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HP 3000 APPLICATION NOTE #23

VFC FILES

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Note #	*Published*	*Topic*
1	2/21/85	*HP 3000 Printer Configuration Guide (superseded by note #4)*
2	10/15/85	*Terminal Types for HP 3000 HPIB Computers (superseded by note #13)*
3	4/01/86	*HP 3000 Plotter Configuration Guide*
4	4/15/86	*HP 3000 Printer Configuration Guide - Revised*
5	5/01/86	*MPE System Logfile Record Formats*
6	5/15/86	*HP 3000 Stack Operation*
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VFC FILES

The purpose of this Application Note is to provide an overview of Forms Control (VFC) and to supplement Chapter 8 of the *System Operation and Resource Management Reference Manual* (Part No. 32033-90005). This note contains a general description of VFC including a table which describes the standard VFC channel definitions and a table on the action taken by the printer when a channel is selected. The next section describes the format of the VFC file followed by four examples of VFC files.

WHAT'S VFC ALL ABOUT?

VFC allows you to specify how your printouts will appear when they are printed on the printer. Most customers use the HP default VFC, but when you need to print special forms (such as those used for printing paychecks or invoices) you can design your own VFC.

Carriage Control (CCTL) is a single byte at the beginning of each record of a file defined with CCTL. The carriage control byte tells the printer which VFC channel to use. The actions that HP printers will take with the HP standard VFC are specified in Table 1.

The printer may either execute the carriage control before printing the line (pre-space mode) or after (post-space mode). The default on the 3000 is post spacing, with two exceptions. COBOL (when using the AFTER ADVANCING clause) and FORTRAN default to pre-space mode.

This discussion pertains to electronic VFCs that can be used with the 2608A/S and 256x printers with an HPIB interface. This does not apply to printers connected to ADCC/ATP serial ports.

The VFC file is created with the Editor and is downloaded to the printer with the :DOWNLOAD command or by using the ";ENV=" parameter of the :FILE command. The :DOWNLOAD command should always be used with the 2608A printer. The ";ENV=" parameter of the file command should be used with the 2608S and 256x printers. The :DOWNLOAD command will work with the 2608S and 256x printers, but eliminates the ability of the printer to recover automatically from a power failure. The :DOWNLOAD command can also hang a 2608S or 256x printer if the command is issued when another spoolfile is active. The system must then be restarted to clear the printer. Please refer to the MPE Commands Reference Manual for the use and syntax of the :DOWNLOAD and :FILE commands.

Table 1. VFC Channel Definitions

Channel	Definition
1	Top of Form (line 1)
2	Bottom of Form (BOF (last line of text))
3	Single space (lines 1,2,3,4...)

Table 1. VFC Channel Definitions (continued)

Channel	Definition
4	Double space (lines 1,3,5,7...)
5	Triple space (lines 1,4,7,10...)
6	Half Form*
7	Quarter Form*
8	Tenth space (lines 1,11,21,32...)
9	Bottom of Form
10	Bottom of Form minus one line (BOF-1)
11	Top of Form minus one line (TOF-1)
12	Top of Form
13	Seven space (lines 1,8,15...)
14	Six space (lines 1,7,13...)
15	Five space (lines 1,6,11...)
16	Four space (lines 1,5,9...)

* VFC channels 6 and 7 (half form and quarter form) are computed based on the desired form length. In the formulas that follow, BOF stands for Bottom of Form.

Channel #	Formula	Description
6	(BOF + 1)/2 + 1	Half Form line #
7	(BOF + 3)4 + 1	First Quarter Form line #
7	(BOF + 1)/2 + 1	Second Quarter Form line #
7	3 * (BOF + 1)/4 + 1	Third Quarter Form line #

For example, to determine which line on the page should contain the definition for channel 6 (Half Form) for a form with the Bottom of Form (channel 2) defined as print line 60, use the following equation:

```
Half Form line # = (60 + 1)/2 + 1
                 = 30.5 + 1
                 = 31.5
```

The fraction is dropped, leaving 31 as the line to be defined as the Half Form line. To calculate where the third Quarter Form line should be defined, use the following equation:

```
third Quarter Form line # = 3*(60 + 1)/4 + 1
                          =183/4 + 1
                          =45.75 + 1
                          =46.75
```

The fraction is dropped, leaving 46 as the line to be defined as the third Quarter Form line. The first and second Quarter Form lines are calculated in a similar manner.

Programs can send VFC commands to the printer in a variety of ways. Some examples are the FWRITE and FCONTROL intrinsics. When the printer receives a VFC command from the program, it refers to the image of the VFC file that has been downloaded into its memory. The carriage control directives used to select the VFC channels are listed in the MPE Intrinsics Manual under the FWRITE intrinsic and range from %300 to %317 ("%" denotes octal). For example, if a program issued a %304 carriage control command to the printer (%304 selects VFC channel 5 which is triple space), the printer would start at its current print line and look down the VFC image to find the next occurrence of a "1" in VFC channel 5. It would then advance paper to that line. This is called "slewing" paper and is sometimes more efficient than stepping paper on a line by line basis. The action taken by the printer when a VFC channel command is received is listed in the following table.

Table 2. Printer Action When a VFC Channel is Selected

Channel	Action Taken
1	Slew paper to the top of the next form
2	Slew paper to the bottom of the form
3	Slew paper to the next line
4	Slew paper to the next double space line
5	Slew paper to the next triple space line
6	Slew paper to the next half page line
7	Slew paper to the next quarter page line

Table 2. Printer Action When a VFC Channel is Selected (continued)

Channel	Action Taken
8	Slew paper to the next tenth space line
9	Slew paper to the bottom of the form
10	Slew paper to one line previous to the bottom of the current form
11	Slew paper to one line previous to the top of the next form
12	Slew paper to the top of the next form
13	Slew paper to the next seventh space line
14	Slew paper to the next sixth space line
15	Slew paper to the next fifth space line
16	Slew paper to the next fourth space line

The actual number of lines that the printer will move is dependent upon the current line of print. For example, if the printer was on a line defined as a triple space line (VFC channel 5) and a command was received to slew to the next occurrence of a triple space line, the printer would advance three lines. If the current line of print was on a line not defined as a triple space line, the printer would advance one or two lines, depending where the next triple space line was defined.

Format of the VFC File

The VFC file is built using the Editor and is kept unnumbered. Three parameters can be specified in this file: MARGIN=, MODE=, and VFC. These parameters are placed on separate lines at the beginning of the file; MARGIN= and MODE= are optional, but, if used, should appear before VFC. All text in the Editor file should begin in column 1. Do not add spaces or blank lines between the parameters or the page image. This may make the VFC file more readable for the user, but the system and printer will not interpret the VFC file correctly.

NOTE

Certain limitations exist in using the MODE= and MARGIN= parameters. First, MODE= cannot be used in a VFC Editor file for an HP 2608A. Secondly, MARGIN= can cause data on the right hand side of the printout to be lost. A difference exists in the way that the columns are numbered for the different printers. The physical left margin for the 256x printers is column "0". The physical left margin for the 2608A/S is column "1".

Following is the format of the three parameters:

`MARGIN=nn`

The value nn is an integer between 1 and 16, inclusive, and specifies the left margin indentation.

The HP 2608A hardware documentation that comes with the printer discusses a "margin offset" which varies from 0 to 15. This offset is not the same as the MARGIN= parameter, because the software compensates for the hardware offset of nn+1.

`MODE=[TRANSPARENT / FEATURE]`

Specifies that control characters and escape sequences are printed as part of the normal data stream instead of being executed. FEATURE allows the printer to act on these control characters and escape sequences. MODE= is valid only on the HP 2608S and the HP 256x, and is ignored by the 2608A. The default is the MODE specified by the subtype for the device in the system I/O configuration. Subtype 9 is for FEATURE mode and 13 is for TRANSPARENT mode. The MODE= parameter in the VFC file allows the user to temporarily override the device subtype for the 2608S and 256x printers.

`VFC,x,y,string`

The value of x is either 6, 8, or blank, and specifies print line spacing in lines per inch. Default (blank) is six lines per inch; if a blank is used, a comma (,) must be used as a place holder. Note that a comma must always follow "VFC".

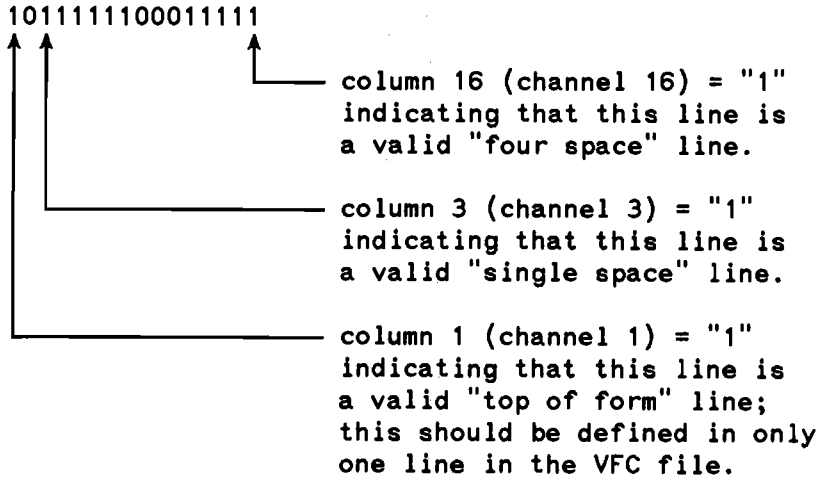
The value of y is an integer between 0 and 127, inclusive, and specifies the number of lines (rows) in the VFC pattern. This number does not include the lines used by the MARGIN=, MODE=, or VFC parameters. If "0" is specified, the printer will reset its internal VFC to the default state, including lines and pages.

The string is an optional comment field that may be used to describe the VFC file. If used, it must be separated from y by a comma.

After these three parameters, each line in the VFC file corresponds to a line on the special form. A series of "1's" and "0's" are used to define each of the 16 channels for each of the lines on the form. A "1" in a column (channel) indicates that the channel definition is valid for that line. A "0" means that the channel is not valid for that line. A line may have multiple channels defined.

Some of the channels have a special meaning to MPE subsystems, and complications may arise if these channels are not defined in the VFC file. The System Operation and Resource Management Reference Manual contains a list of these in Chapter 8, Special Considerations for Peripheral Devices.

An example of an individual record of the page definition portion of a VFC file is shown below. The line shown in the example happens to be for the first line defined on the form, since a "1" is defined in column 1 (column 1 = channel 1 = Top of Form).



Example 1

A simplified VFC file can be designed to specify a non-standard form length and not take advantage of channels 4 through 16. This is handy if the program only issues line feeds and form feeds. Line feeds (single space) access VFC channel 3 and form feeds access VFC channel 1. The program is responsible for ensuring that the proper number of line feeds is issued to position the paper on the correct line. An example of this type of VFC file is shown below for a four inch form to be printed at 6 lines per inch.

```
Editor          Column Numbers (Channels)
Line Number                1111111
                1234567890123456

 1              VFC,6,24
 2              101
 3              001
 4              001
 5              001
 6              001
 7              001
 8              001
 9              001
10              001
11              001
12              001
13              001
14              001
15              001
16              001
17              001
18              001
19              001
```

```
20          001
21          001
22          001
23          001
24          001
25          011
```

The first line in the simplified VFC file has "VFC,6,24", indicating that the form is to be printed at 6 lines per inch and is 24 lines long (6 lines/inch * 4 inches = 24 lines). The second line containing "101" is specifying that this line is the top of the form ("1" in column 1) and a valid single space line ("1" in column 3). The rest of the lines contain "001" indicating that each line is a valid single space line. The last line contains "011", indicating that this line is defined as the bottom of the form ("1" in column 2) and also is a valid single space line ("1" in column 3). If the program issues a call to any other channel, an error will occur indicating that the printer was told to access an undefined VFC channel. This VFC example does not have an "unprintable" top and bottom margin area defined. A later example shows how to implement this feature. The channels not explicitly specified in the VFC file (channels 4 - 16 in the above example) are treated as "0's" by the printer.

Example 2

The following is an example of a VFC file for a 6 inch form to be printed at 6 lines per inch with all of the channels defined in their proper locations.

```
Editor          Column Numbers (Channels)
Line Number                1111111
                1234567890123456

 1              VFC,6,36
 2              1011111100011111
 3              0010000000000000
 4              0011000000000000
 5              0010100000000000
 6              0011000000000001
 7              0010000000000010
 8              0011100000000100
 9              0010000000001000
10              0011000000000001
11              0010101000000000
12              0011000100000010
13              0010000000000000
14              0011100000000101
15              0010000000000000
16              0011000000001000
17              0010100000000010
18              0011000000000001
19              0010000000000000
20              0011111000000100
21              0010000000000000
22              0011000100000011
23              0010100000001000
```

```
24              0011000000000000
25              0010000000000000
26              0011100000000101
27              0010000000000010
28              0011000000000000
29              0010101000000000
30              0011000000001001
31              0010000000000000
32              0011100100000110
33              0010000000000000
34              0011000000000001
35              0010100000000000
36              0011000001000000
37              0110000010101010
```

The first line in the file, "VFC,6,36", indicates that the page definition that follows is for printing at 6 lines per inch and is 36 lines long (6 lines/inch * 6 inches = 36 lines). The remainder of the lines in the Editor file each correspond to a line on the form. The first line is the top of the form, so a "1" is placed in columns 1 and 12. This line is also the starting point for defining some of the other channels (double space, triple space, etc.), so a "1" is placed in columns 3,4,5,6,7,8,12,13,14,15, and 16. Please refer to Table 1 for definitions of the channels. Each line is a valid single space line, so a "1" is placed in column 3 for all lines. Starting from the first line, every other line is a valid double space line, so a "1" is placed in column 4 for every other line. The same approach is taken for every third, fourth, fifth, sixth, seventh, and tenth line (columns 5,16,15,14,13, and 8, respectively). The last line is the bottom of the form, so a "1" is placed in columns 2 and 9. The next to the last line is "one line previous to bottom of form", so a "1" is placed in column 10. In this example, the bottom of the form happens to be "one line previous to top of next form", so a "1" is placed in column 11 of the last line. Channels 6 and 7 (half page and quarter page) depend upon the length of the form. The half page definition for this form was placed in Editor line number 20 and the quarter page definitions were placed in lines 11,20, and 29.

Example 3

The previous example had all lines defined as valid printable lines, because there was a "1" in column 3 (channel 3) for each line. A VFC image can include non-printable lines to allow for a margin between each form. The following example shows a VFC image for a 5 inch form to be printed at 8 lines per inch. The last 8 lines will not contain a "1" in channel 3. This will allow a one inch margin between the printing on each form. The paper on the printer can then be physically positioned so that the first line of print starts one half inch from the top of the page, resulting in one half inch of unprinted area at the top and bottom of each page.

```
Editor          Column Numbers (Channels)
Line Number                1111111
                1234567890123456

 1              VFC,8,40
 2              1011111100011111
 3              0010000000000000
 4              0011000000000000
 5              0010100000000000
 6              0011000000000001
 7              0010000000000010
 8              0011100000000100
```

```
 9          0010000000001000
10          0011001000000001
11          0010100000000000
12          0011000100000010
13          0010000000000000
14          0011100000000101
15          0010000000000000
16          0011000000001000
17          0010100000000010
18          0011011000000001
19          0010000000000000
20          0011100000000100
21          0010000000000000
22          0011000100000011
23          0010100000001000
24          0011000000000000
25          0010000000000000
26          0011101000000101
27          0010000000000010
28          0011000000000000
29          0010100000000000
30          0011000000001001
31          0010000000000000
32          0011100101000110
33          0110000010000000
34          0000000000000000
35          0000000000000000
36          0000000000000000
37          0000000000000000
38          0000000000000000
39          0000000000000000
40          0000000000000000
41          0000000000100000
```

The first line in this example, "VFC,8,40", indicates that the page definition that follows is for printing at 8 lines per inch and is 40 lines long (8 lines/inch * 5 inches = 40 lines). The bottom of form (channels 2 and 9) has been defined in line 33. In this example, channel 11 (one line previous to top of next form) is not on the same line as bottom of form like it was in the previous example. The half page and quarter page channels (6 and 7) have been calculated for the printable area and do not include the one inch margin area at the bottom. Channel 10 (one line previous to bottom of form) has been specified in line 32. The rest of the channels are defined in the same manner as in the previous example.

Example 4

This last example will be for a 3-1/4 inch form to be printed at 8 lines per inch. This introduces a potentially complicating factor: stopping gracefully after running out of paper. The 2608S and 256x printers allow the physical page length to be set from 2.0 to 16.0 inches, in 1/2 inch increments. The 3-1/4 inch form does not align on a physical page setting. The front panel setting, in this case, should be set to 6.5 inches. This is equal to two special form lengths and will make it easier to realign the forms if the printer runs out of paper.

```
Editor          Column Numbers (Channels)
Line Number                1111111
                1234567890123456

  1             MODE=FEATURE
  2             VFC,8,26
  3             1011111100011111
  4             0010000000000000
  5             0011000000000000
  6             0010100000000000
  7             0011000000000001
  8             0010000000000010
  9             0011100000000100
 10             0010001000001000
 11             0011000000000001
 12             0010100000000000
 13             0011000100000010
 14             0010000000000000
 15             0011100000000101
 16             0010011000000000
 17             0011000000001000
 18             0010100000000010
 19             0011000000000001
 20             0010000000000000
 21             0011100000000100
 22             0010000000000000
 23             0011001100000011
 24             0010100000001000
 25             0011000000000000
 26             0010000000000000
 27             0011100001000101
 28             0110000010100010
```

This example includes the optional parameter, MODE=FEATURE to allow the printer to act on control characters and escape sequences embedded in the data. VFC,8,26 indicates that the page definition that follows is for printing at 8 lines per inch and is 26 lines long (8 lines/inch * 3-1/4 inches = 26 lines). Editor lines 3 through 28 define the page image with the channels defined as specified in Table 1. There are no unprintable lines in this definition, so any top and bottom margins desired are the responsibility of the program.

The intent of this discussion was to clear up some of the mystery surrounding the use of carriage control and VFC files for special forms. In addition, the reference manuals for the individual printers contain information specific to the model of the printer being discussed. The System Operation and Resource Management Reference Manual contains a discussion of VFCs and additional examples in chapter 8, Special Considerations for Peripheral Devices. The MPE V Intrinsics Manual lists octal codes for the carriage control directives as well as some helpful notes about using carriage control.

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HEWLETT PACKARD RESPONSE CENTER QUESTIONS & ANSWERS

HP 3000 Questions Commonly Received by the North American Response Centers

Q. I have noticed that with HPTREND running on my system, the number of logfiles generated has increased. Why?

A. To perform its analysis, HPTREND requires that LOG TYPE 5 (File Close records) be enabled. Since logging this event increases the number of log records written, the number of logfiles generated will usually also increase. HPTREND runs a program, TRLOGDCP, to capture data from the logfiles. Once HPTREND has analyzed these logfiles you can archive them. Make sure you run any other utilities that need to analyze these files before you purge them from your system.

Q. I have a KSAM file with a file limit of 100,000 records. While adding records to the file, I encountered an EOF condition. LISTF shows the EOF at 100,000 but when I run FCOPY against the file it stops after copying 82,000 records. What has happened to the other 18,000 records, and how can I recover that space?

A. When you delete a record from a KSAM file, it is flagged as deleted but it is not physically removed (The first word is set to -1 [%177777] to indicate a deleted record). Also, deleted records are not reused. Therefore, the space occupied by the deleted records is *not* available for new data. This allows you to recover deleted records later, but it also causes them to accumulate -- 18,000 of them in your case. The only way to "recover" this space is to create a new KSAM file and copy only the active records. Please refer to the KSAM or FCOPY Reference manual for the procedures to remove the deleted records.

Q. I built a KSAM file with one 24-byte key and I specified a key blocking factor of 100. KSAMUTIL show that the actual key blocking factor is 102, why?

A. KSAM uses the requested key blocking factor for all of your keys to determine the largest key block size. This size is then used to set the actual key blocking factor (which may be larger but never smaller than the requested value). This method results in the best use of key file space.

Q. When starting an IMAGE application I received a condition word value of -9 on a DBOPEN call. The message stated MPE ERROR %2002 RETURNED BY GETDSEG OF 32764 WORDS. What does this mean?

A. The IMAGE condition word -9, MPE ERROR GETDSEG 32764 WORDS is informing you that the DBOPEN intrinsic was unable to obtain the required number of words for the DBCB (Data Base Control Block) from either the DST (Data Segment Table) or from VM (Virtual Memory).

If you have OPT, you can use the Tables Context to examine the usage of the DST and VM. You can also use the unsupported program TUNER to determine which tables are at maximum usage or approaching maximum usage. If either or both are flagged as near maximum, they should be increased.

You can increase the size of the DST by using SYSDUMP. Virtual Memory can be changed by using the INITATOR/USER dialogue during a system startup, such as a COOLSTART. However, VM

more...

allocation changes for LDEV 1 must be done during a RELOAD. (Please note that you *cannot* make VM changes using SYSDUMP. The July 1, 1986 issue of *Response Center Questions & Answers* explains this more fully.)

Q. What PARITY do the Hewlett Packard tape drives support?

A. The entire family of Hewlett Packard tape drives that use the standard 2400 ft. tape reel use *odd parity*.

The following is a cross reference chart of the Hewlett Packard tape drives:

Model	Max Tape Length	cpi	Encode	Parity	ANSI Standard	Notes
HP 7970B	2400'	800	NRZI	ODD	X3.22-1983	(note1)
HP 7970E	2400'	1600	PE	ODD	X3.39-1973	(note2)
HP 7974A	2400'	1600	PE	ODD	X3.39-1973	(note3)
		800	NRZI	ODD	X3.22-1983	(note4)
HP 7976A	2400'	6250	GCR	ODD	X3.54-1976	(note5)
		1600	PE	ODD	X3.39-1973	(note5)
HP 7978B	2400'	6250	GCR	ODD	X3.54-1976	(note3)
		1600	PE	ODD	X3.39-1973	(note3)

Glossary:

NRZI (Non-Return-To-Zero-Inverted). Check character used to check the parity of each track in the block.

PE (Phase Encoded). The bits are written as successive magnetic pole reversals. Repeating groups of '1' or '0' bits will have a required reversal placed between the bits.

GCR (Group-Coded Recording). Collecting groups of characters and encodeing them prior to writing them on the tape.

cpi Number of Characters stored Per Inch of tape.

ANSI American National Standards Institute.

***note1** Supported on the Series I, II, III systems only

***note2** Supported on the Series I, II, III and 39, 40/42/52, 44/48/58, 64/68/70

***note3** Supported on the Series 39, 40/42/52, 44/48/58, 64/68/70

***note4** 800 cpi recording density is optional

***note5** Supported on the Series 37, 39, 40/42/52, 44/48/58, 64/68/70