DIGITEK

SCREENMASTER 80

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SCREEN MASTER 80

80 COLUMN EXPANSION CARD

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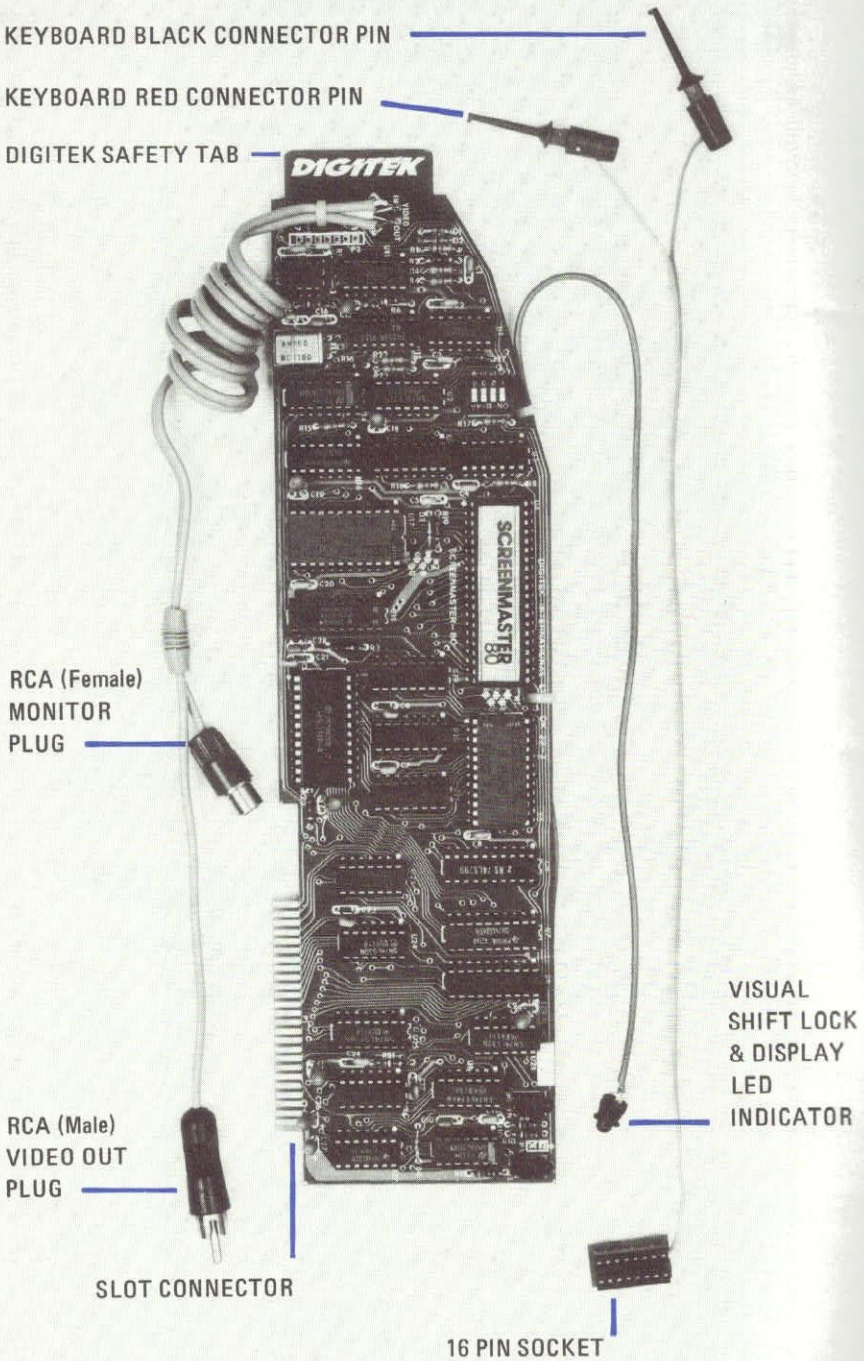


INTRODUCING THE SCREENMASTER 80

There are a number of video cards on the market which enable an Apple II to display an 80 column by 24 line display. These cards all aim to perform certain basic functions, because of its unique design, the SCREEN MASTER 80 has a number of addtional features which give it a range, ease and flexibility in word precessing and applications software that sets it apart from all its competitors.

First of all, because the SCREEN MASTER 80's emulation of Apple is so complete, the combined system can be run as virtually an unaltered Apple when desired, very few, if any, program changes will be required.

Secondly, the additional SCREEN MASTER 80 control codes that bring in 80 column operation and other new facilites have been designed so that they can be memorised without effort.

To show the basis on which these claims are being made, we now look at the SCREEN MASTER 80's capabilities in more detail.

EMULATION OF APPLE The SCREEN MASTER 80 supports all (APPLESOFT) Apple 11 commands, whether in 40 by 24 or 80 by 24 mode. These commands include the graphics and display commands for Apple Hi-res and Lo-res graphics, and inverse and normal (51 and 50) (highlight and lowlight in CP/M and Pascal) and all tabulating and cursor commands (monitor escape codes).

OPERATING MODES Any operating mode can be selected, or a switch made from one mode to another by in each case, a single simple command.

The modes include, obviously, 80 column by 24 line, 40 column by 24 as well as 80 column BASIC listing, which makes for faster and more efficient program editing. The Display Control Characters mode is notably useful. This mode deactivates control characters and thus prevents any control character present in a program from producing its effects during a program listing (such as causing the cursor to move about the screen in a disconcerting fashion). The Display Control Character mode displays control characters as underscored upper-case characters, thereby making them easy to detect in a program listing.

Additional Video Control Codes

The additional video control codes used by SCREEN MASTER 80 have a simple standard form in which the relevant control codes are directly related to its function. Thus "B" is the control code for Block Cursor, "U" for Underscore Cursor and so on:

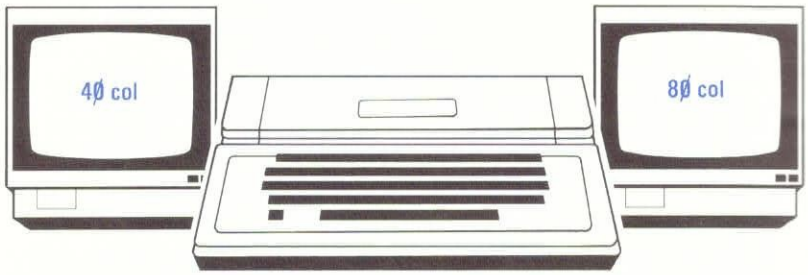
"4"	Switch to Apple 40 × 24 format
"8"	Switch to 80 × 24 format
"9"	Switch to 9 dot character format (9 × 10 EURO AND US)
"B"	Block cursor
"C"	Cursor enable (hardware cursor)
"D"	Switch 80 × 24 Display control characters ON/OFF
"E"	Erase screen line
"F"	Fast blink cursor
"G"	Switch to (GRAPHICS) 8 dot character format (8 × 10 EURO and US)
"H"	High speed scroll mode enable
"I"	Insert screen line
"L"	Lists output to another device
"N"	Non blink cursor
"P"	Print current screen display to printer
"S"	Slow blink cursor
"U"	Underscore cursor
"V"	Video (interlace enhancement

Note: These commands are all prefixed with a <CTRL Z> to allow the SCREEN MASTER 80 to identify them from an Apple or software command so they will not interfere with the normal operation of the Apple or your software.
<CTRL Z> commands when issued from the keyboard and followed by <RETURN> will cause an annoying "SYNTAX ERROR" message to appear on the screen. To overcome this type <CTRL X> after the <CTRL Z> "CHR" command is issued this cancels the command to Apple but allows SCREEN MASTER 80 to act upon it.

One Monitor and Two Monitor Displays

The SCREEN MASTER 8Ø treats both the 8Ø by 24 and 4Ø by 24 and all graphics screens as completely independent display areas. On the 8Ø column monitor this allows video source switching between, for instance, 8Ø by 24 upper/lower case text and 4Ø by 24 uppercase text and Apple HIRES graphics.

However standard Apple output is always available at the normal video output socket. This allows the use of two monitors simultaneously displaying 4Ø or 8Ø by 24 text or graphics on the SCREEN MASTER 8Ø's monitor, and Apple text of graphics (in colour or black and white) on the other monitor.



An Example of the value of this arrangement is that of displaying material on the Apple screen which is required as references for inputs to the 8Ø by 24 screen. But above all, this arrangement transforms the development of graphics programs, since it enables the graphical consequences of any input to the 8Ø × 24 screen to be shown on the Apple screen, so that the effects of parameter variation or of changing numerical values of input data, for example, are seen immediately (this arrangement has obvious advantages for such tasks as modelling).

These advantages can still be obtained when using a single monitor by means of the TOGGLE control, a simple software command which switches the monitor screen between displaying the SCREEN MASTER 8Ø video output to displaying the Apple video output. As with the monitor operation, it is possible therefore to type input data to the SCREEN MASTER 8Ø and immediately see the graphical consequences of this input on the Apple display.

Typewriter Emulation

Besides providing the upper and lower case in 8Ø column operation (also in 4Ø column if a suitable adaptor such as a Paymar has been fitted) the SCREEN MASTER 8Ø will, after a simple keyboard modification has been affected, provide a natural equivalent of the typewriter SHIFT and SHIFT/LOCK controls.

In addition, 12 extra characters are provided so that with the normal character set, 128 characters are available. With a graphics or an alternate character set an additional 128 character are available i.e. : up to 256 characters are available from the keyboard.

The SCREEN MASTER's typeface is attractive in form and highly legible.

INSTALLING THE SCREENMASTER 8O

This section will take you through the simple steps required to install your SCREEN MASTER 8Ø. Also covered is the installation of the keyboard modification which allows the SCREEN MASTER 8Ø to display upper and lower case.
As well as the Visual Shift Lock Indicator for upper and lower case and the Display Control Line assembly use to toggle the video source switch when using PASCAL and CP/M graphics.

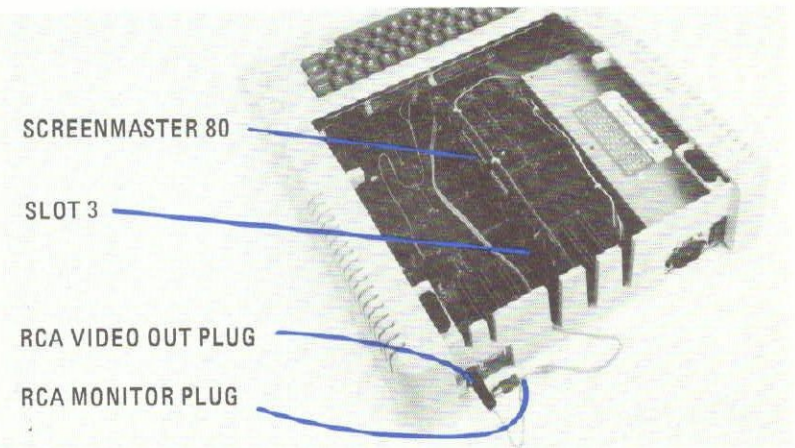
Please read through all the steps below before beginning the installation.

CAUTION: BE CERTAIN THE APPLE II IS TURNED OFF AND UNPLUGGED BEFORE PERFORMING THESE STEPS.

2.1 Installing the Screen Master 8Ø.

The SCREEN MASTER 8Ø is installed in Slot 3 of the Apple II's Peripheral Connectors, located at the back of the Apple II main circuit board. Cable connections are made to the normal Apple video output connector, and to a suitable video monitor. (A monitor with a bandwidth of at least 12 Megahertz is recommended).
Modified colour and black and white TV receivers are not suitable as they do not have sufficient signal ranges to handle the additional character dots generated with 8Ø columns.

There are two (2) cables connected to the SCREEN MASTER 8Ø. One has a plug similar to the one that is connected at the back right hand side of the APPLE and marked VIDEO OUT this is called a female RCA plug and is for connecting the video monitor screen to the SCREEN MASTER 8Ø. The other is called a male RCA plug and connects into the VIDEO OUTPUT connector on the APPLE and is used to divert the Apple video signal to the SCREEN MASTER 8Ø.



Follow these steps to install the card:

1) SWITCH OFF THE POWER TO THE COMPUTER!
2) Open the cover of your APPLE computer and you will note 8 slots numbered 0 through 7 insert the card into Slot 3 the fourth from the left using a firm downward pressure. Be sure the card is seated completely and squarely in the slot.
3) Orient the cables (with the female and male RCA-type plugs) coming from the SCREEN MASTER 8Ø along the right hand side of the APPLE case and out through one of the cut outs at the rear.
4) Connect the longer of the leads the one with the male RCA plug into the APPLE VIDEO OUT connector.
5) Connect the cable coming from your monitor to the female RCA plug coming from the SCREEN MASTER 8Ø.

THE SCREEN MASTER 8Ø IS NOW INSTALLED.

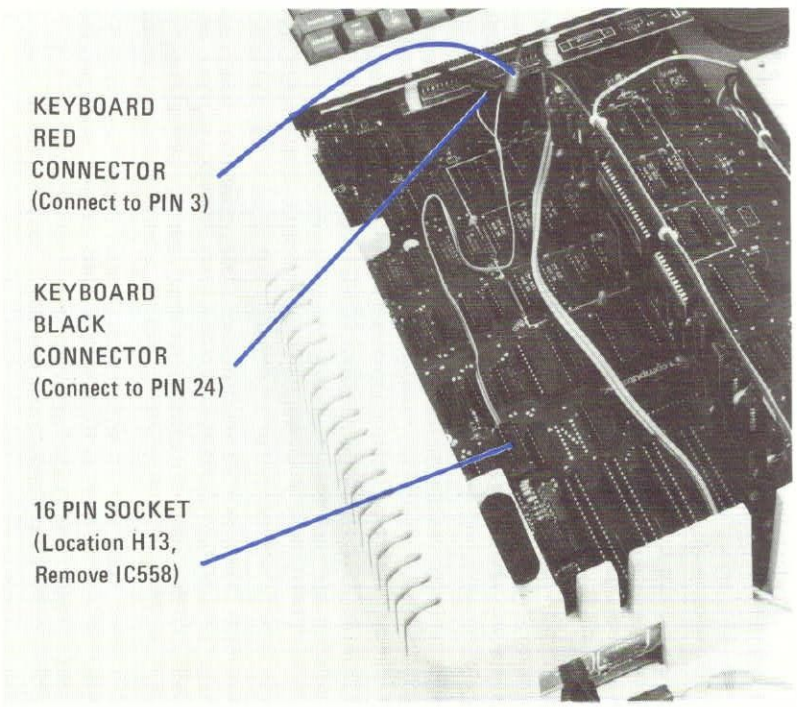
2.2 Keyboard Modification

To take full advantage of the upper and lower case features provided by the SCREEN MASTER 8Ø, a minor modification to the Apple II keyboard is necessary. This modification allows the <SHIFT> key to operate like a normal <SHITFT> key and the <CTRL> key to operate like the <SHIFT LOCK> key on a typewriter. Without this modification the SCREEN MASTER 8Ø will not allow switching between upper and lower case.

Before attempting this modification, bear in mind that it is easy to cause extensive damage to the Apple II by using tools not designed for digital circuitry or by making incorrect connections. If any doubt exists about making this modification, it may be prudent to check with your Apple service organization, and allow them to carry out the task.

To implement the SHIFT and LOCK functions, the program on the SCREEN MASTER 8Ø must be able to sense the setting of the <SHIFT> and <CTRL> keys.

This is achieved by connecting the two leads to the Apple motherboard. The result of the modification is to connect the <SHIFT> key to switch PDL2 and <CTRL> key to PDL3.



2.2.1 Installing the Keyboard modification

To perform this modification the SCREEN MASTER 8Ø comes with a cable assembly with (2) two connector wires with spring-loaded test clips attached at one end and a 16 pin socket at the other.

The steps needed to make this modification differ depending on the version of the keyboard on your Apple II. On the newer Apples with a two-part keyboard, the changes can be made without any soldering or other warranty-voiding changes. On older machines some simple soldering is required. Your dealer can make these changes for you, in roughly 15 minutes, if you prefer not to do the job yourself.

CAUTION: SWITCH OFF THE POWER BEFORE MAKING ANY MODIFICATIONS.

Newer Apples:

1) On newer Apples, there is a circuit board labelled ENCODER BOARD. APPLE this is mounted underneath the keybaord circuit board and has 25 connecting pins between it and the keyboard circuit board.
   The test clips connect to two of the pins connecting the ENCODER BOARD. APPLE and the KEYBOARD. The connecting pins are numbered from 1 to 25 when facing the APPLE II keyboard (i.e. the position when normally operating the system), pin 1 is on the left and pin 25 on the right.
2) Connect the BLACK test clip to pin 24 (second from the right) of the connector and the RED test clip to pin 3 (third from the left).
3) Remove IC 558 at location H13 on the motherboard of the APPLE and insert the socket at the other end of the cable assembly in it's place then insert IC 558 into the new socket provided.

The SCREEN MASTER 8Ø Keyboard Modification is now complete.

Older Apples

On older APPLES there is no ENCODER so the wires must be connected directly to the keyboard. This alternative requires that you remove the case on your Apple II, and that solder connections be made.

Here are the steps:

1) Remove the Apple's case, and disconnect the keyboard cable from the main circuit board (motherboard).
2) Remove the test clips from the ends of the wires, strip the end leaving no more than 1/8 inch of exposed wire.
3) On the bottom of the keyboard, the (shift) key is numbered 42. At the bottom of each key there are 2 pins. Locate the right hand pin of key 42 (i.e. the pin that does not have a circuit baord trace in common with all other keys).
4) Solder the Black wire to the not common pin of key 42, the shift key.
5) Solder the Red wire to the not common pin of key 28, the control key.
6) Replace the keyboard cable and then the base of the Apple II, and turn the system upright.
7) Remove IC 558 at location H13 on the motherboard of the Apple and insert the socket at the other end of the cable assembly in it's place. Then insert IC 558 into the new socket provided.

The SCREEN MASTER 8Ø Keyboard Modification is now complete.

Note: PDL INPUTS 2 AND 3 ARE DISABLED BY THIS MODIFICATION.

2.2.2 Installing the Visual Shift Lock Indicator and Display Control Line.

To install the VSLI use the cable assembly (supplied) with a lamp (LED) and a single wire with (1) one spring loaded test clip attached at one end and a rectangular (4) four pin in line connector at the other.

You may install the VSLI in two ways. The steps required are simple providing some care is taken. The two methods are outlined below:

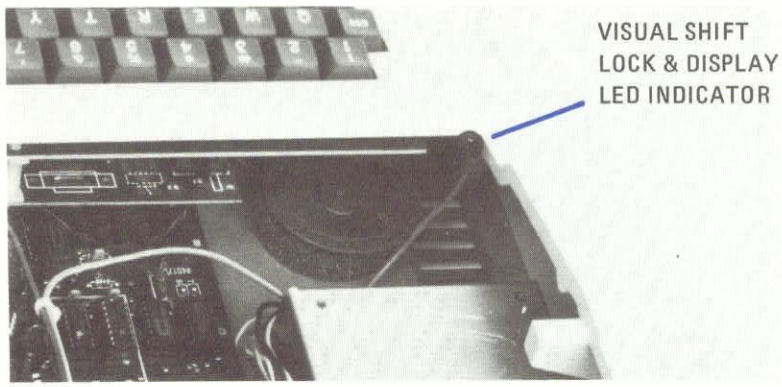
1) Remove the Apple case and keyboard.
   WARNING: REMOVE THE APPLE CASE AND KEYBOARD OR THE MOTHERBOARD COULD BE DAMAGED
   Drill a 17/64 inch hole in a convenient position on the Apple case.
   (We suggest that it be mounted on the right hand side of the channel that runs across and above the keyboard).
   Then remove the plastic LED mount from the LED.
   Feed the LED through the drilled hole from underneath the Apple case.
   Press the LED MOUNT over the LED.
   Press the ASSEMBLY back into the hole in the Apple case.
   Replace the keyboard and the Apple case.

OR

2) File two (2) small flat sides on the LED and place it through the first ventilation slot on the Apple case. A metal nail file is suitable to perform this job.
   Then press the (4) four pin rectagular connector with (3) three wires coming

from it over the (3) pins attached to SCREEN MASTER 8Ø at the left hand top end of the board this connector has (1) one pin missing to provide a keyway so that the connector cannot be installed incorrectly.
The other wire attached to this assembly is called the Display Control Line and is used to toggle the Video source to the graphics display when using PASCAL or CP/M graphics commands.
Connect the single spring loaded test clip to the keyboard end of resistor marked 4.7 K located between IC-F13 and F14.

Note: THE SCREEN MASTER 8Ø input routine toggles location "AND" on the game I/O.
The display control line is only available on Revision 4 Plus
The SCREEN MASTER 8Ø - KEYBOARD MODIFICATION - VISUAL SHIFT LOCK INDICATOR and the DISPLAY CONTORL LINE should now be installed and ready for use.



WARNING:

BEFORE TURNING ON THE POWER TO THE APPLE ENSURE THAT THE PREVIOUS STEPS HAVE BEEN TAKEN AND FOLLOW THE NEXT STEPS CAREFULLY!!

1. CHECK ALL CONNECTIONS
2. ALL O.K.?
3. IF NOT THEN GO BACK TO STEP 1
4. TURN ON THE POWER TO YOUR APPLE
5. IS 40 COLUMN OUTPUT O.K.?
6. IS APPLESOFT PROMPT "J" AND CURSOR O.K.?
7. IF NOT THEN GO BACK TO STEP 1 OR TO SECTION 6 OF THE MANUAL
8. TYPE "PR#3" THEN PRESS <RETURN>
9. IS PROMPT "J" AND CURSOR NOW DISPLAYED ON 80 COLUMN SCREEN?
10. IF NOT THEN GO BACK TO STEP 1
11. TYPE "10 PRINT "A"; : GOTO 10" THEN PRESS <RETURN>
12. TYPE 'RUN" THEN PRESS <RETURN>
13. THE SCREEN SHOULD NOW FILL UP WITH "A" 'S
14. IF NOT THEN GO BACK TO STEP 1 OR TO SECTION 6 OF THE MANUAL
15. READ THE NEXT SECTION OR GO TO SECTION 6 OF THE MANUAL

2.3 VIDEO ADJUSTMENT

The contrast, signal level and vertical height of the video monitor or your Apple may require adjustment. This can be made by adjustment to the following:

- Apple II video level potentiometer
- Monitor Contrast and Brightness controls
- Monitor Height and Vertical linearity
- Monitor Horizontal and Vertical hold

REFER TO SECTION 6, "DIAGNOSTICS" FOR FURTHER INFORMATION IF YOU EXPERIENCE ANY DIFFICULTY.

OPERATING THE SCREENMASTER 8O

The sections below provide all the details needed to use your SCREEN MASTER 8Ø from either the keyboard or a program. The commands and features are explained separately.
Within each section, special cautions or conditions are indicated in specific "NOTES".

3.1 ACCESSING THE SCREEN MASTER 8Ø

The SCREEN MASTER 8Ø's advanced software located on the board allows the use of all Applesoft and graphics commands.

Once the Card has been installed in your Apple II, (refer to Section 2), it is accessed by issuing the command:

"PR#3 <RETURN>"

When this command is executed the screen will immediately switch to 8Ø × 24 format, and remain in this mode until:

1. an appropriate card control command is given.

OR

2. <RESET> (HARD EXIT) is pressed

OR

3. the command <CONTROL Z> <4> FOLLOWED BY "PR#Ø" and " PIN #Ø" is executed (SOFT EXIT).

Note: IF A HARD EXIT <RESET> IS GIVEN, THE <FP> (FLOATING POINT) <RETURN> COMMAND MUST BE GIVEN BEFORE ANY OTHER COMMAND IS ISSUED. TO RETURN TO THE SCREEN MASTER 8Ø, ISSUE ANOTHER "PR#3" COMMAND.

Note: DOS MUST ALWAYS BE EXECUTED WITH THE 4Ø × 24 APPLE SCREEN DISPLAYED.

Note: A "PR#3" WILL RECONNECT YOU TO THE SCREEN MASTER 8Ø. FOLLOWING A "PR#n" TO ANY OTHER DEVICE OTHER THAN A DISK DRIVE CONTROLLER

Note: WHEN THE SCREEN MASTER 8Ø IS ACTIVE, THE BELL CHARACTER <CONTROL G> SOUNDS DIFFERENT TO THE STANDARD APPLE BELL. IT HAS A MORE MUSICAL TONE.

3.2 Upper and Lower Case

Upper and lower case may be typed into the Apple with the keyboard modification of Section 2.1, above. The modification permits a closer emulation of standard typewriter shift and shift lock, allowing all the SCREEN MASTER 8Ø commands to function. After the keyboard modification has been installed, upper and lower case characters are generated under control of the <SHIFT> and <CTRL> keys similar to a typewriter.

With the modification, the card has two keyboard modes:

- "APPLE" keyboard mode (when locked in upper case)
- "TYPEWRITER" mode (when in upper and lower case)

Characters available differ in these two modes.

3.2.1 SHIFTING WITH THE MODIFIED KEYBOARD

The <CTRL> key is used to carry out the function of the "SHIFT LOCK" key missing from the Apple II: When the <SHIFT> key is pressed and released without any other key being pressed, the keyboard will change into lower case, or "TYPEWRITER" keyboard mode, until the <CTRL> is pressed and released this returns the keyboard to "APPLE" mode.

When in "TYPEWRITER" mode all ALPHA keys will be in lower case except when <SHIFT> and the appropriate key are simultanously pressed.

When in "APPLE" mode the keyboard acts the same as a normal APPLE keyboard except that additional keyboard characters can also be entered (refer to Section 3.2.2 ADDITIONAL KEYBOARD CHARACTERS) by simultaneously pressing the <SHIFT> key and the appropriate key.

Note: WHEN SHIFTING BETWEEN "APPLE" KEYBOARD AND "TYPEWRITER"

MODES TWO DIFFERENT BELL TONES WILL GIVE AN AUDIBLE FEEDBACK THAT THE SHIFT HAS TAKEN PLACE.
IF THE VISUAL SHIFT LOCK INDICATOR HAS BEEN INSTALLED THE LED WILL BE LIT WHEN IN "APPLE" KEYBOARD MODE.

3.2.2 Additional Keyboard Characters

Twelve additional keyboard characters are available when the SCREEN MASTER 80 Card is active and the keyboard modification is installed. The keyboard must be in "APPLE" mode (i.e locked in upper case) to obtain these characters:

<SHIFT> <O>	<SHIFT> <S>
<SHIFT> <M>	<SHIFT> <R>
<SHIFT> <L>	<SHIFT> <U>
<SHIFT> <P>	<SHIFT> <T>
<SHIFT> <N>	<SHIFT> <V>
<SHIFT> <Q>	<SHIFT> <K>

3.2.3 Visual Shift Lock Indicator

When installed the LED will LIGHT UP when in "APPLE" keyboard, to distinguish it from "TYPEWRITER" mode. This gives a visual indication of the keyboard's current shifted status.

3.3 Screen Master 8Ø codes

Upon entering one of the following CONTROL SEQUENCES, from the keyboard or under program control the SCREEN MASTER 8Ø will switch into a different operating or video display mode.

Note: These commands are all prefixed with a <CTRL Z> to allow the SCREEN MASTER 8Ø to identify them from an Apple or software command so they will not interfere with the normal operation of the Apple or your software.
<CTRL Z> commands when issued form the keyboard and followed by <RETURN> will cause an annoying "SYNTAX ERROR" message to appear on the screen.
To overcome this type <CTRL X> after the <CTRL Z> "CHR" command is issued this cancels the command to Apple but allows SCREEN MASTER 8Ø to act upon it.

The control sequence is:

From the keyboard <CONTROL Z > "CHR" <CTRL X>

OR

PRINT CHR$ (26); "CHR" under program control.

Where < CONTROL Z > is the character formed by pressing the <CONTROL> and <Z> keys simultaneously, and then "CHR" as an upper case character or number, as follows:

"4"	Switch to Apple video display.
"8"	Switch to back to SCREEN MASTER 8Ø display following "4"
"9"	Switch to 9 dot character display (9 × 1Ø Normal).
"B"	BLOCK CURSOR.
"C"	CURSOR always ENABLED.
"D"	Switch display Control Character ON/OFF.
"E"	ERASE Line on screen.
"F"	FAST Blink Cursor.
"G"	Switch to GRAPHICS 8 Dot character display (8 × 1Ø).
"H"	HIGH SPEED Scroll.
"I"	INSERT Line on screen.
"L"	LINK output to other device.
"N"	NON Blink Cursor.
"P"	PRINT current screen display to printer.
"S"	SLOW Blink Cursor.
"T"	TOGGLE Video Source.
"U"	UNDERLINE Cursor.
"V"	VIDEO (interlace enhancement.

These commands are discussed in detail in the following sections.

3.3.1 <CONTROL Z> "4" Switch to APPLE (40 × 24) video displays:

After the SCREEN MASTER 8Ø has been initialized (i.e. with PR#3) this control sequence displays the standard APPLE video screen.

Control will now be taken to the APPLE screen and commands (i.e. TEXT) will now apply only to the APPLE screen.

Note: This also allows the keyboard modification to work on the APPLE screen (4Ø × 24) to display upper and lower case with an appropriate character generator installed.

3.3.2 <CONTROL Z> "8" Switch back to SCREEN MASTER 8Ø display:

Reactivates the SCREEN MASTER 8Ø screen following a <CONTROL Z> "4"

3.3.3 <CONTROL Z> "9" 9 dot character display:

Returns the SCREEN MASTER 8Ø to a 9 dot character display (9 × 10 EURO or US) after selecting a <CONTROL Z> "G" (8 dot character display).
Refer section 5 ALTERNATE CHARACTER SETS

3.3.4 <CONTROL Z> "C" Cursor always enabled:

The Apple cursor convention is to have the cursor disabled until an input is requested. By issuing this command the cursor will be enabled permanently in BASIC, PASCAL AND CP/M. If you experience the situation of running software with the SCREEN MASTER 8Ø and it appears to function, however there is no visable cursor then use this command to enable the cursor.

3.3.5 <CONTROL Z> "D" Display control characters ON/OFF.

This allows CONTROL CHARACTERS to be displayed but not activated. With the standard character set they appear as underscore uppercase characters i.e. <CR> or CARRIAGE RETURN would appear as "underscored M" <CONTROL M>, the appropriate control code for <CR>.

3.3.6 <CONTROL Z> "E" Erase line on screen:

This command can be implemented in programs such as word processors to speed up editing by issuing this command a screen line will be erased.
This will not erase a line in memory.
This command sequence can be installed in Wordstar to increase editing speed.

3.3.7 <CONTROL Z> "G" Graphics Characters:

The SCREEN MASTER 8Ø can, instead of the normal 9 × 1Ø EURO or US character set you can display a GRAPHICS character set with an 8 DOT character format (8 × 1Ø EURO or US).
Refer section 5 ALTERNATE CHARACTER SET.
A Graphics character set has been included with the SCREEN MASTER 8Ø.
Additional character sets are available from your SCREEN MASTER 8Ø dealer as an additional option. (Or you may define your own). Included on the UTILITIES DISK are the standard character sets and a CHARACTER SET GENERATOR.

3.3.8 <CONTROL Z> "H" High speed scroll:

The SCREEN MASTER 8Ø can have three (3) scroll speeds two (2) are controlled by hardware switch (1) when using the DMA enable mode switch (1) OFF then by issuing this command an improved scroll speed of 50% can be obtained on the normal scroll speed. REFER SECTION 5.2 SCREEN MASTER 8Ø DIP SWITCH SETTINGS

3.3.9 <CONTROL Z> "I" Insert line on screen:

This command can be implemented in programs such as word processors to speed up editing by issuing this command a screen line will be inserted.
This will not insert a line in memory.
This command sequence can be installed in Wordstar to increase editing speed.

3.3.10 <CONTROL Z> "L" Link output to another device:

When this command is issued and is followed by a slot number to a printer or other device then all output to the device will be displayed onto the SCREEN MASTER 8Ø screen in 8Ø column. The command sequence would appear as <CONTROL Z> "L1" <CTRL X> "LIST" if you wished to display a

program listing on the screen as you were printing it.
To turn this command OFF issue a <CONTROL Z> "L3" or "L0" command.

3.3.11 <CONTROL Z> "P" Print current screen to printer

This command is similar to <CONTROL Z> 'L" above except that only the current screen displayed is printed and return to SCREEN MASTER 8Ø is automatic.

3.3.12 <CONTROL Z> "T" Toggle the Video Source

Because the SCREEN MASTER 8Ø has its own independant screen RAM and APPLE video display pickup it does not interfere with the normal APPLE video screen in any way. This allows completely INDEPENDENT video screen displays to be selected. The TOGGLE VIDEO SOURCE control code <CONTROL Z> "T" has been included to allow switching between the SCREEN MASTER 8Ø and APPLE display screens without affecting either display:
The cursor and any program printed output remain on the current active screen, while the other is being displayed, e.g. you can input data to create a graph on the SCREEN MASTER display while displaying the graph on the APPLE display.

3.3.13 <CONTROL Z> "V" Video (interlace) enhancement ON/OFF.

This command sets the 6845 variables on SCREEN MASTER 8Ø to display the characters in interlaced video mode this gives a very clear rounded character intensity display when used on very high quality monitors.

Most monitors on the market do not have sufficient "large signal" bandwidth to generate a data display of the quality required.

A good example of the quality improvement can be seen if used with the Apple Monitor III this monitor has all the requirements to display 8Ø columns in this mode.

3.3.14 CURSOR DEFINITION

Two types of Cursors, BLOCK and UNDERLINE are available with THREE BLINK Speeds.
These commands can be issued from the keyboard or under program control by issuing the appropriate command sequences.

TO SET THE CURSOR TYPE:

<CONTROL Z> "B" BLOCK
<CONTROL Z> "U" UNDERLINE

TO SET CURSOR BLINK SPEED:

<CONTROL Z> "N" NON BLINK
<CONTROL Z> "F" FAST BLINK
<CONTROL Z> "S" SLOW BLINK

3.4 SCREEN MASTER 8Ø SCREEN CONTROL CODES.

The SCREEN MASTER 8Ø uses the following control codes for screen display and control. These codes are affected by issuing the appropriate ASCII codes from within a program : i.e. PRINT CHR$ (nn) where "nn" is the appropriate ASCII value for the function required:

ASCII NAME	DECIMAL VALUE	FUNCTION
BEL	**7**	SOUND SYSTEM BELL
BS	**8**	NON DESTRUCTIVE BACK SPACE
LF	**10**	LINE FEED
VT	**11**	CLEAR TO END OF SCREEN
FF	**12**	FORM FEED (equivalent to "HOME")
CR	**13**	CARRIAGE RETURN
SO	**14**	SET "NORMAL" DISPLAY MODE (HIGHLIGHT TEXT IN CPM)
SI	**15**	SET "INVERSE" DISPLAY MODE (LOWLIGHT TEXT IN CPM)
EM	**25**	HOME CURSOR WITHOUT CLEARING SCREEN
FS	**28**	NON DISTRUCTIVE FORWARD SPACE
GS	**29**	CLEAR TO END OF LINE
RS	**30**	GOTO XY cursor addressing lead in
US	**31**	REVERSE LINE FEED

3.5 MONITOR ESCAPE CODES

The SCREEN MASTER 8Ø card uses the standard APPLE monitor escape codes obtainable only from keyboard input:

<**ESC**> - **A** Move Cursor RIGHT
<**ESC**> - **B** Move Cursor LEFT
<**ESC**> - **C** Move Cursor DOWN
<**ESC**> - **D** Move Cursor UP

OR

<**ESC**> - followed by either I,J,K,M or multiples of these which you may note form a diamond shape on the keyboard indicating the direction of cursor movement.

```
   I
J<>K
   M
```

<**ESC**> - **E** CLEAR TO END OF LINE from current cursor position

<**ESC**> - **F** CLEAR TO END OF SCREEN from current cursor position

<**ESC**> - @ CLEAR SCREEN and HOME the cursor.

3.6 <CONTROL S> - STOP LIST - This command suspends output to the screen and suspends program execution until any other key except <ESC>, <CTRL>, <SHIFT> or <RESET> is pressed, at which time normal processing will resume. It is commonly used to suspend a program listing during editing.

3.7 <CONTROL F> - FLUSH - This command allows the output to the screen to be halted without the running program being affected. It is terminated when a keyboard input is requested. It has been added to speed up the operation of a program having output to the screen where display may not be required continuously.

THE COMMAND WILL BE TURNED OFF BY THE ISSUE OF A SECOND COMMAND

3.8 FAST AND SLOW Scroll or DMA enabled DMA disabled.

The SCREEN MASTER 8Ø Has 3 Scroll Speeds:

1. SLOW SCROLL (NORMAL). This is activated by switching No. 1 switch on the SCREEN MASTER 8Ø to the ON position and the display is FLICKER FREE and thereby ENHANCED.
2. FAST SCROLL. This is activated by switching No. 1 switch on the SCREEN MASTER 8Ø to the OFF position this by-passes the Flicker Free Display controls and allows a faster scroll rate. This Mode also allows DIRECT MEMORY ACCESS to the SCREEN MASTER 8Ø Display RAM, hence DMA (DIRECT MEMORY ACCESS) capability.
3. VERY FAST SCROLL By issuing the SCREEN MASTER 8Ø Command <CONTROL Z> "H" while in FAST SCROLL mode you will activate an even higher scroll speed.
   A further speed improvement of up to 50% can be obtained.

3.9 Dual Character Sets

The SCREEN MASTER 8Ø can display up to 256 characters on the screen at any one time by a flick of a switch.
These characters may be normal characters and line or block graphics character or they may be any characters you may wish to generate, e.g. GREEK OR MATHEMATICAL SYMBOLS.
The No.4 switch on the SCREEN MASTER 8Ø must be set to the OFF Position for SINGLE or ON for DUAL (Normal and Alternate) character set switching.
This enables the ALTERNATE CHARACTER SET to be used when the command INVERSE is issued.
Also Set No. 3 switch on the SCREEN MASTER 8Ø to the OFF position. This allows the INVERSE (SI) Command to select a different character in the Alternate, additional Character Set without displaying it in INVERSE.

3.10 Using the Screen Master 80 with Applesoft Basic

The Screen Master 80 can be used with any Applesoft Basic programs with little or no modification required in the program code. The following sections review the Apple text and graphics commmands.

Other than the notes outlined ALL APPLESOFT AND DOS COMMANDS will function and all APPLESOFT programs will run on the SCREEN MASTER 80 excepting that they may still only be formatted in 40 column. In this case TABS will need to be altered to utilise the 80 column screen.

3.10.1 HOME imm & def

HOME moves the cursor to the upper left screen position within the 80 × 24 or 40 × 24 scrolling window and clears all text within the window . The monitor escape equivalent is <ESC> < @ >.

Note: "CALL-936" SHOULD BE REPLACED WITHIN A PROGRAM BY "HOME" OR "PRINT CHR$ (12)" – FORM FEED – MAY ALSO BE USED, AND WOULD NORMALLY APPLY IN INTEGER BASIC.
A "CALL-936" COMMAND WILL NOT CAUSE ANY PROGRAM CORRUPTION, IT WILL HOME THE CURSOR BUT WILL NOT CLEAR THE SCREEN.

3.10.2 TEXT imm & def

TEXT sets the screen to full-screen text mode. The prompt and cursor are moved to the last line of the ACTIVE screen (equivalent to VTAB 24). If the text window has been set to anything other than full screen TEXT will reset the screen window.

e.g. If the <GR> command was issued from the SCREEN MASTER 80 the TEXT command will return the cursor to the SCREEN MASTER 80 display. However if <CONTROL Z> "4" was issued from the SCREEN MASTER 80 followed by the <GR> command the TEXT will reset Apple video display.

3.10.3 GR imm & def

<GR> displays and sets the APPLE screen to (40 × 24) low-ewsolution <GR>aphics leaving 4 lines (40 × 24) of text at the bottom. To return to the SCREEN MASTER 80 the command TEXT would be issued.

3.10.4 HGR imm & def

<HGR> displays and sets the APPLE screen to (280 × 160) high-resolution graphics screen one, leaving 4 lines (40 × 24) of text at the bottom. A POKE -16302, 0 will set the full 280 × 192 HIRES screen. To return to the SCREEN MASTER 80 the command TEXT would be issued.

3.10.5 HGR 2 imm & def

<HGR2> displays and sets the Apple screen to full (280 × 192) high-resolution graphics. To return to the SCREEN MASTER 80 the command TEXT would be issued.

3.10.6 Text Window - Poke 32,33,34,35

The following commands set the size of the "window" in which text is shown and scrolled the commands set the window accordingly:

POKE 32 – Sets the left window margin.
POKE 33 – Sets the window width. (NOT SUPPORTED)
POKE 34 – Sets the top of the window.
POKE 35 – Sets the bottom of the window.

Refer APPLESOFT manual pages 128-129 for a more complete description of these commands.

Note: AS SCREEN MASTER 80 ALLOWS THE CALLS-936, 958 AND 868 TO BE USED WITHOUT CAUSING ANY PROGRAM CORRUPTION WHEN ATTEMPTING TO CLEAR AN 80 COLUMN SCREEN WHEN WINDON WIDTH IS SET TO 40 THEN THE COMMAND "POKE 33" CANNOT BE SUPPORTED.

3.10.7 VTAB – HTAB and TAB

VTAB – HTAB and TAB COMMANDS move the cursor in different directions as follows:
VTAB – Moves the cursor to the line that is expressed in the argument given when the command is issued in relation to the current cursor position. This may involve moving the cursor either up or down in the range 1 to 24.

HTAB – Moves the cursor to the right from the left edge of the current screen line. HTAB will only move the cursor through the positions 1 to 40 on the current screen line positions 41 through 80 will be Displayed on the next line irrespective of the text window.

TAB – This command must be used in a PRINT statement and will move the cursor right relative to the left margin of the text window and will move the cursor to the extreme of the right margin and spacing will continue from the next lower line at the left margin of the text window.

Refer Applesoft manual page 50 for a more complete description of these commands.

3.10.8 PR#0 imm & def

PR#0 does NOT return output to the SCREEN MASTER 80,PR#0 must be replaced with PR#3 to return to the SCREEN MASTER 80.

Note: PR#0 MUST BE REPLACED WITH PR#3.

3.10.9 Clear to end of Line

A clear to end of line command is not supported by the APPLE. A CALL (-868) to a monitor routine is often used for this functon.
These calls SHOULD be replaced by PRINT CHR$ (29).

Monitor escape equivalent is <ESC> <E>.

Note: (CALL -868) SHOULD BE REPLACED WITH <PRINT CHR$(29)>. A "CALL -868" WILL NOT CAUSE ANY PROGRAM CORRUPTION HOWEVER IT WILL NOT HAVE THE DESIRED EFFECT.

3.10.10 Clear to end of Screen

A clear to end of screen command is not supported by the APPLE.
A CALL -958 to a monitor routine is often used.
These calls SHOULD be replaced by <PRINT CHR$ (11)>.

Monitor escape equivalent is <ESC> <F>.

Note: (CALL -958) SHOULD BE REPLACED WITH <PRINT CHR$ (11)>. A "CALL -958" WILL NOT CAUSE ANY PROGRAM CORRUPTION HOWEVER IT WILL NOT PERFORM THE FUNCTION.

3.10.11 Upper and Lower Case

ALL APPLESOFT BASIC commands must be typed in UPPER CASE.
The content of text strings may be in upper or lower case, however, lower case will display correctly on the SCREEN MASTER 80, and on the APPLE display if a commercial lower case adapter (such as the Paymar) has been installed. Upper and lower case may be typed directly on the APPLE display if the SCREEN MASTER 80 has first been initialised (PR#3) and the command <CONTROL Z> "4" has been issued.

The following statement is correct:

```
10 PRINT "The Quick Brown Fox"
```

but

```
10 PRINT "The Quick Brown Fox"
```

is incorrect.

3.10.12 Inverse Normal and Flash

INVERSE, NORMAL and FLASH commands are supported by the APPLE display and by the SCREEN MASTER 80, however FLASH will be treated automatically as INVERSE on the SCREEN MASTER 80.
INVERSE and NORMAL will display the same way on the SCREEN MASTER 80 display as it would be one the APPLE display.

3.10.13 GOTO XY

Direct screen addressing, GOTO followed by X,Y co-ordinates where X and Y are single ASCII characters greater than 32, for absolute screen positioning is supported in BASIC when used with the SCREEN MASTER 80 although this is normally a function of PASCAL, FORTRAN, AND CP/M.

This command may be used as a substitute for HTAB and VTAB in BASIC.

To implement GOTO XY the following statement would apply:

PRINT CHR$ (30); CHR$ (X + 32); CHR$ (Y + 32)

3.10.14 Parellel Printers

This section has been included since there is a problem using this type of printer interface. The problem has been defined thus:

The parallel printer interface, when addressed (usually with a PR≠1) has its firmware set to print 40 columns, and will attempt to print 80 columns with the result usually beng disasterous. Therefore a <CONTROL I> "80N" command must be issued to the printer interface after the PR≠1 to set the width to 80 columns.

Note: THIS PROBLEM DOES NOT EXIST WHEN USING A DIGITEK "SUPER PRINTMASTER III" Parallel Interface Card, or a "PRINTMASTER" Parallel Interface Card.

3.11 Pascal, Fortran and CP/M

Programs in these languages were originally formatted to use an 80 × 24 line screen display. They use the SCREEN MASTER 80 automatically and require no modification except one in PASCAL which you may not elect to do. That is change of (1) parameter in the SYSTEM. MISCINFO file on your APPLE 1 system disk.

Apple initially set the console screen width to 79 columns allowing abbreviated prompt lines on the 40 × 24 screen. By executing the program SETUP. CODE supplied on APPLE 3 diskette and setting the screen width parameter to 80 column will ensure that all prompt lines will appear in their unabbreviated form. This change if not done will in no way effect the operation of the SCREEN MASTER 80.

The SCREEN MASTER 80 will automatically switch to 80 × 24 display on executing PASCAL, FORTRAN or CP/M and will assume the role of a SYSTEM CONSOLE device, i.e. APPLE HIGH SPEED SERIAL CARD.

The SCREEN MASTER 80 screen control codes, full upper and lower case keyboard including additional keyboard characters, cursor definition and all SCREEN MASTER 80 control codes are available for users of PASCAL, CP/M and FORTRAN.

3.11.1 Screen Master 80 Control Codes Refer Section 3.3

3.11.2 Screen master 80 Screen Control Codes Refer Section 3.4

3.11.3 GOTO XY

Direct screen addressing, GOTO followed by X and Y co-ordinates where X and Y are single ASCII characters greater than 32, for absolute cursor positioning is fully supported for PASCAL, FORTRAN AND CP/M.

3.11.4 Pascal Graphics

ONE MONITOR DISPLAY

With the SCREEN MASTER 80 Display Control Line cable installed PASCAL graphics commands can be detected and appropriate screen switching will be performed.

The <CONTROL Z> "T" command has also been included. This allows PASCAL graphics to be displayed by switching the SCREEN MASTER 80 video source to the APPLE display. Also refer section 3.3.12 <CONTROL Z> "T".

Note: THE FOLLOWING COMMAND SEQUENCE IS USED TO INVOKE PASCAL GRAPHICS USING ONE MONITOR.

"WRITE <CHR(26)>;"
"WRITELN ('T');"
"INITTURTLE"

to exit:

"WRITE <CHR(26)>;"
"WRITELN ('T');"
"TEXTMODE"

A demonstration of this function can be found on the PASCAL demonstration disk by executing the file DEM1. CODE.

TWO MONITOR DISPLAY

Should you wish to use two monitors, no change in software is required. PASCAL graphics will automatically be displayed on both monitors with the Video Control Line installed.

When the Display Control Line cable is removed the 80 column display will remain on the SCREEN MASTER 80 display and PASCAL graphics will be displayed on the monitor connected to the APPLE video output connector or PAL colour card.

3.11.5 CP/M Graphics

ONE MONITOR DISPLAY

With the SCREEN MASTER 80 Display Control Line cable installed CP/M graphics commands can be detected and appropriate screen switching will be performed.

The <CONTROL Z> "T" command has also been included. This allows CP/M graphics to be displayed by switching the SCREEN MASTER 80 video source to the Apple display. Also refer sectgion 3.3.12 <CONTROL Z> "T".

e.g. 10 PRINT CHR$(26); "T" : GR
ALLOWS GRAHICS COMMANDS TO BE ISSUED.

20 PRINT CHR$(26): "T" : TEXT
RETURNS TO THE SCREEN MASTER 80 DISPLAY.

TWO MONITOR DISPLAY

Should you wish to use two monitors, no change in software is required. CP/M graphics will automatically be displayed on both monitors with the Video Control Line installed.

When the Display Control Line cable is removed the 80 column display will remain on the SCREEN MASTER 80 display and CP/M graphics will be displayed on the monitor connected to the APPLE video output connector or PAL colour card.

3.11.6 Highlight Text, Lowlight Text

The SCREEN MASTER 80 includes the capability to display text in both INVERSE and NORMAL. This is an added feature to Apple Pascal and enchances the use of CP/M. e.g. WORDSTAR, SPELLBINDER and SELECT wordprocessors utilise the HIGHLIGHT-LOWLIGHT TEXT capabilites.

SO (NORMAL)	CHR$ (15) HIGHLIGHT TEXT IN CP/M and PASCAL
SI (INVERSE)	CHR$ (14) LOWLIGHT TEXT in CP/M and PASCAL

3.11.7 Warm Boot Pascal; and CP/M

The SCREEN MASTER 80 supports WARM BOOT <CTRL C> in both PASCAL and CP/M. This means that the screen will not clear when a warm boot is effected. On a cold start first entry to the SCREEN MASTER 80, the screen will not be cleared except by the software, this means on the first time boot in PASCAL the screen will display garbage for a few seconds until PASCAL effects its clear screen command.

3.11.8 Keypress and the Type Ahead Buffer in Pascal

PASCAL 1.1 sees the SCREENMASTER 80 as a firmware card, thus enabling keypress and the Type-ahead Buffer. However APPLE PASCAL I.O considers the SCREEN MASTER 80 to be a High-speed Serial Interface connected to an external terminal it does not look at the Apple keyboard, thus precluding the use of KEYPRESS and the TYPE-AHEAD BUFFER.

On the PASCAL utilities disk will be found a file called ATTACH. CODE when this file is executed from PASCAL and the appropriate questions answered the SCREEN MASTER 80 will perform the function KEYPRESS and the TYPE-AHEAD buffer will be available. The following functions will also be available to the user:

<CTRL>	"A" will clear the Type-ahead buffer
<CTRL>	"S" will stop listing to output device
<CTRL>	"F" will stop listing to screen but will not interrupt the program.
<CTRL> <SHIFT>	"P" will BREAK the execution of a running program and return to outer command level.

The program DEM1. CODE will demonstrate the keypress function and the inplementation of PASCAL graphics with the SCREEN MASTER 80.

Note: BEFORE EXECUTING THE FILE ATTACH. CODE ENTER THE FILER AND SET PREFIX TO #5.

Note: THE ABOVE ONLY APPLIES TO RELEASES OF SYSTEM: APPLE PRIOR TO 24 AUG 1982 RELEASES SINCE THAT DATE DO NOT NEED MODIFICATION. SCREEN MASTER 8Ø **HAS THE APPLE FIRMWARE PROTOCOLS TO IMPLEMENT BOTH THESE FUNCTIONS AUTOMATICALLY.**

3.12 Corvus Hard Disk Systems and Omninet

SCREEN MASTER 8Ø will work with the CORVUS disk system and OMNINET however when the OMNINET system is installed it detects SCREEN MASTER 8Ø and displays the banner in 8Ø columns. If a BASIC user is put onto the system and a "PR#3" has not been included in the HELLO boot program then the SCREEN MASTER 8Ø will hang until <RESET> is pressed. If you are working in a NETWORK situation where some systems do not have SCREEN MASTER 8Ø installed and some do and both are using the same volume access then problems will occur if just a "PR#3" was used. The following one line BASIC change will overcome this problem and allow all users access to the same volumes.

```
10 IF PEEK (49925)=56 AND PEEK (49927)=24 THEN PRINT CHR$ (4); "PR#3": PRINT "  "
```

Note: THIS PROGRAM LINE CAN ALSO BE USED FOR ANY OTHER SOFTWARE TO DETECT THE PRESENCE OF SCREEN MASTER 8Ø AND SWITCH AUTOMATICALLY TO THE 8Ø COLUMN DISPLAY.

3.13 Additional Video Output Connector

SCREEN MASTER 8Ø also has available the video signals required to drive additional video generator devices. The most common of these would be PAL or RGB video boards.

THESE PINS ARE LOCATED AT THE LEFT HAND BOTTOM END OF THE BOARD AND THE SIGNALS AVAILABLE AT EACH PIN ARE!

1 = GROUND
2 = COMPOSITE VIDEO
3 = GROUND
4 = H SYNC
5 = GROUND
6 = V SYNC
7 = GROUND

ASSEMBLER PROGRAMMER'S INFORMATION

The following general points are included to assist programmers using the SCREEN MASTER 8Ø in ASSEMBLER:

- ★ ALL STANDARD Apple II input/output and command conventions are used by the SCREEN MASTER 8Ø.
- ★ The SCREEN MASTE 8Ø uses no Apple RAM locations except screen variables in Page Zero (CH, CV, etc) and slot- dependent locations assigned and ALLOWED by Apple.
- ★ The standard Apple II text window is utilised with screen RAM located sequentially from $C800 to $CF00.
- ★ To initialize the SCREEN MASTER 8Ø from assembler, use the instruction JSR $C300.
  This will also set the I/O hooks.
- ★ To output a character to the screen without using the I/O hooks, use the following sequence:

```
LDA CHAR    ; GET CHARACTER IN THE A REGISTER
JSR $C305   ; OUTPUT TO SCREEN (PRESERVING ALL REGISTERS)
```

- ★ To read a character from the keyboard using the firmware routines without using the the I/O hooks, use the following sequence:

```
JSR $C307       ; READ A KEYBOARD CHARACTER AND RETURN IT IN THE REGISTER
```

- ★ **Note:** ALL LOWER CASE CHARACTERS WILL HAVE BIT 7 RESET WHEN THIS ROUTINE IS USED.
- ★ The Dan Paymar lower case adapter can be used with this card to display lower case input from the SCREEN MASTER 8Ø onto the 4Ø column screen, or to allow typing directly on the 4Ø column screen in upper and lower case. Firstly initialise the card then issue the command <CONTROL Z> "4".

ASSEMBLER CALLS

Note: THE FOLLOWING CALLS IN ASSEMBLER SHOULD BE CHANGED TO ISSUE THE APPROPRIATE PRINT CHR$ (nn)'s FOR THEM TO PERFORM CORRECTLY.

JSR	$FC58	CLEAR SCREEN
JSR	$FC9C	CLEAR TO END OF LINE
JSR	$FC9E	CLEAR TO END OF LINE
JSR	$FC42	CLEAR TO END OF PAGE

4.1 Screen Master 8Ø Control Routines

The entry points and routines below are sufficient to allow assembler programs to link to the SCREEN MASTER 8Ø's ROM program. Note that these routines, and the ROM itself, are COPYRIGHT 1982 DIGITEK INTERNATIONAL LTD.

4.1.1 Page Zero Utilization

CH	EPZ $24	CURSOR H. POSN.
CV	EPZ $25	CURSOR V. POSN.
BASL	EPZ $28	BASE ADDRESS
BASH	EPZ $29	HIGH ORDER
BAS2L	EPZ $2A	ALTERNATE BASE ADDRESS
BAS2H	EPZ $2B	HIGH ORDER

4.2 Slot Dependent Locations

CONFLG EQU $47B CONTROL/DEBUG FLAG

BIT USAGE (BIT 7 MSB)

BIT 7 – SHIFT LOCK FLAG	– Ø = SHIFT LOCK
BIT 6 – CURSOR FLAG	– 1 = CURSOR DISABLE
BIT 5 – FLUSH FLAG	– 1 = FLUSH ACTIVE
BIT 4 – HIGH SPEED-SCROLL	– 1 = HIGH-SPEED SCROLL
BIT 3 – ESCAPE FLAG	– 1 = TERMINAL ESCAPE CURRENT
BIT 2 – PASCAL CP/M FLAG	– 1 = PASCAL CP/M MODE
BIT 1 – 8Ø/4Ø×24 FLAG	– 1 = 4Ø×24 MODE
BIT Ø – DEBUG FLAG	– 1 = DEBUG MODE ON

```
CH8Ø      EQU $4FB    HPOSN. SAVE AREA (PASCAL CP/M)
CV8Ø      EQU $57B    VPOSN. SAVE AREA (PASCAL CP/M)
CURS1     EQU $5FB    CURSOR START/TYPE
OLDCHR    EQU $6FB    OLD CHARACTER FOR KEYBOARD MODE
INV8Ø     EQU $77B    NORMAL/INVERSE FLAG FOR PASCAL AND CP/M
LNKBYT    EQU $7FB    CHAIN BYTE FOR LINKED OUTPUT
CHSAVE    EQU $67B    PASCAL / CP/M INVERSE FLAG
```

4.3 Screen Master 8Ø Device Select Addresses

$C0B0 – C0BF DEVICE ADDRESSES

$C0B0 – SET CRTC ADDRESS REGISTER

$C0B1 – LOAD CRTC REGISTER

$C0B2 – CONTROL REGISTER WRITE

$C0B3 – CONTROL REGISTER READ

$C0B4 – DISABLE V.L.S.I.

$C0B5 – ENABLE V.L.S.I.

Note: WHEN READ, $C0B0 CHECKS THE AVAILABILITY OF THE VIDEO RAM. IF RAM IS AVAILABLE BIT 7 WILL BE SET.

4.4 Control Register Read and Write Flags (Bit Usage)

$C0B2 & $C0B3 –

BIT 7 (MSB)	1 = DISPLAY 8Ø × 24	–	Ø = DISPLAY 4Ø × 24
BIT 6	1 = 8Ø COLUMN LIST ON	–	Ø = 8Ø COLUMN LIST OFF
BIT 5	1 = KEYBOARD MODE OUT	–	Ø = KEYBOARD MODE IN
BIT 4	1 = INTERLACE VIDEO	–	Ø = NON INTERLACE VIDEO
BIT 3	1 = PASCAL 1.1 FLAG		1 = PASCAL 1.1
BIT 2	ESCAPE COUNTER (GOTO XY) L.O. BIT		
BIT 1	ESCAPE COUNTER (GOTO XY) L.O. BIT		
BIT 0 (LSB)	1 = SELECT RAM	–	Ø = SELECT ROM

4.5 Video Ram Address Organization

The video RAM is located at $C800 – $CFFF, and is organised as a linear array, i.e. the first displayable position (line 1, character 1) is located at $C800, and all addresses are sequential from that location. e.g. the first character of line 2 is located at $C850.

4.6 Initializing the Screen Master 8Ø

This does not clear the screen.

```
CRTINT    EQU *
          LDY #$0F        SET INDEX
CRT01P    EQU*
          STY $C0B0       SET REGISTER ADDRESS
          LDA VARTAB, Y   GET REGISTER VALUE
          STA $C0B1       SET REGISTER VALUE
          DEY             DECREMENT LOOP COUNT
          BPL CRT01       LOOP UNTIL DONE
          LDA $C0B3       READ CONTROL FLAGS
          ORA #$80        SET 8Ø × 24 DISPLAY
          STA $C0B2       WRITE CONTROL FLAGS
          LDA #$00        CLEAR REGISTER
          STA CONFLG      AND SET CONTROL FLAGS
          RTS             AND RETURN
```

4.7 6845 Variables

```
VARTAB    EQU*
NHT       HEX 7F                  HORIZONTAL TOTAL
NHDSP     HEX 50                  TOTAL HORIZ. DISPLAYED
NHSYNC    HX  60                  HORIZONTAL SYNC. POSITION
NHSWID    HEX 29                  HORIZONTAL SYSC. WIDTH
NVTOT     HEX 1F (US) HEX 19      VERTICAL TOTAL
NVADJ     HEX 04 (US) HEX 02      VERTICAL ADJUST
NVDSP     HEX 18                  VERTICAL DISPLAYED
NVSYNC    HEX 1C (US) HEX 18      VERTICAL SYSC POSITION
MDMODE    HEX 00                  INTERLACE MODE
NSCANL    HEX 09                  NUMBER OF SCAN LINES/ROW
NCSTRT    HEX 21                  CURSOR START LINE
NCEND     HEX 07                  CUROR END LINE
DSPADR    HEX 0000                SCREEN RAM START ADDRESS
CURSAD    HEX 0000                CURSOR ADDRESS
```

4.8 Routine to Place a Character on the Screen

This routine must be followed to place a character on the screen to avoid screen interference, due to timing differences between the Apple and the SCREEN MASTER 8Ø. The character to be displayed is in the A register. BASL and BASH contain the base address (the address of the first character on the line). CH contains the first cursor position.

```
PUTCHR    EQU*
          JSR RAMSEL      ENABLE RAM
          LDY CH          CURSOR H. POSN. TO Y
NRDY01    EQU *
          LDX $C0B0       CHECK IF RAM AVAILABLE
          BPL NRDY01      LOOP UNTIL AVAILABLE
          STA (BASL), Y   PLACR CHAR ONTO SCREEN
          LDX $C0B0       CHECK IF STILL OK
          BPL NRDY01      LOOP UNTIL AVAILABLE
          JMP ROMSEL      RETURN TO CALLING ROUTINE (ENABLING ROM)
```

4.9 Routine to Read a Character From the Screen

This routine be followed to read a character from the screen to avoid screen interference, due to timing differences between the Apple and SCREEN MASTER 8Ø.

```
GETSCR    EQU*
          JSR RAMSEL      ENABLE RAM
GSCR01    EQU*
          LDX $C0B0       CHECK IF ANY RAM AVAILABLE
          BPL GSCR01      LOOP UNTIL OK
          LDA (BASL), Y   GET CHARACTER FROM SCREEN
          LDX $C0B0       CHECK IF STILL OK
          BPL GSCR01      TRY AGAIN IF NOT
          JMP ROMSEL      ENABLE ROM
```

4.10 Routine to Select Ram

```
RAMSEL    EQU*
          PHA             SAVE CHARACTER
          BIT $CFFF       DISABLE ROMS
          BIT  C300       ENABLE EXPANSION SPACE.
          LDA $C0B3       GET CONTROL REGISTER
          ORA #$01        SELECT RAM
          STA $C0B2       RESTORE IT
          PLA             GET CHARACTER
          RTS             RETURN TO CALLING ROUTINE
```

4.11 Routine to Select Ram

```
ROMSEL    EQU*
          PHA             SAVE CHARACTERS
          BIT $CFFF       DISABLE ROMS
          BIT  C300       ENABLE EXPANSION SPACE.
          LDA $C0B3       GET CONTROL REGISTER
          AND #$FE        SELECT ROM
          STA $C0B2       RESTORE IT
          PLA             GET CHARACTER
          RTS             RETURN TO CALLING ROUTINE
```

4.12 Cursor Control Routines

The cursor format is set by the values loaded into the registers $0A and $0B of the 6845. Register $0A determines the cursor format and start line. The high-order nybble of $0A sets the cursor type:

$0X – INVERSE CURSOR (NON-BLINK)
$2X – NO CURSOR
$4X – INVERSE CURSOR (FAST BLINK)
$6X – INVERSE CURSOR (SLOW BLINK) (DEFAULT)

The low-order nybble of $0A sets the cursor start lines:

$X0 – START AT LINE 1 (TOP LINE OF CHARACTER) (DEFAULT)
$X07 – START AT LINE 8 (BOTTOM LINE OF CHARACTER)

These values may be put into $5FB and will be automatically picked up by the on board routines.

Register $0B sets the cursor end line (not in on card routines):

$00 – END AT LINE 1 (TOP LINE OF CHARACTER)
$07 – END AT BOTTOM LINE OF CHARACTER

4.13 Turn Cursor ON

```
CURSON  EQU*
        LDA #$0F        GET REGISTER ADDRESS
        STA $C0B0       SET ADDRESS REGISTER
        CLC
        LDA BASL        GET LOW ORDER ADDRESS
        ADC CH          ADD CURRENT CURSOR
        STA $C0B1       SET REGISTER
        LDA #$0E        GET REGISTER ADDRESS
        STA $C0B0       SET ADDRESS REGISTER
        LDA BASH        GET HIGH ORDER ADDRESS
        ADC #$00        ADD IN CARRY (IF ANY)
        AND #$07        MASK OUT HIGH ORDER BITS
        STA $C0B1       SET REGISTER VALUE
        LDA #$0A        SET CRTC ADDRESS REGISTER
        STA $C0B0       SET ADDRESS REGISTER
        LDA #$60        TURN CURSOR ON (MODIFY VALUE TO SUIT)
        STA $C0B1       SET REGISTER VALUE
        RTS             RETURN TO CALLING ROUTINE
```

4.14 Turn Cursor OFF

```
CURSOF  EQU *
        LDA #$0A        GET REGISTER ADDRESS
        STA $C0B0       SET ADDRESS REGISTER
        LDA #$20        MAKE CURSOR INVISIBLE (MODIFY VALUE TO
                        SUIT)
        STA $C0B1       SET REGISTER CONTENTS
        RTS             RETURN TO CALLING ROUTINE
```

4.15 Using Programme Line Editros

Most Programme Line Editors (such as C.R.A.E. and P.L.E.) will NOT work the SCREEN MASTER 80 because they modify the DOS hooks to point themselves and then pass output directly to the 40 × 24 screen-handling routines. However you may find it possible to modify these programs to utilise the SCREEN MASTER 80 routines.

4.16 Technical Assistance

Should you require any further technical information, please contact:

DIGITEK INTERNATIONAL LTD.
UNIT 14,
GRAFTON PLACE,
DUKES PARK INDUSTRIAL ESTATE,
CHELMSFORD, ESSEX, U.K.
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ALTERNATE CHARACTER SETS

The SCREEN MASTER 80 is capable of accessing a total of 256 characters at any one time. This is accomplished by the use of the standard BASIC command "INVERSE" or "SI".
The following is a discussion on the varied uses of this command in association with the relevant DIP switches located on the SCREEN MASTER 80.

5.1 Accessing Alternate/Graphics Character Sets

The character generator is labelled U17 on the component side of the SCREEN MASTER 80. It is supplied with a 2732 EPROM containing two character sets. A 2732A or 2532 EPROM of at least 390 n. sec access time should be used if you wish to define your own character set.
To access the alternate or graphics character set, the following switches should be set on the DIP switch located on the SCREEN MASTER 80.
Switch 2 selects the character display NORMAL (9 column) or GRAPHICS (8 column) display.
ON = NORMAL (9 column display)
OFF = GRAPHICS (8 column display), also use command <CONTROL Z> "G"

Note: THE DIFFERENCE BETWEEN NORMAL AND GRAPHICS CHARACTER SETS ARE THAT THE NORMAL CHARACTER SET HAS ONE SCREEN DOT SPACING ON ONE SIDE OF THE CHARACTER, GENERATED BY THE CRT CONTROLLER. THIS DOT WOULD SHOW AS A VERTICAL LINE WHEN THE GRAPHICS CHARACTER SET IS SELECTED.

Switch 3 selects INVERSE enable INVERSE disabled.
ON = ENABLED
OFF = DISABLED

Note: THE INVERSE COMMAND WILL ALWAYS SELECT THE ALTERNATE CHARACTER SET UNLESS SWITCH 4 IS SET TO DISPLAY THE SINGLE CHARACTER SET.

If you wish to display the ALTERNATE character set in INVERSE then set SWITCH THREE to the ON/ENABLED position.
If you wish the ALTERNATE character set to be displayed in NORMAL then set SWITCH THREE to the OFF/DISABLED position.
Switch 4 selects SINGLE or DUAL character set.
ON = DUAL CHARACTER SET
OFF = SINGLE CHARACTER SET

Note: IF SWITCH FOUR (4) IS SET TO DUAL CHARACTER SET OPERATION THE COMMAND "INVERSE" WILL SELECT THE SECOND CHARACTER SET. I.E. THE ALTERNATE CHARACTER SET.

5.2 Screen Master 80 Dip Switch Settings

The following is a table of switch settings and commands appropriate to SCREEN MASTER 80 for controlling the SCROLL speed and CHARACTER displays.

The DEFAULT settings to allow SCREEN MASTER 80 to function without any adverse effects should be:

SWITCH 1 = ON
SWITCH 2 = ON
SWITCH 3 = ON
SWITCH 4 = OFF

To alter the SCROLL speeds of SCREEN MASTER 80 the following switch settings and command would apply:

	SET SWITCH 1 and ISSUE COMMAND	
SLOW SCROLL	= ON	NONE
FAST SCROLL (DMA)	= OFF	NONE
HIGH SPEED SCROLL (DMA)	= OFF	<CTRL Z> "H"

TO SELECT ONE OF THE FOLLOWING DISPLAY MODES AND CHARACTER SETS USE THE TABLE BELOW LOOKING DOWN THE LIST FOR THE DISPLAY REQUIRED THEN THE SWITCH SETTINGS AND COMMANDS RQUIRED:

TO DISPLAY THE FOLLOWING:

MATRIX	= 9 × 10	9 × 10	8 × 10	8 × 10
CHRSET 1 PLUS DIS.	= NORMAL INVERSE	NORMAL NORMAL	NORMAL INVERSE	NORMAL NORMAL
CHRSET 2 PLUS DIS.	= NONE NONE	ALTERNATE NORMAL	NONE NONE	ALTERNATE NORMAL
SET SWITCHES TO THE FOLLOWING:				
SW 2	= ON	ON	OFF	OFF
SW 3	= ON	OFF	ON	OFF
SW 4	= OFF	ON	OFF	ON
AND ISSUE THE FOLLOWING COMMANDS:				
CMD 1	= INVERSE	INVERSE	INVERSE	INVERSE
CMD 2	= <CTRL Z> "9"	<CTRL Z> "9"	<CTRL Z> "G"	<CTRL Z> "G"

5.3 Jumper Pad Settings

The jumper pads located at W1 and W2 are used to indicate the EPROM types for U5 (PROGRAM EPROM) and U17 (CHARACTER SET EPROM) the two types of EPROM's used are 2732 and 2532 and the settings for each are:

2732 = A – B C – D
2532 = C – B D – E

DIAGNOSTIC TROUBLE SHOOTING

This section is included to help correct common errors made in installation and use of your SCREEN MASTER 8Ø.

IF AFTER TRYING ALL OF THESE SUGGESTED REMEDIES YOU STILL CANNOT OBTAIN SATISFACTORY OPERATION, PLEASE RETURN YOUR SCREEN MASTER 8Ø TO THE DEALER YOU PURCHASED IT FROM.

6.1 No Display on Screen

★ Is your monitor plugged in correctly and turned on.
★ Is the SCREEN MASTER 8Ø seated firmly in slot 3.
★ Are the SCREEN MASTER 8Ø cables connected properly.

6.2 Weak or Low Contrast Video

★ Check the monitors brightness and contrast controls.

6.3 Rolling Display (HORIZONTALLY and/or VERTICALLY)

★ Adjust the horizontal and/or vertical hold controls of your monitor until a stable and centered display results.

6.4 Bent or Torn Display

★ This usually occurs in the top left corner of the display and may be corrected by the adjustment of the monitor's horizontal hold control and/or the video level adjustment.

6.5 Apple Display But on Screen Master 8Ø Display

★ Check that the Screen Master 8Ø is plugged into slot 3 of your Apple.
★ Check that the monitor is connected to the cable supplied with the SCREEN MASTER 8Ø.
★ Check that your program is issuing the correct PR≠ or IN≠ command to access the SCREEN MASTER 8Ø.

6.6 Screen Master 8Ø Display but not Apple Display

★ Ensure that the correct cable is connected to the Apple video output.
★ Turn the Apple video level pot clockwise.

6.7 Erratic Operation of the Screen Master 8Ø

★ Turn off the power to your Apple.
★ Gently remove your SCREEN MASTER 8Ø.
★ Using moderate pressure, press down on all the Integrated Circuits on the SCREEN MASTER 8Ø.
★ Clean the gold "fingers" of the card with a NEW pencil eraser to ensure a good electrical contact.
★ Re-install the card in slot 3 and ensure that it is firmly seated.
★ Ensure that your programme is not overwritting any of the slot-dependent locations assigned to the SCREEN MASTER 8Ø.

6.8 "Fuzzy" Characters when Screen Master 8Ø is Accessed

★ The most common cause of fuzziness is the use of a monitor with insufficient band width. Colour television sets are particularly prone to this problem.
★ Use of an RF modulator will cuase this problem as most modulators do not have sufficient bandwidth to correctly process the 12 MHz video signal from the SCREEN MASTER 8Ø.

6.9 Missing Lines and/or Characters in 8Ø-Column Mode (Overscanning)

★ If you find that you are missing lines from the top or bottom of the screen, adjust your monitors vertical height and linearity controls until all 24 lines are visible and evenly proportioned.
★ If you are losing characters from the edges of the screen, adjust your monitors width, centering, and horizontal hold controls until the full line length is visible in the centre of the screen.

6.10 Incorrect Program Operation

★ This may be caused by the program issuing one or more of the following commands:

6.10.1 Basic

```
CALL - 936    CLEAR SCREEN
CALL - 958    CLEAR TO END OF SCREEN
CALL - 868    CLEAR TO END OF LINE
```

6.10.2 Assembler

```
JSR $FC58    CLEAR SCREEN
JSR $FC9C    CLEAR TO END OF LINE
JSR $FC9E    CLEAR TO END OF LINE
JSR $FC42    CLEAR OF END OF SCREEN
```

6.11 System "Hanging" when Attempting to Address another Slot

★ The most likely cause of this is an interface which does not follow APPLE conventions on the use of the expansion ROM and does NOT turn other cards ROMS off before it enables its own ROM, thereby causing an addressing conflict with the SCREEN MASTER 8Ø.

6.12 "Garbage" Characters Appear on the APPLE Display after <CTRL Z> "4"

★ You are in "typewriter" keyboard mode and do not have a lowercase adaptor installed in your Apple.

6.13 No Graphics Display when using Pascal, CP/M or Interger Basic

★ A video source toggle command, <CTRL Z> "T", must be issued when using these languages to enable display of the Apple graphics screen.

★ The Display Control Line cable has not been installed correctly.

6.14 Loss of Sync when Graphics Mode Selected

★ Switch 2 should be set to the OFF position when the command <CTRL Z> "G" is issued.

★ REFER SECTION 5 CHARACTER SETS FOR MORE INFORMATION.

6.15 Erratic Operation when using a Parallel Printer

★ This section has been included since there is a problem using this type of printer interface. The problem has been defined thus:
The parallel printer when addressed (usually with a PR#1) has it's firmware set to print 4Ø columns, and will attempt to print to 8Ø columns with the results usually being disasterous. Therefore a <CONTROL I> "8ØN" command must be issued to the printer after the PR#1 to set the width to 8Ø columns.
This problem does NOT occur when using any of the DIGITEK range of parallel cards.

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SERVICING

SERVICE.
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Digitek (International) Ltd.,
Customer Service Dept. Unit 14
Grafton Place, Dukes Park
Industrial Estate,
Chelmsford, Essex, England.

Along with an explanation of the suspected defect and your warranty number.

For Cards under warranty there will be no service charge. A nominal charge will be made for repair of Cards out of warranty.

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