

SOFTWARE MANUAL

for

MODEL 5091-P8  
COMPUTER ADAPTER

PUBLICATION NO. 1266.2

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## INTRODUCTION

The Model 5091-P8 Software Manual contains descriptions, operating instructions, source listings, and flow charts for the software package furnished by DATUM, Inc. as part of the Model 5091 Magnetic Tape Controller.

Programs for checkout and exercising of the Model 5091 Magnetic Tape Controller are furnished on tape. Operating instructions for use with each program are included in this software manual. Note that the identification number for each program has two parts. The number preceding the decimal point identifies the program, and the number following the point indicates a revision.

The DIAGNOSTIC program verifies correct operation of the 5091-P8 Magnetic Tape System. The systems for operation with each configuration of the Digital Equipment Corporation PDP-8 computer, and with different tape transports, require individual diagnostic programs and PDP-8 test programs. Only the programs pertaining to the Model 5091-P8 Controller ordered are furnished with the system. The numbers of the programs that accompany this manual are listed on the fly sheet.

The CHECKOUT AID program (1.x W) enables the computer operator to input a desired sequence of tape commands utilizing either a teletypewriter keyboard or a punched paper tape. Tape command inputs are immediately transformed into equivalent PDP-8 program instructions. These program instructions are then used to control system operation during a programmed system checkout routine.

The CHECKOUT AID program includes a program write-up and an object tape. This program has proven very useful in troubleshooting hardware malfunctions. With this program, the operator is able to quickly tailor a specific computer program to be used in checking for malfunctions in a suspected area of the hardware.

The CALIBRATION programs are initiated by inputting the indicated sequence of commands into the CHECKOUT AID program.

The EXTENSIVE WRITE/READ COMPARE/CHECK STATUS object tapes may be input to the computer utilizing the CHECKOUT AID program and may prove very useful in checking overall system operation. Computer console switches are utilized to select data character bit-patterns, select data record lengths, and to terminate program execution.

The MAGNETIC TAPE DRIVER program is provided as write-ups, source listings, flow charts, and source tapes that must be assembled along with the user's source tapes at assembly time.



## 28.3 W

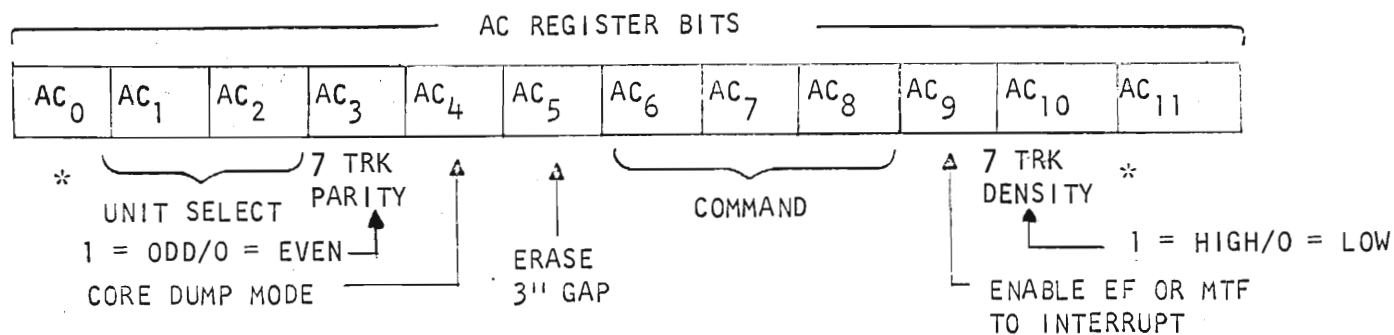
### 5091-P8 MAGNETIC TAPE CONTROLLER DESCRIPTION

The DATUM Model 5091-P8 Controller is configured to transfer data via the three-cycle data break facility of the PDP-8 family of computers and can control up to four tape units. Locations 32 and 33 (octal) of the computer memory are used to retain the word count (WC) and current address (CA) governing data transfers. The 5091-P8 Controller functions similarly to the DEC TC58 Controller.

The DATUM Model 5091-P8 Controller accepts coded "IOT" commands from the PDP-8 via the PDP-8 AC register. The status of the tape transport and the controller are returned to the PDP-8 register under programmed IOT command control. The controller interrupts the PDP-8 if either or both the Error Flag (EF) or the Magnetic Tape Flag (MTF) is set and the program has "enabled" these controller interrupts by setting bit 9 in the controller control register.

Magnetic tape operations are initiated by the program executing an MTGO instruction. This causes the controller to initiate the operation currently contained in its control "register".

The control register is loaded or modified by the program using either MTLC or MTCM instructions. It is convenient to discuss the control register as a 12-bit register to facilitate correspondence to the PDP-8 accumulator.



Unit                      Logical  
                            Unit  
                            Selected

0	0	0
0	1	1
1	0	2
1	1	3

\* NOT USED (Ignored)

Command Codes

0	0	0	No operation
0	0	1	Rewind
0	1	0	Read 1 Record
0	1	1	Test Read
1	0	0	Write 1 Record
1	0	1	Write EOF
1	1	0	Space Forward
1	1	1	Space Reverse

The "000 command" will cause an "illegal command" error (set EF and cause an interrupt) if an MTGO instruction is executed while this code is present in the command register. However the unit is selected when the command register is loaded regardless of command.

#### GAP (AC<sub>5</sub>)

This causes the erasure of three inches of tape prior to any forward motion command. This bit should only be set in conjunction with a Write or Write EOF to effect an elongated gap on encountering bad tape. A gap will be generated on the tape if MTG0 is executed and the command is Read or Space Forward giving an erroneous result. This bit is always reset with the execution of an MTG0 instruction.

#### ENABLE INTERRUPT (AC<sub>9</sub>)

The PDP-8 will be interrupted if this bit is set and either MTF (Magnetic Tape Flag) or EF (Error Flag) or both MTF and EF are set. MTSF IOT is used to determine that MTF or EF caused the interrupt.

#### UNIT SELECTION (AC<sub>1-2</sub>)

These two bits select the "logical" unit. An option is provided on the controller for switching physical tape drives to logical unit numbers.

#### CORE DUMP MODE (AC<sub>4</sub>)

This mode allows complete 12-bit memory words to be dumped as two 6-bit characters. Bits 0 through 5 form character #1 and bits 6 through 11 form character #2. When employing the "Read One Record" command or "Write One Record" command in core dump mode, it is necessary to load the WC with the negative of the number of 12-bit words to be trans-



ferred. Bit 4, designating core dump mode, is ignored unless the command is a read or write. Core dump bit is ignored in 7-track mode.

#### TAPE COMMANDS (AC<sub>6-8</sub>)

##### 1. Rewind Command

The "Rewind" command causes the selected unit to rewind to the beginning of tape. There are two situations after a rewind:

- a. Program does not execute either an MTLC (6716<sub>8</sub>) or an MTCM (6714<sub>8</sub>) prior to the rewind being complete. This causes MTF to be set on the rewind being complete with an interrupt (if enabled). Also, the selected tape unit and the controller will remain not ready until the rewind is complete so that the program could use MTSF (6701<sub>8</sub>), MTCR (6711<sub>8</sub>), or MTTF (6721<sub>8</sub>) or interrupt to denote controller and unit available.
- b. Program executes an MTLC (6716<sub>8</sub>) or an MTCM (6714<sub>8</sub>) which selects a different unit prior to rewind operation being complete. This causes MTF to become set 16 ms after execution of MTLC or MTCM, providing the second unit is itself ready. At this time, an interrupt will occur if enabled and the controller is ready for another command. The tape unit rewinding will remain not ready until the rewind is complete.

NOTE: This is the only time that MTF is set after an MTLC or MTCM which is not followed by an MTGO (6722<sub>8</sub>).

## 2. Read One Record Command

The "Read One Record" command causes the next record to be read into core memory. Records may only be read in the forward mode, and both PDP-8 CA and WC core memory 3-cycle data break control registers must be set up before issuing the command. CA must be set to the initial buffer address minus one, and WC must be set to the 2's complement of the number of 12-bit computer "words" to be read. In 9-track non-core dump mode, each 9-bit (8 bits plus parity) tape character utilizes the least significant 9 bits of the 12-bit "word". In 9-track core dump or 7-track modes, two sequential 6-bit tape characters are "packed" into bits 0 through 5 and then 6 through 11 of the 12-bit computer word. The parity bits are discarded.

If WC is set to less than the actual record length, the indicated number of words are read in and data transfer halts, although the tape continues moving until it reaches the next inter-record gap. If WC is set to greater than the actual record length, the entire record is input.

In either case, the vertical and longitudinal parity checks are performed on the entire record and the MTF is set when the tape transport reaches the next inter-record gap. On completion, bit 8 of status is made 1, and WC can be interrogated to determine if record was longer or shorter than expected.

## 3. Write One Record Command

The "Write One Record" command requires that the CA and WC core locations be set up before execution.

CA must be set to the initial core address minus one, and WC must be set to the 2's complement of the number of 12-bit computer 'words' to be transferred. When WC overflows (indicating the last word to be written), the 3-cycle data break transfer ceases. In the 9-track mode, the CRC character is written after three blank characters; the LRC character is written after three more blank characters (per IBM 9-track specifications). In the 7-track mode, the LRC character is written after three blank characters. A portion of the inter-record gap (IRG) is then erased. The tape transport halts and the MTF is set to interrupt the program.

#### 4. Write EOF Command

The 'Write EOF' command causes an octal 023 character to be written on the tape, seven blank characters (no CRC), then the LRC character (which, in this case, is another octal 023 character). This format is per IBM 9-track specification. Octal 17, three 'blank' characters, then the LRC character (another octal 17) is written in the 7-track mode.

The tape transport erases a portion of the IRG and then halts. The MTF then sets the program interrupt. The EOF status bit will be set to indicate that the EOF has been written. The parity error and EF will also be set for odd parity mode 7-track file marks (since the file mark exhibits even parity).

#### 5. Space Forward Command

The 'Space Forward' command requires that the PDP-8 WC core

location be loaded with the 2's complement of the number of records to be spaced over. The PDP-8 CA core location need not be set up, since it is ignored. When WC overflows, EOF is detected, or EOT is detected, the tape transport is halted in the IRG, and MTF is set to interrupt the program. Records are spaced over continuously without stopping in the inter-record gaps.

#### 6. Space Reverse Command

The "Space Reverse" command also requires that the PDP-8 WC core location be loaded with the 2's complement of the number of records to be spaced over before execution. CA is ignored as in the "Space Forward" command. When WC overflows, EOF is detected, or BOT is detected, the tape transport is halted in the IRG, and the MTF is set to interrupt the program. Records are spaced over continuously without stopping in the inter-record gap.

When load point is detected in a backspace operation, the transport becomes not ready for .5 second.

#### 7. Test Read Command

This functions exactly as a Read One Record command with the exception that the controller will also input into the computer the LRC and CRC characters. The WC register should be preset to account for the two extra characters. The command is included for maintenance purposes.

## IOT INSTRUCTIONS

### 1. Load Control Register

MTLC — Octal Code 6716

This instruction has different effects depending on whether the controller is busy.

#### a. Controller Not Busy

The EF and MTF flags are cleared. The contents of the AC register are loaded into the control register causing a select of the designated unit.

#### b. Controller Busy

The EF and MTF flags are cleared. Bits 0, 3-5, 9-11 of the AC register are inclusively ORed into the corresponding bits of the control register, while bits 1, 2, 6-8 (unit and command function) replace corresponding bits of the command register.

### 2. Skip on Error Flag (EF) or Mag Tape Flag (MTF)

MTSF — Octal 6701

The state of the EF and MTF status bits is sampled. If either (or both) is set, a pulse is returned on the "skip" bus to skip the next sequential instruction. This instruction

allows the program to test the controller when interrupted, to ascertain if the controller is generating the interrupt. The EF and MTF generated interrupt is not turned off until the MTAF IOT instruction is executed; hence, the ION IOT instruction (octal 6001) should not be executed to enable interrupts until after the MTAF instruction is executed in the tape interrupt service subroutine.

3. Skip on Tape Controller Ready

MTCR - Octal 6711

Allows the program to test to see if tape controller is ready (not busy).

4. Skip on Tape Transport Ready

MTTF - Octal 6721

Allows the program to test to see if the selected tape transport is ready.

5. Clear Registers and Flags

MTAF - Octal 6712

Clears status and control registers (including EF and MTF interrupt flags) if the controller is ready. If the con-

troller is not ready, then clears only the EF and MTF flags.

6. Inclusive OR Control Register Into PDP-8 AC Register

Octal 6746

Inclusively ORs the controller control register contents into AC.

7. Inclusive OR AC Into Control Register

MTCM — Octal 6714

Transfers three command bits ( $AC_6$ ,  $AC_7$ , and  $AC_8$ ) and two unit select bits ( $AC_1$  and  $AC_2$ ) into control register and inclusively ORs the rest of the AC into the control register.

8. Read Status

MTRS — Octal 6706

Status register is loaded into AC.

9. Mag Tape GO

MTGO — Octal 6722

Causes the controller to execute command present in its control register (if a legal command). Also causes bit 5 of the control register to be set to a zero.

#### 10. Memory Field Select

Octal 6717

This instruction causes the least significant three bits of the PDP-8 AC register to be loaded into the controller memory extension register. The controller extension register prefixing the CA allows data transfers to 32K memory. These three bits control fields as follows:

DB09 = ADRX1

DB10 = ADRX2

DB11 = ADRX3

Therefore:

DATA BIT			<u>FIELD ADDRESSED</u>
<u>9</u>	<u>10</u>	<u>11</u>	
0	0	0	0 to 4K
1	0	0	4 to 8K
0	1	0	8 to 12K
1	1	0	12 to 16K
0	0	1	16 to 20K
1	0	1	20 to 24K
0	1	1	24 to 28K
1	1	1	28 to 32K



The START switch on the computer causes the controller to reset the extension register to 000, which is basic 4K memory.

### STATUS

The status word is normally input to the PDP-8 AC register with an MTRS (Mag Tape Read Status) IOT instruction, octal 6706.

#### AC<sub>0</sub> (EF)

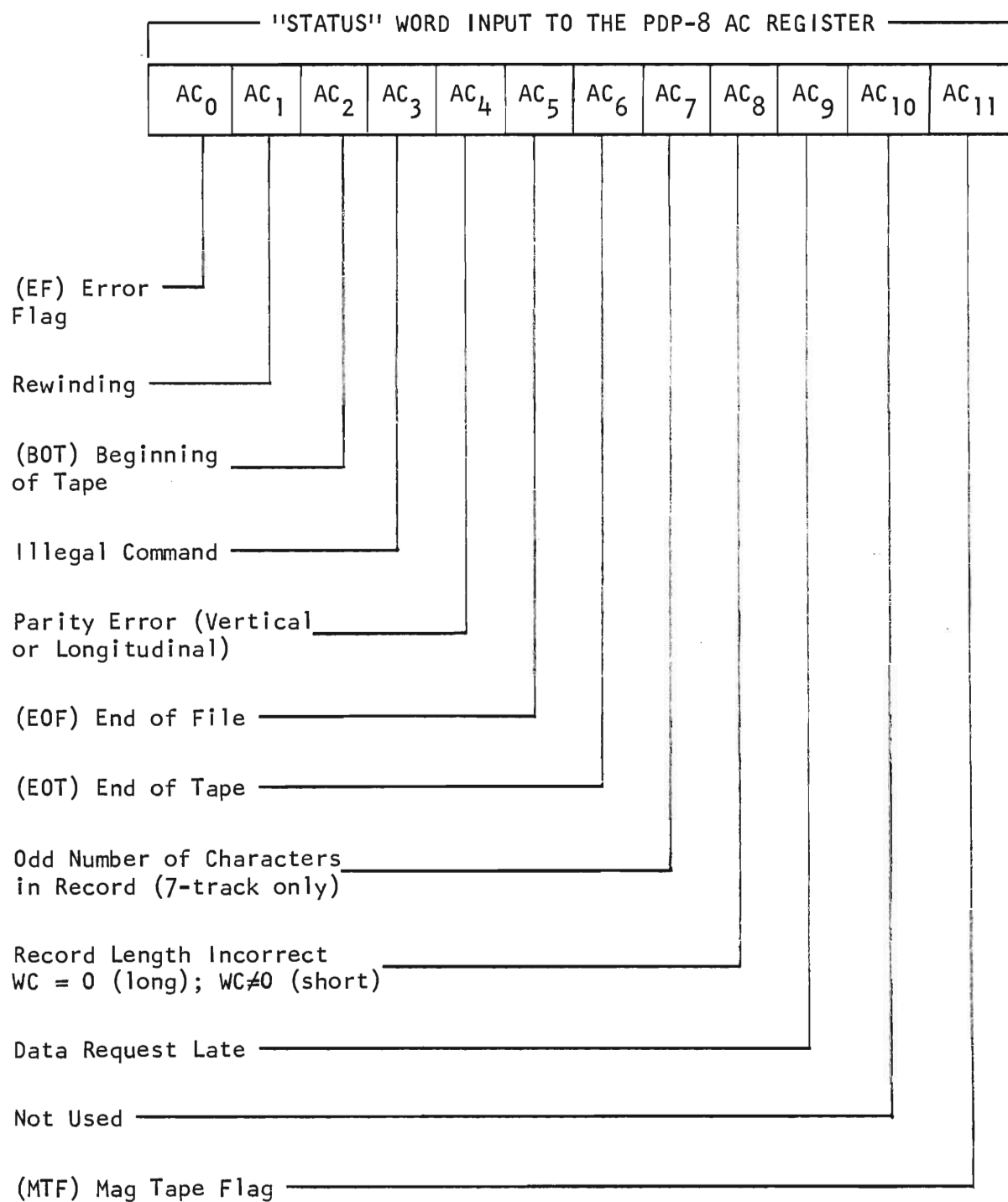
The error flag (EF) sets if any "error" status bit (AC<sub>4</sub>, AC<sub>6</sub>, AC<sub>8</sub>, or AC<sub>9</sub>) is on when MTF goes set or if illegal command is detected. In the case of an illegal command, MTF is not set. EF causes an interrupt if bit 9 is set in the command register. The status of EF can be tested with IOT instruction 6701 (MTSF), "Mag Tape Skip on Flag Set".

#### AC<sub>1</sub> (REWINDING)

Set while selected transport is in rewind mode.

#### AC<sub>2</sub> (BOT)

Set while selected transport is on the BOT foil. BOT also is set along with MTF if the BOT foil sensed after the tape has initiated space reverse. WC can be interrogated to determine the number of records spaced over prior to sensing the beginning of tape.



### AC<sub>3</sub> (ILLEGAL COMMAND)

Illegal commands are:

1. Command is issued when tape controller is not ready.
2. MTGO command is issued to a tape unit which is not ready (even though tape controller may be ready).
3. Write or Write EOF command is issued when no write enable ring is in reel.
4. Space Reverse command is issued when at BOT. If the tape requires movement to reach BOT on a Space Reverse, then the result is not an illegal command. See BOT.
5. An MTGO command when bits 6, 7, and 8 of the command register are set to 000.

The EF (AC<sub>0</sub>) status flag is set but MTF (AC<sub>11</sub>) does not set for an illegal command.

### AC<sub>4</sub> (PARITY ERROR)

The parity error detection is for both "vertical" odd parity checks on each character and upon "longitudinal" even parity checks on each track throughout the entire record. Once a parity error is detected, the status bit remains set until either the MTAF instruction 6712 or MTLC 6716 is issued to clear the status and command registers. Parity is checked after a Read, Write, or Space Forward.

### AC<sub>5</sub> (EOF)

EOF is set if an end-of-file mark is encountered when perform-

ing a Read operation. A length error may be set. In 7-track odd parity mode, the parity error is also set. Thus, EOF on Read may be accomplished by EF, MTF, parity error, and length error.

EOF is also set after completing a write EOF command. MTF will also be set.

EOF is also set (along with MTF) if an end-of-file mark is encountered on a Space Forward or Space Reverse. These commands are then terminated and the program can interrogate WC to determine number of records spaced over prior to encountering the tape mark. The end-of-file mark is to be considered as a record spaced over.

#### AC<sub>6</sub> (EOT)

The EOT status bit sets when the EOT foil is sensed. However, the command is completed. At completion, both the EF and MTF status bits are set and the interrupt is generated, if it was enabled. The EOT status does not clear until the tape transport is commanded to Rewind or Space Reverse. If EOT foil is sensed on a Space Forward, the operation is terminated at the next IRG. WC can be interrogated to determine actual number of records spaced over.

#### AC<sub>7</sub> (ODD NUMBER CHARACTERS)

Used in 7-track mode only, the bit indicates that there were an odd number of characters in the record. Since the last character is repeated in both halves of the 12-bit computer word, the least significant half of the computer word should be discarded.

The length error status bit will also be set. Thus, the EF will indicate an unusual condition.

AC<sub>8</sub> (RECORD LENGTH INCORRECT)

During a read operation, this status bit is set whenever the WC overflow does not agree with the number of words actually read, or if an odd number of characters were in the record in 7-track mode. The EF is set and an interrupt may be generated.

AC<sub>9</sub> (DATA REQUEST LATE)

This status bit sets whenever a word is not transferred in time in either a write or read cycle. The EF status bit is set and an interrupt is generated when MTF is set.

AC<sub>10</sub> (NOT USED)

AC<sub>11</sub> (MTF)

The Magnetic Tape Flag status bit is set whenever the tape controller has completed an acceptable command and is ready to accept the next command. MTF causes an interrupt if bit 9 is set in the command register. When MTF goes set, the Error Flag (EF) will set if any errors are present. MTF can be tested with IOT instruction 6701 (MTSF), "Magnetic Tape Skip on Flag Set".



### 1.3 W

## 5091-P8 CHECKOUT AID

### FUNCTION

Enable checkout engineer to input "programs" of tape controller commands, to cause immediate execution of these programs.

### USAGE

The operator inputs the desired sequence of tape control commands either by causing a paper tape to be read or by typing in the commands in the desired sequence.

Prior to the execution of the sequence of tape commands, the computer interrogates the console data switches which have been preset by the operator to reflect the size of records and bit pattern.

### CONSOLE SWITCHES

Sw 0 is most significant. (Switch is on if in up position.)

Sw 0 on — stop after execution of current sequence.

Sw 0 off — recycle at end of current sequence.

Sw 1 on — Bit pattern for first word and odd words\* of records will be all zeros on first execution of sequence. On subsequent executions the first and odd words in the records incremented by 1.

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\* Even-position words not necessarily equal to the odd words unless DV command is in effect.

Sw 2-3 — used to select record size.

00 — writes are two words.

01 — writes are 100 words.

10 — writes are 500 words.

11 — writes are 800 words.

Sw 4-11 — Bit pattern to be used for odd-positioned\* words to be written. (Only if Sw 1 is off.)

### PROCEDURE

After program has been loaded, the operator starts at 200<sub>8</sub>. Note that the WC and CA modification, if required (see next paragraph), must be done before starting. The computer will type out the word "IDLE". Upon seeing this signal, the operator sets up the console data switches to reflect size of buffer, and bit pattern for the tape characters.

He then inputs the desired sequence of tape commands he wishes executed. This is done by typing in mnemonics for each command or, alternately, to input a paper tape containing the desired command sequence.

### WC AND CA MODIFICATION

As supplied, the program assumes that the WC address is 32 and the CA address is 33. In cases where these addresses are not 32 and 33, the program may be modified after it has been loaded. The modification steps are as follows:

- a. Enter address 20 on the SWITCH REGISTER and press LOAD ADDR.  
The MEMORY ADDRESS display should indicate 20.

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\*Even-position words not necessarily equal to the odd words unless DV command is in effect.



- b. Set SWITCH REGISTER to desired address of WC and press DEP.
- c. Set SWITCH REGISTER to desired address of CA and press DEP.

#### COMMAND INPUT FORMAT

M1, M2, . . . Mn where the Mi are taken from the command repertoire list. Each Mi is followed by a comma or carriage return and the last Mn is always G0.

It is important to note that if a command sequence is to be recycled, command Mn-1 is logically followed by command M1. Therefore, Mn-1 is usually a wait for interrupt (IN) or appropriate delay in order to ensure that two tape motion operations do not fall back to back.

The paper tape input has the same format. Program ignores spaces, line feeds, and rubouts. The paper tape can be prepared and modified using the PDP-8 Editor Program.

#### ADDITIONAL FORMAT NOTES

1. The nnn in JN, JF, DC, and J is the relative position of a command in the sequence where 1 is the first command.
2. Prior to execution of command #1 the computer interrogates the console switches for stop option, change of record size, or changes of character.
3. The computer automatically puts a J1 at the end of the sequence to ensure looping back. Thus a G0  $\equiv$  J1.

4. DC1, JF1, JN1 will cause interrogation of the console switches.
5. All nnn (and mmm) in command repertoire are decimal radix. XXXX are octal radix.
6. A BT0000 is assumed (not actually inserted) at the beginning of a command sequence. In other words, if the first command is a W, the program will attempt to write on unit 0 with interrupt disabled, not core dump mode and without extended gap. Appropriate BT's must be put into sequence where applicable.
7. The last input of IV or DV will be in effect. If an input command sequence does not include IV or DV, then the last use of IV or DV (previous sequence) will be in effect. If IV or DV is not used in any program, then DV is in effect.

#### COMMAND REPERTOIRE

W	Write one record.
R	Clear input area and then read one record.
B nnn	Backspace nnn records.
F nnn	Forward space nnn records.
RW	Rewind.
EF	Write end of file.
D nnnn	Delay nnnn milliseconds.
P	Print last record input.

P nnnn	Print nnnn <sup>th</sup> word of last record input.
P mmm-nnnn	Print mmm to nnnn <sup>th</sup> words of last record input.
IN	Wait for interrupt and read status after interrupt.
RS	Read status.
PS	Print status last input with IN or RS.
X xxxx	Execute xxxx as PDP-8 instruction.
L xxxx	Load AC of PDP-8 with xxxx.
PA	Type AC of PDP-8 in octal.
GO	Initiate execution of command sequence. This is always the last command input in a sequence. It also can be the only command input if an appropriate sequence already is in memory.
MK xxxx	Form logical product of status as last input with IN or RS and xxxx. Save logical product as yyyy.
JF nn	Jump to command nn if yyyy (formed with MK) is all zero.
JN nn	Jump to command nn if any bit in yyyy (formed with MK) is a one.
J nn	Jump to command nn.
SC nnn	Set counter to nnn.

DC nn	Decrement counter. If counter after decrementing is non-zero, jump to command nn; otherwise, continue.
BT xxxx	Bits xxxx are to be added to all subsequent commands sent to command register. At beginning of command sequence it is assumed that zeros are added to the commands. This permits the operator to have control over the unit, core dump, extended gap, and enable-disable of the tape interrupts.
IV	Causes program to generate records to be written such that the characters in even positions are the one's complement of characters in odd positions.
NV	Causes program to generate records to be written where all characters are constant.
	When program is initially loaded, DV is the mode. User should precede his sequence of commands with IV or NV, whichever is desired. <u>Only</u> one should be used in a sequence.
TR	Test read. Word count automatically set to two words more than that signalled by switches 2-3. Input area is cleared first.
PC	Print the counter in octal. "CTR = XXXX"

PW                      Print the first word of the write buffer. This command serves to identify the execution cycle when switch 1 is on (modulo 4096). Denotes current character bit pattern for reads/writes.

'WROTE XXXX'

Cn                      Compare read buffer versus write buffer. n must be 7 or 9 and signals amount of tracks on tape. Note that n is 7 if core dump mode.

For C9 the program will also check the vertical parity bit on each character in the read buffer. Switches 2-3 will control length of buffer — number of words checked.

On error (including parity check for C9) program will type:

CP n W R #E

where    n is position of first word in error  
          W is contents of write buffer  
          R is contents of read buffer  
          #E is total number of errors

#### EXAMPLES OF COMMAND SEQUENCES

1. Write records (switches determine size and pattern) continuously and rewind at end of reel.

Assume unit # = 0 and no core dump mode and no interrupts. Also, no extended gap. If these assumptions are not made, then the W is preceded by an appropriate BT.

W,RS,MK1,JF2,MK40,JF1,RW,J2,GO

Breakdown is:

W	Write.
RS,MK1,JF2	Delay until write finished. Waiting until LSB of status (MTF) is a one.
MK40,JF1	If end of tape in status is off, go to start of sequence; otherwise, continue.
RW	Rewind.
J2	Jump to RS command. This will delay until rewind finished using same three commands used to signal write completed.

Note that when it falls through the JF2, the end-of-tape bit will be off.

2. Write 4000 records. Write end of file. Rewind and read each record. After each read check for error flag (MSB of status). If error flag is present, print status and 998-1002<sup>nd</sup> word of record. Check that EOF occurs after 4000<sup>th</sup> record.

Assume use of unit #1.

BT1004,	Select unit #1 and enable interrupt.
SC4000,	Set counter on number of records.

W,IN,	Write and wait for completion.
DC3,	Return to write if 4000 records are not written.
EF,IN,RW,IN,	Write end of file and rewind.
SC4000,	Reset counter.
R,IN,	Read and wait for completion.
MK4000,	Mask out error bit.
JN24,	
DC11,	Return to read if 4000 records not read.
R,IN,	Attempt read over tape mark.
MK100,	Mask EOF status bit.
JN21,PS,	Print status if not EOF.
RW,IN,J1	Rewind and go to start.
PS,P98-1002,	Print status and words 98-1002.
J15,G0	Return to DC11.





4.1 W

## MAGNETIC TAPE DRIVER (LONG)

### ABSTRACT

A general-purpose driver subroutine for initiating and testing input/output exchanges with the Model 5091-P8 Magnetic Tape System.

### PRELIMINARY REQUIREMENTS

### EQUIPMENT

A PDP-8, PDP-8/L, or PDP-8/I with three-cycle data break and a minimum memory size of 4096 words and a Model 5091-P8 Magnetic Tape System.

### STORAGE

In its distributed form, the magnetic tape driver occupies 196 locations. Because this exceeds one page of memory, instructions are given for incorporating the routine into a user's program at assembly time. The routine is divided into three sections:

8 words of page 0

96 words section 1

94 words section 2

The routine is supplied in source form and it is possible for a user to reduce the size of the routine by deleting features not required for a particular application.

## USAGE

### INTEGRATION INTO PROGRAM

This subroutine is supplied in source form. The source tape is to be assembled either using PAL III or MACRO-8 along with the user's mainline and other subroutines.

The source tape supplied has been split into two sections, because the subroutine exceeds one page of memory and the sectioning enables two modular parts with a minimum of inter-page communication. Eight words of page 0 are used to effect the storage of parameters required by both sections.

### ASSEMBLY INSTRUCTIONS

The two sections of source are assembled into separate pages of the same field. Refer to 2.2 of this documentation, on the length of each of these sections. In addition to the two sections, eight words in page 0 of the same memory field must be set aside for the two sections to share.

The first executable statement of section 1 has the symbolic name DRTAPE. The first executable statement of section 2 has the symbolic name DRT700. Section 2 also includes the tape interrupt routine which has the symbolic name DRT800. As distributed, DRT800 is the 72nd executable statement in section 2.

The actual memory location of these three instructions is required for correct utilization of the driver subroutine. Magnetic tape functions are initiated by entering the routine with an effective JMS to

DRTAPE. The user's interrupt routine should include an effective JMS to DRT800 if tape interrupts are enabled. Finally, the contents of the first word of the set of eight words in page 0 should contain the address of DRT700.

The eight words of page 0 are referred to as DRT910 to DRT910+7 and should be given this label.

### INTERRUPTS

It is possible for the user to use interrupts to signal the completion of certain requested tape operations. This is done by adding 4 to the "request parameters" in the calling sequences. The basic PDP-8 interrupt system must be enabled (ION). In the event interrupts are used, it is necessary for the user to include a link to the tape interrupt handler as part of his interrupt processor. The code is an effective JMS DRT800 where DRT800 is in the section 2 source. For the supplied tape, it is the 68th executable location in the section 2 assembly.

The DRT800 routine will test the magnetic tape hardware flags, retry reads and writes in the event of errors, and reset the software interrupt flag. It is important that the user use this routine when interrupts are to be used. The use of interrupts in conjunction with this routine allows full overlap of tape input/output with other processing.

### EXTENDED MEMORY

The subroutine may be used in an extended memory installation. Therefore, the user must precede his calling sequences with appropriate CDF instructions in case of interfield linkage.

In the event that an application does not involve extended memory, then the source tapes supplied have a double slash (//) in the comments for all instructions which are no longer necessary. This would also change the relative location of DRT800 (see 3.3) in section 2.

### CALLING SEQUENCES

In each of the listed sequences the first instruction is an effective JMS DRTAPE. A "request parameter" always follows the JMS. This request parameter is four octal digits where in most instances the first digit is u denoting the particular tape unit to be used (u = 0, 1, 2, 3).

The routine does not check for a valid tape unit number.

On all entries, the routine will delay if the previous operation has not been completed.

#### a. Test Tape Status

```
JMS      DRTAPE
          0000
          EXIT #1
          EXIT #2
```

When entered via this sequence, the routine will exit after the last requested tape operation has been completed. In the case of read or write operations, this implies the completion after error retries. Therefore, the user employs this sequence to synchronize his processing with tape input/output operations.

On either exit the AC register will contain tape status. The following table denotes the meaning of the status when the respective bit is a one.

0	Error Flag (EF) Set
1	Selected Tape is Rewinding
2	Selected Tape is at Load Point
3	Last Command Illegal
4	Parity Error (Vertical and/or Longitudinal)
5	Tape Mark (End of File)
6	End of Reel
7	Odd Record Length (7-Track Only)
8	Record Length Incorrect
9	Timing Error — Data Request Late
10	Not Used
11	Mag Tape Flag — Controller is Not Busy

Exit #1 is used for a variety of reasons and it is the user's responsibility to know his last operation in order to decode the meaning of the status bits. Following are the conditions which will cause this exit, listed in the order to be tested per tape operation.

Exit #2 is the normal exit taken when there is no "unusual end" to the last operation, such as errors, end of file, etc.

1. Last Operation was a Read

- (a) Illegal command error — implies the tape unit is off-line.

- (b) Parity and/or timing error — subroutine attempts 10 times to correctly read a record prior to taking exit #1. At this point the tape is positioned as if erroneous record read correctly.
- (c) End of file or end of reel — on end of file the length error bit will also be found set.
- (d) Length error — location 32 of field 0 can be used to determine if record was longer or shorter than expected. If shorter, then its actual length can be computed. In conjunction with the odd record length status (7-track only), the record may be the expected length but the last 12-bit computer word will have the last 6-bit tape character repeated in both halves.

## 2. Last Operation was a Write

- (a) Illegal command error — implies the ring is missing on tape unit or the unit is off-line.
- (b) Parity and/or timing error — subroutine attempts three times to correctly write a record prior to taking the error exit. The retries are with extended gap.
- (c) End of tape on writing last record — can occur simultaneously with parity and timing errors.

3. Last Operation was a Write EOF

- (a) Illegal command error — implies the ring is missing on tape unit or the unit is off-line.

4. Last Operation was a Space Forward

- (a) Illegal command error — implies the tape unit is off-line.
- (b) Parity error encountered on at least one of the records spaced over.
- (c) End of file or end of tape encountered — the user can check WC (32 of field 0) to determine how many records have actually been spaced over prior to end of file or end of tape. These conditions can occur simultaneously with parity error. The end of file is to be considered as a record.

5. Last Operation was a Space Backward

- (a) Illegal command error — implies the tape unit is off-line or that the user attempted to backspace while at the beginning of the tape.
- (b) End of file or load point encountered. The user can check WC (32 of field 0) to determine how many records have actually been spaced over prior to encountering a tape mark or beginning of tape. An end of file is to be considered as one record.

6. Last Operation was a Rewind

- (a) Illegal command error — implies that the tape unit is off-line.

b. Supply Word Count

```
JMS      DRTAPE
          0030
          WORD COUNT
```

The supplied word count will be retained by the subroutine for all subsequent read and write requests. The routine will delay until the last operation has been completed (including any necessary retries at reading or writing) before accepting the new word count.

c. Rewind

```
JMS      DRTAPE
           $\mu$ 010  (or  $\mu$ 014)
```

Subroutine will initiate a rewind of unit  $\mu$ . If the user desires to follow the Rewind request with a command to a different tape unit, then he should first execute an MTLC ( $6716_8$ ) with a unit address different than that commanded to rewind. If the user fails to execute above, the subroutine will wait for rewind to complete before initiating the succeeding tape operation.



d. Read Without Core Dump Mode

```
JMS      DRTAPE
      u020  (or u024)
      LOCATION OF BUFFER
```

Subroutine will initiate a read of one record into memory at location given by third word of calling sequence. The length of the record is supplied by the use of a supply word count calling sequence.

The number of words read will equal the number of characters in the record. The subroutine will not remove the parity bit on the characters input.

e. Read in 9-Track Core Dump Mode or 7-Track Mode

```
JMS      DRTAPE
      u220  (or u224)
      LOCATION OF BUFFER
```

Subroutine will initiate a read of one record into memory at location given to third word of calling sequence. The length of the record (in words) is supplied by the use of a supply word count calling sequence.

f. Write Without Core Dump Mode or Extended Gap

```
JMS      DRTAPE
      u040  (or u044)
      LOCATION OF BUFFER
```

Subroutine will initiate a write of one record from memory at location given by third word of calling sequence. The length of the record is supplied by the use of a supply word count calling sequence.

g. Write Without Core Dump — With Extended Gap

JMS        DRTAPE  
          u140    (or u144)  
          LOCATION OF BUFFER

Same as f except that an extended gap is used prior to recording the data.

h. Write in 9-Track Core Dump or 7-Track Mode — Without Extended Gap

JMS        DRTAPE  
          u240    (or u244)  
          LOCATION OF BUFFER

Subroutine will initiate a write of one record from memory at the location given by third word of calling sequence. The length of the record (in words) is supplied by the use of a supply word count calling sequence.

i. Write in 9-Track Core Dump or 7-Track Mode — With Extended Gap

JMS        DRTAPE  
          u340    (or u344)  
          LOCATION OF BUFFER

Same as h except for use of extended gap prior to recording.

j. Write Tape Mark Without Extended Gap

```
JMS      DRTAPE
      u050  (or u054)
```

Subroutine will initiate the recording of a tape mark on unit u.

k. Write Tape Mark With Extended Gap

```
JMS      DRTAPE
      u150  (or u154)
```

Subroutine will initiate the recording of a tape mark preceded by an extended gap.

l. Space Forward k Records

```
JMS      DRTAPE
      u060  (or u064)
      k
```

Subroutine will initiate the space forward of k records on unit u. If k is zero, then the request is ignored.

m. Space Backward k Records

```
JMS      DRTAPE
      u070  (or u074)
      k
```

Subroutine will initiate the space backward of k records.  
If k is zero, the request is ignored.

n. Select Tape Unit

```
JMS      DRTAPE
      u000
```

This causes the controller to select unit u. The user can thus acquire status with the 6706 command or test unit ready.

USAGE COMMENTS

- a. The eight words required in page 0 have the following usage:
1. Word 1 is a pointer to the DRT700 routine — enables section 1 to use this routine.
  2. Word 2 is the word count in two's complement form to be used in all reads and writes.
  3. Word 3 is the current tape status bits obtained when the tape system completed its last operation.

4. Word 4 is the counter on number of attempts to repeat request on parity or timing errors.
5. Word 5 is the request parameter for the most recent tape operation initiated.
6. Word 6 is a software flag to denote that tape is currently backspacing for a read/write retry.
7. Word 7 is a software interrupt flag. It is non-zero if the tape system has been initiated to perform a request with an interrupt to be used for tape completions.
8. Word 8 is the location of the read/write buffer.

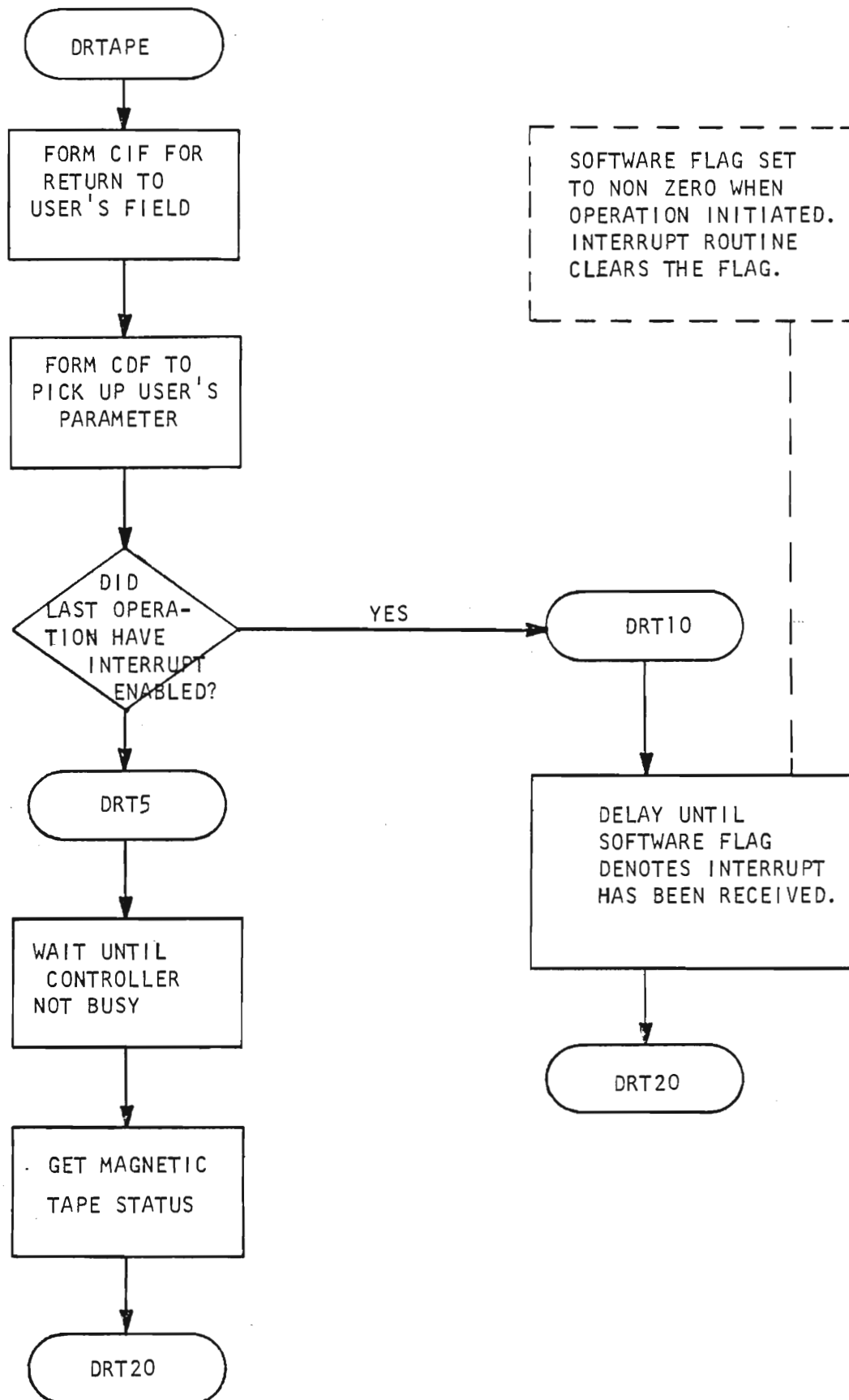
b. Initialization of eight words:

The seventh word (current request parameter) should be set to zero when initiating a program which uses the tape driver subroutine. This will ensure that the routine will not enter an endless loop waiting for "last" operation to be completed.

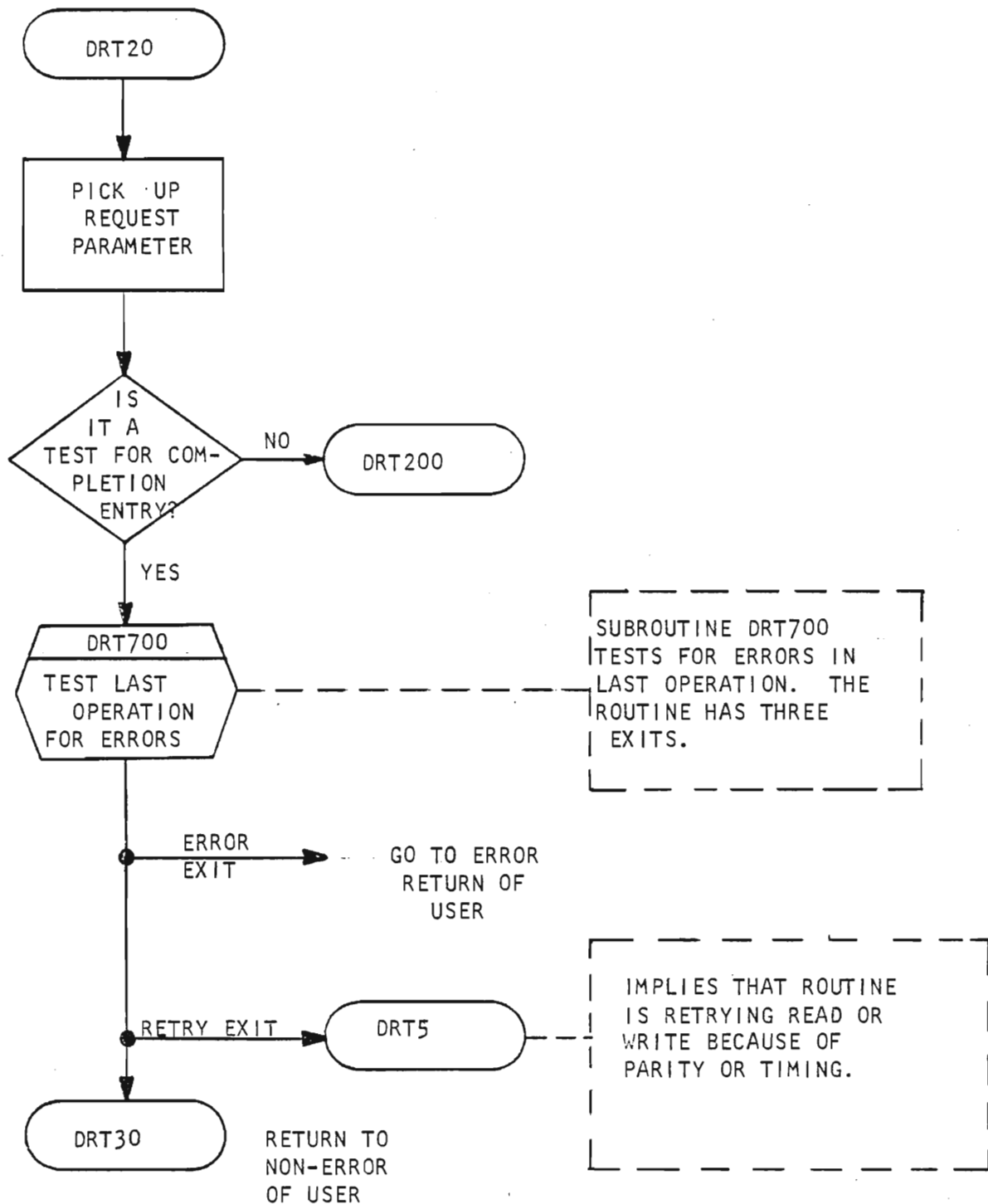
The first word is set to the address of DRT700.

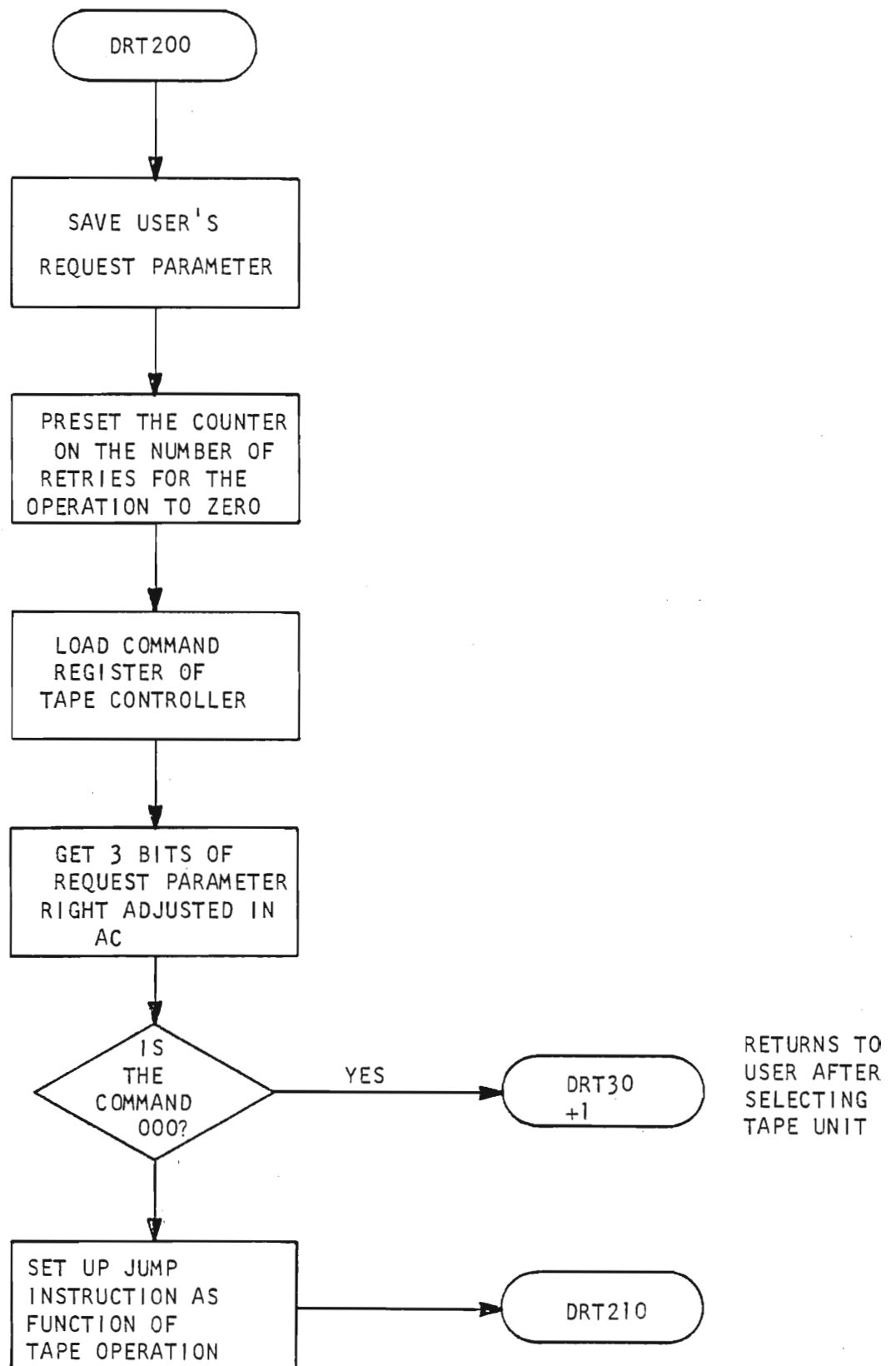


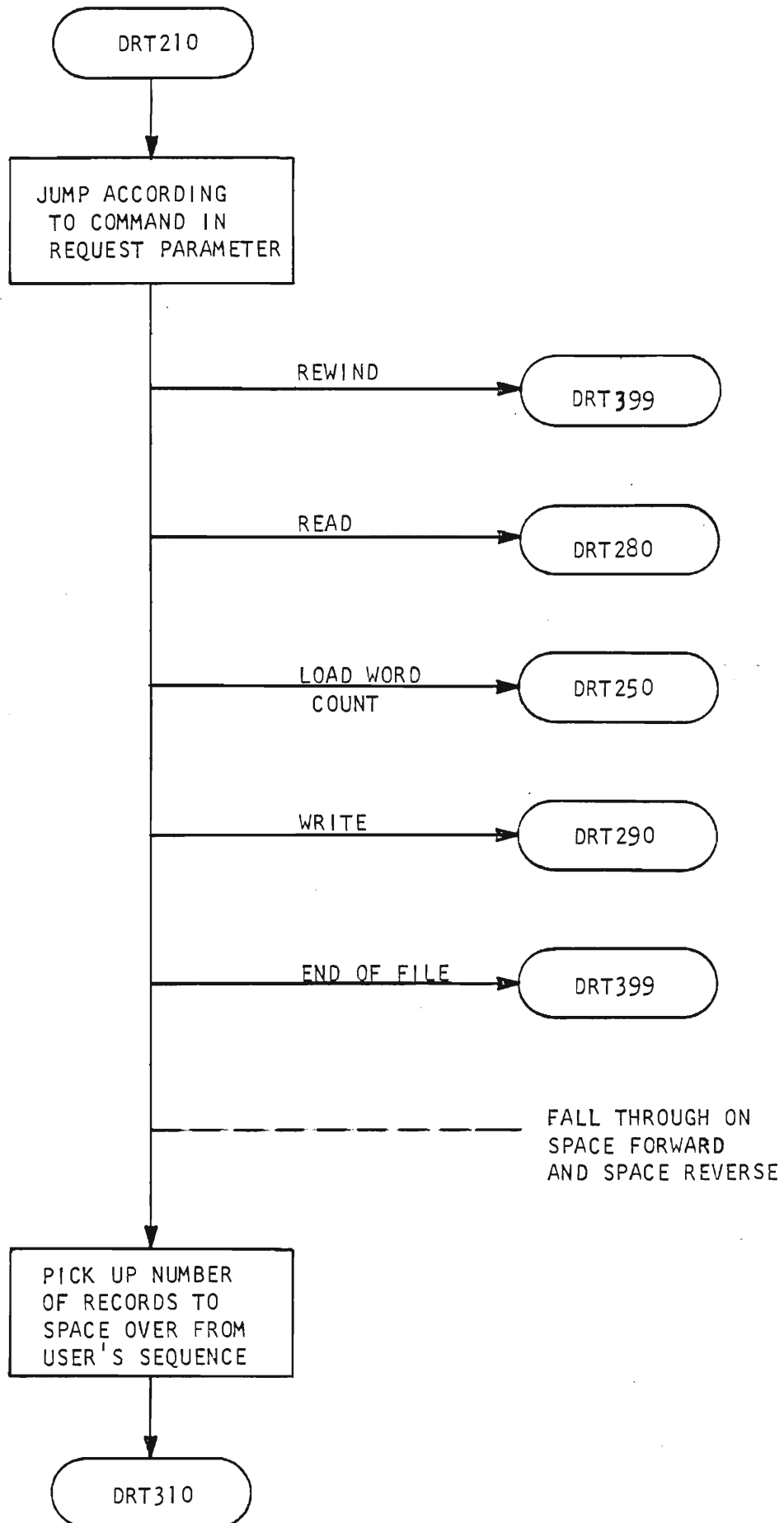
#### 4.0 FC - Magnetic Tape Driver

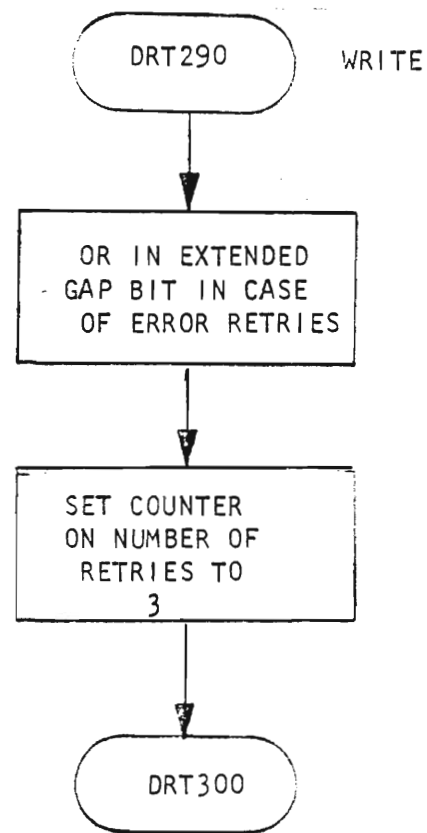
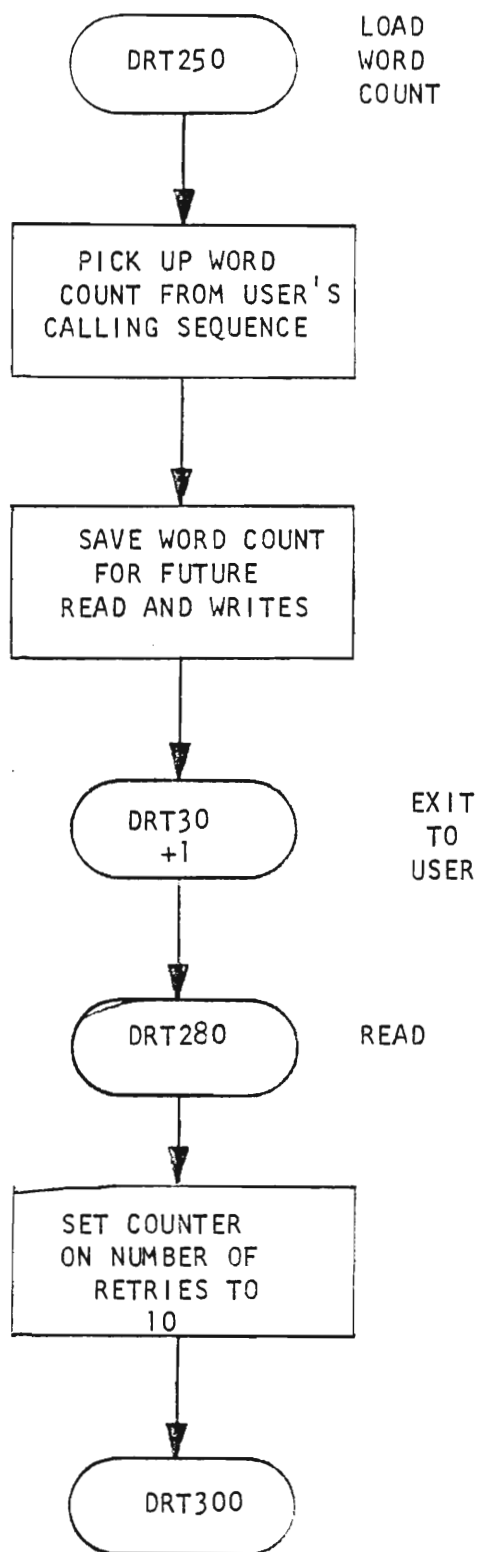


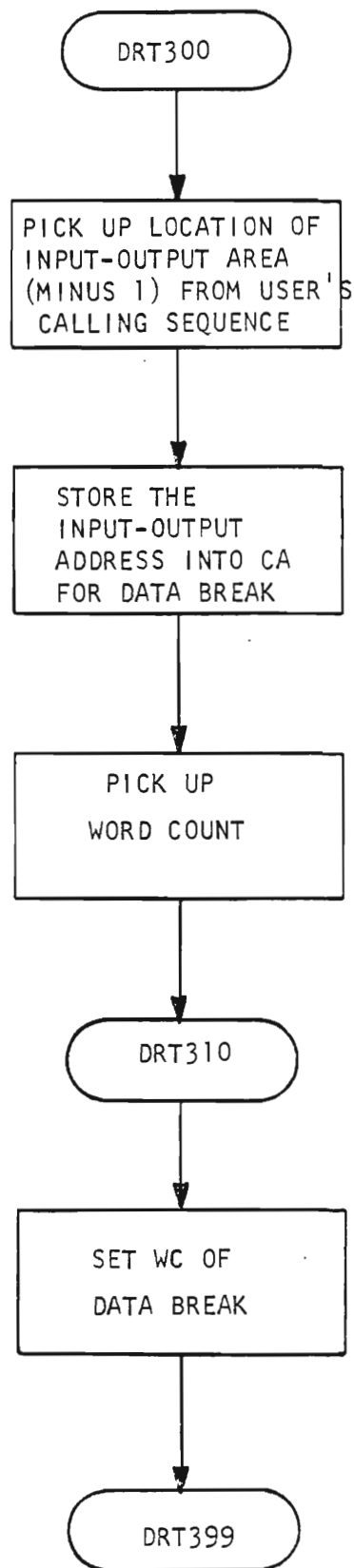


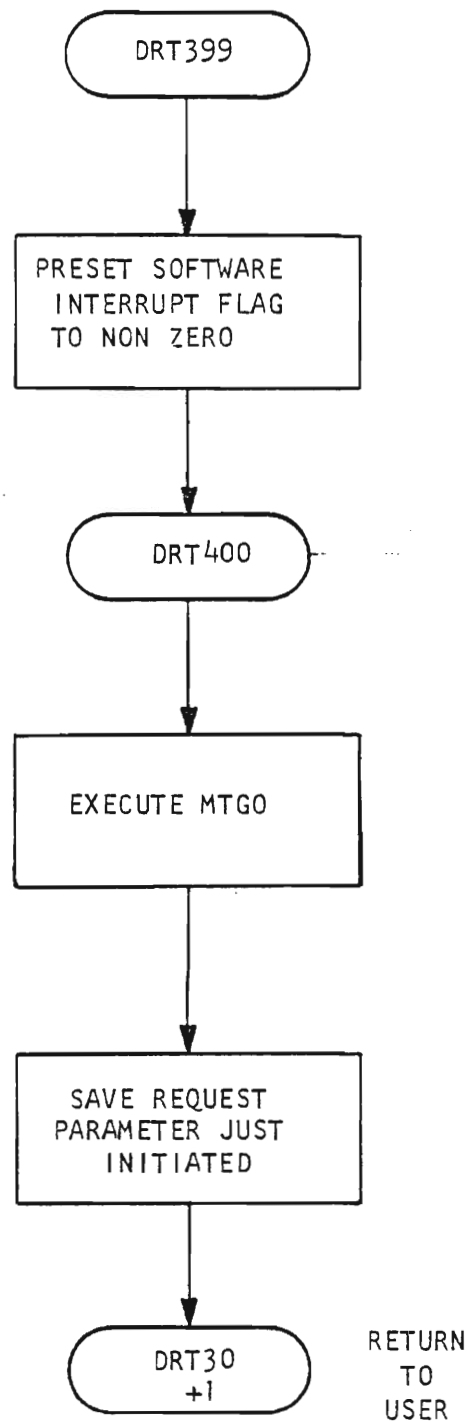


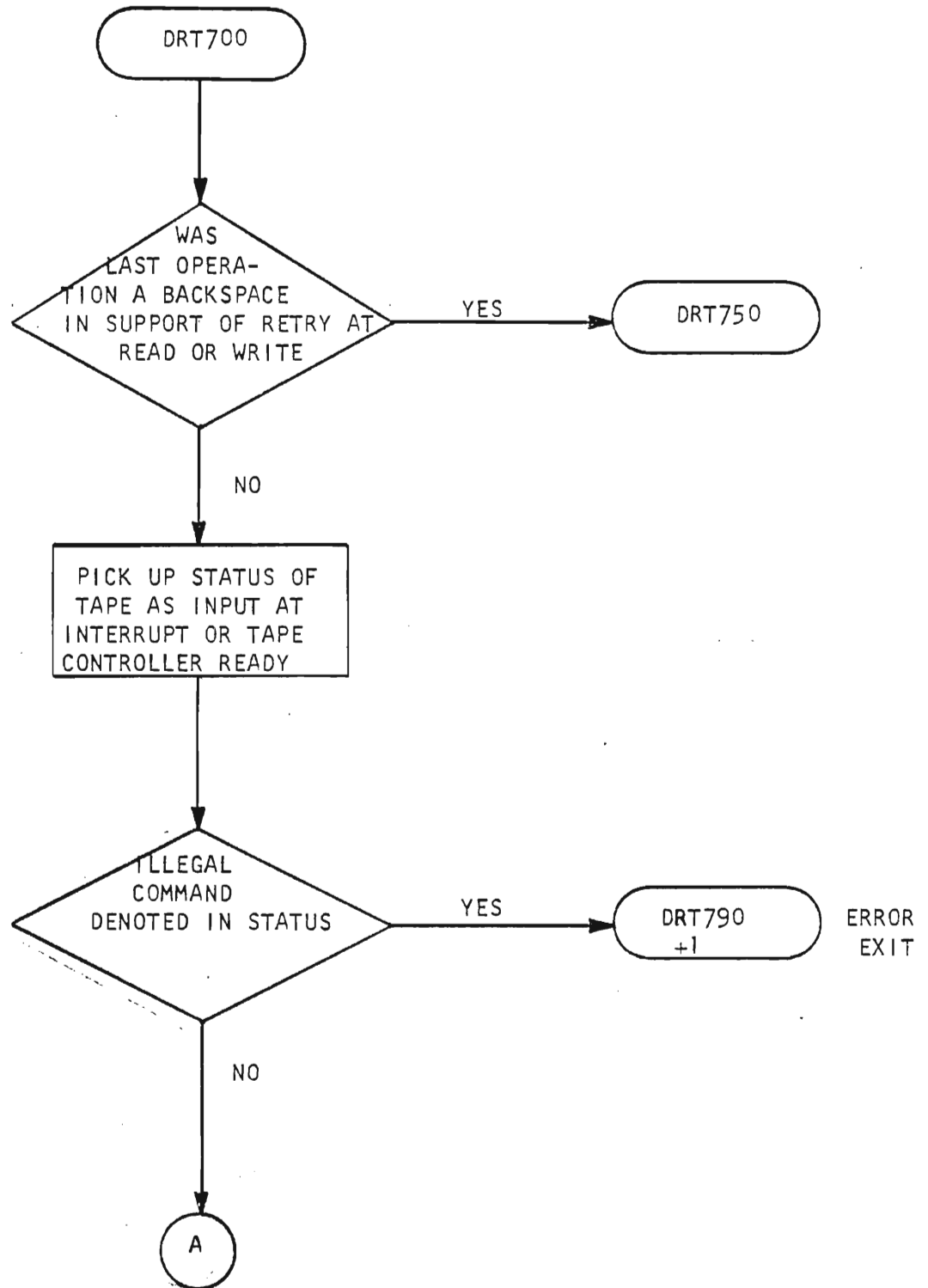


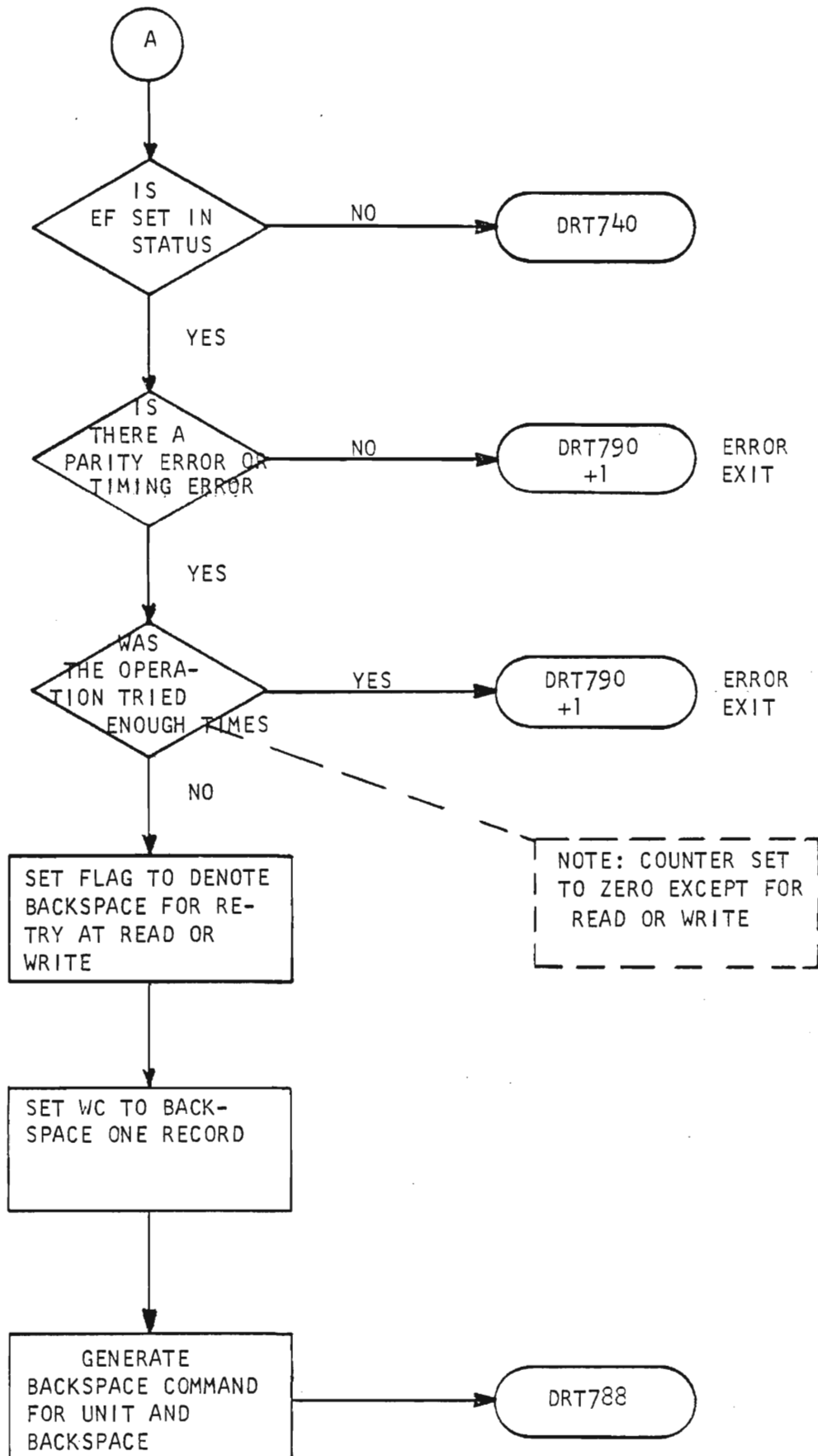




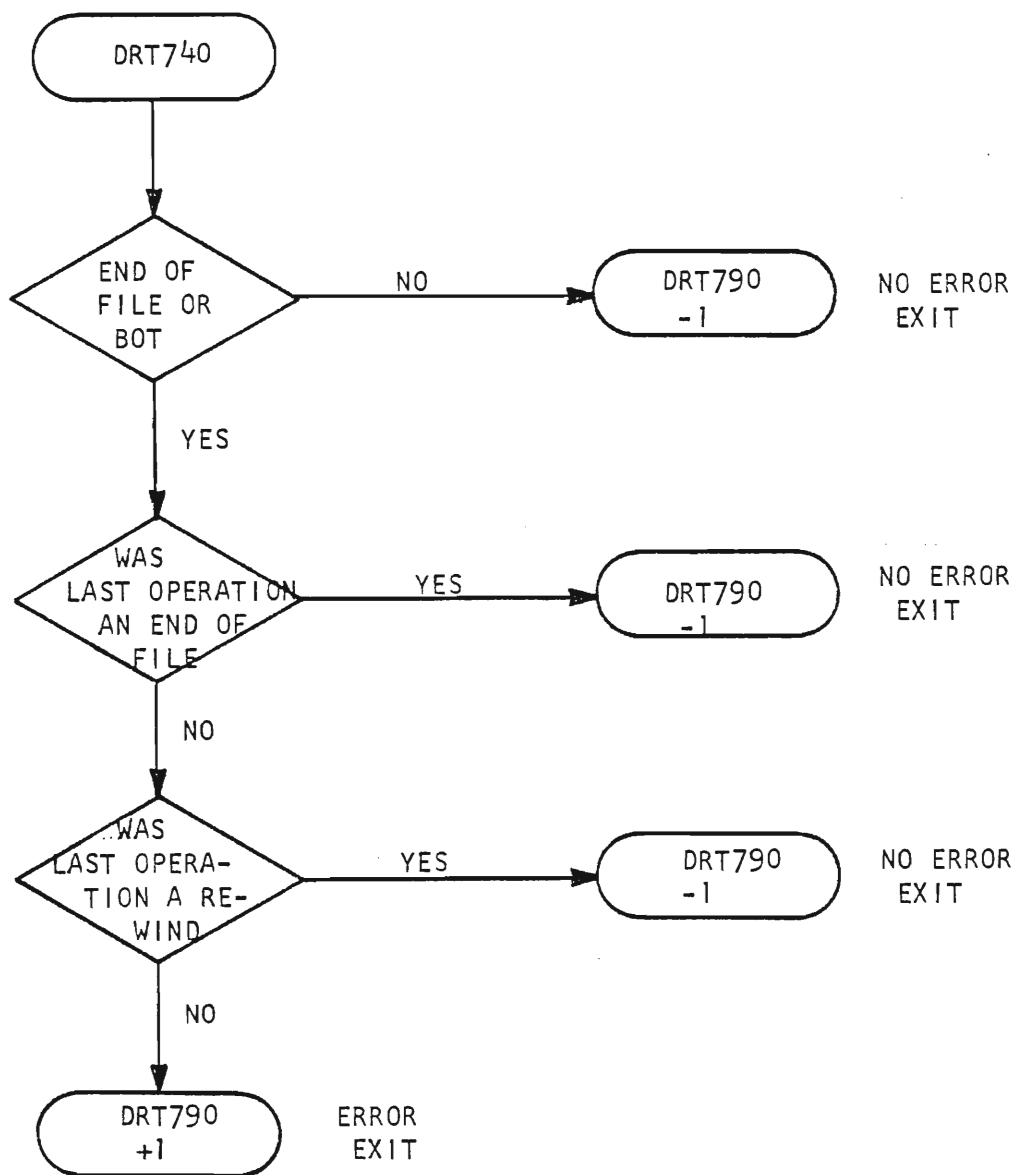


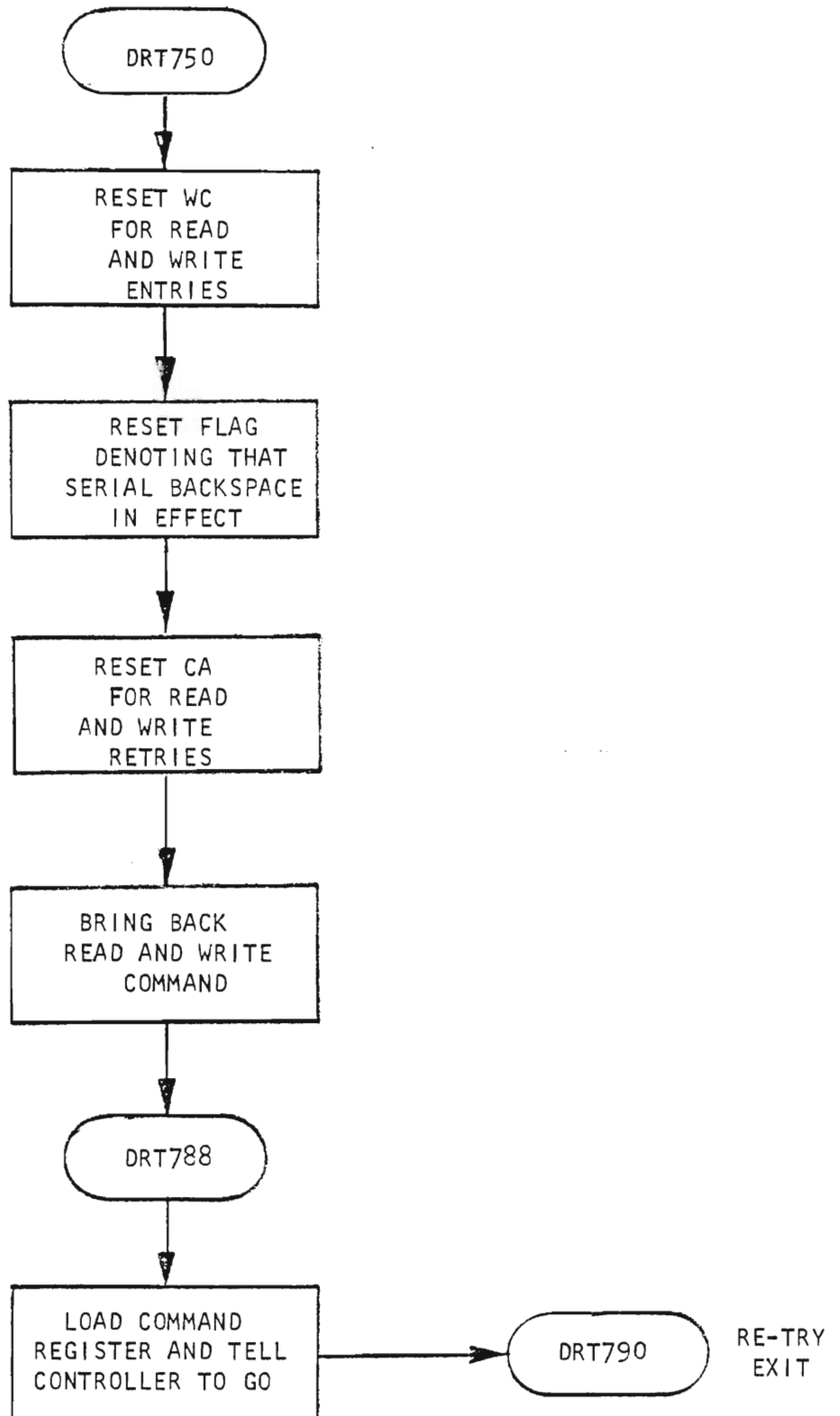


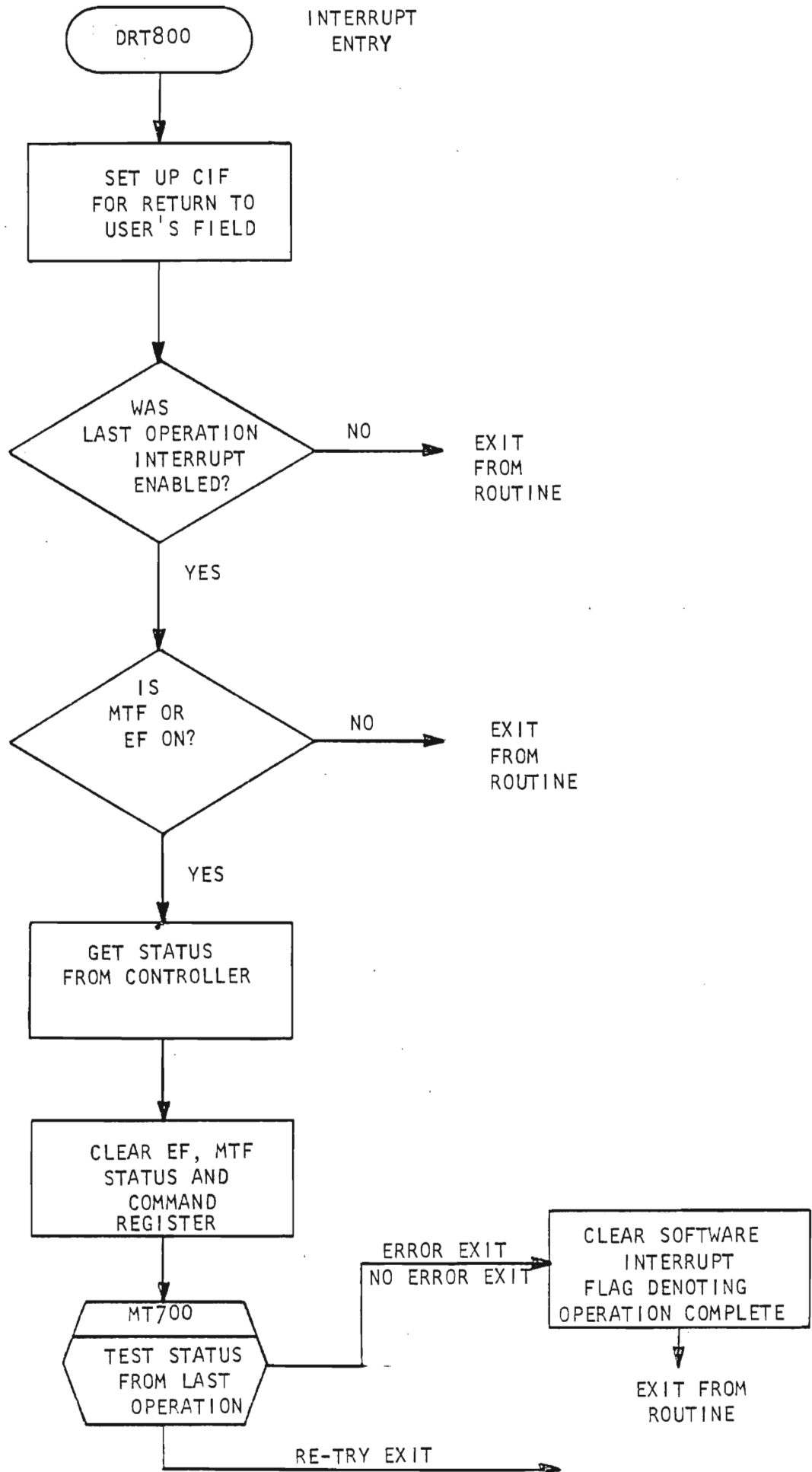














MAGNETIC TAPE DRIVER (4.1)

4.1 SL

DATUM MODEL 5091-P8 TAPE SYSTEM

DRTAPE, 0

CLA 6224 // CIF  
 6214 //RDF INSTRUCTION  
 TAD DRT10-1 //FORMING APPROPRIATE  
 DCA DRT30+1 //CIF  
 6214 //RDF INSTRUCTION  
 TAD DRT10-2 //  
 DCA DRT20 //  
 CLA  
 TAD DRT910+4 /PICK UP PREVIOUS COMMAND  
 AND DRT900+2 /WAS INTERRUPT BIT ON  
 SZA  
 JMP DRT10

DRT5,

6711 /CONTROLLER BUST TEST  
 JMP -1  
 6706  
 DCA DRT910+2 /SAVE STATUS  
 JMP DRT20  
 6201 // SKELETON CDF  
 6202 //SKELETON CIF

DRT10,

CLA  
 TAD DRT910+6 /WAIT FOR SIGNAL  
 SZA /THAT INTERRUPT OBTAINED  
 JMP DRT10

DRT20,

HLT //  
 TAD I DRTAPE  
 // LABEL DRT20 COULB BE PUT  
 // ON THE TAD INST IF NO MEMORY EXTENSION  
 /TO YIELD STATUS

SZA  
 JMP DRT200  
 JMS I DRT910 /GO TO DRT700 ROUTINE  
 JMP DRT30+1 /GO TO ERROR EXIT  
 JMP DRT5 /RETRY EXIT  
 DRT30, ISZ DRTAPE /OK EXIT  
 0 //APPROPIATE CIF

DRT30,

ISZ DRTAPE  
 JMP I DRTAPE  
 DRT200, DCA DRT910+4 /SAVE COMMAND PARAMETER  
 DCA DRT910+3 /PRESET FOR NO RETRIES  
 TAD DRT910+4

6716 /LOAD COMMAND REGISTER  
 AND DRT900+1 /ISOLATE COMMAND  
 RTR CLL

RAR  
 SNA  
 JMP DRT30+1 /NO-OP

TAD DRT210  
 DCA +2  
 CLA  
 0

DRT210,	JMP	.	
	JMP	DRT399	
	JMP	DRT280	/READ
	JMP	DRT250	/LOAD WORD COUNT
	JMP	DRT290	/WRITE
	JMP	DRT399	/END OF FILR
	NOP		/FORWARD SPACE
	ISZ	DRTAPE	
	TAD	I DRTAPE	/HERE ON BACKSPACE
	CIA		
	6201		//SET TO FIELD 0
	JMP	DRT310	
DRT250,	ISZ	DRTAPE	
	TAD	I DRTAPE	/PICK UP WORD COUNT
	CIA		
	DCA	DRT910+1	
	JMP	DRT30+1	
DRT280,	TAD	DRT900+3	/SET RETRY COUNTER TO 9
	JMP	DRT295	
DRT290,	TAD	DRT910+4	/PICK UP REQUEST PARAMETER
	AND	DRT900	
	SZA		
	JMP	DRT295-1	
	TAD	DRT910+4	/PUT IN EXTENDED GAP
	TAD	DRT900	/IN CASE OF RETRIES
	DCA	DRT910+4	
	TAD	DRT900+4	/SET RETRY COUNTER TO 2
DRT295,	DCA	DRT910+3	
	ISZ	DRTAPE	
DRT300,	CLA	CMA	/-1 IN AC
	TAD	I DRTAPE	
	DCA	DRT910+7	/SAVE CURRENT ADDRESS
	TAD	DRT910+7	
	6201		//SET TO FIELD 0
	DCA	I DRT450	/SET CA FOR
			//ABOVE CAN BE A DCA 33
			//IF NO MEMORY EXTENSION
	TAD	DRT910+1	
DRT310,	DCA	I DRT450+1	/SET WC FOR DATA BREAK
			//ABOVE CAN BE A DCA 32
			//IF NO MEMORY EXTENSION
DRT399,	TAD	DRT399	/PRESET INTERRUPT FLAG
	DCA	DRT910+6	
DRT400,	6722		/MTGO
	JMP	DRT30+1	
DRT450,		33; 32	//
/			
DRT900,	100		/0-EXTENDED GAP MASK
	70		/1-MASK FOR COMMAND
	4		/2-CONSTANT 4
	-11		/3 - READ ATTEMPTS
	-2		/4 - WRITE ATTEMPTS

PAUSE

PART 2 MAG TAPE DRIVER (4.1)

```

/
/
/
DRT700, 0      /CHECK STATUS
                /JUST FINISH BACKSPACE FOR
                /RETRY AT READ/WRITE?
TAD DRT910+5    /YES
SZA              /GET STATUS
JMP DRT750
TAD DRT910+2
AND DRT799-1
SZA              /ILLEGAL COMMAND ERROR
JMP DRT790+1     /EXIT DENOTING ERROR
TAD DRT910+2
SMA
JMP DRT740       /NO ERROR FLAG
AND DRT799+1
SNA
JMP DRT790+1     /NOT PARITY OR TIMING
CLA
TAD DRT910+2     /ALWAYS GET PARITY
AND DRT799-4     /ON EOF IF 7 TRK - ODD
SNA
JMP .+3
DCA DRT910+2     /SAVE AS EOF ONLY
JMP DRT790       /TAKE ERROR EXIT
TAD DRT910+3
SMA
JMP DRT790+1     /EXIT WITH STATUS
ISZ DRT910+3
NOP
DCA DRT910+5     /SET FOR SPECIAL BACKSPACE
6201            //CDF TO FIELD ZERO
CLA CMA          /MINUS 1
DCA I DRT799+2

                //PREV INST CHANGES TO
                //DCA 32 WITHOUT
                //EXTENDED MEMORY
                /PREVIOUS COMMAND
                /ISOLATE UNIT-INTERRUPT
                /NOW HAVE BACKSPACE

                /END OF FILE OR BOT

                /NO ERRORS

                /END OF FILE BIT IS
                /EXPECTED IF END OF FILE REQUEST

                /BOT EXPECTED IF
                /REWIND

                /ERROR EXIT

DRT740, AND DRT799-4
SNA
JMP DRT790-1
CLA CLL
TAD DRT910+4
AND DRT799-2
TAD DRT799-3
SNA
JMP DRT790-1
TAD DRT799-5
SNA
JMP DRT790-1
JMP DRT790+1

```

DRT750,	CLA		/PICK UP WORD COUNT
	TAD	DRT910+1	//CDF TO FIELD 0
	6201		
	DCA	I DRT799+2	
			//PREV INST CHANGES TO
			//DCA Z 32 WITHOUT
			//EXTENDED MEMORY
	DCA	DRT910+5	/SIGNAL NOT SPECIAL BACKSPACE
	TAD	DRT910+7	/RESET BUFFER ADDRESS
	DCA	I DRT799+3	
			//ABOVE CAN BE A DCA 33
DRT788,	TAD	DRT910+4	/LOAD COMMAND REGISTER
		6716	/MTGO
	6722		
	JMP	DRT790	
	ISZ	DRT700	
DRT790,	ISZ	DRT700	
	CLA		
	TAD	DRT910+2	/PICK UP STATUS
	JMP	I DRT700	
		40	
		1100	/END OF FILE - BOT MASK
	-50		
	70		
	400		/MASK FOR ILLEGAL COMMAND
DRT799,	7004		/UNIT - INTERRUPT FLAG
	204		/ TO MASK OUT PARITY-TIMING
		32; 33	//
DRT800,	0		
	CLA		
	6214		//BDF INSTRUCTION
	TAD	DRT899+1	//FORMING APPROPRIATE
	DCA	DRT890+2	//CIF
	TAD	DRT910+4	
	AND	DRT899	
	SZA		
	6701		/TAPE INTERRUPT?
	JMP	DRT890+2	/NO
	6706		/PICK UP STATUS
	DCA	DRT910+2	
	6712		/CLEAR FLAGS
	JMS	DRT700	
	JMP	DRT890	
	JMP	DRT890+2	
DRT890,	CLA		/SIGNAL INTERRUPT
	DCA	DRT910+6	/OBTAINED
	0		//CIF
	JMP	I DRT800	
DRT899,		4	
		6202	// SKELETON CIF
PAUSE			





174.1 W

MAGNETIC TAPE DRIVER ROUTINE, 5091-P8 CONTROLLER

ABSTRACT

A general-purpose driver subroutine for initiating and testing input/output exchanged with the Model 5091-P8 Magnetic Tape System.

PRELIMINARY REQUIREMENTS

EQUIPMENT

A PDP-8, PDP-8/L, or PDP-8/I with three-cycle data break and a Model 5091-P8 Magnetic Tape System. The data break control words are 32 and 33 (octal).

STORAGE

In its distributed form, the magnetic tape driver occupies 121 locations.

RESTRICTIONS

This program will not operate when the user's calling sequence (linkage) is not in the same field. The I/O buffers could be in any field.

The routine prevents the setting of the tape system's interrupt enable bit. Hence, the calling sequence descriptions the alternate XXX4 is identical to lack of 4 bit.

#### USAGE

#### INTEGRATION INTO PROGRAM

This subroutine is supplied in source form. The source tape is to be assembled either using PAL III or MACRO-8 along with the user's mainline and other subroutines.

The subroutine will initiate and wait for completion of all tape operations except REWIND.

Magnetic tape functions are initiated by entering the routine with an effective JMS to DRTAPE. The user is referred to the section entitled "CALLING SEQUENCES".

#### EXTENDED MEMORY

This routine will not function if it does not reside in the same field as the appropriate calling sequence.

The I/O buffers could be in any field. The user is responsible for setting the register in the magnetic tape controller with IOT 6717 as applicable. Refer to "5091-P8 Magnetic Tape Controller Description".

## CALLING SEQUENCES

In each of the listed sequences the first instruction is an effective JMS DRTAPE. A "request parameter" always follows the JMS. This request parameter is four octal digits where, in most instances, the first digit is  $f_{\mu\mu}$ , designating the formatter-tape unit to be used.

On all entries, the routine will delay if the previous operation has not been completed.

On exit from the subroutine, the AC register will contain tape status. The following table denotes the meaning of the status when the respective bit is a one. This status is that after the requested tape operation has been completed including read-write retries.

0	Error Flag (EF) Set
1	Selected Tape is Rewinding
2	Selected Tape is at Load Point
3	Last Command Illegal
4	Parity Error (Vertical and/or Longitudinal)
5	Tape Mark (End of File)
6	End of Reel
7	Odd Record Length (7-track only)
8	Record Length Incorrect
9	Timing Error — Data Request Late
10	Selected Unit is 9-Track
11	Mag Tape Flag — Controller is Not Busy

Following are the situations to be tested for listed in the order to be tested.

1. Operation was a Read

- a. Illegal command error. Implies the tape unit is off-line.
- b. End of file or end of reel. On end of file, the length error bit will also be found set. Also parity bit will be set if parity on 7-tracks is ODD.
- c. Parity and/or timing error. Subroutine attempts 10 times to correctly read a record prior to exiting. At this point the tape is positioned as if erroneous record was read correctly.
- d. Length error. Location 32 (or 7752) of field 0 can be used to determine if record was longer or shorter than expected. If shorter, then its actual length can be computer. In conjunction with the odd record length status (7-track only), the record may be the expected length but the last 12-bit computer word will have the last 6-bit tape character repeated in both halves.

2. Operation was a Write

- a. Illegal command error. Implies the ring is missing on tape unit or the unit is off-line.
- b. Parity and/or timing error. Subroutine attempts three times to correctly write the record. After

the third time the routine exits with parity and/or timing error status set with tape positioned as if record was written correctly. On each rewrite an extended gap is employed.

3. Operation was Write End-of-File

- a. Illegal command error. Implies the ring is missing on tape unit or the unit is off-line.

4. Operation was a Backspace

- a. Illegal command error. Implies the unit is off-line or was at load point when backspace was attempted.

5. Operation was Rewind or Forward Space

- a. Illegal command error. Implies the unit is off-line.

A. Supply Word Count

JMS DRTAPE  
0030  
WORD COUNT

The supplied word count will be retained by the subroutine for all subsequent read and write requests. The routine will delay until

the last operation has been completed (including any necessary retries at reading or writing) before accepting the new word count.

B. Rewind

JMS DRTAPE  
 $\mu 010$  (or  $\mu 014$ )

Subroutine will initiate a rewind of unit  $\mu$ . If the user desires to follow the rewind request with a command to a different tape unit, then he should first execute an MTLC ( $6716_8$ ) with a unit address different than that commanded to rewind. If the user fails to execute above, the subroutine will wait for rewind to complete before initiating the succeeding tape operation.

C. Read Without Core Dump Mode

JMS DRTAPE  
 $\mu 020$  (or  $\mu 024$ )  
LOCATION OF BUFFER

Subroutine will initiate a read of one record into memory at location given by third word of calling sequence. The length of the record is supplied by the use of a supply word count calling sequence.

The number of words read will equal the number of characters in the record. The subroutine will not remove the parity bit on the characters input.

D. Read in 9-Track Core Dump Mode or 7-Track Mode

JMS DRTAPE  
     $\mu 220$  (or  $\mu 224$ )  
    LOCATION OF BUFFER

Subroutine will initiate a read of one record into memory at location given to third word of calling sequence. The length of the record (in words) is supplied by the use of a supply word count calling sequence.

E. Write Without Core Dump Mode or Extended Gap

JMS DRTAPE  
     $\mu 040$  (or  $\mu 044$ )  
    LOCATION OF BUFFER

Subroutine will initiate a write of one record from memory at location given by third word of calling sequence. The length of the record is supplied by the use of a supply word count calling sequence.

F. Write Without Core Dump — With Extended Gap

JMS DRTAPE  
     $\mu 140$  (or  $\mu 144$ )  
    LOCATION OF BUFFER

Same as E above except that an extended gap is used prior to recording the data.



G. Write in 9-Track Core Dump or 7-Track Mode

— Without Extended Gap

JMS DRTAPE  
 $\mu 240$  (or  $\mu 244$ )  
LOCATION OF BUFFER

Subroutine will initiate a write of one record from memory at the location given by the third word of calling sequence. The length of the record (in words) is supplied by the use of a supply word count calling sequence.

H. Write in 9-Track Core Dump or 7-Track Mode

— With Extended Gap

JMS DRTAPE  
 $\mu 340$  (or  $\mu 344$ )  
LOCATION OF BUFFER

Same as G above except for use of extended gap prior to recording.

I. Write Tape Mark Without Extended Gap

JMS DRTAPE  
 $\mu 050$  (or  $\mu 054$ )

Subroutine will initiate the recording of a tape mark on unit  $\mu$ .

J. Write Tape Mark With Extended Gap

JMS DRTAPE

$\mu 150$  (or  $\mu 154$ )

Subroutine will initiate the recording of a tape mark preceded by an extended gap.

K. Space Forward k Records

JMS DRTAPE

$\mu 060$  (or  $\mu 064$ )

k

Subroutine will initiate the space forward of k records on unit  $\mu$ . If k is zero, then the request is ignored.

L. Space Backward k Records

JMS DRTAPE

$\mu 070$  (or  $\mu 074$ )

k

Subroutine will initiate the space backward of k records. If k is zero, the request is ignored.

M. Select Tape Unit

JMS DRTAPE  
μ000

This causes the controller to select unit  $\mu$ . The user can thus acquire status with the 6706 command or test unit ready.



174.1 SL

```
/
/
/
/
/
DRTAPE, 0
6711 /WAIT FOR CONTROLLER
JMP --1
CLA
TAD I DRTAPE
AND DRT900+2 /PREVENT INTERRUPTS
DCA DRT910+4 /SAVE COMMAND PARAMETER
CMA
DCA DRT910+3 /PRESET FOR NO RETRIES
TAD DRT910+4
6716 /LOAD COMMAND REGISTER
AND DRT900+1 /ISOLATE COMMAND
RTR CLL
RAR
TAD DRT210
DCA ++4
6214 /RDF INST.
TAD DRT310
DCA DRT790+1
0
DRT210, JMP .
JMP DRT285 /REWIND
JMP DRT280 /READ
JMP DRT250 /LOAD WORD COUNT
JMP DRT290 /WRITE
JMP DRT400 /END OF FILE
NOP /FORWARD SPACE
ISZ DRTAPE /HERE ON BACKSPACE
TAD I DRTAPE
CIA
JMP DRT310
DRT250, ISZ DRTAPE
TAD I DRTAPE /PICK UP WORD COUNT
CIA
DCA DRT910+1
JMP DRT790
DRT280, TAD DRT900+3 /10 RETRIES
JMP DRT295
DRT285, 6722 /OVERLAP REWINDS
JMP DRT790
```

DRT290,	TAD	DRT910+4	/PICK UP REQUEST PARAMETER
	AND	DRT900	
	SZA		
	JMP	DRT295-2	
	TAD	DRT910+4	/PUT IN EXTENDED GAP
	TAD	DRT900	/IN CASE OF RETRIES
	DCA	DRT910+4	
	CLA		
	TAD	DRT900+4	/3 RETRIES
DRT295,	DCA	DRT910+3	
	ISZ	DRTAPE	
DRT300,	CLA	CMA	/-1 IN AC
	TAD	I DRTAPE	
	DCA	DRT910	/SAVE CURRENT ADDRESS
DRT305,	CLA		
	TAD	DRT910	
	6201		/DATA FIELD TO 0
	DCA	I DRT800	/SET CA
	TAD	DRT910+1	
DRT310,	6201		/DATA FIELD TO 0
	DCA	I DRT800+1	/SET WC
DRT400,	6722		/MTGO
/			
	6711		/WAIT FOR CONTROLLER
	JMP	.-1	
	6706		
	DCA	DRT910+2	/SAVE STATUS
	TAD	DRT910+2	/GET STATUS
	AND	DRT799-1	
	SZA		/ILLEGAL COMMAND ERROR
	JMP	DRT790	/EXIT DENOTING ERROR
	TAD	DRT910+2	
	SMA		
	JMP	DRT740	/NO ERROR FLAG
	AND	DRT799+1	
	SNA		
	JMP	DRT790	/NOT PARITY OR TIMING
	CLA		
	TAD	DRT910+2	/PARITY ON EOF
	AND	DRT799-3	/7 TRK - ODD
	SZA		
	JMP	DRT790-1	
	ISZ	DRT910+3	
	JMP	..+2	
	JMP	DRT790	/IRRECOVERABLE R-W
	CLA	CMA	/ -1 IN AC
	DCA	I DRT800+1	

TAD	DRT910+4	/PREVIOUS COMMAND
AND	DRT799	/ISOLATE UNIT
TAD	DRT900+1	/NOW HAVE BACKSPACE
6716		
6722		
6711		
JMP	.-1	
CLA		
TAD	DRT910+4	/GET BACK COMMAND
6716		
JMP	DRT305	
/		
DRT740,	AND DRT799-3	/EOF OR BOT
	SNA	
	JMP DRT790-1	/NO ERRORS
	CLA CLL	
	TAD DRT910+4	/END OF FILE BIT IS
	AND DRT900+1	/EXPECTED ON AN
	TAD DRT799-2	/WRITE EOF
	SNA	
DRT790,	DCA DRT910+2	/CLEAR STAU5
	ISZ DRTAPE	
	0	/RESTORE DATA FIELD
	CLA	
	TAD DRT910+2	/PICK UP STATUS
	JMP I DRTAPE	
	1100	/END OF FILE - BOT MASK
	-50	
	400	/MASK FOR ILLEGAL COMMAND
DRT799,	7000	
	204	/ TO MASK OUT PARITY-TIMING
DRT800,	33; 32	
/		
DRT900,	100	/0- EXTENDED GAP MASK
	70	/1- MASK OUT COMMAND
	7773	/2- COMPLEMENT OF 4
	-12	/3- READ ATTEMPTS
	-3	/4- WRITE ATTEMPTS
/		
DRT910,	0	/0- SAVE LAST BUFFER LOC
	0	/1- CURRENT WORD COUNT
	0	/2- STATUS LAST READ
	0	/3- RETRY COUNTER
	0	/4- LAST EXEC COMMAND
PAUSE		





275.3 W

MODEL 5091-P8  
NRZI FORMATTER  
DIAGNOSTIC

#### USER NOTE

Except for the timing windows, the paper tape supplied with this writeup is the same for all transports, regardless of their speed. These tapes are numbered, variously, 330.0, 669.0, 288.0, 668.0, etc.

To locate the data pertaining to the tape you have, first locate the table (amongst those in the rear of this manual) for your transport speed (12.5, 25, 37.5, 45, or 75 IPS). The speed designation appears over the next-to-last column on each page. The number of your tape will be one of the three tables for each speed (556/200, 800/200, or 800/556 BPI density).

DATUM INC.  
1363 South State College Boulevard  
Anaheim, California 92806

275.3 W

MODEL 5091-P8 NRZI FORMATTER DIAGNOSTIC

FUNCTION:

This program is used to test and verify the operation of the 5091-P8 Magnetic Tape System utilizing an NRZI Formatter.

PROGRAM DESIGN:

The diagnostic is broken down into several tests. The individual tests are designed to check the correct operation of particular characteristics of the tape system.

Most of the tests consist of more than one step. The operator is free to choose which test or tests to execute.

The tests are flagged so that they are classified as to the type of transports required; 7-track, 9-track, or either. They are also categorized as to whether they are to be executable for all selected transports or only the first transport selected. Finally, they are classified as manual, extensive write-read, timing, or neither of these three.

LOADING PROCEDURE:

This program is loaded using the binary loader. The program assumes the location of data break WC and CA addresses are 32 and 33. Locations 106 and 107 can be manually modified if WC and CA are other than 32 and 33.

OPERATING PROCEDURE:

The program is started at 200<sub>8</sub>. The operator must designate to the program which units are 9-track and which units are 7-track in response to a request by the program. (See unit selection.)

275.3 W

PDP8-E MAGNETIC TAPE DIAGNOSTIC

The object tape of 275.2 was punched erroneously. Memory location 4217 contained 5472, which caused the program to inhibit the use of tests 37-77 or 79-last test. This problem occurred only on initial execution or test after loading.

Object tape 275.3 has restored location 4217 to contain 45. It is identical to 275.2 in other respects.

After the tape drives to be used have been identified, the program will request test selection input. See section on test selection. Note that if console switch 2 is found on a start or restart, the program will not request test selection input.

#### UNIT SELECTION:

Program types "UNITS?". Operator responds by typing a four-digit number. Four digits must be input. The first digit input is for unit 0; the second digit input is for unit 1; etc. The value of the digits is:

0 = unit not to be used

7 = unit is 7-track

9 = unit is 9-track

The program does not check for the digits being 0, 7, or 9. If other than 0, 7, or 9 is input the relationship is:

ASCII  
CODE

0 mod 4 = unit not to be used

1 mod 4 = unit is 9-track

2 mod 4 = unit not to be used

3 mod 4 = unit is 7-track

#### TEST SELECTION:

When the program requests the list of tests to be executed it does so by typing the message "INPUT TAPE".

In response to this, the operator types in (or causes a paper tape input) of test numbers typed in decimal notation. The program ignores line

feeds, carriage returns, rubouts, and spaces. Blank tape input is also ignored.

The test numbers are input in decimal notation in the order in which they are to be executed. Each test number is followed by a comma except the last test number, which is followed by a period.

The message "FORMAT ERROR" results if this format is violated. The operator must re-input his list. The same message results if a particular test does not exist.

To facilitate the selection of tests it is possible to respond to the request "INPUT TAPE" with a period (or 0 period). This designates the desire to execute all the tests. Switches 3, 4, and 5 are then used to cause inclusion or omission of the manual, extensive read-write, and timing tests.

#### CONSOLE SWITCHES:

- |   |  |
|---|--|
| 0 | Interrogated at end of execution of each test. When found equal to 1 will cause program to restart asking for new unit selection (see switch 1) and new test selection (see switch 2). |
| 1 | If on at a restart caused by switch 0 being on, this switch will cause bypass of unit selection.   |
| 2 | If this switch is on (and switch 1 is off) in a start or restart, it causes bypass of test selection.  |
| 3 | Interrogated if operator responds to "INPUT TAPE" with . or 0.   |

If this switch is on, the program will include manual tests in list of tests to be executed.

If this switch is off, manual tests will be omitted.

- 4 Interrogated if operator responds to "INPUT TAPE" with . or 0.

If this switch is on, timing tests (lxx) will be included in list of tests to execute.

- 5 Interrogated if operator responds to "INPUT TAPE" with . or 0.

If this switch is on, extended write-read tests (2xx) will be included in list of tests to be executed.

- 6 If this switch is on, the computer will halt after next error printout.

- 7 If this switch is on, the computer will type the number of cycles completed. A cycle is one execution of the set of tests selected.

The program always prints at end of 4095 cycles completed to indicate reset of cycle counter unless switch 11 is on.

- 8 If this switch is on test 24 will be skipped. Test 24 causes miscellaneous IOT's to be executed.

- 9 Causes typeout designating last test completed.

- 10 If on, this switch causes typeout of time measurements. If off, it causes time measurements to be compared against window and typeout occurs if outside of window. Typeouts can be suppressed if switch 11 is on.

11 Suppresses all printouts

ERROR PRINTOUTS:

1. "FORMAT ERROR"

This message is typed if a violation was made in test selection. Check for test number not included in the repertoire.

2. Standard error printout

c t s (UNIT u)

c = cycle number which is incremented by 1 each time the given set of selected tests is executed.

t = test number where error occurred.

s = step number or sub-identification of error in test.

Unit number is typed if test automatically cycles over all transports.

The standard error printout can be followed by tape status, contents of AC register, contents of WC, and/or compare information. The first three are typed in octal while compare information has the following format:

W w G g B b #E e

W, G, B, and #E identify the quantities typed immediately following.

w is typed in decimal and equals the position in the tape read buffer of this first word that did not agree to corresponding word of the write buffer.

- g is the contents of word w in the write buffer typed in octal.
- b is the contents of word w in the read buffer typed in octal.
- e is the total number of mismatches.

3. TEST t TIME xxx.xxx

This message types if a timing test was selected and switch 10 is on.

If switch 10 is off, this message being typed implies that time xxx.xxx fell outside window for test t.

4. Extended write-read tests

On an error for these tests the standard error printout (with status) is followed by a typeout denoting size and number of record in error.



MODEL 5091-P8 DIAGNOSTIC

SKIP ON ERROR FLAG (6701)

PROCEDURE:

- a. Cause reject (Error Flag) by attempting a backspace while at load point.
- b. Verify that 6701 causes a skip.
  - (1) c 3 1 (STATUS)
- c. Turn off error flag and MTF flag with 6712.
- d. Verify that 6701 does not cause a skip.
  - (2) c 3 2 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

SKIP ON MAGNETIC TAPE FLAG (6701)

PROCEDURE:

- a. Initiate an end-of-file.
- b. Delay 100 ms.
- c. Verify that 6701 causes the skip.

(1) c 4 1 (STATUS)

- d. Again initiate an end-of-file.
- e. Delay 100 ms.
- f. Verify that 6701 again causes a skip.

(2) c 4 2 (STATUS)

- g. Turn off MTF with 6712.
- h. Verify that 6701 does not cause a skip.

(3) c 4 3 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

SKIP ON CONTROLLER READY (6711)

PROCEDURE:

- a. Execute MTG0 with 50 in the CR (end-of-file).
- b. Verify that 6711 does not cause a skip.

(1)                   c 5 1 (STATUS)

- c. Delay 100 ms.
- d. Verify that 6711 does cause a skip.

(2)                   c 5 2 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

SKIP ON TRANSPORT READY (6721)

PROCEDURE:

- a. Verify that 6721 causes a skip.
- (1)                    c   6   1   UNIT U (STATUS)
- b. Ensure that tape transport is off load point by executing a write end-of-file, and then waiting for skip on controller ready before proceeding.
  - c. Execute rewind command.
  - d. Delay 100  $\mu$ s.
  - e. Verify that 6721 does not cause a skip.
- (2)                    c   6   2   UNIT U (STATUS)
- f.. Wait for controller ready, then exit.

MODEL 5091-P8 DIAGNOSTIC

OR STATUS INTO AC (6704)

PROCEDURE:

- a. Load AC with all ones.
- b. Execute 6704.
- c. Verify that AC is all ones.

(1) c 11 1 (AC)

MODEL 5091-P8 DIAGNOSTIC

READ STATUS REGISTER FOR  
ERROR FLAG (6706)

PROCEDURE:

- a. Attempt backspace while at load point.
- b. Execute 6706 to input status.
- c. Verify that most significant bit (EF) of AC is non-zero.

(1)                   c   12   1    (STATUS)

- d. Execute 6712 to clear error flag.
- e. Execute 6706 to input status.
- f. Verify that most significant bit of status (EF) is now zero.

(2)                   c   12   2    (STATUS)

MODEL 5091-P8 DIAGNOSTIC

REWINDING STATUS BIT (6706) .

PROCEDURE:

- a. Write end-of-file to ensure transport is off load point. Wait for controller ready before proceeding.
- b. Execute rewind command.
- c. Delay 100  $\mu$ s.
- d. Input status and verify that the rewind status bit is on and all the others are off.

(1)                    c   13   1   UNIT U   (STATUS)

- e. Wait for controller ready.
- f. Input status and verify that error flag and rewinding bits are false.

(2)                    c   13   2   UNIT U   (STATUS)

MODEL 5091-P8 DIAGNOSTIC

LOAD POINT STATUS BIT (6706)

PROCEDURE:

- a. Ensure that transport is off load point by executing end-of-file and wait for controller ready before proceeding.
- b. Input status and check that load point bit reads false.

(1) c 14 1 UNIT U (STATUS)

- c. Execute rewind command and then wait for controller ready.
- d. Input status and verify that load point bit is true.

(2) c 14 2 UNIT U (STATUS)



MODEL 5091-P8 DIAGNOSTIC

ILLEGAL COMMAND STATUS (6706)

PROCEDURE:

- a. Attempt backspace while transport is at load point.
  - b. Input status and verify that error flag and reject bit are set.
- (1)                   c   15   1    (STATUS)
- c. Execute write end-of-file and wait until controller ready. Valid command should reset reject bit.
  - d. Input status and verify that MTF and end-of-file bit are set and that reject is reset.
- (2)                   c   15   2    (STATUS)

MODEL 5091-P8 DIAGNOSTIC

END-OF-FILE STATUS BIT (6706)

PROCEDURE:

- a. Write end-of-file and delay until controller ready.
- b. Input status and verify that end-of-file and MTF are set. (Ignore other 10 bits of status.)

(1)                   c 16 1 (STATUS)

- c. Write end-of-file and delay until controller ready.
- d. Input status and verify that end-of-file and MTF are set. (Ignore other 10 bits of status.)

(2)                   c 16 2 (STATUS)

- e. Write eight words and delay 100 ms.
- f. Wait for controller ready.
- g. Input status and verify that only bit set is MTF.

(3)                   c 16 3 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

END-OF-TAPE STATUS (6706)

(Manual).

PROCEDURE:

- a. Instruct operator to momentarily insert white card in front of photo sensors of selected tape machine.
- b. Halt computer and wait for operator to depress CONT when he has used the white card.
- c. Write end-of-file and wait until controller ready before proceeding. .
- d. Check status and verify that the error flag, MTF flag, end-of-file, and end-of-tape bits are at 1, and ignore remaining bits.

(1)           c 17 1 UNIT U (STATUS)

- e. Rewind selected unit and wait for controller ready.
- f. Check status and verify that the only bits found true are load point and MTF.

(2)           c 17 2 UNIT U (STATUS)

MODEL 5091-P8 DIAGNOSTIC

RECORD LENGTH TOO LONG STATUS (6706)

PROCEDURE:

- a. Write a record of 10 words.
- b. Backspace over the record written.
- c. Reset MTF and EF flags.
- d. Read record but set word count to 9.
- e. Check status and verify that the bits for error flag, length error, and MTF are found equal to 1.

(1)                    c 18 1 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

RECORD LENGTH TOO SHORT STATUS (6706)

PROCEDURE:

- a. Write a record of 10 words.
- b. Backspace over the record.
- c. Reset error flag and MTF flag.
- d. Read a record but set word count to 11.
- e. Check status and verify that the error flag, MTF flag, and length error bits are found equal to 1.

(1)                    c 19 1 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

RECORD LENGTH CORRECT STATUS (6706)

PROCEDURE:

- a. Write a record of 10 words.
- b. Backspace over the record.
- c. Reset error flag and MTF flag.
- d. Set word count to -10 and then read record.
- e. Check status and verify that the only bit found equal to one is the MTF flag and also that the error flag and length error flag are zero.

(1) c 20 1 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

DATA REQUEST LATE ERROR (6706)

(Manual)

PROCEDURE:

- a. Write a record of 10 words.
- b. Backspace over the record.
- c. Reset MTF and error flags.
- d. Output message to instruct operator to press CONT (on upcoming halt).
- e. Initiate read of record of 10 words and then immediately halt.
- f. When operator restarts, check status and verify that error flag, MTF flag, and data request status bits are 1.

(1)                   c 21 1 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

NO DATA REQUEST LATE (6706)

PROCEDURE:

- a. Write record of 10 words.
- b. Backspace over the record.
- c. Reset MTF and error flags.
- d. Read record of 10 words.
- e. Check status and verify that only bit found equal to 1 is MTF and verify also that error flag and length error flag are not set to 1.

(1)

c 22 1 (STATUS)



MODEL 5091-P8 DIAGNOSTIC

MTF FLAG STATUS (6706)

PROCEDURE:

- a. Reset MTF and error flags.
- b. Initiate write end-of-file and immediately check status. Verify that MTF bit is not set to 1.

(1)                   c 23 1 (STATUS)

- c. Delay 100 ms, and then check status. Verify that MTF flag is now equal to 1.

(2)                   c 23 2 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

· 10T DECODING

(Can be omitted by setting Switch 8)

PROCEDURE:

- a. Set MTF by writing end-of-file and waiting for controller ready.
- b. Execute 10T of 6n12 where n goes from 0 to 6. Verify that MTF (bit 11 of status) remains set.

(n+1)                    c 24 n+1 (STATUS)

- c. Execute 10T of 6712 and check that MTF is then reset.

(8)                    c 24 8 (STATUS)

- d. Set MTF by writing end-of-file and waiting for controller ready.
- e. Execute 10T of 67n2 where n is 0, 2-7 and verify that MTF remains set.

(9)                    c 24 9 (STATUS)                    6702 FAILED

(10-15)                    c 24 n+8 (STATUS)                    67n2 FAILED

- f. Execute 10T of 6712 and check that MTF is then reset.

(16)                    c 24 16 (STATUS)

- g. Set MTF by writing an end-of-file and waiting for controller ready.

- h. Execute 10T of 671n and verify that MTF remains set.  $n = 0, 1, 4$ .

(17)           c 24 17 (STATUS)       6710 FAILED

(18)           c 24 18 (STATUS)       6711 FAILED

(19)           c 24 19 (STATUS)       6714 FAILED

- i. Execute 10T of 6712 and verify that MTF is then reset.

(20)           c 24 20 (STATUS)

- j. Clear reject status bit by rewinding and waiting for transport ready.

- k. Load control register with space reverse command.

- l. Execute 6n22 10T where n goes from 0 to 6 and verify that reject is still clear.

(21-27)       c 24 n+21 (STATUS)

- m. Execute 6722 10T and check that reject becomes set.

(28)           c 24 28 (STATUS)

- n. Rewind to again clear reject status bit.

- o. Load command register with space reverse command.

- p. Execute 67n2 10T where n is 0, 1, 3-7. Verify that reject status bit remains clear.

(29) c 24 23 (STATUS) 6702 FAILED

(30) c 24 30 (STATUS) 6712 FAILED

(31-35) c 24 n+28 (STATUS) 67n2 FAILED

q. Execute 6722 IOT and verify that reject status bit is set.

(36) c 24 36 (STATUS)

r. Rewind to clear reject status bit.

s. Load command register with space reverse command.

t. Execute 672n for n = 0, 1, 4, and verify that reject bit remains clear.

(37) c 24 37 (STATUS) 6720 FAILED

(38) c 24 38 (STATUS) 6721 FAILED

(39) c 24 39 (STATUS) 6724 FAILED

u. Execute 6722 and verify that the reject bit is set.

(40) c 24 40 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

. INTERRUPT LOGIC .

PROCEDURE:

- a. Have the computer interrupt system disabled.
- b. Rewind and then attempt a space reverse. This should cause the error flag to be set.
- c. Enable interrupts into the computer. If an interrupt is received from the tape controller, this is an error as the interrupt enable bit is not set in the control register. The error message is:

(1)           c   25   1   (STATUS)

- d. Enable interrupt from the controller by "ORing" the interrupt enable bit in the control register. Check that interrupt is received within 100 milliseconds.

(2)           c   25   2   (STATUS)

- e. Execute command to write end-of-file and having interrupt enabled.
- f. Check that interrupt is received within 100 milliseconds.

(3)           c   25   3   (STATUS)

MODEL 5091-P8 DIAGNOSTIC

TAPE UNIT SELECT LOGIC

(MANUAL)

PROCEDURE:

- a. The given units should all be on line.
  - b. Select unit by loading command register.  
Check that the MTTR command causes a skip.
- (1)                    c 26 1 UNIT  $\mu$  (STATUS)
- c. Type message requesting operator to take the particular unit off line. Halt waiting for operator to continue by pressing the CONT switch.
  - d. Execute MTTR and check that the MTTR does not cause a skip.
- (2)                    c 26 2 UNIT  $\mu$  (STATUS)
- e. Type message requesting operator to restore the unit back on line.

MODEL 5091-P8 DIAGNOSTIC

COMPUTER RESET (Initialize)

(MANUAL)

PROCEDURE:

- a. Load command register with zeros and then execute an MTGO.
- b. Check that status response on the tape controller has the error flag and the reject flag set.

(1) c 27 1 (STATUS)

- c. Type message requesting operator to depress START on the upcoming halt, then halt.
- d. After the operator depresses START, check that the status response from the controller now has the reject and the error flag reset.

(2) c 27 2 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (Parity)

PROCEDURE:

- a. Rewind to beginning of tape.
- b. Write record of all zeros. After the write has been completed check that the only flag set in status is MTF. The error message is:

(1)           c 28 1 UNIT  $\mu$  (STATUS)

- c. Rewind back to beginning of tape.
- d. Preset read buffer to something other than zero, and then execute a read of one record.
- e. Check that the word count changes prior to 200 milliseconds elapsing. The error message is:

(2)           c 28 2 UNIT  $\mu$  (STATUS)

- f. Check that the read buffer is equal to all zeros, for the number of words in the record.

(3)           c 28 3 UNIT  $\mu$  (STATUS) (COMPARE INFORMATION)

- g. Check that the status response after read has only MTF set.

(4)           c 28 4 UNIT  $\mu$  (STATUS)



MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (One Bit)

PROCEDURE:

- a. This test is similar to Test 28. The difference is in the contents of the record. In this test, the characters in the record written have only the least significant bit set.

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (Two Bit) .

PROCEDURE:

- a. This test is similar to Test 28. The difference is that the characters in the record written have the next to the least significant bit set, and only that bit set.

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (Four Bit)

PROCEDURE:

- a. This test is similar to Test 28. The difference is that the characters in the record written have the bit with weight equal to 4 set and only that bit set.

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (Eight Bit)

PROCEDURE:

- a. This test is similar to Test 28, the difference being that the characters in the record written have only the bit with weight 8 set.

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (Sixteen Bit)

PROCEDURE:

- a. This test is similar to Test 28, the difference being that the bit with a weight of 16 is set, rather than zeros, in the record written.

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (Thirty-Two Bit)

PROCEDURE:

- a. This test is similar to Test 28, the difference being that in the record written the bit with a weight of 32 is set rather than zeros.

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (Sixty-Four Bit)

PROCEDURE:

- a. This test is similar to Test 28. The difference is the record written has the bit on that has a weight of 64 and only that bit set.

MODEL 5091-P8 DIAGNOSTIC

SINGLE TRACK TEST (128 Bit)

PROCEDURE:

- a. This test is similar to Test 28. The difference is that the characters in record written have only a bit on and that is the bit with a weight of 128.



MODEL 5091-P8 DIAGNOSTIC

CRCC/LRCC GENERATION

PROCEDURE:

- a. Write two character record where each character is equal to 001.
- b. Check that after the write the only bit found set is MTF.

(1) c 38 1 UNIT  $\mu$  (STATUS)

- c. Backspace.
- d. Execute a test read for four characters.
- e. After the test read has been completed, check that the first two characters input are equal to 001 and that the next two characters input are equal to 165 (octal).

(2) c 38 2 UNIT  $\mu$  (STATUS) (COMPARE INFORMATION)

- f. Input status and check that error flag, length error, and MTF are only bits set.

(3) c 38 3 UNIT  $\mu$  (STATUS)

NOTE: The EF and length error status bits will normally be set because of "Test Read" mode.

MODEL 5091-P8 DIAGNOSTIC

CRCC/LRCC GENERATION

PROCEDURE:

- a. Write two character record where each character is equal to 335 (octal).
  - b. Check that after the write the only bit found set is MTF.
- (1)            c 39 1 UNIT  $\mu$  (STATUS)
- c. Backspace.
  - d. Execute a test read for four characters.
  - e. After the test read has been completed, check that the first two characters input are equal to 335 (octal) and that the next two characters input are equal to 354 (octal).
- (2)            c 39 2 UNIT  $\mu$  (STATUS) (COMPARE INFORMATION)
- f. Input status and check that error flag, length error, and MTF are only bits set.
- (3)            c 39 3 UNIT  $\mu$  (STATUS)

NOTE: The EF and length error status bits will normally be set because of "Test Read" mode.

MODEL 5091-P8 DIAGNOSTIC

CRCC/LRCC GENERATION

PROCEDURE:

- a. Write two-character record where each character is equal to 267 (octal).
  - b. Check that after the write the only bit found set is MTF.
- (1)           c 40 1 UNIT  $\mu$  (STATUS)
- c. Backspace.
  - d. Execute a test read for four characters.
  - e. After the test read has been completed, check that the first two characters input are equal to 267 (octal) and that the next two characters input are equal to 377 (octal).
- (2)           c 40 2 UNIT  $\mu$  (STATUS) (COMPARE INFORMATION)
- f. Input status and check that error flag, length error, and MTF are only bits set.
- (3)           c 40 3 UNIT  $\mu$  (STATUS)

NOTE: The EF and length error status bits will normally be set because of the "Test Read" mode.

MODEL 5091-P8 DIAGNOSTIC

CRCC/LRCC GENERATION

PROCEDURE:

- a. Write two-character record where each character is equal to 115 (octal).
- b. Check that after the write the only bit found set is MTF.

(1)                    c 41 1 UNIT  $\mu$  (STATUS)

- c. Backspace.
- d. Execute a test read for four characters.
- e. After the test read has been completed, check that the first two characters input are equal to 115 (octal) and that the next two characters input are equal to 200 (octal).

(2)                    c 41 2 UNIT  $\mu$  (STATUS) (COMPARE INFORMATION)

- f. Input status and check that error flag, length error, and MTF are only bits set.

(3)                    c 41 3 UNIT  $\mu$  (STATUS)

NOTE: The EF and length error status bits will normally be set because of the "Test Read" mode.

MODEL 5091-P8 DIAGNOSTIC

7 TRACK TRD EVEN PARITY LRCC GENERATION

PROCEDURE:

- a. Write one word record where the word is equal to 5225 (octal).
  - b. Check that after the write the only bit found set is MTF.
- (1)                    c 42 1 UNIT  $\mu$  (STATUS)
- c. Backspace.
  - d. Execute a test read for three characters.(words).
  - e. After the test read has been completed, check that the three words input are equal to 0452, 0425, 0077.
- (2)                    c 42 2 UNIT  $\mu$  (STATUS) (COMPARE INFORMATION)
- f. Input status and check that error flag, length error, and MTF are only bits set.
- (3)                    c 42 3 UNIT  $\mu$  (STATUS)

NOTE: The EF and length error status bits will normally be set because of the "Test Read" mode.

MODEL 5091-P8 DIAGNOSTIC

CORE DUMP MODE

PROCEDURE:

- a. Write 256-word record. For this record the first word is all zeros. The second word has a 1 in the least significant bit; the third word has a 1 in the next to the least significant bit, etc., so that the first 13 words (26 characters) are zeros and then 1 and 2 up to 2048. The succeeding 243 words on the record are all zero characters.
- b. Check that after the write the only bit found set is MTF.
  - (1) c 43 1 (STATUS)
- c. Backspace and check that after the backspace the only bit found in status is MTF.
  - (2) c 43 2 (STATUS)
- d. Execute a read of the record. Check that after the read the only bit found set in status is MTF.
  - (3) c 43 3 (STATUS)
- e. Compare data input with the read. Check that it is equal to the 256-word record written.
  - (4) c 43 4 (STATUS) (COMPARE INFORMATION)

MODEL 5091-P8 DIAGNOSTIC

PHONY FILE MARK

PROCEDURE:

- a. Write a one-character record with the character equal to 23 (octal).
- b. Check that after the write the only bit found set is MTF.

(1) c 44 1 (STATUS)

- c. Execute a backspace and check that after the backspace the only bit found set is MTF.

(2) c 44 2 (STATUS)

- d. Execute a read of one character from the tape and check that after the read the only bit found set is MTF.

(3) c 44 3 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

END-OF-FILE HALT OF SPACE COMMANDS

PROCEDURE:

- a. Write end-of-file on the tape. Check that status response after end-of-file has MTF and end-of-file status bits set.

(1) c 45 1 (STATUS)

- b. Write a one-character record of all ones. Check that after the record is written the only bit found set in status is MTF.

(2) c 45 2 (STATUS)

- c. Backspace. After the backspace is complete, check that the only bit found set is MTF.

(3) c 45 3 (STATUS)

- d. Execute command to backspace 10 records.
- e. After backspace command is terminated, check that the status response has end-of-file and MTF bits set.

(4) c 45 4 (STATUS)

- f. Check that word count after the backspace is set to -9.

(5) c 45 5 (WORD COUNT)



- g. Execute command to forward space 10 records.
- h. Verify that status response after forward space has end-of-file and MTF bits set.

(6)                   c 45 6 (STATUS)

- i. Check that word count after forward space is equal to -9.

(7)                   c 45 7 (WORD COUNT)

;

## MODEL 5091-P8 DIAGNOSTIC

## SENSE FILE MARK ON SPACE OPERATIONS

(7-Track - Even Parity)

## PROCEDURE:

- a. Write file mark.
  - b. At completion of operation verify that status is end-of-file, MTF, and all other bits are off.
- (1)                   c 46 1 (STATUS)
- c. Initiate backspace of 10 records.
  - d. After controller becomes ready, check that status response has EOF and MTF, and all other bits are off.
- (2)                   c 46 2 (STATUS)
- e. Check that the WC register is equal to -9.
- (3)                   c 46 3 (CONTENTS OF WC)
- f. Initiate space forward of 10 records.
  - g. After controller becomes ready, check that status response has EOF and MTF, and all other bits are off.
- (4)                   c 46 4 (STATUS)
- h. Check that WC register is equal to -9.
- (5)                   c 46 5 (CONTENTS OF WC)

MODEL 5091-P8 DIAGNOSTIC

SENSE FILE MARK ON SPACE OPERATIONS  
(7-Track - Odd Parity)

PROCEDURE:

- a. Set to use odd parity in tape operations.
- b. Write file mark.
- c. At completion of operation, verify that status is end-of-file, MTF, EF, and PE.

(1) c 47 1 (STATUS)

- d. Initiate backspace of 10 records.
- e. After controller becomes ready, check that status response has EOF and MTF.

(2) c 47 2 (STATUS)

- f. Check that the WC register is equal to -9.

(3) c 47 3 (CONTENTS OF WC)

- g. Initiate space forward of 10 records.
- h. After controller becomes ready, check that status response has EF, MTF, End-of-File and PE.

(4) c 47 4 (STATUS)

- i. Check that WC register is equal to -9.

(5) c 47 5 (CONTENTS OF WC)

MODEL 5091-P8 DIAGNOSTIC

COMMAND REJECT

PROCEDURE:

- a. Rewind tape and check for no reject after controller is ready.

(1) c 50 1 (STATUS)

- b. Backspace and verify that after the backspace command has been executed the status response has the error flag, MTF, and illegal command bits set.

(2) c 50 2 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

WRITE RING TEST  
(MANUAL)

PROCEDURE:

- a. Request operator to remove the write ring, and then halt enabling the operator to continue after he has performed the request.
- b. Execute command to write end-of-file and verify that the status response has the error flag and reject bits set.

(1) c 51 1 UNIT  $\mu$  (STATUS)

- c. Execute command to write a record and check that the status response has error flag and reject bits set.

(2) c 51 2 UNIT  $\mu$  (STATUS)

- d. Output message requesting operator to reinsert write rings, then halt, allowing the operator to perform the request.
- e. Execute write end-of-file on tape and check that the status response has the MTF and end-of-file bits set and the error flag and reject bits are not set.

(3) c 51 3 UNIT  $\mu$  (STATUS)

- f. Execute write command and check that after the write command has been terminated the status response has only MTF set.

(4) c 51 4 UNIT  $\mu$  (STATUS)

MODEL 5091-P8 DIAGNOSTIC  
7-TRACK PARITY (ODD)

PROCEDURE:

1. Set to ODD parity.
2. Write a one-word record equal to 0077<sub>8</sub>.
3. Wait for Controller Ready and when ready, that only MTF status.  
c 60 1 UNIT u (STATUS)
4. Backspace one record.
5. After backspace is completed, check that MTF is only status bit.  
c 60 2 UNIT u (STATUS)
6. Test read a two-word record.
7. Wait for completion of Read and then check that only MTF status is set.  
c 60 3 UNIT u (STATUS)
8. Test that the parity is correct for the two-word Read buffer. (Test read is always 9-bit mode)  
c 60 4 UNIT u (STATUS) (COMPARE INFORMATION)

MODEL 5091-P8 DIAGNOSTIC  
7-TRACK PARITY (EVEN)

PROCEDURE:

1. Write a one-word record equal to 0077<sub>8</sub>.
2. Wait for Controller Ready and, when ready, check that only MTF status is set.  
c 61 1 UNIT u (STATUS)
3. Backspace a record.
4. After backspace is completed, check that MTF is only status bit.  
c 61 2 UNIT u (STATUS)
5. Test read a two-word record.
6. Wait for completion of Read. Then check that MTF only is set.  
c 61 3 UNIT u (STATUS)
7. Test that parity is even on first two words of Read Buffer.  
(Test Read always inputs in 9-bit mode.)  
c 61 4 UNIT u (STATUS) (COMPARE INFO)

MODEL 5091-P8 DIAGNOSTIC  
PARITY GENERATION

PROCEDURE:

1. Write a 256-word record of incrementing pattern. First word = 1, etc.
2. Wait for Controller Ready and then test that MTF is the only bit set.  
c 63 1 UNIT u (STATUS)
3. Backspace a record.
4. Wait for Controller Ready and then test that MTF is the only bit set.  
c 63 2 UNIT u (STATUS)
5. Test Read of 256 words.
6. Wait for completion of Read. Then test that MTF only is set.  
c 63 3 UNIT u (STATUS)
7. Test that parity is ODD on data read.  
c 63 4 UNIT u (STATUS) (COMPARE INFO)



MODEL 5091-P8 DIAGNOSTIC  
7-TRACK PARITY (EVEN)

PROCEDURE:

1. Write a 64-word record of incrementing pattern. First word = 0, second word = 1, etc.  
  
c 64 1 UNIT u (STATUS)
3. Backspace a record.
4. Wait for completion of Controller Ready. Then check that MTF is the only bit set.  
  
c 64 2 UNIT u (STATUS)
5. Test read 128 words.
6. Wait for completion of Read. Then test that MTF only is set.  
  
c 64 3 UNIT u (STATUS)
7. Test that parity is even on Data Read.  
  
c 64 UNIT u (STATUS) (COMPARE INFO)

MODEL 5091-P8 DIAGNOSTIC

PARITY GENERATION

PROCEDURE:

NOTE: If test finds parity error and exits at sub-tests 1, 2, or 3 you can ground out the parity error flip-flop at L12-13 (logic 3) on the motherboard to force a printout of sub-test 4 to find the bad character pattern.

- a. Write record of 64 words (128 characters) containing 64 different bit combinations. First word is 0, second word is 1, nth word is n-1.
- b. Check that after the write the only status bit found set is MTF.

(1) c 65 1 (STATUS)

- c. Backspace a record. Check that only status bit set after the backspace is MTF.

(2) c 65 2 (STATUS)

- d. Test read of 128 words (128 characters).
- e. Check that only status bit found set after the test read is MTF.

(3) c 65 3 (STATUS)

- f. Examine the parity bit of each character input verifying that it is correct by computing odd parity on the information bits of the character.

(4) c 65 4  
(Char #) (Erroneous Char)

MODEL 5091-P8 DIAGNOSTIC

SPACE FORWARD COMMAND

9-Track or 7-Track (Even Parity)

PROCEDURE:

- a. Write two eight-word records.
- b. Write end-of-file.
- c. Backspace over end-of-file.
- d. Backspace two records.
- e. At completion of backspace check that only status bit is MTF.

(1) c 73 1 (STATUS)

- f. Check that WC = 0.

(2) c 73 2 (WC)

- g. Initiate forward space of 1 record. Check that controller becomes ready before 100 ms has elapsed.

(3) c 73 3 (STATUS)

- h. Initiate forward space of eight records. Check that controller becomes ready before 100 ms.

(4) c 73 4 (STATUS)

i. Check that WC is equal to -6.

(5) c 73 5 (WC)

j. Check that status has end-of-file  
and MTF bits on.

(6) c 73 6 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

END-OF-TAPE HALT OF SPACE FORWARD COMMAND

9-Track or 7-Track (Even Parity)

(MANUAL)

PROCEDURE:

- a. Write 10 short records.
- b. Backspace 10 records.
- c. Forward space 1 record.
- d. Request operator to manually insert white card to simulate EOT.
- e. After operator continues, initiate forward space of nine records.
- f. Check that controller signals ready before 100 ms have elapsed.

(1)           c 74 1 (STATUS)

- g. Check that WC = -8.

(2)           c 74 2 (WC)

- h. Rewind and wait for controller ready to reset EOT before exiting this test.

MODEL 5091-P8 DIAGNOSTIC

SPACE FORWARD (Odd Parity)

PROCEDURE:

- a. Set controller via program to odd parity.
- b. Write two 8-word records.
- c. Write end-of-file.
- d. Backspace over end-of-file.
- e. Backspace two records.
- f. At completion of backspace check that only status bit is MTF.

(1)           c 75 1 (STATUS)

- g. Check that WC = 0.

(2)           c 75 2 (WC)

- h. Initiate forward space of 1 record. Check that controller becomes ready before 100 ms have elapsed.

(3)           c 75 3 (STATUS)

- i. Initiate forward space of eight records. Check that controller becomes ready before 100 ms.

(4)           c 75 4 (STATUS)

j. Check that WC = -6.

(5) c 75 5 (WC)

k. Check that status has end-of-file,  
MTF, EF, and PE set.

(6) c 75 6 (STATUS)

2  
7

MODEL 5091-P8 DIAGNOSTIC

END-OF-TAPE HALT OF SPACE FORWARD COMMAND  
(MANUAL)

PROCEDURE:

- a. Set unit to odd parity.
- b. Write 10 short records.
- c. Backspace 10 records.
- d. Forward space 1 record.
- e. Request operator to manually insert white card to simulate EOT.
- f. After operator continues, initiate forward space of nine records.
- g. Check that controller signals ready before 100 ms have elapsed.

(1)            c 76 1 (STATUS)

- h. Check that WC = -8.

(2)            c 76 2 (WC)

- i. Rewind.



MODEL 5091-P8 DIAGNOSTIC

BACKSPACE TESTS

9-Track or 7-Track (Even Parity)

PROCEDURE:

- a. Rewind unit.
- b. Write record.
- c. Write end-of-file.
- d. Write two records.
- e. Initiate backspace of one record.
- f. Check that MTF occurs within 100 ms.

(1)           c 77 1 (STATUS)

- g. Check that MTF is only status response.

(2)           c 77 2 (STATUS)

- h. Initiate backspace of eight records.
- i. Check that MTF occurs within 100 ms.

(3)           c 77 3 (STATUS)

- j. Check that status response is MTF and end-of-file.

(4) c 77 4 (STATUS)

k. Check that word count is equal to -6.

(5) c 77 5 (ERRONEOUS WC)

l. Initiate backspace of eight records.

m. Check that MTF occurs within 300 ms.

(6) c 77 6 (STATUS)

n. Check that WC equals -7.

(7) c 77 7 (ERRONEOUS WC)

o. Check that status response is only load point and MTF.

(8) c 77 8 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

BACKSPACE TESTS  
(7-Track Odd Parity)

PROCEDURE:

- a. Select odd parity.
- b. Rewind unit.
- c. Write record.
- d. Write end-of-file.
- e. Write two records.
- f. Initiate backspace of one record.
- g. Check that MTF occurs within 100 ms.

(1) c 78 1 (STATUS)

- h. Check that MTF is only status response.

(2) c 78 2 (STATUS)

- i. Initiate backspace of eight records.
- j. Check that MTF occurs within 100 ms.

(3) c 78 3 (STATUS)

- k. Check that status response is MTF, and end-of-file.

(4) c 78 4 (STATUS)

1. Check that word count is equal to -6.

(5) c 78 5 (ERRONEOUS WC)

- m. Initiate backspace of eight records.
- n. Check that MTF occurs within 300 ms.

(6) c 78 6 (STATUS)

- o. Check that WC equals -7.

(7) c 78 7 (ERRONEOUS WC)

- p. Check that status response is only load point and MTF.

(8) c 78 8 (STATUS)

MODEL 5091-P8 DIAGNOSTIC

AUTOMATIC THREE-INCH GAP AT BOT FOR FILE MARK

PROCEDURE:

- a. Write file mark.
- b. Rewind tape.
- c. Write a file mark.
- d. Rewind tape again.
- e. Execute read for a one-character record.  
Get elapsed time to the nearest 10 microseconds for the time that word count goes from 1 to 0.
- f. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c:101 1

TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

AUTOMATIC THREE-INCH GAP AT BOT FOR WRITE

PROCEDURE:

- a. Write file mark.
- b. Rewind.
- c. Write a one-character record.
- d. Rewind again.
- e. Execute read for a one-character record. Time out to the nearest 10 microseconds, the time it takes for the word count to change from 1 to 0.
- f. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c-102 1      TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

HALT DELAY TIME-OUT

PROCEDURE:

- a. Rewind to beginning of tape.
- b. Execute another rewind command while at beginning of tape. Time out the interval from the time the rewind command has been executed until the MTF flag has set. Time out this interval to the nearest 10 microseconds.
- c. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 103 1.            TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

UP-TO-SPEED DELAY

PROCEDURE:

- a. Write end-of-file just to ensure that we are not at BOT.
- b. Write a one-character record.
- c. Time out interval from when write is issued until the time the word count becomes zero.
- d. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 104 1            TIME XXX.XXX

45 IPS    10.1 - 11.9 NOM 10.4  
READ    8.517 - 8.546



MODEL 5091-P8 DIAGNOSTIC

POST DELAY

PROCEDURE:

- a. Write a file mark.
- b. Backspace.
- c. Read a one-character record and time out to the nearest 10 microseconds the interval between word count becoming zero and the file mark status bit coming on.
- d. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 105 1            TIME XXX.XXX.

MODEL 5091-P8 DIAGNOSTIC

BACKSPACE "STOP" F. F. DELAY

(Lo Density if 7-Track is selected  
due to being first transport)

PROCEDURE:

- a. Write a file mark, then write a one-character record.
- b. Backspace two records and time out the interval between word count becoming zero and the FM status bit becoming set.
- c. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 106 1 TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

READ BLANK DELAY  
(MANUAL)

PROCEDURE:

- a. Write long record.
- b. Backspace over record.
- c. Instruct operator to "move tape forward one inch manually." Then halt program and wait for operator to take tape unit off line, then turn "FORWARD" switch on momentarily (to move tape), and then put tape unit back "on line."
- d. Wait for operator to press CONT.
- e. Initiate read of one character.
- f. Time out interval until WC  $\rightarrow$  0.
- g. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 107 1

TIME XXX.XXX

*FAILED*

2  
/

MODEL 5091-P8 DIAGNOSTIC

CRYSTAL OSCILLATOR TEST  
(REMOTE DENSITY SELECTION)

PROCEDURE:

- a. Select high density via program.
- b. Initiate write of two-word record.
- c. Time out the interval from WC = -1 to WC = 0.
- d. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 108 1

TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

CRYSTAL OSCILLATOR TEST  
(REMOTE DENSITY SELECTION)

PROCEDURE:

- a. Select low density via program.
- b. Initiate write of two-word record.
- c. Time out the interval from WC = -1 to WC = 0.
- d. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 109 1            TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

CRYSTAL OSCILLATOR TEST

PROCEDURE:

- a. Initiate write of a two-word record.
- b. Time out the interval from  $WC = -1$  to  $WC = 0$ .
- c. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 110 1      TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

SPACING FROM RECORD TO CRC

PROCEDURE:

- a. Write one-word record.
- b. Backspace.
- c. Initiate test read of three words.
- d. Time out interval from WC = -2 to WC = -1.
- e. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 111 1.

TIME XXX.XXX

0.087 READ

.078-.128 NOT 111

MODEL 5091-P8 DIAGNOSTIC

SPACING FROM CRC TO LRC

PROCEDURE:

- a. Write one-word record.
- b. Backspace.
- c. Initiate test read of three words.
- d. Time out interval from WC = -1 to WC = 0.
- e. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 112 1.      TIME XXX.XXX

MDL

.087 PEA

.095

.111

.128



MODEL 5091-P8 DIAGNOSTIC  
SPACING BETWEEN FILE MARK AND LRCC

PROCEDURE:

- a. Write file mark.
- b. Backspace.
- c. Initiate test read of two words.
- d. Time out interval from WC = -1 to WC = 0.
- e. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 113 1.

TIME XXX.XXX

.184  
200 222 230

MODEL 5091-P8 DIAGNOSTIC

SPACING BETWEEN FILE MARK AND LRCC

PROCEDURE:

- a. Set to high density,
- b. Write file mark.
- c. Backspace.
- d. Initiate test read of two words.
- e. Time out interval from WC = -1 to WC = 0.
- f. If switch 10 is on print out time in milliseconds. If switch 10 is off, print out time in milliseconds only if it is outside window defined for this test.

c 114 1      TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

EXTENDED GAP BEFORE WRITE

PROCEDURE:

- a. Ensure that transport is not at load point by writing an end-of-file.
- b. Write a one-word record.
- c. Write a one-word record with an extended gap.
- d. Write a one-word record.
- e. Backspace over three records.
- f. Forward space one record.
- g. Initiate read of one record.
- h. Time out interval until WC = 0.
- i. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 115.1      UNIT U      TIME XXX.XXX

NOTE: Test 116 automatically follows.

77.993  
84 92.5 103

MODEL 5091-P8 DIAGNOSTIC

AUTOMATIC CLEARING OF EXTENDED GAP OPTION

PROCEDURE:

This test automatically follows Test 115. The test cannot be selected.

- a. Initiate read of one record.
- b. Time out interval until WC = 0.
- c. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 116 1      UNIT U      TIME XXX.XXX

11.512  
12.7    15.4    16.4

MODEL 5091-P8 DIAGNOSTIC

EXTENDED GAP BEFORE WRITE END-OF-FILE

PROCEDURE:

- a. Ensure that transport is not at load point by writing an end-of-file.
- b. Write end-of-file.
- c. Write end-of-file with extended gap.
- d. Write end-of-file.
- e. Backspace over three records.
- f. Forward space one record.
- g. Initiate read of one record.
- h. Time out interval until WC=0.
- i. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 117 1      UNIT U      TIME XXX.XXX

NOTE: Test 118 automatically follows.

73.9/6  
84 92.5 103

MODEL 5091-P8 DIAGNOSTIC

AUTOMATIC CLEARING OF EXTENDED GAP OPTION

PROCEDURE:

This test automatically follows Test 117. The test cannot be selected.

- a. Initiate read of one record.
- b. Time out interval from WC = -1 to WC = 0.
- c. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 118 1      UNIT U      TIME XXX.XXX

11.695

17.2    15.4    16.4

MODEL 5091-P8 DIAGNOSTIC

CRYSTAL OSCILLATOR TEST  
(MANUAL DENSITY SELECTION)

PROCEDURE:

- a. Request operator to select high density via controller switches.
- b. Initiate write of two-word record.
- c. Time out the interval from WC = -1 to WC = 0.
- d. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 119 1'      TIME XXX.XXX

2  
/

MODEL 5091-P8 DIAGNOSTIC

CRYSTAL OSCILLATOR TEST  
(MANUAL DENSITY SELECTION)

PROCEDURE:

- a. Request operator to select low density via controller switches.
- b. Initiate write of two-word record.
- c. Time out the interval from WC = -1 to WC = 0.
- d. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 120 1            TIME XXX.XXX



MODEL 5091-P8 DIAGNOSTIC

POST DELAY  
(Lo Density)

PROCEDURE:

- a. Write a file mark.
- b. Backspace.
- c. Read a one-character record and time out to the nearest 10 microseconds the interval between word count becoming zero and the file mark status bit coming on.
- d. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 121 1

TIME XXX.XXX

MODEL 5091-P8 DIAGNOSTIC

State 4 Plus State 5

HALT DELAY

PROCEDURE:

- a. Initiate write end-of-file.
- b. Time out interval from the end-of-file bit being set in status until MTF flag (6701 skip).
- c. If switch 10 is on print out time in milliseconds. If switch 10 is off print out time in milliseconds only if it is outside window defined for this test.

c 122 1      TIME XXX.XXX

9.056

10.6    11.2    11.9

MODEL 5091-P8 DIAGNOSTIC

9-TRACK EXTENDED WRITE-READ  
(Not Core Dump)

PROCEDURE:

- a. Rewind the tape.
- b. Write a record, backspace and read. Perform with increasing record size from 1 to 256 words. After record of 256 words, start again at 1-word record.

First character of each record is 0.  
Second character of each record is 1, etc.

Repeat until end-of-tape on the write or 1000 records\* have been written/read.

After each write, check that only status bit is MTF.

*1 201 1 UNIT 4201  
REC 509 SIZE 248*

(1)                    c 201 1 UNIT  $\mu$  (STATUS)  
                         RECORD n    SIZE s

Also, on write status error, the program will backspace and rewrite the record with an extended gap. This is repeated indefinitely on write errors until the record is written without a status error.

NOTE: Program permits up to 128 total errors (read and write) for a selected unit. It will switch to next unit (if more than one unit) if this number is reached.

\*The parameter 1000 can be changed by modifying location 50<sub>g</sub>.

After each read, check that only status bit is MTF.

(2)           c 201 2 UNIT  $\mu$  (STATUS)  
              RECORD n   SIZE s

The program attempts a maximum of 10 tries to read the record without status errors. The message is typed prior to each retry. The step number is 2 to signal a read status error to distinguish from a write status error.

After reading the record without a status error, or after 10 attempts to read, compare the input data for correct contents.

(2)           c 201 3 (STATUS) (COMPARE INFO)  
              RECORD n   SIZE s

After writing/reading 1000 records\* or end-of-tape on writing, the tape is rewound.

---

\*The parameter 1000 can be changed by modifying location 50<sub>8</sub>.

MODEL 5091-P8 DIAGNOSTIC

9-TRACK EXTENDED WRITE-READ  
(Core Dump Mode)

PROCEDURE:

Exactly as Test 201, except the controller set to core dump mode and the record formats are:

Word 1 = 0000

Word 2 = 0001

Word 3 =  $0102_8$

In general, word  $n$  = word  $n-1$  plus  $101_8$ ,  
except for word 2.

MODEL 5091-P8 DIAGNOSTIC

7-TRACK EXTENDED WRITE-READ  
(Even Parity — Low Density)

PROCEDURE:

Exactly as Test 201, except the setting to even parity-low density. The record formats are exactly those used in Test 202.

MODEL 5091-P8 DIAGNOSTIC

7-TRACK EXTENDED WRITE-READ  
(Odd Parity — Low Density)

PROCEDURE:

Exactly as Test 201, except the setting to odd parity-low density. The record formats are exactly those used in Test 202.

MODEL 5091-P8 DIAGNOSTIC

7-TRACK EXTENDED WRITE-READ

(Even Parity — High Density)

PROCEDURE:

Exactly as Test 201, except the setting to even parity-high density. The record formats are exactly those used in Test 202.



MODEL 5091-P8 DIAGNOSTIC

7-TRACK EXTENDED WRITE-READ  
(Odd Parity — High Density)

PROCEDURE:

Exactly as Test 201, except the setting to odd parity-high density. The record formats are exactly those used in Test 202.

NRZI FORMATTER  
275.3 PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	45 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM</u>	
101	5600	0025 5650 0050 6130	89	121	167
102	5604	0025 5650 0050 6130	89	121	167
103	5610	0144 0426	.1	.113	.278
104	5614	0002 3564 0002 7174	10.1	10.8	11.9
105	5620	1060 1750	.56	.78	1.0
106	5624	1142 2304	.61	1.0	1.22
107	5630	0001 2740 0001 5054	5.6	6.1	6.7
108	5634	0103 0137	.067	.08	.095
109	5640	0316 0360	.206	.223	.240
110	5644	0026 0051	.022	.028	.041
111	5650	0137 0020	.095	.111	.128
112	5654	0137 0200	.095	.111	.128
113	5660	0310 0372	.200	.222	.250
114	5664	0212 0262	.138	.160	.178

NRZI FORMATTER  
275.3 PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	45 IPS (IN MILLISECONDS) <u>NOM</u>	<u>STOP</u>
115	5670	0024 4040 0031 1130	84	92.5	103
116	5674	0003 1764 0004 0020	13.3	15.4	16.4
117	5700	0024 4040 0031 1130	84	92.5	103
118	5704	0003 1764 0004 0020	13.3	15.4	16.4
119	5710	1236 1666	.67	.78	.95
120	5714	0316 0360	.206	.222	.240
121	5720	1022 1572	.53	.76	.89
122	5724	0002 4550 0002 6520	10.6	11.2	11.6

330.0

NRZI FORMATTER

## PDP-8 DIAGNOSTIC TIME CONSTANTS

TEST	ADDRESS	TIME	CONSTANTS	START	12.5 IPS	STOP
					(IN MILLISECONDS)	
					NOM(Actual)	
101	5600	0116	1000	320	438	600
		0222	3700			
102	5604	0116	1000	320	438	600
		0222	3700			
103	5610	0000	0550	.360	.4	1.0
		0000	1750			
104	5614	0010	3760	34.8	38.8	42.8
		0012	3460			
105	5620		3720	2.0	2.8	3.6
			7020			
106	5624		4230	2.2	3.6	4.4
		0001	0460			
107	5630	0004	7040	20	22.0	24
		0005	6700			
108	5634		0360	.240	.288	.340
			0524			
109	5640		1344	.740	.8	.86
			1534			
110	5644		0120	.08	.10	.140
			0214			
111	5650		0524	.340	.400	.460
			0714			
112	5654		0524	.340	.400	.460
			0714			
113	5660		1320	.720	.800	.880
			1560			

330.0  
NRZI FORMATTER  
PDP-8 DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	12.5 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM(Actual)</u>	
114	5664	0764 1200	.5	.576	.64
115	5670	0111 5600 0131 2660	302	334	366
116	5674	0013 5600 0016 3170	48	56	59
117	5700	0111 5660 0131 2660	302	334	366
118	5704	0013 5600 0016 3170	48	54.4	59
119	5710	0360 0524	.24	.288	.340
120	5714	1344 1534	.740	.800	.860
121	5720	3554 6200	1.9	2.8	3.2
122	5724	0011 2160 0012 2640	38	40.4	42.4

670.0

NRZI FORMATTER

## PDP8E DIAGNOSTIC TIME CONSTANTS

TEST	ADDRESS	TIME CONSTANTS	START	12.5 IPS (IN MILLISECONDS)		STOP
				NOM	(Actual)	
101	5600	0116 1000 0222 3700	320	438		600
102	5604	0116 1000 0222 3700	320	438		600
103	5610	0000 0550 0000 1750	.360	.4		1.0
104	5614	0010 3760 0012 3460	34.8	38.8		42.8
105	5620		3720 7020	2.0	2.8	3.6
106	5624		4230 0001 0460	2.2	3.6	4.4
107	5630	0004 7040 0005 6700	20	22.0		24
108	5634		0214 0410	.140	.200	.264
109	5640		1344 1534	.740	.8	.86
110	5644		0120 0214	.08	.10	.140
111	5650		0524 0714	.340	.400	.460
112	5654		0524 0714	.340	.400	.460
113	5660		1320 1560	.720	.800	.880

670.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME</u>	<u>CONSTANTS</u>	<u>START</u>	<u>12.5 ips (in msec)</u> <u>NOM (Actual)</u>	<u>STOP</u>
114	5664		0500 0740	320	.400	.480
115	5670	0111 0131	5600 2660	302	334	366
116	5674	0013 0016	5600 3170	48	56	59
117	5700	0111 0131	5660 2660	302	334	366
118	5704	0013 0016	5600 3170	48	54.4	59
119	5710		0240 0360	.160	.200	.240
120	5714		1344 1534	.740	.800	.860
121	5720		3554 6200	1.9	2.8	3.2
122	5724	0011 0012	2160 2640	38	40.4	42.4

669.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>		<u>START</u>	12.5 IPS (In Milliseconds)	
					<u>NOM</u>	<u>STOP</u>
101	5600	0116 0222	1000 3700	320	418	600
102	5604	0116 0222	1000 3700	320	418	600
103	5610		0550 1750	.36	.4	1.0
104	5614	10 12	3760 3460	34.8	38.8	42.8
105	5620		3720 7020	2.0	2.8	3.6
106	5624	0001	4230 0460	2.2	3.6	4.4
107	5630	4 5	7040 6700	20	22	24
108	5634		214 410	.14	.2	.264
109	5640		360 524	.24	.304	.34
110	5644		120 214	.08	.12	.14
111	5650		524 714	.34	.4	.46
112	5654		524 714	.34	.4	.46
113	5660		1320 1560	.72	.8	.88



669.0  
NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	12.5 IPS (In Milliseconds)		
			<u>START</u>	<u>NOM</u>	<u>STOP</u>
114	5664	360 714	.24	.38	.46
115	5670	111 5660 131 2660	300	338.0	366.0
116	5674	13 7550 16 5140	49	54	60
117	5700	111 5660 131 2660	300	338.0	366.0
118	5704	13 7550 16 5140	49	54	60
119	5710	240 410	.16	.2	.264
120	5714	360 534	.24	.288	.35
121	5720	3554 6200	1.9	2.3	3.2
122	5724	11 2160 12 5740	38	40.4	44



288.0 W

MODEL 5091-P8 FORMATTER DIAGNOSTIC

This diagnostic is identical to 275.0.

288.0

NRZI FORMATTER

## PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	25 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM(Actual)</u>	
101	5600	0047 0400 0111 1740	160	217 (209)	300
102	5604	0047 0400 0111 1740	160	217 (209)	300
103	5610	0000 0264 0000 0764	.180	.2	.5
104	5614	0004 1770 0005 1630	17.4	19.4	21.4
105	5620	1750 3410	1.0	1.4	1.8
106	5624	2114 4230	1.1	1.8	2.2
107	5630	0002 3420 0002 7340	10	11.0 (11.3)	12
108	5634	0170 0252	.120	.144 (.152)	.170
109	5640	0562 0656	.370	.400 (.396)	.430
110	5644	0050 0106	.04	.05 (.063)	.070
111	5650	0252 0346	.170	.200 (.184)	.230
112	5654	0252 0346	.170	.200 (.191)	.230
113	5660	0550 0670	.360	.400 (.396)	.440

288.0

7 or 9 Track 556/200 BPI  
Dual Gap Head

NRZI FORMATTER

## PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	25 IPS (IN MILLISECONDS) <u>NOM(Actual)</u>	<u>STOP</u>
114	5664	0372 0500	.250	.288	.320
115	5670	0044 6730 0054 5330	151	167 (167.6 to 169)	183
116	5674	0005 6700 0007 1474	24	28	29.5
117	5700	0044 6730 0054 5330	151	167 (167.5 to 169.3)	183
118	5704	0005 6700 0007 1474	24	27.2 (26.4 to 28.1)	29.5
119	5710	0170 0252	.120	.144	.170
120	5714	0562 0656	.370	.400	.430
121	5720	1666 3100	.95	1.4	1.6
122	5724	0004 5070 0005 1320	19	20.2	21.2

668.0

NRZI FORMATTER

## PDP-8 DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	25 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM(Actual)</u>	
101	5600	0047 0400 0111 1740	160	217 (209)	300
102	5604	0047 0400 0111 1740	160	217 (209)	300
103	5610	0000 0264 0000 0764	.180	.2	.5
104	5614	0004 1770 0005 1630	17.4	19.4	21.4
105	5620	1750 3410	1.0	1.4	1.8
106	5624	2114 4230	1.1	1.8	2.2
107	5630	0002 3420 0002 7340	10	11.0 (11.3)	12
108	5634	0106 0204	.070	.100	.130
109	5640	0562 0656	.370	.400 (.396)	.430
110	5644	0050 0106	.04	.05 (.063)	.070
111	5650	0252 0346	.170	.200 (.184)	.230
112	5654	0252 0346	.170	.200 (.191)	.230
113	5660	0550 0670	.360	.400 (.396)	.440

668.0

7 or 9 Track 800/200 BPI  
Dual Gap Head

NRZI FORMATTER

## PDP-8 DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	25 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM(Actual)</u>	
114	5664	0170 0360	.120	.200	.240
115	5670	0044 6730 0054 5330	151	167 (167.6 to 169)	183
116	5674	0005 6700 0007 1474	24	28	29.5
117	5700	0044 6730 0054 5330	151	167 (167.5 to 169.3)	183
118	5704	0005 6700 0007 1474	24	27.2 (26.4 to 28.1)	29.5
119	5710	0106 0204	.070	.100	.130
120	5714	0562 0656	.370	.400	.430
121	5720	1666 3100	.95	1.4	1.6
122	5724	0004 5070 0005 1320	19	20.2	21.2

667.0  
NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>		<u>START</u>	25 IPS (IN MILLISECONDS)		<u>STOP</u>
					NOM	(Actual)	
101	5600	0047 0111	0400 1740	160	217	(230)	300
102	5604	0047 0111	0400 1740	160	217	(230)	300
103	5610		0264 0764	.180	.2	(.23 to .36)	.5
104	5614	0004 0005	1770 1630	17.4		(19.4)	21.4
105	5620		1750 3410	1.0	1.4	(1.4 to 1.56)	1.8
106	5624		2114 4230	1.1	1.8	(1.3 to 1.46)	2.2
107	5630	0002 0002	3420 7340	10	11.0	(11.3)	12
108	5634		0106 0204	.070		(.1)	.132
109	5640		0170 0252	.120		(.152)	.170
110	5644		0050 0106	.04	.05	(.063)	.070
111	5644		0252 0346	.170	.200	(.184)	.230
112	5654		0252 0346	.170	.200	(.191)	.230
113	5660		0550 0670	.360	.400	(.396)	.440



667.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	25 IPS (IN MILLISECONDS)		<u>STOP</u>
				<u>NOM</u>	<u>(Actual)</u>	
114	5664	0170 0346	.120	.178 to .191		.230
115	5670	0044 6730 0054 5330	151	167	(167.6 to 169)	183
116	5674	0005 7664 0007 2460	24.5	27	(26.3 to 27.6)	30
117	5700	0044 6730 0054 5330	151	167	(167.5 to 169.3)	183
118	5704	0005 7664 0007 2460	24.5	27	(26.1 to 27.4)	30
119	5710	0120 0204	.08	.100		.132
120	5714	0170 0256	.120	.144		.175
121	5720	1666 3100	.95	1.18		1.6
122	5724	0004 5070 0005 2760	19	20.2		22

665.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	37.5 IPS (IN MILLISECONDS)		<u>STOP</u>
				<u>NOM</u>		
101	5600	0030 3240 0060 6500	100	150		200
102	5604	0030 3240 0060 6500	100	150		200
103	5610	0170 0512	.120	.133		.330
104	5614	0002 6044 0003 3570	11.3	12.9		14.2
105	5620	1224 2260	.66	1.0		1.2
106	5624	1224 2676	.66	1.2		1.47
107	5630	0001 4710 0001 7500	6.6	7.5		8.0
108	5634	0120 0204	.08	.1		.132
109	5640	0366 0436	.246	.266		.286
110	5644	0032 0062	.026	.033		.050
111	5650	0170 0512	.120	.133		.330
112	5654	0170 0512	.120	.133		.330
113	5660	0366 0436	.246	.266		.286

665.0

NRZI FORMATTER

PDP 8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	37.5 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM.</u>	
114	5664	0246 0324	.166	.192	.212
115	5670	0030 3240 0035 6220	100	111	122
116	5674	0003 7200 0004 6620	16.0	18.7	19.6
117	5700	0030 3240 0035 6220	100	111	122
118	5704	0003 7200 0004 6620	16.0	18.5	19.6
119	5710	0120 0204	.08	.096	.132
120	5714	0366 0436	.246	.266	.286
121	5720	1224 2260	.66	1.0	1.2
122	5724	0003 0634 0003 3570	12.7	13.4	14.2

666.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

TEST	ADDRESS	TIME	CONSTANTS	START	37.5 ips (msec, NOM)	STOP
101	5600	0030 0060	3240 6500	100	150	200
102	5604	0030 0060	3240 6500	100	150	200
103	5610		0170 0512	.120	.133	.330
104	5614	0002 0003	6044 3570	11.3	12.9	14.2
105	5620		1224 2260	.66	1.0	1.2
106	5624		1224 2676	.66	1.2	1.47
107	5630	0001 0001	4710 7500	6.6	7.5	8.0
108	5634		0062 0132	.050	.066	.90
109	5640		0366 0436	.246	.266	.286
110	5644		0032 0062	.026	.033	.050
111	5650		0170 0512	.120	.133	.330
112	5654		0170 0512	.120	.133	.330
113	5660		0366 0436	.246	.266	.286
114	5664		0144 0264	.100	.132	.180
115	5670	0030 0035	3240 6220	100	111	122
116	5674	0003 0004	7200 6620	16.0	18.7	19.6
117	5700	0030 0035	3240 6220	100	111	122
118	5704	0003 0004	7200 6620	16.0	18.5	19.6
119	5710		0062 0132	.050	.066	.90

666.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME</u>	<u>CONSTANTS</u>	<u>START</u>	<u>37.5 ips (msec, NOM)</u>	<u>STOP</u>
120	5714		0366 0436	.246	.266	.286
121	5720		1224 2260	.66	1.0	1.2
122	5724	0003 0003	0634 3570	12.7	13.4	14.2

545.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	37.5 IPS (IN MILLISECONDS)		<u>STOP</u>
				<u>NOM</u>		
101	5600	0030 3240 0060 6500	100	150		200
102	5604	0030 3240 0060 6500	100	150		200
103	5610	0170 0512	.120	.133		.330
104	5614	0002 6044 0003 3570	11.3	12.9		14.2
105	5620	1224 2260	.66	1.0		1.2
106	5624	1224 2676	.66	1.2		1.47
107	5630	0001 4710 0001 7500	6.6	7.5		8.0
108	5634	0062 0132	.050	.066		.90
109	5640	0074 0214	.06	.096		.140
110	5644	0032 0062	.026	.033		.050
111	5650	0170 0512	.120	.133		.330
112	5654	0170 0512	.120	.133		.330
113	5660	0366 0436	.246	.266		.286

545.0

NRZI FORMATTER

PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	37.5 IPS (IN MILLISECONDS)		<u>STOP</u>
				<u>NOM.</u>		
114	5664	0144 0264	.100	.132		.180
115	5670	0030 3240 0035 6220	100	111		122
116	5674	0003 7200 0004 6620	16.0	18.7		19.6
117	5700	0030 3240 0035 6220	100	111		122
118	5704	0003 7200 0004 6620	16.0	18.5		19.6
119	5710	0062 0132	.050	.066		.90
120	5714	0074 0214	.06	.096		.140
121	5720	1224 2260	.66	1.0		1.2
122	5724	0003 0634 0003 3570	12.7	13.4		14.2

664.0

## NRZI FORMATTER

## PDP-8E DIAGNOSTIC TIME CONSTANTS

TEST	ADDRESS	TIME CONSTANTS	START	45 IPS (IN MILLISECONDS)	STOP
				NOM (Actual)	
101	5600	0025 5650 0050 6130	89	121	167
102	5604	0025 5650 0050 6130	89	121	167
103	5610	0144 0426	.1	.113	.278
104	5614	0002 3564 0002 5060	10.1	10.4	10.8
105	5620	1060 1750	.56	.78	1.0
106	5624	1142 2304	.61	.83	1.22
107	5630	0001 2740 0001 5054	5.6	6.1	6.7
108	5634	0047 0111	.039	.056	.073
109	5640	0316 0360	.206	.223	.240
110	5644	0026 0051	.022	.028	.041
111	5650	0137 0200	.095	.111	.128
112	5654	0137 0200	.095	.111	.128
113	5660	0310 0372	.200	.222	.250
114	5664	0130 0244	.088	.112	.164
115	5670	0024 4040 0031 1130	84	92.5	103



664.0

## NRZI FORMATTER

## PDP-8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	45 IPS (IN MILLISECONDS)		<u>STOP</u>
				<u>NOM</u>	<u>(Actual)</u>	
116	5674	0003 1764 0004 0020	13.3	15.4		16.4
117	5700	0024 4040 0031 1130	84	92.5		103
118	5704	0003 1764 0004 0020	13.3	15.4		16.4
119	5710	0054 0127	.044	.056		.087
120	5714	0316 0360	.206	.222		.24
121	5720	1022 1572	.53	.76		.89
122	5724	0002 4550 0002 6520	10.6	11.2		11.6

## NRZI FORMATTER

## 663.0 PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	45 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM</u>	
101	5600	0025 5650 0050 6130	89	121	167
102	5604	0025 5650 0050 6130	89	121	167
103	5610	0144 0426	.1	.113	.278
104	5614	0002 3564 0002 7174	10.1	10.4	11.9
105	5620	1060 1750	.56	.78 to .87	1.0
106	5624	1142 2304	.61	.83	1.22
107	5630	0001 2740 0001 5054	5.6	6.1	6.7
108	5634	0047 0111	.039	.056	.073
109	5640	0102 0136	.066	.084	.094
110	5644	0026 0051	.022	.035	.041
111	5650	0137 0200	.095	.111	.128
112	5654	0137 0200	.095	.111	.128
113	5660	0310 0372	.200	.222	.250
114	5664	0102 0200	.066	.106	.128

NRZI FORMATTER  
663.0 PDP8E DIAGNOSTIC TIME CONSTANTS

<u>TEST</u>	<u>ADDRESS</u>	<u>TIME CONSTANTS</u>	<u>START</u>	45 IPS (IN MILLISECONDS)	<u>STOP</u>
				<u>NOM</u>	
115	5670	0024 4040 0031 1130	84	92.5	103
116	5674	0003 1764 0004 0020	13.3	15.4	16.4
117	5700	0024 4040 0031 1130	84	92.5	103
118	5704	0003 1764 0004 0020	13.3	15.4	16.4
119	5710	0054 0112	.044	.056	.074
120	5714	0102 0141	.066	.080	.097
121	5720	1022 1572	.53	.76	.89
122	5724	0002 4550 0002 7174	10.6	11.2	11.9



432.1 - W

MODEL 5091-P8 NRZI FORMATTER DIAGNOSTIC

Same as 275.0 W with tests 119 and 120 deleted.



280.0 W  
MAGNETIC TAPE DRIVER ROUTINE  
DATUM, INC. 5091-P8 CONTROLLER

1.0        ABSTRACT

A general-purpose driver subroutine for initiating and testing input/output exchanged with the Model 5091-P8 Magnetic Tape System.

2.0        PRELIMINARY REQUIREMENTS

2.1        Equipment

A PDP-8, PDP-8/L or PDP-8/I and a Model 5091-P8 Magnetic Tape System.

2.2        Storage

In its distributed form, the magnetic tape driver occupies 127 locations.

2.3        Restriction

This program will not operate when the users' calling sequence (linkage) is not in the same field. The I/O buffers could be in any field.

The routine prevents the setting of the tape system's interrupt enable bit. Hence, on the calling sequence descriptions the alternate XXX4 is identical to lack of 4 bit.

3.0        USAGE

3.1        Integration Into Program

This subroutine is supplied in source form. The source tape is to be assembled wither using PAL III or MACRO-8 along with the users' mainline and other subroutines.

The subroutine will initiate and wait for completion of all tape operations except REWIND.

Magnetic tape functions are initiated by entering the routine with an effective JMS to DRTAPE. The user is referred to Section 3.3 for calling sequences.

### 3.2 Extended Memory

This routine will not function if it does not reside in the same field as the appropriate calling sequence.

The I/O buffers could be in any field. The user must set AC prior to the JMS for writing and reading with the appropriate 62n1 IOT instruction where n is field containing buffer. At entry to routine the data field must be that containing the JMS.

### 3.3 Calling Sequences

In each of the listed sequences the first instruction is an effective JMS DRTAPE. A "Request parameter" always follows the JMS. This request parameter is four octal digits where in most instances the first digit is  $\mu$  denoting the particular tape unit to be used ( $\mu = 0, 1, 2, 3$ )

The routine does not check for a valid tape unit number.

On all entries, the routine will delay if the previous operation has not been completed.

On exit from the subroutine, the AC register will contain tape status. The following table denotes the meaning of the status when the respective bit is a one. This status is that after the requested tape operation has been completed including read-write retries.

- 0 Error Flag (EF) Set
- 1 Selected Tape is Rewinding



- 2 Selected Tape is at Load Point
- 3 Last Command Illegal
- 4 Parity Error (Vertical and/or Longitudinal)
- 5 Tape Mark (End of File)
- 6 End of Reel
- 7 Odd Record Length (7 Track Only)
- 8 Record Length Incorrect
- 9 Timing Error - Data Request Late
- 10 Selected Tape is 9 Track
- 11 Mag Tape Flag - Controller is Not Busy

Following are the situations to be tested for listed in the order to be tested.

1. Operation was a Read

- a. Illegal command error. Implies the tape unit is off-line.
- b. End of file or end of reel. On end of file the length error bit will also be found set. Also parity bit will be set if parity on 7 tracks is ODD.
- c. Parity and/or timing error. Subroutine attempts 10 times to correctly read a record prior to exiting. At this point the tape is positioned as if erroneous record read correctly.
- d. Length error. Location L1 + 126 of routine can be used to determine if record was longer or shorter than expected. If shorter, then its actual length can be computed. In conjunction with the odd record length status (7 track only), the record may be the expected length but the last 12 bit computer word will have the last 6 bit tape character repeated in both halves.

2. Operation was a Write

- a. Illegal command error. Implies the ring is missing on tape unit or the unit is off-line.

- b. Parity and/or timing error. Subroutine attempts three times to correctly write the record. After the third time the routine exits with parity and/or timing error status set with tape positioned as if record written correctly. On each rewrite an extended gap is employed.

3. Operation was Write End-of-File

- a. Illegal command error. Implies the ring is missing on tape unit or the unit is off-line.

4. Operation was a Backspace

- a. Illegal command error. Implies the unit is off-line or was at load point when backspace attempted.

5. Operation was Rewind or Forward Space

- a. Illegal command error. Implies the unit is off-line.

A. Supply Word Count

JMS        DRTAPE  
          0030  
          WORD COUNT

The supplied word count will be retained by the subroutine for all subsequent read and write requests. The routine will delay until the last operation has been completed (including any necessary retries at reading or writing) before accepting the new word count.

B. Rewind

JMS        DRTAPE  
           $\mu$ 010        (or  $\mu$ 014)

Subroutine will initiate a rewind of unit  $\mu$ . If the user desires to follow the Rewind request with a command to a different tape unit, then he should first execute an MTLC (6716<sub>8</sub>) with a unit address different than that commanded to Rewind. If the user fails to execute above, the subroutine will wait for rewind to complete before initiating the succeeding tape operation.

C. Read Without Core Dump Mode

JMS        DRTAPE  
           $\mu$ 020        (or  $\mu$ 024)  
          LOCATION OF BUFFER

Subroutine will initiate a read of one record into memory at location given by third word of calling sequence. The length of the record is supplied by the use of a supply word count calling sequence.

The number of words read will equal the number of characters in the record. The subroutine will not remove the parity bit on the characters input.

D. Read in 9 Track Core Dump Mode or 7 Track Mode

JMS        DRTAPE  
           $\mu 220$         (or  $\mu 224$ )  
          LOCATION OF BUFFER

Subroutine will initiate a read of one record into memory at location given to third word of calling sequence. The length of the record (in words) is supplied by the use of a supply word count calling sequence.

E. Write Without Core Dump Mode

JMS        DRTAPE  
           $\mu 040$         (or  $\mu 044$ )  
          LOCATION OF BUFFER

Subroutine will initiate a write of one record from memory at location given by third word of calling sequence. The length of the record is supplied by the use of a supply word count calling sequence.

F. Write in 9 Track Core Dump or 7 Track Mode

JMS        DRTAPE  
           $\mu 240$         (or  $\mu 244$ )  
          LOCATION OF BUFFER

Subroutine will initiate a write of one record from memory at location given by third word of calling sequence. The length of the record (in words) is supplied by use of a supply word count calling sequence.

G. Write Tape Mark

JMS        DRTAPE  
           $\mu 050$         (or  $\mu 054$ )

Subroutine will initiate the recording of a tape mark on unit  $\mu$ .

H. Space Forward a Record

JMS      DRTAPE  
 $\mu 060$       (or  $\mu 064$ )

I. Space Backward a Record

JMS      DRTAPE  
 $\mu 070$       (or  $\mu 074$ )



```

/
/      MAGNETIC TAPE DRIVER - DATUM 280.0
/
/      DATUM MODEL 5091-P8 TAPE SYSTEM
/
DRTAPE, 0
DCA DRT400+1      /SET USERS DATA FIELD
6711              /WAIT FOR CONTROLLER
JMP  -1
TAD  I DRTAPE
AND  DRT900+2      /PREVENT INTERRUPTS
DCA  DRT910+4      /SAVE COMMAND PARAMETER
CMA
DCA  DRT910+3      /PRESET FOR NO RETRIES
TAD  DRT910+4
6716              /LOAD COMMAND REGISTER
AND  DRT900+1      /ISOLATE COMMAND
RTR CLL
RAR
TAD  DRT210
DCA  +1
0
DRT210, JMP  .
JMP  DRT285        /REWIND
JMP  DRT280        /READ
JMP  DRT250        /LOAD WORD COUNT
JMP  DRT290        /WRITE
NOP               /FORWARD SPACE
TAD  DRT550        /SET TO SKIP
DCA  DRT420
CLA CMA          /ONE RECORD
JMP  DRT400-1
DRT250, ISZ DRTAPE
TAD  I DRTAPE      /PICK UP WORD COUNT
CIA
DCA  DRT910+1
JMP  DRT790
DRT280, TAD DRT920+1 /SET TO 6726
DCA  DRT420
TAD  DRT900+3      /10 RETRIES
JMP  DRT295
DRT285, 6722      /OVERLAP REMINDS
JMP  DRT790
DRT290, TAD DRT920 /SET TO 6715
DCA  DRT420
TAD  DRT910+4      /PUT IN EXTENDED GAP
TAD  DRT900        /IN CASE OF RETRIES
DCA  DRT910+4
7346              /3 RETRIES
DRT295, DCA DRT910+3
ISZ  DRTAPE

```

DRT300,	CLA	CMA	/-1 IN AC
	TAD	I DRTAPE	
	DCA	DRT910	/SAVE CURRENT ADDRESS
DRT305,	CLA		
	TAD	DRT910	
	DCA	PTR	/SET POINTER
	TAD	DRT910+1	
	DCA	COUNT	/NO. OF WORDS TO TRANS
DRT400,	6722		/MITGO
	0		
DRT410,	TAD	I PTR	
	6713		
	JMP	DRT800	
DRT420,	0		
	DCA	I PTR	
	ISZ	PTR	
	ISZ	COUNT	
	JMP	DRT410	
	6723		
	6711		/WAIT FOR CONTROLLER
	JMP	.-1	
DRT500,	6706		
	DCA	DRT910+2	/SAVE STATUS
	TAD	DRT910+2	/GET STATUS
	AND	DRT799-1	
	SZA	CLA	/ILLEGAL COMMAND ERROR
	JMP	DRT790	/EXIT DENOTING ERROR
	TAD	DRT910+2	
	SMA		
	JMP	DRT740	/NO ERROR FLAG
	AND	DRT799	
	SNA	CLA	
	JMP	DRT790	/NOT PARITY OR TIMING
	TAD	DRT910+2	/PARITY ON EOF
	AND	DRT799-3	/7 TRK - ODD
	SZA		
	JMP	DRT790-1	
	ISZ	DRT910+3	
DRT550,	7610		
	JMP	DRT790	/IRRECOVERABLE R-W
	TAD	DRT910+4	
	AND	DRT305	/ISOLATE UNIT
	TAD	DRT900+1	/BACKSPACE TO CR
	6714		
	6722		
	6711		
	JMP	.-1	
	CLA		
	TAD	DRT910+4	/GET BACK COMMAND
	6716		
	JMP	DRT305	



```

/
DRT740, AND DRT799-3      /EOF OR BOT
      SNA CLA
      JMP DRT790-1        /NO ERRORS
      TAD DRT910+4        /END OF FILE BIT IS
      AND DRT900+1        /EXPECTED ON AN
      TAD DRT799-2        /WRITE EOF
      SNA CLA
      DCA DRT910+2        /CLEAR STATUS
DRT790, ISZ DRTAPE
      TAD DRT910+2        /PICK UP STATUS
      JMP I DRTAPE
      1100                /END OF FILE - BOT MASK
      -50
      400                /MASK FOR ILLEGAL COMMAND
DRT799, 204                /TO MASK OUT PARITY-TIMING
DRT800, 6711
      JMP DRT410+1
      JMP DRT500

/
DRT900, 100      /0- EXTENDED GAP MASK
      70         /1- MASK OUT COMMAND
      7773      /2- COMPLEMENT OF 4
      -12       /3- READ ATTEMPTS

/
DRT910, 0        /0- SAVE LAST BUFFER LOC
      0         /1- CURRENT WORD COUNT
      0         /2- STATUS LAST READ
      0         /3- RETRY COUNTER
      0         /4- LAST EXEC COMMAND
DRT920, 6715
      6726
PTR, 0
COUNT, 0
PAUSE

```



316.0 W

## 5091-P8 CHECKOUT AID

### FUNCTION

Enable checkout engineer to input "programs" of tape controller commands, to cause immediate execution of these programs.

### USAGE

The operator inputs the desired sequence of tape control commands either by causing a paper tape to be read or by typing in the commands in the desired sequence.

Prior to the execution of the sequence of tape commands, the computer interrogates the console data switches which have been preset by the operator to reflect the size of records and bit pattern.

### CONSOLE SWITCHES

Sw 0 is most significant. (Switch is on if in up position.)

Sw 0 on - stop after execution of current sequence.

Sw 0 off - recycle at end of current sequence.

Sw 1 on - Bit pattern for first word and odd words\* of records will be all zeroes on first execution of sequence. On subsequent executions the first and odd words in the records incremented by 1.

---

\* Even position words not necessarily equal to the odd words unless DV command in effect.

Sw 2-3 - used to select record size.

00 - writes are two words.

01 - writes are 100 words.

10 - writes are 500 words.

11 - writes are 800 words.

Sw 4-11 - bit pattern to be used for odd positioned\* words to be written. (Only if Sw 1 is off.)

### PROCEDURE

After program has been loaded, the operator starts at 200<sub>8</sub>. Note that the WC and CA modification, if required, (see next paragraph) must be done before starting. The computer will type out the word "IDLE". Upon seeing this signal, the operator sets up the console data switches to reflect size of buffer, and bit pattern for the tape characters.

He then inputs the desired sequence of tape commands he wished executed. This is done by typing in mnemonics for each command or, alternately, to input a paper tape containing the desired command sequence.

### WC and CA MODIFICATION

As supplied, the program assumes that the WC address is 32 and the CA address is 33. In cases where these addresses are not 32 and 33, the program may be modified after it has been loaded. The modification steps are as follows:

- a. Enter address 20 on the SWITCH REGISTER and press LOAD ADDR. The MEMORY ADDRESS display should indicate 20.
- b. Set SWITCH REGISTER to desired address of WC and press DEP.
- c. Set SWITCH REGISTER to desired address of CA and press DEP.

### COMMAND INPUT FORMAT

M1, M2, . . . Mn where the Mi are taken from the command repertoire list. Each Mi is followed by a comma or carriage return and the last Mn is always G0.

It is important to note that if a command sequence is to be recycled, command Mn-1 is logically followed by command M1. Therefore, Mn-1 is usually a wait for interrupt (IN) or appropriate delay in order to ensure that two tape motion operations do not fall back to back.

The paper tape input has the same format. Program ignores spaces, line feeds and rubouts. The paper tape can be prepared and modified using the PDP-8 Editor Program.

### ADDITIONAL FORMAT NOTES

1. The nnn in JN, JF, DC, and J is the relative position of a command in the sequence where 1 is the first command.
2. Prior to execution of command #1 the computer interrogates the console switches for stop option, change of record size or changes of character.
3. The computer automatically puts a J1 at the end of the sequence to ensure looping back. Thus a G0 = J1.
4. DC1, JF1, JN1 will cause interrogation of the console switches.
5. All nnn (and mmm) in command repertoire are decimal radix. XXXX are octal radix.
6. A BT0000 is assumed (not actually inserted) at the beginning of a command sequence. In other words, if the first command

is a W, the program will attempt to write on unit 0 with interrupt disabled, not core dump mode and without extended gap. Appropriate BT's must be put into sequence where applicable.

#### COMMAND REPERTOIRE

W	Write one record.
R	Clear input area and then read one record.
B nnn	Backspace nnn records.
F nnn	Forward space nnn records.
RW	Rewind.
EF	Write end of file.
D nnnn	Delay nnnn milliseconds.
P	Print last record input.
P nnnn	Print nnnn <sup>th</sup> word of last record input.
P mmm-nnnn	Print mmm to nnn <sup>th</sup> words of last record input.
IN	Wait for interrupt and read status after interrupt.
RS	Read status.
PS	Print status last input with IN or RS.
X xxxx	Execute xxxx as PDP-8 instruction.

L xxxx	Load AC of PDP-8 with xxxx.
PA	Type AC of PDP-8 in octal.
GO	Initiate execution of command sequence. This is always the last command input in a sequence. It also can be the only command input if an appropriate sequence already is in memory.
MK xxxx	Form logical product of status as last input with IN or RS and xxxx. Save logical product as yyyy.
JF nn	Jump to command nn if yyyy (formed with MK) is all zero.
JN nn	Jump to command nn if any bit in yyyy (formed with MK) is a one.
J nn	Jump to command nn.
SC nnn	Set counter to nnn.
DC nn	Decrement counter. If counter after decrementing is non-zero, jump to command nn; otherwise, continue.
BT xxxx	Bits xxxx are to be added to all subsequent commands sent to command register. At beginning of command sequence it is assumed that zeros are added to the commands. This permits the operator to have control over the unit, core dump, extended gap and enable-disable of the tape interrupts.
TR	Test Read. Word count automatically set to two words more than that signalled by switches 2-3. Input area is cleared first.

PC            Print the Counter in octal.

    "CTR = XXXX"

PW            Print the first word of the Write buffer. This command serves to identify the execution cycle when switch 1 is on (modulo 4096). Denotes current character bit pattern for reads/writes.

    "WROTE XXXX"

Cn            Compare read buffer versus write buffer. n must be 7 or 9 and signals amount of tracks on tape. Note that n is 7 if core dump mode.

For C9 the program will also check the vertical parity bit on each character in the read buffer. Switches 2-3 will control length of buffer--number of words checked.

On error (including parity check for C9) program will type:

    CP n W R #E

where n is position of first word in error

    W is contents of write buffer

    R is contents of read buffer

    #E is total number of errors

SW            Sense switch (11). Skip if switch 11 is true and take next instruction if false.

HT            Resets total system and reconstructs necessary flags. Used to reset controller when run away, etc. occurs.



## EXAMPLES OF COMMAND SEQUENCES

1. Write records (switches determine size and pattern) continuously and rewind at end of reel.

Assume unit # = 0 and no core dump mode and no interrupts. Also, no extended gap. If these assumptions are not made then the W is preceded by an appropriate BT.

W,RS,MK1,JF2,MK40,JF1,RW,J2,G0

Breakdown is:

W	Write.
RS,MK1,JF2	Delay until write finished. Waiting until lsb of status (MTF) is a one.
MK40,JF1	If end of tape in status is off go to start of sequence, otherwise continue.
RW	Rewind.
J2	Jump to RS command. This will delay until rewind finished using same three commands used to signal write completed.

Note that when it falls through the JF2 the end of tape bit will be off.

2. Write 4000 records. Write end of file. Rewind and read each record. After each read check for error flag (msb of status). If error flag is present print status and 998-1002<sup>nd</sup> word of

record. Check that EOF occurs after 4000<sup>th</sup> record.

Assume use of unit #1.

BT1004,        Select unit #1 and enable interrupt.

SC4000,        Set counter on number of records.

W,IN,         Write and wait for completion.

DC3,         Return to write if 4000 records are not written.

EF,IN,RW,IN,   Write end of file and rewind.

SC4000,        Reset counter.

R,IN,         Read and wait for completion.

MK4000,        Mask out error bit.

JN24,

DC11,         Return to read if 4000 records not read.

R,IN,         Attempt read over tape mark.

MK100,        Mask EOF status bit.

JN21,PS,       Print status if not EOF

RW,IN,J1       Rewind and go to start

PS,P98-1002,   Print status and words 98-1002

J15,G0        Return to DC11.

IMPORTANT NOTICE TO PURCHASER

The following is made in lieu of all warranties, express or implied:

Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his intended use, and user assumes all risk and liability whatsoever in connection therewith.

No statement or recommendation not contained herein shall have any force or effect unless in an agreement signed by officers of seller and manufacturer.