Yamaha SY77 LCD Display Repair or Upgrade Procedure

Author

Derek Cook, January 2008

The Display Upgrade is based on original research and work undertaken by EX5_Etc, which he kindly posted under the FM forum on EX5Tech.

Purpose of Document

This document covers both replacing the backlight foil in the SY77 LCD, or replacing it with the "cool blue" LCD (white text on a blue background) that was the subject of the EX5Tech thread listed in the **Links** section of this document.

It's a well known fact that the Yamaha SY77's Liquid Crystal Display (LCD) backlight will progressively get dimmer and dimmer over time. I've just acquired my SY77, and it was suffering from this problem; the backlight was so dim that it was difficult to read the display in even normal lighting conditions, let alone on a dark stage!

I enquired about the cost of a replacement LCD from Yamaha UK, and nearly had a heart attack at the price; £140, which is nearly as much as I paid for the synth!

So I started looking at other options, and found that there were at least two:
- Replace the backlight foil in the display;
- Upgrade the display to the "cool blue" display.

For the hell of it, I decided to try both, as I wanted to go for the "cool blue" upgrade, but, given the cost of a replacement from Yamaha, I decided I might as well try and fix my current display as a spare, in case I ran into problems doing the upgrade, which was written up for the SY99, not the SY77.

Most of the work involved is in actually getting the keyboard apart and back together again, and this is the same for both options.

The disassembly and assembly took about two hours each way (although I was taking my time, taking pictures and writing notes); replacing the backlight foil took about twenty minutes; and the display upgrade took about an hour. So you need to allow about five hours for the job in total.

Disclaimer

Whilst I have taken care in preparing these notes, and whilst both the repair and upgrade options worked fine on my SY77, I cannot be held responsible for any damage that you could do to your machine or injury to yourself and/or others as a result of you following these notes; either on your own account or by any error or omission in these notes. You do this upgrade at your own risk!

Please bear in mind that during a production run of any manufactured item, a manufacturer can make changes, and I can't guarantee that all SY machines are identical, as I only have the one. So care is needed in checking that the steps advised are appropriate for your machine, as it might be different to mine.

This is a significant point on the "cool blue" upgrade option because you need to source a 5V power supply from within the synth for the backlight, not the inverter derived voltage for powering the original LCD backlight strip. I found an easy way of doing this, and hopefully this is the same on all SY77's, but you will need to check.

Pre-Requisites

First of all, make sure that you're comfortable with the concept of completely dismantling your beloved SY77. Keyboards are usually dismantled from the "bottom up", so the LCD will be the last item you get to after undoing what seems like hundreds of screws, unplugging many cables, removing five circuit boards, other bits and pieces and the keyboard assembly itself! And of course disassembly is the easy part; you need to get it all back together again (hopefully with no screws left over)!

You also need to be proficient in soldering, or know somebody who is and who can help you.

You will need the following tools to do this job:
- Posidrive screwdrivers;
- Wire cutters;
- Some small fine nose pliers also come in handy;
- Soldering iron and solder;
- A desoldering pump, or solder removal wick;
- An anti-static wrist strap is recommended;
- Voltmeter (for the Display Upgrade option).

For the LCD backlight repair, you need to have the replacement backlight foil (see the **Links** Section at the back of this document for a suitable source).

For the LCD upgrade, you will need the new LCD panel itself (see the **Links** Section at the back of this document for a suitable source), a 2 by 10 way right angled PCB header with 0.1" lead pitch, and a 20 way ribbon cable terminated either end in 2 by 10 female connectors (either purchased pre-made or you need to buy the components to make it yourself); the cable needs to be at least 16cm long.

You need to ensure you take anti-static precautions whilst the synth is open. If you don't have an anti-static wrist strap, then ensure that you regularly earth yourself on a metal object, such as a radiator to prevent the build up of any static charge.

Electric Shock Hazard Warning

Finally be aware, that in opening the keyboard, and if it is powered whilst it is open (I had to power it whilst finding a 5V supply for the "Cool Blue" LCD backlight), there will be exposed mains voltages on the power supply board and thus a risk of electric shock. Obviously, the synth only needs to be powered up for a short period whilst it is disassembled if you are doing the upgrade, and if you keep your hands well away from the power supply board when the case is open and the synth is powered, then the odds of you getting an electric shock will be very small.

If you are in any doubt regarding your ability to work with a potential exposed mains voltage hazard, then you can: perform just the backlight repair (where you can leave the synthesizer unpowered all the time it is disassembled); take a chance on the display upgrade that what worked for me as a 5V source will work for you (so again the synth can remain unpowered), or refer this job to a competent electronics technician.

Procedure

Step 1 – Find a Good Work Area

You'll be working on this for a while, so find somewhere comfortable and where there's plenty of light. My kitchen was the best place for this in my house. Note the towels under the keyboard to protect the fascia.

References in this document to "top" and "bottom", "left" and "right", refer to you looking at the keyboard in this orientation of the base upwards and the back panel towards you.

Before placing the keyboard in this position, don't forget to remove the volume knobs from the volume sliders. They come off quite easily, as they are just a push fit.

Whilst on the subject of avoiding scratches, the next step is very important!

Step 2 – Remove Cat from Work Area

An [EX5Tech](#) pre-requisite in the guides we write, and a very important step if you wish to avoid being "scrammed"! And of course, cat hair is terrible for static, and it gets everywhere[1]!
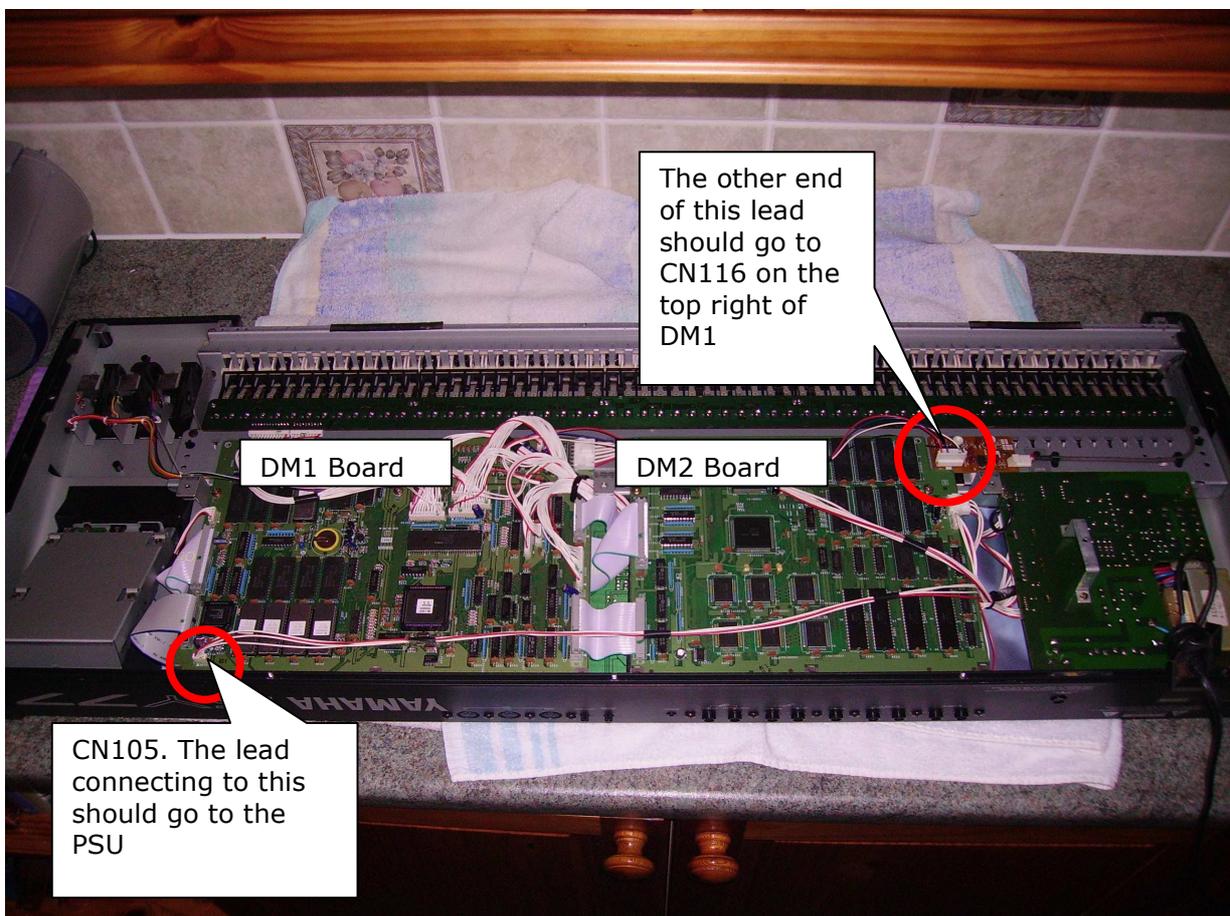

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[1] Synth Trivia: If you're in the market for an OSCAR monosynth, look out for one where the innards contain cigarette ash and cat hair; as these were supposedly hand built by chain smoking, cat loving Chris Huggett, the main man behind the Oxford Synthesiser Company.
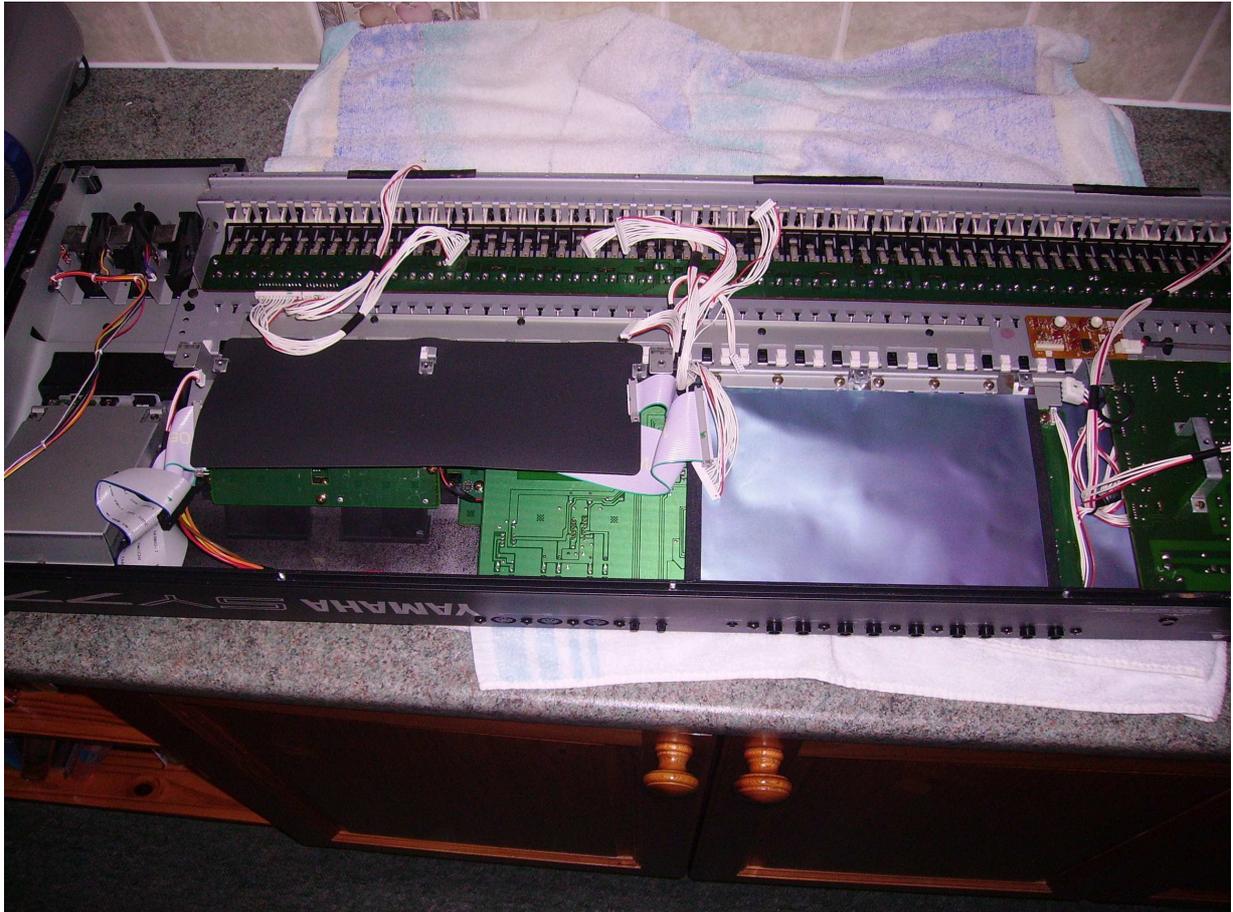
Step 3 – Remove Bottom Plate

As there are only a few different types of screws, I didn't worry about making diagrams as to where they came from, but I kept the external screws in one bowl, and the internal screws in another to make it easier to sort them out later.

Most connectors you need to remove are on the Left hand board (DM1). Fortunately, most of them have different numbers of pins, and thus their associated plugs cannot be connected in the wrong place. So I didn't worry about labeling the leads with the numbers of the Printed Circuit Board (PCB) connectors that they go to. However, CN105 in the lower left corner has the same number of connectors as CN116 (out of sight under the mass of cables, but on the top right of board DM1). The plug that goes into CN105 comes from the PSU, connected via a very long flying lead. The plug that connects to CN116 is connected via a shorter lead to the after-touch circuit on the keybed.

The other end of this lead should go to CN116 on the top right of DM1

DM1 Board   DM2 Board

CN105. The lead connecting to this should go to the PSU

Step 4 – Remove Main Boards

Note the location of cardboard cover to the left and how it fits, and what is probably some form of screening on the right. On the screening, note how the top of it is sandwiched between the long metal bracket and the rear of the keybed (which probably earths the screening. The cardboard cover is a simple push fit around the three metal pillars that you can see towards the top of the cover.
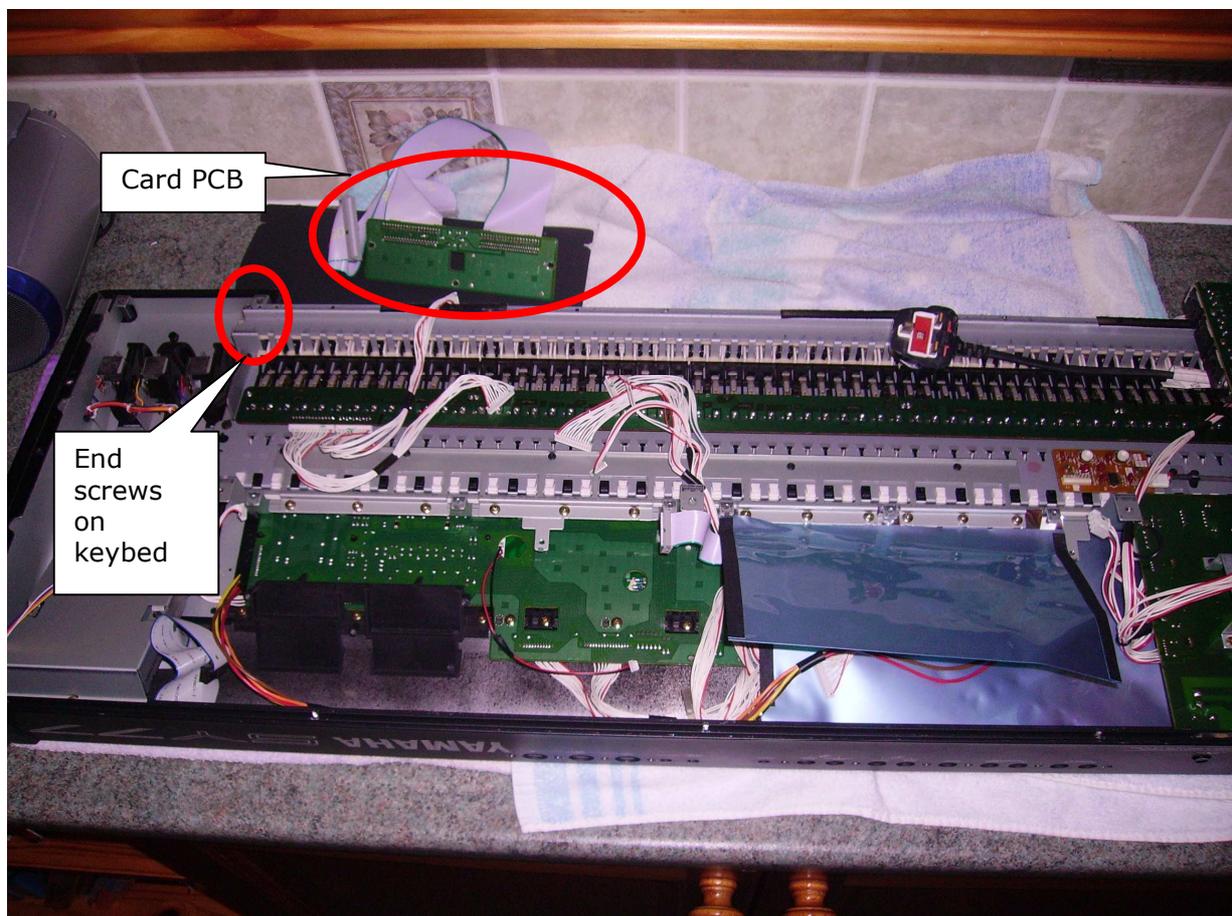
Step 5 – Remove XG530 IO Board

This is the IO board with all the back panel connectors. You need to remove all the screws on the back panel in the vicinity of the connectors. There are some header connectors on the underside of the board (e.g. from the pitchbend and mod wheels, and from the LCD board), so look for those and remove them first.

I was learning whilst doing this and trying to minimize what I took off. So I tried first, as shown in this shot, to leave the screen in place. But it will come out anyway when you remove the keybed. So the screen can come off at this stage, along with the cardboard.

At this stage I have also removed the PCB for the Voice and Wave ROM cards. You can also remove the plastic bracket it is fixed to at this point.
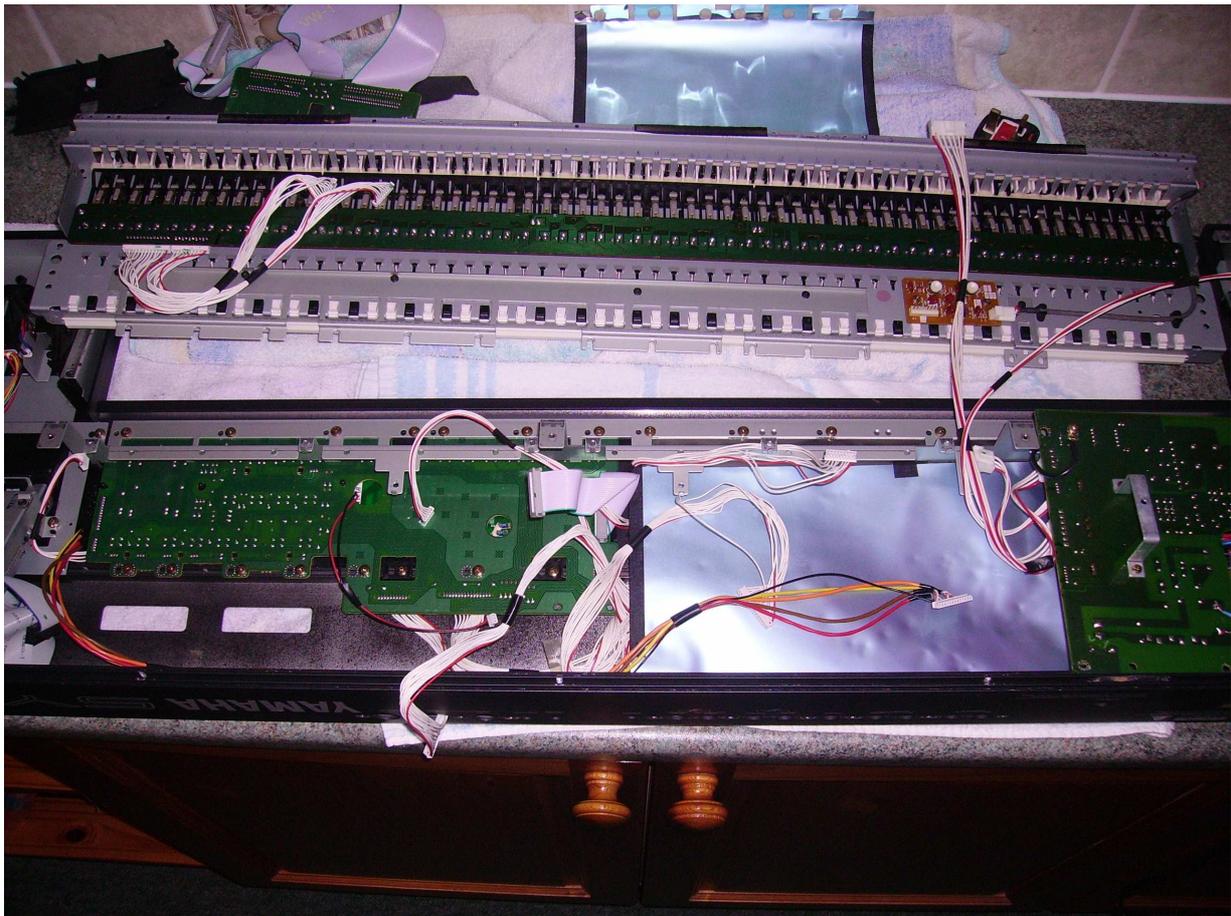
Step 6 – Remove the Keybed

You need to remove the two end screws either side of the keybed. Note that these screws are different to all the other internal ones; they are black with a coarser self tapping thread.

Undo all the screws connecting the rear of the keybed to the metal bracket. There's a couple of screws underneath the power supply board, so the power supply board needs to be loosened first to access those.
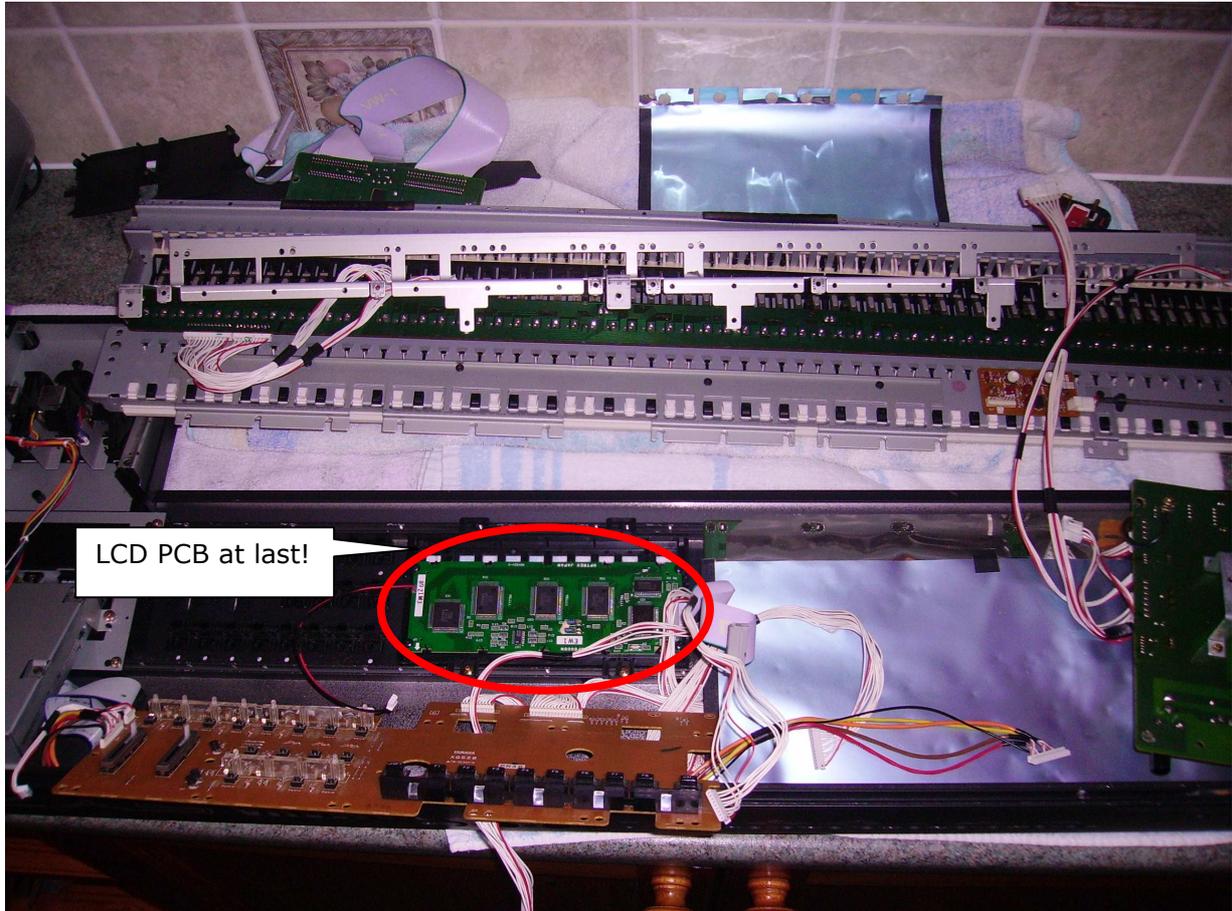
You can see at this point that I've now also removed the bracket for the ROM card PCB.

Step 7 – Remove the Switch Board

I didn't remove this board completely and just rested it against the back panel. This saved removing even more wires.

We've now at last reached the LCD display, which is secured by four small screws!

LCD PCB at last!

Step 8 – Have a Cup of Coffee, Tea, or a Stiff Drink!

Pat yourself on your back (or get somebody else to do that for you)!

You've done well to get this far, although of course, there's no going back now!
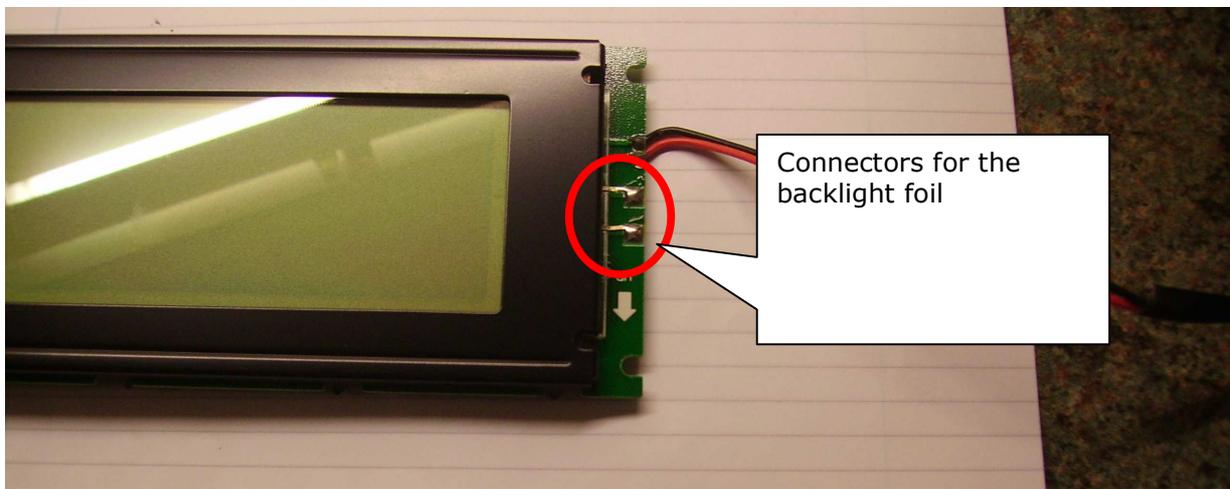
Step 9 – Replacing the Backlight Foil

This step and sub-steps pertain to the option of replacing the backlight foil. The actual display replacement with the "Cool Blue" display is in Step 10.

I couldn't remove the existing backlight foil, as it appears to be glued in place on the PCB. However, there is plenty of space between the PCB and the LCD "glass" for you to slide the new foil on top of the existing one.

9a – Desolder the connectors for the existing backlight foil. A de-soldering pump is best for this to remove as much solder as possible.
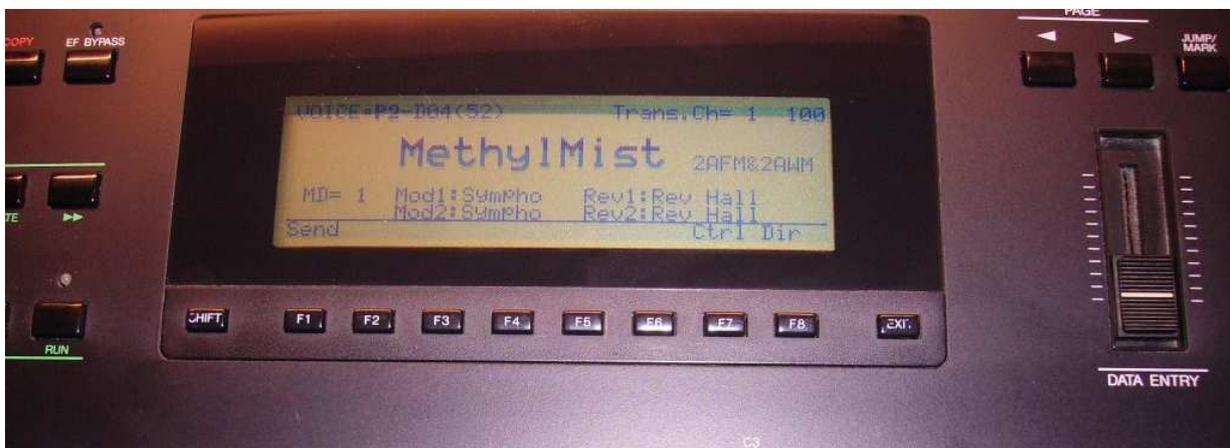
9b – Lift the wires going to the backlight foil away from the PCB solder pads and cut the wires back as far as you can.

Connectors for the backlight foil

9c – Slide in the new backlight foil and solder the wires to the PCB solder pads. Note that the pink side goes uppermost, facing towards the LCD "glass".

9d – So easy to say it, but assembly is "simply" the reverse of disassembly, taking care that all the connectors go back in the right place!

The end result of all that trauma is shown below: A working backlight!

Step 10 – Upgrading to the "Cool Blue" Display

This step and sub-steps pertain to the option of replacing the complete backlight, with what I call the "cool blue" display, or an Emerging Display Technologies type EW50340BMW.
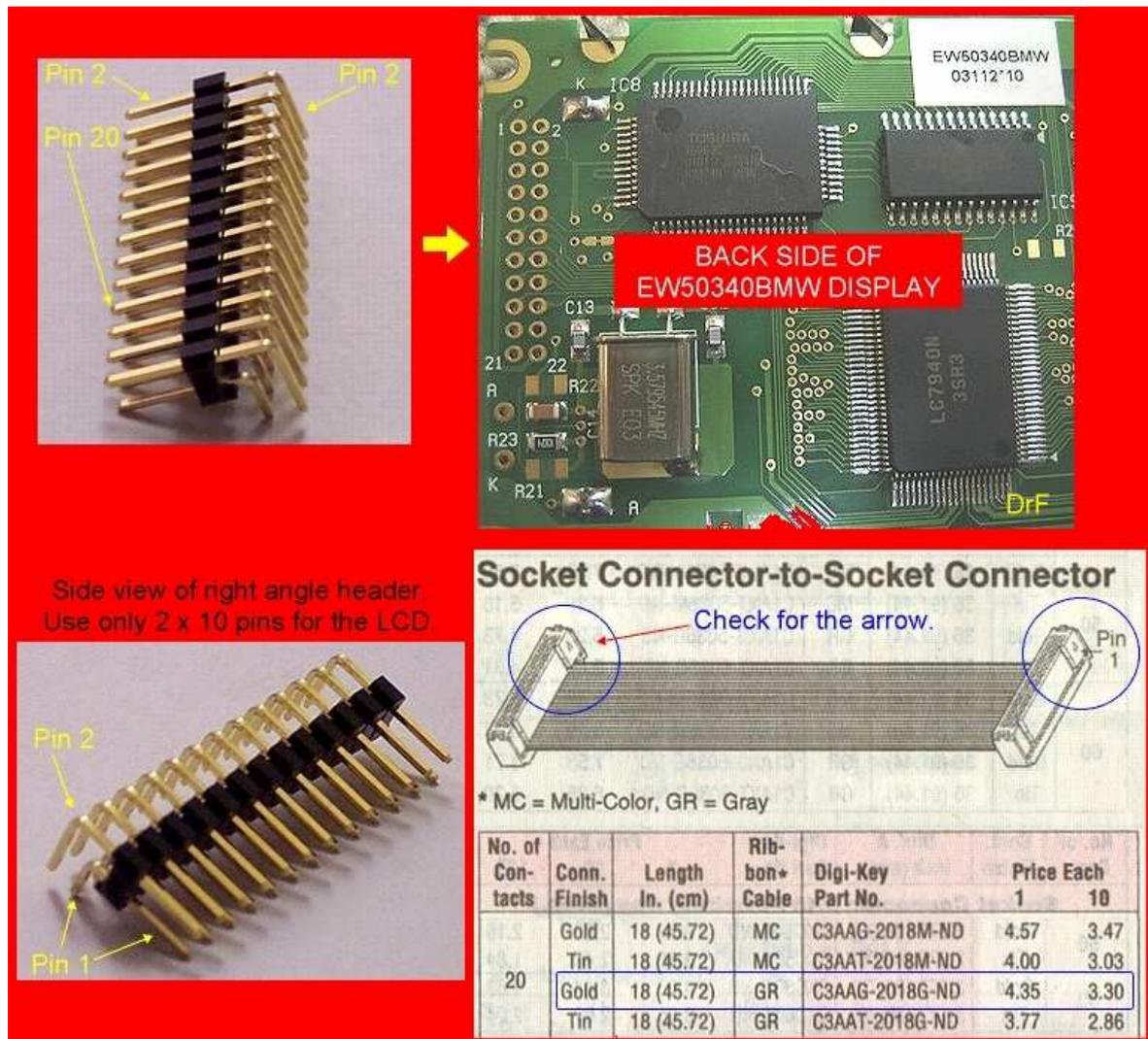
This option is a little more involved than replacing the backlight foil because:
- You need to solder a header connector onto the LCD PCB;
- You need to provide a ribbon cable and connectors to connect the LCD to the DM1 board;
- You need to find a 5V power source for the backlight.

Taking these in turn:

10a – PCB Header Connector

You need a 20 way right angled header connector (the picture below actually shows a 26 way connector), and this needs to be soldered so that it is on the rear of the display PCB. As shown below, you need to align Pin 1 and Pin 2 of the header with holes 1 and 2 on the PCB.

No. of Contacts	Conn. Finish	Length In. (cm)	Ribbon* Cable	Digi-Key Part No.	Price Each 1	10
	Gold	18 (45.72)	MC	C3AAG-2018M-ND	4.57	3.47
	Tin	18 (45.72)	MC	C3AAT-2018M-ND	4.00	3.03
20	Gold	18 (45.72)	GR	C3AAG-2018G-ND	4.35	3.30
	Tin	18 (45.72)	GR	C3AAT-2018G-ND	3.77	2.86

*MC = Multi-Color, GR = Gray

The PCB holes for Pins 21 and 22 of a 22 way connector are not used on this upgrade, as the corresponding connector on the SY77 DM1 board is itself only a 20 way connector. If you look at the LCD PCB, Pins 21 and 22 and actually connected to the "A" and "K" solder pads for the backlight power, which is where I connected the power for the backlight.

The particular header required is available in USA from DigiKey, and in the United Kingdom in RS components as stock number 360-6544. This was the only UK source that I could find, and there is a minimum order quantity of five parts, and I only wanted one!

So, as I'm an ex-engineer, I looked about to see what I had which could be adapted, and I found some old DIN41612 96 way (3 * 32) male connectors. I decided to hacksaw one down to a 30 way connector. In the following picture you can see an original and the surgery I did, to make a 30 way connector. Not seen here is the fact the I clipped the row C pins on the back of the connector to convert from a 3 row to 2 row connector. The ribbon cable of course only connects to rows A and B. It's not elegant, but it worked!

Basically any 20 way connector organised on a 2 by 10 matrix with 0.1" lead spacing should do the trick.
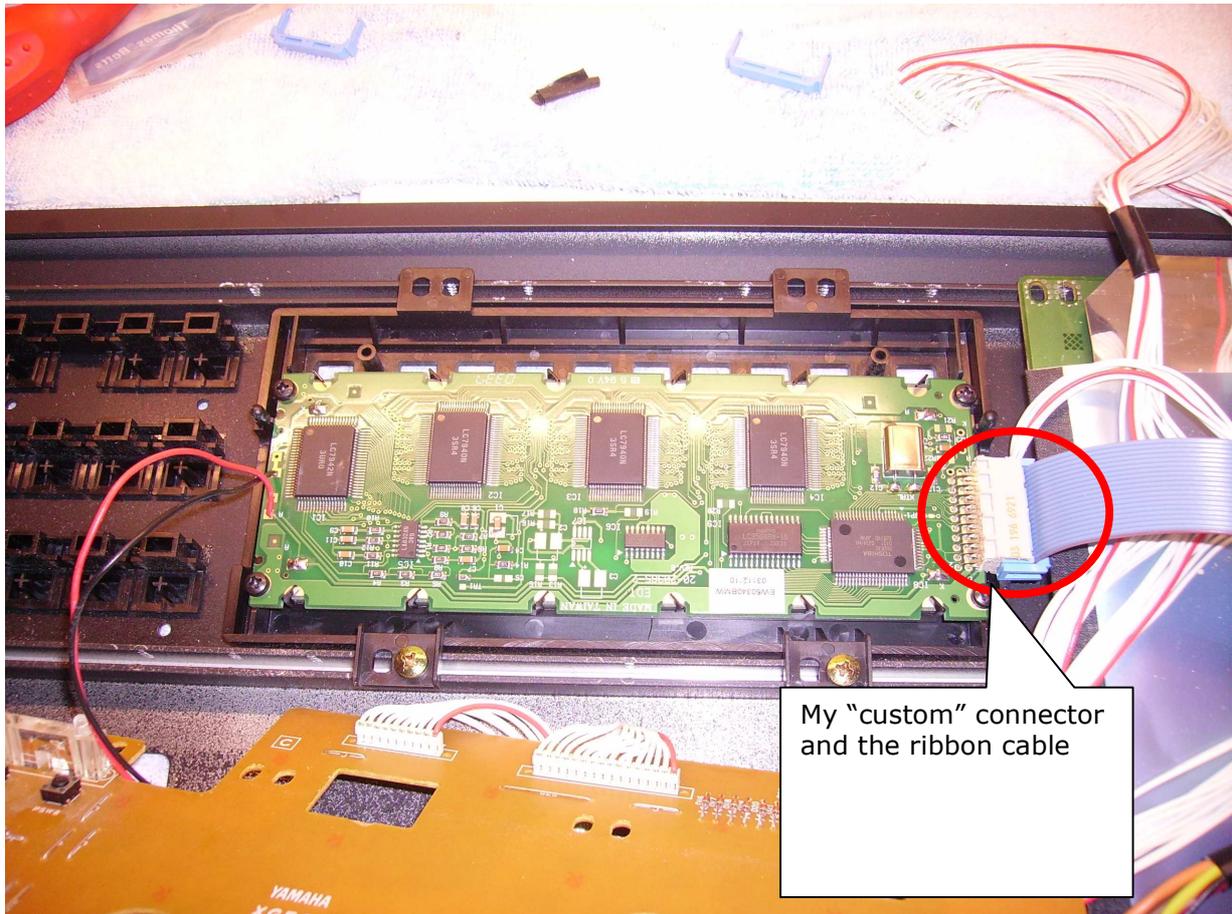

Step 10b – Ribbon Cable

I then made a twenty way lead similar to the one shown on the previous page, which will connect the LCD (via the new header) to the LCD connector on the DM1 PCB. I used standard Insulation Displacement Connectors (IDC) and ribbon cable, where the red lead on the ribbon is connected to pin 1 on both connectors.

Whilst a special tool is usually recommended for attaching the IDC connectors to the ribbon, I find that you can get away with squeezing the connectors in a small vice if you're careful; you just need to make sure that you don't short circuit several cores in the cable, which can happen if you have the cable misaligned.

The following picture shows the LCD PCB in situ, with the header soldered on the PCB and the ribbon lead connected. It's a bit of a tight fit in there, but it does fit.

My "custom" connector and the ribbon cable

10c – Alternative Option for the LCD Connector

An alternative to 10a and 10b (although I didn't try it), would be to actually desolder the ribbon lead and header on the original LCD PCB and solder it on the new board.

It is sometimes difficult to get multi-way connectors off of a PCB, but it's not impossible, and I've desoldered and removed much larger connectors before with a bit of care. So if you can't get the parts mentioned above, this is worth considering.
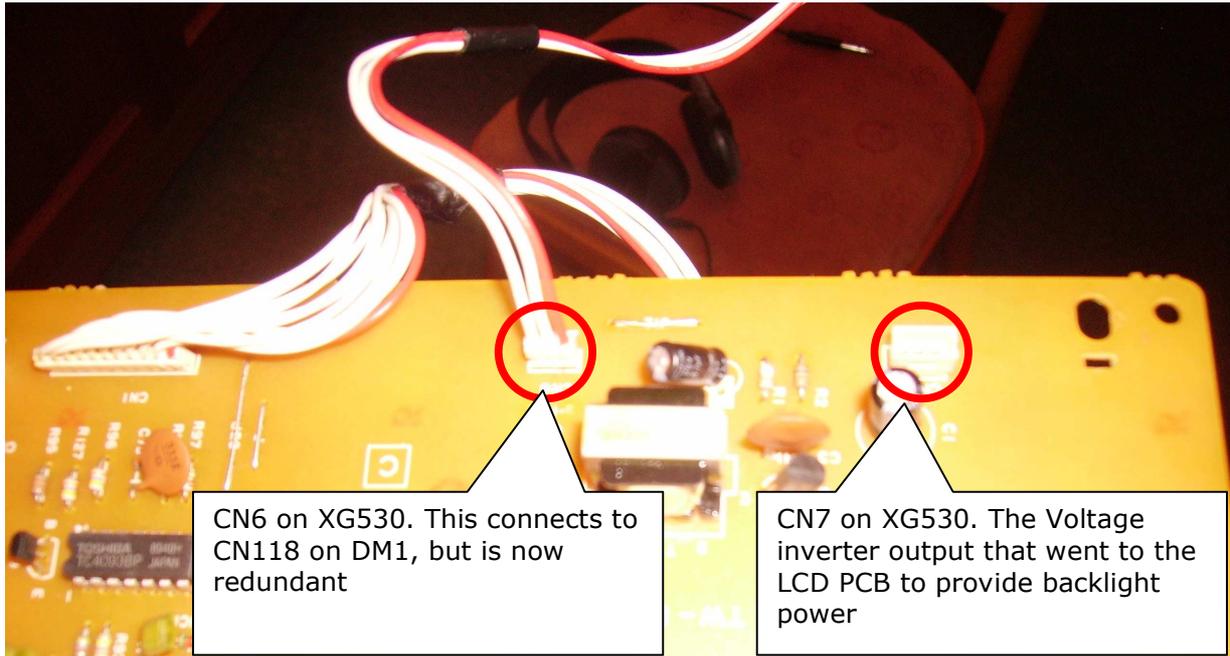
10d – 5V Power for the LCD Backlight

The original backlight is driven from a voltage inverter on the XG530 IO board. This inverter is provided with 5V from CN118 on the DM1 board, which connects to CN6 on the XG530 board. The Red/Black lead from the original LCD PCB connected to the inverter output via CN7.

On my SY77, CN118 on DM1 can thus provide the 5V source needed for the new LCD backlight.

The lead connected to CN6 on the XG530 board that normally goes to CN118 is left unconnected, as the inverter is no longer needed.

A positive benefit of this as well is that the inverter is then unpowered, so you've removed a possible source of high frequency noise!

CN6 on XG530. This connects to CN118 on DM1, but is now redundant

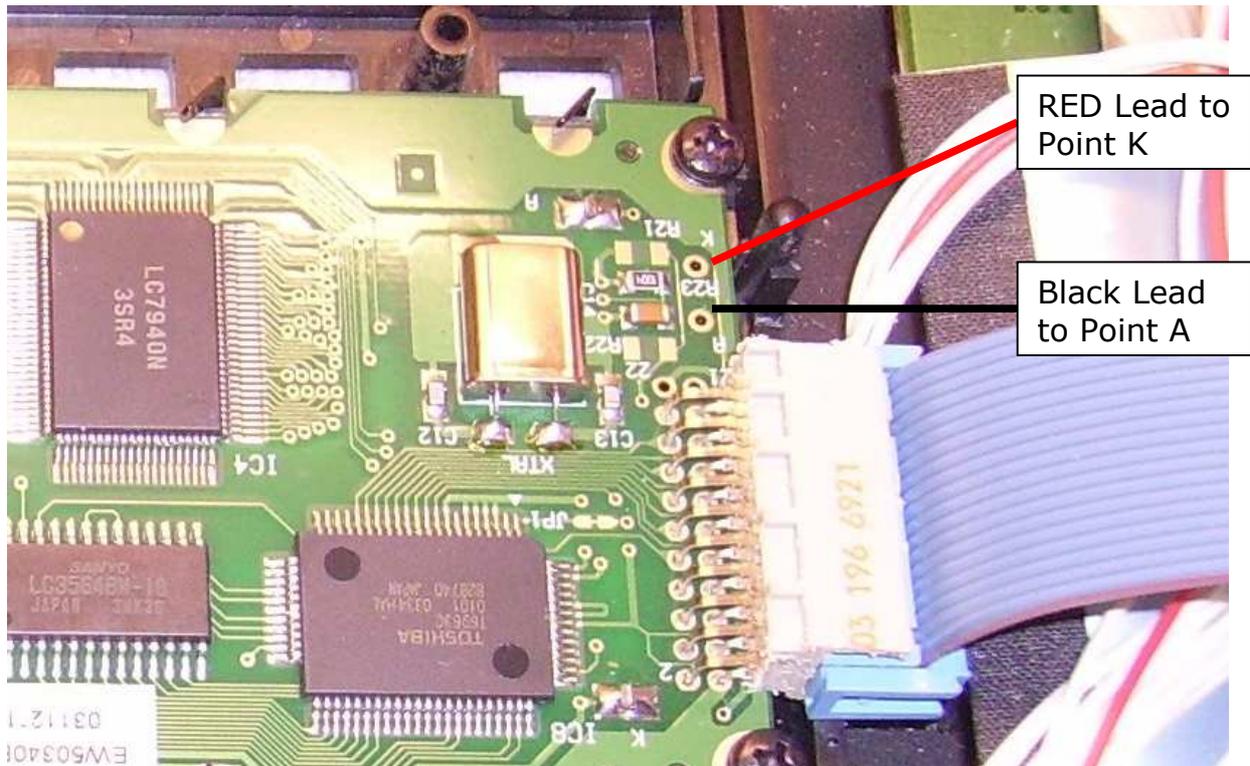CN7 on XG530. The Voltage inverter output that went to the LCD PCB to provide backlight power

I desoldered the red/black flying lead on the old LCD for reuse, as it terminates in a Plug that fits into CN118 on DM1.

On my SY77 I then plugged this red/black lead into CN118 and measured the voltage on the red lead as **-5V**, and black was **0V**.

So I connected the Red lead to Point K on the new LCD, and the Black lead to Point A on the new LCD.
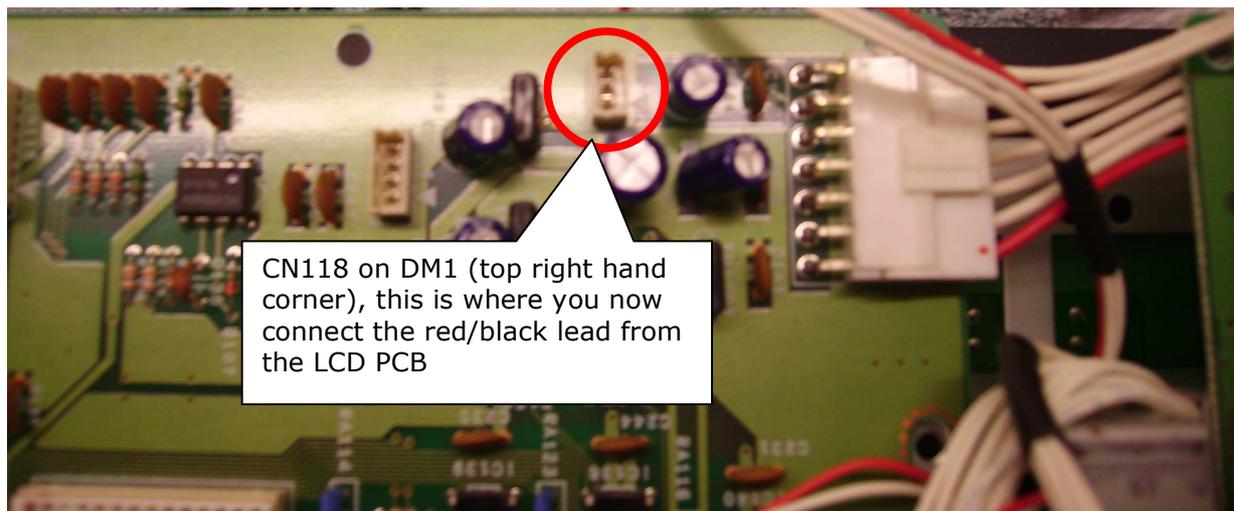
This is an area where you need to measure with a voltmeter to ensure that it is the same on your SY. Point A on the new LCD should be positive 5 volts with respect to Point K.

RED Lead to Point K

Black Lead to Point A

10d – Reassemble Keyboard

So easy to say it, but assembly is "simply" the reverse of disassembly, taking care that all the connectors go back in the right place!

When you reassemble the keyboard, the Black/Red lead that provides LCD backlight power now connects to CN118 on DM1. The original lead/connector that went here (a flying lead to CN6 on the XG350 board) is now redundant and can be ignored.

CN118 on DM1 (top right hand corner), this is where you now connect the red/black lead from the LCD PCB

The ribbon cable from the LCD goes to the connector on DM1 that the original display connected to. Note that Pin 1 (connected to the red lead on the ribbon) should orientate with the connector on the side indicated by the ◄ symbol on the PCB.

The end result of all this is a "cool blue" alternative look to your SY77!

Conclusion

By the end of this, hopefully you now have a repaired SY77 display, or an upgraded "cool blue version" and you can now see the SY77 data displayed on the screen again!

And hopefully, you had no screws left over!

Acknowledgements

Huge thanks go to EX5_Etc for posting the information regarding his "cool blue" display upgrade on the SY99, which prompted me to do the same for the SY77. This guide is based on his original work.

Some images used in this guide were produced by EX5_Etc, and are reproduced in this guide with his kind permission.

The "Cat on Keyboard" shot is courtesy of my EX5Tech colleague, Jim Attfield. As an ex-cat owner, I know that this could have happened to me if I still had mine, as they're nosey creatures. Sadly our daughter was diagnosed as being allergic to cats at a young age, so it was either them or her! I sometimes wonder if we made the right choice, as the cats probably would not have exhibited teenage tendencies later in their life! The observant of you will notice that the keyboard in this instance was not an SY77.

Links

A good source for the replacement "Cool Blue" LCD display, Emerging Display Technologies type EW50340BMW, is:

http://www.zinguy.com/lcdpage.htm

The source for replacement backlight foils (the SY77 requires foil type ELF-04L-w):

http://www.midi-rakete.de/

The EX5Tech thread that inspired this upgrade:

http://www.ex5tech.com/ex5ubb_cgi/ultimatebb.cgi?ubb=get_topic&f=21&t=000075

And of course, EX5Tech in general:

http://www.ex5tech.com

The Yamaha UK forums also provide a good forum, which is a good resource for the Yamaha SY series

http://www.yamahaforums.co.uk/

Finally, a bit of blatant self promotion(!):

My website for my Java based x.factory librarians, available for the EX5, AN1x, FS1R, DX7/DX7II and Motif synthesizers. A version for the SY77 will soon be available!

http://www.xfactory-librarians.co.uk/

And my progressive/classic rock influenced band, Echoes

http://www.echoes-music.co.uk/

http://www.myspace.com/echoesmusic