TM11-7010-200-10-9-1

TECHNICAL MANUAL

OPERATOR'S INSTRUCTIONS

SYSTEM TEST PROGRAM
AN/UYQ ( )
TYPE IS/1000

HEADQUARTERS
DEPARTMENT OF THE ARMY
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" # JO861 (10)
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NG: NONE

USAR: NONE

For explanation of abbreviations see, AR 310-50.

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SECTION 1
INTRODUCTION

1.1 PURPOSE

The purpose of this manual is to provide all the console control information including system directives and message outputs required by the service engineer to run the system test program (STP).

1.2 SCOPE

The information in this manual is intended to provide support as follows:

- For operating the STP to verify system integrity.
- For isolating malfunctions to the controller-device level.

1.3 CONTENT

This manual consists of 14 sections. The sections of the manual and their respective contents are as follows:

- Section 1: Introduction. Describes the manual by defining the purpose, scope, and prerequisites for use.
- Section 2: Description. Describes the software requirements, configurations, and system control directives.
- Section 3: Operation. Provides the manual procedures for operating the system including use of the operator directives, and describes message outputs.
- Sections 4 thru 14: 'TST' Test Modules. Describes the functions, directives, and message outputs for the 'TST' test module. Test modules are listed in Section 2.

1.4 PREREQUISITES/USE

System operators using this manual should be familiar with the operation of the GTE/IS communications processor control panel, control consoles, and peripheral devices.

1.5 DOCUMENTATION

The following publications support this manual:

- BOO06 Read/Write and Read-After-Write Magnetic Tape Controller Field Maintenance Manual.
- BOO07 Medium Capacity Removable Disc Controller Field Maintenance Manual.
- BOO13 NRZI, Phase Encoded and Universal Magnetic Tape Controller Field Maintenance Manual.
- BOO29 Card Reader/Line Printer Maintenance Manual.

- B0031 Line Multiplexer Unit Maintenance Manual.
- B0032 Discrete Digital Input/Output subsystem Maintenance Manual.
- BOO33 Line Switch Subsystem Maintenance Manual.
- BOO34 High-Capacity Disk Controller Maintenance Manual.
- BOO35 Drum Memory Group Maintenance Manual.
- BOO40 Interval Timer; Real-Time Clock, and Audible Alarm Maintenance Manual.
- E0006 IS/1000 communications Processor User's Manual.
- E001O IS/1000 Utilities User's and Operating Procedures Manual.

1.6 CONVENTIONS

The following conventions are used in this manual:

- "TST" refers to the 3-letter test module mnemoic.
- ( ) Specifies an optional parameter in a job control command statement or a control parameter list.
- $ preceding a constant specifies a hexadecimal number. For example: $3BF7.

SECTION 2
DESCRIPTION

2.1 GENERAL

The STP is a system program the main function of which is to verify the proper operation of a system whose units have been successfully tested at the unit level. The program is designed to test worst-case operations, that is, the maximum number of devices are exercised simultaneously to prove system capability.

The STP requires the physical environment of a basic system in which to operate. The system must be functioning efficiently enough to execute the program. All units of the system must have successfully completed unit test prior to systems test.

The STP consists of three basic parts as follows:

- System executive.
- System data base.
- Test modules.

2.1.1 System Executive

The STP contains a stand-alone system executive. The system executive is partitioned into three functional parts as follows:

- Executive configuration routines.

  Enable the system to accept and execute the executive directives. The executive directives are used to modify the system data base, and standard parts of test module data bases.

- Executive operation routines.

  Used to direct the test-oriented real-time and non-real-time operations.

- Executive utility routines.

  Special service routines provided for the use of the independent test modules.

2.1.2 System Data Base

The system data base consists of non-executable data which require common access by the system test modules. The data are grouped in tables.

2.1.3 Test Module

Test modules are a group of routines configured to test all the functions of a specific device directly as in the case of the core memory, or indirectly via the device controller as in the case of

the universal magnetic tape. A separate test module is required to test the controller of a specific device; each test module can drive up to 16 controllers,

The test modules and their mnemonics are as follows:

CPA	Communications Processor Unit.
MEM	Memory.
UMT	Universal Magnetic Tape.
DSK	Model 5060 Disk.
RTA	Real-Time Clock/Audible Alarm.
LMU	Line Multiplexer Unit.
HCD	High Capacity Disc.
LSS	Line Switch Subsystem.
CDR	Card Reader.
DDI	Discrete Digital I/O Subsystem.
DMD	DMA Drum.

2.2 SYSTEM CONTROL DIRECTIVES

2.2.1 General

2.2.1.1 Purpose and Use

Directives are commands to the system input by the system operator to configure and control the operation of the system under test. The console is used to input the directives. Additionally, several general directives are imposed on the system by the SENSE switches on the processor control panel.

2.2.1.2 Classification

System control directives are divided into two groups as follows:

- Executive directives - pertain to all test modules.
- Module directives - pertain to a particular test module.

2.2.1.3 Form

Each directive is defined as a three-letter mnemonic function followed by a colon. The function can be succeeded by a series of parameters and subparameters which differ in delimiters as follows:

- Parameters - delimiters are semicolons.
- Subparameters - delimiters are commas.

Directives may include parameters, subparameters, or a combination of both. A parameter may consist of a grouping of subparameters. The directive or the directive and parameter string are always

terminated by a carriage return (CR). If the parameter string cannot be contained on one line, a continuation character > is used to continue the string on the next line. Entries into the machine are in free-field form.

2.2.1.4 Test Module Parameters

The following discussion applies to both parameters and subparameters. Test module parameters identify the test modules and controllers and provide controls for the directive. The types of parameters are as follows:

- Test module or module controller - A test module directive may be followed by a parameter referencing a test module or a test module controller. A parameter referencing a test module is defined as a three-letter mnemonic label.

  Example: DSK;MEM

  In most systems there will be only one of each type of controller; therefore, the controller unit number will normally be zero.

  A parameter referencing a controller is defined as a three-letter mnemonic label followed by the controller unit number in decimal or hexadecimal notation.

  Example: DSK 0

- Control - A control parameter contains up to five decimal or four hexadecimal characters.

  Example: A;R;100;$5555

2.2.1.5 Delimiters

The following delimiters are available for use in directive expressions:

[/] ← ! " # % & ( ) * + , - . / : ; < = ? @ .

These characters *are* recognized as 8-bit ANSCII characters.

2.2.1.6 Unacceptable Data

If unacceptable data has been keyed in, the standard rejection message (??) is output. All the data between the last two delimiters has been rejected. The operator can then enter new data for all the rejected data.

2.2.2 Executive Directives

There are two classes of executive directives as follows:

- Static - Directives that can be input by the user only while the system is not in operation. These directives are as follows:
  - ALT alter directive.
  - SEQ sequence directive.

- **FRE set frequency directive.**
- RUN run directive.
- CNT pass counter directive.
- ADM add memory directive.
- DEM delete memory directive.
- COM common interrupt directive.
- INT interrupt directive.
- DEV device address directive.
- IOP I/O processor directive.
- OVR override directive.
- DMP memory dump directive.
- REC reset error count directive.
- LOG log directive.

- Dynamic - Directives that can be input by the user while the system is in operation. These directives are as follows:
  - ALT alter directive.
  - HLT halt directive.
  - TIM time directive.
  - LOG log directive.
  - TOD time of day directive.
  - MSG message directive.
  - REC reset error count directive.

  In addition, there are several general directives determined by the settings of the SENSE switches on the processor control panel.

2.2.2.1 Static Directives

There are 15 static directives as follows:

Alter Directive (ALT). This directive enables the user to alter the contents of any memory location or succession of memory locations. The directive is followed by two parameters. The first parameter designates the memory location whose contents are to be altered, or the first of successive memory locations. The second parameter consists of the altered contents of the successive locations.

Examples: ALT:$lDEF;$FFFE

This directive alters the contents of memory location $lDEF to -2 ($FFFE).

ALT:$lDEF;$FFFE,$FFFF,O

This directive alters the contents of successive memory locations $lDEF, $lDFO, and $lDFl to -2 ($FFFE), -1 ($FFFF),and 0 respectively.

Sequence Directive (SEQ) This directive enables the user to designate the order in which the STP executes the test modules. Any or all of the selected test module controllers can-be exercised. The specific controller depends on the RUN directives. The parameters are listed in the desired sequence of testing.

Example: SEQ:MEM;DSK

The program sets up the sequence table ready to start execution of the memory (MEM) test module, to be followed by execution of the model 5060 disk (DSK) test module.

Set Frequency Directive (FRE). This directive, effective only when a line timer (real-time clock) is in the system, enables the user to specify the frequency of the primary power supply. The parameter is the frequency in Hz and is limited to 50 or 60. If the directive is not used, the frequency defaults to 60 Hz.

Example: FRE:50

This directive specifies a 50 Hz primary power supply.

Run Directive (RUN). This directive enables the user to designate the controllers to be tested. This directive can designate only those controllers which have been previously sequenced.

If all the controllers of a particular device are to be exercised, the parameter consists of the test module mnemonic. If selected controllers are to be exercised, the parameter consists of the controller mnemonics.

The RUN directive alone reactivates all previously sequenced test modules and repeats the tests as configured with the last RUN directive. General control parameters are as follows:

- C - directs the program to test all devices concurrently, or continuously.
- S - directs the program to test all devices sequentially.
- R - directs the program to report via the video monitor as each test is completed and when the entire system has been tested.
- NR - negates the R parameter.
- A - directs the program to allocate a different memory area for the I/O buffers each time a test module has been completed.
- NA - negates the A parameter.

All necessary system configurations must be completed prior to issuing the RUN directive. The RUN directive initiates execution of the designated test modules.

Examples: RUN:MEM;DSK;C

This directive tests the memory and the disk controller. The tests are run concurrently.

RUN:S,R,A

This directive reactivates all previously sequenced test modules. The tests are executed sequentially. The completion of each test and the completion of the testing of the entire system are reported via the video monitor. A different memory area is allocated for the I/O buffer each time a teat module is completed.

Pass Counter Directive (CNT). This directive permits the user to control the number of times a given controller is exercised during the system test, The parameters consist of the test module or controller mnemonic and the pas; count in decimal or hexadecimal notation. General control parameters are as follows:

- H - each controller will halt when its pass counter expires.
- R - each controller will re-initialize its pass count and continue running if the RUN:C directive has been issued.

Examples: CNT:DSK,20,H

The DSK controller is primed to be exercised twenty times and then halted.

CNT:20

The pass count of each previously sequenced controller is set to twenty.

CLUT:DSK,$10

The pass count of the DSK controller is set to sixteen.

CNT:H

Each previously sequenced controller is primed to halt when its pass counter expires.

CNT:R

Each previously sequenced controller is set to re-initialize its pass count and continue running if the RUN:C directive has been issued.

CNT:DSK,R;MEM,30,H;CDR,l00

This example shows how several count parameters can be input using a single count directive.

Add Memory Directive (ADM). This directive enables the user to increase the core memory available as buffers for exercising the STP after using the DEM directive. The memory is increased in 4096-word blocks. The parameters are the affected block numbers for addresses $N000 thru $NFFF.

Example: ADM:5,6,8

This directive adds block 5 (addresses $5000 thru $5FFF), block 6 (addresses $6000 thru $6FFF), and block 8 (addresses $8000 thru $8FFF) to the current core memory being exercised.

Delete Memory Directive (DEM). This directive enables the user to decrease the core memory available as buffers for exercising the STP. The memory is decreased in 4096-word blocks. The parameters are the affected block numbers for addresses $NOOO thru $NFFF.

Example: DEM:3,6,4

This directive deletes block 3 (addresses $3000 thru $3FFF), block 4 (addresses $4000 thru $4FFF), and block 6 (addresses $6000 thru $6FFF) from the current core memory being exercised.

Common Interrupt Directive (COM). This directive allows the user to reconfigure common interrupt assignments. The directive is followed by two or more parameters. The first parameter defines the device address range and the interrupt level. Subsequent parameters must contain three subparameters. The first subparameter designates the controller. The second subparameter designates the interrupt within the controller. The third subparameter designates the ICI bit assigned to that interrupt within the controller.

Example: COM:$10,5;DSK0,B,3;CDR0,A,5

This directive assigns interrupt B of the DSK controller and interrupt A of the CDR controller to interrupt service routine for device addresses $10 thru $lF and level 5. Also the ICI bit assigned to DSK interrupt B is bit 3 and the ICI bit assigned to CDR interrupt A is 5.

Interrupt Directive (INT). This directive enables the user to reconfigure interrupt assignments. The controller parameters consist of three subparameters. The first subparameter designates the controller. The second subparameter designates the address level within the controller (A, B, or C). The third subparameter assigns the interrupt level (0 thru 15).

Example: INT:DSKO,A,6

This directive assigns interrupt A in the DSK controller to interrupt level six.

Device Address Directive (DEV). This directive enables the user to reconfigure controller device address assignments. The controller parameters consist of three subparameters. The first subparameter designates the controller. The second subparameter designates the address level within the controller (A, B, or C). The third subparameter designates the device address number.

Example: DEV:DSKO,A,32;DSKO,B,33;DSKO,C,48

This directive assigns device address numbers 32, 33, and 48 to address levels A, B, and C respectively of the DSK controller.

I/O Processor Directive (IOP). This directive enables the user to reconfigure the channel number assigned to high rate devices working through the IOP. However, this directive is not used because there are no IOP devices in the system.

Override Directive (OVR). This directive permits the user to start operation of the system test although the system will overload because too many devices will be running concurrently. No succeeding parameters are necessary. This directive is not to be used other than after a SYSTEM OVLD message.

Memory Dump Directive (DMP). This directive allows the user to output designated areas of core memory to the console monitor. The output will be in 8 locations (words) per line, each line preceded by the location of the first word in the line and four spaces. Words are separated by one space, groups of four words by two spaces, every two groups by four spaces. The first parameter is the memory area. Memory areas are designated by the absolute address in decimal or hexadecimal notation or by buffer name and controller number. Designating the buffer name is useful when the user does not necessarily know the absolute addresses of the buffer as would be the case if the program were using the I/O buffer reallocation feature. The second parameter is the output device: OCN for the console monitor.

Examples:. DMP:$200 - $230;OCN

The directive initiates a memory dump of the contents of memory locations 200_{16} thru 230_{16} to the console monitor.

DMP:DSKO;OCN

This directive requests a memory dump of the DSK controller buffers to the console monitor.

Reset Error Count Directive (REC). This directive enables the user to reset any or all of the error counts for one or more controllers. The parameter consists of the controller mnemonic.

Examples: REC:DSKO

This directive resets the error count for DSK controller 0.

REC

This directive resets all error counts.

Log Directive (LOG). This directive enables the user to monitor the running log of any designated controller while the system is in operation. The log is output on the console monitor, and contains the buffer location, the total error count, the total pass count, and the current contents of the error queue, of the designated controller.

The parameters consist of the controller mnemonics.

The log directive alone results in the logs of all previously sequenced devices being printed out.

The information output resulting from the log directive is as follows:

XXXN YYYY Z W hh:mm:ss

Where XXX = the test module mnemonic label.
N = the controller number.

YYYY = the present buffer address.
Z = cumulative number of errors since the last REC or RUN directive
W = number of passes completed.
hh = time of day (hours), in 24-hour time.
mm = time of day (minutes).
ss = time of day (seconds), at 2-second intervals.

Examples : LOG:DSK;HCD

The first parameter instructs the program to output the log of all DSK controllers. The second parameter directs the program to output. the log of the HCD controller.

LOG

This directive is used to output the log for all sequenced devices,

LOG:DSKO input

DSKO 3030 0 5 4:25:2 printout

The DSK controller has a current buffer memory address of 3030. There were no cumulative errors since the last RUN directive= Five passes were completed and the time of day is 2 seconds past 4:25 a.m.

If the LOG directive is used in the sequential mode, the output will not be received until the module starts running.

2.2.2.2 Dynamic Directives

There are seven dynamic directives as follows:

Alter Directive (ALT). Same as static directive ALT.

Halt Directive HLT). This directive enables the user to stop the execution of designated test modules or individual controllers. This directive can be issued at any time.

Examples: HLT

This directive causes the program to stop testing of all the currently active controllers.

HLT: DSK

This directive directs the program to halt just the DSK controller and leave all other designated controllers active.

Time Directive (TIM). This directive enables the user to specify a minimum time interval between executions of the designated test module.

The first subparameter designates the test module. The second subparameter, expressed in decimal or hexadecimal, represents the time interval in tenths of a second. The maximum time interval that can be selected is 16383 tenths of a second. The parameter R stops the interval timer for each test module.

Examples: TIM:DSK,100;HCD,500

This directive specifies a minimum time interval of 100-tenths of a second between executions of the DSK test module and 500-tenths of a second between executions of the HCD test module.

TIM:R

The interval timer for each test module is stopped.

Log Directive (LOG). Same as static directive LOG.

Time of Day Directive (TOD). This directive enables the user to pass to the real time clock the time of day. This action allows the real time of error detection to be included in error printouts. The real time readout is accurate for a total of 24 hours. The first subparameter is the hour setting from 0 to 24, and the second subparameter is the minute setting.

Example: TOD:15:10

Here the real time clock is set at 3:10 p.m.

Message Directive (MSG) This directive allows the user to select the console monitor for error message printouts. The parameter is OCN for the console monitor. If no parameter is used, the output is to the console monitor.

Examples: MSG:OCN

This directive will result in error message outputs to the console monitor.

Reset Error Count Directive (REC). Same as static directive REC.

SENSE Switch Controls. The SENSE switches on the processor control panel provide the user with optional controls of the STP. SENSE switch settings and controls are listed in. Table 2-1.

Table 2-1. SENSE Switch Settings (Sheet 1 of 2)

SENSE Switch	Position	Program Control	Remarks
SSW1	ON	Halt on reject or unexpected interrupt.	
	OFF	Retry or continue.	If an excessive number of unexpected interrupts or rejects occur, a halt will occur. If the error is a reject, the cause of the halt is determined by resetting the system and actuating the RUN switch. The reject error message

Table 2-1. SENSE Switch Settings (Sheet 2 of 2)

SENSE Switch	Position	Program Control	Remarks
			will be output, and control returned to the configuration routine. If the error is an unexpected interrupt, the contents of the I-Register are noted before resetting the system. The error halt conditions are listed in Paragraph 3.6.
SSW2	ON	Suppress error and completion message printouts.	
	OFF	Print all error and completion messages.	
SSW8	ON	Emergency abort.	Returns control to configuration routine without regard to device operation. If SSW8 is on, a test module may not have completed its test, and its device may still be operating.
	OFF	Normal operation.	

2.3 MODULE DIRECTIVES

2.3.1 Purpose and Use

Each test module may have a unique set of directives used to configure that test module. These directives are used in conjunction with the universal executive directives. After the test module is configured, the executive directives SEQ and RUN select and execute the desired test module. The SEQ and RUN directives are entered as follows:

```
SEQ:xxx
RUN:XXX
```

Where XXX is the test module mnemonic.

If all the test modules in the assembled system are to be run, the RUN directive is as follows:

```
RUN
```

Program execution commences with the RUN directive.

2.3.1.1 Form

Each directive is defined as a three-letter mnemonic function and is always used with the test module mnemonic and often a call symbol. This combination is the configuration call statement. Directives may include parameters, subparameters, or a combination of both. Delimiters are required as shown for each test module directive. The directive or the directive and parameter string are always terminated by a carriage return (CR). If the parameter string cannot be contained on one line, a delimiter is used to continue the string on the next list.

2.3.1.2 Delimiters

Delimiter	Expression
Colon(:)	Call symbol.
Semicolon (;)	Test module controller. Directive followed by a second directive. Parameter followed by a directive.
Comma (,)	Directive followed by a parameter. Parameter followed by another parameter.
Dash (-)	Between two parameters which are the first and last of a contiguous series.
Greater than (>)	(Line continuation) end of input line(s) when call sequence requires two or more lines.
Carriage return (CR)	Follows last item of call sequence.

2.3.1.3 Unacceptable Data

If unacceptable data has been keyed in, the standard rejection message (33) is output. The operator can then enter new data, The last parameter or directive before the ?? is effectively deleted.

2.3.2 Test Module Directive Summary

Table 2-2 is a summary of the test module directives These directives are described in detail in the respective sections for each test module.

Table 2-2. Test Module Directives Summary (Sheet 1 of 3)

Module	Directive	Variable
CPA	(None)	
MEM	CME:MEM;BIT CME:MEM;RPL CME:MEM;UAD CME:MEM;BYT	N = no. words

Table 2-2. Test Module Directives Summary (Sheet 2 of 3)

Module	Directive	Variable
	CME:MEM;RNM CME:MEM;PRB CME:MEM;ALL CME:BSZ;N,DIR(1),DIR(2),... DIR(x)	
UMT	DEL:UMTx;a,b,c,d ADD:UMTx;a,b,c,d PAR:UMTx;a,b,c,d;P BUF:UMTx;dddd	a,b,c,d = units P = parity dddd = no. words
DSK	FIX:DSKm;n,(S or D),(F or R), (($BA-$EA) or A)	S = single D = double F = fixed R = removable BA = begin address EA = end address A = all addresses
RTA	CYC:RTA,N	N = 2-second periods
LMU	LIN,a,b,c-e CLK,a RTX,a CSZ,a SBS,a PAR,a LUP,a BSZ,a PAT,a	a,b,c-e = line numbers a = index values
HCD	DEL:HCDx;a,b,c,...h ADD:HCDx;a,b,c,...h NDR:HCDx;n CYL:HCDx;D(1),B(1)-E(1),D(2), B(2)-E(2),...D(N),B(N)-E(H) TST:HCDx;Tn	a,b,c,...h = units n = no. active units D = drive number B = begin cylinder E = end cylinder Tn = test number
LSS	(None)	
CDR	CRM:CDRx:MODE CRS:CDRx;SSS	MODE = data mode BIN, HOL, or PKD SSS = cards per minute

Table 2-2. Test Module Directive Summary Sheet 3 of 3)

Module	Directive	Variable
DDI	LPX:DDI;N(1),N(2),Fn-Ln,N(x)	N = group/line number Fn = first group/line no. Ln = last group/line no.
DMD	BEG:DMDx;N	N = No. of 16-track groups not tested (0-4)
	DTS:DMDx;m,n	m = no. drums n = no. tracks on last drum (64-512), nearest 16

SECTION 3
OPERATION

3.1 GENERAL

3.1.1 Modes of Operation

The STP II operates in two modes: foreground and background. Test modules are written using any combination of these modes. A test module service routine is defined as that background routine which performs periodic functions required by the test module.

The test module is entered in the background mode for the initial start up of the controllers, and thereafter for periodic servicing of the controllers selected for testing. The test modules are entered in the order listed in the sequencing directive (SEQ), or in the order of the original test module assembly. The STP executive operates in the background mode except for the real time clock/ interval timer service routines.

3.1.2 Operating Procedures

The operating procedures are manual actions performed by the system operator to execute the STP. The system controls, indicators, and peripheral devices such as the processor control panel and the console are used in the system operation.

During operation of the STP, operator messages will be output to the console monitor, and error codes will be displayed. Refer to Paragraph 3.5 for the operator messages. Refer to Paragraph 3.6 for an explanation of the error code displays.

The operating procedures, along with the STP software, enable the operator to perform the following functions:

- Load Program.
- Select Operating Modes.
- Output Operator Messages.
- Display Error Codes.

Whenever the STP indicates system malfunctions, perform the trouble-shooting procedures and any required maintenance, including unit tests. When maintenance has been completed, rerun those test modules that failed, or if the type and extent of the malfunctions so dictate, the entire STP.

3.2 HARDWARE SYSTEM CONFIGURATION

The hardware system must be in the proper configuration to enable the STP to execute properly. Perform hardware system configuration as follows:

1. Ensure that there is a processor with sufficient core memory for the STP.

2. Ensure that a console/monitor or equivalent is in the system.

3. Ensure that a processor control panel or equivalent is in the system.

4. Ensure that all controllers to be tested are installed.

5. Ensure that all devices required with controllers are installed.

6. In order to perform the STP, the system must be isolated from all external systems., Ensure that all test cabling connections and other wiring changes for each particular controller are performed. Configure identification (ID) of all devices to be tested.

   a. For DDIO tests, connect cable assembly 104208 between each set of DIG and DOG expansion modules.

   b. For LMU tests, connect LMU external-loop test connector 104241 to I/O interface connector of any LIA to be tested in the external mode.

   c. Since the Model 5060 disk drives are series connected, the ID numbering is O-l-2-3. The terminator is installed on the functionally last unit. If only one disk drive is in the system, the terminator is installed on this unit.

      If there are two or more disk drives in the system, the functionally last disk drive (which contains the terminator board) must always be actively (power up) in the system to enable the other disk drives to function properly. Another disk drive cannot be designated as terminal unless the terminal board is installed. Installing the terminal board is a screwdriver operation.

      Configure the 5060 disk drives for required ID.

   d. Since the Model 2312-compatible high-capacity disc drives are series connected, the ID numbering is O-l-2-3-4-5-6-7. The terminator is installed on the functionally last unit. If only one disc drive is in the system, the terminator is installed on this unit.

      If there are two or more disc drives in the system, the same rules apply as for the 5060 disk drives.

      The disc drives are identified by ID plugs. Configure the disc drives for the required ID.

   e. Since the tape transports are series connected, the ID numbering is O-l-2-3. The terminating resistors are installed on the functionally last unit. If only one unit is in the system, the terminators are installed on this unit.

      If there are two or more tape transports in the system, the (functionally) last tape transport (which contains the terminators) must always be actively (power up) in the system to enable the other tape transports to

function properly. The first tape transport cannot be designated as terminal unless the terminator (resistors) are installed. Installing terminators is a soldering operation.

Determine tape transport ID numbers by sequence of, cabling. First unit is zero.

f. Determine drum ID numbers by drum controller connectors. Connector J11 is associated with drum 0; J12 with drum 1.

7. When hardware system is configured, apply power to all equipment.

8. Ensure that all recording devices are scratch or that selected tracks are write protected. Mount scratch tapes on all tape transports to be tested. Refer to disk and drum directives.

3.3 PROGRAM LOADING

Load the STP in accordance with the operational system loading procedures.

3.4 OPERATING MODES SELECTION

The system can be operated in various operating modes. The operating modes are listed and briefly defined in Table 3-l. The operator can change modes as desired and can use more than one mode at a time. All directives are entered on the console and are terminated with carriage return (CR). Where test modules are specified in the directives, controllers can be substituted by adding the controller number to the test module mnemonic.

3.4.1 Load-and-Go Run Mode

In this operating mode, the system is tested as configured at assembly time. Each test module is exercised once and every available controller in each test module is tested once.

Perform load-and-go run mode as follows:

1. Enter the following directive:

   RUN:R

   The R parameter enables the completion message for each test module.

2. Verify that completion messages are output for each test module.

3. Verify that the following message prints out:

   SYSTEM TEST PROGRAM II

   The STP is completed.

Table 3-1. Operating Modes

Mode	Operation
Load-and-Go Run Mode	System tested as configured at assembly time.
	Each controller exercised as assembled, sequentially.
Continuous Run Mode	System configured by operator.
	System runs continuously until halted by operator.
• Timed Restart Mode.	Test modules exercised at timed intervals.
• Memory Allocate Mode.	Controllers exercised limited number of times for each test module start.
	Memory core reallocated after each test module stop.
• Continuous/ Concurrent Mode.	Test modules exercised concurrently and continuously until halted by operator.
Single-Cycle Run Mode	System configured by operator.
	Test modules exercised limited number of times.
• Single-Cycle Concurrent Run Mode.	Test modules exercised concurrently.
• Single-Cycle Sequential Run Mode.	Test modules exercised sequentially.

4. If there were no error messages, perform system shut-down procedures.

   If there were ***error*** messages, proceed to Paragraph 3.4.2 or 3.4.3 for continuous run mode or single-cycle run mode.

   Rerun the STP. If there are still error messages, perform troubleshooting and maintenance procedures.

3.4.2 Continuous Run Mode

In this operating mode, the system can be configured by the operator during system operation. All the operator directives are valid. Tests are always run as last configured. The directives are used to make the configuration changes. The symbol TST will be used to designate any test module mnemonic.

There are three continuous run modes as follows:

- Timed restart mode.
- Memory allocate mode.
- Continuous/concurrent mode.

The test module or system test must be stopped to enter static directives.

To stop a test module or the system test, enter the following directive:

```
HLT:TST
```

Or

```
HLT
```

To start a test module or the system test, enter the following directive:

```
RUN:TST
```

Or

```
RUN
```

3.4.2.1 Timed Restart Mode

The timed restart mode is used to specify the time between restarts of a given test module. The time is input in tenths of a second. The range of the time interval which may be used is from zero to 16383 tenths of a second, or a maximum restart period of 27.3 minutes.

More than one test module may be timed for restart at various intervals by delimiting the parameters by semicolons.

The timed restart mode will operate concurrently with the memory allocate mode. When both are selected, the test module memory will be reallocated, but the test module will not be restarted until the period specified has been completed.

Perform timed restart mode as follows:

1. Enter the following directives:

```
TIM:TST,SS
RUN
```

Where :

SS is the time between restarts in tenths of a second.

Test module TST will be restarted every SS tenths of a second.

2. Enter the following directive:

   TIM:TST,R

   R is the interval reset command.

   The interval for the TST test module will be set to zero, indicating it is not to be restarted by timed restart,

3.4.2.2 Memory Allocate Mode

The memory allocate mode is used to stop the test module after the test module has exercised its device the number of times specified in the pass counter field of each controller. After the device test module has stopped, the memory /Allocate routine will reallocate for each controller tested the amount of core required for the controller use. The allocate routine will then determine if a timed restart condition is pending. If there is, the allocate routine will defer to the timed restart routine. If no timed restart is pending, the allocate routine will cause the test module to be restarted.

The memory allocate mode is entered by use of the A parameter in the RUM directive.

Perform memory allocate mode as follows:

1. Enter the following directives:

   HLT: TST

   CNT:TST,TT

   RUN:TST,A

   Where :

   TT is the pass count of test module TST.

   A is memory allocate command.

2- Enter the following directive:

   RUN:TST,NA

   The program will be taken out of the memory allocate mode.

3.4.3 Continuous/Concurrent Mode

The continuous/concurrent mode is used to exercise the test modules continuously and concurrently instead of sequentially. The concurrent mode can be used with the timed restart mode, the memory allocate mode, or with both. In this case, each test module will be halted, and then restarted when the proper conditions are met. To cause the test modules to run without stopping, the CNT directive must be used with the R parameter before using the RUN directive with the C parameter.

The continuous/concurrent mode is entered by issuing the directives:

CNT:R

RUN:C

Perform continuous/concurrent mode as follows:

1. Enter the following directives:

   HLT

   CNT:R

   RUN:TST(1),TST(2),...TST(N),C

   Where :

   TST(1),TST(2) ,...TST(N) are the test modules to be exercised concurrently.

   C is the test concurrently command.

2. Enter the following directives:

   HLT

   CNT:H

   RUN

   Each previously-sequenced TST test module will halt when its pass counter expires.

3.4.4 Single Cycle Run Mode

In this operating mode, as in the continuous run mode, the system can be configured by the operator during system operation. All the operator directives are valid. Test modules can be run for a specific number of passes and then automatically halted. The number of passes is determined by use of the CNT directive. There are two single cycle modes as follows:

- Single-cycle concurrent run mode.
- Single-cycle sequential run mode.

3.4.4.1 Single-Cycle Concurrent Run Mode

The single-cycle concurrent run mode is used to run the test modules concurrently. The CNT and RUN directives are used. The CNT parameters specify the number of times each test module is to be exercised. The RUN directive is used to select the concurrent method of testing. If the allocate or timed restart mode has previously been used, the TIM directive with the R parameter, and the NA parameter with the PUN directive are required. R stops the internal timer for each test module; NA negates the A parameter.

Perform single-cycle concurrent run mode as follows:

1. Enter the following directives:

   TIM:R

   HLT

   CNT:TST(1),X(1),H;TST(2),X(2)H;....TST(N),X(N),H

   RUN:TST(1),TST(2),....TST(N),C,NA

Where :

TST(1),TST(2) .,.TST(N) are the test modules to be exercised concurrently.

X(1) ,X (2) .X(N) are the pass counter for the respective test modules.

Each previously-sequenced TST test module will halt when its pass counter expires.

3.4.4.2 Single-Cycle Sequential Run Mode

The single cycle sequential run mode is used to run the test modules sequentially. The CNT and RUN directives are used. The CNT parameters specify the number of times each test module is to be exercised. The RUN directive is used to select the sequential method of testing. If the allocate or timed restart mode has previously been used, the TIM directive with the R parameter, and the RUN directive with the NA parameter are required. ***R*** resets the time interval for each test module; NA negates the A parameter.

Perform single-cycle sequential run mode as follows:

1. Enter the following directives:

```
TIM:R
HLT
┌CNT:TST(1),X(1),H;TST(2),X(2)rH;...TST(N),X(N),H
or
└CNT:H
RUN:TST(1),TST(2),....TST(N),S,NA
```

Where:

TST(1).TST(2) ...TST(N) are the test modules to be exercised sequentially.

X(1) ,X (2) . . ..X(N) *are* the pass counts for the respective test modules.

Each previously-sequenced TST test module will halt when its pass counter expires.

3.5 OPERATOR MESSAGE OUTPUTS

The operator message outputs are the means of communications from the STP to the system operator.

The categories of operator messages are as follows:

- Start execution message.
- Test progress reports.
- Error **messages.**
- I/O command reject **messages.**
- Data error **messages.**
- Status error **messages.**
- System unexpected interrupt **messages.**

When the messages contain a time or time-of-day parameter, the real or relative time is expressed in hours, minutes, and seconds in 2-second intervals. A 24-hour clock is used.

3.5.1 Start Execution Messages

The start execution message is output when the STP has been loaded and starts execution. The message indicates that the console is enabled for operator input at all times except during outputs. The start execution message is as follows:

SYSTEM TEST PROGRAM II

3.5.2 Test Progress Reports

The test progress reports are presented in the form of completion messages. If the user specifies the report feature in the RUN directive, the program outputs its progress via the console monitor. Real or relative time of completion is indicated as hh:mm:ss.

The completion messages are as follows:

- TST TEST COMPLETE hh:mm:ss — Output after each test module has been exercised.
- SYSTEM TEST COMPLETE hh:mm:ss — Output after each selected test module has been exercised once.
- SYSTEM TEST PROGRAM II — Output when all controllers in the system test have been exercised and have halted.

3.5.3 Error Messages

Error messages notify the operator that an unacceptable console entry has been made, that a memory overload has occurred, or that a system overload has occurred. Data and status errors are discussed separately. The error messages are as follows:

- ?? — Input error.

  When an illegal console entry is detected in any user directive, a pair of question marks (??) are output. If an input error occurs, the operator must repeat the last subparameter.

  Example: RUN:CPA,MEE,??MEM,DSK

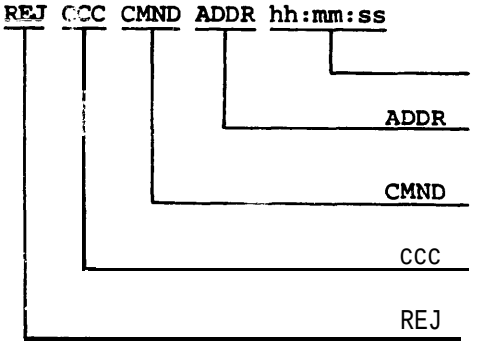
- MEMORY OVLD — Memory overload.

  As the user assigns the devices to be exercised by the system test, the program calculates the total core memory required for the input and output buffers. If the total memory required exceeds the memory available to or allocated by the user, the memory overload message is output.

• SYSTEM OVLD	System overload. After the user has input the RUN directive, the program calculates whether the configured system can be exercised without causing a system overload. A system overload is caused by trying to exercise too many devices concurrently. If a system overload occurs, the system overload message is output.

3.5.4 I/O Command Reject Messages

If an I/O command is rejected by any controller, an I/O command reject message is displayed. The message format and symbol explanation are as follows:



Time	
ADDR	**Address of the rejected command** in hex.
CMND	Value of the rejected command in hex.
CCC	Controller mnemonic label.
REJ	Literal 'REJ'. Identifies the output as an I/O command reject message.

An example of an I/O command reject error message is as follows:

```
REJ DSK 21B5 lF37 2:20:18
```

This message indicates that the disk controller rejected the I/O command $21B5 which resides in location $1F37 at a real or relative time of 2 hours, 20 minutes, and 18 seconds.

If SENSE switch 1 is on (up), I/O command reject will cause a halt to occur. The reject error will be in the I-register display. Look up error in error code display, Paragraph 3.6 before resetting system. To reset system and resume operations, press the RUN switch. The reject message will be displayed, and control will return to the configuration routine.

3.5.5 Data Error Messages

Data error messages contain the data in error and the correct version of the required data.

An example of a standard error message is as follows:

```
DSK 0 0 DE 13 5 BBBC BBB8 3:21:18
```

This error message gives the information that a data error was detected by disk controller number zero at the real or relative time of 3 hours, 21 minutes and 18 seconds. ***The error*** occurred on cylinder head position 13, of the input buffer. The data word should have been $BBBC but was $BBB8.

3.5.6 Status Error Messages

Status error messages apprise the operator of status errors, no interrupt errors, and unexpected active controller interrupts.

An example of a no interrupt error message is as follows:

UMT 0 0 A NO IPT INT 0002 4:10:22

This error message gives the information that a type A input interrupt was detected by the UMT controller number zero, tape transport zero$_8$ and the interrupt occurred at the real or relative time of 4 hours, 10 minutes, and 22 seconds.

An example of a unexpected interrupt error message is as follows:

UMT 0 0 A UN OPT INT 0002 5:21:02

This error messages gives the information that a type A unexpected output interrupt was detected by the UMT controller number zero, tape transport zero, and the interrupt occurred at the real or relative time of 5 hours, 21 minutes, and 2 seconds.

3.5.7 System Unexpected Interrupt Messages

System unexpected interrupt messages contain the interrupt level and the common interrupt bit, if present, of an interrupt intercepted on a level not currently used by the controller being exercised. The message format is asfollows:

UNEXPECTED INTERRUPT XX YY hh:mm:ss

Where :

xx	is the level (O-15) of the intercepted interrupt, in hexadecimal notation.
YY	indicates the common interrupt bit, if present, in hexadecimal notation.
hh:mm:ss	is the real or relative time that error was detected to the nearest two seconds, on a 24-hour clock.

If this message is repeated, set SENSE switch 1 on (up). If the interrupt was truly unexpected, a halt will occur with the I-Register display equal to O-3 or $A-$1F.

3.6 ERROR CODE DISPLAYS

The error codes reside in the I-Register and will be displayed on the processor control panel when SENSE switch 1 is on (up). The error code displays are contained in Table 3-2.

Table 3-2. Error Code Displays

Error Code Display I-Register	Conditions
0000-0003	These conditions indicate that an unexpected common interrupt occurred on a non-configured level. I-Register bits 14-15 identify the common interrupt level (0-3). The A-Register displays the ICI status word. B-Register bits 4-7 identify the external interrupt level. B-Register bits 12-15 display the ICI status bit number in error. If SENSE switch 1 is set off (down) all unexpected interrupt messages will be output.
0004	This condition indicates that an I/O command was rejected.
0008, 000A-000F	These conditions indicate that an unexpected internal interrupt occurred on a nonconfigured level. I-Register bits 12-15 identify the interrupt level.
0008	System call pointer.
000A	Power fail.
000B	Parity error.
000C	Instruction trap.
000D	Memory protect.
000E	Privileged instruction.
000F	System.
0010-001F	These conditions indicate that an unexpected external interrupt occurred on a non-configured level. I-Register bits 12-15 identify the interrupt level.
0020-002F	Excessive unexpected interrupts (more than 8) caused unexpected interrupt queue overflow.

SECTION 4
CPA TEST MODULE

4.1 FUNCTIONAL DESCRIPTION

The CPA Test Module exercises all of the instruction set except the I/O functions. All the basic instructions, special instructions, byte instructions, and the program flag instruction are tested with a standard operand and an applicable addressing mode.

4.2 CPA DIRECTIVES

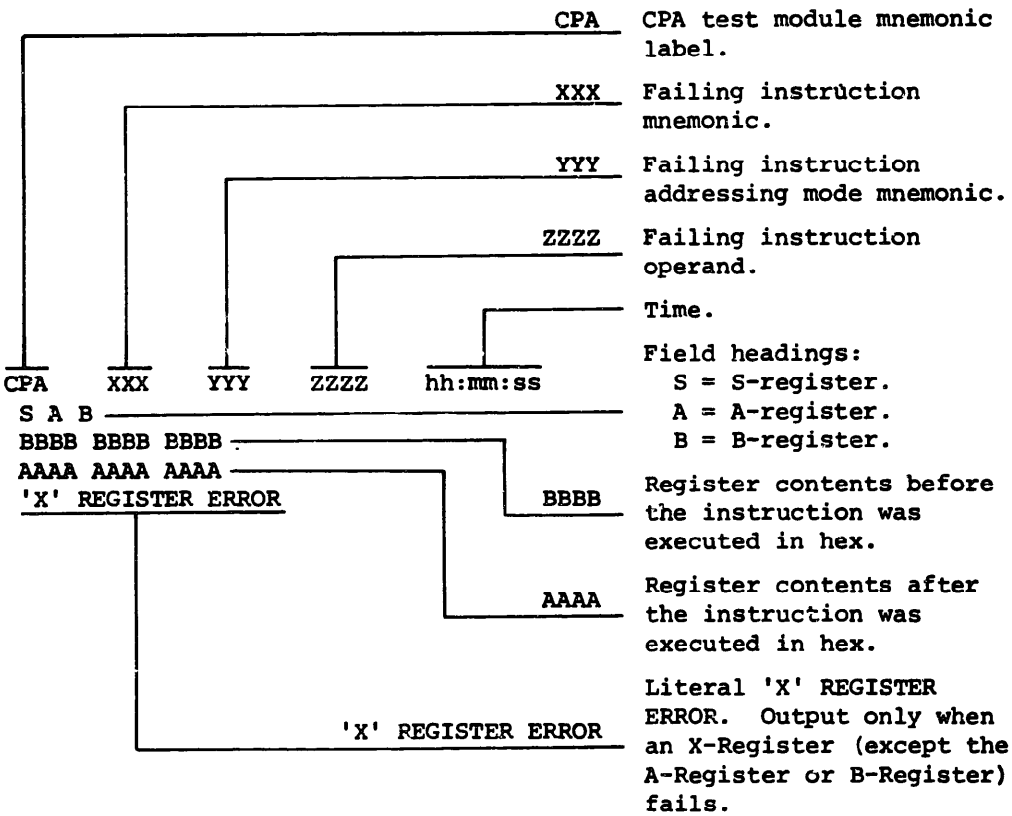
There are no directives unique to the CPA test module.

4.3 CPA ERROR MESSAGES

This paragraph contains the CPA error messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data or status errors. Time is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

Data/Status Error

The first four lines of the error message are always output, but indicate an error condition only when the X-Register in error is the A-Register or the B-Resister, or both.



SECTION 5
MEM TEST MODULE

5.1 FUNCTIONAL DESCRIPTION

The MEM Test Module checks out the operational condition of the core memory by loading the core with a test pattern and then testing the core.

5.2 MEM DIRECTIVES

There are eight directives which are used with the MEM test module. Any number of these directives may be input during one call to the MEM configuration, or each directive may be input in a separate call. The configuration call statement is as follows:

```
CME:MEM;
```

The MEM directives are as follows:

- BIT Bit complement test selection.
- RPL Bit propagation test selection.
- UAD Unique address test selection.
- BYT Byte access test selection.
- RNM Random number test selection.
- PRB Probe test selection.
- BSZ Block size selection.
- ALL All tests selection.

Bit Complement Test Selection (BIT). This directive selects the bit complement test sequence. There are no parameters required.

The format of the BIT directive is as follows:

```
CME:MEM;BIT
```

Bit Propagation Test Selection (RPL). This directive selects the bit propagation test sequence, or ripple tests. There are no parameters required.

The format of the RPL directive is as follows:

```
CME:MEM;RPL
```

Unique Address Test Selection (UAD). This directive selects the unique address test. There are no parameters required.

The format of the UAD directive is as follows:

```
CME:MEM;UAD
```

Byte Access Test Selection (BYT). This directive selects the byte access test. There **are** no parameters required.

The format of the BYT directive is as follows:

CME:MBM;BYT

Random Number Test Selection (RNM). This directive selects the pseudorandom number test. There are no parameters required.

The format of the RNM directive is as follows:

CMB:MBM;RNM

Probe Test Selection (PRB). This directive selects the probe or instruction execution test. There are no parameters required.

The format of the PRB directive is as follows:

CMB:MEM;PRB

Block Size Selection (BSZ). This directive selects the size of the memory block to be allocated to and tested by the MEM test module. The memory block may be from 3 to 4096 words in length. When this directive Is used, the test routines must be re-selected.

The format of the BSZ directive is as follows:

CMB:MBM;BSZ,N,DIR(1),DIR(2)...DIR(x)

Where :

N is the block size in decimal or hexadecimal notation.
DIR(1),DIR(2) ...DIR(x) are the test routine directives.

Example: CME:MEM;BSZ,$100;BIT;BYT

This directive selects a memory block of 256 words and selects the bit complement and byte access tests to be run.

All Tests Selection (ALL). This directive selects all the memory tests. There are no parameters required.

The format of the ALL directive is as follows:

CMB:MBM;ALL

Example: CMB:MBM;BSZ,$1000;ALL

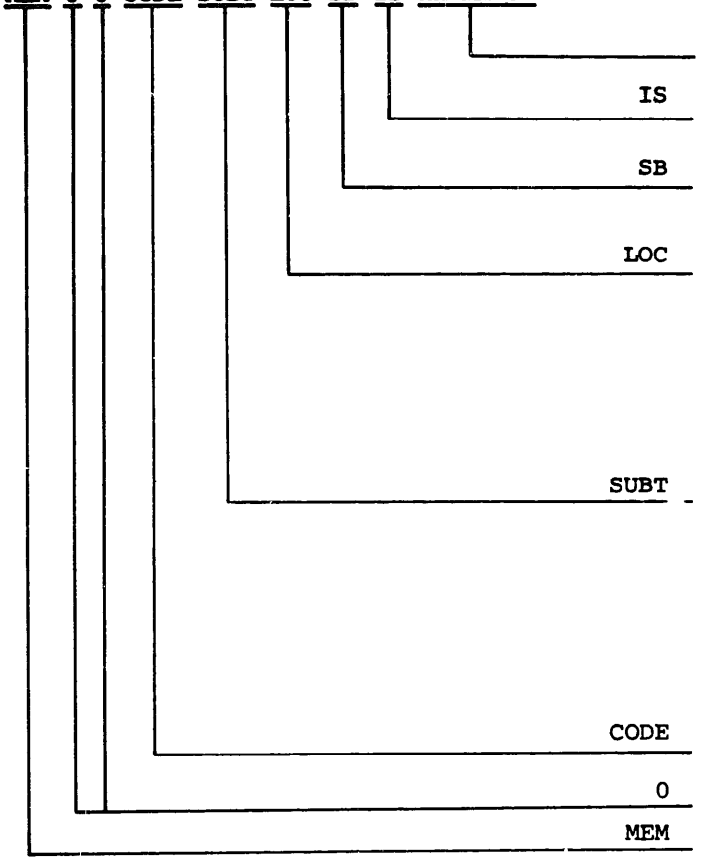
This directive selects all the memory tests to be run and allocates the' maximum allowable size memory block of 4096 words for the tests.

5.3 MEM ERROR MESSAGES

This paragraph contains the MEM error messages presented in a symbolic **format.** An explanation of each symbol is provided. Error **messages** are classified as data errors. Time is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

Data Error

MEM 0 0 CODE SUBT LOC SB IS hh:mm:ss



Time.

IS — Value the data word does contain in hex.

SB — Value the data word should contain in hex.

LOC — Location, in the block of core memory tested, which is in error in hex.

SUBT — Sub-test number within the test module in decimal notation.

SUBT	Sub-Test
0 thru 3	bit complement
4 thru 7	bit propagation
8	unique address
9	byte access
10	random number
11	probe

CODE — Two-letter code mnemonic:

DE = data error.

0 — Unused field. (May be blank.)

MEM — MEM test module mnemonic label.

SECTION 6
UMT TEST MODULE

6.1 FUNCTIONAL DESCRIPTION

The UMT Test Module checks the MT controller, formatter, and tape transport. The test performs the following background routines:

Write A Record	Writes a record of random data patterns and random record size.
Backspace	Backspaces over the record just written.
Read A Record	Reads record just written.
Check Data	Checks data in processor memory buffer.
Write File Mark	
Search File Mark Reverse	
Search File Mark Forward	

6.2 UMT DIRECTIVES

There are four directives which may be used with the UMT test module. The directives de-activate and activate magnetic tape transports, and set buffer size.

The UMT directives are as follows:

- DEL delete magnetic tape transport.
- ADD add magnetic tape transport.
- PAR set parity.
- BUF set buffer size.

The configuration call statement is as follows:

DDD:UMT;

Where DDD is the directive mnemonic.

Delete Magnetic Tape Transport (DEL). This directive deactivates any configured magnetic tape transport unit.

The format of the DEL directive is as follows:

DEL:UMTx;a,b,c,d

Where:

x is the controller number.
a,b,c,d are the units 0 thru 3 controlled by the controller.

Example: DEL:UMTO;1

This directive deactivates unit one of magnetic tape transport controller zero.

Add Magnetic Tape Transport (ADD). This directive activates additional magnetic tape transports and reactivates any units which have beendeactivated by the DEL directive.

The format of the ADD directive is as follows:

ADD:UMTx;a,b,c,d

Where:

x is the controller ***number'.***
a,b,c,d are the units 0 thru 3 controlled by the controller.

Example: ADD:UMTO;1

This directive activates (or reactivates) unit one of magnetic tape transport controller zero. Unit one may have been previously deactivated.

Set Parity (PAR). This directive sets odd or even parity in any configured magnetic tape transport unit. Units using 7-track code may use even or odd parity; units using g-track code must use odd parity.

The format of the PAR directive is as follows:

PAB:UMTx;a,b,c,d;P

Where :

x is the controller number.
a,b,c,d are the units 0 thru 3 controlled by the controller.
P is the parity: E for even parity. 0 for odd parity.

Example: PAR:UMTO;1;O

This directive sets odd parity for unit one of magnetic tape transport controller zero.

Set Buffer Size (BUF). This directive sets the buffer size. Buffer size can be from 20 to 2048 memory words (40 to 4096 bytes). The normal buffer size is the maximum 2048 words to permit maximum record size.

The format of the BUF directive is as follows:

BUF:UMTx;dddd

Where :

x is the controller number.
dddd is the buffer size in memory words in decimal notation.

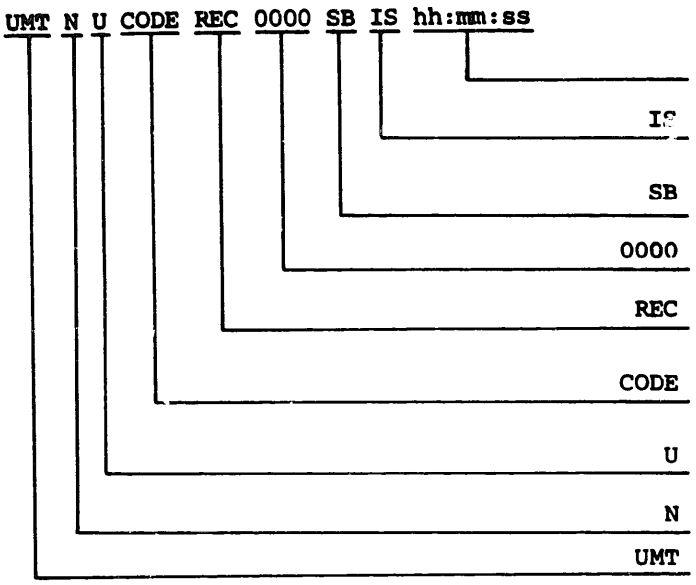
Example : BUF:UMTO;2048

This directive sets the buffer size for magnetic tape transport controller zero to 2048 memory words (4096 bytes).

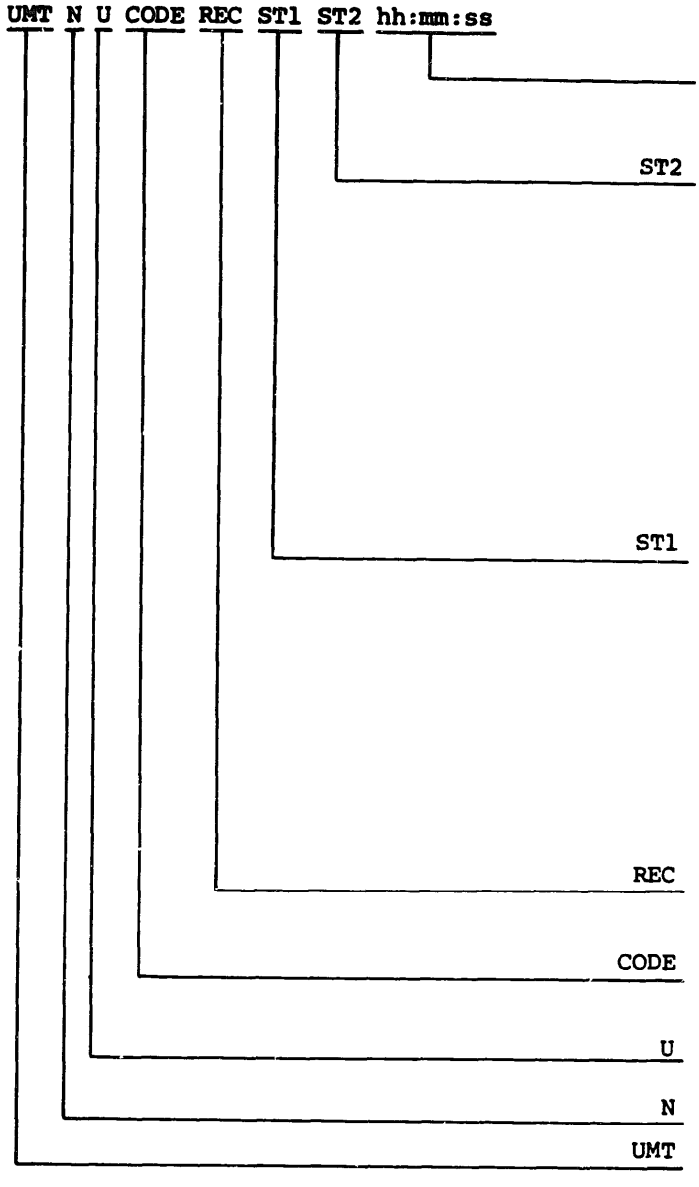
6.3 UXT ERROR MESSAGES

This paragraph contains the UMT error messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data, status, or interrupt errors. Time is real or relative, expressed in hours, minutes and seconds at 2-second intervals. A 24-hour clock is used.

Data Error


UMT N U CODE REC 0000 SB IS hh:mm:ss
Time.
IS
Value the data word does contain in hex.
SB
Value the data word should contain in hex.
0000
Unused field. (May be blank.)
REC
Record number from 0 to 4095 in dec.
CODE
Two-letter code mnemonic:
DE = data error.
U
Unit number of the device in hex.
N
Controller number in dec.
UMT
UMT controller mnemonic label.

Status Error



Time.

Status word two in hex:

Bit	Status
0-3	op code.
4-15	byte count.

Status word one in hex:

Bit	Status
0	busy.
1	not ready.
2	off-line.
3	write enable.
4	rewind.
5	beginning of tape.
6	end of tape.
7	file mark read.
8	hard error.
9	corrected error (PE only).
10	identification (PE only).
11	phase encoded.
12	rate error.
13	seven-track.
14,15	transport address.

REC — Record number from 0 to 4095 in dec.

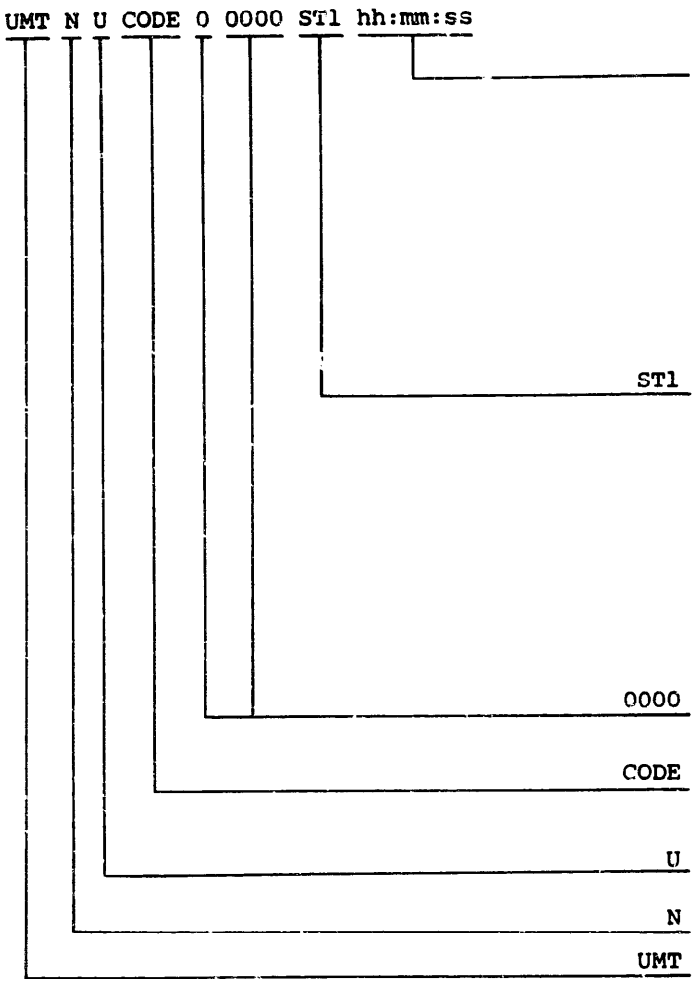
CODE — Two-letter mnemonic identifying the type of status error:
ST = status error.

U — Unit number of the device in hex.

N — Controller number in dec.

UMT — UMT controller mnemonic label.

Status Error



Time.

Status word one in hex:

Bit	Status
0	busy.
1	not ready.
2	off-line.
3	write enable.
4	rewind.
5	beginning of tape.
6	end of tape.
7	file mark read.
8	hard error.
9	corrected error (PE only).
10	identification (PE only).
11	phase encoded.
12	rate error.
13	seven-track.
14,15	transport address.

Unused field.

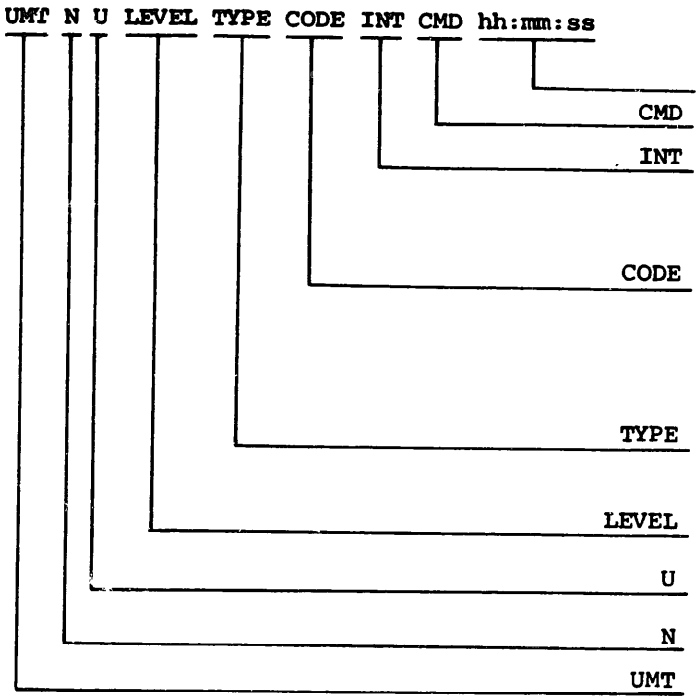
Two-letter mnemonic identifying the type of status error:
RW = rewind error.

Unit number of the device in hex.

Controller number in dec.

UMT controller mnemonic label.

Interrupt Error



SECTION 7
DSK TEST MODULE

7.1 FUNCTIONAL DESCRIPTION

The DSK Test **Module** tests the Model 5060 disk systems disk controller and the Caelus Model 103; 303, and 306 disk drives. The test performs the following background routines:

Sequential Verify	Takes beginning cylinder address and performs a seek, then increments cylinder +1 and repeats the seek. This test goes all the way to the end address of 203.
Alternate Cylinder Test	Test issues pairs of verify commands to begin address +1, end address -1 and so on till both addresses are equal.
Random Write Sector Test	Random addresses are generated and write commands are issued for 200 cylinder addresses.
Read Half Sector	First 64 bytes of sector are read and checked, then second 64 bytes are read and checked.
Write and Verify Test	A random address is accessed and the sector is written. The first 64 words are written with $5555, the last 64 words with $AAAA.
Random Access Write/Read Test	This test writes to and reads from 200 random addresses. Worst case data pattern is used: pattern is 0000 8000 FFFE FFFF 5555 5555 AAAA AAAA.

7.2 DSK DIRECTIVE

There is only one directive which is used with the DSK test module. The directive selects the sectors to be used in the test. In this way, testing can be performed without destroying data already on the disk. If a C is used in the addresses, the directive selects cylinders instead of sectors. If a drive is to be excluded from testing, an N follows the drive number, and the remaining parameters are not used. Multiple drives can be configured by inserting a semicolon and continuing with the next drive number and its parameters. If both disk packs are to be tested, an F or R and address parameters are inserted after the first (disk) end address.

The format of the FIX directive is as follows:

FIX:DSKm;n, (S or D),(F or R),(($BA-$EA) or/A)

Where:

m is controller number.
n is drive number.
S is single density.
D is double density.
F is fixed disk pack.
R is removable disk pack.
BA is beginning disk pack address limit in hexadecimal notation.
EA is ending disk pack address limit in hexadecimal notation.
A is entire disk pack.
"C" is cylinder, when used with BA and EA.

Example: FIX:DSK2;0,S,F,$20-$40:1,D,R,$3-$9O,F,A;2,N

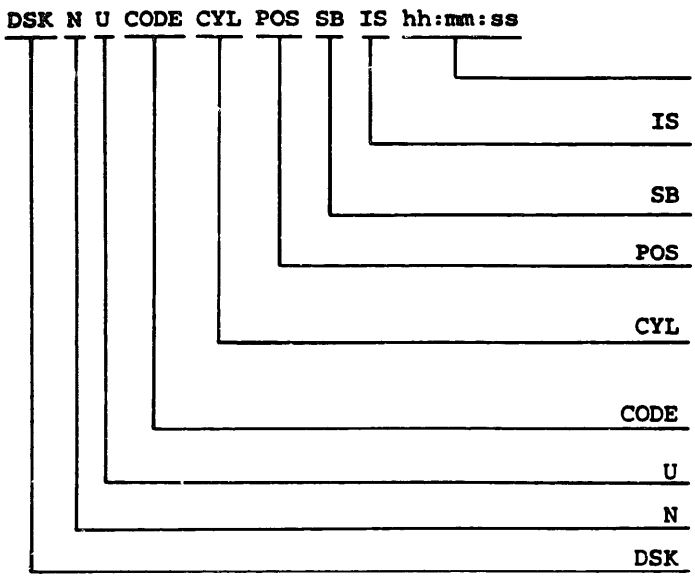
This directive tests controller 2 as follows:

- On drive 0, the fixed disk pack, addresses $20 thru $40 at single density.
- On drive 1, the removable disk pack, addresses $3 thru $90 at double density; and, the entire fixed disk pack at double density.
- On drive 2, no test.
- Drive 3 to be tested as configured at assembly time (and therefore not included in the directive).

7.3 DSK ERROR MESSAGES

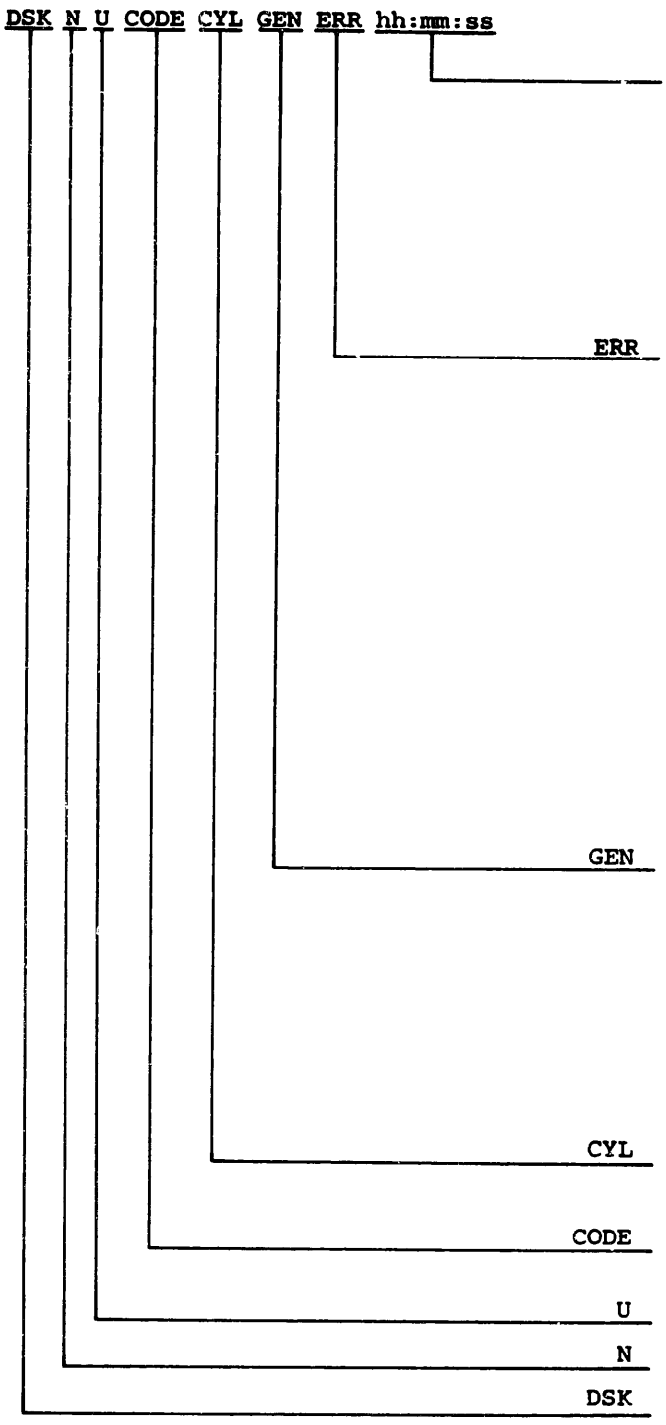
This paragraph contains the DSK error messages presented in a slymbolic format. An explanation of each symbol is provided. Error messages are classified as data, status, or interrupt errors. Time is real or relative? expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

Data Error

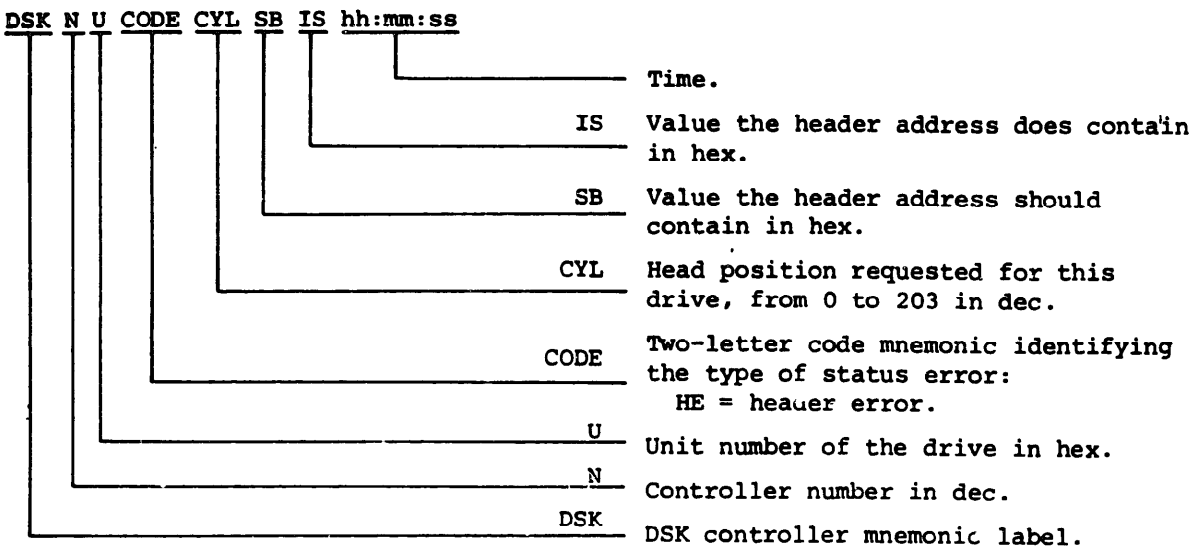


hh:mm:ss	Time.
IS	Received (read) data word in hex.
SB	Transmitted (write) data word in hex.
POS	Index into the buffers in hex.
CYL	Head position requested for this drive, from 0 to 203 in dec.
CODE	Two-letter code mnemonic: DE = data error.
U	Unit number of the drive in hex.
N	Controller number in dec.
DSK	DSK controller mnemonic label.

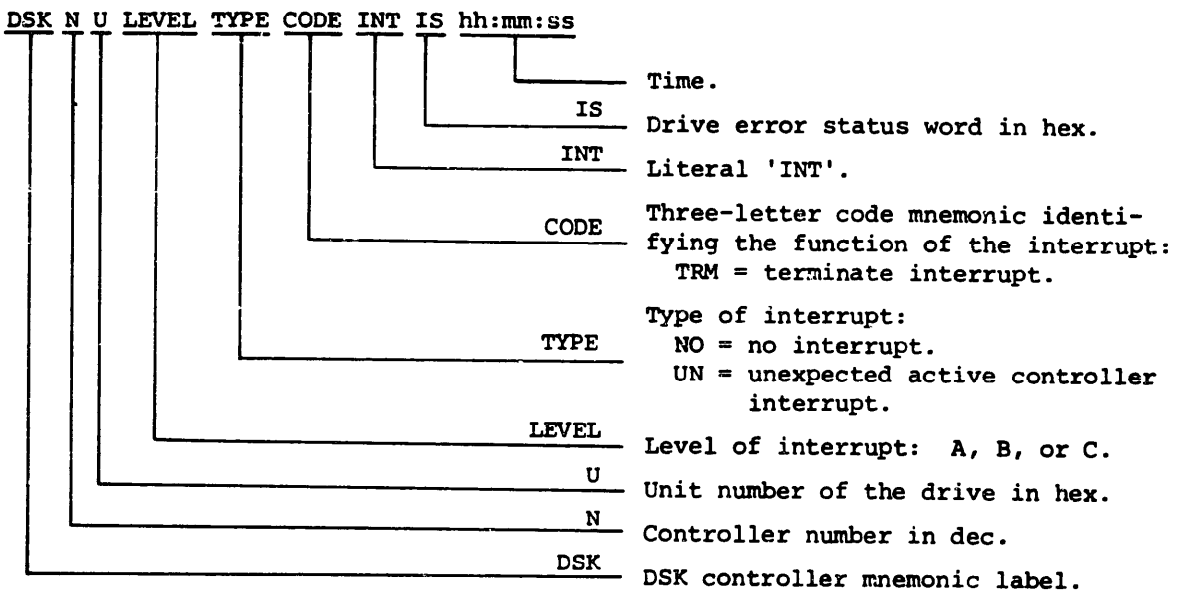
Status Error



Status Error



Interrupt Error



SECTION 8
RTA TEST MODULE

8.1 FUNCTIONAL DESCRIPTION

The RTA Test Module checks the interrupt rate of the real-time clock (RTC) and the operation of the audible alarm (AA).

The RTC should interrupt at a 16 2/3 millisecond rate. The RTC is started and stopped at precise 2-second points and the number of interrupts between these starting and stopping points is counted. If the number of RTC interrupts is not 120 per cycle, an error is posted.

The AA is enabled at the beginning of the test cycle. When the AA 250 msec timer times out, the AA should generate an interrupt. When the interrupt occurs and the alarm rings, the AA is disabled. If the interrupt does not occur at all, or if the interrupt does not occur when expected (within 250 ±16 msec after the alarm is enabled), an error is posted.

8.2 RTA DIRECTIVE

There is only one directive which is used with the RTA test module. The directive selects the number of 2-second periods over which the RTA controller is to be tested. The value is assembled as 2, but may be changed by this directive to any value between 1 and 255. The directive also sets the expected interrupt count to 120 times (100 times for 50 Hz supply power) the selected periods.

The format of the RTA directive is as follows:

CYC:RTA,N

Where N is the number of 2-second periods expressed in decimal or hexadecimal notation and 120 N (or 100N) is the expected interrupt count.

Example: CYC:RTA,15

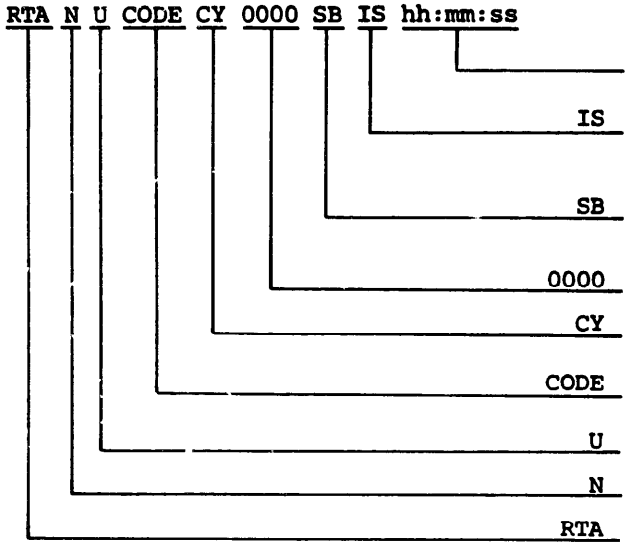
This directive tests the RTA controller for 30 seconds and sets the expected interrupt count to 1800.

8.3 RTA ERROR MESSAGES

This paragraph contains the RTA error messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data errors. Time is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

Data Error

RTA N U CODE CY 0000 SB IS hh:mm:ss

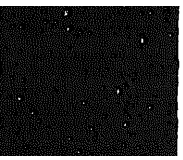


Time.	
IS	Number of RTA interrupts that do occur in hex.
SB	Number of RTA interrupts that should occur, 120 CY, (100 CY for 50 Hz power) in hex.
0000	Unused field.
CY	Number of 2-second cycles in dec.
CODE	Two-letter code mnemonic: DE = data error.
U	Unit number of the device in hex.
N	Controller number in dec.
RTA	RTA controller mnemonic label.

SECTION 9
LMU TEST MODULE

9.1 FUNCTIONAL DESCRIPTION

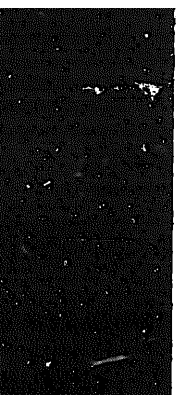
The LMU Test Module performs the following functions:



- Checks for terminate interrupts and queues unexpected interrupt and absent interrupts.
- Checks for data errors and queues data ***error*** failures.
- Performs checksum operations at each entry to the background service routine and queues checksum errors.

9.2 LMU DIRECTIVES

There are nine directives which may be used with the LMU test module. Any number of these directives may be input during one call to the LMU configuration, or each directive may be input in a separate call. The LMU directives are as follows:



- LIN Line selection.
- CLK Clock mode selection.
- RTX Baud rate selection.
- csz Character size selection.
- SBS Stop bit selection.
- PAR Parity selection.
- LUP Loop selection.
- BSZ Buffer size selection.
- PAT Pattern selection.

The configuration call statement is as follows:

DDD:LMUx;

Where DDD is any one of the nine directive mnemonics, and x is the controller number.

Following the call statement delimiter (semicolon), the next input must be a parameter associated with the first directive (DDD). Additional directives (DDD_i) may be added following a semicolon delimiter between each directive/parameters input.

The configuration sequence is as follows:

DDD:LMUx;p,p ,...p;DDD1,P1,P_1,...P_i; D D D_2,....

Where :

p,p... are the parameters for DDD
P1,P1... are the parameters for DDD1

Example: LIN:LMUO;O,2-6,10;BSZ,l2;PAT,$FAOB

Line Selection (LIN). This directive specifier the line pairs which are to be configured, and/or run. If a given group of lines are to be run, and no others, this directive need be used only once. Thereafter, any configuration directives will be directed to those lines. If there is any change in the lines to be configured and run, the LIN directive must be used before any other directives are used.

The format of the LIN directive is as follows:

LIN,a,b,c-e

Where a,b,c and e are line numbers in decimal or hexadecimal notation. The numbers delimited by commas can be non-contiguous or contiguous. The **range** is 0 thru 15 (decimal). The parameter 'N' (N = No Lines Selected) is used for the special case of exercising the programmable device controller (PDC) only.

Example: LIN,0,2,5,6,7,9-15

This directive selects line pairs 0,2,5,6,7, and 9 through 15.

Clock Mode Selection (CLK). This directive selects the clock mode of all lines under test. There are four input values each of which corresponds to a clock mode.

The format of the CLX directive is as follows:

CLK,a

Where 'a' is the clock input value as follows:

Clock Input Value (a)	Clock Mode
0	Free run (asyn)
1	Acquire character step
2	Source bit step
4	Source character step

Example: CLk,2

This directive selects the source bit step clock mode.

Baud Rate Selection (RTX). This directive selects the baud rate of all lines under test. There are 16 input values each of which corresponds to a baud rate. The input values can be in decimal or hexadecimal notation.

The format of the RTX directive is as follows:

RTX,a

Where 'a' is the baud rate value as follows:

Baud Rate Input Value (a)	Baud Rate
0	External
1	50
2	75
3	100
4	110

Baud Rate Input Value (a)	Baud Rate
5	134.5
6	150
7	200
8	300
9	600
10 or $A	1200
11 or $B	1800
12 or $C	2400
13 or $D	4800
14 or $E	7200
15 or $F	9600

Example: RTX,l2 or RTX,$C

This directive selects a baud rate of 2400.

Character Size Selection (CSZ). This directive selects the size of the character including the stop bit to be transmitted by each line under test. There are four input values each of which corresponds to a character size. Character size is limited to a range of 5 thru 8 bits. Any number outside of this range will be rejected.

The format of the CSZ directive is as follows:

CSZ,a

Where 'a' is the character size as follows:

Character Size Input Value (a)	Character Size
5	5 bits
6	6 bits
7	7 bits
8	8 bits

Example: CSZ,6

This directive selects a character size of 6 bits.

Stop Bit Selection (SBS). This directive selects the size of the stop bit of the characters used in the line tests. There are three input values each of which corresponds to a stop bit size. stop bits of 1.5 bits can be used only with S-bit characters.

The format of the SBS directive is as follows:

SBS,a

Where 'a' is the stop-bit size as follows:

Stop-bit Size Input Value (a)	Stop-Bit Size
0	1.0 bit
1	1.5 bits
2	2.0 bits

Example: SBS,2

This directive selects a stop-bit size of 2.0 bits.

Parity Selection (PAR). This directive selects the parity used in the lines under test. Even, Odd, or No parity may be selected.

The format of the PAR directive is as follows:

PAR,a

Where 'a' represent the parity as follows:

Input (a)	Parity
E	Even parity.
O	Odd parity.
N	No parity.

Example: PAR,N

This directive selects 'NO' parity.

Loop Selection (LUP). This directive selects the internal or external mode of test looping. The normal mode is internal looping. An LMU External Loop connector must be installed for each line pair to be externally looped.

The format of the LUP directive is as follows:

LUP,a

Where 'a' is the loop mode as follows:

Input (a)	Loop Mode
I	Internal.
E	External.

Example: LUP,I

This directive selects the internal loop mode for testing.

Buffer Size Selection (BSZ). This directive selects the buffer size for each of the lines under test. The buffer size applies to all controllers and not just the one specified in the configuration call sequence. Buffer size can be from a minimum of 3 to a maximum of 128 words. The values can be in decimal or hexadecimal notation.

The format of the BSZ directive is as follows:

BSZ,a

Where 'a' is the buffer size, from 3 to 128 words.

Example: BSZ,12

This directive selects a buffer size of 12 words.

Pattern Selection (PAT). This directive selects a one-word data pattern which is stored in the output buffers of all the lines under test. The pattern can be a one-word pattern or an incrementing pattern. The word is in hexadecimal notation.

The format of the PAT directive is as follows:

PAT,a

Where 'a' is the pattern input, or the mnemonic 'IN'.

If the input is a one-word pattern followed by 'IN', the incrementing pattern will be used.

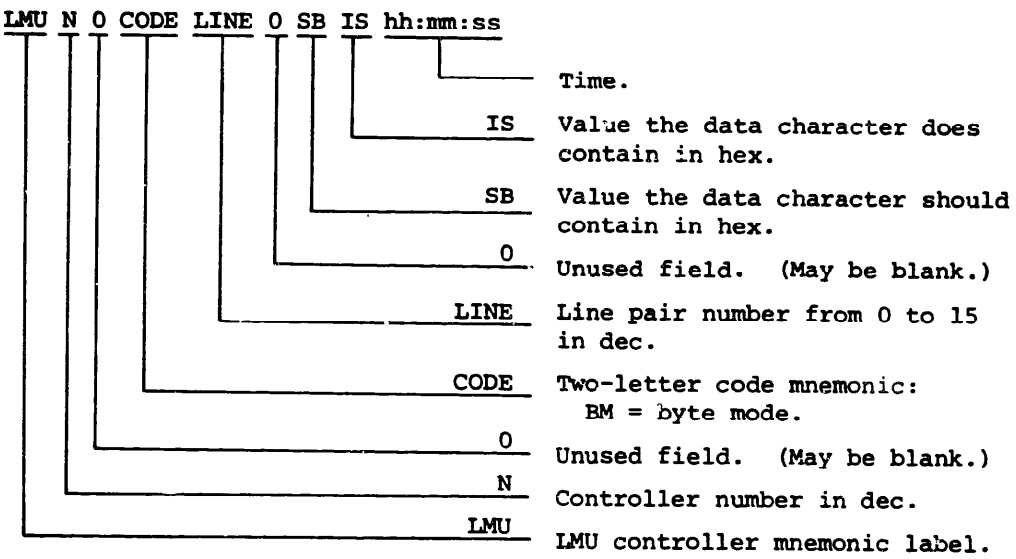
Example: PAT,$0123

This directive selects '0123' for the one-word pattern.

9.3 LMU ERROR MESSAGES

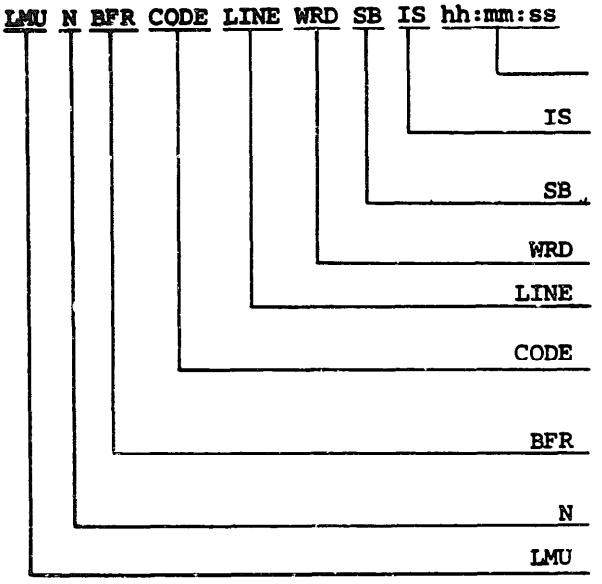
This paragraph contains the LMU error messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data, status, or interrupt errors. Time is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

Data Error



Data Error

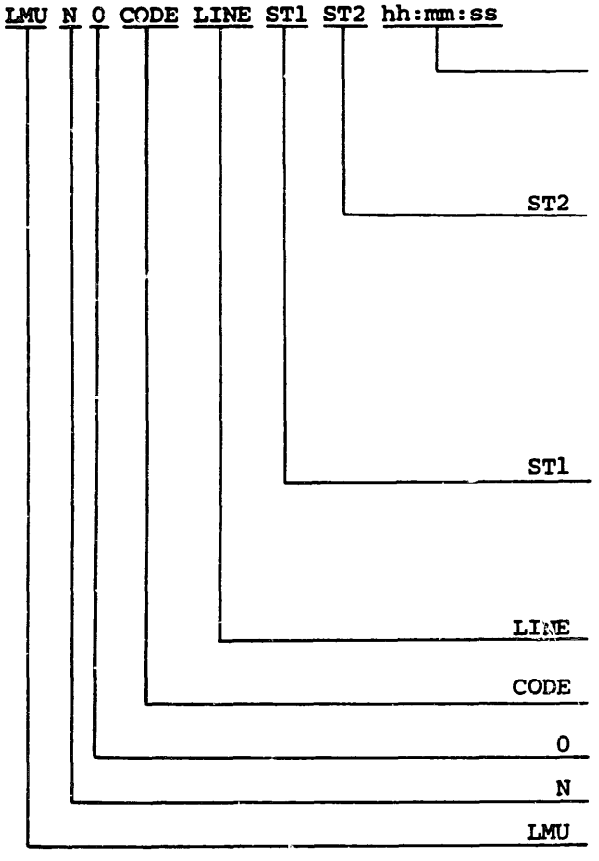
LMU N BFR CODE LINE WRD SB IS hh:mm:ss



- Time.
- IS — Value the buffer word does contain in hex.
- SB — Value the buffer word should contain in hex.
- WRD — Index into the buffer in hex.
- LINE — Line pair number from 0 to 15 in dec.
- CODE — Two-letter code mnemonic:
  DE = data error.
- BFR — Buffer index:
  0 = buffered-data format.
  1 = byte mode.
- N — Controller number in dec.
- LMU — LMU controller mnemonic label.

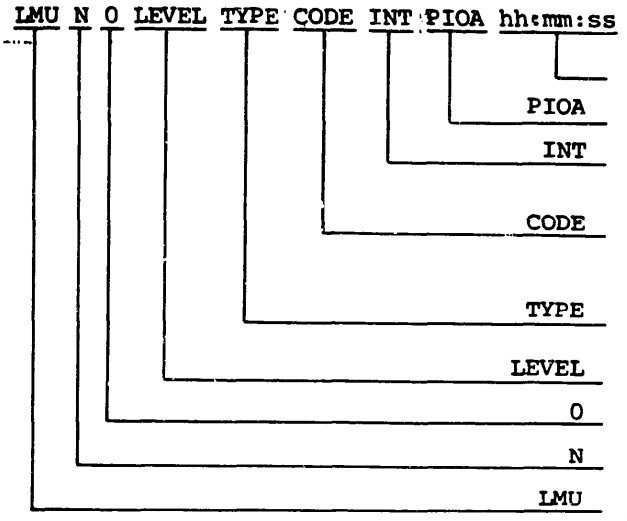
Status Error

LMU N 0 CODE LINE ST1 ST2 hh:mm:ss

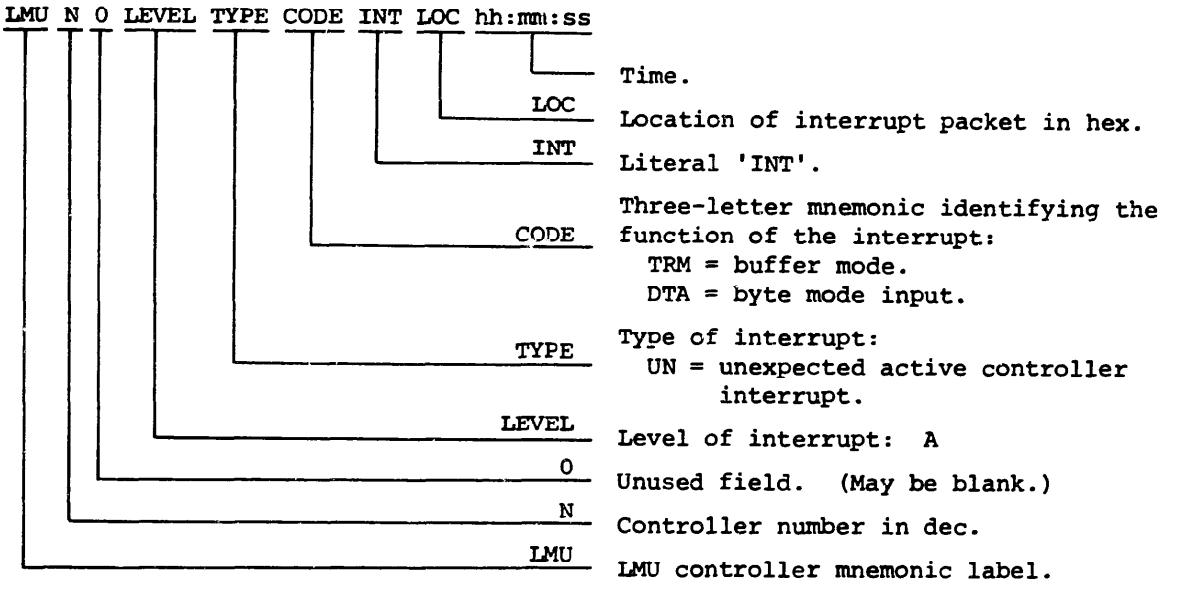


- Time.
- ST2 — Character-dependent Status Word 2:
  0 = (DOR) data overrun.
  1 = (FE) framing error.
  2 = (PE) parity error.
  3 = (BRK) break.
  4 = (EOB) end of break.
  5-7 = Not used.
  8-15 = (COUNT) number of characters.
- ST1 — Packet-related Status Word 1
  0 = (CMP) complete.
  1 = (CHN) chaining.
  2 = (NBE) nearing buffer end.
  3 = (TRM) I/O packet terminated.
  4 = (BNA) buffer not available.
  5 = (FME) format error.
  6, 7 = Not used.
  8-15 = line number.
- LINE — Line pair number from 0 to 15 in dec.
- CODE — Two-letter code mnemonic:
  ST = status.
- 0 — Unused field. (May be blank.)
- N — Controller number in dec.
- LMU — LMU controller mnemonic label.

Interrupt Error



Interrupt Error



SECTION 10
HCD TEST MODULE

10.1 FUNCTIONAL DESCRIPTION

The HCD Test Module checks the high-capacity disc system. Four separate tests are executed sequentially to each disc drive in the system. In the write/read random data, random addressing and random record length test, each random write/read is executed to a different disc drive (if more than one unit in the system) until 500 random writes/reads have been executed.

The four background routines are as follows:

Verify Test (T1). The verify routine verifies the whole pack on each selected drive. The verify command is executed to a track at a time. At the occurrence of the termination interrupt the major status is interrogated on bits 0, 1, 3 and 12. If any of these bits are on, a request status command is executed and the seven status words are stored at the beginning of the data buffer. The major and minor status words are stored in the error log for output.

Seek Sequential (T2). This routine verifies sequential seeks by cylinder number. First a restore command is executed and a check is made that two interrupts occur. At the occurrence of the second interrupt the read track descriptor command is executed to reset the gated attention bits. The cylinder number is converted to binary sector address and the seek command is executed. Two interrupts are processed for the seek command and the read track descriptor command is executed. The cylinder numbers are compared to determine that the seek was to the specified cylinder address. At the completion of each seek command the appropriate gated attention bit is checked for on.

Seek Increment/Decrement (T3). In this routine, four commands are linked together with the interrupt disabled bit on for the first three commands. The four commands are: seek first cylinder, read track descriptor for first cylinder, seek last cylinder, read track descriptor of last cylinder. Upon the occurrence of the interrupt, the major status is interrogated and the cylinder numbers are compared. If everything checks, the first cylinder number is incremented and the last cylinder number is decremented and the four commands are executed again until the first cylinder number equal 202 and the last cylinder number equals zero. In case of status error or seek error, the restore command is executed and the errors are logged.

Write/Read Random (T4). This routine writes/reads and compares random data. Random cylinder, head, and sector numbers are generated and converted to binary sector addresses. The random numbers are either generated for the whole range, or, if limits have been entered, are generated within these limits. The random cylinder number is multiplied by two and used as the random record length

to be written and read. The write and read commands are linked together and executed 500 times. At the occurrence of the interrupt, the drive number is changed in the control words, and again the commands are executed. In this manner, all drives are exercised simultaneously. In case of rate errors, the write or read is retried three times before an error is logged.

10.2 HCD DIRECTIVES

There are five directives which may be used with the HCD test module. The directives deactivate and activate disc drives, designate the number of active disc drives, select range of cylinders to be tested, and select the disc tests to be run.

The HCD directives are as follows:

- DEL delete disc drive.
- ADD add disc drive.
- NDR designate number of disc drives.
- CYL select cylinders.
- TSF select disc tests.

The configuration call statement is as follows:

DDD:HCDx;

Where DDD is the directive mnemonic, and x is the controller number.

Delete High Capacity Disc Drive (DEL). This directive deactivates any configured high capacity disc drive unit.

The format of the DEL directive is as follows:

DEL:HCDx;a,b,d...h

Where :

x is the controller number.
a,b,c,...etc. are the units 0 thru 7 controlled by the controller.

Example: DEL:HCD0;1

This directive deactivates unit one of high capacity disc drive controller zero.

Add High Capacity Disc Drive (ADD). This directive activates additional high capacity disc drives and reactivates any units which have been deactivated by the DEL directive.

The format of the ADD directive is as follows:

ADD:HCDx;a,b,c,....h

Where :

x is the controller number.
a,b,c,...etc. are the units 0 thru 7 controlled by the controller.

Example: ADD:HCD0;1

This directive activates (or reactivates) unit one of high capacity disc controller zero: Unit one may have been previously deactivated.

Designate Number of Active High Capacity Disc Drives (NDR). This directive specifies the number of active units for a particular controller. The number of active units is one thru eight.

The format of the NDR directive is as follows:

NDR:HCDx;n

Where:

x is the controller number.
h is the number of active units controlled by the controller.

Example: NDR:HCD0,2

This directive specifies that there are two active units with high capacity disc controller zero.

Cylinders To Be Tested (CYL). This directive selects the cylinders to be tested for each high capacity disc drive. Cylinders are numbered from 0 through 202 (decimal). A single cylinder can be selectedm, or a contiguous range of cylinders. If this directive is not used, all cylinders of all active units will be operated on.

The format of the CYL directive is as follows:

CYL:HCDx;D(1),B(1)-E(1),D(2),(B2)-E(2),...D(n),B(n)-E(n)

Where :

x is the controller number.
D is the high capacity disc drive number.
B is the start cylinder number in decimal or hexadecimal.
E is the end cylinder number in decimal or hexadecimal.
B-E is the range of cylinders to be tested.

Example: CYL:HCD0;0,28-42,1,100-105

This directive specifies that cylinders 28 thru 42 of unit 0, and cylinders 100 thru 105 of unit 1 of high capacity disc controller zero are to be tested.

Select Disc Test (TST). This directive selects one particular disc test to be run. There are five disc tests as follows:

Test Number	Test
0	All tests.
1	Verify Test.
2	Sequential Seeks by Cylinder Test.
3	Increment/Decrement Seeks Test.
4	Random Write/Read Test.

The selected test will be run on all the active units of the high capacity disc controller.

The format of the TST directive is as follows:

TST:HCDx;n

Where:

x is the controller number.
n is the selected test number.

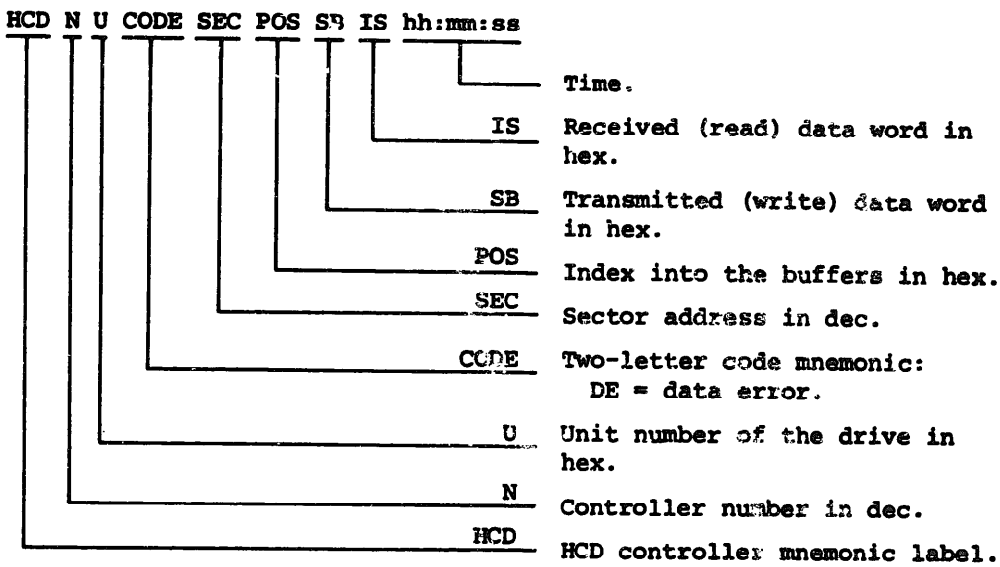
Example: TST:HCD0;2

This directive selects the Increment/Decrment Seeks Test for the active units of high capacity disc controller zero.

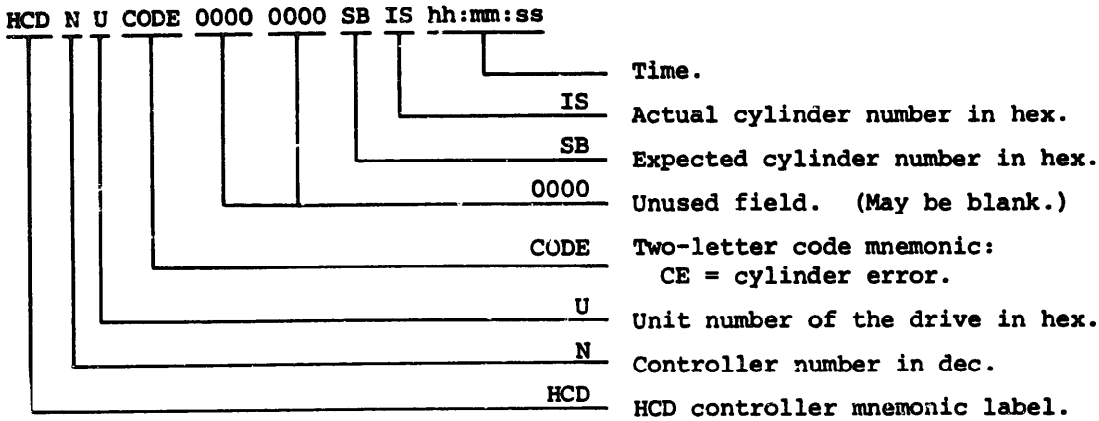
10.3 HCD ERROR MESSAGES

This paragraph contains the HCD *error* messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data, status, or interrupt errors. Time is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 14-hour clock is used.

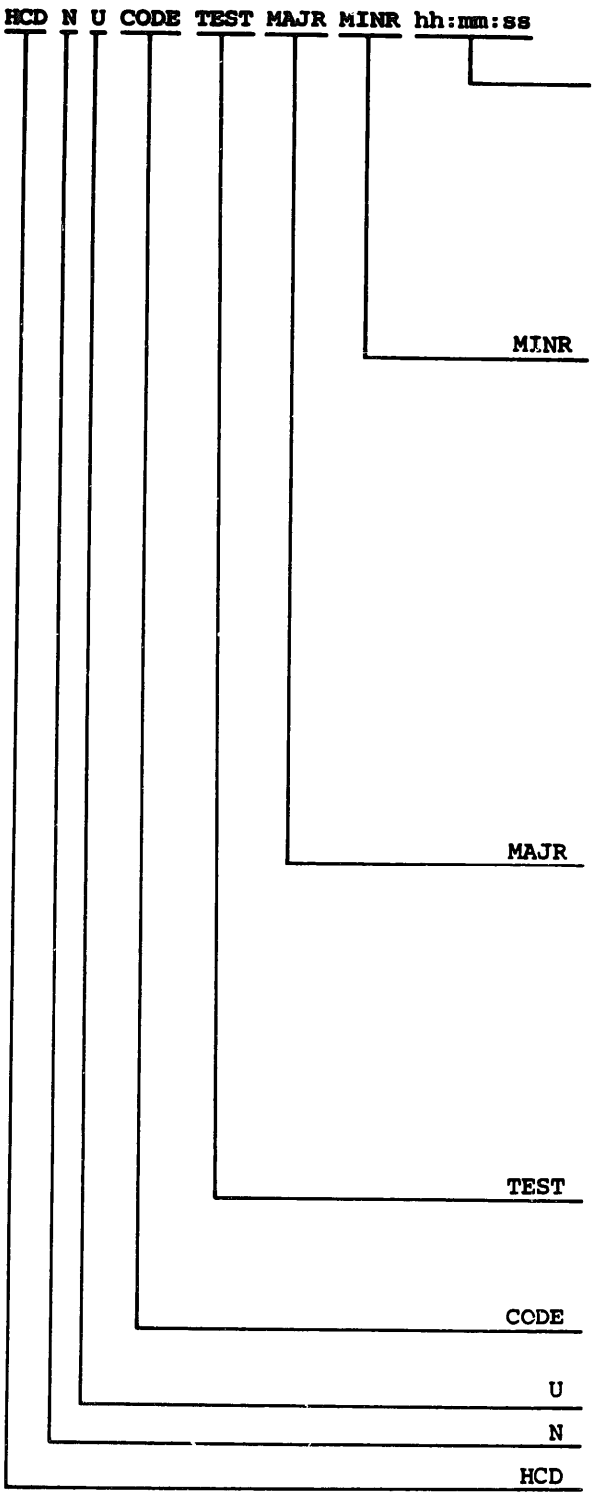
Data Error



Data Error


HCD N U CODE 0000 0000 SB IS hh:mm:ss
Time.
IS
Actual cylinder number in hex.
SB
Expected cylinder number in hex.
0000
Unused field. (May be blank.)
CODE
Two-letter code mnemonic:
CE = cylinder error.
U
Unit number of the drive in hex.
N
Controller number in dec.
HCD
HCD controller mnemonic label.

Status Error



Time.

Minor status word in hex:
- 0 = data error.
- 1 = invalid address.
- 2 = rate error.
- 3 = flag verify error.
- 4 = header verify error.
- 5 = end of pack.
- 6 = last flag bit.
- 7 = last flag bit.
- 8 = write current sense.
- 9 = selected pack change.
- 10 = invalid command.
- 11 =
- 12 = drive selection error.
- 13 = selected seek incomplete.
- 14 = selected drive unsafe.
- 15 = selected drive off line.

Major status word in hex:
- 0 = controller alert.
- 1 = controller busy.
- 2 = format protect.
- 3 = selected drive busy.
- 4 = drive 7 attention.
- 5 = drive 6 attention.
- 6 = drive 5 attention.
- 7 = drive 4 attention.
- 8 = drive 3 attention.
- 9 = drive 2 attention.
- 10 = drive 1 attention.
- 11 = drive 0 attention.
- 12 = selected drive alert.
- 13 = double track.
- 14 = gated attention.
- 15 = terminate.

Test number in dec:
- 1 = verify.
- 2 = seek sequential.
- 3 = seek increment/decrement.
- 4 = write/read random.

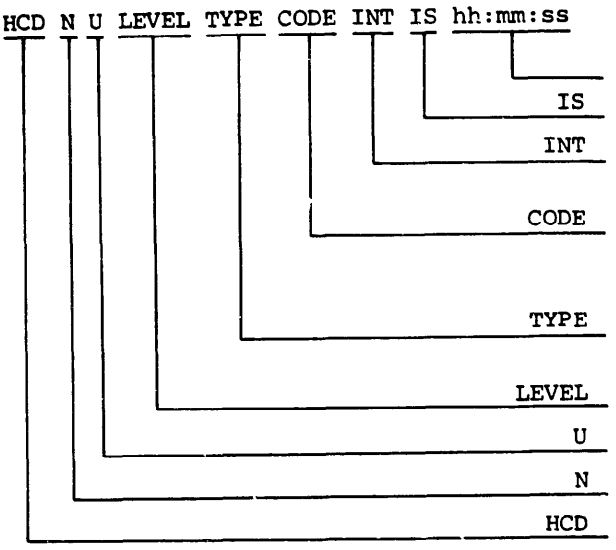
Two-letter code mnemonic identifying the type of status error:
- SE = status error.

Unit number of the drive in hex.

Controller number in dec.

HCD controller mnemonic label.

Interrupt Error



SECTION 11
LSS TEST MODULE

11.1 FUNCTIONAL DESCRIPTION

The LSS Test Module performs a check on the operational status of the line switch subsystem and controller. Hardware faults such as failure of the controller to echo an I/O command **or** failure to interrupt, are detected and reported by the LSS Test Module.

11.2 LSS DIRECTIVES

There are no directives unique to the LSS test module.

11.3 LINE SWITCH ENABLED MESSAGE

The line switch enabled message notifies the operator that the line switch cannot be started after two attempts to enable the Line Switch Subsystem (LSS). After two rejects, the program assumes that the LSS either is not available or is powered off.

The enabled message is as follows:

LINE SWITCH IS NOT STARTED

SECTION 12
CDR TEST MODULE

12.1 FUNCTIONAL DESCRIPTION

The CDR Test Module checks the card reader system with background service routines.

The background service routine verifies input data and checks **system** flags for halt and start read of next card. This routine also queues any errors detected and checks for pass complete and test complete.

The first function is to check for **halt flag** in executive. If a halt is detected, a stop and branch and reset external interrupt are issued. Return is to the executive where the test can be halted in response to the halt (HLT) directive.

The next check is for card complete which signifies that 80 columns of data have been read and a stop command issued in the interrupt service routine. If the card complete flag is not set, a timeout check is made by calling the timeout check routine. If timeout has occurred, a status check is made to determine if a pick failure or other trouble has caused the timeout in which case a status error is queued in the card read routine. If the status was correct, a no data interrupt message will be queued and return made to the return point.

If the card complete flag was set, then the interrupt status error flag is checked to determine if there were valid reads. If the status error flag is set, the error queue is stuffed. Verification of data follows whether the error flag was or was not set.

The background service routine verifies data according to the data mode set and queues only one data miscompare error per card. The log is accordingly more meaningful as each error in the card reader log refers to one card that was in error. The number of errors corresponds directly with the number of cards that have not been properly read. No status errors are counted for report in the LOG.

After the data has been verified, the service routine checks the mode flags to determine if the mode flag is to be reset and initializes data mode test pointers.

If all cards have been read and verified, a pass complete check is made for teat complete.

If all cards have not been read, an exit is made to the next card read routine.

12.2 CDR DIRECTIVES

There are two directives which may be used with the CDR test module. The directives select the data mods and the timeout constant for the card reader speed.

The CDR directives are as follows:

- CRM select data mode.
- CRS select card reader speed.

The configuration call statement is as follows:

DDD:CDR;

Where DDD is the directive mnemonic.

Select Data Mode (CRM). This directive selects the data mode or modes. The four modes that can be selected are as follows:

- Binary data (BIN).
- Hollerith data (HOL).
- Packed data (PKD).
- Sequential data (SEQ).

The format of the CRM directive is as follows:

CRH:CDRx;MODE

Where :

x is the controller number.
Mode is a three-letter mnemonic for the test module data mode:
BIN, HOL, PKD, or SEQ

Example: CRM:CDRO;PKD

This directive selects the Packed Data data mode for card reader controller zero.

Select Card Reader Speed (CRS). This directive selects the timeout constant for the card reader speed. The card reader speed is expressed as cards per minute in decimal notation.

The format of the CRS directive is as follows:

CRS:CDRx;SSS

Where :

x is the controller number.
SSS is the cards per minute in decimal notation.

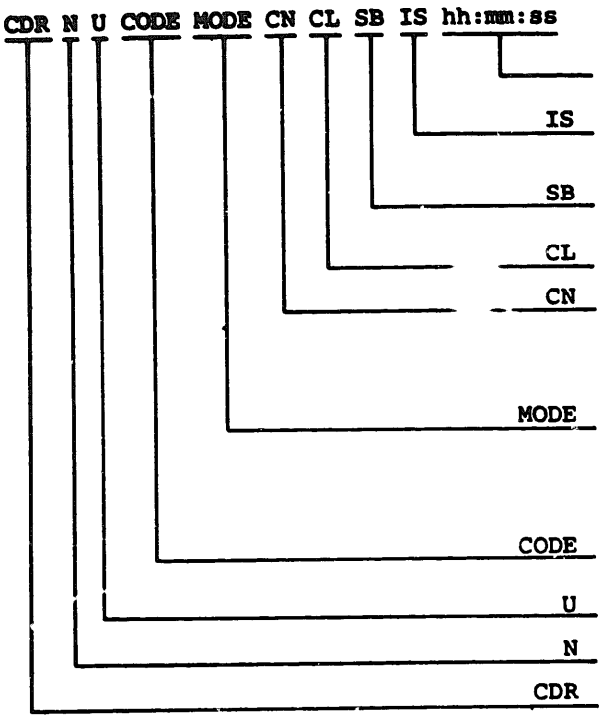
Example: CRS:CDR0;600

This directive selects a card reader speed of 600 cards per minute for card reader controller zero.

12.3 CDR ERROR MESSAGES

This paragraph contains the CDR error messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data, status, or interrupt errors. Tine is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

Data Error

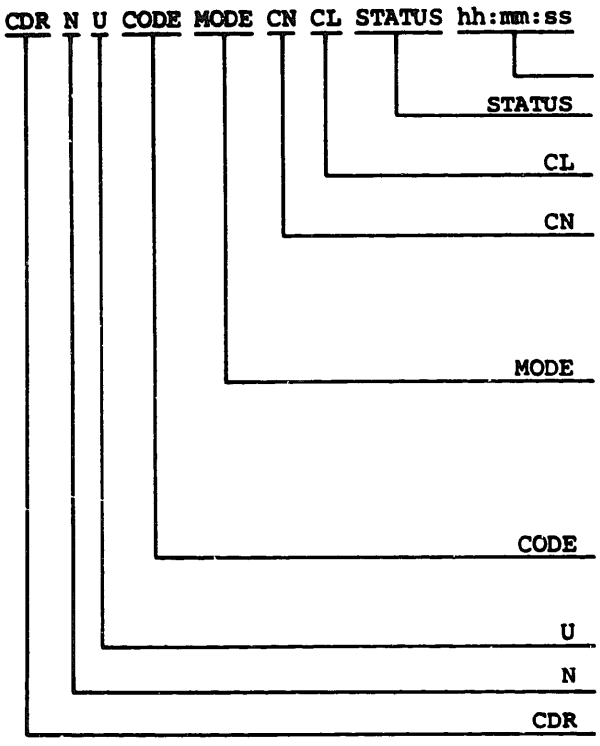


- hh:mm:ss — Time.
- IS — Value the data word does contain in hex.
- SB — Value the data word should contain in hex.
- CL — Column number in hex.
- CN — Number of cards from end in hex.
- MODE — Data mode:

Bit	Mode
0	Hollerith.
1	Packed.
2	Binary.

- CODE — Two-letter code mnemonic:
  DE = data error.
- U — Unit number of the device in hex.
- N — Controller number in dec.
- CDR — CDR controller mnemonic label.

Status Error



- hh:mm:ss — Time.
- STATUS — Status word in hex.
- CL — Column number in hex. N/A for not ready (NR) status.
- CN — Number of cards from end in hex.
- MODE — Data mode:

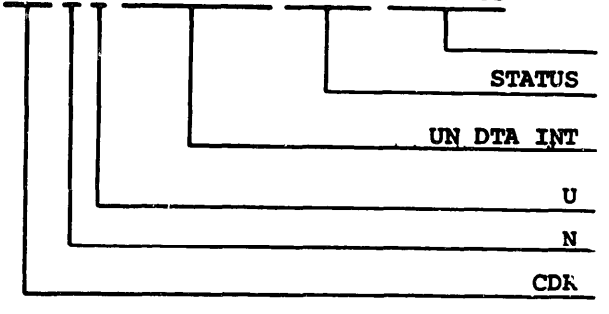
Bit	Mode
0	Hollerith.
1	Packed.
2	Binary.

N/A for not ready (NR) status.

- CODE — Two-letter code mnemonic:
  NR = not ready.
  SE = status error.
  NI = no data interrupt.
- U — Unit number of the device in hex.
- N — Controller number in dec.
- CDR — CDR controller mnemonic label.

Interrupt Error

CDR N U UN DTA INT STATUS hh:mm:ss



Time.

STATUS — Status word in hex.

UN DTA INT — Literal 'UN DTA INT'
UN DTA INT = unexpected data interrupt.

U — Unit number of the device in hex.

N — Controller number in dec.

CDR — CDR controller mnemonic level.

SECTION 13
DDI TEST MODULE

13.1 FUNCTIONAL DESCRIPTION

The DDI Test Module checks the DDIO system with the background service routine. This routine performs DDIO testing and error checking, as well as post-past re-initialization and local data base maintenance. The DDIO is tested by line group. Error checking includes data matching (input versus output), device status checking, and interrupt occurrence checking. In the external loop tests, one input interrupt is expected per line group tested. In the internal tests, no interrupts are expected.

13.2 DDI DIRECTIVE

There is only one directive which is used with the DDI test module. The directive selects the digital data line groups (cards) and the specific line ports in each group to be tested. The group/line combination is expressed as a two-digit hexadecimal number: the first digit is the group, the second digit is the line. For example, '$27' specifies group 2, line part 7. Single group/line numbers are delimited by comas, a range of group/line numbers is delimited by a dash.

The format of the LPX directive is as follows:

LPX:DDI;N(1),N(2),Fn-Ln,N(x)

Where :

N(1),N(2),N(x) are group/line numbers in hexadecimal notation. Fn-Ln are contiguous group/line numbers.

Example : LPX:DDI;0-3,$1A,$1F,$24-$27

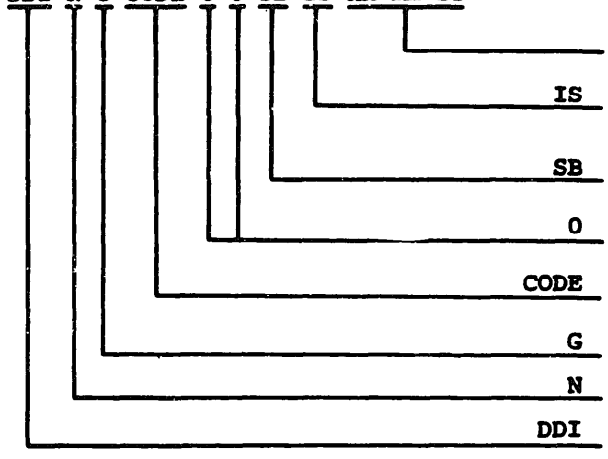
This directive selects group 0 (implied), line ports 0 thru 3; group 1, line port A (or 10); group 1, line port F (or 15); and group 2, line ports 4 thru 7.

13.3 DDI ERROR MESSAGES

This paragraph contains the DDI error messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data, status, or interrupt errors. Time is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

Data Error

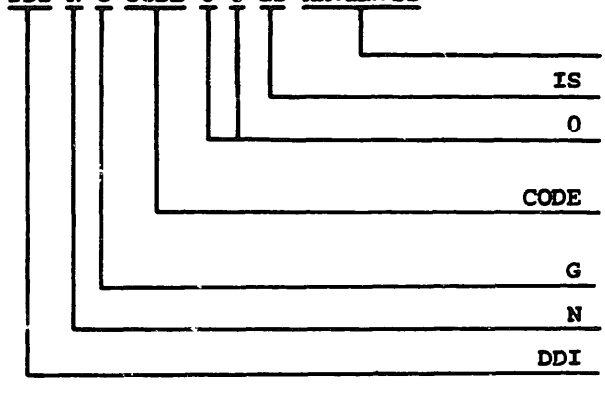
DDI N G CODE 0 0 SB IS hh:mm:ss



Time.	
IS	Value the data word does contain in hex.
SB	Value the data word should contain in hex.
0	Unused field. (May be blank.)
CODE	Two-letter code mnemonic: DE = data error.
G	Group number in hex.
N	Controller number in dec.
DDI	DDI controller mnemonic label.

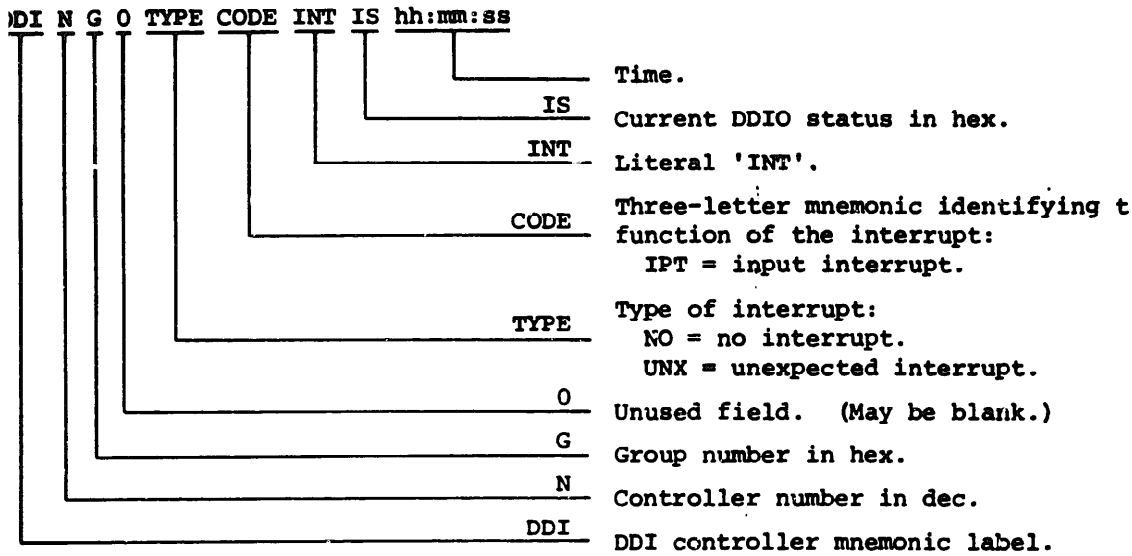
Status Error

DDI N G CODE 0 0 IS hh:mm:ss



Time.	
IS	Is status word in error in hex.
0	Unused field. (May be blank.)
CODE	Two-letter code mnemonic: XL = external loop mode. IL = internal mode.
G	Group number in hex.
N	Controller number in dec.
DDI	DDI controller mnemonic label.

:nterrupt Error



SECTION 14
DMD TESTMODULE

14.1 FUNCTIONAL DESCRIPTION

The DMD Test Module checks the drum memory system with the background service routines. The background service routine initializes the verify packet and issues a command to the drum controller to verify one sector. These steps ensure that the drum subsystem is ready. The write packet is then initialized to the first available sector address, and data are written into all sectors up to and including the last available sector. The read packet is then initialized to the first available sector and the data are read back from the drum in the same order as they were written. As the data are being read, they are compared with the original (written) data.

14.2 DMD DIRECTIVES

There are two directives which may be used with the DMD test module. The directives select the first available sector for testing and the last available address. The first 64 tracks may be write-protected in groups of 16 by use of the write-protect switches. The write-protect switches are assigned as follows:

W-P Switch	No. Tracks	Tracks
1 thru 4	4 tracks each	First 16 tracks (O-15)
5 thru 8	4 tracks each	Second 16 tracks (16-31)
9	16 tracks	Third 16 tracks (32-47)
10	16 tracks	Fourth 16 tracks (48-63)
11 thru 24	Not used for STP.	If these switches are enabled, interrupts will occur.

The DMD directives are as follows:

- BEG select first available sector.
- DTS specify last available sector.

The configuration call statement is as follows:

```
DDD:DMD;
```

Where DDD is the directive mnemonic.

Select First Available Sector (BEG). This directive selects the first available sector for testing. The first 64 tracks may be write-protected in groups of 16 tracks. The start sector is selected by designating which groups of tracks are not to be tested..

The format of the BEG directive is as follows:

```
BEG:DMDx;N
```

Where:

x is the controller number.
N designates the number of tracks not to be tested as follows:

N	Do Not Test	Start Test At Sector 0
0	None	Track 0
1	First 16 tracks	Track 16
2	First 32 tracks	Track 32
3	First 48 tracks	Track 40
4	First 64 tracks	Track 64

Example: BEG:DMD0;2

This directive specifies that the first 32 tracks are not to be tested and that sector zero of track 32 is the first available sector for testing for drum controller zero.

Specify Last Available Sector (DTS). This directive specifies the last sector address available for testing and does so by specifying the number of drums in the system and the number of tracks on the last drum. A drum has 512 tracks referenced in groups of 16 tracks each.

The format of the DTS directive is as follows:

DTS:DMDx;m,n

Where:

x is the controller number.
m is the number of drums, 1 or 2.
n is the number of tracks on the last drum in decimal. n must be in the range 64 thru 512 in increments of 16.

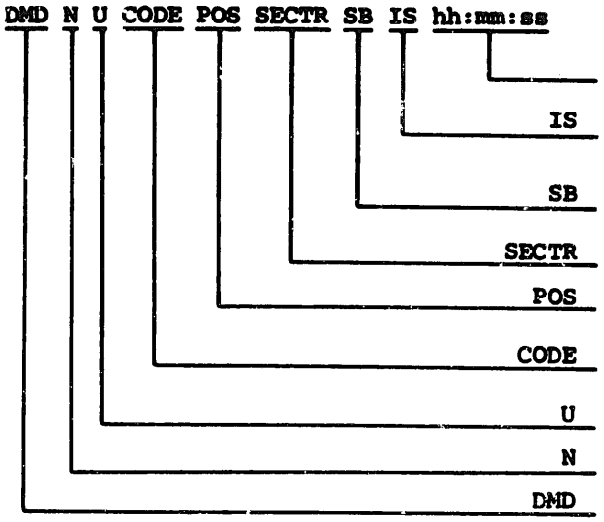
Example: DTS:DMD0;1,512

This directive specifies that there is one drum in the subsystem for drum controller zero and that the drum has 512 tracks.

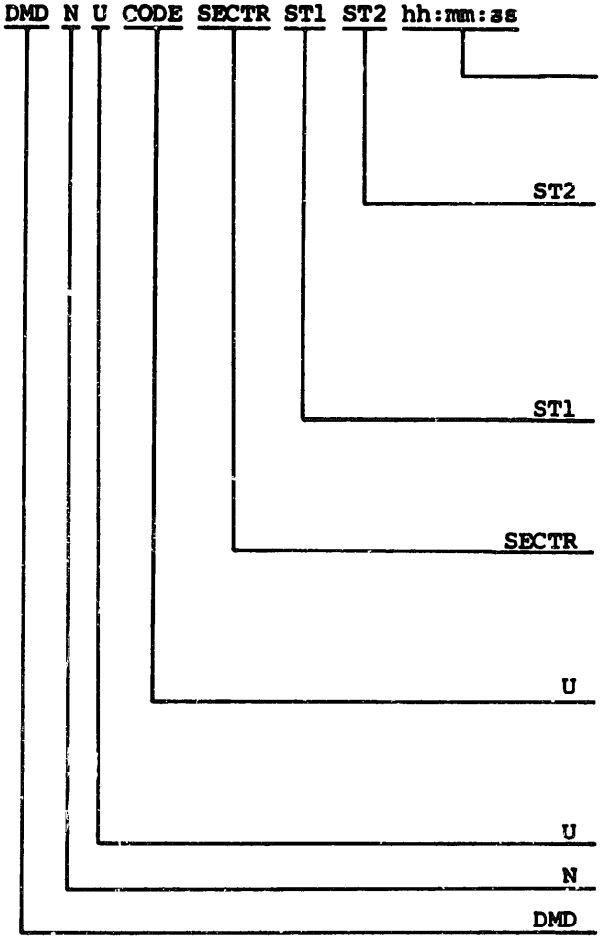
14.3 DMD ERROR MESSAGES

This paragraph contains the DMD error messages presented in a symbolic format. An explanation of each symbol is provided. Error messages are classified as data, status, or interrupt errors. Time is real or relative, expressed in hours, minutes, and seconds at 2-second intervals. A 24-hour clock is used.

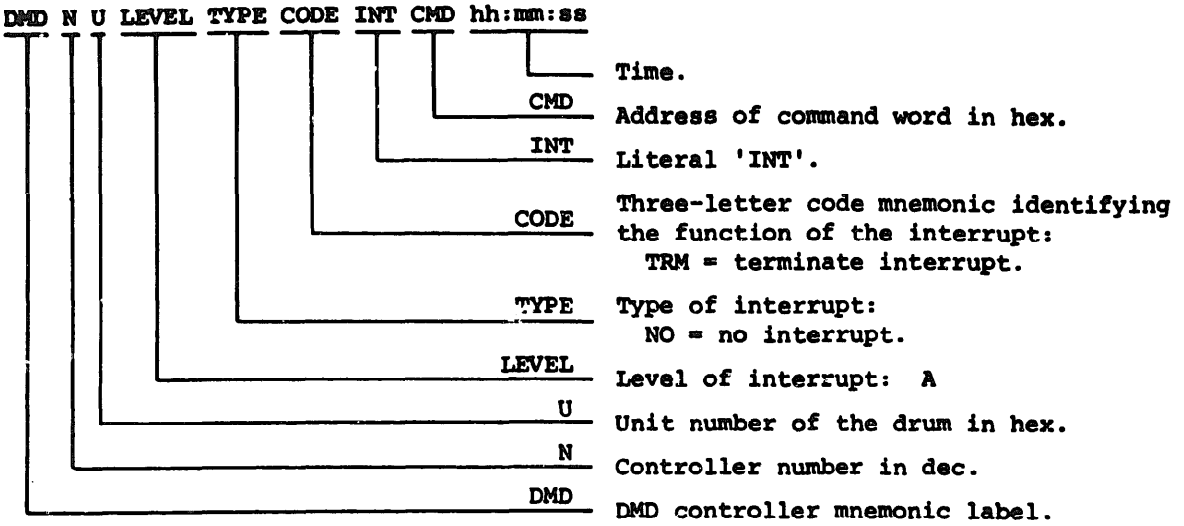
Data Error



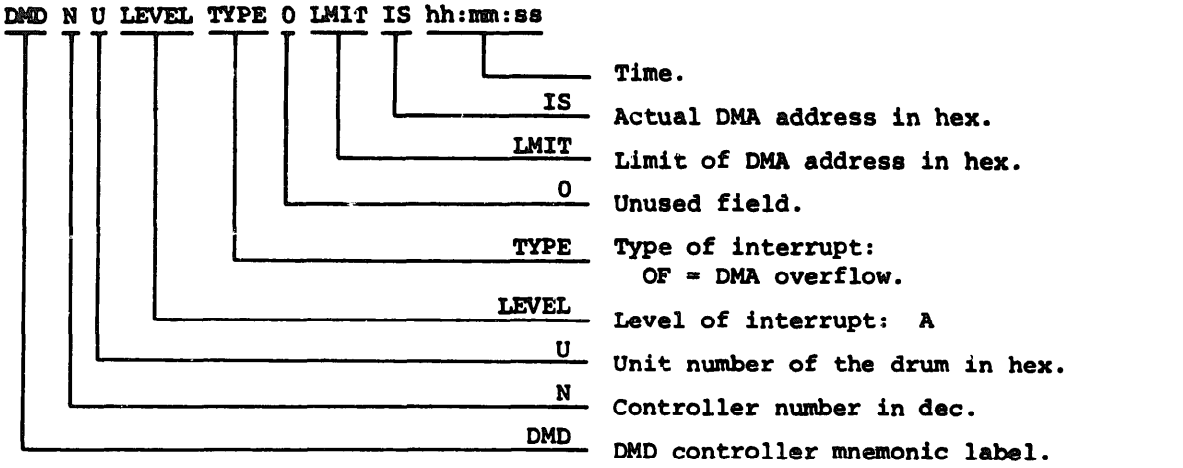
Status Error



Interrupt Error



Interrupt Error



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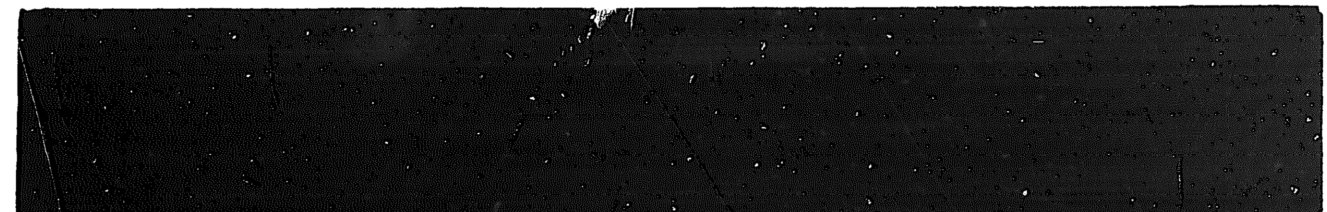

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