TOYOTA SOARER
Electro Multi Vision (EMV) Screen Back Light Repair

By
Harry Lemmens

This is a free document!
If you find it useful please e-mail Harry and say thanks
hlemmens@optushome.com.au

Australian Lexus Soarer Club (ALSC)
www.lexus.australia.as

SOARER DIEHARD
www.users.bigpond.com/pgscott

Repairing Faulty EMV Backlight Inverter.

A fault that seems to be becoming more prevalent as the Soarers fitted with the EMV screens age is that the backlight fails. This fault usually leaves the touch sensitive screen functional, but the user is left guessing as to what functions he may be accessing.

The repair itself is relatively simple. It appears that a high voltage capacitor fails, and this then causes one of the two main inverter transistors to fail. The backlight inverter failure sometimes blows a 3 amp fuse located on the primary power supply board. This board has several different switching power supplies, but the fuse that blows is for the 12 to 24 volt inverter which powers the backlight. (I would have said this was overly complex myself, the backlight inverter could just as easily have run directly from 12 volts!) I have replaced the original transistors with much larger devices, capable of much higher power than the originals. (One reason was that I could not identify what the original transistors were, due to the clear lacquer obscuring the SMD codes on the original transistors.) These transistors are mounted on the case of the original converter to facilitate cooling of the new devices.

You will need a new 68 nF capacitor, with a voltage rating of at least 250 volts, and two transistors, I have tried two different types. You will also require a new 3.15 amp, 5AG fuse.

1	68 nF (nanoFarad, 0.068 uF (microfarad)) 250 Volt minimum.
2	MJE340 transistors or MJE13003 transistors.
1	3.15 Amp 5AG fuse.
2	Insulating washers (preferably silicon rubber insulators)
	Some wire (preferably 3 different colours)
2	3 mm screws + nuts and shake proof washers.

Table 1 Parts Required for repair.

Remove the unit from the car

Remove the computer module from the display.

Remove the back tin coloured cover, disconnect the two plugs from the displays computer board to the touch screen. (pictures)
Remove the touch screen from the display. You will need to prise up the plastic shroud slightly to pop over the detents pressed into the case.

If the foam rubber between the touch screen and the display unit is disintegrating, scrap it right off the display unit, this stuff is worse than snot, and will get everywhere otherwise. Some foam rubber strip can be cut and contact adhesive used to replace the original when you reassemble the unit.

While you have the touch screen out, I suggest you remove the screws holding the touch plate in, and clean the whole plate. (Wash in mild detergent, dry off with a chamois.)

Undo the two screws on the computer board.
Lift the board up, and undo the screw holding the thick loom in place.

Undo all the screws and totally disassemble the unit. There are four small black Philips head screws at the front of the unit, these must also be removed.

You should now be able to remove one side from the display. (careful!)
The rest of the display can now slide sideways out of the case with a bit of jiggling, and slight bending of the side. (*The screw holes have been extended via deliberate burring, and make lifting the unit out of the case difficult without excessive bending*.)

Note that the flexible strip connecting the electronics to the actual display is captured by special connectors, the outer part of these connectors must be popped up before the flexible display cable can be disconnected. (There are two connectors.) This only requires gentle pressure, do not get carried away! There is also a thin cable which goes to the power supply board. (Two wires in a 4 pin connector.)

Fortunately, although there are connectors of the same type within the unit, where this is the case, the manufacturer has colour coded them!

At this point, it would pay to examine the primary power supply for intact fuses. The 24 volt inverter fuse may be blown. (Should be fairly obvious, the glass part of the fuse will be a dirty brown from the fuses original contents!)

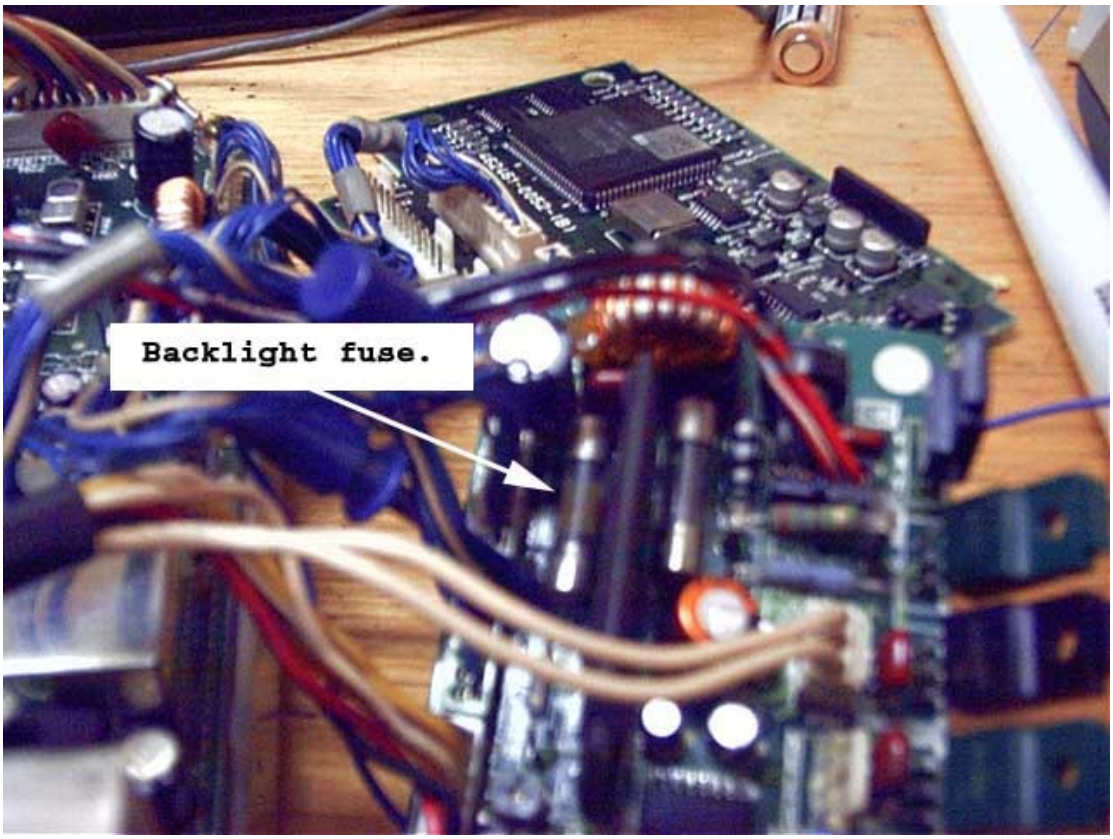

Figure 1 Blown Fuse

You need to replace this fuse if it is blown (Has been in all the units repaired so far!). Using the tip of the soldering iron, you can melt the solder on the end of the fuse. Apply pressure to the fuse and push the fuse across several millimetres while the solder is melted. (I use force on the iron for this. Do not press from the centre of the solder on the fuse end though, you are trying to disconnect the fuse from its mounting wire! Once you have one end free, you can unsolder the other end easily, and lift out the old fuse. Tin up the ends of your new fuse, and solder it back in place. (It might pay to check the new fuse with a multimeter after you have tinned up the ends, sometimes the fuse wire becomes detached when the ends are tinned.) It might help if you temporarily release the clip holding the wire loom which goes to the main board.)

(Careful, Glass tends to remain very hot for a substantial amount of time after the soldering iron has been removed. Use long nose pliers or tweezers to hold the fuse if you do not wish to burn your fingers!)

Once you have the unit out of the case, and the LCD detached from the front, you next need to remove the cover from the backlight power supply.

Undo the two screws shown in the picture shown below, and bend the metal tabs straight. (Only two tabs are visible in the picture below, but there are four tabs in all.)

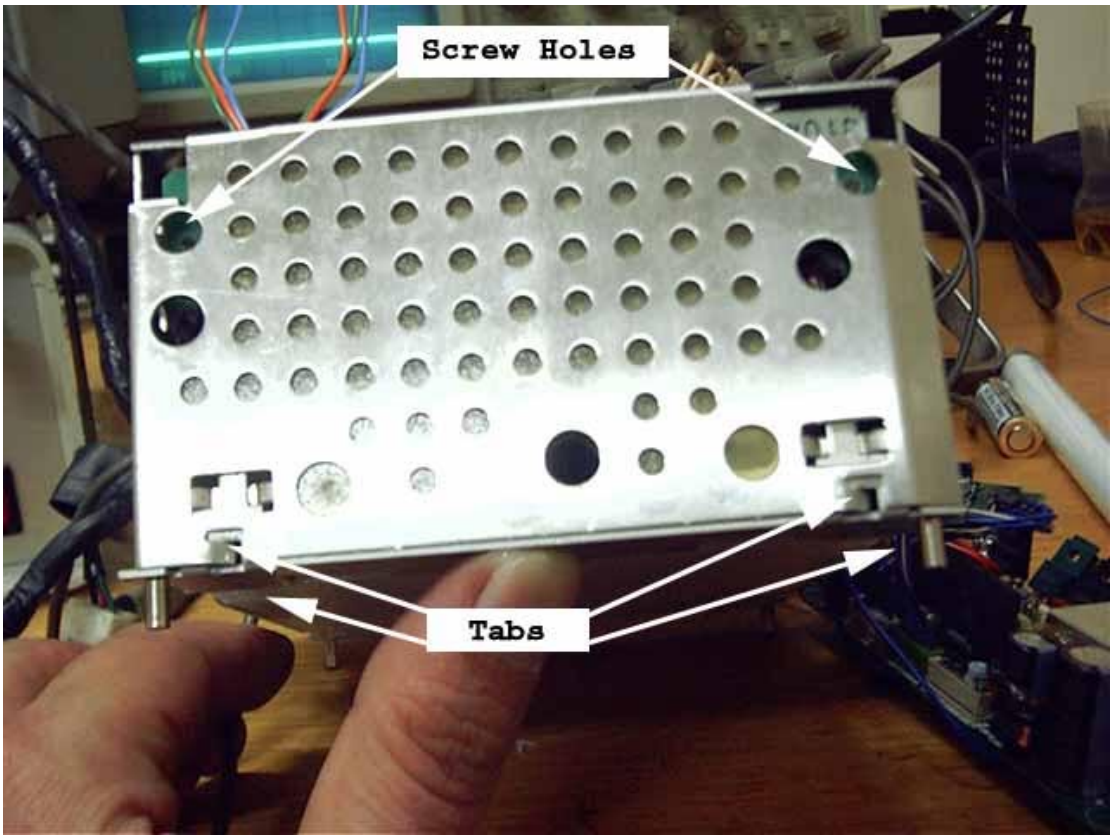

Figure 2 Backlight Inverter Cover.

You should now be able to lift the cover off. (May require some jiggling.)

To make things a little easier, the components for the repair can be purchased from Radio Spares, or Farnell. (Both companies are in the UK and Australia.) Rockby Electronics are in Melbourne.

The RS part numbers are:

MJE13003 **348-4603** (Aus $1.06 each) (I recommend this one!)
MJE340 **294-227** (Aus $2.57 each)
The actual value of capacitor required is not stocked by RS, but can be made by the parallel combination of a 47 nF and a 22 nF capacitor. (Near enough, anyway.) The RS Part numbers are **190-7693** and **190-7700** (Each is less than $0.70) (In fact, this is the way I have been doing the repair.)
Silicone Thermal Pad **656-811** (Not the right ones, but the cheapest, trim to size if too large.) Aus $3.04.

The Farnell Part Numbers are:

MJE13003 **3526367** (But, they may not have them in stock!)
68 nanofarad (0.068 uF) 630 volt working. **3038488 (Aus $1.35)**

Rocby Electronics: (They do mail order within Australia http://www.rockby.com.au)

MJE13003 **12128** $1.65 (Recommended type) MJE340 **12323** Aus $2.17
0.022 uF 250 Volts AC capacitor **13298** Aus $0.64
0.047 uF 250 Volts AC Capacitor **13300** Aus $0.77
Insulating washers (Pkt of 10) **12680** Aus $1.21

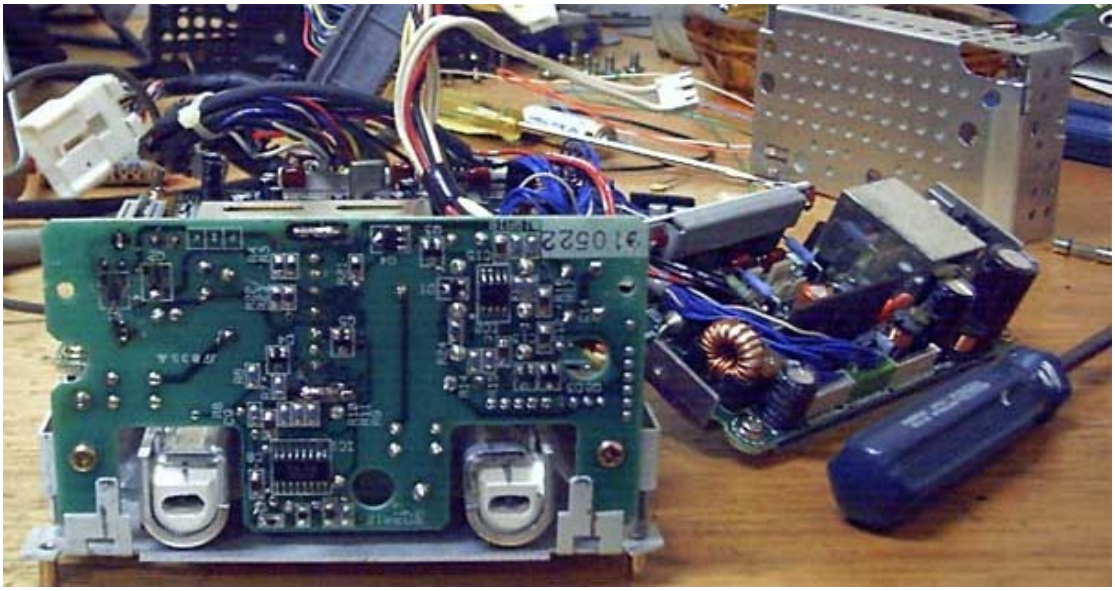

Figure 3 Cover Removed.

The transistors to be removed are in the upper left hand corner of the inverter board. To remove them, heat all three pins with a soldering iron and then flick or slide the transistors off. (Once again, be careful as solder burns, as would the still hot transistor.) It may help to add some solder to the pins being heated up! The solder should melt within one to two seconds. Do not apply the iron continuously for more than about ten seconds.

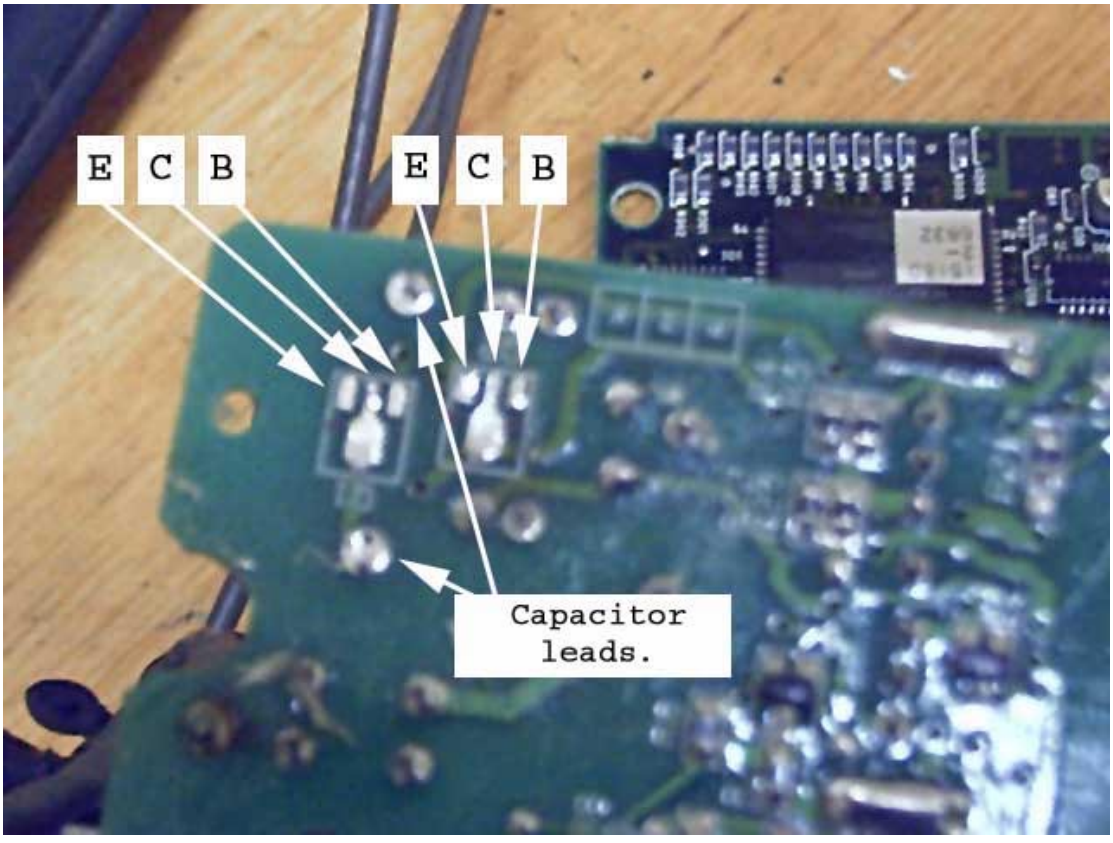

Figure 4 Q1 & Q2 lead identification.

Remove the 68 nF capacitor, (the leads are indicated above), and re-install the new one. This capacitor is invariably faulty, and I suspect its failure is the main cause of the subsequent transistor failure. The original capacitor is rectangular, about 1 * 3 * 2 cm. (Coloured black)

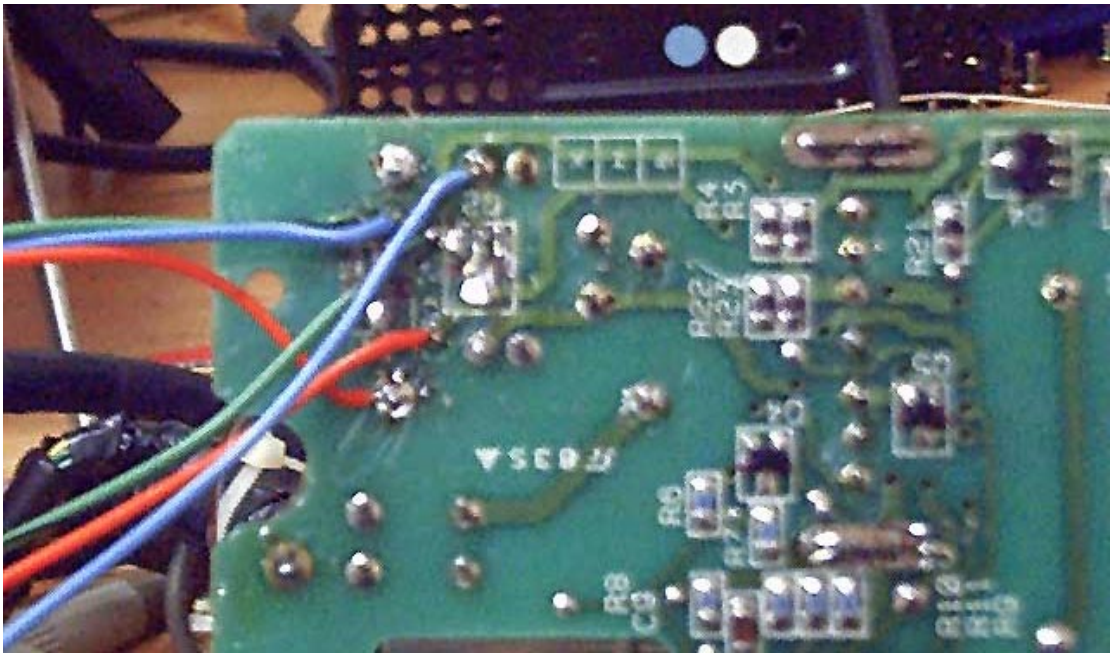

Figure 5 Wires added.

Next, you will need to add wires to attach to the new transistors. Wherever convenient, use pre-existing board holes for this (for mounting strength). You will need to scrape the solder mask off the plated through holes first, and then tin the holes with fresh solder. The final required result is shown in the picture above (Fig 5). I used blue wire for the Base connection, Orange for the collector, and green for the Emitter, although the colour is not important, use whatever you have at hand. Take note of the wire grouping above, it is important that the wires for the transistors are not mixed up.

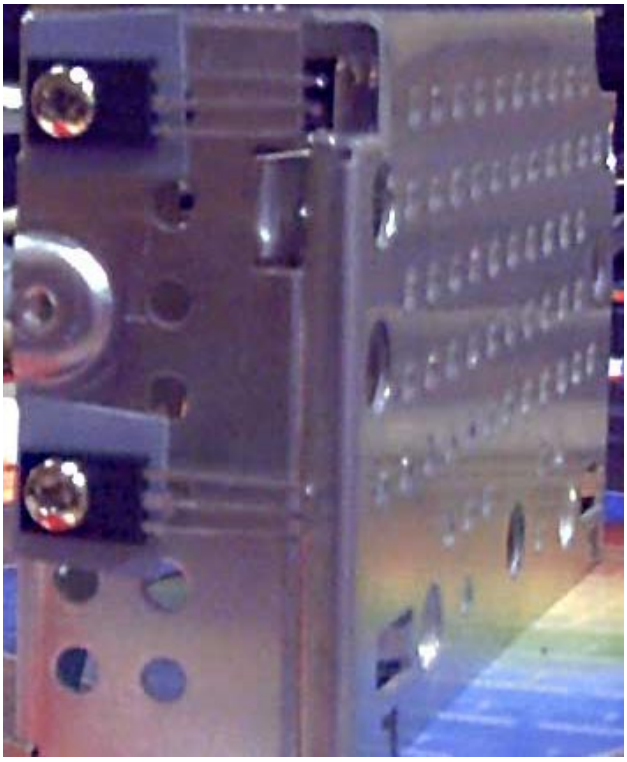

Figure 6 Transistor mounting.

You will need to mount the transistors on the case as shown on the left. (Fig 6)

Note that the transistors MUST be insulated from the aluminium case. (There is a metal backing plate on the back of the transistor, which is connected to the collector of the device.)

After the transistors have been mounted, you should check that the insulator is still intact by measuring between the centre leg of the transistor and the aluminium case with a multimeter. .(Using the Ohms range.) This should read as an open circuit!

NB: the nuts of the 3 mm screws must go inside the cover, there is insufficient room inside the main case to have the nut on the transistors face.

After you have mounted the transistors, you can trim the leads down to approximately 5 mm in length in preparation for the wire attachment.

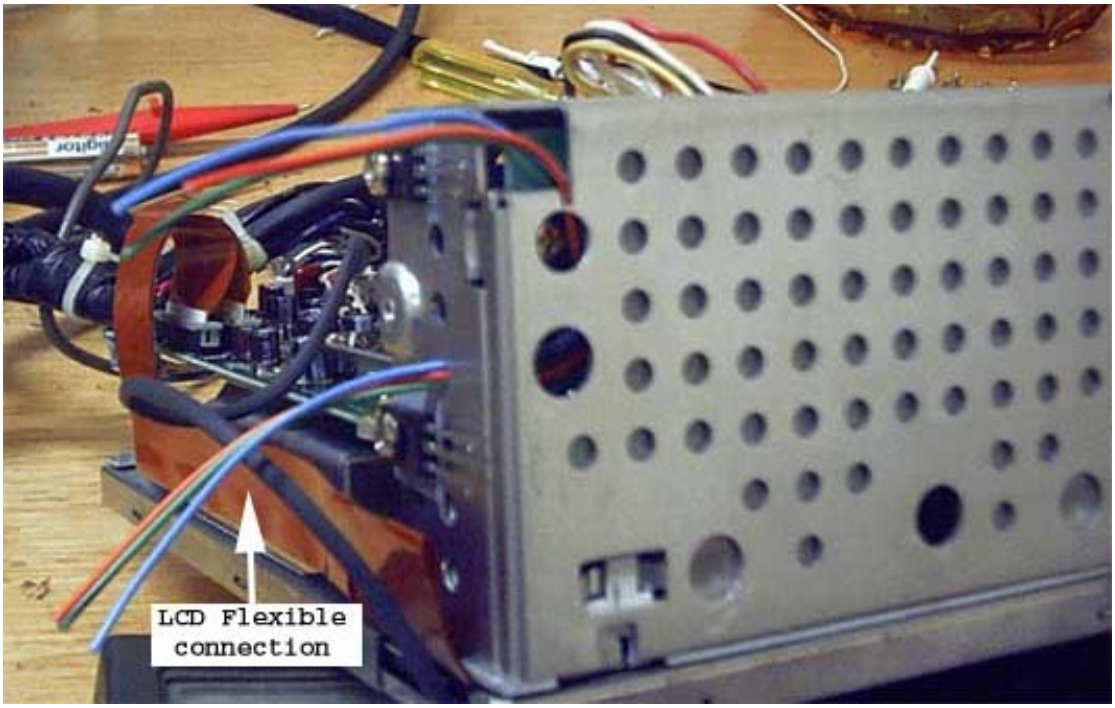

Figure 7 Backlight Inverter Cover Re-installed

Carefully slip the aluminium cover back into position, while threading the wires for the transistors through appropriate holes as shown above in Figure 7. The screws that hold the backlight high voltage inverter board in position can be re-inserted, and the tabs can be bent back to their original positions.

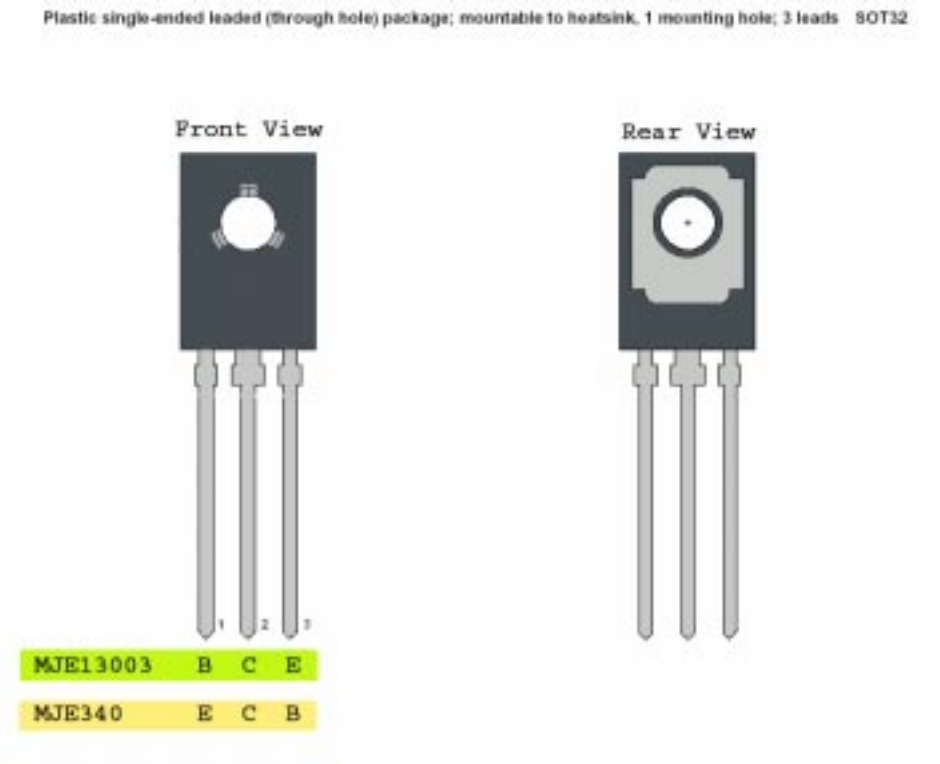

Figure 8 Transistor Connections.

Take note of the above transistor connections, as the Base and Emitter connections are swapped around between the two types! *(I have been using the MJE13003 type, as it has higher ratings, but either type works acceptably well.)*

Trim the wire length so that each connection to be made will not put undue strain anywhere. (So as not to cut through the wires on any part of the casing.) strip the insulation of the wire back by about 3 to 5 mm and tin the bare end with solder. (Tin the transistor legs at the same time.)

Although not essential, I used insulating sleeves on each connection. Slip a loose fitting plastic sleeve on each wire before soldering it in place. When the connection has been made, the sleeve can be slid over the bare connection. After all connections have been made, the job is essentially complete, and you can re-assemble the unit. Take note that the LCD flexible connection must go under the aluminium bracket visible in the picture below (Fig 9), **not** on the outside, as can be seen in fig 7. (Which is shown like that because I test the units operation before I reassemble it.)

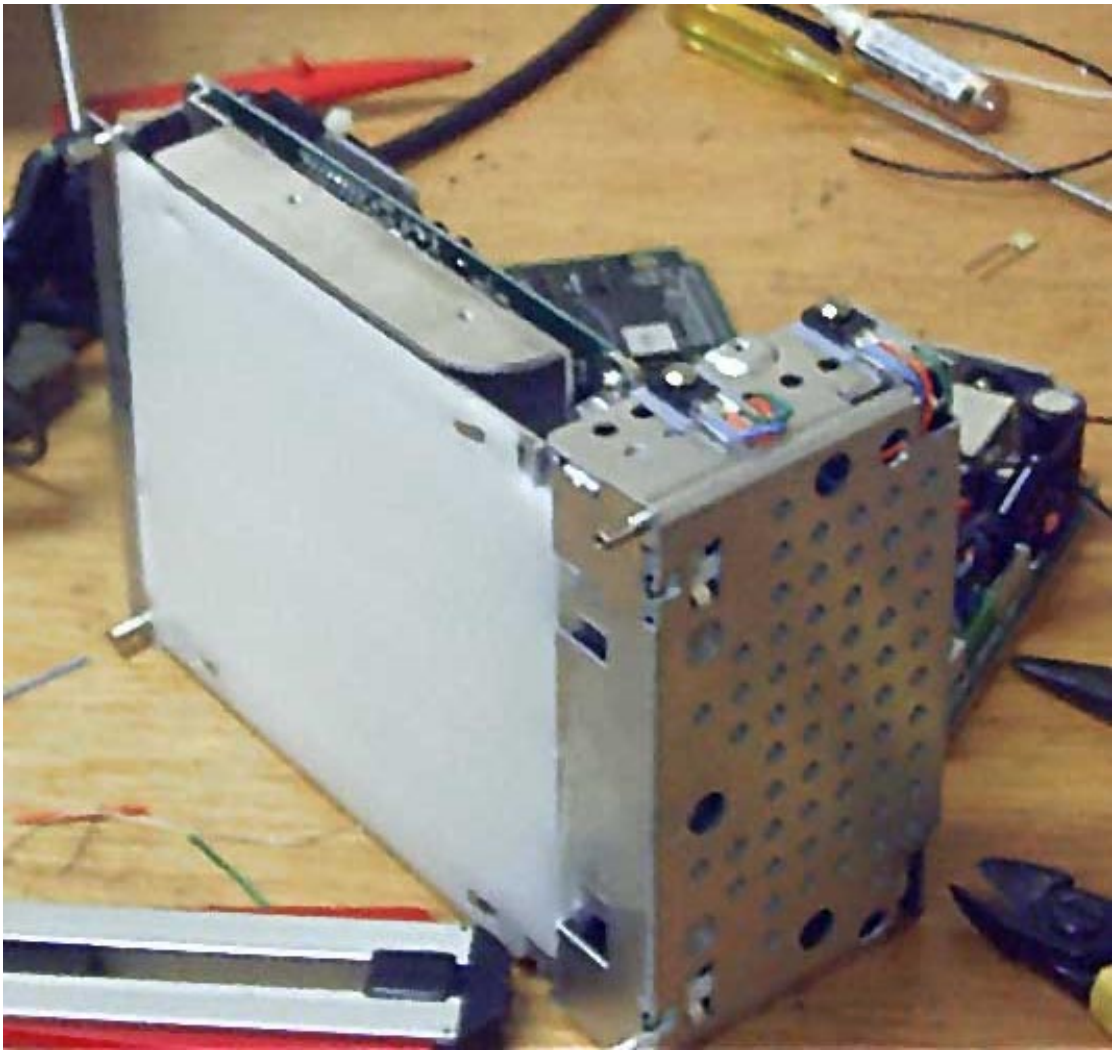

Figure 9 Finished, ready for re-assembly.

The assembly procedure is essentially the reverse of the disassembly procedure, so I will not bother to repeat it here. (You should have been taking note when you pulled it apart!)