Dell LCD Monitor

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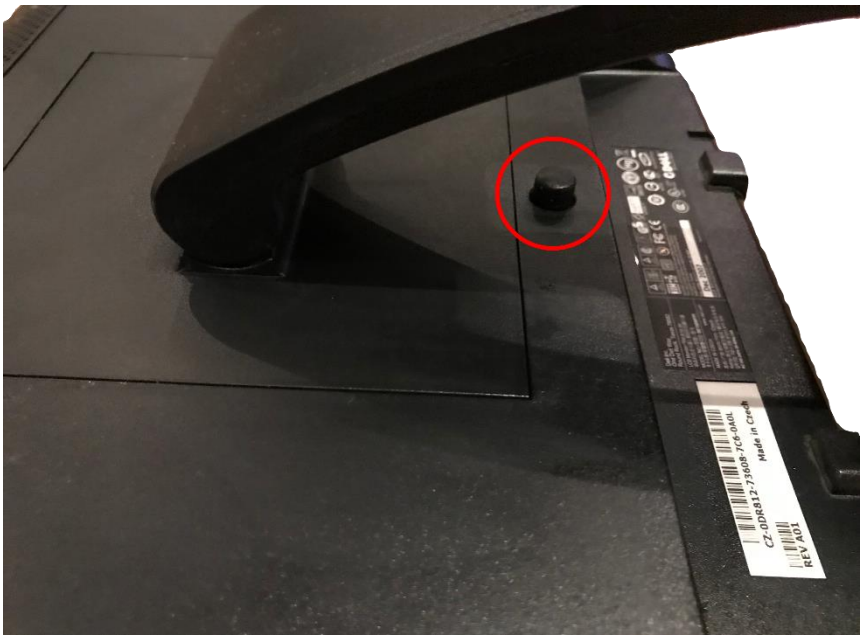
PARTS LIST:

My choice of electronic device for this challenge is the Dell SE198WFP 19 inch LCD monitor. I chose this device, because I felt that it would give me an insight to what components come together to produce an image from a computer's video signal.

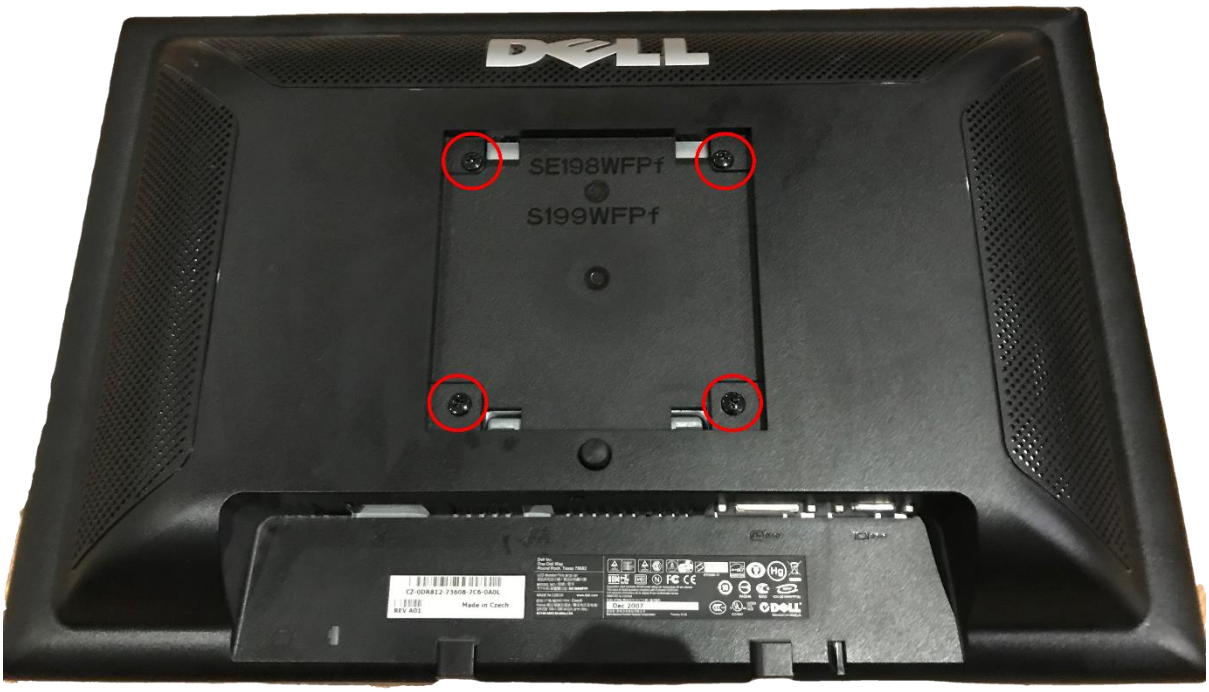
To disassemble the monitor, I used the PH1 screwdriver bit from the Wiha Precision Screwdriver Set.

DISASSEMBLY:

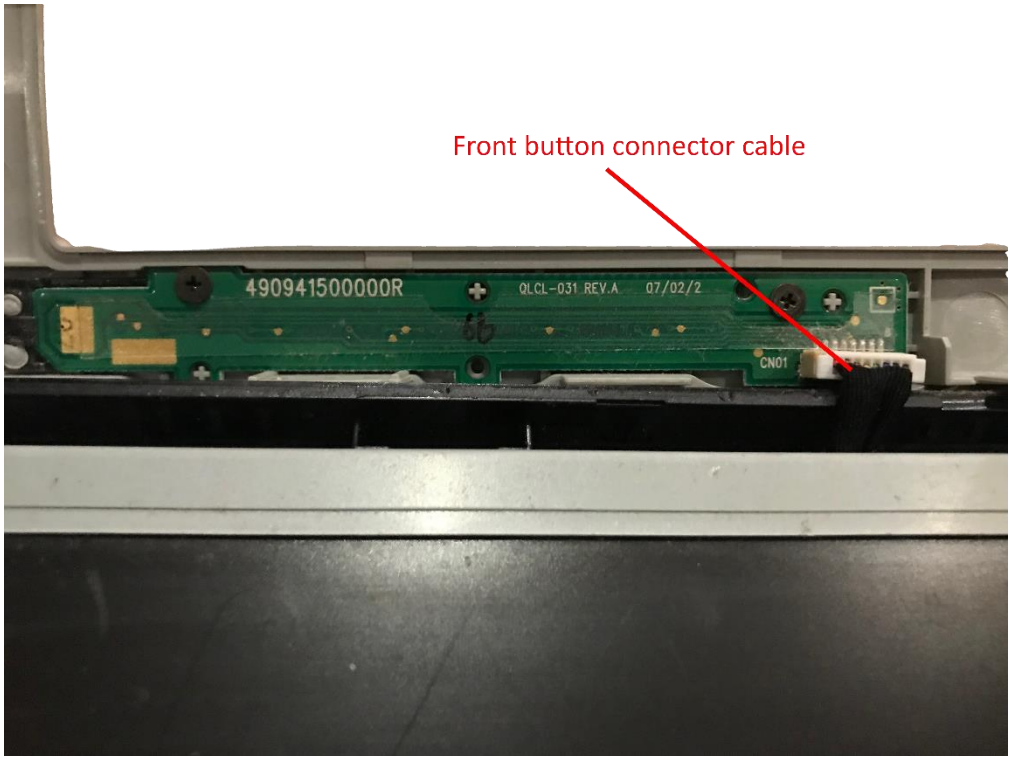
Firstly, I removed the VESA mount stand from the monitor assembly by pressing the stand removal button:



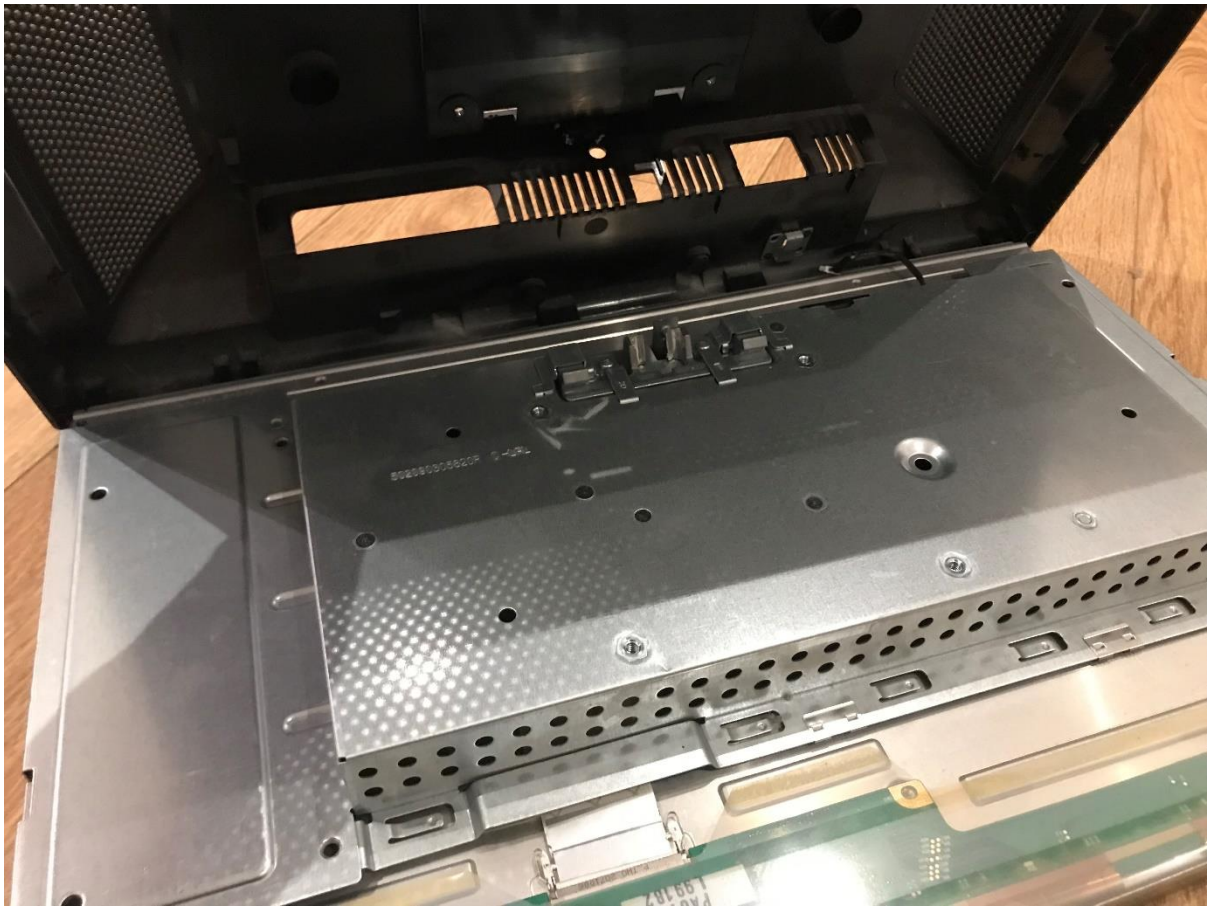
Next, I unscrewed 4 phillips-head screws:



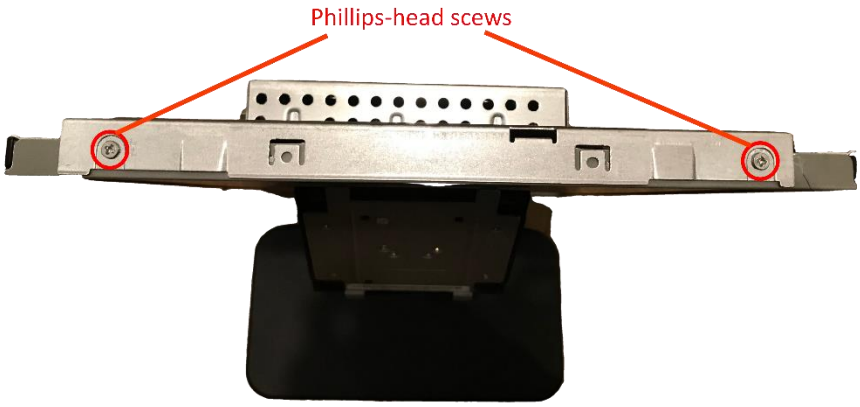
I then pried off the front bezel, and the back plastic case came off. Extreme care had to be taken to remove the front connector cable:

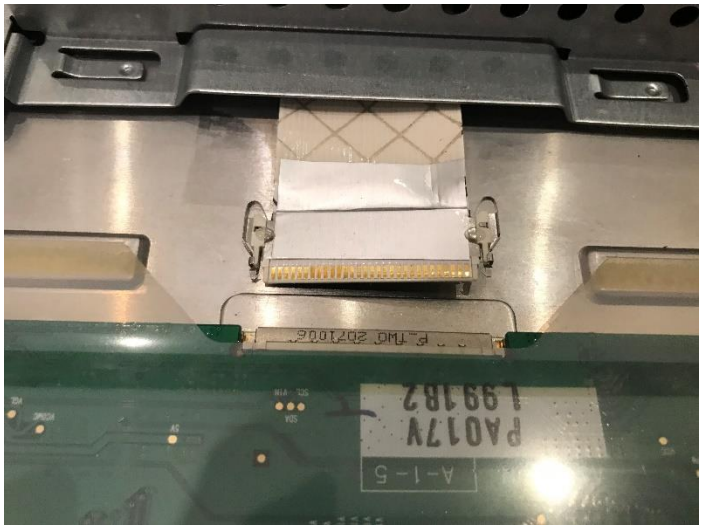


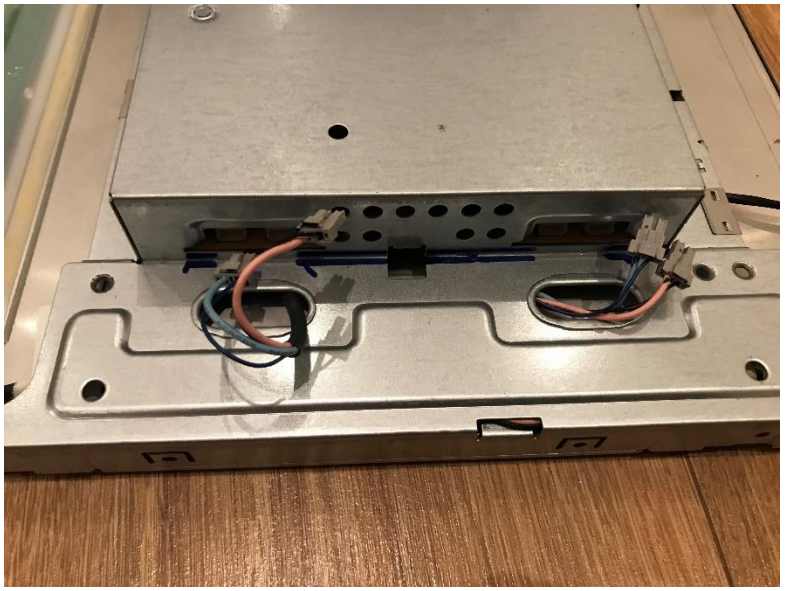

DELL



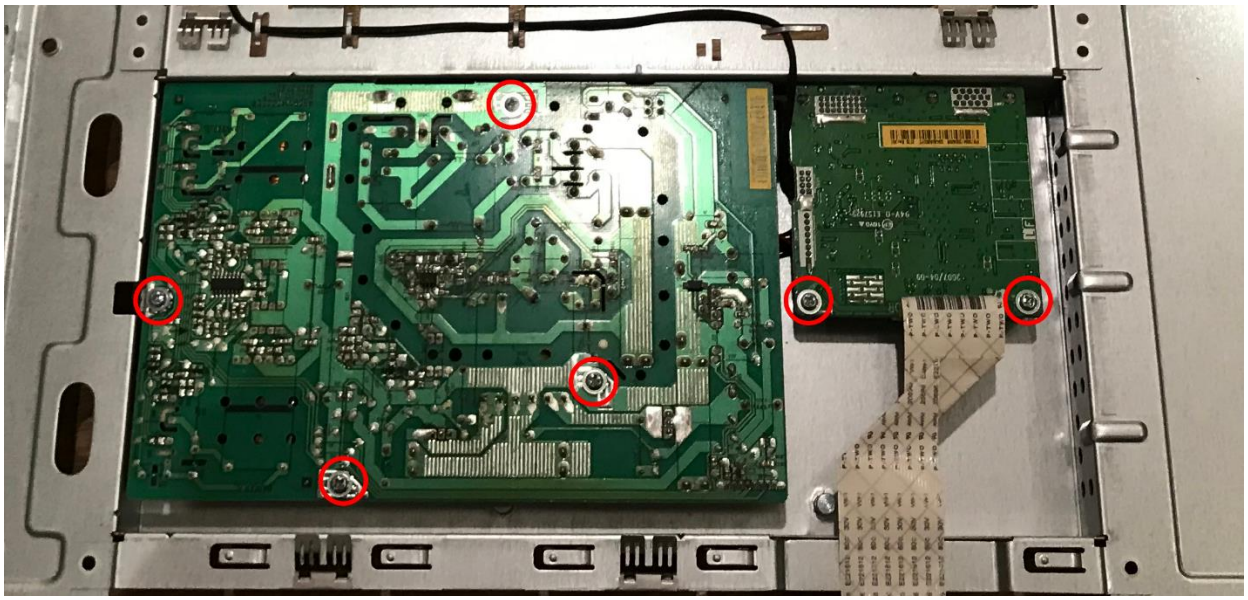
Next, I removed a metal shell enclosing the electronics by unclipping some cables and unscrewing 4 screws:

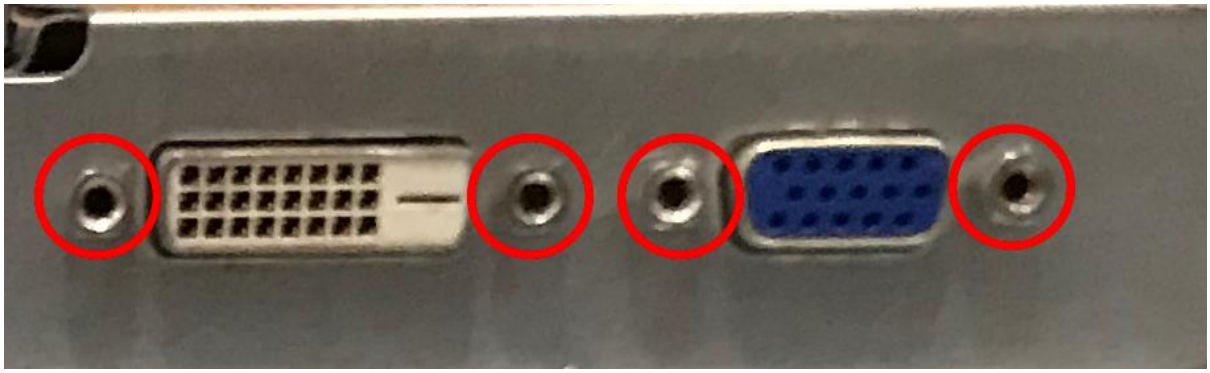




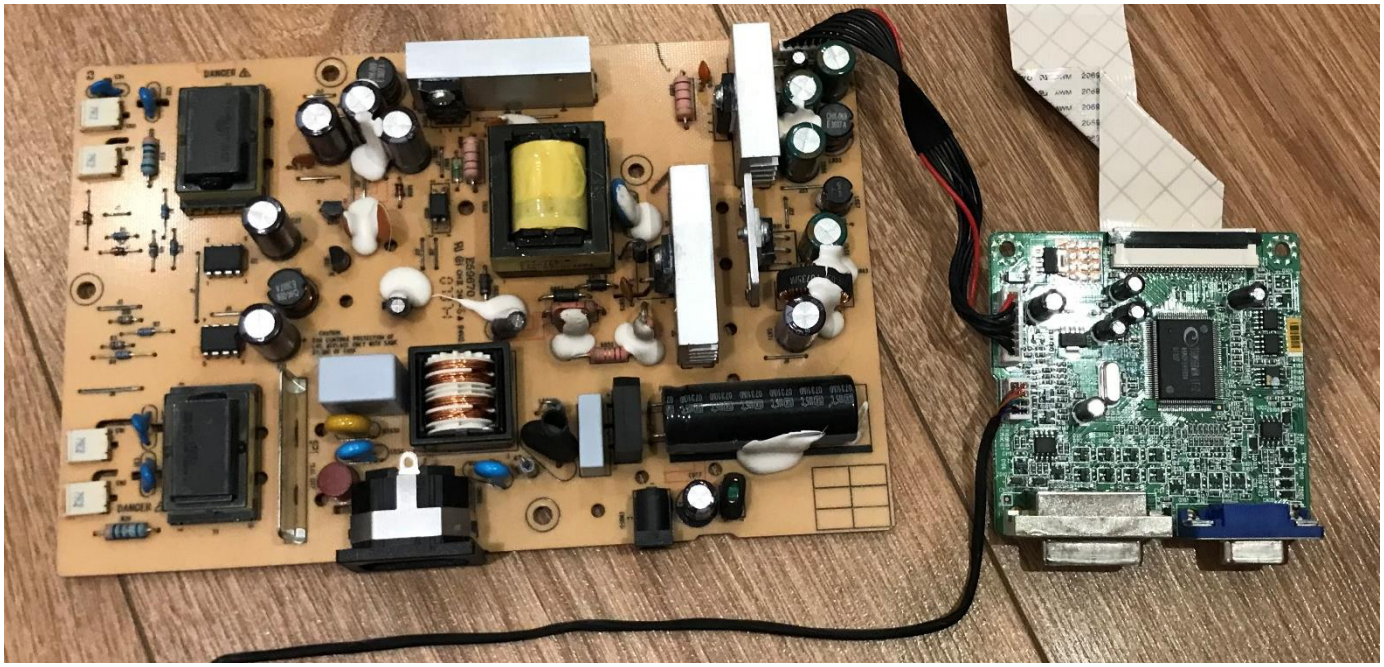


6 Screws and 4 threaded standoffs needed to be removed:

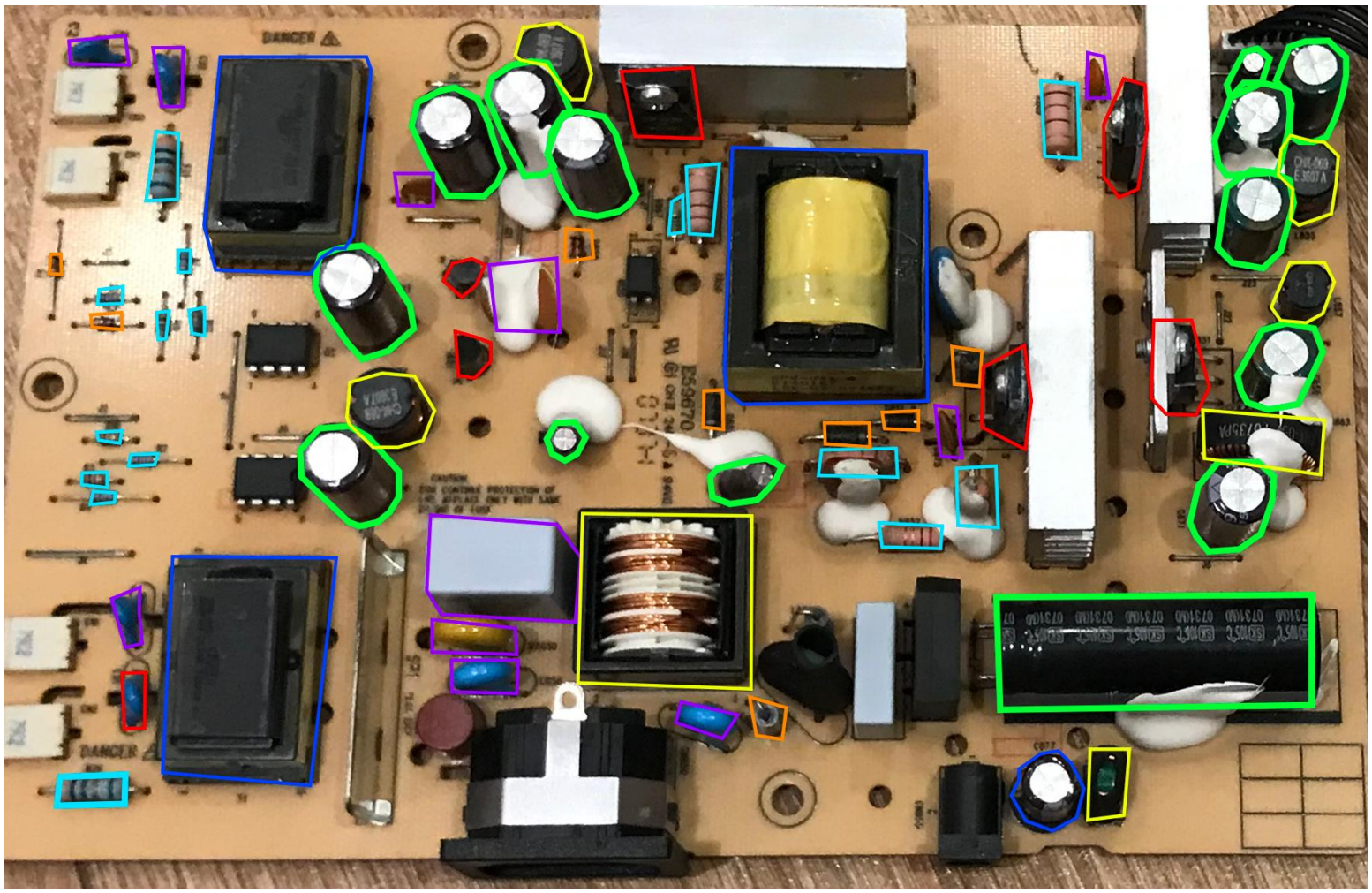




This left me with the power circuitry (left) and the control board (right):



First, I looked at the power circuitry to see which components I could identify. Here are the components colour-coded:



Electrolytic capacitors – Polarised components that store electrical charge

Ceramic capacitors - Non-polarised components that store electrical charge

Transistors – Switch electronic signals

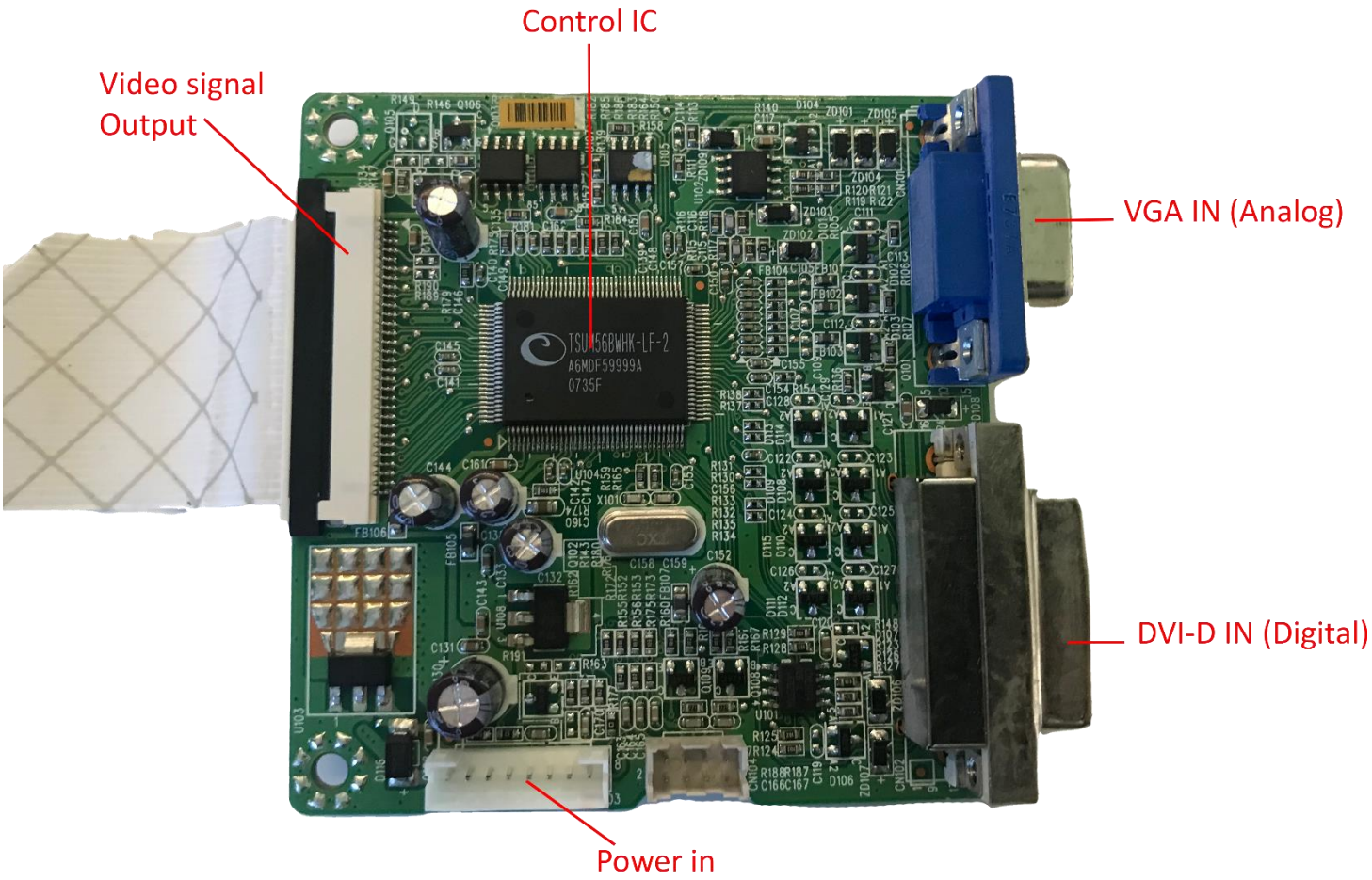
Coils – Provide electrical resistance or inductance

Transformers – Convert alternating current from one voltage to another

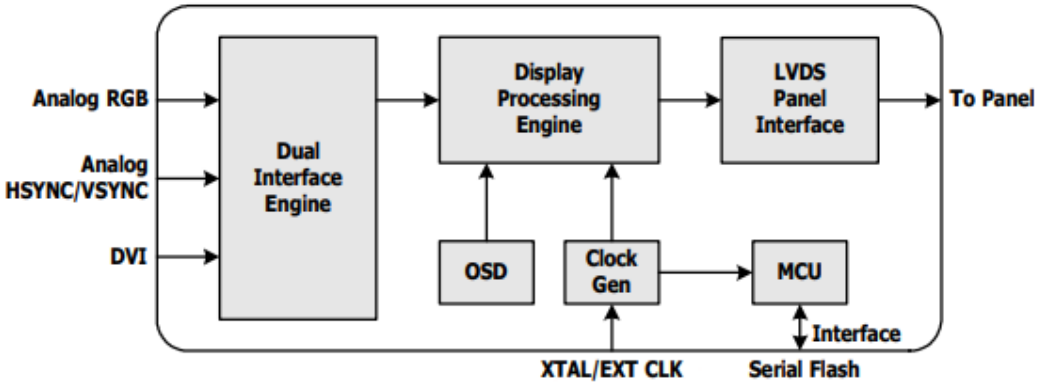
Resistors – Restrict flow of current

Diodes – Act as one-way gates for current

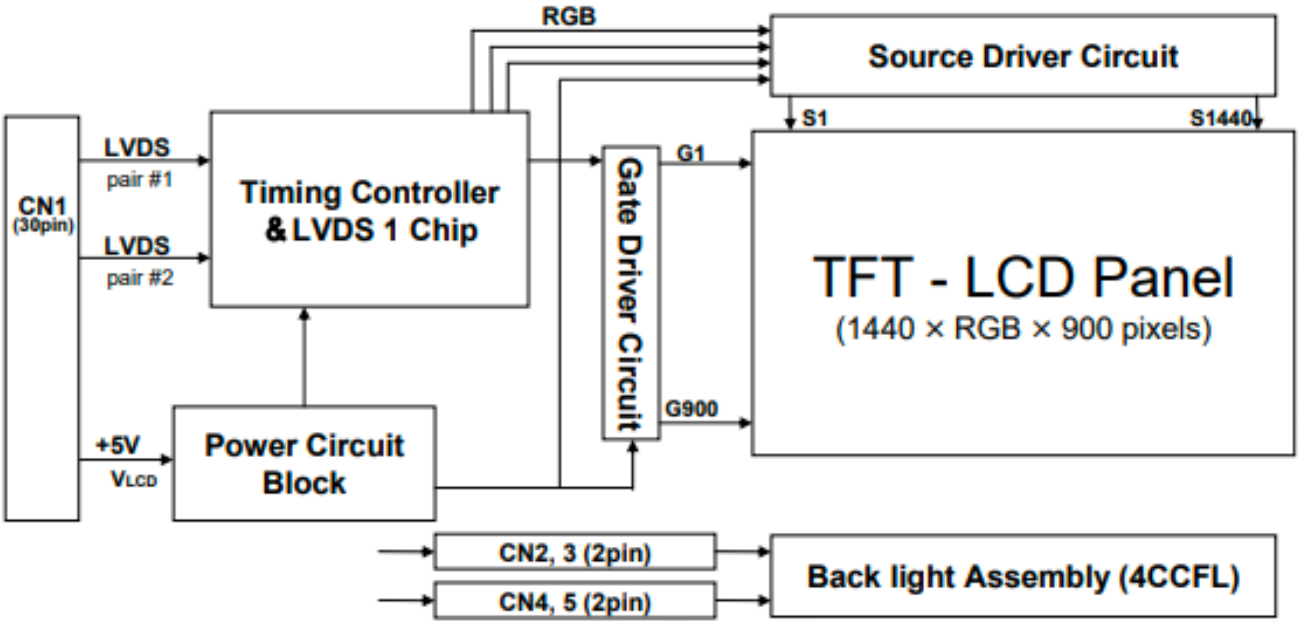
This circuit converts 220v alternating current (AC) into direct current (DC)



This is the control circuit, and I identified the control IC to be the TSUM56. After searching around on the internet, I found a datasheet for this IC. Here is its working flowchart:



This IC takes the video input and converts it into the LVDS Panel Interface signal which has fast data transfer and low power consumption.



This is the flowchart of the Phillips LM190WX1 LCD panel. It shows that the panel runs on 5 volts DC, and the LVDS signal passes through a timing controller before being sent to the panel.

CONCLUSION:

Overall, disassembling this monitor gave me an understanding of how monitors work. This reverse engineering project taught me how the signal from a computer needs to be converted into a different interface signal (in this case the LVDS interface) to be sent to a timing controller. The timing controller then sends signals to the source driver circuit for the vertical columns of the LCD, and signals to the gate driver circuit for the horizontal rows of the LCD. The screen, when it receives these signals, displays the final image. Additionally, I found out that LCD displays require backlights to function, since the backlight is what illuminates the liquid pixels.

Since this monitor was made in 2007, there have been many advancements in display technologies such as OLED, high resolution displays and the HDMI interface. This project has made me marvel as to how far technology has advanced and will always continue to do so.

Monitor Flowchart