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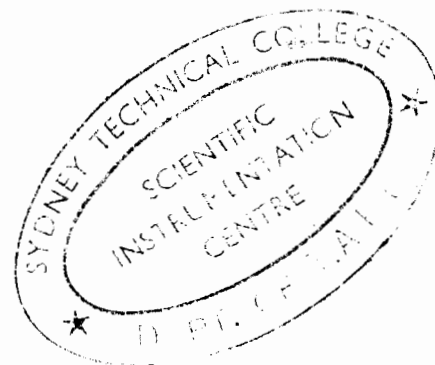
DVC12
Line Printer Driver

Reference Manual

PRINTING HISTORY

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

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 software 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.

First Edition .... Jul 1982

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Chapter 1
General Information

Product Description

This manual describes the HP driver DVC12 included with the RTE-IVB or RTE-6/VM operating system. References to RTE pertain to both operating systems. Driver DVC12 provides the software interface between the RTE operating system and the HP 2608S graphics printer.

The 2608S graphics printer is a medium speed, hard copy system list and plot device. It is microprocessor controlled and is capable of alphanumeric output in both programmably selectable languages and print fonts or in a graphics mode.

The graphics mode of the 2608S enables it to transmit a dot-per-bit binary pattern. On any given transmission the user is able to place a dot or dots in any or all of the 924 dot positions. The dot-per-bit capability is especially useful when a software graphics application package is used.

Interface Requirements

The 2608S graphics printer must interface to an HP 1000 M/E/F-Series computer through the 12821A-001 interface card and its associated cable. Only one 2608S printer can be connected to each 12821A-001 interface card, with 11 meters of maximum cable length. The printer HP-IB address must be set to 0. No other devices (disc, voltmeters, magnetic tape units, etc.) can share the interface card.

Functional Features

The following capabilities of the 2608S are supported by DVC12:

1. Print from primary and/or secondary character set on the same line.

2. Select print and transparency modes.

3. User selection of primary/secondary character sets.

4. Programmatic definition of vertical forms control at 6 or 8 lines per inch (LPI).

5. Programmatic reset of vertical forms to standard HP 6 or 8 LPI definitions.

6. Device Clear Request.

7. Dynamic Status Request.

8. VFC Control Request.

9. Device Self Test Request.

10. Definition of First Print Column.

Chapter 2
Functional Description

DVC12 is a non-privileged, RTE driver, operating without DMA (DCPC). Control and data information is passed to DVC12 in EQT entries in the base page communication area per the standard RTE driver format. The EQT entries are described in Table 2-1.

Driver DVC12 contains an initiation section, IC12, and a continuation/completion section, CC12. IC12 initiates requests unique to the 2608S for various print modes and control functions. IC12 exits in all cases in a maximum of 3 milliseconds from entry time. The continuation/completion section, CC12, is reentered to complete those user requests requiring more than 3ms. Upon exit of IC12, the content of the A-register shows the request status:

A=0	Operation initiated
A=1	Illegal request code
A=2	Illegal control function
A=3	Device not ready or device malfunction
A=4	Immediate completion

Upon successful completion of a user request, the A-register contains the device status, shown in Table 2-2. The B-register contains the number of words or characters transferred, depending upon the user request. The current configuration of the printer is given in EQT 11, as shown in Table 2-3.

Table 2-1. DVC12 EQT Usage

EQT Entries	Description
EQT 1	Device suspend list pointer
EQT 2	Driver initiation section address
EQT 3	Driver completion section address
EQT 4	[Driver Flags][Unit #][Channel]
EQT 5	[AV][EQ Type code][Status]
EQT 6	CONWD (Current I/O request)
For write or read requests	
EQT 7	Buffer Address
For control requests	
EQT 7	Optional parameters
EQT 8	Buffer length
For write requests	
EQT 9	Optional VFC/Line Skip control request
EQT 10	Temp. Storage for DVC12
EQT 11	Temp. Storage for DVC12
EQT 12	EQT Extension size (XX words)
EQT 13	EQT Extension starting address
EQT 14	Device time-out reset value
EQT 15	Device time-out clock

Table 2-2. Device Status

EQT 5	Description
Bit 7	Power failed
Bit 6	Undefined
Bit 5	Undefined
Bit 4	Undefined
Bit 3	On line
Bit 2	Undefined
Bit 1	Undefined
Bit 0	Undefined

Table 2-3. EQT 11 Definition

Bit #	Description
Bit 15	Continuation return
Bit 12	Transparency on/off flag
Bits11	Current print mode where:
thru 8	0000 = Standard print
	0001 = Double size print
	others = Reserved
Bit 7	Supress space on next operation
Bit 1	Auto page eject mode
Bit 0	Control word output

Bits 14,13,6,5,4,3,2 are reserved.

Write Request

The write request directs the contents of a user buffer to the 2608S and initiates printing from the currently specified primary and/or secondary character set in the selected print mode. The user must supply DVC12 with the address of the first buffer word and the number of words or ASCII characters to be transferred. Paper movement may be controlled in one of two ways:

1. Use of first data character for forms control. The second character of the buffer is printed in the first print position.

2. The use of a paper motion control request to either skip a specified number of lines from current position or to select a predetermined position on the paper with a Vertical Format Channel (VFC) command.

The user must ensure that the data stream does not exceed the printing capabilities of the 2608S (132 characters maximum). DVC12 does not detect excessive length in the user data buffer. All characters following the 132nd character will be lost.

The appearance of the output is a direct function of the currently selected print mode. The write request itself neither checks nor modifies the current print mode. The print mode is controlled by a control request, described in the following section.

Select Print Mode Control Request

The select-print-mode control request specifies the current and all subsequent print modes for write requests to the driver. The print modes available in the 2608S printer are the standard alphanumeric print, the double-size print, or graphics. On receipt of this control request, the driver changes the 2608S printer into the requested print mode which remains in effect until either a new mode is requested or a "device clear" control request is received.

If the printer returns with a power-fail status or the operator presses the "RESET" key on the front panel, the driver will restore the print mode that existed prior to the power fail or "RESET".

In conjunction with the selected print mode, a transparency mode can be turned ON or OFF. If turned on, the transparency mode disables the following control characters in the 2608S printer: the SHIFT IN (SI), SHIFT OUT (SO), and BACKSPACE (BS) control characters. The result is that the SI, SO and BS control characters are printed rather than causing the printer to perform the specified action. The default transparency mode is OFF which enables the 2608S to perform the action specified by the control character.

The calling sequences for the select print mode control request and for turning the transparency mode ON or OFF are given in Chapter 4.

Selection of the double size print mode causes subsequent write requests to be printed at twice the normal print size up to a maximum of 66 characters per line. Paper motion following the print is either to select VFC channel 3 or skip 1 line depending on the state of the "auto page eject" flag in the driver. Control requests for paper motion, when in double size print, are available. Line skip requests causes twice the normal paper motion. While in the double size print mode, a skip-1-line command moves the paper twice as far as the normal print mode. For example, skip 4 lines moves one inch of paper if in the 8 lines/inch and double size print mode. The same skip would move only one half inch of paper in the 8 lines/inch and normal print mode. If 6 lines/inch is selected, a skip of 3 lines causes one inch of paper movement in double size print mode, half an inch in normal print mode. VFC channel requests cause motion to the selected channel independent of the current double size print mode.

Character Set Change Control Request

This control request changes the primary/secondary character set definitions of the 2608S to those requested in the IPRAM parameter. Parameter IPRAM is described in the control request description given in Chapter 4 of this manual. The available HP supported character sets are described in Table 2-4.

Table 2-4. Standard and Optional Character Sets

```
+-------------------------------------------------------------------+
|          LANGUAGE              OCTAL CODE    BINARY CODE           |
|-------------------------------------------------------------------|
|     Standard Language                                             |
|        ASCII                       00           0000              |
|                                                                   |
|     Optional Language (-001)                                      |
|        ARABIC                      01           0001              |
|        CYRILLIC                    02           0010              |
|        KATAKANA                    03           0011              |
|        DRAW                        04           0100              |
|                                                                   |
|     Block                          05           0101              |
|     Math                           06           0110              |
|                                                                   |
|     Optional Language (-002)                                      |
|     (ISO Substitution Set)                                        |
|        APL                         07           0111              |
|        FRENCH                      10           1000              |
|        GERMAN                      11           1001              |
|        SWEDISH/FINNISH             12           1010              |
|        DANISH/NORWEGIAN            13           1011              |
|        SPANISH                     14           1100              |
|        BRITISH                     15           1101              |
|        JAPANESE ASCII              16           1110              |
|        ROMAN EXTENSION SET         17           1111              |
|                                                                   |
+-------------------------------------------------------------------+
```

Programmatic Definition of Vertical Format Information

The vertical forms definitions of the the 2608S may be redefined programmatically by a write request. This write request requires a user buffer containing vertical format channel information for each line of the form. The IBUFL parameter in the write request defines 6 or 8 lines per inch and the number of lines to be included in one page. The maximum forms length is 127 lines. The driver rejects any request with form length equal to zero. The IBUFA parameter in the write request contains the first word address of a user buffer defining the forms channels. The buffer should contain X words, where 1<X<127 is the number of lines in the form. Word 1 of the buffer defines the 16 VFC channels for line 1 for the form, word 2 defines the 16 channels for line 2, etc. Refer to the control request calling sequence description in Chapter 4 for more details on the data format. In all cases of defining the VFC programmatically, the forms position at the time of the request is defined as the new top-of-form (TOF). Should either a power fail or a RESET occur on the 2608S, all aspects of the programmable VFC are lost. The driver is unable to recover such information.

Programmatic Reset of Vertical Forms

The user may reset the vertical forms to a predefined 2608S standard VFC. Specification of 6 or 8 LPI is via the IPRAM parameter.

NOTE

If a standard VFC is installed when this command is received then the current forms position is NOT redefined as a new TOF. Rather the line count number is transposed from 6 to 8 or 8 to 6 LPI as the case may be. In any other possible combination the current forms position is redefined as the new TOF.

Self Test Control Request

The self test control request causes the 2608S to execute the internal microprocessor controlled self test function. The self test takes approximately 17 seconds to execute and results in a full page of output.

All conditions that existed prior to execution of this request are restored on completion of self test unless self test fails.

Device Clear Request

The device clear request causes a TOF command to be sent to the printer followed by a Master Clear command. The TOF command is issued to ensure that there is no data in the printer buffer and that the form is properly positioned on completion of the Master Clear.

This request should be used at the start of all applications since it always resets the 2608S to a known power up state.

Dynamic Status Request

The dynamic status request returns the I/O status of the 2608S. EQT 5 is updated and the status is returned to the calling program in the A-register. The device status definition is shown in Table 2-2.

Paper Motion Control Request

The paper motion control request provides the following options:

* Skip from 1-55 lines (print lines, not dot rows)

* VFC channels 1 thru 16

* Auto page eject mode ON or OFF

* Suppress paper motion following data transfer. This allows the "overprint" mode

Detail explanation of the parameter required for each request is contained in Chapter 4.

Definition of First Print Column

Under program control the user is able to dynamically define which column is to be column 1. The value supplied in IPRAM by this control request is used to logically "blank out" the number of columns specified in IPRAM. For example, a value of seven causes all subsequent printing to begin in column 8. Note that this shortens the maximum line length to 124. A value of zero resets the first column back to the power up state, printing starting in column 1. The effective print line length is then equal to 132.

The driver does monitor the state of this feature. Should a power fail or RESET occur, the first column is defined as per the value last supplied by this control request. Once the first column has been defined, the operator will NOT be able to reset to physical column 1 via local operation, i.e., by pressing RESET on the front panel. This feature, once enabled, is turned off by one of the following:

1. Repeat of control request with IPRAM = 0.
2. Master clear control request.
3. Re-boot the system.

If the current print mode is double size, the shift in column 1 position is proportional. If the mode is graphics then the shift is calculated by (IPRAM X 8) which determines the number of leading dot columns that are skipped.

Automatic Device Restart

Whenever the printer is placed on-line by the operator, it generates an interrupt. Upon detection of such a spurious interrupt, the driver calls $UPIO to allow the system to initiate any pending calls. It is therefore not necessary for the operator to respond to the NOT READY message with the UP command but rather to satisfy all conditions required to allow the device to go ON-LINE and then press the ON LINE switch on the front panel of the 2608S.

Device Timeout

The driver always overrides either the timeout value supplied at generation time or the TO operator command by inserting a timeout value directly into EQT 15. The worst possible case is the timeout associated with the self test control request which is about 17 seconds. Next is about 4 seconds for a maximum paper skip in double size print. The driver supplies a timeout value in EQT 15 appropriate to the request. The driver does not handle a timeout should it occur but rather lets the system process the timeout in normal fashion.

2608S Internal Buffering

Due to the design of the RTE system and the design of the 2608S there is a situation whereby from 1 to 2 lines of output may be lost because of the power fail recovery process in the 2608S. The internal buffering scheme of the 2608S is such that a complete output record will be accepted and the system signaled prior to any actual mechanical print action. Furthermore, it will be able to accept all of the data in the next print request while it is just beginning to print the previous request. Should either a power fail or a manual RESET occur at this time, all the buffered data in the 2608S will be lost and any print in progress will be abruptly terminated. But as far as the system is concerned, the previous record was signaled complete prior to the detection of the power fail or RESET, and the interrupt caused by the power fail or RESET will flag the last request complete.

Chapter 3
Configuration Guidelines

This chapter provides configuration guidelines for integration of DVC12 into an HP 1000 RTE-IVB or RTE-6/VM system. It is intended to augment the information provided in the system generation/software installation manuals. The driver size is approximately 1325 words and the driver module name is %DVC12.

Generation Procedure

Load the relocatable module, %DVC12, into the RTE system during system generation as described in the above mentioned manuals. During the system generation, take the following steps to configure the driver into the system.

Program Input Phase

The relocatable module %DVC12 must be provided with all other system modules during this phase.

Table Generation Phase

In this phase, make the following entries:

a. Provide an Equipment Table (EQT) entry for each 2608S intended for the system.
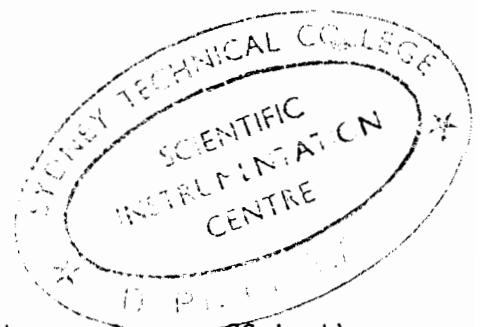
   * EQUIPMENT TABLE ENTRY

   Where the prompt is in the format: EQT XX?

   The response for DVC12 should be:

   SC,DVC12,B,X=10

   Where XX in the prompt is the current EQT entry number. SC is the select code of the I/O controller. The B specifies the buffering option. The X option for extended EQT is required and will result in driver malfunction if not specified. A ten-word extension is required. The T for Time Out option is meaningless since the driver controls its own time outs.

   DMA is not used by this driver.

b. Provide a Device Reference Table (DRT) entry to relate the desired Logical Unit (LU) number for each printer to the EQT entry.

    * DEVICE REFERENCE TABLE

    Where the prompt is in the format: LU = EQT#?

    The response is in the format: EQT#

    The response is to provide the EQT number to relate to the LU specified in the prompt. The 2608S always uses HP-IB address 0 (subchannel 0).

c. Provide an Interrupt Table entry to establish the links that tie the Select Codes back to the EQT entries.

    * INTERRUPT TABLE

    Where the response is in the format: SC,EQT,N

    SC is the Select Code. EQT,N specifies that control should be directed to EQT entry N when the device in SC interrupts.

Hardware Configuration

Install the 12821A-001 interface card in the processor per the interface card installation and service manual. Set the HP-IB address on the 2608S printer to 0. Only one printer can be connected per interface card. However, there is no limit on the number of printer and interface card combinations that can be installed in your system. No other device can share the 12821A-001 interface card with the 2608S printer. The maximum cable length between the printer and processor is 11 meters.

Chapter 4
Calling Sequences

Standard Write Request

The standard calling sequence for write requests is as follows:

Assembly call: FORTRAN call:

```
EXT EXEC          CALL EXEC(ICODE,ICNWD,IBUFA,IBUFL)
JSB EXEC
DEF *+5
DEF ICODE
DEF ICNWD
DEF IBUFA
DEF IBUFL
```

where: ICODE = 2 = Request code

    ICNWD = Control Word Defined as:
            Bits 0
            thru 5 = Device Logical Unit Number

        Bit 6 = Not used

        Bit 7 = Print mode bit ("V"-bit) where if:

            1 = Print contents of print buffer using standard
                or double size print followed by VFC channel 3
                (Auto page eject on) or skip 1 line (Auto page
                eject off).

            0 = First character of buffer is used for line
                control. The second character of the buffer is
                printed in column 1 of the printer. The
                control meanings of the first character in the
                buffer are:

                Blank = single space. Data is printed followed
                        by either VFC ch. 3 or skip 1 line for
                        auto page eject on or off.

                    0 = double space. VFC ch. 3 or skip 1 line
                        precedes the data followed by the same
                        VFC ch. 3 or skip 1 line. In both
```

cases the choice is a function of auto page eject on or off.

1 = Eject current page with VFC ch. 1 then transfer data followed by VFC ch. 3 or skip 1 line depending on auto page eject on or off.

* = No paper motion either before or after the data transfer, overprint.

+ = same as "*".

Any other = same as for blank character.
character

Bit 8  = Reserved – Set to zero.

Bit 9  = VFC define bit where if:

0    Then user buffer contains data. It is not a VFC define request. Interpretation of a standard write continues.

1    The user is requesting a programmatic modification of the current VFC definition. The request is interpreted as per a VFC define write request.

Bit 10 = Honesty mode where if:

0    Then print using standard line data with driver providing carriage control.

1    Then print using only imbedded carriage control, driver provides none.

Bits 11
thru 15 = Reserved; set to zero

IBUFA = Address of first word of user data buffer.

IBUFL = Length of data buffer. If positive, length is given in words; if negative, length is in characters. A buffer length of zero causes a VFC ch. 3 if auto page eject is set. Otherwise it causes a skip of 1 line.

NOTE

The "V" bit is not implemented in the graphics mode. In graphics, all paper movement other than the default of skip 1 dot row must be controlled by a specific control request.

In summary, line movement following the print may be controlled by:

1.  The "V" bit (bit 7).
2.  First character of the buffer.
3.  Specific control requests to specify paper motion.
4.  Current print mode of the 2608S.

# VFC Define Write Requests

The VFC define write request is a continuation of the write request described above. This section explains the parameter definitions when Bit 9 of ICNWD is set, a VFC define operation.

IBUFA = Address of first word of buffer containing data for all 16 VFC channels. Buffer must be set up with the same number of words as specified by Bits 0 thru 6 of IBUFL.

Buffer format: Each bit of each word defines a specific VFC channel. For example:

First word of buffer

    Bit 15 = VFC channel 16
    Bit 14 = VFC channel 15
    Bit 13 = VFC channel 14
     :    :
    Bit  0 = VFC channel 1

Second word of buffer
     :
     :
Consecutive words of the buffer define consecutive VFC channel assignments thru the length of the buffer.

IBUFL = Length of VFC define buffer and whether 6 or 8 LPI.

    Bit 7 = 0 or 1 for 6 or 8 LPI.

    Bit 0
    thru 6 = Length of the form for the VFC define. This is the number of lines from top of form to the top of the next form. Maximum forms length is 127 lines. Standard forms size for 6 LPI is 66 lines and for 8 LPI is 88 lines. A buffer length of zero causes a command reject.

The IFORM parameter is not required for this operation.

# Control Requests

The calling sequence for control requests is as follows:

Assembly call:                    FORTRAN call:

    EXT EXEC            CALL EXEC(ICODE,ICNWD,IPRAM)
    JSB EXEC
    DEF *+3(or 4)
    DEF ICODE
    DEF ICNWD
    DEF IPRAM (Optional)

 Where:

ICODE = 3 = Request code

ICNWD = Control word

        Bits 0
        thru 5  = Device Logical Unit Number

        Bits 6
        thru 10 = Control Information, where if:

        OB = Clear Control. The following sequence of events occur:

        Top of Form is issued to position the paper.

        Master Clear is issued to reinstall default conditions:

        a. Print mode is  set to standard and transparency  is set to
           "off".
        b. Page eject mode is set "on".
        c. Primary/secondary language and 6/8 LPI are selected as per
           switch labeled  "POWER ON CONDITIONS"  on the  front panel
           under the access cover.
        d. A standard 6  or 8 LPI VFC  is selected as per  the switch
           mentioned above.
        e. The internal print buffer is  cleared and logical column 1
           is set equal to physical column 1.
        f. Selection  of  Primary/Secondary  languages  via  SI/SO
           defaults to SI.

        6B = Dynamic status request

            This request returns the 2608S I/O status to the user in
            the A-register and updates the driver status in EQT 5.

        11B = Paper motion request (requires IPRAM)

IPRAM = Parameter to indicate one of the following:

| IPRAM (decimal) | VFC Channel | Description |
|---|---|---|
| <0 | 1 | Page eject (Top of form) |
| 0 | | Suppress space on next operation |
| 1 thru 55 | | Skip 1 thru 55 lines as specified |
| 56 | 3 | Skip to next single space line |
| 57 | 4 | Skip to next double line |
| 58 | 5 | Skip to next triple line |
| 59 | 6 | Skip to next half page |
| 60 | 7 | Skip to next quarter page |
| 61 | 8 | Skip to next tenth line |
| 62 | 2 | Skip to bottom of form |
| 63 | 1 | Skip to top of form |
| 64 | | Set auto page eject mode (Default) |
| 65 | | Clear auto page eject mode |
| 66 | 9 | Skip to bottom of form with status |
| 67 | 10 | Skip to line before bottom of form |
| 68 | 11 | Skip to line before top of form |
| 69 | 12 | Skip to top of form with status |
| 70 | 13 | Skip to next seventh line |
| 71 | 14 | Skip to next sixth line |
| 72 | 15 | Skip to next fifth line |
| 73 | 16 | Skip to next fourth line |
| >73 | | Not defined so ignore the request |

15B = Change character set (requires IPRAM)

> IPRAM contains the codes for primary and secondary character set assignment. See Table 2-1 for code assignments.

> Bits 0 thru 3 = Octal code for new primary set

> Bits 4 thru 7 = Octal code for new secondary set

16B = VFC reset (requires IPRAM)

> IPRAM = 0 or 1 to select either the standard 6 or standard 8 lines per inch VFC definition.

20B = Self Test (requires IPRAM)

> Requests either the printing or non-printing version of the internal microprocessor controlled self test function of the 2608S.

```
        IPRAM (0)=Do the printing version of self test
              (1)=Do the non-printing version of self test
```

21B = Definition of First Column (requires IPRAM)

IPRAM defines which physical print column is to be the
first print column.   Refer to the Internal Buffering
section in Chapter 2 for details.

```
Bits 0
thru 7  = Column definition where:

          000 = Print in column 1
          001 = Print in column 2
                  :
          203 = Print in column 132
Bits 8
thru 15 = Not used
```

30B = Select Print Mode (requires IPRAM)

IPRAM contains the code for the requested print mode and
whether or not it is selected in the transparent mode.

```
Bits 0
thru 3  = Mode code where:

          0000 Standard print(default)
          0001 Double size print
          0010
          thru
          1111 Reserved
```

Selection of a reserved mode defaults to standard print.

```
Bit 4 = 0 Transparency "OFF" (default)
      = 1 Transparency "ON"
```

Transparency "ON" or "OFF" can only be selected in
conjunction with a print mode select.   The appropriate
value for the print mode must be supplied in bits 0 thru
3. This bit is meaningless in graphics mode.

```
Bits 5
thru 15 = Not used
```

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