REAL-TIME EXECUTIVE SYSTEM DRIVER DVR 23

FOR

Computer
Museum

HP 7970 SERIES DIGITAL MAGNETIC TAPE UNITS

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HEWLETT hp *PACKARD*

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SECTION I
GENERAL INFORMATION

1-1. GENERAL DESCRIPTION

1-2.   This manual contains information and procedures that will allow the
user to write application programs using FORTRAN or Assembly language and RTE
Driver DVR23.   Section III provides information required when configuring
DVR23 into a Real-Time Executive (RTE) Operating System. The driver is entered
through a FORTRAN or Assembly language call to control one to four HP 7970 Series
9-track Digital Magnetic Tape Units (via a HP 13181A Magnetic Tape Unit Interface
Kit) in a Real-Time Executive Operating System environment. The interface pro-
vides all tape motion and data transfer control signals required for generating
IBM-compatible nine-track formats. The multispeed capability of the interface
kit permits interfacing with tape units operating at 12.5, 37.5, or 45 inches per
second with a packing density of 800 characters per inch. (Commonly-controlled
paralleled tape units must be at the same tape speeds.)

1-3.   The interface kit requires two computer I/O addresses: a command
channel address and a data channel address. The data channel is assigned the
higher priority I/O address. DMA is always required for 45 ips tape units.
For all other configurations, DMA may be used but is not required.

1-4. OPERATING ENVIRONMENT

1-5.   The operating environment for this software must be a HP 2100 Series
Computer, an RTE Operating System, and the interface kit hardware. Refer to
the HP 13181A Digital Magnetic Tape Unit Interface Kit Operating and Service
Manual (HP Part No. 13181-90000) for interface kit hardware details.

1-6. COMPONENTS

1-7.   The following components are included with Driver DVR23:

    a.   This manual.
    b.   Driver DVR23 binary tape, HP Part No. 92202-16001.

SECTION II
APPLICATION INFORMATION

2-1. GENERAL

2-2. This section details the calls to the driver and describes any results of the hardware/software marriage where the hardware may influence software techniques.

2-3. Before writing programs using the driver, it is recommended that the user consult Section III of the interface kit operating and service manual. This provides instructions on how to operate the tape unit, including a description of controller commands, status information, and typical Assembly language operating programs.

2-4. CALLING SEQUENCES

2-5. The HP 7970 Series Magnetic Tape Unit is operated in the Real-Time Executive System through FORTRAN/Assembly language programs calling DVR23. The driver will cause the magnetic tape unit to respond to Read, Write, Control and Status requests using the standard calls to EXEC. These calls are listed in Tables 2-1 through 2-3.

2-6. STATUS REQUEST

2-7. Information returned from a status request is detailed in Table 2-4. It should be noted that:

      a.   A rewind backspace record or backspace file request will perform no action if the tape unit is at load point. The start-of-tape condition will be reflected both before and after the request is made in the status word.

      b.   Forwardspace File and Backspace File commands cause the tape unit to go forward or backward until a file mark has been detected. Data is not transferred, but parity is checked. A parity error in any record of the file will set the parity error status bit. A backspace file will position the tape in front of a file mark or at load point whichever comes first.

      c.   If the end-of-tape mark is sensed during the execution of a forwardspace file function, the tape will stop at the end of the current record rather than after a file mark. The user must check for this condition with a status request.

2-1

Table 2-1. HP 7970 Read/Write Calls (DVR23)

Assembly Language	Where:

EXT EXEC
.
.
JSB EXEC
DEF *+5
DEF ICODE
DEF ICNWD
DEF IBUFR
DEF IBUFL
\<return point>
.
.
	ICODE = Function Code
	    1 = Read request
	    2 = Write request
	
	ICNWD = Control Word
	    Bits 0 thru 5 } = Logical unit number of tape unit
	    Bit 6 = Type of data
	        0 = BCD read/write
	        1 = binary read/write
	
	    All other Bits } = Set to 0
	
	IBUFR = Address of first word of input/output buffer
	
	IBUFL = Input/output buffer length in either characters or words. A negative value indicates ASCII characters (two per word); a positive value indicates words.
	A length of zero causes immediate completion of the request.
	On input, only as much data as will fit within specified buffer length is transmitted.
	A zero length buffer size on Binary Read causes a forward skip of one record.
	A zero length buffer size on ASCII Read causes immediate completion of the request.
	The minimum length of a Read/Write operation for tape unit is one word (two characters).
	The tape unit does not write an odd number of characters; driver will "pad" input buffer if an odd number of characters is read.

FORTRAN	CALL EXEC (ICODE,ICNWD,IBUFR,IBUFL)

Table 2-2. HP 7970 Control Request Calls (DVR23)

Assembly Language	Where:

EXT EXEC
.
.
JSB EXEC
DEF *+3
DEF ICODE
DEF ICNWD
<return point>
.
.
	ICODE = Function Code
	    3 = Control request
	
	ICNWD = Control Word
	    Bits 0 thru 5 } = Logical unit number of tape unit
	    Bits 6 thru 10 } = Function code
	        01 = Write End-of-File
	        02 = Backspace 1 record
	        03 = Forwardspace 1 record
	        04 = Rewind
	        05 = Rewind/Standby
	        06 = Dynamic Status
	        12 = Erase 4 inches of tape
	        13 = Forward space file
	        14 = Backspace file
	    All un-used Bits } = Set to 0
	
	NOTE
	
	Motion requests (codes 02 thru 05 and 12 thru 14) set the transmission log to zero. When a rewind is requested, control is returned to the caller after a rewind is indicated (before rewind is completed).

FORTRAN	CALL EXEC (3,ICNWD)

Table 2-3. HP 7970 Status Request Call (DVR23)

Assembly Language	Where:

EXT EXEC
·
·
JSB EXEC
DEF *+4 (or 5)
DEF ICODE
DEF ICNWD
DEF ISTA1
DEF ISTA2(op-
    tional)
<return point>
·
·
	ICODE = Function Code
	        13 = Status Request
	
	ICNWD = Control Word
	        Bits 0 ⎫
	        thru 5 ⎬ = Logical unit number
	                  of tape unit
	        All other ⎫
	        Bits ⎬ = not used
	
	ISTA1 = Word 5 of Equipment Table (EQT) Tape Unit
	        Status flags. See Table 2-4 for format.
	
	ISTA2 = Most recent transmission count. May be
	        omitted from calling sequence.

FORTRAN	CALL EXEC (13,ICNWD,ISTA1,ISTA2[optional])

Table 2-4. Status Return Information (ISTA1)

Bits	Function
14 and 15	Tape unit availability code 0 = Unit available for use (not busy) 1 = Unit disabled 2 = Unit currently in operation (busy) 3 = Unit waiting for an available DMA channel
13 - 8	Equipment code Always = 23 octal
7 - 0	Status flags. Meaning when in (1 = on, 0 = off)

<table>
<tr><td>Bit</td><td>Status</td></tr>
<tr><td>7</td><td>End-of-file record encountered when reading, forward spacing, or backward spacing</td></tr>
<tr><td>6</td><td>Start-of-tape marker sensed</td></tr>
<tr><td>5</td><td>End-of-tape marker sensed</td></tr>
<tr><td>4</td><td>Timing error on last read/write operation</td></tr>
<tr><td>3</td><td>I/O request rejected:
a. Tape motion required, but tape is at load point
b. Backward tape motion required, but tape is at load point
c. Write Request was given, but reel does not have a Write enable ring.</td></tr>
<tr><td>2</td><td>Reel does not have a Write enable ring</td></tr>
<tr><td>1</td><td>Parity and/or timing error</td></tr>
<tr><td>0</td><td>Tape unit not on-line</td></tr>
</table>

NOTE: Bit 0 can be ignored by user.

2-8. ERROR RECOVERY PROCEDURES

2-9. READ PARITY ERROR

2-10. The driver will re-read a given record up to ten times before declaring the parity error to be irrecoverable. After the tenth attempt, the last try will be transmitted to the user buffer and a nominal return taken. The status will indicate the parity error; the user must check for this condition. The operating system prints:

        I/O ERR PE EQT #n

where "n" is the logical unit number.

2-11. WRITE PARITY ERROR

2-12. The driver will continue to retry writing a given record until one of two conditions is met:

        a.   The record is successfully written.
        b.   The end-of-tape (EOT) is encountered.
        c.   34 attempts have been made.

2-13. EQUIPMENT NOT READY

2-14. The tape unit will stop if a write is made and no write ring is provided or if a tape motion request is made when the tape unit is off-line. The operating system prints:

        I/O ERR NR EQT #n

where "n" is the logical unit number.

2-15. ATTEMPTED WRITE AT END-OF-TAPE (EOT)

2-16. The drive will allow 1 additional forward motion request made after an EOT condition is encountered.

2-17. There are only two "legal" forward motion requests after EOT:

        a.   Write end-of-file (EOF) mark.
        b.   Read record.

2-18. A second forward motion request after EOT is sensed will put the magnetic tape unit down. This is to ensure that the user rewinds the magnetic tape, inserts a new reel and ups the units. This will ensure that data either on read or units will not be lost.

2-19. Backward motion requests (rewind and backspace record and backspace file) will reinstate the EOT situation to the way it was upon first encountering EOT.

2-20. LIMITED LENGTH RECORDS

2-21. The minimum record length is one word. The user may make read/write requests up to a maximum of 15,999 words in length, if core is available: this

is a restriction imposed by DMA operation. Only the length specified in the request will actually be transmitted from or to the user buffer.

2-22.   DYNAMIC STATUS

2-23.   The dynamic status request has been provided so that the actual status of the tape unit can be determined while I/O operations are being performed. Because this type of status request goes all the way to the driver for its operation, it may take slighltly longer than the normal status request. The status word, is returned in the A-Register to the user. This request will not be processed until the MT EQT entry is not busy. The EOT entry is updated by this request.

SECTION III
CONFIGURATION INFORMATION

3-1. GENERAL

3-2.   This section provides configuration information for Driver DVR66 and is intended to augment the data provided in the Real-Time Executive Software System Programming and Operating Manual.

3-3. REAL-TIME GENERATION

3-4.   The driver is loaded into the RTE System during System generation, as described in the appropriate Real-Time Software Manual. At this time, the following items must be supplied by the operator to configure the tape unit into the RTE System being generated:

3-5.   PROGRAM INPUT PHASE

3-6.   Driver DVR23 must be loaded during this phase.

3-7.   TABLE GENERATION PHASE

3-8.   In this phase, the following three entries must be made:

    a.   An Equipment Table entry for each HP 13181A Interface card
          * EQUIPMENT TABLE ENTRY

          .
          .

          nn, DVR23

          .
          .

          where "nn" is the select code of the HP 12773A Interface Card
    b.   A Device Reference Table entry for each HP 13181A Interface card
          * DEVICE REFERENCE TABLE

          .
          .

          n = EQT#?
          m

          .
          .

where "n" is the logical unit number assigned to the subsystem. Response "m" is a number that corresponds to the "nn", DVR23 position in the Equipment Table.

c.   An Interrupt Table entry for each HP 13181A card

* INTERRUPT TABLE
     .
     .
     .
   nn, EQT, m
     .
     .

   where "nn" is again the select code of the HP 12773A card and "m" is again the position of the subsystem in the Equipment Table.