

OWNER'S MANUAL

MODEL V81 DAM-1

DIGITAL TO ANALOG MODULE

BayTech Publication #U140E108

Thank you for selecting the BayTech Model V81 DAM-1 Digital-to-Analog Module.

The data provided in this Owner's Manual explains the various ways you can operate the V81 DAM-1 and how to configure your unit. We suggest that you read this manual carefully before attempting to install the V81 DAM-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 V81 DAM-1 programmable digital-to-analog input board, is a plug-in module designed for use with the BayTech M Series DAC Data Acquisition Controllers. The DAM-1 takes a digital value from a host controller and converts this value to an analog voltage output to as many as eight channels. The primary feature of the DAM-1 is a 12 bit digital-to-analog converter which provides conversion of data with high accuracy and resolution at moderate throughput rates. Two hardware selectable voltage ranges are available.

A host controller can read the present voltage output level of one or more DAM-1 channels. This voltage level is sent to the requesting host controller in the form of a "data message". "Time Tagging" of data messages is available through the use of a "time-of-day" clock located in the M16/M8 base unit. A time tag includes month, day, year, hour, minute and second.

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

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

2 SPECIFICATIONS

(typical for 25° C unless otherwise noted)

DIGITAL-TO-ANALOG CONVERTERS:

No. of Channels: 8
Resolution: 12 bits, 1 part in 4,095
Relative Accuracy: \leq 1/2 LSB maximum
Differential Linearity: \leq 1 LSB maximum
Temperature Coefficient of Gain: \pm 2 ppm/°C
Output Ranges: 0 to 5V, 0 to 10V

VOLTAGE OUTPUT CHARACTERISTICS:

Load Current: \geq 5mA minimum
Short Circuit Current: 25mA maximum
Voltage Output Resistance: <0.1 ohm maximum
Settling Time: 100 microseconds maximum to 0.001% for full-scale step

POWER REQUIREMENTS:

+5VDC (from M16/M8 power supply), 175 ma maximum, 150 ma typical

ENVIRONMENTAL:

Operating temperature range: 0° to 70° C
Storage temperature range: -40° to 85° C
Humidity: 5% to 95% non-condensing

3 INSTALLATION

The V81 DAM-1 operates in one of two operating voltage ranges: 0 to 5 volts or 0 to 10 volts. The operating voltage range is set for each individual channel via jumper setting. Refer to *Appendix C* for the jumper locations of each channel. Each jumper location has three pins for installation of a 2-position jumper. The center pin is *COMMON*. The top pin is marked *10* for 10 volts and the bottom pin is marked *5* for 5 volts. The 0 to 5 volt operating range is selected by connecting the *5* and *COMMON* pins together with the 2-position jumper. Similarly, the 0 to 10 volt operating range is selected by connecting the *10* and *COMMON* pins together with the 2-position jumper. The DAM-1 is installed in the M Series chassis as described in *Section 3.5* of the base unit operator's manual.

NOTE: The DAM-1 cannot be installed as Module 1. If an DAM-1 is removed from a module slot and a different DAM-1 is installed in that location, the newly installed module acquires the previous module's configuration. Moving an DAM-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 DAM-1 has been installed in the M Series chassis, connect a cable with a DB-25 male connector to the input connector, J2. Configure your input cable as shown in *Figure 1*.

Input	Pin #	Input
Channel 1	1	14 Ground
Channel 2	2	15 Ground
Channel 3	3	16 Ground
Channel 4	4	17 Ground
Channel 5	5	18 Ground
Channel 6	6	19 Ground
Channel 7	7	20 Ground
Channel 8	8	21 Ground
Ground	9	22 Ground
Ground	10	23 Ground
Ground	11	24 Ground
Ground	12	25 Ground
Ground	13	

Figure 1: DAM-1 Output Connections

4 OPERATION

This section discusses the general DAM-1 operation (*Section 4.1*), user-programmable features (*Section 4.2*), supported data commands (*Section 4.3*), and data message presentation (*Section 4.4*).

4.1 GENERAL

The DAM-1 takes a digital value from the host controller (0 to 4095 decimal or 000 Hex to FFF Hex) and converts this value to an analog voltage (0-5 volts or 0-10 volts). If using 0-5 volt operating range, each count represents 1.221 millivolts (5 divided by 4095). If using 0-10 volt operating range, each count represents 2.442 millivolts (10 divided by 4095). The host controller may write values to as many as eight channels on a single DAM-1.

The host controller may read the present output voltage level of one or more channels as a *data message*. The data message is sent to a *host communication module* automatically or upon request. Each data message may be presented in a hexadecimal, decimal, or voltage format and will be preceded by the unit/module/channel number from which the data message came. The data message may be optionally appended with a "real time" *Time Tag* showing the date and time the data message was recorded. Data resolution is 12 bits.

Data commands are used to instruct the DAM-1 to perform various tasks that pertain to data acquisition. These buffer clearing, report a single data message or all data messages in the receive buffer, and write digital-to-analog data. The supported data commands and the data command procedure are described in *Section 4.3*.

You have the choice of programming the DAM-1 via verbose or non-verbose configuration mode (see *Section 5*). When using verbose mode, a series of menus will prompt you to enter the desired configuration parameters. Non-verbose (dynamic) configuration mode allows programming by downloading configuration commands.

4.2 USER-PROGRAMMABLE FEATURES

You may program the *Reporting Setup* and enable or disable *Dynamic Configuration* on the DAM-1.

4.2.1 REPORTING SETUP

Reporting Setup allows you to program how the DAM-1 reports data messages to the host module. The items you may program in the Reporting Setup include *Reporting Method*, *Report Start Time*, *Report Interval*, *Set Host Address*, *Data Format*, *Time Tag*, and *Terminating Character(s)*. The following subsections describe these features in more detail.

4.2.1.1 REPORTING METHOD

Reporting Method is the manner in which data messages are sent to the designated host module. The DAM-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.**

4.2.1.2 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.**

4.2.1.3 REPORT INTERVAL

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

4.2.1.4 HOST ADDRESS

Host Address is the designated host module where data messages are sent when using Immediate or Schedule Reporting Method. The Host Address consists of the Unit Number (1 to 32), Module Number (1 to 16), and Port Number (1 to 4) of the designated host module. **The default Host Address is Unit 1, Module 1, Port 1.**

4.2.1.5 DATA FORMAT

Data Format is the format of the data messages sent to the designated host module which may be in Hexadecimal, Decimal, or Engineering Units. When Hexadecimal Data Format is selected, the data message will appear as a hexadecimal value between 000 Hex (low range) and FFF Hex (high range). When Decimal Data Format is selected, the data message will appear as a decimal value between 0 (low range) and 4095 (high range). When Engineering Units Data Format is selected, the data message will appear as the actual voltage.

The default Data Format is Hexadecimal.

4.2.1.6 TIME TAG

When Time Tag is enabled, a time tag is appended immediately after the data. The time tag consists of the month, day, year, hour, minute, and second at which the data was calculated. Time Tag may be enabled or disabled. **The default Time Tag is disabled.**

4.2.1.7 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*).**

4.2.2 DYNAMIC CONFIGURATION

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

4.3 DATA COMMANDS

You may issue DAM-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 DAM-1's actions. You may issue a single data command for action on multiple channels. Data commands must be used to obtain data messages when using Command Reporting Method. DAM-1 data commands are sent through a host module using the following procedure:

1. Select the DAM-1 from a 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 DAM-1 Module installed as Module 15 in a non-cascaded unit using the default port select code, send **\$BT15<cr>**.

2. Once the DAM-1 is selected, it will go into *Command Mode* and allow you to send data commands. The DAM-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 may use one of the following formats as shown for the RA (sample) command:

RA1,2,3,4,5,6,7,8<cr>	Report all messages for Ports 1-8
RA1-8<cr>	Report all messages for Ports 1-8
RA0<cr>	Report all messages for Ports 1-8
RA1,2,4-8<cr>	Report all messages for Ports 1, 3, 4, 5, 6, 7, and 8

3. After you have sent the desired data commands to the DAM-1 module, you may disconnect from the DAM-1, by sending **\$BT<cr>**. You may disconnect from the DAM-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 DAM-1 is operating in *self reporting mode* (i.e., Immediate or Schedule Reporting Method) and a host device issues a data command, the host system must disconnect by sending the Port Select Code and *Carriage Return* or *Line Feed* before the DAM-1 will resume sending data messages to the designated host module.

Sections 4.3.1 through *4.3.4* provide detailed information on the functionality of each data command supported by the DAM-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 useful to clear all old data from the FIFO buffer when a new data set is started. If the buffer is not cleared, previous data samples remain in the buffer until overwritten. The Clear Buffer command has the following format: **CB n <cr>** where n = Channel# (1 to 8 or 0 for all).

4.3.2 REPORT ALL BUFFERED MESSAGES COMMAND

The Report All Buffered Messages (RA) command instructs the DAM-1 to report all samples currently stored in the buffer of the selected channel(s). The Report All Buffered Messages command has the following format: **RA n <cr>** where n = Channel# (1 to 8 or 0 for all).

4.3.3 REPORT A SINGLE BUFFERED MESSAGE COMMAND

The Report A Single Buffered Message (RS) command instructs the DAM-1 to report the first sample stored in the buffer of the selected channel(s). The Report A Single Buffered Message command has the following format: **RS n <cr>** where n = Channel# (1 to 8 or 0 for all).

4.3.4 WRITE DIGITAL-TO-ANALOG DATA COMMAND

The Write Digital-to-Analog Data (WD) command is used to send a digital value to one or more DAM-1 channels. This digital value is then converted to an analog voltage level. The Write Digital-to-Analog Data command has the following format: **WD n ; d <cr>** where n = Channel# (1 to 8 or 0 for all) and d is the digital value (0 to 4095 decimal).

4.4 DATA MESSAGE PRESENTATION

Data message presentation varies slightly in format depending on module configuration. Entries such as, time tag, data format, number of active channels, etc. all change how data messages appear to a host-controller. However, all data messages are presented in the same basic order of fields as follows:

UU:MM,CC HHH or DDDD or VV MM/DD/YY HH:MM:SS

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

MM is the DAM-1 Module Number

CC is the DAM-1 Channel Number

HHH is a Hex value ranging from 000 to FFF

DDDD is a Decimal value ranging from 0 to 4095

VV is an Engineering unit ranging from 0 to +10 volts

MM is the month (if Time Tag enabled)

DD is the day (if Time Tag enabled)

YY is the year (if Time Tag enabled)

HH is the hour (if Time Tag enabled)

MM is the minute (if Time Tag enabled)

SS is the second (if Time Tag enabled)

EXAMPLE: A complete data message from Channels 1-8 an DAM-1 installed as Unit 1, Module 15 using Hex Data Format and having Time Tag enabled, would appear as follows:

```
1:15:1 7FE 11/18/93 09:12:22
1:15:2 7FA 11/18/93 09:12:22
1:15:3 8C3 11/18/93 09:12:22
1:15:4 CD4 11/18/93 09:12:22
1:15:5 568 11/18/93 09:12:22
1:15:6 04E 11/18/93 09:12:22
1:15:7 CBA 11/18/93 09:12:22
1:15:8 7D2 11/18/93 09:12:22
```

```
UNIT#
MODULE#
CHANNEL#
DATA
DATE
TIME
```

Data messages requested through the use of Data Commands might include the messages from one or more channels.

5 CONFIGURATION

You may program the DAM-1 using a menu-driven configuration procedure from a host module or the M16/M8 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 DAM-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 a utility diskette which includes software to put an IBM PC or compatible into a terminal mode (TERM.EXE).

NOTE: All commands must be in uppercase.

2. Connect to the DAM-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 DAM-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.

To access the menu-driven configuration mode of the DAM-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 DAM-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.

5.1.1 CONFIGURATION MAIN MENU

The DAM-1 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 V81 DAM-1 Rev. 1.##
This Module is X
```

CONFIGURATION MAIN MENU

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

Enter Selection:

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

Enter the number corresponding to your desired choice. Each choice 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 DAM-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 DAM-1 will respond with a menu similar to the following:

MODULE STATUS

```
Reporting Method.....COMMAND
Report Start Time.....24:00
Report Interval.....24:00
Host Address.....1:1,1
Data Format.....HEX
Time Tagging.....DISABLED
Terminating Character(s).....0D0A
Dynamic Configuration.....DISABLED
```

Press a key to Exit...

5.1.3 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 DAM-1 reports data messages to the host device and the format in which the data messages will appear. The items you may program are *Reporting Method*, *Report Start Time*, *Report Interval*, *Host Address*, *Data Format*, *Time Tag*, and *Terminating Character(s)*. The operational functionality of these items is discussed in *Section 4.2.1*. The DAM-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
Data Format.....5
Time Tag.....6
Terminating Character(s).....7
Exit.....X
```

Enter Selection:

If you respond to one of the above selections with 1 to 7, a sub-menu will be presented for that item. After making any necessary changes under sub-menus 1 to 7, you be returned to the Reporting Setup menu. The "Exit" selection will return you to the Configuration Main Menu.

5.1.3.1 REPORTING METHOD

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu with "1" (Reporting Method), you may program how the DAM-1 reports data messages to the host device. The DAM-1 will respond with the following:

```
SELECT REPORTING METHOD
Reporting Method.....COMMAND

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

Enter Selection:

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

When Command Reporting Method is selected, the DAM-1 will report data messages to the host module only when the **RA_n** and **RS_n** commands are issued (see *Section 4.3.2* and *Section 4.3.3* respectively). If DAM-1 receives a **RA_n** (Read All Buffered Samples) command, all data messages currently stored in the buffer of the selected channel(s) are transmitted to the host-controller. Each time the DAM-1 receives a **RS_n** (Report a Single Sample if available) command, the oldest data message available is transmitted to the host-controller. The **RA_n** and **RS_n** commands may be issued to the DAM-1 in any of the three Reporting Methods.

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

When Schedule Reporting Method is selected, the DAM-1 will begin reporting data messages at the programmed Report Start Time (see *Section 5.1.3.2*). 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 5.1.3.3*.

NOTE: When a data message is requested by entering the **RA_n** or **RS_n** data commands, the Reporting and Sampling Methods currently programmed are overridden and the data message(s) is reported. To resume the programmed Sampling Method and Reporting Method, sent the port select code followed by *Carriage Return*.

5.1.3.2 REPORT START TIME

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 16 with "2" (Report Start Time), you may program the time the DAM-1 will start reporting when using Schedule Reporting Method. The DAM-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 DAM-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 DAM-1 is initially reporting, if you enter into the menu-driven mode of configuration and exit, the DAM-1 will not resume reporting data messages until the programmed Report Start Time elapses. You may program the DAM-1 without disrupting data message reporting by using dynamic configuration (see *Section 5.2*).

5.1.3.3 REPORT INTERVAL

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 16 with "3" (Report Interval), you may program the time interval between reporting periods when using Schedule Reporting Method. The DAM-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 DAM-1 will report all buffered data messages to the designated host module until the buffer is empty. The DAM-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 DAM-1 will report all messages in its buffer every hour on the hour starting at 12:00.

5.1.3.4 HOST ADDRESS

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 16 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 DAM-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.

5.1.3.5 DATA FORMAT

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 16 with "5" (Data Format), you may program the how the DAM-1 will present sampled data to the designated host module. The DAM-1 will respond with the Select Data Format menu as follows:

```
SELECT DATA FORMAT

Data Format.....HEX

Hexadecimal.....1
Decimal.....2
Engineering Units.....3
Exit.....X

Enter Selection:
```

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

5.1.3.6 TIME TAG

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 16 with "6" (Time Tag), you may program the DAM-1 to append a time tag to the end of data samples automatically. The DAM-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.

5.1.3.7 TERMINATING CHARACTER(S)

By responding to the *Enter Selection:* message at the end of the Reporting Setup Menu on page 16 with "7" (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 DAM-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.

5.1.4 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 DAM-1 to respond to dynamic configuration (non-verbose) commands. The DAM-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 DAM-1 to be programmed by downloading dynamic (on-the-fly) commands. See *Section 5.2* for the procedure to program the DAM-1 via dynamic configuration and a description of the available configuration commands.

5.1.5 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 DAM-1 will exit the menu-driven configuration mode. If changes are made to any configuration parameter, the DAM-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 DAM-1 will respond with:

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

5.2 DYNAMIC CONFIGURATION PROCEDURE AND COMMANDS

DAM-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 DAM-1 will recognize dynamic configuration commands only when Dynamic Configuration is enabled (see *Section 5.1.4*). Use the following procedure to send dynamic configuration commands to the DAM-1:

1. Select the DAM-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 an DAM-1 Module installed as Module 15 of a non-cascaded unit using the default port select code, send **\$BT15<cr>**.
2. Once the DAM-1 is selected, it will go into *Command Mode* and allow you to send dynamic configuration commands. The DAM-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 DAM-1 module, you may disconnect from the DAM-1, by sending **\$BT<cr>**. You may disconnect from the DAM-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* provide detailed information on the functionality of each configuration command supported by the DAM-1. *Appendix A* provides these commands as a quick reference.

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

RM1<cr>TT1<cr>

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

5.2.1 REPORTING METHOD COMMAND

The Reporting Method (RM) command programs the DAM-1 Reporting Method (see *Section 4.2.1.1* and *Section 5.1.3.1*). 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 4.2.1.6* and *Section 5.1.3.6*. 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 DAM-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 DAM-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:

```
V81 DAM-1 MODULE XX
Display Status
Exit Module Menus
```

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

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

Pressing the  or  keys scrolls through the following entries:

```
Host Address 1:1,1
Data Format HEX
Time Tagging ENABLE
Term Characters 0DOA
Dyna Cfg Cmd ENABLE
```

To exit the configuration status mode and return to the DAM-1's LCD main menu, press the *SELECT* key. Highlight "Exit Module Menus" and press the *SELECT* key to return 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 V81 DAM-1 I/O module:

V81 DAM-1 DATA COMMAND SUMMARY	
Command	Description
CBc <cr> (c=Ch# 1 to 8, 0=all)	Clear Buffer. Clears all old data from the buffer when a new data set is started.
RAc <cr> (c=Ch# 1 to 8, 0=all)	Report All Buffered Samples.
RSc <cr> (c=Ch# 1 to 8, 0=all)	Report Single Sample if Available
WDe,d <cr> (c=Ch# 1 to 8, 0=all; d=digital data 0 to 4095 decimal)	Write D/A Output Data

V81 DAM-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 DAM-1 module to be upgraded. The materials you will need to supply are:

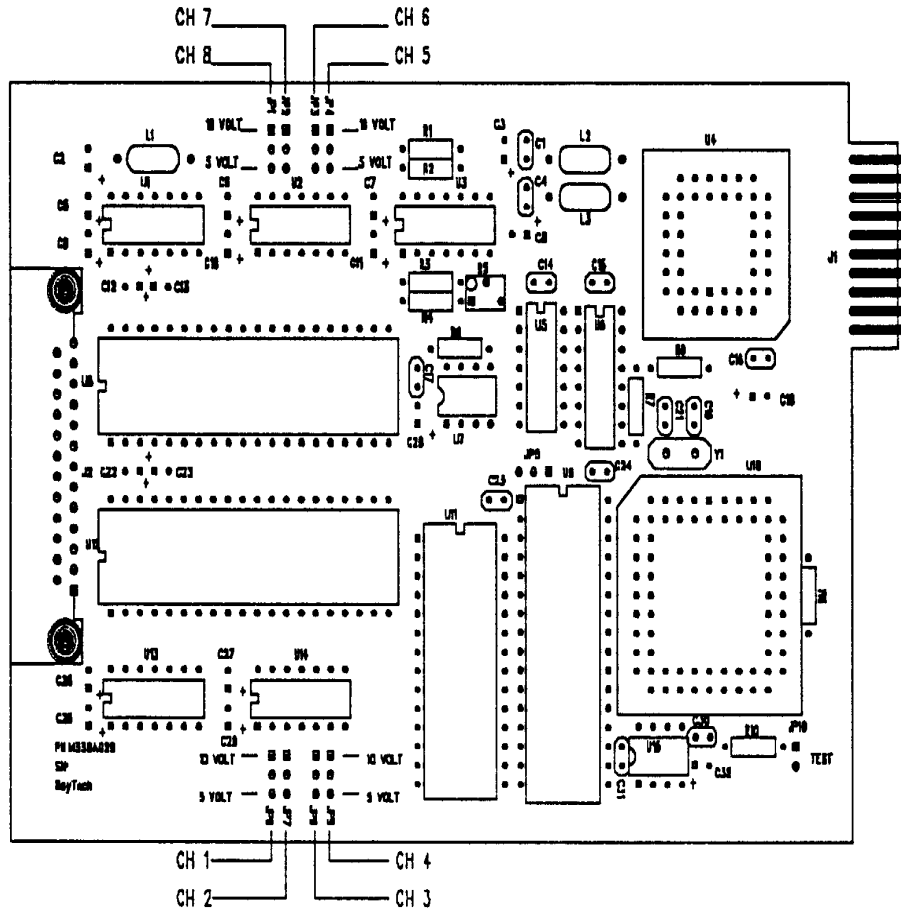
Phillips-head screwdriver
IC DIP extractor or a pair of curved needle-nose pliers

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 DAM-1 mechanical layout (see *Appendix C*) 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.

APPENDIX C

V81 DAM-1 MECHANICAL LAYOUT



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