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COMPUTER SYSTEMS GROUP
SANTA BARBARA PLANT

BOLT MAGNETIC TAPE TEST

PRODUCT SPECIFICATION

REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
A	1/8/82	R Rhode	Original Issue -- Special Mark 10.0 Release

(c)

TC-1

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SANTA BARBARA PLANT   P.S. 2228 3592(A)

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INTRODUCTION

The magnetic tape confidence test sections are part of BOLT,
B1000 On-Line TEST, software system and designed to test Magnetic
Tape Controls 2 through 6.

MTC-6 has On-Line diagnostic capabilities under the MCP, as a
result the test sections are divided into test sections that do
not need the operator's intervention (Default), test sections
that do need his intervention (Optional) and test sections that
are only valid for MTC-6 (Diagnostic).

Due to the limitations on BOLT, only one unit can be tested at a
time, and as a result no interactive testing can be done between
the units.

The general assumptions are:

a) All the Controls are assummed to be 9-T; as a result MTC-1
    (7-T) can not be tested.

b) Noise bursts of 15 characters and less are rejected by all
    the Controls.

DEFAULT CONFIDENCE TEST SECTIONS

Default Confidence Test Sections operate the Control as a whole
unit, using operations similar to those that would be encountered
in normal operation of the unit. These test sections are used to
gain confidence in the operability of the Control. They are
common to all Magnetic Tape Controls, and will run by default.

OPTIONAL CONFIDENCE TEST SECTIONS

The Optional Confidence Test Sections are basically functional
tests, testing the Control's ability to recognize and report
certain conditions (e.g. Not Ready, Ready, etc.). They are
common to all MT Controls, but will not run by default because
operator intervention is required for each.

OPTIONAL DIAGNOSTIC TEST SECTIONS

The Optional Diagnostic Test Sections are a series of test
routines designed to exercise the logic functions of the MTC-6
that can be tested On-Line.

RELATED DOCUMENTS

Part Number	Part Name
P.S. 2228 3543	B1000 BOLT Executive
P.S. 2208 2952	Magnetic Tape Control 1, 2 & 3
P.S. 2210 0267	Magnetic Tape Control 4, 5 & 6

BACKGROUND INFORMATION

It is intended that the following section give a brief discussion
of the MT Controls so that the sections to follow are easier to
understand. In some cases, the reader is referred to related
documents for more detailed information.

GENERAL DESCRIPTION

MTC-2 and -3 consist of an 8-card backplane and five logic cards.
They interface to the system via the interface described in P.S.
2204 8623, B1700 I/O Bus Subsystem. MTC-2 provides two 200
character buffers. MTC-3 provides two 400 character buffers.

MTC-4 consists of a 4-card backplane and three logic cards. It
is connected to the processor's I/O Bus via frontplane ribbon
cables. MTC-5 occupies a 2-card position area in an I/O
backplane and consists of two logic cards. It connects to the
I/O Bus via the backplane. Except for the physical size and data
buffer size MTC-4 and -5 are equivalent. MTC-4 provides three
300 character buffers. MTC-5 provides six 300 character buffers.

MTC-6 consists of one logic card and occupies a 1-card position
area in an I/O backplane. It connects to the I/O Bus via the
backplane.

MTC-2, -3, -4, and -5 operate with a system clock of 2, 4 or 6
MHz.   MTC-6 operates with a system clock of 4 or 6 MHz.   MTC-2
and -3 can be assigned any channel number from 0 to 15, however,
channel #15 is preempted for memory parity error report by the
I/O driver. MTC-4, -5, and -6 can be assigned any channel number
from 8 to 14.

Logic cards in a MTC meet the card tester compatibility
requirements of P.S. 2204 8672, Card Tester.

Both MTC-2 and -3 interface to the NRZ Formatter contained in the
Magnetic Tape Subsystem. The Subsystem can accomodate up to 8 MT
drives.

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Both MTC-4 and -5 interface to the PE control module contained in the Master Electronics Control (MEC) of a module 4 or 5 Tape Subsystem. This PE control module contains the tape drive motion control, deskew buffering, parity checking, error correcting, formatting, timing, and OP-code decoding logic. The M4A/M5A MEC subsystems provide for up to four controls and sixteen tape drives via a dual MEC configuration. The M5B MEC subsystem provides for up to two controls and eight tape drives via a single MEC. See B1700/B1800/B1900 System Index for permitted configuration.

MTC-6 interfaces to the PE Formatter contained in the Model 11 Magnetic Tape Subsystem. This subsystem can accomodate up to four MT drives.

DATA TRANSFER

For MT Controls -2, -3, -4, and -5 data is transferred between the processor and the Control on the 24 bit wide I/O Bus using the multiple RC protocol for data transfer. For MTC-6, data is transferred one byte at a time using single RC protocol. In the case of MTC-2 and -3 only two bytes of data are placed on the bus at a time, the other byte contains control information.

Data transfer between the MEC and MTC-4 or -5 are 16 bits per transfer via the 25 wire standard interface described in S.D.S. 2046 4863. Data transfer between the MT Subsystem and MTC-6 is 8 bits per transfer via the interface described in S.D.S. 2051 3917, Interface, MT Subsystem Model 11.

The buffers are used in a cyclic manner to receive data during data transfer operations.

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OPERATION CODES

The controls are basically divided into three groups:

    a) MTC 2 and 3,
    b) MTC 4 and 5,
    c) MTC 6.

The operation codes are the same in each group but, because of the variants that can be set in them, are not necessarily the same for different groups.

The following are the brief descriptions of the operation codes for each group, and the ones that are common among the different Controls, and thus are used in the Default and Optional Confidence test sections.

READ

The common read ops are READ FORWARD and READ BACKWARD. MTC 2 and 3 can correct an incorrect track by using a variation of read forward op; they also have the capability of rejecting noise bursts of 6 characters and less which doubles the number of the op codes.

MTC-6 has diagnostic reads, forward and backward.

```
---------------------------------------------------------------
  1  0  0  C  V  C  T  T  T  0  S  .  .  .  .  .  .  D  D  D  .  U  U  U  U  1
---------------------------------------------------------------
```

    V = 0   Read forward
    V = 1   Read reverse
    C = 1   Correct the designated track (MTC 2 & 3 only)
 TTT = 000....111 Track # (if C = 1)
    S = 0   Reject noise bursts of 15 characters and less
                                    (MTC 2 & 3 only)
    S = 1   Reject noise bursts of 6 characters and less
                                    (MTC 2 & 3 only)
 DDD = 000 Normal read
 DDD = 101 Diagnostic write variant, DIAGWR
                                     (MTC 6 only)
UUUU =   Unit #

UUUU	MTC-2/3	MTC-4/5	MTC-6
0000	invalid	unit 16	unit 4
0001	unit 1	unit 1	unit 1
0010	unit 2	unit 2	unit 2
0011	unit 3	unit 3	unit 3
0100	unit 4	unit 4	unit 4
0101	unit 5	unit 5	unit 1
0110	unit 6	unit 6	unit 2
0111	unit 7	unit 7	unit 3
1000	unit 8	unit 8	unit 4
1001	invalid	unit 9	unit 1
1010	invalid	unit 10	unit 2
1011	invalid	unit 11	unit 3
1100	invalid	unit 12	unit 4
1101	invalid	unit 13	unit 1
1110	invalid	unit 14	unit 2
1111	invalid	unit 15	unit 3

Note: No invalid unit must be designated;   also non-present
units   must   not be designated by any operations other than TEST.
Results are undefined if invalid or non_present units are so
designated.

WRITE

The general write ops are WRITE, WRITE TAPE MARK and ERASE.
MTC-6 has diagnostic write, write tape mark and erase.

```
----------------------------------------------------
I 0 1 0 E T . . . . P . . . . . . D D D . U U U U I
----------------------------------------------------
```

```
    E = 0    Write
    E = 1    Erase
    T = 0    Normal write
    T = 1    Write tape mark
    P = 0    Number of data bytes in record is even
                                        (MTC 2 & 3 only)
    P = 1    Number of data bytes in record is odd
                                        (MTC 2 & 3 only)
  DDD = 000 Normal write
  DDD = 101 Diagnostic write variant, DIAGWR
                                        (MTC 6 only)
 UUUU =     Unit #
```

Note: E = T = 1 is invalid.   The P-bit is reserved for software
use.   MTC 2 & 3 must ignore this bit. The I/O Driver indicates
odd / even to the Control by command.

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SPACE

The usual ops are Space forward / backward one record / past the
next EOF / tape mark record.

MTC 2 and 3 have 4 more space ops with the same description for
noise bursts of 6 characters and less.

MTC 4 and 5 have one more op, which is space backward two
records.

```
-------------------------------------------------------
I 1 1 0 V N B . . . S . . . . . . . . . . . U U U U I
-------------------------------------------------------
```

```
        V = 0     Space forward
        V = 1     Space backward
        N = 0     Space past next EOF or tape mark record
        N = 1     Space one record
      VNB = 111   Space 2 records backward        (MTC 4 & 5)
        S = 0     Reject noise bursts of 15 characters and less
                                                  (MTC 2 & 3 only)
        S = 1     Reject noise bursts of 6 characters and less
                                                  (MTC 2 & 3 only)
     UUUU =       Unit #
```

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TEST

The common test ops are Test and store the result unconditionally, Test and store the result only if the unit is ready and not rewinding and Test and store the result only if the unit is not ready.

MTC 2 and 3 have 3 more ops with the same description with the PAUSE bit, used only for software control, set.

MTC-6 has diagnostic test ops to check the READY condition, SAD (System Address Register) and PAD (Peripheral Address Register).

```
------------------------------------------------------
1 1 0 0 V V P . . . . . . . . . . D D D . U U U U 1
------------------------------------------------------
```

VV = 00 Store result unconditionally
   = 01 Store result only if not ready
   = 10 Store result only if ready & not rewinding
   = 11 Undefined
P = 1   Pause, used for software control
                                   (MTC 2 & 3 only)
DDD = 000 Normal
   = 011 Diagnostic check of Ready   (MTC 6 only)
   = 101 Diagnostic check of SAD   (MTC 6 only)
   = 111 Diagnostic check of PAD   (MTC 6 only)
UUUU =   Unit #

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REWIND

The usual op code is REWIND.   MTC 4, 5 and 6 have one more op
which is REWIND and UNLOAD / OFFLINE.

```
-----------------------------------------------------
I  0  1  1  V . . . . . . . . . . . . . . . . U U U U I
-----------------------------------------------------
```

V = 0   Normal rewind
V = 1   Rewind unload / offline (MTC 4, 5 & 6 only)

LOCK, STOP and PAUSE

These are pseudo-op codes which may be used by MCP for software
control and are never sent to Mag Tape Control.

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RESULT STATUS INFORMATION

The conditions reported in the Result Status field are described
in the following paragraphs.   A bit is set only if the condition
is true, otherwise it is cleared to zero.

OP-COMPLETE

BITS 1 & 17: Bits #1 and #17 are always set to indicate
operation complete.   However,   in certain cases, bit 17 is
suppressed by the Control in order to signal to the I/O driver
that the result is not to be stored (See the description of the
TEST OP).

EXCEPTION CONDITION

BIT 2: Bit #2 indicating an exception condition is set on all
operations except TEST if one or more bits #3 through #12 (13 for
MTC 2 & 3), bit #20 (MTC 2 & 3 only), #22 (MTC 4, 5 & 6 only), or
#23 (MTC 4, 5 & 6 only) are set. An interrupt is always returned
regardless of request.   On TEST, bit #2 is set only if one or
more bits 3, 6, 7, 8, 9, 11, or 12 are set or if bit 10 is not
set.

NOT READY, NOT PRESENT, NOT COMPATIBLE, BUSY, INITIATE, PHASE TRANSMISSION ERROR

BIT 3:   If the designated unit is Not Ready at the start of any
operation or goes Not Ready during the operation, the operation
is terminated immediately and a result indicating NOT READY is
reported.

Not Ready is also reported by MTC-6 on the REWIND-UNLOAD OP
regardless of the initial Ready / Not Ready status of the drive.

On all operations,   if the unit is not present, Not Ready is
reported.   In addition, for the TEST operation,   presence /
absence is appropriately reported.

On all operations, if the unit is not compatible in format, the
MEC terminates the operation without moving tape and reports an
invalid OP code.   The Control, except for the TEST operation,
returns a Not Compatible result.   For the TEST operation ,   the
Control inhibits the Not Compatible result and reports 800 BPI
density.

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On all operations if a unit is busy, the Control will return a Busy result. The busy can be caused by another control or the maintenance panel using the same interface to the MEC as the MTC returning the result. (MTC 4 & 5 only)

On all operations, if a transmission error occurs during the initiate phase, the MEC terminates the operation without moving tape and reports an invalid OP code and a transmission error. The Control returns an Initiate Phase Transmission Error report and a Transmission Error. (MTC 4 & 5 only)

DATA ERROR

BIT 4: During WRITE, the Control calculates and records vertical parity (VPC), cyclic redundancy (CRC), and longitudinal parity (LPC). By means of read-after-write function, the Control checks for errors in VPC, CRC, or LPC, and also for dropout. Any error is reported.

On READ or SPACE one record, forward or backward, single track dropouts or error caused by excessive skew are corrected by the PE logic and are not reported to the MTC. Errors that cannot be corrected by the MEC logic will be reported.

During a SPACE to EOF operation, any errors detected on intermediate records are not reported; errors on the EOF record are reported.

Data error does not terminate any operation.

SUBSYSTEM ID

BITS 4 - 5: On a TEST operation the field changeable SUBSYSTEM ID is reported on bits 4 and 5. MTC-6 will always return 00.

ACCESS ERROR

BIT 5: In a WRITE operation, if an access failure occurs after
one buffer or more has been written,   the Control immediately
completes a validly formatted record and halts the tape. The
Control accepts the late bufferload of data and returns a result
indicating ACCESS ERROR.

If an access error occurs at any point in an ERASE operation, the
Control immediately halts the tape. The Control accepts the late
bufferload of data and returns a result indicating ACCESS ERROR.

If an access failure occurs at any point during a READ or SPACE
operation (including first bufferload), the tape is stopped in
the following IRG.   After the tape has been stopped, the result
is sent indicating ACCESS ERROR and any other   exception
conditions occurring in the complete record. Following the
access failure,   one bufferload of data is returned.   The
remainder of the record is not returned.

TRANSMISSION ERROR

BIT 6: Transmission error detected by either the MTC or the MEC
during a TEST operation is reported in the result by setting bit
#6;   this report invalidates other status reports such as NOT
READY, EOT, BOT, WLO, and Density Switch Setting.   (MTC 4 & 5
only)

EOT

BIT 7: EOT does not terminate any operation.   End of Tape is
reported on any operation except backward READ or backward SPACE
if at the end of the operation the tape is positioned at or
beyond the point EOT is detected.

BOT

BIT 8: BOT terminates any backward operation.   Tape   is
immediately decelerated and stopped, and remains at BOT. BOT is
reported in the operation during which it was sensed, and on all
following operations until a forward operation is performed.   If
any backward operation except REWIND-UNLOAD is commanded while
the tape unit is at BOT,   the tape is not moved and BOT is
reported.

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WRITE LOCKOUT

BIT 9: If a write ring is not installed on the tape reel on the
designated drive,   it will be impossible to perform a WRITE or
ERASE operation. If a WRITE or ERASE operation is received, the
Control will return a result indicating Write Lockout.   The tape
will not be moved and no data will be transferred to the MTC.
WRITE LOCKOUT is also reported on a TEST OP.

EOF / TAPE MARK DETECTED

BIT 10: If a tape mark is detected in a READ or SPACE operation,
no data is sent to the processor, and the result indicates END of
FILE.

UNIT PRESENT

BIT 10: If on a TEST operation, the designated unit is present,
the result returned will indicate PRESENT.   If a not PRESENT
result is returned, the other bits returned may not be correct.

REWINDING

BIT 11:   REWINDING is reported if any operation except REWIND is
received while the tape is rewinding and Ready.   If the unit is
rewinding and Not Ready as a result of an UNLOAD operation, Not
Ready is reported.

TIMEOUT

BIT 12:   The MEC will Timeout if the operation does not begin
within approximately 2 1/2 seconds of its initiation.   In the
case of a WRITE, READ, or SPACE or higher speeds, as much as 52
feet of blank tape may be moved past the head before the absence
of data transfers causes a Timeout.

MTC 4 and 5 will Timeout if after the initialization of a command
(except SPACE to EOF) to the MEC, it does not receive an MEC
interface clock within 4 seconds of the initiation or within 4
seconds of the last interface clock.   Both Timeout conditions are
OR'd in the result.

MTC-6 will Timeout if the operation does not begin within 1 to 2
seconds of its initiation.   This permits detection of blank tape
of 2 to 4 feet.

CRC CORRECTION POSSIBLE

BIT 13: In READ or SPACE forward if CRC error is detected, the
Control checks the CRC to determine whether the error is
correctable and if so which track is in error. This information
is reported unless the track-in-error is the parity track, in
which case no error is reported and correct data must be assumed.
If an error is reported as correctable, the software can
reposition the tape via backward READ or SPACE and then READ
forward with variants to correct the track-in-error. Correcting
the track in error during backward READ is not allowed. (MTC 2 &
3 only)

TRACK IN ERROR

BITS 14 - 16: If bit #13 is set, bits #14 through #16 indicate
which track should be corrected. (MTC 2 & 3 only)

DENSITY SWITCH SETTING

BITS 13 - 15: With MTC 4 and 5, 1600 BPI is reported if the MEC
reports valid OP code in response to a TEST. If the unit is
ready and the MEC reports invalid OP code (which it will if the
density switch on the drive is set at 800 BPI), the Control will
report 800 BPI.

With MTC-6, the density report depends upon which formatter (PE
or NRZ) is present in the drive. Presently only the PE formatter
is defined for use.

CONTROL ID

BITS 18 - 24: The Control ID is returned in bits 18 through 24
on a TEST operation.

INITIATION LATE

BIT 21: When the Control in an idle state, receives a WRITE
operation, it starts tape movement immediately upon receipt of
the OP code. If the first bufferload of data on WRITE or ERASE
is not received in time for the Control to start writing at the
proper time, the tape is stopped and a result indicating
INITIATION LATE is returned. (MTC-3 only)

MEC DETECTED TRANSMISSION ERROR

BIT 22: If a Transmission Error is detected during the initiate phase, when OP codes are sent to the MEC, or during a WRITE data transfer, the MEC will report a Transmission Error and Invalid Request to the MTC and then will go idle. The Control then reports Not Ready and Mec Detected Transmission Error. (MTC 4 & 5 only)

INTERNAL RAM PARITY ERROR

BIT 22: Parity is checked on all data read from the Control's internal RAM. This RAM is used to store data received from the tape on READ and data to be sent to the tape on WRITE. (MTC-6 only)

CONTROL DETECTED TRANSMISSION ERROR

BIT 23: If a Transmission Error occurs during transfer of the result from the MEC or during a READ data transfer, Control Detected Transmission Error is reported. The rest of the exception bits stored in the RS field may be incorrect. (MTC 4 & 5 only)

MT INTERFACE PARITY ERROR

BIT 23: MT Interface Parity Error is reported for READ, WRITE (read after write), and SPACE OPs if the Control detects an error. (MTC-6 only)

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RESULT STATUS TABLES

MTC-2   id = 2302

Bits (1-24, left to right)	MEANING	MODE *
1	OP-COMPLETE	ALL MODES
2	EXCEPTION CONDITION	ALL MODES
3	NOT READY	ALL MODES
4	DATA ERROR	R, W, S
4-5	SUBSYSTEM ID	T
	00 - NO EXCHANGE	
	01 - #0	
	10 - #1	
	11 - #2	
5	ACCESS ERROR	R, S, W, E
6	RESERVED	
7	EOT	RF, SF, W, E, T
8	BOT	RB, SB, T
9	WRITE LOCKOUT	W, E, T
10	EOF / TAPE MARK DETECTED	R, S
10	UNIT PRESENT	T
11	REWINDING	R, W, E, S, T
12	TIMEOUT (3 feet of blank tape)	R, W, S
13	CRC CORRRECTION POSSIBLE	RF, SF
14-16	TRACK IN ERROR	R, S
	(MEANINGFUL ONLY WITH BIT 13 SET)	
13-15	DENSITY SWITCH SETTING	T
	101 9-T 800 BPI NRZ	
	111 9-T 1600 BPI PE	
17	OP-COMPLETE	ALL MODES
18-24	CONTROL ID = 0110000	T

*MODES:

R = read, W = write, S = space, T = test, RB = read backward,
SB = space backward, RF = read forward, SF = space forward,
REW = rewind

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MTC-3   id = 2302

The Result Descriptor for MTC-3 is the same as MTC-2 with the only difference being that bit 21 (INITIATION LATE) gets set if the first bufferload of data on ERASE or WRITE is not received in time for the Control to start writing at the proper time. MTC-2 reports this condition as an ACCESS ERROR while with MTC-3 one can differentiate between the two cases; if the error happens on the first bufferload no data has been recorded on the tape; if later, data has been put on it.

MTC 4 & 5   id = 2342

1	OP-COMPLETE	ALL MODES
2 *	EXCEPTION CONDITION	ALL MODES
3 **	NOT READY	ALL MODES
4	DATA ERROR	R, W, S
4-5	SUBSYSTEM ID	T
5	ACCESS ERROR	R, W, E
6	TRANSMISSION ERROR	T
7	EOT	RF, SF, W, E, T
8	BOT	RB, SB, T, REW
9	WRITE LOCKOUT	W, E, T
10	EOF / TAPE MARK DETECTED	R, S
10	UNIT PRESENT	T
11	REWINDIND	R, S, W, E, T
12	TIMEOUT	ALL MODES
13-15	DENSITY SWITCH SETTING	T
	101 9-T 800 BPI NRZ	
	111 9-T 1600 BPI PE	
16	RESERVED	
17	OP-COMPLETE	ALL MODES
18-24	CONTROL ID = 0110100	T
22	MEC DETECTED TRANSMISSION ERROR	R, S, W, E, REW
23	CONTROL DETECTED TRANSMISSON ERROR	R, S, W, E, REW

* On TEST, EXCEPTION bit is:
     a) not set for 4, 5, 10, 22.
     b) set if bit 10 is a zero indicating Not Present.

** On TEST, bit 3 is not set for non-compatible unit.

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MTC-6   id = 2092

1	OP-COMPLETE	ALL MODES
2 *	EXCEPTION CONDITION	ALL MODES
3 **	NOT READY-NOT PRESENT	ALL MODES
4	DATA ERROR	R, W, S
5	ACCESS ERROR	R, W, E
6	RESERVED	
7	EOT	RF, SF, W, E, T
8	BOT	RB, SB, T, REW
9	WRITE LOCKOUT	W, E, T
10	EOF / TAPE MARK DETECTED	R, S
10	UNIT PRESENT	T
11	REWINDIND	R, S, W, E, T
12	TIMEOUT	ALL MODES
13-15	DENSITY SWITCH SETTING	T
	101 9-T 800 BPI NRZ	
	111 9-T 1600 BPI PE	
16	RESERVED	
17	OP-COMPLETE	ALL MODES
18-24	CONTROL ID = 0001001	T
22	INTERNAL RAM PARITY ERROR	R, W
23	MT INTERFACE PARITY ERROR	R, W, S

*   On Test EXCEPTION bit is :
    a) Not set for 4, 5, 10, 22.
    b) Set if bit 10 is a zero indicating not present.

** On TEST, bit 3 is not set for non-compatible unit.

ABOUT MAGNETIC TAPE TEST SECTIONS

It is intended that this section familiarize the reader with the basics of running the On-Line Magnetic Tape test sections.

1 - MT Test Sections, for the most part, are pre-defined tests which run by default parameters. Some test sections allow the operator to change default parameters. At the end of each test section is included an indicator table which describes which aspects of the sections are operator sensitive. The term "operator sensitive" is used to mean that the BOLT operator may alter the default parameters. Note that all the sections are sensitive to operator input in the respect that the BOLT commands like CLEAR, RESTART, EXIT, etc., are acted on and can affect the test in progress.

2 - When the operator selects a MT unit, the presence of the unit is checked and if WR LOCKOUT or NOT READY is reported then the operator is reminded that for Common and Optional Confidence test sections the designated unit should be ready and must have a tape reel with the write ring installed on it.

3 - The default buffer size for Read, Write and Erase ops for Common and Optional Confidence test sections is 1024 bytes with the exception of section #3 where the buffer length is subject to change for each Read or Write operation. if the operator changes the length through the LENGTH command, the dynamic memory is checked to insure that there is enough memory allocated at run time. The maximum and minimum buffer sizes that can be selected by the operator are 4095 and 16 bytes respectively. The buffer size is fixed once the test section has begun.

4 - Each record must contain an even number of bytes for MTC-4/5; therefore, in the case of these controls if the operator selects an odd value for LENGTH, BOLT adjusts the entered value and displays a warning message in addition to the modified value for LENGTH.

5 - The default value for the number of physical records to be read, written or spaced over is 256, unless otherwise noted. However, for some of the sections, the operator can change this value by using the BOLT RECORDS command; this value is fixed once the test section execution has begun.

6 - The default value for the RETRY count is 10 for all of the Magnetic Tape operations; however, the operator can change this value by using the BOLT RETRY command.

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7 - For some of the test sections, the operator is able to specify his own data pattern for write operations through the BOLT DATA command; once a bit pattern is selected it stays the same during the execution of any section. The following bit patterns are used, unless otherwise noted, if none has been specified: The first record contains all HEX 00, second one all HEX 55, third one all HEX AA, fourth one all HEX FF, fifth one alternating HEX AA 55, and sixth one alternating HEX FF 00. These same records are repeated as needed depending on the number of records to be written.

8 - For Diagnostic test sections, the entire Control must be obtained through the BOLT UNIT command; otherwise, the test section is aborted.

9 - If DATA ERRORs are reported during a Write operation, depending on the RETRY COUNT in BOLT, the bad record is backspaced, erased, and again written until either the error is not reported or the RETRY COUNT is exhausted. the test section is aborted if DATA ERROR is still detected after the retries.

10 - If DATA ERRORs are reported during a Read or Space op, depending on the RETRY COUNT in BOLT, the bad record is backspaced and the operation is again repeated until the error is not detected or the RETRY COUNT is exhausted.

11 - If a DATA ERROR is reported as a CRC correctable on a Read or Space Forward operation (MTC-2 and MTC-3 only), depending on the RETRY COUNT, the operation is retried; if the same error is still detected on a Read op, the tape is backspaced and a Read Forward with the CRC correction Variant and the track to be corrected is performed.

12 - If ACCESS ERROR is detected during a Read, Write, Space or Erase operation, depending on the RETRY count, the record is backspaced and the operation is again retried until either the RETRY count is zero or no error is reported.

13 - If TIMEOUT is reported during a Write OP, the operator is informed and the test section is aborted.

14 - If WRITE LOCKOUT is reported during a Write or Erase OP, meaning that there is no write ring installed on the tape reel on the designated drive, the operator is informed and the test section is aborted.

15 - If NOT READY / NOT PRESENT is reported during any kind of OP, meaning that the designated unit goes not ready or is not present, the operator is informed and the test section is aborted.

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16 - In case of any detected error other than what have been mentioned so far, depending on the RETRY count, the same operation is retried without moving the tape in advance.

17 - In case of any error, depending on the DISPLAY and PRINTER options in BOLT, an error message is displayed. If the operation has completed with EXCEPTION then the RD bits are displayed in addition to a short interpretation of the result. If the error has been on a data compare a portion of expected and observed data are displayed with the total number of miscompares and miscompares marked.

18 - If the tape is expected to be at BOT after a REWIND op and before the next op can be issued then the state of the unit is checked by issuing TEST ops at the unit until either BOT is detected or a wait period is elapsed. The RD for the last issued TEST op is displayed if REWINDING bit has been set.

19 - When the operator selects a new unit BOLT first releases the MT unit currently under the test before gairing control of the new unit; to do this a Rewind op is issued to the unit and if for some reason the Rewind op fails to complete properly, the operator will be informed and RD will be displayed.

OPERATING INSTRUCTIONS

The first step in testing any MTC is to gain exclusive access
either to the MT drive, for Default or Optional Confidence test
sections, or to the MT control, for Diagnostic test sections, to
be tested using the BOLT "UNIT" command.   Once access has been
granted the operator builds a list of test sections to be run
using the BOLT "SECTION" command. BOLT will verify that the test
section numbers are valid for the device being tested and will
also verify that the proper access has been acquired for the type
of test section being executed.

DYNAMIC MEMORY ALLOCATION

The default allocated dynamic core for BOLT is 1024 bytes.   This
area is used as a buffer for Magnetic Tape operations (Read,
Write & Erase); however, the operator can increase the size of
the buffer using the MCP MO command.

Example:

    MO BOLT ME 16384   Sets the buffer size to 2048
                                                bytes.

The maximum dynamic memory that can be allocated is 4095 bytes.
It should be noted that the LENGTH command can be used to adjust
the length of the buffer according to the assigned value for the
dynamic core.   In the above example length of the buffer can not
be greater than 2K bytes; as a result since the default length
for Mag Tape operations is 1K bytes, the operator can change this
value to any value equal to or less than 2K bytes.   Note that if
the dynamic memory is modified to any value less than 1K bytes
BOLT will inform the operator that not enough dynamic memory has
been allocated and will go to EOJ.

One can inquire the allocated dynamic memory using the MCP QF
command.

Example:

    QF BOLT ME   Displays the size of dynamic
                                                core in bits.

DEFAULT & OPTIONAL CONFIDENCE TEST SECTIONS

These test sections should be the first level of tests run to detect peripheral failure and the last level of tests run to gain confidence in a peripheral and control after a failure has been repaired.

A unit is selected for confidence testing by entering "UNIT MTx" where x = A-H for a total of 8 units.

MTA corresponds to the lowest unit on the lowest port. MTB corresponds to the second lowest unit on the lowest port.

The operator then builds a list of desired test sections using the "SECTION" command and the test sections are executed by entering "GO".

The following are the examples of the necessary commands to run all the Default and Optional Confidence Test Sections:

<job number>AX UNIT MTA;   Exclusive access to MTA drive is
                                  gained.

<job number>AX GO;   Default Confidence Test Sections
                                  (1-13) are executed with the
                                  default parameters in ascending
                                  order.

<job number>AX SEC 25;
<job number>AX GO;   Optional Confidence Test Section
                                  25 is executed with the default
                                  parameters.

<job number>AX SEC 5 10 25;
<job number>AX GO;   Default Confidence Test Sections
                                  5 & 10 and Optional Confidence
                                  Test Section 25 are executed with
                                  the default parameters.

If MTA is "in use" or "saved" by another program then the UNIT command will generate an error message.

FIGURE 1 below gives an example of what the output would be if sections 5, 10 and 25 are run on unit MTA, and no errors were reported.

```
   % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
   : BOLT =<JN> ACCEPT
<JN>AXSEC 5 10 25; GO;
   % BOLT =<JN> BEGINNING OF TEST FOR UNIT MTA
   % BOLT =<JN> MTA: BEGIN SECTION 5:   TEST TIMEOUT
   % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
   % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
   % BOLT =<JN> MTA: END SECTION 5:   TEST TIMEOUT
   % BOLT =<JN>
   % BOLT =<JN> MTA: BEGIN SECTION 10:  WRITE ONLY
   % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
   % BOLT =<JN> MTA: END SECTION 10:  WRITE ONLY
   % BOLT =<JN>
   % BOLT =<JN> MTA: BEGIN SECTION 25:  OPTIONAL TEST OP VARIANTS
   % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
   % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
   % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
   % BOLT =<JN> PLEASE MAKE THE MT UNIT NOT READY;
   % BOLT =<JN> THEN ENTER THE GO COMMAND.
   : BOLT =<JN> ACCEPT
<JN>AXGO
   % BOLT =<JN> PLEASE MAKE THE MT UNIT READY;
   % BOLT =<JN> THEN ENTER THE GO COMMAND.
   : BOLT =<JN> ACCEPT
<JN>AXGO
   % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
   % BOLT =<JN> MTA: END SECTION 25:  OPTIONAL TEST OP VARIANTS
   % BOLT =<JN>
   % BOLT =<JN> END OF TEST ON UNIT MTA -- 0000 ERRORS REPORTED.
   % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
```

FIGURE 1:   EXAMPLE CONFIDENCE TEST SECTIONS OUTPUT

FIGURE 2 below gives an example of what the output would look
like if the MTA unit were not ready prior to the selection of the
unit and execution of section 8.

```
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
    : BOLT =<JN> ACCEPT.
 <JN>AXUNIT MTA; SEC 8; GO
    % BOLT =<JN>           MAGNETIC TAPE TEST -- VERSION AA
    % BOLT =<JN>           --------------------------------------
    % BOLT =<JN>  DEFAULT CONFIDENCE TEST SECTIONS ARE   1 - 13
    % BOLT =<JN>  OPTIONAL CONFIDENCE TEST SECTION IS   25
    % BOLT =<JN>  OPTIONAL DIAGNOSTIC TEST SECTIONS ARE 50 - 55
    % BOLT =<JN>        ( 50 - 55 ARE VALID ONLY FOR MTC 6 )
    % BOLT =<JN> FOR A  DESCRIPTION  OF  THE  MAG  TAPE TEST  ENTER
                   "TEACH MT"
    % BOLT =<JN> ENTER "TEACH MT <SECTION-NUMBER>" FOR THE DESCRI-
                   PTION OF ANY TEST SECTION LISTED ABOVE.
    % BOLT =<JN>               UNIT TABLE INFORMATION
    % BOLT =<JN>               ----------------------
    % BOLT =<JN>
    % BOLT =<JN> TOTAL UNITS OBTAINED = 01
    % BOLT =<JN> UNIT NAME = MTA   PORT/CH = 7A   UNIT NUMBER = 1
    % BOLT =<JN>
    % BOLT =<JN> THE OP CODE ISSUED WAS:  800000
    % BOLT =<JN> IO RESULT STATUS FIELD:  E04E89
    % BOLT =<JN> THE FOLLOWING STATUS BITS ARE ON:
    % BOLT =<JN>     RS (1):        OPERATION COMPLETE
    % BOLT =<JN>     RS (2):        EXCEPTION
    % BOLT =<JN>     RS (3):        UNIT NOT READY
    % BOLT =<JN>     RS (4-5):      SUBSYSTEM ID = 00
    % BOLT =<JN>     RS (10):       UNIT PRESENT
    % BOLT =<JN>     RS (13-15):    TAPE FORMAT = 111
    % BOLT =<JN>     RS (17):       OPERATION COMPLETE
    % BOLT =<JN>     RS (18-24):    CONTROL ID = MTC 6
    % BOLT =<JN> UNIT MUST BE PRESENT & READY FOR CONFIDENCE & OP-
                   TIONAL SECTIONS.
    % BOLT =<JN> BEGINNING OF TEST FOR UNIT MTA
    % BOLT =<JN> MTA: BEGIN SECTION 8:   SPACE FORWARD AND REVERSE
    % BOLT =<JN> MTA:SEC 08:ERR # 01: - THE REWIND OP FAILED
    % BOLT =<JN> THE OP CODE ISSUED WAS:  600000
    % BOLT =<JN> IO RESULT STATUS FIELD:  E00080
    % BOLT =<JN> THE FOLLOWING STATUS BITS ARE ON:
    % BOLT =<JN>     RS (1):        OPERATION COMPLETE
    % BOLT =<JN>     RS (2):        EXCEPTION
    % BOLT =<JN>     RS (3):        UNIT NOT READY
    % BOLT =<JN>     RS (17):       OPERATION COMPLETE
    % BOLT =<JN> UNABLE TO  CONTINUE THE SECTION  DUE TO NOT READY
                   CONDITION.
    % BOLT =<JN> END OF TEST ON UNIT MTA -- 0001 ERRORS REPORTED.
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
```

          FIGURE 2:   EXAMPLE OUTPUT WHEN I/O ERRORS ARE DETECTED

FIGURE 3 below gives an example of what the output might be if data miscompare were detected during the execution of section 1 on unit MTA.

```
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
    : BOLT =<JN> ACCEPT
 <JN>AXSEC 1; GO
    % BOLT =<JN> BEGINNING OF TEST FOR UNIT MTA
    % BOLT =<JN> MTA: BEGIN SECTION 1:   WRITE, READ
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> MTA:SEC 02:ERR # 04: - MISCOMPARE BETWEEN EXPECT-
                     ED AND OBSERVED DATA.
    % BOLT =<JN> FIRST ERROR DETECTED AT HEX 02024
    % BOLT =<JN> MAX. OF 46 CHARACTERS  ARE DISPLAYED  STARTING AT
                     THE FIRST DETECTED ERROR.
    % BOLT =<JN>
    % BOLT =<JN> EXPECTED(02024):000000 000000 000000 000000
    % BOLT =<JN> OBSERVED       :FF00FF 00FF00 FF00FF 00FF00
    % BOLT =<JN> ERROR(S)       :**  **    **    **  **    **
    % BOLT =<JN>
    % BOLT =<JN> TOTAL NUMBER OF 4-BITS IN ERROR: 00012
    % BOLT =<JN> THE RECORD IN ERROR = 00240
    % BOLT =<JN> MTA: END SECTION 1:   WRITE, READ
    % BOLT =<JN>            000001   SECTION ERROR(S) REPORTED.
    % BOLT =<JN> END OF TEST ON UNIT MTA -- 0001 ERRORS REPORTED.
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
```

    FIGURE 3: EXAMPLE OUTPUT WHEN DATA MISCOMPARE ARE DETECTED

FIGURE 4 below gives an example of what the output would be if
sections 2 and 7 are run on unit MTA with user entered options.

```
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
    : BOLT =<JN> ACCEPT
 <JN>AXREC 40; CYC ON; REP 2; SEC 2 7; DISP OPT; GO
    % BOLT =<JN>            BOLT OPTIONS
    % BOLT =<JN>            ------------
    % BOLT =<JN>
    % BOLT =<JN> TEST STATUS        IDLE     ADAPTER SELECTED    NO
    % BOLT =<JN> UNIT SELECTED      MTA      CONTROL SELECTED    NO
    % BOLT =<JN> SECTION NUMBER     002      NO. OF RECORDS      040
    % BOLT =<JN> REPEAT VALUE       002      DATA LENGTH         DEFAULT
    % BOLT =<JN> REPEAT COUNT       000      TEST SECTION DATA   DEFAULT
    % BOLT =<JN> RETRY VALUE        010
    % BOLT =<JN> UNIT ERROR COUNT   000      MAX. UNIT ERRORS    000
    % BOLT =<JN> SECTION ERRORS     000


    % BOLT =<JN> BOOLEAN OPTIONS:
    % BOLT =<JN> DISPLAY:   ODT =1   PRI =0   BOJ =1   HEX =1   ALPH =0
    % BOLT =<JN> ERROR:     LOCK =0     HALT =0     ELOG =0
    % BOLT =<JN> OTHER:     CYCL =1    TRA BUF =0    TRA DESC =0
    % BOLT =<JN>
    % BOLT =<JN> MTA: BEGIN SECTION 2:    WRITE, READ REVERSE, READ
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> MTA:  REPEATING SECTION #2, 2 TIMES.
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> MTA: END SECTION 2:    WRITE, READ REVERSE, READ
    % BOLT =<JN>
    % BOLT =<JN> MTA: BEGIN SECTION 7:    WRITE, BACKSPACE, READ
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> MTA:  REPEATING SECTION #7, 2 TIMES.
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> MTA: END SECTION 7:    WRITE, BACKSPACE, READ
    % BOLT =<JN>
    % BOLT =<JN> MTA: BEGIN SECTION 2:    WRITE, READ REVERSE, READ
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> MTA:  REPEATING SECTION #2, 2 TIMES.
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
    % BOLT =<JN> MTA: END SECTION 2:    WRITE, READ REVERSE, READ
    % BOLT =<JN>
    % BOLT =<JN> MTA: BEGIN SECTION 7:    WRITE, BACKSPACE, READ
    % BOLT =<JN> BEGINNING OF TAPE WAS DETECTED.
 <JN>AXEXIT
    % BOLT =<JN> MTA: SECTION 7 HAS BEEN EXITED BEFORE COMPLETION.
    % BOLT =<JN> END OF TEST ON UNIT MTA -- 0000 ERRORS REPORTED.
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
```

     FIGURE 4: EXAMPLE OUTPUT WHEN SOME OF THE OPTIONS ARE SET.

OPTIONAL DIAGNOSTIC TEST SECTIONS

These test sections (50-55) are exclusive to MTC-6 and designed
to exercise some of the logic functions of MTC-6.

The entire control must be obtained to run these test sections by
entering "UNIT CONTROL MTx" where x = A-H; otherwise, BOLT will
report an error and the test section will be aborted.

Below is an example of the commands needed to run Optional
Diagnostic Test Sections:

```
<job number>AX UNIT CONTROL MTB;
<job number>AX SEC 50-55;
<job number>AX GO;                        All the Diagnostic test
                                          sections are executed.
```

FIGURE 5 below gives an example of what the output would be if
diagnostic test sections 50 and 53 are run on unit MTA, and no
errors were reported. It is assumed that the Control which has
been previously selected is MTC-6.

```
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
    : BOLT =<JN> ACCEPT
 <JN>AXSEC 50 53; GO;
    % BOLT =<JN> BEGINNING OF TEST FOR UNIT MTA
    % BOLT =<JN> MTA: BEGIN SECTION 50:  TEST OP WITH DIAGRD VAR.
    % BOLT =<JN> MTA: END SECTION 50:  TEST OP WITH DIAGRD VAR.
    % BOLT =<JN>
    % BOLT =<JN> MTA: BEGIN SECTION 53:  RAM MEMORY TEST,   2 FULL
                 BUFFERS
    % BOLT =<JN> MTA: END SECTION 53:  RAM MEMORY TEST,     2 FULL
                 BUFFERS
    % BOLT =<JN>
    % BOLT =<JN> END OF TEST ON UNIT MTA -- 0000 ERRORS REPORTED.
    % BOLT =<JN> *****  ENTER NEXT COMMAND  *****
```

        FIGURE 5: EXAMPLE DIAGNOSTIC TEST SECTIONS OUTPUT

FIGURE 6 below gives an example of what the output would look like if the Control were not MTC-6 and the selected section were 51.

```
% BOLT =<JN> *****   ENTER NEXT COMMAND  *****
: BOLT =<JN> ACCEPT
<JN>AXSEC 51; GO
  % BOLT =<JN> BEGINNING OF TEST FOR UNIT MTA
  % BOLT =<JN> ERROR:  SECTION 51 IS ONLY VALID FOR MTC-6.
  % BOLT =<JN> SECTION 51 HAS BEEN ABORTED DUE TO INVALID OPERA-
              TOR REQUEST.
  % BOLT =<JN> END OF TEST ON UNIT MTA -- 0000 ERRORS REPORTED.
  % BOLT =<JN> *****   ENTER NEXT COMMAND  *****
```

FIGURE 6: EXAMPLE OUTPUT INVALID OPERATOR REQUEST

Note:
In FIGURE 6 number of reported errors is 0 although one error has been reported; this is due to the fact that error counter represents number of errors that are related to either the unit or the Control.

PCAP TESTING

At the lowest level of testing, BOLT allows the operator to issue single predefined normal operation codes to a device through LOGICAL PCAP commands or a chain of up to six operator defined operation codes through PHYSICAL PCAP commands. PCAP commands require that access to the entire control to be gained since the operator may issue diagnostic ops which affect the entire control. The LOGICAL and PHYSICAL PCAP commands are described below.

LOGICAL I/O

BOLT provides a means for the immediate execution of basic operations to each device using minimum operator input. This is accomplished with a set of logical commands. Logical commands use the zero (0) PCAP MODE I/O descriptor; therefore, descriptor fields may be set by using the appropriate BOLT commands. Logical Commands cause an immediate action, implying that all descriptor fields must be changed before the logical command is issued (if the operator so desires). The result descriptor of any Logical I/O may be viewed by entering the "DISPLAY DESC [0]" command. The list of valid logical commands for Magnetic Tape control are shown below.

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WRI - @40000U@
Write 1 record with data <data> of length <length>
where <data> and <length> can be specified by using
the BOLT DATA and LENGTH commands; however, there
are default bit pattern and value for <data> and
<length> in BOLT.

REA - @00000U@
Read Forward 1 record.

REW - @60000U@
Rewind the unit.

UNL - @70000U@
Rewind and unload the unit (MTC 4, 5 & 6 only).

SPA - @C8000U@
Space forward one record.

BS - @D8000U@
Backspace one record.

BSE - @D0000U@
Backspace to EOF.

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```
RR   - a10000Ua
       Read reverse 1 record.


SE   - aC0000Ua
       Space Forward to EOF.


TES  - a8C000Ua
       Send a Test OP.


WTM  - a48000Ua
       Write Tape Mark.


TNR  - a88000Ua
       Test if the unit is not ready.


TR   - a90000Ua
       Test if the unit is ready.


ERA  - a5C000Ua
       Erase 1 record.
```

PHYSICAL I/O

At the lowest level of testing BOLT provides the operator the capability of building up to six physical I/O descriptors, linking them together in any order and dispatching them to the MT control. FIGURE 7 below gives an example of PCAP testing; anyting following "%" is a comment and would not be present in input. For more information on how to build physical descriptors refer to the OP, LINK, DATA, LENGTH and SEND commands (P.S. 2228 3543).

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```
<JN>AXUNIT CONTROL MTA
   % BOLT =<JN>        MAGNETIC TAPE TEST -- VERSION AA
   % BOLT =<JN>        ------------------------------------------
   % BOLT =<JN> DEFAULT CONFIDENCE TEST SECTIONS ARE   1 - 13
   % BOLT =<JN> OPTIONAL CONFIDENCE TEST SECTION IS   25
   % BOLT =<JN> OPTIONAL DIAGNOSTIC TEST SECTIONS ARE 50 - 55
   % BOLT =<JN>    ( 50 - 55 ARE VALID ONLY FOR MTC 6 )
   % BOLT =<JN> FOR A  DESCRIPTION  OF  THE MAG  TAPE TEST  ENTER
           "TEACH MT"
   % BOLT =<JN> ENTER "TEACH MT <SECTION-NUMBER>" FOR THE DESCRI-
           PTION OF ANY TEST SECTION LISTED ABOVE.
   % BOLT =<JN>         UNIT TABLE INFORMATION
   % BOLT =<JN>         ----------------------
   % BOLT =<JN>
   % BOLT =<JN> TOTAL UNITS OBTAINED = 01
   % BOLT =<JN> UNIT NAME = MTA   PORT/CH = 7A   UNIT NUMBER = 1
   % BOLT =<JN>
   % BOLT =<JN> ***** ENTER NEXT COMMAND  *****
   : BOLT =<JN> ACCEPT
<JN>AXWRI; DISP DESC [0]   % Write a record of length 1K bytes
                           % with data all HEX 00  and display
                           % result descriptor
   % BOLT =<JN>
   % BOLT =<JN>                  DESCRIPTOR 0
   % BOLT =<JN>                  ------------
   % BOLT =<JN>
   % BOLT =<JN> OP:     400001   A_FIELD: 380813   RESULT: 800080
   % BOLT =<JN> LINK:  -000001   B_FIELD: 380413   XRSLT1: 000000
   % BOLT =<JN> PRT/CH:     7A   C_FIELD: 000000   XRSLT2: 000000
   % BOLT =<JN>                  LENGTH:  000400 (001024)
   % BOLT =<JN>
   % BOLT =<JN> ***** ENTER NEXT COMMAND  *****
   : BOLT =<JN> ACCEPT
<JN>AXDATA [0] @AA55@       % Data pattern af all HEX AA 55
   % BOLT =<JN> ***** ENTER NEXT COMMAND  *****
   : BOLT =<JN> ACCEPT
<JN>AXLENGTH [0] 256        % Record of length 256 bytes
   % BOLT =<JN> ***** ENTER NEXT COMMAND  *****
   : BOLT =<JN> ACCEPT
<JN>AXWRI                    % Write a record  of length 256 bytes
                            % with data all alternating HEX AA 55
   % BOLT =<JN> ***** ENTER NEXT COMMAND  *****
   : BOLT =<JN> ACCEPT
<JN>AXOP [0] @4000000@; SEND [0]
                           % set OP [0] to WRITE op  and write a
                           % record of length 256 bytes with all
                           % alternating HEX AA 55
```

FIGURE 7: EXAMPLE OUTPUT PCAP TESTING

DEFAULT CONFIDENCE TEST SECTIONS

There are 13 valid Default Confidence Test Sections, 1 through
13. The following are the description of these sections that are
valid for all the Controls and are run by default:

Section #1   Write, Read

The unit is first rewound, then <record> records with data <data>
of length <length> are written. The unit is then rewound and the
records are read back and the data are compared. Finally, the
unit is rewound.

```
DEFAULT DATA:        The following bit patterns are used in a cyclic
                     manner:   All HEX 00, all HEX 55, all HEX AA,
                     all HEX FF, alternating HEX AA 55  and finally
                     alternating HEX FF 00.
DEFAULT LENGTH:      1024 bytes
DEFAULT RECORD:      256
DATA SENSITIVE:      Yes
LENGTH SENSITIVE:    Yes
RECORD SENSITIVE:    Yes
```


ERROR 01
Before starting the actual testing the unit is rewound.   The
REWIND op @60000U@ was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
One of the WRITE ops @40000U@ has failed.   The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
After the records have been written the unit is rewound.   The
REWIND op @60000U@ was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 04
One of the READ forward ops @00000U@ has failed.   The record in
error will be displayed in addition to the I/O result descriptor
if I/O has completed with EXCEPTION; if data miscompare have
been detected then the total number of miscompares will be
displayed as well a portion of expected and observed data with
miscompares marked.

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ERROR 05
Before exiting the test section the unit is rewound. The REWIND op 360000U3 was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

Section #2   Write, Read reverse, Read

After rewinding the unit, the following is done <record> times:

A record with data <data> of length <length> is written and read reverse; the data are then compared. The record is read forward and once again the data are compared. The unit is rewound at the end of the section.

```
DEFAULT DATA:      refer to test section #1
DEFAULT LENGTH:    1024 bytes
DEFAULT RECORD:    256
DATA SENSITIVE:    Yes
LENGTH SENSITIVE:  Yes
RECORD SENSITIVE:  Yes
```

ERROR 01
Before starting the actual testing the unit is rewound. The REWIND op 360000U3 was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

ERROR 02
A WRITE op 340000U3 has failed. The record in error will be displayed in addition to the I/O result descriptor if the OP has not timed out.

ERROR 03
A READ reverse op 310000U3 has failed. The record in error will be displayed in addition to the I/O result descriptor if the OP has completed with EXCEPTION; if data miscompare have been detected then the total number of miscompares will be displayed as well as a portion of expected and observed data with miscompares marked.

ERROR 04
A READ forward op 300000U3 has failed. The record in error will be displayed in addition to the I/O result descriptor if I/O has completed with EXCEPTION; also in the case of data miscompare the total number of miscompares will be displayed as well as a portion of expected and observed data with miscompares marked.

ERROR 05
Before exiting the test section the unit is rewound.   The REWIND
op a60000Ua was issued but failed.   The I/O result descriptor
will be displayed if the OP did not time out.

Section #3   Ascending, Descending Record Length

After initially rewinding the unit, 247 records each with data
<data> are written beginning with a 16 byte record;   each
succeeding record has an additional 2 bytes until the last one
has 508 bytes.   The records are then read reverse and the data
are compared. Then the records are read forward and the data are
again compared.   Finally, the unit is rewound at the end of the
section.

DEFAULT DATA: refer to test section #1
DATA SENSITIVE: Yes
LENGTH SENSITIVE: No
RECORD SENSITIVE: No

ERROR 01
Before starting the actual testing the unit is rewound.   The
REWIND op a60000Ua was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
One of the WRITE ops a40000Ua has failed.   The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
One of the READ reverse ops a10000Ua has failed.   The record in
error will be displayed in addition to the I/O result descriptor
if I/O has completed with EXCEPTION;   also in the case of data
miscompare the total number of miscompares will be displayed as
well as a portion of observed and expected data with miscompares
marked.

ERROR 04
One of the READ forward ops a00000Ua has failed.   The record in
error will be displayed in addition to the I/O result descriptor
if the OP has completed with EXCEPTION;   if data miscompare have
been detected then the total number of miscompares will be
displayed as well as a portion of expected and observed data with
miscompares marked.

ERROR 05
Before exiting the test section the unit is rewound.   The REWIND
op ä60000Uä was issued but failed.   The I/O result descriptor
will be displayed if the OP did not time out.

Section #4   Write Tape Mark and Space to EOF

The unit is first rewound, then a Tape Mark is written.   Next 200
records with data <data> of length <length> are written   followed
by   a Tape Mark.   Then two Space Backwards to EOF are sent
followed by two Space Forwards to EOF and a Space Backward.   The
Result Descriptor is tested after sending each op code.   If the
total number of records   written   is less than <record>,   the
section is repeated with 200 more records.   The unit is rewound
at the end of the test section.

```
DEFAULT DATA:       all HEX 00
DEFAULT LENGTH:     1024 bytes
DEFAULT RECORD:     256
DATA SENSITIVE:     Yes
LENGTH SENSITIVE:   Yes
RECORD SENSITIVE:   Yes
```


ERROR 01
Before starting the actual testing the unit is rewound.   The
REWIND op ä60000Uä was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
The first WRITE TAPE MARK op ä48000Uä, before writing the first
200 records, has failed.   The I/O result descriptor will be
displayed if the OP has not timed out.

ERROR 03
One of the 200 WRITE ops ä40000Uä has failed.   The record in
error will be displayed in addition to the I/O result descriptor
if the OP has not timed out.

ERROR 04
The WRITE TAPE MARK op ä48000Uä, after writing 200 records, has
failed.   The I/O result descriptor will be displayed if the OP
has not timed out.

ERROR 05
The first SPACE reverse to EOF @D0000U@, after writing the second
tape mark, has failed.   The I/O result descriptor will be
displayed if the OP has not timed out. Also, if BOT has been
detected it will be reported as an error.

ERROR 06
The second SPACE reverse op to EOF @D0000U@ has failed.   The I/O
result descriptor will be displayed if the OP has not timed out.
Also, if BOT has been detected it will be regarded as an error.

ERROR 07
The first SPACE forward op to EOF @C0000U@, after the issued
SPACE reverse to EOF ops has failed.   The I/O result descriptor
will be displayed if the OP has not timed out.   Also, if EOT has
been detected it will be regarded as an error.

ERROR 08
The second SPACE forward op to EOF @C0000U@,   after the issued
SPACE reverse to EOF ops has failed.   The I/O result descriptor
will be displayed if the OP has not timed out.

ERROR 09
The SPACE reverse one record op @D8000U@, after the issued SPACE
forward to EOF ops, has failed.   The record in error will be
displayed in addition to the I/O result descriptor if the OP has
not timed out.

ERROR 10
Before exiting the test section the unit is rewound.   The REWIND
op @60000U@ was issued but failed.   The. I/O result descriptor
will be displayed if the OP did not time out.

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Section #5   Test Timeout

After initially rewinding the unit, <record> records of length
<length> are erased and the unit is rewound. A Read is sent and
the Result Descriptor is checked for TIMEOUT. Then a Space
Forward and finally a Space Forward to EOF are sent and each time
the Result Descriptor is again tested for TIMEOUT. In each
operation if TIMEOUT is not reported, it will be regarded as an
error. The unit is rewound at the end of the section.

DEFAULT LENGTH: 4096 bytes
DEFAULT RECORD: 500
LENGTH SENSITIVE: Yes
RECORD SENSITIVE: Yes

ERROR 01
Before starting the actual testing the unit is rewound. The
REWIND op ≥60000U≥ was issued but failed. The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
One of the ERASE ops ≥50000U≥ has failed. The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
After the records have been erased the unit is rewound. The
REWIND op ≥60000U≥ was issued but failed. The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 04
A READ op ≥00000U≥ is issued and operation is expected to
complete with TIMEOUT bit set. The OP was issued but either the
TIMEOUT bit was not on, bits other than TIMEOUT were set, or the
OP timed out (soft timeout). The I/O result descriptor will be
displayed if the OP did not time out (soft timeout).

ERROR 05
A SPACE forward one record op ≥C8000U≥ is issued and operation is
expected to complete with TIMEOUT bit set. The OP was issued but
either the TIMEOUT bit was not on, bits other than TIMEOUT were
set, or the OP timed out (soft timeout). The I/O result
descriptor will be displayed if the OP did not time out (soft
timeout).

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ERROR 06
A SPACE forward to EOF op ɑC0000Uɑ is issued and operation is expected to complete with TIMEOUT bit set. The OP was issued but either the TIMEOUT bit was not on, bits other than TIMEOUT were set, or the OP timed out (soft timeout). The I/O result descriptor will be displayed if the OP did not time out (soft timeout).

ERROR 07
Before exiting the test section the unit is rewound. The REWIND op ɑ60000Uɑ was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

Note:
It should be noted that if enough records were not erased, then TIMEOUT bit would not be set for read or space forward operations; as a result, one should be cautious in changing the default values for LENGTH and RECORD when running this section.

Section #6   Test OP Variants

The unit is first rewound, then <record> records of length <length> are erased and the unit is rewound. A Test Op is sent while the unit is rewinding; RD should report REWINDING. Then a Test for Ready and Not Rewinding is sent when the unit is at BOT; REWINDING bit should be off in RD. If the expected results are not reported for any of the operations, an appropriate error is reported.

DEFAULT LENGTH: 1024 bytes
DEFAULT RECORD: 256
LENGTH SENSITIVE: Yes
RECORD SENSITIVE: Yes

ERROR 01
Before starting the actual testing the unit is rewound. The REWIND op ɑ60000Uɑ was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

ERROR 02
One of the ERASE ops ɑ50000Uɑ has failed. The record in error will be displayed in addition to the I/O result descriptor if the OP has not timed out.

ERROR 03
After the records have been erased the unit is rewound. The REWIND op @60000U@ was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

ERROR 04
A TEST op @80000U@ is issued and unit is tested for rewinding. The OP was issued but either the REWINDING bit was not set or other bits were unexpectedly set. The I/O result descriptor will be displayed if the OP did not time out.

ERROR 05
A TEST for ready and not rewinding @90000U@ is issued. This OP will hang the system if the unit is not ready; this is reported as a soft time out. the OP was issued but either it has timed out or unexpected bits have been set in the result where the I/O result descriptor will be displayed in the latter.

Note:
It should be mentioned that the BOLT TRACE command would slow down the dispatching operations, as a result if enough records were not erased then REWINDING bit would not be set for TEST operation; therefore, one should be cautious in changing the default values for LENGTH and RECORD when running this section.

Section #7   Write, Backspace and Read

The unit is first rewound and then the following is repeated <record> times:

A record with data <data> of length <length> is written, backspaced, read and the data are compared. The unit is rewound at the end of the section.

```
DEFAULT DATA:      refer to test section #1
DEFAULT LENGTH:    1024 bytes
DEFAULT RECORD:    256
DATA SENSITIVE:    Yes
LENGTH SENSITIVE:  Yes
RECORD SENSITIVE:  Yes
```


ERROR 01
Before starting the actual testing the unit is rewound. The REWIND op @60000U@ was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

ERROR 02
A WRITE op 340000U2 has failed.   The record in error will be
displayed in addition to the I/O result descriptor if the OP has
not timed out.

ERROR 03
A SPACE reverse one record op 3C8000U2 has failed. The record in
error will be displayed in addition to the I/O result descriptor
if the OP has not timed out.

ERROR 04
A READ forward op 300000U2 has failed.   The record in error will
be displayed in addition to the I/O result descriptor if I/O has
completed with EXCEPTION;   if data miscompare have been detected
then the total number of miscompares will be displayed as well as
a portion of expected and observed data with miscompares marked.

ERROR 05
Before exiting the test section the unit is rewound.   The REWIND
op 360000U2 was issued out failed.   The I/O result descriptor
will be displayed if the OP did not time out.

Section #8   Space Forward and Reverse

After rewinding the unit, <record> records each with data <data>,
with the exception of first and last records where first record
contains all HEX 00 and last one contains all HEX FF, of length
<length> are written and <record> Space Reverse OPs are sent;
one record is read and the data are compared with the first
record written.   The unit is then rewound and <record> - 1 Space
Forward OPs are sent and again one record is read and the data
are compared with the last record written.   Finally, the unit is
rewound.

```
DEFAULT DATA:       refer to test section #1
DEFAULT LENGTH:     1024 bytes
DEFAULT RECORD:     256
DATA SENSITIVE:     Yes
LENGTH SENSITIVE:   Yes
RECORD SENSITIVE:   Yes
```


ERROR 01
Before starting the actual testing the unit is rewound.   The
REWIND op 360000U2 was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

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ERROR 02
One of the WRITE ops �internal40000Ua has failed. The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
Last record to be written must always contain all Hex FF;
therefore, if EOT is detected before writing the last record, the
last record written is backspaced and again rewritten with all
HEX FF.   A SPACE reverse one record op a08000Ua was issued but
failed. The I/O result descriptor will be displayed if the OP
did not time out.

ERROR 04
One of the SPACE reverse one record ops a08000Ua has failed. The
record in error will be displayed in addition to the I/O result
descriptor if the OP has not timed out.

ERROR 05
The READ forward op a00000Ua, to read the first record written,
has failed.   The I/O result descriptor will be displayed if the
OP has completed with EXCEPTION;   also in the case of data
miscompare the total number of miscompares will be displayed in
addition to a portion of expected and observed data with
miscompares marked.

ERROR 06
After reading the first record the unit is rewound. The REWIND
op a60000Ua was issued but failed. The I/O result descriptor
will be displayed if the OP did not time out.

ERROR 07
One of the SPACE forward one record ops aC8000Ua has failed. The
record in error will be displayed in addition to the I/O result
descriptor if the OP has not timed out.

ERROR 08
The READ forward op a00000Ua, to read the last record written,
has failed.   The I/O result descriptor will be displayed if the
OP has completed with EXCEPTION;   if data miscompare have been
detected then the total number of miscompares will be displayed
as well as a portion of observed and expected data with
miscompares marked.

ERROR 09
Before exiting the test section the unit is rewound.   The REWIND
op ə60000Uə was issued but failed.   The I/O result descriptor
will be displayed if the OP did not time out.

Section #9   Write, Backspace, Read and Erase

The unit is initially rewound;   then Two records each with data
<data> of length <length> are written and then backspaced over
the second record.   The record is then read, compared, backspaced
and erased.

The same procedure is repeated <record> times;   then the unit is
rewound, the records are read forward and the data are compared.
Finally, the unit is rewound.

```
DEFAULT DATA:       refer to test section #1
DEFAULT LENGTH:     1024 bytes
DEFAULT RECORD:     256
DATA SENSITIVE:     Yes
LENGTH SENSITIVE:   Yes
RECORD SENSITIVE:   Yes
```


ERROR 01
Before starting the actual testing the unit is rewound.   The
REWIND op ə60000Uə was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
One of the WRITE ops ə40000Uə has failed.   The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
A SPACE reverse one record op ə03000Uə, to backspace over the
second of the two records written, has failed.   The record in
error will be displayed in addition to the I/O result descriptor
if the OP has not timed out.   Also, if BOT has been detected it
will be reported as an error.

ERROR 04
A READ forward op ə00000Uə, to read the second of the two records
written, has failed.   The record in error will be displayed in
addition to the I/O result descriptor if the OP has completed
with EXCEPTION;   if data miscompare have been detected then the
total number of miscompares will be displayed as well as a
portion of expected and observed data with miscompares marked.

ERROR 05

A SPACE reverse one record op 3D8000U3, after reading the second of the two records written, has failed. The record in error will be displayed in addition to the I/O result descriptor if the OP has not timed out. Also, if BOT has been detected it will be reported as an error.

ERROR 06

An ERASE op 350000U3, to erase the second of the two records written, has failed. The record in error will be displayed in addition to the I/O result descriptor if the OP has not timed out.

ERROR 07

Before reading all the remaining records on the tape the unit is rewound. The REWIND op was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

ERROR 08

One of the READ forward ops 300000U3 has failed. The record in error will be displayed as well as the I/O result descriptor if the OP has completed with EXCEPTION; also in the case of data miscompare the total number of miscompares will be displayed in addition to a portion of expected and observed data with miscompares marked.

ERROR 09

Before exiting the test section the unit is rewound. The REWIND op 350000U3 was issued but failed. The I/O result descriptor will be displayed if the OP did not time out.

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Section #10   Write only

After rewinding the unit, <record> records each with data <data>
of length <length> are written followed by a Tape Mark.   At the
end, the unit is rewound.

DEFAULT DATA: refer to test section #1
DEFAULT LENGTH: 1024 bytes
DEFAULT RECORD: 256
DATA SENSITIVE: Yes
LENGTH SENSITIVE: Yes
RECORD SENSITIVE: Yes

ERROR 01
Before starting the actual testing the unit is rewound.   The
REWIND op 260000U3 was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
One of the WRITE ops 240000U3 has failed.   The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
The   WRITE TAPE MARK op 248000U2, after writing all the records,
has failed.   The I/O result descriptor will be displayed if the
OP has not timed out.   Note that no tape mark is writtten if EOT
has been detected on the last write.

ERROR 04
Before exiting the test section the unit is rewound.   The REWIND
op 260000U3 was issued but failed.   The I/O result descriptor
will be displayed if the OP did not time out.

Section #11   Read only

After initially rewinding the unit, records of length <length>
are read until EOT or EOF whichever comes first. If the Result
Descriptor indicates TIMEOUT, meaning that no record has been
read, a message will be displayed to inform the operator. The
unit is rewound at the end of the section.

Section #10 should be executed before this one to obtain the
proper results.

DEFAULT LENGTH: 1024 bytes
LENGTH SENSITIVE: Yes

ERROR 01
Before starting the actual testing the unit is rewound. The
REWIND op 360000U3 was issued but failed. The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
A READ forward op 300000U3 has failed. The record in error will
be displayed in addition to the I/O result descriptor if the OP
has completed with EXCEPTION. If TIMEOUT has been detected then
the operator will be informed that no record has been read.

ERROR 03
Before exiting the test section the unit is rewound. The REWIND
op 360000U3 was issued but failed. The I/O result descriptor
will be displayed if the OP did not time out.

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Section #12   Write EOT and Read EOT

The unit is first rewound, then records each of length <length>
with data <data> are written until EOT is detected. The tape is
then backspaced two records and read forward two records.   The
EOT bit in the result is checked after each READ OP. The unit is
rewound at the end of the section.

DEFAULT DATA: All HEX 00
DEFAULT LENGTH: 1024 bytes
DATA SENSITIVE: Yes
LENGTH SENSITIVE: Yes

ERROR 01
Before starting the actual testing the unit is rewound.   The
REWIND op a60000Ua was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
One of the WRITE ops a40000Ua has failed.   The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
The first SPACE reverse one record op a08000Ua has failed.   The
I/O result descriptor will be displayed if the OP has not timed
out.

ERROR 04
The second SPACE reverse one record op a08000Ua has failed.   The
I/O result descriptor will be displayed if the OP has not timed
out.

ERROR 05
The first READ forward op has failed.   The I/O result descriptor
will be displayed in the case of EXCEPTION on I/O.   If EOT has
been detected it will be reported as an error.

ERROR 06
The second READ forward op is expected to complete with EOT bit
set.   Either EOT bit has not been set or bits other than that
have been unexpectedly set.   The I/O result descriptor will be
displayed.

ERROR 07
Before exiting the test section the unit is rewound.   The REWIND
op ə60000Uə was issued but failed.   The I/O result descriptor
will be displayed if the OP did not time out.

Section #13   Rewind

<record> records of length <length> are erased to move the tape
from BOT.   The unit is then rewound and a Test Op is sent and
checked for REWINDING. Then <record> records with data <data> of
length <length> are written;   then the unit is rewound and Read
Ops are fired at the rewinding unit;   RD should indicate
REWINDING as long as the unit rewinds. The records are read back
and compared after the unit is at BOT.   Then the unit is rewound
and Write ops are sent to it while it is rewinding;   RD should
indicate REWINDING as long as the unit rewinds;   one record with
data <data> of length <length> is then written.   If the expected
results are not reported for any of the operations,   an
appropriate error is reported. The unit is rewound at the end of
the test section.

```
DEFAULT DATA:      refer to test section #1
DEFAULT LENGTH:    1024 bytes
DEFAULT RECORD:    256
DATA SENSITIVE:    Yes
LENGTH SENSITIVE:  Yes
RECORD SENSITIVE:  Yes
```


ERROR 01
One of the ERASE ops ə50000Uə has failed.   The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 02
After the records have been erased the unit is rewound.   The
REWIND op ə50000Uə was issued but failed.   The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 03
A TEST op ə30000Uə is issued and checks the unit for rewinding.
The OP was issued but either the REWINDING bit was not on,   bits
other than that were unexpectedly set,   or the OP timed out. The
I/O result descriptor will be displayed if the OP did not time
out.

ERROR 04

One of the WRITE ops a40000Ua has failed. The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 05

After writing the records the unit is rewound. The REWIND op
a60000Ua was issued but failed. The I/O result descriptor will
be displayed if the OP did not time out.

ERROR 06

READ forward ops a00000Ua are fired at the rewinding unit and one
or more are expected to complete with REWINDING bit on. The OPs
have been issued but either the REWINDING bit has not been set
for the first one or bits other than that have been unexpectedly
set in RD. The record in error will be displayed in addition to
the I/O result descriptor if the OP has not timed out; also in
the case of data miscompare the total number of miscompares will
be displayed as well as a portion of expected and observed data
with data miscompares marked.

ERROR 07

After reading the records the unit is rewound. The REWIND op
a60000Ua was issued but failed. The I/O result descriptor will
be displayed if the OP did not time out.

ERROR 08

WRITE ops a40000Ua are fired at the rewinding unit and one or
more OPs are expected to complete with REWINDING bit on. WRITE
op(s) have been issued but either the REWINDING bit has not been
set or bits other than that have been unexpectedly set in RD.
The I/O result descriptor will be displayed if the OP has not
timed out.

ERROR 09

Before exiting the test section the unit is rewound. The REWIND
op a60000Ua was issued but failed. The I/O result descriptor
will be displayed if the OP did not time out.

Note:

It should be noted that the BOLT TRACE command would slow down
the dispatching operations. As a result, if enough records were
not erased then REWINDING bit would not be set for TEST, READ,
and WRITE operations; therefore, one should be cautious in
changing the default values for LENGTH and RECORD when running
this section.

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OPTIONAL CONFIDENCE TEST SECTIONS

There is only one Optional test section which is valid for all
the Controls and it is described below.

Section #25   Test OP Variants

The unit is first rewound, then <record> records of length
<length> are erased and the unit is rewound. A Test Op is sent
while the unit is rewinding; RD should report REWINDING. Then a
Test for Ready and Not Rewinding is sent when the unit is at BOT;
REWINDING bit should be off in RD. Finally the operator is asked
to make the unit not ready and a Test for Not Ready is sent; RD
should indicate the NOT_READY condition. In each operation if
the expected results are not detected, an appropriate error is
reported. At the end the operator is asked to make the unit
ready.

```
DEFAULT LENGTH:    1024 bytes
DEFAULT RECORD:    256
LENGTH SENSITIVE:  Yes
RECORD SENSITIVE:  Yes
```


ERROR 01
Before starting the actual testing the unit is rewound. The
REWIND op @50000U@ was issued but failed. The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 02
One of the ERASE ops @50000U@ has failed. The record in error
will be displayed in addition to the I/O result descriptor if the
OP has not timed out.

ERROR 03
After the records have been erased the unit is rewound. The
REWIND op @60000U@ was issued but failed. The I/O result
descriptor will be displayed if the OP did not time out.

ERROR 04
A TEST op @80000U@ is issued and unit is tested for rewinding.
The OP was issued but either the REWINDING bit was not set or
other bits were unexpectedly set. The I/O result descriptor will
be displayed if the OP did not time out.

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ERROR 05
A TEST for ready and not rewinding @90000U@ is issued. This OP
will hang the system if the unit is not ready; this is reported
as a soft time out. the OP was issued but either it has timed
out or unexpected bits have been set in the result where the I/O
result descriptor will be displayed in the latter.

ERROR 06
After the operator is asked to make the device not ready and to
enter "GO", the state of the unit is checked by issuing a TEST op
@80000U@; if the unit is still ready the operator is informed
and again asked to change the status of the device. This is
repeated 3 times and if the unit is still ready at the end of the
third time, a warning message will be displayed and section will
go on as though the desired state has been found.

A TEST for not ready @88000U@ is issued. This OP will hang the
system if the unit is ready; this is reported as a soft time
out. the OP was issued but either it has timed out or unexpected
bits have been set in the result where the I/O result descriptor
will be displayed in the latter.

Note:
It should be mentioned that the BOLT TRACE command would slow
down the dispatching operations. As a result, if enough records
were not erased then REWINDIND bit would not be set for TEST
operation; therefore, one should be cautious in changing the
default values for LENGTH and RECORD when running this section.

MTC-6 OPTIONAL DIAGNOSTIC TEST SECTIONS

As it was mentioned earlier, MTC-6 has On-Line diagnostic
capabilities under the MCP. Whenever any of the Write, Read or
Test ops are used with the Diagnostic Variant bit on, the mag
tape interface is disabled and the Ready condition is simulated;
the rest of the operation is the same as a regular one with the
only differences being, the Status Count transition from STC 10
to STC 13 is not dependent on the drive and there is no data
transfer between the Control and mag tape.

There are six valid Optional Diagnostic Test Sections beginning
with section 50 and ending with section 55, and are described
below.

Section #50   Test OP with DIAGRD Var.

A Test OP with DIAGRD Variant @80006U@ is issued. The DIAGRD
Variant simulates a Ready condition and the Result Descriptor
should report this as well as the CONTROL ID.

ERROR 01
A TEST op with DIAGRD @80006U@ was issued but failed. The I/O
result descriptor will be displayed.

Section #51   Ram Memory Test, Partial Buffer

A Write OP with DIAGWR Variant is used to load the RAM with 250
bytes of data (less than a full buffer which is 256 bytes). A
Read OP with DIAGWR is then issued to transfer the data from the
RAM to the system and the data are compared with whatever was
sent to the RAM. The Result Descriptors in both operations
should indicate OP-COMPLETE with no EXCEPTION. The same
procedure is repeated four times with four different bit
patterns.

DEFAULT DATA: All HEX 00, all HEX 55, all HEX AA, all HEX FF.
DATA SENSITIVE: No
LENGTH SENSITIVE: No
RECORD SENSITIVE: No

ERROR 01
A WRITE op with DIAGWR @4000AU@ has been failed. The record in
error will be displayed in addition to the I/O result descriptor.

ERROR 02

A READ op with DIAGWR @0000AU@ has been failed. The record in
error will be displayed as well as the I/O result descriptor; if
data miscompare have been detected then the total number of
miscompares will be displayed in addition to a portion of
expected and observed data with miscompares marked.
It should be noted that if the previous WRITE op has failed then
the operator is informed that no READ op will be issued.

Section #52   Ram Memory Test, 1 Full Buffer

This section is similar to Section #51 with the only difference
being that the number of bytes is 256, which is one full buffer.

Section #53   Ram Memory Test, 2 Full Buffers

This section is similar to Section #51 but it includes 2 full
buffers or 512 bytes.

Section #54   Ram Memory Test, 3 Full Buffers

This section is also similar to Section #51 but it includes 3
full buffers or 768 bytes.

Section #55   Ram Memory Test, 4 Full Buffers

This section is similar to Section #51 but it includes 4 full
buffers or 1024 bytes.

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