

# **Model BMX-2**

Mag Tape Coupler

## **Technical Manual**

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REVISION HISTORY

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|---------|----------|---|-----------------|
| 0463    | 5/15/85  | Revision per New Format                               |                 |
| 0477    | 9/26/85  | Release New Paddleboards                              | 2-1 thru<br>2-9 |
| 0699    | 10/08/86 | Added further explanation of Remote Density Selection | 4-4,4-5         |
| 0714    | 10-16-86 | Attach ground braid on FCC external cable.            | 3-9             |
| 0760    | 1/27/87  | Add tape drive to list.                               | 2-7,2-8         |
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| 1347    | 7/31/89  | REMOVE STATEMENT FROM PG.                             | 2-1             |
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|         |          |   |                 |

*Handwritten initials:*  
 JBP  
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 ROL

# Technical Manual for the BMX-2 Tape Coupler

## PREFACE

This manual provides complete instructions for installing ZETACO'S Model BMX-2 mag tape coupler with cabling and tailoring the Coupler to meet your specific requirements.

The technical contents of the manual have been written based on the assumptions that the reader 1) has a working knowledge of Data General's (DG) Nova, Eclipse and MV class computer hardware and their associated operating systems; 2) is familiar with the standard installation, power, grounding, and peripheral cabling procedures; and 3) has access to technical information describing the magnetic tape drive(s) to be installed with this coupler.

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

- SECTION 1            PRODUCT OVERVIEW - Briefly describes the Coupler features, capabilities, specifications, power and interface requirements.
- SECTION 2            INSTALLATION - Describes and illustrates the procedures required to install the BMX-2.
- SECTION 3            TEST PROGRAMS, TROUBLESHOOTING AND CUSTOMER SERVICE - Contains information useful in analyzing subsystem faults and how to get help.
- SECTION 4            USAGE GUIDELINES - Describes performance features implemented by the BMX-2.
- SECTION 5            PROGRAMMING NOTES - Contains detailed technical information for those involved in fault analysis or programming.

## APPENDICES

## TABLE OF CONTENTS

|  | Page No. |
|--|----------|
| Title Page                                     | i        |
| Notice   | ii       |
| Revision History                               | iii      |
| Preface  | iv       |
| Table of Contents                              | v-vii    |
| List of Tables, List of Illustrations          | viii     |
| Section:                                       |          |
| 1.0 Product Overview                           | 1-1      |
| 1.1 General Description                        | 1-1      |
| 1.2 Features                                   | 1-1      |
| 1.3 Specifications                             | 1-3      |
| 1.3.1 Functional                               | 1-3      |
| 1.3.2 Computer Interface                       | 1-3      |
| 1.3.3 Tape Drive Interface                     | 1-3      |
| 1.3.4 Mechanical                               | 1-4      |
| 1.3.5 Power Requirements                       | 1-4      |
| 1.3.6 Environmental Requirements               | 1-4      |
| 1.3.7 Magnetic Tape Media Capacity             | 1-4      |
| 2.0 Installation                               | 2-1      |
| 2.1 Unpacking and Inspection                   | 2-1      |
| 2.2 Options not "Configurator" Selectable      | 2-3      |
| 2.2.1 BMC Bus Termination                      | 2-3      |
| 2.2.2 Device Code Selection                    | 2-3      |
| 2.2.3 EEPROM Reinitialization                  | 2-5      |
| 2.3 Board Insertion                            | 2-5      |
| 2.4 CPU Priority Selection                     | 2-5      |
| 2.5 BMC Bus Cable Installation                 | 2-6      |
| 2.6 Drive Cable Installation                   | 2-6      |
| 2.6.1 Paddleboard Installation                 | 2-6      |
| 2.6.2 Non-FCC Paddleboard to Drive Cabling     | 2-6      |
| 2.6.3 FCC Internal Cabling                     | 2-9      |
| 2.6.4 FCC External Cabling                     | 2-9      |
| 2.6.5 Multiple Drives                          | 2-9      |
| 2.7 Tape Drive Preparation                     | 2-12     |
| 2.7.1 Drive Address Selection                  | 2-12     |
| 2.7.2 Parity Selection                         | 2-12     |
| 2.7.3 Tape Density - Remotely Selected         | 2-12     |
| 2.8 Powering Up                                | 2-14     |
| 2.9 Loading the BMX-2 Software Support Package | 2-14     |
| 2.9.1 Using the 400-387-00 Tape                | 2-14     |
| 2.9.2 Bootstrap Procedures                     | 2-15     |
| 2.9.3 Copying the 400-387-00 Tape to Disk      | 2-16     |
| 2.10 The BMX-2 Configurator                    | 2-17     |
| 2.10.1 Running the Configurator                | 2-17     |
| 2.10.2 Reinitializing EEPROM                   | 2-18     |
| 2.11 Sysgen Considerations                     | 2-20     |

|       |  |      |
|-------|--|------|
| 3.0   | Test Programs, Troubleshooting, and Customer Service | 3-1  |
| 3.1   | Self-test  | 3-1  |
| 3.2   | BMX-2 Maintenance Software                           | 3-2  |
| 3.2.1 | BMX-2 Diagnostic                                     | 3-2  |
| 3.2.2 | Tape Coupler Reliability                             | 3-6  |
| 3.3   | System Error Reporting                               | 3-8  |
| 3.3.1 | Runaway Tape   | 3-8  |
| 3.3.2 | Beginning of Tape                                    | 3-9  |
| 3.3.3 | End of Tape  | 3-9  |
| 3.3.4 | Off-line   | 3-9  |
| 3.3.5 | Write Lock   | 3-9  |
| 3.3.6 | Parity or Data Error                                 | 3-10 |
| 3.3.7 | Check Error  | 3-10 |
| 3.3.8 | Data Late  | 3-10 |
| 3.3.9 | Tape Density Mismatch                                | 3-11 |
| 3.4   | Customer Support Hotline                             | 3-12 |
| 3.5   | Warranty Information                                 | 3-12 |
| 3.6   | Product Return Authorization                         | 3-12 |
| 4.0   | Feature Usage Guidelines                             | 4-1  |
| 4.1   | Coupler Features                                     | 4-1  |
| 4.1.1 | Emulation  | 4-1  |
| 4.1.2 | Data Transfer Mode                                   | 4-1  |
| 4.1.3 | BMC Bus Priority                                     | 4-1  |
| 4.1.4 | Burst Rate   | 4-2  |
| 4.1.5 | Automatic Retry                                      | 4-2  |
| 4.1.6 | Read-Look-Ahead                                      | 4-3  |
| 4.2   | Drive Types  | 4-3  |
| 4.2.1 | Variable Gap   | 4-3  |
| 4.2.2 | High Speed Select                                    | 4-3  |
| 4.2.3 | Automatic High Speed File Search                     | 4-3  |
| 4.2.4 | Remote Density Select                                | 4-4  |
| 5.0   | Programming Notes                                    | 5-1  |
| 5.1   | 6026 Program Control                                 | 5-1  |
| 5.1.1 | Instruction Format                                   | 5-1  |
| 5.1.2 | Skip Instructions                                    | 5-2  |
| 5.1.3 | DOA = Send Command                                   | 5-2  |
| 5.1.4 | DOB = Load Starting Memory Address                   | 5-4  |
| 5.1.5 | DOC = Load Word Count                                | 5-4  |
| 5.1.6 | DIA = Read Status Word One                           | 5-5  |
| 5.1.7 | DIB = Read Current Address                           | 5-8  |
| 5.1.8 | DIC = Read Status Word Two                           | 5-9  |
| 5.2   | 6026 Command Descriptions                            | 5-11 |
| 5.2.1 | Read   | 5-11 |
| 5.2.2 | Write  | 5-11 |
| 5.2.3 | Write End of File                                    | 5-12 |
| 5.2.4 | Rewind   | 5-12 |
| 5.2.5 | Space Forward  | 5-12 |
| 5.2.6 | Space Reverse  | 5-13 |
| 5.2.7 | Erase  | 5-13 |
| 5.2.8 | Set Control Mode                                     | 5-13 |

|     |           |                                    |      |
|-----|-----------|------------------------------------|------|
|     | 5.2.9     | Set Drive Mode (Encoding)          | 5-13 |
|     | 5.2.10    | Read Non-Stop                      | 5-14 |
| 5.3 | 6300/4307 | Program Control                    | 5-15 |
|     | 5.3.1     | Instruction Format                 | 5-15 |
|     | 5.3.2     | DOA = Send Command                 | 5-15 |
|     | 5.3.3     | DOB = Load Starting Memory Address | 5-17 |
|     | 5.3.4     | DOC = Load Word Count              | 5-18 |
|     | 5.3.5     | DIA = Read Status Word One         | 5-18 |
|     | 5.3.6     | DIB = Read Current Address         | 5-19 |
|     | 5.3.7     | DIC = Read Status Word Two         | 5-20 |
| 5.4 | 6300/4307 | Command Descriptions               | 5-22 |

## APPENDICES

|     |                              |     |
|-----|------------------------------|-----|
| A.0 | Installing BMX-2 Under DG/UX | A-1 |
| A.1 | Notes                        | A-1 |
| A.2 | Installation                 | A-1 |
| A.3 | Trouble-shooting             | A-1 |
| A.4 | Usage Guidelines             | A-2 |
| A.5 | Programming Notes            | A-3 |
| A.6 | Restrictions                 | A-3 |

## LIST OF TABLES

|           |                         |      |
|-----------|-------------------------|------|
| Table 2.1 | Configuration Fact List | 2-19 |
| Table 3.1 | Self-Test Error Codes   | 3-2  |

## LIST OF ILLUSTRATIONS

|            |                                       |      |
|------------|---------------------------------------|------|
| Figure 2.0 | Board Layout and Device Switch        | 2-2  |
| Figure 2.1 | Backpanel Priority Jumpers            | 2-4  |
| Figure 2.2 | Non-FCC Cabling and Bus Cabling       | 2-7  |
| Figure 2.3 | FCC Cabling and Bus Cabling           | 2-8  |
| Figure 2.4 | Multiple Tape Drive Cabling-6026      | 2-10 |
| Figure 2.5 | Multiple Tape Drive Cabling-6300/4307 | 2-11 |
| Figure 2.6 | Cable Matrix                          | 2-13 |



## 1.0 PRODUCT OVERVIEW

### 1.1 GENERAL DESCRIPTION

The ZETACO BMX-2 Mag Tape Coupler interfaces to start/stop or streaming tape drives with the "Pertec" industry-standard embedded formatters that employ PE, NRZI, GCR and other recording formats. The Coupler transfers up to 32K word blocks of data via the Data Channel (DCH) or Burst Multiplexer Channel (BMC) and is totally transparent to Data General's (DG) operating software. The BMX-2 emulates DG 6300/4307 and 6026 tape subsystems.

### 1.2 FEATURES

- \* Interfaces DG minicomputers to formatted magnetic tape drives produced by popular tape drive manufacturers.
- \* Microprocessor-based design provides flexibility and performance enhancements.
- \* Software compatible with unmodified DG operating system software.
- \* Emulates DG's 6026 subsystem on the DCH, and 6300/4307 subsystem on the BMC.
- \* FIFO buffering for DCH latency.
- \* High speed buffer for BMC transfers.
- \* Automatic Self-test with error reporting by visual LED.
- \* Separate LED indicators for:
  - error reporting
  - coupler activity
  - BMC/DCH activity
- \* Burst Rates user-selectable from 1 to 256 words.
- \* Interfaces up to 8 industry-standard half-inch tape drives on 6026 and up to 4 drives on 6300/4307.
- \* Automatic high speed file search.
- \* On-board Automatic Re-try.

- \* Remote Density Select under AOS and AOS/VS.
- \* The use of Electronically Erasable Programmable Read Only Memory (EEPROM) eliminates switches and provides total software configurability.
- \* EEPROM Configurator Program provides complete flexibility with a "user friendly" format.
- \* Fairchild "FAST" logic used to increase performance and reduce power consumption.

## 1.3 SPECIFICATIONS

### 1.3.1 FUNCTIONAL

Drives/coupler: Up to 8 as 6026 and up to 4 as 6300/4307.

Emulations: 6026 and 6300/4307

Parity: Odd.

Transfer rate: Up to 2.0 MB/second

Tape Format: Specified by drive formatter; (PE, NRZI and GCR).

### 1.3.2 COMPUTER INTERFACE

The BMX-2 uses standard Data Channel and BMC timing. The coupler can be installed in any I/O slot in the chassis. The coupler will run in Nova, Eclipse or MV series computer using RDOS, AOS or AOS/VS operating systems respectively.

### 1.3.3 TAPE DRIVE INTERFACE

Electrical: Industry standard, embedded formatter, open collector, low active, TTL

Driver: Logic Low = .4V Max.  
Logic High = 2.4V Min.

Receiver: Schmidt Trigger

Cabling: Two 50-pin non-shielded ribbon cables installed on computer backplane, or round shielded FCC cabling. Maximum length 20 feet (6.1 meters)

Daisy Chain: 8 drives, or 3 (slave) drives plus one formatted (master) drive. Refer to Figure 2.4 Diagrams A, B and C for 6026 Emulation and Figure 2.5 Diagrams A, B and C for 4 drives on 6300/4307 Emulation.

#### 1.3.4 MECHANICAL

Dimensions: 15" x 15" x 1/2"  
(38.1 cm x 38.1 cm x 1.3 cm)

Shipping Weight: 10 lbs.  
(4.54 kg)

#### 1.3.5 POWER REQUIREMENTS

Typically 6.04 Amps at 5 VDC +/-5%  
(approx. 30.2 WATTS)

#### 1.3.6 ENVIRONMENTAL REQUIREMENTS

Operating Temperature: 0° to 55° C

Relative Humidity: 10% to 90%  
(non-condensing)

#### 1.3.7 MAGNETIC TAPE MEDIA CAPACITY

The following formula will aid in determining how much data storage capacity in bytes (byte = 8 bits) a length of tape will offer.

$$\text{Number of bytes/length of tape} = \frac{(\text{TLEN} - 25) (\text{RLEN}) (12)}{((\text{RLEN} + \text{TFD})/\text{BPI}) + \text{GAPL}}$$

TLEN = Length of tape in feet  
RLEN = Record length in bytes  
TFD = Tape format data (PE = 82, NRZI = 8)  
BPI = Recording density (PE = 1600, NRZI = 800,  
GCR = 6250)  
GAPL = Gap length in inches (NOMINAL = .6")

## 2.0      INSTALLATION

Please read this entire section carefully before beginning installation. Run Diagnostics and Reliability after the board has been configured for the correct emulation and drive type(s). Refer to Section 3.2 for Diagnostics and Reliability.

## 2.1      UNPACKING AND INSPECTION

It is recommended that all packing material and cartons be saved, in case re-shipping is necessary.

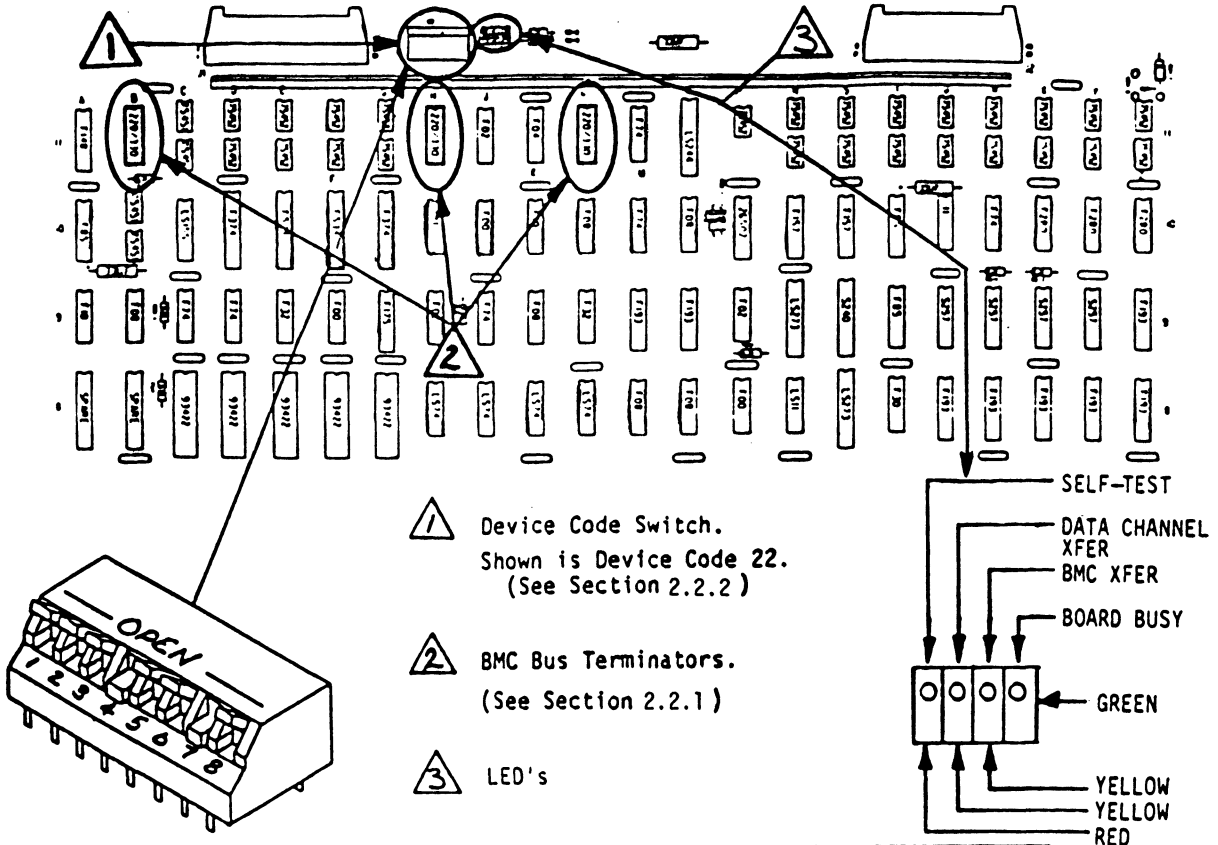
Upon receipt of the BMX-2 from the carrier, inspect the shipping carton immediately for any evidence of damage or mishandling in transit.

If the shipping carton is water stained or damaged, contact the carrier and shipper immediately, 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 or a ZETACO Authorized Distributor to obtain Return Authorization instructions.

FIGURE 2.0 Board Layout and Device Switch



| DEVICE CODE | S1 RESERVED | S2 RESERVED | S3 DSO | S4 DSI | S5 DS2 | S6 DS3 | S7 DS4 | S8 DS5 |
|-------------|-------------|-------------|--------|--------|--------|--------|--------|--------|
| 0X          | UP          | UP          | UP     | UP     | UP     |        |        |        |
| 1X          | UP          | UP          | UP     | UP     | DOWN   |        |        |        |
| 2X          | UP          | UP          | UP     | DOWN   | UP     |        |        |        |
| 3X          | UP          | UP          | UP     | DOWN   | DOWN   |        |        |        |
| 4X          | UP          | UP          | DOWN   | UP     | UP     |        |        |        |
| 5X          | UP          | UP          | DOWN   | UP     | DOWN   |        |        |        |
| 6X          | UP          | UP          | DOWN   | DOWN   | UP     |        |        |        |
| 7X          | UP          | UP          | DOWN   | DOWN   | DOWN   |        |        |        |
| X0          | UP          | UP          |        |        |        | UP     | UP     | UP     |
| X1          | UP          | UP          |        |        |        | UP     | UP     | DOWN   |
| X2          | UP          | UP          |        |        |        | UP     | DOWN   | UP     |
| X3          | UP          | UP          |        |        |        | UP     | DOWN   | DOWN   |
| X4          | UP          | UP          |        |        |        | DOWN   | UP     | UP     |
| X5          | UP          | UP          |        |        |        | DOWN   | UP     | DOWN   |
| X6          | UP          | UP          |        |        |        | DOWN   | DOWN   | UP     |
| X7          | UP          | UP          |        |        |        | DOWN   | DOWN   | DOWN   |

## 2.2      OPTIONS NOT "CONFIGURATOR" SELECTABLE

Most of the features of the BMX-2 are easily configured through a program called Configurator supplied on the 400-387-00 tape. The following describes features that are not selectable via the Configurator and how to modify them. All jumpers on the BMX-2 are for Zetaco maintenance only and do not enable or disable any features.

### 2.2.1      BMC BUS TERMINATION

Devices that transfer data on the BMC are cabled together in a "daisy chain" fashion. Because of this specification, BMC termination should only exist on the last BMC device in the chain. If the BMX-2 is to be installed as the last or only BMC device, then make sure the 3 DIP terminators are installed in their respective sockets at locations B11, H11, and L11 on the coupler. If it isn't the last or only BMC device in the chain then insure that the terminators are removed from the sockets at the above locations. The last BMC device is defined as the BMC device furthest from the I/O Controller (IOC). To determine if the terminators are installed properly remove the board cover and inspect the chip locations described above and in Figure 2.0.

NOTE:        The BMX-2 is shipped from the factory with these terminators installed unless otherwise specified.

### 2.2.2      DEVICE CODE SELECTION

Device code for a controller is determined when a compare is achieved between the Device Select bits on the DG interface (DS0 - DS5), and the comparator on the coupler. The DIP switch on the handle edge of the Coupler is used to select desired device code.

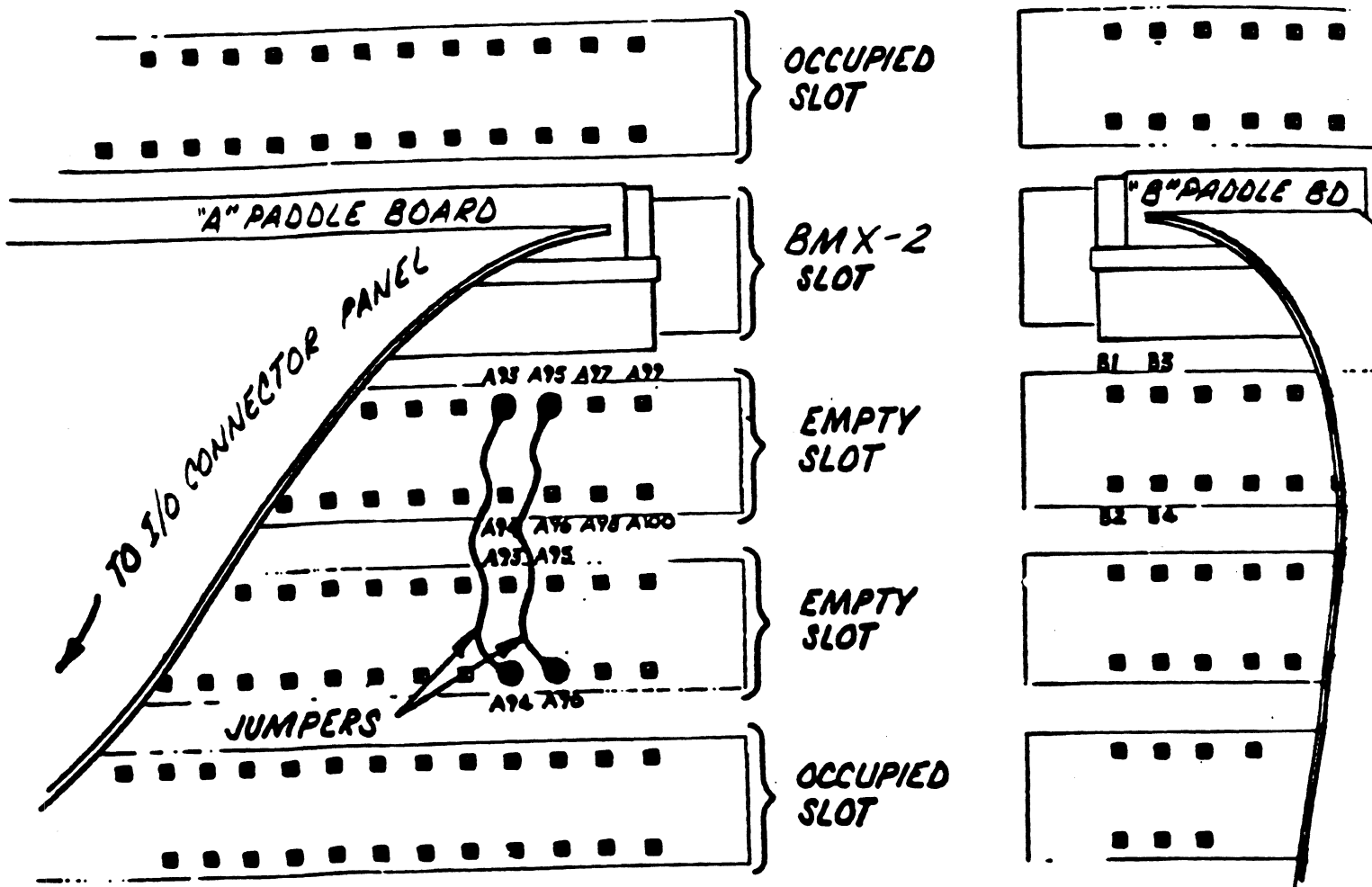
Its individual switches are labeled 1 through 8. Switches 3 through 8 are used for device select. DS0 is the most significant bit of the six-bit device code representation and corresponds to switch 3. The least significant bit, DS5, corresponds to switch 8.

FIGURE 2.1 Backpanel Priority Jumpers

A SIDE

B SIDE

COMPUTER CHASSIS





The BMX-2 can be configured for any device code between 0 and 77 (octal); however, the primary is 22 and the secondary is 62. Primary device code 22 has been factory set and should be left accordingly unless another tape subsystem exists with that device code. To select device code 22 the switches from 3 to 8 would be UP,DOWN,UP,UP,DOWN,UP respectively and for device 62 would be DOWN,DOWN,UP,UP,DOWN,UP respectively. For more information refer to Figure 2.0.

### 2.2.3 EEPROM REINITIALIZING

Switch 1 is used in the operation described in Section 2.10.2.

### 2.3 BOARD INSERTION

With no power applied carefully guide the Coupler board into the desired slot, allowing the edges of the board to follow the guides evenly. Use the lock tabs on the two outside corners to provide leverage when the board meets the connector. Use equal pressure on both lock tabs until the board seats firmly into the backplane connectors.

### 2.4 CPU PRIORITY SELECTION

The Coupler must receive two priority signals from the DG minicomputer backplane, (Data Channel Priority In) Pin A94 and (Interrupt Priority In) Pin A96.

If there are vacant slots between the Coupler and the processor, priority jumper wires must be installed to obtain priority continuity between controllers. To jumper across unused slots, connect (Data Channel Priority Out) Pin A93 of the top empty slot to (Data Channel Priority In) Pin A94 of the bottom empty slot and (Interrupt Priority Out) Pin A95 of the top empty slot to (Interrupt Priority In) Pin A96 of the bottom empty slot. Reference Figure 2.1.

## 2.5 BMC BUS CABLE INSTALLATION

Install the BMC cables as shown in Figures 2.2 or 2.3, observing the arrows on the connectors. If more than one BMC controller is being installed and the D.G. BMC cables have only one set of connector plugs, then the BMC cables provided by ZETACO must be used. These cables have four sets of connector plugs, allowing up to four BMC couplers. Reference Section 2.2.1 for BMC terminator installation.

## 2.6 DRIVE CABLE INSTALLATION

### 2.6.1 PADDLEBOARD INSTALLATION

Two paddleboards with 50-pin, 2-row cable headers provide the interface between the tape drive cabling and the computer backplane. The "A" paddleboard is P/N 500-411-00 and the "B" is P/N 500-412-00. Block connectors on each attach onto the row of backplane pins that correspond to the slot containing the BMX-2 board. The computer backplane, viewed from the rear, contains the "A" side pins on the left and the "B" pins on the right. Pins on both sides are numbered 1 to 100 from left to right. See Figure 2.1.

Install the "A" paddleboard by placing it over pins A29-A100 with the header on top. First make sure all pins are straight, then carefully press the paddleboard onto the pins, making sure all pins are inserted and do not bend, until the block is flush with the backplane. If necessary, gently rock the outer edge of the paddleboard up and down slightly to help guide the pins into the contacts.

Install the "B" paddleboard onto pins B1-B72 by repeating the above procedure.

### 2.6.2 NON-FCC PADDLEBOARD TO DRIVE CABLING

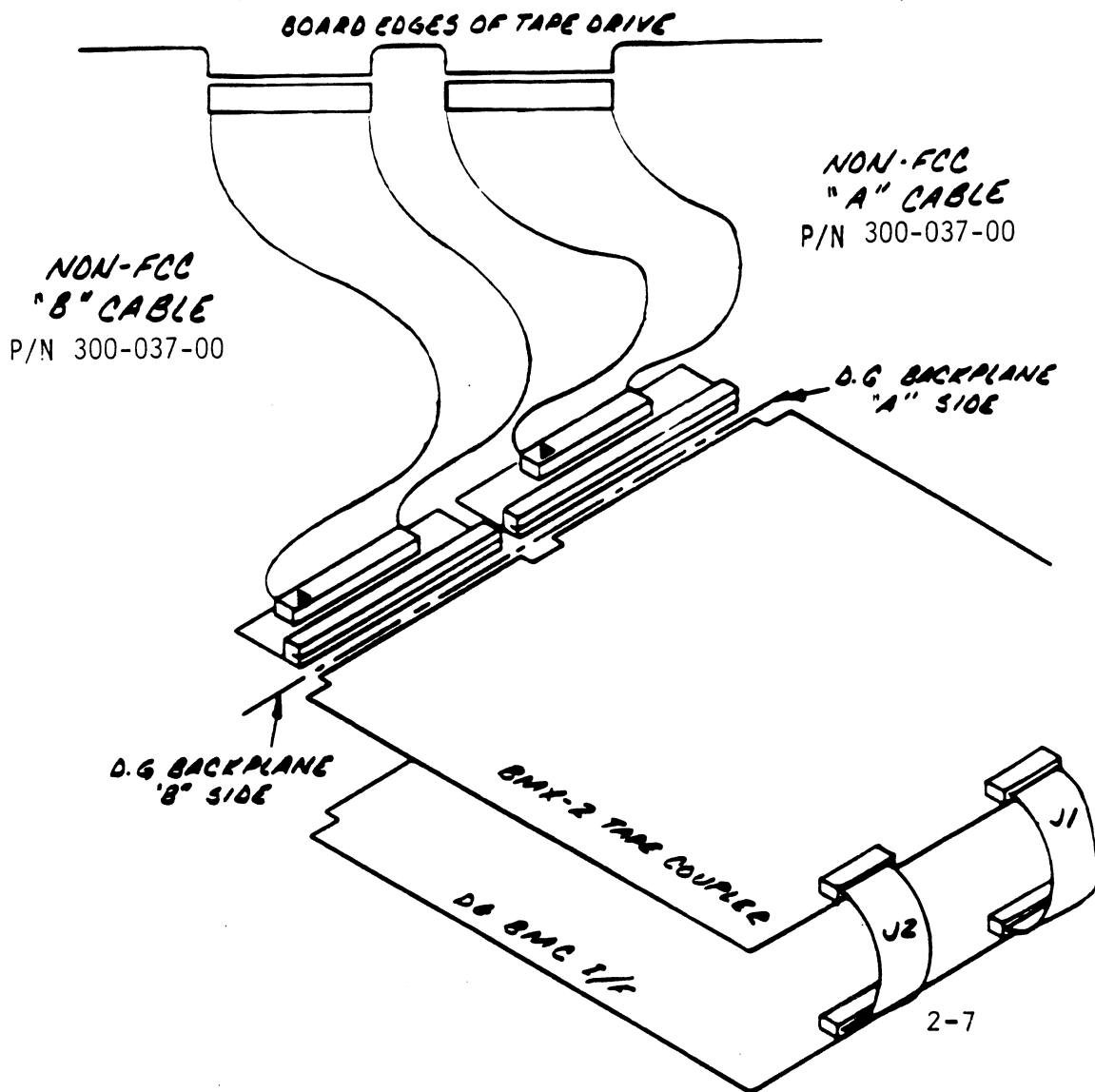
Two ribbon cables (P/N 300-037-XX) attach the paddleboards directly to the tape drive board-edge connectors. Connect the 2-row receptacle end of the cables to the "A" and "B" paddleboards, observing that the arrow on the cable connector aligns with the arrow on the top right side of the header.

To connect the cables to the tape drive formatter board, refer to Figure 2.2. Reference the tape drive manufacturers manual for proper connection to the tape drive connectors.

**FIGURE 2.2 Non-FCC Cabling and BMC Bus Cabling**

**D.G. Backplane**

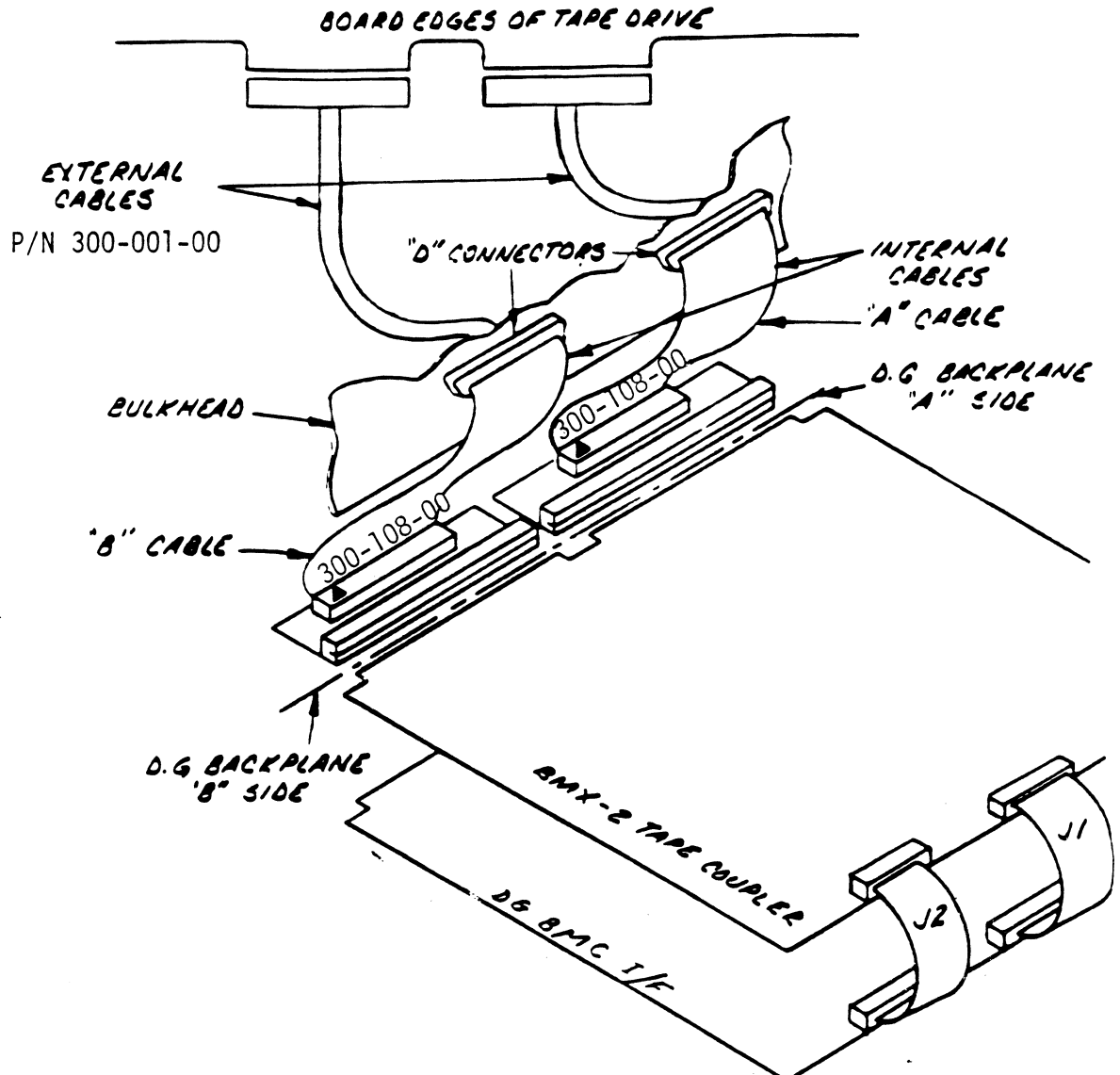
| <b>"B" Side</b>   |      | <b>"A" Side</b> |                                      |
|-------------------|------|-----------------|--------------------------------------|
| Cipher Streamer   | P1   | P2              |                                      |
| *Cipher Formatter | P4   | P5              | *Requires Cipher 100                 |
| Kennedy Streamer  | P1   | P2              | pin to two 50-Pin                    |
| Kennedy Formatter | J5   | J1              | Adapter Boards                       |
| Kennedy 9400 GCR  | P100 | P200            | P/N 160006-001                       |
| CDC Streamer      | J4   | J5              |                                      |
| CDC GCR           | J2   | J3              |                                      |
| Pertec            | P4   | P5              |                                      |
| **STC 2920        | P1   | P2              | **Requires STA-1<br>or 2920A Adapter |
| STC 2921          | P6   | P7              |                                      |
| Fujitsu 2442      | B    | A               |                                      |
| ***Fujitsu 2436   | P1   | P2              | ***Requires STA-2                    |
| Telex 9251 /9271  | J3   | J2              |                                      |



**FIGURE 2.3 FCC Cabling and BMC Bus Cabling**

**D.G. Backplane**

|                   | "B" Side |  | "A" Side |                                      |
|-------------------|----------|--|----------|--------------------------------------|
| Cipher Streamer   | P1       |  | P2       |                                      |
| *Cipher Formatter | P4       |  | P5       | *Requires Cipher 100                 |
| Kennedy Streamer  | P1       |  | P2       | pin to two 50 Pin                    |
| Kennedy Formatter | J5       |  | J1       | Adapter Boards                       |
| Kennedy 9400 GCR  | P100     |  | P200     | P/N 160006-001                       |
| CDC Streamer      | J4       |  | J5       |                                      |
| CDC GCR           | J2       |  | J3       |                                      |
| Pertec            | P4       |  | P5       |                                      |
| **STC 2920        | P1       |  | P2       | **Requires STA-1<br>or 2920A Adapter |
| STC 2921          | P6       |  | P7       |                                      |
| Fujitsu 2442      | B        |  | A        |                                      |
| ***Fujitsu 2436   | P1       |  | P2       | ***Requires STA-2                    |
| Telex 9251/9271   | J3       |  | J2       |                                      |



### 2.6.3 FCC INTERNAL CABLING

Two internal ribbon cables (P/N 300-108-XX) connect the paddleboard headers to the computer bulkhead panel. Attach the 2-row receptacle end of the cables to the "A" and "B" paddleboards, observing that the arrows on the cable connector align with the arrows on the top right side of the headers. To mount the "D" connectors, remove the covers from the necessary mounting holes on the panel. With the mounting hardware removed from the connectors, insert the connectors into the panel and insert the hex bolts from the outside. Secure each connector to the panel with the washers and nuts.

### 2.6.4 FCC EXTERNAL CABLING

Connect the two 300-001-00 cables as shown in Figure 2.3. Ensure Pin 1 on each cable connector (marked with small triangle or arrow) is aligned with Pin 1 of the drive formatter board. Mark each 300-001-00 cable "A" or "B", depending on whether it comes from the "A" or "B" side of the backplane. Also connect the external ground wire on both cables to the drive's chassis ground.

Example: Take either one of the 300-001-00 cables and connect it to the "A" side of the bulkhead and to the appropriate tape formatter connector. Mark the white tab as cable "A". Connect the remaining cable and mark it as cable "B".

### 2.6.5 MULTIPLE DRIVES

Figure 2.4 shows 3 multiple-drive cabling schemes. The Coupler may address up to 8 tape units as a 6026 subsystem. These may be all drives with individual formatters as shown in Diagram A, drives that share a common formatter as in Diagram B, or a combination of both as in Diagram C.

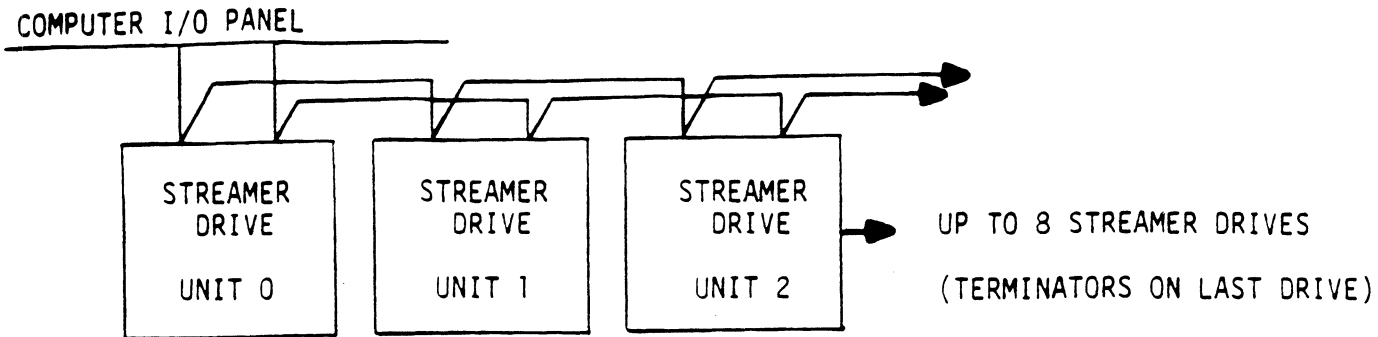
In Diagram A, the drives are set Unit 0-7. In Diagrams B and C, each embedded formatter responds to 4 consecutive units, 0-3 or 4-7. Note that in Diagram C, the first streamer drive is set to Unit 4, although the Unit 0 formatter may only be controlling a single drive.

To attach two formatters to the Coupler, use the optional cables (P/N 300-012-00). Each cable has a connector spliced for attachment to the two board-edge connectors of the first formatter. The ends of each cable then attach to the second formatter. Be sure terminators are removed from the first formatter and are installed on the second.

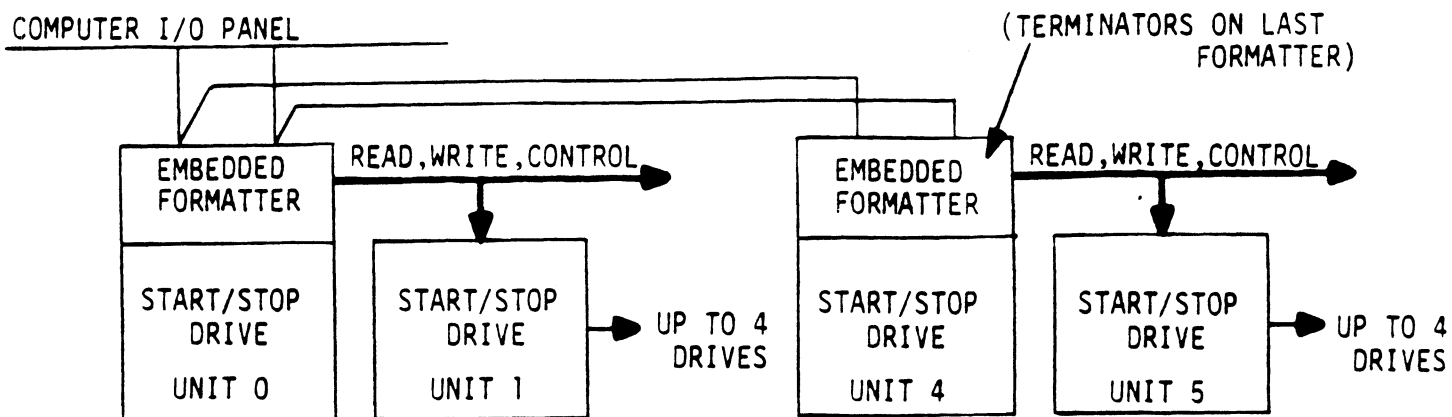
Figure 2.5 shows the multiple-drive cabling scheme for 6300/4307 emulation. The Coupler may address up to 4 tape drives.

FIGURE 2.4 Multiple Tape Drive Cabling (6026 Emulation)

### A. STREAMER DRIVES ONLY



### B. TWO EMBEDDED FORMATTERS



### C. EMBEDDED FORMATTER AND STREAMER DRIVES

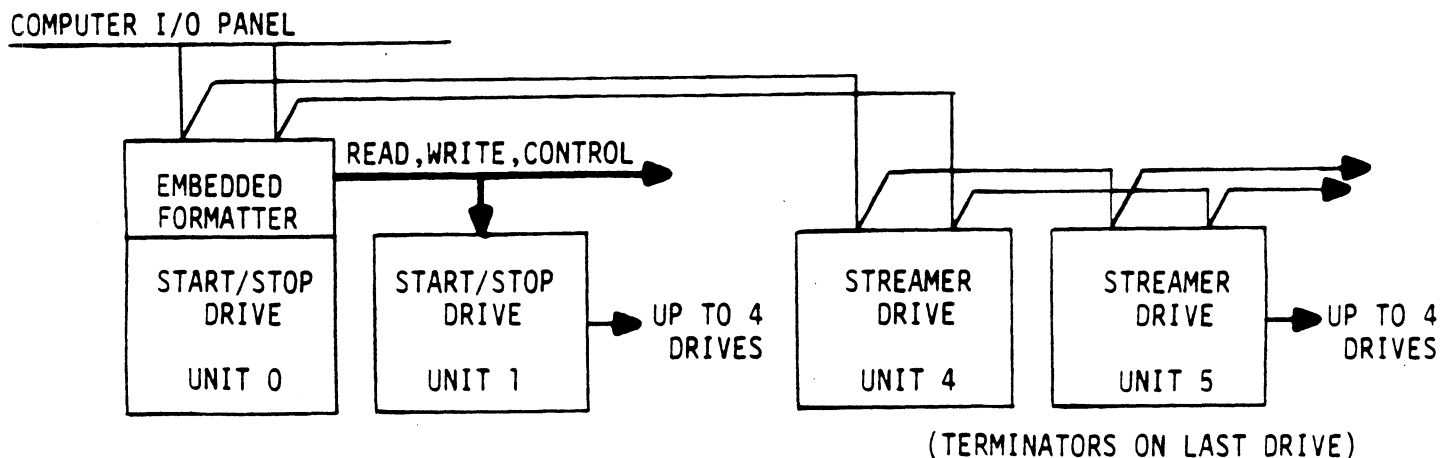
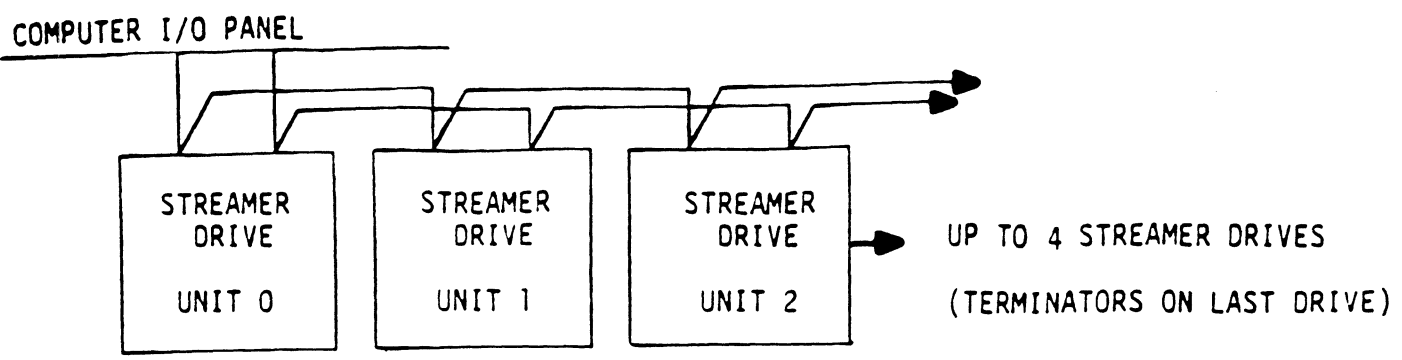


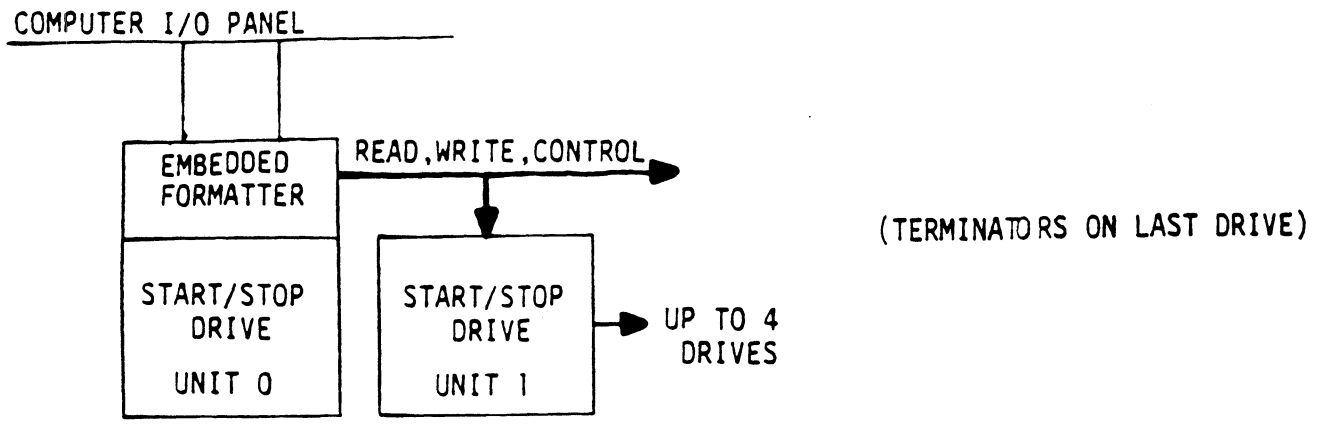
FIGURE 2.5 Multiple Tape Drive Cabling (6300/4307 Emulation)

### A. STREAMER DRIVES ONLY



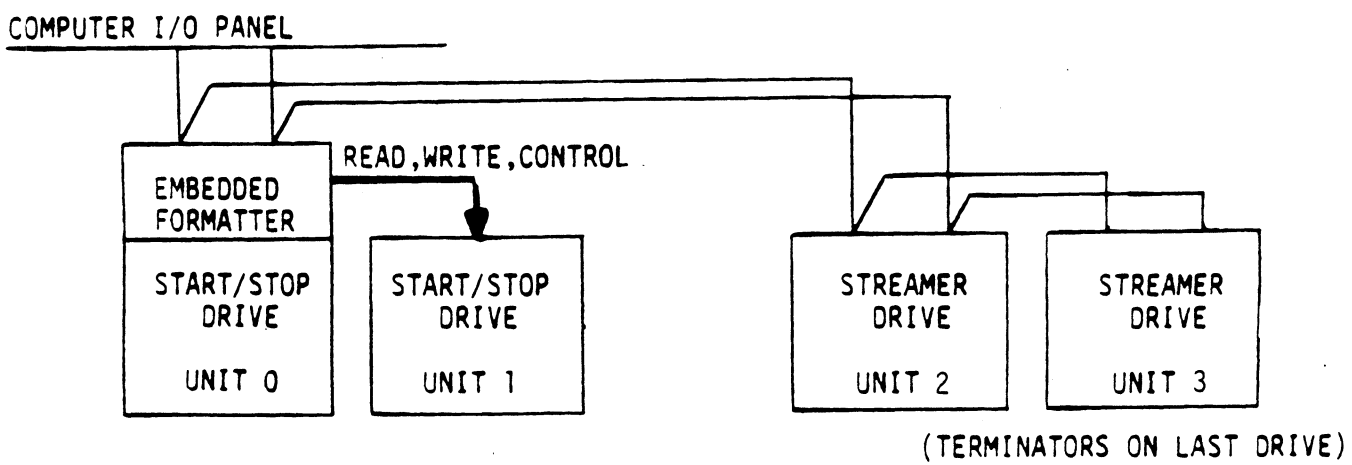
---

### B. ONE EMBEDDED FORMATTER



---

### C. EMBEDDED FORMATTER AND STREAMER DRIVES



## 2.7 TAPE DRIVE PREPARATION

### 2.7.1 DRIVE ADDRESS SELECTION

Most drives have internal selector switches to address decoding, one formatter address selection (IFAD) and two for drive selection (ITAD0, ITAD1). Refer to your drive documentation for specific switch setting information. Below lists the necessary drive address settings for the corresponding unit number.

| UNIT # | IFAD | ITAD0 | ITAD1 |
|--------|------|-------|-------|
| 0      | 0    | 0     | 0     |
| 1      | 0    | 0     | 1     |
| 2      | 0    | 1     | 0     |
| 3      | 0    | 1     | 1     |
| 4      | 1    | 0     | 0     |
| 5      | 1    | 0     | 1     |
| 6      | 1    | 1     | 0     |
| 7      | 1    | 1     | 1     |

### 2.7.2 PARITY SELECTION

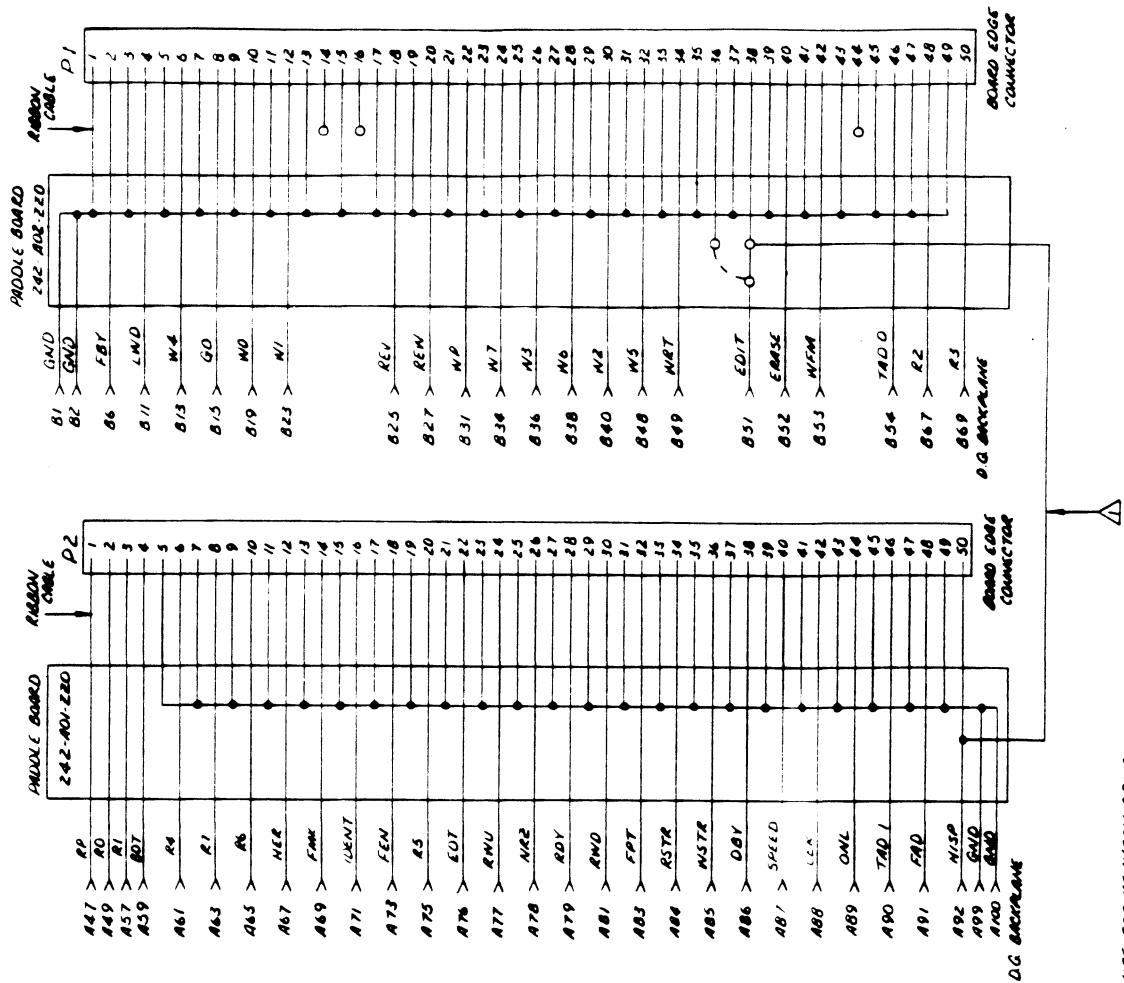
Most drives have an internal switch for parity options. One position will cause the drive to generate its own parity according to the data it receives from the coupler. The other position causes the drive to accept parity from the coupler and record it exactly as it was received. It is recommended that the drive be set for the later option (external parity) -- that generated by the coupler.

### 2.7.3 TAPE DENSITY - REMOTELY SELECTED

Many dual or tri-density tape units incorporate some type of remote density select. This feature is generally enabled with a switch or jumper on the drive. For your specific settings refer to the tape unit's technical manual. This feature can be used with the BMX-2 if "Remote" is shown under the Configurator (refer to section 4.2.4).



FIGURE 2.6 Cable Matrix



**A CONNECTOR**

| EVEN | ODD |
|------|-----|
| 2    | 1   |
| 4    | 3   |
| 6    | 5   |
| 8    | 7   |
| 10   | 9   |
| 12   | 11  |
| 14   | 13  |
| 16   | 15  |
| 18   | 17  |
| 20   | 19  |
| 22   | 21  |
| 24   | 23  |
| 26   | 25  |
| 28   | 27  |
| 30   | 29  |
| 32   | 31  |
| 34   | 33  |
| 36   | 35  |
| 38   | 37  |
| 40   | 39  |
| 42   | 41  |
| 44   | 43  |
| 46   | 45  |
| 48   | 47  |
| 50   | 49  |
| 52   | 51  |
| 54   | 53  |
| 56   | 55  |
| 58   | 57  |
| 60   | 59  |
| 62   | 61  |
| 64   | 63  |
| 66   | 65  |
| 68   | 67  |
| 70   | 69  |
| 72   | 71  |
| 74   | 73  |
| 76   | 75  |
| 78   | 77  |
| 80   | 79  |
| 82   | 81  |
| 84   | 83  |
| 86   | 85  |
| 88   | 87  |
| 90   | 89  |
| 92   | 91  |
| 94   | 93  |
| 96   | 95  |
| 98   | 97  |
| 100  | 99  |

**B CONNECTOR**

| EVEN | ODD |
|------|-----|
| 2    | 1   |
| 4    | 3   |
| 6    | 5   |
| 8    | 7   |
| 10   | 9   |
| 12   | 11  |
| 14   | 13  |
| 16   | 15  |
| 18   | 17  |
| 20   | 19  |
| 22   | 21  |
| 24   | 23  |
| 26   | 25  |
| 28   | 27  |
| 30   | 29  |
| 32   | 31  |
| 34   | 33  |
| 36   | 35  |
| 38   | 37  |
| 40   | 39  |
| 42   | 41  |
| 44   | 43  |
| 46   | 45  |
| 48   | 47  |
| 50   | 49  |
| 52   | 51  |
| 54   | 53  |
| 56   | 55  |
| 58   | 57  |
| 60   | 59  |
| 62   | 61  |
| 64   | 63  |
| 66   | 65  |
| 68   | 67  |
| 70   | 69  |
| 72   | 71  |
| 74   | 73  |
| 76   | 75  |
| 78   | 77  |
| 80   | 79  |
| 82   | 81  |
| 84   | 83  |
| 86   | 85  |
| 88   | 87  |
| 90   | 89  |
| 92   | 91  |
| 94   | 93  |
| 96   | 95  |
| 98   | 97  |
| 100  | 99  |

NOTES:  
 Δ OPTIONAL WIRE FOR KENNEDY DRIVE.

## 2.8 POWERING UP

Turn system power ON. The BMX-2 will perform an initial Self-test, indicated by a red LED. A good test is indicated by the LED going OFF (wait 14 seconds). For more details refer to Section 3.1.

There are three more LEDs on the BMX-2. The green LED indicates "Coupler Busy" and will be lit whenever a start pulse is sent to the Coupler (except for a rewind command). The left yellow LED is used to indicate DCH activity and right will indicate BMC activity. Refer to Figure 2.0.

## 2.9 LOADING THE BMX-2 SOFTWARE SUPPORT PACKAGE

The Software Support Package is supplied on the 400-387-00 1/2" magnetic tape. Included on the tape are the Configurator, Diagnostic and Reliability programs for the BMX-2 tape coupler. File 2 on this tape must be used to configure the Coupler to your requirements. You should use this tape for Diagnostics and Reliability; DG's Subsystem Diagnostics and Reliability or system level diagnostics may not work on all subsystems because of the imposition of certain timing restrictions not applicable to the BMX-2 coupler.

### 2.9.1 USING THE 400-387-00 TAPE

#### System Requirements:

- DG Nova/Eclipse Family CPU/SPU
- Minimum 32 K words memory (for Configurator)
- Console device at 10/11
- BMX-2 tape coupler with drive
- Printer at device 17 for hard copy (optional)

If your system has another 1/2" tape subsystem, we recommend that it be used to load ZETACO's programs until the BMX-2 interface is determined to be working properly.

The 400-387-00 tape is structured so that the programs on Files 2-4 can be loaded and executed directly from the tape. Files 0 and 1 contain the software that enables you to boot from the tape and select the particular program you want loaded into the system.

Each of the programs on Files 2-4 is a stand-alone program. This means that they do not need, and cannot have, an operating system running when they are executed.

Programs cannot be loaded onto your disk directly from Files 0-4. File 5 for RDOS and File 6 for AOS or AOS/VS contain the programs in the standard system dump format and you can load them from these files onto your disk.

The following sequence of events is recommended by ZETACO. Each step is described in greater detail in the subsequent sections of this chapter.

1. Mount the 400-387-00 tape and boot it. (See Section 2.9.2)
2. Select #2 on the menu - configure the Coupler (See Section 2.10)
3. Select #3 on the menu - tape Diagnostics. (See Section 3.2.1)
4. Select #4 on the menu - tape Reliability. (See Section 3.2.2)

NOTE: It is not essential that you run Diagnostics or Reliability. However, they can locate installation or subsystem problems. It is better that these be found at this time.

5. Load the programs from File 5 or File 6 onto a system disk if one is available. (see section 2.9.3)

## 2.9.2 BOOTSTRAP PROCEDURES

1. Mount the tape on the drive and put it on-line. Be sure that the BPI setting matches that specified on the tape label (normally 1600 BPI). If your CPU has a tape drive other than the one you are testing, you should use the other tape drive for booting.
2. Program Load - The method of program load varies for different processors. Some of the possibilities are described here.

If your system has front-panel switches, set them to 100022 when loading from the primary tape drive, or to 100062 when loading from the secondary tape drive. Then press reset and the program load switch.

For the S140 virtual console, set 11A to 100022 (or 100062 for secondary tape drive). Then enter 100022L (or 100062L).

For the S120 virtual console, enter 22H (or 62H for the secondary tape drive).

For MV class CPU's you must enter the full virtual console and respond to the prompt:

SCP-CLI>  
with BOOT 22 (or 62 for secondary tape)

3. 400-387-00 menu will be displayed on console:

| FILE # | PROGRAM  | FILENAME  |
|--------|--|-----------|
| 2      | BMX-2 CONFIGURATOR                                       | CFBMX2.SV |
| 3      | DUAL DENSITY TAPE DIAG                                   | BMX2D.SV  |
| 4      | ZETACO MAG TAPE RELI                                     | ZMTRL.SV  |
| 5      | ".SV & .LS" Files and any Utilities in RDOS dump format. |           |
| 6      | ".SV & .LS" Files and any Utilities in AOS dump format.  |           |

FILE NUMBER?

Enter the file number (2-4) you wish to execute followed by CR. The tape should then space forward and load the program into memory. Refer to the sections that follow for information regarding the individual programs.

### 2.9.3 COPYING THE 400-387-00 TAPE TO DISK

Files 5-6 are RDOS and AOS "dump" versions of the programs on the previous files. This allows you to load the programs onto your disk. We encourage you to transfer the programs to some media other than 1/2" tape to prevent having to load the programs from a suspect drive or an inaccurately configured coupler. To load Files 5-6 onto disk, use the standard CLI commands:

```

FOR RDOS:      DIR %MDIR%
                INIT MTO
                LOAD/A/R/V MTO:5
                RELEASE MTO

FOR AOS OR    SUPERUSER ON
AOS/VS        DIR :
                LOAD/V/R @MTn:6 (Where n is your tape unit)
                REWIND @MTn
                SUPERUSER OFF

```

The files can now be booted from disk. For RDOS enter the filename (see menu in Section 2.9.1) in response to FILENAME? For AOS enter the full pathname (including .SV) in response to PATHNAME?.

## 2.10 THE BMX-2 CONFIGURATOR

The purpose of the Configurator is to set up the Controller with information unique to your particular installation. The facts are then saved within the Controller in non-volatile memory. Configuration need only be done at installation time, or can be redone at any time to adjust performance, attach new tape drives, etc.

### 2.10.1 RUNNING THE CONFIGURATOR

Unless otherwise specified, the BMX-2 is factory shipped for 6026 AOS emulation and all special features are disabled.

NOTE: We strongly recommend that you save a hard copy of the dialogue between operator and Configurator for future reference. The program has printer output control at device code 17 (LPT). If a printer is not available, the operator can record on Table 2.1 all the configuration facts displayed by using the "L" command.

The program will display a heading and an introduction. Read the introduction carefully before proceeding. Initially you must specify on which device code the BMX-2 is currently running, so that the current facts can be read from the EEPROM on the Coupler.

The BMX-2 Configurator includes two "HELP" commands, one for OPERATIONAL questions and one that suggests WHAT you might want to do. In addition, you can get an explanation for any item by responding with an "H" to the question. Please use these functions whenever you are uncertain as to what to do.

- It is recommended that the "E" command be used for the initial installation to allow setup of all parameters.
- When the Configuration is complete, enable logging to the printer and list the Configuration. Use the "U" command to update the Controller and the "Q" command to end the session.

### 2.10.2 REINITIALIZING EEPROM

The BMX-2 has the capability to be configured in many different ways. In the event that during the Configuration process a mistake was made, for example, by selecting the wrong data transfer method, we provide a Reinit switch so that the user can get back to the basic configuration (see section 2.10.1) and reload the Configurator Program. The steps one must take to reinitialize the EEPROM are as follows:

- 1) Remove power from the computer
- 2) Locate switch 1 on the handle edge of the BMX-2 and put it in the DOWN position
- 3) Reapply power to the computer
- 4) Wait for the Red Self-test LED turn off
- 5) Put switch 1 of the BMX-2 back in the UP position.

TABLE 2.1 CONFIGURATOR FACT LIST

Current Configuration Facts:

Emulation..... \_\_\_\_\_  
 Auto Retry..... \_\_\_\_\_  
 Erase Before Retry..... \_\_\_\_\_  
 Read Look-Ahead Enabled. \_\_\_\_\_  
 Data Transfer Method.... \_\_\_\_\_  
 BMC Priority..... \_\_\_\_\_  
 Burst Rate..... \_\_\_\_\_

The drives on this controller are:

| Unit | Drive Type | Var. Gap | Limits | Select Method | Speed | File Search |
|------|------------|----------|--------|---------------|-------|-------------|
| 0    | _____      | _____    | _____  | _____         | _____ | _____       |
| 1    | _____      | _____    | _____  | _____         | _____ | _____       |
| 2    | _____      | _____    | _____  | _____         | _____ | _____       |
| 3    | _____      | _____    | _____  | _____         | _____ | _____       |
| 4    | _____      | _____    | _____  | _____         | _____ | _____       |
| 5    | _____      | _____    | _____  | _____         | _____ | _____       |
| 6    | _____      | _____    | _____  | _____         | _____ | _____       |
| 7    | _____      | _____    | _____  | _____         | _____ | _____       |

You must correctly specify the tape coupler device mnemonic at Sysgen time. The correct mnemonic depends on the emulation for which the Coupler is configured (see Section 4.1.1). The situation is as follows:

|        |  |
|--------|--|
| RDOS   | 6026 RDOS emulation is MTX<br>(Rev. 7.0 or newer)<br>6300/4307 N/A |
| AOS    | 6026 AOS emulation is MTB<br>6300/4307 N/A                         |
| AOS/VS | 6026 AOS emulation is MTB<br>6300/4307 emulation is MTD            |



### 3.0 TEST PROGRAMS, TROUBLESHOOTING, AND CUSTOMER SERVICE

ZETACO products are supported in many ways:

- Microprocessor based Self-test of over 75% of the coupler each time it is powered up, with LED status reporting.
- Diagnostic and Reliability programs on 9-track tape for use during installation and troubleshooting.
- 48-hour turnaround on most factory repairs or replacements.
- Customer Support Hotline, manned from 8:00 a.m. to 5:00 p.m. (Central Time) to answer questions. Call 612-941-9480.
- Factory-trained personnel in our Authorized Distributor and Authorized Service Organizations.
- Two year warranty on all couplers in the event of hardware chip failures or manufacturing defect.

#### 3.1 SELF-TEST

Self-test runs through the major internal functions of the BMX-2 coupler once every time power is applied to the board. The test takes approximately 14 seconds to complete. The Coupler will appear not ready to the system until Self-test successfully completes.

If Self-test passed, the red LED will go off. If a failure was detected, the LED will blink a number of times representing the failing test (see table 3.1). The LED will then pause and then repeat the code. This sequence will continue until either power is removed or the I/O reset switch of the CPU is depressed.

Depressing the I/O reset switch causes the failing test to be looped on and the red LED to be illuminated constantly. This looping feature is used only for fault analysis by ZETACO's technicians.

When a fault code occurs indicate the failing code as the symptom to be attached with the coupler board upon return to your Authorized Distributor or to ZETACO for repair.

TABLE 3.1 SELF-TEST-ERROR CODES

| CODE | TEST                     | POSSIBLE PROBLEM   |
|------|--------------------------|--|
| 1    | Microprocessor RAM Test  | Read data did not compare with what was written. (6810 RAM)  |
| 2    | Done/Busy Test           | DONE did not set or BUSY/DONE were not cleared on power up.  |
| 3    | Word Count Overflow Test | Word count overflow flip-flop did not set when expected.   |
| 4    | FIFO Buffer Test         | The READ data did not compare with what was written.(2114's)   |
| 5    | Address Turnover Test    | Address turnover flip-flop did not set when expected. (Should set after 1024 references).              |
| 6    | Illegal Flag Test        | Illegal status bit did not set or it was not detected as being set (ISTAT).                            |
| 7    | Data Late Test           | Data late flip-flop was set on power on or it did not set after one more reference with a full buffer. |
| 8    | EEPROM Check Sum         | Check sum calculation did not agree with the data in EEPROM (replace EEPROM).                          |

3.2 BMX-2 MAINTENANCE SOFTWARE

3.2.1 BMX-2 DIAGNOSTIC

The tape coupler Diagnostic program is provided to find failures that are related to the basic operations of tape control. The diagnostic assumes the magnetic tape media is not the cause of errors. You should use a good scratch tape for the testing. In the interest of saving time during the EOT portion of Diagnostics, it is a good idea to use a small tape reel.

A. Boot the Diagnostics program (File 3) from tape 400-387-00 or disk. You should see the following:

- BMX2D - Release N.NN
- Dual Mode Tape Coupler Diagnostics
- Product of ZETACO
  
- Please mount a write-enabled error free scratch tape.
- Only the drive you are testing can be on-line.
- Set switches to desired value, then press RETURN to proceed.

If you have a printer at device code 17, we recommend that you type at your console "5" to set a switch for logging to a character printer or "G" for DMA printer hard copy. Other switches should be set as they fit your needs. You can set/reset any switch while the program is running. Type "M" to display current switch settings.

B. After you have set the switches you will be asked if you want help:

- Do you want help (Y/[N]) ?

C. If you respond Y, there is a self-explanatory HELP menu:

- HELP TOPICS
  
- S - Switches
- B - DIA Status Bits
- C - 6300/4307 DIC Status bits
- D - 6026 DIC Status bits
- T - Tests
  
- Select HELP topic:

We recommend that you read HELP. In particular, Switches, as you may want to set additional switches while diagnostics is running.

D. After you are finished reading HELP, respond RETURN to

- Select HELP topic:

Program will next display:

- Enter device code[22]:

E. Enter the device code of the BMX-2 Coupler  
Then the program will display:

- Enter drive unit number:

You should enter the unit number of the drive  
being tested.

F. After you have entered the unit number, the  
program will read the coupler/drive parameters  
from the EEPROM and display them. As an example:

- Reading parameters from coupler:

- Emulation = 6026 AOS
- Transfer = Data Channel
- Dual Mode drive

- Do you want to override the coupler  
- values(Y/[N]) ?

You will almost always respond N. If any values are incorrect the coupler should be reconfigured correctly. If the EEPROM cannot be read, you may have entered an incorrect device code. At this point you should return to Step E. (Results of reading other couplers are unpredictable.)

- G. If the drive you are testing is not a Dual Mode drive, program displays:

- Tape drive will be tested as 1600 BPI.

If the drive you are testing is a Dual Mode drive, program will ask you to select starting density:

- Start with 1600 BPI density ? (Y/N)

Respond with either Y or N and tests will begin. On a Dual Mode drive, all tests will be performed at the starting density and then all except some initial tests will be performed at the other density. This cycle of both densities is considered a PASS.

- H. As each test is executed it is proceeded by a brief description. When a pass has completed, the word END, proceeded by pass # will display. When errors occur, a brief explanation will display and the program will loop on the error. To proceed beyond the error, set switch 1 on. CTRL R will allow you to restart the program.

### 3.2.2 TAPE COUPLER RELIABILITY

The tape Reliability program is a maintenance program designed to exercise and test the tape subsystem. It will find intermittent and pattern sensitive problems. You can test up to 8 units at one time. You should always let it run for at least 15 minutes. If you suspect a problem in the tape subsystem, it should be run continuously overnight. (at least 8 hrs.)

A. Load the program (File 4) from 400-387-00 tape or disk.

Program displays:

- ZMTRL - Release N.NN
- Mag Tape Reliability
- Product of ZETACO
  
- Please mount a write-enabled scratch tape on each drive to be tested.
- Set switches to desired value, then press return to proceed.

If you have a printer at device code 17, we recommend that you set switch 5 for character printer or G for DMA printer hard copy. Other switches should be set as they fit your needs. You can set/reset any switch while the program is running. Pressing "M" while the program is running will cause the display of the current switch settings.

B. After you have set the switches you will be asked if you want help:

- Do you want help (YES/NO) ?

If you want HELP, respond with YES (CR), and then select one of the 5 topics:

- A) Starting Addresses
- B) Switch register/console control
- C) Data patterns
- D) Command String
- E) Miscellaneous

HELP will be available only at start up. After you have finished with HELP, you must specify the address at which you want to start:

- Start address (octal) =

If you do not want to read the HELP files, respond with NO and the program will automatically start running all tests. (starting address = 200)

C. Next you should specify if you want to test to end of tape.

- Test to end of tape (EOT)? (YES/NO)

D. Next, if you have an MV class machine, you will be asked to specify the number of the IOC your tape controller is attached to.

- Enter number of IOC to exercise tape controllers.

E. Next you must specify the Coupler device code(s) and for each device code which unit(s) you want tested:

- Enter Device code(s) (up to 8. octal numbers) -

- Device select - nn

- Enter unit(s) to be tested (EX. 0,2,3):

F. Next you should specify the coupler type:

- Controller emulations:

- 1 = 6021 (N/A)

- 2 = 6125 (N/A)

- 3 = 6026 AOS

- 4 = 6026 RDOS

- 5 = 6300/4307

Note: This program contains emulation support for all of ZETACO's tape couplers. The valid choices for the BMX-2 are 3, 4, and 5.

- Select emulation:

You will specify the emulation for which your BMX2 coupler is set.

G. For each unit, you should then select the density:

- Which density to test: PE, NON-PE(NON), BOTH ?

- Unit: n

- H. You can specify a maximum number of errors:
- Enter errors per unit to halt testing [65536.]:
- For the test history report, you can enter the starting time of the program:
- Start time ? (Mon,Day,Year Hr,Min)
- I. The last question allows for maps to be enabled, if the system has maps.
- Are maps to be exercised (YES/NO) ?
- If you respond YES, the result will be displayed:
- MMPU1 Total of 1K's = nnn
- J. As the testing begins for each device code you will see:
- Testing
  - NOTE: For test statistics, press W at ANY time.
  - Device select - nn Units: m

### 3.3 SYSTEM ERROR REPORTING

Below is a list of some common errors that could be reported to the host computer by the coupler. Included with a description of the error is a possible 'cause' of the error and 'action' if any should be taken.

#### 3.3.1 RUNAWAY TAPE

Meaning - The tape being read is blank or incorrectly formatted.

Action - Check the density setting of the drive. Check the tape. Make sure the Tape Coupler is configured properly for your drive.



### 3.3.2 BEGINNING OF TAPE

Meaning - The beginning of tape marker was encountered on a space back operation.

Cause - The user issued a backspace command with the tape positioned at the beginning of the tape or the backspace reached the beginning of the tape before the space count reached zero.

Action - Try a new tape. Check that the correct type of tape is installed. Check the density switch (if any) on the drive.

### 3.3.3 END OF TAPE

Meaning - The end of tape marker was encountered on a read, write, WEOF, or forward space command.

Cause - Same

Action - Mount the next reel of tape.

### 3.3.4 OFF-LINE

Meaning - The tape drive is off-line.

Cause - The user has not loaded a tape on the tape drive or has failed to place it on-line. The cables may be incorrectly connected. The unit is daisy-chained and the power is not applied to one of the chained units.

Action - Load a tape and place unit on-line, connect cables correctly or apply power to all units.

### 3.3.5 WRITE LOCK

Meaning - A write, WEOF, or erase type operation was attempted when the tape reel's write ring was missing.

Cause - Same

Action - Install the reel's write ring.

### 3.3.6 PARITY OR DATA ERROR

Meaning - Without retrying on the coupler enabled, the tape unit encountered a condition that requires the system to retry the operation. If retrying is enabled on the coupler and this error is received it means that the operation was retried eight times and the coupler was unable to recover. This system must then try to recover.

Cause - a) The tape is bad or b) the tape requires maintenance or cleaning.

Action - Try a new tape or service the tape drive.

### 3.3.7 CHECK ERROR

Meaning - If received without a Data Error in the DIA register a data related error occurred but the coupler recovered from it by doing a retry. If it received along with a Data Error in the DIA register an error was encountered and was unrecoverable by the coupler.

Cause - a) The data on the interface cables has been altered, b) the tape is bad or c) the tape unit requires service.

Action - Check that the cables are not too long and are intact, try a new tape or service the tape unit by possibly cleaning the heads.

### 3.3.8 DATA LATE

Meaning - Data was not transferred successfully because of high activity on the Data Channel or BMC.

Cause - Too much tape, disk, and/or memory activity.

Action - Retry the operation, reduce the amount of activity on the Data Channel or BMC.

### 3.3.9 TAPE DENSITY MISMATCH

Meaning - 1) The format of the tape being read does not match the density specified in the CLI command, 2) the tape unit does not have remote density select enabled or 3) the density specified in the CLI command is not allowed because the tape drive being used has a density select method of "manual" or "fixed".

Cause - Same

Action - 1) Specify another density in the CLI command, 2) set the tape drive for remote density select (refer to section 2.7.3) or 3) the tape drive being used is of the "manual" or "fixed" variety and in that case a density switch of 1600 should always be used. For more information refer to section 4.2.4.

### 3.4 CUSTOMER SUPPORT HOTLINE

ZETACO, Inc. provides a Customer Support Hotline 1-612-890-5135 to answer technical questions and to assist with installation and troubleshooting problems.

The Hotline is manned by a technical team from 8:00 a.m. to 5:00 p.m. (Central Time) Monday through Friday.

### 3.5 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 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 damages arising out of or in connection with the use or performance of ZETACO's products.

### 3.6 PRODUCT RETURN AUTHORIZATION

When coupler malfunction has been confirmed using the tests outlined above 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 Returned Material Authorization (RMA) number is required before shipment and should be referenced on all packaging and correspondence.

Each product to be returned requires a separate RMA number. To insure fastest response, the information outlined in the Material Return Information form on the following page should be gathered before calling the ZETACO Hotline or the ZETACO Distributor from whom you bought the unit for the RMA number. Please include a completed copy of the Material Return Information form with the product.

To safeguard the coupler during shipment, please use 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 coupler should be made before returning the coupler to ZETACO for repair. This will: 1) Determine if in fact the board is defective. 2) Increase the speed and accuracy of a product's repair which is often dependent upon a complete understanding of the user checkout test results, problem characteristics, and the user system configuration. Test results for the BMX-2 should be obtained by performing the tests below. (Use back of sheet if more space is needed.)

| TEST                                 | RESULTS |
|--------------------------------------|---------|
| 1. Power-up self-test                | _____   |
| 2. Dual Mode Tape Coupler Diagnostic | _____   |
| 2. Zetaco Mag Tape Reliability       | _____   |

Other tests performed:

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

1. Does the problem appear to be intermittent or heat sensitive? (If yes, explain).
2. What operating system are you running under? (AOS, AOS/VS, RDOS, DDOS, DTOS).
3. Describe the system configuration (i.e. peripherals, I/O controllers, model of computer, etc.).
4. Has the coupler been returned before?  
Same problem?

To be filled out by CUSTOMER:

Model #: \_\_\_\_\_  
 Serial #: \_\_\_\_\_  
 RMA #: \_\_\_\_\_ (Call ZETACO for RMA number)

Returned by:

Your name: \_\_\_\_\_  
 Firm: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Phone: \_\_\_\_\_



## 4.0 FEATURE USAGE GUIDELINES

This section provides information to allow the user to best utilize the advanced features offered by the BMX-2 tape coupler. All of these features are selectable via the Configurator. See section 2.10 for usage of the Configurator Program.

### 4.1 COUPLER FEATURES

#### 4.1.1 EMULATION

The BMX-2 emulates the following:

##### EMULATION

| OPERATING SYSTEM  | 6300/4307 | 6026/AOS  | 6026/RDOS |
|-------------------|-----------|-----------|-----------|
| AOS/VS            | Yes (BMC) | Yes (DCH) | No        |
| AOS               | No        | Yes (DCH) | No        |
| RDOS (rev. 7.0 +) | No        | No        | Yes       |
| RDOS (below 7.0)  | No        | No        | No        |

#### 4.1.2 DATA TRANSFER MODE

When running as a 6026 subsystem, only DCH is supported. As a 6300/4307 subsystem, the BMX-2 is configured for BMC.

#### 4.1.3 BMC BUS PRIORITY

The BMX-2 has the capability of co-existing with up to seven other BMC controllers. However, some DG computers, such as the MV/4000, only support up to four BMC devices. In this case you must only select Priority 0-3. The lower the priority number the lower the priority level. If there is more than one BMC device, be sure you select a priority level that is different than the other BMC device/s.

#### 4.1.4 BURST RATE

Burst Rate is defined as the number of word transfers that take place on the BMC on a single BMC request. Burst Rate does not apply on the DCH.

Burst Rate adjustment is dependent on the type of system configuration in which the controller is installed. Too low a Burst Rate could cause data lates on the BMX-2, and too high a setting could cause data lates on another BMC device. The BMX-2 supports Burst Rates from 1 to 256 words, selectable by the user.

If running with a BMC disk controller it is recommended that the choice of Burst Rate for the BMX-2 be of some value less than the configured Burst Rate on the disk controller.

#### 4.1.5 AUTOMATIC RE-TRY

Upon encountering an error during a READ or WRITE command, the BMX-2 will attempt to recover the error by re-trying up to eight times on its own and then reporting the final status in the (DIA) and the (DIC) status words. If the error was soft or recoverable, an error bit will be seen in the DIC word but not in the DIA. If it was unrecoverable, an error status will be seen in both DIC and DIA.

ZETACO has added the automatic re-try feature to the BMX-2 in the 6300/4307 and 6026 RDOS configuration. This feature can be enabled or disabled via the Configurator.

The 6026 AOS mode implements automatic re-tries via the SET CONTROL MODE. Refer to Section 5.2.8 for additional comments.



#### 4.1.6 READ/LOOK-AHEAD

Read/Look-Ahead is a feature that helps avoid drive re-positioning during multiple record reads on basic streamer type drives. When running basic streamer drives such as Cipher F880 and CDC 92185 (Read/Look-Ahead enabled) and your re-instruct times are not met, the system will run inefficiently. When re-instruct times are not met disable Read/Look-Ahead. It is recommended that Read/Look-Ahead be disabled when running less efficient utilities such as Load/Dump with the coupler configured for 6026 AOS (MTB) driver. Insure Read/Look-Ahead is disabled on any tension arm or vacuum column drive.

#### 4.2 DRIVE TYPES

The BMX-2 is capable of running with virtually any tape drive that meets the (Perfec) industry-standard specifications. However, it should be noted that if a single density drive is used and the user selects a density other than what the drive actually is, an error message will result.

Drive dependent features:

##### 4.2.1 VARIABLE GAP

During a WRITE, reinstruct times can be extended by using a variable erase command that extends interrecord gaps. This increases maximum times needed for command reinstruct, thereby decreasing the number of repositions that the streaming tape unit has to make. This is a user-selectable time limit set in the Configurator.

##### 4.2.2 HIGH SPEED SELECT

The BMX-2 can select the high and low speed of a dual speed drive. This feature is user-selectable at configuration time.

##### 4.2.3 AUTOMATIC HIGH SPEED FILE SEARCH

This feature enables the coupler, after spacing forward or reverse 15 records, to automatically switch the selected unit into high speed and finish the spacing operation. This significantly shortens file search time that requires the movement of large amounts of tape. The use of this feature is limited to dual speed drives only.

#### 4.2.4 REMOTE DENSITY SELECT

Remote density select is a feature utilized by both 6026 AOS and 6300/4307 emulations. This feature enables the user to select tape density from the users console with operating system commands (CLI commands). If your drive (chosen through the Configurator) incorporates a "Remote" density select method, then its available density choices can be selected via CLI commands. Make sure the switches are set correctly on the tape drive (refer to Section 2.7.3).

Each emulation allows a choice between two specific densities. In 4307, they are PE and GCR; in 6026, PE and NRZ. However, since we allow drives with different density combinations to run under both emulations, a density specified in the CLI commands may actually select a different density at the drive. Consider the following example:

```
Chosen drive type = C1 - CDC 92185 "Remote"  
Available densities = 1600 and 6250
```

\*\* As a 6026 subsystem:

```
DUMP/V/DEN=800 @MTB0:0 >>> selects 6250  
DUMP/V/DEN=1600 @MTB0:0 >>> selects 1600
```

\*\* As a 6300/4307 subsystem:

```
DUMP/V/DEN=1600 @MTD0:0 >>> selects 1600  
DUMP/V/DEN=6250 @MTD0:0 >>> selects 6250
```

In general, specifying "1600" in the command selects 1600 at the drive, while specifying the other density in the emulation selects the other density available at the drive.

Note that the Kennedy 9400 has three available densities, presented in the Configurator paired in three different ways. These pairings are determined at the drive by DIP switch settings. Choices K3 and K4 follow the above guideline, but K5 is different, as shown below:

Drive type = K5 - Kennedy 9400  
Available densities = 800 and 6250

\*\*\* As a 6026 subsystem:

DUMP/V/DEN=800 @MTB0:0 >>> selects 800  
DUMP/V/DEN=1600 @MTB0:0 >>> selects 6250

\*\*\* As a 6300/4307 subsystem:

DUMP/V/DEN=1600 @MTD0:0 >>> selects 6250  
DUMP/V/DEN=6250 @MTD0:0 >>> selects 800

NOTE: If a "manual" or "Fixed" select type drive is chosen from the Configurator, the density switch used in the CLI Command should always be "DEN=1600" regardless of the manually selected or fixed density of the drive. This also applies for 6300/4307 emulation.



5.0 PROGRAMMING NOTES

The section describes protocol needed to communicate with the BMX-2. Unless the user desires to write his/her own controlling driver, this section is provided for reference only, as the controlling driver is already provided through the choice of "MTB", "MTD" or "MTX".

NOTE: For the choice of driver type refer to Sysgen Considerations in Section 2.11.

5.1 6026 PROGRAM CONTROL

5.1.1 INSTRUCTION FORMAT

Symbolic Form for I/O Instructions

DXXF AC,MTA

DXX = DOA, DOB, DOC, DIA, DIB, DIC

F = FUNCTION:

C (CLEAR) - Clear all error flags (except EOT/BOT) and DONE and BUSY flip-flops. If by some chance the system issues a clear pulse during the command operation, the Coupler will abort the command and DONE will not set.

S (START) - Clears all errors except illegal, set BUSY and clear DONE. Command that was issued by a DOA will be executed.

P (PULSE) - Reserved

AC = ACCUMULATOR: 0, 1, 2 OR 3

MTA = DEVICE CODE: PRIMARY - 22 OCTAL  
SECONDARY - 62 OCTAL

BINARY REPRESENTATION

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |         |      |                   |
|---|---|---|----|---------|------|-------------------|
| 0 | 1 | 1 | AC | OP CODE | FUNC | DEVICE CODE (MTA) |
|---|---|---|----|---------|------|-------------------|

INTERRUPT MASK BIT = 10

5.1.2 SKIP INSTRUCTIONS

Used to poll the state of the Coupler (command is DONE or BUSY). If the skip condition is met the next instruction is skipped, or else the next instruction is executed.

- SKPBZ MTA - SKIP IF BUSY FLIP-FLOP IS CLEAR.
- SKPBN MTA - SKIP IF BUSY FLIP-FLOP IS SET.
- SKPDZ MTA - SKIP IF DONE FLIP-FLOP IS CLEAR.
- SKPDN MTA - SKIP IF DONE FLIP-FLOP IS SET.

5.1.3 DOA = SEND COMMAND

DOAF AC,MTA

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |   |   |   |   |             |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|
| 0 | 1 | 1 | AC | 0 | 1 | 0 | F | DEVICE CODE |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|

AC

0 1 2 3 4 5 6 7 8 9

|                        |             |                   |                  |                   |                |         |
|------------------------|-------------|-------------------|------------------|-------------------|----------------|---------|
| CLEAR<br>STATUS<br>INT | NOT<br>USED | ENABLE<br>POLLING | DISABLE<br>ERASE | DENSITY<br>SELECT | EXT<br>COMMAND | IGNORED |
|------------------------|-------------|-------------------|------------------|-------------------|----------------|---------|

10 11 12 13 14 15

|                |                   |
|----------------|-------------------|
| COMMAND (0-10) | UNIT SELECT (0-7) |
|----------------|-------------------|

- 0 - READ
  - 1 - REWIND
  - 2 - SET CONTROL MODE
  - 3 - SPACE FORWARD
  - 4 - SPACE REVERSE
  - 5 - WRITE
  - 6 - WRITE END OF FILE
  - 7 - ERASE
  - 8 - READ NON-STOP
  - 9 - NOT USED
  - 10 - SET DRIVE MODE (ENCODING)
- UNIT SELECT: USED TO  
SELECT ONE OF A POSSIBLE  
EIGHT TAPE DRIVES

The command and unit select will default to READ and Unit zero after a clear pulse or IORESET.

The Coupler addresses up to 8 tape drives but only one command can be done at a time with the exception of rewind.

- CLEAR STATUS (BIT 0)  
INTERRUPT
- Used to clear a status check interrupt flag. (Condition described in BIT 5 description)
- RESERVED (BIT 1-4)
- Must be all zeros.
- (BIT 5)  
1) ENABLE POLLING  
2) NOT USED  
COMMAND DEPENDENT
- When 1, enables the Coupler to request a program interrupt if any of the drive's statuses change. When this interrupt occurs, BIT 12 in the DIA status word will be set and BITS 5-7 in the DIC status word will reflect the unit number of the drive in which the status has changed. To clear this condition issue a DOA with BIT 0 as a "0". This bit is only used in the SET CONTROL MODE command. Must be 0 in all other commands.
- (BIT 6)  
1) ERASE ON RETRY  
2) NOT USED  
COMMAND DEPENDENT
- When 0, the Coupler issues an erase before it automatically retries a WRITE failure. This bit is effective only when issuing the SET CONTROL MODE command. Must be 0 in all other commands.
- (BIT 7)  
1) DISABLE AUTO RETRY  
2) DRIVE MODE  
3) NOT USED  
COMMAND DEPENDENT
- When using the SET CONTROL MODE command a 0 enables automatic retries (up to seven times) of any read or WRITE operation that fails.
- When using the SET DRIVE MODE command, a 1 sets the currently selected drive to the PE encoding format. 0 selects NRZI or GCR, depending on the type of drive you are using. In all other commands this bit must be 0.
- EXT COMMAND BIT (BIT 8)
- Most significant bit of the command code.
- NOT USED (BIT 9)
- IGNORED

5.1.4 DOB = LOAD STARTING MEMORY ADDRESS

DOBF AC, MTA

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |   |   |   |   |             |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|
| 0 | 1 | 1 | AC | 1 | 0 | 0 | F | DEVICE CODE |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|

AC

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| CONTENTS OF SELECTED ACCUMULATOR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

The contents of Selected Accumulator will be loaded into the Coupler's address counter and becomes the starting address for the next command that requires the DCH (READ or WRITE).

5.1.5 DOC = LOAD WORD COUNT

DOCF AC, MTA

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |   |   |   |   |             |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|
| 0 | 1 | 1 | AC | 1 | 1 | 0 | F | DEVICE CODE |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|

AC

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|             |                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| SEE<br>NOTE | CONTENTS OF SELECTED ACCUMULATOR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

Program must place two's complement of desired word count into Selected Accumulator before this instruction is executed.

NOTE: Because logical address space is 32,768 words, only 15 bits of word count are needed. However, it is quite possible for a large tape to contain more than 32,768 records. This bit can then be written to a 0 to extend the number of records spaced forward or backward. Otherwise this bit should be written to a 1.

Spacing Forward/Reverse - Place two's complement of the maximum number of records to be spaced.



5.1.6 DIA = READ STATUS WORD ONE

DIAF AC,MTA

|   |   |   |    |   |   |   |   |             |   |    |    |    |    |    |    |
|---|---|---|----|---|---|---|---|-------------|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3  | 4 | 5 | 6 | 7 | 8           | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 1 | 1 | AC | 0 | 0 | 1 | F | DEVICE CODE |   |    |    |    |    |    |    |

AC

|               |              |                |              |                  |               |                 |               |
|---------------|--------------|----------------|--------------|------------------|---------------|-----------------|---------------|
| 0             | 1            | 2              | 3            | 4                | 5             | 6               | 7             |
| ERROR<br>FLAG | DATA<br>LATE | RE-<br>WINDING | IL-<br>LEGAL | HIGH<br>DENSITY  | DATA<br>ERROR | END OF<br>TAPE  | FILE<br>MARK  |
| 8             | 9            | 10             | 11           | 12               | 13            | 14              | 15            |
| LOAD<br>POINT | 9 TRK        | BAD<br>TAPE    | RES          | STATUS<br>CHANGE | WRITE<br>LOCK | ODD<br>REC READ | UNIT<br>READY |

STATUS BITS:

- 0 ERROR FLAG - A condition was detected by the Coupler that may require attention. If BIT 1, 3, 5, 6, 7, 8, 10 or 14 are a one, the error flag will be set to a one.
- 1 DATA LATE - DCH requests were not honored in time to keep up with device, resulting in one or more lost data words. This condition will not occur until the FIFO buffer overflows.
- 2 REWINDING - Selected unit is rewinding.
- 3 ILLEGAL - A start function is asserted under one of the following cases:
  - 1) WRITE protect is on (no write ring installed and the command that was issued prior to the start was a WRITE, ERASE, or WRITE FILE MARK:
  - 2) SPACE REVERSE command was issued and unit is at load point.
  - 3) Unit is not ready.

NOTE:

No tape motion will take place and DONE will set. Only clear function or IORESET will clear illegal.

- |    |            |   |
|----|------------|---|
| 4  | DENSITY    | - Always a one for 6026 or 6300/4307 emulations.  |
| 5  | DATA ERROR | - One of two conditions possibly occurred: even vertical parity was detected by the Coupler or a corrected error occurred during a WRITE command. This status bit will be set only if the condition was uncorrectable by the Coupler.   |
| 6  | END OF     | - The selected unit is at or beyond the EOT mark. A SPACE REVERSE or REWIND command will clear this bit.  |
| 7  | FILE MARK  | - Will be set to a one when the unit detects the presence of a file mark during a WRITE FILE MARK command (READ AFTER WRITE) or when a READ or SPACING command passes over a previously written file mark.  |
| 8  | LOAD POINT | - Selected unit senses a load point marker (BOT).   |
| 9  | 9 TRACK    | - Always a one.   |
| 10 | BAD TAPE   | - Set to a one bit by the occurrence of any of the following conditions:<br><ol style="list-style-type: none"><li>1) PE only, did not detect an ID burst when reading from load point.</li><li>2) PE only, tape was in a runaway condition (reading an erased tape).</li><li>3) PE only, multi-track dropout.</li><li>4) PE only, uncorrectable parity error.</li><li>5) PE only, non-zero character in postamble.</li><li>6) Excessive skew.</li><li>7) PE only, loss of data envelope prior to postamble detection.</li></ol> |

- 8) Vertical parity on cable in error.
- 9) NRZ only, vertical parity error on data character.
- 10) NRZ only, longitudinal parity error.
- 11) NRZ only, CRCC parity error.
- 12) NRZ only, improper record format.
- 13) NRZ only, CRC error.

\*\*\*\*\*  
 \* SYSTEM RE-TRIES MAY CORRECT THE ABOVE PROBLEMS \*  
 \* IF AUTO RE-TRY IS NOT ENABLED ON THE CONTROLLER \*  
 \*\*\*\*\*

- 11 RESERVED - Always 0.
- 12 STATUS CHANGE - This condition will only occur if POLLING has been enabled and a drive's status has changed to something other than what it was when polling was enabled. A system interrupt would have also been requested by the Coupler.
- 13 WRITE - A write ring was not installed on the PROTECT tape reel.
- 14 ODD RECORD - An odd number of characters were read READ within the record.
- 15 READY - The selected tape unit is ready. All of these conditions must be satisfied before this bit is a one:
  - 1) Unit is online.
  - 2) Not rewinding.
  - 3) Coupler is not busy.
  - 4) Ready line from unit must be received.
  - 5) Self-test is done.

5.1.7 DIB = READ CURRENT ADDRESS

DIBF AC,MTA

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |   |   |   |   |  |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|--|--|--|--|--|--|--|--|
| 0 | 1 | 1 | AC | 0 | 1 | 1 | F |  |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|--|--|--|--|--|--|--|--|

AC

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| CURRENT CONTENTS OF THE ADDRESS COUNTER |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

The Selected Accumulator will contain the current contents of the address counter after the execution of this instruction.

READ WRITE RECORD

- Contains the memory address to where the next data word transfer will take place. The memory address counter is incremented by one after each DCH transfer.

SPACING FORWARD/REVERSE

- The address counter becomes a record counter on a SPACE FORWARD or REVERSE command. The difference between the contents of the counter before and after the SPACE command will indicate the number of records spaced over.

5.1.8 DIC - READ STATUS WORD TWO

NOTE: DIC Status word is ignored in 6026 RDOS mode.

DICF AC, MTA

|   |   |   |    |   |   |   |   |   |   |    |    |    |    |    |    |
|---|---|---|----|---|---|---|---|---|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3  | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 1 | 1 | AC |   | 1 | 0 | 1 | F |   |    |    |    |    |    |    |

|                |                          |    |    |                      |                            |              |            |    |   |    |  |  |  |  |  |
|----------------|--------------------------|----|----|----------------------|----------------------------|--------------|------------|----|---|----|--|--|--|--|--|
| AC             |                          |    |    |                      |                            |              |            |    |   |    |  |  |  |  |  |
| 0              | 1                        | 2  | 3  | 4                    | 5                          | 6            | 7          | 8  | 9 | 10 |  |  |  |  |  |
| ERROR          | RUNAWAY<br>TAPE          | NU | NU | CORR<br>DATA<br>LATE | RETRY COUNT<br>DRY CHANGED | WCNT<br>OVFL | BAD<br>SIG | NU |   |    |  |  |  |  |  |
| 11             | 12                       | 13 | 14 | 15                   |                            |              |            |    |   |    |  |  |  |  |  |
| CHECK<br>ERROR | SINGLE<br>TRACK<br>ERROR | NU | NU | PE<br>MODE           |                            |              |            |    |   |    |  |  |  |  |  |

ERROR (BIT 0) - Set if any of the following status bits are also set:

- 1) RUNAWAY TAPE
- 4) CORRECTED DATA LATE
- 9) BAD SIGNAL
- 11) CHECK ERROR
- 12) SINGLE TRACK FAIL

RUNAWAY TAPE (BIT 1) - When spacing, reading or writing and no interrecord gap has been detected in 4 seconds from the time data busy was detected.

(BIT 2 & 3) - Always 0.

CORRECTED DATA LATE (BIT 4) - A data late has occurred and was corrected by the Coupler during an automatic re-try.

- RETRY COUNT OR DRIVE CHANGED (BITS 5-7) - If, in the status check, mode reflects the drive number whose status has changed. If not in this mode, it reflects the number of re-tries the coupler took to recover on a READ or WRITE failure. (If automatic re-try is enabled).
- WORD COUNT OVERFLOW (BIT 8) - Record length has exceeded the word count.
- BAD SIGNAL (BIT 9) - If in PE mode, it indicates a multiple track failure. If in NRZI or GCR mode, it indicates signal written below threshold level.
- (BIT 10) - Always 0.
- CHECK ERROR (BIT 11) - Indicates that the Coupler detected either a vertical parity, LRC or a CRC error.
- SINGLE TRACK ERROR (BIT 12) - Correctable single track failure was detected and correction was attempted. (PE only)
- FORMAT ERROR (BIT 14) - Selected tape density is different than that of the mounted tape.
- PE MODE (BIT 15) - Selected drive is in the PE mode.

NOTE: When the drive is in the status check mode, the status read in this word is invalid, except after a status interrupt has been requested by the Coupler.

## 5.2      6026 COMMAND DESCRIPTIONS

### 5.2.1      READ

DOA Command is read and a start pulse was issued.

Start sets BUSY, Coupler then sends a READ FORWARD command to the tape unit. Tape unit will ramp up to speed and transfer data to the Coupler when it reaches the data field. Every two bytes sent by the unit will be transferred to the host's memory as one complete word. After the transfer, the address and word counter will increase by one. Tape motion will continue until a record GAP is reached (unless on the fly is achieved). Word transfer to the CPU continues until the word count limit is met or the last word of the record is sent via the DCH or the BMC.

If the record is a file mark, tape motion will cease and no data transfers on the DCH will take place.

DONE will set when the command is finished or an error has occurred.

#### Possible Errors:

- 1) Selected unit is not ready (rewinding, off line coupler busy or drive not in system).
- 2) Hard or corrected error.
- 3) Data Late.

### 5.2.2      WRITE

A WRITE Command is issued by doing a DOA with a Start Pulse.

Busy sets and the Coupler asserts a WRITE FORWARD command to the tape unit. Tape unit ramps up to speed and continues to write bytes of data until the word count limit is reached and the FIFO is empty. DCH or BMC operations are the same as a READ, except their words are read from the CPU's memory instead of written to it. The tape unit will write its format data and inter-record gap and if on the fly is not achieved, tape motion will cease.

DONE will set when the command is finished or an error has occurred.

Possible Errors:

- 1) Same as READ Command.

NOTE: Since a READ or WRITE Command will normally result in BMC or DCH activity, it is imperative that the word counter (DOC) and address counter (DOB) are initialized prior to the start pulse.

5.2.3 WRITE END OF FILE

Start will set busy (illegal and done sets if no write ring) and the tape unit will move forward and write one file mark. DONE sets when the command is completed.

5.2.4 REWIND

Start does not set BUSY, selected tape unit will rewind at high speed. The unit will not be ready until the tape is stopped at the BOT marker. Other units are available for commands while this unit is rewinding. DONE does not set when command is completed.

5.2.5 SPACE FORWARD

When start sets BUSY, forward tape motion starts. When unit reaches a record gap the Coupler then makes the decision whether to continue onto the next record gap or to stop tape motion. It will stop under any of the following conditions: word count overflowed, file mark was detected, or last record spaced contains EOT marker.

The word counter should be loaded with two's complement of the desired number of records to be spaced prior to start pulse. The maximum number of records to be spaced is 64K. DONE will set after command completion and the file mark status bit will be set if a file mark was encountered.

If the drive is a streamer, high speed will be selected automatically after four records, to greatly increase file access time.



### 5.2.6 SPACE REVERSE

Start sets BUSY. If the selected tape unit is at load point, no tape motion will take place. DONE and Illegal will set. If the tape unit is not at a load point, tape motion will continue until the word count overflows, a file mark is encountered, or load point is reached.

The word counter is handled the same way as the SPACE FORWARD command: When the command is completed, DONE will set. If the Coupler is connected to a streaming drive, high speed will be selected automatically after ten records.

### 5.2.7 ERASE

When start sets BUSY and a write ring is on the reel, the tape unit will erase approximately 3.5 inches of tape. The amount of tape erased varies somewhat with different drive manufacturers. (Refer to the drive manual for the actual amount). DONE sets when the command is completed.

### 5.2.8 SET CONTROL MODE

A SET CONTROL MODE command is issued by doing a DOA with a start pulse. BUSY sets and stays set while the Coupler is setting internal parameters according to the data received from the DOA command. The selections available to the user are as follows:

- 1) enable or disable automatic re-try
- 2) enable or disable erase before write re-try when re-trying is enabled
- 3) enable or disable status polling

When the command is complete, DONE will set.

### 5.2.9 SET DRIVE MODE (ENCODING)

This command is issued by sending a DOA command with a start pulse. The BMX-2 will then select the density of the selected tape drive if the mounted tape is at BOT and the unit is ready and on-line. If these conditions are not met, DONE will set, along with the ILLEGAL bit in the DIA status word.

The density choices are PE, (bit 7 of DOA = 1), and NRZI if your drive is a PE, NRZI type, or GCR if drive is PE, GCR. Upon command completion, DONE will set.

#### 5.2.10 READ NON-STOP

This command is identical to the READ command except that when this command is received by the Coupler it is understood that another READ is going to follow within 1MS from the time DONE was set from the previous read. The advantage to this is that the Coupler will know that it can switch to high speed and will be reinstructed fast enough so that it will not have to reposition before starting the next READ and run on the fly at high speed. (Dual speed is specified in the Configurator Program. Refer to Section 2.10).

NOTE: If the 1MS time is not met the drive may have to stop and reposition, consequently running less efficiently than if you were to use the normal READ command.

5.3 6300/4307 PROGRAM CONTROL

5.3.1 INSTRUCTION FORMAT

Although the individual bit definitions may vary from 6026 to 6300/4307, instruction format is identical. For instruction format of 6300/4307 refer to Section 5.1.

5.3.2 DOA = SEND COMMAND

DOAF AC,MTA

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |   |   |   |   |             |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|
| 0 | 1 | 1 | AC | 0 | 1 | 0 | F | DEVICE CODE |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|

AC

0 1 2 3 4 5 6 7 8 9

|          |                            |  |  |  |            |  |        |                 |          |
|----------|----------------------------|--|--|--|------------|--|--------|-----------------|----------|
| NOT USED | EXTENDED MEM BITS BMC ONLY |  |  |  | MAP ENABLE |  | PE/GCR | ALT COMMAND BIT | NOT USED |
|----------|----------------------------|--|--|--|------------|--|--------|-----------------|----------|

10 11 12 13 14 15

|                   |  |  |  |  |  |                   |  |  |  |  |  |
|-------------------|--|--|--|--|--|-------------------|--|--|--|--|--|
| LSB COMMAND (0-7) |  |  |  |  |  | UNIT SELECT (0-7) |  |  |  |  |  |
|-------------------|--|--|--|--|--|-------------------|--|--|--|--|--|

- |                       |                          |
|-----------------------|--------------------------|
| 0 - READ              | UNIT SELECT: USED TO     |
| 1 - REWIND            | SELECT ONE OF A POSSIBLE |
| 2 - RESERVED          | EIGHT TAPE DRIVES        |
| 3 - SPACE FORWARD     |                          |
| 4 - SPACE REVERSE     |                          |
| 5 - WRITE             |                          |
| 6 - WRITE END OF FILE |                          |
| 7 - ERASE             |                          |
| 8 - READ NON-STOP     |                          |

The command and unit select will default to READ and Unit zero after a clear pulse or IORESET.

The Coupler addresses up to 8 tape drives but only one command can be done at a time with the exception of rewind.

- (BIT 0)
- Reserved, must be zero.
- EXTENDED MEMORY BITS  
(BITS 1-5)
- Extended memory address used only when the data transfer method selected is BMC. When BIT 6, MAP ENABLE, is a one these bits are translated from 5 address bits to 9. Which 9 bits they select depends upon the value with which one selected map slot has been loaded. When BIT 6 is a zero, there is no map translation. In this case, the 5 extended bits represent the upper 5 bits of a 21 bit memory address.
- MAP ENABLE (BIT 6)
- When 1, enables mapped memory address translations. Can be used only when running on the BMC and system I/O is mapped.
- PE SELECT (BIT 7)
- When 1, selects the PE recording format on remotely selected tape drives. Effective use of this bit can be achieved after first running the Configurator. Refer to Section 2.10 of this manual.
- ALT COMMAND BIT (BIT 8)
- Most significant bit of the command code.
- NOT USED (BIT 9)
- IGNORED

5.3.3 DOB = LOAD STARTING MEMORY ADDRESS

DOBF AC, MTA

|   |   |   |    |   |   |   |   |             |   |    |    |    |    |    |    |
|---|---|---|----|---|---|---|---|-------------|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3  | 4 | 5 | 6 | 7 | 8           | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 1 | 1 | AC | 1 | 0 | 0 | F | DEVICE CODE |   |    |    |    |    |    |    |

AC

|                   |                                 |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|-------------------|---------------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 0                 | 1                               | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| DCH MAP<br>SELECT | CONTENTS OF SELECTED ACCUMLATOR |   |   |   |   |   |   |   |   |    |    |    |    |    |    |

The contents of Selected Accumulator will be loaded into the address counter of the Coupler. This will become the starting address for the next command that requires the DCH or BMC (READ or WRITE).

When running on the DCH BIT 0 is the map A or B select.

BIT 0 = 0 >>>> Select DCH MAP A  
          = 1 >>>> Select DCH MAP B

When running on the BMC, BIT 0 should be used simply as the next higher address bit from BIT 1.

5.3.4 DOC = LOAD WORD COUNT

DOCF AC,MTA

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |   |   |   |   |             |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|
| 0 | 1 | 1 | AC | 1 | 1 | 0 | F | DEVICE CODE |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|

AC

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|             |                                  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| NOT<br>USED | CONTENTS OF SELECTED ACCUMULATOR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

Program must place two's complement of desired word count into Selected Accumulator before this instruction is executed.

Spacing Forward/Reverse - Place two's complement of the maximum number of records to be spaced.

5.3.5 DIA = READ STATUS WORD ONE

Refer to Section 5.2.4 of this manual for individual bit representations and instruction format, with the exception of BIT 12. BIT 12, in the 6300/4307 DIA status word, is not used and will always be zero.

5.3.6 DIB = READ CURRENT ADDRESS

DIBF AC,MTA

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|   |   |   |    |   |   |   |   |             |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|
| 0 | 1 | 1 | AC | 0 | 1 | 1 | F | DEVICE CODE |  |  |  |  |  |  |  |
|---|---|---|----|---|---|---|---|-------------|--|--|--|--|--|--|--|

AC

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

|                 |   |
|-----------------|---|
| SELECTED<br>MAP | CURRENT CONTENTS OF THE ADDRESS COUNTER |
|-----------------|---|

The Selected Accumulator will contain the current contents of the address counter after the execution of this instruction.

In the DCH mode:

BIT 0 = 0 >>>> DCH MAP A selected  
 = 1 >>>> DCH MAP B selected

In the BMC mode:

BIT 0 = given significance of that bit in the memory address

- READ WRITE RECORD - Contains the memory address to where the next data word transfer will take place. The memory address counter is incremented by one after each DCH BMC transfer.
- SPACING FORWARD/REVERSE - The address counter becomes a record counter on a SPACE FORWARD or REVERSE command. The difference between the contents of the counter before and after the space command will indicate the number of records spaced over.

5.3.7 DIC = READ STATUS WORD TWO

DICF AC, MTA

|   |   |   |    |   |   |   |   |             |   |    |    |    |    |    |    |
|---|---|---|----|---|---|---|---|-------------|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3  | 4 | 5 | 6 | 7 | 8           | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 1 | 1 | AC | 1 | 0 | 1 | F | DEVICE CODE |   |    |    |    |    |    |    |

AC

|             |                    |    |     |         |                |          |           |         |    |    |
|-------------|--------------------|----|-----|---------|----------------|----------|-----------|---------|----|----|
| 0           | 1                  | 2  | 3   | 4       | 5              | 6        | 7         | 8       | 9  | 10 |
| ERROR       | RUNAWAY TAPE       | NU | GCR | BMC     | FCU DATA CHECK | NOT USED | WCNT OVFL | BAD SIG | NU |    |
| 11          | 12                 | 13 | 14  | 15      |                |          |           |         |    |    |
| CHECK ERROR | SINGLE TRACK ERROR | NU | NU  | PE MODE |                |          |           |         |    |    |

ERROR (BIT 0)

- Set if any of the following status bits are also set:

- 1) RUNAWAY TAPE
- 5) FCU DATA CHECK
- 9) BAD SIGNAL
- 11) CHECK ERROR
- 12) SINGLE TRACK FAIL

RUNAWAY TAPE (BIT 1)

- When spacing, reading or writing, and no inter-record gap has been detected in 4 seconds.

GCR (BIT 3)

- Always a 1 for a 6300/4307 subsystem controller.

BMC (BIT 4)

- When this bit is a 1 the controller is running on the BMC; if 0, then DCH.



- FCU (BIT 5) - The formatter has detected one or more of the following errors listed below:
- 1) CRC
  - 2) Write tape mark check
  - 3) Uncorrectable error
  - 4) Partial record
  - 5) Multi-track error
  - 6) BOT reached on reverse command
  - 7) No data detected
  - 8) Write overrun
- (BIT 6 & 7) - Reserved, always 0.
- WORD COUNT OVERFLOW (BIT 8) - Record length has exceeded the word count.
- BAD SIGNAL (BIT 9) - If in PE mode, this indicates a multiple track failure. If in NRZI or GCR mode, it indicates signal written below threshold level.
- (BIT 10) - Always 0.
- CHECK ERROR (BIT 11) - Indicates that the Coupler detected either a vertical parity, LRC, or a CRC error.
- SINGLE TRACK ERROR (BIT 12) - Correctable single track failure was detected and correction was attempted. (PE only)
- BIT 13 - Always 0.
- FORMAT ERROR (BIT 14) - Selected tape density is different from that of the mounted tape.
- PE MODE (BIT 15) - Selected drive is in the PE mode.

Refer to Section 5.2 of this manual for command descriptions with these exceptions:

- 1) SET CONTROL MODE is not supported in 6300/4307.
- 2) The drive mode (density) is selected by including the density select bit (BIT 7 of DOA) along with the WRITE command you are trying to execute. (Thus, there is not a SET DRIVE MODE command supported in 6300/4307.)

## APPENDIX A

### A.0 INSTALLING BMX-2 UNDER DG/UX

#### A.1 NOTES

The BMX-2 Tape Coupler provides full emulation integration of start/stop or streaming tape drives with industry standard (Perfec) embedded formatters that employ PE, GCR, NRZI, and other recording formats into Data General MV series minicomputers using DG/UX.

Supports Remote Density Select capability under DG/UX.

Changes to existing DG/UX software are not necessary.

DG/UX 6026 AOS emulation is mtb, 6300/4307 emulation is mtd.

For an overview of the BMX-2, please read Section 1.0 in the BMX-2 Technical Manual.

#### A.2 INSTALLATION

Follow Section 2.0 in the BMX-2 Technical Manual for proper installation and configuration of the Coupler.

For proper system installation and configuration, refer to Data General's DG/UX System Administrator Guide.

#### A.3 TROUBLE-SHOOTING

For error description, diagnostic, and trouble-shooting techniques, read Section 3.0 of the BMX-2 Technical Manual.

Below are some common error codes that could be reported by the host computer when using volcopy, tar, or cpio:

##### **volcopy**

\* Error Code 6, in GCR mode

Meaning: No such device or address. I/O on a special file refers to a sub-device that does not exist, or that extends beyond the limits of the device. It may also occur when a device is not on-line or no disk pack is loaded on a drive.

Cause: A poor quality tape for use at 6250 bpi is being used action.

Solution: Use a higher quality tape at 6250 bpi.

\* Error Code 28

Meaning: No space left on device. During a write to an ordinary file, there is no space left on the device on which to write.

Cause: The length of the reel of tape being used was incorrectly specified.

Solution: Specify a shorter length for the reel of tape or use a longer tape.

cpio

\* Error Code 6, in GCR mode (see volcopy description)

\* Error Code 28 (see volcopy description)

\* Errno: 5, Can't write output  
(NOTE: Errno is the correct display)

\* Errno: 5, Can't read input

Possible Causes: - a data late has occurred  
- an illegal operation has occurred  
- a parity error has occurred  
- a bad tape status has occurred  
- an odd number of characters has been read within the record

tar

\* Tape write error  
Tape read error

Possible Causes: - a data late has occurred  
- an illegal operation has occurred  
- a parity error has occurred  
- a bad tape status has occurred  
- an odd number of characters has been read within the record

A.4 USAGE GUIDELINES

Tape Density Select Considerations: If a manual or fixed density select drive type is chosen from the BMX-2 Configurator, the tape mode density should always be set to medium (1600 bpi), regardless of the manually selected or fixed density of the tape drive. This applies to both 6026 and 6300/4307 emulations.

For further guidelines, refer to Data General's DG/UX System Administrator Guide, /UX Family Administrator Reference Manual, and DG/UX System Operator Guide.

A.5      PROGRAMMING NOTES

Read Section 5.0 of the BMX-2 Technical Manual.

Refer to the /UX Family Programmer Reference Manual.

A.6      RESTRICTIONS

The BMX-2 Software Support Package cannot be loaded onto disk. Support programs must be loaded from tape.



NAME: ZMTRL

DESCRIPTION: DUAL DENSITY MAGNETIC TAPE RELIABILITY  
FOR USE ON CSI TAPE COUPLER'S EMULATING DG'S  
6026 & 6125 & 4307 & 6021

REVISION NUMBER = 1.00

1.00 4/85 INCLUDE 6021 EMULATION AND  
RENAME FROM BMX2R (REV 02)  
ADD DOUBLE WORD SWITCH REGISTER

\*\*\*\*\*

SYSTEM REQUIREMENTS:

NOVA/ECLIPSE FAMILY CPU  
16K READ/WRITE MEMORY  
TELETYPE OR CRT AT DEVICE CODE 10/11  
ZETACO COUPLER BOARD - WITH 1 TO 8 TAPE DRIVES  
FORMATTED TAPE DRIVE  
PRINTER AT DEVICE CODE 17 (OPTIONAL, FOR LOGGING)

SUMMARY:

MAINTENANCE PROGRAM DESIGNED TO TEST AND EXERCISE  
ZETACO TAPE COUPLER AND DRIVES. THE COUPLER CAN BE  
AT ANY DEVICE CODE 20-76 (DEFAULT = 22).

PROGRAM DESCRIPTION/THEORY OF OPERATION

1. THEORY OF OPERATION

A. GENERAL OVERVIEW

MAIN RELIABILITY PROGRAM (SA'S 500,501,502) ARE BASED  
AROUND THE USE OF TWO I/O BLOCKS LOCATED AT PROGRAM  
LOCATIONS APOINT AND BPOINT, AND DESIGNATED AS THE  
A-I/O BLOCK AND THE B-I/O BLOCK. TWO OTHER IMPORTANT  
TERMS FOREGROUND (FG) AND BACKGROUND (BG) ARE DEFINED  
AS FOLLOWS:

BACKGROUND(BG) ALL I/O PROCESSES. FALLING UNDER THIS  
CATEGORY ARE TAPE I/O DRIVES, TAPE  
OPERATION CHECKS (EXCEPT CORE COMPARE  
WITH NO PARITY DETECTION), INTERRUPT  
HANDLERS AND RETURNS, TAPE ERROR HANDLERS,  
AND ALL CONSOLE I/O. AS A RULE, THIS  
CODE IS EXECUTED WITH INTERRUPT OFF, AND  
IS DESIRED TO BE AS QUICK AS POSSIBLE,  
WITH THE EXCEPTION OF ERROR HANDLING AND  
CONSOLE I/O, CONSIDERED TO HAVE A LOW  
FREQUENCY OF OPERATION. THE PROGRAM LOC.  
FGPT POINTS TO THE I/O BLOCK UNDER (FG)  
PROCESS.

BACKGROUND(BG) ALL NON-I/O PROCESS. FALLING UNDER THIS  
CATEGORY ARE TAPE DATA GENERATION, TAPE  
DATA CHECKING (UNLESS PARITY ERROR), TAPE  
TRANSFER DEFINITION AND SETUP. AS A RULE

THIS CODE IS EXECUTED WITH INTERRUPT ON,  
AND CONTAINS THE BULK OF TIME CONSUMING  
CODE. PROGRAM LOCATION BGPT POINTS TO  
THE I/O BLOCK UNDER THE (BG) PROCESS.

IN GENERAL, ROUTINES PROCESSING I/O BLK. VARIABLES, SAVE  
AC2 AND USUALLY REQUIRE AC2 TO POINT TO THE I/O BLOCK  
UNDER PROCESS. SOME CODE IS RE-ENTRANT AND REQUIRES  
THAT AC2 NOT BE USED FOR ANY OTHER PURPOSE(CHECK, SETP).  
ALL SUCH VARIABLES ARE DEFINED AS DISPLACEMENT VALUES TO  
THE START OF THE BLOCK (0-N). THUS IF THE 4TH VARIABLE  
OF THE BLOCK IS DESIRED, AN LDA 0,XX,2 MAY BE USED, IF  
AC2 POINTS TO THE BLOCK START AND XX IS DEFINED AS 4  
(XX=4).

THE FOREGROUND PROCESS CAN BE THOUGHT OF AS THE  
EXECUTION OF I/O TRANSFER (N), WHILE THE  
BACKGROUND CAN BE THOUGHT OF AS THE CHECKING  
(CORE-COMPARE) OF I/O TRANSFER (N-1) AND THE SETUP  
OF TRANSFER (N+1). THE GATE BETWEEN THE TWO  
PROCESSES IS THE EOT FLAG DEFINED AS (XD,2/XD=1).  
WHEN THE FOREGROUND TASK HAS COMPLETED,  
IT SETS ITS FLAG (XD,2) AND DOES A BACKGROUND  
RETURN VIA A CALL IBGEOT. WHEN THE BACKGROUND TASK HAS  
FINISHED, IT WAITS VIA A CALL XFRDN, WHICH MONITERS  
THE FOREGROUND EOT FLAG VIA (@0,2), WHICH POINTS TO THE  
OTHER BLOCK'S XD,2 FLAG.

AFTER THE (BG) HAS DETECTED THE (FG) EOT FLAG, THE  
FLAG IS CLEARED, INTERRUPTS ARE DISABLED, A PSUEDO  
(BG) RETURN IS LOADED TO LOC 0, AND THE (BG) AND (FG)  
I/O BLOCKS ARE SWAPPED VIA THE CALL INTFB. AFTER THE  
NEW (FG) I/O IS INITIATED, THE NEXT (BG) TASK BEGINS.

## B. OPERATING MODES

1 OF 5 DIFFERENT MEMORY/INTERRUPT MODES MAY BE IN USE  
IN THIS PROGRAM AND ARE DESCRIBED AS FOLLOWS:

1-BACKGROUND ONLY, WAIT ON INTERRUPT.  
MAX WORD COUNT = ALL OF AVAILABLE CORE (IE NOT TAKEN  
BY PROGRAM). USED FOR SA'S 503,506

2-BACKGROUND/FOREGROUND MODES, 2 BUFFERS USED FOR  
BOTH READ AND WRITE PURPOSES. MAX WORD COUNT  
= 1/2 OF AVAILABLE CORE. USED  
FOR CONSTANT DATA PATTERNS.

3.-BACKGROUND/FOREGROUND MODES, 4 BUFFERS ( 2 FOR READ  
AND 2 FOR WRITE). MAX WORD COUNT =1/3 OF AVAILABLE  
CORE . USED FOR VARIABLE DATA(EXPECT ADDR).

4. -IF ECLIPSE (MMPU1) OR NOVA-3 MAPS ARE IN THE SYSTEM,  
AND MAPPING IS REQUESTED, ONE OF TWO MAPPING SCHEMES  
WILL BE IN EFFECT.

### 4.1 -VARIABLE DATA

THE 1ST N PHYSICAL 1K BLOCKS CONTAINING THE PROGRAM  
WILL BE MAPPED TO THE 1ST N 1K LOGICAL BLOCKS IN BOTH  
THE A AND B USER MAPS. THIS MAPPING WILL REMAIN  
CONSTANT. A 28. K PHYSICAL BLOCK WITH THE  
START 1K DESIGNATED BY THE PROGRAM VARIABLE MPB?N  
WILL BE ALLOCATED TO THE TAPE I/O BUFFER AS FOLLOWS:



WRITES AND END OF FILE MARK FOLLOWED BY  
FOUR HUNDRED RECORDS AND TWO END OF FILE MARKS.  
THIS IS FOLLOWED BY A REWIND AND A  
SEQUENTIAL READ OF THE WRITTEN TAPE.

\*\*NOTE - IF THE DRIVE IS DUAL MODE, READ NON-STOP  
WILL BE USED DURING THE TAPE READ.

THE FOLLOWING OPTIONS WILL EXIST TO SUPPORT  
TAPE INTERCHANGE AND MEDIA VERIFICATION  
REQUIREMENTS:

DATA: (SEE 7.2.4.2)  
WORD COUNT (MAX, RANDOM, OR N, (CR)=1000.) =

READ ONLY MODE (SWREG BIT 8=1)

A SPECIAL DATA OPTION (INT) WILL BE DEVELOPED  
TO WRITE THE 1ST 200. RECORDS WITH SKEW DATA  
AND THE 2ND 200. WITH RANDOM DATA TO PROVIDE  
A QUICK SUBSYSTEM CHECK AND TO VERIFY  
TAPE INTERCHANGE.

#### 7.2.4 COMMAND STRING INTERPRETER (SA 503)

THE COMMAND STRING INTERPRETER IS PROVIDED  
AS A TROUBLE SHOOTING AID. ITS OPERATION IS  
SIMILAR TO THAT OF THE DISK RELIABILITY PRO-  
GRAM. THE OPERATOR WILL BE ABLE TO SELECT  
ALL POSSIBLE OPERATING MODES TO AID IN ISO-  
LATING THE FAILING MODULE.

TO CONTROL THE OPERATING MODE, THE OPERATOR  
MUST PROVIDE PROPER REPNSES TO THE PROG-  
RAM REQUESTS AS FOLLOWS:

7.2.4.1 UNIT: UNIT NUMBER AND/OR CARRIAGE  
RETURN TO USE THE PREVIOUS  
ENTRY.

7.2.4.2 DATA: SELECT ONE OF THE FOLLOWING  
DATA PATTERNS AND/OR A CARRIAGE  
RETURN TO USE THE PREVIOUS  
ENTRY. A LIST OF THE DATA PAT-  
TERNS AND THEIR MEANINGS IS AS  
FOLLOWS:

ALZ - ALL ZERO PATTERN  
ALO - ALL ONE PATTERN  
FLZ - FLOATING ZERO PATTERN  
FLO - FLOATING ONE PATTERN  
BFZ - FLOATING 0/BYTE  
BFO - FLOATING 1/BYTE  
ABT - ALTERNATING BYTE ZERO(000377)  
ALT - ALTERNATING BIT (125125)  
PAT - ODD BIT PATTERN  
(177777,377,177400)REPEATED  
RAN - RANDOM DATA PATTERN  
VAR - UP TO 15. OCTAL WORDS \*\*\*  
SKEW - WORST CASE NRZI SKEW DATA  
MWP - 177777,0 REPEATED  
BKA - WORST CASE PE, BLOCK A  
BKB - WORST CASE PE, BLOCK B  
INT - 200 (1000. WORD) RECORDS OF SKEW

THE 28K I/O BUFFER IS DIVIDED INTO 3 16K BLOCKS (10K OF COMMON TO BOTH THE A AND B I/O BLOCKS) WRITE BUFFER(WAB), 9K OF READ BUFFER ALLOCATED TO THE A-I/O BLOCK(RA) VIA THE A USER AND DCH MAPS, AND 9K OF READ BUFFER ALLOCATED TO THE B-I/O BLOCK(RB) VIA THE B USER AND DCH MAPS. THE 1K BLOCKS OF THE 3 BUFFERS ARE INTERLEAVED IN THE PHYSICAL SPACE IN THE FOLLOWING MANNER:

WAB1, RA1, RB1, WAB2, RA2, RB2, WAB3 ETC.

4.2 THE 28K I/O BUFFER IS MOVED ACROSS 256.K DURING A PASS OF SA'S 500 OR 501. A PASS OF THE 502 SA TESTS WILL MOVE THE I/O BUFFER 8K EACH PASS.

#### 5.1 -CONSTANT DATA

THE 1ST N PHYSICAL 1K BLOCKS CONTAINING THE PROGRAM WILL BE MAPPED TO THE 1ST N LOGICAL BLOCKS IN BOTH THE A AND B USER MAPS, AND TO THE A AND B DCH MAPS.

A 32K PHYSICAL I/O BLOCK IS DIVIDED INTO 2 16K BUFFERS. THE 1ST 16K IS MAPPED TO THE A USER MAP, AND THE A DCH MAP. THE 2NS 16K IS MAPPED TO THE B USER MAP, AND TO THE B DCH MAP. BOTH BUFFERS ARE MAPPED TO THE SAME LOGICAL SPACE POINTED TO BY THE PROGRAM POINTER BUFF.

## 7.2 PROGRAM DESCRIPTION

### 7.2.1 RELIABILITY TEST (SA 500) RANDOM

THE RANDOM RELIABILITY TEST WRITES RANDOM LENGTH FILES TO RANDOMLY SELECTED UNITS. EACH FILE CONSISTS OF FROM 1 TO 17 RANDOM LENGTH RECORDS OF RANDOM DATA. AFTER WRITING THE EOF, THE PROGRAM THEN BACKSPACES ACROSS THE N RECORDS, THEN READS THE ENTIRE FILE. AFTER SPACING ACROSS THE EOF, THE SEQUENCE REPEATS UNTIL EACH UNIT REACHES EOT OR N RECORDS WHERE N IS OPERATOR SELECTABLE (SEE 9.2). IF BOTH NRZ AND PE IS TO BE TESTED, NRZ IS TESTED 1ST FOLLOWED BY THE PE TESTING.

### 7.2.2 RELIABILITY TEST (SA 501) OPTIONS

SAME AS RANDOM RELIABILITY (500), EXCEPT THAT THE OPERATOR IS GIVEN THE FOLLOWING OPTIONS:

DATA: (SEE 7.2.4.2)

ENTER RECORDS/FILE AND WORD COUNT  
(OCTAL #, R(RANDOM), CR-ALL RANDOM):

JITTER OPTION (YES/NO) ?

IF YES, A RANDOM DELAY IS INSERTED INTO THE BACKGROUND TASK TO CREATE A MORE ASYNCHRONOUS TAPE I/O LOOP. \*\* A YES RESPONSE WILL ALSO RESULT IN A LONGER TEST TIME.

### 7.2.3 MEDIA VERIFICATION/INTERCHANGE TEST (SA 502)

THE SEQUENTIAL MEDIA VERIFICATION TEST

THE FOLLOWING CONTROL CHARACTERS  
CAUSE CHANGES IN THE CSI PROGRAM  
FLOW.

"ESC" RETURNS PROGRAM CONTROL  
TO THE COMMAND STRING PROMPT.

"R" RETURNS PROGRAM CONTROL  
TO THE UNIT PROMPT.

ALL SWREG AND HISTORY CONTROL WILL  
BE VALID DURING THE CSI.

7.2.5 MEMORY DUMP ROUTINE (SA 504)

THE MEMORY DUMP PROGRAM IS PROVIDED AS A DEBUG  
AID TO ISOLATE THE FAILING MODULE. THIS PRO-  
GRAM WILL PROVIDE THE OPERATOR WITH A MEANS  
OF EXAMINING THE DATA BUFFERS. THIS PROGRAM  
IS DESCRIBED UNDER SECTION 11., DEBUG AIDS.

7.2.6 RUNALL (SA 505)

THE RUNALL PROGRAM WILL PROVIDE A TOP-DOWN METHOD  
OF TESTING THE TAPE SUBSYSTEM BY LINKING A  
SERIES OF TESTS OF THE 501,502 AND 506 TYPE  
WITH A CORRESPONDING SERIES OF DATA PATTERNS(TBD).  
THE PROPOSED SEQUENCE IS:

TEST 501 WITH (ALT,RAN,FLZ,FLO) DATA PATTERNS  
TEST 502 WITH (SKEW,RAN,MWP,BKA,ALZ) DATA PATTERNS  
TEST 506 WITH ALZ DATA PATTERN

7.2.7 SPACING TEST (SA 506)

THE SPACING TEST WILL MAKE 2 PASSES WITH MAX  
WORD COUNT AND WITH THE MIN. WORD COUNT. THE  
DATA WILL BE OPERATOR SELECTABLE. THE FOLLOWING  
SEQUENCE WILL BE REPEATED 10. X PER PASS AFTER  
AN INITIAL REWIND TO BOT.

WRITE EOF  
WRITE 100./5 RECORDS OF 2/MAX WORD COUNT  
WRITE EOF  
SPACE BACK ACROSS EOF  
SPACE BACK TO EOF AT START OF FILE  
SPACE FORWARD 100./5 RECORDS  
SPACE BACKWARD 100./5 RECORDS  
READ 100./5 RECORDS OF 2/MAX WORD COUNT  
SPACE ACROSS EOF

7.2.9 HISTORY RECOVERY (SA 510)

THE HISTORY RECOVERY PROGRAM WILL PROVIDE  
THE OPERATOR A MEANS OF RECOVERING THE  
ACCUMULATED HISTORY OF ALL TESTED UNITS  
AFTER THE PROGRAM HAS BEEN STOPPED. SEE 9.3

NOTE: IN ORDER TO RECOVER HISTORY,  
THIS PROGRAM MUST BE OPERATED  
BEFORE RESTARTING ANY OTHER  
PROGRAM AS THAT WILL INITIALIZE  
ALL COUNTERS.

DATA FOLLOWED BY 200 RECORDS OF  
RANDOM DATA (SA 502 ONLY)  
REC - RECORD NUMBER IN FILE  
(SA'S 501,502,506 ONLY)

\*\*\* THE VARIABLE DATA PATTERN (VAR) IS  
ENTERED BY TYPING UP TO SEVEN  
OCTAL DATA WORDS. IF AN ALPHA  
CHARACTER IS TYPED DURING THE  
DATA INPUT, AN ERROR WILL OC-  
CUR. THE PATTERN IS GENERATED  
BY REPEATING THE TYPED SEQUENCE  
UNTIL THE DATA BUFFER IS FULL.

7.2.4.3 COMMAND STRING:

THE COMMAND STRING SECTION WILL  
BE USED TO SELECT THE DESIRED  
SYSTEM OPERATING COMMANDS. THE  
OPERATOR MAY SELECT A NEW COMMAND  
STRING OR A CARRIAGE RETURN TO  
SELECT THE PREVIOUSLY SELECTED  
COMMAND. THE FIRST 3 CHARACTERS  
OF EACH WORD CAN BE TYPED  
TO ABBREVIATE THE ENTRY. THE  
N(NUMBER) ENTRIES MUST BE IN  
OCTAL. A LIST OF THE COMMANDS  
AND THEIR MEANINGS ARE AS FOL-  
LWS:

REWIND REWIND UNIT  
PE SET PE MODE  
NRZ SET NRZ MODE  
\*\*ABOVE 2 ONLY VALID AT  
BOT AND ON 6026 OR 4307 DRIVES

READ N1,N2 READ N1 WORDS  
FROM N2 RECORDS  
WRITE N1,N2 WRITE N1 WORDS  
(OR SAME) TO N2 RECORDS  
RDN N1,N2 READ NON-STOP  
N1 WORDS FROM N2  
RECORDS(6026 DRIVES ONLY)

SPF N SPACE FORWARD  
N RECORDS.  
SPB N SPACE BACKWARD  
N RECORDS.  
REOF READ EOF/FORWARD  
BEOF READ EOF/BACKWARD  
WEOF WRITE EOF  
ERASE ERASE 3" OF TAPE  
LOOP LOOP TO START  
OR LR  
LEOT LOOP ON EOT TO START  
OTHERWISE/LOOP TO LR  
OR START  
LR LOOP RETURN/ IF  
NO LR, LOOP,LEOT  
LOOP TO START

\*\*\* - ALL CSI COMMAND, WITH THE  
EXCEPTION OF REWIND , WILL TIMEOUT  
IF NOT COMPLETED WITHIN 1 MINUTE.

ERASES (BOTH AUTO AND SOFTWARE)

15(F)                   0        AUTO AND/OR SOFTWARE RETRY ENABLED  
                          1        DISABLE AUTO AND/OR SOFTWARE RETRY

NOTE - ALL ERRORS ARE CONSIDERED  
HARD BY THE SOFTWARE EXCEPT  
WRITE AND READ PARITY ERRORS,  
(IE, SOFTWARE RETRIES WILL ONLY  
AFFECT PARITY ERRORS).

16(G)                   0        NO DMA PRINTER (AT DEVICE 17).

                          1        THERE IS A DMA PRINTER (AT 17)  
                                  CAN'T HAVE SWITCH 5 ON

OTHER COMMANDS (CTRL = CONTROL KEY DEPRESSED ALONG WITH THE  
SPECIFIED CHARACTER. I.E "CTRL D" MEANS ENTERING  
D WHILE THE CTRL KEY IS DEPRESSED.)

"CR"        A "RETURN" CAN BE TYPED TO CONTINUE THE PROGRAM  
AFTER ITS LOCKED IN A SWITCH MODIFICATION MODE

CTRL D     THIS COMMAND GIVEN AT ANY TIME WILL RESET "SWREG"  
TO DEFAULT MODE AND RESTART THE PROGRAM.

CTRL R     THIS COMMAND GIVEN AT ANY TIME WILL RESTART THE  
PROGRAM. SWICHES ARE LEFT WITH THE VALUES THEY  
HAD BEFORE THE COMMAND WAS ISSUED.

CTRL O     TIS COMMAND GIVEN AT ANY TIME WILL CAUSE THE  
PROGRAM CONTROL TO GO TO ODT.

M         THIS COMMAND GIVEN AT ANY TIME WILL PRINT THE  
MODIFICATION MODE, WHERE MORE THAN 1 SWITCH  
MAY BE CHANGED.

O         THIS COMMAND WILL LOCK THE PROGRAM INTO SWITCH  
MODIFICATION MODE, WHERE MORE THAN 1 SWITCH  
MAY BE CHANGED.

W         GET PRINTOUT OF STATISTICS AND ERROR LOG.

CTRL S     INHIBIT LOG PRINTOUT - ANY SUBSEQUENT KEY WILL  
RESUME PRINTOUT. ANY OTHER KEY TYPED DURING  
LOG PRINTOUT WILL TERMINATE PRINTOUT.

ERROR CHECKING AND HANDLING/PROGRAM OUTPUT

ALL ERRORS ARE IDENTIFIED AND COUNTED. THE  
PROGRAM, DEPENDING ON THE SWREG REGISTER  
SETTINGS, WILL LOOP ON ERROR, BACKSPACE ACROSS  
FAILING RECORD, EXIT TO ODT, OR CONTINUE. IF  
THE PROGRAM IS LOOPING ON AN ERROR, COMMAND  
REGISTER BIT 11(B) CAN BE USED TO DETERMINE IF THE  
ERROR IS HARD OR INTERMITTENT.

THE FIRST NN ERRORS PER UNIT WILL BE PRINTED  
AND ACCUMULATED PER PASS. AFTER NN ERRORS  
HAVE OCCURED, ALL ADDITIONAL ERRORS WILL  
BE ACCUMULATED BUT NOT PRINTED. NN IS OPERATOR  
SELECTABLE.

# SWITCH SETTINGS

LOCATION "SWREG" IS USED TO SELECT THE PROGRAM OPTIONS THIS LOCATION WILL BE SET ACCORDING TO THE ANSWERS SUPPLIED BY THE OPERATOR. IN ANY CASE THE OPTIONS CAN BE CHANGED OR VERIFIED BY USING ONE OF THE COMMANDS DESCRIBED BELOW.

ONCE THE PROGRAM STARTS EXECUTING THE STATE OF ANY OF THE BITS CAN BE CHANGED BY HITTING KEYS 1-9, A-F. THE PROGRAM WILL CONTINUE RUNING AFTER UPDATING THE OPTIONS. EACH KEY WILL COMPLEMENT THE STATE OF THE BIT AFFILIATED WITH IT, THUS BIT 4 CAN BE ALTERED BY HITTING KEY 4. SETTING OF ANY BIT OF LOCATION "SWREG" WILL SET BIT 0. (DEFAULT MODE IS DEFINED AS ALL BITS OF SWREG SET TO 0)

DIFFERENT BITS AND THEIR INTERPRETATION AT LOCATION "SWREG" IS AS FOLLOWS:

| BIT   | OCTAL VALUE | BINARY VALUE | INTERPRETATION   |
|-------|-------------|--------------|--|
| 1     |             | 0            | LOOP ON ERROR  |
|       |             | 1            | SKIP LOOPING ON ERROR  |
| 2     |             | 0            | PRINT TO CONSOLE   |
|       |             | 1            | ABORT PRINT OUT TO CONSOLE   |
| 4     |             | 0            | PRINT PASS   |
|       |             | 1            | DO NOT PRINT PASS  |
| 5     |             | 0            | DO NOT PRINT ON THE BYTE I/O PRINTER                               |
|       |             | 1            | PRINT ON THE BYTE I/O PRINTER (DEVICE CODE = 17)                   |
| 6     |             | 0            | DO NOT EXIT TO ODT ON ERROR  |
|       |             | 1            | EXIT TO ODT ON HARD ERROR<br>HIT P TO CONTINUE                     |
| 7     |             |              | NOT USED CURRENTLY   |
| 8     |             | 0            | N/A  |
|       |             | 1            | FOR READ ONLY MODE (SA 502)<br>(FOR TAPE INTERCHANGE)              |
| 9     |             | 0            | N/A  |
|       |             | 1            | BYPASS DATA CHECK  |
| 10(A) |             | 0            | PRINT ALL SOFT(DIC) ERRORS   |
|       |             | 1            | INHIBIT ALL SOFT(DIC) ERROR<br>PRINTOUTS (DUAL MODE ONLY)          |
| 11(B) |             | 0            | PRINT EACH ERROR ONCE ONLY   |
|       |             | 1            | PRINT ALL ERRORS ON RETRIES<br>(IE LOOPING ON ERROR)               |
| 12(C) |             | 0            | N/A  |
|       |             | 1            | PRINT ERROR SUMMARY ON PASS  |
| 13(D) |             | 0            | N/A  |
|       |             | 1            | PRINT I/O TRACE ON HARD ERROR<br>(LAST 5 I/O CALL PC'S + COMMANDS) |
| 14(E) |             | 0            | ERASE HARD WRITE ERROR RECORDS                                     |

OTHERWISE, SPACING OPERATION IS  
ATTEMPTED AGAIN.

SPACING NOT TO EOF - APPROPRIATE  
SPACING OPERATIONS ARE TAKEN TO  
BRING TAPE BACK TO BACKSIDE OF  
EOF MARK DENOTING START OF PRESENT  
FILE. A SPACING OPERATION IS THEN  
TAKEN TO RECORD FROM (IE RECORD WHERE  
ORIGINAL SPACING OPERATION BEGAN).  
THE ORIGINAL SPACING OPERATION IS  
THEN RETRIED.

ALL OTHER TAPE OPERATIONS ARE SIMPLY  
RETRIED.

ERROR PRINTOUTS

\*\*\* ALL N,NN VALUES ARE OCTAL NUMBERS \*\*\*

A. DEVICE STATUS ERRORS

;6XXX MAGNETIC TAPE RELIABILITY -REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;DIA AND/OR DIC STATUS = NN  
;'DESCRIPTIVE ERROR MESSAGES' \*\* FOR EACH FAILING BIT

B. ENDING ADDRESS ERRORS

;6XXX MAGNETIC TAPE RELIABILITY REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;ENDING MEMORY ADDRESS/RECORD COUNT ERROR  
;EXPECTED ACTUAL  
;NN NN

C. DATA + PARITY(CHECK) ERROR

;6XXX MAGNETIC TAPE RELIABILITY REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;DIA STATUS = NN  
;DATA ERROR (BIT 5)  
;GOOD ADDRESS(\*)BAD ADDRESS WORD # GOOD BAD  
;NN NN NN NN NN  
;NN NN NN NN NN  
;TOTAL ERRORS NN

D. DATA WITHOUT PARITY(CHECK) ERRORS

;6XXX MAGNETIC TAPE RELIABILITY -REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;HARDWARE UNDETECTED DATA ERROR  
;GOOD ADDRESS(\*)BAD ADDRESS WORD # GOOD BAD  
;NN NN NN NN NN  
;NN NN NN NN NN

IF A UNIT LOSES READY OR WRITE LOCK SETS, THE PROGRAM WILL PRINT THE APPROPRIATE ERROR MESSAGE. IF MULTIPLE UNITS ARE BEING TESTED, THE PROGRAM WILL CONTINUE WITH OTHER UNITS, OTHERWISE PROGRAM WILL WAIT FOR OPERATOR INTERVENTION. IF THE UNIT BECOMES READY AGAIN, TESTING ON THE UNIT WILL CONTINUE.

FOLLOWING AN INTERRUPT OR BOT CONDITION (REWIND), DIA STATUS WORD IS CHECKED AGAINST A CHECKWORD. THE ONLY DON'T CARE BITS WILL BE EOF/BOT FOR COMMAND STRING OPERATIONS. ALL STATUS BITS NOT EQUAL TO THEIR EXPECTED VALUES WILL BE INTERPRETED BY DESCRIPTIVE MESSAGE, AND A CORRESPONDING ERROR COUNT (INDEXED BY UNIT, DRIVE MODE, AND I/O MODE) WILL BE INCREMENTED.

#### I/O OR SPACING OPERATIONS

IN ADDITION TO GENERAL STATUS, THE MEMORY ADDRESS REGISTER WILL BE CHECKED TO VERIFY PROPER WORD AND RECORD COUNTING AND ADDRESSING. IF AN ERROR EXISTS, THE CONDITION WILL BE IDENTIFIED, GOOD/BAD VALUES WILL BE PRINTED, AND AN ERROR COUNT WILL BE BUMPED.

#### WRITE ERRORS

IF A WRITE PARITY ERROR IS SOFT, IE PASSES ON ONE OF THE 7 RETRIES, A NORMAL ERROR RETURN IS TAKEN. IF THE ERROR IS HARD, THE FAILING RECORD IS BACKSPACED ACROSS, ERASED, AND THE WRITE IS RETRIED AGAIN. ALL OTHER ERRORS ARE CONSIDERED HARD.

#### READ OPERATIONS

READ OPERATIONS WITH GOOD STATUS OR DATA ERROR STATUS ARE FOLLOWED BY A CORE COMPARE. THE 1ST THREE CORE MIS-COMPARES WILL RESULT IN GOOD/BAD AND ADDRESS INFORMATION PRINTED. AFTER THE 1ST THREE ERRORS, ONLY A TOTAL WILL BE MAINTAINED AND PRINTED. IF THE CORE COMPARE ERRORS WERE NOT ACCOMPANIED BY A HARD DATA ERROR STATUS, A 'DATA ERROR WITH CUT PARITY ERROR' MESSAGE WILL BE PRINTED. OTHERWISE, THE DATA ERROR PRINTOUT WILL BE PRECEDED BY A STANDARD PARITY ERROR STATUS PRINTOUT.

#### HARD ERROR RECOVERY/LOOPING

WRITE ERRORS - FAILING RECORD IS BACKSPACED ACROSS, ERASED, AND THE WRITE IS ATTEMPTED AGAIN.

READ ERRORS - FAILING RECORD IS BACKSPACED ACROSS, AND THE READ IS ATTEMPTED AGAIN.

SPACING TO EOF - IF EOF STATUS



THE COMMAND TO OPEN ONE OF THE INTERNAL REGISTERS IS OF THE FORM "NA" WHERE N IS ANY OCTAL EXPRESSION BETWEEN 0 AND 7

0-3 FOR ACCUMULATORS 0-3 .  
4 FOR PC OF THE NEXT INSTRUCTION TO BE EXECUTED IN THE EVENT OF A "P" COMMAND.  
5 CPU AND TTO STATUS  
BIT INTERPRETATION  
15 STATUS OF TTO DONE FLAG  
14 STATUS OF INTERRUPTS (ION FLAG)  
13 STATUS OF CARRY BIT  
6 ADDRESS OF THE LOCATION HAVING THE BREAK POINT (IF ANY)  
7 INSTRUCTION AT THE BREAK POINT LOCATION

OTHER COMMANDS TO OPEN CELLS ARE:

"ADR"/ OPEN THE CELL AND PRINT ITS CONTENTS  
./ OPEN THE CELL CURRENTLY POINTED TO BY THE POINTER AND PRINT ITS CONTENTS.  
."ADR"/ ADD "ADR" TO THE POINTER, OPEN THE CELL AND PRINT ITS CONTENTS.  
.-"ADR"/ SUBTRACT "ADR" FROM THE POINTER, OPEN THE CELL AND PRINT ITS CONTENTS.  
"CR" THE RETURN KEY IS USED TO CLOSE THE OPEN CELL WITH OR WITHOUT MODIFICATION.  
"LF" LINE FEED IS USED TO CLOSE THE OPEN CELL WITH OR WITHOUT MODIFICATION AND TO OPEN THE SUCCEEDING CELL.  
CTRL CLOSE THE OPEN CELL WITH OR WITHOUT MODIFICATION AND OPEN THE PRECEEDING CELL.  
/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND OPEN THE CELL POINTED TO BY ITS CONTENTS.  
+"ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND OPEN THE CELL POINTED TO BY ITS CONTENTS + "ADR".  
-"ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND OPEN THE CELL POINTED TO BY ITS CONTENTS - "ADR".

MODIFICATION OF A CELL:

ONCE A CELL HAS BEEN OPENED ITS CONTENTS CAN BE MODIFIED BY TYPING THE NEW VALUE THE CELL IS TO CONTAIN IN THE FORM OF AN OCTAL EXPRESSION FOLLOWED BY "CR" OR "LF". IF A + OR - IS TYPED AS THE FIRST CHARACTER OF THE EXPRESSION THEN THE VALUE OF THE EXPRESSION IS ADDED TO OR SUBTRACTED FROM THE OLD CONTENTS OF THE CELL. THE ADDRESS ITSELF OR AN EXPRESSION RELATIVE TO THE ADDRESS CAN BE DEPOSITED BY TYPING A "." OR ":", +/-OCTAL EXPRESSION". A RUBOUT COMMAND GIVEN RIGHT AFTER OPENING A CELL ALLOWS THE MODIFICATION OF ITS CONTENTS AS IF THEY WERE TYPED IN JUST BEFORE THE COMMAND WAS ISSUED.

OTHER ODT COMMANDS:

RUBOUT THIS KEY IS USED TO DELETE ERRONEOUSLY TYPED DIGITS. EACH TIME THE KEY IS PRESSED THE RIGHT MOST DIGIT IS DELETED AND ECHOED ON THE TERMINAL. IF THE RUBOUT KEY IS PRESSED RIGHT AFTER OPENING A CELL THEN IT DELETES THE RIGHT MOST DIGIT OF THE CELLS CONTENTS. THIS ALLOWS THE MODIFICATION OF THE CELL AS IF ITS CONTENTS WERE TYPED IN JUST BEFORE THE KEY WAS PRESSED.

```

; TOTAL ERRORS
;
; IF DATA ERROR WAS HARDWARE UNDETECTED,
; AND PROGRAM IS RUNNING MAPPED, FOLLOWING
; PRINTOUT WILL BE APPENDED.
;
;
; MAP TYPE          USER (A OR B)
; READ
; LOG 1K           PHYS 1K          DCH LOGICAL
; NN              NN              NN
; WRITE
; LOG 1K           PHYS 1K          DCH LOGICAL
; NN              NN              NN
;
; ***NO WRITE DATA IF IN READ ONLY MODE
;
; (*) -NOTE, ACTUAL WRITE DATA(GOOD DATA)
; MAY NOT EXIST IN MEMORY AT TIME OF READ
; AND THEREFORE THE GOOD ADDRESS WILL NOT
; BE PRINTED.
;
; WHEN DATA ERRORS ARE ENCOUNTERED, ONLY THREE ARE
; PRINTED PER RECORD. WHEN LOOPING IS REQUESTED,
; STATUS IS PRINTED ON THE FIRST PASS ONLY.
; IF COMMAND REGISTER BIT 11 IS SET ALL
; ERRORS WILL BE PRINTED TO VERIFY THAT
; THE ERROR IS STILL OCCURRING.
;
; IF THE DATA ERROR WAS HARDWARE DETECTED
; VIA CRC,ECC, OR PARITY, STANDARD STATUS
; ERROR PRINTOUT WILL PRECEED THE DATA
; COMPARE INFORMATION. IF THE DATA ERROR
; WAS NOT HARDWARE DETECTED, THEN
; ADDITIONAL MAP AND PHYSICAL MEMORY
; INFORMATION WILL BE DUMPED IF THE MAPS
; WERE ENABLED.
;
; OCTAL DEBUGGER (ODT)
;
; THIS DIAGNOSTIC IS EQUIPPED WITH A BUILT IN ODT WHICH CAN
; BE ACCESSED BY HITTING CONTROL 0 AT ANY TIME DURING
; THE EXECUTION OF THE PROGRAM (AFTER SETTING THE PARA-
; METERS).
; ON ENTERING ODT THE ADDRESS OF THE LOCATION HAVING THE
; NEXT INSTRUCTION TO BE EXECUTED WILL BE TYPED-OUT.
;
; THE FOLLOWING CONVENTIONS ARE USED BY THE ODT:
; ?      PRESSING ANY ILLEGAL KEY CAUSES THE ODT TO RES-
;        POND WITH A "?".
; @      ODT IS READY AND AT YOUR SERVICE.
;
; AN ODT COMMAND HAS THE FOLLOWING FORMAT:
;        [ARGUMENT][COMMAND]
; AN ARGUMENT MAY BE ONE OF THE FOLLOWING:
; "EXP"  AN OCTAL EXPRESSION CONSISTING OF OCTAL NUMBERS
;        SEPARATED BY PLUS (+) OR MINUS (-) SIGNS. LEAD-
;        ING ZEROS NEED NOT BE TYPED.
; "ADR"  AN ADDRESS IS THE SAME AS AN EXPRESSION EXCEPT
;        THAT BIT 0 IS NEGLECTED.
; A COMMAND IS A SINGLE TELETYPE CHARACTER
;
; THE LOCATIONS THAT CAN BE EXAMINED AND MODIFIED BY THE
; USER ARE CALLED CELLS. THESE CELLS ARE OF TWO TYPES:
; INTERNAL CPU CELLS AND MEMORY LOCATIONS.

```

; REVISION HISTORY

; REV 1.00

; 9/84

; KEY-IN, MODIFY MESSAGES, DEVICE CODE  
; CHANGE MACRO INCLUDED. ALLOW FOR SWITCH  
; SETTING PRIOR TO HELP FOR HARD-COPY  
; OF SAME.

; 9/20/84

; LET SET PRINTER SWITCH BEFORE HELP  
; USE CSI PRINTER ROUTINES SO CAN HAVE  
; DMA PRINTER LATER  
; IN SIZING DLIBS, HAVE MV SET FOR NO MAP  
; (MV WITH MAPS DOESN'T WORK EVEN  
; IN DG DTOS REV 1)  
; DON'T USE UNLOAD COMMAND - BMX2  
; DOESN'T SUPPORT UNLOAD  
; DON'T REFER TO NRZ; MAKE IT NON-PE SO  
; CAN BE GCR OR NRZ

=====

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; TABLE OF CONTENTS:

; PAGEZ P. 2  
; DRIVER P. 3  
; SIZE (WITHOUT DLIBS RTNS) P. 4  
; SETMAP P. 5  
; SETMEM P. 6  
; SETUNIT P. 7  
; INIT P. 8  
; MAINS P. 9  
; MAIN.SUBS P. 10  
; INTER P. 11  
; IO P. 12  
; STATUS P. 13  
; DATA P. 14  
; ERROR P. 15  
; LIB P. 16  
; INPUT P. 17  
; CMD.STRING P. 18  
; RESPONSES P. 19  
; ERR.DISPLAY P. 20  
; MESS P. 21  
; BUFFERS P. 22  
; MAPIT P. 23  
; MESS.MAP P. 24  
; PRT.MAP P. 25  
; HELP P. 26

(INCLUDES TIMER RTN)  
ASSEMBLE WITH PS FROM BUILD.OLDTIMER.PS  
TO GET CLEAN FILECOM. LATER MUST RE-ASM  
USING STANDARD PS.

; SIZE.DLIB P. 27  
; MESS.HELP P. 28

-----

ONLY ONE BREAK POINT CAN BE INSERTED AND ANY ENTRY TO ODT AFTER EXECUTING A BREAK POINT WILL CAUSE IT TO BE DELETED.

D DELETE THE BREAK POINT IF ANY.  
P RESTART THE EXECUTION OF THE PROGRAM AT CURRENT LOCATION.  
"ADR"R START EXECUTING THE PROGRAM AT "ADR" AFTER AN IO-RESET.  
K KILL THE STRING TYPED SO FAR. THE ODT RESPONDS WITH A "?" AND THE OPEN CELL IS CLOSED WITHOUT MODIFICATION.  
= PRINT THE OCTAL VALUE OF THE INPUT ONLY. THIS WILL CLOSE ANY OPEN CELLS WITHOUT MODIFICATION AND WILL NOT OPEN A CELL

NOTE: IN PROGRAMS WHICH RELOCATE THEMSELVES THE USER SHOULD PLACE BREAK POINTS ONLY IN THE ORIGINAL PROGRAM AREA. IF A BREAK POINT IS PLACED OUTSIDE THIS AREA THE RESULTS WILL BE UNPREDICTABLE.

;NOTES/SPECIAL FEATURES:

1. A CR ONLY RESPONSE TO UNIT NUMBERS, ETC WILL LEAVE INFORMATION IN PREVIOUS STATE.
2. THE PROGRAM WILL ACCOUNT FOR UP TO A MAX. OF  $2^{*}31$  WORDS WRITTEN OR READ. SPECIAL TEST RUNS EXCEEDING THIS FACILITY WILL REQUIRE AN OPERATOR'S TEST LOG TO AUGMENT SOFTWARE ACCOUNTING.  $2^{*}31$  WORDS = APPROX.  $2 * 10^{*}9$  WORDS.
3. ALL NUMBERS ENTERED IN 7.0 MUST BE IN OCTAL. ANY NON-OCTAL INPUT IS TREATED AS A LETTER. ANY LETTER INPUT FOR RECORD COUNT, WORD COUNT GETS RANDOM FUNCTION IN THE RELIABILITY. TEST WITH OPTIONS.

;PROGRAM RUNTIME:

PROGRAM THROUGHPUT IS SUBSTANTIALLY INCREASED WITH MEMORIES OF 24K OR LARGER. PROGRAM CAN USE UP TO 56K(MAPPED) IN THE RELIABILITY TESTS. ## SEE 7.1 RUNTIMES WILL ALSO VARY WITH DRIVE TYPE AND DRIVE MODE.

READ,WRITE OPERATIONS ARE TIMED BY SPECIAL ROUTINES. WHEN THE PROGRAM IS FIRST STARTED, THE TIMING ROUTINE WILL TEST FOR THE PRESENCE OF A REAL TIME CLOCK (RTC) TO DERIVE TIMING FROM IT. IF NO RTC IS PRESENT, THE PROGRAM WILL TYPE "TTO BAUD RATE". THIS MESSAGE REFERS TO THE BAUD RATE OF THE CONSOLE TERMINAL (DEVICE 10 & 11). TYPE IN THE BAUD RATE. IF A TYPING ERROR OCCURS IN THE NUMBER STRING (BEFORE THE CARRIAGE RETURN),

SIMPLY TYPE A NON-NUMERIC CHARACTER AND THE REQUEST FOR THE BAUD RATE WILL BE REPEATED. IF THE CARRIAGE RETURN HAS BEEN GIVEN AFTER A TYPING ERROR, RELOAD THE PROGRAM.

\*\*\*\*\*  
; DESCRIPTION: DUAL MODE MAGNETIC TAPE DRIVE DIAGNOSTIC  
;

; PRODUCT OF ZETACO, 1984  
\*\*\*\*\*

.TITLE BMX2D  
X=1  
NOP=101033  
.TXTM 0

;1. PROGRAM NAME: BMX2D.SR

;2. REVISION HISTORY:

; REVISION HISTORY

| REV. | DATE     |   |
|------|----------|---|
| 1.00 | 09/17/84 | INITIAL RELEASE<br>ADDED WRITE RING OPERATOR TEST<br>ADDED UNIT READY OPERATOR TEST<br>REWROTE DEVICE CODE ROUTINE  |
| 2.00 | 09/27/84 | MODIFYING PROGRAM TO INCLUDE<br>4307 EMULATION<br>INSERTED RESPONSE CONCERNING<br>EMULATION (0=4307, 1=6026)<br>REWROTE SET DRIVE MODE<br>INSTRUCTION CHECK<br>REWROTE DENSITY CHANGE ROUTINE<br>SKIPPED POLLING TEST SECTION -<br>4307 DOES NOT SUPPORT THIS<br>DISABLED THE READ NON-STOP TEST<br>4307 DOES NOT USE THIS TEST<br>REWROTE RUNAWAY TAPE CHECK<br>REWROTE ERASE ROUTINE SO BIT 7<br>EQUALS PE IF BOT DURING ERASE<br>REWROTE WRITE ROUTINE SO BIT 7<br>EQUALS PE IF BOT DURING WRITE |
| 2.09 | 10/11/84 | ADDED 4307 REWIND ROUTINE<br>RELEASED   |
|      | 10/23/84 | PHASE II, INITIAL RELEASE<br>OPERATOR WARNING FOR PARITY<br>WRITE RING AND READY UNITS.<br>ILLEGAL COMMAND USED IN PLACE<br>OF DIAGNOSTIC MODE. GENERAL<br>CLEAN UP OF PROGRAM.   |
|      | 2-85     | PAN.<br>DOUBLE SWITCH REGISTER<br>SWITCHES: HELP, HARD COPY, DMA<br>LINE PRINTER<br>HELP AND TEST DESCRIPTIONS<br>CLEANUP REWIND FOR CYPHER   |
|      | 3-85     | CLEANUP TESTS 31 AND 33<br>SWITCH TO BYPASS DRIVE DEPENDENT TESTS   |

ADD SUPPORT FOR 6020 RDOS-THIS  
(REALLY IS SAME AS 6125)  
READ PARAMETERS FROM EEPROM:  
DATA TRANSFER METHOD  
DRIVE DUAL MODE FLAG  
EMULATION  
UNIT TEST COMPLETE - TO SYSTEM  
TEST AND RELEASE

3.00 4-85

;3. MACHINE REQUIREMENTS:

- ; A. A NOVA/ECLIPSE OR MV CPU.
- ; B. AT LEAST 10K MEMORY
- ; C. TELETYPE OR CRT.
- ; D. BMX2 MAGNETIC TAPE CONTROLLER AND FORMATTED TAPE DRIVE.
- ; E. PRINTER AT DEVICE CODE 17 (OPTIONAL)

;4. TEST REQUIREMENTS: N/A

;5. SUMMARY:

; THIS PROGRAM IS A DIAGNOSTIC TEST TO DETECT AND  
; ISOLATE FAULTS EXISTING IN THE BMX2 TAPE CONTROLLER  
; BOARD OR TAPE DRIVE.

;6. RESTRICTIONS

; THIS PROGRAM CAN BE RUN WITH ONLY ONE DRIVE ON LINE.  
;  
; IF A RTC IS NOT AVAILABLE THE TERMINAL BAUD RATE IS  
; USED TO SET THE TIMING CONSTANTS. THE PROGRAM ASSUMES  
; THAT ALL 110 BAUD TRANSMISSION CONSISTS OF 11 BITS/CHAR  
; AND THAT ALL OTHER BAUD RATES HAVE 10 BITS/CHAR.

;7. PROGRAM DESCRIPTION/THEORY OF OPERATION

; THE PROGRAM IS DIVIDED INTO TWO PARTS.  
; THE FIRST PART DEALS WITH THE CONTROLLER  
; BOARD. IT CONSISTS OF A NUMBER OF INDEPEN-  
; DENT TESTS MOST OF WHICH WILL ISSUE AN ILLEGAL  
; COMMAND WITH A START PULSE. WHEN THE CONTROLLER  
; COMPLETES ITS OPERATIONS IT SETS DONE. THE  
; HOST PROGRAM WAITS FOR THE DONE FLOP TO SET  
; BEFORE IT ANALYZES THE RESULTS OF THE OPERATION.

; THE SECOND PART DEALS MAINLY WITH COMMANDS TO  
; THE DRIVE. IF A DUAL MODE DRIVE IS BEING TESTED  
; BOTH MODES ARE AUTOMATICALLY EXERCISED DURING  
; EVERY PASS. WHEN LOOPING ON THE DIAGNOSTIC THE  
; END OF A PASS IS NOTED WITH AN "END" DISPLAY.

;9. OPERATING PROCEDURE/OPERATOR INPUT

- ; A. LOAD USING THE BINARY LOADER
- ; B. STARTING ADDRESSES:
  - ; 200 - START DIAGNOSTIC FOR FIRST PASS.
  - ; 500 - SAME AS 200.

;10.0 PROGRAM OUTPUT/ERROR DESCRIPTION

; WHEN AN ERROR CONDITION OCCURS THE PROGRAM  
; DISPLAYS THE FOUR ACCUMULATORS AND THE PC AT  
; THE POINT OF ERROR. THE SIGNIFICANCE OF THIS  
; INFORMATION IS EXPLAINED IN THE LISTING.  
; GENERALLY, WHERE EVER POSSIBLE, ACO WILL CONTAIN  
; THE RECEIVED DATA, AC1 WILL CONTAIN THE  
; EXPECTED DATA, AC2 WILL BE THE LOOP COUNTER  
; AND AC3 WILL CONTAIN THE ADDRESS FROM  
; WHERE THE SUBROUTINE WAS CALLED.  
; THE ACTION OF THE PROGRAM AFTER THE ERROR  
; OCCURRENCE IS DICTATED BY THE SWITCH SETTINGS

;12. SPECIAL NOTES/SPECIAL FEATURES

; THE DIAGNOSTIC WILL WRITE ON THE ENTIRE TAPE.  
; THEREFORE, ONLY A SCRATCH TAPE SHOULD BE USED.  
; TO SAVE TIME WHEN RUNNING THE "END OF TAPE"  
; TESTS OF PASS 1, A SHORT TAPE CAN BE USED.  
; ALTHOUGH A DUAL MODE CONTROLLER BOARD CAN BE TESTED  
; WITHOUT A TAPE DRIVE A COMPLETE CHECKOUT OF THE BOARD  
; REQUIRES A DRIVE. THERE ARE CERTAIN CIRCUITS ON THE  
; BOARD THAT ARE ONLY CHECKED BY RUNNING THE ENTIRE  
; DIAGNOSTIC PROGRAM.

NAME: ZMTRL

DESCRIPTION: DUAL DENSITY MAGNETIC TAPE RELIABILITY  
FOR USE ON CSI TAPE COUPLER'S EMULATING DG'S  
6026 & 6125 & 4307 & 6021

REVISION NUMBER = 1.00

1.00 4/85 INCLUDE 6021 EMULATION AND  
RENAME FROM BMX2R (REV 02)  
ADD DOUBLE WORD SWITCH REGISTER

\*\*\*\*\*

SYSTEM REQUIREMENTS:

NOVA/ECLIPSE FAMILY CPU  
16K READ/WRITE MEMORY  
TELETYPE OR CRT AT DEVICE CODE 10/11  
ZETACO COUPLER BOARD - WITH 1 TO 8 TAPE DRIVES  
FORMATTED TAPE DRIVE  
PRINTER AT DEVICE CODE 17 (OPTIONAL, FOR LOGGING)

SUMMARY:

MAINTENANCE PROGRAM DESIGNED TO TEST AND EXERCISE  
ZETACO TAPE COUPLER AND DRIVES. THE COUPLER CAN BE  
AT ANY DEVICE CODE 20-76 (DEFAULT = 22).

PROGRAM DESCRIPTION/THEORY OF OPERATION

1. THEORY OF OPERATION

A. GENERAL OVERVIEW

MAIN RELIABILITY PROGRAM (SA'S 500,501,502) ARE BASED  
AROUND THE USE OF TWO I/O BLOCKS LOCATED AT PROGRAM  
LOCATIONS APOINT AND BPOINT, AND DESIGNATED AS THE  
A-I/O BLOCK AND THE B-I/O BLOCK. TWO OTHER IMPORTANT  
TERMS FOREGROUND (FG) AND BACKGROUND (BG) ARE DEFINED  
AS FOLLOWS:

BACKGROUND(BG) ALL I/O PROCESSES. FALLING UNDER THIS  
CATEGORY ARE TAPE I/O DRIVES, TAPE  
OPERATION CHECKS (EXCEPT CORE COMPARE  
WITH NO PARITY DETECTION), INTERRUPT  
HANDLERS AND RETURNS, TAPE ERROR HANDLERS,  
AND ALL CONSOLE I/O. AS A RULE, THIS  
CODE IS EXECUTED WITH INTERRUPT OFF, AND  
IS DESIRED TO BE AS QUICK AS POSSIBLE,  
WITH THE EXCEPTION OF ERROR HANDLING AND  
CONSOLE I/O, CONSIDERED TO HAVE A LOW  
FREQUENCY OF OPERATION. THE PROGRAM LOC.  
FGPT POINTS TO THE I/O BLOCK UNDER (FG)  
PROCESS.

BACKGROUND(BG) ALL NON-I/O PROCESS. FALLING UNDER THIS  
CATEGORY ARE TAPE DATA GENERATION, TAPE  
DATA CHECKING (UNLESS PARITY ERROR), TAPE  
TRANSFER DEFINITION AND SETUP. AS A RULE



THIS CODE IS EXECUTED WITH INTERRUPTION,  
AND CONTAINS THE BULK OF TIME CONSUMING  
CODE. PROGRAM LOCATION BGPT POINTS TO  
THE I/O BLOCK UNDER THE (BG) PROCESS.

IN GENERAL, ROUTINES PROCESSING I/O BLK. VARIABLES, SAVE  
AC2 AND USUALLY REQUIRE AC2 TO POINT TO THE I/O BLOCK  
UNDER PROCESS. SOME CODE IS RE-ENTRANT AND REQUIRES  
THAT AC2 NOT BE USED FOR ANY OTHER PURPOSE(CHECK, SETP).  
ALL SUCH VARIABLES ARE DEFINED AS DISPLACEMENT VALUES TO  
THE START OF THE BLOCK (0-N). THUS IF THE 4TH VARIABLE  
OF THE BLOCK IS DESIRED, AN LDA 0,XX,2 MAY BE USED, IF  
AC2 POINTS TO THE BLOCK START AND XX IS DEFINED AS 4  
(XX=4).

THE FOREGROUND PROCESS CAN BE THOUGHT OF AS THE  
EXECUTION OF I/O TRANSFER (N), WHILE THE  
BACKGROUND CAN BE THOUGHT OF AS THE CHECKING  
(CORE-COMPARE) OF I/O TRANSFER (N-1) AND THE SETUP  
OF TRANSFER (N+1). THE GATE BETWEEN THE TWO  
PROCESSES IS THE EOT FLAG DEFINED AS (XD,2/XD=1).  
WHEN THE FOREGROUND TASK HAS COMPLETED,  
IT SETS ITS FLAG (XD,2) AND DOES A BACKGROUND  
RETURN VIA A CALL IBGEOT. WHEN THE BACKGROUND TASK HAS  
FINISHED, IT WAITS VIA A CALL XFRDN, WHICH MONITERS  
THE FOREGROUND EOT FLAG VIA (@0,2), WHICH POINTS TO THE  
OTHER BLOCK'S XD,2 FLAG.

AFTER THE (BG) HAS DETECTED THE (FG) EOT FLAG, THE  
FLAG IS CLEARED, INTERRUPTS ARE DISABLED, A PSUEDO  
(BG) RETURN IS LOADED TO LOC 0, AND THE (BG) AND (FG)  
I/O BLOCKS ARE SWAPPED VIA THE CALL INTFB. AFTER THE  
NEW (FG) I/O IS INITIATED, THE NEXT (BG) TASK BEGINS.

## B. OPERATING MODES

1 OF 5 DIFFERENT MEMORY/INTERRUPT MODES MAY BE IN USE  
IN THIS PROGRAM AND ARE DESCRIBED AS FOLLOWS:

1-BACKGROUND ONLY, WAIT ON INTERRUPT.  
MAX WORD COUNT = ALL OF AVAILABLE CORE (IE NOT TAKEN  
BY PROGRAM). USED FOR SA'S 503,506

2-BACKGROUND/FOREGROUND MODES, 2 BUFFERS USED FOR  
BOTH READ AND WRITE PURPOSES. MAX WORD COUNT  
= 1/2 OF AVAILABLE CORE. USED  
FOR CONSTANT DATA PATTERNS.

3.-BACKGROUND/FOREGROUND MODES, 4 BUFFERS ( 2 FOR READ  
AND 2 FOR WRITE). MAX WORD COUNT =1/3 OF AVAILABLE  
CORE . USED FOR VARIABLE DATA(EXPECT ADDR).

4. -IF ECLIPSE (MMPU1) OR NOVA-3 MAPS ARE IN THE SYSTEM,  
AND MAPPING IS REQUESTED, ONE OF TWO MAPPING SCHEMES  
WILL BE IN EFFECT.

### 4.1 -VARIABLE DATA

THE 1ST N PHYSICAL 1K BLOCKS CONTAINING THE PROGRAM  
WILL BE MAPPED TO THE 1ST N 1K LOGICAL BLOCKS IN BOTH  
THE A AND B USER MAPS. THIS MAPPING WILL REMAIN  
CONSTANT. A 28. K PHYSICAL BLOCK WITH THE  
START 1K DESIGNATED BY THE PROGRAM VARIABLE MPB?N  
WILL BE ALLOCATED TO THE TAPE I/O BUFFER AS FOLLOWS:

WRITES AND END OF FILE MARK FOLLOWED BY  
FOUR HUNDRED RECORDS AND TWO END OF FILE MARKS.  
THIS IS FOLLOWED BY A REWIND AND A  
SEQUENTIAL READ OF THE WRITTEN TAPE.

\*\*NOTE - IF THE DRIVE IS DUAL MODE, READ NON-STOP  
WILL BE USED DURING THE TAPE READ.

THE FOLLOWING OPTIONS WILL EXIST TO SUPPORT  
TAPE INTERCHANGE AND MEDIA VERIFICATION  
REQUIREMENTS:

DATA: (SEE 7.2.4.2)  
WORD COUNT (MAX, RANDOM, OR N, (CR)=1000.) =

READ ONLY MODE (SWREG BIT 8=1)

A SPECIAL DATA OPTION (INT) WILL BE DEVELOPED  
TO WRITE THE 1ST 200. RECORDS WITH SKEW DATA  
AND THE 2ND 200. WITH RANDOM DATA TO PROVIDE  
A QUICK SUBSYSTEM CHECK AND TO VERIFY  
TAPE INTERCHANGE.

#### 7.2.4 COMMAND STRING INTERPRETER (SA 503)

THE COMMAND STRING INTERPRETER IS PROVIDED  
AS A TROUBLE SHOOTING AID. ITS OPERATION IS  
SIMILAR TO THAT OF THE DISK RELIABILITY PRO-  
GRAM. THE OPERATOR WILL BE ABLE TO SELECT  
ALL POSSIBLE OPERATING MODES TO AID IN ISO-  
LATING THE FAILING MODULE.

TO CONTROL THE OPERATING MODE, THE OPERATOR  
MUST PROVIDE PROPER REPOSSES TO THE PROG-  
RAM REQUESTS AS FOLLOWS:

7.2.4.1 UNIT: UNIT NUMBER AND/OR CARRIAGE  
RETURN TO USE THE PREVIOUS  
ENTRY.

7.2.4.2 DATA: SELECT ONE OF THE FOLLOWING  
DATA PATTERNS AND/OR A CARRIAGE  
RETURN TO USE THE PREVIOUS  
ENTRY. A LIST OF THE DATA PAT-  
TERNS AND THEIR MEANINGS IS AS  
FOLLOWS:

ALZ - ALL ZERO PATTERN  
ALO - ALL ONE PATTERN  
FLZ - FLOATING ZERO PATTERN  
FLO - FLOATING ONE PATTERN  
BFZ - FLOATING 0/BYTE  
BFO - FLOATING 1/BYTE  
ABT - ALTERNATING BYTE ZERO(000377)  
ALT - ALTERNATING BIT (125125)  
PAT - ODD BIT PATTERN  
(177777,377,177400)REPEATED  
RAN - RANDOM DATA PATTERN  
VAR - UP TO 15. OCTAL WORDS \*\*\*  
SKEW - WORST CASE NRZI SKEW DATA  
MWP - 177777,0 REPEATED  
BKA - WORST CASE PE, BLOCK A  
BKB - WORST CASE PE, BLOCK B  
INT - 200 (1000. WORD) RECORDS OF SKEW

THE 28K I/O BUFFER IS DIVIDED INTO 3 NON-CONTIGUOUS BUFFERS, 10K OF COMMON (TO BOTH THE A AND B I/O BLOCKS) WRITE BUFFER (WAB), 9K OF READ BUFFER ALLOCATED TO THE A-I/O BLOCK (RA) VIA THE A USER AND DCH MAPS, AND 9K OF READ BUFFER ALLOCATED TO THE B-I/O BLOCK (RB) VIA THE B USER AND DCH MAPS. THE 1K BLOCKS OF THE 3 BUFFERS ARE INTERLEAVED IN THE PHYSICAL SPACE IN THE FOLLOWING MANNER:

WAB1, RA1, RB1, WAB2, RA2, RB2, WAB3 ETC.

4.2 THE 28K I/O BUFFER IS MOVED ACROSS 256.K DURING A PASS OF SA'S 500 OR 501. A PASS OF THE 502 SA TESTS WILL MOVE THE I/O BUFFER 8K EACH PASS.

5.1 -CONSTANT DATA  
THE 1ST N PHYSICAL 1K BLOCKS CONTAINING THE PROGRAM WILL BE MAPPED TO THE 1ST N LOGICAL BLOCKS IN BOTH THE A AND B USER MAPS, AND TO THE A AND B DCH MAPS.

A 32K PHYSICAL I/O BLOCK IS DIVIDED INTO 2 16K BUFFERS. THE 1ST 16K IS MAPPED TO THE A USER MAP, AND THE A DCH MAP. THE 2NS 16K IS MAPPED TO THE B USER MAP, AND TO THE B DCH MAP. BOTH BUFFERS ARE MAPPED TO THE SAME LOGICAL SPACE POINTED TO BY THE PROGRAM POINTER BUFF.

## 7.2 PROGRAM DESCRIPTION

### 7.2.1 RELIABILITY TEST (SA 500) RANDOM

THE RANDOM RELIABILITY TEST WRITES RANDOM LENGTH FILES TO RANDOMLY SELECTED UNITS. EACH FILE CONSISTS OF FROM 1 TO 17 RANDOM LENGTH RECORDS OF RANDOM DATA. AFTER WRITING THE EOF, THE PROGRAM THEN BACKSPACES ACROSS THE N RECORDS, THEN READS THE ENTIRE FILE. AFTER SPACING ACROSS THE EOF, THE SEQUENCE REPEATS UNTIL EACH UNIT REACHES EOT OR N RECORDS WHERE N IS OPERATOR SELECTABLE (SEE 9.2). IF BOTH NRZ AND PE IS TO BE TESTED, NRZ IS TESTED 1ST FOLLOWED BY THE PE TESTING.

### 7.2.2 RELIABILITY TEST (SA 501) OPTIONS

SAME AS RANDOM RELIABILITY (500), EXCEPT THAT THE OPERATOR IS GIVEN THE FOLLOWING OPTIONS:

DATA: (SEE 7.2.4.2)

ENTER RECORDS/FILE AND WORD COUNT  
(OCTAL #, R(RANDOM), CR-ALL RANDOM):

JITTER OPTION (YES/NO) ?

IF YES, A RANDOM DELAY IS INSERTED INTO THE BACKGROUND TASK TO CREATE A MORE ASYNCHRONOUS TAPE I/O LOOP. \*\* A YES RESPONSE WILL ALSO RESULT IN A LONGER TEST TIME.

### 7.2.3 MEDIA VERIFICATION/INTERCHANGE TEST (SA 502)

THE SEQUENTIAL MEDIA VERIFICATION TEST

THE FOLLOWING CONTROL CHARACTERS  
CAUSE CHANGES IN THE CSI PROGRAM  
FLOW.

"ESC" RETURNS PROGRAM CONTROL  
TO THE COMMAND STRING PROMPT.

"R" RETURNS PROGRAM CONTROL  
TO THE UNIT PROMPT.

ALL SWREG AND HISTORY CONTROL WILL  
BE VALID DURING THE CSI.

7.2.5 MEMORY DUMP ROUTINE (SA 504)

THE MEMORY DUMP PROGRAM IS PROVIDED AS A DEBUG  
AID TO ISOLATE THE FAILING MODULE. THIS PRO-  
GRAM WILL PROVIDE THE OPERATOR WITH A MEANS  
OF EXAMINING THE DATA BUFFERS. THIS PROGRAM  
IS DESCRIBED UNDER SECTION 11..., DEBUG AIDS.

7.2.6 RUNALL (SA 505)

THE RUNALL PROGRAM WILL PROVIDE A TOP-DOWN METHOD  
OF TESTING THE TAPE SUBSYSTEM BY LINKING A  
SERIES OF TESTS OF THE 501,502 AND 506 TYPE  
WITH A CORRESPONDING SERIES OF DATA PATTERNS(TBD).  
THE PROPOSED SEQUENCE IS:

TEST 501 WITH (ALT,RAN,FLZ,FLO) DATA PATTERNS  
TEST 502 WITH (SKEW,RAN,MWP,BKA,ALZ) DATA PATTERNS  
TEST 506 WITH ALZ DATA PATTERN

7.2.7 SPACING TEST (SA 506)

THE SPACING TEST WILL MAKE 2 PASSES WITH MAX  
WORD COUNT AND WITH THE MIN. WORD COUNT. THE  
DATA WILL BE OPERATOR SELECTABLE. THE FOLLOWING  
SEQUENCE WILL BE REPEATED 10. X PER PASS AFTER  
AN INITIAL REWIND TO BOT.

WRITE EOF  
WRITE 100./5 RECORDS OF 2/MAX WORD COUNT  
WRITE EOF  
SPACE BACK ACROSS EOF  
SPACE BACK TO EOF AT START OF FILE  
SPACE FORWARD 100./5 RECORDS  
SPACE BACKWARD 100./5 RECORDS  
READ 100./5 RECORDS OF 2/MAX WORD COUNT  
SPACE ACROSS EOF

7.2.9 HISTORY RECOVERY (SA 510)

THE HISTORY RECOVERY PROGRAM WILL PROVIDE  
THE OPERATOR A MEANS OF RECOVERING THE  
ACCUMULATED HISTORY OF ALL TESTED UNITS  
AFTER THE PROGRAM HAS BEEN STOPPED. SEE 9.3

NOTE: IN ORDER TO RECOVER HISTORY,  
THIS PROGRAM MUST BE OPERATED  
BEFORE RESTARTING ANY OTHER  
PROGRAM AS THAT WILL INITIALIZE  
ALL COUNTERS.

DATA FOLLOWED BY 200 RECORDS OF  
RANDOM DATA (SA 502 ONLY)  
REC - RECORD NUMBER IN FILE  
(SA'S 501,502,506 ONLY)

\*\*\* THE VARIABLE DATA PATTERN (VAR) IS  
ENTERED BY TYPING UP TO SEVEN  
OCTAL DATA WORDS. IF AN ALPHA  
CHARACTER IS TYPED DURING THE  
DATA INPUT, AN ERROR WILL OC-  
CUR. THE PATTERN IS GENERATED  
BY REPEATING THE TYPED SEQUENCE  
UNTIL THE DATA BUFFER IS FULL.

#### 7.2.4.3 COMMAND STRING:

THE COMMAND STRING SECTION WILL  
BE USED TO SELECT THE DESIRED  
SYSTEM OPERATING COMMANDS. THE  
OPERATOR MAY SELECT A NEW COMMAND  
STRING OR A CARRIAGE RETURN TO  
SELECT THE PREVIOUSLY SELECTED  
COMMAND. THE FIRST 3 CHARACTERS  
OF EACH WORD CAN BE TYPED  
TO ABBREVIATE THE ENTRY. THE  
N(NUMBER) ENTRIES MUST BE IN  
OCTAL. A LIST OF THE COMMANDS  
AND THEIR MEANINGS ARE AS FOL-  
LWS:

REWIND REWIND UNIT  
PE SET PE MODE  
NRZ SET NRZ MODE  
\*\*ABOVE 2 ONLY VALID AT  
BOT AND ON 6026 OR 4307 DRIVES

READ N1,N2 READ N1 WORDS  
FROM N2 RECORDS  
WRITE N1,N2 WRITE N1 WORDS  
(OR SAME) TO N2 RECORDS  
RDN N1,N2 READ NON-STOP  
N1 WORDS FROM N2  
RECORDS(6026 DRIVES ONLY)

SPF N SPACE FORWARD  
N RECORDS.  
SPB N SPACE BACKWARD  
N RECORDS.  
REOF READ EOF/FORWARD  
BEOF READ EOF/BACKWARD  
WEOF WRITE EOF  
ERASE ERASE 3" OF TAPE  
LOOP LOOP TO START  
OR LR  
LEOT LOOP ON EOT TO START  
OTHERWISE/LOOP TO LR  
OR START  
LR LOOP RETURN/ IF  
NO LR, LOOP,LEOT  
LOOP TO START

\*\*\* - ALL CSI COMMAND, WITH THE  
EXCEPTION OF REWIND , WILL TIMEOUT  
IF NOT COMPLETED WITHIN 1 MINUTE.

INHIBIT HARD WRITE ERROR RECORD  
ERASES (BOTH AUTO AND SOFTWARE)

15(F) 0 AUTO AND/OR SOFTWARE RETRY ENABLED  
1 DISABLE AUTO AND/OR SOFTWARE RETRY

NOTE - ALL ERRORS ARE CONSIDERED  
HARD BY THE SOFTWARE EXCEPT  
WRITE AND READ PARITY ERRORS,  
(IE, SOFTWARE RETRIES WILL ONLY  
AFFECT PARITY ERRORS).

16(G) 0 NO DMA PRINTER (AT DEVICE 17).

1 THERE IS A DMA PRINTER (AT 17)  
CAN'T HAVE SWITCH 5 ON

OTHER COMMANDS (CTRL = CONTROL KEY DEPRESSED ALONG WITH THE  
SPECIFIED CHARACTER. I.E "CTRL D" MEANS ENTERING  
D WHILE THE CTRL KEY IS DEPRESSED.)

"CR" A "RETURN" CAN BE TYPED TO CONTINUE THE PROGRAM  
AFTER ITS LOCKED IN A SWITCH MODIFICATION MODE

CTRL D THIS COMMAND GIVEN AT ANY TIME WILL RESET "SWREG"  
TO DEFAULT MODE AND RESTART THE PROGRAM.

CTRL R THIS COMMAND GIVEN AT ANY TIME WILL RESTART THE  
PROGRAM. SWICHES ARE LEFT WITH THE VALUES THEY  
HAD BEFORE THE COMMAND WAS ISSUED.

CTRL O TIS COMMAND GIVEN AT ANY TIME WILL CAUSE THE  
PROGRAM CONTROL TO GO TO ODT.

M THIS COMMAND GIVEN AT ANY TIME WILL PRINT THE  
MODIFICATION MODE, WHERE MORE THAN 1 SWITCH  
MAY BE CHANGED.

O THIS COMMAND WILL LOCK THE PROGRAM INTO SWITCH  
MODIFICATION MODE, WHERE MORE THAN 1 SWITCH  
MAY BE CHANGED.

W GET PRINTOUT OF STATISTICS AND ERROR LOG.

CTRL S INHIBIT LOG PRINTOUT - ANY SUBSEQUENT KEY WILL  
RESUME PRINTOUT. ANY OTHER KEY TYPED DURING  
LOG PRINTOUT WILL TERMINATE PRINTOUT.

ERROR CHECKING AND HANDLING/PROGRAM OUTPUT

ALL ERRORS ARE IDENTIFIED AND COUNTED. THE  
PROGRAM, DEPENDING ON THE SWREG REGISTER  
SETTINGS, WILL LOOP ON ERROR, BACKSPACE ACROSS  
FAILING RECORD, EXIT TO ODT, OR CONTINUE. IF  
THE PROGRAM IS LOOPING ON AN ERROR, COMMAND  
REGISTER BIT 11(B) CAN BE USED TO DETERMINE IF THE  
ERROR IS HARD OR INTERMITTENT.

THE FIRST NN ERRORS PER UNIT WILL BE PRINTED  
AND ACCUMULATED PER PASS. AFTER NN ERRORS  
HAVE OCCURED, ALL ADDITIONAL ERRORS WILL  
BE ACCUMULATED BUT NOT PRINTED. NN IS OPERATOR  
SELECTABLE.

# SWITCH SETTINGS

LOCATION "SWREG" IS USED TO SELECT THE PROGRAM OPTIONS THIS LOCATION WILL BE SET ACCORDING TO THE ANSWERS SUPPLIED BY THE OPERATOR. IN ANY CASE THE OPTIONS CAN BE CHANGED OR VERIFIED BY USING ONE OF THE COMMANDS DESCRIBED BELOW.

ONCE THE PROGRAM STARTS EXECUTING THE STATE OF ANY OF THE BITS CAN BE CHANGED BY HITTING KEYS 1-9, A-F. THE PROGRAM WILL CONTINUE RUNING AFTER UPDATING THE OPTIONS. EACH KEY WILL COMPLEMENT THE STATE OF THE BIT AFFILIATED WITH IT, THUS BIT 4 CAN BE ALTERED BY HITTING KEY 4. SETTING OF ANY BIT OF LOCATION "SWREG" WILL SET BIT 0. (DEFAULT MODE IS DEFINED AS ALL BITS OF SWREG SET TO 0)

DIFFERENT BITS AND THEIR INTERPRETATION AT LOCATION "SWREG" IS AS FOLLOWS:

| BIT   | OCTAL VALUE | BINARY VALUE | INTERPRETATION   |
|-------|-------------|--------------|--|
| 1     |             | 0            | LOOP ON ERROR  |
|       |             | 1            | SKIP LOOPING ON ERROR  |
| 2     |             | 0            | PRINT TO CONSOLE   |
|       |             | 1            | ABORT PRINT OUT TO CONSOLE   |
| 4     |             | 0            | PRINT PASS   |
|       |             | 1            | DO NOT PRINT PASS  |
| 5     |             | 0            | DO NOT PRINT ON THE BYTE I/O PRINTER                               |
|       |             | 1            | PRINT ON THE BYTE I/O PRINTER (DEVICE CODE = 17)                   |
| 6     |             | 0            | DO NOT EXIT TO ODT ON ERROR  |
|       |             | 1            | EXIT TO ODT ON HARD ERROR<br>HIT P TO CONTINUE                     |
| 7     |             |              | NOT USED CURRENTLY   |
| 8     |             | 0            | N/A  |
|       |             | 1            | FOR READ ONLY MODE (SA 502)<br>(FOR TAPE INTERCHANGE)              |
| 9     |             | 0            | N/A  |
|       |             | 1            | BYPASS DATA CHECK  |
| 10(A) |             | 0            | PRINT ALL SOFT(DIC) ERRORS   |
|       |             | 1            | INHIBIT ALL SOFT(DIC) ERROR<br>PRINTOUTS (DUAL MODE ONLY)          |
| 11(B) |             | 0            | PRINT EACH ERROR ONCE ONLY   |
|       |             | 1            | PRINT ALL ERRORS ON RETRIES<br>(IE LOOPING ON ERROR)               |
| 12(C) |             | 0            | N/A  |
|       |             | 1            | PRINT ERROR SUMMARY ON PASS  |
| 13(D) |             | 0            | N/A  |
|       |             | 1            | PRINT I/O TRACE ON HARD ERROR<br>(LAST 5 I/O CALL PC'S + COMMANDS) |
| 14(E) |             | 0            | ERASE HARD WRITE ERROR RECORDS                                     |

EXISTS, NO ACTION IS TAKEN.  
OTHERWISE, SPACING OPERATION IS  
ATTEMPTED AGAIN.

SPACING NOT TO EOF - APPROPRIATE  
SPACING OPERATIONS ARE TAKEN TO  
BRING TAPE BACK TO BACKSIDE OF  
EOF MARK DENOTING START OF PRESENT  
FILE. A SPACING OPERATION IS THEN  
TAKEN TO RECORD FROM (IE RECORD WHERE  
ORIGINAL SPACING OPERATION BEGAN).  
THE ORIGINAL SPACING OPERATION IS  
THEN RETRIED.

ALL OTHER TAPE OPERATIONS ARE SIMPLY  
RETRIED.

ERROR PRINTOUTS

\*\*\* ALL N,NN VALUES ARE OCTAL NUMBERS \*\*\*

A. DEVICE STATUS ERRORS

;6XXX MAGNETIC TAPE RELIABILITY -REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;  
;DIA AND/OR DIC STATUS = NN  
;'DESCRIPTIVE ERROR MESSAGES' \*\* FOR EACH FAILING BIT

B. ENDING ADDRESS ERRORS

;6XXX MAGNETIC TAPE RELIABILITY REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;ENDING MEMORY ADDRESS/RECORD COUNT ERROR  
;EXPECTED ACTUAL  
;NN NN

C. DATA + PARITY(CHECK) ERROR

;6XXX MAGNETIC TAPE RELIABILITY REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;  
;DIA STATUS = NN  
;DATA ERROR (BIT 5)  
;GOOD ADDRESS(\*)BAD ADDRESS WORD # GOOD BAD  
;NN NN NN NN NN  
;NN NN NN NN NN  
;  
;TOTAL ERRORS NN

D. DATA WITHOUT PARITY(CHECK) ERRORS

;6XXX MAGNETIC TAPE RELIABILITY -REV AA TEST # NN  
;COMMAND MODE UNIT N RECORDS/BOT N  
;FILE N RECORD N WORD/RECORD COUNT N  
;HARDWARE UNDETECTED DATA ERROR  
;  
;GOOD ADDRESS(\*)BAD ADDRESS WORD # GOOD BAD  
;NN NN NN NN NN  
;NN NN NN NN NN



IF A UNIT LOSES READY OR WRITE LOCK SETS, THE PROGRAM WILL PRINT THE APPROPRIATE ERROR MESSAGE. IF MULTIPLE UNITS ARE BEING TESTED, THE PROGRAM WILL CONTINUE WITH OTHER UNITS, OTHERWISE PROGRAM WILL WAIT FOR OPERATOR INTERVENTION. IF THE UNIT BECOMES READY AGAIN, TESTING ON THE UNIT WILL CONTINUE.

FOLLOWING AN INTERRUPT OR BOT CONDITION (REWIND), DIA STATUS WORD IS CHECKED AGAINST A CHECKWORD. THE ONLY DON'T CARE BITS WILL BE EOF/BOT FOR COMMAND STRING OPERATIONS. ALL STATUS BITS NOT EQUAL TO THEIR EXPECTED VALUES WILL BE INTERPRETED BY DESCRIPTIVE MESSAGE, AND A CORRESPONDING ERROR COUNT (INDEXED BY UNIT, DRIVE MODE, AND I/O MODE) WILL BE INCREMENTED.

#### I/O OR SPACING OPERATIONS

IN ADDITION TO GENERAL STATUS, THE MEMORY ADDRESS REGISTER WILL BE CHECKED TO VERIFY PROPER WORD AND RECORD COUNTING AND ADDRESSING. IF AN ERROR EXISTS, THE CONDITION WILL BE IDENTIFIED, GOOD/BAD VALUES WILL BE PRINTED, AND AN ERROR COUNT WILL BE BUMPED.

#### WRITE ERRORS

IF A WRITE PARITY ERROR IS SOFT, IE PASSES ON ONE OF THE 7 RETRIES, A NORMAL ERROR RETURN IS TAKEN. IF THE ERROR IS HARD, THE FAILING RECORD IS BACKSPACED ACROSS, ERASED, AND THE WRITE IS RETRIED AGAIN. ALL OTHER ERRORS ARE CONSIDERED HARD.

#### READ OPERATIONS

READ OPERATIONS WITH GOOD STATUS OR DATA ERROR STATUS ARE FOLLOWED BY A CORE COMPARE. THE 1ST THREE CORE MIS-COMPARES WILL RESULT IN GOOD/BAD AND ADDRESS INFORMATION PRINTED. AFTER THE 1ST THREE ERRORS, ONLY A TOTAL WILL BE MAINTAINED AND PRINTED. IF THE CORE COMPARE ERRORS WERE NOT ACCOMPANIED BY A HARD DATA ERROR STATUS, A 'DATA ERROR WITH CUT PARITY ERROR' MESSAGE WILL BE PRINTED. OTHERWISE, THE DATA ERROR PRINTOUT WILL BE PRECEDED BY A STANDARD PARITY ERROR STATUS PRINTOUT.

#### HARD ERROR RECOVERY/LOOPING

WRITE ERRORS - FAILING RECORD IS BACKSPACED ACROSS, ERASED, AND THE WRITE IS ATTEMPTED AGAIN.

READ ERRORS - FAILING RECORD IS BACKSPACED ACROSS, AND THE READ IS ATTEMPTED AGAIN.

SPACING TO EOF - IF EOF STATUS

THE COMMAND TO OPEN ONE OF THE INTERNAL REGISTERS IS OF THE FORM "NA" WHERE N IS ANY OCTAL EXPRESSION BETWEEN 0 AND 7

0-3 FOR ACCUMULATORS 0-3 .  
4 FOR PC OF THE NEXT INSTRUCTION TO BE EXECUTED IN THE EVENT OF A "P" COMMAND.  
5 CPU AND TTO STATUS  
BIT INTERPRETATION  
15 STATUS OF TTO DONE FLAG  
14 STATUS OF INTERRUPTS (ION FLAG)  
13 STATUS OF CARRY BIT  
6 ADDRESS OF THE LOCATION HAVING THE BREAK POINT (IF ANY)  
7 INSTRUCTION AT THE BREAK POINT LOCATION

OTHER COMMANDS TO OPEN CELLS ARE:

"ADR"/ OPEN THE CELL AND PRINT ITS CONTENTS  
./ OPEN THE CELL CURRENTLY POINTED TO BY THE POINTER AND PRINT ITS CONTENTS.  
."ADR"/ ADD "ADR" TO THE POINTER, OPEN THE CELL AND PRINT ITS CONTENTS.  
.-"ADR"/ SUBTRACT "ADR" FROM THE POINTER, OPEN THE CELL AND PRINT ITS CONTENTS.  
"CR" THE RETURN KEY IS USED TO CLOSE THE OPEN CELL

WITH OR WITHOUT MODIFICATION.

"LF" LINE FEED IS USED TO CLOSE THE OPEN CELL WITH OR WITHOUT MODIFICATION AND TO OPEN THE SUCCEEDING CELL.

CTRL CLOSE THE OPEN CELL WITH OR WITHOUT MODIFICATION AND OPEN THE PRECEEDING CELL.

/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND OPEN THE CELL POINTED TO BY ITS CONTENTS.

+"ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND OPEN THE CELL POINTED TO BY ITS CONTENTS + "ADDR".

-"ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND OPEN THE CELL POINTED TO BY ITS CONTENTS - "ADR".

MODIFICATION OF A CELL:

ONCE A CELL HAS BEEN OPENED ITS CONTENTS CAN BE MODIFIED BY TYPING THE NEW VALUE THE CELL IS TO CONTAIN IN THE FORM OF AN OCTAL EXPRESSION FOLLOWED BY "CR" OR "LF". IF A + OR - IS TYPED AS THE FIRST CHARACTER OF THE EXPRESSION THEN THE VALUE OF THE EXPRESSION IS ADDED TO OR SUBTRACTED FROM THE OLD CONTENTS OF THE CELL. THE ADDRESS ITSELF OR AN EXPRESSION RELATIVE TO THE ADDRESS CAN BE DEPOSITED BY TYPING A "." OR ;,+/-OCTAL EXPRESSION". A RUBOUT COMMAND GIVEN RIGHT AFTER OPENING A CELL ALLOWS THE MODIFICATION OF ITS CONTENTS AS IF THEY WERE TYPED IN JUST BEFORE THE COMMAND WAS ISSUED.

OTHER ODT COMMANDS:

RUBOUT THIS KEY IS USED TO DELETE ERRONEOUSLY TYPED DIGITS. EACH TIME THE KEY IS PRESSED THE RIGHT MOST DIGIT IS DELETED AND ECHOED ON THE TERMINAL. IF THE RUBOUT KEY IS PRESSED RIGHT AFTER OPENING A CELL THEN IT DELETES THE RIGHT MOST DIGIT OF THE CELLS CONTENTS. THIS ALLOWS THE MODIFICATION OF THE CELL AS IF ITS CONTENTS WERE TYPED IN JUST BEFORE THE KEY WAS PRESSED.

;TOTAL ERRORS NN

; IF DATA ERROR WAS HARDWARE UNDETECTED,  
; AND PROGRAM IS RUNNING MAPPED, FOLLOWING  
; PRINTOUT WILL BE APPENDED.

;MAP TYPE USER (A OR B)  
;READ  
;LOG 1K PHYS 1K DCH LOGICAL  
;NN NN  
;WRITE  
;LOG 1K PHYS 1K DCH LOGICAL  
;NN NN

;\*\*\*NO WRITE DATA IF IN READ ONLY MODE

; (\*) -NOTE, ACTUAL WRITE DATA(GOOD DATA)  
; MAY NOT EXIST IN MEMORY AT TIME OF READ  
; AND THEREFORE THE GOOD ADDRESS WILL NOT  
; BE PRINTED.

; WHEN DATA ERRORS ARE ENCOUNTERED, ONLY THREE ARE  
; PRINTED PER RECORD. WHEN LOOPING IS REQUESTED,  
; STATUS IS PRINTED ON THE FIRST PASS ONLY.  
; IF COMMAND REGISTER BIT 11 IS SET ALL  
; ERRORS WILL BE PRINTED TO VERIFY THAT  
; THE ERROR IS STILL OCCURRING.

; IF THE DATA ERROR WAS HARDWARE DETECTED  
; VIA CRC,ECC, OR PARITY, STANDARD STATUS  
; ERROR PRINTOUT WILL PRECEED THE DATA  
; COMPARE INFORMATION. IF THE DATA ERROR  
; WAS NOT HARDWARE DETECTED, THEN  
; ADDITIONAL MAP AND PHYSICAL MEMORY  
; INFORMATION WILL BE DUMPED IF THE MAPS  
; WERE ENABLED.

;OCTAL DEBUGGER (ODT)

; THIS DIAGNOSTIC IS EQUIPPED WITH A BUILT IN ODT WHICH CAN  
; BE ACCESSED BY HITTING CONTROL 0 AT ANY TIME DURING  
; THE EXECUTION OF THE PROGRAM (AFTER SETTING THE PARA-  
; METERS).

; ON ENTERING ODT THE ADDRESS OF THE LOCATION HAVING THE  
; NEXT INSTRUCTION TO BE EXECUTED WILL BE TYPED-OUT.

; THE FOLLOWING CONVENTIONS ARE USED BY THE ODT:

; ? PRESSING ANY ILLEGAL KEY CAUSES THE ODT TO RES-  
; POND WITH A "?".  
; @ ODT IS READY AND AT YOUR SERVICE.

; AN ODT COMMAND HAS THE FOLLOWING FORMAT:  
; [ARGUMENT][COMMAND]

; AN ARGUMENT MAY BE ONE OF THE FOLLOWING:

; "EXP" AN OCTAL EXPRESSION CONSISTING OF OCTAL NUMBERS  
; SEPARATED BY PLUS (+) OR MINUS (-) SIGNS. LEAD-  
; ING ZEROS NEED NOT BE TYPED.

; "ADR" AN ADDRESS IS THE SAME AS AN EXPRESSION EXCEPT  
; THAT BIT 0 IS NEGLECTED.

; A COMMAND IS A SINGLE TELETYPE CHARACTER

; THE LOCATIONS THAT CAN BE EXAMINED AND MODIFIED BY THE  
; USER ARE CALLED CELLS. THESE CELLS ARE OF TWO TYPES:  
; INTERNAL CPU CELLS AND MEMORY LOCATIONS.

; REVISION HISTORY

; REV 1.00

9/84

KEY-IN, MODIFY MESSAGES, DEVICE CODE  
CHANGE MACRO INCLUDED. ALLOW FOR SWITCH  
SETTING PRIOR TO HELP FOR HARD-COPY  
OF SAME.

9/20/84

LET SET PRINTER SWITCH BEFORE HELP  
USE CSI PRINTER ROUTINES SO CAN HAVE  
DMA PRINTER LATER  
IN SIZING DLIBS, HAVE MV SET FOR NO MAP  
(MV WITH MAPS DOESN'T WORK EVEN  
IN DG DTOS REV 1)  
DON'T USE UNLOAD COMMAND - BMX2  
DOESN'T SUPPORT UNLOAD  
DON'T REFER TO NRZ; MAKE IT NON-PE SO  
CAN BE GCR OR NRZ

=====

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; TABLE OF CONTENTS:

|                           |       |
|---------------------------|-------|
| PAGEZ                     | P. 2  |
| DRIVER                    | P. 3  |
| SIZE (WITHOUT DLIBS RTNS) | P. 4  |
| SEMAP                     | P. 5  |
| SEMEM                     | P. 6  |
| SETUNIT                   | P. 7  |
| INIT                      | P. 8  |
| MAINS                     | P. 9  |
| MAIN.SUBS                 | P. 10 |
| INTER                     | P. 11 |
| IO                        | P. 12 |
| STATUS                    | P. 13 |
| DATA                      | P. 14 |
| ERROR                     | P. 15 |
| LIB                       | P. 16 |
| INPUT                     | P. 17 |
| CMD.STRING                | P. 18 |
| RESPONSES                 | P. 19 |
| ERR.DISPLAY               | P. 20 |
| MESS                      | P. 21 |
| BUFFERS                   | P. 22 |
| MAPIT                     | P. 23 |
| MESS.MAP                  | P. 24 |
| PRT.MAP                   | P. 25 |
| HELP                      | P. 26 |

(INCLUDES TIMER RTN)  
ASSEMBLE WITH PS FROM BUILD.OLDTIMER.PS  
TO GET CLEAN FILECOM. LATER MUST RE-ASM  
USING STANDARD PS.

|           |       |
|-----------|-------|
| SIZE.DLIB | P. 27 |
| MESS.HELP | P. 28 |

-----

ADR B INSERT A BREAK POINT AT LOCATION ADR .  
ONLY ONE BREAK POINT CAN BE INSERTED AND ANY  
ENTRY TO ODT AFTER EXECUTING A BREAK POINT WILL  
CAUSE IT TO BE DELETED.  
D DELETE THE BREAK POINT IF ANY.  
P RESTART THE EXECUTION OF THE PROGRAM AT CURRENT  
LOCATION  
"ADR"R START EXECUTING THE PROGRAM AT "ADR" AFTER AN  
IO-RESET.  
K KILL THE STRING TYPED SO FAR. THE ODT RESPONDS  
WITH A "?" AND THE OPEN CELL IS CLOSED WITHOUT  
MODIFICATION.  
= PRINT THE OCTAL VALUE OF THE INPUT ONLY.  
THIS WILL CLOSE ANY OPEN CELLS WITHOUT  
MODIFICATION AND WILL NOT OPEN A CELL

NOTE: IN PROGRAMS WHICH RELOCATE THEMSELVES THE  
USER SHOULD PLACE BREAK POINTS ONLY IN THE  
ORIGINAL PROGRAM AREA. IF A BREAK POINT IS  
PLACED OUTSIDE THIS AREA THE RESULTS WILL  
BE UNPREDICTABLE.

; NOTES/SPECIAL FEATURES:

1. A CR ONLY RESPONSE TO UNIT NUMBERS, ETC WILL LEAVE  
INFORMATION IN PREVIOUS STATE.
2. THE PROGRAM WILL ACCOUNT FOR UP TO A MAX.  
OF 2\*\*31 WORDS WRITTEN OR READ. SPECIAL  
TEST RUNS EXCEEDING THIS FACILITY WILL  
REQUIRE AN OPERATOR'S TEST LOG TO AUGMENT  
SOFTWARE ACCOUNTING. 2\*\*31 WORDS =  
APPROX. 2\* 10\*\*9 WORDS:
3. ALL NUMBERS ENTERED IN 7.0 MUST BE IN OCTAL.  
ANY NON-OCTAL INPUT IS TREATED AS A LETTER.  
ANY LETTER INPUT FOR RECORD COUNT, WORD COUNT  
GETS RANDOM FUNCTION IN THE RELIABILITY.  
TEST WITH OPTIONS.

; PROGRAM RUNTIME:

PROGRAM THROUGHPUT IS SUBSTANTIALLY INCREASED WITH  
MEMORIES OF 24K OR LARGER. PROGRAM CAN USE UP TO  
56K(MAPPED) IN THE RELIABILITY TESTS. ## SEE 7.1  
RUNTIMES WILL ALSO VARY WITH DRIVE TYPE AND DRIVE  
MODE.

READ,WRITE OPERATIONS ARE TIMED  
BY SPECIAL ROUTINES. WHEN THE PROGRAM IS  
FIRST STARTED, THE TIMING ROUTINE WILL TEST  
FOR THE PRESENCE OF A REAL TIME CLOCK (RTC)  
TO DERIVE TIMING FROM IT. IF NO RTC IS  
PRESENT, THE PROGRAM WILL TYPE "TTO BAUD  
RATE". THIS MESSAGE REFERS TO THE BAUD RATE  
OF THE CONSOLE TERMINAL (DEVICE 10 & 11).  
TYPE IN THE BAUD RATE. IF A TYPING ERROR OCCURS  
IN THE NUMBER STRING (BEFORE THE CARRIAGE RETURN),

SIMPLY TYPE A NON-NUMERIC CHARACTER AND  
THE REQUEST FOR THE BAUD RATE WILL BE  
REPEATED. IF THE CARRIAGE RETURN HAS BEEN  
GIVEN AFTER A TYPING ERROR, RELOAD THE PROGRAM.

\*\*\*\*\*  
; DESCRIPTION: DUAL MODE MAGNETIC TAPE DRIVE DIAGNOSTIC  
;

; PRODUCT OF ZETACO, 1984  
\*\*\*\*\*

.TITLE BMX2D  
X=1  
NOP=101033  
.TXTM 0

;1. PROGRAM NAME: BMX2D.SR

;2. REVISION HISTORY:

; REVISION HISTORY

| REV. | DATE     |   |
|------|----------|---|
| 1.00 | 09/17/84 | INITIAL RELEASE<br>ADDED WRITE RING OPERATOR TEST<br>ADDED UNIT READY OPERATOR TEST<br>REWROTE DEVICE CODE ROUTINE  |
| 2.00 | 09/27/84 | MODIFYING PROGRAM TO INCLUDE<br>4307 EMULATION<br>INSERTED RESPONSE CONCERNING<br>EMULATION (0=4307, 1=6026)<br>REWROTE SET DRIVE MODE<br>INSTRUCTION CHECK<br>REWROTE DENSITY CHANGE ROUTINE<br>SKIPPED POLLING TEST SECTION -<br>4307 DOES NOT SUPPORT THIS<br>DISABLED THE READ NON-STOP TEST<br>4307 DOES NOT USE THIS TEST<br>REWROTE RUNAWAY TAPE CHECK<br>REWROTE ERASE ROUTINE SO BIT 7<br>EQUALS PE IF BOT DURING ERASE<br>REWROTE WRITE ROUTINE SO BIT 7<br>EQUALS PE IF BOT DURING WRITE |
| 2.09 | 10/11/84 | ADDED 4307 REWIND ROUTINE<br>RELEASED   |
|      | 10/23/84 | PHASE II, INITIAL RELEASE<br>OPERATOR WARNING FOR PARITY<br>WRITE RING AND READY UNITS.<br>ILLEGAL COMMAND USED IN PLACE<br>OF DIAGNOSTIC MODE. GENERAL<br>CLEAN UP OF PROGRAM.   |
|      | 2-85     | PAN.<br>DOUBLE SWITCH REGISTER<br>SWITCHES: HELP, HARD COPY, DMA<br>LINE PRINTER<br>HELP AND TEST DESCRIPTIONS<br>CLEANUP REWIND FOR CYPHER   |
|      | 3-85     | CLEANUP TESTS 31 AND 33<br>SWITCH TO BYPASS DRIVE DEPENDENT TESTS   |

ADD SUPPORT FOR 6026 RDOs-THIS  
(REALLY IS SAME AS 6125)  
READ PARAMETERS FROM EEPROM:  
DATA TRANSFER METHOD  
DRIVE DUAL MODE FLAG  
EMULATION  
3.00                    4-85                    UNIT TEST COMPLETE - TO SYSTEM  
TEST AND RELEASE

;3. MACHINE REQUIREMENTS:

- ; A. A NOVA/ECLIPSE OR MV CPU.
- ; B. AT LEAST 10K MEMORY
- ; C. TELETYPE OR CRT.
- ; D. BMX2 MAGNETIC TAPE CONTROLLER AND FORMATTED TAPE DRIVE.
- ; E. PRINTER AT DEVICE CODE 17 (OPTIONAL)

;4. TEST REQUIREMENTS: N/A

;5. SUMMARY:

; THIS PROGRAM IS A DIAGNOSTIC TEST TO DETECT AND  
; ISOLATE FAULTS EXISTING IN THE BMX2 TAPE CONTROLLER  
; BOARD OR TAPE DRIVE.

;6. RESTRICTIONS

; THIS PROGRAM CAN BE RUN WITH ONLY ONE DRIVE ON LINE.  
;  
; IF A RTC IS NOT AVAILABLE THE TERMINAL BAUD RATE IS  
; USED TO SET THE TIMING CONSTANTS. THE PROGRAM ASSUMES  
; THAT ALL 110 BAUD TRANSMISSION CONSISTS OF 11 BITS/CHAR  
; AND THAT ALL OTHER BAUD RATES HAVE 10 BITS/CHAR.

;7. PROGRAM DESCRIPTION/THEORY OF OPERATION

; THE PROGRAM IS DIVIDED INTO TWO PARTS.  
; THE FIRST PART DEALS WITH THE CONTROLLER  
; BOARD. IT CONSISTS OF A NUMBER OF INDEPEN-  
; DENT TESTS MOST OF WHICH WILL ISSUE AN ILLEGAL  
; COMMAND WITH A START PULSE. WHEN THE CONTROLLER  
; COMPLETES ITS OPERATIONS IT SETS DONE. THE  
; HOST PROGRAM WAITS FOR THE DONE FLOP TO SET  
; BEFORE IT ANALYZES THE RESULTS OF THE OPERATION.

; THE SECOND PART DEALS MAINLY WITH COMMANDS TO  
; THE DRIVE. IF A DUAL MODE DRIVE IS BEING TESTED  
; BOTH MODES ARE AUTOMATICALLY EXERCISED DURING  
; EVERY PASS. WHEN LOOPING ON THE DIAGNOSTIC THE  
; END OF A PASS IS NOTED WITH AN "END" DISPLAY.

;9. OPERATING PROCEDURE/OPERATOR INPUT

- ; A. LOAD USING THE BINARY LOADER
- ; B. STARTING ADDRESSES:
  - ; 200 - START DIAGNOSTIC FOR FIRST PASS.
  - ; 500 - SAME AS 200.

;10.0 PROGRAM OUTPUT/ERROR DESCRIPTION

; WHEN AN ERROR CONDITION OCCURS THE PROGRAM  
; DISPLAYS THE FOUR ACCUMULATORS AND THE PC AT  
; THE POINT OF ERROR. THE SIGNIFICANCE OF THIS  
; INFORMATION IS EXPLAINED IN THE LISTING.  
; GENERALLY, WHERE EVER POSSIBLE, ACO WILL CONTAIN  
; THE RECEIVED DATA, AC1 WILL CONTAIN THE  
; EXPECTED DATA, AC2 WILL BE THE LOOP COUNTER  
; AND AC3 WILL CONTAIN THE ADDRESS FROM  
; WHERE THE SUBROUTINE WAS CALLED.  
; THE ACTION OF THE PROGRAM AFTER THE ERROR  
; OCCURRENCE IS DICTATED BY THE SWITCH SETTINGS  
;

;12. SPECIAL NOTES/SPECIAL FEATURES

; THE DIAGNOSTIC WILL WRITE ON THE ENTIRE TAPE.  
; THEREFORE, ONLY A SCRATCH TAPE SHOULD BE USED.  
; TO SAVE TIME WHEN RUNNING THE "END OF TAPE"  
; TESTS OF PASS 1, A SHORT TAPE CAN BE USED.  
; ALTHOUGH A DUAL MODE CONTROLLER BOARD CAN BE TESTED  
; WITHOUT A TAPE DRIVE A COMPLETE CHECKOUT OF THE BOARD  
; REQUIRES A DRIVE. THERE ARE CERTAIN CIRCUITS ON THE  
; BOARD THAT ARE ONLY CHECKED BY RUNNING THE ENTIRE  
; DIAGNOSTIC PROGRAM.  
;