

“DIGITAL VIDEO MULTIPLEXOR”
(Preliminary) INSTALLATION AND CHECKOUT INSTRUCTIONS

----- **WARNING** -----

The DVM must be installed by an individual accustomed to working with the Apple II hardware. The installation is not difficult, however it must be done in a carefully prescribed manner. If the DVM is installed improperly, damage can result to the DVM and also to the Apple II. The area of primary concern is where connections are made to the Apple II motherboard. The two daughterboards provided with the DVM are required because of the use of certain Apple II signals not provided on the peripheral connectors. The installation of the two daughterboards must be made correctly to prevent damage to the DVM or your Apple II. The following installation technique should be followed very carefully. If you are unsure of any step, please have the DVM installed by your Apple II dealer. After the initial installation, the DVM board may be removed easily from the Apple II for shipping or repair. The daughterboards and the attached cable assembly can remain permanently installed on the Apple II motherboard.

Installation Checklist (preferred method)

1. Remove the Apple II base from the keyboard case. Use extra caution in removing the DIP connector from the keyboard at IC location A-7. Please note the position of pin 1 of the DIP connector. It is very unhealthy for the keyboard if the DIP connector is reversed when re-inserted.
2. Using an IC extractor, remove the four 74LS161 ICs located at D-11, D-12, D-13 and D-14. These positions are shown in Figure 1. Insert the four chip daughterboard into the empty four IC sockets as shown in Figures 2 and 3. Figure 3 shows how the daughterboard is inserted into the empty sockets. If your particular Apple has bypass capacitors that cause an interference with the insertion of the daughterboard, push these capacitors down flat on the Apple motherboard. We have found that the board can be rotated downward as the pins engage the IC socket holes. After the board has been partially inserted, apply pressure to the top of the board sockets to firmly seat all of the pins. The board must be firmly seated for proper operation. The four 74LS161s removed from position D-11, D-12, D-13 and D-14 can now be inserted into the daughterboard. Please maintain proper orientation of the ICs. The cable attached to the daughterboard should be pointing toward the front of the Apple II.

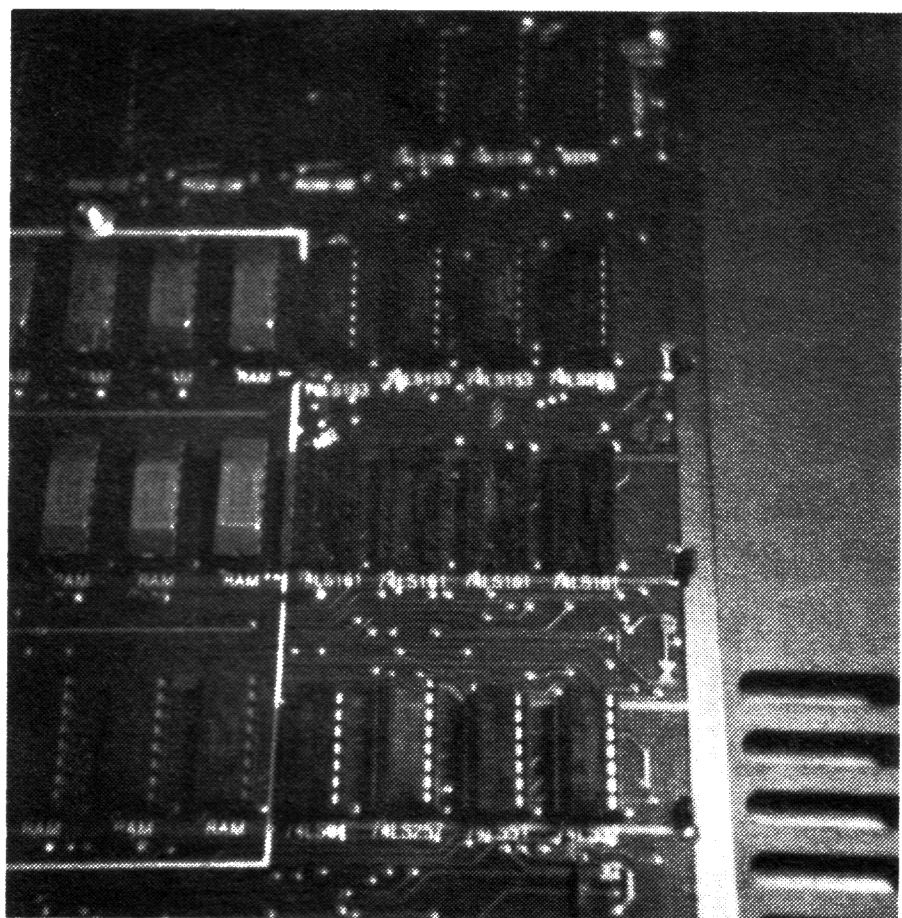


FIGURE 1
Remove these Four
ICs (74LS161)

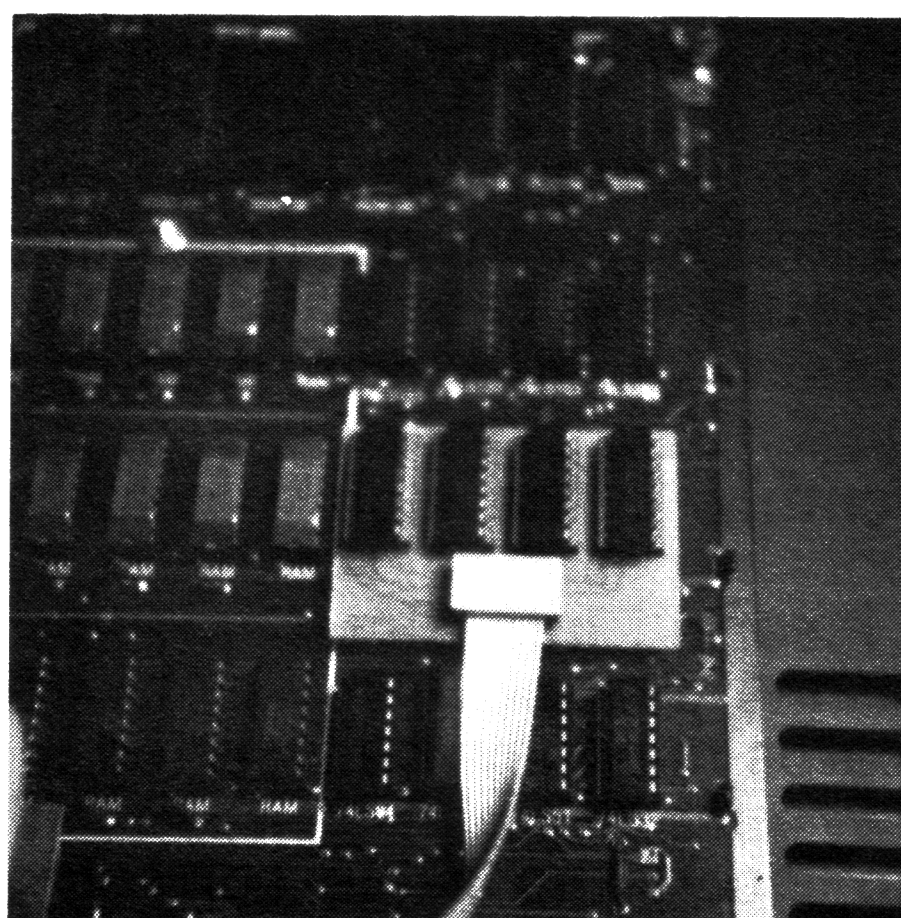


FIGURE 2
Insert Daughterboard
As Shown.

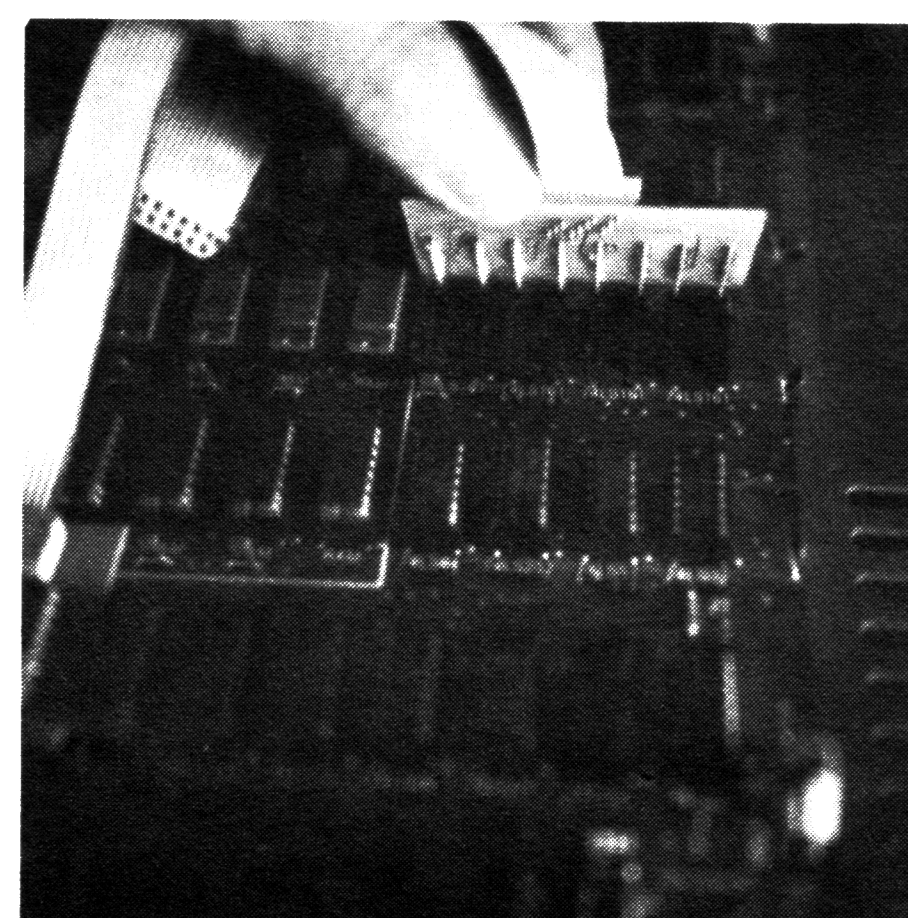


FIGURE 3
Rotation of Daughterboard
as Pins insert into Sockets.

3. Using an IC extractor remove the two 74LS257 ICs located at B-6 and B-7. These positions are shown in Figure 4. Insert the two chip daughterboard into the Apple II motherboard as shown in Figure 5. Repeat the seating procedure described in step. The two 74LS257s removed from positions B-6 and B-7 can now be inserted into the daughterboard.

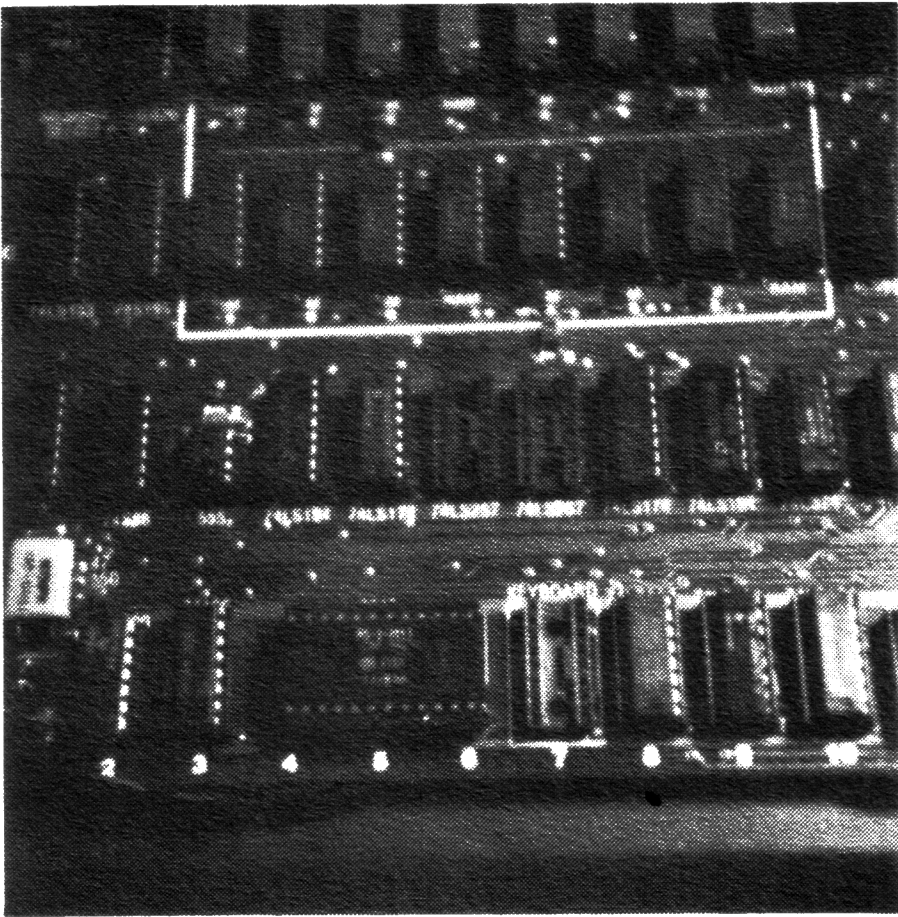


FIGURE 4
Remove these Two
ICs (74LS257)

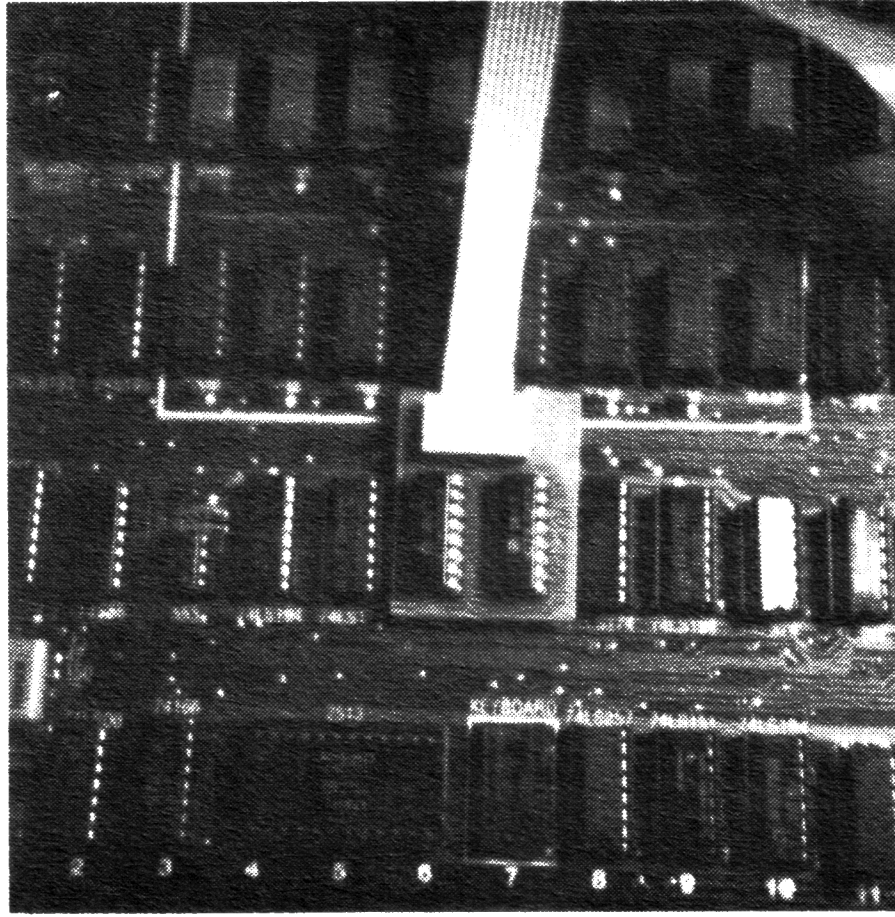


FIGURE 5
Insert Daughterboard
As Shown.

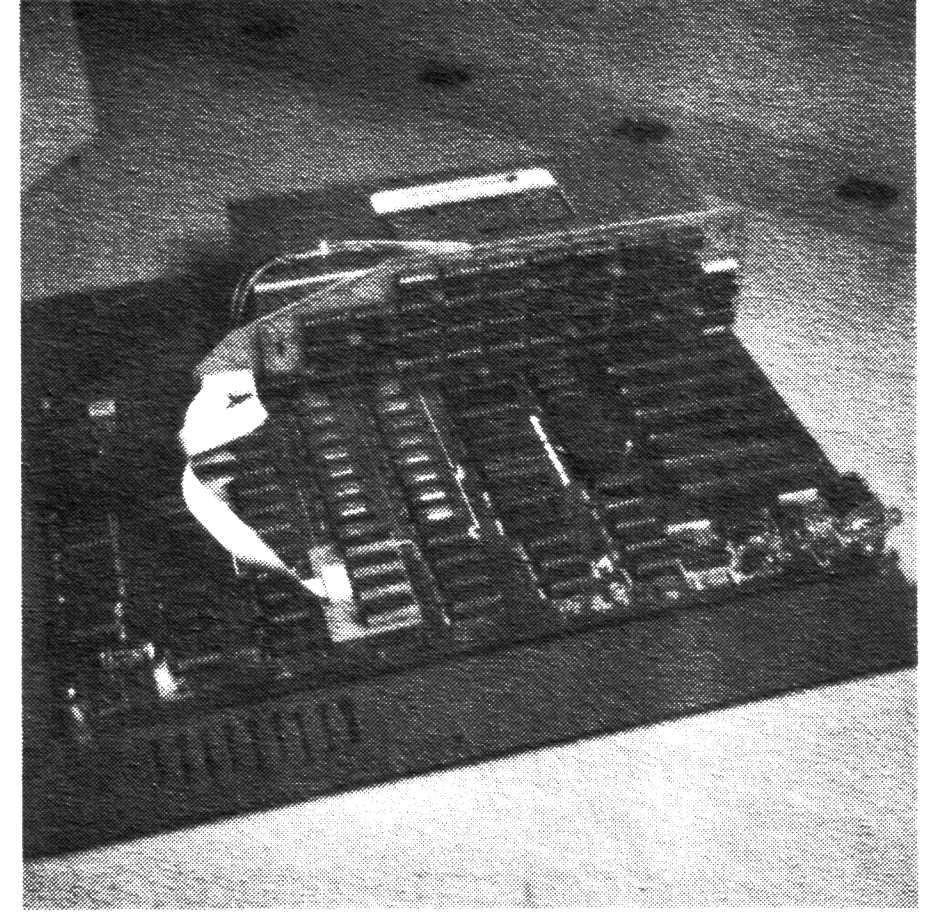


FIGURE 6
Insert DVM Board in any
Convenient Slot (Slot 1 Shown).

4. Check for proper orientation of both daughterboards. The cable assembly attached to the two chip daughterboard should be pointing toward the rear of the Apple II. The chips inserted into the two chip daughterboard have pin 1 toward the front of the Apple II. The four chip daughterboard has the cable assembly pointing toward the front of the Apple II. The chips inserted into the four chip daughterboard have pin 1 pointing toward the front of the Apple II.

5. Insert the DVM board into any convenient peripheral slot. Slot 7 provides short access to the Apple II text pin. However, if an eighty character video board is installed, the cable assembly to the eighty character board must be folded back. The DVM is shown inserted into Slot 1 in Figure 6. The cable assembly connecting the daughterboards may now be inserted into the DVM board shown in Figure 7. Be careful to insert the cable correctly onto the 16 pin header provided. There is no danger of damage, however the operation of the board is unpredictable.

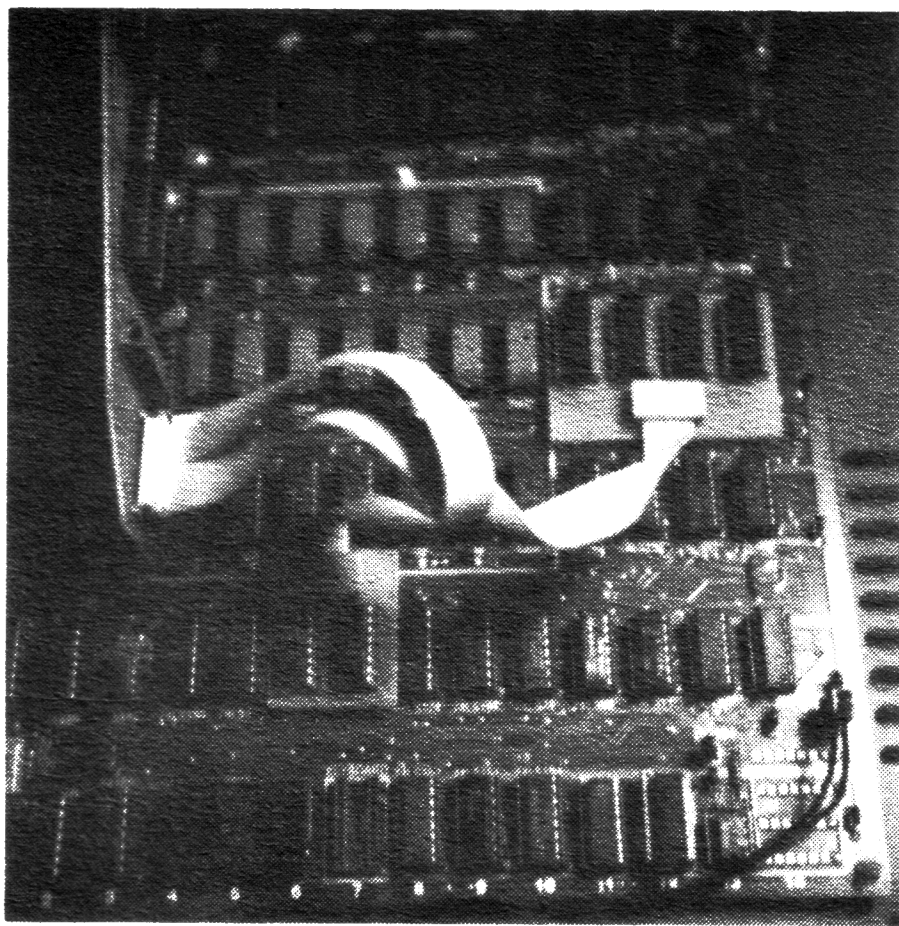


FIGURE 7
Plug in Daughterboard Cable
Assembly as Shown.

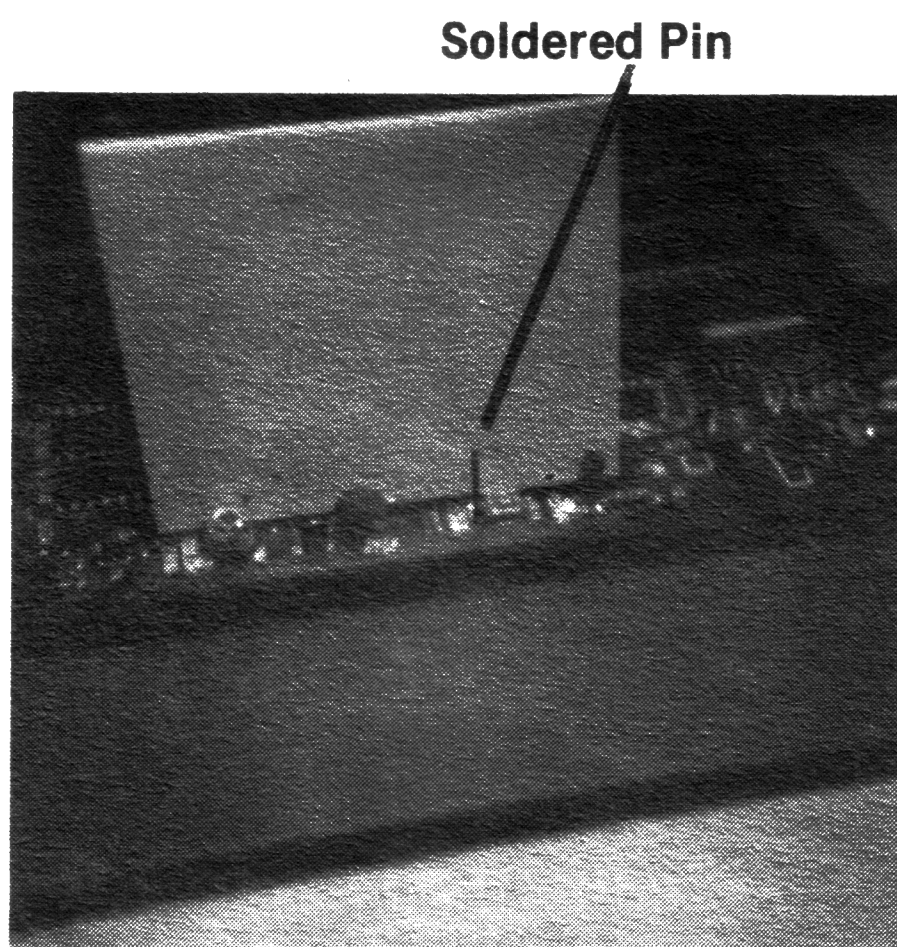


FIGURE 8
Solder a Pin to the 1.5K Resistor at
this Location if Noise Immunity
is too Poor.

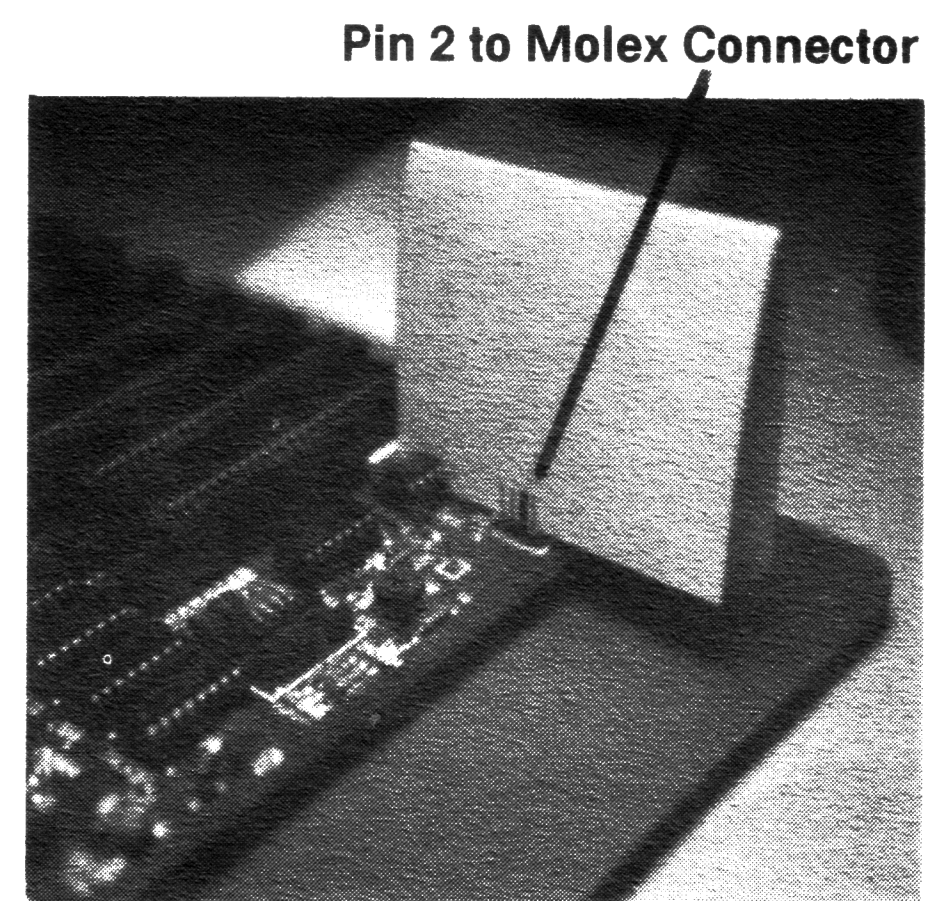


FIGURE 9
Try the Apple Text Input at this Pin
first. Noise Immunity may be sufficient
for good Operation. If Ok, Crimp Pin
slightly for a tight fit on Molex Pin.

6. The DVM board utilizes existing Apple II video as the source of the Apple II text input. Apple II video is available at pin 2 of the Molex KK100 connector on the Apple II motherboard at position K-14. This connector is shown in Figure 9. The video signal available at this pin has a high level at 2.2 volts and a low level at .8 volts. These levels are at the limits of the TTL gate's threshold. In most circumstances the signal available at this pin is adequate for proper DVM operation. However, in some circumstances we have found that background noise will feed through the TTL gate's threshold at this point. This noise pickup has especially been true with the new shielded Apple II case. If results are not satisfactory, a permanent fix can be made. A socket pin is supplied with the DVM board for making the connection to the Apple II text source. Male pins are enclosed for your use in soldering takeoff points on an eighty character video board. A fourth male pin is provided for your use in establishing a pickup point for the Apple II text while still at TTL levels. If you are able to use the Molex pin, crimp the socket pin slightly so that a snug fit on the male pin results. If you have to use the TTL level text source, it will be necessary for you to solder a male pin onto the Apple II motherboard. The position of this pin is shown in Figure 8. The pin is soldered on the end of the 1.5K resistor located at J-14. This pin taps into the Apple II video output while it is still at TTL levels. This pin is the desired pickup point. However, the soldering of the pin requires some degree of skill.

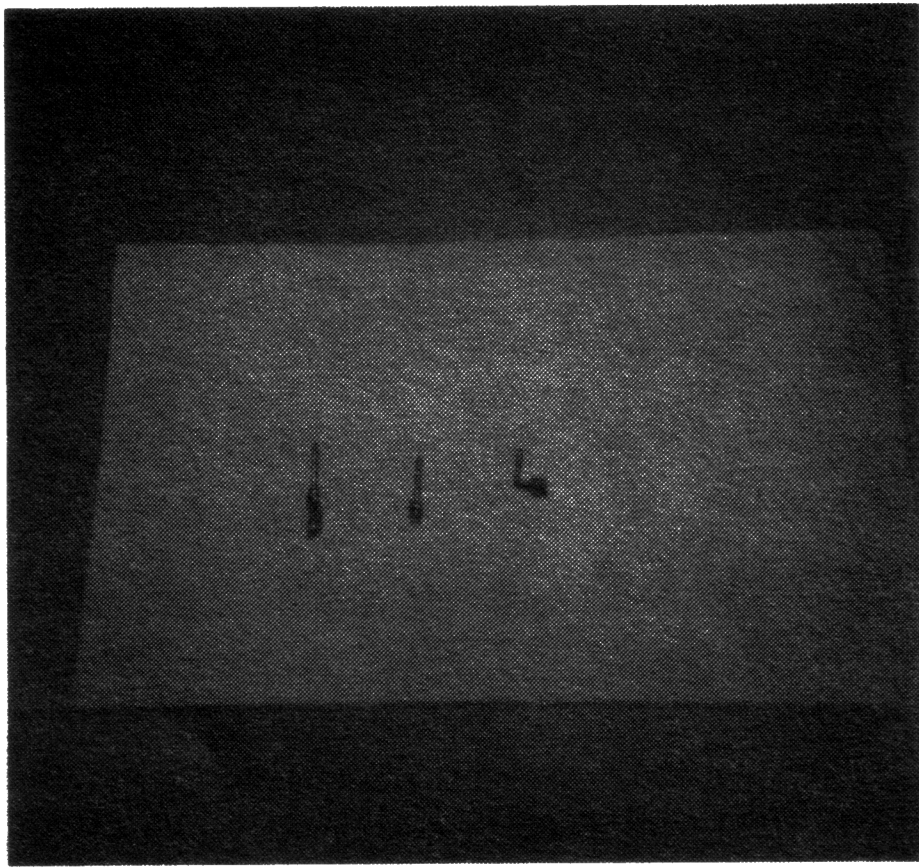


FIGURE 10
Pins supplied for use as Video
Input Connections.

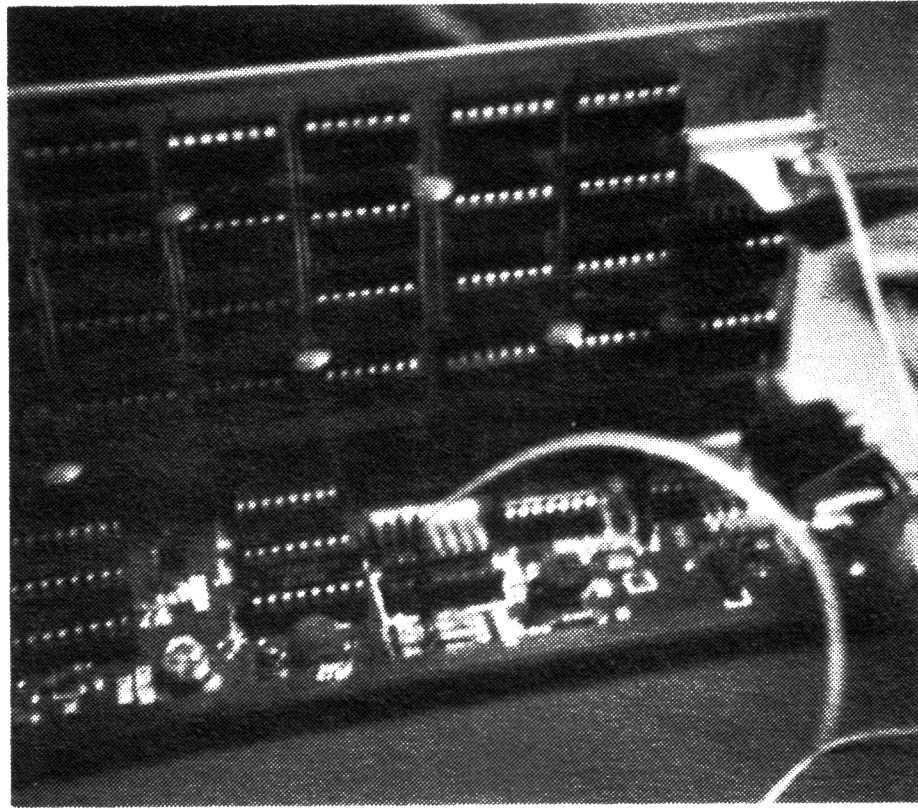


FIGURE 11
Insert Apple Video Pin Input to either
Molex Connector or Pin Soldered
to the 1.5K Resistor.

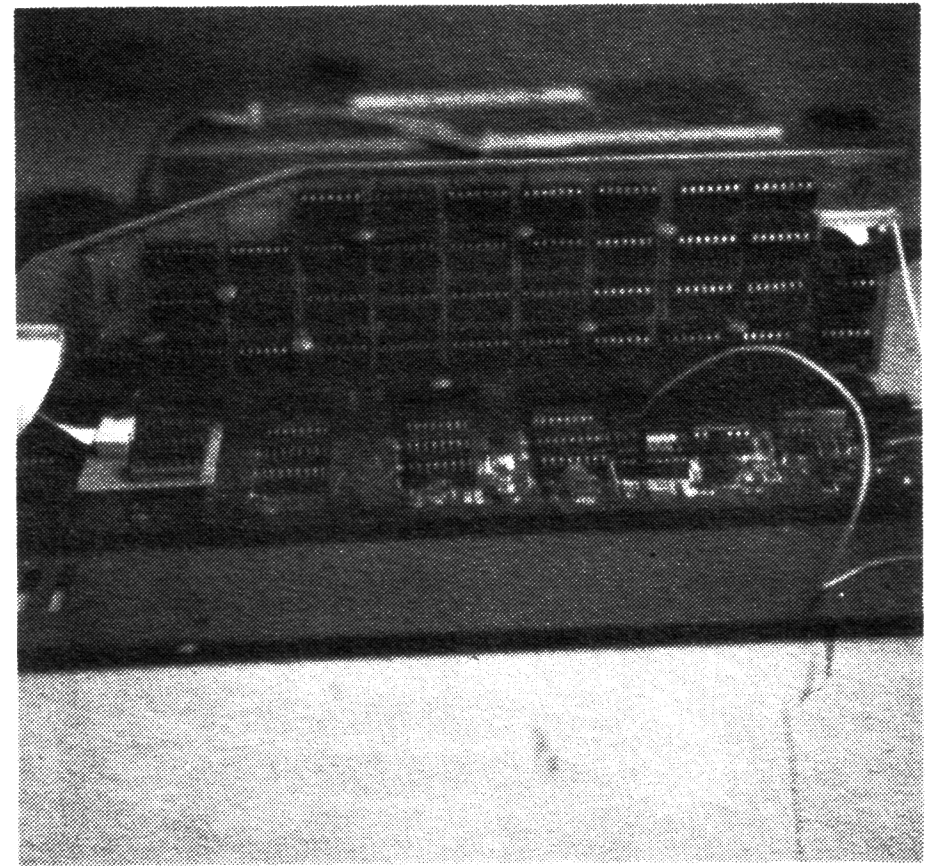


FIGURE 12
Insert Video Cable
Assembly as Shown.

Figure 10 shows the male pins prior to soldering. The crimping tabs should be removed. A straight pin is soldered onto the 1.5K resistor. Pins bent at a 90 degree angle are used if a video board is utilized. See section 7 for installation of a Videx Videoterm board. The socket pin that is closest to the RGB monitor connections is used for the Apple II text connection. Figure 16 shows a diagram of the video cable assembly. Figure 11 and Figure 12 shows the installation of the video cable assembly.

7. This section is provided as an assist for the installation of a Videx Videoterm board. As we install other eighty character text video boards, additional instructions will be provided. Three of the enclosed male pins are bent at 90 degrees as shown in Figure 10. These three pins will be soldered onto the video board to provide pickup points for the DVM board. It is our understanding that the required signals will be available at a connector on future revisions of the Videx board. The following connections are made:

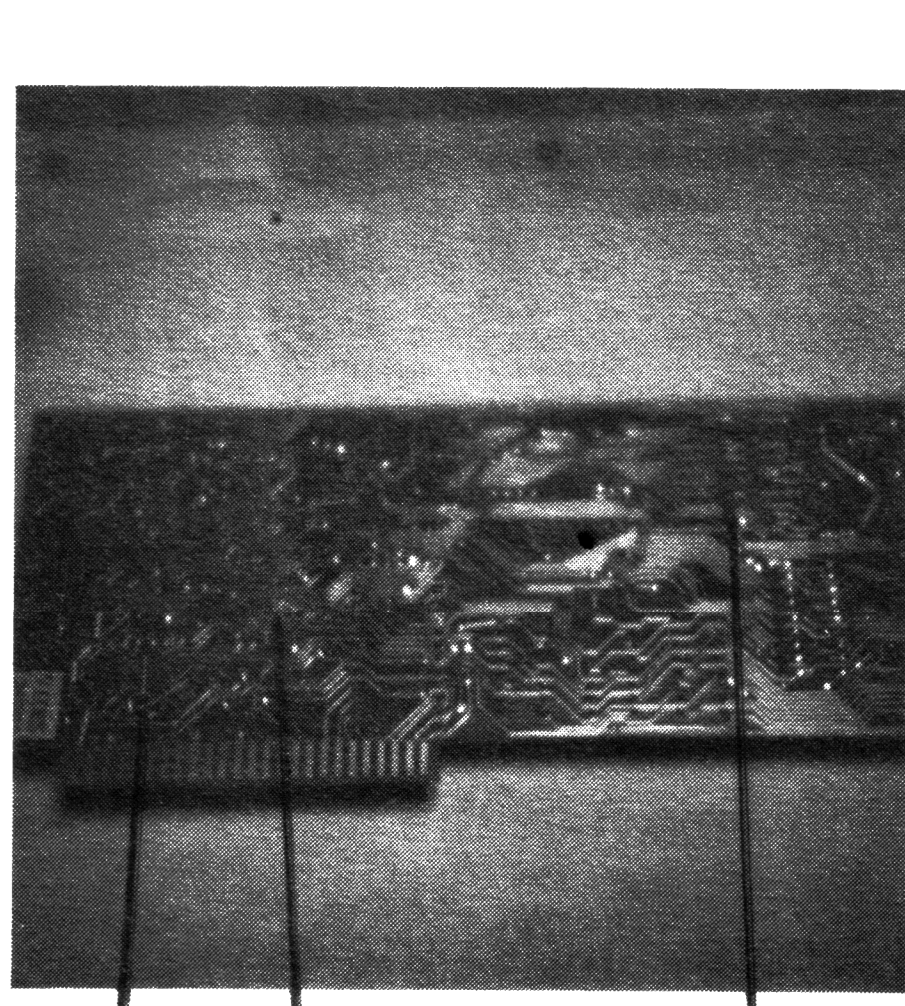
A pin is soldered onto pin 40 of IC U19

A pin is soldered onto pin 3 of IC U2

A pin is soldered onto pin 3 of IC U1

These three connections bring out vertical sync, horizontal sync and text respectively. Actually horizontal sync is available at pin 39 of IC U19 also. However the spacing is a little too close for two pins in the same area. The remaining three

socket pins should now be inserted onto the male pins soldered onto the video board. The order of the connection is shown in Figure 16. The horizontal sync connection is next to the Apple II text connection. The video connection is next and the vertical sync connection is last. There are two spare conductors in the cable. These conductors may be cut off or taped back. Figure 13 and Figure 14 show the soldering of the pins and the installation of the socket pins. Figure 15 shows the installation of the Videx and the DVM board in the Apple II.



PIN 3 7486 VIDEO
PIN 3 7402 HSYNC
PIN 40 U19 VSYNC

FIGURE 13
Solder Pins to Videx Board
As Shown.

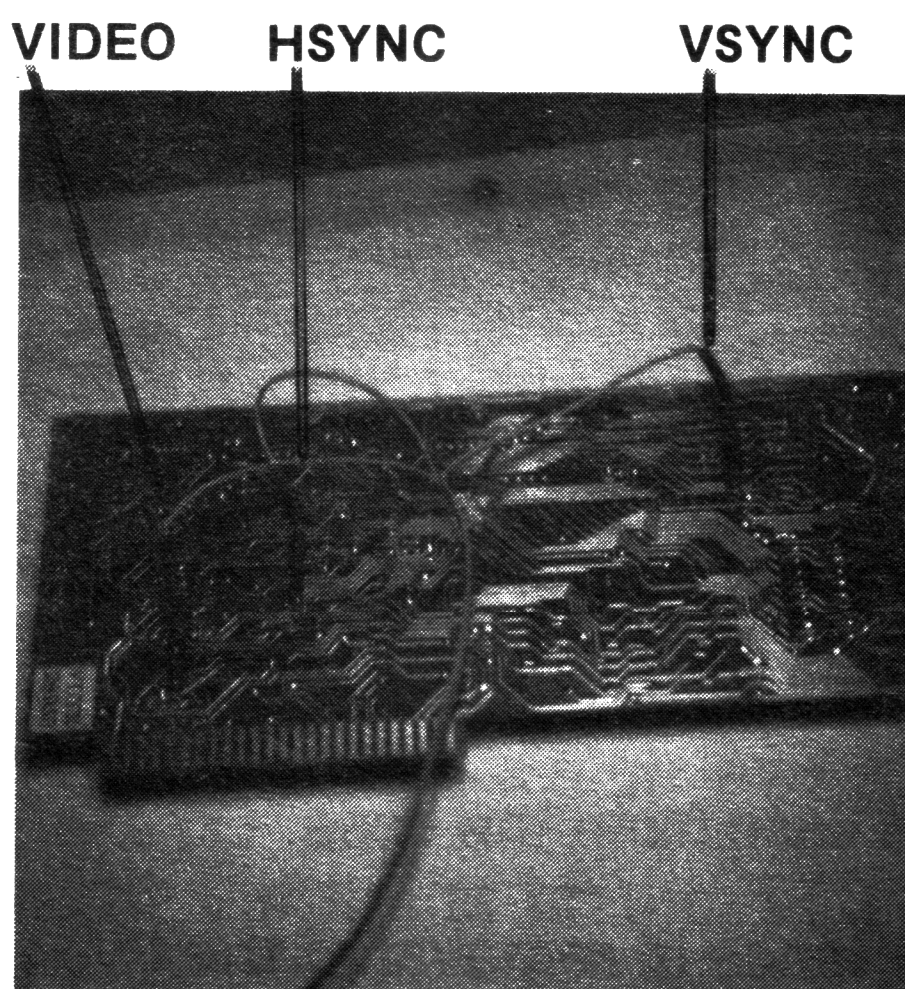


FIGURE 14
Slide on Socket Pins to the Videx Pins
As Shown. See Cable Diagram
for proper Pins.

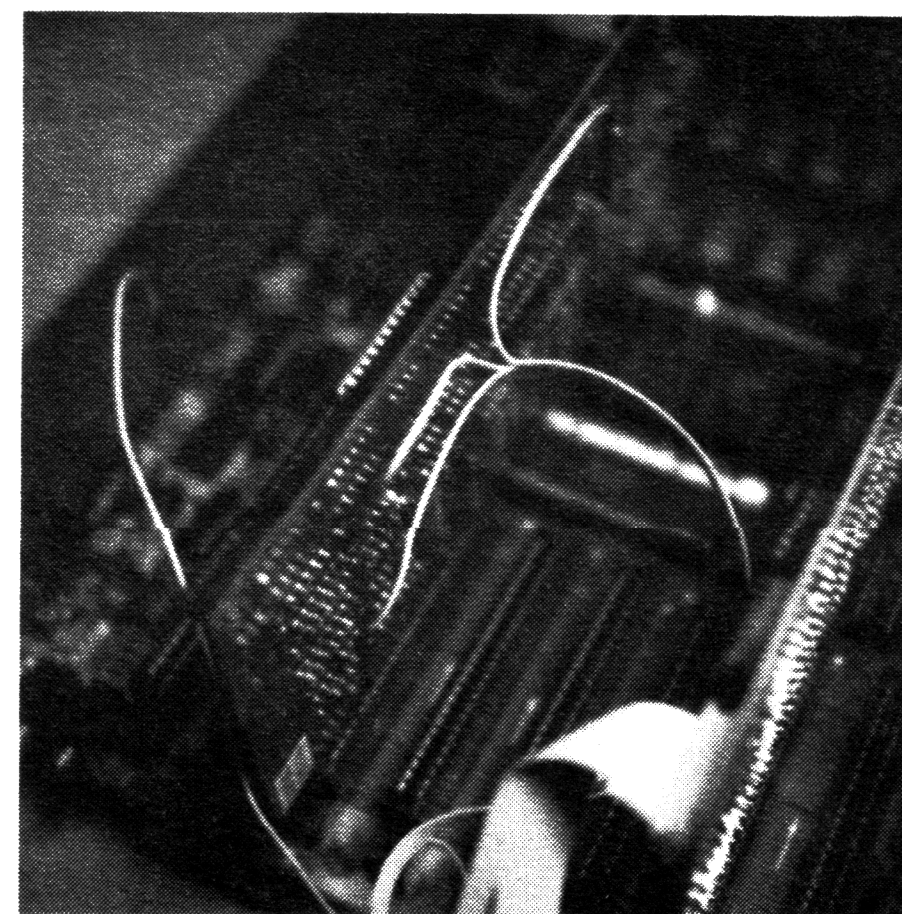


FIGURE 15
Videx Board Installed with DVM
Board and all Video Connections.

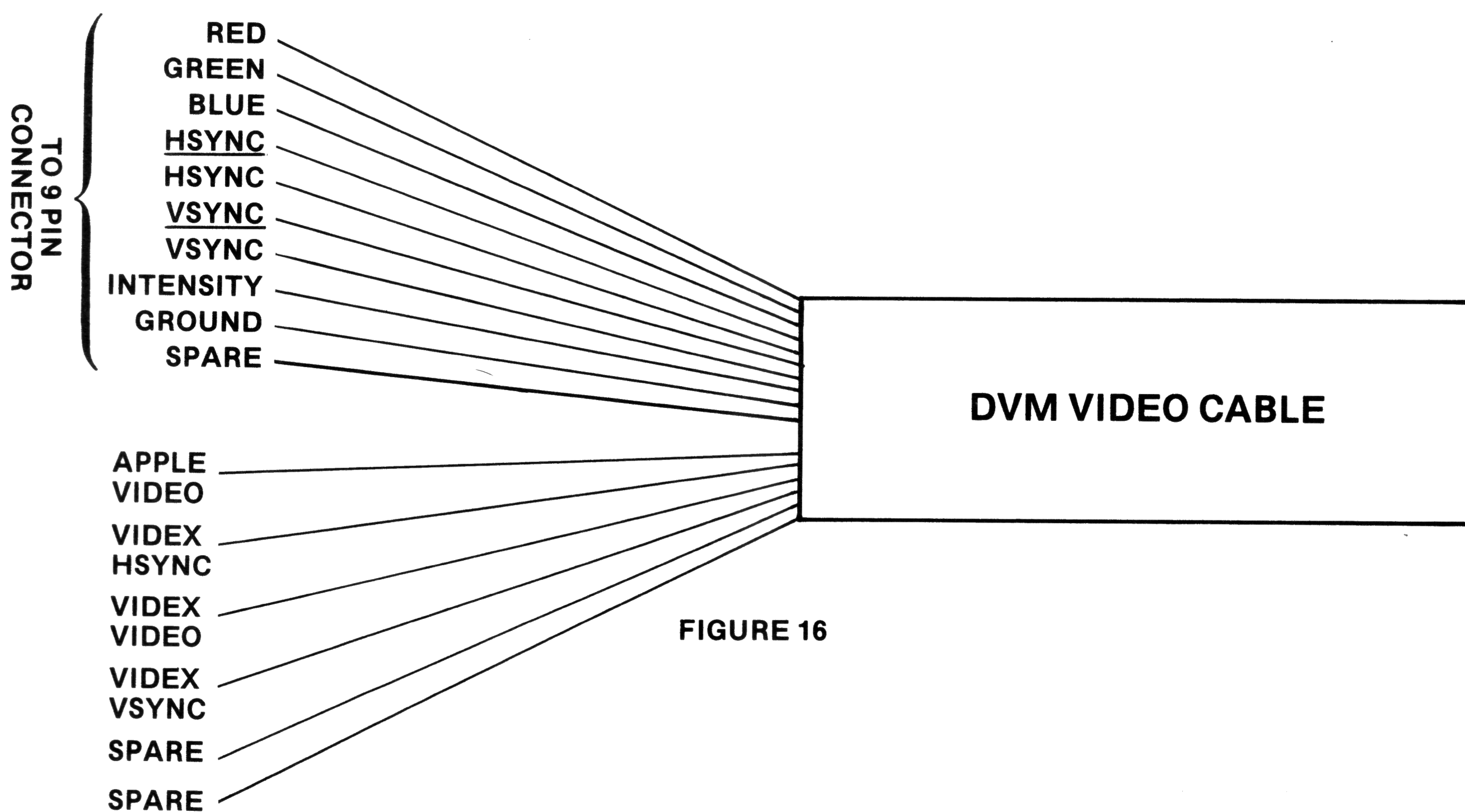


FIGURE 16

Alternate Installation Method (not recommended)

Don't bother to remove the case from the base. Do everything else just the same. After some degree of experience in removal of the two ICs located under the keyboard assembly, it is possible to install the DVM without removing the case. It is not recommended for the first installation.

Checkout Instructions

The checkout of the DVM is simple to perform. The successful use of the DVM depends on a clear understanding of what is happening. The operation of the DVM is controlled by seven software switches that are contained in the Apple II hardware. There are actually eight available in the hardware. However, the switch that controls the high resolution graphics page displayed is of no concern to us here. The seven switches used are shown here for reference:

Text mode off (Graphics mode on)	POKE-16304,0
Test mode on	POKE-16303,0
Mixed mode off	POKE-16302,0
Mixed mode on	POKE-16301,0
Hires mode off	POKE-16298,0
Hires mode on	POKE-16297,0
Video card (Apple video on)	POKE-16296,0
Video card on	POKE-16295,0
Red video on	POKE-16294,0
Red video off	POKE-16293,0
Green video off	POKE-16292,0
Green video on	POKE-16291,0
Blue video off	POKE-16290,0
Blue video on	POKE-16289,0

When an Integer Basic Apple II is powered up, there is no guarantee that the last four switches will be set or reset. An Apple II Plus will power up with the Apple II video on and the red, green and blue video on. Therefore, an Integer Apple II may be initialized by executing the short program as shown below. If you are using a disk based system you can include these statements in your init program.

POKE-16296,0	Puts DVM in Apple II mode
POKE-16294,0	Turns on red video
POKE-16291,0	Turns on green video
POKE-16289,0	Turns on blue video

The DVM should be operational after these four statements have been executed.

The checkout of the text operation is easily accomplished. You should fill up the screen with text after selecting the TEXT mode. You should ensure that all of the 40 characters in each line is completely visible. The color of the text page may be changed by selecting the video color with POKES.

The mixed mode with low resolution graphics can be checked by executing the following programs:

```
10 GR
20 FOR X = 0 TO 7
30 FOR Y = 0 TO 39
35 COLOR = X
40 VLIN 0, 39 AT Y
50 NEXT Y
60 NEXT X
70 GOTO 20
```

This program will cycle the DVM through the eight colors available with the text window still visible below. The full graphics mode can be tested by including these additional two statements:

```
15 POKE -16302,0          Sets Mixed mode off
40 VLIN 0, 47 AT Y
```

This change will write a full page of low resolution graphics to the screen.

The high resolution graphics mode is most easily checked with Applesoft. The program provided below checks the high resolution graphics in the full page mode.

```
10 HGR
20 POKE -16302,0
30 FOR X = 1 TO 7
40 FOR Y = 0 TO 279
50 FOR Z = 0 TO 191
60 HCOLOR = X
70 HPLOT Y,Z
80 NEXT Z
90 NEXT Y
100 NEXT X
110 GOTO 30
```


This program will fill the screen (slowly) with high resolution color. The colors will cycle in the order green, magenta, white, black, red, blue and white.

The following limitations should be noted:

1. The high resolution graphic vertical line 0, Vertical line 279 and Horizontal line 159 for mixed mode graphics or 191 for full screen graphics should not be addressed.
2. The high resolution window and the low resolution window are displaced from each other by one low resolution cell width.
3. The low resolution colors available are only black, red, green, yellow magenta, cyan and white.

The windowing described above was necessary to eliminate some artifacts that are sometimes visible. A good rule to follow in your software is to stay away from the edge.

The phase of the colors presented in hi res may be reversed by adjusting the trim pot located on the DVM board. If a noisy hi res display is noticed, this pot may need to be adjusted for your particular Apple II. The pot has been adjusted at the factory on two different generation machines. Therefore the adjustment should be good for most machines in the field.

There are several modifications that can be made to the DVM for additional features. These will be discussed in the manual that is currently under development.

The use of 80 Character Video Cards and CPM Cards

To use an external video source you must throw the soft switch to put the DVM in the video card mode. This can be performed by executing a POKE-16295,0. It should be understood at this time that this just puts the DVM in the video card mode. It will still be necessary to turn on the video card with a PR#n command. When returning to the Apple II mode, you must throw the soft switch back with a POKE-16296,0. You must also return the Apple II keyboard and display to Apple II control. This is usually done with a PR#0 and IN#0.

The use of a CPM soft card complicates the use of the DVM. The soft switches must be thrown before booting the CPM disk or a Basic must be invoked to allow Basic commands to be sent to the DVM. When in MSOFT or GSOFT you must add 8192 to all soft switches values. For example when turning on the 80 character mode from MBASIC the command is POKE-8103,0 (-16295 + 8192). You must use a good deal of caution in using the 80 character card, the DVM card and the CPM soft card together in a graphics mode. The 80 character card must be soft switched in and out with the graphics since the graphics are controlled from the Apple II.