

OWNER'S MANUAL

MODEL V78 CRM-1

CONTROL RELAY MODULE

BayTech Publication #U140E104

Thank you for selecting a BayTech Model V78 CRM-1 Control Relay Module.

The data provided in this Owner's Manual explains the various ways you can operate the V78 CRM-1 and how to configure your unit. We suggest that you read this manual carefully before attempting to install the Model V78 CRM-1, and that you place special emphasis on correct cabling and configuration. If you have any problems with your installation, please contact a BayTech applications engineer for assistance.

BayTech also manufactures other data communications devices that provide port sharing and expansion, networking, port contention, buffered and non-buffered printer sharing, network print servers, and statistical multiplexing. If you would like information on any of these models, please contact BayTech Customer Service.

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

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1 GENERAL

BayTech's CRM-1 eight channel, control relay module is a microprocessor controlled plug-in unit designed for use with the BayTech M16 and M8 (DAC) 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 M16/M8 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.

2 SPECIFICATIONS

(typical for 25° C unless otherwise noted)

RELAYS:

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° to 55° C

Storage temperature range -55° to 85° C

Humidity 5% to 95% non-condensing

3 INSTALLATION

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

NOTE: The CRM-1 cannot be installed as Module 1. If an CRM-1 is removed from a module slot and a different CRM-1 is installed in that location, the newly installed module acquires the previous module's configuration. Moving an 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 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 in *Figure 1*.

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 #4 NO	12	25 Relay #8 NO
No Connect	13	

Figure 1: Relay Contact Connections

4 OPERATION

This section discusses the general CRM-1 operation (*Section 4.1*), user-programmable features (*Section 4.2*), data commands (*Section 4.3*), data message generation and relay control (*Section 4.4*), and data message presentation (*Section 4.5*).

4.1 GENERAL

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 normally closed (NC) contacts and is capable of switching AC and DC loads up to 3 amps. The 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 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 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 CRM-1 by downloading configuration commands (see *Section 5.2*). You may review the current CRM-1 configuration status from the control panel (see *Section 5.3*).

4.2 USER-PROGRAMMABLE FEATURES

You may program the *Relay Operating Setup*, *Reporting Setup*, and *Dynamic Configuration* on the CRM-1. *Section 4.2.1* discusses Relay Operating Setup, *Section 4.2.2* discusses Reporting Setup, and *Section 4.2.3* discusses Dynamic Configuration.

4.2.1 RELAY OPERATING SETUP

Relay Operating Setup allows you to program the 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).**

4.2.2 REPORTING SETUP

Reporting Setup allows you to program how the 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)*. The following subsections describe these features in more detail.

4.2.2.1 REPORTING METHOD

Reporting Method is the manner in which data messages are sent to a designated host computer/controller. The 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.**

4.2.2.2 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.**

4.2.2.3 REPORT INTERVAL

You may program the CRM-1 to report in repetitive periods using Schedule Reporting Method, where the CRM-1 will report all event data messages in the receive buffer after the specified Report Interval has elapsed. The 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).**

4.2.2.4 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.**

4.2.2.5 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.**

4.2.2.6 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 (*Carriage Return*) followed by 0A Hex (*Line Feed*).**

4.2.3 DYNAMIC CONFIGURATION

You may enable or disable Dynamic Configuration for the CRM-1. Dynamic configuration mode allows non-verbose or "on-the-fly" configuration commands to be issued to the CRM-1 which are summarized in *Section 5.2*. **The default Dynamic Configuration setting is disabled.**

4.3 DATA COMMANDS

You may issue 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 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.

CRM-1 data commands are sent through a host module using the following procedure:

1. Select the 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 a terminating character of *Carriage Return* (0D Hex) or *Line Feed* (0A Hex). For example, to select a CRM-1 installed as Module 15 in a non-cascaded unit using the default port select code, send **\$BT15<cr>**.
2. Once the CRM-1 is selected, it will go into *Command Mode* and allow you to send data commands. The CRM-1 data commands begin with two capital letters designating the specific command and are terminated with a *Carriage Return*. Most data commands also require a number between the command letters and *Carriage Return*. 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
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 CRM-1 module, you may disconnect from the CRM-1, by sending **\$BT<cr>**. You may disconnect from the CRM-1 and select a different module or the base unit by sending **\$BTX<cr>**, where X is the desired module number or 0 for the base unit.

IMPORTANT: If the 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 *Carriage Return* or *Line Feed* before the CRM-1 will resume sending data messages to the designated host module.

Sections 4.3.1 through 4.3.6 provide detailed information on the functionality of each data command supported by the CRM-1. *Appendix A* provides these same commands in a condensed version for quick reference.

4.3.1 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:

CBn<cr>

where n = Relay# (1 to 8 or 0 for all).

4.3.2 REPORT ALL BUFFERED DATA MESSAGES COMMAND

The Report All Buffered Data Messages (RA) command instructs the 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).

4.3.3 REPORT A SINGLE BUFFERED DATA MESSAGE COMMAND

The Report A Single Buffered Data Message (RS) command instructs the 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:

RSn<cr>

where n = Relay# (1 to 8 or 0 for all).

4.3.4 SAMPLE COMMAND

The Sample (SA) command instructs the 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).

4.3.5 DE-ENERGIZE RELAY COMMAND

The De-energize Relay (DR) command instructs the 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).

4.3.6 ENERGIZE RELAY COMMAND

The Energize Relay (ER) command instructs the 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).

4.4 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 CRM-1 module. Data message generation depends on the Reporting Method used. When using Immediate Reporting Method, the 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 CRM-1 will generate an event data message whenever a change-in-state of a relay occurs after the Report Start Time has elapsed (see *Section 4.2.2.2*). When using Command Reporting Method, the 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.

4.5 DATA MESSAGE PRESENTATION

Data message presentation varies slightly in format depending on module configuration. However, all data messages 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 CRM-1 Module Number
CC is the CRM-1 Channel Number
1 indicates the relay is energized
0 indicates the relay is de-energized
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 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 1 11/18/93 09:12:22
1:15:2 1 11/18/93 09:12:22
1:15:3 1 11/18/93 09:12:22
1:15:4 1 11/18/93 09:12:22
1:15:5 0 11/18/93 09:12:22
1:15:6 0 11/18/93 09:12:22
1:15:7 0 11/18/93 09:12:22
1:15:8 0 11/18/93 09:12:22
```

```
UNIT#
MODULE#
RELAY#
RELAY STATUS
DATE
TIME
```

Data messages requested through the use of data commands might include messages from one or more relays.

5 CONFIGURATION

You may program the CRM-1 using a menu-driven configuration procedure from a host module or the M Series service port as described in *Section 5.1* or by sending dynamic configuration commands from a host module as described in *Section 5.2*. You may view the current configuration from the front panel (see *Section 5.3*).

5.1 MENU-DRIVEN CONFIGURATION

To access the menu-driven configuration mode of the CRM-1 from any host module, use the following procedure:

1. Configure the host terminal's serial parameters to match those of the host module. From the factory, the V71 host module is set at 9600 baud, 8 bit word size, 1 stop bit, no parity, and XON/XOFF disabled. If you do not have a dumb terminal or a terminal emulation program, BayTech supplies a utility diskette which includes software to put an IBM PC or compatible into a terminal mode (TERM.EXE).

2. Connect to the CRM-1 module by sending 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 *Carriage Return* or *Line Feed*.
3. Access configuration mode by sending **\$CONFIG<cr>**.

For example, if the CRM-1 is installed as Module 2 in a non-cascaded unit and the default port select code (\$BT) is used, send **\$BT2<cr>\$CONFIG<cr>** to enter into configuration mode. No characters should be typed between \$BT2<cr> and \$CONFIG<cr>. If this happens, the entire configuration sequence will be discarded and you will have to send the configuration sequence again.

NOTE: All commands must be in uppercase.

To access the menu-driven configuration mode of the CRM-1 from the service port, use the following procedure:

1. 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.
2. Connect to the CRM-1 by sending **\$BAYTECH**, the desired module number (2 to 16), and *Carriage Return* or *Line Feed*.
3. Access configuration mode by sending **\$CONFIG<cr>**. Following the example above, you would send **\$BAYTECH2<cr>\$CONFIG<cr>** to configure Module 2.

NOTE: All commands must be in uppercase.

5.1.1 CONFIGURATION MAIN MENU

The CRM-1 installed as Module X (X = 2 to 16) will respond to the receiving of \$CONFIG<cr> 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 CRM-1 will exit from configuration mode and go into an active data collection mode.

5.1.2 MODULE STATUS

By responding to the *Enter Selection:* message at the end of the Configuration Main Menu (see *Section 5.1.1*) with "1" (Module Status), you may review the current configuration status. The CRM-1 will respond with a menu similar to the following:

```
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.
```

5.1.3 RELAY OPERATING SETUP

By responding to the *Enter Selection:* message at the end of the Configuration Main Menu (see *Section 5.1.1*) with "2" (Relay Operating Setup), you may program the relay schedule. The CRM-1 will respond with the following menu:

```
RELAY OPERATING SETUP

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

Enter Selection:
```

Type the number corresponding to your desired choice. The "List Current Schedule" choice will display the current relay schedule, the "Create/Modify Schedule" choice allows you to program individual relay events. The "Enable/Disable Events" choice allows you to enable or disable individual relay events once they are programmed. The "Delete Events/Schedule" choice allows you delete individual programmed relay events or the entire schedule. *Section 5.1.3.1* through *Section 5.1.3.4* describes these items in more detail. Type "X" to return to the Configuration Main Menu (see *Section 5.1.1*).

5.1.3.1 LIST CURRENT SCHEDULE

If you select "1" from the *Enter Selection:* prompt at the end of the Relay Operating Setup menu (List Current schedule), you may review the current relay schedule. The CRM-1 will respond with:

```
CURRENT SCHEDULE

EVENT START DURATION INTERVAL RELAY
NO.   TIME                NO.
      DD HH:MM:SS HH:MM  D HH:MM:SS
      NNNNN

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.

5.1.3.2 CREATE/MODIFY SCHEDULE

If you select "2" from the *Enter Selection:* prompt at the end of the Relay Operating Setup menu (Create/Modify Schedule), you may edit the existing relay schedule. The CRM-1 will respond with:

```
EVENT NUMBER

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

Type the desired Event Number (1 to 12) followed by <ENTER>. The 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 Date, 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 <ENTER>. For example if you enter "1" for Monday, the 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 <ENTER>. 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 <ENTER>. For example, type "0" to start at the top of the selected hour. After you have entered in the desired Event Start Time, the 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 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 <ENTER>.

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 <ENTER>. 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.

5.1.3.3 ENABLE/DISABLE EVENTS

If you select "3" from the *Enter Selection:* prompt at the end of the Relay Operating Setup menu on page 16 (Enable/Disable Events), you may enable or disable individual relay events. The CRM-1 will respond with:

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 <ENTER>. Enter the desired Event Number to enable or disable. The 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. The CRM-1 will return to the Relay Operating Setup menu shown on page 16.

5.1.3.4 DELETE EVENTS/SCHEDULE

If you select "4" from the *Enter Selection:* prompt at the end of the Relay Operating Setup menu on page 16 (Delete Events/Schedule), you may delete individual relay events or the entire schedule. The CRM-1 will respond with:

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 <ENTER>.

5.1.4 REPORTING SETUP

By responding to the *Enter Selection:* message at the end of the Configuration Main Menu (see *Section 5.1.1*) with "3" (Reporting Setup), you may program how the CRM-1 reports data messages to the host computer/controller. The items you may program are *Reporting Method, Report Start Time, Report Interval, Host Address, Time Tag, and Terminating Character(s)*. The operational functionality of these items is discussed in *Section 4.2.2*. The CRM-1 will respond with the Reporting Setup menu as follows:

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:

If you respond to one of the above selections with 1 to 6, a sub-menu will be presented for that item. After making any necessary changes under sub-menus 1 to 6, you will be returned to the Reporting Setup menu. The "Exit" selection will return you to the Configuration Main Menu.

5.1.4.1 REPORTING METHOD

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu with "1" (Reporting Method), you may program the Reporting Method. The CRM-1 will respond with the Select Reporting Method sub-menu as follows:

```
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 CRM-1 receives a **SA***n***<cr>** command, it will report the current status of the selected relay (energized or de-energized) to the host-controller (see *Section 4.3.4*).

When Command Reporting Method is selected, the CRM-1 will report event data messages to the host module only when the **RA***n* or **RS***n* commands are issued (see *Section 4.3.2* or *Section 4.3.3* respectively). If CRM-1 receives a **RA***n* (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 CRM-1 receives a **RS***n* (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 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 CRM-1 will begin reporting data messages as events occur at the programmed Report Start Time (see *Section 5.1.4.2*). 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 as explained in *Section 5.1.4.3*.

5.1.4.2 REPORT START TIME

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 20 with "2" (Report Start Time), you may program the time the CRM-1 will start reporting when using Schedule Reporting Method. The CRM-1 will respond with the Report Start Time menu as follows:

```
REPORT START TIME

Reporting Start Time.....HH:MM
Current Date 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 Date 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 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 Date 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 CRM-1 is initially reporting, if you enter into the menu-driven mode of configuration and exit, the 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 (see *Section 5.2*).

5.1.4.3 REPORT INTERVAL

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 20 with "3" (Report Interval), you may program the time interval between reporting periods when using Schedule Reporting Method. The CRM-1 will respond with the Report Interval menu as follows:

```
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 CRM-1 will report all buffered data messages to the designated host module until the buffer is empty. The 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 CRM-1 will report all messages in its buffer every hour on the hour starting at 12:00.

5.1.4.4 HOST ADDRESS

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 20 with "4" (Host Address), you may program the address of the designated host module. The designated host module is where data messages are sent when using Immediate or Schedule Reporting Method. The CRM-1 will respond with the Host Address menu as follows:

```
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 <ENTER>. 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.

5.1.4.5 TIME TAG

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 20 with "5" (Time Tag), you may program the CRM-1 to append a time tag to the end of data samples automatically. The CRM-1 will respond with the Enable/Disable Time Tagging menu as follows:

```
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.

5.1.4.6 TERMINATING CHARACTER(S)

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 20 with "6" (Terminating Character(s)), you may program one or two characters to be appended at the end of each data message. This option allows a user to match the host terminal and/or requirements of their application software. The CRM-1 will respond with the Enter Terminating Character menu as follows:

```
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, *Carriage Return* would be represented by 0D Hex and *Line Feed* would be represented by 0A Hex.

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

5.1.5 DYNAMIC CONFIGURATION

By responding to the *Enter Selection:* message at the end of the Configuration Main Menu (see *Section 5.1.1*) with "5" (Dynamic Configuration), you may program the CRM-1 to respond to dynamic configuration (non-verbose) commands. The CRM-1 will respond with the Dynamic Configuration Commands menu as follows:

```
DYNAMIC CONFIGURATION COMMANDS

Dynamic Configuration Commands.....DISABLED

Enable.....1
Disable.....2
Exit.....X

Enter Selection:
```

Dynamic configuration mode allows the CRM-1 to be programmed by downloading dynamic (on-the-fly) commands. See *Section 5.2* for the procedure to program the CRM-1 via dynamic configuration and a description of the available configuration commands.

5.1.6 EXIT

By responding to the *Enter Selection:* message at the end of the Configuration Main Menu (see *Section 5.1.1*) with "X" (Exit), the CRM-1 will exit the menu-driven configuration mode. If changes are made to any configuration parameter, the CRM-1 will respond with:

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

If you reply in the affirmative (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 in the negative (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 CRM-1 will respond with:

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

5.2 DYNAMIC CONFIGURATION PROCEDURE AND COMMANDS

CRM-1 dynamic configuration commands are issued through a host module. Some configuration commands apply to all types of DAC modules, while others apply to specific modules. The CRM-1 will recognize dynamic configuration commands only when Dynamic Configuration is enabled (see *Section 5.1.5*).

Use the following procedure to send dynamic configuration commands to the CRM-1 from a host module:

1. Select the 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 a terminating character of *Carriage Return* (0D Hex) or *Line Feed* (0A Hex). For example, to select a CRM-1 installed as Module 15 of a non-cascaded unit using the default port select code, send **\$BT15<cr>**.
2. Once the CRM-1 is selected, it will go into *Command Mode* and allow you to send dynamic configuration commands. The CRM-1 configuration commands begin with two capital letters designating the specific command and are terminated with a *Carriage Return*. Most configuration commands require a number between the command letters and *Carriage Return*. This number represents the desired configuration parameter.
3. After you have sent the desired configuration command(s) to the CRM-1 module, you may disconnect from the CRM-1, by sending **\$BT<cr>**. You may disconnect from the CRM-1 and select a different module or the base unit by sending **\$BTX<cr>**, where X is the desired module number or 0 for the base unit.

Sections 5.2.1 and 5.2.2 provide detailed information on the functionality of each configuration command supported by the CRM-1. *Appendix A* provides these commands as a quick reference.

NOTE: Multiple configuration commands may be sent while the CRM-1 is in command mode. Each command should be terminated with a *Carriage Return*. For example:

RM1<cr>TT2<cr>

Please see the following subsections for a description of the RM and TT commands.

5.2.1 REPORTING METHOD COMMAND

The Reporting Method (RM) command programs the CRM-1 Reporting Method (see *Section 4.2.2.1* and *Section 5.1.4.1*). The Reporting Method command has the following format:

RM*n*<cr>

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

5.2.2 TIME TAG COMMAND

The Time Tag (TT) command is used to enable or disable time tagging as described in *Section 4.2.2.6* and *Section 5.1.4.6*. The Time Tag command has the following format:

TT*n*

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



5.3 FRONT PANEL CONFIGURATION

The LCD display and associated front panel controls can provide the configuration status of the CRM-1. All the parameters shown in the LCD status message are fully described in *Section 5.1*.

When the M8/M16 DAC has completed its power-up self-test, the following menu will be displayed on the LCD:


```
Bay Technical Assoc
Select Module
00
```

NOTE: The following LCD screens are examples and will vary depending upon current configuration status.

To review the configuration status of the CRM-1 installed as Module XX (XX = 02 to 16), use the  or  keys to highlight "Module XX" from the M Series main menu screen and press the *SELECT* key. The LCD will respond with:

```
V78 CRM-1 MODULE XX
Display Status
Exit Module Menus
```

Highlight "Display Status" with the arrow keys and press *SELECT*. The LCD will respond with:

```
Relay Op Sk DISABLED
Report Method COMMAND
Report Start HH:MM
-PAGE SELECT-EXIT
```

Pressing the  or  keys scrolls through the following entries:

```
Report Interval HH:MM
Host Address 1:1,1
Time Tagging ENABLE
Term Characters ODOA
Dyna Cfg Cmd ENABLE
```

To exit the configuration status mode, press the SELECT key at any time. You are returned to the CRM-1's LCD main menu. Next, press either arrow key until the cursor is located on the "Exit Module Menus." Pressing the SELECT button returns you to the M Series main LCD menu.

APPENDIX A DATA/CONFIGURATION COMMAND SUMMARY

The tables below summarize the data and configuration commands supported by the V78 CRM-1 I/O module:

V78 CRM-1 DATA COMMAND SUMMARY	
Command	Description
CB <i>r</i> <cr> (<i>r</i> =Relay# 1 to 8, 0=all*)	Clear Buffer. Clears all buffered relay status history (change of state).
DR <i>r</i> <cr> (<i>r</i> =Relay# 1 to 8, 0=all*)	De-energize Relay(s)
ER <i>r</i> <cr> (<i>r</i> =Relay# 1 to 8, 0=all*)	Energize Relay(s)
RA <i>r</i> <cr> (<i>r</i> =Relay# 1 to 8, 0=all*)	Report All Buffered Relay Status History
RS <i>r</i> <cr> (<i>r</i> =Relay# 1 to 8, 0=all*)	Report Single Relay Status History Sample if Available
SA <i>r</i> <cr> (<i>r</i> =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 <i>n</i> <cr> (<i>n</i> =1 to 3)	Reporting Method. 1=Command, 2=Immediate, and 3=Schedule.
TT <i>n</i> <cr> (<i>n</i> =1 or 2)	Time Tag. 1=Enable and 2=Disable.

APPENDIX B

EPROM UPGRADE

You will receive one EPROM (chip with label) for each CRM-1 module to be upgraded. The materials you will need to supply are:

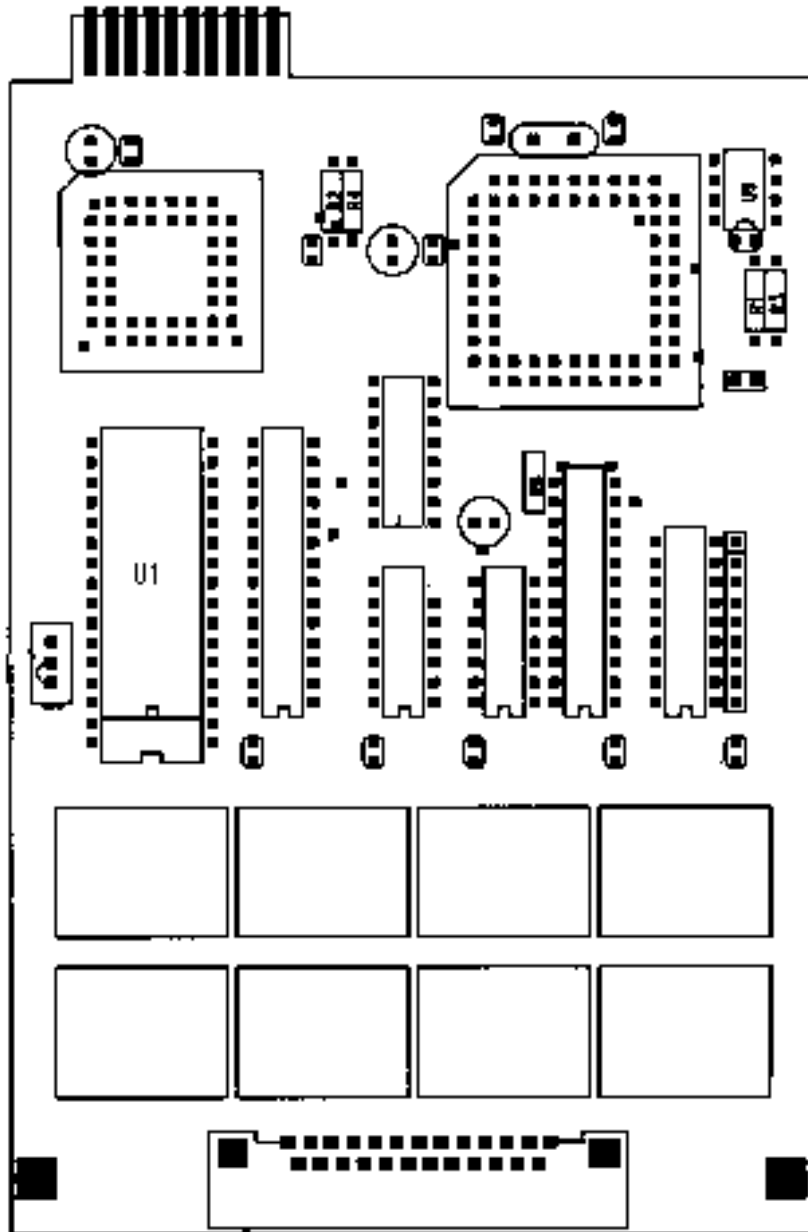
Straight-slot screwdriver

IC DIP extractor or a pair of curved needle-nose pliers

1. **IMPORTANT:** Remove power from the unit by depressing the power switch on the front of the unit to OFF. Also remove power cord from the AC outlet.
2. Remove the appropriate module by loosening the 2 straight slot screws that attach the connector board I/O module to the chassis and then pulling the module out.
3. Refer to the CRM-1 mechanical layout (see *Appendix C*) and locate socket *U1*. Remove existing EPROM from the appropriate socket with IC extractor or needle-nose pliers. Gradually loosen each side of the chip, alternating pliers from side to side, so as not to bend chip pins. Pull loosened EPROM all the way out.
4. Install new EPROM into the appropriate socket. (Make certain you are installing the correct EPROM into the correct module by referring to the label on the EPROM). The EPROM is notched; the notch on the EPROM should line up with the notch on the socket. When installing the new chips, be careful not to bend any of the pins.
5. Re-install the module(s) and apply power to the unit. The upgrade is now complete.

Before you begin operations, check the configuration status to make certain it matches your application. If configuration changes (baud rates, handshaking, etc.) are required, you must make these changes in the configuration mode. See *Section 5* for complete instructions.

APPENDIX C
CRM-1 MECHANICAL LAYOUT



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