A Backlighted LCD for your K1

(K1BKLTKIT-X)

Tom Hammond - NØSS, September 23, 2005

Rev 1.18

Thanks to Wayne Burdick, N6KR for suggesting this implementation of backlighting the K1 display.

APPLICABILITY

This modification is applicable to all **UNASSEMBLED** revisions of the K1.

BACKGROUND

Ever since the K1 was first released, builders have asked for and discussed various methods of adding backlighting to their LCD display.

Early K1's were supplied with opaque rear polarizers which would not pass light. Elecraft now uses a 'transflective' rear polarizer, capable of both passing light from the back side AND of reflecting ambient light entering from the front of the display. It is the transflective LCD display which now permits backlighting.

Elecraft does not presently supply a backlight with the K1 kit. However, if you have not assembled your K1, you can add a backlight at the time of construction.

CHANGES TO BE MADE TO YOUR K1 ASSEMBLY MANUAL

Add the following note to your K1 Assembly Manual (p. 21 of the rev. F manual), immediately following the 5th step in the left column, in which you have just verified proper installation of the MCU IC (U1) into it's socket on the Front Panel PC board:

> **"At this point, refer to the instruction set for adding the K1 LCD Backlight. Once installation is completed, continue with the first step on the next page ('Visual Inspection')."**

PARTS NEEDED

A kit of parts for use in making the changes can be ordered as the "**K1BKLTKIT-X**". This kit consists of the following items:

Quan.	Item	Elecraft Part #
1	K1 Backlight	E100192
1	Resistor, 330Ω1/4W (Orange-Orange-Brown) (for 6mA current draw, lower brightness backlight)	E500103
1	Resistor, 200Ω 1/4W (Red-Black-Brown) (for 10mA current draw, brighter backlight)	E500020
1	Insulator Card Assy., K1 LCD	E850215

MODIFICATION

Removal of the K1 MCU

Experience has shown that when removing an IC from its socket, it is safest to insert the tip of a thin-bladed screwdriver between the bottom of the IC and the top of the IC socket, and then to alternately lift the two ends of the IC until it comes free of the socket.

Using ESD-safe practices, carefully remove the MCU (U1) from the bottom side of the Front Panel PC board and store it in a safe place (anti-static foam, metal tray or wrapped in aluminum foil).

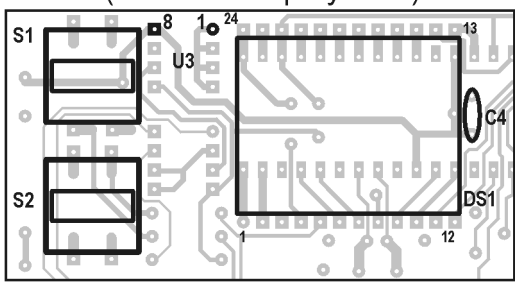
Preparation of the Backlight Installation Site (on the Front Panel Board)

Using a pair of flush-cutting wire cutters, flush-trim all of the component leads which are located **between** the two rows of the LCD PC board pads. This includes all wires and pins contained within the large rectangle (just to the left of C4) shown in the illustration below. Flush-trimming these leads ensures that the LED backlight and LCD will fit properly when they are installed in later steps.

Installation of the LCD Backlight

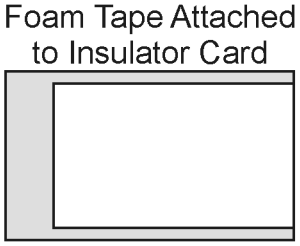
Note: During this part of the modification, you will be working with the front (switch & display) side of the Front Panel PC board. Please take time now to orient yourself with the section of the PC board which will be involved and match it against the illustration to the right.

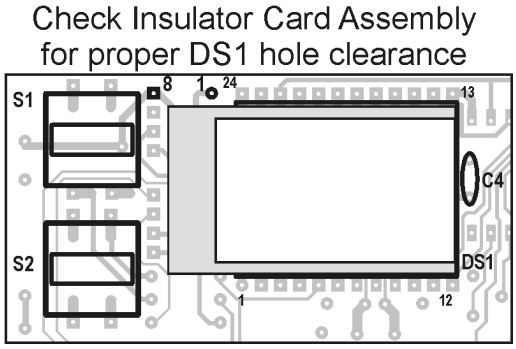
Top-left corner of Front Panel board
(switch & display side)



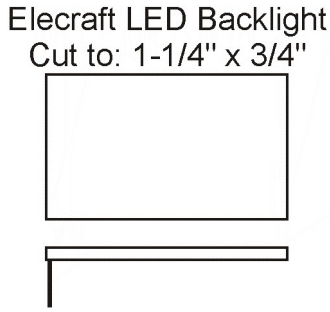
Installation of the LCD Backlight (cont'd.)

1. Locate the Insulator Card assembly. This assembly will include a pre-installed piece of double-sided foam tape. **DO *NOT* REMOVE THE PROTECTIVE PAPER COVERING THE ADHESIVE SIDE OF THE TAPE**. When properly installed, this insulating card will fit cleanly between the PC board pins for the LCD (DS1) and, when placed up against C4 (just to the right of the LCD), it will just clear the leftmost four pins of U2 and U3 (just to the right of S1 and S2 on the left side of the PC board). Refer to the illustration .

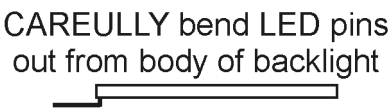




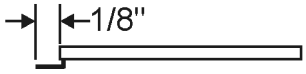
2. Locate the K1 LED backlight. The front side of the backlight is protected by a thin sheet of **clear** plastic which ***will*** be removed in a later step. However, **DO NOT REMOVE** the thin white plastic sheets covering the front and back of the backlight. These sheets MUST remain in place. Note that the LED pins are built into a small plastic block which is embedded into the edge of the clear plastic backlight lens.



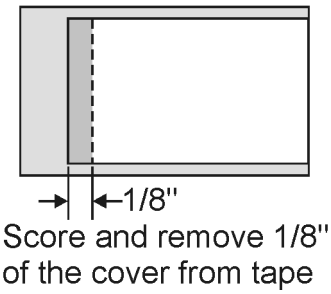
3. Using a pair of needle-nosed pliers, or similar device, grasp each of the LED leads about 1/16" (1.6mm) from the point at which it enters the white plastic block, and ***carefully*** bend the lead so it is parallel to the body of the backlight body, as shown at right.



4. Trim the length of the LED leads to 1/8" (3.2mm), as shown at right.



5. Using a sharp blade (a single-edged razor blade or Xacto knife works well), carefully score the protective covering of the foam tape 1/8" (3.2mm) from its left edge (see illustration) and remove the scored covering to expose the adhesive of the foam.

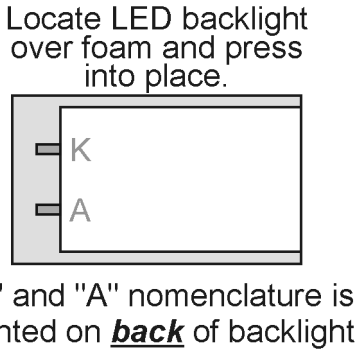


Installation of the LCD Backlight (cont'd.)

6. Taking care to not pull loose the thin white plastic covers which are attached to the front and back of the LED backlight, carefully remove the masking tape from the cut end of the LED backlight. At this time you **should** remove the **clear** plastic film which may still be protecting the front of the backlight assembly. Again, **DO NOT** remove the thin white plastic sheets which cover both the front and back of the backlight assembly.

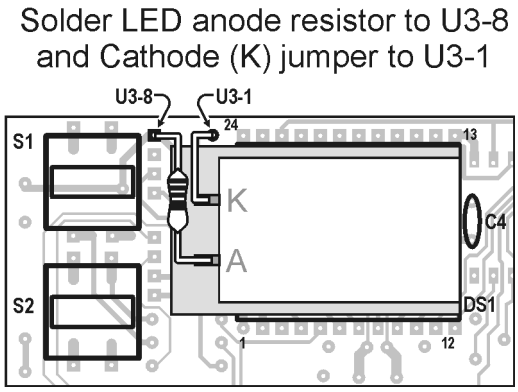
7. With its LED leads positioned to the left, as illustrated, and with the **right** edges of both the LED backlight and the insulator card assembly aligned, place the LED backlight on top of the foam, and press down lightly.

   NOTE: The "K" and "A" annotations shown on the illustration indicate the cathode (K) and anode (A) of the LED within the backlight. This nomenclature is printed on the ***back*** side of the backlight, but is shown here for future reference. The Anode (A) pin will ***always*** be the bottom of the two pins.



8. The LED current-limiting resistor must now be chosen. A value of 330 ohms will give you a current drain of about 6mA with adequate illumination. A value of 200 ohms will provide a somewhat brighter display, but with a slightly higher current drain of about 10mA.

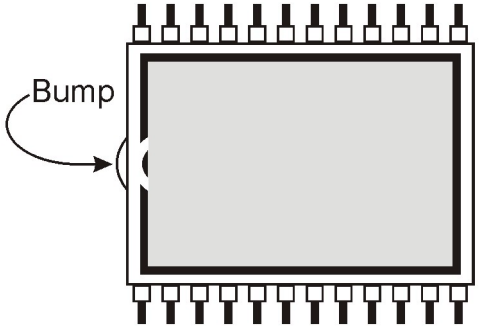
   Using the illustration at right, install the selected current-limiting resistor between the ANODE (A) pin of the backlight LED and pin 8 of U3 (+6VDC). Refer to the illustration and the other side of the Front Panel PC board to confirm the position of U3-8.



9. Following the illustration above, use one of the clipped resistor leads and install a jumper wire between the cathode (K) lead of the backlight LED and the grounded pin 1 of at U3. Note that the insulator card assembly is covering most of the pins of U3, so you must be sure that you have found pin 1 of U3 before you attach this short jumper wire. Pin U13-1 is just to the left of Pin 24 of the LCD display (DS1).

10. Carefully reinstall U1 into its socket. Ensure that ALL of the IC pins are inside the socket before you press it into place.

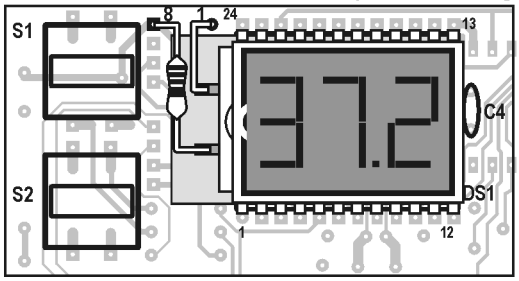
11. In this step, you will install the LCD display. It is ***IMPORTANT*** that you install the LCD properly, so the small bump on the side of the display is pointing to the ***left***. See the illustration at right for assistance in identifying the proper orientation of the LCD display when it is installed.



Installation of the LCD Backlight (cont'd.)

CAREFULLY install the LCD display over the top of the backlight, taking care to ensure that all of the LCD display pins are seated into their mating holes on the PC board. The pins should enter all of the PC board holes, but they should just. be flush with the back side of the PC board, as they were when the original LCD display was installed.

New LCD mounted over top of backlight



12. DOUBLE-CHECK the positioning of the LCD, and the fact that the 'bump' on the LCD package faces to the left. See step 11, above.

13. Solder pins 1 and 13 of the LCD and verify that all pins are properly positioned within their holes. Then solder the remaining pins of the LCD.

This completes the K1 LCD backlight modification.

Once you have your K1 fully assembled and working. If you find that the illumination of the LCD is either too bright (or too dim), you can easily remove the K1 front panel, separate the front panel PC board from the case front panel, and replace the existing current limiting resistor with the other resistor supplied with the kit.

Return to the ***Visual Inspection*** section of your K1 Assembly Manual for the remainder of the K1 assembly.

Additional Note: K1 Backlight On-Off Control

The backlight draws only 6 to 10 mA, but you can add on/off control if desired. One possibility is to use a switch mounted on the left side panel. However, since most K1 owners never turn off AGC, it may be preferable to use the AGC menu entry to control the backlight. To do this: (1) cut the RF board trace running from pin 8 of J6 to C31; (2) add a jumper on the bottom of the RF board from J6 pin 8 to P1 pin 18; (3) use another jumper to connect the cathode (K) lead of the backlight LED to pin 18 of J1 on the front panel board.

The AGC menu entry can be assigned to PFn if you don't use this switch for XIT or some other function. This makes the backlight even easier to turn on/off.