The Retroleum Nebula

A Spectrum ULA Replacement Module by Phil Ruston and Alessandro Dorigatti

Very important:

- If your Spectrum PCB has been upgraded from 16KB to 48KB (or been repaired) chips IC3, IC4, IC24 & IC25 may be in sockets. In rubber key Spectrums, space inside the case is very limited, so it is recommended that any chips that are in sockets covered by the Nebula board are removed and re-soldered directly to the PCB. (Although the Nebula's components have been arranged to avoid these components they tend to push the module upwards causing tension in the case during reassembly. This does not apply to the Spectrum+).

- Some Spectrums have ULA sockets with very small pin holes (please see the photo on the next page). The Nebula's pins are a bit wide for this type of socket - it *SHOULD* push in eventually if a lot of force is used, but ideally the socket should be replaced with a modern, generic type.

Other Fitting Notes:

- Prior to fitting the Nebula, it is strongly recommended that the Spectrum motherboard is re-capped (IE: its electrolytic capacitors replaced with new ones) and video output modded to give a composite signal - both will improve the TV picture.

- The Nebula PCB is thinner than a standard PCB to gain a little more space – this means that it is not as rigid as a normal PCB therefore extra care should be taken to avoid damaging it.

- The Nebula has components which can be damaged by the natural static electricity that builds up in the human body. Ideally a grounding wrist strap should be worn (or at the very least discharge yourself on an nearby earthed surface (EG: Radiator, PC metal case) before fitting).

- Before fitting, you may prefer to remove the Spectrum PCB from its case and place it on a hard surface (naturally protect it with a sheet of cardboard etc). Press down the Nebula down between the columns of ULA pins top, middle and bottom - avoiding touching the soldered pin tops or components. Make sure the board does not bend! Below the board, the pins should be evenly aligned in the socket with ideally no gap between the ULA socket body and the Nebula's black plastic stand-offs.

- The Nebula uses "header pins" for its contacts - these are wider than normal chip legs and tend to force open the ULA socket's contacts. This is fine for the Nebula, but you will notice that a normal ULA chip will be a loose fit afterwards. This may necessitate replacement of the DIL socket. (To remove the Nebula - use a wide flat blade screwdriver to pry it up from one end, then the other.)

- Many component variations were used on Spectrum motherboards over the years and obviously every possibility cannot be foreseen.

Spectrum "Issue TWO" board specifics (the type with the heatsink in the lower right corner)

- You may need to push the large 15 ohm (Brown/Green/Black) resistor by the ULA socket slightly to the left.

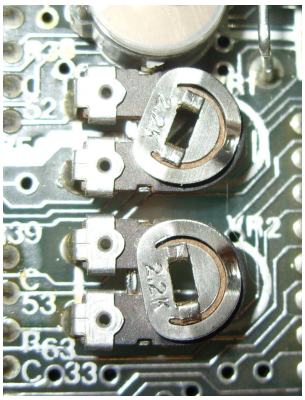
- Before re-assembly, trimmers VR1 and VR2 need to be adjusted to set the colour balance. The range of adjustment (going by the position of the indentation on the wiper) is from approx 11 o'clock to 7 o'clock. Use a small screwdriver and start by setting them to the midway positions - approx 3 o'clock. You may want the connect the keyboard tails so that you can change the screen colour with BASIC commands. Power the Spectrum up and adjust VR1 so that the background is white (but still in colour - too far out of range will make the output monochrome) then adjust VR2 until the colours look correct. Go back and adjust VR1 again if satisfactory colours cannot be attained. Usually, the ideal positions will be just a fraction away from 3 o'clock.

- The trimmers TC1 and TC2 above VR1 and VR2 should not normally be touched.

A simple BASIC colour test program:

```
10 FOR N=0 to 7
20 POKE 22528+n,n*8
30 NEXT N
```

Or of course you can just use BORDER 1, BORDER 2 etc

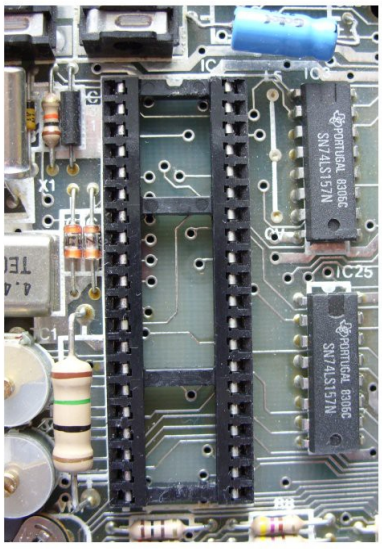


VR1 and VR2

Known Fitting Issues:

Some Spectrums have ULA sockets with very small pin holes – please see to the photo below. The Nebula's pins are too wide for these so ideally the DIL socket needs to removed and replaced with the normal (modern) type shown on the left.

Good socket type



Problem socket type