The Serviceman

Just when I thought I knew all the tricks!

My main story this month relates to one of the most frustrating service experiences I have had for a long time. What made it all the more infuriating was that it involved a set which has been around for many years, and about which I blissfully imagined I knew all the tricks.

The set was one of the Decca 33 series, a hybrid model using solid state devices for most functions, but with valves in the heavier duty sections of the line and frame circuits. By and large they have proved very reliable, most of the failures being due to sick valves, which serve to remind us just what a weak link these devices were in the old days of monochrome TV.

The story started with a phone call from the owner to my home early one evening. Since he was as much a friend as a customer, I didn't really mind, provided he didn't expect me to dash around to his home right away. He didn't, as it transpired, but he did have a problem.

It seemed that he wanted to watch a particular program later in the evening, and the picture had suddenly started to roll. As a short term measure he wanted to adjust the vertical hold control in the hope that he could stabilise the picture for a few hours. Longer term he assumed he would have to have the set serviced.

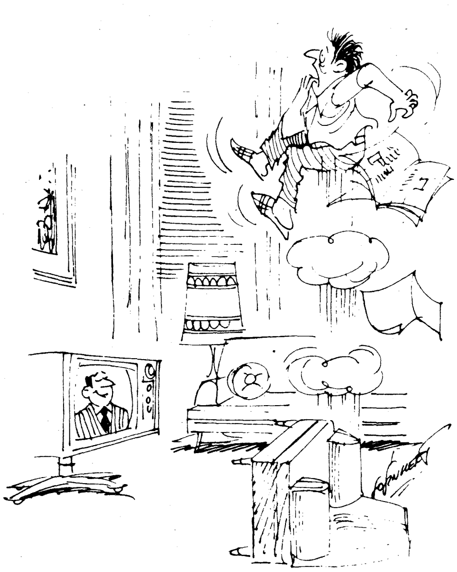
NO VERTICAL HOLD?

But his immediate problem was that he couldn't find the vertical hold control, and had rung me in desperation. Unfortunately I couldn't help him, because there is no such control on this set; a piece of news which he didn't receive too happily.

Fortunately, I was still able to offer some help. It is my experience that most rolling faults in this model tend to be temperature sensitive; most likely to occur after the set has been running for some time as, I gathered, was so in this case. I suggested that he switch set off immediately and let it cool for the next hour or so until his program was scheduled. With luck, it might just work.

And that was the last I heard about the set for the next three weeks. In fact, I had forgotten all about it when the next phone call came along. It seemed that my original trick had worked and, strangely enough, the set had more or less behaved itself ever since, with just an occasional flip. But now it had completely run amok, rolling continuously, whether it was hot or cold.

So I duly called at the house and, for once, the set behaved for me just as it had for the customer; it rolled continuously. This is not an uncommon fault in this set, and is most often due to a sick PL508 valve in the frame output stage. In fact, I had gone in armed with a replacement valve.



"That siren was a test. We wanted to determine whether you were awake and watching our program." (Radio-Electronics.)

It took only a moment to swap the valves and, when the picture came up again, it was rock steady. So that was that. I spent a few minutes making routine adjustments to height, linearity, etc, then began to pack up and prepare to leave. And guess what? No prizes; it rolled again!

Even then I was only mildly concerned. The next most likely culprit was the PCF80, a triode pentode, the triode portion of which is used as one half of a multivibrator circuit, with the PL508 frame output valve as the other half. It is a somewhat unusual arrangement, but one that normally works very well.

So I tried a new PCF80, which made no difference whatsoever. But I was still convinced that it must be a valve problem and fetched another PL508 from the van on the off chance that my replacement might have been faulty. But I was really clutching at straws and, when this effort failed, I realised that I couldn't play valve jockey any more. I also realised that it was no longer a house-call job; it would have to go into hospital – sorry, the workshop.

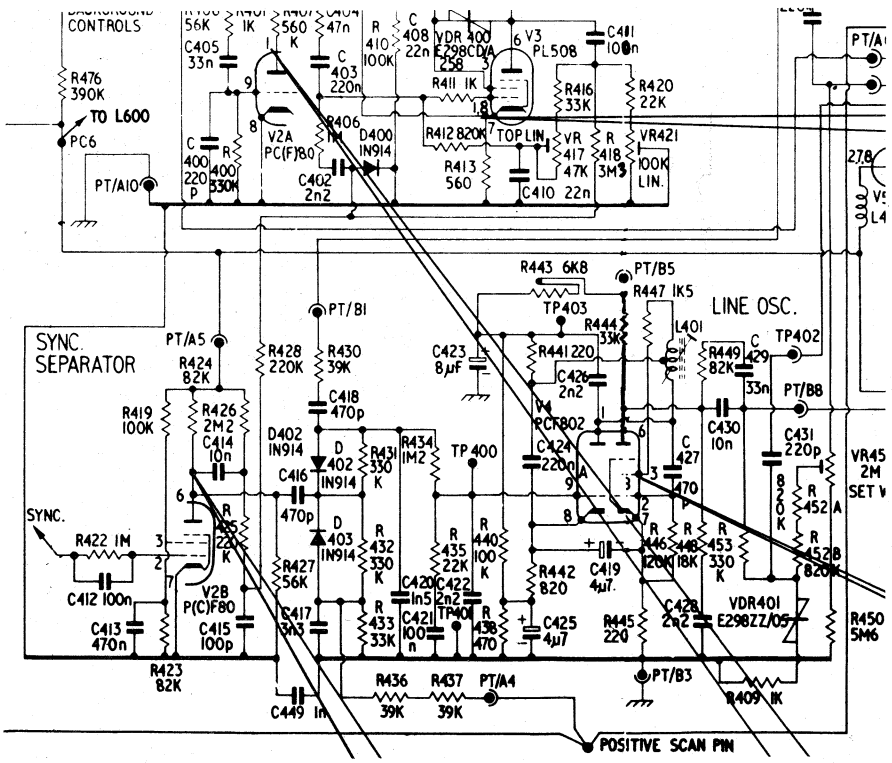
And need I add that, having set it up on the bench, it stubbornly refused to roll? Well, its true, even if you've heard it all before. But not for long. After it had been running for a while it started to roll again, suggesting that my original heat sensitive theory was correct.

At this point I couldn't be sure whether I had a frame oscillator fault, or a sync fault. Since it wasn't either valve in the oscillator circuit, I was tempted to suspect the sync but, on the other hand, there was no suggestion of line sync failure.

OUT WITH THE CRO

I stoked up the CRO and hooked it onto TP (Test Point) 201, the output of the first sync separator stage. Unfortunately, although designated as a test point, the circuit diagram gives no waveform pattern for it. But the pattern I observed was clean enough and appeared to be of reasonable amplitude for that part of the circuit.

From here the sync pulses go to a se-



Frame oscillator and sync separator stages of the Decca 33 receiver. C415 had gone low in value, reducing the amplitude of the sync pulses.

cond sync separator stage, which is the pentode section of the previously mentioned PCF80. As well as providing additional amplification, it is in the output circuit of this stage that the horizontal and vertical pulses are separated and the vertical pulses suitably integrated.

I was just contemplating which part of this circuit to check when the rolling suddenly stopped. This seemed to provide a good opportunity to observe some waveforms while the set was normal, against the next time it failed. Again this circuit falls down rather badly in the matter of waveforms, at least in regard to the ones I wanted.

The only waveform shown is that at the output of the PCF80 pentode, and that is for the line pulses only. The frame pulses cannot be readily observed until they have been integrated by an RC network consisting of a 2.2MΩ resistor (R426), a 220kΩ resistor (R425), a .01μF capacitor (C414), and a 100pF capacitor (C415).

From the junction of R425 and C415 a vertical sync pulse line is taken to the vertical oscillator multivibrator circuit, via a 220kΩ resistor, R428. I checked the waveform on the oscillator side of R428 and observed what appeared to be a classic waveform; the sync pulse was clearly visible, as was the vertical oscillator pulse, the one sitting on top of the other and, firmly locked together.

The next time the picture rolled I checked this and other waveforms again. But I didn't seem to be getting anywhere. Both the frame pulses and the sync pulses appeared to be the same, except that they were no longer locked together. If there were any other differences, they were too subtle for me to see.

On the other hand, the temperature sensitivity of the fault appeared to be fairly consistent, and it seemed likely that the fault might respond to some freezer spray. In particular I suspected the integrating components I have already mentioned, plus R406, C404, and diode D400. As well as being in the vital part of the circuit, they are all mounted quite close to the PCF80 and can absorb heat from it.

THE OLD FREEZER TRICK

So I began a systematic routine of spraying these components whenever the picture rolled. And I seemed to be getting somewhere, because blanket spraying did cure the fault. Then I began to narrow it down, and, eventually, I settled on C402, a 2200pF capacitor. Every time I sprayed it the rolling stopped and held for some time afterwards.

So out it came and in went a new one. And that fixed it. I ran the set for several more days in the workshop, putting it through many hot and cold cycles, and it never missed a beat. So I took it back to the customer, collected my fee, and everyone was happy.

For about 10 days, that is. Then the customer was on the phone complaining, somewhat apologetically, that the picture was rolling again. And, he added, it now seemed to be worse than ever.

I'm afraid that really rocked me. No one likes having a set bounce; it tends to shatter the ego, and it can also shatter one's reputation. Fortunately, this customer knew me well enough to accept the situation, but that didn't alter the fact that a lengthy exercise on my part, and one about which I had felt so confident, had suddenly blown up in my face.

I lost no time in getting the set back into the workshop and setting it up. And it behaved exactly as the owner had said; rolling virtually continuously. In fact, that was the only bright spot in the whole nasty business; the fact that it was no longer intermittent.

To start things rolling I decided to have another go with the freezer spray, hoping against hope that there might have been two temperature sensitive components. But it was a wasted effort, no amount of spraying had any effect at all.

So what now? I hooked the CRO into the junction of C402 and D400 and watched the sync pulse float along the vertical oscillator pulses with absolutely no sign of locking. Otherwise I couldn't detect any difference between the waveform now and when the system was locked.

Then I had another idea. Could it be that the multivibrator's free running speed had drifted, due to component drift, and was now so far off that it wouldn't lock? It was a good thought, the only trouble being that I had no idea just how tolerant this particular circuit was in this regard.

As a first step, I removed the sync pulses by lifting the 220kΩ resistor, R428. Then I went over the multivibrator circuit and checked or replaced every component likely to effect the free running frequency. These included R407 and R408, and C405 and C403. The capacitors were checked on the bridge and found to be OK, so were re-fitted. The two resistors were marginally high, and were replaced, but this had little affect on the frequency.

Then I checked C411, R416 and R412 in the feedback network, even though these would have only a secondary affect on frequency. In fact, these all checked out OK. By now, I felt I had to accept that the multivibrator was probably running within tolerance, and I would have to look elsewhere.

So it was back to the sync pulse. But I was still working blind. Was the amplitude of the pulse at TP201 correct, or was it low? And similarly for the other pulse waveforms. If only I had a good set as a reference. And with that thought came inspiration. One of my customers did have such a set, and I had serviced it only a couple of months previously. With a little guile I could make use of it.

So I loaded the CRO into the van, drove to the customer's home and, on the pretext of giving the set a (free) routine check after service, I gained access to the chassis. (No doubt the customer was surprised that I was being so conscientious, but it didn't harm my image.)

The first thing I checked was the waveform at TP201, and this was exactly the same shape and amplitude as on the faulty set; no problem there. The same thing applied at the grid of the sync separator valve, but it was a different story at the junction of C402 and D400, even though the difference was somewhat subtle without being able to make a side-by-side comparison.

The truth is I couldn't be quite sure what the differences were right then. All I could do was take very careful note of the waveform, then hurry back to the workshop while it was still fresh in my mind. (What a way to make a living!)

DIFFERENT WAVEFORMS

When I looked at these waveforms there was no doubt in my mind; two differences were immediately obvious. One was the amplitude of the sync pulse, which was only about 10V p-p on the faulty set, as against 20V on the good set. The other was more subtle, but involved the outline of the frame pulse which could only be described as "mushy" in the faulty set, as against a clean outline on the good set.

I eventually established that this "mushiness" was really a pattern of line sync pulses which, somehow, were getting mixed up with the frame pulses. Just how much this was contributing to the fault I'm not sure, but it clearly indicated something wrong.

But I still had to find the cause. There seemed little doubt that it must be somewhere in the pentode sync separator stage, but I had already checked or replaced most of the components in this section, quite early in the exercise. These included R426 and R425, which had been replaced, and C415 (100pF) which had been checked on the bridge. It had checked out OK and been refitted.

But it had to be something. So there was nothing for it but to go over these components again, replacing them all if necessary, until the faulty one was found. It so happened that the first one I chose was C415, which I pulled out and replaced.

And suddenly everything was back to normal. The pulse amplitude jumped to 20V, the "mush" disappeared, and, most importantly, the picture stopped rolling. But why? I had already checked that capacitor and could find nothing wrong with it. What had I missed?

I put it on the bridge again and there was the answer. Whereas it had previously measured something like 105pF it was now down to 40pF. What was more, nothing I could do would change that value. I heated it, cooled it, even bashed it, but it stuck stubbornly at 40pF.

In the days that followed, I checked that capacitor many times, and not once did it have the same value; 50pF, 100pF, 63pF, and so on. And, regardless of the value it elected to assume for the day, nothing could change it from that value. Why? You tell me and we'll both know.

As far as the set was concerned, I gave it a good workout over the next several days then, with my fingers crossed, took it back to the customer. That was several weeks ago, and my most recent check back, a few days ago, confirmed that it hasn't missed a beat.

Which is all very gratifying to the ego, but not much help in balancing the books. The second half of the exercise took up a lot of time, but there was no way I could charge for it. Even if the first component I replaced (C402) was genuinely faulty, as I suspect it was, it was playing only a minor part in the overall problem. So, in simple terms, the real fault had not been found when I took the set back the first time and charged the customer.

Which is all part of the service game. You have to take the rough with the smooth. When I'm tempted to gnash my teeth over a job like this I try to recall all the walk-in, walk-out, all-over-in-10 minutes jobs I've had, and which help to offset it.

To change the subject, here is a story from a New Zealand reader, Mr R. N. of Wellington. Mr R. N. makes some nice remarks about this column, and insists that it is always the first thing he reads in the magazine. Then he goes on to describe a strange fault he encountered in an old valve type radio. This is how he tells it.

OLD VALVE RECEIVER

This concerns a Philips BC/SW radio type 596, with a valve line-up of EF39, ECH35, ECB33, and push-pull EL33s in the output — a beautiful receiver capable of superlative performance when working properly. The set belonged to a neighbour, who had had it in storage for many years, and decided to resurrect it.

He found it to be working, except for a loud howl when tuned to a station at about 560kHz. Knowing my interest in old sets he asked whether I could fix it and, being intrigued, I agreed. I remarked that, considering its time in storage, and the likely effect on the electrolytics, he was lucky to get away with only a howl.

I soon determined that the howl was due to a spurious signal beating with the set's own local oscillator. The spurious signal was being generated somewhere within the set, but the question was, where? I thought of decoupling and earthing faults, but I also observed that literally everything I touched in the set, including the chassis, caused a slight shift in frequency.

I checked all the earths for dry joints and found none. I checked all the decoupling capacitors for open circuits and found none of these either. I then tried disconnecting the HT from various parts of the set to see what stopped the oscillation, and found that removing the voltage from the output stage screens seemed to stop it.

This was somewhat inconclusive as, with the stage disabled, I needed an oscilloscope to confirm the cure. And, anyway, why should an output stage produce a 500kHz signal and still work correctly?

Little did I know!

I was beginning to despair by now, and was reduced to proding, poking, and knob twisting in the hope that I might stumble on a clue. Not very professional, I agree, but this time it paid off. I found that I could shift the oscillation frequency slightly with the audio tone control, a simple R/C network on the output stage.

Thus encouraged, I made a very careful check of all components in this section and, in the process, I moved one of the output valves in its socket. Lo and behold, the oscillation ceased, and I was unable to restore it. Closer inspection showed that the grid pin of the EL33 was corroded and that moving it had cleared the condition. For some reason, this had caused the valve to oscillate.

A COMMON PROBLEM

Thank you, R. N. for an interesting story. The truth is that these valves, and their ancestors, the EL3, were notorious for their tendency to spurious oscillation. Excellent performers though they were, their high gain made them very critical, and called for very careful circuit design.

Not that they were the only output valves that could oscillate. Many years ago the story was told about a serious interference problem experienced at Sydney Airport, not long after the first VHF aircraft-to-ground circuits were established after the war. The interference took the form of broadcast signals appearing on the channel for long periods and followed a fairly regular pattern.

Naturally the authorities were horrified, and lost no time in getting their DF equipment to work and tracking down the source. It turned out to be an ordinary pre-war vintage domestic radio set, close by the airport which used (I think) a type 42 valve in the output. It was oscillating, at the aeronautical frequency, the signal being modulated by the local broadcast program, as selected by the owner.

Even more intriguing was the reason for the frequency it had elected to generate. Investigation showed that the speaker cable was just one quarter wavelength long at that frequency, and had been acting as a tuned line to set the frequency and, no doubt, as a quite effective antenna into the bargain.

So take heart, R. N., you're not the only one who has been caught.