolated Voltage Module Note: This module must be programmed to operate in command mode.	1 2 . . 16	1 = voltage dete 0 = no voltage
V84 A-to-D/Relay/Switch/Isolated Voltage Input Module Note: A-to-D channels must be programmed to operate in immediate sampling mode and command reporting mode.	1 (A-to-D) 2 (A-to-D) . . 6 (A-to-D) 7 (Switch/Voltage Input) . . 12(Switch/Volatage Input) 13 (Relay) 14 (Relay) 15 (Relay) 16 (Relay)	A-to-D Channe Switch Closure 1 = closed (no 0 = open (max Isolated Voltag 1 = voltage dete 0 = no voltage Relay Channel 1 = Energized 0 = De-Energiz

V93 OPERATION

a. You are ready to perform commands when a terminal or PC is communicating with:

(1) the V93A's EIA-232 port.

(2) a remote modem is communicating with the V93A's modem.

b. If you are using a PC, you can communicate with the V93A by using a terminal emulation program or by using a software communications program that emulates a terminal. BayTech supplies an utility diskette which includes TERM.EXE, a terminal emulation program, to put your PC into terminal emulation mode. Popular

communication software packages such as PROCOMM PLUS(R) by Data Storm Technologies, also provide terminal emulation capabilities and allow for communications with the V93A.

c. If configuring the V93A from the EIA-232 port, configure the host terminal's serial parameters to match those of the V93A. From the factory, the V93A is set at 9600 baud, 8 data bits, 1 stop bit no parity and XON/XOFF disabled.

LOGIN PASSWORD

Once the V93A has been connected to the phone line and configured for the desired parameters, a remote host computer can make a connection to the V93A modem over a dial line and perform data acquisition and control functions with the various M Series I/O modules. The V93A will send a message similar the following when a remote host computer establishes a connection:

```
M-Series V93A DAC Host
Unit 2 Module 1
REV. 4.XX  Copyright (c)  1995-1997
Bay Technical Associates

To login, enter password
Login: BTA (default)
```

You will be prompted to type in the desired password followed by <ENTER> when a connection to the V93A modem is first made. You are given three tries to type in the correct password before the modem hangs up. Type the appropriate password (Default is BTA). The V93A will respond with:

```
Login successful
Port Select Code:  $BT
Attnetion Character:  ;
```

Among the functions you can perform are data commands/port selection and configuration. Configuration commands are used to program the features of the various I/O modules and the data

commands are typically used to request stored data received from an I/O module. Data commands are also used to instruct certain I/O modules to perform a specific task (e.g., energize or de-energize a relay).

The configuration menu is invoked by selecting configure(C) from the port selection menu. The supported configuration and data commands for a specific I/O module are described in the documentation for that module.

PORT SELECTION MENU

To activate the port selection menu, type **5 or more ;;;;;** (default) in a row and a menu similar to the following will appear.

```
.      M-Series V93A DAC Host
       Unit 1  Module 2
       REV.  4.00  Copyright(c) 1995-1997
       Bay Technical Associates

       Device A         (2,1).............1
       Device B         (2,2).............2
       Device C         (2,3).............3
       Device D         (2,4).............4
       Configure.........................C
       Manual Mode.......................M
       Exit..............................X
       Unit Reset........................R
       Logout............................T
       Enter Request :
```

The device names in the menu correspond to the device names assigned to the serial ports installed in the unit. To select a particular device simply enter the number of the device then hit return. *Refer to section 16.4 of the M-Series DAC owners manual for configuration of device names.*

The other items in the menu provide various functions described below:

Configure - Allows users enter into the configuration mode for any installed modules or for the base unit. See Section 6 CONFIGURATION for details to configure the unit.

MANUAL MODE

Manual Mode allows users to manually select a module and/or port. The "*Manual Mode*" selection for the V93A menu is used to make a module level connection which is used for sending commands to the module. The "*Manual Mode*" is used to make a connection to a module such as the Control Relay Module, A-to-D Module, Event Counter Module, main board, etc. Use the "*Manual Mode*" for module connections other than a Serial I/O module unless you want to operate a Serial I/O module in the Command Mode of operation. The "*Manual Mode*" selection **should not** be used for configuration.

By responding to the *Enter Request*: message at the end of the V93A menu with "M" you receive a response similar to the following:

```
Device A        (2,1)..................  1
Device B        (2,2)..................  2
Device C        (2,3)..................  3
Device D        (2,4)..................  4
Device A        (3,1)..................  5
Device B        (3,2)..................  6
Device C        (3,3)..................  7
Device D        (3,4)..................  8
Configure ..............................  C
Manual Mode ............................  M
Exit....................................X
Unit Reset .............................  R
Logout .................................  T

Enter Request:  M

Enter Module number: 2
```

```
Enter Port number (<CR> for none): 3
```

By entering "2" at the *Enter Module number* and entering "3" at the *Enter Port number*, the user has selected module number 2 and port number 3. Verify the connection by insuring that the red LED of Port 3, Module 2 on the front panel of the M-Series DAC base unit has been selected.

EXIT

By responding to the *Enter Request*: message in the V93A Status & Diagnostics Menu with "X" (Exit), you will exit the V93A Status & Diagnostics Menu. The V93A host module will respond with a menu that is similar to the following:

> X

UNIT RESET

Users can instruct the M-Series DAC with the V93A module, to "reset" by using the *Menu Selection Method* to reset the unit. The Unit Reset command does not affect any saved configuration parameters that have been changed from the default values.

By responding to the *Enter Request:* message at the end of the menu with "R"(Unit Reset), you will reset the M-Series unit.

```
Device A        (2,1)..................... 1
Device B        (2,2)..................... 2
Device C        (2,3)..................... 3
Device D        (2,4)..................... 4
Device A        (3,1)..................... 5
Device B        (3,2)..................... 6
Device C        (3,3)..................... 7
Device D        (3,4)..................... 8
```

```
Configure ............................... C
Manual Mode ............................. M
Exit.....................................X
Unit Reset .............................. R
Logout .................................. T

Enter Request:  R
```

The M-Series DAC unit has been reset.

Important: The Unit Reset command will terminate communications with connected equipment to the M-Series DAC.
You must re-establish communications with the M-Series DAC system after the unit has been reset.
The Menu is invoked by sending the **Attention Character(default ;;;;;)** to the V93A host module five times. The V93A will respond with a menu similar to the following, if two Serial I/O modules are installed.

LOGOUT

By responding to the *Enter Request*: message in the V93A Main Menu with "T" (Logout), you will take you out of menu mode If you have a modem connection it will terminate that connection. The V93A host module will respond with a message similar to the following:

```
Device A        (2,1)................... 1
Device B        (2,2)................... 2
Device C        (2,3)................... 3
Device D        (2,4)................... 4
Device A        (3,1)................... 5
Device B        (3,2)................... 6
Device C        (3,3)................... 7
Device D        (3,4)................... 8

Configure ............................... C
Manual Mode...... ....................... M
Exit.....................................X
Unit Reset .............................. R
Logout .................................. T
Enter Request:
```

To return to the menu after making a connection, simply type 5 or more ';' semicolons(default).

NOTE: Menu selection is case sensitive.

TECHNICAL SUPPORT

BayTech has a staff of applications engineers on duty to assist you from 7 a.m. to 6 p.m. (CST or CDT), Monday through Friday. If you have problems installing, setting up, or operating your Bay Tech product, please contact BayTech's technical support office. For information on all of BayTech's data communication products, contact our Web Site at the address shown below.

If you call the BayTech support desk, please have the following information available to help the applications engineers answer your questions efficiently. Use the next page to record vital information.

1. Identify which modules you are using and have the serial number handy (located on the back of the unit).

2. Identify what host device and peripheral devices you have connected to the M Series unit.

3. Determine the type of application you are using (e.g., the reporting and/or sampling method you are using).

4. Identify what cables/adapters you are using, the lengths of the cable and who sold you the cables/adapters.

5. Identify any special options you may have ordered.

6. If possible, have a print-out of the unit's configuration status ready when you call.

Bay Technical Associates, Inc.
200 N. Second Street, P. O. Box 387
Bay St. Louis, MS 39520-1000, USA
Telephone: 800-523-2702
228-467-8231
FAX: 228-467-4551
Web Site: www.baytechdcd.com

EQUIPMENT SETUP

MODULE 1	MODULE 2	MODULE 3	MODU
MODEL	MODEL	MODEL	MODEL
SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBE
USE	USE	USE	USE
MODULE 5	**MODULE 6**	**MODULE 7**	**MODU**
MODEL	MODEL	MODEL	MODEL
SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBE
USE	USE	USE	USE
MODULE 9	**MODULE 10**	**MODULE 11**	**MODU**
MODEL	MODEL	MODEL	MODEL
SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBE
USE	USE	USE	USE
MODULE 13	**MODULE 14**	**MODULE 15**	**MODU**
MODEL	MODEL	MODEL	MODEL
SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBER	SERIAL NUMBE
USE	USE	USE	

Type of adapters

_____

Type of cables

_____

Name of software program

_____

REPACKAGING, SHIPPING AND RETURNING TO THE FACTORY

If your Bay Tech unit needs service, upgrade, or repair, return it to BayTech. Before dismantling your equipment or before returning the unit for any reason, always call BayTech. The user should never attempt repairs on this unit. If you need to return the RPC Series to the factory for repair, warranty work, or upgrade, follow the instructions below for repackaging and shipping.

INSTRUCTIONS FOR REPACKAGING AND SHIPPING:

a. Call BayTech to get a Return Authorization Number.

IMPORTANT: Without this number, BayTech will not accept returns.

b. Use the original packaging if available or choose a heavy cardboard box.

c. Surround your unit with a minimum of two inches of insulation.

d. Be sure to seal the box securely with strapping or packing tape. We do not recommend masking tape or cellophane tape.

e. On the outside of the box, please write the Return Authorization Number.

f. Ship the unit to the following address:

Bay Technical Associates, Inc.
200 N. Second Street
Bay St. Louis, MS 39520-1000, USA

FCC RADIO FREQUENCY INTERFACE STATEMENT

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this manual, may cause interference to radio communication. This equipment has been type tested and found to comply within the limits for a Class A digital device pursuant to Subpart J of Part 15 of FCC rules. FCC rules provide reasonable protection against interference with radio communications in a commercial environment. Not installing in accordance with this manual or operating this unit in a residential environment is likely to cause interference. In such cases, the user will be responsible for the expense of correcting the interference.

FCC REQUIREMENTS

a. Federal Communications Commission (FCC) has established rules permitting a direct connection to the telephone network. These connections use standardized jacks. Do not use this equipment on party lines or coin lines.

b. If this device is malfunctioning, it may also be causing harm to the telephone network; disconnect this device until the source of the problem is determined and repairs made. The Telephone Company may temporarily disconnect service until the problem is corrected.

c. The Telephone Company may make changes in its technical operations and procedures. If such changes affect the compatibility or use of this device, the Telephone Company is required to give adequate notice of the changes. In this case, you have the right to file a complaint with the FCC.

d. If the Telephone Company requests information on connected equipment to their lines, inform them of the following:

1. The telephone number of this unit.
2. The ringer equivalence number (indicated on the label).
3. The USOC jack required: RJ-11
4. The FCC Registration Number (indicated on the label).

The ringer equivalence number (REN) is used to determine how many devices can be connected to you telephone line. In most areas, the sum of the RENs of all devices on a single line should not exceed five. If there are too many devices attached, they may not ring properly. In case of equipment malfunction, BayTech should perform all repairs. It is the responsibility of the user requiring service to report the need for service to BayTech:

Bay Technical Associates, Inc.
P.O. Box 387, 200 N. Second Street
Bay Saint Louis, MS 39520-1000, USA
Telephone: 228-467-8231
800-523-2702
Fax: 228-467-4551

SPECIFICATIONS

BASE UNIT SPECIFICATIONS

	M3	M4	M6	M9	M16
Expansion Slots	3	4	6	9	16
Power Requirements	AC Adapter Input: 115 VAC, 60 Hz, 15 watts maximum; Output: 14-16 VAC, .8A				115 VAC, 60 HZ, .3A; or 230 VAC, 50 HZ, .2A
Power Supply	+5VDC, 0.3A; +12VDC, .02A; -12VDC, 0.2A				
Single Channel Bus Speed	1.5M bps				
Non-Volatile Storage	8KB holds power-up default information				
Edge Connectors	20 pin; 3, 4, 6, 8, 9, or 16 total…one for each expansion slot				
Environment	0^{o} to 55^{o}C temperature; 5% to 95% humidity.				
Dimensions	16¾"w x 10"d x 1¾"h	$7\,^{5}/_{16}$"w x $8\,^{3}/_{8}$"d x $4\,^{1}/_{16}$"h	16 ¾ "w x 10"d x $2\,^{5}/_{8}$"h.	16¾"w x 10"d x $3\,^{1}/_{2}$"h	16¾"w x 10"d x $5\,^{1}/_{4}$"h.
Weight	M3 - 7 lbs with 3 modules installed.	M4 - 7 lbs with 4 modules installed.	M6 - 8 lbs with 6 modules installed. 6 lbs with no modules installed.	14 lbs with 9 modules installed. 8 lbs with no modules installed.	16 lbs with 16 modules installed. 11 lbs with no modules installed
LED Displays	(LEDs Standard) 4 port activity LEDs for each module				
Service Port					
Mounting					
Warranty					

V71 SPECIFICATIONS

INTERFACE:	Asynchronous; EIA-232, -12v mark, +12v space; EIA-422 0 to +5 volt differential (TX+, TX-, RX+, RX-); current loop.
CONNECTORS:	DB-25 or RJ-45.
HANDSHAKING:	CTS/DTR or selectable XON/XOFF.
DIMENSIONS:	6"h x 4.5"w.

FACTORY POWER-UP DEFAULT CONFIGURATIONS:

Baud rate:	9600.
Word size:	8 bits.
Parity:	None.
Stop bits:	1
XON/XOFF:	Disabled
Port Select Code:	$BT
Line Interface:	EIA-232

USER-PROGRAMMABLE CONFIGURATIONS:

User-friendly on-screen menu or front panel. Choices are saved in non-volatile memory to become the new power-up default configuration.

Baud rate:	50, 75, 110, 135, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, and 115200 bps.
Word size:	7 or 8 bits.
Parity:	Even, odd or none.
Stop bits:	1 or 2.
XON/XOFF:	Enabled or disabled for transmit/receive.
Line Interface:	EIA-232, EIA-422, or current loop.
Port Select Code:	Any ASCII character string up to 8 characters.

V72TP SPECIFICATIONS

Protocols:	IP, ARP, ICMP, TCP, TELNET
Network Interface:	Ethernet; IEEE 802.3 compliant, Automatic media and frame selection. both 10BASE-T and 10BASE2 V72TP has a 10BASE-T connector.
10BASE2 (thin	coax, BNC) and 10BASE-T (twisted pair,
RJ-45).	
The V72 has	
connectors. The	
Frame Types:	Ethernet II & SNAP
Speeds:	10 mbps
Buffer Size:	256 KB
Program Memory:	Selector erase FLASH memory
Security:	Password protected log-on procedure
Indicators:	Green LED - Link integrity (10BASE-T
only),	Red LED - Network activity (RX/TX)
Power Requirements:	Supplied by M-Series base unit. +5 VDC,
300 mA	
Environment:	Operating Temperature Range: 0° to 70°
C.	Storage Temperature Range: -40° to 80°
C.	Humidity: 5 to 95% RH.

V74/V75/V87 SPECIFICATIONS

FACTORY POWER-UP DEFAULT CONFIGURATIONS:

Baud rate:	9600
Word size:	8 bits
Parity:	None
Stop bits:	1

XON/XOFF:	Disabled
Device Name:	Device A for Port 1 to Device D for Port 4
Port ID:	UU:MM,PP - enabled; UU = Unit Number, MM = Module Number, and PP = Port Number
Designate Host Module Location	Unit 1, Module 1, Port 1
Message Terminating Character:	Carriage Return (0D Hex)
Mode of operation:	Full duplex mode
Time Tag:	Disabled
Connect Port ID Echo:	Disabled
Port EIA Driver:	Current EIA line driver is : RS485
User Programmable Features:	
Baud rate*:	300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 76.8k, and 115.2k bps
Word size*:	5, 6, 7, or 8 bits
Parity*:	Even, odd or none
Stop bits*:	1, 1.5, or 2
XON/XOFF*:	Enabled or disabled for transmit and receive
Port device name*:	Any character string up 16 ASCII characters
Port ID*:	UU:MM,PP or device name;
Designate host module location:	Unit 1 to 30, Module 0 to 16, Port 1 to 4
Message terminate character:	Any character from 00 Hex to 7F Hex
Mode of operation:	Full duplex mode, immediate message mode, command mode or immediate data mode
Time tag mode:	Enabled or disabled
Connect port ID echo:	Enabled or Disabled
Port EIA line Driver:	RS-485 or RS-422

* Option is configurable per port.

Interface:	EIA-232 Asynchronous, -12v mark, +12v space (V74 and V75); EIA-422 0 to +5 volt diff TX+, TX- , RX+, RX- (V75 & V87); EIA-485 (V87 & V86).
Connectors:	8-pin modular.
Handshaking:	EIA-232 - CTS/DTR; selectable XON/XOFF
Buffer:	1k character input/output.
Dimensions:	6"h x 4.5"w.

V77 SPECIFICATIONS

ANALOG INPUT:

Channels:	8 Differential or 16 Singled-Ended inputs
Input Resolution:	12 bits, 1 to 4,096 (11 bits plus sign in bipolar mode); Guaranteed monotonic over operating temperature range
Type of Converter:	Successive-Approximation
Input impedance:	> 1 Meg ohm
Input Ranges:	±0.675V, ±1.25V, ±2.5V, ±5V, ±10V; 0 to 1.25V, 0 to 2.5V, 0 to 5V, 0 to 10V

Gain ranges:	0.5 (jumper selectable), 1, 2, 4, 8 (software selectable)
System noise:	<1.5 LSB rms (all gains)
Overvoltage Protection:	±50 V without damage, power "on" 35 V without damage, power "off"
Common-Mode Input Voltage:	±13 volts (max)
Common-Mode Rejection Ratio:	95 db @60 Hz, all gains

ACCURACY

Relative accuracy:	±1.5 LSB maximum (nonlinearity + quantization error)±1.0 LSB typical
Differential nonlinearity:	±1.0 LSB maximum (no missing codes over temperature range)
Integral nonlinearity:	±1.0 LSB maximum (no missing codes over temperature range)
Full Scale (FS) Error:	±0.2% maximum (gain = 1) ±0.03% typical
Offset error:	±3 LSB maximum, ±1 LSB typical
Internal Voltage Reference:	0.05 % (of 5V) maximum 0.002% (of 5V) typical
Self Calibration:	3 points (25%, 50%, & 75%) on -5 to +5 V range. Auto offset calibration on all ranges
Sample Rates:	1 to 4000 S/s
Sample Averaging:	1 to 4000 samples
FIFO buffer:	12KB (stores up to 6000 averaged samples w/o a Time Tag or 1500 w/Time Tag, without requiring

data transfer to an external memory module)

Dynamic Performance

Gain	Bipolar	Unipolar	Sample rate	Selectable
0.5	±10 V	NA	4 kS/s	Jumper
1	±5 V	0 to 10 V	4 kS/s	Software
2	±2.5 V	0 to 5 V	4 kS/s	Software
4	±1.25 V	0 to 2.5 V	4 kS/s	Software
8	±0.625 V	0 to 1.25 V	4 kS/s	Software

Power Requirements: +5VDC (from M16/M8 power supply), 175 ma maximum, 150 ma typical

Environmental:

Operating temperature range: 0^o to 70^o C

Storage temperature range: -40^o to 85^o C

Humidity: 5% to 95% non-condensing

V78 SPECIFICATIONS

NOTE: These values are typical for 25^o C unless otherwise noted)

Relay Type & Quantity: 8 SPDT (single pole, double throw), form-C electromechanical relays

Contact material: Silver, gold plated

Operate time: 5 ms at nominal coil voltage

Release time: 2 milliseconds at nominal coil voltage

Contact rating:	3A @120 VAC, 2A @220 VAC or 28 VDC resistive load
Contact resistance:	100 milliohms initially
Life expectancy:	Mechanical: 20 million operations (min) Electrical: 100,000 (min) @ full load
Vibration:	10g @ 55-110Hz, 0.062", Dual amplitude(DA) -55Hz
Shock:	10g
Voltage isolation:	500 Vrms Channel-Channel & Channel-Ground
Connector:	DB-25 female
Power Requirements:	+5VDC, 300ma typical when all relays are on – (provided by M16/M8 power supply).
Software Control:	Relays individually programmable to act upon, record and/or report events by time, or on demand.
Environmental:	Operating temperature range 0^o to 55^o C Storage temperature range -55^o to 85^o C Humidity 5% to 95% non-condensing

V79 PDI-1 SWITCH INPUT STATUS MODULE

NOTE: These values are typical for 25^o C unless otherwise noted)

Inputs:	16 with individual ground returns or common (single-point) ground.
Drive Distance:	Up to 1000 Ohms cable resistance, for example: AWG 36 - 2400 ft., AWG 24 - 15000 ft., AWG 22 - 62000 ft.

Power Requirements: +5VDC, 40 ma typical (provided by M16/M8 pwr supply).

Debounce: 0 to 60000 ms (software selectable).

Environmental: Operating temperature range: 0^o to 70^o C
Storage temperature range: -40^o to 85^o C
Humidity: 5% to 95% non-condensing

V80 PDI-2 OPTICALLY ISOLATED INPUT MODULE

Module Type	PDI-2A	PDI-2B
Number of Inputs:	16	16
Input Voltage Range:	5-24	100-130 AC/DC
Maximum Input Current:	50ma	20ma
Minimum Turn On Current:	8ma	8ma
Max Turn On Time:	1ms	1ms
Max Turn Off Time:	1ms	1ms
VOLTAGE ISOLATION:	500V	500V

(Input to Input and Input to ground)

Power Requirements: +5VDC, 40 ma typical (provided by M16/M8 pwr supply)

Debounce Time: 0 to 60000 ms (software selectable)

Environmental: Operating temperature range: 0^o to 70^o C
Storage temperature range: -40^o to 85^o C
Humidity: 5% to 95% non-condensing

V82 PCM-1 SPECIFICATIONS

FACTORY POWER-UP DEFAULT CONFIGURATION:

Channel Names: *MOD01P01* for Module 1 Channel 1
MOD01P02 for Module 1 Channel 2

.
.
.

MOD16P16 for Module 16 Channel 16

Instruction Table: The Instruction Table is blank by default. If an instruction is entered into the Instruction Table, that instruction and the "latch" parameter are disabled by default.

Program Strings: All output strings are blank by default.

Conversion Tables: All conversion tables are blank by default.

User-Programmable Configurations: Easy to configure using on-screen menu. Choices are saved in non-volatile memory to become the new power-up default configuration.

Channel Names: Any character string up to 16 ASCII characters.

Instruction Table: Up to 999 instructions can be entered. Each instruction can be enabled or disabled and given a name up to 8 ASCII characters. There are fields for Enable, Line Name, CMD Type, and 5 arguments for each instruction. Each instruction has a "latch" parameter that can be enabled or disabled.

Program Strings: Up to 64 ASCII strings can be programmed.

String Name: Up to 8 ASCII characters.

String Content: Up to 64 ASCII characters.

Conversion Tables: Up to 16 conversion tables can be programmed.

Conversion Table Name: Up to 8 ASCII characters.

Slope:	-9999.99 to +9999.99
Y-Intercept:	-9999.99 to +9999.99
Range:	Up to 5 linear ranges per conversion table.

V 93A SPECIFICATIONS

Interface:	Dial-up telephone line
Modulation:	V.32bis (14,400 bps) or V.32 (9600 bps)
Compression:	V.42bis, MNP5
Connectors:	2 x 4-pin modular
Module LEDS:	*TD* (Transmit Data), *RD* (Receive Data), *CD* (Carrier Detect), *MR* (Modem Ready), and *CX* (Connection) status LEDs.
Transmit Level:	-10 dBm (dial-up)
Receiver Sensitivity:	-45 dBm
Dimensions:	6"h x 4.5"w.

APPENDIX B

MODEM COMMAND SUMMARY

U.S. ROBOTIC MODEMS

COMMAND	INTERPRETATION
AT&B1	Fixed Serial Port Rate (default)
AT&C1	Normal CD Operations (default)
AT&D2	Normal DTR Operations (default)
ATSO=1	Auto answer telephone line in 4 or fewer rings
ATE0	Modem does not display keyboard commands.
ATQ1	Place modem into quiet mode
AT&W0	Save the modem's configuration in non-volatile memory

NOTE: To send all of the above at the same time, type the following command:
AT&B1&C1&D2S0=1E0Q1&W0

ROCKWELL CHIP SET MODEMS

COMMAND	INTERPRETATION
ATS23=59	Fixed Serial Port Rate (default)
AT&C1	Normal CD Operations (default)
AT&D2	Normal DTR Operations (default)
ATS0=1	Auto answer telephone line in 4 or fewer rings
ATE0	Modem does not display keyboard commands
ATQ1	Place modem into quiet mode
AT&W0	Save modem's configuration in non-volatile memory

NOTE: To send all of the above at the same time, type the following command: ATS23=59&C1&D2S0=1E0Q1&W0

APPENDIX C

MODULE COMMAND SUMMARY

V74/V75/V87 DAC DATA COMMAND SUMMARY	
Command	Description
$CONFIG<cr>	Full menu configuration command.
$BTBn<cr> (n=1 to 16)	Broadcast. This command puts module n into broadcast mode where data received by the host module is sent to all V74/V75/V76/V87 ports simultaneously.
CB*n*<cr> (*n*=1 to 4, 0=all)	Clear Buffer. This command clears all buffered messages from the specified ports.
ID<cr>	Port ID Status. This command reports the current Port ID status for the ports of the selected module. The Port ID can have the format of either UU:MM,PP (Unit:Module, Port) or the device name of the port.
RA*n*<cr> (*n*=1 to 4, 0=all)	Report All Buffered Messages. This command reports all messages in the buffer at the time the command was sent. If there are no messages, <lf> is sent to the host controller.
RB*n*<cr> (*n*=1 to 4, 0=all)	Report All Buffered Data. This command reports all data in the buffer at the time which the command was received with no regard for messages. If there is no data, <lf> is sent to the host controller.
* RESET<cr>	Reset. This command instructs the entire M Series system to do a software reset.
RS*n*<cr> (*n*=1 to 4, 0=all)	Report Single Message. This command reports a single buffered message. If there is no message, <lf> is sent to the host controller.
RT<cr>	Read Time. This command requests the base unit to send the current date and time.
SR*n*<cr> (*n*=1 to 4, 0=all)	Stop Report. This command stops data flow from an RBn or RAn command.
ST HH:MM:SS,MM/DD/YY<cr>	Set Time. This command programs the date and time of the base unit's time-of-day clock.
NOTE: Multiple V74/V75/V76/V87 ports are selected using 2 formats. Examples: RA1,2,3,4<cr> and RA0<cr>. * The RESET<cr> command must be issued from the service port or service modem.	

V77 ADM-1 DATA COMMAND SUMMARY	
Command	**Description**
CA*n*<cr> (*n*=0 or 1 to 3)	Calibrate. 0=all, 1=25%, 2=50%, and 3=75% of Full Scale (FS). Initiates auto-calibration. ADM-1 tests for offsets and makes necessary corrections. Corrections are continually applied to all reported data messages until another Calibrate command is issued.
CB*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Clear Buffer. Clears all old data from the buffer when a new data set is started.
RA*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report All Buffered Samples.
RS*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Single Sample if Available
SA*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Sample. Read and report sample at programmed setup.

V77 ADM-1 DYNAMIC CONFIGURATION COMMAND SUMMARY	
Command	**Description**
AV*n*<cr> (*n*=1 to 4,000)	Number of Samples to Average
DF*n*<cr> (*n*=1 or 2)	Data Format. 1=Hexadecimal and 2=Decimal.
RMn<cr> (*n*=1 to 3)	Reporting Method. 1=Command, 2=Immediate, and 3=Schedule.
SD*n*<cr> (*n*=1 or 2)	Single Ended/Differential. 1=single ended and 2=differential.
SM*n*<cr> (*n*=1 or 2)	Sampling Method. 1=Command, 2=Immediate, and 3=Schedule.
SP*n*<cr> (*n*=1 or 2)	Sample Period. 1=Continuous and 2=Time.
SR*n*<cr> (*n*=1 to 4000)	Sample Rate (Samples/Sec)
TT*n*<cr> (*n*=1 or 2)	Time Tag. 1=Enable and 2=Disable.
UB*n*<cr> (*n*=1 or 2)	Unipolar/Bipolar. 1=unipolar and 2=bipolar.
VR*n*<cr> (*n*=1 to 5)	Set Voltage Range. 1 = ±10V (with JP1 installed), 2 = ±5V (or 0 to +10V), 3 = ±2.5V (or 0 to +5V), 4 = ±1.25V (or 0 to +2.5V) and 5 = ±0.625V (or 0 to +1.25V)

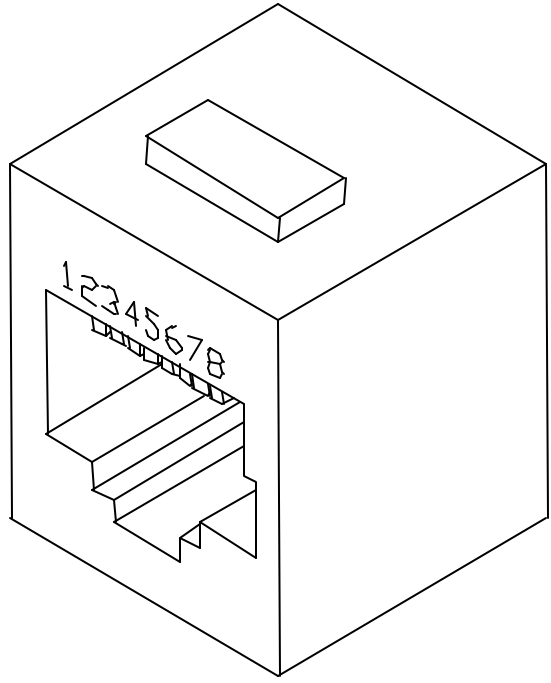
V78 CRM-1 DATA COMMAND SUMMARY	
Command	**Description**
CB*r*<cr> (*r*=Relay# 1 to 8, 0=all*)	Clear Buffer. Clears all buffered relay status history (change of state).
DR*r*<cr> (*r*=Relay# 1 to 8, 0=all*)	De-energize Relay(s)
ER*r*<cr> (*r*=Relay# 1 to 8, 0=all*)	Energize Relay(s)
RA*r*<cr> (*r*=Relay# 1 to 8, 0=all*)	Report All Buffered Relay Status History
RS*r*<cr> (*r*=Relay# 1 to 8, 0=all*)	Report Single Relay Status History Sample if Available
SA*r*<cr> (*r*=Relay# 1 to 8, 0=all*)	Sample. Read and report the current status of the selected relay(s).

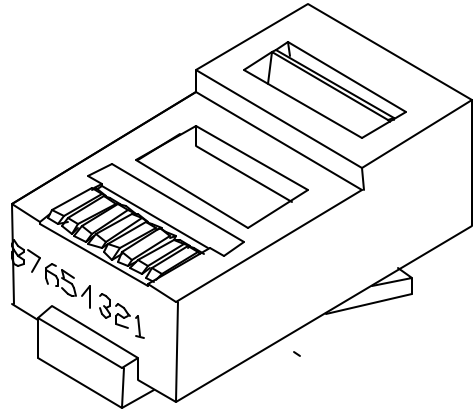
V78 CRM-1 I/O MODULE DYNAMIC CONFIGURATION COMMAND SUMMARY	
Command	**Description**
RM*n*<cr> (*n*=1 to 3)	Reporting Method. 1=Command, 2=Immediate, and 3=Schedule.
TT*n*<cr> (*n*=1 or 2)	Time Tag. 1=Enable and 2=Disable.

V79 PDI-1 & V80 PDI-2 COMMAND SUMMARY	
Command	**Description**
CB*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Clear Event Buffer. Clear all buffered event samples.
CC*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Clear Event Counter(s)
CR*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Clear Event Latch Data
RA*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report All Buffered Events
RC*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Event Counter(s)
RD*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Event Duration(s)
RL*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Event Latch Data
RO*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Event Counter and Reset
RR*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Event Latch Data
RS*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Single Buffered Event (first in, first out)
SA*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Read and report the current state of the selected input(s).
SL*c*<cr> (*c*=Ch# 1 to 16, 0=all)	Report Latest Event
* Multiple channels are selected using 4 formats. Examples: **SA1,2,3,4,5,6,7,8<cr>**, **SA1-8<cr>**, **SA0<cr>**, **SA1,2,4-8<cr>**	

V79 PDI-1 & V80 PDI-2 DYNAMIC CONFIGURATION COMMAND SUMMARY	
Command	**Description**
DB*n*<cr> (*n*=0-65535ms)	Debounce Delay
DF*n*<cr> (*n*=1 or 2)	Data Format. 1=Hexadecimal and 2=Decimal.
RM*n*<cr> (*n*=1 to 3)	Reporting Method. 1=Command, 2=Immediate, and 3=Schedule.
TT*n*<cr> (*n*=1 or 2)	Time Tag. 1=Enable and 2=Disable.

APPENDIX D – CABLES AND ADAPTERS





r

APPENDIX E

V82 PCM-1 (Programmable Control Module) OPERATION

INDEX

F

H

I

J

L

M

N

O

P

R

S

T

U

V

W

X