

# **RTE Driver DVR00 for Multiple-Device System Control Programming and Operating Manual**

# PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

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To determine what manual edition and update is compatible with your current software revision code, refer to the appropriate Software Numbering Catalog, Software Product Catalog, or Diagnostic Configurator Manual.

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## SECTION I

# GENERAL INFORMATION

### 1-1. GENERAL DESCRIPTION

1-2. This manual contains information and procedures that allow the user to write application programs using FORTRAN or Assembly Language programs and RTE Driver 00. Section III provides information required when configuring Driver DVR00 into a Real-Time Executive (RTE) Operating System. The driver is entered through a FORTRAN or Assembly language call to control data transmission of various input/output devices operating in a Real-Time Executive Operating System environment. The equipment controlled by the driver includes HP 2752A/2754B Teleprinters, HP 2600A, HP 262X, HP 264X (without CTU) and HP 2615A Keyboard Display Terminals, the HP 2762 Terminal Printer, the HP 5614 Command Printer, the HP 2895B Paper Tape Punch, and the HP 2748B Paper Tape Reader. Driver DVR00 operates in the Interrupt mode through the I/O Read/Write EXEC calls in RTE. The driver does not have Direct Memory Address (DMA) capability, but it can be used with programs that schedule interrupts.

### 1-3. OPERATING ENVIRONMENT

1-4. The operating environment for this software must be a HP 2100 Series Computer, an RTE Operating System, and interface kit hardware for the input/output equipment in use. Refer to the appropriate interface kit operating and service manual(s) for hardware details.

NOTE: DVR00 revision 1740 or greater requires an RTE Operating System revision 1740 or greater.

### 1-5. COMPONENTS

1-6. The following components are included with Driver DVR00.

- a. This manual.
- b. Driver DVR00 binary tape, HP Part No. 29029-60001.



## 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.     CALLING SEQUENCES

2-4.     The input/output devices are operated in the Real-Time Executive System through FORTRAN/Assembly language programs calling DVR00. The driver will cause the units to respond to the Read/Write, and Control calls as described in Tables 2-1 and 2-2 respectively.

2-5.     RECORD FORMATS

2-6.     ASCII INPUT

2-7.     ASCII input is a string of characters terminated by a Carriage Return code. If the required length is fulfilled before a Carriage Return code is input, the remaining characters are ignored. In any case, a Carriage Return code must still be input. The 8-level bit (bit 7) is set to  $\emptyset$  for 7-bit ASCII code. Special characters are processed as follows:

LINE FEED	Always ignored and is not transmitted to user buffer. However, depressing the LF key will gain the attention of the operating system. Caution should be observed when using the HP 2762 Terminal Printer - the AUTO LF switch option should be in the OFF position.
RETURN	This is the record terminator at the end of a record and is not transmitted to the buffer or counted. Return causes an automatic Line Feed on a keyboard device.
CONTROL A	Deletes previous character.
BACKSPACE (CRT, HP 2762) CONTROL Y, or CONTROL H	} Deletes previous character.
RUB OUT	Deletes current record. On keyboard devices, Rub Out causes "\ " (backslash) to be printed and then a Carriage Return and Line Feed to be issued, after which the next record can be read.
CONTROL D	Forces EOT (End Of Tape) if entered at any time.

Table 2-1. Device Read and Write Calls (DVR00)

Assembly Language	Where:
<pre> EXT EXEC . . JSB EXEC DEF *+5, 6, or 7 DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL DEF IPRM1 DEF IPRM2 &lt;return point&gt; . . </pre>	<pre> ICODE = Request code     1 = Read     2 = Write  ICNWD = Control Word     Bits 0   = Logical unit number     thru 5       Bit 6 = Data transfer mode         0 = ASCII         1 = binary     Bit 7 = Punched tape input length         1 = length is determined by             word count in first non-             zero character read from             tape (Note: Bit 6 = 1)         0 = Length is determined by             buffer length specified             in EXEC call (Note: Bit             6 = 1)     Bit 8 = Keyboard input mode         1 = Keyboard input is printed             as received         0 = Keyboard input not printed     Bit 9 = Teleprinter Punch mode         1 = ASCII characters punched             (Bit 6 = 0)         0 = ASCII or binary characters             punched (determined by             status of bit 6)     Bit 10 = Moving head disc write mode         1 = moving head disc write             with cyclic checking      Bits 11   = Not used, set to 0.     thru 15    IBUFR = Buffer location  IBUFL = Buffer length     + number = words     - number = characters  IPRM1 = Optional parameter or track number if         disc transfer  IPRM2 = Optional parameter or sector number if         disc transfer </pre>
FORTRAN	CALL EXEC(ICODE, ICNWD, IBUFR, IBUFL, IPRM1, IPRM2)

Table 2-2. Device I/O Control Call (DVR00)

Assembly Language	
<pre> EXT EXEC . . JSB EXEC DEF *+3, or 4 DEF ICODE DEF ICNWD DEF IPRAM &lt;return point&gt; . . </pre>	<p>Where:</p> <p>ICODE = Request Code 3 = Control request.</p> <p>ICNWD = Control word</p> <p>Bits 0   = Logical unit number thru 5  </p> <p>Bits 6   = Function code thru 10  </p> <p>00 = Unused 01 = Write end-of-file (magnetic tape) 02 = Backspace one record (magnetic tape) 03 = Forward space on record (magnetic tape) 04 = Rewind 05 = Rewind standby (magnetic tape) 06 = Dynamic status (magnetic tape) 07 = Set end-of-paper tape 10 = Generate paper tape reader 11 = List output line spacing</p> <p>IPRAM = Optional parameter. Used with ICNWD = 11 to designate number of lines to be spaced on the specified logical unit. A negative parameter specifies a page eject on line printer.</p>
FORTRAN	CALL EXEC(3,ICNWD,IPRAM)

2-8. ASCII OUTPUT

2-9. ASCII output is a string of characters, the number of which is designated by the buffer length parameter in the request. The string is terminated by a Carriage Return and Line Feed (supplied by the driver).

2-10. Special processing for ASCII output is provided if bit 9 in the control word equals 1. This means that the ASCII information is to be punched instead of printed on an HP 2752A/2754B Teleprinter.

2-11. A zero buffer length causes only a Carriage Return and Line Feed to be output.

2-12. Special character processing:

BACK ARROW	If a Back Arrow is the last character in the new buffer, the Carriage Return, Line Feed, and Arrow codes are not output.
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2-13. BINARY INPUT

2-14. Binary input is a string of characters specified by the buffer length parameters in the request. If the "V" field in the control word of the request equals 1, the length of the record is designated (in words) by the first character of the record. The word count includes the first word. If the word count is larger than the buffer length, the buffer length is used.

2-15. BINARY OUTPUT

2-16. Binary output is a string of characters specified by the buffer length parameter in the request. Four (4) feed-frames are output at the end of the string to serve as an inter-record gap.

2-17. SIMULATED END-OF-TAPE

2-18. If CONTROL D is entered during a normal ASCII Read, or if 30 feed-frames (zeros) are input before the first character of a record, an EOT indication is set in the status field (bit 5 of word 5) of the Equipment Table (EQT) entry and the input is terminated. If the EQT bit is set when the condition is encountered, the EQT is ignored and characters are input until a record is started (i.e., leader is automatically skipped after EQT).

2-19. SPECIAL FORMAT BIT

2-20. The special format bit (10) allows reading, and writing of non-standard paper tape formats. If the special format bit set is and V is not set, leader is not skipped and the specified number of words are read. On Binary Output the inter-record four feed frames will be suppressed. In addition, all characters in an ASCII string, except the terminal Carriage Return are passed to the user buffer and are counted. If, on input the V-bit is set, the record will be processed as an absolute binary record (3 will be added to the word count in the first non-zero character). The V-bit is not tested for output so the four feed-frames will be suppressed as if the V-bit were not set.



2-21. CONTROL FUNCTIONS

2-22. Bits 10 through 6 define the control word function code as detailed in Table 2-3.

Table 2-3. Control Word Function Code

Function Code (octal)	Action
07	EOT status bit is set to allow leader to be skipped on next input request.
10	Ten inches of null (feed-frames) are output for leader/trailer.
11	Line spacing: Parameter word of request determines number of Line Feeds to the output
20	Enable terminal - allows terminal to schedule its program when any key is struck.
21	Disable terminal - inhibits scheduling of terminals program.
22	Set time-out - extra control word is to be new time-out.
23	Ignore all further action requests until: <ol style="list-style-type: none"> <li>a. Queue is empty or</li> <li>b. An input request is received or</li> <li>c. A restore control request is received.</li> </ol>
24	Restore output processing. This request need only be given if some of buffer is to be saved.

2-23. SYSTEM TELETYPE PROCESSING

2-24. When processing input from keyboard devices, it is possible to receive a character before the previous one has been correctly read. When this happens, the driver interprets the last character as a rubout, then automatically issues the Backslash character, Carriage Return, and Line Feed.

2-25. HP 2762 TERMINAL PRINTER PROCESSING

2-26. The HP 2762 Printer requires a sufficient number of null characters in each line to provide the needed delays for line feed timing. This is taken care of automatically as a function of the device type, and number of characters already in the buffer.

## 2-27. HP 2615A KEYBOARD DISPLAY TERMINAL PROCESSING

2-28. The HP 2615A requires that null characters be output before each line. Therefore, it must be configured with an odd channel number.

2-29. EOT/TIME-OUT OPTIONS

2-30. Driver DVR00 will intercept both a time-out and EOT. The caller will always receive the status appropriate to the condition; however, the system need not be notified of that condition. The driver takes the subchannel number assignment, set by the operator during generation or set with the LU Command, and performs a "logical OR" with both it and the error code. The result is placed in the A-register prior to the completion return. This has the effect of telling the system what to do with the device when a time-out or EOT occurs. Thus, the subchannel entry in the DRT Table defines both the possible errors sent to the system and the device type, as shown in Table 2-4. For example, if a time-out is to set an HP 2762B as down, bits 3 and 0 must be set (type is 2762B), and bit 2 must also be set (time-out downs device). The result of setting bits 3, 2 and 0 to 1 gives a subchannel number of 13 (octal 15). If a time-out is to set the 2762A as down, bit 2 must be set (time-out downs device), and bit 0 must also be set (type is 2762A). Setting bits 2 and 0 gives a subchannel number of 5.

2-31. The NOT-READY error caused by low tape on the punch is detected at initiation and will cause the punch to be set down, regardless of the subchannel setting. This implies that a teleprinter or photo reader with a subchannel number of 0 or 1 is set down only by an operator "DN" request.

Table 2-4. DRT Table Entry

Sub-channel Function			
Bit 3 "8"	Bit 2 "4"	Bit 1 "2"	Bit 0 "1"
HP 2762B	Time-out downs device	EOT downs device	HP 2762A, 2762B, or 2615

2-32. PROGRAM SCHEDULING

2-33. If a program is linked to the trap cell for one or more of the EQT entries for this driver, it is assumed that EQT entry is a TTY and is a terminal.

2-34. A terminal, when enabled, may schedule the linked program, possibly a different program for each terminal, by the operator striking any key on the terminal when it is not doing input (the same as getting system attention). If the terminal is the system TTY, the system attention flag is set and the program is not scheduled. When the program runs, a call to RMPAR will recover words 4 through 8 of the EQT of the interrupting TTY, that is, the address of EQT4 is set in the program's B-register.

\*For a 2762B, bit 0 must also be set.

## SECTION III

### CONFIGURATION INFORMATION

#### 3-1. GENERAL

3-2. This section provides configuration information for Driver DVR00 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. Due to the variety of input/output devices which can be controlled by DVR00, it is not possible to provide the user with specific configuring information. Instead, Table 3-1 supplies the user with typical device configurations which will assist him in configuring his own system. Particular attention should be made to "Note A", detailing the use of DVR01 and DVR02 with a photoreader and punch respectively.

Table 3-1. Typical Device Configurations (DVR00)

Device	EQT Entry	DRT Entry	Interrupt Table
1 - Aux TTY (or CRT)	11, DVR00, B	7 = 1	11, EQT, 1
2 - Aux TTY	12, DVR00	8 = 2, 1	12, EQT, 2
3 - Aux TTY	13, DVR00	9 = 3	13, PRG, TCTL
4 - Punch	14, DVR02, B,T	10 = 4, 4	14, EQT, 4
5 - Photoreader	15, DVR01, T	11 = 5, 6	15, EQT, 5

## NOTES

- A. At generation time, EQT entries for both photoreader and punch must be specified as follows:

Photoreader - xx, DVR01 (,T)  
Punch - yy, DVR02 (,B,T)

Where xx and yy are the device select codes and the bracketed parameters are optional. Note that DVR01 and DVR02 must be used - even though the driver is designated as DVR00 - in order for this driver to properly recognize the specific type of device with which it is communicating.

- B. Device 1 is an auxiliary TTY or CRT and is buffered.
- C. Device 2 is an auxiliary TTY. Because it is an odd-numbered subchannel, it will be treated like an HP 2762 Terminal Printer or an HP 2615 or HP 2640 Terminal.
- D. Device 3 is an auxiliary TTY that has been designated as a terminal. When enabled, any character input from the terminal will schedule the sample program by the name TCTL.
- E. Device 4 is a buffered punch with a subchannel equal to four, so it will be downed when a timeout condition occurs.
- F. Device 5 is a photoreader with a subchannel of 6, so it will be downed on either a timeout or an end-of-tape condition.



