An LED backlight for the ATARI Portfolio™

Parts list

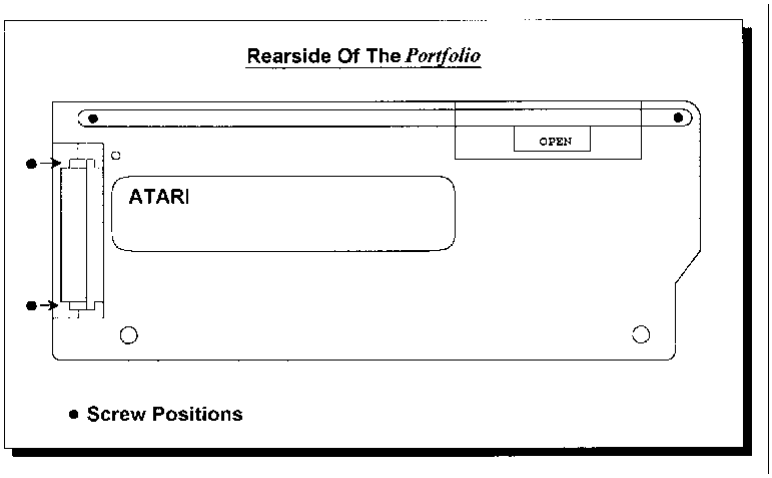
- 1 light guide body with reflective film on the back (with our logo) and diffuser film on the front
- 1 LED strip with 4 LEDs for 4 - 6 volt DC
- 1 silver adhesive strip 69mm x 5mm for masking the LED strip
- 1 SMD slide switch (optional installation)
- this guide

The necessary tools

- antistatic wrist strap
- Phillips screwdriver, medium, for the housing screws
- Phillips screwdriver, small, or only the bit for the 4 screws on the display board
- flat screwdriver, small, for lifting
- middle pliers to bend the noses
- release paper, wax paper or similar in approx. DIN A5 to cover the front sheet from the display housing
- soldering needle to be able to solder SMD
- solder tin to be able to solder SMD
- small pliers to shorten the cables
- small, sharp scissors to shorten the silver conductive strips
- model building band or circular saw, paper lever cutting machine or CO2 laser cutter to cut the light-guide body and the foils, as well as to separate a piece from the metal frame
- small cutter knife or craft scalpel to raise the reflective tape and cut the cutout for the switch in the housing
- large, powerful scissors to cut a piece of thin sheet metal (optional)
- 2-component adhesive for gluing the SMD switch
- double-sided carpet tape

On the way to the display

First we put on an antistatic wristband to avoid static discharge on the circuit boards and components.



In order to be able to detach the LCD board from the display housing, we have to start by opening the lower part of the Portfolio. There are four screws to be loosened. The two larger ones are located on the right and left under the rubber feet. The other two are located on the right and left in the holes of the Portfolio bus connector, to which e.g. the interfaces are plugged in. After removing the screws, pull off the Portfolio base with force. The display cable is now carefully released from the snap lock.

Open the display case

The plastic film with the imprint „PORTFOLIO, 16 BIT PERSONAL COMPUTER“ is removed first. The film is levered at a corner with a pointed object (e.g. spatula made of plastic or wood. If necessary, screwdriver or knife if you want to risk scratching). Conn. pull off with force and evenly, at a not too steep angle. The film can be easily put back on afterwards and still sticks firmly enough! Place this film as protected as possible, e.g. with release paper on top, so that nothing else comes to rest on the adhesive surface! There are two clearly visible screws in the housing under the film that have to be loosened. Then use a little force to push the top and bottom of the housing apart by approx. 70°. The display board is again connected to the front part of the display housing with four tiny screws. Loosen these with a short, small Phillips screwdriver or just the Phillips bit and you now have the display board in your hand.

Disassemble the display

(A dust-free or low-dust room is good for this step, so that no lint of dust can get behind the display or backlight.)

Unfortunately, it is not enough to simply slide the light guide behind the display, i.e. into the gap between the glass and the circuit board. Because the back of the LC display is covered with an opaque reflection film. This must first be carefully removed.

To do this, bend the tabs of the metal frame that holds the display straight on the back of the display board until the frame can be pushed forward and released. Now the glass display is loose or can be easily detached from the electrically conductive pink rubber strip. These are responsible for contacting the display with the golden contact pads underneath.

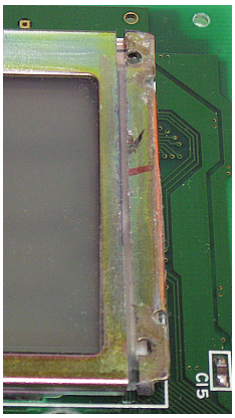
You can now easily get to the reflective tape on the back of the LC display.

Caution! There is a thicker polarizing film under the thin reflective film, which must NOT be removed! Therefore, take a carpet knife blade or a scalpel and carefully go under the thin reflective tape and lift it up. Pull off the LC glass steadily with a strong, slow pull. Caution! Hold the glass firmly with the other hand and make sure that the folded flex cable to the LC display is not torn or even stressed. Both would be irreparable! Peeling off the reflective tape is the most delicate process of the installation.

Possibly remaining adhesive residues on the polarizing film can be removed with kerosene(am.) / paraffin(brit.). Please in no way use acetone, isopropanol, petrol or white spirit!).

Process the metal frame

In the area to the right of the display, we need space to connect the LED strip to the light guide, or for an uncomplicated change, if you want to try a different light color later (without having to disassemble the LCD again). I shortened the metal frame on the right side by 5mm with my band saw, see picture. The further connection work is quite simple after this measure.



Cutting the light guide body

The light guide body already has the optimal length of 125mm, but the width must be reduced to 41mm. This can be done with a paper lever cutting machine, powerful scissors or a model circular saw, scroll saw or a CO2 laser cutter.

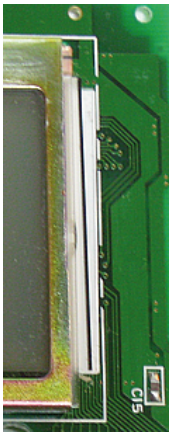
The cutting of the width to 41mm also applies to the white reflective back with our company logo and the diffuser film for the front, which comes directly under the LCD glass.

Assemble the light guide

After cutting to a width of 41mm, the light guide body is reassembled. The white reflective film (with our logo) is stuck to the back of the light-guiding body (which can be felt very slightly rough) and points to the circuit board side of the display and the right side of the LCD.

The diffuser film comes on the smooth side of the light guide body and should point upwards towards the glass.

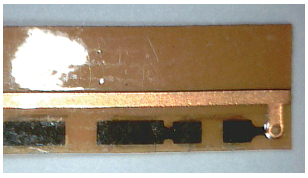
(Optionally, the rim of the pure light-guiding body (except for the right-hand side to which the LED strip is attached) can be brushed with white or silver nail polish. The white or silver lacquer serves to reflect the light emerging from the end faces back inwards. This makes the backlight a bit brighter on the frontside.)



Put the LCD with the light guide back into the board

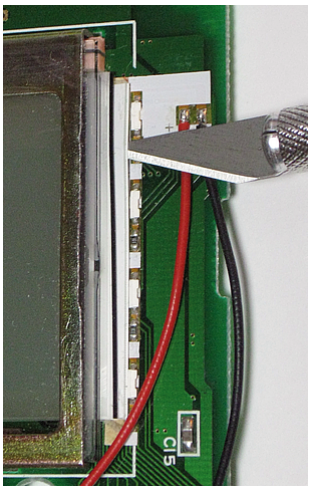
Now the assembled light guide body is placed behind the glass and over the flex cable folded in the LCD! And put it back on the two pink MOS rubbers and sunk the metal noses into the corresponding holes, but do not bend them back yet. It should now be checked whether the light guide body is correctly positioned, namely to the front right up to the white edge in the picture.

Attach the LED strip to the light guide



The LED strip consists of 4 special LEDs, each with a series resistor. Please keep the LED strip flat and do not bend it! The LEDs can be individually cut down to 1 LED, see picture. It may well be that only 2 or 3 LEDs are enough for the brightness of your backlight. This also means less less power consumption!

It is therefore recommended to test the LED strip first (do not remove the cover from the adhesive strip yet) and under the light guide, see picture. And connect either to the 4.8 volts of the Portfolio or to an external source of 4.8 volts DC. It is recommended to connect the display to the mainboard of the Portfolio and to switch the Portfolio on. With light pressure on the metal frame (the noses are not yet bent back) you can see a few pixels and get an impression of the actual working brightness, see picture with only 2 warm white LEDs.



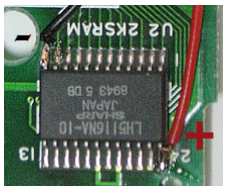
Once you have clarified this for yourself, you can detach the cover from the adhesive strip of the LED strip and attach it in the middle and under the light guide. To do this, you can lift the light guide body slightly at the point that protrudes slightly. The slightly wider silver strip, cut to a length of 41mm, is glued over the edge where the light guide body and the LEDs abut, so that too much light does not fall into the housing, see picture.

(Optional: If you want to test several colors over a while, the LED strip can also be pushed under the light-guiding body without sticking. The covering silver strip holds it in place or you can also use a piece of adhesive tape for temporary fixing from the side or above to use.)

The adjustment of the LCD

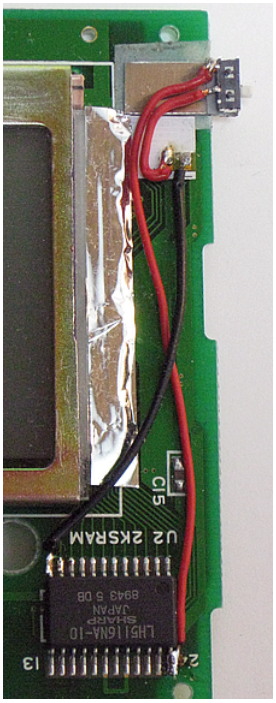
The metal frame is on top of the LCD, but not yet stretched over the lugs from below. Now temporarily switch on the Portfolio to find the correct position of the pixels of the LC display.
Depending on the completeness of the pixel representation on the screen (right / left edge), shift the display glass in portions of a millimeter to the right or left until the pixel representation is 100% complete. Now the metal tabs on the back of the PCB can be bent back. Then you should test again whether the pixel alignment and the pressure are correct.

The power supply for the backlight



The power supply can be conveniently obtained from the neighborhood on the LH5116NA. Pin 24 carries +4.8 volts and pin 12 -4.8 volts, see picture.

If you switch, you control



A switch to turn the backlight on and off can be very useful. Although the backlight turns dark when the power is down, it lights up briefly with full power consumption in the interrupt cycle after 128s. Over time, this is a certain amount of additional power consumption, depending on the LED strip or the color and number of active LEDs.

If you are you satisfied with e.g. only 2 LEDs of the warm-white LED strip, you can get by with additionally 13mA, only. If you don't mind the flashing every 2 min. a switch can be avoided. Because a switch means a visible intervention into the housing and additional work.

For the included slide switch I have e.g. cut a thin sheet of steel (0.3mm) to size (not included in the kit) and glued to the display board with double-sided carpet tape. The full width of the switch protrudes, see in the picture. With this structure, you determine the points for the incision in the housing and carefully cut with the craft scalpel. A little fine adjustment is necessary so that only the white switch button protrudes outside. Then glue the switch to the red cables e.g. with 2-component adhesive to the ground. The structure shown here has the advantage that the display board can be removed as a whole. Other procedures for installing the switch are conceivable.

Assembly

The reassembly of the ATARI Portfolio is done in reverse order and should not be difficult.

Portfolio tip 1: Of the 4 small and silver screws that hold the display, only the top two are actually needed.

Portfolio tip 2: It is also best to remove the round bolt in the center of the folding area or to widen the bushing with a file to approx. 3mm, because the too tight bushing will sooner or later kink the display cable of the Portfolio and destroy the conductor tracks.