

**Models MZ-412,
MZ-414, MZ-418**
Memory Module
Technical Manual

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PREFACE

This manual contains information regarding installation, testing, and operation of the ZETACO Model MZ-412, MZ-414, and MZ-418 Memory Modules.

The technical contents of this manual have been written based on the assumptions that the reader 1) has a working knowledge of Data General computer hardware (or has access to hardware documentation) and the operating system; 2) has some familiarity with standard installation and 3) has access to technical information about the DG Universal Memory Modules that may be installed with this module.

The information in this manual is organized into three major sections:

- SECTION 1.0 PRODUCT OVERVIEW - Describes the Model MZ-41X Memory Modules' features, capabilities, specifications, and power requirements.

- SECTION 2.0 INSTALLATION PROCEDURES - Contains procedures for unpacking, configuring and installing the module.

- SECTION 3.0 TROUBLE-SHOOTING and CUSTOMER SERVICE - Contains information useful in fault analysis and how to get help.

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1.0 PRODUCT OVERVIEW

1.1 GENERAL DESCRIPTION

ZETACO's MZ-41X Modules are plug-in compatible memory modules for Data General S/280, MV/4000, and MV/10000 CPUs, and use 256K DRAM technology. Three sizes are available: 2 megabytes (MB) (Model MZ-412), 4 MB (Model MZ-414), and 8 MB (Model MZ-418). They are designed to work with Data General Universal Memory Modules, which are already in the system. The MZ-41X series is fully compatible with DG's Memory and Memory Control Unit. They will, therefore, run DG's MVADES Diagnostics and operating system tests such as CONTEST. Complete configuration of the board is done with a single 4-position DIP switch.

We recommend that this manual be read through in its entirety before installation of the module.

1.2 FEATURES

READ and WRITE accesses to the module are done 32 bits (a double word) at a time. A 7-bit ERCC (Error Correction Code) is supported. Therefore, READs and WRITEs to the module are actually 39 bits in length. Data General's Memory Control Unit (the part of the CPU that interfaces to the memory modules) calculates and appends these 7 bits to each double word that is written to the module.

Every time a double word is read from the module, the Memory Control Unit uses the ERCC bits to detect and correct any single bit errors (including the ERCC bits themselves). Double bit errors can also be detected, but not corrected. The Memory Control Unit also does operations called "sniffing". During each refresh operation, one double word is read and corrected. This prevents correctable single bit errors from accumulating into uncorrectable double bit errors in the less frequently used areas of the system memory.

The memory in each module is divided into two "planes". Each plane has two individual sets of registers. One set holds data to be written to the memory, and the other set holds data that was read from memory. Individual read and write registers for each plane allow operations to overlap. Thus, two double words can be read or written in little more time than it would have taken to read or write one double word without the "plane" technique.

At the front of the board is an LED which indicates that the board is selected and that a READ or WRITE operation is occurring.

Battery backup operations by the CPU are also supported. If a power failure occurs, a system equipped with battery backup will indicate the power failure to the module. The module will allow refresh operations to continue, but will prevent READs and WRITEs from occurring until the power failure condition ceases. This will prevent any data loss.

1.3 SPECIFICATIONS

1.3.1 PHYSICAL CHARACTERISTICS

DIMENSIONS: 15" X 15" X 0.5" (38.1 X 38.1 X 1.3 cm)

1.3.2 POWER REQUIREMENTS

8 MB: +5V @ 10 AMPS.
4 MB: +5V @ 6 AMPS.
2 MB: +5V @ 4 AMPS.

1.3.3 ENVIRONMENTAL REQUIREMENTS

OPERATING TEMPERATURE: 0 to 55 degrees C

RELATIVE HUMIDITY: 10% to 90 % (non-condensing)

2.0 INSTALLATION PROCEDURES

2.1 UNPACKING AND INSPECTION

The following items are shipped with each MZ-41X Memory Module:

1. MZ-41X Memory Module with Cover
2. Technical Manual

Upon receipt of the MZ-41X Memory Module from the carrier, inspect the shipping carton immediately for any evidence of damage or mishandling in transit.

If the shipping carton is water stained or damaged, contact the carrier and shipper immediately and specify the nature and extent of the damage and request that the carrier's agent be present when the carton is opened.

ZETACO's warranty does not cover shipping damage.

For repair or replacement of any ZETACO product damaged in shipment, call ZETACO to obtain return authorization instructions.

2.2 MODULE PREPARATION

Various size modules can be added to increase the size of the system memory. The maximum amount of system memory is limited by the type of CPU in which they are being installed (see Table 2.1).

TABLE 2.1 MAXIMUM CPU MEMORY

CPU	MAX MEMORY SUPPORTABLE	TOTAL NUMBER OF MEMORY SLOTS
S/280	2 MB	3
MV/4000	8 MB	5
MV/10000	32 MB	8

Table 2.1 reveals constraints that the maximum system memory places on the size and number of modules that may be used. For instance, since the S/280 has a 2 MB maximum system memory, only a single MZ-412 may be used. Any other modules that were already in the system cannot be used, as this would exceed the S/280's memory space.

NOTE: Only MZ-414 and MZ-418 Modules are recommended for MV/10000 CPUs. Because of the 256K technology, the MZ-412 has only 1 (one) bank of DRAMs (consisting of only 1 set of double planes, see Section 1.2), whereas the MZ-414 has 2 banks and the MZ-418 has 4 banks. Consecutive READ and WRITE "hits" are interleaved to the multiple banks in the MZ-414 and MZ-418. However, since the MZ-412 has only 1 bank, consecutive "hits" are always on the same DRAM chips. Due to the timing of the Memory Control Unit on the MV/10000, these consecutive "hits" occur so close together that, without the multiple bank interleaving of the MZ-414 and 418, the minimal RAS precharge times of the DRAMs on the MZ-412 are violated.

DG Universal Memory Modules may be mixed with ZETACO MZ-41X Modules, provided the maximum amount of system memory is not exceeded, and provided there are enough memory slots available in the CPU to accomodate all of the modules.

REFER TO THE HARDWARE CONFIGURATION MANUAL OF THE DG CPU IN QUESTION TO DETERMINE THE NUMBER OF THE AVAILABLE MEMORY SLOTS AND THEIR LOCATION IN THE CPU CHASSIS.

Based on these two constraints, the number of Memory Modules (both ZETACO and DG), and the MB size of each must be determined. DG Universal Memory Modules use either 64K or 256K DRAM technology and have 5 possible sizes: 0.5 MB, 1 MB, 2 MB, 4 MB or 8 MB. ZETACO Memory Modules use 256K DRAM technology and have 3 possible sizes: 2 MB (MZ-412), 4 MB (MZ-414), or 8 MB (MZ-418).

The configuration of the address limits for each module must now be done. In this procedure, the modules are configured to have contiguous addresses. This is done so that the modules fit one right after the other in the system's memory address space starting with the lowest address. Improper configuration of the module's addresses will result in modules that overlap in the address space or gaps in the address space.

Below are two rules that MUST be followed in determining which modules should fit where in the address space:

1. Module addresses are configured contiguously in the address space. The first module starts out at the lowest address, the next module starts where the first one left off, etc. Each module is placed in consecutive address order until all of the modules have been configured.

2. If an MZ-412 is being added, the amount of memory at lower addresses must be a multiple of 2 MB (e.g., 0 MB, 2 MB, 4 MB, 6 MB, etc.). If an MZ-414 is being added, the amount of memory at lower addresses must be a multiple of 4 MB (e.g., 0 MB, 4 MB, 8 MB, 12 MB, etc.). If an MZ-418 is being added, the amount of memory at lower addresses must be a multiple of 8 MB (e.g., 0 MB, 8 MB, 16 MB, etc.).

Two additional guidelines:

1. In general, the largest modules should have the lowest addresses. If there are valid reasons to violate this guideline (for instance, to use guideline 2), there should be no problem, provided the two rules are followed.
2. It may be desirable to have any memory that has already been running reliably with the system, and that is to remain in the system, at lower addresses than the new constraint of the two rules.

The reason for this becomes apparent if there are problems and the new module is suspect. If the new module has the highest address of all the modules, it can be removed without having to reconfigure any of the other modules. However, if it is not the highest addressed module and it is desired to remove only it from the system, all of the other modules with higher addresses will have to be reconfigured so that there isn't a gap in the address space.


With the rules and guidelines in mind, determine where in the address space each of the modules is to be placed. If any DG Universal Memory Modules are to be involved in the system memory, use a DG system configuration guide to determine the jumper settings needed to place the module in the address space desired. Shown below are charts and explanations for setting up the addresses for the MZ-412, MZ-414, and MZ-418. Once the addresses are properly configured for all of the modules, they are ready to be inserted into the CPU's memory slots.

2.2.1

MZ-412 ADDRESS CONFIGURATION

Using the rules in Section 2.2, determine the number of megabytes to be at addresses lower than the MZ-412 module presently being configured. This is done by figuring out which modules will be at lower addresses and adding up the total number of megabytes of these modules. Recall from rule #4 that the total number of megabytes at lower addresses must be a multiple of 2. Then use Table 2.2 below to set the 4 switches on the DIP switch, which is accessible through the window on the board cover.

TABLE 2.2 MZ-412 ADDRESS SWITCH SETTINGS

# of MB Below Module	Switch Settings (X=ON, 0=OFF)				Address of Module	
	SW1	SW2	SW3	SW4		
0	0	0	0	0	LOWEST	
2	X	0	0	0		
4	0	X	0	0		
6	X	X	0	0		
8	0	0	X	0		
10	X	0	X	0		
12	0	X	X	0		
14	X	X	X	0		
16	0	0	0	X		
18	X	0	0	X		
20	0	X	0	X		
22	X	X	0	X		
24	0	0	X	X		
26	X	0	X	X		
28	0	X	X	X		
30	X	X	X	X		HIGHEST

Using the Rules in Section 2.2, determine the number of megabytes to be at addresses lower than the MZ-414 module presently being configured. This is done by figuring out which modules will be at lower addresses and adding up the total number of megabytes of these modules. Recall from Rule #4 that the total number of megabytes at lower addresses must be a multiple of 4. Then set SWITCH 1 of the DIP switch which is accessible through the window of the board cover to its "ON" position. Finally, configure the three remaining switches according to Table 2.3.

TABLE 2.3 MZ-414 ADDRESS SWITCH SETTINGS

SWITCH 1 is set to its "ON" position.

# of MB Below Module	Switch Settings (X=ON, 0=OFF)			Address of Module
	SW2	SW3	SW4	
0	0	0	0	LOWEST
4	X	0	0	↓ HIGHEST
8	0	X	0	
12	X	X	0	
16	0	0	X	
20	X	0	X	
24	0	X	X	
28	X	X	X	

2.2.3 MZ-418 ADDRESS CONFIGURATION

Using the Rules in Section 2.2, determine the number of megabytes to be at addresses lower than the MZ-418 module presently being configured. This is done by figuring out which modules will be at lower addresses and adding up the total number of megabytes of these modules. Recall from Rule #4 that the total number of megabytes at lower addresses must be a multiple of 8. Then set SWITCHES 1 and 2 of the DIP switch, which is accessible through the window of the board cover, to "ON" positions. Finally, configure the two remaining switches according to Table 2.4.

TABLE 2.4 MZ-418 ADDRESS SWITCH SETTINGS

SWITCHES 1 and 2 are set to their "ON" positions.

# of MB Below Module	Switch Settings (X=ON, 0=OFF)		Address of Module
	SW3	SW4	
0	0	0	LOWEST
8	X	0	↓
16	0	X	
24	X	X	

2.3 SLOT SELECTION AND BOARD INSERTION

After the address limits for each of the modules have been configured (Section 2.2), the boards are ready for insertion into the CPU. Refer to the hardware configuration manual or the silkscreened information on the backplane of your DG CPU to determine the number of the available memory slots and their location in the CPU chassis.

It is recommended, although not absolutely necessary, to put the modules in the CPU chassis in the consecutive order of their addresses. In the S/280 and MV/4000 CPUs, the lowest addressed module should be placed in the memory slot closest to the CPU, i.e., the lowest memory slot. Some memory slots might be able to accommodate another type of board besides a memory module, such as an IOU or an FPU, so the previous statement refers to the lowest "available" memory slot. The rest of the modules should be placed in ascending slots and ascending address order. In the MV/10000 CPU, the lowest (leftmost) to highest (rightmost) addressed memory slots are marked on the chassis.

For trouble-shooting purposes, you may opt to mix the address order of the modules with respect to the slots they are in, or leave open slots between some of the modules. This will not damage the modules and they should function normally; however, once the system is functioning properly and is ready to be placed in operation, the setup described in the previous paragraph should be used if possible.

Make sure the CPU is powered down. After selecting the slot in which the module is to be placed, insert the module by fitting the board edges between the slot guides and sliding the board evenly down the guides. Pull out the ejectors on the two outside corners of the front of the board and use them to provide leverage to insert the back of the board into the backpanel connectors. Use equal pressure on both ejectors until the board seats firmly into the connectors.

3.0 TROUBLE-SHOOTING AND CUSTOMER SERVICE

3.1 DIAGNOSTICS

We recommend that the MZ-41X Modules be run with DG Diagnostics. If a preliminary checkout of the board is desired, DG's MVSYSYSTEMX program in the MVADES Diagnostics is recommended. The AOS and AOS/VS utility called CONTEST is another good way to test the Reliability of the memory modules.

When running MVSYSYSTEMX or CONTEST, ensure that the proper amount of system memory was sized by the program. If it is impossible to boot the system or if the correct amount of memory was not found, go through the procedure in Section 2.2 again. Also, ensure that the two socketed chips are fully seated.

If there is a problem, and you found that the modules were addressed properly and there is more than one module in the system, with the CPU powered down, remove the highest addressed module. Try running the program again. If there is still a problem, repeat the process until the particular module that is causing the problem is isolated. Contact your local Authorized Stocking Distributor or ZETACO Customer Support with any information acquired during the fault isolation.

3.2 CUSTOMER SUPPORT

ZETACO provides technical support for you from three sources: 1) Authorized Stocking Distributors across the U.S. and Canada, who have factory-trained service personnel on staff. 2) Authorized Service Organizations in the U.S., who have also been factory trained. And 3) ZETACO's Customer Support Hotline (612-941-9480), which is manned with a technical team from 8:00 a.m. to 5:00 p.m. (Central Standard Time), Monday through Friday.

3.3 WARRANTY INFORMATION

All ZETACO controllers and couplers are warranted free from manufacturing and material defects, when used in a normal and proper manner, for a period of up to two years from date of shipment. Except for the express warranties stated above, ZETACO disclaims all warranties including all implied warranties of merchantability and fitness. The stated express warranties are in lieu of all obligations of liabilities on the part of ZETACO for damages, including but not limited to, special, indirect or consequential arising out of or in connection with the use or performance of ZETACO's products.

When controller malfunction has been confirmed, the board can be returned to ZETACO for warranty repair or for time-and-material repair if the product has been damaged or is out of warranty. A Return Material Authorization (RMA) number is required before shipment and should be referenced on all packaging and correspondence.

To ensure prompt response, the information outlined in the Material Return Information form on the following page should be gathered before calling the ZETACO Hotline for the RMA number. Please include a completed copy of the Material Return Information form with the product. Each product to be returned requires a separate RMA number and Material Return Information Form.

To safeguard the controller during shipment, please use the original packaging or packaging that is adequate to protect it from damage. Mark the box "Delicate Instrument" and indicate the RMA number(s) on the shipping label.

MATERIAL RETURN INFORMATION

All possible effort to test a suspected malfunctioning module should be made before returning the module to ZETACO, Inc. for repair. The speed and accuracy of a product's repair is often dependent upon a complete understanding of the user's checkout test results, problem characteristics, and the user system configuration. Use the form below to record the results of your trouble-shooting procedures. If more space is needed, use additional sheets.

Please allow our service department to do the best job possible by answering the following questions thoroughly and returning this information with the malfunctioning board.

1. Does the problem appear to be intermittent or heat sensitive? (If yes, explain.)
2. Under what operating system are you running? (AOS or AOS/VS)
3. Describe the system configuration (i.e.; other modules in the system, their address arrangement), model of computer, etc.)
4. Has the unit been returned before? Same problem?

To be filled out by CUSTOMER:

Model #: _____
Serial #: _____
RMA #: _____ (Call ZETACO to obtain an RMA number.)

Returned by:

Your name: _____
Firm: _____
Address: _____
Phone: _____



Please give us your comments.

Please use this form to send us your comments regarding this Technical Manual. Your input is greatly appreciated! Problems will be promptly addressed and action taken as necessary. If you wish a written reply, please furnish your name and mailing address. Thank you.

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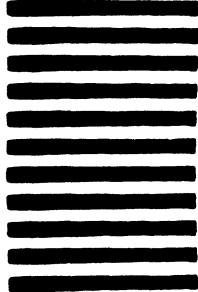
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