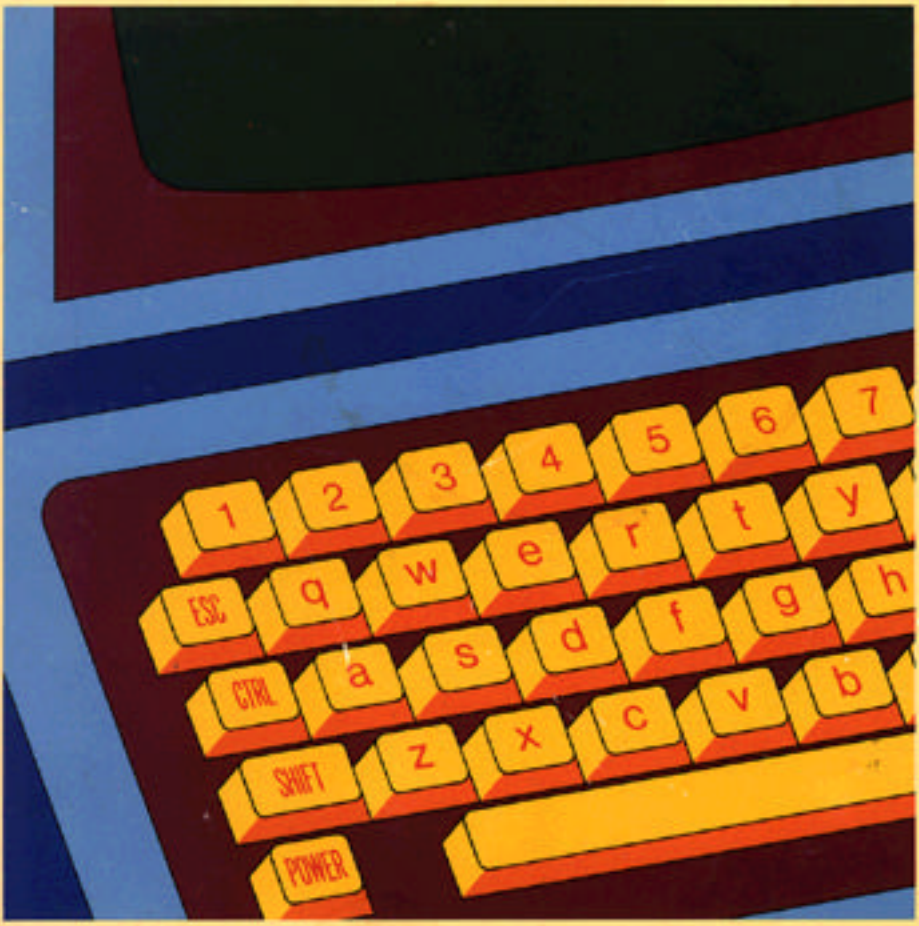
Videx

# Enhancer II

## Installation and Operation Manual



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P R E L I M I N A R Y  D O C U M E N T A T I O N

# Enhancer ][

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Circa: 6—November—81

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# Chapter One: Introduction

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1.a) Manual Organization and the Conventions Used
    1.a.1) Protocol
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1.b) Product Registration Form
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# Chapter One:Introduction

## Section 1.a  Manual Organization and the Conventions Used

The purpose of this manual is to provide technical support to the end user of the Enhancer [ after the sale. While we have attempted to make this manual as complete as possible, it is not a replacement for the manuals to your Apple computer, peripherals or software. This edition of the manual is a preliminary edition. If you complete the product registration form, you will be notified by mail when the Second Edition is available.

The general organization is in four parts:

Part I
Preliminaries

Chapter One: General information
- Product registration
- Standard features
- Optional features

Chapter Two: Installation and initial checkout

Chapter Three: Troubleshooting
- How to save time and money
- Some common problems (with solutions)
- The RMA form
- Warranty and non—warranty service

Part II
Operation
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Part IV
Quick Reference
Appendices: Concise technical data

This manual has been designed for ease of use by both the beginner and advanced user. The various chapters deal with certain topics in some detail, whereas the appendices contain a more technical synopsis of operation.

# Chapter One: Introduction

Chapter one is devoted to general information. Chapter two covers installation and initial checkout. Chapter three is the crisis chapter. Reading chapters two and three carefully can save both money and "system downtime". Chapter three contains a troubleshooting section and the return procedure for warranty and non—warranty repairs. Chapter four is a primer for beginners while subsequent chapters deal with the product in more detail. The appendices contain quick, concise data with references to sections containing more detailed information.

## Section 1.a.1 Protocol

The sections are numbered with a chapter.section protocol, the format of which is: chapter.section.subsection.sub—sub—section.... This is family structured. i.e. each section of a chapter may have subsections. each of which may, in turn, have subsections of their own, ad infinitum. Each subsection is an expansion of one theme expressed in its parent section or subsection. Subsections may therefore be viewed as a closer or more detailed look at one topic.

Each parent section begins with a lower case letter. For example, the fifth section of chapter two would be labeled: 5.e. The first subsection of the fifth section would be: 5.e.1. The second subsection would bet 5.e.2. The first subsection of subsection of 5.e.2 would be labeled: 5.e.2.1.

The pages are numbered with a chapter — page number protocol. For example, the fifth page of chapter two would be: 2—5.

At the beginning of each chapter is a Chapter Table of Contents. Each CTOC (\see—tock\) completely lists all sections and subsections of that chapter. In this way, the reader can know what topics are discussed in that chapter.

## Section 1.a.2 References

References to particular pages or sections may be found within square brackets. A reference to page 2—5, for example. might appear like this:

[page: 2—5]

whereas a reference to section 2.e could appear as:

[section: 2.e].

## Section 1.a.3 Notation

Control characters will be designated with a circumflex preceeding the character. For example, a control X would appear as:

^X

Sometimes we will use the name of the character rather than the character itself. When this is done, the name of the character — or it's abbreviation — will be contained in angle brackets. For example, a control left square bracket —^[ — might appear as:

<escape>

or as:

<esc>

Likewise, a ^M could be denoted as:

<cr>

Naturally, these characters are not meant to be entered into the computer in this long hand fashion. To enter a ^G, for example, one would hold the CTRL (control) key down and depress the G key.

## Section 1.b The Product Registration Form

You will find a product registration form attached in the back of this manual. Another one may be found in this section. While you are not required to mail this card to us for warranty protection, it is strongly recommended that you do complete the form and mail it to us at your earliest possible convenience. This allows us to mail any information which may be of interest to our customers at a later date. It also allows us to compile data so that we may better determine the needs of all our customers and to serve you better.

Please try to answer all the questions as completely as possible. If you are unable to answer any question, leave it blank. If you have any additional comments, please use the comment card for that purpose or write us a letter. Please do not write any comments on the Product Registration Form itself since those cards are not reviewed by our technical staff. Please do NOT fold the Product Registration form.

## Section 1.c Features and Options

The following are some of the Enhancer ][’s features:

* Full ASCII keyboard (128 ASCII codes)
* The complete printable ASCII character set —including lower case — may be displayed
* User definable keys — with down loading from disc [section: 5.f]
* Type ahead buffer [section: 5.g]
* Auto repeat [section: 5.a.3]
* Fast repeat [section: 5.a.3]
* Normal Apple ][ mode [section: 5.d]
* Typewriter like operation [section: 5.e]
* Shift—lock feature [section: 5.e.1]
* Control — Reset protection (section: 5.c.1]
* Simple installation [chapter two]
* Microprocessor controlled (6500 series)
* Self test diagnostics [section: 5.h]
* A 2716 EPROM is used for on board firmware
* Complete firmware listings [appendix Y]
* Complete schematic [appendix Z]
* Dvorak keyboard option [section: 5.i]

Your new keyboard Enhancer ][ utilizes a sophisticated microprocessor with its own RAM. Although the Enhancer ][ is more sophisticated than it’s predecessor, the Keyboard & Display Enhancer, it is significantly easier to install. The microprocessor extends the features of the Enhancer ][ beyond those of the original Keyboard & Display Enhancer with features such as user definable keys and a type ahead buffer. The caps lock, caps unlock, shift lock and control — reset features are preserved, thus supporting the normal Apple ][ keyboard as well as a typewriter like mode.

## Section 1.d Hardware Requirements

The Enhancer ][ may be installed on any Apple ][ or Apple ][plus with a piggyback style keyboard (normally found only on revision 7 or greater Apples). Revision 0 through 6 Apples (with piggyback keyboards) can use the Enhancer ][ but will require a device for displaying lower case letters not supplied with the Enhancer ][. such as the Videoterm 80 column card.

To determine the revision of your Apple, look inside along the left hand edge of your motherboard. You should see white letters next to each row of chips. If next to the letter E you see a socket labeled “memory select”, you have a revision 0 through 6 Apple. Otherwise, you should see a white dashed rectangle with three large holes. This -is a revision 7 or greater Apple.

Note: This manual assumes that the user has a revision 7 or greater Apple ][ you have a revision 0 through 6 Apple, you should NOT install the Lower Case Chip in your system. All references to lower case display (in 40 columns) would. therefore, be invalid for your system unless you have some kind of 40 column lower case display device [appendix B].

Chapter Two:Getting Started

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2.d) Enhancer ][ Installation
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2.e) Enhancer ][ Installation Checkout

# Chapter Two: Getting Started

## Section 2.a Enhancer ][ Utilities Disc Checkout

Since the disc which comes with the Enhancer ][ is not copy protected, the user should ensure that the disc they receive is in good working order and that adequate backups are made by the user to insure against data loss.

The Enhancer ][ Utilities Disc is a double sided disc. The primary (label) side is the BASICS side. The second (back) side is the Pascal side. Since the Pascal side is intended to be used only once, damage due to double sided usage is unlikely. The Pascal side is not notched and is therefore write protected.

### Section 2.a.1 The BASICs Side

To verify the data on the BASICs side, boot DOS, insert the Enhancer ][ Utilities Disc into your drive and type the following:

```
VERIFY CHECK OUT
EXEC CHECK OUT
```

If I/O ERROR appears anywhere, you may have a problem. Repeat the steps, if an error still continues, you will need to get a new copy of the disc from your dealer.

This concludes the checkout of the BASICs side of the Enhancer ][ Utilities Disc. If you have a Pascal system, continue with the next section. otherwise the disc checkout is now complete.

### Section 2.a.2 The Pascal Side

If you do not have the Pascal language system, you should ignore this section. If you do have Pascal, you will want to verify the Pascal side of the utilities disc. To do this, perform the followings

```
Boot Pascal.
To enter the Filer type~ F
```

Once in the Filer, place the Enhancer ][ Utilities Disc into one of your drives. To do this, hold the disc with label as you normally would, then turn it over by rotating your wrist. This should result in the correct orientation of the disc. To verify, the label should be on the bottom of the disc as you are ready to insert it and it should be the last part of the disc which will enter the drive when you insert the disc.

Type: E
Pascal will ask: "Bad block scan of what vol?"
Type: Enh2:
Pascal will ask: "Scan for 28 blocks ? (Y/N)"
Type: y

If it says "0 bad blocks", your disc is probably good, otherwiSe it will name any files which are in danger. If no files are in danger, don't worry, even if there are many bad blocks found. If the files OUTPATCH.CODE and OUTPATCH.TEXT are both listed as endangered, then you will have to get at least one good copy of these files. You can ask your dealer or call Videex.

## Section 2.b How to Remove the case From Your Apple

( ) EnSure that your Apple ][ is functioning properly.

( ) Turn your Apple ][']s power off!

( ) Disconnect the power cord from the power supply.

( ) Now, remove the lid from your Apple. Curl your fingers under the back corners of the lid, bracing your hands against either side of it. Pull it up until it pops loose. Do NOT pull the lid straight up, slide it back until its front edge clears the keyboard end of the case, then lift it clear. This procedure avoids prying your keyboard off its mounts.

( ) Remove all peripheral cards from slots 0—7. This may be done by rocking thin forward and back while pulling up, until they come free. If you have a card in slot 0 (far left), it nay be necessary to remove a short cable leading from it to the motherboard.

( ) If you have an RF modulator connected to the four—prong video output connector of the Apple ][']s motherboard, disconnect it.

( ) Turn your Apple ][ upside down.

( ) Remove the screws around the edge of the Apple ][ which hold the case on [photo: 2.1]. The four screws at the

Photo: 2.1

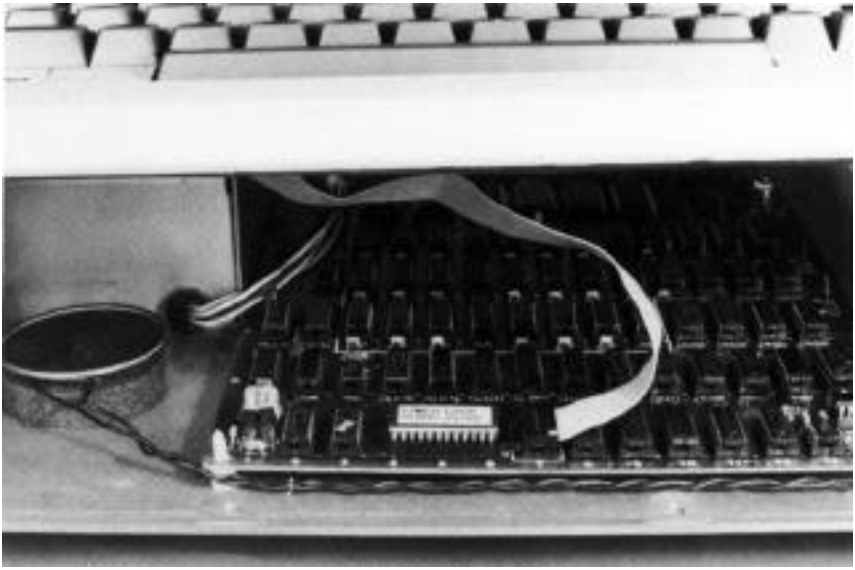


Photo: 2.2

front edge, under the keyboard, may have washers mounted BETWEEN the Apple ][ case and the bottom. When you remove these screws, lift the keyboard end of the base off the case and remove these washers.

( ) Holding the top and bottom together, carefully turn the Apple ][ over (top side up).

( ) Gently lift the front of the case just enough to reach in and pry loose the keyboards ribbon cable connector [photo: 2.2] using a screwdriver to lift first one end then the other. If you plan to use your hand be prepared to have two holes in your thumb and two bent pins on the connector. NOTE CAREFULLY the orientation of the cable; you will have to put it back the same way later.

( ) Completely remove the case from the bottom of the Apple.

## Section 2.c Lower Case Chip Installation and Checkout

The Lower Case Chip replaces the character generator chip (A5) on your motherboard. No special knowledge of computer systems nor electronics is required. No soldering nor cutting of traces necessary. You should be able to do it yourself without any special tools within a half hour. Please read this section thoroughly before attempting to install your new Lower Case Chip.

### Section 2.c.1 Tools Required

These are the tools required to install your Lower Case Chip

1) Phillips screwdriver
ii) Standard blade screwdriver or IC extractor

### Section 2.c.2 Procedure

Please read these instructions carefully and completely before attempting to install your Lower Case Chip. If you have not already done so, refer to Section 2.b for instructions on removing the case of your Apple.

Locate and remove the large chip at socket location A5 on the motherboard [photo: 2.4]. Wrap it in tinfoil and set it aside where it will not be lost.

Place the chip labeled Lower Case in the A5 socket on the motherboard. The notched end of the chip should be to the left.

Photo: 2.3

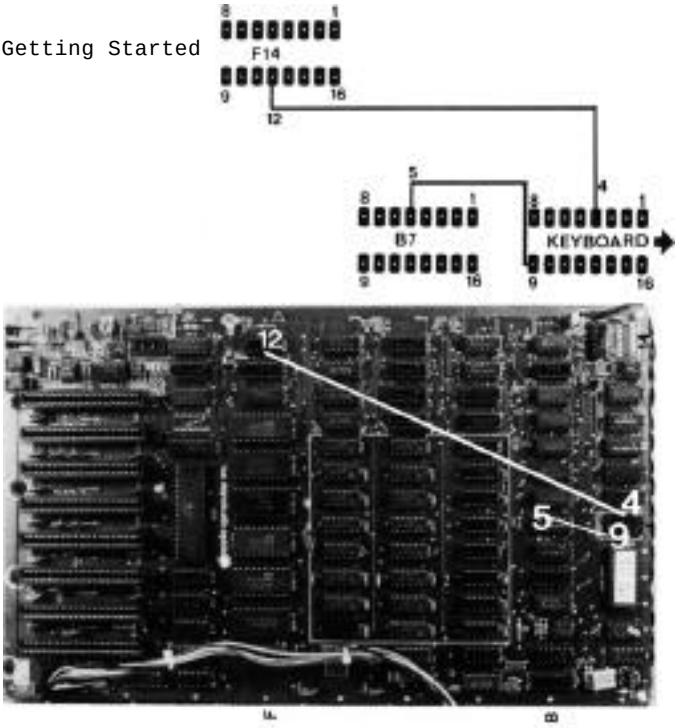



Photo: 2.4

( ) Connect your monitor or RF modulator to the Apple's video output.

( ) Connect your power cord to the Apple's power supply.

( ) Turn your monitor or television set on.

( ) Turn the power on to your Apple ][ and listen for its initial beep. If the power light does not come on, turn the power switch off and check the power connections. If the power light does come on. but you do not hear a beep, carefully recheck all your installation.

( ) If you see vertical lines, graphic characters, or anything unusual on your screen, your Lower Case Chip is probably not installed correctly. Check to see that the notched end is to the left. Carefully check to see if any pins might be bent. If the problem does not become obvious, refer to Section 3.b.

( ) If you see the normal characters on your screen, your Lower Case Chip is probably installed correctly.

( ) Proceed to the Enhancer ][ installation section [section, 2.d]

End of the Lower Case Chip installation.

## Section 2.d Enhancer ][ Installation

The Enhancer ][ replaces the encoder board of your keyboard, making installation relatively simple. No special knowledge of computer systems nor electronics is required. There is no soldering nor cutting of traces necessary. You should be able to do it yourself without any special tools within an hour. Please read this section thoroughly before attempting to install your new Enhancer ][.

### Section 2.d.1 Tools Required

These are the tools required to install your Enhancer ][:

i) Phillips screwdriver
ii) Pliers (preferably needle—nose)
iii) Wire cutters (optional)
iiii) Wire stripper (optional)

## Section 2.d.2 Procedure

Please read these instructions carefully and completely before attempting to install your Enhancer ][. If you have not already done so, refer to Section 2.b for instructions on preparing your Apple.

## Section 2.d.2.1 Installation of The Acknowledge Line

This Section describes the installation of the Acknowledge wire (this enables use of the type ahead buffer and ensures proper operation of the macro definitions). While this wire is not necessary, it is strongly encouraged.

( ) Cut a length of wire about two inches long (about 5 cm).

( ) Strip one eighth inch (or 3 m) of insulation from each end.

( ) Locate on the Apple motherboard the integrated circuit (IC) at location B—? [photo: 2.31. It is in the second row from the front and seventh from the left edge of the motherboard, and is marked 74L5257 both on the IC and on the motherboard next to it.

( ) Remove the 74LS257 by using a flat—bladed screwdriver to pry up first one end, then the other, until the IC is free. Use needle—nose pliers to straighten any pins you may have bent.

( ) Locate pin number 5 of the empty socket at 3—7 [photo: 2.71. Insert one of the stripped ends of the short wire Imo this hole.

( ) Examine the 74L5257 again for bent pins, then insert it into the socket, letting pin 5 join the wire in the hole. BE SURE that the end of the IC with the notch or dimple is pointed toward the keyboard socket [photo: 2.71. If it is installed backward it and/or your Apple could be damaged.

( ) After inserting the IC in B—7, check that the bare part of the wire does not touch any pins other than pin 5.

( ) Bring the other end of the wire over to pin 9 of the keyboard cable socket at location A—7. Insert it into pin 9, makIng sure that it will not touch any other pins of the keyboard cable plug.

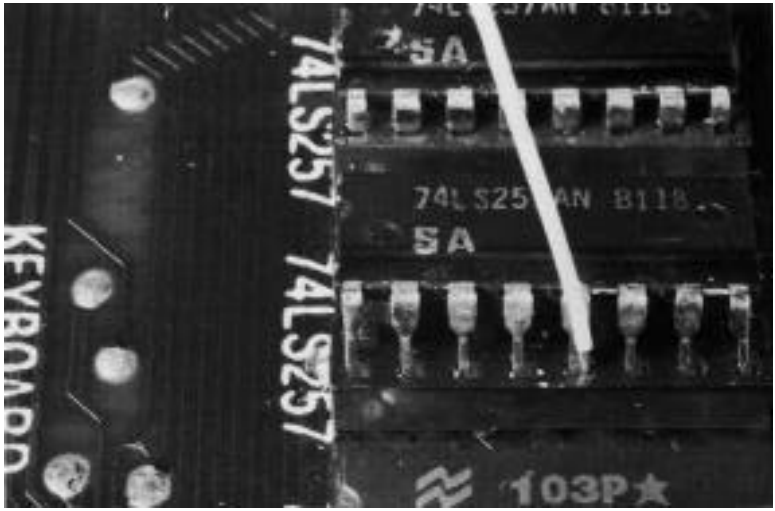
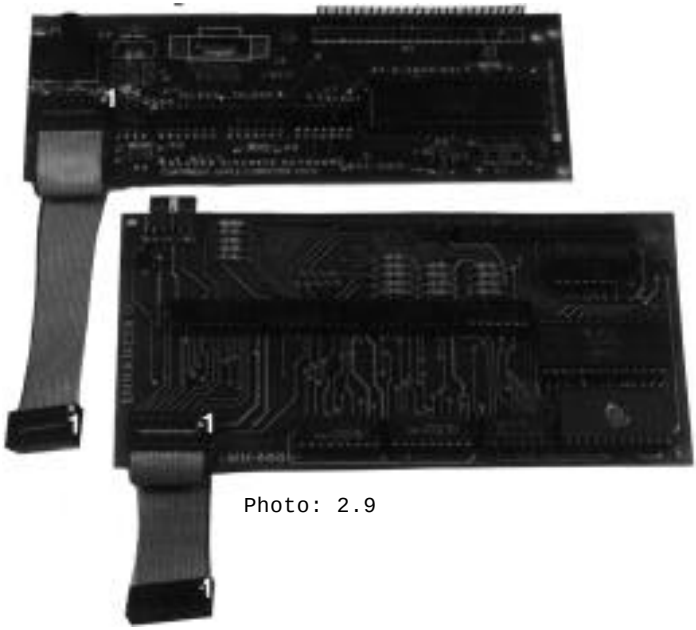



Photo: 2.7

Photo: 2.8

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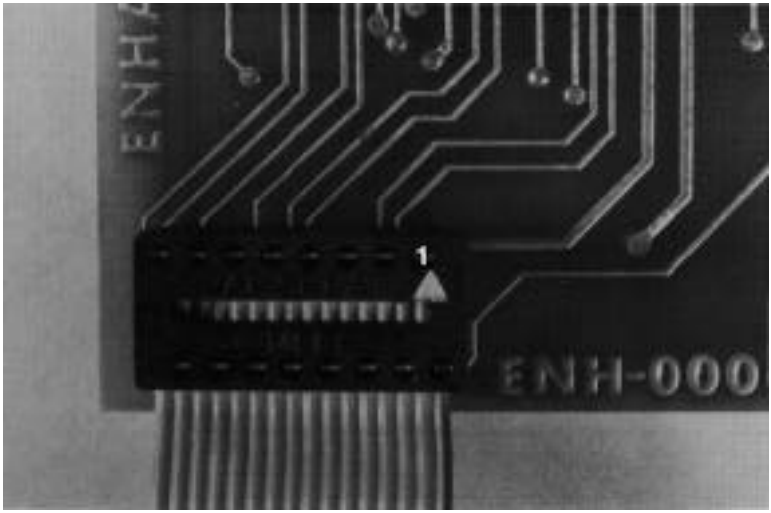


Photo: 2.10

( ) Invert the case of your Apple and-observe the keyboard and the ‘piggyback” encoder board mounted on it.

( ) Note the nylon spacers that extend through the piggyback board. The board will have to slide off of these spacers. Squeeze the ends of the spacers with your pliers so they will fit through the board’s holes [photo: 2.8]. At the sane tine, pull the piggyback board away from the keyboard. There will be some resistance from the 25—pin connector (the contacts are spring—loaded) but it should slide smoothly out, once the spacers are freed.

( ) Very carefully remove the 16—pin cable connector from your piggyback board, using the flat screwdriver to pry up alternately one end, then the other, until it is free. Note the orientation of the connector. You will have to plug it into your Enhancer ][ from the same direction [photo: 2.9].

( ) Examine the 16 pin cable. At each end you should see a white triangle or dot or perhaps some numbers. The dot or other mark indicates pin one.

( ) Examine the Enhancer ][ circuit board. The socket at the lower left hand corner is the keyboard cable socket. The upper right hand pin is pin number one. Take the 16 pin cable and insert it into this socket, taking care to ensure that pin one of the cable is inserted into pin one of the socket [photo: 2.10].

( ) Examine the 25—pin connector on the Enhancer ][. Make sure all pins are straight and parallel. Straighten any that are not.

( ) Now, look at the underside of your keyboard. On some Apples there will be a metal stiffener bar across the back of the keyboard, extending up about three—eighths inch from the keyboard surface. If this is present, it must be covered before your Enhancer ][ is installed further. There should have been included in your Enhancer ][ box a strip of insulating material about four inches long. This should be placed over the edge of the bar so Chat when the Enhancer ][ is installed, no Dare metal touches it [photo: 2.12].

( ) Look now at the plastic spacers that held the piggyback board on. There will be a center post flanked by two curved flanges. The right spacer (the one further from the side of the Apple) must be rotated 90 degrees so the flanges are parallel to the edge of the keyboard, as shown in photo 2.13.

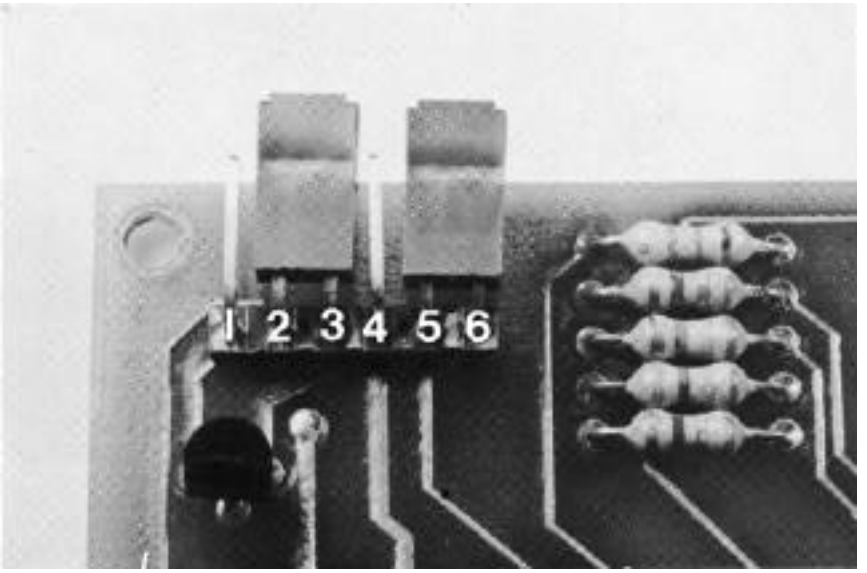


Photo: 2.11

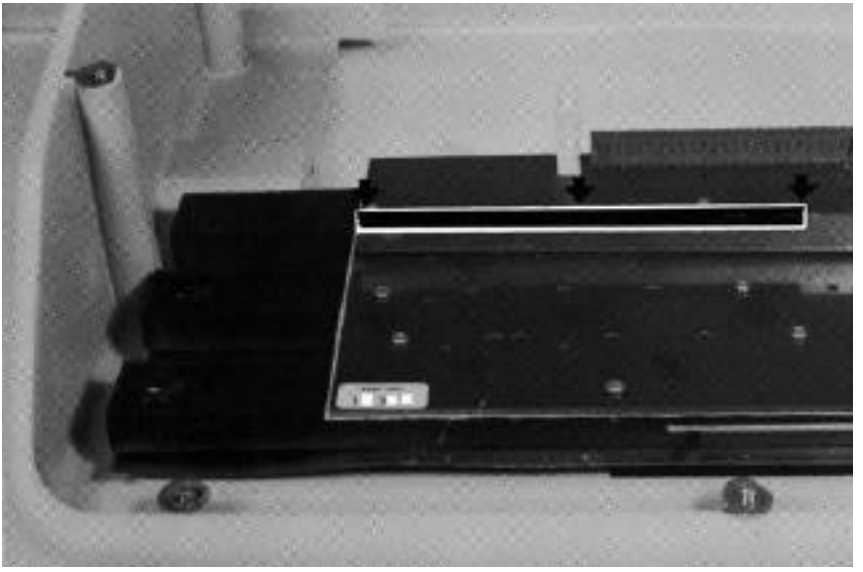

Photo: 2.22

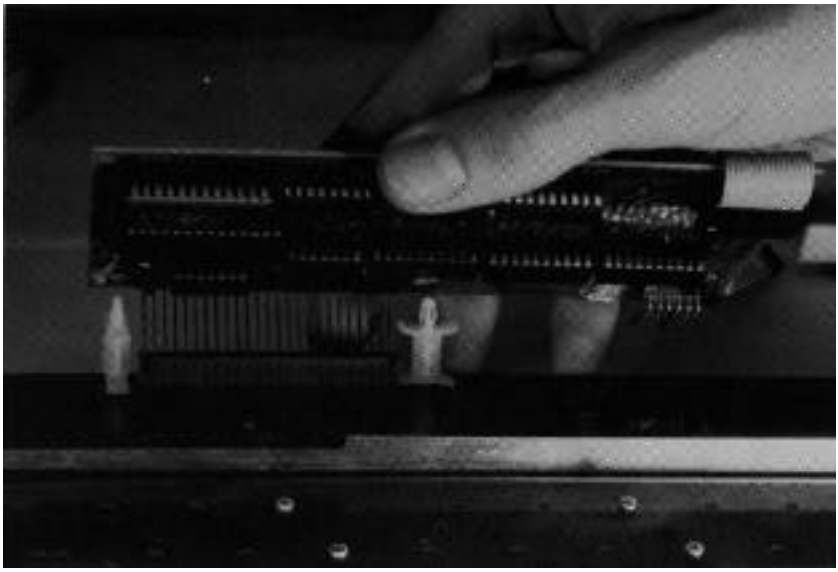

Photo: 2.13

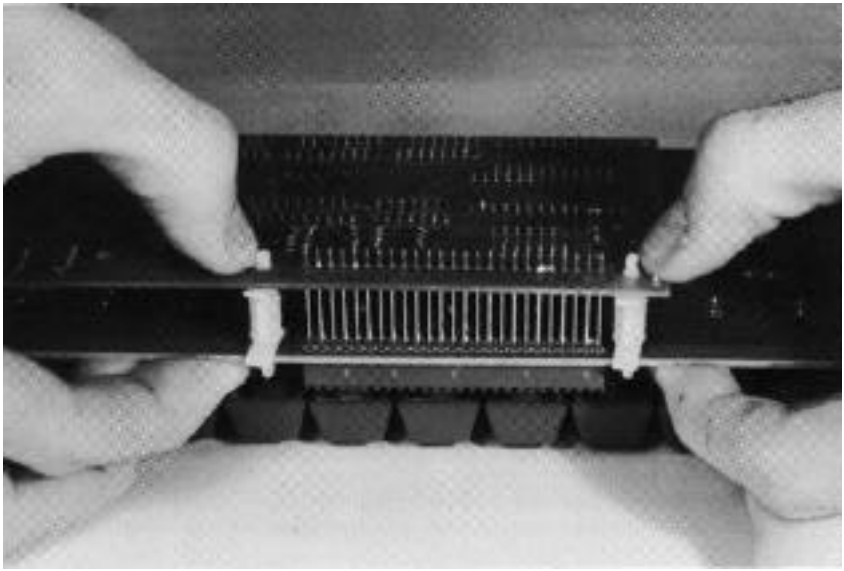

Photo: 2.14

( ) Once the 16—pin ribbon cable is installed and any of the 25 pins straightened as necessary, you may install the Enhancer ][ on the keyboard in place of the piggyback board you removed. To line up the pins, tilt the board a little so the tips of the pins press on the edges of the holes in the keyboard [photo: 2.13]. By wiggling the Enhancer ][ you should be able to make most of the pins pop into the correct holes, any that do not may be lined up with a screwdriver.

( ) When all the pins line up, press the Enhancer ][ smoothly onto the keyboard until the spacers lock in place.

## Section 2.d.2.3 Automatic Download Wire

This section concerns the installation of a wire that allows totally automatic downloading of key redefinitions. If you are not sure you wish to have this, refer to Section 5.f.4 for an explanation of its effects.

IMPORTANT: If you install this wire, the blue plastic cap on Molex pin five [photo: 2.11] must be removed.

( ) Cut a length of wire about twelve inches (30 cm) long.

( ) Strip one eighth inch (or 3 mm) of insulation from each end.

( ) Locate on the Apple motherboard the integrated circuit (IC) at location F—14. It is in the sixth row from the front, at the right edge of the motherboard. and is marked as a 9334 (or 74LS259) both on the IC and on the motherboard next to it. NOTE: There may be a Soft Video Switch installed in this socket. If so. install the wire under the SVS, not the 9334.

( ) Remove the 9334 by using a flat—bladed screwdriver to pry up first one end, then the other, until the IC is free. Use needle—nose pliers to straighten any pins you may have bent.

( ) Locate pin number 12 of the empty socket at F—14. Insert one of the stripped ends of the long wire into this hole.

( ) Examine the 9334 again for bent pins, then insert it into the socket, letting pin 12 join the wire in the hole. BE SURE that the end of the IC with the notch or dimple is pointed toward the keyboard. If it is installed backward will be destroyed when you turn the power on.

( ) After inserting the IC in F—14. check that the bare part of the wire does not touch any pins other than pin 12.

( ) Bring the other end of the wire over to pin 4 of the keyboard cable socket at location A—7. Insert it into pin 4, making sure that it will not touch any other pins of the keyboard cable plug.

( ) Make sure the blue shorting plug in photo 2.11 is removed.

End of download—control—wire installation

( ) Now, place the case of your Apple back on its base. left edge first. Be careful not to crush the keyboard cable connector.

( ) Lift the right side of the case just enough to reach in and grab the keyboard cable connector plug. Plug the connector into its socket, making sure that pin one of the cable enters hole number one of the socket (this able will have a white dot silkscreened next to it).

( ) Reinstall two of the screws immediately under the keyboard, but don’t bother replacing the washers. (If your Apple is on a table you should be able to do this without inverting it.)

( ) Proceed to the installation checkout section. If everything checks out ok, complete the re—assembly of your Apple ][ (with the power off), else refer to Chapter 3.

End of installation.

## Section 2.e Enhancer ][ Installation Checkout

The purpose of this section is to determine whether your Enhancer ][ is installed and functioning correctly. If these steps are followed precisely, independent variables which can give the appearance of disfunction will be controlled. If you are unable to perform any of these steps, proceed to Chapter three.

( ) Turn the power off (important).

( ) Disconnect any and all, peripheral cards which may be installed in slots 0—7.

( ) If your monitor is not connected to the Apples video output, connect it.

( ) Turn the power on.

( ) If the power light does not come on, shut off the power immediately and check your connections. Probably your keyboard cable is plugged in backwards, this can damage your Enhancer ][. If it does not become obvious, turn to Chapter 3: Troubleshooting.

( ) If the power light does cone on but there is no beep and no prompt on the screen, check your connections, and check that the IC’s you had pulled are plugged in right. Again if it’s not something obvious, turn to Chapter 3.

( ) If the you get a beep but no prompt on the screen, check that your monitor is connected correctly and powered up.

( ) If you get a beep and a prompt, you are ready to begin checking your Enhancer ][. If a message is displayed, either ENHANCER CHECKSUM FAILURE, ENHANCER MEMORY FAILURE. BREAK ERROR, or INTERRUPT, your Enhancer ][ has failed its own self—check and must be fixed. Refer to Section 3.a.

( ) Type some random characters, just to see that you can enter characters. If none appear, your Enhancer ][ is not working yet, recheck your installation, then refer to Chapter 3 if you do not find anything.

( ) If characters are being entered, you may begin the full check. Enter the following keys several times each, and check that they are echoed to the screen properly.

Q W E R T Y T U I O P then 3 Q S D Z then

@ A B C D E F G H I J K L M N O P Z
<ctrl>G (expect a beep)
<ESC> then I (expect the cursor to move up one line)

(<ctrl> and <ESC> are the keys with those labels on them).

The first set of characters composes one row and one column of the keyboard matrix, Table 3.1. The second defines a row and column of the ASCII chart, Table 5.1 [section: 5.b.1]. Problems tend to show as patterns of errors associated with the arrangement of one of these charts. If these keys all produced the correct characters, skip the next three steps.

( ) If any of the keys you pressed did not echo as the correct character, try each of the other keys in that row and column. The results of this check should be noted down for use in servicing your Enhancer ][.

( ) If the correct character is being entered but is followed by an underline character, then PROBABLY your download—control wire, the one leading from the keyboard socket to position F—14 near the back edge of your motherboard is not connected well. To check this, remove the wire and reinstall the blue shorting plug across pins 5 and 6 of the Molex connector, then repeat the checkout sequence.

( ) If the wrong characters are entered but do not show a regular pattern on Table 3.1, check the characters against the chart in Chapter 5, Table 5.1. Again, if you can detect any pattern, note it down.

( ) Assuming the characters tried so far have been correct, we can now check the rest of the Enhancer ][. Begin by pressing RESET by itself. It should not cause a system reset (a beep), if it does, the (left) blue shorting plug to the left in photo 2.11 is in the wrong position, or something is not right with your Enhancer ][.

( ) Enter a 'G' it should be displayed as such.

( ) Holding CTRL down, enter a ‘G' again, you should hear a beep.

( ) Enter an ‘N’, you should see an ‘N,’ displayed.

( ) Now, hold SHIFT down while entering an ‘N’, you should see an '^' displayed.

( ) If these characters work OK, then your character keys, your control key, and your shift key are known to work. Now check your REPEAT function. Hold REPEAT down and press another key such as ‘F’. It should IMMEDIATELY begin repeating at high speed.

( ) If you installed the wire that enables the type ahead buffer, check it this way: Fill a line with characters, then hold down REPT and RETURN for a few moments, then let them up, the screen should continue scrolling for a moment afterwards. If it does not, check installation of the type ahead wire.

( ) Now, hold down the shift key, press reset and let it up, then let op the shift key. This puts your Enhancer ][ in Lower Case node.

( ) Now enter an ‘N’ then a <shift> ’N’, both should result in an upper—case ‘N’. (The Enhancer ][ is actually producing a lower case n’, but the Apple is converting it to upper case.)

( ) The following steps check the automatic download capability. If you installed the wire that enables this, check it this way: If the prompt now displayed at the left side of your screen is a ‘]’ or a '>’, proceed to the next step, otherwise, enter a CTRL—’B’ then RETURN.

( ) Now. assuming you have a BASIC prompt, enter the line:

<cntl—reset> PRINT POKE —16290,0

and press RETURN. There should be an underline character displayed just to the left of the cursor. If not, the download control wire is not properly installed.

( ) This concludes manual checkout of the Enhancer ][. You may wish to try the rest of the codes in Table 5.1, especially if you had installed the keyboard cable connector backwards.

You may now proceed to Chapter 4 for an introduction to your new Enhancer ][.

# Chapter Three: H E L P or What To Do If All Else Fails

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3.a) Save Time & Money
3.b) Trouble—Shooting
  3.b.1) The Lower Case Chip
  3.b.2) The Enhancer ][
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3.c) The *RMA* Form
  3.c.1) How to Complete the RMA Form

3.d) How to Package your Enhancer ][Before Shipping It Back for Repair

## Chapter Three: H E L P ! or What To Do If All Else Fails

### Section 3.a Save Time & Money

Careful reading of this chapter can save you both time and money. It covers most of the difficulties that you are likely to encounter. You should read this chapter in its entirely prior to calling Videx or shipping the Enhancer ][ back for repair. You will probably want to skip the entire chapter unless you encounter some nasty snag in installation or operation.

A great deal of care and testing goes into each product that we make. Your Enhancer ][ was exhaustively tested by our quality control department prior to being packaged. Though it may not seen like it, the problem which you have encountered is probably not due to equipment failure. By reading this chapter carefully, you will probably be able to resolve any problem yourself without costly long distance phone calls or needless shipping of a perfectly good Enhancer ][ for repair. This, in turn, will tend to reduce “system down time.” If after you have read this chapter. carefully checked the operation of the Enhancer ][ and you are still having difficulty, please give us a call.

All products returned to Videx must be accompanied by a RMA (returned merchandize authorization) number. To receive an RMA number. you must call or write Videx.

### Section 3.b Trouble—Shooting

That you are reading this implies that something does not seen to be working right with your Enhancer ][. The following sections are arranged in the order in which problems would be discovered.

### Section 3.b.1 The Lower Case Chip

This section refers to problems that occur in following the instructions in Section 2.c. There are a number of problems that could occur:

a. The power comes on, but the Apple does not beep.
   1. Check installation, probably the Lower Case Chip is installed backwards or offset one pin, this results in a destroyed Lover Case Chip.

b. The Apple beeps, but the screen remains blank.
   1. Check that the monitor is plugged in
   2. Turned on
   3. The cable is connected
   4. The RF modulator, if any, is connected correctly.

d. The screen lights up, but no characters are displayed. There may be horizontal or vertical bars, or no real pattern at all.
   1. Check for bent pins on the Lower Case Chip.
   2. The Lower Case Chip may be faulty, replace it with the original and see if that works now.

e. Characters are displayed, but at random (no pattern).

f. Characters are displayed, but they are the wrong characters for those positions.

NOTE: Turning the power on with the Lower Case Chip plugged in backwards will destroy the Lower Case Chip. If this occurs, you must return the Lower Case Chip for exchange.

Returned merchandise must be accompanied by an RMA form, a detailed description of the problem will greatly speed service.

## Section 3.b.2 The Enhancer ][

The Enhancer ][ is a complex device, many different problems my occur, some gross, some subtle. This section begins with those problems that may occur on power—up.

1. No power light, power supply make snapping noises power supply is shorted out. Remove the keyboard connector cable from A—7 and try again. Restore one feature of your Apple to its original state at a time, each time checking whether your Apple works afterward. If your Apple is returned to its pristine state and still does not work, there probably is a damaged chip on it, but first check that all the chips are plugged in with the notched or dimpled end pointed TOWARD the keyboard end of the A Apple, any that are plugged backwards will grow very hot immediately after powerup. If the Apple works (beeps on powerup)) after removing the keyboard cable, there is something drastically wrong with your Enhancer ][. Since each is checked before leaving Videx. the most likely cause is either: one (or both) of the wires leading to the wrong hole in a socket, or one of the blue shorting blocks on the wrong pair of Molex pins (if they should be there at all).

2. No power light, no snapping noises: Your keyboard cable is probably plugged backwards (This would damage your Enhancer ][). If not, check other things: Assuming you had already checked your Lower Case chip with the keyboard cable disconnected, you should check that each chip you removed is plugged right, with no pins bent under or out; that the wires are plugged into the right

holes, that they are not touching (and cannot touch) any other pins; check that the wire leading to your speaker is free, not pinned to the bottom of your motherboard.

3. Power light, no beep: again, follow the instructions in step 2

4. Power light, beep, no display: check the conditions in b) above, as well as those in step 2. Check the shorting plugs against photo 2.d.<> and the instructions in Section 2.4.

5. Power OK, beep, APPLE ][ display, Basic prompt; no character entry, no messages displayed: Then there is anything serious wrong with the Enhancer ][, this is how it will usually fail. Is there a bar across the back of your keyboard? If so, check that it is adequately insulated from the Enhancer ][. Is there any other equipment under the position where the Enhancer ][ mounts? If so, do they touch? The bottom side of the Enhancer must not be allowed to touch bare metal. If there is Anything occurring additionally, be sure to note it on the RMA form.

6. Characters being entered, but erratically: this includes any instance of characters being entered when you haven't been typing anything, usually it involves a single character repeating indefinitely. Check that the wires installed in the keyboard socket enter the correct holes, and that they do not touch any pins other than the proper ones.

7. Characters entered when key is struck, but more than one character: If it is an underline, the download—control—wire is improperly installed, or the blue plastic shorting plug is on the wrong pair of Molex pins [photo 2.d.x]. If it is a set off characters, see if there is any correspondence between which ones are produced for a certain character and keys in Table 3.1 on the RMA form. Check the repeat speed, if it is incredibly fast, write that down.

8. One character entered when one key is struck, but (sometimes) the wrong character: Again, check for correspondence against both Tables. 3.1 and 5.1. Note amy patterns.

## Section 3.b.3 Later Problems

This section deals with problems that occur some time after installation checkout, It assumes that you had successfully run through the installation checkout procedure some time before.

The most common problems will be:

1. No lower case entry to BASIC: refer to Section 6.a.

2. Repeat Won't work well in Pascal: This is because Pascal is too slow to pick up characters as they become available. Use the "flush buffer" command (<reset> or <shift><resetS) to stop the cursor where you want it, or anytime Pascal runs away from you.

3. Shift—lock is too easily set: this feature my be turned off by the down—load program supplied with your Enhancer ][.

4. Macros defined earlier are gone: what mode were they defined under, Caps Lock or Lower Case? What node are you in now? Try switching to the other mode and using the macro -- it nay be there! Is it possible that you have pressed <rept><reset> or shut off your Apple since defining the macro? Are you running a program that could be doing things with Annunciator #3, perhaps as a "copy—protect" scheme? If so, you may wish to use the down—load program to disable automatic downloading (this would have to be done only once after turning the power on but prior to running the offending program).

5. The Enhancer ][ works fine for about a half—hour, then quits: First, check if you haven't gotten it into a weird mode: does it think you're defining a macro? Press <space> then <rept> and try it then. If that doesn't do it, press <rept><reset>, which will clear any macros now defined, including spurious ones. If that doesn't do it, try a system reset (probably <ctrl><reset>) and try it then. If it works then, use it for another ten minutes, very suspiciously: it may be a subtle thermal problem. Finally, try turning the system off, then on again. Again, try it for awhile. with a wary eye on what it is (and you are) doing. Anything you notice should be written on the RMA form.

## Section 3.c  The RMA Form

All products returned to Videx for repair or replacement should be accompanied by an RMA (returned merchandize authorization) form. By completing an RMA form in detail and returning it with your shipment, you will probably cut the repair time at least by half. The RMA form ensures accurate handling and quick diagnosis of your board. You will find one of these forms in the back of this manual and smother in figure 3.3. Figure 3.1 is a sample of a completed RMA form.

If your blank RMA form is missing, you may use a photocopy of figure 3.3. It is suggested that you do not write on figure 3.3 itself.

## Section 3.c.1  How to Complete the RMA Form

Figure 3.2 is a sample of a completed RMA form. You should ensure that the RMA form is complEtely filled in. If the form is completed in detail, the repair time can be significantly reduced.

The RMA form is divided into four parts. Section A is for general information. Section 3 deals with your system's configuration. This data is useful in determining if some part of your system may be conflicting with the Enhancer ][ or related problem. Section C asks questions which we have found to be useful in determining certain problems. Section D is reserved for a complete description of the problem.

Please refer to figure 3.2 for the following discussion.

RMA Form for Enhancer ][ ENH—000 RMA # _____
Serial # _____
Previous Service RMA # _____

Name _____ Shipping Address:
Organization _____ Name _____
_____ Addr._____
Addr. _____ _____
_____ _____
_____ Shipping Instr._____
Phone # _____ times _____ time Zone
Phone # _____ times _____ _____
Dates purchased _____ sent _____

System Configuration:

___ Autostart ___ Old Monitor ROM
___ Apple ][ plus ___ Apple ][
Resident Language: ___ AppleSoft ___ Integer

Number of disc drives:

List on the back of the page all products installed in the Apple at the time the failure occurred, and any software that was in use.

For problems that occurred during installation, did you get a:

___ power light?
___ power—up beep?
___ Display?

Were there any installation errors? (no penalty for honesty...)

Any messages displayed on power—up or later?:

___ ENHANCER RAM FAILURE
___ ENHANCER CHECKSUM FAILURE
___ BREAK ERROR
___ INTERRUPT

___ Single character repeating continuously? (no keys pressed)
___ Some keys produce several characters?
___ Some keys produce nothing?
___ Some keys produce Wrong characters?
___ All keys produce nothing?

No effect from:

___ Shift key
___ Control key
___ Repeat key
___ typeahead doesn't work
___ autodownload doesn't work

Does the problem occur only several minutes after powerup?

Describe on the back of the sheet, in detail, the circumstances under which the problem occurred.

```
          columns
      |  C9  C8  C7  C6  C5  C4  C3  C2  C1  C0
rows  |-----------------------------------------     legend:
      |
      |  3__ 4__ 5__ 6__ 7__ 8__ 9__ 0__ :__ —__   ^H: backarrow
      |
      |  Q__ W__ E__ R__ T__ Y__ U__ I__ 0__ P__   ^U: forearrow
      |
      |
      |  D__ F__ G__ H__ J__ K__ L__ ;__ ^H__^U__    ^]: ESC
      |
      |  Z__ X__ C__ V__ B__ N__ M__ ,__ .__ /__    ^M: RETURN
      |
      |  S__ 2__ 1__ ^]__ sP__                ^M__   sp: Space
```

Table 3.1: Substitution Chart (may be photocopied to speed service; fill in the character produced for that key)

## Section 3.d How to Package your Enhancer ][ Before Shipping it Back for Repair

Before you return your Enhancer ][ to Videx for repair, please be sure that you have carefully followed the troubleshooting section of this chapter [section: 3.b] . Many problems can be corrected by carefully reading this manual without the expense of costly long distance phone calls or needless shipping.

All returned merchandise must be accompanied by a RMA [section: 3.c] form AND a RMA number. You must call Videx for the RMA number. Enclosing a completed RMA form will greatly reduce the time necessary for repair.

Do NOT return manuals, cables, etc. Only return the board itself. This will decrease the total shipping weight and speed up our processing of your repair. Be sure to ship the boards using the boxes in which they were originally shipped, including any packing materials. Please ensure that any protruding parts on the board are adequately protected.

You should insure your shipment for replacement cost. Videx cannot assume liability for materials lost or damaged in transit.

Send all repairs to the following address:

Videx, Inc.
Service Department
897 NW Grant Avenue
Corvallis, Oregon 97330

For a RMA number, call: (503) 758—0521.

# Chapter Four: A Primer for Beginners

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4.a) Introduction
4.b) Limitations of the Apple ][ Keyboard
4.c) What the Enhancer ][ Can Do

# Chapter four: A Primer for beginners

## Section 4.a Introduction

This chapter is a primer for people who do not consider themselves computer wizards, It attempts to answer many of the questions which are probably racing through your mind. It cannot anticipate all questions, however. Your Apple ][ computer is a complex piece of machinery. The Enhancer ][ makes it even more complex yet it can actually make your Apple ][ easier to use. As with any device, machines cannot be utilized to their fullest potential unless they are thoroughly understood by the operator. In the end, your best teacher will be yourself. This manual should be thought of as a tool in teaching yourself how to use your improved keyboard. It is strongly recommended that you install your Enhancer ][, if you have not already done so, before reading further so that you can try the things that you will be reading about. This will reinforce your learning and make the reading easier.

Even if you have never had any experience with computers before, you will probably be able to install and learn how to operate the Enhancer ][ in a relatively short period of time. familiarity with your Apple ][ is a prerequisite to the use of the Enhancer ][’s advanced features. This manual is NOT a substitute for the documentation supplied by Apple. If you do not feel comfortable with the Apple ][, you may leave the Enhancer ][ installed but you should review your Apple ][ manuals before proceeding with this manual.

There is a glossary in the back of this manual. We have attempted to make it as comprehensive as possible. If you come across a word or term you aren’t familiar with, refer to the glossary.

## Section 4.b Limitations of the Apple ][ Keyboard

The standard Apple ][ keyboard is an upper case only keyboard. Even though it is equipped with shift keys, it is incapable of lower case character entry. The shift keys are only used to shift the number and a few other keys. The Enhancer ][ changes all this so that the shift keys, and most other keys, may be put to greater use.

The standard Apple ][ keyboard is capable of entering only 91 of the possible 128 ASCII characters. The characters which cannot be entered are:

| | | | |
|---|---|---|---|
| -\ | <fg> (control backslash) | { | (left brace) |
| ^_ | <Us> (control underscore) | \| | (vertical bar) |
| [ | Cleft square bracket) | } | (right brace) |
| \ | (backslash) | ~ | (tilde) |
| _ | (underscore) | <Rub> | (Rub—out) |
| ' | (grave accent) | a—z | (all lower case |

letters)

The Apple ][ keyboard does not have auto repeat nor fast repeat, as found on many computer terminals and some typewriters. Auto repeat means that when a key has been pressed and held down, after a brief pause it will repeat that character automatically.

The Apple ][ keyboard has a one character buffer. This means that you may type only one character while the computer is doing something else. If you type more than one character, the last character typed will be the character buffered (remembered).

The Apple ][ keyboard does not allow macro definitions. A keyboard with macro definitions would allow all or some keys or keystrokes to be defined as any combination of characters, up to a given limit.

## Section 4.c What the Enhancer ][ Can Do

The Enhancer ][ completely changes your old Apple ][ keyboard into an intelligent keyboard. By installing the Enhancer ][, you have the potential to completely redefine the operation of your keyboard. The Apple ][ ( keyboard is divided into two parts: the keyboard switches and the encode? board (i.e. the electronics). The Enhancer ][ replaces the encoder board, so your keyboard is keeping its switches, but is getting a whole new brain. A much larger brain.

With the Enhancer ][, your shift keys become fully functional — like those of a typewriter [section: 5.e]. You may enter upper and lower case characters. You may enter any ASCII character, including those that the normal Apple ][ keyboard is incapable of entering [section: 4.b].

The Enhancer ][ gives your keyboard auto repeat and fast repeat (section: 5.a.31. When you press and hold a key down for just less than a second, that key will begin to repeat at a rate of about 15 characters per second. If you press and hold the repeat (REPT) key down along with some other key simultaneously, the other key will, be repeated at a faster rate. approximately SO characters per second.

Since the Enhancer ][ has its own RAM, it is capable of remembering characters that you type while your Apple ][ is ignoring you (like when it's talking to the disc system). This is called a type ahead buffer [section: 5.g]. naturally. the type ahead buffer is not unlimited. It has room for 128 characters. This is probably more than enough for most purposes.

The Enhancer ][ is also blessed with user definable keys — or macros [section: 5.f]. This means that you can equate a particular key with a character or sequence of characters up to 510 characters in length.

Your Enhancer ][ should have come with a chip labeled: “Lower Case”. This chip may already be installed on your Apple ][. It cannot readily be seen without disassembly of your Apple ][. The function of this chip is to allow the display of lower case letters on your screen in the normal 40 column display format. If you have the Videoterm 80 column card, you do not need the Lower Case Chip to display lower case letters on the 80 column screen since the Videoterm has its own character generator.

Note: Do NOT attempt to install the Lower Case Chip in a Revision 0 through 6 Apple. Attempting to do so can cause damage to your computer.

# Chapter Five: Operation

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# Chapter Five: Operation

## Section 5.a Overview

This chapter will discuss the operation of the Enhancer ][ This section is a brief overview of the chapter. Most of the questions that are raised as you read this section will probably be answered in subsequent sections. The Enhancer ][ is a sophisticated product and it will take some time for the user to become entirely familiar with its operation. Please do not feel intimidated if you find it necessary to re—read this chapter several times before all of the features are completely understood.

The Enhancer ][ has two modes of operation: The Caps Lock Mode, and the Lower Case Mode. If you think of your Apple ][ as having two separate keyboards, each functioning differently, you will begin to comprehend how the Enhancer ][ behaves. Each of these keyboards corresponds to one of the two nodes.

### Section 5.a.1 The Two Modes

The Caps Lock Mode behaves very much like the Apple's normal keyboard. Added are user definable macro keys, a type ahead buffer and auto repeat. In the Lower Case Mode, the shift key becomes fully functional for upper & lower case input and a Shift Lock feature is added. All 128 ASCII characters may be entered from this node [section: 5.e]

As we begin to use advanced features, the two modes begin to diverge even farther. A macro defined in one node will not be present in the other mode. It is as if your Apple had two physically different keyboards. This is a very important concept of this chapter.

Programmer's Note: A Mode Lock feature is selectable from down load [section: 5.f.4].

### Section 5.a.2 Macro Keys

Later sections of this chapter will discuss exactly which key combinations may be defined as macros [section, 5.f.1]. For now, we will state that there are 376 unique keystroke combinations which may be defined. Exactly half of these keystrokes are found in each node. If we define a keystroke combination to be equal to some macro in one mode, change modes and type the sane keystroke combination, that macro will not exist in the second mode. Going back to our dual keyboard analogy, if we define some key on one keyboard, we would not expect it to have an effect upon the second keyboard. This is perhaps the single most important factor in understanding the use of macros.

## Section 5.a.3 Auto & Fast Repeat

Your keyboard is now capable of auto repeat. That is, when you press and hold a key down, after a brief pause (approximately 3/4 second), the character or macro associated with that key will begin to repeat. If you hold the repeat key down simultaneously, it will repeat at a faster rate. These two features are known as Auto Repeat and Fast Repeat respectively.

Programmer's Note: Auto and fast repeats nay be disabled from a down load [section: 5.f.4].

## Section 5.a.4 The Type Ahead Buffer

The Enhancer ][ is equipped with a 128 character type ahead buffer. This means that you may type up to 128 characters while the Apple ][ is not scanning the keyboard (like when its doing disc operations). When the Apple is ready for more keyboard input, the Enhancer ][ will tell the Apple exactly what you typed. Naturally, there will probably he times when you want to clear the buffer, so there are two flush buffer commands: ^C and Reset. More about this later [section: 5.g.2].

Programmer's Note: The type ahead buffer may be disabled from a down load [section: 5.f.4].

## Section 5.b Semantics

This section deals with sons important definitions that will be used throughout this chapter. The reader is encouraged to understand the differences between the definitions of ASCII CHARACTER, KEYBOARD CHARACTER, KEYSTROKE, FUNCTION KEY and CHARACTER KEY. Once these definitions are clear, we will be better suited to understand the sometimes complex operation of macro key definitions and other functions.

## Section 5.b.1 ASCII Characters

The ASCII character set consists of 128 characters. Table 5.1 shows these characters and their corresponding decimal and hexadecimal values. With the Enhancer ][, you can enter any and all of these ASCII characters directly from your Apple ][ keyboard.

Definition: An ASCII CHARACTER is defined as a single element of Table 5.1.

Table 5.1 The ASCII Character Codes

| Decimal: | | 128 | | | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hex: | | $80 | | | $90 | $A0 | $B0 | $C0 | $D0 | $E0 | $F0 |
| 0 | $0 | ^@ | Nul | ^P | Dle | | 0 | @ | P | ` | P |
| 1 | $1 | ^A | Soh | ^Q | Dc1 | ! | 1 | A | Q | a | q |
| 2 | $2 | ^B | Stx | ^R | Dc2 | “ | 2 | B | R | b | r |
| 3 | $3 | ^C | Etx | ^S | Dc3 | # | 3 | C | S | C | s |
| 4 | $4 | ^D | Eot | ^T | Dc4 | $ | 4 | D | T | d | t |
| 5 | $5 | ^H | Enq | ^U | Nak | % | 5 | E | U | e | u |
| 6 | $6 | ^F | Ack | ^V | Sym | & | 6 | F | V | f | v |
| 7 | $7 | ^G | Eel | ^W | Etb | ` | 7 | G | W | g | w |
| 8 | $8 | ^H | Bs | ^X | Can | ( | 8 | H | X | h | x |
| 9 | $9 | ^I | Ht | ^Y | Em | ) | 9 | I | Y | i | y |
| 10 | $A | ^J | Lf | ^Z | Sub | * | : | J | Z | j | z |
| 11 | $B | ^K | vt | ^[ | Esc | + | ; | K | [ | k | { |
| 12 | $C | ^L | Ff | ^\ | Fs | , | < | L | \ | l | \| |
| 13 | $D | ^M | Cr | ^] | Gs | - | = | M | ] | m | } |
| 14 | $E | ^N | So | ^^ | Rs | . | > | N | ^ | n | ~ |
| 15 | $F | ^O | Si | ^_ | Us | / | ? | O | _ | o | rub |

Note: HOW TO READ TABLE 5.1. The ASCII value of any character in table 5.1. may be determined by adding the value at the top of the column with the value to the, left of the row that the character appears in. [A dollar sign ($) preceeding any value indicates hexadecimal. Values without a dollar sign are represented in decimal or base ten.] The first two columns of characters are the control characters. They are preceeded by circumflexes (^) and followed by their ASCII names.

Example: A control G is represented by: ^G Bel. “Bel" is a short hand notation for “bell”, meaning the bell character. Its ASCII value is $87 (hexadecimal) or 135 (decimal,).

Programmer Note: Table 5.1 shows the ASCII values with the high bit on. For equivalent ASCII representation with the high bit off, subtract $80 (hexadecimal) or 128 (decimal).

Section 5.b.2 Keystrokes

Definition: A KEYSTROKE is, for the purposes of this text, one and only one depression of any given key. Depressing two keys simultaneously constitutes two keystrokes.

Each character in Table 5.1 has a unique name and a corresponding ASCII value. Some ASCII characters may be entered

from the keyboard with only one, keystroke (e.g. Return and Escape) while others may require as many as three keystrokes (e.g. the null character is a control—shift F). Regardless of how many keystrokes are required to type a particular ASCII character, it is considered to be only a single ASCII character. An ASCII character, therefore, is a single element of Table 5.1.

## Section 5.b.3 Function Keys and Character Keys

Definition: A FUNCTION KEY is a key that, when depressed by itself or in combination with another key(s), causes some function to occur. By themselves, function keys do not generate ASCII characters. The function keys are: the repeat, reset, control and shift keys. [Exception: depressing the Repeat and Reset keys simultaneously will cause the rub—out character to be generated.]

Note: Repeat — Reset should not be used to output a rub—out since this particular key sequence has other ramifications.

Definition: A CHARACTER KEY is any key on the Apple ][']s keyboard which is NOT a function key.

The Apple keyboard contains 52 keys, five of which are function keys (One repeat key, one reset key. one control key and two shift keys). The remaining 47 are character keys.

## Section 5.b.4 Keyboard Characters

Definition: A KEYBOARD CHARACTER is one, two or three keystrokes (of a mode) produced by a combination of one character key and one of the following four possible function key combinations: control, shift, control — shift or none. There are 376 unique keyboard characters, 188 in each mode.

Example: Depressing the shift and escape keys simultaneously produces an escape character. Depressing the escape key produces the escape character. Shift — Escape and Escape are two distinct keyboard characters. Normally, both of these keyboard characters produce the same ASCII character: <escape>.

Another Example: Depressing the Control and G keys simultaneously in the Caps Lock Mode produces a ^G. Depressing the Control and 0 keys simultaneously in the Lower Case Mode produces a ^G. A control 0 in Caps Lock Mode is a different keyboard character than a control G in the Lower Case Mode. however, both of these keystrokes produce the sane ASCII character, namely a ^G.

The Apple ][ keyboard is capable of producing 188 unique keyboard character combinations in each mode. This number is calculated by the following formula:

(47 character keys) * 4 possible control—shift combinations

Where the 4 control—shift combinations are:

i) A key nay be pressed by itself
ii) A key may be shifted (with either or both shift keys)
iii) A key may be pressed in conjunction with the control key
iv) A key may be control— shifted

There are a total of 376 keyboard characters. 188 in the Caps Lock Mode, 188 in the Lower Case Mode.

Table 5.2 [section: 5.d] lists the 47 character keys by their labels and the ASCII character returned by depressing these keys with or without the control or shift keys in the Caps Lock Mode. Table 5.3 [section: 5.e] is a similar table to Table 5.2 except that the characters listed are those of the Lower Case Mode. Table 5.4 [section: 5.e] depicts the differences between Table 5.2 & Table 5.3.

## Section 5.c The Reset Key

The Enhancer ][ uses the reset key as a command key. If, for example, the reset key is depressed by itself, the Enhancer will go into Caps Lock Mode. If the shift and reset keys are depressed simultaneously, the Enhancer ][ will go into the Lower Case Mode.

note: The above does not apply if the Mode Lock options has been selected during down load (section: 5.f.4].

### Section 5.c.1 The System Reset

The Enhancer ][ has the ability to select one of the following system reset options:

i) Control—Reset
ii) Reset Only
iii) Disable Reset

In the first setting, whenever the control and reset keys are depressed simultaneously, a system reset (processor reset) will occur. This node is the default node for which your Enhancer ][ has been configured at the factory. Most people prefer this configuration since it is less prone to accidental resets. In the second setting, a system reset occurs whenever

the reset key is depressed. If the Reset Only option has been selected, changing modes of the Enhancer ][ will also cause a system reset — generally not very useful. The third setting completely disables the system reset. With this option, it is still possible to change between the two nodes.

Photo 2.11 shows the Enhancer ][. At the top right of the Enhancer ][, you will see a 6 pin Molex connector. The left three pins (1—3) are the reset control pins. When you examine your Enhancer ][, you should be able to see the plastic (probably blue) shorting blocks on pins 2 and 3. If you place this shorting block on pins 1 and 2, the Reset Only option is selected. Removing the block altogether totally disables the system reset.

## Section 5.d The Caps Lock Mode

The Enhancer ][has two fundamental modes of operation. One is the Caps Lock Mode, the other is the Lower Case (caps unlock) Mode [section: 5.d. With only one exception [section: 5.f.3.1], lower case letters may NOT be entered from Caps Lock Mode.

In the Caps Lock Mode, any keystroke sequence will produce the same character as would be produced on the standard Apple. The difference between the standard Apple and the Enhancer ][ in Caps Lock Mode is the auto and fast repeats, the user definable macros and the type ahead buffer. Table 5.1 shows all the possible combinations of keys and the ASCII values generated by typing them.

Table 5.2 Keyboard Characters and their Associated ASCII Characters In the Caps Lock Mode

| Key | Alone | Cntl | Shift | Both | Key | Alone | Cntl | Shift | Both |
|---|---|---|---|---|---|---|---|---|---|
| Space | | | | | Return | ^M | ^M | ^M | ^M |
| 0 | 0 | 0 | 0 | 0 | G | G | ^G | G | ^G |
| 1 | 1 | 1 | ! | ! | H | H | ^H | H | ^H |
| 2 | 2 | 2 | " | " | I | I | ^I | I | ^I |
| 3 | 3 | 3 | # | # | J | J | ^J | J | ^J |
| 4 | 4 | 4 | $ | $ | K | K | ^K | K | ^K |
| 5 | 5 | 5 | % | % | L | L | ^L | L | ^L |
| 6 | 6 | 6 | & | & | M | M | ^M | ] | ^] |
| 7 | 7 | 7 | ' | ' | N | N | ^N | ^ | ^^ |
| 8 | 8 | 8 | ( | ( | 0 | O | ^O | O | ^O |
| 9 | 9 | 9 | ) | ) | p | P | ^P | @ | ^@ |
| :* | : | : | * | * | Q | Q | ^Q | Q | ^Q |
| ;+ | ; | ; | + | + | R | R | ^R | R | ^R |
| ,< | , | , | < | < | S | S | ^S | S | ^S |
| -= | _ | _ | = | = | T | T | ^T | T | ^T |
| ·> | . | . | > | > | U | U | ^U | U | ^U |
| /? | / | / | ? | ? | v | V | ^V | V | ^V |
| A | A | ^A | A | ^A | W | W | ^W | W | ^W |
| B | B | ^B | B | ^B | X | X | ^X | X | ^X |
| C | C | ^C | C | ^C | Y | Y | ^Y | Y | ^Y |
| D | D | ^D | D | ^D | Z | Z | ^Z | Z | ^Z |
| E | E | ^E | E | ^E | Right Arrow | ^U | ^U | ^U | ^U |
| F | F | ^F | F | ^F | Left Arrow | ^H | ^H | ^H | ^H |
| | | | | | Escape | ^[ | ^[ | ^[ | ^[ |

Section 5.e The Lower Case (Caps Unlock) Mode

The Enhancer ][ has two fundamental modes of operation. One is the Lower Case (caps unlock) Mode, the other is the Caps Lock Mode [sections 5.d] . With only one exception [section: 5.f.3.1). lower case letters may ONLY be entered from the Lower Case Mode.

In the Lower Case Mode, all 128 ASCII characters may be entered directly from the keyboard. Naturally, user definable macros, a type ahead buffer and auto and fast repeats are available, table 5.3 shows all the possible combinations of keys and the ASCII values generated by typing then.

Section 5.e.1 Shift Lock

When in the Lower Case Mode, if you depress the control key BY ITSELF, you will be placed in shift lock mode. In this mode, if you depress any key, the character output will be the same as if the shift key were held down. This mode will be maintained until either shift key is pressed.

Table 5.3 Keyboard Characters and their Associated ASCII Characters In the Lower Case Mode

| Key | Alone | Cntl | Shift | Both | Key | Alone | Cntl | Shift | Both |
|---|---|---|---|---|---|---|---|---|---|
| Space | | | | | Return | ^M | ^M | ^M | ^M |
| 0 | 0 | ^@ | @ | ^@ | G | g | ^G | G | ^G |
| 1 | 1 | \| | ! | \| | H | h | ^H | H | ^H |
| 2 | 2 | ~ | " | ~ | I | i | ^t | I | ^I |
| 3 | 3 | rub | # | rub | J | j | ^J | J | ^J |
| 4 | 4 | ^\ | $ | ^\ | K | k | ^K | K | ^K |
| 5 | 5 | ^] | % | ^] | L | 1 | ^L | L | ^L |
| 6 | 6 | ^^ | & | ^^ | M | m | ^M | M | ^M |
| 7 | 7 | ' | ` | ' | N | n | ^N | N | ^N |
| S | 8 | { | ( | { | 0 | o | ^0 | 0 | ^O |
| 9 | 9 | ) | ) | } | P | p | ^P | P | ^P |
| :* | : | ^_ | * | ^_ | Q | q | ^Q | Q | ^Q |
| ;+ | | | + | | R | r | ^R | R | ^R |
| ,< | · | [ | < | ! | S | s | ^S | S | ^S |
| -= | = | _ | = | _ | T | t | ^r | T | ^E |
| .> | · | ] | > | ] | U | u | ^U | U | ^U |
| /? | / | \ | ? | \ | V | v | ^V | V | ^V |
| A | a | ^A | A | ^A | W | w | ^W | W | ^W |
| B | b | ^B | B | ^B | x | x | ^X | K | ^X |
| C | c | ^C | C | ^C | Y | y | ^Y | Y | ^Y |
| D | d | ^D | D | ^D | Z | z | ^Z | Z | ^Z |
| E | e | ^E | E | ^E | Right Arrow | ^U | ^U | ^U | ^U |
| F | f | ^F | F | ^F | Left Arrow | ^H | ^H | ^H | ^H |
| | | | | | Escape | ^[ | ^[ | ^[ | ^[ |

Example: Depress the control key BY ITSELF. After releasing the control key, depress the K key. Mi upper case K will appear. Now depress the comma key, a less than sign will appear on the screen. Numbers will also be shifted. Depressing the shift key (and releasing) and depressing the K key again now yields a lower case K.

Note: Shift Lock does NOT apply to macros either during definition nor use.

Examples Suppose that the K key had been redefined as some other character. Now if we depressed the control key by itself, we would be in shift lock mode. If we depressed any key except the K key, it would be shifted. The K key, because it has a macro associated with it, is not effected by the Shift Lock Mode. This is true even if the K key were redefined as a K.

Table 5.4 Differences Between Table 5.2 and Table 5.3 using the Values of Table 5.3

| Key | Alone | Cntl | Shift | Both |
|---|---|---|---|---|
| Space | | | | |
| 0 | | ^@ | @ | ^@ |
| 1 | | \| | | \| |
| 2 | | ~ | | ~ |
| 3 | | rub | | rub |
| 4 | | ^\ | | ^\ |
| 5 | | ^] | | ^] |
| 6 | | ^^ | | ^^ |
| 7 | | ` | | ` |
| 8 | | { | | { |
| 9 | | } | | } |
| :* | | ^_ | | ^_ |
| ;+ | | ^ | | ^ |
| ,< | | [ | | [ |
| -= | | _ | | _ |
| .> | | ] | | ] |
| /? | | \ | | \ |
| A | a | | | |
| B | b | | | |
| C | C | | | |
| D | d | | | |
| E | e | | | |
| F | f | | | |

| Key | Alone | Cntl | Shift | Both |
|---|---|---|---|---|
| Return | | | | |
| G | g | | | |
| H | h | | | |
| I | i | | | |
| J | j | | | |
| K | k | | | |
| L | l | | | |
| M | m | | M | ^M |
| N | n | | N | ^N |
| O | o | | | |
| P | p | | P | ^p |
| Q | q | | | |
| R | r | | | |
| S | s | | | |
| T | t | | | |
| U | u | | | |
| V | v | | | |
| W | w | | | |
| X | x | | | |
| Y | y | | | |
| Z | z | | | |
| Right Arrow | | | | |
| Left Arrow | | | | |
| Escape | | | | |

Section 5.f User Definable Macro Keys

With your Enhancer ][ you may redefine up to 170 single character macros or one 510 character macro. A macro is a keyboard character which has been redefined to be any ASCII character, or sequence of ASCII characters up to 510 ASCII characters in length. Careful reading of this section and section 5.b is recommended if you plan to use this feature as it is rather complex.

You have already learned how to issue some of the commands that you may give the Enhancer ][ by using the reset and shift keys. In this section you will learn how to use new commands utilizing the repeat key.

## Section 5.f.1 The Keys Which May Be Redefined

The Enhancer ][ has two nodes of operation [section, 5.d & 5.e3. Each keyboard character in one mode is distinct from any keyboard character in the other node (section: 5.b.4). Since there are 188 keyboard characters possible from the Apple ][']s keyboard, there are exactly 376 unique keyboard characters possible in both the modes of operation [section: 5.b.4]. Any of these 376 keyboard characters may be redefined. A definition may be from one to 510 ASCII characters in length.

Example: Suppose the Enhancer ][ is in the Caps Lock Mode and that we have redefined the shift C keyboard character to be: CATALOG. Now if one depressed the shift C, CATALOG would be printed on the screen. If we entered the Lower Case Mode and depressed shift C, a shifted C would appear on the screen. Returning to the Caps Lock Mode, and depressing a shift C would, once again, cause CATALOG to be printed. Depressing the C key by itself will produce a capital C.

## Section 5.f.2 Macro Memory Usage

The Enhancer ][ has 512 bytes of memory reserved for macro definitions. Each macro requires two bytes overhead and one byte for each ASCII character of the macro. The following formula determines the number of macros possible given the average size of each macro:

$$\text{Number of Macros} = \frac{512}{2 + \text{Average Size of Macros}}$$

Likewise, the average size nay be computed by:

$$\text{Average Size of Macros} = \frac{512}{\text{Number of Macros}} - 2$$

## Section 5.f.3 Defining a Macro

Macros may be defined in two ways:

i) From the Keyboard
ii) Down Loaded from a Disc File

Note: Both methods of Macro definitions may he selectively disabled from a down load [section: 5.f.4].

### Section 5.f.3.1 Macro Definitions From the Keyboard

Probably the beet way to describe how a Macro may be defined from the keyboard is to start with an example. Let us redefine a shift C keyboard character to he: CATALOG <cr>. Here are the steps we would perform:

| Keystroke Sequence | Characters Output from the Keyboard |
|---|---|
| Step 1: Control—shift—repeat | <None> |
| Step 2: Shift C | <None> |
| Step 3: CATALOG <cr> | CATALOG <cr> |
| Step 4: Repeat | <None> |

Step 1 tells the Enhancer ][ that we want to define a macro. At step 2. we enter the keyboard character that we wish to define. Step 3 is to enter the macro itself and at Step 4 we tell the Enhancer ][ that we wish to end the macro definition by depressing the repeat key. Notice that the only step which sends any ASCII character(s) to the Apple ][ is Step 3. The characters of the macro definition are the only characters which are output from the keyboard during a macro definition. [Please note that these characters may or may not be output to your monitor, depending upon what software is active at the time.] Step 4 ends the macro definition.

If you depress the shift, control and repeat keys in conjunction with a character key, the corresponding ASCII character or macro definition is fast repeated, and a macro definition is NOT begun.

Note: When fast repeating a character which is control — shifted, it is recommended that the repeat key be the last key pressed and the first key released to eliminate any keyboard bounce.

Here is an example of how to clear a macro key definition or abort a definition once you have depressed the shift, control and repeat keys simultaneously:

| Keystroke Sequence | Characters Output from the Keyboard |
|---|---|
| Step 1: Control—shift—repeat | <None> |
| Step 2: Space Bar | <None> |
| Step 3: Repeat | <None> |

Step 1 begins the macro definition. At Step 2 you enter the macro to be cleared. If you wish to abort the definition sequence once you have begun, you must enter some keyboard character. You might want to use some key that you have not already defined (perhaps the space bar). Step 3 is to end the macro definition without entering any macro. This procedure will clear any macro associated with the keyboard character in Step 2.

Warning: Omitting Step 2 will not abort a macro definition.

Note: You cannot use the repeat key when defining a macro. You may, however, use the auto repeat function by pressing and holding a key down.

When you are defining a macro, all other macros are temporarily disabled. Recursive macros are not allowed, that is, a macro cannot call another macro. A macro is defined as being some set of ASCII characters, not keyboard characters.

Mode changes are legal when defining a macro. It is possible, therefore, to define a macro in Caps Lock Mode using lower case characters. Changing modes within a macro does not take extra memory to store that macro since only the ASCII values are stored in the macro definition, not the mode actually used to generate the character. Likewise, use of a macro will NEVER cause the node of your keyboard to change. If you begin a macro in one mode, change the mode during the definition and end the definition, your keyboard will be in the second mode once the definition is complete. Your macro, however, will only be defined in the first mode, the mode in which you are not (in this scenario).

Example: You are in the Caps Lock Mode. You depress the shift, control and repeat keys simultaneously. Now you depress the shift and L keys simultaneously. You have just begun to define a shift L in Caps Lock Mode. You now depress the shift

and reset keys simultaneously. This puts you into the Lower Case Mode. You type: “Lower Case Characters” <repeat>. The <repeat> means that you have depressed the repeat key. The definition is now complete. Depressing another character, you find that you are still in the Lower Case Mode. You depress the shift L and a capital I appears on the screen. You now return the Caps Lock Mode by depressing the reset key. Depressing shift L, you find “Lower Case Characters” displayed on your screen.

Section 5.f.4 Down Loading of User Defined Keys.

It is possible to program your keyboard’s macro definitions directly from a disc file without having to enter them from the keyboard. Two programs have been provided on the Enhancer ][ Utilities Disc for this purpose: the Macro Editor [section: X.d] and the flown Load Program [section: X.e]. You may create disc files containing different macro definitions for various purposes using the Macro Editor and down load them into your keyboard anytime by using the Down Load Program. You may therefore establish a turnkey system where your keyboard will automatically be programmed by your hello program each time DOS is booted.

Note: Macros CANNOT be down loaded from disc unless the acknowledge wire has been installed [section: 5.g.1].

There are two methods of beginning the down load process. The first is by depressing the repeat and reset keys simultaneously. The second is by installing a one wire modification from pin 12 of F14 on the motherboard to the keyboard connector socket. When this is done, down loading can be done without any operator intervention (i.e. automatically). If the Enhancer I receives the signal to begin down load but the down load program is not running, the down load is aborted. however all, macro definitions are cleared.

Down loading has certain advantages over keyboard entry. You will probably become accustomed to special macros that you will want to have all the time. Down loading is a quick and easy way to enter them into your Enhancer ][. There are certain other options which normally are not available from the keyboard alone. These include the following:

i) Disable Shift Lock
ii) Lock Keyboard Mode
iii) Select Mode After Down Load
iv) Disable Auto Repeat
v) Disable Type Ahead
vi) Disable Keyboard Macro Entry & Clear
vii) Disable Auto Down Load

For more information, refer to Appendix C and section X.d.

### Section 5.f.5 Repeat Reset

Depressing the repeat and reset keys simultaneously will clear all macro definitions and produce a rub—out character to be output from the keyboard. Tt will also begin the down load process IF the down load program is running.

Note: Use of the repeat — reset to produce a rub—out character is discouraged due to the other effects.

## Section 5.g The Type Ahead suffer

The type ahead buffer is useful in many applications, especially when the microprocessor is busy with tasks other than checking the keyboard output, such as disc operations. To take full advantage of this feature, the acknowledge wire should be installed (between sockets A7 and B7 on the motherboard). The Enhancer ][ is programmed to give a pseudo type ahead buffer in the absence of this wire, however this operation is discouraged due to the possibility of data loss.

Programmer Note: The type ahead buffer may be disabled from a down load [section: 5.f.4].

### Section 5.g.1 The Acknowledge Line

Normally, when the keyboard has a character to send, it sends it. When the Apple receives a character from the keyboard, it will set a strobe. This means that programs know when a character is waiting to be read from the keyboard. The keyboard, on the other hand, does not know when that character has been processed by the Apple. To make a type ahead buffer function efficiently, it must know when the character has been read so that it can send the next character. The acknowledge wire gives this information to the Enhancer ][. Without the acknowledge wire, the Enhancer ][ has no way of knowing when the Apple has read the data off the keyboard and is ready for more.

Note: The Enhancer ][ is programmed to send characters Out at certain intervals IF the acknowledge wire has NOT been installed, in the hope that the Apple will be ready to receive the next character. Since many factors can determine when the Apple is ready for character, this method is prone to data loss. The Enhancer ][ has been programmed using techniques which will minimize data loss without causing a severe delay in overall throughput.

Installation of the acknowledge wire [section: 2.d] is neither very difficult nor time consuming The time taken to install it will pay for itself many times over and will significantly improve the reliability and efficiency of your Enhancer ][.

Note: If the acknowledge wire is not installed, macros CANNOT be down loaded from disc.

## Section 5.g.2 The Flush Buffer Commands

There are two commands which will flush (empty) the type ahead buffer. They are Reset and ^C. A flush buffer command is necessary for a number of reasons, the most significant of which is to clear the buffer once you no longer need its contents or when you believe that you may have entered garbage into it.

Control, C was chosen as a flush buffer command because of BASIC. If ^C did not flush the buffer, BASIC wouldn't see the ^C if there was any character in the buffer before the ^C and you wouldn't be able to halt program execution without a system reset. Since it might be useful to enter a C into a macro. ^C will not flush the buffer IF the ^C is PART of the macro definition.

Note: If you redefine the Control—C keyboard character to be a ^C ASCII character, depressing Control—C will not cause the buffer to be flushed (in the mode defined) since it is a macro. If that macro is cleared, ^C will once again cause a flush buffer.

Note: Changing modes, or depression of the Reset key at any time will cause the buffer to be flushed.

## Section 5.g.3 Macros

Macros use the type ahead buffer. When a macro key is struck, that macro is placed into the type ahead buffer. If the buffer is filled, the Enhancer I will wait until a character is output from the buffer before placing the next character of the macro into the buffer.

Note: If the acknowledge wire has not been installed or the type ahead buffer has been disabled, macros MAY appear not to function properly due to data loss.

Notes: If the acknowledge wire is not installed, macros CANNOT be down loaded from disc.

## Section 5.h Self Test Diagnostics

Whenever the power is turned on to your Apple ][ computer, your Enhancer ][ performs a self test. The entire test takes less than a second but is rather comprehensive. The RAM is tested and a checksum is performed on the firmware. If any fault conditions are found, the Enhancer ][ will attempt to print an error message to your screen. Naturally, there can be conditions where output of an error message is impossible.

To initiate the self test routine manually, turn your Apple ]['s power off and remove any disc controller card you may have in the system. Now turn the power on. If no error message is printed and you can enter characters into the system normally. your Enhancer ][ is probably in good working order. If an error message is printed, refer to chapter three.

Generally, if errors which are subtle in nature do occur in the Enhancer ][, they will be detected by the self test diagnostics. Gross errors will probably lock your keyboard up entirely. Therefore, if no error message is printed on power up, and your keyboard allows you to enter characters, it is very likely that it is functioning correctly. If you feel, however, that there is something wrong, refer to chapter three.

Note: The Enhancer ][‘s RAM and ROM are entirely separate from any of your Apple ][‘s memory (both RAM & ROM). You CANNOT make a memory listing of your Enhancer ][ from your Apple ][.

## Section 5.1 Dvorak Option

As lore would have it, the Dvorak keyboard layout [photo: 5.i.1] was the result of a United States government grant — the purpose of which was to find the most efficient keyboard layout possible. Apparently, the beloved QWERTY keyboard, with which the Apple ][ is blessed. was designed to actually slow the typist down. This is because the first typewriters could not type as fast as the first typists could strike the keys, causing damage to their primitive mechanisms. Thus the QWERTY layout.

The Dvorak keyboard is a keyboard in which all the vowels are located on the home row of keys. Supposedly all the other keys are placed in such a way that the most frequently used keys are easiest to get to. Proponents say that the Dvorak keyboard can be learned 2 to 4 times more quickly than the QWERTY keyboard. Typing speed is supposed to be increased by about 70%.

Since June of 1981, Videx has supported a Dvorak option for the original Keyboard & Display Enhancer and will continue this support for the Enhancer ][. An optional firmware EPROM which will remap your keyboard into the Dvorak layout may be purchased

from Videx. The user may then pull the key–caps off their keyboard and change the layout of the keys themselves.

# Chapter Six: Apple ][ Language Considerations

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# Chapter Six: Apple ][ Language Considerations

## Section 6.a Apple BASICs and DOS

In both of the Apple ]['s monitor ROMs (old and new), there is a routine that converts lower case characters to upper case characters. This routine, named CAPTST, also converts certain symbols into other characters (appendix: A). Unfortunately, CAPTST is used by most of the major input routines of the monitor, DOS and both BASICs (including BASICS INPUT statement). Most lower case characters entered into the computer will therefore be mapped into upper case characters unless CAPTST is either altered or bypassed. The Videoterm 80 column board, when active, will bypass CAPTST. The text of this section, therefore, applies only to the 40 column mode.

In this section, we will discuss software and hardware methods of bypassing or altering CAPTST. Not all methods may be used by all users. Please be careful to note any of the cautions listed for the method you choose to use.

The optimal solution for your system configuration depends upon whether or not it includes a RAM card, either Apple's Language Card or some other brand.

### Section 6.a.1 The RAM Card Solution

There are two types of RAM cards: those with on—board F8 ROMs and those without. The Apple Language Card contains this ROM. moat of the others do not.

If your card does have a socket for a 2716 EPROM to replace the PS ROM, you are advised to take advantage of this feature. Here is what it does: the on—board F8 RON completely replaces the F8 ROM on the motherboard. This means that the motherboard F8 ROM is permanently disabled. It may be removed from the system completely. If the RAM is active, both the on—board P8 RON and the motherboard P8 ROM are disabled. If you do replace the on—board F8 ROM with your own copy, your resident language can contain the Lower Case Fix. If you do not replace this ROM, your system will behave just like the RAM cards without the on—board F8 ROMs.

RAM cards without on—board F8 ROMs will not be able to implement the Lower Case Fix in the resident BASIC. You may. however, load either BASIC into the RAM card and once there, make the Lover Case Fix. The Configuration Program on the Enhancer ][ Utilities Disc will create modified FPBASIC and INTBASIC files and set the HELLO program to load one of the two BASICs into you RAM card every time you boot to that disc. When you run the configuration program [section: X.a), you should select the version of BASIC that you use the most to be loaded into the RAM card.

Note: If YOU have an Apple ][ plus system, cad you configure your hello program to load Applesoft into the RAM card, Integer BASIC will not be immediately available to you. That is, if you try to RUN an Integer BASIC file, or type in INT, you will get a LANGUAGE NOT AVAILABLE error message. To use Integer BASIC, you need to types BRUN INTBASIC. At this point, Integer BASIC is available, however Applesoft will no longer be capable of lower case input since your system will use the ROM version. To return to a Lower Case Fixed version of Applesoft. you should BRUN FPBASIC followed by an attempt to enter Integer BASIC (i.e. type INT). This has to do with the version of Applesoft at which DOS is currently looking.

## Section 6.a.2 ROM Cards

Owners of ROM cards may program and modify a 2716 EPROM to allow lower case input in both BASICs [section: A.c].

## Section 6.a.3 The Key Filter Program

There is a program on the Enhancer ][ Utilities Disc called Key Filter. Key Filter is a software method of bypassing CAPTST. It can be used to allow input of lower case characters by most programs written in either BASIC or 6502 machine language. The Key Filter program should not be used with word processors [section: 7.a].

Since the Key Filter program lives in RAM, it will take up some of your free memory — though not a great deal. It is vulnerable to attack from other programs. It can be disconnected with certain monitor, DOS and BASIC commands. It must be loaded from disc each time the power is turned on or DOS is booted. Key Filter is a good solution for many people. however, there are other solutions as well.

## Section 6.b 6502 Machine Language

When writing programs in 6502 machine code, if you do not use the Apple ][ monitor's GETLN routine (including GETLNZ & GETLN1), you should not encounter problems with lower case input. We suggest that you write your own GET LINE routine. If you should choose not to. CAPTST must be modified. The procedure is the same as that which is listed in the Apple DOS and BASICS section [section: 6.a].

The single character input routines of the monitor, namely KEYIN, RDKEY and RDCHAR have no problems inputting any ASCII character, including lower case characters.

Direct reading of the keyboard causes no problems.

## Section 6.c Pascal

Pascal has no problems with lower case letters if you are using the Videoterm 80 column card or once SYSTEM.APPLE has been modified by OUTPATCH (40 columns) [section: X.f]

## Section 6.d FORTRAN

Apple FORTRAN uses the Apple Pascal Operating System. Therefore, if you have a Videoterm or, in 40 columns, if you use a Outpatched [section: X.f] version of the SYSTEM.APPLE file (which you might be using for your Pascal discs) on your FORTRAN discs, Apple FORTRAN will have no more problems with lower case characters than Pascal does, which presumably is none. If you are having problems, refer to the Pascal section of this manual (section: 6.c]

# Chapter Seven: Other Software Considerations

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# Chapter Seven: Other Software Considerations

## Section 7..a Word Processors

Most word processors will work with the Enhancer ][. Some have a special configuration for hardware input of lower case. Some have various other Options available. This section presents some general guidelines to follow.

### Section 7.a.1 Generally

Almost all word processors have some kind of configuration program or routine. You should read your word processing system a manual to determine the various options available to you. Since each word processing system is different, we will present some of the options which are usually available and whether or not they are appropriate.

> The Enhancer ][ DOES have lower case (hardware) DISPLAY capability.
>
> The Enhancer ][ DOES have lower case (hardware) INPUT capability.
>
> The Enhancer ][ is NOT a shift wire, single wire or single wire shift mod. It does not use any game paddle port nor push button input. Answering yes to this option of ten inhibits input of upper case letters.

If your word processor does not have an option for hardware input of lover case characters, you should select the software input option (if any). Every time you go into the editor, you should select the shift lock Option OF THE WORD PROCESSOR. On some systems this is a double escape or perhaps a control C. Read you Owner's manual to find out what the command is for your system. Once your word processor is in shift lock mode, it will probably read the keyboard directly without trying to convert anything to lower case. Since the Enhancer ][ produces true upper and lower case, you should be able to use the Enhancer ][. as you normally would, to enter upper and lower case characters. How long this shift lock will last (without having to re—issue the command to invoke it) varies from word processor to word processor. It may be that whenever you re—enter the editor, you will also have to reset the shift lock mode.

### Section 7.a.2 A Note on Wordstar

The original release of Wordstar 3.0 had an option for hardware input of lower case. Unfortunately, this release contained son software errors dealing with the use of control K

and control A. MicroPro has indicated that a patch to correct this software problem will be available from MicroPro no later than November, 1981. If your version of Wordstar doesn't function properly, contact MicroPro directly.

Note: Wordstar is a registered trademark of MicroPro.

Apple CP/M is compatible with the Enhancer ][. Depending upon your system configuration, you may have to inform your CP/M system that you can display lower case characters.

If you have a Videoterm 80 column card, you will not need to perform the following operation. The normal Apple does not allow for the display of lower case characters in the 40 column mode, therefore, 40 column CP/M does not normally display lower case characters. Since the Lower Case Chip supplied with the Enhancer ][ gives your Apple lower case display capability, you will probably want to activate the lowercase display ability of the CP/M system. To do this, you will need to perform the following:

```
A> MBASIC CONFIGIO
```

The A> is, of course, the CP/M prompt. You will then be asked if you have lower case, the answer is yes. Once you exit CONFIGIO, you will be able to display lower case letters.

## Section 7.c Other Commercial Software

How friendly your software packages are to lover case characters depends upon a number of independent variables. This section will discuss some of the reasons why certain programs work or don't work, how they might he made to work and the ramifications involved.

Generally speaking, the largest single factor in determining whether a program will like lower case characters is the environment in which it lives. On the Apple ][, we have three basic environments:

i) Applesoft. Integer BASE or DOS.
ii) Pascal. FORTRAN. or any other language using the Pascal operating system.
iii) CP/M

## Chapter Seven: Other Software Considerations

### Section 7.c.1 Applesoft. Integer BASIC and DOS.

Note: The following paragraph does not apply to systems using the Videoterm 80 column card.

Programs written in Applesoft, Integer BASIC or which use the input routines of the Apple ]['s monitor generally do not like lower case letters. This is usually due to CAPTST [section: 6.a; appendix: A] a routine of the Apple monitor. If CAPTST is the root of the problem, modifying CAPTST [appendix: A] might allow lower case entry. If CAPTST is not the problem, then the software package in question probably has its own input routines. If so. then the software itself will probably have to be modified. This is usually more work than profitable.

Assuming that one cam get a program to accept lower case input, the the battle is not necessarily over. Since upper ease characters have completely different ASCII values than lower case characters, and since programs which are not designed to accept lower case input are not expecting lower case characters, it is likely that lower case characters cannot be substituted for their upper case equivalents.

Example: A program may stop and ask a yes or no question. You enter a lower case “y” in response. The program checks for an upper case “Y” only. If the response is not an upper case “Y”, it assumes the answer was no. It didn’t see an upper case “Y”. You thought you said yes, the program thought that you said no.

### Section 7.c.2 Pascal, etc.

Note: FORTRAN and other languages which use the Pascal operating system have the same restrictions as Pascal.

Once you have made the SYSTEM.APPLE patch [section: X.f] you nay enter lower case characters to your hearts content. Pascal recognizes lower case characters as legitimate commands. Again, the same problem as outlined in the example of section 7.c.1 above applies to programs written in Pascal as well.

Note: If you have a Videoterm, 80 column card in slot 3. Pascal will turn it on when you boot. With the Videoterm, you do not need to make the patches to SYSTEM.APPLE as mentioned above.

Section 7.c.3 CP/M

Any program in the CP/M or Softcard environment should be able to enter lower case letters directly from the keyboard. Naturally, CONFIGIO must be set for lower case display [section: 7.b]. Again, the restriction as illustrated in the example of section 7.c.l applies to any CP/M based program.

Note: If you have a Videoterm 80 column card in slot 3. CP/M will turn it on when you boot. With the Videoterm, you do not need to run CONFIGIO as mentioned above.

# Chapter Eight: Peripheral Considerations

Chapter Table of Contents.


8.a) Peripherals in General
8.b) Videoterm
8.c) Language Card and Other RAM Cards
8.d) Softcard (Z80)
8.e) Printers, Parallel and Serial I/O Boards
8.f) Disc Drive Controllers

# Chapter Eight: Peripherals Considerations

## Section 8.a Peripherals in General

There should be no interference between the Enhancer ][ and any peripheral. This is because the Enhancer ][ only modifies the output of the keyboard. It does not use any of the Apple's memory or other address lines. Even the wires that you installed for the type ahead buffer and the automatic down loading of the macro definitions from disc should not affect any peripheral. It is possible, however, that the software used to automatically down load the macro definitions could interfere with a device using the annunicator port number three. In this event, the Auto flown Load Disable option should be selected [section: 5.f.4].

Problems could arise if the firmware of some peripheral looked at the keyboard output for an upper case character and saw a lower case character instead. This problem may be negated by selecting Caps Lock mode.

## Section 8.b The Videoterm

The Videoterm 80 column card is completely compatible with the Enhancer ][. In fact, it can make life a lot easier since it does not try to convert lower case characters into upper case characters. The original Keyboard & Display Enhancer was originally conceived as an option for the Videoterm. but our engineers decided to make it a stand alone product which could be used in the 40 column mode as well.

Throughout this manual, you are likely to find notes indicating that use of the Videoterm 80 column card negates certain problems and negates the need for various patches.

## Section 8.c The Language Card and Other RAM Cards

There is no interference between the Enhancer ][ and any of the RAM cards available on the market. As a matter of fact, the use of a RAM card can actually be a benefit to the Enhancer ][ [sections A.d] . This is true in the 40 column Apple BASICs or DOS environments since the monitor may easily be modified to accept lower case input.

## Section 8.d Softcard (Z80)

There is no problem using the Softcard in conjunction with the Enhancer ][. If you are using the Enhancer ][ without a Videoterm 80 column card under CP/M, you will probably want to refer to section 7.b.

## Section 8.e Printers, Parallel & Serial I/O Boards

There should be no interference between the Enhancer ][ and any I/O device. This is because the Enhancer ][ only modifies the output of the keyboard, it does not use any Apple ][ RAM or addresses other than the keyboard input byte. If you are having problems with your printer or other device, it is probably a software problem.

You should keep in mind that some software may be looking for upper case characters and does not expect the input of any lower case characters [section: 7c.1]. Also, some printers cannot print lower case characters. To test your printer's capabilities, you might try the following from Applesoft:

```
]PR# <printer slot number>
]FOR DU=32 TO 127:PRINT CHR$(DU)"";:NEXT
```

Where the "]" is the Applesoft prompt (and is not typed into the computer). This should print all of the 96 printable ASCII characters that your printer cam print. If you do not see any lower case characters printed, then your printer doesn't know how to print lower case characters.

## Section 8.f Disc Drive Controllers

Generally, the Enhancer ][ should be completely compatible with any disc drive and disc drive controller. Once again, the only problem that one is likely to encounter is that the Disc Operating System is likely not to be able to understand lower case characters (section: 7.c.1].

## Appendix A: The lower Case Fix

While the Enhancer ][ turns your Apple Vs keyboard into a full ASCII keyboard, not all programs will be able to read lower case letters and certain special symbols, i.e. ASCII characters with an ASCII value greater than $E0 (224 decimal). This is because the routine CAPTST always subtracts $20 (32 decimal) from ASCII characters greater than $E0 (224 decimal). To input lower case characters directly from the keyboard. CAPTST must either be modified or bypassed. This appendix deals with some of the solutions which are possible.

Note: Use of the Videoterm 80 column board (or any environment other than Apple DOS or BASIC, e.g. Pascal, FORTRAN or CP/M) will bypass CAPTST.

There are basically four groups of system configuration:

i) No card in slot zero (neither a RAM nor ROM card)
ii) A ROM card in slot zero (either Applesoft or Integer BASIC)
iii) An Apple RAM card (i.e. a Language Card) or other RAM card with an on board F8 ROM
iv) A non—Apple RAM card (i.e. without the on hoard F8 ROM)

Note: This appendix explains how to create a binary file that can be used to program a 2716 EPROM. The 2716 nay be plugged into any Apple Language Card. A 2716 EPROM is strongly recommended for those who are able to take advantage of this tact. A method of modifying a 2716 EPROM to plug directly into the on—board ROM sockets is also described. Extreme caution is urged when using a MODIFIED 2716 EPROM as damage to the computer or it's peripherals could result if it is improperly implemented.

### Section A.a CAPTST

CAPTST itself looks something like this:

```
FD7E:C9   E0      CAPTST CMP #$E0       ;Greater than $E0 ?
FD80:90   02             BCC FD84       ;No, Jump to next part
FD82:29   0F             AND #$DF       ;Yes, Convert to CAPS
FD84: ...
```

While several fixes are possible, we suggest a change in the third instruction:

```
FD82: 29 FF       AND, #$FF      ;Yes, Do nothing
```

An AND with $FF will, of course, do nothing at all. To do this, we need to change the byte at $FD83 — not $FD82 — from a $DF to an $FF.

## Section A.b Implementation

The Key Filter program [section: X.f] is a software method which will work for all system configurations, however it will not work with all programs. Aa with any program located in RAM, it is volatile and can be disconnected or destroyed. Other alternatives should be examined before deciding to rely on the Key Filter program. Likewise, the Key Filter program should be reviewed since it has some extra features. The Key Filter program is completely compatible with the methods of this appendix. Systems with ROM cards (either Applesoft or Integer) nay program end modify a 2716 EPROM to replace the motherboard FS ROM [section: A.c]. RAM card owners will find a number of solutions, depending upon their needs and exact system configuration [section: A.d].

## Section A.c The ROM Card Solution

Applesoft cards and Integer BASIC cards are the same except for the ROMs they come with. There is a single set of solder pads labeled F8 near the bottom of the card, toward the left of center. If this pad does not have a solder bridge across it, the F8 socket on the motherboard will always be active. Therefore, a modified 2716 EPROM [section: A.f] nay be used in this socket. This solution will then allow direct entry of lower case characters in both Applesoft and Integer BASIC.

Warning: If a modified 2716 EPROM is placed in the FS socket on the motherboard, care should, be exercised at all times to ensure that the F8 solder pad is never bridged end that a RAM card is never used while the modified 2716 EPROM is in any socket on the motherboard. Failure to observe this restriction may result in permanent damage to your Apple ][ or any of it’s peripherals. It is therefore suggested that labels reminding you of this be placed on the modified 2716 EPROM. the ROM Card and the RAM chip at socket location E3 on the motherboard.

Note: It is strongly suggested that the F8 ROM which would be replaced by the modified 2716 EPROM be kept and stored in conductive foam, a metal box or some aluminum foil to prevent damage from static electricity.

Appendix A: The Lower Case Fix

Section A.d The RAM Card Solution

There are a number of solutions available for RAM card systems. The optimal would be an Apple Language Card with your own 2716 EPROM on—board. This would allow easy implementation of the patches to CAPTST in both Applesoft and Integer BASIC. Things can become a little more complex if your RAN card does not have an onboard 2716 EPROM. Let us now examine both of these cases to see what cam be done and how it may be done.

RAM cards duplicate the area of memory used by the on—board ROMs. This includes the F8 monitor ROM. Normally, when the resident language is being used, the ROMs on the motherboard are active and the RAM card is totally disabled. Likewise, when the non—resident language is being used, the RAM card is active and the motherboard ROMS are completely disabled.

Note: In the case of the Apple ][ Language Card, the motherboard F8 ROM is always disabled. It is always replaced by the RON on—board the RAM card. That is. when the motherboard ROMs are active, the ROM on—board the RAM card is also active (replacing the disabled F8 ROM on the motherboard). when the RAM is active, all the ROMs are disabled (including the on—board RAM) and the F8 area in RAM is active.

Section A.d.1 Apple Language Cards

Since the on—board ROM completely replaces the motherboard F8 ROM. and since this ROM may be configured for a 2716 EPROM. one may make the changes necessary in the monitor and program a 2716 so that the resident language will have lower case capability. The non—resident language poses little problem since it is contained in RAM and stored on disc. It may therefore be easily modified and saved.

Note: If you do not intend to program a 2716 EPROM for use on your Apple ][ Language Card, you will not be able to modify the resident BASIC language (i.e. Applesoft on an Apple ][ plus). You should therefore refer to the procedure for RAM cards without the on—board F8 ROM.

Section A.d.1.1 Installing the 2716 EPROM

To use the programmed 2716 EPROM on the Language Card, you will need to configure the card for a 2716. If you examine the board, you will find a single pair of solder pads located near the top right corner labeled 2716. You should place a solder bridge across these pads, completing the circuit. Further examination should yield an etched symbol which looks something like two arrow heads meeting head on, or like the silhouette of art hour glass, near the bottom center of the board. The

connection between the two triangles must be severed. Once both of these steps have been performed, the Language Card is configured for a 2716 EPROM.

The next step is to carefully replace the on—board ROM in the socket on the Language Card with the 2716 EPROM. The notched end of the EPROM should point toward the top of the board (as silk screened) You should ensure that the window portion of the EPROM has some kind of label over it to prevent program erasure.

## Section A.e Row to Modify the Monitor Without a RAM Card

Modifications for Old Monitor ROM are NOT the same as those for the Autostart Monitor ROM. If you do not know which monitor ROM you have, perform this simple test. Turn your power off and turn it back on. If your disc drives start to boot or you see either the Applesoft or Integer BASIC prompt or you see APPLE ][ at the top of the screen, you have the Autostart Monitor, otherwise you should see a screen full of garbage with a monitor (asterisk) prompt at the lower left hand edge of the screen.

## Section A.e.1 Modifying the Autostart Monitor

Boot DOS. From either BASIC, type: CALL —151 <cr> to get into the monitor. Now type the following:

```
800<F800.FFFFM <Cr>
800:4A 08 20 <cr>
BB3:C9 E0 B0 5 29 3F 9 40 60 29 1F 60 <Cr>
D11:20 B3 FB EA <Cr>
D83:FF <Cr>
```

If you want a solid cursor, type: BBA:00 <Cr> Now type:

```
BSAVE MONITOR,A$800,L$800
```

This now completes the modifications to the monitor code.

## Section A.e.2 Old Monitor ROM

Boot DOS. From either BASIC, type: CALL —151 <Cr> to get into the monitor. Now type the following:

```
800<F800.FFFFM <Cr>
D83:FF <Cr>
```

If you want a solid cursor, type: D14:00 *<Cr>*

Now type:

```
BSAVE MONITOR,A$800,L$800
```

This now Completes the modifications to the monitor code.

## Section A.f Modifying a 2716 EPROM

Warning: The following modification should never be used in conjunction with a RAM card. Doing so could cause damage to your RAM card.

Note: Apple ][ Language Cards can be configured for unmodified 2716 EPROMs.

To allow the 2716 to be plugged directly into a ROM socket on the Apple ][ motherboard (i.e. a socket which CANNOT be configured for a 2716 EPROM), you will need to make the following modifications to the EPROM AFTER it has been burned:

Place a jumper wire between pins 12 and 18. Place another jumper wire between pins 21 and 24. These jumper wires should be soldered into place. Bend pins 18 and 21 up flat next to the bottom of the chip so that the pins do not go into the motherboard socket.

Naturally, you will want to place some kind of label over the window portion of the chip to prevent it from being erased.

Note: The pins are numbered from 1 to 24 on a 2716. One end of the chip will have a notch, dot or depression. Placing this at the twelve o'clock position with the top (window) side up, pin one is the first pin to the left (counter—clockwise). The pins are numbered counter—clockwise around the chip. Pin 24 is directly opposite pin 1.

## Appendix B: Lower Case Display

### Section B.a Revision 0 through 6 Apples

The Enhancer ][ may be used on revision 0 through 6 Apples with certain restrictions. Since the Enhancer ][ replaces the keyboard encoder board, the keyboard must be the piggyback style. Though revision 0 through 6 Apples usually don't have this style of keyboard, the user may purchase one from Apple WITHOUT the encoder board — and install it on their system. Older style keyboards may be used on the newer machines and vice versa.

The other problem that one faces is that of lower case display. The Lower Case Chip CANNOT be used with revision 0 through 6 Apples. Here are some solutions:

i) Use the Videoterm 80 column card. It is capable of displaying lower case characters in the 80 column mode.

ii) Modify the an old Keyboard & Display Enhancer I to be a display only device [section: B.b]

iii) Use some other revision 0 through 6 Apple 40 column lower case display device

Note: This manual assumes that you have a revision 7 or greater Apple. If you have a revision 0 through 6 Apple, all references to lower case display (in 40 columns) does not apply unless you have implemented options ii or iii above.

### Appendix B.b How to Modify Your Old Enhancer for Display Only

Note: This section is applicable only to Revision 0 through 6 motherboards only.

This section addresses a modification which can be made to the original Keyboard & Display Enhancer to turn it into a display only device. This will allow the Keyboard & Display Enhancer the be used as a 40 column lower case character generator and the Enhancer ][ to be used as normal. The Enhancer ][ will, of course, have to be installed on a piggyback style keyboard.

All of these modifications nay be made on the back side of the Keyboard & Display Enhancer. The first step is to disable the control and shift key inputs. To do this we need only one piece of wire not much longer than 6 centimeters (approximately 2 inches). This may be a bare wire of just about any thickness. Wire wrap wire will do just fine. Referring to page A—4 of the Keyboard & Display Enhancer Owner's Reference Manual, you should see the 6 fingered Molex connector jack to the right of the

board in the photograph. Pins 1 and 3 must both be connected to ground (i.e. Pin 7 of 1J6). You say connect all six pins to ground, if you like.

The next step is to jumper the normally no—connections from the keyboard socket to the keyboard header going to the A7 socket on the motherboard. There are only two that we will need. One is for the type ahead buffer, the other for the automatic down loading of macro definitions. Simply jumper Pin 9 of P3 to Pin 9 of J1 and Pin 4 of P3 to Pin 4 of J1.

Note: You should place a piece of paper inbetween the two Enhancers to prevent electrical contact. A standard piece of note book paper will probably due the job nicely.

## Appendix C: Down Load Technical Data

The data transmitted to the keyboard during down load is of the following format:

| byte | name | function |
|---|---|---|
| 0 | status. | Selects down load options |
| 1&2 | pntend | Pointer to end of table (Low byte, high byte) |
| All other bytes | macdef | Macro definition (format below) |
| Last Byte | tabend | End of Table (must be zero) |

Where STATUS is of the following format:

| | | | |
|---|---|---|---|
| 0 | $0 | BitC: | Disable Shift Lock |
| 2 | $2 | Bit1: | Lock Keyboard Mode |
| 4 | $4 | Bit2: | Select Lower Case Mode after flown Load |
| 8 | $8 | Bit3: | Disable Auto Repeat |
| 16 | $10 | Bit4: | Disable Type Ahead |
| 32 | $20 | Bit5: | Disable Macro Entry & Clear from Keyboard |
| 64 | $40 | Bit6: | Lock Out Auto Down Load |
| 128 | $80 | Bit7: | Unused |

If any given bit is on, that option is selected. If Bit 2 Is off, Caps Lock Mode is selected after down load. If Bit 6 is on, down load is disabled and it is impossible to change any of the above conditions until the system has been powered off.

PNTEND is equal to the number of bytes in MACDEF + 1.

Where MACDEF (macro definition) is in the following format:

| byte | name | function |
|---|---|---|
| 0 | mcsib | Contains information on mode, control & shift keys |
| 1 | matrx | Location on key map |
| All other bytes | macro | ASCII values of macro definition, high bit set |

Appendix C: Down load Technical Data

MCSIB is a value from 0 to 7. If MCSIB is in the range of 0 to 3, the macro being defined is in Caps lock Mode. If MCSIB is in the range of 4 to 7, the macro is defined in lower Case Mode. The following table define MCSIB:

| | Caps lock Mode | Lower Case Mode |
|---|---|---|
| Alone | 0 | 4 |
| Control | 1 | 5 |
| Shift | 2 | 6 |
| Control — Shift | 3 | 7 |

Matrx is the location in the keyboard matrix. This table lists the values in both decimal and hexadecimal:

| Decimal: | 0 | 16 | 32 | 48 |
|---|---|---|---|---|
| Hex: | $00 | $10 | $20 | $30 |
| 0 $0 | 3 | U | C | |
| 1 $1 | 4 | I | V | Return |
| 2 $2 | 5 | O | B | |
| 3 $3 | 6 | P | N | |
| 4 $4 | 7 | D | M | |
| 5 $5 | 8 | F | , | |
| 6 $6 | 9 | G | . | |
| 7 $7 | 0 | H | / | |
| 8 $8 | : | J | S | |
| 9 $9 | - | K | 2 | |
| 10 $A | Q | L | I | |
| 11 $B | W | ; | Escape | |
| 12 $C | E | Left Arrow | A | |
| 13 $D | R | Right Arrow | Space Bar | |
| 14 $E | T | Z | | |
| 15 $F | Y | X | | |

## Appendix V: Tech's Installation Checklist

These are the tools required to install the Enhancer ][:

i) Phillips screwdriver
ii) PIiers (preferably needle—nose)
iii) Wire cutters
iv) Wire stripper

( ) Unplug the Apple and remove all the cards from the slots.

( ) Remove the case from the bottom of the Apple.

( ) Replace the chip in socket A—5 with the one marked 'Lower Case

( ) Remove the piggyback board from the keyboard.

( ) Transfer the 16 pin cable to the equivalent socket on the Enhancer ][.

( ) Now, look at the underside of the keyboard; On some Apples there will be a metal stiffener bar across the back of the keyboard; a strip of insulating material should be placed over the edge of this bar so that when the Enhancer ][ is installed, no bare metal touches it.

( ) Look mow at the plastic spacers that held the piggyback board on. The right spacer (the one further from the side of the Apple) must be rotated 90 degrees so its flanges are parallel to the edge of the keyboard [photo: 2.13}.

( ) Install tine Enhancer ][ on the keyboard in place of the piggyback board you removed.

( ) Optional: Install a wire leading from pin 5 of socket B—7 to pin 9 of the keyboard cable socket. This enables the type—ahead buffer.

( ) Optional: Install another wire leading from pin 12 of. socket F—14 to pin 4 of the keyboard table socket and
( ) REMOVE THE BLUE SHORTING PLUG FROM PIN 5 OF THE MOLEX CONNECTOR [photo: 2.11]. This enables totally automatic downloading of key redefinitions.

( ) Place the case of tile Apple back on its base, being careful not to crush the keyboard cable plug.

( ) Plug the keyboard cable connector into its socket, making sure that pin one of the cable enters hole number one of the socket.

( ) Reinstall two of the screws immediately under the keyboard, but don't bother replacing the washers.

( ) Proceed to the installation checkout section. If everything checks out ok, complete the re—assembly of the Apple ][(with the power off), else refer to Chapter 3.

End of installation.

# Appendix W: Specifications

Microprocessor: 6504 (uses the 6502 instruction set)
RAM: 1K static (low power)
Firmware ROM: 2716 EPROM
Dimensions: 16.1 cm by 7.4 cm
Technology: LS TTL, MOS, and CMOS
Type ahead buffer: 128 characters
Auto repeat: approximately 15 characters per second
Fast repeat: approximately 50 characters per second
Installation: replaces keyboard encoder board
Control — Reset protection: plug/jumper selectable
Key redefinitations: down loadable from disc
Memory for macro definitions: 1/2 K (up to 170 single character macros)
Self test diagnostics: RAM test & ROM checksum, automatic on power up.

Specifications are subject to change without notice.

# Appendix X: Supporting Software

## Section X.a The Configuration & Hello Programs

The Configuration & Hello Programs run, for the most part, automatically. When run the first time, the Hello program will call one of the configuration programs. The configuration programs request that you insert a DOS system master diskette. This is to load in the FPBASIC and INTBASIC files, modify them [appendix: A] with the Lower Case Fix and save them on the Enhancer ][ Utilities Disc.

The configuration program will ask you whether you want to load Integer BASIC or Applesoft in the RAM card. You should respond with the BASIC that you plan to use the most. (If you have a RAM card with an on—board F8 ROM and you have burned your own 2716 EPROM monitor ROM, then you should respond with the BASIC that is not resident.)

There are two Hello programs on the disc. One is in Applesoft, the other in Integer BASIC. The Applesoft program is named hELLO. The DOS is set to boot to this file. The Integer file is named APPLESOFT. If you boot this disc on an Integer system, DOS will attempt to load in HELLO, but since it is in Applesoft, it will attempt to Load Applesoft into the system from a file named APPLESOFT. Therefore, regardless of what kind of ROMs you have, the appropriate file will be run upon boot—up.

Line 10 of the Hello program controls what the program will do when booted. If it is missing, the configuration program is called. Otherwise, line 10 will set the variable I equal to 1, 2 or 3. If it is 1, Key Filter is run. If it is 2, Integer BASIC is loaded into the language card. If it is 3, Applesoft is selected (to be loaded into the language card).

Note: The configuration programs produce super fast loading FPBASIC and INTBASIC files.

```
]LIST

5 POKE 216,0: TEXT :PRINT :HOME :POKE — 23112,129: POKE — 23104,128
      : REM CHANGE DOS TO SELECT NON RESIDENT BASIC FIRST
15 PRINT “DOS VERSION 3.3": IF LEN (J$) THEN PRINT CHR$ (4)”BRUN”J$
20 PRINT :PRINT "Apple II plus
                                                    Loading";

25 ON I GOTO 50,100,150
30 PRINT “Configuration program”
40 PRINT CHR$ (4)”RUN CONFIGURE.A”
50 PRINT “Keyfilter”
60 PRINT CHR$ (4)”BRUN KEYFILTER"
70 PRINT CHR$ (4)”FP”
100 PRINT “Integer into Language card”
120 PRINT CHR$ (4)”BRUN INTBASIC”
140 END
150 PRINT “Applesoft into Language card”
170 PRINT CHR$ (4)”BRUN FPBASIC”
180 POKE 49280,0
190 END

]
```

```
10 I = 2
20 REM
30 POKE 768,0: POKE 769,173: POKE 770,0: POKE 771,224: POKE 772,72: POKE
     773,173: POKE 774,129: POKE 775,192, POKE 776,104:
40 POKE 777,72: POKE 778,205: POKE 779,0: POKE 780,224: POKE 781,208: POKE
     782,35: POKE 783,173: POKE 784,131: POKE 785,192:
50 POKE 786,173: POKE 787,131: POKE 788.192: POKE 789,169: POKE 790,165:
     POKE 791,141: POKE 792,0: POKE 793,208: POKE 794,205:
60 POKE 795,0: POKE 796,208: POKE 797,208: POKE 798,19: POKE 799,74: POKE
     800,141: POKE 801,0: POKE 802,208: POKE 803,205:
70 POKE 804,0: POKE 805,208: POKE 806.208: POKE 807,10: POKE 808,173: POKE
     809,129: POKE 810,192: POKE 811,173: POKE 812,129:
80 POKE 813,192: POKE 814,169: POKE 815,1: POKE 816,208: POKE 817,2: POKE
     818,169: POKE 819,0: POKE 820,141: POKE 821,0:
90 POKE 822,3: POKE 823,104: POKE 824,205: POKE 825,0: POKE 826,224: POKE
     827,240: POKE 828,3: POKE 829,173: POKE 830,128:
100 POKE 831,192: POKE 832,96:
110 CALL 769
120 IF PEEK (768) < >1 THEN I = 1: GOTO 280
130 REM
140 PRINT : PRINT "Language card found"
150 PRINT : INPUT "Insert DOS 3.3 Master diskette ";A$
160 PRINT CHR$ (4)"BLOAD INTBASIC,A$2000": PRINT CHR$ (4)"BLOAD FPBASI
     C ,A$5000"
170 POKE 19379,201: POKE 19380,224: POKE 19381,176: POKE 19382,5: POKE 1
     9383,41: POKE 19384,63: POKE 19385,9: POKE 19386,64
180 POKE 19387,96: POKE 19388,41: POKE 19389,31: POKE 19390,96: POKE 197
     29,32: POKE 19730,179: POKE 19731,251: POKE 19732,234: POKE 19843,25
     5
190 POKE 31667,201: POKE 31668.224: POKE 31669,176: POKE 31670,5: POKE 3
     1671,41: POKE 31672,63: POKE 31673,9: POKE 31674,64
200 POKE 31675,96: POKE 31676,41: POKE 31677,31: POKE 31678,96: POKE 320
     17,32: POKE 32018,179: POKE 32019,251: POKE 32020,234: POKE 32131,25
     5
210 PRINT : INPUT "Insert Enhancer Utility diskette ";A$
220 PRINT CHR$ (4)"BLOAD BASIC": PRINT CHR$ (4)"BSAVE INTBASIC,A$1F04,
     L$30FB": PRINT CHR$ (4)"BSAVE INTBASIC,A768,L108": PRINT CHR$ (4)"
     BSAVE FPBASIC,A$4F04,L$30FB": PRINT CHR$ (4)"BSAVE FPBASIC,A768,L10
     8"
230 GOTO 500
300 PRINT : PRINT : PRINT : PRINT : PRINT CHR$ (4)"OPEN CONFIG"
310 PRINT CHR$ (4)"WRITE CONFIG"
320 PRINT "LOAD HELLO"
330 PRINT "10 I="I":J$=" CHR$ (34)A$ CHR$ (34)
340 PRINT "SAVE HELLO"
350 PRINT "RUN"
360 PRINT CHR$ (4)"CLOSE"
370 PRINT CHR$ (4)"EXEC CONFIG"
380 END
500 PRINT : PRINT : PRINT "Select one:"
510 PRINT : PRINT "1 Load Integer into Language card"
520 PRINT : PRINT "2 Load Applesoft into Language card"
530 VTAB PEEK (37) — 4: HTAB 12
540 GET A$:I = VAL (A$) + 1: IF I < > 2 AND I < > 3 THEN 540
550 VTAB PEEK (37): HTAB 1: INPUT "Enter Macro file to download
        or, RETURN for none ";A$
560 GOTO 300
```

## Section X.b The Key Filter Program

There is a program on the Enhancer ][ Utilities DISC called Key Filter. Key Filter is a software method of bypassing CAPTST. It can be used to allow input of lower case characters by most programs written in either BASIC or 6502 machine language. The Key Filter program should not be used with word processors (section: 7.a)

Since the Key Filter program lives in RAM, it will take up some of your free memory — though not a great deal. It is vulnerable to attack from other programs. It can be disconnected with certain monitor, DOS and BASIC commands. It must be loaded from disc each time the power is turned on or DOS is booted. Key Filter is a good solution for many people, however, there are other solutions which we shall discuss in subsequent sections.

### Section X.b.1.1 Installing Key Filter

The disc which accompanies your Enhancer ][ contains a copyable version of Key Filter. You may relocate the Key Filter program by running the program FID on your DOS 3.3 system master disc or by inserting the Enhancer ][ Utilities Disc in one of your disc drives and issue the following DOS command:

```
BLOAD KEY FILTER,A$800
```

To save it onto another disc, place the destination disc into your disc drive and type:

```
BSAVE KEY FILTER,A$800,L$ <unknown>
```

If you wish to save Key Filter on more than one disc, you may repeat the second step above without having to reload Key Filter from the Enhancer ][ Utilities Disc.

### Section X.b.1.2 Using Key Filter

To use Key Filter, the DOS commands:

```
BRUN KEY FILTER
FP or INT
```

should be issued. This will cause Key Filter to be loaded into memory and set up all the necessary vectors.

Note: The Hello program on the Enhancer ][ Utilities Disc will configure itself to automatically load in Key Filter if you do not have a language card. If you do have a language card but wish to have Key Filter loaded in each time you boot, change line ten of the Hello program as follows:

```
10 I = 1
```

After you make this change, you should save the program.

Note: If you have an Apple ][plus, the name of your Hello program should be: HELLO. If you have Integer BASIC in ROM (non—plus systems), the name of your Hello program should be: APPLESOFT.

Note: If you Want to reconfigure the HELLO program, remove line ten from the program by typing:

```
10 <Cr>
```

Issuance of the PR#nl and IN#n2 commands, or the equivalent monitor commands, where n1 and n2 are integer values between 0 and 7 inclusive (e.g. PR#0:IN#0) will disconnect Key Filter. If Key Filter becomes disconnected, it may be reconnected with a control reset (Autostart ROM only), by a & command from Applesoft, a 3F5G from the monitor or by a CALL 1013 from either BASIC.

Example:

```
*3F5G
```

or

```
]&
```

or

```
>CALL 1013
```

```
                    6   ******************************
                    7   *                            *
                    8   *   ENHANCER INTERFACE        *
                    9   *                            *
                   10   * SOFTWARE 2.0                *
                   11   *                            *
                   12   * 10/31/1981   11:30          *
                   13   *                            *
                   14   ******************************
                   15   *
                   16   *
                   17   BASL      EQU  $28
                   18   PROMPT    EQU  $33
                   19   CSWL      EQU  $36
                   20   KSWL      EQU  $38
                   21   A1L       EQU  $3C
                   22   A1H       EQU  $3D
                   23   A2L       EQU  $3E
                   24   A2H       EQU  $3F
                   25   A4L       EQU  $42
                   26   A4H       EQU  $43
                   27   IN        EQU  $200
                   28   RSVECL    EQU  $3F2
                   29   RSVECH    EQU  $3F3
                   30   AMPER     EQU  $3F5
                   31   DEST      EQU  $9300
                   32   KEYIN     EQU  $FD1B
                   33   COUT1     EQU  $FDF0
                   34   MOVE      EQU  $FE2C
                   35   *
                   36       OBJ   $6000
                   37       ORG   $6000
                   38   *
                   39   ******************************
                   40   *                            *
                   41   *   RELOCATE KEYFILTER       *
                   42   *                            *
                   43   ******************************
                   44   *
6000: A9 9A        45   RELOCATE LDA  #$9A
6002: 8D 01 9D     46            STA  $9D01
6005: A9 00        47            LDA  #<DEST
6007: 85 42        48            STA  A4L
6009: A9 93        49            LDA  #>DEST
600B: 85 43        50            STA  A4H
600D: A9 25        51            LDA  #<START
600F: 85 3C        52            STA  A1L
6011: A9 60        53            LDA  >START
6013: 85 3D        54            STA  A1H
6015: A9 4F        55            LDA  $<END
6017: 85 3E        56            STA  A2L
6019: A9 61        57            LDA  #>END
601B: 85 3F        58            STA  A2H
601D: A0 00        59            LDY  #$00
601F: 20 2C FE     60            JSR  MOVE
6022: 4C 00 9B     61            JMP  DEST
                   62   *
                   63   ****************************
```

```
                    64  *                           *
                    65  *       START UP ROUTINE    *
                    66  *                           *
                    67  ****************************
                    68  *
                    69  START   ORG  DEST
                    70  *
9B00: 20 2A 9B      71  STARTUP JSR  INITIAL
9B03: A9 4C         72          LDA  #$4C   ESTABLISH & AND RESET VECTORS
9B05: 8D F5 03      73          STA  AMPER
9B08: A9 00         74          LDA  #<STARTUP
9B0A: 8D F6 03      75          STA  AMPER+1
9B0D: A9 9B         76          LDA  #>STARTUP
9B0F: 8D F7 03      77          STA  AMPER+2
9B12: A9 24         78          LDA  #<RESTART
9B14: 8D F2 03      79          STA  RSVECL
9B17: A9 9B         80          LDA  #>RESTART
9B19: 8D F3 03      81          STA  RSVECH
9B1C: 49 A5         82          EOR  #$A5
9B1E: 8D F4 03      83          STA  RSVECH+1
9B21: 4C EA 03      84          JMP  $3EA
                    85  *
9B24, 20 2A 93      86  RESTART JSR  INITIAL
9B27: 4C D0 03      87          JMP  $3D0
                    88  *
                    89  ****************************
                    90  *                           *
                    91  *       INITIALIZATION      *
                    92  *                           *
                    93  ****************************
                    94  *
9B2A: A9 4C         95  INITIAL LDA #<KEYIN1 ; CHANCE INPUT AND OUTPUT HOOKS
9B2C: 85 38         96          STA KSWL
9B2E: A9 93         97          LDA #>KEYIN1
9B30: 85 39         98          STA  KSWL+1
9B32: A9 03         99          LDA  #<COUT2
9B34: 85 36        100          STA  CSWL
9B36: A9 9C        101          LDA  #>COUT2
9B38: 85 37        102          STA  CSWL+1
9B3A: A9 00        103          LDA  #$00     ; INITIALIZE VARIABLES
9B3C: SD 24 9C     104          STA  XSAVE
9B3F: 8D 25 9C     105          STA  YSAVE
9B42: 8D 26 9C     106          STA  OLDCHAR
9B45: 8D 27 9C     107          STA  FLAGS
9B48: 8D 28 9C     108          STA  ESCFLG
9B43: 60           109          RTS
                   110 *
                   111 ****************************
                   112 *                           *
                   113 *     INPUT ENTRY POINT     *
                   114 *                           *
                   115 ****************************
                   116 *
9B4C: 8E 24 9C     117 KETIN1  STX  XSAVE    ; SAVE K
9B4F: 48           118          PHA
9B50: C9 E0        119          CMP #$E0      ; FIX LOWER CASE CURSOR
9B52: 90 04        120          BLT SKIP1
9B54: 29 1F        121          AND #$1F
```

```
9B56: 91 28       122             STA  (BASL),Y
9B58: E0 00       123  SKIP1      CPX
9B5A: F0 lA       124             BEQ            ; IF ZERO ASSUME GETLN
9B5C: CA          125             DEX
9B5D: AD 26 9C    126             LDA            ; GET LAST CHARACTER FROM GETLN
9B60: C9 88       127             CMP            ; IF BS ASSUME GETLN
9B62: F0 12       128             BEQ  GETLN
9B64: DD 00 02    129             CMP  IN,X
9B67: F0 0D       130             BEQ  GETLN
9B69: 29 DF       131             AND  #$DF
9B6B: DD 00 02    132             CMP  IN,X      ; IF SAME AS CHARACTER IN INPUT
9B6E: D0 28       133             BNE  NTGETLN   ; BUFFER THEN ASSUME GETLN
9B70: AD 26 9C    134             LDA  OLDCHAR   ; GET LAST CHARACTER FROM GETLN
9B73: 9D 00 02    135             STA  IN,X      ; FIX INPUT BUFFER
9B76: 38          136  GETLN      SEC            ; SET GETLN FLAG
9B77: 6E 27 9C    137             ROR  FLAGS
9B7A: 68          138             PLA
9B7B: AE 24 9C    139             LDX  XSAVE
9B7E: 20 lB FD    140             JSR  KEYIN     ; GET CHARACTER FROM KEYBOARD
9B81: 2C 28 9C    141             BIT  ESCFLG
9B84: 30 2C       142                  ESC1      ; IF LAST KEY WAS ESC THEN FINISH IT
 UP
9B86: C9 95       143             CMP  #$95      ; CHECK FOR COPY KEY
9B88: D0 02       144             BNE  NOTPICK
9B8A: B1 28       145             LDA  (BASL),Y  ; GET CHARACTER FROM SCREEN
9BSC: C9 9B       146  NOTPICK    CMP  #$9B      ; CHECK TO ESCAPE
9B8E: F0 17       147             BEQ  ESC       ; BEGIN ESC SEQUENCE
9B9O: 8D 26 9C    148             STA  OLDCHA; IF CR THEN FIX INPUT BUFFERR
9B93: C9 8D       149             CMP  #$8D
9B95: F0 3E       150             BEQ  FIXBUFF
9B97: 60          151             RTS
9B98: 68          152  NTGETLN    PLA
9B99: AE 24 9C    153             LDX  XSAVE
9B9C: 20 lB FD    154             JSR  KEYIN     ; GET CHARACTER FROM KEYBOARD
9B9F: 48          155             PHA
9BA0: A9 00       156             LDA  #$00
9BA2: 8D 26 9C    157             STA  OLDCHAR
9BA5: 68          158             PLA
9BA6: 60          159             RTS
                  160  *
9BA7: 48          161  ESC        PHA
9BA8: A9 88       162             LDA  #$88
9BAA: 8D 28 9C    163             STA  ESCFLG    ; SET ESCAPE FLAG
9BAD: 8D 26 9C    164             STA  OLDCHAR   ; AND OLDCHAR
9BB0: 68          165             PLA
9BB1: 60          166             RTS
                  167  *
9BB2:  8C 25 9C   168  ESC1       STY  YSAVE     ; SAVE Y
9BB5: C9 E0       169             CMP  #$E0      ; MAKE UPPER CASE FOR ESCAPE FUNCTION
N
9BB7: 90 02       170             BLT  SKIP
9BB9: 29 0F       171             AND  #$DF
9EBB: A0 03       172  SKIP       LDY  #$03      ; CHECK FOR TYPE OF ESCAPE FUNCTION
9BBD: D9 Dl 9B    173  LOOP       CMP  XTBL,Y
9BC0: F0 06       174             BEQ  ESC2
9BC2: 88          175             DEY
9BC3: 10 F8       176             BPL  LOOP
9BC5: 4E 28 9C    177             LSR  ESCFLG
```

```
9BC8: A0 88      178  ESC2       LDY #$88
93CA: SC 26 9C   179             STY OLDCHAR
9BCD: AC 25 9C   180             LDY YSAVE
93D0: 60         181             RTS
9BD1: C9 CA CB
9BD4: CD         182  XTBL       HEX C9CACBCD
                 183  *
                 184  *
 48              185  FIXBUFF    PHA             ;CONVERT LOWER CASE TO UPPER CASE
 A5 33           186             LDA PROMPT      ;EXCEPT THOSE WITHIN QUOTES
 C9 BE           187             CMP # ">"       ;OR INPUTS WITHOUT > OR ] PROMPTS
 93DA: F0 04     188             BEQ GOOD
9BDC: C9 DD      189             CMP #"]"
9BDE: D0 26      190             BNE FIXEXIT     ;PROMPT DOESN'T MATCH, EXIT
9BE0: A2 00      191  GOOD       LDX #$00
9BE2: 8E 29 9C   192             STX QTEFLG      ;CLEAR QUOTE FLAG
9BE5: BD 00 02   193  FIXLOOP    LDA IN,X        ;GET CHARACTER
9BE8: C9 A2      194             CMP #$A2        ;IF QUOTE THEN FLIP QUOTE FLAG
9BEA: D0 06      195             BNE NTQTE
9BEC: 4D 29 9C   196             EOR QTEFLG
9BEF: 8D 29 9C   197             STA QTEFLG
9BF2: 2C 29 9C   198  NTQTE      BIT QTEFLG      ;CHECK FOR CONVERSION
9BF5: 30 0C      199             BMI NEXTIN      ;NO, SKIP TO NEXT
9BF7: BD 00 02   200             LDA IN,X        ;CONVERT TO UPPER CASE
9BFA: C9 E0      201             CMP #$EO
9BFC: 90 05      202             BLT NEXTIN
9BEE: 29 DF      203             AND #$DF
9C00: 9D 00 02   204             STA IN,X
9C03: E8         205  NEXTIN     INX             ;CONTINUE TO END OF BUFFER
9C04: D0 DF      206             BNE FIXLOOP
9C06: 68         207 FIXEXIT     PLA
9C07: AE 24 9C   208             LDX XSAVE
9C0A: 60         209             RTS
                 210  *
                 211  ********************************
                 212  *                              *
                 213  *       OUTPUT ENTRY POINT     *
                 214  *                              *
                 215  ********************************
                 216  *
9C0B: 8C 25 9C   217  COUT2      STY YSAVE
9C0E: AC 27 9C   218             LDY FLAGS       ;CHECK GETLN FLAG
9C11: 10 08      219             BPL DONE        ;IF CLEAR THEN SKIP
9C13: AC 26 9C   220             LDY OLDCHAR     ;GET LAST CHARACTER FROM GETLN
9C16: C0 20      221             CPY #$E0        ;IF IT IS LOWER CASE THEN USE IT
9C18: 90 01      222             BLT DONE
9C1A: 98         223             TYA
9C1B: AC 25 9C   224  DONE       LDY YSAVE
9C1E: 4E 27 9C   225             LSR FLAGS
9C21: 4C F0 FD   226             HEX COUT1 ;OUTPUT CEARACTER
9C24: 00         227  XSAVE      HEX 00
9C25: 00         228  YSAVE      HEX 00
9C26: 00         229  OLDCHAR    HEX 00
9C27: 00         230  FLAGS      HEX 00
9C28: 00         231  ESCFLG     HEX 00
                 232  QTEFLG     HEX 00
                 233  LEN        EQU *_STARTUP
                 234  END        EQU LEN+START
```

```
——END ASSEMBLY——

ERRORS: 0

335 BYTES


SYMBOL TABLE — ALPHABETICAL ORDER:

  AIB      =$3D       AlL      =$3C       A2H      =$3F       A2L      =$3E
  A4H      =$43       A4L      =$42       AMPER    =$03F5     BASL     =$28
  COUT1    =$FDF0     COUT2    =$9C0B     CSWL     =$36       BEST     =$9300
  DONE     =$9C1B     END      =$614F     ESC      =$9BA7     ESC1     =$9BB2
  ESC2     =$9BC8     ESCFLG   =$9C28     FIXBUFF  =$9BD5     FIXEXIT  =$9C06
  FIXLOOP  =$9BE5     FLAGS    =$9C27     GETLN    =$9376     GOOD     =$9BE0
  IN       =$0200     INITIAL  =$9B2A     KEYIN    =$FD1E     KEYTN1   =$9B4C
  KSWL     =$38       LEN      =$012A     LOOP     =$9BED     MOVE     =$FB2C
  NEXTIN   =$9003     NOTPICK  =$9BBC     NTGETLN  =$9B98     NTQTE    =$9BF2
  OLDCHAR  =$9C26     PROMPT   =$33       QTEFLG   =S9C29 ?   RELOCATE =$6000
  RESTART  =$9B24     RSVECH   =$03F3     RSVECL   =$03F2     SKIP     =$9BBB
  SKIP1    =$9B58     START    =$6025     STARTUP  =$9B00     XSAVE    =$9024
  XTEL     =$9BD1     YSAVE    =$9C25


SYMBOL TABLE — NUMERICAL ORDER:

  BASL     =$28       PROMPT   =$33       CSWL     =$36       KSWL     =$38
  AlL      =$3C       A1H      =$3D       A2L      =$3E       A2E      =$3F
  A4L      =$42       A4H      =$43       LEN      =$012A     IN       =$0200
  RSVECL   =$03F2     RSVECH   =$03F3     AMPER    =$03F5 ?   RELOCATE =$6000
  START    =$6025     END      =$614F     DEST     =$9300     STARTUP  =$9300
  RESTART  =$9B24     INITIAL  =$9B2A     KEYIN1   =$9B4C     SKIP1    =$9358
  GETLN    =$9B76     NOTPICK  =$9B8C     NTGETLN  =$9B98     ESC      =$9BA7
  ESCL     =$9BB2     SKIP     =$9BBB     LOOP     =$9BBD     ESC2     =$9BC8
  XTBL     =$9BDI     FIXBUFF  =$9BD5     GOOD     =$9BE0     FIXLOOP  =$9BE5
  NTQTE    =$9BF2     NEXTIN   =$9C03     FIXEXIT  =$9006     COUT2    =$9C0B
  DONE     =$9C1B     XSAVE    =$9024     YSAVE    =$9025     OLBCHAR  =$9C26
  FLAGS    =$9027     ESCFLG   =$9028     QTEFLG   =$9029     KEYIN    =SF01B
  COUT1    =$FDF0     MOVE     =$FE2C
```

Appendix X: Supporting Software

Section X.c Apple Writer Modify

The Apple Writer Modify program contains patches for Apple Writer which will permit-lower case entry and display. You should type the followings

BRUN APPLE WRITER MODIFY

Just follow the instructions it gives you. You will be requested to swap discs several tines. At the end of this process, a copy of Apple Writer will appear on the Enhancer ][ Utilities Disc. Your original Apple Writer disc is not altered.

```
                    6  ***********************************
                    7  *                                 *
                    8  *     APPLE WRITER MODIFIER       *
                    9  *                                 *
                   10  *        10/30/81  19:00          *
                   11  *                                 *
                   12  ***********************************
                   13  *
                   14  BASEL    EQU   $00
                   15  BASEH    EQU   $01
                   16  HOME     EQU   $FC58
                   17  RDKEY    EQU   $FD0C
                   18  KEYIN    EQU   $FD1B
                   19  COUT     EQU   $FDED
                   20  COUT1    EQU   $FDF0
                   21  *
                   22           ORG   $6000
                   23           OBJ   $6000
                   24  *
6000:  20 58 FC    25           JSR   HOME         ; CLEAR SCREEN
6003:  20 94 60    26           JSR   HEADER       ; PRINT PAGE HEADER
6006:  20 9B 60    27           JSR   AWMSG        ; PRINT INSERT APPLE WRITER
6009:  20 AF 60    28           JSR   BLD          ; BLOAD TEDITOR
600C:  20 BD 60    29           JSR   TED
600?:  20 8F 60    30           JSR   CROUT
6012:  A2 15       31           LDX   #$15         ; MAKE CHANGES
6014:  A0 00       32           LDY   #$00
6016:  BD 20 62    33  TMLOOP   LDA   TLADR,X      ; GET ADDRESS TO CHANGE
6019,  85 00       34           STA   BASEL
601B:  BD 36 62    35           LDA   THADR,X
601E:  85 01       36           STA   BASEH
6020:  BD 4C 62    37           LDA   TPATCH,X     ; GET CHANGE
6023:  91 00       38           STA   (BASEL),Y    ; MAKE CHANCE
6025:  CA          39           DEX
6026:  10 EE       40           EPL   TMLOOP       ; CONTINUE
6028:  20 6C 60    41           JSR   GMOD         ; ADD GENERAL MODIFICATION
602B:  20 B6 60    42           JSR   BSV          ; BSAVE TEDITOR
602E:  20 BD 60    43           JSR   TED
6031:  20 CE 60    44           JSR   SFX
                   45  *
6034: 20 9B 60     46           JSR   AWMSG        ; PRINT INSERT APPLE WRITER
6037: 20 AF 60     47           JSR   BLD          ; BLOAD PRINTER
603A: 20 C4 60     48           JSR   PRNT
603D: 20 8F 60     49           JSR   CROUT
6040: A2 07        50           LDX   #$07
6042: AO 00        51           LDY   #$00
6044: BD A0 62     52  PMLOOP   LDA   PLADR,X      ; GET ADDRESS TO CHANGE
6047: 85 00        53           STA   BASEL
6049: BD A8 62     54           LDA   PHADR,X
604C: 85 01        55           STA   BASEH
604E: BD B0 62     56           LDA   PPATCH,X     ; GET CHANGE
6051: 91 00        57           STA   (BASEL),Y    ; MAKE CHANGE
6053: CA           58           DEX
6054: 10 EE        59           BPL   PMLOOP       ; CONTINUE
6056: 20 6C 60     60           JSR   GMOD         ; ADD GENERAL MODIFICATION
6059: 20 B6 60     61           JSR   BSV          ; BSAVE PRINTER
605C: 20 C4 60     62           JSR   PRNT
605F: 20 CE 60     63           JSR   SFX
```

```
6062: A9 60        64            LDA   #>ENDMSG
6064: AC EO        65            LDY   #>ENDMSG
6066: 20 7A 60     66            JSR   MESSAGE     ; PRINT END MESSAGE
6069: 4C D0 03 67      JMP       $3D0  ; JUMP TO BASIC
                   68  *
606C: A0 4F        69  GMOD      LDA   #END-OUTPATCH ;GENERAL MODIFICATION
606E: 39 C8 61     70  MDLOOP    LDY   GPATCH,Y    ;GET BYTE
6071: 99 20 18     71            STA   $1820,Y     ;STORE IT IN TEDITOR OR PRINTER
6074: 88           72            DEY
6075: 10 F7        73            BPL   MDLOOP      ;CONTINUE UNTIL DONE
6077: 4C A5 60     74            JMP   EUMSG       ;INSERT ENHANCER UTILITY
                   75  *
607A: 8D 84 60     76  MESSAGE   STA   MSGLOOP+2
607D: SC 83 60 77      STY       MSGLOOP+1
6080: A0 00        78            LDY   #$00
6082: B9 29 61     79  MSGLOOP   LDA   MSG1,Y
6085: F0 07        80            BEQ   RTS1
6087: 20 ED FD     81            JSR   COUT
608A: C8           82            INY
608B: 4C 82 60     83            JMP   MSGLOOP
                   84  *
608E: 60           85  RTS1      RTS
                   86  *
608F: A9 80        87  CROUT     LDA   #$8D
6091: 4C ED FD     88            JMP   COUT
                   89  *
6094: A9 61        90  HEADER    LDA   #>HEAD
6096: A0 0B        91            LDY   #<HEAD
6098: 4C 7A 60     92            JMP   MESSAGE
                   93  *
6093: A9 61        94  AWMSC     LDA   #>MSG1
609D: A0 29        95            LDY   #<MSG1
609?: 20 7A 60     96            JSR   MESSAGE
60A2: 4C D2 60     97            JMP   KEYWAIT
                   98  *
60A5: A9 61        99  EUMSG     LDA   #>MSG2
60A7: A0 5C        100           LDY   #<MSG2
60A9: 20 7A 60     101           JSR   MESSAGE
60AC: 4C D2 60     102           JMP   KEYWAIT
                   103 *
60AF: A9 61        104 BLD       LDA   #>BLOAD
60B1: A0 93        105           LDY   #<BLOAD
60B3: 4C 7A 60     106           JMP   MESSAGE
                   107 *
60B6: A9 61        108 BSV       LDA   #>BSAVE
60B8: AC 93        109           LDY   #<BSAVE
6OBA: 4C 7A 60     110           JMP   MESSAGE
                   111 *
6OBD: A9 61        112 TED       LDA   #>TEDIT
60BE: A0 A3        113           LDY   #<TEDIT
60C1: 4C 7A 60     114           JMP   MESSAGE
                   115 *
60C4: A9 61        116 PRNT      LDA   #>PRINT
60C6: A0 31        117           LDY   #<PRINT
60C8: 4C 7A 60     118           JMP   MESSAGE
                   119 *
60C3: A9 61        120 SFX       LDA   #>SUFFIX
60CD: A0 EF        121           JMP   #<SUFFIX
```

```
60CF: 4C 7A 60   122          JMP MESSAGE
                 123 *
60D2: 2C 10 C0   124 KEYWAIT  BIT $C010
60D5: A4 24      125          LDY $24
60D7: A9 60      126          LDA #$60
60D9: 91 28      127          STA ($28),y
60DB: A9 A0      128          LDA
600D: 4C lB FD   129          JMP KEYIN
                 130 *
60E0: 8D 8D      131 ENDMSG   HEX 8D8D
60E2: Cl F0 F0
60E5: EC E5 A0
60E8: D7 F2 E9
60E3: P4 E5 F2
60EE: AD ED EF
60F1: E4 E9 E6
60F4: E9 E3 El
60F7: F4 E9 EF
60FA: EE F3      132          ASC “Apple Writer Modifications”
60PC: 8D         133          HEX 8D
60FD: El F2 E5
6100: A0 E3 EF
6103: ED F0 EC
6106: E5 F4 E5   134          ASC “are complete”
6109: 8D 00      135          HEX 8D00
                 136 *
610B: Cl FC F0
610E: EC E5 A0
6111: D7 F2 E9
6114: F4 E5 F2
6117: A0 CD EF
611A: E4 E9 E6
611D: F9 A0 D0
6120: F2 EF E7
6123: F2 El ED   137 HEAD     ASC “Apple Writer modify Program”
6126: 8D 8D 00   138          HEX 8D800
6129: 8D 8D      139 MSCI     HEX 8D8D
612B: C9 EE F3
612E: E5 F2 F4
6131: AC Cl F0
6134: F0 EC E5
6137: A0 D7 F2
613A: E9 F4 E5
613D: F2 A0 E4
6140: E9 F3 EB
6143: E5 F4 F4
6146: E5         140          ASC “Insert Apple Writer diskette”
6147: 8D         141          HEX 8D
6148: El EE E4
614B: A0 F0 F2
614E: E5 F3 F3
6151: AC D3 D2
6154: C5 D4 D5
6157: D2 CE DD
615A: A0         142          ASC “and press [RETURN}"
615B: 00         143          HEX 00
                 144 *
615C: 8D 8D      145 MSG2     HEX 8D8D
```

```
615E: C9 EE F3
6161: E5 F2 F4
6164: AC 05 EE
6167: E8 El EE
616A: E3 E5 F2
6160: AC D5 F4
6170: E9 EC E9
6173: F4 F9       146          ASC “Insert Enhancer Utility”
6175: A0 E4 E9
6178: F3 EB E5
617B: F4 F4 E5    147          ASC “ diskette”
617E: 8D          148          HEX 8D
617F: El EE E4
6182: AC F0 F2
6185: E5 F3 F3
6188: AC 03 02
618B: C5 D4 05
618E: 02 CE DD
6191: AC          149          ASC "and press [RETURN)"
6192: 00          150          HEX 00
                  151 *
6193: 8D 84       152 BLOAD    HEX 8D84
6195: C2 CC CF
6198: Cl C4       153          ASC "BLOAD"
619A: 00          154          HEX 00
                  155 *
619B: 8D 84       156 BSAVE    HEX 8D84
619D: C2 D3 Cl
61A0: D6 C5       157          ASC "BSAVE”
61A2: 00          158          HEX 00
                  159 *
61A3: D4 C5 C4
61A6: C9 D4 CF
61A9: D2 AC Cl
61AC: A4 B8 B0
61AF: B3          160 TEDIT    ASC "TEDITOR,A$803"
61B0: 00          161          HEX 00
                  162 *
61B1: D0 D2 C9
61B4: CE D4 D5
61B7: D2 AC Cl
61BA: A4 B8 B0
61BD: B3          163 PRINT    ASC "PRINTER,A$803"
61BE: 00          164          HEX 00
                  165 *
61BF: AC CC A4
61C2: B1 B0 B7
61C5: B0          166 SUFFIX   ASC ",L$1070"
61C6: 8D          167          HEX 8D
61C7: 00          168          HEX 00
                  169 *
                  170 **********************************
                  171 *                                *
                  172 *    Apple Writer nodifications  *
                  173 *                                *
                  174 *                                *
                  175 **********************************
                  176 *
```

```
                        *
                GPATCR  ORG $1820
                        *
1820: C9 E0     OUTPATCH CMP #$E0
1822: 90 02             BCC SKIP1
1824: 29 BF             AND #$BF
1826: C9 C0     SKIP1   CMP #$C0
1828: 90 02             BCC SKIP2
182A: 09 20             ORA #$20
182C: C9 40     SKIP2   CMP #$40
182E: B0 04             BCS SKIP3
1830: 49 20             EOR #$20
1832: 69 40             ADC #$A0
1834: 60        SKIP3   RTS
                        *
1835: C9 E0     INPATCH CMP #$E0
1837: 90 03             BCC SKIP4
1839: 29 DF             AND #$DF
183B: 60                RTS
                        *
183C: C9 C0     SKIP4   CMP #$C0
183E: 90 03             BCC SKIP5
1840: 29 1F             AND #S1F
1842: 60                RTS
                        *
1843: C9 A0     SK1P5   CMP #$A0
1845: 90 ED             BCC SKIP3
1847: 09 40             ORA #$40
1849: 60                RTS
                        *
184A: 20 20 18  OUT1    JSR OUTPATCH
184D: 4C F0 FD          JMP COUT1
                        *
1850: 20 20 18  OUT2    JSR OUTPATCH
1853: 91 28             STA ($28),y
1855: C8                INY
1856: 60                RTS
                        *
1857: A5 10     CAPSET  LDA $10
1859: C9 E0             CMP #$E0
185B: 90 02             BCC SKIP6
185D: 29 DF             AND #SDF
185F: C9 C9     SKIP6   CMP #$C9
1861: 60                RTS
                        *
                        *
1862: 48        SHPATCH PHA
1863: A5 0B             LDA $03
1865: D0 04             BNE SKIP7
1867: 68                PLA
1868: 29 3F             AND #$3F
186A: 60                RTS
                        *
186B: 68        SKIP7   PLA
186C: 4C 35 18          JMP INPATCH
                        *
186F: 00        END     HEX 00
                        *
```

```
                    235          ORG $6220
                    236          OBJ $6220
                    237 *
6220: E0            238 TLADR    HEX E0
6221: E6 E7 E8
6224: E9            239          HEX E6E7E8E9
6225: E6 E7 E8      240          HEX E6E7E8
6228: 05 06 07      241          HEX 050607
622B: 32 33 34
622E: 35 36 37
6231: 38 39         242          HEX 3233343536373839
6233: 49 4A 4B      243          HEX 494A4B
                    244 *
6236: 09            245 THADR    HEX 09
6237: 09 09 09
623A: 09            246          HEX 09090909
623B: 0A 0A 0A      247          HEX 0A0A0A
623E: 15 15 15      248          HEX 151515
6241: 15 15 15
6244: 15 15 15
6247: 15 15         249          HEX 1515151515151515
6249: 15 15 15      250          HEX 151515
                    251 *
                    252 ******************************
                    253 *                            *
                    254 *    PATCHES FOR             *
                    255 *                            *
                    256 ******************************
                    257 *
                    258 TPATCH   ORG $9E0
09E0: EA            259          NOP
                    260 *
                    261          ORG $9E6
09E6: 20 57 18      262          JSR CAPSET
09E9: EA            263          NOP
                    264 *
                    265          ORG $AE6
0AE6: 20 50 18      266          JSR OUT2
                    267 *
                    268          ORG $1505
1505: 4C 62 18      269          JMP SHPATCH
                    270 *
                    271          ORG $1532
1532: EA            272          NOP
1533: EA            273          NOP
1534: D0 DF         274          BNE $1515
1536: 20 01 15      275          JSR $1501
1539: 48            276          PHA
                    277 *
                    278          ORG $1549
1549: 20 4A 18      279          JSR OUT1
                    280 *
                    281          ORG $62A0
                    282          OBJ $62A0
                    283 *
6245: 9D 9E 9F      284 PLADR    HEX 9D9E9F
62A3: CA CB         285          HEX CACB
62A5: DD DE DF      286          HEX DDDEDF
```

```
                287 *
62A8: 10 10 10  288 PHADR     HEX 101010
62AB: 10 10     289           HEX 1010
62AD: 10 10 10  290           HEX 101010
                291 *
                292 ********************************
                293 *                              *
                294 *    PATCHES FOR PRINTER       *
                295 *                              *
                296 ********************************
                297 *
                298 PPATCH    ORG $1090
109D: 4C 35 18  299           JMP INPATCH
                300 *
                301           ORG $10CA
10CA: EA        302           NOP
10CR: EA        303           NOP
                304 *
                305           ORG $10DD
10DD: 20 4A 18  306           JSR OUT1


——END ASSEMBLY——

ERRORS:         0

24 BYTES

SYMBOL TABLE - ALPHABETICAL ORDER:

   AWMSG    =$609B  BASEH    =$01    BASEL    =$00     BLD     =$60AF
   BLOAD    =$6193  BSAVE    =$619B  BSV      =$60B6   CAPSET  =$1857
   COUT     =$FDED  COUT1    =$FDE0  CROUT    =$608F   END     =$186F
   ENDMSG   =$60E0  EUMSG    =$60A5  GMOD     =$606C   GPATCH  =$61C8
   HEAD     =$610B  HEADER   =$6094  HOME     =$FC58   INPATCH =$1835
   KEYIN    =$FD1B  KEYWAIT  =$60D2  MDLOOP   =$606E   MESSAGE =$607A
   MSG1     =$6129  MSG2     =$615C  MSGLOOP  =$6082   OUT1    =$184A
   OUT2     =$1850  OUTPATCH =$1820  PHADR    =$62A8   PLADR   =$62A0
   PMLOOP   =$6044  PPATCH   =$62B0  PRINT    =$61B1   PRNT    =$60C4
?  RDKEY    =$fD0C  RTS1     =$608E  SFX      =$60CB   SHPATCH =$1862
   SKIP1    =$1826  SKIP2    =$182C  SKIPS    =$1834   SKIP4   =$183C
   SKIP5    =$1843  SKIP6    =$185F  SKIP7    =$186B   SUFFIX  =$61BF
   TED      =$6OED  TEDIT    =$61A3  THADR    =$6236   TLADR   =$6220
   TMLOOP   =$6016  TPATCH   =$624C


SYMBOL TABLE — NUMERICAL ORDER:

   BASEL    =$00    BASEH    =$01    OUTPATCH =$1820   SKIP1   =$1826
   SKIP2    =$182C  SKIP3    =$1834  IMPATCH  =$1835   SKIP4   =$183C
   SKIP5    =$1843  OUTL     =$184A  OUT2     =$1850   CAPSET  =$1857
   SKIP6    =$185F  SHPATCH  =$1862  SKIP7    =$186B   END     =$186F
   TMLCOP   =$6016  PMLOOP   =$6044  GMOD     =$606C   MDLOOP  =$606E
   MESSAGE  =$607A  MSGLOOP  =$6082  RYS1     =$608E   CROUT   =$608F
   READER   =$6094  AWMSG    =$609B  EUMSG    =$60A5   BLD     =$60AF
   BSV      =$60B6  TED      =$60B0  PRNT     =$60C4   SFX     =$60CB
   KEYWAIT  =$6002  ENDMSG   =$60E0  HEAD     =$610B   MSG1    =$6129
```

```
MSG2    =$615C  BLOAD   =$6193     BSAVE   =$619B  TEDIT   =$61A3
PRINT   =$61B1  SUFFIX  =S61BF     GPATCH  =$61C8  TLADR   =$6220
THADR   =$6236  TPATCH  =$624C     PLADR   =$62A0  PHADR   =$62A8
PPATCH  =$6230  HOME    =$FC58  ?  RDKEY   =$FD0C  KEYIN   =$FD1B
COUT    =$FDED  COUT1   =$FDF0
```

Appendix X: Supporting Software

Section X.d The Macro editor

Included on the Enhancer ][ utility diskette is an Applesoft program to create, add, or modify predefined keystrokes for use as Macro keys. To use the program just type. RUN MACRO EDITOR and wait for the main menu to be displayed on the screen. It is self explanatory and does not need a detailed explanation. Just depress the letter corresponding to what function you want. There is no need to press the return key. Pressing the ESCAPE key will immediately return you to the main menu from most of the program.

Section X.d.l The Edit Mode

Depressing the E key from the main menu will put you in the edit mode. The editor will display at the top of the screen the amount of memory which you have used and the amount of memory that remains free for definitions. Editor node definitions are explained below:

LOWERCASE: depress the L key to activate/deactivate this node. When this option is displayed in inverse video, you are accessing macros in the Lower Case Mode.

CONTROL: depress the C key to activate/deactivate this mode. When this Option is displayed in inverse video, the keyboard character for which you are about to define a macro will be one that has the control key pressed.

SHIFT: depress the S key to activate/deactivate this mode. When this option is displayed in inverse video, the keyboard character for which you are about to define a macro will be one that has the shift key pressed.

KEYPAD: depress the K key to activate/deactivate this mode. When this option is displayed in inverse video, the keyboard character for which your are about to define a macro must come from an optional keypad input port on the Enhancer ][ (keypad not available from Videx). You may, therefore, only access the macro key from an optional keypad that is connected to the Enhancer ][.

Note: Keypad Mode automatically deselects all the other three modes. Likewise, any of the other modes will deselect Keypad Mode.

When you have selected the nodes above that you want to use, depress the return key. The editor will ask which character key you want to use.

Example: Suppose we want to define a control D in the Lower Case Mode. Here are our keystroke sequences (starting from the main menu):

```
E
C
L
<Cr>
D
```

The E selects Edit Mode. The C selects the Control Mode (i.e. CONTROL is displayed in inverse), The L selects Lower Case Mode (not for the keyboard, however). The <cr> ends the Edit Menu selection. The D selects the keyboard character key.

Once you have selected the Edit Mode and character key, the editor will search through memory to see if that key has already been defined. If it has, it will be displayed with the cursor to the right of the definition. otherwise, the cursor will appear along the left edge of the screen. The macro is now open for editing. To type in a definition just type out the key sequence normally — well, almost normally.

For example, if you had defined a shift—C for your macro access key, you might type in the word CATALOG <Cr> for your macro. If you do this, you will notice that the RETURN key gets printed out as an inverse M on the screen. This is because the RETURN is a control—M. The editor prints out all control characters as inverse characters. Any control character may be directly entered from the keyboard except for the left and right arrow keys (i.e. ^H and ^U), ^X, ^C, ^O. and ESCAPE (i.e. ^[). Below is a brief explanation of each key and what they do.

CONTROL—C (^C): Accept. Once you have finished defining your macro, type ^C to accept the definition and return you to the main menu.

ESCAPE (^[): Depressing this key will delete the macro and return you to the main menu.

CONTROL—X (^X): Depressing this key will delete the macro definition and return the Cursor to the beginning of the macro define sequence, with the mode and macro access key already selected.

LEFT AND RIGHT ARROW (^H and ^U): These keys allow you to move through the text of the macro. With the Left arrow deleting characters and the Right arrow key restoring then.

CONTROL—O (^O): Overide. Once you type in a ~O, the editor will accept any character you wish — including the command keys described above — but you may only enter one at tine. So, if you want to place two ^C's right next to each other, you must press the ^O before each occurence of a ~C else the editor will process the ^C as an Accept and return you to the Main Menu.

Section X.d.2 The Display Mode.

Typing D from the main menu will put you in the display mode. The program will search through memory for the macros you have defined and display them on the screen. Under the mode column, the options that have been selected are indicated by the first letter of the option (i.e. L meaning lowercase) being shown for every option you have selected, if you haven't selected the option. it will not be printed. Following the mode options is the macro access key, or the key that will have to pressed to activate the macro. And finally, the description of the macro itself with all control characters shown in inverse video. Pressing any key will halt or resume the listing, with the Escape key returning you to the main menu.

Section X.d.3 The Catalog Mode.

Typing C from the main menu will catalog the current disc drive.

Section X.d.4 Save Macros to Disc

Typing S from the main menu will save the current macro in memory (not the macros in the Enhancer) to the disc. The main menu will be replaced with a new menu showing download options you may wish to include in your macro file [appendix: C). To select an option, just depress the corresponding number next to the option and the option selected will be shown in inverse video. Once you have selected the down load options you want. you may continue the save operation by pressing the RETURN key. The prompt: "ENTER FILENAME: MACRO." will appear. At this point you may type in whatever filename you want for your Macro and a BRUN able file will be saved to the disc. If you don't want your file prefixed with "MACRO." you may use the Left arrow to backover it or use X to remove it from the filename.

Section X.d.5 Load Macros from Disk

Typing L from the main menu will give you the same "ENTER FILENAME: MACRO." prompt that you get in the Save node, To load in your macro just type in your filename and press the

RETURN key. If you don't need the automatic "MACRO." prefixed to your file name, you may hack over it with the left arrow key or use the X to remove it. Also, if you want to get a quick catalog of you disc, you may type in a return without typing in a filename. You will be returned to the ENTER FILENAME:' prompt.

Section X.d.6 quit

Typing Q from the main menu will unceremoniously dump you out into Applesoft Basic. If you want to re—enter the program type in GOTO 1000 and you will be back in the main menu. However, if you type GOTO 1000 and the program does not function properly, it is likely that the program variables have been altered or lost, and you will have to type RUN to re—initialize the variables so the program will work properly.

Section X.d.7 Macro Down Load

Typing M from the main menu will automatically down load the current macro in memory to the Enhancer. This option is only available after a macro file has been saved or loaded from disc.

Section X.d.8 Program Errata

Since the Macro Editor is written in Applesoft Basic it is possible to tailor the program for your own use. The program is commented and structured in a logical order. The last few REM statements in the program give an abbreviated list of the variables and what they stand for. However. we also want to say that small changes in a program can lead to unexpected results. so please be careful when you make changes. Murphy's laws are not a figment of the imagination. If you want to speed up the Editor you cam compile it with Microsoft's TASC without modification using its default values. We estimate an approximate 3001 increase in execution speed for many of its functions.

Note: The down load program resides in memory from $8CA0 TO $8F90.

```
LIST

1   HIMEM: 30000: GOTO 25000
2   REM ******************************
3   REM *                            *
4   REM * ENHANCER ][ MACRO EDITOR   *
5   REM *                            *
6   REM *     NOVEMBER 4, 1981       *
7   REM *                            *
8   REM ******************************
10   FOR I — 1. TO 512:AP — AP + 1
20   IF PEEK (AD + AP) < 127 THEN I — 512
30   NEXT I: RETURN
40   IF CHR < 32 THEN INVERSE :CHR CHR + 64
50   PRINT CHR$ (CHR); NORMAL : RETURN
100  AP = 2:FA = 0: REM * SEARCH FOR SIMILAR MACRO KEY *
110  IF AP > = 512 - BU THEN FA = 1: RETURN
120  P0 = AP
130  IF PEEK (AD + AP) = MK AND PEEK (AD + AP - 1) = MO THEN 170
140  GOSUE 10: REM SEARCH FOR HI BIT CLEAR +1
150  IF AP > = 512 — BU THEN FA = 1: RETURN
160  GOTO 120
170  IF AP> = 512 — BU THEN FA = 1: RETURN
180  RETURN
200  PS = AP — 1:PO = PS + 2: REM * REMOVE MACRO & COMPACT BUFFER *
210  IF PEEK (AD + P0)> 127 THEN P0 = P0 + 1: GOTO 210
215  IF PO > = 512 — BU THEN BU = 512 — PS: RETURN
220  FOR PI = 0 TO 512 — BU — P0
230  POKE (AD + PS + PI), PEEK (AD + P0 + PI): NEXT
240  BU = BU + P0 — PS: RETURN
300  IF AL = 1 THEN INVERSE
310  VTAB 5: HTAB 07: PRINT “LOWERCASE”: NORMAL
320  IF CN = 1 THEN INVERSE
330  VTAB 5: HTAB 18: PRINT “CONTROL”: NORMAL
340  IF SH = 1 THEN INVERSE
350  VTAB 5: HTAB 27: PRINT “SHIFT”: NORMAL
360  IF KP = 1 THEN INVERSE
370  VTAB 5: HTAB 34: PRINT “KEYPAD”: NORMAL
380  MO = KP * 8 + AL * 4 + SH * 2 + CN
390  RETURN
400  PS = AP + 1:PO = 1
410  CHR = PEEK (AD + PS): IF CHR < 128 THEN 490
420  NA%(PO)=CHR:PS = PS + 1:PO = P0 + 1:IF PS > = 512 — PU THEN 490
430  GOTO 410
490  NA%(0) = PO — 1: RETURN
500  PS — 514 — EU: POKE AD + PS — 2,MO: POKE AD + PS — 1,MK
510  FOR P = 1 TO NA%(0): POKE AD + PS + P — 1,NA%(P): NEXT :BU = EU — NA
     %(0) — 2: POKE AD + 512 — BU,0
520  RETURN
700  Q = MO:DU$ = ""
710  FOR P = 1 TO 4
720  IF Q — INT (Q /2) * 2 THEN DU$ = QA$(P) +DU$
740  Q = INT (Q /2)
750  NEXT HTAB 2: PRINT DU$;: RETURN
800  MR = — 1: FOR P = 0 TO 15
810  IF KA(P) = KY THEN MK = P
820  NEXT : RETURN
900  POKE — 16368,0: REM * GET BUT DON’T SHOW CURSOR *
```

```
910  IF PEEK ( — 16384) < 128 THEN 910
920  IF PEEK ( — 16384 ) = 155 THEN POP : GOTO 1000
930  POKE — 16368,0:GC$ = CHR$ ( PEEK ( — 16384)): RETURN
1000  REM

          * ENTRY POINT FOR MENU *

1010  TEXT : HOME POKE 34,2: INVERSE : PRINT HTAB 9: PRINT "ENHANCER
      ][ MACRO EDITOR": POKE — 16368,0: NORMAL : IF LEN (NA$) THEN PRINT
      : HTAB (35 — LEN (NA$)) / 2: PRINT "File: "NA$
1020  VTAB 08: HTAB 10: PRINT "E — EDIT MACROB"
1040  VTAB 09: HTAB 10: PRINT "D — DISPLAY MACROS"
1050  VTAB 10: HTAB 10: PRINT "C — CATALOG DISK"
1060  VTAB 11: HTAB 10: PRINT "S — SAVE MACROS TO DISK"
1070  VTAB 12: HTAB 10: PRINT "L — LOAD MACROS FROM DISK"
1080  VTAB 13: HTAB 10: PRINT "Q — QUIT EDITOR"
1085  IF LEN (NA$) THEN VTAB 14: HTAB 10: PRINT "M — MACRO DOWN LOAD"
1090  EN = 1023 — BU:EL = EN — INT (EN / 256) * 256:EH = EN / 256
1095  POKE AD — 1,EL: POKE AD,EH
1100  VTAB 20: HTAB 05: PRINT "SELECT OPTION:";: GET GC$: IF ASC (GC$) >
      95 THEN GC$ = CHR$ ( ASC (GC$) — 32)
1110 IF GCS = "C" THEN : PRINT : PRINT D$"CATALOG": GOSUB 19100: GOTO 10
      00
1120  IF GC$ = "Q" THEN TEXT : HOME : END
      1130       IF GC$ = "L" THEN 13000
      1140       IF GC$ = "S" THEN 3000
      1150       IF GC$ = "H" THEN 5000
      1160       IF GC$ = "U" THEN 4000
1170  IF GC$ = "M" AND LEN (NA$) THEN HOME PRINT : PRINT "Are you sur
      e? ": GOSUB 900: IF CC$ = "Y" OR GC$ = "y" THEN PRINT : PRINT "Dow
      n Loading.": CALL 36000
1200  GOTO 1000: REM * MAIN MENU *
3000  REM

           * DOWN LOAD OPTIONS *

3010   HOME : HTAB 11: INVERSE : PRINT "DOWN LOAD OPTIONS": NORMAL POKE
      34,3: PRINT : PRINT
3500 Q = ST
3510   FOR P = I TO 7
3520 B(P) = Q — INT (Q / 2) * 2:Q = INT (Q / 2)
3530   NEXT
3600   VTAB 5: HTAB 2; PRINT "1 ";: IF B(1) = 1 THEN INVERSE
3610   PRINT "DISABLE SHIFT LOCK": NORMAL
3620   VTAB 7: HTAB 2: PRINT "2 ";: IF B(2) = 1 THEN INVERSE
3630   PRINT "LOCK KEYBOARD MODE": NORMAL
3640   VTAB 9: HTAB 2: PRINT "3 ";: IF B(3) = 1 THEN INVERSE
3650   PRINT "SELECT DEFAULT TO LOWER CASE": NORMAL
3660   VTAB 11: HTAB 2: PRINT "4 ";: IF B(4) = 1 THEN INVERSE
3670   PRINT "DISABLE AUTO REPEAT": NORMAL
3680   VTAB 13: HTAB 2: PRINT "5 ";: IF B(5) = 1 THEN INVERSE
3690   PRINT "DISABLE TYPE AHEAD BUFFER": NORMAL
3700   VTAB 15: HTAB 2: PRINT "6 ";: IF B(6) = 1 THEN INVERSE
3710   PRINT "DISABLE KEYBOARD EDITING OF MACROS": NORMAL
3720   VTAB 17: HTAB 2: PRINT "7 ";: IF B(7) = 1 THEN INVERSE
3730   PRINT "LOCK OUT AUTO DOWN LOAD": NORMAL
3740 ST = 0: FOR P = 1 TO 7:ST = 2 * ST + B(8 — P): NEXT
3800   VTAB 24: HTAB 5: PRINT "SELECT OPTION (RET TO CONTINUE)";: GOSUB 90
```

```
0
3810 IF GC$ = CHR$ (13) THEN 14000
3820 IF GC$ = CHR$ (27) THEN 1000
3830 IF GC$ < "8" AND GC$ > "0" THEN B( ASC (GC$) — 48) = 1 — B( ASC (GC
     $) — 48)
3840 GOTO 3600
4000 REM


*     DISPLAY MACROS *
4010  HOME :: HTAB 14: INVERSE : PRINT "DISPLAY MACROS" : NORMAL : POKE 34
,4
4020  PRINT "MODE KY MACRO DESCRIPTION" : PRINT
4030  I = 1
4040  IF BU > = 511 THEN GOSUB 19100, GOTO 1000
4050  PRINT :MO = PEEK (AD + I): GOSUB 700: HTAB 7, IF MO < 8 THEN CHR =
     LB( PEEK (AD + I + 1)): GOSUB 40, HTAB 10: GOTO 4060
4055  CHR = KA( PEEK (AD + I + 1)): GOSUB 40: HTAB 10
4060  I = 1+2
4070  CHR = PEEK (AD + I) — 128: IF CHR < 0 THEN 4050
4080  IF NOT PEEK (36) THEN HTAB 10
4085  GOSUB 40
4090  I = I + 1, IF BU + I = 512 THEN POKE 32,0: POKE 33,40: PRINT : GOSUB
      19100: GOTO 1000
4100  KY = PEEK ( — 16384), IF KY = 155 THEN POKE — 16368,0, GOTO 1000
4110  IF KY > 127 THEN POKE — 16368,0: WAIT — 16384,128: POKE — 16368
      ,0
4120  GOTO 4070
5000  REM

        * EDIT MACRO ENTRY POINT *

5010  INVERSE HTAB 1, VTAB 1: PRINT "USED:                              FREE:
        ": NORMAL : VTAB 5
5020  HOME HTAB 15, INVERSE : PRINT "EDIT MACRO", NORMAL , POKE 34,3, PRINT PRINT
5100  PRINT : VTAB 5: PRINT "MODE,",NA$(0) = — 2: GOSUE 8180: GOSUB 300
5110  VTAB 5: HTAB 6: GOSUB 900: IF ASC (GC$) > 95 THEN GC$ = CHR$ ( ASC
     (GC$) — 32)
5120  IF GC$ = "L" THEN AL = 1 — AL:KP = 0: GOSUB 300
5130  IF GC$ = "C" THEN CN = 1 — CN:KP = 0: COSUB 300
5140  IF GC$ = "S" THEN SH = 1 — SH:KP = 0: GOSUB 300
5150  IF GC$ = "K" THEN KP = 1 — KP:CN = 0:AL = 0:SH = 0: GOSUB 300
5160  IF GC$ = CHR$ (27) THEN 1000
5170  IF GC$ = CHR$ (13) THEN 5200
5180  GOTO 5110
5200  HTAB 1: VTAB 7: PRINT "ENTER MACRO ACCESS KEY: ";: GET GC$, IF GC$
     =""THEN KY = 0, GOTO 5204
5201  IF ASC (GC$) > 95 THEN GC$ = CHR$ (ASC GC$) — 32)
5203  KY = ASC (GC$):CHR = KY: GOSUB 40
5204  MK = LF(KY), IF KP THEN GOSUB 800

5206  IF MK > 0 THEN PRINT CHR$ (8) ;" ": GOTO 5200
5208  PRINT : VTAB 20: HTAB 16: FLASH : PRINT "WORING"
5210  GOSUB 100: IF FA = 0 THEN GOSUB 400: (JOSTlE 200: GOTO 5500
5220  NA%(0) = 0
5500  VTAB 9: CALL — 958: NORMAL : GOSUB 8000
5510  IF NA%(0) < = 0 THEN 1000
```

```
5600  GOSUB 500
5999  GOTO 1000: REM * MAIN MENU *
8000  REM

*     EDIT MACROS HERE *

8010  IF NA%(0) THEN FOR DU — 1 TO NA%(0):CHR NA%(DU) — 128: GOSUB 40:
      NEXT
8020  DU$ — CHR$ (8) + "" + CHR$ (8)
8030  MA% = NA%(0) — 1
8040  IF PEEK ( — 16384) < 128 THEN GOSUB 8180
8050  CALL 769:DU = PEEK (768): IF DU = 131 THEN PRINT CHR$ (29);: CALL
      — 868: GOTO 8170
8060  IF DU > 160 GOTO 8140
8070  IF DU = 143 THEN CALL 769:DU = PEEK (768): GOTO 8130
8080  IF DU = 155 THEN POP : GOTO 1000
8090  IF DU = 136 AND NA%(0) THEN NA%(0) = NAZ(0) = 1: PRINT DU$;: GOTO 8
      040
8100  IF DU = 152 AND NA%(0) THEN FOR DU = 1 TO NA%(0): PRINT DU$;: NEXT
      :NA%(0) = 0:GOTO 8030
8110  IF DU =149 AND NA%(0) < = MA% THEN DU — NA%(NA%(0) + 1): GOTO 813
      0
8120  IF DU = 136 OR DU = 149 THEN 8040
8130  IF DU < 160 THEN INVERSE
8140  IF NAZ(0) ~ MAX THEN MAX — NA%(0)
8150  IF NA%(0) < BU — 1 THEN PRINT CHR$ (DU — 64 * (DU < 160));: NORMAL
      :NA%(O) = NA%(0) + 1:NA%(NA%(0)) = DU: GOTO 8040
8160  PRINT CHR$ (7);: GOTO 8040
8170  RETURN
8180  DU = PEEK (36):DD = PEEK (37): INVERSE : VTAB 1: HTAB 08: PRINT 51
      3 — BU + NA%(0)"              ";: HTAB 36: PRINT BU — 1 - NA%(0)" "
      ;:NORMAL : HTAB DU + 1: VTAB DD + 1: RETURN
13000 REM

*     DISK LOAD ENTRY POINT *


13010 HOME : HTAB 14: INVERSE : PRINT "LOAD FROM DISK": NORMAL : PRINT :
      PRINT : POKE 34,3
13020 NA$ = "MACRO."
13050 VTAB 5: PRINT "ENTER FILENAME: ";: GOSUB 18000: PRINT
13060 IF NOT LEN (NA$) OR NA$ = "MACRO." THEN PRINT D$"CATALOG", GOSUB
      19100: HOME VTAB 4: GOTO 13050
13230 PRINT D$"BLOAD"NA$
13240 EN = PEEK (AD - 1) + PEEK (AD) * 256:BU = 1023 — EN
13250 ST = PEEK (AD— 2)
13999 GOTO 1000: REM * MAIN MENU *
14000 REM

*     DISK SAVE ENTRY POINT *
14010 POKE 34,2: HOME HTAB 15: INVERSE PRINT "SAVE TO DISK": NORMAL
     : PRINT : PRINT : POKE 34,3
14015 IF NOT LEN (NA$) THEN NA$ = "MACRO."
14020 VTAB 5: PRINT "ENTER FILENAME: ";: GOSUE 18000: PRINT
14040 IF NOT LEN (NA$) OR NA$ = "MACRO." THEN PRINT D$"CATALOG": GOSUB
     1910q: HOME : VTAB 4: GOTO 14020
```

```
14050   POKE AD — 2,ST
14100   PRINT D$"BSAVE"NA$" ,A$8CA0 ,L$2F0"
14999   GOTO 1000: REM * MAIN MENU *
18000 REM

               *** Getput for strings ***

18020   DU$ = "":DD$ — "": PRINT MA$;
18030   CALL 769:DU$ = CHR$ ( PEEK (768) — 128): IF ABC (DU$) = 13 THEN
     PRINT CHR$ (29);: CALL — 868: GOTO 18100
18040   IF DU$ = CHR$ (3) OR DU$ = CHR$ (27) THEN NA$ = "": POP : GOTO 1
     000
18050   IF ABC (DU$) = 8 AND LEN (NA$) THEN DD$ = RIGHTS (NA$,1) + DD$:
     NA$ - MID$ (NA$,1, LEN (NA$) — 1): PRINT CHR$ (8)"" CHR$ (8);: GOTO
     18030
18060   IF ASC (DU$) = 21 AND LEN (DD$) THEN DU$ = LEFT$ (DD$,1)
18070   IF ASC (DU$) = 24 AND LEN (NA$) THEN FOR DU = 1 TO LEN (NA$): PRINT
      CHR$ (8)"" CHR$ (8);: NEXT :DD$ = "": NA$ = "": GOTO 18030
18080   IF ASC (DUS) < 32 GOTO 18030
18090   PRINT DU$;:NA$ = NAS + DU$:DD$ = MID$ (DD$,2, LEN (DD$) — ( LEN (
     DD$) > 0)): GOTO 18030
18100   RETURN
19000   REM

          * MISC SUBROUTINES *


19100   VTAB 24: HTAB 10: PRINT "HIT ANY KEY TO CONTINUE";: GOSUB 900: RETURN

19500   REM * ONEER ENTRY POINT *
19540 ER = PEEK (222)
19550   CALL 966: TEXT : HOME : VTAB 12
19600   ON ER GOTO 19700,19700,19700,19620,19700,19630,19700,19640,19650,1
        9660,19670
19610   IF ER = 255 THEN TEXT : HOME VTAB 12: HTAB 9: PRINT "CONTROL—C
     INTERRUPT ERROR": GOSUE 19100: GOTO 1000
19615   IF ER > = 12 THEN 19700
19620   HTAB 09:PRINT "WITH PROTECTED DISK ERROR": GOSUB 19100: GOTO 100
      0
19630   HTAB 12: PRINT "FILE NOT POUND ERROR": GOSUB 19100:NA$ = "": GOTO
      1000
19640   HTAB 14: PRINT "DISK I/O ERROR": GOSUB 19100: GOTO 1000
19650   HTAB 14: PRINT "DISK FULL ERROR": GOSUB 19100: GOTO 1000
19660   HTAB 11: PRINT "DISK FILE LOCKED ERROR": GOSUE 19100: GOTO 1000
19670   HTAB 13: PRINT "DOS SYNTAX ERROR": GOSUB 19100: GOTO 1000
19700   HTAB 11, PRINT "ERROR PEEK(222)==>";ER: GOSUB 19100
19750   GOTO 1000: REM * MAIN MENU *
25000   REM * INITIALIZE PROGRAM VARIABLES *
25010   PR# 0: IN# 0: POKE — 16296,0: CALL 1002: PRINT CHR$ (4)"NOMONIOC
     ":TEXT : HOME : VTAB 12: HTAB 16: FLASH : PRINT "WORKING": NORMAL
25020   PRINT CHR$ (4)"BLOAD DOWNLOAD,A$8CA0"
25130   DIM LF(96): REM * LOOKUP TABLE FORWARD *
25140   DIM LB(50): REM * LOOKUP TABLE BACKWARD *
25150   DIM NA%(512): REM * EDIT ARRAY *
25180   DIM KA(15): REM * KEYPAD LOOKUP TABLE *
25300  FP = 1:AP = 1:CN = O:AL = 0:KP = 0:SH = 0:AD = 36098:ST = 0:BU = 51
      1
```

```
25310  QA$(1) = “C”:QA$(2) = “S”:QA$(3) = “L”:QA$(4) = “K”:D$ = CHR$ (4)
25320  ONERR GOTO 19500
25400  POKE 966,104: POKE 967,168: POKE 968,104: POKE 969,166: POKE 970,2
     23: POKE 971,154: POKE 972,72: POKE 973,152: POKE 974,72: POKE 975,9
     6
25410 POKE 769,32: POKE 770,12: POKE 771,253: POKE 772,141: POKE 773,0: POKE
     774,3: POKE 775,96
25500  DATA —1,—1,—1,—1,—1,—1,—1,—1,28,—1,—1,—1,1,49,—1,—1,—1,—1,—1,—1,—
25520  DATA 45,—1,—1,—1,—1,—1,—1,—1 ,—1,—1,—1,—1,—1.37,9,38,39,7,42,41,0,1,2
     ,3,4,5,6,8,27,—1,—1,—1,-1
25540 DATA 48,44,34,32,20,12,21,22,23,17,24,25,26,36,35,18,19,1O,13,40,
     14,16,33,11,31,15,30,-1,-1,-1,-1
25550  DATA 51,52,53,54,55,56,57,48,58,45,81,87,69,82,84,89.85,73,79,80,6
      8,70,71,72,74,75,76,59,8,21,90,88,67,86.66,78,77,44,46,47,83,50,49,2
      7,65,32,0,0,0,13
25560  DATA 48,52,56,43,49,53,57,45,50,54,46,13,51,55,44,0
25600  REM * READ IN DATA STATEMENTS *
25610  FOR I = 0 TO 95: READ LF(I): NEXT
25620  FOR I — 0 TO 49: READ LB(I): NEXT
25630  FOR I — 0 TO 15: READ KA(I): NEXT
25999  GOTO 1000: REM * MAIN MENU *
30000  REM * CN - CONTROL KEY SELECT
30010  REM * AL - ALPHA LOCK SELECT
30020  REM * SE - SHIFT KEY SELECT
30030  REM * KP - KEYPAD SELECT
30040  REM * LF - LOOKUP TABLE FORWARD
30050  REM * LB - LOOKUP TABLE BACKWARD
30060  REM * KA - KEYPAD LOOKUP TABLE
30070  REM * EA - EDIT ARRAY
30080  REM * MX - MACRO KEY
30090  REM * AP - ARRAY POINTER
30110  REM * GC - GET CHARACTER
30120  REM * MO - MODE OF MACRO
30130  REM * BU - BUFFER SPACE AVAILABLE
30140  REM * NA - NAME OF DISK FILE
30150  REM * ER - ERROR NUMBER
30160  REM * FA - FAIL (SEARCH) FLAG
30170  REM * ST - STATUS OF DOWNLOAD OPTIONS
30180  REM * DU - DUMMY VARIABLE
30190  REM * DD - DOUBLE DUMMY VARIABLE
40000  REM **************************
40010  REM *                        *
40020  RPM * ENHANCER ][ MACRO EDITOR  *
40030  RPM *                        *
40040  RPM *    NOVEMBER 4, 1981      *
40050  RPM *                        *
40070  RPM **************************
```

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## Section X.e The Down Load Program

The Macro Editor [section: X.d] Creates BRUNable programs which are down load programs. The Macro Editor loads in the file named DOWNLOAD each time it runs. This file should NOT be deleted from the disc. Any file output from the Macro Editor may be put onto any disc and BRUN. Doing so will cause keyboard macros to be downloaded from disc.

```
                    6   ****************************
                    7   *                          *
                    8   *       ENHANCER ][        *
                    9   *                          *
                    10  *   MACRO DOWNLOAD PROGRAM  *
                    11  *                          *
                    12  *    11/8/1981   19:30     *
                    13  *                          *
                    14  *                          *
                    15  ****************************
                    16  MACTABLE EQU  $8D00
                    17  KBD      EQU  $C000
                    18  KBDSTRB  EQU  $C010
                    19  WAIT     EQU  $FCA8
                    20  BASEL    EQU  $00
                    21  BASEH    EQU  $01
                    22  *
                    23           ORG  $8CA0
                    24           OBJ  $S8A0
                    25  *
8CA0: AD 5E C0      26  WRMACROS LDA  $C05E        ; SEND START DOWNLOAD SIGNAL
SCA3: A9 8D         27           LDA  #>MACTABLE   ; INITIALIZE POINTERS
8CA5: 85 01         28           STA  BASEH
SCA7: AD 00         29           LDY  #$00
8CA9: 84 00         30           STY  BABEL
8CAB: B1 00         31  WMLOOP   LDA  (BASEL),Y    ; GET BYTE FROM TABLE
8CAD: 8D F5 8C      32           STA  BYTE         ; SAVE IT FOR ROTATING
8C3C: 20 C3 8C      33           JSR  WRBYTE       ; OUTPUT BYTE TO ENHANCER
SCB3: C8            34           INY               ; ADVANCE POINTER
8CB4: D0 02         35           BNE  WMSKIP
8CB6: E6 01         36           INC  BASEH
SCB8: C0 03         37  WMSKIP   CPY  #$03         ; CONTINUE UNTIL 515 BYTES ARE SENT
8CBA: D0 EF         38           BNE  WMLOOP
8CEC: A5 01         39           LDA  BASEH
8CRE: C9 8F         40           CMP  #>MACTABLE+$200
8CC0: D0 E9         41           BNE  WMLOOP
SCC2: 60            42           RTS
                    43  *
SCC3: SC P4 SC      44  WRBYTE   STY  YSAVE        ; SAVE Y REGISTER
8CC6: A0 08         45           LDY  #$08         ; LOOP 8 TOMES
SCC8: 0E F5 8C      46  BYTELOOP ASL  BYTE         ; SHIFT BIT INTO CARRY
8CCE: 20 D5 8C      47           JSR  WRBIT        ; OUTPUT BIT TO ENHANCER
SCCE: 88            48           DEY
SCCF: D0 F7         49           BNE  BYTELOOP     ; CONTINUE LOOP
8CD1: AC F4 8C      50           LDY  YSAVE        ; RECOVER Y REGISTER
8CD4: 60            51           RTS
                    52  *
8CD5: 08            53  WRBIT    PHP               ; SAVE CARRY
8GD6: AD 00 C0      54  WBLOOP   LDA  KBD          ; WAIT FOR RUBOUT FROM ENHANCER
8eD9: l0 FB         55           BPL  WBLOOP
8cDB: C9 FF         56           CMP  #$FF
8CDD: D0 F7         57           BNE  WBLOOP
8CDF: AD 5F C0      58           LDA  $C05F        ; TURN OFF THE START SIGNAL
SCE2: 28            59           PLP               ; RECOVER CARRY
8CE3: 90 03         60           BCC  ZEROBIT      ; IF CLEAR DELAY ONCE
SCE5: 20 EF 8C      61           JSR  DELAY        ; DELAY TWICE
SCE8: 20 EF 8C      62  ZEROBIT  JSR  DELAY
SCEB: 2C 10 C0      63           BIT  KBDSTRB      ; CLEAR KEY STROBE (ACKNOWLEGE)
```

```
8CEE: 60          64   RTS
          65      *
8CEF: A9 08       66   DELAY   LDA    #$08
8CF1: 4C A8 FC    67   JMP     WAIT
                  68   *
8CF4: 00          69   YSAVE   HEX    00
8CF5: 00          70   BYTE    HEX    00


--END ASSEMBLY--


ERRORS:   0

86 BYTES


SYMBOL TABLE - ALPHABETICAL ORDER:

BASER     =$01      BASEL     =$00        BYTE      =$8CF5      BYTELOOP  =$8CC8
DELAY     =$8CEF    KBD       =$C000      KBDSTRB   =$C010      MACTABLE  =$SD00
WAIT      =$FCA8    WBLOOP    =$8CD6      WMLOOP    =s$8CAB     WMSKIP    =$8CB8
WRBIT     =$8CD5    WRBYTE    =$8CC3  ?   WRMACROS  =$8CA0      YSAVE     =$8CF4
ZEROBIT   =$8CE8


SYMBOL TASTE - NUMERICAL ORDER:

BASEL     =$00      BASER     =$01    ?   WRMACROS  =$8CA0      WMLOOP    =$8CAB
WMSKIP    =$8CB8    WRBYTE    =$8CC3      BYTELOOP  =$8CC8      WRBIT     =$8CD5
WMLOOP    =$8CD6    ZEROBIT   =$8CE8      DELAY     =$8CEF      YSAVE     =$8CF4
BYTE      =$SCF5    MACTABLE  =$8D00      KBD       =SC000      KBDSTRB   =$C010
WAIT      =$FCA8
```

Notes: OUTPATCH was formerly called KEYPATCH.

OUTPATCH patches SYSTEM.APPLE of Pascal to allow the display of lower case characters. Load a copy of SYSTEM.APPLE onto your disc and Execute OUTPATCH. You may then use this SYSTEM.APPLE file on your Pascal Discs. ALWAYS MAKE BACKUP COPIES OF YOUR ORIGINAL FILES!!!

Note: Pascal is contained on the back side of the Enhancer ][ Utilities Disc. This side is write protected. It is not intended to be used more than a few times. Not all the tracks have been initialized, therefore, some bad blocks are likely to be found on this side of the disc.

Appendix: Supporting Software

Listing of:

```
  PROGRAM OUTPATCH;

    { this program patches the SYSTEM.APPLE for displaying }
    { lower case with the REYBOARD & DISPLAY ENHANCER for  }
    { Pascal 1.1.                 Darre11 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]:=277; 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;
      BUFI5,403]:=104; BUF[5,404]:=144;    BUF[5,405]:=3;
      BUF[5,406]:=73;  BUF[5,407]:=L60;    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.
```

```
                    6   **********************************
                    7   *                                *
                    8   *      BASIC QUICK LOADER        *
                    9   *                                *
                    10  *   CONTRIBUTED BY RON ALDRICH    *
                    11  *                                *
                    12  *          8/28/ 1981            *
                    13  *                                *
                    14  **********************************
                    15  *
                    16  TEMP     EQU  $1E
                    17  IOB      EQU  $48
                    18  *
                    19  READ     EQU  $01
                    20  VOLUME   EQU  $03
                    21  TRACK    EQU  $04
                    22  SECTOR   EQU  $05
                    23  BUFFER   EQU  $08
                    24  COMMAND  EQU  $0C
                    25  *
                    26  RFTS     EQU  $03D9
                    27  GETFMP   EQU  $03DC
                    28  GETIOB   EQU  $03E3
                    29  *
                    30  DEST     EQU  $D000
                    31  *
                    32          ORG $0300
                    33          OBJ $D000
                    34  *
                    35  **********************************
                    36  *                                *
                    37  *          DISK SET UP           *
                    38  *                                *
                    39  **********************************
                    40  *
0300: 2C 83 C0      41          BIT  $C083
0303: 2C 83 C0      42          BIT  $C083
0306: 8A            43          TXA
0307: 48            44          PHA
0308: 20 DC 03      45          JSR  GETFMP      ; GET LAST USED FILE MGR PRAM LIST
030B: 84 lE         46          STY  TEMP
030D: 85 1F         47          STA  TEMP+$01
030F: A0 0E         48          LDY  #$0E        ;FIND TRACK SECTOR LIST OF FILE
0311: Bl 1E         49          LDA  (TEMP),Y
0313: 48            50          PHA
0314: C8            51          INY
0315: Bl lE         52          LDA  (TEMP),Y
0317: 85 1F         53          STA  TEMF+$01
0319: 68            54          PLA
031A: 85 1E         55          STA  TEMP
031C: 20 E3 03      56          JSR  GETIOB      ;GET DOS'S I/O BLOCK
031F: 84 48         57          STY  IOB
0321: 85 49         58          STA  IOB+$01
0323: A0 03         59          LDY  #VOLUME     ;VOLUME = 0
0325: A9 00         60          LDA  #$00
0327: 91 48         61          STA  (IOB),Y
0329: A0 0C         62          LDY  #COMMAND    ;COMMAND = READ
032B: A9 01         63          LDA  #READ
```

```
0320: 91 48     64          STA      (IOB),Y
032F: A0 08     65          LDY      #BUFFER     ; BUFFER = DESTINATION OF DATA
0331: A9 00     66          LDA      #<DEST
0333: 91 48     67          STA      (I0B) ,Y
0335: C8        68          INY
0336: A9 D0     69          LDA      #>DEST
0338: 91 48     70          STA      (IOB),Y
033A: A2 0E     71          LDX      #$0E        ; START READING 2ND T. S. L. PAIR
                72 *
                73 ***************************
                74 *                         *
                75 *       READ FILE         *
                76 *                         *
                77 ***************************
                78 *
033C: 8A        79 LOOP     TXA
033D: A8        80          TAY
033E: 31 IE     81          LDA      (TEMP).Y   ; GET TRACK
0340: F0 24     82          BEQ      DONE       ; DONE IF TRACK 0
0342: A0 04     83          LDY      #TRACK
0344: 91 48     84          STA      (IOB),Y
0346: 8A        85          TXA
0347: A         86          TAY
0348: C8        87          INY
0349: 31 IE     88          LDA      (TEMP),y   ; GET SECTOR
034B: A0 05     89          LDY      #SECTOR
0340: 91 48     90          STA      (IOB),Y
034F: 8A        91          TXA                 ;SAVE X
0350: 48        92          PHA
0351: 20 E3 03  93          JSR      GETIOB     ; GET DOS'S I/O BLOCK
0354: 20 09 03  94          JSR      RWTS       ; READ SECTOR
0357: 68        95          PLA                 ; RECOVER XX
0358: AA        96          TAX
0359: E8        97          INX                 ; ADD 2
035A: E8        98          INX
035B: A0 09     99          LDY      #BUFFER+$01
0350: B1 48     100         LDA      (IOB) ,Y   ; INCREMENT HIGH BYTE
035F: 18        101         CLC                 ; OF BUFFER ADDRESS
0360: 69 01     102         ADC      #$01
0362: 91 48     103         STA      (IOB),Y
0364: D0 06     104         BNE      LOOP       ;OFTEN TAXEN
                105 *
0366: 2C 81 CO  106 DONE    BIT      $C081
0369: 68        107         PLA
036A: AA        108         TAX
03&B: 60        109         RTS


——END ASSEMBLY——

ERRORS: 0

108 BYTES


SYMBOL TABLE — ALPHABETICAL ORDER:

BUFFER =$08       COMMAND =$OC     DEST =$DOOO   DONE =$0366
```

```
GETFMP  =$03DC          GETIOB  =$03K3      IOB     =$48        LOOP    =$033C
READ    =$01            RWTS    =$03D9      SECTOR  =$05        TEMP    =$1E
TRACK   =$04            VOLUME  =$03
```

SYMBOL TABLE — NUMERICAL ORDER

```
READ    =$01            VOLUME  =$03        TRACK   =$04        SECTOR  =$05
BUFFER  =$08            COMMAND =$0C        TEMP    =$1E        IOB     =$48
LOOP    =$033C          DONE    =$0366      RWTS    =$03D9      GETFMP  =$03DC
GETIOB  =$O3E3          DEST    =$D000
```

```
6     ************************************
7     *                                  *
8     *  ENHANCER ] [ OPERATING SYSTEM   *
9     *                                  *
10    *                                  *
11    *    11 / 3 / 1981  11:00          *
12    *                                  *
13    ************************************
14    *
15    *
16    *   C9  C8  C7 C6  C5  C4  C3  C2  Cl  C0
17    *
18    *1  3   4   5  6   7   8   9   0   :   -
19    *
20    *2  Q   W   B  R   T   Y   U   I   O   P
21    *
22    *3  D   F   G  H   J   K   L   ;   ^H  ^U
23    *
24    *4  Z   X   C  V   B   N   M   ,   .   /
25    *
26    *5  S   2   1  ^]  A   SP              ^M
27    *
28    *
29    * 010  —  CONTROL
30    * C11  —  SHIFT
31    * C12  —  REPEAT
32    * C13  —  RESET
33    * C14  —  ACKNOWLEGE
34    * C15  —  OPTION
35    *
36    *
37    CONTROL    EQU  $04
38    SHIFT      EQU  $08
39    REPEAT     EQU  $10
40    RESET      EQU  $20
41    ACKNWLG    EQU  $40
42    OPTION     EQU  $80
43    *
44    DSHIFTLK   EQU  $01
45    OMODESEL   EQU  $02
46    MODESET    EQU  $04
47    DAUTORPT   EQU  $08
48    DBUFFER    EQU  $10
49    DMAGDEF    EQU  $20
50    DDNLOAD    EQU  $40
51    *
52    CKSUM      EQU  $00
53    BEGRPT     EQU  $40
54    STRPT      EQU  $F0
55    FAST       EQU  $FB
56    MCDLY      EQU  $08
57    DLY        EQU  $10
58    DBTIME     EQU  $04
59    LKTIME     EQU  $10
60    *
61    TESTL      EQU  $00
62    TESTH      EQU  $01
63    TEMP       EQU  $02
```

```
64  *
65  BUFIN       EQU   $00
66  BUFOUT      EQU   $01
67  MAPL        EQU   $02
68  MAPH        EQU   $03
69  FLUSH       EQU   $04
70  LOCKFLG     EQU   $05
71  HALFLOCK    EQU   $06
72  MACFLG      EQU   $07
73  REPT        EQU   $08
74  MTXSAVE     EQU   $09
75  REPT1       EQU   $0A
76  DBCNT       EQU   $0B
77  DBKEY       EQU   $0C
78  LOCKCNT     EQU   $0D
79  SPKEYS1     EQU   $0E
80  MODEl       EQU   $0F
81  *
82  DEFLAGS     EQU   $10
83  MODE        EQU   $11
84  KEY         EQU   $12
85  BUFM0DE     EQU   $13
86  PWROFF      EQU   $14
87  SPEED       EQU   $15
88  CHAR        EQU   $16
89  SRCHL       EQU   $17
90  SRCHH       EQU   $18
91  MOVEL       EQU   $19
92  MOVEH       EQU   $lA
93  TENDL       EQU   $1B
94  TENDH       EQU   $1C
95  ANODE       EQU   $1D
96  DFMODE      EQU   $1E
97  DLFLAG      EQU   $1F
98  *
99  *
100 *
101 OLDKEY      EQU   $20
102 *
103 MTXTBL      EQU   $40
104 *
105 BUFFER      EQU   $80
106 *
107 MACTABLE    EQU   $0200
108 *
109 MTRIX1      EQU   $0A00
110 MTRIX2      EQU   $0C00
111 SPKEYS      EQU   $0C01
112 *
113 KEYOUT      EQU   $0E00
114 *
115 OBJECT      EQU   $8800
116 EPROM       EQU   $1800
117 RESVEC      EQU   EPROM+$07FC
```

```
                    119 ************************************
                    120 *                                  *
                    121 *      KEYBOARD MAPS               *
                    122 *                                  *
                    123 ************************************
                    124 *
                    125           ORG  EPROM
                    126           OBJ  OBJECT
                                  127  *
1800: B3 B4 B5
1803: B6 B7 B8
1806: B9 BO BA
1809: AD            128 NTBL      ASC  "34567890:—"
180A: Dl D7 C5
180D: D2 D4 D9
1810: D5 C9 CF
1813: D0            129           ASC  “QWERTYUIOP”
1814: C4 C6 C7
1817: C8 CA CB
181A: CC BB         130           ASC  “DFGHJKL;”
181C: 88 95         131           HEX  8895
181lE: DA D8 C3
1821: D6 C2 CE
1824: CD AC AE
1827: AF            132           ASC  “ZXCVBNM,./”
1828: D3 B2 B1      133           ASC  “S21”
182B: 9B            134           HEX  9B
1S2C: Cl A0 A0
182F: A0 A0         135           ASC  “A
1831: 8D            136           HEX  8D
                    137 *
                    138           DS   14
                    139 *
1840: B3 B4 85
1843: B6 B7 B8
1846: E9 B0 BA
1849: AD            140 CTBL      ASC  “34567890,—”
184A: 91 97 85
184D: 92 94 99
1850: 95 89 8F
1853: 90            141           HEX  91978592949995898F90
1854: 84 86 87
1857: 88 8A 8B
185A: 8C BB 88
1850: 95            142           HEX  848687888A8B8CBB8895
185E: 9A 98 83
1861: 96 82 8E
1864: 8D            143           HEX  9A988396828E8D
1865: AC AE AF      144           ASC  ",./"
1868: 93            145           HEX  93
1869: 82 El         146           ASC  “21”
1868: 9B            147           HEX  9B
1860: 81            148           HEX  81
1860: A0 A0 A0
1870: A0            149           ASC  "  "
1871: 8D            150           HEX  8D
                    151 *
                    152           DS  14
```

```
                        153 *
1880: A3 A4 AS
1883: A6                154 STBL        ASC   “#$%&“
1884: A7                155             HEX   A7
1885: A8 A9 B0
1888: AA BD             156             ASC “()0*=”
188A: D1 D7 C5
188D: D2 D4 D9
1890: D5 C9 CF
1893: C0                157             ASC   “QWERTYUIO@”
1894: C4 C6 C7
1897: C8 CA CB
189A: CC AB             158             ASC   “DFGHJKL+"
189C: 88 95             159             HEX   8895
189E: DA D8 C3
18Al: D6 C2 DE
18A4, DD BC BE
18A7: BF                160             ASC   "ZXCVB^]<>?“
18A8: D3                161             ASC   “S”
18A9: A2                162             HEX   A2
18AA: Al                163             ASC   “!”
18AB: 9B                164             HEX   9B
18AC: Cl A0 A0
18AF: A0 A0             165             ASC   "A"
1831: 8D                166             HEX   8D
                        167 *
                        168             DS    14
                        169 *
18C0: A3 A4 A5
18C3: A6                170 SCTBL       ASC   “#$%&“
18C4: A7                171             HEX   A7
18C5: A8 A9 B0
18C8: AA BD             172             ASC   “Q0*=”
18CA: 91 97 85
18CD: 92 94 99
18D0: 95 89 8F
18D3: 80                173             HEX   919785929499958898F80
18D4: 84 86 87
18D7: 88 8A 8B
18DA: 8C                174             HEX   848687888A838C
18DB: AB                175             ASC   "+"
18DC: 88 95             176             HEX   8895
18DE: 9A 98 83
18El: 96 82 9E
18E4: 9D                177             HEX   9A988396829E9D
18E5: BC BE BF          178             ASC   "<>?"
18E8: 93 A2             179             HEX   93A2
18EA: Al                180             ASC   "!"
18EB: 9B                181             HEX   9B
i8EC: 81                182             HEX   81
18ED: A0 A0 A0
18F0: A0                183             ASC   "  "
18F1: 8D                184             HEX   8D
                        185 *
                        186             DS    14
                        187 *
1900: B3 B4 B5
1903: B6 B7 B8
```

```
1906: B9 B0 BA    188 UNTBL     ASC "34567890:="
1909: AD
190A: F1 F7 E5
1900: F2 F4 F9
1910: F5 E9 EF
1913: F0          189           ASC “qwertyuiop"
1914: E4 E6 E7
1917: ES EA EB
191A: EC BB       190           ASC “dfghjkl;”
191C: 88 95       191           HEX 8895
191E: FA FS E3
1921: F6 E2 EE
1924: ED AC AE
1927: AF          192           ASC "zxcvbnm,./"
1928: F3 B2 B1    193           ASC “s21"
192B: 9B          194           HEX 9B
192C: El A0 A0
192F: A0 A0       195           ASC “a   "
1931: 8D          196           HEX 8D
                  197 *
                  198           DS  14
                  199 *
1940: FF          200 UCTBL     ASC ""
1941: 9C 9D 9E    201           HEX 9C9D9E
1944: E0 FB FD    202           ASC “‘{}“
1947: 80 9F       203           HEX 809F
1949: DF          204           ASC "_"
194A: 91 97 85
1940: 92 94 99
1950: 95 89 8F
1953: 90          205           HEX 919785929499958 98F90
1954: 84 86 87
1957: 88 8A 8B
195A: 8C          206           HEX 848687888A838C
195B: DE          207           ASC "^"
195C: 88 95       208           HEX 8895
195E: 9A 98 83
1961: 96 82 8E
1964: 8D          209           HEX 9A98839682838D
1965: D3 DD DC    210           ASC “[]\”
1968: 93          211           HEX 93
1969: FE FC       212           ASC "~|”
196B: 9B          213           HEX 9B
196C: 81          214           HEX 81
196D: A0 A0 A0
1970: A0          215           ASC "   "
1971: 80          216           HEX 8D
                  217 *
                  218           DS  14
                  219 *
1980: A3 A4 A5
1983: A6          220 USTBL     ASC “#S%&”
1984: A7          221           HEX A7
1985: A8 A9 C0
1988: AA ED       222           ASC “()@*="
198A: D1 D7 C5
198D: D2 D4 D9
1990: D5 C9 CF
```

```
1993: D0          223         ASC   “QWERTYUIOP"
1994: C4 C6 C7
1997: C8 CA C8
199A: CC AB       224         ASC   "DFGHJKL+”
199C: 88 95       225         HEX   8895
199E: DA D8 C3
19A1: D6 C2 CE
19A4: CD BC BE
19A7: BF          226         ASC   “ZXCVBNM<>?”
19A8: D3          227         ASC   “S”
19A9: A2          228         HEX   A2
19AA: Al          229         ASC   “!”
19AB: 9B          230         HEX   9B
l9AC: Cl A0 A0
19AF: A0 A0       231         ASC   “A  "
19B1: 8D          232         HEX   8D
                  233 *
                  234         DS    14
                  235 *
19C0: FF          236 USCTBL  ASC
19C1: 9C 9D 9E    237         HEX   9C9D9E
19C4: E0 FB FD    238         ASC   “‘{}”
19C7: 80 9F       239         HEX   809F
19C9: DF          240         ASC   "_"
19CA: 91 97 85
19CD: 92 94 99
19D0: 95 89 8F
19D3: 90          241         HEX   919785929499958898F90
19D4: 84 86 87
19D7: 88 8A 8B
19DA: 8C          242         HEX   848687888A8B8C
19DB: DE          243         ASC   "^"
19DC: 88 95       244         HEX   8895
19DE: 9A 98 83
19E1: 96 82 8E
19E4: 8D          245         HEX   9A988396825E5D
19E5: DB DD DC    246         ASC   “[]\“
19E8: 93          247         HEX   93
19E9: FE FC       248         ASC   "~|"
19EB: 9B          249         HEX   9B
I9EC: 81          250         HEX   81
I9ED: A0 A0 A0
I9FO: A0          251         ASC   "   "
19F1: 8D          252         HEX 8D
                  253 *
                  254         DS    14
                  255 *
1A00: B0 B4 B8
1A03: AB          256 PADTBL  ASC   “048+”
1A04: B1 B5 B9
1A07: AD          257         ASC   “159—”
1A08: B2 B6 AE    258         ASC   “26.”
1A0B: 8D          259         HEX   8D
1A0C: B3 B7 AC    260         ASC   “37,”
1A0F: 80          261         HEX   80
```

```
                    263 **********************************
                    264 *                                *
                    265 *     MAIN RESET ENTRY POINT     *
                    266 *                                *
                    267 **********************************
                    268 *        CLD              ;BEGIN GOLD START SEQUENCE
1A10: D8            269 RESET1   CLI
1A11: 58            270          LDA   KEY        ;CHECK FOR COLD START
1A12: A5 12         271          EOR   #$A5
1A14: 49 A5         272          CMP   PWROFF
1A16: C5 14         273          BNE   STARTUP    ;IF NO MATCH, DO COLD START
1A18: D0 03         274
                    275 *
1A1A: 4C 05 1B      276          JMP   RESET3
                    277 *
                    278 **********************************
                    279 *                                *
                    280 *      ENHANCER RAM TEST         *
                    281 *                                *
                    282 **********************************
                    283 *
1A1D: A9 A5         284 STARTUP  LDA   #$A5        ;TEST STORAGE AREAS
1A1F: 85 00         285          STA   TESTL
1A21: A9 5A         286          LDA   #$5A
1A23: 85 01         287          STA   TESTH
1A25: A9 66         288          LDA   #$66
1A27: 85 02         289          STA   TEMP
1A29: A5 00         290          LDA   TESTL
1A2B: C9 A5         291          CMP   #$A5
1A2D: DO 0C         292          BNE   MTERROR
1A2F: A5 01         293          LDA   TESTH
1A31: C9 5A         294          CMP   #$5A
1A33: DO 06         295          BNE   MTERROR
1A35: A5 02         296          LDA   TEMP
1A37: C9 66         297          CMP   #$66
1A39: F0 0D         298          BEQ   MTSKIP
                    299 *
1A3B: A0 00         300 MTERROR  LDY   #$00
1A3D: A2 00         301          LDX   #$00
1A3F: CA            302 MLOOP    DEX
1A40: D0 FD         303          BNE   MLOOP
1A42: 88            304          DE
1A43: D0 FA         305          BNE   MLOOP
1A45: 4C A3 1A      306          JMP   ERROR
                    307 *
1A48: A2 01         308 MTSKIP   LDX   #$01        ; 1=WRITE PASS 0=READ PASS
1A4A: A9 03         309 TSTLOOP  LDA   #$03        ; START AT LOCATION $0003
1A4C: 85 00         310          STA   TESTL
1A4E: A9 00         311          LDA   #$00
1A50: 85 01         312          STA   TESTH
1A52: A8            313          TAY
1A53: A5 00         314 SETLOOP  LDA   TESTL       ; CREATE A VALUE THAT TESTS
1A55: 4A            315          LSR               ; DATA BIT ERRORS AND ADDRESS CONFLI
CTS
1A56: 4A            316          LSR
1A57: 4A            317          LSR
1A58: 4A            318          LSR
1A59: 45 00         319          EOR   TESTL
```

```
lASB: 45 01     320           EOR   TESTH
1A5D: 29 0F     321           AND   #$0F
1A5F: 85 02     322           STA   TEMP
1A61: 0A        323           ASL
1A62: 0A        324           ASL
1A63: 0A        325           ASL
1A64: 0A        326           ASL
1A65: 05 02     327           ORA   TEMP
1A67: E0 00     328           CPX   #$00
1A69: D0 06     329           BNE   WRITE       ; READ OF WRITE DATA
1A6B: Dl 00     330           CMP   (TESTL),y
1A6D: D0 CC     331           BNE   MTERROR     ; IF BAD, SEND ERROR MESSAGE
1A6F: F0 02     332           BEQ   READ
1A71: 91 00     333 WRITE     STA   (TESTL),y
1A73: E6 00     334 READ      INC   TESTL       ; ADVANCE TO NEXT LOCATION
1A75: D0 DC     335           BNE   SETLOOP
1A77: E6 01     336           INC   TESTH
1A79: A5 01     337           LDA   TESTH
1A7B: C9 04     338           CMP   #$04
1A7D: 90 D4     339           BLT   SETLOOP
1A7F: CA        340           DEX
1A80: F0 C8     341           DEQ   TSTLOOP
                342 *
                343 *********************************
                344 *                               *
                345 * ENHANCER ROM CHECKSUM TEST    *
                346 *                               *
                347 *********************************
                348 *
1A82: A9 18     349 CHECKSUM  LDA   #>EPROM     ; START AT $1800
1A84: 85 01     350           STA   TESTH
1A86: A9 00     351           LDA   #$00
1A88: 85 00     352           STA   TESTL
1A8A: A8        353           TAY
1A8B: 48        354           PHA
1A8C: 68        355 CSLOOP    PLA               ; RECOVERR SUM
1A8D: 18        356           CLC
1A8E: 71 00     357           ADC   (TESTL),Y   ; ADD TO COUNT
1A90: 48        358           PHA               ; SAVE SUM
1A91: C8        359           INY
1A92: D0 F8     360           BNE   CSLOOP      ; ADVANCE & LOOP UNTIL $2000
1A94: E6 01     361           INC   TESTH
1A96: A5 01     362           LDA   TESTH
1A98: C9 20     363           CMP   #$20
1A9A: D0 F0     364           BNE   CSLOOP
1A9C: 68        365           PLA               ; GET SUM
1A9D: C9 00     366           CMP   #CKSUM      ; IF NOT EQUAL TO CKSUM THEN ERROR
1A9F: F0 31     367           BEQ   CLRTBLS
1AA1: A0 18     368           LDY   #CSMSG-MTMSG ; TRANSMIT CHECKSUM ERROR
                369 *
1AA3: B9 B9 IE  370 ERROR     LDA   MTMSG,Y
1AA6: F0 16     371           BEQ   HALT
1AA8: 8D 00 0E  372           STA   KEYOUT
1AAB: 09 80     373           ORA   #$80
1AAD: 8D 00 0E  374           STA   KEYOUT
1AB0: 29 7F     375           AND   #$7F
1AB2: 8D 00 0E  376           STA   KEYOUT
1AB5: A2 00
 00             377           LDX   #$00
```

```
1AB7: CA          378 ERRWAIT   DEX
1AB8: D0 ED       379           BNE   ERRWAIT
1ABA: C8          380           INY
1ABB: 4C A3 1A    381           JMP   ERROR
                  382 *
1ABE: 58          383 HALT      CLI
1ABF: 4C BE 1A    384           JMP   HALT
                  385 *
1AC2: 68          386 IRQ       PLA
1AC3: 48          387           PHA
1AC4: 29 10       388           AND   #$10
1AC6: D0 05       389           BNE   BREAK
1AC8: A0 32       390           LDY   #IRQMSG-MTMSG
1ACA: 4C A3 1A    391           JMP   ERROR
                  392 *
1ACD: A0 3D       393 BREAK     LDY   #BRKMSG-MTMSG
1ACF: 4C A3 1A    394           JMP   ERROR
                  395 *
1AD2: A2 1B       396 CLRTBLS   LDX   #ROWEND-ROW+1 ; CLEAR LOOK UP TABLES
1AD4: BD 03 1F    397 TBLOOP    LDA   MTXTBL1,X
1AD7: 95 40       398           STA   MXTB1,X
1AD9: A9 00       399           LDA   #$00
1ADB: 95 20       400           STA   OLDKEY,X
1ADD: CA          401           DEX
1ADE: 10 F4       402           BPL   TBLOOP
1AE0: 85 10       403           STA   DEFLAGS
1AE2: AD 01 0C    404           LDA   SPKEYS
1AE5: 29 40       405           AND   #ACKNWLG
1AE7: 85 13       406           STA   BUFMODE
1AE9: A9 80       407           LDA   #$80
1AEB: 85 1F       408           STA   DLFLAG
1AED: A9 FB       409           LDA   #FAST
1AEE:  85 15      410           STA   SPEED
```

```
                412 *********************************
                413 *                               *
                414 *          COLD RESTART         *
                415 *                               *
                416 *********************************
                417 *
1AF1: A9 00     418 RESET2   LDA    #$00
1AF3: SD 00 02  419          STA    MACTABLE
1AF6: 85 lE     420          STA    DEMODE
1AF8: 85 lB     421          STA    TENDL
1AFA: A9 02     422          LDA    #$02
1AFC: 85 1C     423          STA    TENDH
1A7E: AD 01 0C  424 RPWAIT   LDA    SPKEYS
1B01: 29 10     425          AND    #REPEAT
1BO3: F0 F9     426          BEQ    RPWAIT
                427 *
                428 *********************************
                429 *                               *
                430 *          WARM RESTART         *
                431 *                               *
                432 *********************************
                433 *
1B05: A5 10     434 RESET3   LDA    DEFLAGS
1B07: 29 02     435          AND    #DMODESEL
1B09: D0 0A     436          BNE    RESET4
1BOB: AD 01 OC  437          LDA    SPKEYS
1B0E: 29 08     438          AND    #SHIFT
1B10: 49 08     439          EOR    #SHIFT
1B12: 4A        440          LSR
1B13: 85 1D     441          STA    AMODE
                442 *
                443 *********************************
                444 *                               *
                445 *          HOT RESTART          *
                446 *                               *
                447 *********************************
                448 *
1B15: A2 0F     449 RESET4   LDX    #$0F        ;HOT RESTART
LDX 1B17: A9 00 430          LDA    #$00
1B19: 95 00     451 RSLOOP   STA    $00,X
1B1B: CA        452          DEX
1B1C: 10 FB     453          BPL    RSLOOp
1B1E: 9A        454          TXS
1B1F: A9 40     455          LDA    #BEGRPT
1B21: 85 08     456          STA    REPT
```

```
                458 *********************************
                459 *                               *
                460 *        SCAN FOR NEW KEY       *
                461 *                               *
                462 *********************************
                463 *
1B23: 20 IE 1C  464 SCAN     JSR   SPECIAL      ; HANDLE SPECIAL KEYS
1B26: A2 00     465          LDX   #$00
1B28: 86 09     466          STX   MTXSAVE
1B2A: 20 59 lB  467 SCLOOP   JSR   RDKEY        ; READ KEYBOARD
1B2D: 48        468          PHA                ; SAVE MATRIX
1B2E: 15 20     469          ORA   OLDKEY,X     ; REMOVE OLD KEYS
1B30: 49 FF     470          EOR   #$FF
1B32: D0 77     471          BNE   DECODE       ; IF NOT 0 THEN DECODE NEW KEY
1B34: 68        472          PLA                ; RECOVER MATRIX
1B35: 49 FF     473          EOR   #$FF
1B37: 95 20     474          STA   OLDKEY,X     ; ESTABLISH OLD KEYS
1B39: 05 09     475          ORA   MTXSAVE      ; ADD TO KEY DOWN CHECK
1B3B: 85 09     476          STA   MTXSAVE
1B3D: E8        477          INX
1B3E: E8        478          INX
1B3F: E0 1C     479          CPX   #$1C         ; DONE WITH SCAN ?
1B41: 90 E7     480          BLT   SCLOOP       ; NO, CONTINUE
1B43: A5 09     481          LDA   MTXSAVE      ; IF OLD KEY DOWN THEN AUTO REPEAT
1B45: D0 21     482          BNE   REPCHK
1B47: A5 10     483          LDA   DEFLAGS      ; CHECK FOR DEFINE MACROS
1B49: 29 20     484          AND   #DMACDEF
1B4B: D0 D6     485          BNE   SCAN
1B4D: AD 01 0C  486          LDA   SPKEYS
1B50: 29 LC     487          AND   #SHIFT.CONTROL.REPEAT
1B52: D0 CF     488          BNE   SCAN
1B54: 38        489          SEC
1B55: 66 lE     490          ROR   DFMODE
1B57: D0 CA     491          BNE   SCAN
                492 *
                493 *********************************
                494 *                               *
                495 *      READ KEYBOARD ROW        *
                496 *                               *
                497 *********************************
                498 *
1B59: Al 40     499 RDKEY    LDA   (MTXTBL,X)    ; GET MATRIX
1E5B: E0 0A     500          CPX   #$0A          ; USE APPROPRIIATE MASK
1B5D: 90 08     501          BLT   NOMASK
1B5F: E0 14     502          CPX   #$14
1B61: B0 02     503          BGE   MASK1
1B63: 09 FC     504          ORA   #$FC
1B65: 09 F0     505 MASK1    ORA   #$F0
1B67: 60        506 NOMASK   RTS
```

```
                    508 ********************************
                    509 *                              *
                    510 *         PERFORM REPEAT       *
                    511 *         & AUTO REPEAT        *
                    512 *                              *
                    513 ********************************
                    514 *
1B68: AD 01 0C      515 RECHK     LDA   SPKEYS      ; REPEAT KEY DOWN?
1B6B: 29 10         516           AND   #REPEAT
1B6D: F0 09         517           BEQ   KEYREPT     ; YES, DO REPEAT
1B6F: A5 15         518           LDA   SPEED
1B71: C9 F0         519           CMP   #STRPT
1B73: D0 0D         520           BNE   AUTORPT     ; IF FAST THEN AUTO REPEAT
1B75: 4C 23 1B      521           JMP   SCAN
                    522 *
1B78: A9 F0         523 KEYREPT   LDA   #STRPT
1B7A: C5 08         524           CMP   REPT
1B7C: 90 04         525           BLT   AUTORPT
1B7E: A5 15         526           LDA   SPEED
1B80: 85 08         527           STA   REPT        ; RESTART COUNTER
                    528 *
1B82: E6 0A         529 AUTORPT   INC   REPT1       ; INCREMENT REPEAT COUNTER
1B84: A5 0A         530           LDA   REPT1
1B86: 4A            531           LSR
1B87: 90 9A         532           BCC   SCAN
1B89: E6 08         533           INC   REFT
1B8B: D0 96         534           BNE   SCAN        ; IF 0 THEN REPEAT LAST KEY
1B8D: A9 F0         535           LDA   #STRPT
1B8F: 85 08         536           STA   REPT
1B91: A5 1E         537           LDA   DFMODE      ; HANDLE MACROS WIERD
1B93: D0 0A         538           BNE   RDMACRO
1E95: 24 07         539           BIT   MACFLG
1E97: 30 0C         540           BMI   RPMACRO
1B99: 20 99 1D      541           JSR   NOMAC1
1B9C: 4C 23 lB      542           JMP   SCAN
                    543 *
1B9F: 20 ED 1C      544 RDMACRO   JSR   MCRECHK
1BA2: 4C 23 lB      545           SCAN
                    546 *
18A5: 20 5D 1D      547 RPMACRO   JSR   MACRO
1BA8: 4C 23 lB      548           JMP   SCAN
```

```
                    550 ******************************
                    551 *                            *
                    552 *       DECODE NEW KEY       *
                    553 *                            *
                    554 ******************************
                    555 *
1BAB: A0 01         556 DECODE   LDY  #$01     ; SHIFT BITS FROM MATRIX
1BAD: C8            557 DCLOOP   INY
1BAE: 0A            558          ASL
1BAF: 90 FC         559          BCC  DCLOOP
                    560 *
                    561 ******************************
                    562 *                            *
                    563 *       DEBOUNCE KEY         *
                    564 *                            *
                    565 ******************************
                    566 *
1BB1: 84 0C         567          STY  DBKEY    ; DEBOUNCE KEYBOARD
1BB3: A9 04         568          LDA  #DBTIME  ; DBTIME TIMES
1BB5: 85 0B         569          STA  DBCNT
1BB7: 20 59 1B      570 DBLOOP   JSR  RDKEY
1BBA: 15 20         571          ORA  OLDKEY,X
1BBC: A0 01         572          LDY  #$01
1BBE: C8            573 DBLOOP1  INY
1BBF: C4 0C         574          CPY  DBKEY
1BC1: F0 04         575          BEQ  DBEXIT
1BC3: 0A            576          ASL
ASL 1BC4: 4C BE 1B  577          JMP  DBLOOP1
                    578 *
1BC7: 0A            579 DBEXIT   ASL
1BC8: 90 04         580          BCC  GOODKEY  ; GOOD IF KEY STILL DOWN
1BCA: 68            581          PLA
1BCE: 4C 23 1B      582          JMP  SCAN     ; GIVE UP
                    583 *
1BCE: C6 0B         584 GOODKEY  DEC  DBCNT
1BD0: D0 E5         585          BNE  DBLOOP   ; CONTINUE DEBOUNCING UNTIL DONE
                    586 *
1BD2: 68            587 NODB     PLA           ; RECOVER MATRIX
1BD3: 49 FF         588          EOR  #$FF
1BD5: 95 20         589          STA  OLDKEY,X ; ESTABLISH OLD KEY
1BD7: A9 80         590          LDA  #$80     ; CLEAR HALFLOCK FLAG
1BD9: 85 06         591          STA  HALFLOCK
1BDB: A9 40         592          LDA  #BEGRPT  ; RESET REPEAT COUNT
1BDD: 85 08         593          STA  REPT
1BDF: 98            594          TYA           ; COMPUTE KEY INDEX
1BE0: 18            595          CLC
1BE1: 7D 1F 1F      596          ADC  ROW,X
1BE4: 85 16         597          STA  CHAR     ; SAVE IN CHAR
                    598 *
                    599 ******************************
                    600 *                            *
                    601 *       COMPUTE MODE         *
                    602 *                            *
                    603 ******************************
                    604 *
1BE6: A5 0E         605          LDA  SPKEYS1  ; COMPUTE MODE
1BE8: 29 0C         606          AND  #SHIFT.CONTROL
1BEA: 4A            607          LSR
```

```
1BEB: 4A         608          LSR
1BEC: 05 1D      609          ORA   ANODE
1BEE: 85 0F      610          STA   MODE1
                 611 *
1BF0: A5 10      612          LDA   DEFLAGS
1BF2: 29 01      613          AND   #DSHIFTLK
1BF4: 85 02      614          STA   TEMP
1BF6: A5 1D      615          LDA   AMODE
1BF8: 49 04      616          EOR   #$04
1BFA: 05 02      617          ORA   TEMP
1BFC: 05 lE      618          ORA   DFMODE
1BEE: F0 04      619          BEQ   MDSET1
1C00: A9 00      620          LDA   #$00
1C02: F0 06      621          BEQ   ALOCK
                 622 *
1C04: A5 05      623 MDSET1   LDA   LOCKFLG
1C06: 29 08      624          AND   #SHIFT
1C08: 4A         625          LSR
1C09: 4A         626          LSR
1C0A: 05 0F      627 ALOCK    ORA   MODEl
1C0C: 85 11      628          STA   MODE
                 629 *
1C0E: E0 14      630          CPX   #$14         ; IF FROM KEYPAD CHANGE MODE
1C10: 90 06      631          BLT   NTKYPAD
1C12: A9 08      632          LDA   #$08
1C14: 85 11      633          STA   MODE
1C16: 85 0F      634          STA   MODEL
1C18: 20 CC 1C   635 NTKYPAO  JSR   GETKEY       ; PUT KEY IN BUFFER
1C1B: 4C 23 1B   636          JMP   SCAN         ; RETURN TO SCAN
```

```
                    638 ***********************************
                    639 *                                 *
                    640 *      HANDLE SPECIAL KEYS        *
                    641 *     SHIFT CTRL REPT RESET       *
                    642 *                                 *
                    643 *                                 *
                    644 ***********************************
                    645 *
1ClE: AD 01 0C      646 SPECIAL   LDA SPKEYS       ; CREATE SPKYS1
1C21: 49 PP         647           EOR #$FF
1C23: 85 0E         648           STA SPKEYS1
                    649 *
                    650 ***********************************
                    651 *                                 *
                    652 *   CHECK FOR DOWN LOAD MACROS    *
                    653 *                                 *
                    654 ***********************************
                    655 *
1C25: A5 10         656           LDA  DEFLAGS
1C27: 29 40         657           AND  #DDNLOAD    ; CHECK FOR DOWN LOAD DEFEAT
1C29: D0 10         658           BNE  NTDNLD
1C2B: A5 OE         659           LDA  SPKEYS1
1C2D: 29 80         660           AND  #OPTION     ; CHECK FOR AUTO DOWN LOAD
1C2F: F0 0A         661           BEQ  NTDNLD
1C31: A5 1F         662           LDA  DLFLAG
1C33: D0 0A         663           BNE  NTDNLD1
1C35: 38            664           SEC
1C36: 66 1F         665           ROR  DLFLAG
1C38: 4C 20 1E      666           JMP  DOWNLOAD
1C3B: A9 00         667 NTDNLD    LDA  #$00
1C3D: 85 1F         668           STA  DLFLAG
1C3F: A5 0E         669 NTDNLD1   LDA  SPKEYS1
1C41: 29 20         670           AND  #RESET      ; CHECK FOR RESET PRESSED
1C43: F0 12         671           BEQ  NTRESET
1C45: A5 10         672           LDA  DEFLAGS
1C47: 29 20         673           AND  #DMAGDEF    ; CHECK FOR MACRO DEFINE DEFEAT
1C49: D0 09         674           BNE  NTRPT
1C4B: A5 0E         675           LDA  SPKEYS1
1C4D: 29 10         676           AND  #REPEAT     ; CHECK FOR REPEAT—RESET
1C4F: F0 03         677           BEQ  NTRPT
1C51: 4C 20 1E      678           JMP  DOWNLOAD    ; IF SO, DOWN LOAD
1C54: 4C 05 1B      679 NTRPT     JMP  RESET3      ; JUST RESET, WARM START
                    660 *
                    681 ***********************************
                    682 *                                 *
                    683 *   CHECK FOR END MACRO DEFINE    *
                    684 *                                 ^
                    685 ***********************************
                    686 *
1C57: A5 0E         687 NTRESET   LDA  SPKEYS1
1C59: 29 10         688           AND  #REPEAT     ; CHECK FOR REPEAT TO
1C5B: P0 08         689           BEQ  NTREPT      ; TERMINATE MACRO DEFINITION
1C5D: A5 1E         690           LDA  DFMODE
1C5F: 30 04         691           BMI  NTREPT
1C61: A9 00         692           LDA  #$00
1C63: 85 lE         693           STA  DFMODE
```

```
                    695 *********************************
                    696 ^                               *
                    697 *  FERFORM SHIFT LOCK FUNCTION   *
                    698 *                               *
                    699 *                               *
                    700 *********************************
AD 01 OC            701 NTREPT    LDA   SFKEYS
29 08               702           AND   #SHIFT
25 05               703           AND   LOCKFLG
85 05               704           STA   LOCKFLG
                    705 *
1C6E: A5 0E         706           LDA   SFKEYS1
1C70: 29 04         707           AND   #CONTROL
1C72: F0 16         708           BEQ   LOCKSET
1C74: A5 0D         709           LDA   LOCKCNT
1C76: F0 04         710           BEQ   GOODLK
1C78: C6 0D         711           DEC   LOCKCNT
1C7A: 00 lE         712           LDE   OUTPUT
1C7C: A5 05         713 GOODLK    LDA   LOCKFLG
1C7E: D0 lA         714           BNE   OUTPUT
1C80: 24 06         715           BIT   HALFLOCK
1C82: 30 16         716           BMI   OUTPUT
1C84: A9 08         717           LDA   #SHIFT
1C86: 85 06         718           STA   HALFLOCK
1C88: D0 10         719           BNE   OUTPUT
                    720 *
1C8A: A5 05         721 LOCKSET   LDA   LOCKFLG
1C8C: 05 06         722           ORA   HALFLOCK
1C8E: 29 08         723           AND   #SHIFT
1C90: 85 05         724           STA   LOCKFLG
1C92: A9 00         725           LDA   #$00
1C94: 85 06         726           STA   HALELOCK
1C96: A9 10         727           LDA   #LKTIME
1C98: 85 0D         728           STA   LOCKCNT
                    729 *
                    730 *********************************
                    731 *                               *
                    732 *    OUTPUT KEY IF POSSIBLE     *
                    733 *                               *
                    734 *********************************
                    735 *
1C9A: A5 10         736 OUTPUT    LDA   DEFLAGS
1C9C: 29 10         737           AND   #DBUFFER    ; CHECK FOR BUFFER DEFEAT
1C9E: 05 13         738           ORA   BUFMODE
1CA0: D0 0R         739           BNE   NOBUFF
1CA2: A5 04         740           LDA   FLUSH       ; NO BUFFER IF FLUSHED
1CA4: F0 07         741           BEQ   NOBUFF
1CA6: AD 01 0C      742           LDA   SPKEYS
1CA9: 29 40         743           AND   #ACKNWLG    ; WAIT FOR ACKNOWLEGE
1CAB: D0 lE         744           BNE   SPEXIT
1CAD: A6 01         745 NOBUFF    LDX   BUFOUT
1CAF: E4 00         746           CPX   BUFIN       ; BUFFER EMPTY?
1CB1: F0 18         747           BEQ   SPEXIT      ; YES, EXIT
1CE3: E8            748           INX
1CB4: 8A            749           TXA
1CB5: 29 7F         750           AND   #$7F
ICB7: 85 01         751           STA   BUFOUT      ; 128 CHAR BUFFER
1CE9: AA            752           TAX
```

```
1CBA: B5 80      753          LDA   BUFFER,X   ; GET CHARACTER FROM BUFFER
1CBC: 8D 00 0E   754          STA   KEY0UT     ; OUTPUT CHARACTER
1CBF: 09 80      755          ORA   #$80
1CCh: 85 04      756          STA   FLUSH
1CC3: 8D 00 0E   757          STA   KEYOUT
1CC6: 29 7F      758          AND   #$7F
1CC8: 8D 00 0E   759          STA   KEYOUT
1CCB: 60         760 SPEXIT   RTS
```

```
                    762 ******************************
                    763 *                            *
                    764 *        PROCESS KEY         *
                    765 *                            *
                    766 ******************************
                    767 *
1CCC: 46 07         768 GETKEY   LSR  MACFLG    ; CLEAR MACRO FLAG
1CCE: A5 11         769          LDA  MODE      ; COMPUTE ASCII CHARACTER
1CD0: 4A            770          LSR
1CD1: 6A            771          ROR
1CD2: 48            772          PHA
1CD3: 6A            773          ROR
1CD4: 29 C0         774          AND  #$C0
1CD6: 85 02         775          STA  MAPL
1CD8: 68            776          PLA
1CD9: 29 03         777          AND  #$03
1CDB: 09 18         778          ORA  #>EFROM
1CDD: 85 03         779          STA  MAPL
1CDF: A4 16         780          LDY  CHAR
1CE1: B1 02         781          LDA  (MAPL),Y
1CE3: 85 12         782          STA  KEY
1CE5: 49 A5         783          EOR  #$A5
1CE7: 85 14         784          STA  PWROFF
                    785 *
1CE9: A5 lE         786          LDA  DFMODE    ; IS A MACRO BEING DEFINED?
1CEB: F0 70         787          BEQ  MACRO     ; NO, CHECK FOR MACRO KEY
1CED: 30 1A         788 MCRECHR  BMI  MACREATE  ; IF NEC START DEFINITION
                    789 *
                    790 ******************************
                    791 *                            *
                    792 *        DEFINE MACRO        *
                    793 *                            *
                    794 ******************************
                    795 *
1CEF: A5 12         796 MGDFINE  LDA  KEY
1CF1: A0 00         797          LDY  #$00
1CF3: 91 17         798          STA  (SRCHL),Y ; SAVE KEY IN TABLE
1CF5: 20 E2 1D      799          JSR  NXTBYTE   ; ADVANCE
1CF8: P0 26         800          BEQ  MCABORT   ; TERMINATE DEFFINE IF FAIL
1CFA: A9 00         801          LDA  #$00      ; SAVE END CHARACTER
1CFC: 91 17         802          STA  (SRCHL),Y
1CFE: A5 17         803          LDA  SRCHL     ; SAVE NEW END POINTER
1D00: 85 lB         804          STA  TENDL
1D02: A5 18         805          LDA  SRCHH
1D04: 85 1C         806          STA  TENDL
1D06: 4C 8B 1D      807          JMP  NOMACRO   ; CONTINUE
                    808 *
                    809 ******************************
                    810 *                            *
                    811 *    START MACRO DEFINITION  *
                    812 *                            *
                    813 ******************************
                    814 *
1D09: 46 lE         815 MACREATE LSR  DFMODE    ; MAKE DFMODE POSITIVE
1D0B: 20 50 1D      816          JSR  SEARCH    ; IS KEY A MACRO ALREADY?
1D0E: DO 16         817          BNE MACEMOVE   ; YES, REMOVE IT
1D10: 20 E8 1D      818          JSR ENDCHK     ; IS THERE ROOM?
1D13: F0 0B         819          BEQ MCABORT    ; NO, ABORT
```

```
1D15: AS 17      820           LDA   SRCHL       ; MOVE = SRCH
lD17: 85 19      821           STA   MOVEL
1D19: A5 18      822           LDA   SRCHB
lDlB: 85 IA      823           STA   MOVEH
1D1D: 4C 48 1D   824           JMP   NEWMACRO
                 825 *
1D20: A9 00      826 MCABORT   LDA   #$00        ; ABORT DEFINITION
1D22: 85 lE      827           STA   DFMODE
1D24: 70 65      828           BEQ   NOMACRO
                 829 *
lD26: 20 ED 1D   830 MACRMOVE  JSR   NXTCHAR     ; FIND END OF MACRO
1D29: DO 06      831           BNE   MOVE        ; IF FOUND, MOVE THE REST DOWN
1D2B: 20 B0 1D   832           JSR   SEARCH      ; FIND MACRO AGAIN
1D2E: 4C 17 1E   833           JMP   ENDSET      ; ESTABLISH NEW END
                 834 *
1D31: Bl 17      835 MOVE      LDA   (SRCHL),Y   ; MOVE REMAINING MACROS DOWN
1D33: 91 19      836           STA   (MOVEL),Y
1D35: E6 19      837           INC   MOVEL
1D37: D0 02      838           BNE   MSKIP1
lD39: E6 IA      839           INC   MOVEL
ID3B: 20 06 lE   840 MSKIP1    JSR   NXTCHK
1D3E: D0 Fl      841           BNE   MOVE
1D40: A5 19      842           LDA   NOVEL
1D42: 85 17      843           STA   SRCHL
1D44: A5 1A      844           LDA   MOVEH
1D46: 85 18      845           STA   SRCHH
                 846 *
1D48: A5 11      847 NEWMACRO  LDA   MODE        ; SAVE MODE AND CHAR
1D4M: 91 17      848           STA   (SRCIIL),Y  ; IN TABLE
ID4C: 20 E2 1D   849           JSR   NXTBYTE
1D4F: F0 CF      850           BEQ   MCABORT
1D51: A5 16      851           LDA   CHAR
1D53: 91 17      852           STA   (SRCHL),Y
1D55: 20 E2 lD   853           JSR   NXTBYTE
1D58: F0 C6      854           BEQ   MCABORT
1D5A: 4C 17 lE   855           JMP   ENDSET      ; ESTABLISH NEW END POINTER
```

```
                857 ****************************************
                858 *                                      *
                859 *        CHECK KEY FOR MACRO OUTPUT    *
                860 *                                      *
                861 ****************************************
                862 *
1D50: 20 B0 1D  863 MACRO    JSR   SEARCH       ; IS KEY A MACRO?
1D60: P0 29     864          BEQ   NOMACRO      ; NO, OUTPUT NORMAL
1D62: 38        865          SEC
1D63: 66 07     866          ROR   MACFLG       ; SET MACRO FLAG
1D65: B1 17     867 MACLOOP  LDA   (SRCHL),Y    ; STUFF MACRO INTO BUFFER
1D67: 10 46     868          BPL   INDONE       ; EXIT WHEN DONE
1D69: 85 12     869          STA   KEY
1D6B: 49 A5     870          EOR   #$A5
1D6D: 85 14     871          STA   PWROFF
1D6P: 20 99 1D  872          JSR   NOMAC1       ; STUFF CHARACTER
1D72: A5 10     873          LDA   DEFLAGS      ; IF NO BUFFER, USE DELAY
1D74: 29 10     874          AND   #DBUFFER
1D76: 05 13     875          ORA   BUFMODE
lD78: F0 0A     876          BEQ   NODLY
1D7A: A0 08     877          LDY   #MCDLY
1D7C: A2 00     878 MDLOOP   LDX   #$00
1D7E: 20 B0 lE  879          JSR   DLYLOOP
1D81: 88        880          DEY
1D82: D0 F8     881          BNE   MDLOOP
1D84: 20 E2 10  882 NODLY    JSR   NXTBYTE      ; POINT TO NEXT BYTE
1D87: F0 26     883          BEQ   INDONE       ; IF FAIL THEN DONE
1D89: D0 DA     884          BNE   MACLOOP
                885 *
1D8B: A5 12     886 NOMACRO  LDA   KEY          ; IF KEY IS CTRL C THEN
1D8D: C9 83     887          CMP   #$83         ; FLUSH BUFFER
ID8F: D0 08     888          BNE   NOMAC1
1D91: A9 00     889          LDA   #$00
1D93: 85 00     890          STA   BUFIN
1D95: 85 01     891          STA   BUFOUT
1D97: 85 04     892          STA   FLUSH
1D99: 20 9A 1C  893 NOMAC1   JSR   OUTPUT       ; TRY OUTPUT
1D9C: A6 00     894          LDX   BUFIN
1D9E: E8        895          INX
1D9F: 8A        896          TXA
1DA0: 29 7F     897          AND   #$7F
1DA2: C5 01     898          CMP   BUFOUT       ; IF BUFFER FULL
1DA4: F0 F3     899          BEQ   NOMAC1       ; LOOP UNTIL AVAILABLE
1DA6: AA        900          TAX
1DA7: A5 12     901          LDA   KEY
1DA9: 29 7F     902          AND   #$7F
1DAB: 95 80     903          STA   BUFFER,X     ; STUFF KEY IN BUFFER
IDAD: 86 00     904          STX   BUFIN
1DAF: 60        905 INDONE   RTS
```

```
                907 *
                908 *
                909 *        SEARCH FOR MACRO
                910 *
                911 *
                912 *
1DB0: A9 00     913 SEARCH   LDA     #$00        ; INIT SEARCH VARIABLES
1DB2: 85 17     914          STA     SRCHL
1DB4: A8        915          TAY
1DBS: A9 02     916          LDA     #>MACTABLE
1DB7: 85 18     917          STA     SRCHH
1DR9: 20 0C lE  918          JSR     LASTCHK     ; CHECK FOR NO MACROS
1DRC: F0 18     919          BEQ     SHEXIT      ; IF SO, EXIT
1DRE: A5 17     920 SHLOOP   LDA     SRCHL       ; MOVE = SRCH
1DC0: 85 19     921          STA     MOVEL
1DC2: A5 18     922          LDA     SRCHH
1DC4: 85 lA     923          STA     MOVEH
1DC6: B1 17     924          LDA     (SRCHL),Y   ; GET BYTE
1DCS: C5 0F     925          CMP     MODE1       ; IS IT MODE?
1DCA: F0 0B     926          BEQ     MODFND      ; YES. CHECK CHAR
1DCC: 20 E2 1D  927          JSR     NXTBYTE     ; SKIP A BYTE
1DCF: F0 05     928          BEQ     SHEXIT      ; IF FAIL, EXIT
1DDH: 20 ED 1D  929 NTCHAR   JSR     NXTCHAR     ; ADVANCE TO NEXT MACRO
1DD4: D0 E8     930          BNE     SHLOOP      ; LOOP UNLESS FAILURE
1DD6: 60        931 SHEXIT   RTS
                932 *
1DD7: 20 06 lE  933 MODFND   JSR     NXTCHK      ; ADVANCE TO NEXT BYTE
1DDA: F0 FA     934          BEQ     SHEXIT      ; IF FAIL, EXIT
1DDC: B1 17     935          LDA     (SRCHL),Y   ; GET BYTE
1DDE: C5 16     936          CMP     CHAR        ; IS IT CHAR?
1DE0: D0 EF     937          BNE     NTCHAR      ; NO, TRY AGAIN
                938 *
1DE2: E6 17     939 NXTBYTE  INC     SRCHL       ; INCREMENT SEARCH COUNTER
1DE4: D0 02     940          BNE     ENDCHK
1DE6: E6 18     941          INC     SRCHH
                942 *
1DE8: A5 18     943 ENDCHK   LDA     SRCRH       ; CHECK FOR END OF MEMORY
1DEA: C9 04     944          CMP     #$04
1DEC: 60        945          RTS
                946 *
1DED: E6 17     947 NXTCHAR  INC     SRCHL       ; INCREMENT SEARCH COUNTER
1DEF: D0 02     948          BNE     NCSKIP
1DF1: E6 18     949          INC     SRCHH
1DF3: A5 18     950 NCSKIP   LDA     SRCHH       ; CHECK FOR END OF MACROS
1DF5: C5 1C     951          CMP     TENDH
IDF7: DO 06     952          BNE     NCSKIP1
1DF9: A5 17     953          LDA     SRCHL
1DFB: C5 1B     954          CMP     TENDL
LDFD: F0 06     955          BEQ     RTS2
1DFF: Bl 17     956 NCSKIP1  LDA     (SRCHL),Y   ; GET BYTE
IE01: 30 EA     957          BMI     NXTCHAR     ; LOOP UNTIL HIGH BIT CLEAR
1E03: A9 80     958          LDA     #$80        ; RETURN NO FAIL
lE05: 60        959 RTS2     RTS
                960 *
1E06: E6 17     961 NXTCHK   INC     SRCHL       ; INCREMENT SEARCH COUNTER
1E08: D0 02     962          BNE     LASTCHK
lE0A: E6 18     963          INC     SRCHH
                964 *
```

```
1E0C: A5 18       965 LASTCHK   LDA  SRCHH         ;CHECK FOR END OF MACROS
1E0E: C5 1C       966           CMP  TENDH
1E10: D0 04       967           BNE  RTS1
1E12: A5 17       968           LDA  SRCBL
1E14: C5 lB       969           CMP  TENDL
1E16: 60          970 RTSI      RTS
                  971 *
1E17: AS 19       972 ENDSET    LDA  MOVEL          ; SET END POINTER TO MOVE
1E19: 85 1B       973           STA  TENDL
1E1B: A5 lA       974           LDA  MOVEH
lE1D: 85 1C       975           STA  TENDH
1E1F: 60          976           RTS
```

```
                    978 *********************************
                    979 *                               *
                    980 *  DOWN LOAD MACROS FROM APPLE   *
                    981 *                               *
                    982 *********************************
                    983 *
1E20: 20 75 lE      984 DOWNLOAD   JSR   RDBYTE      ;READ FIRST BYTE
1E23: F0 34         985            BEQ   DLERROR     ; EXIT ON FAIL
1E25: A5 02         986            LDA   TEMP
1E27: 85 0F         987            STA   MODE1
1E29: 20 75 lE      988            JSR   RDBYTE      ;READ END POINTER
1E2C: F0 2E         989            BEQ   DLERROR
lE2E: A5 02         990            LDA   TEMP
1E30: 85 lB         991            STA   TENDL
1E32: 20 75 lE      992            JSR   RDBYTE
1E35: F0 22         993            BEQ   DLERROR
1E37: A5 02         994            LDA   TEMP
1E39: 85 1C         995            STA   TENDH
1E3B: 20 5C lE      996            JSR   RDMACROS    ; READ MACROS
1E3E: F0 19         997            BEQ   DLERROR     ; EXIT ON FAIL
1E40: A5 0F         998            LDA   MODE1
1E42: 85 10         999            STA   DEFLAGS
1E44: 29 04         1000           AND   #MODESET    ; SET ALPHA MODE
lE46: 85 1D         1001           STA   AMODE
1E48: A5 10         1002           LDA   DEFLAGS     ; SET DEFEAT FLAGS
1E4A: 29 08         1003           AND   #DAUTORPT   ; SET AUTO REPEAT SPEED
1E4C: F0 04         1004           BEQ   NORMRPT
1E4E: A9 F0         1005           LDA   #STRPT
1E50: 00 02         1006           ME    SETSPEED
1E52: A9 FE         1007 NORMEPT   LDA   #FAST
1E54: 85 15         1008 SETSPEED  STA   SPEED
1E56: 4C 15 lE      1009           JMP   RESET4      ; DO NOT RESTART
                    1010 *
1E59: 4C Fl 1A      1011 DLERROR   JMP   RESET2      ; DO COLD RESTART
                    1012 *
1E5C: A9 02         1013 RDMACROS  LDA   #MACTABLE   ; INIT VARIABLES
1E5E: 85 18         1014           STA   SRCHH
1E60: A9 00         1015           LDA   #$00
1E62: 85 17         1016           STA   SRCHL
1E64: 20 75 1E      1017 RMLOOP    JSR   RDBYTE      ; READ BYTE
1E67: F0 0R         1018           BEQ   RTS3        ; EXIT ON FAIL
1E69: A5 02         1019           LDA   TEMP
1E6B: 91 17         1020           STA   (SRCHL),Y   ; SAVE BYTE IN MACRO TABLE
1E6D: 20 E2 1D      1021           JSR   NXTBYTE     ; ADVANCE TABLE POINTER
1E70: D0 F2         1022           BNE   RDLOOP      ; CONTINUE LOOP UNTIL FAIL
1E72: A9 FF         1023           LDA   #$FF        ; NO FAIL
1E74: 60            1024 RTS3      RTS
                    1025 *
1E75: A0 08         1026 RDBYTE    LDY   #$08        ; READ 8 BITS
1E77: 20 84         1027 BYTELOOP  JSR   RDBIT
1E7A: F0 07 lE      1028           BEQ   RTS4        ; EXIT ON FAIL
1E7C: 26 02         1029           ROL   TEMP        ; ROTATE BIT IN
1E7E: 88            1030           DEY
1E7F: D0 F6         1031           BNE   BYTELOOP
lE81: A9 FF         1032           LDA   #$FF        ; NO FAIL
1E83: 60            1033 RTS4      RTS
                    1034 *
1E84: A9 7F         1035 RDBIT     LDA   #$7F        ; OUTPUT A RUBOUT
```

```
1E86: 8D 00 0E   1036           STA  KEYOUT
1E89: A9 FF      1037           LDA  #$FF
1E8B: 8D 00 0E   1038           STA  KEYOUT
1E8E: A9 7T      1039           LDA  #$7F
1E90: 8D 00 0E   1040           STA  KEYOUT
1E93: 20 AE 1E   1041           JSR  DELAY      ; DELAY ONCE
1E96: F0 0F      1042           BEQ  RTS5       ; EXIT ON BAD HANDSHAKE
1E98: 20 AE 1B   1043           JSR  DELAY      ; DELAY ONCE
1E9B: F0 0B      1044           BEQ  ZEROBIT    ; CLEAR CARRY AND EXIT
1E9D: 20 AE 1E   1045           JSR  DELAY      ; DELAY TWICE
1EA0: 20 AE 1E   1046           JSR  DELAY
1EA3: F0 05      1047           BEQ  ONEBIT     ; SET CARRY AND EXIT
1EA5: A9 00      1048           LDA  #$00       ; FAIL
1EA7: 60         1049 RTS5      RTS
                 1050 *
1EA8: 18         1051 ZEROBIT   CLC
1EA9: B0         1052           HEX  B0
1BAA: 38         1053 ONEBIT    SEC
1EAB: A9 FF      1054           LDA  #$FF       ; NO FAIL
1EAD: 60         1055           RTS
                 1056 *
1EAE: A2 10      1057 DELAY     LDX  #DLY
1EB0: CA         1058 DLYLOOP   DEX
1EB1: D0 FD      1059           BNE  DLYLOOF
1EB3: AD 01 0C   1060           LDA  SFKEYS
1EB6: 29 40      1061           AND  #ACKNWLG
1EB8: 60         1062           RTS
```

```
                1064 ********************************
                1065 *                              *
                1066 *        MESSAGES AND TABLES   *
                1067 *                              *
                1068 ********************************
                1069 *
1EB9: 45 4E 48
1EBC: 41 4E 43
1EBF: 45 52 20
1EC2: 4B 45 4D
1EC5: 4F 52 59
1EC8: 20 46 41
1ECB: 49 4C 55
1ECE: 52 45     1070 MTMSG    ASC    'ENHANCER MEMORY FAILURE'
1ED0: 00        1071          HEX    00
1ED1: 45 4E 48
1ED4: 41 4E 43
1ED7: 45 52 20
1EDA: 43 48 45
1EDB: 43 43 53
1EE0: 55 4B 20
1EE3: 46 41 49
1EE6: 4C 55 52
1EE9: 45        1072 CSMSG    ASC    'ENHANCER CHECKSUM FAILURE'
1EEA: 00        1073          HEX    00
1EEB: 49 4E 54
1EEE: 45 52 52
1EF1: 55 50 54
1EF4: 20        1074 IRQMSG   ASC    HEX            'INTERRUPT'
1EF5: 00        1075          HEX    00
1EF6: 42 52 45
1EF9: 41 43 20
1EFC: 45 52 52
1EFF: 4F 52 20  1076 BRKMSG   ASC    'BREAK ERROR'
1F02: 00        1077          HEX    00
                1078 *
1F03: 10 0A     1079 MTXTBL1  DA     MTRIXl+$10
1F05: 08 0A     1080          DA     MTRIX1+$08
1F07: 04 0A     1081          DA     MTRTX1+$04
1F09: 02 0A     1082          DA     MTRIX1+$02
1F0B: 01 0A     1083          DA     MTRIX1+$01
1F0D: 10 0C     1084          DA     MTRIX2+S10
1F0F: 08 0C     1085          DA     MTRIX2+$08
1F11: 04 0C     1086          DA     MTRIX2+$04
1F13: 02 0C     1087          DA     MTRIX2+$02
1F15: 01 0C     1088          DA     MTRIX2+$01
1F17: 00 03     1089          DA     MTRIXl+$0100
1F19: 80 0A     1090          DA     MTRIX1+$80
1F1B: 40 0A     1091          DA     MTRIX1+S40
1F1D: 20 0A     1092          DA     MTRIX1+$20
                1093 *
1FLF: 00 00     1094 ROW      HEX    0000
1F21: 0A 00     1095          HEX    0A00
1723: 14 00     1096          HEX    1400
1725: lE 00     1097          HEX    1E00
1727: 28 00     1098          HEX    2800
1F29: F8 00     1099          HEX    FB00
172B: 02 00     1100          HEX    0200
```

```
1F2D: 0C 00       1101         HEX  0C00
1F2F: 16 00       1102         HEX  1600
1F31: 20 00       1103         HEX  2000
1F33: FA 00       1104         HEX  FA00
1F35: FE 00       1105         HEX  FE00
1F37: 02 00       1106         HEX  0200
1F39: 06 00       1107 ROWEND  HEX  0600
                  1108 *
1F3B: C3 CF 00
1F3E: D9 02 C9
1F41: C7 C8 D4
1F44: A0 B1 39
1F47: B8 31 AC
1F4A: A0 D6 C9
1F4D: C4 C5 D8
1F50: AC A0 C9
1F53: CE C3 AE    1109         ASC “COPYRIGHT 1981, VIDEX, INC.”
                  1110 *
1F56: 00          1111 BYTE    HEX 00
                  1112 *
                  1113         DS RESVEC_*
1FFC:10 lA        1114         DA RESET1
1FFE: C2 lA       1115         DA IRQ
```

```
--END ASSEMBLY--

ERRORS: 0

2086 BYTES

SYMBOL TABLE — ALPHABETICAL ORDER

   ACKNWLG   =$40          ALOCK     =$1C0A      AMODE     =$10        AUTORPT   =$1B82
   BEGRPT    =$40          BREAK     =$1ACD      BRKMSG    =$1EF6      BUFFER    =$80
   BUFIN     =$00          BUFMODE   =$13        BUFOUT    =$01        BYTE      =$1F56
   BYTELOOP  =$1E77        CHAR      =$16   ?    CHECKSUM  =$1A82      CKSUM     =$00
   CLOOP     =$200A        CLRTBLS   =$1AD2      CONTROL   =$04        CSLOOP    =$1A8C
   CSMSG     =$1ED1 ?      CTBL      =$1840      DAUTORPT  =$08        DBCNY     =$0B
   DBEXIT    =$1BC7        DBKEY     =$0C        DBLOOP    =$1BB7      DBLOOP1   =$1BBE
   DBTIME    =$04          DBUFFER   =$10        DCLOOP    =$1BAD      DDNLOAD   =$40
   DECODE    =$1BAB        DEFLAGS   =$10        DELAY     =$1EAE      DFMODE    =$1E
   OLERROR   =$1E59        DLFLAG    =$1F        DLY       =$10        DLYLOOP   =$1EB0
   DMACDEF   =$20          DMODESEL  =$02        DOWNLOAD  =$1E20      DSHIFTLK  =$01
   ENDCHK    =$1DE8        ENDSET    =$1E17      EPROM     =$1800      ERROR     =$1AA3
   ERRWAIT   =$1AB7        FAST      =$F3        FLUSH     =$04        GETKEY    =$1CCC
   GOODKEY   =$1BCE        GOODLK    =$1C7C      HALFLOCK  =$06        HALT      =$1ABE
   INDONE    =$1DAF        IRQ       =$1AC2      IRQMSG    =$1EEB      KEY       =$12
   KEYOIJT   =$0E00        KEYREPT   =$1B78      LASTCHK   =$1E0C      LKTIME    =$10
   LOCKCNT   =$0D          LOCKFLG   =$05        LOCKSET   =$1C8A      MACFLG    =$07
   MACLOOP   =$1D65        MACREATE  =$1D09      MACRMOVE  =$1D26      MACRO     =$1D5D
   MACTABLE  =$0200        MAPH      =$03        MAPL      =$02        MASK1     =$1B65
   MCABORT   =$1D20 ?      MCDFINE   =$1CEF      MCDLY     =$08        MCRECHK   =$1CED
   MDLOOP    =$1D7C        MDSET1    =$1C04      MLOOP     =$1A3F      MODE      =$11
   MODE1     =$0F          MODESET   =$04        MODFND    =$1DD7      MOVE      =$1D31
   MOVER     =$1A          MOVEL     =$19        MSKIP1    =$1D3E      MTERR0R   =$1A3B
   MTMSG     =$1EB9        MTRIX1    =$0A00      MTRIX2    =$0C00      MTSRIP    =$1A48
   MTXSAVE   =$09          MTXTBL    =$40        MTXTBL1   =$1F03      NCSKIP    =$1DF3
   NCSKIP1   =$1DFF        NEWMACRO  =$1D48      NOBUFF    =$1CAD ?    NODB      =$1BD2
   NODLY     =$1D84        NOMAC1    =$1D99      NOMACRO   =$1D8B      NOMASK    =$1B67
   NORMRPT   =$1E52 ?      NTBL      =$1800      NTCHAR    =$1DD1      NTDNLD    =$1C3B
   NTDNLD1   =$1C3F        NTKYPAD   =$1C18      NTREPT    =$1C65      NTRESET   =$1C57
   NTRPT     =$1C54        NXTBYTE   =$1DE2      NXTCHAR   =$1DED      NXTCHK    =$1E06
   OBJECT    =$8800        OLDKEY    =$20        ONEBIT    =$1EAA      OPTION    =$80
   OUTPUT    =$1C9A ?      PADTBL    =$1A00      PWROFF    =$14        RDBIT     =$1E84
   RDBYTE    =$1E75        RDKEY     =$1B59      RDMACRO   =$1B9F      RDMACROS  =$1E5C
   READ      =$1A73        REPCHR    =$1B68      REPEAT    =$10        REPT      =$08
   REPT1     =$0A          RESET     =$20        RESET1    =$1A10      RESET2    =$1AF1
   RESET3    =$1B05        RESET4    =$1B15      RESVEC    =$1FFC      RMLOOP    =$1E64
   ROW       =$1F1F        ROWEND    =$1F39      RPMACRO   =$1BA5      RPWAIT    =$1AFE
   RSLOOP    =$1B19        RTS1      =$1E16      RTS2      =$1E05      RTS3      =$1E74
   RTS4      =$1E83        RTS5      =$1EA7      SCAN      =$1B23      SCLOOP    =$1B2A
?  SCTBL     =$18C0        SEARCH    =$DB0       SETL00P   =$1A53      SETSPEED  =$1E54
   SHEXIT    =$1DD6        SHIFT     =$08        SHLOOP    =$1DBE      SPECIAL   =$1C1E
   SPEED     =$15          SPEXIT    =$1CCB      SPKEYS    =$0C01      SPREYS1   =$0E
   SRCHH     =$18          SRCHL     =$17        STARTUP   =$1A1D ?    STBL      =$1880
   STRPT     =$F0          TBLOOP    =$1AD4      TEMP      =$02        TENDH     =$1C
   TENDL     =$13   ?      UNTEL     =$01        TESTL     =$00        TSTLOOP   =$1A4A
?  UCTBL     =$1940        TESTH     =$1900 ?    USCTBL    =$19C0      USTBL     =$1980
   WRITE     =$1A71        ZEROBIT   =$1EA8
```

SYMBOL TABLE — NUMERICAL ORDER:

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CKSUM | =$00 | | TESTL | =$00 | | BUFIN | =$00 | | DSHIFTLK | =$01 |
| | TESTH | =$01 | | BUFOUT | =$01 | | DMODESEL | =$02 | | TEMP | =$02 |
| | MAPL | =$02 | | MAPH | =$03 | | CONTROL | =$04 | | MODESET | =$04 |
| | DBTIME | =$04 | | FLUSH | =$04 | | LOCKFLG | =$05 | | HALFLOCK | =$06 |
| | MACFLG | =$07 | | SHIFT | =$08 | | DAUTORPT | =$08 | | MCDLY | =$08 |
| | REPT | =$08 | | MTXSAVE | =$09 | | REPT1 | =$0A | | DBCNT | =$OB |
| | DBKEY | =$0C | | LOCKCNT | =$00 | | SPKEYS1 | =$0E | | MODEl | =$0F |
| | REPEAT | =$10 | | DBUFFER | =$10 | | DLY | =$10 | | LKTTME | =$10 |
| | DBFLAGS | =$10 | | MODE | =$11 | | KEY | =$12 | | BUFMODE | =$13 |
| | PWROFF | =$14 | | SPEED | =$15 | | CHAR | =$16 | | SRCHL | =$17 |
| | SRCHH | =$18 | | MOVEL | =$19 | | MOVER | =$1A | | TENDL | =$lB |
| | TENDH | =$1C | | AMODE | =$1D | | DFMODE | =$1E | | DLFLAG | =$1F |
| | RESET | =$20 | | DMACDEF | =$20 | | OLDKEY | =$20 | | ACKNWLG | =$40 |
| | DDNLOAD | =$40 | | BEGRPT | =$40 | | MTXTBL | =$40 | | OPTION | =$80 |
| | BUFFER | =$80 | | STRPT | =$F0 | | FAST | =$FB | | MACTABLE | =$0200 |
| | MTREX1 | =$0A00 | | MTRIX2 | =$0C00 | | SPKEYS | =$0C01 | | KEYOUT | =$0E00 |
| | EPROM | =$1800 | ? | NTBL | =$1800 | ? | CTBL | =$1840 | ? | STBL | =$1880 |
| ? | SCTBI | =$18C0 | ? | UNTBL | =$1900 | ? | UCTBL | =$1940 | ? | USTBL | =$1980 |
| ? | USCTBL | =$19C0 | ? | PADTBL | =$1A00 | | RESET1 | =$1A10 | | STARTUP | =$1Al0 |
| | MTERROR | =$lA3B | | MLOOP | =$1A3F | | MTSKIP | =$1A48 | | TSTLOOP | =$1A4A |
| | SETLOOP | =$1A53 | | WRITE | =$1A71 | | READ | =$1A73 | ? | CHECKSUM | =$1A82 |
| | CSLOOP | =$1A8C | | ERROR | =$1AA3 | | ERRWAIT | =$1AB7 | | HALT | =$1ABE |
| | IRQ | =$1AC2 | | BREAK | =$IACD | | CLRTBLS | =$1AD2 | | TBLOOP | =$1AD4 |
| | RESET2 | =$1AF1 | | RPWAIT | =$1AFE | | RESET3 | =$1B05 | | RESET4 | =$1B15 |
| | RSLOOP | =$1319 | | SCAN | =$1B23 | | SCLOOP | =$1B2A | | RDKEY | =$1B59 |
| | MASK1 | =$1B65 | | NOMASK | =$1B67 | | REPCHK | =$1B68 | | KEYREPT | =$1B78 |
| | AUTORPT | =$1B82 | | RDMACRO | =$1B9F | | RPMACRO | =$1BA5 | | DECODE | =$1BAB |
| | DCLOOP | =$1BAD | | DBLOOP | =$IBB7 | | DBLOOP1 | =$1BBE | | DBEXIT | =$1BC7 |
| | GOODKEY | =$1BCE | ? | NODB | =$1BD2 | | NOSET1 | =$1C04 | | ALOCK | =$1C0A |
| | NTKYPAD | =$1CI8 | | SPECIAL | =$1ClE | | NTDNLD | =$1C3B | | NTDNLD1 | =$1C3F |
| | NTRPT | =$1C54 | | NTRESET | =$1C57 | | NTREPT | =$1C65 | | GOODLK | =$1C7C |
| | LOCKSET | =$1C8A | | OUTPUT | =$1C9A | | NOBUFF | =$1CAD | | SPEXIT | =$1CCB |
| | GETKEY | =$1CCC | | MCRECHK | =$1CED | ? | MCDFINE | =$1CEF | | MACREATE | =$1D09 |
| | MCABORT | =$1D20 | | MACRMOVE | =$1D26 | | MOVE | =$1D31 | | MSKIP1 | =$1D3B |
| | NEWMACRO | =$1D48 | | MACRO | =$1D5D | | MACLOOP | =$1D65 | | MDLOOP | =$1D7C |
| | NODLY | =$1D84 | | NOMACRO | =$1D8E | | NOMAC1 | =$1D99 | | INDONE | =$1DAF |
| | SEARCH | =$1DB0 | | SHLOOP | =$1DBE | | NTCHAR | =$1DD1 | | SHEXIT | =$1DD6 |
| | MODFND | =$1DD7 | | NXTBYTE | =$1DE2 | | ENDCHK | =$1DE8 | | NXTCHAR | =$1DED |
| | NCSKIP | =$1DF3 | | NCSKIP1 | =$1DFF | | RTS2 | =$1E05 | | NXTCHK | =$1E06 |
| | LASTCHK | =$1E0C | | RTS1 | =$1E16 | | ENDSET | =$1E17 | | DOWNLOAD | =$1E20 |
| | NORMRPT | =$1E52 | | SETSPEED | =$1E54 | | DLERROR | =$1E59 | | RDMACROS | =$1E5C |
| | RMLOOP | =$1E64 | | RTS3 | =$1E74 | | RDBYTE | =$1E75 | | BYTELOOP | =$1E77 |
| | RTS4 | =$1E83 | | RDBIT | =$1E84 | | RTS5 | =$1EA7 | | ZEROBIT | =$1EA8 |
| | ONEBIT | =S1EAA | | DELAY | =$1EAE | | DLYLOOP | =$1EB0 | | MTMSG | =$1EB9 |
| | CSMSG | =$IED1 | | IRQMSG | =$1EEB | | BRKMSG | =$1EF6 | | MTXTBL1 | =$1F03 |
| | ROW | =$1F1F | | ROWEND | =$1F39 | | BYTE | =$1F56 | | RESVEC | =$lFFC |
| | CLOOP | =$200A | | OBJECT | =$8800 | | | | | | |

Glossary

ASCII — American Standard Code of Information Interchange. The standard by which microcomputers (and most other computers) encode alpha numeric data.

ASCII character — A character of the ASCII chart.

Auto Repeat — The automatic repeating of any key held down after a brief pause.

BASIC — Beginner's All—purpose Symbolic Instruction Code. A relatively simple programming language used extensively on microcomputers. The Apple ][ has two versions of this language: Integer BASIC and Applesoft, a floating point BASIC.

Buffer —An area of memory for temporary storage of data. In the Enhancer ][. buffer means some portion of RAM memory.

Circumflex — ASCII character $DE (222 decimal): ^.

EPROM — Erasable Programmable Read Only Memory. ROMs which may be erased by ultra violet light and reprogrammed.

Fast Repeat — Usually the fastest of two repeat speeds.

Keyboard character — A sequence of keystrokes which produce an ASCII character.

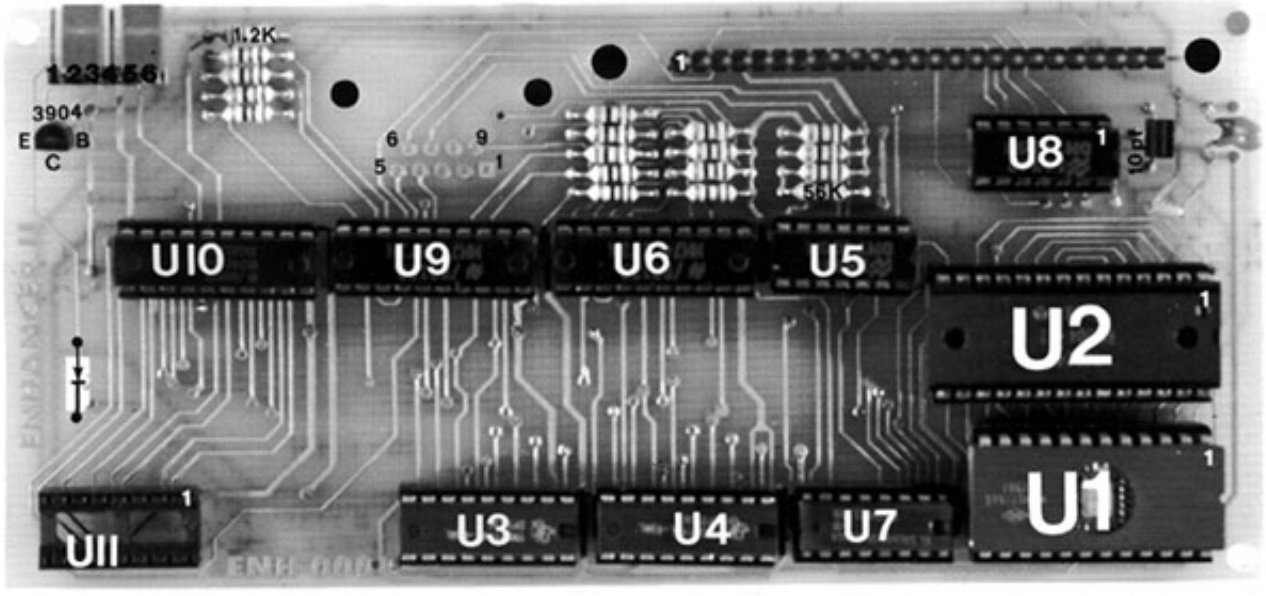
Macro — A single instruction which stands for a sequence of instructions. In the Enhancer ][, macro means the definition of a keyboard character.

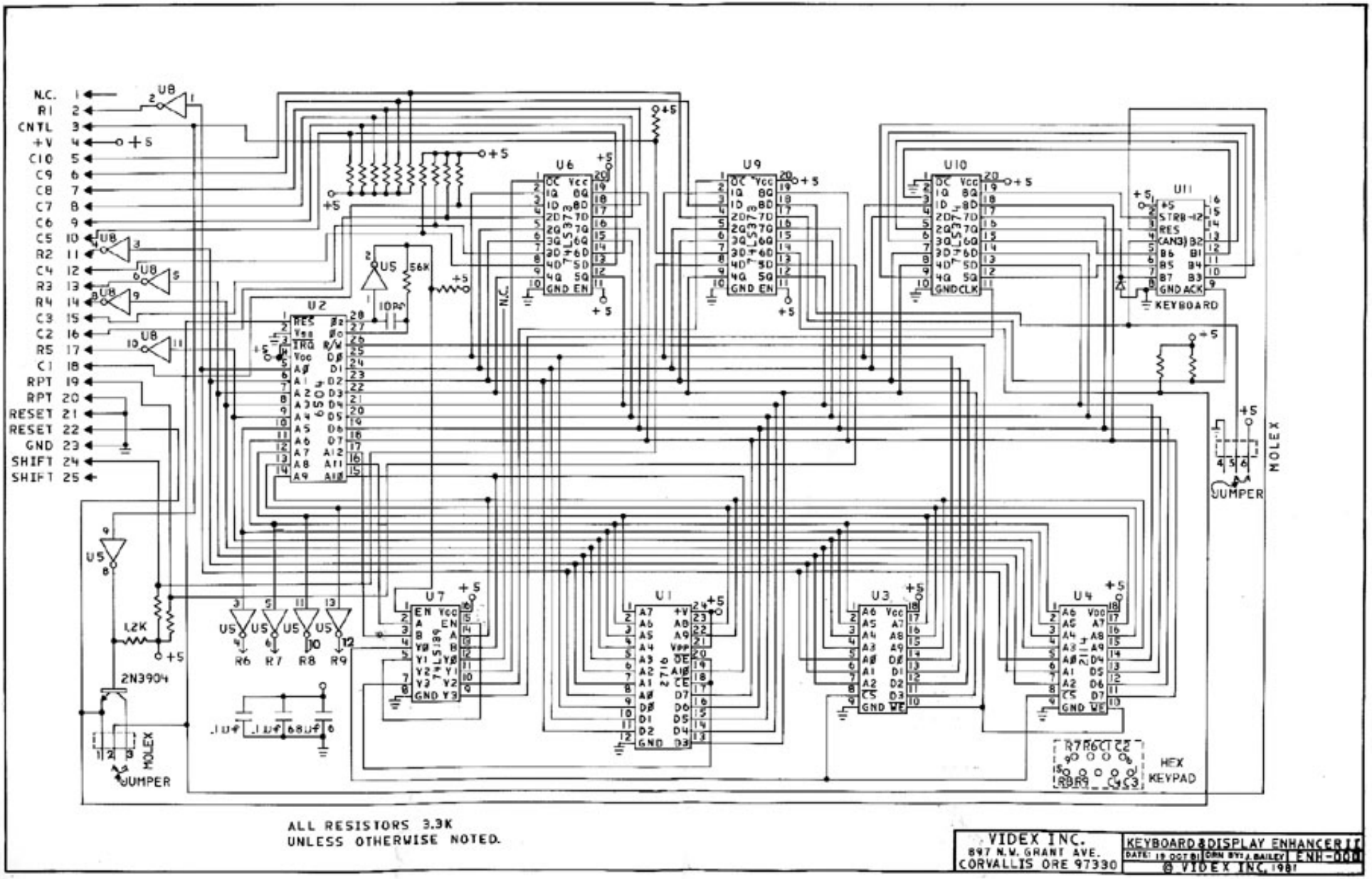
RAM — Random Access Memory. Memory which may be read from and written to electronically.

RON — Read Only Memory. Memory which may be programmed only once and may only be read from subsequently.

Ul — 2716 EFROM (Enhancer ][ Firmware)
U2 — 6504 Microprocessor (6502 instruction set)
U3 — 2114 1K x 4 RAM
U4 — 2114 1K x 4 RAM
U5 — 74LS05 Hex inverter, open collector
U6 — 74LS373 Octal D latch
U7 — 74LS139 Dual 2—4 line decoder
U8 — 74LS05 Hex inverter, open collector
U9 — 74LS373 Octal D latch
U10 — 74LS374 Octal D flip—flop
Ull — Keyboard output

2N3904 — Reset logic


1.2K
1 2 3 4 5 6
3904
E B
C
6 9
5 1
56K
U8
10pf
U10
U9
U6
U5
U2
U11
U3
U4
U7
U1




ALL RESISTORS 3.3K
UNLESS OTHERWISE NOTED.

| | |
|---|---|
| VIDEX INC.<br>897 N.W. GRANT AVE.<br>CORVALLIS ORE 97330 | KEYBOARD & DISPLAY ENHANCER II<br>DATE: 19 OCT 81 DRN BY: J. BAILEY ENH-000<br>© VIDEX INC. 1981 |