

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

Reference Manual



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Reference Manual

92001-90015 October 1984

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PRINTING HISTORY

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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.

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Chapter 1

General Information

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 introduces 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 terminals listed below, 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 Async. 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 or 92084-16607 (RTE-6/VM)	1600 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 especially 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. RTE-M, II/III, IV, IVB: binary files named %4DV05 (for 92001-12027) and %0DV05 (for 92001-16028).

RTE-6/VM: binary file named %0DV05 (for 92001-16028).

Use %DVA05 (for 92084-16607) hardwired, for CTU equipped terminals.

The following components are included with DVA05 (only):

- a. This manual, part number 92001-90015.
- b. The binary file named %DVA05 for 92001-16035 or 92084-16607 (RTE-6/VM only).

1.2 Operating Environment

The operating environment for DVR05 or DVA05 over hardwire 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 12966 Buffered Asynchronous Data Set Interface Kit with Option 002.
- d. Terminals connected to full-duplex asynchronous modems (Bell 103 or equivalent).

General Information

- 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 no. 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 no. 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.

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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 communications with the RTE system)
PARITY - Hardwired	NONE
- Modem	As selected by user for keyboard/CRT and CTU ASCII only. No parity for binary.

General Information

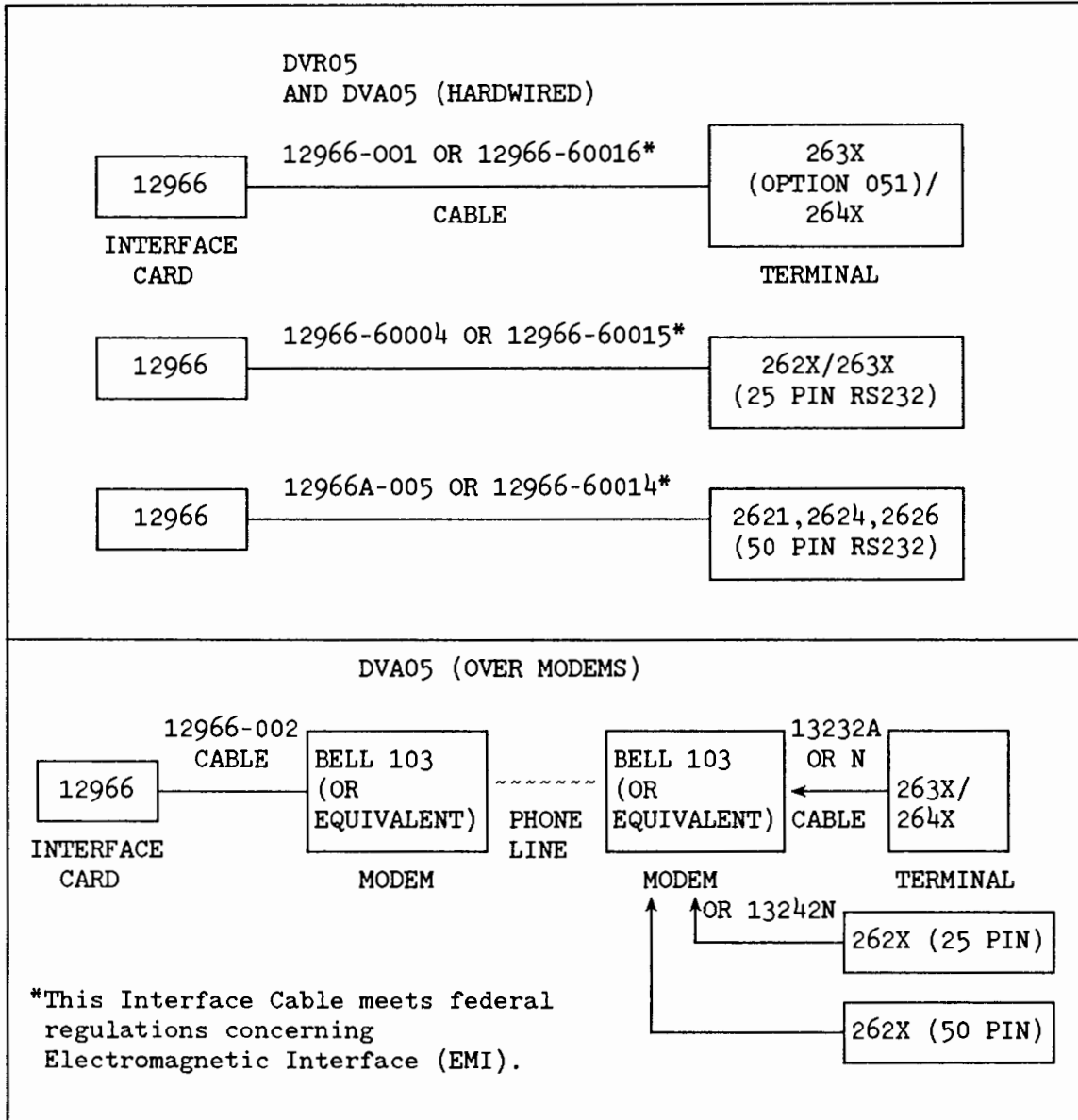


Figure 1-1. Hardware Connections

Chapter 2

Application Information

This section describes the driver cells 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.



Application Information

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
2645/2648 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

Application Information

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 Oper.
2640A/B	Yes	Yes	No	No	No	No	Yes	Yes
2644 w/Ext. Async Data Comm. I/F	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2645/2648 w/Ext. Async Data Comm. I/F	Yes	Yes	No	No	No	No	Yes	Yes
264X w/Cass, and Ext. Async Data Comm. I/F	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
264X with Device Supp. 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 MM 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). 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 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 and the system cannot respond to the keyboard.

Application Information

Table 2-3. Display Control Request

Assembly Language	
<pre> EXT EXEC . . JSB EXEC DEF *+3 (or 4) DEF ICODE DEF ICNWD DEF IPRM1 </pre>	<p>Where:</p> <p>ICODE = Request Code 3 = Control Request</p> <p>ICNWD = Control Word Bits 0 thru 5 = LU number of display 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</p> <p>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 functional code = 11.</p>
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 boot-up, DVR05 reads the terminal status to determine Line or Page strapping. If the user changes the strapping boot-up, 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 time-out. 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	
<pre> EXT EXEC . . JSB EXEC DEF *+5 DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL </pre>	<p>Where:</p> <p>ICODE = Request Code 1 = Read keyboard 2 = Write to display</p> <p>ICNWD = Control Word Bits 0 thru 5 = Logical unit of terminal Bits 6 thru 10 = Function Code Bit 6 = 0 = ASCII Read 1 = Binary Read Bit 7 = 0 = Reserved Bit 8 = 1 = Echo "on" 0 = Echo "off" Bit 9&10 = 11 = Program enabled block read = 01 = Transparent Mode, terminal enabled character or block read = 00 = Non-Transparent Mode, terminal enabled character or block read = 10 = Unused</p> <p>IBUFR = Address of first word of I/O buffer</p> <p>IBUFL = I/O buffer length = n if specified as 16-bit words = -n if specified as 8-bit characters</p>
<pre> FORTRAN </pre>	<p>CALL EXEC (ICODE, ICNWD, IBUFR, IBUFL)</p>

Application Information

- 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 an ASCII display write request, consider the following:

- * In the non-transparent write function, 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). If an underscore character is the last word in the buffer, neither it nor CR and LF are output to the display.
- * 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, the driver does not supply CR and LF. If there are any underscore characters (ASCII 137 octal) in the buffer, they 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*1 (small "L"). Subchannel 3 is used to invoke label mode with the 2648 Graphics Terminal.

Application Information

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 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. In ASCII mode, 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 then echoes a line feed. If a CR is the first character, the driver returns a zero length buffer. In binary mode, the request is complete when the specified number of characters is read.

In both modes, the driver 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 IBUF can be used. Any unused portion of the data buffer, including the unfilled byte of an odd byte length record, may or may not be cleared.

- * 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 (\), DR, 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 (CNTRL 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.

Application Information

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 word5 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.

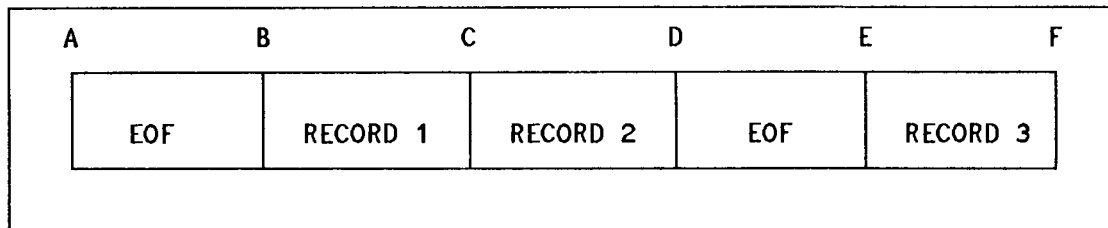


Figure 2-1. CTU Positioning Illustration

Application Information

NOTE

For 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	
<pre> EXT EXEC . . JSB EXEC DEF *+3 (or 4) DEF ICODE DEF ICNWD DEF IPRM1 </pre>	<p>Where:</p> <p>ICODE = Request Code 3 = Control Request</p> <p>ICNWD = Control Word Bits 0 thru 5 = Logical unit number of CTU Bits 6 thru 10 = Function Code</p> <ul style="list-style-type: none"> 01 = Write end-of-file (EOF) 02 = Backspace one record 03 = Forward space one record 04 = Rewind 05 = Rewind Standby 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) <p>All unused bits = Set to 0</p> <p>Note: Motion requests (codes 2-5 and 13-27) set transmission log to zero.</p> <p>IPRM1 = Absolute file number if function code set to 27</p>
<pre> FORTRAN </pre>	<pre> CALL EXEC (3, ICNWD [,IPRM1]) </pre>

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) specifies 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. The maximum buffer length is 128 words; if a greater length is specified, the driver rejects the request (system outputs error code I007). 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.)

Application Information

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

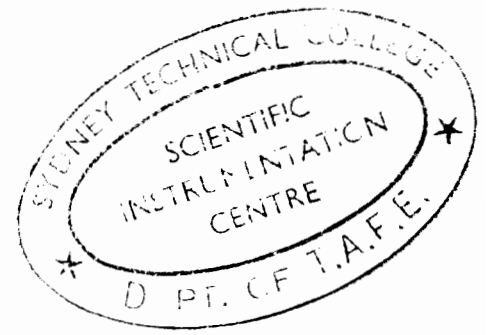
- * Continuously moving the tape back and forth (e.g., re-reading) more than 100 times over a short section of the tape may permanently damage the tape cartridge. Periodically "conditioning" the tape prevents failures due to such back and forth motions. (Refer to "Tape Conditioning Procedures" in the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

<p>Assembly Language</p>	<p>Where:</p> <p>ICODE = Request Code 3 = Control Request</p> <p>ICNWD = Control Word Bits 0 thru 5 = LU number of printer Bits 6 thru 10 = Function code 11 = Space IPRM1 (less than 156) lines</p> <p>IPRM1 = Number of printer space lines; or when negative: 2631/9871 goes to top-of-form; 9866 ignores request</p>
<p>FORTRAN</p>	<p>CALL EXEC (3, ICNWD, IPRM1)</p>



2.7 Printer List Request

Table 2-8 shows the request formats for listing on a supported printer interface 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 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 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 word = -n if specified a 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 operation 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.

Application Information

Table 2-9. Status Request

Assembly Language	
JSB EXEC DEF *+4 (OR 5) DEF ICODE DEF ICNWD DEF ISTA1 DEF ISTA2 DEF ISTA3	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/III Manual for standard description. ISTA3 = LU status (optional). Refer to RTE reference manuals for standard description.
FORTRAN	CALL EXEC (13, ICNWD, ISTA1 [,ISTA2] [ISTA3])

Table 2-10. EQT5 (ISTA1)

Bit Set	Cartridge Unit Tape (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 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 using 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	<p>Where:</p> <p>ICODE = Request Code 3 = Control Request</p> <p>ICNWD = Control Word Bits 0 thru 5 = LU Number of Terminal Bits 6 thru 10 = Function Code 30 = Terminal Initialization</p> <p>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</p>
<pre>EXT EXEC . . JSB EXEC DEF *+4 DEF ICODE DEF ICNWD DEF IPRM1</pre>	
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

Application Information

**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 sent 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	
<pre> EXT EXEC . . JSB EXEC DEF *+4 DEF ICODE DEF ICNWD DEF IPRM1 </pre>	<p>Where:</p> <pre> 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 </pre>
<pre> FORTRAN </pre>	<pre> CALL EXEC (3, ICNWD, IPRM1) </pre>



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

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 the 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 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.

Chapter 3

Configuration Information

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 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.

3.1.1 Program Input Phase

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

3.1.2 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 indefinite 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
:
```

Configuration Information

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 the 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.)

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Tel: 255503-255950
Telex: 84419
P

Wael Pharmacy

P.O. Box 648

BAHRAIN

Tel: 256123
Telex: 8550 WAEL BN
E,C,M

BELGIUM

Hewlett-Packard Belgium S.A./N.V.
Blvd de la Woluwe, 100
Woluwedal
B-1200 BRUSSELS
Tel: (02) 762-32-00
Telex: 23-494 paloben bru
A,CH,CM,CS,E,MP,P

BRAZIL

Hewlett-Packard do Brasil I.e.C. Ltda.
Alameda Rio Negro, 750
Alphaville
06400 BARUERI SP
Tel: (011) 421.1311
Telex: (011) 33872 HPBR-BR
Cable: HEWPACK Sao Paulo
A,CH,CM,CS,E,M,P
Hewlett-Packard do Brasil I.e.C. Ltda.
Avenida Epitacio Pessoa, 4664
22471 RIO DE JANEIRO-RJ
Tel: (021) 286.0237
Telex: 021-21905 HPBR-BR
Cable: HEWPACK Rio de Janeiro
A,CH,CM,E,MS,P*
ANAMED I.C.E.I. Ltda.
Rua Bage, 103
04012 SAO PAULO
Tel: (011) 570-5726
Telex: 021-21905 HPBR-BR
M



SALES & SUPPORT OFFICES

Arranged alphabetically by country

CANADA

Alberta

Hewlett-Packard (Canada) Ltd.
3030 3rd Avenue N.E.
CALGARY, Alberta T2A 6T7
Tel: (403) 235-3100
A,CH,CM,E*,MS,P*

Hewlett-Packard (Canada) Ltd.
11120A-178th Street
EDMONTON, Alberta T5S 1P2
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A,CH,CM,CS,E,MS,P

British Columbia

Hewlett-Packard (Canada) Ltd.
10691 Shellbridge Way
RICHMOND,
British Columbia V6X 2W7
Tel: (604) 270-2277
Telex: 610-922-5059
A,CH,CM,CS,E*,MS,P*

Manitoba

Hewlett-Packard (Canada) Ltd.
380-550 Century Street
WINNIPEG, Manitoba R3H 0Y1
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Nova Scotia

Hewlett-Packard (Canada) Ltd.
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900 Windmill Road
DARTMOUTH, Nova Scotia B2Y 3Z6
Tel: (902) 469-7820
CH,CM,CS,E*,MS,P*

Ontario

Hewlett-Packard (Canada) Ltd.
3325 N. Service Rd., Unit 6
BURLINGTON, Ontario P3A 2A3
Tel: (416) 335-8644
CS,M*

Hewlett-Packard (Canada) Ltd.
552 Newbold Street
LONDON, Ontario N6E 2S5
Tel: (519) 686-9181
A,CH,CM,E*,MS,P*

Hewlett-Packard (Canada) Ltd.
6877 Goreway Drive
MISSISSAUGA, Ontario L4V 1M8
Tel: (416) 678-9430
A,CH,CM,CS,E,MP,P

Hewlett-Packard (Canada) Ltd.
2670 Queensview Dr.
OTTAWA, Ontario K2B 8K1
Tel: (613) 820-6483
A,CH,CM,CS,E*,MS,P*

Hewlett-Packard (Canada) Ltd.
220 Yorkland Blvd., Unit #11
WILLOWDALE, Ontario M2J 1R5
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CH

Quebec

Hewlett-Packard (Canada) Ltd.
17500 South Service Road
Trans-Canada Highway
KIRKLAND, Quebec H9J 2M5
Tel: (514) 697-4232
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Hewlett-Packard (Canada) Ltd.
Les Galeries du Vallon
2323 Du Versant Nord
STE. FOY, Quebec G1N 4C2
Tel: (418) 687-4570
CH

CHILE

Jorge Calcagni y Cia. Ltda.
Av. Italia 634 Santiago
Casilla 16475
SANTIAGO 9
Tel: 222-0222
Telex: Public Booth 440001
A,CM,E,M

Olympia (Chile) Ltda.
Av. Rodrigo de Araya 1045
Casilla 256-V
SANTIAGO 21
Tel: (02) 22 55 044
Telex: 240-565 OLYMP CL
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CH,CS,P

CHINA, People's Republic of

China Hewlett-Packard Rep. Office
P.O. Box 418
1A Lane 2, Luchang St.
Beiwei Rd., Xuanwu District
BEIJING
Tel: 33-1947, 33-7426
Telex: 22601 CTSHP CN
Cable: 1920
A,CH,CM,CS,E,P

COLOMBIA

Instrumentación
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Carrera 4A No. 52A-26
Apartado Aereo 6287
BOGOTA 1, D.E.
Tel: 212-1466
Telex: 44400 INST CO
Cable: AARIS Bogota
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Casa Humboldt Ltda.
Carrera 14, No. 98-60
Apartado Aereo 51283
BOGOTA 1, D.E.
Tel: 256-1686
Telex: 45403 CCAL CO.
A

COSTA RICA

Científica Costarricense S.A.
Avenida 2, Calle 5
San Pedro de Montes de Oca
Apartado 10159
SAN JOSE
Tel: 24-38-20, 24-08-19
Telex: 2367 GALGUR CR
CM,E,M

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Telexera Ltd.
P.O. Box 4809
14C Stassinou Avenue
NICOSIA
Tel: 62698
Telex: 2894 LEVIDO CY
E,M,P

DENMARK

Hewlett-Packard A/S
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Telex: 37409 hpas dk
A,CH,CM,CS,E,MS,P

Hewlett-Packard A/S
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DK-8240 RISSKOV, Aarhus
Tel: (06) 17-60-00
Telex: 37409 hpas dk
CH,E

DOMINICAN REPUBLIC

Microprog S.A.
Juan Tomás Mejía y Cotes No. 60
Arroyo Hondo
SANTO DOMINGO
Tel: 565-6268
Telex: 4510 ARENTA DR (RCA) P

ECUADOR

CYEDE Cia. Ltda.
Avenida Eloy Alfaro 1749
Casilla 6423 CCI
QUITO
Tel: 450-975, 243-052
Telex: 2548 CYEDE ED
CM,E,P

Hospitalar S.A.

Robles 625
Casilla 3590
QUITO
Tel: 545-250, 545-122
Telex: 2485 HOSPPL ED
Cable: HOSPITALAR-Quito
M

EGYPT

International Engineering Associates
24 Hussein Hegazi Street
Kasr-el-Aini
CAIRO
Tel: 23829, 21641
Telex: IEA UN 93830
CH,CS,E,M

EGYPOR
P.O. Box 2558
42 El Zahraa Street
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Telex: 93 337
P

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IPESA de El Salvador S.A.
29 Avenida Norte 1216
SAN SALVADOR
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A,CH,CM,CS,E,P

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Telex: 121563 hewpa sf
CH,CM,CS,P

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02101 ESPOO 10
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A,E,MS

Hewlett-Packard Oy
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Hewlett-Packard Oy
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SF-90140-14 OULU
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Tel: 16 (33) 29 04 42

Hewlett-Packard France
Boite Postale 503
F-25026 BESANCON
28 rue de la Republique
F-25000 BESANCON
Tel: 16 (81) 83-16-22
CH,M

Hewlett-Packard France
13, Place Napoleon III
F-29000 BREST
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Hewlett-Packard France
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Boite Postale 162
F-69130 ECULLY Cedex (Lyon)
Tel: 16 (78) 833-81-25
Telex: 310617F
A,CH,CS,E,MP

Hewlett-Packard France
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F-91035 EVRY Cedex
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Telex: 692315F
E

Hewlett-Packard France
Parc d'Activite du Bois Briard
Ave. du Lac
F-91040 EVRY Cedex
Tel: 16 6 077-8383
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E

Hewlett-Packard France
5, avenue Raymond Chanas
F-38320 EYBENS (Grenoble)
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CH

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Telex: 211032F
CH,CS,E,MS

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Parc d'Activités Cadera
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Avenue du Président JF Kennedy
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Telex: 550105F
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Immeuble "Les 3 B"
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CH**



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125, rue du Faubourg Bannier
F-45000 **ORLEANS**
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Hewlett-Packard France
Zone Industrielle de Courtaboeuf
Avenue des Tropiques
F-91947 Les Ulis Cedex **ORSAY**
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F-75782 **PARIS CEDEX 16**
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Telex: 613663F
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F-64000 **PAU**
Tel: 16 (59) 80 38 02

Hewlett-Packard France
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F-35100 **RENNES**
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Telex: 740912F
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98 Avenue de Bretagne
F-76100 **ROUEN**
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CH* *,CS

Hewlett-Packard France
4 Rue Thomas Mann
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F-67033 **STRASBOURG** Cedex
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Telex: 890 141F
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9, rue Baudin
F-26000 **VALENCE**
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Hewlett-Packard France
Carolor
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F-57640 **VIGY** (Metz)
Tel: 16 (8) 771 20 22
CH

Hewlett-Packard France
Immeuble Péricentre
F-59658 **VILLENEUVE D'ASCQ** Cedex
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A,CH,E,M,P

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Vertriebszentrale Frankfurt
Bernar Strasse 117
Postfach 560 140
D-6000 **FRANKFURT 56**
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A,CH,CM,CS,E,MP,P

Hewlett-Packard GmbH
Geschäftsstelle
Aussonstelle Bad Homburg
Louisenstrasse 115
D-6380 **BAD HOMBURG**
Tel: (06172) 109-0

Hewlett-Packard GmbH
Geschäftsstelle
Kapstadtring 5
D-2000 **HAMBURG 60**
Tel: (040) 63804-1
Telex: 021 63 032 hphh d
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Hewlett-Packard GmbH
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A,CH,CM,E,MS,P

Hewlett-Packard GmbH
Geschäftsstelle
Rosslauer Weg 2-4
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Telex: 0462105
A,C,E

Hewlett-Packard GmbH
Geschäftsstelle
Messerschmittstrasse 7
D-7910 **NEU ULM**
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Telex: 0712816 HP ULM-D
A,C,E*

Hewlett-Packard GmbH
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Ehhericherstr. 13
D-8500 **NÜRNBERG 10**
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Telex: 0623 860
CH,CM,E,MS,P

Hewlett-Packard GmbH
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Eschenstrasse 5
D-8028 **TAUFKIRCHEN**
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GREAT BRITAIN

See United Kingdom

GREECE

Kostas Karayannis S.A.
8 Omirou Street
ATHENS 133
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Telex: 215962 RKAR GR
A,CH,CM,CS,E,M,P

PLAISIO S.A.
G. Gerardos
24 Stournara Street
ATHENS
Tel: 36-11-160
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P

GUATEMALA

IPESA
Avenida Reforma 3-48, Zona 9
GUATEMALA CITY
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Telex: 4192 TELTRO GU
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HONG KONG

Hewlett-Packard Hong Kong, Ltd.
G.P.O. Box 795
5th Floor, Sun Hung Kai Centre
30 Harbour Road
HONG KONG
Tel: 5-8323211
Telex: 66678 HEWPA HX
Cable: HEWPACK HONG KONG
E,CH,CS,P

CET Ltd.
1402 Tung Wah Mansion
199-203 Hennessy Rd.
Wanchia, **HONG KONG**
Tel: 5-729376
Telex: 85148 CET HX
CM

Schmidt & Co. (Hong Kong) Ltd.
Wing On Centre, 28th Floor
Connaught Road, C.
HONG KONG
Tel: 5-455644
Telex: 74766 SCHMX HX
A,M

ICELAND

Elding Trading Company Inc.
Hafnamvöli-Tryggvagölu
P.O. Box 895
IS-REYKJAVIK
Tel: 1-58-20, 1-63-03
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INDIA

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Blue Star Ltd. All computer repairs and
maintenance service is done through
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Band Box House
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BOMBAY 400 025
Tel: 422-3101
Telex: 011-3751
Cable: BLUESTAR
A,M

Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
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BOMBAY 400 025
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Telex: 011-4093
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Kalyan, 19 Vishwas Colony
Alkapuri, **BORODA, 390 005**
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A

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CALCUTTA 700 001
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Telex: 021-7655
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A,M

Blue Star Ltd.
133 Kodambakkam High Road
MADRAS 600 034
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Telex: 041-379
Cable: BLUESTAR
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Blue Star Ltd.
Bhandari House, 7th/8th Floors
91 Nehru Place
NEW DELHI 110 024
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Telex: 031-2463
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15/16-C Wellesley Rd.
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Tel: 22775
Cable: BLUE STAR
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Blue Star Ltd.
2-2-47/1108 Bolarum Rd.
SECUNDERABAD 500 003
Tel: 72057
Telex: 0155-459
Cable: BLUEFROST
A,E

Blue Star Ltd.
T.C. 7/603 Poornima
Maruthankuzhi
TRIVANDRUM 695 013
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR
E

Computer Maintenance Corporation
Ltd.
115, Sarojini Devi Road
SECUNDERABAD 500 003
Tel: 310-184, 345-774
Telex: 031-2960
CH**



SALES & SUPPORT OFFICES

Arranged alphabetically by country

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Jl. Abdul Muis 62
JAKARTA
Tel: 21-373009
Telex: 46748 BERSAL IA
Cable: BERSAL JAKARTA P

BERCA Indonesia P.T.
P.O.Box 2497/Jki
Antara Bldg., 17th Floor
Jl. Medan Merdeka Selatan 17
JAKARTA-PUSAT
Tel: 21-344-181
Telex: BERSAL IA
A,CS,E,M

BERCA Indonesia P.T.
P.O. Box 174/SBY.
Jl. Kutei No. 11
SURABAYA
Tel: 68172
Telex: 31146 BERSAL SB
Cable: BERSAL-SURABAYA
A*,E,M,P

IRAQ

Hewlett-Packard Trading S.A.
Service Operation
Al Mansoor City 9B/3/7
BAGHDAD
Tel: 551-49-73
Telex: 212-455 HEPAIRAQ IK
CH,CS

IRELAND

Hewlett-Packard Ireland Ltd.
82/83 Lower Leeson Street
DUBLIN 2
Tel: 0001 608800
Telex: 30439
A,CH,CM,CS,E,M,P
Cardiac Services Ltd.
Kilmore Road
Artane
DUBLIN 5
Tel: (01) 351820
Telex: 30439
M

ISRAEL

Eldan Electronic Instrument Ltd.
P.O.Box 1270
JERUSALEM 91000
16, Ohaliav St.
JERUSALEM 94467
Tel: 533 221, 553 242
Telex: 25231 AB/PAKRD IL
A

Electronics Engineering Division
Motorola Israel Ltd.
16 Kremenetski Street
P.O. Box 25016
TEL-AVIV 67899
Tel: 3 88 388
Telex: 33569 Motil IL
Cable: BASTEL Tel-Aviv
CH,CM,CS,E,M,P

ITALY

Hewlett-Packard Italiana S.p.A
Traversa 99C
Via Giulio Petroni, 19
I-70124 **BARI**
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M

Hewlett-Packard Italiana S.p.A.
Via Martin Luther King, 38/III
I-40132 **BOLOGNA**
Tel: (051) 402394
Telex: 511630
CH,E,MS

Hewlett-Packard Italiana S.p.A.
Via Principe Nicola 43G/C
I-95126 **CATANIA**
Tel: (095) 37-10-87
Telex: 970291
C,P

Hewlett-Packard Italiana S.p.A.
Via G. Di Vittorio 9
I-20063 **CERNUSCO SUL NAVIGLIO**
(Milano)
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Telex: 334632
A,CH,CM,CS,E,MP,P
Hewlett-Packard Italiana S.p.A.
Via C. Colombo 49
I-20090 **TREZZANO SUL NAVIGLIO**
(Milano)
Tel: (02) 4459041
Telex: 322116
C,M

Hewlett-Packard Italiana S.p.A.
Via Nuova San Rocco a
Capodimonte, 62/A
I-80131 **NAPOLI**
Tel: (081) 7413544
Telex: 710698
A,CH,E

Hewlett-Packard Italiana S.p.A.
Viale G. Modugno 33
I-16156 **GENOVA PEGLI**
Tel: (010) 68-37-07
Telex: 215238
E,C

Hewlett-Packard Italiana S.p.A.
Via Pelizzo 15
I-35128 **PADOVA**
Tel: (049) 664888
Telex: 430315
A,CH,E,MS

Hewlett-Packard Italiana S.p.A.
Viale C. Pavese 340
I-00144 **ROMA EUR**
Tel: (06) 54831
Telex: 610514
A,CH,CM,CS,E,MS,P*

Hewlett-Packard Italiana S.p.A.
Via di Casellina 57/C
I-50018 **SCANDICCI-FIRENZE**
Tel: (055) 753863
Hewlett-Packard Italiana S.p.A.
Corso Svizzera, 185
I-10144 **TORINO**
Tel: (011) 74 4044
Telex: 221079
CH,E

JAPAN

Yokogawa-Hewlett-Packard Ltd.
152-1, Onna
ATSUGI, Kanagawa, 243
Tel: (0462) 28-0451
CM,C*,E

Yokogawa-Hewlett-Packard Ltd.
Meiji-Seimei Bldg. 6F
3-1 Hon Chiba-Cho
CHIBA, 280
Tel: 472 25 7701
E,CH,CS

Yokogawa-Hewlett-Packard Ltd.
Yasuda-Seimei Hiroshima Bldg.
6-11, Hon-dori, Naka-ku
HIROSHIMA, 730
Tel: 82-241-0611

Yokogawa-Hewlett-Packard Ltd.
Towa Building
2-3, Kaigan-dori, 2 Chome Chuo-ku
KOBE, 650
Tel: (078) 392-4791
C,E

Yokogawa-Hewlett-Packard Ltd.
Kumagaya Asahi 82 Bldg
3-4 Tsukuba
KUMAGAYA, Saitama 360
Tel: (0485) 24-6563
CH,CM,E

Yokogawa-Hewlett-Packard Ltd.
Asahi Shinbun Daiichi Seimei Bldg.
4-7, Hanabata-cho
KUMAMOTO, 860
Tel: (0963) 54-7311
CH,E

Yokogawa-Hewlett-Packard Ltd.
Shin-Kyoto Center Bldg.
614, Higashi-Shiokoji-cho
Karasuma-Nishiiru
Shiokoji-dori, Shimogyo-ku
KYOTO, 600
Tel: 075-343-0921
CH,E

Yokogawa-Hewlett-Packard Ltd.
Mito Mitsui Bldg
4-73, Sanno-maru, 1 Chome
MITO, Ibaraki 310
Tel: (0292) 25-7470
CH,CM,E

Yokogawa-Hewlett-Packard Ltd.
Sumitomo Seimei 14-9 Bldg.
Meieki-Minami, 2 Chome
Nakamura-ku
NAGOYA, 450
Tel: (052) 571-5171
CH,CM,CS,E,MS

Yokogawa-Hewlett-Packard Ltd.
Chuo Bldg.,
4-20 Nishinakajima, 5 Chome
Yodogawa-ku
OSAKA, 532
Tel: (06) 304-6021
Telex: YHPOSA 523-3624
A,CH,CM,CS,E,MP,P*

Yokogawa-Hewlett-Packard Ltd.
27-15, Yabe, 1 Chome
SAGAMIHARA Kanagawa, 229
Tel: 0427 59-1311

Yokogawa-Hewlett-Packard Ltd.
Daiichi Seimei Bldg.
7-1, Nishi Shinjuku, 2 Chome
Shinjuku-ku, **TOKYO** 160
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CH,E

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Suginami-ku **TOKYO** 168
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Telex: 232-2024 YHPTOK
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