

“LCA-47”

User's Manual

True lower case adapter for
the TRS-80 Color Computer.

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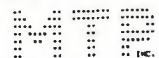


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Warranty

The LCA-47 is well designed and reliable. Should it ever be needed, technical support is always available. Micro Technical Products warrants the LCA-47 to be free from defects in materials and workmanship for a period of 1 year from the date of purchase. Simply return the LCA-47 to Micro Technical Products with proof of purchase date and name of dealer purchased from for prompt repair or replacement. Problems caused by neglect or misuse are not warranted.

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Section 1: Installation

Be forewarned -- installing the LCA-47 in your TRS-80C Color Computer is a very simple thing to do. However, since you must open the computer's case, the Radio Shack 90 day warranty will be voided. If voiding your warranty makes you feel a little queasy, you might prefer to wait until your computer has reached the ripe old age of 90 days or more, when the warranty will terminate of its own accord. If you are going to use the LCA-47 on a system other than the TRS-80C Color Computer, see section 7. See section 8 if your 6847 IC is soldered directly to your computer's PC board.

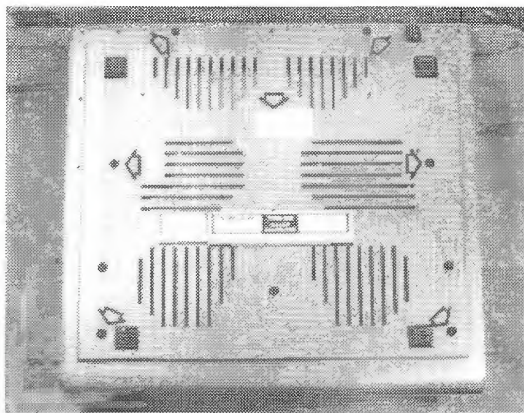
If you follow the instructions below very carefully, the odds of causing any damage to your computer are extremely slim. Pay attention to all warnings and notes of caution. Read the instructions all the way through to familiarize yourself with what we are going to do. Micro Technical Products cannot be held responsible for any damages that occur to your computer. If all this sounds too risky to you, you may return the LCA-47 in its original condition for a complete refund. When you are ready to proceed -- let's go!

What you will need:

Phillips head screwdriver # 2
Small straight blade screwdriver
Small towel or soft cloth
Wire cutters to cut plastic tie wraps securing RF shield cover.

- step 1) Have you pre-read all the instructions yet? If not, you'd better do it now. After all, this is YOUR valuable machine that we are trying to protect, isn't it?
- step 2) There, that's better! Now, unplug the AC line cord and disconnect all cables connected to your computer. Remove any ROM packs that you may have plugged in.
- step 3) Spread the towel out on the table in front of you to protect the computer's case from getting all scratched up. Turn your computer upside-down on the towel. As indicated in the picture below use the Phillips head screwdriver to remove the seven screws that hold the case together. When you remove the screws take note of the fact that they are of different lengths -- REMEMBER where they belong so you can put them back correctly. The seventh screw is located under the warranty sticker. You may either poke your screwdriver through the sticker or use a sharp pointed knife to cut a hole in it allowing access to the head of the screw (odds are that you can't peel the sticker off in one piece!).

Photo 1:
Bottom of
computer case.



- step 4) Now that you have removed the screws, firmly grip the case at both sides, holding together the top and bottom halves, and turn the computer right-side up. Now, gently lift off the top half of the case.

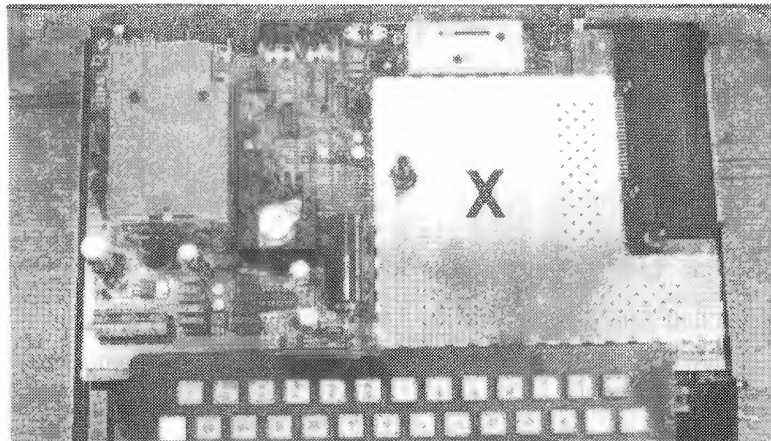
WAIT -- do not reach inside your computer yet!!! See step 5 for warnings.

step 5) From this point on extreme caution must be used to protect your computer from being damaged by static electricity. Follow these common sense precautions:

- a) Don't scuffle your feet on the carpet.
- b) Don't pet your dog or cat.
- c) If there is an electric outlet or a light switch nearby reach over and touch the metal screw holding on the face plate. A metal water pipe or any other earth-grounded item will work as well.
- d) Don't go poking your fingers into the computer without first making sure that you and your computer are safely at the same voltage potential. Do this by ALWAYS touching the metal RF shield before you touch any thing else in the computer.

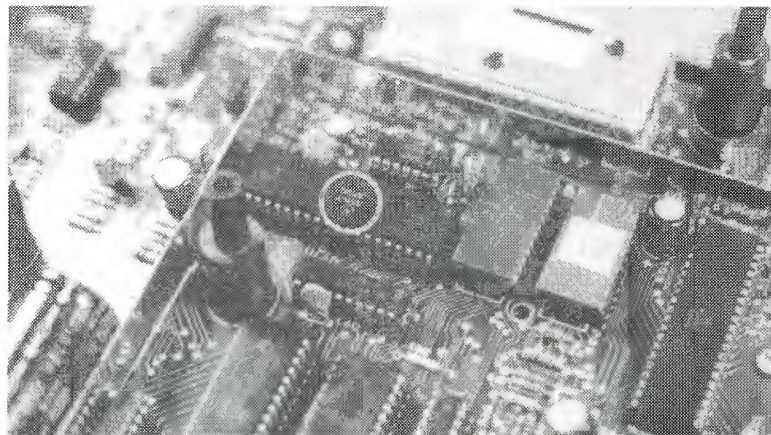
Bearing the above precautions in mind, let's continue. Remove the cover of the RF shield. It lifts straight up, but, it may be necessary to use the small straight blade screwdriver to gently break it loose. You may find some plastic tie-wraps holding the cover on. Simply cut them in two and dispose of them -- they are for shipping purposes only. Set the cover to the side for now.

Photo 2:
Inside of computer
showing RF shield.



step 6) Inside the RF shield you will see:

Photo 3:
Inside of RF shield
showing location of
6847 IC.



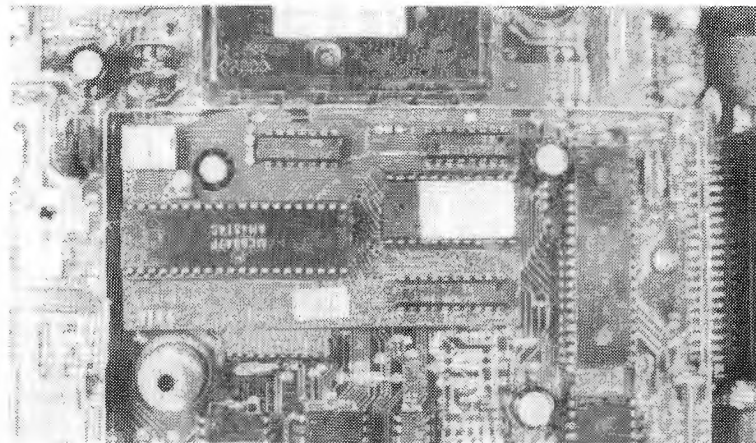
Use the small straight blade screwdriver to gently lift the 6847 IC from its socket. Be extremely careful not to bend any pins. It may be necessary to pry up one end of the IC just enough to slip the screwdriver under the IC so you can pry it up along its entire length. Set the 6847 IC on top of the RF shield cover beside your computer. Note -- touch the cover with your finger before setting the IC down on it!

step 7) Remove the LCA-47 from its packing material. Orient the LCA-47 over the empty 6847 socket as shown in photo 4. Note that on the 40-pin connector on the bottom of the LCA-47, pin number 1 is identified by one of the corners of the connector being trimmed at an angle. Make sure that this pin plugs into pin 1 of the 6847 socket. Peeking under the LCA-47, align all 40 pins carefully with the pins of the empty 6847 socket and gently press it all the way down into the socket. You may find that you must bend the small ceramic disc capacitors C26, C30, and C84 over to make room for the LCA-47 to fully insert into the 6847's socket.

Note: If you have Computerware's "16-Plus" memory expansion board already installed then you may use two low-profile 40-pin IC sockets sandwiched together as an extender. Plug this extender into the empty 6847 socket and plug the LCA-47 into the top of the extender. This will elevate the LCA-47 above the "16-Plus" board. The cover of the RF shield will no longer fit in place. However, most systems cause little or no noticeable RF 'noise' with the cover left off.

step 8) Now, gently insert the 6847 IC into the 40 pin socket on top of the LCA-47. Make sure that pin 1 of the 6847 IC (indicated by a small dot or indent on top of the IC package) is inserted into pin 1 of the socket on the LCA-47.

Photo 4
LCA-47 installed.



step 9) Set the on board switches as desired according to figure 1 on page 4.

step 10) Replace the cover of the RF shield and press it down firmly. It may not fit down all the way over the LCA-47, but, press it down as far as it will go.

step 11) Set the top half of the case back into position. Firmly grasp the computer by the sides, holding the two halves of the case together, and turn it upside down on the towel. Replace the seven screws in their proper places. You do remember where each one goes, don't you? If you have forgotten, the shorter ones go to the front of the computer and the longer ones go to the back.

Section 2: Use

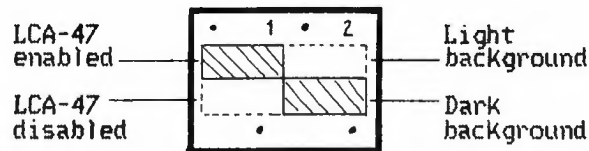
To Enable or not to Enable:

Switch number 1 on the LCA-47 will enable or disable the new character generator. When this switch is to the rear, or toward the number 1 printed on the switch, the LCA-47's character generator is enabled. In this position the new, enhanced uppercase characters and the lowercase letters are available. When this switch is to the front, or away from the number 1 printed on the switch, the LCA-47's character generator is disabled. In this position the 6847's internal character generator is used and all characters will appear the same as if the LCA-47 wasn't installed.

To Light or to Dark:

Switch number 2 is used to reverse the video image of alphanumeric characters on the TV screen. The normal mode of operation is dark characters on a light background. This is accomplished by sliding switch 2 to the rear, toward the number 2 printed on the switch. With the switch to the front, away from the number 2 on the switch, the characters will be light against a dark background.

Figure 1:
On board
switch
positions.



Using with BASIC:

With the LCA-47 installed in your system you will be able to display the entire uppercase character set as well as true lowercase letters. The entire character set provided is completely compatible with Color BASIC, Extended Color BASIC, and Disk Color BASIC. Simply type 'shift-zero' to unlock your keyboard. Your keyboard now behaves like a normal typewriter in that pressing a single key will produce a lowercase letter, while simultaneously pressing the shift key along with the first key will produce an uppercase letter. The new lowercase letters may be used within the quote marks of a PRINT statement, within REM statements, etc. However, all keywords such as PRINT, REM, FOR, POKE, etc., must be all capitals in order to be recognized by the BASIC ROMs.

To use with Radio Shack's Color Scripsit:

The LCA-47 is a fantastic enhancement to Color Scripsit -- the two are completely compatible with each other. However, a quick word here might save you a few minutes of frustration. You may notice an effect that looks like:

nOW IS THE tIME FOR aLL gOOD mEN...

instead of what you actually typed, which was:

Now Is The Time For All Good Men...

The situation is quickly remedied by using the 'Break-2' command. The upper and lower case characters will then be correct and will remain that way until you use the 'Break-2' command again or turn off the computer's power.

Using with other programs:

As mentioned above, the LCA-47 is a fantastic enhancement to your Color Computer. Text editors and word processors by several different companies seem to come to life. The LCA-47 is 100% compatible with all of them that we are aware of. All other programs, whether they are written in BASIC or machine language, no matter whether they are games, educational programs, business programs, or whatever, should all be compatible with the LCA-47. If by some chance you happen to find some program that isn't compatible with the LCA-47 please let the software vendor know so that he can remedy the situation the right way! (Please let us know too -- we like to keep a list of which software vendors are naughty or nice.) Meanwhile, simply disable the LCA-47 by sliding switch number 1 forward, or via the remote disable switch if you decided to install one.

Section 3: How it works

In this description an asterisk (*) in a signal name indicates that the signal is true low.

The LCA-47, when enabled, causes the 6847 Video Display Generator (VDG) to operate in a mode which uses an external character generator. Character generators must be supplied with two pieces of information; the code number (generally ASCII) that specifies which character is to be displayed, and a row number indicating which particular scan line through the character is being processed at this particular time. As can be seen from the schematic on page 12 the eight data lines that carry the ASCII character codes (albeit somewhat modified ASCII) from the system RAM, go to an octal buffer, U2. These data lines also go to U3, our new character generator ROM. If the LCA-47 is disabled (via S1) or is not displaying an alphanumeric character then our character generator is disabled and U2 is enabled by U5-C. In this mode data from the system RAM passes straight through U2 to the VDG chip unaltered. The VDG is instructed to use its internal character generator via its pin 31, INT*/EXT. Data to be displayed in any of the graphics modes is passed through U2 to the VDG chip for internal processing.

When it is determined that the LCA-47 is enabled (via S1) and that the character to be displayed is alphanumeric then U5-C disables the octal buffer U2 and enables our external character generator, U3. U3 transforms the character code into the proper series of dots to, for example, make the letter 'A' look like an 'A', and passes this series of dots to the VDG chip. The VDG chip is instructed to use an external character generator via its pin 31 and therefore processes the data passed to it as a series of dots to be displayed rather than an ASCII character code.

IC U4 acts as a scan line row counter. At the end of each scan line the horizontal sync pulse, HS*, increments this counter so that our character generator will create the proper series of dots for the particular scan line through the character being displayed. The row preset signal from the VDG chip, RP*, resets our row counter back to zero after each twelve scan lines. The vertical sync (or field sync) pulse, FS*, presets our row counter to a value such that when the top of the active display region is again reached, the row counter will have incremented to zero.

The maximum size dot-matrix character that can be produced by our character generator is eight dots wide and twelve scan lines tall which is the entire matrix of dots processed by the VDG in its alphanumeric mode.

The decision as to whether a character from the system RAM is an alphanumeric character or a graphics code is made by U5-C. The two inputs to this gate are Alpha*/Graphic (A*/G) and Alpha*/Semigraphic (A*/S). The A*/G signal in the Color Computer, and most other systems as well, comes from an output bit of a PIA. The A*/S signal in the Color Computer comes from the most significant data bit (bit 7) going from the system RAM to the VDG chip. As long as the VDG is not in a full-graphics mode (A*/G = low) each character position on the screen may display either an alphanumeric character or a semi-graphics character since the most significant bit of each character is the determining factor. If either signal, A*/G or A*/S, is high then U5-C disables our external character generator and enables U2 to pass the data from the RAM to the VDG.

Gates U5-D and U5-B are used to select the proper level of the invert signal, INV', going to pin 32 of the VDG chip. Because of the manner in which these gates work it is impossible to access the semi-graphics-six mode of the VDG chip. Without the LCA-47 installed this mode is available, but, due to the design of the Color Computer, is severely limited at best. Only two of the four available colors may be used and it cannot be intermixed with alphanumeric characters on the same screen like semi-graphics-four can. We know of no vendors who have made use of this very limited feature, and so believe that you will never miss it.

Section 4: Demonstration programs

These programs are intended to be examples only. They are undoubtedly not the ultimate demonstrations. Neither are they intended to be examples of good programming technique.

Although programs DEMO-1 and DEMO-2 are very similar, note the different effects they produce. This demonstrates that the PRINT statement eats (or throws away) ASCII codes \$00 through \$1F (\$ means hexadecimal) (or 00 through 31 decimal). To access the characters in the character generator represented by these codes, POKE statements must be used. The range of values to POKE is \$20 through \$3F (or 32 through 63 decimal). The address of the display RAM is \$0400 through \$05FF (or 1024 through 1535 decimal).

```

10 /
20 / DEMO-1
30 /
40 CLS
50 PRINT "DEMO-1"
60 FOR CHAR=0 TO 127
70 PRINT CHR$(CHAR);
80 NEXT CHAR
90 /
100 / DEMO-2
110 /
120 PRINT @224,"DEMO-2"
130 ADR=1280
140 FOR CHAR=0 TO 127
150 POKE ADR,CHAR
160 ADR=ADR+1
170 NEXT CHAR
180 PRINT @256,"";
190 PRINT @448,"";
200 END

```

```

10 /
20 / DEMO-3
30 /
40 CLS
50 ADR=1024
60 FOR CHAR=0 TO 255
70 POKE ADR,CHAR
80 ADR=ADR+1
90 NEXT CHAR
100 PRINT @256,"";
110 END

```

```

10 /
20 / DEMO-4
30 /
40 CLS
50 PRINT @128,"";
60 START=65: GOSUB 100
70 PRINT @ 128,"";
80 START=97: GOSUB 100
90 GOTO 50
100 FOR CHAR=START TO START+25
110 PRINT CHR$(CHAR);
120 NEXT CHAR
130 RETURN

```

```

10 /
20 / DEMO-5
30 /
40 CLS
50 PRINT @128,"HOW TO GET someone's ATTENTION"
60 GOSUB 100
70 PRINT @128,"how to get SOMEONE'S attention"
80 GOSUB 100
90 GOTO 50
100 FOR I=1 TO 100:NEXT:RETURN

```

0001 0600

```

NAM MLDEMO3
*****
*
* Machine language equivalent *
* of the BASIC program DEMO-3 *
*
* Program is position indepen- *
* dent -- it may be loaded at *
* any available address. *
*
*****

```

```

0002 0600
0003 0000 8E0400
0004 0003 86FF
0005 0005 4C
0006 0006 A780
0007 0008 8C0600
0008 000B 26FB
0009 000D 20FE
0010 000F

```

```

START ORG $0000
LDX #$0400 X=screen ptr.
LDA #$FF A = Char.
LOOP INCA Increment char.
STA 0,X+ Output to screen
CMPX #$0600 Check for done
BNE LOOP Loop until done
ERA * Stall
END

```


The following programs are written in 6800 assembly language for the Micro-Chroma-68 Kit -- they will NOT work on the TRS-80C Color Computer. For systems other than the Micro-Chroma-68 these programs may serve as guidelines for how to use the LCA-47.

```
1          NAM      MC68D1
2          OPT      LLE=120,P=84

4          *****
5          *
6          * Micro-Chroma 68 Demo Program # 1 *
7          *
8          * Generate test pattern for LCA-47 *
9          *
10         *****

12         F440     A RIOT   EQU    $F440     Address of 6846 RIOT chip
13         D000     A SCREEN EQU    $D000     Address of display RAM

15A F000                                ORG    $F000

17A F000 8E      F440     A START  LDX    #RIOT     X = ptr to RIOT chip
18A F003 6F      01      A        CLR    1,X      Remove RESET condition from peripheral port
19A F005 86      BF      A        LDAA   #BF       Set bit P6 low to enable INV signal to VDG
20A F007 A7      03      A        STAA  3,X
21A F009 86      FF      A        LDAA   #FF       Make all lines of RIOT I/O port be outputs
22A F00B A7      02      A        STAA  2,X
23
24A F00D 8E      D000     A        LDX    #SCREEN   X = ptr to display RAM
25A F010 86      FF      A        LDAA   #FF       A = output character
26
27A F012 4C      *       LOOP    INCA      Increment character
28A F013 A7      84      A        STAA  0,X      Output to screen
29A F015 30      01      A        INX      Increment screen ptr.
30A F017 8C      D200     A        CPX    #SCREEN+$0200 Done?
31A F01A 26      F6      F012  *       BNE    LOOP    Loop back if not
32
33A F01C 20      FE      F01C  *       BRA    *       Yes -- stall

35                                END
```

1 NAM MC68D2
2 OPT LLE=120,P=84

4 *****
5 *
6 * Micro-Chroma 68 Demo Program # 2 *
7 *
8 * Keyboard echo function: allows *
9 * user to type messages on the *
10 * screen in upper and lower case *
11 * letters. Screen scrolls when *
12 * needed. 'CTRL-X' clears screen. *
13 * 'CTRL-H' is back-space. *
14 * *
15 *****

17 D000 A SCREEN EQU \$D000 Address of display RAM
18 F404 A PIA EQU \$F404 Address of Keyboard PIA
19 F440 A RIOT EQU \$F440 Address of 6846 RIOT chip

21 0020 A SPACE EQU \$20 ASCII space character
22 000D A CR EQU \$0D ASCII carriage return character
23 0008 A BS EQU \$08 ASCII back-space character ('CTRL-H')
24 008C A CURSOR EQU \$8C Semi-graphics character for cursor

26A F000 ORG \$F000

28A F000 CE F440 A START LDX #RIOT X = pointer to RIOT chip
29A F003 4F 01 A CLR 1,X Remove RESET condition from peripheral port
30A F005 86 BF A LDAA #\$BF Set bit P6 low to enable INV signal to VDG
31A F007 A7 03 A STAA 3,X
32A F009 86 FF A LDAA #\$FF Make all lines of RIOT I/O port be outputs
33A F00B A7 02 A STAA 2,X
34 *
35A F00D 7F F0A3 A CLR PRVCHR Clear previous character
36A F010 8D 19 F02B A BSR CLEAR Clear screen
37A F012 8D 04 F018 LOOP BSR INPUT Go get character from keyboard
38A F014 8D 2A F040 BSR OUTPUT Go output it to display
39A F016 20 FA F012 BRA LOOP

41A F018 B6 F404 A INPUT LDAA FIA Check to see if any keys down
42A F01B 2A 05 F022 BPL IN10 Br if yes
43A F01D 7F F0A3 A CLR PRVCHR No -- clear previous character
44A F020 20 F6 F018 BRA INPUT Loop until key down
45 *
46A F022 B1 F0A3 A IN10 CMPA PRVCHR Same key as last time?
47A F025 27 F1 F018 BEQ INPUT Br if yes -- wait for another
48A F027 B7 F0A3 A STA PRVCHR No -- process it
49A F02A 39 RTS

51A F02B CE D000 A CLEAR LDX #SCREEN X = ptr to display RAM
52A F02E 86 60 A LDAA #\$60 A = blank code for character generator
53A F030 A7 00 A CLR2 STAA 0,X Output to screen
54A F032 08 Bump screen ptr
55A F033 8C D200 A CPX #SCREEN+512 Done with whole screen yet?
56A F036 26 F8 F030 BNE CLR2 Loop back if not
57A F038 CE D000 A LDX #SCREEN Set X = ptr to first position on screen
58A F03B 86 8C A LDAA #CURSOR Put cursor in upper left corner
59A F03D A7 00 A STAA 0,X
60A F03F 39 RTS

62 *
63 * Routine to output one character to the display.
64 * Converts pure ASCII into character generator codes.
65 * Scrolls if necessary.
66 *

68A F040 36 OUTPUT PSHA Save character

```

69A F041 81 20 A CMFA #SPACE Check for displayable character
70A F043 2D 2F F074 BLT CTRL Br if control character
71A F045 81 40 A CMFA #40
72A F047 2C 04 F04D BGE OUT10
73A F049 8F 40 A ADDA #40 Here if ASCII $20-$3F; add bit-6
74A F04E 20 06 F053 BRA OUT20 Go output
75 *
76A F04D 81 60 A OUT10 CMFA #60
77A F04F 2D 02 F053 BLT OUT20 Br if ASCII $40-$5F; don't modify
78A F051 84 1F A ANDA #1F Here if ASCII $60-$7F; clear bits 5 & 6
79 *
80A F053 A7 00 A OUT20 STAA 0,X Output character to screen
81A F055 08 INX Bump screen ptr
82A F056 86 8C A OUT25 LDAA #CURSOR Output cursor
83A F058 A7 00 A STAA 0,X
84 *
85A F05A 8C D200 A OUT30 CPX #SCREEN+512 Beyond end of screen?
86A F05D 26 13 F072 BNE OUT40 Br if no -- exit
87 *
88 * Do scroll
89 *
90A F05F CE D000 A LDX #SCREEN X = screen pointer
91A F062 A6 20 A SCRL10 LDAA 32,X Get a character and...
92A F064 A7 00 A STAA 0,X move it up one line.
93A F066 86 60 A LDAA #60 Erase original character
94A F068 A7 20 A STAA 32,X
95A F06A 08 INX Bump pointer
96A F06B 8C D1E0 A CPX #SCREEN+512-32
97A F06E 26 F2 F062 BNE SCRL10 Loop until done with entire screen
98A F070 20 E4 F056 BRA OUT25 Go output cursor
99 *
100 *
101A F072 32 OUT40 FULA Restore A reg.
102A F073 39 RTS
103 *
104 *
105A F074 81 0D A CTRL CMFA #CR Carriage return?
106A F076 26 11 F089 BNE CTRL20 Br if no
107A F078 86 60 A CTRL10 LDAA #60 Yes -- blank rest of line
108A F07A A7 00 A STAA 0,X
109A F07C 08 INX
110A F07D FF FOA1 A STX TEMP
111A F080 86 FOA2 A LDAA TEMP+1 Test pointer to see if at end of line
112A F083 84 1F A ANDA #1F
113A F085 26 F1 F078 BNE CTRL10 Loop until end of line reached
114A F087 20 CD F056 BRA OUT25 Go output cursor and check for scroll
115 *
116A F089 81 18 A CTRL20 CMFA #18 'CTRL-X' key?
117A F08B 26 04 F091 BNE CTRL30 Br if no
118A F08D 8D 9C F02B BSR CLEAR Yes --clear screen
119A F08F 20 C9 F05A BRA OUT30
120 *
121A F091 81 08 A CTRL30 CMFA #BS Back-space?
122A F093 26 C5 F05A BNE OUT30 Br if no -- ignore it
123A F095 8C D000 A CPX #SCREEN Yes -- At beginning of screen?
124A F098 27 C0 F05A BEQ OUT30 Br if yes -- ignore it
125A F09A 86 60 A LDAA #60 Erase current cursor
126A F09C A7 00 A STAA 0,X
127A F09E 09 DEX Decrement pointer
128A F09F 20 B5 F056 BRA OUT25 Go output a new cursor

130 *
131 * Data storage
132 *
133A FOA1 0002 A TEMP RMB 2 Temp X storage
134A FOA3 0001 A FRVCHR RMB 1 Previous character

```

136

END

Section 5: Changing Character Generator ROMs

Integrated circuit U2 is the character generator. To change character sets this IC must be replaced with another. Make sure that the computer's power is turned off. Also, make sure that you pay attention to the static electricity precautions on page 2. Carefully remove the current ROM from the U2 socket. Orient the new ROM so that its pin 1 is aligned with pin 1 of the socket and gently press it into position. Make sure that all of the ROM's pins are correctly seated in the socket -- that none of them folded under the IC or stuck outside the socket.

Section 6: Using remote switches

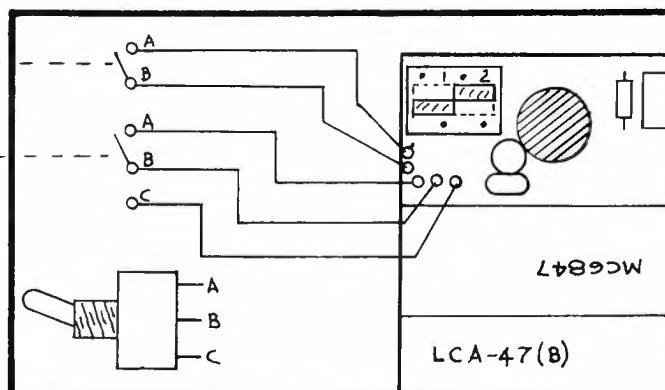
The LCA-47 is designed to allow you to use remote switches to perform the same functions as the two on board switches. These remote switches, for example, could be mounted on the side or rear of the computer so that it would not be necessary to open the case to alter their settings. However, we have found the LCA-47 to be so compatible with all software that you can just install it and forget it -- there's no need to disable it for 'some' programs!

If you choose to install remote switches then the following diagram shows how to connect them. Either or both of the switches may be removed. Read the notes below VERY carefully.

Figure 2. * Remote enable switch

** Remote video invert switch

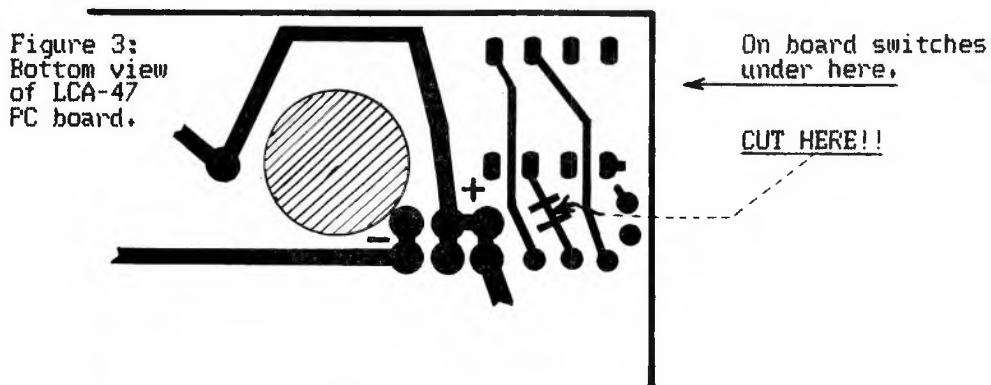
A typical switch:



Notes:

* In order for the remote enable switch to function correctly the on board switch number 1 must be set for 'disable' (positioned as shown). When the remote switch is closed the LCA-47 is enabled.

** Warning -- do NOT install the remote video invert switch without cutting the following trace on the underside of the LCA-47 PC board. Use a sharp knife such as an X-acto and cut very carefully.



Section 7: Installation and Use on other systems

There are two requirements that must be met by your system in order for the LCA-47 to function correctly. The first is physical space -- there must be sufficient room for the LCA-47 to fit into your system's configuration. Only you can determine this.

The second has to do with the 'output character' subroutine in software. This subroutine currently takes the normal 7-bit ASCII codes passed to it and converts them into the 6-bit codes required by the 6847 VDG chip. You may find it necessary to alter or replace this subroutine with one which will set the seventh bit (bit-6) if the character is to be an uppercase letter and clear the seventh bit if the character is to be a lowercase letter. If the original subroutine is in your system's ROM then you may need to supply a new subroutine which will load into RAM. Study program 'MC68D2' on page 8 to see how this can be done. Feel free to contact us if you have any questions.

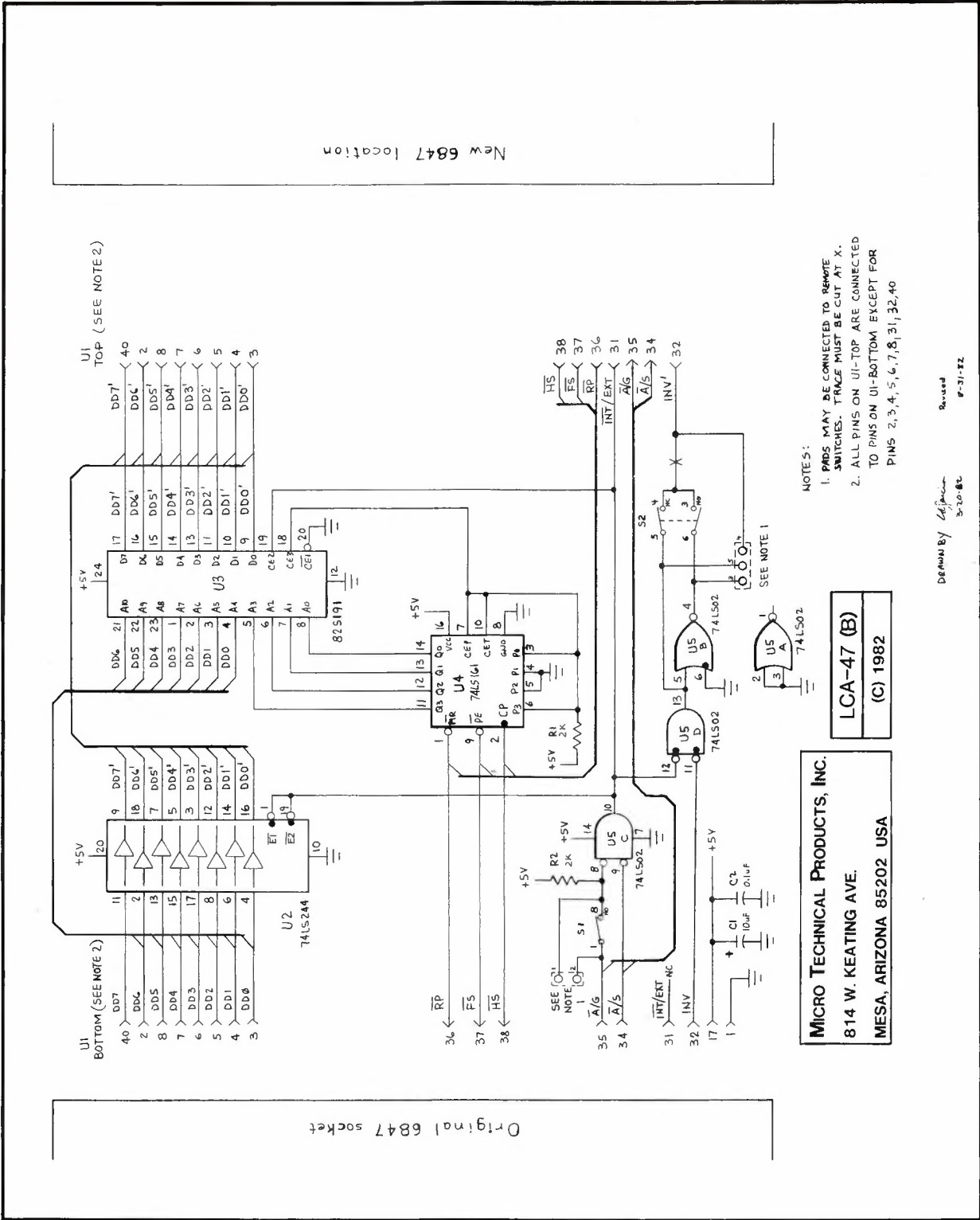
Section 8: What to do if your 6847 is not on a socket

This could be one of your biggest heart-aches. Your LCA-47 arrives, you open your computer, and UGH!! -- the 6847 IC is soldered directly to the computer's printed circuit board. You now have three choices: 1) give up and return the LCA-47 for a refund, 2) buy a newer computer since only the older ones didn't use a socket, or 3) install a socket for the 6847 like Radio Shack should have done in the first place.

If you choose number 3 above, we wish you the best of luck. Unsoldering a 40 pin IC is no piece of cake!!! If you are the technician-type then you can probably accomplish this feat with a minimum of difficulty. If you are the type who doesn't know which end of a soldering iron to hold then you had better think twice about your other choices. If you have a technician-type friend that you trust a WHOLE lot, you might let him do the work for you.

Here is a suggestion (although a somewhat expensive one). Rather than unsoldering and removing the 6847 intact from the computer's PC board (which requires removing the PC board from the case), purchase a new 6847 chip (less expensive than a whole new computer) and cut the old one out with small wire cutters. Cut the leads up against the IC rather than down against the PC board!!! After cutting all forty leads lift the rather useless, leadless, old IC package out of the way (it might make a nice souvenir). You now have forty pins sticking up out of the PC board. Take a forty pin IC socket and bend its pins out slightly so that it can straddle these forty original pins. Set the IC socket lightly in place on top of the forty pins. Grab each of the original pins at its base with a pair of needle nose pliers to act as a heat sink. Now, with your two other hands, quickly solder the pin of the IC socket to this original pin. Do this to all forty pins and there you have it -- you are now ready to install the LCA-47!

Section 9: Schematic



NOTES:
 1. PADS MAY BE CONNECTED TO REMOTE SWITCHES. TRACE MUST BE CUT AT X.
 2. ALL PINS ON UI-TOP ARE CONNECTED TO PINS ON UI-BOTTOM EXCEPT FOR PINS 2, 3, 4, 5, 6, 7, 8, 31, 32, 40

LCA-47 (B)
 (C) 1982

MICRO TECHNICAL PRODUCTS, INC.
 814 W. KEATING AVE.
 MESA, ARIZONA 85202 USA

DESIGNED BY *Chipman* 5-20-82
 REVISED 8-31-82

New 6847 location

Original 6847 socket

Micro Technical Products, Inc.
 814 W. Keating Ave.
 Mesa, Arizona 85202
 602-839-8902