HEWLETT PACKARD

RTE Drivers DVR05/DVA05 For HP 263X/264X Terminals

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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.

Each reprinting of this manual will incorporate all past Updates, however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all Updates.

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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GENERAL INFORMATION

SECTION I

This manual contains information and procedures that allow you to write application programs using FORTRAN or HP Assembly Language to call RTE driver DVR05 or RTE driver DVA05. This section inroduces the drivers' components and the operating environment required; Section II describes the available program calling sequences for the drivers; and Section III provides the information you need when incorporating DVR05 or DVA05 into an RTE operating system.

DVR05 is used to control I/O data transmissions of the following terminals, operating either as system consoles or as auxiliary terminals; no other terminals are supported with DVR05.

DVA05 is a modified version of DVR05 that provides all the capabilities of DVR05, plus full-duplex asynchronous modem support for Bell 103 or equivalent (Vadic 3400) type modems. Note that DVA05 defaults to hardwired DVA05 on system bootup, and the control requests that are specific to DVA05 over modems are not applicable unless the user specifies a Terminal Initialization request.

Terminal Model (with option)	DVR05 Part No.	Approximate Size (words)
2635 (with Maximum Board)	92001-16028	900
2640A	92001-16028	900
2640B	92001-16028	900
2645A (with Extended Asynchronous Data Comm.)	92001-16028	900
2644A (020)	92001-16027	1350
264X (with Cassettes and Ext. Async. Data Comm.)	92001-16027	1350
2645A (with device support firmware)	92001-16027	1350
262X	92001-16027	1350

Terminal Model	DVA05 Part No.	Approximate Size (words)
all terminal models (see Tables 2-1 and 2-2)	92001-16035	1600

If your RTE system requires punched paper tape read/write capability, RTE DVR00 will be required.

Note that except where otherwise specified in text, all references to DVR05 pertain equally to DVA05. Also, references to RTE refer specifically to RTE-II/III, IV, IVB, 6/VM, and all versions of RTE-M.

1-1. COMPONENTS

The following components are included with DVR05 (only):

a. This manual, part number 92001-90015.

b. The binary files named %4DV05 (for 92001-16027) and %0DV05 (for 92001-16028).

The following components are included with DVA05 (only):

a. This manual, part number 92001-90015.

b. The binary file named %DVA05 (for 92001-16035).

1-2. OPERATING ENVIRONMENT

The operating environment for DVR05 or DVA05 over hardwired connections must be:

a. HP 1000, M, E, or F-Series computer.

b. RTE software operating system.
(DVR05 revision code 1740 or greater requires RTE software revision code 1740 or greater).

c. HP 12966A Buffered Asynchronous Data Set Interface Kit with optional cable configurations.

d. Terminals directly connected to the 12966 PCA (modems not allowed).

Optional for 264X and 262X terminals: supported external printers.

The operating environment for DVA05 (with modems) must be:

a. HP 1000 M,E, or F-Series computer.

b. RTE software (revision code 1740 or greater) operating system.

c. HP 12966A Buffered Asynchronous Data Set Interface Kit with Option 002.

d. Terminals connected to full-duplex asynchronous modems (Bell 103 or equivalent).

e. Terminal modem cable for 103 modems.

f. Time Base Generator in RTE system.

Note that DVA05 (over modems) is not intended for use with the system console.

Optional for 264X and 262X terminals: supported external printers.

Figure 1-1 shows the hardware connections from the interface cards to the terminals for both DVR05 and DVA05.

Terminal communications card (part number 02640-60089) switches must be set as follows for DVR05 or DVA05. Note that you can find switch locations in the *HP 13250A Accessory Manual,* part number 02640-90042.

a. Switches S1 through S3: all open.

b. S4: all open except A9, A10, A11, and THE.

Terminal communications card (part no. 02640-60239) switches must be set as follows for DVR05 or DVA05:

THE: open (for DVR00 operation, close THE)
600: closed
EBE: open
200: closed

Terminal PCA part number 02640-60019 must be strapped as follows. Note that some terminals have switches rather than straps; an installed strap is the same as a closed switch.

a. Straps A, B, G, and H: closed.

b. Straps C, D, E, and F: as desired.

c. For the 2640B and 2645 only, switches J through Z: closed, except for switches R, U, and V, which are open.

For the 2635, switches and jumpers must be set as follows:

1. The maximum communications card (02631-60009) is required. On this card, W9 is jumpered as below:

   a. Jumper W9 in for DVR05 (revision code 1650 and earlier) and for DVA05 over modems.

   b. Jumper W9 out for DVR05 (revision code 1740) and hardwired DVA05.

2. All S1 switches closed for 9600 Baud Rate. See the 2635 manual for other baud rates.

3. S2 switches on 02631-60009 set as follows:

   S2(1), S2(2), S2(3), S2(4), and S2(5): all open.
   S2(6), S2(7): closed.
   S2(8): selected by user (see 2635 manual for switch descriptions).

Refer to the appropriate service manual for strap locations and descriptions.

The switches on the extended serial interface (02631-60159) should be set as follows:

S1(1), S1(2), S1(5), and S1(6): all closed.
S1(3), S1(4), S1(7), and S1(8): all open.

S2: all open
S3: CH off

Jumpers W6 and W10 installed.

Refer to the HP 2630 Family Reference Manual (02635-90905) for more information.

Terminal front-panel switches listed below must be set as indicated:

Switch	Position
DUPLEX	FULL
BAUD RATE	User Selected (AUX for 2635)
REMOTE	Latched in
AUTO LF	Latched out
DISPLAY FUNCTIONS	Latched out
CAPS LOCK	Latched in (for communication with the RTE system)
PARITY - Hardwired	NONE
- Modem	As selected by user for keyboard/CRT and CTU ASCII only. No parity for CTU binary.

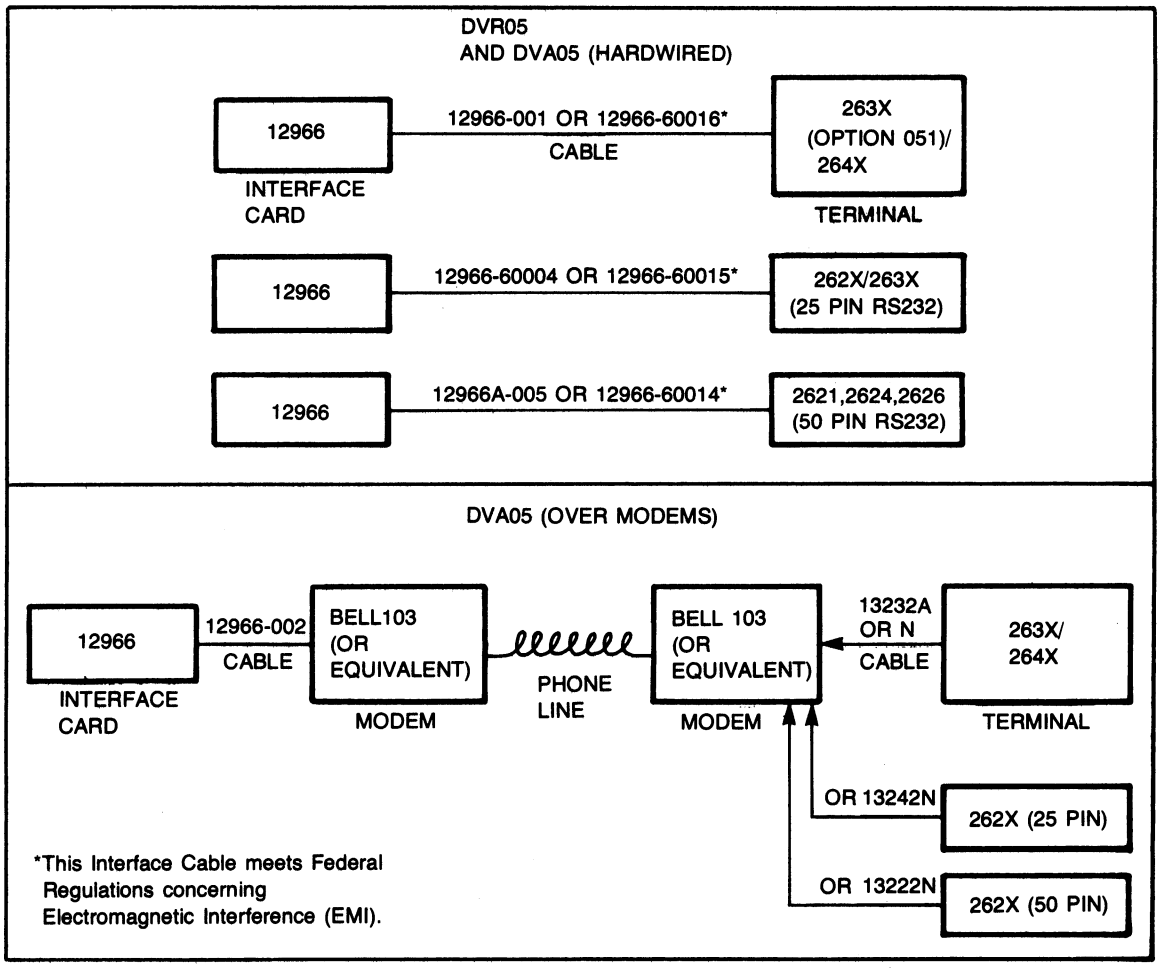

Figure 1-1. Hardware Connections

APPLICATION INFORMATION

SECTION II

This section describes the driver calls and provides information on software/hardware conditions that may influence programming techniques.

Before writing programs using DVR05 or DVA05, it is recommended that you familiarize yourself with the appropriate Terminal Owner's Manual, and the strapping options part of the appropriate Terminal Service Manual.

Drivers DVR05 and DVA05 can communicate with the RTE system in ASCII or binary codes and in either character or block mode. The user can strap the terminal for line-by-line or page-by-page data transmission to the computer.

Table 2-1 relates the currently supported terminal models to the calling sequences you can code with DVR05 or hardwired DVA05.

Table 2-1. DVR05 and Hardwired DVA05 Calling Sequences

Terminal Model (and option)	Calling Sequences Allowed						
	Display Control	Keyboard-Display Read/Write	CTU Control	CTU Read/Write	Printer Control	Printer List	Status
2640A/B	Yes	Yes	No	No	No	No	Yes
2644A with Ext. Async Data Comm. I/F	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2645A/2648 with Ext. Async Data Comm. I/F	Yes	Yes	No	No	No	No	Yes
264X with Cassette and Ext. Async Data Comm. I/F	Yes	Yes	Yes	Yes	Yes	Yes	Yes
264X with Device Support Firmware	Yes	Yes	No	No	Yes	Yes	Yes
2635	Yes	Yes	No	No	No	No	Yes
262X	Yes	Yes	No	No	Yes	Yes	Yes

Table 2-2 relates the currently supported terminal models to the calling sequences you can code with DVA05 over modems.

Table 2-2. DVA05 (over modem) Calling Sequences

Terminal Model (with option)	Calling Sequences Allowed							
	Display Control	Keyboard-Display Read/Write	CTU Control	CTU Read/Write	Printer Control	Printer List	Status	Modem Operation
2640A/B	Yes	Yes	No	No	No	No	Yes	Yes
2644 with Ext. Async Data Comm. I/F	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2645/2648 with Ext. Async Data Comm. I/F	Yes	Yes	No	No	No	No	Yes	Yes
264X with Cassette and Ext. Async Data Comm. I/F	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
264X with Device Support Firmware	Yes	Yes	No	No	Yes	Yes	Yes	Yes
2635	Yes	Yes	No	No	No	No	Yes	Yes
262X	Yes	Yes	No	No	Yes	Yes	Yes	Yes

NOTE

Writing binary data to the display, or incorrectly specifying the data type (ASCII or Binary) when reading from a CTU may cause unpredictable results. For example, if there is no system response to keyboard input, try this: press RESET key. When the CTU EQT times out, a system time-out message will be sent to the display, thereby enabling keyboard input. If the terminal is operating under MTM control and there is no response to keyboard input, try this: press RESET key; remove any I/O requests pending to the terminal (from the console), then enable the terminal with the File Manager command CN, *lu*, 20B.

2-1. CALLING SEQUENCES

The following paragraphs describe the driver calling formats in both FORTRAN and HP Assembly Languages.

Note that DVA05 has three additional requests (see Sections 2-9, 2-10, 2-11, and 2-12) that allow modem support.

2-2. DISPLAY CONTROL REQUEST

Table 2-3 shows the control request formats for the display. The control word (ICNWD) parameter specifies the logical unit (LU) number of the display and the control function code. The functions are:

a. Enable terminal: this allows a terminal to schedule a program (assigned to the terminal during RTE generation) when the operator initially presses any terminal key. If the terminal is used as the system console, the program outputs the system prompt character (*). If the terminal is an auxiliary terminal, the system outputs the terminal LU and a prompt (> or an RTE Session Monitor prompt). In any case, a prompt means that the system is ready to accept input from the operator. (If the terminal is performing an operation and you wish to interrupt the system, you can get a new prompt by simultaneously pressing the space bar and RETURN key several times.)

CAUTION

When attempting to get system attention, never depress more than three keys at the same time: to do so may cause the EQT to time out. Also, **never** use the BREAK key to get the system's attention. On the 2635 terminal, the REPEAT key and an adjacent key should be depressed simultaneously to get the system's attention.

b. Disable terminal: this "locks" a terminal keyboard out of the system. System cannot respond to keyboard.)

Table 2-3. Display Control Request

Assembly Language	Where:
EXT EXEC . . JSB EXEC DEF *+3 (or 4) DEF ICODE DEF ICNWD DEF IPRM1	ICODE = Request Code 3 = Control Request ICNWD = Control Word Bits 0 thru 5 = LU number of display Bits 6 thru 10 = Function code 11 = Line spacing 20 = Enable terminal 21 = Disable terminal 22 = Set read time out 23 = Buffer flush 24 = Restore output processing 25 = Update terminal configuration 34 = Set write time out IPRM1 = Optional parameter. Used to set time out (tens of milliseconds) if function code 22 or 34 is set, or lines to be spaced for function code = 11.
FORTRAN	CALL EXEC (3,ICNWD [,IPRM1])

c. Set read time out: this, along with parameter IPRM1, sets a new RTE device time-out value for keyboard input, allowing the user to change the time-out value specified at generation time.

d. Buffer flush: driver ignores all further action until:

   (1) Buffer is empty or
   (2) An input request is received or
   (3) A restore output processing request is received.

e. Restore output processing: this request enables output processing to resume following a buffer flush.

f. Line spacing: the optional parameter specifies the number of lines to be spaced. The maximum number of lines which can be spaced in one request is 55 lines.

g. Update terminal configuration: The first time the driver is entered after system bootup, DVR05 reads the terminal status to determine Line or Page strapping. If the user changes the strapping after bootup, this update request must be issued to notify DVR05 of the change.

h. Set write time out: this, along with parameter IPRM1, sets a new value for the display write timeout. The value defaults to approximately 3.8 seconds at system boot-up. IPRM1 is in units of 10 milliseconds.

2-3. KEYBOARD-DISPLAY READ/WRITE REQUEST

Table 2-4 shows read/write request formats for the keyboard-display. The request code (ICODE) parameter specifies read or write, and ICNWD specifies the terminal's LU and function code. The functions are:

Table 2-4. Keyboard-Display Read/Write Request

Assembly Language	
EXT EXEC . . JSB EXEC DEF *+5 DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL	Where: ICODE = Request Code 1 = Read keyboard 2 = Write to display ICNWD = Control Word Bits 0 thru 5 = Logical unit of terminal Bits 6 thru 10 = Function Code Bit 6 = 0 Bit 8 = 1 = Echo "on" 0 = Echo "off" Bits 9 & 10 = 11= Program enabled block read Bit 10 = 01 = Transparent Mode, terminal enabled character or block read = 00 = Non-Transparent Mode, terminal enabled character or block read = 10 = Unused IBUFR = Address of first word of I/O buffer IBUFL = I/O buffer length = n if specified as 16-bit words = −n if specified as 8-bit characters
FORTRAN	CALL EXEC (ICODE, ICNWD, IBUFR, IBUFL)

a. Echo "on"/echo "off". This enables (or prevents) the HP 12966 I/O Card to automatically return (echo "on") a character to the display as it is received from the keyboard.

b. Transparent mode/non-transparent mode. As discussed later, this determines the processing mode for certain special characters.

The Read/Write request covers three types of data transmission as follows:

a. Write to display.

b. Read from keyboard in character mode.

c. Read from keyboard in block mode (BLOCK MODE key latched in).

When you program a display write request, consider the following:

- The output is a string of ASCII characters from a buffer in which each word contains two characters. The buffer length (IBUFL) must be specified by a positive integer if you count the words or by a negative integer if you count the characters. In either case, the driver terminates the character string by supplying a carriage return (CR) and line feed (LF).

- The length of the buffer should be limited to 80 displayable characters unless the terminal's Cursor End-of-Line Wrap Around strap is installed.

- In the transparent write function, if there are any underscore characters (ASCII 137 octal) in the buffer, they are output to the display but the driver does not supply CR and LF. In the non-transparent write, if an underscore character is the last word in the buffer, neither it nor CR and LF are output to the display.

- The write request can control programmable functions requiring escape code sequences defined in the owner's manual for the terminal.

- The driver strips out all ESC characters from binary writes to the display; it does not supply CR and LF.

- If the LU points to an EQT with subchannel 3, the output is preceded with ESC*l (small "l"). Subchannel 3 is used to invoke label mode with the 2648 Graphics Terminal.

For keyboard read requests, the driver always sends a DC1 code to the terminal prior to setting the I/O card to the receive mode. Therefore, when reading cursor status or other special terminal information, do not explicitly send a DC1 in your write buffer; send only the escape sequence up to the DC1. The DC1 that triggers the terminal transfer will be supplied by DVR05/DVA05 in the read request. The driver distinguishes block and character modes by examining the first character received from the keyboard. If it is a DC2 (ASCII 22 octal), the driver assumes the ENTER key was pressed and a block transmission is pending; the driver responds with DC1 to trigger the block transfer. If the first character is not a DC2, the driver assumes a character transfer is pending.

For a character mode keyboard read request (BLOCK MODE key latched out), consider the following:

- The terminal transmits one character at a time as a key is pressed. The record terminator is a CR or RS (record separator) and must be entered to complete the request (the terminator is not sent to the user's buffer). The driver echos a line feed (LF) and returns

the transmission log (number of character/words sent) in the B register. The transmission log in the B-register is used to determine how much of IBUFR can be used. Any unused portion of the data buffer may or may not be cleared. If a CR is the first character, the driver returns a zero transmission log.

- In the non-transparent character mode, the driver processes the following special characters:

  DEL (RUBOUT, ASCII 177 octal). Entering DEL (shift and underscore keys) deletes the current record and outputs a backslash (\), CR, and LF; this is used to delete the line and start a new line.

  BACKSPACE (ASCII 10 octal). Pressing the BACKSPACE key deletes the last character; the terminal's cursor moves back one position.

  LINE FEED (ASCII 12 octal). A line feed (LF) is echoed back to the display but is not sent to the user's buffer.

  CONTROL D (ASCII 4). Entering Control D (CNTL and D keys) terminates data transmission and sets status word bit 5 to "1" with all zeros in the B register.

- In the transparent mode, the special characters listed above are not processed by the driver but are passed to the user's buffer.

For a block mode keyboard read request (transmit from keyboard), consider the following:

- In block mode (BLOCK MODE key latched in), terminal transmissions are either line-by-line (line strapping) or page-by-page (page strapping). The DEL, BACKSPACE, LINE FEED, and CNTL D keys have no special meaning.

  NOTE

  If RTE File Manager requests are used for data transfer, data blocks longer than 128 words are truncated.

- The first time the driver is entered after system bootup, DVR05 reads the terminal status to determine Line or Page strapping. If the user changes the strapping after bootup, an update request must be issued to notify DVR05 of the change.

- With line strapping, the data terminator (CR) and RS's are not passed to the user's buffer.

- With page strapping, line separators (CR,LF) are passed to the user's buffer but the data terminator (RS) is not.

- With both strapping options if bits 9 and 10 are set the unit separator (US) is not passed to the user's buffer.

- If program enabled block read is used (bit 9 and 10 = 1) then immediately prior to the read, a write "ESC d" request must have been issued.

- For terminal enabled block read (bits 9 and 10 = 0) the user must press the ENTER key.

- If bit 6 is set, characters are entered into the user buffer until it is full. No processing of the characters (e.g., backspaces) is performed.

2-4. CTU CONTROL REQUEST

Table 2-5 shows the request formats for controlling a cartridge tape unit (CTU) in a Terminal. The control word (ICNWD) specifies cartridge LU and function code. When you program a CTU control request, note the following.

- A rewind, backspace one record, or backspace one file request does not cause any action if the CTU is at the load point (beginning of tape). The load point condition is reported in the status word.
- If a terminal is Page Strapped, the BLOCK MODE key must be latched out for CTU operation.
- For dynamic status requests, the A-register contains EQT word 5 of left or right CTU (depending upon which LU is being addressed).

Below are given the various requests that allow positioning of the CTU. Figure 2-1 illustrates the points where the tape will be positioned (in this example) after each request.

- Forward space one file (function code 13): If at A, will move to B.
  If at B, will move to E.
- Backspace one file (function code 14): If at C, will move to A.
  If at E, will move to D.
- Forward space one record (function code 03): If at A, will move to B.
  If at B, will move to C.
- Backspace one record (function code 02): If at B, will move to A.
  If at C, will move to B.

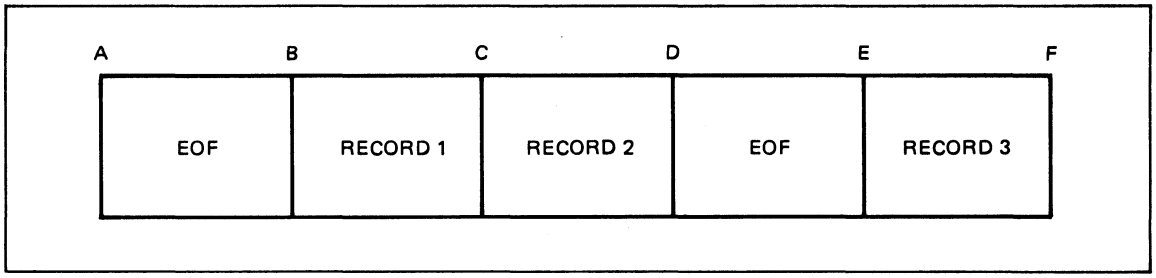

Figure 2-1. CTU Positioning Illustration

NOTE

For a one record file directly in front of the load point, with the tape positioned after the EOF mark, the backspace one record command will position the tape to the load point. This condition can be found programmatically by testing status for "load point and not EOF". The user can then space forward one record.

Note: For a one record file directly in front of the load point, with the tape positioned after the EOF mark, the backspace one record command will position the tape to the load point. This condition can be found programmatically by testing status for "load point and not EOF". The user can then space forward one record.

Table 2-5. CTU Control Request

Assembly Language	
EXT EXEC . . JSB EXEC DEF *+3 (or 4) DEF ICODE DEF ICNWD DEF IPRM1	Where: ICODE = Request Code 3 = Control Request ICNWD = Control Word Bits 0 thru 5 = Logical unit number of CTU Bits 6 thru 10 = Function Code 01 = Write end-of-file (EOF) 02 = Backspace one record 03 = Forward space one record 04 = Rewind 05 = Rewind 06 = Dynamic Status 10 = Write EOF if not just previously written or not at load point 13 = Forward space one file 14 = Backspace one file 26 = Write End-of-Data (EOD) 27 = Locate absolute file IPRM1 IPRM1 (less than 256) All unused bits = Set to 0 Note: Motion requests (codes 2-5 and 13-27) set transmission log to zero. IPRM1 = Absolute file number if function code set to 27
FORTRAN	CALL EXEC (3, ICNWD [,IPRM1])

2-5. CTU READ/WRITE REQUEST

Table 2-6 shows the read-write request formats for a cartridge tape unit (CTU) in a terminal. The request code (ICODE) specified read or write, and ICNWD specifies the CTU's LU and function code. Note that you must specify the buffer length (IBUFL) by a positive integer if you count the words or by a negative integer for characters. When programming a CTU read/write request, note the following.

- If terminal is Page Strapped, BLOCK MODE key must be latched out for CTU operation.
- A binary read request inputs (via the driver) a word (or character) string to a buffer of specified length. If the buffer is filled before an End-of-Record (EOR) is read, the driver ignores the remaining data and stops the CTU at the first EOR it reads. If an EOR is read before the specified length is filled, the CTU stops at the EOR. The maximum buffer length is 128 words; if a greater length is specified, the driver rejects the request (system outputs error code IO07). The CTU skips one record if the buffer length is specified as zero.

- A binary write outputs (via the driver) a word (or character) string from a buffer of specified length. The maximum buffer length is 128 words; if a greater length is specified (or if the length is specified as zero), the driver rejects the request.

- Before a binary transmission, the operator must issue a Terminal Initialization request (see Table 2-11) for no parity, and also set the terminal for no parity.

- An ASCII read request inputs (via the driver) a word (or character) string terminated by a carriage return (CR). If the specified buffer length is filled before a CR is read, the driver ignores the remaining characters; however, a CR must still be read in order to complete the request. The maximum buffer length is 127 words.

- An ASCII write request outputs (via the driver) a word (or character) string from a buffer of specified length. Maximum buffer length is 127 words (the driver supplies a CR). The driver terminates the request if the string includes a CR, LF, or RS. (The driver uses CR as a record terminator on input and the terminal uses LF as a terminator on output; an RS is passed to the driver when the CTU encounters a file gap.)

- If the End-of-Tape (EOT) point is sensed during a write operation, an End-of-Data (EOD) mark is recorded automatically; the driver completes the current record. Further attempts to write will cause DVR05 to reject the request with the A-register = 1 (not ready). Similarly, the driver reads the current record if an EOD is sensed during a read operation. Either condition (EOT or EOD) is reported in the status word. Further attempts to read past EOT will cause the driver to reject the request with the A-register = 1 (not ready).

- Read requests are rejected if the tape is at EOD. However, the EOD can be overwritten (write request) with data or a file mark unless the tape is at EOT.

Table 2-6. CTU Read/Write Request

Assembly Language	Where:
EXT EXEC . . JSB EXEC DEF *+5 DEF ICODE DEF ICNWD DEF IBUFL	ICODE = Request Code 1 = Read from CTU 2 = Write to CTU ICNWD = Control Word Bits 0 thru 5 = LU number of CTU Bits 6 thru 10 = Function code 01 = binary 00 = ASCII IBUFR = Address of first word of I/O buffer IBUFL = I/O Buffer length = n if specified as 16-bit words = −n if specified as 8-bit characters
FORTRAN	CALL EXEC (ICODE, ICNWD, IBUFR, IBUFL)

- Continuously moving the tape back and forth (e.g., re-reading) more than 100 times over a short section of the tape may permanently damage the tape cartridge. Periodically "conditioning" the tape prevents failures due to such back and forth motions. (Refer to "Tape Conditioning Procedure" in the appropriate manual.)

2-6. PRINTER CONTROL REQUEST

Table 2-7 shows the request formats for controlling any of the optional HP printers when they are interfaced to a 264X or 262X terminal. The control word (ICNWD) specifies printer LU and function code. Function code 11 octal advances printer paper the number of lines specified by the IPRM1 parameter if IPRM1 is positive. If IPRM1 is negative, the 9871A, 7310A, and 2631 advance to top-of-form. (The 9866A ignores a negative IPRM1.)

Table 2-7. Printer Control Request

Assembly Language	
JSB EXEC DEF *+4 DEF ICODE DEF ICNWD DEF IRPM1	Where: ICODE = Request Code 3 = Control Request ICNWD = Control Word = Bits 0 thru 5 = LU number of printer Bits 6 thru 10= Function code 11 = Space IPRM1 (less than 256) lines IPRM1 = Number of printer space lines; or when negative: 2631/9871 goes to top-of-form; 9866 ignores request
FORTRAN	CALL EXEC (3, ICNWD, IPRM1)

2-7. PRINTER LIST REQUEST

Table 2-8 shows the request formats for listing on a supported printer interfaced to a terminal. In effect, the drivers list directly to an optional printer from the user's write buffer. When preparing the buffer, note the following:

- The printer's maximum line length is 80 characters (9866, 7310A) or 132 characters (9871, 2631).

- The drivers supply the printer with a CR and LF as needed and terminate the request if the buffer contains a CR, LF, or RS.

- The drivers do not support the following features: Reverse Line Feed, Plotting.

- For any 9871A escape sequence which requires a parameter with a value of zero, use ASCII "@" (not a NULL) to send the zero.

- DVR05 and DVA05 do not support transparent mode listing to the printers.

Table 2-8. 264X Printer List Request

Assembly Language	
JSB EXEC DEF *+5 DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL	Where: ICODE = Request Code 2 = List on printer ICNWD = Control Word Bits 0 thru 5 = LU number of printer IBUFR = Address of first word of input/output buffer IBUFL = Input/output buffer length = n if specified as 16-bit words = −n if specified as 8-bit characters
FORTRAN	CALL EXEC (2, ICNWD, IBUFR, IBUFL)

2-8. STATUS REQUEST

Table 2-9 shows the request formats for obtaining the status of the most recent operation performed by the terminal or CTU. The driver returns the status to ISTA1 (word 5 of the device EQT) and, optionally, to ISTA2 (EQT4) and ISTA3 (LU status). (Refer to the RTE reference manuals for more detailed information.) Table 2-10 gives the meaning of EQT5 (ISTAT) bits when set to "1". For the cartridge tape unit (CTU), note the following:

- End-of-data (EOD): driver detected an EOD mark during read (or search) operation or has just recorded an EOD mark; driver positions the tape before the EOD mark. Recording operations may be executed to overwrite this mark with data records or a file mark unless the tape is at End-of-Tape (EOT) point.

- Write protected: the protect tab on the cartridge is set to prevent data recording.

- Last command aborted: the last command from the program or the terminal keyboard was not performed successfully; other status bits may give the cause of the failure.

- Hard read error: three successive read attempts failed to recover data from a record. Driver positions tape after the bad record. It is usually possible to retrieve the data by "conditioning" the tape and then making another read request; refer to "Tape Conditioning Procedures" in the terminal manual. If hard read errors occur frequently, clean the tape transport record heads. If the errors persist, the user should consider copying the taped data into a new tape cartridge.

- End-of-Tape (EOT): tape passed early warning mark on tape and driver recorded an EOD mark. Driver rejects commands directing forward motion of tape.

- Write error: a write request sent to the CTU cannot be executed.

- Load point: tape is positioned at or before load point marker.
- End-of-File (EOF): driver detected file mark during read operation or has just recorded file mark.

Table 2-9. Status Request

Assembly Language	Where: ICODE = Request Code 13 = Status Request ICNWD = Control Word Bits 0 thru 5 = LU number of terminal or CTU ISTA1 = Word 5 of terminal or CTU EQT (refer to table 2-8 for details) ISTA2 = EQT word 4 (optional). Refer to RTE-II/RTE-III Manual) for standard description. ISTA3 = LU status (optional). Refer to the RTE reference manuals for a standard description.
JSB EXEC DEF *+4 (or 5) DEF ICODE DEF ICNWD DEF ISTA1 DEF ISTA2 DEF ISTA3	
FORTRAN	CALL EXEC (13, ICNWD, ISTA1 [,ISTA2] [,ISTA3])

Table 2-10. EQT5 (ISTA1)

Bit Set	Cartridge Tape Unit (CTU)	Terminal	Printer
0	Cartridge not inserted or unit busy (2645) Cartridge not inserted (2644)		
1	End of data (EOD)	Terminal enabled	
2	Cartridge write protected		
3	Last command aborted; check other bits for cause	*Parity error	Last command aborted
4	Hard read error (2644) Hard read error or write error (2645) *Parity error	*Data set not ready	
5	End of tape (EOT)	Control D entered	
6	Tape at load point		
7	End of file (EOF)	Buffer flushed	

*These apply only to DVA05 over modem.

2-9. ADDITIONAL DVA05 CONTROL REQUESTS

The following three requests (see Sections 2-10, 2-11, and 2-12) allow modem support and are unique to DVA05 over modems (they are not applicable to hardwired DVA05).

Note that for modem operation the Terminal Initialization request must be issued first. Next, a Line Control request specifying line open is issued. At this time the communication channel between the remote user's data set and the system's data set should be established. When this connection is complete, the line control request completes. These two requests are issued only once, and thereafter the modem connection is transparent to the program and operator. (The requests do not need to be reissued for each program that makes an I/O request to the terminal.) If a line close request is issued and a new line open request is required, it is not necessary to issue a second Terminal Initialization request.

Before each transmission over a modem, the modem status lines "clear to send" (CB), "data carrier detector" (CF), and "data set ready" (CC) are checked. If they are not correct, the EQT will be downed with bit 4 set in the status word EQT5. When the line problem is fixed (CB, CF, and CC are set), an interrupt into DVA05 occurs, and the EQT is set up via a JMP $UPIO.

When the transmission is complete, that data set is removed from the communication line by issuing a line close request. This request completes when the data set is no longer connected to the line.

2-10. TERMINAL INITIALIZATION

Table 2-11 shows the request formats for initializing a terminal when using modems. If a modem is used, a Terminal Initialization request must be complete before issuing any other request with DVA05. The initialization request sets up the transmission rate and the parity selection. The baud rate specified in the Terminal Initialization request must be the same as the baud rate that is set on the terminal.

Table 2-11. Terminal Initialization Request

Assembly Language	
EXT EXEC • • JSB EXEC DEF *+4 DEF ICODE DEF ICNWD DEF IPRM1	Where: ICODE = Request Code 3 = Control Request ICNWD = Control Word Bits 0 thru 5 = LU Number of Terminal Bits 6 thru 10 = Function Code 30 = Terminal Initialization IPRM1 = Terminal Initialization Parameter *Bits 0 thru 3 = Baud Rate **Bit 4 = 0 = Odd Parity = 1 = Even Parity **Bit 5 = 0 = Parity "Off" = 1 = Parity "On" Bit 8 = Line Type = 0 = Hardwire = 1 = Modem
FORTRAN	CALL EXEC (3,ICNWD,IPRM1)

*Bit Field 0-3	Octal Value	Baud Rate
0011	3	110
0110	6	300
1001	11	1200
1011	13	2400
1111	17	9600

**The parity function applies only to CRT/KEYD and ASCII CTU operations. Parity errors are detected and reported in the following four cases:

a. If a parity error is detected in input character mode, DVA05 interprets it as though a RUBOUT occurred. A /,CRLF is sent to the CRT, and the line must be reentered.

b. In input block mode, a parity error causes a zero to be posted in the transmission log (B-register). Also, bit 3 in the status word is set for the user to check.

c. For a CTU ASCII read, a parity error causes the transmission log to be set to zero (however, the entire record is received). Also, bit 4 in the status word is set for the user to check.

d. On output, a parity error is indicated by a ■ on the CRT.

It is the operator's responsibility to set the terminal parity to NONE, and to program no parity via a Terminal Initialization request for all binary operations.

2-11. LINE CONTROL REQUEST WITH MANUAL ANSWER

Before issuing the first read/write request with DVA05 over a modem, a Line Open (manual or auto answer) must be completed. Table 2-12 shows the request formats for issuing a Line Control request with Manual answer.

Manual Line Open results in the 12966 Interface Card setting the "request to send" (CA) and "data terminal ready" (CD) control lines. The line is then checked every two seconds for the "clear to send" (CB), "data carrier detector" (CF), and "data set ready" (CC) status lines. The request is completed upon detection of these three signals.

A Line Close request will clear "request to send" (CA) and "data terminal ready" (CD). Every two seconds thereafter, the status of the line is checked (for "clear to send" and "data carrier detector" clear).

Table 2-12. Line Control Request - Manual Answer

Assembly Language	Where:
EXT EXEC • • JSB EXEC DEF *+4 DEF ICODE DEF ICNWD DEF IPRM1	ICODE = Request Code 3 = Control Request ICNWD = Control Word Bits 0 thru 5 = LU Number of Terminal Bits 6 thru 10 = Function Code 31 = Line Control-Manual IPRM1 = Line Selection = 0 = Line Close = non-zero = Line Open
FORTRAN	CALL EXEC (3,ICNWD,IPRM1)

2-12. LINE CONTROL REQUEST WITH AUTO ANSWER

This request can only be used with an auto answer modem that sets the Ring Indicator (CE) in response to answering a call. Table 2-13 shows the request formats for issuing a Line Control request with Auto answer.

DVA05 enables the Ring Interrupt on the I/O card. Upon interrupt, "request to send" (CA) and "data terminal ready" (CD) are set, and the line is checked every two seconds thereafter for "clear to send" (CB), "data carrier detector" (CF), and "data set ready" (CC). The request is completed upon detection of these three signals.

Table 2-13. Line Control Request - Auto Answer

Assembly Language	
EXT EXEC • • JSB EXEC DEF *+3 DEF ICODE DEF ICNWD	Where: ICODE = Request Code 3 = Control Request ICNWD = Control Word Bits 0 thru 5 = LU Number of Terminal Bits 6 thru 10 = Function Code 32 = Line Control-Auto
FORTRAN	CALL EXEC (3,ICNWD)

2-13. EXAMPLE WITH MODEM OPERATION

For modem operation, the Terminal Initialization request must be issued first. An example of a Terminal Initialization is given below for the following specifications:

Baud rate — 1200
Parity on
Parity odd
Logical Unit 7

Then:
```
ICNWD = 3007B
IPRM1 = 451B
CALL EXEC(3,ICNWD,IPRM1)
```
} Terminal Initialization

Next, a Line Control request for logical unit 7, specifying line open, is issued:

```
ICNWD = 3107B
IPRM1 = 1
CALL EXEC(3,ICNWD,IPRM1)
```
} Line Open with Manual Answer

When the transmission is complete, that data set is removed from the communication line by issuing a line close request for logical unit 7. When the data set is no longer connected to the link, this request completes.

```
ICNWD = 3107B
IPRM1 = 0
CALL EXEC(3,ICNWD,IPRM1)
```
} Line Close

The equivalent RTE File Manager commands for this example are:

```
:CN,7,30B,451B
:CN,7,31B,1
:CN,7,31B,0
```

Under RTE-IVB or later systems, you can use the CT command instead of CN.

2-14. PROTOCOL

The ENQ/ACK handshake protocol, described in this section, is used by DVR05 and DVA05 to prevent data overrun *at the terminal* at high transfer rates. The DC1/DC2 handshake is used to prevent data overrun *at the computer* at high transfer rates. The protocol uses the ASCII characters, DC1, DC2, ENQ, ACK, CR, LF, and RS. These characters have the decimal values 17, 18, 5, 6, 13, 10, and 30, respectively.

For a read from a device, the sequence is as follows:

The driver

1. Checks hardware lines OK?
2. Sends a DC1.
3. Receives message from device.
4. Receives CR or RS.
5. Sends CR/LF.
6. Sends ENQ, receives ACK.
7. Sends ENQ, receives ACK.

If the first character received at Step 3 is a DC2 (18 decimal), a second DC1 is sent and the card is configured for a block transfer. The terminating character (Step 4) will be one of CR or RS, depending if the terminal is line or page block mode, respectively.

For a normal ASCII writes to the device, the driver initiates one ENQ/ACK handshake after each 33-character transfer, and the operation is terminated by the driver with ENQ/ACK handshakes. The sequence is as follows:

1. Checks hardware lines OK?
2. Sends 33 characters of message.
3. Sends ENQ, receives ACK.
4. Continues 33-character transfers as in steps 2 and 3, until the transfer is complete.
5. Sends CR/LF.
6. Sends ENQ, receives ACK.
7. Sends ENQ, receives ACK.
8. Sends ENQ, receives ACK.

If the last character in the write buffer is an underscore ("_", octal 137), steps 5 and 6 will not be performed and the underscore will not be output.

For more information regarding terminal handshake protocols, refer to the manual for the terminal in question.

CONFIGURATION INFORMATION

SECTION III

This section provides configuration information for Driver DVR05 and is intended to augment the data provided in the Real-Time Executive Software System Programming and Operating Manual or the RTE On-Line Generator Reference Manual.

The configuration requirements for generating DVA05 into an RTE system are the same as those necessary for configuring DVR05. If you are using hardwired DVA05, simply replace DVR05 with DVA05 in the following example. If you are using DVA05 over modems, the configuration will be the same, except that it is recommended that the terminal be unbuffered.

NOTE

There is no SIO driver for these terminals and HP 12966 hardware combinations; consequently, RTE-II/RTE-III system generators that require an SIO driver cannot use these combinations during system generation.

3-1. GENERATION PROCEDURE

Load the driver into the RTE System during system generation as described in the appropriate Real-Time Software Manual. During the system generation, take the following steps to configure the driver into the RTE system being generated.

3-2. PROGRAM INPUT PHASE

During the Program Input Phase, load Driver DVR05 along with other I/O drivers being loaded.

3-3. TABLE GENERATION PHASE

In the Table Generation Phase, make the following entries:

a. An Equipment Table (EQT) entry for each terminal.

```
* EQUIPMENT TABLE ENTRY
  .
  .
EQT n?
sc,DVR05,B,T=32000,X=13
```

where: "n" is the EQT entry number, "sc" is the select code of the I/O card, "B" specifies the buffering option, "T" is the time out value for the device, and "X" indicates EQT extensions. For DVA05 over modems it is recommended that the buffering option not be specified. When a remote terminal is buffered, it is not possible to remove the current request from the system even if the remote terminal cannot process that request. When the terminal is unbuffered, the user can recover from an error because the incorrect request can be removed.

NOTE

Should the system display a file manager or RTE prompt when you are entering text from the terminal keyboard, the time out value is too small. Increase it. You should consider using a very large time out value (e.g., 32000) to prevent idenfinite I/O suspension should the terminal not respond with an expected interrupt. Note also that the time out value refers only to the keyboard and input; DVR05 uses a time out value of 80 seconds for all cartridge tape and line printer operations and 3.8 seconds (or whatever was entered on the last control 34B request) for a display write.

Set "T" equal to at least 3000 (30 seconds) and set "X" equal to 13.

b. A Device Reference Table (DRT) entry relating the desired logical unit number (LU) for each terminal device (e.g., cartridge tape unit) to the EQT entry.

```
* DEVICE REFERENCE TABLE
  .
  .
lu=EQT #?
n,m
  .
  .
```

where: "lu" is the LU number to be assigned to a terminal device, "n" is the EQT entry number of the terminal, and "m" is a subchannel number. For example, if the EQT entry for a 2640 Terminal is the eighth entry in the EQT table and you select 11 as the LU number for the terminal, then "8,0" is the correct response to:

```
11=EQT #?
```

In the above example, "0" specifies the terminal's keyboard-display as subchannel 0. Similarly, an HP 264X or 262X with optional printer requires four DRT entries; the following examples are commented (*) for explanatory purposes.

```
.
.                                    *DEVICE                                  *REQUIRED
.                                                                             *SUBCHANNEL
.
11=EQT #?
8,0              *KEYBOARD-DISPLAY LU (Non-graphics)                          0
12=EQT #?
8,3              *KEYBOARD-DISPLAY LU (Graphics mode — 2648)                  3
13=EQT #?
8,1              *LEFT CARTRIDGE TAPE UNIT LU                                 1
14=EQT #?
8,2              *RIGHT CARTRIDGE TAPE UNIT LU                                2
15=EQT #?
8,4              *OPTIONAL PRINTER LU                                         4
.
.
```

Note that the 264X keyboard-display must have the lowest of the three (or four) LU numbers; however, it is not necessary that the LU numbers be consecutive as shown above. If the terminal is to be the system console, its keyboard-display must be LU 1.

c. An Interrupt Table entry for each terminal I/O card.

```
* INTERRUPT TABLE
  .
  .
sc,PRG,PRMPT
  .
  .
```

where: "sc" is the select code of the I/O card, "PRG" indicates that a program is assigned to the associated terminal, and "PRMPT" is the name of the program (supplied with the operating system). Note that a user-written program may be substituted for program PRMPT, or the interrupt may point directly to the EQT entry (refer to the RTE manuals for details.)

READER COMMENT SHEET

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For HP 263X/264X Terminals

92001-90015 October 1983

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Northrop Instruments & Systems Ltd.
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P.O. Box 8388
CHRISTCHURCH
Tel: 486-928
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Northrop Instruments & Systems Ltd.
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
WELLINGTON
Tel: 850-091
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N-5033 **FYLLINGSDALEN** (Bergen)
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OMAN
Khimjil Ramdas
P.O. Box 19
MUSCAT
Tel: 722225, 745601
Telex: 3289 BROKER MB MUSCAT
P

Suhail & Saud Bahwan
P.O.Box 169
MUSCAT
Tel: 734 201-3
Telex: 3274 BAHWAN MB

PAKISTAN
Mushko & Company Ltd.
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Sector F-8/1
ISLAMABAD
Tel: 51071
Cable: FEMUS Rawalpindi
A,E,M

Mushko & Company Ltd.
Oosman Chambers
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***KARACHI** 0302*
Tel: 524131, 524132
Telex: 2894 MUSKO PK
Cable: COOPERATOR Karachi
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PANAMA
Electrónico Balboa, S.A.
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Apartado 4929
PANAMA 5
Tel: 63-6613, 63-6748
Telex: 3483 ELECTRON PG
A,CM,E,M,P

PERU
Cía Electro Médica S.A.
Los Flamencos 145, San Isidro
Casilla 1030
***LIMA** 1*
Tel: 41-4325, 41-3703
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CM,E,M,P

PHILIPPINES
The Online Advanced Systems Corporation
Rico House, Amorsolo Cor. Herrera Street
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Electronic Specialists and Proponents Inc.
690-B Epifanio de los Santos Avenue
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P.O. Box 2649 Manila
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P

PORTUGAL
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Intercambio Mundial de Comércio S.A.R.L.
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P-LISBON
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Telex: 16691 munter p
M

Soquimica
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