A Portable Battery Powered 1” CRT NBTV Monitor.

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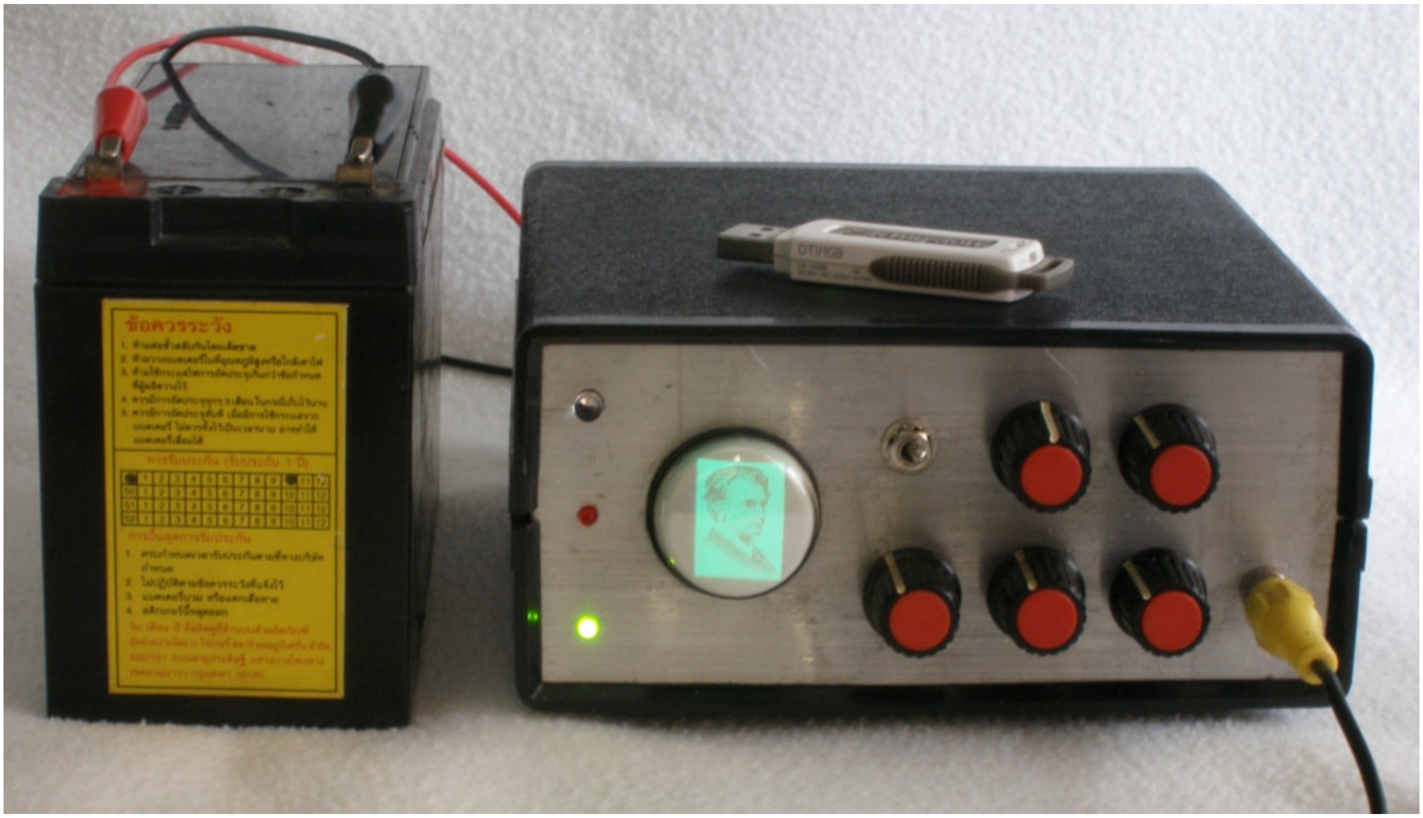
Introduction.

This is portable but not what I would call pocket sized. For all intents and purposes it looks like a standard NBTV monitor; it has 32 vertical lines, ‘Club Standard’ scanning and operates in the usual manner. But it is a little different in certain places.



Battery powered it is, not four AA cells as one might think, but a 12V/7Ah sealed lead acid battery. Not for the pocket unless large and reinforced!

Caution.

Although battery powered this unit uses both high AC and DC voltages and the author of this in no way accepts any responsibility for any incident, injury or fatality of those attempting to replicate it in any manner. If you’re not used to working with high voltages, get some experienced supervision. There is some 600V of potential difference in parts of the device. Do not work on this alone.

The Differences.

The first difference is the video signal itself. (Fig. 1). Sampling at 48kHz yields 120 pixels per line at the usual 400Hz line rate, 96 are used for the active video, the remaining 24 are used for syncs. Instead of using the missing pulse system for frame syncs a broad frame sync pulse is used instead thus providing an uninterrupted 400Hz signal for PLLs and other circuitry.

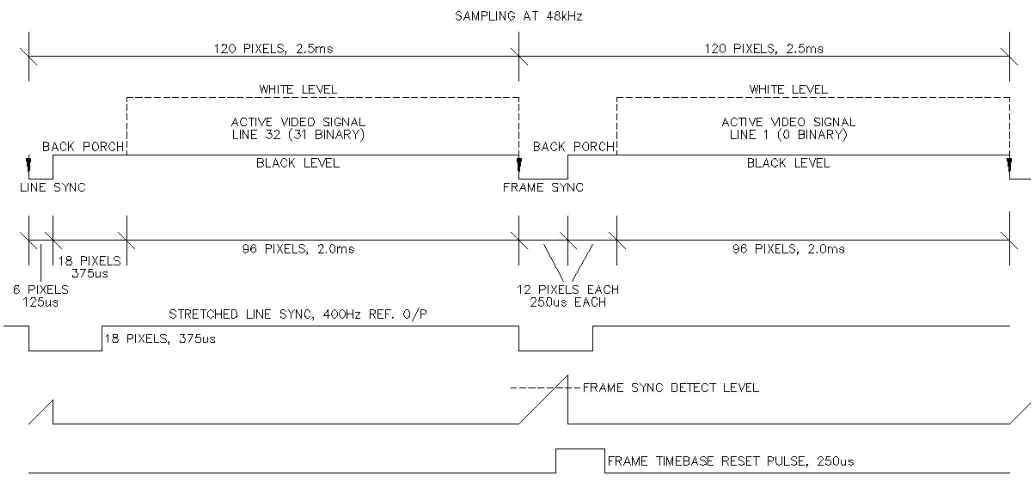


Figure1

The storage media for the signal is a standard eight bit wave file at a 48kHz sampling rate, with the use of conventional type sync pulses the video resolution is just over seven bits, enough for NBTV.

The Circuits.

As this is battery powered and uses a CRT an inverter is used to generate two positive high voltages of 260 and 540 volts as well as a negative 21 volt rail which is regulated down to -12V. (Fig. 2). It uses a small standard mains transformer in reverse driven by a bi-phase waveform at 200Hz. The driver transistors don't even get warm and have no need for heatsinks. The total output power used is 1.75W and the input power is 2.66W, an efficiency of 66% which is surprisingly good for what is a bit of a bodge. A high-frequency inverter based on RM cores would have been better but they're not available here. Reverse battery polarity protection comprises of F901 and D901. (Fig. 3).

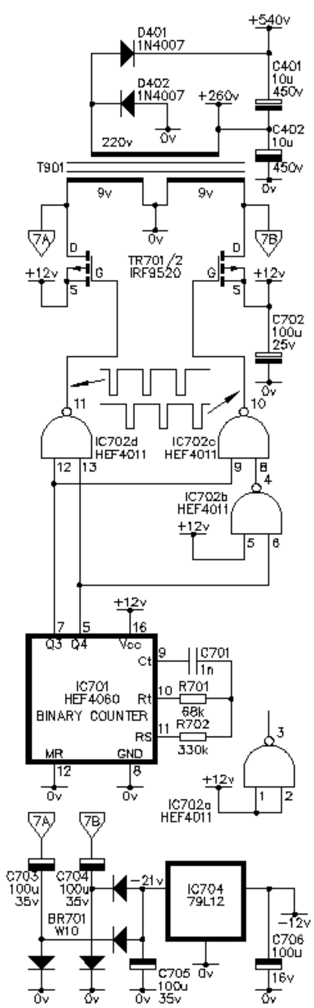


Figure 2

INVERTER, HV PSU & -12v PSU

The rest of it is fairly conventional (Fig. 4, 5, 6 and 7) perhaps with the exception of the +11V regulator (Fig. 3) which is required to have a low drop-out voltage. As I use linear video not Gamma encoded I need to 'un-Gamma' the CRT. This is based on a break-point Gamma correction circuit which is covered elsewhere (Fig. 5).

The CRT is a low voltage type and the cathode sits at +11V rather than the usual high negative voltage easing grid drive and heater insulation requirements. A full charge on the battery will provide some 12 hours of continuous operation, the supply drain being 530mA of which 300mA (57%) is for the CRT heater! SW901 is to turn off the CRT heater about 30 seconds before turning the main supply off. The +12 and -11V supplies collapse very quickly but the high voltage supplies do not and the cathode is still hot. The result is a single bright spot on the tube face which could cause a burn mark, doing this prevents this happening. There is a low battery warning that comes on at 11V, at 10.5V a lead-acid battery of this type is considered fully discharged and discharge should be terminated otherwise a short battery life results.

The negative going edge of syncs triggers IC301a (Fig. 4) which resets the line timebase, this monostable has a duration longer than both types of sync pulse so the line raster is consistent in start point and time. Frame sync separation is performed by IC302 which triggers the frame reset monostable IC301b. In the absence of syncs the beam is shut off by IC303a which also provides visual indication of sync presence or otherwise via two LEDs. Retrace blanking is added to this by a simple two transistor arrangement. (Fig. 6).

A look inside the box reveals that it was a bit of a squeeze to get it all in but not too hard (Photo 2). The only control that is functional on the front panel is the CRT heater switch; the others are leftovers from a previous incarnation.

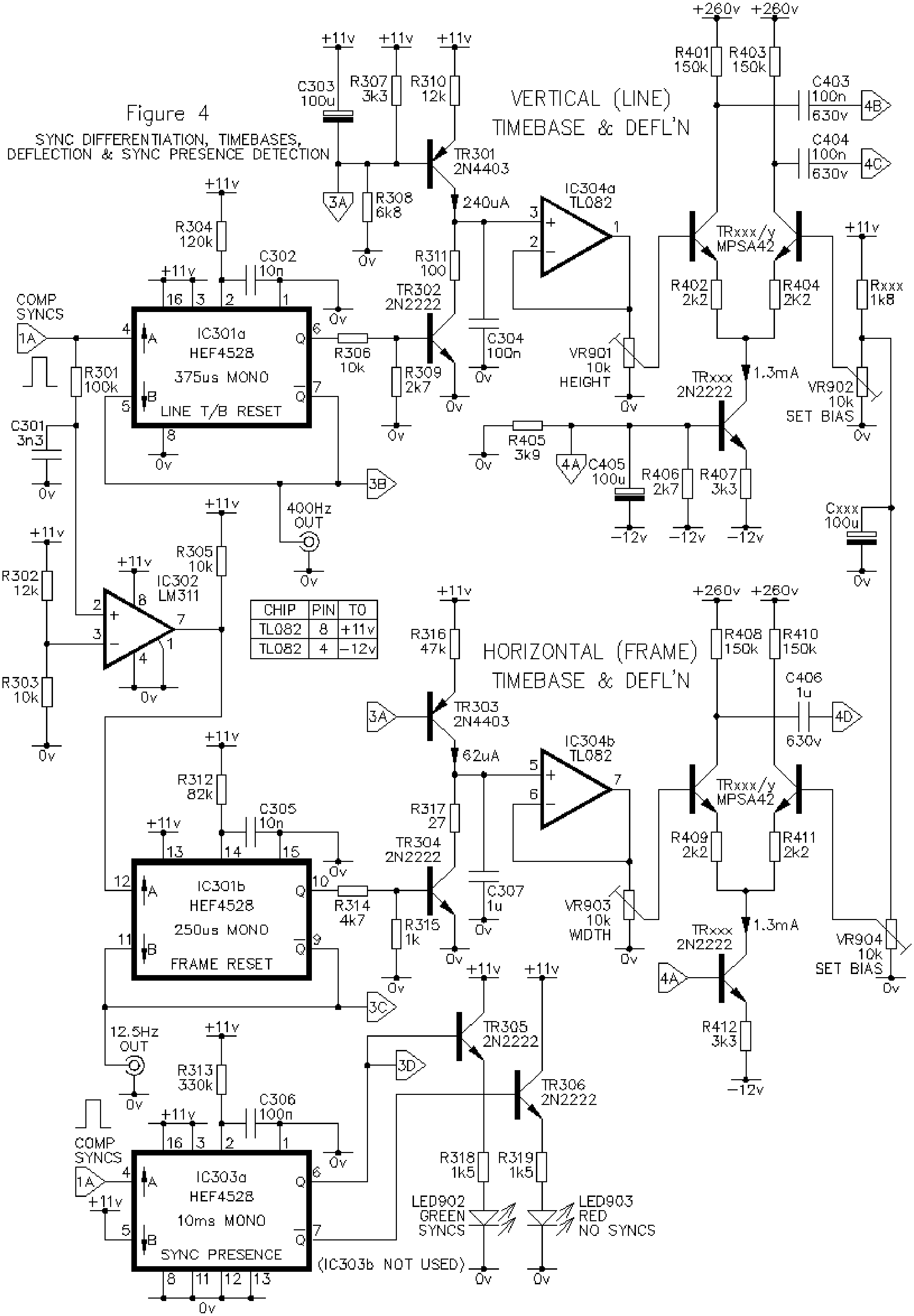
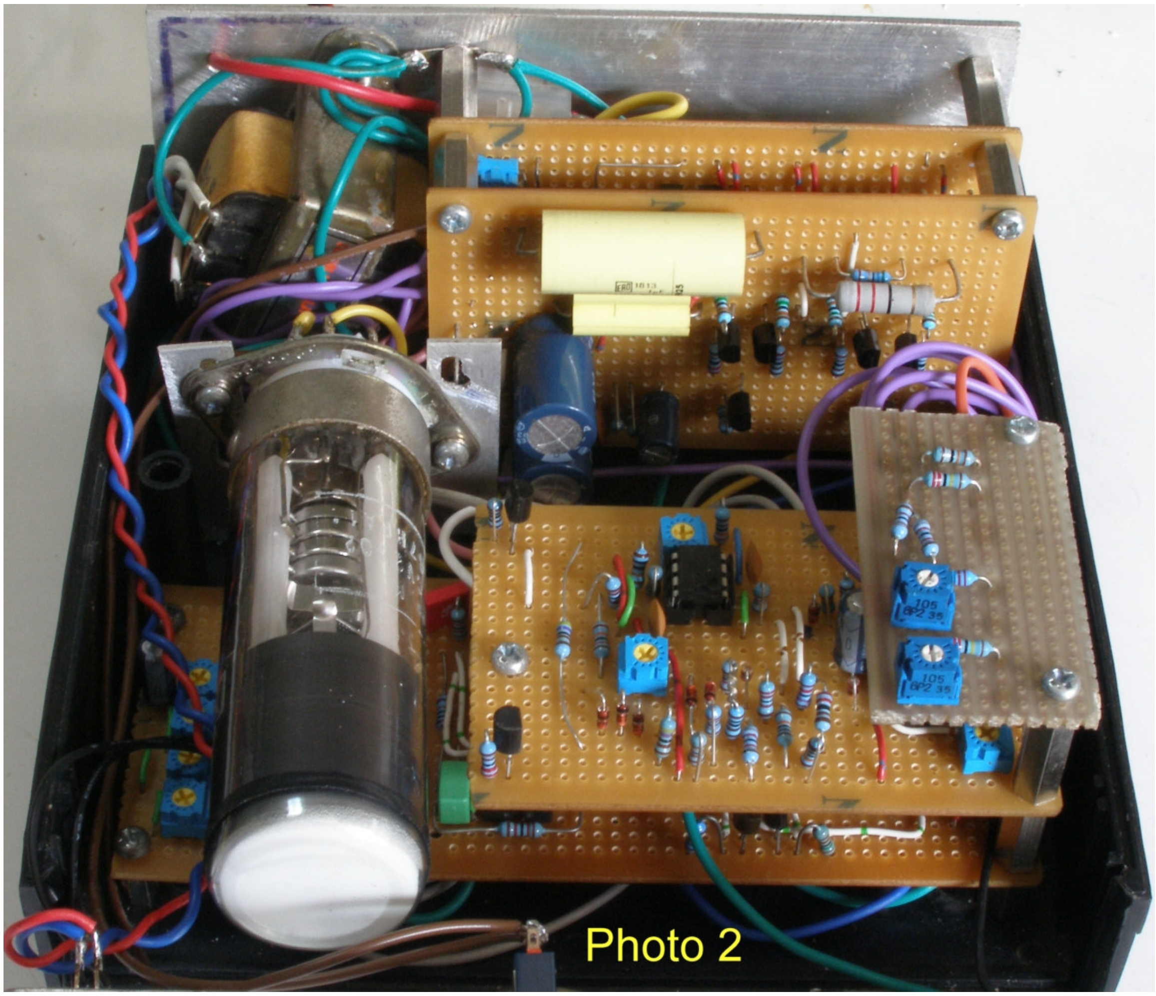


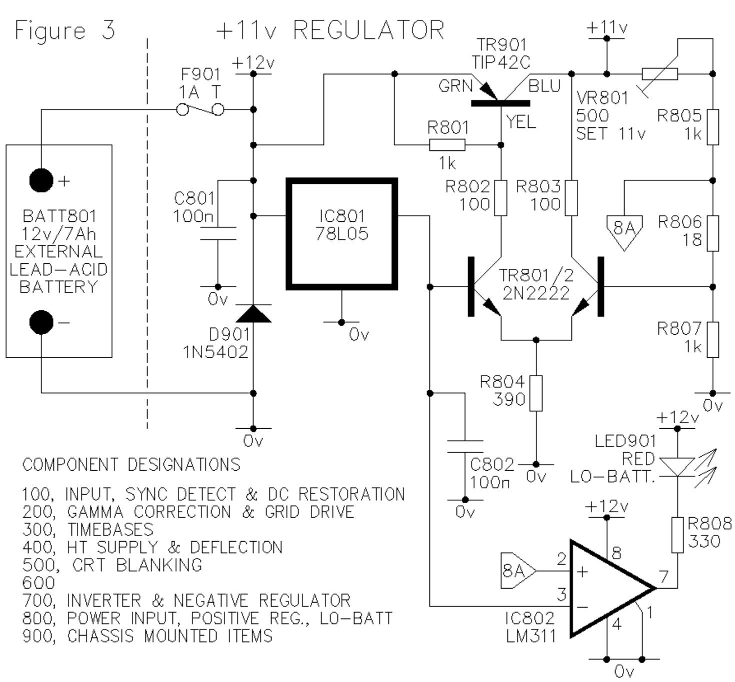
Figure 4

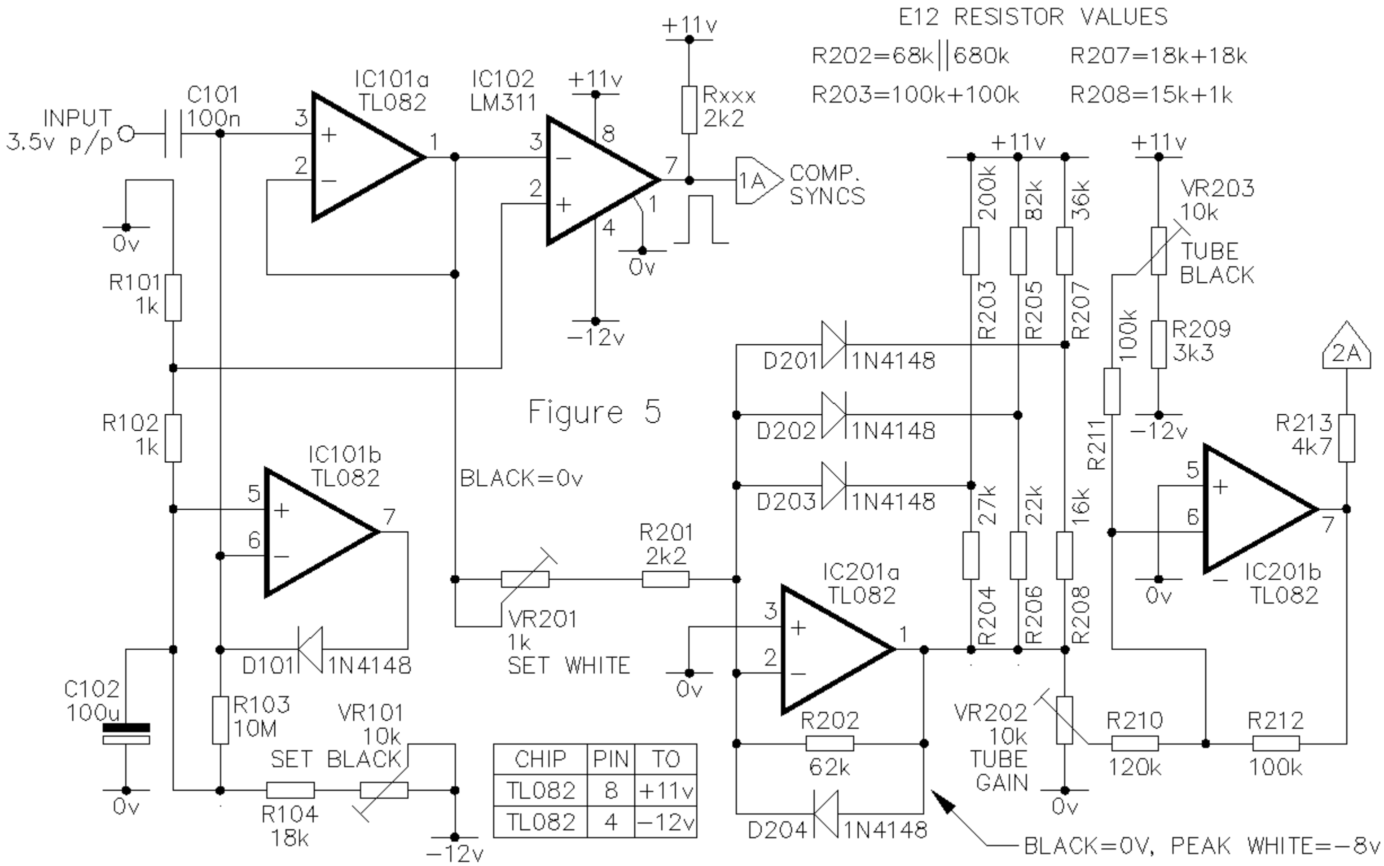
SYNC DIFFERENTIATION, TIMEBASES, DEFLECTION & SYNC PRESENCE DETECTION

CHIP	PIN	TO
TL082	8	+11v
TL082	4	-12v

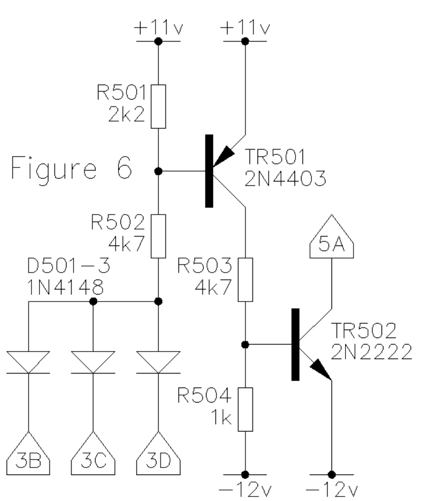


In Photo 2 the rearmost board is the inverter and -12V supply with the transformer to the left of it. In front of that is the HV supply and deflection circuits. At the front the small topmost board is the positioning controls, below that is the DC restoration, sync separation, Gamma correction, grid drive and blanking circuits. The bottom board comprises of the timebases and sync differentiation circuits.





DC RESTORATION, SYNC SEPARATION, GAMMA CORRECTION & CRT GRID DRIVE



CRT BLANKING

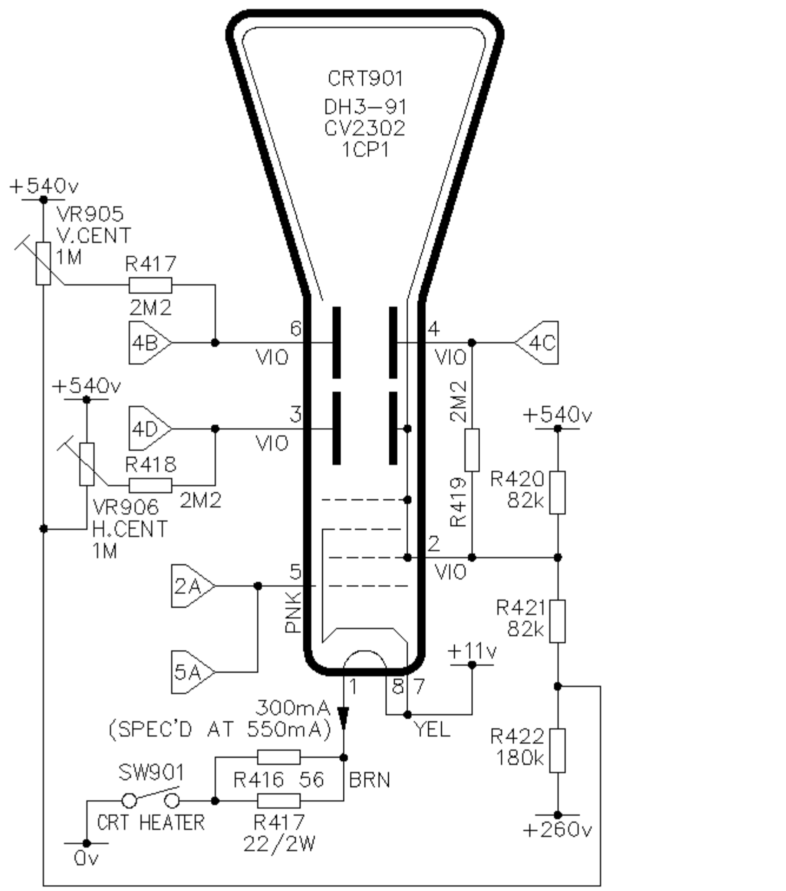


Figure 7 CRT HV CIRCUIT

The Results.

Because the display is only some 10x15mm *and* at quite low light levels *and* green *and* flickering it's very hard to take screenshots. This is about the best I was able to get with my...err…sub-standard camera.

It does look better in real life if you ignore the flicker and the green colour!