CORTEX VIDEO FIX

The Cortex has trouble with its vision systems and Andy Armstrong performs some neat surgery.

Foolishly, perhaps, I offered to do a mod to improve the colour balance on a friend's Cortex. The red was weak and, as a result, there were some colours and backgrounds he didn't use. Fiddling around with the circuitry produced a quick improvement in the colours, but a comprehensive test of the available backgrounds showed that the picture would not lock when bright colours were in use. It bounced continually up and down. Very annoying. On reflection, my friend said it had always done this on one particular video game. And, it turned out, he was not the only one to suffer.

The Sync-ing Feeling

At first I suspected that the UHF modulator was clipping off some of the sync pulse due to non-linearity. Adjusting the bias pot, R37 on the circuit shown (Fig. 1 — which incorporates changes from the original circuit made by kit suppliers Powertran), did not improve matters, however. The next thing I suspected was that I had damaged the sync transistor — Q2, a 2N3906 — so I replaced it. The video now refused to give a locked picture at all!

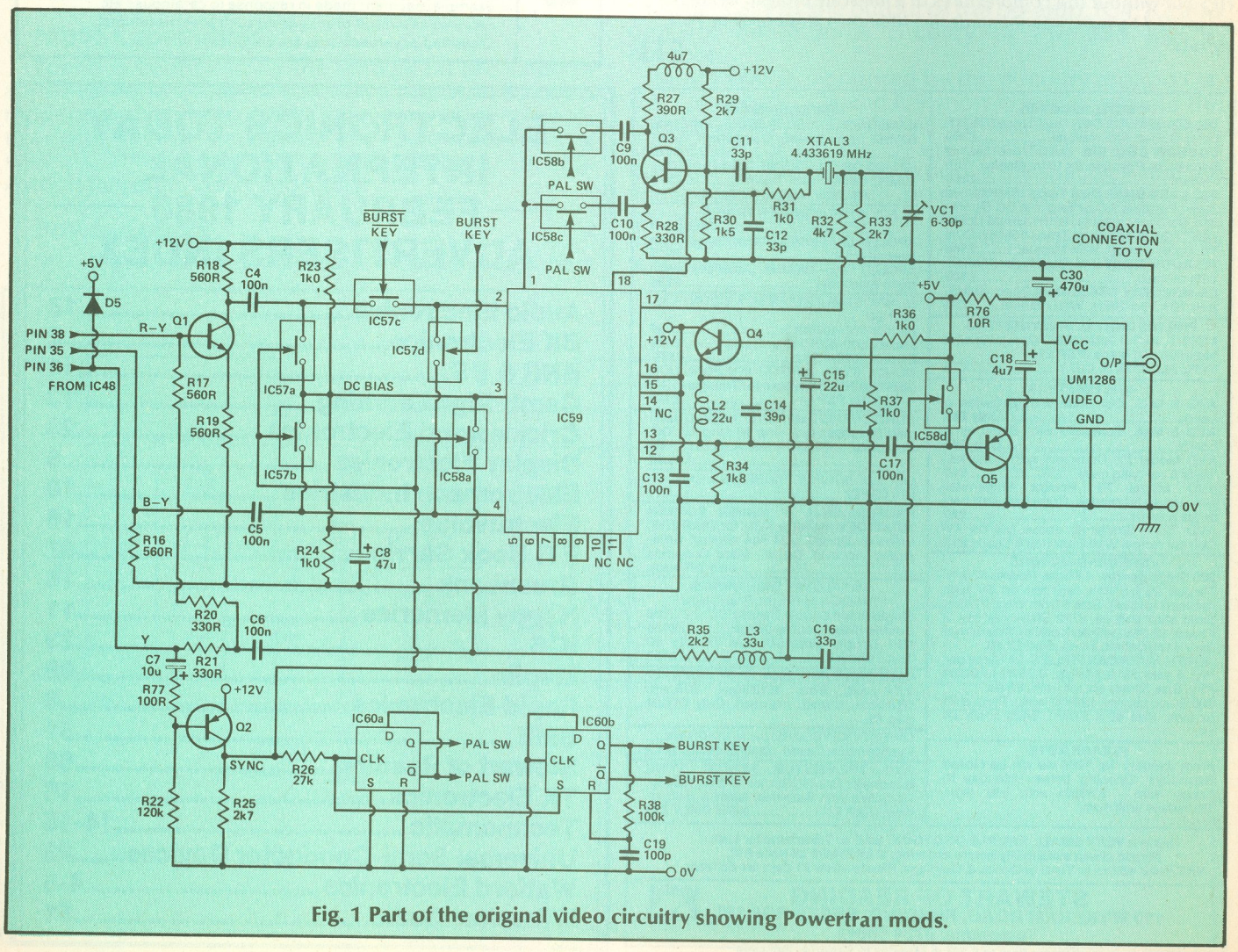

Fig. 1 Part of the original video circuitry showing Powertran mods.

I hadn't got an oscilloscope with me at the time, so the next day — armed with a borrowed 'scope — I set out to discover what was really going on. Tests showed conclusively that the original design was working, partly by luck. The biasing of Q2 was a major part of the problem.

The negative going sync pulse on the Y-signal line from IC48, pin 36, was being heavily loaded by the base-emitter conduction of Q2, which takes place during the sync pulse. This conduction is essential, because the transistor is used to provide a 12V positive going clock pulse when it receives the 0.6V negative going signal on its base. The required base current flow to permit this is only about 400μA, which only needs to occur during the sync pulse. However, because the only DC path to the base of the transistor is via R22, all the charge which enters C7 via R22 during the visible part of the video line must flow into the base of Q2 during the sync pulse.

The current during this period, with the value of R22 given in the original circuit, is much greater than 400μA, and the loading on the Y-signal line during the sync pulse is heavy in consequence.

The first solution I tried is shown in Fig. 2. The pot setting required is affected by the gain of the particular sample of Q2. If an oscilloscope is available, the pot resistance should be increased until the positive going pulse on the collector of Q2 is slightly reduced in amplitude, and then decreased a little bit. If an oscilloscope is not available, then the pot should be adjusted to produce a good picture.

After making this solution work, I wondered about temperature induced drift in the transistor characteristics, and came up with another circuit (Fig. 3). This adjusts the transistor bias according to the amplitude and time of the pulse on the collector of the transistor. The values are chosen to give good performance with an average transistor and to work well with most or all samples. Extreme variations might cause multiple or no clocking of the flip-flop, IC60a, which gives rise to random flashes of colour. The Fig. 3 circuit might be best if an oscilloscope is not available.

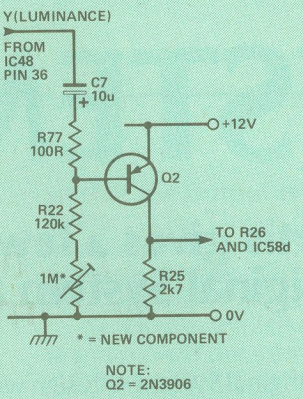

Fig. 2 The fix, part one.

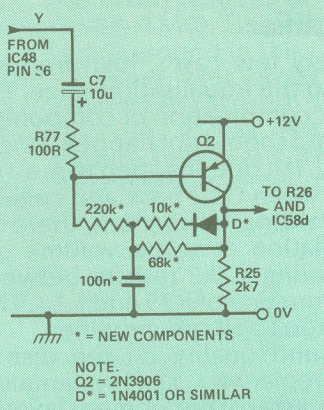

Fig. 3 The fix, part two — overcomes drift and lack of oscilloscope.

Pretty Colours

The remaining problem was to improve the quality of the colours. The circuit of Fig. 4 shows the method used to increase the R-Y gain without upsetting the bias. In order to assess the perfomrance, we used a program which paints colour bars on the screen, and displayed one bar of each colour, with only one pixel between them. It was then easy to adjust the 10k pot, to achieve maximum contrast between the different shades of red and of green.

Postscript

My friend recently showed me copies of a users' magazine, in which several readers had written in with the same problem of vertical jitter on the picture. This decided me to write up the solution. Now, he says that the Cortex performs so well that it should fetch a reasonable second hand price because he wants something bigger and better. (*Is there such a thing? — Ed.*)

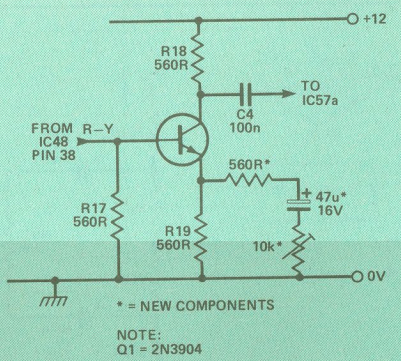

Fig. 4 An added bonus — better colour all round.

The CIRCUIT SOLUTION section is designed to provide original design ideas and solutions more comprehensively than TECH TIPS but without the complexities of a full-scale project. Readers are invited to experiment and design their own stripboard or PCB layouts.