Yamaha TG77 LCD Display Upgrade Procedure

Author

Derek Cook, December 2012

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

Purpose of Document

It's a well known fact that the Liquid Crystal Display (LCD) backlight used in the Yamaha SY77/TG77/SY99 series will progressively get dimmer and dimmer over time. I have just acquired my TG77, and it exhibited this failing; in fact the backlight had completely failed.

This document covers replacing the TG77 LCD with a "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.

The EW50340BMW display used in the original work by EX5_Etc, is no longer available, so this guide has been written for the Newhaven display type ***NHD-24064WG-ATMI-VZ#***, which is a more recent alternative, and which was selected as it is one of the slimmer options on the market.

The disassembly and assembly took about an hour each way (although I was taking my time, taking pictures and writing notes); replacing the display took about two hours with the modifications required to the TG77, so you need to allow about four hours for the job in total.

The Newhaven display is very similar to the EW50340BMW, but with the following differences that need to be accounted for in the upgrade:

- The required supply voltage for the LED backlight is 3V, with 3.5V quoted as the maximum. If 5V from the TG77 is used, the display is too bright, and there is probably a risk of long term damage to the display as you are overdriving it.
- The TG77 contrast circuit requires adaptation to get the contrast voltage required by the display in the correct range.

So, it's a little more wok than the original upgrade, but nothing terribly complicated.

Disclaimer

Whilst I have taken care in preparing this guide, and whilst the upgrade worked fine on my TG77, 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 this guide. You do this upgrade entirely 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 TG77 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.

Pre-Requisites

First of all, make sure that you're comfortable with the concept of dismantling your beloved TG77, including cutting wires and unsoldering/soldering components on the synth's circuit boards.

You will need the following tools to do this job:

- Posidrive and Jewelers' 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.

You will need the new LCD panel itself and the parts identified in the **Parts** Section at the back of this document.

You need to ensure that 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

Be very aware that in opening the rack, and if it is powered whilst it is open, there will be exposed mains voltages on the power supply board and thus a risk of electric shock. Obviously, the rack only needs to be powered up for short periods whilst it is disassembled. If you keep your hands well away from the power supply board when the case is open and the rack 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 safely with a potential exposed mains voltage hazard, then you should refer this job to a competent electronics technician.

Procedure

Step 1 – Backup your Data

As you are doing a lot of internal disassembly, as a precaution you should ensure that all of your important user data (Voices, etc.) is backed up via MIDI to computer.

Step 2 – Remove the Cover

Place the rack in a well lit area, where it is easy to work on, and remove the cover.

There are two screws either side of the Rack, two on top of the rack, and three at the rear of the rack (at the top).

Step 3 – Disconnect the Front Panel Cables

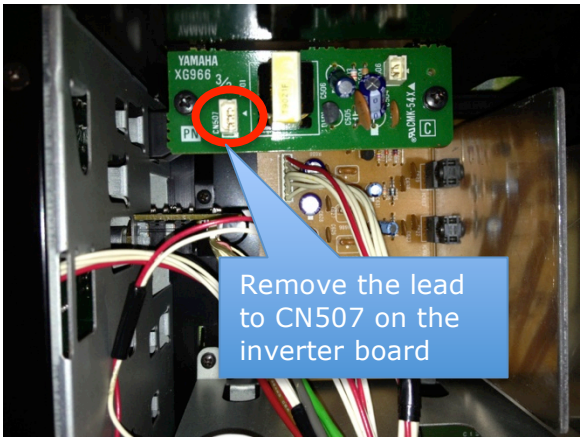
You now need to remove the connectors going to the front panel switch board and the display itself.

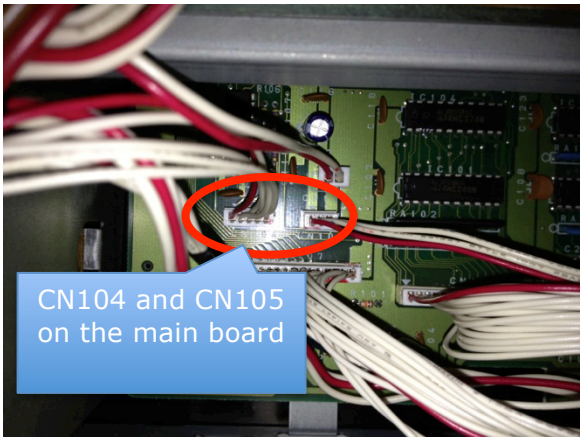
- CN507 on the display inverter board;
- CN104, CN105, CN106 and CN108 (Display Ribbon) on the main board.

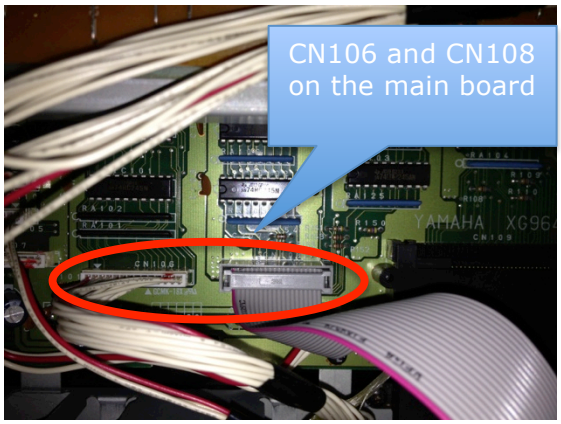
CN507 and CN108 go to the display. The others go to the switch board, and need to be removed due to a fitting problem with the new display that is covered in Step 6.

The cover of the inverter circuit is secured by two countersunk screws (see picture on Page 4) on the side of the case, once these are removed, the cover can be lifted upwards.

The headers for the main board connectors are all different sizes, so there is no need to label them.



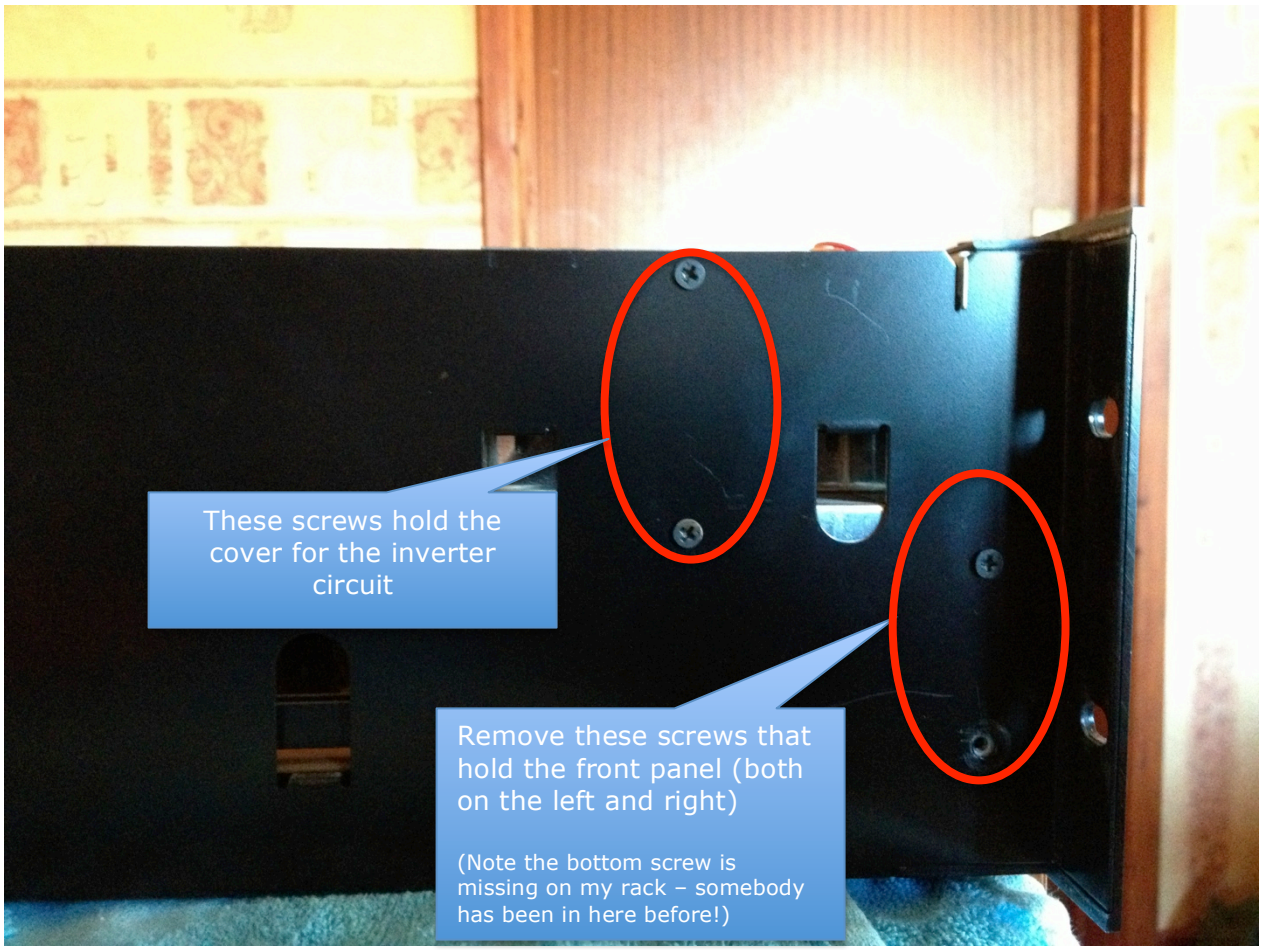




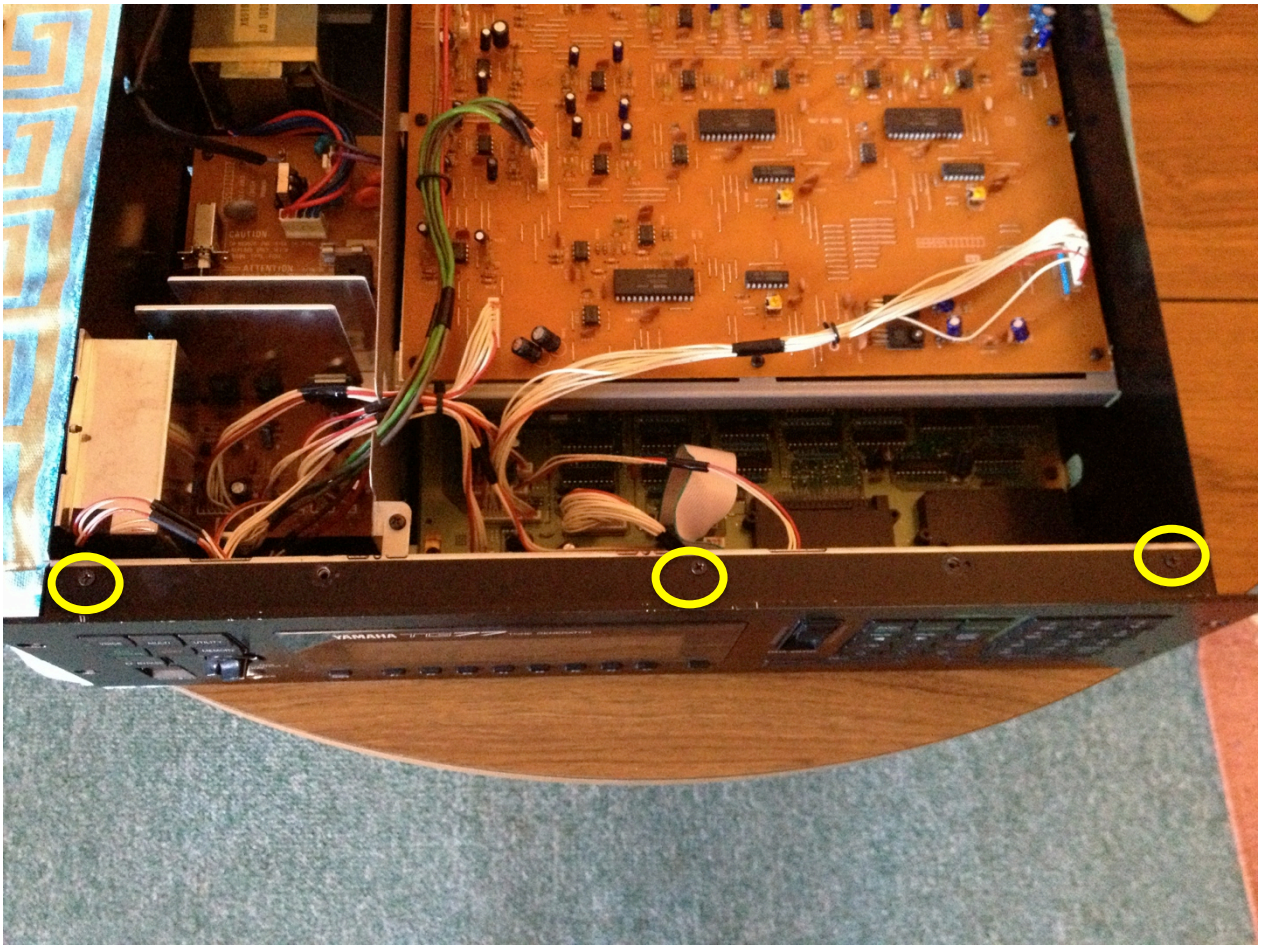
Step 4 – Remove the Front Panel

Gently prise out the Volume and Data slider knobs; they are a push fit.

On each side of the rack there are two counter sunk screws, so remove those. Whilst you are at it, also remove the two countersunk sunk screws on the left hand side, which hold the cover for the inverter circuit, and remove the cover.

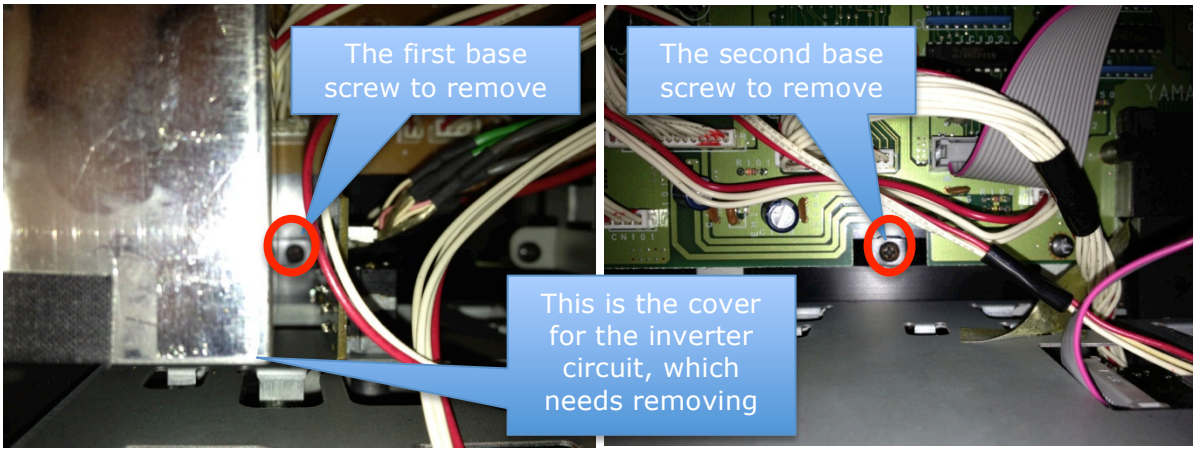


Remove the three countersunk screws on the top of the panel.

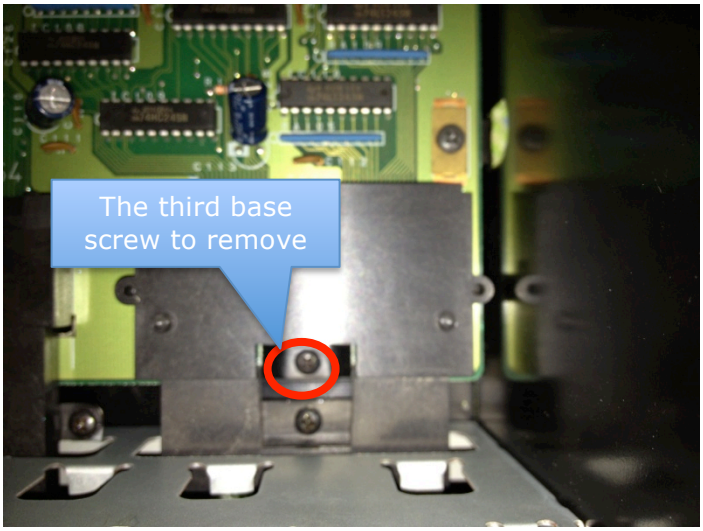


Now there are three more screws to remove at the base of the panel on the inside of the rack. They are a little hard to spot.

The first is just to the left of the headphone board, and the second is within a notch in the front of the PCB.



The third is accessed through a gap in the Wave Card slot



With all the screws removed, the front should now be easily removed. As you move it forward, it needs to drop down as well to clear things.

Step 5 – Remove the Display Bezel

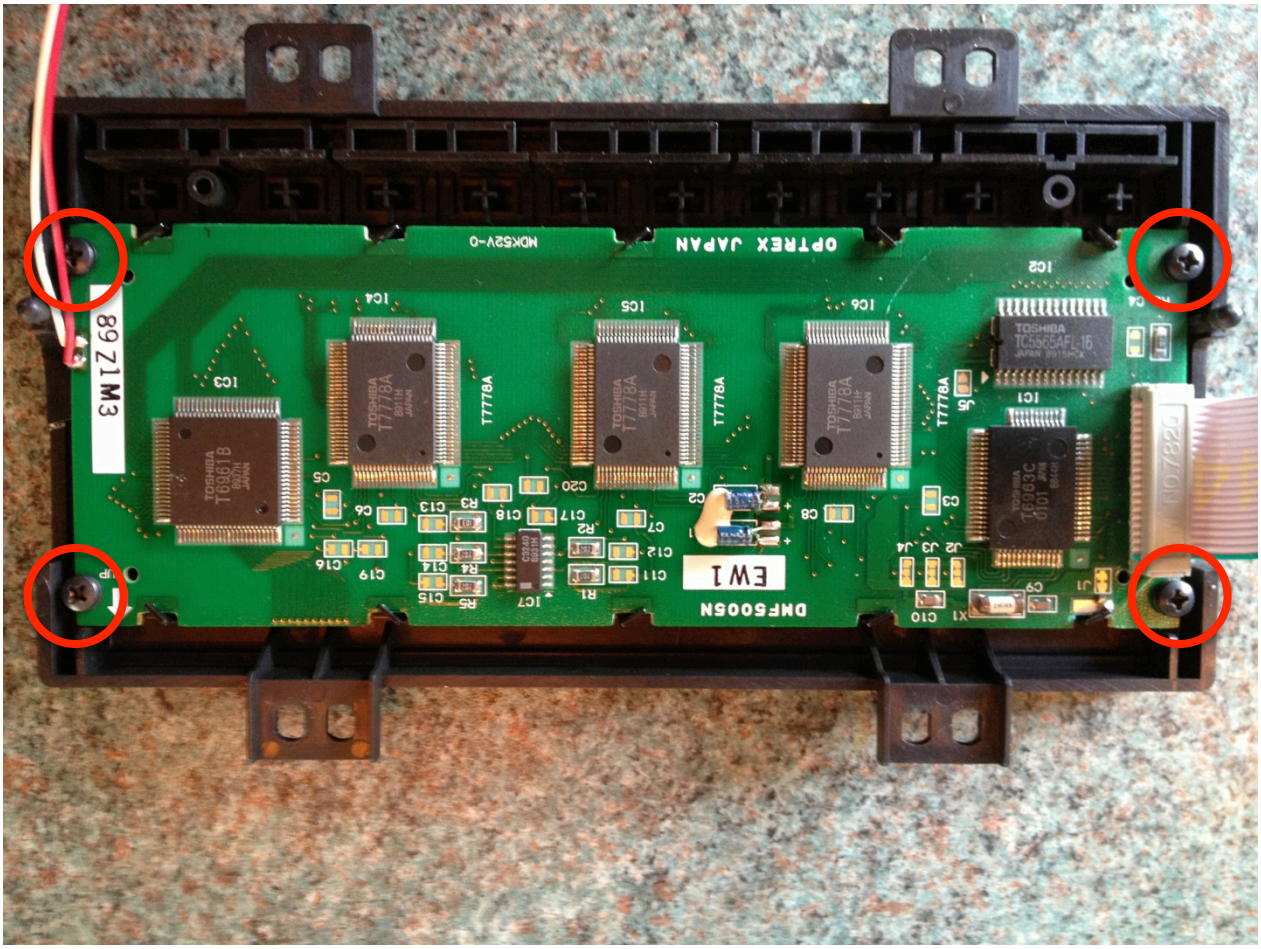
The display bezel is simply held by four screws, so undo and remove them

You can now remove the bezel, carefully guiding the disconnected leads through the cutouts.

You may find that the display bezel does not come off easily and there is some resistance in the lower right corner. This is due to a bit of self adhesive tape on the Switch PCB[1] It's OK to keep pulling until the bezel is free. You can see the self adhesive tape in the picture on Page 9, just below SW517 (the EXIT switch).

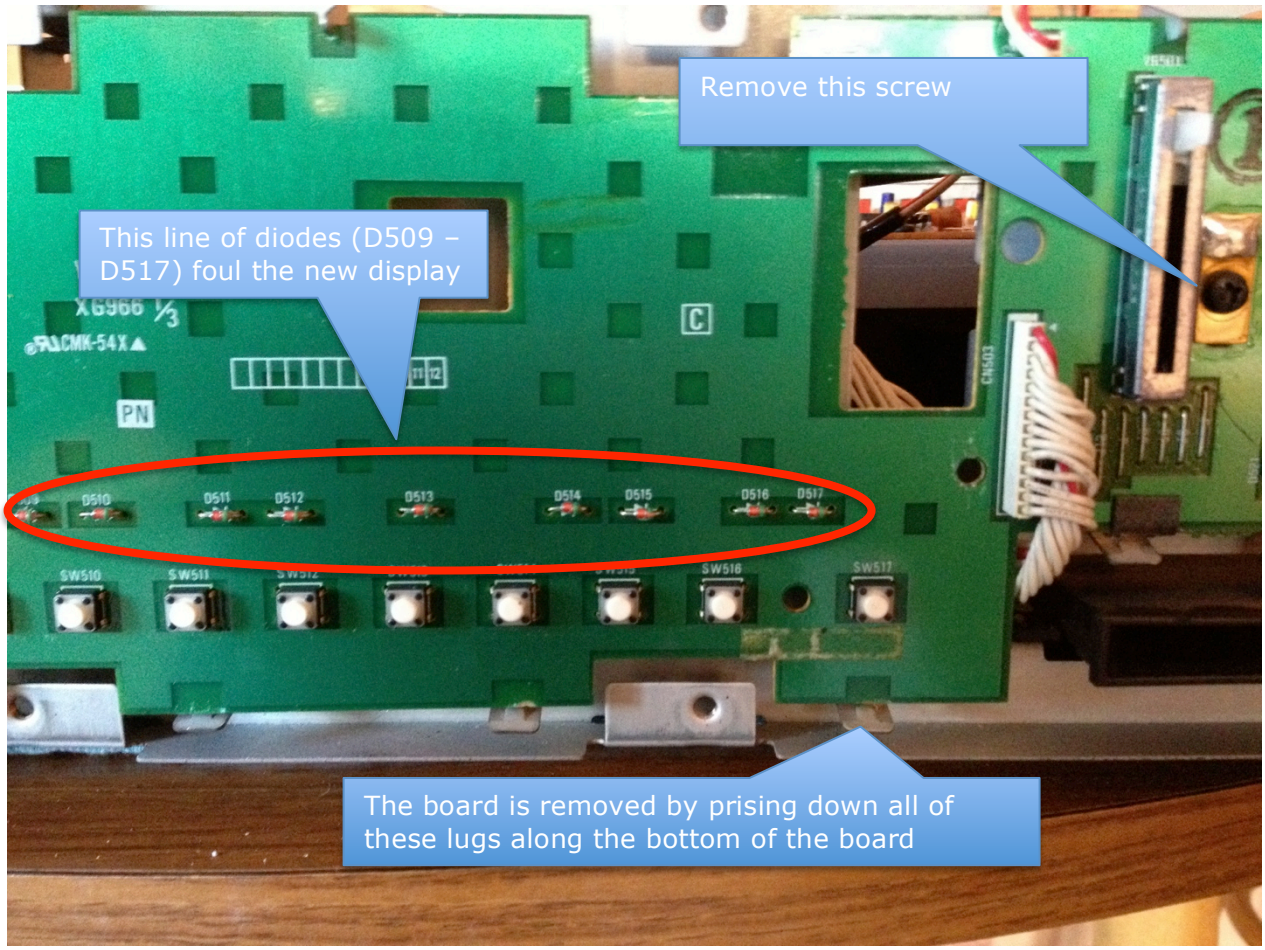
[1] See this topic on Yamaha Forums: http://www.yamahaforums.co.uk/forum/viewtopic.php?f=54&t=5621

The old display is removed from the bezel by simply removing the four retaining screws



Step 6 – Reposition Key Scan Matrix Diodes

One problem that I found is that, due to the depth of the NewHaven display (despite being a slim model), the display fouls the diodes D508 to D517 on the switch PCB when you try and refit it. So I decided to reposition them on the other size of the PCB, which requires careful desoldering, component removal and resoldering. Whilst not all of the diodes foul the display, I decided to move them all. You could be more selective if you wish and check and see which diodes actually cause the problem.

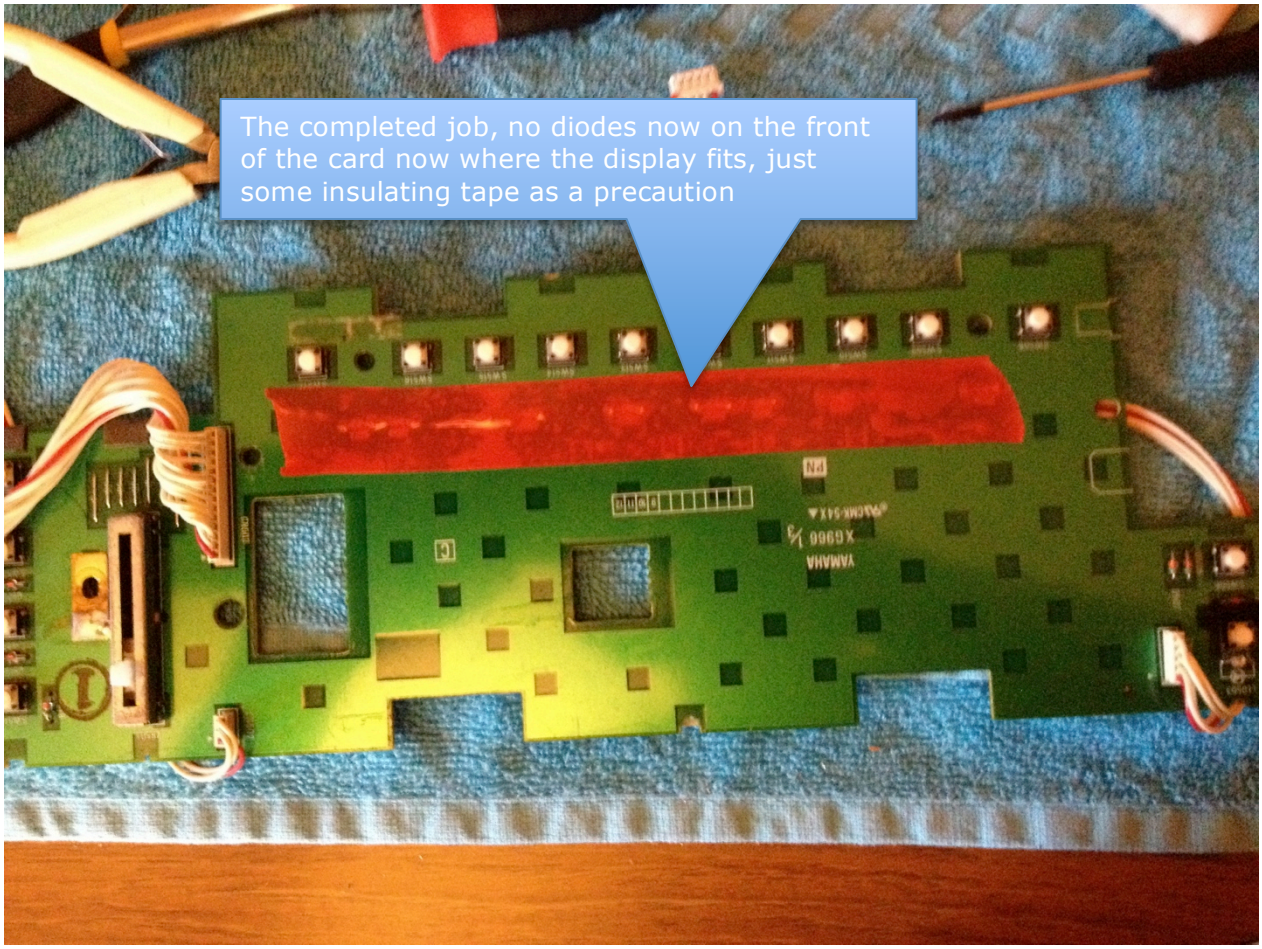


You need to prise down all of the lugs that hold the board at the bottom. There is also a single screw by the Data Entry slider.

I used a desoldering pump to remove the solder from the diode legs, then removed them, ensured that the PCB through holes were clear and then resoldered the diodes on the opposite side.

Diodes need to be correctly oriented, with the cathode (negative terminal) being denoted by a bar (on the right of the diodes in the photo). Ensure that you get this orientation correct, which is indicated by the silk screening on the PCB under the diodes. Once the diodes were refitted, I checked them in both forward and reverse directions using the diode test function on my mulitmeter to ensure that all the diodes survived the transplant.

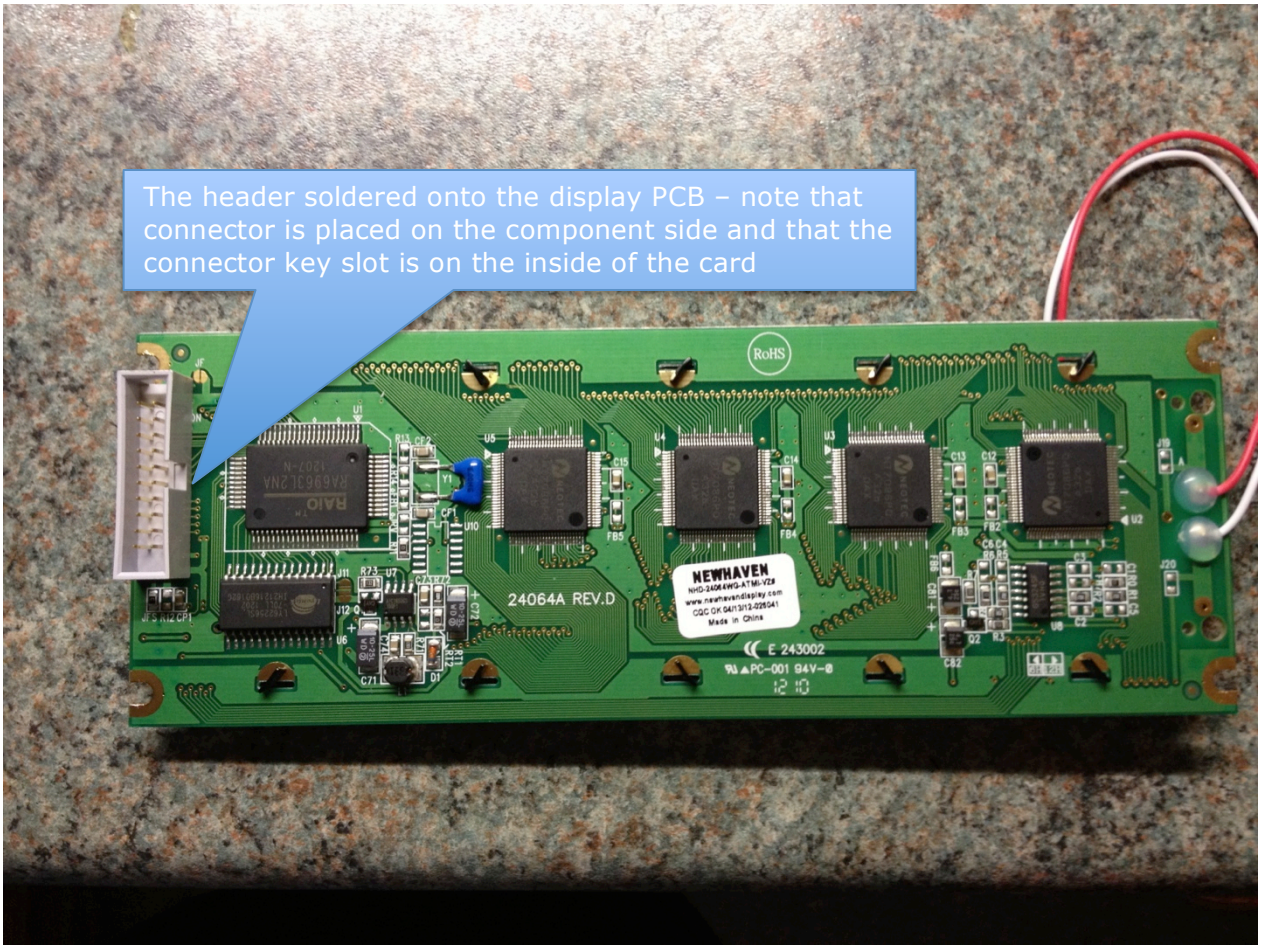
I placed a piece of insulating tape on the front of the board, just as a precaution[2], and then refitted the board. Remember to prise the metal lugs that hold the board back in position before refitting, and to refit the screw by the Data Entry Slider.



[2] Because there are now solder connections for the diodes this side of the board.

Step 7 – Preparing the "Cool Blue" Display

The display comes without a connector for the ribbon cable. So solder the header that you have acquired to do the job. A straight header is required (compared to the SY77/SY99 which need a right angled header).

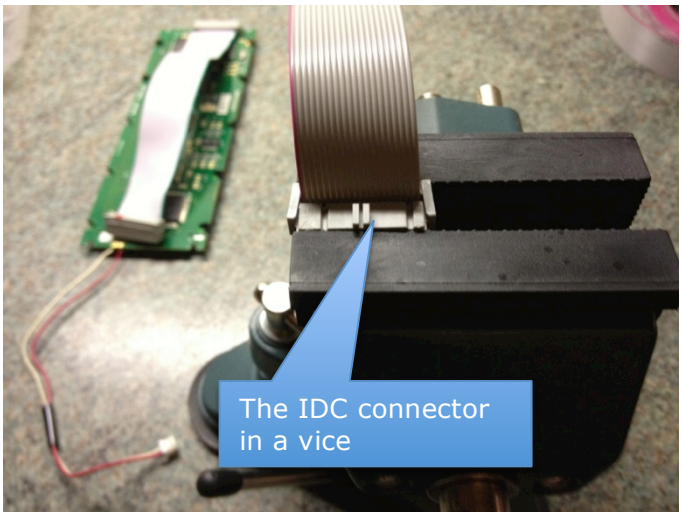


Note that the connector goes on the component side of the card, like the directly soldered connector on the display that you have just removed, and the key slot faces towards the components.

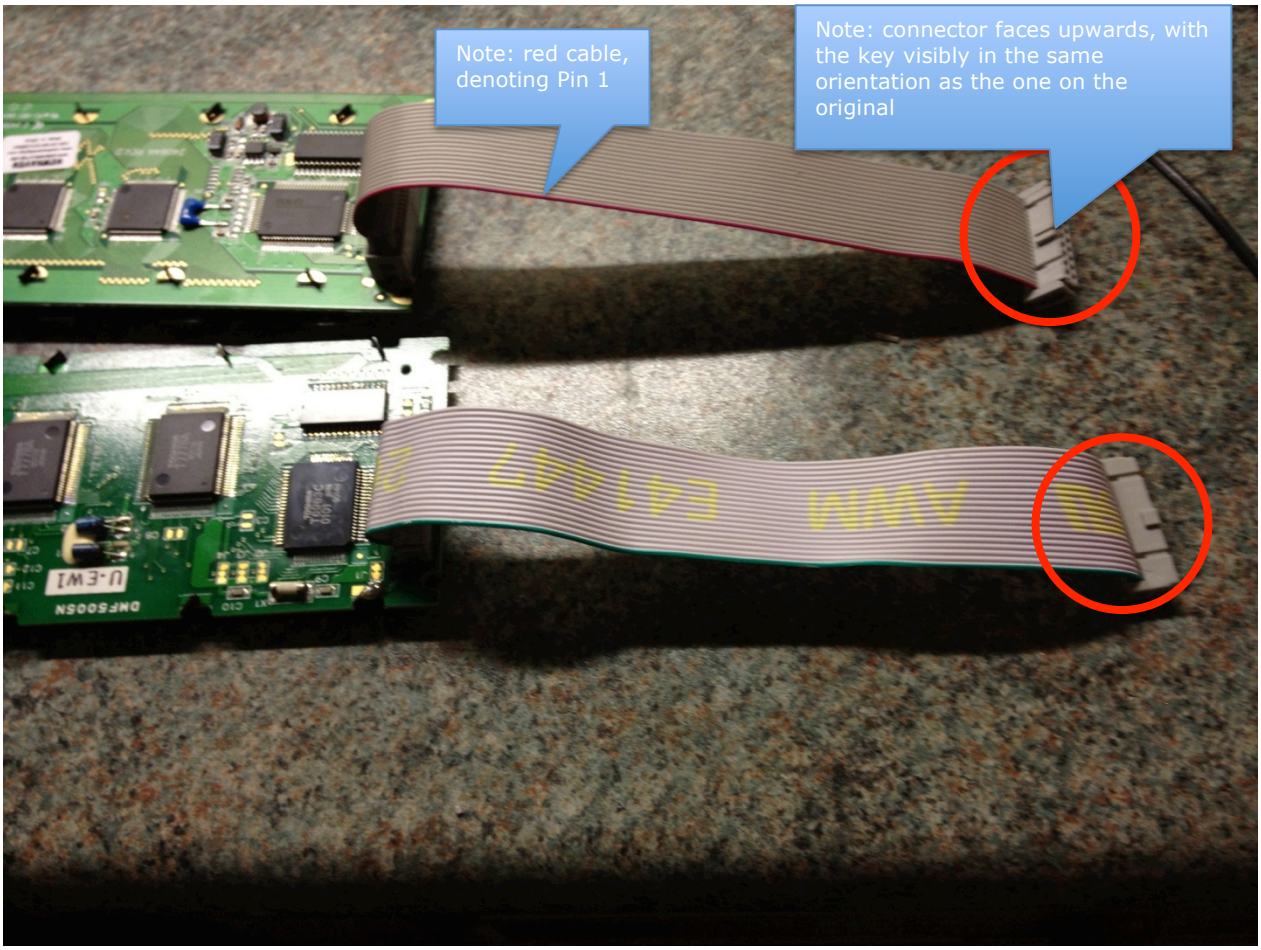
Step 8 – Make the Ribbon Cable

Whilst a special tool is usually recommended for attaching the IDC connectors to the ribbon, they are expensive and 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. So, I always check the cable for continuity pin by pin after completing it. I also check adjacent pins to ensure there is no unwanted continuity (i.e. short circuited cables).

Tighten and untighten the vice as you apply the pressure to attach both connectors to the ribbon cable.



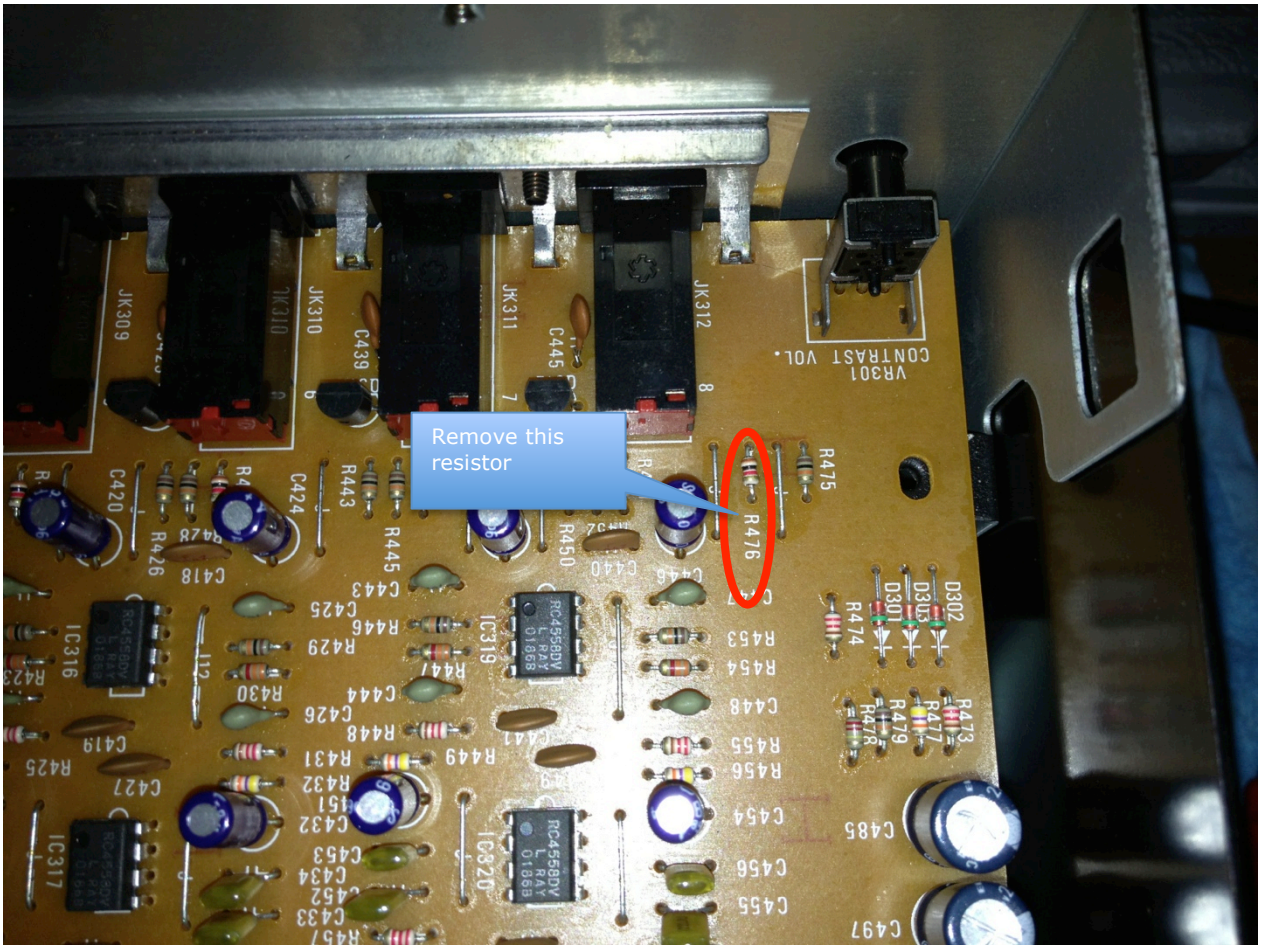
Note that you need to get the orientation of the plugs on the cable correct, to match the connector keys either end. Use the existing display (in the foreground in the picture below) to get this right.



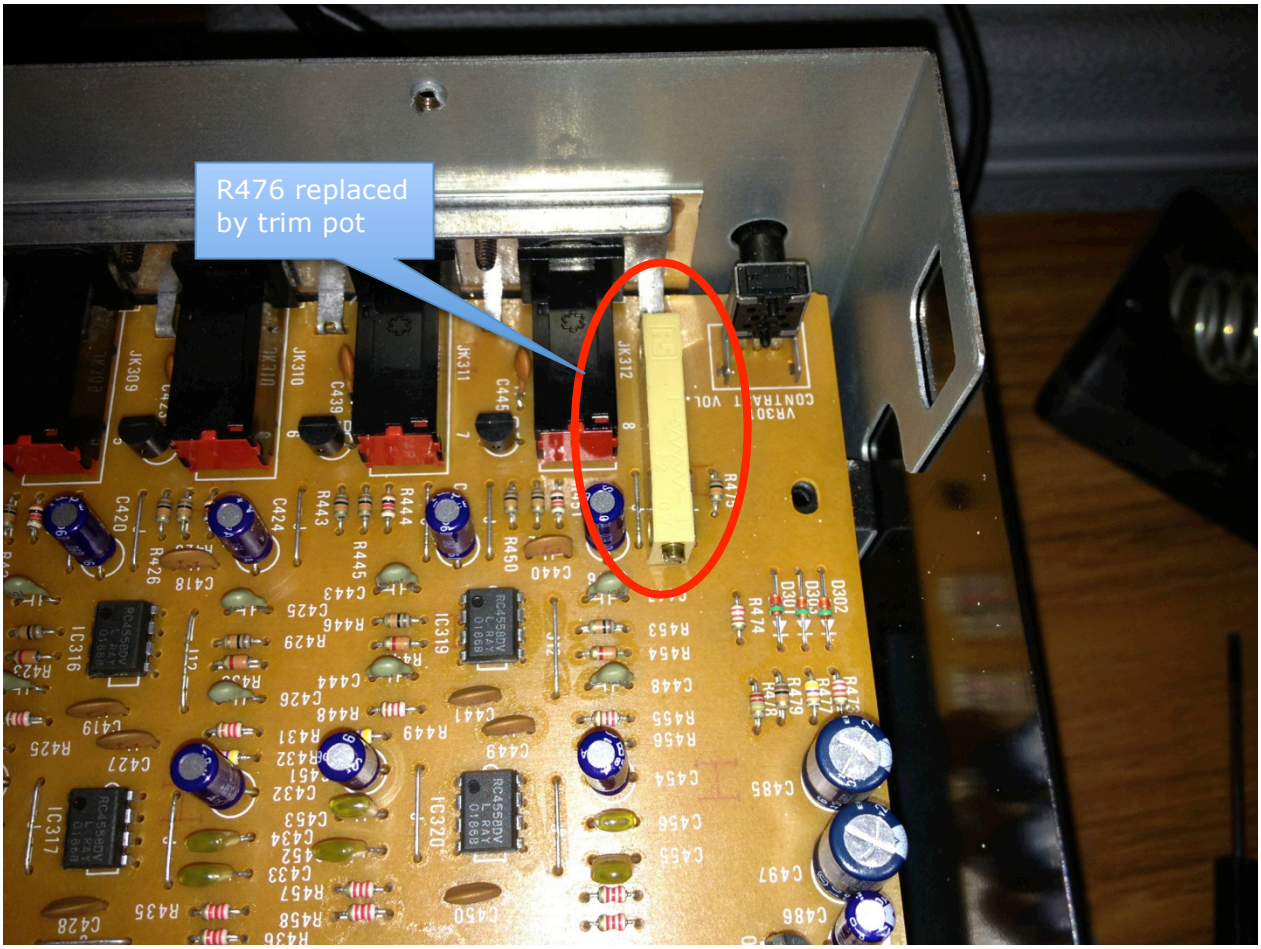
Step 9 – Replace Resistor R476

If this resistor is not replaced, your display will look very washed out like this.

R476 can be found in the top right corner of the top board (X6965), close to the contrast control. There are 7 screws inside holding the card (three each side and one in front), and six on the outside rear by the connectors. Remove these screws so that you can remove the board to turn it over. Desolder and remove this resistor.

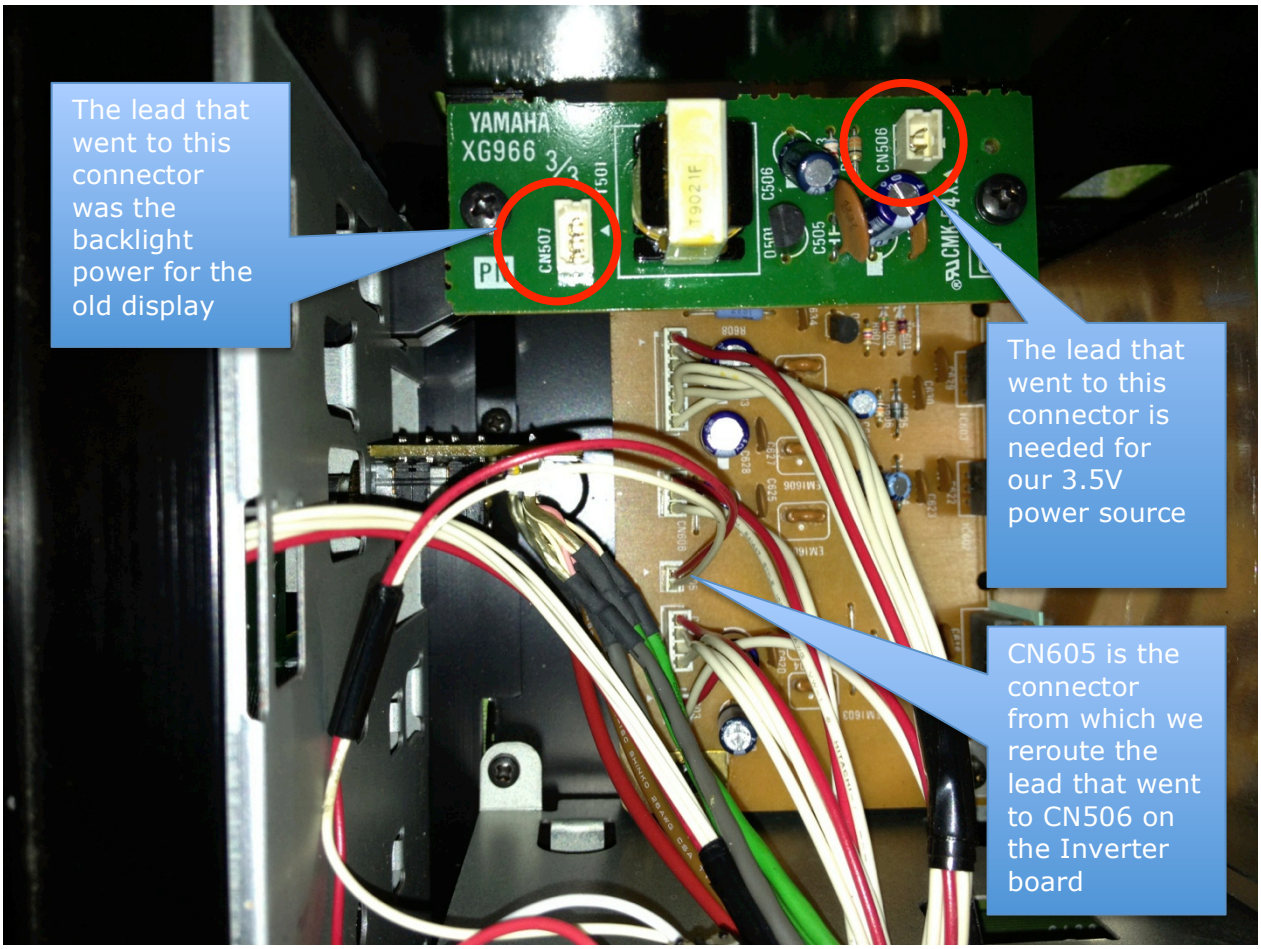


Rather than try different resistor values (and so need a whole load of resistors!), I elected to use a multi-turn trimmer (variable resistor) with a value of 10K. I snipped the 3rd leg off and formed the other two to fit the lead spacing of R476.



Step 10 – Provide 3V Power for the LED Backlight

As mentioned previously, you need a power source for the LED backlight in the new display, and the inverter circuit on the XG966 board is now redundant. So we will take the power lead coming from the PSU CN605 that provides the 5V power source to CN506 on the inverter board. See the following photo (I forgot to take a picture here before removing the leads!).



So remove the connector and wires running from the PSU to CN506 on the X6966 board. This board is now unpowered and no longer needed. It can be removed or left in situ. I elected to leave it in place as it's doing no harm (and no longer whining).

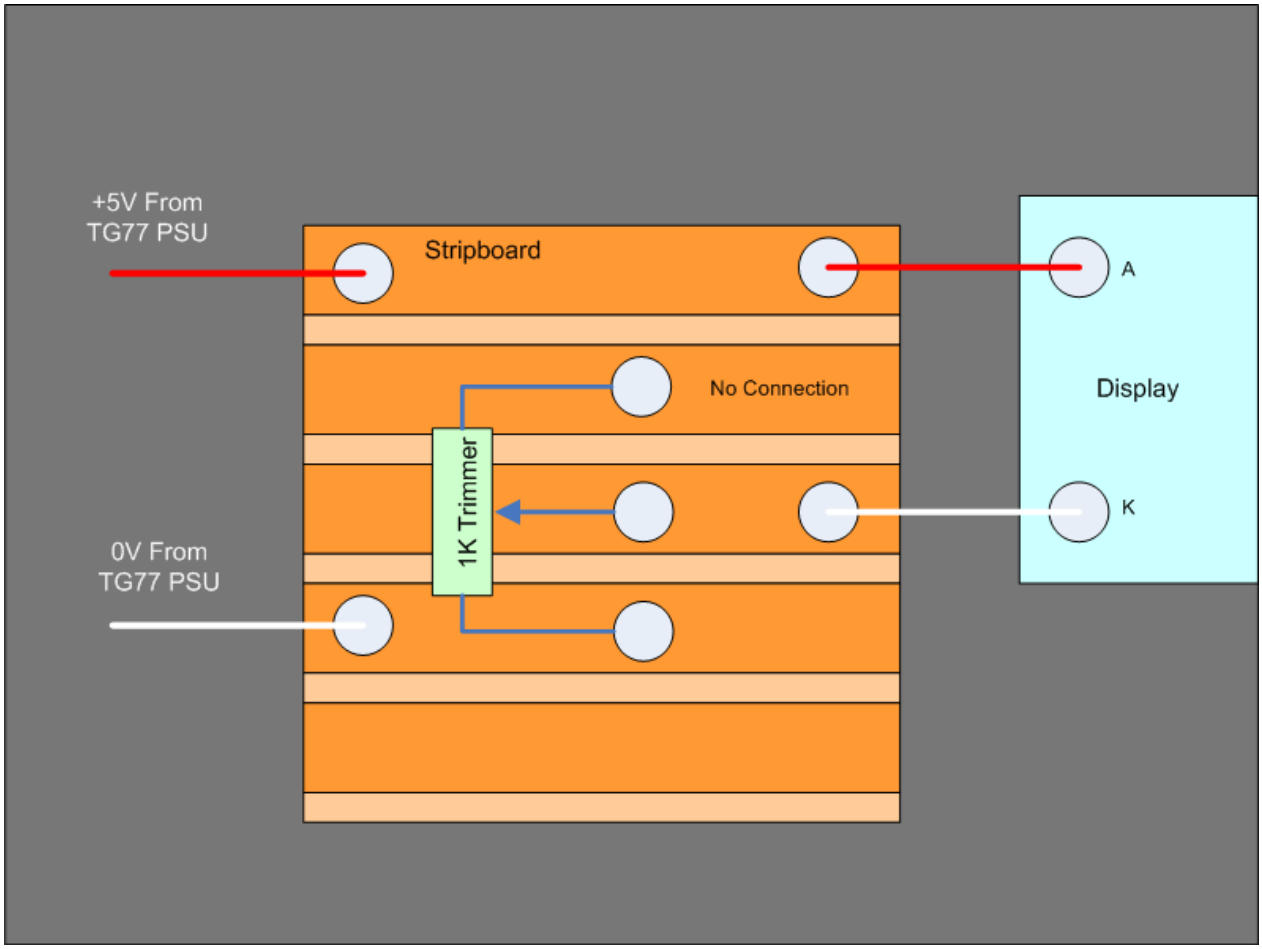
The red wire of the lead from CN605 provides the 5V supply, and the white wire provides the 0V connection. Cut the connector off the wires.

As mentioned, earlier, this 5V supply is outside the quoted range of the new Display's LED backlight, so we need to simply drop some voltage. This is done by putting a resistor in series with the negative line of the supply. Again, I elected to use a 1K trimmer rather than experimenting to find the right value.

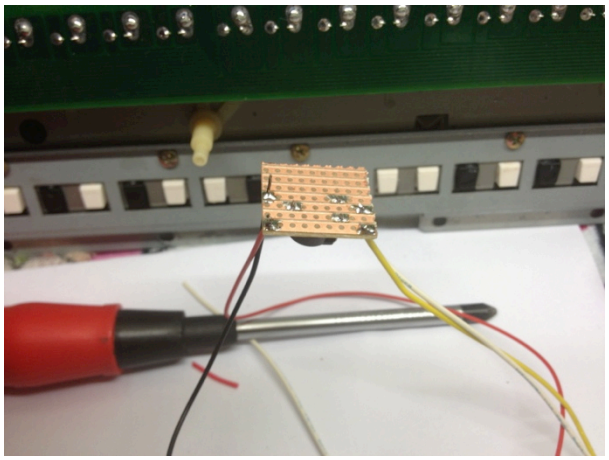
As this is a new addition and not a replacement of an existing component, you need to find a way of holding it and connecting the wires.

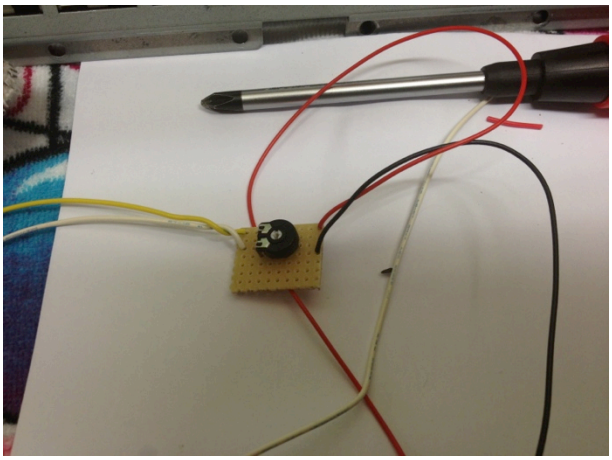
I elected to use a piece of Veroboard (SRBP Stripboard), cut into a square which is large enough to hold the trimmer, but small enough to fit in a convenient space on the DM1 board

The following diagram, shows my very simple circuit.

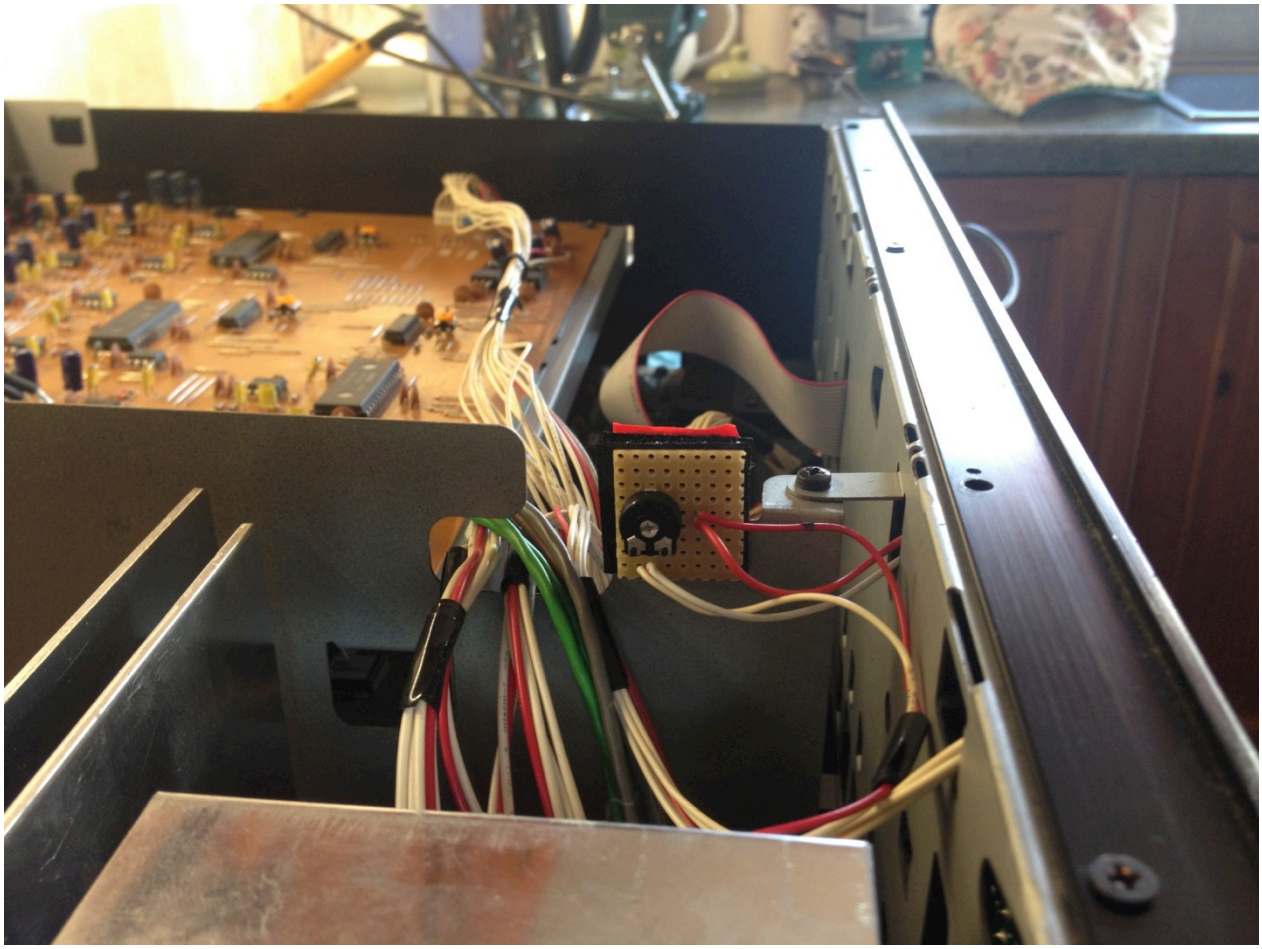


This is what the circuit looks like whilst under construction and testing (example from my SY99 upgrade, and the lead colours are different to those given above).





And this is where I placed it in the rack (just above and to the right of the PSU), using some sticky Velcro pads, which also insulate the rear of the board (I also wrapped some red insulating tape around the frame as an extra precaution). I placed it here, as I wanted it in an accessible location so that I could adjust it in future if needed without having to disassemble everything! Placement in this location was also ideal for the lead lengths on both the new display and the power lead that used to go the inverter circuit.



Step 11 – Reassemble Rack

Replace everything other than the top cover. Essentially, follow this guide in reverse!

Power on the rack, and check that the display is working. If not then check your work.

Step 12 – Adjust the Trimmers

With the display working, it now needs to be setup

Check that the voltage drop across the used terminals of the trimmer on the Veroboard is 2V or greater (so the voltage drop across the LED backlight is 3V or less), and adjust if required.

With the rear panel contrast knob in a central position, adjust the trimmer that replaced R476 until you get a contrast level that you like.

The end result of all this is a "cool blue" alternative look to your TG77!

Conclusion

By the end of this, hopefully you now have an upgraded "cool blue display" and you can now see the TG77 data displayed on the screen again!

So here is the "before" and "after" side by side. It's hard work, and a lot of disassembly and reassembly, but the results speak for themselves.

And hopefully, you had no screws left over!

Acknowledgements

Huge thanks go to EX5_Etc for posting the information regarding his original "cool blue" display upgrade on the SY99, which prompted me to do the same for my SY77 in 2008, and now my TG77 and SY99 in 2012. This guide is based on his original work.

The following Yamaha Forum Members have, via discussion on Yamaha Forums, contributed information that helped me to achieve this upgrade:

- Accordeosynther
- Synthjoe
- Kaffimusic

Parts List

The following table provides a list of parts that I used in this project. For the trimmers, the choice of type is not critical. The trimmers listed are not the exact same ones I had to hand, but are similar in style to what I had, so give you an idea of what to go for. I used RS Components as a supplier, as they are happy to deal with private individuals and are very prompt in their service. I ordered the components one evening, and had them via standard post the next day, which is astounding given that I live in darkest (and wettish) Wales!

Part	Description	Supplier	Link
NHD-24064WG-ATMI-VZ#	NewHaven 240 x 64 STN-BL	Mouser Electronics	http://uk.mouser.com/
289-9896	10 Way Ribbon Cable[3]	RS	http://uk.rs-online.com/web/
192-7473	20 Way IDC Socket	RS	http://uk.rs-online.com/web/
674-1246	20 Way IDC Header Straight	RS	http://uk.rs-online.com/web/
434-217	SRBP Strip Board (Veroboard)	RS	http://uk.rs-online.com/web/
186-053	10K Trimmer	RS	http://uk.rs-online.com/web/
743-2369	1K Trimmer	RS	http://uk.rs-online.com/web/

[3] This is for a 5M reel, which is far more than needed for the upgrade, but it comes in handy for other things. Maplin Electronics sell 20 way ribbon cable that can be ordered to length, and of course can split in half. Or you can rob an old PC for its ribbon cable, or try a PC supplier/repairer for a suitable cable.

Links

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 very good forum for all things Yamaha (and more), which is a good resource for the Yamaha SY series, and there has been a lot of activity recently about doing these upgrades on the SY77, TG77 and SY99.

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 and, of course, the SY77, TG77 and SY99!

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

My Pink Floyd Tribute Band, Pure Floyd

http://www.purefloyd.co.uk/

My Celtic/Ambient/Progressive project, Carreg Ddu

http://www.carregddu.co.uk/

And my progressive/classic rock influenced project, Echoes

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