

Dan Paymar LCA-1b

Lower-Case Adapter & D.I.C.E.

Schematics & Instructions

Print The Unprintables
by Bert Kersey ✓

Call - A.P.P.L.E., Sept., '80

DICE 82

Call - A.P.P.L.E., Apr., '82

DICE 83

Call - A.P.P.L.E., Apr., '83 ✓

Shift Key Mod

Call - APPLE, May, '82

Important Notice

Due to a shortage of parts for the LCA-1a we have had to substitute a different character generator chip. The resulting LCA-1b which you have received is functionally equivalent to the LCA-1a with one exception: the symbol generated by the \$FF code consists of two parallel horizontal lines (like an overscore and an underscore) instead of the small solid block produced by other models of the Dan Paymar Lower Case Adapters.

This difference should not affect most software that supports the LCA's. It will have a small affect upon our DICE support software, as DICE uses the \$FF code as the cursor in lower case entry mode. Therefore, instead of seeing a small solid block for the cursor when lower case entry is enabled, you will see the two horizontal lines. However, this has no affect on the function of DICE.

Since the chip used in the LCA-1b is not an LCA-2 chip, please change paragraph 7 of the Trouble-Shooting Guide in the manual to read as follows:

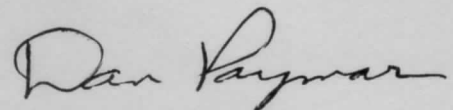
7. Computer is a revision 7 or newer model. If the mother board does ~~not~~ have the RAM configuration blocks, then return the LCA-1b to your dealer for exchange for an LCA-2, or pack it in a box for shipment and send it postpaid to Enhanceware for a no-cost exchange.

There is a small side benefit to the LCA-1b. The chip used also contains a second character set that can be accessed by modifying the LCA-1b as follows:

1. Find the three pads labeled 1, 2 and 3 on the circuit side of the LCA-1b. Cut the short trace between the pads labeled 2 and 3.
2. Using about 8" to 10" of wire for each line, connect these three points to a SPDT switch, with pad 2 going to the common of the switch.
3. Tape or otherwise cover the contacts on the switch with insulation so they cannot cause a short to some other part of the computer.

Flipping the switch will select either the normal or the secondary character set. Run the 6-line program given in step 8 of the Installation Instructions, then flip the switch back and forth to see both character sets. Unfortunately, there is no way to select between the sets by software, so symbols of the two sets cannot be mixed on the screen.

Sincerely yours,



Dan Paymar, Owner
Enhanceware

ENHANCEWARE (tm)

by Dan Paymar
91 Pioneer Place
Durango, CO 81301
(303) 259-3598

USING DICE 83

In our continuing effort to supply support software for the Dan Paymar Lower Case Adapters at the lowest possible cost, DICE 83 is now supplied in 16-sector format. If you have DOS 3.3 then DICE 83 may be booted as you would any DOS diskette. However, if you have an older 13-sector disk system, then you may return the DICE 83 diskette in a good protective mailer, along with return postage (usually 54 cents, depending on the weight, and we will send you a DICE 82 diskette in 13-sector format.

As supplied, DICE 83 assumes that you have an Apple-II Plus, that you have Applesoft in a ROM card, or that you have a 16K RAM card (e.g. the Apple Language Card). If you have only an Integer Apple then follow the instructions in the INFO program to modify DICE 83 for normal operation in that environment.

On the disk you will find two information files named DICE INFO APPLESOFT and DICE INFO INTEGER. Running the version appropriate to your machine will give you several pages of instructions on the use of DICE 83. If you have a printer then turn it on (e.g. PR#1) before running the DICE INFO program so that you get a hard copy of the instructions.

Included in DICE INFO are instructions to do the following:

1. Utilize all of the features of DICE 83.
2. Adapt DICE 83 to use the modified shift key. See the other side of this sheet for instructions on modifying the shift key. Also, see "Curing a Shiftless Apple" in the May, 1982 issue of Call-A-P.P.L.E. for a detailed article on the shift key modification.
3. Convert DICE 83 to boot properly in Integer BASIC.
4. Copy DICE 83 onto an existing disk so that your old BASIC programs may use lower case in string I/O.
5. Convert DICE 83 to support the KeyTronic KB200 keyboard (this may also work with other auxillary keyboards).

DICE 82 is fully documented in the April, 1982 issue of Call-A-P.P.L.E., including assembly source listings. However, due to the use of a different assembler, the published listing has an error. In each case where the operand is of the form *X (where X is any character), you must add \$80 to the second byte of the assembled object code (the ASCII value of the character). DICE 83 is nearly identical to DICE 82 except for the addition of the KeyTronic keyboard version.

MODIFYING THE SHIFT KEY FOR USE WITH DICE

DICE works well either using the ESC key for shifting or with the modified shift key. If your Apple is still under warranty (or under an extended Apple service contract), then you probably should stick with using the ESC key. However, if you feel you must use the shift key, then read on.

The first step is to remove the Apple's case. Remove the power cord, the cover, and all I/O boards and other cables. If you have an RF modulator then be sure to unplug it from the motherboard. Turn the Apple upside down, and remove the two Phillips head screws at each side of the base plate, one screw at each rear corner, and the two center screws along the front edge. Turn the Apple right side up, with the keyboard hanging over the front edge of the desk, and remove the remaining two screws. Lift the case slightly, and unplug the keyboard cable. If you have an LCA-1 then it must be removed before removing the keyboard cable; simply set it aside temporarily. The case may now be removed.

Locate the shift key circuit. If you have an old style keyboard (with all components on a single PC board) then simply locate the contacts below the right-hand shift key (the one below the arrow keys). One of the contacts is tied to logic ground; you will see this line going to other keys. The other contact is the shift key circuit.

If you have the newer keyboard with the separate encoder board "piggy-backed" below the main keyboard, then hold the case so that you are looking at the bottom of the encoder board with the keyboard cable connector at the lower right. Locate the feed-through pad next to the small rectangular hole (see Figure 1). This is the shift key circuit.

Take a 15" piece of wire-wrap type wire, and strip 1/16" of insulation from one end. Solder it to the shift key circuit (which we located above), and leave the other end free for the time being. Lower the case over the computer, and reach under the front edge to plug in the keyboard cable. If you have an LCA-1, it should now be plugged back in. Then lower the case, and replace two of the screws at the front edge, but don't tighten them yet. Turn the Apple upside down, and start all of the other screws before tightening them all. Turn the Apple right side up.

Now is the time to strip 3/16" of insulation from the wire that we left dangling above, and insert it into pin 4 of the game I/O connector. Alternatively, if you have something plugged into the game connector, the wire may be soldered to pin #1 of the 74LS251 in location H14. As you can see in the schematic on page 114 of the Apple Reference Manual, this is where game switch two goes (labeled SW2 on the schematic). If you remove the 74LS251 from its socket and solder carefully to pin one right next to the plastics then the modification can later be removed at this point by simply replacing the chip with a new one. Tuck the wire out of the way, or tape it to the motherboard, to avoid tangling with I/O boards.

Reconnect the RF modulator, and replace any I/O boards and other cables. Turn on the computer, and check out its normal functions. (Will the disk boot? Will a BASIC program run? Do the game paddles work properly?) If any problems are noted, turn off the computer immediately and check again for shorts or incorrect wiring. This modification should not affect any of the standard features of the Apple, including the game paddles and switches.

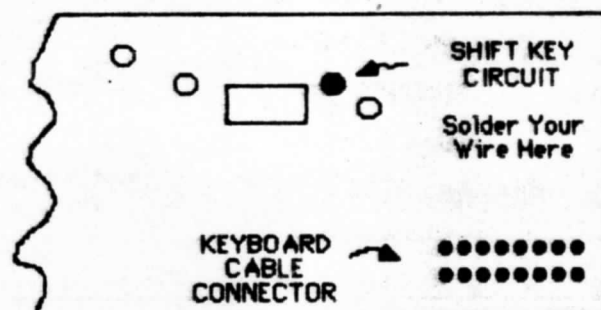


Fig. 1: Bottom view of encoder board.

LCA-1aTM

Lower Case for the Apple-II*

For **Revision 6** and older Apple-II and Apple-II Plus only
[CPU boards **with** the RAM Configuration Blocks]

This is a demonstration of Dan Paymar's
lower case adapter for the APPLE-II.

The quick brown fox jumps over the lazy
dog. Notice the improved readability,
including descenders on the lower case
letters g, j, p, q, and y.

Here are all 32 new symbols along with
their upper case counterparts:

```
@ABCDEFGHIJKLMN O PQRSTU VWXYZ[\]^_`  
`abcdefghijklmnopqrstuvwxyz{|}~■
```

The lower case adapter is an extension
of the Apple's hardware character gen-
erator, and is compatible with printers
that have lower case. Also, several
compatible text editors are available.
It operates in normal text mode, so
there is no 8k bytes overhead as with
software and firmware methods.

Get the most from your computer with

ENHANCEWARETM

since 1978 by

Dan Paymar

91 Pioneer Place
Durango, CO 81301

*Trademarks of Apple Computer Inc.

FEATURES of the LOWER CASE ADAPTER:

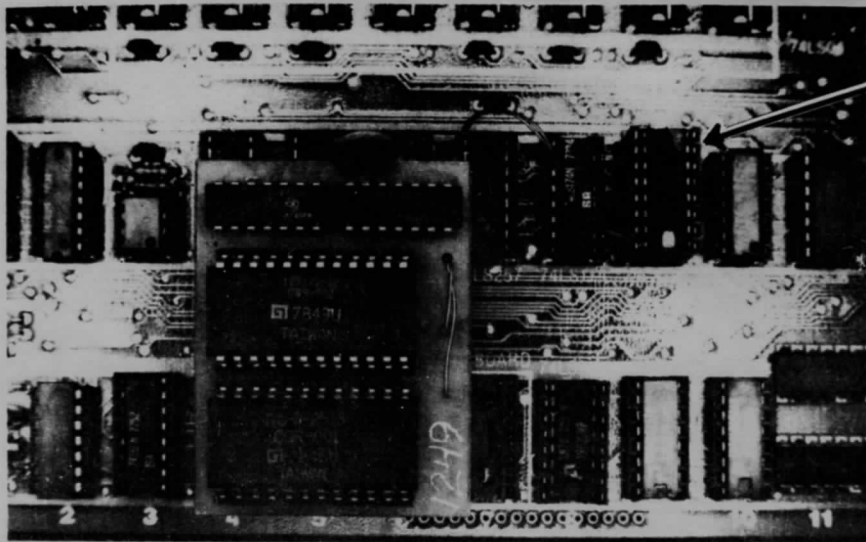
- ☆ Plugs in with no modifications to the Apple
- ☆ Extends the Apple's normal text display mode to the full 96-character ASCII set, including lower case letters with pseudo-descenders
- ☆ More readable than "true" descenders
- ☆ More readable than 80-column display, yet works with a color TV
- ☆ Includes the symbols \ { } ~ | and ■
- ☆ Software included for use with Applewriter* and Pascal
- ☆ Machine language support software available, works with or without the shift key modification (ask your dealer for the DICE 82 diskette)
- ☆ No memory space or time overhead as there are with firmware and software methods that utilize the Apple's high resolution graphics
- ☆ Fully compatible with Apple's DOS 3.2 and 3.3
- ☆ Compatible with nearly all good text editors
- ☆ Compatible with printers that have lower case

LIMITED WARRANTY:

The Lower Case Adapter is warranted to be free of defects for as long as it is owned by the original purchaser. If it fails to perform as described, then return it in the original package along with a copy of the sales receipt. It will be replaced or repaired (at our option) without charge. This warranty is void if the Adapter has been modified or physically damaged. This warranty is in lieu of any other warranty, express or implied.

INSTALLATION

The photograph at the left shows an old model Lower Case Adapter (LCA-1) properly installed in an Apple-II computer. The photo shows a portion of the CPU board at the front edge. The first row of RAM memory chips can just be seen at the top of the photo, and the keyboard cable connector is partly visible below the right side of the LCA-1. The computer's case was removed to take this photo because this area of the CPU board is normally obscured by the keyboard. Although the LCA-1a has a slightly different appearance, it is installed in the same locations.



B9

LCA-1aTM

Lower Case for the Apple-II*

For **Revision 6** and older Apple-II and Apple-II Plus only
(CPU boards **with** the RAM Configuration Blocks)

Get the most from your computer with

ENHANCEWARETM

since 1978 by

Dan Paymar

91 Pioneer Place
Durango, CO 81301

*Trademark of Apple Computer Inc.

LCA-1aTM

LOWER CASE ADAPTER FOR APPLE-II*

This is the LCA Model 1a. It is for the Apple-II with Revision 6 and older CPU board only. These boards have the RAM Configuration Blocks (the small plastic blocks along the left side of the CPU board, usually labeled 16K 16K 16K and described on page 70 of the Apple-II Reference Manual). Do not install an LCA-1a on a computer that does not have the RAM Configuration Blocks. See step 7 of the trouble-shooting guide in this manual.

INSTALLATION INSTRUCTIONS:

1. Turn off power, remove the power cord, and remove all cards from the I/O slots. Turn the computer on its top or side, and remove the three phillips head screws along each side of the base plate. Then set the computer right side up with the front edge overhanging the edge of the table, and remove the four screws along the front edge. Lift the case only enough to slide it forward a few inches. Do not remove the case completely. Be careful not to pull out the keyboard cable plug.
2. Remove the black foam pad from the LCA, and check for bent pins. Save the pad for use in storing the old character generator chip.
3. Carefully remove the 2513 chip from location A5 on the CPU board (the 24-pin chip next to the keyboard connector) by gently prying each end upward with a small screwdriver. Be sure to pry between the chip and the socket, not under the socket. **CAUTION -Avoid causes of static electricity while installing the LCA.** Press the old chip into the black foam pad for protection, and store it in a safe place.

4. Plug the LCA-1 main assembly into socket A5 (where the 24-pin chip was removed), being sure it is fully seated with all pins in the socket (no pins overhanging at either end).
5. Remove the 74LS194 chip at location B9 on the CPU board, and plug the LCA's 16-pin connector assembly into the socket at B9. The white dot MUST be toward the front of the computer (see drawing on back cover).
6. Plug the 74LS194 into the top of the LCA's 16-pin assembly. Be sure that it's oriented the same as when it was removed.
7. The case may now be replaced. (First check that the keyboard cable plug is still fully seated.) You may want to replace only a couple of screws before testing the LCA.
8. To see all 256 character codes displayed by your computer, run the following Applesoft[®] program:
 - 1 CALL -936 : DIM H\$(16) : H\$="0123456789ABCDEF"
 - 2 VTAB 4 : HTAB 13 : PRINT H\$: PRINT
 - 3 FOR Y = 0 TO 15 : VTAB (Y+6) : HTAB 10
 - 4 PRINT MID\$(H\$,Y+1,1);
 - 5 FOR X = 0 TO 15 : COLOR =X : PLOT X+12,2*Y+10
 - 6 COLOR = Y : PLOT X+12,2*Y+11 : NEXT X,Y : END

The leftmost column of the display is the most significant hex digit, and the top row gives the least significant hex digit of each character code. This program is based on a contribution by David M. Sanders of Cupertino, California. For an explanation of how this program works, see "PRINT THE UNPRINTABLES" by Bert Kersey in the September, 1980, issue of *Call-A.P.P.L.E.*

[®]Trademarks of Apple Computer Inc.

LCA, LCA-1, LCA-1a, LCA-2, and Lower Case Adapter are trademarks of Dan Paymar

OPERATION:

The Lower Case Adapter affects only the text mode display of the Apple, extending the character generator to include the set of 32 lower case characters. Specifically, the LCA causes any byte containing 111 in the top three bits to be displayed as a lower case letter or as one of the standard ASCII symbols "", "{", "|", "}", or "~". A small block "■" is displayed if the byte is \$FF. There is no conflict with most standard Apple software because the 111 combination in the top three bits was not previously used. The top two bits are used by the Apple, however, to select reverse video or flashing, so lower case letters cannot be displayed flashing or in reverse video.

USING LOWER CASE:

The Apple's keyboard generates only upper case ASCII codes, and its monitor (in ROM) intercepts any lower case input and changes it to upper case. Therefore, it is necessary to use special means to enter lower case letters and the other new symbols.

Most popular editors and word processors, such as Applewriter II*, include facilities for lower case entry and optional lower case display. Others require a patch to allow displaying lower case on the screen. Patches are included in the back of this manual for Applewriter* 1.0 and Apple Pascal 1.1. We do not have patches for other versions of these products or for any other products, nor do we have patches to enable using the shift key with these products.

Some software products make no provision for lower case, and some of these are "protected" so that it is even impossible to patch them. Check the manual that should have been provided with the specific

software product to determine whether it will support lower case display. If the manual is not clear, or if the product will not support lower case, then check with the supplier of the software. Unfortunately, there is no way that Enhanceware can be of help in such a case.

For users who have a disk system, we have DICE (Dan's I/O Control Enhancements) available on a DOS 3.3 diskette. DICE makes it easy to enter and use lower case with most BASIC programs (either Integer BASIC or Applesoft*). DICE bypasses part of the monitor code to allow easy entry of lower case letters and special symbols from Apple's keyboard. With the latest version, DICE 83, either the ESC key or the modified shift key may be used for case shifting. DICE also provides several other enhancements to the Apple's I/O system, including variable speed slow list, entry of all special symbols, and easy cursor positioning. To use DICE, make a copy of the diskette and load your programs onto the copy. Each time you boot the diskette, the active routines (which are completely in 6502 machine code) are automatically loaded into a file buffer so that they are out of the way of your programs. There is no need of a HIMEN or LOMEN to avoid overlaying DICE, and only 8 bytes of zero page are used (locations 9 and \$19-\$1F). DICE should be available at your dealer where it may be copied for support of the LCA, or it may be ordered direct from Enhanceware for \$10 postpaid. Instructions for modifying the shift key are included. The DICE INFO programs on the diskette give complete instructions for using DICE. Telephone orders are accepted at (303)259-3598 for C.O.D. shipment or using Visa or MasterCard.

The very similar DICE 82 is fully documented in the April, 1982, issue of *Call-A.P.P.L.E.*, with corrections in the April, 1983, issue. The shift key modification is documented in the May, 1982, issue.

DEMO PROGRAMS

```

LIST
100 REM APPLESOFT LCA DEMO
110 REM 11-25-79
120 CALL - 936: VTAB 5
130 DJN A$(255)
180 UCF = 2: REM UPPER CASE FLAG:
    0=LOWER CASE, 2=UPPER CASE,
    1=ONE UPPER CASE INPUT
190 A$ = "THIS PROGRAM DEMONSTRAT
    ES THE USE OF": GOSUB 1000
200 A$ = " THELOWER CASE ADAPTER
    WITH ": GOSUB 1000
201 A$ = "APPLESOFT": GOSUB 1000
210 PRINT " BASIC.":A$ = "THE SU
    BROUTINE AT LINE 1000": GOSUB
    1000
220 A$ = " CONVERTS AN ENTIRE STR
    ING (EXCEPT FOR": GOSUB 1000
230 A$ = " THE FIRST CHARACTE
    R) AND PRINTS IT AS LOWER CA
    SE.": GOSUB 1000
240 PRINT : PRINT A$ = "LINES 5
    00-699 GET CHARACTERS DIRECT
    LY. ": GOSUB 1000
250 A$ = " FROM THE KEYBOARD, AND
    THE UPPER CASE ": GOSUB 10
    00
260 A$ = " FLAG DETERMINES UPPER
    OR LOWER CASE. ": GOSUB 1000
270 PRINT : PRINT : PRINT "ESC";
    :A$ = " SWITCHES TO LOWER CA
    SE, OR TO UPPER CASE FOR THE
    NEXT CHARACTER ONLY.": GOSUB
    1000
280 PRINT : PRINT : PRINT "ESC E
    SC":A$ = " SWITCHES TO ALL
    UPPER CASE. ": GOSUB 1000
290 PRINT : PRINT :A$ = "TRY IT
    NOW!": GOSUB 1000: PRINT : PRINT
300 H$ = CHR$(8): REM CTRL-H

```

```

500 A$ = "": FOR I = 1 TO 255
520 GET C$:C = ASC (C$): REM
    GET AN INPUT CHARACTER
530 IF C = 3 THEN END
540 IF C > 31 THEN 620
550 REM CONTROL CHARACTER
560 IF C = 8 THEN 600: REM BACKS
    PACE
570 IF C = 13 THEN 680: REM RETU
    RN
580 IF C < > 27 THEN 520: REM
    ESC
590 UCF = UCF + 1: IF UCF > 2 THEN
    UCF = 0
595 GOTO 520
600 IF I < 2 THEN 520
605 PRINT " ";H$;H$:" ";H$:
610 I = I - 1: IF I > 1 THEN 615
612 A$ = "": GOTO 520
615 A$ = LEFT$(A$,I - 1): GOTO
    520
620 IF C > 63 AND UCF = 0 THEN C
    = C + 32: REM IF A LETTER O
    R SPECIAL SYMBOL AND IN LOWE
    R CASE MODE, THEN CHANGE CH
    AR TO LOWER CASE
640 PRINT CHR$(C): REM ECHO
650 IF UCF = 1 THEN UCF = 0: REM
    IF SINGLE UPPER CASE SWITCH
    BACK TO LOWER CASE
660 LET A$ = LEFT$(A$,I) + CHR$(
    C): REM APPEND TO A$
670 NEXT I
680 PRINT " ": REM ERASE CURSOR
690 PRINT A$: REM OPTIONAL
695 PRINT : GOTO 500
1000 REM SUBROUTINE TO PRINT A
    STRING, CHANGING LETTERS TO
    LOWER CASE.
1010 REM STARTS AT CHARACTER #2.
    CHANGE 2 IN NEXT LINE TO 1
    TO START AT CHAR #1.
1020 FOR I = 1 TO LEN (A$)
1030 A = ASC ( MID$(A$,I,1))
1040 IF A < 65 OR A > 90 OR I =
    1 THEN 1050
1045 A = A + 32: REM CHANGELETTER
    TO LOWER CASE
1050 PRINT CHR$(A);
1060 NEXT I
1070 RETURN

```

These programs (Applesoft[®] version at left and Integer version below) show how it is possible to accept entry of lower case from the standard Apple keyboard without special software or hardware modifications. However, these programs are presented for pedagogic purposes only and are not meant to be a practical means of using lower case. It is recommended that the DICE support software be obtained for simplified use of lower case with BASIC programs.

```

>LIST
100 REM LOWER CASE INPUT DEMO
110 REM 5-17-79
120 CALL -936: VTAB 5
130 LENS=100: REM LENGTH OF A$
140 REM CREATE A$, AND SET LOCA TO ITS LOCATION
150 DIM A$(LENS):LOCA=256* PEEK (205)+ PEEK (204)-LENS-10
160 REM CREATE C$, AND SET LOCC TO ITS LOCATION
170 DIM C$(1):LOCC=256* PEEK (205)+ PEEK (204)-11
180 UCF=0: REM UPPER CASE FLAG -- 0= LOWER CASE, 2=UPPER CASE, 1=ONE UPPER CASE CHAR
190 A$="THIS PROGRAM DEMONSTRATES THE USE OF": GOSUB 1000
200 A$=" THE LOWER CASE ADAPTER WITH INTEGER": GOSUB 1000
210 PRINT " BASIC. ":A$="THE SUBROUTINE AT LINE 1000": GOSUB 1000
220 A$=" CONVERTS AN ENTIRE STRING (EXCEPT FOR)": GOSUB 1000
230 A$=" THE FIRST CHARACTER) TO LOWER CASE. ": GOSUB 1000
240 PRINT :A$="LINES 500-600 GET CHARACTERS DIRECTLY": GOSUB 1000
250 A$=" FROM THE KEYBOARD, AND THE UPPER CASE": GOSUB 1000
260 A$=" FLAG DETERMINES UPPER OR LOWER CASE. ": GOSUB 1000
270 PRINT : PRINT "ESC":A$=" SWITCHES TO LOWER CASE, OR CAUSES THE NEXT CHARACTER ONLY TO BE UPPER CASE ": GOSUB 1000
280 PRINT : PRINT "ESC ESC":A$=" SWITCHES TO ALL UPPER CASE. ": GOSUB 1000
290 PRINT :A$="TRY IT NOW!": GOSUB 1000: PRINT
300 POKE LOCC,136:H$=C$: REM CTRL H
310 POKE LOCC,255:X$=C$: REM CURSOR

```

```

500 FOR I=1 TO LENS
510 PRINT X$:H$: REM SHOW CURSOR
520 C= PEEK (-16384): IF C<128 OR C>223 THEN 520: REM GET INPUT CHARACTER
530 POKE -16368,0: REM CLEAR STROBE
540 IF C>159 THEN 620
550 REM CONTROL CHARACTER
560 IF C=136 THEN 600: REM BACKSPACE

570 IF C=141 THEN 600: REM RETURN
580 IF C>155 THEN 520: REM ESC (IGNORE OTHER CONTROL CHARACTERS)
590 UCF=UCF+1: IF UCF>2 THEN UCF=0: GOTO 520
600 IF I<2 THEN 520: PRINT " ":H$:H$: REM BACKSPACE
610 POKE LOCC,0:I=-1:A$(I)=C$: GOTO 510
620 IF C>191 AND UCF=0 THEN C=C+32: REM IF A LETTER OR SPECIAL SYMBOL AND IN LOWER CASE MODE, THEN CHANGE CHAR TO LOWER CASE
630 POKE LOCC,C: REM C$=CHR(C)
640 PRINT C$: REM ECHO CHAR
650 IF UCF=1 THEN UCF=0: REM IF SINGLE UPPER CASE SWITCH BACK TO LOWER CASE
660 A$(I)=C$: REM APPEND CHAR TO A$
670 NEXT I
680 PRINT " ": GOTO 500
1000 REM SUBROUTINE TO CONVERT AN ENTIRE STRING (STARTING AT CHAR #2) TO LOWER CASE
1010 REM CHANGE 'LOCA+1' IN NEXT LINE TO 'LOCA' TO CONVERT THE ENTIRE STRING TO LOWER CASE
1020 FOR I=LOCA+1 TO LOCA+LENA$
1030 A= PEEK (I): REM GET ONE CHAR
1040 IF A<193 OR A>218 THEN 1060
1050 POKE I,A+32: REM CHANGE LETTER TO LOWER CASE
1060 NEXT I
1070 PRINT A$: REM OPTIONAL
1080 RETURN

```


TROUBLE-SHOOTING THE LCA-1a:

Although it is unlikely that you will need this section, it is included to assist you in case any problem should arise. Except for a few early units, there have been no actual failures other than those due to physical damage. It is because of this low failure rate that the warranty was extended from the original 90 days to a lifetime warranty (i.e. for as long as you own the LCA).

Most units returned have had no problems that showed up in our tests, and no further problems were reported when they were returned to their owners. It is most likely that their problems were due to improper installation. This supposition has been confirmed by a great reduction in the number of problem calls since we started including this guide with each LCA. Several installation errors are possible (see 1 through 4 below), and these account for most problems encountered with the LCA-1.

This document was prepared because the nature of most problems is such that they can be remedied by the store or by the user, thus saving shipping costs and getting your system on the air more quickly. If an LCA fails to operate properly, please check for the following common errors before returning it for warranty service:

1. 16-pin connector assembly installed backwards or in the wrong location. The white dot must be toward the front of the computer (nearest the keyboard). Location B9 is just below the 7th RAM chip in row C (see drawing on back cover).

2. 74LS194 left out or inserted backwards. After removal from the CPU board, the 74LS194 must be installed in the socket on top of the 16-pin connector assembly. The dimple (between pins 1 and 16) should be over the white dot on the connector assembly. Compare alignment with other nearby chips.

3. 24-pin plug offset. Check that all pins are in the socket. It is all too easy to insert this plug incorrectly such that pins are hanging over one end of the socket on the CPU board.

4. Bent, broken, or dirty pin. Check and clean all pins. Use a small brush such as a clean soldering flux brush, dipped in a mild flux solvent. Isopropyl alcohol (91% or higher, available in most drug stores) is also good. Rubbing alcohol (usually 60% isopropyl alcohol) may be used, but be sure the unit is dry before installing it in the computer since this is 40% water. DO NOT use an abrasive cleaner, such as a pencil eraser, because the protective plating is easily removed.

5. Broken wire between main assembly and 16-pin connector. These wires should be on pins 5 and 6 of the 16-pin plug. Check the solder joints at both ends of the wires. Resolder if necessary, or return for warranty service.

6. Broken solder joint between socket and plug of 16-pin connector assembly. Resolder if necessary, or return for warranty service. (This is not pertinent on some LCA-1's that have an integral plug/connector assembly.)

7. Computer is a revision 7 or newer model. If the mother board does **not** have the RAM configuration blocks, then simply remove the LCA-2 chip from the LCA-1a and use it to replace the chip in location A5. The rest of the LCA-1 assembly is not used.

8. Lower case ROM failure. Return the LCA for warranty service.

Following are the most common failure modes. The numbers in parentheses refer to the above paragraphs to indicate probable causes.

Computer won't operate at all, or DOS won't boot. (2,3,4,6)

Some parts of character set repeated. (4)

Lower case text garbled or jittery (upper case ok). (4,5,8)

Upper case text garbled or jittery (lower case ok). (4,5,6,8)

Parital characters and vertical lines.(7)

All text garbled. (1,4,5)

No text at all (e.g. only white blocks). (3,4,8)

Graphics (either Lo-Res or Hi-Res) don't work. (2,4,6)

Graphics messed up or intermittent. (4,6)

If the above efforts fail, please return the unit for warranty repair. Use the black conductive foam over the pins to avoid static electricity damage as well as to prevent bent pins. This is a must since **THE WARRANTY DOES NOT COVER PHYSICAL DAMAGE!** If conductive foam is not available, press a piece of aluminum foil over the pins of both plugs, then pack with sufficient padding to prevent bent pins. Return the unit to your dealer, or pack it **in a box** for shipment and send postpaid to **ENHANCEWARE**. Please include a **complete, detailed** description of the problem and a copy of your sale receipt.

You may also call (303) 259-3598 for assistance between 9:00 a.m. and 2:00 p.m. mountain time on business days.

APPLEWRITER* AND PASCAL PATCHES:

Applewriter* 1.0 may be modified for lower case display with the Dan Paymar Lower Case Adapter as follows:

1. Boot a DOS master, use COPY to make a copy of Applewriter, and put the **copy** into drive 1. Never modify an original!

2. >BLOAD TEDITOR [The prompt is "]" on an Apple-II Plus*]
>CALL -151 The prompt symbol will now be "*"
* AE4.AE7 The computer should display
0AE4- A4 24 91 28

If it displays anything else then stop; you probably have a different version of Applewriter, and this patch won't work.

3. Enter the patch as follows:

```
*AE4:20 25 18 EA
*152A:D0 06 A9 00 85 0B F0 E3 C9 88 F0 09 20 01 15
*1539:9D 00 02 20 33 18 48 A4 24 A9 A0 91 28 68
*1547:C9 8D F0 11 48 20 F0 FD A9 C0 85 0B 68 EA
*1825:A4 24 8D 23 18 20 33 18 91 28 AD 23 18 60
*1833:C9 20 B0 04 49 C0 30 15 C9 40 90 0F C9 A0
*1841:90 0D 29 BF C9 A0 10 07 49 60 4C 50 18 49 80 60
```

4. Press CTRL-C and RETURN to re-enter BASIC.

```
>UNLOCK TEDITOR
>BSAVE TEDITOR,A$803,L$1070
>LOCK TEDITOR
```

We do not have a patch for Applewriter 1.1 or for use of the shift keys with Applewriter. No patch is required for Applewriter 2.

Pascal 1.1 may be modified for lower case display by entering and running the following Pascal program. Be sure to prepare a copy of SYSTEM.APPLE **before** running this program, and insert the **copy** at the appropriate point. Never modify an original diskette!

```
PROGRAM MODBIOS2;
VAR F:FILE
B: PACKED ARRAY[0..511] OF 0..255;
BEGIN
  WRITELN ('PLACE A COPY OF SYSTEM.APPLE');
  WRITELN ('IN DRIVE 4, THEN PRESS RETURN.');
```

COPYRIGHT © 1988 BY GUY F. HARRIS

```
  READLN;
  RESET (F, '#4:SYSTEM.APPLE');
  IF BLOCKREAD(F,B,1,5)=1 THEN BEGIN
    B[171]:=234; (* DAAB: NOP NOP NOP NOP *)
    B[172]:=234;
    B[173]:=234;
    B[174]:=234;
    B[388]:=76; (* DB84: JMP DB9C *)
    B[389]:=156;
    B[390]:=219;
  END;
  IF BLOCKWRITE(F,B,1,5)=1 THEN BEGIN
    WRITELN;
    WRITELN ('THE PATCH IS COMPLETE.');
```

COPYRIGHT © 1988 BY GUY F. HARRIS

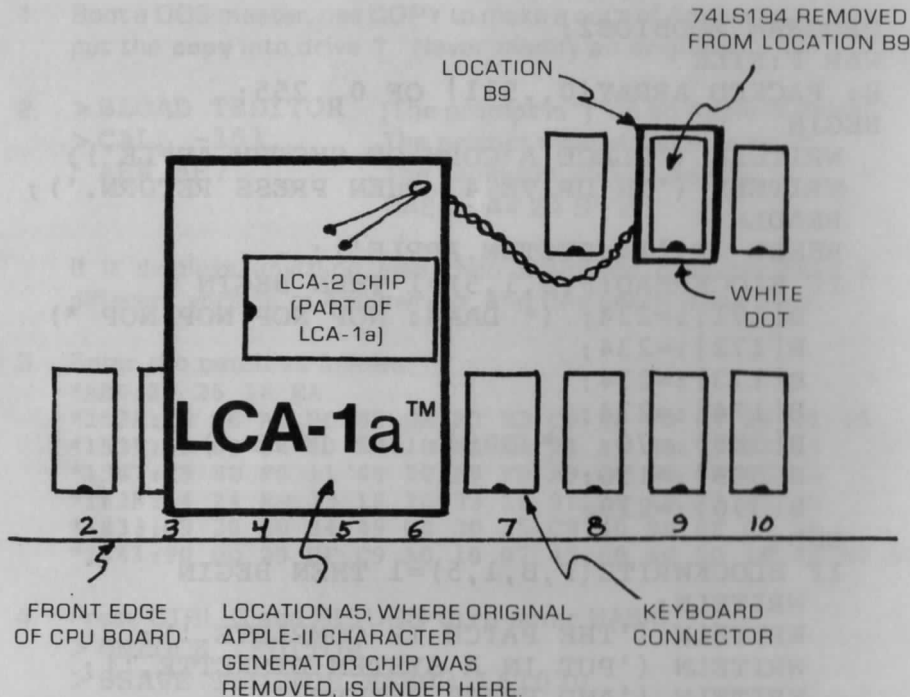
```
    WRITELN ('PUT IN A SYSTEM DISKETTE,');
    WRITELN ('AND PRESS RETURN.');
```

COPYRIGHT © 1988 BY GUY F. HARRIS

```
  END;
  READLN;
END.
```

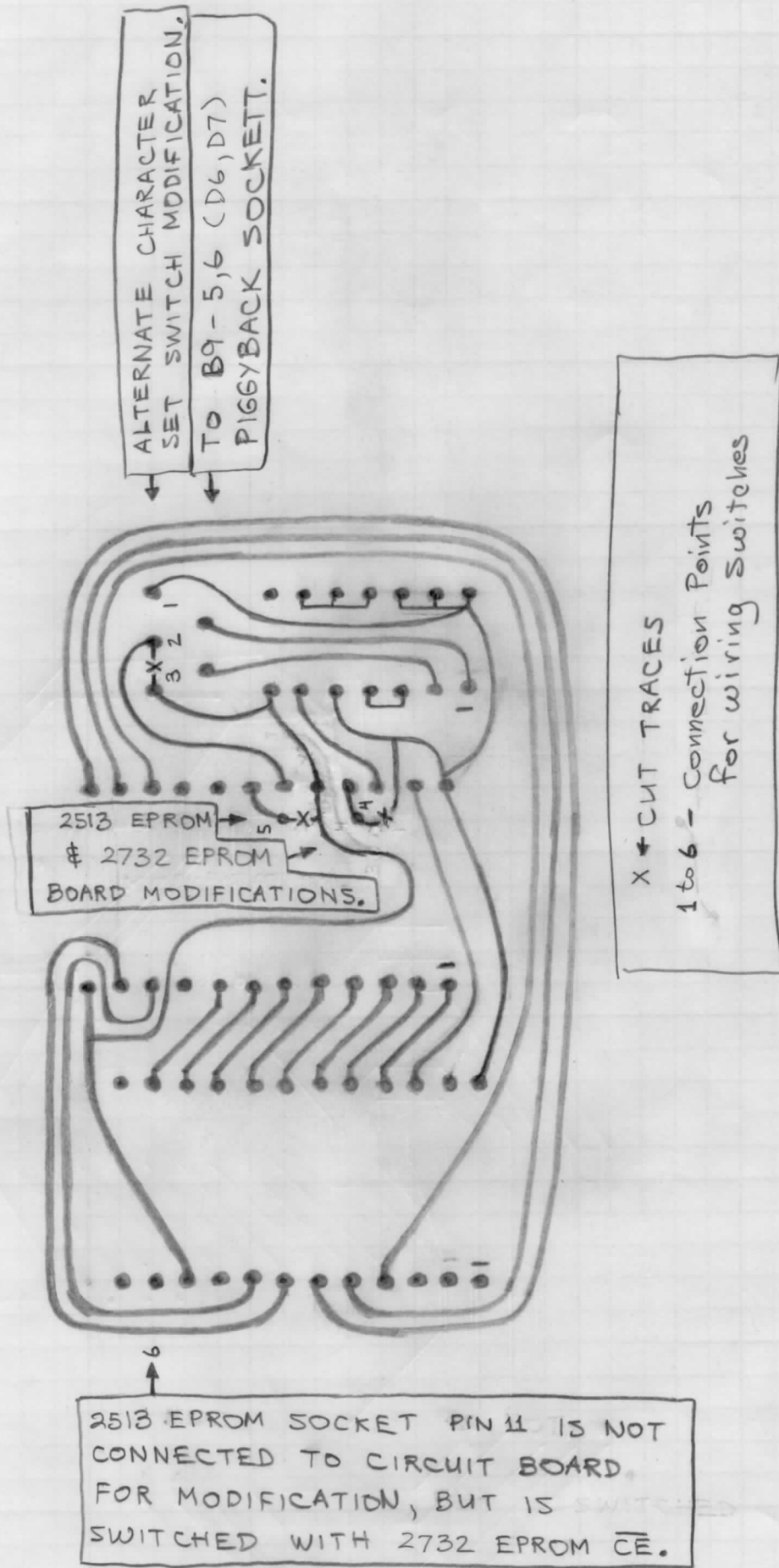
Now boot the copy and test it. Use it as your master whenever you need a new SYSTEM.APPLE diskette.

Installation of LCA-1a™

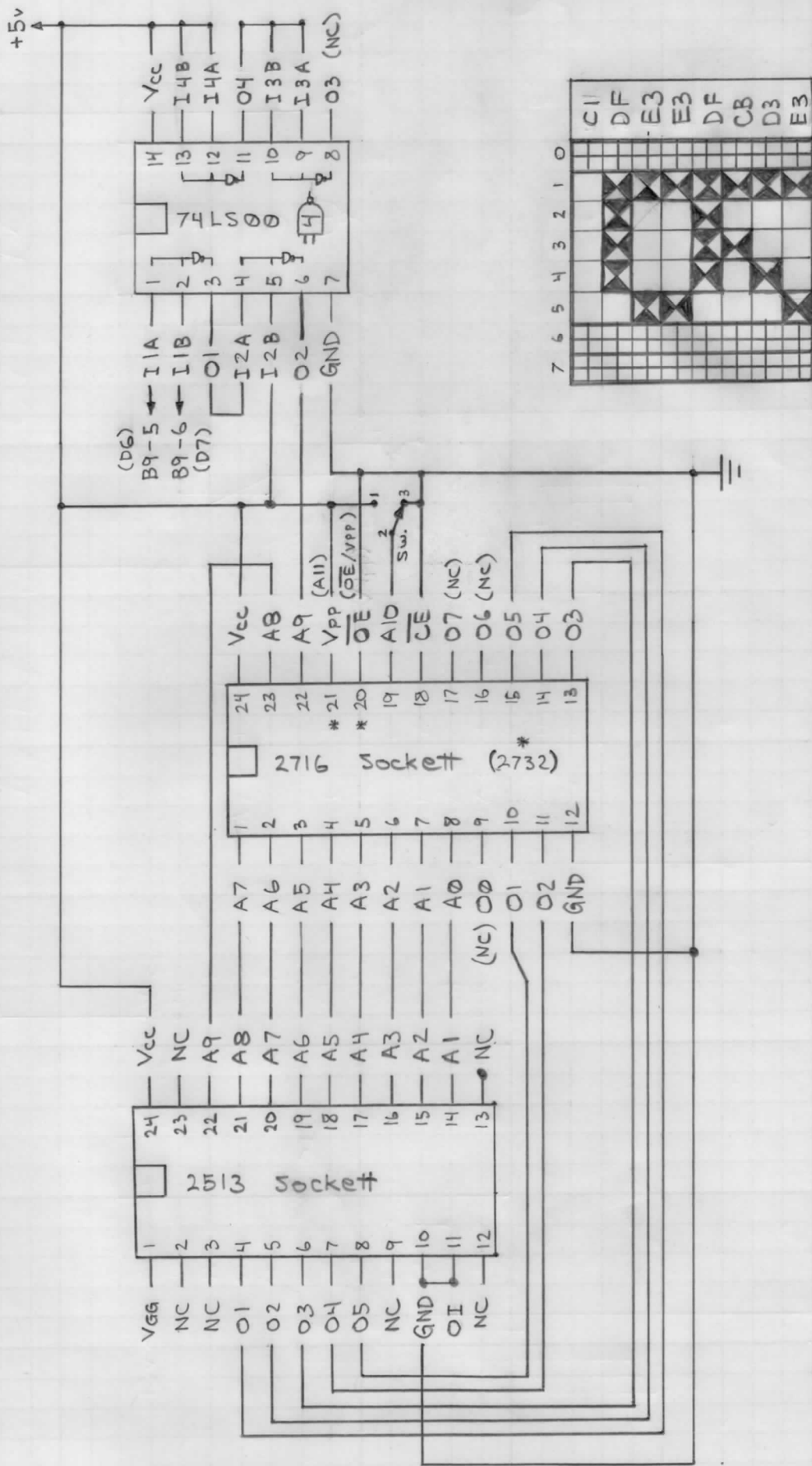


Copyright © 1983 by Dan Paymar

DAN PAYMAR LCA-16 Circuit Board Layout (Bottom Traces).



DAN PAYMAR LCA-16 LOWER CASE ADAPTER



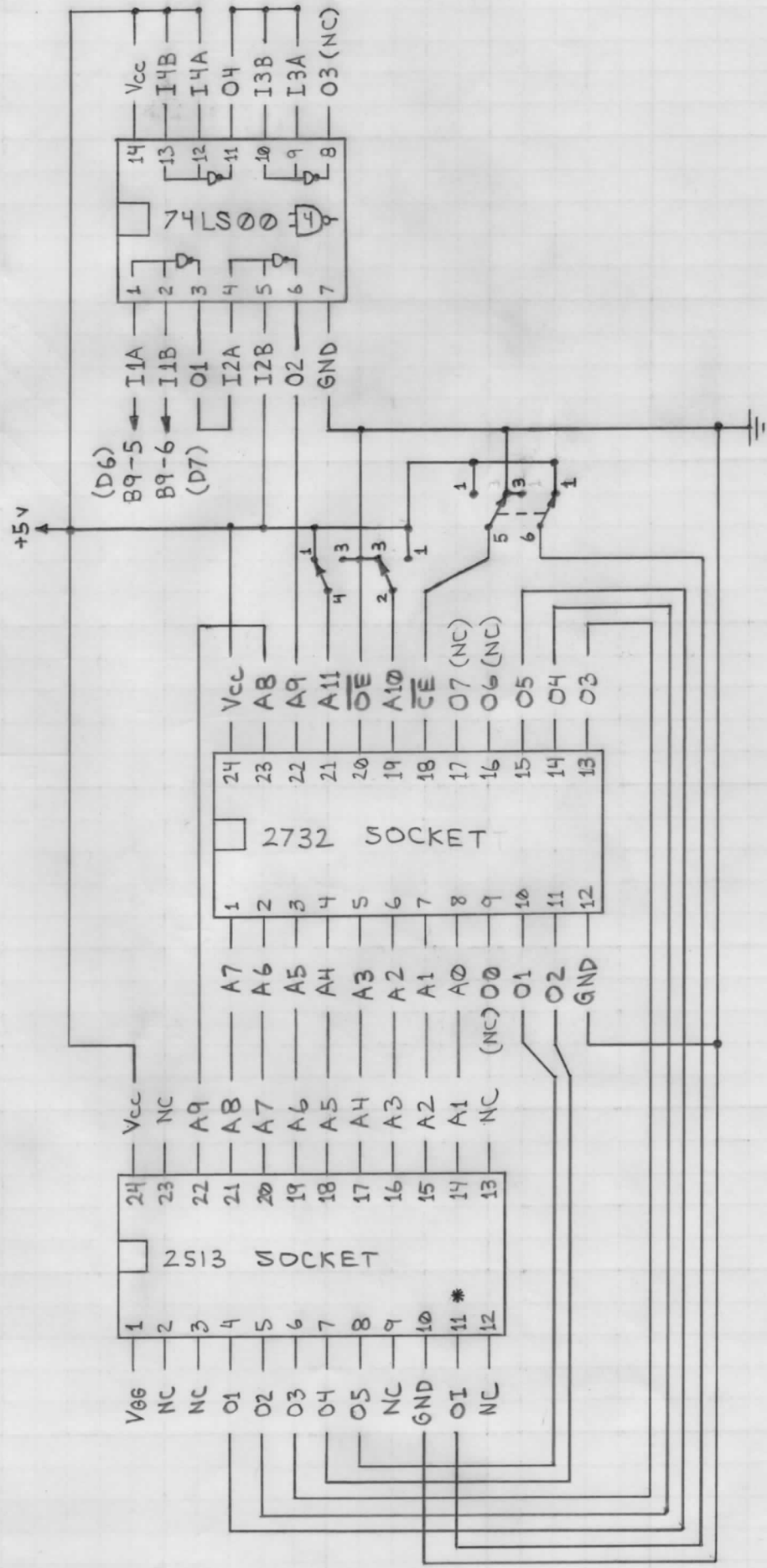
DAN PAYMAR LCA-1b LOWER CASE ADAPTER

Modified to switch between 5 Character sets;

1 - The original Apple II+ 2513 ROM Character Set and

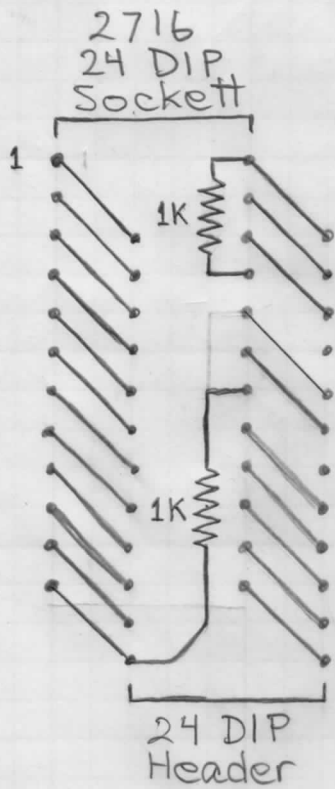
2,3,4,5 - A 2732 EPROM Containing 4 Character Sets.

* 2513 socket Pin 11 is not connected to LCA-1b Circuit Board.



Apple II ROM (DØ-F8)

to 2716 EPROM Sockett Converter



00 1C 22 2A 36 0A 02 3C

00 1C 22 22 3E 22 22

00 1E 22 22 1E 22 1E

00 1C 22 02 02 02 1C

00 1E 22 22 22 22 1E

00 3E 02 02 1E 02 02 3E

00 3E 02 02 1E 02 02

00 1C 22 02 02 32 22 1C

00 22 22 22 3E 22 22 22

00 1C 08 08 08 08 1C

00 A0 A0 A0 A0 A2 9C

00 22 12 0A 06 0A 12 22

00 02 02 02 02 02 3E

00 22 36 2A 2A 22 22 22

00 22 22 26 2A 32 22 22

00 1C 22 22 22 22 22 1C

00 1E 22 22 1E 02 02 02

00 1C 22 22 22 2A 12 2C

00 1E 22 22 1E 0A 12 22

00 1C 22 02 1C 20 22 1C

00 3E 08 08 08 08 08

00 22 22 22 22 22 1C

00 22 22 22 22 14 08

00 22 22 22 2A 2A 36 22

00 22 22 14 08 14 22 22

00 22 22 22 14 08 08 08

00 3E 20 10 08 04 02 3E

00 1E 02 02 02 02 1E

00 00 02 04 08 10 20 00

00 9E 90 90 90 90 9E

00 08 1C 2A 08 08 08 08

80 80 80 80 80 80 80 FF

00 1C 22 2A 36 0A 02 3C

00 1C 22 22 3E 22 22

00 1E 22 22 1E 22 1E

00 1C 22 02 02 02 22 1C

00 1E 22 22 22 22 1E

00 3E 02 02 1E 02 02 3E

00 3E 02 02 1E 02 02

00 1C 22 02 02 32 22 1C

00 22 22 22 3E 22 22

00 1C 08 08 08 08 1C

00 A0 A0 A0 A0 A2 9C

00 22 12 0A 06 0A 12 22

00 02 02 02 02 02 3E

00 22 36 2A 2A 22 22

00 22 22 26 2A 32 22 22

00 1C 22 22 22 22 1C

00 1E 22 22 1E 02 02 02

00 1C 22 22 22 2A 12 2C

00 1E 22 22 1E 0A 12 22

00 1C 22 02 1C 20 22 1C

00 3E 08 08 08 08 08

00 22 22 22 22 22 1C

00 22 22 22 22 14 08

00 22 22 22 2A 2A 36 22

00 22 22 14 08 14 22 22

00 22 22 22 14 08 08 08

00 3E 20 10 08 04 02 3E

00 1E 02 02 02 02 02 1E

00 00 02 04 08 10 20 00

00 9E 90 90 90 90 90 9E

00 08 1C 2A 08 08 08 08

80 80 80 80 80 80 80 FF

00 84 88 90 80 80 80 80

80 00 1C 20 3C 24 5C 00

00 04 04 1C 24 1E 00

80 80 98 A4 84 A4 98 80

00 10 10 1C 12 3C 00

80 80 98 A4 BC 84 98 80

80 10 28 08 1C 08 00

80 80 98 A4 88 A0 98

80 84 84 9C A4 A4 A4 80

00 08 00 0C 08 1C 00

00 90 80 98 90 90 94 88

80 84 A4 94 8C 94 A4 80

00 0C 08 08 08 1C 00

00 00 16 2A 2A 2A 2A 00

80 80 9C A4 A4 A4 80

80 00 18 24 24 24 18 00

80 80 9C A4 A4 9C 84 84

00 80 9C 92 92 9C 90 80

80 80 84 8C 84 84 84 80

80 00 38 04 18 20 1C 00

00 08 08 1C 08 08 10 00

80 00 24 24 24 24 38 00

00 00 22 22 14 14 08 00

00 00 22 22 2A 2A 14 00

00 00 22 14 08 14 22 00

80 00 24 24 24 38 20 18

00 00 3E 10 08 04 3E 00

00 98 84 84 82 84 84 98

08 08 08 08 08 08 08 08

00 8C 90 90 A0 90 90 8C

00 20 1C 02 00 00 00 00

7F 41 41 41 41 41 41 7F

00 3E 02 02 1E 02 02 02

00 3E 02 02 1E 02 02 3E

00 1E 22 22 22 22 22 1E

00 1E 22 22 1E 22 22 1E

```

00 1C 22 22 3E 22 22 22

```

41 49 5D 7F 7F 5D 49 41

00 22 22 26 2A 32 22 22

00 22 36 2A 2A 22 22 22

00 02 02 02 02 02 02 02 3E

00 22 12 0A 06 0A 12 22

00 A0 A0 A0 A0 A0 A2 9C

001C 003B 003B 003B 003B 003B 003B 001C

```

      00 22 22 22 3E 22 22 22
      00 22 22 22 3E 22 22 22
      00 22 22 22 3E 22 22 22

```

00 22 22 22 2A 2A 36 22

00 22 22 22 22 22 14 08

00 22 22 22 22 22 22 1C

00 3E 0B 0B 0B 0B 0B 0B 0B 0B

00 1E 22 22 1E 0A 12 22

00 1C 22 22 22 2A 12 2C

00 1E 22 22 1E 02 02 02

00000000

000030300000

Figure 1. Schematic representation of the experimental design. The first part of the experiment consisted of a 10-min familiarization period. The second part consisted of 10 trials, each with a 10-min familiarization period. The third part consisted of 10 trials, each with a 10-min familiarization period. The fourth part consisted of 10 trials, each with a 10-min familiarization period. The fifth part consisted of 10 trials, each with a 10-min familiarization period. The sixth part consisted of 10 trials, each with a 10-min familiarization period. The seventh part consisted of 10 trials, each with a 10-min familiarization period. The eighth part consisted of 10 trials, each with a 10-min familiarization period. The ninth part consisted of 10 trials, each with a 10-min familiarization period. The tenth part consisted of 10 trials, each with a 10-min familiarization period.

Year	Number of people (millions)
1980	25
1981	30
1982	28
1983	32
1984	30
1985	35
1986	33
1987	38
1988	40

08 04 02 01 01 02 04 08

00 22 22 22 14 08 08 08

00 22 22 14 08 14 22 22

