CP/M CVT

Color Video Terminal

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885-1232 [-37]

$20.00

CVT (Color Video Terminal)

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Heath Users' Group Part Numbers

HDOS 885-1129[-37]
CP/M 885-1232[-37]

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CVT Instructions

(part of 885-1129[-37] or 885-1232[-37])

CVT (Color Video Terminal) is a program that allows a color board for Heath/Zenith 8-bit computers to emulate the character set of a Heath H19 terminal. It was designed for use with the HA-8-3 and HA-89-3 color boards from New Orleans General Data Services, but will function with similar boards that use the TMS-9918 or TMS-9918A Video Display Processor component. It is available in HDOS or CP/M versions.

Running CVT

CVT will operate in one of three modes, depending on what you enter at the command line. If you just enter the program name alone, it will enter the interactive mode:

HDOS	CP/M
>CVT	A>CVT

In this mode, what you type on the keyboard appears on your color monitor. The keypad operates in the shifted mode, so that the 2, 4, 6, and 8 keys can be used to move the cursor (separate arrow keys on an H/Z-29 can also be used), and the IC, DC, IL, DL, and HOME keys perform their labeled functions. The function keys at the top of the keyboard perform special functions that are described on your terminal screen (not the color monitor). These will be described in detail later.

The second CVT mode of operation is invoked by entering a second file name after the program name:

>CVT dev:PICTURE	A>CVT d:PICTURE

(When you see dev: or d: in this document, it refers to an HDOS or CP/M drive designation, such as SY1: or B:.)

The additional file may be either a picture created by CVT or a text file created by an editor. If it is a text file, it must contain no more than 24 lines. It can contain escape codes to produce graphics, etc. If no extension or file type is given, .PIC is assumed. Two sample picture files, CVT.PIC and GRAPH.PIC, are included, and may be viewed this way.

The third CVT mode is invoked by entering two filenames after the program name:

>CVT dev:PICTURE dev:PROGRAM	A>CVT d:PICTURE d:PROGRAM

As with mode two, the first additional file may be either a picture or text file. The second additional file should be an executable program (.ABS or .COM file). If the program does not overlay CVT, it can use CVT as a subroutine to process text

strings and modify the picture. For the HDOS version of CVT, the program should be ORG'd at 3800H (70000A) or higher to avoid overlaying it. For the CP/M version, the program must run at 100H, so CVT reserves 1k of space for it. As long as the program is 1k or less in size, it will not overlay CVT.

To use CVT, the program should first store the address of the string to be processed at address 2280H (42200A) for the HDOS version or 500H for the CP/M version. Then it should CALL address 2282H (HDOS) or 502H (CP/M). The text string must end with a zero (null) in the HDOS version or a Control-Z (1AH) in the CP/M version. The file MCVT.ABS or MCVT.COM provided with CVT is a sample program that passes strings to CVT. The source code is provided so programmers wishing to use this technique can study it. MCVT should NOT be run by itself.

Drawing a Picture

The Function Keys

To create a picture with CVT, run it in mode one. When CVT signs on, it will display instructions on your computer screen (not the color monitor) for the use of the top row function keys. These keys are used as follows:

F1 — Increment foreground color. Initially, CVT is in the text mode, and the foreground color is set to white. This means that any characters you type will be white. Each color is assigned a number as shown on the appendix to this document. When you press F1, the foreground color increments once to the next higher number color, and starts over with zero when color 15 (white) is reached. Therefore, for example, it will take two presses of F1 to change the characters from white to black.

F2 — Increment background color. Initially, the background color in cvt is dark blue (color no. 4). Each press of F2 will change the background color to the next higher number until 15 (white) is reached, and then it will start over with zero.

F3 — Change VDP (Video Display Processor) mode. When you first start CVT, the VDP is operated in the text mode. In this mode, you can put 40 characters on each line, and you are allowed only two colors: foreground and background. When you press the F3 key, CVT changes to the pattern mode. In this mode, you can put only 32 characters on each line, but you can you can control the foreground and background of individual characters as long as they are in separate groups (discussed later). To make this mode immediately distinguishable from the text mode, it starts out with the foreground color set to black and the

background color set to dark green (12). You will notice when you change to this mode that the border around the screen remains set to the text mode background color (initially blue). This is because the pattern mode lays its own foreground and background over the text background. Should you ever want to change the border color, just re-enter the text mode by pressing F3 again, change the color with F2, and re-enter the pattern mode (F3). A picture created while you are in the pattern mode will appear scrambled when you change to the text mode, but will be restored when you change back to the pattern mode.

F4 — Change video mode. When you press F4, CVT changes to the reverse video mode. What really happens is that the foreground and background colors are reversed. It is important to remember this concept when you are creating a picture, as we shall discuss later. Another press of F4 changes back to normal video.

F5 — Change character mode. When you press F5, CVT changes to the graphic character mode. In this mode, typing lower case characters produces H19-style graphic characters. The aspect ratio (height to width ratio) of characters in CVT is approximately one to one instead of two to one as on an H19. You will have to adjust for this if you are used to using the graphic characters on an H19. Another press of F5 changes back to the normal character mode.

F6 or BLUE — Set pattern colors. When you are in the pattern mode, all of the characters produced by CVT are divided into groups of eight characters each. The foreground and background colors of the characters in a group can be set separately from the colors of characters in other groups. There are 32 groups all together, with the normal video characters in the first 16, and the reverse video characters in the second 16. Each group is assigned a hexadecimal address, as shown in the appendix. When you press the F6 or BLUE key, all of the characters with their pattern addresses will be displayed on your computer screen (not the color monitor), and you will be prompted to enter the address of the pattern group you wish to change. Always enter the address as a two digit number. When you enter the address, the colors names will be displayed on the screen with their numerical equivalents in hex, and you will be prompted to enter a number for the foreground color. Enter a single hex digit. Then you will be asked for a background color. When you enter

its digit, the screen will return to its normal state, and the colors for your selected pattern will be set. Remember when setting colors for reverse video characters that the foreground color is the color of the space around the character, and the background color is the color of the character itself. If you enter an illegal character for any entry, nothing is changed (the command is ignored).

F7 or RED — Load picture file. When you press F7 or RED, you will be prompted to enter the name of a picture file. It can be either an ASCII text file, or a file previously saved by CVT. If no extension or file type is specified, .PIC is assumed. Lower case numbers in the file name are capitalized.

F8 or WHITE — Save picture file. When you press F8 or WHITE, CVT will prompt you for a file name. When you enter one, the current picture on your color monitor will be saved as a disk file. All pattern colors and the mode (pattern or text) are saved in the file, and will be reset when it is loaded again. The file is saved by dumping the Video Display Processor's memory directly to disk, so the file cannot be TYPED or otherwise viewed without CVT. As with the load command, the default extension is .PIC. The ability to load and save a picture file means that you can work on a picture in stages, and save it when you are not working on it.

The current setting of the F3, F4, and F5 keys will be displayed on your computer screen (not the color monitor).

The Keypad

While you are running CVT, the keypad on your terminal functions in the shifted mode, as stated previously. The 7 or IC key toggles the insert mode on or off. While insert is on, any characters typed while the cursor is in a line will cause characters to the right to "move over". If insert is off, new characters typed replace old ones. The DC or 9 key deletes the character at the cursor, and any characters to the right move to the left to fill the gap. The IL key inserts a blank line where the cursor is, and the DL line deletes the line at the cursor, and any lines below it "move up".

When you press the shift key, some of the keypad keys take on new functions. The 1 key moves the cursor to the bottom of the screen. The 2 key moves the cursor down one line and to the beginning of the line. The 4 key moves the cursor to the beginning of the line. The 6 key moves the cursor to the end of the current line. The 5 and 7 keys both home the cursor. The 8 key moves the cursor up one line, and to the beginning of the line.

Escape Sequences

CVT supports all H19 escape sequences with the following exceptions: ESC-I, reverse index; ESC-n, cursor position report. None of the set (ESC-x) and reset (ESC-y) modes are supported except for ESC-x4, block cursor; ESC-x5, cursor off; ESC-y4, underline cursor; ESC-y5, cursor on. CVT adds the following new escape sequences: ESC-r, move cursor to end of line; ESC-xA, set pattern mode; ESC-xB, enable external video (not supported on HA-8-3 or HA-89-3 cards); ESC-yA, set text mode; ESC-yB, disable external video; ESC-mFB, set global foreground and background colors; ESC-!AdFB, set pattern colors. When you use ESC-mFB, you enter ESC, m, a hex digit for the foreground color, and a hex digit for the background color. To use ESC-!AdFB, enter ESC, !, a two hex digit pattern address, and single hex digits for the foreground and background colors. These sequences may be included in text files that are to be displayed with CVT. For drawing a picture, however, it is much easier to use the function keys to set colors.

Hints for using CVT

Once you have set up individual colors for various pattern groups, you should NOT use any global color change commands (F1, F2, or ESC-mFB) except that you may still use F2 in the TEXT mode to change the border color for the pattern mode. The reason is that the global commands, while you are in the pattern mode, affect ALL patterns.

If you want to make two characters that are in the same pattern group different colors, try using reverse video. For example, if you want the letter "A" to be black on green, but you want "B" to be white on green, set the colors for the reverse video "B" (address 18 hex) to green for the foreground and white for the background. Then go to reverse video (F4 key) whenever you want to type a "B". This technique was used in the sample picture CVT.PIC to make some of the letters black and some white. It was also used to make the diamond shape on the left light red (orange), and the one on the right yellow. The yellow one is actually in reverse video.

If you want to make bars or blocks of several different colors, try setting both the foreground and background colors of some unused groups to the same colors. Then when you type a character from that group, a block of solid color will appear. This technique was used in the sample picture GRAPH.PIC. The last four

groups (1C, 1D, 1E, and 1F) were used to make the four colored bars in the graph. The yellow bar, for example, is actually composed of lower case "a" characters, whose foreground and background colors are both yellow.

On a low to medium resolution color monitor, some colors do not get along with each other very well. For making readable text characters, I have found that black on dark green or white on dark blue are the best combinations.

APPENDIX: PATTERN TABLES, COLOR TABLES, AND OTHER INFORMATION

ADDRESS (HEX) Nor	Rev	PATTERN NOS. Nor	Rev	CHARACTERS
00	10	0-7	128-135	▏ ─ ┼ ┐ ┘ └ ┌ ● ` a b c d e f ^,g
01	11	8-15	136-143	→ ▒ ▚ ↓ ▝ ▗ ▀ ▄ h i j k l m n o
02	12	16-23	144-151	■ ▌ ▛ ▀ ┤ ┴ ├ ╳ p q r s t u v w
03	13	24-31	152-159	╱ ╲ ▔ _ ▕ ▕ ¶ ¶ x y z { | } ~ _
04	14	32-39	160-167	SPACE ! " # $ % & '
05	15	40-47	168-175	( ) * + , - . /
06	16	48-55	176-183	0 1 2 3 4 5 6 7
07	17	56-63	184-191	8 9 : ; < = > ?
08	18	64-71	192-199	@ A B C D E F G
09	19	72-79	200-207	H I J K L M N O
0A	1A	80-87	208-215	P Q R S T U V W
0B	1B	88-95	216-223	X Y Z [\ ] ^ _
0C	1C	96-103	224-231	` a b c d e f g
0D	1D	104-111	232-239	h i j k l m n o
0E	1E	112-119	240-247	p q r s t u v w
0F	1F	120-127	248-256	x y z { | } ~ CURSOR

COLOR DEFINITIONS

VALUE Hex	Decimal	COLOR
0	0	TRANSPARENT
1	1	BLACK
2	2	MEDIUM GREEN
3	3	LIGHT GREEN
4	4	DARK BLUE
5	5	LIGHT BLUE
6	6	DARK RED
7	7	CYAN (BLUE-GREEN)
8	8	MEDIUM RED
9	9	LIGHT RED
A	10	DARK YELLOW
B	11	LIGHT YELLOW
C	12	DARK GREEN
D	13	MAGENTA (RED-VIOLET)
E	14	GRAY
F	15	WHITE

SETTING GLOBAL COLORS

ESC mFB

F = Foreground color
B = Background color
(use hex digits for colors)

SETTING PATTERN COLORS

ESC !AdFB

Ad = Address
F = Foreground color
B = Background color
(Address is two digits.
You may use F6 instead
of ESC !.)