PROTECTO 80
VIDEO CARTRIDGE

INSTRUCTION MANUAL

WRITTEN BY BILL SCHLANGER

MARCH 1983
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Congratulations! You have purchased the PROTECTO 80 video expansion for the VIC-20. It 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 PROTECTO 80 will optionally add 8K of memory to the 5K of memory already in the VIC.

The PROTECTO 80 comes complete with everything required for immediate upgrade of the VIC including:

1. The PROTECTO 80 cartridge.
2. Complete 40/80 column driver software resident in the cartridge. This allows programs from Commodore's larger machines to run on the VIC.
3. Terminal emulation software so that you can use the VIC as a high quality terminal to access computer data bases.

INSTALLING THE PROTECTO 80

Installing the PROTECTO 80 is extremely easy. First, you must decide whether you want to use the PROTECTO 80 in 40 or 80 column mode. If you are using a T.V. set, the 40 column mode should be used for best results. Plug the PROTECTO 80 in the expansion slot in the rear of the VIC with the label facing up. Now, move the video cable to the video output of the PROTECTO 80 and power up the VIC. If you want 80 column operation, hold down the RUN/STOP key until the bytes free message appears. This indicates that the PROTECTO 80 is ready for use. If your unit has the optional 8K memory, the bytes free will go from 3583 to 11175. The PROTECTO 80 behaves almost exactly like the 22 column screen, but you should consult the section below on differences.

If you forget to hold down the RUN/STOP key, and the PROTECTO 80 software comes up in 40 columns when you wanted 80, hit the F7 key. Likewise, if you accidentally got 80 columns and wanted 40, this can be easily corrected by hitting the F5 key.

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SPECIFICATIONS

Functions added	40 column by 24 line or 80 column by 24 line video and optionally 8K of memory
Video Column Selection	software selectable
Video Output	1.75V 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 characters

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Video Attributes
  supported..................... Reverse video

Video Memory................ 2K located at Hex B800

User Memory Size........... optional 8K

Memory organization .... one 8K block that may be located at either Hex 2000 (decimal 8192) or at Hex 6000 (decimal 24576) switch selectable

Memory Technology .... High reliability static

Firmware Capacity............ 2K located at Hex A000 consisting of one 2K ROM

Firmware Provided........... 2K video driver located at Hex A000

Dimensions.................. 4½" L X 4½" W X 1" H including plastic case

Power Requirements .... 1 watt at 5V DC

DIFFERENCES BETWEEN VIC SCREEN AND THE PROTECTO 80 SCREEN

Line length:
The VIC allows an 88 column line (4 lines) for programs and data. The PROTECTO 80 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 PROTECTO 80 uses the F2 key to shift into lower case letters, F1 to unshift back to upper case.

Cursor:
The VIC turns the cursor off during program execution, while the PROTECTO 80 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 PROTECTO 80, a string variable will be set to the null string and a numeric variable will be set to O.

Quote mode in PRINT or INPUT statements:
The VIC interprets cursor control characters within quotes as regular character. The INSERT and DELETE keys toggle this function to allow using the cursor control keys to move the cursor. The PROTECTO 80 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 PROTECTO 80:
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 (see the section on using the screen dump feature). This can be done by using the terminal mode (see below) or using an OPEN statement (see the Programmer's Reference Guide). The F5 key switches the software to 40 column mode, the F7 key switches the software to 80 column mode.

If it is necessary to read the function keys, use a GET statement instead of an INPUT. This allows the keys to be read with out them doing their above listed functions.

TERMINAL MODE

The PROTECTO 80 software has provisions to emulate a terminal. You can use the terminal mode in either 80 or 40 columns to access many remote data bases such as the Source and Compuserve in conjunction with the VIC Modem.

To use the terminal mode, all you have to do is first open the RS-232 port using the OPEN statement (see the programmer's reference guide for the particulars) and then hit the F8 key. It is not necessary to load the VICTERM program from tape. The exact form of the OPEN statement will vary from service to service, but there are only a few things to look for: speed of transmission, parity, word length, and duplex mode. A form that should work with most of them is: OPEN127,2,0,CHR$(6). To exit the terminal mode, just hit the F8 again.

When the remote computer sends certain codes, the terminal software responds as follows:

Code	Action	Code	Action
1	Cursor home	6	Cursor right
8	Back space	10	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

You can also generate the following special codes from the keyboard:

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 Commodore keys the control key. The terminal mode is set to uppercase characters. You must press the shift key to get lower case.

The PROTECTO 80 can also be used with the PROTECTO PRINTER INTERFACE to make a general purpose 40 or 80 column terminal. With the PROTECTO PRINTER INTERFACE, the software can take advantage of the switches to automatically set the operating parameters. To enter the terminal mode, simply press the F8 key and it will be set up 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).

USING THE MEMORY

The PROTECTO 80 cartridges have an option of 8K of smemory. If your unit shows 11175 bytes free on power up, it has that memory in place. Should you require more memory than is available in the PROTECTO 80 you can use most of the 3K, 8K or 16K memory expanders on the market. To do so however, you will need some sort of an expansion chassis. PROTECTO makes several varieties—please ask you dealer for the one that best suits your needs. The instructions below will help you if you have the 8K option installed. If you don't have the optional memory then you can plug in the appropriate memory combination as if the PROTECTO 80 were not in place at all.

To use a 3K memory, you will have to tell the computer that there is an extra 3K present because it doesn't look for that 3K if there is already 8K there. This statement will do the trick: POKE 642,4:SYS 58232. Upon doing this you will notice that the bytes free will go from 11175 to 15359. Be sure that there is no program present when you enter this command because it will clear the memory!

To use an 8K memory, set the memory cartridge to operate in block 2. Instructions to do this can be found in the manufacturer's literature.

A 16K memory requires that the 8K in the PROTECTO 80 be moved to so that it resides in block 3. This can be accomplished by opening the case and moving the switch to the position marked block 3.

SCREEN DUMP

The screen dump feature is included in the PROTECTO 80 operating software. It has the ability to send the contents of the screen to most devices including: the serial bus printer (the VIC printer or a printer with a serial bus interface), an RW-232 printer, the Datasette, or a file on the disk drive. This feature can be accessed either with a BASIC program or from the keyboard.

A BASIC program must first open the device that is to receive the dump using the OPEN statement (device 127 must be used for the file number) and then it must send a CHR$(139). As an example, print the contents of the screen to the serial bus printer:

10 OPEN 127,4:REM THIS OPENS THE SERIAL BUS PRINTER
20 PRINT#127,CHR$(139);:REM THIS CAUSES THE SCREEN TO DUMP
30 CLOSE 127

Dumping the screen from the keyboard requires only that you first open your devicewith the appropriate OPEN statement and then hit the F6 key. For example to dump the screen to an RS-232 printer running at 110 BAUD, use OPEN 127,2,0,CHR$(3) and then hit the F6 key.

If you happen to be using the screen dump in conjunction with a PROTECTO printer interface, you can use the terminal mode to open the RS-232 port without typing in an OPEN statement. Remember that the F8 key opens the terminal mode and its parameters are read from the switches. Pressing F8 again exits terminal mode but leaves the RS-232 port open. So, to use this little trick, hit the F8 twice and then the F6 and your screen will dump to the RS-232 port. Subsequent dumps only require you to hit the F6 key until the port is closed.

USING THE PROTECTO 80 WITH OTHER CARTRIDGES

You can use the PROTECTO 80 with many other software cartridges. However, it is not possible to make it work with all of them. All of the cartridges that auto start like games won't work. Any cartridge that uses block 5 (they would have a SYS command greater that 40960) also won't work. But the good news is that many of the cartridges that use block 3 will work as long as you don't have any expansion memory there. If the cartridge was specifically designed to use the 22 column screen, you may find that the screen is still used.

For example the Commodore Programmer's Aid will work except that the functions that print to the screen like the TRACE still print to the 22 column screen. In order to use the Programmer's Aid you have to follow this procedure:

1. type in SYS 40975 (this returns control to the 22 column screen so you will have to move the video cable)

2. type in SYS 28681 (this activates the Programmer's aid

3. type in SYS 40978 (this re-starts the 40/80 column screen so you will have to the video cable back)

The VICMON cartridge will not work in 40 or 80 column mode. To use the VICMON, type in SYS 40975 to return to the 22 column screen, move the video cable, and activate the VICMON according to instructions. You will however, be able to take advantage of the extra memory when using the VICMON.

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 A015 and A018 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 A015. The character will be placed at the current cursor location and the cursor location will be incremented.

PROTECTO 80 Memory Map

Hex address	Decimal address	Function
9BF8	39928	CRT controller control register
9BF9	39929	CRT controller data register
9BFC	39932	Mode register
		Bit 0-1 selects lower case characters
		Bit 5-1 selects 80 columns 0 selects 40 columns
A000-A7FF	40960-43007	Driver software PROM
B800-BFFF	47104-49151	Video RAM- B800 is upper left corner, addresses are sequential character positions left to right

SYSTEM COMMANDS

Startup:
Normally, the PROTECTO 80 starts itself on power up. However, there will be times when it is necessary to start up the PROTECTO 80 from BASIC. To start it in 40 column mode, enter the command SYS 40969; for 80 column mode, enter SYS 40972.

Eighty column 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 PROTECTO--see your dealer.

Return to VIC mode:
To resume using the VIC 22 column screen after using the PROTECTO 80, type in SYS 40972 (RETURN). 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. Note that the 22 column screen is left operational even when the PROTECTO 80 is running. There is nothing to keep you from using both concurrently if you wish.

Restart 40/80 column mode
This function can only be used after the return to VIC mode above. The command is SYS 40978 (RETURN). 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.

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STARTUP COMMANDS

SYS 40969	40 column mode
SYS 40972	80 column mode
SYS 40975	return to VIC 22 column screen
SYS 40978	restart 40 or 80 column mode (does not clear screen)

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DIFFERENCES BETWEEN PROTECTO 80 SCREEN AND VIC 20 SCREEN

FEATURE	VIC 20 Screen	PROTECTO 80
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- S232 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 DE-LETE toggles this function	Allows putting cursor control characters in only when first entering line
Cursor	off during program execution	always on

PROTECTO One Year Limited Warranty

PROTECTO warrants the PROTECTO 80 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 PROTECTO, in the PROTECTO 80 only. No liability is assumed for damage due to accident, abuse, lack of reasonable care, or for incidental or consequential damages.

To obtain warranty service, 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 PROTECTO 80 and the date when it was purchased. Without this information your warranty service cannot be processed. Please send your PROTECTO 80 insured and shipping prepaid. Ship to:

PROTECTO: ATTENTION: Warranty Service

PROTECTO: ATTENTION: Warranty Service
22N049 Pepper Road
Barrington, Illinois 60010

_____
Name

_____
Address

_____
City   State   Zip

_____
Description of problem with the unit

_____
Name of Dealer where purchased

Vertical centering POKE 39928, 7
                        POKE 39929, X

Horizontal centering – POKE 39928, 99: POKE 39929, X
(screen not picture) –

Non-Bling cursor:
vertical height   POKE 39928, 10
Top to bottom   — POKE 39929, 0 – 7
Bottom to top   —

Blinking cursor –
vertical Height
Top to bottom – POKE 39928 11: POKE 39929, 0–7
Sliding screen – POKE 39928, 13 : POKE 39929, A
A = 0 – 80 80 column 0 – 40 40 column

POKE 39928, 36

Scrolling up – 39928, 39
25 screens – 39928, 40

horizontal line length – POKE 39928, 1 29, X
X = # of columns