

OWNER'S MANUAL

MODEL V83 ECM-1

12 CHANNEL EVENT COUNTER
MODULE

BayTech Publication #U140E114

Thank you for selecting the BayTech Model V83 ECM-1 Twelve Channel Event Counter Module.

The data provided in this Owner's Manual explains the various ways you can configure and operate a V83 ECM-1. We suggest that you read this manual carefully before attempting to install a ECM module, 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. We hope that you will continue to look to BayTech for your data collection and communications needs.

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1 V83 ECM-1 INTRODUCTION

BayTech's ECM-1 Event Counter Module is a plug-in module designed for use with BayTech M Series DAC Data Acquisition Controllers. The ECM-1 is used to detect, record, and report the number of events that occur during a specified time interval. An event is defined as a change-in-state of an input and return to the original state. Applications requiring the counting of events, such as the movement of objects on a conveyor or a high speed pulse train generated by a shaft encoder, can take advantage of the ECM-1.

The main features of the ECM-1 are twelve, microprocessor-controlled input channels. Each channel can be connected with an individual ground return or to a common single-point ground. These input channels provide a flexible, reliable method to detect and report the change-in-state of a circuit as an event.

All events detected by the ECM-1 are recorded as an *event data message* and sent to a host computer/controller connected to a V71 host module. Event data messages can be provided with a "time stamp" or "Time Tag" which is available through the use of a "time-of-day" clock located in the M Series base unit. A time tag includes the month, day, year, hour, minute and second the event occurred.

The ECM-1 supports four different modes of operation. The first mode of operation is a simple event accumulator. Each time an event occurs, the total for that counter is incremented by one. Under the second and third modes of operation, the counter can be set to count up or down to a value between two and 65535. When the terminal count value is reached, the module reports that fact and the counter is reset to the original value. The fourth mode of operation provides a divide by "n" function that allows any channel of the ECM-1 to act as a programmable frequency divider. Each counter is independently configurable, allowing any combination of modes.

Event data messages are 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).

Input connections to the ECM-1 are made through a standard DC-37F connector.

2 SPECIFICATIONS

(typical for 25° C unless otherwise noted)

INPUTS: Twelve with individual ground returns or common (single-point) ground.

CONTROL INPUTS/SIGNAL OUTPUTS: Gate Input or Counter Output, jumper selective.

POWER REQUIREMENTS: +5VDC 100 ma typical (provided by M16/M8 power supply)

ENVIRONMENTAL:

Operating temperature range: 0° to 55° C

Storage temperature range: -55° to 85° C

Humidity: 5% to 95% non-condensing

3 INSTALLATION AND 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.

Circuit Connection	Pin #	Circuit Connection
Input #1	1	Ground #10
Ground #1	2	Input #11
Input #2	3	Ground #11
Ground #2	4	Input #12
Input #3	5	Ground #12
Ground #3	6	Input #13
Input #4	7	Ground #13
Ground #4	8	Input #14
Input #5	9	Ground #14
Ground #5	10	Input #15
Input #6	11	Ground #15
Ground #6	12	Input #16
Input #7	13	Ground #16
Ground #7	14	N.C.
Input #8	15	N.C.
Ground #8	16	N.C.
Input #9	17	N.C.
Ground #9	18	N.C.
Input #10	19	

Figure 1: ECM-1 Signal Connections

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.

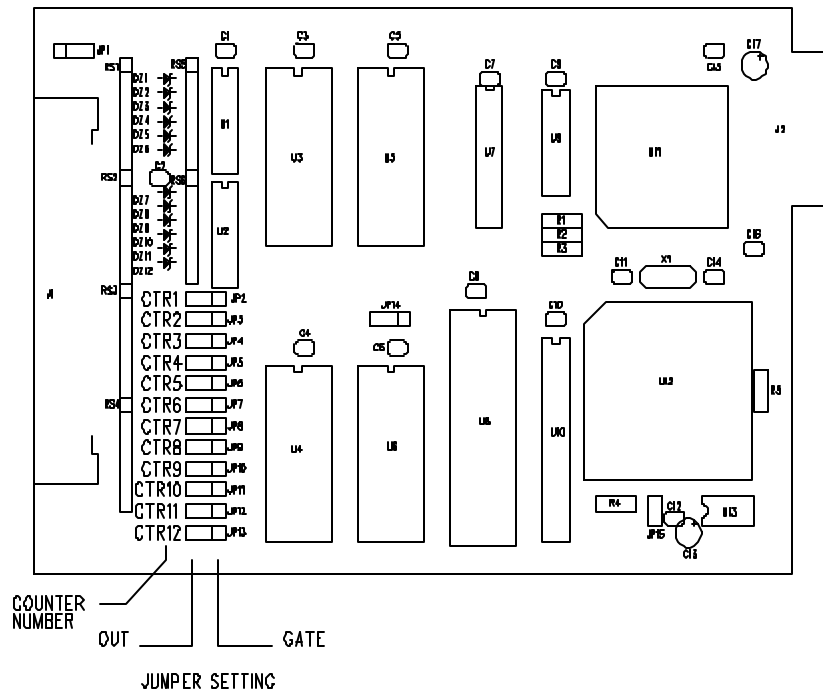


Figure 2: ECM-1 Board and GATE/OUT Jumpers

4 OPERATION

This section discusses the general ECM-1 operation (*Section 4.1*), user-programmable features (*Section 4.2*), counter mode operation (*Section 4.3*), data commands (*Section 4.4*), event data message reporting (*Section 4.5*), and data presentation (*Section 4.6*).

4.1 GENERAL

The ECM-1 module is used in applications requiring counting of events such as the movement of objects on a conveyor or a high speed pulse train generated by a shaft encoder. The ECM-1 has 12 microprocessor-controlled input channels that provide a flexible, reliable method to detect and report events. An *Event* is defined as a change-in-state from LO to HI and back to LO. An input channel is "HI" when +5 volts is detected on that channel and is "LO" when no voltage is detected. The actual data associated with an event which is calculated by the ECM-1 module is referred to as an *event data message*. An event data message can be the actual number of events that have occurred since the event counter was reset or an *outcome*, where an outcome is the result of an up or a down counter reaching a preset "terminal count".

Individual ECM-1 channels can be programmed to operate in one of the following four Counter Modes: (1) Event Counter, (2) Up Counter, (3) Down Counter, or (4) Programmable Divider. The Event Counter mode records the total number of events observed from 0 to 65535. If an event counter value of 65535 is reached, the event counter "rolls over" to zero. The Up Counter and Down Counter modes provide methods for counters to count up and count down respectively and generate a message report upon reaching a *terminal count*. The terminal count can be any value between 2 and 65535. The Programmable Divider mode acts as a frequency divider where an external 0 to +5 volt square wave acts as an input signal to an ECM-1 channel. An output signal is generated on the same ECM-1 port's *OUT* pin. The output signal has a frequency equal to the input signal frequency divided by a programmable divisor value (2 to 65535).

Individual ECM-1 channels can be programmed to report event data messages upon request via data commands (Command Reporting Method), at a specific date/time (Schedule Reporting Method), or as the event terminal count occurs (Immediate Reporting Method). The Schedule and Immediate Reporting modes apply only when an ECM-1 channel is programmed to operate in the Up Counter or Down Counter modes. Event data messages 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 event data was recorded.

You have the choice of programming the ECM-1 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 ECM-1 by downloading configuration commands (see *Section 5.2*).

4.2 USER-PROGRAMMABLE FEATURES

You can program the *Counter Setup*, *Reporting Setup*, and *Dynamic Configuration* on the ECM-1 which are discussed in *Section 4.2.1* through *Section 4.2.3* respectively.

4.2.1 COUNTER SETUP

Counter Setup allows you to program the Counter Mode, Terminal Count/Divisor Value, and Active Counters for individual ECM-1 input channels. The Counter Mode for an individual channel can be programmed to be an Event Counter, an Up Counter, a Down Counter, or a Programmable Divider. *Section 4.3* discusses the Counter Modes in more detail.

The Active Counters selection allows you to program individual channels to be active or inactive.

The Terminal Count/Divisor Value allows you to enter a preset value for each ECM-1 channel. When a channel is programmed to use Up Counter or Down Counter mode and the channel senses an event, the counter value is incremented or decremented by one. When the counter reaches the "Terminal Count", a message is either stored or sent to the host controller. The Terminal Count value is then reloaded into the counter and the process repeats. When a channel is programmed to use Programmable Divider mode, this parameter becomes a Divisor Value rather than a Terminal Count Value. *Section 4.3.3* discusses the Divisor Value in more detail. The Terminal Count/Divisor Value can be any number from two (2) to 65535.

The factory default Counter Mode and Terminal Count/Divisor are undefined and all ECM-1 channels are disabled.

4.2.2 REPORTING SETUP

Reporting Setup allows you to program how the ECM-1 reports event data messages to the host module. The items you can program in the Reporting Setup include *Reporting Method*, *Report Start Time*, *Report Interval*, *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 event data messages are sent to the designated host module. The ECM-1 provides three Reporting Methods: Command (upon request via data commands), Immediate (when Terminal Count is reached), 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 can 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 can program the ECM-1 to report in repetitive periods using Schedule Reporting Method, where the ECM-1 will report all event data messages in the receive buffer after the specified Report Interval has elapsed. The ECM-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 appended immediately after the event data message. The time tag consists of the month, day, year, hour, minute, and second at which the data was calculated. Time Tag can 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 an event 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 can enable or disable Dynamic Configuration for the ECM-1. Dynamic configuration mode allows non-verbose or "on-the-fly" configuration commands to be issued to the ECM-1 which are summarized in *Section 5.2*. **The default Dynamic Configuration setting is disabled.**

4.3 COUNTER MODE OPERATION

The individual channels of the ECM-1 can be programmed to operate in one of four operating modes. The Counter Mode selections available are: (1) Event Counter, (2) Up Counter, (3) Down Counter or (4) Programmable Divider. *Section 4.3.1* through *Section 4.3.3* discuss these modes in more detail.

4.3.1 EVENT COUNTER MODE

If an ECM-1 channel is programmed to operate in Event Counter mode, that channel can record the total number of events observed from 0 to 65535. If a value of 65535 is reached, the counter will "roll-over" to zero. Immediate Reporting mode and Schedule Reporting mode as described in *Section 4.5.1* are not available for an ECM-1 channel operating in Event Counter mode. Therefore, the user must periodically poll the ECM-1 for accumulated events via data commands (see *Section 4.4*). An event counter can be reset to 0 at any time using the **ROn** or **CCn** commands.

4.3.2 UP COUNTER AND DOWN COUNTER MODES

The Up Counter and Down Counter modes provide methods for ECM-1 channels to generate a message report upon reaching a "terminal count". A terminal count can be any value between 2 and 65535. The action of both modes is similar except for the direction in which a counter counts (either up or down) to a programmed terminal count. The current event counter value for one or more ECM-1 channels can be sent to a user by using the appropriate data command(s). See Section 4.4 for additional information on the use of data commands.

4.3.3 PROGRAMMABLE DIVIDER MODE

An ECM-1 channel configured to use the Programmable Divider mode acts as a frequency divider. In this mode, an external 0 to +5 volt square wave acts as an input signal to an ECM-1 channel. An output signal is generated on the same ECM-1 port that has a frequency equal to the input signal frequency divided by a programmable divisor value (2 to 65535). Use the following procedure to configure an ECM-1 channel to operate in Programmable Divider mode:

1. Power down the M Series unit and remove the ECM-1 module. Reposition the desired counter(s) GATE/OUT jumper(s) to the OUT position (see *Section 3*). Re-install the ECM-1 module in M Series chassis and apply AC power.
2. Access the ECM-1 configuration mode and program the desired channel to operate in Programmable Divider mode. Also enter a divisor value from two (2) to 65535 as the reference frequency divider (see *Section 5.1.3*).
3. Provide a reference signal (square wave, 0 to +5 volt amplitude) to the selected counter(s) input pin (see *Section 3*).

A pulse train equal in frequency to the reference signal divided by the divisor value is generated at the OUT pin of the corresponding input circuit (see *Section 3*). For example, a 5Mhz reference signal divided by a divisor value of five (5) provides an output frequency of 1Mhz.

NOTE: The resultant output signal is not a 50% duty cycle (symmetrical square wave), and actually consists of a narrow pulse approximately 1 μ sec in width.

4.4 DATA COMMANDS

You can issue ECM-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 can be entered repeatedly to get specific event data messages. You can issue a single data command to obtain event data messages from multiple channels. Data commands must be used to obtain event data messages when using Command Reporting Method.

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

1. Select the ECM-1 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 terminating character of *Carriage Return* (0D Hex) or *Line Feed* (0A Hex). For example, to select an ECM-1 Module located in slot 15 using the default port select code, send **\$BT15<cr>**.

2. Once the ECM-1 is selected, it will go into *Command Mode* and allow you to send data commands. The ECM-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 channel(s) for the data command. If you have a requirement to send the data command to multiple channels simultaneously, you can use one of the following formats as shown for the RC (Report Event Counters) command:

RC1,2,3,4,5,6,7,8<cr>	Report counters for Ports 1-8
RC1-8<cr>	Report counters for Ports 1-8
RC0<cr>	Report counters for Ports 1-8
RC1,2,4-8<cr>	Report counters for Ports 1, 2, 4, 5, 6, 7, and 8

3. After you have sent the desired data commands to the ECM-1 module, you can disconnect from the ECM-1 by sending **\$BT<cr>**. You can disconnect from the ECM-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 ECM-1 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 *Carriage Return* or *Line Feed* before the ECM-1 will resume sending event data messages to the designated host module.

Section 4.4.1 through *Section 4.4.7* provide detailed information on the functionality of each data command supported by the ECM-1. *Appendix A* provides these commands in a condensed version for quick reference.

4.4.1 CLEAR EVENT BUFFER COMMAND

The Clear Event Buffer (CB) command is used to clear all stored event data messages from the buffer of the selected channel(s). The Clear Event Buffer command has the following format: **CB n < cr >** where c = Channel# (1 to 12 or 0 for all).

4.4.2 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 function of the event counters is discussed in *Section 4.5.2*. The Clear Event Counter command has the following format: **CC c < cr >** where c = Channel# (1 to 12 or 0 for all).

4.4.3 REPORT ALL BUFFERED EVENTS COMMAND

The Report All Buffered Events (RA) command instructs the ECM-1 to report all event data messages currently stored in the buffer of the selected channel(s). The Report All Buffered Events command has the following format: **RA n < cr >** where c = Channel# (1 to 12 or 0 for all).

4.4.4 REPORT EVENT COUNTER COMMAND

The Report Event Counter (RC) command instructs the ECM-1 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: **RC c < cr >** where c = Channel# (1 to 12 or 0 for all).

4.4.5 REPORT EVENT COUNTER AND RESET COMMAND

The Report Event Counter and Reset (RO) command instructs the ECM-1 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: **RO c <cr>** where c = Channel# (1 to 12 or 0 for all).

4.4.6 REPORT OLDEST TERMINAL COUNT EVENT COMMAND

The Report Oldest Terminal Count Event (RS) command instructs the ECM-1 to report the first terminal count event data message stored in the buffer of the selected channel(s). The Report Oldest Terminal Count Event command has the following format: **RS c <cr>** where c = Channel# (1 to 12 or 0 for all).

4.4.7 REPORT LATEST TERMINAL COUNT EVENT COMMAND

The Report Latest Terminal Count Event (SL) command instructs the ECM-1 to report the last terminal count event data message stored in the buffer of the selected channel(s). The Report Latest Terminal Count Event command has the following format: **SL c <cr>** where c = Channel# (1 to 12 or 0 for all).

4.5 EVENT DATA MESSAGE REPORTING

An event data message is the actual data calculated by the ECM-1 module as the result of an "outcome" or an actual event count. *Section 4.5.1* discusses event data messages generated as the result of an outcome and *Section 4.5.2* discusses event counter data messages generated in response to an event counter data command.

4.5.1 OUTCOME DATA MESSAGE REPORTING

An outcome is the result of an ECM-1 channel programmed to operate in Up Counter mode or Down Counter mode reaching its preset terminal count. Each time the input of the ECM-1 channel transitions from a **HI** to **LO**, the counter either increments (Up Counter mode) or decrements (Down Counter mode). When the programmed Terminal Count is reached, an outcome data message is generated. After an outcome data message is generated, the counter is reset and resumes its counting action as determined by the current configuration.

ECM-1 outcome data message reporting depends on the Reporting Method used. Outcome data messages are automatically reported to the designated host module if using Immediate Reporting method or Schedule Reporting mode (if the programmed Report Start Time has elapsed). If using Command Reporting Method, outcome data messages are reported to the requesting host module via data commands only (see *Section 4.4*). Regardless of the Reporting Method used, a host computer can request an outcome data message by issuing a data command.

4.5.2 EVENT COUNTER DATA MESSAGE REPORTING

Event Counts are the number of transitions (from a "HI" to a "LO" state) observed at a ECM-1 channel's input, commencing when the counter is initialized and continuing until the information is requested via data commands (see *Section 4.4*). These values are available for individual counters or all channels.

Immediate Reporting mode and Schedule Reporting mode as described in *Section 4.5.1* are not available for an ECM-1 channel operating in Event Counter mode. Therefore, the user must periodically poll the ECM-1 for accumulated events via data commands (see *Section 4.4*). An event counter is reset to 0 by using the **ROn** or **CCn** commands.

4.6 EVENT DATA MESSAGE PRESENTATION

Event Data message presentation varies slightly in format depending on module configuration. Items such as time tag, number of active channels, etc. all change how event data messages appear to a host-controller. *Section 4.6.1* discusses outcome data message presentation and *Section 4.6.2* discusses event counter data message presentation.

4.6.1 OUTCOME DATA MESSAGE PRESENTATION

Data messages that are generated in response to an outcome, have the following appearance: **UU:MM,CC T MM/DD/YY HH:MM:SS**

where, **UU** is the M Series Unit Number

MM is the ECM-1 Module Number

CC is the ECM-1 Channel Number

T indicates the terminal count has been reached

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 outcome data messages received using immediate or schedule reporting where the ECM-1 is installed in Unit 1 as Module 15 with Time Tagging enabled:

```
1:15,1 T 11/18/93 09:12:22<cr><lf>
1:15,2 T 11/18/93 09:12:22<cr><lf>
UNIT#
MODULE#
CHANNEL#
TERMINAL COUNT HAS
HAS BEEN REACHED
DATE
TIME
```

4.6.2 EVENT COUNTER DATA MESSAGE PRESENTATION

Data messages that are generated in response to an outcome, have the following appearance: **UU:MM,CC T MM/DD/YY HH:MM:SS**

where, **UU** is the M Series Unit Number

MM is the ECM-1 Module Number

CC is the ECM-1 Channel Number

T indicates the terminal count has been reached

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 counter data messages received using immediate or schedule reporting where the ECM-1 is installed in Unit 1 as Module 15 with Time Tagging enabled:

```
1:15,1 0 11/18/93 09:12:22<cr><lf>
1:15,2 823 11/18/93 09:12:22<cr><lf>
UNIT#
MODULE#
CHANNEL#
EVENT COUNTER
DATE
TIME
```

5 CONFIGURATION

You can program the ECM-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 can 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 ECM-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 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 software to put an IBM PC or compatible into a terminal mode (TERM.EXE).
2. Connect to the ECM-1 by sending the port select code, the appropriate Unit Number followed by a colon (1: to 30: - only if using cascaded units), 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 ECM-1 is installed in a non-cascaded unit as Module 2 and you are using the default port select code (\$BT), 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 ECM-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 ECM-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 on the previous page, you would send **\$BAYTECH2<cr>\$CONFIG<cr>** to configure Module 2.

NOTE: All commands must be in uppercase.

5.1.1 CONFIGURATION MAIN MENU

An ECM-1 module installed as Module X 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 V83 ECM-1 Rev. 1.00
This Module is X
```

CONFIGURATION MAIN MENU

```
Module Status.....1
Counter 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 ECM-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 can review the current configuration status. The ECM-1 will respond with a menu similar to the following:

```
MODULE STATUS

Active Counters.....000000000000
Reporting Method.....COMMAND
Reporting Start Time.....24:00
Reporting Period.....24:00
Host Address.....1:1,1
Time Tag.....DISABLED
Terminating Character(s).....0D0A
Dynamic Configuration.....DISABLED
```

Press any key to continue

COUNTER MODE SETTINGS:

```
Counter 01.....UNPROGRAMMED
Counter 02.....UNPROGRAMMED
Counter 03.....UNPROGRAMMED
Counter 04.....UNPROGRAMMED
Counter 05.....UNPROGRAMMED
Counter 06.....UNPROGRAMMED
Counter 07.....UNPROGRAMMED
Counter 08.....UNPROGRAMMED
Counter 09.....UNPROGRAMMED
Counter 10.....UNPROGRAMMED
Counter 11.....UNPROGRAMMED
Counter 12.....UNPROGRAMMED
```

Press any key to continue

TERMINAL COUNT/DIVISOR VALUES:

Counter 01.....*
Counter 02.....*
Counter 03.....*
Counter 04.....*
Counter 05.....*
Counter 06.....*
Counter 07.....*
Counter 08.....*
Counter 09.....*
Counter 10.....*
Counter 11.....*
Counter 12.....*

Press any key to continue

Copyright (c) Bay Technical Associates,1993
DAC V83 ECM-1 Rev. 1.00
This Module is X

CONFIGURATION MAIN MENU

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

Enter Selection:

Type the number corresponding to your desired choice or "X" to exit configuration.

5.1.3 COUNTER SETUP

By responding to the *Enter Selection:* message at the end of the Configuration Main Menu (see *Section 5.1.1*) with "2" (Counter Setup), you can program the Counter Mode, Terminal Count/Divisor Value, and Active Counters for each individual ECM-1 channel. The ECM-1 will respond with the following menu:

COUNTER SETUP

Counter Mode Selection.....1
Terminal Count/Divisor Value....2
Select Active Counters.....3
Exit.....X

Enter Selection:

Type the number corresponding to your desired choice. The Exit selection will return you to the configuration main menu. If you type "1" (Counter Mode Selection), the ECM-1 will respond with the following:

Enter Counter Number:

Type the desired counter number (1 to 12) followed by <ENTER> or type "X" to return to the "Counter Setup" menu shown on the previous page. For example, if you type "1" and <ENTER> (for Channel 1), the ECM-1 will respond with the following:

```
Counter 01.....PROGRAMMABLE DIVIDER
Event Counter.....1
Preset Up Counter.....2
Preset Down Counter.....3
Programmable Divider.....4
Exit.....X
```

Enter Selection:

Type the number corresponding to the desired Counter Mode. See *Section 4.3* for an operational description of the four Counter Modes. The "X" selection will return you to the "Enter Counter Number" menu shown above.

If you type "2" from the "Counter Setup" menu shown on the previous page (Terminal Count/Divisor Value), you can program the Terminal Count for ECM-1 channels using Up Count or Down Count Counter Mode. You can also program the Divisor Value for ECM-1 channels using Programmable Divider Counter Mode. The ECM-1 will respond with the following:

Enter Counter Number:

Type the desired channel number (1 to 12) followed by <ENTER> or type "X" to return to the "Counter Setup" menu shown on the previous page. For example, if you type "1" and <ENTER> (for Channel 1), the ECM-1 will respond with the following:

```
Present Value is.....0
Enter New Value:
```

Type the desired Terminal Count or Divisor Value (2 to 65535). For example, if you type "32767", the ECM-1 will respond with:

```
Present Value is.....32767
Enter New Value:
```

If the present Terminal Count/Divisor Value is satisfactory, type <ENTER> and the ECM-1 will return to the "Enter Counter Number" menu shown on the previous page.

If you type "3" from the "Counter Setup" menu shown on Page 21 (Select Active Counters), you can program which ECM-1 counter(s) are active. An ECM-1 counter must be active (enabled) in order to function as an event counter, up counter, down counter, or frequency divider. The ECM-1 will respond with the following:

```
Enter 1 to ENABLE or 0 to DISABLE each counter <cr>, or X to Exit
```

```

                                COUNTER NUMBERS
                                111
                                123456789012
CURRENT STATUS                   000000000000
Enter Selection:
```

"0" indicates the counter is disabled and "1" indicates the counter is enabled. Type a "1" corresponding to the counter number you wish to enable. Any counter that does not have a "1" entered for its status is automatically assigned a "0". For example, if you activate Counter 1 by typing "1" followed by <ENTER>, Counter 2 through Counter 12 will be assigned "0" to indicate that they are disabled. As another example, if you wish to activate Counter 5 and Counter 6, you must enter zeros for Counter 1 through Counter 4. Therefore, the entry would be: 000011 followed by <ENTER>. The resulting display would be 000011000000. If you type <cr> or "X" from this menu, the ECM-1 will return to the "Counter Setup" menu shown on Page 21.

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 can program how the ECM-1 reports event data messages to the host device. The items you can 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 ECM-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 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 can program how the ECM-1 reports event data messages to the host device. The ECM-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 ECM-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). If Command Reporting Method is selected, the ECM-1 will report event data messages to the host module only when data commands are issued (see *Section 4.4.*).

If Immediate Reporting Method is selected, the ECM-1 will report event data messages to the host module as events occur. If no event has occurred, no event data message is generated. Reporting begins immediately after exiting the Configuration Main Menu

If Schedule Reporting Method is selected, the ECM-1 will begin reporting event 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. Event data messages are stored in the buffer until the Report Start Time is reached at which time all buffered event 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 the previous page with "2" (Report Start Time), you can program the time the ECM-1 will start reporting when using Schedule Reporting Method. The ECM-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 ECM-1 will start reporting event 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 ECM-1 is initially reporting, if you enter into the menu-driven mode of configuration and exit, the ECM-1 will not resume reporting event data messages until the programmed Report Start Time elapses. You can program the ECM-1 without disrupting event 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 24 with "3" (Report Interval), you can program the time interval between reporting periods when using Schedule Reporting Method. The ECM-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 ECM-1 will report all buffered event data messages to the designated host module until the buffer is empty. The ECM-1 will continue to transmit all buffered event 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 ECM-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 24 with "4" (Host Address), you can program the address of the designated host module. The designated host module is where event data messages are sent when using Immediate or Schedule Reporting Method. The ECM-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 event data messages to the desired destination. If the Host Address is incorrect, self-reporting event 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 24 with "6" (Time Tag), you can program the ECM-1 to append a time tag to the end of event data messages automatically. The ECM-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 data messages, 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 24 with "7" (Terminating Character(s)), you can program one or two characters to be appended at the end of each event data message. This option allows a user to match the host terminal and/or requirements of their application software. The ECM-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 "4" (Dynamic Configuration), you can program the ECM-1 to respond to dynamic configuration (non-verbose) commands. The ECM-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 ECM-1 to be programmed by downloading dynamic (on-the-fly) commands. See *Section 5.2* for the procedure to program the ECM-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 ECM-1 will exit the menu-driven configuration mode. If changes are made to any configuration parameter, the ECM-1 will respond with:

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

If you respond with "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 respond with "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 ECM-1 will respond with:

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

5.2 DYNAMIC CONFIGURATION PROCEDURE AND COMMANDS

ECM-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 ECM-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 ECM-1 from a host module:

1. Select the ECM-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: - only if using cascaded units), 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 an ECM-1 Module located in slot 15 of a non-cascaded unit using the default port select code, send **\$BT15<cr>**.
2. Once the ECM-1 is selected, it will go into *Command Mode* and allow you to send dynamic configuration commands. The ECM-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 ECM-1 module, you can disconnect from the ECM-1, by sending **\$BT<cr>**. You can disconnect from the ECM-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.

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

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

5.2.1 REPORTING METHOD COMMAND

The Reporting Method (RM) command programs the ECM-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 4.2.2.5* and *Section 5.1.4.5*. The Time Tag command has the following format: **TT n <cr>** 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 ECM-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 ECM-1 installed as Module XX (XX = 02 to 16), use the \odot or \otimes keys to highlight "Module XX" from the M Series main menu and press the *SELECT* key. The LCD will respond with a menu similar to the following for the ECM-1:

```
V83 ECM-1 MODULE XX
Display Status
Exit Module Menus
```

Select "Display Status" the LCD will respond with:

```
Report Method COMMD.
Report Start HH:MM
Report Int. HH:MM
PAGE SELECT-EXIT
```

Pressing the \odot or \otimes keys scrolls through the following entries:

```
Host Address 1:1,1
Time Tagging ENABLE
Term Characters ODOA
Dyna Cfg Cmd DISABLE
Counter 1 UNPROG
Counter 2 UNPROG
Counter 3 UNPROG
Counter 4 UNPROG
Counter 5 UNPROG
Counter 6 UNPROG
Counter 7 UNPROG
Counter 8 UNPROG
Counter 9 UNPROG
Counter 10 UNPROG
Counter 11 UNPROG
Counter 12 UNPROG
```

To exit the configuration status mode, press the SELECT key at any time. You are returned to the ECM-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 main M Series LCD menu.

APPENDIX A

DATA/CONFIGURATION COMMAND SUMMARY

The tables below summarize the data and configuration commands supported by the V83 ECM-1 I/O module:

V83 ECM-1 DATA COMMAND SUMMARY	
Command	Description
CBc<cr> (c=Ch# 1 to 16, 0=all)	Clear Event Buffer. Clear all buffered data messages.
CCc<cr> (c=Ch# 1 to 16, 0=all)	Clear Event Counter(s)
RAc<cr> (c=Ch# 1 to 16, 0=all)	Report All Buffered Events
RCc<cr> (c=Ch# 1 to 16, 0=all)	Report Event Counter(s)
ROc<cr> (c=Ch# 1 to 16, 0=all)	Report Event Counter(s) and Reset
RSc<cr> (c=Ch# 1 to 16, 0=all)	Report Oldest Terminal Count Event
SLc<cr> (c=Ch# 1 to 16, 0=all)	Report Latest Terminal Count Event
* Multiple channels are selected using 4 formats. Examples: CB1,2,3,4,5,6,7,8<cr> , CB1-8<cr> , CB0<cr> , CB1,2,4-8<cr>	

V83 ECM-1 DYNAMIC CONFIGURATION COMMAND SUMMARY	
Command	Description
RMn<cr> (n=1 to 3)	Reporting Method. 1=Command, 2=Immediate, and 3=Schedule.
TTn<cr> (n=1 or 2)	Time Tag. 1=Enable and 2=Disable.

APPENDIX B

EPROM UPGRADE

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

Phillips-head 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 ECM-1 mechanical layout (see *Section 3*) and locate socket *U8*. 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.

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