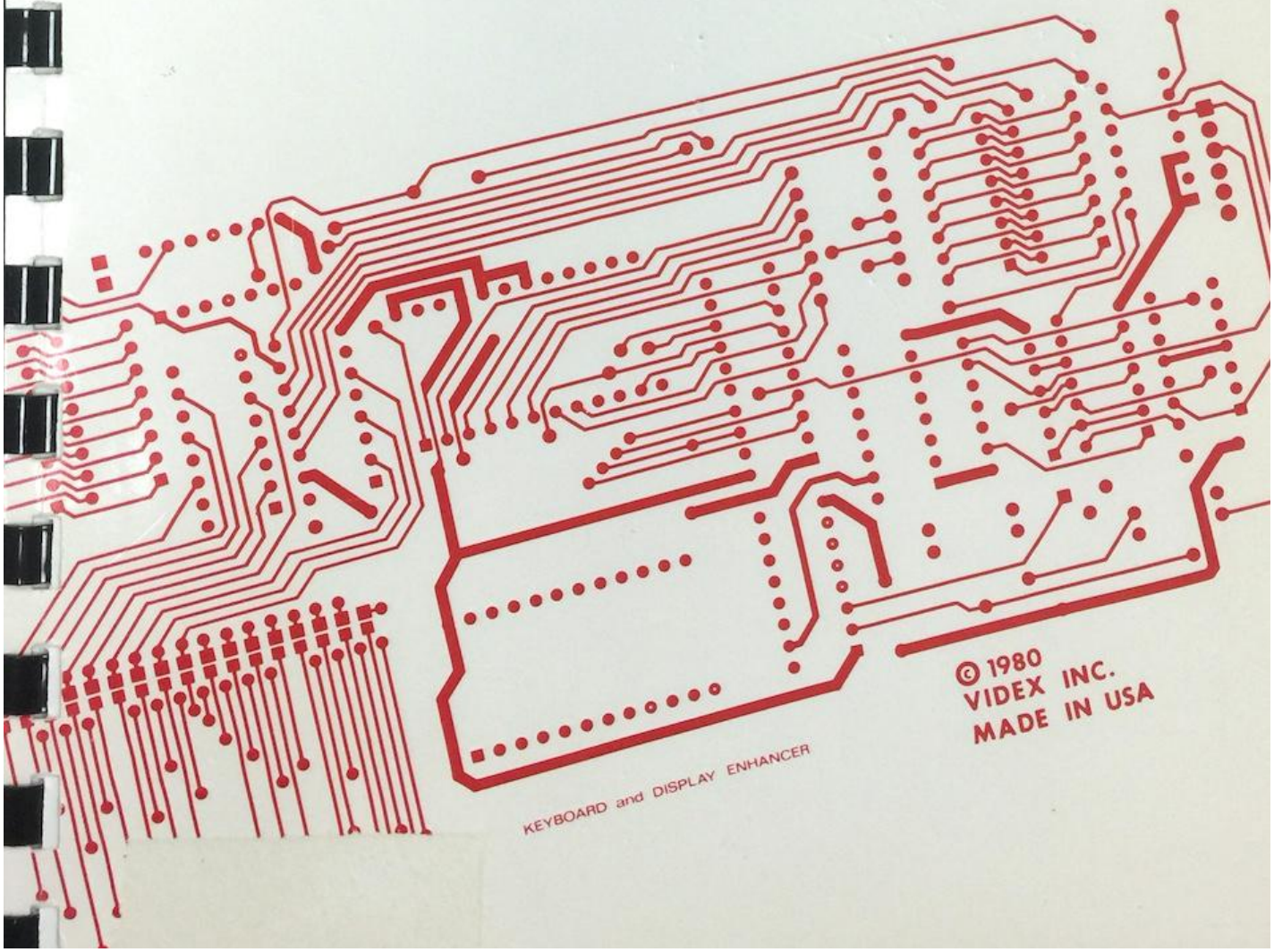
Videx INC.

KEYBOARD & DISPLAY ENHANCER
REFERENCE MANUAL



VIDEX

KEYBOARD AND DISPLAY ENHANCER

OWNERS REFERENCE MANUAL

CURTIS WHITE

PAUL DAVIS

DARRELL ALDRICH

OCTOBER, 1980

FIGURES AND ILLUSTRATIONS

TABLES

VIDEX, Inc. makes no warranties, either express or implied, with respect to this documentation or with respect to the firmware described herein, its quality, performance, merchantability, or fitness for any particular purpose except as explicitly set forth in the VIDEX, Inc. warranty. VIDEX, Inc. products are sold 'as is'. The entire risk as to its quality and performance is with the buyer. Should the firmware prove defective following its purchase, the buyer assumes the entire cost of all necessary repair or correction and any incidental or consequential damages, except as explicity set forth in the VIDEX, Inc. warranty. In no event will VIDEX, Inc. be liable for direct, indirect, incidental, or consequential damages resulting from any defect in the firmware, even if VIDEX, Inc. has been advised of the possibilities of such damages. Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

The information contained herein is correct as far as VIDEX, Inc. can determine, but VIDEX, Inc. reserves the right to change and/or add such information and specifications as it may desire at any time without prior notice.

VIDEX KEYBOARD AND DISPLAY ENHANCER

WARRANTY

VIDEX, INC. WARRANTS THIS PRODUCT TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF NINETY (90) DAYS FROM THE DATE OF ORIGINAL PURCHASE FOR USE. VIDEX, INC. AGREES TO REPAIR OR, AT OUR OPTION, REPLACE ANY DEFECTIVE UNIT WITHOUT CHARGE. VIDEX, INC. ASSUMES NO RESPONSIBILITY FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES, RECOGNIZING THAT SUCH RIGHT MAY NOT BE EFFECTIVE WHERE SUCH IS PROHIBITED BY LAW. THIS WARRANTY IS NON-TRANSFERRABLE. THE WARRANTY IS VALID WHEN REGISTERED WITHIN TEN (10) DAYS OF PURCHASE DATE. NO OTHER WARRANTY, WRITTEN OR VERBAL, IS AUTHORIZED BY VIDEX, INC..

PLEASE RETURN THE REGISTRATION CARD IN ORDER THAT VIDEX CAN NOTIFY YOU OF NEW PRODUCTS, KEYBOARD AND DISPLAY ENHANCER UPDATES AND NEW SOFTWARE.

MAIL TO: VIDEX, INC.
897 N.W. GRANT AVE.
CORVALLIS, OR 97330

VIDEX REGISTRATION FORM

PLEASE PRINT

NAME _____
TITLE _____
BUSINESS _____
ADDRESS _____
CITY/STATE _____
ZIP CODE _____
PHONE NUMBER _____
K•A•D•E• SERIAL NUMBER _____
DATE PURCHASED _____
PURCHASED FROM _____
_____
_____

HOW DID YOU HEAR OF PRODUCT?
AD (IN_____) FRIEND RETAIL STORE
ANOTHER OWNER COMPUTER SHOW

HOW ARE PLANNING ON USING THE KEYBOARD AND DISPLAY ENHANCER?

WHAT IS YOUR PRESENT APPLE II SYSTEM?

MEMORY SIZE _____K
DISK DRIVE(S) _____
APPLESOFT _____
INTEGER _____
LANGUAGE CARD _____
PRINTER _____
MONITOR _____
WORD PROCESSOR _____
OTHER _____

VIDEOTERM _____
SOFTCARD _____
ROMWRITER _____
CLOCK _____
MICROMODEM _____
BRAND _____
BRAND _____
BRAND _____

WHAT COMMENTS OR SUGGESTIONS DO YOU HAVE ABOUT THE KEYBOARD AND DISPLAY ENHANCER?

OVERVIEW

Introduction

Congratulations on the new Apple II peripheral that you have just purchased. The KEYBOARD AND DISPLAY ENHANCER gives you full typewriter keyboard style operation while displaying the entire 96 ASCII display character set using a 5 by 7 dot matrix size. Special character sets may be defined by the user and preprogrammed EPROM chips are available from VIDEX that offer various character fonts. By changing the EPROM, you may also remap the keyboard to allow entry of any character using any of the keys. These capabilities are available under Pascal and both Basic languages that Apple Computer, Inc. offers.

All of these features are included on one printed circuit (PC) board utilizing only 6 additional integrated circuits (ICs). The use of CMOS and low power electronic components reduces the power needed for the board to properly function and virtually eliminates power draw.

The firmware used with the KEYBOARD AND DISPLAY ENHANCER board is transparent to standard Apple II and Apple II-compatible software. Any software that is compatible with the Dan Paymar Lower Case Adapter will immediately work with the KEYBOARD AND DISPLAY ENHANCER. You can use the ROMWriter by Mountain Hardware to create custom character sets or rearrange the keyboard.

The KEYBOARD AND DISPLAY ENHANCER will work with most word processors including Super-Text by MUSE, Inc., Apple Writer by Apple Computer, Inc. and the Apple PIE by Programma International, Inc. The software patches necessary for proper operation of the KEYBOARD AND DISPLAY ENHANCER with the Apple

Pascal and Basic languages are fully explained.

The remainder of this Overview chapter is devoted to a description of the physical appearance of the KEYBOARD AND DISPLAY ENHANCER board, a full description of all features of the board and the necessary Apple II system prerequisites for its proper function.

If any difficulty with the unit arises, you should contact the store where you purchased the KEYBOARD AND DISPLAY ENHANCER. They should be able to determine if the fault lies with the KEYBOARD AND DISPLAY ENHANCER or not. If they cannot help you, please feel free to contact VIDEX directly so that the problem may be quickly corrected.

Physical Description

As you can see when you hold the KEYBOARD AND DISPLAY ENHANCER board in your hand, the board is small, compact and uncluttered with electronic components. The design minimizes the number of parts which may fail. The board measures only 6.25 by 5.5 inches, and is designed to fit underneath your Apple II keyboard. A labelled photograph and a complete board schematic drawing are included as Figures 11 and 12, respectively, at the end of this manual.

At the upper right of the board, you will see five small prongs of the keyboard cable takeoff jack. A cable is included which connects these five prongs to an IC on the Apple II keyboard.

The large chip in the middle of the board is the EPROM (erasable programmable read-only memory chip) which contains the current character set which the board displays. By switching this EPROM with another, the character set may be changed. The board comes equipped with the standard ASCII character set.

This chip also determines the keyboard/character map of the KEYBOARD AND DISPLAY ENHANCER. Two maps are included on the standard EPROM, one for the regular U.S. style keyboard, the other for a keyboard in which the upper and lower case alphabetic characters are reversed. The active map is chosen by the setting of a dip-switch on the board.

On the underside of the board there are 4 double-row groups of protruding wire connectors. It is this part of the board which will be pushed into the Apple II's Main board to install the KEYBOARD AND DISPLAY ENHANCER. .You should avoid touching the connectors with your fingers as this may impair the

quality of electrical contact. In general, hold the card by its edges when examining it and when installing or removing it from the Apple II.

You will notice that there are three empty dip sockets on the top of the board. Two of these will be filled with ICs removed from the Apple II Main board as part of the installation process. The third will be used to connect with the keyboard using its ribbon cable.

You will see either one (standard model, KDE-000) or two (Revision 7 model, KDE-700) dip-switches on the board. The one near the five prong connector is on both boards. It controls default keyboard map selection, RESET control and default operating mode (alpha lock or unlock). The KDE-700 has a second dip-switch above the EPROM. It allows choice of inverse or flashing lower case characters. Although the KDE-000 has only one dip-switch, there is a socket provided for insertion of a second dip-switch, so that you can easily upgrade a your KEYBOARD AND DISPLAY ENHANCER if you so desire. Full instructions for this procedure are given on page 6-4.

KEYBOARD AND DISPLAY ENHANCER Features

The KEYBOARD AND DISPLAY ENHANCER Board offers you a great many features. A complete list is given below. At the end of each description, a manual page reference is given so that you may immediately read more concerning that feature. This allows you to use this section as a cross-index to the more detailed instructions and information which follow.

<1> You can enter all 128 ASCII characters from the keyboard and display all 96 ASCII non-Control characters. Nine previously non-enterable characters may be input using various keys in conjunction with the Shift key while in normal Apple II operating (alpha lock) mode (page 3-3).

<2> Text is entered in upper and/or lower case at your discretion (pages 3-1, 3-5). All 96 ASCII display characters are available if your software is compatible with Dan Paymar's Lower Case Adapter (pages 4-1, 4-13).

<3> You have direct screen cursor control in Apple's Basic languages using the familiar ESCape key sequences. In Pascal, cursor control is the same as the Pascal defaults and may be controlled using GOTOXY.

<4> The KEYBOARD AND DISPLAY ENHANCER board is completely compatible with the Apple Language card. You will need to make a one-time change to SYSTEM.APPLE to initialize Pascal correctly (page 4-12). Applesoft Basic and Integer Basic usage on the Language card requires a one time change to INTBAS.DATA and FPBAS.DATA

files (pages 4-8 to 4-10). These same changes will need to be made to the INTBASIC or FPBASIC files on DOS 3.3 diskettes (page 4-10). You can reprogram the Auto-start ROM so that these changes will also work with the resident Basic language (page 4-11).

<5> On standard Apple IIs without the Language card, you will need to modify your HELLO program to run a special Assembly language program when you boot your system if you have a Disk II or you will need to load the program from cassette and run it when you first turn on your Apple II (pages 4-1 to 4-8). This program will provide full lower case character entry from the keyboard in either Basic.

<6> The KEYBOARD AND DISPLAY ENHANCER board generates an immediate response to all inputs.

<7> The board is compatible with the D. C. Hayes Micromodem II, the Microsoft Softcard, and many other peripherals that allow interaction with a standard typewriter keyboard (page 4-18). KEYBOARD AND DISPLAY ENHANCER is compatible with Super-Text, Apple Writer, the Apple PIE editor and other word processors available for the Apple II (pages 4-14 to 4-17). With only slight modifications, you will find that most software will work excellently with the KEYBOARD AND DISPLAY ENHANCER. And the board is completely compatible with the VIDEX VIDEOTERM (page 4-18).

<8> The KEYBOARD AND DISPLAY ENHANCER board allows you the option of displaying a set

of user defined or VIDEX predefined character sets, in place of the standard 96 ASCII display characters. Using the Mountain Hardware ROMWriter (or other EPROM programmer) the user can create any desired graphical or character set. A special VIDEX Font Editor program is available which enormously simplifies the process of creating new fonts (pages 5-1 to 5-3).

<9> The KEYBOARD AND DISPLAY ENHANCER in no way interferes with the memory-mapped graphics display of the Apple II itself. You may thus generate graphical output on either of the two high-resolution graphics pages without disturbing the text display image.

<10> Optional operating default modes may be selected on the KEYBOARD AND DISPLAY ENHANCER (pages 3-4 to 3-6). All options are dip-switch selectable. The Revision 7 model KEYBOARD AND DISPLAY ENHANCER has two dip-switches, allowing even greater flexibility in operational mode choices (page 3-7).

<11> The KEYBOARD AND DISPLAY ENHANCER allows you to remap the keyboard so that any character may be entered from any key at your discretion. An alternate keyboard map is included as an example (Table 5, page 5-7). The alternate keyboard map is dip-switch selectable (page 3-6). To change the keyboard map you will need to program an EPROM and replace the one on the board with it, a procedure similar to the one used to implement a new character set (pages 5-5 to 5-8).

<12> The KEYBOARD AND. DISPLAY ENHANCER protects against accidental RESETs by requiring that the CONTROL key be depressed along with the RESET key to initiate the RESET condition (Table 1, page 3-2). This option is, again, dip-switch selectable (pages 3-5 to 3-6).

<13> Installation of the board is simple and requires no soldering. You will not void your Apple II warranty if you follow the installation and checkout instructions carefully (pages 2-1 to 2-20).

<14> You can switch between normal Apple II keyboard operation and either shift lock or unlock typewriter keyboard operation using only the Shift, Control and Reset keys (page 3-1). The signals generated do not enter the Apple II input character buffer and thus are not seen directly by any of your programs. The results of switching between the different modes is seen by the programs. Lower case text is stored directly into your Apple II memory as true lower case (page 3-2).

Apple II Prerequisites and Options

To fully use all the features and capabilities of the KEYBOARD AND DISPLAY ENHANCER board, you need only the minimum 16K Apple II or Apple II plus system. It will display equally well on a black and white monitor or on a color TV set connected with a RF modulator. The KEYBOARD AND DISPLAY ENHANCER works with all Apple II peripherals and software that accept lower case text.

INSTALLATION AND CHECKOUT

How to Install the KEYBOARD AND DISPLAY ENHANCER

The VIDEX KEYBOARD AND DISPLAY ENHANCER consists of two parts: the KEYBOARD AND DISPLAY ENHANCER board itself and a connector from the board to the Apple II keyboard. As the installation procedure for the KEYBOARD AND DISPLAY ENHANCER is different than that for other Apple II peripherals, you should carefully examine the photographs in this chapter, read completely through the installation instructions at least twice, and then follow the checklist at the end of this section as you actually install the board. During the installation, you will be directed to consult the Checkout section, page 2-16.

To orient you as to how the board appears when installed, a photograph is included as Figure 1. The view shows the inside of the Apple II with the completed installation. Examine this photograph carefully before installing the board and again after installation but before turning on your computer's power switch.

VIDEX CAN ASSUME NO LIABILITY OR RESPONSIBILITY FOR DAMAGES CAUSED BY INCORRECT KEYBOARD AND DISPLAY ENHANCER INSTALLATION! So please double check all connections before you power up the system.

In the following instructions, it is assumed that you are seated at your Apple II, with the keyboard directly in front of you as if you were about to type. You should clear the top of the Apple II so that you can easily open the computer case and install the board. You should also clear a work area immediately around the computer as you will need to completely open up the Apple II to have easy access to the Main board.

You will need the following tools: a Phillips head screwdriver, a small flat head screwdriver that is not magnetized (or an IC extractor) and a cup to hold the various screws that you will remove. A pair of needlenose pliers might also prove useful. Plan on spending about an hour installing the KEYBOARD AND DISPLAY ENHANCER. Do not rush yourself as it is easier not to make a mistake than to correct one!

Some of the ICs that you will touch are EXTREMELY sensitive to static electricity. Touch the case of the Apple II power supply to ground yourself before starting. Also, do not stand on a carpet during the installation.

(1) Turn the power switch OFF. The power switch is located at the rear of the Apple II near the power cord connector. It is imperative that this be done, otherwise permanent damage

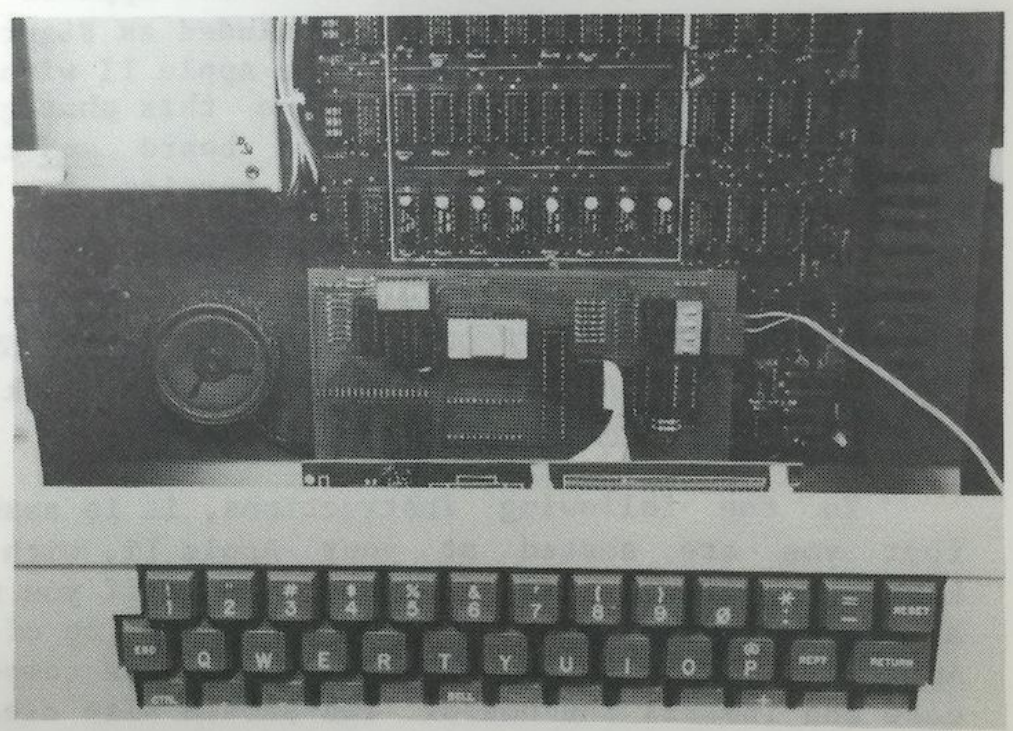


Figure 1: Board Installed in System

may be done the Apple II Main board and/or any of the other peripheral boards that may be plugged into the expansion bus at the time. You should also detach the power cord from the Apple II as it necessary to turn the Apple II upside down to remove the bottom retaining screws.

(2) Remove the cover from the Apple II. Grasp the cover under its rear lip, using one hand at each corner, and pop the cover loose from its fasteners. Then pull the cover directly out toward the rear to avoid possible prying on the keyboard. When the cover is free, lift and remove it from the Apple II.

(3) Inside, covering almost the entire bottom of the computer case, is the green PC Main board of the Apple II. Across the rear of the Main Board is a row of 8 connectors or expansion slots. Remove <u>all</u> of your peripheral cards

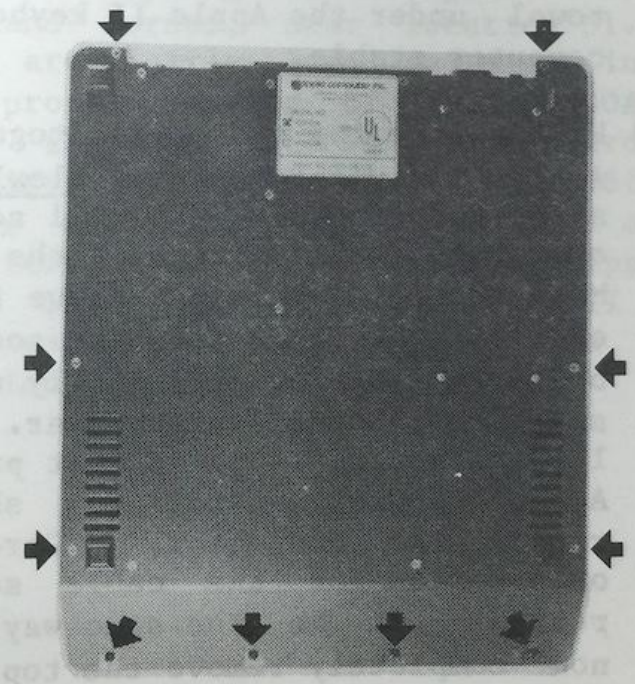


Figure 2: Screw Removal on the Bottom of the Apple II

from these slots before proceeding further. If you are using a RF modulator, disconnect it from the four prong video output jack on the Apple II Main board. Disconnect your game paddles. Disconnect all cables from the back of the computer, including cassette and video wires.

(4) Turn your Apple II over and remove the six screws which hold the outer molded plastic top to the base plate of the Apple II. Examine Figure 2 for the exact location of these screws. Place the screws aside until time for reassembly. It is best to put them in a cup to keep from losing them. A muffin pan is excellent, as there are various size screws that you will be removing during the installation and it is easier to keep track of them if you keep them separate. You will notice that the Apple II has a tendency to roll forward onto its keyboard during this procedure. You might want to place a folded towel under the Apple II keyboard to keep the computer stable.

(5) Holding the top and bottom together, turn your Apple II rightside up. Slowly raise the top about four inches. You will see that there is a ribbon cable attaching the keyboard to the Main Board. Carefully remove the dip pin plug end of the cable from its socket on the Main board by easing it slowly upward using the small, flathead screwdriver. If you have an IC extractor, such as that provided with the Apple Language card, you should use it to remove the connector. Carefully note the orientation of the cable so that you can reattach it in the same way later. You can now completely remove the top of the Apple II and place it to the side, upside down so that you can see the keyboard.

(6) At this time, you must determine which Apple II Main board Revision you have. Revision 7 and greater Apple II's are the most recent and do not have the 4K/16K memory configuration blocks on the Main board at locations D-1, E-1 and F-1. The KEYBOARD AND DISPLAY ENHANCER that you install in Revision 7 Main boards has two sets of dip-switches on it. Earlier Main boards are of two types, Revision 0 and Revision 1. The differences between these Main boards is detailed in the Apple II Reference Manual, pages 26 and 27. For both types, the KEYBOARD AND DISPLAY ENHANCER that you install will have only one dip-switch. The two KEYBOARD AND DISPLAY ENHANCER models have different soldering connections, which are explained in Optional Hardware Modifications, starting on page 6-4.

You will notice that on Revision 7 Main boards there is a 4 prong take-off jack at the lower left hand corner, near location B1. These prongs are fairly long and might interfere with proper seating of the KEYBOARD AND DISPLAY ENHANCER into the Main board. As a precaution, you can remove about 1/16th of an inch of each prong using a pair of ordinary wirecutters. Make sure that the clipped ends do not fall inside of the Apple II as they could possibly short out some of the connection traces on the Main board.

(7) Using the flathead screwdriver or the IC extractor, gently remove the following IC chips and replace them in the KEYBOARD AND DISPLAY ENHANCER at the locations shown in Figure 3. The following ICs are to be removed and replaced on the KEYBOARD AND DISPLAY ENHANCER: B-1 (a 74LS175) and B-9 (a 74LS194). Be sure that you do not change the orientation of the chips when you reinsert them in the KEYBOARD AND DISPLAY ENHANCER. All ICs on the board should be pointed in the same direction. To reinsert the ICs, make sure first that all pins are straight. If they are not, use your fingernails or the needlenose pliers to slowly straighten them. Then position the chip above the appropriate socket and make sure that all pins are over a hole. Then firmly press the chip into its socket. Make sure that it is seated all the way into the socket.

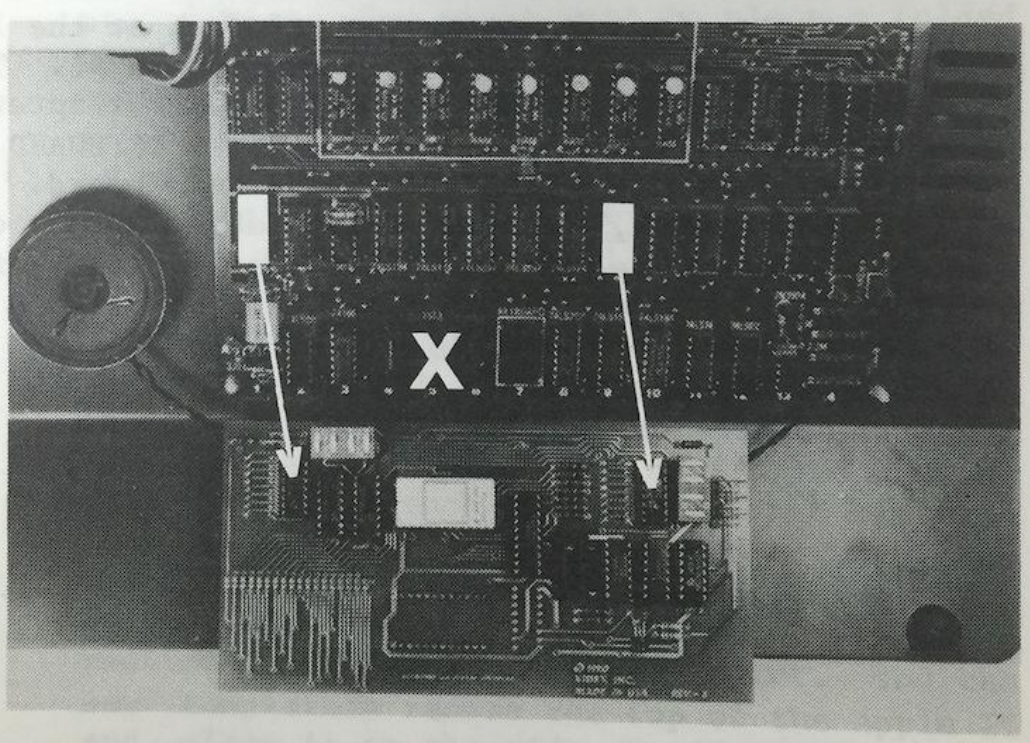


Figure 3: Removal and Reinsertion of Main board ICs

Remove the large chip A-5 and place it aside in a safe location. You will not need this chip as long as the KEYBOARD AND DISPLAY ENHANCER is installed.

(8) Position the KEYBOARD AND DISPLAY ENHANCER board's protruding set of connectors over the now empty set of dip socket holes on the Main board. The connectors should exactly match the vacant locations. Make sure that the board is positioned horizontally and not twisted in any manner. Also make sure that all the pins are over vacant holes. Holding firmly onto the corners of the board, push the connectors into their holes. Check that the KEYBOARD AND DISPLAY ENHANCER board is fully seated all the way into the Main board by pushing firmly above the various connectors in such a manner that even pressure is applied over the entire board, as shown in Figure 4.

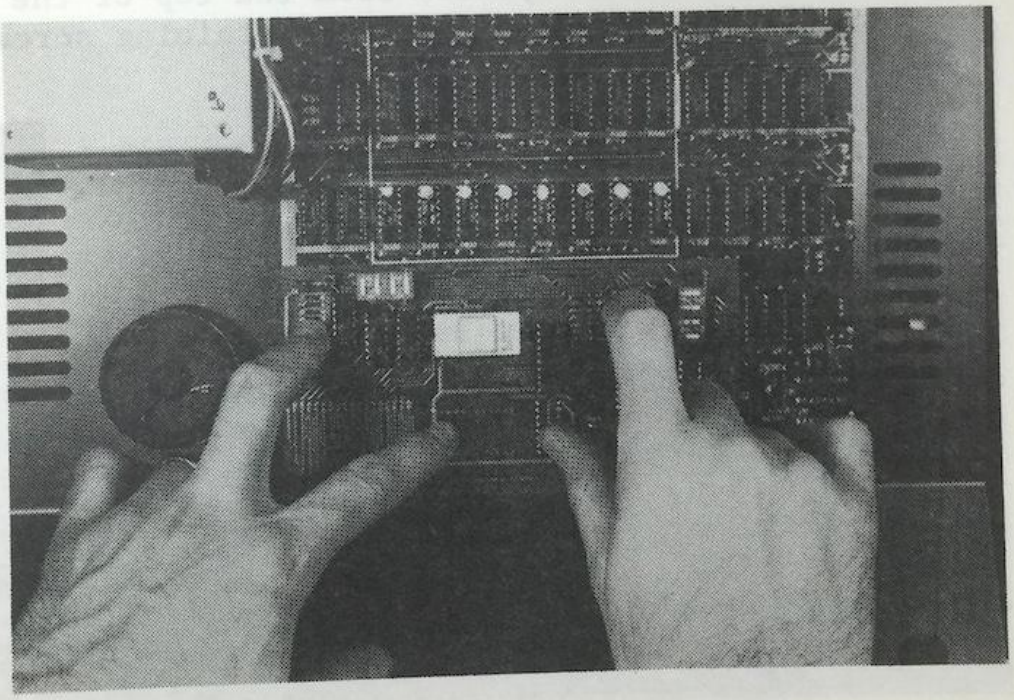


Figure 4: Board Installation in System

Make sure that all of the board's connectors are seated into the dip socket holes on the Main board. Failure to have complete connections could have possibly disastrous effects when the power is turned on. If you notice the Main board flexing during installation, you might try carefully inserting a pen or pencil between the Main board and the bottom plate to give the Main board extra support.

(9) You are now ready to attach the supplied keyboard connector wire to the keyboard. There are two different versions of Apple II keyboards. The early version consists of a single PC board, while the later version consists of two PC boards, one being attached to the other in piggyback fashion using two plastic clips. First, we will explain the procedure with the early version keyboards.

Remove the keyboard from the top of the Apple II by removing the four retaining screws, as shown in Figure 5.

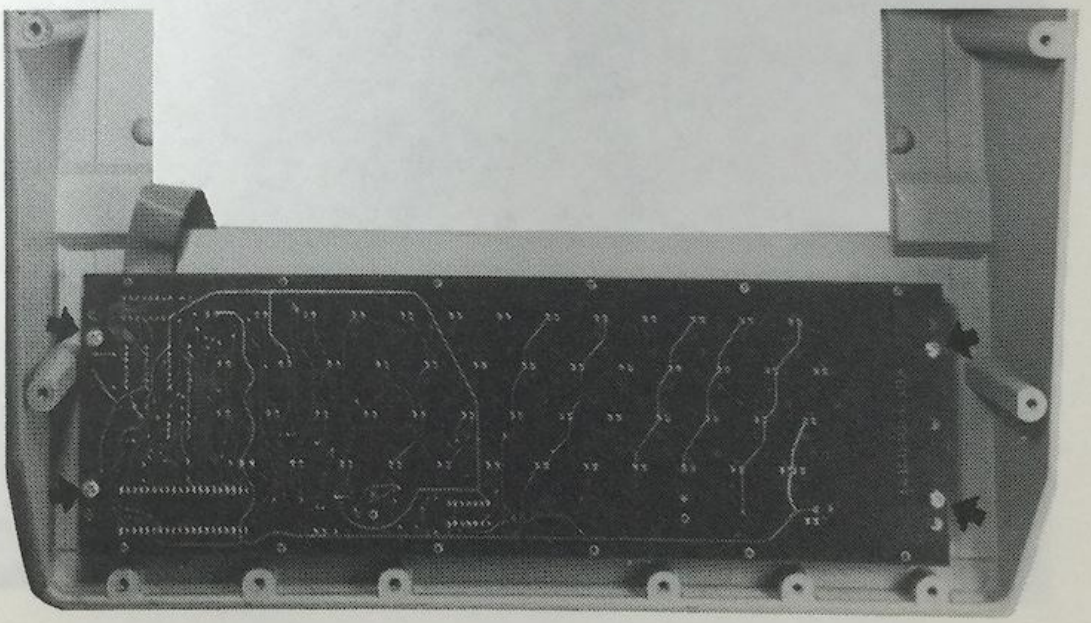


Figure 5: Removal of the Keyboard

Find the keyboard encoder chip. It will be the largest chip on the keyboard. This chip is extremely sensitive to static electricity. Carefully remove it, noticing the orientation of the chip so that it may be reinstalled in the same way. One corner of the chip or the board will be marked with a small dot. This is the location of pin number one. Count along this side to pin number nineteen. Note that there are 20 pins to a side, so this will be the next to last pin on the same side as pin one.

Now examine the two wire connecting cable. The wire that attaches to the outside of the five slot connector is the Control wire. The wire that attaches to the middle of the connector is the Shift wire. Insert the end of the Control (outside, colored) wire into hole number 19 in the dip socket.

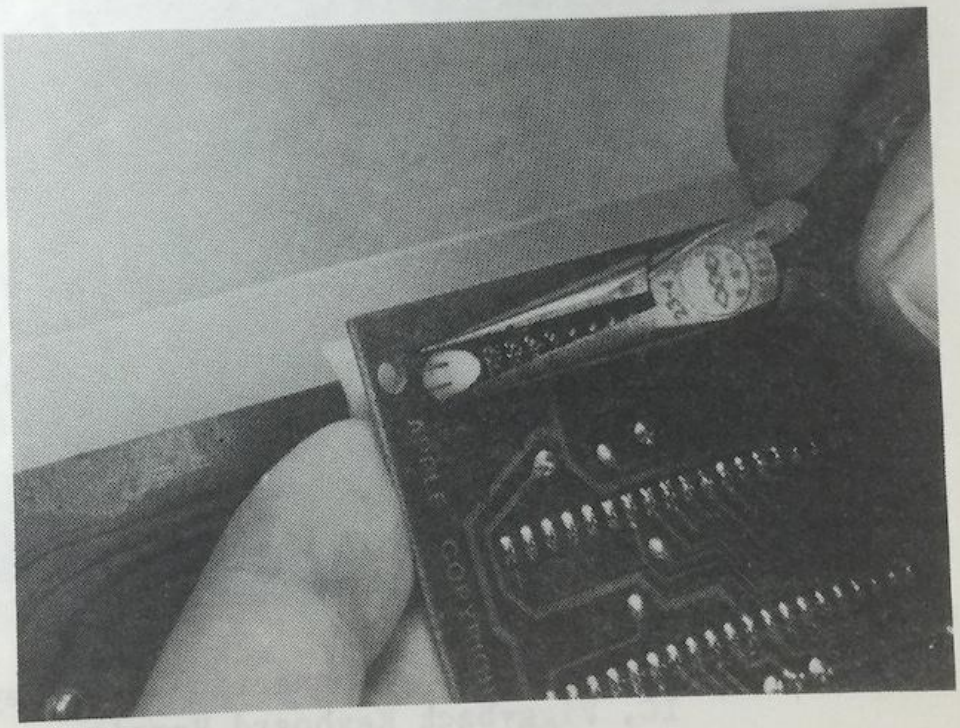


Figure 6: Removal of the Piggyback Keyboard

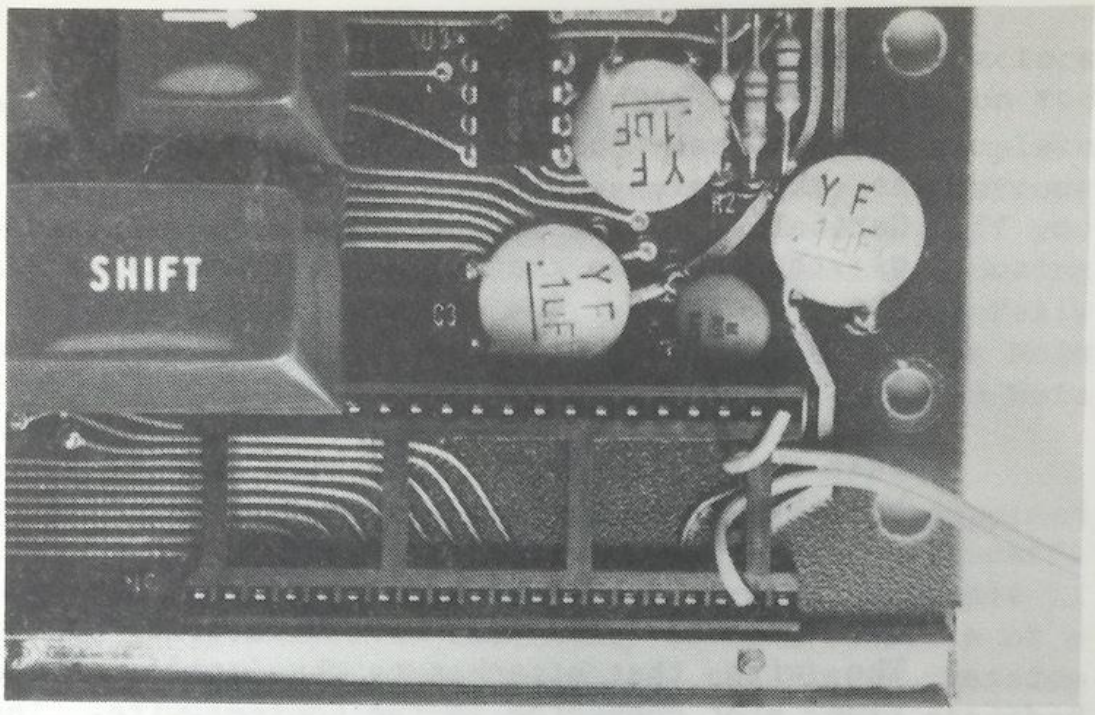


Figure 7a: Jumper Cable Connection with Keyboard IC, Early Keyboard Version

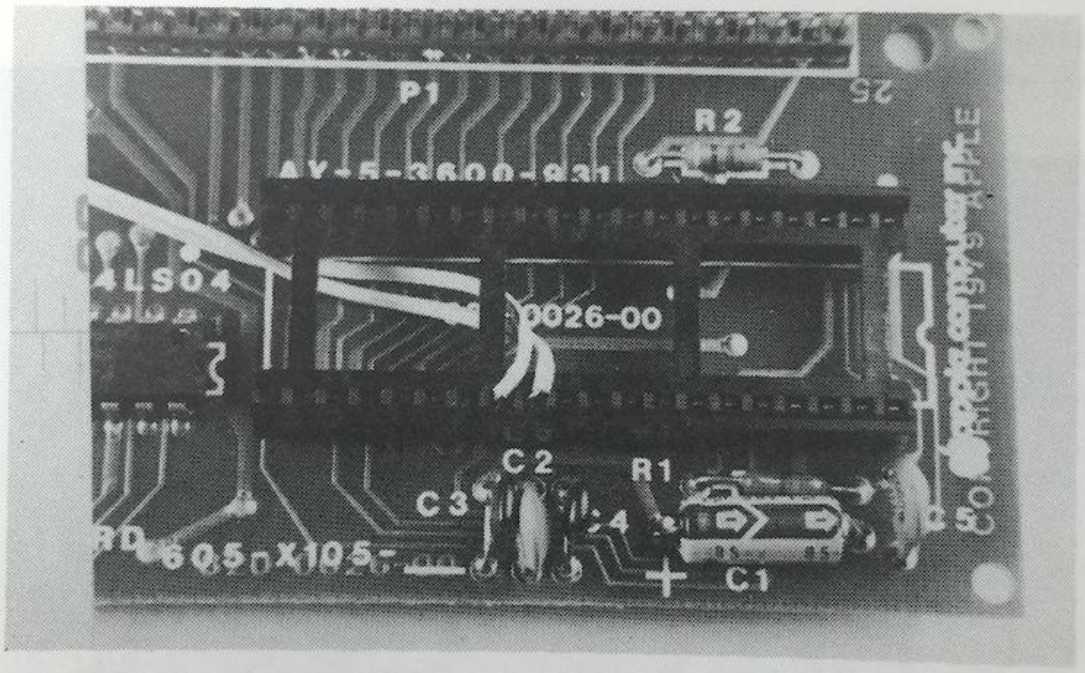


Figure 7b: Jumper Cable Connection with Keyboard IC, Piggyback Keyboard Version

Just across from this, the first hole on the opposite side at the same end of the chip or dip socket is pin 21. Insert the Shift (middle) wire into this hole. See Figure 7a for confirmation of the hole locations. When inserting both of these wires, leave some bare wire exposed. You want to just overlap the wire's insulation onto the dip socket. Then when you reinsert the IC, the chip will pinch the insulation tightly, creating a very secure connection.

Now position the chip over the correct holes, making sure it is oriented properly, and firmly push it back in. Make sure that the chip is completely pushed in before proceeding.

If you have a Piggyback style Keyboard in your Apple II, you will not need to remove the Keyboard from the case in order to access the keyboard encoder chip, only the Piggyback board. There are two plastic clips holding the Piggyback board to the keyboard. Each clip has two retaining stand offs that must be pushed into the clip in order to withdraw the Piggyback board from the clip. Do each clip by itself, pinching in the stand offs with a pair of needlenose pliers while gently wiggling the board forward, slightly, with the other hand, so that the board hole is now free to slide the rest of the way off of the clip. Now simply grasp the Piggyback board firmly and pull it away from the keyboard.

Proceed as above for attaching the cable to the dip socket except that you will want to locate dip socket holes 28 for the Control (colored) wire and 29 for the Shift wire. Run the wires under the cross braces of the dip socket so that they will not keep the chip

from reseating correctly. See Figure 7b for an illustration of how the wires should appear. Reinsert the chip with the proper orientation and replace the Piggyback board. Simply align the Piggyback board correctly and push it firmly back onto the keyboard making sure that the stand offs on the plastic clips come out, resecuring the Piggyback keyboard.

(10) Set the default settings of the KEYBOARD AND DISPLAY ENHANCER dip-switches according to Figure 10 and the information given starting on page 3-4.

(11) Bring the top of the Apple II back over the base and lower it so that you can reattach the keyboard ribbon cable into the remaining empty dip socket of the KEYBOARD AND DISPLAY ENHANCER. Attach the end of the keyboard jumper cable connector to the five prong take

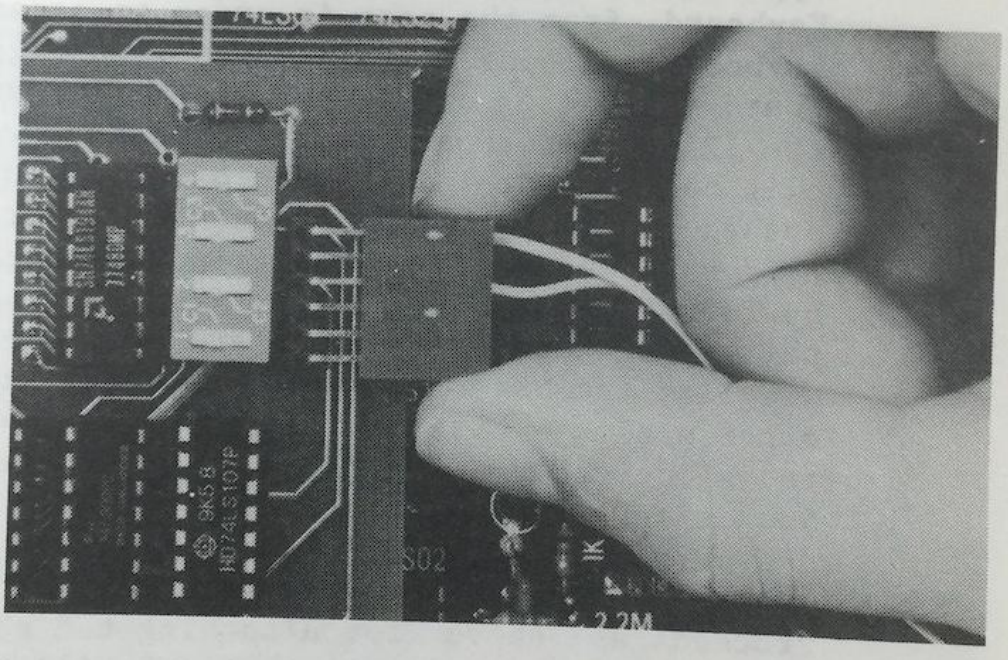


Figure 8: Jumper Cable Connection with the KEYBOARD AND DISPLAY ENHANCER

off jack on the upper right hand corner of the KEYBOARD AND DISPLAY ENHANCER as illustrated in Figure 8. Be sure that the outside wire is on the side of the jack farthest away from you, that is, toward the back of the Apple II. You should now proceed to the Checkout section, page 2-16.

(12) You should now have verified that the KEYBOARD AND DISPLAY ENHANCER is working properly. Hold the top of the Apple II in place over the base, turn it over and replace the screws into the bottom. Turn the computer rightside up again.

(13) Reinstall all of your Apple II peripheral boards. You might wish to make sure that all ICs are firmly seated in the Main board at this time by pressing each of them into their sockets. Quite often, a problem with installation of the KEYBOARD AND DISPLAY ENHANCER can be traced directly to other chips not being seated all the way into their sockets! Reconnect your RF modulator, game paddles, cassette and/or video cables to their proper places.

(14) Replace the Apple II cover. At the same time, press down firmly on both rear corners of the lid to resecure it.

(15) Reattach the power cable and turn on the power switch located on the back of the Apple II.

Installation Checklist

To assist you in the actual installation, you may wish to use the following outline as a checklist.

(1) Turn OFF the power switch and unplug the power cord.

(2) Remove the cover.

(3) Remove all peripheral boards. Disconnect game paddles, cassette cable, video cable and/or RF modulator.

(4) Turn the Apple II over. Detach the top by removing the screws holding it to the base. Turn it rightside up and carefully remove the top, disconnecting the keyboard ribbon cable while removing it.

(5) Turn the Apple II rightside up. Lift the top enough to remove the keyboard ribbon cable from the Main board. Place the top aside.

(6) Determine the Revision type of your Main board. Clip the B1 take-off jack prongs slightly on the Revision 7 Main board.

(7) Remove IC chips B1 and B9 from the Main board and replace them on the KEYBOARD AND DISPLAY ENHANCER board. Remove IC A5 from the Main board and save it in a safe place.

(8) Insert the KEYBOARD AND DISPLAY ENHANCER into the Apple II Main board. Make sure it is fully seated.

(9) Remove the keyboard or Piggyback keyboard, depending on your keyboard version. Locate and remove the large keyboard encoder chip. Insert the ends of the jumper cable into the

proper dip socket holes (pages 2-9 to 2-11). Replace the keyboard encoder chip. Replace the keyboard.

(10) Set the dip-switches on the KEYBOARD AND DISPLAY ENHANCER according to the instructions on page 3-4.

(11) Bring the top of the Apple II over the bottom, and connect the jumper cable to its five prong jack and insert the keyboard ribbon cable into its dip socket on the KEYBOARD AND DISPLAY ENHANCER. Turn to page 2-16 and perform the operation checkout.

(12) Reattach the top of the Apple II to its base.

(13) Reinstall all peripheral boards and cables.

(14) Replace the cover of the Apple II.

(15) Reattach the power cord. Your Apple II is ready to use!

Checkout

You should complete the checkout of the KEYBOARD AND DISPLAY ENHANCER before reassembling your Apple II. This allows you to take any corrective actions first. This section will tell you how to make sure that the board is operating normally, make minor adjustments and fix minor errors, or diagnose serious hardware problems. All boards are thoroughly tested before sale, but problems can arise with anything. Contact your Apple dealer if a serious problem develops.

A. How to Verify Correct Performance

Verification of board performance is fairly simple and straightforward. First, make sure that all connections have been made properly, that all chips are firmly pushed in on both the Main board and the KEYBOARD AND DISPLAY ENHANCER, and that you do not have <u>any</u> peripheral boards installed.

Reattach your video display and power cord. Turn on your video monitor and let it completely warm up. Then, very quickly, turn your Apple II on and off again. You should see some type of video display in the brief instant that the Apple II was on. If you do not, recheck all connections, consult the Fault Diagnosis section below and try again. LEAVING THE APPLE II ON WITHOUT A DISPLAY MAY BURN-OUT SOME OF YOUR CHIPS! If the power supply makes a clicking noise, you have a DEFINITE PROBLEM and you should immediately turn your Apple II off and consult the Fault Diagnosis section.

Program 1: Test Display Program

```
10 CALL -936: FOR I=1024 TO 1024+255:
     POKE I,I-1024: NEXT I
   20  GO TO 20
```

If all seems normal you are ready to complete your checkout procedure. Turn on your Apple II and press the Control and Reset keys together. Then press just the Reset key. This puts the KEYBOARD AND DISPLAY ENHANCER into alpha lock mode, so that the keyboard will be in standard Apple II mode. When you turn your system on, it should beep and fill the screen with rub-out characters and/or other symbols. Some older Apple IIs will not beep and it will be necessary to press the Reset key while holding down the Control key.

An asterisk with a flashing square cursor next to it will appear near the lower left corner, indicating that you are in the Apple II Monitor. Now enter your default, or resident, Basic language by typing Control-B, followed by a Return. Enter the program listed as Program 1 and RUN it. You should see displayed the entire KEYBOARD AND DISPLAY ENHANCER character set, Figure 9.

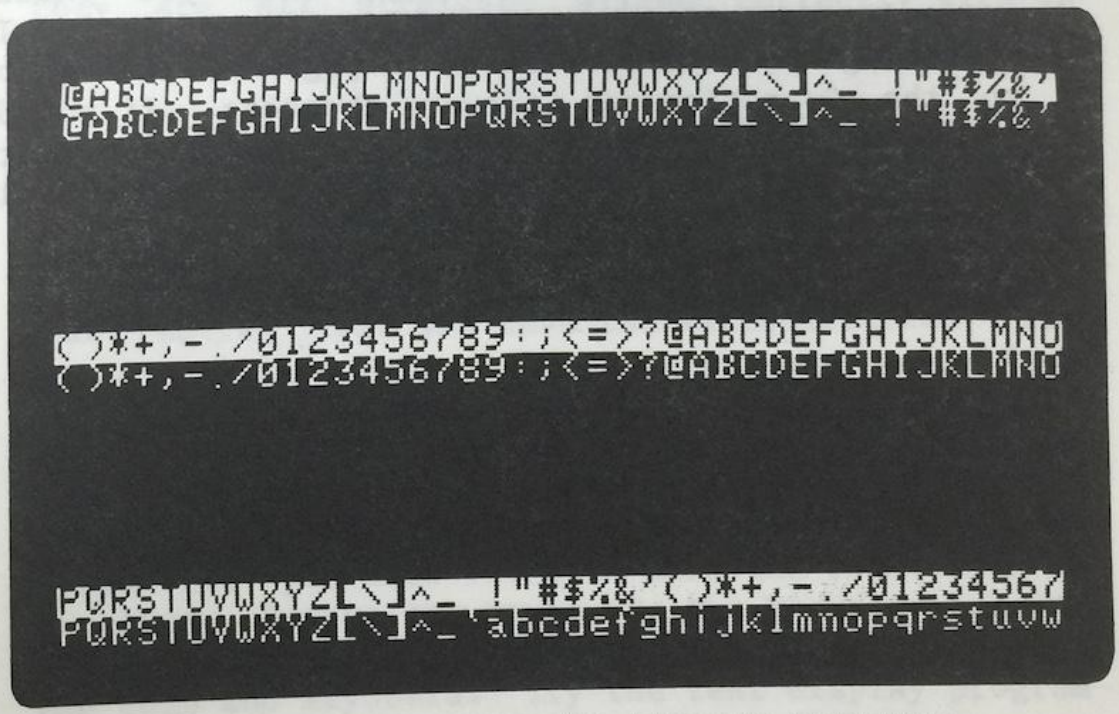


Figure 9: KEYBOARD AND DISPLAY ENHANCER Character Set

If you have the Autostart-ROM installed in your Apple II, the probable conditon with the Apple II Plus, you will see

APPLE II

at the top center of your screen. Since the Disk II system will not be present, you must still press Control and Reset to enter the Monitor. Enter your resident Basic and proceed as above.

After running the program, enter a Control-C to interrupt the program. Press the Reset key to make sure that you are in alpha lock mode with the keyboard and try typing N and Shift-N. You should get the ^ symbol with the Shift-N entry. Now try entering a Shift-Reset which will put you in alpha unlock mode. You should see N when you enter N or Shift-N. If this is occurring then the KEYBOARD AND DISPLAY ENHANCER is working correctly.

If all proceeds smoothly, then you should proceed to finish reassembling your Apple II according to the directions on page 2-13 and go on to the Operation and Software chapters. If you do not see the display or cannot get your Apple II to respond then follow the directions in the Fault Diagnosis section which follows.

Fault Diagnosis

The first thing to check is if you have any video image at all. Did your Apple II beep when you turned it on? If not, and if you have no display, then you probably do not have a complete connection somewhere with your Main board. Immediately turn off your power and proceed to carefully check all of your connections. Push in ALL of your ICs. Make sure that your video display connection is properly made and that your monitor is on and working. If after several repeated tries you cannot get ANY KIND of response, then you should contact your dealer directly to let him check your system. This is an unlikely situation.

It is possible that you may have bent one of the dip pins when trying to install the KEYBOARD AND DISPLAY ENHANCER, so you might try removing the board, after turning OFF the Apple II power, and check all of the pin connectors. Make sure that they are all straight, aligned correctly with an empty hole and then reinsert the board.

A more likely occurance is that you will get the proper display but you will not have connected the Shift and Control wires of the jumper cable correctly and so the Control-Reset will not work. Try using the Shift-Reset. If your Apple II beeps and RESETs, then you have the wires switched. Try changing the jumper cable connection with the five prong take off jack so that the outside slot mates with the middle pin and the middle slot with the rear pin (two prongs will not be in a connector hole). If the Control-Reset entry now RESETs the Apple II, you know for sure that the connection is reversed. Remove the keyboard, the keyboard encoder chip, reverse the wire connections, and reinstall the chip and keyboard. Try the test display program again.

Another possible problem is that you might not have set the KEYBOARD AND DISPLAY ENHANCER to the correct default dip-switch settings. Check your settings against those shown in Figure 10, page 3-4, and described in the related text.

You might want to type in various keys to make sure that all characters are appearing correctly. If not, then it is likely that you have a problem with the keyboard encoder chip or some other chip on the keyboard itself.

Once you have checked out the board, then you should reassemble your Apple II, continuing with the instructions on page 2-13. Make sure that the power is off and the power cable is disconnected before resuming the reassembly procedure.

If you cannot get the board to function, contact your Apple dealer. He can check your connections and verify that all of your ICs are still operating correctly. Also, have your dealer check that you are inserting the proper model of the KEYBOARD AND DISPLAY ENHANCER.

In the rare event that your Apple dealer cannot diagnose and correct the fault, return the board postpaid directly to VIDEX, Inc. in Corvallis, Oregon, for prompt servicing.

OPERATION

Using the KEYBOARD AND DISPLAY ENHANCER

The KEYBOARD AND DISPLAY ENHANCER has two distinct operating modes. The first is called alpha lock mode. It is the mode that the Apple II originally operated in. All of the text entered will be in upper case, but when a number is typed, you will see the number. To get the other symbols, you must use the Shift key. Essentially, only the alphabetic characters are locked into upper case.

The second operating mode is called the alpha unlock mode. In this mode, the Apple II keyboard behaves the same as a normal typewriter. You get lower case text entry unless you use the Shift key. And, as with a typewriter, you can perform a Shift lock and get all shifted, upper case text. If you type a '1' then you'll get a '!' instead.

Operation of the KEYBOARD AND DISPLAY ENHANCER depends on the setting of various dip-switches located on the board. These settings and their effects are detailed in following sections of this chapter. We will assume, for this discussion, that dip-switches 1 and 2 have been set for alpha lock performance (page 3-5) and that the RESET control, dip-switch 3, is in its alternate setting, that is, in the left position (pages 3-5 and 3-6). With these settings you can select for alpha lock mode by hitting just the Reset key. You select for alpha unlock mode by typing Reset while holding either Shift key down. To RESET, type the Reset key while holding the Control key down. Naturally, you will want the keyboard map selector, switch A-4, in the left position for the standard map.

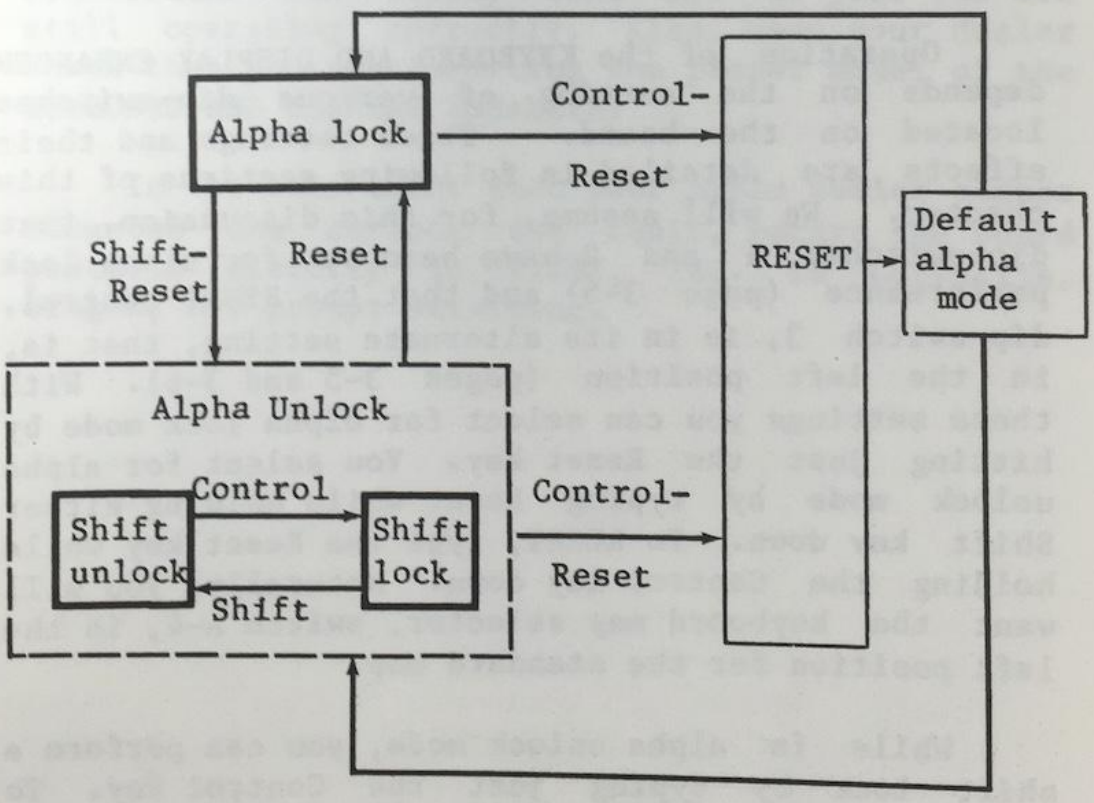
While in alpha unlock mode, you can perform a shift lock by typing just the Control key. To unlock, strike either Shift key. You need press

each key only once. This is exactly like a normal typewriter in operation.

None of these entries are transmitted to the Apple II keyboard input buffer, so that they are not sensed directly by the computer. However, the result of the entry, that is upper or lower case selection, does determine which ASCII code will be stored in the Apple II input buffer.

The operating modes and the key entry needed to select them are summarized in Table 1. Try them after making the necessary software patches so that you can see the results of your selections.

Table 1: Operating Modes Summary



Special Character Entry

The Apple II has nine ASCII characters, in addition to lower case alphabetic characters, that you cannot normally enter from the keyboard. Only three of these can be displayed on your screen. Table 2 lists these characters. With the KEYBOARD AND DISPLAY ENHANCER you can enter and display all 9 characters. First, enter alpha lock mode. Then type one of the letters listed in Table 2 while holding down the Shift key. That's all there is to it.

Table 2: Special ASCII Character Entry

Must be in alpha lock mode!

Shift and	Character	ASCII Code
E	`	60$,96
I	}	7D$,125
K	[	5B$,91
L	\	5C$,92
O	_	5F$,95
R	(rub-out)	7F$,127
T	~	7E$,126
U	{	7B$,123
Y	|	7C$,124

KEYBOARD AND DISPLAY ENHANCER Dip-switch Initialization

Your KEYBOARD AND DISPLAY ENHANCER has either one (standard) or two (Revision 7 version) dip-switches on it. The standard dip-switch is located on both boards near the five prong keyboard jumper cable take-off jack. It actually has four switches on it. The Revision 7 version has a second dip-switch located directly above the EPROM. Only 3 of the 4 switches on this dip-switch are functional. Both groups of switches are easily accessible when you remove the cover from your Apple II, so that it is a relatively simple task to change the settings.

Figure 10 shows the two dip-switches and identifies the switches by a letter and number. For example, switch A3 is the RESET control switch and B1 is the flashing lower case switch.

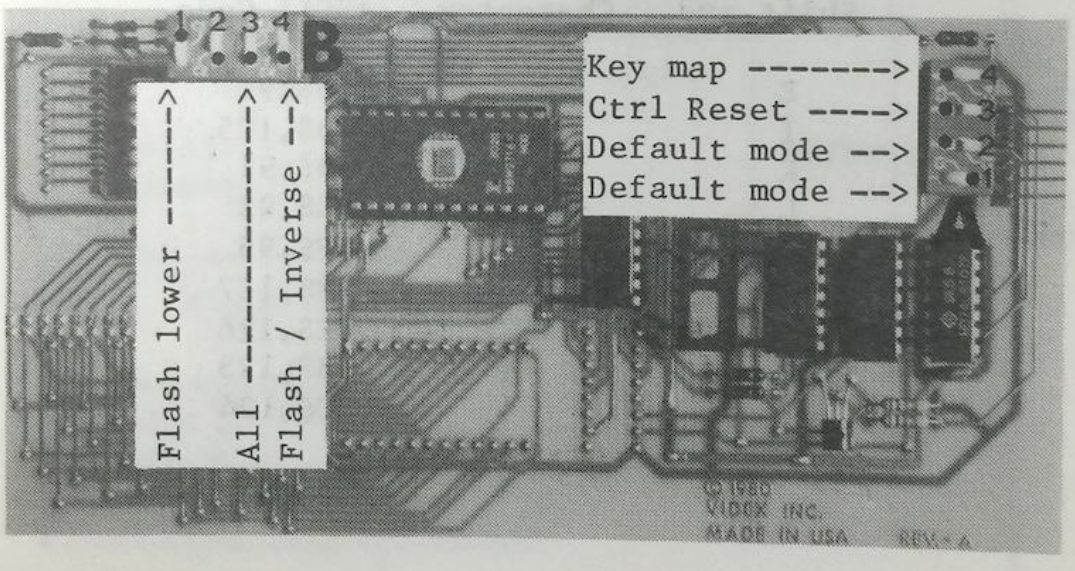


Figure 10: KEYBOARD AND DISPLAY ENHANCER Dip-switches

Upper and Lower Case

Standard switches A1 and A2 control the default operation mode of the KEYBOARD AND DISPLAY ENHANCER when you turn it on. Consider pushing the switch down on the side toward the middle of the board as the left position and pushing it down on the side toward the edge of the board as the right position.

Normal Apple II alpha lock mode is selected by putting switch A1 in the right position and A2 in the left postion. You should use this setting when installing and checking out the KEYBOARD AND DISPLAY ENHANCER.

To select typewriter style alpha unlock operation as the mode your Apple II will be in when you turn it on, set switch A1 left and A2 right. This is exactly the reverse of the alpha lock setting.

Note that this setting has nothing to do with how you select the different operating modes. It only determines which mode you will enter when you turn on your Apple II or when you perform a RESET operation. If you use your Apple II for word processing applications, we recommend the alpha unlock default. If you use your Apple II for programming, you will probably prefer the alpha lock default.

RESET Control

One of the very annoying features of the Apple II is the location of the Reset key so close to the Return key. Every owner has, at one time or another, pushed the wrong key, and, in accordance with Murphy's law, usually when it was the worst possible time to do so. The setting of switch A3 lets you change all of that.

If you set A3 in the right position, you will have the standard Apple II RESET operation. Simply striking the Reset key will initiate the process. Your KEYBOARD AND DISPLAY ENHANCER will only work in the default alpha mode, as chosen by A1 and A2, with this setting for A3. Use it only if you want to use your Apple II in a single alpha mode.

When you set A3 in the left position, you will have chosen the alternate form of operation, which is the one described earlier, page 3-1. This is the setting you should select when you are installing and checking out the board. Refer to Table 1, page 3-2, for a summary of operating mode selection with this setting.

Remapping the Keyboard

Switch A4 selects which keyboard map is currently active. Set in the left position, it selects for the standard American keyboard character correspondence. Set to the right, it selects for the alternate character set mapping. The standard alternate character set map simply reverses the choice of upper and lower case text with the Shift key, so that, for example, a Shift-N in the alpha unlock mode will generate a 'n'.

The EPROM supplied with the KEYBOARD AND DISPLAY ENHANCER contains 2K bytes of memory storage. Half of this is used to define the display character set. Of the remaining 1K, half of it is used for each keyboard map. To be really useful, you need to change the character set to the proper one for the keyboard mapping chosen. To do this, you must reprogram the EPROM as described in the EPROM Modification chapter, which starts on page 5-1.

Revision 7 Version Settings

As mentioned, the Revision 7 version of the KEYBOARD AND DISPLAY ENHANCER has a second set of dip-switches above the EPROM as shown in Figure 10. Again, we will regard these switches as being in the down position if they are set toward the center of the board, and in the up position if they are set toward the edge side of the board.

Switch B1 is the flashing lower case selector. In the down position, you will have the standard KEYBOARD AND DISPLAY ENHANCER character set. In the up position you will exchange the flashing numbers and special characters for flashing lower case characters.

The other switches should all be set in the down position. Switch B2 is non-functional. Switches B3 and B4 are used together. Turning B3 up while leaving B4 down will transform all inverse characters to flashing. Turning both B3 and B4 up changes all flashing characters to inverse ones. This is discussed in detail in the section on Creating New Character Sets, pages 5-1 to 5-3, and is illustrated in Table 3, page 5-4.

SOFTWARE

Apple Language Interactions

While the KEYBOARD AND DISPLAY ENHANCER will work immediately upon installation, you must make some changes to your system to get it to enter or display lower case and other special characters correctly. These changes are called software patches. We will discuss the changes by considering different languages on differently configured Apple II systems. You will not need these patches if your software is currently compatible with the Dan Paymar Lower Case Adapter.

The software patches that will be discussed provide the capability to enter lower case text from the Apple II keyboard and display lower case text on the Apple II video display. The Basic languages change lower case characters to upper case as they are entered from the keyboard. The Pascal language, on the other hand, changes lower case to upper case as it passes the character to the display. Thus, a different type of software patch is needed with each of these languages. After making these changes, you will be storing in memory the true ASCII code for all characters entered. Keep this in mind when you are writing software.

Basics

We will first consider the two Basic languages on a standard Apple II or Apple II Plus without the Language card. You can directly access correct keyboard ASCII values using the GET statement. This is not very convenient in many cases. To correctly enter all characters you will need to BRUN an assembly language program as your first program when you turn your system on. If you are using cassette storage, simply load and run the program first.

Program 2: Keyboard Filter Program

(Unnecessary if Monitor is patched, Program 5.)

```
*300:A9 13 85 38 A9 03 85 39 (CR)
*:A9 95 85 36 A9 03 85 37 (CR)
*:4C EA 03 8E AE 03 48 C9 (CR)
*:E0 90 04 29 1F 91 28 AD (CR)
*:B1 03 E0 00 F0 19 CA AD (CR)
*:B0 03 C9 88 F0 11 C9 E0 (CR)
*:90 02 29 DF DD 00 02 D0 (CR)
*:1E AD B0 03 9D 00 02 38 (CR)
*:6E B1 03 68 AE AE 03 20 (CR)
*:1B FD 2C B2 03 30 22 C9 (CR)
*:9B F0 13 8D B0 03 60 68 (CR)
*:AE AE 03 20 1B FD 48 A9 (CR)
*:00 8D B0 03 68 60 48 A9 (CR)
*:88 8D B2 03 8D B0 03 68 (CR)
*:60 8C AF 03 C9 E0 90 02 (CR)
*:29 DF A0 03 D9 90 03 F0 (CR)
*:06 88 10 F8 4E B2 03 A0 (CR)
*:88 8C B0 03 AC AF 03 60 (CR)
*:C9 CA CB CD 9B 8C AF 03 (CR)
*:AC B1 03 10 08 AC B0 03 (CR)
*:C0 E0 90 01 98 AC AF 03 (CR)
*:4E B1 03 4C F0 FD 00 00 (CR)
*:00 00 00 (CR)
```

To save on disk: BSAVE KEYFILT,A$300,L$B3 (CR)

To run from either Basic: CALL 768 (CR)

Program 3: Keyboard Filter Assembly Listing

```
0300-   A9 13       LDA   #$13
0302-   85 38       STA   $38
0304-   A9 03       LDA   #$03
0306-   85 39       STA   $39
0308-   A9 95       LDA   #$95
030A-   85 36       STA   $36
030C-   A9 03       LDA   #$03
030E-   85 37       STA   $37
0310-   4C EA 03    JMP   $03EA
0313-   8E AE 03    STX   $03AE
0316-   48          PHA
0317-   C9 E0       CMP   #$E0
0319-   90 04       BCC   $031F
031B-   29 1F       AND   #$1F
031D-   91 28       STA   ($28),Y
031F-   AD B1 03    LDA   $03B1
0322-   E0 00       CPX   #$00
0324-   F0 19       BEQ   $033F
0326-   CA          DEX
0327-   AD B0 03    LDA   $03B0
032A-   C9 88       CMP   #$88
032C-   F0 11       BEQ   $033F
032E-   C9 E0       CMP   #$E0
0330-   90 02       BCC   $0334
0332-   29 DF       AND   #$DF
0334-   DD 00 02    CMP   $0200,X
0337-   D0 1E       BNE   $0357
0339-   AD B0 03    LDA   $03B0
033C-   9D 00 02    STA   $0200,X
033F-   38          SEC
0340-   6E B1 03    ROR   $03B1
0343-   68          PLA
0344-   AE AE 03    LDX   $03AE
0347-   20 1B FD    JSR   $FD1B
034A-   2C B2 03    BIT   $03B2
034D-   30 22       BMI   $0371
034F-   C9 9B       CMP   #$9B
0351-   F0 13       BEQ   $0366
0353-   8D B0 03    STA   $03B0
0356-   60          RTS
```

Program 3: Keyboard Filter Assembly Listing (cont.)

```
0357-   68          PLA
0358-   AE AE 03    LDX   $03AE
035B-   20 1B FD    JSR   $FD1B
035E-   48          PHA
035F-   A9 00       LDA   #$00
0361-   8D B0 03    STA   $03B0
0364-   68          PLA
0365-   60          RTS
0366-   48          PHA
0367-   A9 88       LDA   #$88
0369-   8D B2 03    STA   $03B2
036C-   8D B0 03    STA   $03B0
036F-   68          PLA
0370-   60          RTS
0371-   8C AF 03    STY   $03AF
0374-   C9 E0       CMP   #$E0
0376-   90 02       BCC   $037A
0378-   29 DF       AND   #$DF
037A-   A0 03       LDY   #$03
037C-   D9 90 03    CMP   $0390,Y
037F-   F0 06       BEQ   $0387
0381-   88          DEY
0382-   10 F8       BPL   $037C
0384-   4E B2 03    LSR   $03B2
0387-   A0 88       LDY   #$88
0389-   8C B0 03    STY   $03B0
038C-   AC AF 03    LDY   $03AF
038F-   60          RTS
0390-   C9 CA       CMP   #$CA
0392-   CB          ???
0393-   CD 9B 8C    CMP   $8C9B
0396-   AF          ???
0397-   03          ???
0398-   AC B1 03    LDY   $03B1
039B-   10 08       BPL   $03A5
039D-   AC B0 03    LDY   $03B0
03A0-   C0 E0       CPY   #$E0
03A2-   90 01       BCC   $03A5
03A4-   98          TYA
03A5-   AC AF 03    LDY   $03AF
```

Program 3: Keyboard Filter Assembly Listing (cont.)

```
03A8-   4E B1 03    LSR   $03B1
03AB-   4C F0 FD    JMP   $FDF0
03AE-   00          BRK
03AF-   00          BRK
03B0-   00          BRK
03B1-   00          BRK
03B2-   00          BRK
03B3-   26 27       ROL   $27
03B5-   28          PLP
03B6-   46 53       LSR   $53
03B8-   59 54 4B    EOR   $4B54,Y
03BB-   29 2A       AND   #$2A
03BD-   2B          ???
03BE-   41 2C       EOR   ($2C,X)
03C0-   2D 2E 2F    AND   $2F2E
03C3-   30 31       BMI   $03F6
03C5-   32          ???
03C6-   54          ???
03C7-   2C 33 34    BIT   $3433
03CA-   35 36       AND   $36,X
```

If you have a Disk II with DOS 3.2.1 or earlier, then you should modify your HELLO program to automatically BRUN a program as part of its initialization process. Enter the Apple Monitor mode by typing

CALL -151 (CR)

from whichever Basic that you are in. The (CR) indicates that you should press the Return key. An asterisk will appear which indicates Monitor mode. Enter Program 2 by typing in the listed hexadecimal values. Notice that you do not have to type an address after $300, but you must repeat the colon.

In order to check your entry while still in Monitor mode, enter

*L (CR)

You will see the first part of the listing in Program 3 displayed. To see more, simply continue to enter

*L (CR)

for successive 20-line groups of the program. Check it carefully and modify any entries which are not correct. You can also check the entry by entering

*300.3B3 (CR)

and comparing it to the listing of Program 2.

To run the program in either Basic, you can have your Hello program

BLOAD KEYFILT (CR)
CALL 768 (CR)

or simply

BRUN KEYFILT (CR)

You will need to rerun this program only if you turn your Apple II off and on again. However, this does require commitment of the $300 to $3B3 memory area to this program. If for some reason you need to use this space for another program, you have two choices. The first is to relocate the program to another place in memory by changing those addresses which are absolute. Assume for discussion purposes that we wish to relocate the program starting at $9500. You should then make the following changes to the program after first verifying that it works at $300.

First, place $95 in place of $30 at locations

$305	$342	$36B	$38D
$30D	$346	$36E	$397
$315	$34C	$373	$39A
$321	$355	$37E	$39F
$329	$35A	$384	$3A7
$33B	$363	$38B	$3AA

For example

*305:95 (CR)

Then move the code to its new location

*9500<300.3B2M (CR)

Finally, save the routine from its new location

BSAVE KEYFILT,A$9500,L$B3 (CR)

Your second choice is to use the other program at $300 for a while and then reload the KEYFILT program when you want to use it again. Before using another program in this area after having run the KEYFILT program, however, you must enter

PR#0 (CR)
IN#0 (CR)

If you do not have a Disk II system, you must make a change to the KEYFILT program. After verifying that you have Program 2 correctly entered, enter

310:60 (CR)

This will avoid jumping into the Disk Operating System, which, of course, is not there.

If you have the Apple Language card, then you have several other options open with regard to the Basic languages. You can make a simple change to the Monitor routines and you will not need the program discussed above FOR THAT LANGUAGE WHICH IS NOT RESIDENT on the Main board by a one-time software patch. This program is given in Program Listing 4.

Enter this program using the Pascal Editor, compile and run it. The BASICS diskette must be in drive Volume 5 and must not be write protected when you run the program.

There is another change that you must make if you are using DOS 3.3 on the Language card. You can make a one-time patch and have the lower case entry capability, again, ONLY WITH THE NON-RESIDENT LANGUAGE. Do this immediately after running the BASPATCH program. Then, if Integer Basic is your non-resident language, enter

BSAVE INTBASIC,A$D000,L$3000 (CR)

with your DOS 3.3 diskette in your disk drive. Of course, this diskette cannot be write protected or you will get a disk I/O error! If you have Applesoft as your non-resident language, then

substitute 'FPBASIC' for 'INTBASIC' when you do the BSAVE.

Program 4: BASICS Diskette Patches

```
PROGRAM BASPATCH;

(* This program patches the INTBAS.DATA and FPBAS.DATA *)
(* files  on the BASICS disk to allow lower case entry *)
(* in INTEGER and APPLESOFT BASICS.                    *)


VAR BUF:PACKED ARRAY [0..23,0..511] OF 0..255;
F:FILE;
I:INTEGER;
BASIC:STRING;

PROCEDURE MODIFY;
BEGIN
  RESET(F,BASIC);
  I:=BLOCKREAD (F,BUF,23);
  CLOSE(F);

  BUF[21,435]:=201; BUF[21,436]:=224; BUF[21,437]:=176;
  BUF[21,438]:=5;   BUF[21,439]:=41;  BUF[21,440]:=63;
  BUF[21,441]:=9;   BUF[21,442]:=64;  BUF[21,443]:=96;
  BUF[21,444]:=41;  BUF[21,445]:=31;  BUF[21,446]:=96;

  BUF[22,273]:=32;  BUF[22,274]:=179; BUF[22,275]:=251;
  BUF[22,276]:=234;

  BUF[22,387]:=255;

  RESET(F,BASIC);
  I:=BLOCKWRITE(F,BUF,23);
  CLOSE(F);
END;

BEGIN
  BASIC:='#5:INTBAS.DATA';
  MODIFY;
  BASIC:='#5:FPBAS.DATA';
  MODIFY;
END.
```

This procedure is fairly simple. But what about the resident Basic language, the one contained in the ROMs on your Main board? For this, you will have to use Program 2. That is, unless you are prepared to take several rather drastic steps WHICH VIDEX HIGHLY RECOMMENDS. Primarily, this means programming a 2716 EPROM with a changed Auto-start ROM program. Boot the system from a diskette that contains the modified BASICS diskette. Enter your non-resident Basic language and

BSAVE MONITOR,A$F800,L$800 (CR)

You are now ready to use an EPROM programmer to program a 2716 EPROM. We recommend using the ROMWriter by Mountain Computer, Inc. Follow the instructions that come with your EPROM programmer. Next, take your Apple Language card and examine it carefully. On it, you will see two locations marked 2716. One of these is a bow-tie shaped pair of solder connectors which are joined and WHICH MUST BE CUT and the other is a connector shaped like two half-moons, which are not joined and WHICH MUST BE CONNECTED. Your language card will now accept a standard 2716 EPROM as its Monitor ROM. Remove the Auto-start ROM from your Language card replace it with your newly programmed 2716.

This change is important, because without it you cannot take advantage of the Monitor patch with your resident Basic language and you must devote 179 bytes of memory to the lower-case conversion program, Program 2. However, you must use caution when making this change, as IT MAY VOID your Apple Language card warranty. You might want to request help from your Apple Dealer if you do decide to make the change in case you are not comfortable with soldering.

Pascal

In order to display lower case and special characters when using the Pascal Language, you must make a one-time change to your APPLE 1 diskette, modifying the file SYSTEM.APPLE. Enter the KEYPATCH program listed as Program 5 using the Pascal Editor, compile and run it. You will need to have APPLE 1 in drive Volume 4 and it must not be write protected. After running it, you must reboot your system by typing 'H' while in command mode.

Program 5: Pascal KEYPATCH Program

```
(* This program patches the SYSTEM.APPLE for *)
(* displaying lower case VIDEX KEYBOARD & DISPLAY *)
(* ENHANCER.          Darrell Aldrich  10/80     *)

VAR BUF:PACKED ARRAY [0..31,0..511] OF 0..255;
F:FILE;
I:INTEGER;

BEGIN
  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKREAD (F,BUF,32);
  CLOSE(F);

  BUF[5,190]:=177; BUF[5,191]:=240; BUF[5,192]:=73;
  BUF[5,193]:=128; BUF[5,194]:=72;  BUF[5,195]:=41;
  BUF[5,196]:=127; BUF[5,197]:=201; BUF[5,198]:=64;
  BUF[5,199]:=104; BUF[5,200]:=144; BUF[5,201]:=2;
  BUF[5,202]:=73;  BUF[5,203]:=32;  BUF[5,204]:=96;

  BUF[4,465]:=32;  BUF[4,466]:=190; BUF[4,467]:=218;
  BUF[4,468]:=234;

  BUF[4,232]:=208; BUF[4,233]:=2;

  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKWRITE(F,BUF,32);
  CLOSE(F);
END.
```

General Use of the KEYBOARD AND DISPLAY ENHANCER with Word Processors

Probably the most useful application of the KEYBOARD AND DISPLAY ENHANCER is with word processors. If your word processor is compatible with the Dan Paymar Lower Case Adapter, you should be able to make immediate use of the lower case entry and display features. We will discuss such word processors using Super-Text by Muse, Inc. as an example. The Apple Writer by Apple Computer, Inc. is <u>not</u> immediately compatible, but because of its wide distribution we have included specific software patches for it.

The general rule for lower case entry in any word processor is to replace the combination of Control or Escape key entry sequences that were formerly used to indicate that the following text was to be printed in lower case with the standard KEYBOARD AND DISPLAY ENHANCER use of the Shift and Control keys. For example, let us consider Super-Text, Version 2.0. First, you must make the changes to ^HELLO or APPLESOFT as directed in the Version 2.0 Changes regarding the Dan Paymar Lower Case Adapter.

With any word processor, you will have to enter the shift lock mode before the shift key will operate correctly. Enter your word processor's editor. With Super-Text this means booting the master diskette and pressing Return. After you enter the Editor, enter text entry mode. In Super-Text, you enter a Control-A. Press the Reset key to place the KEYBOARD AND DISPLAY ENHANCER in alpha lock mode. Try typing in various characters. Now enter a Shift-Reset to go into alpha unlock mode. Again, type a few characters. You will notice that all entries are in lower case. Try using the Shift key. You will probably still see all lower case characters.

In order to go into correct word processing mode, you must enter the word processors shift lock mode. In Super-Text you must enter a Control-C, which, as you will note on page 5 of the Super-Text documentation, puts Super-Text into all upper case entry. Now type any key while holding the Shift key down. It will be in upper case. Try typing just the Control key and follow by typing other keys. You will be in Shift lock. This will be most obvious when you type the number keys.

If you are entering upper case letters and you do not remember if you are in alpha lock mode or Shift lock in alpha unlock mode, type any number. If you see the number, you are in alpha lock mode.

There will probably be some minor problems with your word processor which you will have to circumvent. For example, when you enter a Control-P to start a new paragraph in Super-Text, you will notice that you cannot enter an upper case character using the Shift key. After each Control-P entry, you will have to immediately enter a Control-C to reinstate the correct word processing set-up.

If you do notice some such minor problem with your word processor, there will undoubtedly be a fix for it. Just try a combination of entries until you find one that works. You might have to enter the old Shift lock or equivalent entry mode after first going into alpha unlock mode.

Apple Writer

The Apple Writer will work with the KEYBOARD AND DISPLAY ENHANCER after you make the changes that are summarized in Program 6. First, change the TEDITOR program by entering

BLOAD TEDITOR (CR)

CALL -151 (CR)

from whichever Basic language you are in to load the program, and then enter the changes indicated for TEDITOR. Then save the changes by entering

BSAVE TEDITOR,A$803,L$1060 (CR)
BLOAD PRINTER (CR)

and enter the changes indicated for PRINTER. Note that one set of changes is marked for both programs. Now save these changes by typing

BSAVE PRINTER,A$803,L$1060 (CR)

You will note that the single shift using the Escape key no longer works and you should enter single shifts using the Shift key. The double Escape key shift lock entry still works but you can use the single Control key entry for the same purpose.

These changes are necessary due to the way that the Apple Writer internally stores its characters. For example, an exclamation mark is stored as a lower case 'a'.

Program 6: Apple Writer Patches

Patches for TEDITOR

```
*9E6:20 57 18 EA (CR)
*AE6:20 50 18 (CR)
*1505:4C 35 18 (CR)
*1532:EA EA DO DF 20 01 15 48 (CR)
*1549:20 4A 18 (CR)
```

Patches for PRINTER

```
*109D:4C 35 18 (CR)
*10DD:20 4A 18 (CR)
*10CA:EA EA (CR)
```

Patches for both TEDITOR and PRINTER

```
*1820:C9 E0 90 02 29 BF C9 C0 (CR)
*:90 02 09 20 C9 40 B0 04 (CR)
*:49 20 69 A0 60 C9 E0 90 (CR)
*:03 29 DF 60 C9 C0 90 03 (CR)
*:29 1F 60 C9 A0 90 ED 09 (CR)
*:40 60 20 20 18 4C F0 FD (CR)
*:20 20 18 91 28 C8 60 A5 (CR)
*:10 C9 E0 90 02 29 DF C9 (CR)
*:C9 60 (CR)
```

However, the selection of flashing or inverse character display, as described here, does not change the dot-matrix pattern definition of the character.

You can change your current character set by redefining the dot matrix patterns contained in the 2716 EPROM. This is done using the VIDEX Font Editor, available on diskette directly from VIDEX. This program is extremely easy to use. It will automatically create the correct dot matrix patterns for different character sets in Apple II memory locations $1000 to $13FF under your direction. These will be mapped into the EPROM addresses $00 to $3FF when you program the EPROM itself. When running the Font Editor, you can see exactly what will be diplayed when you use a character set.

If you do not have access to the Font Editor, then the following explanation should serve to identify use of the EPROM address space. Each address points to one byte. Of that byte, five of its eight bits are used to define one horizontal row of one character. The two highest, or leftmost, bits are not used, nor is the lowest, or rightmost, bit. Setting a bit to 1 will select for a white dot, while a setting of 0 leaves that dot black. For each character, 8 addresses or bytes are needed to define the entire character since we actually have a 5 by 8 matrix. In the standard character set, we have used the bottom row for true descenders on the lower case characters.

The character definition is entered in reverse order so that, for example, $00 contains the bottom row of the rub-out character and $07 contains the top dot row of the rub-out character. Location $08 will contain the definition of the bottom row of the next to last character in the character set.

You should now examine the bottom part of Table 3. The 96 ASCII display characters are all shown,

along with the non-display Control characters. These are positioned in a matrix so that you can see which character corresponds to which ASCII code. The matrix layout corresponds to the layout used later in Tables 4 and 5.

In addition to the dot matrix rows being entered in reverse order, from bottom to top, all characters are defined from last to first. If you start at the end of the ASCII Value/Character Correspondence Matrix, Table 3, each character occupies the next group of 8 bytes. Thus, $10 to $1F is occupied by the definition of the tilda character, $20 to $2F is occupied by the definition of the right curly bracket character and $70 to $7F is occupied by the definition of a lower case letter 'p'.

EPROM addresses $00 to $FF are used for the lower case letters, $100 to $1FF are used for the upper case letters, $200 to $2FF are used for the special characters and the numerals, and $300 to $3FF repeats the upper case characters. The repetition of the upper case character set is necessitated by the way that the KEYBOARD AND DISPLAY ENHANCER hardware generates flashing and inverse characters. Note that $3FF will be the upper dot matrix row of the @ sign.

If you wish to create special graphic character sets, you can. Remember that you are operating in a 5 by 8 dot matrix size and that the dot matrix row definitions must be entered in reverse order for the entire character set. If you do create an alternate keyboard map, you will probably need to mark the keys in some manner so that you can easily tell which key produces which graphics symbol.

Table 3: Character Map

Video	Hex	ASCII
INVERSE	00-1F	@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
	20-3F	!"#$%&'()*+,-./0123456789:;<=>?
FLASH	40-5F	@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
	60-7F	!"#$%&'()*+,-./0123456789:;<=>?
NORMAL	80-9F	@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
	A0-BF	!"#$%&'()*+,-./0123456789:;<=>?
	C0-DF	@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
	E0-FF	`abcdefghijklmnopqrstuvwxyz{|}~■

ASCII Value/Character Correspondence Matrix

	0	1	2	3	4	5	6	7	8	9	A	B	C	E	D	F
00	Nl	Sh	Sx	Ex	Et	Eq	Ak	Bl	Bs	Ht	Lf	Vt	Ff	Cr	So	Si
10	De	D1	D2	D3	D4	Nk	Sn	Eb	Cn	Em	Sb	Ec	Fs	Gs	Rs	Us
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	■

Remapping the Keyboard

The keyboard map occupies memory locations $400-$7FF in the 2716 EPROM. This area is divided into 8 equal sections, each one 128 characters in length. Four of these sections define a standard keyboard map, chosen by dip-switch A4 being set toward the left, and the other four define an alternate keyboard character map, chosen by A4 being set toward the right.

The definitions of the two keyboard maps are shown in Tables 4 and 5, for the standard and alternate maps, respectively. Note that the alpha lock and unlock mode, and the status of the shift operation, determine which of the four sub-maps are chosen. For example, if we are looking at the standard keyboard map in alpha unlock, non-shifted mode, we would look at Apple II memory addresses $1400-$147F. If we wanted the alternate keyboard map for alpha lock, shift lock mode, we would examine Apple II memory addresses $1780-$17FF. Naturally, on the EPROM these addresses will be $400-$47F and $780-$7FF for the two examples.

Tables 4 and 5 have been organized for ease of comparison with the lower part of Table 3. Notice in all maps that the lower case entry maps through to a lower case character, except the last map where there are only $00 entries. This is because you cannot generate these lower case ASCII codes directly from the Apple II keyboard, and their map is inconsequential.

Now let us look at a specific case to examine the keyboard map in detail. Look at the entries in $1400 to $147F. These correspond to the alpha unlock, non-shift mode for the standard keyboard map. You can see that the first 32 entries simply map Control characters directly through. As noted, the lower case entries also map directly through.

1400.147F

Table 4: Standard Keyboard Map

```
1400- 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
1410- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
1420- 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
1430- 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
1440- 40 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
1450- 70 71 72 73 74 75 76 77 78 79 7A 5B 5C 5D 5E 5F
1460- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
1470- 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F
*
*1480.14FF

1480- 00 01 02 03 04 05 06 07 08 09 0A 1B 1C 0D 0E 1F
1490- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
14A0- 20 21 22 23 24 25 26 27 28 29 2A 2B 3C 3D 3E 3F
14B0- 40 21 22 23 24 25 26 27 28 29 2A 2B 3C 3D 3E 3F
14C0- 50 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
14D0- 50 51 52 53 54 55 56 57 58 59 5A 4B 4C 4D 4E 4F
14E0- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
14F0- 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F
*
*1500.157F

1500- 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
1510- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
1520- 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
1530- 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
1540- 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
1550- 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F
1560- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
1570- 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F
*
*1580.15FF

1580- 00 01 02 03 04 05 06 07 08 09 0A 1B 1C 0D 0E 1F
1590- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
15A0- 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
15B0- 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
15C0- 40 41 42 43 44 60 46 47 48 7D 4A 5B 5C 4D 4E 5F
15D0- 50 51 7F 53 7E 7B 56 57 58 7C 5A 5B 5C 5D 5E 5F
15E0- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
15F0- 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F
```

1600.167F

Table 5: Alternate Keyboard Map

```
1600- 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
1610- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
1620- 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
1630- 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
1640- 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
1650- 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F
1660- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
1670- 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F
*
*1680.16FF

1680- 00 01 02 03 04 05 06 07 08 09 0A 1B 1C 0D 0E 1F
1690- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
16A0- 20 21 22 23 24 25 26 27 28 29 2A 2B 3C 3D 3E 3F
16B0- 40 21 22 23 24 25 26 27 28 29 2A 2B 3C 3D 3E 3F
16C0- 70 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
16D0- 70 71 72 73 74 75 76 77 78 79 7A 6B 6C 6D 6E 6F
16E0- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
16F0- 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F
*
*1700.177F

1700- 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
1710- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
1720- 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
1730- 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
1740- 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
1750- 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F
1760- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
1770- 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F
*
*1780.17FF

1780- 00 01 02 03 04 05 06 07 08 09 0A 1B 1C 0D 0E 1F
1790- 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
17A0- 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
17B0- 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
17C0- 40 41 42 43 44 60 46 47 48 7D 4A 5B 5C 4D 4E 5F
17D0- 50 51 7F 53 7E 7B 56 57 58 7C 5A 5B 5C 5D 5E 5F
17E0- 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F
17F0- 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

There is also no need to change the special characters and the numerals. The change occurs with the entries at $1441 to $145A, where the upper case ASCII values have been replace with the lower case ASCII values. Thus, the ASCII keyboard entry value $41 or 'A' is changed to $61 or 'a' and the KEYBOARD AND DISPLAY ENHANCER will choose the lower case character for display and storage in the Apple II memory.

When the Shift key is held down or we are in shift lock, while still in alpha unlock mode, we will be using the map in $1480 to $14FF. In the same relative part of the map, actual memory addresses $14C0 to $14DF, you can see that all upper case characters are chosen. Of special note, and something that is repeated frequently in the maps, is that whether you enter a 'P', $14D0, or a Shift-P, $14C0, you will still get the upper case 'P'. You do not get the @ sign. Try looking up the 'N' key entry in this mode and you will see that the ^ ($5E from Table 3) cannot be selected in this mode.

When creating keyboard maps, extreme care must be taken in the initial design of the ASCII entry value/selection value correspondence. The standard alternate keyboard map is included as an example of such a design. It incorporates a relatively simple design idea, the reversal of lower and upper case alphabetic characters in the alpha unlock mode. Thus, two of the character maps in the alternate selection are the same as in the standard keyboard map selection. This example is worthy of careful study before you embark on creating an entirely new keyboard map.

HARDWARE OPERATION

Theory of Operation

During the following discussion, you should make frequent reference to the photograph of the KEYBOARD AND DISPLAY ENHANCER board and the schematic, both located at the end of this manual and labelled Figures 11 and 12, respectively. The Technical Summary, Appendix page A-3, summarizes the various parts of the board.

The operation of the board is synchronized by the Apple II character display clock cycle. The board switches between two modes at a very high frequency, spending half of its time in a keyboard character map mode and the other half in a character display mode. Due to the high switching rate, there is never a chance of missing a typed character.

In the keyboard character map mode, the KEYBOARD AND DISPLAY ENHANCER checks the keyboard to see if any keys have been pressed. If they have, it maps the character selected by the particular keyboard entry into an ASCII value. This is done by filtering the incoming keyboard ASCII value through the EPROM-resident keyboard map to select another, possibly different, ASCII value. This last value is then passed to the Apple II input buffer as the character which was 'typed'.

In the character display mode, the KEYBOARD AND DISPLAY ENHANCER is being requested by the Apple II video display logic to generate a single row of the dot matrix of a selected display character. This request is being made at a very high rate of speed so that the board can keep up with the raster scan of a normal video display. Let us examine each mode in more detail.

Part U-1 is the heart of the KEYBOARD AND

DISPLAY ENHANCER. Half of this EPROM contains the standard and alternate keyboard maps. Characters that are typed from the keyboard are mapped, depending on the operating mode of the board, into another character. Essentially, the 1K devoted to the two character maps is divided into eight portions, four of which constitute the standard keyboard map (selected by the left position of dip-switch A4), and four of which constitute the alternate keyboard map (selected by the right position of dip-switch A4).

But how is one of the four sub-maps chosen? The alpha lock/unlock and the shift/no-shift status of the keyboard controls this selection process. These selections are passed by the keyboard jumper cable to P-5. The Shift-Reset status is remembered by U-5 and the Control status is remembered by U-6. U-5 and U-6, then, direct the typed keyboard character into a particular sub-map, where an ASCII value is finally chosen for entry into the Apple II input buffer.

First, however, the chosen character is passed to U-2. It is stored here until requested by the Apple II.

Part Q-7 is the logic circuit which controls the RESET function. It is connected to P-5. Its operation is controlled by the setting of dip-switch A3.

The other half of the EPROM, U-1, contains the KEYBOARD AND DISPLAY ENHANCER character set. In the character display mode, the Apple II video display circuitry is scanning down the screen at a very high rate. As this is a raster scan, one line of display is generated at a time. On each line a set of dots will be displayed. The character which is to be displayed at a position has its ASCII character code passed to U-3 and U-4, which together access U-1 and select the correct character dot matrix definition.

Only one row of dots, out of the matrix which defines the character, will be chosen at a time. This row of dots, which is the contents of one word or byte from the EPROM, is then sent directly to the Apple II display logic and the screen is refreshed. All of this happens at a very high speed when compared to keyboard character entry operation.

There is a part of the board's circuit logic that interfaces with the Apple II clock which determines which mode the board should be in at any one time. Thus the KEYBOARD AND DISPLAY ENHANCER does not need its own on-board crystal clock.

The KEYBOARD AND DISPLAY ENHANCER interfaces with the Apple Main board through connections P-1 through P-4. P-1 connects at Main board position B-9, P-2 at position B-1, P-3 at position A-6, and P-4 at position A-5.

Only one row of dots, out of the matrix which defines the character, will be chosen at a time. This row of dots, which is the contents of one word or byte from the EPROM, is then sent directly to the Apple II display logic and the screen is refreshed. All of this happens at a very high speed when compared to keyboard character entry operation.

There is a part of the board's circuit logic that interfaces with the Apple II clock which determines which mode the board should be in at any one time. Thus the KEYBOARD AND DISPLAY ENHANCER does not need its own on-board crystal clock.

The KEYBOARD AND DISPLAY ENHANCER interfaces with the Apple Main board through connections P-1 through P-4. P-1 connects at Main board position B-9, P-2 at position B-1, P-3 at position A-6, and P-4 at position A-5.

Optional Hardware Modifications

The primary difference between KDE-700, the KEYBOARD AND DISPLAY ENHANCER designed for the Revision 7 and later Apple II Main boards, and KDE-000, the board designed for earlier revision Apple IIs is the solder connections in the lower left corner of the board.

On the KDE-000 model, all the solder connections are on the bottom of the board. On the KDE-700 model, all solder connections are made on the top of the board. To change the type of KEYBOARD AND DISPLAY ENHANCER version that you have, simply resolder the board on one side, making all connections and remove the connections from the reverse side of the board.

Note that the KDE-700 has a second dip-switch installed on it, but both versions have a socket provided for this dip-switch. If you update a KDE-000 to a KDE-700 then you should order one directly from VIDEX or otherwise obtain the additional socketed dip-switch.

APPENDIX

ASCII CHARACTER CODE CHART

	0	1	2	3	4	5	6	7	8	9	A	B	C	E	D	F
00	Nl	Sh	Sx	Ex	Et	Eq	Ak	Bl	Bs	Ht	Lf	Vt	Ff	Cr	So	Si
10	De	D1	D2	D3	D4	Nk	Sn	Eb	Cn	Em	Sb	Ec	Fs	Gs	Rs	Us
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	■

USER NOTES

TECHNICAL SUMMARY

Board Description

Consult Figure 13, page A-4, for the location of each IC on the KEYBOARD AND DISPLAY ENHANCER board. Function of each chip is described in the Theory of Operation section, page 6-1.

Unit No.		Description
U-1	2716	EPROM containing character set, keyboard map
U-2	74LS374	Keyboard output buffer
U-3	74LS368	Part of Input buffer for character generator
U-4	74LS368	Part of Input buffer for character generator
U-5	4013	Alpha lock and unlock latch CMOS flip-flops
U-6	75LS107	Shift lock logic
U-7	74LS00	General logic use
J-1	Socket	Keyboard ribbon cable dip-plug socket
P-1	Pins	Connect pins to Main board B-9
P-2	Pins	Connect pins to Main board B-1
P-3	Pins	Connect pins to Main board A-6
P-4	Pins	Connect pins to Main board A-5
P-5	Jack	Five prong take-off jack to keyboard connector wire
Q-1	Transistor	RESET control logic

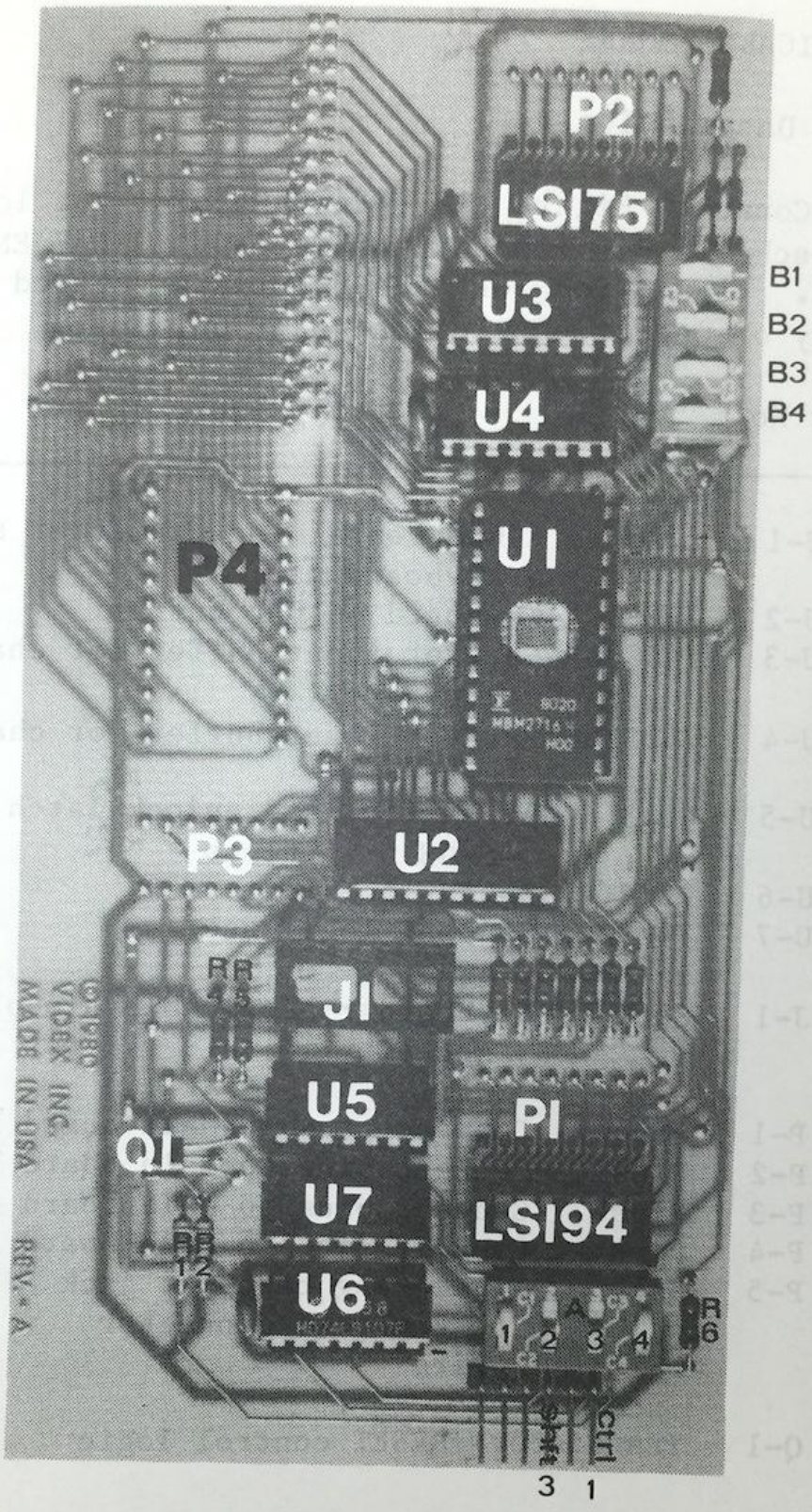
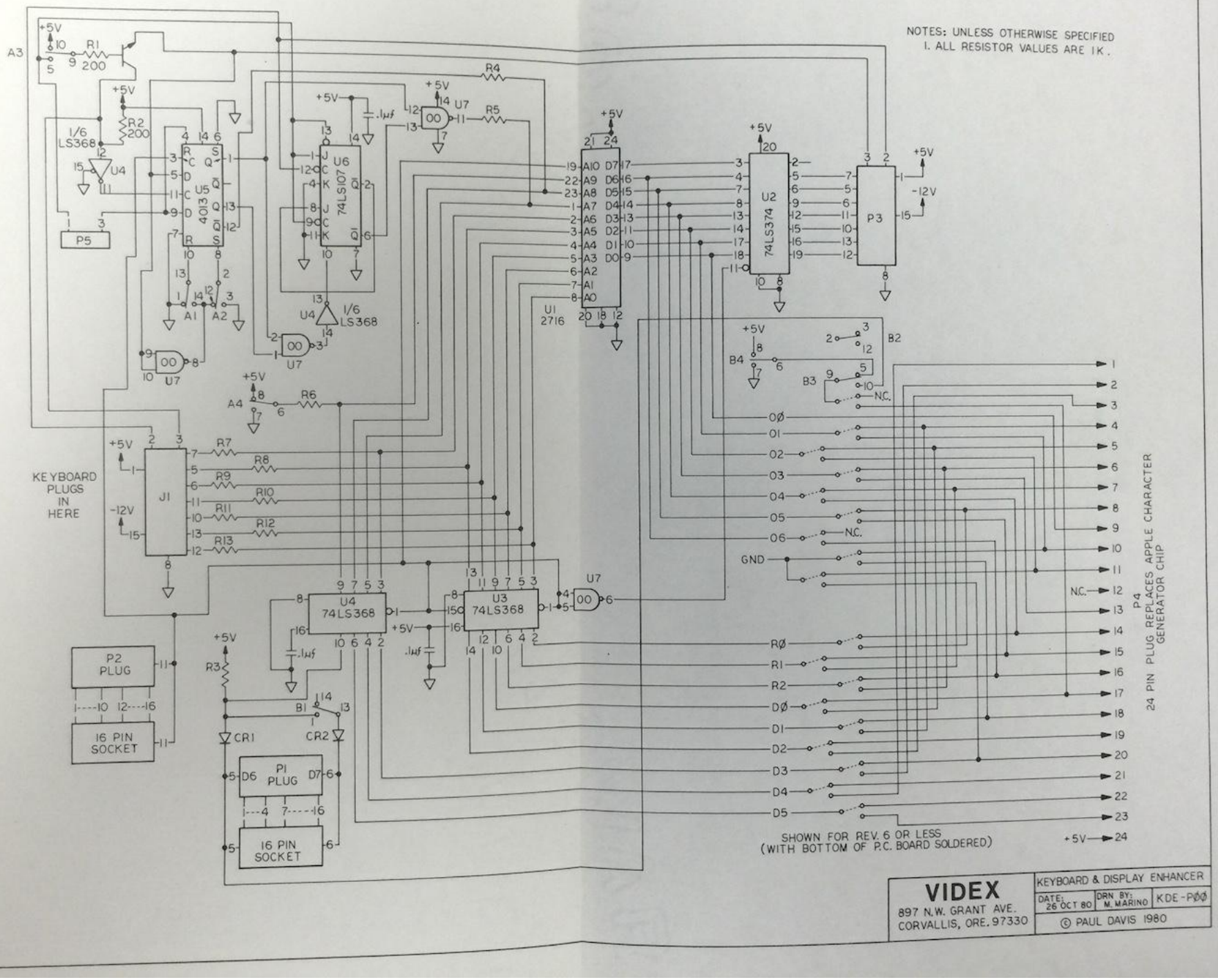


Fig 11: KEYBOARD AND DISPLAY ENHANCER
board photograph


NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES ARE 1K.
A3
+5V
R1
200
R2
200
1/6 LS368
U4
P5
4013 U5
74LS107 U6
R4
R5
U7
.1µf
U1 2716
74LS374 U2
P3
+5V
-12V
A1
A2
A4
R6
B1
B2
B3
B4
N.C.
KEYBOARD PLUGS IN HERE
J1
R7
R8
R9
R10
R11
R12
R13
U4 74LS368
U3 74LS368
R3
CR1
CR2
P2 PLUG
16 PIN SOCKET
P1 PLUG
16 PIN SOCKET
GND
P4
24 PIN PLUG REPLACES APPLE CHARACTER GENERATOR CHIP
SHOWN FOR REV. 6 OR LESS
(WITH BOTTOM OF P.C. BOARD SOLDERED)
VIDEX
897 N.W. GRANT AVE.
CORVALLIS, ORE. 97330
KEYBOARD & DISPLAY ENHANCER
DATE: 26 OCT 80
DRN BY: M. MARINO
KDE-PØØ
© PAUL DAVIS 1980

VIDEX, Inc.
897 N.W. Grant Avenue
Corvallis, OR 97330
Phone: (503) 758-0521

Dear VIDEOTERM owner,

In response to inquiries on making the Pascal KEYPRESS function work with the VIDEOTERM we are providing you these listings.

The listings are patch programs for KEYPRESS, the appropriate one should be run for your version of Pascal with the disk that has SYSTEM.APPLE on it in the drive that is volume #4. In addition to enabling the KEYPRESS function, the type-ahead buffer and system break have also been enabled.

```
PROGRAM VIDPATCH;

(* This program patches the SYSTEM.APPLE console check     *)
(* routine for version 1.0 to allow KEYPRESS, SYSTEM BREAK *)
(* and type ahead buffers to operate with the VIDEOTERM.   *)
(*                Darrell Aldrich   10/80                  *)

VAR BUF:PACKED ARRAY [0..31,0..511] OF 0..255;
F:FILE;
I:INTEGER;

BEGIN
  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKREAD (F,BUF,32);
  CLOSE(F);

  BUF[3,147]:=4;

  BUF[3,366]:=234;      BUF[3,367]:=234;      BUF[3,368]:=234;

  BUF[3,202]:=160;      BUF[3,203]:=48;       BUF[3,204]:=173;
  BUF[3,205]:=0;        BUF[3,206]:=192;      BUF[3,207]:=16;
  BUF[3,208]:=18;       BUF[3,209]:=32;       BUF[3,210]:=111;
  BUF[3,211]:=216;      BUF[3,212]:=234;

  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKWRITE(F,BUF,32);
  CLOSE(F);
END.
```

```
PROGRAM VIDPATCH;

(* This program patches the SYSTEM.APPLE console check     *)
(* routine for version 1.1 to allow KEYPRESS, SYSTEM BREAK *)
(* and type ahead buffers to operate with the VIDEOTERM.   *)
(*                 Darrell Aldrich   1/81                  *)


VAR BUF:PACKED ARRAY [0..31,0..511] OF 0..255;
F:FILE;
I:INTEGER;

BEGIN
  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKREAD (F,BUF,32);
  CLOSE(F);

  BUF[3,389]:=160;      BUF[3,390]:=48;

  BUF[3,394]:=60;

  BUF[3,455]:=173;      BUF[3,456]:=0;        BUF[3,457]:=192;
  BUF[3,458]:=16;       BUF[3,459]:=29;       BUF[3,460]:=32;
  BUF[3,461]:=24;       BUF[3,462]:=218;      BUF[3,463]:=234;

  BUF[4,207]:=3;

  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKWRITE(F,BUF,32);
  CLOSE(F);
END.
```

E N H A N C E R A D D E N D U M
C I R C A 17-Aug-1981

IMPORTANT NOTE: This model of enhancer has only one set of dip switches. DIP SWITCH B has NOT been installed. The chip at location U3 (see page A-4 of the reference manual) and/or its socket has not been installed either. This redesign has been necessitated by changes in the Apple][motherboard. The functions of dip switch B and the chip at U3 have been replaced by the accompaning Lower Case Chip. The keyboard operation of the Enhancer has NOT been changed.

Installation:

1. Perform steps 1 through 7 of the installation & checkout section of the manual.

2. Install the part marked "LOWER CASE CHIP" into the Apple][at motherboard location A-5 with the notch to the left.

3. Perform the rest of the steps of the Installation & Checkout section.

NOTE: Make sure the control-reset switch on your keyboard encoder board (the piggyback board) is set to the reset only position. This will not disable the control-reset function when the enhancer is installed.

```
{ This program patches the SYSTEM.APPLE for displaying lower case with the}
{ KEYBOARD & DISPLAY ENHANCER for Pascal 1.1.     Darrell Aldrich Aug-1981}

 VAR BUF:PACKED ARRAY [0..31,0..511] OF 0..255;
 F:FILE;
 I:INTEGER;
 BEGIN
   RESET(F,'#4:SYSTEM.APPLE');
   I:=BLOCKREAD (F,BUF,32);
   CLOSE(F);
   BUF[5,388]:=76;   BUF[5,389]:=156;  BUF[5,390]:=219;  BUF[5,391]:=177;
   BUF[5,392]:=240;  BUF[5,393]:=76;   BUF[5,394]:=142;  BUF[5,395]:=219;
   BUF[5,396]:=177;  BUF[5,397]:=242;  BUF[5,398]:=72;   BUF[5,399]:=41;
   BUF[5,400]:=127;  BUF[5,401]:=201;  BUF[5,402]:=64;   BUF[5,403]:=104;
   BUF[5,404]:=144;  BUF[5,405]:=3;    BUF[5,406]:=73;   BUF[5,407]:=160;
   BUF[5,408]:=96;   BUF[5,409]:=73;   BUF[5,410]:=128;  BUF[5,411]:=96;
   BUF[5,428]:=32;   BUF[5,429]:=135;  BUF[5,430]:=219;  BUF[5,531]:=234;
   BUF[5,448]:=32;   BUF[5,449]:=140;  BUF[5,450]:=219;  BUF[5,451]:=234;
   BUF[5,169]:=176;  BUF[5,170]:=4;    BUF[5,171]:=234;  BUF[5,172]:=234;
   RESET(F,'#4:SYSTEM.APPLE');
   I:=BLOCKWRITE(F,BUF,32);
   CLOSE(F);
END.
```

Additional patches to Apple Writer

These are additional patches to those printed on page 4-17 of the KEYBOARD & DISPLAY ENHANCER manual. These additional patches correct the wild card option in the search mode. To enter the wild card character, type the escape key and then the space bar.

From the Apple monitor type in the following while the modified Apple Writer disk is in the disk drive.

*BLOAD TEDITOR

*1862:48 A5 0B D0 04 68 29 3F 60 68 4C 35 18 (CR)

*1506:62 (CR)

*BSAVE TEDITOR,A$803,L$1070 (CR)

Corrections to the Keyboard Filter program

This patch corrects the problem with copy character key in the Keyboard Filter program. Enter these corrections after typing in the keyboard filter program as described in the manual.

*3B3:C9 95 D0 02 B1 28 8D B0 03 60 (CR)
*353:4C B3 03 (CR)

To save on disk: BSAVE KEYFILT,A$300,L$C0 (CR)

Patching the non-resident Basic in DOS 3.3

After running the BASPATCH program boot the BASICS diskette and then a 13 sector scratch diskette. Enter the non-resident language and BSAVE it under its appropriate name. Now boot a 16 sector diskette and use the MUFFIN program to transfer the program to a 16 sector diskette.

ADDENDUM TO THE ENHANCER REFERENCE MANUAL

```
(* This program patches the SYSTEM.APPLE file for version *)
(* 1.1 to display lower case with the VIDEX KEYBOARD &    *)
(* DISPLAY ENHANCER.        Darrell Aldrich 1/81          *)

VAR BUF:PACKED ARRAY [0..31,0..511] OF 0..255;
F:FILE;
I:INTEGER;

BEGIN
  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKREAD (F,BUF,32);
  CLOSE(F);

  BUF[5,388]:=76;      BUF[5,389]:=156;     BUF[5,390]:=219;
  BUF[5,391]:=177;     BUF[5,392]:=240;     BUF[5,393]:=76;
  BUF[5,394]:=142;     BUF[5,395]:=219;     BUF[5,396]:=177;
  BUF[5,397]:=242;     BUF[5,398]:=72;      BUF[5,399]:=41;
  BUF[5,400]:=127;     BUF[5,401]:=201;     BUF[5,402]:=64;
  BUF[5,403]:=104;     BUF[5,404]:=144;     BUF[5,405]:=3;
  BUF[5,406]:=73;      BUF[5,407]:=160;     BUF[5,408]:=96;
  BUF[5,409]:=73;      BUF[5,410]:=128;     BUF[5,411]:=96;

  BUF[5,428]:=32;      BUF[5,429]:=135;     BUF[5,430]:=219;
  BUF[5,431]:=234;

  BUF[5,448]:=32;      BUF[5,449]:=140;     BUF[5,450]:=219;
  BUF[5,451]:=234;

  BUF[5,169]:=176;     BUF[5,170]:=4;       BUF[5,171]:=234;
  BUF[5,172]:=234;

  RESET(F,'#4:SYSTEM.APPLE');
  I:=BLOCKWRITE(F,BUF,32);
  CLOSE(F);
END.
```

Additional patches to Apple Writer

These are additional patches to those printed on page 4-17 of the KEYBOARD & DISPLAY ENHANCER manual. These additional patches correct the wild card option in the search mode. To enter the wild card character, type the escape key and then the space bar.

From the Apple monitor type in the following while the modified Apple Writer disk is in the disk drive.

*BLOAD TEDITOR

*1862:48 A5 0B D0 04 68 29 3F 60 68 4C 35 18 (CR)

*1506:62 (CR)

*BSAVE TEDITOR,A$803,L$1070 (CR)

Corrections to the Keyboard Filter program

This patch corrects the problem with copy character key in the Keyboard Filter program. Enter these corrections after typing in the keyboard filter program as described in the manual.

*3B3:C9 95 D0 02 B1 28 8D B0 03 60 (CR)
*353:4C B3 03 (CR)

To save on disk: BSAVE KEYFILT,A$300,L$C0 (CR)

Patching the non-resident Basic in DOS 3.3

After running the BASPATCH program boot the BASICS diskette and then a 13 sector scratch diskette. Enter the non-resident language and BSAVE it under its appropriate name. Now boot a 16 sector diskette and use the MUFFIN program to transfer the program to a 16 sector diskette.

IMPORTANT NOTICE:

Because of the recent changes in the location of the character generator chip in the Apple][, we have separated the character generator chip from the Enhancer to make installation easier. Please follow the directions given below for installation.

1. Perform steps 1 through 7 of the Installation & checkout section of the manual.

2. Install the part marked "LOWER CASE CHIP" into the Apple][at motherboard location A-5 with the notch to the left.

3. Perform the rest of the steps of the Installation & Checkout section.

Note: Reference to dip switch B in section 3 does not apply to this version of the Enhancer as it may not be installed.

```
{ This program patches the SYSTEM.APPLE for displaying lower case with the }
{ KEYBOARD & DISPLAY ENHANCER for Pascal 1.1.          Darrell Aldrich 1/81 }

VAR BUF:PACKED ARRAY [0..31,0..511] OF 0..255;
F:FILE;
I:INTEGER;
BEGIN
   RESET(F,'#4:SYSTEM.APPLE');
   I:=BLOCKREAD (F,BUF,32);
   CLOSE(F);
   BUF[5,388]:=76;  BUF[5,389]:=156; BUF[5,390]:=219; BUF[5,391]:=177;
   BUF[5,392]:=240; BUF[5,393]:=76;  BUF[5,394]:=142; BUF[5,395]:=219;
   BUF[5,396]:=177; BUF[5,397]:=242; BUF[5,598]:=72;  buf[5,399]:=41;
   BUF[5,400]:=127; BUF[5,401]:=201; BUF[5,402]:=64;  BUF[5,403]:=104;
   BUF[5,404]:=144; BUF[5,405]:=3;   BUF[5,406]:=73;  BUF[5,407]:=160;
   BUF[5,408]:=96;  BUF[5,409]:=73;  BUF[5,410]:=128; BUF[5,411]:=96;
   BUF[5,428]:=32;  BUF[5,429]:=135; BUF[5,430]:=219; BUF[5,431]:=234;
   BUF[5,448]:=32;  BUF[5,449]:=140; BUF[5,450]:=219; BUF[5,451]:=234;
   BUF[5,169]:=176; BUF[5,170]:=4;   BUF[5,171]:=234; BUF[5,172]:=234;
   RESET(F,'#4:SYSTEM.APPLE');
   I:=BLOCKWRITE(F,BUF,32);
   CLOSE(F);
END.
```

Additional patches to Apple Writer

These are additional patches to those printed on page 4-17 of the KEYBOARD & DISPLAY ENHANCER manual. These additional patches correct the wild card option in the search mode. To enter the wild card character, type the escape key and then the space bar.

From the Apple monitor type in the following while the modified Apple Writer disk is in the disk drive.

```
*BLOAD TEDITOR

*1862:48 A5 0B D0 04 68 29 3F 60 68 4C 35 18 (CR)

*1506:62 (CR)

*BSAVE TEDITOR,A$803,L$1070 (CR)
```

Corrections to the Keyboard Filter program

This patch corrects the problem with copy character key in the Keyboard Filter program. Enter these corrections after typing in the keyboard filter program as described in the manual.

```
*3B3:C9 95 D0 02 B1 28 8D B0 03 60 (CR)
*353:4C B3 03 (CR)

To save on disk: BSAVE KEYFILT,A$300,L$C0 (CR)
```

Patching the non-resident Basic in DOS 3.3

After running the BASPATCH program boot the BASICS diskette and then a 13 sector scratch diskette. Enter the non-resident language and BSAVE it under its appropriate name. Now boot a 16 sector diskette and use the MUFFIN program to transfer the program to a 16 sector diskette.