VIDEO PAK VIDEO CARTRIDGE
INSTRUCTION MANUAL

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Congratulations! You have purchased the Data 20 Video Pak video expansion for the VIC-20. The Video Pak will increase the screen size from 23 lines of 22 characters to either 24 lines of 40 characters or 24 lines of 80 characters. In addition, the Video Pak will add 16K or optionally, 64K of memory to the 5K of memory already in the VIC.

The Video Pak comes complete with everything required for immediate upgrade of the VIC including:

1. The Video Pak video cartridge.
2. An AC adapter (so that it doesn't use any power from the VIC, which allows you to use that power for other accessories).
3. Complete 40/80 column driver software resident in the cartridge. This allows programs from Commodore's larger machines to run on the VIC.
4. Terminal emulation software so that you can use the VIC as a high quality terminal to access computer data bases.

INSTALLING THE VIDEO PAK

Installing the Video Pak is extremely easy. First, you must decide whether you want to use the Video Pak in 40 or 80 column mode. A switch inside the case sets the number of columns. This switch is set from the factory for 40 column mode as 80 columns are not recommended for use with an ordinary T.V. because of the poor picture quality that results. Plug the Video Pak in the expansion slot in the rear of the VIC with the label facing up. Next, plug the AC adapter in a convenient outlet and plug the cord into the back of the Video Pak (the plug can go in two ways; either way is correct). Now, power up the VIC. You will notice that the bytes free have gone from 3583 to 19967 for a 16K Video Pak, or 28159 for a 64K Video Pak. To turn on the video expansion, type SYS 45056 (RETURN) for 40 column mode or SYS 45059 for 80 column mode. BE SURE THAT THE SYS COMMAND AGREES WITH THE WAY THE COLUMN MODE SWITCH IS SET; OTHERWISE YOU WILL GET AN UNUSABLE PICTURE. Then, take the video modulator or monitor cable and plug it into the video connector on the back of the Video Pak. You will get a message saying DATA 20 CORP. REV 1.0. This indicates that the Video Pak is ready for use. The Video Pak will behave almost exactly like the 22 column screen, but you should consult the section below on differences.

After the above routine becomes familiar, you may want to leave the video cable permanently connected to the Video Pak. All you have to do is type in the appropriate SYS command after the VIC has been powered up and has checked its memory. An easy way to tell when this is done is with the Cassette recorder. Just put it in play before turning on the VIC. When the VIC is powered up and has checked its memory and is ready to accept a command, the cassette motor will turn on.

QUICK REFERENCE GUIDE

Startup Commands

SYS 45056	40 column mode
SYS 45059	80 column mode
SYS 45062	return to VIC 22 column screen
SYS 45065	restart 40 or 80 column mode (does not clear screen)

Differences Between VIDEO PAK Screen And VIC 20 Screen

Feature	VIC 20 Screen	VIDEO PAK
Line Length	88 Columns	40 or 80 Columns
Switch to Lower Case	Press SHIFT and Commodore Keys	Press F1 for shift Press F2 for unshift
Null Response to Input Statement	Returns previous value of variable	Returns null string for string variable, 0 for numeric variable
Erase to end of line	Not supported	Press F3 key
Erase to end of screen	Not supported	Press F4 key
Screen Dump	Not supported	Press F6 key - RS232 port must already be open using device 127, can use CRT mode to do this
Terminal mode	Not supported	Press F8 key - used with printer interface
Quote Mode In Print or Input Statements	Allows putting cursor control characters in on subsequent edits - INSERT AND DELETE toggles this function	Allows putting cursor control characters in only when first entering line
Cursor	off during program execution	always on

VIDEO PAK
Memory Map

Function	Hex address	Decimal address
9BF8	39928	CRT controller control register
9BF9	39929	CRT controller data register
9BFC	39932	Mode register Bit 0 - 1 selects lower case characters Bits 1 - 4 used only on 64K Bit 1 - 1 selects 2 - 24K banks 0 selects 4 - 16K banks Bit 2 - 16K bank select LSB Bit 3 - 16K bank select MSB or 24K bank select Bit 4 - 1 deselects user RAM
B800 - BFFF	47104 - 49151	Video RAM - B800 is upper left corner, address are sequential character positions left to right
FD22	64802	VIC cold start address - used to configure 64K board as 4 16K blocks for use with Programmer's Aid Cartridge

USING THE 64K MEMORY

The Video Paks with 64K have a very flexible memory system that may be configured as two blocks of 24K or as four blocks of 16K. On power up, the 24K mode is automatically selected to allow maximum use of memory for BASIC programming. The 16K mode is intended for advanced word processing and other machine language programs. All the modes on the Video Pak are set in one register located at hex 9BFC or 39932 decimal. The bits in the register have the following functions:

Bit 0:

Case select for characters displayed. On power up, it defaults to 0, upper case with graphics. Writing a 1 in this bit selects lower case letters. Care must be exercized when writing in the register to keep the case bit intact.

Bit 1:

Memory bank size. On power up, it defaults to 0, two 24K banks. Writing a 1 into this bit selects four 16K banks. The 16K memory configuration also allows a cartridge like the Programmer's Aid to be used in block 3. To do this, plug the Video Pak and the cartridge in and power up. Poke a 1 in 39932 and type in SYS 64802 (this does a cold start to reconfigure memory).

Bit 2:

16K bank address least significant bit. This bit is only used in 16K mode.

Bit 3:

Memory address most significant bit. In 16K mode this bit is the address most significant bit. In 24K mode this bit selects which 24K bank is selected.

Bit 4:

Ram deselect. A 1 in this bit turns off the on-board RAM. This allows other boards to use the RAM area.

MACHINE LANGUAGE ACCESS TO INPUT AND OUTPUT ROUTINES

There are two routines accessible to the programmer: a character output routine and a line input routine. These are accessed with a JSR to hex BOOC and BOOF respectively.

On entry to the line input routine, the X register must be set to zero if a full line of data is desired upon exit from the editor. After a RETURN is entered, the editor will return with the character in the accumulator and with the X register set to the same value as on entry. To get each successive character, re-enter the routine, each time incrementing the X register until a carriage return character is returned.

To use the character output routine, place the desired character in the accumulator and JSR to BOOF. The character will be placed at the current cursor location and the cursor location will be incremented.

TERMINAL MODE

The Video Pak software has provisions to emulate a terminal. If the Video Pak is used in conjunction with the Data 20 PRINTER INTERFACE, then the software can take advantage of the switches to automatically set the operating parameters. To enter the terminal mode press the F8 key. Upon doing this, the software will check to see if device 127 is open. If device 127 is not open, it will assume that a PRINTER INTERFACE is present and attempt to read the switches. Be sure to open device 127 with an OPEN statement (see the Programmer's Reference Guide) before pressing the F8 key if the terminal mode is to be used with something other than the Data 20 PRINTER INTERFACE.

The switches are set as follows:

SW1	SW2	Parity	SW3	SW4	Baud Rate	
OFF	OFF	MARK	OFF	OFF	1200	Switches
OFF	ON	EVEN	OFF	ON	600	5 and 6
ON	OFF	ODD	ON	OFF	300	should be
ON	ON	SPACE	ON	ON	110	left off

Word lengths are fixed at 7 bits with one start bit and one stop bit (except 110 baud which automatically has 2 stop bits).

The terminal mode software responds to these control codes:

Code	Action	Code	Action
1	Cursor home	6	Cursor right
8	Back space	9	Line feed
12	Clear screen	13	Carriage return
21	Cursor left	26	Cursor up
28	Erase to end of line	29	Erase to end of page
30	Switch to reverse video	31	Switch to normal video

The following keys generate control codes:

Key	Control Code		Key	Control Code	
HOME	CURSOR home	1	STOP	Control C	3
RIGHT	Cursor Right	6	F5	Bell	7
DEL	Back Space	8	DOWN	Cursor Down	10
CLR	Clear screen	12	F1	DC1	17
F2	DC2	18	F3	DC3	19
F4	DC4	20	LEFT	Cursor left	21
F7	Control X	24	UP	Cursor up	26
INST	Escape	27	F6	Delete	127

Other control codes may be generated by using the Commadore key as the control key. Lower case letters are generated by using the shift key.

DIFFERENCES BETWEEN VIC SCREEN AND VIDEO PAK SCREEN

Line Length:

The VIC allows an 88 column line (4 lines) for programs and data. The Video Pak allows 80 columns in 80 column mode, 40 columns in 40 column mode.

Switch to lower case:

The VIC switches to lower case by pressing the SHIFT and Commodore keys simultaneously. The Video Pak uses the F1 key to shift into lower case letters, F2 to unshift back to upper case.

Cursor:

The VIC turns the cursor off during program execution, while the Video Pak cursor is always on. To turn the cursor off, use the following: POKE 39928,10: POKE 39929,48. To turn the cursor on, use POKE 39928,10: POKE 39929,96.

Null response to INPUT statement:

If a RETURN is entered as the response to an INPUT statement, the variable in that statement will remain unchanged on the VIC. On the Video Pak, a string variable will be set to the null string and a numeric variable will be set to 0.

Quote mode in PRINT or INPUT statements:

The VIC interprets cursor control characters within quotes as regular characters. The INSERT and DELETE keys toggle this function to allow using the cursor control keys to move the cursor. The Video Pak only allows cursor control characters to be entered when first entering the line. Subsequent edits use the cursor control keys to move cursor.

Additional features supported in the Video Pak:

To erase to end of the current line from the cursor position, press the F3 key. To erase to the end of the screen from the current cursor position, press the F4 key. To print the contents of the screen, press the F6 key. To use this, device 127 must already be open. This can be done by using the terminal mode (see below) or using an OPEN statement (see the Programmer's Reference Guide).

If it is necessary to read the function keys, use a GET statement instead of an INPUT. This allows the keys to be read without them doing their above listed functions.

STARTUP COMMANDS

40 Column Mode:

To startup the Video Pak in 40 column mode, type in SYS 45056 (RETURN). Use this mode with the VIC modulator and a regular home T.V. The switch inside case comes set for 40 column mode from the factory.

80 Column Mode:

To startup the Video Pak in 80 column mode, type in SYS 45059 (RETURN). This mode is only recommended for use with a video monitor, because the resolution required is beyond the capacity of a normal T.V. set. A video cable for use with most video monitors is available from Data 20 — see your dealer. The switch inside the case must be set to 80 column mode for this to work properly.

Return to VIC mode:

To resume using the VIC 22 column screen after using the Video Pak, type in SYS 45062 (RETURN). This function can also be accomplished by pressing the RUN/STOP and RESTORE simultaneously. Remember that you will have to move the video cable back to the VIC video output. Never enter this command when using the 22 column screen, doing so may destroy any program or data in memory.

Restart 40/80 column mode:

This function can only be used after the return to VIC mode above. The command is SYS 45065 (RETURN). Care must be used with this command because it requires that the Video Pak already be initialized for 40 or 80 column mode. This command does not clear the screen. Never use this command in 40/80 column mode, doing so may destroy any program or data in memory.

SPECIFICATIONS

Functions added	40 column by 24 line or 80 column by 24 line video, 16K or 64K memory, up to 8K firmware
Video Column Selection	single switch inside
Video Output	1.75 V RS-170 compatible standard composite video 75 Ohm, Black and white
Video Output Connector	5 pin DIN, VIC 20 pinouts
Modulator Compatibility	Can use VIC video modulator in 40 column mode
Character Set	Full Commodore character set including all graphics
Video Attributes supported	Reverse video
Video Memory	2K located at Hex 8800
User Memory Size	16K or 64K
Memory Organization	16K is organized as one 16K block located at Hex 2000, 64K is organized as two 24K blocks, or four 16K blocks. Software selectable, each starting at Hex 2000. Entire block can also be deselected by software.
Memory Technology	High reliability dynamic
Firmware Capacity	6K standard, located at Hex A000. Consisting of one 2K PROM and one 4K PROM, 8K located at Hex 6000 consisting of two 4K PROMS available as an OEM option
Firmware Provided	2K video driver located at Hex B000
Dimensions	6½" l x 4½" w x 1" H including plastic case
Power Requirements	7.2 watts at 9V, 120V AC adaptor provided

DATA 20 One Year Limited Warranty

DATA 20 warrants the Video Pak to be free of defects for one year from the date of purchase. This warranty is limited to replacement or repair of defects, at the descretion of DATA 20, in the Video Pak only. No liability is assumed for damage due to accident, abuse, lack of reasonable care, or for incidental or consequential damages.

To use the DATA 20 Warranty simply fill out the form below and send it along with a proof of purchase showing the name of the dealer where you bought your Video Pak and the date when it was purchased. Without this information your warranty service cannot be processed. Please send your Video Pak insured and shipping prepaid. Ship to:

DATA 20:ATTENTION WRNTY.
23011 Moulton Parkway #B10
Laguna Hills, CA 92653

DATA 20:ATTENTION WRNTY.
23011 Moulton Parkway #B10
Laguna Hills, CA 92653

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Name

_____
Address

_____
City State Zip

_____
Name of Dealer where purchased City

How was your dealer service?

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